Palladium Catalyzed Synthesis of *N*-Vinyl Pyrroles and Indoles

Mohammad Movassaghi* and Alison E. Ondrus
Massachusetts Institute of Technology, Department of Chemistry, Massachusetts 02139

Supporting Information

Contents:

General Procedures. All reactions were performed in oven-dried or flame-dried round bottomed flasks or modified Schlenk (Kjeldahl shape) flasks. The flasks were fitted with rubber septa and reactions were conducted under a positive pressure of argon. Stainless steel syringes or cannulae were used to transfer air- and moisture-sensitive liquids. Flash column chromatography was performed as described by Still et al. using silica gel (60-Å pore size, 32–63 μm, standard grade) or non-activated alumina gel (80–325 mesh, chromatographic grade).[1] Analytical thin–layer chromatography was performed using glass plates pre-coated with 0.25 mm 230–400 mesh silica gel or neutral alumina gel impregnated with a fluorescent indicator (254 nm). Thin layer chromatography plates were visualized by exposure to ultraviolet light and/or by exposure to an ethanolic phosphomolybdic acid (PMA), an acidic solution of *p*-anisaldehyde (anis), an aqueous solution of ceric ammonium molybdate (CAM), an aqueous solution of potassium permanganate ($KMnO_4$) or an ethanolic solution of ninhydrin followed by heating (<1 min) on a hot plate (~250 °C). Organic solutions were concentrated on a rotary evaporators at ~20 Torr (house vacuum) at 25–35 °C, then at ~1 Torr (vacuum pump) unless otherwise indicated.

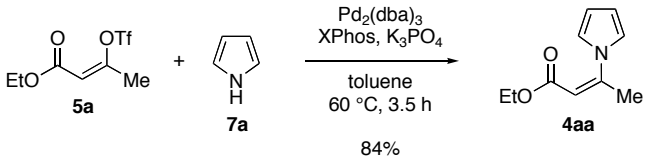
Materials. Commercial reagents and solvents were used as received with the following exceptions: Dichloromethane, diethyl ether, tetrahydrofuran, acetonitrile, and toluene were purified by the method of Grubbs et al. under positive argon pressure,[2] 1,4-dioxane was distilled from sodium hydride. Potassium phosphate was dried at 180 ºC under vacuum (~1 torr) for 24 h then stored in a

[1] Still, W. C.; Kahn, M.; Mitra, A. *J. Org. Chem.* **1978**, *43*, 2923–2925.
[2] Pangborn, A. B.; Giardello, M. A.; Grubbs, R. H.; Rosen, R. K.; Timmers, F. J. *Organometallics* **1996**, *15*, 1518–1520.

glove box. Sodium hydride was purchased as a 60% dispersion in oil and then washed four times with hexanes and stored dry in a glove box. The molarity of *n*-butyllithium solutions was determined by titration using diphenylacetic acid as an indicator (average of three determinations).[3] Vinyl triflates used in this study were prepared according to literature procedures as noted below. Pyrrole was distilled from calcium hydride and stored at –10 ºC in the dark. Commercially available azaheterocycles and XPhos were purchased and used as received.

Instrumentation. Proton nuclear magnetic resonance (^{1}H NMR) spectra were recorded on a 500 MHz spectrometer. Chemical shifts are recorded in parts per million from internal tetramethylsilane on the δ scale and are referenced from the residual protium in the NMR solvent ($CHCl_3$: δ 7.27, C_6H_6: δ7.16). Data is reported as follows: chemical shift [multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constant(s) in Hertz, integration, assignment]. Carbon-13 nuclear magnetic resonance spectra were recorded on a 500 MHz spectrometer and are recorded in parts per million from internal tetramethylsilane on the δ scale and are referenced from the carbon resonances of the solvent ($CDCl_3$: δ 77.2, benzene-d_6: δ 128.0). Data is reported as follows: chemical shift [multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constant(s) in Hertz, assignment]. Infrared data were on a FT-IR and are reported as follows: [frequency of absorption (cm^{-1}), intensity of absorption (s = strong, m = medium, w = weak, br = broad), assignment]. Gas chromatograpy was performed on a HP-5 5% Phenyl Methyl Siloxane column.

[3] Kofron, W. G.; Baclawski, L. M. *J. Org. Chem.* **1976**, *41*, 1879–1880.

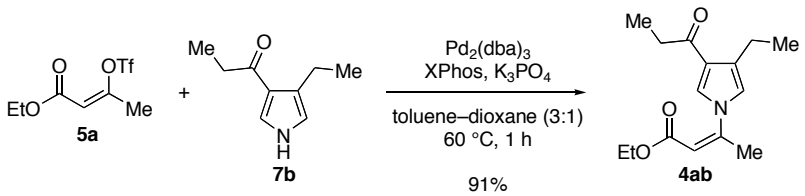


Z-3-Pyrrol-1-yl-but-2-enoic acid ethyl ester (4aa, Table 1, entry 1):

Toluene (1.90 mL) was added to an argon–purged sample of $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask. Pyrrole (**7a**, 40.0 μL, 572 μmol, 1.50 equiv) was then added and the deep red mixture was heated to 60 °C. After 30 min, triflate **5a**[4] (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to forest green within approximately 10 min then to brown within an additional 1h. After 3.5h TLC analysis indicated that the reaction was complete, whereupon the mixture was allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with an additional 15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to give a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 22 cm; 60% EtOAc–hexanes) afforded the vinyl pyrrole **4aa**[5] (57.1 mg, 84%) as a yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	6.90 (app t, J = 2.2 Hz, 2H), 6.23 (app-t, J = 2.2 Hz, 2H), 5.52 (q, J = 1.2 Hz, 1H), 4.10 (q, J = 7.1 Hz, 2H), 2.26 (d, J = 1.3 Hz, 3H), 1.20 (t, J = 7.1 Hz, 3H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	165.2, 147.7, 121.4, 110.1, 107.6, 60.5, 24.5, 14.4.
FTIR (neat):	2982 (w, C–H), 1718 (s, C=O), 1641 (s, C=C), 1481, 1182, 1051.
HRMS–ESI (*m/z*):	calcd for $C_{10}H_{13}NO_2Na$ $[M + Na]^+$: 202.0838, found: 202.0839
TLC (7.5% EtOAc–hexanes), *Rf*:	0.15 (UV, anis)

[4] For the general procedure used to prepare the vinyl triflate **5a**, see: Kim, H.-O.; Ogbu, C. O.; Nelson, S.; Kahn, M. *Synlett* **1998**, 1059–1060.
[5] For an alternate synthesis of **4aa**, see: Rainka, M. P.; Aye, Y.; Buchwald, S. L. *Proc. Nat. Acad. Sci., USA* **2004**, *101*, 5821–5823.

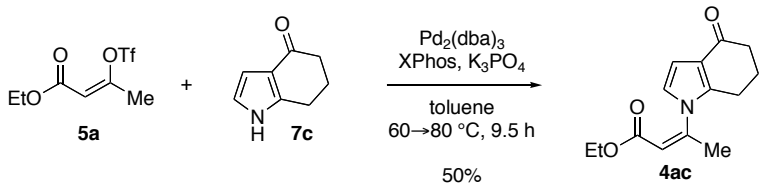


_Z_-3-(3-Ethyl-4-propionyl-pyrrol-1-yl)-but-2-enoic acid ethyl ester (4ab, Table 1, entry 3):

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of acyl pyrrole **7b**[6] (86.5 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5a** (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to brown within approximately 1 min. After 1h, GC analysis indicated that the reaction was complete, whereupon the mixture was allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with a15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to yield a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 18 cm, 20% EtOAc–hexanes) gave the vinyl pyrrole **4ab** (91.2 mg, 91%) as a yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.53 (d, *J* = 2.3 Hz, 1H), 6.60 (dt, *J* = 2.3, 1.2 Hz, 1H), 5.64 (q, *J* = 1.2 Hz, 1H), 4.13 (q, *J* = 7.1 Hz, 2H), 2.78 (qd, *J* = 7.3, 1.2 Hz, 2H), 2.75 (q, *J* = 7.3, 2H), 2.29 (d, *J* = 1.2 Hz, 3H), 1.22 (t, *J* = 7.1 Hz, 3H), 1.19 (t, *J* = 7.3 Hz, 3H), 1.17 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	197.3, 164.7, 146.9, 129.3, 128.0, 123.8, 119.4, 109.8, 60.7, 33.2, 24.3, 20.2, 14.4, 14.3, 8.8.
FTIR (neat):	2971 (m, C–H), 1705 (m, C=O), 1662 (s, C=O), 1518, 1189, 1047.
HRMS–ESI (*m/z*):	calcd for $C_{15}H_{21}NO_3Na$ $[M + Na]^+$: 286.1414, found: 286.1417
TLC (40% EtOAc–hexanes), *Rf*:	0.42 (UV, anis)

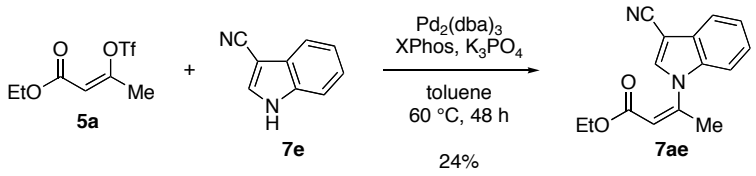
[6] For the synthesis of pyrroles using tosylmethylisocyanide, see: (a) van Leusen, A. M.; Siderius, H.; Hoogenboom, B. E.; van Leusen, D. *Tetrahedron Lett.* **1972**, *52*, 5337–5340 and (b) Chamberlin, K. S.; LeGoff, E. *Heterocycles* **1979**, *12*, 1567–1570.



Z-3-(4-Oxo-4,5,6,7-tetrahydro-indol-1-yl)-but-2-enoic acid ethyl ester (4ac, Table 1, entry 7):

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of 1,5,6,7-tetrahydro-4*H*-indol-4-one (**7c**, 77.3 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5a** (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to forest green within approximately 1 min. After 2.5 h, the temperature was increased to 80 °C and the green–brown mixture stirred for 7h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with an additional 15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to give a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 22 cm; 60% EtOAc–hexanes) afforded the vinyl indolone **4ac** (47.3 mg, 50%) as a white solid.

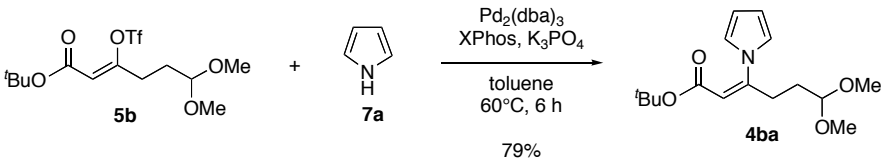
^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	6.65 (d, *J* = 1.2 Hz, 1H), 6.55 (d, *J* = 1.2 Hz, 1H), 6.01 (q, *J* = 1.2 Hz, 1H), 4.04 (q, *J* = 7.1 Hz, 2H), 2.63 (t, *J* = 6.2 Hz, 2H), 2.48 (app t, *J* = 6.2 Hz, 2H), 2.21 (d, *J* = 1.3 Hz, 3H), 2.12 (pentet, *J* = 6.2 Hz, 2H), 1.12 (t, *J* = 7.1 Hz, 3H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	194.7, 163.7, 147.0, 143.9, 121.6, 121.2, 118.1, 106.9, 60.9, 38.1, 24.9, 24.1, 22.4, 14.2.
FTIR (neat):	2944 (m, C–H), 1722 (s, C=O), 1659 (s, C=O), 1464, 1048.
HRMS–ESI (*m/z*):	calcd for $C_{14}H_{17}NO_3Na$ $[M + Na]^+$: 270.1101, found: 270.1102
TLC (60% EtOAc–hexanes), *Rf*:	0.29 (UV, anis)



_Z_-3-(3-Cyano-indol-1-yl)-but-2-enoic acid ethyl ester (4ae, Table 1, entry 8):

Toluene (1.90 mL) was added to an argon–purged sample of 3-cyanoindole (**7e**, 81.3 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5a** (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to olive green within approximately 3 min. After 48 h, GC analysis indicated that the reaction was no longer proceeding at an appreciable rate. The mixture was then allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with an additional 15-mL portion of EtOAc and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to an orange residue. Analysis of the crude product mixture by ^{1}H NMR revealed the presence of unreacted starting triflate **5a**, product **7ae**, and ethyl but-2-ynoate (**5a**:**7ae**:**9a** = 30:17:5). Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 22 cm; 20% EtOAc–hexanes) provided the vinyl indole **7ae** (23.0 mg, 24%) as an off–white solid.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.78 (dd, *J* = 6.6, 1.5 Hz, 1H), 7.63 (s, 1H), 7.29–7.36 (m, 3H), 6.15 (q, *J* = 1.2 Hz, 1H), 3.90 (q, *J* = 7.1 Hz, 2H), 2.36 (d, *J* = 1.2 Hz, 3H), 0.90 (t, *J* = 7.1 Hz, 3H).
^{13}C NMR (125.8 MHz, $CDCl_3$, 20°C):	163.9, 146.1, 135.6, 134.6, 129.0, 128.1, 125.2, 123.4, 120.7, 118.8, 116.0, 112.1, 61.4, 24.5, 14.4.
FTIR (neat):	2983 (w, C–H), 2222 (s, C≡N), 1720 (s, C=O), 1660, 1535, 1217.
HRMS–ESI (*m/z*):	calcd for $C_{15}H_{14}N_2O_2Na$ $[M + Na]^+$: 277.0947, found: 277.0950
TLC (35% EtOAc–hexanes), *Rf*:	0.33 (UV, CAM)

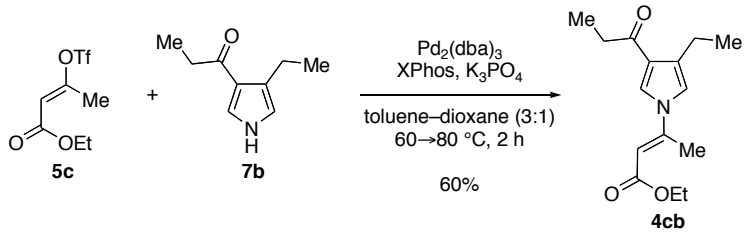


Z-3-(3-Ethyl-4-propionyl-pyrrol-1-yl)-but-2-enoic acid ethyl ester (4ba, equation 2):

Toluene (1.90 mL) was added to an argon–purged sample of $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.05 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask. Pyrrole (**7a**, 40.0 μL, 572 μmol, 1.50 equiv) was then added via syringe and the deep red mixture was heated to 60 °C. After 30 min, triflate **5b**[7] (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to brown within approximately 10 min. After 6h, GC analysis indicated that the reaction was complete, whereupon the mixture was allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with a15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to yield a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 2.0 cm, ht. 17 cm, 5% EtOAc–CH_2Cl_2) gave the vinyl pyrrole **4ba** (89.1 mg, 79%) as a yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	6.73 (app t, *J* = 2.2 Hz, 2H), 6.22 (app t, *J* = 2.2 Hz, 2H), 5.55 (s, 1H), 4.28 (t, *J* = 5.5 Hz, 1H), 3.27 (s, 6H), 2.53 (t, *J* = 7.8 Hz, 2H), 1.64 (dt, *J* = 7.8, 5.5 Hz, 2H), 1.37 (s, 9H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	164.6, 150.1, 121.1, 112.0, 109.9, 103.6, 81.0, 53.3, 32.5, 30.1, 28.1.
FTIR (neat):	2978 (m, C–H), 1704 (m, C=O), 1645 (m, C=C), 1482, 1367, 1154.
HRMS–ESI (*m/z*):	calcd for $C_{16}H_{25}NO_4Na$ $[M + Na]^+$: 318.1676, found: 318.1674
TLC (20% EtOAc–hexanes), *Rf*:	0.34 (UV, anis)

[7] For general procedures used to prepare the vinyl triflate **5b**, see: Comins, D. L.; Dehghani, A. *Tetrahedron Lett*. **1992**, *33*, 6299–6302 and Kim, H.-O.; Ogbu, C. O.; Nelson, S.; Kahn, M. *Synlett* **1998**, 1059–1060.

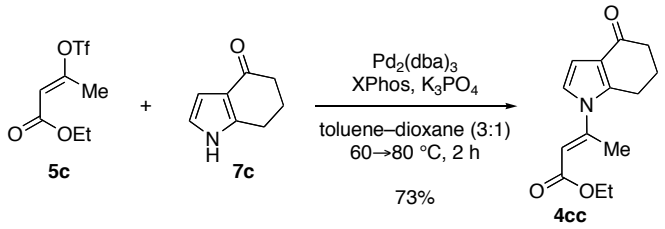


***E*-3-(3-Ethyl-4-propionyl-pyrrol-1-yl)-but-2-enoic acid ethyl ester (4cb, Table 1, entry 12):**

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of acyl pyrrole **7b** (86.5 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5c**[8] (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to brown within approximately 5 min. After 30 min, the temperature was increased to 80 °C and the brown mixture stirred for 1.5 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with a 15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to give a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 24 cm; 20% EtOAc–hexanes) afforded the vinyl pyrrole **4cb** (59.8 mg, 60%) as a yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.56 (d, *J* = 2.3 Hz, 1H), 6.84 (dt, *J* = 2.3, 1.3 Hz, 1H), 5.97 (q, *J* = 0.9 Hz, 1H), 4.22 (q, *J* = 7.1 Hz, 2H), 2.78 (qd, *J* = 7.4, 1.3 Hz, 2H), 2.78 (q, *J* = 7.3, 2H), 2.70 (d, *J* = 0.9 Hz, 3H), 1.32 (t, *J* = 7.1 Hz, 3H), 1.20 (t, *J* = 7.4 Hz, 3H), 1.18 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (125.8 MHz, $CDCl_3$, 20°C):	197.9, 167.2, 150.7, 131.4, 125.8, 124.7, 117.8, 105.9, 60.9, 33.7, 20.7, 16.7, 15.0, 14.7, 9.2.
FTIR (neat):	2976 (m, C–H), 1713 (s, C=O), 1640 (s, C=O), 1516, 1409, 1154.
HRMS–EI (*m/z*):	calcd for $C_{15}H_{21}NO_3Na$ $[M + Na]^+$: 286.1414, found: 286.1419
TLC (25% EtOAc–hexanes), *Rf*:	0.39 (UV, anis)

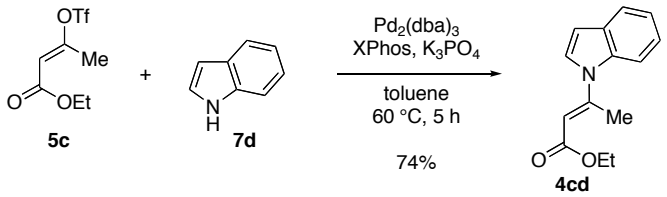
[8] For the synthesis of *Z*-vinyl triflate **5c**, see: Ohba, M.; Kawase, N.; Fujii, T. *J. Am. Chem. Soc.* **1996**, *118*, 8250–8257.



***E*-3-(4-Oxo-4,5,6,7-tetrahydro-indol-1-yl)-but-2-enoic acid ethyl ester (4cc, Table 1, entry 14):**

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of 1,5,6,7-tetrahydro-4*H*-indol-4-one (**7c**, 77.3 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5c** (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to forest green within approximately 5 min. After 30 min, the temperature was increased to 80 °C and the brown mixture stirred for 1.5 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23°C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with a 15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated to a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 25 cm; 60% EtOAc–hexanes) gave the vinyl indolone **4cc** (68.7 mg, 73%) as a yellow oil.

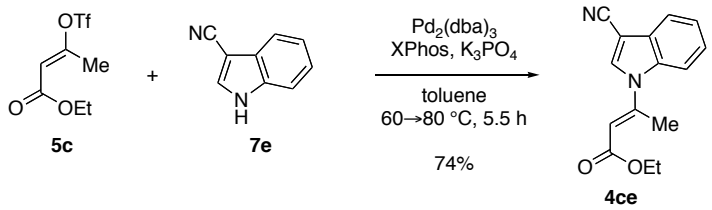
^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	6.76 (d, *J* = 3.3 Hz, 1H), 6.64 (d, *J* = 3.3 Hz, 1H), 5.81 (q, *J* = 1.1 Hz, 1H), 4.32 (q, *J* = 7.2 Hz, 2H), 2.87 (t, *J* = 6.2 Hz, 2H), 2.62 (d, *J* = 1.1 Hz, 3H), 2.51 (app t, *J* = 6.2 Hz, 2H), 2.15 (pentet, *J* = 6.2 Hz, 2H), 1.32 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (125.8 MHz, $CDCl_3$, 20°C):	195.3, 166.5, 151.1, 143.4, 129.0, 123.6, 122.0, 114.8, 107.9, 61.2, 38.4, 24.8, 19.7, 15.0.
FTIR (neat):	2943 (w, C–H), 1712 (s, C=O), 1659 (s, C=O), 1461, 1158.
HRMS–ESI (*m/z*):	calcd for $C_{14}H_{17}NO_3Na$ $[M + Na]^+$: 270.1101, found: 270.1106
TLC (65% EtOAc–hexanes), *Rf*:	0.38 (UV, anis)



***E*-3-Indol-1-yl-but-2-enoic acid ethyl ester (4cd, Table 1, entry 15):**

Toluene (1.90 mL) was added to an argon–purged sample of indole (**7d**, 67.0 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5c** (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to brown within approximately 5 min. After 5h at 60ºC GC analysis indicated that the reaction was complete, whereupon the mixture was allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with a 15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to give a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 2.0 cm, ht. 24 cm; 3.5→7.5% EtOAc–hexanes) afforded the vinyl indole **4cd** (65.3 mg, 74%) as a colorless oil.

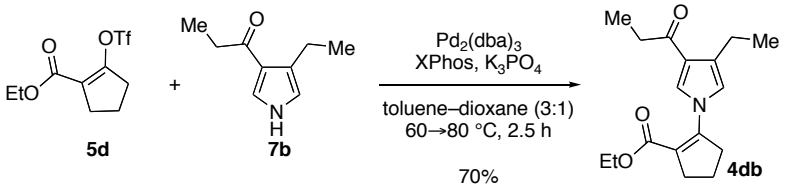
^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.70 (dq, *J* = 8.4, 0.8 Hz, 1H), 7.62 (dt, *J* = 7.6, 0.8 Hz, 1H), 7.29 (d, *J* = 3.4, 1H), 7.27 (ddd, *J* = 8.4, 7.1, 0.8 Hz, 1H), 7.18 (ddd, *J* = 7.6, 7.1, 0.8 Hz, 1H), 6.64 (dd, *J* = 3.4, 0.8 Hz, 1H), 6.12 (q, *J* = 0.8 Hz, 1H), 4.23 (q, *J* = 7.1 Hz, 2H), 2.78 (d, *J* = 0.8 Hz, 3H), 1.32 (t, *J* = 7.1 Hz, 3H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	167.3, 151.7, 135.4, 130.6, 126.2, 123.4, 121.7, 121.7, 112.9, 109.1, 105.9, 60.3, 19.0, 14.6.
FTIR (neat):	2980 (s, C–H), 1710 (s, C=O), 1633 (s, C=C), 1454, 1151.
HRMS–EI (*m/z*):	calcd for $C_{14}H_{15}NO_2Na$ $[M + Na]^+$: 252.0995, found: 252.1003
TLC (7.5% EtOAc–hexanes), *Rf*:	0.29 (UV, anis)



***E*-3-(3-Cyano-indol-1-yl)-but-2-enoic acid ethyl ester (4ce, Table 1, entry 16):**

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of 3-cyanoindole (**7e**, 81.3 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5c** (100 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to forest green within approximately 5 min. After 2.5 h, the temperature was increased to 80 °C and the brown mixture stirred for an additional 3 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite-plug and flask were rinsed with a 15mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to provide an orange residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 24 cm; 20% EtOAc–hexanes) gave the vinyl indole **4ce** (71.9 mg, 74%) as an off–white solid.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.79 (dd, *J* = 8.2, 1.1 Hz, 1H), 7.78 (s, 1H), 7.67 (dd, *J* = 8.4, 0.9 Hz, 1H), 7.41 (ddd, *J* = 8.4, 7.1, 1.1 Hz, 1H), 7.37 (ddd, *J* = 8.2, 7.1, 0.9 Hz, 1H), 6.19 (q, *J* = 0.9 Hz, 1H), 4.28 (q, *J* = 7.2 Hz, 2H), 2.77 (d, *J* = 0.9 Hz, 3H), 1.35 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (125.8 MHz, $CDCl_3$, 20°C):	166.5, 150.1, 135.2, 133.5, 129.0, 125.8, 124.2, 121.0, 115.5, 114.6, 113.5, 90.6, 61.4, 19.5, 15.0.
FTIR (neat):	2983 (w, C–H), 2225 (s, C≡N), 1717 (s, C=O), 1644, 1551, 1182.
HRMS–ESI (*m/z*):	calcd for $C_{15}H_{14}N_2O_2Na$ $[M + Na]^+$: 277.0947, found: 277.0951
TLC (25% EtOAc–hexanes), *Rf*:	0.37 (UV, CAM)

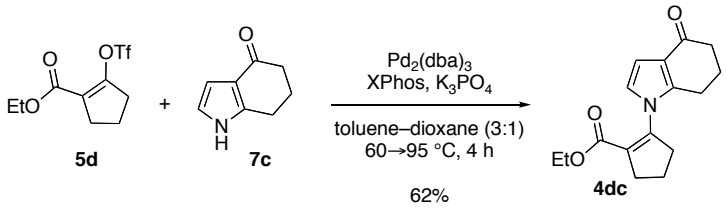


2-(3-Ethyl-4-propionyl-pyrrol-1-yl)-cyclopent-1-enecarboxylic acid ethyl ester (4db, Table 1, entry 18):

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of acyl pyrrole **7b** (86.5 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5d**[9] (110 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to brown within approximately 5 min. After 30 min, the temperature was increased to 80 °C and the brown mixture stirred for 2 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite–plug and flask were rinsed with an additional 15-mL portion of EtOAc, then the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to give a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 24 cm; 17.5→20% EtOAc–hexanes) provided the vinyl pyrrole **4db** (77.3 mg, 70%) as a yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.84 (d, *J* = 2.3 Hz, 1H), 6.77 (dt, *J* = 2.3, 1.1 Hz, 1H), 4.21 (q, *J* = 7.2 Hz, 2H), 2.93 (app tt, *J* = 7.6, 2.1 Hz, 2H), 2.84 (app tt, *J* = 7.6, 2.1 Hz, 2H), 2.78 (qd, *J* = 7.4, 1.1 Hz, 2H), 2.77 (q, *J* = 7.3, 2H), 1.99 (pentet, *J* = 7.6 Hz, 2H), 1.27 (t, *J* = 7.2 Hz, 3H), 1.19 (t, *J* = 7.3 Hz, 3H), 1.17 (t, *J* = 7.4 Hz, 3H).
^{13}C NMR (125.8 MHz, $CDCl_3$, 20°C):	197.9, 165.5, 146.7, 129.5, 129.0, 124.3, 120.7, 118.1, 61.2, 37.6, 34.4, 33.6, 20.8, 20.6, 14.9, 14.8, 9.3.
FTIR (neat):	2969 (s, C–H), 1708 (s, C=O), 1666 (s, C=O), 1518, 1199, 1063.
HRMS–ESI (*m/z*):	calcd for $C_{17}H_{23}NO_3Na$ $[M + Na]^+$: 312.1570, found: 312.1566
TLC (25% EtOAc–hexanes), *Rf*:	0.44 (UV, anis)

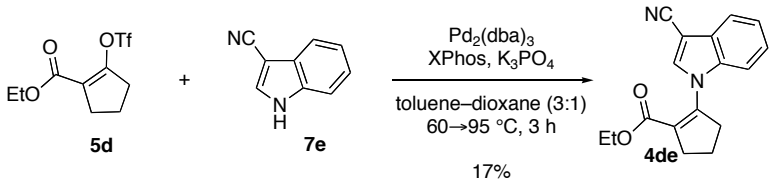
[9] For the synthesis of vinyl triflate **5d**, see: Jasperse, C. P.; Curran, D. P. *J. Am. Chem. Soc.* **1990**, *112*, 5601–5609.



2-(4-Oxo-4,5,6,7-tetrahydro-indol-1-yl)-cyclopent-1-enecarboxylic acid ethyl ester (4dc, Table 1, entry 20):

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of 1,5,6,7-tetrahydro-4*H*-indol-4-one (**7c**, 77.3 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5d** (110 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to olive green within approximately 10 min. After 30 min, the temperature was increased to 95 °C and the green–brown mixture stirred for 3.5 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite–plug and flask were rinsed with an additional 15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to provide a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 22 cm, 60% EtOAc–hexanes) gave the vinyl indolone **4dc** (63.7 mg, 62%) as an off–white solid.

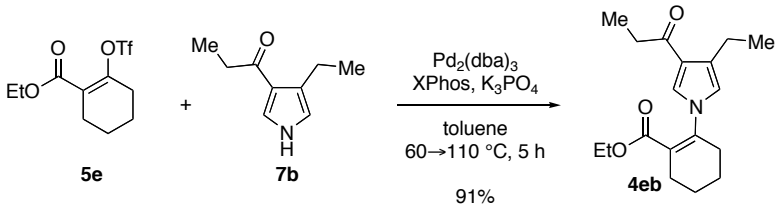
^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	6.62 (d, *J* = 3.4 Hz, 1H), 6.58 (d, *J* = 3.4 Hz, 1H), 4.08 (q, *J* = 7.1 Hz, 2H), 2.84 (app tt, *J* = 7.6, 2.5 Hz, 2H), 2.80 (app tt, *J* = 7.6, 2.5 Hz, 2H), 2.64 (t, *J* = 6.3 Hz, 2H), 2.48 (app t, *J* = 6.3 Hz, 2H), 2.11 (pentet, *J* = 6.3 Hz, 2H), 2.07 (pentet, *J* = 7.6 Hz, 2H), 1.11 (t, *J* = 7.1 Hz, 3H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	194.7, 163.9, 146.7, 144.3, 128.4, 122.1, 121.6, 106.5, 60.9, 38.1, 37.7, 32.4, 24.1, 22.7, 20.5, 14.2.
FTIR (neat):	2948 (m, C–H), 1710 (s, C=O), 1660 (s, C=O), 1499, 1464, 1237.
HRMS–EI (*m/z*):	calcd for $C_{16}H_{19}NO_3Na$ $[M + Na]^+$: 296.1257, found: 296.1248
TLC (65% EtOAc–hexanes), *Rf*:	0.22 (UV, anis)



2-(3-Cyano-indol-1-yl)-cyclopent-1-enecarboxylic acid ethyl ester (4de, Table 1, entry 22):

A mixture of toluene–dioxane (3:1, 1.90 mL) was added to an argon–purged sample of 3-cyanoindole (**7e**, 81.3 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5d** (110 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to olive green within approximately 10 min. After 30 min, the temperature was increased to 95 °C and the green–brown mixture stirred for 2.5 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23 °C, was diluted by the addition of EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite–plug and flask were rinsed with an additional 15-mL portion of EtOAc, and the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated to yield a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 22 cm, 25% EtOAc–hexanes) gave the vinyl indole **4de** (18.9 mg, 17%) as an off–white solid.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.77 (m, 1H), 7.69 (s, 1H), 7.27–7.37 (m, 3H), 3.97 (q, *J* = 7.2 Hz, 2H), 2.98 (app tt, *J* = 7.6, 2.5 Hz, 2H), 2.93 (app tt, *J* = 7.6, 2.5 Hz, 2H), 2.16 (pentet, *J* = 7.6 Hz, 2H), 0.89 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	163.7, 145.4, 135.5, 135.1, 128.1, 127.7, 124.6, 123.0, 120.2, 115.5, 112.3, 88.4, 61.0, 36.9, 32.5, 20.7, 13.9.
FTIR (neat):	2978 (w, C–H), 2221 (s, C≡N), 1710 (s, C=O), 1536, 1461, 1213.
HRMS–ESI (*m/z*):	calcd for $C_{17}H_{16}N_2O_2Na$ $[M + Na]^+$: 303.1104, found: 303.1095
TLC (25% EtOAc–hexanes), *Rf*:	0.23 (UV, anis)

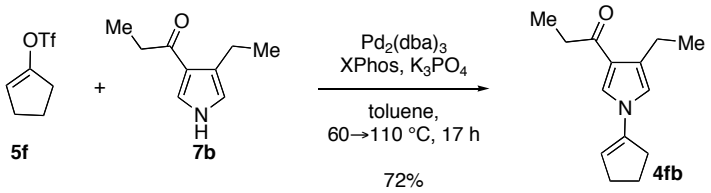


2-(3-Ethyl-4-propionyl-pyrrol-1-yl)-cyclohex-1-enecarboxylic acid ethyl ester (4eb, Table 1, entry 24):

Toluene (1.90 mL) was added to an argon–purged mixture of acyl pyrrole **7b** (86.5 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, vinyl triflate **5e**[10] (110 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to burgundy within approximately 15 min. After an additional 2.5 h, the reaction temperature was raised to 110 °C and the deep brown mixture stirred for 2 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23°C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite–plug and flask were rinsed with an additional 15-mL portion of EtOAc, and the combined organic filtrates were washed sequentially with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to give a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 3.0 cm, ht. 24 cm, 20% EtOAc–hexanes) gave vinyl pyrrole **4eb** (105 mg, 91%) as a yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.22 (d, *J* = 2.3 Hz, 1H), 6.77 (dt, *J* = 2.3, 1.1 Hz, 1H), 3.99 (q, *J* = 7.1 Hz, 2H), 2.77 (qd, *J* = 7.5, 1.1 Hz, 2H), 2.71 (q, *J* = 7.4, 2H), 2.46 (m, 4H), 1.82 (dtd, *J* = 8.8, 6.0, 2.7 Hz, 2H), 1.73 (dtd, *J* = 8.8, 6.0, 2.7 Hz, 2H), 1.17 (t, *J* = 7.5 Hz, 3H), 1.16 (t, *J* = 7.4 Hz, 3H), 1.01 (t, *J* = 7.1 Hz, 3H).
^{13}C NMR (125.8 MHz, $CDCl_3$, 20°C):	197.7, 169.2, 141.0, 129.4, 127.1, 126.1, 123.9, 120.1, 61.7, 33.6, 31.2, 27.1, 22.9, 22.1, 20.6, 14.9, 14.6, 9.5.
FTIR (neat):	2937 (m, C–H), 1710 (s, C=O), 1659 (s, C=O), 1516, 1282.
HRMS–ESI (*m/z*):	calcd for $C_{18}H_{25}NO_3Na$ $[M + Na]^+$: 326.1727, found: 326.1731
TLC (35% EtOAc–hexanes), *Rf*:	0.38 (UV, anis)

[10] For the synthesis of vinyl triflate **5e**, see: Li, S.-J.; Dieter, R. K. *J. Org. Chem.* **2003**, *68*, 969–973.



1-(3-Ethyl-4-propionyl-pyrrol-1-yl)-cyclopentene (4fb, Table 1, entry 26):

Toluene (1.90 mL) was added to an argon–purged sample of acyl pyrrole **7b** (86.5 mg, 572 μmol, 1.50 equiv), $Pd_2(dba)_3$ (17.5 mg, 19.1 μmol, 0.05 equiv), XPhos (18.2 mg, 38.1 μmol, 0.10 equiv), and rigorously anhydrous K_3PO_4 (113 mg, 534 μmol, 1.40 equiv) in a flame-dried flask and the resulting deep red mixture was heated to 60 °C. After 30 min, triflate **5f**[11] (82.4 mg, 381 μmol, 1 equiv) was added via syringe, producing a color change to green within approximately 10 min. After 1 h, the temperature was increased to 110 °C and the brown mixture stirred for 16 h, at which point GC analysis indicated that the reaction was complete. The mixture was then allowed to cool to 23 °C, was diluted with EtOAc (10 mL), and was vacuum filtered through a plug of celite (diam. 2.5 cm, ht. 2.5 cm). The celite–plug and flask were rinsed with an additional 15-mL portion of EtOAc, then the combined organic filtrates were washed with water (7.5 mL) and brine (7.5 mL), were dried over anhydrous sodium sulfate, were filtered, and were concentrated under reduced pressure to give a deep brown residue. Purification of the crude material by flash column chromatography (silica gel: diam. 2.0 cm, ht. 23 cm; 7.5% EtOAc–hexanes) provided the vinyl pyrrole **4fb** (60.4 mg, 72%) as a white solid.

^{1}H NMR (500 MHz, $CDCl_3$, 20°C):	7.35 (d, *J* = 2.1 Hz, 1H), 6.71 (dt, *J* = 2.1, 1.0 Hz, 1H), 5.58 (app pentet, *J* = 2.2 Hz, 1H), 2.77 (qd, *J* = 7.4, 1.0 Hz, 2H), 2.74 (m, 2H), 2.74 (q, *J* = 7.4 Hz, 2H), 2.50 (app tq, *J* = 7.3, 2.2 Hz, 2H), 2.07 (app pentet, *J* = 7.4, Hz, 2H), 1.18 (t, *J* = 7.4 Hz, 3H), 1.16 (t, *J* = 7.4 Hz, 3H).
^{13}C NMR (125.7 MHz, $CDCl_3$, 20°C):	197.3, 139.6, 129.6, 124.6, 123.4, 117.9, 111.9, 33.1, 31.8, 30.9, 22.3, 20.2, 14.5, 9.0.
FTIR (neat):	2967 (m, C–H), 1648 (s, C=O), 1519 (s, C=C), 1206.
HRMS–ESI (*m/z*):	calcd for $C_{14}H_{19}NONa$ $[M + Na]^+$: 240.1359, found: 240.1367
TLC (10% EtOAc–hexanes), *Rf*:	0.22 (UV, anis)

[11] For the synthesis of vinyl triflate **5f**, see: (a) Pfeifer, W. D.; Bahn, C. A.; Schleyer, P. v. R.; Bocher, S.; Harding, C. E.; Hummel, K.; Hanack, M.; Stang, P. J. *J. Am. Chem. Soc*. **1971**, *93*, 1513–1516 and (b) Stang, P. J.; Treptow, W. *Synthesis* **1980**, 283–284.

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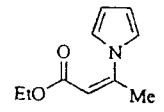
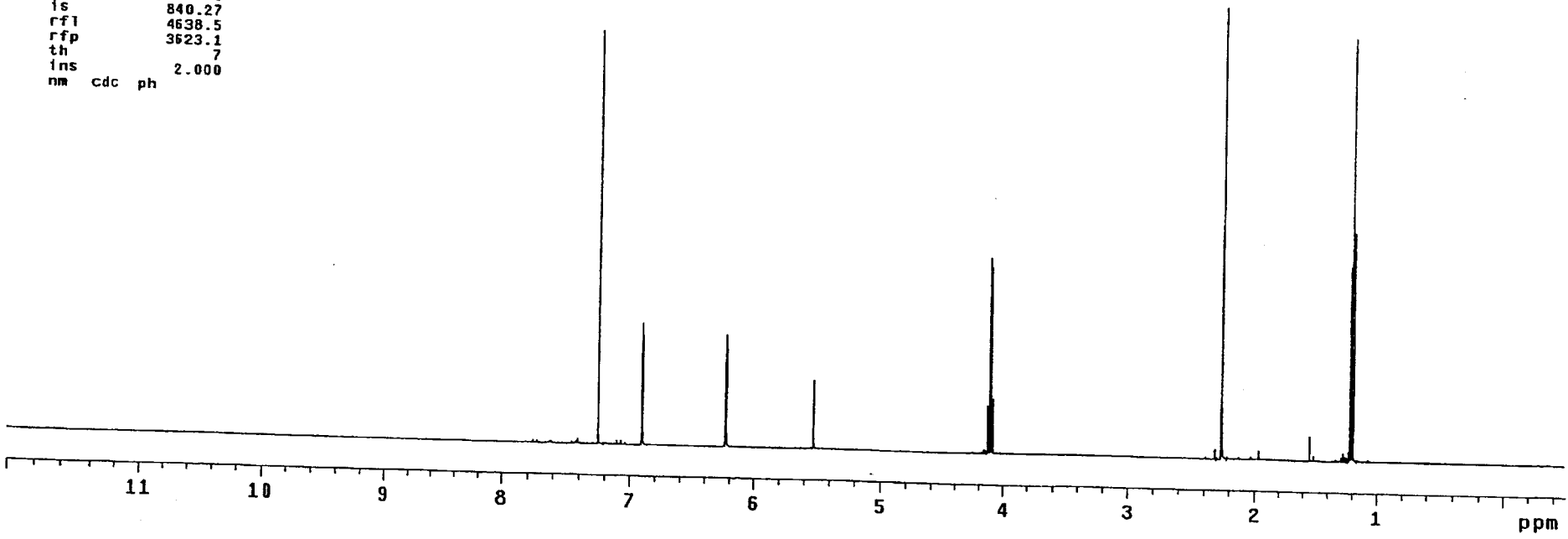


4aa



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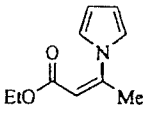
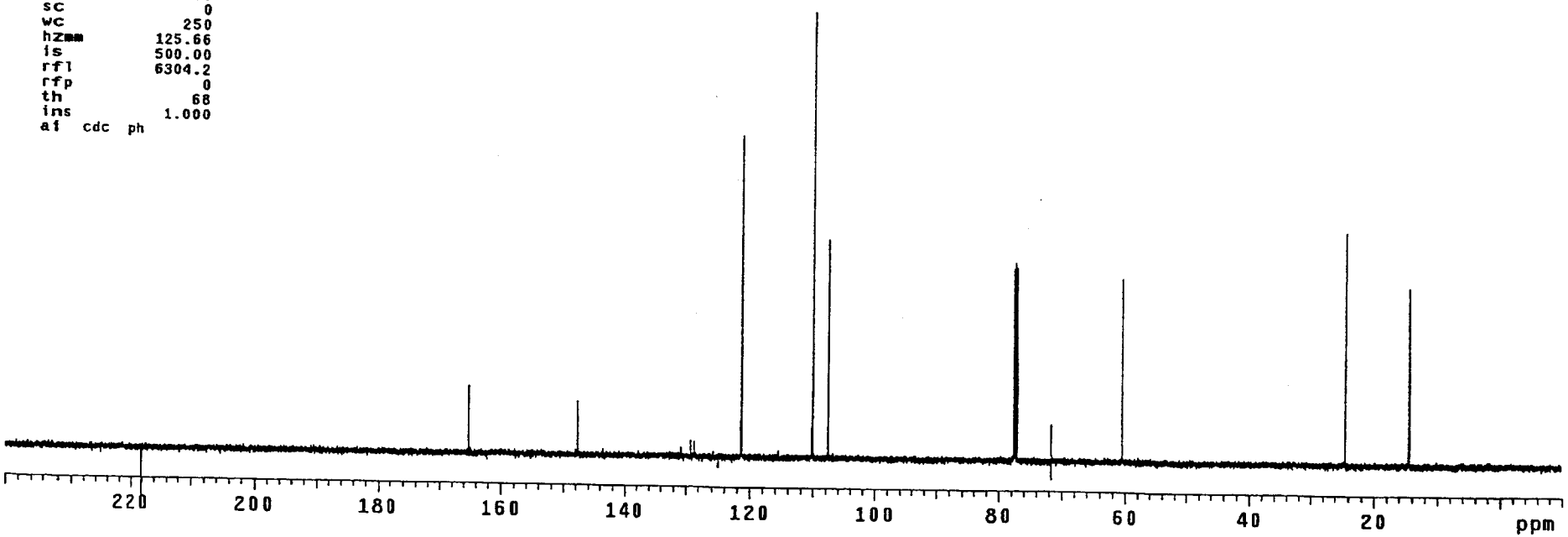
th                68
ins            1.000
ai  cdc  ph

       DEC. & VT
dfrq       499.747
dn              H1
dpwr            34
dof              0
dm             yyy
dmm              w
dmf          10000
dseq
dres           1.0
homo             n
     PROCESSING
lb             1.00
wtfile
proc             ft
fn          131072
math              f

werr
wexp
wbs
wnt
```



4aa

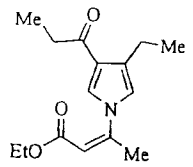


```
exp1  s2pul

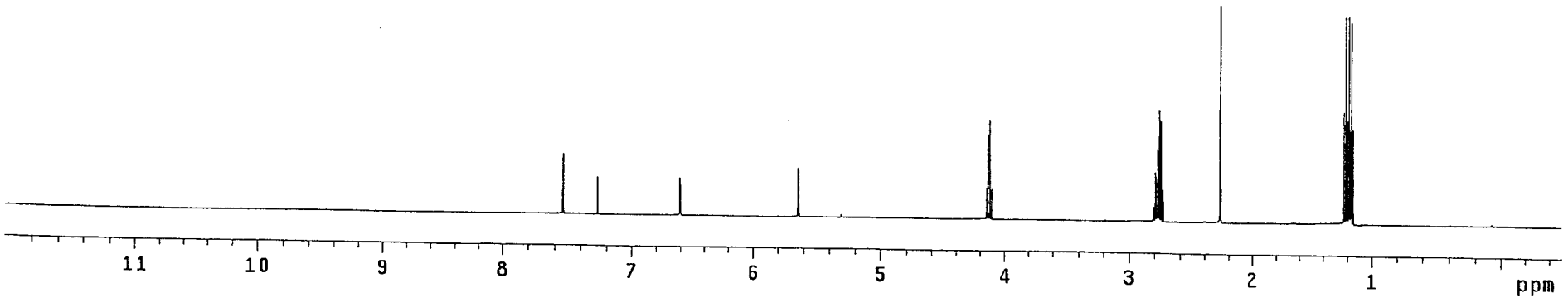
      SAMPLE
date    Feb 12 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_021~
205_AOII074_1H.fid
   ACQUISITION
sfrq        499.758
tn               H1
at             3.277
np             65536
sw            9998.8
fb         not used
bs                 4
tpwr              56
pw               8.2
d1             2.000
tof           1498.1
nt                18
ct                18
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp            -250.4
wp            6246.5
vs                35
sc                 0
wc               250
hzmm           40.00
is             33.57
rfl           1002.5
rfp                0
th                 7
ins            2.000
nm  cdc  ph

      DEC. & VT
dfrq        125.677
dn              C13
dpwr             34
dof          1498.1
dm               nnn
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
     PROCESSING
wtfile
proc              ft
fn             65536
math               f

werr
wexp
wbs
wnt
```



4ab

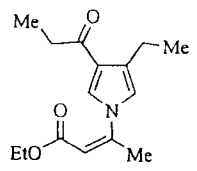


```
exp1  s2pul

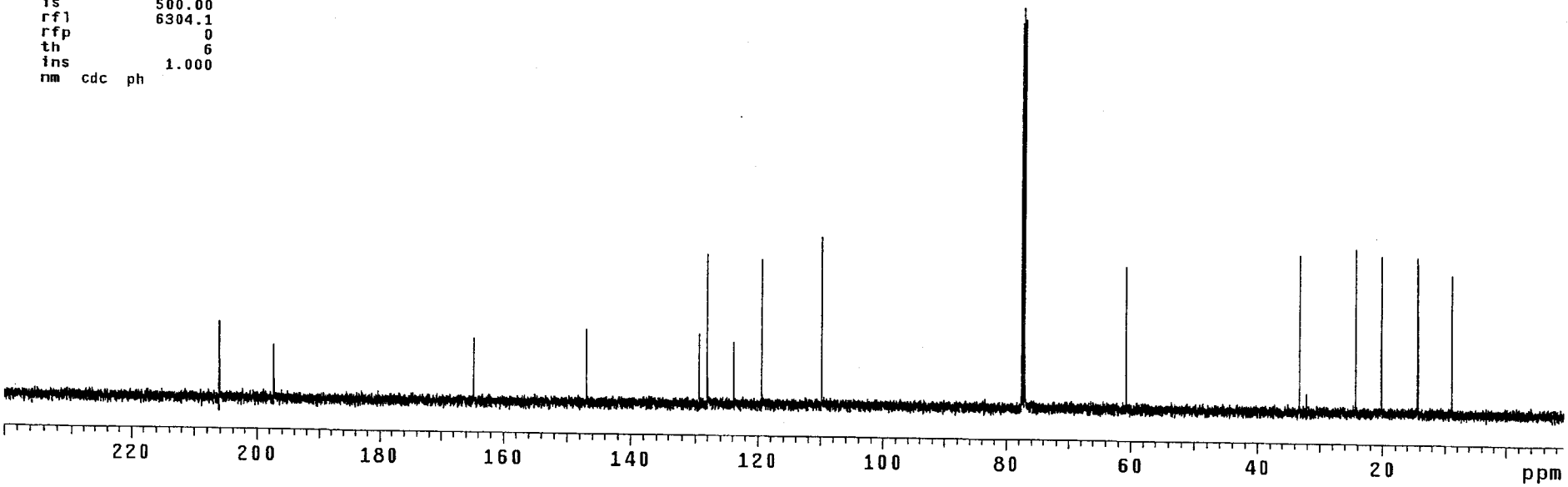
      SAMPLE
date   Feb 12 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_021~
205_AOII074_13C.fi~
                 d
   ACQUISITION
sfrq       125.676
tn             C13
at             0.869
np             65536
sw          37718.1
fb         not used
bs               16
ss                1
tpwr             58
pw              7.5
d1            3.000
tof           615.5
nt           100000
ct              576
alock             n
gain       not used
      FLAGS
il                n
in                n
dp                y
hs               nn
     DISPLAY
sp         -1256.7
wp         31415.4
vs              63
sc               0
wc             250
hzmm        125.66
is          500.00
rfl         6304.1
rfp              0
th               6
ins          1.000
nm  cdc  ph

      DEC. & VT
dfrq       499.756
dn              H1
dpwr            34
dof              0
dm             yyy
dmm              w
dmf          10000
dseq
dres           1.0
homo             n
     PROCESSING
lb             1.00
wtfile
proc            ft
fn          131072
math             f

werr
wexp
wbs
wnt
```



4ab

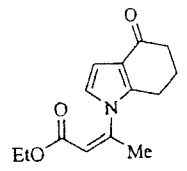


```
expl  s2pul

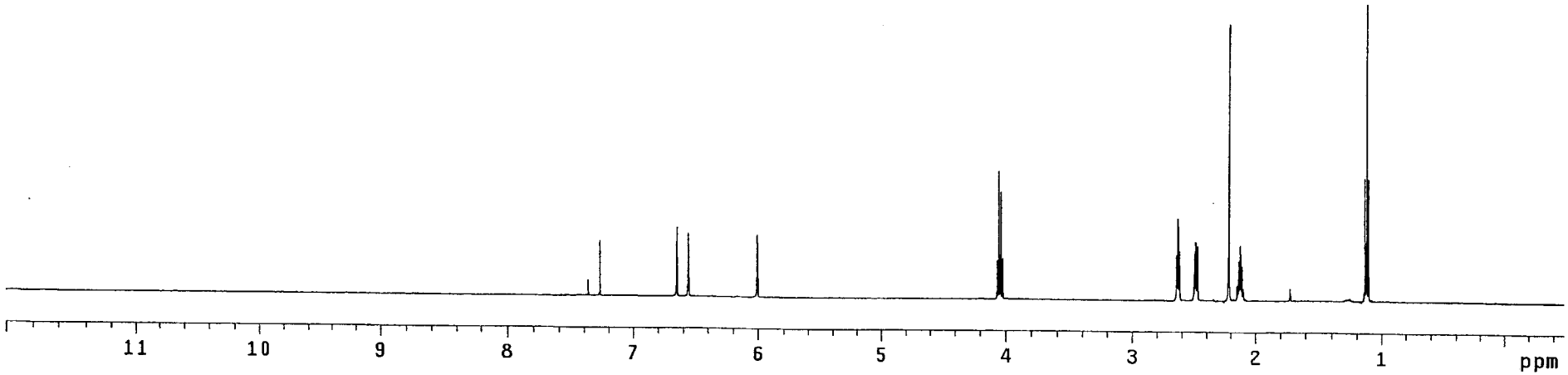
      SAMPLE
date    Feb 15 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_021~
5-5_AOII051_1H.fid
   ACQUISITION
sfrq        499.758
tn               H1
at             3.277
np             65536
sw            9998.8
fb         not used
bs                 4
tpwr              56
pw               8.2
d1             2.000
tof           1498.1
nt                20
ct                20
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp            -250.1
wp            6246.8
vs                11
sc                 0
wc               250
hzmm           40.00
is             33.57
rfl            1002.5
rfp                0
th                 7
ins            2.000
ai   cdc  ph

      DEC. & VT
dfrq        125.677
dn              C13
dpwr             34
dof          1498.1
dm              nnn
dmm               W
dmf           10000
dseq
dres            1.0
homo              n
     PROCESSING
wtfile
proc             ft
fn            65536
math              f

werr
wexp
wbs
wnt
```



4ac

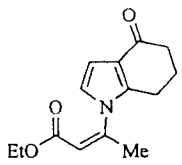


```
exp1  s2pul

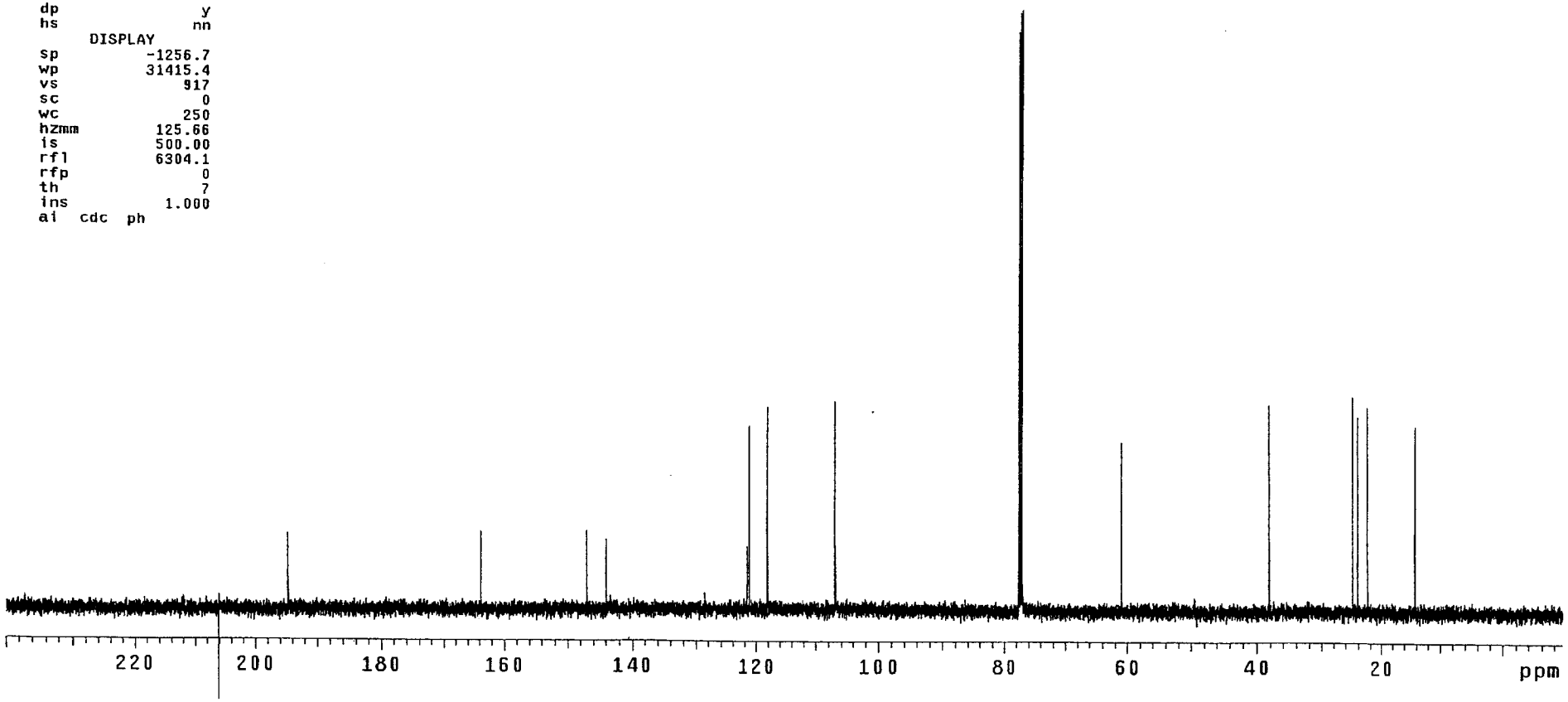
      SAMPLE
date    Feb 15 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_021~
505_AOII051_13C.fi~
                  d
   ACQUISITION
sfrq         125.676
tn               C13
at             0.869
np             65536
sw          37718.1
fb          not used
bs                16
ss                 1
tpwr              58
pw               7.5
d1             3.000
tof            615.5
nt             10000
ct               672
alock              n
gain        not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp           -1256.7
wp           31415.4
vs               917
sc                 0
wc               250
hzmm          125.66
is            500.00
rfl           6304.1
rfp                0
th                 7
ins            1.000
ai  cdc  ph

      DEC. & VT
dfrq         499.756
dn                H1
dpwr              34
dof                0
dm               yyy
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
    PROCESSING
lb               1.00
wtfile
proc              ft
fn            131072
math               f

werr
wexp
wbs
wnt
```



4ac

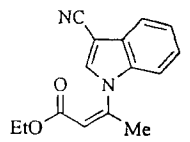


```
exp1  s2pul

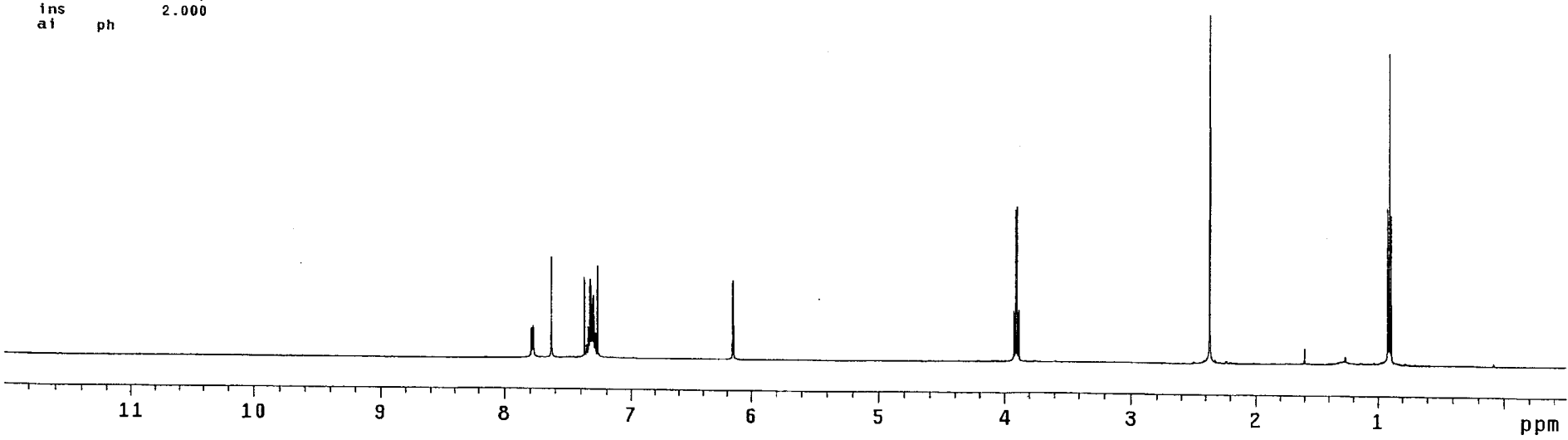
      SAMPLE
date    Feb 15 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
   OII05283_1H.fid
   ACQUISITION
sfrq        500.235
tn               H1
at              3.200
np              64000
sw          10000.0
fb          not used
bs                 4
ss                 1
tpwr              59
pw               9.8
d1             2.000
tof           1498.2
nt                20
ct                20
alock              n
gain        not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp            -250.1
wp            6246.6
vs                45
sc                 0
wc               250
hzmm           40.00
is            100.00
rfl           4632.9
rfp           3636.7
th                 7
ins            2.000
ai     ph

      DEC. & VT
dfrq        125.795
dn              C13
dpwr             37
dof               0
dm              nnn
dmm               c
dmf           10000
dseq
dres            1.0
homo              n
     PROCESSING
wtfile
proc             ft
fn           131072
math              f

werr
wexp
wbs
wnt
```



4ae

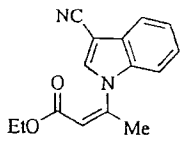


```
exp1  s2pul

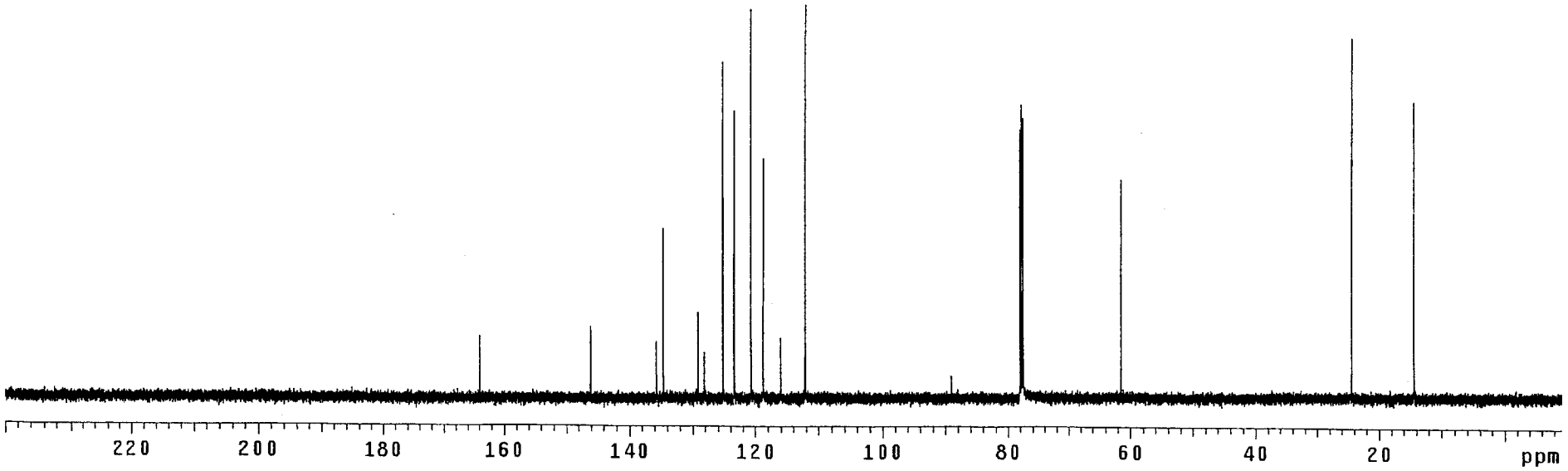
      SAMPLE
date    Feb 15 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
 OII052083_13C.fid
   ACQUISITION
sfrq        125.796
tn              C13
at              1.736
np             131010
sw           37735.8
fb         not used
bs                 8
ss                 1
tpwr              53
pw               6.9
d1             0.763
tof            631.4
nt             10000
ct               968
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp          -1258.3
wp          31448.1
vs             4325
sc                 0
wc               250
hzmm         125.79
is           500.00
rfl         15911.8
rfp          9686.0
th                 4
ins            1.000
ai    ph

      DEC. & VT
dfrq        500.233
dn               H1
dpwr             37
dof          -500.0
dm                 y
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
     PROCESSING
lb              0.30
wtfile
proc             ft
fn           131072
math               f

werr
wexp
wbs
wnt
```



4ae

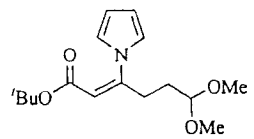


```
exp1  s2pul

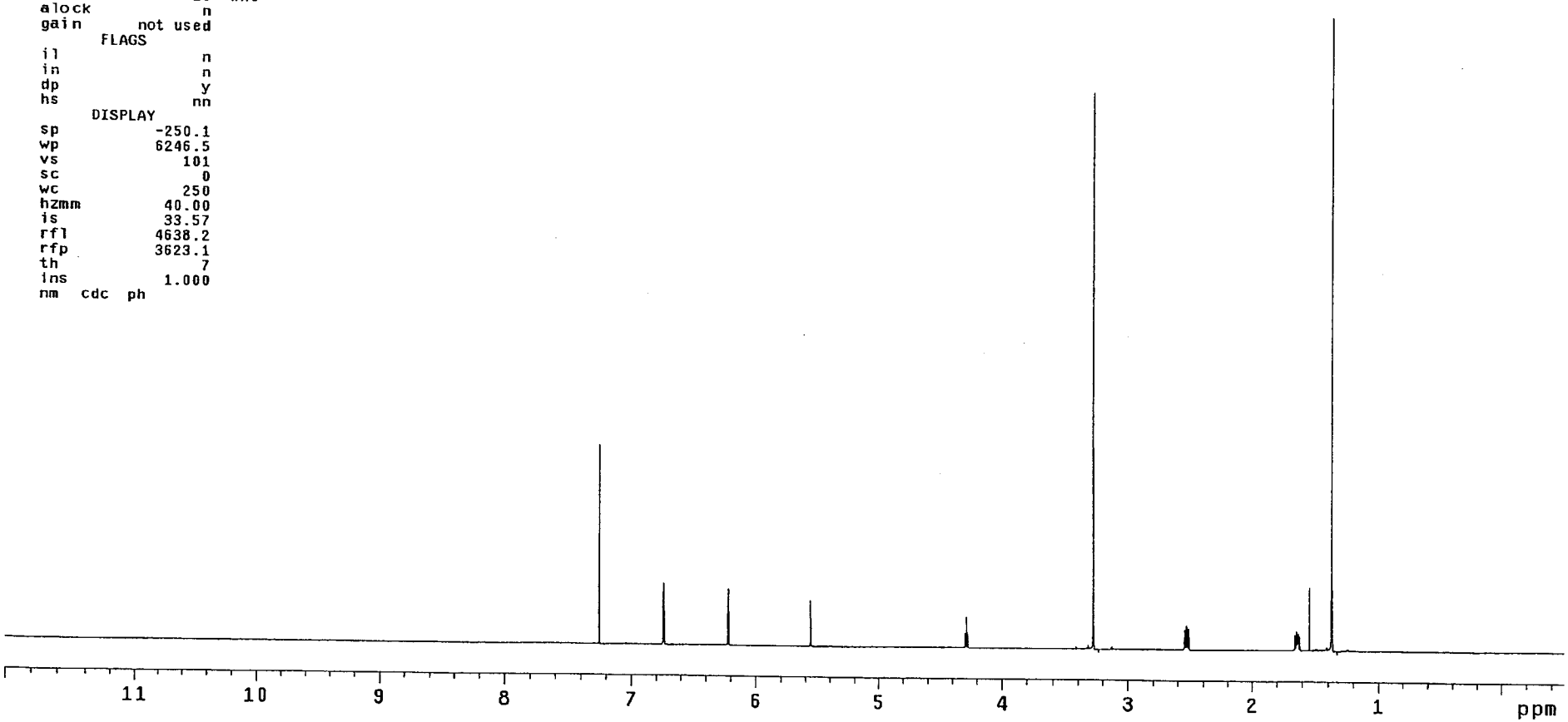
      SAMPLE
date    May  6 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_050~
605_AOII178_1H.fid
   ACQUISITION
sfrq        499.749
tn               H1
at             3.277
np             65536
sw            9998.8
fb         not used
bs                 4
tpwr              56
pw               8.2
d1             2.000
tof           1498.1
nt                20
ct                20
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp            -250.1
wp            6246.5
vs               101
sc                 0
wc               250
hzmm           40.00
is             33.57
rfl            4638.2
rfp            3623.1
th                 7
ins            1.000
nm   cdc  ph

      DEC. & VT
dfrq        125.674
dn              C13
dpwr             34
dof          1498.1
dm               nnn
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
     PROCESSING
wtfile
proc              ft
fn             65536
math               f

werr
wexp
wbs
wnt
```



4ba

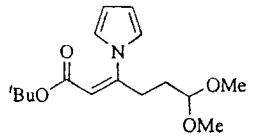


```
exp2  s2pul

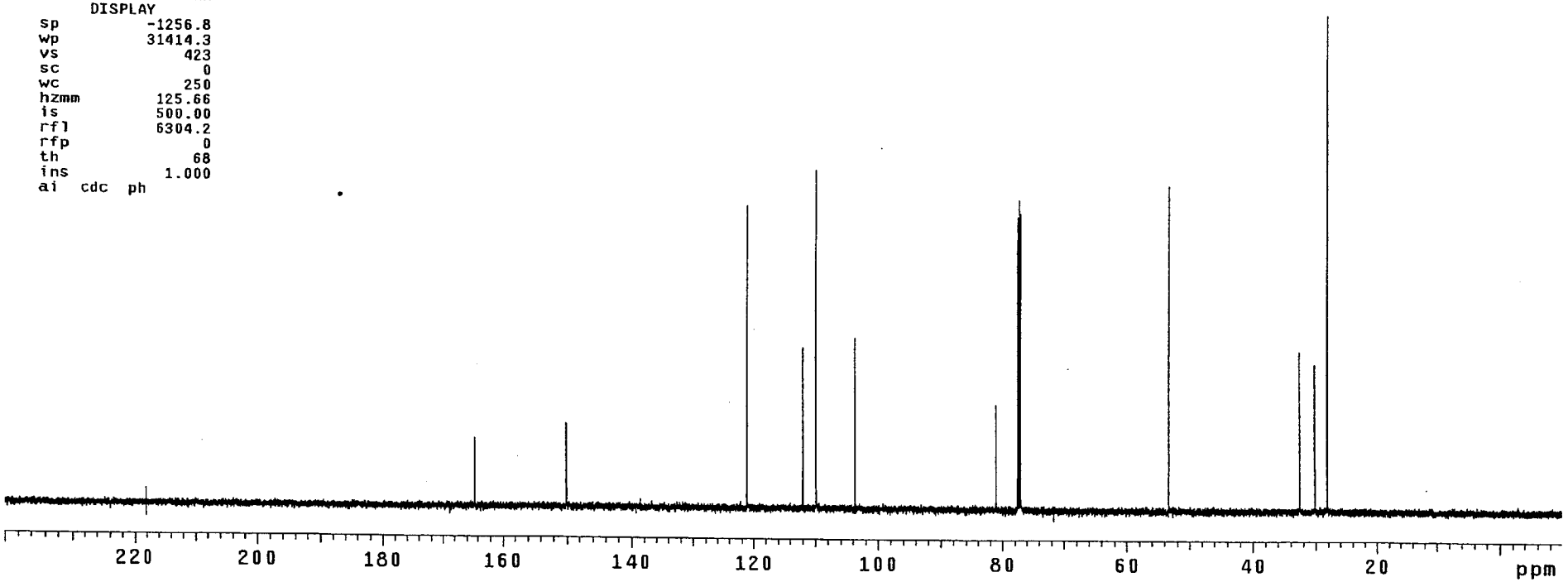
      SAMPLE
date    May  6 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_050~
605_AOII178_13C.fi~
                  d
   ACQUISITION
sfrq         125.673
tn               C13
at               0.869
np             65536
sw           37718.1
fb         not used
bs                 16
ss                  1
tpwr               58
pw                7.5
d1              3.000
tof             615.5
nt              10000
ct                752
alock               n
gain       not used
       FLAGS
il                  n
in                  n
dp                  y
hs                 nn
     DISPLAY
sp           -1256.8
wp           31414.3
vs               423
sc                 0
wc               250
hzmm          125.66
is            500.00
rfl           6304.2
rfp                0
th                68
ins            1.000
ai  cdc  ph

      DEC. & VT
dfrq         499.747
dn                H1
dpwr              34
dof                0
dm               yyy
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
    PROCESSING
lb               1.00
wtfile
proc              ft
fn            131072
math               f

werr
wexp
wbs
wnt
```



4ba

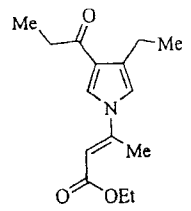


```
expl  s2pul

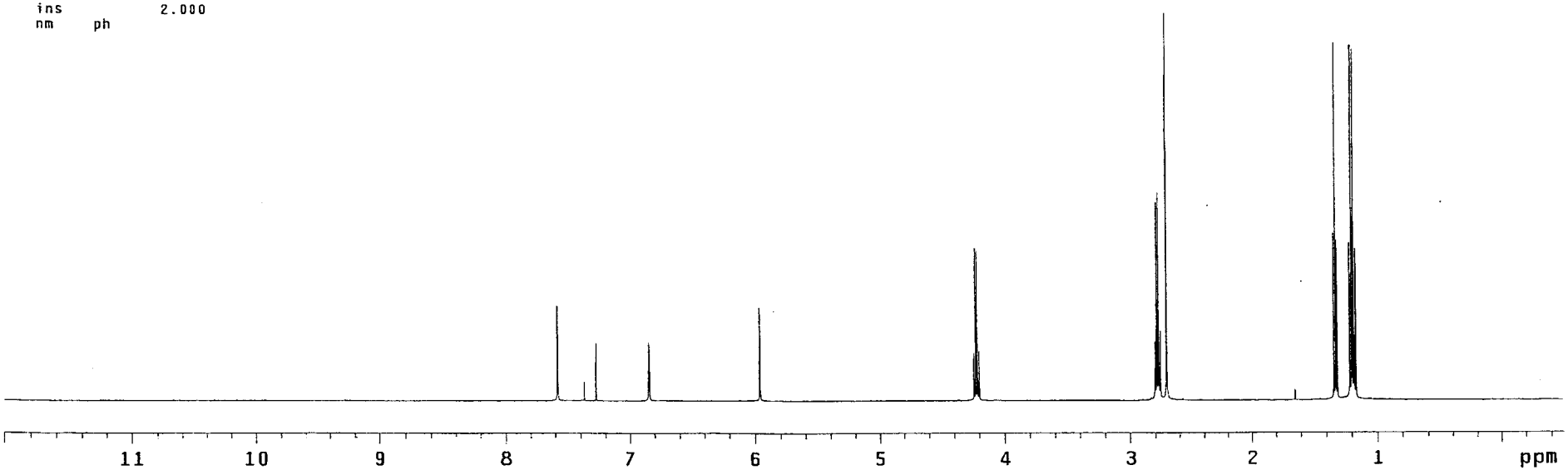
      SAMPLE
date   Feb 15 2005
solvent      CDCl3
file           exp
   ACQUISITION
sfrq       500.235
tn              H1
at             3.200
np             64000
sw           10000.0
fb         not used
bs                4
ss                1
tpwr             59
pw              9.8
d1            2.000
tof          1498.2
nt               20
ct               20
alock             n
gain       not used
      FLAGS
il                n
in                n
dp                y
hs               nn
     DISPLAY
sp           -250.2
wp           6252.8
vs               62
sc                0
wc              250
hzmm          40.00
is           119.21
rfl          4632.8
rfp          3636.7
th               23
ins           2.000
nm     ph

      DEC. & VT
dfrq       125.795
dn             C13
dpwr            37
dof              0
dm             nnn
dmm              c
dmf          10000
dseq
dres           1.0
homo             n
     PROCESSING
wtfile
proc            ft
fn          131072
math             f

werr
wexp
wbs
wnt
```

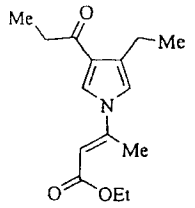


4cb

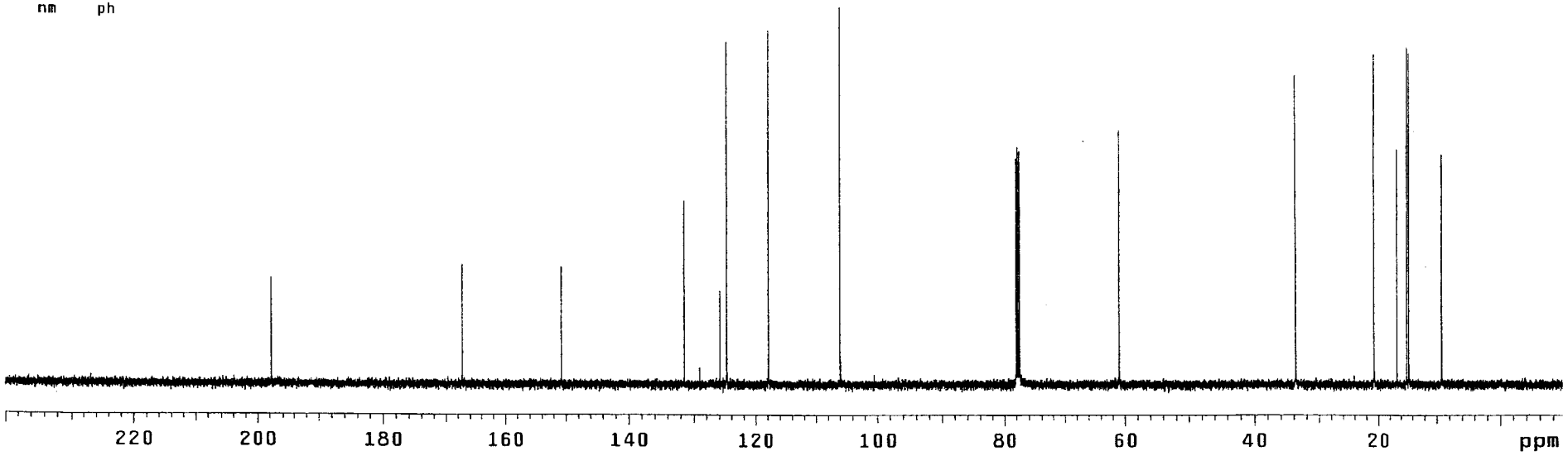


exp5 s2pul

SAMPLE		DEC. & VT	
date	Feb 15 2005	dfrq	500.233
solvent	CDCl3	dn	H1
file	exp	dpwr	37
ACQUISITION		dof	-500.0
sfrq	125.796	dm	y
tn	C13	dmm	w
at	1.736	dmf	10000
np	131010	dseq	
sw	37735.8	dres	1.0
fb	not used	homo	n
bs	8	PROCESSING	
ss	1	lb	0.30
tpwr	53	wtfile	
pw	6.9	proc	ft
d1	0.763	fn	131072
tof	631.4	math	f
nt	10000		
ct	904	werr	
alock	n	wexp	
gain	not used	wbs	
FLAGS		wnt	
il	n		
in	n		
dp	y		
hs	nn		
DISPLAY			
sp	-1258.3		
wp	31448.0		
vs	60		
sc	0		
wc	250		
hzmm	125.79		
is	500.00		
rfl	15911.8		
rfp	9686.0		
th	5		
ins	1.000		
nm	ph		



4cb

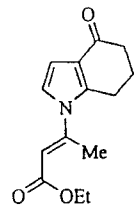


```
exp1  s2pul

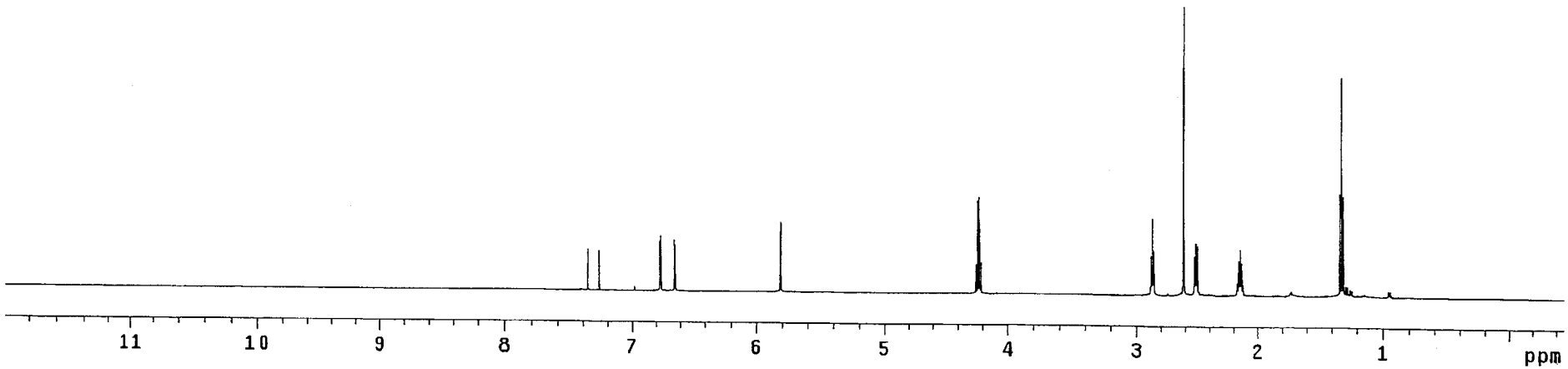
      SAMPLE
date   Feb 15 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
    OII079_1H.fid
   ACQUISITION
sfrq       500.235
tn              H1
at             3.200
np             64000
sw           10000.0
fb         not used
bs                4
ss                1
tpwr             59
pw              9.8
d1            2.000
tof          1498.2
nt               20
ct               20
alock             n
gain       not used
      FLAGS
il                n
in                n
dp                y
hs               nn
     DISPLAY
sp           -250.4
wp           6246.3
vs               46
sc                0
wc              250
hzmm           2.00
is           100.00
rfl          4632.9
rfp          3636.7
th                7
ins            2.000
nm    ph

      DEC. & VT
dfrq       125.795
dn             C13
dpwr            37
dof              0
dm             nnn
dmm              c
dmf          10000
dseq
dres           1.0
homo             n
    PROCESSING
wtfile
proc            ft
fn          131072
math             f

werr
wexp
wbs
wnt
```



4cc

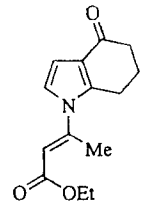


```
exp1  s2pul

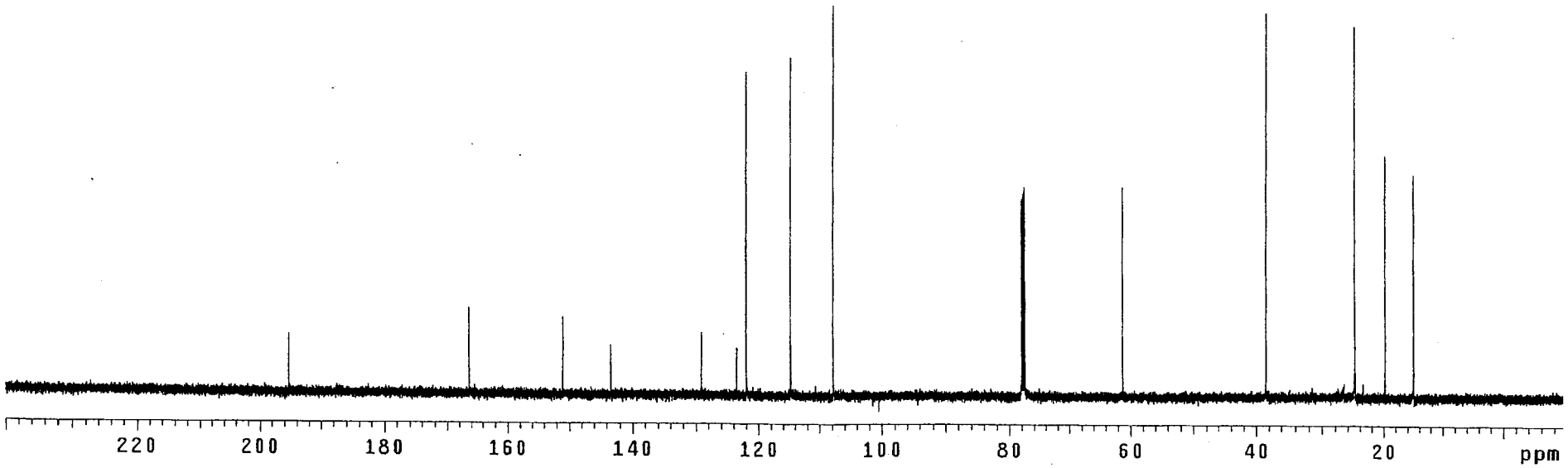
      SAMPLE
date    Feb 15 2005
solvent        CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
     OII079_13C.fid
   ACQUISITION
sfrq         125.796
tn               C13
at             1.736
np            131010
sw          37735.8
fb          not used
bs                 8
ss                 1
tpwr              53
pw               6.9
d1             0.763
tof            631.4
nt             1e+06
ct               616
alock              n
gain        not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp           -1258.3
wp           31448.1
vs              3026
sc                 0
wc               250
hzmm          125.79
is            500.00
rfl           15911.8
rfp            9686.0
th                 4
ins            1.000
ai     ph

      DEC. & VT
dfrq         500.233
dn                H1
dpwr              37
dof           -500.0
dm                 y
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
     PROCESSING
lb               0.30
wtfile
proc               ft
fn            131072
math               f

werr
wexp
wbs
wnt
```



4cc

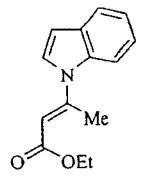


```
exp1  s2pul

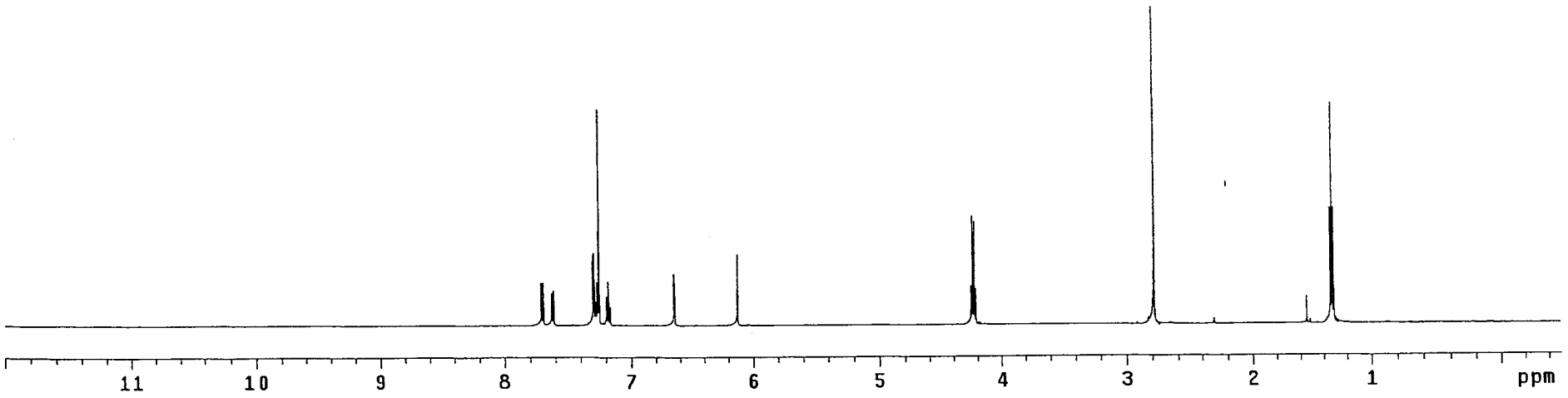
      SAMPLE
date   Apr 25 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_042~
505_AOII164_1H.fid
   ACQUISITION
sfrq        499.749
tn               H1
at             3.277
np             65536
sw            9998.8
fb         not used
bs                 4
tpwr              56
pw               8.2
d1             2.000
tof           1498.1
nt                18
ct                18
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp            -250.1
wp            6246.8
vs                32
sc                 0
wc               250
hzmm            4.87
is            840.27
rfl           1015.4
rfp                0
th                 7
ins            2.000
ai  cdc  ph

      DEC. & VT
dfrq        125.674
dn              C13
dpwr             34
dof          1498.1
dm               nnn
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
     PROCESSING
wtfile
proc              ft
fn             65536
math               f

werr
wexp
wbs
wnt
```

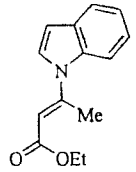


4cd

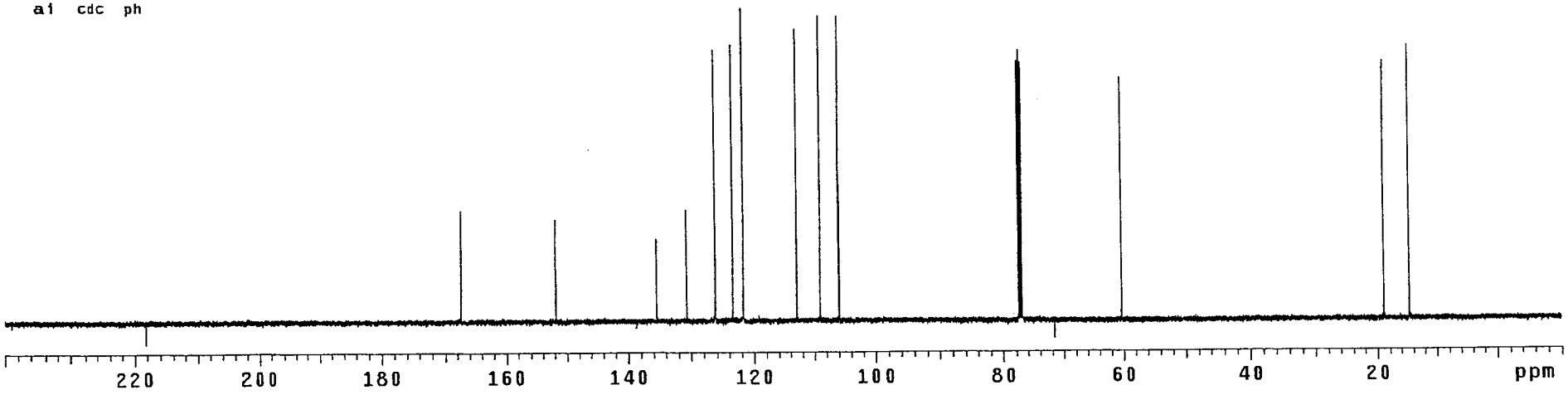


exp2 s2pul

SAMPLE		DEC. & VT	
date	Apr 30 2005	dfrq	499.747
solvent	CDCl3	dn	H1
file	/data/export/~	dpwr	34
home/movassag/Mao/~		dof	0
bullwinkle/Mao_043~		dm	yyy
005_AOII164_13C.fi~		dmm	w
	d	dmf	10000
ACQUISITION		dseq	
sfrq	125.673	dres	1.0
tn	C13	homo	n
at	0.869	PROCESSING	
np	65536	lb	1.00
sw	37718.1	wtfile	
fb	not used	proc	ft
bs	16	fn	131072
ss	1	math	f
tpwr	58		
pw	7.5	werr	
d1	3.000	wexp	
tof	615.5	wbs	
nt	10000	wnt	
ct	1168		
alock	n		
gain	not used		
FLAGS			
il	n		
in	n		
dp	y		
hs	nn		
DISPLAY			
sp	-1256.8		
wp	31414.3		
vs	447		
sc	0		
wc	250		
hzmm	150.87		
is	500.00		
rfl	6304.2		
rfp	0		
th	8		
ins	1.000		
ai cdc ph			

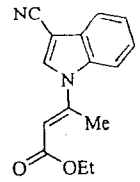


4cd

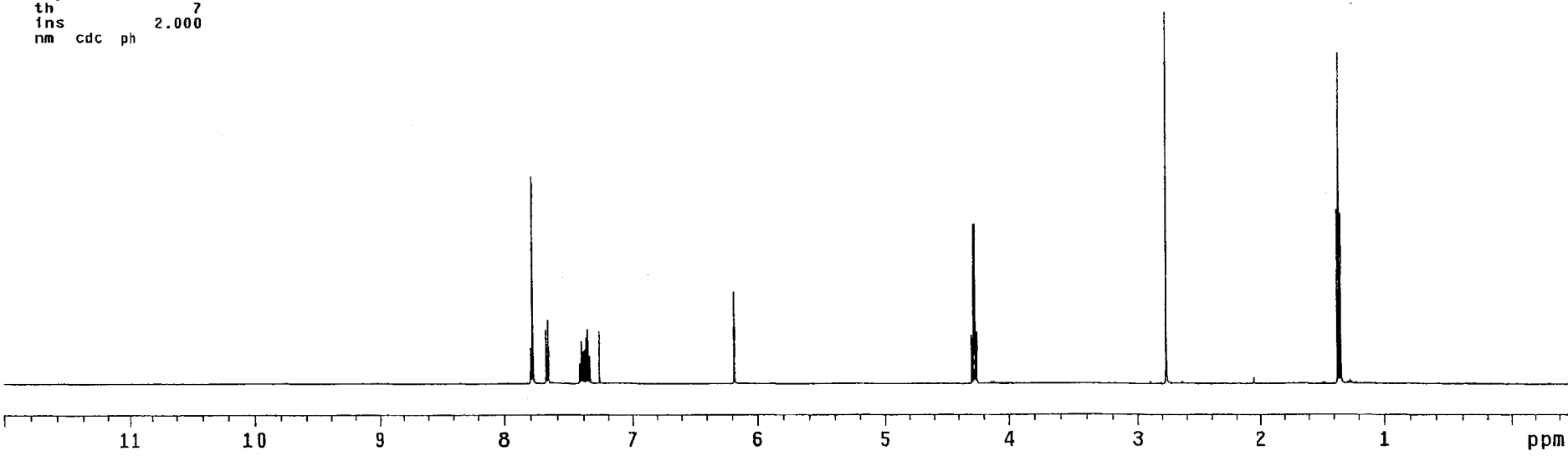


exp5 s2pul

SAMPLE		DEC. & VT	
date	Feb 5 2005	dfrq	125.677
solvent	CDCl3	dn	C13
file	/data/export/~	dpwr	34
	home/movassag/Mao/~	dof	1498.1
	bullwinkle/Mao_020~	dm	nnn
	505_AOII084_1H.fid	dmm	w
ACQUISITION		dmf	10000
sfrq	499.758	dseq	
tn	H1	dres	1.0
at	3.277	homo	n
np	65536	PROCESSING	
sw	9998.8	wtfile	
fb	not used	proc	ft
bs	4	fn	65536
tpwr	56	math	f
pw	8.2		
d1	2.000	werr	
tof	1498.1	wexp	
nt	18	wbs	
ct	18	wnt	
alock	n		
gain	not used		
FLAGS			
il	n		
in	n		
dp	y		
hs	nn		
DISPLAY			
sp	-250.1		
wp	6246.8		
vs	59		
sc	0		
wc	250		
hzmm	2.36		
is	33.57		
rfl	1002.0		
rfp	0		
th	7		
ins	2.000		
nm	cdc ph		

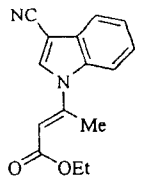


4ce

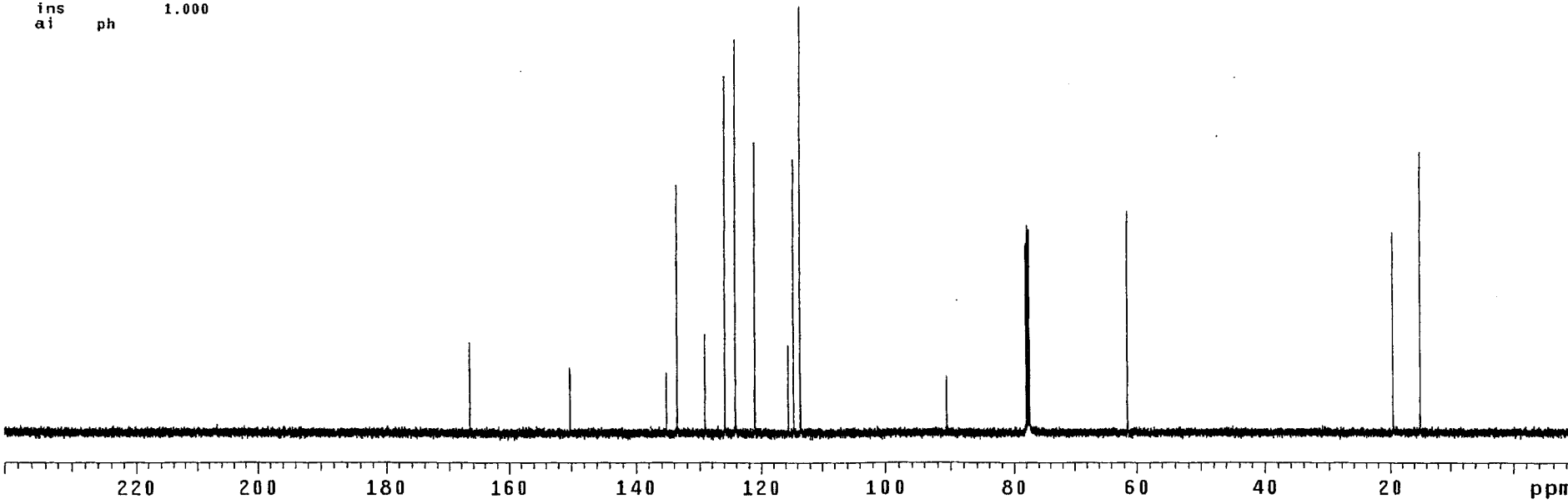


exp5 s2pul

SAMPLE		DEC. & VT	
date	Feb 15 2005	dfrq	500.233
solvent	CDCl3	dn	H1
file	/data/export/~	dpwr	37
home/movassag/Mao/~		dof	-500.0
rocky/Mao_021505_A~		dm	y
OII084_13C.fid		dmm	w
ACQUISITION		dmf	10000
sfrq	125.796	dseq	
tn	C13	dres	1.0
at	1.736	homo	n
np	131010	PROCESSING	
sw	37735.8	lb	0.30
fb	not used	wtfile	
bs	8	proc	ft
ss	1	fn	131072
tpwr	53	math	f
pw	6.9		
d1	0.763	werr	
tof	631.4	wexp	
nt	10000	wbs	
ct	896	wnt	
alock	n		
gain	not used		
FLAGS			
il	n		
in	n		
dp	y		
hs	nn		
DISPLAY			
sp	-1258.3		
wp	31448.1		
vs	3159		
sc	0		
wc	250		
hzmm	125.79		
is	500.00		
rfl	15911.8		
rfp	9686.0		
th	6		
ins	1.000		
ai	ph		



4ce

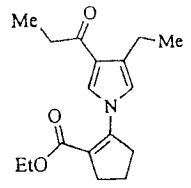


```
exp1  s2pul

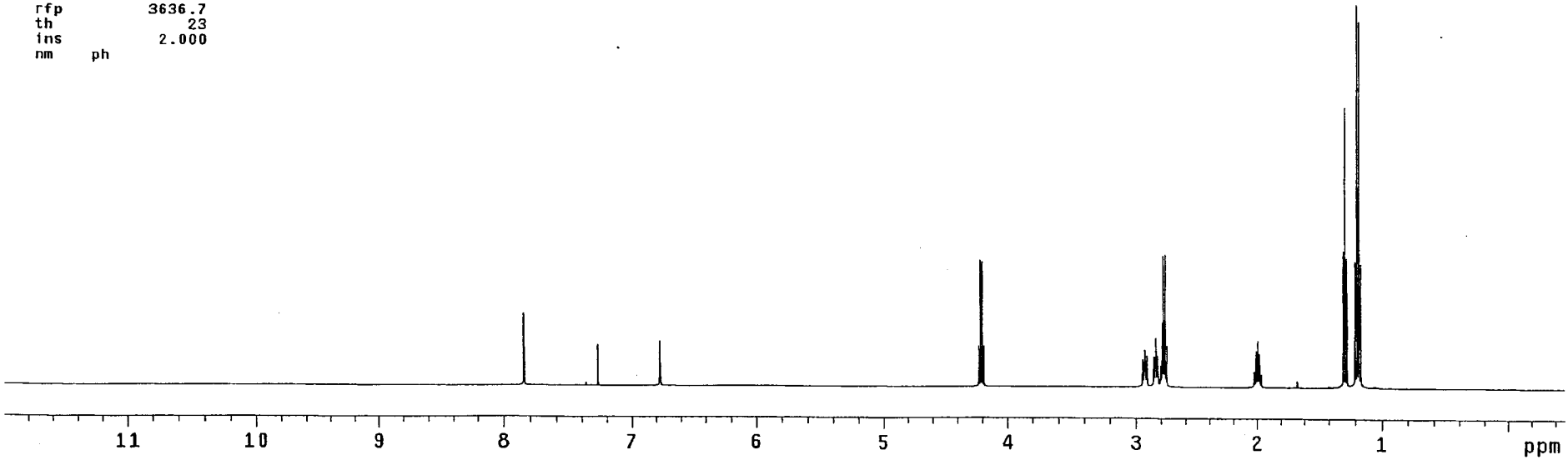
      SAMPLE
date   Feb 15 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
     OII087_1H.fid
   ACQUISITION
sfrq       500.235
tn              H1
at             3.200
np             64000
sw           10000.0
fb         not used
bs                4
ss                1
tpwr             59
pw              9.8
d1            2.000
tof          1498.2
nt               20
ct               20
alock             n
gain       not used
      FLAGS
il                n
in                n
dp                y
hs               nn
     DISPLAY
sp           -250.4
wp           6246.3
vs               61
sc                0
wc              250
hzmm           3.57
is           119.21
rfl          4632.8
rfp          3636.7
th               23
ins           2.000
nm    ph

      DEC. & VT
dfrq       125.795
dn             C13
dpwr            37
dof              0
dm             nnn
dmm              c
dmf          10000
dseq
dres           1.0
homo             n
     PROCESSING
wtfile
proc            ft
fn          131072
math             f

werr
wexp
wbs
wnt
```



4db

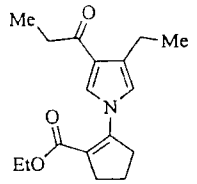


```
expl  s2pul

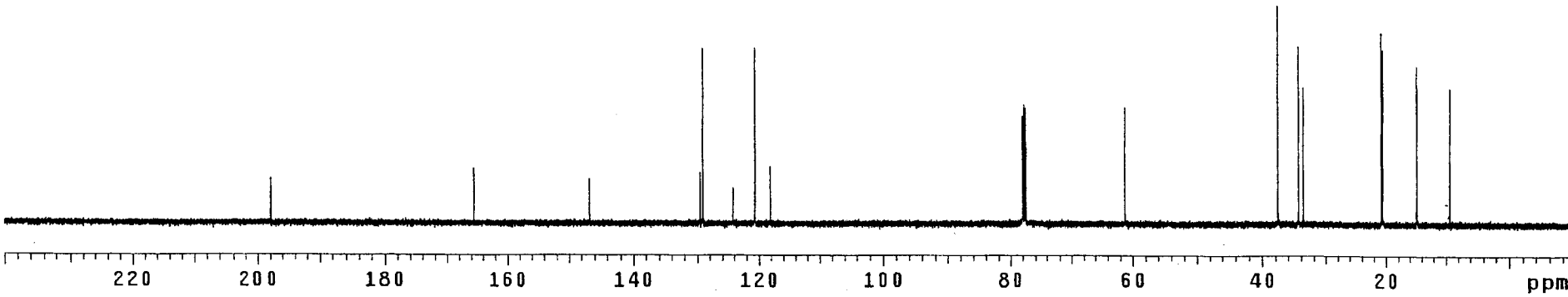
      SAMPLE
date    Feb 15 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
    OII087_13C.fid
   ACQUISITION
sfrq       125.796
tn             C13
at             1.736
np            131010
sw          37735.8
fb         not used
bs                8
ss                1
tpwr             53
pw              6.9
d1            0.763
tof           631.4
nt            10000
ct              584
alock             n
gain       not used
      FLAGS
il                n
in                n
dp                y
hs               nn
     DISPLAY
sp         -1258.3
wp         31448.1
vs              35
sc               0
wc             250
hzmm        125.79
is          500.00
rfl        15911.8
rfp         9686.0
th               5
ins          1.000
nm    ph

      DEC. & VT
dfrq       500.233
dn              H1
dpwr            37
dof         -500.0
dm                y
dmm               w
dmf           10000
dseq
dres            1.0
homo              n
     PROCESSING
lb              0.30
wtfile
proc             ft
fn           131072
math              f

werr
wexp
wbs
wnt
```

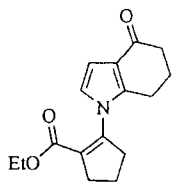


4db

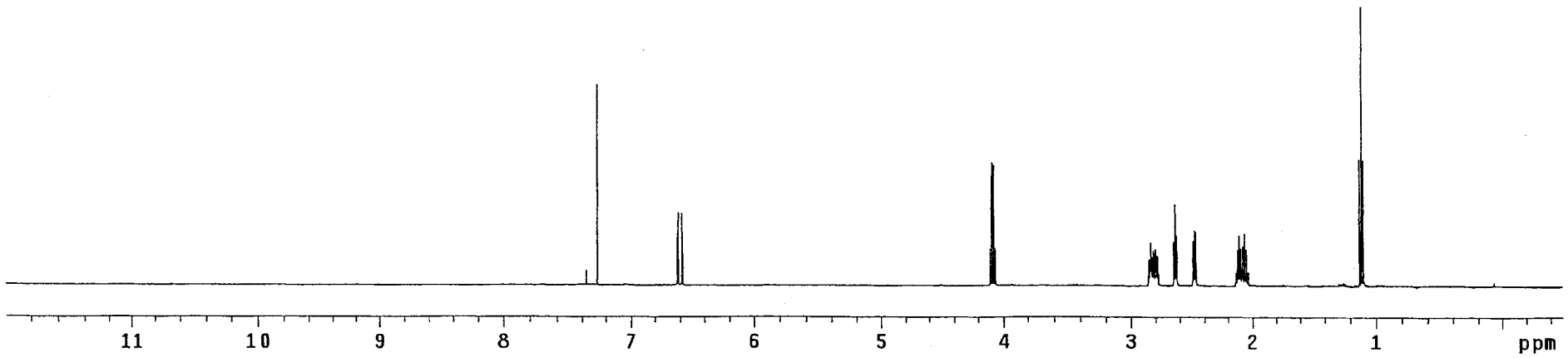


```
exp1  s2pul

      SAMPLE            DEC. & VT
date   Feb 12 2005  dfrq       125.677
solvent      CDCl3  dn             C13
file /data/export/~ dpwr            34
home/movassag/Mao/~ dof         1498.1
bullwinkle/Mao_021~ dm             nnn
205_AOII088_1H.fid  dmm              w
   ACQUISITION      dmf          10000
sfrq       499.758  dseq
tn              H1  dres           1.0
at           3.277  homo             n
np           65536      PROCESSING
sw          9998.8  wtfile
fb        not used  proc            ft
bs               4  fn           65536
tpwr            56  math             f
pw             8.2
d1           2.000  werr
tof         1498.1  wexp
nt              18  wbs
ct              18  wnt
alock            n
gain     not used
      FLAGS
il               n
in               n
dp               y
hs              nn
     DISPLAY
sp          -250.4
wp          6246.5
vs              45
sc               0
wc             250
hzmm         40.00
is           33.57
rfl         1002.5
rfp              0
th               7
ins          2.000
nm  cdc  ph
```



4dc

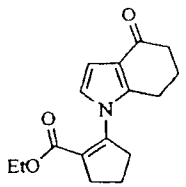


```
expl  s2pul

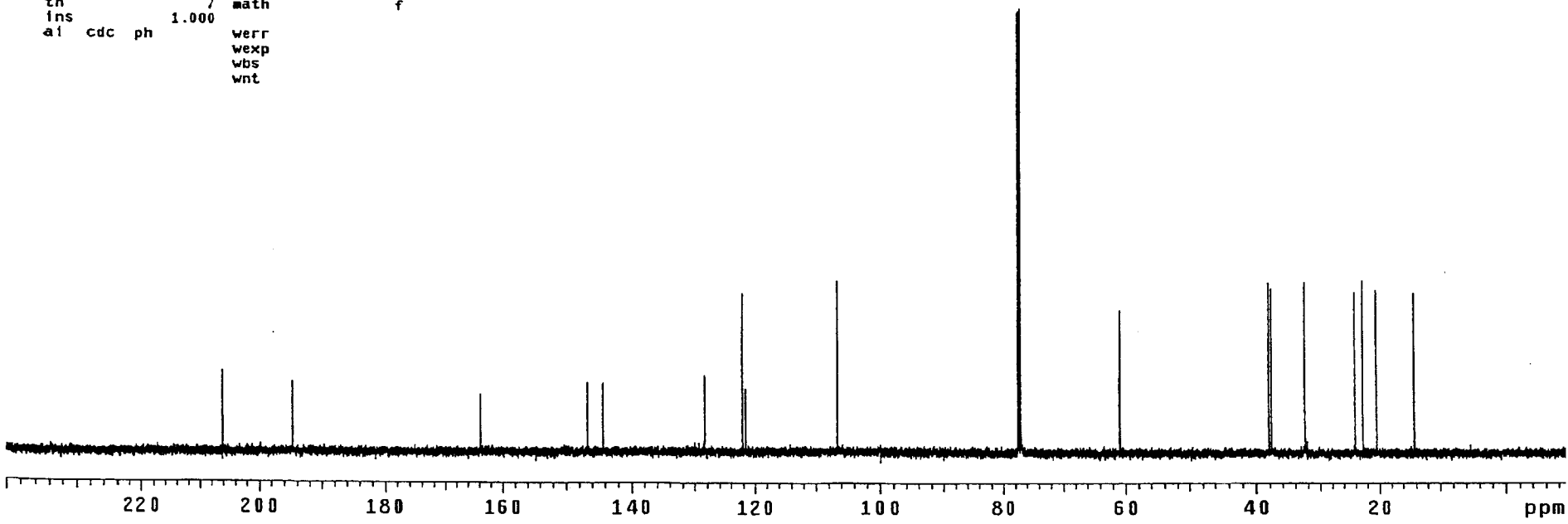
      SAMPLE
date    Feb 12 2005
solvent       CDCl3
file /data/movassa~
g/Mao/Mao_021205_A~
    OII088_13C.fid
   ACQUISITION
sfrq        125.676
tn              C13
at              0.869
np              65536
sw          37718.1
fb          not used
bs                16
ss                 1
tpwr              58
pw               7.5
d1             3.000
tof            615.5
nt             10000
ct               832
alock              n
gain        not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp          -1257.2
wp          31415.3
vs              677
sc                0
wc              250
hzmm         125.66
is           500.00
rfl          6304.1
rfp               0
th                7
ins           1.000
ai  cdc  ph

      DEC. & VT
dfrq        499.756
dn               H1
dpwr             34
dof               0
dm              yyy
dmm               w
dmf           10000
dseq
dres            1.0
homo              n
      DEC2
dfrq2             0
dn2
dpwr2             1
dof2              0
dm2               n
dmm2              c
dmf2          10000
dseq2
dres2           1.0
homo2             n
      DEC3
dfrq3             0
dn3
dpwr3             1
dof3              0
dm3               n
dmm3              c
dmf3          10000
dseq3
dres3           1.0
homo3             n
    PROCESSING
lb             1.00
wtfile
proc             ft
fn           131072
math              f

werr
wexp
wbs
wnt
```



4dc

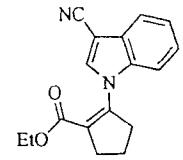


```
exp1  s2pul

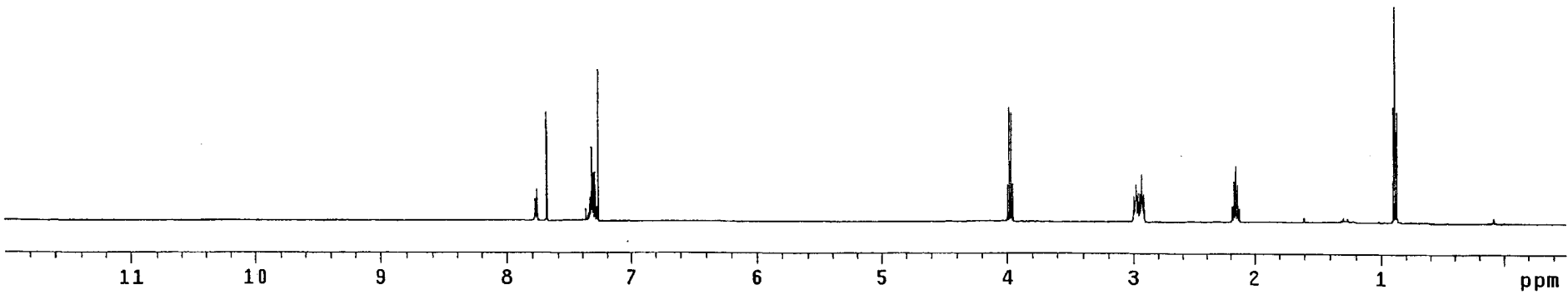
      SAMPLE
date    Feb 12 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_021~
205_AOII089_1H.fid
   ACQUISITION
sfrq        499.758
tn               H1
at             3.277
np             65536
sw            9998.8
fb         not used
bs                 4
tpwr              56
pw               8.2
d1             2.000
tof           1498.1
nt                18
ct                18
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp            -250.4
wp            6246.5
vs                35
sc                 0
wc               250
hzmm           40.00
is             33.57
rfl           4635.5
rfp           3633.2
th                 7
ins            2.000
nm  cdc  ph

      DEC. & VT
dfrq        125.677
dn              C13
dpwr             34
dof          1498.1
dm              nnn
dmm               w
dmf           10000
dseq
dres            1.0
homo              n
     PROCESSING
wtfile
proc             ft
fn            65536
math              f

werr
wexp
wbs
wnt
```

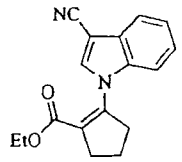


4de

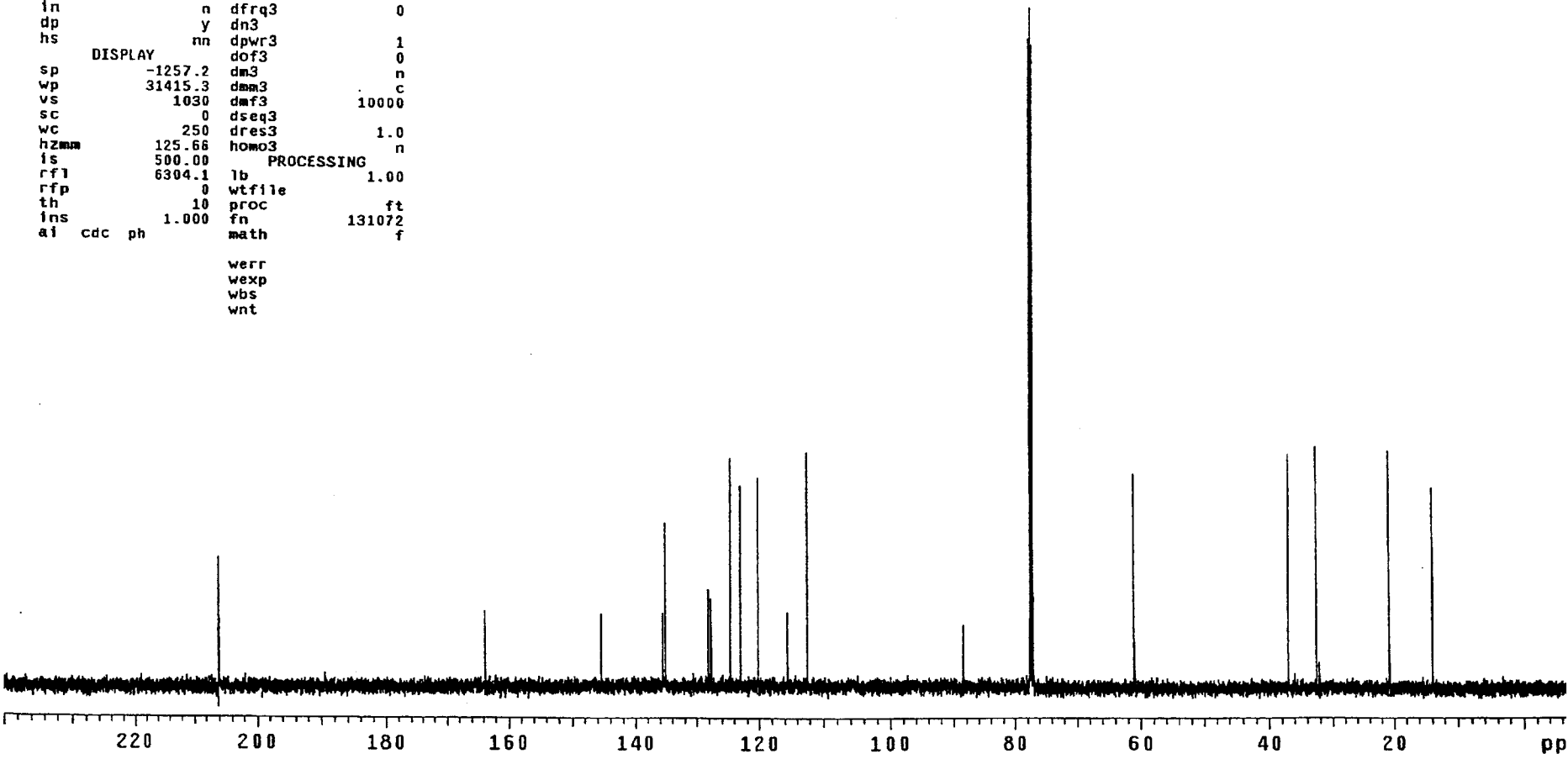


exp3 s2pul

SAMPLE		DEC. & VT	
date	Feb 12 2005	dfrq	499.756
solvent	CDCl3	dn	H1
file	exp	dpwr	34
ACQUISITION		dof	0
sfrq	125.676	dm	yyy
tn	C13	dmm	w
at	0.869	dmf	10000
np	65536	dseq	
sw	37718.1	dres	1.0
fb	not used	homo	n
bs	16	DEC2	
ss	1	dfrq2	0
tpwr	58	dn2	
pw	7.5	dpwr2	1
d1	3.000	dof2	0
tof	615.5	dm2	n
nt	10000	dmm2	c
ct	800	dmf2	10000
alock	n	dseq2	
gain	not used	dres2	1.0
FLAGS		homo2	n
il	n	DEC3	
in	n	dfrq3	0
dp	y	dn3	
hs	nn	dpwr3	1
DISPLAY		dof3	0
sp	-1257.2	dm3	n
wp	31415.3	dmm3	c
vs	1030	dmf3	10000
sc	0	dseq3	
wc	250	dres3	1.0
hzmm	125.66	homo3	n
is	500.00	PROCESSING	
rfl	6304.1	lb	1.00
rfp	0	wtfile	
th	10	proc	ft
ins	1.000	fn	131072
ai cdc ph		math	f
		werr	
		wexp	
		wbs	
		wnt	



4de

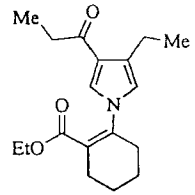


```
exp1  s2pul

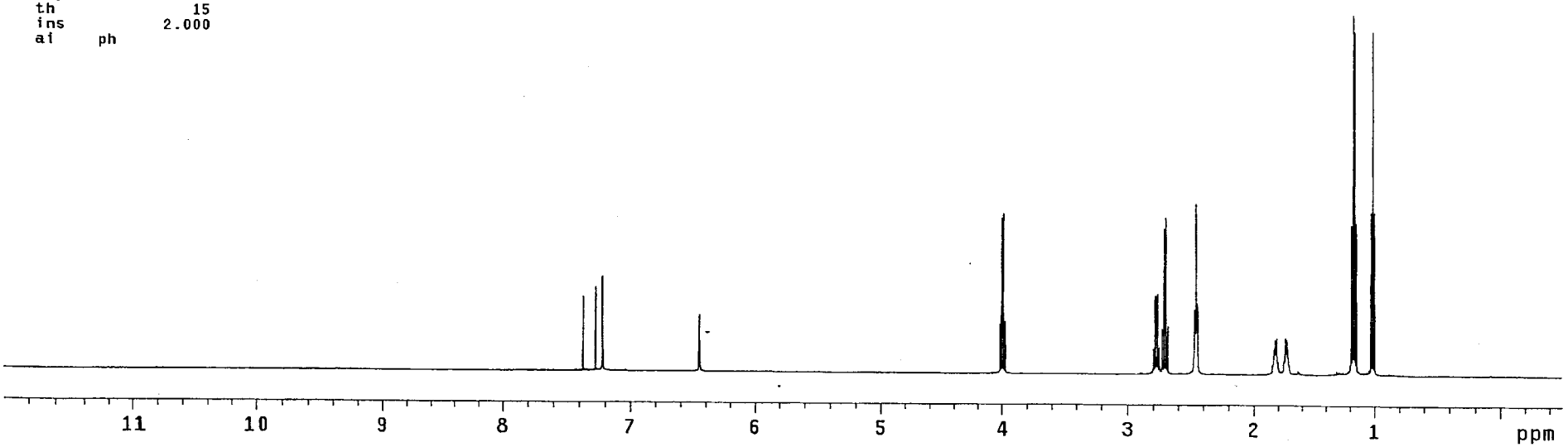
      SAMPLE
date    Feb 15 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
      OII055_1H.fid
   ACQUISITION
sfrq        500.235
tn               H1
at              3.200
np              64000
sw           10000.0
fb         not used
bs                 4
ss                 1
tpwr              59
pw               9.8
d1             2.000
tof           1498.2
nt                20
ct                20
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
      DISPLAY
sp            -250.1
wp            6246.6
vs                37
sc                 0
wc               250
hzmm            7.04
is            119.21
rfl           4632.9
rfp           3636.7
th                15
ins            2.000
ai     ph

      DEC. & VT
dfrq        125.795
dn              C13
dpwr             37
dof               0
dm              nnn
dmm               c
dmf           10000
dseq
dres            1.0
homo              n
      PROCESSING
wtfile
proc             ft
fn           131072
math              f

werr
wexp
wbs
wnt
```



4eb

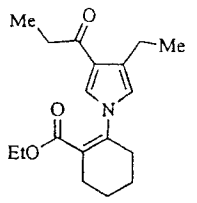


```
exp1  s2pul

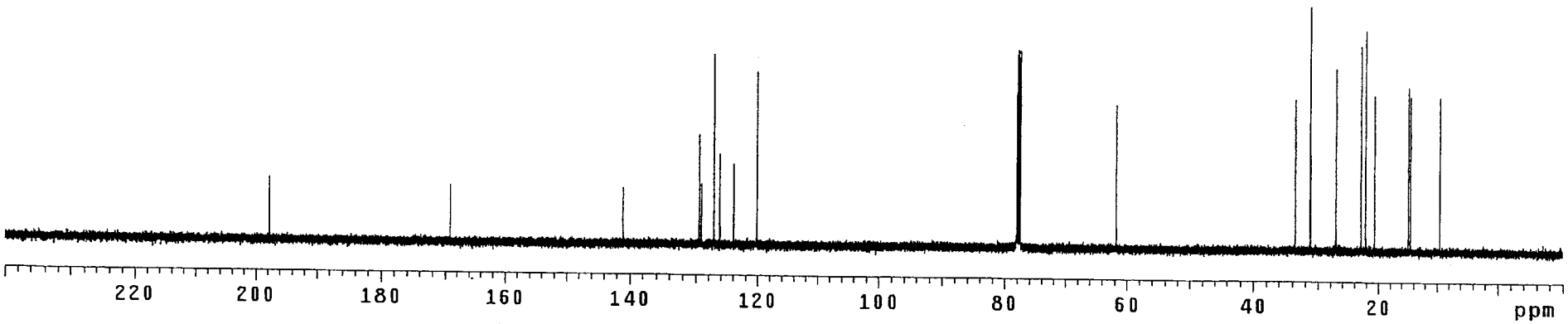
      SAMPLE
date    Feb 15 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
rocky/Mao_021505_A~
    0II055_13C.fid
   ACQUISITION
sfrq        125.796
tn              C13
at              1.736
np            131010
sw           37735.8
fb          not used
bs                 8
ss                 1
tpwr              53
pw               6.9
d1             0.763
tof            631.4
nt             10000
ct               736
alock              n
gain        not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp           -1258.3
wp           31448.1
vs                39
sc                 0
wc               250
hzmm          125.79
is            500.00
rfl          15911.8
rfp           9686.0
th                 6
ins            1.000
nm     ph

      DEC. & VT
dfrq        500.233
dn               H1
dpwr             37
dof          -500.0
dm                 y
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
    PROCESSING
lb               0.30
wtfile
proc              ft
fn            131072
math               f

werr
wexp
wbs
wnt
```



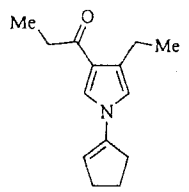
4eb



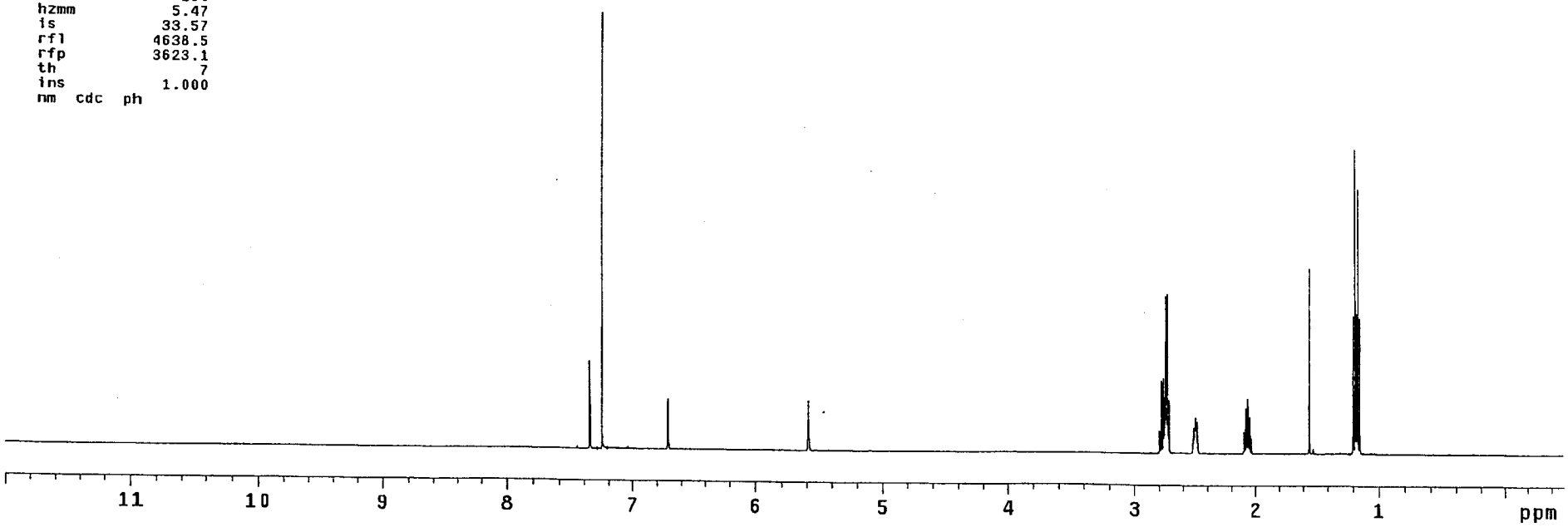
```
expl  s2pul

      SAMPLE
date   Apr 30 2005
solvent      CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_043~
005_AOII169_1H.fid
   ACQUISITION
sfrq        499.749
tn               H1
at             3.277
np             65536
sw            9998.8
fb         not used
bs                 4
tpwr              56
pw               8.2
d1             2.000
tof           1498.1
nt                20
ct                20
alock              n
gain       not used
      FLAGS
il                 n
in                 n
dp                 y
hs                nn
     DISPLAY
sp            -250.1
wp            6246.5
vs                69
sc                 0
wc               250
hzmm            5.47
is             33.57
rfl           4638.5
rfp           3623.1
th                 7
ins            1.000
nm  cdc  ph

      DEC. & VT
dfrq        125.674
dn              C13
dpwr             34
dof          1498.1
dm              nnn
dmm               w
dmf           10000
dseq
dres            1.0
homo              n
     PROCESSING
wtfile
proc             ft
fn            65536
math              f
werr
wexp
wbs
wnt
```



4fb

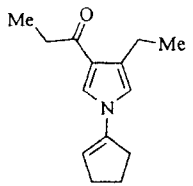


```
exp2  s2pul

      SAMPLE
date    Apr 30 2005
solvent       CDCl3
file /data/export/~
home/movassag/Mao/~
bullwinkle/Mao_043~
005_AOII169_13C.fi~
                  d
   ACQUISITION
sfrq         125.673
tn               C13
at               0.869
np             65536
sw           37718.1
fb         not used
bs                 16
ss                  1
tpwr               58
pw                7.5
d1              3.000
tof             615.5
nt             100000
ct                432
alock               n
gain       not used
      FLAGS
il                  n
in                  n
dp                  y
hs                 nn
      DISPLAY
sp            -1256.8
wp            31414.3
vs                328
sc                  0
wc                250
hzmm          125.66
is            500.00
rfl           6304.2
rfp                 0
th                 10
ins             1.000
ai   cdc   ph

      DEC. & VT
dfrq         499.747
dn                H1
dpwr              34
dof                0
dm               yyy
dmm                w
dmf            10000
dseq
dres             1.0
homo               n
      PROCESSING
lb               1.00
wtfile
proc               ft
fn             131072
math               f

werr
wexp
wbs
wnt
```



4fb