Supporting Information for *Organic Letters*

Lewis Acid-Catalyzed Nucleophilic Reactions of Enol Silyl Ethers with Propargyl Silyl Ethers

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Experimental Section

Instrumentation. IR spectra ware recorded on a Horiba Fourier transform infrared spectrophotometer Model FT-210 instrument. ^{1}H-NMR and ^{13}C-NMR spectra were recorded on a Varian Mercury-300 (300 MHz for proton and 75 MHz for carbon-13) instrument. The chemical shifts are given in δ unit relative to internal $CHCl_3$ (7.26 ppm for ^{1}H) or $CDCl_3$ (77 ppm for ^{13}C). All NMR experiments were performed using deuteriochloroform as a solvent. Mass spectra were obtained on a JEOL JMS-DX303 instrument relying on a JMA-DA5000 mass data system. Elemental analyses were made with a Perkin-Elmer 2400 CHN Elemental Analyzer.

Analytical Procedure and Data Presentation. Analytical thin layer chromatography was performed on Merck pre-coated silica gel 60 F-254 (0.25 mm thickness). ^{1}H-NMR spectral data were indicated in the form: δ-value of signal (peak multiplicity, integrated number of protons and coupling constant (if any)). Splitting patterns are abbreviated as follows: s, singlet; d, doublet; t, triplet; q, quartet; m, multiplet; b, broad.

General Reaction Procedure. All reactions were conducted under a nitrogen or an argon atmosphere. Liquid reagents were transferred via a dry hypodermic syringe from sure seal bottles to a reaction flask through a rubber septa wired on to the reaction flask. The septa can also serve to permit evacuation to eliminate air and introduce the inert gas by means of a steady stream of inert gas flowing system. Organic extracts were concentrated by evaporation with a rotary evaporator evacuated at around 60 mmHg. Column chromatography was performed with an open column packed with Merck silica gel 60 7734 using an appropriate ratio of ethyl acetate-hexane mixed solvent.

*Synthesis of **3a–d, 4a–b, 5a–i, 6a–i***. The following procedure for the synthesis of **3a** is representative. To a solution of **1a** (61 mg, 0.23 mmol) and **2a** (74 mg, 0.21 mmol) in CH_2Cl_2 was added $BF_3{\cdot}Et_2O$ (0.0025 mL, 0.02 mmol) at –30 °C. The reaction was stirred at –30 °C for 15 min and quenched by the addition of saturated aqueous solution of $NaHCO_3$ (1 mL). The mixture was diluted with water and extracted with ethyl acetate-hexane mixed solvent. The organic layers were dried over Na_2SO_4 and concentrated by a rotary evaporator. Purification by column chromatography (hexane/EtOAc = 100/1) provided **3a** (69 mg, 80 %): for spectral data for **3a**, see ref. 3.

2-(3,3-Diphenyl-1,2-propadienyl)-2-methylcyclohexanone (**3b**). ^{1}H NMR δ 0.19 (s, 9H), 1.35 (s, 3H), 1.55–1.72 (m, 4H), 1.76–1.87 (m, 1H), 2.20–2.33 (m, 2H), 2.37–2.49 (m, 1H), 7.20–7.38 (m, 10H); ^{13}C NMR δ 1.1, 22.2, 25.3, 27.8, 39.5, 40.5, 54.0, 105.5, 106.9, 126.68, 126.72, 127.7, 128.1, 128.39, 128.41, 136.7 (2C), 206.5, 213.7; IR (neat) 2935, 1907, 1707 cm^{-1}: exact mass, m/z 374.2068 (calcd for $C_{25}H_{30}OSi$ m/z 374.2066). Anal. Calcd for $C_{25}H_{30}OSi$: C, 80.16; H, 8.07. Found: C, 80.30; H, 8.28.

4,4-Dimethyl-1,1,5-triphenyl-3-propyl-1,2-pentadien-5-one (**3c**). ^{1}H NMR δ 0.84 (t, 3H, *J* = 6.4 Hz),

1.50–1.66 (m, 2H), 1.55 (s, 6H), 2.01 (t, 2H, *J* = 7.1 Hz), 7.10–7.18 (m, 2H), 7.30–7.45 (m, 11H), 7.88–7.94 (m, 2H); ^{13}C NMR δ 14.1, 21.5, 26.5, 31.7, 51.4, 114.1, 114.8, 127.1, 127.9, 128.1, 128.4, 128.9, 132.0, 136.1, 136.8, 201.2, 203.4; IR (neat) 2961, 1910, 1675 cm^{-1}: exact mass, m/z 380.2138 (calcd for $C_{28}H_{28}O$ m/z 380.2140). Anal. Calcd for $C_{28}H_{28}O$: C, 88.38; H, 7.42. Found: C, 88.07; H, 7.22.

1,3-Diphenyl-2,2,3-trimethyl-5-trimethylsilyl-4-pentyn-1-one (**4a**). ^{1}H NMR δ 0.20 (s, 9H), 1.30 (s, 3H), 1.43 (s, 3H), 1.93 (s, 3H), 6.76–6.80 (m, 2H), 7.14–7.20 (m, 2H), 7.26–7.36 (m, 4H), 7.57–7.60 (m, 2H); ^{13}C NMR δ 0.3, 24.8, 24.9, 25.8, 48.1, 53.9, 89.0, 111.0, 127.3, 127.4, 127.6, 128.1, 128.9, 130.2, 141.5, 142.6, 210.9; IR (neat) 2167, 1670 cm^{-1}: exact mass, m/z 348.1908 (calcd for $C_{28}H_{28}O$ m/z 348.1909). Anal. Calcd for $C_{23}H_{28}OSi$: C, 79.26; H, 8.10. Found: C, 79.44; H, 8.01.

4,4-Dimethyl-3-trimethylsilyl-1,1,7-triphenyl-1,2,(6*E*)-heptatrien-5-one (**3d**) and **4,4-Dimethyl-7-trimethylsilyl-1,5,5-triphenyl-(1*E*)-hepten-6-yn-3-one** (**4b**). Data for **3d:** ^{1}H NMR δ 0.17 (s, 9H), 1.47 (s, 6H), 7.20–7.58 (m, 17 H); Data for **4b**: ^{1}H NMR δ 0.30 (s, 9H), 1.43 (s, 6H), 6.93–7.04 (m b, 2H), 7.20–7.58 (m, 15 H); ^{13}C NMR δ 0.0, 24.8, 53.9, 57.1, 91.8, 111.5, 124.4, 126.8, 127.7, 128.3, 128.5, 129.7, 135.2, 141.3, 142.6, 203.2; IR (neat) 3002, 2207, 1750 cm^{-1}: exact mass, m/z 374.2061 (calcd for $C_{25}H_{30}OSi$ m/z 374.2066). Anal. Calcd for $C_{25}H_{30}OSi$: C, 80.16; H, 8.07. Found: C, 79.91; H, 8.22.

Ethyl 4,7,7-trimethyl-8-oxo-6,8-diphenyl-4-octen-2-ynoate (**5a**). Data for *Z*-isomer: ^{1}H NMR δ 1.29 (s, 3H), 1.35 (t, 3H, *J* = 7.1 Hz), 1.36 (s, 3H), 1.92 (d, 3H, *J* = 1.4 Hz), 4.28 (q, 2H, *J* = 7.1 Hz), 4.59 (d, 1H, *J* = 10.7 Hz), 6.50 (dq, 1H, *J* = 1.4, 10.7 Hz), 7.08–7.58 (m, 10H); ^{13}C NMR δ 14.1, 22.2, 24.0, 24.4, 52.0, 53.8, 61.9, 84.8, 84.9, 117.9, 126.9, 127.8, 128.05, 128.13, 129.4, 130.8, 139.1, 139.5, 142.5, 153.8, 208.0; IR (neat) 2212, 1709, 1674 cm^{-1}: exact mass, m/z 374.1879 (calcd for $C_{25}H_{26}O_3$ m/z 374.1882). Anal. Calcd for $C_{25}H_{26}O_3$: C, 80.18; H, 7.00. Found: C, 79.95; H, 6.88.

1,5-Diphenyl-4,4,7-trimethyl-9-trimethylsilyl-6-nonene-1,8-diyn-3-one (**5b**). Data for *Z*-isomer: ^{1}H NMR δ 0.11 (s, 9H), 1.26 (s, 3H), 1.28 (s, 3H), 1.88 (d, 3H, *J* = 1.4 Hz), 4.39 (d, 1H, *J* = 10.4 Hz), 6.16 (dq, 1H, *J* = 1.4, 10.4 Hz), 7.17–7.60 (m, 10H); ^{13}C NMR δ –0.1, 22.1, 22.3, 23.1, 52.4, 53.5, 86.8, 92.7, 99.0, 104.2, 120.3, 121.0, 126.6, 127.9, 128.5, 129.5, 130.5, 132.9, 136.4, 140.1, 192.9; IR (neat) 2964, 2199, 2143, 1664 cm^{-1}: exact mass, m/z 398.2056 (calcd for $C_{27}H_{30}OSi$ m/z 398.2066). Anal. Calcd for $C_{27}H_{30}OSi$: C, 81.35; H, 7.59. Found: C, 81.15; H, 7.44.

1,5-Diphenyl-4,4,7-trimethyl-9-trimethylsilyl-(1*E*),6-nonadien-8-yn-3-one (**5c**). Data for *Z*-isomer: ^{1}H NMR δ 0.23 (s, 9H), 1.21 (s, 3H), 1.22 (s, 3H), 1.85 (d, 3H, *J* = 1.4 Hz), 4.35 (d, 1H, J = 10.4 Hz), 6.13 (dq, 1H, *J* = 1.4, 10.4 Hz), 7.11 (d, 1H, *J* = 15.7 Hz), 7.12–7.58 (m, 10H), 7.62 (d, 1H, *J* = 15.7 Hz); ^{13}C NMR δ 0.1, 22.1, 22.5, 23.0, 50.9, 53.4, 98.8, 104.4, 120.7, 121.9, 126.6, 127.9, 128.3, 128.8, 129.4, 130.1, 135.1, 136.7, 140.2, 142.4, 202.8; IR (neat) 2964, 2204, 1608 cm^{-1}. exact mass, m/z 400.2221 (calcd for $C_{27}H_{32}OSi$ m/z 400.2222). Anal. Calcd for $C_{27}H_{32}OSi$: C, 80.95; H, 8.05. Found: C, 80.88; H, 8.01.

2,5-Dimethyl-1,3-diphenyl-7-trimethylsilyl-4-hepten-6-yn-1-one (**5d**). Data for major isomer: ^{1}H NMR δ 0.25 (s, 9H), 1.28 (d, 3H, *J* = 7.2 Hz), 1.87 (d, 3H, *J* = 1.7 Hz), 3.84–4.00 (m, 1H), 4.45 (t, 1H, *J* = 10.2 Hz), 5.88 (dq, 1H, *J* = 1.4, 10.4 Hz), 7.16–7.60 (m, 10H); ^{13}C NMR δ 0.0, 16.4, 23.0, 45.8, 49.5, 98.5, 104.4, 119.7, 126.2, 127.7, 128.0, 128.2, 128.4, 132.7, 137.0, 139.1, 142.8, 202.9; IR (neat) 2964, 2180, 1716 cm^{-1}. exact mass, m/z 360.1907 (calcd for $C_{24}H_{28}OSi$ m/z 360.1909). Anal. Calcd for $C_{24}H_{28}OSi$: C, 79.95; H, 7.83. Found: C, 79.79; H, 7.68.

2-Methyl-2-(3-methyl-5-trimethylsilyl-1-phenyl-2-penten-4-ynyl)cyclohexanone (**5e**). Data for major isomer: ^{1}H NMR δ 0.22 (s, 9H), 0.95 (s, 3H), 1.20–1.34 (m, 1H), 1.60–1.80 (m, 3H), 1.78 (d, 3H, *J* = 1.4 Hz), 1.92–2.40 (m, 3H), 2.86 (dt, 1H, *J* = 6.0, 13.7 Hz), 4.66 (d, 1H, *J* = 10.7 Hz), 6.05 (dq, 1H, *J* =

1.4, 10.7 Hz), 7.10–7.36 (m, 5H); ^{13}C NMR δ 0.0, 19.2, 21.1, 22.7, 27.9, 37.5, 39.1, 48.1, 52.4, 98.6, 104.3, 119.9, 126.7, 127.9, 129.8, 136.3, 139.5, 215.3; IR (neat) 2935, 2143, 1707 cm^{-1}. exact mass, m/z 338.2052 (calcd for $C_{22}H_{30}OSi$ m/z 338.2066). Anal. Calcd for $C_{22}H_{30}OSi$: C, 78.05; H, 8.93. Found: C, 78.23; H, 901.

(6*E*)-Benzylidene-2-methyl-2-(3-methyl-5-trimethylsilyl-1-phenyl-2-penten-4-ynyl)cyclohexanone (**5f**). Data for major isomer: ^{1}H NMR δ 0.14 (s, 9H), 1.17 (s, 3H), 1.21 (s, 3H), 1.58–2.20 (m, 4H), 1.87 (d, 3H, *J* = 1.4 Hz), 2.62–2.82 (m b, 2H), 4.22 (d, 1H, *J* = 10.4 Hz), 6.32 (dq, 1H, *J* = 1.4, 10.4 Hz), 7.10–7.40 (m, 11H); ^{13}C NMR δ –0.1, 19.7, 22.6, 23.0, 29.2, 35.4, 51.5, 53.3, 98.5, 104.6, 119.9, 126.5, 127.9, 128.1, 129.5, 129.7, 130.0, 135.6, 136.1, 137.8, 140.7, 206.1; IR (neat) 2935, 2180, 1628 cm^{-1}. exact mass, m/z 426.2382 (calcd for $C_{29}H_{34}OSi$ m/z 426.2379). Anal. Calcd for $C_{29}H_{34}OSi$: C, 81.64; H, 8.03. Found: C, 81.71; H, 7.91.

2-Methyl-2-(3-methyl-5-trimethylsilyl-1-phenyl-2-penten-4-ynyl)cyclopentanone (**5g**). Data for diastereomer pair: ^{1}H NMR δ (0.20, 0.22) (s, 9H for each), (1.05, 1.06) (s, 3H for each), 1.58–1.80 (m, 8/2H), (1.85, 1.87) (d, 3H, *J* = 1.4 Hz for each), 2.10–2.22 (m, 4/2H), [3.95 (d, 1H, *J* = 10.4 Hz), 4.25 (d, 1H, *J* = 10.7 Hz)], [6.06 (dq, 1H, *J* = 1.4, 10.7 Hz), 6.40 (dq, 1H, *J* = 1.4, 10.4 Hz)], 7.10–7.30 (m, 10/2H); ^{13}C NMR δ (0.06, 0.17), (18.5, 18.7), (21.6, 22.4), (18.8, 22.9), (32.6, 35.0), (38.3, 39.4), (50.6, 53.5), (52.3, 52.9), (98.4, 98.7), (104.1, 104.6), (119.7, 120.7), (126.4, 126.5), (127.3, 128.1), (129.0, 129.6), (136.7, 137.7), (140.4, 141.2), (222.0, 222.8); IR (neat) 2958, 2143, 1737 cm^{-1}. exact mass, m/z 324.1915 (calcd for $C_{21}H_{28}OSi$ m/z 324.1909). Anal. Calcd for $C_{21}H_{28}OSi$: C, 77.72; H, 8.70. Found: C, 77.90; H, 8.91.

2-*tert*-Butyldimethylsilyloxy-4,4,7-trimethyl-9-trimethylsilyl-6-nonen-8-yn-3-one (**5h**). Data for major isomer: ^{1}H NMR δ –0.02 (s, 3H), 0.04 (s, 3H), 0.20 (s, 9H), 0.86 (s, 9H), 1.13 (d, 3H, *J* = 6.6 Hz), 1.21 (s, 3H), 1.22 (s, 3H), 1.84 (d, 3H, *J* = 1.7 Hz), 4.26 (d, 1H, *J* = 10.4 Hz), 4.48 (q, 1H, *J* = 6.6 Hz), 6.19 (dq, 1H, *J* = 1.7, 10.4 Hz), 7.10–7.26 (m, 5H); ^{13}C NMR δ –4.5, –4.4, 0.0, 18.2, 20.8, 23.0, 23.2, 25.8, 51.0, 53.7, 71.3, 98.8, 104.3, 120.3, 126.4, 127.9, 129.8, 137.7, 140.8, 213.7; IR (neat) 2935, 2143, 1707 cm^{-1}. exact mass, m/z 456.28775 (calcd for $C_{27}H_{44}O_2Si_2$ m/z 456.28798). Anal. Calcd for $C_{27}H_{44}O_2Si_2$: C, 70.99; H, 9.71. Found: C, 70.71; H, 9.60.

2-*tert*-Butyldimethylsilyloxy-4,7-dimethyl-9-trimethylsilyl-6-nonen-8-yn-3-one (**5i**). Data for major isomer: ^{1}H NMR δ –0.05 (s, 3H), 0.01(s, 3H), 0.25 (s, 9H), 0.76 (d, 3H, J = 6.9 Hz), 0.90 (s, 9H), 1.10 (d, 3H, J = 6.9 Hz), 1.84 (d, 3H, J = 1.4 Hz), 3.56 (dq, 1H, J = 6.9, 10.3 Hz), 3.96 (q, 1H, J = 6.9 Hz), 4.02–4.26 (m, 1H), 5.80 (dq, 1H, J = 1.4, 10.3 Hz), 7.10–7.26 (m, 5H); ^{13}C NMR δ –4.8, –4.5, 0.0, 16.0, 18.0, 19.6, 25.8, 22.9, 45.0, 49.2, 74.7, 98.5, 104.2, 119.8, 126.3, 128.0, 128.4, 139.3, 142.9, 215.8; IR (neat) 2979, 2138, 1714 cm^{-1}. exact mass, m/z 442.27248 (calcd for $C_{26}H_{42}O_2Si_2$ m/z 442.27233). Anal. Calcd for $C_{26}H_{42}O_2Si_2$: C, 70.53; H, 9.56. Found: C, 70.31; H, 9.68.

3-(1-Benzoyl-1-methylethyl)-1-(phenylethynyl)cyclohexene (**6a**): for spectral data and copies of NMR spectra (^{1}H and ^{13}C) of **6a**, see supporting information accompanied to ref. 3.

3-(1-Phenylpropioloyl-1-methylethyl)-1-(phenylethynyl)cyclohexene (**6b**). ^{1}H NMR δ 1.23 (s, 3H), 1.27 (s, 3H), 1.26–1.38 (m, 1H), 1.54–1.70 (m, 1H), 1.76–1.96 (m, 2H), 2.18–2.26 (m b, 2H), 2.81–2.91 (m b, 1H), 6.09 (s b, 1H), 7.25–7.62 (m, 10H); ^{13}C-NMR δ 20.8, 21.2, 22.3, 23.3, 29.3, 43.0, 51.3, 86.3, 87.6, 90.9, 92.5, 120.1, 123.0, 123.5, 127.8, 128.2, 128.6, 130.6, 131.4, 133.0, 134.7, 193.5; IR (neat) 2935, 2197, 1662 cm^{-1}. exact mass, m/z 352.18262 (calcd for $C_{26}H_{24}O$ m/z 352.18271). Anal. Calcd for $C_{26}H_{24}O$: C, 88.60; H, 6.86. Found: C, 88.81; H, 6.71.

3-(1-Cinnamoyl-1-methylethyl)-1-(phenylethynyl)cyclohexene (**6c**). ^{1}H NMR δ 1.18 (s, 3H), 1.23 (s,

3H), 1.20–1.35 (m, 1H), 1.50–1.90 (m, 3H), 2.16–2.24 (m b, 2H), 2.68–2.80 (m, 1H), 6.06 (s b, 1H), 7.14 (d, 1H, *J* = 15.4 Hz), 7.26–7.46 (m, 8H), 7.57–7.63 (m, 2H), 7.73 (d, 1H, *J* = 15.4 Hz); ^{13}C-NMR δ 20.8, 21.4, 22.3, 23.4, 29.3, 42.8, 49.6, 87.5, 90.9, 120.9, 122.9, 123.5, 127.8, 128.2, 128.3, 128.8, 130.3, 131.4, 134.9, 135.0, 143.3, 203.4; IR (neat) 2964, 2213, 1618 cm^{-1}. exact mass, m/z 354.19829 (calcd for $C_{26}H_{26}O$ m/z 354.19836). Anal. Calcd for $C_{26}H_{42}O_2Si_2$: C, 88.09; H, 7.39. Found: C, 88.33; H, 7.40.

Ethyl [3-(1-benzoyl-1-methylethyl)cyclohexenyl]propiolate (**6d**) and **Ethyl (3-Hydroxycyclohexenyl)propiolate** (**7a**). Data for **6d**: ^{1}H NMR δ 1.23 (s, 3H), 1.31 (t, 3H, *J* = 7.1 Hz), 1.32 (s, 3H), 1.40–1.92 (m, 4H), 2.10–2.20 (m b, 2H), 2.92–3.02 (m b, 1H), 4.24 (q, 2H, *J* = 7.1), 6.30 (s b, 1H), 7.34–7.66 (m, 5H); ^{13}C-NMR δ 14.1, 21.9, 22.6, 23.1, 28.2, 43.5, 50.6, 61.9, 79.1, 87.7, 120.4, 127.6, 128.2, 131.0, 138.8, 142.0, 154.2, 208.3; IR (neat) 2980, 2937, 2212, 1707, 1674 cm^{-1}; exact mass, m/z 324.17248 (calcd for $C_{21}H_{24}O_3$ m/z 324.17254). Anal. Calcd for $C_{21}H_{24}O_3$: C, 77.75; H, 7.46. Found: C, 77.65; H, 7.33.

Data for **7a**: ^{1}H NMR δ 1.31 (t, 3H J = 7.1 Hz), 1.50–1.96 (m, 4H), 2.06–2.22 (m, 2H), 4.25 (q, 2H, J = 7.1 Hz), 4.24–4.30 (m b, 1H), 6.35–6.40 (m b, 1H); ^{13}C-NMR δ 14.0, 18.8, 28.2, 30.7, 62.0, 65.3, 79.9, 86.4, 121.3, 141.7, 154.0; IR (neat) 3450, 2942, 2214, 1711 cm^{-1}.

3-(1-Benzoyl-1-methylethyl)-1-(trimethylsilylethynyl)cyclohexene (**6e**) and **3-Hydroxy-1-(trimethylsilylethynyl)cyclohexene** (**7b**). Data for **6e**: ^{1}H NMR δ 0.17 (s, 9H), 1.22 (s, 3H), 1.23–1.28 (m, 1H), 1.30 (s, 3H), 1.38–1.85 (m, 3H), 2.06–2.14 (m b, 2H), 2.86–2.98 (m, 1H), 6.01 (s b, 1H), 7.37–7.50 (m, 3H), 7.61–7.67 (m, 2H); ^{13}C-NMR δ 0.0, 22.2, 22.5, 23.0, 23.4, 29.2, 43.1, 50.7, 91.7, 106.8, 122.8, 127.6, 128.1, 130.8, 135.9, 139.0, 208.8;.IR (neat) 2939, 2242, 1674 cm^{-1}; exact mass, m/z 324.19090 (calcd for $C_{21}H_{28}OSi$ m/z 324.19094). Anal. Calcd for $C_{21}H_{28}OSi$: C, 77.72; H, 8.70. Found: C, 77.61; H, 8.66.

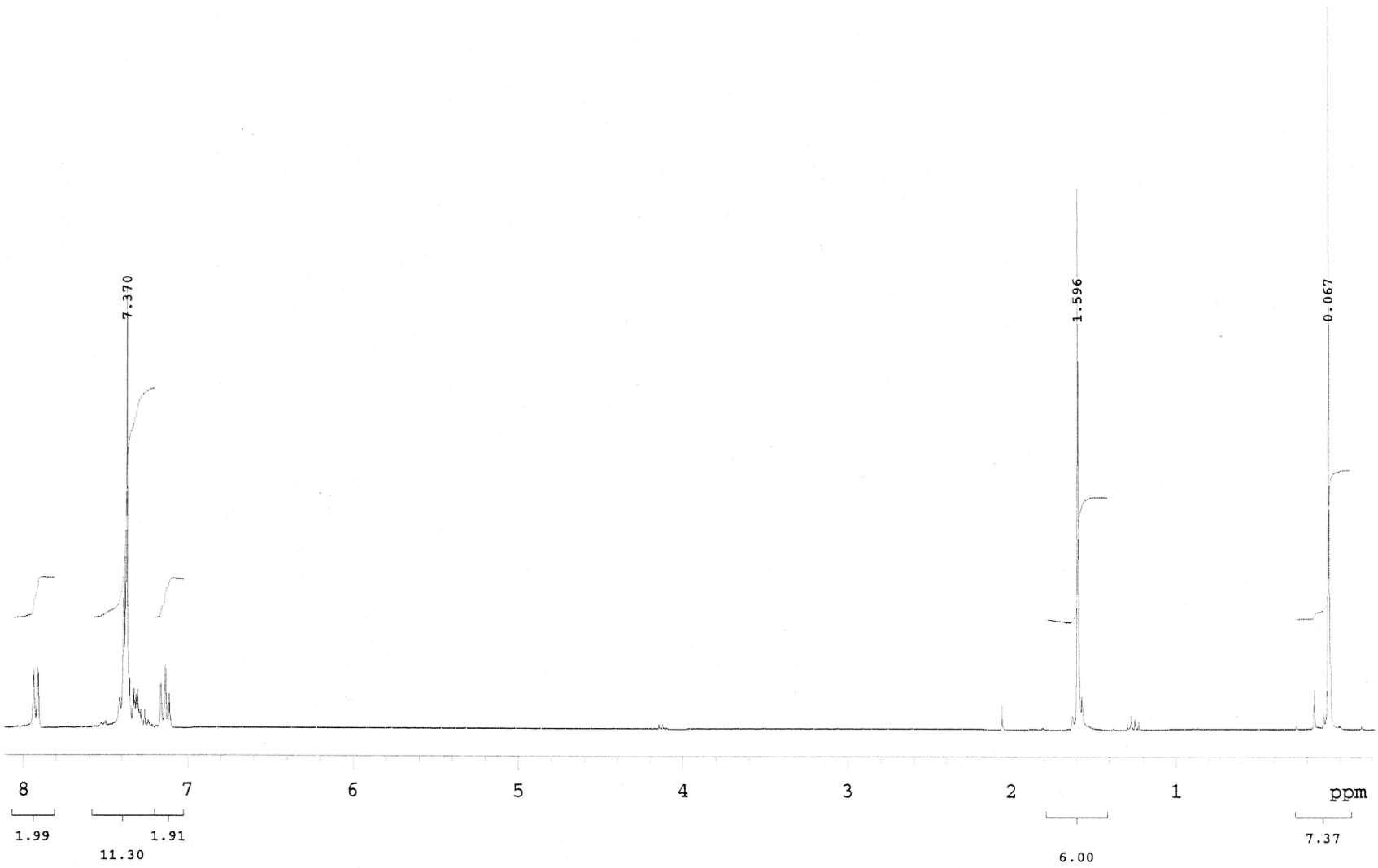
Data for **7e**: ^{1}H NMR δ 0.17 (s, 9H), 1.50–1.90 (m, 4H), 2.05–2.18 (m, 2H), 4.18–4.28 (m b, 1H), 6.11–6.16 (m, 1H); ^{13}C-NMR δ –0.1, 18.8, 29.2, 31.0, 65.4, 93.5, 105.7, 124.0, 136.6; IR (neat) 3450, 2939, 2240 cm^{-1}.

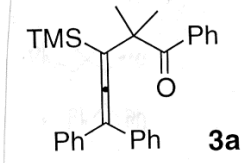
2-Methyl-2-[3-(phenylethynyl)-2-cyclohexen-1-yl]cyclohexanone (**6f**). Data for diastereomer pair: ^{1}H NMR δ 0.97 (s, 6/2H), 1.16–1.28 (m, 2/2H), 1.38–2.10 (m, 18/2H), 2.14–2.24 (m, 4/2H), 2.32–2.58 (m, 4/2H), 2.80–2.96 (m, 2/2H), (5.80, 6.04) (s b, 1H for each), 7.24–7.45 (m, 10/2H); ^{13}C-NMR δ (18.8, 19.5), (20.6, 20.7), (22.0, 22.6), (22.36, 22.39), (27.2, 27.5), 29.2, (35.5, 36.5), (38.6, 39.1), (39.2, 39.8), (51.5, 51.7), 87.4, (90.7, 90.9), (122.6, 122.7), 123.5, (127.76, 127.83), (128.17, 128.20), 131.4, (134.8, 135.4), (215.2, 215.8); IR (neat) 2935, 2204, 1705 cm^{-1}; exact mass, m/z 292.18271 (calcd for $C_{21}H_{24}O$ m/z 292.18271). Anal. Calcd for $C_{21}H_{24}O$: C, 86.26; H, 8.27. Found: C, 86.20; H, 8.20.

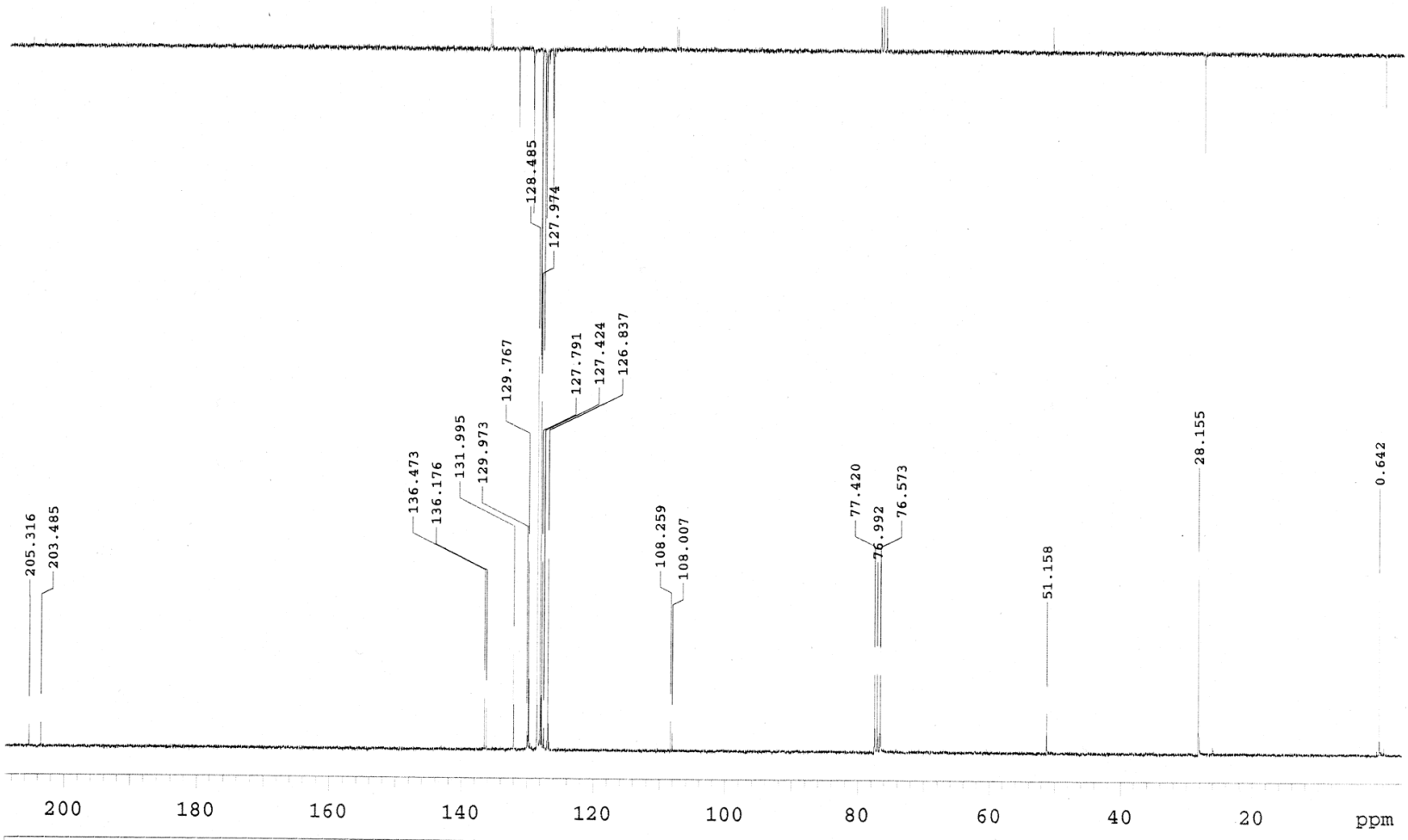
(6*E*)-Benzilidene-2-methyl-2-[3-(phenylethynyl)-2-cyclohexen-1-yl]cyclohexanone (**6g**). Data for major isomer: ^{1}H NMR δ 1.19 (s, 3H), 1.20–1.34 (m, 1H), 1.50–2.00 (m, 7H), 2.17–2.26 (m, 2H), 2.68–2.86 (m b, 3H), 6.10 (s b, 1H), 7.25–7.46 (m, 11H); ^{13}C-NMR δ 19.6, 22.0, 22.3, 22.9, 29.1, 29.4, 32.6, 42.0, 49.9, 87.3, 91.1, 122.7, 123.6, 128.2, 128.3, 130.2, 131.4, 135.2, 135.7, 135.8, 135.9, 136.4, 137.2, 206.6; IR (neat) 2935, 2204, 1631 cm^{-1}; exact mass, m/z 380.21411 (calcd for $C_{28}H_{28}O$ m/z 380.21402). Anal. Calcd for $C_{28}H_{28}O$: C, 88.38; H, 7.42. Found: C, 88.45; H, 7.40.

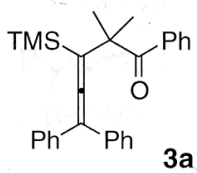
2-Methyl-2-[3-(phenylethynyl)-2-cyclohexen-1-yl]cyclopentanone (**6h**). Data for major isomer: ^{1}H NMR δ 1.08 (s, 3H), 1.14–1.28 (m, 3H), 1.46–2.00 (m, 8H), 2.10–2.24 (m, 3H), 2.28–2.64 (m, 2H), 6.23 (s b, 1H), 7.25–7.44 (m, 5H); ^{13}C-NMR δ 18.7, 20.8, 22.1, 23.5, 38.6, 41.6, 50.8, 87.3, 90.8, 123.1, 123.5, 127.8, 128.2, 131.4, 134.9, 222.9; IR (neat) 2958, 2204, 1735 cm^{-1}; exact mass, m/z 278.16695 (calcd for $C_{20}H_{22}O$ m/z 278.16706). Anal. Calcd for $C_{20}H_{22}O$: C, 86.29; H, 7.97. Found: C, 85.98; H, 7.90.

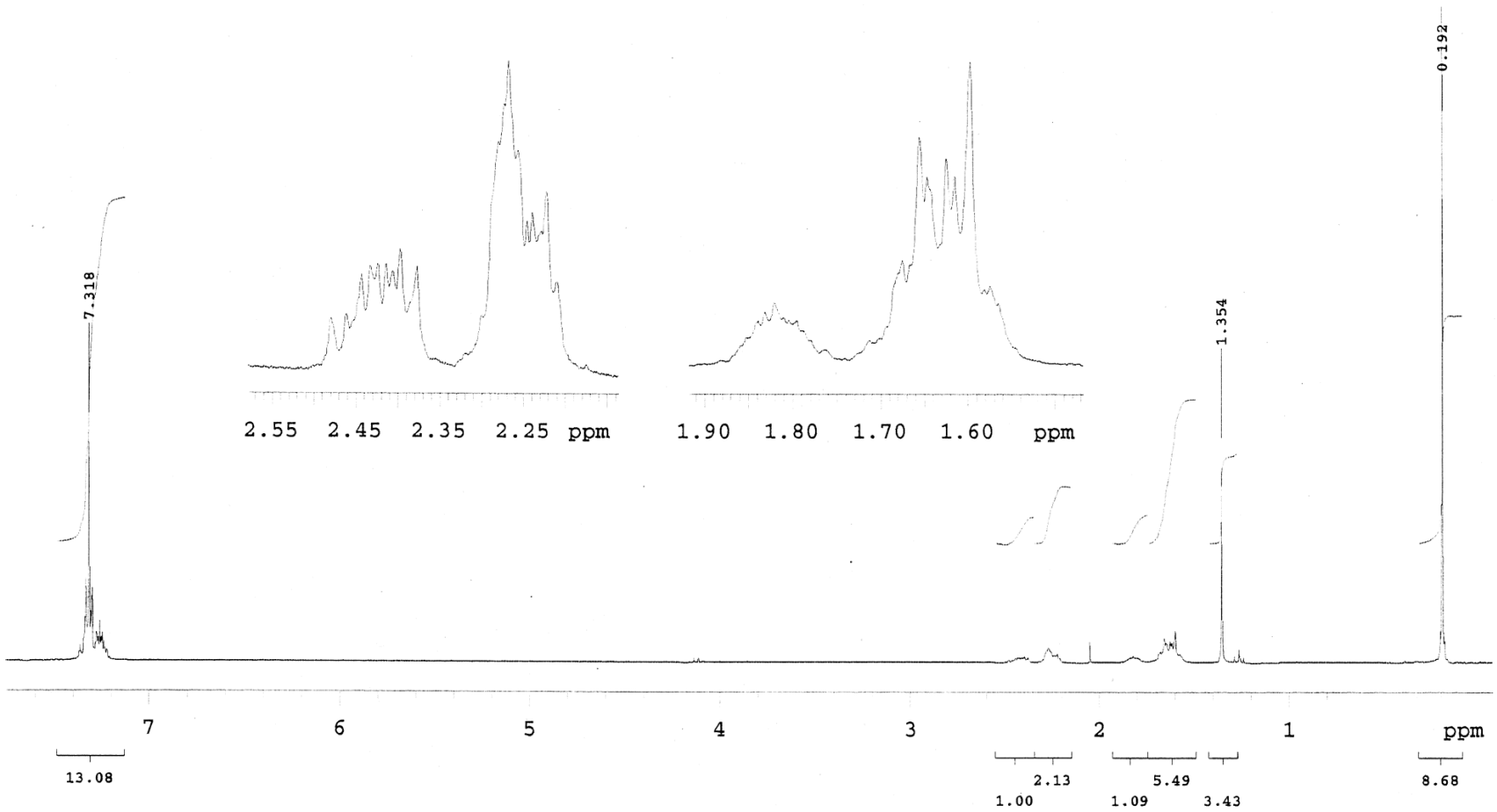
4-*tert*-Butyldimethylsiloxy-2-methyl-2-[3-(phenylethynyl)-2-cyclohexen-1-yl]-3-pentanone (**6i**). Data for major isomer: ^{1}H NMR δ 0.10 (s, 3H), 0.11(s, 3H), 0.91 (s, 9H), 1.11 (s, 3H), 1.23 (s, 3H), 1.20–1.28 (m, 1H), 1.34 (d, 3H, *J* = 6.9 Hz), 1.58–1.74 (m, 2H), 1.80–1.92 (m, 1H), 2.14–2.24 (m b, 2H), 2.90–3.00 (m, 1H), 4.59 (q, 1H, *J* = 6.9 Hz), 5.97 (s b, 1H), 7.25–7.43 (m, 5H); ^{13}C-NMR δ –4.6, –4.2, 18.0, 21.0, 21.1, 21.3, 22.3, 23.4, 25.8, 29.2, 41.8, 50.4, 72.2, 87.2, 91.0, 122.3, 123.5, 128.2, 131.4, 131.5, 135.5, 214.9; IR (neat) 2933, 2206, 1716 cm^{-1}; exact mass, m/z 410.26418 (calcd for $C_{26}H_{38}O_2Si$ m/z 410.26411). Anal. Calcd for $C_{26}H_{38}O_2Si$: C, 76.04; H, 9.33. Found: C, 76.22; H, 9.31.



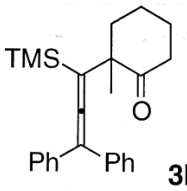
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute	 **3a**	TurnA-III-135 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 512 repetitions	OBSERVE C13, 75.4560975 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 17 minutes	 **3a**	TurnA-III-135 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE H1, 300.0836525	DATA PROCESSING
Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 8 repetitions		FT size 32768 Total time 1 minute

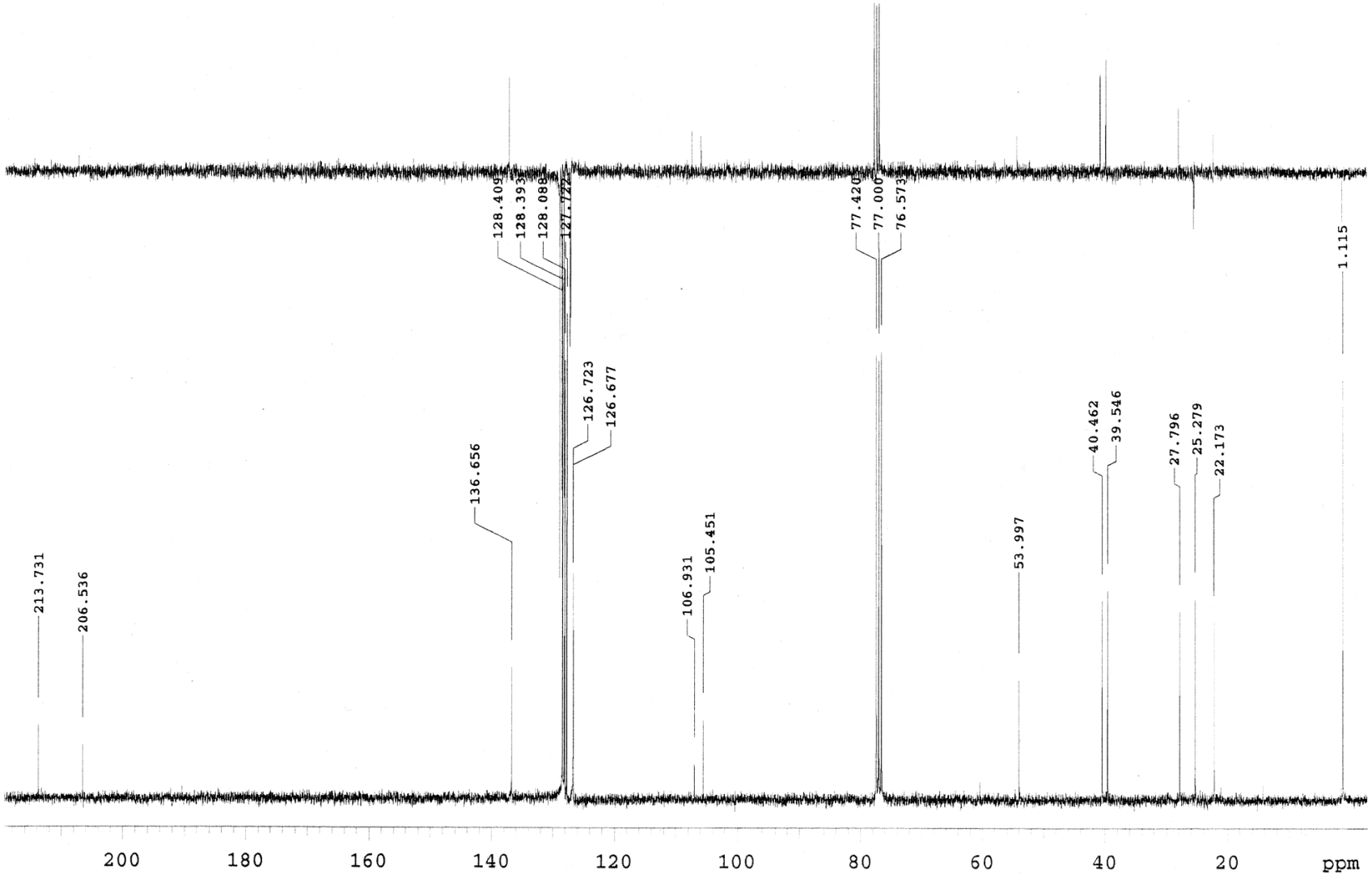


3b

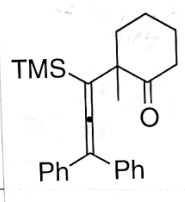
TurnA-V-154

Pulse Sequence: s2pul

Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE C13, 75.4560958	DATA PROCESSING
Relax. delay 0.501 sec	DECOUPLE H1, 300.0851346	Line broadening 1.0 Hz
Pulse 45.0 degrees	Power 36 dB	FT size 65536
Acq. time 1.499 sec	continuously on	Total time 57 minutes
Width 18865.6 Hz	WALTZ-16 modulated	
1728 repetitions		

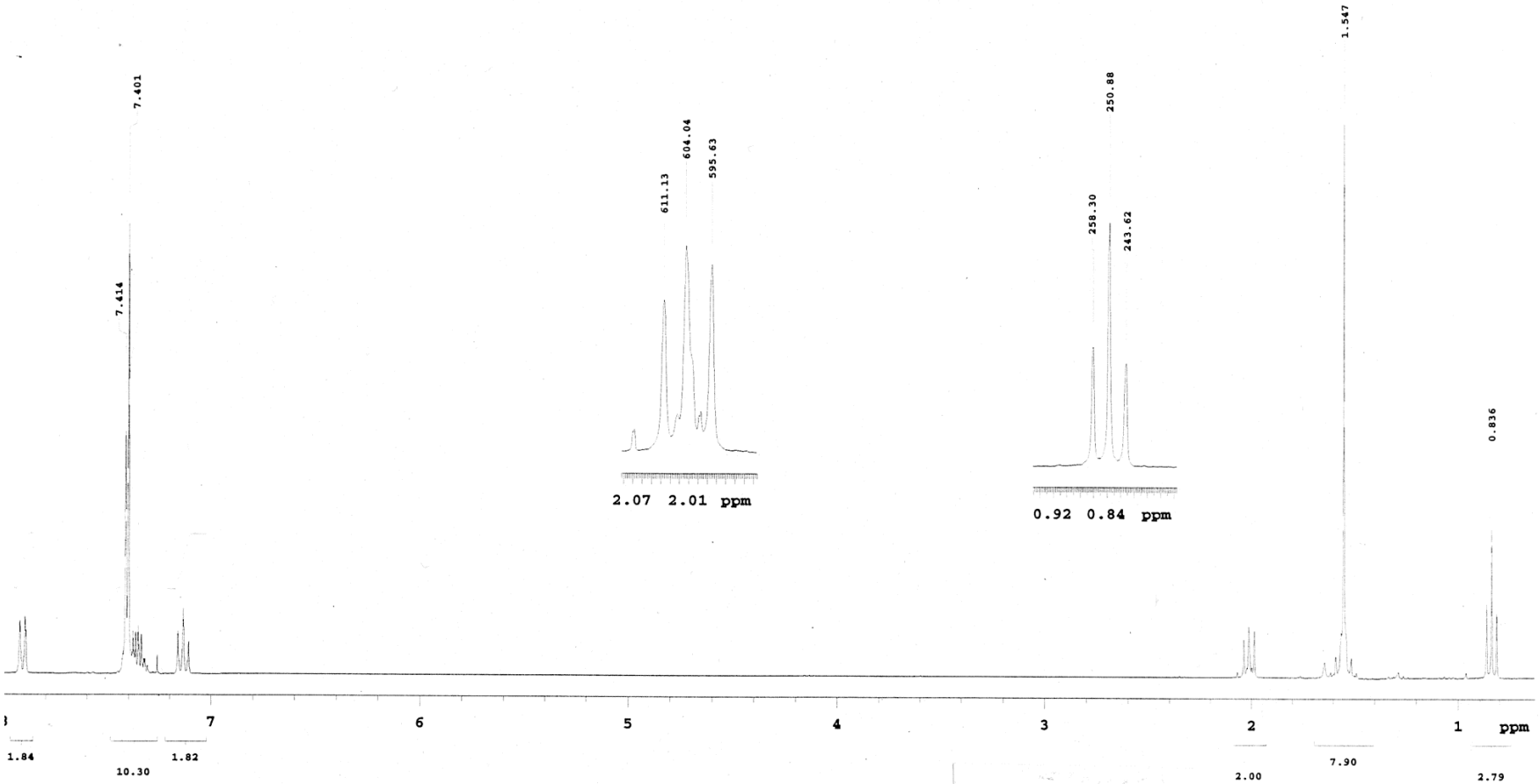


3b

TurnA-V-154

Pulse Sequence: s2pul

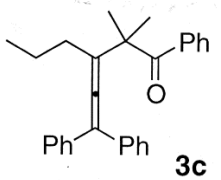
Solvent: CDC13
Ambient temperature
Mercury-300 "varian"



SE SEQUENCE
lax. delay 1.000 sec
lse 45.0 degrees
q. time 3.200 sec
lth 5402.5 Hz
repetitions

OBSERVE H1, 300.0836523

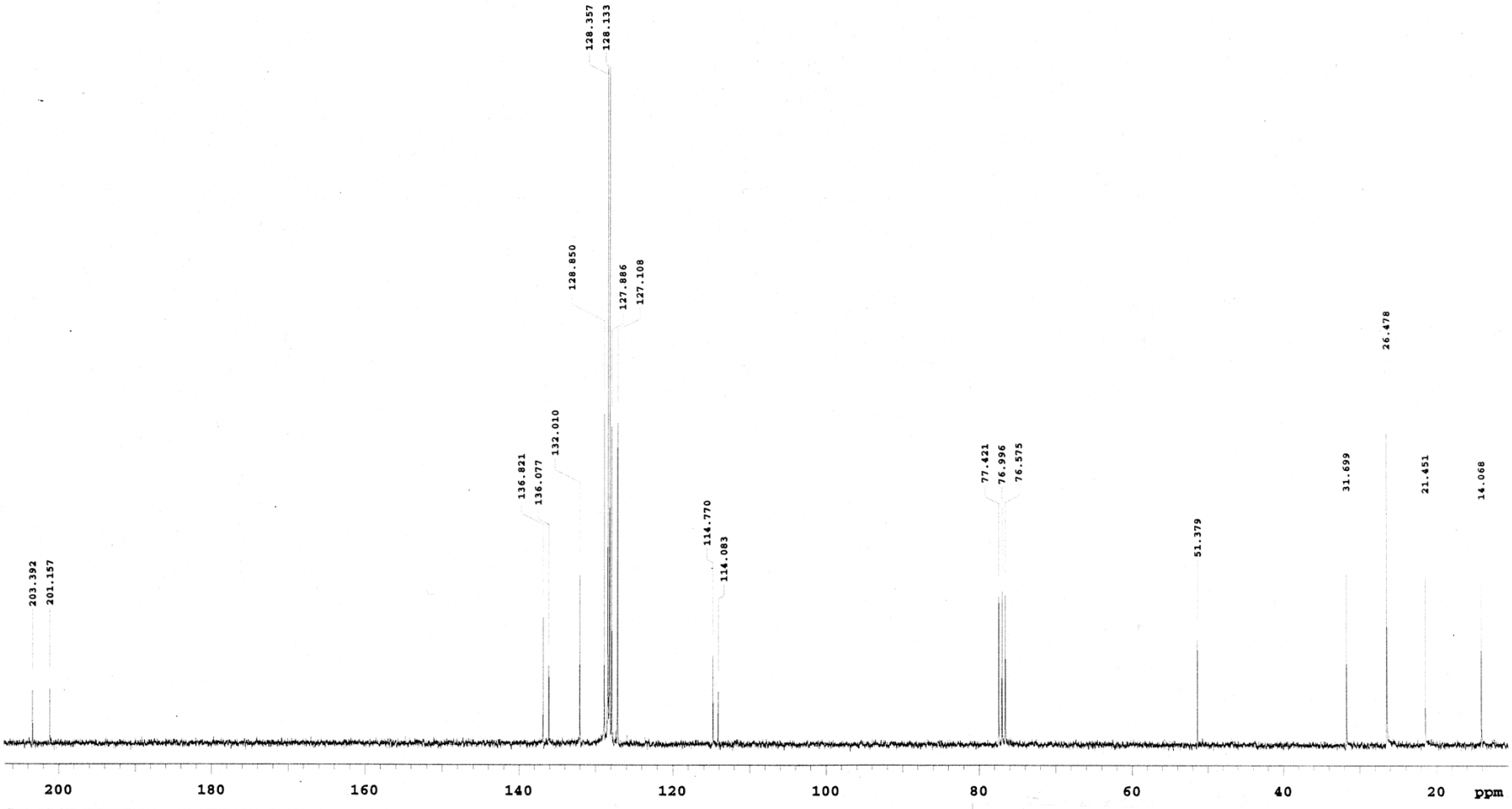
DATA PROCESSING
FT size 65536
Total time 1 minute



3c

TurnA-V-185

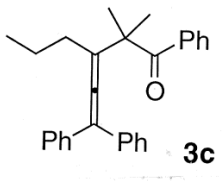
Pulse Sequence: s2pul
Solvent: CDCl3
Ambient temperature
Mercury-300 "scnmr2"



PULSE SEQUENCE
Relax. delay 1.185 sec
Pulse 45.0 degrees
Acq. time 1.815 sec
Width 18761.7 Hz
192 repetitions

OBSERVE C13, 75.4561013
DECOUPLE H1, 300.0851348
Power 40 dB
continuously on
WALTZ-16 modulated

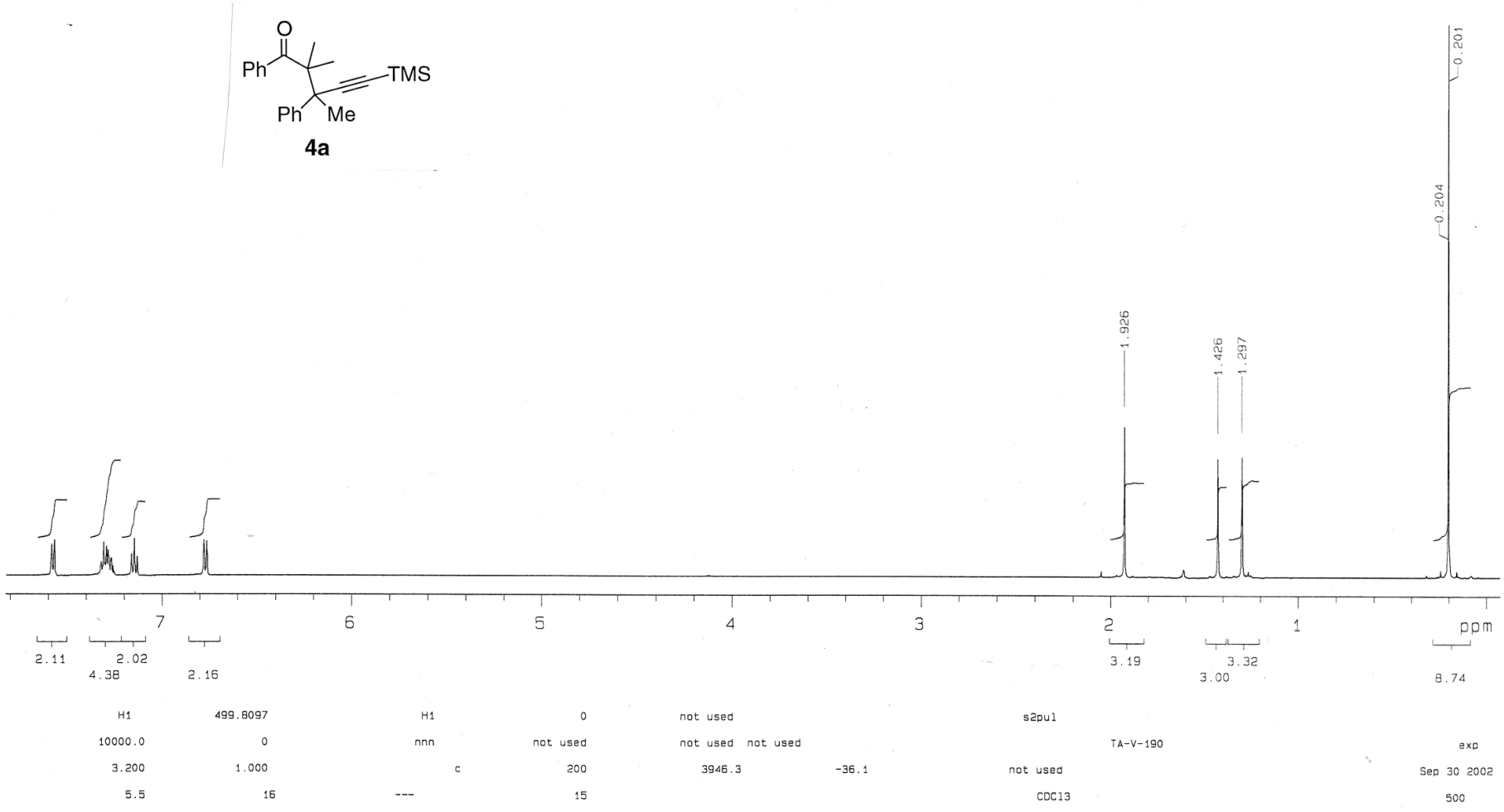
DATA PROCESSING
Line broadening 1.0 Hz
FT size 131072
Total time 9 minutes

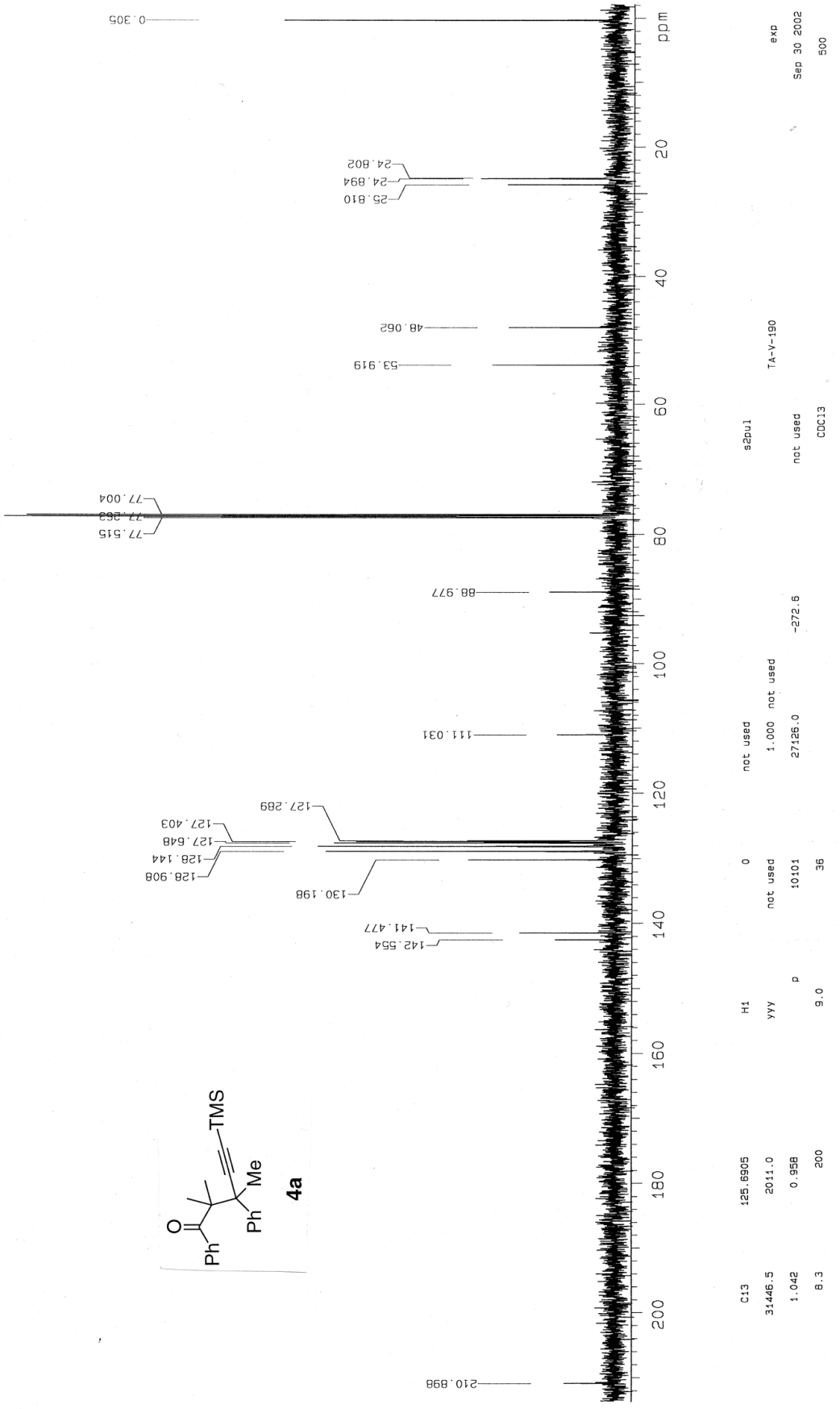


3c

TurnA-V-185

Pulse Sequence: s2pul
Solvent: CDCl3
Ambient temperature
Mercury-300 "scnmr2"


O
Ph
TMS
Ph
Me
4a
1.926
1.426
1.297
0.204
0.201
7
6
5
4
3
2
1
ppm
2.11
2.02
4.38
2.16
3.19
3.32
3.00
8.74
H1 499.8097 H1 0 not used s2pul
10000.0 0 nnn not used not used not used TA-V-190 exp
3.200 1.000 c 200 3946.3 -36.1 not used Sep 30 2002
5.5 16 --- 15 CDCl3 500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77.263
77.515
88.977
111.031
127.289
127.403
127.648
128.144
128.908
130.198
141.477
142.554
210.898
ppm
20
40
60
80
100
120
140
160
180
200
exp
Sep 30 2002
500
TA-V-190
s2pul
not used
CDCl3
not used
1.000
not used
27126.0
-272.6
0
not used
10101
36
H1
yyy
p
9.0
C13
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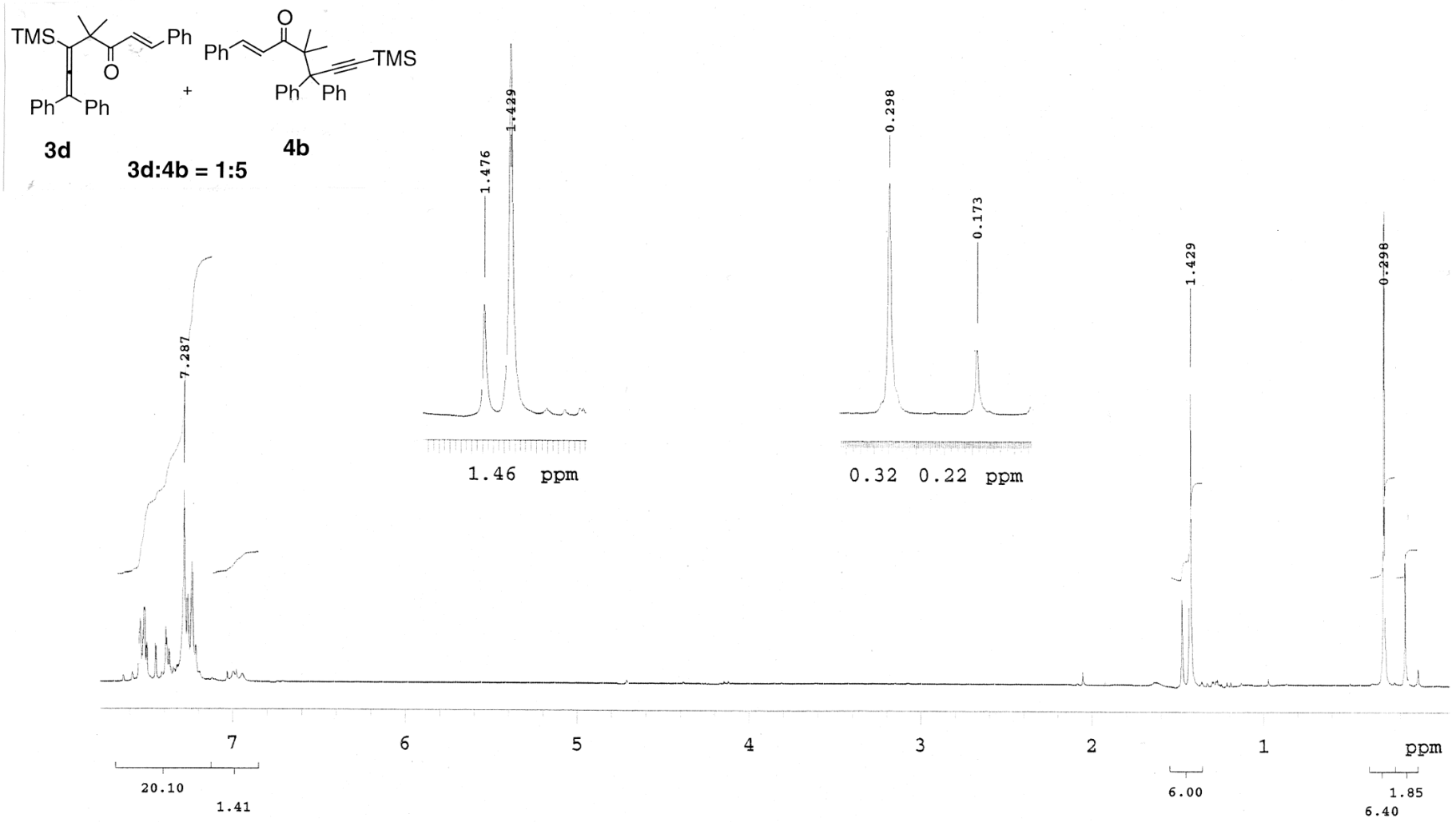
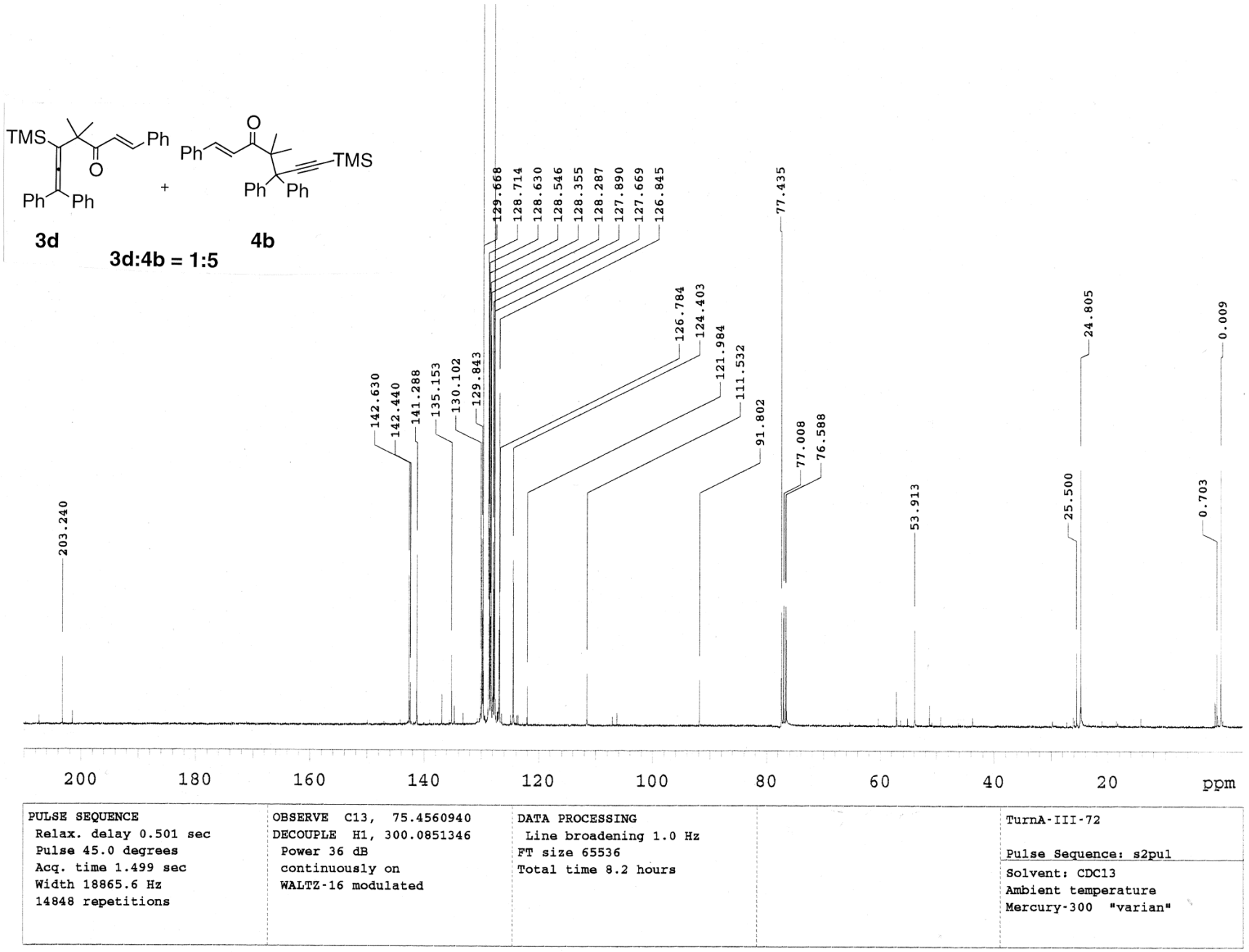
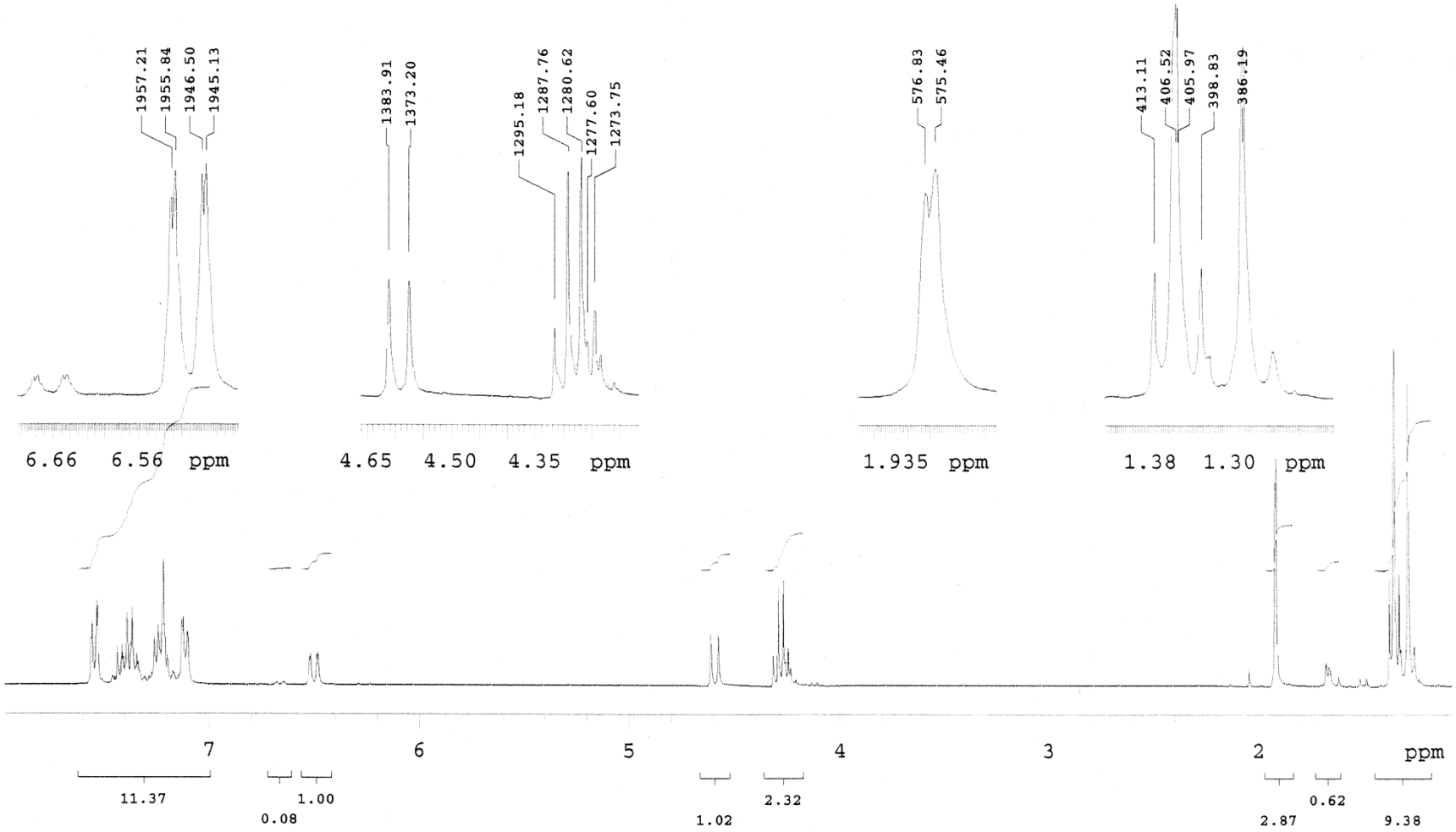
2011.0
0.958
200
31446.5
1.042
8.3
TMS
Me
Ph
O
Ph
4a

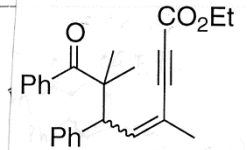


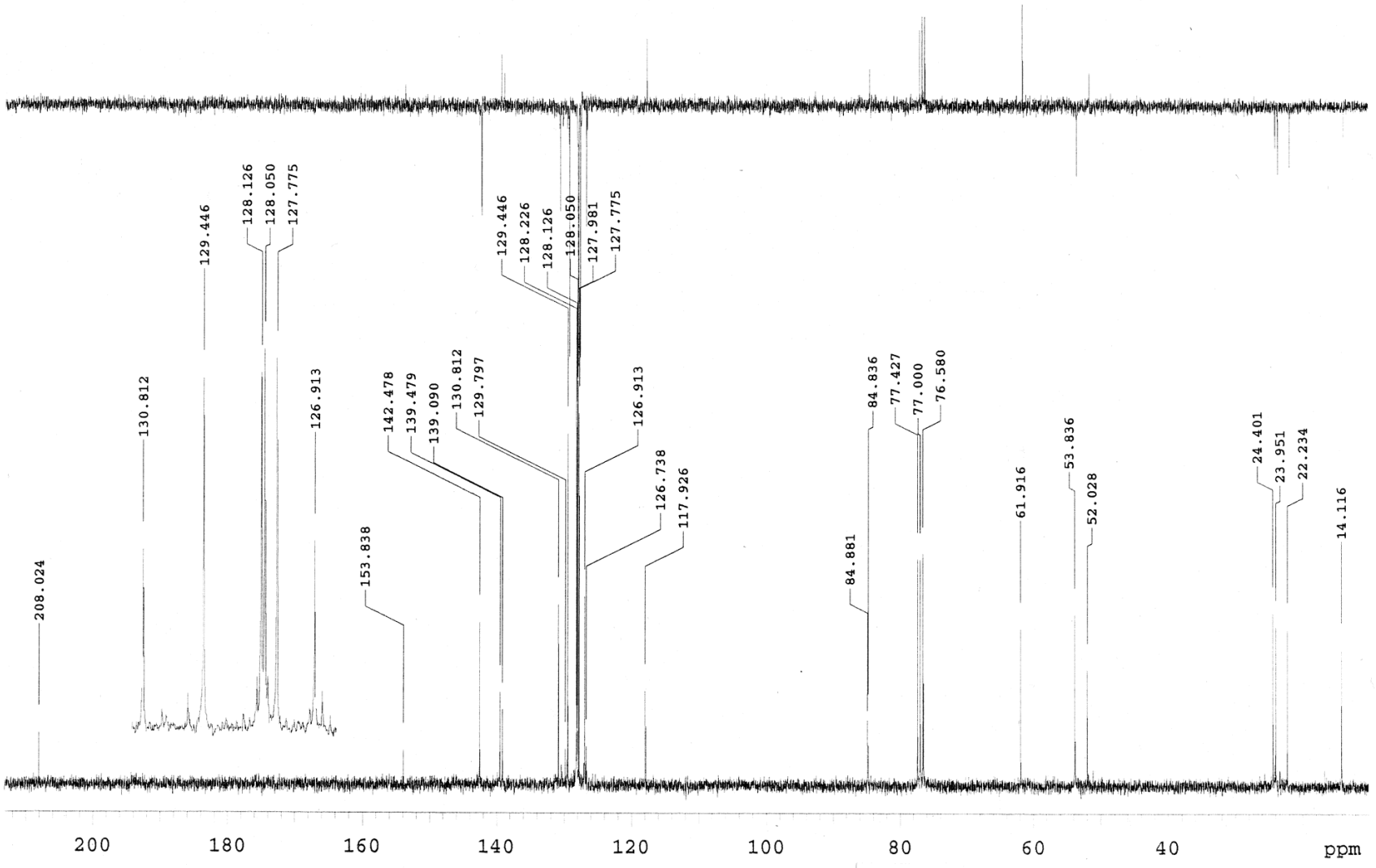
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute		TurnA-III-72 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



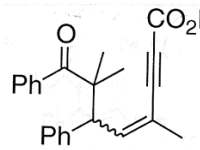
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 14848 repetitions	OBSERVE C13, 75.4560940 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 8.2 hours		TurnA-III-72 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute	 **5a** ($E:Z = 10:1$)	TurnA-III-150 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE C13, 75.4560969	DATA PROCESSING
Relax. delay 0.501 sec	DECOUPLE H1, 300.0851346	Line broadening 1.0 Hz
Pulse 45.0 degrees	Power 36 dB	FT size 65536
Acq. time 1.499 sec	continuously on	Total time 8 minutes
Width 18865.6 Hz	WALTZ-16 modulated	
256 repetitions		

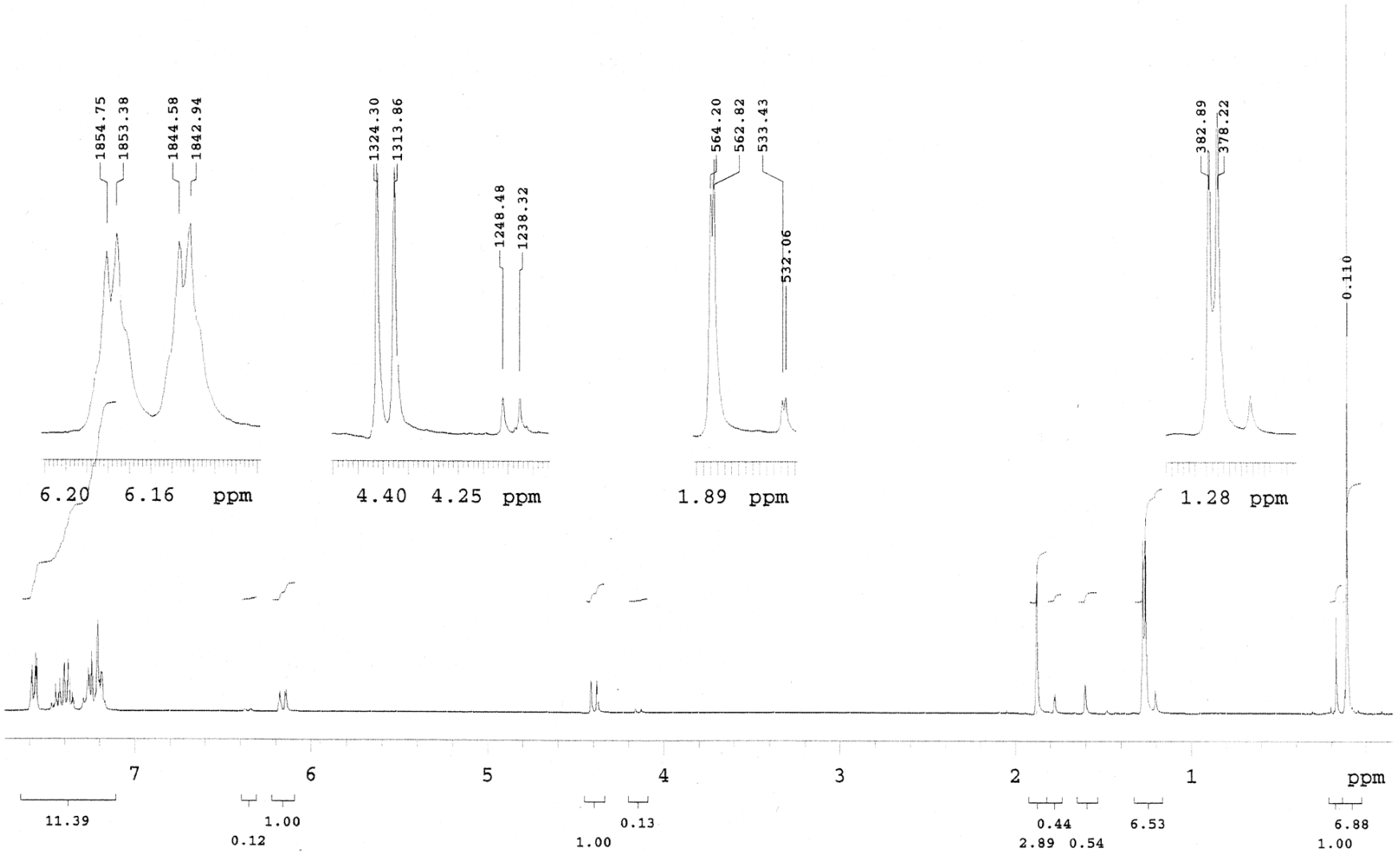


5a ($E:Z = 10:1$)

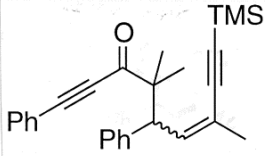
TurnA-III-150

Pulse Sequence: s2pul

Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836525	DATA PROCESSING FT size 32768 Total time 1 minute

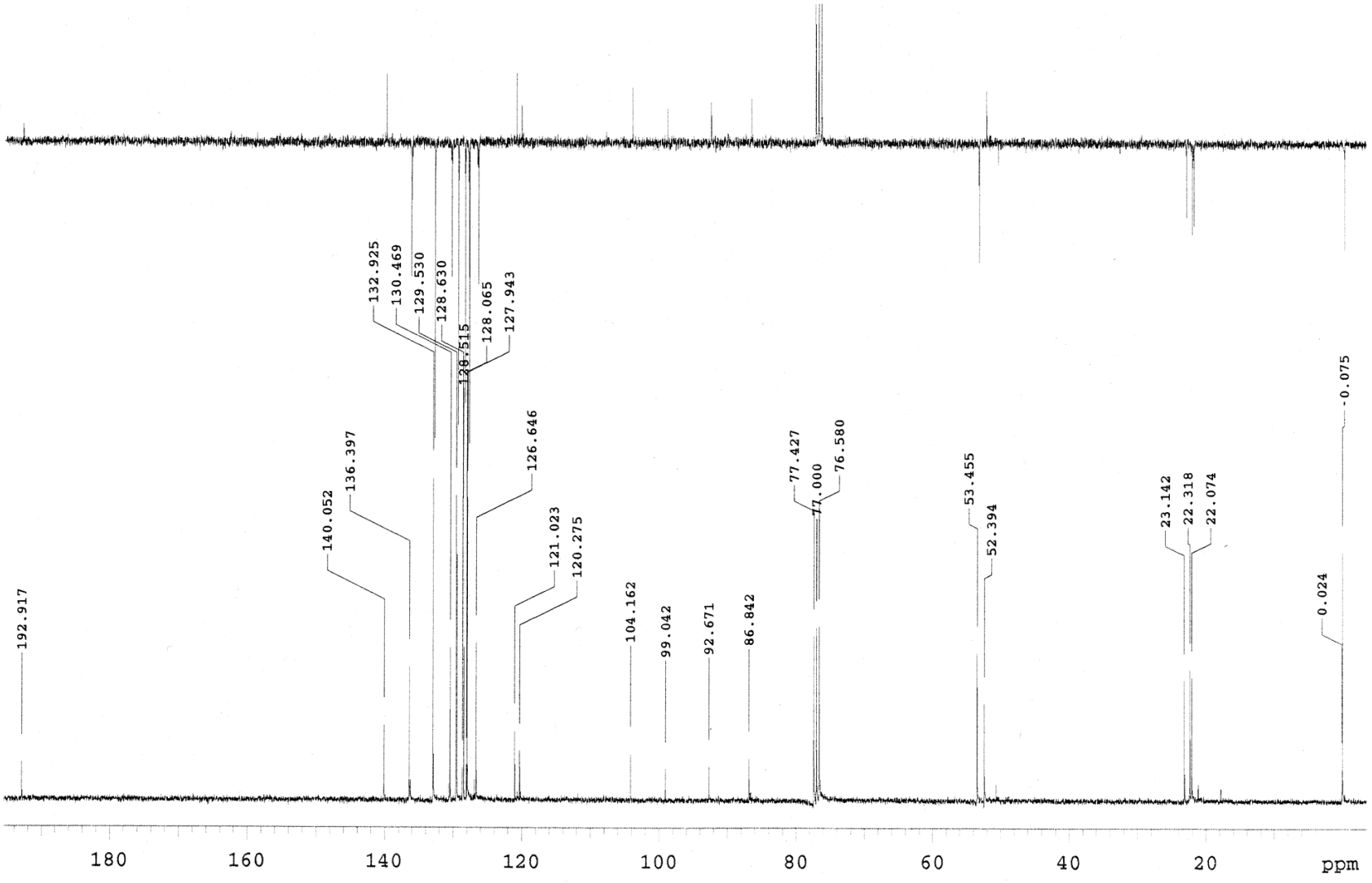


5b (E : Z = 10 : 1)

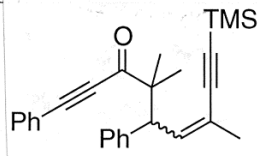
TurnA-III-127

Pulse Sequence: s2pul

Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE C13, 75.4560963	DATA PROCESSING
Relax. delay 0.501 sec	DECOUPLE H1, 300.0851346	Line broadening 1.0 Hz
Pulse 45.0 degrees	Power 36 dB	FT size 65536
Acq. time 1.499 sec	continuously on	Total time 34 minutes
Width 18865.6 Hz	WALTZ-16 modulated	
1040 repetitions		



5b (*E* : *Z* = 10 : 1)

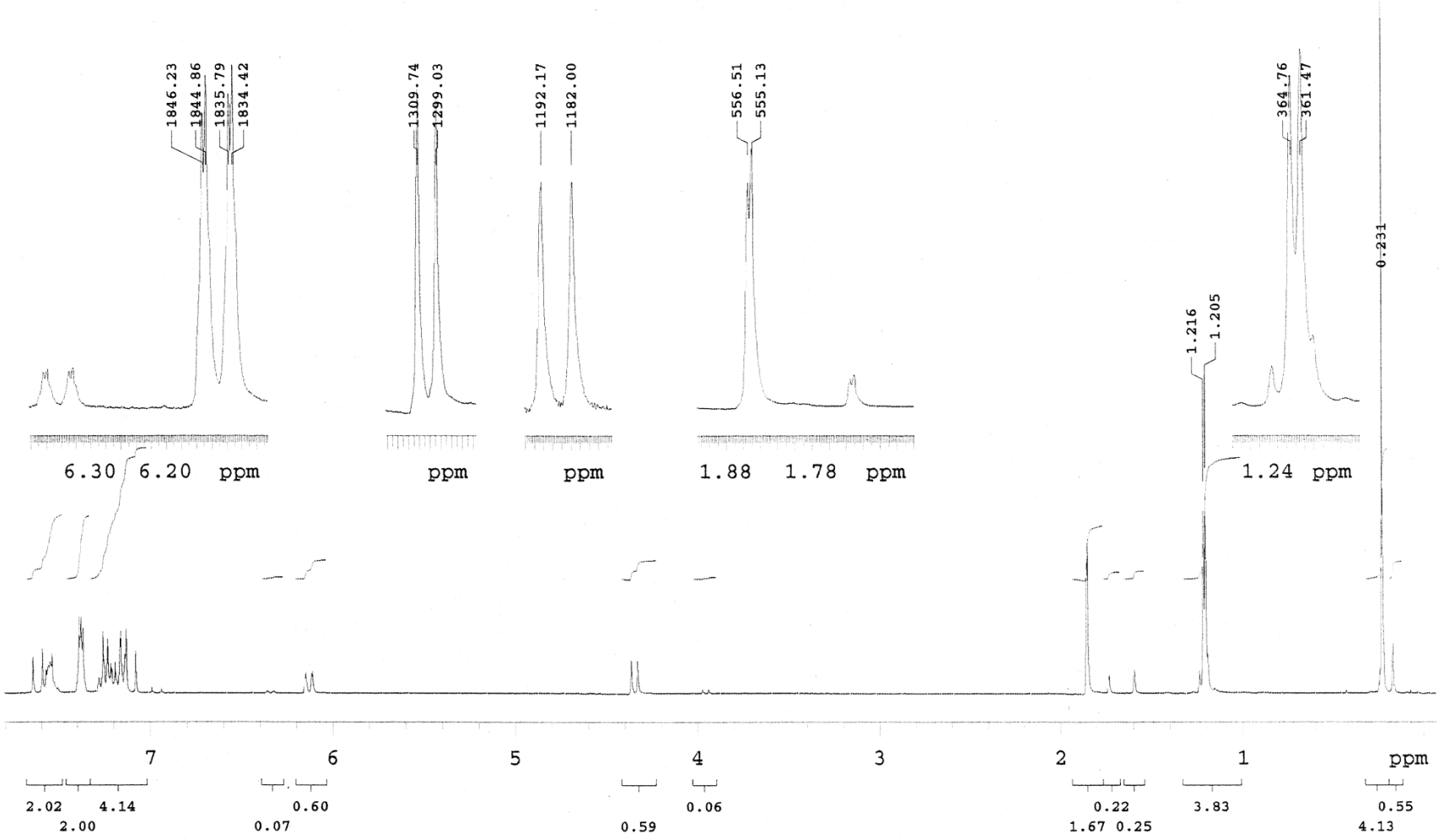
TurnA-III-127

Pulse Sequence: s2pul

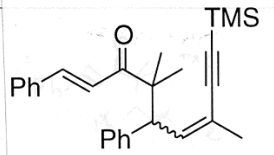
Solvent: CDCl3

Ambient temperature

Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE H1, 300.0836523	DATA PROCESSING
Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions		FT size 32768 Total time 1 minute

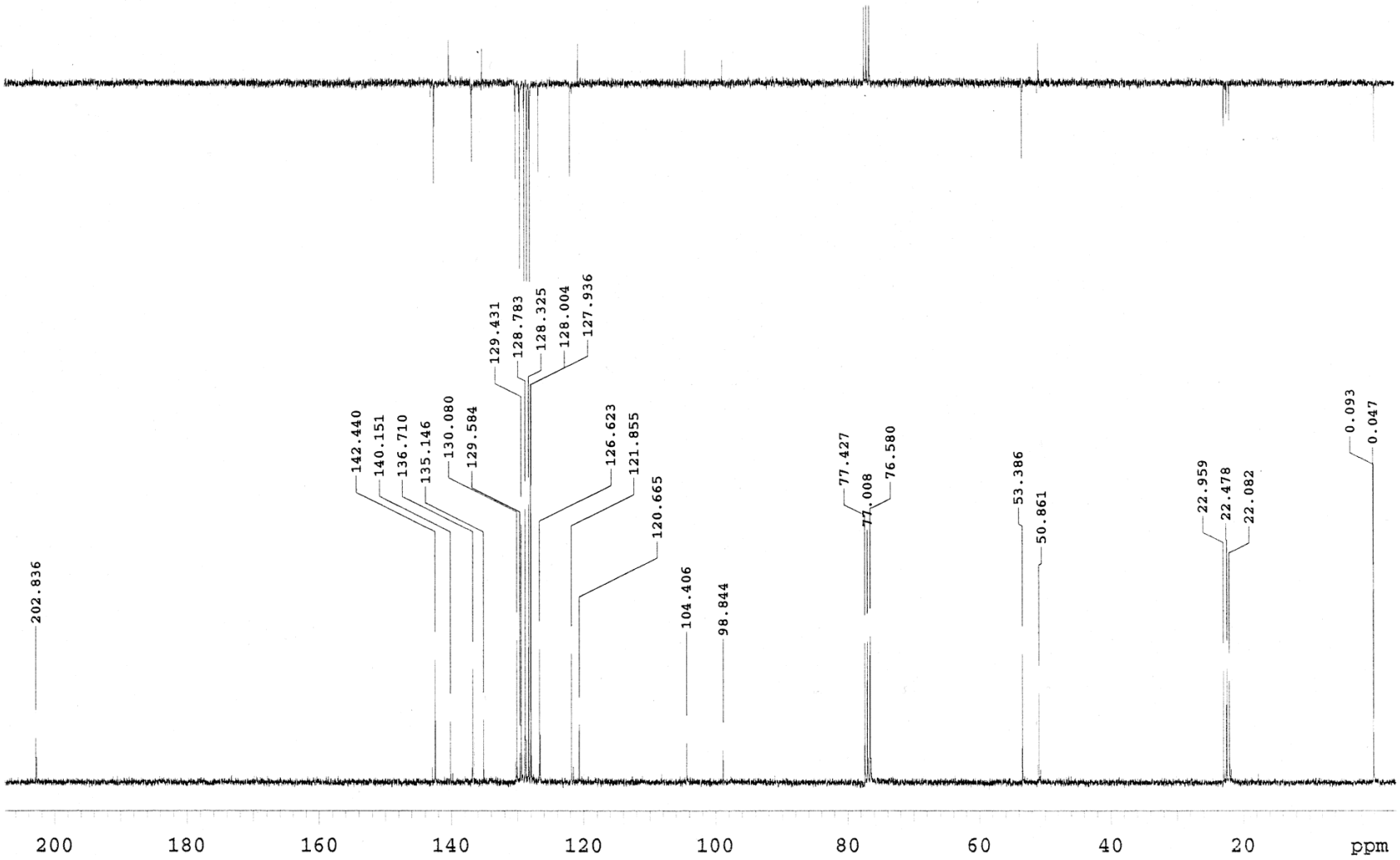


5c (*E* : *Z* = 10 : 1.2)

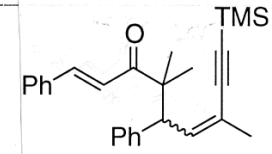
TurnA-III-65

Pulse Sequence: s2pul

Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE C13, 75.4560946	DATA PROCESSING
Relax. delay 0.501 sec	DECOUPLE H1, 300.0851346	Line broadening 1.0 Hz
Pulse 45.0 degrees	Power 36 dB	FT size 65536
Acq. time 1.499 sec	continuously on	Total time 17 minutes
Width 18865.6 Hz	WALTZ-16 modulated	
512 repetitions		

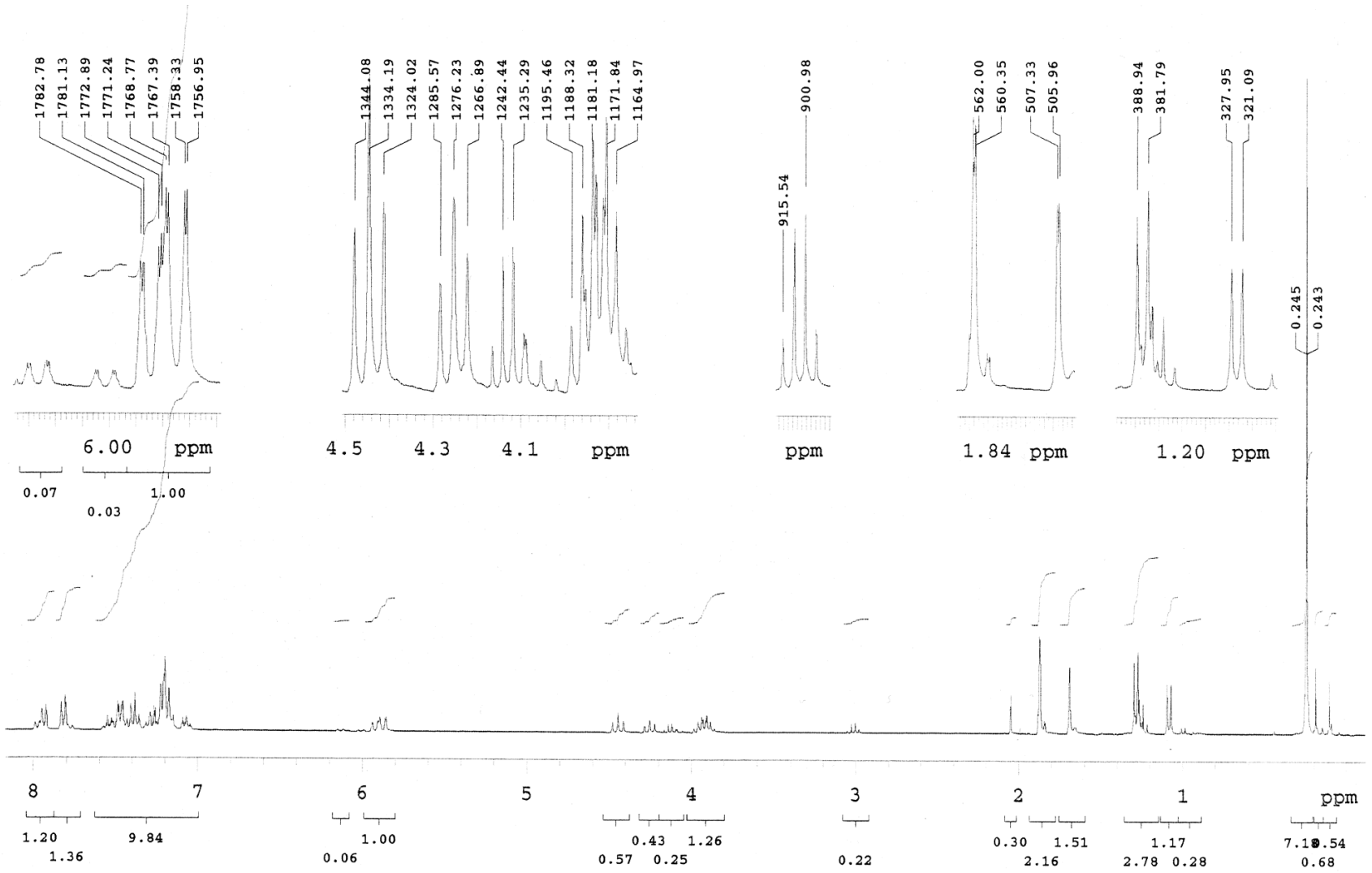


5c (E : Z = 10 : 1.2)

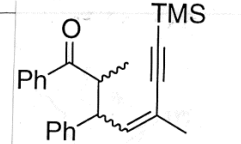
TurnA-III-65

Pulse Sequence: s2pul

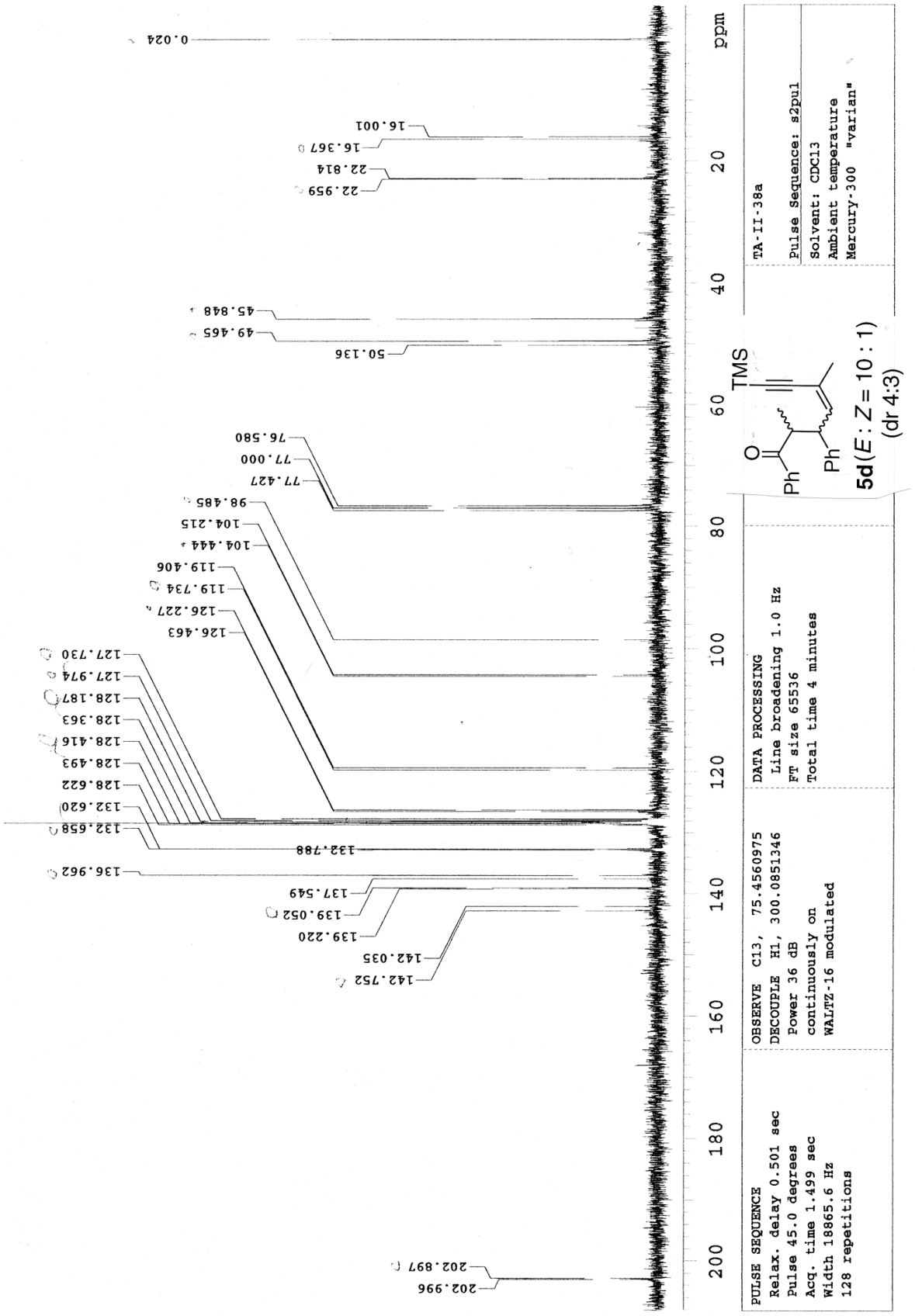
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836531	DATA PROCESSING FT size 32768 Total time 1 minute	TA-II-38a Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



5d(*E* : *Z* = 10 : 1)
(dr 4:3)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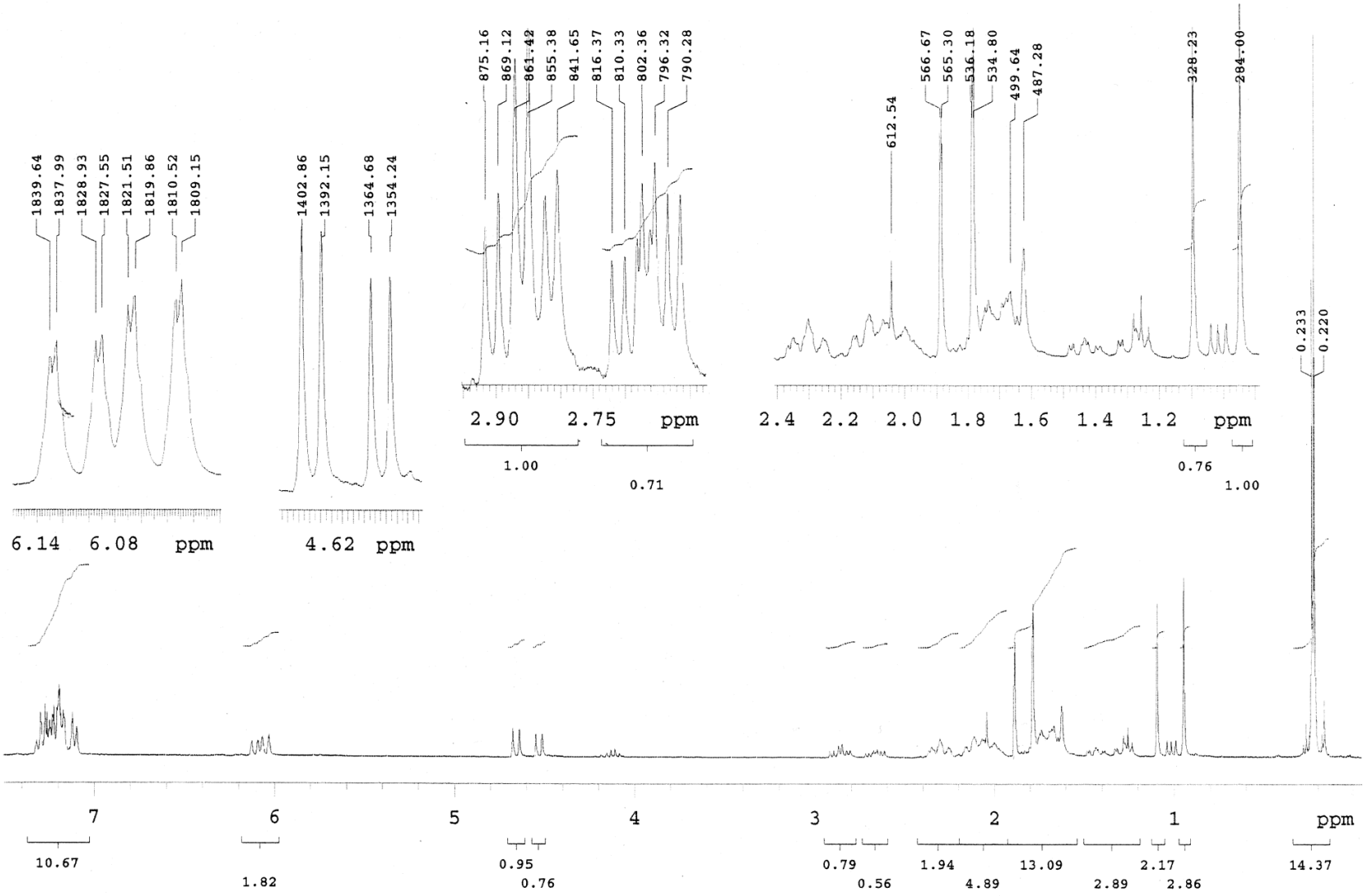
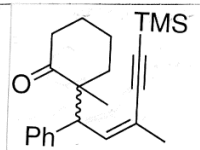
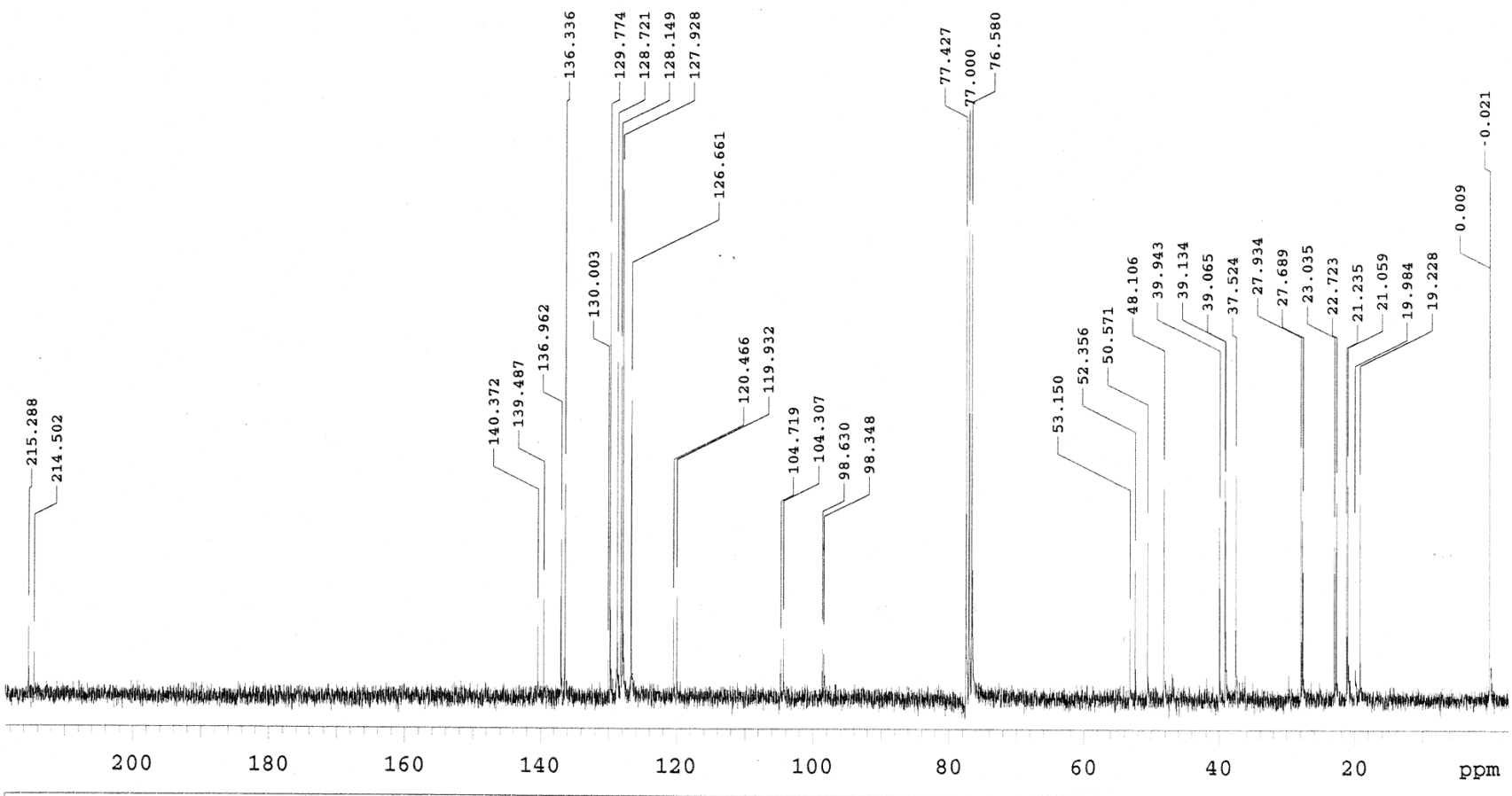
128.416
128.493
128.622
132.620
132.658
132.788
136.962
137.549
139.052
139.220
142.035
142.752
202.897
202.996
200
180
160
140
120
100
80
60
40
20
ppm
TMS
O
Ph
Ph
5d(E : Z = 10 : 1)
(dr 4:3)
TA-II-38a
Pulse Sequence: s2pul
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"
PULSE SEQUENCE
Relax. delay 0.501 sec
Pulse 45.0 degrees
Acq. time 1.499 sec
Width 18865.6 Hz
128 repetitions
OBSERVE C13, 75.4560975
DECOUPLE H1, 300.0851346
Power 36 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Line broadening 1.0 Hz
FT size 65536
Total time 4 minutes

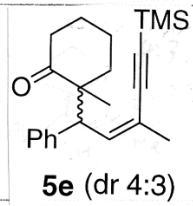


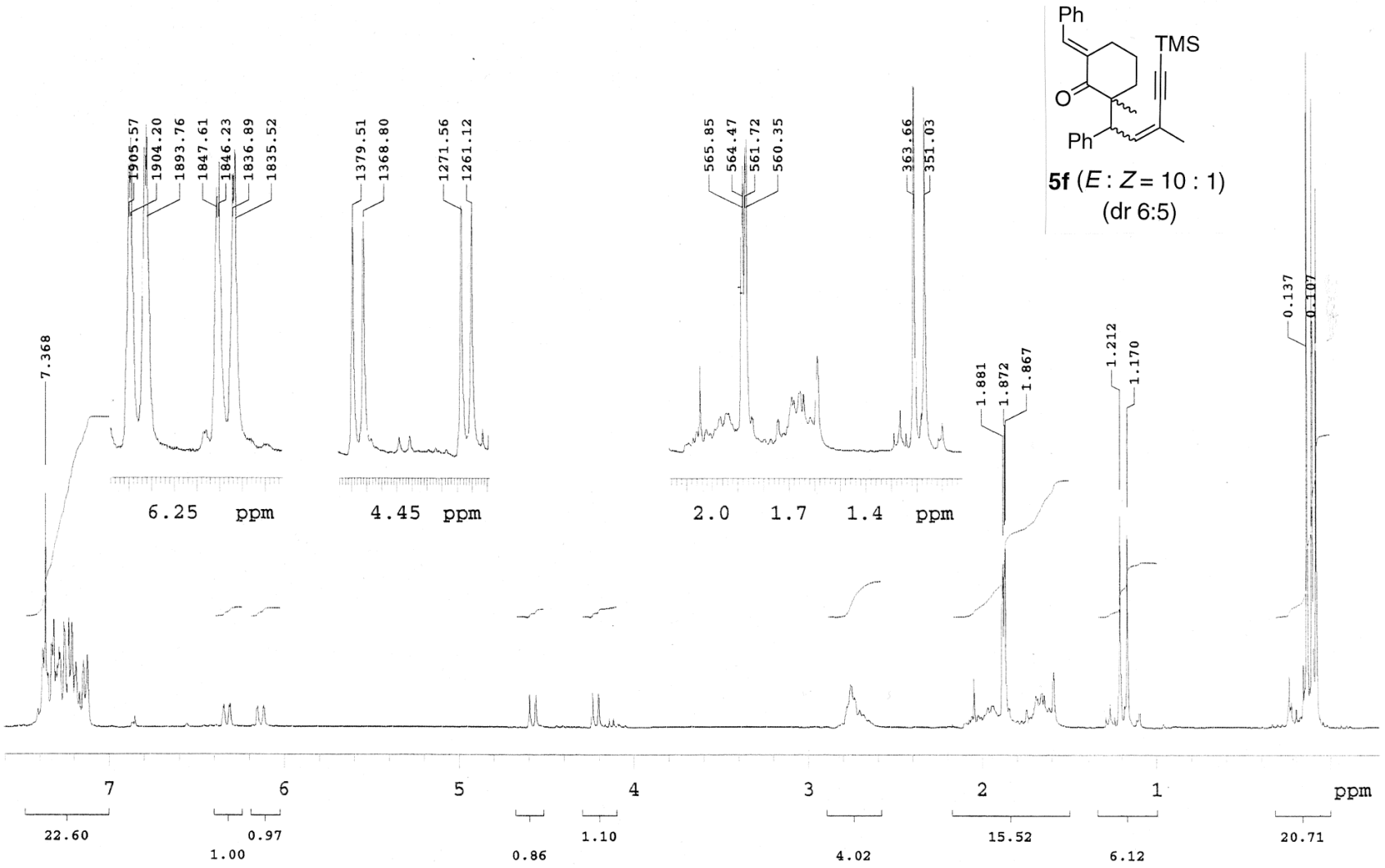
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836531	DATA PROCESSING FT size 32768 Total time 1 minute	TurnA-III-133 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



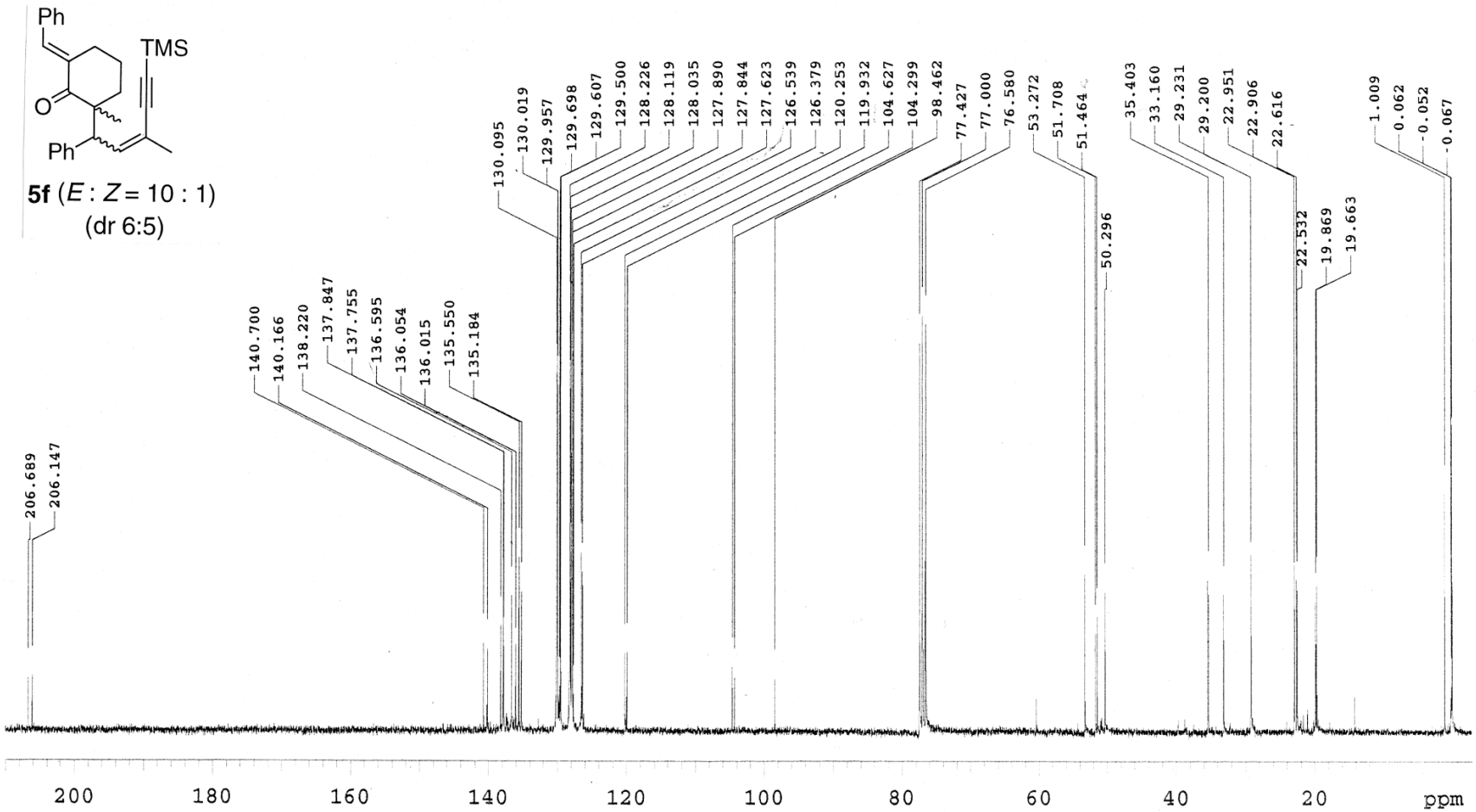
5e (dr 4:3)



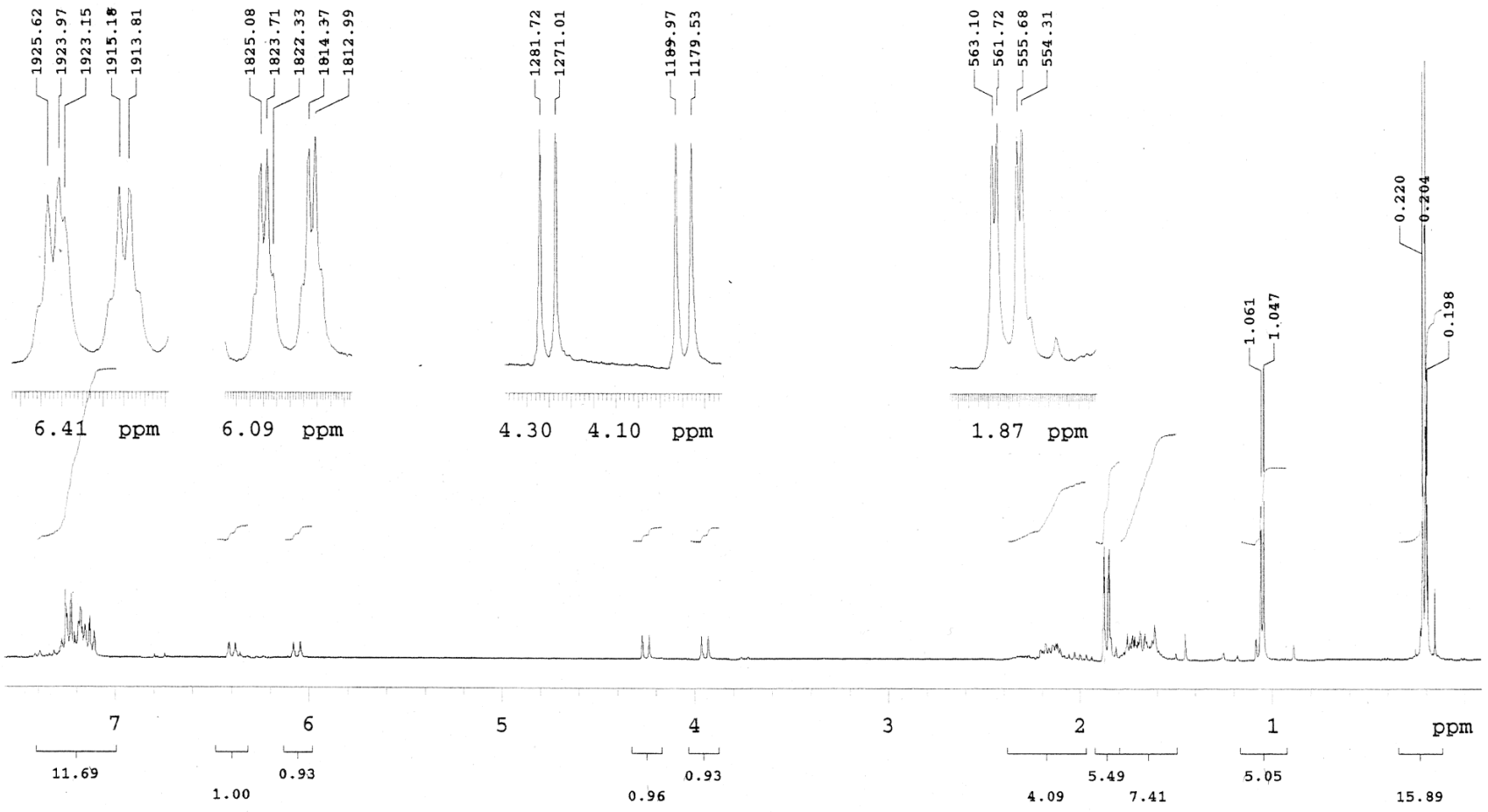
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 1024 repetitions	OBSERVE C13, 75.4560952 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 34 minutes	 **5e** (dr 4:3)	TurnA-III-133 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"

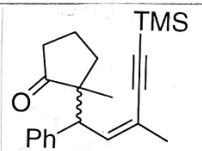


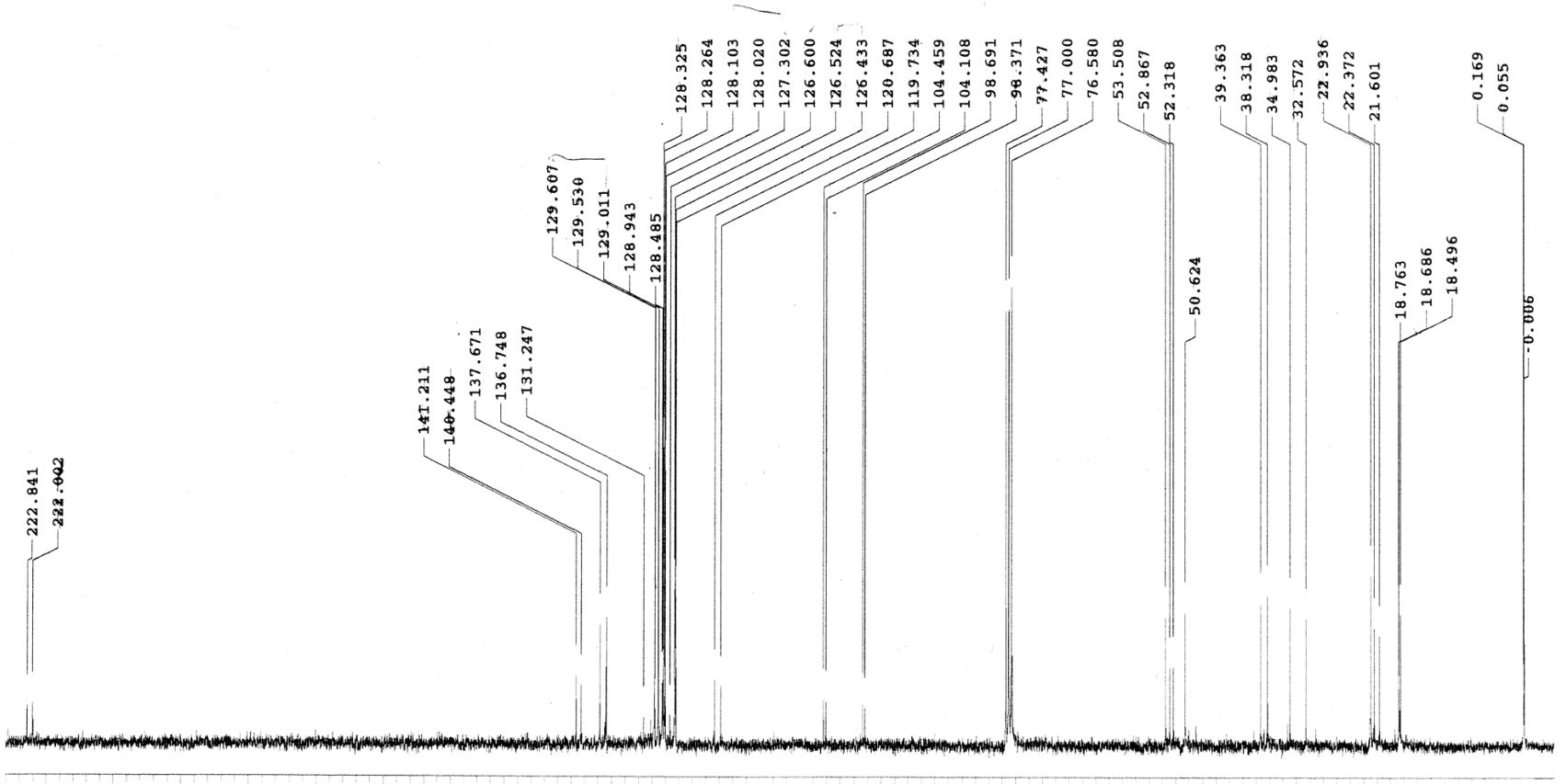
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute		TurnA-III-78b Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 4368 repetitions	OBSERVE C13, 75.4560946 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 2.4 hours		TurnA-II-78b Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



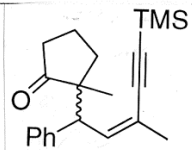
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 32 repetitions	OBSERVE H1, 300.0836525	DATA PROCESSING FT size 32768 Total time 2 minutes	 **5g** (dr 1:1)	TurnA-V-169 Pulse Sequence: s2pul Solvent: $CDCl_3$ Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE
Relax. delay 0.501 sec
Pulse 45.0 degrees
Acq. time 1.499 sec
Width 18865.6 Hz
1408 repetitions

OBSERVE C13, 75.4560952
DECOUPLE H1, 300.0851346
Power 36 dB
continuously on
WALTZ-16 modulated

DATA PROCESSING
Line broadening 1.0 Hz
FT size 65536
Total time 46 minutes

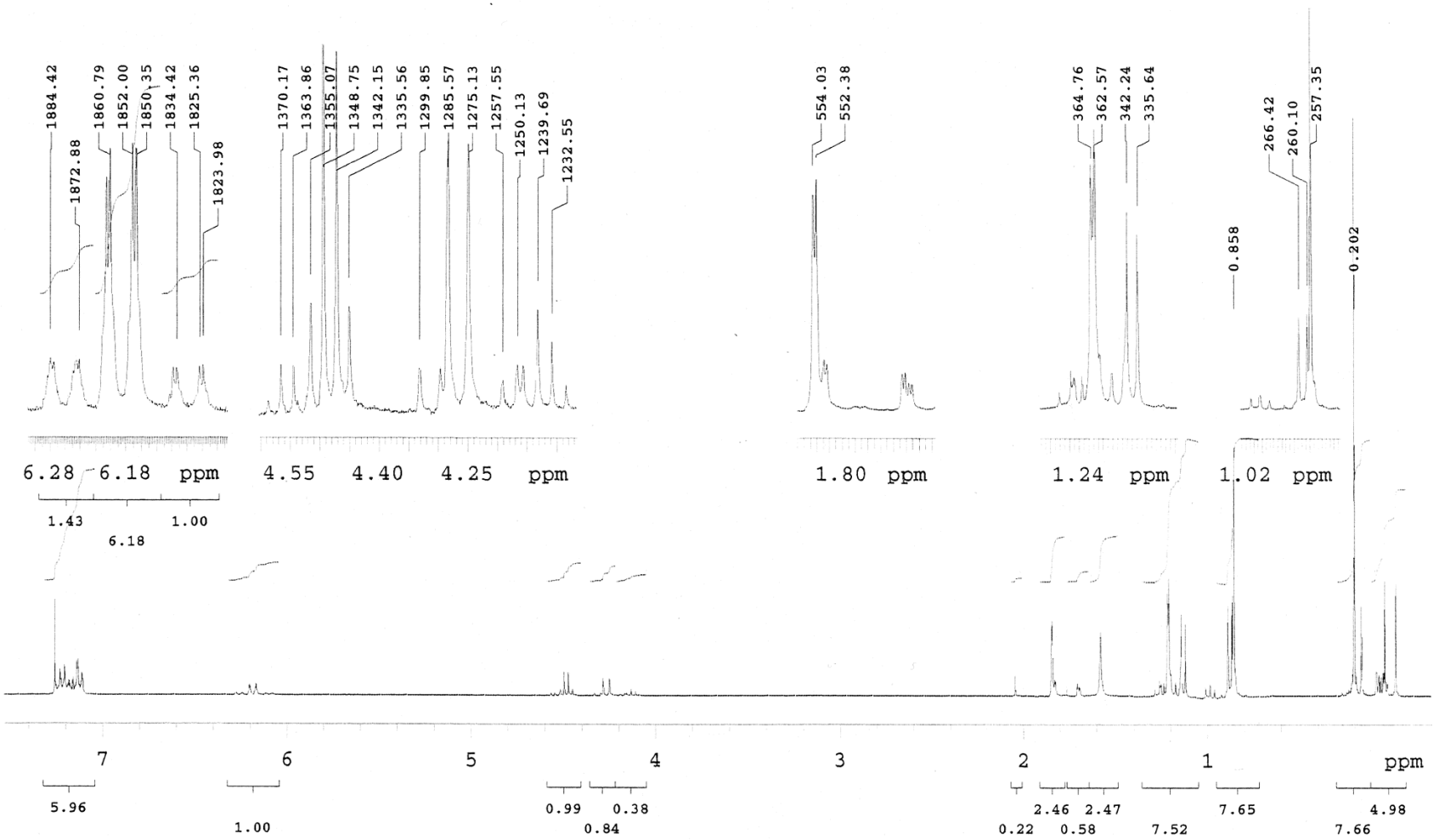


5g (dr 1:1)

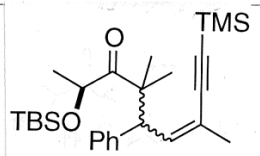
TurnA-V-169

Pulse Sequence: s2pul

Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE H1, 300.0836525	DATA PROCESSING
Relax. delay 4.000 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions		FT size 32768 Total time 2 minutes

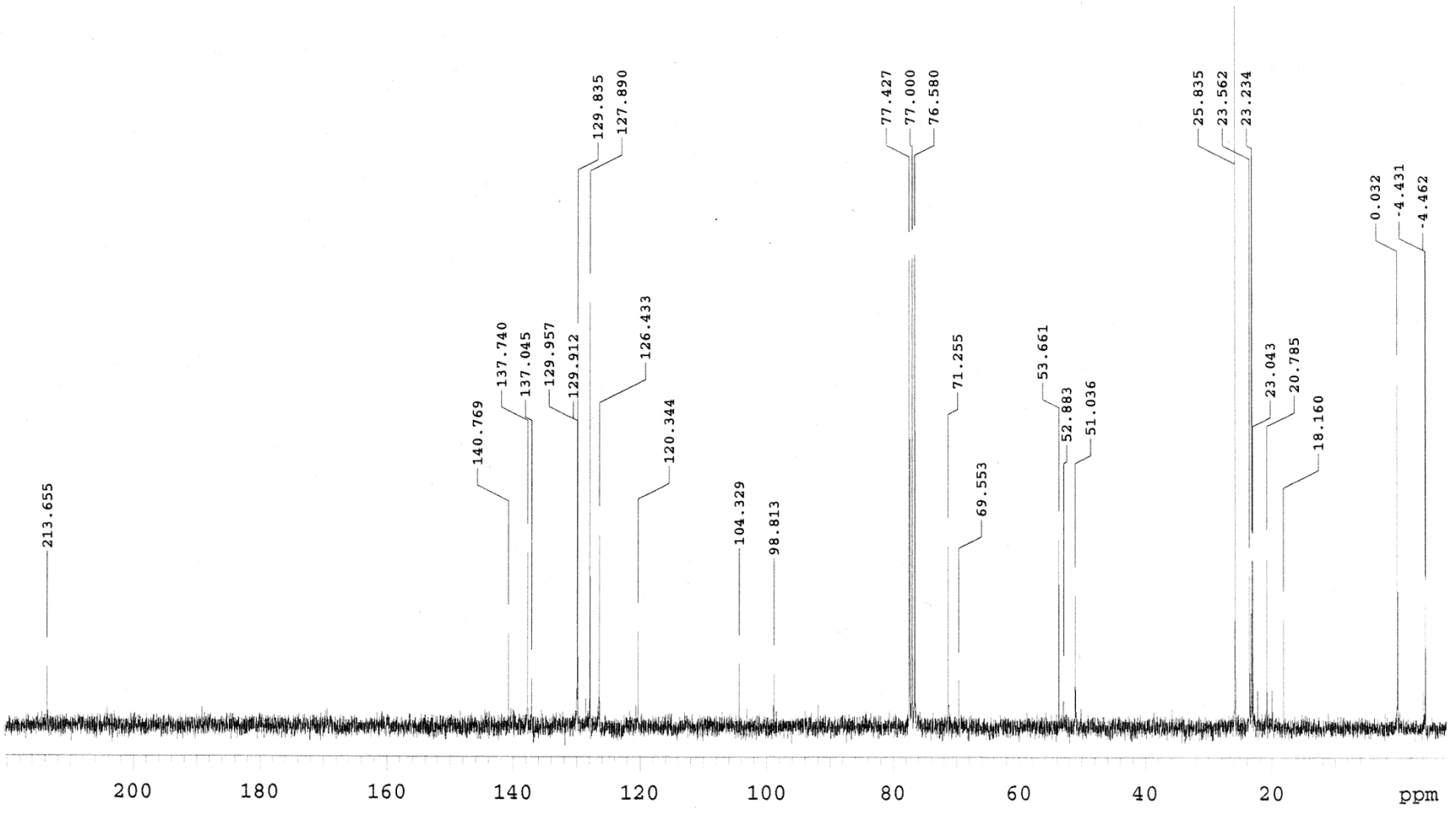


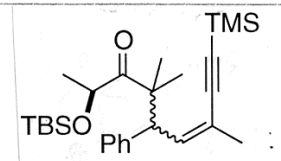
5h (6 : 1.5 : 1)

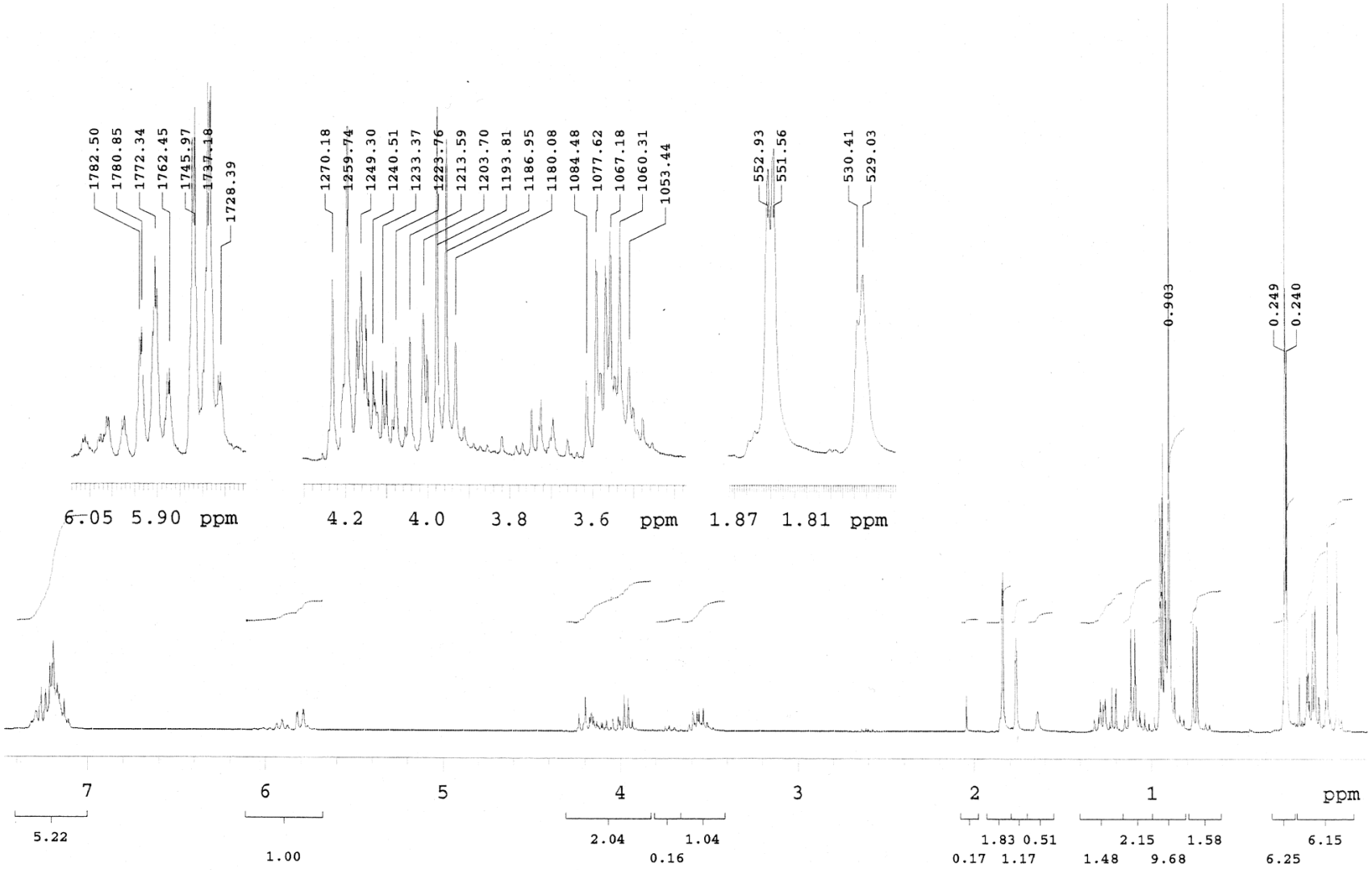
TurnA-III-163 pure

Pulse Sequence: s2pul

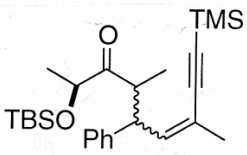
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 512 repetitions	OBSERVE C13, 75.4560952 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 17 minutes	 **5h** (6 : 1.5 : 1)	TurnA-III-163 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute

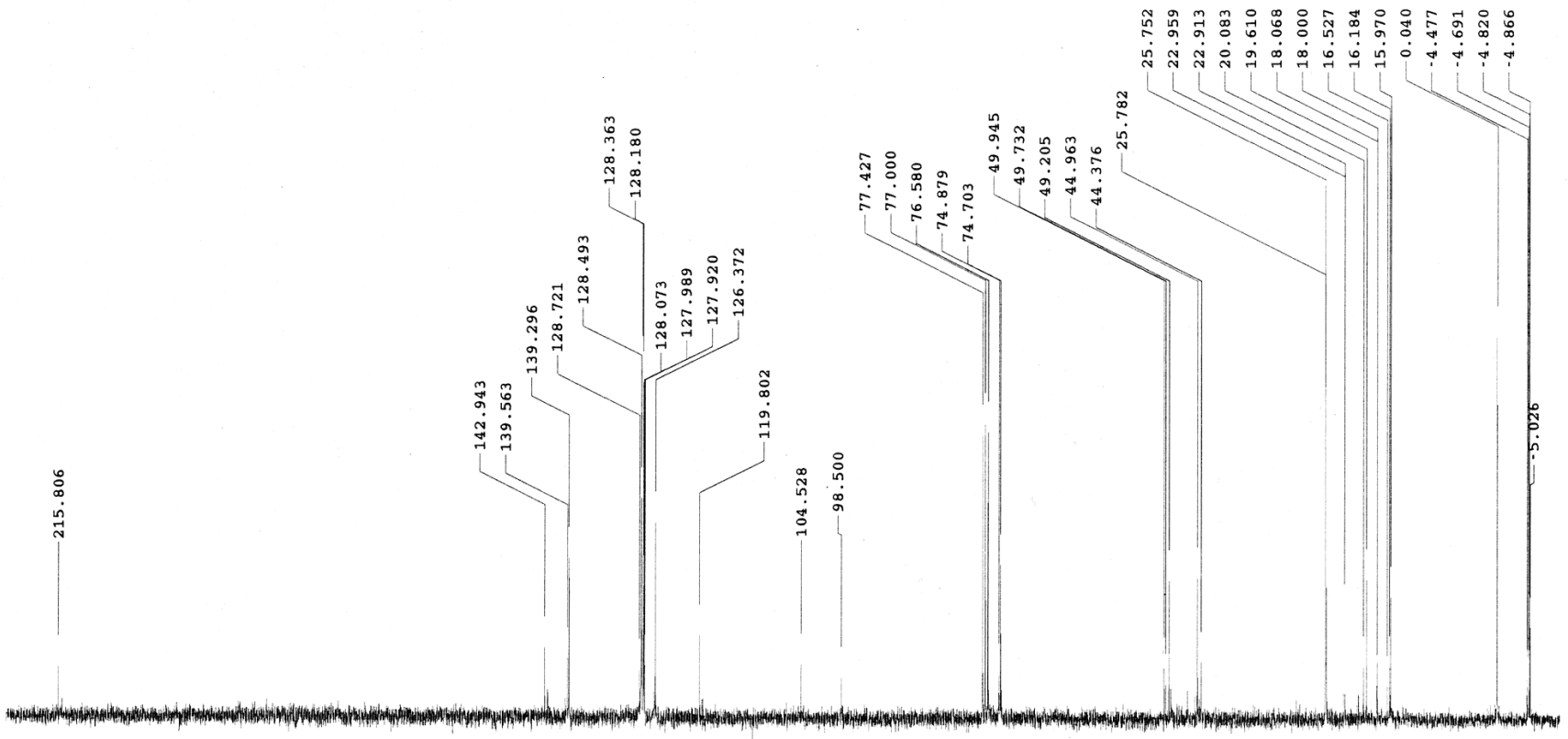


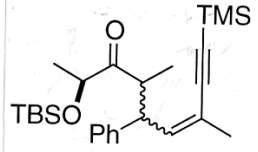
5i (many isomers)

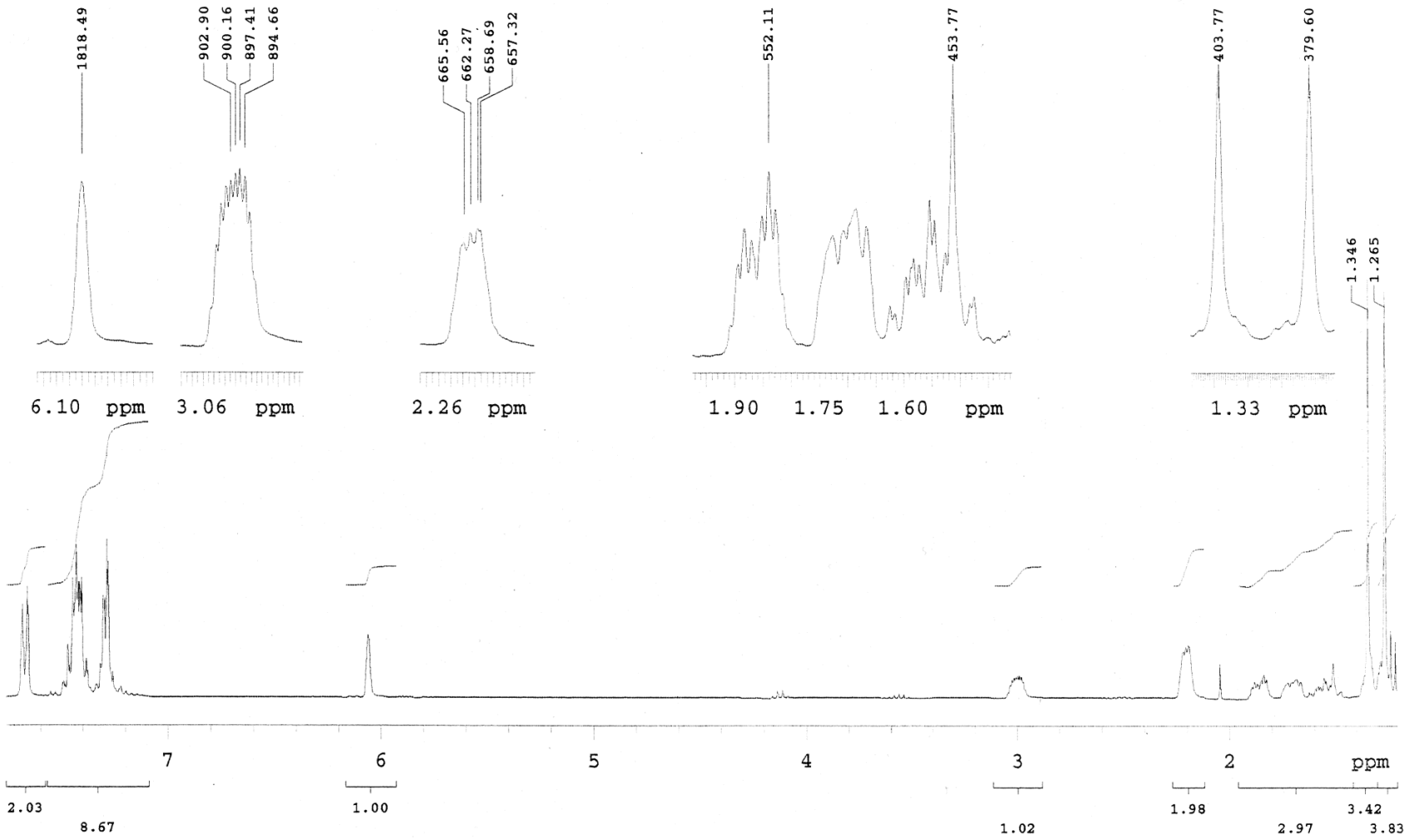
TurnA-III-164

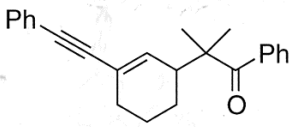
Pulse Sequence: s2pul

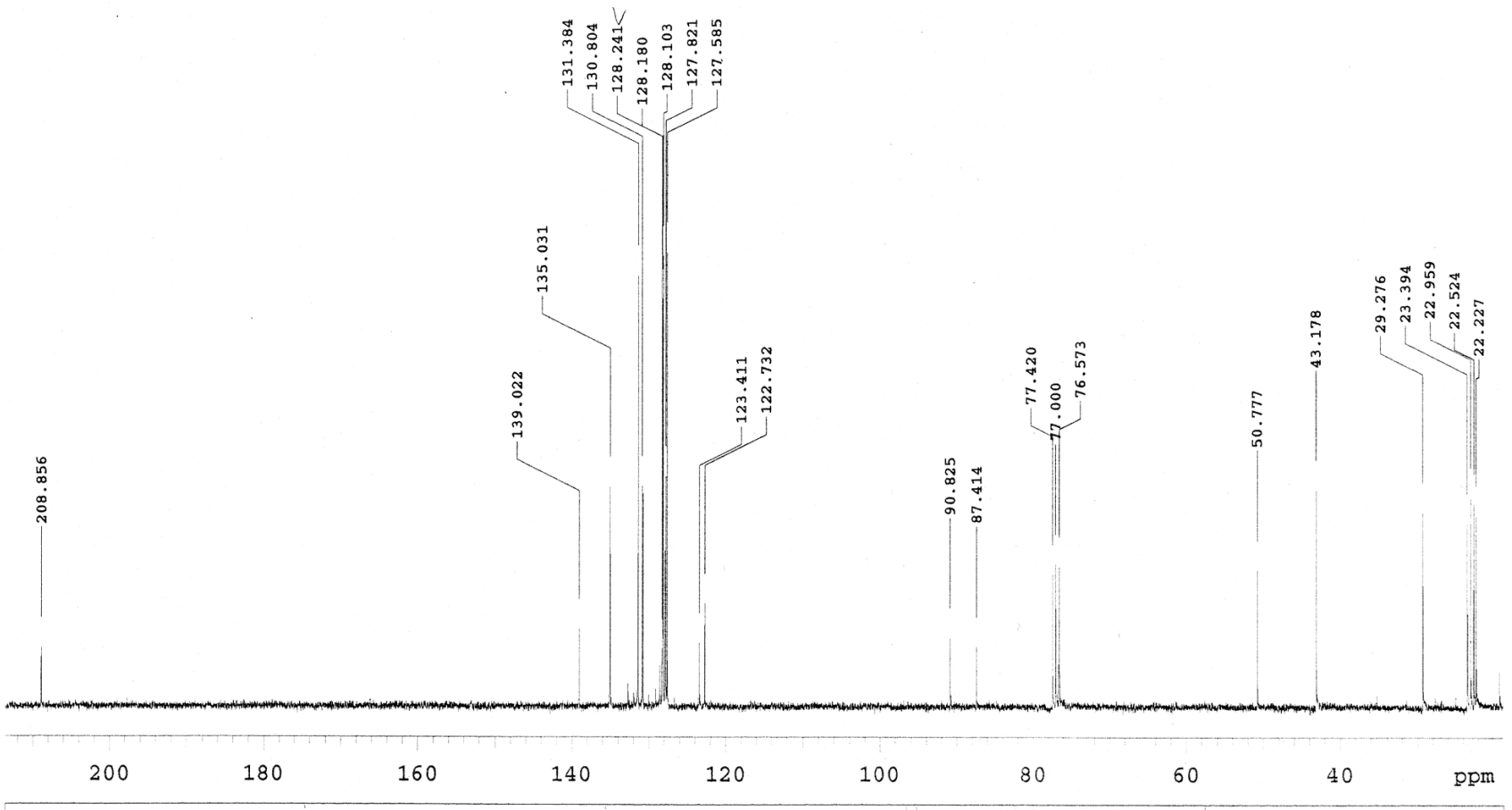
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"

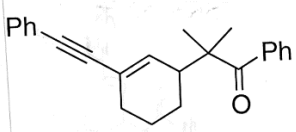


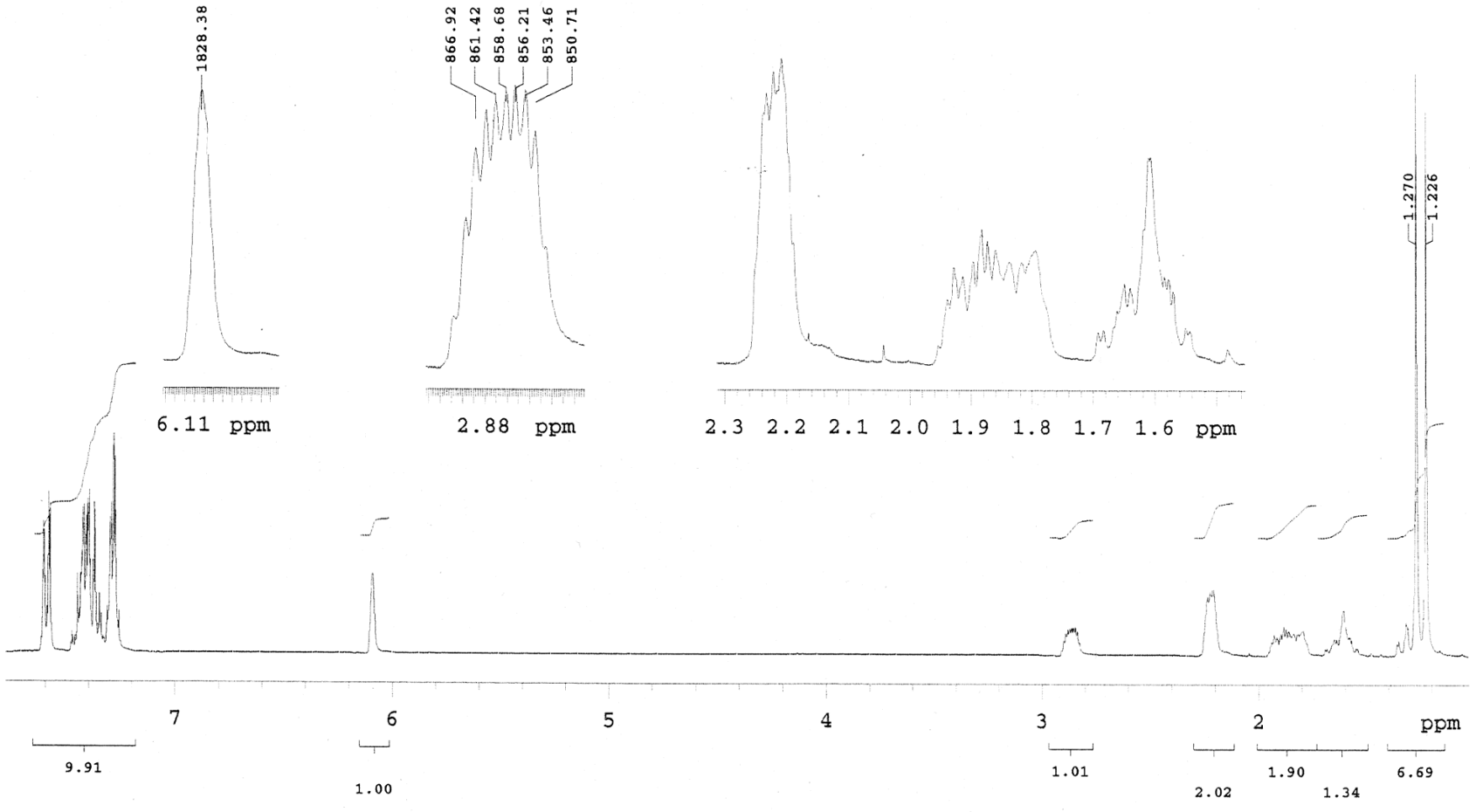
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 256 repetitions	OBSERVE C13, 75.4560958 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 8 minutes	 **5i** (many isomers)	TurnA-III-164 Pulse Sequence: s2pul Solvent: CDC13 Ambient temperature Mercury-300 "varian"

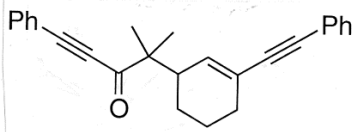


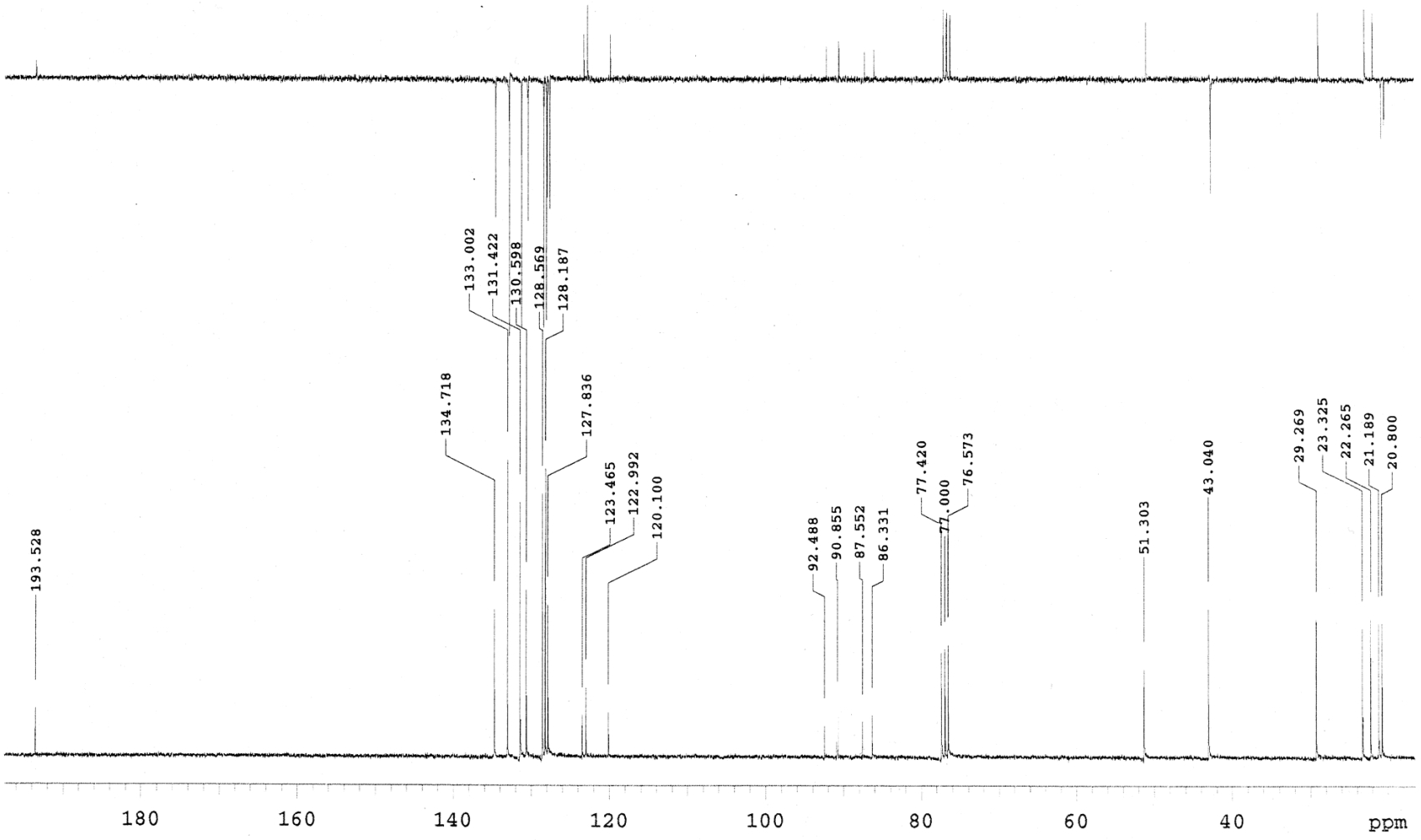
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836525	DATA PROCESSING FT size 32768 Total time 1 minute	 **6a**	TA-II-112 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"

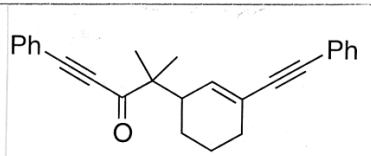


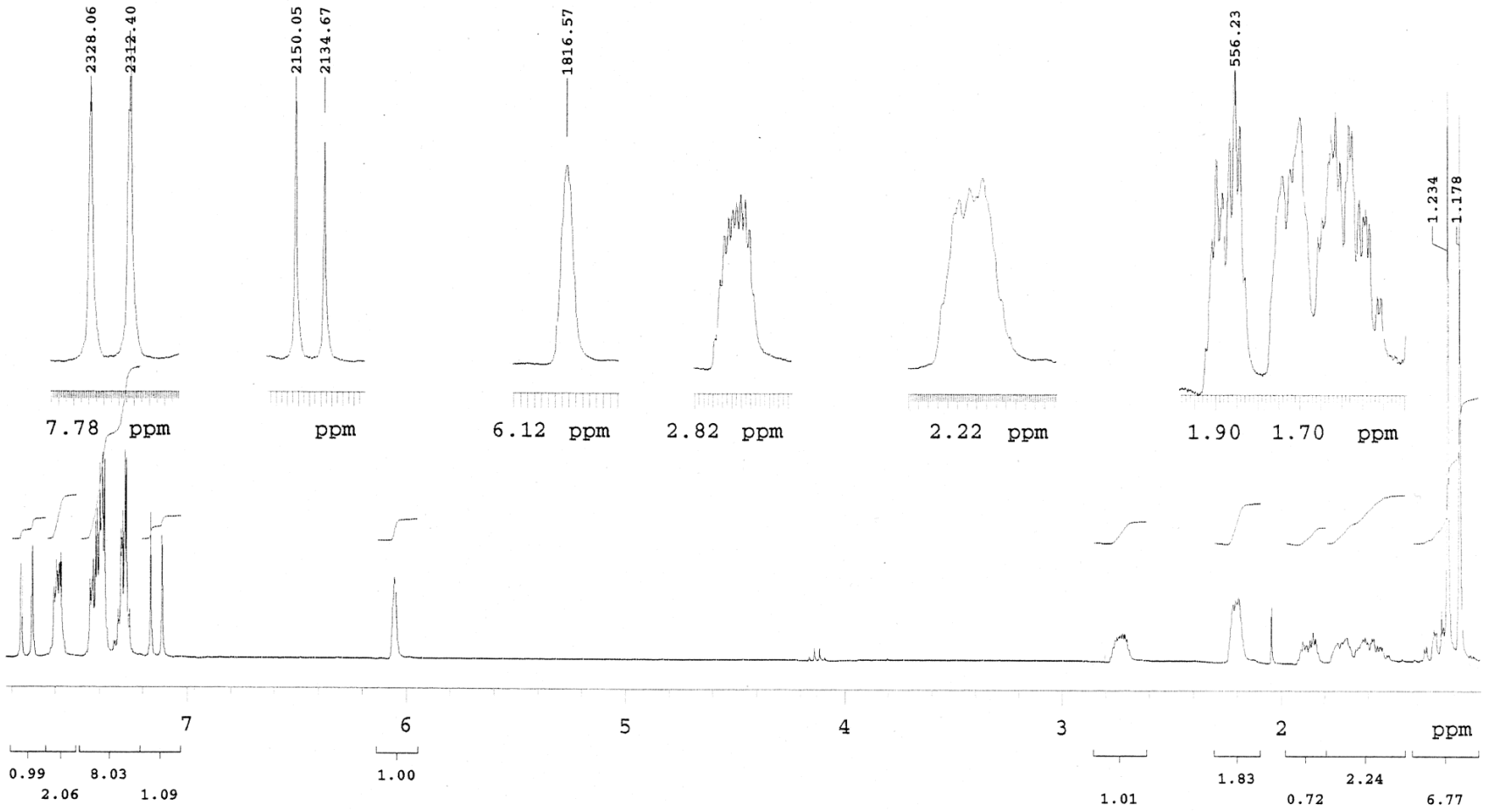
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 256 repetitions	OBSERVE C13, 75.4560998 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 8 minutes	 **6a**	TA-II-112 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



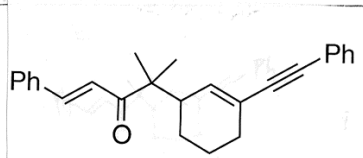
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836525	DATA PROCESSING FT size 32768 Total time 1 minute	 **6b**	TurnA-III-128 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 1024 repetitions	OBSERVE C13, 75.4560963 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 34 minutes	 **6b**	TurnA-III-128 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE H1, 300.0836523	DATA PROCESSING
Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 8 repetitions		FT size 32768 Total time 1 minute

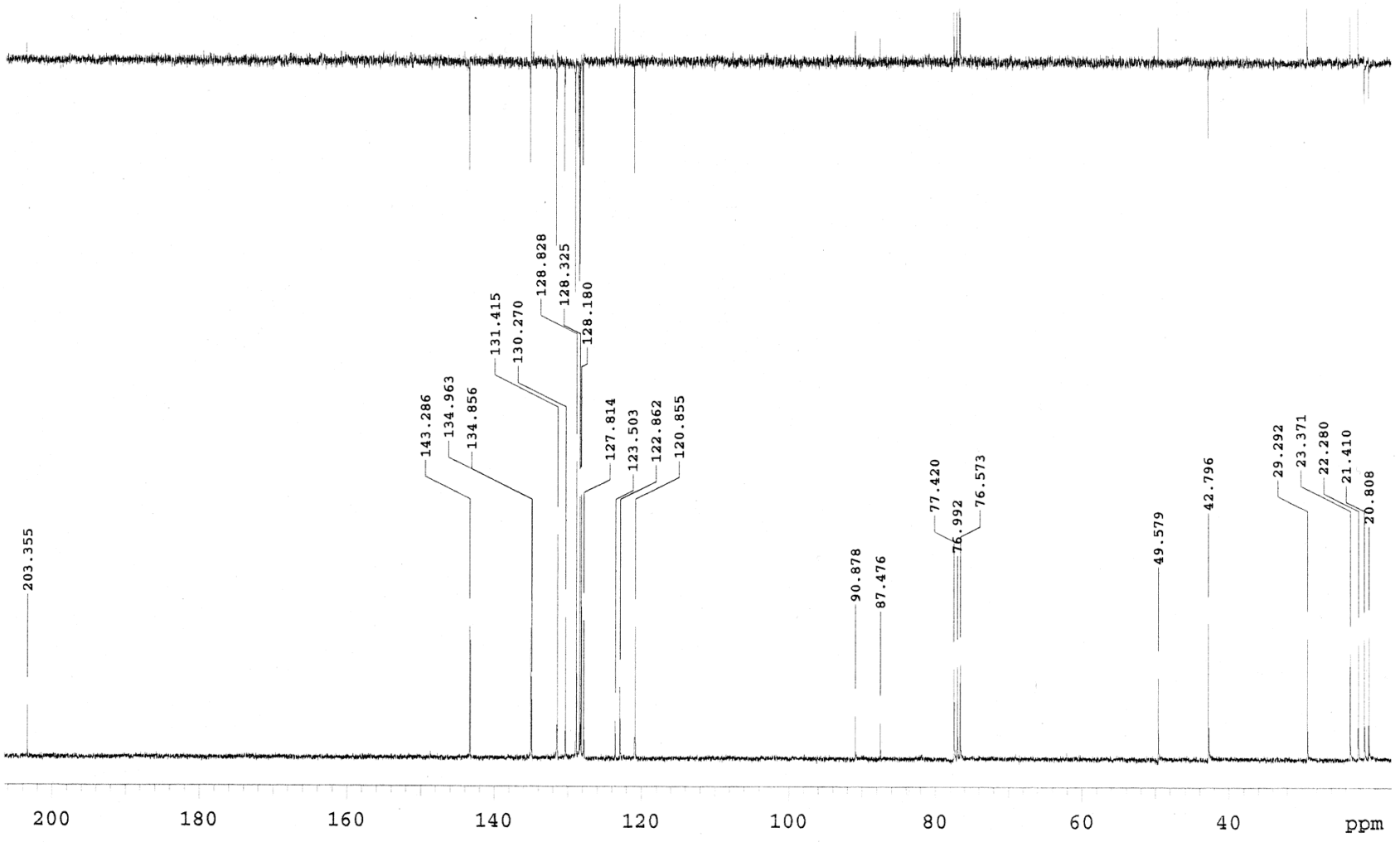


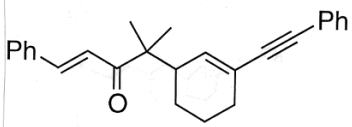
6c

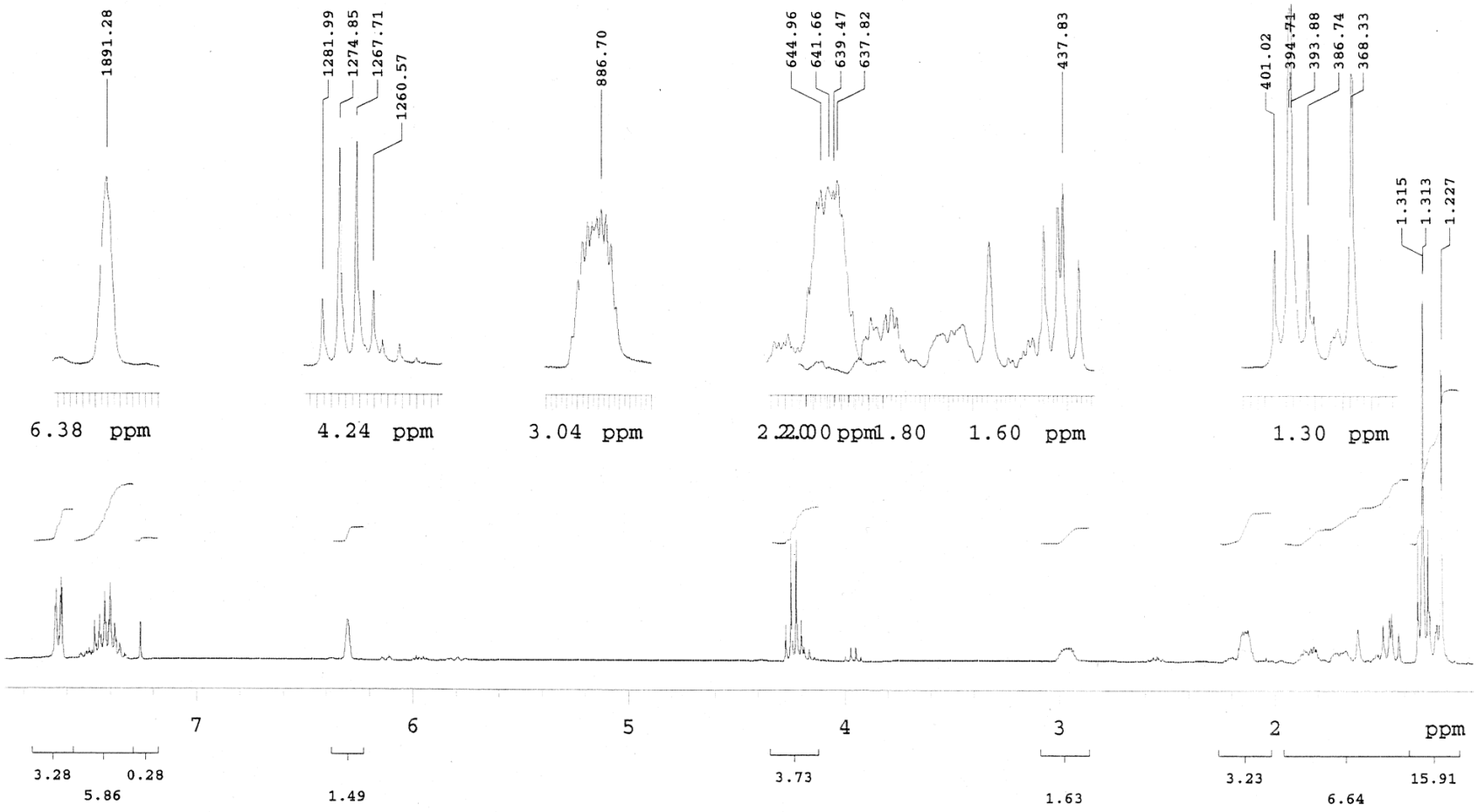
TurnA-III-73

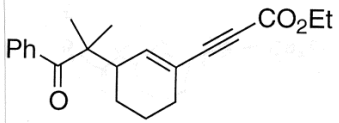
Pulse Sequence: s2pul

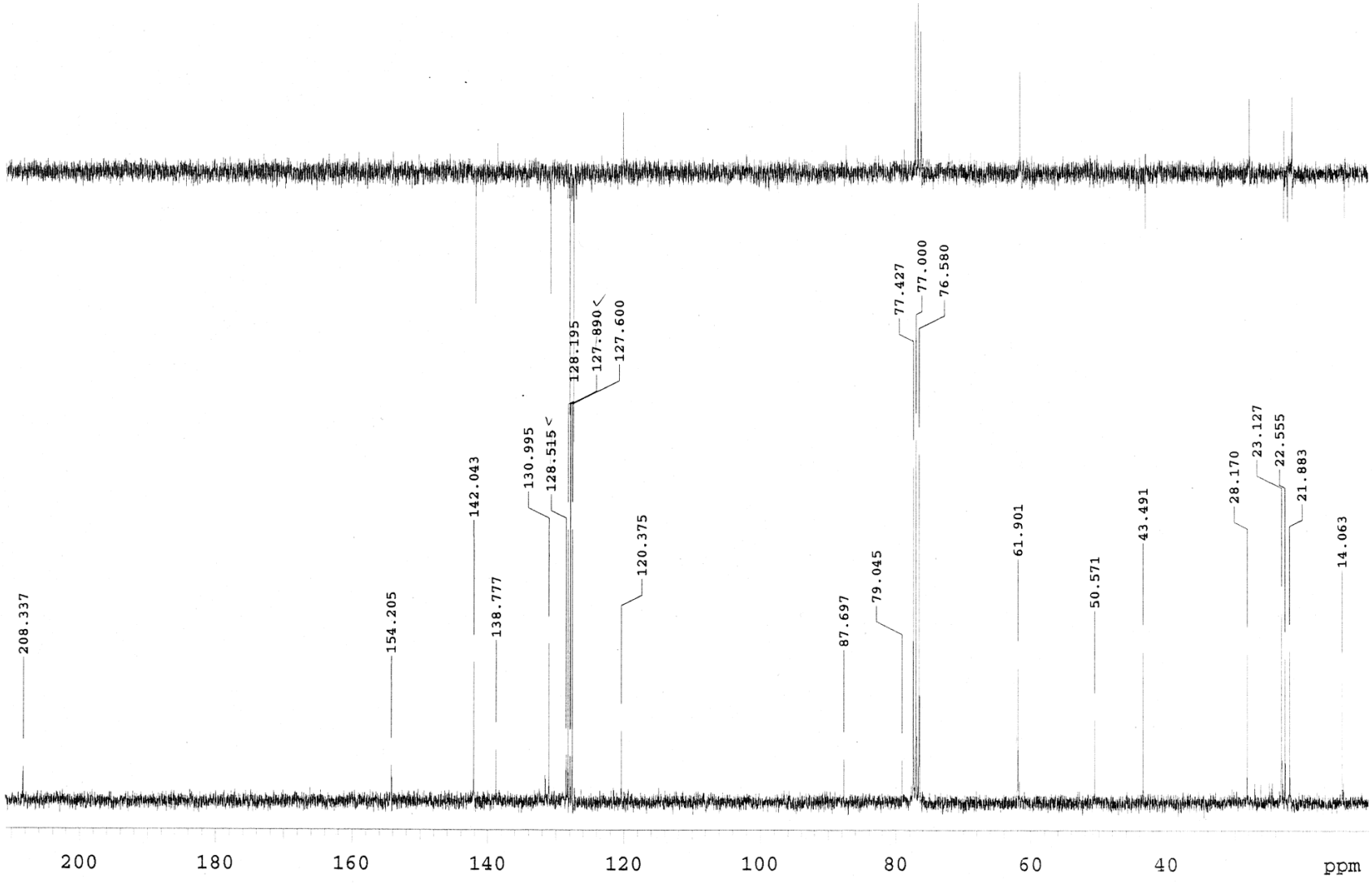
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"

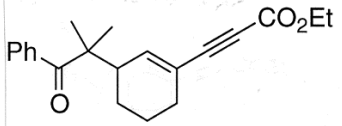


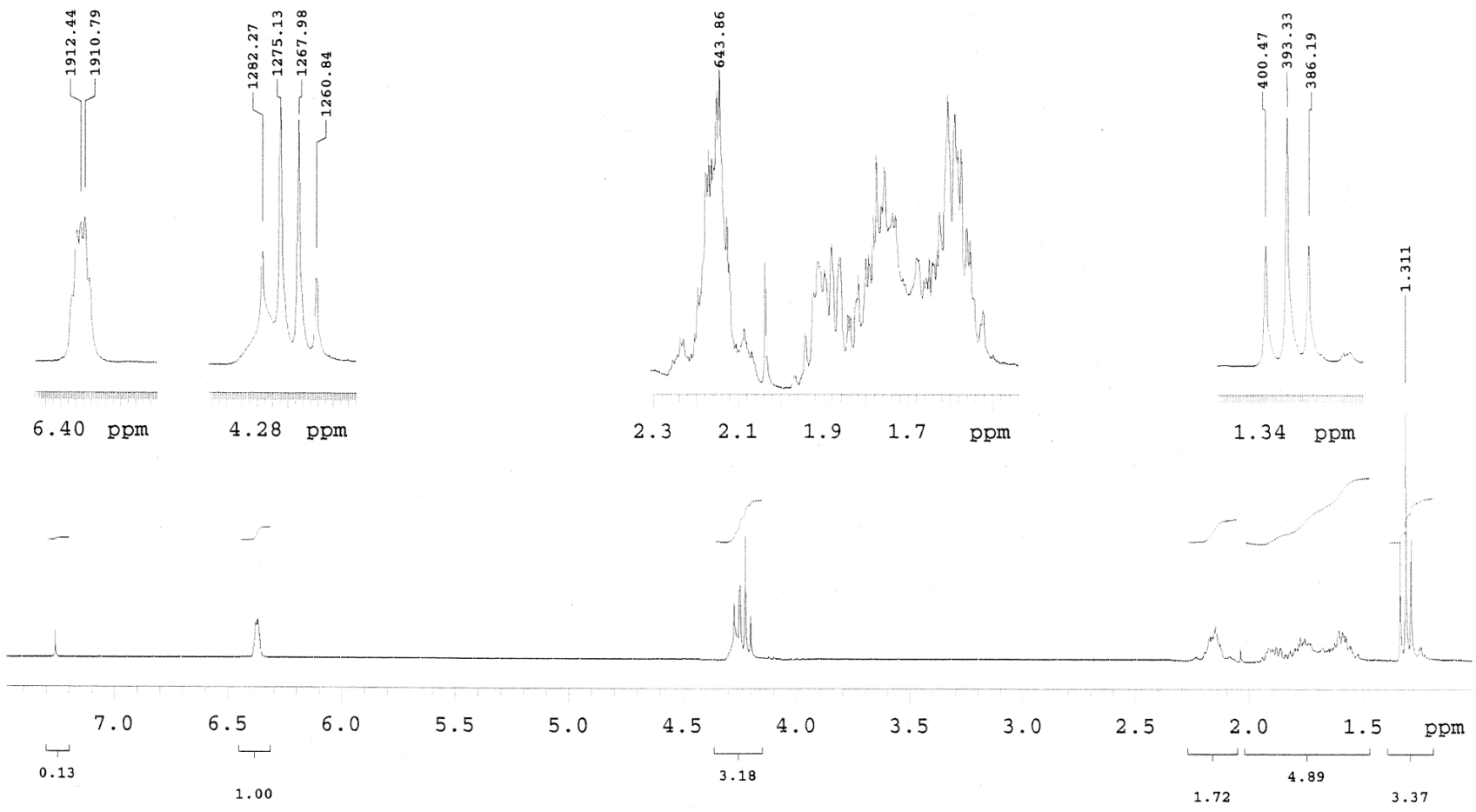
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 512 repetitions	OBSERVE C13, 75.4560963 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 17 minutes	 **6c**	TurnA-III-73 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



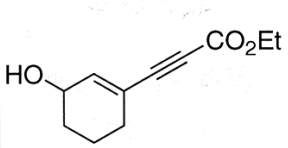
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute	 **6d**	TurnA-III-144a Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 512 repetitions	OBSERVE C13, 75.4560958 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 17 minutes	 **6d**	~~13C OBSERVE~~ U-III-194a Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE	OBSERVE H1, 300.0836523	DATA PROCESSING
Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions		FT size 32768 Total time 1 minute

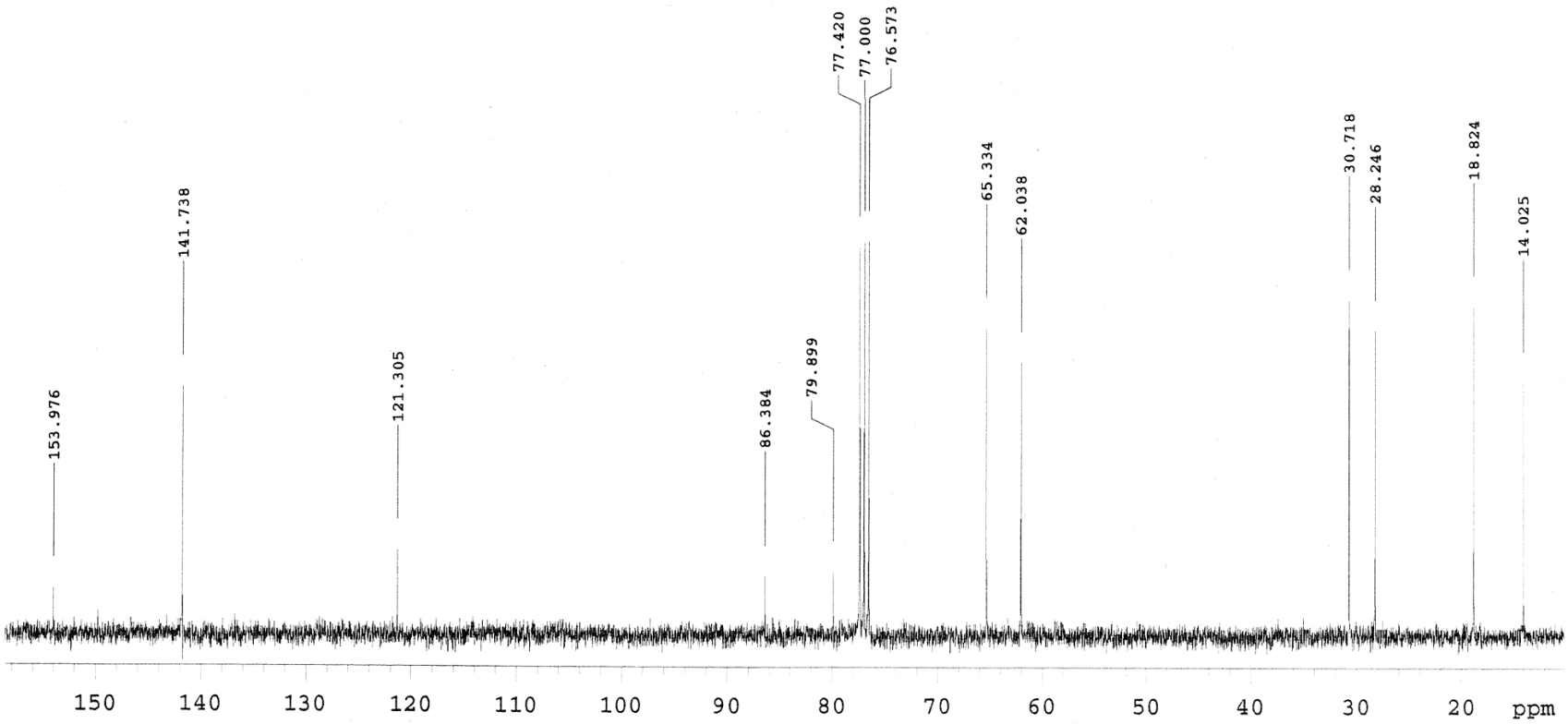


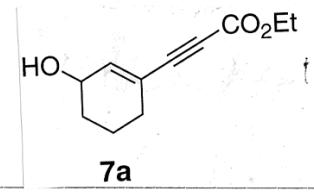
7a

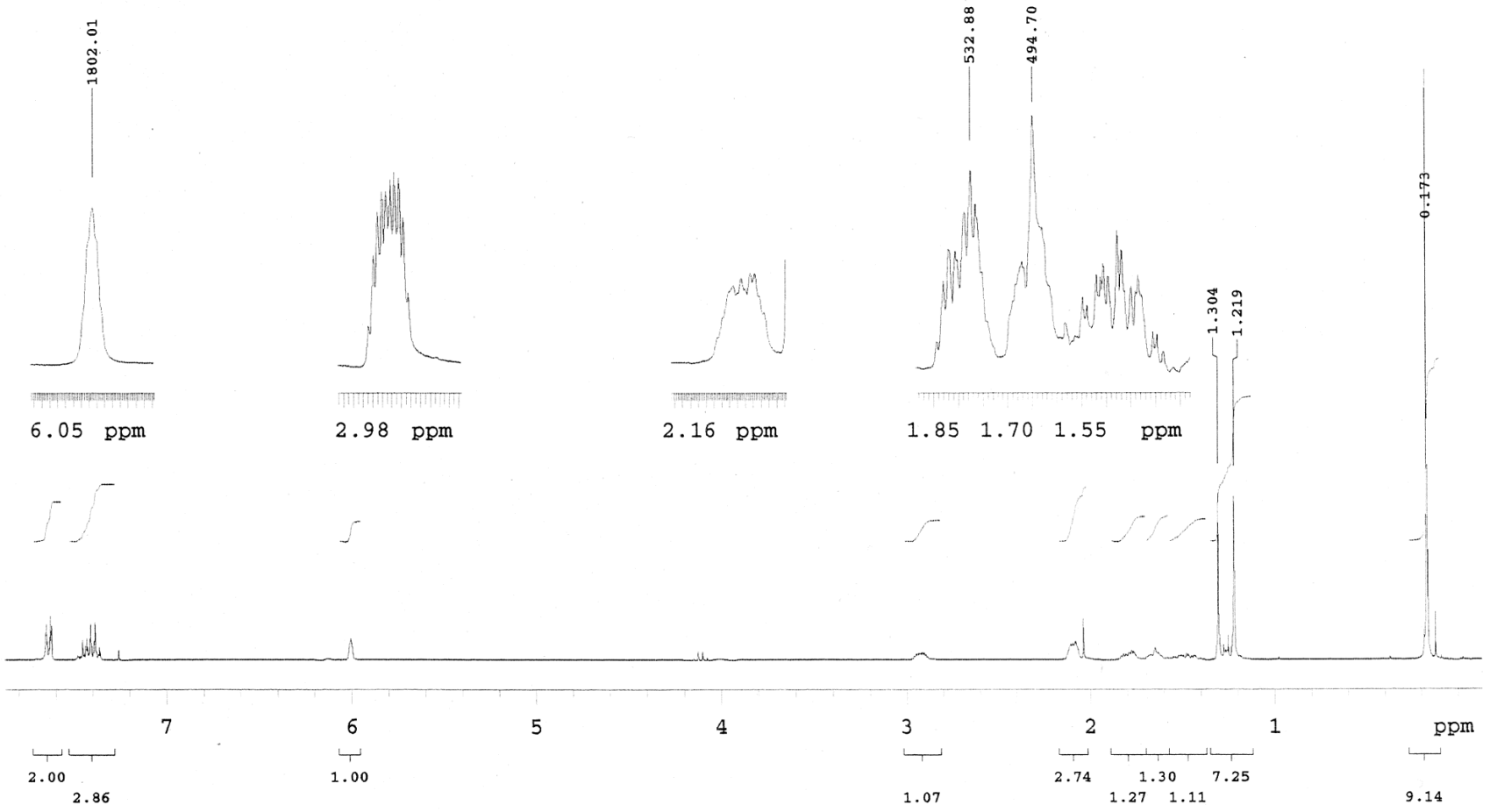
TurnA-III-144b

Pulse Sequence: s2pul

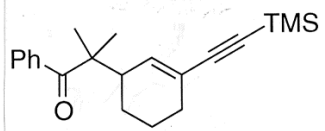
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 288 repetitions	OBSERVE C13, 75.4560963 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 9 minutes	 7a	~~13C OBSERVE~~ V.P-1046. Pulse Sequence: s2pul Solvent: CDC13 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute

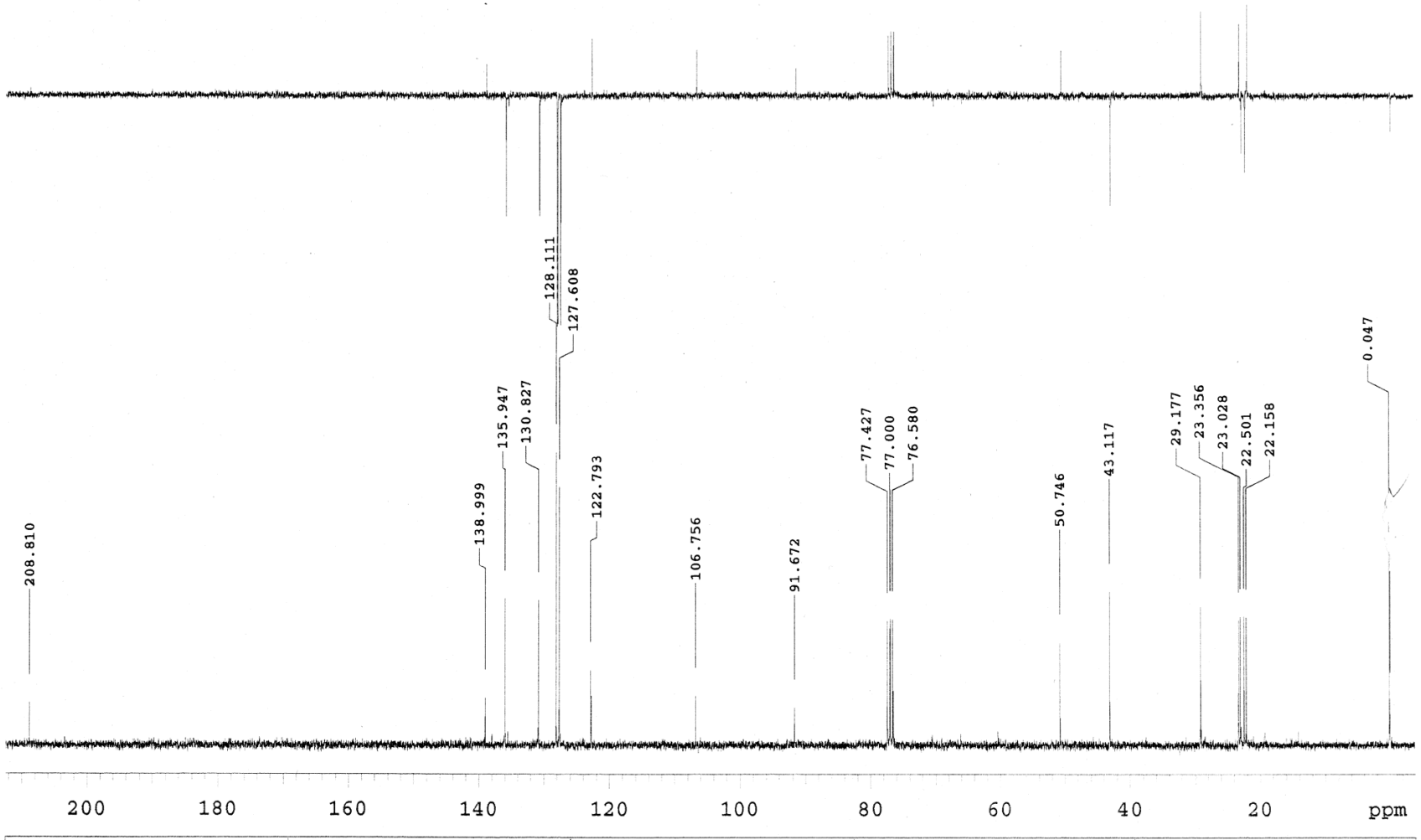


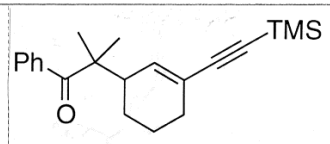
6e

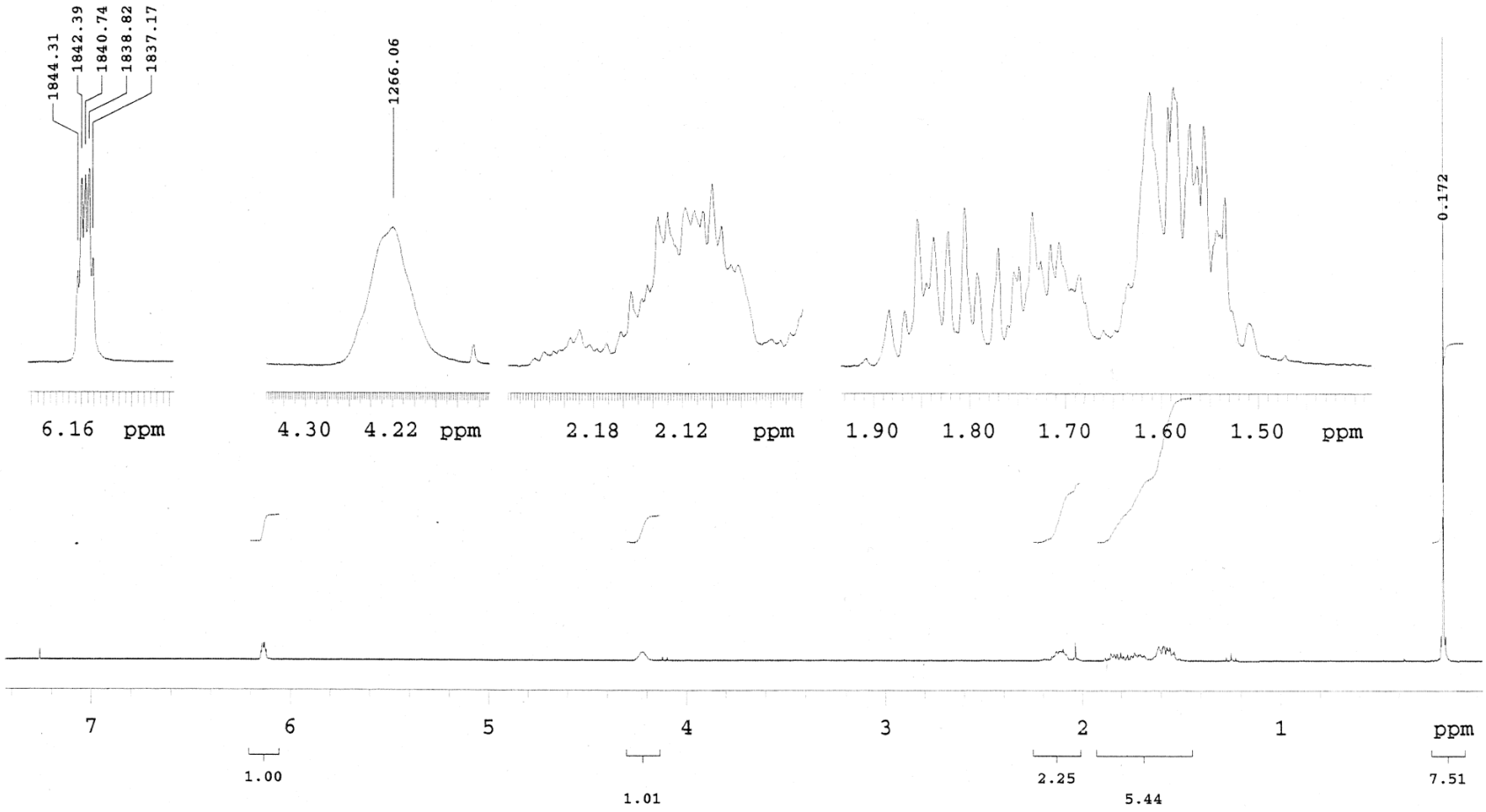
TurnA-V-139a

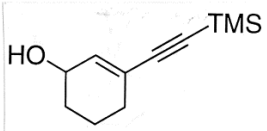
Pulse Sequence: s2pul

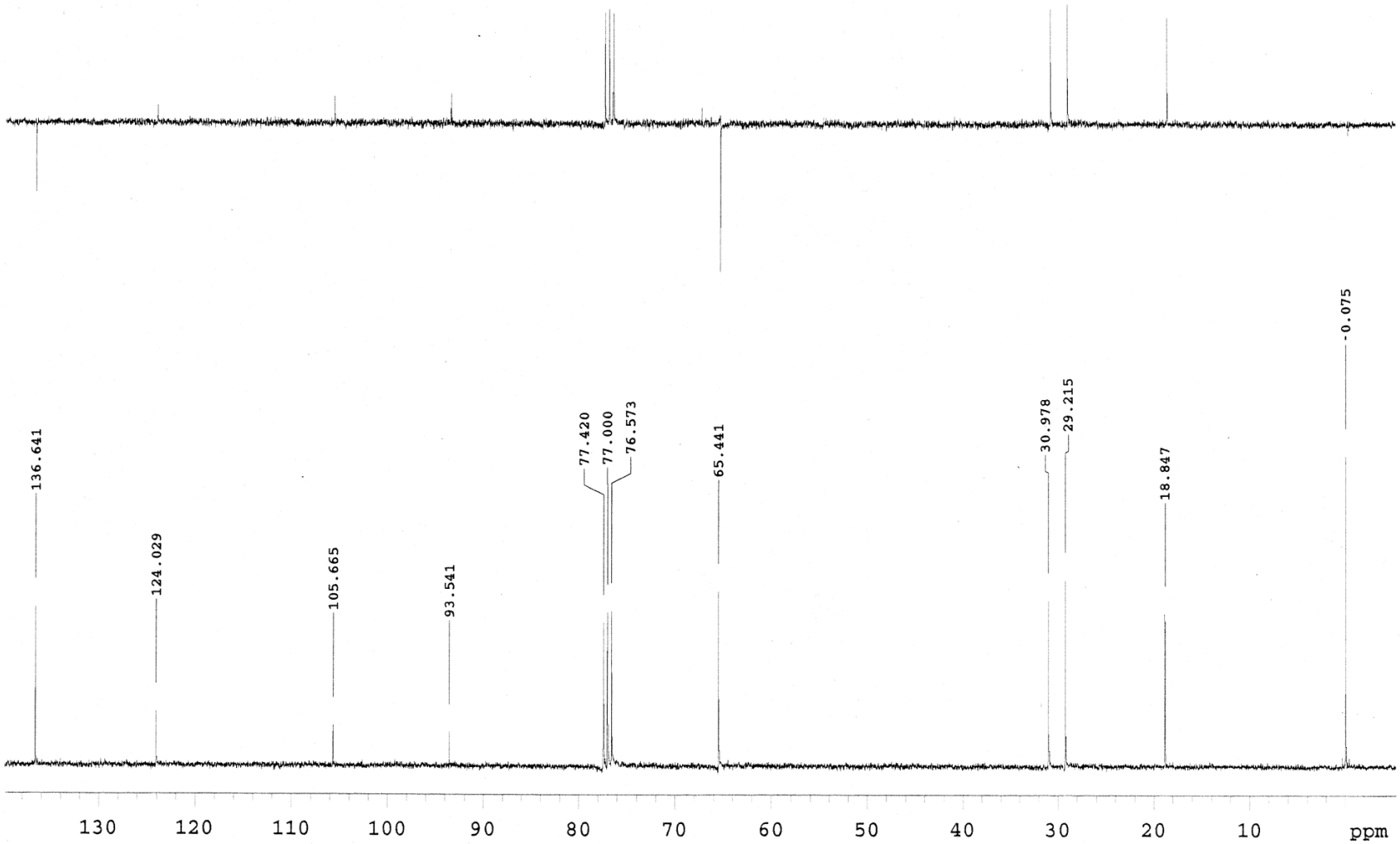
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"



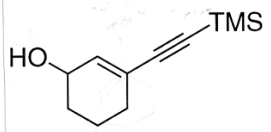
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 512 repetitions	OBSERVE C13, 75.4560963 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 17 minutes	 **6e**	TurnA-V-139a Pulse Sequence: s2pul Solvent: CDC13 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836525	DATA PROCESSING FT size 32768 Total time 1 minute	 **7b**	TurnA-V-139b Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 560 repetitions	OBSERVE C13, 75.4560958 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 18 minutes

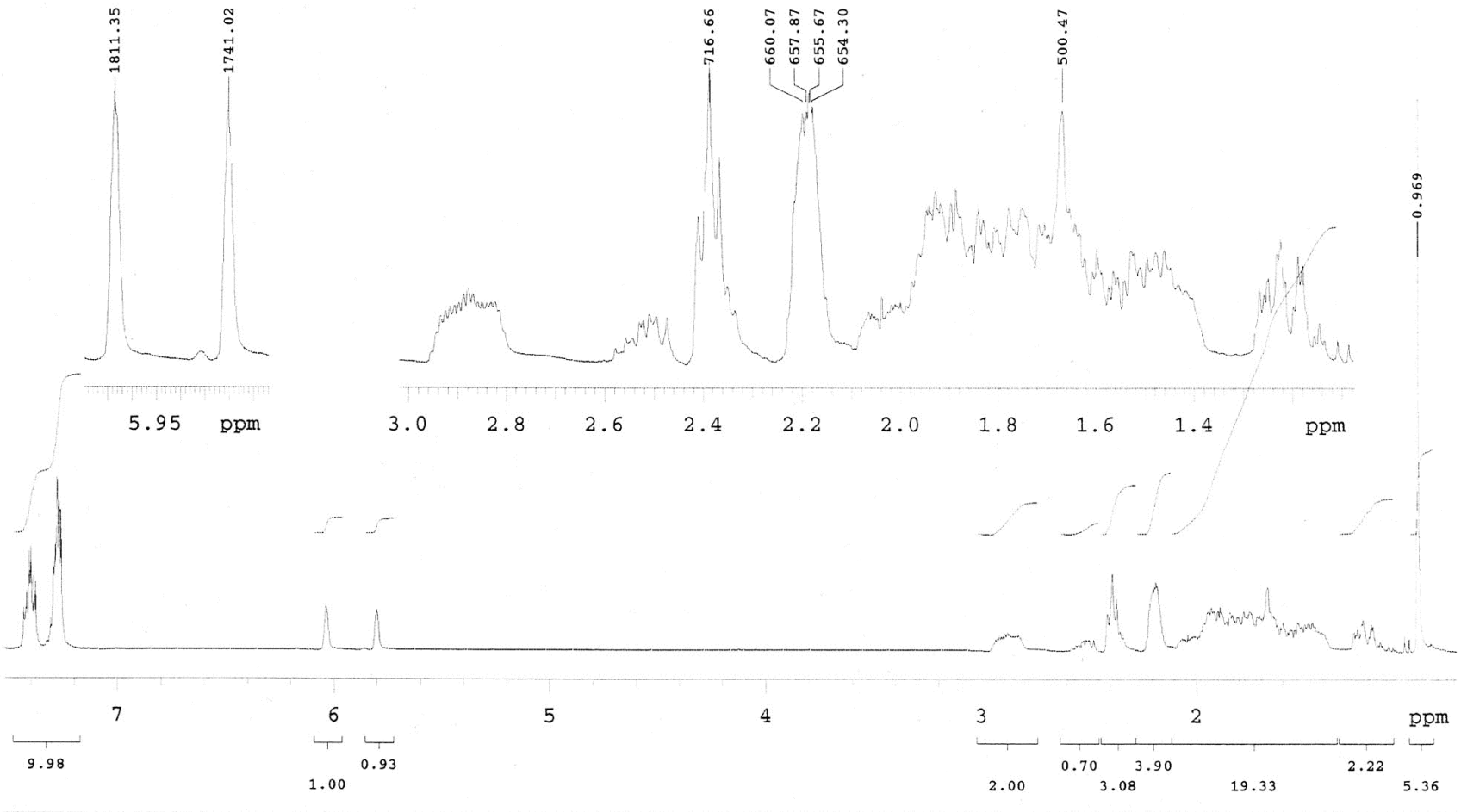


7b

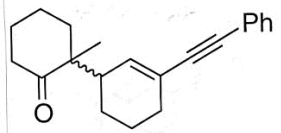
TurnA-V-139b

Pulse Sequence: s2pul

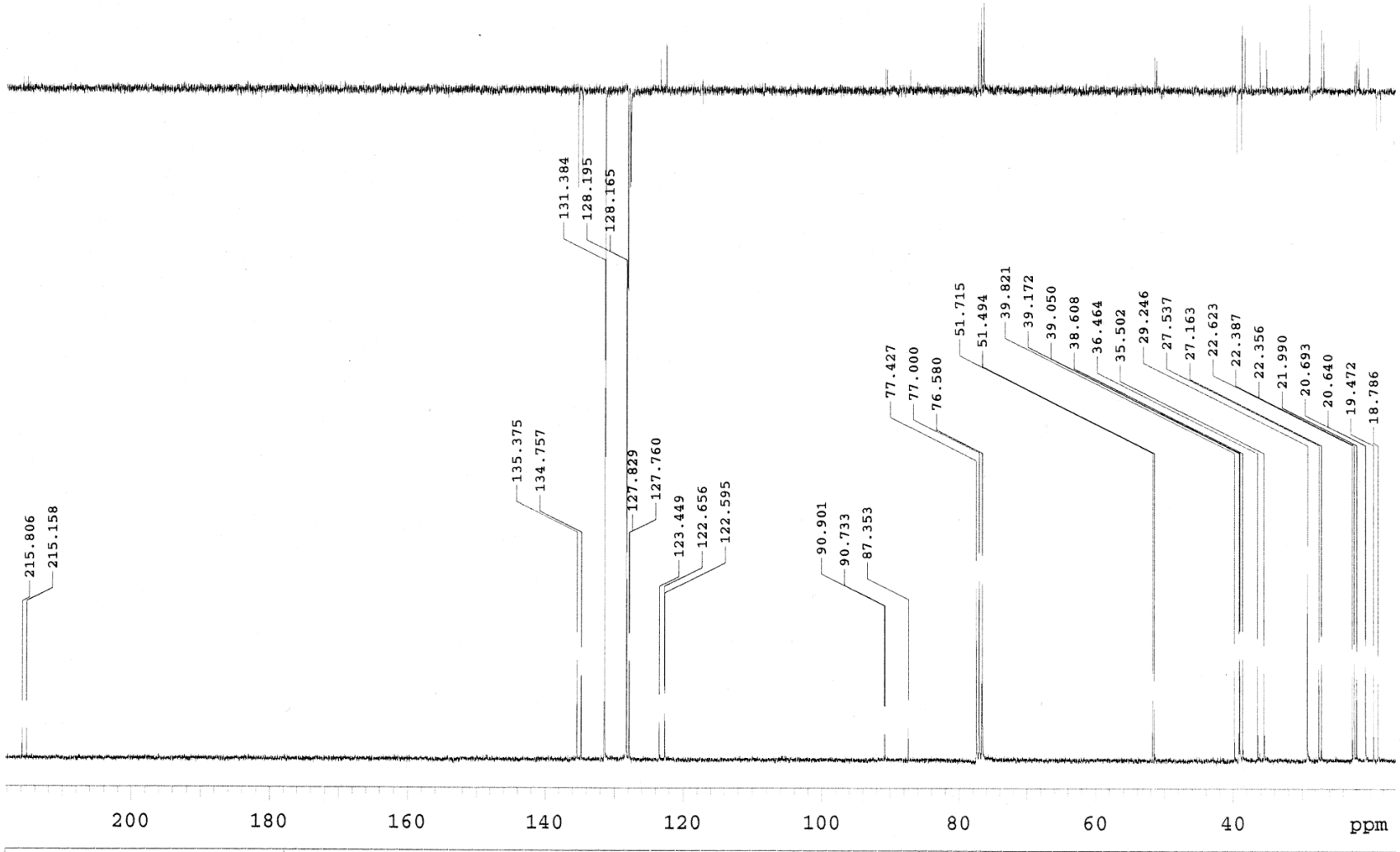
Solvent: CDCl3
Ambient temperature
Mercury-300 "varian"

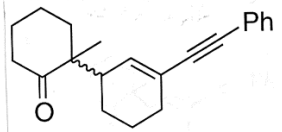


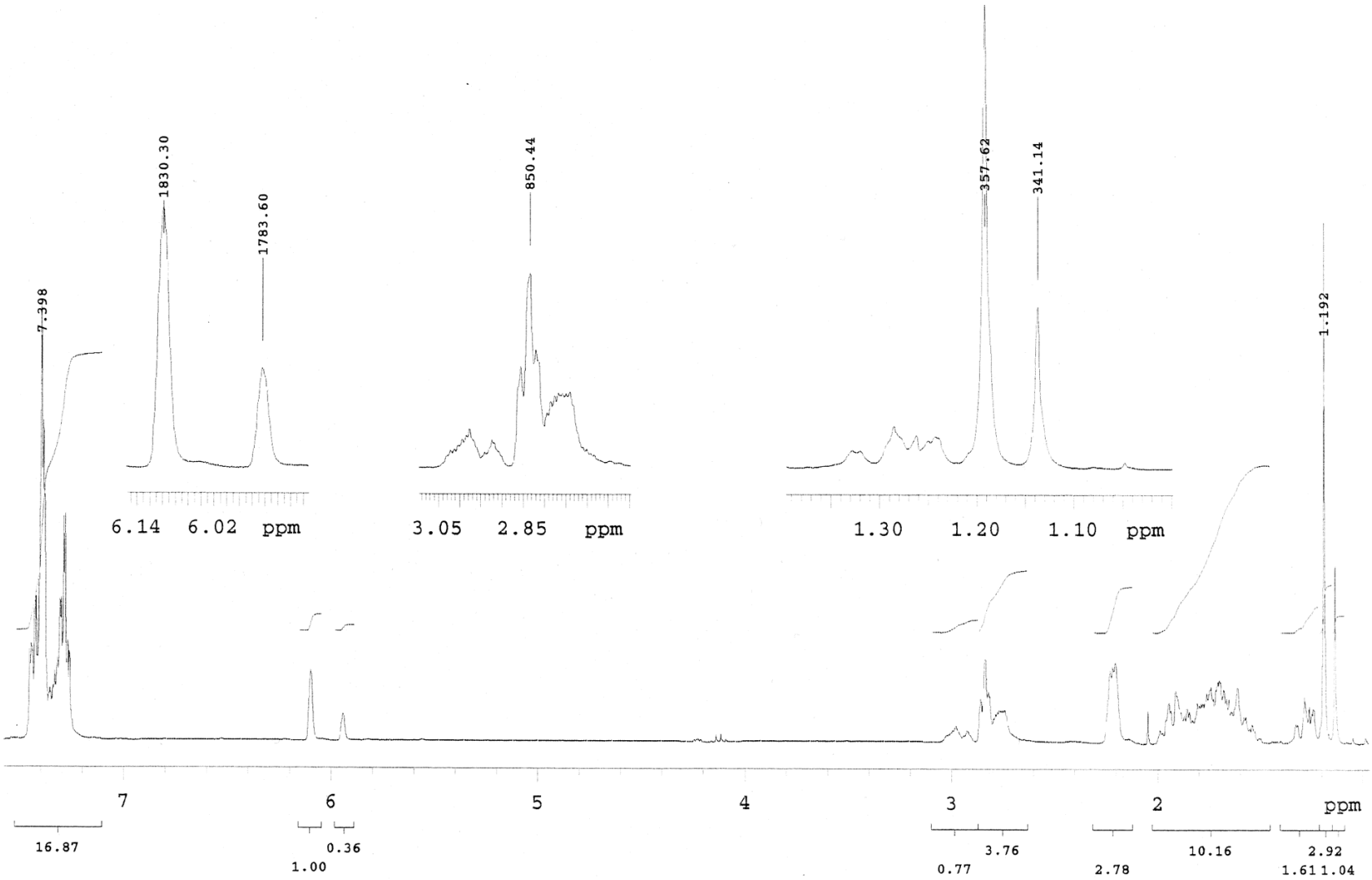
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 1 minute	TurnA-III-134 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"

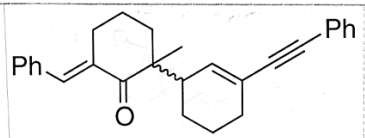


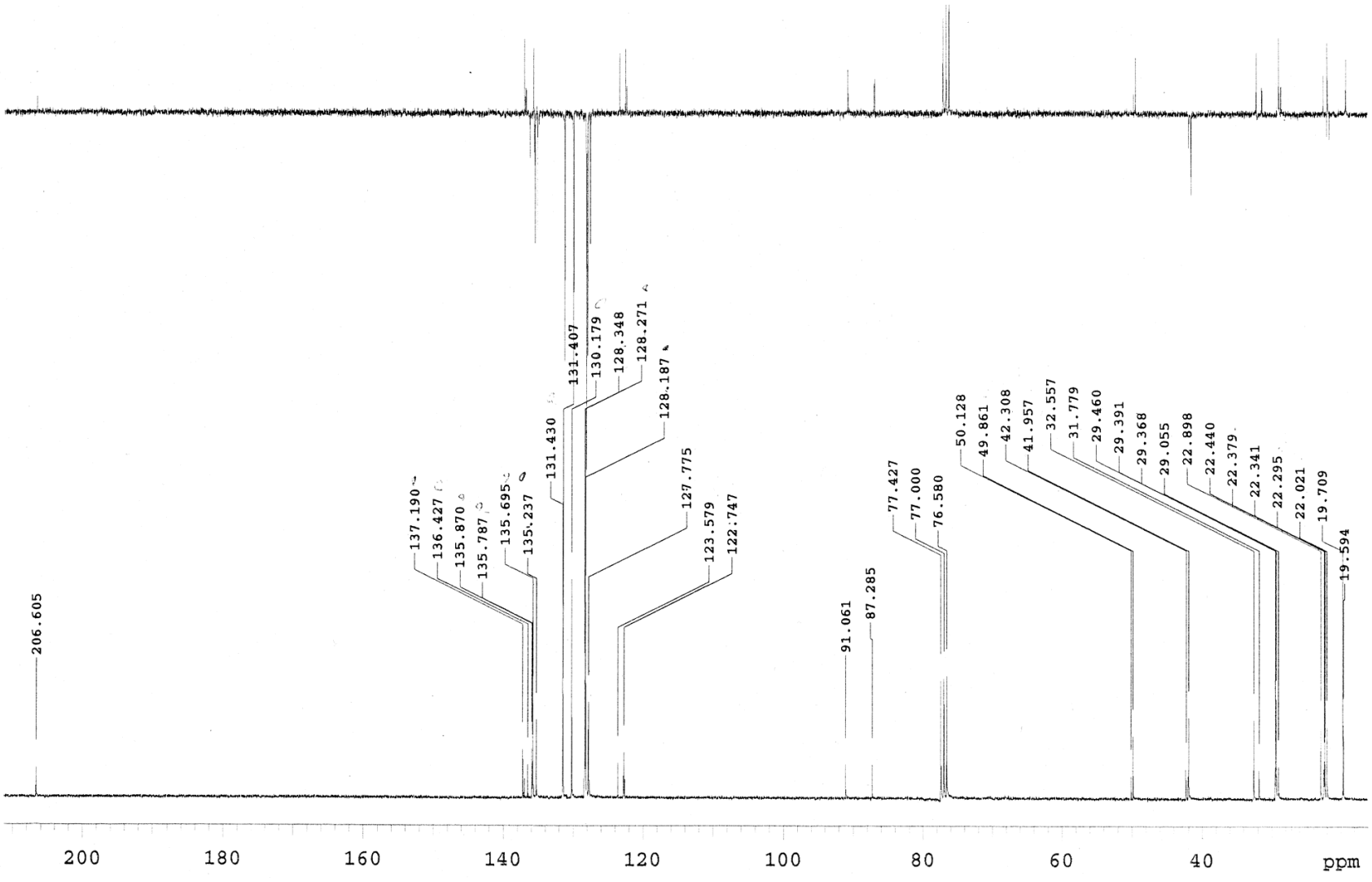
6f (1 : 1)

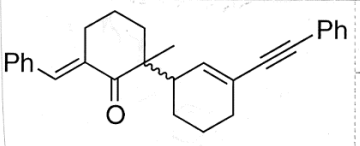


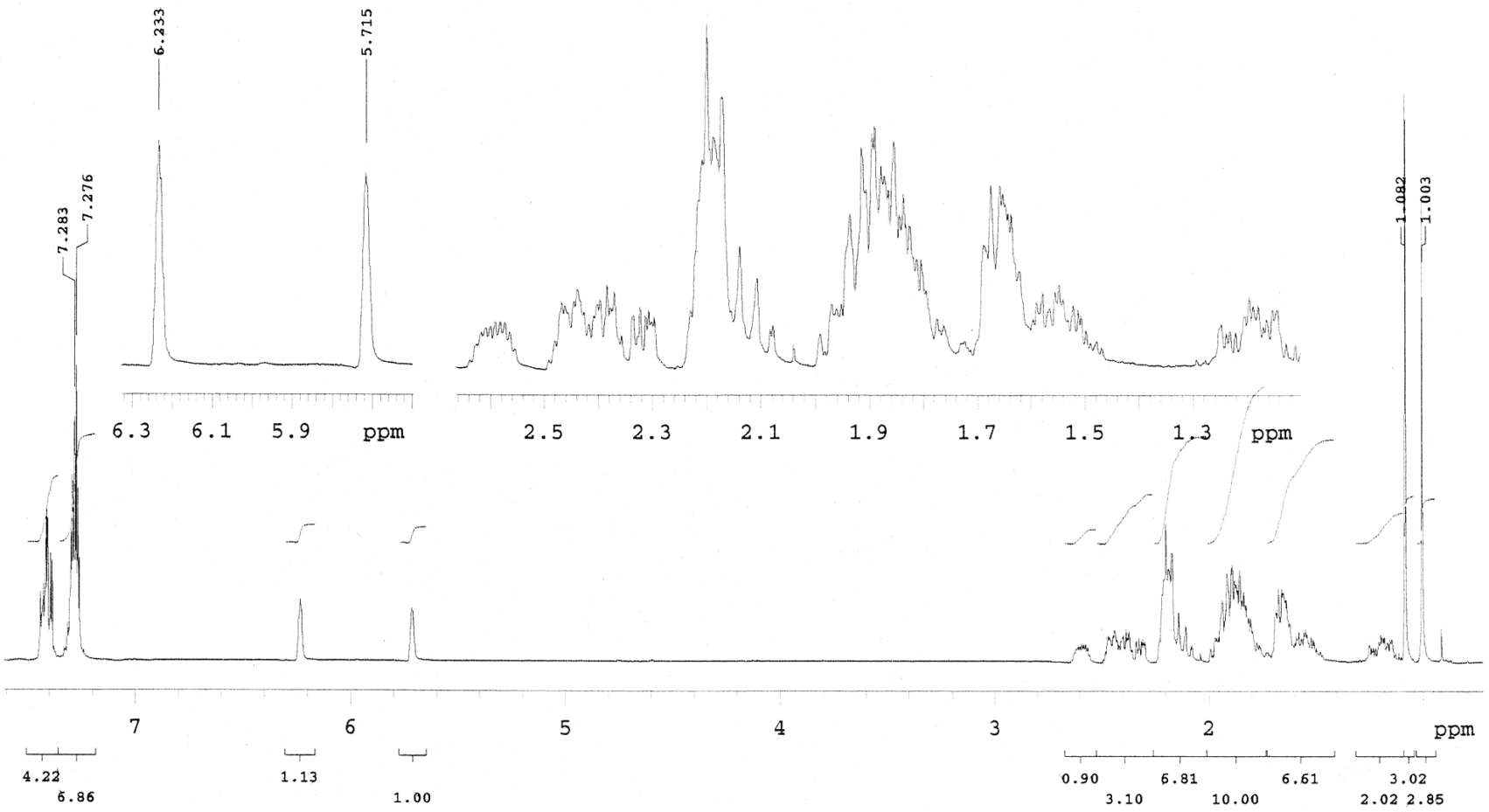
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 1136 repetitions	OBSERVE C13, 75.4560969 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 37 minutes	 **6f** (1 : 1)	TurnA-III-134 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"

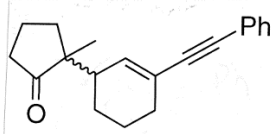


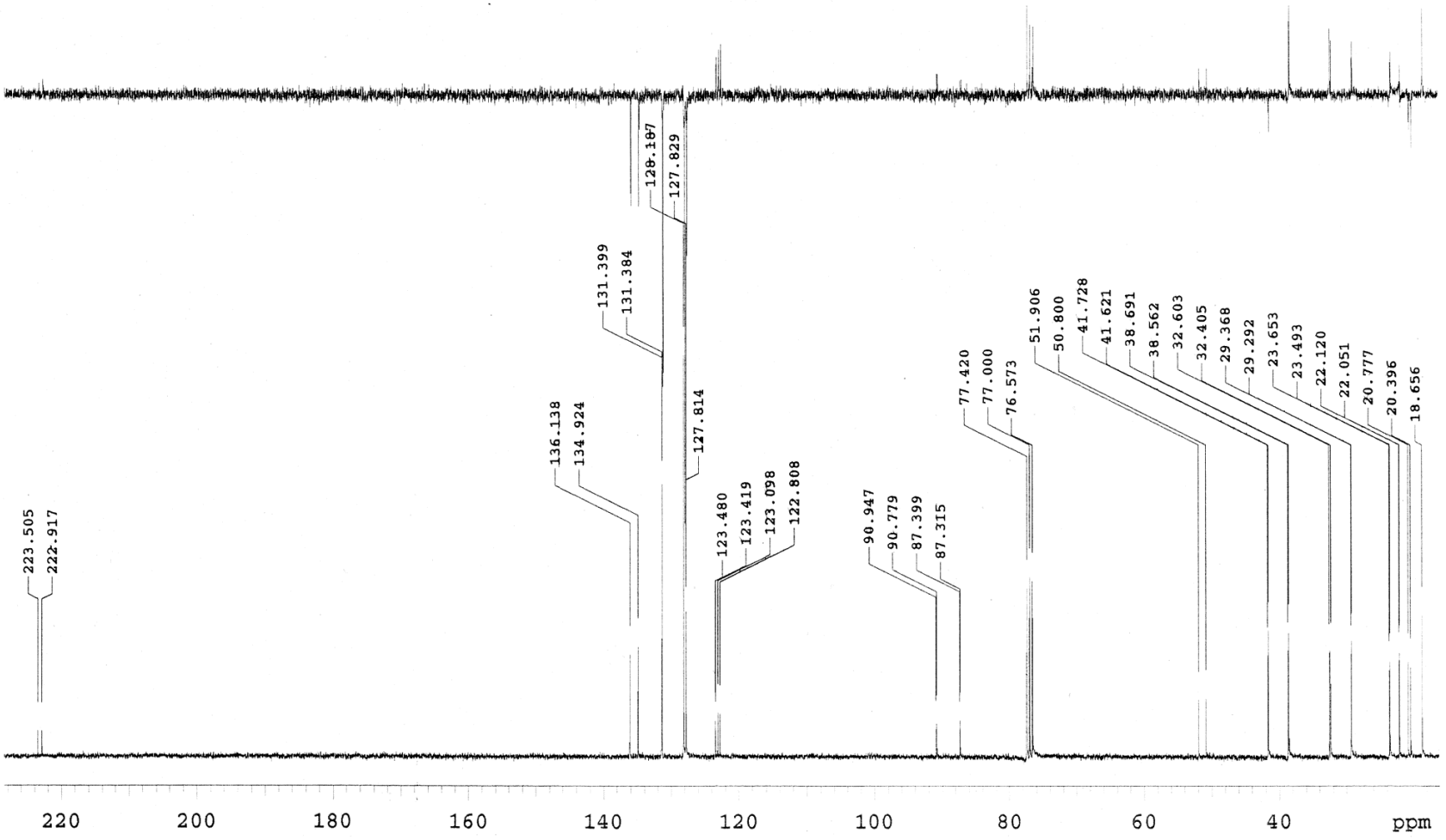
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 32 repetitions	OBSERVE H1, 300.0836523	DATA PROCESSING FT size 32768 Total time 2 minutes	 **6g** (3 : 1)	TurnA-III-84 Pulse Sequence: s2pul Solvent: CDC13 Ambient temperature Mercury-300 "varian"

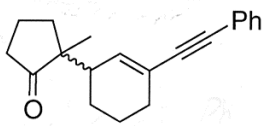


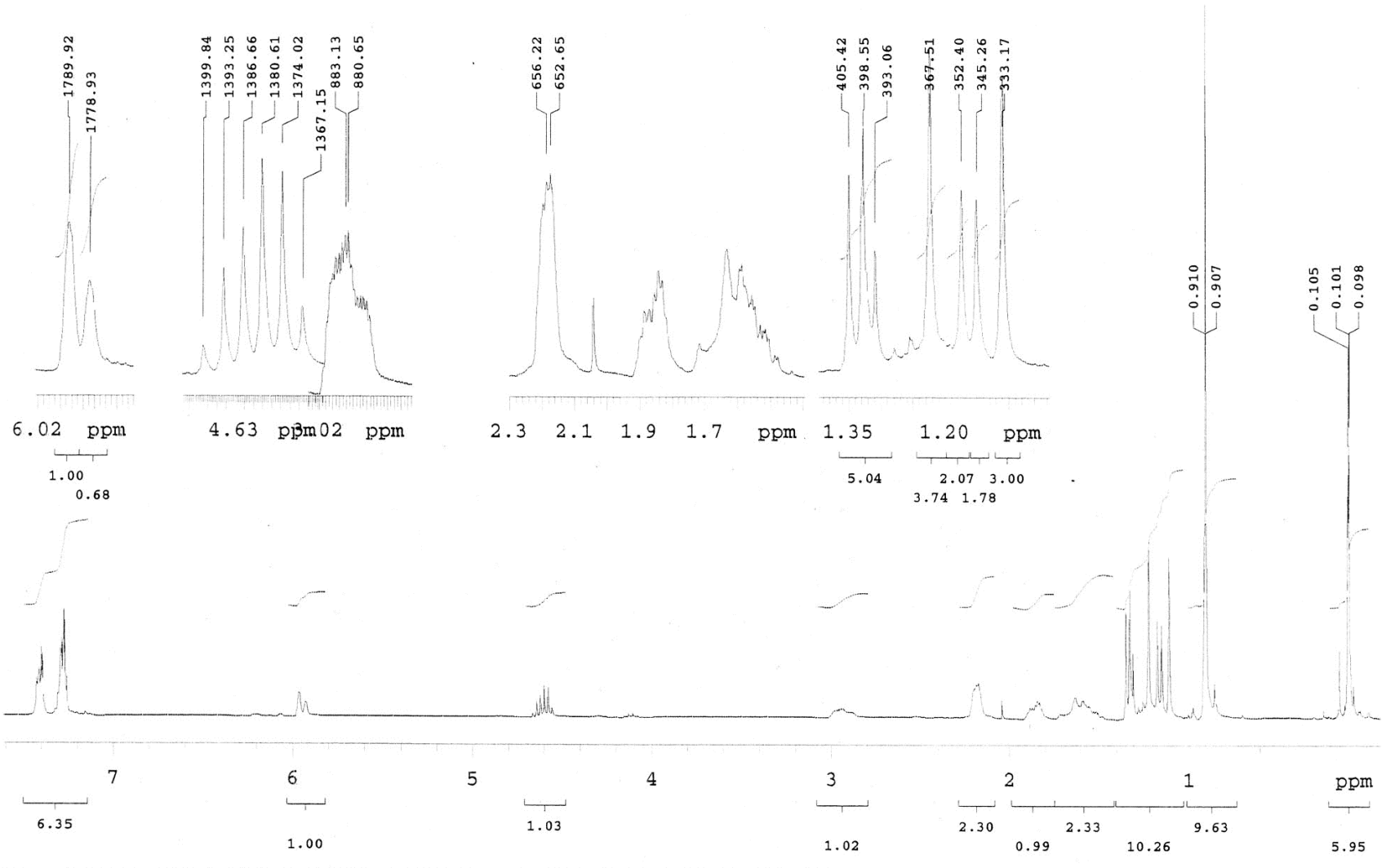
PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 2048 repetitions	OBSERVE C13, 75.4560958 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 68 minutes	 **6g** (3 : 1)	TurnA-III-84 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"

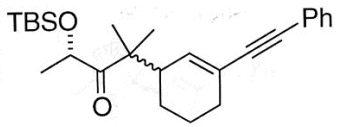


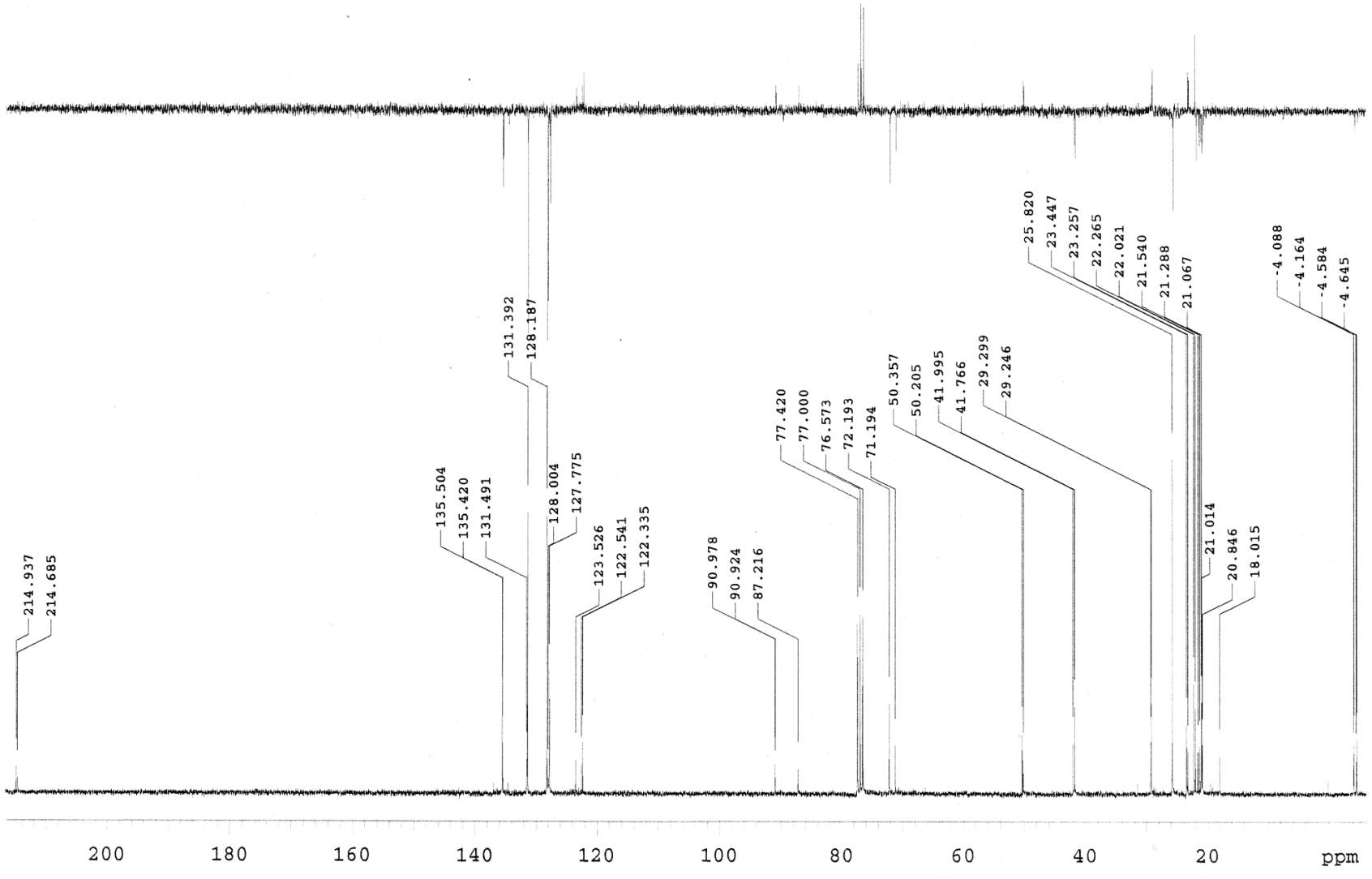
PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836522	DATA PROCESSING FT size 32768 Total time 1 minute	 **6h** (1.1 : 1)	TurnA-V-164 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"

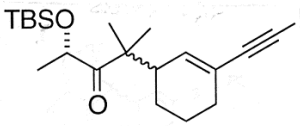


PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 1024 repetitions	OBSERVE C13, 75.4560969 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line Broadening 1.0 Hz FT size 65536 Total time 34 minutes	 **6h** (1.1 : 1)	TurnA-V-164 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 1.502 sec Pulse 45.0 degrees Acq. time 3.498 sec Width 4500.5 Hz 16 repetitions	OBSERVE H1, 300.0836525	DATA PROCESSING FT size 32768 Total time 1 minute	 **6i** (5 : 3)	TurnA-III-149 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"



PULSE SEQUENCE Relax. delay 0.501 sec Pulse 45.0 degrees Acq. time 1.499 sec Width 18865.6 Hz 1024 repetitions	OBSERVE C13, 75.4560963 DECOUPLE H1, 300.0851346 Power 36 dB continuously on WALTZ-16 modulated	DATA PROCESSING Line broadening 1.0 Hz FT size 65536 Total time 34 minutes	 **6i** (5 : 3) TurnA-III-149 Pulse Sequence: s2pul Solvent: CDCl3 Ambient temperature Mercury-300 "varian"