

1-Cyclohexyl-3-(4-chlorophenyl)-4-vinyltetrahydro-2H-imidazolidin-2-one

(5b)

82 % yield; colorless solid Mpt. 78°C; IR (neat) ν (C=O) 1698 cm^{-1} ; ^1H NMR (CDCl_3) δ 1.0 – 1.2 (br, 1H), 1.2 – 1.5 (m, br, 4H), 1.6 – 1.9 (br, 5H), 3.10 (dd, 1H J = 8.9 and 5.9 Hz), 3.61 (t, 1H, J = 9.0 Hz), 3.7 – 3.9 (br, 1H) 4.57 (q, 1H, J = 7.3 Hz), 5.24 (m, 3H), 5.75 (m, 1H), 7.22 (d, 2H, J = 9.0 Hz), 7.38 (d, 2H, J = 9.0 Hz); ^{13}C NMR (CDCl_3) δ 156.85, 138.04, 136.20, 128.44, 127.77, 121.14, 118.51, 56.55, 51.45, 44.44, 30.15, 25.47; MS (m/e) 304 [M^{35}Cl] $^+$, 306 [M^{37}Cl] $^+$; EIHRMS calcd for $\text{C}_{17}\text{H}_{21}\text{ClN}_2\text{O}$ 304.1342, found 304.1342.

1-Cyclohexyl-3-(4-methoxyphenyl)-4-vinyltetrahydro-2H-imidazolidin-2-one

(5c)

88 % yield; colorless solid Mpt. 69°C; IR (neat) ν (C=O) 1696 cm^{-1} ; ^1H NMR (CDCl_3) δ 1.0 – 1.2 (br, 1H), 1.3 – 1.5 (br, 4H), 1.6 – 1.9 (br, 5H), 3.09 (dd, 1H, J = 8.8 and 6.9 Hz), 3.57 (t, 1H, J = 8.8 Hz), 3.75 (s, 3H), 3.7 – 3.9 (br, 1H), 4.52 (q, 1H, J = 7.8 Hz), 5.20 (m, 2H), 6.80 (m, 1H), 6.82 (d, 2H, J = 9.2 Hz), 7.28 (d, 2H, J = 9.2 Hz); ^{13}C NMR (CDCl_3) δ 157.78, 155.87, 136.77, 132.45, 123.01, 118.56, 113.84, 57.73, 55.39, 51.43, 44.53, 30.35, 30.03, 25.55, 25.49; MS (m/e) 300 [M] $^+$; EIHRMS calcd for $\text{C}_{18}\text{H}_{24}\text{N}_2\text{O}_2$ 300.1838, found 300.1837.

1-(tert-Butyl)-3-phenyl-4-vinyltetrahydro-2H-imidazolidin-2-one (5d)

67 % yield; colorless oil; IR (neat) ν (C=O) 1700 cm^{-1} ; ^1H NMR (CDCl_3) δ 1.39 (s, 9H), 3.14 (dd, 1H, J = 8.6 and 7.1 Hz), 3.63 (t, 1H, J = 8.6 Hz), 4.48 (q, 1H, J = 7.6 Hz), 5.25 (m, 2H), 5.77 (m, 1H), 7.01 (t, 1H, J = 7.2 Hz), 7.27 (t, 2H, J = 7.6 Hz), 7.39 (d, 2H, J = 7.6 Hz); ^{13}C NMR (CDCl_3) δ 157.98, 139.28, 136.58, 128.37, 123.13, 120.88, 118.53, 56.08, 53.42, 46.81, 27.45; MS (m/e) 244 [M] $^+$; EIHRMS calcd for $\text{C}_{15}\text{H}_{20}\text{N}_2\text{O}$ 244.1576, found 244.1565.

1-(tert-Butyl)-3-(4-chlorophenyl)-4-vinyltetrahydro-2H-imidazolidin-2-one

(5e)

34 % yield; colorless solid Mpt. 96°C; IR (neat) ν (C=O) 1700 cm^{-1} ; ^1H NMR (CDCl_3) δ 1.38 (s, 9H), 3.14 (dd, 1H, J = 8.6 and 6.8 Hz), 3.64, (t, 1H, J = 8.6 Hz), 4.48 (q, 1H, J = 7.6 Hz), 5.25 (m, 2H), 5.74 (m, 1H), 7.21 (d, 2H, J = 9.2 Hz), 7.34 (d, 2H, J = 9.2 Hz); ^{13}C NMR (CDCl_3) δ 157.66, 137.95, 136.22, 128.41, 121.82, 118.84, 56.03, 53.55, 46.76,

27.47; MS (*m/e*) 278 [$M^{35}Cl$] $^+$, 280 [$M^{37}Cl$] $^+$; EIHRMS calcd for $C_{15}H_{19}ClN_2O$ 278.1189, found 278.1213.

1-(*tert*-Butyl)-3-(4-methoxyphenyl)-4-vinyltetrahydro-2*H*-imidazolidin-2-one (5f)

61 % yield; colorless oil; IR (neat) ν (C=O) 1701 cm^{-1} ; 1H NMR ($CDCl_3$) δ 1.38 (s, 9H), 3.11 (t, 1H, J = 8.1 Hz), 3.60 (t, 1H, J = 8.6 Hz), 3.74 (s, 3H), 4.42 (q, 1H, J = 8.0 Hz), 5.20 (m, 2H), 5.74 (m, 1H), 6.82 (d, 2H, J = 9.1 Hz), 7.24 (d, 2H, J = 9.1 Hz); ^{13}C NMR ($CDCl_3$) δ 158.62, 156.05, 136.70, 132.34, 123.51, 118.78, 113.79, 57.06, 55.40, 53.35, 46.85, 27.44; MS (*m/e*) 274 [M] $^+$; EIHRMS calcd for $C_{16}H_{22}N_2O_2$ 274.1681, found 274.1694.

1-Butyl-5-methyl-3-(4-chlorophenyl)-4-vinyltetrahydro-2*H*-imidazolidin-2-one (5h) (ca. 2:1 mixture of *cis* and *trans*)

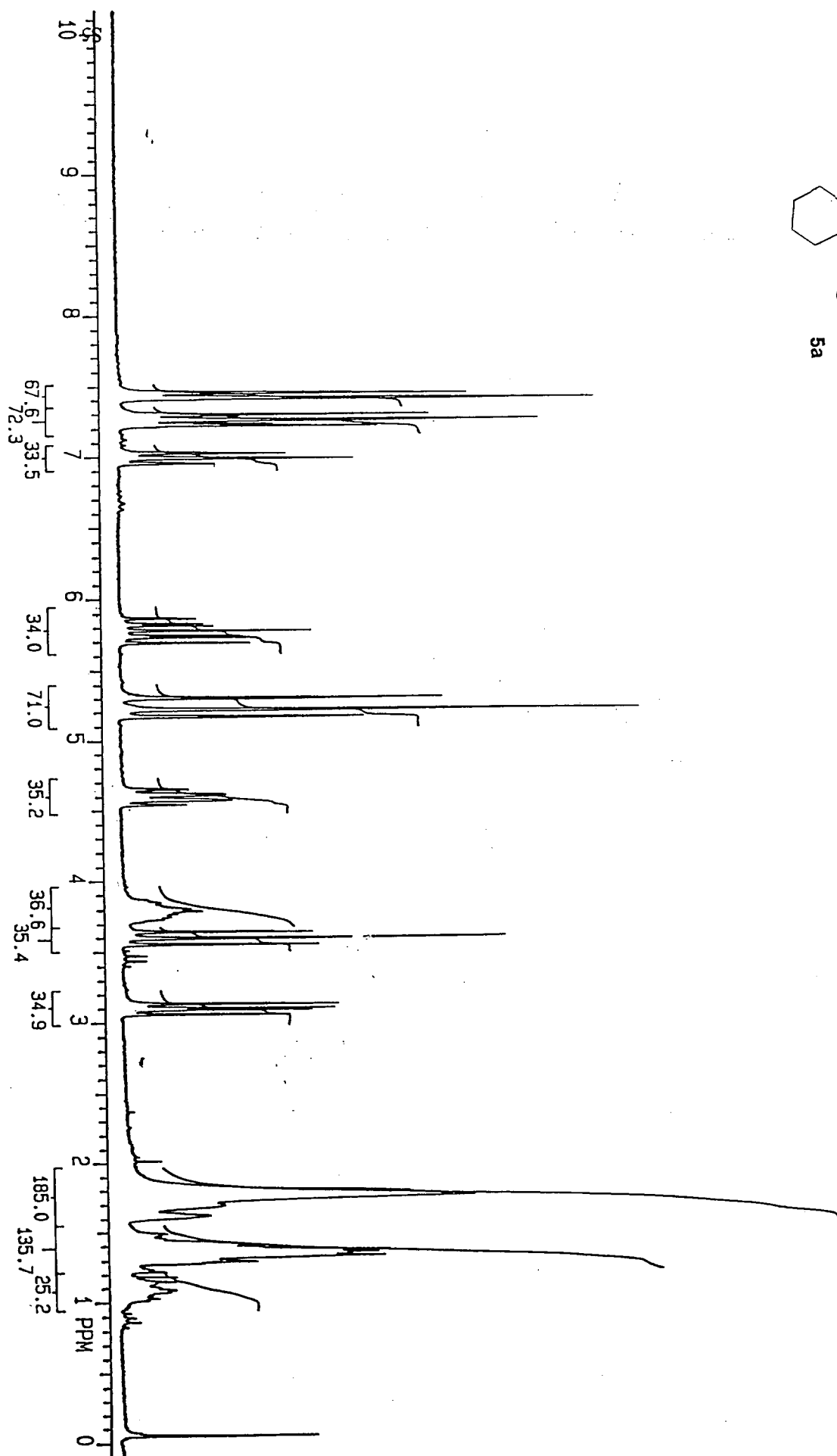
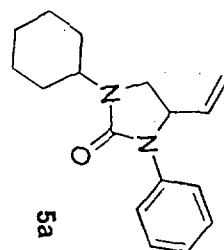
97 % yield; colorless oil; IR (neat) ν (C=O) 1706 cm^{-1} ; 1H NMR ($CDCl_3$) δ 0.92 (t, 4.5H, J = 7.1 Hz), 1.15 (d, 1.5H, J = 6.5 Hz), 1.28 (d, 3H, J = 6.2 Hz), 1.3 – 1.6 (m, 6.5H), 3.1 (m, 1.5H), 3.4 (m, 2.5H), 3.9 (m, 0.5H), 4.03 (t, 1H, J = 7.0 Hz), 4.52 (t, 0.5H, J = 8.1 Hz), 5.34 (m, 3H), 5.70 (m, 1.5H), 7.21 (m, 3H), 7.35 (m, 3H); ^{13}C NMR ($CDCl_3$) δ 157.17, 137.96, 135.78, 132.85, 128.32, 127.94, 121.43, 121.11, 120.36, 119.08, 64.72, 61.02, 54.72, 51.98, 41.11, 40.84, 29.70, 29.55, 20.01, 19.95, 17.46, 14.22, 13.70; MS (*m/e*) 292 [$M^{35}Cl$] $^+$, 294 [$M^{37}Cl$] $^+$; EIHRMS calcd for $C_{16}H_{21}ClN_2O$ 292.1342, found 292.1309.

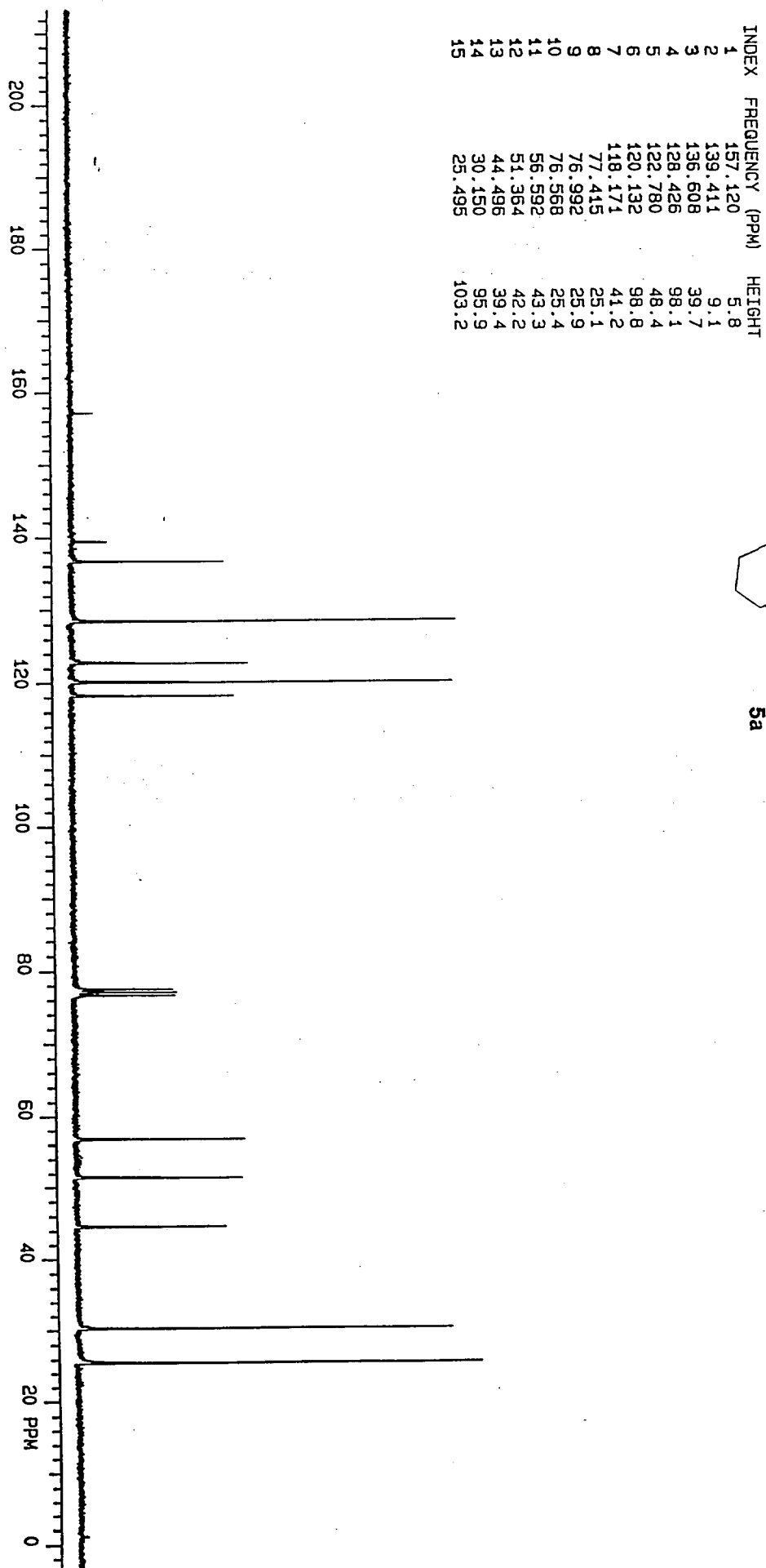
***N*-[1-Cyclohexyl-3-(4-chlorophenyl)-4-vinyltetrahydro-2*H*-imidazol-2-ylidene]–4-chloroaniline (6b)**

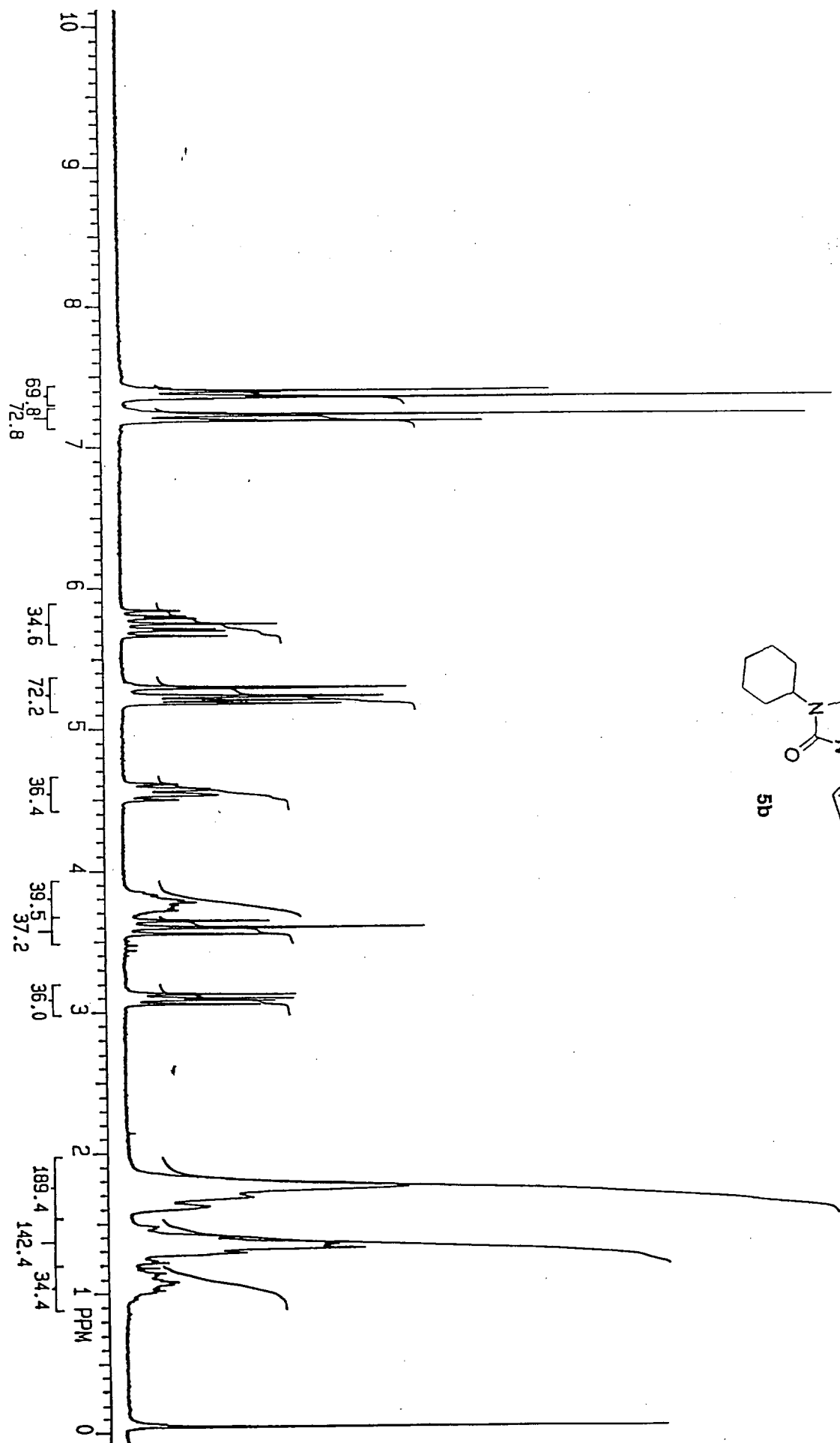
61 % yield; colorless oil; IR (neat) ν (C=N) 1627 cm^{-1} ; 1H NMR ($CDCl_3$) δ 1.0 – 1.2 (br, 1H), 1.2 – 1.5 (br, 4H), 1.6 – 2.0 (br, 5H), 3.14 (dd, 1H, J = 8.8 and 6.8 Hz), 3.62 (t, 1H, J = 8.6 Hz), 3.82 (br, 1H), 4.13 (q, 1H, J = 7.5 Hz), 5.20 (m, 2H), 5.81 (m, 1H), 6.52 (m, 2H), 6.87 (m, 3H), 6.96 (m, 2H); ^{13}C NMR ($CDCl_3$) δ 151.34, 140.32, 137.15, 130.04, 128.32, 127.93, 126.37, 124.80, 123.34, 121.18, 118.67, 64.32, 52.92, 46.25, 30.12, 29.03, 25.69, 25.65, 25.36; MS (*m/e*) 413 [$M^{35}Cl_2$] $^+$, 415 [$M^{35}Cl^{37}Cl$] $^+$; EIHRMS calcd for $C_{23}H_{25}Cl_2N_3$ 413.1425, found 413.1441.

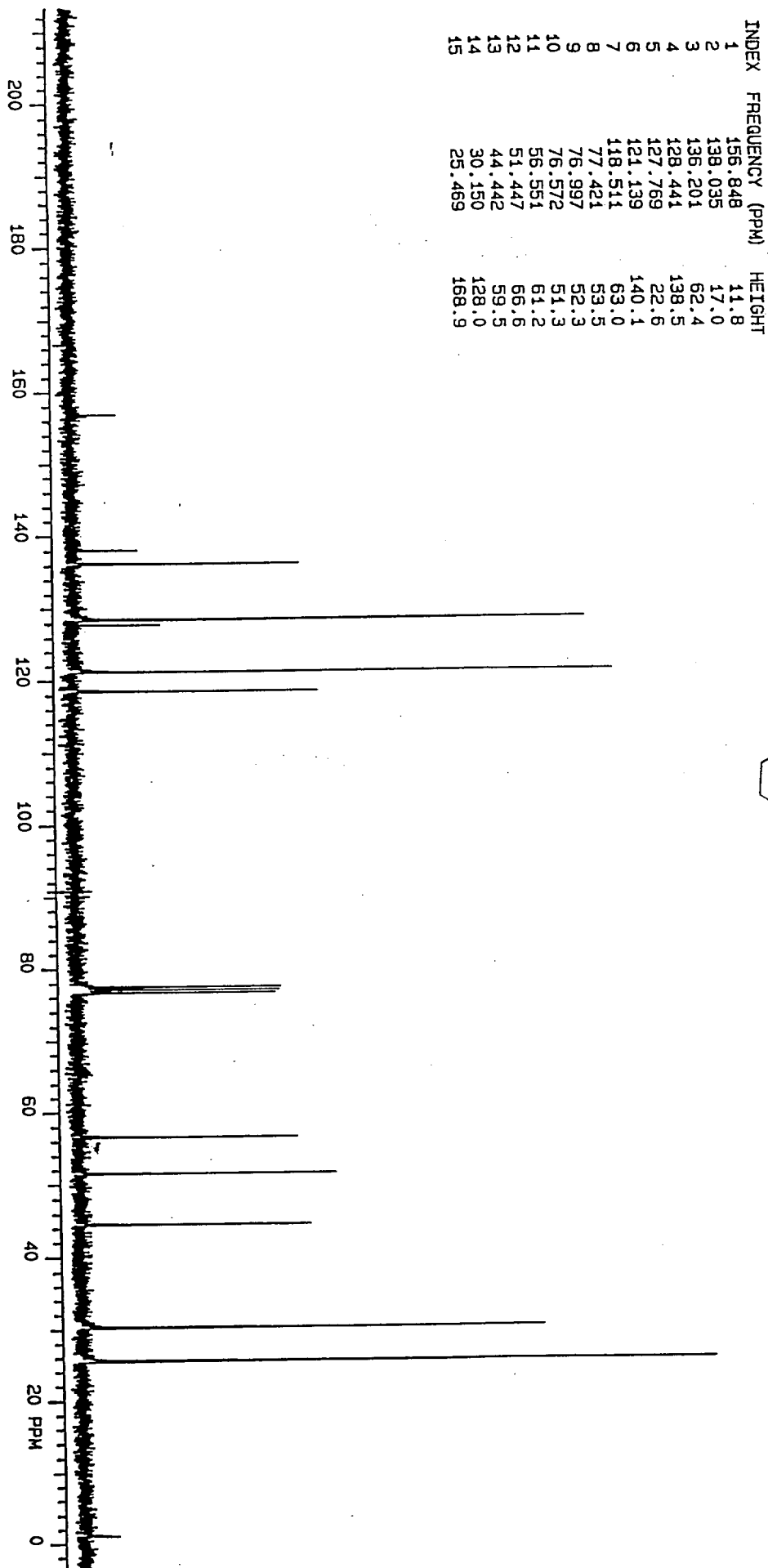
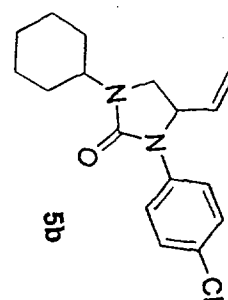
***N*-[1-Cyclohexyl-3-(4-methoxyphenyl)-4-vinyltetrahydro-2*H*-imidazol-2-ylidene]–4-methoxyaniline (6c)**

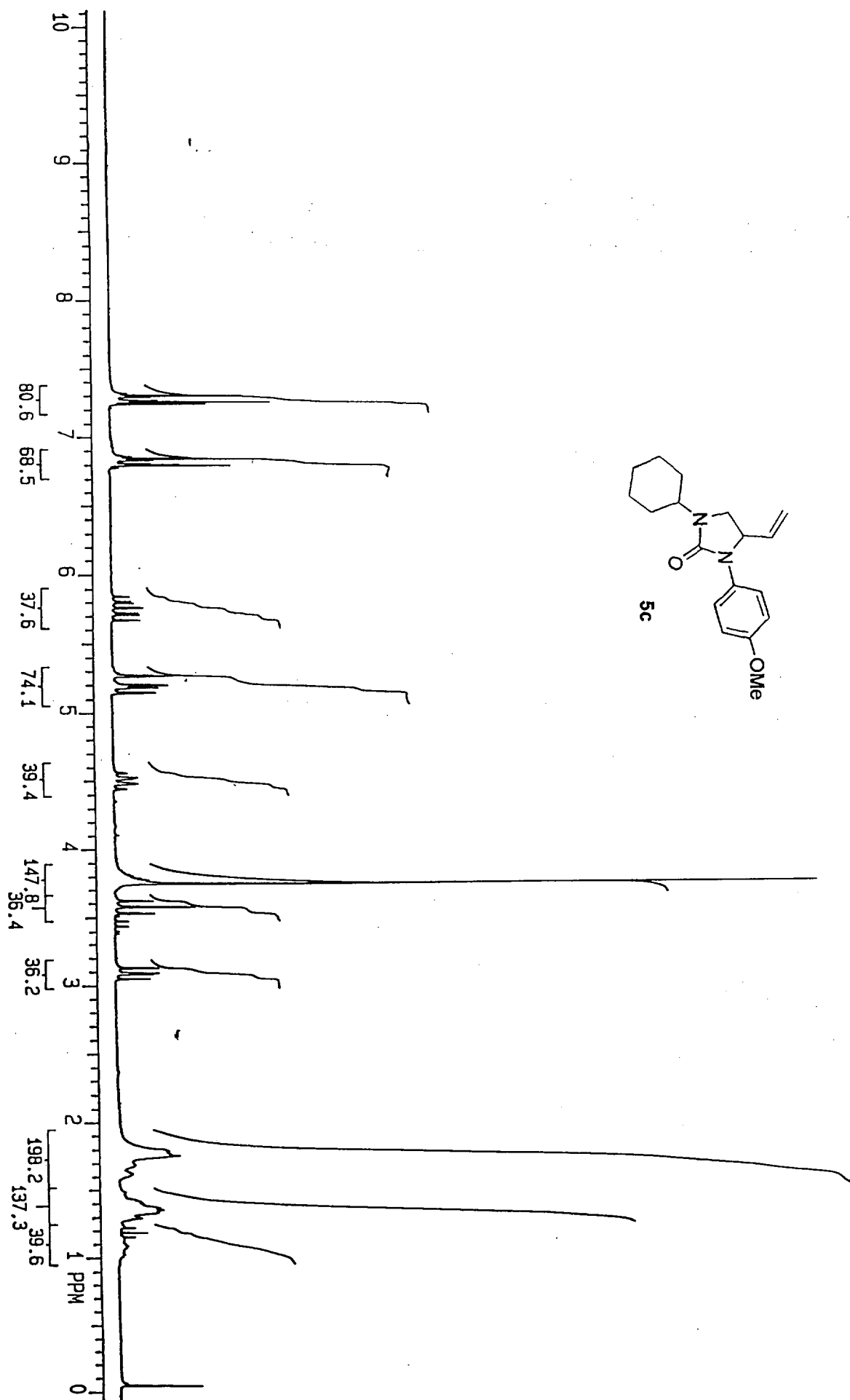
36 % yield; colorless oil; IR (neat) ν (C=N) 1638 cm^{-1} ; ^1H NMR (CDCl_3) δ 1.0 – 1.2 (br, 1H), 1.2 – 1.4 (br, 4H), 1.6 – 2.0 (br, 5H), 3.12 (t, 1H, $J = 8.3\text{ Hz}$), 3.55 (t, 1H, $J = 8.3\text{ Hz}$), 3.60 (s, 3H), 3.64 (s, 3H), 3.85 (br, 1H), 4.05 (q, 1H, $J = 8.0\text{ Hz}$), 5.10 (m, 2H), 5.83 (m, 1H), 6.45 (m, 6H), 7.80 (d, 2H $J = 8.9\text{ Hz}$); ^{13}C NMR (CDCl_3) δ 156.79, 153.30, 152.60, 143.14, 137.60, 135.27, 127.71, 123.05, 118.32, 113.46, 113.41, 65.15, 55.62, 55.29, 52.94, 46.18, 30.38, 28.39, 25.83, 25.75, 25.38; MS (m/e) 405 $[\text{M}]^+$; EHRMS calcd for $\text{C}_{25}\text{H}_{31}\text{N}_3\text{O}_2$ 405.2416, found 405.2428.

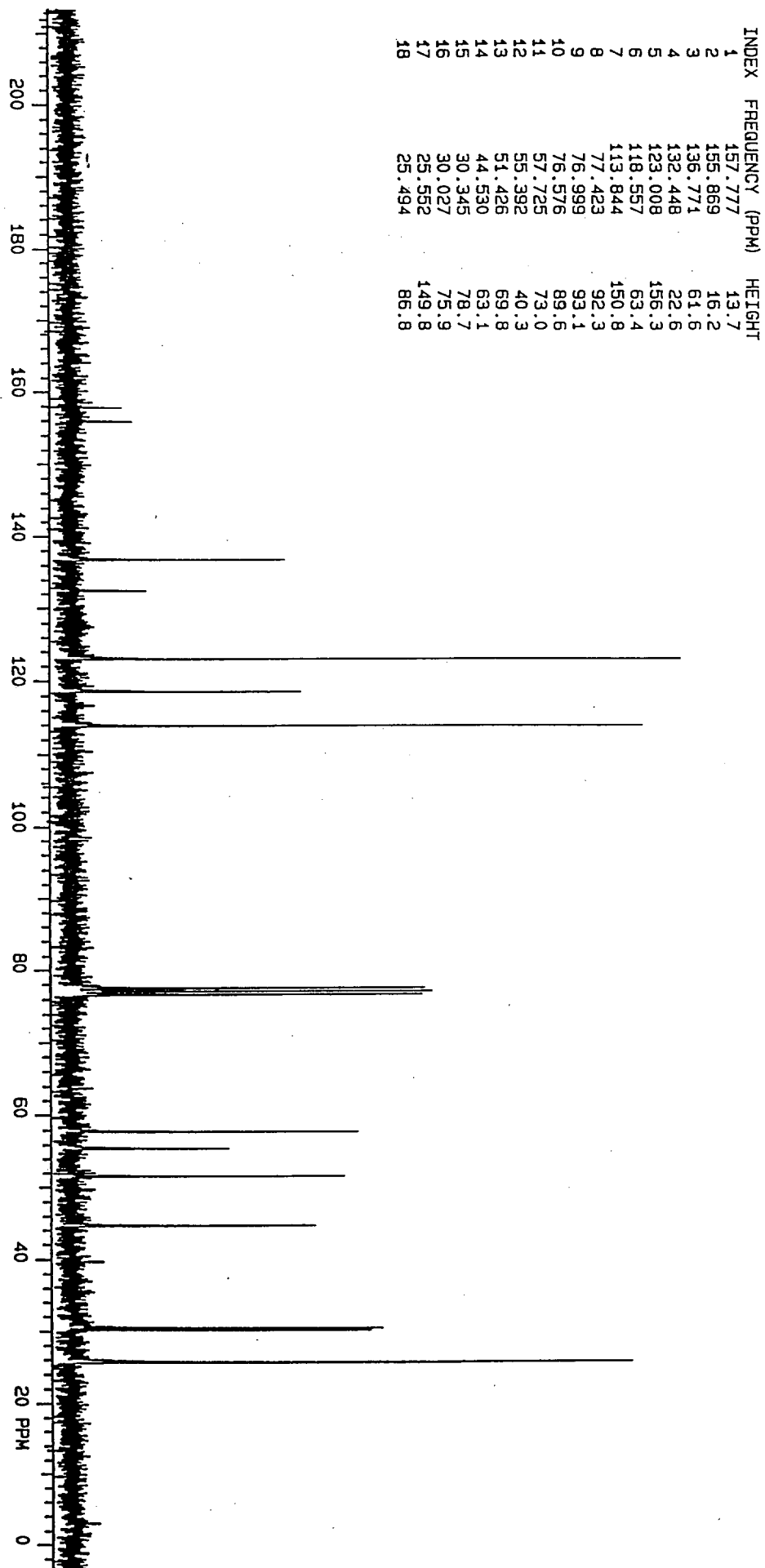
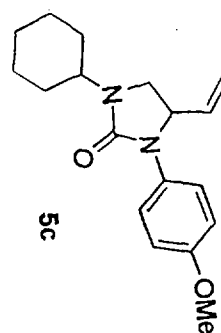


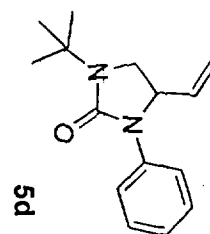
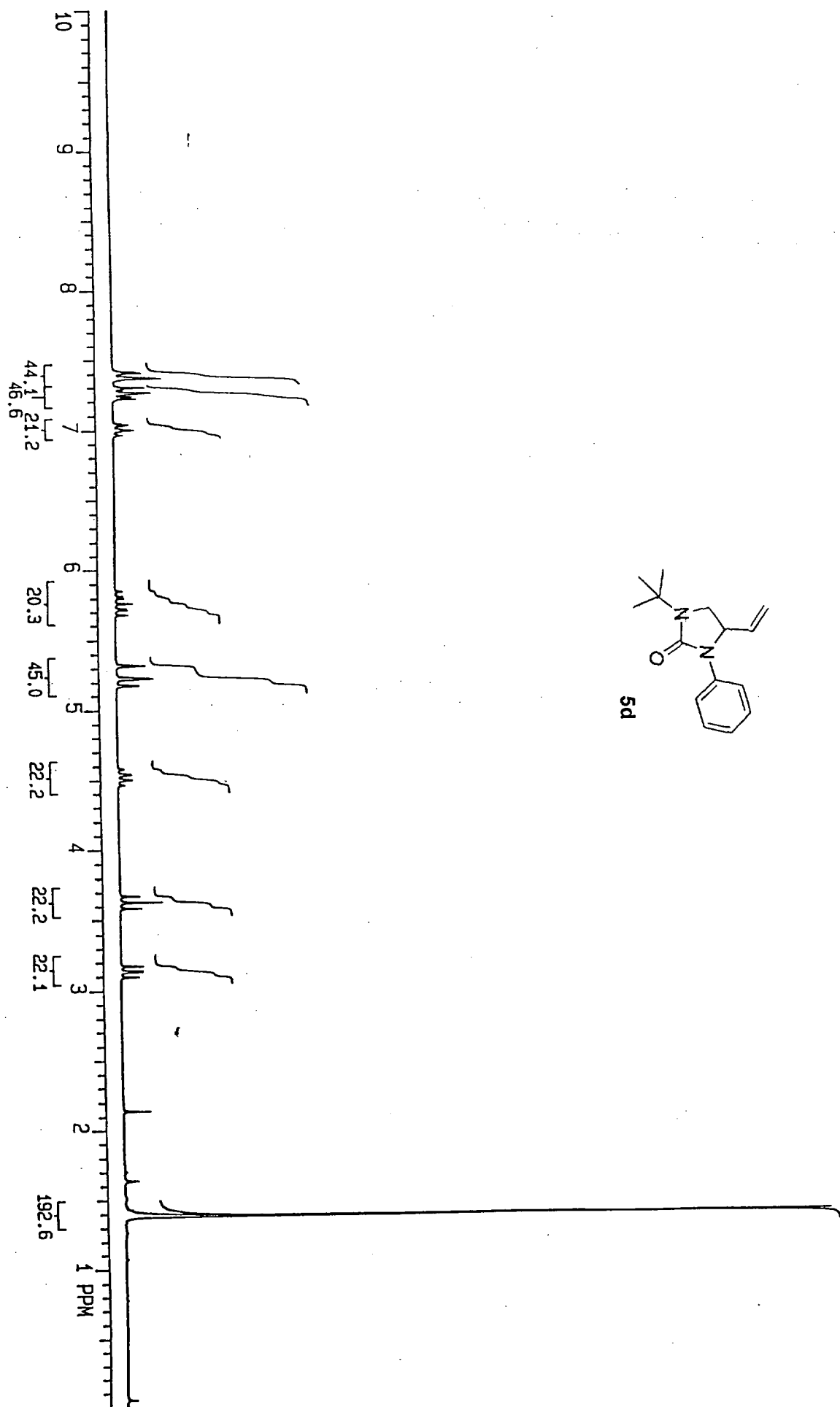


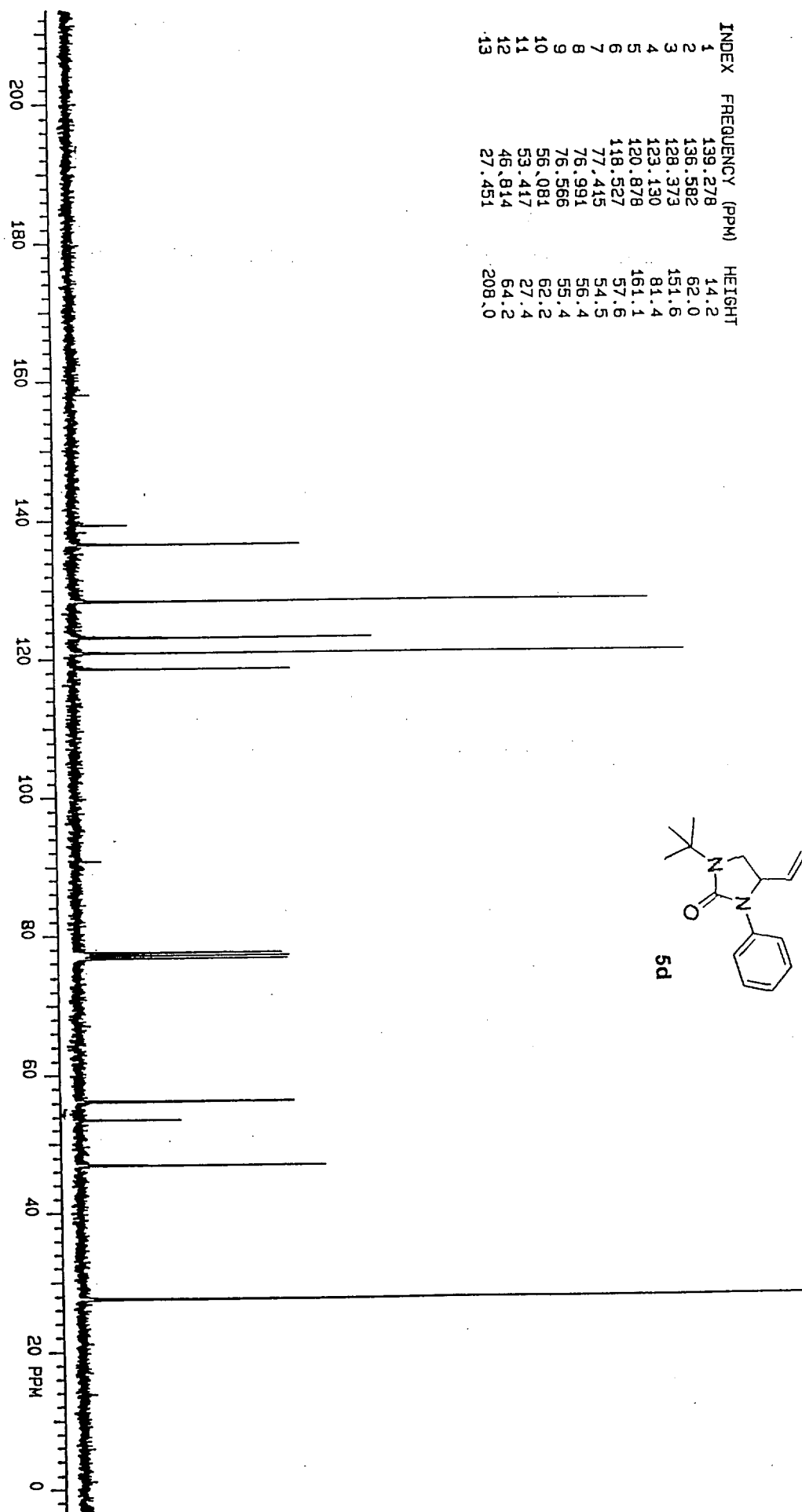


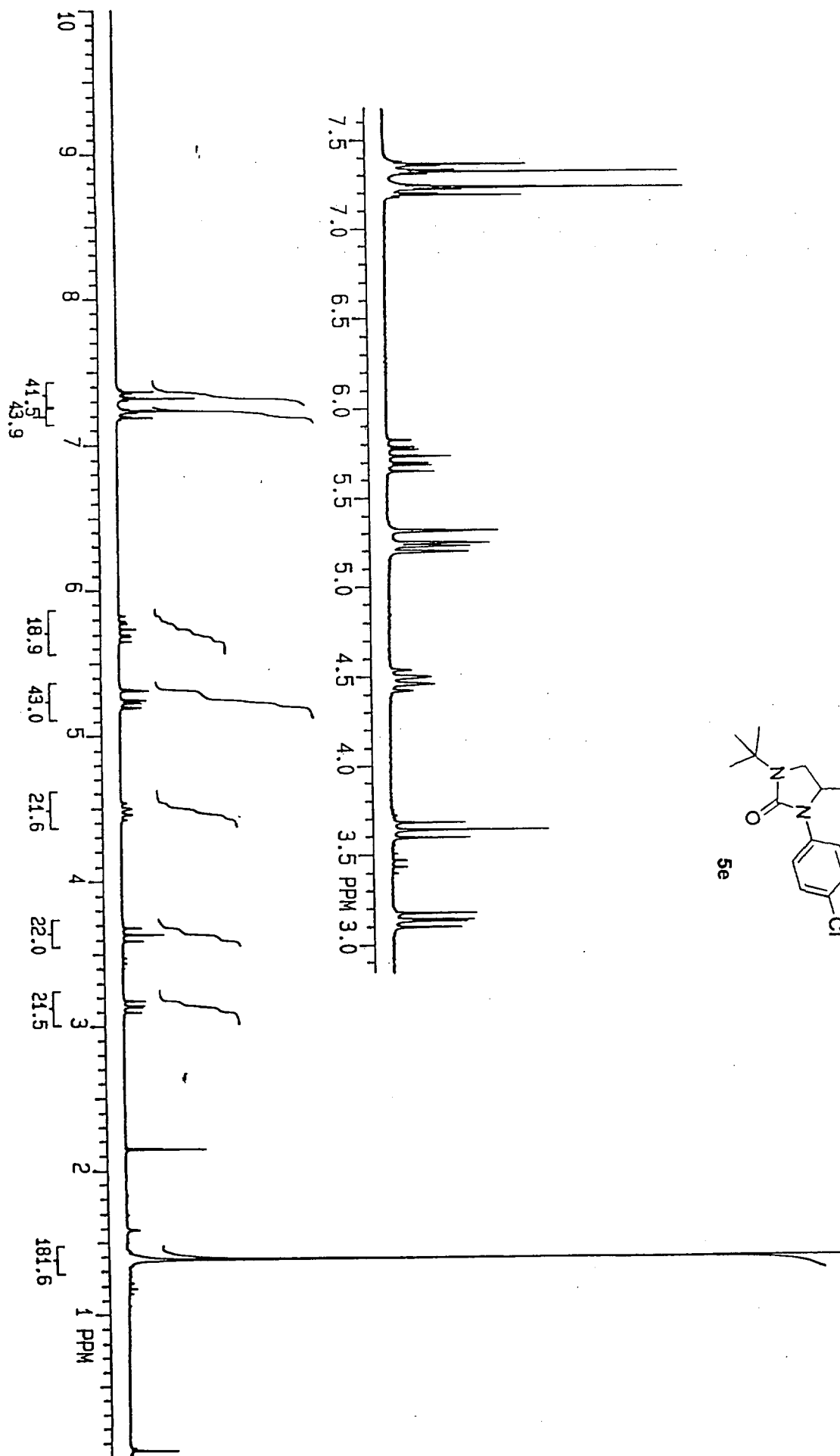
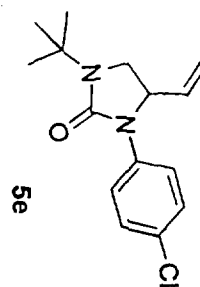


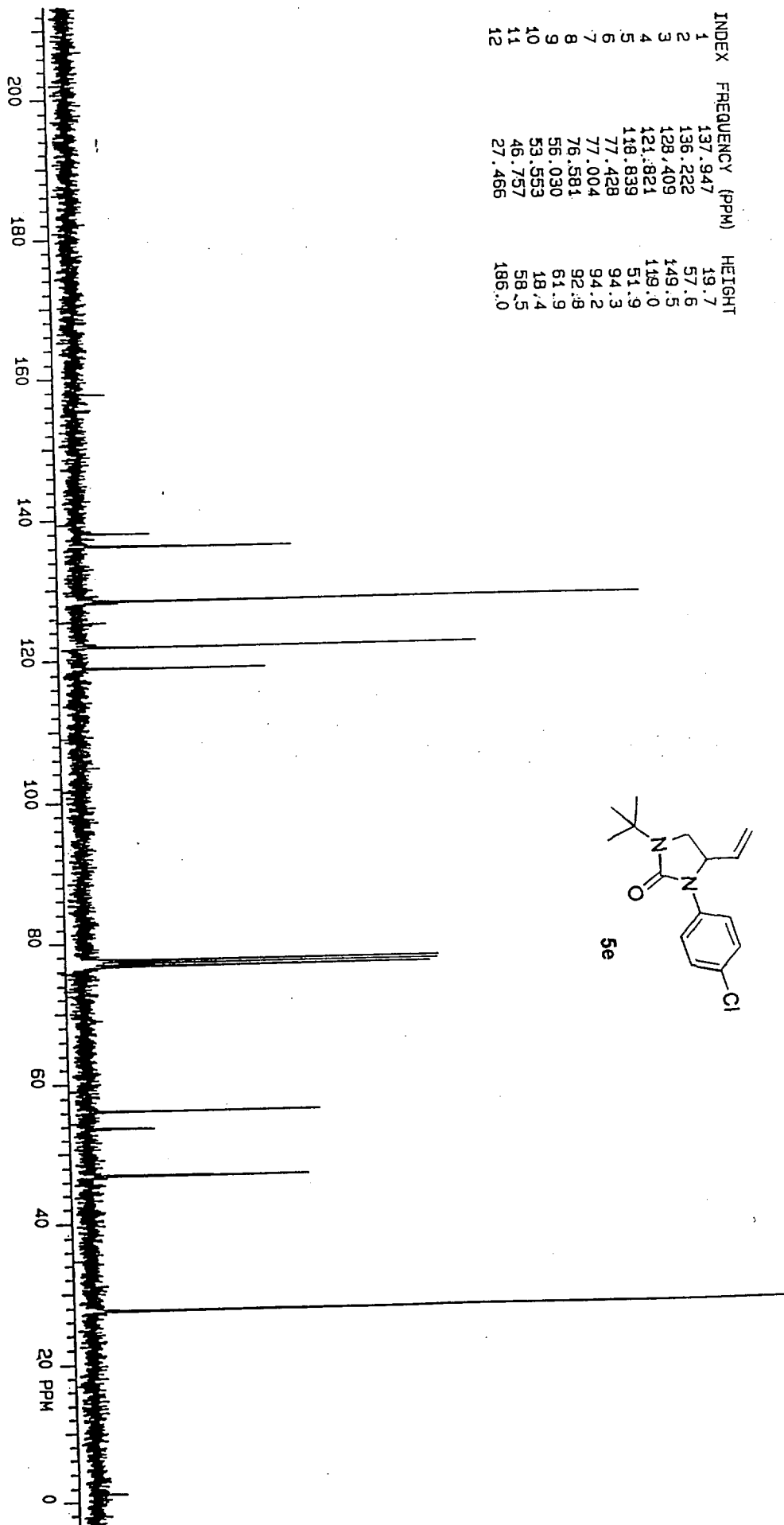


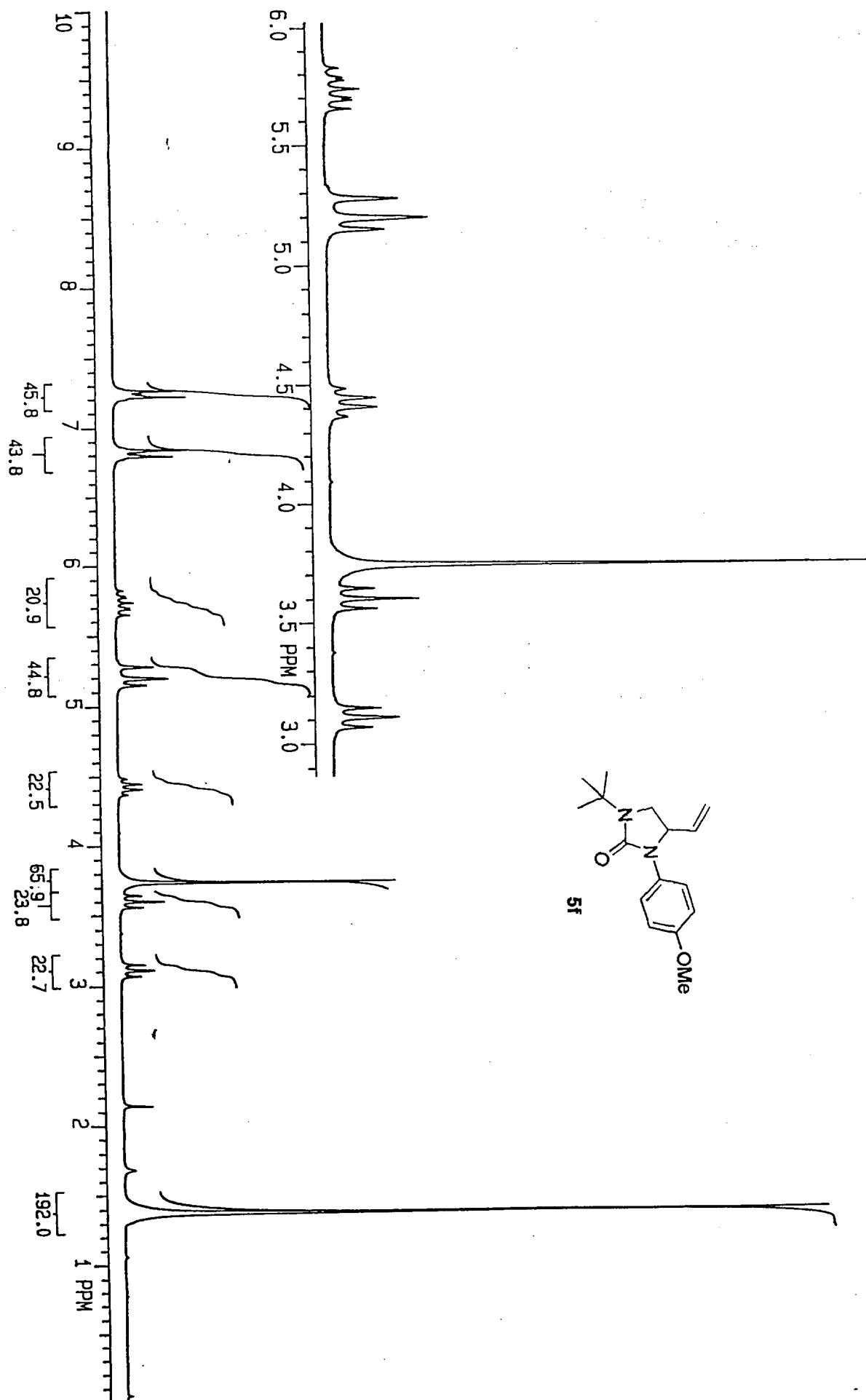


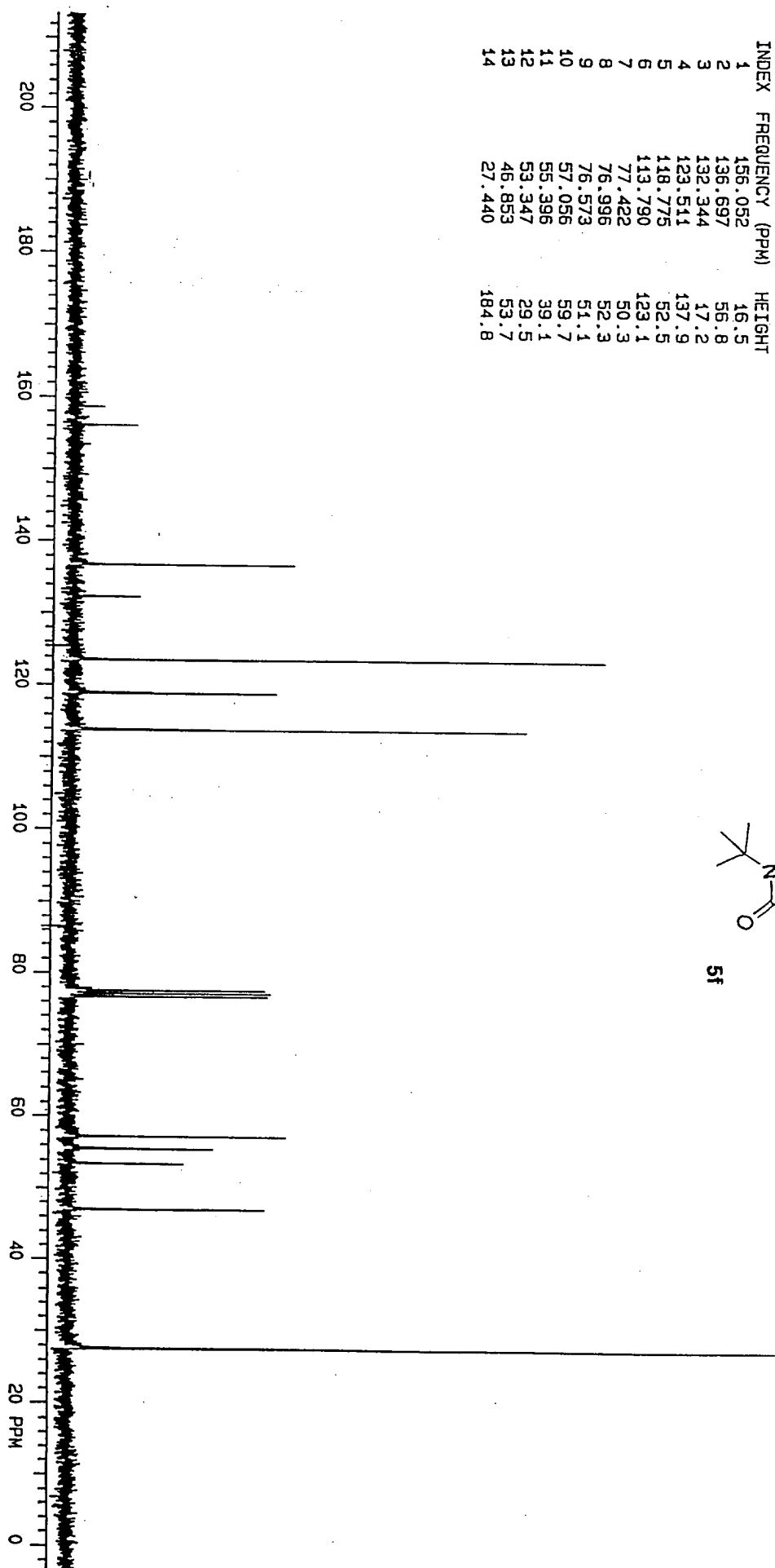


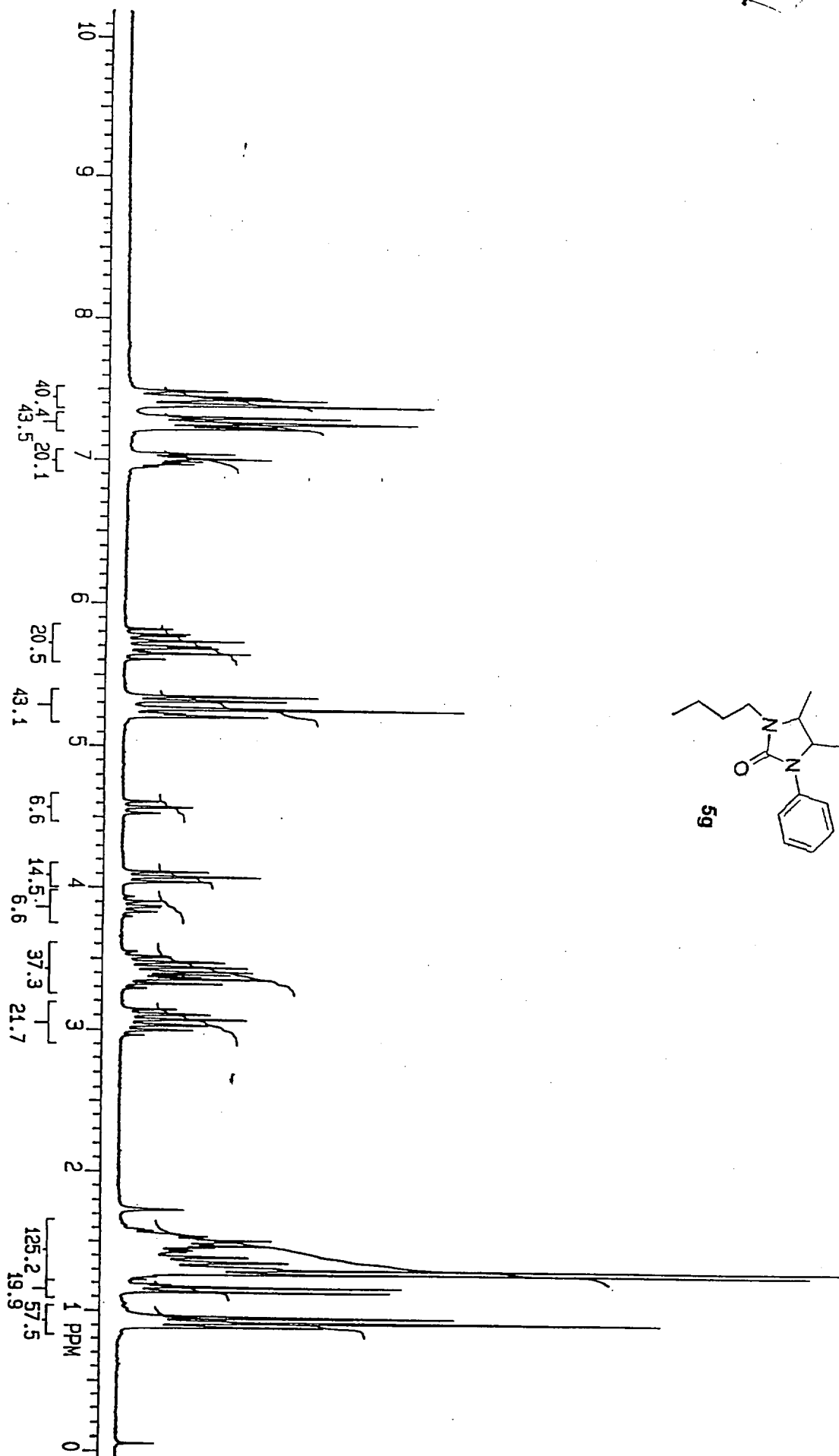
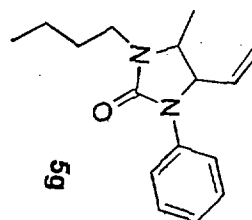


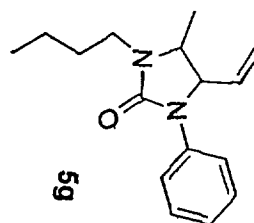
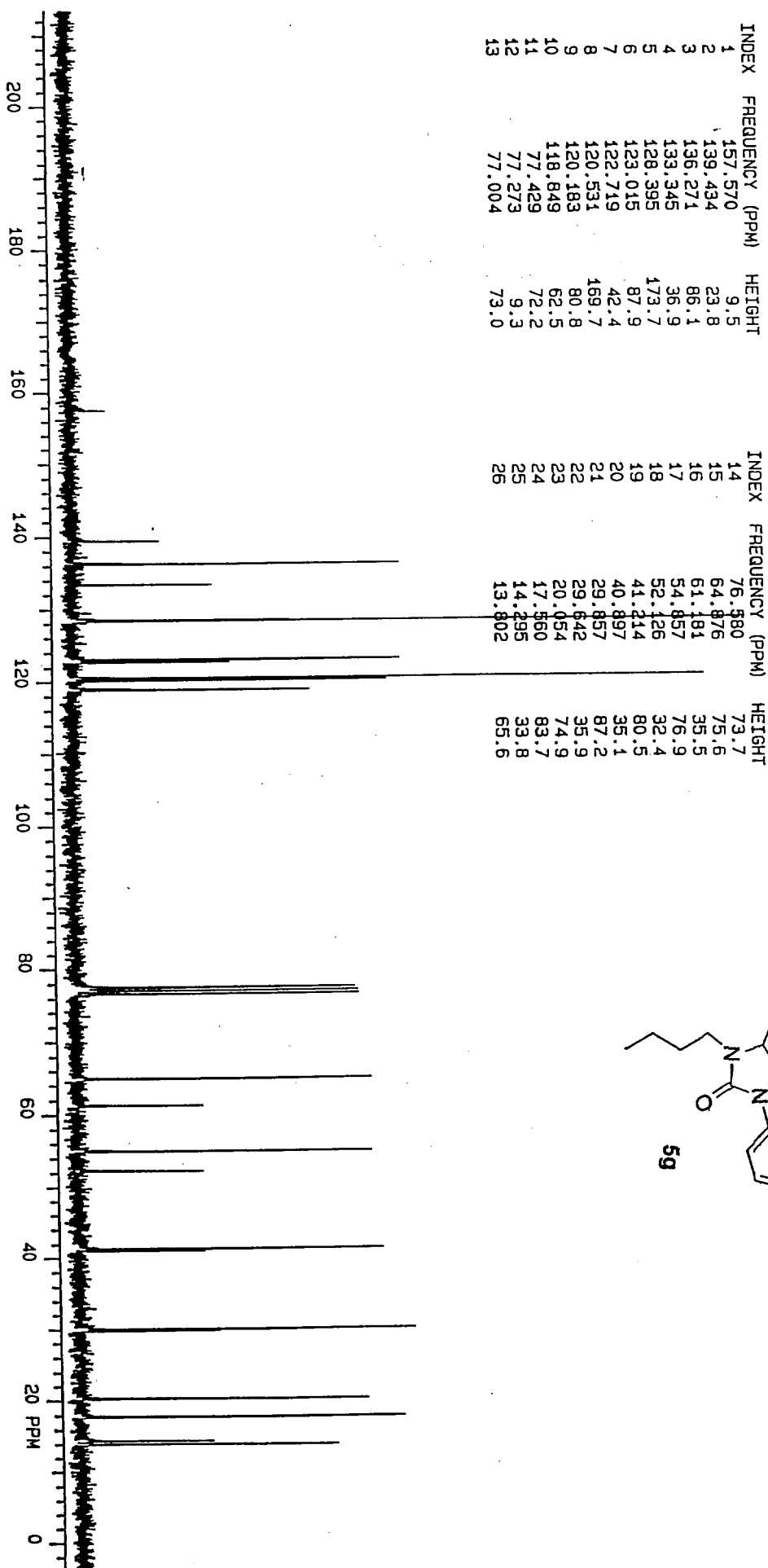


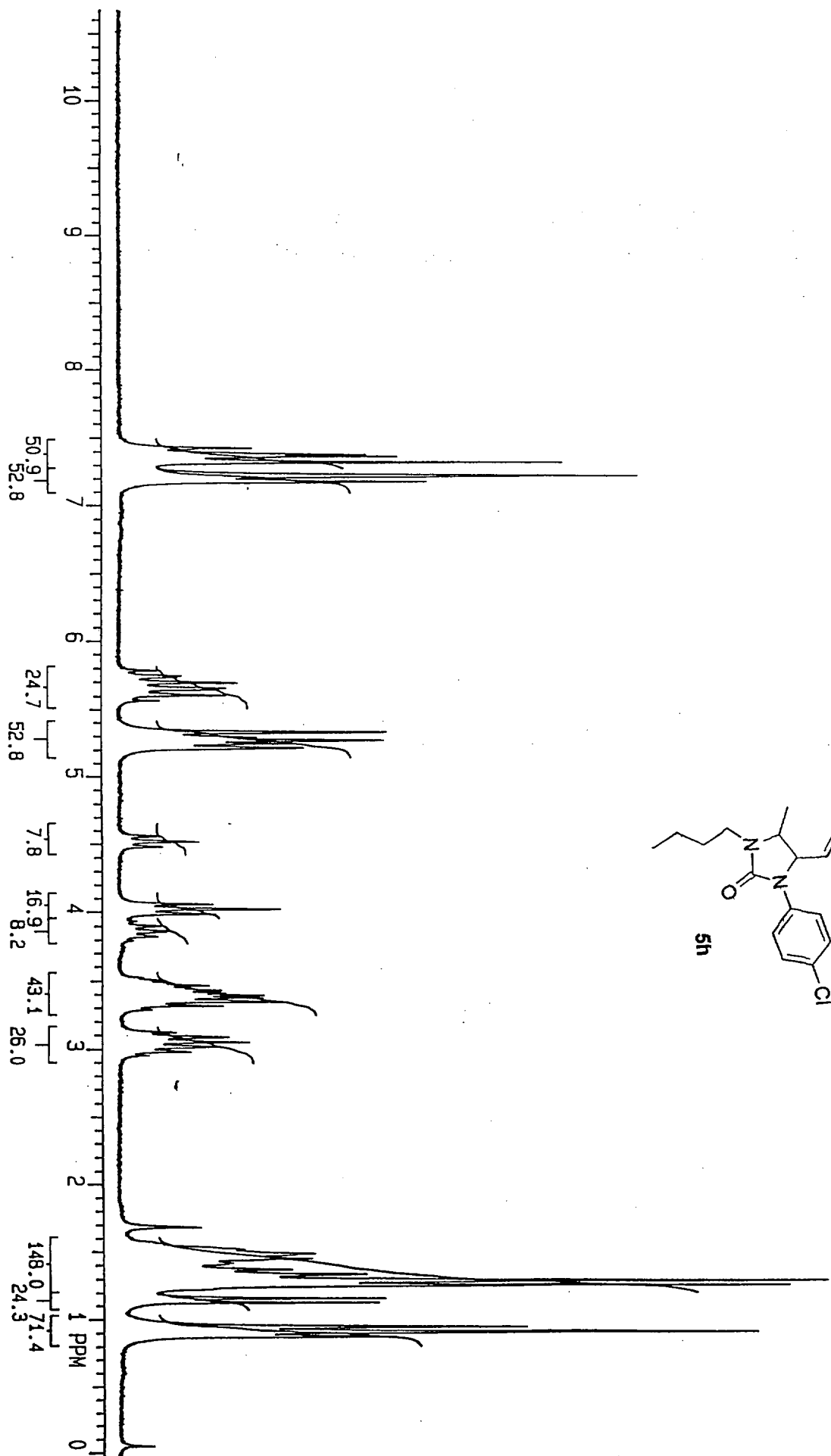


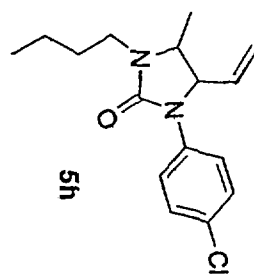
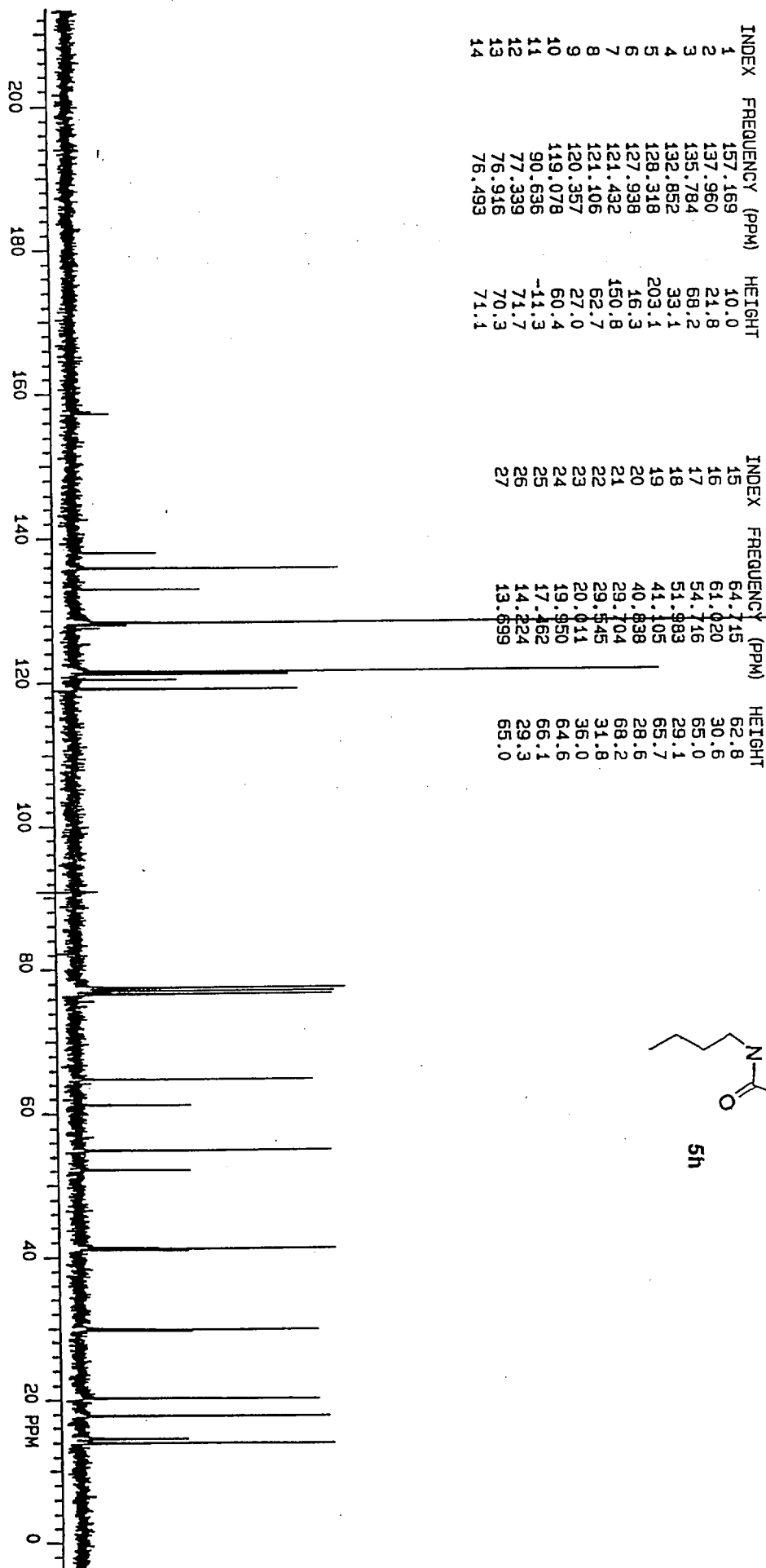












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