Supplementary Material (ESI) for Organic & Biomolecular Chemistry

Supporting Information

Iron-catalyzed sulfonyl radical formations from sulfonylhydrazides and oxidative addition of alkenes

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General. All reactions were carried out in a flame-dried glassware under nitrogen atmosphere. Amines were distilled over calcium hydride. All reagents were purchased commercially and used without further purification. Melting points are uncorrected. IR spectra were recorded on a commercial FT/IR spectrometer. ^{1}H NMR spectra were recorded at 600 and 400 MHz spectrometers; chemical shifts (δ) are quoted relative to tetramethylsilane. ^{13}C NMR spectra were recorded at 150 and 100 MHz spectrometers with complete proton decoupling; chemical shift (δ) are quoted relative to the residual signals of chloroform. Silica gel column chromatography was carried out on silica gel 60N. Mass spectra were recorded on a high-resolution mass spectrometer in fast atom bombardment mode (FAB).

Starting materials. 1a, **1c**, **1f**, **1m**, **2a**, **2b** and **2d** was commercially available. **1b**,[1] **1c**,[1] **1d**,[2] **1g**,[3] **1h**,[4] **1i**,[5] **1j**,[6] **1k**[7] and **1l**[8] were prepared by Wittig reaction of corresponding ketones (commercially available). **2c**,[9] **2e**,[9] **2f**,[10] **2g** and **2h** were prepared by reactions of corresponding sulfonyl chlorides (commercially available) with hydrazine monohydrate.

2-Hydroxy-2-phenylpropyl 4-methylphenyl sulfone (3a). 95% yield. Colourless crystals, mp 84.5–85.5 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1313 1157 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 1.71 (3H, s), 2.39 (3H, s), 3.58 (1H, d, *J*=14.6 Hz), 3.69 (1H, d, *J*=14.6 Hz), 7.15–7.21 (5H, m), 7.29 (2H, d, *J*=7.6 Hz), 7.48 (2H, d, *J*=7.6 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 21.5, 30.7, 66.7, 73.1, 124.6, 127.1, 127.5, 128.2, 129.7, 137.3, 144.48, 144.50. Anal. Calcd for $C_{16}H_{18}O_3S$: C, 66.18; H, 6.25. Found: C, 66.10; H, 6.40.

2-Hydroxy-2-phenylpropyl 4-methylphenyl sulfone (3b) :89% yield. Colourless crystals, mp 98.0–101.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1308 1159 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 1.71 (3H, s), 3.10–3.54 (1H, br), 3.62 (1H, d, *J*=14.8 Hz), 3.73 (1H, d, *J*=14.8 Hz), 7.14–7.19 (3H, m), 7.28 (2H, d, *J*=7.9 Hz), 7.38 (2H, t, *J*=7.6 Hz), 7.53 (1H, t-like, *J*=7.6 Hz), 7.59 (2H, d, *J*=7.9 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 30.7, 66.6, 73.1, 124.6, 127.2, 127.5, 128.3, 129.1, 133.4, 140.2, 144.3. Anal. Calcd for $C_{15}H_{16}O_3S$: C, 65.19; H, 5.84. Found: C, 65.04; H, 5.91.

4-Bromophenyl 2-hydroxy-2-phenylpropyl sulfone (3c). 73% yield. Colourless crystals, mp 153.0–153.5 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3514, 1315 1159 cm^{-1}; ^{1}H NMR (600 MHz, DMSO-d_6) δ 1.57 (3H, s), 3.84 (2H, AB, *J*=15.0 Hz), 5.34 (1H, s),

7.12–7.19 (3H, m), 7.34 (2H, d-like, *J*=7.2 Hz), 7.60 (2H, d-like, *J*=8.7 Hz), 7.68 (2H, d-like, *J*=8.7 Hz); ^{13}C NMR (150 MHz, DMSO-d_6) δ 30.0, 66.0, 71.7, 125.0, 126.5, 127.1, 127.6, 129.8, 131.8, 140.6, 146.5. Anal. Calcd for $C_{15}H_{15}BrO_3S$: C, 50.71; H, 4.26. Found: C, 50.68; H, 4.28.

2-Hydroxy-2-phenylpropyl 4-methoxyphenyl sulfone (3d). 46% yield. Yellow crystals, mp 90.5–92.5 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1317 1153 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 1.56 (3H, s), 3.59 (1H, d, *J*=14.8 Hz), 3.69 (1H, d, *J*=14.8 Hz), 3.95 (3H, s), 6.81 (2H, d-like, *J*=8.9 Hz), 7.15–7.21 (5H, m), 7.27–7.29 (2H, m), 7.50 (2H, d-like, *J*=8.9 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 30.8, 55.6, 66.7, 73.1, 114.3, 124.6, 127.1, 128.2, 129.7, 131.8, 144.5, 163.5. Anal. Calcd for $C_{16}H_{18}O_4S$: C, 62.72; H, 5.92. Found: C, 62.68; H, 6.02.

2-Hydroxy-2-phenylpropyl 4-nitrophenyl sulfone (3e). 71% yield. Colourless crystals, mp 187.0–190.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3511, 1309, 1159 cm^{-1}; ^{1}H NMR (600 MHz, DMSO-d_6) δ 1.59 (3H, s), 3.98 (2H, AB, *J*=15.1 Hz), 5.45 (1H, s), 7.10–7.18 (3H, m), 7.33 (2H, d, *J*=7.6 Hz), 7.95 (2H, d, *J*=8.6 Hz), 8.28 (2H, d, *J*=8.6 Hz); ^{13}C NMR (150 MHz, DMSO-d_6) δ 30.1, 65.8, 71.7, 123.9, 125.0, 126.6, 127.7, 129.6, 146.4, 146.8, 149.8. Anal. Calcd for $C_{15}H_{15}NO_5S$: C, 56.06; H, 4.72; N, 4.36. Found: C, 55.89; H, 4.69; N, 4.28.

2-Hydroxy-2-phenylpropyl 4-trifluorophenyl sulfone (3f). 55% yield. Colourless crystals, mp 157.5–158.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3513, 1322 1143 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 1.66 (3H, s), 3.68 (1H, d, *J*=15.1 Hz), 3.82 (1H, d, *J*=15.1 Hz), 4.46 (1H, s), 7.09–7.15 (3H, m), 7.17–7.19 (2H, m), 7.57 (2H, d, *J*=8.6 Hz), 7.61 (2H, d, *J*=8.6 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 31.2, 66.5, 72.9, 123.0 (q, $J_{C–F}$=273 Hz), 124.7, 126.0 (q, $J_{C–F}$=5.7 Hz), 127.4, 128.1, 128.3, 134.9 (q, $J_{C–F}$=33.4 Hz), 143.3, 143.6. Anal. Calcd for $C_{16}H_{15}F_3O_3S$: C, 55.81; H, 4.39. Found: C, 55.73; H, 4.36.

Cyclohexyl 2-hydroxy-2-phenylpropyl sulfone (3g). 26% yield. Colourless crystals, mp 87.0–88.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3496, 1306 1107 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 0.97–1.05 (2H, m), 1.08–1.16 (1H, m), 1.35–1.46 (2H, m), 1.76 (3H, s), 1.77–1.92 (3H, m), 2.00–2.06 (2H, m), 3.24 (1H, d, *J*=14.8 Hz), 3.56 (1H, d, *J*=14.8 Hz), 4.73 (1H, s), 7.31 (1H, t-like, *J*=7.6 Hz), 7.40 (2H, t-like, *J*=7.6 Hz), 7.49 (2H, d-like, *J*=7.9 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 23.3, 24.7, 24.9, 25.0, 25.7, 30.4, 59.8, 62.4, 72.7, 124.6, 127.6, 128.6, 145.1. Anal. Calcd for $C_{15}H_{22}O_3S$: C, 63.80; H,

7.85. Found: C, 63.72; H, 8.18.

2-Hydroxy-2-phenylpropyl octyl sulfone (3h). 73% yield. Colourless oil. IR ($CHCl_3$) υ 3496, 1303 1108 cm^{-1}; ^1H NMR (600 MHz, $CDCl_3$) δ 0.88 (3H, t, *J*=7.2 Hz), 1.16–1.30 (10H, m), 1.54–1.70 (2H, m), 1.74 (3H, s), 2.33–2.43 (2H, m), 3.33 (1H, d, *J*=14.8 Hz), 3.57 (1H, d, *J*=14.8 Hz), 7.31 (1H, t-like, *J*=7.6 Hz), 7.40 (2H, t-like, *J*=7.6 Hz), 7.48 (2H, d-like, *J*=7.9 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 14.0, 21.7, 22.5, 28.1, 28.77, 28.80, 30.6, 31.6, 54.9, 63.2, 72.6, 124.7, 127.7, 128.6, 144.8. Anal. Calcd for $C_{17}H_{28}O_3S$: C, 65.35; H, 9.03. Found: C, 65.01; H, 9.36.

2-(4-Bromophenyl)-2-hydroxypropyl 4-methylphenyl sulfone (4b). 73% yield. Colourless crystals, mp 164.0–166.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3498, 1313, 1157 cm^{-1}; ^1H NMR (600 MHz, $CDCl_3$) δ 1.62 (3H, s), 2.42 (3H, s), 3.57 (1H, d, *J*=14.7 Hz), 3.70 (1H, d, *J*=14.7 Hz), 4.70 (1H, s), 7.09 (2H, d, *J*=7.9 Hz), 7.17 (2H, d, *J*=7.9 Hz), 7.24 (2H, d, *J*=7.9 Hz), 7.41 (2H, d, *J*=7.6 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 21.6, 31.0, 66.2, 72.8, 121.3, 126.6, 127.5, 129.7, 131.1, 136.8, 143.2, 144.8. Anal. Calcd for $C_{16}H_{17}BrO_3S$: C, 52.04; H, 4.64. Found: C, 51.81; H, 4.63.

2-Hydroxy-2-(4-methoxyphenyl)propyl 4-methylphenyl sulfone (4c). 62% yield. Colourless crystals, mp 94.5–95.5 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1311, 1141 cm^{-1}; ^1H NMR (600 MHz, $CDCl_3$) δ 1.68 (3H, s), 2.39 (3H, s), 3.56 (1H, d, *J*=14.8 Hz), 3.67 (1H, d, *J*=14.8 Hz), 3.76 (3H, s), 6.69 (2H, d-like, *J*=8.9 Hz), 7.17–7.20 (4H, m), 7.49 (2H, d, *J*=8.2 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 21.5, 30.7, 55.2, 66.9, 72.9, 113.5, 125.8, 127.6, 129.6, 136.7, 137.5, 144.4, 158.7. Anal. Calcd for $C_{17}H_{20}O_4S$: C, 63.73; H, 6.29. Found: C, 63.57; H, 6.24.

2-Hydroxy-2-(4-nitrophenyl)propyl 4-methylphenyl sulfone (4d). 80% yield. Colourless crystals, mp 140.0–142.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1349, 1313, 1157 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 1.68 (3H, s), 2.39 (3H, s), 3.63 (1H, d, *J*=14.7 Hz), 3.76 (1H, d, *J*=14.7 Hz), 4.84 (1H, s), 7.17 (2H, d, *J*=8.7 Hz), 7.46 (2H, d-like, *J*=9.2 Hz), 7.48 (2H, d, *J*=8.2 Hz), 8.01 (2H, d-like, *J*=9.2 Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 21.5, 31.0, 65.7, 73.0, 123.3, 125.9, 127.5, 129.8, 136.7, 145.3, 146.9, 151.5. Anal. Calcd for $C_{16}H_{17}NO_5S$: C, 57.30; H, 5.11; N, 4.18. Found: C, 57.18; H, 5.07; N, 4.19.

2-Hydroxy-2-phenylethyl 4-methylphenyl sulfone (4e). 55% yield. Colourless oil. IR

($CHCl_3$) υ 3523, 1313 1137 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 2.47 (3H, s), 3.32 (1H, dd, *J*=14.7, 1.8 Hz), 3.48 (1H, dd, *J*=14.7, 10.1 Hz), 3.74 (1H, s), 5.25 (1H, d, *J*=10.1 Hz), 7.27–7.34 (5H, m), 7.38 (2H, d, *J*=8.2 Hz), 7.84 (2H, d, *J*=8.2 Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 21.7, 64.0, 68.4, 125.6, 128.0, 128.3, 128.7, 130.1, 136.1, 140.6, 145.3; HRFABMS calcd for $C_{15}H_{17}O_3S$ (M^++H) 277.0899, found:277.0901.

2-Hydroxy-2-naphthylpropyl 4-methylphenyl sulfone (4f). 83% yield. Colourless crystals, mp 135.0–136.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1311 1153 cm^{-1}; ^1H NMR (600 MHz, $CDCl_3$) δ 1.73 (3H, s), 2.18 (3H, s), 3.68 (1H, d, *J*=14.8 Hz), 3.84 (1H, d, *J*=14.8 Hz), 4.81 (1H, s), 6.84 (2H, d, *J*=8.2 Hz), 7.22 (1H, dd, *J*=8.6, 2.1 Hz), 7.31 (2H, d, *J*=8.2 Hz), 7.44–7.47 (2H, m), 7.54 (1H, d, *J*=8.6 Hz), 7.69–7.73 (2H, m), 7.75 (1H, s); ^{13}C NMR (150 MHz, $CDCl_3$) δ 21.3, 31.0, 66.3, 73.1, 122.7, 123.7, 126.0, 126.1, 127.2, 127.4, 127.9, 128.1, 129.3, 132.4, 132.9, 136.8, 141.3, 144.3. Anal. Calcd for $C_{20}H_{20}O_3S$: C, 70.56; H, 5.92. Found: C, 70.64; H, 5.95.

2-Hydroxy-2-pyridylpropyl 4-methylphenyl sulfone (4g). 48% yield. Colourless crystals, mp 151.0–152.5 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1311 1145 cm^{-1}; ^1H NMR (600 MHz, $CDCl_3$) δ 1.72 (3H, s), 2.40 (3H, s), 3.61 (1H, d, *J*=14.8 Hz), 3.71 (1H, d, *J*=14.8 Hz), 7.15 (1H, dd, *J*=7.9, 4.8 Hz), 7.21 (2H, d, *J*=8.2 Hz), 7.52 (2H, d, *J*=8.2 Hz), 7.69 (1H, dt, *J*=8.2, 2.1 Hz), 8.41 (1H, dd, *J*=4.8, 1.4 Hz), 8.52 (1H, d, *J*=2.4 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 21.6, 30.7, 66.1, 72.0, 123.0, 127.5, 129.9, 132.5, 137.0, 140.1, 145.0, 146.6, 148.2; HRFABMS calcd for $C_{15}H_{18}NO_3S$ (M^++H) 292.1007, found: 292.1004.

1-(1-Hydroxy-1,2,3,4-tetrahydronaphthyl)methyl 4-methylphenyl sulfone (4h). 46% yield. Colourless crystals, mp 78.0–80.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3523, 1311 1144 cm^{-1}; ^1H NMR (600 MHz, $CDCl_3$) δ 1.77–1.85 (1H, m), 1.94–2.00 (1H, m), 2.12–2.16 (1H, m), 2.44 (3H, s), 2.71–2.79 (2H, m), 2.84 (1H, ddd, *J*=15.9, 9.6, 6.2 Hz), 3.51 (1H, d, *J*=14.4 Hz), 3.56 (1H, d, *J*=14.4 Hz), 4.23 (1H, s), 7.04–7.06 (1H, m), 7.13–7.16 (2H, m), 7.35 (1H, d, *J*=8.3 Hz), 7.48–7.50 (1H, m), 7.80 (1H, d, *J*=8.3 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 19.9, 21.6, 29.0, 35.5, 65.0, 72.6, 126.1, 126.4, 127.5, 127.8, 129.1, 129.9, 136.2, 138.2, 139.7, 144.9. Anal. Calcd for $C_{18}H_{20}O_3S$: C, 68.33; H, 6.37. Found: C, 68.52; H, 6.17.

2-Cyclopropyl-2-hydroxypropyl 4-methylphenyl sulfone (4i). 54% yield. Colourless crystals, mp 109.0–112.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 1311 1155 cm^{-1}; ^1H

NMR (600 MHz, $CDCl_3$) δ 0.25–0.31 (1H, m), 0.43–0.54 (2H, m), 0.69–0.74 (1H, m), 1.20–1.26 (1H, m), 2.38 (3H, s), 3.69 (1H, d, *J*=14.8 Hz), 3.86 (1H, d, *J*=14.8 Hz), 4.50 (1H, s), 7.12–7.15 (5H, m), 7.24–7.27 (3H, m), 7.43 (1H, d, *J*=8.3 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 0.7, 2.4, 21.5, 22.7, 65.9, 73.0, 125.1, 126.9, 127.6, 128.0, 128.3, 128.4, 129.6, 137.3, 143.5, 144.3. HRFABMS calcd for $C_{18}H_{20}NaO_3S$ (M^++Na) 339.1031, found:339.1031.

2-Hydroxy-2-phenylpropyl 4-methylphenyl sulfone (4j). 74% yield. Colourless crystals, mp 74.0–75.0 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3502, 2227, 1315 1159 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 1.67 (3H, s), 2.32 (3H, s), 3.52 (1H, d, *J*=14.8 Hz), 3.68 (1H, d, *J*=14.8 Hz), 4.51 (1H, br), 7.19–7.30 (7H, m), 7.83 (2H, d, *J*=8.2 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 21.5, 30.6, 65.1, 65.7, 85.4, 89.2, 121.9, 128.0, 128.2, 128.5, 129.8, 131.6, 137.2, 144.9. Anal. Calcd for $C_{18}H_{18}O_3S$: C, 68.76; H, 5.77. Found: C, 68.74; H, 5.97.

3-(4-Bromophenyl)-3-hydroxybut-2-yl 4-methylphenyl sulfone (4l). 21% yield (single isomer). Colourless crystals, mp 152.0–152.5 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3531, 1288, 1142 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 0.95 (3H, d, *J*=7.2 Hz), 1.89 (3H, s), 2.45 (3H, s), 3.44 (1H, q, *J*=7.2 Hz), 4.17 (1H, s), 7.30 (2H, d-like, *J*=8.6 Hz), 7.34 (2H, d, *J*=8.3 Hz), 7.45 (2H, d-like, *J*=8.6 Hz), 7.71 (2H, d, *J*=8.3 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 12.3, 21.6, 30.6, 67.7, 75.5, 121.2, 126.7, 128.4, 129.8, 131.3, 136.0, 144.4, 145,0. Anal. Calcd for $C_{17}H_{19}BrO_3S$: C, 53.27; H, 5.00. Found: C, 53.16; H, 5.01.

2-Ethoxycarbonyl-2-hydroxypropyl 4-methylphenyl sulfone (4m). 55% yield. Colourless crystals, mp 67.0–68.5 °C (hexane-EtOAc). IR ($CHCl_3$) υ 3521, 1319, 1147 cm^{-1}; ^{1}H NMR (600 MHz, $CDCl_3$) δ 1.33 (3H, t, *J*=7.2 Hz), 1.44 (3H, s), 2.44 (3H, s), 3.53 (1H, d, *J*=14.8 Hz), 3.75 (1H, d, *J*=14.8 Hz), 4.20–4.31 (2H, m), 7.35 (2H, d, *J*=8.2 Hz), 7.77 (2H, d, *J*=8.2 Hz); ^{13}C NMR (150 MHz, $CDCl_3$) δ 15.0, 21.6, 27.2, 62.8, 63.9, 72.2, 128.1, 129.7, 137.8, 144.8, 174.0. Anal. Calcd for $C_{17}H_{19}BrO_3S$: C, 53.27; H, 5.00. Found: C, 53.16; H, 5.01. HRFABMS calcd for $C_{13}H_{19}O_5S$ (M^++H) 287.0953, found:287.0956.

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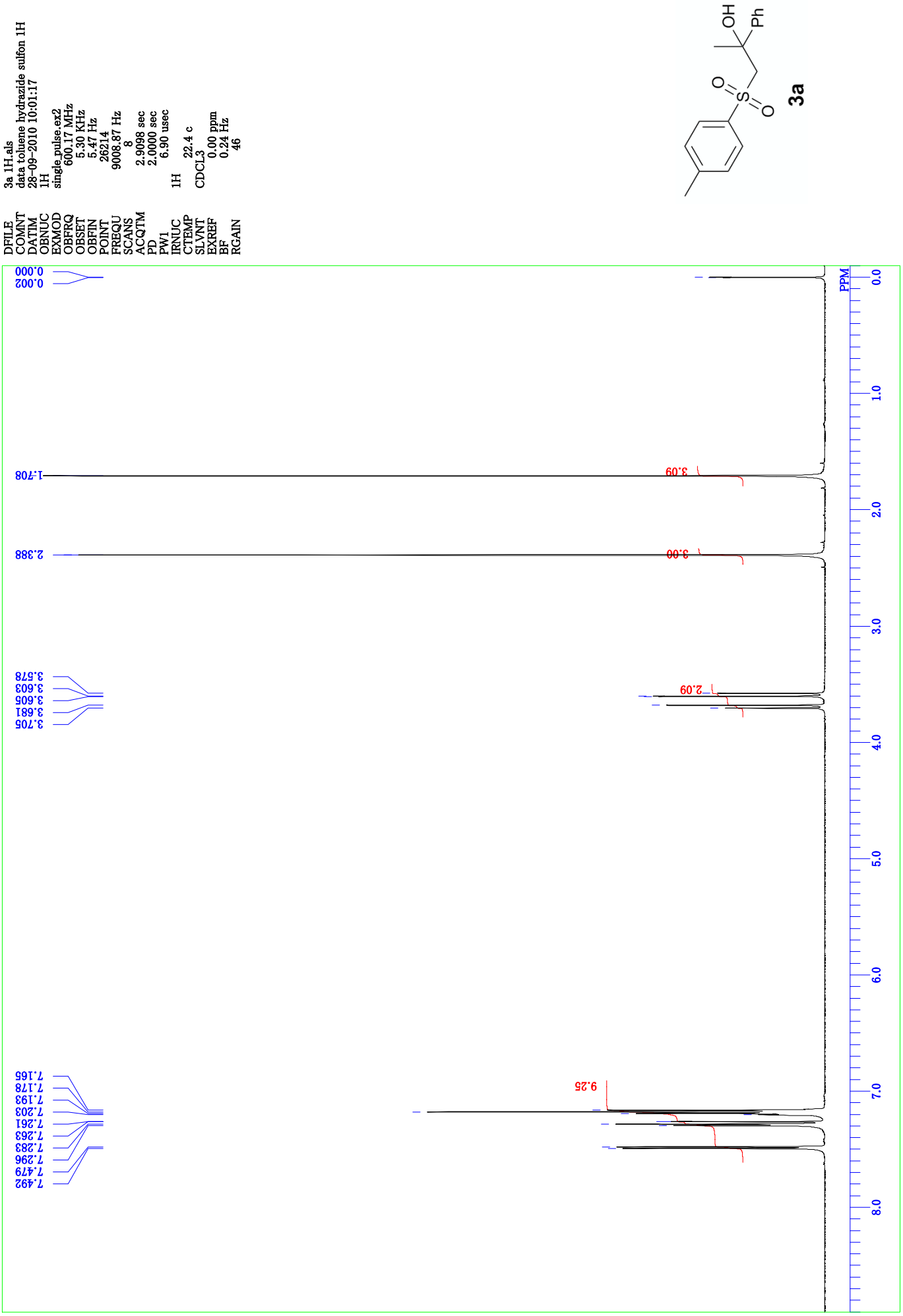
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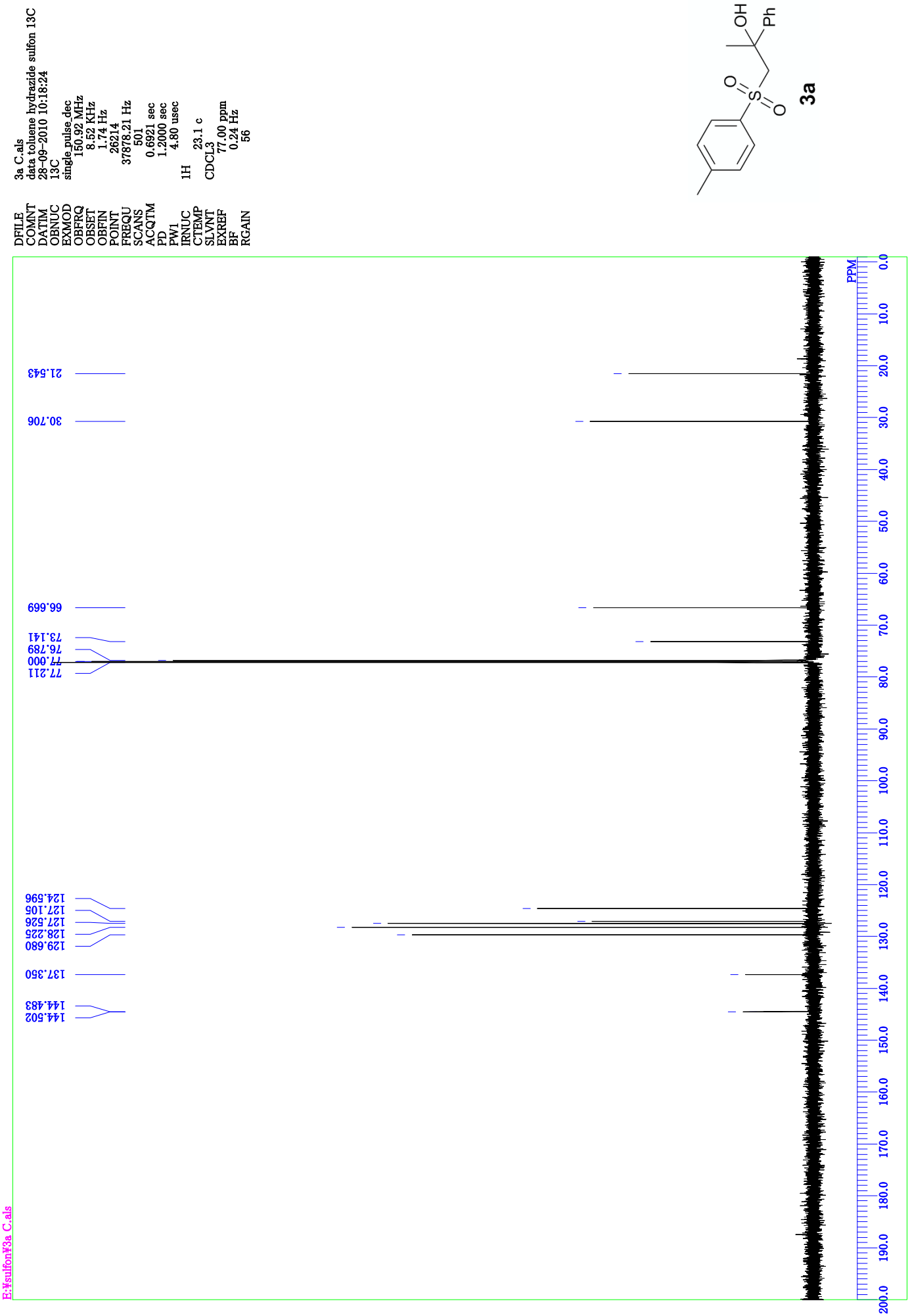
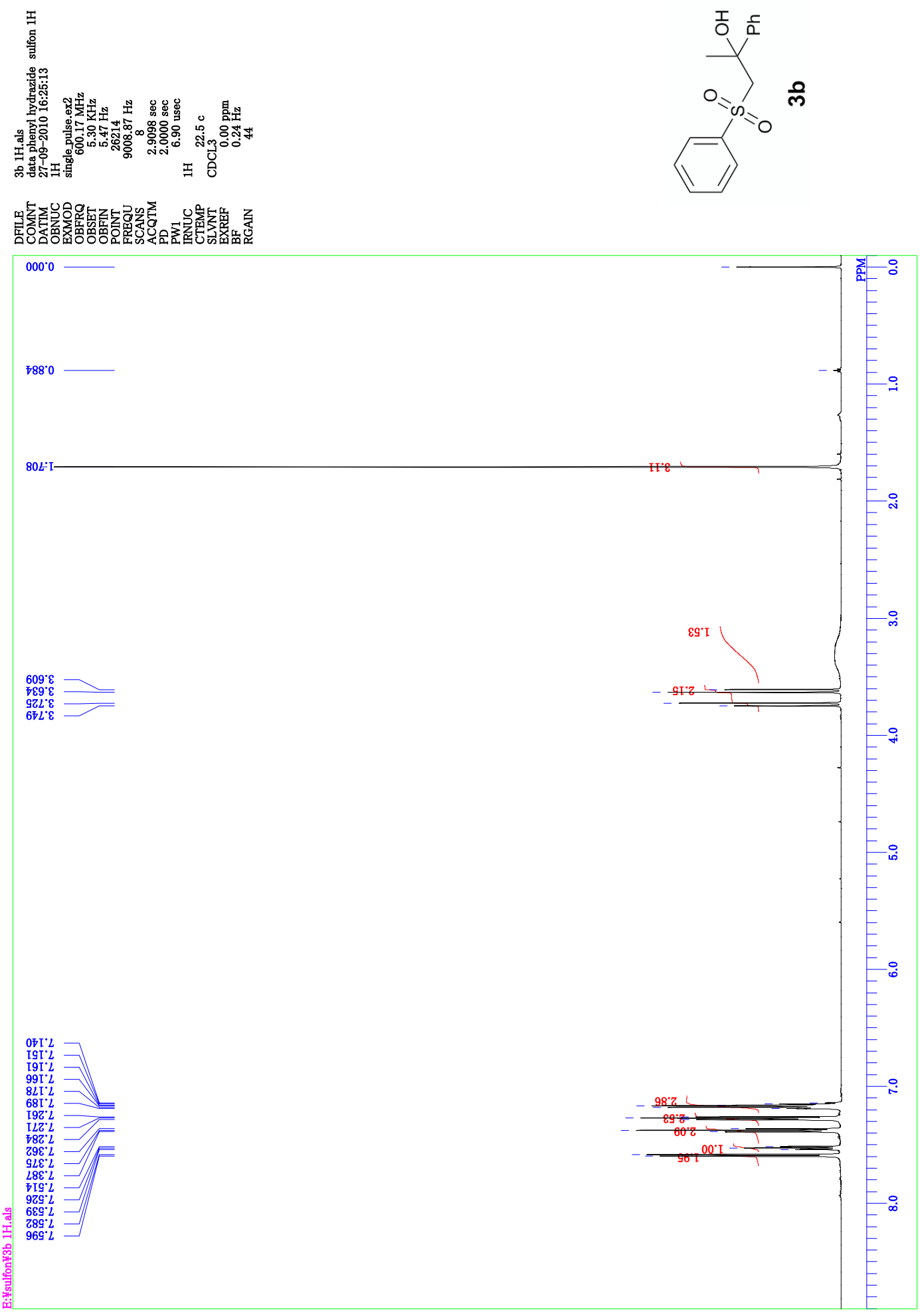
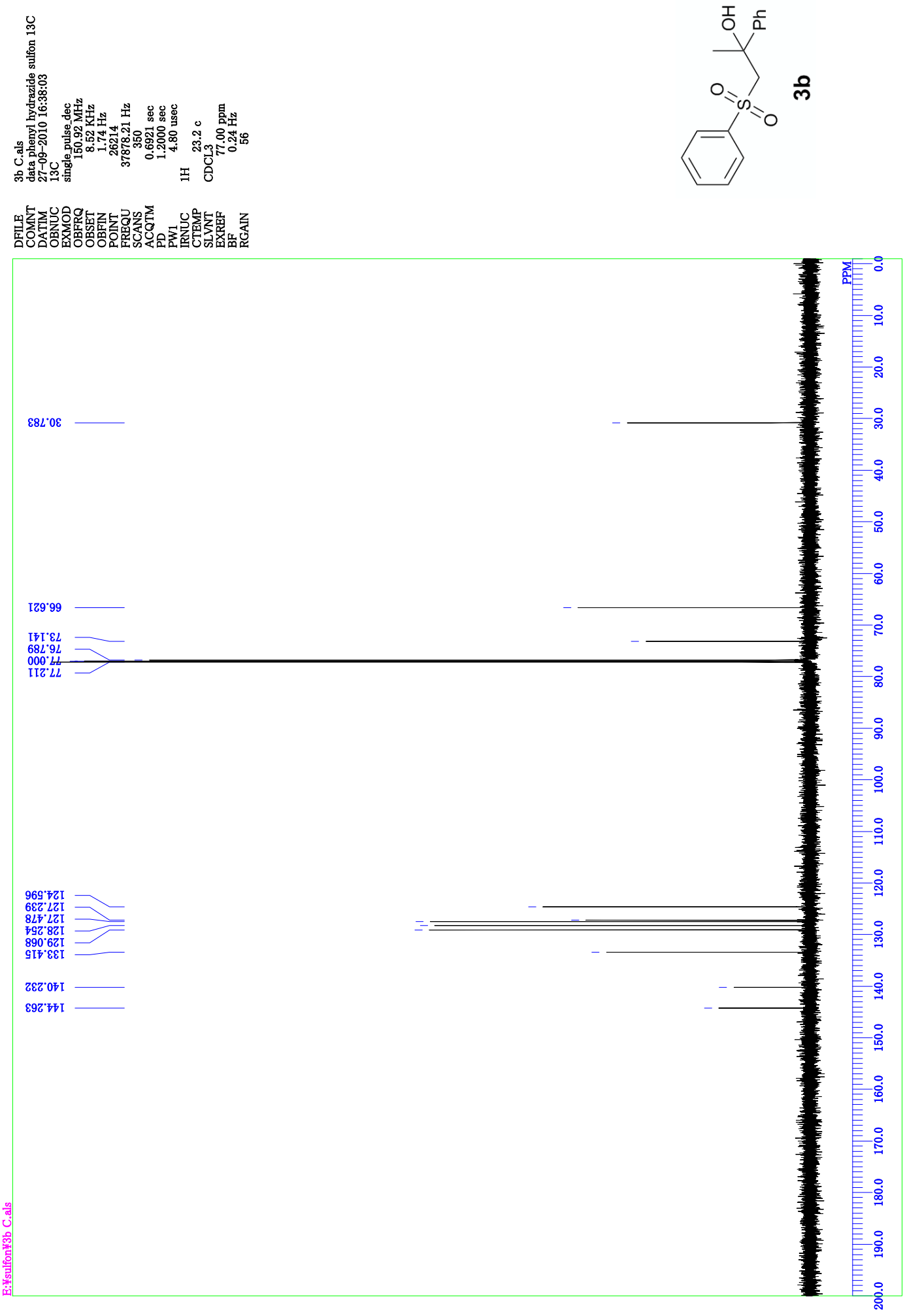
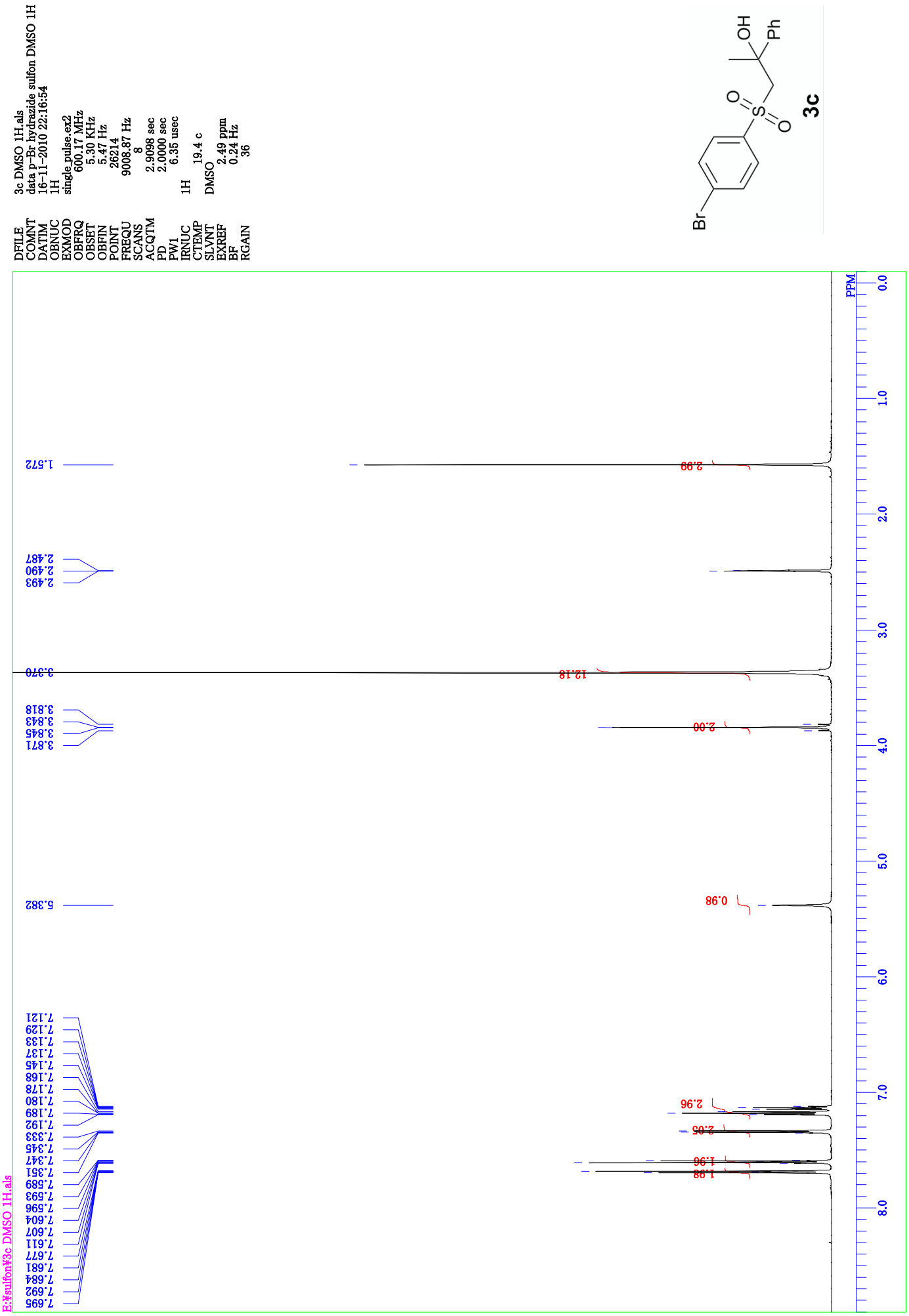
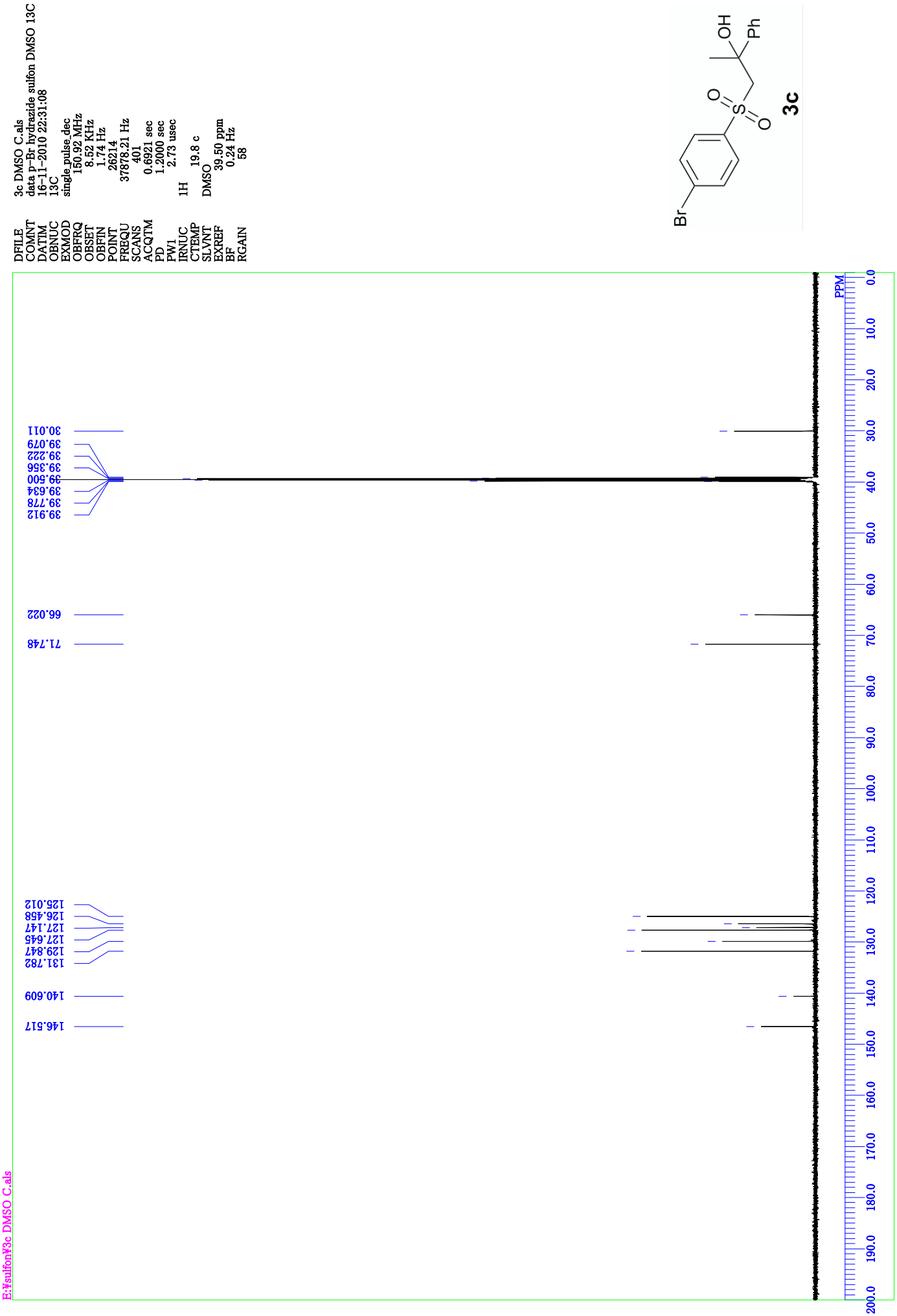
7.193
7.203
7.261
7.263
7.283
7.296
7.479
7.492
3.09
3.00
2.09
9.25
PPM
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
data toluene hydrazide sulfon 1H

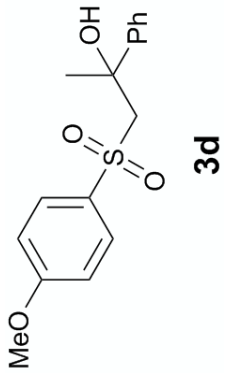

3a C.als
data toluene hydrazide sulfon 13C
28-09-2010 10:18:24
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
501
0.6921 sec
1.2000 sec
4.80 usec
1H
23.1 c
CDCL3
77.00 ppm
0.24 Hz
56
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
3a
21.543
30.706
66.669
73.141
76.789
77.000
77.211
124.596
127.105
127.526
128.225
129.680
137.360
144.483
144.502
PPM
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
140.0
150.0
160.0
170.0
180.0
190.0
200.0
data toluene hydrazide sulfon 13C
E:¥sulfon¥3a C.als


3b 1H.als
data phenyl hydrazide sulfon 1H
27-09-2010 16:25:13
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.90 usec
1H
22.5 c
CDCL3
0.00 ppm
0.24 Hz
44
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
3b
0.000
0.884
1.708
3.609
3.634
3.725
3.749
7.140
7.151
7.161
7.166
7.178
7.189
7.261
7.271
7.284
7.362
7.375
7.387
7.514
7.526
7.539
7.582
7.596
3.11
1.53
2.16
2.86
2.83
2.09
1.00
1.95
PPM
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
data phenyl hydrazide sulfon 1H
E:¥sulfon¥3b 1H.als


3b C.als
data phenyl hydrazide sulfon 13C
27-09-2010 16:38:03
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
350
0.6921 sec
1.2000 sec
4.80 usec
1H
23.2 c
CDCL3
77.00 ppm
0.24 Hz
56
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
3b
30.783
66.621
73.141
76.789
77.000
77.211
124.596
127.239
127.478
128.254
129.068
133.415
140.232
144.263
PPM
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
140.0
150.0
160.0
170.0
180.0
190.0
200.0
data phenyl hydrazide sulfon 13C
E:¥sulfon¥3b C.als

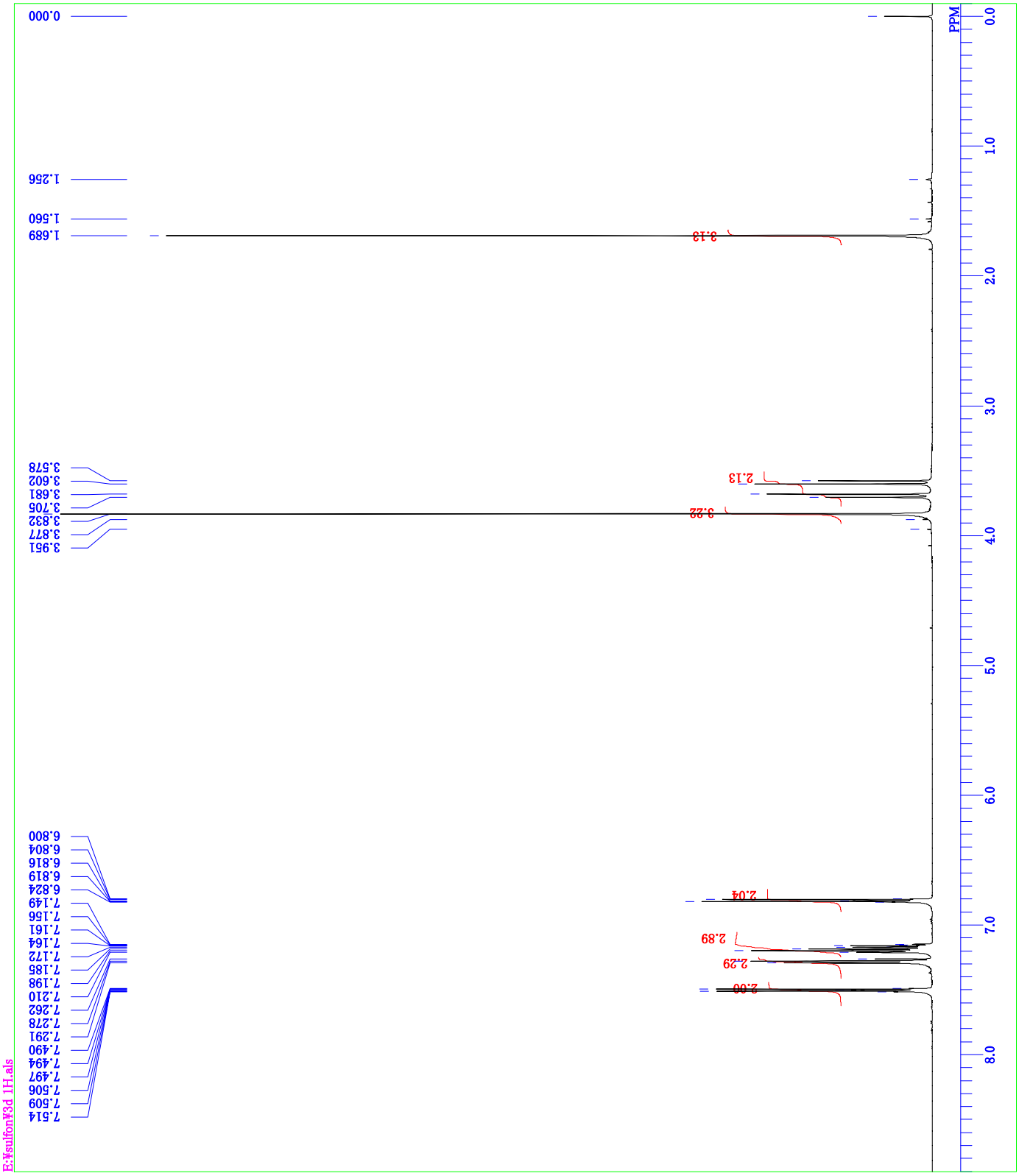

3c DMSO 1H.als
data p-Br hydrazide sulfon DMSO 1H
16-11-2010 22:16:54
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.35 usec
1H
19.4 c
DMSO
2.49 ppm
0.24 Hz
36
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
Br
3c
PPM
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
1.572
2.487
2.490
2.493
3.370
3.818
3.843
3.845
3.871
5.382
7.121
7.129
7.133
7.137
7.145
7.168
7.178
7.180
7.189
7.192
7.333
7.345
7.347
7.351
7.589
7.593
7.596
7.604
7.607
7.611
7.677
7.681
7.684
7.692
7.695
2.99
12.18
2.00
0.98
2.96
2.06
1.96
1.98
data p-Br hydrazide sulfon DMSO 1H
E:¥sulfon¥3c DMSO 1H.als


3c DMSO C.als
data p-Br hydrazide sulfon DMSO 13C
16-11-2010 22:31:08
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
401
0.6921 sec
1.2000 sec
2.73 usec
1H
19.8 c
DMSO
39.50 ppm
0.24 Hz
58
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
Br
3c
30.011
39.079
39.222
39.356
39.500
39.634
39.778
39.912
66.022
71.748
125.012
126.458
127.147
127.645
129.847
131.782
140.609
146.517
PPM
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
140.0
150.0
160.0
170.0
180.0
190.0
200.0
data p-Br hydrazide sulfon DMSO 13C
E:¥sulfon¥3c DMSO C.als



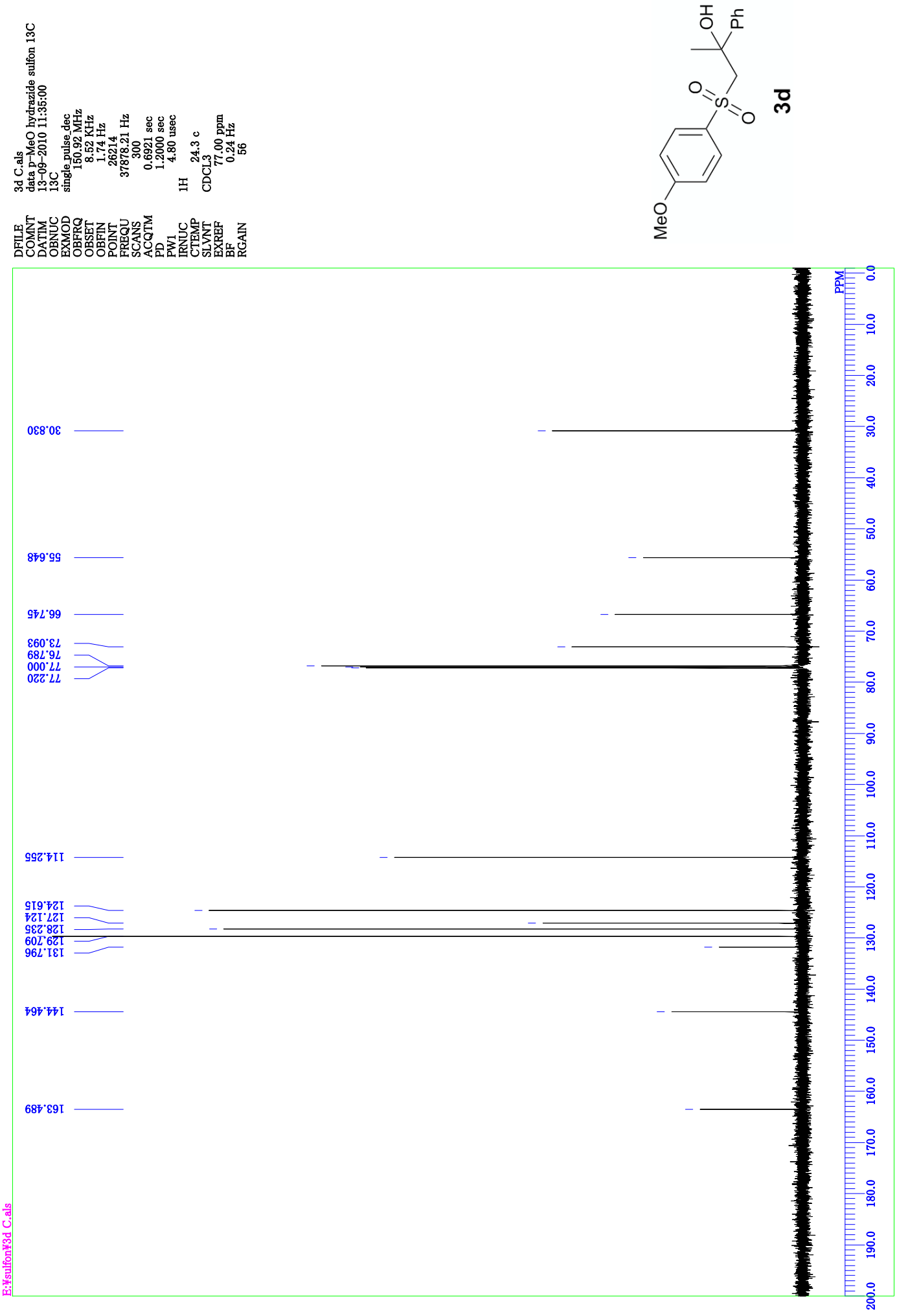
3d

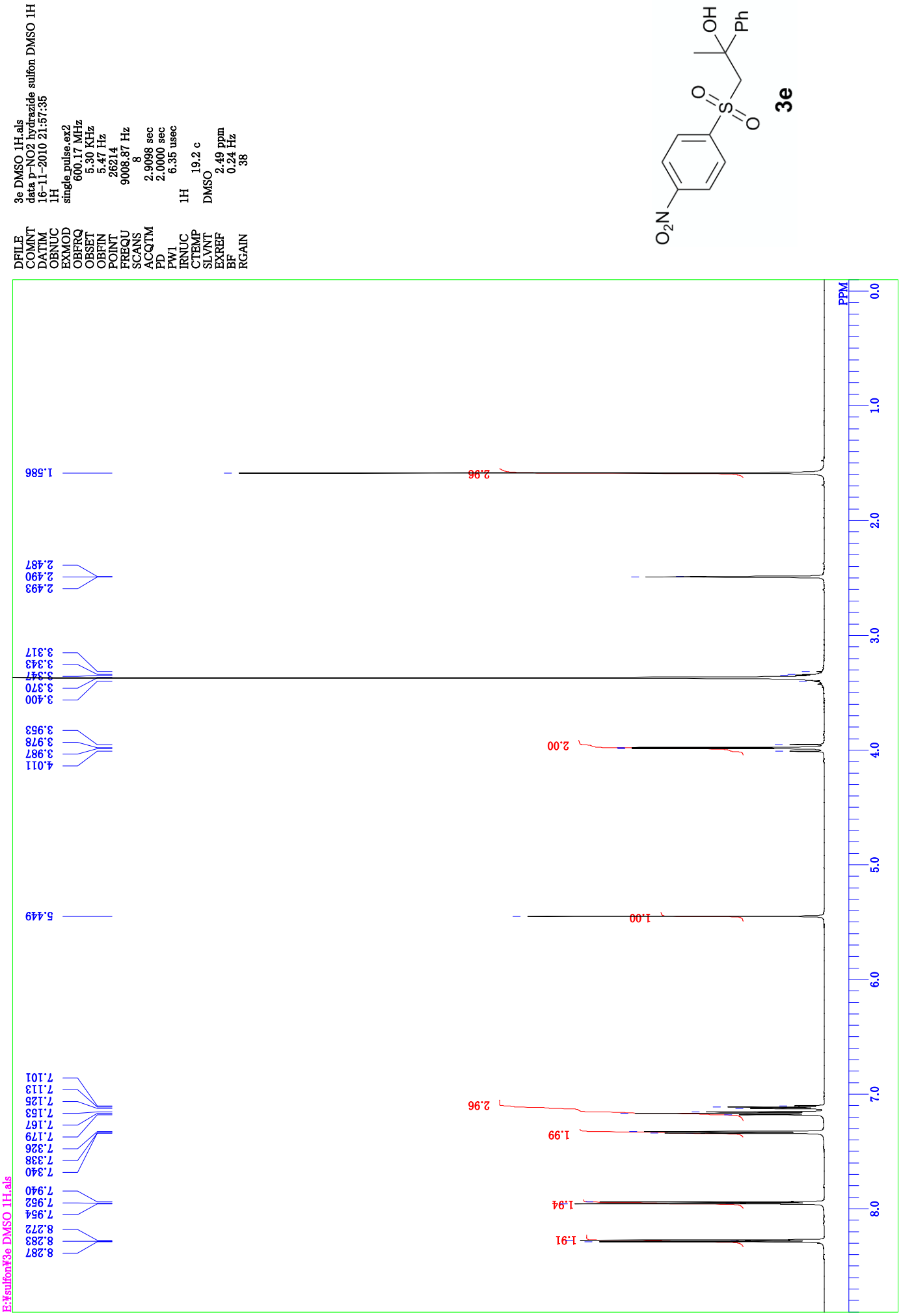
```
DFILE   3d 1H.als
COMNT   data p-MeO hydrazide sulfon 1H
DATIM   13-09-2010 11:24:09
OBNUC   1H
EXMOD   single_pulse.ex2
OBFRQ   600.17 MHz
OBSET   5.30 KHz
OBFIN   5.47 Hz
POINT   26214
FREQU   9008.87 Hz
SCANS   8
ACQTM   2.9098 sec
PD      2.0000 sec
PW1     6.90 usec
IRNUC   1H
CTEMP   23.4 c
SLVNT   CDCL3
EXREF   0.00 ppm
BF      0.24 Hz
RGAIN   36
```

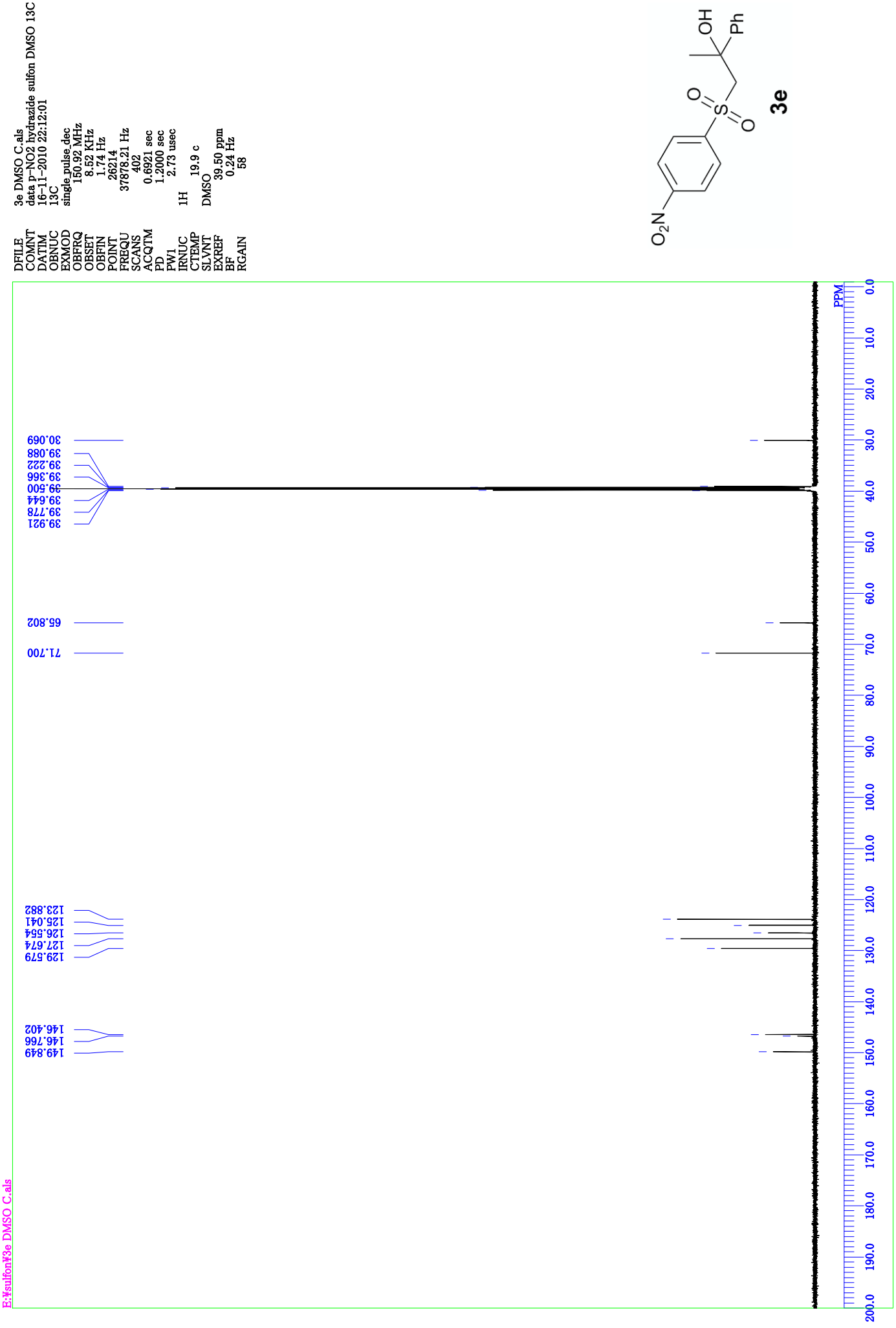


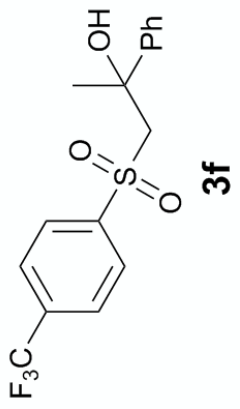
data p-MeO hydrazide sulfon 1H

E:¥sulfon¥3d 1H.als


3d C.als
data p-MeO hydrazide sulfon 13C
13-09-2010 11:35:00
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
300
0.6921 sec
1.2000 sec
4.80 usec
1H
24.3 c
CDCL3
77.00 ppm
0.24 Hz
56
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
MeO
3d
30.830
55.648
66.745
73.093
76.789
77.000
77.220
114.255
124.615
127.124
128.235
129.709
131.796
144.464
163.489
PPM
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
140.0
150.0
160.0
170.0
180.0
190.0
200.0
data p-MeO hydrazide sulfon 13C
E:¥sulfon¥3d C.als

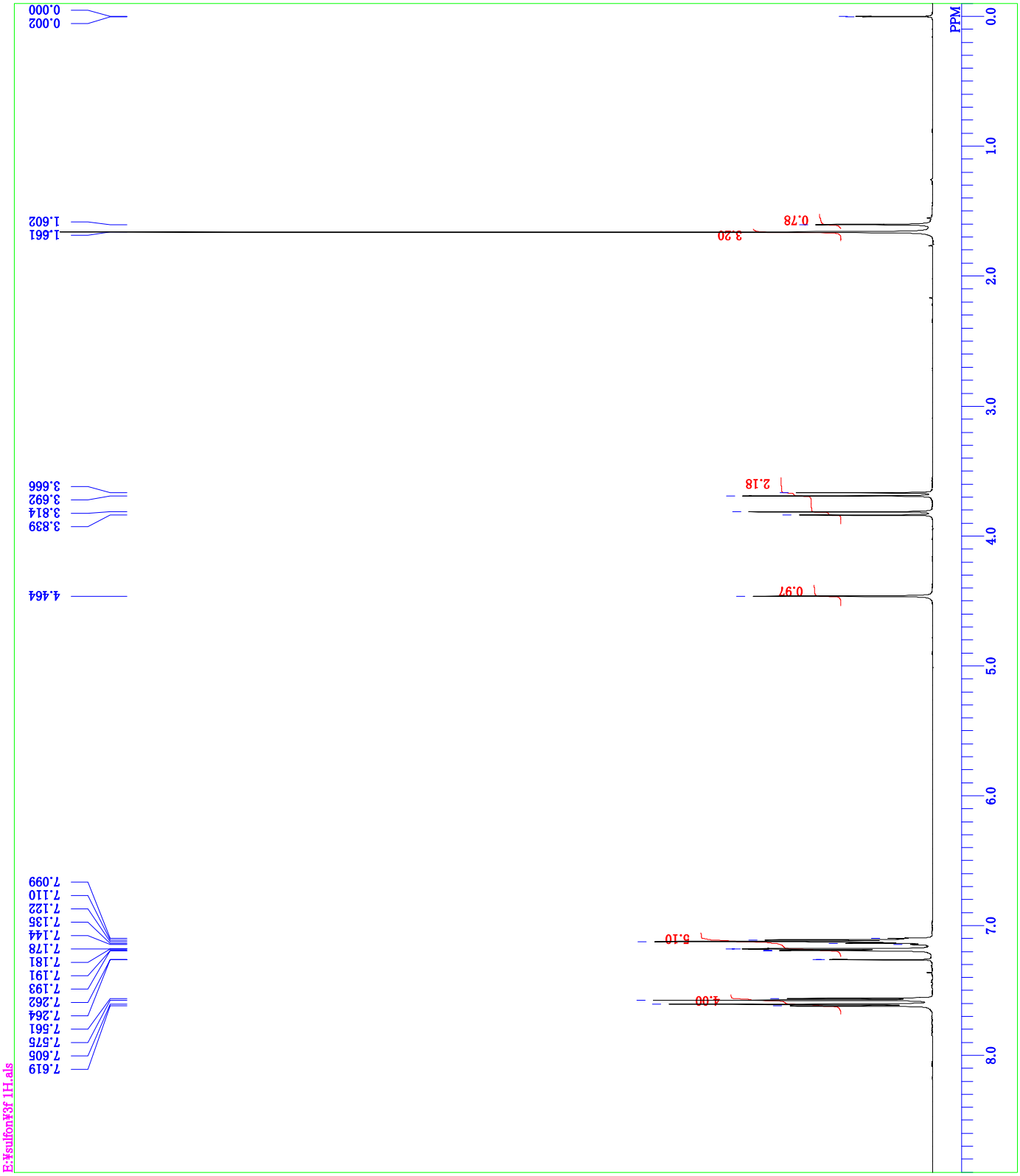

3e DMSO 1H.als
data p-NO2 hydrazide sulfon DMSO 1H
16-11-2010 21:57:35
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.35 usec
1H
19.2 c
DMSO
2.49 ppm
0.24 Hz
38
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
O2N
3e
PPM
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
1.586
2.487
2.490
2.493
3.317
3.343
3.347
3.370
3.400
3.953
3.978
3.987
4.011
5.449
7.101
7.113
7.125
7.153
7.167
7.179
7.326
7.338
7.340
7.940
7.952
7.954
8.272
8.283
8.287
2.96
2.00
1.00
2.96
1.99
1.94
1.91
data p-NO2 hydrazide sulfon DMSO 1H
E:¥sulfon¥3e DMSO 1H.als


3e DMSO C.als
data p-NO2 hydrazide sulfon DMSO 13C
16-11-2010 22:12:01
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
402
0.6921 sec
1.2000 sec
2.73 usec
1H
19.9 c
DMSO
39.50 ppm
0.24 Hz
58
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
O2N
3e
30.069
39.088
39.222
39.366
39.500
39.644
39.778
39.921
65.802
71.700
123.882
125.041
126.564
127.674
129.579
146.402
146.766
149.849
PPM
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
140.0
150.0
160.0
170.0
180.0
190.0
200.0
data p-NO2 hydrazide sulfon DMSO 13C
E:¥sulfon¥3e DMSO C.als



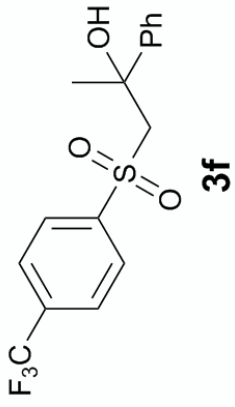
3f 1H.als
data p-CF3 hydrazide sulfon 1H
17-09-2010 10:55:10
1H
single_pulse.ex2

DFILE	
COMNT	
DATIM	
OBNUC	
EXMOD	
OBFRQ	600.17 MHz
OBSET	5.30 KHz
OBFIN	5.47 Hz
POINT	26214
FREQU	9008.87 Hz
SCANS	8
ACQTM	2.9098 sec
PD	2.0000 sec
PW1	6.90 usec
IRNUC	1H
CTEMP	22.4 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	40



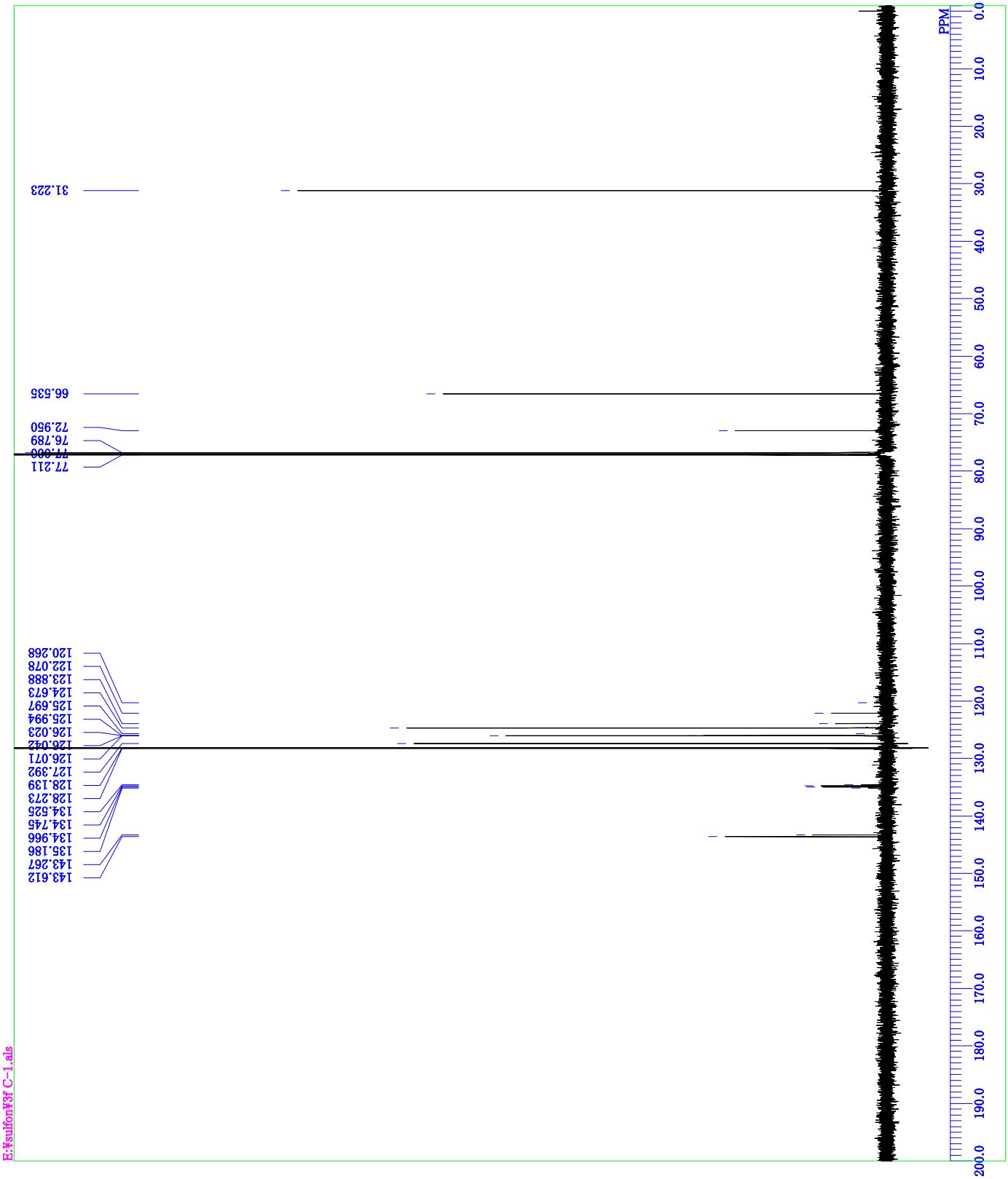
data p-CF3 hydrazide sulfon 1H

E:¥sulfon¥3f 1H.als

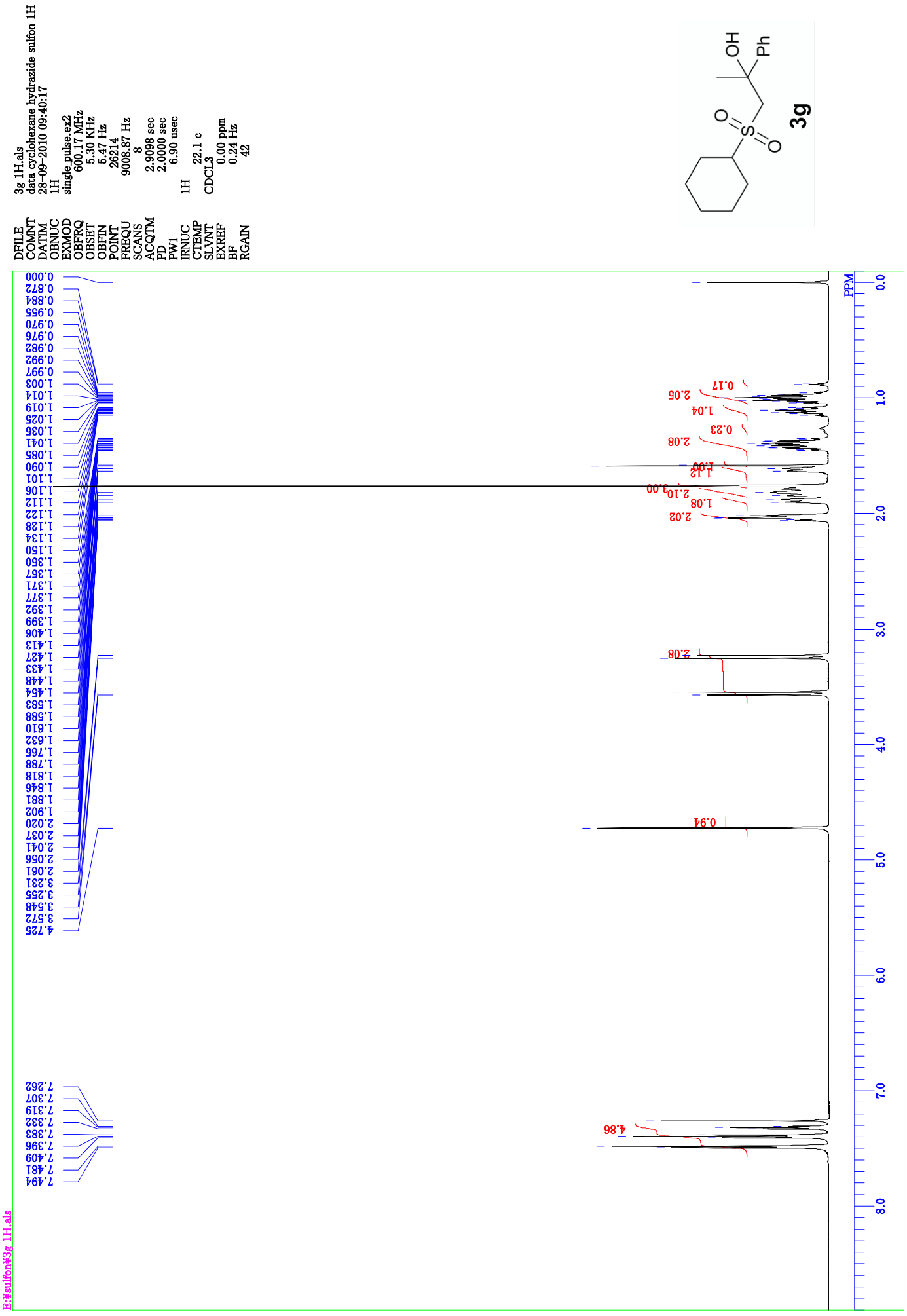


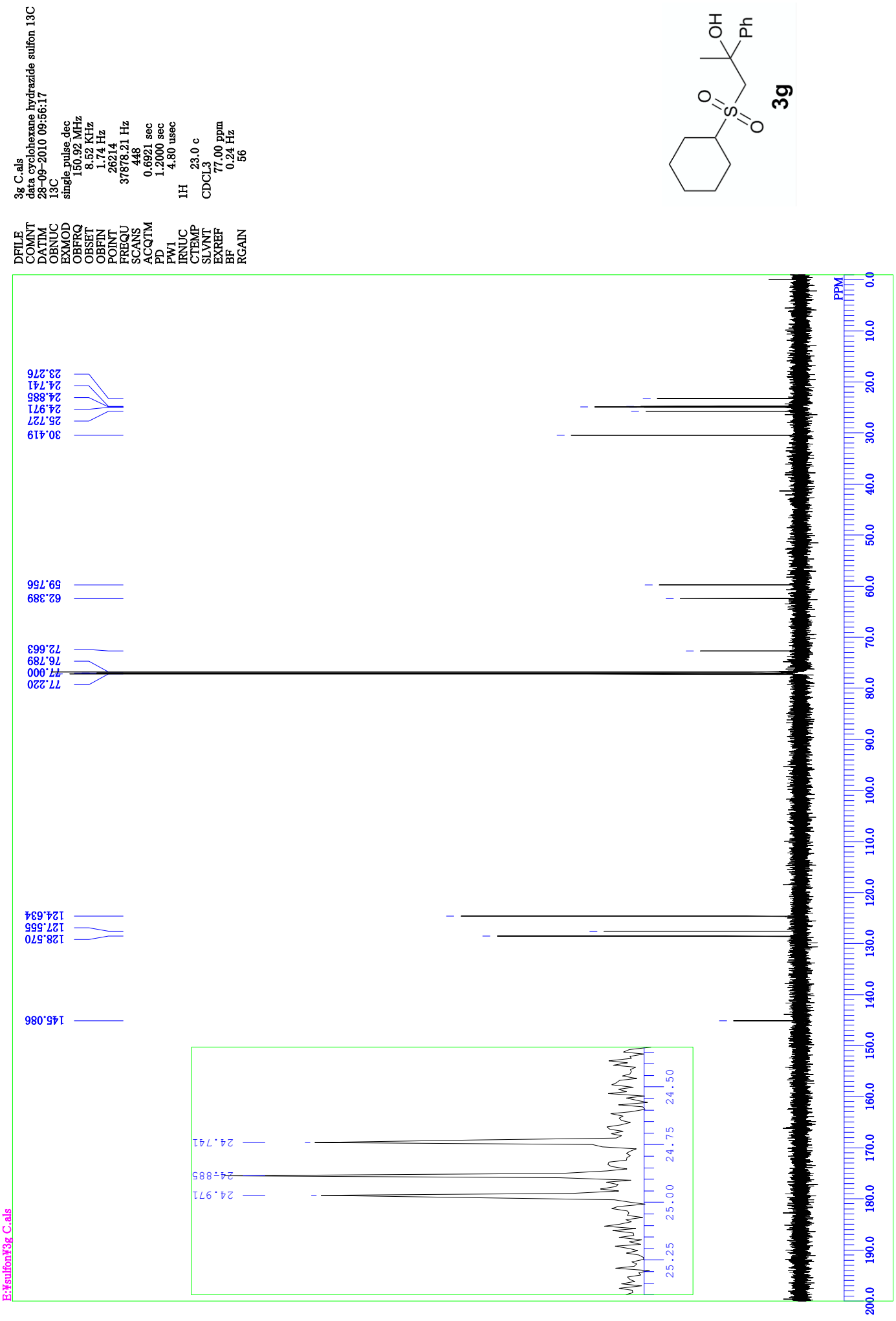
3f C-1.als
data p-CF3 hydrazide sulfon 13C
17-09-2010 22:06:28
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
800
0.6921 sec
1.2000 sec
4.80 usec
1H
23.8 c
CDCL3
77.00 ppm
0.24 Hz
56

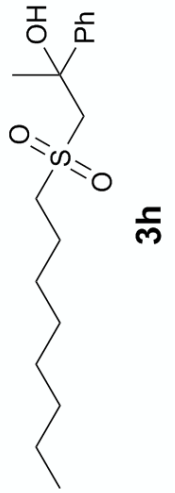
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN



data p-CF3 hydrazide sulfon 13C
E:¥sulfon¥3f C-1.als

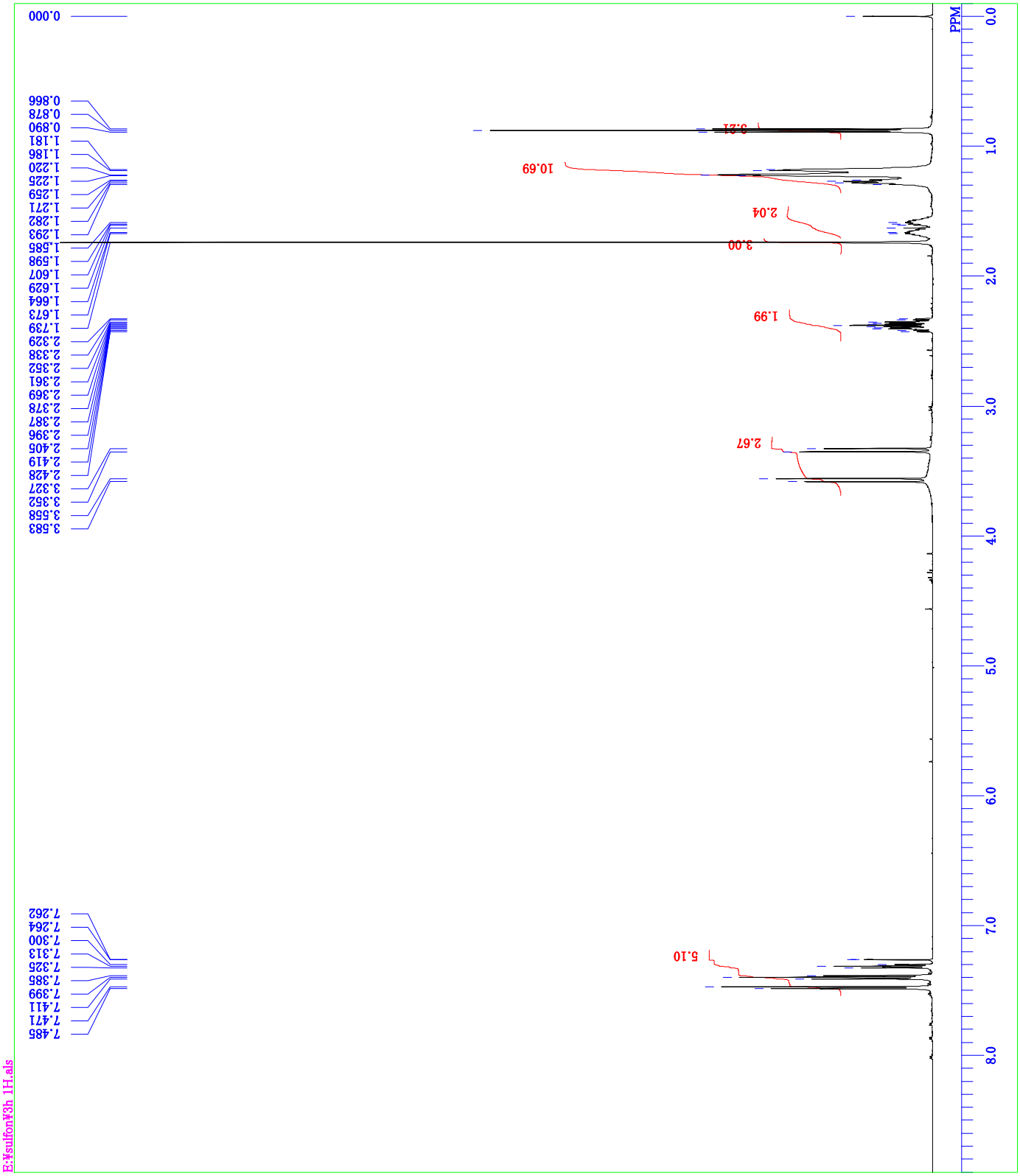

3g 1H.als
data cyclohexane hydrazide sulfon 1H
28-09-2010 09:40:17
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.90 usec
1H
22.1 c
CDCL3
0.00 ppm
0.24 Hz
42
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
3g
PPM
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
0.17
2.05
1.04
0.23
2.08
1.12
3.00
2.10
1.08
2.02
2.08
0.94
4.86
data cyclohexane hydrazide sulfon 1H
E:¥sulfon¥3g 1H.als


3g C.als
data cyclohexane hydrazide sulfon 13C
28-09-2010 09:56:17
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
448
0.6921 sec
1.2000 sec
4.80 usec
1H
23.0 c
CDCL3
77.00 ppm
0.24 Hz
56
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OH
Ph
O
S
O
3g
23.276
24.741
24.885
24.971
25.727
30.419
59.756
62.389
72.663
76.789
77.000
77.220
124.634
127.555
128.570
145.086
24.741
24.885
24.971
PPM
data cyclohexane hydrazide sulfon 13C
E:¥sulfon¥3g C.als

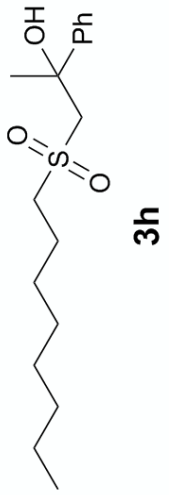


3h 1H.als
data octane hydrazide sulfon 1H
13-09-2010 19:26:29
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.90 usec
1H
23.4 c
CDCL3
0.00 ppm
0.12 Hz
34

DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN

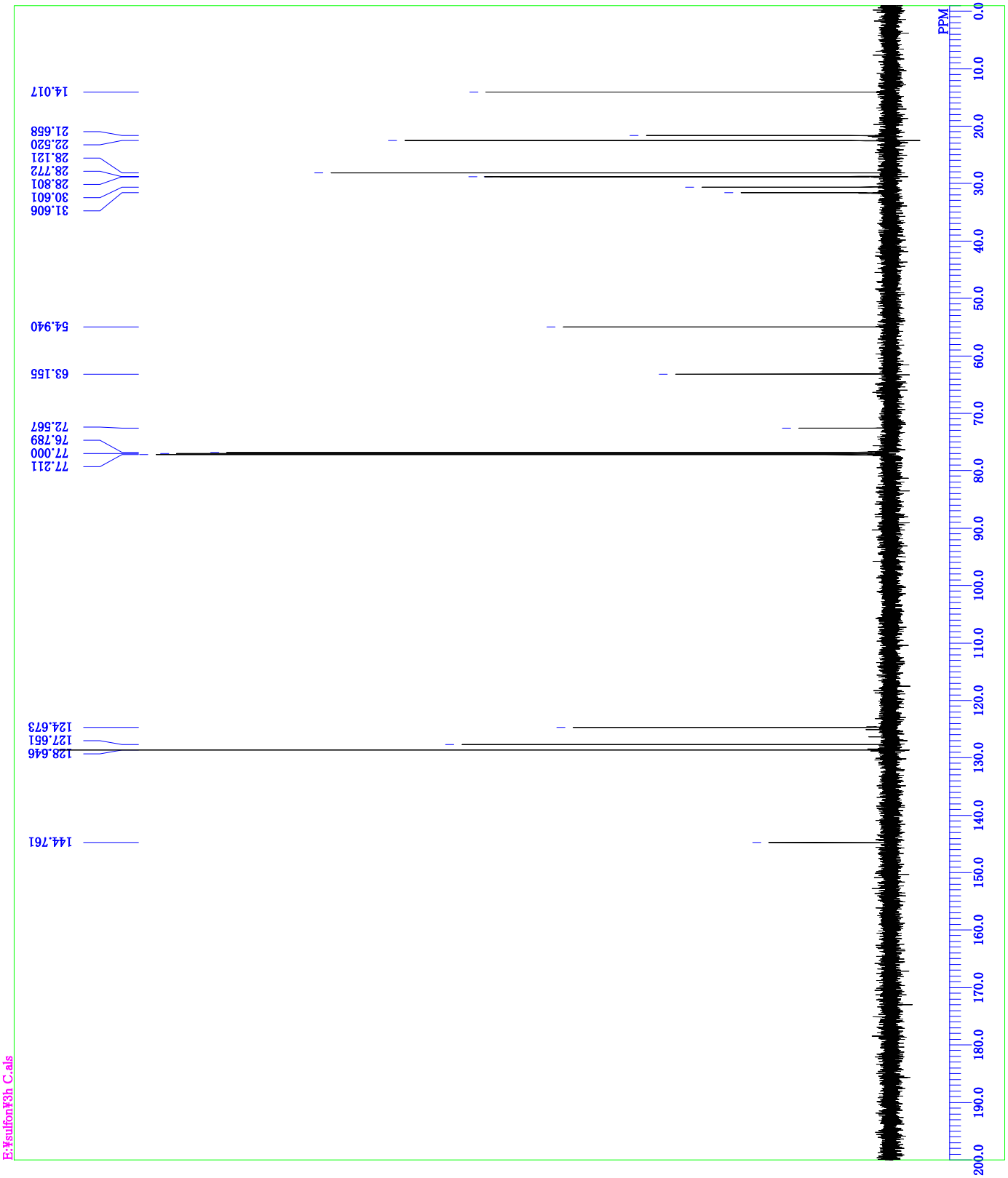


data octane hydrazide sulfon 1H
E:¥sulfon¥3h 1H.als

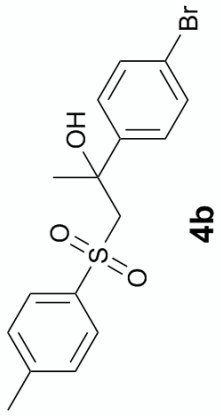


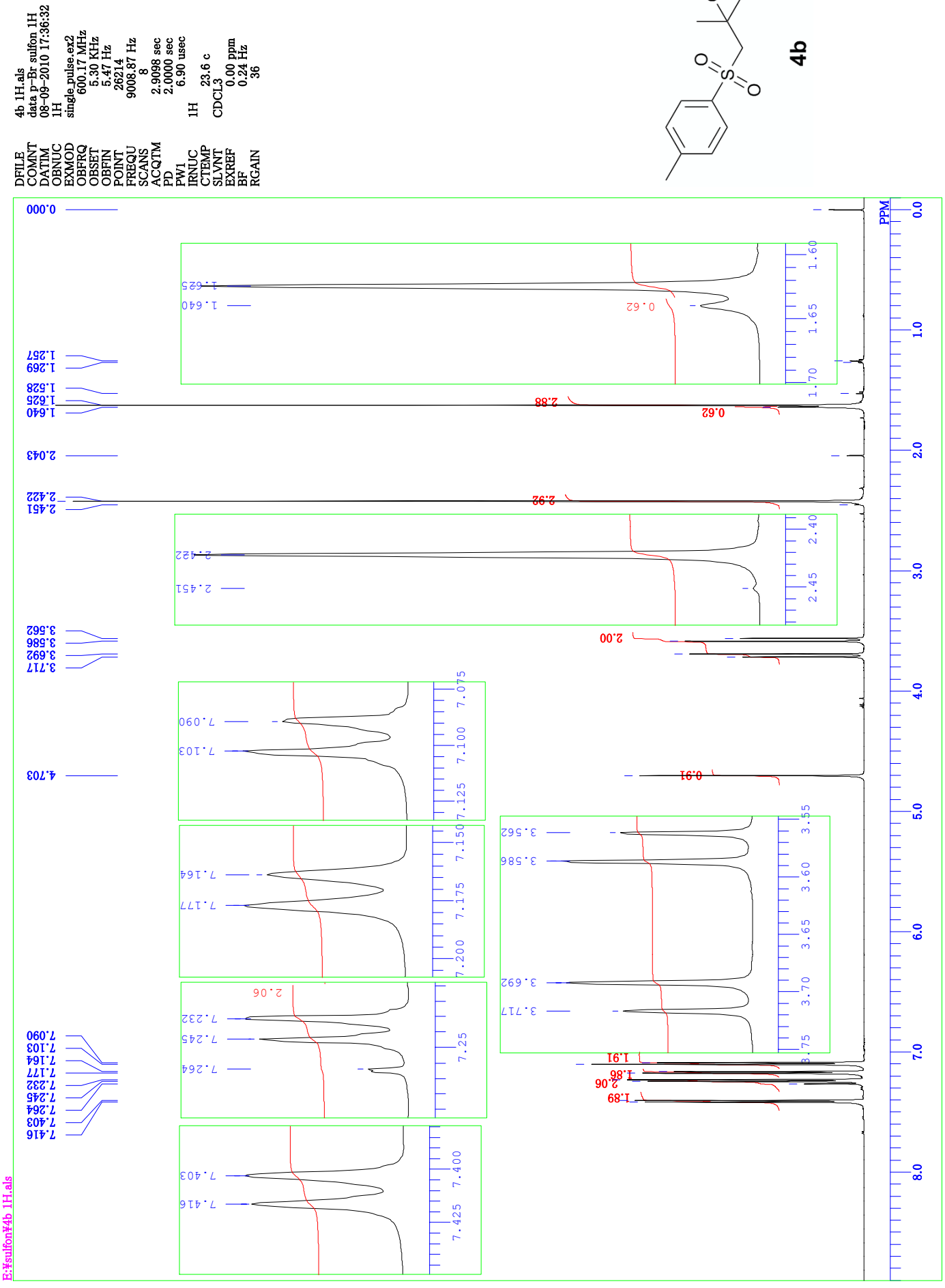
3h C.als
data octane hydrazide sulfon 13C
13-09-2010 19:37:10
13C
single_pulse_dec

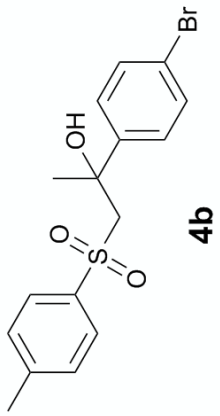
DFILE	
COMNT	
DATIM	
OBNUC	
EXMOD	
OBFRQ	150.92 MHz
OBSET	8.52 KHz
OBFIN	1.74 Hz
POINT	26214
FREQU	37878.21 Hz
SCANS	276
ACQTM	0.6921 sec
PD	1.2000 sec
PW1	4.80 usec
IRNUC	1H
CTEMP	24.1 c
SLVNT	CDCL3
EXREF	77.00 ppm
BF	0.12 Hz
RGAIN	56



data octane hydrazide sulfon 13C
E:¥sulfon¥3h C.als

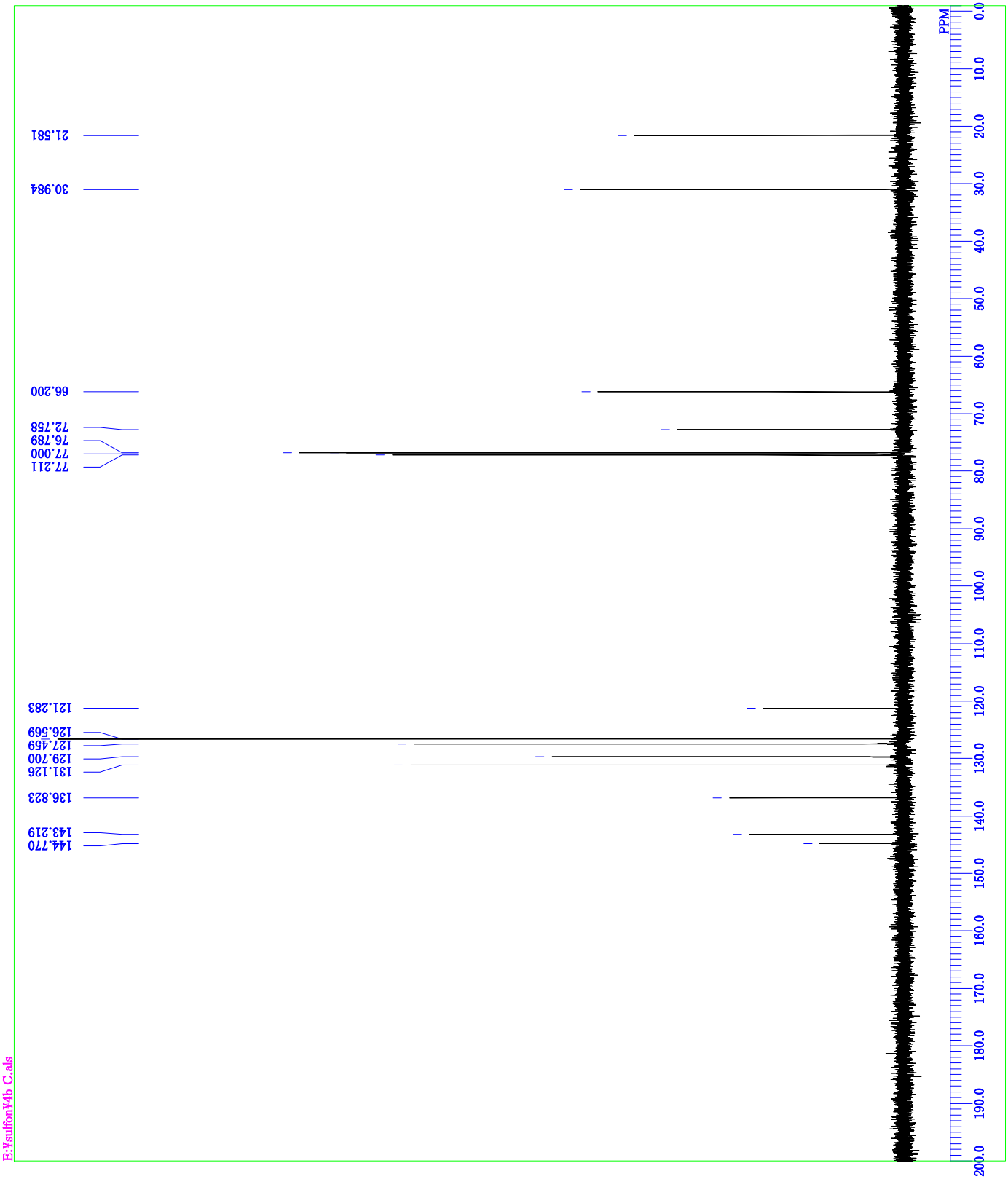

Br
OH
O
S
O
4b


DFILE 4b 1H.als
COMNT data p-Br sulfon 1H
DATIM 08-09-2010 17:36:32
OBNUC 1H
EXMOD single_pulse.ex2
OBFRQ 600.17 MHz
OBSET 5.30 KHz
OBFIN 5.47 Hz
POINT 26214
FREQU 9008.87 Hz
SCANS 8
ACQTM 2.9098 sec
PD 2.0000 sec
PW1 6.90 usec
IRNUC 1H
CTEMP 23.6 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.24 Hz
RGAIN 36
data p-Br sulfon 1H
E:¥sulfon¥4b 1H.als
PPM



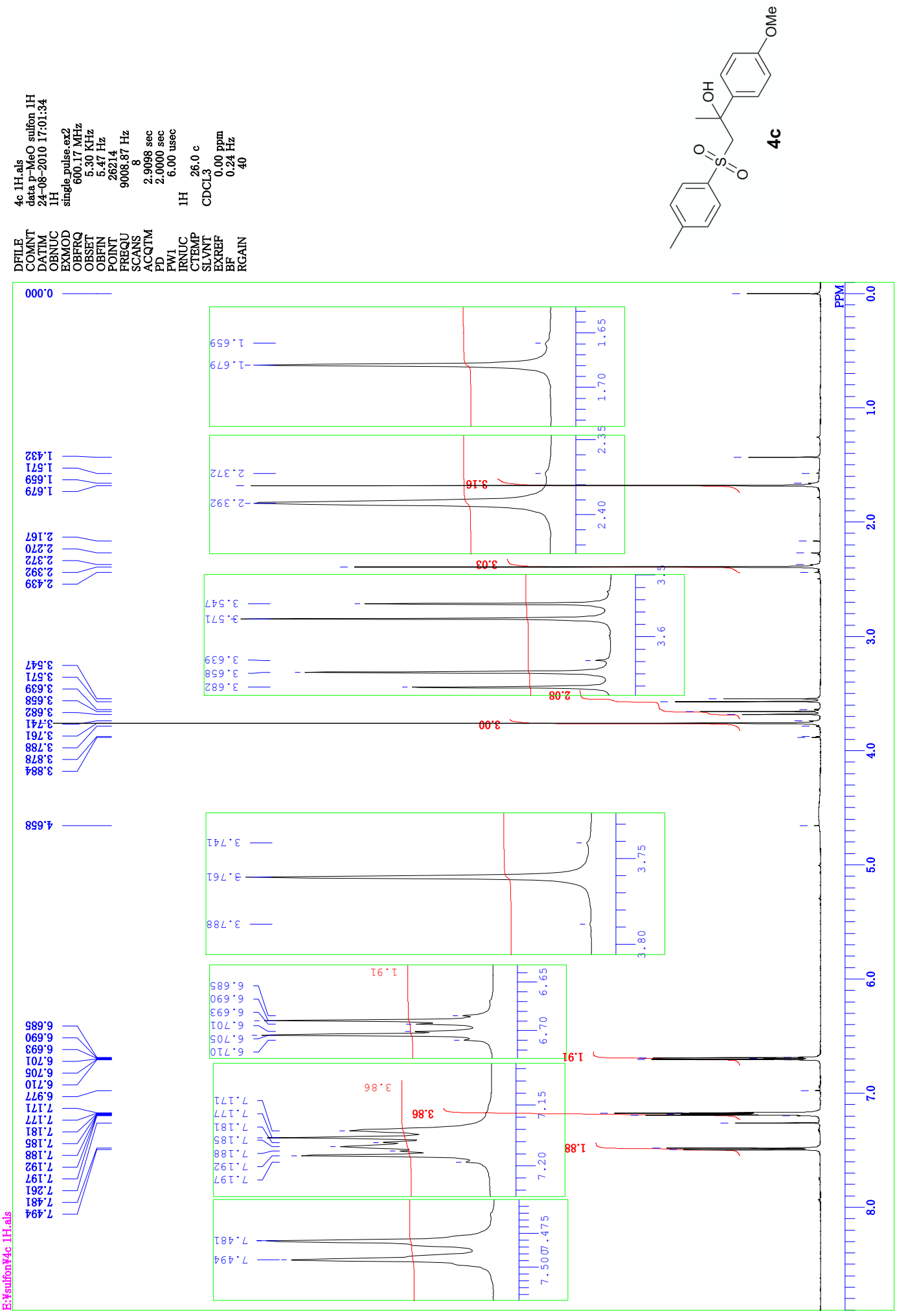
4b C.als
data p-Br sulfon 13C
08-09-2010 17:45:33
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
250
0.6921 sec
1.2000 sec
4.80 usec
1H
24.3 c
CDCL3
77.00 ppm
0.24 Hz
56

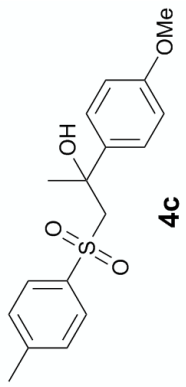
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN



data p-Br sulfon 13C

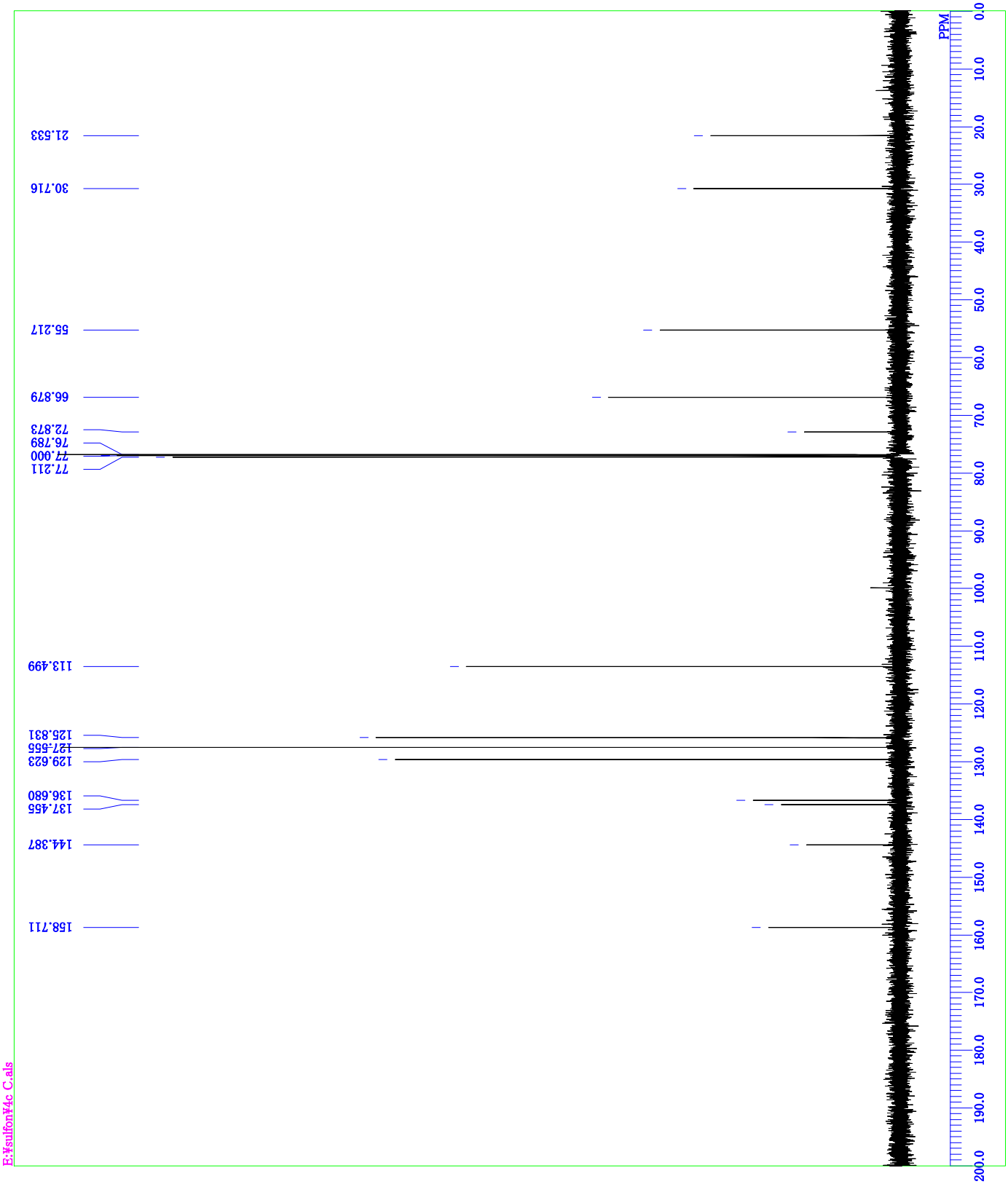
E:¥sulfon¥4b C.als


4c 1H.als
data p-MeO sulfon 1H
24-08-2010 17:01:34
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.00 usec
1H
26.0 c
CDCL3
0.00 ppm
0.24 Hz
40
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN
OMe
OH
O
S
O
4c
PPM
data p-MeO sulfon 1H
E:¥sulfon¥4c 1H.als



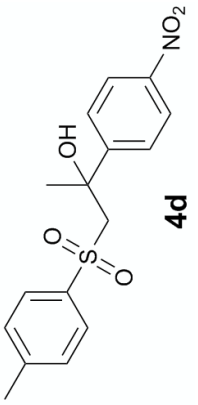
4c C.als
data p-MeO sulfon 13C
24-08-2010 17:07:43
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
150
0.6921 sec
1.2000 sec
2.83 usec
1H
26.6 c
CDCL3
77.00 ppm
0.24 Hz
54

DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN

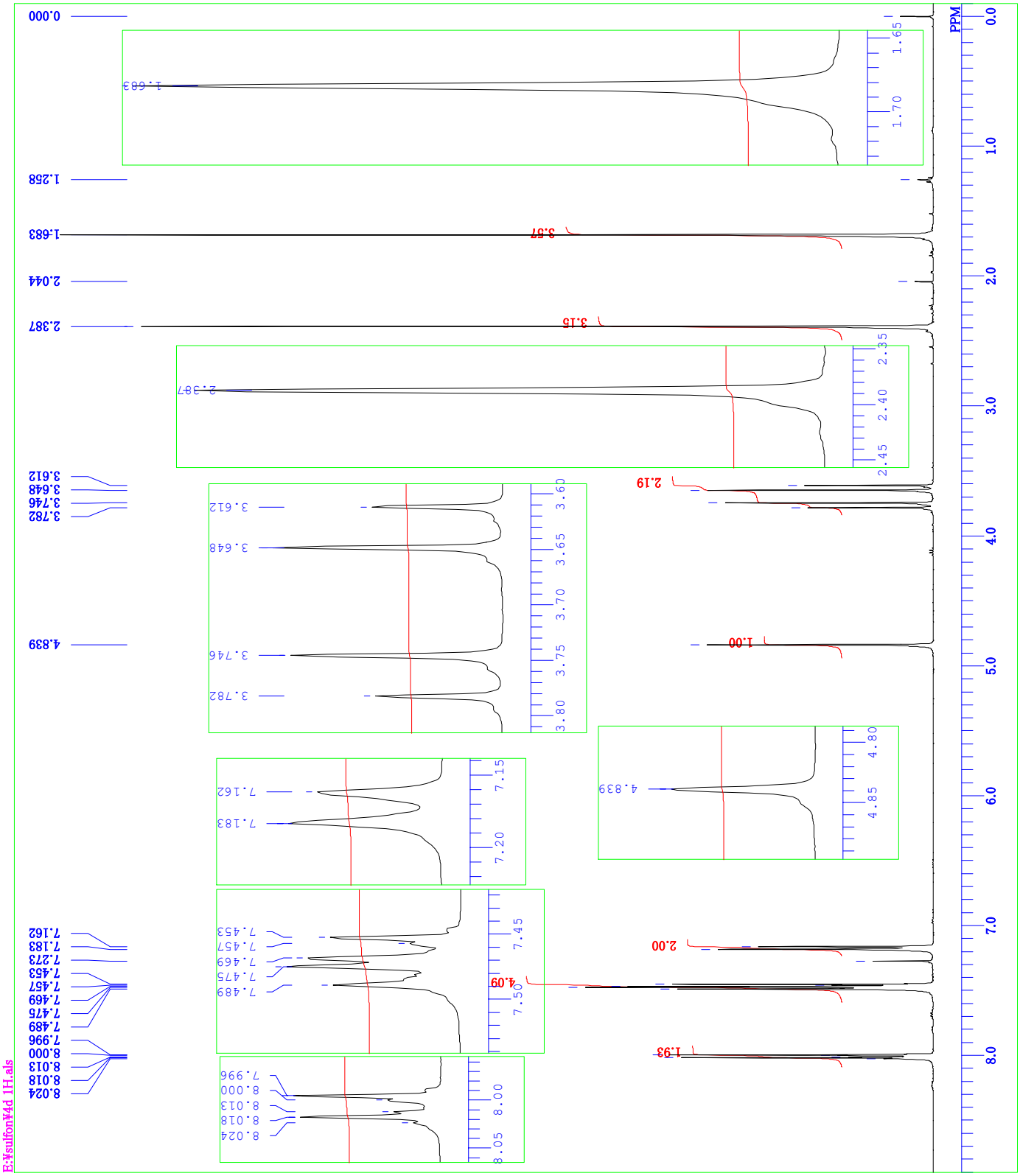


data p-MeO sulfon 13C

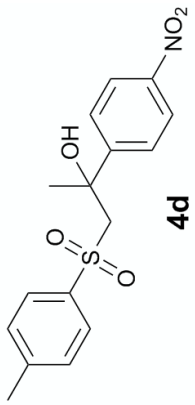
E:¥sulfon¥4c C.als



DFILE 4d 1H.als
COMNT data p-NO2 sulfon 1H
DATIM 31-08-2010 16:55:24
OBNUC 1H
EXMOD single_pulse.ex2
OBFRQ 399.78 MHz
OBSET 4.19 KHz
OBFIN 7.29 Hz
POINT 13107
FREQU 6002.31 Hz
SCANS 8
ACQTM 2.1837 sec
PD 2.0000 sec
PW1 4.75 usec
IRNUC 1H
CTEMP 26.4 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.00 Hz
RGAIN 30

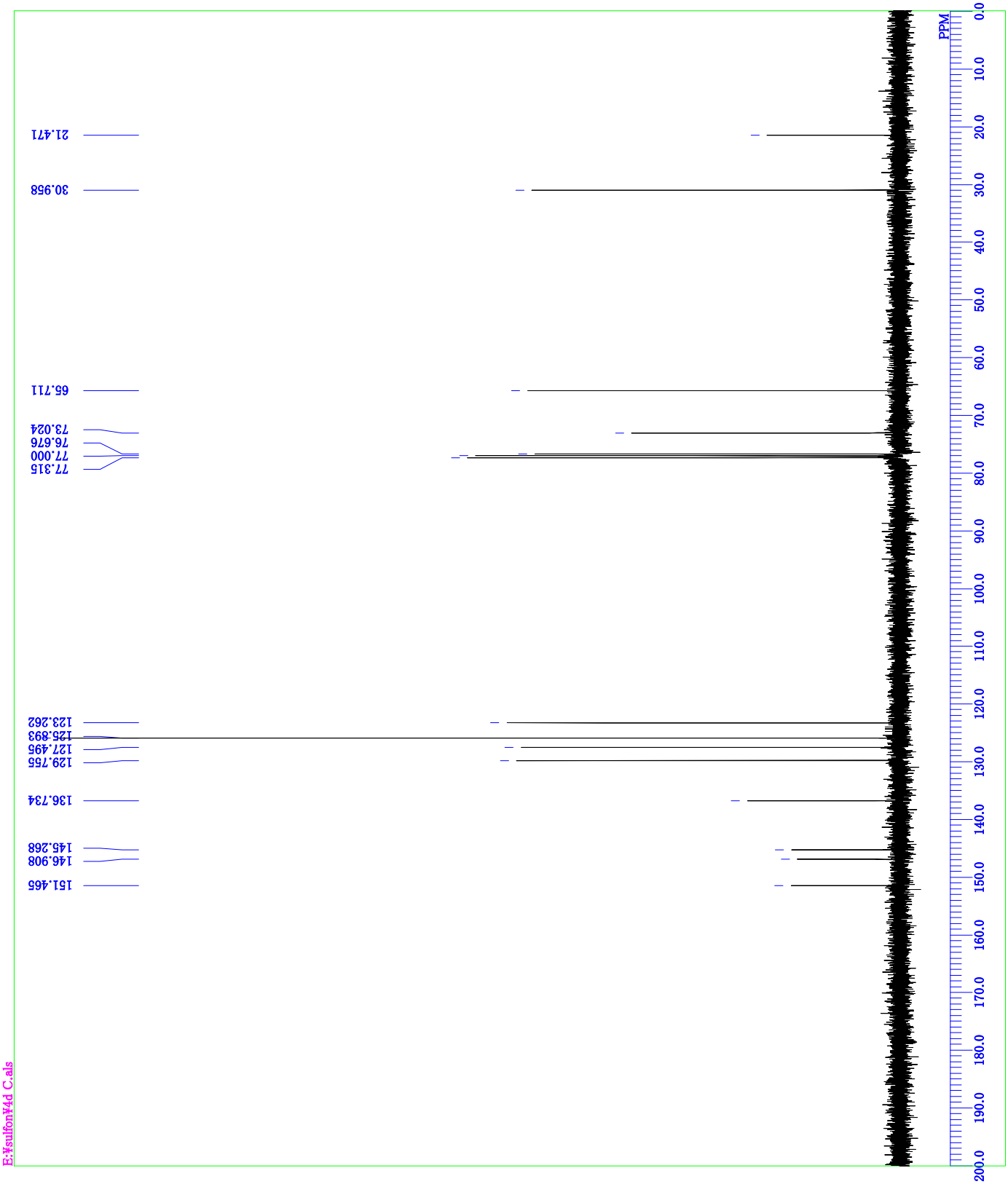


data p-NO2 sulfon 1H
E:¥sulfon¥4d 1H.als

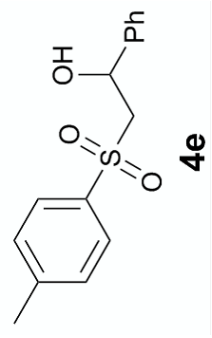


4d C.als
data p-NO2 sulfon 13C
31-08-2010 17:03:29
13C
single_pulse_dec
100.53 MHz
5.35 KHz
5.86 Hz
26214
25125.24 Hz
150
1.0433 sec
1.2000 sec
2.87 usec
1H
26.6 c
CDCL3
77.00 ppm
0.00 Hz
60

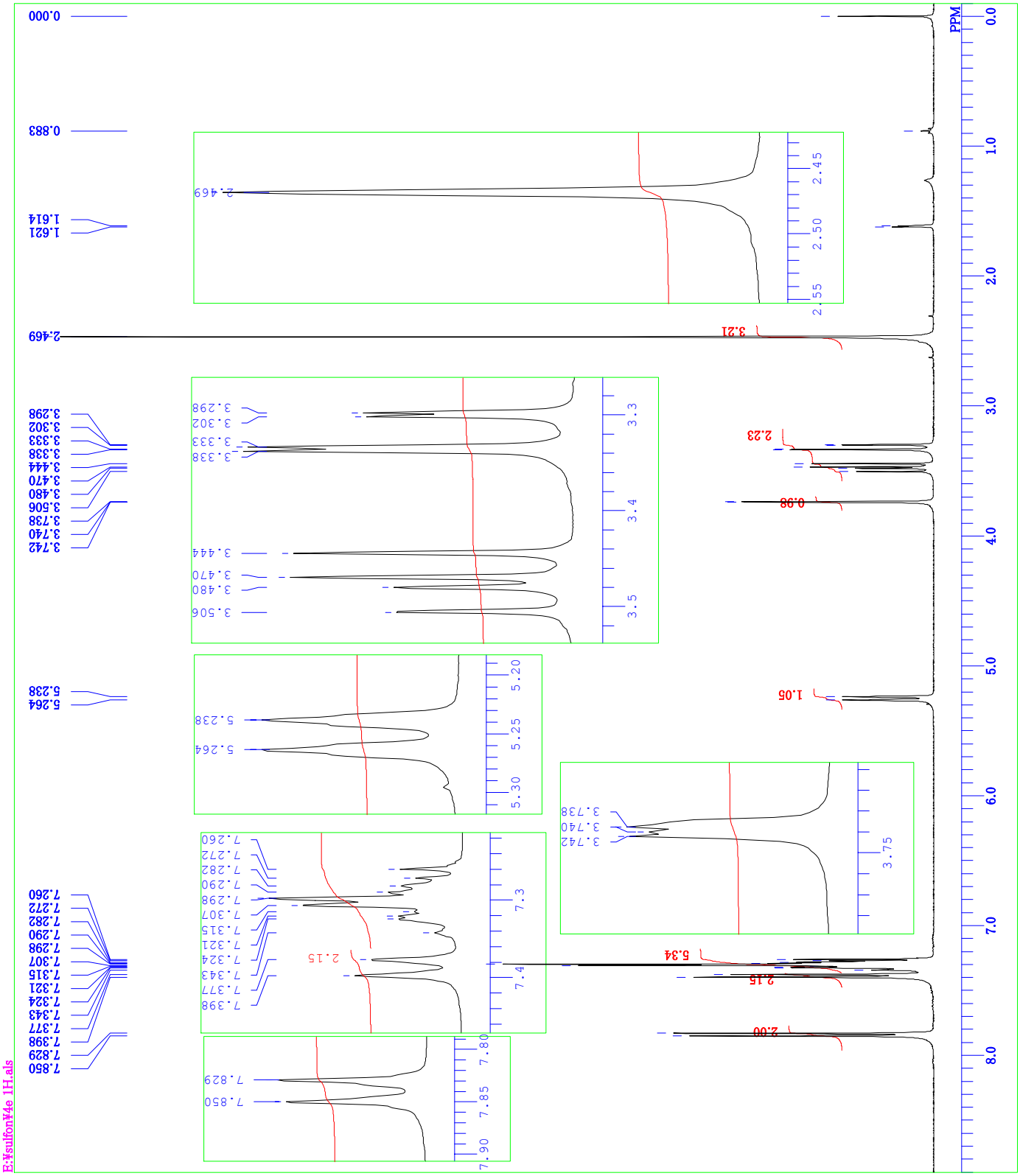
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN

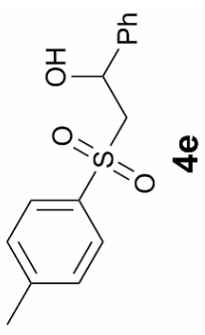


data p-NO2 sulfon 13C
E:¥sulfon¥4d C.als

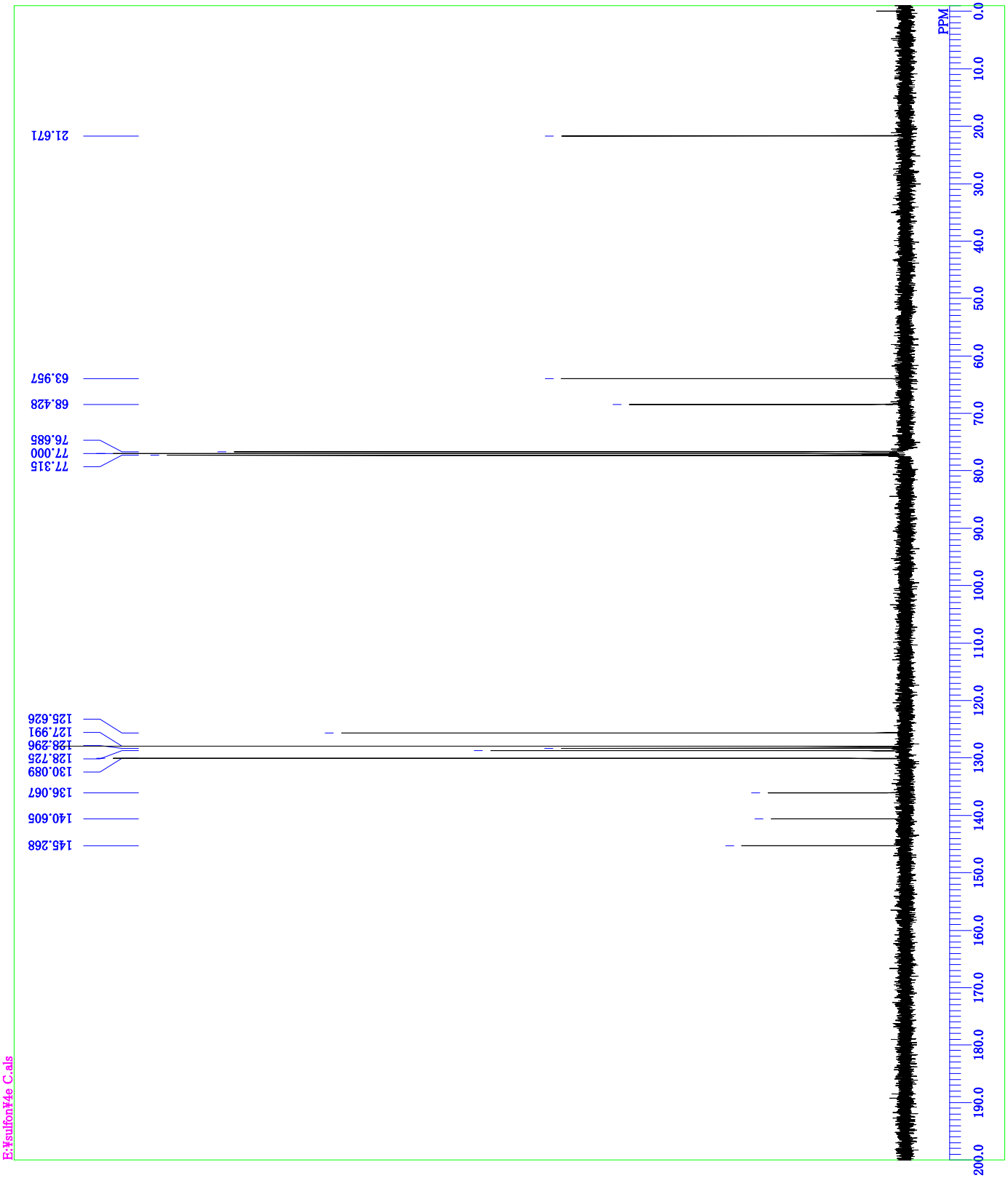



```
DFILE     4e 1H.als
COMNT     data styrene sulfon 1H
DATIM     19-10-2010 20:21:50
OBNUC     1H
EXMOD     single_pulse.ex2
OBFRQ     399.78 MHz
OBSET     4.19 KHz
OBFIN     7.29 Hz
POINT     13107
FREQU     6002.31 Hz
SCANS     8
ACQTM     2.1837 sec
PD        2.0000 sec
PW1       4.75 usec
IRNUC     1H
CTEMP     20.6 c
SLVNT     CDCL3
EXREF     0.00 ppm
BF        0.24 Hz
RGAIN     38
```



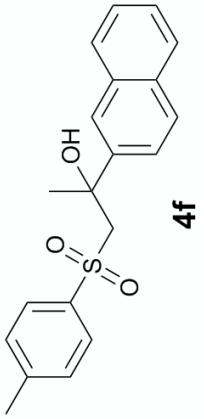


DFILE 4e C.als
COMNT data styrene sulfon 13C
DATIM 19-10-2010 20:43:09
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 100.53 MHz
OBSET 5.35 KHz
OBFIN 5.86 Hz
POINT 26214
FREQU 25125.24 Hz
SCANS 529
ACQTM 1.0433 sec
PD 1.2000 sec
PW1 2.87 usec
IRNUC 1H
CTEMP 20.9 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.24 Hz
RGAIN 60

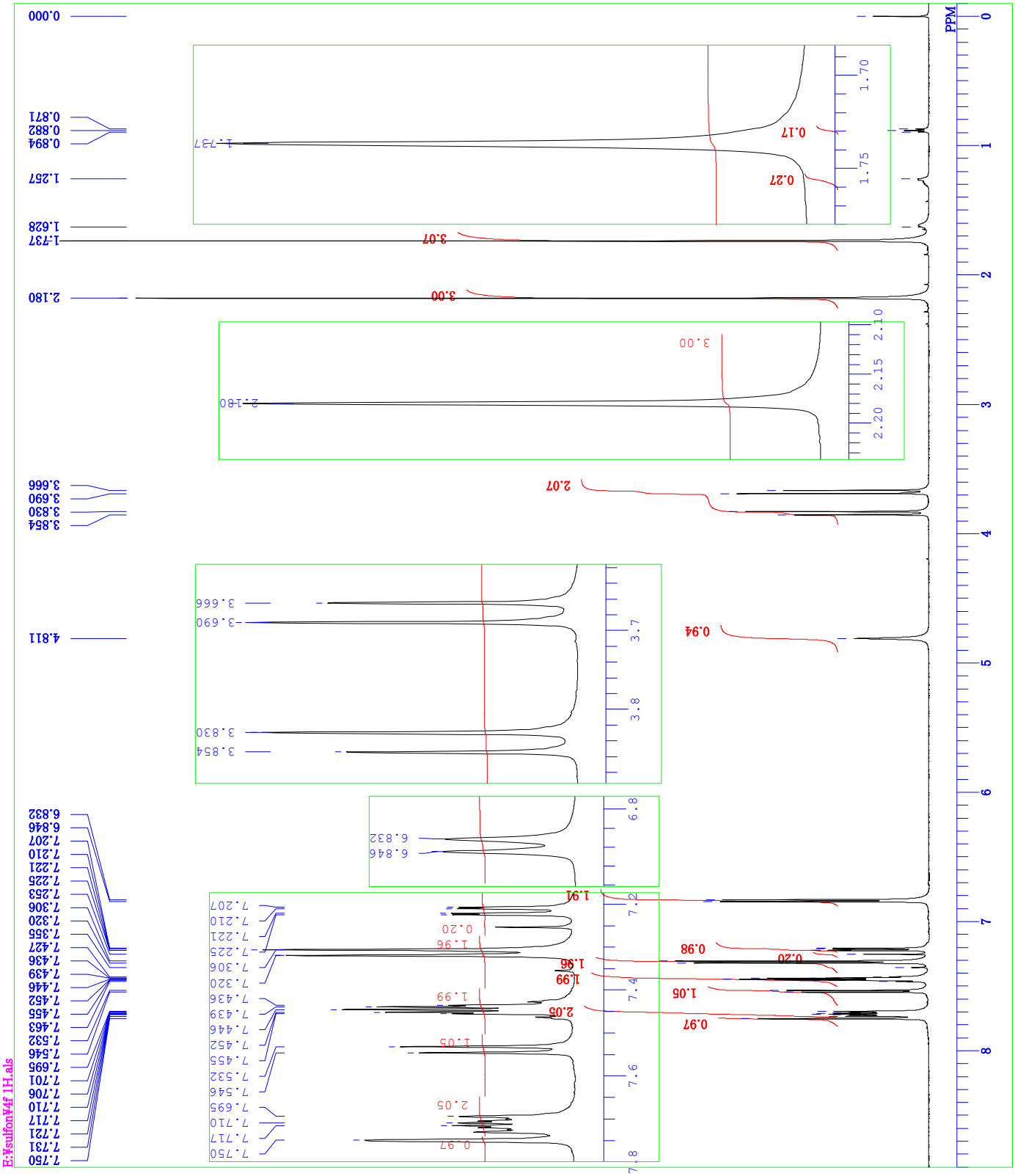


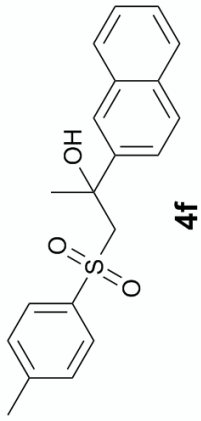
data styrene sulfon 13C

E:¥sulfon¥4e C.als

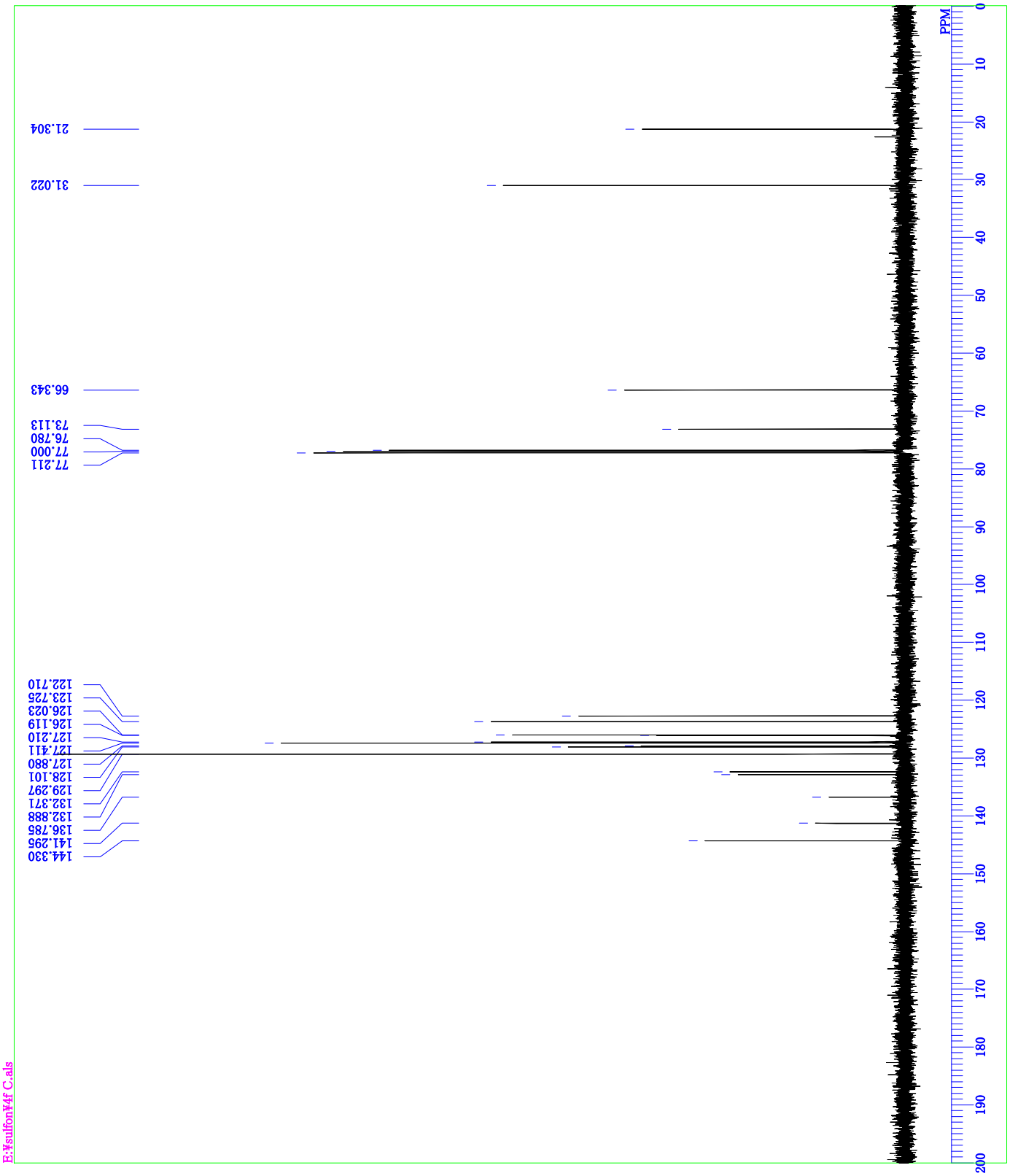


DFILE	4f 1H.als
COMNT	data naphthyl sulfon 1H
DATIM	23-08-2010 11:46:36
OBNUC	1H
EXMOD	single_pulse.ex2
OBFRQ	600.17 MHz
OBSET	5.30 KHz
OBFIN	5.47 Hz
POINT	26214
FREQU	9008.87 Hz
SCANS	8
ACQTM	2.9098 sec
PD	2.0000 sec
PW1	6.00 usec
IRNUC	1H
CTEMP	25.5 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.24 Hz
RGAIN	36



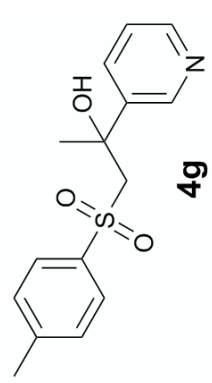


DFILE 4f C.als
COMNT data naphthyl sulfon 13C
DATIM 23-08-2010 11:51:05
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 150.92 MHz
OBSET 8.52 KHz
OBFIN 1.74 Hz
POINT 26214
FREQU 37878.21 Hz
SCANS 100
ACQTM 0.6921 sec
PD 1.2000 sec
PW1 2.83 usec
IRNUC 1H
CTEMP 26.1 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.24 Hz
RGAIN 54

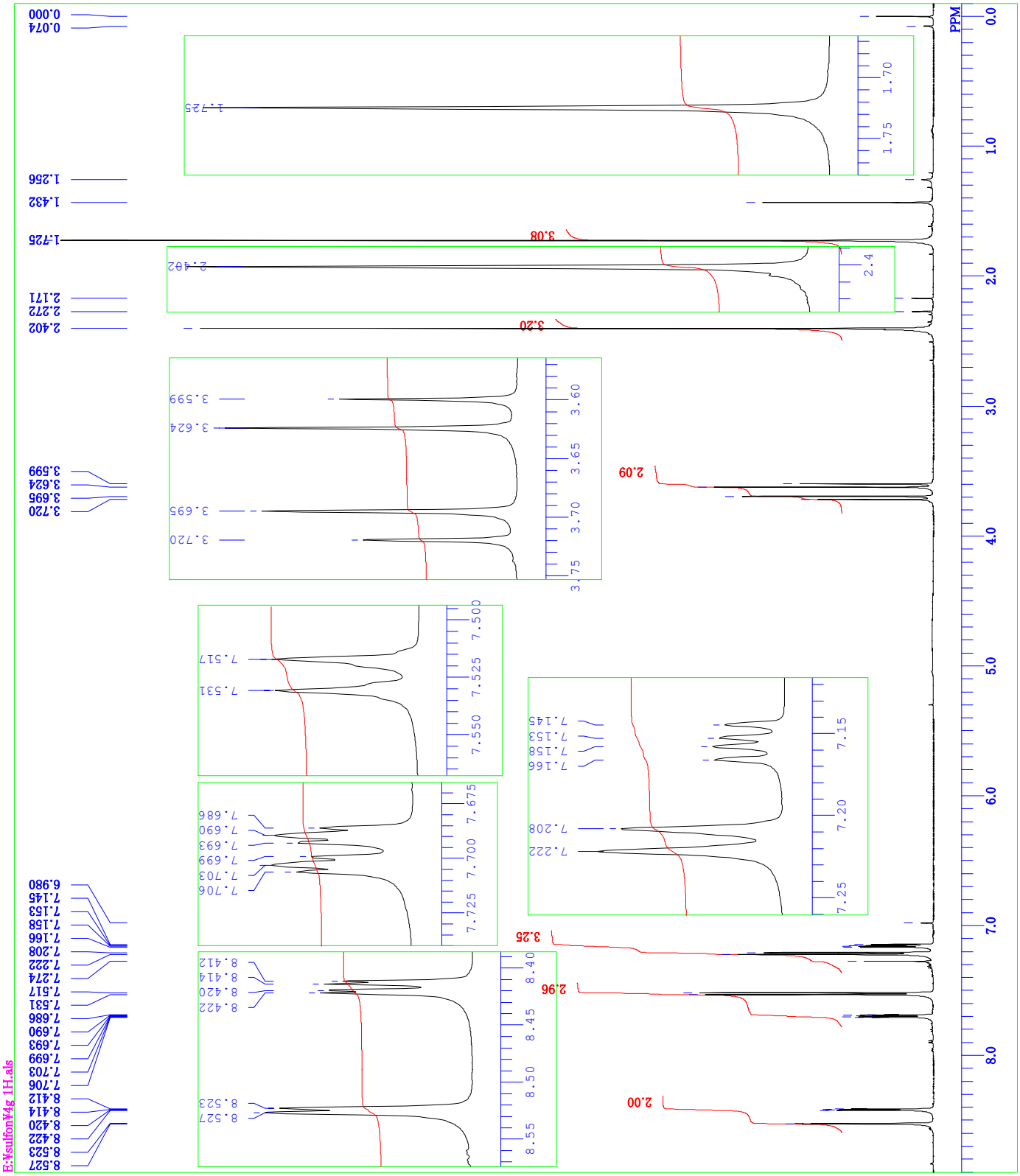


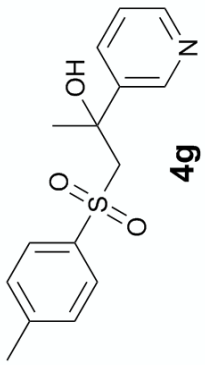
data naphthyl sulfon 13C

E:¥sulfon¥4f C.als



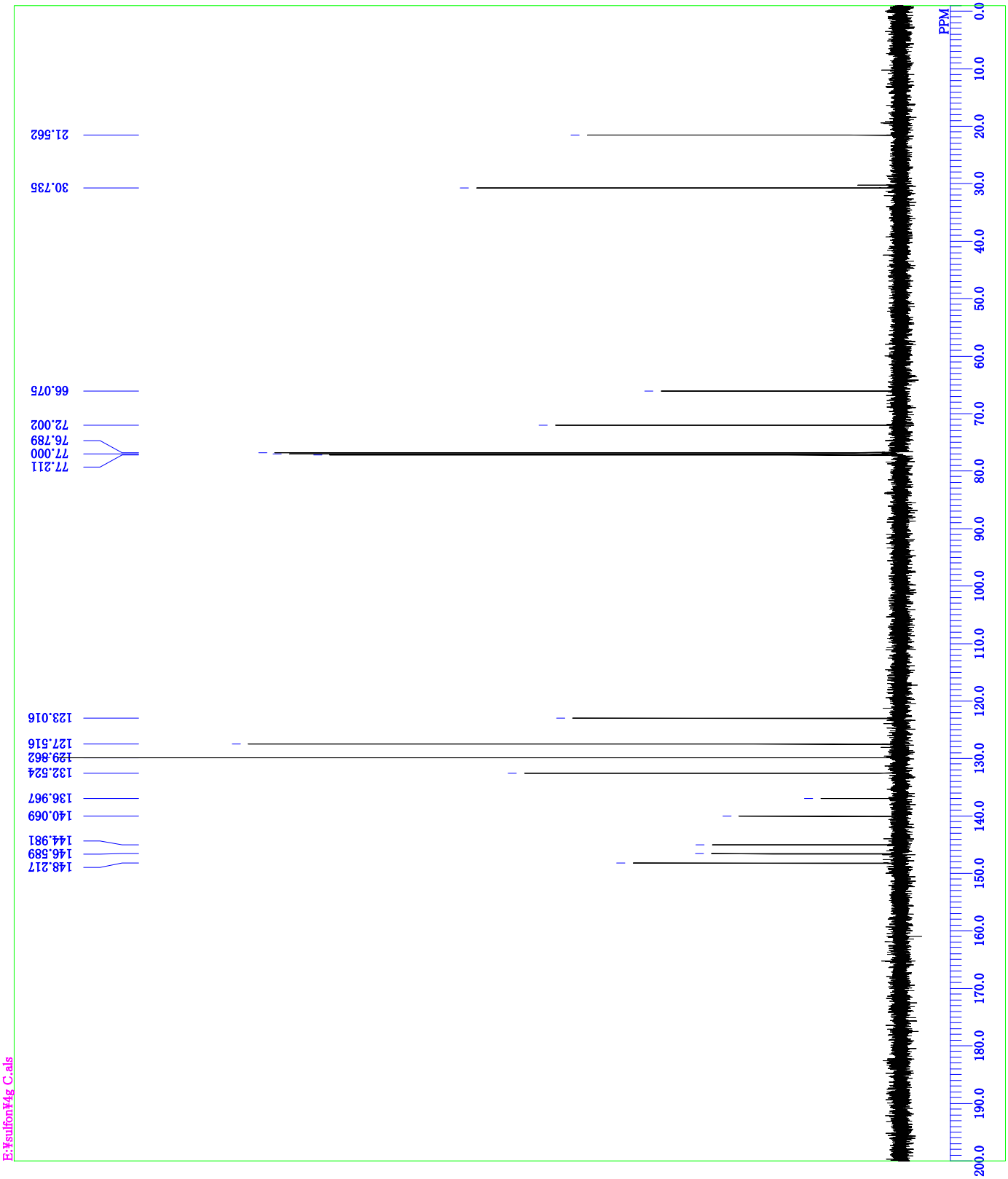

```
DFILE   4g 1H.als
COMNT   data pyri sulfon 1H
DATIM   08-09-2010 17:23:31
OBNUC   1H
EXMOD   single_pulse.ex2
OBFRQ   600.17 MHz
OBSET     5.30 KHz
OBFIN     5.47 Hz
POINT   26214
FREQU   9008.87 Hz
SCANS       8
ACQTM     2.9098 sec
PD        2.0000 sec
PW1       6.90 usec
IRNUC   1H
CTEMP     23.4 c
SLVNT   CDCL3
EXREF     0.00 ppm
BF        0.24 Hz
RGAIN       36
```





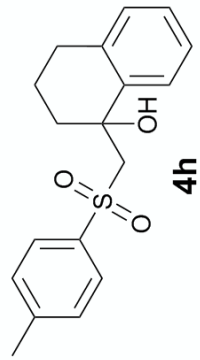
4g C.als
data pyri sulfon 13C
08-09-2010 17:31:27
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
200
0.6921 sec
1.2000 sec
4.80 usec
1H
24.2 c
CDCL3
77.00 ppm
0.24 Hz
56

DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN

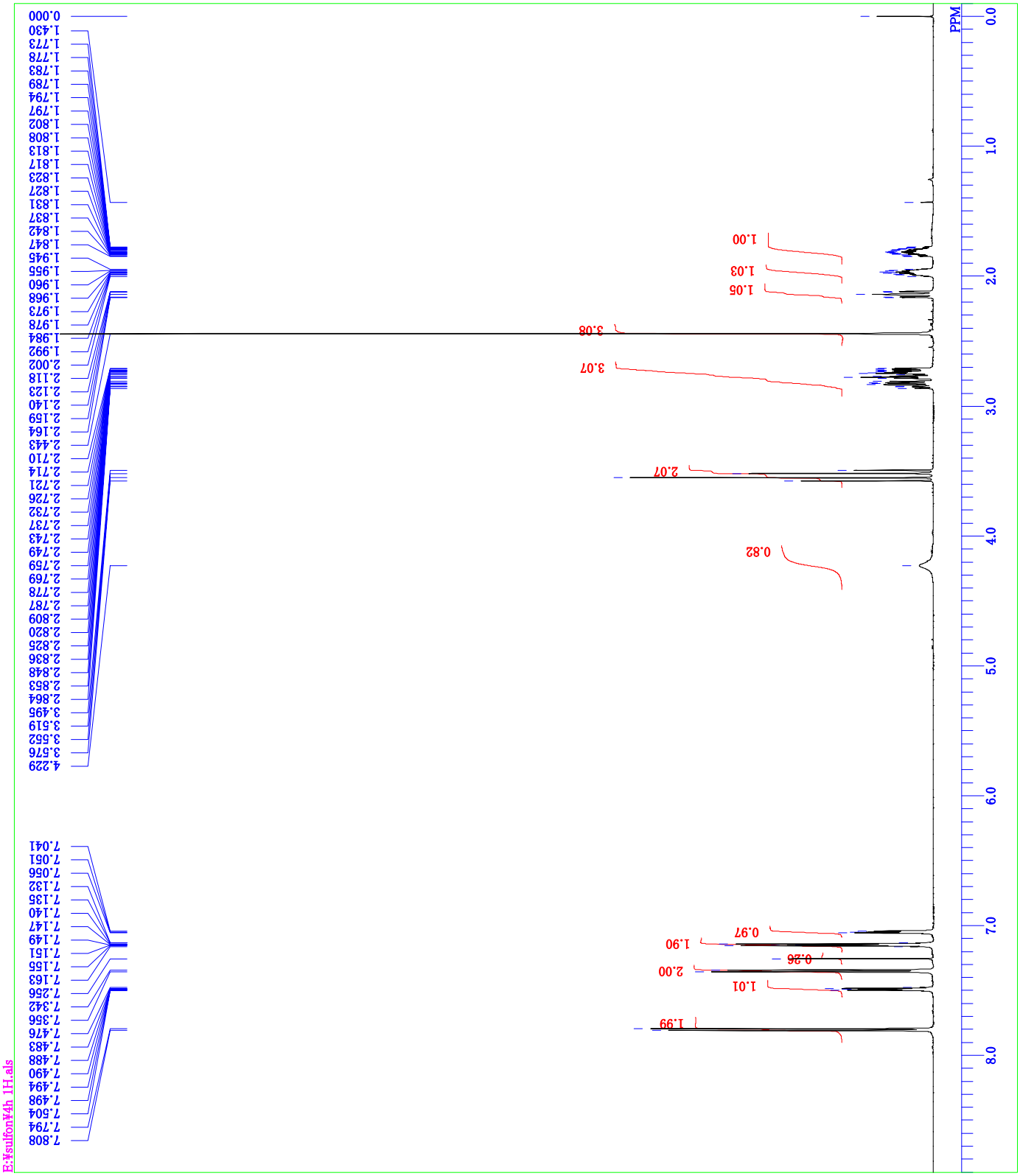


data pyri sulfon 13C

E:¥sulfon¥4g C.als

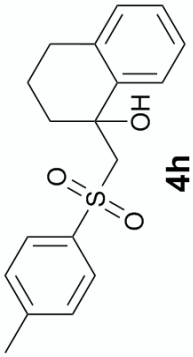



```
DFILE   4h 1H.als
COMNT   data cyclohexane sulfon 1H
DATIM   16-09-2010 09:55:27
OBNUC   1H
EXMOD   single_pulse.ex2
OBFRQ   600.17 MHz
OBSET     5.30 KHz
OBFIN     5.47 Hz
POINT    26214
FREQU    9008.87 Hz
SCANS        8
ACQTM     2.9098 sec
PD        2.0000 sec
PW1       6.90 usec
IRNUC   1H
CTEMP     21.9 c
SLVNT   CDCL3
EXREF     0.00 ppm
BF        0.12 Hz
RGAIN       34
```



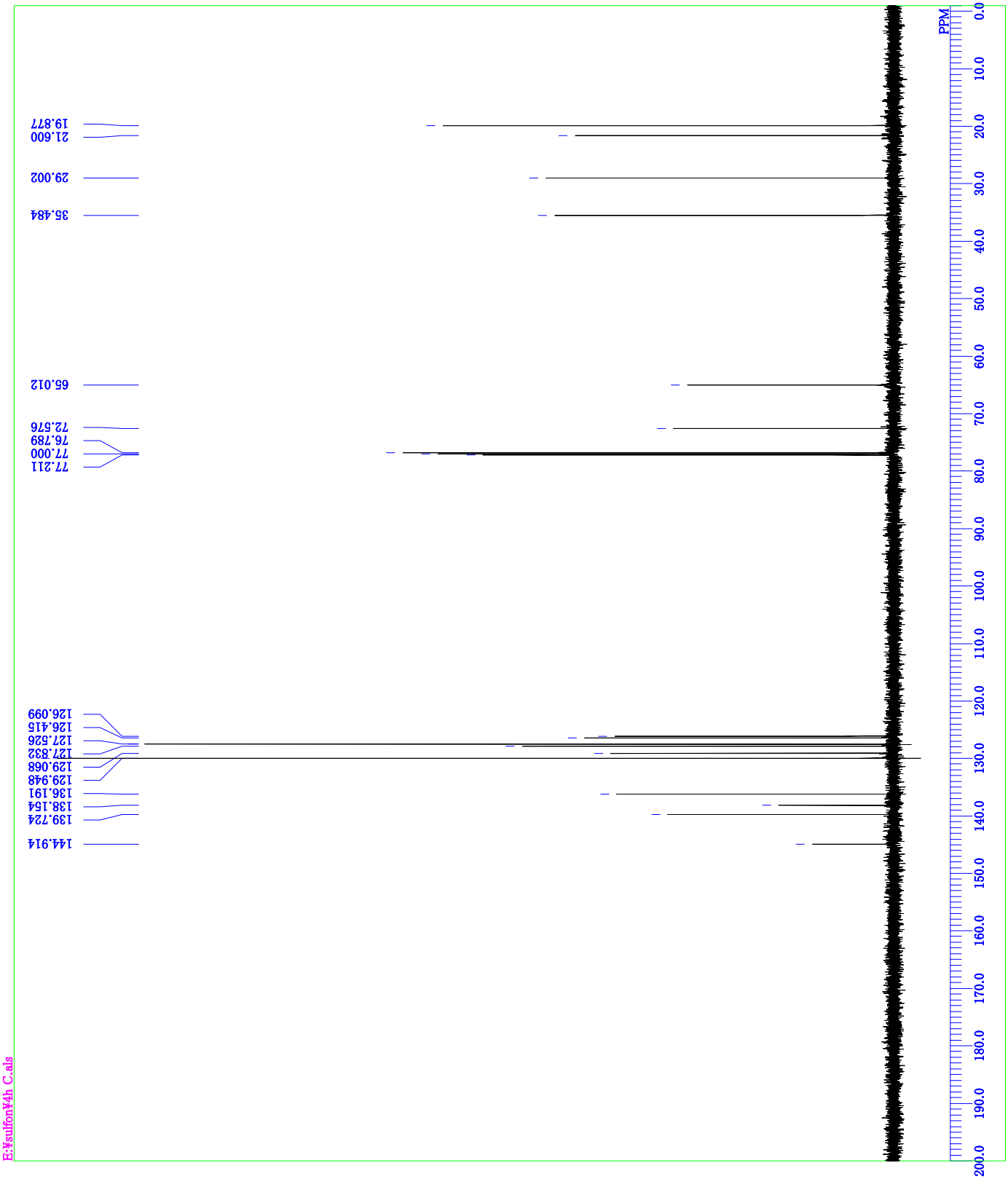
data cyclohexane sulfon 1H

E:¥sulfon¥4h 1H.als

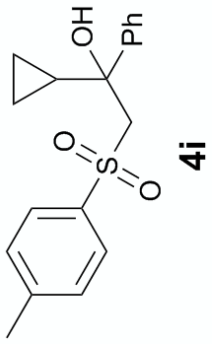


4h C.als
data cyclohexane sulfon 13C
16-09-2010 10:02:54
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
200
0.6921 sec
1.2000 sec
4.80 usec
1H
22.8 c
CDCL3
77.00 ppm
0.12 Hz
56

DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN

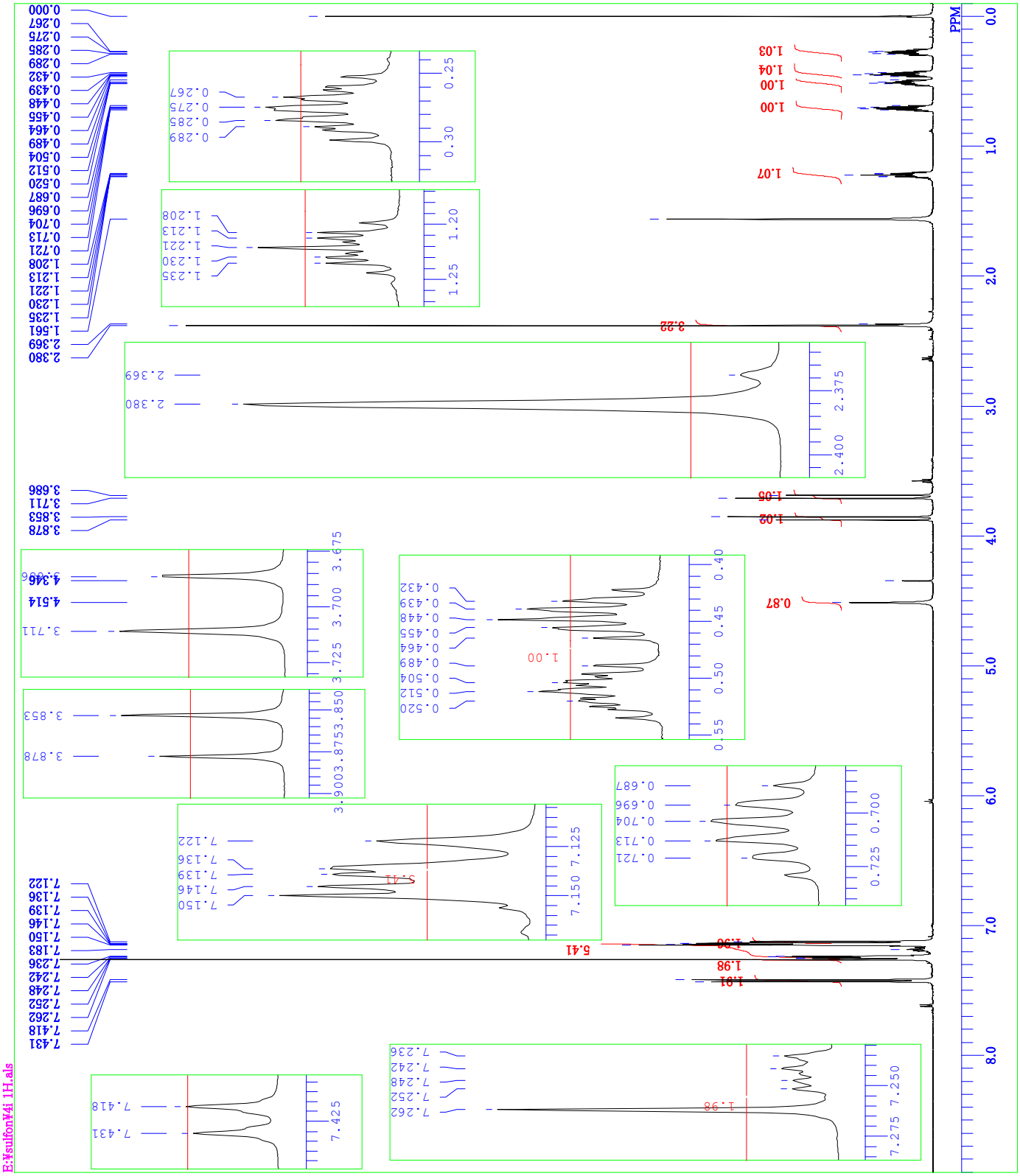


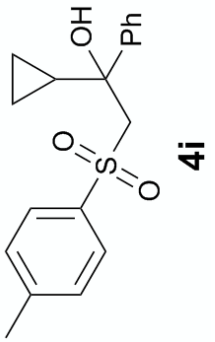
data cyclohexane sulfon 13C
E:¥sulfon¥4h C.als



4i 1H.als
data cyclopropyl sulfon 1H
16-11-2010 21:51:55
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.35 usec
1H 19.1 c
CDCL3
0.00 ppm
0.24 Hz
50

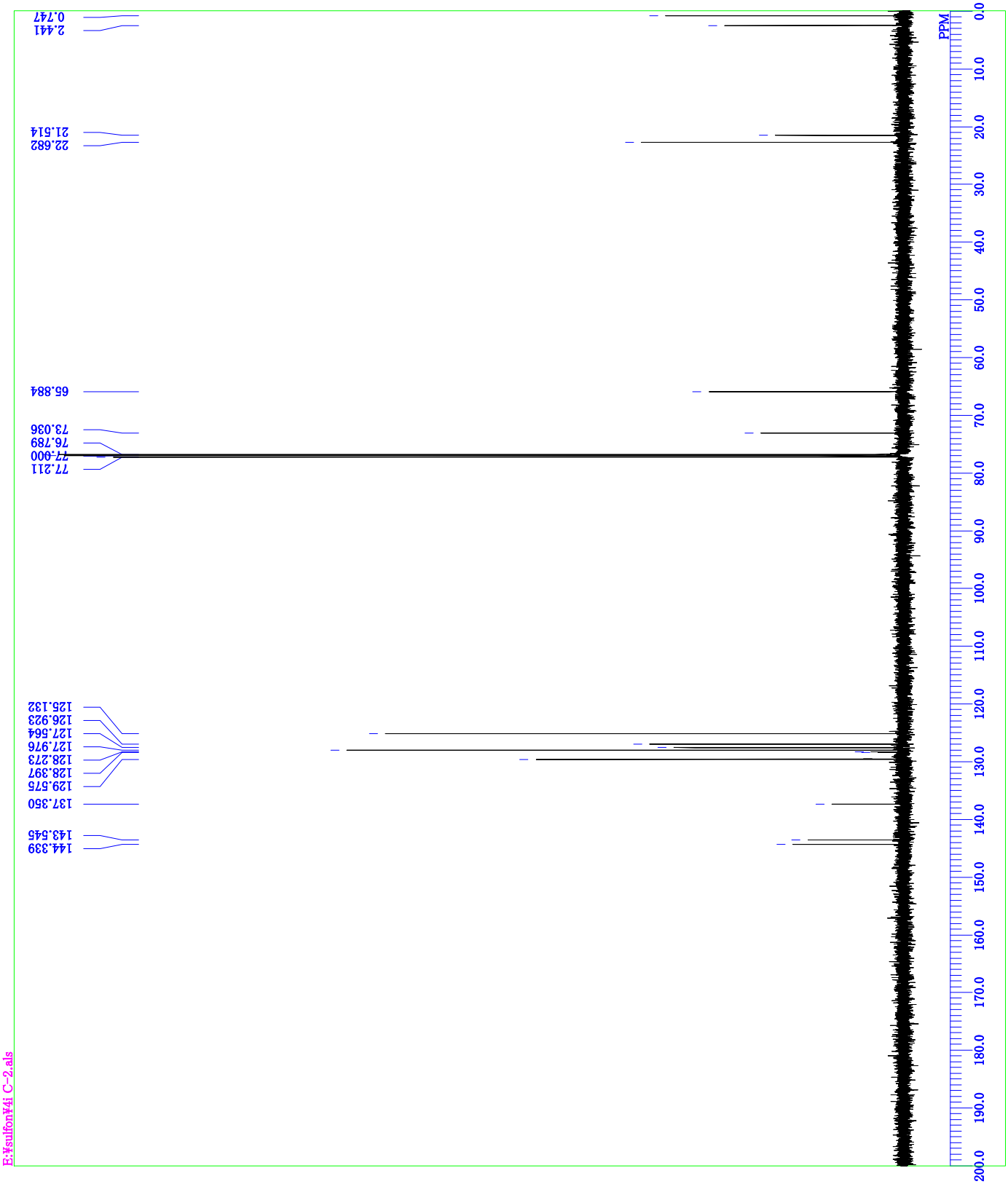
DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN





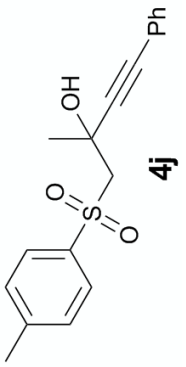
4i C-2.als
data cyclopropyl sulfon 13C
24-08-2010 16:56:04
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
200
0.6921 sec
1.2000 sec
2.83 usec
1H
26.5 c
CDCL3
77.00 ppm
0.24 Hz
54

DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN

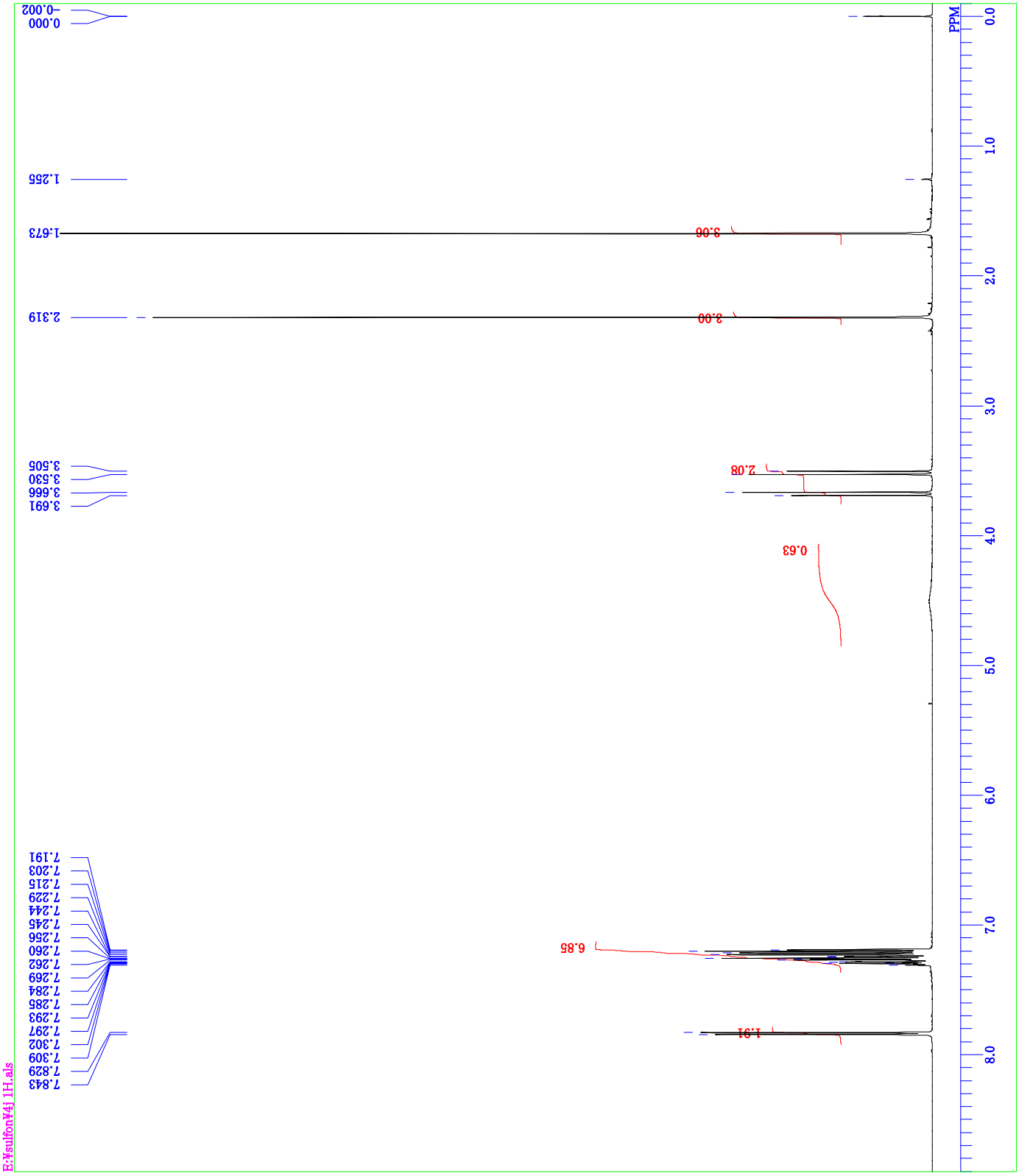


data cyclopropyl sulfon 13C

E:¥sulfon¥4i C-2.als

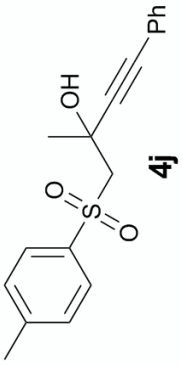


DFILE	4j 1H.als
COMNT	data alkyne sulfon 1H
DATIM	14-09-2010 13:24:26
OBNUC	1H
EXMOD	single_pulse.ex2
OBFRQ	600.17 MHz
OBSET	5.30 KHz
OBFIN	5.47 Hz
POINT	26214
FREQU	9008.87 Hz
SCANS	8
ACQTM	2.9098 sec
PD	2.0000 sec
PW1	6.90 usec
IRNUC	1H
CTEMP	23.7 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.24 Hz
RGAIN	38

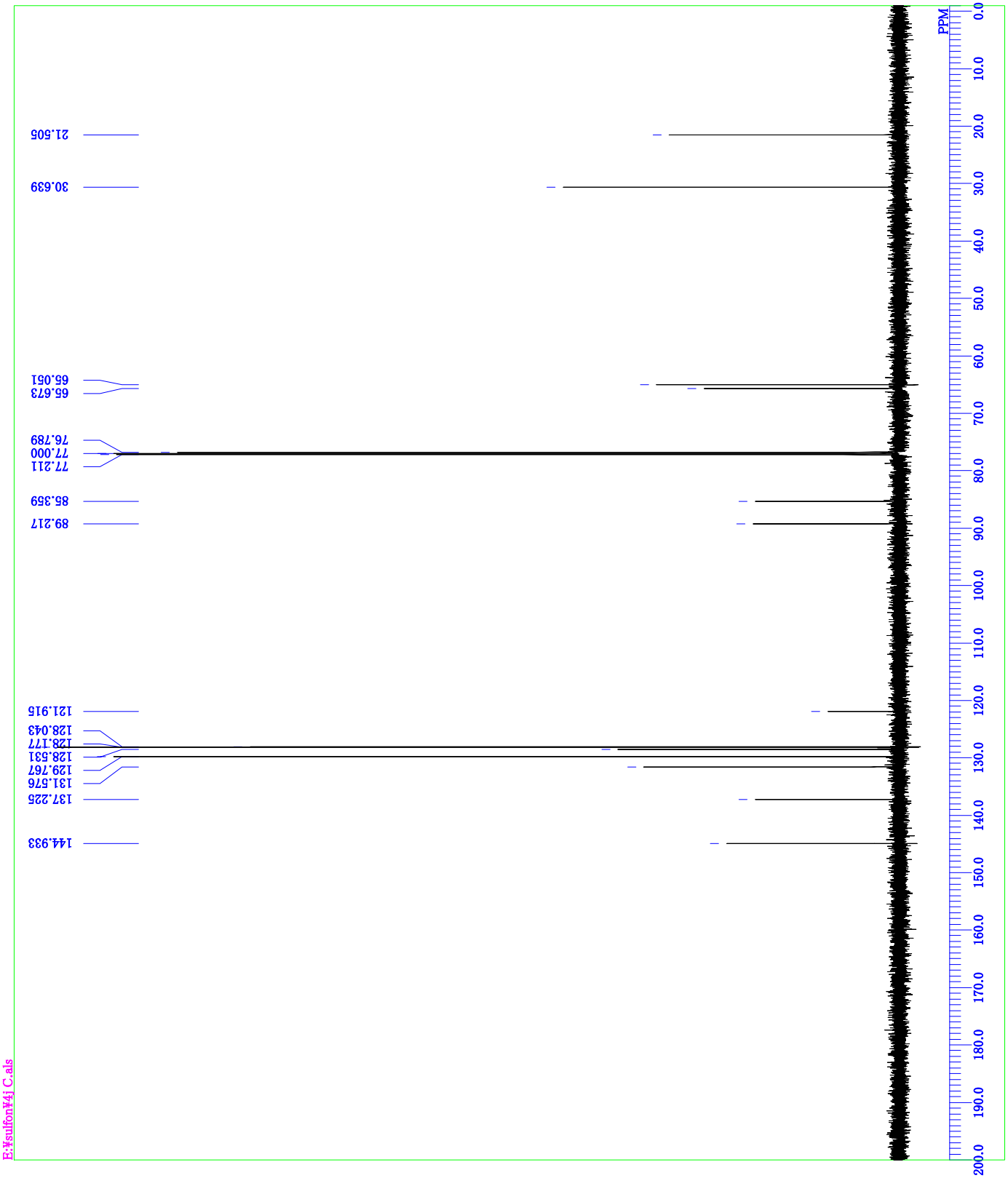


data alkyne sulfon 1H

E:¥sulfon¥4j 1H.als

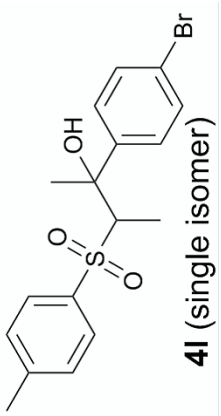


DFILE 4j C.als
COMNT data alkyne sulfon 13C
DATIM 14-09-2010 13:35:03
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 150.92 MHz
OBSET 8.52 KHz
OBFIN 1.74 Hz
POINT 26214
FREQU 37878.21 Hz
SCANS 300
ACQTM 0.6921 sec
PD 1.2000 sec
PW1 4.80 usec
IRNUC 1H
CTEMP 24.6 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.24 Hz
RGAIN 56



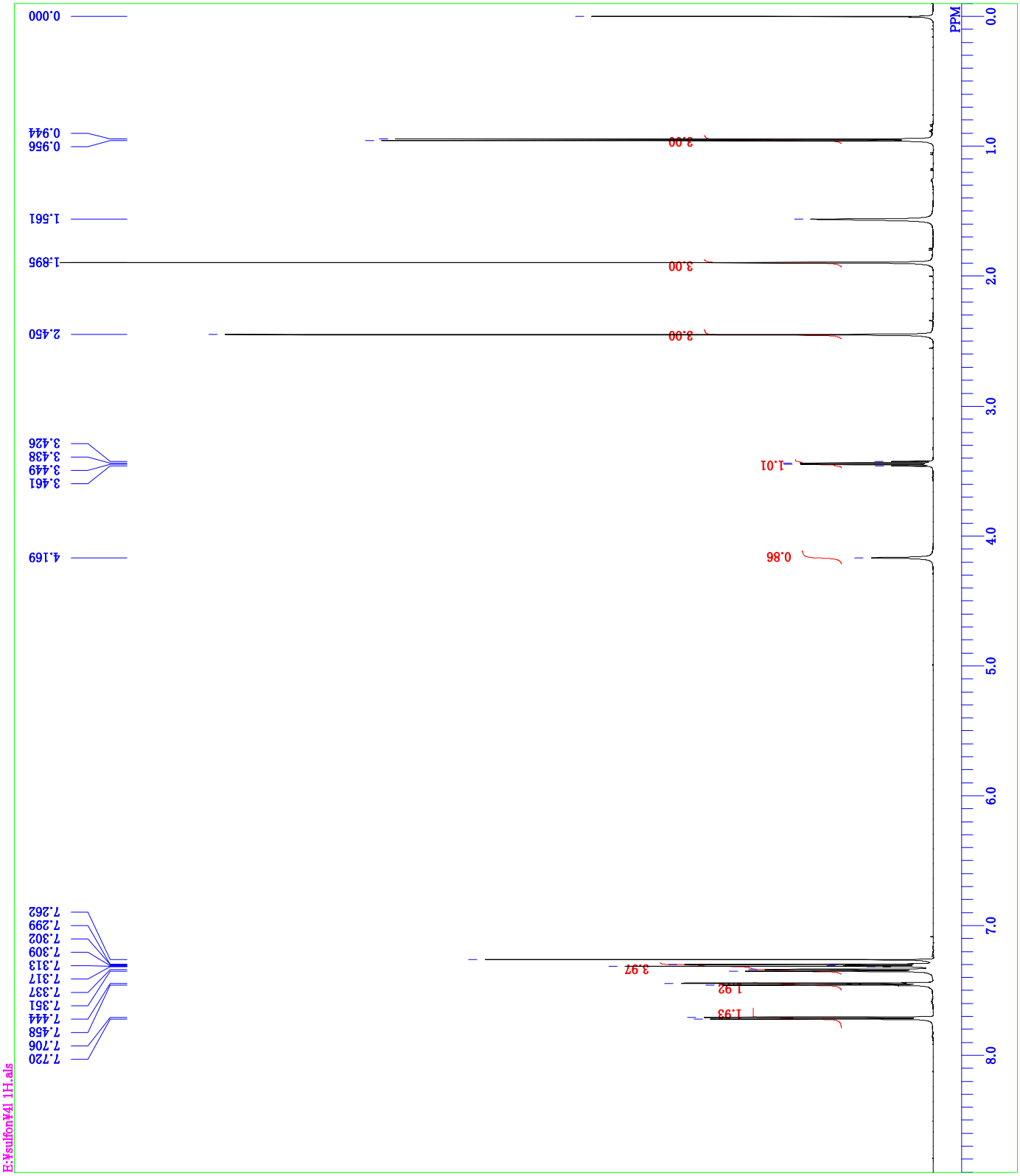
data alkyne sulfon 13C

E:¥sulfon¥4j C.als



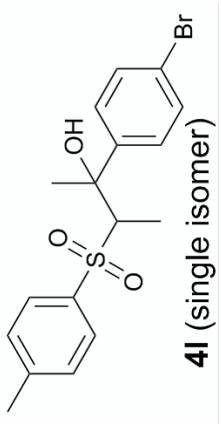
4l (single isomer)

DFILE 4l 1H.als
COMNT data naibu sulfon 1H
DATIM 21-09-2010 11:55:30
OBNUC 1H
EXMOD single_pulse.ex2
OBFRQ 600.17 MHz
OBSET 5.30 KHz
OBFIN 5.47 Hz
POINT 26214
FREQU 9008.87 Hz
SCANS 16
ACQTM 2.9098 sec
PD 2.0000 sec
PW1 6.90 usec
IRNUC 1H
CTEMP 23.2 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.24 Hz
RGAIN 48

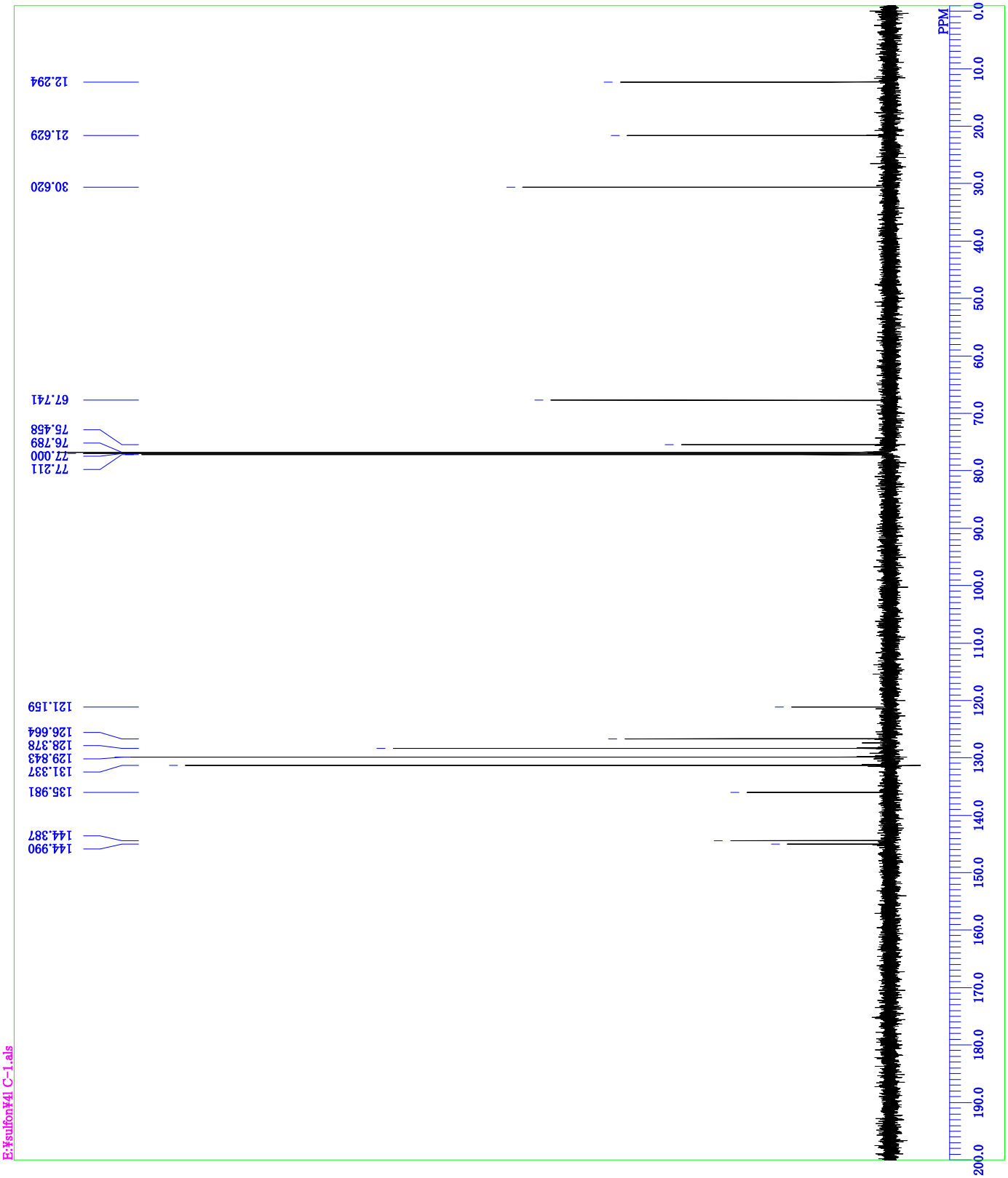


data naibu sulfon 1H

E:¥sulfon¥4l 1H.als

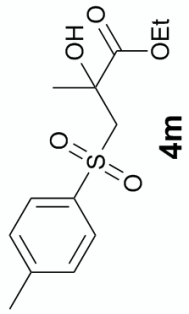


DFILE 4l C-1.als
COMNT data naibu sulfon 13C
DATIM 15-09-2010 20:12:45
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 150.92 MHz
OBSET 8.52 KHz
OBFIN 1.74 Hz
POINT 26214
FREQU 37878.21 Hz
SCANS 350
ACQTM 0.6921 sec
PD 1.2000 sec
PW1 4.80 usec
IRNUC 1H
CTEMP 24.3 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 56



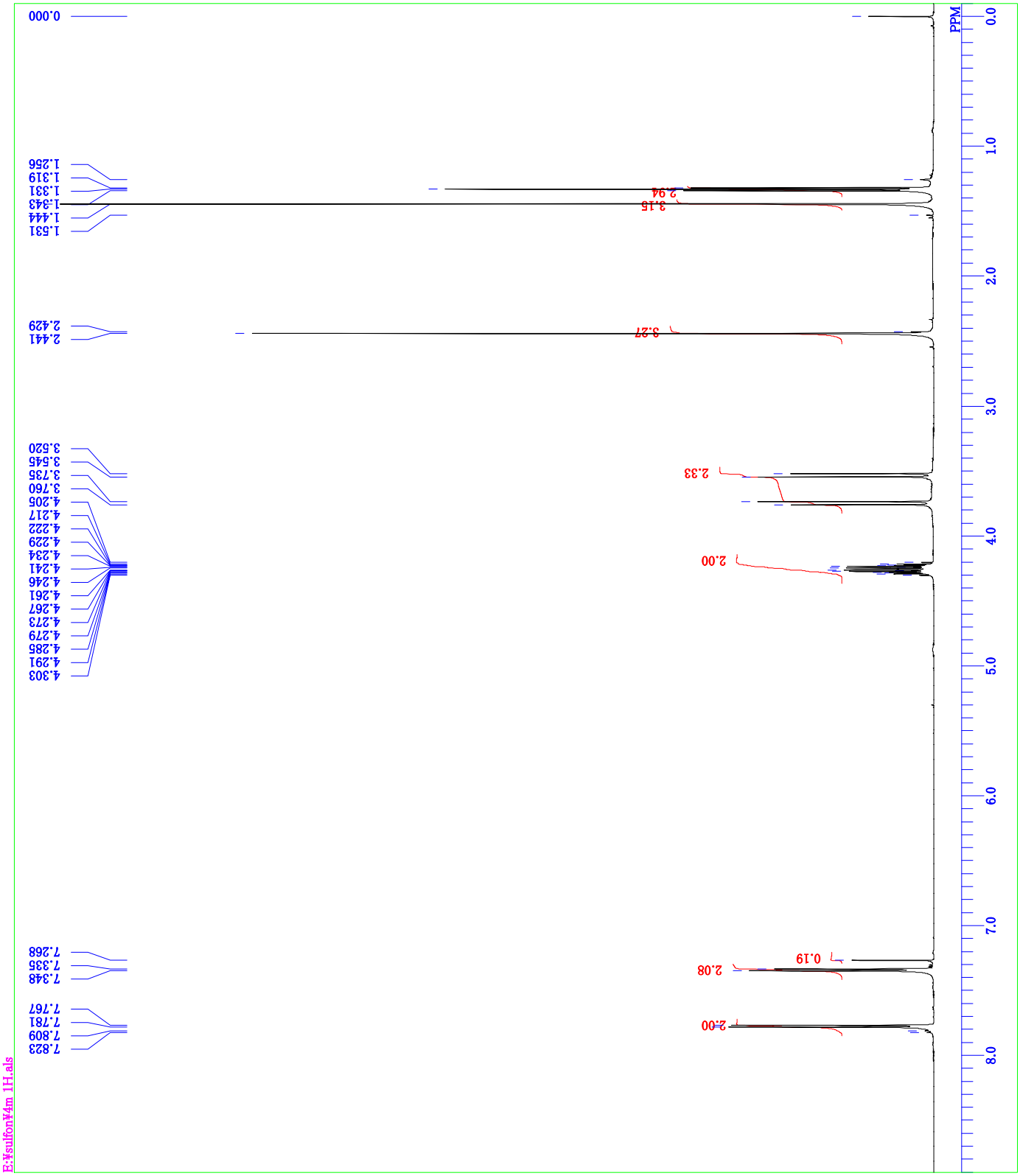
data naibu sulfon 13C

E:¥sulfon¥4l C-1.als

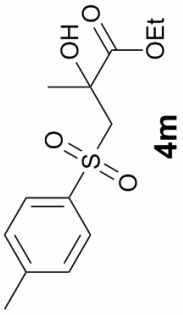


4m 1H.als
data methacrylate sulfon 1H
14-09-2010 13:41:41
1H
single_pulse.ex2
600.17 MHz
5.30 KHz
5.47 Hz
26214
9008.87 Hz
8
2.9098 sec
2.0000 sec
6.90 usec
1H
23.9 c
CDCL3
0.00 ppm
0.24 Hz
38

DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN

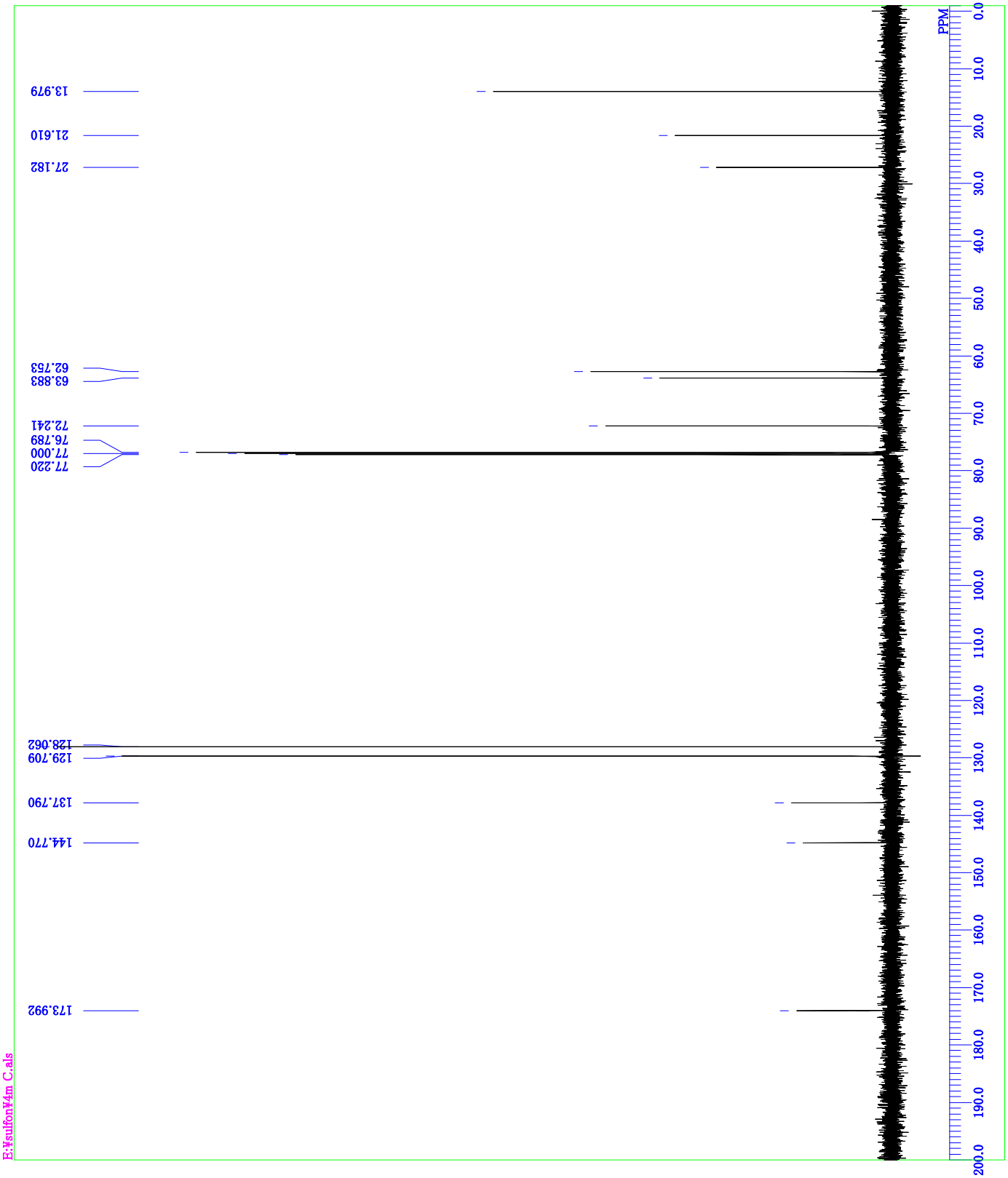


data methacrylate sulfon 1H
E:¥sulfon¥4m 1H.als



4m C.als
data methacrylate sulfon 13C
14-09-2010 13:52:12
13C
single_pulse_dec
150.92 MHz
8.52 KHz
1.74 Hz
26214
37878.21 Hz
284
0.6921 sec
1.2000 sec
4.80 usec
1H
24.6 c
CDCL3
77.00 ppm
0.24 Hz
56

DFILE
COMNT
DATIM
OBNUC
EXMOD
OBFRQ
OBSET
OBFIN
POINT
FREQU
SCANS
ACQTM
PD
PW1
IRNUC
CTEMP
SLVNT
EXREF
BF
RGAIN



data methacrylate sulfon 13C
E:¥sulfon¥4m C.als