SUPPORTING INFORMATION

$PtCl_2$-Catalyzed Rearrangement of Methylenecyclopropanes

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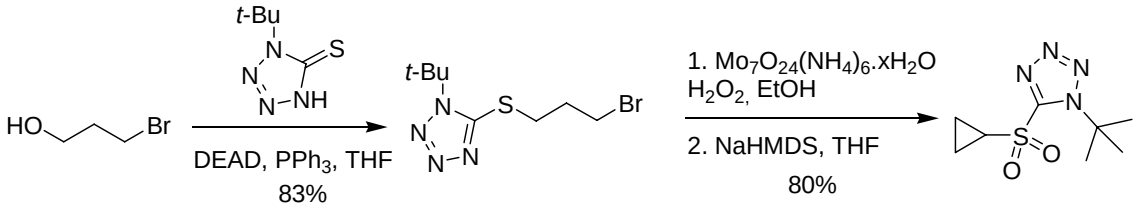
General. All reactions were carried out in flame-dried glassware under Ar. The solvents were purified by distillation over the drying agents indicated and were transferred under Ar: THF, Et_2O (Mg-anthracene), CH_2Cl_2 (P_4O_{10}), MeCN, Et_3N (CaH_2), MeOH (Mg), DMF, DMA (Desmodur®, dibutyltin dilaurate), hexane, toluene (Na/K). Flash chromatography: Merck silica gel 60 (230-400 mesh). NMR: Spectra were recorded on a Bruker DPX 300, AV 400, or DMX 600 spectrometer in the solvents indicated; chemical shifts (δ) are given in ppm relative to TMS, coupling constants (J) in Hz. The solvent signals were used as references and the chemical shifts converted to the TMS scale ($CDCl_3$: $\delta_C \equiv 77.0$ ppm; residual $CHCl_3$ in $CDCl_3$: $\delta_H \equiv 7.24$ ppm; CD_2Cl_2: $\delta_C \equiv 53.8$ ppm; residual CH_2Cl_2 in CD_2Cl_2: $\delta_H \equiv 5.32$ ppm). IR: Nicolet FT-7199 spectrometer, wavenumbers ($\tilde{\nu}$) in cm^{-1}. MS (EI): Finnigan MAT 8200 (70 eV), ESI-MS: Finnigan MAT 95, accurate mass determinations: Bruker APEX III FT-MS (7 T magnet). Melting points: Büchi melting point apparatus B-540 (corrected). Elemental analyses: H. Kolbe, Mülheim/Ruhr. All commercially available compounds (Fluka, Lancaster, Aldrich) were used as received.

Substrates



5-(3-Bromo-propylsulfanyl)-1-*tert*-butyl-1*H*-tetrazole. DEAD (1.73 mL, 11 mmol) was added to a solution of PPh_3 (2.89 g, 11 mmol) and 1-*tert*-butyl-1,4-dihydrotetrazole-5-thione (1.74 g, 11 mmol) in THF. The mixture was cooled to 0°C before 3-bromopropan-1-ol (0.9 mL, 10 mmol) was added via syringe. The resulting solution was stirred at ambient temperature for 30 min before all volatile materials were evaporated. The residue was purified by flash chromatography (hexanes/EtOAc gradient, 30/1→20/1→15/1→10/1) to give the title compound as a white solid (2.32 g, 83%). m.p.: 50-53°C. IR (film) 2982, 2938, 1507, 1473, 1431, 1409, 1375, 651, 544 cm^{-1}. ^1H NMR ($CDCl_3$, 300 MHz): δ = 3.54 (4H, q, *J* = 6.5 Hz), 2.42 (2H, quint., *J* = 6.7 Hz), 1.73 (9H, s). ^{13}C NMR ($CDCl_3$, 75 MHz): δ = 152.2, 61.3, 32.2, 31.8, 31.7, 28.9 (3C). Anal. *calcd* for $C_8H_{15}BrN_4S$: C 34.42, H 5.42, N 20.07, *found*: C 34.74, H 5.52, N 20.14.

1-***tert*-Butyl-5-cyclopropanesulfonyl-1*H*-tetrazole**. A solution of $Mo_7O_{24}(NH_4)_6{\cdot}xH_2O$ (2.1 g, 1.7 mmol) in H_2O_2 (30 % *w/w*, 21 mL) was added dropwise at 0°C within 5 minutes to a solution of 5-(3-bromo-propylsulfanyl)-1-*tert*-butyl-1*H*-tetrazole (5.54 g, 20.2 mmol) in EtOH (155 mL). After stirring for 90 min at room temperature, the solvent was evaporated. The crude material was dissolved in *tert*-butyl methyl ether, the organic phase was washed with water and brine, dried over Na_2SO_4 and concentrated.

A solution of the resulting colorless oil (5.77 g) in THF (45 mL) was slowly added via a dropping funnel within 9h to a solution of NaHMDS (3.74 g) in THF (900 mL) at –78°C. After the addition was complete, the reacton mixture was stirred for 1 h before it was quenched with sat. aq. NH_4Cl. The mixture was partitioned between water and *tert*-butyl methyl ether, the combined organic layers were washed with brine, dried over Na_2SO_4 and concentrated. Purification of the residue by flash chromatography (hexanes/EtOAc, 10/1) furnished compound **2** as a white solid (3.76 g, 80%). m.p. 93-95 °C. IR (KBr): 3067, 3000, 1336, 1161, 1052, 877, 709, 615 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): δ = 3.33-3.23 (1H, m), 1.86 (9H, s), 1.55-1-46 (2H, m), 1.46-1.33 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 154.9, 65.5, 33.5, 29.9 (3C), 7.1 (2C). MS (EI) *m/z* (rel. intensity): 111 (13), 110 (30), 82 (6), 67 (5), 57 (100), 41 (66). HRMS (ESIpos): *calcd* for $C_8H_{14}N_4NaO_2S$: 253.072966, *found*

253.072974. Anal. *calcd* for $C_8H_{14}N_4O_2S$: C 41.73, H 6.13, N 24.33; *found* C 41.81, H 6.25, N 24.42.

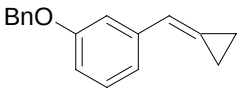
2-Allyloxy-3-methoxy-benzaldehyde. 2-Hydroxy-3-methoxy-benzaldehyde (760 mg, 5 mmol) was added as a solid to a stirred suspension of NaH (150 mg, 6.25 mmol) in DMF (5 mL) at 0°C. After stirring at room temperature for 2 h, allyliodide (0.9 mL, 10 mmol) was introduced and stirring was continued for 20 h. For work up, the mixture was diluted with *tert*-butyl methyl ether and washed with sat. aq. NH_4Cl and brine. Drying of the organic layer over Na_2SO_4, evaporation of the solvent, and purification of the residue by flash chromatography (hexanes/EtOAc, 15/1) gave the title compound as a pale yellow oil (737 mg, 68%). IR (neat): 3082, 3011, 2940, 2862, 2841, 2757, 1692, 1648, 1595, 1584, 1482, 1458, 1442, 1422, 1390, 1267, 1249, 1067, 983, 911, 786 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): δ = 10.46 (1H, s), 7.45-7.41 (1H, m), 7.16-7.14 (2H, m), 6.09 (1H, ddt, *J* = 17.2, 10.4, 5.8 Hz), 5.35 (1H, dq, *J* = 17.1, 1.6 Hz), 5.28 (1H, dq, *J* = 10.4, 1.2 Hz), 4.68 (2H), 3.92 (3H, s). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 190.7, 153.2, 151.4, 133.3, 130.3, 124.4, 119.2, 119.1, 118.2, 75.4, 56.2. MS (EI) *m/z* (rel. intensity): 192 (57), 151 (100), 136 (23), 131 (11), 122 (25), 108 (34), 93 (28), 65 (20), 52 (19), 41 (40). HRMS (EI): *calcd* for $C_{11}H_{12}O_3$: 192.078642, *found* 192.078848. Anal. *calcd* for $C_{11}H_{12}O_3$: C 53.55, H 4.87; *found* C 53.51, H 4.94.

Preparation of Alkylidenecyclopropanes by a Modified Julia-Kocienski Olefination

Representative procedure: 4-Cyclopropylidenemethyl-biphenyl (3). Cs_2CO_3 (1.95 g, 6 mmol) was added to a solution of 4-phenyl-benzaldehyde (364 mg, 2 mmol) and sulfone **2**(690 mg, 3 mmol) in THF (15 mL) and DMF (5 mL). The resulting suspension was stirred at 70°C for 40h. For work up, the mixture was poured into a saturated solution of NH_4Cl, the aqueous layer was extracted with *tert*-butyl methyl ether, the combined organic layers were washed with brine, dried over Na_2SO_4, filtered and evaporated. Purification of the residue by flash chromatography furnished product **3** as a white solid (313 mg, 76%). m.p. 66-68 °C. IR (KBr): 3086, 3033, 2971, 1747, 1596, 1580, 1558, 1521, 1488, 1450, 1427, 1408, 847, 757, 691 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): δ = 7.65-7.58 (6H, m), 7.46 (2H, t, *J* = 7.6 Hz), 7.38-7.33 (1H, m), 6.82-6.80 (1H, m), 1.51-1.46 (2H, m), 1.26-1.21 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 141.0, 139.6, 137.5, 128.9 (2C), 127.3 (2C), 127.2, 127.1 (2C), 127.0 (2C), 124.8, 118.0, 4.4, 0.9. MS (EI) *m/z* (rel. intensity): 206 (100), 191 (55), 165 (23), 152 (12), 128 (30), 101 (7), 91 (22). HRMS (EI): *calcd* for $C_{16}H_{14}$: 206.109549, *found* 206.109351. The

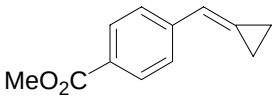
deuterated compound **3-D** was obtained analogously. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 7.68-7.56 (6H, m), 7.46 (2H, *t*, *J* = 7.6 Hz), 7.40-7.33 (1H, m), 1.48 (2H, dd, *J* = 10.1, 5.3 Hz), 1.24 (2H, dd, *J* = 9.7, 5.7 Hz). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 141.1, 139.6, 137.4, 128.9 (2C), 127.3 (2C), 127.2, 127.1 (2C), 127.0 (2C), 124.7, 117.7 (1C, t, *J* = 24.0 Hz), 4.4, 0.9. MS (EI) *m/z* (rel. intensity): 207 (100), 192 (41), 166 (13), 152 (12), 129 (21), 102 (4), 91 (15). HRMS (EI): *calcd* for $C_{16}H_{13}D$: 207.115829, *found* 207.115890.

1-Benzyloxy-3-cyclopropylidenemethyl-benzene (5). Prepared analogously as a white solid



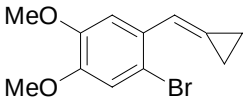
(156 mg, 66%). m.p. 72-74°C. IR (KBr): 3066, 3033, 2966, 2939, 2886, 1751, 1595, 1585, 1495, 1446, 1419, 1411, 1388, 1253, 1177, 1016, 993, 936, 1862, 808, 744, 696 cm^{-1}. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 7.52-7.32 (5H, m), 7.31-7.24 (1H, m), 7.23-7.19 (1H, m), 7.14 (1H, d, *J* = 7.3 Hz), 6.87 (1H, dd, *J* = 8.0, 2.6 Hz), 6.74 (1H, quint, *J* = 1.8 Hz), 5.12 (2H, s), 1.46-1.37 (2H, m), 1.24-1.15 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 159.1, 139.8, 137.3, 129.5, 128.7 (2C), 128.0, 127.6 (2C), 124.9, 119.9, 118.2, 113.4, 112.9, 70.1, 4.4, 0.7. MS (EI) *m/z* (rel. intensity): 236 (7), 145 (24), 91 (100). HRMS (EI): *calcd* for $C_{17}H_{16}O$: 236.120112, *found* 236.120433. Anal. *calcd* for $C_{17}H_{16}O$: C 86.41, H 6.82; *found* C 86.31, H 6.85.

4-Cyclopropylidenemethyl-benzoic acid methyl ester (7). Prepared analogously as a white



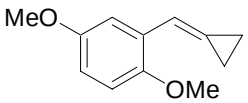
solid (113 mg, 60%). m.p. 53-55 °C. IR (KBr): 3077, 3037, 2977, 2951, 2844, 1720, 1606, 1436, 1278, 1109, 866, 759, 697 cm^{-1}. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 8.00 (2H, d, *J* = 8.4 Hz), 7.58 (2H, d, *J* = 8.4 Hz), 6.81 (1H, quint, *J* = 2.0 Hz), 3.92 (3H, s), 1.52-1.44 (2H, m), 1.27-1.18 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 167.2, 143.0, 130.2 (2C), 128.3, 126.6 (2C), 117.9, 52.2, 4.7, 0.9. MS (EI) *m/z* (rel. intensity): 188 (9), 157 (4), 129 (100). HRMS (EI): *calcd* for $C_{12}H_{12}O_2$: 188.083732, *found* 188.083656. Anal. *calcd* for $C_{12}H_{12}O_2$: C 76.57, H 6.43; *found* C 76.62, H 6.24.

1-Bromo-2-cyclopropylidenemethyl-4,5-dimethoxy-benzene (9). Prepared analogously as a



white solid (319 mg, 59%). m.p. 102-105 °C. IR (KBr): 2960, 2935, 2908, 2835, 1778, 1597, 1505, 1461 ,1450, 1381, 1257, 1208, 1163, 1026, 857. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 7.38 (1H, s), 7.05 (1H, qt, *J* = 2.0 Hz), 7.02 (1H, s), 3.89 (3H, s), 3.88 (3H, s), 1.45-1.39 (2H, m), 1.25-1.20 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 148.5, 148.3, 129.8, 124.9, 116.7, 115.2, 113.5, 109.4, 56.1, 55.8, 3.7, 0.7. MS (EI) *m/z* (rel. intensity): 270 (17), 268 (17), 239 (86), 237 (87), 189 (100), 145 (30). HRMS (ESIpos): *calcd* for $C_{12}H_{13}BrO_2$+Na 290.999126, *found* 290.998798. Anal. *calcd* for $C_{12}H_{13}BrO_2$: C 77.75, H 7.46; *found* C 77.63, H 7.51.

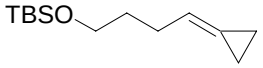
2-Cyclopropylidenemethyl-1,4-dimethoxy-benzene (11). Prepared analogously as a white



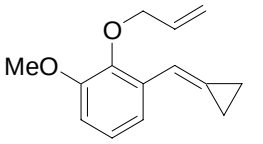
solid (75 mg, 64%). m.p. 68-70 °C. IR (KBr): 3114, 3085, 3045, 3008, 2961, 2934, 2836, 1721, 1636, 1586, 1500, 1645, 1453, 1417, 1180, 1045, 861, 816, 804 cm^{-1}. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 7.34 (1H,

d, *J* = 3.0 Hz), 7.12 (1H, quint, *J* = 2.0 Hz), 6.84 (1H, d, *J* = 8.9 Hz), 6.75 (1H, dd, *J* = 8.9, 3.1 Hz), 3.83 (3H, s), 3.80 (3H, s), 1.45-1.38 (2H, m), 1.22-1.15 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 153.9, 150.9, 128.2, 125.0, 112.6, 112.4 (2C), 112.2, 56.6, 55.8, 4.1, 0.9. MS (EI) *m/z* (rel. intensity): 190 (51), 175 (27), 159 (100). HRMS (EI): *calcd* for $C_{12}H_{14}O_2$: 190.099377, *found* 190.09950. Anal. *calcd* for $C_{12}H_{14}O_2$: C 75.76, H 7.42; *found* C 75.60, H 7.42.

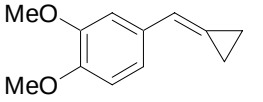
1-*tert*-Butyl-(4-cyclopropyliden-butoxy)-dimethyl-silane (13). Prepared analogously as a colorless oil (123 mg, 43%). IR (neat): 3052, 2980, 2955, 2929, 2895, 2857, 1256, 1101, 837, 775 cm^{-1}. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 5.77 (1H, tt, *J* = 6.7, 2.1 Hz), 3.64 (2H, t, *J* = 6.7 Hz), 2.23 (2H, q, *J* = 7.1 Hz), 1.68 (2H, quint, *J* = 6.8 Hz), 1.04-1.01 (4H, m), 0.91 (9H, s), 0.06 (6H, s). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 121.4, 118.0, 63.0, 32.7, 28.3, 26.1 (3C), 18.5, 2.2, 2.0, –5.1 (2C). MS (EI) *m/z* (rel. intensity): 226 (1), 169 (43), 139 (21), 75 (100). HRMS (ESIpos): *calcd* for $C_{13}H_{26}OSi$: 226.175297, *found* 226.175518.



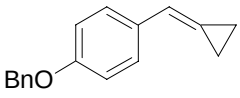
2-Allyloxy-1-cyclopropylidenemethyl-3-methoxy-benzene (17). Prepared analogously as a colorless oil (173 mg, 80%). IR (neat): 3077, 3046, 3007, 2975, 2936, 2836, 1769, 1743, 1647, 1596, 1579, 1475, 1439, 1420, 1271, 1208, 1092, 989, 927, 812, 746 cm^{-1}. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.42 (1H, dd, *J* = 7.9, 1.4 Hz), 7.14 (1H, quint, *J* = 2.0 Hz), 7.03 (1H, t, *J* = 8.0 Hz), 6.79 (1H, dd, *J* = 8.2, 1.4 Hz), 6.14 (1H, ddt, *J* = 17.2, 10.4, 5.8 Hz), 5.40 (1H, dq, *J* = 17.1, 1.6 Hz), 5.24 (1H, dq, *J* = 10.4, 1.2 Hz), 4.51 (2H, dt, *J* = 5.8, 1.3 Hz), 3.87 (3H, s), 1.44-1.38 (2H, m), 1.20-1.15 (2H, m). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 153.2, 145.1, 134.5, 132.6, 125.4, 123.9, 118.5, 117.4, 112.5, 110.6, 74.4, 55.9, 4.2, 0.7. MS (EI) *m/z* (rel. intensity): 216 (7), 175 (100), 159 (12), 147 (7), 132 (18), 115 (15), 103 (10), 91 (10), 77 (9). HRMS (ESIpos): *calcd* for $C_{14}H_{16}NaO_2$: 239.104248, *found* 239.104492. Anal. *calcd* for $C_{14}H_{16}O_2$: C 68.74, H 6.29; *found* C 68.52, H 6.36.



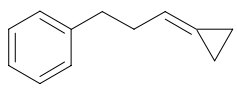
4-Cyclopropylidenemethyl-1,2-dimethoxy-benzene (22). Prepared analogously as a white solid (73 mg, 62%). m.p. 78-81 °C. IR (KBr): 3084, 3044, 3008, 2963, 2925, 2840, 1781, 1600, 1585, 1516, 1471, 1455, 1419, 1229, 1158, 1141, 1027, 858, 827, 787, 776 cm^{-1}. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 7.16 (1H, d, *J* = 1.8 Hz), 7.05 (1H, dd, *J* = 8.3, 1.9 Hz), 6.85 (1H, d, *J* = 8.3 Hz), 6.69 (1H, quint, *J* = 2.0 Hz), 3.92 (3H, s), 3.90 (3H, s), 1.45-1.37 (2H, m), 1.21-1.14 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 149.1, 148.2, 131.7, 122.2, 119.5, 118.0, 111.3, 109.4, 56.1, 55.9, 4.1, 0.7. MS (EI) *m/z* (rel. intensity): 190 (31), 175 (14), 159 (100). HRMS (EI): *calcd* for $C_{12}H_{14}O_2$: 190.099383, *found* 190.099238. Anal. *calcd* for $C_{12}H_{14}O_2$: C 75.76, H 7.42; *found* C 75.56, H 7.36.



1-Benzyloxy-4-cyclopropylidenemethyl-benzene (25). Prepared analogously as a white solid (145 mg, 56%). m.p. 72-74 °C. IR (KBr): 3060, 3037, 2968, 2942, 2922, 2865, 1764, 1606, 1573, 1510, 1452, 1414, 1381, 1249, 1012, 837, 741, 696 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): δ = 7.51-7.43 (3H, m), 7.42-7.38 (2H, m), 7.37-7.33 (1H, m), 6.96 (2H, d, *J* = 9.0 Hz), 6.70 (1H, quint, *J* = 2.0 Hz), 5.09 (2H, s), 1.42-1.36 (2H, m), 1.19-1.14 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 157.8, 137.2, 131.6, 128.7 (2C), 128.1, 127.8 (2C), 127.6 (2C), 122.0, 117.6, 115.0 (2C), 70.1, 4.1, 0.6. MS (EI) *m/z* (rel. intensity): 236 (6), 145 (52), 91 (100). HRMS (EI): *calcd* for $C_{17}H_{16}O$: 236.120118, *found* 236.120187. Anal. *calcd* for $C_{17}H_{16}O$: C 86.41, H 6.82; *found* C 86.35, H 6.84.

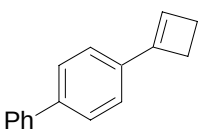


(3-Cyclopropylidene-propyl)-benzene (15). *t*-BuOK (750 mg, 6.6 mmol) was added in portions within 15 minutes to a stirred suspension of 3-bromopropyl triphenylphosphonium bromide (1.56 g, 3.3 mmol) in THF (20 mL). The orange mixture was then stirred at 70°C for 2h, before 3-phenyl-propionaldehyde (0.4 mL, 3 mmol) was added and reflux was continued for 2h. The reaction was quenched at room temperature with water, the aqueous layer was extracted twice with hexanes, and the combined organic layers were washed with brine and were dried over Na_2SO_4. Evaporation of the solvent followed by flash chromatography (pentanes) of the residue gave the title compound as a colorless oil (274 mg, 58%). IR (neat): 3027, 2978, 2924, 2853, 1603, 1495, 1453, 1410, 743, 695 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): δ = 7.39-7.15 (5H, m), 5.81 (1H, tt, *J* = 6.7, 2.1 Hz), 2.78 (2H, dd, *J* = 8.4, 7.2 Hz), 2.51 (2H, q, *J* = 7.5 Hz), 1.07-0.93 (4H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 142.4, 128.6 (2C), 128.4 (2C), 125.8, 122.1, 117.5, 35.9, 33.8, 2.3, 2.0. MS (EI) *m/z* (rel. intensity): 158 (2), 143 (22), 130 (28), 91 (100). HRMS (EI): *calcd* for $C_{12}H_{14}$: 158.109548, *found* 158.109365.



$PtCl_2$ Catalyzed Rearrangement Reactions

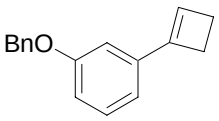
Representative Procedure: 4-Cyclobuten-1-yl-biphenyl (4). $PtCl_2$ (1 mg, 0.0038 mmol) was added to a solution of 4-cyclopropylidenemethyl-biphenyl **3** (90 mg, 0.437 mmol) in toluene (4.3 mL). CO was bubbled into the solution via a needle for ca. 30 seconds and the resulting mixture was then stirred at 80 °C under CO atmosphere (1 atm). For work up, the mixture was filtered under Argon through a short pad of silica and the filtrate was evaporated to give product **4** as a white, air sensitive solid (69 mg, 77%). IR (KBr): 3054, 3030, 2949, 2915, 1867, 2834, 1672, 1596, 1580, 1485, 1448, 1407, 840, 745, 689 cm^{-1}. ^1H NMR (300 MHz, CD_3CN): δ = 7.68-7.60 (4H, m), 7.50-7.42 (4H, m), 7.40-7.33 (1H, m), 6.82-6.80 (1H, t, *J* = 1.4 Hz), 2.87-2.83 (2H, m), 2.57-2.53 (2H, m). ^{13}C NMR (75 MHz, CD_3CN): δ = 147.1, 141.4, 140.9, 135.1, 129.9 (2C), 128.6, 128.4, 127.9 (2C), 127.7 (2C), 125.7 (2C), 29.4, 27.0. MS (EI) *m/z*



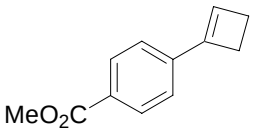
(rel. intensity): 206 (100), 191 (38), 178 (37), 165 (16), 152 (15), 128 (17), 101 (8), 91 (15). HRMS (EI): *calcd* for $C_{16}H_{14}$: 206.109547, *found* 206.109387.

All other cyclobutenes were prepared analogously. Their analytical and spectroscopic data are compiled below:

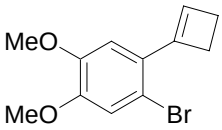
1-Benzyloxy-3-cyclobuten-1-yl-benzene (6). White, air sensitive solid (27 mg, 90%). IR (neat): 3041, 2948, 2918, 2838, 1591, 1576, 1485, 1464, 1455, 1433, 1383, 1324, 1286, 1241, 1220, 1205, 1183, 1160, 1012, 852, 803, 746, 696 cm^{-1}. ^1H NMR (300 MHz, CD_3CN): δ = 7.49-7.32 (5H, m), 7.25 (1H, t, *J* = 7.8 Hz), 7.01-6.95 (2H, m), 6.92-6.86 (1H, m), 6.33 (1H, t, *J* = 1.4 Hz), 5.11 (2H, s), 2.82-2.77 (2H, m), 2.55-2.48 (2H, m). ^{13}C NMR (75 MHz, CD_3CN): δ = 160.0, 147.4, 138.5, 137.5, 130.5, 129.5 (2C), 128.9, 128.8, 128.7 (2C), 117.8, 115.3, 111.5, 70.6, 29.5, 26.8. MS (EI) *m/z* (rel. intensity): 236 (16), 145 (3), 91 (100). HRMS (EI): *calcd* for $C_{17}H_{16}O$: 236.120119, *found* 236.120340.



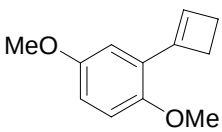
4-Cyclobuten-1-yl-benzoic acid methyl ester (8). White, air sensitive solid (25 mg, 80%). IR (neat): 2946, 2910, 2831, 1717, 1601 ,1567, 1433, 1410, 1276, 1108, 1027, 735 cm^{-1}. ^1H NMR (300 MHz, CD_3CN): δ = 7.96 (2H, d, *J* = 8.4 Hz), 7.47 (2H, d, *J* = 7.7 Hz), 6.51 (1H, t, *J* = 1.4 Hz), 3.86 (3H, s), 2.88-2.83 (2H, m), 2.58-2.53 (2H, m). ^{13}C NMR (75 MHz, CD_3CN): δ = 167.5, 146.6, 140.0, 131.9, 130.5 (2C), 130.0, 125.1 (2C), 52.6, 29.4, 27.2. MS (EI) *m/z* (rel. intensity): 188 (34), 157 (17), 129 (100), 59 (7). HRMS (EI): *calcd* for $C_{12}H_{12}O_2$: 188.083730, *found* 188.083494.



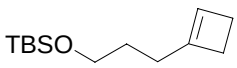
1-Bromo-2-cyclobuten-1-yl-4,5-dimethoxy-benzene (10). White, air sensitive solid (18 mg, 61%). IR (KBr): 3084, 3001, 2919, 2834, 1690, 1593, 1565, 1508, 1458, 1432, 1338, 1259, 1211, 1170, 1027, 852, 785 cm^{-1}. ^1H NMR (300 MHz, CD_2Cl_2): δ = 6.99 (1H, s), 6.77 (1H, s), 6.56 (1H, s), 3.80 (6H, s), 2.92-2.89 (2H, m), 2.51-2.46 (2H, m). ^{13}C NMR (75 MHz, CD_2Cl_2): δ = 149.6, 149.1, 145.1, 132.5, 127.6, 117.3, 112.2, 111.3, 56.8, 56.7, 31.8, 27.0. MS (EI) *m/z* (rel. intensity): 270 (37), 268 (38), 242 (10), 240 (8), 189 (100), 158 (58). HRMS (EI): *calcd* for $C_{12}H_{13}BrO_2$: 268.009907, *found* 268.010036.



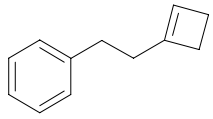
2-Cyclobuten-1-yl-1,4-dimethoxy-benzene (12). Pale yellow, air sensitive solid (50 mg, 50%). IR (KBr): 3001, 2956, 2911, 2832, 1613, 1586, 1497, 1464, 1452, 1442, 1397, 1315, 1279, 1215, 1044, 854, 821, 814, 766, 739 cm^{-1}. ^1H NMR (300 MHz, CD_3CN): δ = 6.88 (1H, d, *J* = 8.8 Hz), 6.79 (1H, dd, *J* = 8.8, 2.9 Hz), 6.74 (1H, d, *J* = 3.3 Hz), 6.34 (1H, t, *J* = 1.3 Hz), 3.80 (3H, s), 3.74 (3H, s), 2.85-2.81 (2H, m), 2.56-2.51 (2H, m). ^{13}C NMR (75 MHz, CD_3CN): δ = 154.4, 153.6, 143.9, 133.4, 125.3, 114.0, 113.2, 112.8, 56.2 (2C), 30.6, 27.8. MS (EI) *m/z* (rel. intensity): 190 (100), 175 (51), 159 (75). HRMS (EI): *calcd* for $C_{12}H_{14}O_2$: 190.099384, *found* 190.099162.



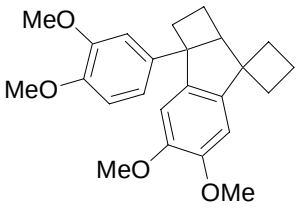
1-*tert*-Butyl-(4-cyclobuten-1-yl)-dimethyl-silane (14). Colorless, air sensitive oil (10 mg, 93%). IR (neat): 2928, 2857, 1631, 1472, 1254, 1099, 832, 773 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): δ = 5.69-5.67 (1H, m), 3.64 (2H, t, *J* = 6.6 Hz), 2.45-2.41 (2H, m), 2.36-2.32 (2H, m), 2.09-2.00 (2H, m), 1.66 (2H, quint, *J* = 6.7 Hz), 0.91 (9H, s), 0.06 (6H, s). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 150.4, 126.9, 63.0, 31.3, 30.1, 27.5, 26.6, 26.1 (3C), 18.5, –5.1 (2C). MS (EI) *m/z* (rel. intensity): 169 (47), 141 (28), 75 (100). HRMS (CI): *calcd* for $C_{13}H_{17}OSi$: 227.183121, *found* 227.183220.



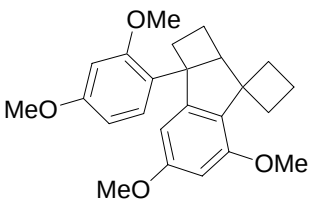
(3-Cyclobutenyl-propyl)-benzene (16). Colorless, air sensitive oil (30 mg, 95%). IR (neat): 3028, 2919, 2841, 1629, 1604, 1496, 1453, 1410, 853, 747, 696 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): δ = 7.32-7.27 (2H, m), 7.23-7.17 (3H, m), 5.71(1H, s), 2.79 (2H, dd, *J* = 8.2, 7.2 Hz), 2.46-2.43 (2H, m), 2.38-2.30 (4H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 150.0, 142.3, 128.4 (4C), 127.4, 125.9, 33.3, 33.0, 31.4, 26.7. MS (EI) *m/z* (rel. intensity): 158 (2), 143 (10), 130 (29), 91 (100). HRMS (EI): *calcd* for $C_{12}H_{14}$: 158.109551, *found* 158.109352.



Compound 23. $PtCl_2$ (2 mg, 0.0075 mmol) was added to a solution of compound **22** (30 mg, 0.158 mmol) in toluene (0.1 M) and the resulting mixture was stirred at 80°C under CO atmosphere for 4h. Purification of the crude mixture by flash chromatography (hexanes, then hexanes/EtOAc, 4/1) gave a first fraction of pure compound **23** (10 mg) and second fraction of a mixture of **23** and its regioisomer **24** (16 mg), both as colorless oils (combined yield 87%). IR (neat): 2931, 1831, 1603, 1587, 1513, 1498, 1642, 1334, 1245, 1173, 1139, 1109, 1027, 849, 759 cm^{-1}. ^1H NMR (600 MHz, $CDCl_3$): δ = 6.94 (1H, s), 6.78 (1H, d, *J* = 8.3 Hz), 6.72 (1H, dd, *J* = 8.2, 2.1 Hz), 6.56 (1H, d, *J* = 2.1 Hz), 6.44 (1H, s), 3.93 (3H, s), 3.82 (3H, s), 3.76 (3H, s), 3.74 (3H, s), 3.10 (1H, t, *J* = 8.1 Hz), 2.69 (1H, dt, *J* = 11.1, 9.7 Hz), 2.39-2.33 (1H, m), 2.26-2.18 (4H, m), 2.08-1.94 (3H, m), 1.62-1.55 (1H, m). ^{13}C NMR (150 MHz, $CDCl_3$): δ = 149.2, 149.0, 148.8, 147.0, 142.2, 141.0, 140.8, 117.6, 111.0, 109.6, 106.9, 105.8, 57.5, 57.3, 56.1, 56.0, 55.9, 55.7, 53.4, 38.1, 29.6, 28.5, 19.5, 16.0. MS (EI) *m/z* (rel. intensity): 380 (42), 352 (74), 324 (100). HRMS (ESIpos): *calcd* for $C_{24}H_{28}O_4$+Na: 403.187979, *found* 403.188368.



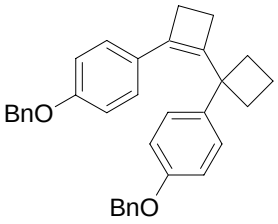
Regioisomer **24**: (resolved signals) ^1H NMR (400 MHz, $CDCl_3$): δ = 7.00-6.95 (2H, m), 6.60 (1H, d, *J* = 2.0 Hz), 3.83 (3H, s), 3.82 (3H, s), 3.80 (3H, s), 3.68 (3H, s), 2.66-2.56 (4H, m), 2.55-2.48 (2H, m), 2.47-2.41 (2H, m). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 148.9, 147.9, 147.2, 145.9, 117.9, 110.6, 110.0, 109.9, 55.8, 55.6, 33.8, 26.6, 26.3, 25.4, 16.7.



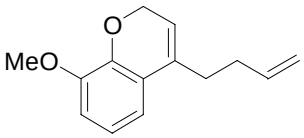
Compound 21. This compound was obtained analogously from substrate **11** as a white solid (16 mg, 53%). m.p. 160-163°C. IR (neat): 2942, 2831, 1587, 1487, 1463, 1436, 1416, 1281, 1253, 1221, 1204, 1178, 1081, 1057, 1032, 874, 796, 725 cm^{-1}. ^1H NMR (600 MHz, $CDCl_3$): δ = 6.79 (1H, d, *J* = 2.9 Hz), 6.71 (1H, d, *J* =

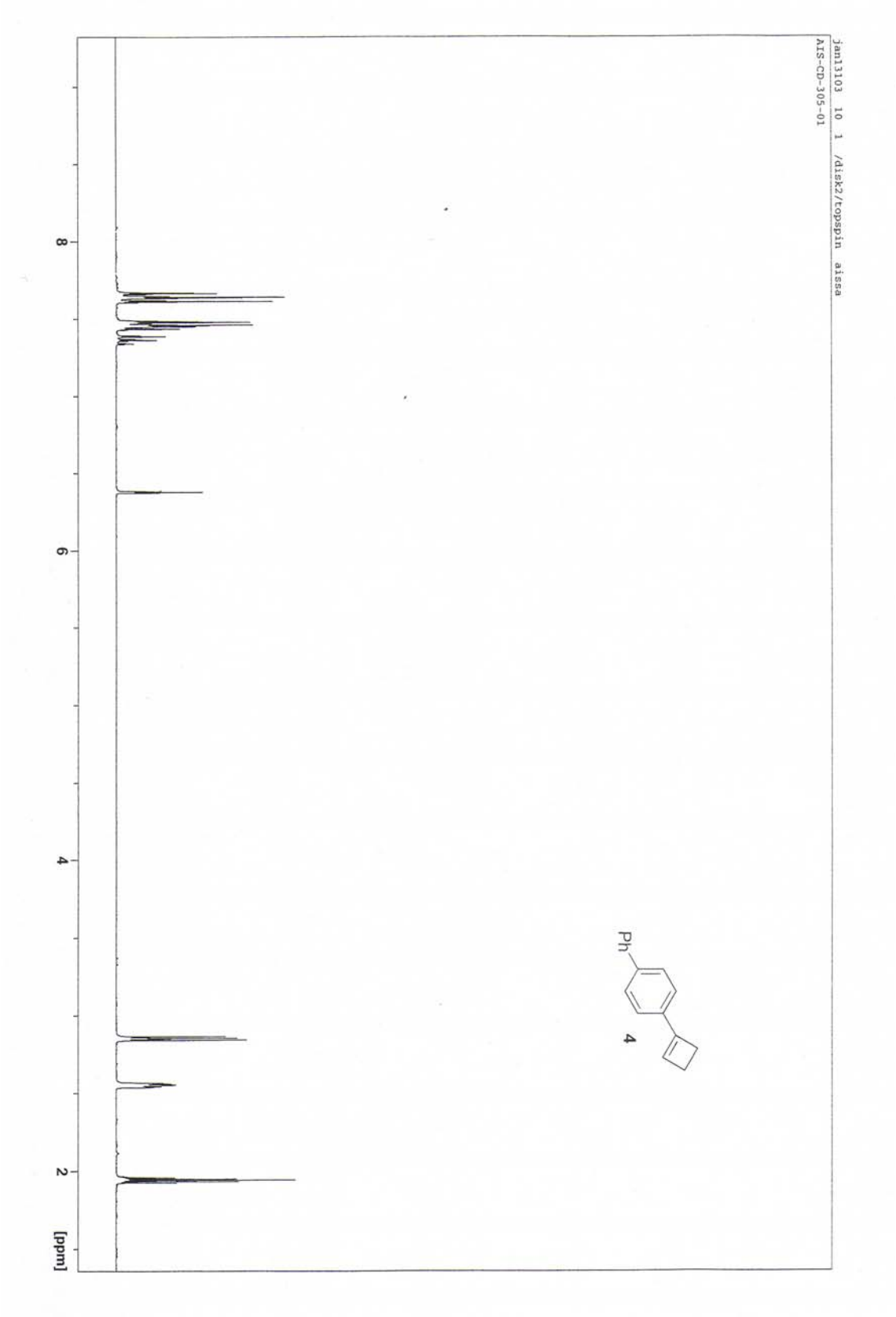
8.6 Hz), 6.66 (1H, d, *J* = 8.8 Hz), 6.63 (1H, dd, *J* = 8.8, 2.9 Hz), 6.57 (1H, d, *J* = 8.6 Hz), 3.86 (3H, s), 3.72 (3H, s), 3.51 (3H, s), 3.47 (3H, s), 3.21 (1H, dd, *J* = 9.1, 7.5 Hz), 2.86 (1H, dt, *J* = 11.2, 9.9 Hz), 2.83-2.77 (1H, m), 2.62-2.55 (1H, m), 2.21-2.09 (4H, m), 2.05 (1H, dddd, *J* = 11.9, 10.1, 9.1, 3.1), 1.85-1.77 (1H, m), 1.63 (1H, ddt, *J* = 11.9, 9.5, 7.5 Hz). ^{13}C NMR (150 MHz, $CDCl_3$): δ = 152.9, 152.1, 151.9, 150.8, 139.9, 137.8, 135.5, 116.3, 111.8, 111.0, 110.2, 110.1, 57.6, 55.9, 55.8, 55.7, 55.6, 55.5, 53.8, 35.4, 28.4, 27.2, 20.2, 15.3. MS (EI) *m/z* (rel. intensity): 380 (30), 352 (36), 324 (100). HRMS (ESIpos): *calcd* for $C_{24}H_{28}O_4$+Na: 403.187981, *found* 403.187676.

Compound 26. Obtained analogously from substrate **25** as a white solid (13 mg, 43%). m.p. 113-117°C. IR (neat): 3033, 2937, 2915, 2899, 2830, 1605, 1571, 1506, 1467, 1454, 1380, 1287, 1235, 1173, 1013, 835, 811, 745, 698 cm^{-1}. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.49-7.31 (10H, m), 7.09 (2H, d, *J* = 8.8 Hz), 6.97 (2H, d, *J* = 8.3 Hz), 6.87 (2H, d, *J* = 8.8 Hz), 5.07 (2H, s), 5.05 (2H, s), 2.68-2.63 (2H, m), 2.61-2.52 (4H, m), 2.51-2.42 (2H, m), 1.99-1.90 (2H, m). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 157.2, 156.6, 145.3, 139.4, 136.9, 136.7, 136.3, 128.7, 128.2 (4C), 127.6, 127.58, 127.5 (2C), 127.2 (2C), 127.1 (2C), 126.8 (2C), 114.3 (2C), 114.0 (2C), 69.7, 69.6, 47.3, 33.6 (2C), 25.9, 25.1, 16.3. MS (EI) *m/z* (rel. intensity): 472 (8), 444 (4), 381 (21), 91 (100). HRMS (EI): *calcd* for $C_{34}H_{32}O_2$: 472.240592, *found* 472.240233.



4-But-3-enyl-8-methoxy-2*H*-chromene (19). $PtCl_2$ (3.5 mg, 0.0132 mmol) was added to a solution of substrate **17** (33 mg, 0.139 mmol) in toluene (1.4 mL). The solution was stirred for 4.5 h at 80°C before it was transferred at room temperature into a flask containing a solution of the Grubbs catalyst $Cl_2(PCy_3)_2Ru$=CHPh (5.7 mg, 0.00695 mmol) in CH_2Cl_2 (30 mL). The resulting mixture was refluxed for 30 min, the reaction was quenched with a few drops of ethyl vinyl ether, the solvent was evaporated, and the residue was purified by flash chromatography (hexanes/EtOAc, 20/1) to give chromene **19** as a yellow oil (21 mg, 64%). IR (neat): 3075, 2997, 2934, 2836, 1641, 1603, 1576, 1477, 1440, 1270, 1220, 1199, 1176, 1152, 1091, 1050, 1007, 913 cm^{-1}. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 6.95-6.79 (3H, m), 5.88 (1H, ddt, *J* = 17.0, 10.2, 6.5 Hz), 5.65-5.60 (1H, m), 5.07 (1H, dq, *J* = 17.0, 1.7 Hz), 5.01 (1H, dq, *J* = 10.1, 1.0 Hz), 4.83-4.79 (2H, m), 3.88 (3H, s), 2.52-2.44 (2H, m), 2.35-2.26 (2H, m). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 148.2, 143.5, 138.1, 133.9, 124.4, 120.7, 117.9, 115.7, 115.1, 111.8, 65.7, 56.2, 32.2, 31.1. MS (EI) *m/z* (rel. intensity): 216 (100), 201 (19), 175 (30). HRMS (EI) : *calcd* for $C_{14}H_{16}O_2$: 216.115032, *found* 216.115269.

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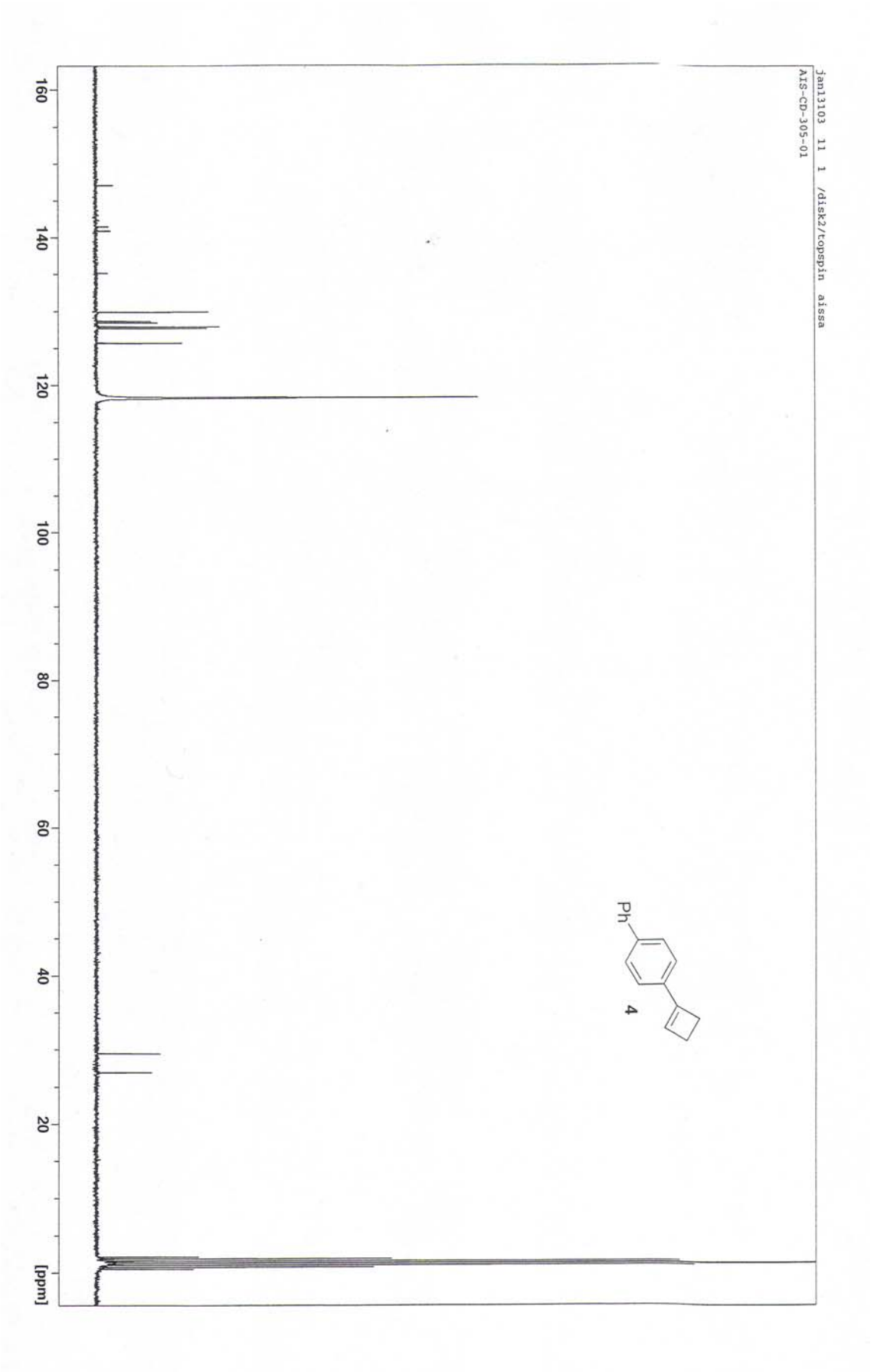
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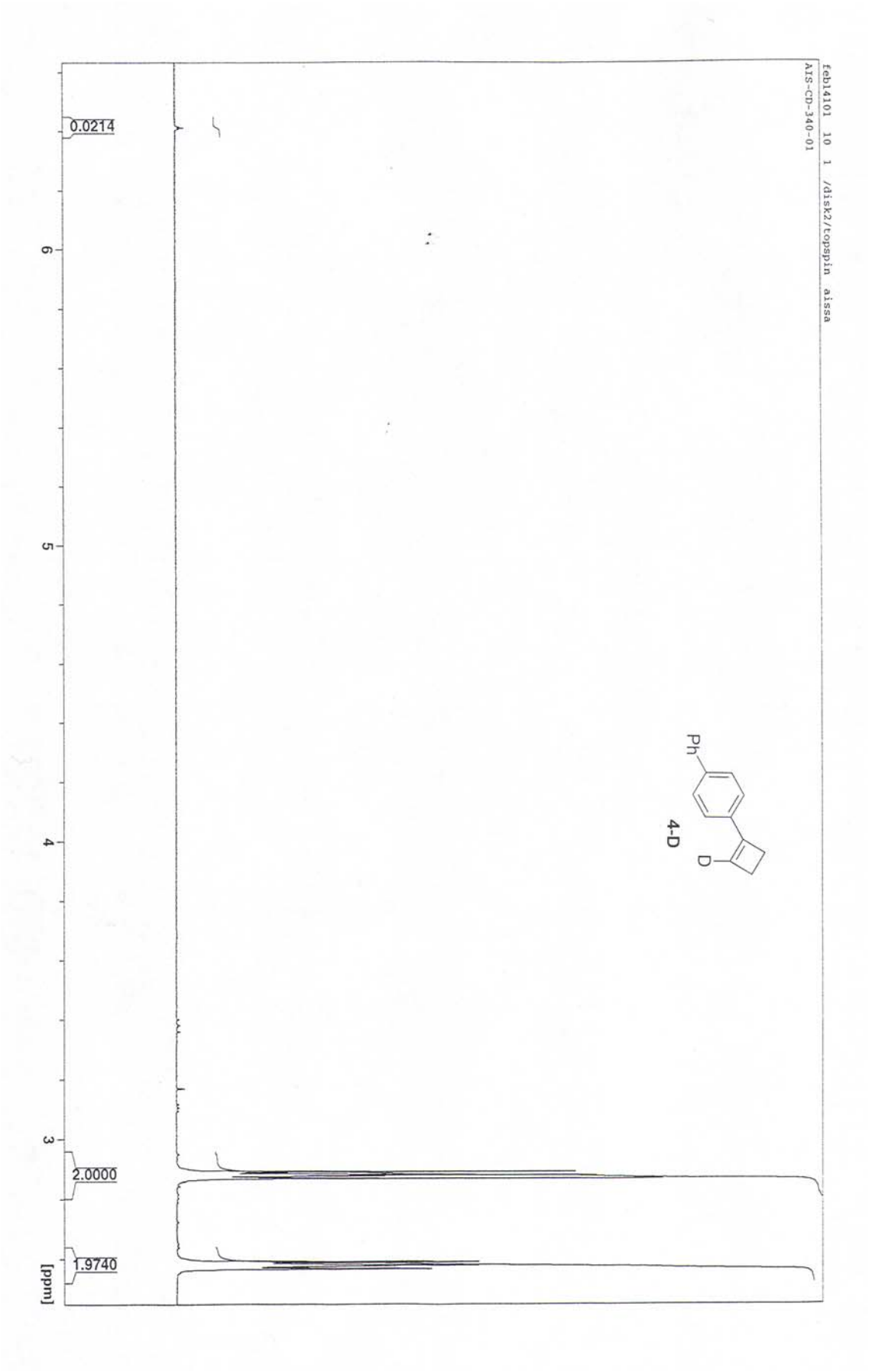
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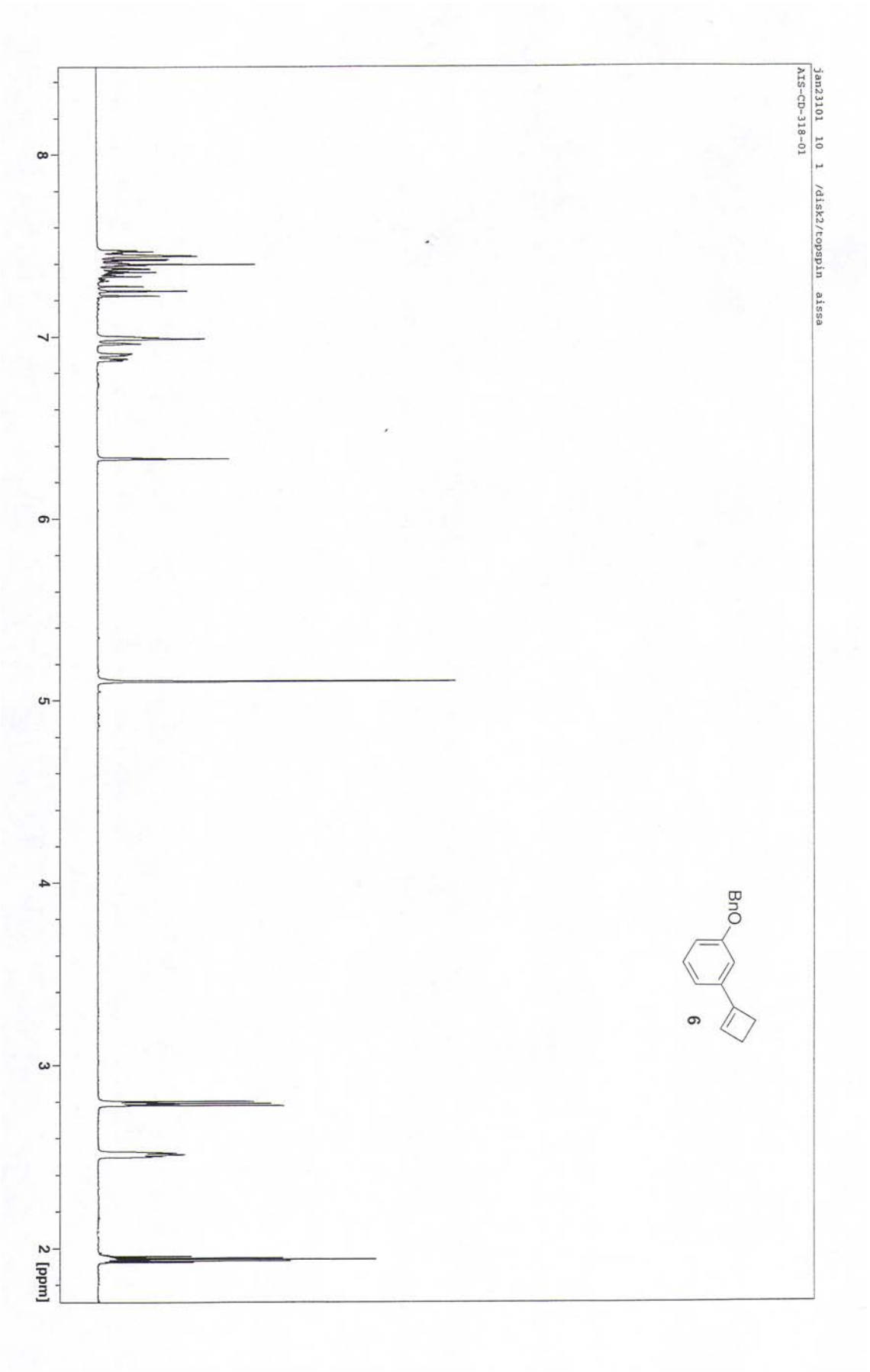
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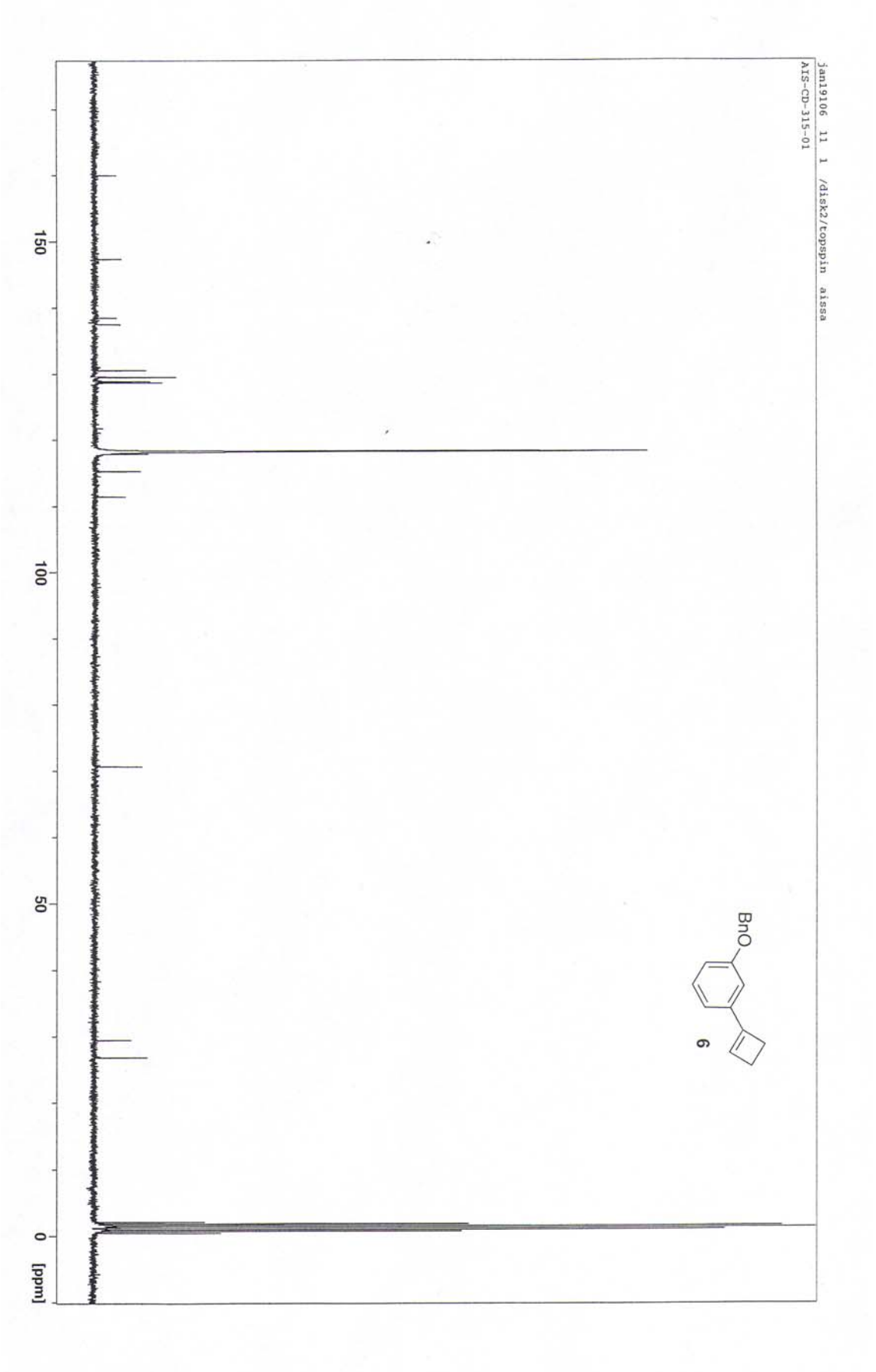
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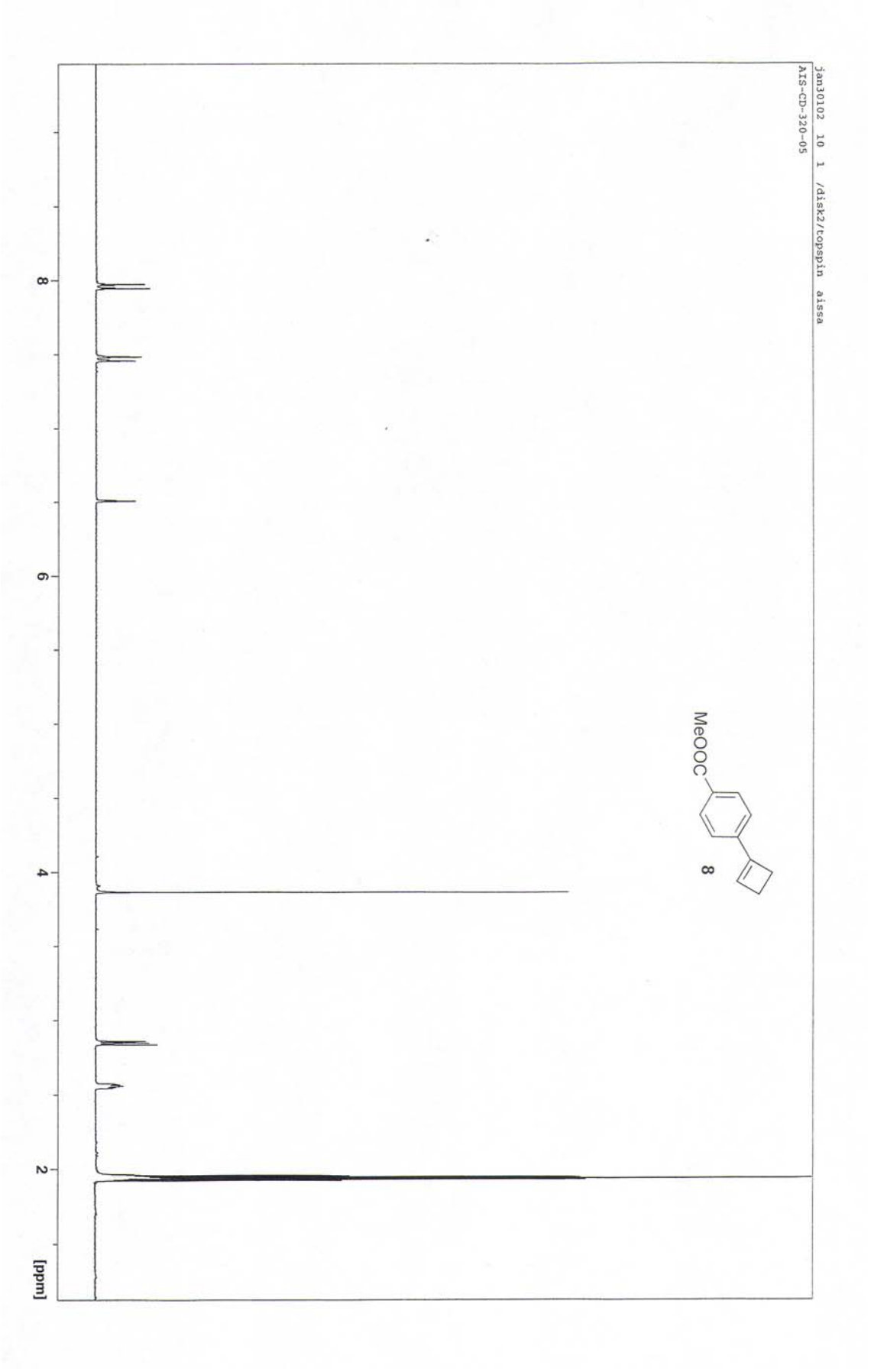
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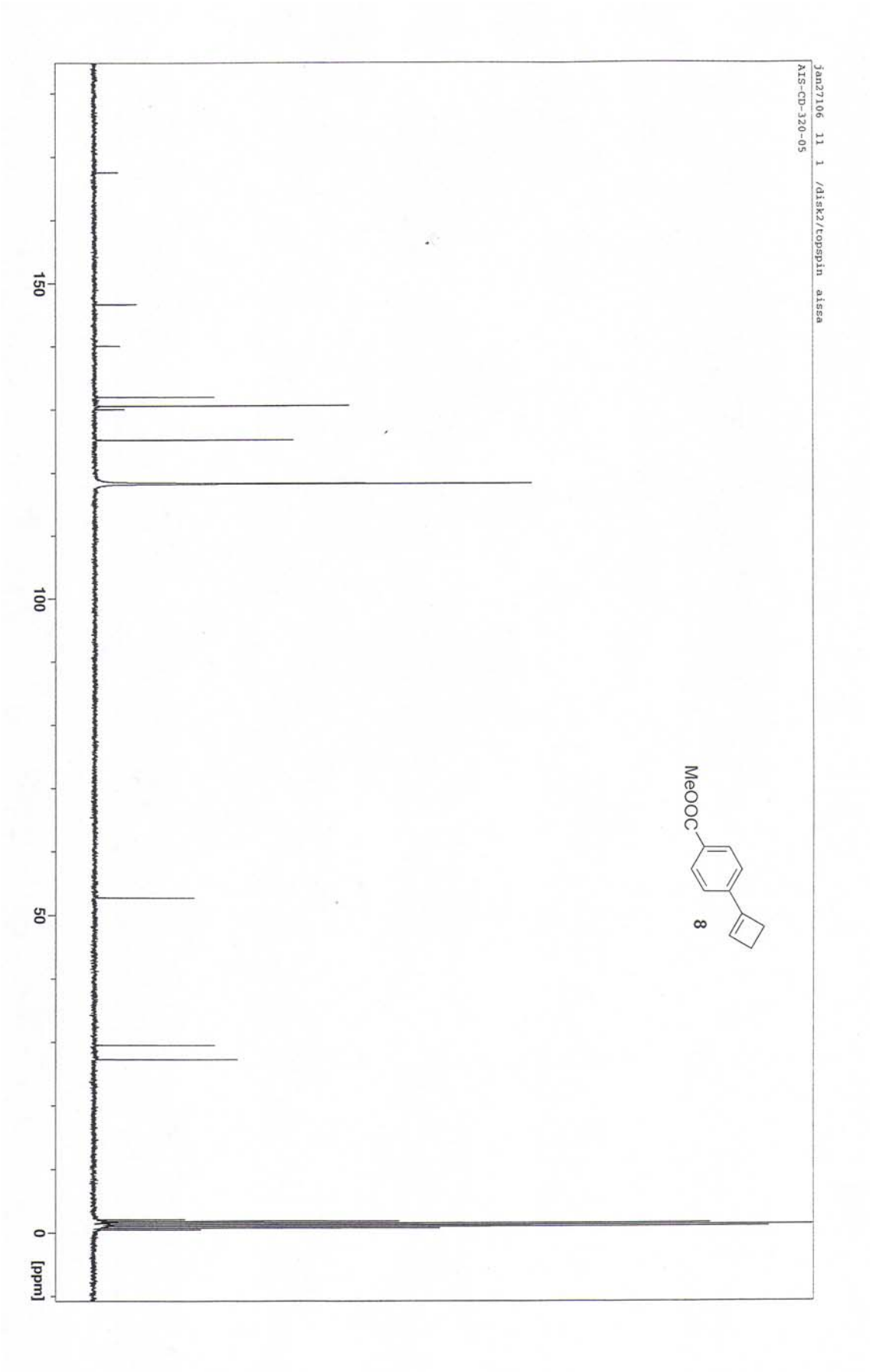
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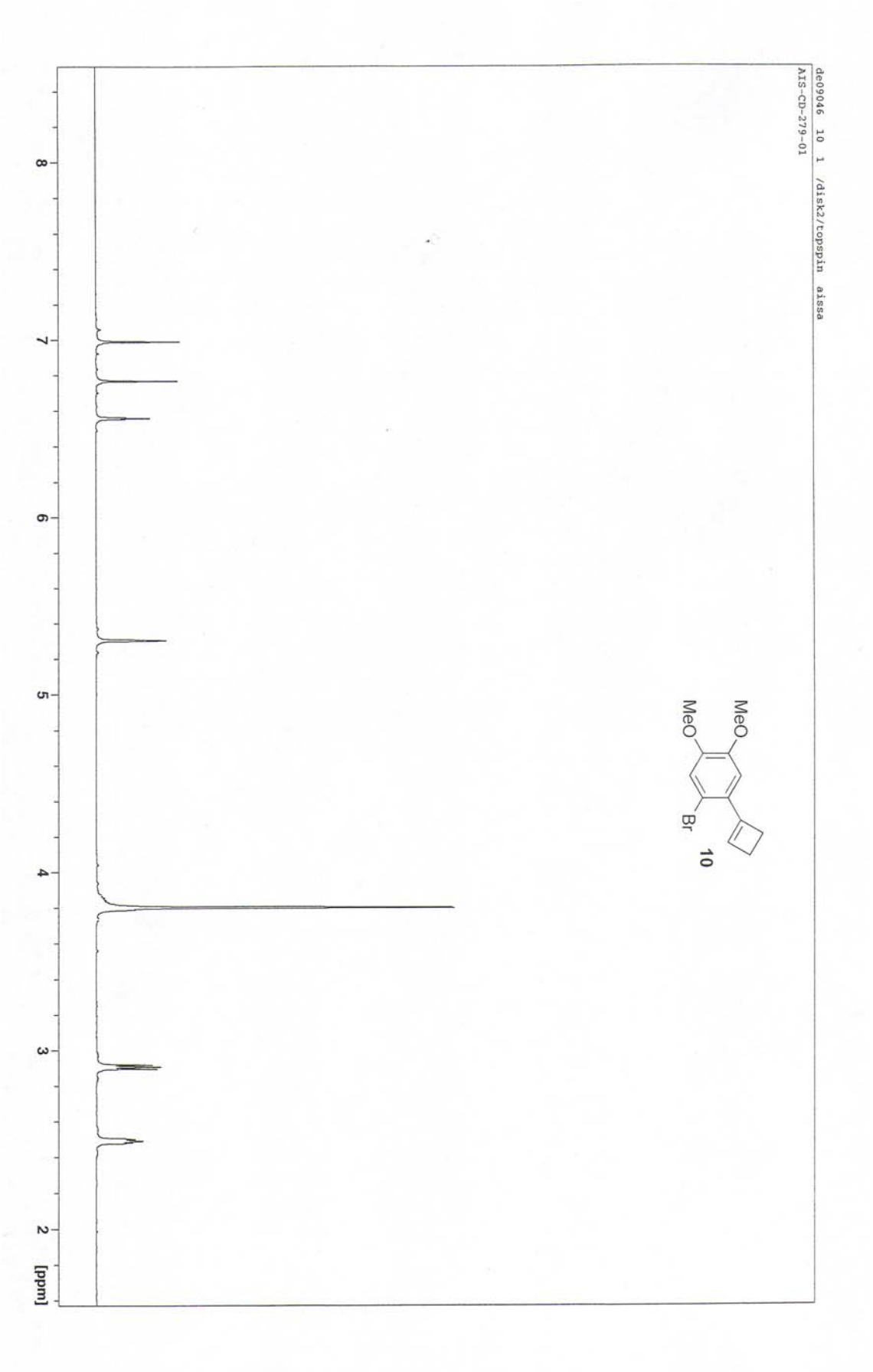
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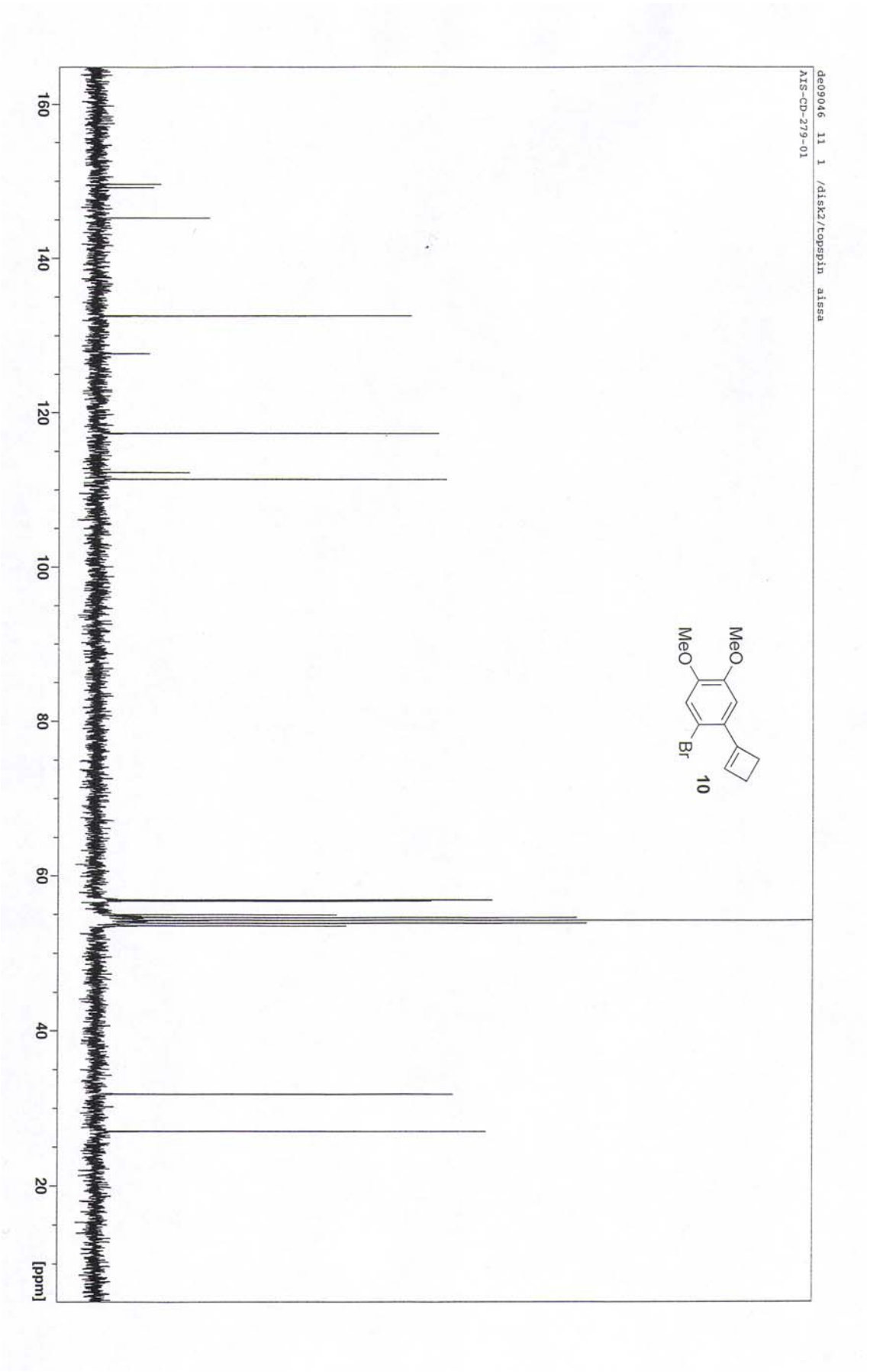
de09046 11 1 /disK2/topspin aissa
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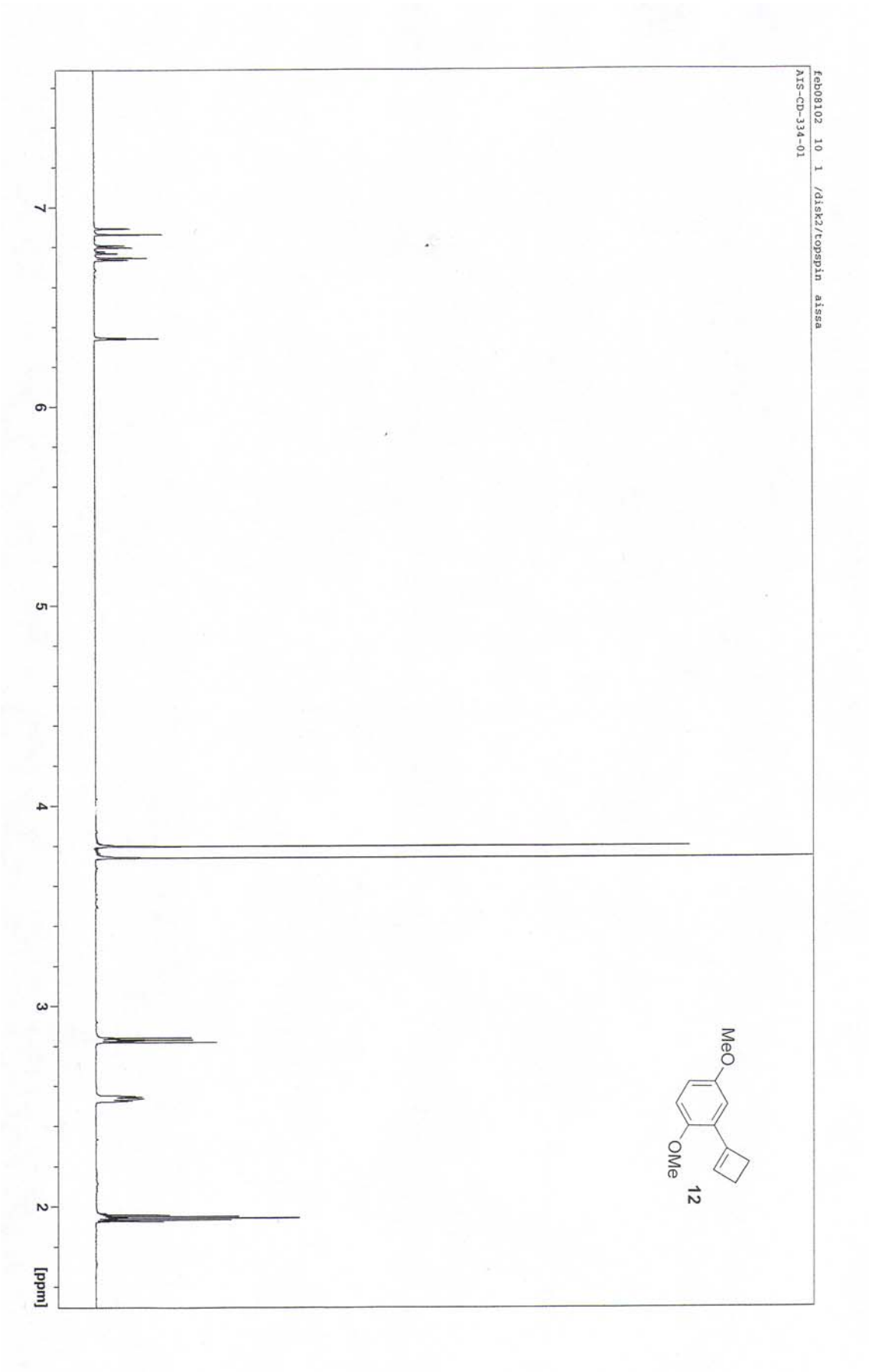
MeO
MeO
Br
10
160
140
120
100
80
60
40
20
[ppm]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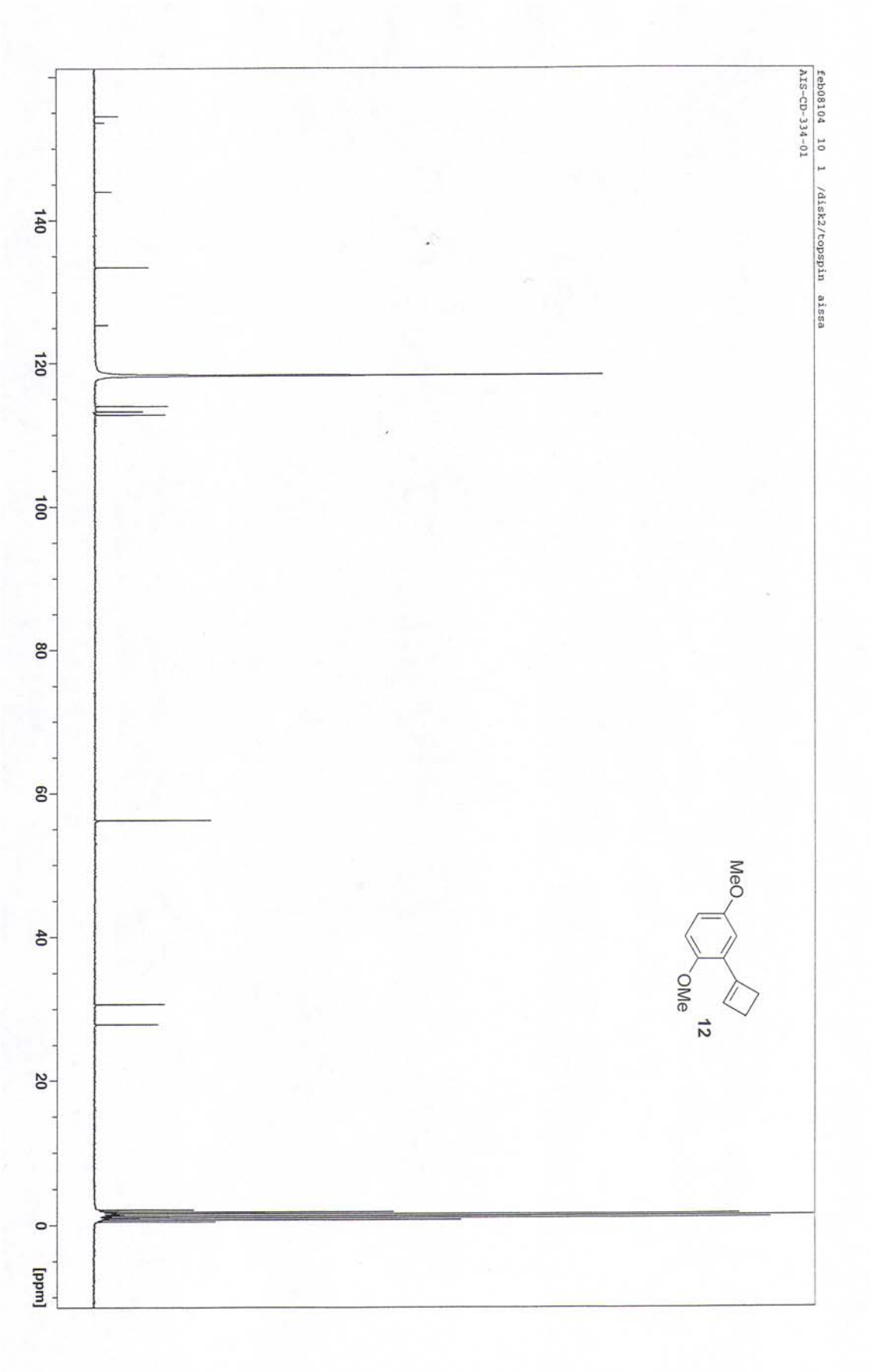
AIS-CD-334-01
MeO
OMe
12
7
6
5
4
3
2
[ppm]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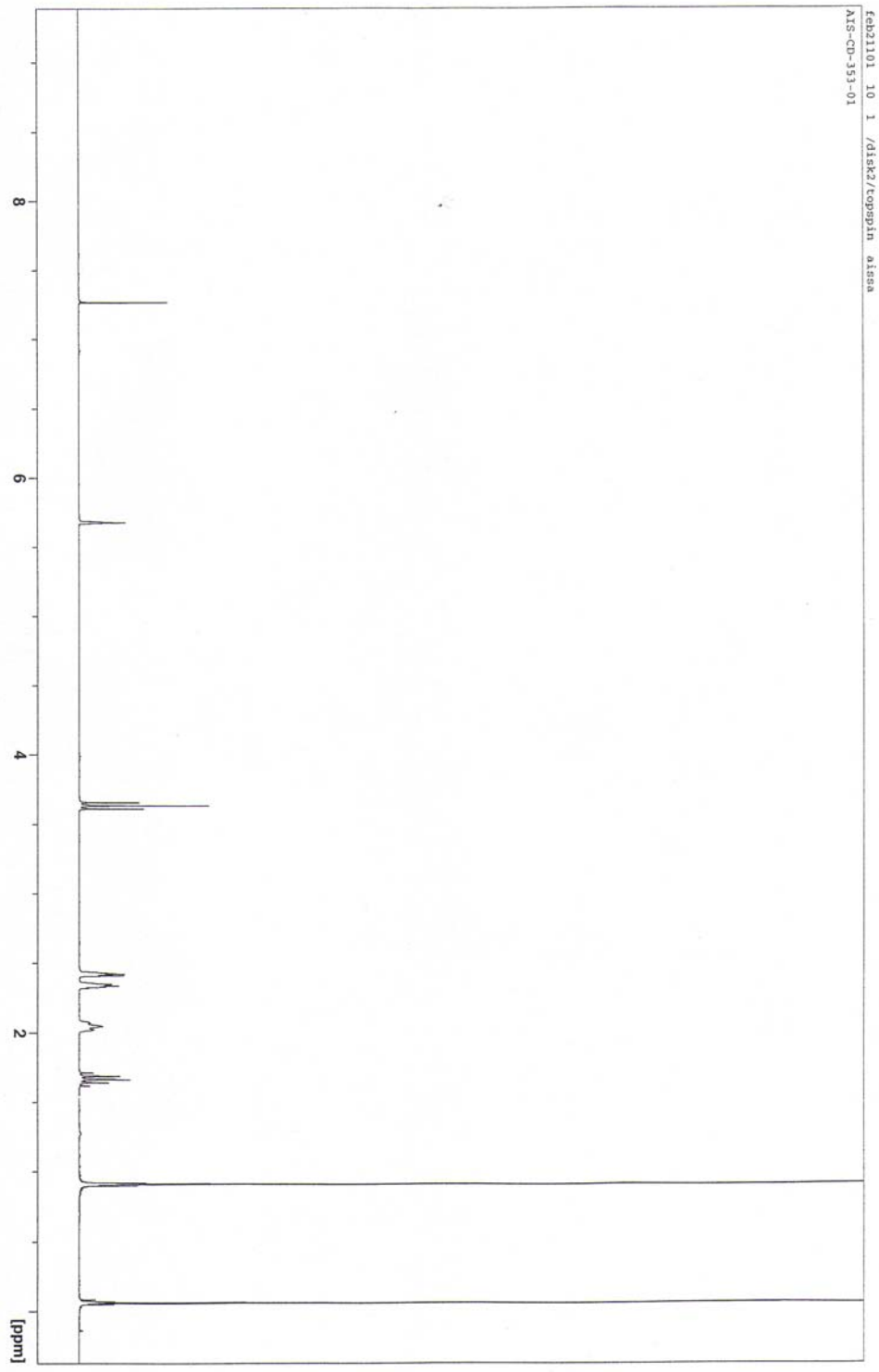
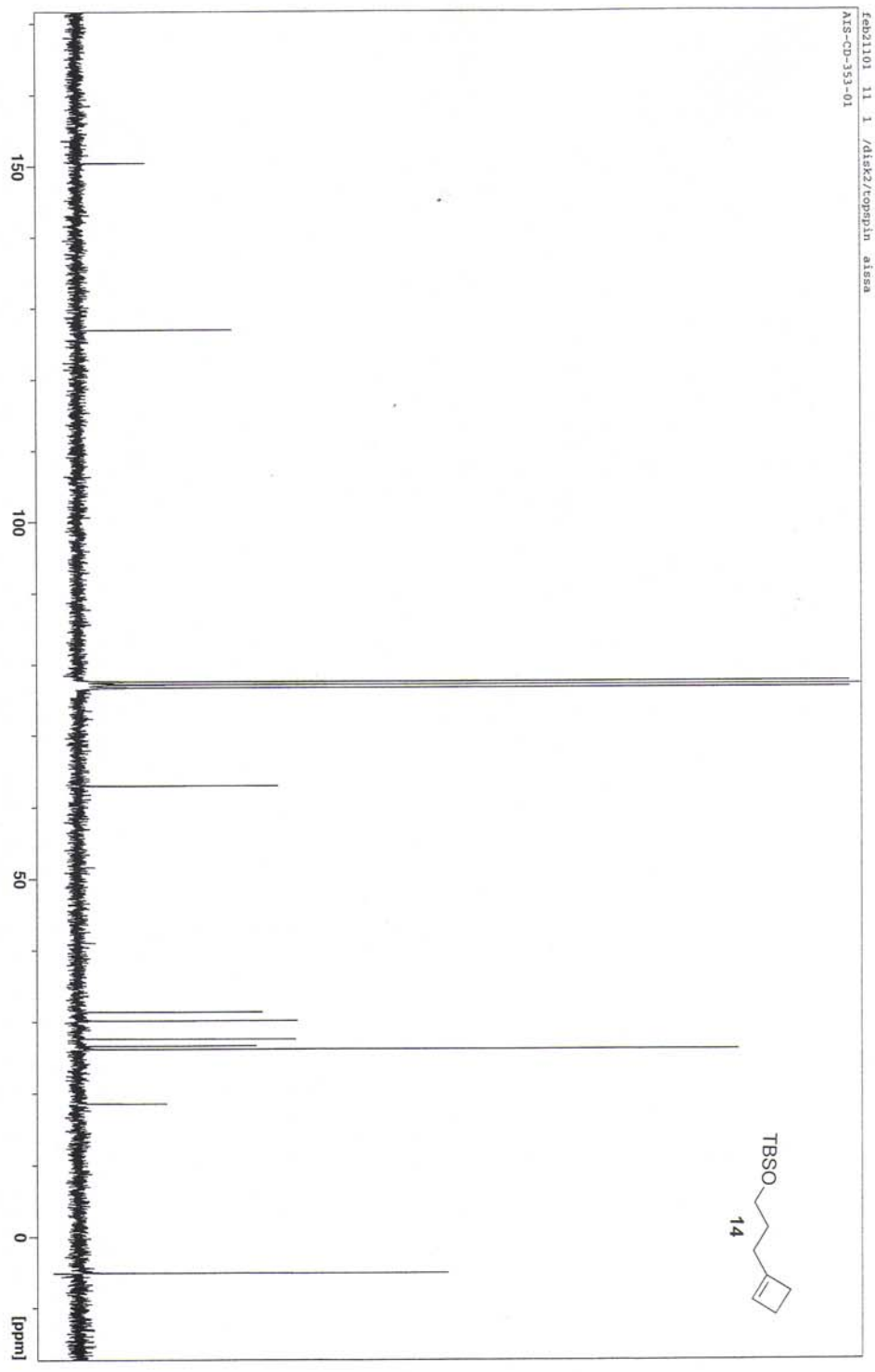
AIS-CD-334-01
MeO
OMe
12
140
120
100
80
60
40
20
0
[ppm]



14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AIS-CD-353-01
TBSO
14
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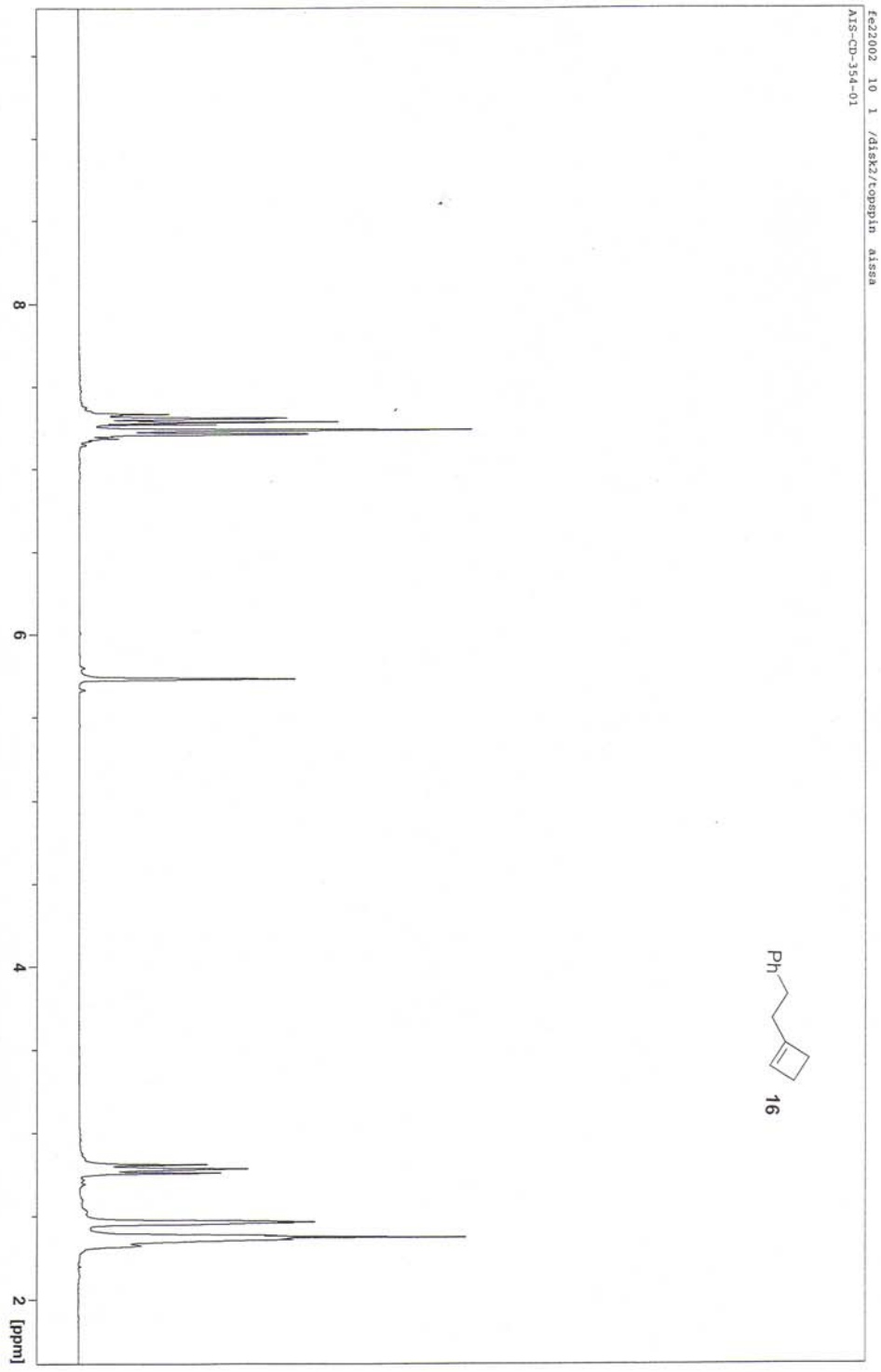
100
50
0
[ppm]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AIS-CD-354-01
Ph
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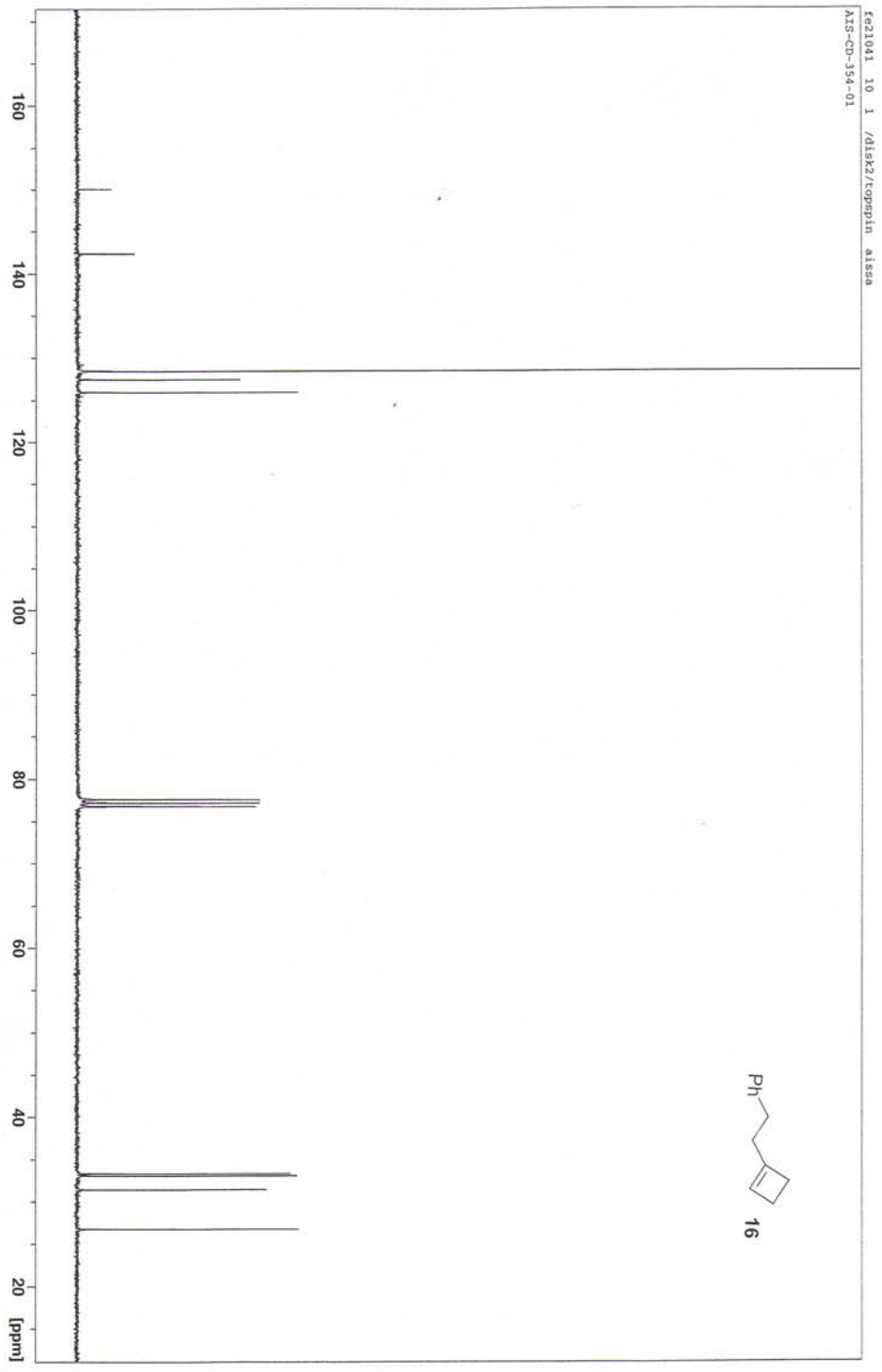
8
6
4
2 [ppm]


fe21041 10 1 /disk2/topspin aissa
AIS-CD-354-01
Ph
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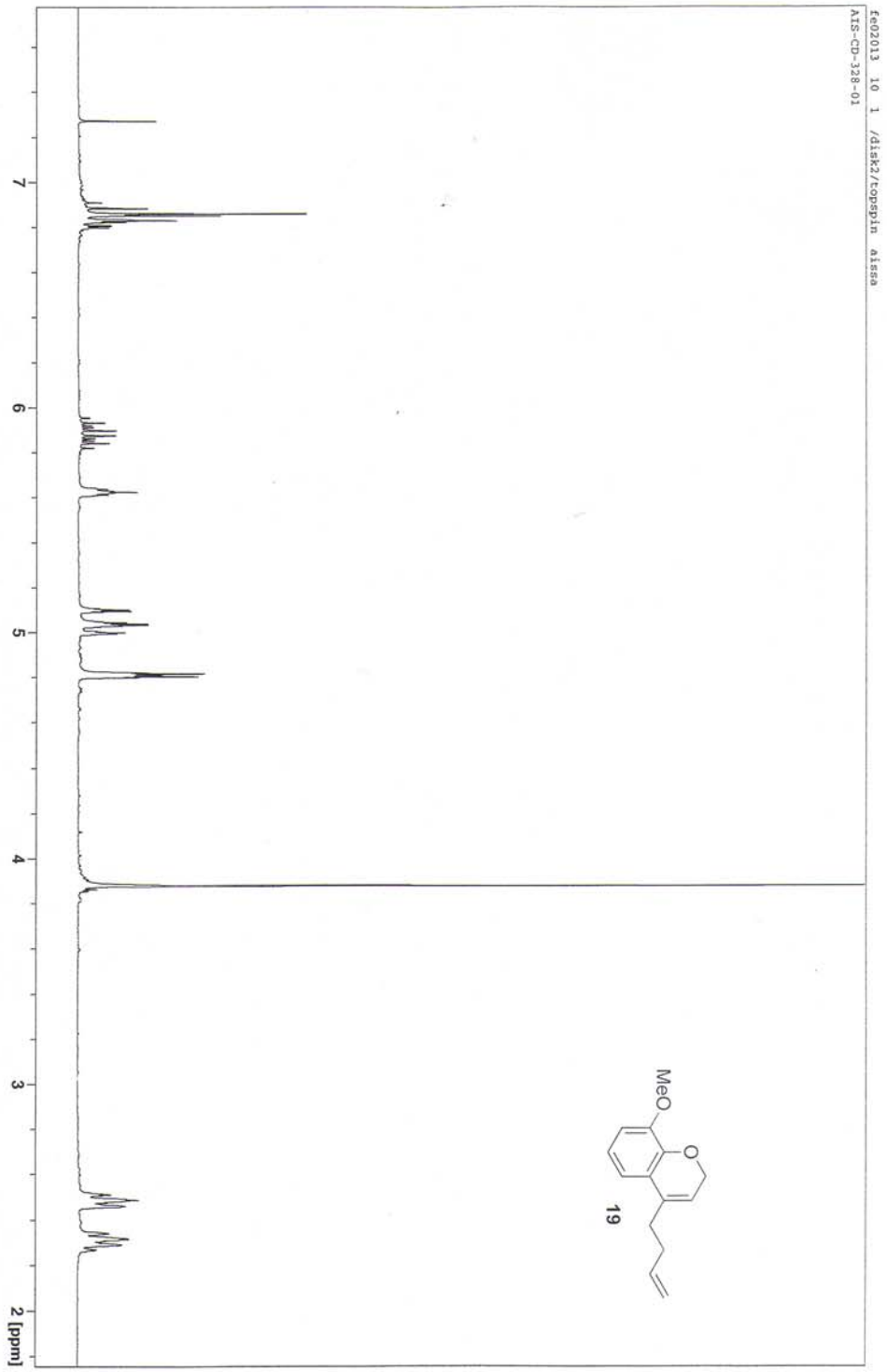
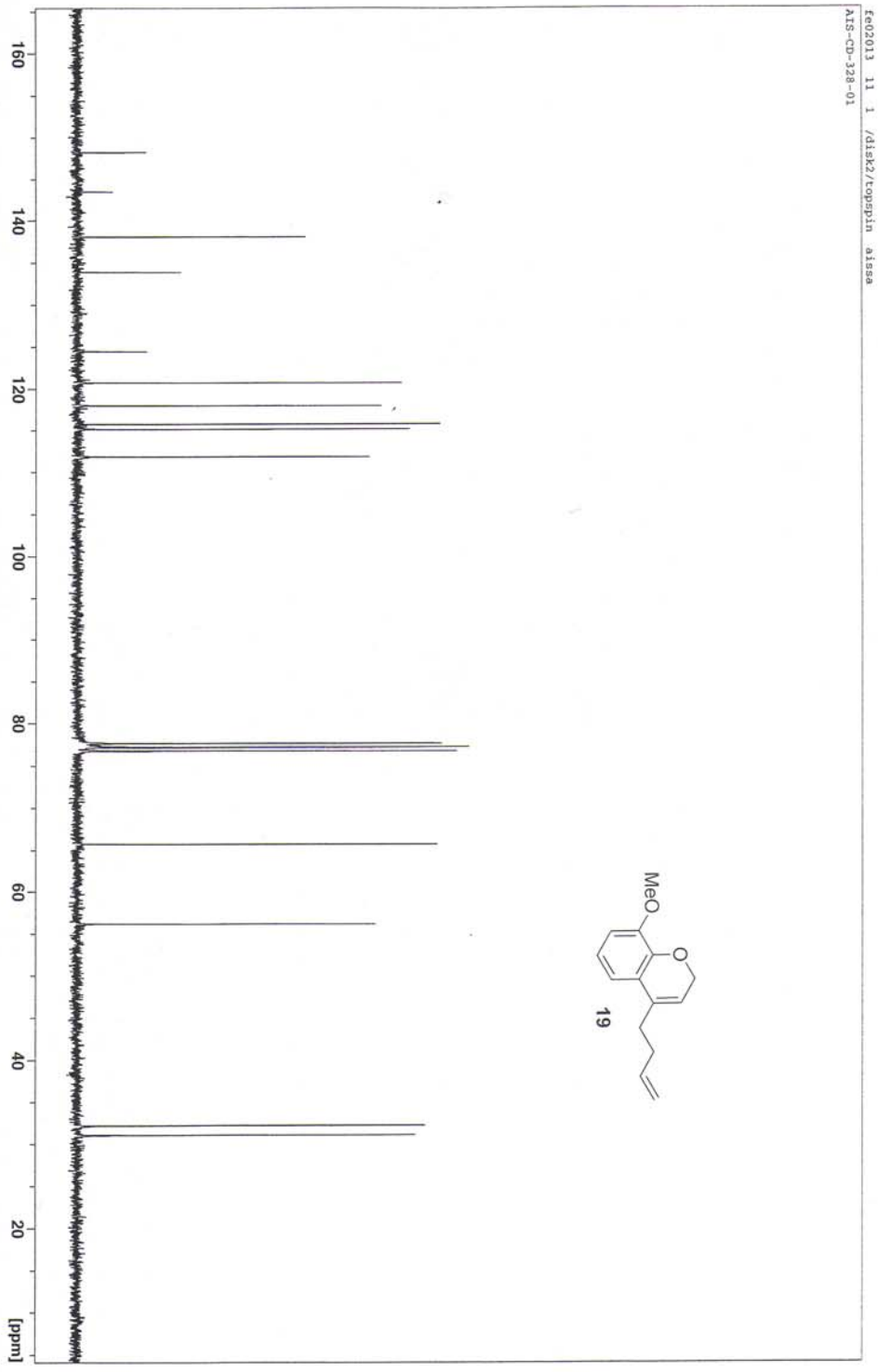
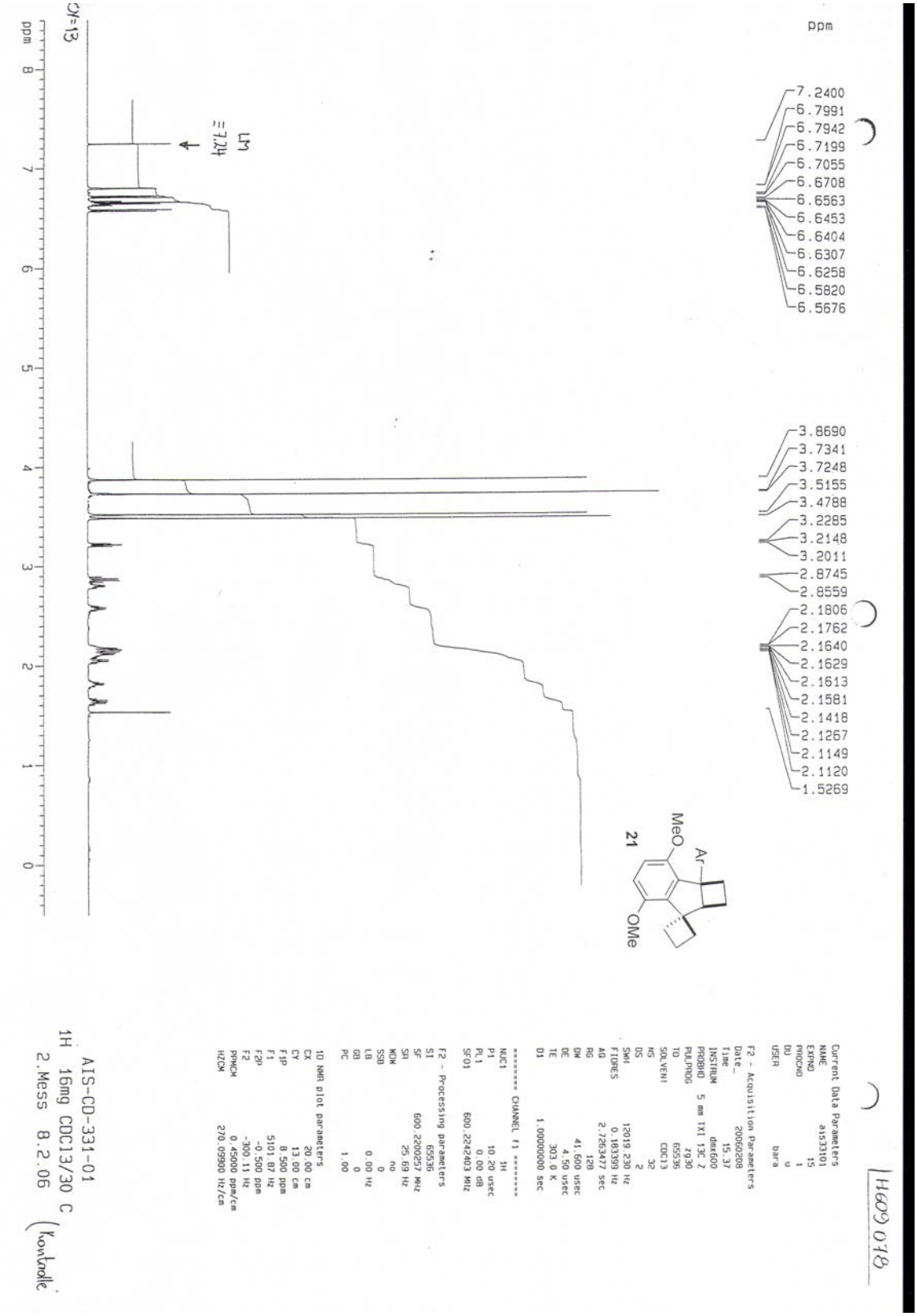
160
140
120
100
80
60
40
20
[ppm]


fe02013 10 1 /disk2/topspin aissa
AIS-CD-328-01
MeO
O
19
7
6
5
4
3
2 [ppm]


fe02013 11 1 /disk2/topspin aissa
AIS-CD-328-01
MeO
O
19
160
140
120
100
80
60
40
20
[ppm]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6.7942
6.7199
6.7055
6.6708
6.6563
6.6453
6.6404
6.6307
6.6258
6.5820
6.5676
3.8690
3.7341
3.7248
3.5155
3.4788
3.2285
3.2148
3.2011
2.8745
2.8559
2.1806
2.1762
2.1640
2.1629
2.1613
2.1581
2.1418
2.1267
2.1149
2.1120
1.5269
LM
=7.24
CY=13
ppm
8
7
6
5
4
3
2
1
0
MeO
Ar
OMe
21
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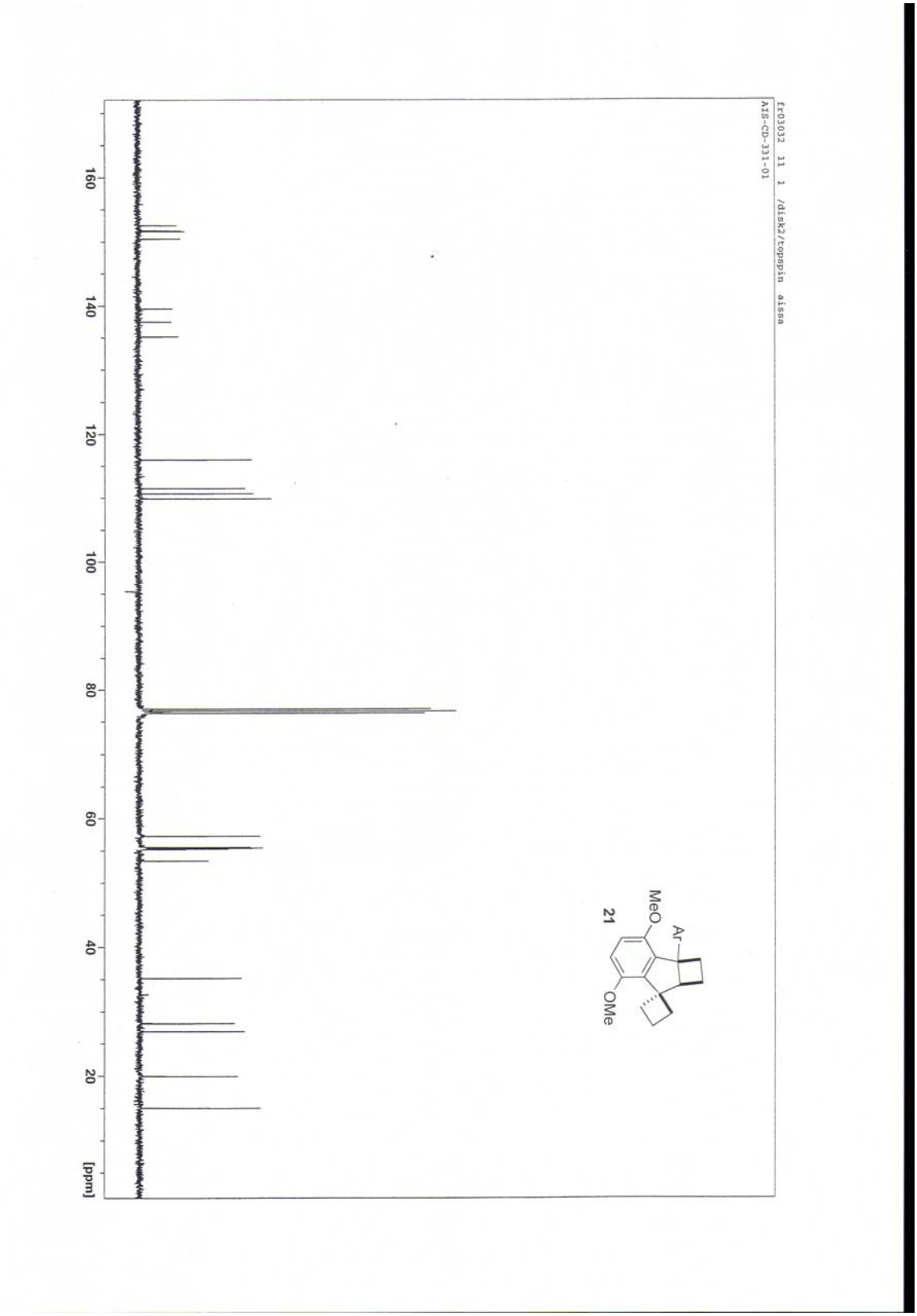
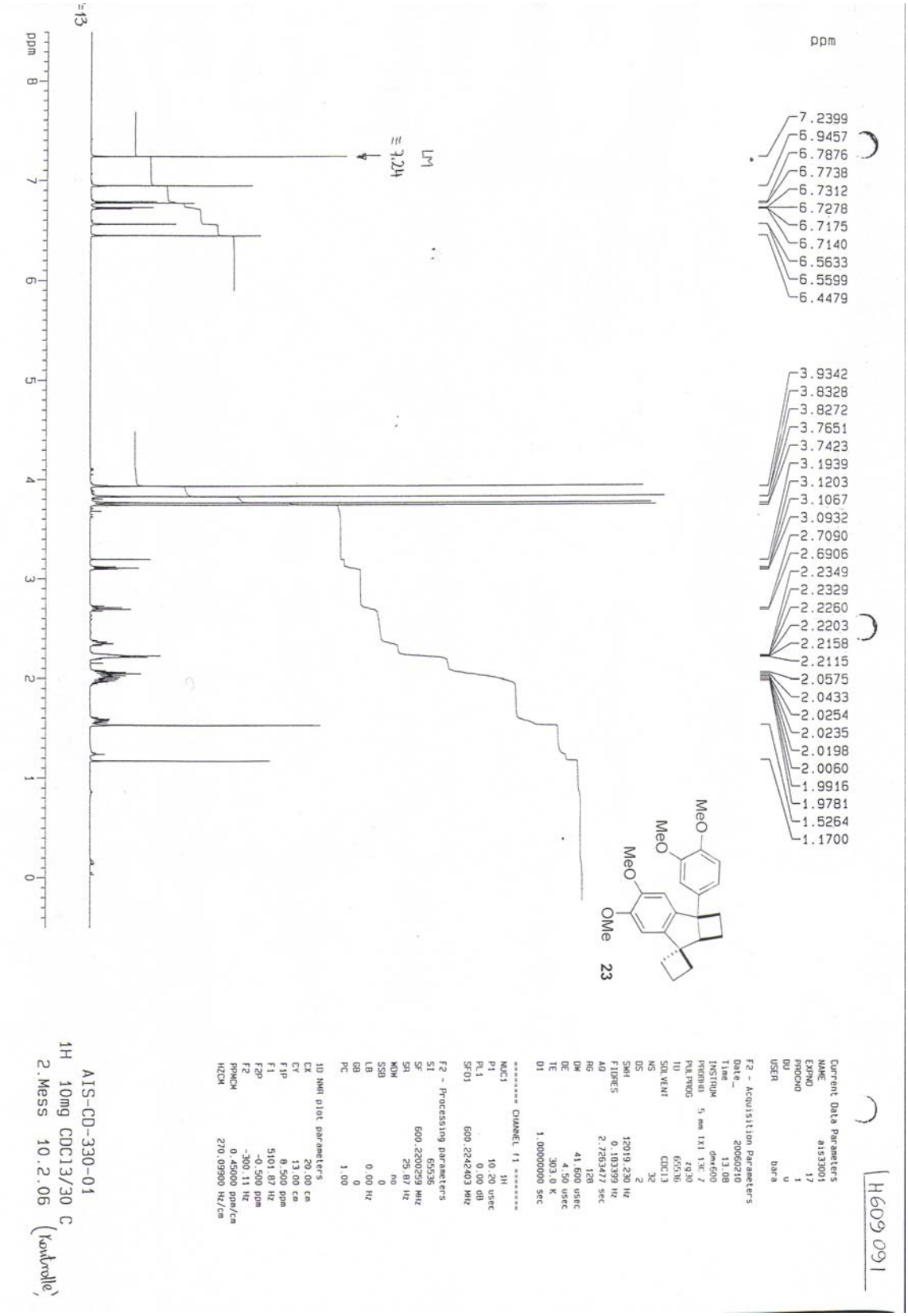
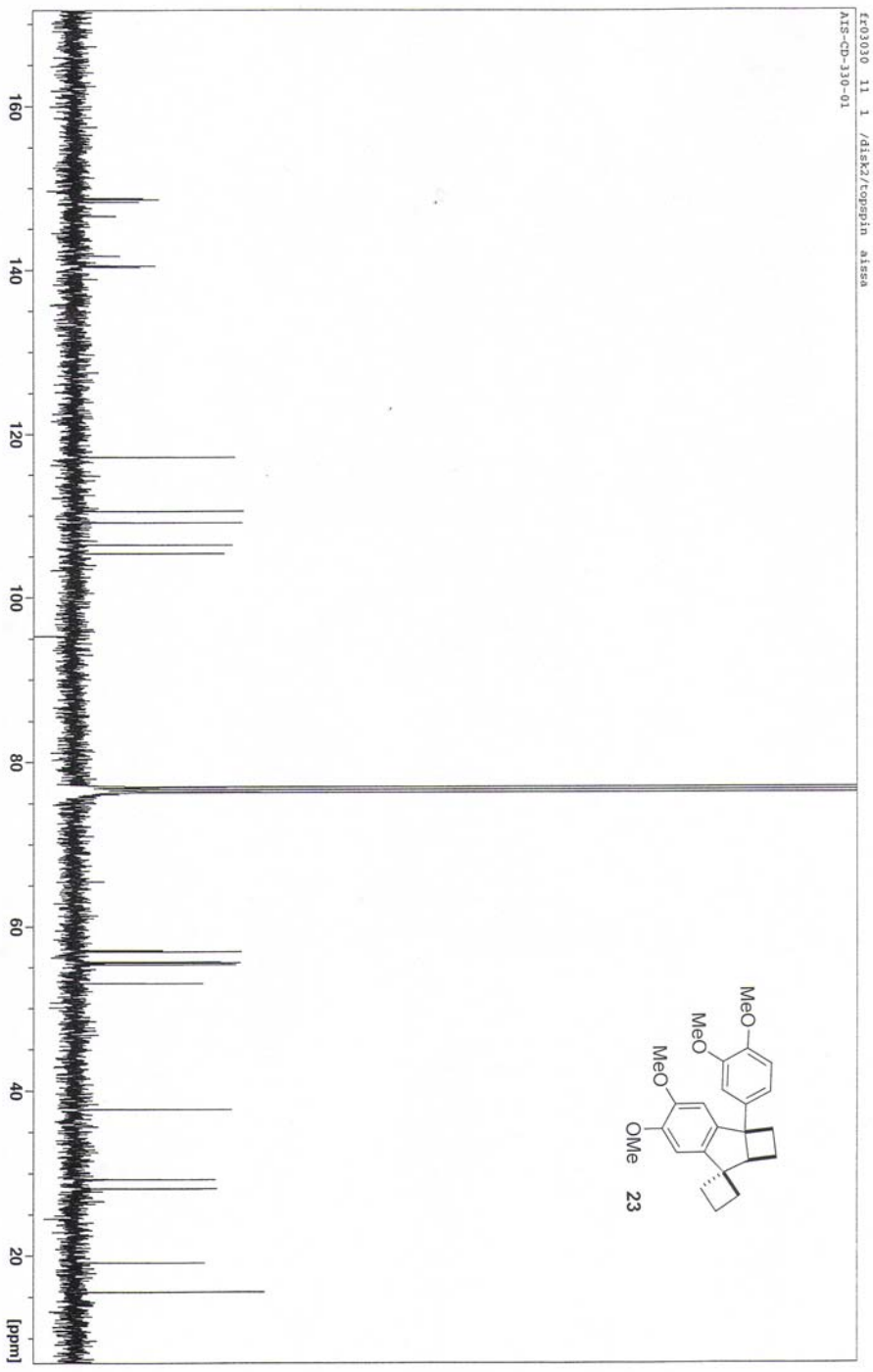
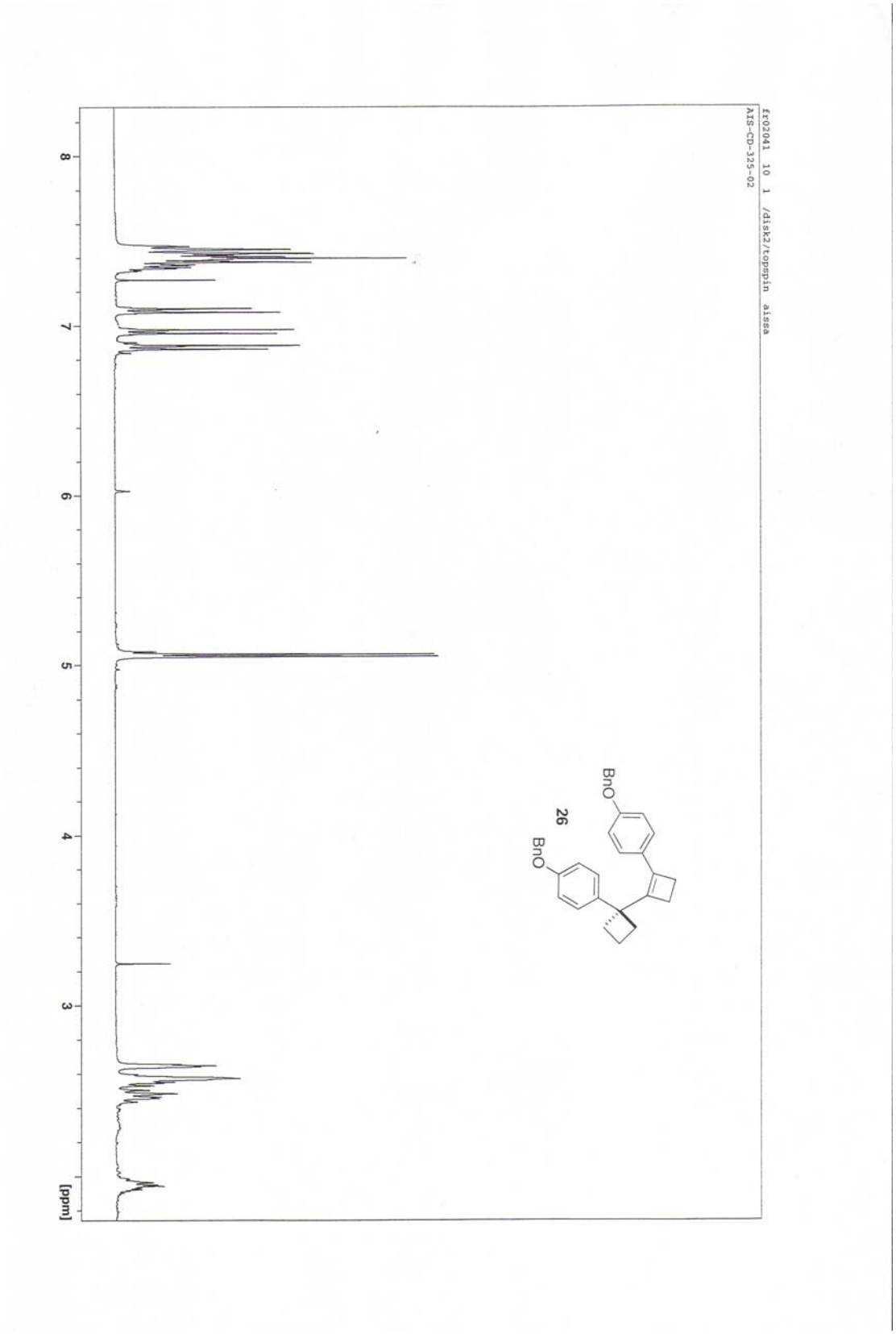
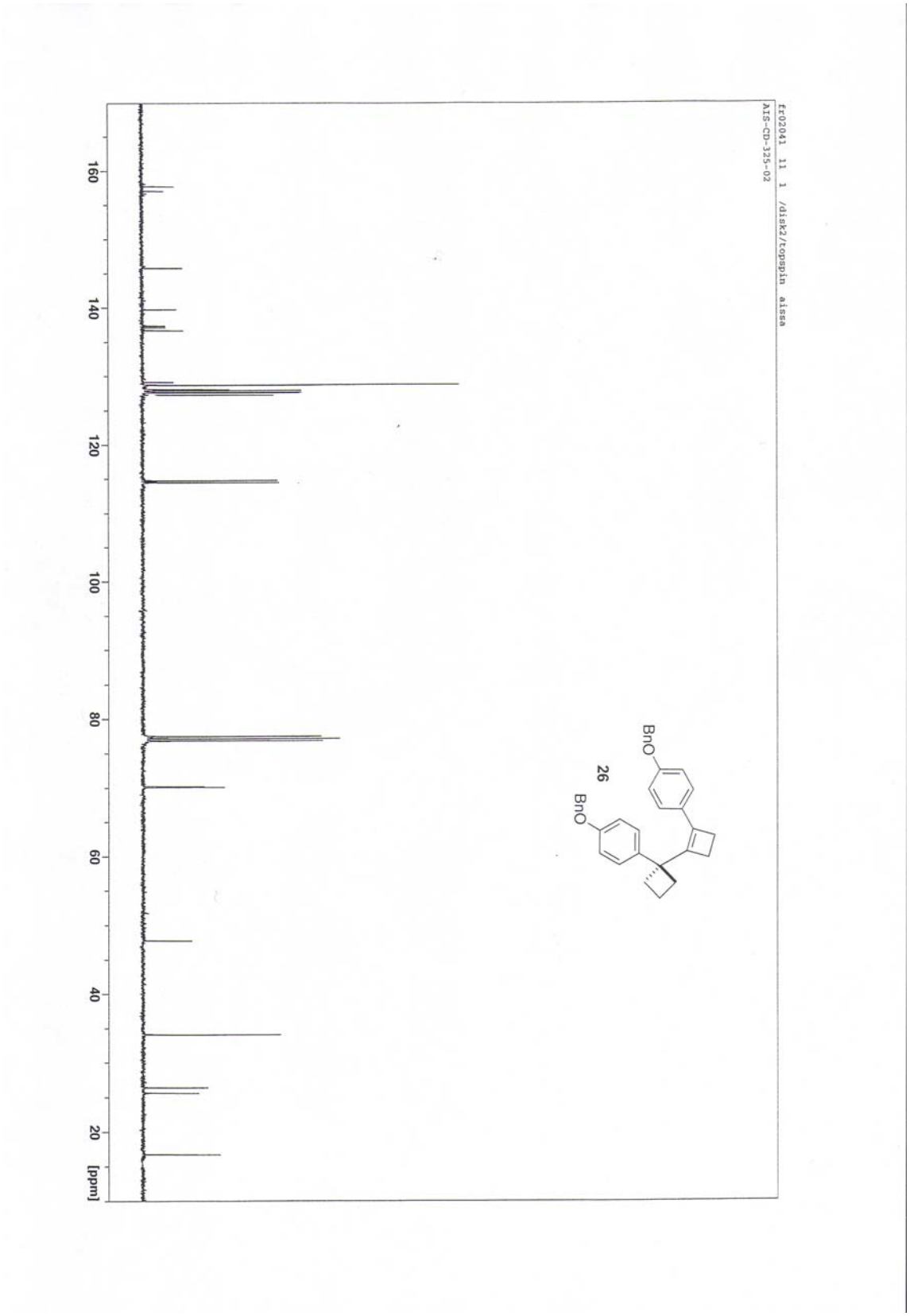
NAME ais33101
EXPNO 15
PROCNO 1
DU u
USER bara
F2 - Acquisition Parameters
Date_ 20060208
Time 15.37
INSTRUM dmx600
PROBHD 5 mm TXI 13C Z
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 32
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7263477 sec
RG 128
DW 41.600 usec
DE 4.50 usec
TE 303.0 K
D1 1.00000000 sec
======== CHANNEL f1 ========
NUC1 1H
P1 10.20 usec
PL1 0.00 dB
SFO1 600.2242403 MHz
F2 - Processing parameters
SI 65536
SF 600.2200257 MHz
SR 25.69 Hz
WDW no
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
1D NMR plot parameters
CX 20.00 cm
CY 13.00 cm
F1P 8.500 ppm
F1 5101.87 Hz
F2P -0.500 ppm
F2 -300.11 Hz
PPMCM 0.45000 ppm/cm
HZCM 270.09990 Hz/cm
AIS-CD-331-01
1H 16mg CDCl3/30 C
2.Mess 8.2.06
Kontrolle
H609 078


fr03032 11 1 /disk2/topspin aiesa
AIS-CD-331-01
160
140
120
100
80
60
40
20
[ppm]
MeO
Ar
OMe
21


H609091
ppm
7.2399
6.9457
6.7876
6.7738
6.7312
6.7278
6.7175
6.7140
6.5633
6.5599
6.4479
3.9342
3.8328
3.8272
3.7651
3.7423
3.1939
3.1203
3.1067
3.0932
2.7090
2.6906
2.2349
2.2329
2.2260
2.2203
2.2158
2.2115
2.0575
2.0433
2.0254
2.0235
2.0198
2.0060
1.9916
1.9781
1.5264
1.1700
MeO
MeO
MeO
OMe
23
LM1
7.24
13
ppm
AIS-CD-330-01
1H 10mg CDCl3/30 C
2.Mess 10.2.06 (Kontrolle)


fr03030 11 1 /disk2/topspin aisa
AIS-CD-330-01
160
140
120
100
80
60
40
20
[ppm]
MeO
MeO
MeO
OMe
23


fr02041 10 1 /disk2/topspin aissa
AIS-CD-325-02
8
7
6
5
4
3
[ppm]
BnO
26
BnO


fr02041 11 1 /disk2/topspin aisss
AIS-CD-325-02
160
140
120
100
80
60
40
20
[ppm]
BnO
26
BnO

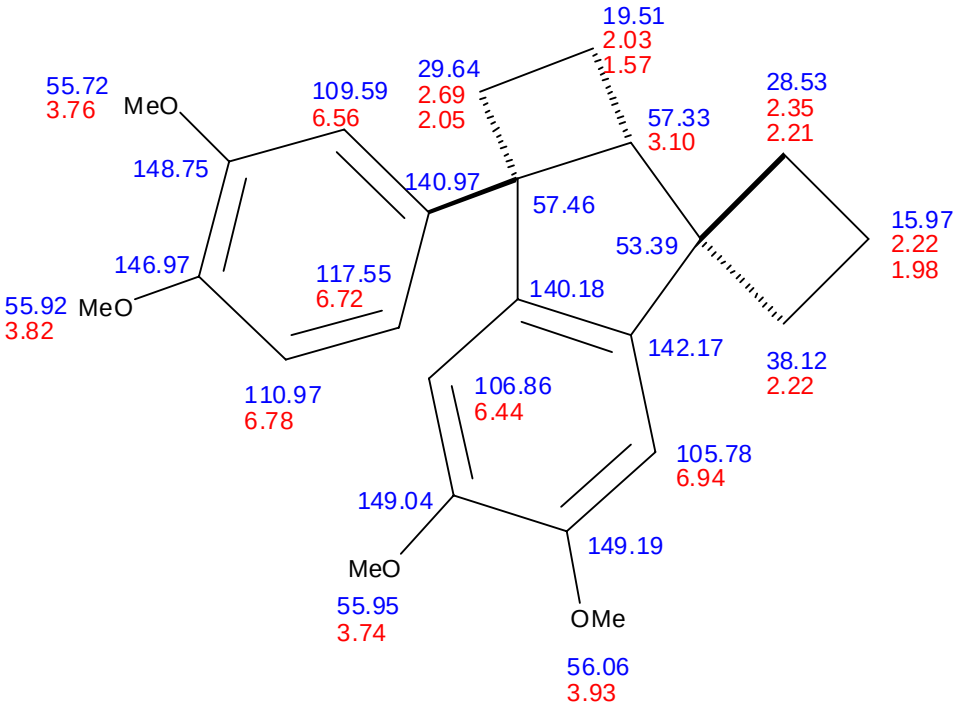
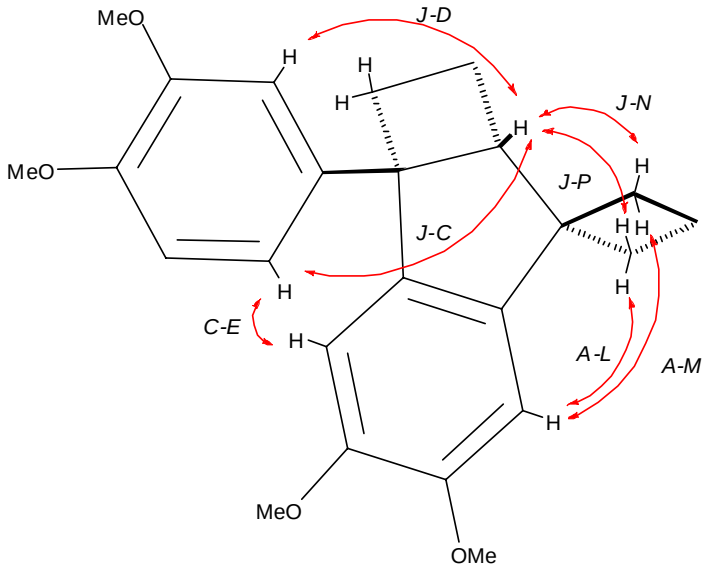
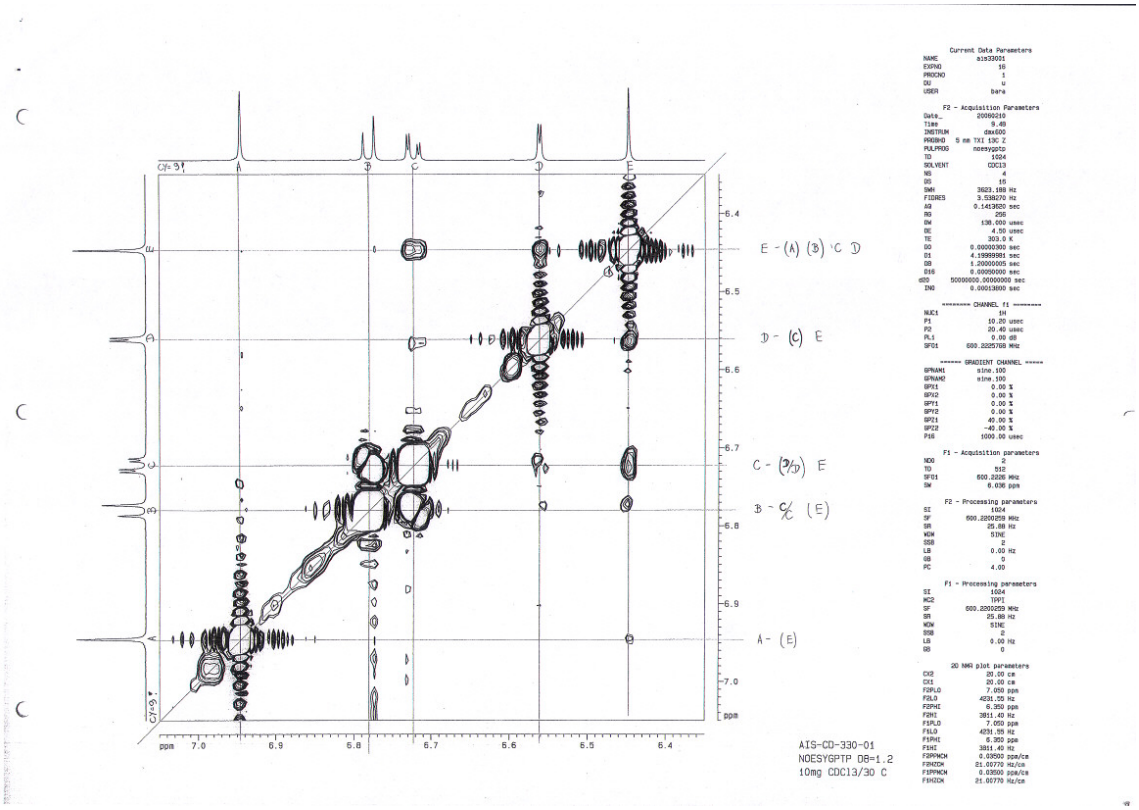
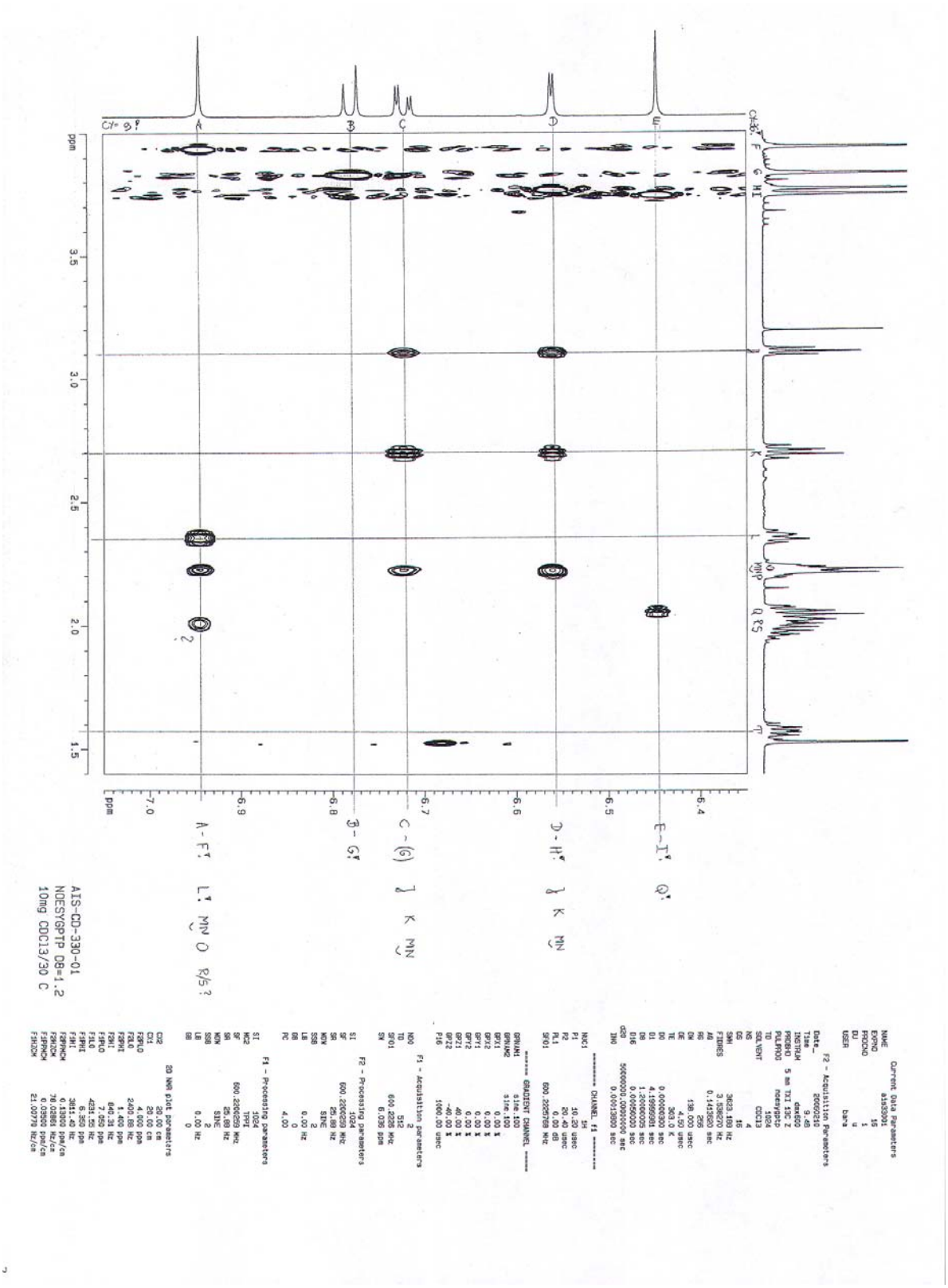


Figure S-1. Overview over the spectral data recorded for compound **23** (DMX 600 spectrometer, $CDCl_3$). ^{1}H NMR shifts are given in red, ^{13}C NMR shifts are shown in blue. The *signal assignments are unambiguous*, based upon 1D and 2D spectra recorded using the following pulse sequences from the Bruker standard pulse program library: DEPT; COSY (*cosygs* and *cosydqtp*); HSQC (*invietgssi*) optimized for ^1J(C,H) = 145 Hz; HMBC (*inv4gslplrnd*) for correlations via ^nJ(C,H); HSQC-TOCSY (*invietgsml*) using an MLEV17 mixing time of 120 ms.

Figure S-2. Selected NOESYs for compound **23**.






A-F?
L? MN O R/S?
B-G?
C-(G)
J K MN
D-H?
J K MN
E-I?
Q?
AIS-CD-330-01
NOESYGPTP DB=1.2
10mg CDCl3/30 C

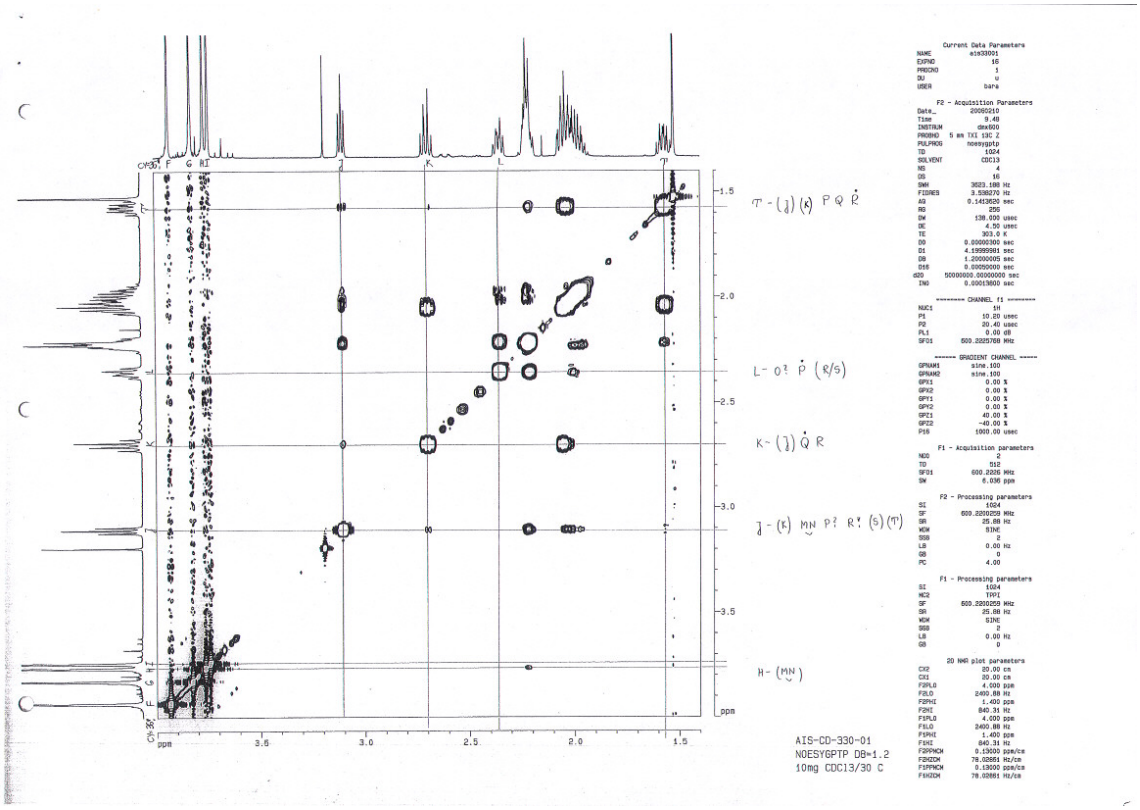
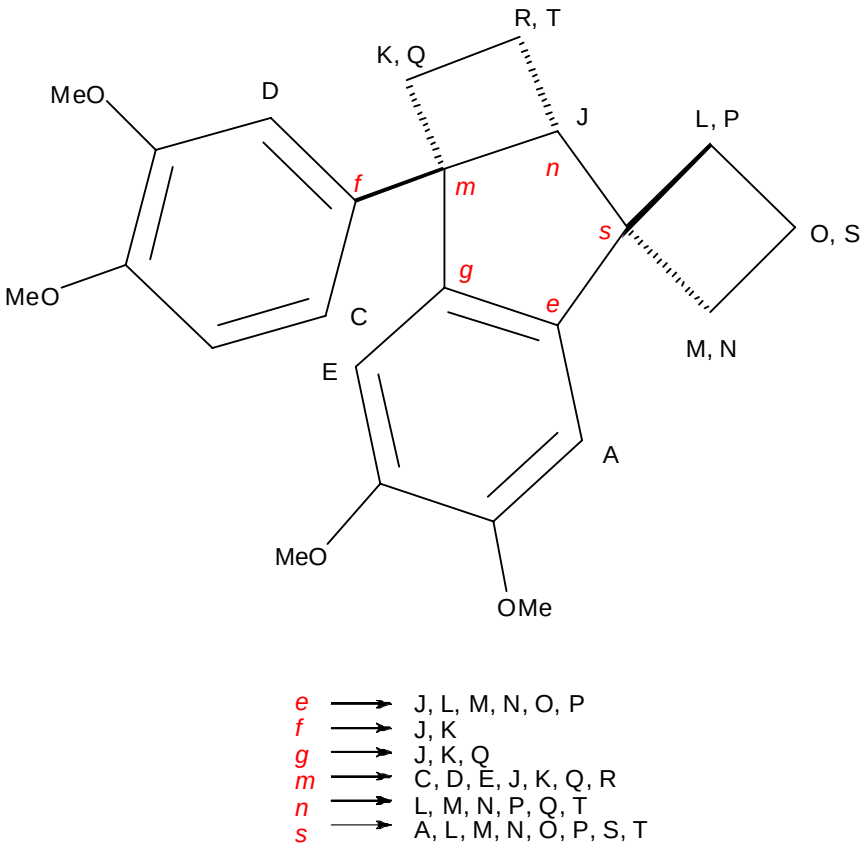
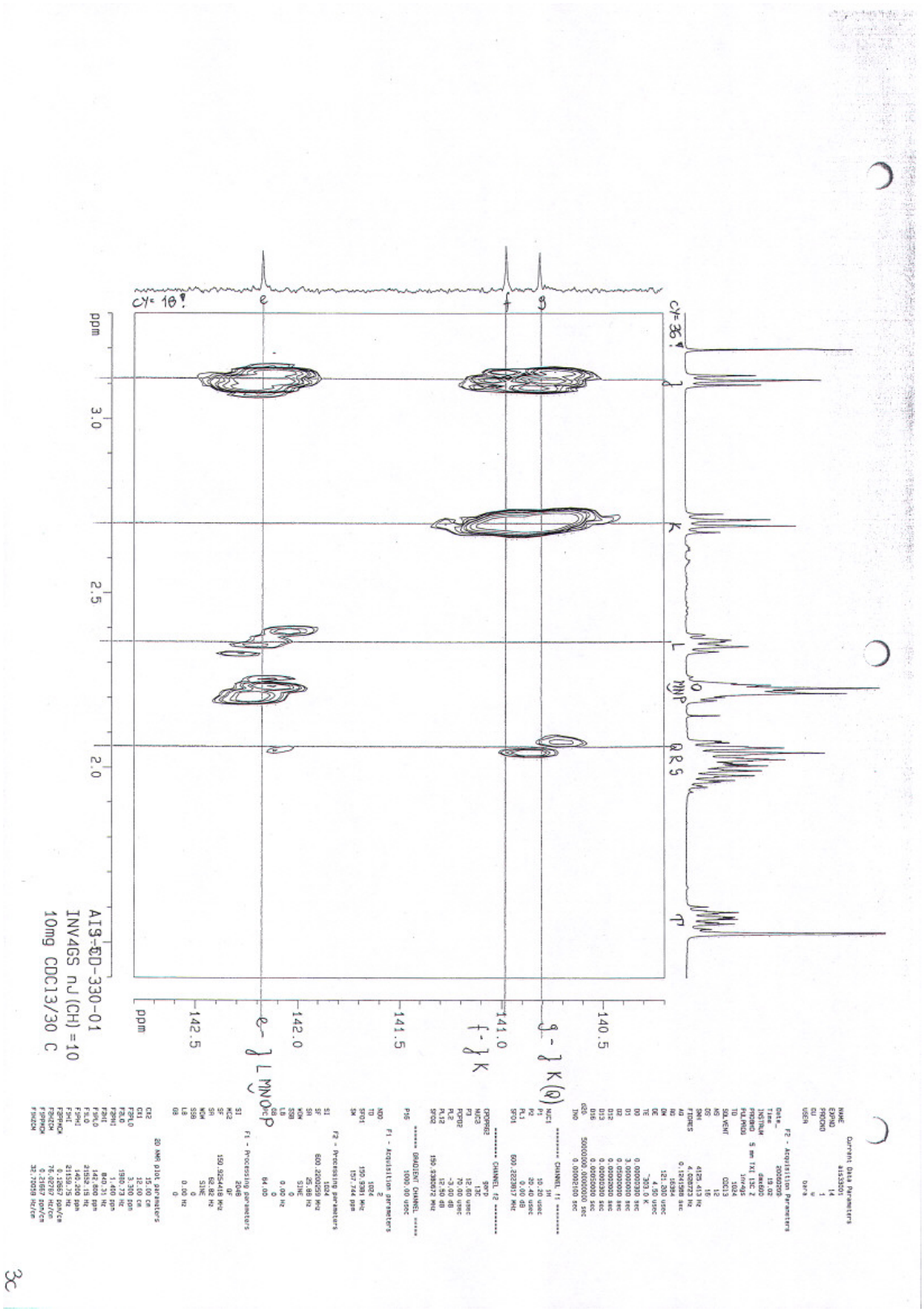

AIS-CD-330-01
NOESYGPTP DB=1.2
10mg CDCl3/30 C
ppm
3.5
3.0
2.5
2.0
1.5
Current Data Parameters
NAME ais33001
EXPNO 16
PROCNO 1
USER bara
F2 - Acquisition Parameters
Date_ 20080210
Time 9.48
INSTRUM dmx600
PROBHD 5 mm TXI 13C Z
PULPROG noesygptp
TD 1024
SOLVENT CDCl3
NS 4
DS 16
SWH 3623.188 Hz
FIDRES 3.538270 Hz
AQ 0.1413520 sec
RG 256
DW 138.000 usec
DE 4.50 usec
TE 303.0 K
D0 0.00000300 sec
D1 4.19999981 sec
D8 1.20000005 sec
D16 0.00020000 sec
d20 50000000.00000000 sec
INO 0.00013800 sec
======== CHANNEL f1 ========
NUC1 1H
P1 10.20 usec
P2 20.40 usec
PL1 0.00 dB
SFO1 600.2225768 MHz
======= GRADIENT CHANNEL =====
GPNAM1 sine.100
GPNAM2 sine.100
GPZ1 0.00 %
GPZ2 0.00 %
GPZ1 0.00 %
GPZ2 0.00 %
GPZ1 40.00 %
GPZ2 -40.00 %
P16 1000.00 usec
F1 - Acquisition parameters
NDO 2
TD 512
SFO1 600.2205 MHz
SW 6.036 ppm
F2 - Processing parameters
SI 1024
SF 600.2200259 MHz
SR 25.88 Hz
WDW SINE
SSB 0
LB 0.00 Hz
GB 0
PC 4.00
F1 - Processing parameters
SI 1024
MC2 TPPI
SF 600.2200259 MHz
SR 25.88 Hz
WDW SINE
SSB 2
LB 0.00 Hz
GB 0
2D NMR plot parameters
CX2 20.00 cm
CX1 20.00 cm
F2PLO 4.000 ppm
F2LO 2400.88 Hz
F2PHI 1.400 ppm
F2HI 840.31 Hz
F1PLO 4.000 ppm
F1LO 2400.88 Hz
F1PHI 1.400 ppm
F1HI 840.31 Hz
F2PPMCM 0.13000 ppm/cm
F2HZCM 78.02661 Hz/cm
F1PPMCM 0.13000 ppm/cm
F1HZCM 78.02661 Hz/cm

Figure S-3. Selected long range couplings for compound **23**.

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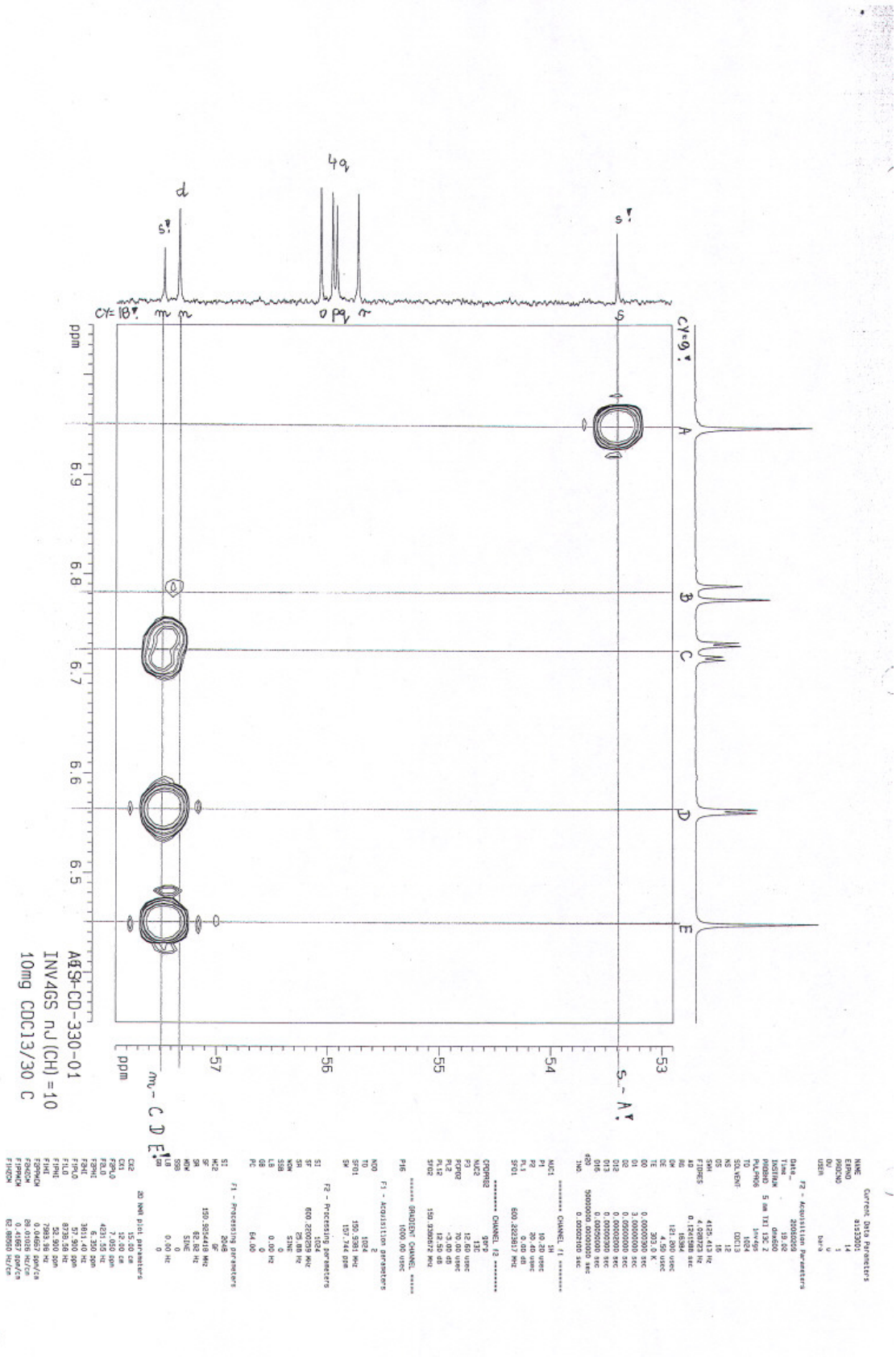
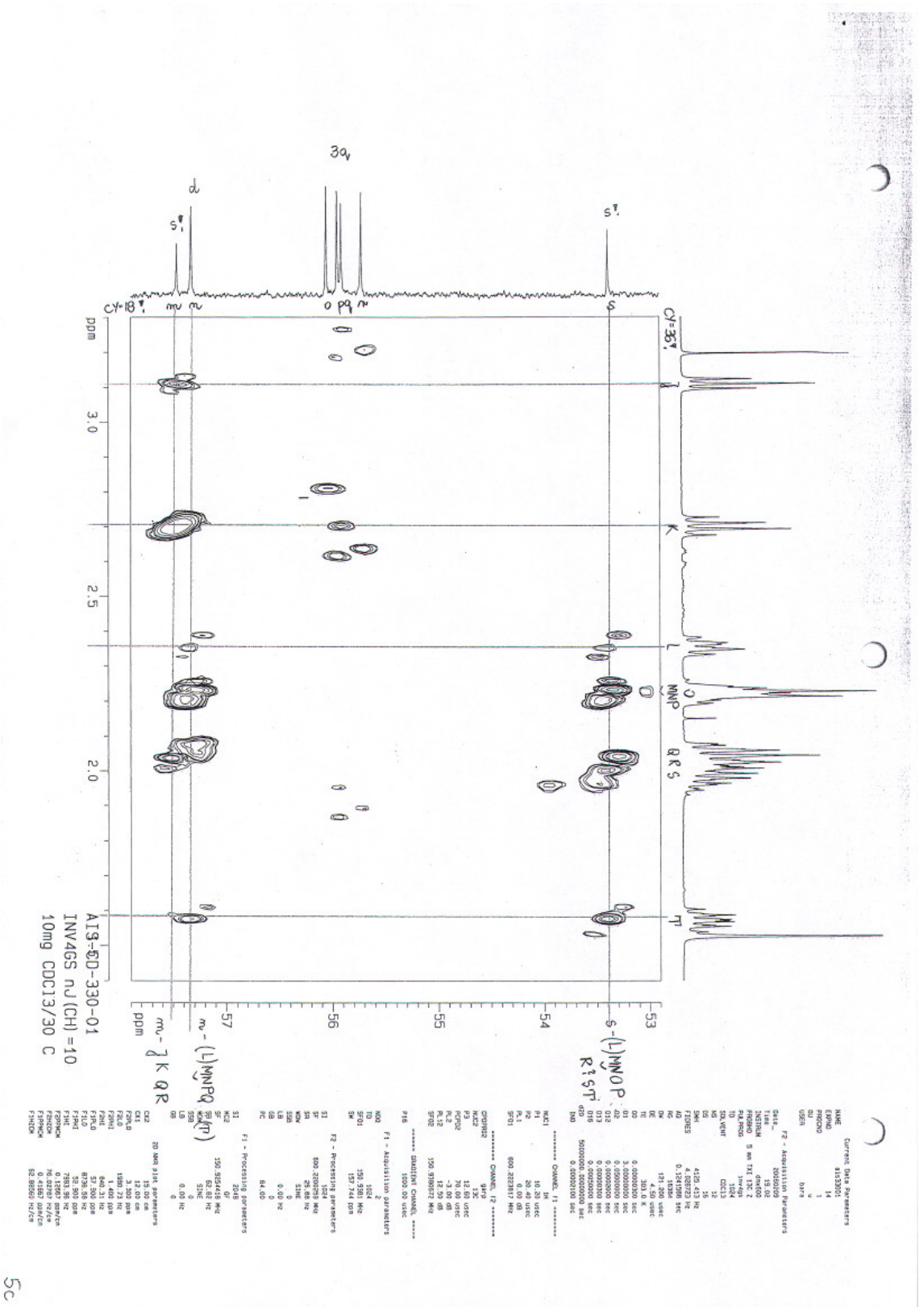
10mg CDCl3/30 C
cy=10!
cy=36!
ppm
3.0
2.5
2.0
142.5
142.0
141.5
141.0
140.5
e
f
g
J
K
L
MNOP
QRS
T


INV4GS nJ(CH)=10
10mg CDCl3/30 C
ppm
6.9
6.8
6.7
6.6
6.5
57
56
55
54
53
A
B
C
D
E

5a


AI9-6D-330-01
INV46S nJ(CH)=10
10mg CDCl3/30 C
ppm
3.0
2.5
2.0
53
54
55
56
57
Current Data Parameters
F2 - Acquisition Parameters
F1 - Acquisition parameters
F2 - Processing parameters
F1 - Processing parameters
20 mm plot parameters

5c

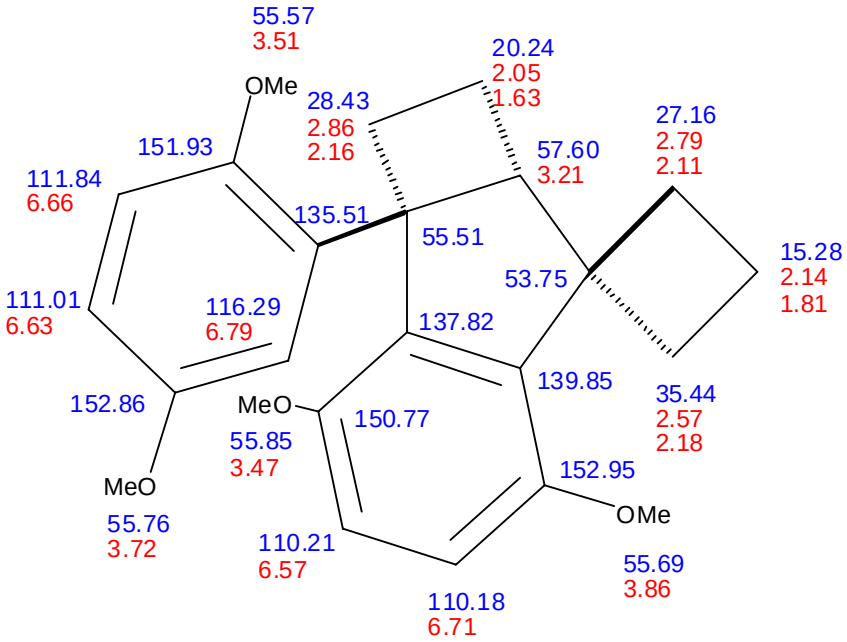
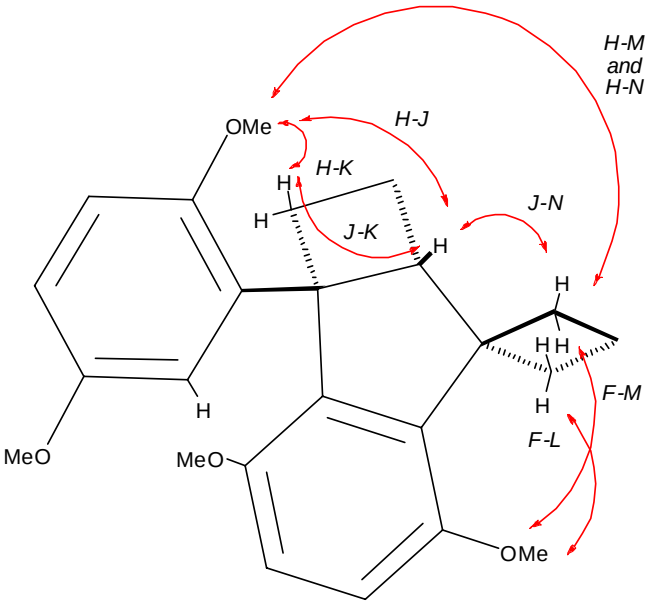


Figure S-4. Overview over the spectral data recorded for compound **21** (DMX 600 spectrometer, $CDCl_3$). ^{1}H NMR shifts are given in red, ^{13}C NMR shifts are shown in blue. The *signal assignments are unambiguous*, based upon 1D and 2D spectra recorded using the following pulse sequences from the Bruker standard pulse program library: DEPT; COSY (*cosygs* and *cosydqtp*); HSQC (*invietgssi*) optimized for ^{1}J(C,H) = 145 Hz; HMBC (*inv4gslplrnd*) for correlations via ^{n}J(C,H); HSQC-TOCSY (*invietgsml*) using an MLEV17 mixing time of 120 ms.

Figure S-5. Selected NOESYs for compound **21**.



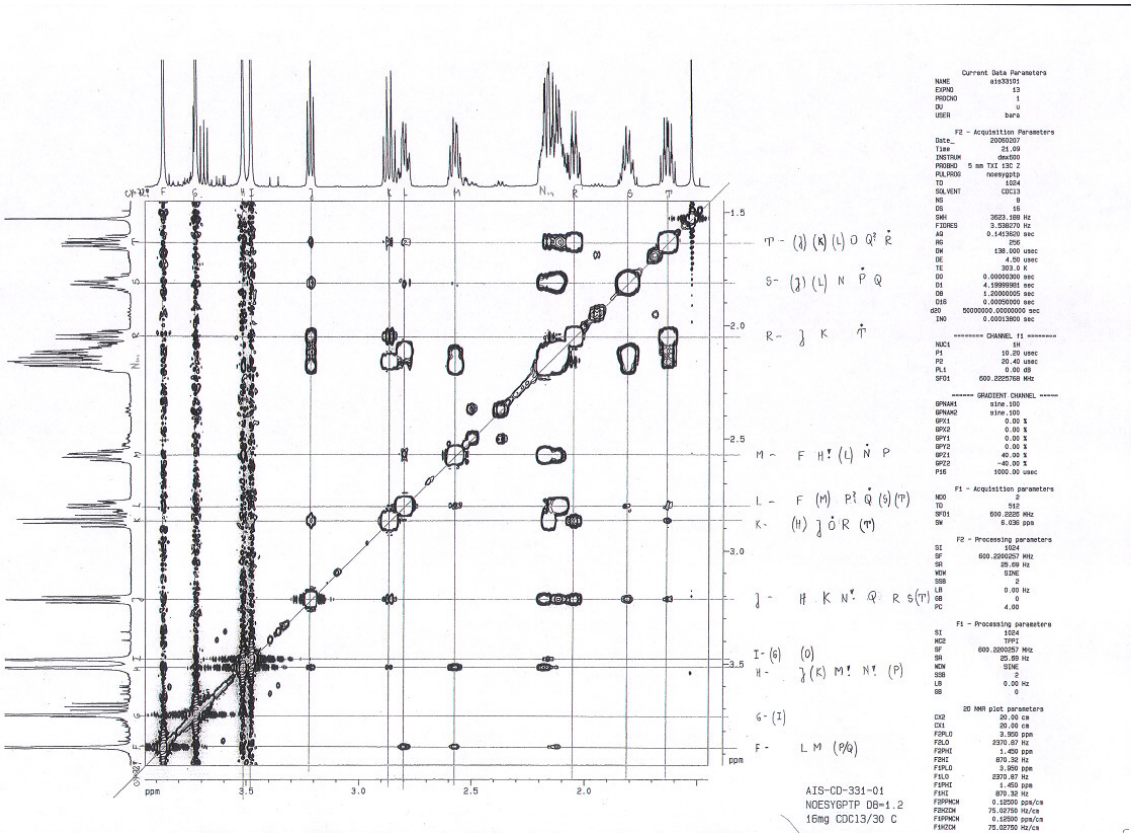
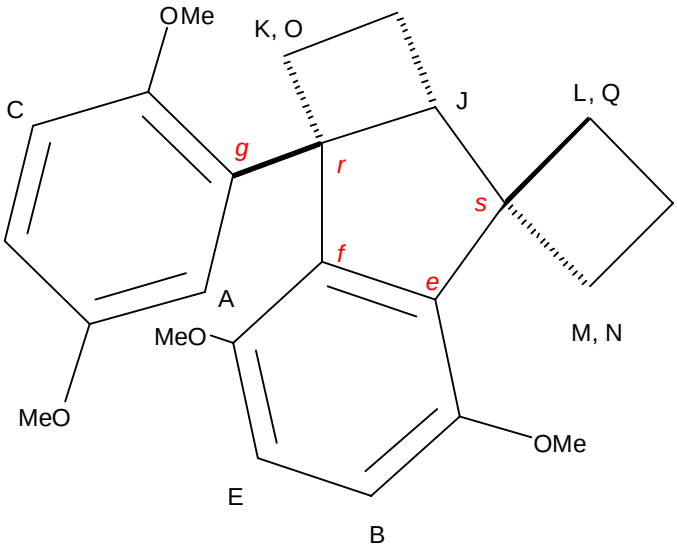
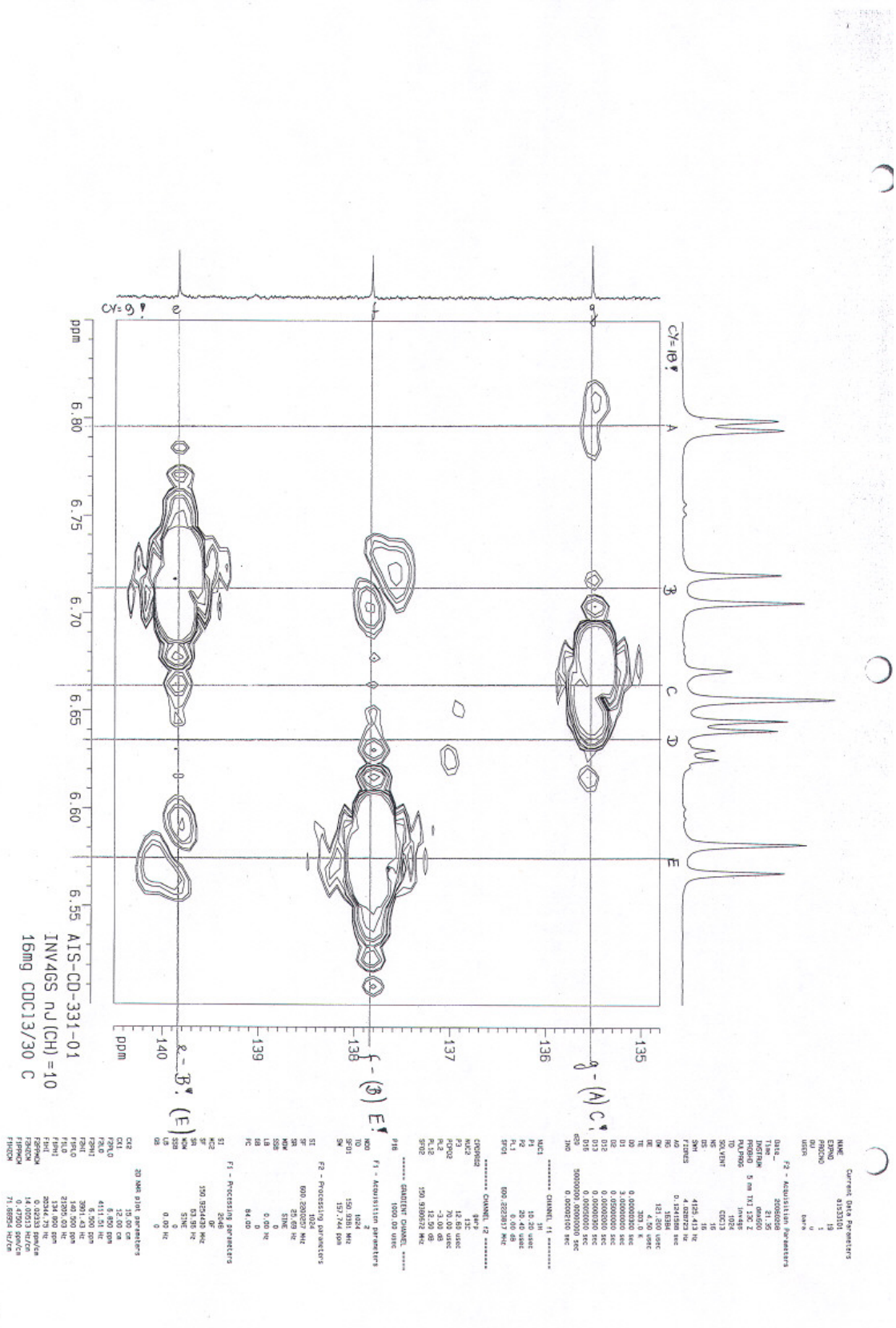
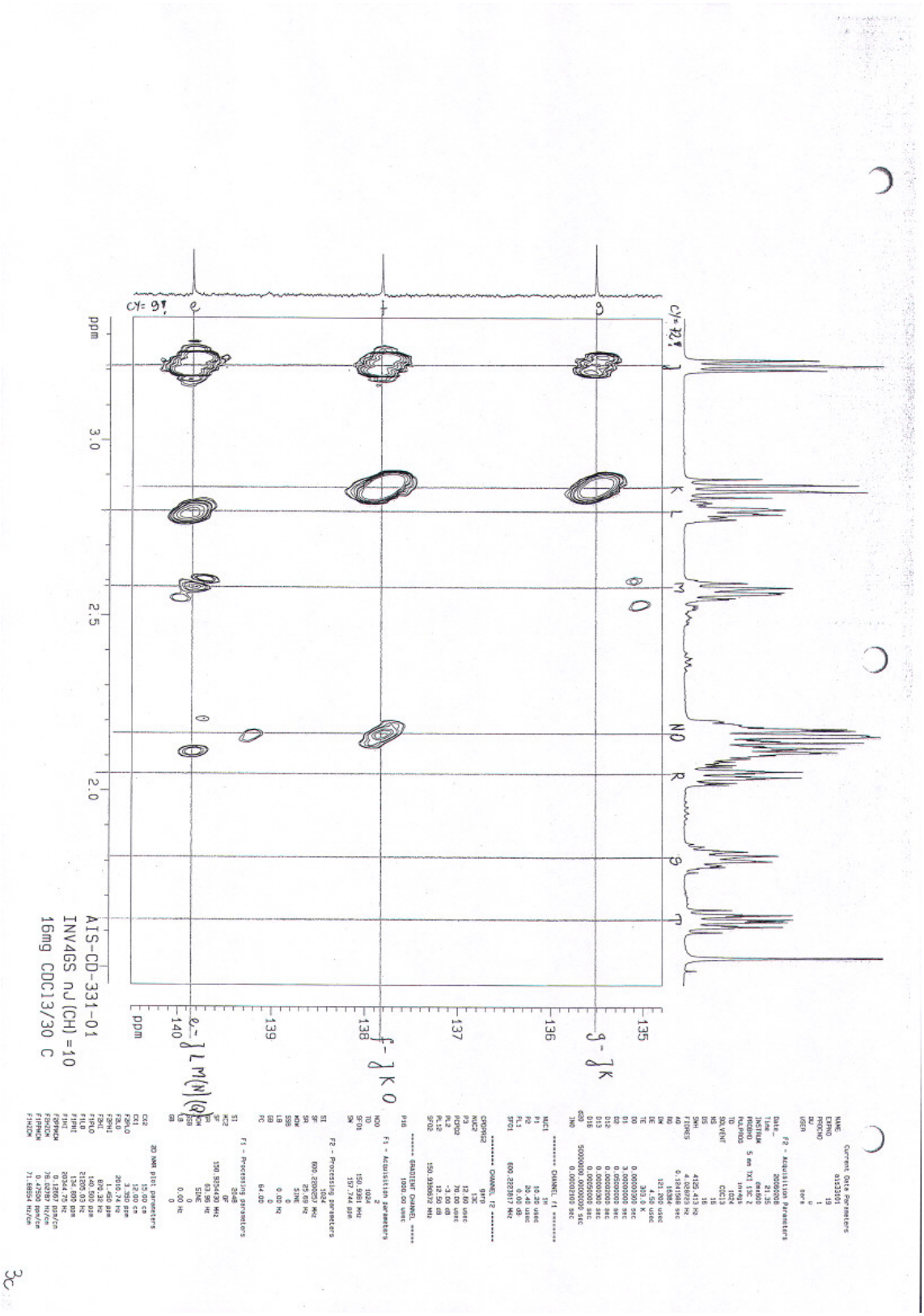


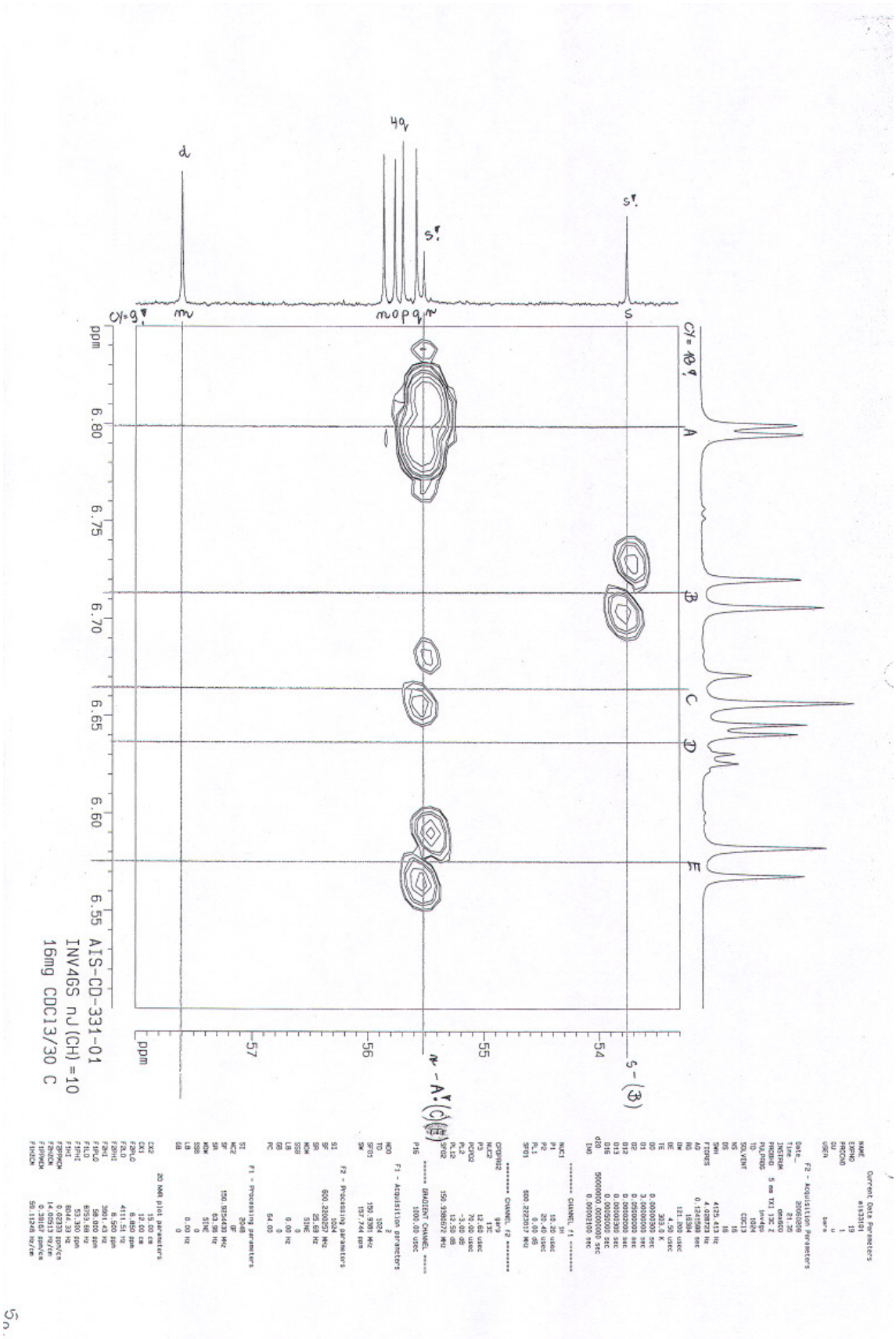
Figure S-6. Selected long range couplings for compound **21**.



e → B, E, J, L, M
f → B, E, J, K, O
g → A, C, J, K
r → A, C, E
s → B


INV4GS nJ (CH) = 10
16mg CDC13/30 C
AIS-CD-331-01
ppm
6.80
6.75
6.70
6.65
6.60
6.55
140
139
138
137
136
135
A
B
C
D
E


AIS-CD-331-01
INV4GS nJ(CH)=10
16mg CDCl3/30 C
ppm
3.0
2.5
2.0
140
139
138
137
136
135


INV4GS nJ(CH)=10
16mg CDCl3/30 C
AIS-CD-331-01
ppm
6.80
6.75
6.70
6.65
6.60
6.55
57
56
55
54
A
B
C
D
E