Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting information:

Fabrication of $Pd/CuFe_2O_4$ hybrid nanowires: Heterogeneous catalyst for Heck couplings

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Figure S1: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3aa** in $CDCl_3$

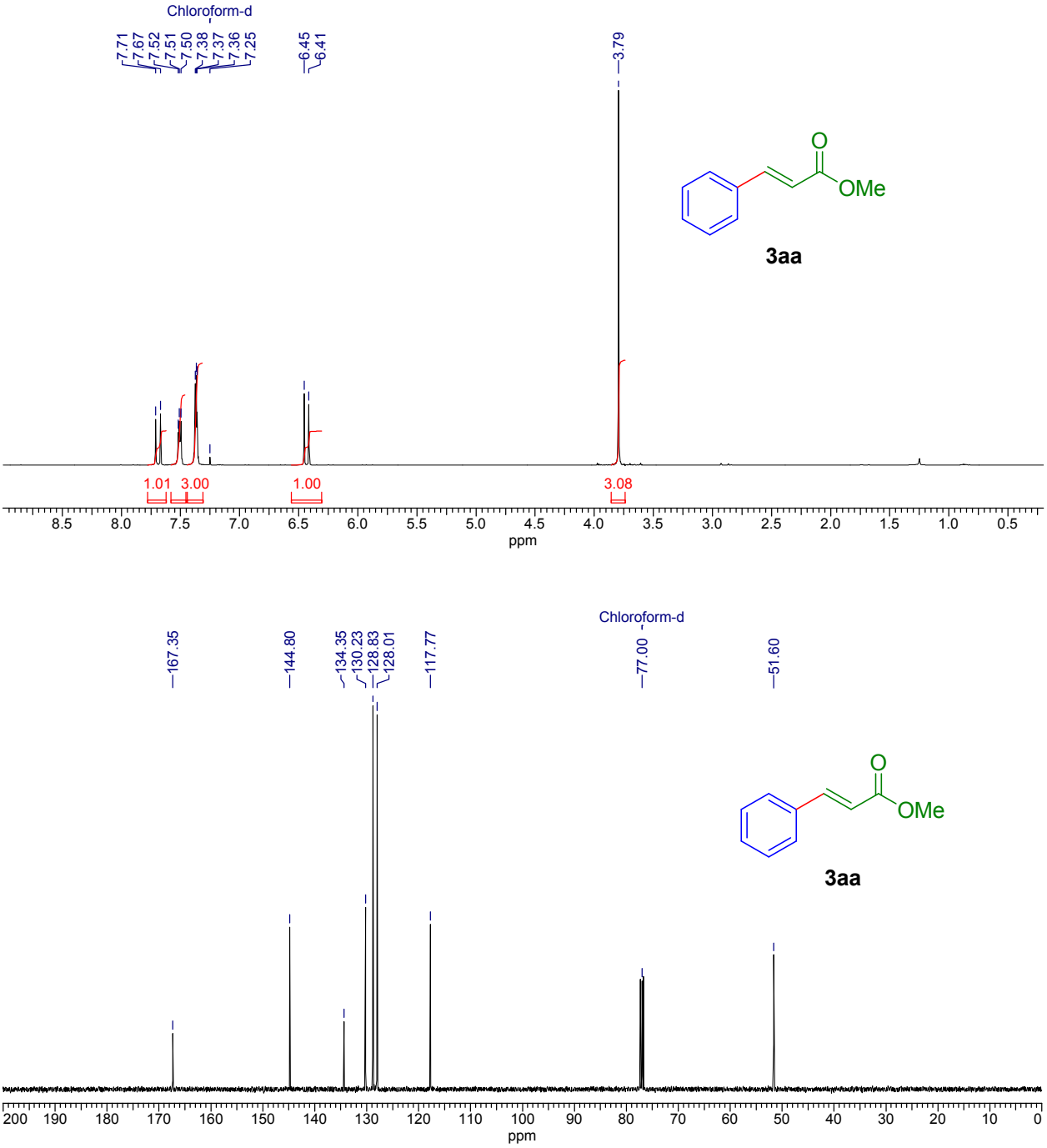
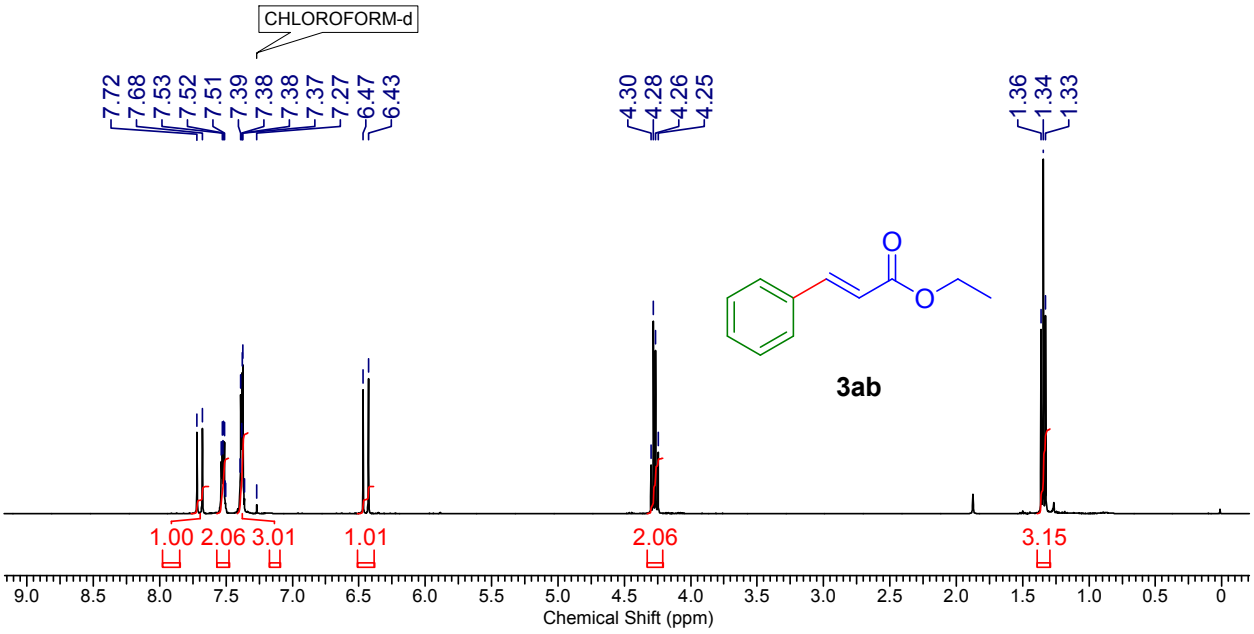


Figure S2: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ab** in $CDCl_3$



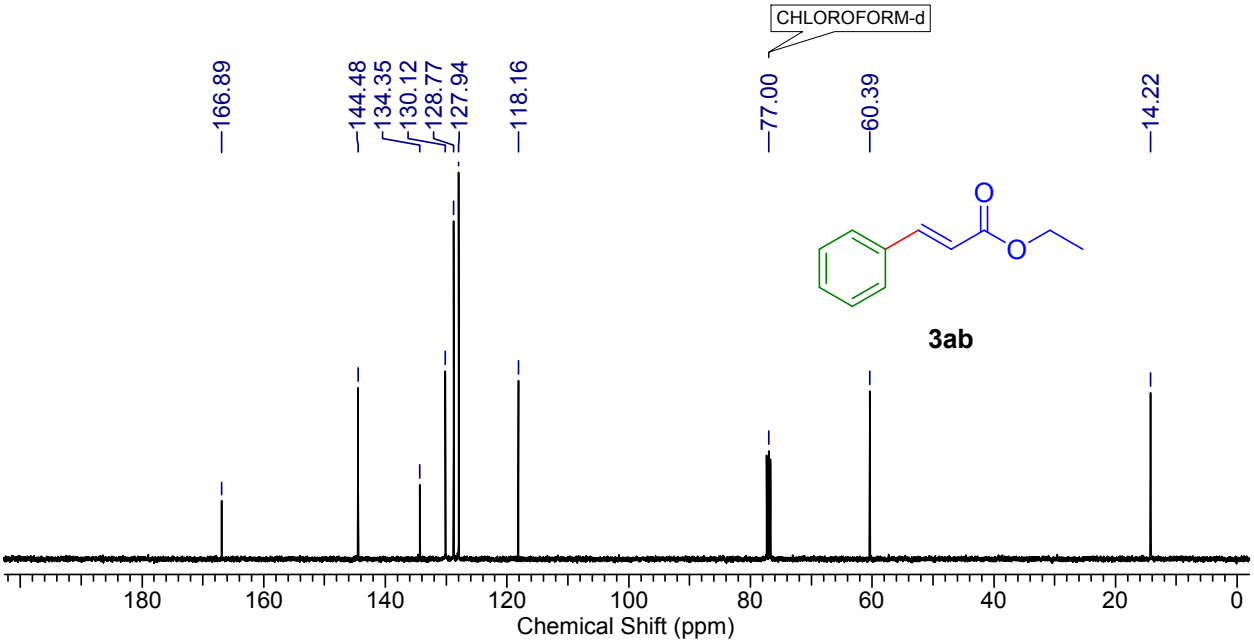
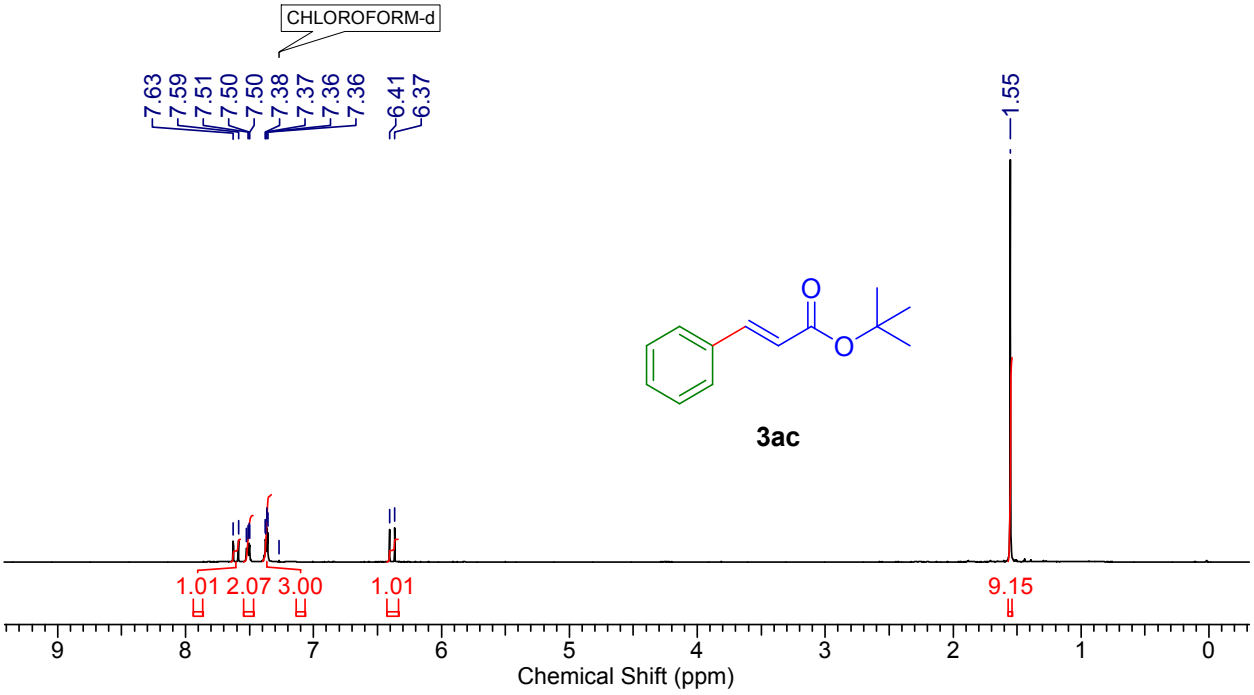


Figure S3: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ac** in $CDCl_3$



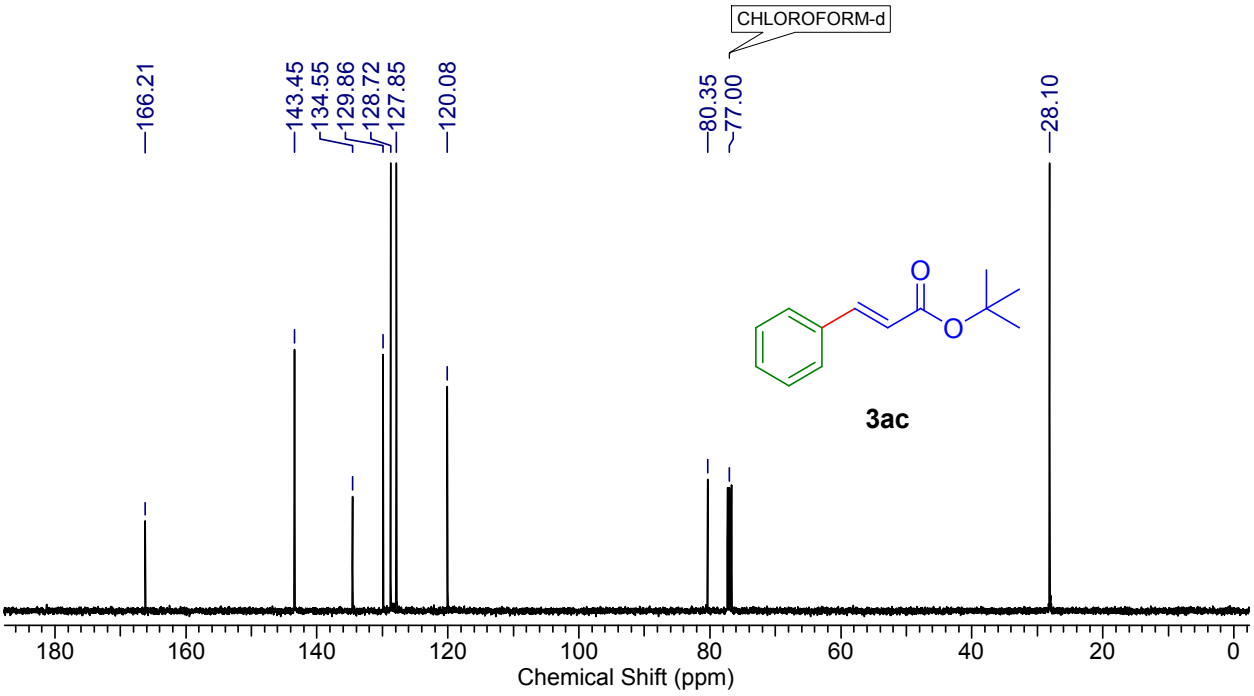


Figure S4: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ba** in $CDCl_3$

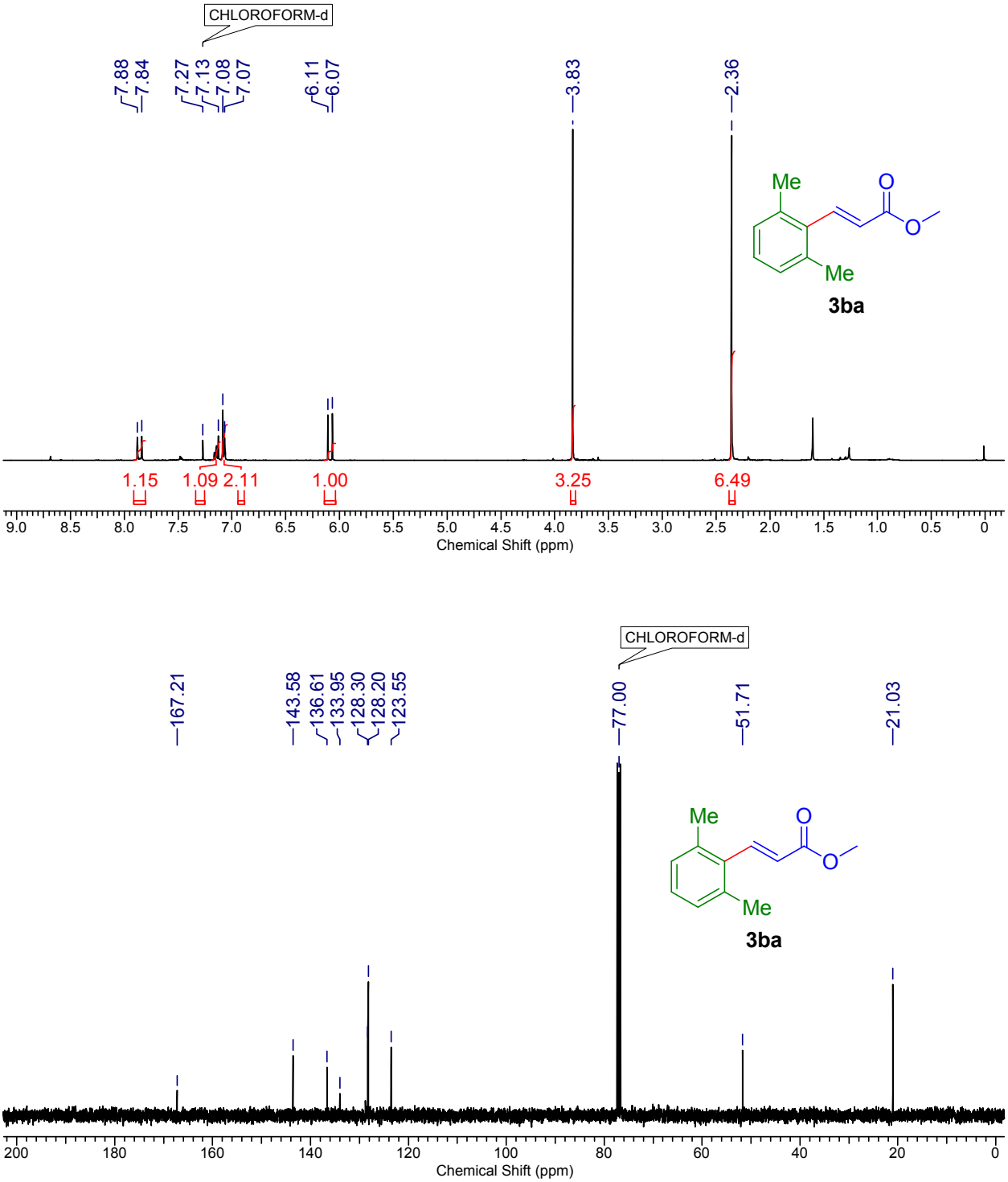


Figure S5: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3bb** in $CDCl_3$

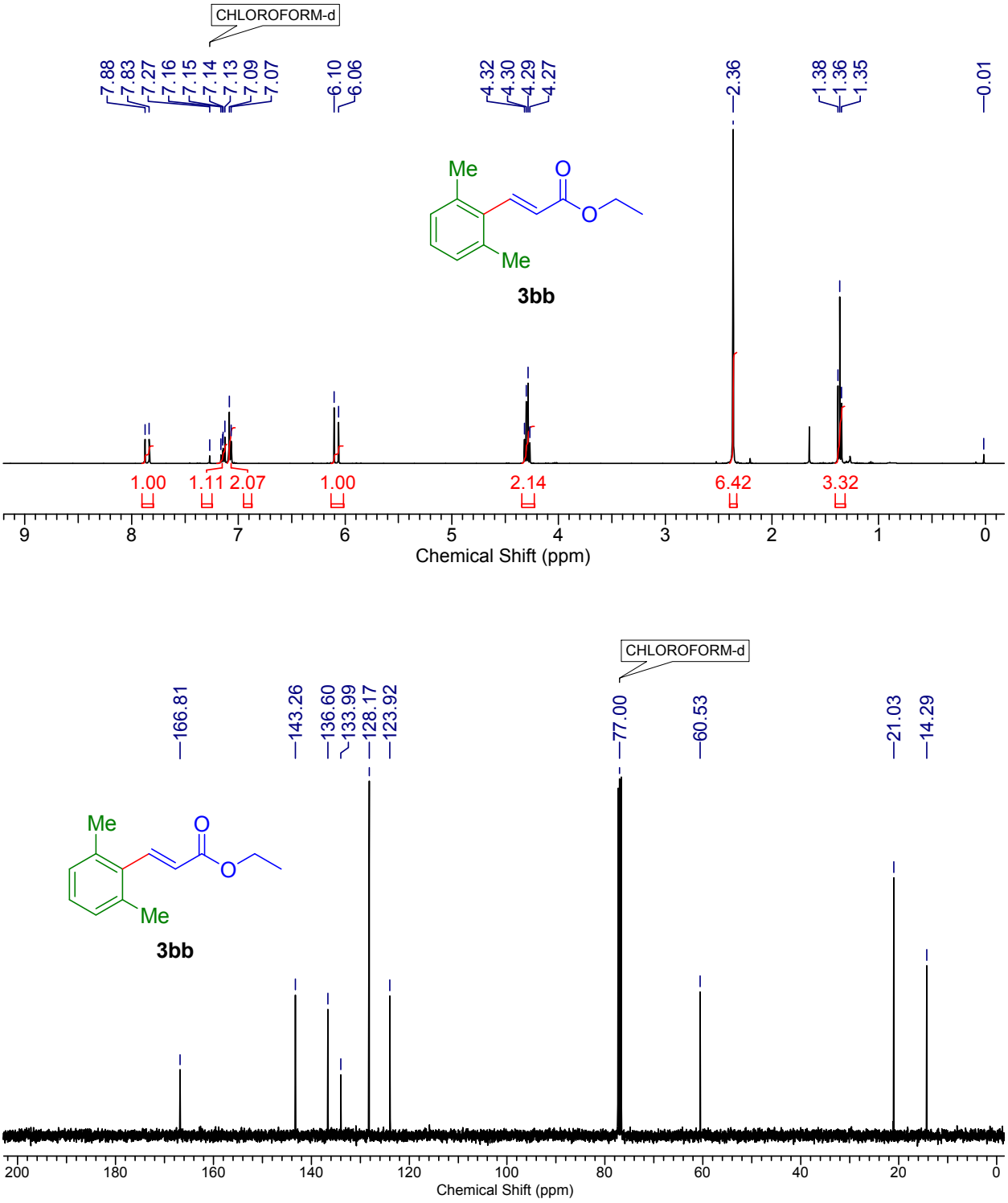


Figure S6: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3bc** in $CDCl_3$

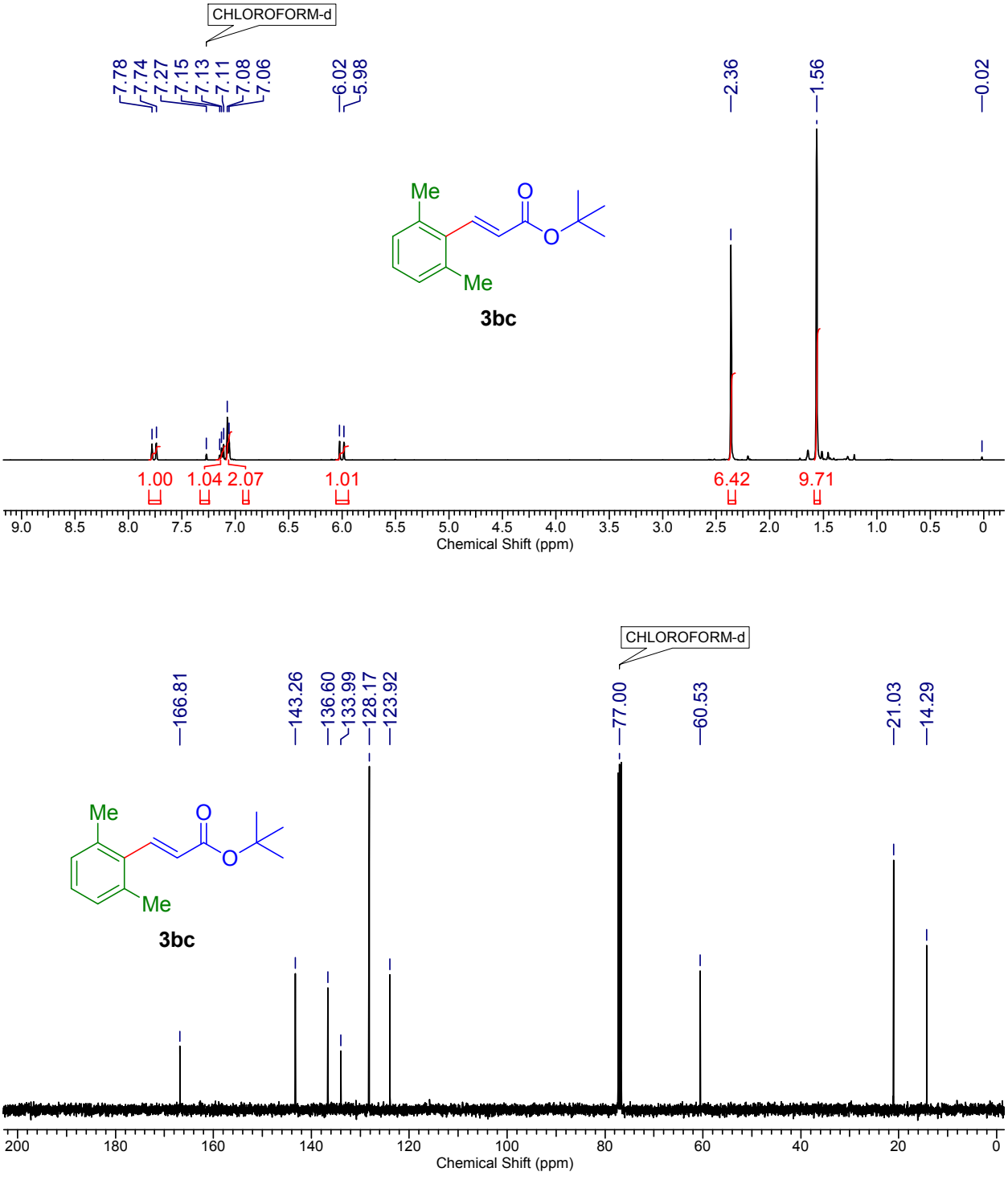


Figure S7: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3cb** in $CDCl_3$

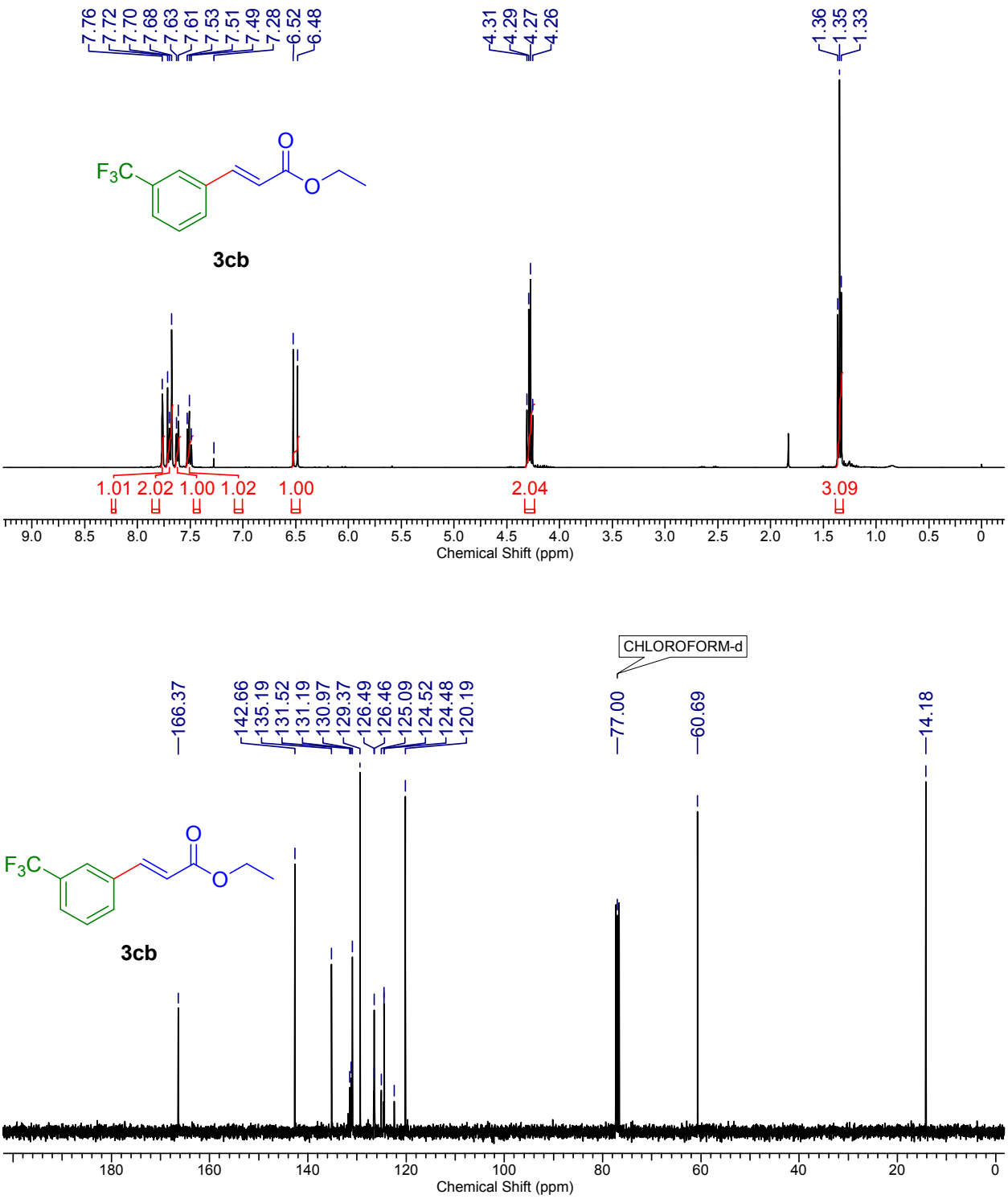


Figure S8: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3da** in $CDCl_3$

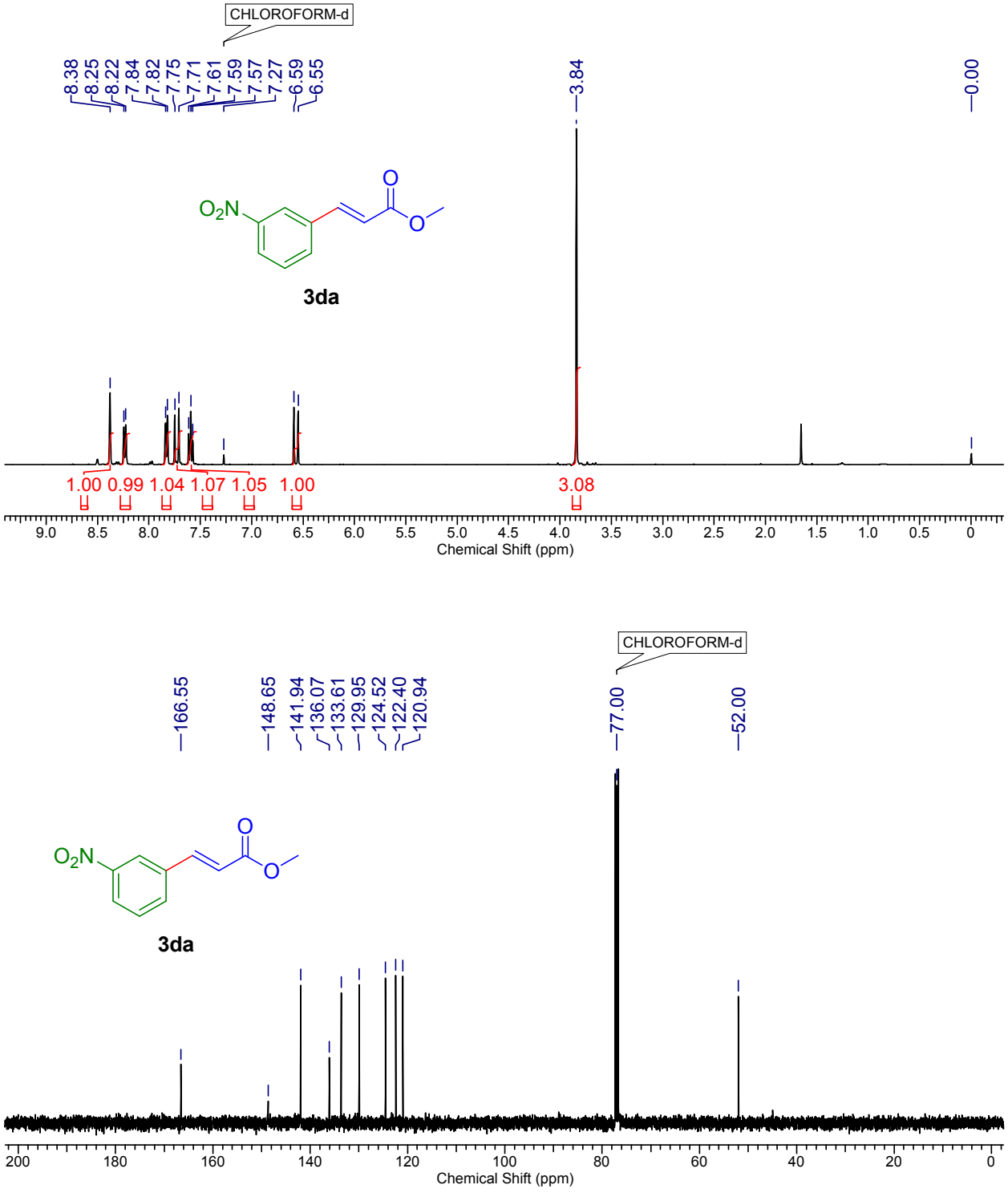


Figure S9: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3db** in $CDCl_3$

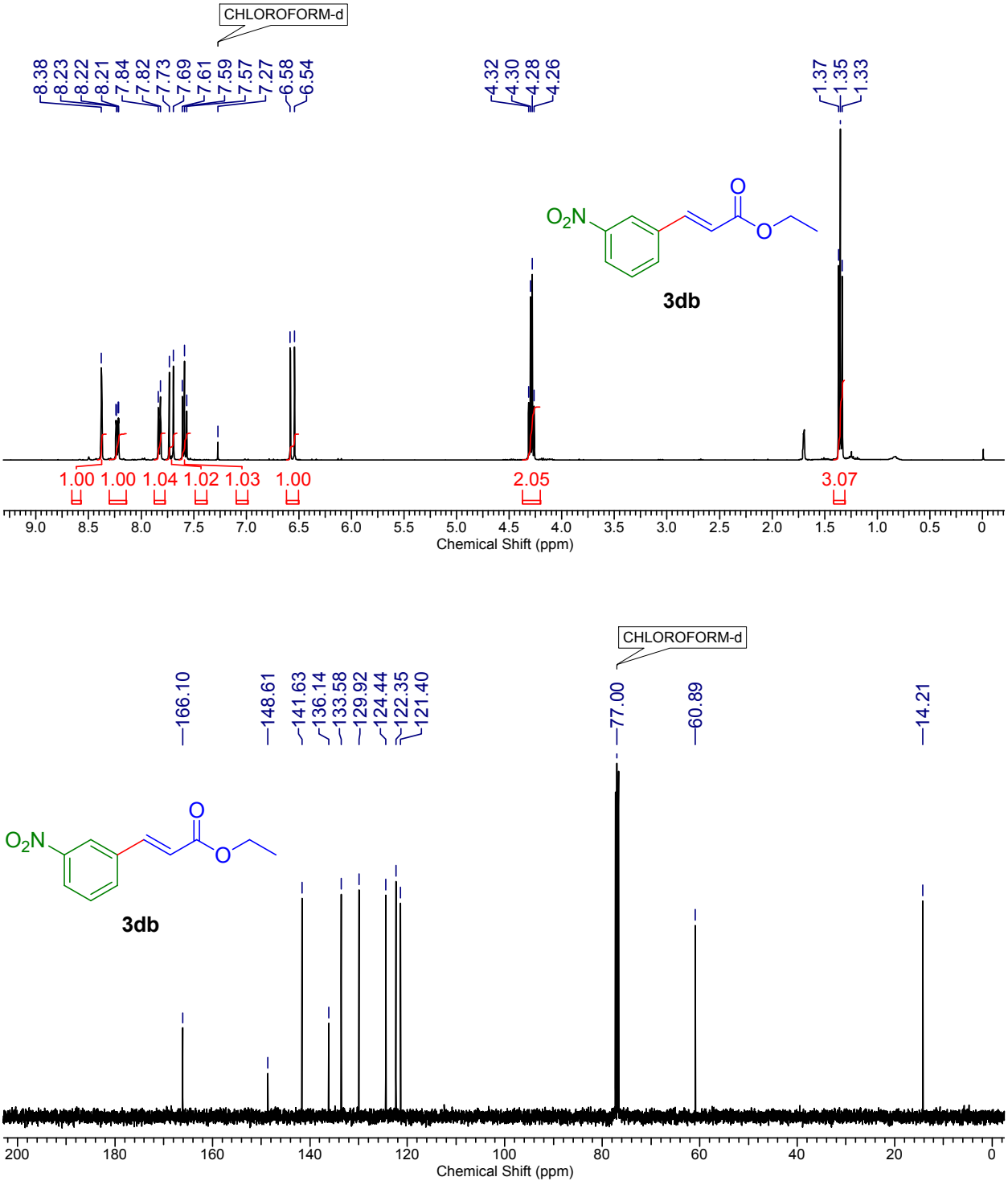


Figure S10: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3dc** in $CDCl_3$

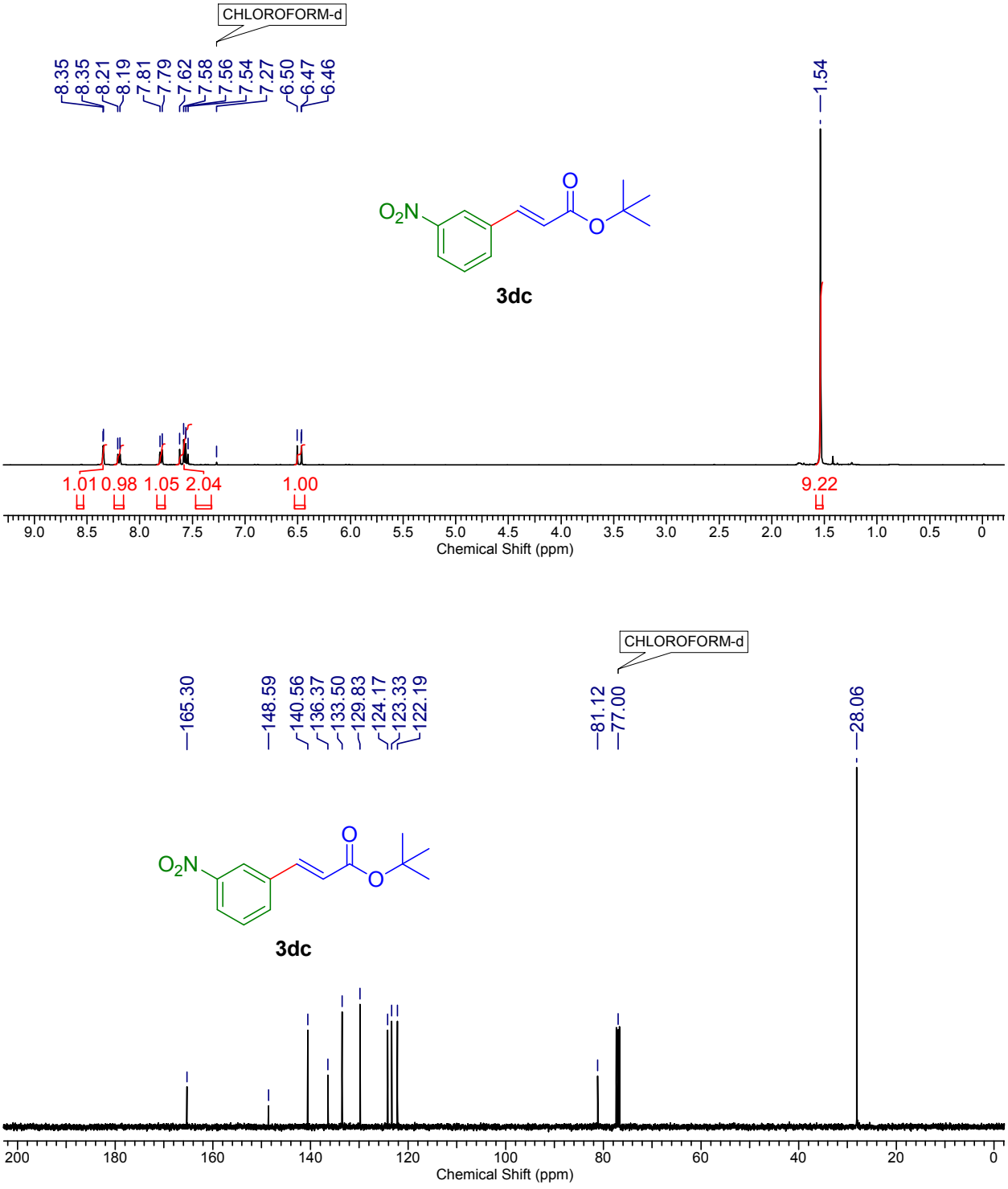


Figure S11: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ea** in $CDCl_3$

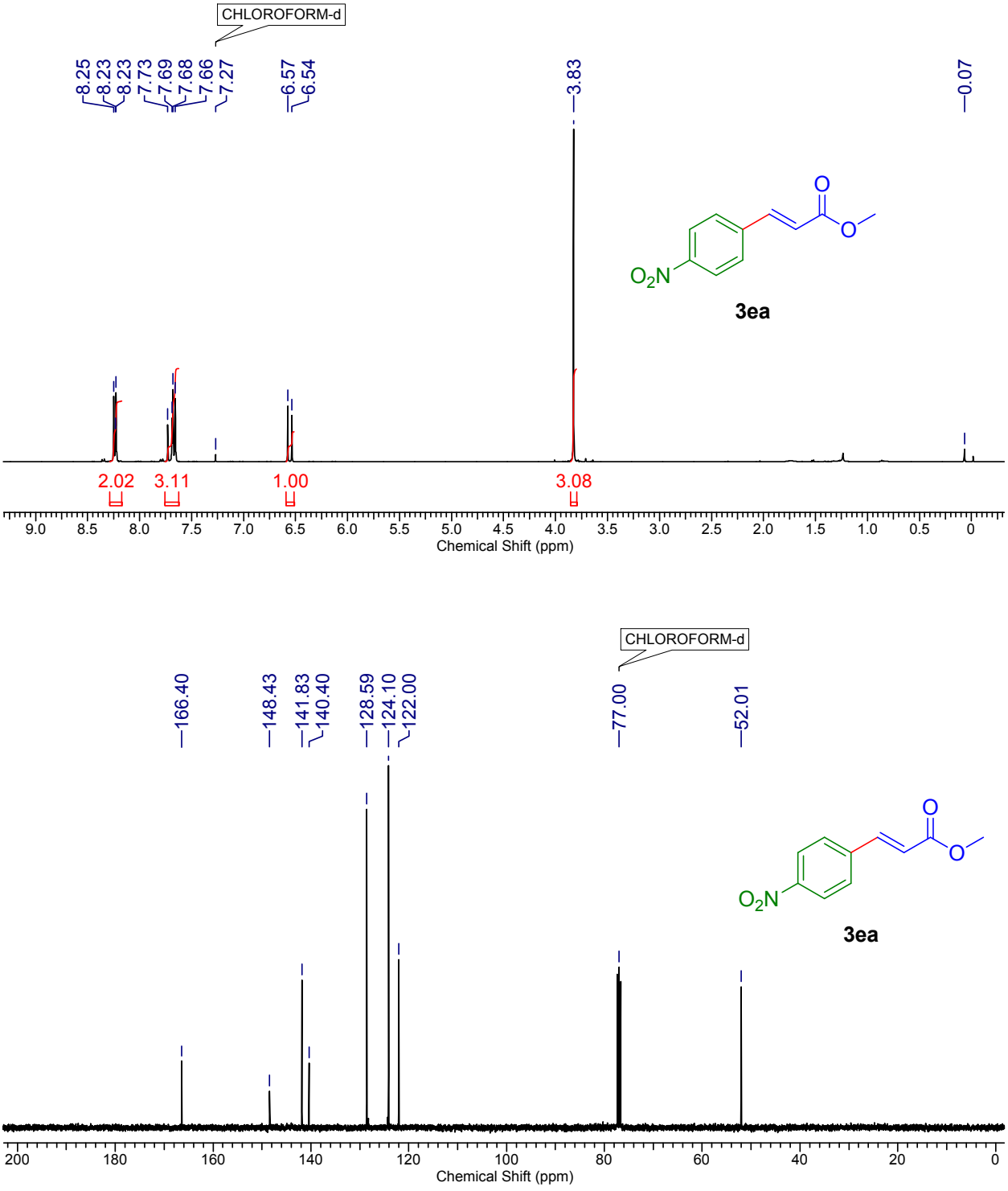


Figure S12: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3eb** in $CDCl_3$

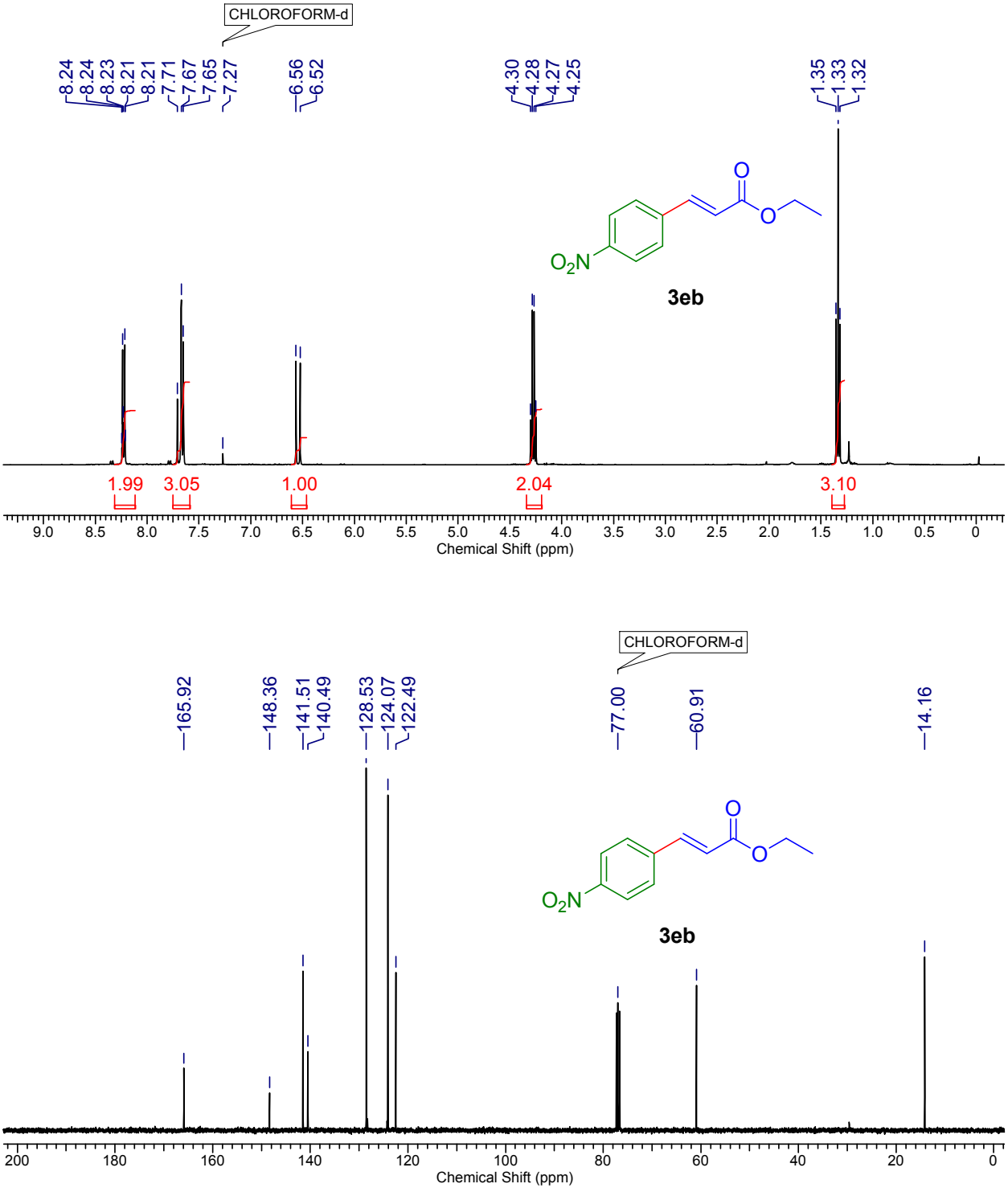


Figure S13: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ec** in $CDCl_3$

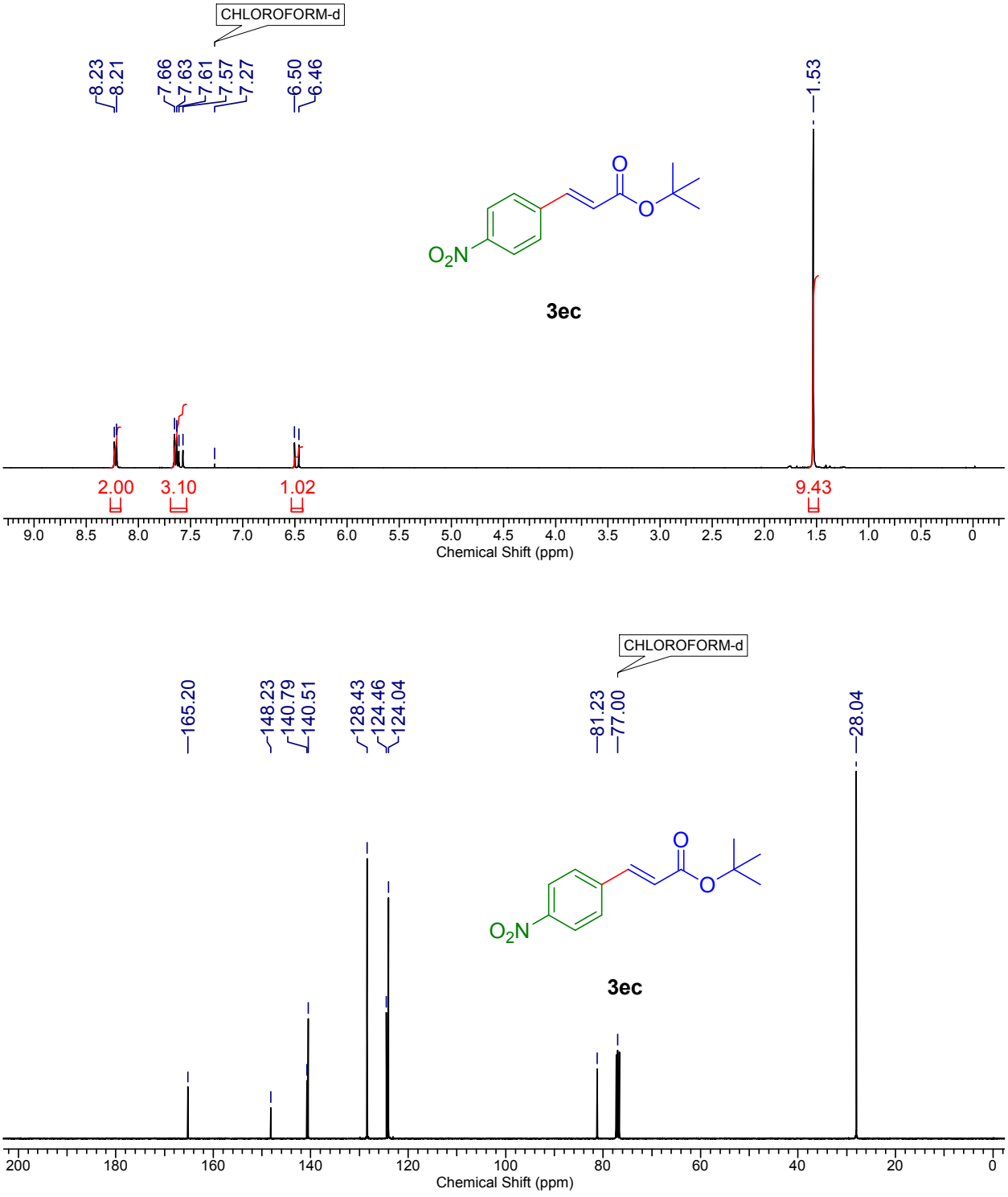


Figure S14: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3fa** in $CDCl_3$

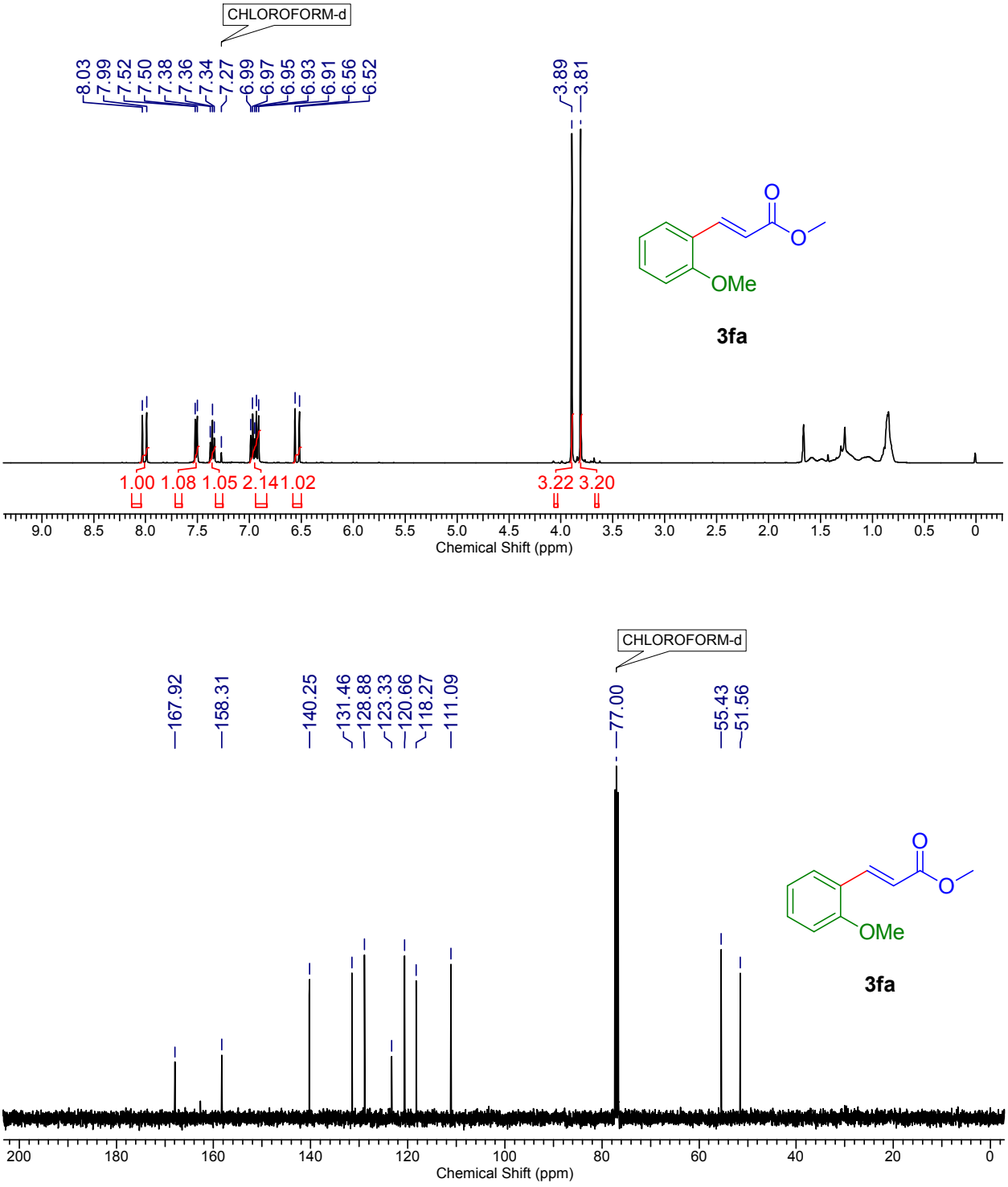


Figure S15: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3fb** in $CDCl_3$

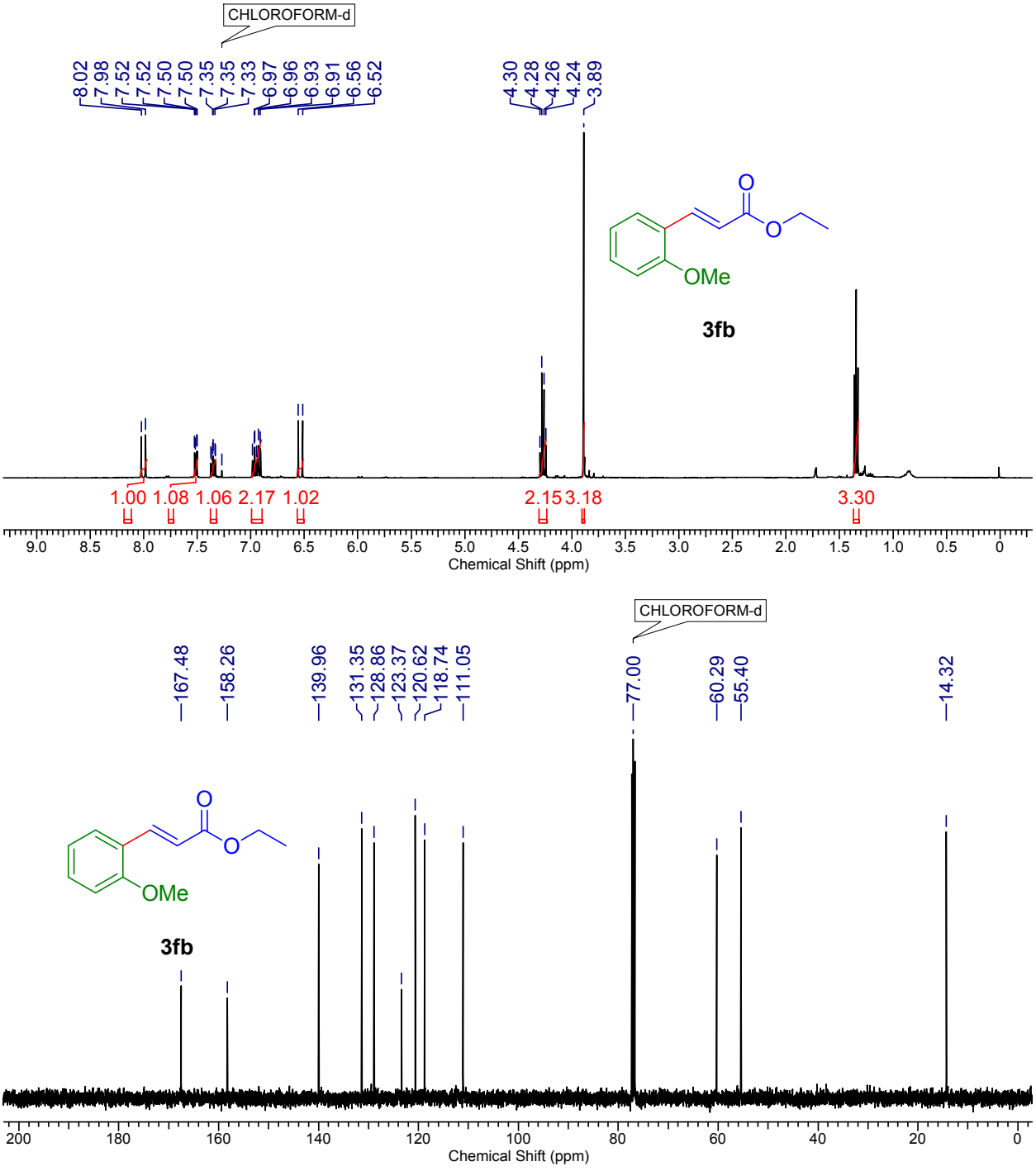


Figure S16: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ga** in $CDCl_3$

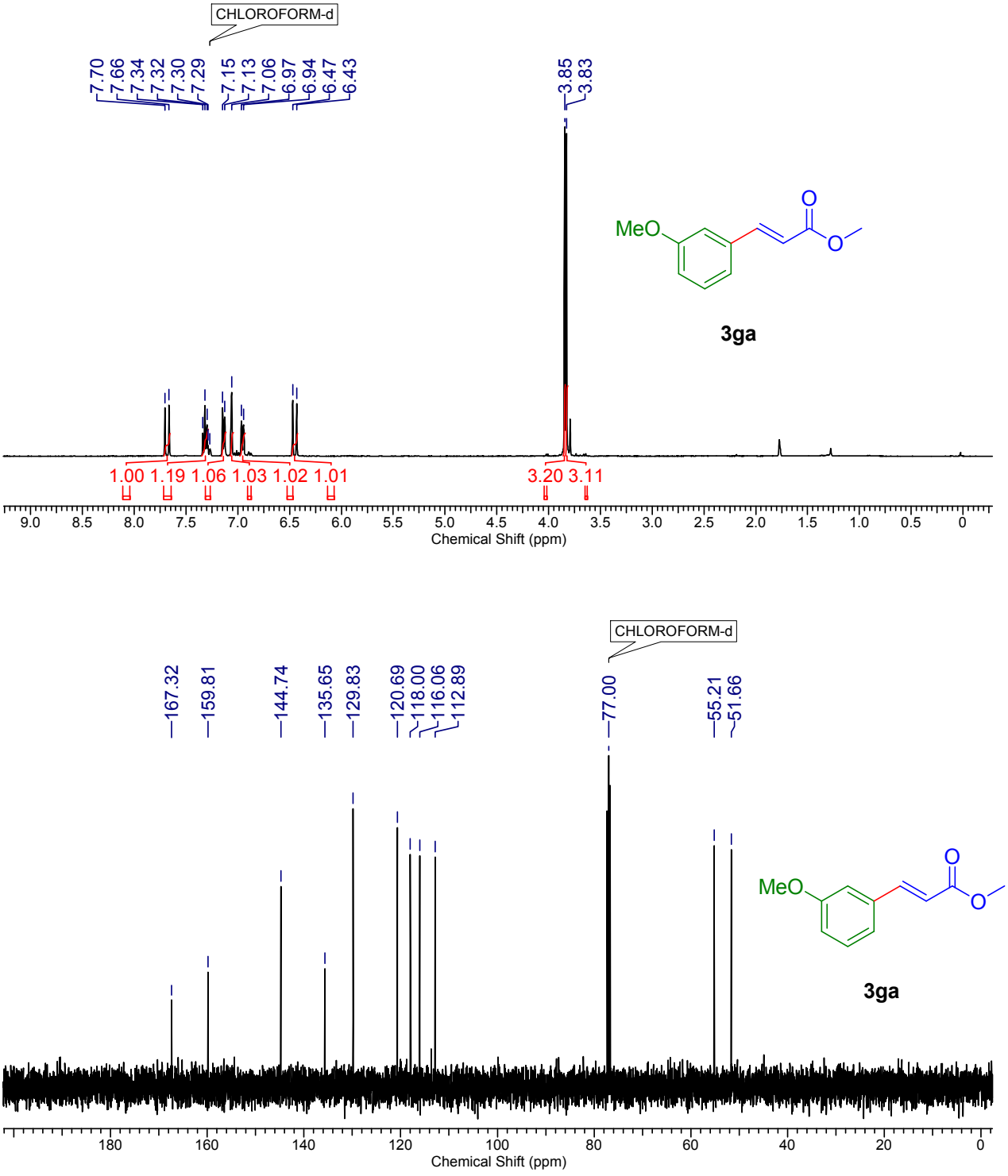


Figure S17: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3gb** in $CDCl_3$

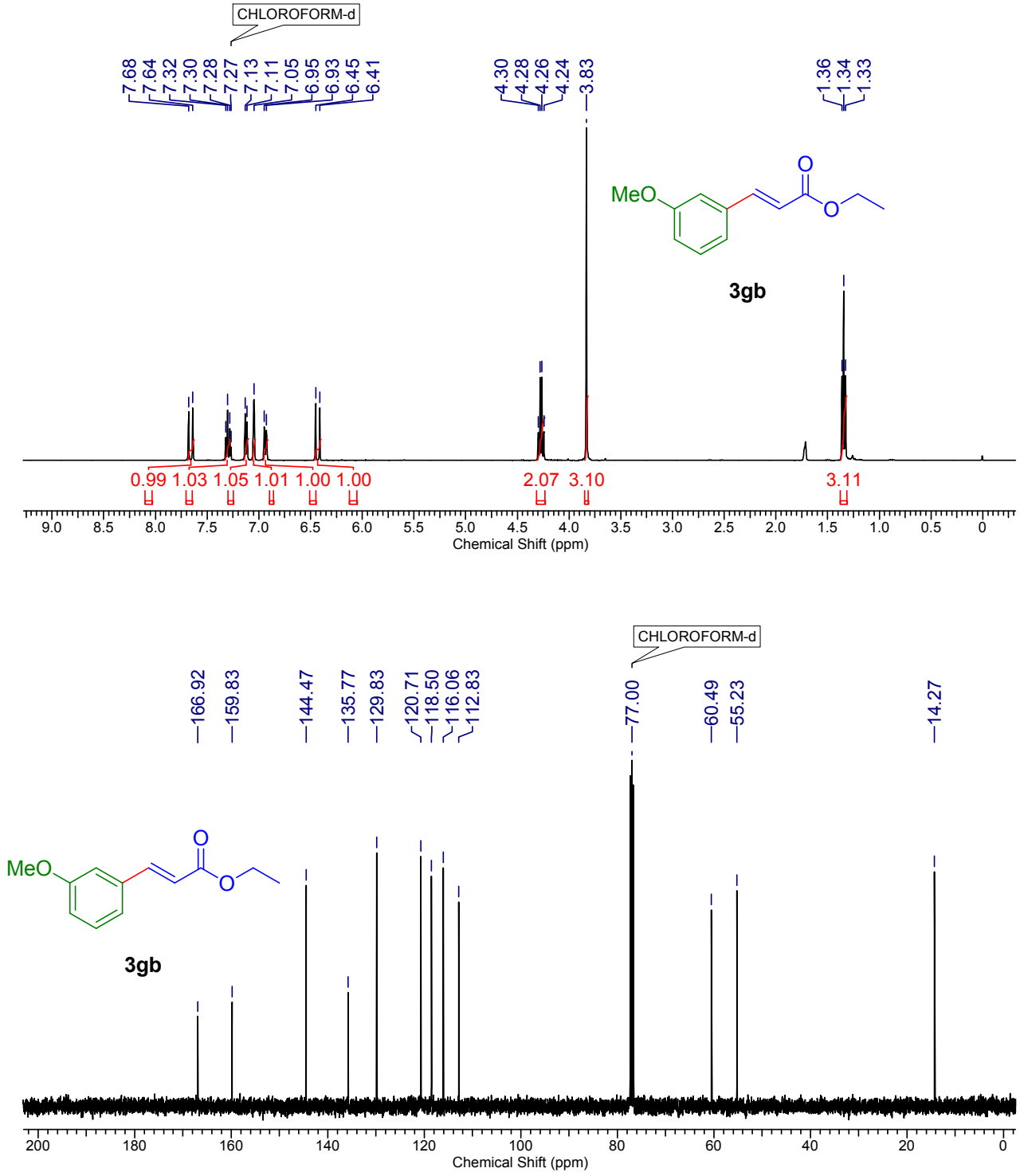


Figure S18: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ha** in $CDCl_3$

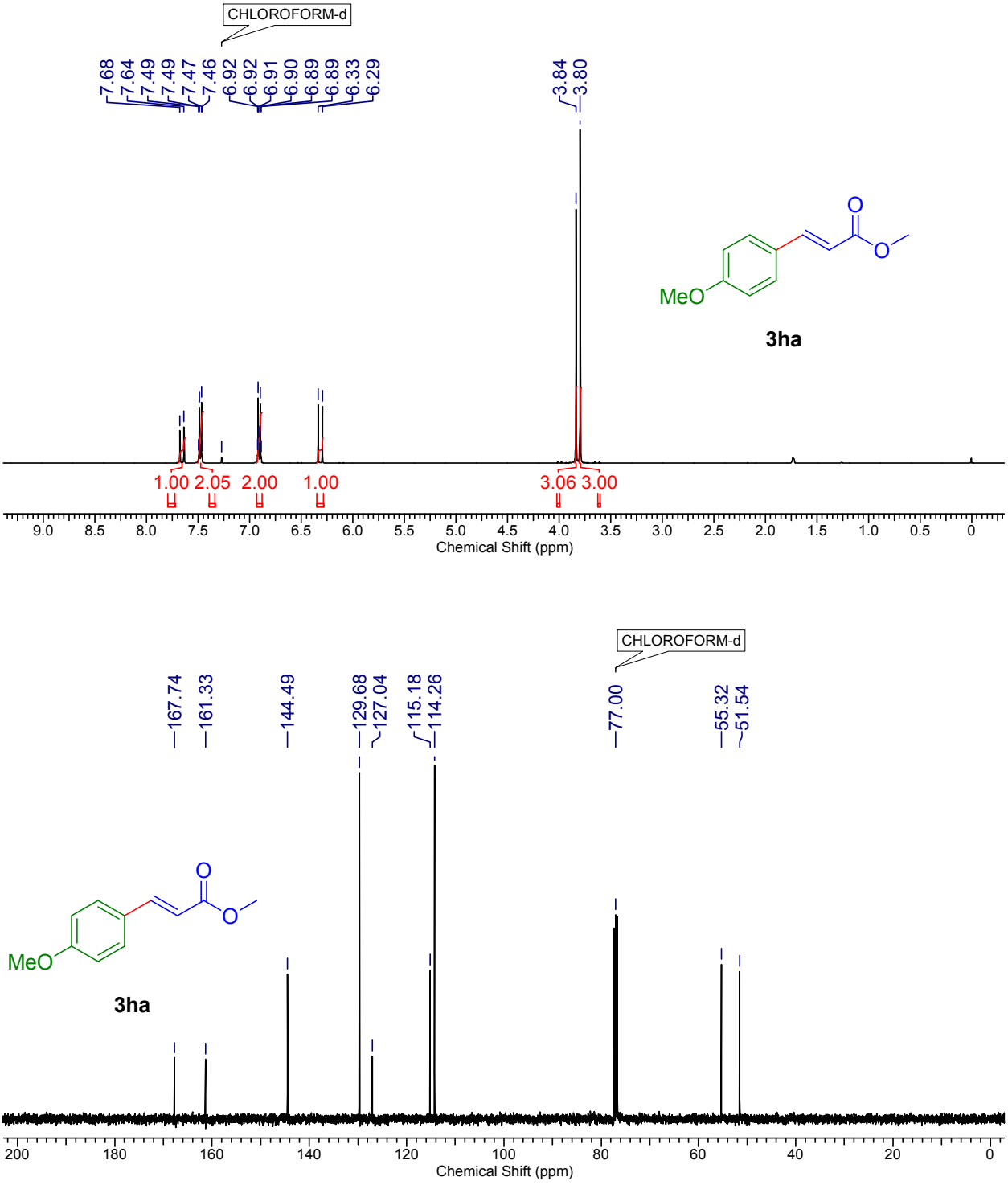


Figure S19: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3hb** in $CDCl_3$

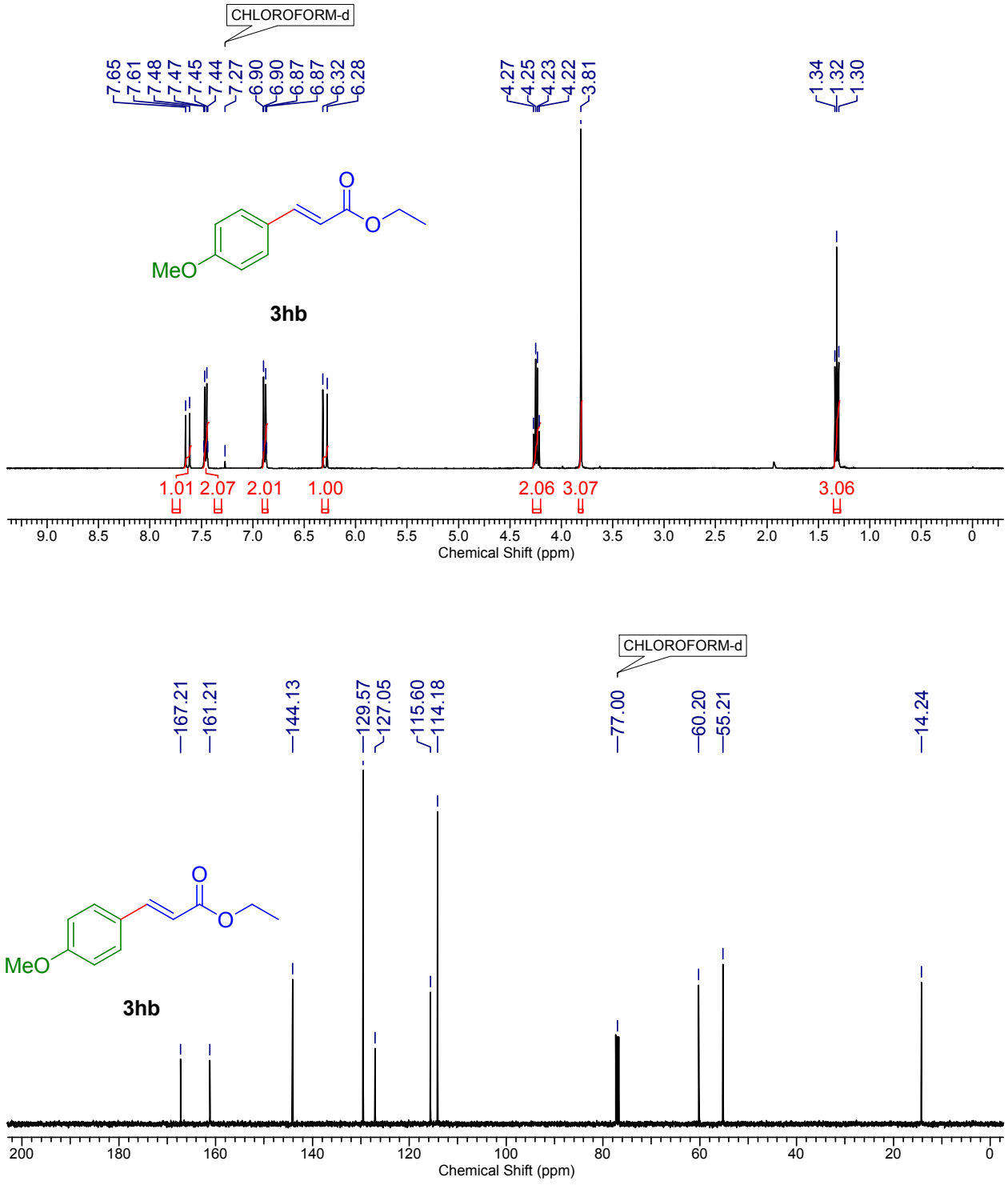


Figure S20: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3hc** in $CDCl_3$

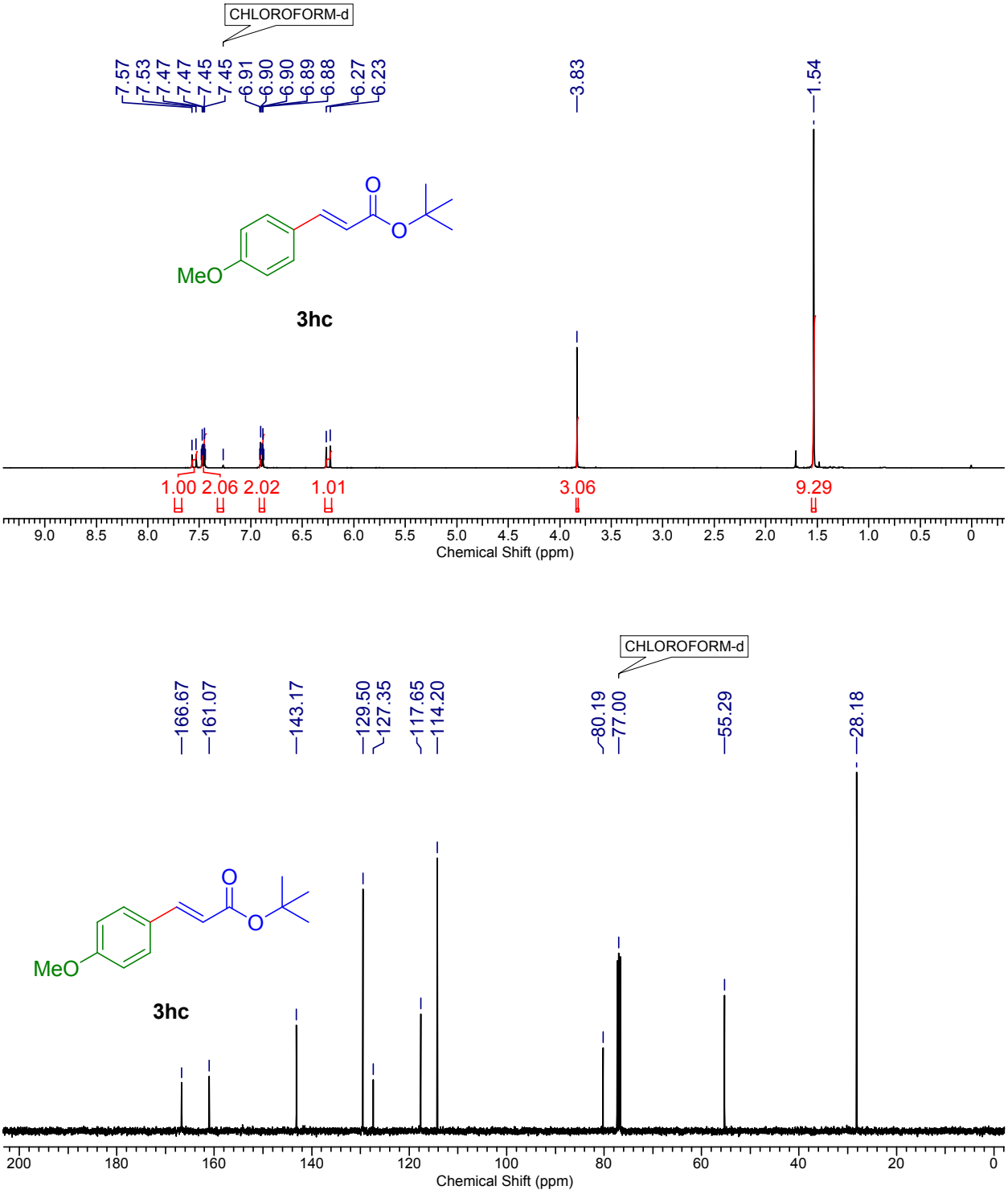


Figure S21: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ib** in $CDCl_3$

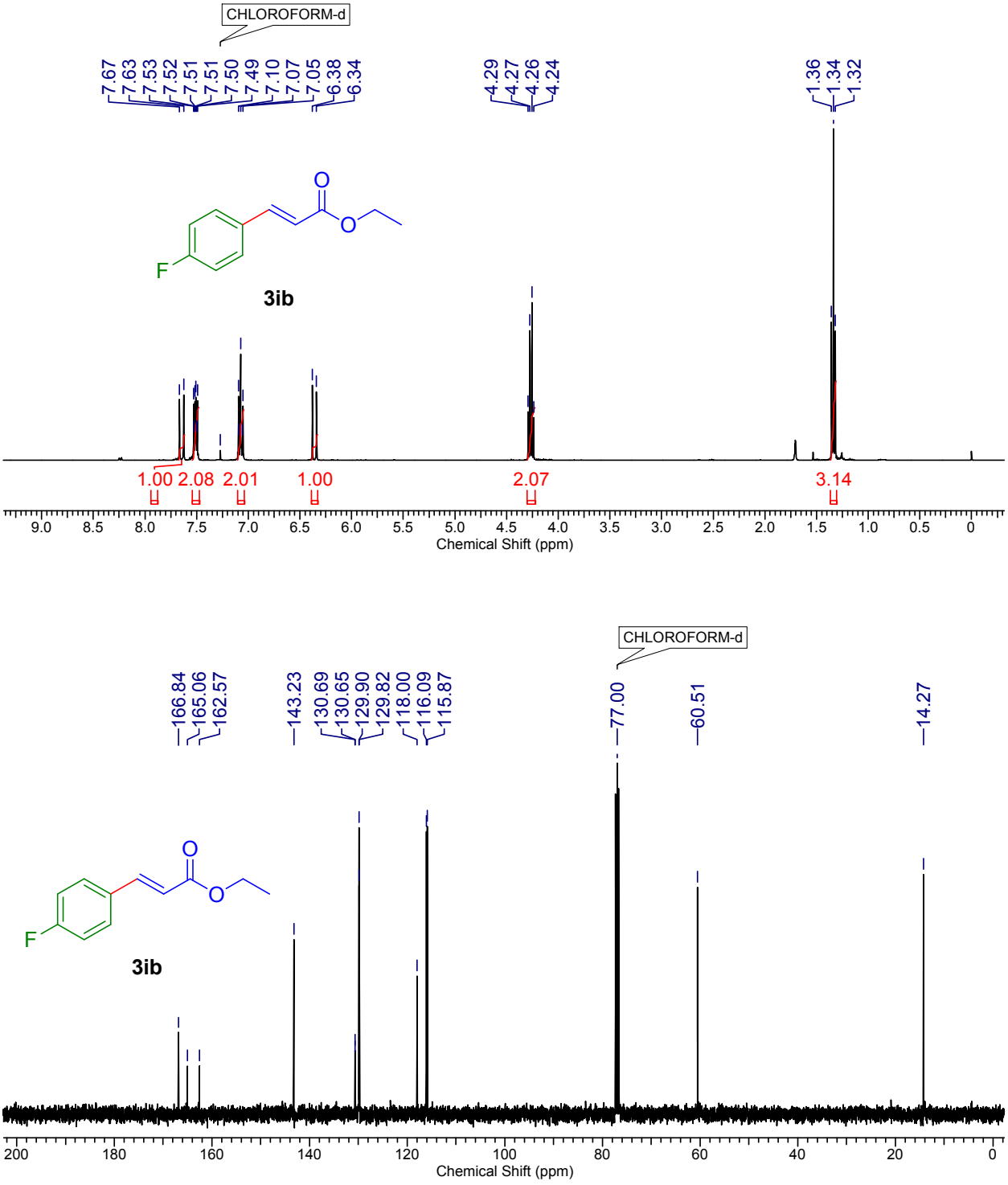


Figure S22: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ic** in $CDCl_3$

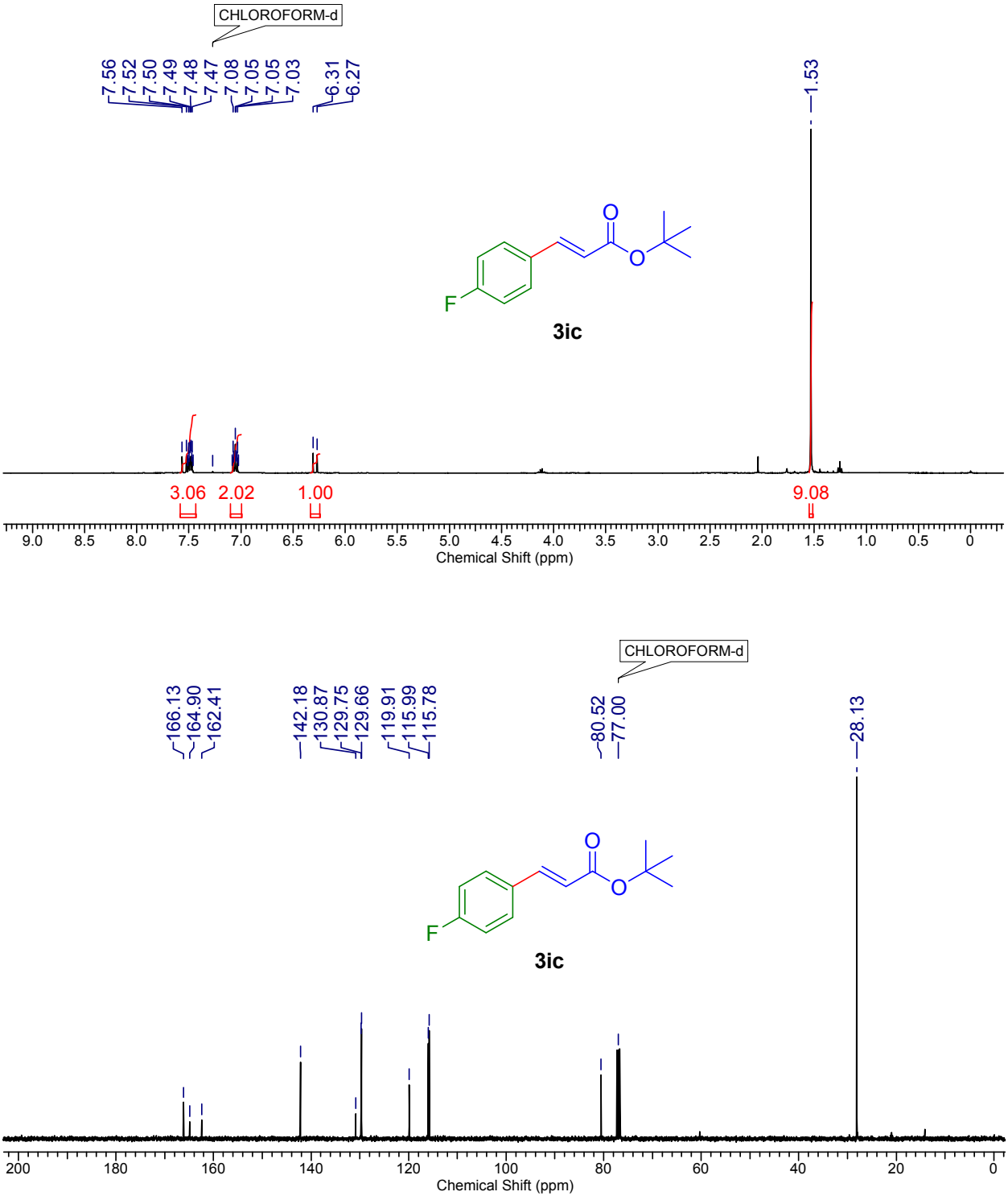


Figure S23: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3ja** in $CDCl_3$

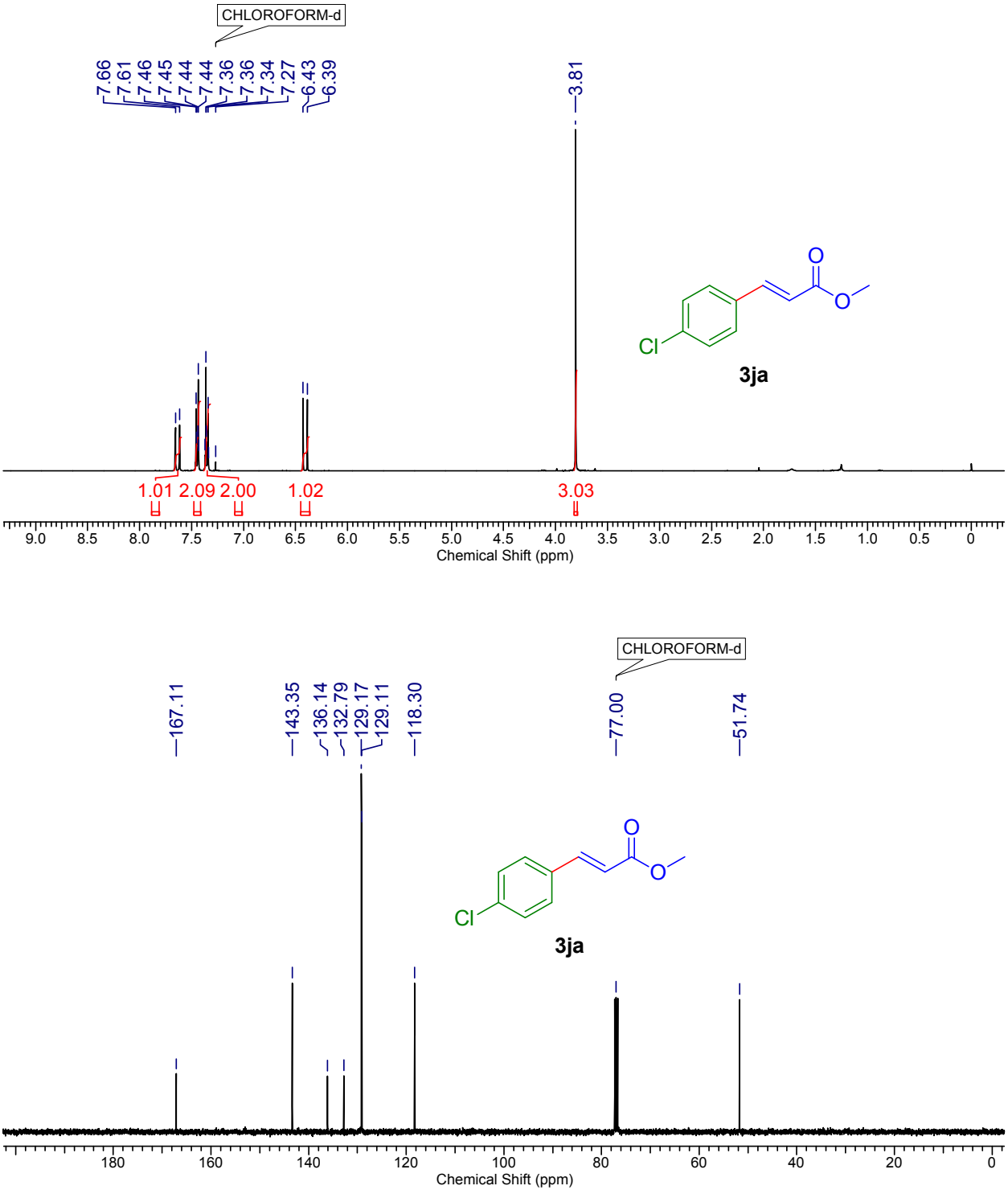


Figure S24: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **3jb** in $CDCl_3$

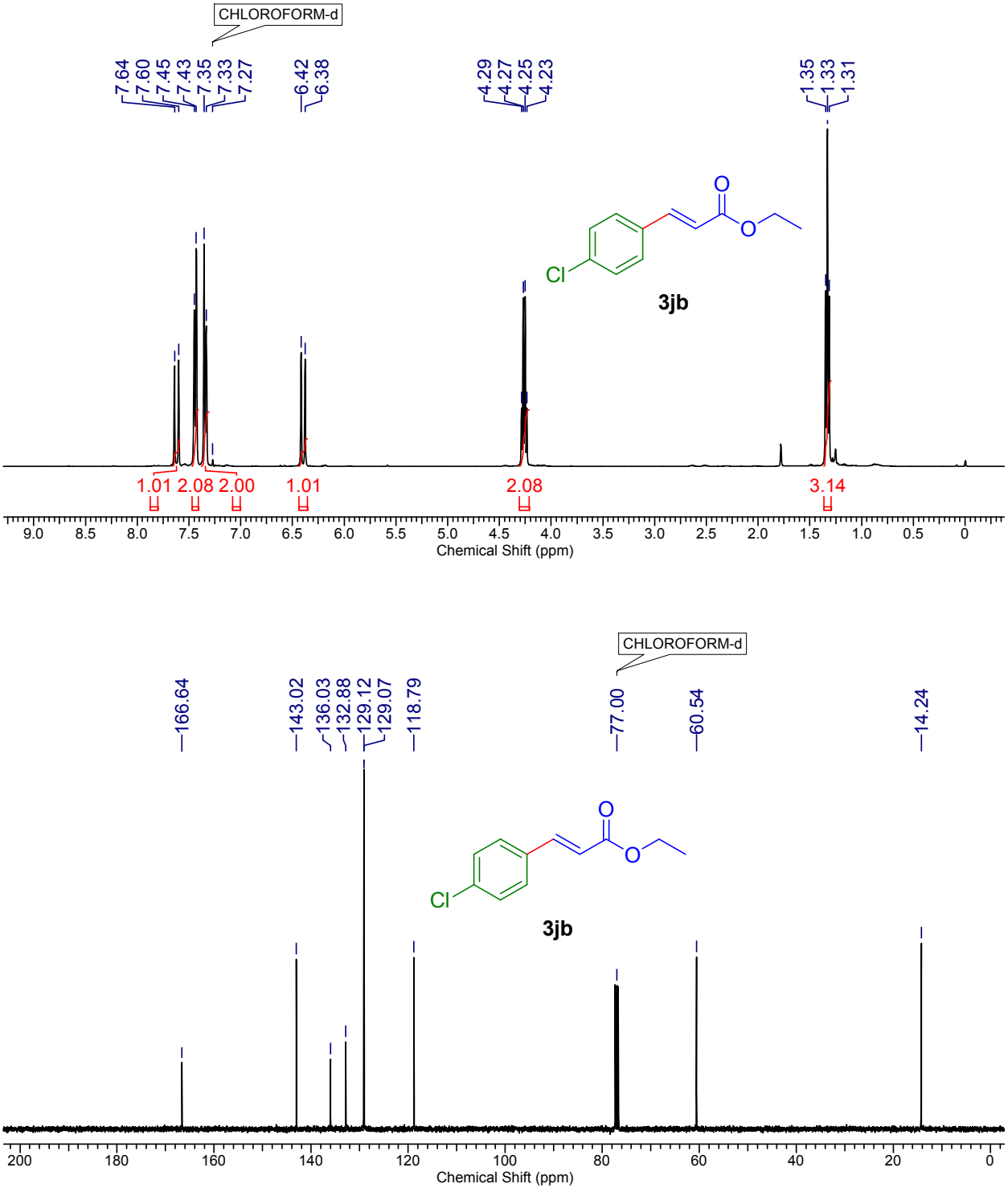


Figure S25: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **5aa** in $CDCl_3$

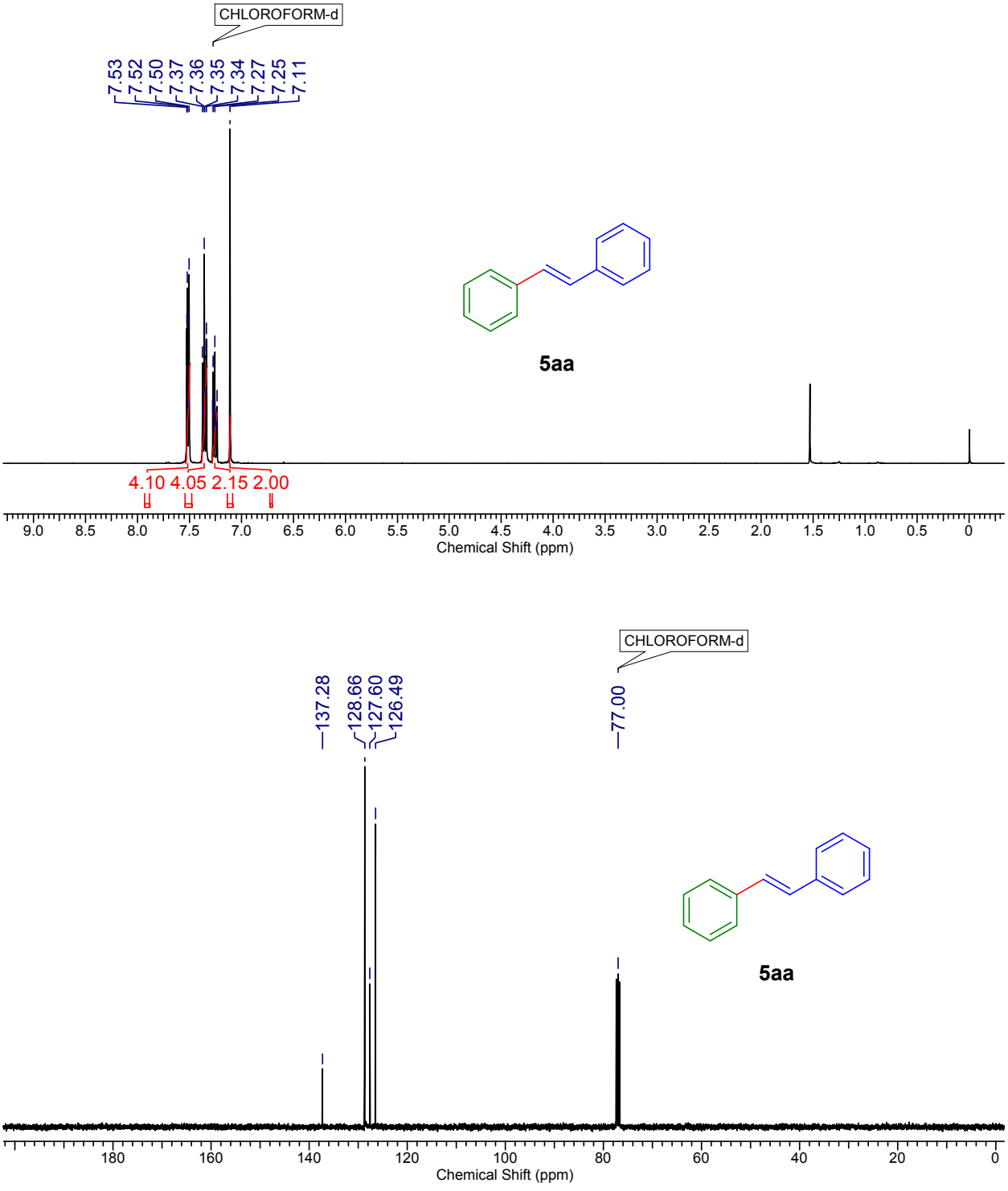


Figure S26: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **5ba** in $CDCl_3$

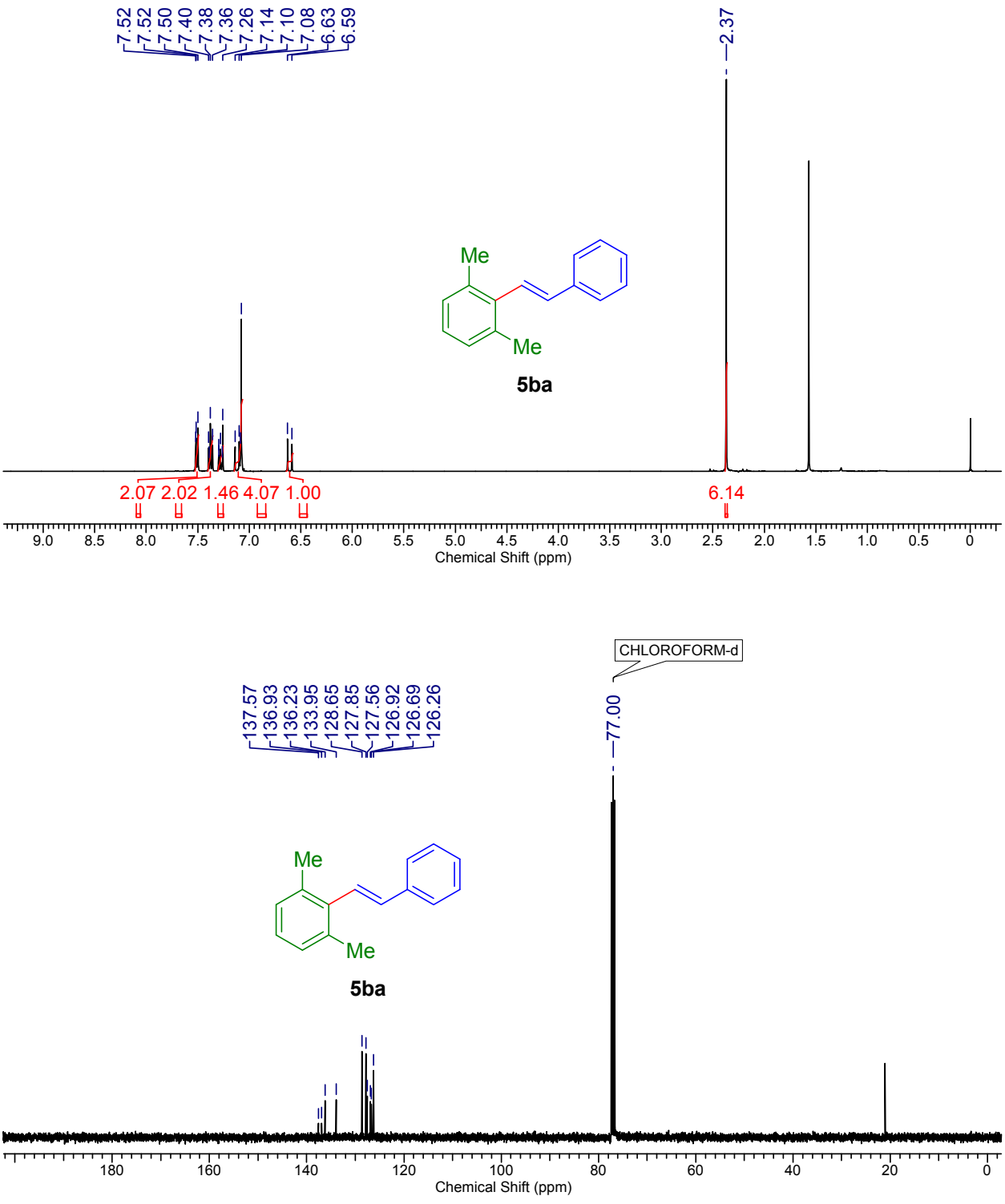


Figure S27: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **5ga** in $CDCl_3$

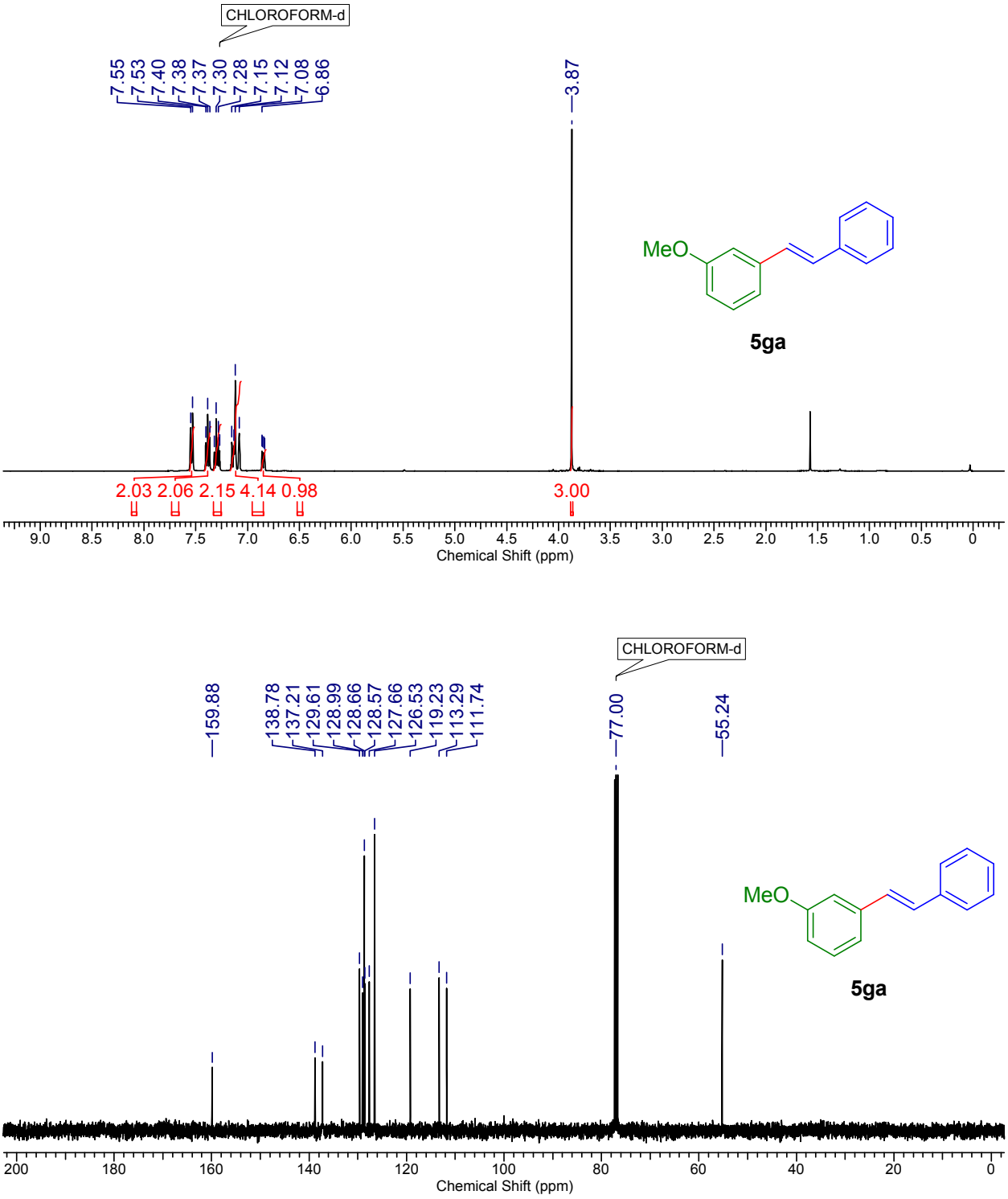


Figure S28: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **5ha** in $CDCl_3$

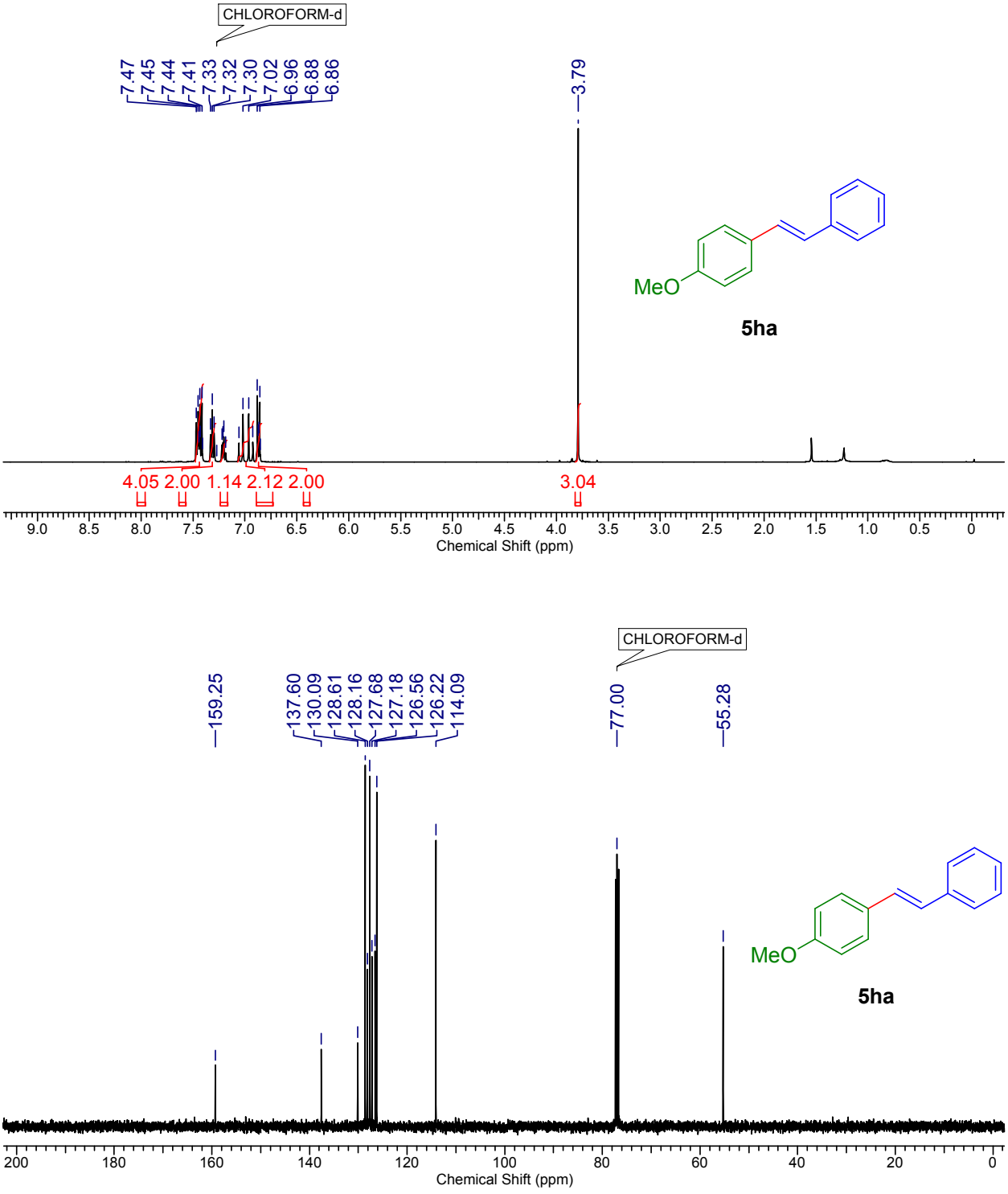


Figure S29: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **5ia** in $CDCl_3$

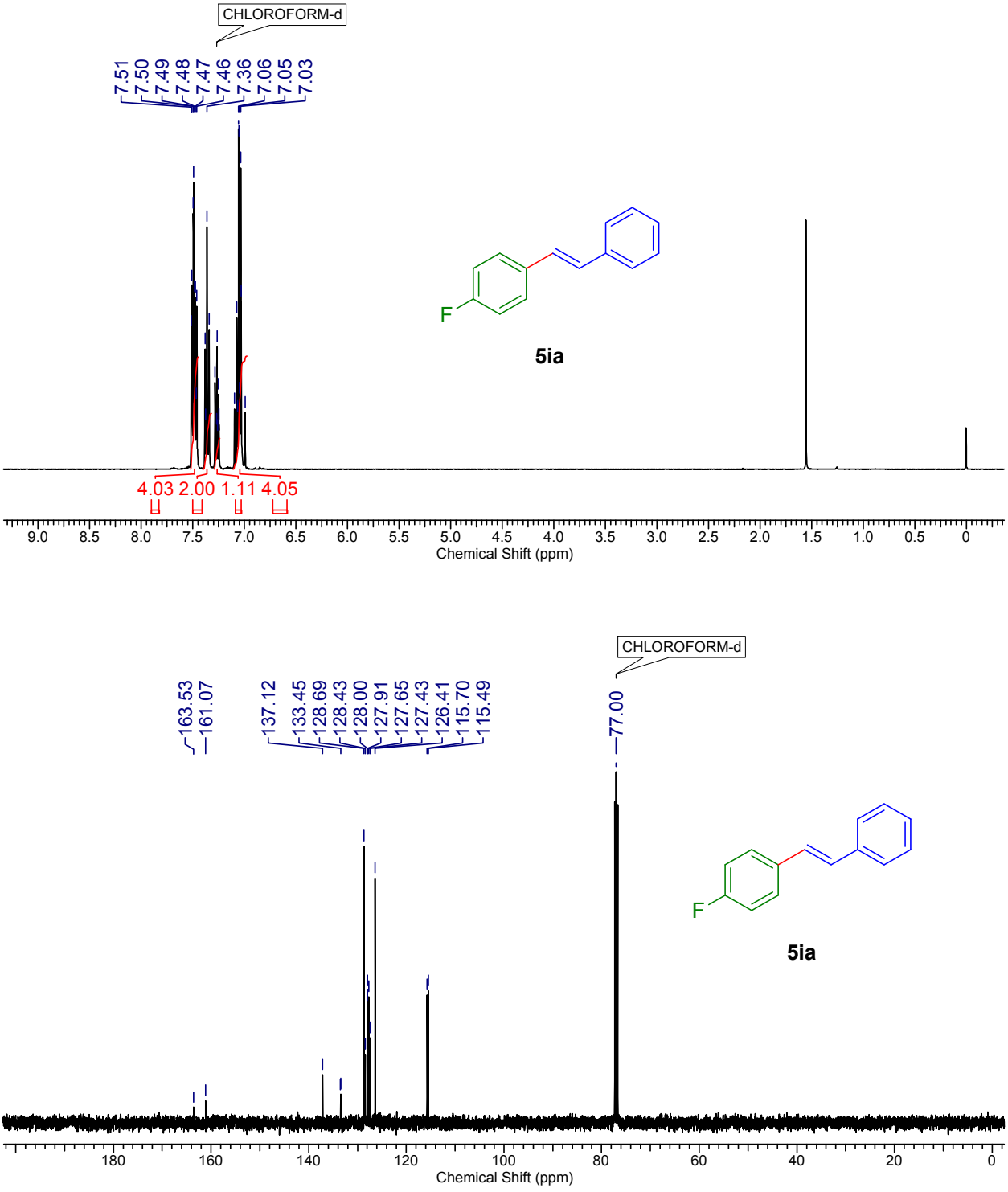


Figure S30: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **5ib** in $CDCl_3$

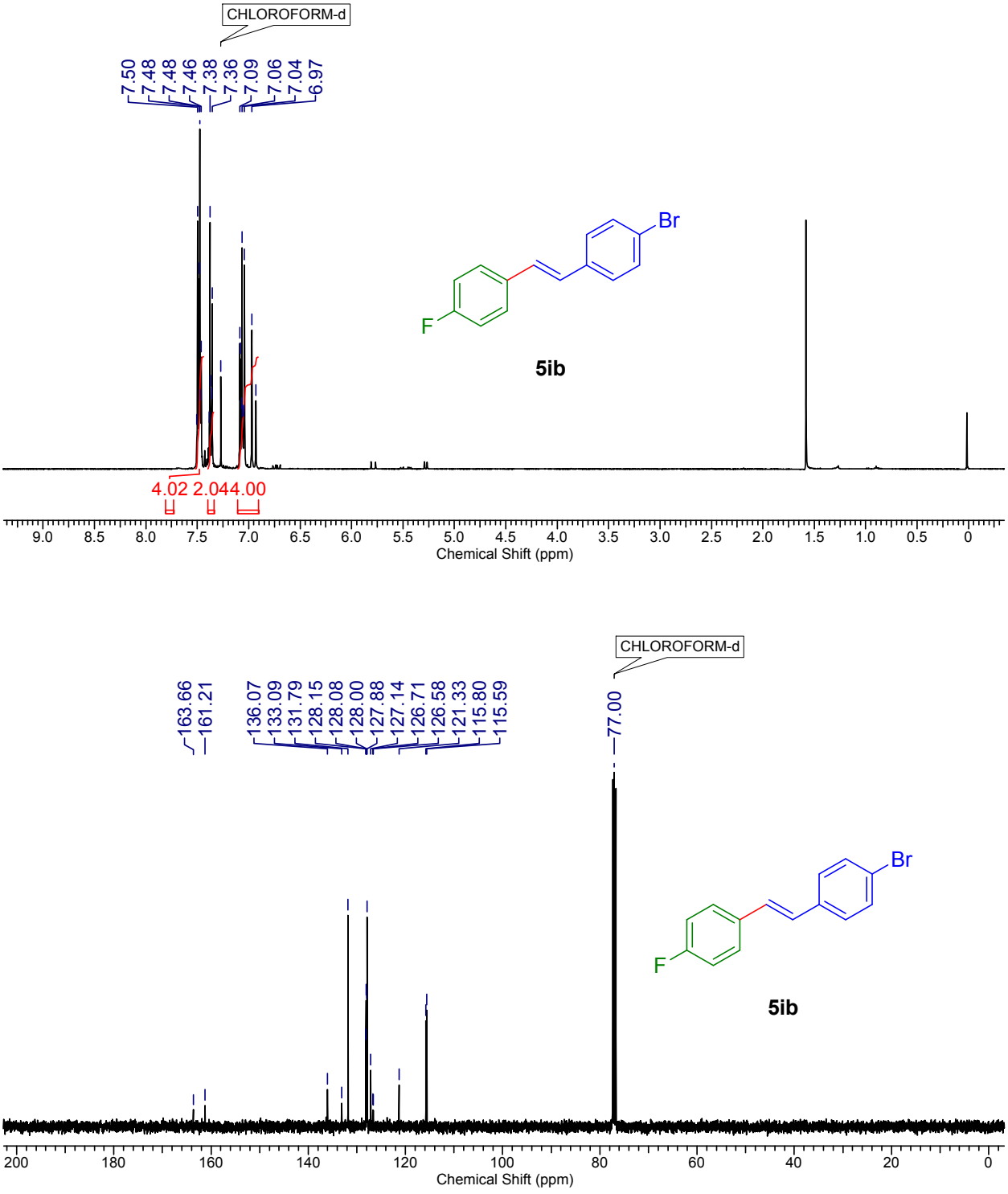


Figure S31: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **5ja** in $CDCl_3$

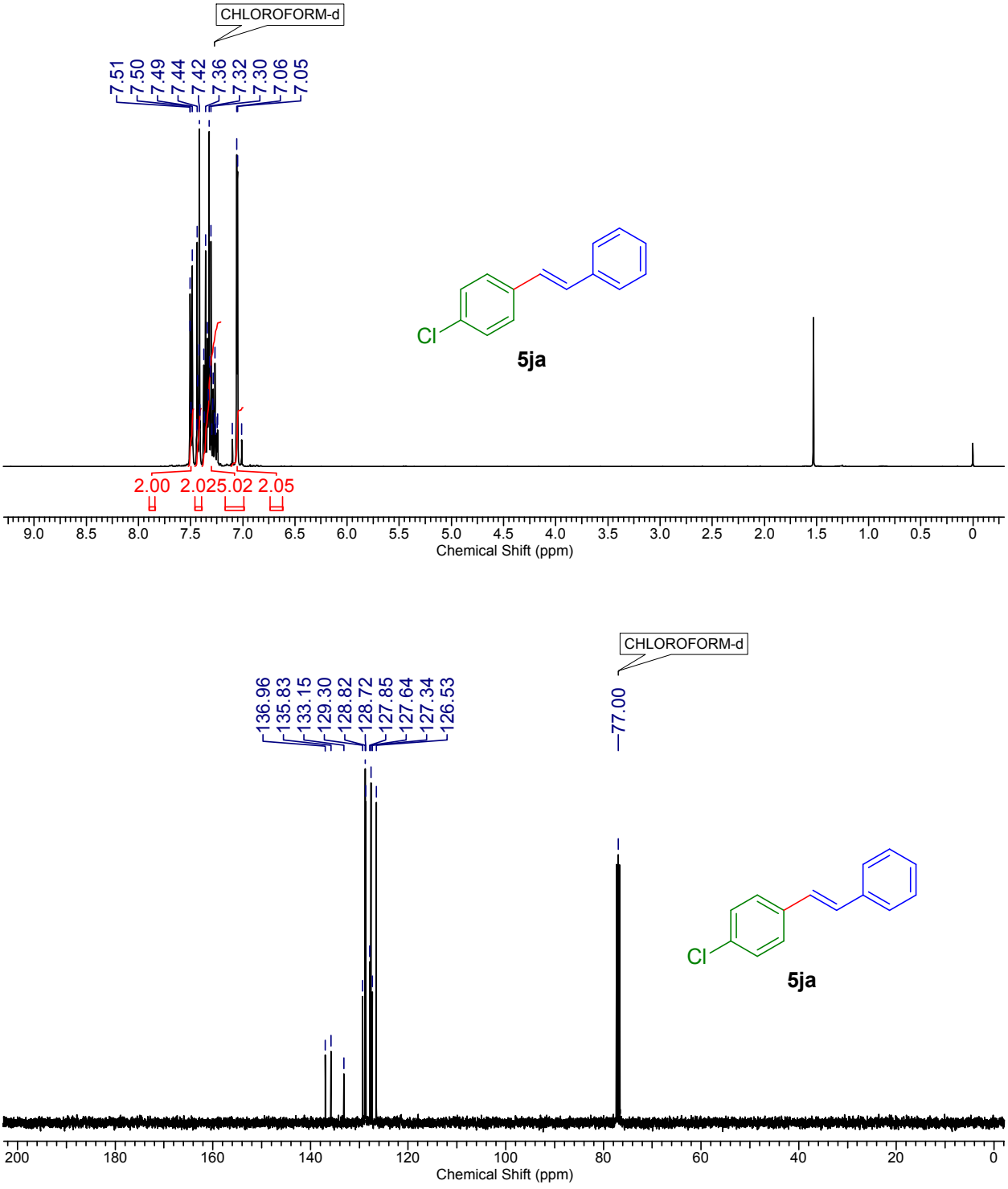


Figure S32: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7ah** in $CDCl_3$

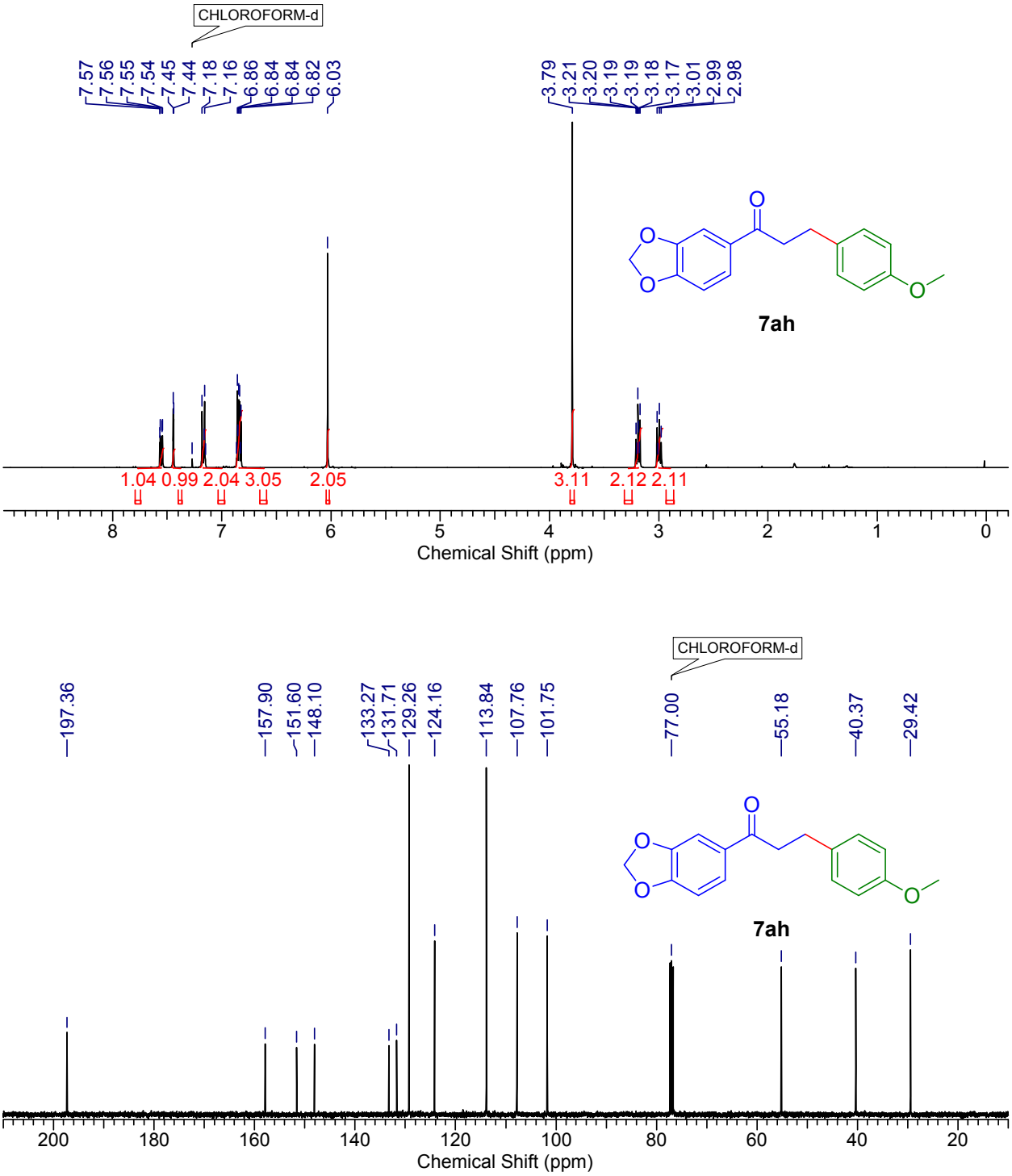


Figure S33: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7ad** in $CDCl_3$

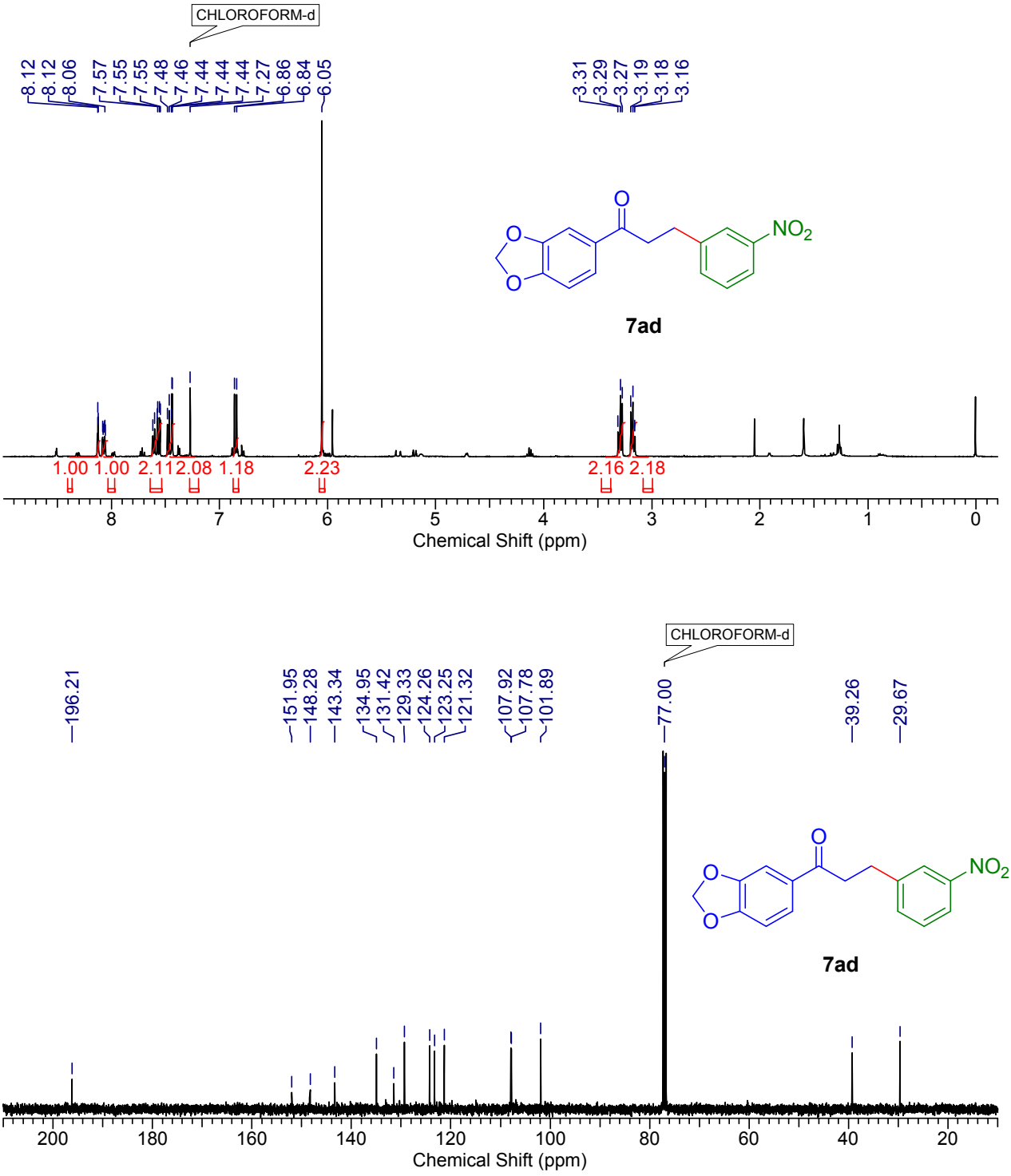


Figure S34: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7aj** in $CDCl_3$

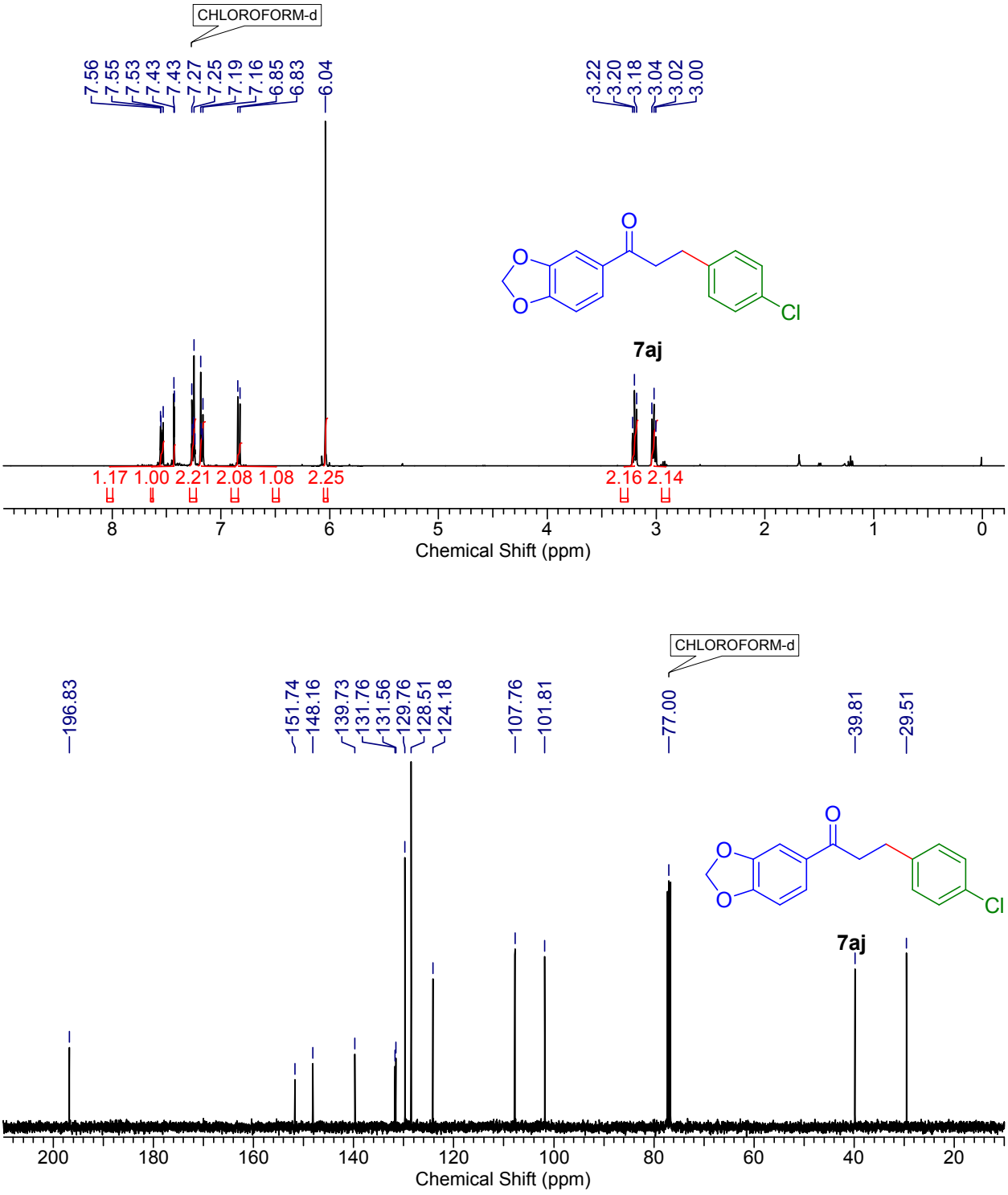


Figure S35: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7aj** in $CDCl_3$

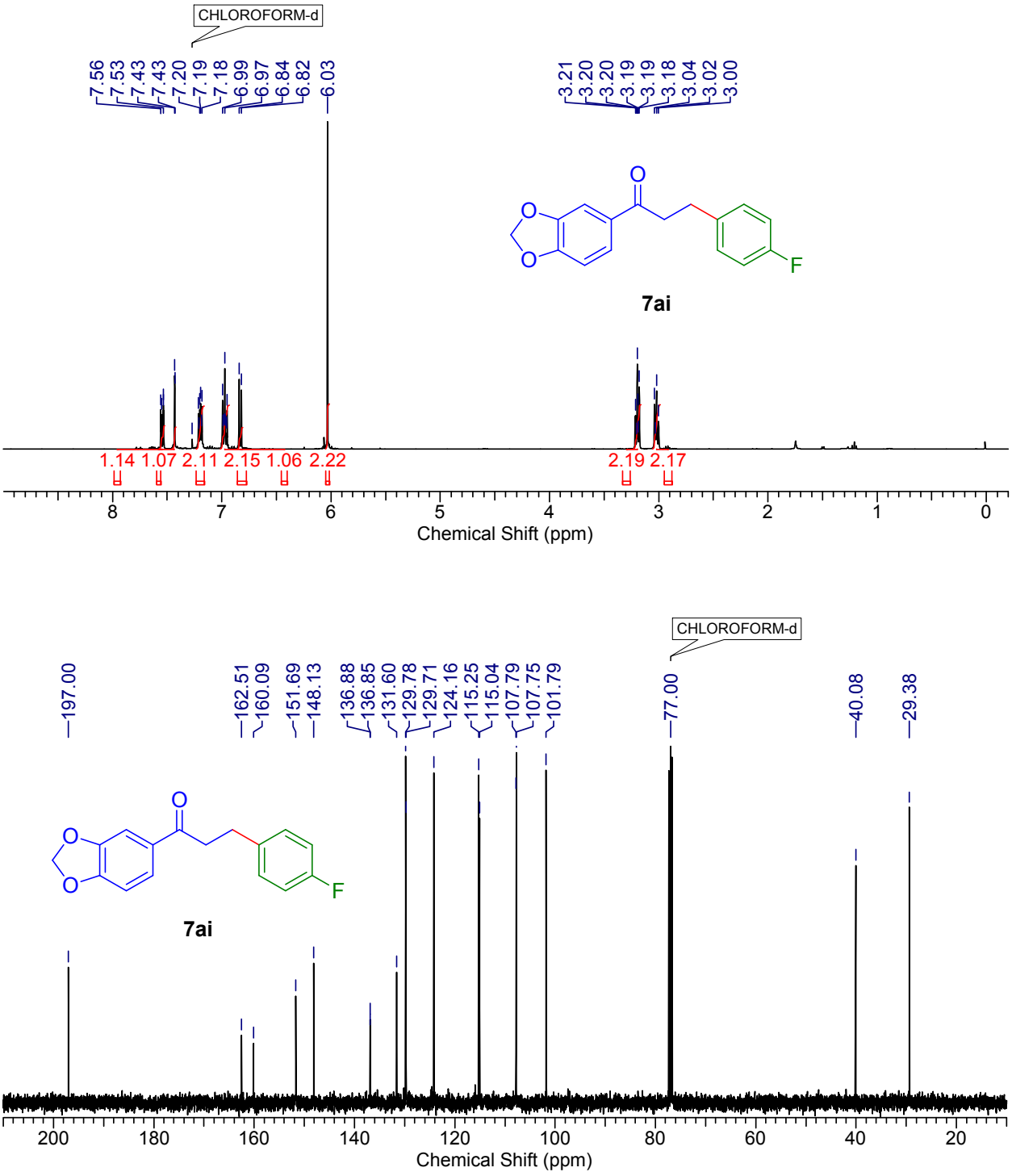


Figure S36: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7ag** in $CDCl_3$

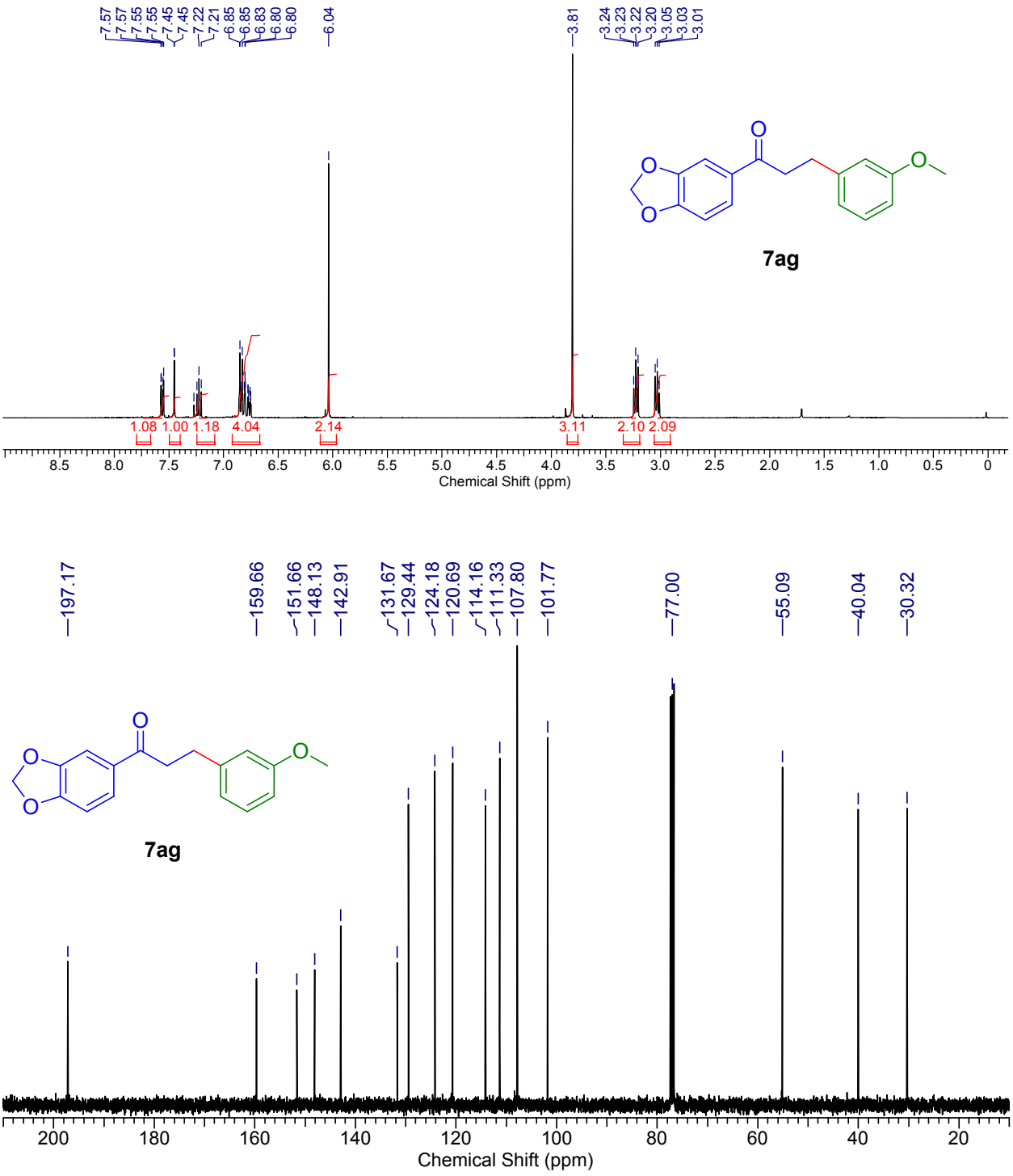


Figure S37: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7bg** in $CDCl_3$

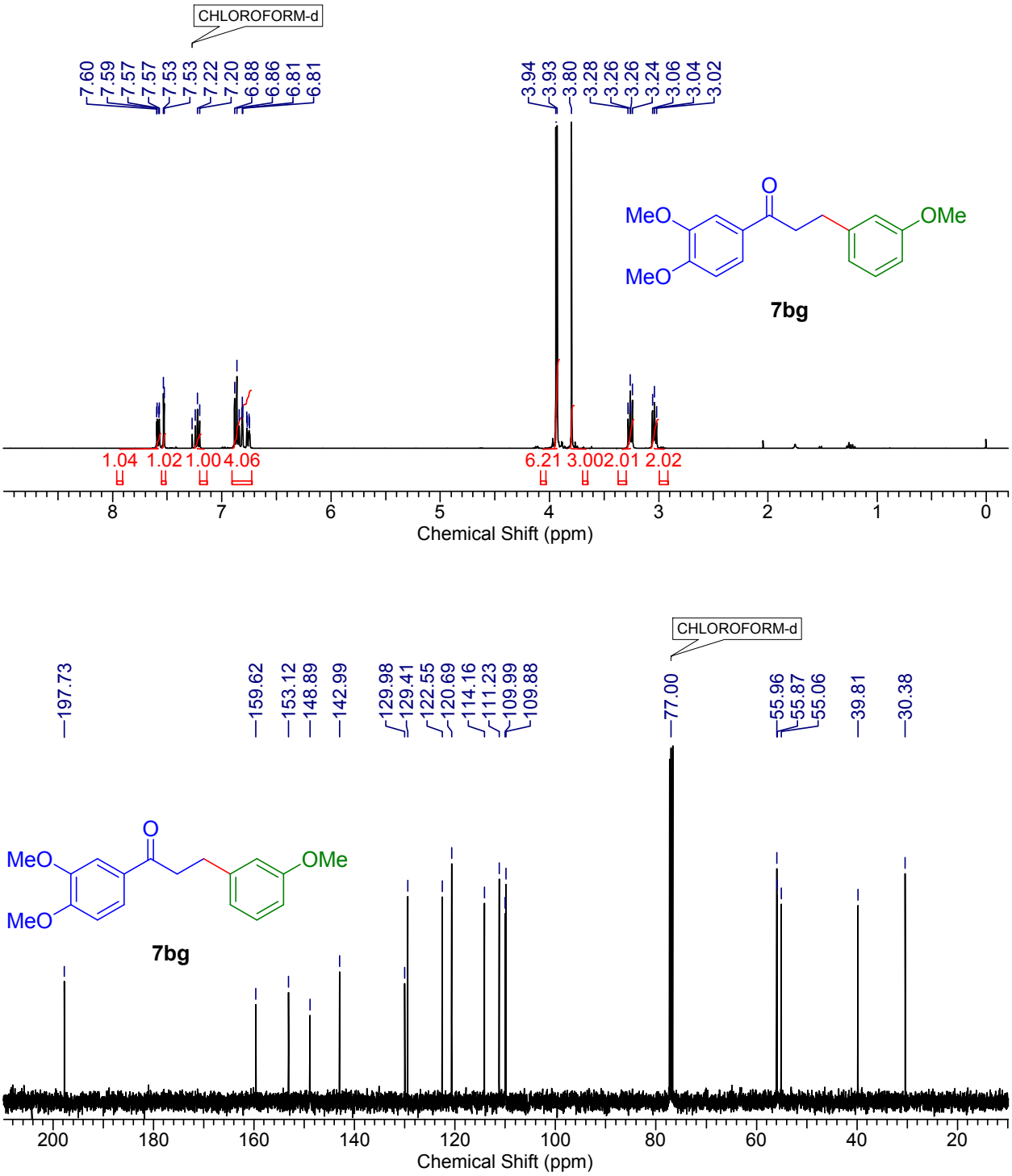


Figure S38: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7bc** in $CDCl_3$

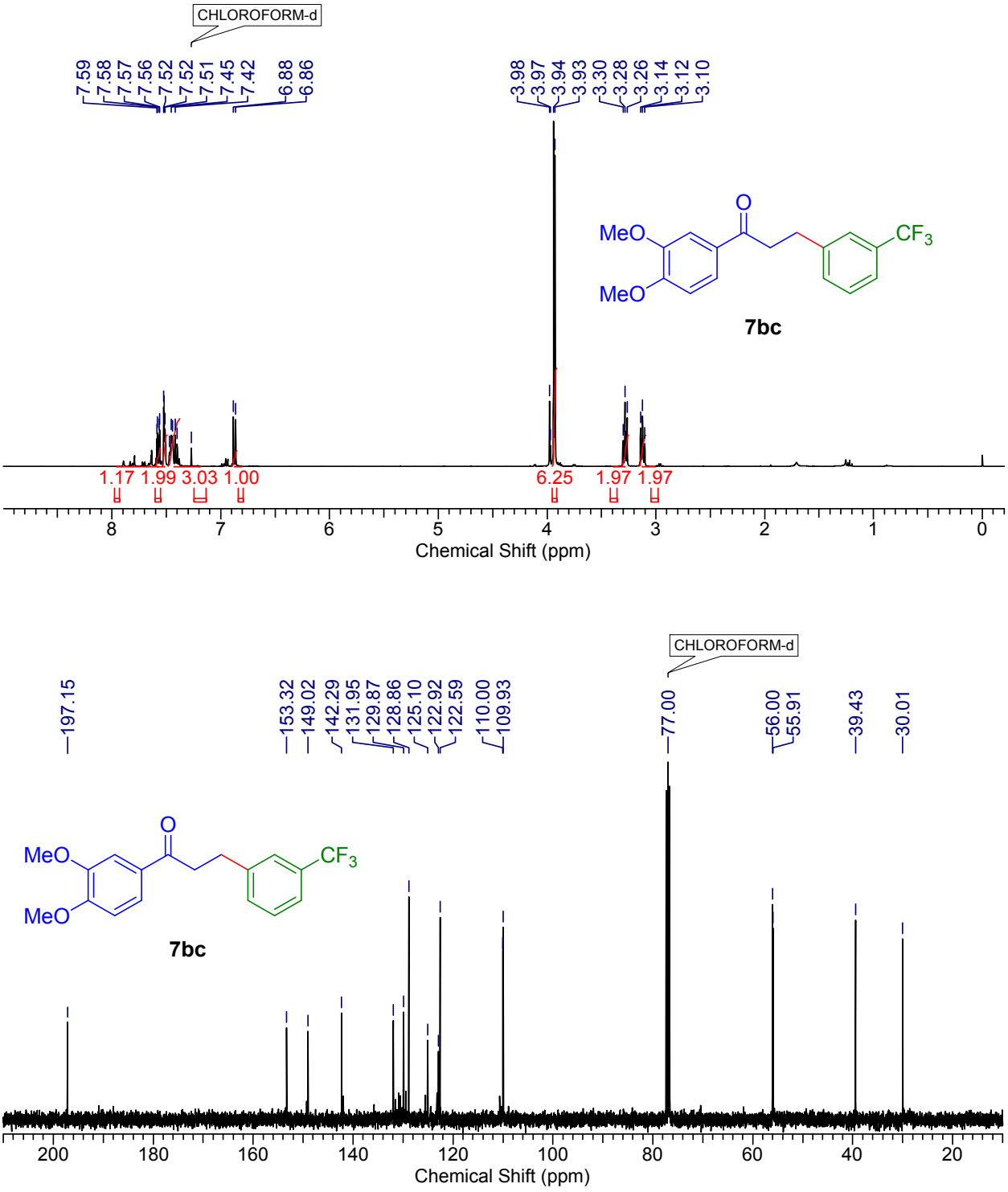


Figure S39: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7bj** in $CDCl_3$

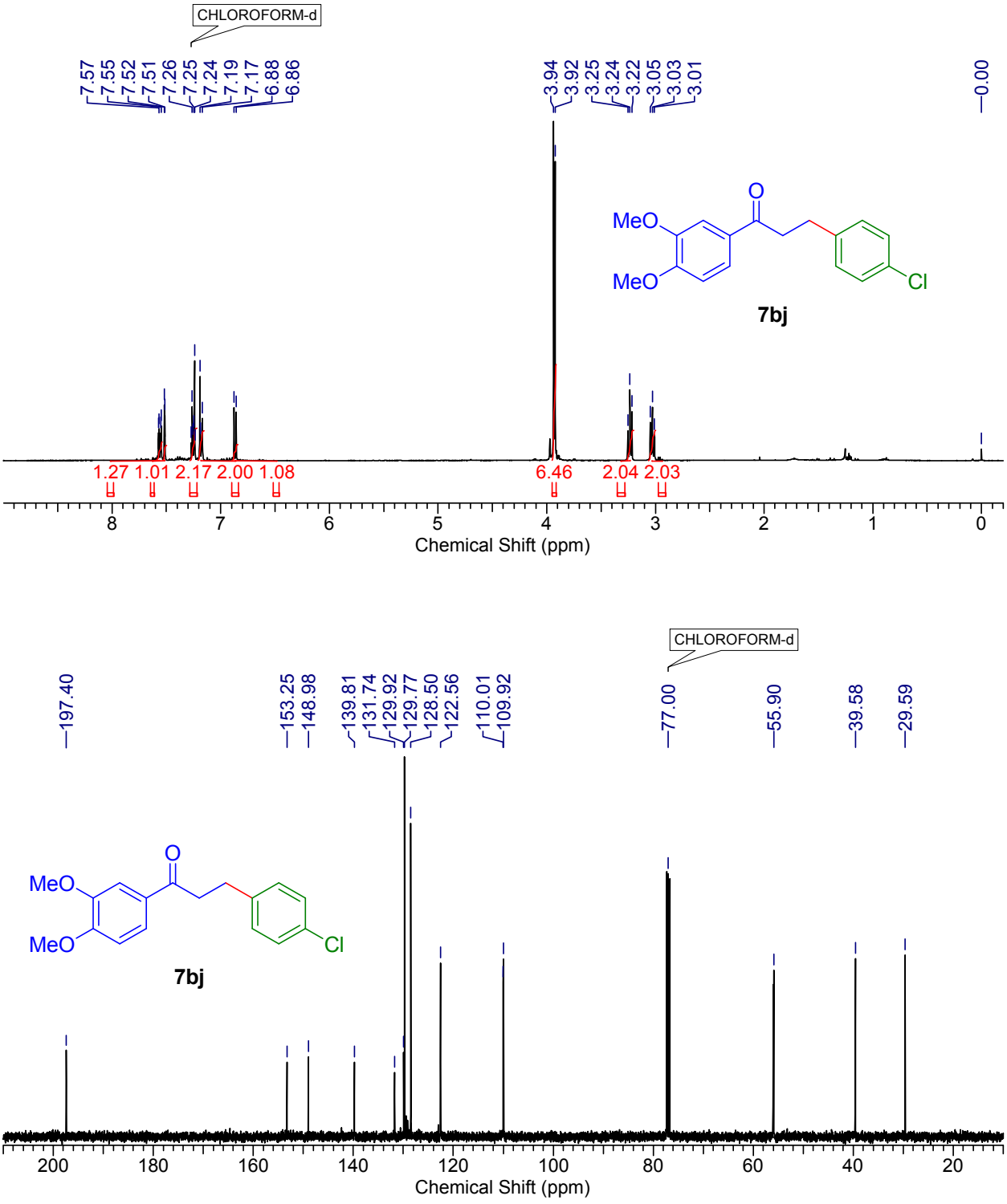


Figure S40: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7bi** in $CDCl_3$

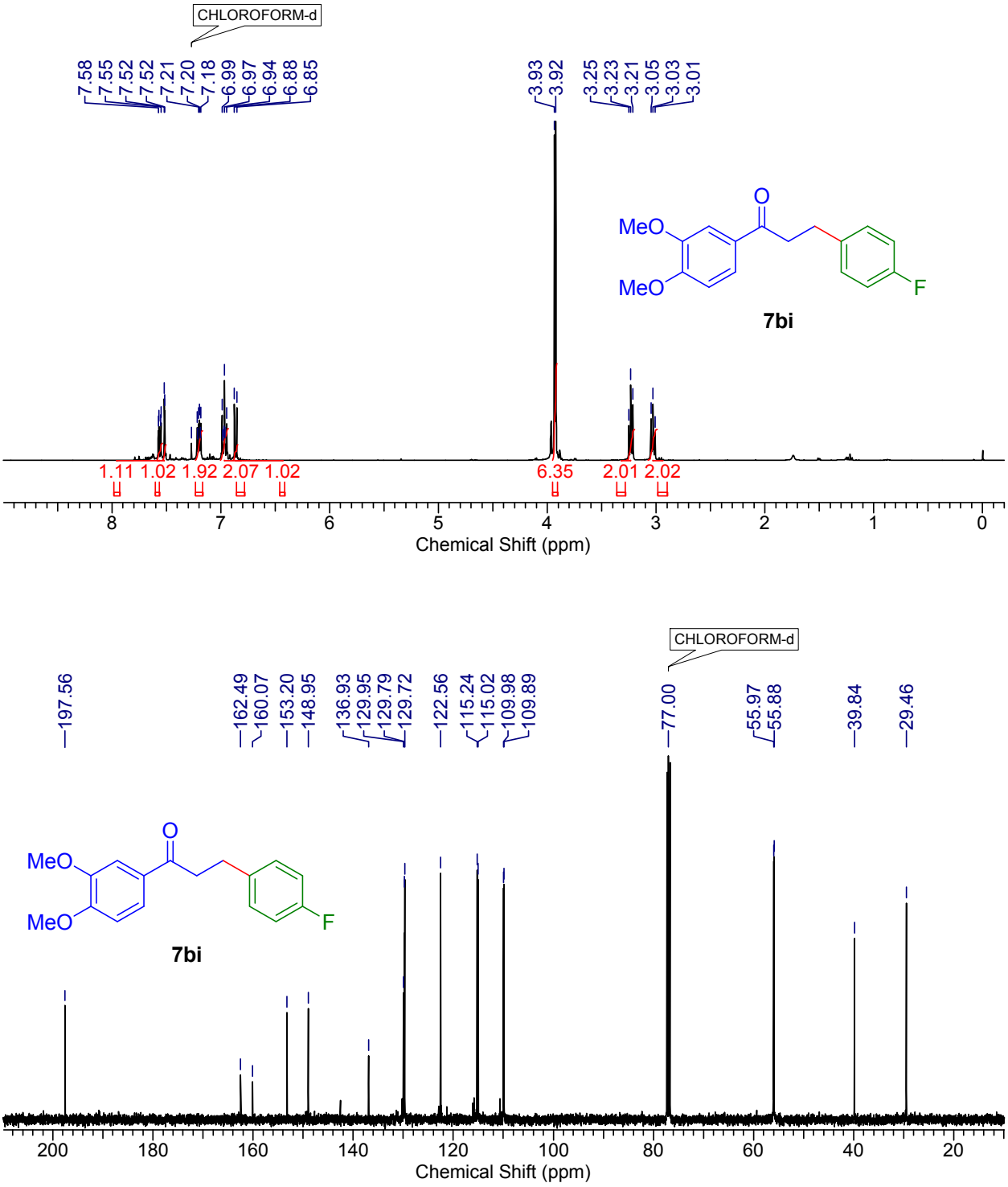


Figure S41: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7bh** in $CDCl_3$

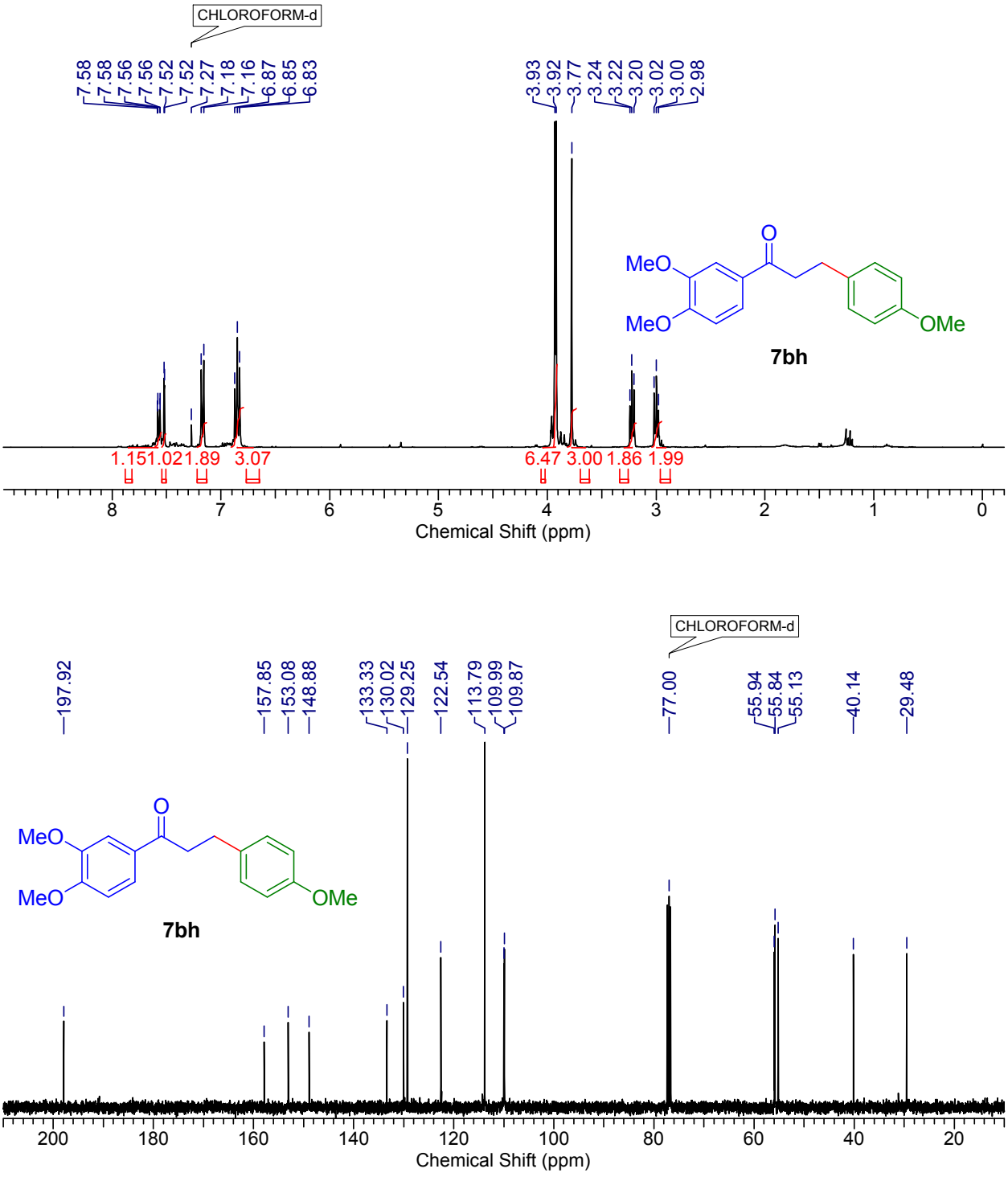


Figure S42: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7be** in $CDCl_3$

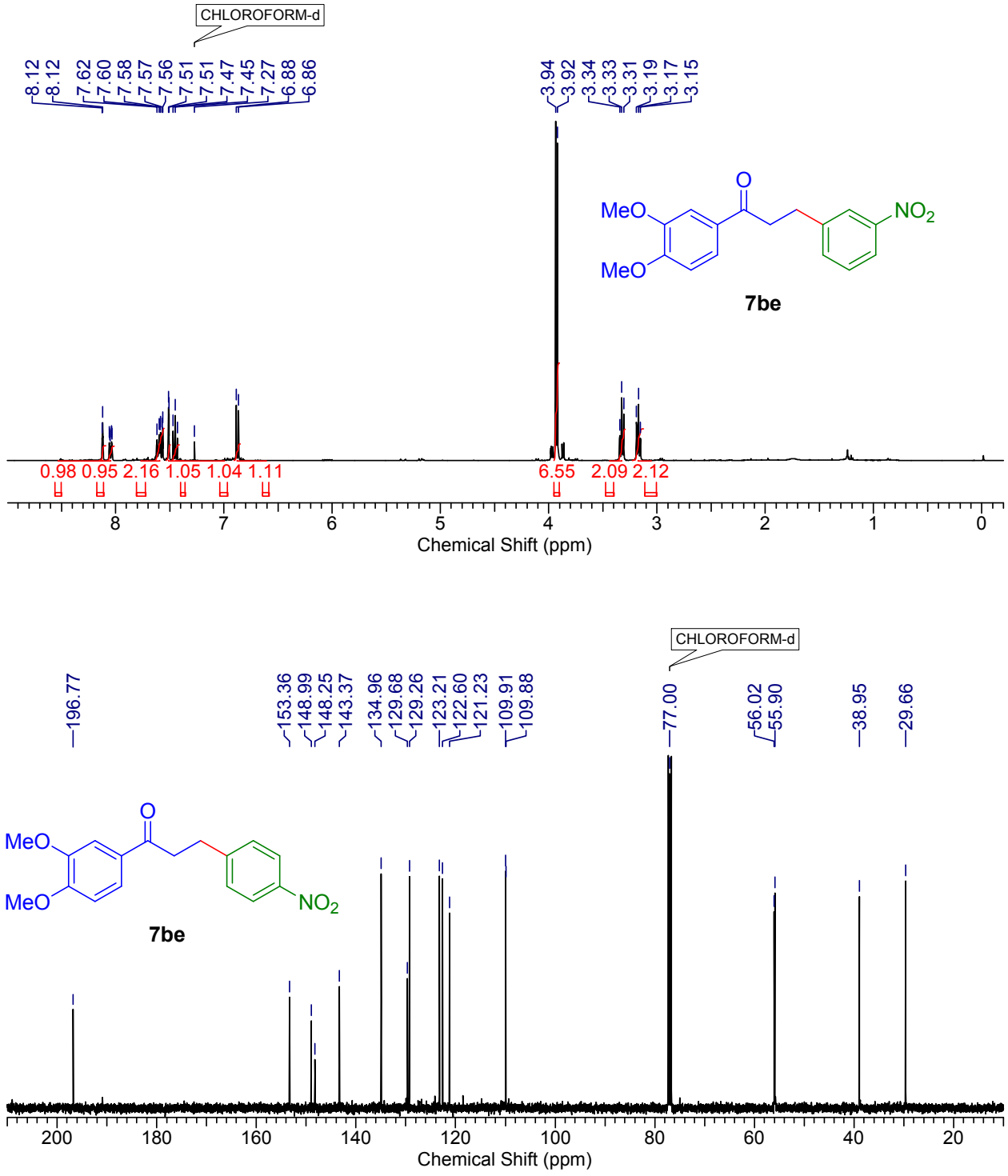


Figure S43: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7ba** in $CDCl_3$

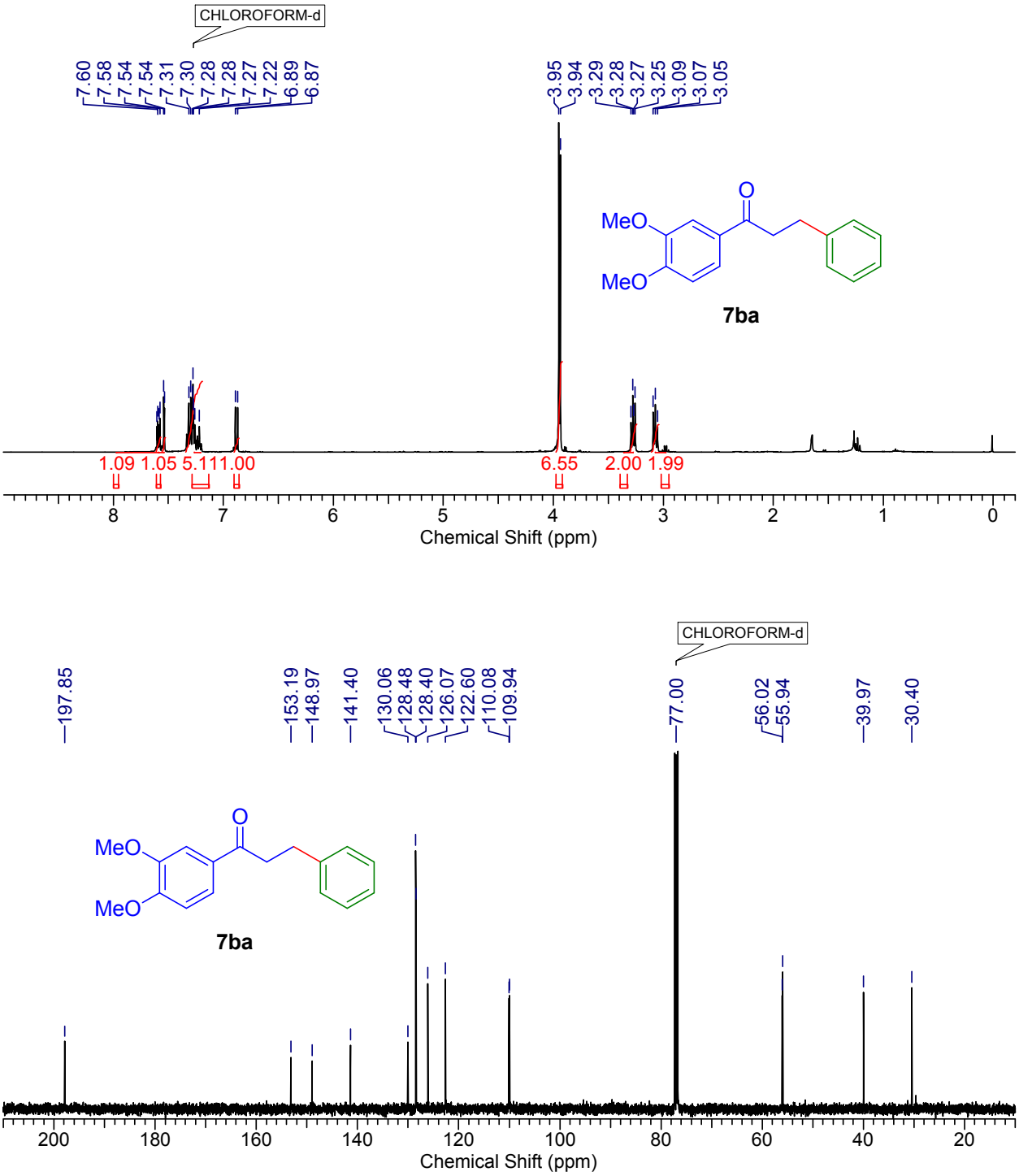


Figure S44: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7cg** in $CDCl_3$

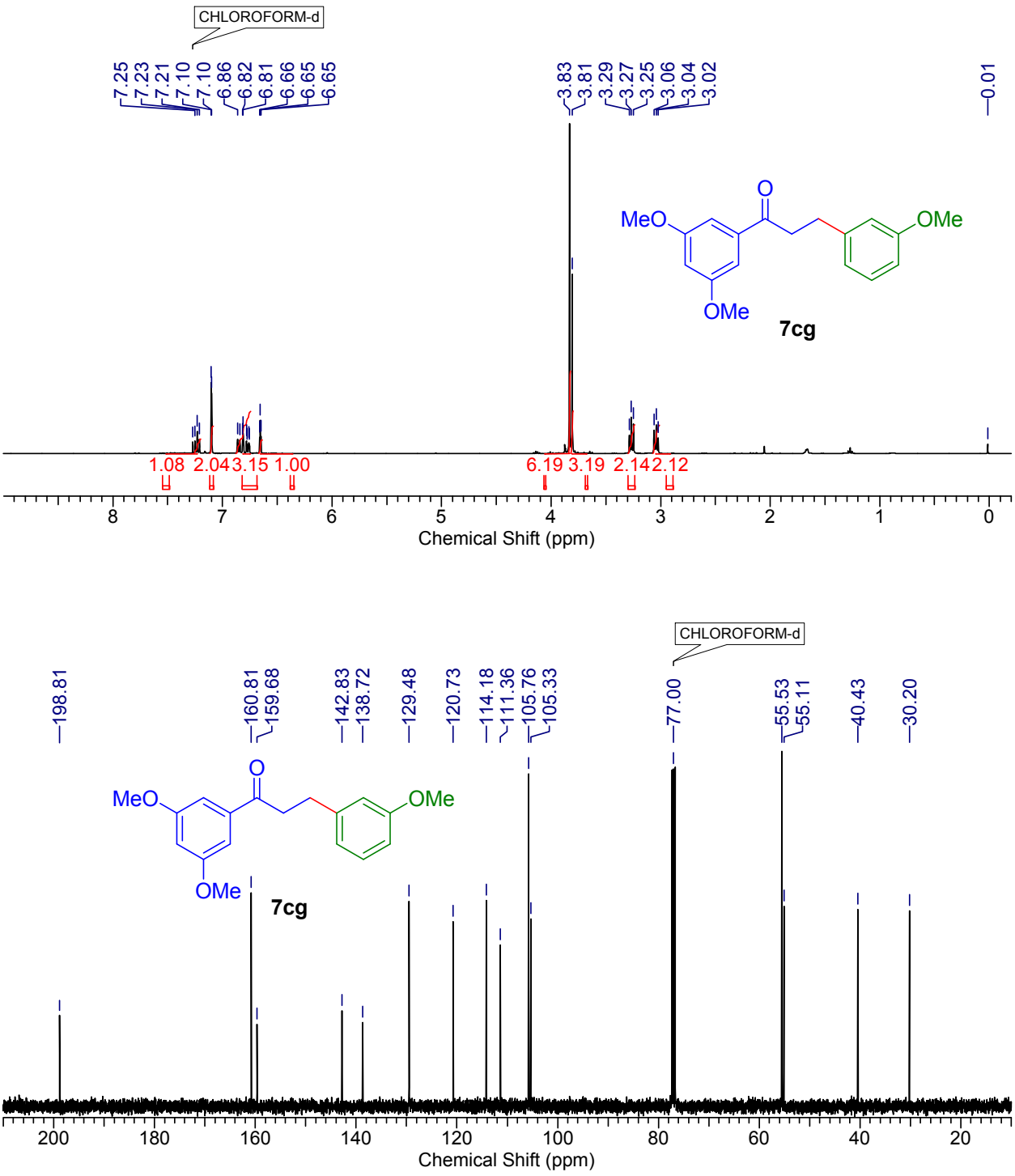


Figure S45: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7dd** in $CDCl_3$

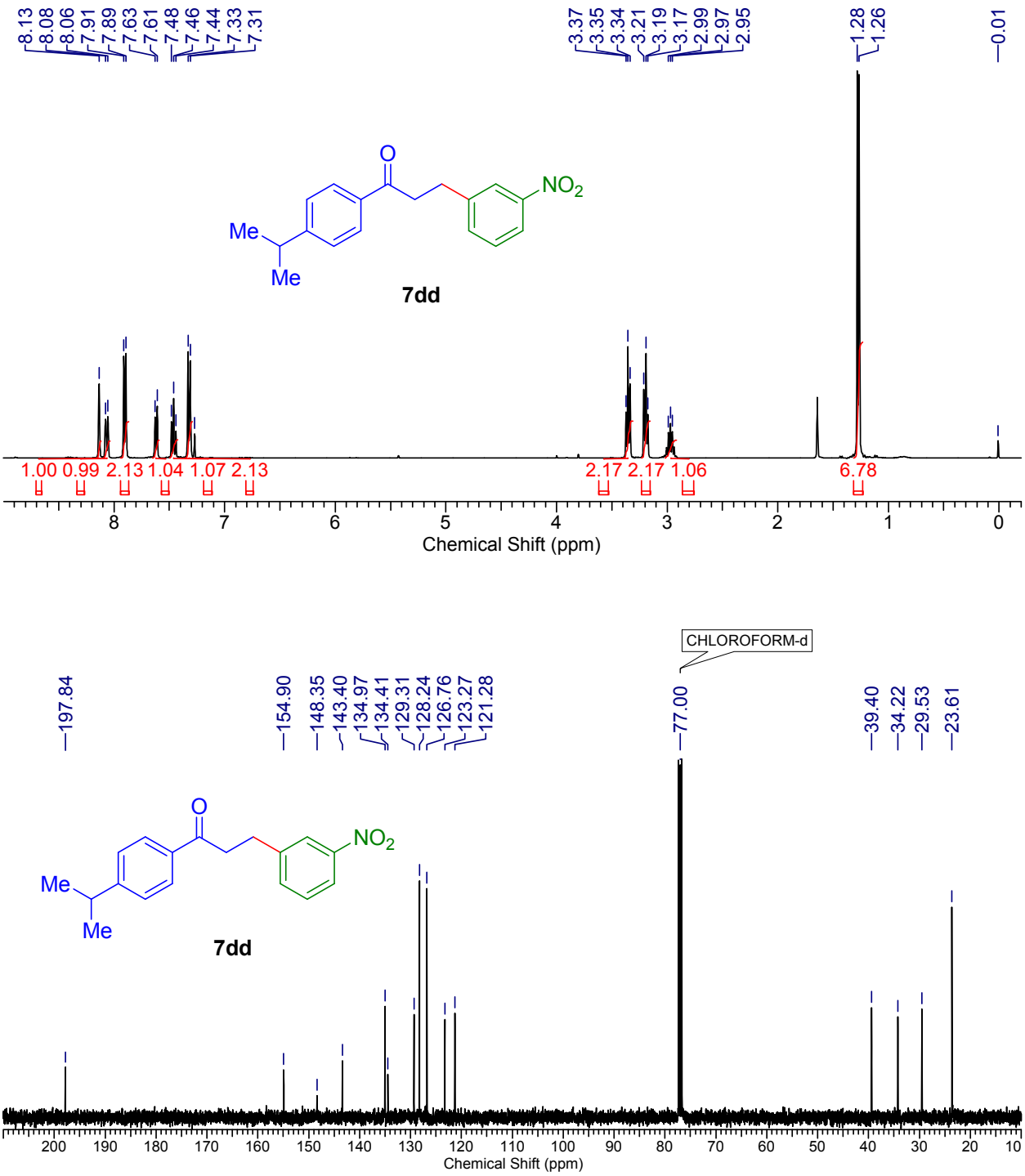


Figure S46: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **7fh** in $CDCl_3$

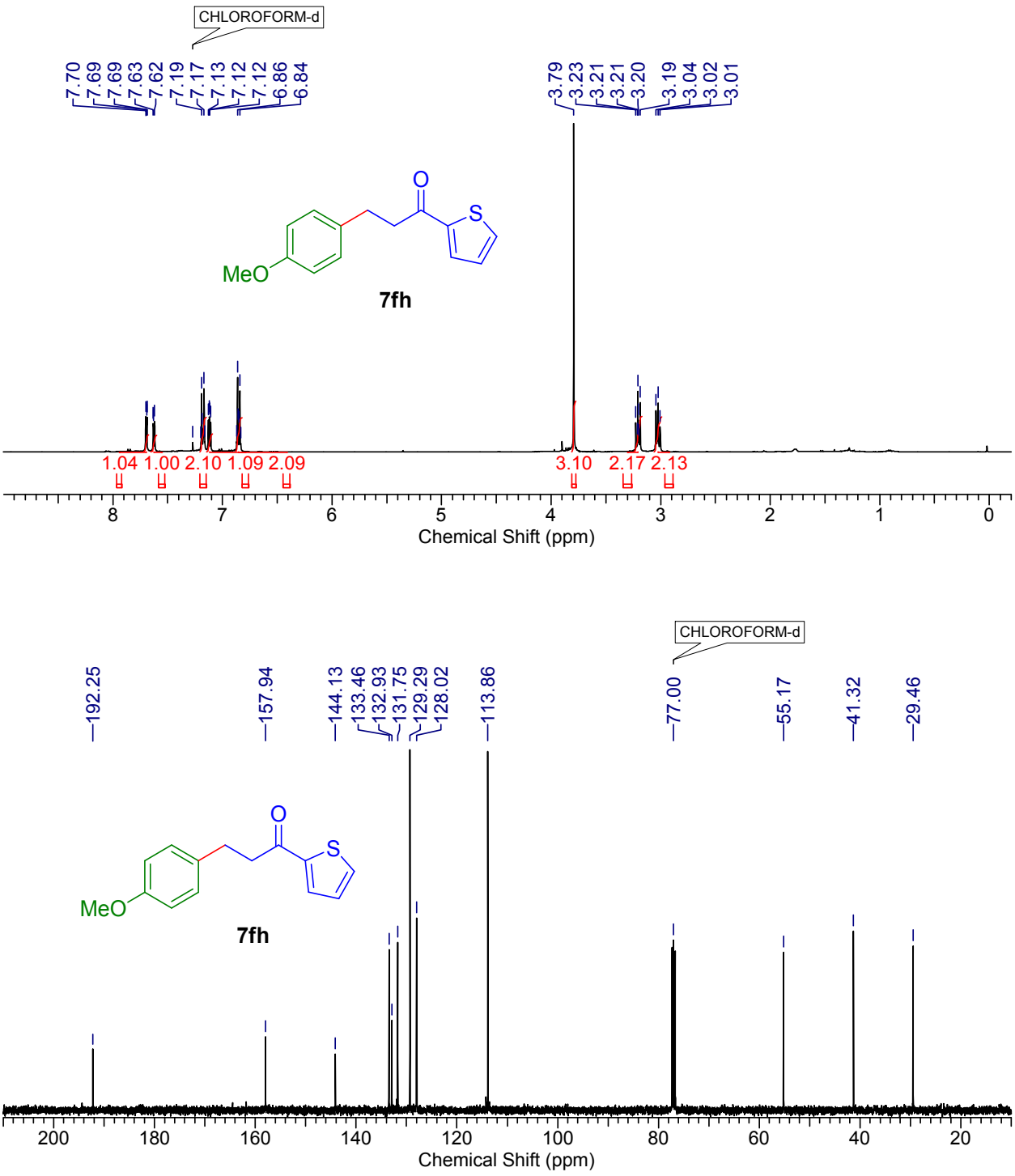


Figure S47: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **8gb** in $CDCl_3$

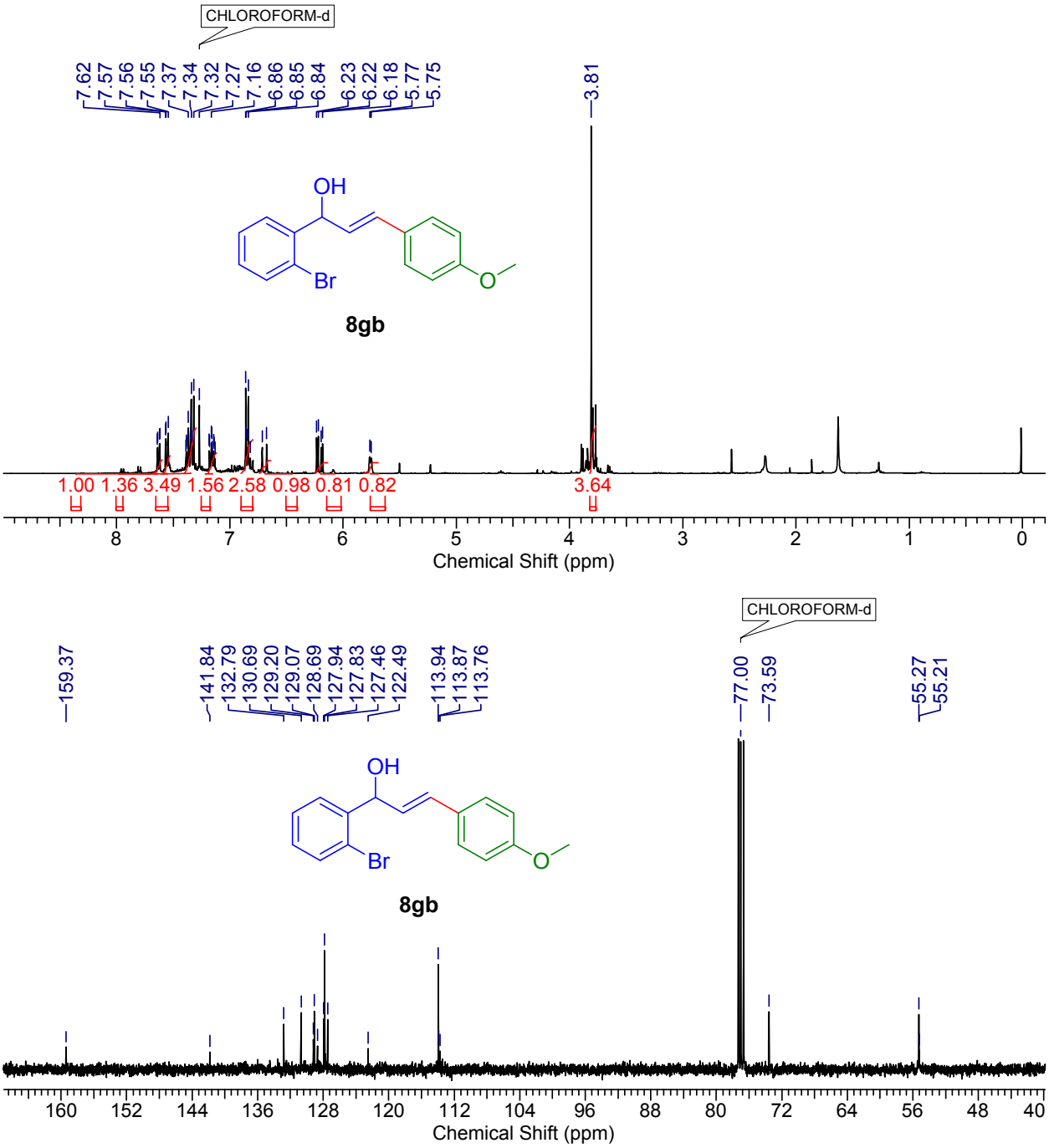


Figure S48: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **8gh** in $CDCl_3$

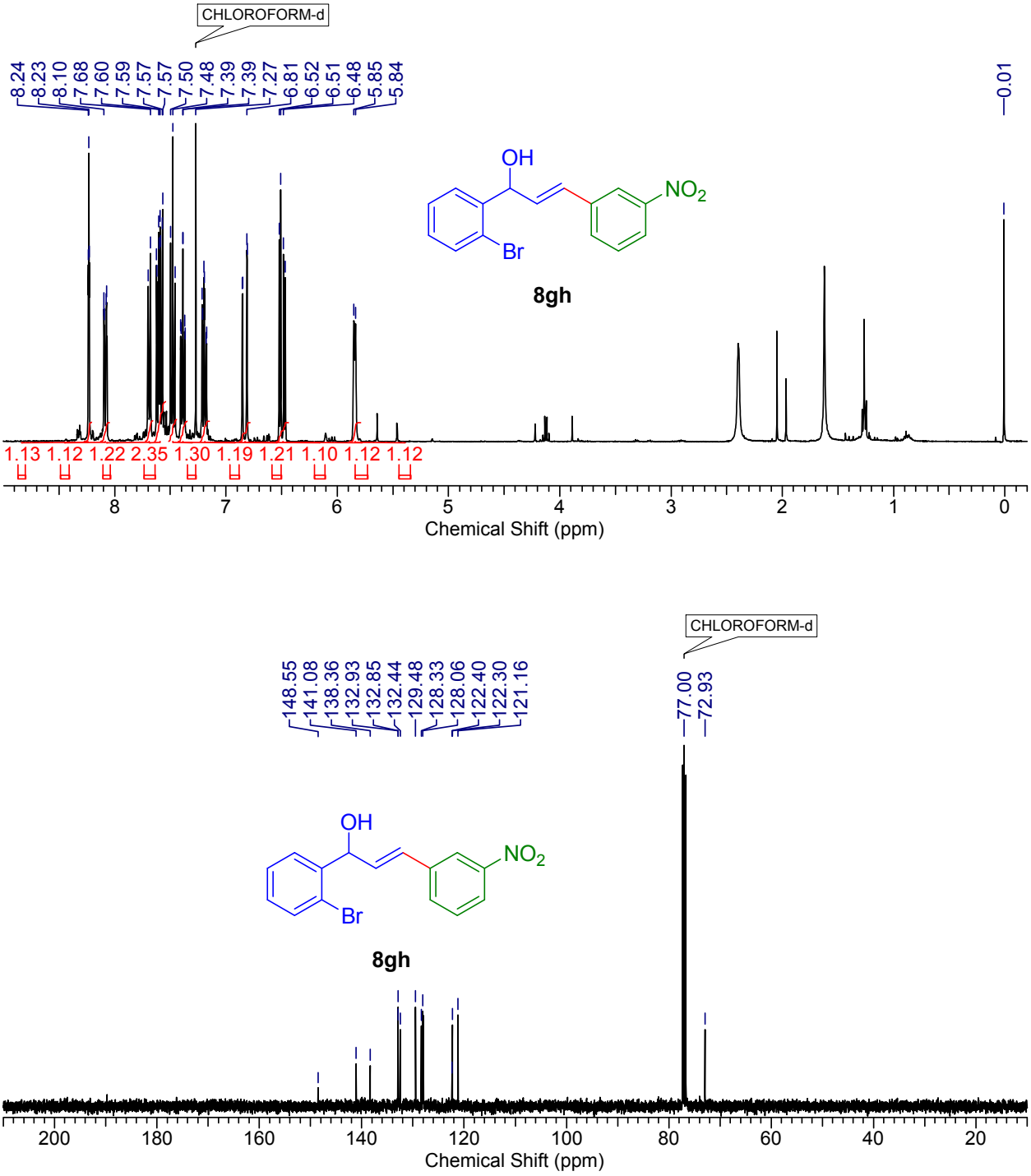
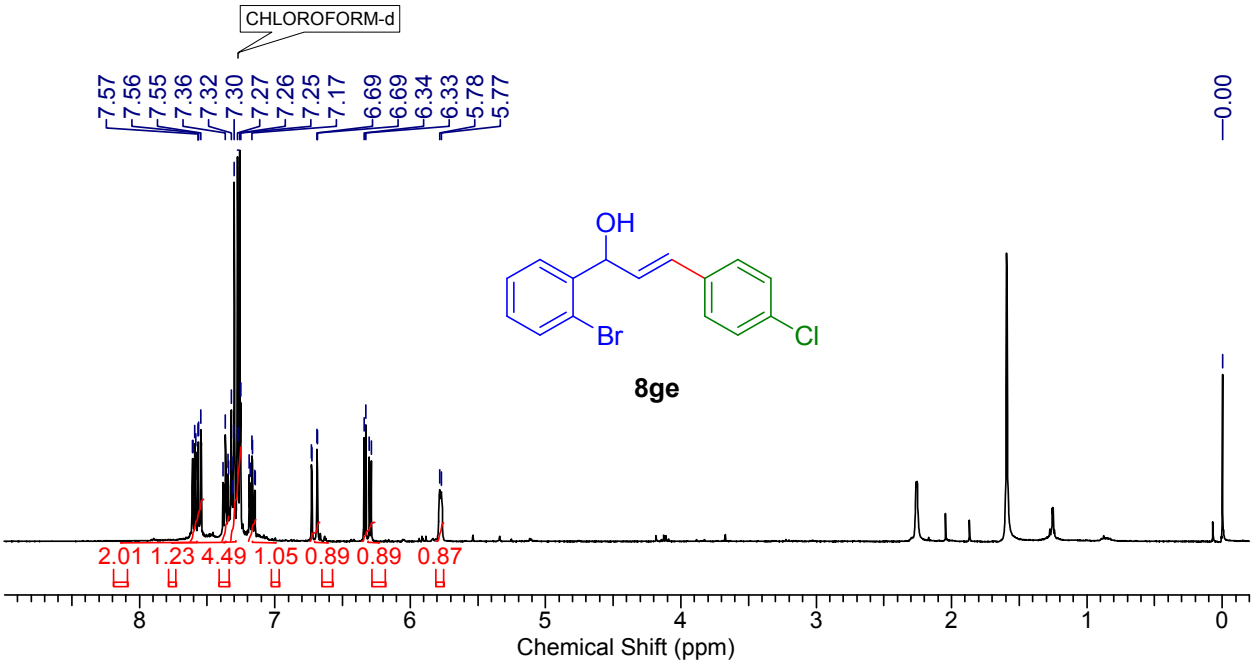
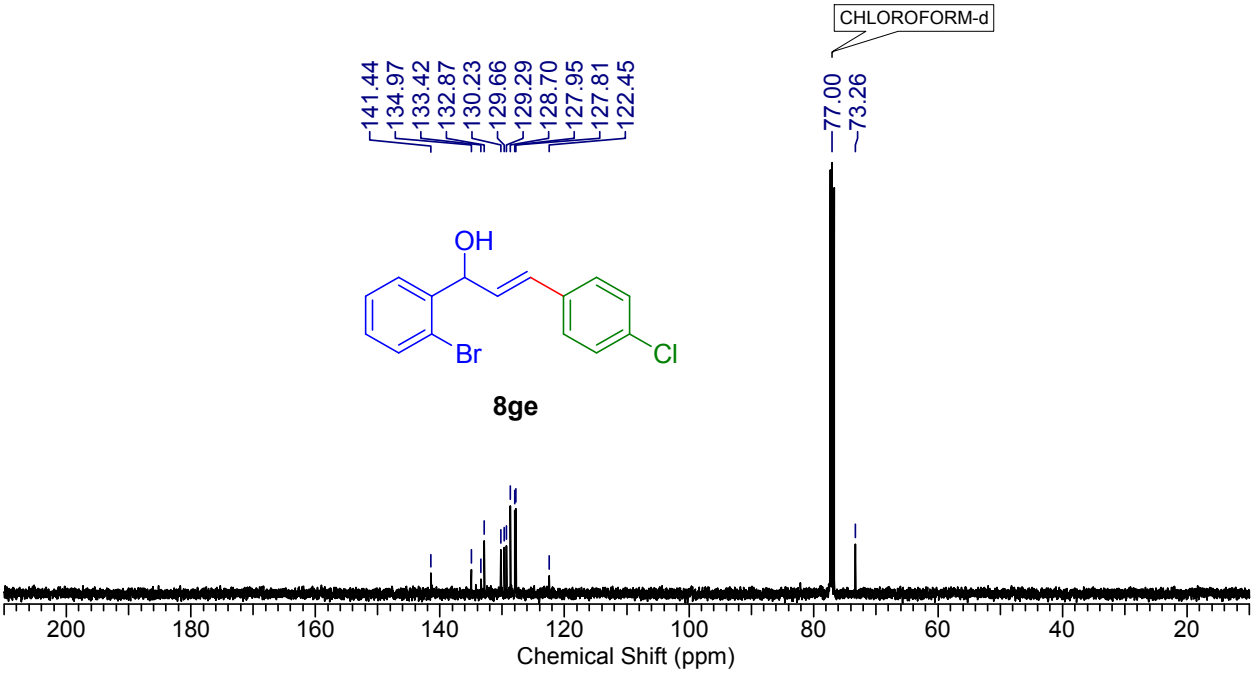


Figure S49: ^{1}H NMR (400 MHz) spectrum (upper) and ^{13}C NMR (100 MHz) spectrum (down) of **8ge** in $CDCl_3$

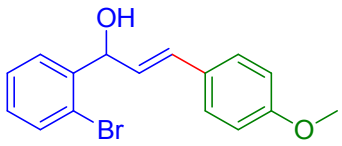




General Procedure (For the synthesis of DHCs and 2-Bromo phenyl vinyl alcohols) (**7 & 8**):

In an oven-dried Schlenk tube aryl vinyl alcohol **6** (0.5 mmol), iodoarenes **1** (0.5 mmol), Pd/$CuFe_2O_4$ nanowires catalyst (4 mol%), $NaHCO_3$ (1 mmol) and solvent (DMSO) (1.0 mL) were added. The

resulting reaction mixture was stirred at 120 °C for 24 h. The progress of the reaction was monitored by TLC. After completion of the reaction, the reaction mixture was allowed to cool to room temperature, then diluted with (approximately 10 mL) ethyl acetate and neutral NH_4Cl solution (approximately10 mL) was added followed by extraction with ethyl acetate(1 × 3 mL). The organic layers were dried with Na_2SO_4 and concentrated in reduced vacuum. Purification of the residue by silica gel column chromatography using petroleum ether/ethyl acetate as the eluent furnished the 2-Bromo phenyl vinyl alcohols (**8**) and DHCs (**7**).



8gb

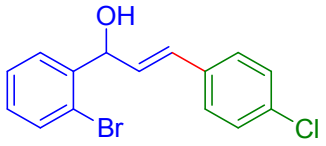
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (85:15) as eluent isolated as whitish yellow colored solid compound 83% yield (132.75 mg):[TLC (petroleum ether/ethyl acetate 8:2, R_f[159.59 mg (0.5mmol)1-(2-bromophenyl)prop-2-en-1-ol]=0.50, R_f[117.01 mg (0.5mmol)1-iodo-4-methoxybenzene]=0.70 and R_f[132.75 mg (0.41 mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=3351, 1441, 1341, 1114, 793, 692 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.61 (dd, 1H, *J*=7.3 and 1.5 Hz), 7.54 (dd, 1H, *J*=8.3 and 1.5 Hz), 7.36-7.29 (m, 3H), 7.15 (dd, 1H, *J*=7.3 and 1.5 Hz), 6.83 (d, 2H, *J*=8.8 Hz), 6.67 (d, 1H, *J*=15.6 Hz), 6.19 (dd, 1H, *J*=15.6 and 6.4 Hz),5.74 (d, 1H, *J*=5.9 Hz), 3.79 (s, 3H) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=159.4 (s, C_q), 141.8 (s, C_q), 132.8 (d, CH), 130.7 (d, CH), 129.2 (s, C_q), 129.1 (d, CH), 128.7 (d, CH), 127.9 (d, CH), 127.8 (d,CH), 127.7 (d, CH), 127.5 (d, CH), 122.5 (s, C_q), 113.9 (d, 2C, CH), 73.6 (d, CH), 55.3 (q, CH_3) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{16}H_{15}{}^{79}BrNaO_2]^+$=$[M+Na]^+$: 341.0226; found 341.0218.



8ge

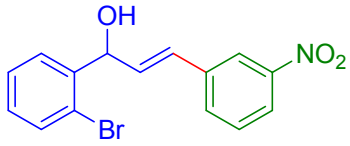
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (90:10) as eluent isolated as light yellow colored solid compound 73% yield (118.1 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[159.59 mg (0.5mmol)1-(2-bromophenyl)prop-2-en-1-ol]=0.50, R_f[119.22 mg (0.5mmol) 1-chloro-4-iodobenzene]=0.70 and R_f(118.1 mg (0.36mmol) product)=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=3353, 1575, 1474, 1077, 967, 748 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.59 (dd, 1H, *J*=7.8 and 1.9 Hz), 7.55 (dd, 1H, *J*=7.8 and 1.0 Hz), 7.36 (dd, 1H, *J*=7.8 and 1.0 Hz), 7.33-7.23 (m, 4H), 7.16 (dd, 1H, *J*=7.8 and 1.5 Hz), 6.70 (d, 1H, *J*=15.6 Hz), 6.30 (dd, 1H, *J*=15.6 and 5.8 Hz), 5.77 (d, 1H, *J*=5.8 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=141.4 (s, C_q), 135.0 (s, C_q), 133.4 (s, C_q), 132.9 (d, CH), 130.2 (d, CH), 129.7 (d, CH), 129.3 (d, CH), 128.7 (d, 2C, CH), 127.9 (d, 2C, CH), 127.8 (d, 2C, CH), 122.4 (s, C_q), 73.3 (d, CH) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{15}H_{12}{}^{79}BrNaClO]^+$=$[M+Na]^+$: 344.9652; found 344.9647.



8gh

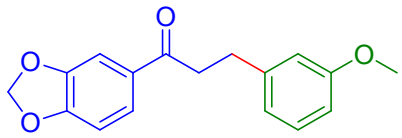
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (80:20) as eluent isolated as brownish colored viscous liquid compound 79% yield (132 mg):[TLC (petroleum ether/ethyl acetate 8:2, R_f[159.59 mg (0.5mmol)1-(2-bromophenyl)prop-2-en-1-ol]=0.50, R_f[124.5 mg (0.5mmol) 1-iodo-4-nitrobenzene]=0.70 and R_f(132 mg [0.39mmol product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=3350, 1510, 1333, 1010, 956, 748 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=8.21 (s, 1H), 8.10-8.06 (m, 1H), 7.67 (d, 1H, *J*=7.8 Hz), 7.61-7.54 (m, 2H), 7.46 (dd, 1H, *J*=8.3 and 7.8 Hz), 7.37(dd, 1H, *J*=8.3 and 7.8 Hz), 7.18 (dd, 1H, *J*=8.3 and 7.8 Hz), 6.80 (d, 1H, *J*=15.6 Hz), 6.47 (dd, 1H, *J*=15.6 and 5.4 Hz), 5.83 (d, 1H, *J*=5.4 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=148.6 (s, C_q), 141.1 (s, C_q), 138.4 (s, C_q), 132.9 (d, CH), 132.8 (d, CH), 132.4 (d, CH), 129.5 (d, CH), 129.4 (d, CH), 128.3 (d, CH), 128.1 (d,CH), 128.0 (d, CH), 122.4 (s, C_q), 122.3 (d, CH), 121.2 (d, CH),72.9 (d, CH) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{15}H_{12}{}^{79}BrNNaO_3]^+$=$[M+Na]^+$: 355.9893; found 355.9888.



7ag

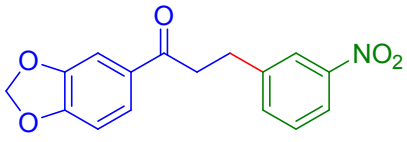
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (95:05) as eluent isolated asyellowcolored solid compound 81% yield (115 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[89.09 mg (0.5mmol) 1-(benzo[d][1,3]dioxol-5-yl)prop-2-en-1-ol]=0.50, R_f[117.01 mg (0.5mmol) 1-iodo-3-methoxybenzene]=0.70 and R_f[115 mg (0.4mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2927, 1641, 1587, 1423, 1234, 916, 765 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.54 (dd, 1H, *J*=7.8 and 1.5 Hz), 7.43 (d, 1H, *J*=1.5 Hz), 7.20 (dd, 1H, *J*=7.8 and 7.8 Hz), 6.88-6.70 (m, 4H), 6.02 (s, 2H), 3.79 (s, 3H), 3.21 (t, 2H, *J*=8.3 Hz), 3.01 (t, 2H, *J*=8.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.2 (s, C_q), 159.7 (s, C_q), 151.7 (s, C_q), 148.1 (s, C_q),142.9 (s, C_q),131.7 (s, C_q),129.4 (d, CH), 124.2 (d, CH), 120.7 (d, CH), 114.2 (d, CH), 111.4 (d, CH), 107.8 (d, 2C, CH), 101.8(t, CH_2), 55.1 (q, CH_3), 40.0 (t, CH_2),30.3 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{17}H_{17}O_4]^+$=$[M+H]^+$: 285.1121; found 285.1127.



7ad

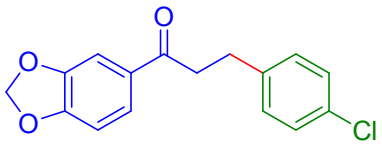
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (95:05) as eluent isolated as grey colored solid compound 83% yield (124 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[89.09 mg (0.5mmol) 1-(benzo[d][1,3]dioxol-5-yl)prop-2-en-1-ol]=0.50, R_f[124.5 mg (0.5mmol) 1-iodo-3-nitrobenzene]=0.70 and R_f[124 mg (0.41mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2878, 1657, 1511, 1425, 1237, 1029, 977, 724 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=8.10 (s, 1H), 8.08-8.02 (m, 1H), 7.59 (d, 1H, J=7.3 Hz), 7.54 (dd, 1H, J=8.3 and 2.0 Hz),7.45 (d, 1H, J=7.8 Hz), 7.42 (d, 1H, J=2.0 Hz), 6.83 (d, 1H, J=8.3 Hz), 6.03 (s, 2H), 3.27 (t, 2H, J=7.3 Hz), 3.16 (t, 2H, J=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=196.2 (s, C_q), 151.9 (s, C_q), 148.3 (s, C_q), 143.3(s, C_q),134.9(d, CH), 131.4 (s, C_q),129.3 (d, CH), 124.3 (d, CH), 123.2 (d, CH), 121.3 (d, CH), 107.9 (d,CH), 107.8 (d,CH),101.9(t, CH_2),39.3 (t, CH_2),29.7 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{16}H_{14}NO_5]^+$=$[M+H]^+$: 300.0866; found 300.0875.



7aj

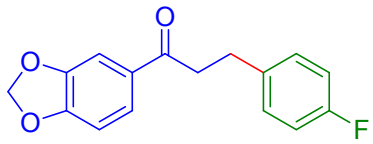
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (96:04) as eluent isolated as whitishcolored solid compound 72% yield (104 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[89.09 mg (0.5mmol) 1-(benzo[d][1,3]dioxol-5-yl)prop-2-en-1-ol]=0.50, R_f[119.22 mg (0.5mmol) 1-chloro-4-iodobenzene]=0.70 and R_f[104 mg (0.36mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2871, 1656, 1423, 1233, 1025, 872, 763 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.54 (dd, 1H, *J*=8.3 and 1.5 Hz), 7.44 (d, 1H, *J*=2.0 Hz), 7.25 (d, 2H, *J*=8.3 Hz), 7.19 (d, 2H, *J*=8.3 Hz), 6.84 (d, 1H, *J*=8.3 Hz), 6.04 (s, 2H), 3.20 (t, 2H, *J*=7.8 Hz), 3.02 (t, 2H, *J*=7.8 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=196.8 (s, C_q), 151.7 (s, C_q), 148.2 (s, C_q), 139.7(s, C_q),131.8 (s, C_q),131.6 (s, C_q),129.8(d, 2C, CH), 128.5 (d, 2C,CH),124.2 (d, CH), 107.8 (d, CH), 101.8(t, CH_2), 39.8 (t, CH_2),29.5 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{16}H_{13}ClO_3]^+$=$[M+H]^+$: 289.0626; found 289.0631.



7ai

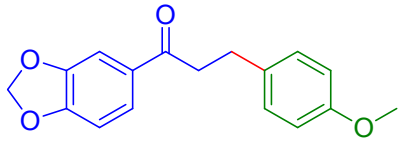
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (95:05) as eluent isolated as yellowish coloredsolid compound 68% yield (93 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[89.09 mg (0.5mmol) 1-(benzo[d][1,3]dioxol-5-yl)prop-2-en-1-ol]=0.50, R_f[111 mg (0.5mmol) 1-fluoro-4-iodobenzene]=0.70 and R_f[93 mg (0.34mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2873, 1655, 1442, 1230, 1023, 975, 721 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.52 (dd, 1H, *J*=8.3 and 2.0 Hz), 7.41 (d, 1H, *J*=2.0 Hz), 7.22-7.12 (m, 2H), 6.95 (dd, 2H, *J*=8.8 and 8.3 Hz), 6.81 (d, 1H, *J*=8.3 Hz), 6.01 (s, 2H), 3.18 (t, 2H, *J*=7.3 Hz), 3.00 (t, 2H, *J*=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.0 (s, C_q), 162.5 (s, C_q), 160.1 (s, C_q), 151.7 (s, C_q),148.1(s, C_q),136.9(s, *J*=7.3 Hz, C_q),131.6(s, C_q), 129.8 (d, CH),129.7 (d, CH), 124.2 (d, CH),115.2 (d, CH), 115.0 (d, CH), 107.8 (d, CH),107.7 (d, CH),101.8 (t, CH_2), 40.1 (t, CH_2),29.4 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{16}H_{14}FO_3]^+$=$[M+H]^+$: 273.0921; found 273.0925.



7ah

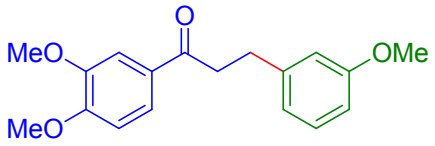
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (93:07) as eluent isolated as yellowish colored viscous liquid compound 83% yield (118 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[89.09 mg (0.5mmol) 1-(benzo[d][1,3]dioxol-5-yl)prop-2-en-1-ol]=0.50, R_f[117.01 mg (0.5mmol)1-iodo-4-methoxybenzene]=0.70 and R_f[118 mg (0.41mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2873, 1656, 1492, 1231, 1023, 975, 720 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.55 (dd, 1H, *J*=8.3 and 2.0 Hz), 7.45 (d, 1H, *J*=2.0 Hz), 7.17 (d, 2H, *J*=8.8 Hz), 6.88-6.80 (m, 3H), 6.03 (s, 2H), 3.79 (s, 2H), 3.19 (t, 2H, *J*=7.3 Hz), 2.99 (t, 2H, *J*=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.4 (s, C_q), 157.9 (s, C_q), 151.6 (s, C_q), 148.1(s, C_q),133.3(s, C_q),131.7(s, C_q),129.3(d, 2C, CH), 124.2 (d, CH),113.8 (d, 2C,CH), 107.8 (d, CH),101.7 (t, CH_2), 55.2 (q, CH_3),40.4 (t, CH_2), 29.4 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{17}H_{17}O_4]^+$=$[M+H]^+$: 285.1121; found 285.1127.



7bg

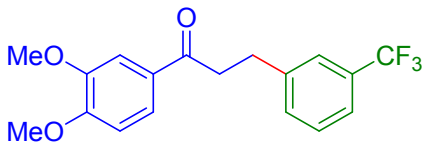
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (94:06) as eluent isolated as yellowish colored solid compound 81% yield (122 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[97 mg (0.5mmol) 1-(3,4-dimethoxyphenyl)prop-2-en-1-ol]=0.50, R_f[117 mg (0.5mmol) 1-iodo-3-methoxybenzene]=0.70 and R_f[122 mg (0.4mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2906, 1654, 1496, 1248, 1010, 866, 760 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.56 (dd, 1H, *J*=8.3 and 2.0 Hz), 7.51 (d, 1H, *J*=2.0 Hz), 7.20 (dd, 1H, *J*=7.8 and 7.8 Hz), 6.84 (dd, 2H, *J*=8.3 and 7.8 Hz), 6.79 (s, 2H),6.74 (dd, 2H, *J*=7.3 and 2.0 Hz),3.92 (s, 3H), 3.91(s, 3H), 3.78 (s, 3H), 3.24 (t, 2H, *J*=7.3 Hz), 3.02 (t, 2H, *J*=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.7 (s, C_q), 159.6 (s, C_q), 153.1 (s, C_q), 148.9(s, C_q),143.0 (s, C_q),130.0(s, C_q),129.4(d, CH),122.5(d, CH), 120.7 (d, CH),114.2 (d, CH),111.2 (d,CH),110.0 (d, CH), 109.9 (d, CH),56.0 (q, CH_3),55.9 (q, CH_3),55.1 (q, CH_3),39.8 (t, CH_2), 30.4 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{18}H_{20}NaO_4]^+$=[M+Na]$^+$: 323.1254; found 323.1252.



7bc

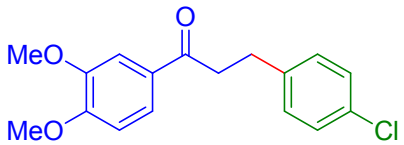
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (95:05) as eluent isolated as yellow colored solid compound 65% yield (110 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[97 mg (0.5mmol) 1-(3,4-dimethoxyphenyl)prop-2-en-1-ol]=0.50, R_f[136 mg (0.5mmol) 1-iodo-3-(trifluoromethyl)benzene]=0.70 and R_f[110 mg (0.32mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2893, 1631, 1495, 1247, 1014, 749 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.55 (dd, 1H, *J*=8.3 and 2.0 Hz), 7.50 (d, 1H, *J*=2.0 Hz), 7.49 (s, 1H), 7.47-7.55 (m, 3H), 6.85 (d, 1H, *J*=8.8 Hz),3.92 (s, 3H), 3.91 (s, 3H), 3.26 (t, 2H, *J*=7.3 Hz), 3.10 (t, 2H, *J*=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.1 (s, C_q), 153.3 (s, C_q), 149.0 (s, C_q), 142.3(s, C_q),131.9(s, C_q),129.9(s, C_q),128.9(d, 2C,CH),125.1(s, *J*=3.7 Hz, C_q),125.0 (s, *J*=3.7 Hz, C_q), 122.6 (d, CH),110.0 (d, CH),109.9 (d, 2C, CH),56.0 (q, CH_3),55.9 (q, CH_3),39.4 (t, CH_2), 30.1 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{18}H_{18}F_3O_3]^+$=[M+H]$^+$: 339.1203; found 339.1206.



7bj

This compound was prepared according to the GP and using petroleum ether/ethyl acetate (95:05) as eluent isolated as black colored viscous compound 79% yield (120.4 mg):[TLC

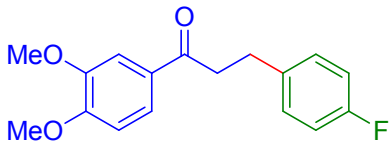
(petroleum ether/ethyl acetate 9:1, R_f[97 mg (0.5mmol) 1-(3,4-dimethoxyphenyl)prop-2-en-1-ol]=0.50, R_f[119.22 mg (0.5mmol) 1-chloro-4-iodobenzene]=0.70 and R_f[120.4 mg (0.39mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2905, 1652, 1490, 1243, 1014, 869, 770 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.55 (dd, 1H, *J*=8.3 and 2.0 Hz), 7.51 (d, 1H, *J*=2.0 Hz), 7.24 (d, 2H, *J*=8.3 Hz), 7.17 (d, 2H, *J*=8.3 Hz), 6.86 (d, 1H, *J*=8.3 Hz),3.93 (s, 3H), 3.91 (s, 3H), 3.22 (t, 2H, *J*=7.3 Hz), 3.02 (t, 2H, *J*=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.4 (s, C_q), 153.2 (s, C_q), 149.0 (s, C_q), 139.8(s, C_q),131.7(s, C_q),129.9 (s, C_q),129.8(d, 2C,CH),128.5(d, 2C, CH),122.6(d, CH), 110.0 (d, CH),109.9 (d, CH),56.0 (q, CH_3),55.9 (q, CH_3),39.6 (t, CH_2), 29.6 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{17}H_{18}O_3]^+$=$[M+H]^+$: 305.0940; found 305.0939.



7bi

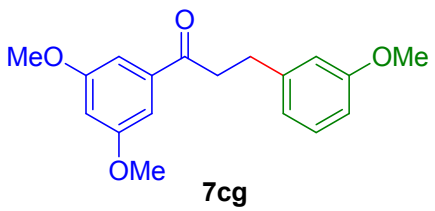
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (95:05) as eluent isolated as light yellow colored solid compound 72% yield (104 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[97 mg (0.5mmol) 1-(3,4-dimethoxyphenyl)prop-2-en-1-ol]=0.50, R_f[111 mg (0.5mmol) 1-fluoro-4-iodobenzene]=0.70 and R_f[104 mg (0.36mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2905, 1653, 1492, 1248, 1008, 810, 758 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.54 (dd, 1H, *J*=8.3 and 2.0 Hz), 7.50 (d, 1H, *J*=2.0 Hz), 7.22-7.13 (m, 2H), 6.95 (dd, 1H, *J*=8.8 and 8.8 Hz),6.84 (d, 1H, *J*=8.3 Hz),3.91 (s, 3H), 3.90 (s, 3H), 3.21 (t, 2H, *J*=7.3 Hz), 3.01 (t, 2H, *J*=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.6 (s, C_q), 162.5 (s, C_q), 160.1 (s, C_q), 153.2(s, C_q),148.9(s, C_q),136.9 (s, C_q, *J*=2.9 Hz), 129.9 (s, C_q),129.8 (d, CH),129.7(d, CH),122.6 (d, CH), 115.2 (d, CH),115.0 (d, CH),110.0 (d, CH),109.9 (d, CH),56.0 (q, CH_3),55.9 (q, CH_3),39.8 (t, CH_2), 29.5 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{17}H_{18}FO_3]^+$=$[M+H]^+$: 289.1234; found 289.1234.



7cg

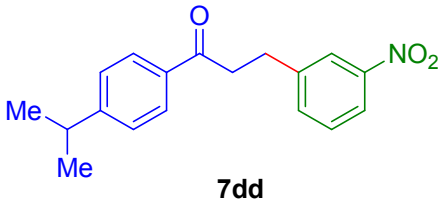
This compound was prepared according to the GP and using petroleum ether/ethyl acetate (95:05) as eluent isolated as white colored solid compound 86% yield (129 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[97 mg (0.5mmol) 1-(3,5-dimethoxyphenyl)prop-2-en-1-ol]=0.50, R_f[117 mg (0.5mmol) 1-iodo-3-methoxybenzene]=0.70 and R_f[129 mg (0.43mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2909, 1665, 1442, 1142, 1035, 838, 775 cm^{-1}.

^{1}H-NMR ($CDCl_3$, 400 MHz): δ=7.21 (dd, 1H, *J*=8.3 and 7.8 Hz), 7.08 (d, 1H, *J*=2.0 Hz), 6.83 (d, 1H, *J*=7.3 Hz),6.79 (s, 1H),6.74 (dd, 1H, *J*=7.8 and 2.0 Hz),6.63 (dd, 1H, *J*=2.4 and 2.4 Hz),3.81 (s, 2C, 6H), 3.79 (s, 3H), 3.25 (t, 2H, *J*=7.3 Hz), 3.02 (t, 2H, *J*=7.3 Hz) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=198.8 (s, C_q), 160.8 (s, 2C,C_q), 159.7 (s, C_q), 142.8(s, C_q),138.7(s, C_q),129.5(d, CH),120.7 (d, CH),114.2(d, CH), 111.4 (d, CH),105.8 (d, 2C, CH),105.3 (d, CH),55.5 (q, 2C,CH_3),55.1 (q, CH_3),40.4 (t, CH_2), 30.2 (t, CH_2) ppm.

HR-MS (ESI$^+$): m/z calculated for $[C_{18}H_{20}NaO_4]^+$=$[M+Na]^+$: 323.1254; found 323.1252.



7dd

This compound was prepared according to the GP and using petroleum ether/ethyl acetate (93:07) as eluent isolated as yellow colored solid compound 70% yield (104 mg):[TLC (petroleum ether/ethyl acetate 9:1, R_f[88 mg (0.5mmol) 1-(4-isopropylphenyl)prop-2-en-1-ol]=0.50, R_f[124.5 mg (0.5mmol) 1-iodo-3-nitrobenzene]=0.70 and R_f[104 mg (0.35mmol) product]=0.40, UV detection].

IR (MIR-ATR, 4000–600 cm^{-1}): ν_{max}=2931, 1662, 1510, 1334, 970, 724 cm^{-1}.

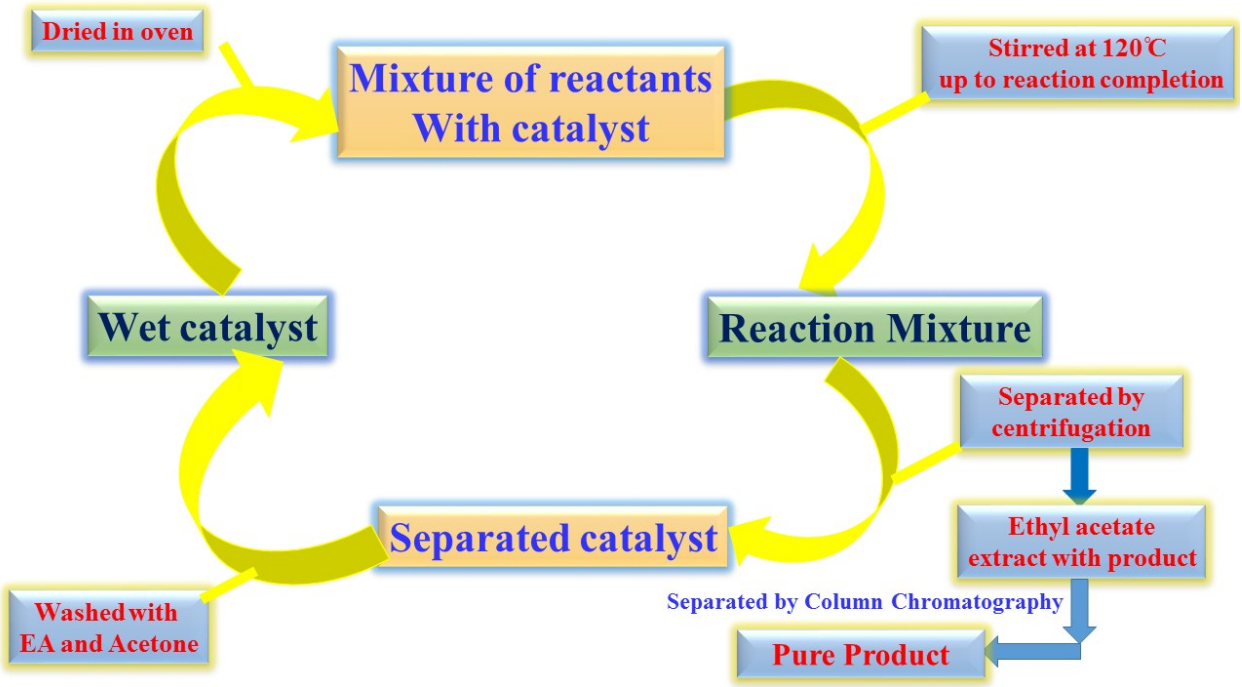
^{1}H-NMR ($CDCl_3$, 400 MHz): δ=8.11 (s, 1H), 8.05 (d, 1H, *J*=8.3 Hz), 7.88 (d, 1H, *J*=8.3 Hz),7.60 (d, 1H, *J*=7.8 Hz), 7.44 (dd, 1H, *J*=7.8 and 7.8 Hz),7.30 (d, 1H, *J*=7.8 Hz),3.33 (t, 2H, *J*=7.3 Hz), 3.17 (t, 2H, *J*=7.3 Hz), 3.00-2.90 (m, 1H), 1.25 (d, 6H) ppm.

^{13}C-NMR ($CDCl_3$, 100 MHz): δ=197.8 (s, C_q), 154.9 (s,C_q), 148.3 (s, C_q), 143.4(s, C_q),135.0(d, CH),134.4 (s, C_q), 129.3(d, CH),128.2(d, 2C,CH),126.8 (d, 2C,CH), 123.3 (d, CH),121.3 (d, CH),39.4 (d, CH), 34.2 (t, CH_2), 29.5 (t, CH_2), 23.6 (q, 2C, CH_3) ppm.

HR-MS (ESI^+): m/z calculated for $[C_{18}H_{20}NO_3]^+$=$[M+H]^+$: 298.1438; found 298.1444

Recyclability of the catalyst:

This recyclability of $Pd/CuFe_2O_4$ nanowires has been studied on the coupling of 4-methoxy iodobenzene with ethyl acrylate. After the first run, the catalyst was recovered using centrifugation method. The catalyst present in the centrifuge tube was washed with a 1:1 mixture of ethyl acetate and acetone (5 × 14 mL) and dried in an oven. The recovered $Pd/CuFe_2O_4$ catalyst was reused for the next run, as depicted in Figure.



Nature of the Pd after the fifth cycle:

The catalyst was recycled five times without an appreciable change in its activity and product yield, under the established reaction conditions. Also, after the fifth cycle, we could not observe any considerable change in its crystal structure of recycled catalyst, as shown in Figure. Thus, reveals that the above catalyst is stable and can be reused.

Fifth cycle XRD: