Supporting Information

for

Scope and limitations of the dual-gold-catalysed hydrophenoxylation of alkynes

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Experimental procedures and characterisation data for all the compounds

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1. General considerations

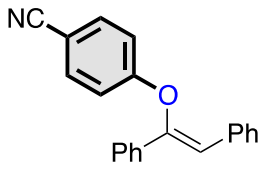
Unless otherwise stated, all solvents and reagents were used as purchased and all reactions were performed under air. Deuterated solvents (CD_2Cl_2, $CDCl_3$) were filtered through basic alumina in order to remove traces of HCl. NMR spectra were recorded on 500, 400 and 300 MHz spectrometers at room temperature in CD_2Cl_2 or $CDCl_3$. Chemical shifts (δ) are reported in ppm, relative to the solvent residual peak CD_2Cl_2 (5.32 ppm for ^1H and 54.00 ppm for ^{13}C) and $CDCl_3$ (7.26 ppm for ^1H and 77.16 ppm for ^{13}C). Data for ^1H NMR are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, br = broad signal, m = multiplet), coupling constants (*J*) in Hz and integration. Flash chromatography was performed on silica gel 60 Å pore diameter and 40–63 µm particle size. Elemental analysis was carried out by the analytical services of London Metropolitan University. High-resolution mass spectrometry was performed by the EPSRC National Mass Spectrometry Service Centre (NMSSC) (Grove Building Extn., Swansea University, Singleton Park, Swansea, SA2 8PP, U.K.). $[\{Au(IPr)\}_2(\mu\text{-OH})][BF_4]$ was synthesized following the reported methodologies [1]:

2. Synthesis & characterization of vinyl ether derivatives (6)

General procedure

As described in reference [2], $\{Au(NHC)\}_2(\mu\text{-OH})][BF_4]$ (0.5–1.0 mol %) was added to a solution of alkyne (0.5 mmol) and phenol (0.55 mmol, 1.1 equiv) in toluene (1 mL). The reaction mixture was stirred at 80 or 110 °C. After the reaction was completed, the solvent was concentrated in vacuum. The residue was purified by flash column chromatography on silica gel to give the corresponding product.

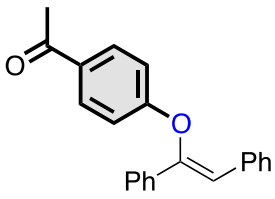
(*Z*)-4-((1,2-Diphenylvinyl)oxy)benzonitrile (3aa)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), 4-hydroxybenzonitrile (**2a**) (65.5 mg, 0.55 mmol) and $[\{Au(IPr)\}_2(\mu\text{-OH})][BF_4]$ (6.5 mg, 5 µmol, 1.0 mol %) in toluene (1 mL) at 110 °C for 24 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **6aa** (74 mg, 50%, average of two runs) as a white solid.

^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.58-7.55 (m, 4H), 7.54-7.51 (m, 2H), 7.38-7.28 (m, 5H), 7.25-7.22 (m, 1H), 7.11-7.07 (m, 2H), 6.75 (s, 1H). **^{13}C{^{1}H} NMR** ($CDCl_3$, 101 MHz): δ 159.94, 148.60, 135.02, 134.36, 134.05, 129.11, 129.03, 128.99, 128.78, 128.03, 125.79, 118.95, 117.43, 117.04, 105.72; **HRMS** (NIS) calcd for $C_{21}H_{16}NO$ [(M+H)+] 298.1226, found 298.1233.

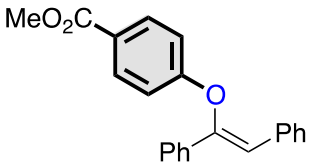
(*Z*)-1-(4-((1,2-Diphenylvinyl)oxy)phenyl)ethanone (3ab)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), 4-hydroxyacetophenone (**2b**) (74.8 mg, 0.55 mmol) and $[\{Au(IPr)\}_2(\mu\text{-OH})][BF_4]$ (3.2 mg, 2.5 µmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 14 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3ab** (140 mg, 90%, average of two runs) as a white solid.

^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.88-7.86 (m, 2H), 7.61-7.58 (m, 4H), 7.36-7.28 (m, 5H), 7.24-7.21 (m, 1H), 7.09-7.06 (m, 2H), 6.74 (s, 1H), 2.51 (s, 3H).; **^{13}C{^{1}H} NMR** ($CDCl_3$, 101 MHz): δ 196.75, 160.51, 149.03, 135.46, 134.34, 131.69, 130.85, 129.11, 128.89, 128.84, 128.73, 127.83, 125.89, 117.18, 116.12, 26.49; **HRMS** (NIS) calcd for $C_{22}H_{19}O_2$ [$(M+H)^+$] 315.1380, found 315.1385.

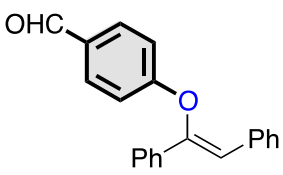
(*Z*)-Methyl 4-[(1,2-diphenylvinyl)oxy]benzoate (3ac)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), methyl 4-hydroxybenzoate (**2c**) (83.7 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF$_4$] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 3 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 9/1) to give **3ac** (140 mg, 85%, average of two runs) as a white solid.

^{1}H NMR (CDCl$_3$, 400 MHz) δ 7.97-7.88 (m, 2H), 7.64-7.53 (m, 4H), 7.39-7.17 (m, 6H), 7.09-6.99 (m, 2H), 6.72 (s, 1H), 3.85 (s, 3H); **^{13}C{^{1}H} NMR** (CDCl$_3$, 101 MHz) δ 166.7, 160.4, 149.1, 135.5, 134.4, 131.9, 129.1, 128.9, 128.8, 128.7, 127.8, 125.9, 124.2, 117.1, 116.1, 52.1; **HRMS** (NIS) calcd for $C_{22}H_{19}O_3$ [(M+H)$^+$] 331.1329, found 331.1327.

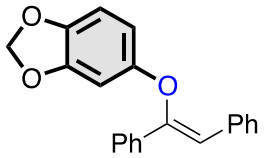
(*Z*)-4-((1,2-Diphenylvinyl)oxy)benzaldehyde (3ad)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), phenol (**2d**) (67.0 mg, 0.50 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF$_4$] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 6 h, was purified by column chromatography on silica gel (CH_2Cl_2), to give **3ad** (142 mg, 94%, average of two runs) as a colourless solid.

^{1}H NMR (CD_2Cl_2, 300 MHz) δ 9.83 (s, 1H), 7.78-7.76 (m, 2H), 7.62-7.59 (m, 4H), 7.36-7.15 (m, 8H), 6.80 (s, 1H); **^{13}C{^{1}H} NMR** (CDCl$_3$, 75 MHz) δ 151.6, 150.4, 136.5, 135.3, 129.4, 129.1, 129.0, 127.9, 126.6, 117.6, 117.2; **HRMS** (APCI) calcd for $C_{21}H_{17}O_2$ [(M+H)$^+$] 301.1223, found 301.1222.

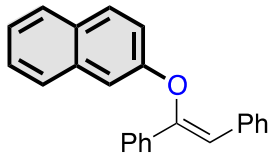
(*Z*)-5-((1,2-Diphenylvinyl)oxy)benzo[*d*][1,3]dioxole (3ae)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), sesamol (**2e**) (70.0 mg, 0.50 mmol) and [Au(IPr)]$_2$(μ-OH)][BF$_4$] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 1 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3ae** (150 mg, 94%, average of two runs) as a white solid.

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.69-7.67 (m, 2H), 7.62-7.60 (m, 2H), 7.37-7.23 (m, 6H), 6.65 (d, *J* = 8.5 Hz, 1H + d, *J* = 2.5 Hz, 1H + s, 1H), 6.49 (dd, *J* = 8.5, 2.5 Hz, 1H), 5.88 (s, 2H). **^{13}C{^{1}H} NMR** (101 MHz, CDCl$_3$): δ 151.46, 150.08, 148.47, 142.66, 136.07, 134.85, 129.03, 128.66, 128.52, 127.52, 126.23, 116.82, 108.30, 108.23, 101.40, 99.18. **HRMS** (APCI) calcd. for $C_{21}H_{17}O_3$ [(M+H)$^+$] 317.1172, found 317.1170.

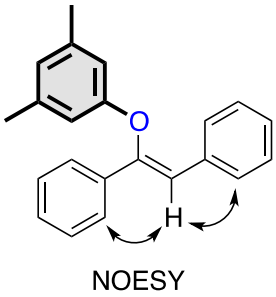
(*Z*)-2-((1,2-Diphenylvinyl)oxy)naphthalene (3af)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), naphthol (**2f**) (79.3 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF$_4$] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 3 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3af** (158 mg, 98%, average of two runs) as a white solid.

^{1}H NMR (CDCl$_3$, 300 MHz) δ 7.82-7.72 (m, 2H), 7.71-7.57 (m, 5H), 7.43-7.14 (m, 10H), 6.75 (s, 1H); **^{13}C{^{1}H} NMR** (CDCl$_3$, 75 MHz) δ 154.3, 149.7, 135.9, 134.8, 134.5, 130.0, 129.7, 129.1, 128.7, 128.7, 128.6, 127.8, 127.6, 127.1, 126.5, 126.1, 124.3, 118.3, 117.1, 111.1; **HRMS** (APCI) calcd for $C_{24}H_{19}O$ [(M+H)$^+$] 323.1430, found 323.1430.

(*Z*)-[1-(3,5-Dimethylphenoxy)ethene-1,2-diyl]dibenzene (3ai)

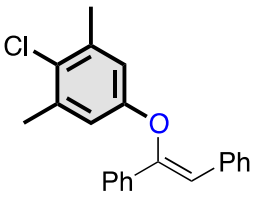


NOESY

According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), 3,5-dimethylphenol (**2i**) (67.0 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 2 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3ai** (142 mg, 94%, average of two runs) as a white solid.

^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.68-7.62 (m, 2H), 7.62-7.57 (m, 2H), 7.37-7.15 (m, 6H), 6.65 (brs, 2H), 6.64 (s, 1H), 6.59 (brs, 1H), 2.21 (s, 6H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 101 MHz) δ 156.4, 149.8, 139.5, 139.5, 136.3, 135.0, 129.1, 128.6, 128.4, 127.4, 126.1, 124.0, 116.7, 114.1, 21.5; **HRMS** (APCI) calcd for $C_{22}H_{20}O$ [M^+] 300.1509, found 300.1507.

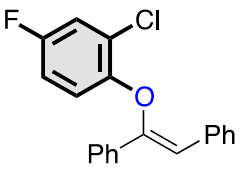
(*Z*)-(1-(4-Chloro-3,5-dimethylphenoxy)ethene-1,2-diyl)dibenzene (3aj)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1a** (89.0 mg, 0.50 mmol), phenol (**2j**) (86.0 mg, 0.50 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 6 h, was purified by column chromatography on silica gel (pentane/EtOAc = 95/5), to give **3aj** (164 mg, 98%, average of two runs) as a colourless solid.

^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.64 (ddd, *J* = 14.4, 7.7, 1.5 Hz, 4H), 7.38-7.22 (m, 6H), 6.80 (s, 2H), 6.69 (s, 1H), 2.30 (s, 6H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 154.2, 149.5, 137.6, 135.9, 134.8, 129.1, 128.7, 128.7, 128.6, 127.6, 126.1, 117.0, 116.2, 21.1; **HRMS** (APCI) calcd for $C_{22}H_{20}OCl$ [$(M+H)^+$] 335.1197, found 335.1195.

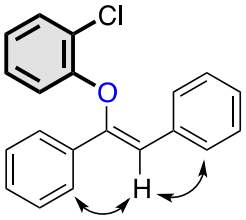
(*Z*)-[1-(2-Chloro-4-fluorophenoxy)ethene-1,2-diyl]dibenzene (3ak)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), 2-chloro-4-fluorophenol (**2k**) (81.0 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (6.5 mg, 5 μmol, 1.0 mol %) in toluene (1 mL) at 110 °C for 6 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3ak** (143 mg, 88%, average of two runs) as a white solid whose NMR data were consistent to those reported in the literature [3].

^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.70-7.61 (m, 2H), 7.61-7.54 (m, 2H), 7.39-7.13 (m, 7H), 6.77 (dd, *J* = 9.1, 5.0 Hz, 1H), 6.73-6.64 (m, 2H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 157.3 (d, $J_{C\text{-}F}$ = 243 Hz), 149.7, 148.1 (d, $J_{C\text{-}F}$ = 2.8 Hz), 135.2, 134.4, 129.0, 128.88, 128.87, 128.7, 127.8, 126.0, 123.4 (d, $J_{C\text{-}F}$ = 11 Hz), 117.8 (d, $J_{C\text{-}F}$ = 26 Hz), 117.2, 116.6 (d, $J_{C\text{-}F}$ = 8.6 Hz), 114.5 (d, $J_{C\text{-}F}$ = 23 Hz); ^{19}F NMR ($CDCl_3$, 282 MHz) δ -120.3.

(*Z*)-[1-(2-Chlorophenoxy)ethene-1,2-diyl]dibenzene (3al)

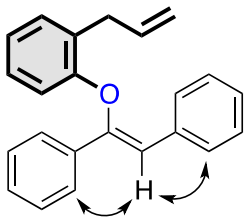


NOESY

According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), 2-chlorophenol (**2l**) (70.7 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (6.5 mg, 5 μmol, 1.0 mol %) in toluene (1 mL) at 110 °C for 3 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3al** (141 mg, 92%, average of two runs) as a colourless liquid whose NMR data were consistent to those reported in the literature [3].

^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.72-7.65 (m, 2H), 7.65-7.57 (m, 2H), 7.43 (dd, *J* = 7.8, 1.7 Hz, 1H), 7.39-7.18 (m, 6H), 6.99 (dt, *J* = 7.7, 1.7 Hz, 1H), 6.93-6.79 (m, 2H), 6.72 (s, 1H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 151.7, 149.5, 135.4, 134.5, 130.6, 129.1, 128.8, 128.8, 128.7, 127.8, 127.7, 125.9, 123.0, 122.9, 117.1, 116.3.

(*Z*)-[1-(2-Allylphenoxy)ethene-1,2-diyl]dibenzene (3am)

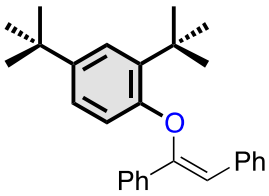


NOESY

According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), 2-allylphenol (**2m**) (74.0 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (6.5 mg, 5 μmol, 1.0 mol %) in toluene (1 mL) at 110 °C for 3 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3am** (144 mg, 92%, average of two runs) as a white solid.

^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.66-7.59 (m, 2H), 7.58-7.51 (m, 2H), 7.39-7.15 (m, 7H), 7.02-6.84 (m, 2H), 6.73 (dd, *J* = 7.8, 1.6 Hz, 1H), 6.67 (s, 1H), 6.25-6.06 (m, 1H), 5.25-5.09 (m, 2H), 3.69 (ddd, *J* = 6.5, 1.6, 1.6 Hz, 2H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 101 MHz) δ 153.8, 149.7, 137.0, 136.1, 134.9, 130.6, 129.0, 128.7, 128.6, 128.5, 128.4, 127.51, 127.45, 126.0, 122.0, 116.9, 116.1, 114.5, 34.3; **HRMS** (APCI) calcd for $C_{23}H_{21}O$ [$(M+H)^+$] 313.1587, found 313.1588.

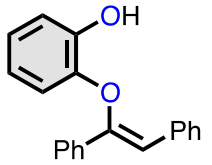
(*Z*)-(1-(2,4-Di-*tert*-butylphenoxy)ethene-1,2-diyl)dibenzene (3an)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), 2,4-di-*tert*-butylphenol (**2o**) (103.2 mg, 0.50 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (6.5 mg, 5 μmol, 1.0 mol %) in toluene (1 mL) at 80 °C for 14 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3an** (160 mg, 83%, average of two runs) as an off-white solid.

^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.62 - 7.58 (m, 2H), 7.57 - 7.53 (m, 2H), 7.40 (d, *J* = 2.5 Hz, 1H), 7.35 - 7.21 (m, 5H), 7.20 - 7.15 (m, 1H), 6.93 (dd, *J* = 8.5, 2.5 Hz, 1H), 6.69 (d, *J* = 8.7 Hz, 1H), 6.67 (s, 1H), 1.58 (s, 9H), 1.26 (s, 9H). **^{13}C{^{1}H} NMR** (101 MHz, $CDCl_3$): δ 152.77, 149.60, 143.77, 136.60, 136.35, 134.95, 129.04, 128.61, 128.42, 128.30, 127.35, 126.43, 124.51, 123.79, 117.49, 114.69, 35.40, 34.44, 31.72, 30.63. **HRMS** (APCI) calcd for $C_{28}H_{33}O$ [$(M+H)^+$] 385.2526, found 385.2519.

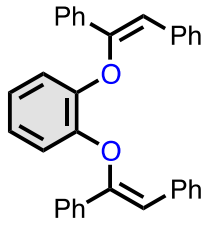
(*Z*)-2-((1,2-Diphenylvinyl)oxy)phenol (3ap)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), catechol (**2p**) (55.1 mg, 0.50 mmol) and [Au(IPr)]$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 6 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3ap** (100 mg, 70%, average of two runs) as a colourless liquid, whose NMR data were consistent to those reported in the literature [4].

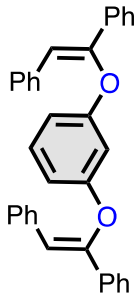
^{1}H NMR (300 MHz; $CDCl_3$): δ 7.60-7.57 (m, 2H), 7.54-7.50 (m, 2H), 7.36-7.28 (m, 5H), 7.27-7.21 (m, 1H), 7.03 (dd, *J* = 8.0, 1.5 Hz, 1H), 6.88 (td, *J* = 7.7, 1.5 Hz, 1H), 6.75 (dd, *J* = 8.1, 1.5 Hz, 1H), 6.71 (s, 1H), 6.64 (ddd, *J* = 8.1, 7.4, 1.6 Hz, 1H), 5.87 (s, 1H). **^{13}C{^{1}H} NMR** (101 MHz, $CDCl_3$): δ 149.27, 145.79, 143.16, 135.25, 134.45, 128.91, 128.84, 128.77, 127.81, 125.79, 123.22, 120.62, 117.44, 115.78, 115.08.

1,2-Bis(((*Z*)-1,2-diphenylvinyl)oxy)benzene (4ap)



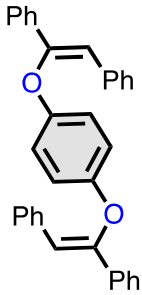
According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (178.0 mg, 1 mmol), catechol (**2p**) (55.1 mg, 0.50 mmol) and $[Au(IPr)]_2(\mu\text{-}OH)][BF_4]$ (3.2 mg, 0.25 µmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 18 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **4ap** (256 mg, 55%, average of two runs) as a colourless liquid, whose NMR data were consistent to those reported in the literature [4].
^{1}H NMR (400 MHz; $CDCl_3$): δ 7.82-7.77 (m, 8H), 7.42-7.33 (m, 10H), 7.32-7.27 (m, 2H), 6.90-6.86 (dt, *J* = 6.0, 3.6 Hz, 2H), 6.76 (s, 2H), 6.69 (dt, *J* = 6.4, 3.3 Hz, 2H). **^{13}C{^{1}H} NMR** ($CDCl_3$, 101 MHz): δ 150.00, 145.53, 136.01, 135.01, 129.19, 128.78, 128.71, 128.66, 127.59, 126.16, 122.60, 117.04, 116.33, 77.48, 77.16, 76.84.

1,3-Bis[(*Z*)-1,2-diphenylvinyloxy]benzene (4aq)



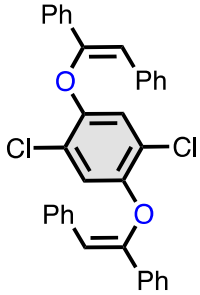
According to the general procedure for hydrophenoxylation, a crude product, which was prepared from diphenylacetylene (**1a**) (89.0 mg, 0.50 mmol), resorcinol (**2q**) (28.0 mg, 0.25 mmol) and $[\{Au(IPr)\}_2(\mu\text{-}OH)][BF_4]$ (3.2 mg, 2.5 µmol, 1.0 mol %) in toluene (1 mL) at 80 °C for 6 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **4aq** (198 mg, 84%, average of two runs) as a white solid, whose NMR data were consistent to those reported in the literature [4].
^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.61-7.53 (m, 4H), 7.52-7.43 (m, 4H), 7.34-7.16 (m, 12H), 7.02 (t, *J* = 8.2 Hz, 1H), 6.74 (t, *J* = 2.3 Hz, 1H), 6.60 (brs, 3H), 6.58 (d, *J* = 2.3 Hz, 1H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 157.7, 149.7, 135.9, 134.7, 130.4, 129.0, 128.6, 128.6, 128.4, 127.4, 126.1, 116.7, 110.2, 105.6.

1,4-Bis(((*Z*)-1,2-diphenylvinyl)oxy)benzene (4ar)



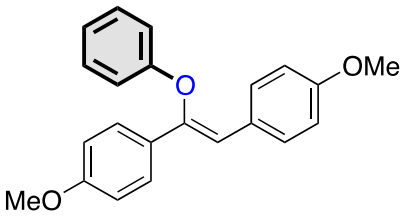
According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1a** (89.0 mg, 0.50 mmol), hydroquinone (**2r**) (28.0 mg, 0.25 mmol) and $[\{Au(IPr)\}_2(\mu\text{-}OH)][BF_4]$ (3.2 mg, 2.5 µmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 1 h, was purified by trituration in pentane after evaporation of the volatiles, to give **4ar** (212 mg, 95%, average of two runs) as a colourless solid, whose NMR data were consistent to those reported in the literature [4].
^{1}H NMR (CD_2Cl_2, 500 MHz) δ 7.62-7.60 (m, 2H), 7.56-7.54 (m, 2H), 7.33-7.26 (m, 5H), 7.22-7.18 (m, 1H), 6.88 (s, 2H), 6.61 (s, 1H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 151.6, 150.7, 136.5, 135.3, 129.4, 129.1, 129.0, 127.9, 126.6, 117.6, 117.2.

1,4-Bis(((*Z*)-1,2-diphenylvinyl)oxy)-2,5-dichlorobenzene (4as)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne (**1a**) (89.0 mg, 0.50 mmol), hydroquinone **2s** (45.0 mg, 0.25 mmol) and $[\{Au(IPr)\}_2(\mu\text{-}OH)][BF_4]$ (3.2 mg, 2.5 µmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 16 h, was purified by trituration in pentane after evaporation of the volatiles, to give **4as** (64 mg, 47%, average of two runs) as an off-white solid.
^{1}H NMR (CD_2Cl_2, 400 MHz): δ 7.61-7.54 (m, 8H), 7.36-7.23 (m, 12H), 6.91 (s, 2H), 6.72 (s, 2H); **HRMS** (APCI) calcd for $C_{34}H_{26}O_2Cl_2$ $[(M+H)^+]$ 534.1148, found 534.1140.

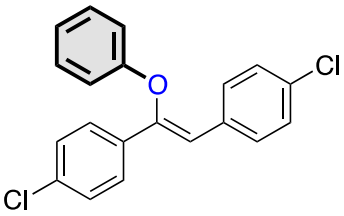
(*Z*)-4,4'-(1-Phenoxyethene-1,2-diyl)bis(methoxybenzene) (3bt)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne (**1b**) (119.2 mg, 0.50 mmol), phenol (**2t**) (52.0 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF$_4$] (6.5 mg, 5 μmol, 1.0 mol %) in toluene (1 mL) at 110 °C for 14 h, was purified by column chromatography on silica gel (pentane/EtOAc = 95/5) to give **2bt** (148 mg, 89%, average of two runs) as a off-white solid.

^{1}H NMR (300 MHz; $CDCl_3$): δ 7.57 (d, *J* = 8.8 Hz, 2H), 7.51 (d, *J* = 8.8 Hz, 2H), 7.26-7.18 (m, 2H), 7.03 (d, *J* = 7.8 Hz, 2H), 6.94 (t, *J* = 7.3 Hz, 1H), 6.82 (dd, *J* = 9.0, 2.6 Hz, 4H), 6.53 (s, 1H), 3.65 (s, 6H). **^{13}C{^{1}H} NMR** (101 MHz, $CDCl_3$): δ 159.60, 158.68, 156.54, 147.82, 130.16, 129.72, 128.72, 127.85, 127.19, 121.92, 116.26, 114.66, 114.06, 114.03, 55.32, 55.28. **HRMS** (APCI) calcd for $C_{22}H_{21}O_3$ [M^+] 333.1485, found 333.1482.

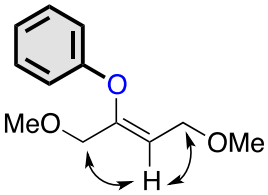
(*Z*)-4,4'-(1-Phenoxyethene-1,2-diyl)bis(chlorobenzene) (3ct)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1c** (123.5 mg, 0.50 mmol), phenol (**2t**) (52.0 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF$_4$] (6.5 mg, 5 μmol, 1.0 mol %) in toluene (1 mL) at 110 °C for 14 h, was purified by column chromatography on silica gel (pentane/EtOAc = 9/1) to give **3ct** (140 mg, 82%, average of two runs) as a off-white solid.

^{1}H NMR (300 MHz; $CDCl_3$): δ 7.58-7.54 (m, 2H), 7.52-7.48 (m, 2H), 7.30-7.21 (m, 6H), 6.99-6.95 (m, 3H), 6.58 (s, 1H). **^{13}C{^{1}H} NMR** (126 MHz, $CDCl_3$): 155.93, 149.23, 134.54, 134.32, 133.24, 133.06, 130.29, 129.93, 129.01, 128.87, 127.45, 122.57, 116.32, 115.99. **HRMS** (APCI) calcd for $C_{20}H_{15}Cl_2O$ [M^+] 341.0494, found 341.0491.

(*Z*)-[(1,4-Dimethoxybut-2-en-2-yl)oxy]benzene (3dt)

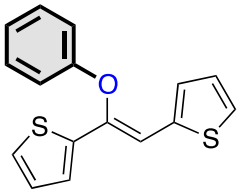


NOESY

According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1d** [5] (114.0 mg, 1.00 mmol), phenol (**2t**) (47.0 mg, 0.50 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF$_4$] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 2 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 10/1) to give **3dt** (89 mg, 85%, average of two runs) as a colourless liquid.

^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.34-7.23 (m, 2H), 7.08-6.93 (m, 3H), 5.51 (tt, *J* = 6.4, 0.9 Hz, 1H), 4.02 (dt, *J* = 6.4, 0.9 Hz, 2H), 3.91 (dt, *J* = 0.9 Hz, 2H), 3.35 (s, 3H), 3.31 (s, 3H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 156.3, 149.9, 129.7, 122.5, 116.5, 114.9, 70.6, 66.4, 58.4, 58.2; **HRMS** (APCI) calcd for $C_{12}H_{16}O_3$ [M^+] 208.1094, found 208.1093.

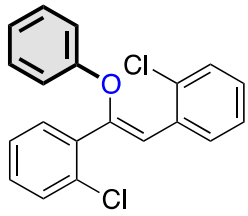
(*Z*)-2,2'-(1-Phenoxyethene-1,2-diyl)dithiophene (3et)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1e** [6] (95.0 mg, 0.50 mmol), phenol (**2t**) (52.0 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF$_4$] (6.5 mg, 5 μmol, 1.0 mol %) in toluene (1 mL) at 110 °C for 1 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 9/1) to give **3et** (91 mg, 64%, average of two runs) as a off-white solid.

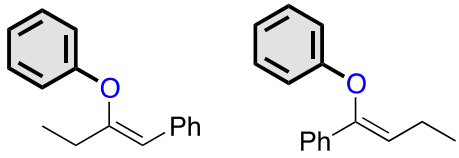
^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.31-7.24 (m, 2H), 7.23-7.20 (m, 1H), 7.19 (ddd, *J* = 5.0, 1.0, 1.0 Hz, 1H), 7.17-7.13 (m, 1H), 7.10-7.07 (m, 3H), 7.04-6.95 (m, 3H), 6.94-6.90 (m, 1H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 101 MHz) δ 156.0, 142.8, 139.1, 137.0, 129.8, 127.9, 127.7, 127.0, 126.6, 125.6, 125.4, 122.6, 116.0, 110.6; **HRMS** (APCI) calcd for $C_{16}H_{13}OS_2$ [$(M+H)^+$] 285.0402, found 285.0397.

(*Z*)-2,2'-(1-Phenoxyethene-1,2-diyl)bis(chlorobenzene) (3ft)



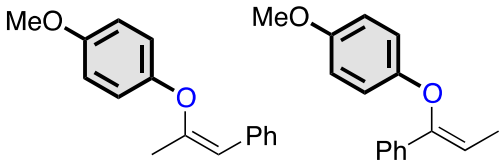
According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1f** (123.0 mg, 0.50 mmol), phenol (**2t**) (47.0 mg, 0.50 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 6 h, was purified by column chromatography on silica gel (pentane), to give **3ft** (148 mg, 87%, average of two runs) as a colourless oil.
^{1}H NMR ($CDCl_3$, 300 MHz) δ 8.18-8.15 (m, 1H), 7.66-7.62 (m, 1H), 7.50-7.47 (m, 1H), 7.44-7.41 (m, 1H), 7.33-7.10 (m, 6H), 7.17-7.13 (m, 2H), 7.05-7.00 (m, 1H), 6.93 (s, 1H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 155.7, 148.7, 136.1, 134.9, 133.6, 132.9, 132.6, 131.1, 130.6, 130.0, 129.8, 129.5, 128.5, 126.8, 126.5, 122.8, 117.6, 116.2; **HRMS** (ESI) calcd for $C_{20}H_{15}OCl_2$ [$(M+H)^+$] 341.0494, found 341.0495.

(*Z*)-(2-Phenoxybut-1-en-1-yl)benzene and (*Z*)-(1-phenoxybut-1-en-1-yl)benzene (3it /3it' = 1/0.23)



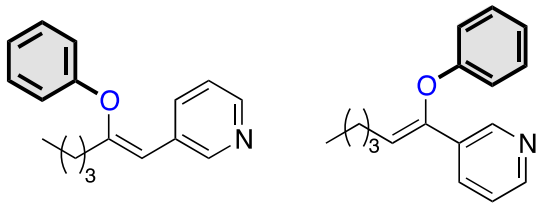
According to the general procedure for hydrophenoxylation, a crude product, which was prepared from **1i** (65.0 mg, 0.50 mmol), phenol (**2t**) (52.0 mg, 0.55 mmol) and [Au(IPr)]$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 6 h, was purified by column chromatography on silica gel (pentane/EtOAc = 95/5) to give the inseparable mixture of **3it** and **3it'** (**3it /3it'** = 1/0.23, 90 mg, 80%, average of two runs) as a colourless liquid.
^{1}H NMR (400 MHz; $CDCl_3$): δ 7.54-7.52 (m, 2H), 7.51-7.48 (m, 0.6H), 7.33-7.21 (m, 6H), 7.17-7.13 (m, 1H), 7.06 (t, *J* = 1.1 Hz, 0.32H), 7.04-7.01 (m, 3H), 6.98-6.95 (m, 0.5H), 6.93-6.91 (m, 0.15H), 5.94 (s, 1H), 5.87 (t, *J* = 7.3 Hz, 0.23H), 2.31 (qd, *J* = 7.4, 0.8 Hz, 2H), 2.23 (quintet, *J* = 7.5 Hz, 0.48H), 1.14 (t, *J* = 7.4 Hz, 3H), 1.04 (t, *J* = 7.5 Hz, 0.74H). **^{13}C{^{1}H} NMR** (126 MHz; $CDCl_3$): δ 157.61, 155.53, 154.39, 148.36, 135.56, 135.22, 129.73, 129.62, 128.54, 128.45, 128.38, 127.92, 126.68, 125.32, 122.44, 121.43, 119.87, 117.32, 115.48, 114.06, 26.41, 19.47, 13.97, 11.96. **HRMS** (APCI) calcd. for $C_{16}H_{17}O$ [$(M+H)^+$] 225.1274, found 225.1271.

(*Z*)-1-Methoxy-4-((1-phenylprop-1-en-2-yl)oxy)benzene and (*Z*)-1-methoxy-4-((1-phenylprop -1-en-1-yl)oxy)benzene (3ju /3ju = 1/0.22)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from **1j** (58.0 mg, 0.50 mmol), phenol **2u** (68.3 mg, 0.55 mmol) and [Au(IPr)]$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 6 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give the inseparable mixture of **3ju** and **3ju'** (**3ju /3ju'** = 1/0.22, 104 mg, 87%, average of two runs) as a colourless liquid.
^{1}H NMR (400 MHz; $CDCl_3$): δ 7.58-7.55 (m, 2H), 7.49-7.46 (m, 0.45), 7.30-7.23 (m, 3H), 7.17-7.13 (m, 1H), 6.99-6.95 (m, 2H), 6.91-6.83 (m, 3H), 6.79-6.76 (m, 0.40), 5.89 (q, *J* = 7.0 Hz, 0.23), 5.78 (s, 1H), 3.79 (s, 3H), 3.73 (s, 0.62H), 1.93 (s, 3H), 1.77 (d, *J* = 7.0 Hz, 0.62H). **^{13}C{^{1}H} NMR** (126 MHz; $CDCl_3$): δ 155.50, 154.23, 151.33, 150.17, 150.09, 149.03, 135.75, 135.62, 128.50, 128.41, 128.16, 127.84, 126.38, 125.32, 121.65, 119.23, 116.17, 114.77, 114.75, 113.55, 112.35, 110.03, 108.34, 55.75, 55.71, 19.69, 11.52. **HRMS** (APCI) calcd. for $C_{16}H_{17}O_2$ [$(M+H)^+$] 241.1223, found 241.1223.

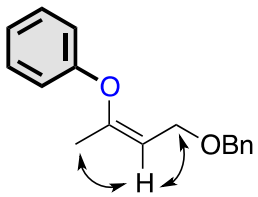
(*Z*)-3-(2-Phenoxyhex-1-en-1-yl)pyridine (3nt) and (*Z*)-3-(1-phenoxyhex-1-en-1-yl)pyridine (3nt') (3nt/3nt' =1/0.43)



According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1n** (79.0 mg, 0.50 mmol), phenol (**2t**) (47.0 mg, 0.50 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (19.5 mg, 15 μmol, 3.0 mol %) in toluene (1 mL) at 110 °C for 24 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5~70/30) to give **3nt** and **3nt'** (**3nt** / **3nt'** = 1/0.43, 96 mg, 76%, average of two runs) as a pale yellow oil.

^{1}H NMR ($CDCl_3$, 300 MHz) δ 8.77 (d, *J* = 1.8 Hz, 1H), 8.63 (br, 2.25H), 8.45 (dd, *J* = 4.7, 1.4 Hz, 1H), 8.36 (d, *J* = 3.7 Hz, 2.33H), 7.94 (dt, *J* = 8.1, 1.9 Hz, 2.36H), 7.71 (dt, *J* = 8.0, 2.0 Hz, 1H), 7.34-7.12 (m, 12H), 7.08-6.92 (m, 10H), 5.95-5.89 (m, 1+2.21H), 2.33-2.20 (m, 6.62H), 1.58-1.21 (m, 15.38H), 0.89 (t, *J* = 7.3 Hz, 10.38H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 157.0, 155.7, 155.1, 149.7, 148.8, 147.5, 147.1, 146.4, 134.9, 132.6, 131.3, 129.8, 129.8, 123.5, 123.3, 122.9, 121.9, 120.4, 117.4, 115.6, 111.2, 32.9, 31.4, 29.3, 25.7, 22.6, 22.2, 14.0, 14.0. **HRMS** (ESI) calcd for $C_{17}H_{20}O_1N_1$ [$(M+H)^+$] 254.1539, found 254.1541.

(*Z*)-[{4-(Benzyloxy)but-2-en-2-yl}oxy]benzene (3ot)

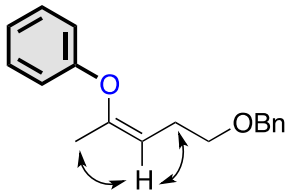


NOESY

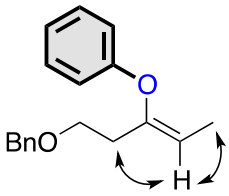
According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1o** [7] (160.0 mg, 1.00 mmol), phenol (**2t**) (47.0 mg, 0.50 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 2 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3ot** (89 mg, 70%, average of two runs) as a colourless liquid.

^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.34-7.18 (m, 7H), 7.03-6.94 (m, 1H), 6.94-6.86 (m, 2 H), 5.21 (t, *J* = 6.8 Hz, 1H), 4.43 (s, 2H), 4.06 (d, *J* = 6.8 Hz, 2H), 1.81 (s, 3H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 101 MHz) δ 156.1, 150.9, 138.6, 129.7, 128.4, 127.9, 127.6, 122.4, 117.0, 112.6, 72.4, 64.5, 18.6; **HRMS** (APCI) calcd for $C_{17}H_{19}O_2$ [$(M+H)^+$] 255.1380, found 255.1375.

(*Z*)-[{5-(Benzyloxy)pent-2-en-2-yl}oxy]benzene (3pt) and (*Z*)-[{5-(benzyloxy)pent-2-en-3-yl} oxy]benzene (3pt') (3pt/3pt' =1/0.17)



NOESY



NOESY

According to the general procedure for hydrophenoxylation, a crude product, which was prepared from alkyne **1p** [8] (87.0 mg, 0.50 mmol), phenol (**2t**) (52.0 mg, 0.55 mmol) and [{Au(IPr)}$_2$(μ-OH)][BF_4] (3.2 mg, 2.5 μmol, 0.5 mol %) in toluene (1 mL) at 80 °C for 3 h, was purified by column chromatography on silica gel (*n*-hexane/EtOAc = 95/5) to give **3pt** and **3pt'** (**3pt** /**3pt'** = 1/0.17, 114 mg, 85%, average of two runs) as a colourless liquid.

^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.33-7.14 (m, 7+1.19H), 6.96-6.80 (m, 3+0.51H), 5.12 (q, *J* = 6.7 Hz, 0.17 H), 5.03 (tq, *J* = 7.2, 1.1 Hz, 1H), 4.43 (s, 2H), 4.42 (s, 0.34H), 3.51 (t, *J* = 6.7 Hz, 0.34H), 3.41 (t, *J* = 7.2 Hz, 2H), 2.45-2.36 (m, 0.34H), 2.31 (dtq, *J* = 7.2, 7.2 1.1 Hz, 2H), 1.75 (dt, *J* = 7.2, 1.1 Hz, 3H), 1.50-1.47 (m, 0.51H); **^{13}C{^{1}H} NMR** ($CDCl_3$, 75 MHz) δ 156.6, 156.4, 148.6, 148.4, 138.7, 138.5, 129.6, 129.6, 128.5, 128.4, 127.8, 127.8, 127.7, 127.6, 121.8, 121.6, 116.4, 115.9, 112.7, 112.3, 73.0, 72.8, 69.8, 67.5, 33.5, 26.0, 18.5, 10.9.

3. References

[1] a) R. S. Ramón, S. Gaillard, A. Poater, L. Cavallo, A. M. Z. Slawin, S. P. Nolan, *Chem. Eur. J.* **2011**, *17*, 1238-1246; b) A. Gómez-Suárez, Y. Oonishi, S. Meiries, S. P. Nolan, *Organometallics* **2013**, *32*, 1106-1111.

[2] Y. Oonishi, A. Gomez-Suarez, A. R. Martin, Y. Makida, A. M. Slawin, S. P. Nolan, *Chem. Eur. J.* **2014**, *20*, 13507-13510.

[3] M. R. Kuram, M. Bhanuchandra, A. K. Sahoo, *J. Org. Chem.* **2010**, *75*, 2247-2258.

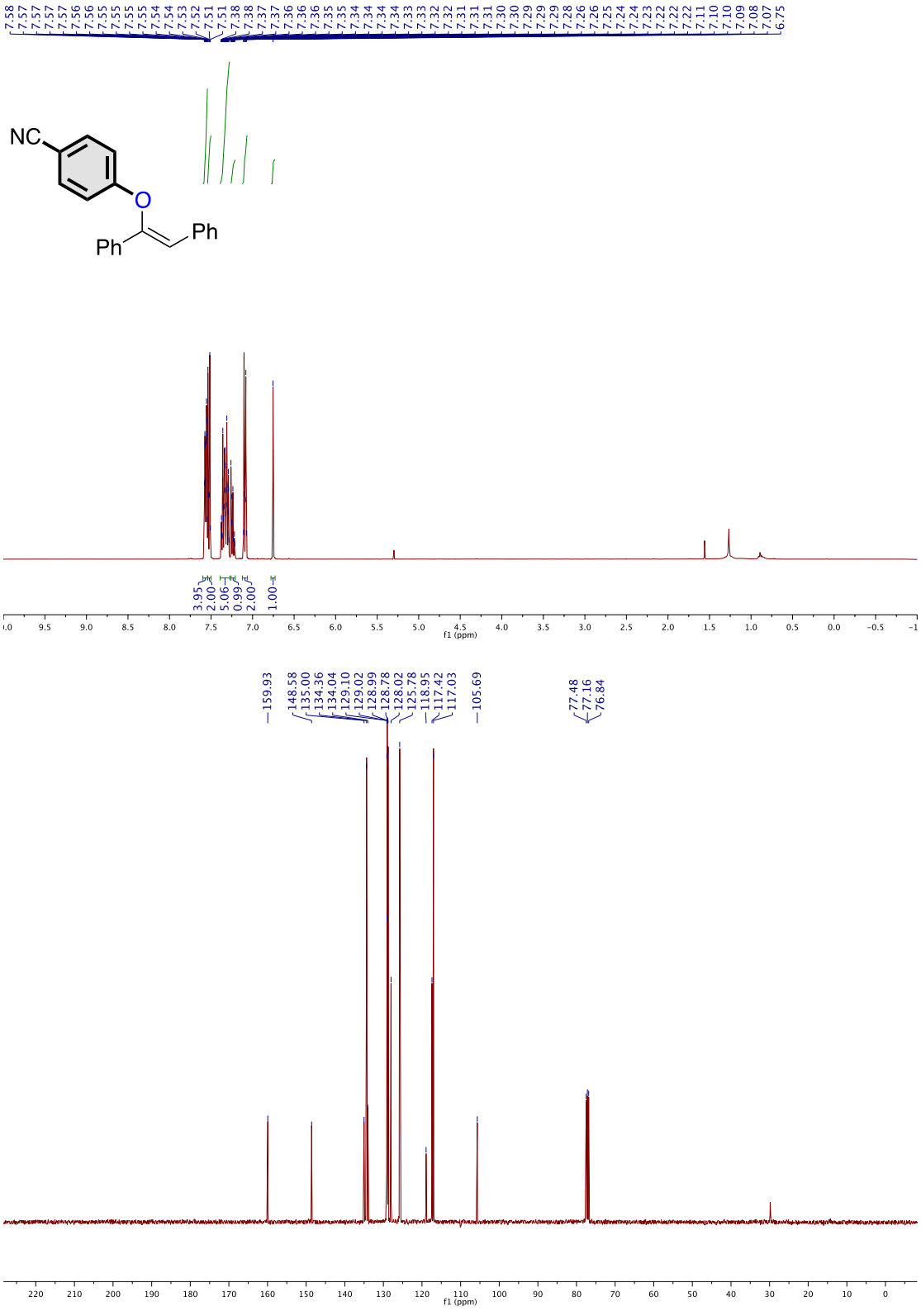
[4] H. Hiranuma, S. I. Miller, *J. Org. Chem.* **1982**, *47*, 5083-5088.

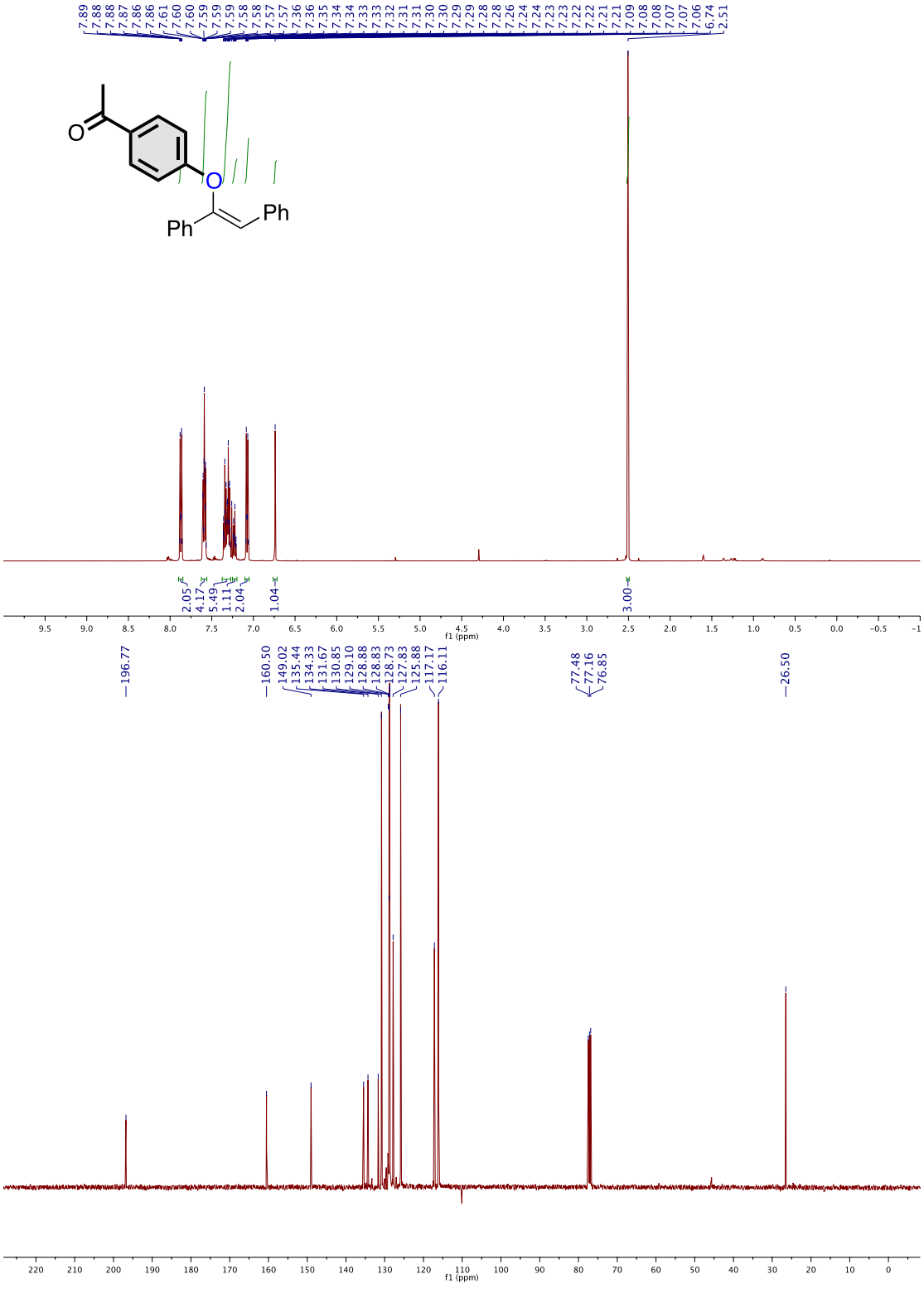
[5] P. Chuentragool, K. Vongnam, P. Rashatasakhon, M. Sukwattanasinitt, S. Wacharasindhu, *Tetrahedron* **2011**, *67*, 8177-8182.

[6] K. Semba, T. Fujihara, J. Terao, Y. Tsuji, *Chem. Eur. J.* **2012**, *18*, 4179-4184.

[7] F. Alonso, I. Osante, M. Yus, *Tetrahedron* **2007**, *63*, 93-102.

4. NMR Spectra

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7.86
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7.60
7.60
7.59
7.59
7.59
7.58
7.58
7.57
7.57
7.36
7.35
7.34
7.34
7.33
7.33
7.32
7.31
7.31
7.30
7.30
7.29
7.29
7.28
7.26
7.24
7.24
7.23
7.23
7.22
7.21
7.21
7.09
7.08
7.08
7.07
7.07
7.06
6.74
2.51
O
O
Ph
Ph
2.05
4.17
5.49
1.11
2.04
1.04
3.00
f1 (ppm)
196.77
160.50
149.02
135.44
134.33
131.67
130.85
129.10
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127.83
125.88
117.17
116.11
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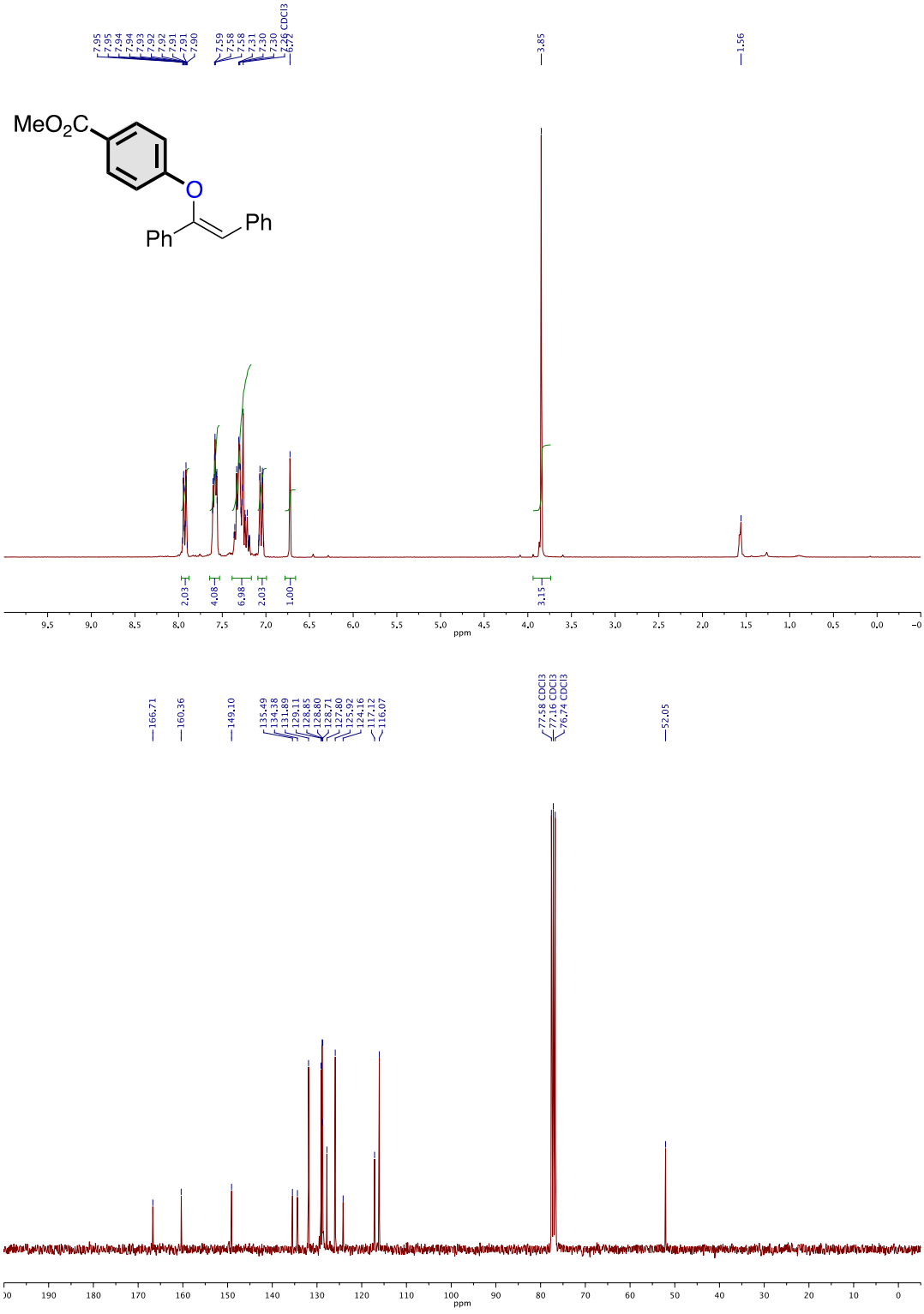
77.16
76.85
26.50
f1 (ppm)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7.95
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7.94
7.93
7.92
7.92
7.91
7.90
7.59
7.58
7.58
7.31
7.30
7.30
7.26 CDCl3
6.29
3.85
1.56
MeO2C
O
Ph
Ph
2.03
4.08
6.98
2.03
1.00
3.15
ppm
166.71
160.36
149.10
135.49
134.38
131.89
129.11
128.85
128.60
128.71
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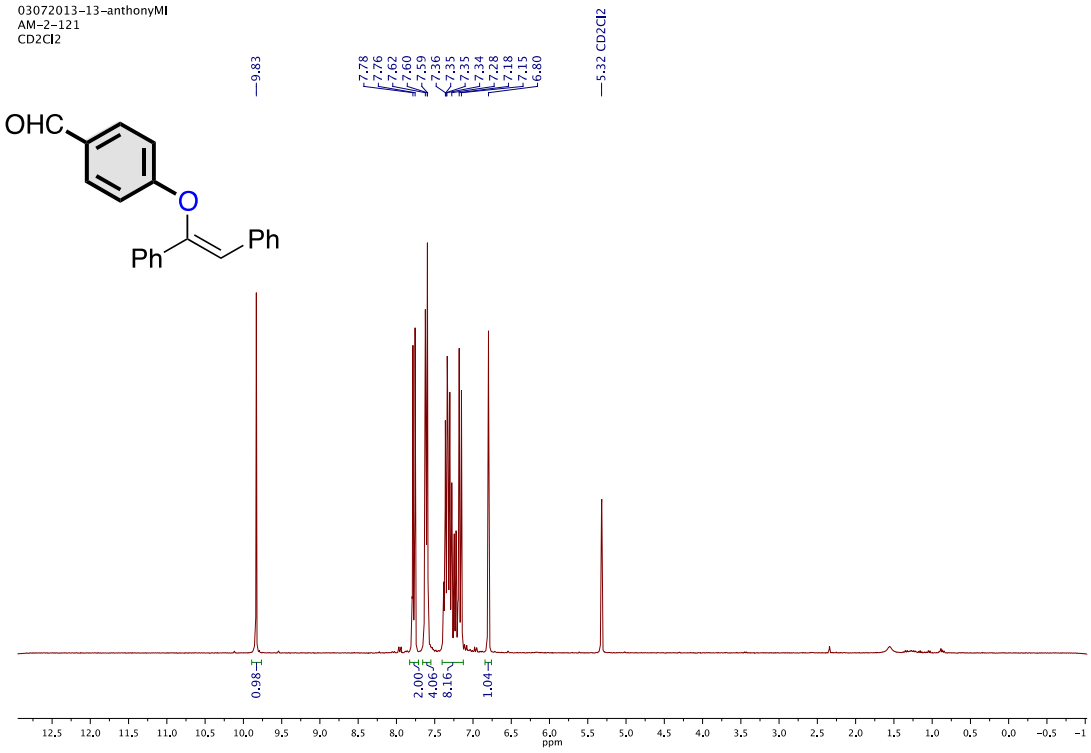
116.07
77.58 CDCl3
77.16 CDCl3
76.74 CDCl3
52.05
ppm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7.76
7.62
7.60
7.59
7.36
7.35
7.35
7.34
7.28
7.18
7.15
6.80
5.32 CD2Cl2
OHC
O
Ph
Ph
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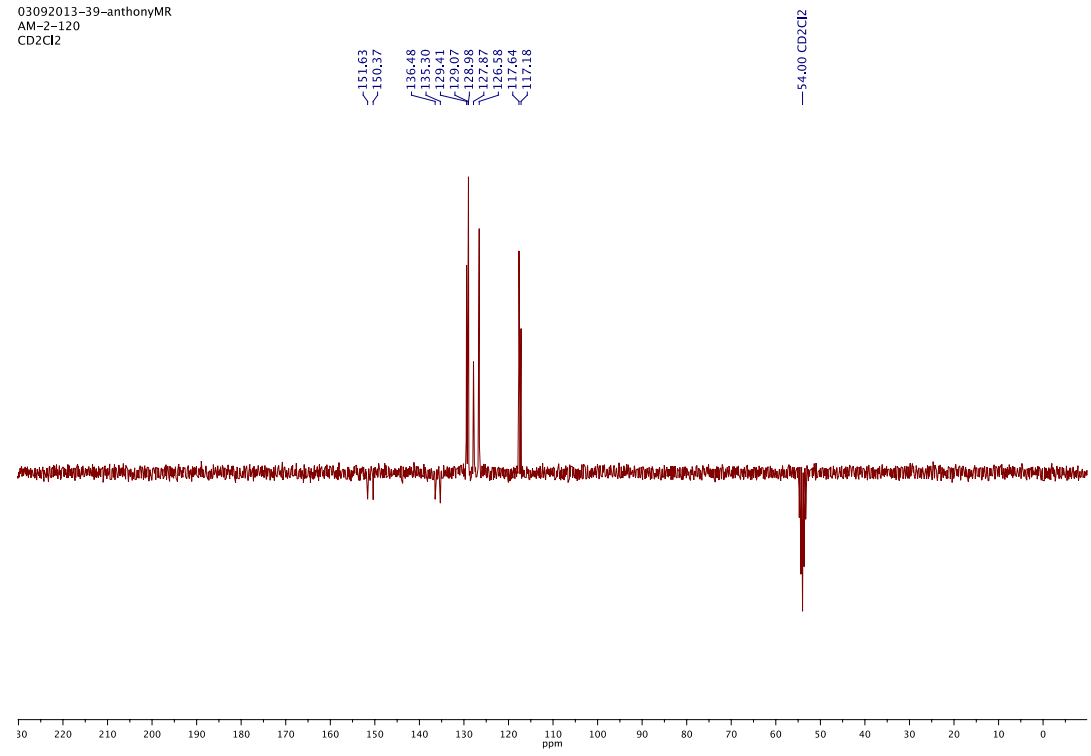
2.00
4.06
8.16
1.04
ppm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126.58
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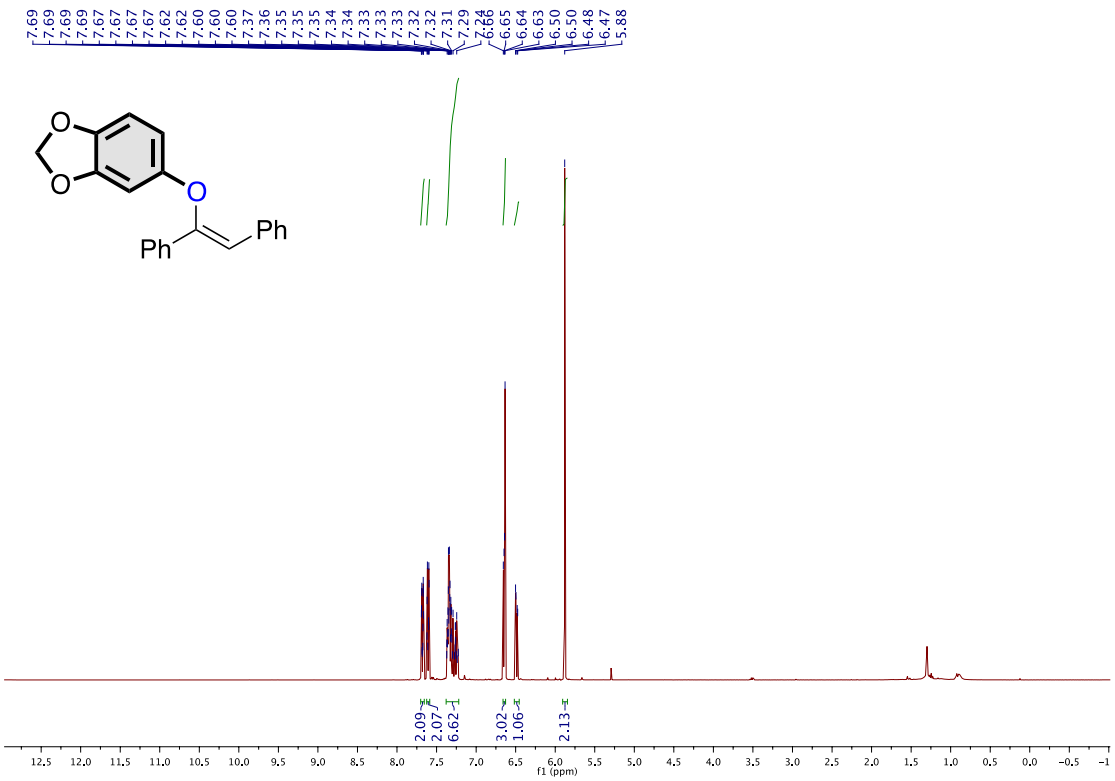
117.18
54.00 CD2Cl2
ppm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7.69
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7.67
7.67
7.67
7.62
7.62
7.60
7.60
7.60
7.37
7.36
7.35
7.35
7.35
7.34
7.34
7.33
7.33
7.33
7.32
7.32
7.31
7.29
6.66
6.65
6.64
6.63
6.50
6.50
6.48
6.47
5.88
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O
O
Ph
Ph
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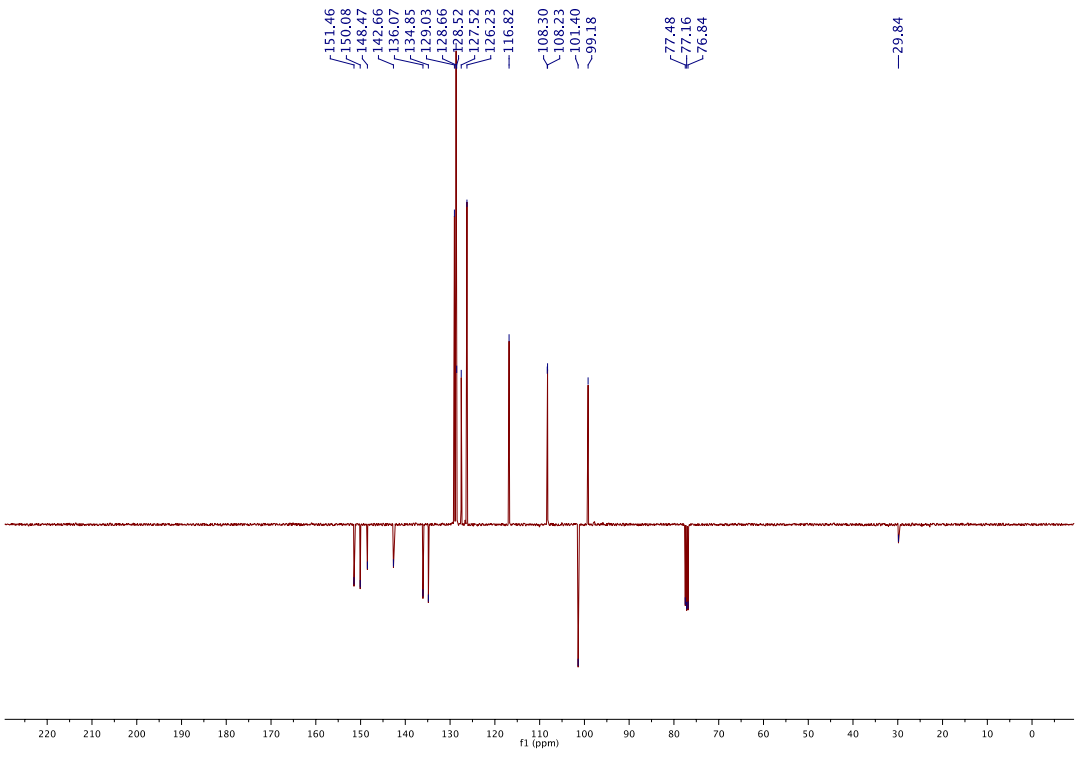
2.07
6.62
3.02
1.06
2.13
f1 (ppm)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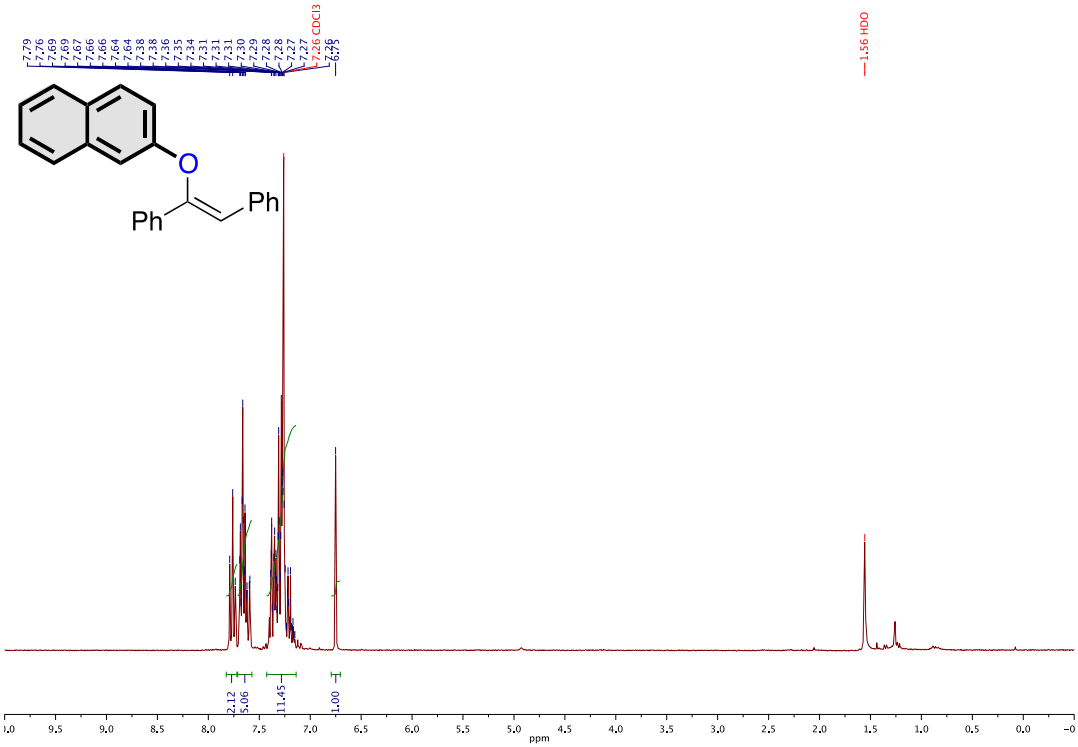
76.84
29.84
f1 (ppm)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7.36
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7.34
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7.30
7.29
7.28
7.27
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6.75
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O
Ph
Ph
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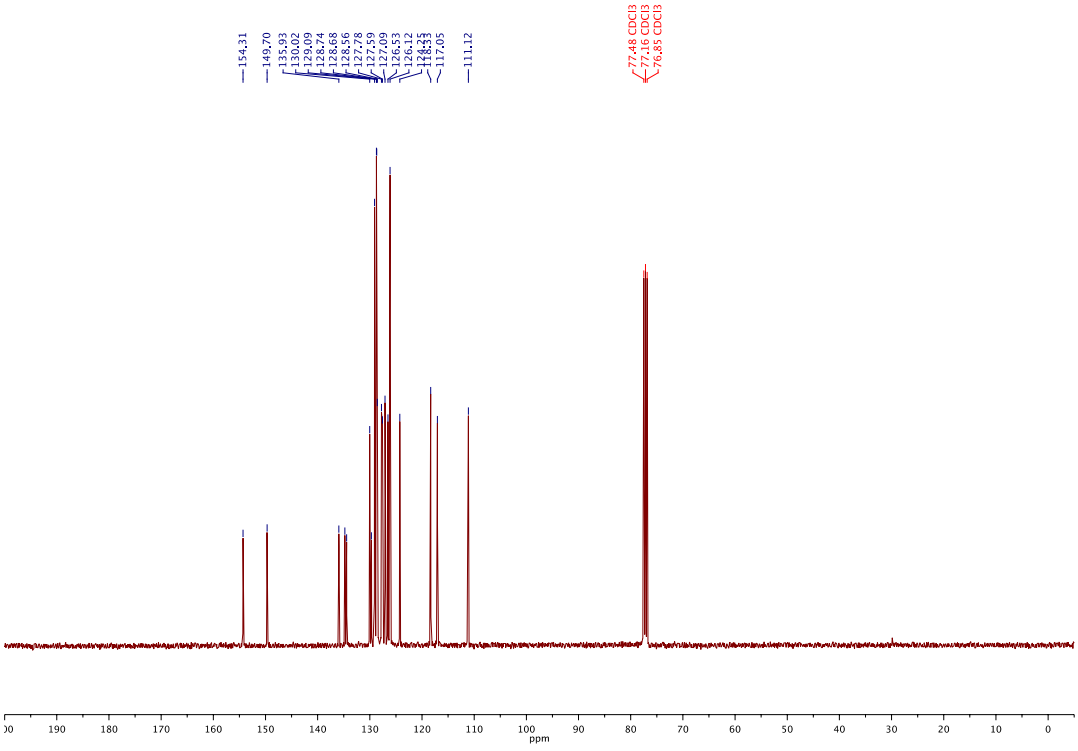
1.00
ppm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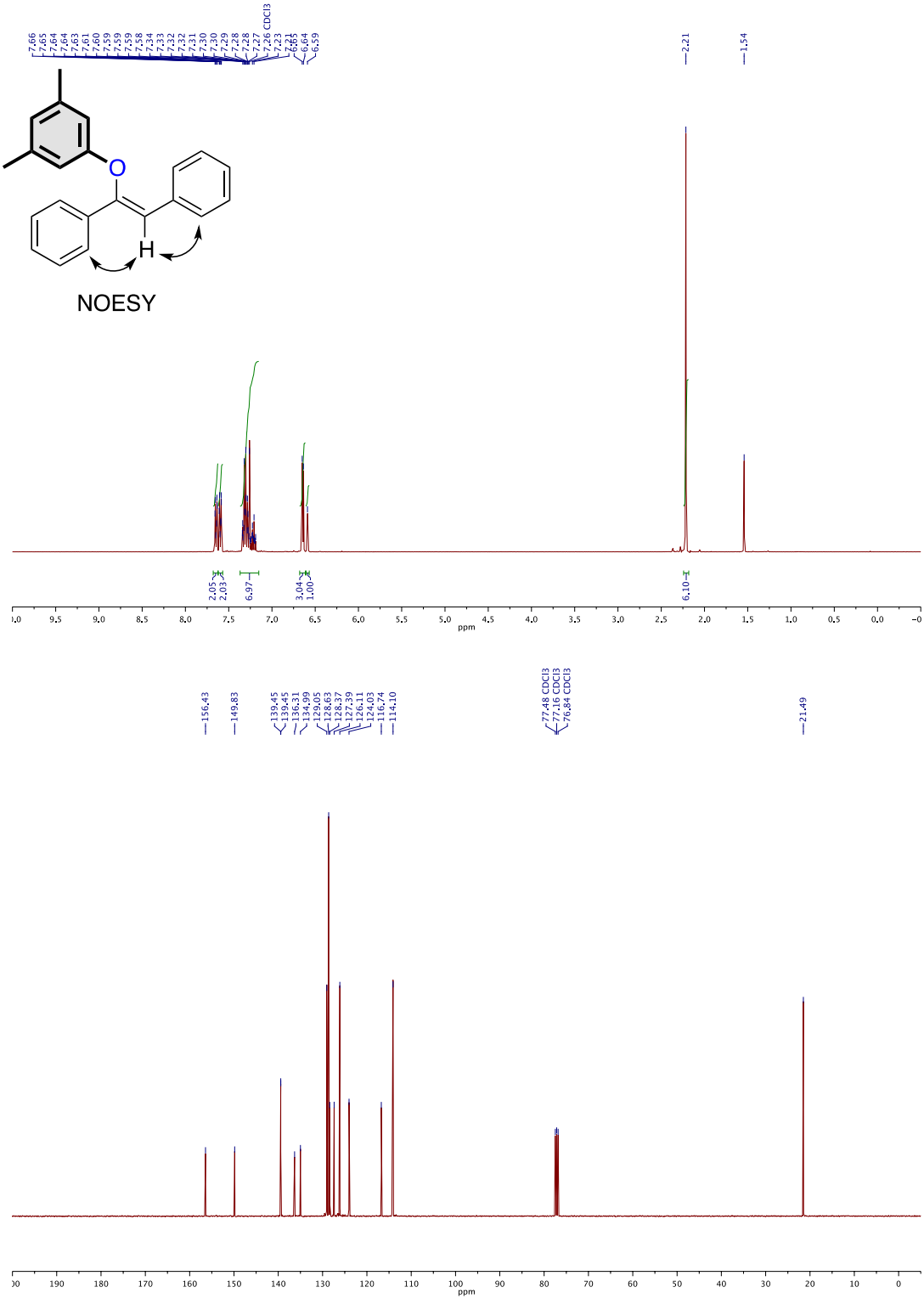
117.05
111.12
77.48 CDCl3
77.16 CDCl3
76.85 CDCl3
ppm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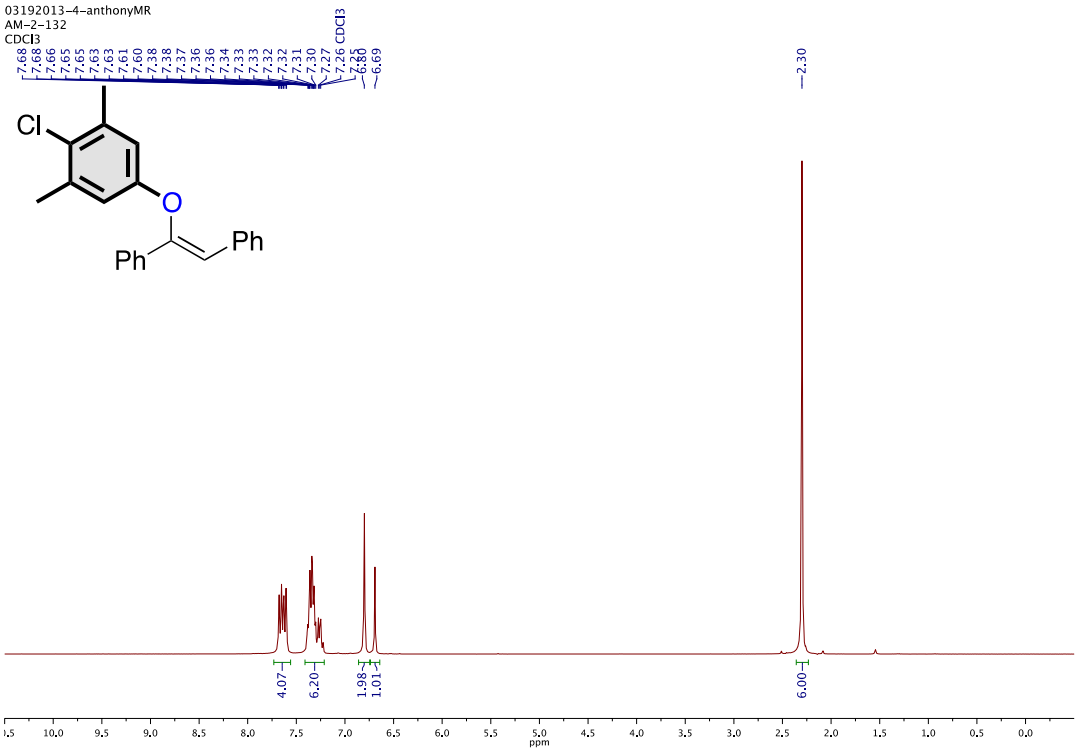
H
NOESY
ppm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7.61
7.60
7.38
7.38
7.37
7.36
7.36
7.34
7.33
7.33
7.32
7.32
7.31
7.30
7.27
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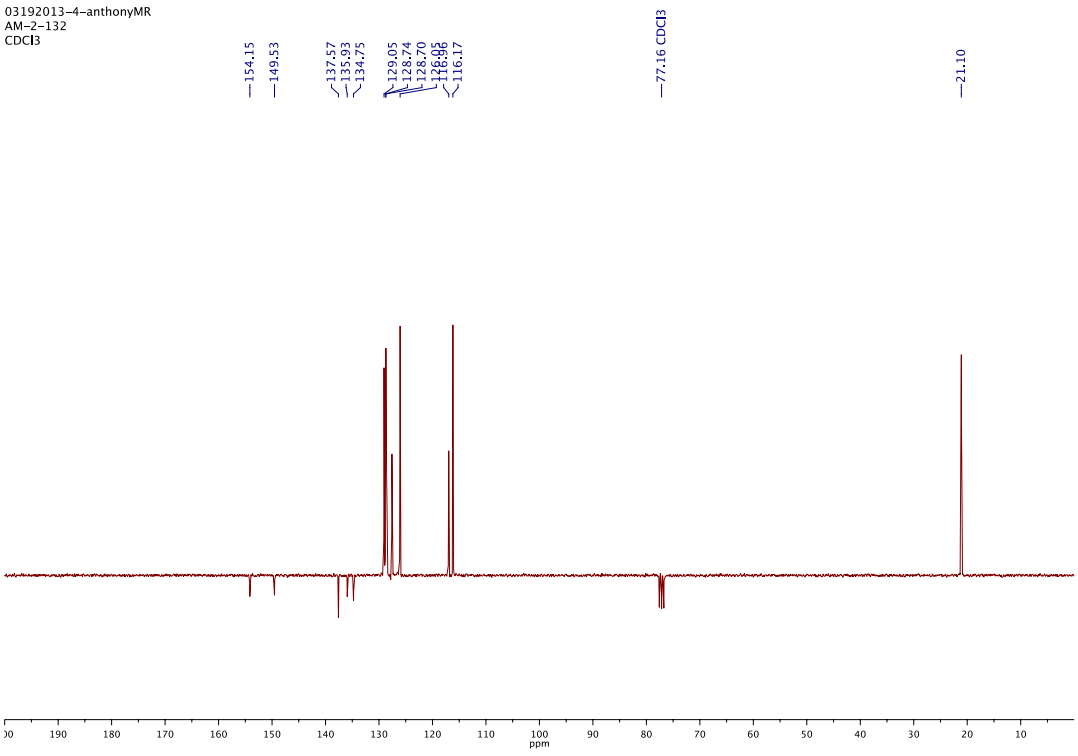
6.00
ppm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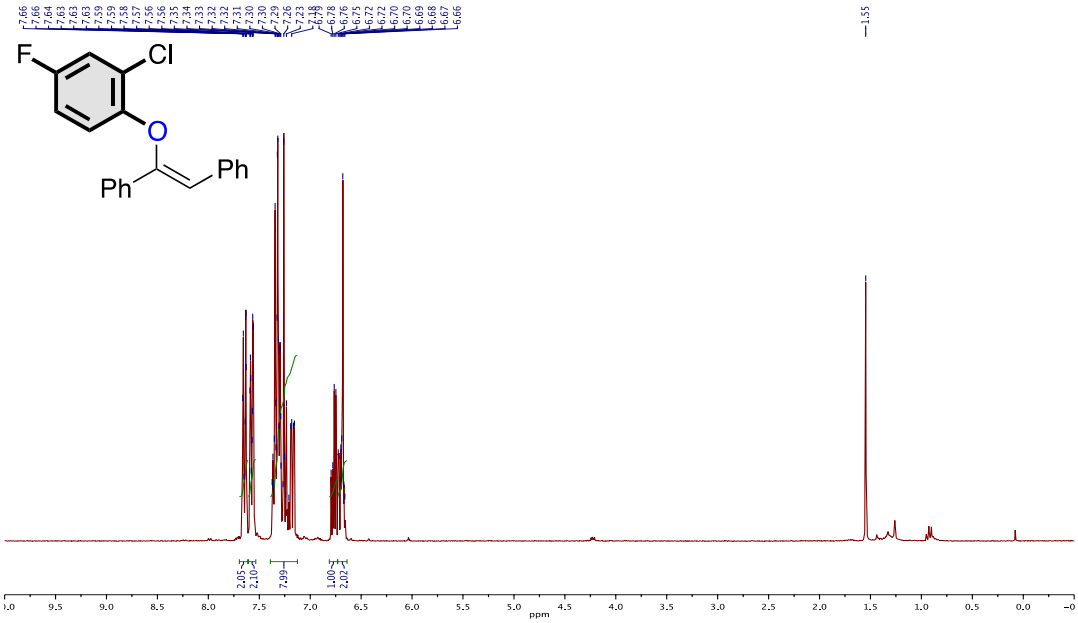
ppm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Cl
O
Ph
Ph
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7.56
7.56
7.35
7.34
7.33
7.32
7.32
7.31
7.30
7.30
7.29
7.26
7.23
7.18
6.79
6.78
6.76
6.75
6.72
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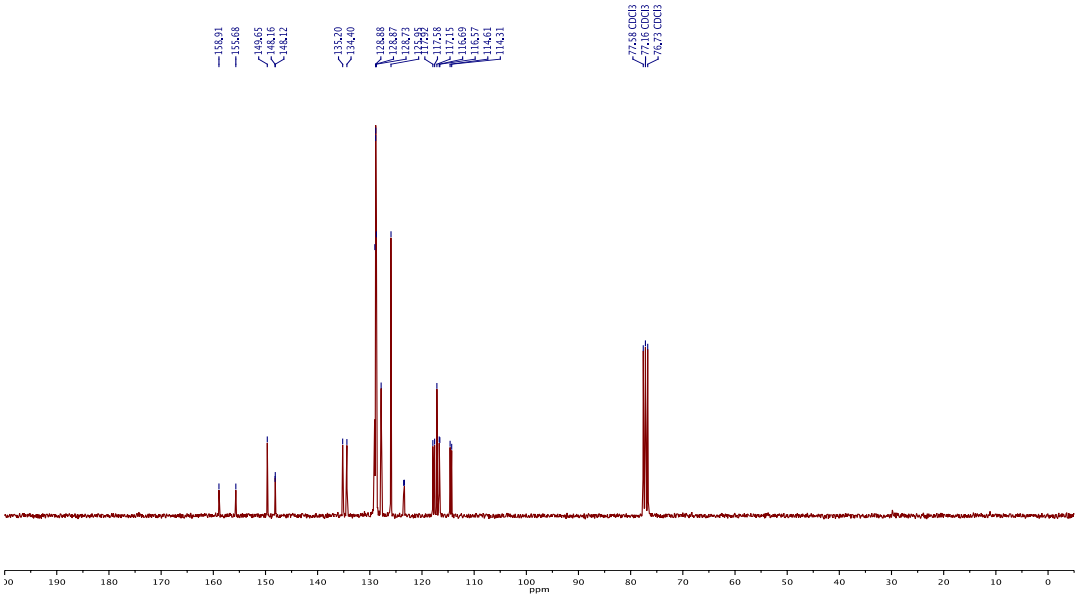
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116.69
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114.61
114.31
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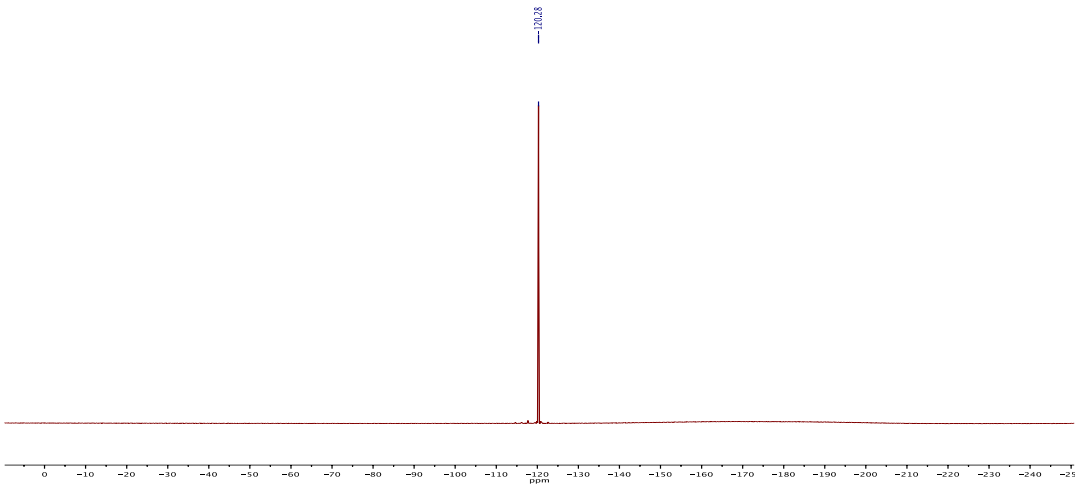
ppm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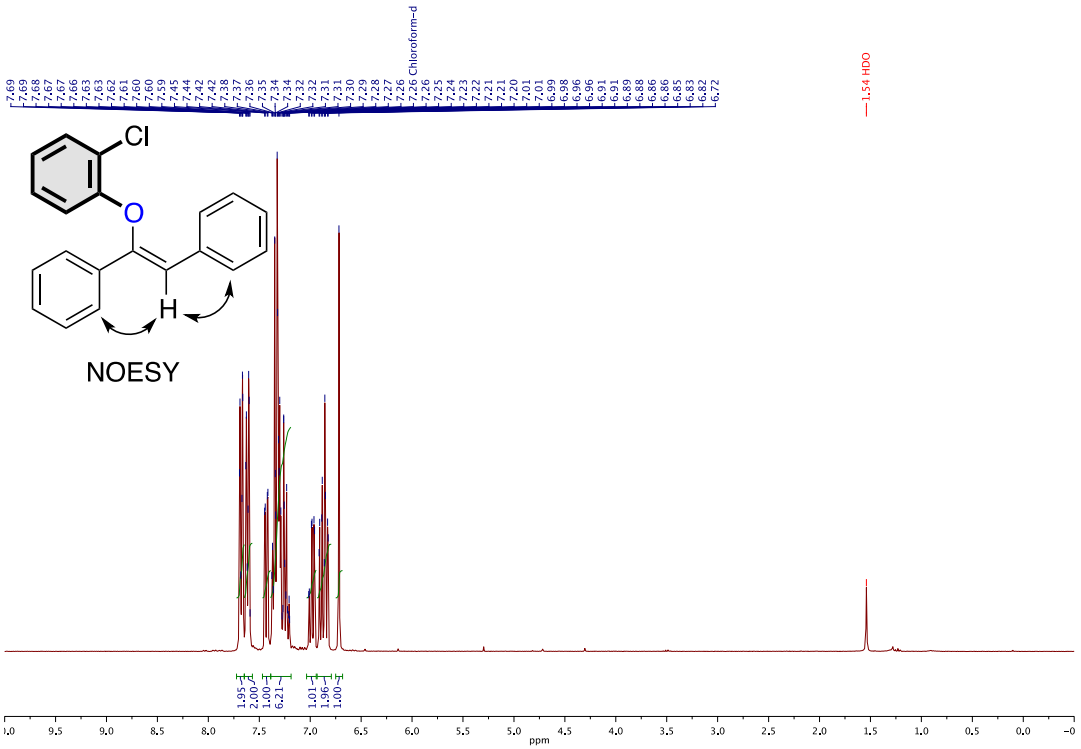
Cl
O
H
NOESY
Chloroform-d
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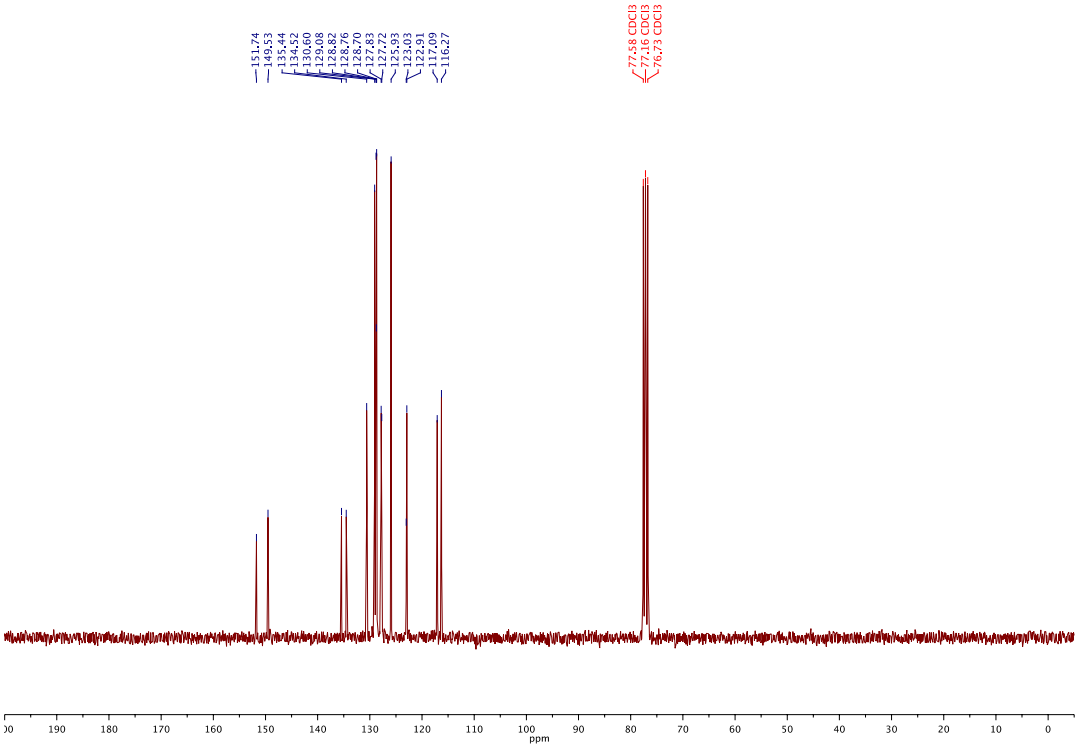
ppm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77.16 CDCl3
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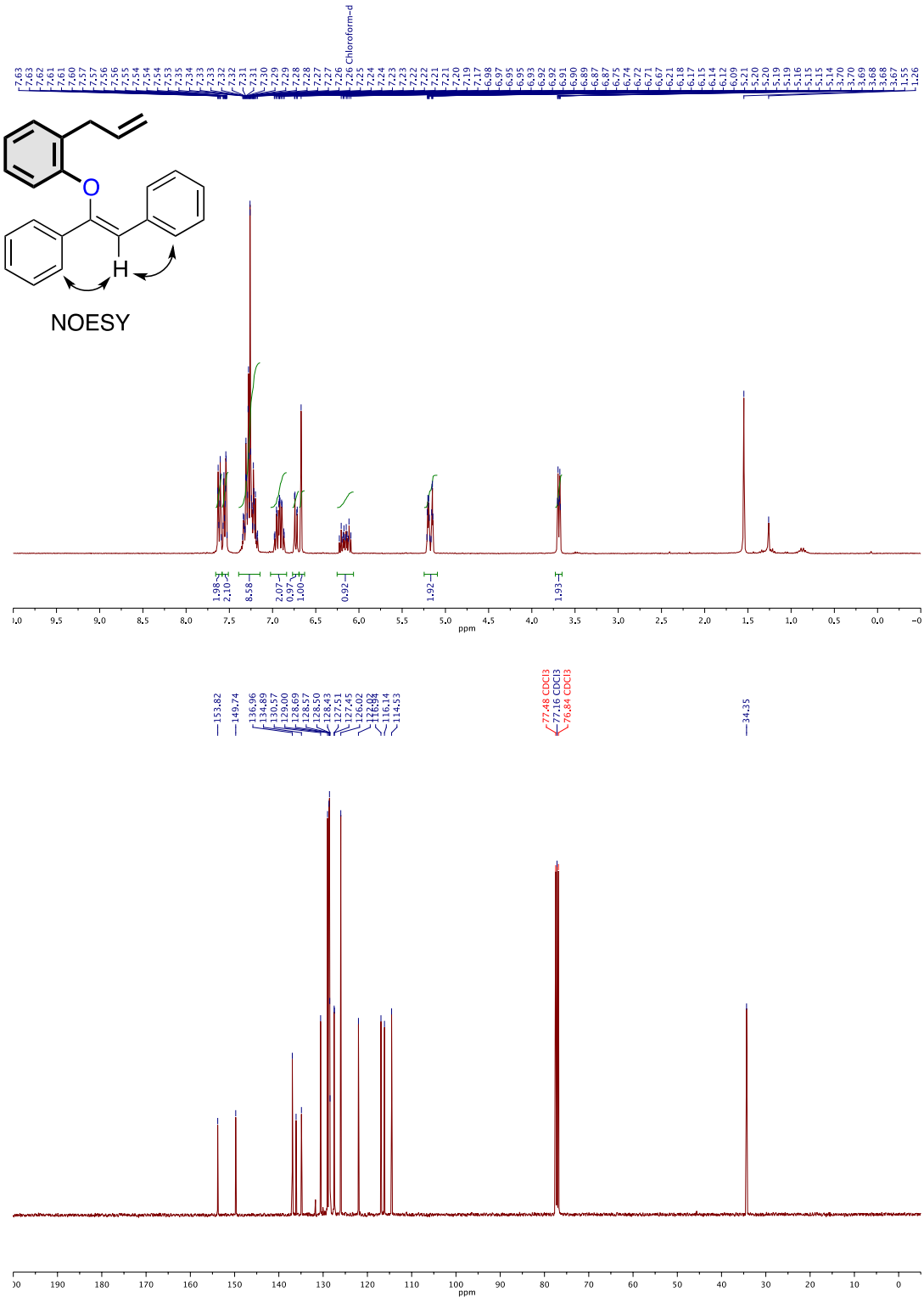
ppm


Chloroform-d
O
H
NOESY
ppm
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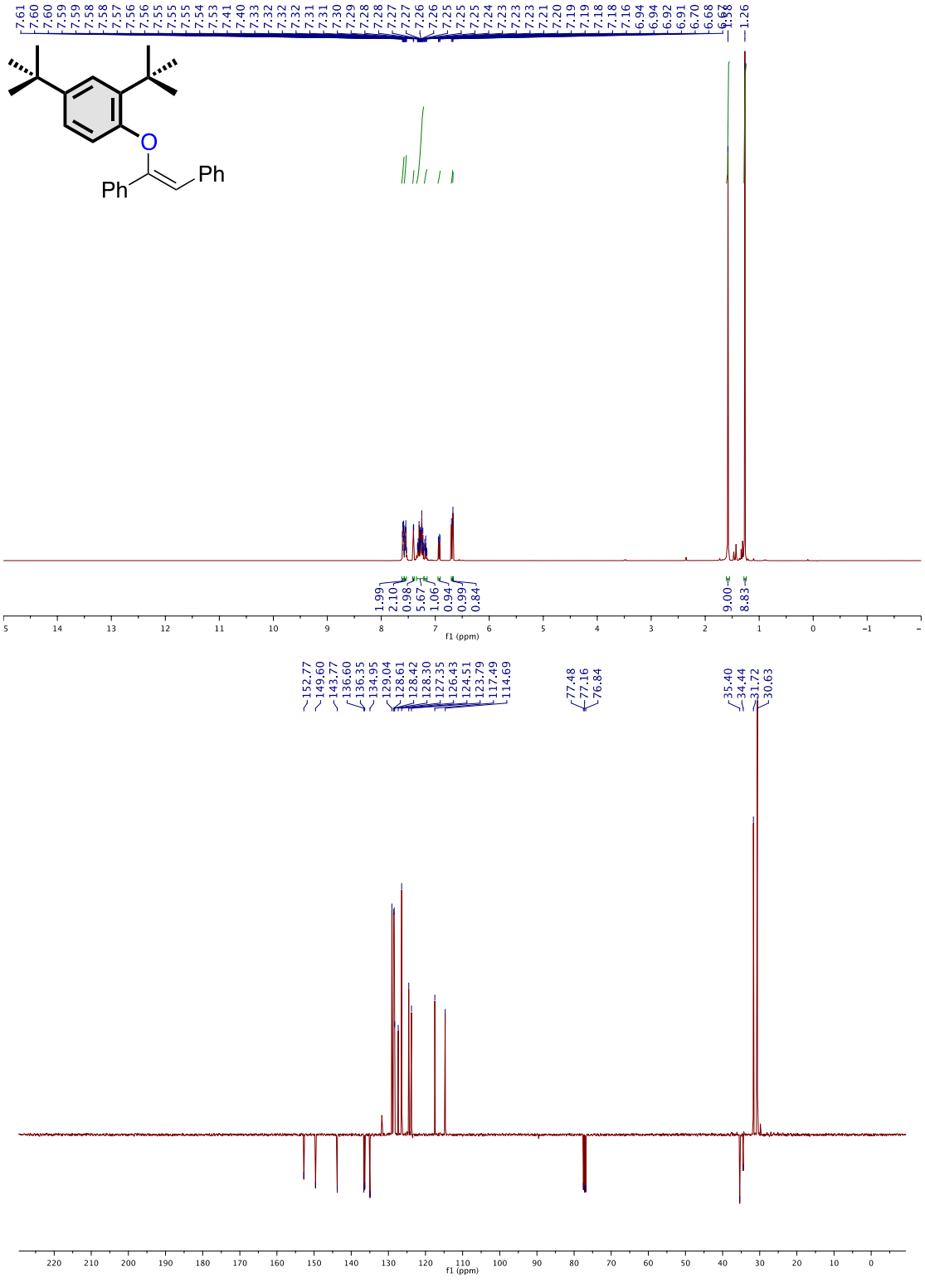
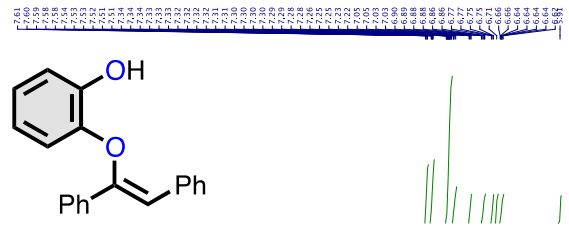
ppm


O
Ph
Ph
f1 (ppm)
f1 (ppm)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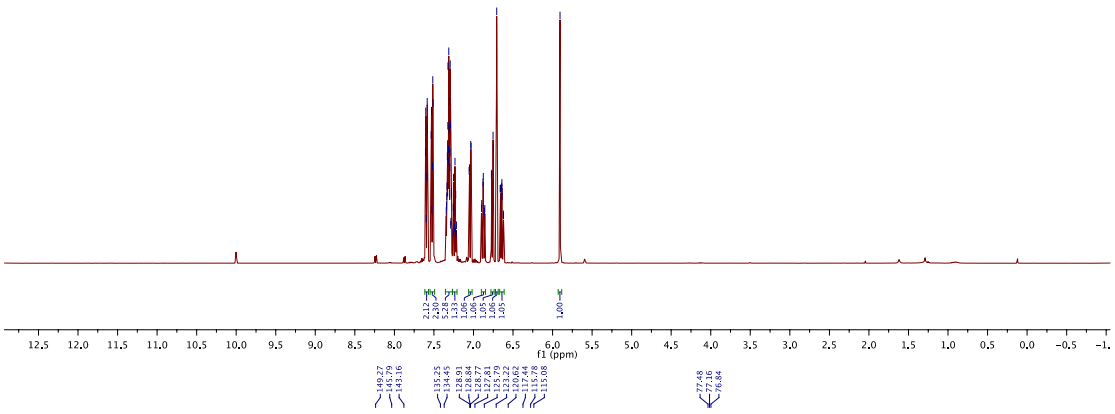
Ph
Ph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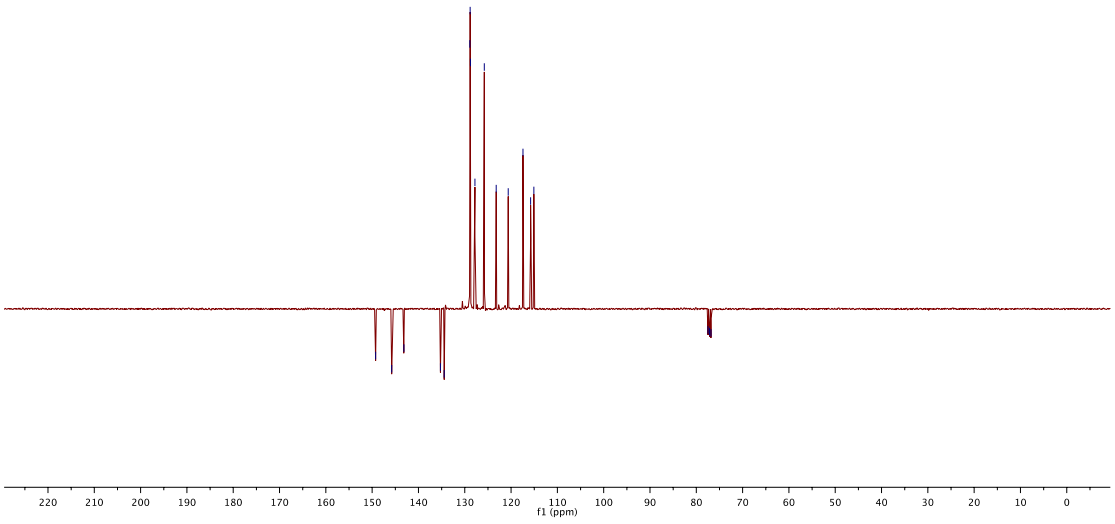
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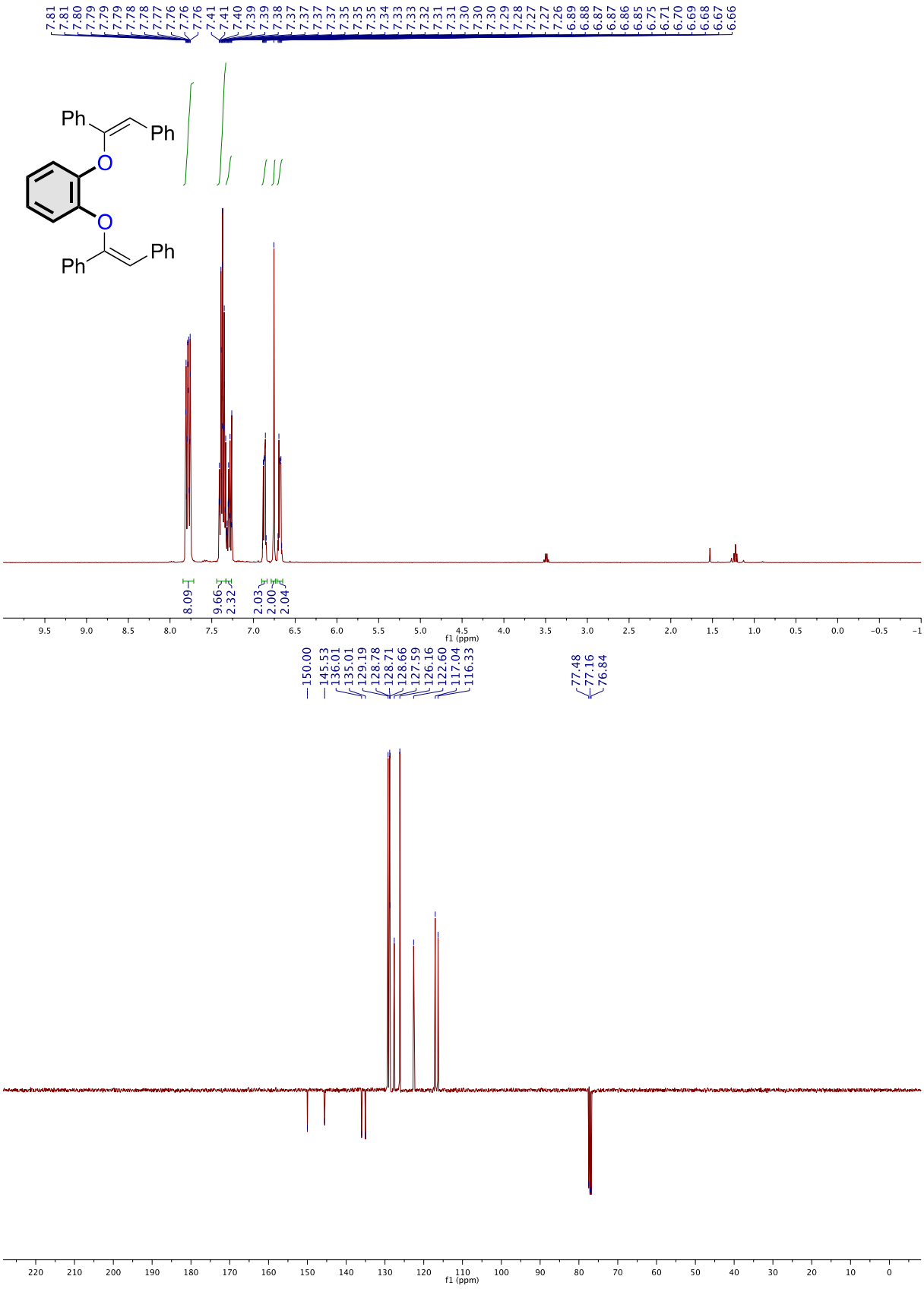
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Ph
Ph
O
O
Ph
Ph
8.09
9.66
2.32
2.03
2.00
2.04
f1 (ppm)
150.00
145.53
136.01
135.01
129.19
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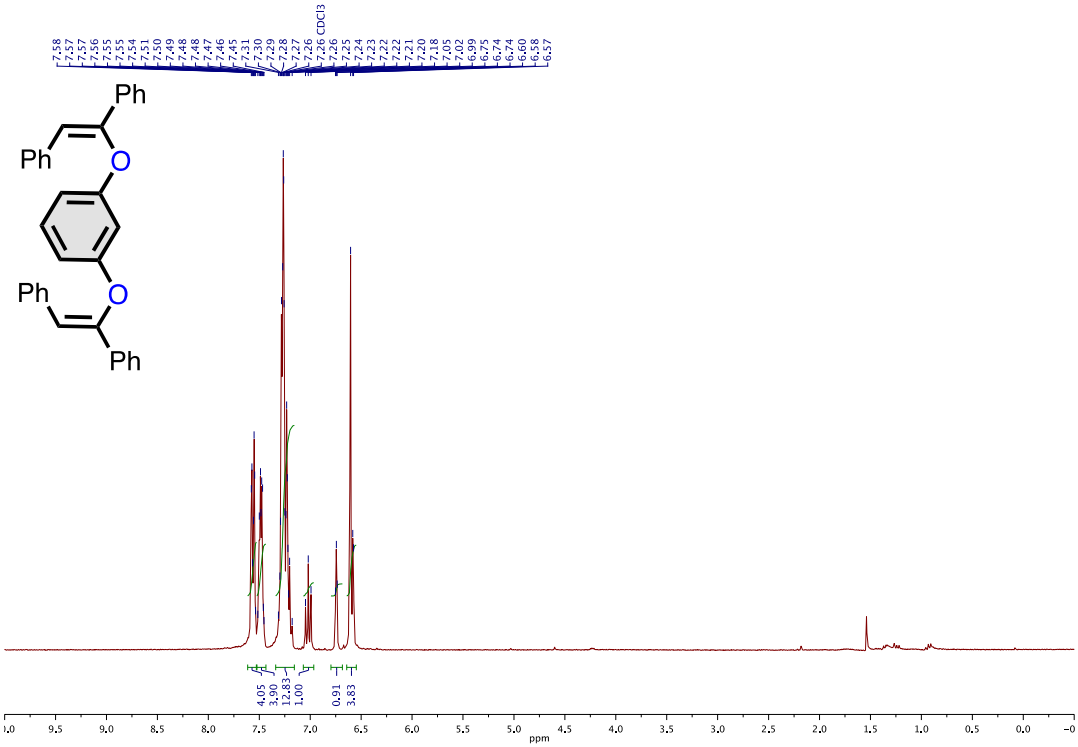
77.48
77.16
76.84
f1 (ppm)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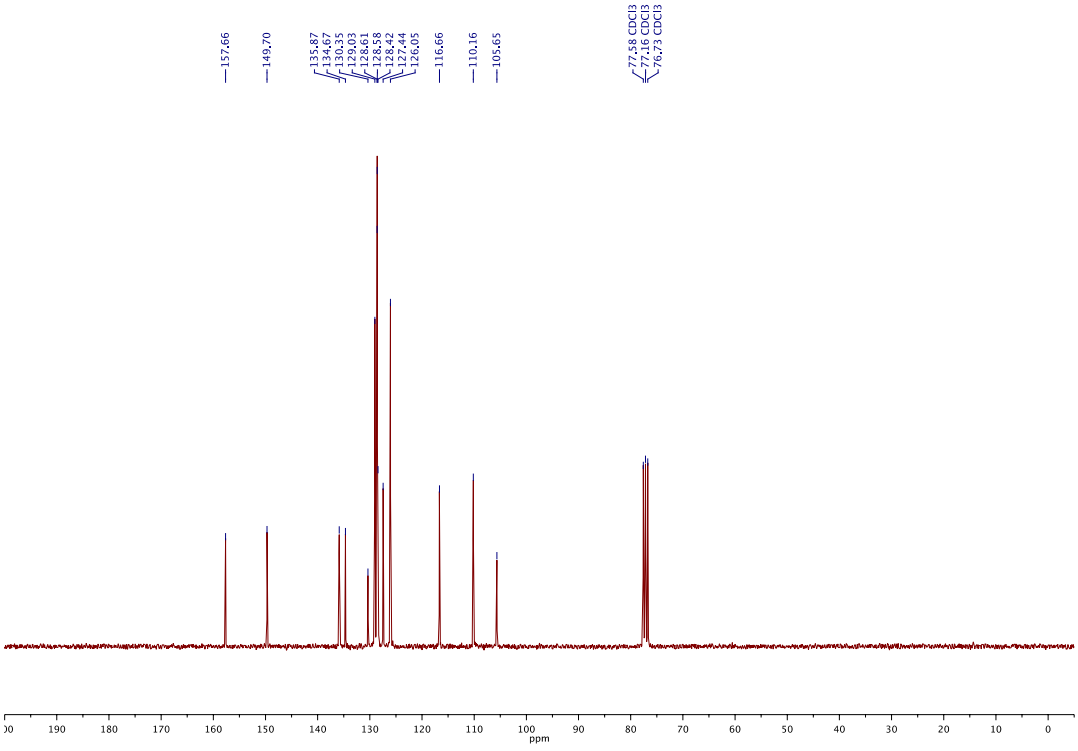
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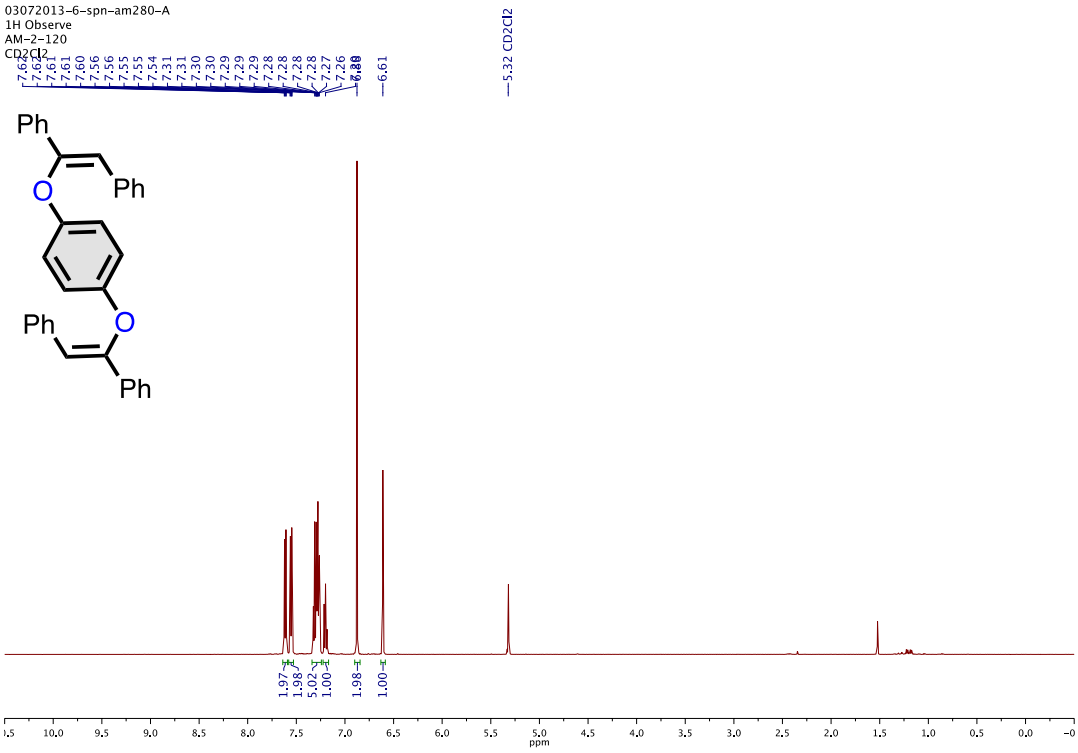
105.65
77.58 CDCl3
77.16 CDCl3
76.73 CDCl3
ppm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1H Observe
AM-2-120
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5.32 CD2Cl2
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Ph
O
Ph
Ph
O
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5.02
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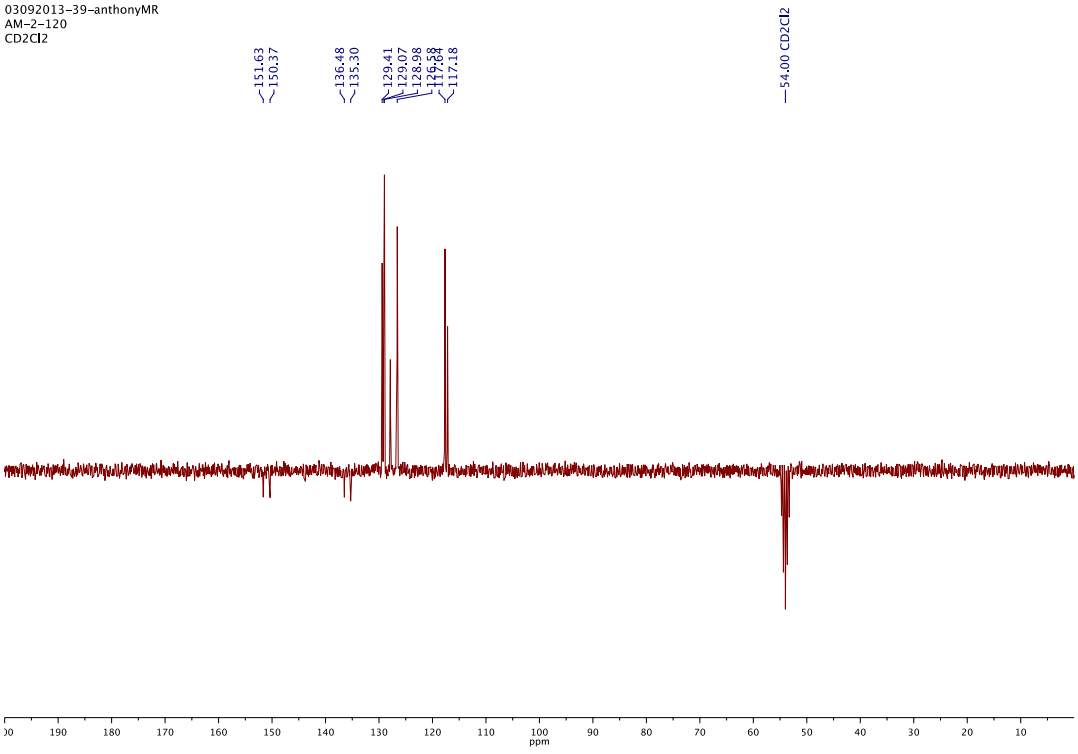
1.00
ppm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135.30
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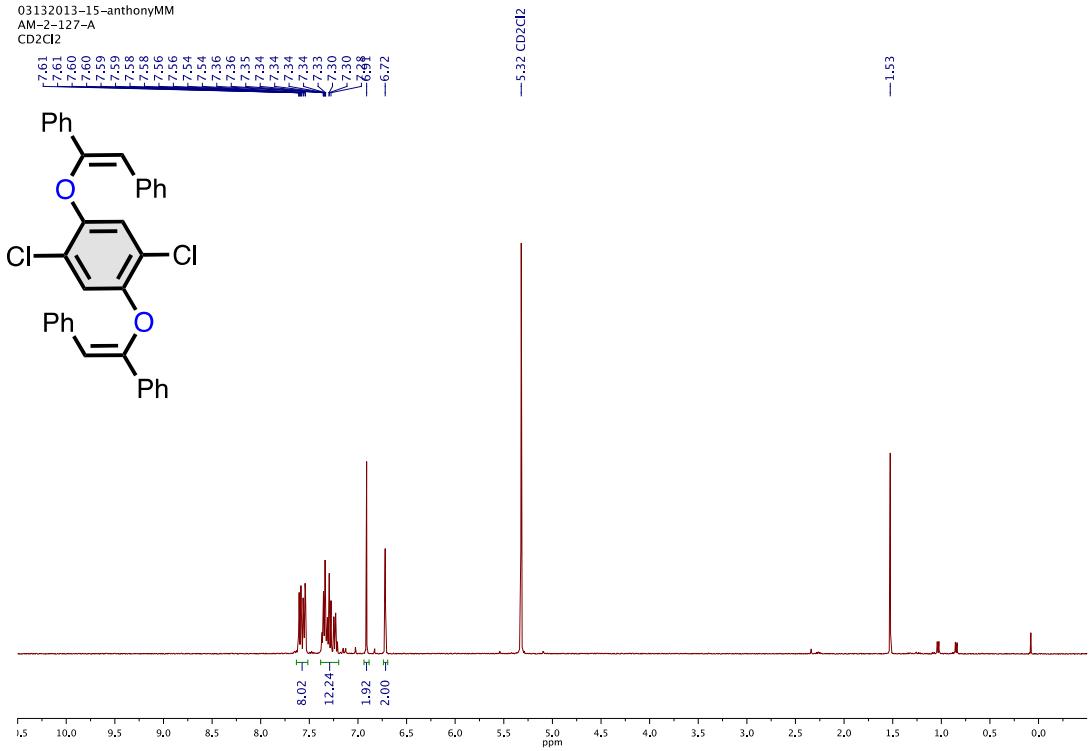
129.07
128.98
117.18
54.00 CD2Cl2
ppm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7.60
7.59
7.59
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7.54
7.36
7.36
7.35
7.34
7.34
7.34
7.34
7.33
7.30
6.72
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Ph
O
Ph
Cl
Cl
Ph
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Ph
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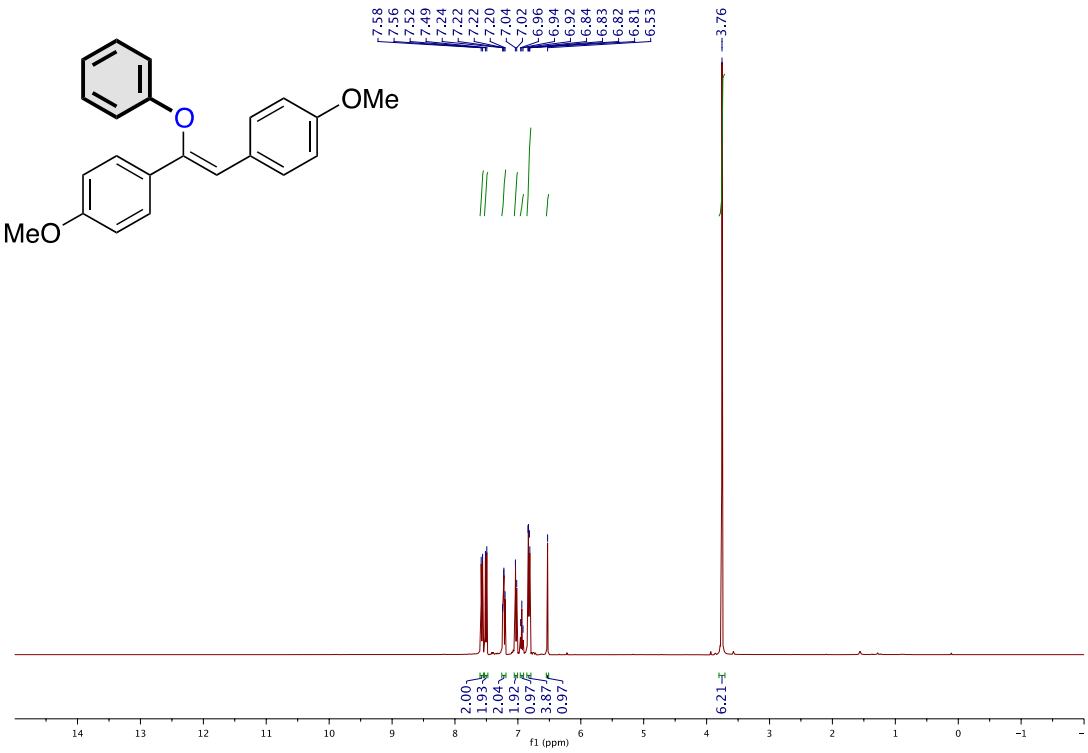
2.00
ppm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MeO
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7.20
7.04
7.02
6.96
6.94
6.92
6.84
6.83
6.82
6.81
6.53
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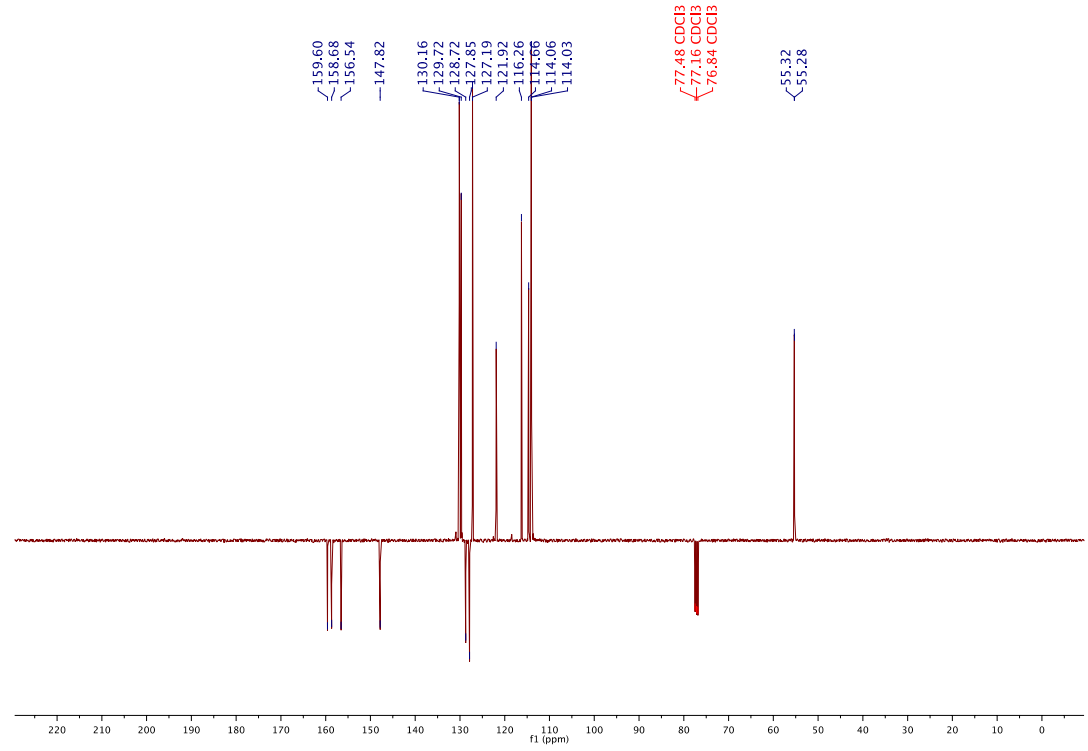
2.00
1.93
2.04
1.92
0.97
3.87
0.97
6.21
f1 (ppm)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158.68
156.54
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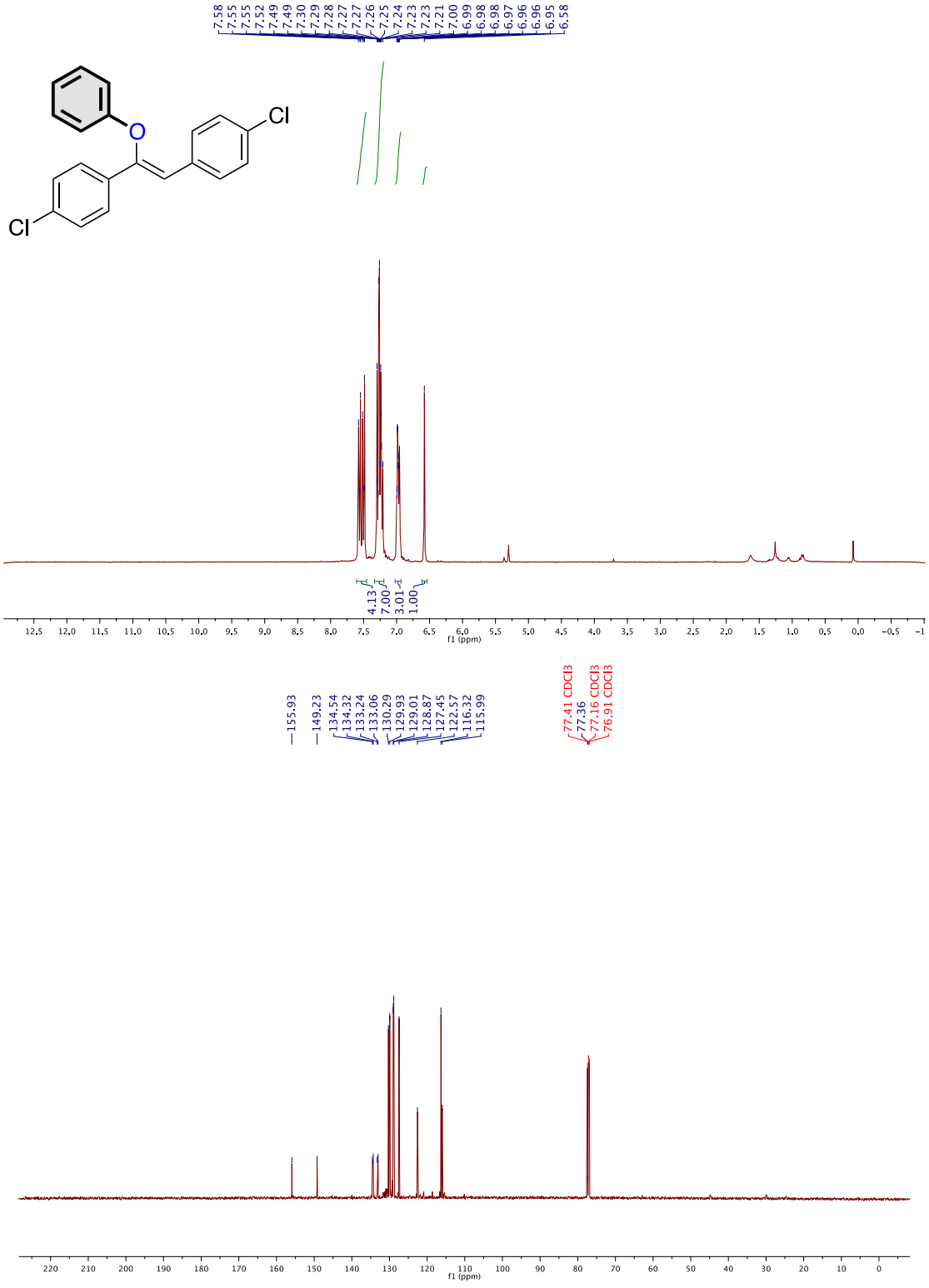
129.72
128.72
127.85
127.19
121.92
116.26
114.66
114.06
114.03
77.48 CDCl3
77.16 CDCl3
76.84 CDCl3
55.32
55.28
f1 (ppm)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7.55
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7.49
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7.29
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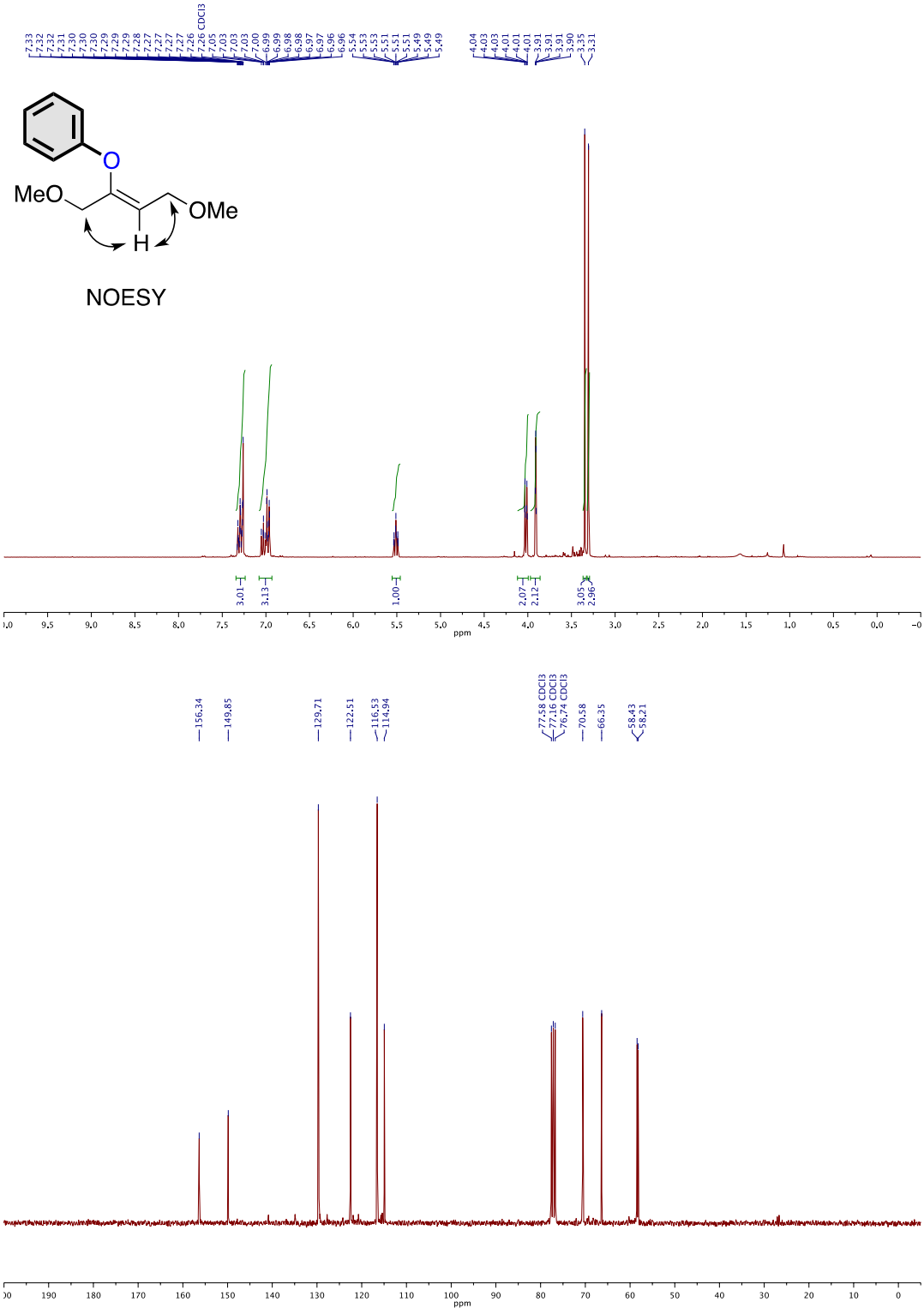
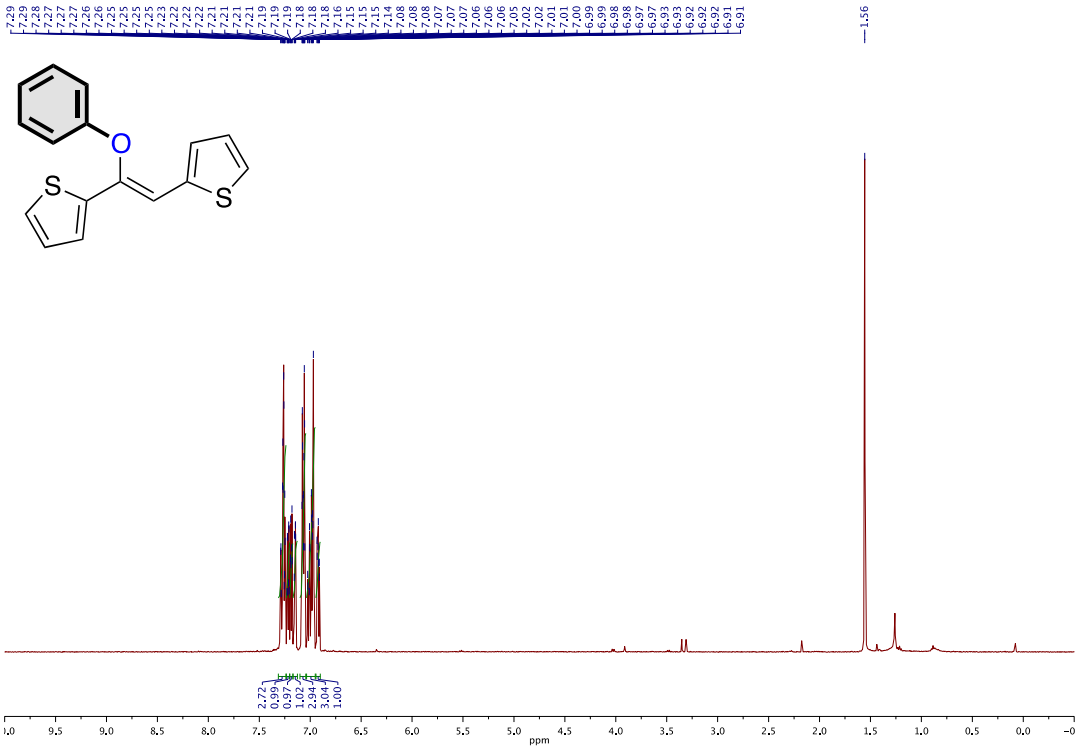
7.27
7.27
7.26
7.25
7.24
7.23
7.23
7.21
7.00
6.99
6.98
6.98
6.97
6.96
6.96
6.95
6.58
Cl
O
Cl
4.13
7.00
3.01
1.00
f1 (ppm)
155.93
149.23
134.54
134.32
133.24
133.06
130.29
129.93
129.01
128.87
127.45
122.57
116.32
115.99
77.41 CDCl3
77.36
77.16 CDCl3
76.91 CDCl3
f1 (ppm)


MeO
OMe
H
NOESY
ppm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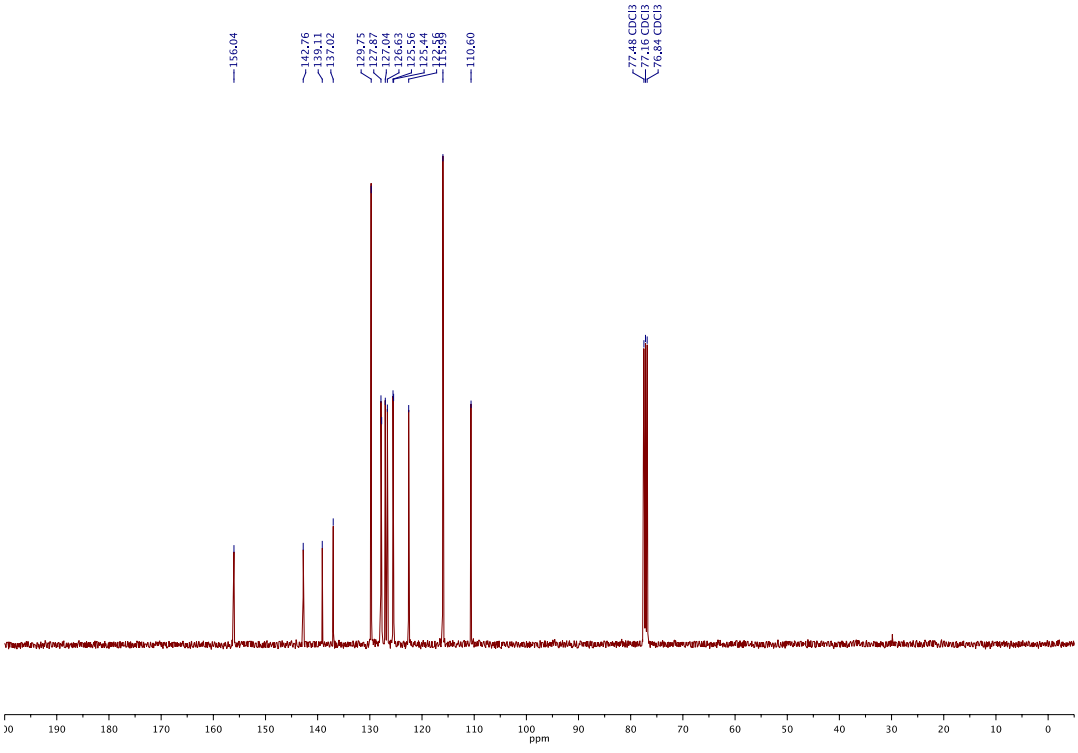
1.56
O
S
S
2.72
0.99
1.07
1.00
2.94
3.04
1.00
ppm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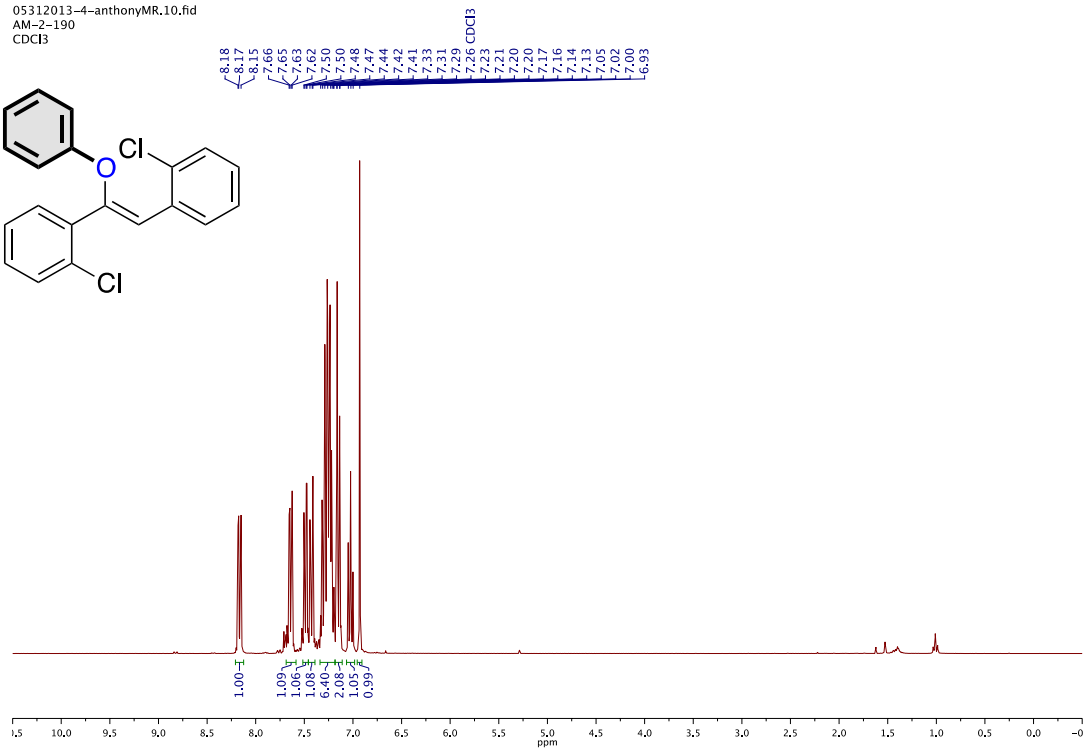
142.76
139.11
137.02
129.75
127.87
127.04
126.63
125.56
125.44
122.56
115.99
110.60
77.48 CDCl3
77.16 CDCl3
76.84 CDCl3
ppm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CDCl3
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8.17
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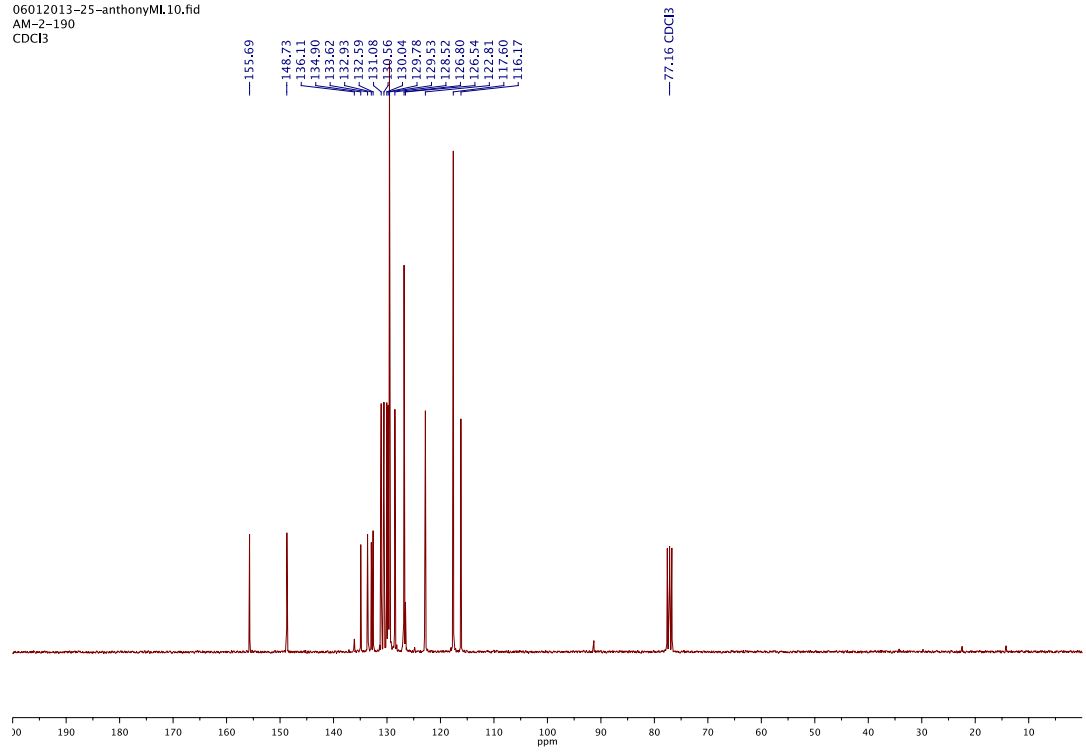
7.65
7.63
7.62
7.50
7.50
7.48
7.47
7.44
7.42
7.41
7.33
7.31
7.29
7.26 CDCl3
7.23
7.21
7.20
7.20
7.17
7.16
7.14
7.13
7.05
7.02
7.00
6.93
Cl
O
Cl
1.00
1.09
1.06
1.08
6.40
2.08
1.05
0.99
ppm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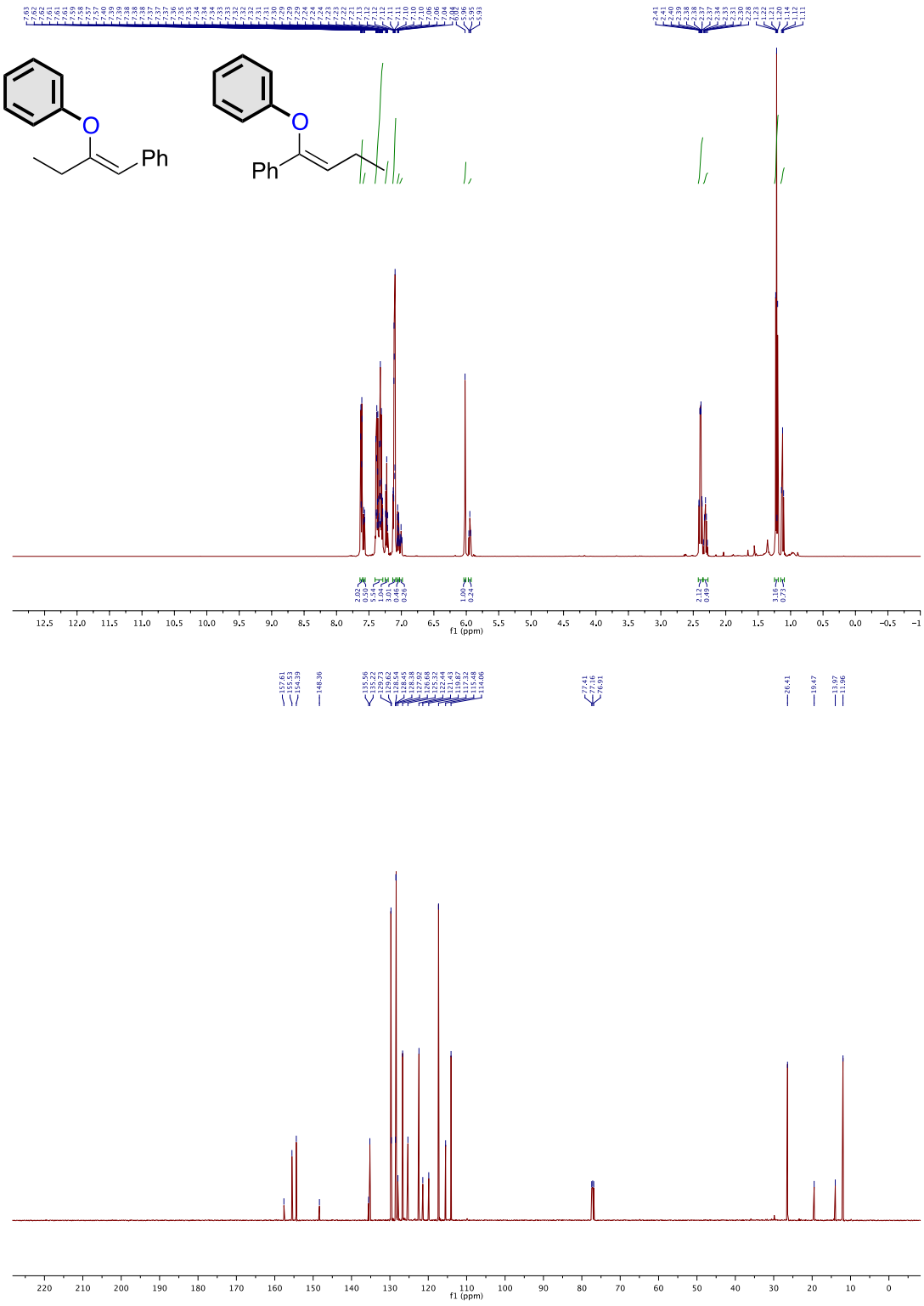
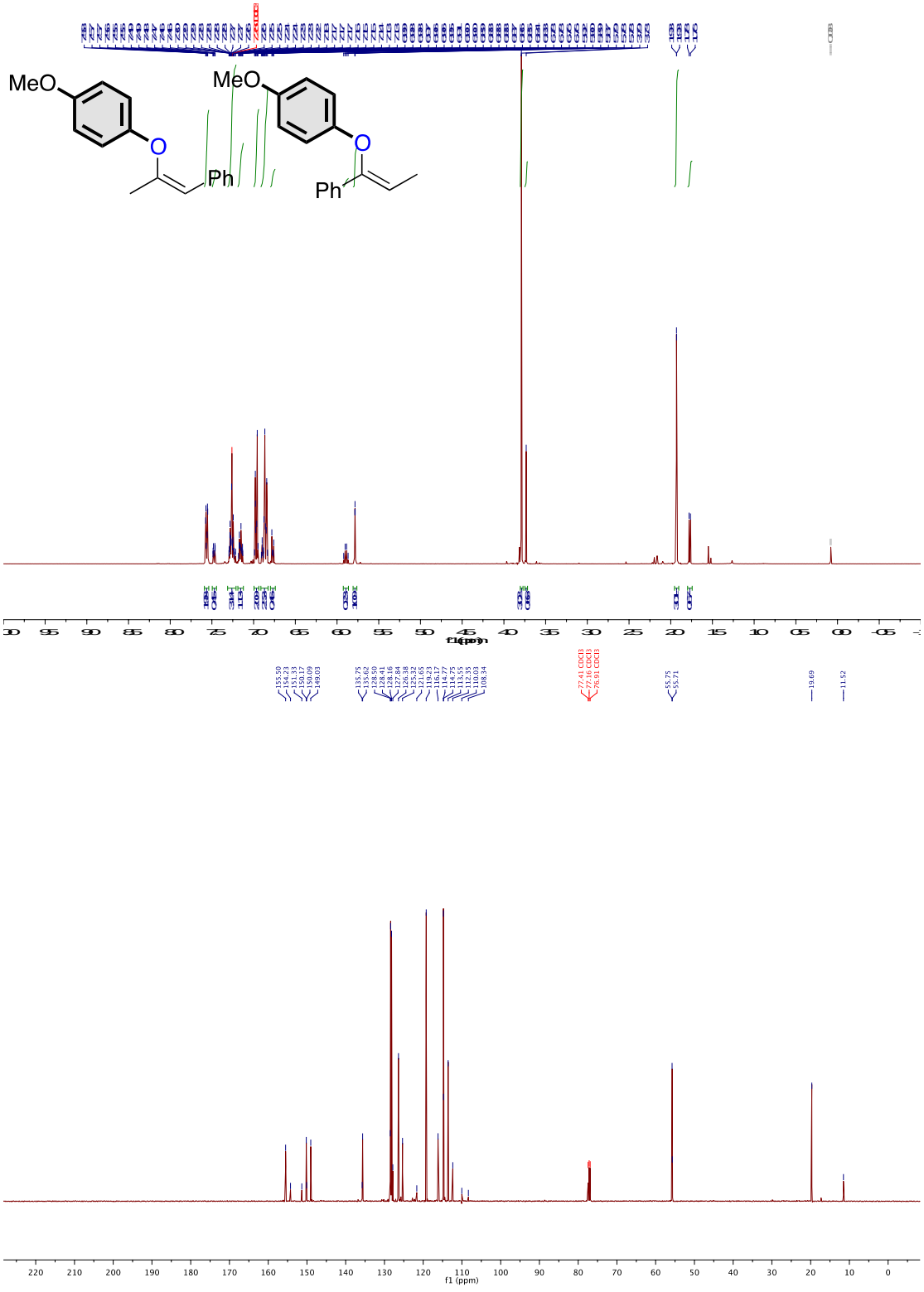
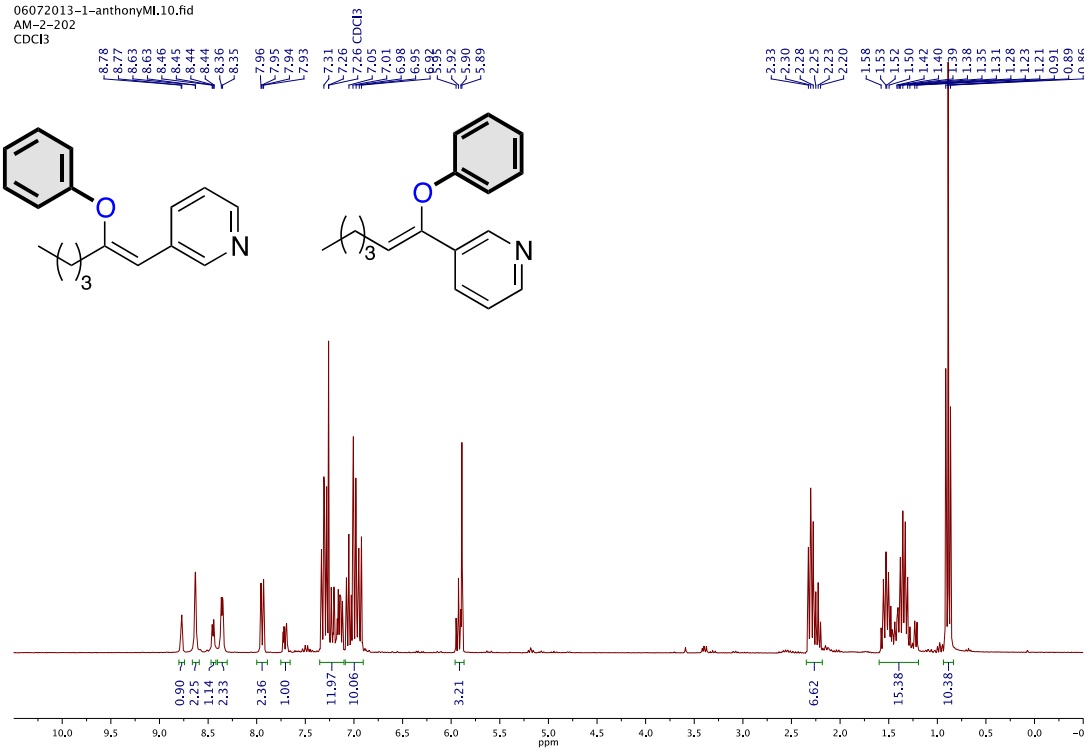
AM-2-190
CDCl3
155.69
148.73
136.11
134.90
133.62
132.93
132.59
131.08
130.56
130.04
129.78
129.53
128.52
126.80
126.54
122.81
117.60
116.17
77.16 CDCl3
ppm


O
Ph
O
Ph
f1 (ppm)
f1 (ppm)


MeO
O
Ph
MeO
O
Ph
f1 (ppm)


06072013-1-anthonyMI.10.fid
AM-2-202
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8.78
8.77
8.63
8.63
8.46
8.45
8.44
8.44
8.36
8.35
7.96
7.95
7.94
7.93
7.31
7.26
7.26 CDCl3
7.05
7.01
6.98
6.95
5.95
5.92
5.90
5.89
2.33
2.30
2.28
2.25
2.23
2.20
1.58
1.53
1.52
1.50
1.42
1.40
1.39
1.38
1.35
1.31
1.28
1.23
1.21
0.91
0.89
O
N
3
O
N
3
0.90
2.25
1.14
2.33
2.36
1.00
11.97
10.06
3.21
6.62
15.38
10.38
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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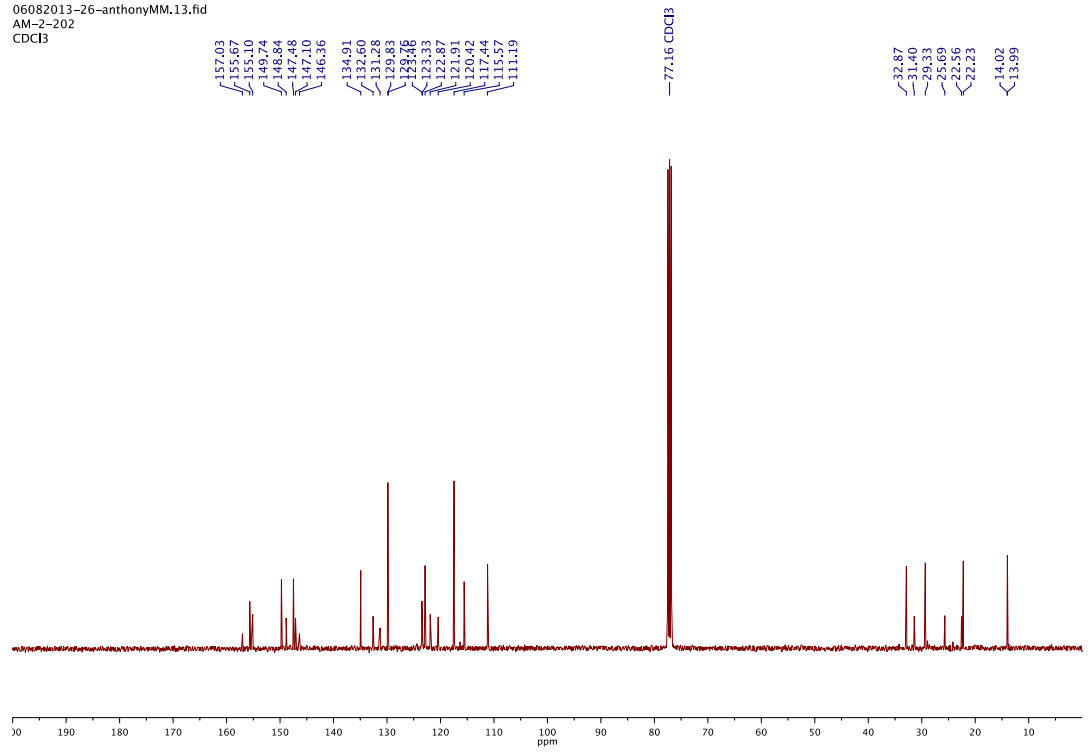
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ppm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CDCl3
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155.10
149.74
148.84
147.48
147.10
146.36
134.91
132.60
131.28
129.83
123.33
122.87
121.91
120.42
117.44
115.57
111.19
77.16 CDCl3
32.87
31.40
29.33
25.69
22.56
22.23
14.02
13.99
190
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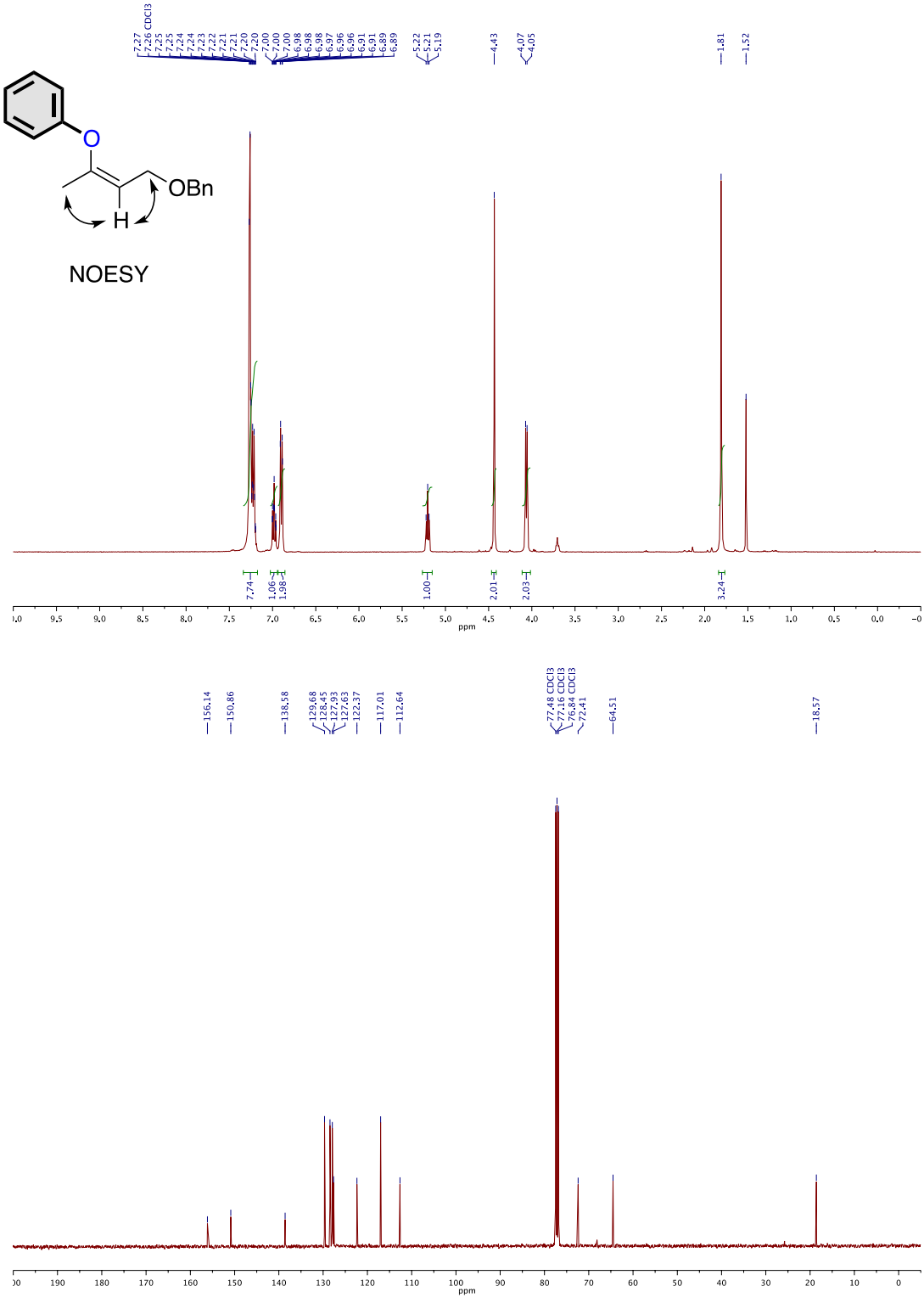
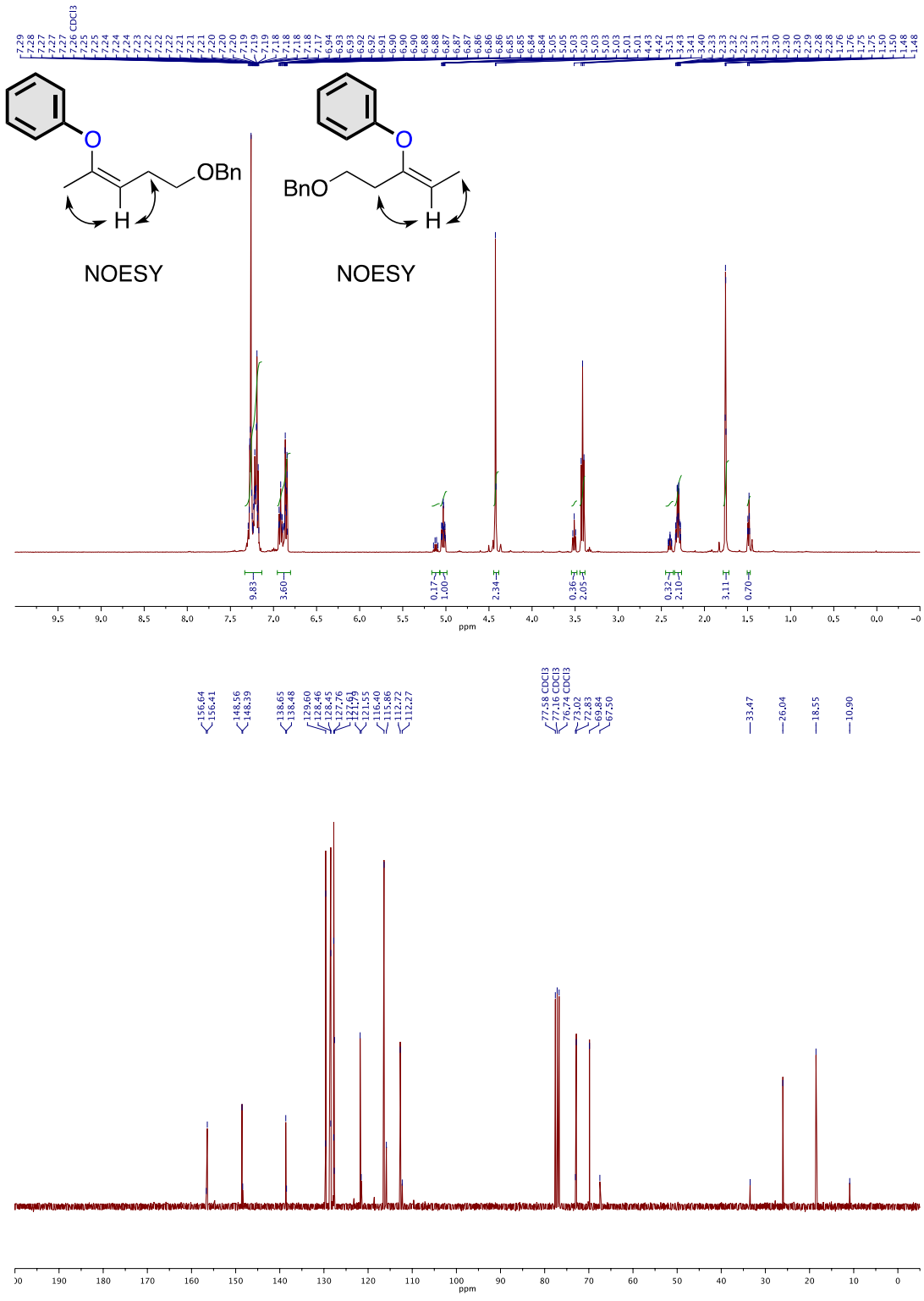
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm


O
OBn
H
NOESY
ppm
ppm



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