Versatile Alkylation of (Hetero)Aryl iodides with Ketones *via* β-C(sp^3)−H Activation

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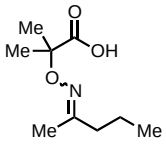
General Information

Ketones were obtained from the commercial sources or synthesized following literature procedures, and used to prepare the corresponding substrates. 2,2-Dimethyl aminooxyacetic acid hydrochloride was obtained from Combi-Blocks. AgTFA and HFIP (Hexafluoro-2-propanol) were obtained from Oakwood. Solvents were obtained from Sigma-Aldrich, Alfa-Aesar and Acros and used directly without further purification. Analytical thin layer chromatography was performed on 0.25 mm silica gel 60-F254. Visualization was carried out with UV light and Vogel's permanganate. ^{1}H NMR was recorded on Bruker AMX-400 instrument (400 MHz) or Bruker DRX-600 instrument (600 MHz). Chemical shifts were quoted in parts per million (ppm) referenced to 0.0 ppm for tetramethylsilane. The following abbreviations (or combinations thereof) were used to explain multiplicities: s = singlet, d = doublet, t = triplet, q =quartet, m = multiplet, br = broad. Coupling constants, *J*, were reported in Hertz unit (Hz). ^{13}C NMR spectra were recorded on Bruker AMX-400 instrument (100 MHz) or Bruker DRX-600 instrument (150 MHz), and were fully decoupled by broad band proton decoupling. ^{19}F NMR spectra were recorded on Bruker AMX-400 instrument (100 MHz), and were fully decoupled by broad band proton decoupling. Chemical shifts were reported in ppm referenced to either the center line of a triplet at 77.0 ppm of chloroform-*d* or the center line of a multiplet at 29.84 ppm of acetone-d^6. High-resolution mass spectra (HRMS) were recorded on an Agilent Mass spectrometer using ESI-TOF (electrospray ionization-time of flight).

Substrate Structures



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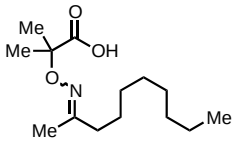

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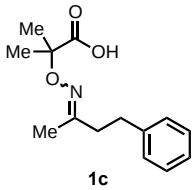

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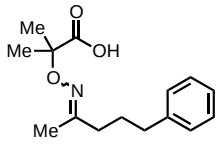

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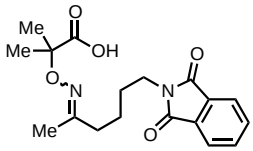

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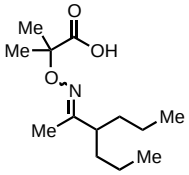

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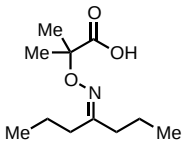

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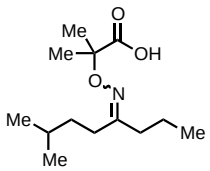

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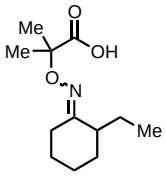

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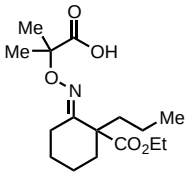

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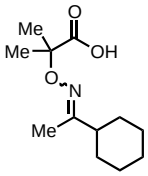

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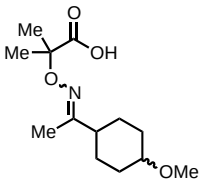

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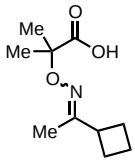

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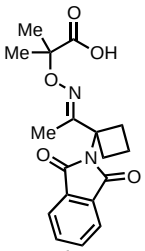

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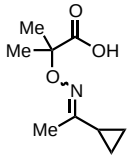

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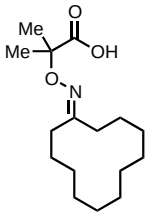

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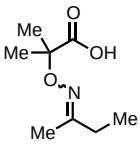

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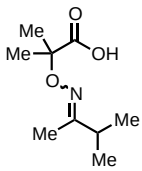

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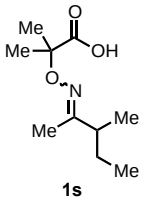

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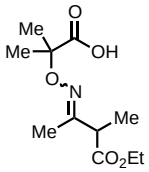

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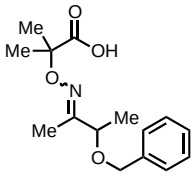

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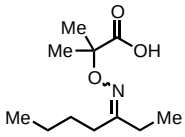

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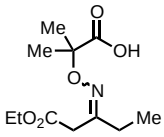

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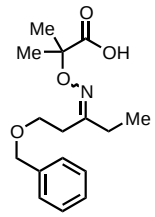

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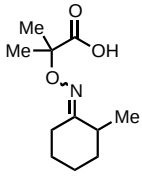

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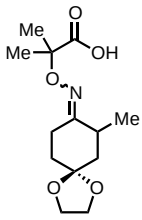

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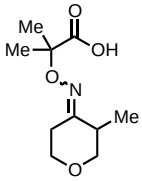

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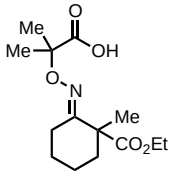

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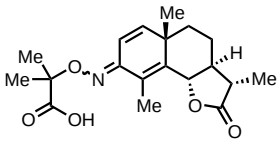
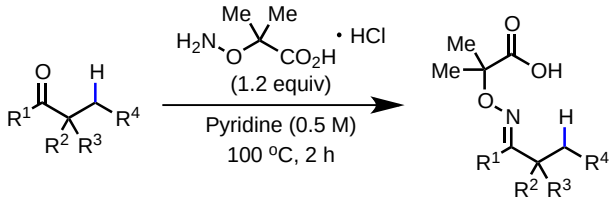


1ac

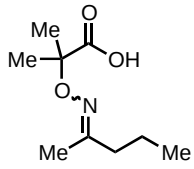
Experimental Section

Substrate Preparation

Ketones for making substrates **1a-d**, **1g**, **1i**, **1k**, **1m**, **1o-t**, **1v-ac** are commercially available. The syntheses of rest of ketones are based on literature.[1]

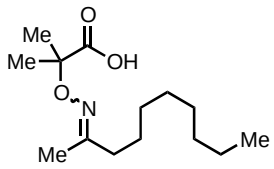


Ketone (2 mmol, 1 equiv) and 2,2-dimethyl aminooxyacetic acid hydrochloride (2.4 mmol, 372 mg, 1.2 equiv) were weighed in an oven dried 50 mL round bottom flask with a magnetic stir bar under air. 4 mL of pyridine was added and the mixture was stirred at 100 °C for 2 h. Upon completion, most pyridine was evaporated under vacuum. The resulting mixture was diluted with EtOAc (50 mL) and washed successively with water (100 mL) and diluted HCl aqueous solution (100 mL, ca. 0.01 M). The organic phase was dried with anhydrous Na_2SO_4 and the solvent was removed under vacuum. Notably, the pure compounds were obtained in good yields for most cases without any chromatography.



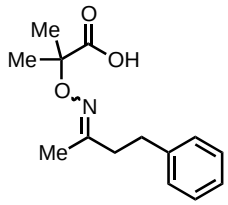
2-Methyl-2-((pentan-2-ylideneamino)oxy)propanoic acid (1a)

White solid, E/Z (3.1:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 2.24-2.22 (m, 2H), 1.92 (s, 3H), 1.61-1.53 (m, 2H), 1.50 (s, 6H), 0.93 (t, *J* = 7.2 Hz, 3H). ^{1}H NMR (600 MHz, $CDCl_3$) of Z isomer (minor) δ 2.38-2.36 (m, 2H), 1.93 (s, 3H), 1.61-1.53 (m, 2H), 1.50 (s, 6H), 0.96 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 177.48, 177.37, 161.45, 160.95, 80.78, 80.67, 37.79, 31.31, 24.22, 20.12, 19.28, 18.94, 14.33, 14.03, 13.41. HRMS (ESI-TOF) Calcd for $C_9H_{16}NO_3^-$ [M-H]$^-$: 186.1136, found: 186.1132.



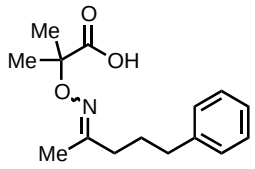
2-((Decan-2-ylideneamino)oxy)-2-methylpropanoic acid (1b)

Colorless oil, E/Z (3.0:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 2.38-2.35 (m, 1H), 2.25-2.21 (m, 3.0H), 1.92-1.90 (m, 6.0H), 1.53-1.50 (m, 16.4H), 1.30-1.26 (m, 21.1H), 0.90-0.86 (m, 6.1H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.85, 162.00, 161.51, 80.88, 80.76, 35.91, 31.81, 31.78, 29.47, 29.40, 29.21, 29.18, 29.14, 29.09, 28.98, 25.94, 25.44, 24.30, 24.26, 22.62, 22.60, 20.17, 14.44, 14.05. HRMS (ESI-TOF) Calcd for $C_{14}H_{26}NO_3^-$ [M-H]$^-$: 256.1918, found: 256.1912.



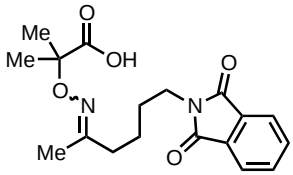
2-Methyl-2-(((4-phenylbutan-2-ylidene)amino)oxy)propanoic acid (1c)

E/Z (2.4:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.30-7.27 (m, 2H), 7.20-7.16 (m, 3H), 2.88-2.85 (m, 2H), 2.60-2.57 (m, 2H), 1.93 (s, 3H), 1.44 (s, 6H). ^{1}H NMR (600 MHz, $CDCl_3$) of Z isomer (minor) δ 7.31-7.29 (m, 2H), 7.23-7.20 (m, 3H), 2.85-2.83 (m, 2H), 2.70-2.68 (m, 2H), 1.88 (s, 3H), 1.46 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.62, 176.54, 160.80, 160.31, 140.60, 140.36, 128.52, 128.50, 128.26, 128.24, 126.36, 126.25, 81.05, 80.91, 37.51, 32.10, 31.56, 31.45, 24.21, 24.18, 20.53, 14.82. HRMS (ESI-TOF) Calcd for $C_{14}H_{18}NO_3^-$ [M-H]$^-$: 248.1292, found: 248.1297.



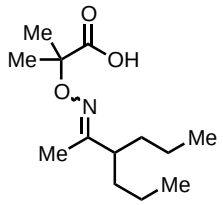
2-Methyl-2-(((5-phenylpentan-2-ylidene)amino)oxy)propanoic acid (1d)

E/Z (3.4:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.30-7.28 (m, 2.6H), 7.22-7.16 (m, 3.9H), 2.66-2.62 (m, 2.6H), 2.42-2.40 (m, 0.59H), 2.29-2.27 (m, 2H), 1.93 (s, 0.81H), 1.91 (s, 3H), 1.89-1.83 (m, 2.7H), 1.51 (s, 6H), 1.48 (s, 1.7H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.51, 176.48, 161.64, 161.06, 141.44, 141.35, 128.42, 126.03, 125.99, 81.01, 80.90, 35.65, 35.43, 35.08, 29.14, 27.57, 27.07, 24.30, 24.25, 20.23, 14.63. HRMS (ESI-TOF) Calcd for $C_{15}H_{20}NO_3^-$ [M-H]$^-$: 262.1449, found: 262.1455.



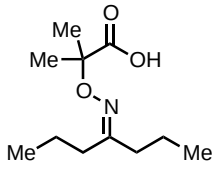
2-(((6-(1,3-Dioxoisoindolin-2-yl)hexan-2-ylidene)amino)oxy)-2-methylpropanoic acid (1e)

White solid, E/Z (6.2:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.86-7.84 (m, 2H), 7.73-7.71 (m, 2H), 3.69 (t, *J* = 7.2 Hz, 2H), 2.29 (t, *J* = 7.2 Hz, 2H), 1.90 (s, 3H), 1.73-1.68 (m, 2H), 1.62-1.57 (m, 2H), 1.50 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 176.13, 168.48, 160.07, 133.97, 132.02, 123.26, 81.05, 37.51, 35.17, 27.78, 24.19, 23.06, 14.56. HRMS (ESI-TOF) Calcd for $C_{18}H_{21}N_2O_5^-$ [M-H]$^-$: 345.1456, found: 345.1450.



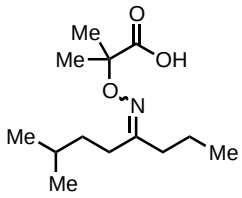
2-Methyl-2-(((3-propylhexan-2-ylidene)amino)oxy)propanoic acid (1f)

Colorless oil, E/Z (10.0:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 2.37-2.31 (m, 1H), 1.82-1.80 (m, 3H), 1.50 (s, 6H), 1.43-1.38 (m, 4H), 1.25-1.18 (m, 4H), 0.90-0.87 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 177.15, 164.21, 80.89, 44.65, 34.48, 24.28, 20.43, 13.88, 10.78. HRMS (ESI-TOF) Calcd for $C_{13}H_{24}NO_3^-$ [M-H]$^-$: 242.1762, found: 242.1755.



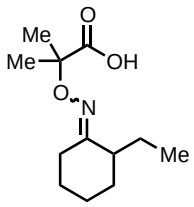
2-((Heptan-4-ylideneamino)oxy)-2-methylpropanoic acid (1g)

Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$) δ 2.35-2.32 (m, 2H), 2.24-2.22 (m, 2H), 1.60-1.52 (m, 4H), 1.50 (s, 6H), 0.96 (t, *J* = 7.2 Hz, 3H), 0.94 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 175.82, 165.29, 81.01, 36.31, 30.45, 24.34, 19.22, 19.16, 14.21, 13.62. HRMS (ESI-TOF) Calcd for $C_{11}H_{20}NO_3^-$ [M-H]$^-$: 214.1449, found: 214.1444.



2-Methyl-2-(((7-methyloctan-4-ylidene)amino)oxy)propanoic acid (1h)

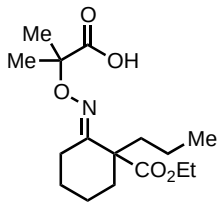
Colorless oil, E/Z (1:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 2.35-2.32 (m, 2H), 2.25-2.21 (m, 2H), 1.59-1.53 (m, 3H), 1.50 (s, 3H), 1.49 (s, 3H), 1.42-1.35 (m, 2H), 0.97-0.90 (m, 9H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.44, 165.38, 165.25, 80.90, 80.87, 36.24, 34.82, 34.55, 32.30, 30.44, 28.21, 27.64, 26.53, 24.28, 22.29, 22.25, 19.24, 19.20, 14.22, 13.60. HRMS (ESI-TOF) Calcd for $C_{13}H_{24}NO_3^-$ [M-H]$^-$: 242.1762, found: 242.1768.



2-(((2-Ethylcyclohexylidene)amino)oxy)-2-methylpropanoic acid (1i)

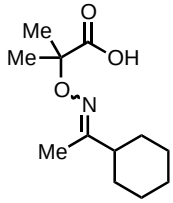
E/Z (3.3:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 3.37-3.33 (m, 0.30H), 2.70-2.66

(m, 1H), 2.34-2.30 (m, 1H), 2.28-2.27 (m, 0.30H), 2.24-2.18 (m, 1.3H), 1.96-1.88 (m, 1.6H), 1.79-1.38 (m, 19.8H), 0.91 (t, *J* = 7.2 Hz, 3H), 0.88 (t, *J* = 7.2 Hz, 1.0H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 175.65, 166.80, 166.30, 166.29, 80.51, 80.42, 43.53, 34.66, 32.24, 29.51, 28.42, 26.66, 25.88, 23.94, 23.88, 23.85, 23.82, 23.49, 23.36, 22.93, 19.98, 11.45, 11.29. HRMS (ESI-TOF) Calcd for $C_{12}H_{20}NO_3^-$ [M-H]$^-$: 226.1449, found: 226.1445.



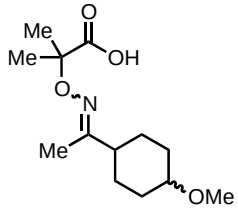
(*E*)-2-(((2-(Ethoxycarbonyl)-2-propylcyclohexylidene)amino)oxy)-2-methylpropanoic acid (1j)

Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$) δ 4.17 (q, *J* = 7.2 Hz, 2H), 3.13-3.09 (m, 1H), 2.37-2.33 (m, 1H), 2.00-1.95 (m, 1H), 1.85-1.80 (m, 1H), 1.79-1.74 (m, 1H), 1.70-1.60 (m, 2H), 1.54-1.50 (m, 1H), 1.52 (s, 6H), 1.47-1.41 (m, 2H), 1.34-1.23 (m, 2H), 1.25 (t, *J* = 7.2 Hz, 3H), 0.88 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 177.19, 173.36, 162.66, 81.31, 61.00, 54.12, 37.63, 35.54, 25.55, 24.15, 24.13, 24.03, 22.53, 17.80, 14.43, 14.11. HRMS (ESI-TOF) Calcd for $C_{16}H_{26}NO_5^-$ [M-H]$^-$: 312.1816, found: 312.1812.



2-(((1-Cyclohexylethylidene)amino)oxy)-2-methylpropanoic acid (1k)

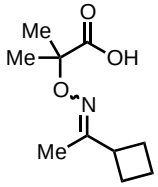
White solid, E/Z (20:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 2.22-2.18 (m, 1H), 1.90-1.88 (s, 3H), 1.81-1.79 (m, 4H), 1.72-1.69 (m, 1H), 1.50 (s, 6H), 1.33-1.18 (m, 5H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 176.23, 165.36, 81.01, 44.70, 29.92, 28.77, 25.86, 24.32, 13.00. HRMS (ESI-TOF) Calcd for $C_{12}H_{20}NO_3^-$ [M-H]$^-$: 226.1449, found: 226.1443.



2-(((1-(4-Methoxycyclohexyl)ethylidene)amino)oxy)-2-methylpropanoic acid (1l)

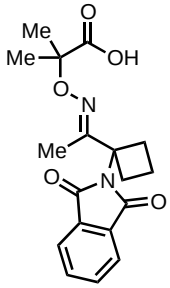
Colorless oil, E/Z (>20:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 3.46-3.43 (m, 1H), 3.36 (s, 4.2H), 3.31 (s, 3H), 3.16-3.11 (m, 1.4H), 2.28-2.23 (m, 1H), 2.19-2.12 (m, 4.0H), 1.97-1.94 (m, 2H), 1.90-1.88 (m, 8.8H), 1.74-1.67 (m, 2H), 1.55-1.44 (m, 20.0H), 1.38-1.32

(m, 3H), 1.29-1.21 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 176.66, 176.54, 164.21, 163.58, 80.97, 80.93, 78.75, 74.54, 55.68, 55.58, 43.81, 43.54, 31.17, 28.69, 27.91, 24.26, 24.21, 23.95, 13.07, 12.58. HRMS (ESI-TOF) Calcd for $C_{13}H_{22}NO_4^-$ [M-H]$^-$: 256.1554, found: 256.1556.



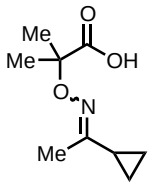
2-(((1-Cyclobutylethylidene)amino)oxy)-2-methylpropanoic acid (1m)

White solid, E/Z (10:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 3.12 (quintet, *J* = 8.4 Hz, 1H), 2.18-2.08 (m, 4H), 2.02-1.96 (m, 1H), 1.87 (s, 3H), 1.86-1.80 (m, 1H), 1.51 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.29, 163.33, 81.06, 40.16, 26.64, 25.62, 24.34, 18.21, 12.63. HRMS (ESI-TOF) Calcd for $C_{10}H_{16}NO_3^-$ [M-H]$^-$: 198.1136, found: 198.1133.



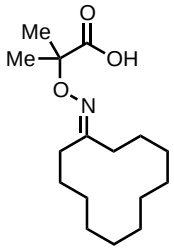
(*E*)-2-(((1-(1-(1,3-Dioxoisoindolin-2-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoic acid (1n)

White solid. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.82-7.78 (m, 2H), 7.72-7.69 (m, 2H), 2.87-2.76 (m, 4H), 2.01 (s, 3H), 2.00-1.94 (m, 2H), 1.50 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 176.89, 168.10, 156.69, 134.05, 131.96, 123.11, 81.70, 61.45, 31.28, 24.07, 17.24, 10.56. HRMS (ESI-TOF) Calcd for $C_{18}H_{19}N_2O_5^-$ [M-H]$^-$: 343.1299, found: 343.1293.



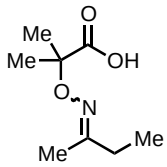
2-(((1-Cyclopropylethylidene)amino)oxy)-2-methylpropanoic acid (1o)

White solid, E/Z (3.2:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 1.76 (s, 3H), 1.69-1.64 (m, 1H), 1.52 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 176.40, 162.69, 162.65, 81.06, 81.03, 24.32, 15.49, 14.90, 11.85, 9.80, 5.9, 5.5. HRMS (ESI-TOF) Calcd for $C_9H_{14}NO_3^-$ [M-H]$^-$: 184.0979, found: 184.0986.



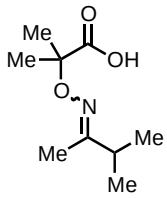
2-((Cyclododecylideneamino)oxy)-2-methylpropanoic acid (1p)

White solid. ^{1}H NMR (600 MHz, $CDCl_3$) δ 2.47-2.45 (m, 2H), 2.37-2.35 (m, 2H), 1.72-1.68 (m, 2H), 1.65-1.60 (m, 2H), 1.53 (s, 6H), 1.41-1.28 (m, 14H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 176.27, 163.80, 81.02, 30.54, 27.60, 25.70, 25.26, 24.52, 24.42, 23.57, 23.41, 23.38, 22.98, 22.68, 22.64. HRMS (ESI-TOF) Calcd for $C_{16}H_{28}NO_3^-$ [M-H]$^-$: 282.2075, found: 282.2071.



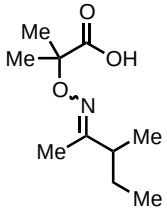
2-((Butan-2-ylideneamino)oxy)-2-methylpropanoic acid (1q)

White solid, E/Z (1:1). ^{1}H NMR (600 MHz, $CDCl_3$) δ 2.44-2.39 (m, 2H), 2.32-2.27 (m, 2H), 1.95-1.93 (m, 6H), 1.53-1.52 (m, 12H), 1.14-1.08 (m, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 177.23, 177.00, 162.80, 162.21, 80.88, 80.72, 29.41, 24.27, 24.24, 22.73, 19.60, 19.58, 14.36, 10.52, 9.9. HRMS (ESI-TOF) Calcd for $C_8H_{14}NO_3^-$ [M-H]$^-$: 172.0979, found: 172.0972.



2-Methyl-2-(((3-methylbutan-2-ylidene)amino)oxy)propanoic acid (1r)

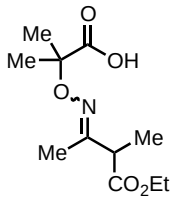
White solid, E/Z (16.7:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 2.54 (septet, J = 7.2 Hz, 1H), 1.89 (s, 3H), 1.50 (s, 6H), 1.13 (s, 3H), 1.12 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 176.16, 165.95, 81.05, 34.80, 24.32, 19.58, 12.37. HRMS (ESI-TOF) Calcd for $C_9H_{16}NO_3^-$ [M-H]$^-$: 186.1136, found: 186.1139.



2-Methyl-2-(((3-methylpentan-2-ylidene)amino)oxy)propanoic acid (1s)

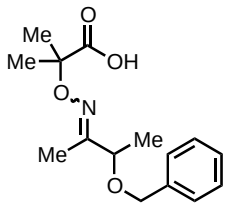
Colorless oil, E/Z (10:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 2.38-2.32 (m,

1H), 1.86 (s, 3H), 1.55-1.50 (m, 1H), 1.51 (s, 3H), 1.50 (s, 3H), 1.47-1.42 (m, 1H), 1.09 (d, *J* = 7.2 Hz, 3H), 0.86 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 176.36, 165.18, 80.98, 41.45, 26.65, 24.30, 17.42, 11.56. HRMS (ESI-TOF) Calcd for $C_{10}H_{18}NO_3^-$ [M-H]$^-$: 200.1292, found: 200.1285.



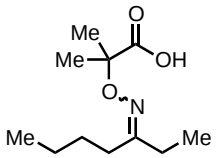
2-(((4-Ethoxy-3-methyl-4-oxobutan-2-ylidene)amino)oxy)-2-methylpropanoic acid (1t)

Colorless oil, E/Z (3.8:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 4.17 (qd, J_1 = 1.8 Hz, J_2 = 7.2 Hz, 2H), 3.39 (q, *J* = 7.2 Hz, 1H), 1.93 (s, 3H), 1.53 (s, 6H), 1.35 (d, *J* = 7.2 Hz, 3H), 1.26 (t, *J* = 7.2 Hz, 3H). ^{1}H NMR (600 MHz, $CDCl_3$) of Z isomer (minor) δ 4.19 (q, J_2 = 7.2 Hz, 2H), 3.92 (q, *J* = 7.2 Hz, 1H), 1.94 (s, 3H), 1.52 (d, J = 14.4 Hz, 6H), 1.34 (d, *J* = 7.2 Hz, 3H), 1.28 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 177.51, 172.11, 158.33, 81.26, 61.14, 45.86, 24.13, 24.08, 14.27, 14.05. ^{13}C NMR (150 MHz, $CDCl_3$) of Z isomer (minor) δ 176.97, 172.21, 157.41, 81.42, 61.34, 39.80, 23.90, 17.99, 12.90, 12.67. HRMS (ESI-TOF) Calcd for $C_{11}H_{18}NO_5^-$ [M-H]$^-$: 244.1190, found: 244.1197.



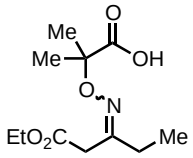
2-(((3-(Benzyloxy)butan-2-ylidene)amino)oxy)-2-methylpropanoic acid (1u)

Colorless oil, E/Z (14.3:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.34-7.25 (m, 5H), 4.43 (d, *J* = 11.4 Hz, 1H), 4.30 (d, *J* = 12.0 Hz, 1H), 4.05 (q, *J* = 6.6 Hz, 1H), 1.89 (s, 3H), 1.54 (s, 3H), 1.53 (s, 3H), 1.30 (d, *J* = 6.6 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 179.23, 160.11, 137.88, 128.36, 127.87, 127.65, 80.94, 75.46, 70.37, 24.13, 23.99, 18.84, 9.12. HRMS (ESI-TOF) Calcd for $C_{15}H_{20}NO_4^-$ [M-H]$^-$: 278.1398, found: 278.1392.



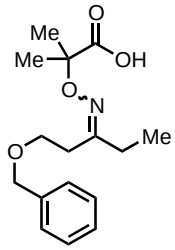
2-((Heptan-3-ylideneamino)oxy)-2-methylpropanoic acid (1v)

Colorless oil, E/Z (1:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 2.39-2.34 (m, 2H), 2.31-2.23 (m, 2H), 1.54-1.46 (m, 2H), 1.50 (s, 6H), 1.39-1.31 (m, 2H), 1.13-1.07 (m, 3H), 0.94-0.91 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.73, 176.61, 165.99, 80.91, 33.63, 28.19, 27.92, 27.79, 27.75, 24.28, 22.71, 22.22, 21.88, 13.73, 10.41, 10.10. HRMS (ESI-TOF) Calcd for $C_{11}H_{20}NO_3^-$ [M-H]$^-$: 214.1449, found: 214.1443.



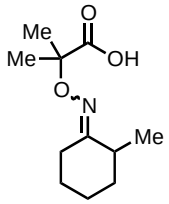
2-(((1-Ethoxy-1-oxopentan-3-ylidene)amino)oxy)-2-methylpropanoic acid (1w)

Colorless oil, E/Z (2.6:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 4.22-4.15 (m, 2H), 3.36 (s, 1.5H), 3.24 (s, 0.5H), 2.46 (q, *J* = 7.8 Hz, 0.6H), 2.32 (q, *J* = 7.2 Hz, 1.4H), 1.52 (s, 6H), 1.30-1.26 (m, 3H), 1.12-1.07 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 177.50, 176.27, 169.45, 169.34, 158.49, 156.57, 81.83, 81.15, 61.72, 61.19, 39.37, 34.63, 28.69, 24.23, 24.06, 23.93, 21.92, 14.02, 10.16, 9.71. HRMS (ESI-TOF) Calcd for $C_{11}H_{18}NO_5^-$ [M-H]$^-$: 244.1190, found: 244.1182.



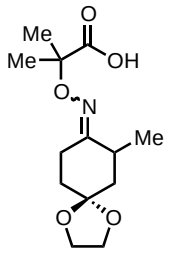
2-(((1-(Benzyloxy)pentan-3-ylidene)amino)oxy)-2-methylpropanoic acid (1x)

Colorless oil, E/Z (1.7:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.36-7.28 (m, 5H), 4.52 (s, 1.2H), 4.51 (s, 0.7H), 3.70 (t, *J* = 6.6 Hz, 0.8H), 3.63 (t, *J* = 6.6 Hz, 1.2H), 2.68 (t, *J* = 6.6 Hz, 1.2H), 2.56 (t, *J* = 6.6 Hz, 0.7H), 2.39 (q, *J* = 7.8 Hz, 0.7H), 2.26 (t, *J* = 7.2 Hz, 1.3H), 1.51-1.49 (m, 6H), 1.09-1.06 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.32, 176.18, 163.35, 162.34, 137.95, 137.41, 128.45, 128.38, 127.89, 127.84, 127.71, 127.67, 81.29, 81.04, 73.06, 72.93, 66.54, 66.05, 34.11, 28.95, 27.88, 24.25, 24.08, 22.17, 10.32, 9.96. HRMS (ESI-TOF) Calcd for $C_{16}H_{22}NO_4^-$ [M-H]$^-$: 292.1554, found: 292.1550.



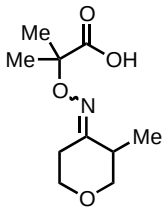
2-Methyl-2-(((2-methylcyclohexylidene)amino)oxy)propanoic acid (1y)

Colorless oil, E/Z (6.6:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 3.56-3.51 (m, 0.13H), 3.09-3.06 (m, 0.86H), 2.40-2.22 (m, 1H), 1.97-1.92 (m, 2H), 1.84-1.77 (m, 1.7H), 1.62-1.43 (m, 8.7H), 1.35-1.29 (m, 1H), 1.13-1.10 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 176.58, 176.45, 166.98, 166.90, 80.91, 80.89, 37.52, 37.50, 35.70, 31.55, 28.40, 27.73, 26.61, 26.14, 25.01, 24.98, 24.48, 24.30, 24.28, 24.18, 24.16, 20.14, 16.62, 16.32. HRMS (ESI-TOF) Calcd for $C_{11}H_{18}NO_3^-$ [M-H]$^-$: 212.1292, found: 212.1298.



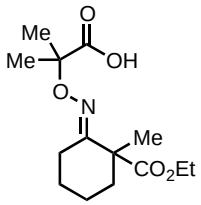
2-Methyl-2-(((7-methyl-1,4-dioxaspiro[4.5]decan-8-ylidene)amino)oxy)propanoic acid (1z)

White solid, E/Z (16.7:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 4.01-3.97 (m, 4H), 3.25-3.21 (m, 1H), 2.72-2.65 (m, 1H), 2.16-2.10 (m, 1H), 1.97-1.94 (m, 1H), 1.89-1.86 (m, 1H), 1.71-1.65 (m, 1H), 1.58-1.53 (m, 1H), 1.51 (s, 6H), 1.13-1.11 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 176.45, 164.26, 107.65, 81.15, 64.59, 64.50, 43.13, 34.75, 33.46, 24.26, 24.13, 22.04, 16.09. HRMS (ESI-TOF) Calcd for $C_{13}H_{20}NO_5^-$ [M-H]$^-$: 270.1347, found: 270.1355.



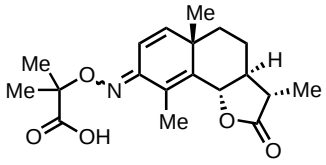
2-Methyl-2-(((3-methyldihydro-2*H*-pyran-4(3*H*)-ylidene)amino)oxy)propanoic acid (1aa)

Colorless oil, E/Z (4.0:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 3.94-3.90 (m, 2H), 3.63-3.59 (m, 1H), 3.36-3.32 (m, 1H), 3.00-2.96 (m, 1H), 2.59-2.54 (m, 1H), 2.40-2.35 (m, 1H), 1.52 (s, 6H), 1.08 (d, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 177.57, 177.20, 161.57, 161.10, 81.05, 80.77, 74.15, 72.16, 68.23, 67.13, 37.01, 30.30, 28.91, 25.80, 24.27, 24.15, 24.12, 24.04, 22.05, 12.79. HRMS (ESI-TOF) Calcd for $C_{10}H_{16}NO_4^-$ [M-H]$^-$: 214.1085, found: 214.1080.



(*E*)-2-(((2-(Ethoxycarbonyl)-2-methylcyclohexylidene)amino)oxy)-2-methylpropanoic acid (1ab)

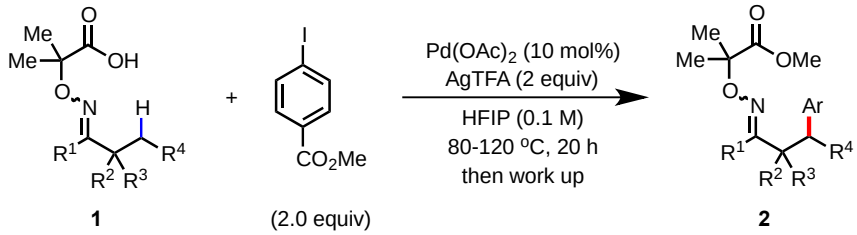
Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$) δ 4.19-4.15 (m, 2H), 3.19-3.15 (m, 1H), 2.42-2.39 (m, 1H), 2.00-1.94 (m, 1H), 1.83-1.80 (m, 1H), 1.71-1.67 (m, 1H), 1.52 (s, 6H), 1.50-1.39 (m, 3H), 1.37-1.35 (m, 3H), 1.27-1.24 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 176.34, 174.02, 163.93, 81.47, 61.26, 50.23, 37.70, 25.40, 24.20, 23.95, 22.57, 22.55, 14.06. HRMS (ESI-TOF) Calcd for $C_{14}H_{22}NO_5^-$ [M-H]$^-$: 284.1503, found: 284.1500.



2-Methyl-2-((((3*S*,3a*S*,5a*S*,9b*S*)-3,5a,9-trimethyl-2-oxo-2,3,3a,4,5,5a-hexahydronaphtho[1,2-*b*]furan-8(9b*H*)-ylidene)amino)oxy)propanoic acid (1ac)

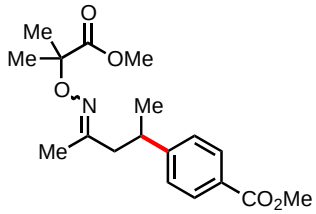
Pale yellow solid, E/Z (11.1:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 6.87 (d, *J* = 10.2 Hz, 3H), 6.15 (d, *J* = 9.6 Hz, 3H), 4.82-4.79 (m, 1H), 2.40-2.34 (m, 1H), 2.14 (s, 3H), 2.03-1.99 (m, 1H), 1.84-1.77 (m, 2H), 1.71-1.64 (m, 1H), 1.58 (s, 3H), 1.57 (s, 3H), 1.52-1.47 (m, 1H), 1.27-1.25 (m, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 177.83, 175.97, 151.79, 147.69, 141.32, 122.22, 112.60, 82.01, 53.48, 40.96, 38.10, 25.60, 24.31, 23.55, 12.44, 12.08. HRMS (ESI-TOF) Calcd for $C_{19}H_{24}NO_5^-$ [M-H]$^-$: 346.1660, found: 346.1669.

The Scope of Ketones



1 **2**

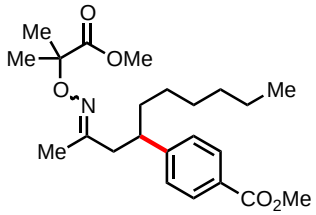
General Procedure for *β*-C(sp^3)–H Arylation of Ketones: Substrate **1** (0.10 mmol), ArI (0.20 mmol, 52.4 mg), $Pd(OAc)_2$ (0.01 mmol, 2.3 mg), and AgTFA (0.20 mmol, 44.2 mg) were weighed into a reaction vial (10 mL) with a magnetic stir bar under air. HFIP (1.0 mL) was added, and the vial was sealed with a cap. The reaction mixture was stirred at 80-120 °C for 20 hours. Upon completion, the reaction mixture was cooled to room temperature and diluted with EtOAc. Then the reaction mixture was filtered through a short celite plug and transferred to a reaction vial (10 mL) with a magnetic stir bar. The solvent was evaporated under vacuum. Anhydrous MeOH (1.0 mL) was added to the mixture. $SOCl_2$ (0.30 mmol, 22 μL) was added dropwise at room temperature. The reaction mixture was stirred at room temperature for 30 min. Upon completion, the solvent was removed under vacuum and the resulting mixture was purified by preparative thin-layer chromatography.



Methyl 4-(4-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)pentan-2-yl)benzoate (2a)

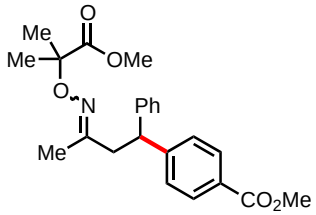
Substrate **1a** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2a**

E/Z (3.7:1) was obtained as a colorless oil (25.1 mg, 75%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.96-7.94 (m, 2H), 7.27-7.25 (m, 2H), 3.90 (s, 3H), 3.67 (s, 3H), 3.10 (sextet, J = 7.2 Hz, 1H), 2.44 (ABqd, J_1 = 7.2 Hz, J_2 = 14.4 Hz, 2H), 1.79 (s, 3H), 1.42 (s, 3H), 1.39 (s, 3H), 1.24 (d, J = 6.6 Hz, 3H). ^{1}H NMR (600 MHz, $CDCl_3$) of Z isomer (minor) δ 7.98-7.96 (m, 2H), 7.32-7.30 (m, 2H), 3.90 (s, 3H), 3.72 (s, 3H), 3.27 (sextet, J = 7.2 Hz, 1H), 2.60 (ABqd, J_1 = 7.2 Hz, J_2 = 13.2 Hz, 2H), 1.62 (s, 3H), 1.49 (s, 3H), 1.44 (s, 3H), 1.30 (d, J = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.95, 174.92, 167.06, 156.49, 155.99, 151.95, 151.76, 129.74, 129.73, 128.07, 126.99, 126.96, 80.68, 51.95, 43.80, 37.91, 37.01, 36.79, 24.30, 24.17, 24.06, 24.03, 21.76, 21.52, 20.84, 14.50. HRMS (ESI-TOF) Calcd for $C_{18}H_{26}NO_5^+$ [M+H] $^+$: 336.1805, found: 336.1800.



Methyl 4-(2-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)decan-4-yl)benzoate (2b)

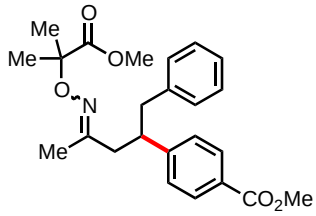
Substrate **1b** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **2b** E/Z (2.8:1) was obtained as a colorless oil (31.7 mg, 78%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.96-7.94 (m, 2H), 7.21-7.20 (m, 2H), 3.90 (s, 3H), 3.66 (s, 3H), 2.94-2.89 (m, 1H), 2.51-2.40 (m, 2H), 1.75 (s, 3H), 1.68-1.61 (m, 1H), 1.56-1.48 (m, 1H), 1.38 (s, 3H), 1.34 (s, 3H), 1.27-1.02 (m, 8H), 1.24 (t, J = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.94, 167.11, 156.67, 156.07, 150.46, 130.18, 129.61, 129.60, 128.19, 128.04, 127.70, 127.65, 127.22, 80.60, 80.52, 51.93, 42.91, 42.63, 42.52, 36.08, 31.64, 29.20, 29.13, 27.29, 27.22, 24.33, 24.16, 23.98, 23.95, 22.55, 22.53, 14.52, 13.99. HRMS (ESI-TOF) Calcd for $C_{23}H_{36}NO_5^+$ [M+H] $^+$: 406.2588, found: 406.2592.



Methyl 4-(3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)-1-phenylbutyl)benzoate (2c)

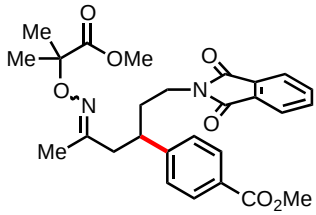
Substrate **1c** was arylated following the general arylation procedure at 100 °C. After purification by preparative thin-layer chromatography (Toluene : EtOAc = 30:1 as eluent), **2c** E/Z (2.7:1) was obtained as a colorless oil (20.7 mg, 52%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.94-7.92 (m, 2H), 7.30-7.16 (m, 7H), 4.38 (t, J = 8.4 Hz, 1H), 3.88 (s, 3H), 3.60 (s, 3H), 2.96-2.90 (m, 2H), 1.80 (s, 3H), 1.32 (s, 3H), 1.31 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.82, 166.95, 156.08, 155.32, 149.35, 149.30, 143.27, 143.18,

129.74, 129.73, 128.53, 128.33, 128.13, 127.99, 127.92, 127.87, 127.79, 126.67, 126.51, 80.73, 52.00, 51.97, 51.93, 47.72, 47.09, 41.52, 35.68, 24.20, 24.18, 24.02, 20.69, 14.59. HRMS (ESI-TOF) Calcd for $C_{23}H_{28}NO_5^+$ $[M+H]^+$: 398.1962, found: 398.1960.



Methyl
4-(4-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)-1-phenylpentan-2-yl)benzoate (2d)

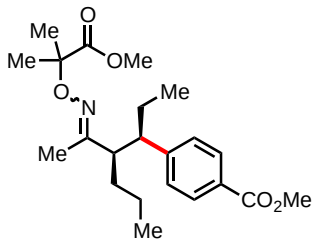
Substrate **1d** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2d** E/Z (3.0:1) was obtained as a colorless oil (26.7 mg, 65%). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.93-7.91 (m, 0.71H), 7.90-7.88 (m, 2H), 7.24-7.23 (m, 0.72H), 7.21-7.11 (m, 6.2H), 7.05-7.04 (m, 0.74H), 6.95-6.94 (m, 2H), 3.90 (s, 1.0H), 3.88 (s, 3H), 3.70 (s, 1.0H), 3.64 (s, 3H), 3.44-3.39 (m, 0.33H), 3.25 (quintet, J = 7.2 Hz, 1H), 2.98-2.92 (m, 1.7H), 2.82-2.79 (m, 1.4H), 2.59-2.49 (m, 2.4H), 1.76 (s, 3H), 1.49 (s, 1.0H), 1.45 (s, 1.0H), 1.39 (s, 4.0H), 1.37 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.91, 174.86, 167.08, 167.04, 156.37, 155.74, 149.37, 139.45, 129.59, 129.50, 129.11, 129.00, 128.20, 128.13, 127.85, 127.79, 80.72, 51.98, 51.95, 44.62, 44.42, 43.13, 42.58, 41.32, 24.39, 24.18, 24.02, 23.92, 20.82, 14.64. HRMS (ESI-TOF) Calcd for $C_{24}H_{30}NO_5^+$ $[M+H]^+$: 412.2118, found: 412.2112.



(*E*)-Methyl
4-(1-(1,3-dioxoisoindolin-2-yl)-5-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)hexan-3-yl)benzoate (2e)

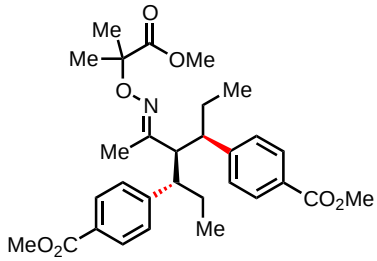
Substrate **1e** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 2:1 as eluent), **2e** E/Z (2.7:1) was obtained as a colorless oil (24.8 mg, 50%). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.89-7.87 (m, 2H), 7.85-7.83 (m, 5.5H), 7.76-7.72 (m, 7.3H), 7.66-7.63 (m, 7.2H), 7.30-7.28 (m, 2H), 7.24-7.22 (m, 5.4H), 3.87 (s, 3H), 3.86 (s, 8.0H), 3.71-3.68 (m, 5.8H), 3.64-3.57 (m, 15.8H), 3.24-3.18 (m, 1H), 3.07-3.02 (m, 2.7H), 2.78 (dd, J_1 = 6.0 Hz, J_2 = 13.2 Hz, 1H), 2.53-2.50 (m, 3.7H), 2.44-2.41 (m, 2.6H), 2.22-2.10 (m, 3.8H), 2.07-1.99 (m, 3.8Hz), 1.74 (s, 8.0H), 1.51 (s, 3H), 1.43 (s, 3H), 1.38 (s, 3H), 1.37 (s, 8.0H), 1.32 (s, 8.0H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.83, 168.38, 168.12, 166.76, 155.84,

155.36, 148.69, 133.90, 133.75, 133.70, 132.06, 131.94, 131.89, 129.73, 128.18, 127.57, 127.55, 123.18, 123.02, 122.99, 80.68, 80.62, 77.21, 77.00, 76.79, 51.93, 51.88, 43.03, 42.83, 41.11, 37.45, 37.20, 36.46, 33.98, 33.61, 29.92, 27.89, 24.14, 23.93, 23.88, 21.01, 20.74, 14.64. HRMS (ESI-TOF) Calcd for $C_{27}H_{31}N_2O_7^+$ $[M+H]^+$: 495.2126, found: 495.2120.



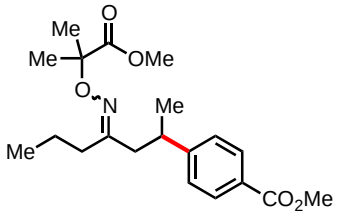
Methyl 4-(4-(1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)heptan-3-yl)benzoate (2f-mono)

Substrate **1f** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2f-mono** E/Z (8.0:1) was obtained as a colorless oil (25.4 mg, 65%, d.r. > 20:1). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.91-7.90 (m, 2H), 7.15-7.14 (m, 2H), 3.89 (s, 3H), 3.65 (s, 3H), 2.59-2.52 (m, 2H), 1.95-1.89 (m, 1H), 1.69-1.63 (m, 1H), 1.52-1.39 (m, 2H), 1.47 (s, 3H), 1.33 (s, 3H), 1.30-1.25 (m, 1H), 1.25 (s, 3H), 1.20-1.11 (m, 1H), 0.89 (t, *J* = 7.2 Hz, 3H), 0.67 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.13, 167.17, 158.16, 149.07, 129.21, 128.71, 127.88, 80.50, 51.91, 51.80, 50.23, 49.58, 32.20, 26.48, 24.13, 23.80, 20.34, 13.92, 11.75, 11.65. HRMS (ESI-TOF) Calcd for $C_{22}H_{34}NO_5^+$ $[M+H]^+$: 392.2431, found: 392.2427.



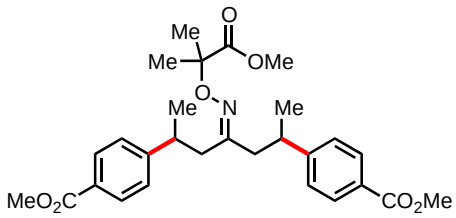
Dimethyl 4,4'-(4-((*E*)-1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)heptane-3,5-diyl)dibenzoate (2f-di)

Substrate **1f** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2f-di** was obtained as a colorless oil (5.3 mg, 10%, d.r. > 20:1). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.91-7.90 (m, 4H), 7.15-7.14 (m, 4H), 3.90 (s, 6H), 3.72 (s, 3H), 3.05 (t, *J* = 7.2 Hz, 1H), 2.86-2.82 (m, 2H), 2.08-2.01 (m, 2H), 1.72-1.66 (m, 2H), 1.33 (s, 6H), 0.80 (t, *J* = 7.2 Hz, 6H), 0.75 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 175.12, 167.08, 157.08, 148.06, 129.18, 128.20, 80.68, 53.55, 51.99, 51.91, 47.12, 27.28, 24.11, 15.03, 11.86. HRMS (ESI-TOF) Calcd for $C_{30}H_{40}NO_7^+$ $[M+H]^+$: 526.2799, found: 526.2792.



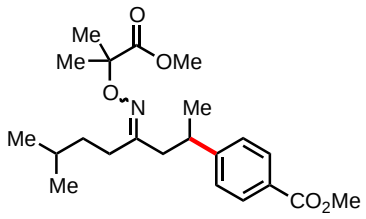
Methyl 4-(4-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)heptan-2-yl)benzoate (2g-mono)

Substrate **1g** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2g-mono** E/Z (10:1) was obtained as a colorless oil (8.0 mg, 22%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.96-7.94 (m, 2H), 7.26-7.25 (m, 2H), 3.90 (s, 3H), 3.66 (s, 3H), 3.13 (sextet, *J* = 7.2 Hz, 1H), 2.48-2.45 (m, 1H), 2.40-2.36 (m, 1H), 2.32-2.26 (m, 1H), 2.19-2.14 (m, 1H), 1.52-1.46 (m, 2H), 1.41 (s, 3H), 1.40 (s, 3H), 1.23 (d, *J* = 7.2 Hz, 3H), 0.90 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.04, 167.12, 159.02, 152.40, 129.71, 127.95, 126.99, 80.62, 51.95, 51.87, 41.97, 36.74, 30.41, 24.10, 24.03, 21.70, 19.08, 14.17. HRMS (ESI-TOF) Calcd for $C_{20}H_{30}NO_5^+$ $[M+H]^+$: 364.2118, found: 364.2112.



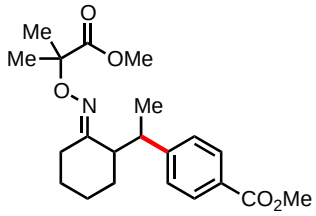
Dimethyl 4,4'-(5-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)nonane-3,7-diyl)dibenzoate (2g-di)

Substrate **1g** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2g-di** was obtained as a colorless oil (29.9 mg, 60%, d.r. = 1:1). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.95-7.93 (m, 4H), 7.92-7.90 (m, 4H), 7.26-7.24 (m, 4H), 7.15-7.12 (m, 4H), 3.92 (s, 3H), 3.91 (s, 3H), 3.90 (s, 3H), 3.89 (s, 3H), 3.67 (s, 3H), 3.65 (s, 3H), 3.28-3.21 (m, 2H), 3.07-3.00 (m, 2H), 2.63 (dd, J_1 = 7.2 Hz, J_2 = 13.2 Hz, 1H), 2.54-2.51 (m, 1H), 2.46-2.42 (m, 1H), 2.32 (dd, J_1 = 7.8 Hz, J_2 = 12.6 Hz, 1H), 2.25-2.21 (m, 1H), 2.20-2.10 (m, 3H), 1.45 (s, 3H), 1.41 (s, 3H), 1.39 (s, 3H), 1.38 (s, 3H), 1.26 (d, *J* = 7.2 Hz, 3H), 1.24 (d, *J* = 7.2 Hz, 3H), 1.13 (d, *J* = 6.6 Hz, 3H), 1.12 (d, *J* = 6.6 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.78, 174.76, 167.05, 167.02, 167.00, 166.98, 157.04, 156.93, 152.13, 152.06, 151.61, 129.70, 129.65, 129.62, 128.22, 127.92, 127.89, 126.93, 126.88, 80.87, 80.84, 51.97, 51.92, 51.89, 51.86, 42.67, 42.66, 37.15, 37.12, 36.78, 36.77, 36.57, 36.52, 24.18, 24.14, 23.98, 23.88, 21.77, 21.71, 21.65, 21.55. HRMS (ESI-TOF) Calcd for $C_{28}H_{36}NO_7^+$ $[M+H]^+$: 498.2486, found: 498.2482.



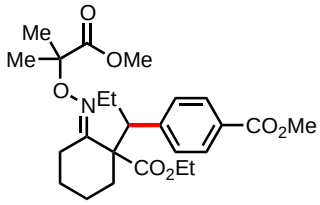
Methyl
4-(4-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)-7-methyloctan-2-yl)benzoate (2h)

Substrate **1h** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2h** E/Z (1.1:1) was obtained as a colorless oil (25.5 mg, 65%). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.97-7.94 (m, 4.5H), 7.31-7.29 (m, 2H), 7.27-7.25 (m, 2.6H), 3.90 (s, 3H), 3.89 (s, 3.3H), 3.70 (s, 3H), 3.66 (s, 3.3H), 3.29 (sextet, *J* = 7.2 Hz, 1H), 3.13 (sextet, *J* = 7.2 Hz, 1.1H), 2.66-2.62 (m, 1.1H), 2.49-2.45 (m, 2.3H), 2.40-2.36 (m, 1.1H), 2.32-2.27 (m, 1.3H), 2.20-2.15 (m, 1.2H), 1.94-1.89 (m, 1H), 1.87-1.82 (m, 1.3H), 1.52-1.40 (m, 17H), 1.33-1.21 (m, 12H), 0.89 (d, *J* = 6.6 Hz, 6.6H), 0.79 (t, *J* = 6.6 Hz, 6.1H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.99, 174.97, 167.07, 167.05, 159.44, 159.24, 152.36, 151.95, 129.69, 129.68, 126.97, 126.95, 80.70, 80.57, 51.95, 51.92, 51.83, 41.87, 36.84, 36.72, 36.60, 34.83, 34.49, 32.47, 28.06, 27.34, 26.44, 24.20, 24.06, 24.00, 22.29, 22.21, 21.70, 21.69. HRMS (ESI-TOF) Calcd for $C_{22}H_{34}NO_5^+$ $[M+H]^+$: 392.2431, found: 392.2437.



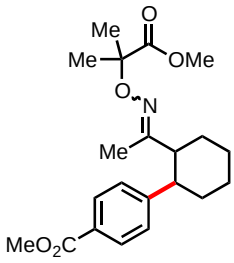
(*E*)-Methyl
4-(4-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)pentan-2-yl)benzoate (2i)

Substrate **1i** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **2i** was obtained as a colorless oil (25.5 mg, 68%, d.r. = 2:1). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.93-7.89 (m, 3H), 7.30-7.28 (m, 1H), 7.23-7.20 (m, 2H), 3.89 (s, 1.5H), 3.88 (s, 3H), 3.64 (s, 3H), 3.60 (s, 1.5H), 3.10 (quintet, *J* = 7.2 Hz, 1H), 3.13-3.08 (m, 0.5H), 2.62 (ddd, J_1 = 4.2 Hz, J_2 = 7.2 Hz, J_2 = 13.6 Hz, 1H), 2.46 (td, J_1 = 4.8 Hz, J_2 = 7.8 Hz, 1H), 2.20-2.15 (m, 1H), 2.07-2.04 (m, 1H), 2.04-2.00 (m, 0.5H), 1.93-1.88 (m, 0.5H), 1.82-1.72 (m, 2H), 1.68-1.62 (m, 2.5H), 1.61-1.51 (m, 2.5H), 1.48-1.36 (m, 1.5H), 1.32 (s, 1.5H), 1.31 (s, 3H), 1.29 (d, *J* = 6.6 Hz, 1.5H), 1.27 (s, 3H), 1.23 (d, *J* = 6.6 Hz, 3H), 1.15 (s, 1.5H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.97, 167.17, 161.00, 160.86, 152.34, 150.84, 129.47, 129.35, 128.03, 127.69, 127.65, 80.49, 80.21, 51.92, 51.90, 51.86, 51.72, 48.01, 39.66, 38.85, 38.73, 29.21, 29.06, 28.15, 27.76, 26.24, 24.48, 24.42, 24.08, 23.84, 23.61, 23.29, 20.39, 20.18, 18.16. HRMS (ESI-TOF) Calcd for $C_{21}H_{30}NO_5^+$ $[M+H]^+$: 376.2118, found: 376.2112.



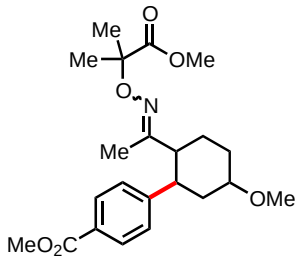
Methyl 4-(1-((*E*)-1-(ethoxycarbonyl)-2-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)cyclohexyl)propyl)benzoate (2j)

Substrate **1j** was arylated following the general arylation procedure at 100 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2j** was obtained as a colorless oil (33.7 mg, 73%, d.r. = 2.4:1). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.93-7.91 (m, 2H), 7.24-7.22 (m, 2H), 4.23-4.15 (m, 2H), 3.90 (s, 3H), 3.89 (s, 1.3H), 3.82-3.77 (m, 0.80H), 3.77 (s, 1.3H), 3.76 (s, 3H), 3.50-3.47 (m, 0.42H), 3.40-3.37 (m, 0.42H), 3.28-3.22 (m, 2H), 2.40-2.36 (m, 0.40H), 2.10-2.04 (m, 1H), 1.92-1.86 (m, 0.47H), 1.83-1.61 (m, 5.6H), 1.60 (s, 1.3H), 1.55 (s, 6H), 1.54 (s, 1.3H), 1.52-1.39 (m, 1.6H), 1.39-1.31 (m, 2.6H), 1.27 (t, *J* = 7.2 Hz, 3H), 1.24-1.19 (m, 1.1H), 1.06 (t, *J* = 7.2 Hz, 1.3H), 0.65 (t, *J* = 7.2 Hz, 1.3H), 0.62 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.88, 174.79, 172.23, 171.88, 167.12, 167.03, 160.21, 157.55, 146.53, 146.23, 130.48, 129.77, 129.16, 128.87, 128.61, 128.51, 81.35, 81.28, 60.77, 58.58, 57.43, 51.93, 51.62, 50.52, 37.01, 25.89, 24.70, 24.58, 24.48, 24.40, 24.34, 24.16, 24.11, 23.88, 23.78, 22.97, 22.42, 14.17, 13.80, 12.81, 12.67. HRMS (ESI-TOF) Calcd for $C_{25}H_{36}NO_7^+$ $[M+H]^+$: 462.2486, found: 462.2490.



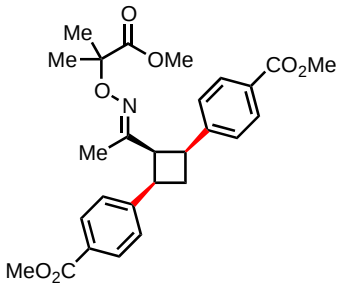
Methyl 4-(2-(1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)cyclohexyl)benzoate (2k)

Substrate **1k** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **2w** E/Z (7.8:1) was obtained as a colorless oil (27.0 mg, 72%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.92-7.90 (m, 2H), 7.20-7.18 (m, 2H), 3.89 (s, 1.5H), 3.88 (s, 3H), 3.62 (s, 3H), 2.72-2.68 (m, 1H), 2.56-2.52 (m, 1H), 1.88-1.81 (m, 4H), 1.62 (s, 3H), 1.47-1.38 (m, 4H), 1.28 (s, 3H), 1.20 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.94, 167.12, 159.73, 150.87, 129.58, 127.86, 127.53, 80.47, 51.91, 51.88, 49.02, 47.06, 35.40, 31.13, 26.38, 25.76, 24.11, 23.71, 12.12. HRMS (ESI-TOF) Calcd for $C_{21}H_{30}NO_5^+$ $[M+H]^+$: 376.2118, found: 376.2111.



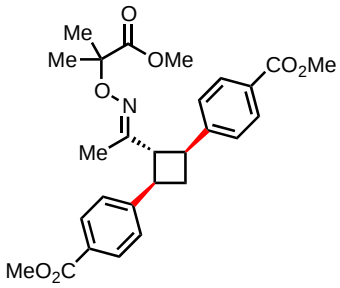
Methyl
4-((5-methoxy-2-(1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)cyclohexyl)benzoate (2l)

Substrate **1l** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2x** E/Z (>20:1) was obtained as a colorless oil (27.1 mg, 67%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.95-7.93 (m, 2H), 7.30-7.28 (m, 2H), 3.90 (s, 3H), 3.74 (s, 3H), 3.37 (s, 3H), 3.29-3.24 (m, 1H), 2.95-2.92 (m, 1H), 2.77-2.75 (m, 1H), 2.27-2.21 (m, 1H), 2.10-2.08 (m, 1H), 2.01-1.98 (m, 1H), 1.89-1.87 (m, 1H), 1.75-1.68 (m, 1H), 1.66-1.62 (m, 1H), 1.46 (s, 3H), 1.44 (s, 3H), 1.38 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.84, 167.14, 157.59, 149.24, 129.32, 127.83, 127.66, 80.95, 79.81, 55.48, 52.16, 51.94, 46.03, 43.88, 31.21, 27.96, 26.65, 24.26, 24.21, 16.42. HRMS (ESI-TOF) Calcd for $C_{20}H_{32}NO_6^+$ $[M+H]^+$: 406.2224, found: 406.2220.



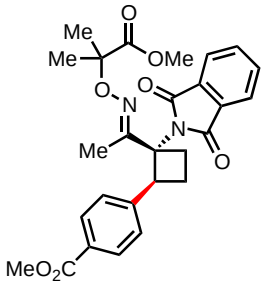
Dimethyl
4,4'-(2-((*E*)-1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)cyclobutane-1,3-diyl)dibenzoate (2m-cis)

Substrate **1m** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2m-cis** was obtained as a colorless oil (20.7 mg, 43%). The assignment of cis/trans structure was based on ^{1}H NMR patterns by comparing with literatures.[2] ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.96-7.94 (m, 4H), 7.21-7.20 (m, 4H), 4.07-3.99 (m, 3H), 3.90 (s, 6H), 3.70 (s, 3H), 3.00 (q, *J* = 10.8 Hz, 1H), 2.81-2.76 (m, 1H), 1.20 (s, 6H), 1.04 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.66, 167.11, 155.16, 146.92, 129.36, 127.70, 126.66, 80.62, 51.95, 51.84, 51.72, 38.45, 29.89, 23.92, 15.38. HRMS (ESI-TOF) Calcd for $C_{27}H_{32}NO_7^+$ $[M+H]^+$: 482.2173, found: 482.2170.



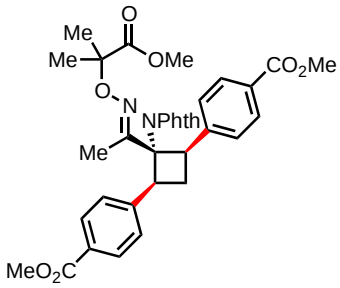
Dimethyl
4,4'-(2-((*E*)-1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)cyclobutane-1,3-diyl)dibenzoate (2m-trans)

Substrate **1m** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2m-trans** was obtained as a colorless oil (18.3 mg, 38%). The assignment of cis/trans structure was based on ^{1}H NMR patterns by comparing with literatures.[2] ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.99-7.98 (m, 4H), 7.35-7.33 (m, 4H), 3.91 (s, 6H), 3.67 (s, 3H), 3.61 (q, *J* = 9.6 Hz, 2H), 3.12 (t, *J* = 9.6 Hz, 1H), 2.75-2.71 (m, 1H), 2.28 (q, *J* = 10.2 Hz, 1H), 1.73 (s, 3H), 1.51 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.76, 166.96, 157.18, 148.70, 129.74, 128.33, 126.84, 81.25, 55.34, 52.02, 52.01, 40.29, 32.62, 24.13, 13.06. HRMS (ESI-TOF) Calcd for $C_{27}H_{32}NO_7^+$ $[M+H]^+$: 482.2173, found: 482.2175.



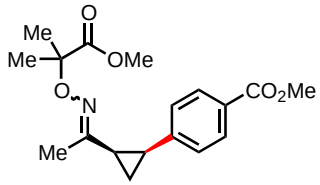
Methyl
4-(2-(1,3-dioxoisoindolin-2-yl)-2-((*E*)-1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)cyclobutyl)benzoate (2n-mono)

Substrate **1n** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 2:1 as eluent), **2n-mono** was obtained as a colorless oil (15.3 mg, 31%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.01-7.99 (m, 2H), 7.82-7.80 (m, 2H), 7.73-7.71 (m, 2H), 7.62-7.61 (m, 2H), 4.68-4.65 (m, 1H), 3.92 (s, 3H), 3.76 (s, 3H), 3.24 (t, *J* = 7.8 Hz, 1H), 2.41-2.31 (m, 3H), 1.54 (s, 3H), 1.52 (s, 3H), 1.27 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.68, 167.97, 167.21, 153.20, 145.09, 134.12, 131.82, 129.26, 129.05, 128.47, 123.10, 81.87, 67.27, 52.00, 46.38, 28.99, 24.38, 23.90, 23.63, 12.24. HRMS (ESI-TOF) Calcd for $C_{27}H_{29}N_2O_7^+$ $[M+H]^+$: 493.1969, found: 493.1963.



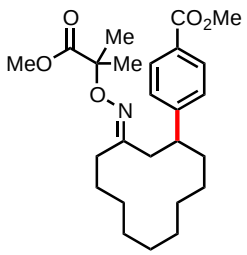
Dimethyl
4,4'-(2-(1,3-dioxoisoindolin-2-yl)-2-((*E*)-1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)cyclobutane-1,3-diyl)dibenzoate (2n-di)

Substrate **1n** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 2:1 as eluent), **2n-di** was obtained as a colorless oil (30.7 mg, 49%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.98-7.96 (m, 4H), 7.88-7.86 (m, 2H), 7.79-7.77 (m, 2H), 7.49-7.47 (m, 4H), 4.83 (t, *J* = 9.6 Hz, 2H), 3.90 (s, 6H), 3.68 (s, 3H), 3.08 (q, *J* = 10.8 Hz, 1H), 2.85 (q, *J* = 10.8 Hz, 1H), 1.21 (s, 6H), 0.99 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.27, 168.92, 167.14, 152.48, 145.81, 134.40, 131.54, 129.04, 128.03, 127.98, 123.20, 81.59, 71.98, 51.98, 51.84, 44.14, 23.91, 14.72. HRMS (ESI-TOF) Calcd for $C_{35}H_{35}N_2O_9^+$ $[M+H]^+$: 627.2337, found: 627.2330.



Methyl
4-(2-((*E*)-1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)cyclopropyl)benzoate (2o)

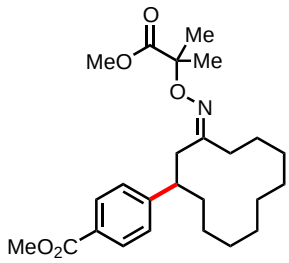
Substrate **1o** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2o** E/Z (6.7:1) was obtained as a colorless oil (15.0 mg, 45%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.89-7.88 (m, 2H), 7.19-7.18 (m, 2H), 3.89 (s, 3H), 3.74 (s, 3H), 2.41-2.37 (m, 1H), 2.02-1.98 (m, 1H), 1.66 (q, *J* = 6.0 Hz, 1H), 1.52 (s, 6H), 1.40 (s, 3H), 1.38 (s, 3H), 1.23-1.19 (m, 1H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.90, 167.16, 154.11, 143.70, 129.12, 128.13, 127.82, 80.75, 52.01, 51.95, 26.10, 24.33, 24.05, 23.03, 15.69, 9.31. HRMS (ESI-TOF) Calcd for $C_{18}H_{24}NO_5^+$ $[M+H]^+$: 334.1649, found: 334.1642.



(*E*)-Methyl

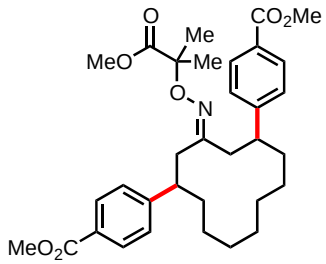
4-(3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)cyclododecyl)benzoate (2p-mono-E)

Substrate **1p** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **2p-mono-E** was obtained as a colorless oil (20.7 mg, 48% including **2p-mono-Z**). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.98-7.96 (m, 2H), 7.32-7.30 (m, 2H), 3.91 (s, 3H), 3.72 (s, 3H), 3.22 (t, *J* = 12.0 Hz, 1H), 3.02-2.97 (m, 1H), 2.48-2.42 (m, 1H), 2.22-2.17 (m, 1H), 1.99-1.93 (m, 2H), 1.83-1.77 (m, 1H), 1.61-1.53 (m, 3H), 1.50 (s, 3H), 1.47 (s, 3H), 1.44-1.08 (m, 13H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 175.09, 167.08, 157.14, 151.11, 129.76, 128.23, 127.61, 80.89, 51.99, 40.66, 35.20, 30.64, 30.36, 25.83, 24.34, 24.16, 24.04, 23.19, 22.90, 22.56, 22.42. HRMS (ESI-TOF) Calcd for $C_{25}H_{38}NO_5^+$ $[M+H]^+$: 432.2744, found: 432.2740.



(*Z*)-Methyl 4-(3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)cyclododecyl)benzoate (2p-mono-Z)

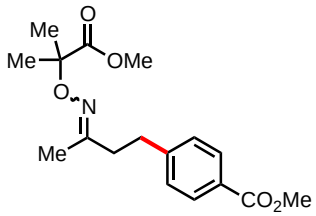
Substrate **1p** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **2p-mono-Z** was obtained as a colorless oil (20.7 mg, 48% including **2p-mono-E**). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.96-7.94 (m, 2H), 7.28-7.26 (m, 2H), 3.90 (s, 3H), 3.68 (s, 3H), 3.30-3.25 (m, 1H), 2.69 (dd, J_1 = 10.2 Hz, J_2 = 15.0 Hz, 1H), 2.55-2.51 (m, 1H), 2.38-2.34 (m, 1H), 2.30 (dd, J_1 = 4.2 Hz, J_2 = 15.0 Hz, 1H), 1.78-1.72 (m, 1H), 1.69-1.64 (m, 2H), 1.57-1.52 (m, 1H), 1.48 (s, 3H), 1.46 (s, 3H), 1.42-1.30 (m, 11H), 1.12-1.06 (m, 1H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 175.12, 167.13, 158.21, 151.17, 129.58, 127.91, 127.57, 80.80, 51.96, 39.79, 38.07, 30.66, 27.47, 25.47, 24.68, 24.43, 24.23, 24.18, 23.80, 22.93, 22.77, 21.50. HRMS (ESI-TOF) Calcd for $C_{25}H_{38}NO_5^+$ $[M+H]^+$: 432.2744, found: 432.2745.



Dimethyl 4,4'-(3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)cyclododecane-1,5-diyl)dibenzoate (2p-di)

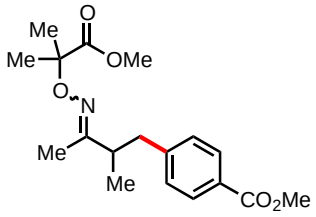
Substrate **1p** was arylated following the general arylation procedure at 120 °C. After

purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **2p-di** was obtained as a colorless oil (22.6 mg, 40%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.02-7.98 (m, 4H), 7.37-7.32 (m, 4H), 3.92 (s, 3H), 3.91 (s, 3H), 3.73 (s, 3H), 3.20 (t, J = 12.6 Hz, 1H), 3.13-3.04 (m, 2H), 2.65 (dd, J_1 = 10.8 Hz, J_2 = 14.4 Hz, 1H), 2.45 (dd, J_1 = 3.6 Hz, J_2 = 14.4 Hz, 1H), 2.10 (dd, J_1 = 3.0 Hz, J_2 = 12.6 Hz, 1H), 2.03-1.95 (m, 2H), 1.71-1.67 (m, 1H), 1.56 (s, 3H), 1.52 (s, 3H), 1.49-1.13 (m, 13H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.87, 167.04, 167.01, 156.54, 151.09, 150.97, 129.89, 129.76, 128.40, 128.20, 127.50, 127.36, 81.07, 52.03, 52.01, 51.98, 42.80, 42.75, 42.33, 36.94, 30.37, 29.52, 24.29, 24.23, 24.19, 23.61, 23.37, 22.26, 21.49. HRMS (ESI-TOF) Calcd for $C_{33}H_{44}NO_7^+$ [M+H] $^+$: 566.3112, found: 566.3117.



Methyl 4-(3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)butyl)benzoate (2q)

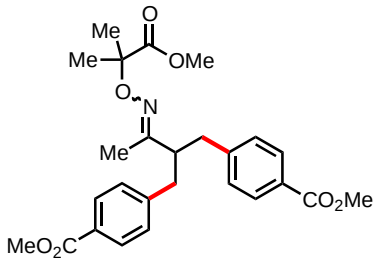
Substrate **1q** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent instead of HFIP. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2q** E/Z (2.7:1) was obtained as a colorless oil (24.4 mg, 76%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.95-7.93 (m, 2H), 7.25-7.24 (m, 2H), 3.90 (s, 3H), 3.68 (s, 3H), 2.88-2.85 (m, 2H), 2.50-2.48 (m, 2H), 1.87 (s, 3H), 1.44 (s, 6H). ^{1}H NMR (600 MHz, $CDCl_3$) of Z isomer (minor) δ 7.97-7.95 (m, 2H), 7.29-7.28 (m, 2H), 3.91 (s, 3.6H), 3.90 (s, 3H), 3.73 (s, 3H), 2.91-2.88 (m, 2H), 2.65-2.62 (m, 2H), 1.75 (s, 3H), 1.48 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.91, 167.06, 157.26, 156.56, 146.84, 129.71, 129.64, 128.40, 128.04, 127.90, 80.73, 80.54, 51.97, 51.94, 36.99, 32.14, 31.58, 30.98, 24.16, 24.12, 20.47, 14.59. HRMS (ESI-TOF) Calcd for $C_{17}H_{24}NO_5^+$ [M+H] $^+$: 322.1649, found: 322.1658.



Methyl 4-(3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)-2-methylbutyl)benzoate (2r-mono)

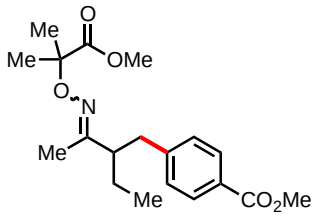
Substrate **1r** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent instead of HFIP. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2r-mono** E/Z (8.3:1) was obtained as a colorless oil (10.4 mg, 31%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.94-7.92 (m, 2H), 7.21-7.20 (m, 2H), 3.90 (s, 3H), 3.66 (s, 3H), 2.92-2.87 (m, 1H), 2.70-2.62 (m, 2H), 1.82

(s, 3H), 1.42 (s, 3H), 1.38 (s, 3H), 1.05 (d, J = 6.6 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.93, 167.11, 160.18, 145.80, 129.52, 129.02, 127.92, 80.76, 51.96, 51.89, 41.22, 40.12, 24.16, 23.96, 17.89, 12.24. HRMS (ESI-TOF) Calcd for $C_{18}H_{26}NO_5^+$ $[M+H]^+$: 336.1805, found: 336.1812.



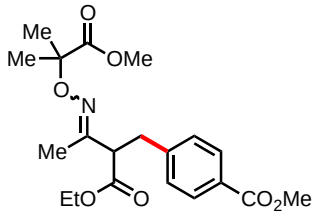
Dimethyl 4,4'-(2-(1-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)ethyl)propane-1,3-diyl)dibenzoate (2r-di)

Substrate **1r** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent instead of HFIP. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2r-di** E/Z (7.3:1) was obtained as a colorless oil (25.9 mg, 55%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.94-7.92 (m, 4H), 7.19-7.18 (m, 4H), 3.89 (s, 6H), 3.59 (s, 3H), 2.92-2.86 (m, 3H), 2.79-2.76 (m, 2H), 1.70 (s, 3H), 1.32 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.79, 166.99, 157.63, 145.00, 129.60, 128.97, 128.13, 80.84, 51.97, 51.88, 48.32, 38.79, 23.99, 13.22. HRMS (ESI-TOF) Calcd for $C_{26}H_{32}NO_7^+$ $[M+H]^+$: 470.2173, found: 470.2180.



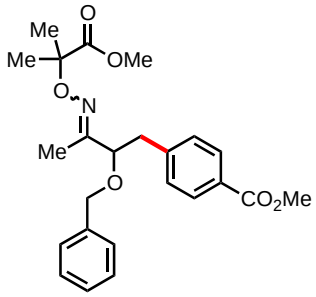
Methyl 4-(2-ethyl-3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)butyl)benzoate (2s)

Substrate **1s** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent instead of HFIP. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2s** E/Z (9.1:1) was obtained as a colorless oil (28.6 mg, 82%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.93-7.92 (m, 2H), 7.20-7.19 (m, 2H), 3.89 (s, 3H), 3.64 (s, 3H), 2.82-2.72 (m, 2H), 2.51 (quintet, J = 7.2 Hz, 1H), 1.75 (s, 3H), 1.48 (quintet, J = 7.2 Hz, 2H), 1.42 (s, 3H), 1.37 (s, 3H), 0.82 (t, J = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.02, 167.11, 158.57, 145.76, 129.50, 128.97, 127.88, 80.71, 51.95, 51.86, 48.02, 38.50, 24.90, 24.13, 23.92, 11.77, 11.28. HRMS (ESI-TOF) Calcd for $C_{19}H_{28}NO_5^+$ $[M+H]^+$: 350.1962, found: 350.1961.



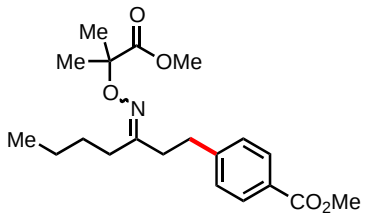
Methyl 4-(2-(ethoxycarbonyl)-3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)butyl)benzoate (2t)

Substrate **1t** was arylated following the general arylation procedure at 120 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2t** E/Z (3.9:1) was obtained as a colorless oil (31.4 mg, 80%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.94-7.92 (m, 2H), 7.25-7.23 (m, 2H), 4.15-4.06 (m, 2H), 3.90 (s, 3H), 3.66 (s, 3H), 3.57 (t, J = 7.8 Hz, 2H), 3.23 (dd, J_1 = 7.8 Hz, J_1 = 14.4 Hz, 1H), 3.04 (dd, J_1 = 7.8 Hz, J_1 = 14.4 Hz, 1H), 1.88 (s, 3H), 1.44 (s, 3H), 1.39 (s, 3H), 1.19 (t, J = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.54, 174.47, 170.99, 170.87, 167.00, 166.97, 154.02, 153.52, 144.41, 144.01, 129.65, 129.04, 128.93, 128.36, 81.31, 81.13, 61.09, 60.99, 52.84, 52.02, 51.99, 51.95, 47.22, 34.90, 24.10, 24.08, 24.02, 23.90, 14.06, 14.04, 12.96. HRMS (ESI-TOF) Calcd for $C_{20}H_{28}NO_7^+$ $[M+H]^+$: 394.1860, found: 394.1862.



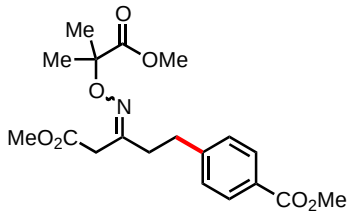
Methyl 4-(2-(benzyloxy)-3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)butyl)benzoate (2u)

Substrate **1u** was arylated following the general arylation procedure at 100 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2e** E/Z (12:1) was obtained as a colorless oil (17.1 mg, 40%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.93-7.92 (m, 2H), 7.27-7.23 (m, 5H), 7.14-7.13 (m, 2H), 4.43 (d, J = 12.0 Hz, 1H), 4.22 (d, J = 12.0 Hz, 1H), 4.12 (dd, J_1 = 6.0 Hz, J_2 = 8.4 Hz, 1H), 3.91 (s, 3H), 3.66 (s, 3H), 3.06 (dd, J_1 = 8.4 Hz, J_2 = 13.8 Hz, 1H), 2.85 (dd, J_1 = 6.0 Hz, J_2 = 13.8 Hz, 1H), 1.91 (s, 3H), 1.48 (s, 3H), 1.41 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.62, 167.09, 156.91, 143.08, 129.53, 129.48, 129.41, 128.28, 128.24, 127.67, 127.63, 81.18, 80.15, 70.42, 52.00, 39.40, 24.19, 23.91, 9.53. HRMS (ESI-TOF) Calcd for $C_{24}H_{30}NO_6^+$ $[M+H]^+$: 428.2068, found: 428.2067.



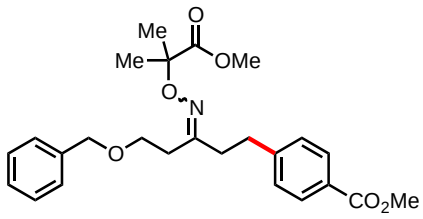
Methyl 4-(3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)heptyl)benzoate (2v)

Substrate **1v** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent instead of HFIP. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2v** E/Z (1.2:1) was obtained as a colorless oil (27.2 mg, 75%). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.97-7.93 (m, 4.5H), 7.29-7.28 (m, 2.4H), 7.26-7.24 (m, 2H), 3.91 (s, 3.6H), 3.90 (s, 3H), 3.72 (s, 3.6H), 3.68 (s, 3H), 2.91-2.89 (m, 2.4H), 2.87-2.84 (m, 2H), 2.59-2.57 (m, 2.4H), 2.49-2.46 (m, 2H), 2.33-2.30 (m, 2H), 2.06-2.04 (m, 2.4H), 1.49 (s, 7.2H), 1.45 (s, 6H), 1.48-1.39 (m, 4.4H), 1.36-1.31 (m, 2H), 1.29-1.25 (m, 2.5H), 0.91 (t, *J* = 7.2 Hz, 3H), 0.86 (t, *J* = 7.2 Hz, 3.6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.98, 174.96, 167.10, 167.07, 159.91, 159.88, 147.24, 147.14, 129.78, 129.70, 129.61, 128.40, 128.37, 127.99, 80.67, 80.66, 51.96, 51.93, 51.88, 51.86, 35.19, 34.17, 32.04, 31.80, 30.04, 29.64, 28.23, 28.08, 27.80, 25.83, 24.12, 24.08, 22.65, 22.08, 13.78, 13.75. HRMS (ESI-TOF) Calcd for $C_{20}H_{30}NO_5^+$ $[M+H]^+$: 364.2118, found: 364.2113.



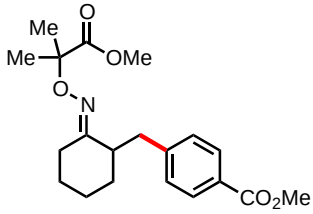
Methyl 4-(5-methoxy-3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)-5-oxopentyl)benzoate (2w)

Substrate **1w** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2w** E/Z (1.8:1) was obtained as a colorless oil (29.9 mg, 79%). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.97-7.94 (m, 3.1H), 7.29-7.25 (m, 3.1H), 3.91 (s, 1.6H), 3.90 (s, 3H), 3.72 (s, 1.6H), 3.69 (s, 3H), 3.68 (s, 4.6H), 3.34 (s, 2H), 3.08 (s, 1.1H), 2.94-2.90 (m, 3.2H), 2.73-2.70 (m, 1.1H), 2.63-2.60 (m, 2H), 1.50 (s, 3.5H), 1.44 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.52, 174.44, 169.98, 169.24, 167.06, 167.03, 154.12, 152.52, 146.63, 129.78, 129.66, 128.41, 128.38, 128.14, 127.96, 81.33, 52.03, 52.00, 51.96, 39.95, 35.85, 34.68, 31.69, 31.34, 30.16, 24.06, 23.99. HRMS (ESI-TOF) Calcd for $C_{19}H_{26}NO_7^+$ $[M+H]^+$: 380.1704, found: 380.1700.



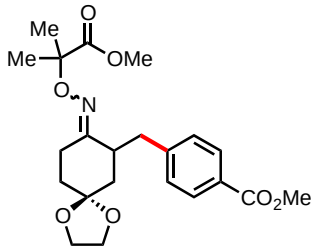
Methyl 4-(5-(benzyloxy)-3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)pentyl)benzoate (2x)

Substrate **1x** was arylated following the general arylation procedure at 100 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2x** E/Z (1:1.2) was obtained as a colorless oil (30.9 mg, 70%). ^{1}H NMR (600 MHz, $CDCl_3$) of E/Z mixture δ 7.95-7.91 (m, 3.7H), 7.35-7.28 (m, 5.1H), 7.25-7.23 (m, 1.7H), 7.22-7.20 (m, 2H), 4.50 (s, 2H), 4.47 (s, 1.7H), 3.91 (s, 2.5H), 3.90 (s, 3H), 3.69 (s, 2.4H), 3.68-3.67 (m, 2H), 3.66 (s, 3H), 3.61-3.59 (m, 1.7H), 2.91-2.88 (m, 1.8H), 2.88-2.85 (m, 2H), 2.67-2.65 (m, 2H), 2.64-2.62 (m, 1.8H), 2.57-2.54 (m, 2H), 2.40-2.38 (m, 1.7H), 1.48 (s, 5.5H), 1.43 (s, 5.5H). ^{13}C NMR (150 MHz, $CDCl_3$) of E/Z mixture δ 174.82, 167.13, 167.08, 157.87, 157.65, 147.18, 146.98, 138.22, 129.73, 129.61, 128.43, 128.41, 128.37, 128.35, 128.03, 127.80, 127.63, 127.60, 127.58, 127.55, 80.89, 80.88, 72.94, 72.83, 67.31, 66.58, 51.99, 51.96, 51.93, 36.06, 34.87, 31.90, 31.61, 30.52, 29.66, 24.11, 24.09. HRMS (ESI-TOF) Calcd for $C_{25}H_{32}NO_6^+$ $[M+H]^+$: 442.2224, found: 442.2228.



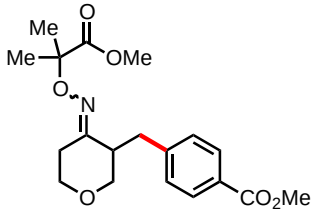
(*E*)-Methyl 4-((2-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)cyclohexyl)methyl)benzoate (2y)

Substrate **1y** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent instead of HFIP. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2y** E/Z (>20:1) was obtained as a colorless oil (28.2 mg, 78%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.93-7.92 (m, 2H), 7.22-7.21 (m, 2H), 3.89 (s, 3H), 3.68 (s, 3H), 3.14 (dd, J_1 = 6.0 Hz, J_2 = 13.8 Hz, 1H), 3.05-3.01 (m, 1H), 2.54 (dd, J_1 = 7.8 Hz, J_2 = 13.8 Hz, 1H), 2.49-2.45 (m, 1H), 2.00-1.95 (m, 1H), 1.79-1.72 (m, 3H), 1.53-1.39 (m, 2H), 1.45 (s, 3H), 1.44 (s, 3H), 1.31-1.26 (m, 1H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.98, 167.15, 161.60, 146.70, 129.42, 129.13, 80.69, 51.91, 51.88, 43.81, 37.20, 33.08, 26.24, 24.90, 24.51, 24.11, 23.95. HRMS (ESI-TOF) Calcd for $C_{20}H_{28}NO_5^+$ $[M+H]^+$: 362.1962, found: 362.1960.



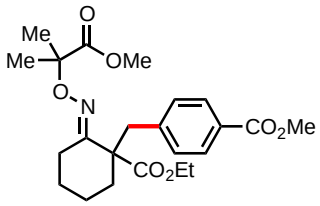
Methyl
4-((8-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)-1,4-dioxaspiro[4.5]decan-7-yl)methyl)benzoate (2z)

Substrate **1z** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent and AgOAc (2.0 equiv) instead of HFIP and AgTFA (2.0 equiv) respectively. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 3:1 as eluent), **2z** E/Z (4.5:1) was obtained as a colorless oil (27.2 mg, 65%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.93-7.92 (m, 2H), 7.23-7.21 (m, 2H), 3.95-3.85 (m, 4H), 3.90 (s, 3H), 3.68 (s, 3H), 3.20-3.16 (m, 2H), 2.85-2.79 (m, 1H), 2.56 (dd, J_1 = 8.4 Hz, J_2 = 14.4 Hz, 1H), 2.16 (ddd, J_1 = 5.4 Hz, J_2 = 12.6 Hz, J_3 = 14.4 Hz, 1H), 1.85-1.76 (m, 2H), 1.74-1.67 (m, 1H), 1.52-1.48 (m, 1H), 1.47 (s, 3H), 1.45 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.82, 167.19, 159.61, 146.21, 129.51, 129.48, 129.18, 108.00, 81.00, 64.52, 64.35, 51.95, 40.88, 40.53, 36.84, 33.81, 24.10, 24.00, 21.69. HRMS (ESI-TOF) Calcd for $C_{22}H_{30}NO_7^+$ $[M+H]^+$: 420.2017, found: 420.2021.



Methyl
4-((4-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)tetrahydro-2*H*-pyran-3-yl)methyl)benzoate (2aa)

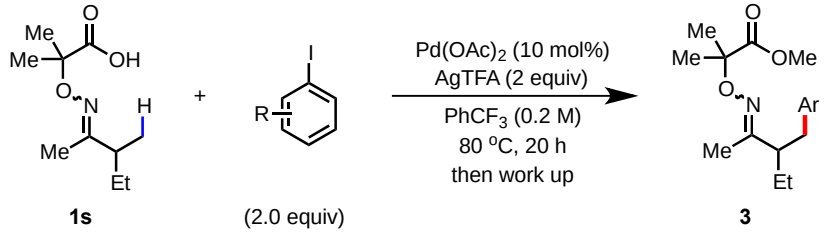
Substrate **1aa** was arylated following the general arylation procedure at 80 °C except the use of $PhCF_3$ as solvent instead of HFIP. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 3:1 as eluent), **2aa** E/Z (15:1) was obtained as a colorless oil (27.2 mg, 75%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.95-7.93 (m, 2H), 7.24-7.23 (m, 2H), 3.90 (s, 3H), 3.80-3.71 (m, 3H), 3.69 (s, 3H), 3.50-3.47 (m, 1H), 3.09-3.05 (m, 1H), 2.82 (ddd, J_1 = 4.8 Hz, J_2 = 6.0 Hz, J_3 = 14.4 Hz, 1H), 2.73-2.67 (m, 2H), 2.82 (ddd, J_1 = 5.4 Hz, J_2 = 7.2 Hz, J_3 = 14.4 Hz, 1H), 1.44 (s, 3H), 1.43 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.69, 167.04, 157.09, 145.07, 129.65, 129.09, 128.12, 80.99, 71.87, 67.38, 51.99, 43.17, 34.71, 25.40, 24.10, 23.94. HRMS (ESI-TOF) Calcd for $C_{19}H_{26}NO_6^+$ $[M+H]^+$: 364.1755, found: 364.1750.



(*E*)-Methyl 4-((1-(ethoxycarbonyl)-2-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)cyclohexyl)methyl)benzoate (2ab)

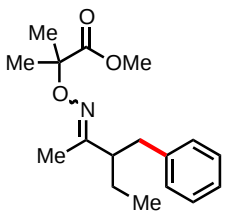
Substrate **1ab** was arylated following the general arylation procedure at 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **2ab** was obtained as a colorless oil (38.1 mg, 88%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.90-7.88 (m, 2H), 7.20-718 (m, 2H), 4.03 (q, *J* = 7.2 Hz, 2H), 3.89 (s, 3H), 3.74 (s, 1.6H), 3.39 (d, *J* = 13.8 Hz, 1H), 3.31-3.27 (m, 1H), 2.92 (d, *J* = 13.8 Hz, 1H), 2.29-2.26 (m, 1H), 1.79-1.73 (m, 2H), 1.68-1.64 (m, 1H), 1.54 (s, 3H), 1.53 (s, 3H), 1.52-1.46 (m, 1H), 1.43-1.35 (m, 2H), 1.14 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.83, 172.44, 167.08, 159.87, 143.07, 130.52, 129.02, 128.26, 81.26, 60.89, 55.03, 51.99, 51.94, 41.08, 35.78, 25.56, 24.34, 24.18, 24.01, 22.69, 13.98. HRMS (ESI-TOF) Calcd for $C_{23}H_{32}NO_7^+$ [M+H] $^+$: 434.2173, found: 434.2169.

The Scope of Aryl Iodides



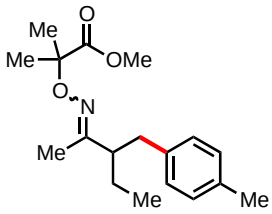
1s (2.0 equiv) **3**

General Procedure for *β*-C(sp^3)–H Arylation of 1s: Substrate **1s** (0.10 mmol, 20.1 mg), ArI (0.20 mmol), $Pd(OAc)_2$ (0.01 mmol, 2.3 mg), and AgTFA (0.20 mmol, 44.2 mg) were weighed into a reaction vial (10 mL) with a magnetic stir bar under air. $PhCF_3$ (0.5 mL) was added, and the vial was sealed with a cap. The reaction mixture was stirred at 80 °C for 20 hours. Upon completion, the reaction mixture was cooled to room temperature and diluted with EtOAc. Then the reaction mixture was filtered through a short celite plug and transferred to a reaction vial (10 mL) with a magnetic stir bar. The solvent was evaporated under vacuum. Anhydrous MeOH (1.0 mL) was added to the mixture. $SOCl_2$ (0.30 mmol, 22 μL) was added dropwise at room temperature. The reaction mixture was stirred at room temperature for 30 min. Upon completion, the solvent was removed under vacuum and the resulting mixture was purified by preparative thin-layer chromatography.



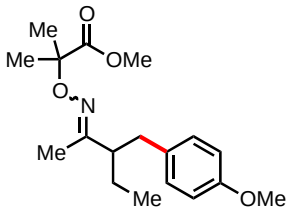
Methyl 2-(((3-benzylpentan-2-ylidene)amino)oxy)-2-methylpropanoate (3a)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3a** E/Z (9.1:1) was obtained as a colorless oil (25.9 mg, 89%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.25-7.23 (m, 2H), 7.16-7.14 (m, 1H), 7.12-7.11 (m, 2H), 3.64 (s, 3H), 2.76-2.73 (m, 1H), 2.69-2.65 (m, 1H), 2.51-2.46 (m, 1H), 1.76 (s, 3H), 1.49-1.45 (m, 2H), 1.43 (s, 3H), 1.37 (s, 3H), 0.81 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.10, 159.07, 140.09, 128.92, 128.12, 125.83, 80.64, 51.83, 48.26, 38.63, 24.70, 24.13, 23.91, 11.60, 11.38. HRMS (ESI-TOF) Calcd for $C_{17}H_{26}NO_3^+$ $[M+H]^+$: 292.1907, found: 292.1913.



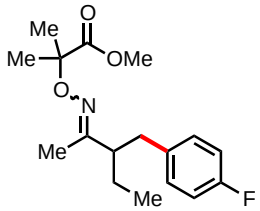
Methyl 2-methyl-2-(((3-(4-methylbenzyl)pentan-2-ylidene)amino)oxy)propanoate (3b)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3b** E/Z (9.1:1) was obtained as a colorless oil (28.1 mg, 92%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.06-7.04 (m, 2H), 7.01-7.00 (m, 2H), 3.64 (s, 3H), 2.72-2.69 (m, 1H), 2.64-2.60 (m, 1H), 2.48-2.43 (m, 1H), 2.29 (s, 3H), 1.74 (s, 3H), 1.48-1.42 (m, 2H), 1.43 (s, 3H), 1.39 (s, 3H), 0.80 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.14, 159.24, 136.97, 135.21, 128.80, 80.62, 51.81, 48.32, 38.21, 24.59, 24.13, 23.92, 20.93, 11.60, 11.39. HRMS (ESI-TOF) Calcd for $C_{18}H_{28}NO_3^+$ $[M+H]^+$: 306.2064, found: 306.2068.



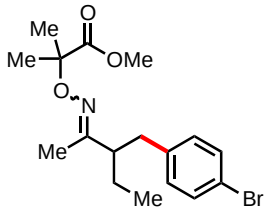
Methyl 2-(((3-(4-methoxybenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3c)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3c** E/Z (9.1:1) was obtained as a colorless oil (28.6 mg, 89%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.04-7.03 (m, 2H), 6.80-6.78 (m, 2H), 3.77 (s, 3H), 3.65 (s, 3H), 2.70-2.66 (m, 1H), 2.63-2.59 (m, 1H), 2.45-2.40 (m, 1H), 1.75 (s, 3H), 1.48-1.38 (m, 2H), 1.43 (s, 3H), 1.39 (s, 3H), 0.80 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.13, 159.23, 157.78, 132.17, 129.81, 113.56, 80.63, 55.19, 51.84, 48.47, 37.77, 24.61, 24.14, 23.95, 11.60, 11.41. HRMS (ESI-TOF) Calcd for $C_{18}H_{28}NO_4^+$ $[M+H]^+$: 322.2013, found: 322.2008.



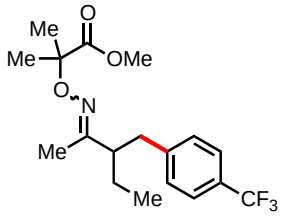
Methyl 2-(((3-(4-fluorobenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3d)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3d** E/Z (9.1:1) was obtained as a colorless oil (25.6 mg, 83%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.08-7.06 (m, 2H), 6.95-6.91 (m, 2H), 3.64 (s, 3H), 2.73-2.64 (m, 2H), 2.46-2.42 (m, 1H), 1.74 (s, 3H), 1.49-1.38 (m, 2H), 1.42 (s, 3H), 1.38 (s, 3H), 0.82 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.05, 161.27 (d, *J* = 242.7 Hz), 158.79, 135.72 (d, *J* = 3.2 Hz), 130.23 (d, *J* = 7.6 Hz), 114.85 (d, *J* = 21.0 Hz), 80.66, 51.84, 48.40, 37.72, 24.77, 24.12, 23.91, 11.59, 11.35. HRMS (ESI-TOF) Calcd for $C_{17}H_{25}FNO_3^+$ $[M+H]^+$: 310.1813, found: 310.1810.



Methyl 2-(((3-(4-bromobenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3e)

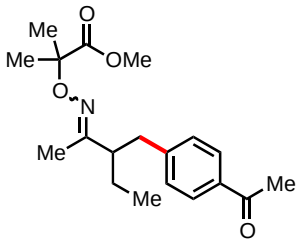
Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3e** E/Z (9.1:1) was obtained as a colorless oil (33.3 mg, 90%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.37-7.35 (m, 2H), 7.00-6.98 (m, 2H), 3.64 (s, 3H), 2.71-2.62 (m, 2H), 2.47-2.42 (m, 1H), 1.74 (s, 3H), 1.49-1.38 (m, 2H), 1.42 (s, 3H), 1.38 (s, 3H), 0.82 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.01, 158.61, 139.10, 131.17, 130.66, 119.62, 80.68, 51.87, 48.16, 37.88, 24.81, 24.11, 23.92, 11.65, 11.31. HRMS (ESI-TOF) Calcd for $C_{17}H_{25}BrNO_3^+$ $[M+H]^+$: 370.1012, found: 370.1018.



Methyl
2-methyl-2-(((3-(4-(trifluoromethyl)benzyl)pentan-2-ylidene)amino)oxy)propanoate (3f)

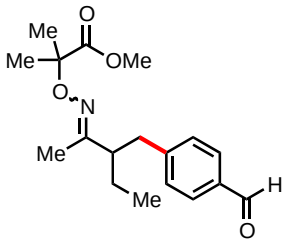
Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3f** E/Z (9.1:1) was obtained as a colorless oil (32.3 mg, 90%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ

7.51-7.49 (m, 2H), 7.24-7.22 (m, 2H), 3.62 (s, 3H), 2.82-2.73 (m, 2H), 2.53-2.48 (m, 1H), 1.76 (s, 3H), 1.50 (quintet, *J* = 7.2 Hz, 2H), 1.41 (s, 3H), 1.35 (s, 3H), 0.84 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.97, 158.36, 144.34, 129.20, 128.23 (q, *J* = 31.6 Hz), 125.05 (q, *J* = 3.4 Hz), 124.31 (q, *J* = 270.2 Hz), 80.72, 51.81, 48.10, 38.22, 24.94, 24.08, 23.84, 11.65, 11.26. HRMS (ESI-TOF) Calcd for $C_{18}H_{25}F_3NO_3^+$ [M+H] $^+$: 360.1781, found: 360.1787.



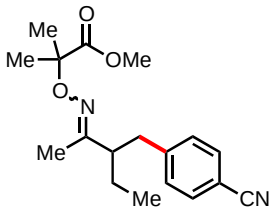
Methyl 2-(((3-(4-acetylbenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3g)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3g** E/Z (9.1:1) was obtained as a colorless oil (25.0 mg, 75%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.86-7.85 (m, 2H), 7.23-7.21 (m, 2H), 3.64 (s, 3H), 2.83-2.80 (m, 1H), 2.76-2.73 (m, 1H), 2.57 (s, 3H), 2.54-2.49 (m, 1H), 1.76 (s, 3H), 1.49 (quintet, *J* = 7.2 Hz, 2H), 1.42 (s, 3H), 1.37 (s, 3H), 0.83 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 197.82, 174.97, 158.53, 146.07, 135.09, 129.14, 128.32, 80.71, 51.85, 48.01, 38.44, 26.52, 24.90, 24.12, 23.90, 11.79, 11.26. HRMS (ESI-TOF) Calcd for $C_{19}H_{28}NO_4^+$ [M+H] $^+$: 334.2013, found: 334.2010.



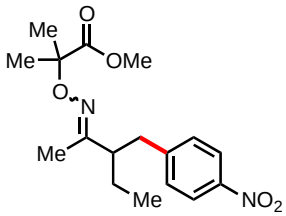
Methyl 2-(((3-(4-formylbenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3h)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3h** E/Z (9.1:1) was obtained as a colorless oil (26.2 mg, 82%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 9.96 (s, 1H), 7.78-7.76 (m, 2H), 7.30-7.29 (m, 2H), 3.63 (s, 3H), 2.86-2.82 (m, 1H), 2.79-2.76 (m, 1H), 2.56-2.51 (m, 1H), 1.76 (s, 3H), 1.50 (quintet, *J* = 7.2 Hz, 2H), 1.41 (s, 3H), 1.36 (s, 3H), 0.84 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 191.94, 174.93, 158.36, 147.75, 134.54, 129.72, 129.61, 80.73, 51.86, 47.99, 38.60, 24.98, 24.11, 23.89, 11.79, 11.25. HRMS (ESI-TOF) Calcd for $C_{18}H_{26}NO_4^+$ [M+H] $^+$: 320.1856, found: 320.1851.



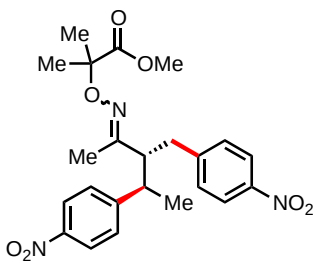
Methyl 2-(((3-(4-cyanobenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3i)

Substrate **1s** was arylated following the general arylation procedure except the use of HFIP (1.0 mL) as solvent instead of $PhCF_3$ (0.5 mL). After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3i** E/Z (9.1:1) was obtained as a colorless oil (29.7 mg, 94%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.55-7.53 (m, 2H), 7.24-7.23 (m, 2H), 3.64 (s, 3H), 2.83-2.79 (m, 1H), 2.77-2.73 (m, 1H), 2.52-2.47 (m, 1H), 1.75 (s, 3H), 1.53-1.47 (m, 2H), 1.41 (s, 3H), 1.36 (s, 3H), 0.84 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.83, 158.07, 145.94, 131.93, 129.69, 118.99, 109.73, 80.72, 51.83, 47.89, 38.37, 24.98, 24.07, 23.86, 11.76, 11.17. HRMS (ESI-TOF) Calcd for $C_{18}H_{25}N_2O_3^+$ $[M+H]^+$: 317.1860, found: 317.1868.



Methyl 2-methyl-2-(((3-(4-nitrobenzyl)pentan-2-ylidene)amino)oxy)propanoate (3j-mono)

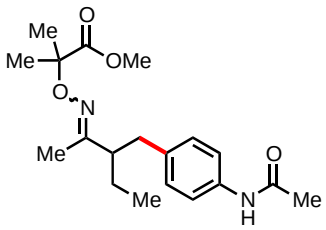
Substrate **1s** was arylated following the general arylation procedure except the use of HFIP (1.0 mL) as solvent instead of $PhCF_3$ (0.5 mL). After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3j-mono** E/Z (9.1:1) was obtained as a colorless oil (26.9 mg, 80%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 8.13-7.10 (m, 2H), 7.30-7.28 (m, 2H), 3.64 (s, 3H), 2.89-2.85 (m, 1H), 2.82-2.78 (m, 1H), 2.55-2.50 (m, 1H), 1.76 (s, 3H), 1.54-1.50 (m, 2H), 1.41 (s, 3H), 1.37 (s, 3H), 0.85 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.82, 158.01, 148.20, 146.36, 129.72, 123.39, 80.76, 51.84, 47.94, 38.10, 25.07, 24.09, 23.90, 11.88, 11.16. HRMS (ESI-TOF) Calcd for $C_{17}H_{25}N_2O_5^+$ $[M+H]^+$: 337.1758, found: 337.1752.



Methyl 2-methyl-2-((((3*R*,4*R*)-3-(4-nitrobenzyl)-4-(4-nitrophenyl)pentan-2-ylidene)amino)oxy)p

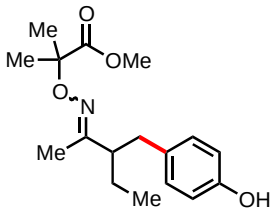
ropanoate (1j-di)

Substrate **1s** was arylated following the general arylation procedure except the use of HFIP (1.0 mL) as solvent instead of $PhCF_3$ (0.5 mL). After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **1j-di** E/Z (10:1) was obtained as a colorless oil (6.4 mg, 14%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 8.16-8.15 (m, 2H), 8.12-8.10 (m, 2H), 7.36-7.34 (m, 2H), 7.26-7.25 (m, 2H), 3.59 (s, 3H), 3.16-3.11 (m, 1H), 3.06 (d, J_1 = 3.6 Hz, J_2 = 13.8 Hz, 1H), 2.90 (d, J_1 = 11.4 Hz, J_2 = 13.8 Hz, 1H), 2.84-2.80 (m, 1H), 1.49 (s, 3H), 1.42 (d, J = 6.6 Hz, 3H), 1.24 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.46, 156.17, 152.48, 147.49, 146.60, 146.49, 129.76, 128.47, 123.65, 123.49, 80.84, 53.54, 51.91, 42.54, 35.65, 24.03, 18.92, 13.86. HRMS (ESI-TOF) Calcd for $C_{23}H_{28}N_3O_7^+$ $[M+H]^+$: 458.1922, found: 458.1921.



Methyl 2-(((3-(4-acetamidobenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3k)

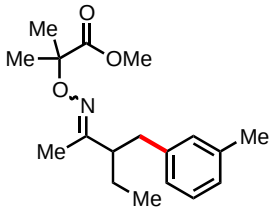
Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 1:1 as eluent), **3k** E/Z (9.1:1) was obtained as a colorless oil (24.4 mg, 70%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.48 (br s, 1H), 7.39-7.37 (m, 2H), 7.07-7.05 (m, 2H), 3.66 (s, 3H), 2.72-2.68 (m, 1H), 2.64-2.60 (m, 1H), 2.46-2.42 (m, 1H), 2.14 (s, 3H), 1.76 (s, 3H), 1.48-1.43 (m, 2H), 1.43 (s, 3H), 1.39 (s, 3H), 0.80 (t, J = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.21, 168.35, 159.17, 136.09, 135.85, 129.35, 119.77, 80.63, 51.88, 48.23, 37.96, 24.61, 24.44, 24.14, 23.94, 11.67, 11.33. HRMS (ESI-TOF) Calcd for $C_{19}H_{29}N_2O_4^+$ $[M+H]^+$: 349.2122, found: 349.2127.



Methyl 2-(((3-(4-hydroxybenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3l)

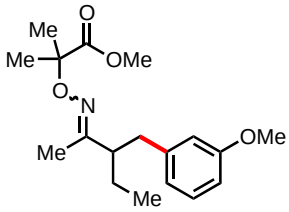
Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3l** E/Z (9.1:1) was obtained as a colorless oil (27.0 mg, 88%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 6.98-6.95 (m, 2H), 6.72-6.70 (m, 2H), 5.26 (s, 1H), 3.66 (s, 3H), 2.68-2.64 (m, 1H), 2.61-2.58 (m, 1H), 2.44-2.40 (m, 1H), 1.75 (s, 3H), 1.48-1.39 (m, 2H), 1.44 (s, 3H), 1.39 (s, 3H), 0.80 (t, J = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.41, 159.55, 153.87, 132.02, 129.96, 115.01, 80.65, 51.98, 48.48, 37.76, 24.63, 24.15, 23.95, 11.55, 11.43. HRMS

(ESI-TOF) Calcd for $C_{17}H_{26}NO_4^+$ $[M+H]^+$: 308.1856, found: 308.1862.



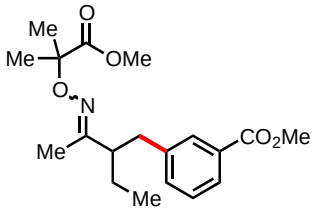
Methyl 2-methyl-2-(((3-(3-methylbenzyl)pentan-2-ylidene)amino)oxy)propanoate (3m)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3m** E/Z (9.1:1) was obtained as a colorless oil (26.2 mg, 86%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.13 (t, *J* = 7.2 Hz, 1H), 6.97 (d, *J* = 7.8 Hz, 1H), 6.94 (s, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 3.65 (s, 3H), 2.73-2.69 (m, 1H), 2.64-2.60 (m, 1H), 2.50-2.45 (m, 1H), 2.30 (s, 3H), 1.76 (s, 3H), 1.47-1.42 (m, 2H), 1.43 (s, 3H), 1.39 (s, 3H), 0.80 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.13, 159.24, 140.01, 137.62, 129.73, 128.00, 126.58, 125.97, 80.64, 51.83, 48.20, 38.56, 24.63, 24.16, 23.92, 21.34, 11.58, 11.40. HRMS (ESI-TOF) Calcd for $C_{18}H_{28}NO_3^+$ $[M+H]^+$: 306.2064, found: 306.2068.



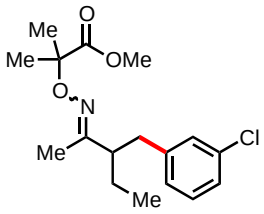
Methyl 2-(((3-(3-methoxybenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3n)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3n** E/Z (9.1:1) was obtained as a colorless oil (26.6 mg, 83%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.16 (t, *J* = 7.8 Hz, 1H), 6.72-6.70 (m, 2H), 6.68-6.66 (m, 1H), 3.78 (s, 3H), 3.65 (s, 3H), 2.74-2.71 (m, 1H), 2.66-2.62 (m, 1H), 2.50-2.45 (m, 1H), 1.76 (s, 3H), 1.49-1.42 (m, 2H), 1.43 (s, 3H), 1.39 (s, 3H), 0.81 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.10, 159.46, 159.11, 141.71, 129.06, 121.39, 114.62, 111.24, 80.65, 55.07, 51.82, 48.14, 38.70, 24.66, 24.15, 23.92, 11.67, 11.36. HRMS (ESI-TOF) Calcd for $C_{18}H_{28}NO_4^+$ $[M+H]^+$: 322.2013, found: 322.2019.



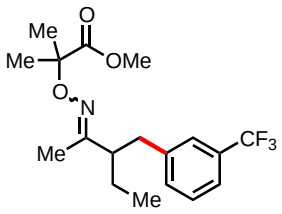
Methyl 3-(2-ethyl-3-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)butyl)benzoate (3o)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **3o** E/Z (9.1:1) was obtained as a colorless oil (30.7 mg, 88%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.86-7.84 (m, 1H), 7.81 (s, 1H), 7.33-7.32 (m, 2H), 3.91 (s, 3H), 3.64 (s, 3H), 2.82-2.78 (m, 1H), 2.75-2.71 (m, 1H), 2.54-2.49 (m, 1H), 1.76 (s, 3H), 1.48 (quintet, *J* = 7.2 Hz, 2H), 1.42 (s, 3H), 1.36 (s, 3H), 0.82 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.99, 167.16, 158.65, 140.46, 133.59, 130.00, 129.97, 128.19, 127.21, 80.66, 51.99, 51.81, 48.11, 38.26, 24.73, 24.11, 23.86, 11.71, 11.28. HRMS (ESI-TOF) Calcd for $C_{19}H_{28}NO_5^+$ $[M+H]^+$: 350.1962, found: 350.1969.



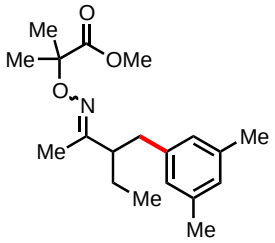
Methyl 2-(((3-(3-chlorobenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3p)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3p** E/Z (9.1:1) was obtained as a colorless oil (30.3 mg, 93%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.18-7.11 (m, 3H), 7.01-7.00 (m, 1H), 3.65 (s, 3H), 2.74-2.70 (m, 1H), 2.67-2.64 (m, 1H), 2.50-2.45 (m, 1H), 1.76 (s, 3H), 1.49-1.45 (m, 2H), 1.43 (s, 3H), 1.39 (s, 3H), 0.82 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.00, 158.55, 142.19, 133.88, 129.36, 128.96, 127.13, 126.05, 80.70, 51.84, 48.01, 38.09, 24.80, 24.13, 23.89, 11.67, 11.27. HRMS (ESI-TOF) Calcd for $C_{17}H_{25}ClNO_3^+$ $[M+H]^+$: 326.1517, found: 326.1522.



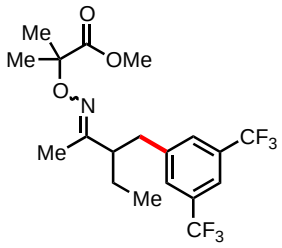
Methyl
2-methyl-2-(((3-(3-(trifluoromethyl)benzyl)pentan-2-ylidene)amino)oxy)propanoate (3q)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3q** E/Z (9.1:1) was obtained as a colorless oil (32.3 mg, 90%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.43-7.42 (m, 1H), 7.38-7.35 (m, 2H), 7.32-7.30 (m, 1H), 3.64 (s, 3H), 2.83-2.79 (m, 1H), 2.76-2.73 (m, 1H), 2.53-2.48 (m, 1H), 1.76 (s, 3H), 1.49 (quintet, *J* = 7.2 Hz, 2H), 1.41 (s, 3H), 1.35 (s, 3H), 0.84 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.97, 158.42, 141.08, 132.33, 130.46 (q, *J* = 31.8 Hz), 128.57, 125.51 (q, *J* = 4.2 Hz), 124.21 (q, *J* = 270.4 Hz), 122.79 (q, *J* = 4.2 Hz), 80.72, 51.81, 48.07, 38.23, 24.89, 24.13, 23.81, 11.72, 11.25. HRMS (ESI-TOF) Calcd for $C_{18}H_{25}F_3NO_3^+$ $[M+H]^+$: 360.1781, found: 360.1789.



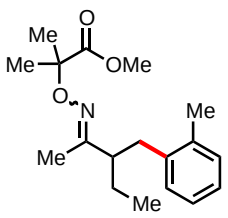
Methyl 2-(((3-(3,5-dimethylbenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3r)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3r** E/Z (9.1:1) was obtained as a colorless oil (29.7 mg, 93%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 6.80 (s, 1H), 6.74 (s, 2H), 3.66 (s, 3H), 2.69-2.66 (m, 1H), 2.59-2.55 (m, 1H), 2.49-2.44 (m, 1H), 2.26 (s, 6H), 1.76 (s, 3H), 1.49-1.44 (m, 2H), 1.44 (s, 3H), 1.40 (s, 3H), 0.80 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.12, 159.38, 139.94, 137.48, 127.47, 126.79, 80.61, 51.79, 48.11, 38.47, 24.54, 24.16, 23.91, 21.20, 11.52, 11.40. HRMS (ESI-TOF) Calcd for $C_{19}H_{30}NO_3^+$ $[M+H]^+$: 320.2220, found: 320.2215.



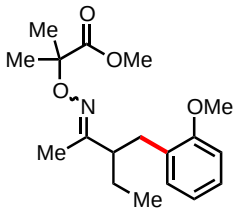
Methyl 2-(((3-(3,5-bis(trifluoromethyl)benzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3s)

Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3s** E/Z (6.5:1) was obtained as a colorless oil (30.7 mg, 72%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.69 (s, 1H), 7.58 (s, 2H), 3.65 (s, 3H), 2.92-2.88 (m, 1H), 2.84-2.81 (m, 1H), 2.57-2.52 (m, 1H), 1.77 (s, 3H), 1.57-1.50 (m, 2H), 1.40 (s, 3H), 1.35 (s, 3H), 0.86 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.82, 157.81, 142.74, 131.41 (q, *J* = 32.8 Hz), 129.00, 123.37 (q, *J* = 268.6 Hz), 120.09 (q, *J* = 3.2 Hz), 80.83, 51.83, 47.83, 37.91, 25.07, 24.13, 23.77, 11.98, 11.11. HRMS (ESI-TOF) Calcd for $C_{19}H_{24}F_6NO_3^+$ $[M+H]^+$: 428.1655, found: 428.1650.

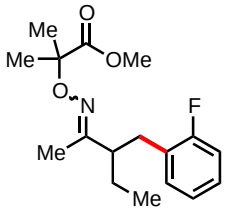


Methyl 2-methyl-2-(((3-(2-methylbenzyl)pentan-2-ylidene)amino)oxy)propanoate (3t)

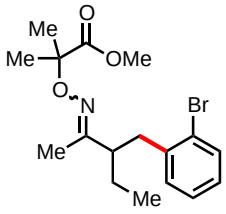
Substrate **1s** was arylated following the general arylation procedure except the use of HFIP (1.0 mL) as solvent instead of $PhCF_3$ (0.5 mL). After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3t** E/Z (11:1) was obtained as a colorless oil (21.4 mg, 70%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.12-7.05 (m, 4H), 3.65 (s, 3H), 2.75-2.72 (m, 1H), 2.66-2.62 (m, 1H), 2.47-2.42 (m, 1H), 2.28 (s, 3H), 1.77 (s, 3H), 1.53-1.47 (m, 2H), 1.44 (s, 3H), 1.40 (s, 3H), 0.81 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.14, 159.35, 138.34, 136.16, 130.18, 129.60, 126.02, 125.61, 80.69, 51.84, 47.02, 36.26, 24.72, 24.15, 23.95, 19.51, 11.58, 11.55. HRMS (ESI-TOF) Calcd for $C_{18}H_{28}NO_3^+$ $[M+H]^+$: 306.2064, found: 306.2069.



Methyl 2-(((3-(2-methoxybenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3u)
Substrate **1s** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3u** E/Z (9.1:1) was obtained as a colorless oil (21.2 mg, 66%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.15-7.13 (m, 1H), 7.07-7.05 (m, 1H), 6.85-6.82 (m, 1H), 6.81-6.80 (m, 1H), 3.80 (s, 3H), 3.64 (s, 3H), 2.74-2.66 (m, 2H), 2.53-2.48 (m, 1H), 1.77 (s, 3H), 1.49-1.44 (m, 2H), 1.42 (s, 3H), 1.36 (s, 3H), 0.81 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.21, 159.60, 157.51, 130.52, 128.57, 127.07, 120.14, 110.12, 80.54, 55.16, 51.80, 46.75, 32.97, 24.82, 24.17, 23.89, 11.52, 11.47. HRMS (ESI-TOF) Calcd for $C_{18}H_{28}NO_4^+$ $[M+H]^+$: 322.2013, found: 322.2008.

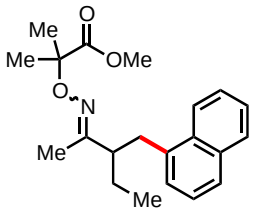


Methyl 2-(((3-(2-fluorobenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3v)
Substrate **3v** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3v** E/Z (10:1) was obtained as a colorless oil (24.1 mg, 78%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.16-7.11 (m, 2H), 7.03-7.00 (m, 1H), 6.98-6.95 (m, 1H), 3.64 (s, 3H), 2.78-2.71 (m, 2H), 2.53-2.48 (m, 1H), 1.78 (s, 3H), 1.52-1.47 (m, 2H), 1.42 (s, 3H), 1.35 (s, 3H), 0.83 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.08, 161.15 (d, *J* = 242.8 Hz), 158.83, 131.20 (d, *J* = 4.4 Hz), 127.58 (d, *J* = 8.8 Hz), 127.00 (d, *J* = 15.3 Hz), 123.73 (d, *J* = 3.2 Hz), 115.06 (d, *J* = 21.0 Hz), 80.66, 51.83, 47.23, 31.51, 24.81, 24.14, 23.86, 11.52, 11.34. HRMS (ESI-TOF) Calcd for $C_{17}H_{25}FNO_3^+$ $[M+H]^+$: 310.1813, found: 310.1819.



Methyl 2-(((3-(2-bromobenzyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (3w)

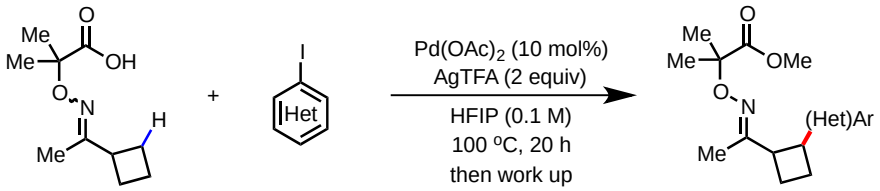
Substrate **1s** was arylated following the general arylation procedure except the use of HFIP (1.0 mL) as solvent instead of $PhCF_3$ (0.5 mL). After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3w** E/Z (9.1:1) was obtained as a colorless oil (25.9 mg, 70%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.51-7.49 (m, 1H), 7.20-7.18 (m, 1H), 7.16-7.14 (m, 1H), 7.04-7.01 (m, 1H), 3.66 (s, 3H), 2.89-2.85 (m, 1H), 2.83-2.80 (m, 1H), 2.61-2.56 (m, 1H), 1.79 (s, 3H), 1.56-1.46 (m, 2H), 1.44 (s, 3H), 1.38 (s, 3H), 0.84 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.08, 158.78, 139.49, 132.73, 131.16, 127.61, 127.09, 80.71, 51.86, 46.64, 38.54, 24.83, 24.18, 23.93, 12.05, 11.37. HRMS (ESI-TOF) Calcd for $C_{17}H_{25}BrNO_3^+$ $[M+H]^+$: 370.1012, found: 370.1018.



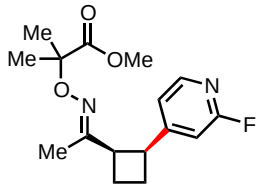
Methyl 2-methyl-2-(((3-(naphthalen-1-ylmethyl)pentan-2-ylidene)amino)oxy)propanoate (3x)

Substrate **1s** was arylated following the general arylation procedure except the use of HFIP (1.0 mL) as solvent instead of $PhCF_3$ (0.5 mL) and the reaction temperature is 100 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 10:1 as eluent), **3x** E/Z (9.1:1) was obtained as a colorless oil (23.9 mg, 70%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 7.99 (d, *J* = 8.4 Hz, 1H), 7.83 (d, *J* = 7.8 Hz, 1H), 7.69 (d, *J* = 8.4 Hz, 1H), 7.51-7.48 (m, 1H), 7.47-7.44 (m, 1H), 7.37-7.34 (m, 1H), 7.27-7.26 (m, 1H), 3.63 (s, 3H), 3.25-3.21 (m, 1H), 3.08-3.04 (m, 1H), 2.69-2.64 (m, 1H), 1.81 (s, 3H), 1.57-1.52 (m, 2H), 1.45 (s, 3H), 1.39 (s, 3H), 0.81 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 175.08, 159.40, 136.17, 133.88, 131.96, 128.73, 126.96, 126.78, 125.79, 125.36, 125.26, 123.84, 80.71, 51.81, 47.36, 36.02, 24.87, 24.15, 23.96, 11.66, 11.43. HRMS (ESI-TOF) Calcd for $C_{21}H_{28}NO_3^+$ $[M+H]^+$: 342.2064, found: 342.2061.

The Scope of Heteroaryl Iodides

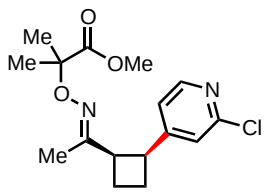


General Procedure for *β*-C(sp^3)–H Heteroarylation of 1m: Substrate **1m** (0.10 mmol, 19.9 mg), (Het)ArI (0.15 mmol), $Pd(OAc)_2$ (0.01 mmol, 2.3 mg), and AgTFA (0.20 mmol, 44.2 mg) were weighed into a reaction vial (10 mL) with a magnetic stir bar under air. HFIP (1.0 mL) was added, and the vial was sealed with a cap. The reaction mixture was stirred at 100 °C for 20 hours. Upon completion, the reaction mixture was cooled to room temperature and diluted with EtOAc. Then the reaction mixture was filtered through a short celite plug and transferred to a reaction vial (10 mL) with a magnetic stir bar. The solvent was evaporated under vacuum. Anhydrous MeOH (1.0 mL) was added to the mixture. $SOCl_2$ (0.30 mmol, 22 μL) was added dropwise at room temperature. The reaction mixture was stirred at room temperature for 30 min. Upon completion, the solvent was removed under vacuum and the resulting mixture was purified by preparative thin-layer chromatography. The assignment of cis/trans structure was based on ^{1}H NMR patterns by comparing with literatures.[2]



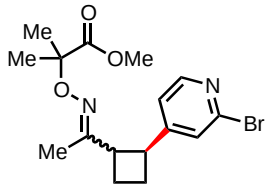
Methyl 2-(((*E*)-(1-(2-(2-fluoropyridin-4-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoate (4a)

Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4a** was obtained as a colorless oil (21.3 mg, 69%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.08 (d, *J* = 5.4 Hz, 1H), 7.02-7.01 (m, 1H), 6.77 (s, 1H), 3.74 (q, *J* = 9.0 Hz, 1H), 3.69 (s, 3H), 3.01 (q, *J* = 9.0 Hz, 1H), 2.26-2.22 (m, 1H), 2.20-2.15 (m, 1H), 2.14-2.08 (m, 1H), 2.01-1.95 (m, 1H), 1.83 (s, 3H), 1.52 (s, 3H), 1.49 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.80, 164.05 (d, *J* = 236.0 Hz), 159.43 (d, *J* = 8.2 Hz), 157.91, 147.15 (d, *J* = 15.4 Hz), 119.79, 107.32 (d, *J* = 36.2 Hz), 81.10, 51.98, 47.36, 41.11, 24.24, 24.06, 23.94, 23.56, 12.42. HRMS (ESI-TOF) Calcd for $C_{16}H_{22}FN_2O_3^+$ $[M+H]^+$: 309.1609, found: 309.1615.



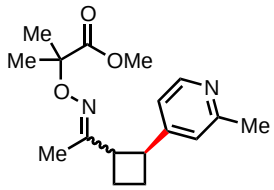
Methyl 2-(((*E*)-(1-(2-(2-chloropyridin-4-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoate (4b)

Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4b** was obtained as a colorless oil (22.8 mg, 70%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.25 (d, *J* = 4.8 Hz, 1H), 7.18 (s, 1H), 7.06 (d, *J* = 4.8 Hz, 1H), 3.73-3.68 (m, 1H), 3.69 (s, 3H), 3.00 (q, *J* = 9.6 Hz, 1H), 2.25-2.20 (m, 1H), 2.20-2.15 (m, 1H), 2.13-2.06 (m, 1H), 2.00-1.94 (m, 1H), 1.83 (s, 3H), 1.52 (s, 3H), 1.49 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.76, 157.88, 156.74, 151.51, 149.29, 122.36, 120.89, 81.09, 52.01, 47.30, 40.94, 24.23, 24.07, 23.89, 23.61, 12.43. HRMS (ESI-TOF) Calcd for $C_{16}H_{22}ClN_2O_3^+$ $[M+H]^+$: 325.1313, found: 325.1310.



Methyl 2-(((*E*)-(1-(2-(2-bromopyridin-4-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoate (4c)

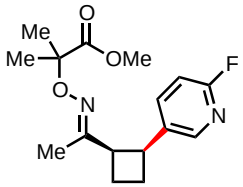
Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4c** cis/trans (3.0:1) was obtained as a colorless oil (25.1 mg, 68%). ^{1}H NMR (600 MHz, $CDCl_3$) of cis isomer (major) δ 8.23 (d, *J* = 5.4 Hz, 1H), 7.33 (s, 1H), 7.10-7.09 (m, 1H), 3.71-3.67 (m, 1H), 3.70 (s, 3H), 3.00 (q, *J* = 9.6 Hz, 1H), 2.25-2.15 (m, 2H), 2.12-2.06 (m, 1H), 2.00-1.94 (m, 1H), 1.83 (s, 3H), 1.51 (s, 3H), 1.49 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of cis isomer (major) δ 174.77, 156.51, 149.74, 149.62, 142.32, 126.19, 121.32, 81.11, 52.06, 47.30, 40.88, 24.24, 24.09, 23.90, 23.62, 12.45. HRMS (ESI-TOF) Calcd for $C_{16}H_{22}BrN_2O_3^+$ $[M+H]^+$: 369.0808, found: 369.0802.



Methyl 2-(((*E*)-(1-(2-(2-methylpyridin-4-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoate (4d)

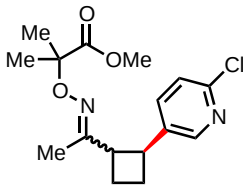
Substrate **1m** was arylated following the general arylation procedure except after the methyl ester formation, 1 mL of NaOH (aq. 2 M) was added to neutralize protonated product. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4d** cis/trans (1:1.4) was obtained as a colorless oil (17.6 mg, 58%). ^{1}H NMR (600 MHz, $CDCl_3$) of cis/trans mixture δ 8.37-8.35 (m, 2.4H), 7.01 (s, 1H), 6.99 (s, 1.4H), 6.95-6.93 (m, 1H), 6.92-6.91 (m, 1.4H), 3.79-3.73 (m, 5.8H), 3.70 (s, 3H), 3.63 (q, *J* = 9.6 Hz, 1H), 3.48-3.44 (m,

1.4H), 3.00 (q, *J* = 9.6 Hz, 1H), 2.52 (s, 7.4H), 2.47-2.41 (m, 1.5H), 2.33-1.97 (m, 9.2H), 1.82 (s, 3H), 1.51 (s, 3H), 1.49 (s, 3H), 1.42 (s, 8.3H), 1.35 (s, 4.1H). ^{13}C NMR (150 MHz, $CDCl_3$) of cis/trans mixture δ 174.90, 174.84, 158.20, 158.05, 157.99, 156.21, 153.46, 151.20, 148.81, 148.69, 122.50, 121.51, 120.20, 119.07, 81.00, 80.82, 51.93, 51.90, 47.30, 45.57, 42.37, 41.53, 24.30, 24.18, 24.10, 24.09, 24.03, 23.30, 20.71, 14.58, 12.43. HRMS (ESI-TOF) Calcd for $C_{17}H_{25}N_2O_3^+$ $[M+H]^+$: 305.1860, found: 305.1866.



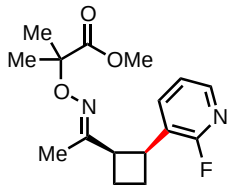
Methyl 2-(((*E*)-(1-(2-(6-fluoropyridin-3-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoate (4e)

Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4e** was obtained as a colorless oil (21.6 mg, 70%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.04-8.03 (m, 1H), 7.67-7.64 (m, 1H), 6.83 (dd, J_1 = 3.0 Hz, J_2 = 8.4 Hz, 1H), 3.70-3.66 (m, 1H), 3.69 (s, 3H), 2.96 (q, *J* = 9.0 Hz, 1H), 2.25-2.21 (m, 1H), 2.19-2.14 (m, 1H), 2.13-2.09 (m, 1H), 2.02-1.95 (m, 1H), 1.81 (s, 3H), 1.51 (s, 3H), 1.48 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.83, 162.26 (d, *J* = 236.4 Hz), 158.13, 145.71 (d, *J* = 14.2 Hz), 139.63 (d, *J* = 7.8 Hz), 137.19 (d, *J* = 4.8 Hz), 108.76 (d, *J* = 37.2 Hz), 81.05, 52.01, 48.09, 39.23, 24.56, 24.20, 24.07, 23.58, 12.44. HRMS (ESI-TOF) Calcd for $C_{16}H_{22}FN_2O_3^+$ $[M+H]^+$: 309.1609, found: 309.1616.



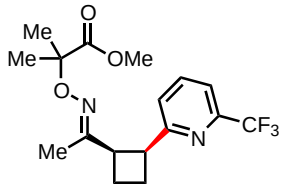
Methyl 2-(((*E*)-(1-(2-(6-chloropyridin-3-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoate (4f)

Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4f** cis/trans (7.1:1) was obtained as a colorless oil (21.1 mg, 65%). ^{1}H NMR (600 MHz, $CDCl_3$) of cis isomer (major) δ 8.22 (d, *J* = 2.4 Hz, 1H), 7.53 (dd, J_1 = 2.4 Hz, J_2 = 8.4 Hz, 1H), 7.23 (d, *J* = 7.8 Hz, 1H), 3.69 (s, 3H), 3.69-3.65 (m, 1H), 2.96 (q, *J* = 9.0 Hz, 1H), 2.25-2.21 (m, 1H), 2.19-2.15 (m, 1H), 2.13-2.07 (m, 1H), 2.02-1.95 (m, 1H), 1.81 (s, 3H), 1.50 (s, 3H), 1.48 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) cis isomer (major) δ 174.82, 158.06, 148.23, 138.48, 137.34, 123.65, 81.06, 52.03, 57.96, 39.33, 24.40, 24.21, 24.10, 23.62, 12.47. HRMS (ESI-TOF) Calcd for $C_{16}H_{22}ClN_2O_3^+$ $[M+H]^+$: 325.1313, found: 325.1317.



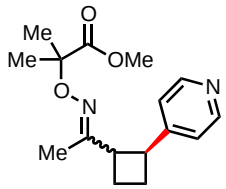
Methyl 2-(((*E*)-(1-(2-(2-fluoropyridin-3-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoate (4g)

Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4g** was obtained as a colorless oil (16.0 mg, 52%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.03 (d, *J* = 4.8 Hz, 1H), 7.68-7.64 (m, 1H), 7.13-7.10 (m, 1H), 3.71 (q, *J* = 9.6 Hz, 1H), 3.64 (s, 3H), 3.19 (q, *J* = 9.0 Hz, 1H), 2.31-2.26 (m, 1H), 2.16-2.03 (m, 3H), 1.85 (s, 3H), 1.47 (s, 3H), 1.46 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.86, 161.56 (d, *J* = 238.4 Hz), 157.94, 144.94 (d, *J* = 14.2 Hz), 138.86 (d, *J* = 6.3 Hz), 125.68 (d, *J* = 29.6 Hz), 121.24 (d, *J* = 3.4 Hz), 81.00, 51.88, 45.88, 37.20 (d, *J* = 3.3 Hz), 25.08 (d, *J* = 2.0 Hz), 24.12, 24.06, 23.26. HRMS (ESI-TOF) Calcd for $C_{16}H_{22}FN_2O_3^+$ [M+H] $^+$: 309.1609, found: 309.1615.



Methyl 2-methyl-2-(((*E*)-(1-(2-(6-(trifluoromethyl)pyridin-2-yl)cyclobutyl)ethylidene)amino)oxy)propanoate (4h)

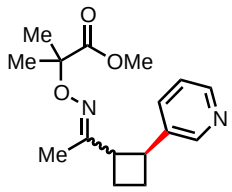
Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4h** was obtained as a colorless oil (19.7 mg, 55%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.72 (t, *J* = 7.8 Hz, 1H), 7.47 (d, *J* = 7.8 Hz, 1H), 7.33 (t, *J* = 8.4 Hz, 1H), 3.80 (q, *J* = 9.0 Hz, 1H), 3.66 (s, 3H), 3.26 (q, *J* = 9.6 Hz, 1H), 2.46-2.39 (m, 1H), 2.18-2.13 (m, 2H), 2.05-1.98 (m, 1H), 1.79 (s, 3H), 1.50 (s, 3H), 1.46 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.98, 163.53, 158.62, 147.61 (q, *J* = 33.9 Hz), 137.05, 125.02, 121.65 (q, *J* = 272.7 Hz), 117.74 (q, *J* = 3.0 Hz), 80.97, 51.85, 46.28, 44.46, 24.13, 24.05, 23.54, 22.91, 12.58. HRMS (ESI-TOF) Calcd for $C_{17}H_{22}F_3N_2O_3^+$ [M+H] $^+$: 359.1577, found: 359.1580.



(*E*)-Methyl 2-methyl-2-(((1-(2-(pyridin-4-yl)cyclobutyl)ethylidene)amino)oxy)propanoate (4i)

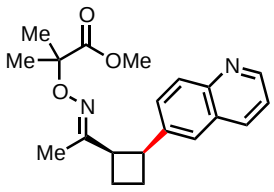
Substrate **1m** was arylated following the general arylation procedure except the reaction

temperature was 120 °C and after the methyl ester formation, 1 mL of NaOH (aq. 2 M) was added to neutralize protonated product. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 2:1 as eluent), **4i** cis/trans (1:1.8) was obtained as a colorless oil (12.2 mg, 42%). ^{1}H NMR (600 MHz, $CDCl_3$) of cis/trans mixture δ 8.49-8.47 (m, 5.6H), 7.14-7.11 (m, 5.6H), 3.81 (q, *J* = 9.0 Hz, 1.8H), 3.74 (s, 5.4H), 3.71-3.66 (m, 1H), 3.67 (s, 3H), 3.51-3.46 (m, 1.8H), 3.01 (q, *J* = 9.0 Hz, 1H), 2.48-2.42 (m, 2H), 2.38-1.96 (m, 12H), 1.82 (s, 3H), 1.51 (s, 3H), 1.49 (s, 3H), 1.42 (s, 5.3H), 1.41 (s, 5.3H), 1.35 (s, 5.3H). ^{13}C NMR (150 MHz, $CDCl_3$) of cis/trans mixture δ 174.92, 174.85, 158.12, 156.03, 153.27, 151.03, 149.44, 149.37, 123.07, 122.03, 81.06, 80.87, 51.95, 47.36, 45.58, 42.40, 41.49, 24.21, 24.15, 24.13, 24.08, 24.06, 23.39, 20.72, 24.56, 12.44. HRMS (ESI-TOF) Calcd for $C_{16}H_{23}N_2O_3^+$ $[M+H]^+$: 291.1703, found: 291.1709.



(*E*)-Methyl
2-methyl-2-(((1-(2-(pyridin-3-yl)cyclobutyl)ethylidene)amino)oxy)propanoate (4j)

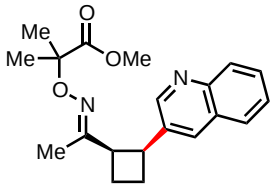
Substrate **1m** was arylated following the general arylation procedure except the reaction temperature was 120 °C and after the methyl ester formation, 1 mL of NaOH (aq. 2 M) was added to neutralize protonated product. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 2:1 as eluent), **4j** cis/trans (1:2.5) was obtained as a colorless oil (13.3 mg, 46%). ^{1}H NMR (600 MHz, $CDCl_3$) of cis/trans mixture δ 8.47-8.42 (m, 7.2H), 7.59-7.54 (m, 3.6H), 7.23-7.19 (m, 3.6H), 3.86 (q, *J* = 9.0 Hz, 2.6fH), 3.75 (s, 7.6H), 3.71-3.66 (m, 1H), 3.68 (s, 3H), 3.48-3.44 (m, 2.5H), 3.01 (q, *J* = 9.0 Hz, 1H), 2.52-2.46 (m, 2.6H), 2.38-2.34 (m, 2.6H), 2.30-2.23 (m, 4.5H), 2.18-2.11 (m, 4.5H), 2.04-1.99 (m, 1H), 1.81 (s, 3H), 1.50 (s, 3H), 1.48 (s, 3H), 1.44 (s, 15.0H), 1.31 (s, 7.5H), 1.35 (s, 5.3H). ^{13}C NMR (150 MHz, $CDCl_3$) of cis/trans mixture δ 174.99, 174.88, 158.20, 156.05, 149.42, 148.50, 147.67, 147.38, 139.46, 137.15, 135.02, 134.90, 134.24, 123.09, 81.02, 80.87, 51.98, 51.95, 47.87, 45.70, 42.03, 40.65, 40.18, 39.16, 24.54, 24.19, 24.15, 24.09, 23.44, 20.50, 14.79, 12.46. HRMS (ESI-TOF) Calcd for $C_{16}H_{23}N_2O_3^+$ $[M+H]^+$: 291.1703, found: 291.1708.



Methyl
2-methyl-2-(((*E*)-(1-(2-(quinolin-6-yl)cyclobutyl)ethylidene)amino)oxy)propanoate (4k)

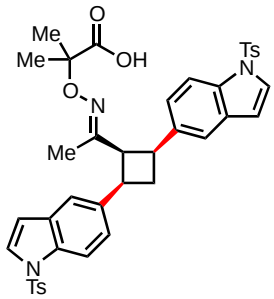
Substrate **1m** was arylated following the general arylation procedure except after the methyl ester formation, 1 mL of NaOH (aq. 2 M) was added to neutralize protonated product. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 3:1 as eluent), **4k** was obtained as a colorless oil (19.7 mg, 58%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.85 (dd, J_1 =

1.8 Hz, J_2 = 4.2 Hz, 1H), 8.13 (d, J = 8.4 Hz, 1H), 8.01 (d, J = 8.4 Hz, 1H), 7.64-7.62 (m, 2H), 7.37 (dd, J_1 = 4.2 Hz, J_2 = 7.8 Hz, 1H), 3.85 (q, J = 9.0 Hz, 1H), 3.64 (s, 3H), 3.11 (q, J = 9.6 Hz, 1H), 2.33-2.28 (m, 1H), 2.25-2.15 (m, 2H), 2.08-2.02 (m, 1H), 1.85 (s, 3H), 1.53 (s, 3H), 1.41 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.96, 158.55, 149.69, 147.17, 142.80, 135.76, 129.19, 129.08, 124.54, 121.06, 81.00, 51.94, 48.04, 42.57, 24.88, 24.22, 24.12, 23.15, 12.49. HRMS (ESI-TOF) Calcd for $C_{20}H_{25}N_2O_3^+$ $[M+H]^+$: 341.1860, found: 341.1867.



Methyl 2-methyl-2-(((*E*)-(1-(2-(quinolin-3-yl)cyclobutyl)ethylidene)amino)oxy)propanoate (4l)

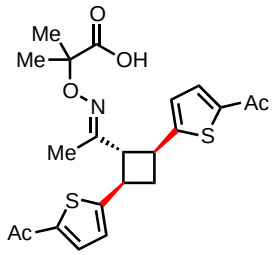
Substrate **1m** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 3:1 as eluent), **4k** was obtained as a colorless oil (17.0 mg, 50%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.74-8.73 (m, 1H), 8.07 (d, J = 8.4 Hz, 1H), 8.03 (s, 1H), 7.82 (d, J = 8.4 Hz, 1H), 7.68-7.65 (m, 1H), 7.54-7.52 (m, 1H), 4.05 (q, J = 8.4 Hz, 1H), 3.73 (s, 3H), 3.55-3.51 (m, 1H), 2.57-2.52 (m, 1H), 2.44-2.40 (m, 2H), 2.23-2.16 (m, 1H), 1.40 (s, 3H), 1.39 (s, 3H), 1.29 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.95, 156.05, 151.40, 146.92, 134.53, 133.76, 128.99, 128.78, 128.04, 127.66, 126.56, 80.88, 51.95, 46.02, 40.82, 24.72, 24.16, 24.13, 20.55, 15.02. HRMS (ESI-TOF) Calcd for $C_{20}H_{25}N_2O_3^+$ $[M+H]^+$: 341.1860, found: 341.1868.



2-(((*E*)-(1-(2,4-bis(1-tosyl-1*H*-indol-5-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoic acid (4m)

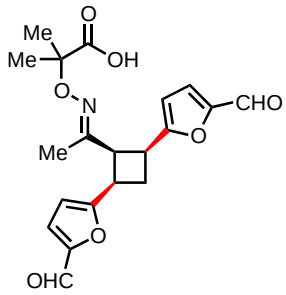
Substrate **1m** was arylated following the general arylation procedure except 2.0 equiv of heteroaryl iodide and AgOAc were used and the reaction temperature was 80 °C. The product was isolated as the acid form without further esterification. After purification by preparative thin-layer chromatography (Hexane : EtOAc : HOAc = 1:1:0.01 as eluent), **4m** was obtained as a colorless oil (55.4 mg, 75%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.87 (d, J = 8.4 Hz, 2H), 7.74-7.72 (m, 4H), 7.51 (d, J = 3.6 Hz, 2H), 7.27 (s, 2H), 7.21-7.19 (m, 4H), 7.05 (dd, J_1 = 1.2 Hz, J_2 = 8.4 Hz, 2H), 6.58 (dd, J_1 = 0.6 Hz, J_2 = 3.6 Hz, 2H), 4.13-4.08 (m, 2H), 4.06-4.03 (m, 1H), 3.03 (q, J = 10.8 Hz, 1H), 2.80-2.75 (m, 1H), 2.32 (s, 6H), 1.04 (s, 3H), 0.90 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 175.33, 160.41, 144.86, 135.91, 135.19, 133.30, 130.91, 129.81, 126.75, 126.68, 123.40, 118.99, 113.29, 108.98, 80.83, 51.80, 38.25, 29.75, 23.59,

21.49, 16.33. HRMS (ESI-TOF) Calcd for $C_{40}H_{38}N_3O_7S_2^-$ [M-H]$^-$: 736.2157, found: 736.2162.



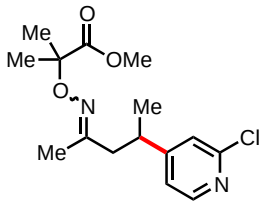
2-(((*E*)-(1-(2,4-bis(5-acetylthiophen-2-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoic acid (4o)

Substrate **1m** was arylated following the general arylation procedure except 2.0 equiv of heteroaryl iodide was used and the reaction temperature was 80 °C. The product was isolated as the acid form without further esterification. After purification by preparative thin-layer chromatography (Hexane : EtOAc : HOAc = 1:1:0.02 as eluent), **4o** was obtained as a colorless oil (29.1 mg, 65%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.56 (d, *J* = 3.6 Hz, 1H), 6.92 (d, *J* = 3.6 Hz, 1H), 3.74 (q, *J* = 10.2 Hz, 2H), 3.09 (t, *J* = 9.6 Hz, 1H), 2.89-2.85 (m, 1H), 2.53 (s, 6H), 2.35 (q, *J* = 10.2 Hz, 1H), 1.79 (s, 3H), 1.56 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 190.68, 176.78, 157.18, 156.42, 142.74, 132.97, 125.03, 81.42, 59.11, 36.24, 36.07, 26.48, 24.14, 13.49. HRMS (ESI-TOF) Calcd for $C_{22}H_{24}NO_5S_2^-$ [M-H]$^-$: 446.1101, found: 446.1100.



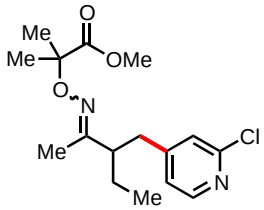
2-(((*E*)-(1-(2,4-bis(5-formylfuran-2-yl)cyclobutyl)ethylidene)amino)oxy)-2-methylpropanoic acid (4p)

Substrate **1m** was arylated following the general arylation procedure except 2.0 equiv of heteroaryl iodide and AgOAc were used and the reaction temperature was 80 °C. The product was isolated as the acid form without further esterification. After purification by preparative thin-layer chromatography (Hexane : EtOAc : HOAc = 1:1:0.02 as eluent), **4p** was obtained as a colorless oil (27.9 mg, 72%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 9.48 (s, 2H), 7.22 (d, *J* = 3.6 Hz, 2H), 6.36 (d, *J* = 3.6 Hz, 2H), 3.94-3.89 (m, 2H), 3.84-3.81 (m, 1H), 3.13 (q, *J* = 10.8 Hz, 1H), 2.70-2.65 (m, 1H), 1.37 (s, 3H), 1.26 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 177.12, 175.56, 161.51, 155.20, 151.83, 124.43, 110.06, 81.48, 50.21, 33.51, 28.20, 23.67, 15.27. HRMS (ESI-TOF) Calcd for $C_{20}H_{20}NO_7^-$ [M-H]$^-$: 386.1245, found: 386.1240.



Methyl 2-(((4-(2-chloropyridin-4-yl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (4q)

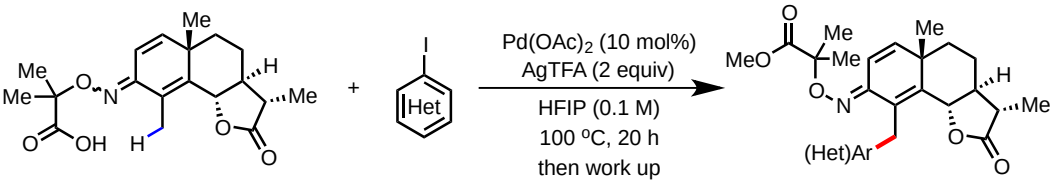
Substrate **1a** was arylated following the general arylation procedure except the reaction temperature was 120 °C and after the methyl ester formation, 1 mL of NaOH (aq. 2 M) was added to neutralize protonated product. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4q** E/Z (5.3:1) was obtained as a colorless oil (12.5 mg, 40%). ^{1}H NMR (600 MHz, $CDCl_3$) of E isomer (major) δ 8.27 (d, J = 5.4 Hz, 1H), 7.15 (s, 1H), 7.04 (dd, J_1 = 1.8 Hz, J_2 = 5.4 Hz, 1H), 3.67 (s, 3H), 3.10-3.04 (m, 1H), 2.49-2.39 (m, 2H), 1.82 (s, 3H), 1.40 (s, 3H), 1.39 (s, 3H), 1.23 (d, J = 6.6 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.76, 158.90, 155.01, 151.61, 149.60, 122.85, 121.32, 80.81, 51.97, 43.00, 36.06, 24.13, 24.01, 21.28, 14.67. HRMS (ESI-TOF) Calcd for $C_{15}H_{22}ClN_2O_3^+$ $[M+H]^+$: 313.1313, found: 313.1309.



Methyl 2-(((3-((2-chloropyridin-4-yl)methyl)pentan-2-ylidene)amino)oxy)-2-methylpropanoate (4r)

Substrate **1s** was arylated following the general arylation procedure except the reaction temperature was 120 °C and after the methyl ester formation, 1 mL of NaOH (aq. 2 M) was added to neutralize protonated product. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 5:1 as eluent), **4r** E/Z (8.3:1) was obtained as a colorless oil (20.3 mg, 62%). ^{1}H NMR (400 MHz, $CDCl_3$) of E isomer (major) δ 8.25 (d, J = 5.2 Hz, 1H), 7.11 (s, 1H), 7.00 (dd, J_1 = 1.6 Hz, J_2 = 5.2 Hz, 1H), 3.65 (s, 3H), 2.79-2.65 (m, 2H), 2.55-2.48 (m, 1H), 1.77 (s, 3H), 1.55-1.47 (m, 2H), 1.42 (s, 3H), 1.38 (s, 3H), 0.85 (t, J = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) of E isomer (major) δ 174.81, 157.63, 152.75, 151.45, 149.28, 124.57, 123.11, 80.83, 51.88, 47.13, 37.07, 25.11, 24.10, 23.92, 11.89, 11.06. HRMS (ESI-TOF) Calcd for $C_{16}H_{24}ClN_2O_3^+$ $[M+H]^+$: 327.1470, found: 327.1475.

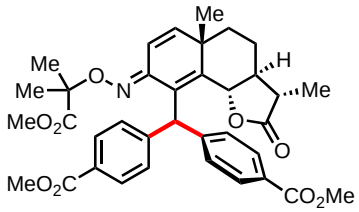
The Late-Stage *β*-C(sp^3)–H (Hetero)Arylation of Santonin



1ac (1.5 equiv) **5**

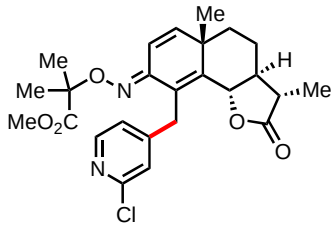
General Procedure for the Late-Stage *β*-C(sp^3)–H (Hetero)Arylation of Santonin:

Substrate **1ac** (0.10 mmol, 34.7 mg), (Het)ArI (0.15 mmol), $Pd(OAc)_2$ (0.01 mmol, 2.3 mg), and AgTFA (0.20 mmol, 44.2 mg) were weighed into a reaction vial (10 mL) with a magnetic stir bar under air. HFIP (1.0 mL) was added, and the vial was sealed with a cap. The reaction mixture was stirred at 100 °C for 20 hours. Upon completion, the reaction mixture was cooled to room temperature and diluted with EtOAc. Then the reaction mixture was filtered through a short celite plug and transferred to a reaction vial (10 mL) with a magnetic stir bar. The solvent was evaporated under vacuum. Anhydrous MeOH (1.0 mL) was added to the mixture. $SOCl_2$ (0.30 mmol, 22 μL) was added dropwise at room temperature. The reaction mixture was stirred at room temperature for 30 min. Upon completion, the solvent was removed under vacuum and the resulting mixture was purified by preparative thin-layer chromatography.



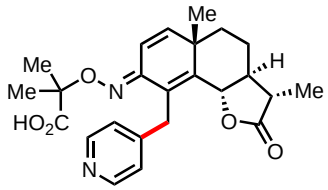
Dimethyl 4,4'-(((3*S*,3a*S*,5a*S*,9b*S*,*E*)-8-(((1-methoxy-2-methyl-1-oxopropan-2-yl)oxy)imino)-3,5a-dimethyl-2-oxo-2,3,3a,4,5,5a,8,9b-octahydronaphtho[1,2-*b*]furan-9-yl)methylene)dibenzoate (5a)

Substrate **1ac** was arylated following the general arylation procedure except 2.0 equiv of aryl iodide was used and the reaction temperature was 80 °C. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 1:1 as eluent), **5a** was obtained as a colorless oil (56.6 mg, 90%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.93-7.91 (m, 2H), 7.90-7.88 (m, 2H), 7.28-7.26 (m, 2H), 7.18-7.16 (m, 2H), 6.92 (d, *J* = 10.2 Hz, 1H), 6.58 (s, 1H), 6.02 (d, *J* = 10.2 Hz, 1H), 4.91 (d, *J* = 10.2 Hz, 1H), 3.89 (s, 3H), 3.88 (s, 3H), 3.45 (s, 3H), 2.32-2.25 (m, 1H), 2.01-1.96 (m, 1H), 1.84-1.80 (m, 1H), 1.73-1.54 (m, 3H), 1.37 (s, 3H), 1.11 (d, *J* = 6.6 Hz, 3H), 1.08 (s, 3H). 0.97 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 176.73, 174.03, 167.17, 167.13, 148.97, 148.00, 147.79, 144.62, 143.96, 129.26, 129.11, 128.40, 127.53, 127.32, 127.08, 113.60, 81.81, 81.38, 53.48, 52.01, 51.88, 51.84, 47.71, 41.98, 40.77, 38.79, 26.20, 24.03, 23.96, 23.71, 12.47. HRMS (ESI-TOF) Calcd for $C_{36}H_{40}NO_9^+$ $[M+H]^+$: 630.2698, found: 630.2692.



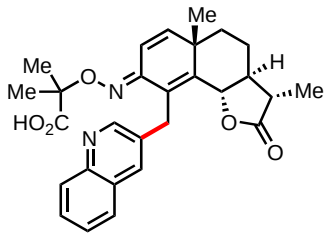
Methyl 2-(((*E*)-((3*S*,3a*S*,5a*S*,9b*S*)-9-((2-chloropyridin-4-yl)methyl)-3,5a-dimethyl-2-oxo-2,3,3a,4,5,5a-hexahydronaphtho[1,2-*b*]furan-8(9b*H*)-ylidene)amino)oxy)-2-methylpropanoate (5b)

Substrate **1ac** was arylated following the general arylation procedure. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 1:1 as eluent), **5b** was obtained as a colorless oil (36.4 mg, 77%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.19-8.18 (m, 1H), 7.08-7.07 (m, 1H), 7.04-7.03 (m, 1H), 6.89 (d, *J* = 10.2 Hz, 1H), 6.05 (d, *J* = 10.2 Hz, 1H), 4.80 (d, *J* = 10.8 Hz, 1H), 4.16 (d, *J* = 15.6 Hz, 1H), 4.00 (d, *J* = 15.0 Hz, 1H), 3.54 (s, 3H), 2.35-2.29 (m, 1H), 2.02-1.99 (m, 1H), 1.83-1.79 (m, 1H), 1.69-1.65 (m, 2H), 1.59-1.54 (m, 1H), 1.45 (s, 3H), 1.43 (s, 3H), 1.32 (s, 3H), 1.18 (d, *J* = 6.6 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 177.20, 174.25, 154.72, 151.15, 148.93, 148.47, 145.30, 142.01, 123.58, 122.72, 113.13, 82.00, 81.59, 53.68, 51.99, 41.17, 40.83, 38.47, 30.36, 25.99, 24.08, 24.00, 23.66, 12.49. HRMS (ESI-TOF) Calcd for $C_{25}H_{30}ClN_2O_5^+$ $[M+H]^+$: 473.1838, found: 473.1832.



2-(((*E*)-((3*S*,3a*S*,5a*S*,9b*S*)-3,5a-Dimethyl-2-oxo-9-(pyridin-4-ylmethyl)-2,3,3a,4,5,5a-hexahydronaphtho[1,2-*b*]furan-8(9b*H*)-ylidene)amino)oxy)-2-methylpropanoic acid (5c)

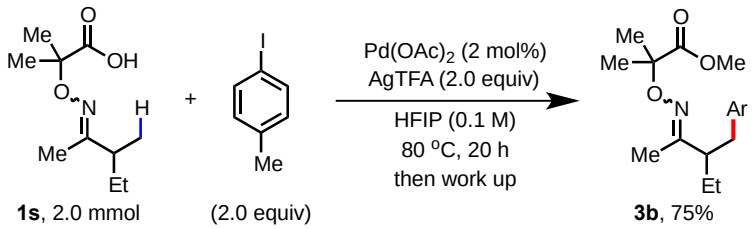
Substrate **1ac** was arylated following the general arylation procedure except the reaction temperature was 120 °C. The product was isolated as the acid form without further esterification. After purification by preparative thin-layer chromatography (EtOAc : MeOH : HOAc = 40:1:0.2 as eluent), **5c** was obtained as a colorless oil (22.5 mg, 53%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.19 (d, *J* = 5.4 Hz, 2H), 7.24 (d, *J* = 5.4 Hz, 2H), 6.97 (d, *J* = 10.2 Hz, 1H), 6.02 (d, *J* = 10.2 Hz, 1H), 4.76 (d, *J* = 11.4 Hz, 1H), 4.27 (d, *J* = 15.0 Hz, 1H), 4.10 (d, *J* = 15.6 Hz, 1H), 2.29-2.23 (m, 1H), 1.97-1.94 (m, 1H), 1.80-1.76 (m, 1H), 1.67-1.49 (m, 3H), 1.56 (s, 3H), 1.54 (s, 3H), 1.30 (s, 3H), 1.11 (d, *J* = 7.2 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 177.27, 154.56, 147.73, 145.52, 144.68, 141.10, 124.44, 124.02, 113.38, 82.52, 81.66, 53.57, 41.08, 40.80, 38.55, 30.83, 29.68, 25.92, 24.47, 24.05, 23.67, 12.41. HRMS (ESI-TOF) Calcd for $C_{24}H_{27}N_2O_5^-$ $[M-H]^-$: 423.1925, found: 423.1920.



2-(((*E*)-((3*S*,3a*S*,5a*S*,9b*S*)-3,5a-Dimethyl-2-oxo-9-(quinolin-3-ylmethyl)-2,3,3a,4,5,5a-hexahydronaphtho[1,2-*b*]furan-8(9b*H*)-ylidene)amino)oxy)-2-methylpropanoic acid (5d)

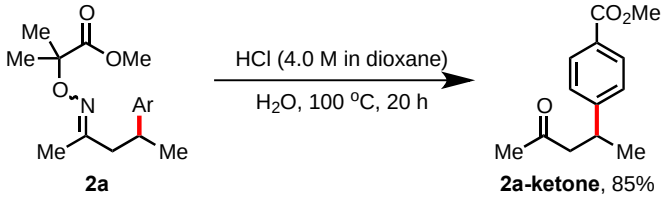
Substrate **1ac** was arylated following the general arylation procedure. The product was isolated as the acid form without further esterification. After purification by preparative thin-layer chromatography (Hexane : EtOAc = 1:2 as eluent), **5d** was obtained as a colorless oil (34.2 mg, 72%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.82 (s, 1H), 8.10 (s, 1H), 7.85 (d, *J* = 8.4 Hz, 1H), 7.69 (d, *J* = 7.8 Hz, 1H), 7.42-7.39 (m, 1H), 7.37-7.34 (m, 1H), 6.96 (d, *J* = 10.2 Hz, 1H), 6.02 (d, *J* = 10.2 Hz, 1H), 4.87-4.85 (m, 1H), 4.41 (d, *J* = 15.0 Hz, 1H), 4.22 (d, *J* = 14.4 Hz, 1H), 2.35-2.29 (m, 1H), 1.97-1.94 (m, 1H), 1.79-1.75 (m, 1H), 1.68-1.63 (m, 2H), 1.57 (s, 3H), 1.55 (s, 3H), 1.57-1.51 (m, 1H), 1.30 (s, 3H), 1.11 (d, *J* = 6.6 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 177.54, 176.95, 150.46, 148.72, 145.04, 143.98, 141.16, 136.79, 134.87, 128.97, 128.13, 127.54, 126.65, 126.60, 125.18, 113.46, 82.34, 81.83, 53.64, 41.18, 40.89, 38.41, 28.27, 25.97, 24.32, 24.13, 23.75, 12.40. HRMS (ESI-TOF) Calcd for $C_{28}H_{29}N_2O_5^-$ [M-H]$^-$: 473.2082, found: 473.2080.

The Scale Up Reaction



General Procedure for The Scale Up Reaction: Substrate **1s** (2.0 mmol, 402 mg), 4-iodotoluene (4.0 mmol, 872 mg), $Pd(OAc)_2$ (0.04 mmol, 9.0 mg), and AgTFA (4.0 mmol, 884 mg) were weighed into a sealed tube (250 mL) with a magnetic stir bar under air. HFIP (20 mL) was added, and the tube was sealed with a cap. The reaction mixture was stirred at 80 °C for 20 hours. Upon completion, the reaction mixture was cooled to room temperature and diluted with EtOAc. Then the reaction mixture was filtered through a short celite plug and transferred to a reaction round bottom flask (100 mL) with a magnetic stir bar. The solvent was evaporated under vacuum. Anhydrous MeOH (20 mL) was added to the mixture. $SOCl_2$ (6.0 mmol, 0.44 mL) was added dropwise at room temperature. The reaction mixture was stirred at room temperature for 1 h. Upon completion, the solvent was removed under vacuum and the resulting mixture was purified by flash chromatography by using Hexane/EtOAc (10:1) as the eluent to give 458 mg of **3b** (75% yield).

The Removal of Auxiliary



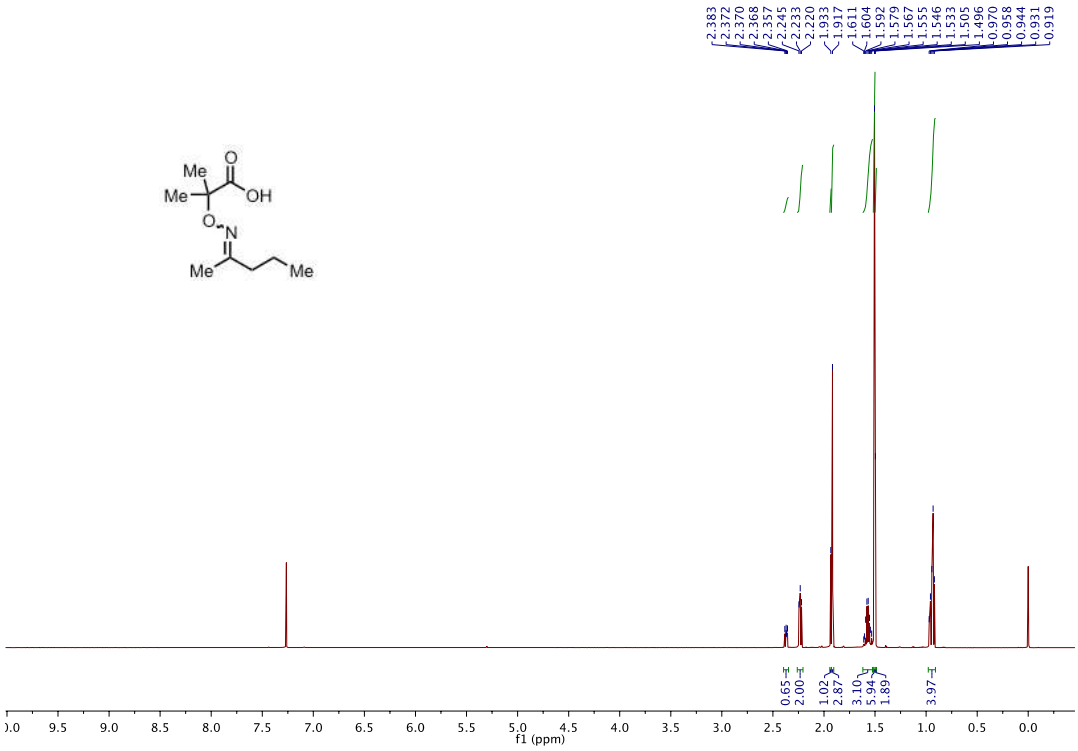
2a **2a-ketone**, 85%

The General Procedure for the Removal of Auxiliary: The arylated product **2a** (0.1 mmol, 33.5 mg) was weighed into a reaction vial (10 mL) with a magnetic stir bar under air. 0.25 mL of H_2O and 1.25 mL of HCl (4 M in dioxane) were added, and the vial was sealed with a cap. The reaction mixture was stirred at 100 °C for 20 hours. Upon completion, the reaction mixture was cooled to room temperature. Followed by the addition of 1 mL of H_2O into the reaction vial. The crude product was extracted three times with EtOAc (2 mL each time) from the aqueous phase. The combined organic phase was dried with anhydrous Na_2SO_4. Then the organic solvent was removed under vacuum and the resulting mixture was purified by preparative thin-layer chromatography by using Hexane/EtOAc (10:1) as the eluent to give 18.7 mg of arylated ketone (85% yield). The analytical data was in consistent with literature.[1]

References

(1) Hong, K.; Park, H.; Yu, J.-Q. *ACS Catal.* **2017**, *7*, 6938.
(2) (a) Parella, R.; Gopalakrishnan, B.; Babu, S. A. *J. Org. Chem.* **2013**, *78*, 11911. (b) Zhang, F.-L.; Hong, K.; Li, T.-J.; Park, H.; Yu, J.-Q. *Science* **2016**, *351*, 252.

^{1}H and ^{13}C NMR Spectra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O
N
Me
Me
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2.00
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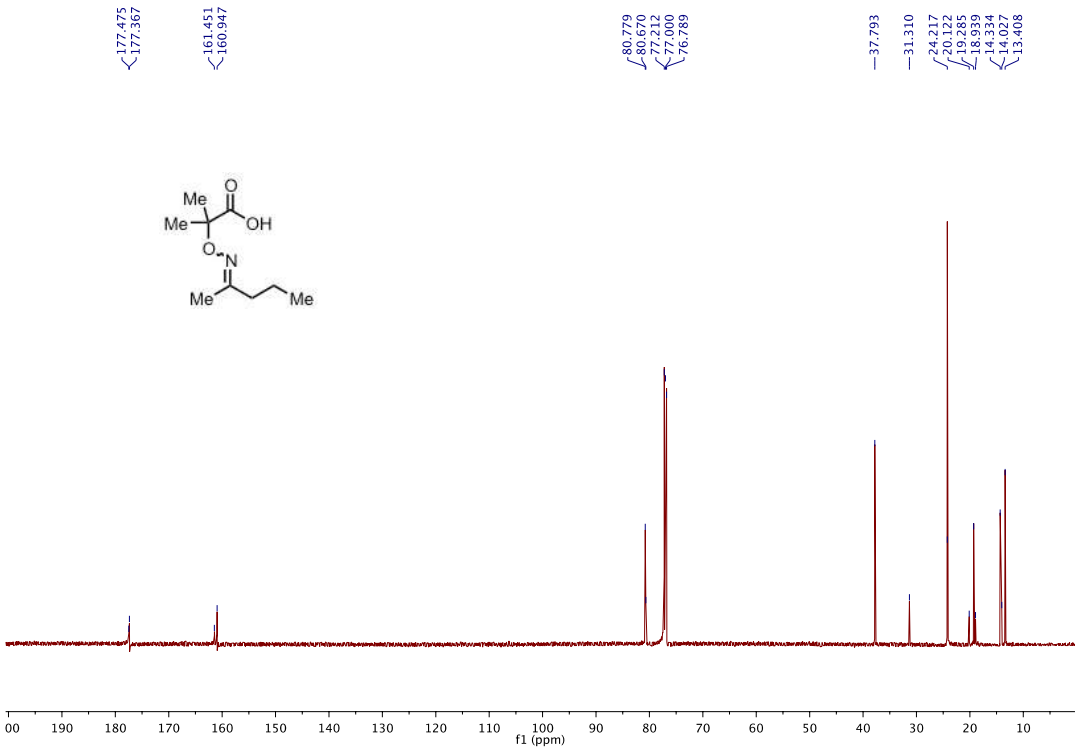
2.87
3.10
5.94
1.89
3.97
f1 (ppm)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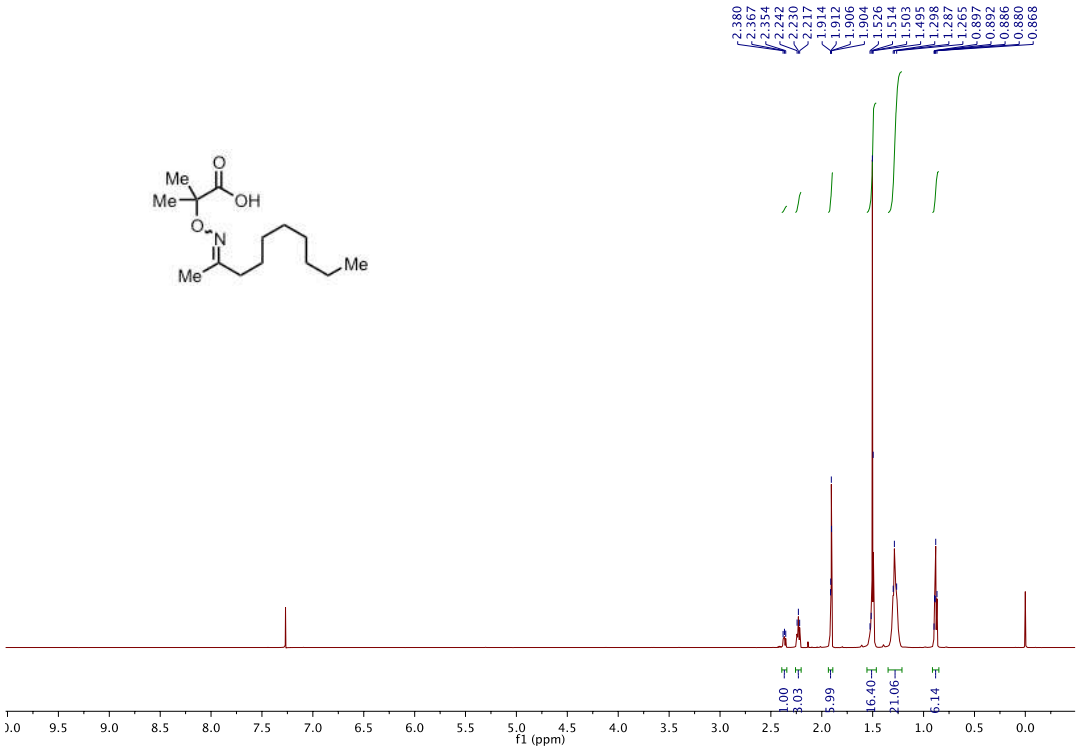
77.000
76.789
37.793
31.310
24.217
20.122
19.285
18.939
14.334
14.027
13.408
Me
O
OH
Me
O
N
Me
Me
f1 (ppm)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2.230
2.217
1.914
1.912
1.906
1.904
1.526
1.514
1.503
1.495
1.298
1.287
1.265
0.897
0.892
0.886
0.880
0.868
Me
Me
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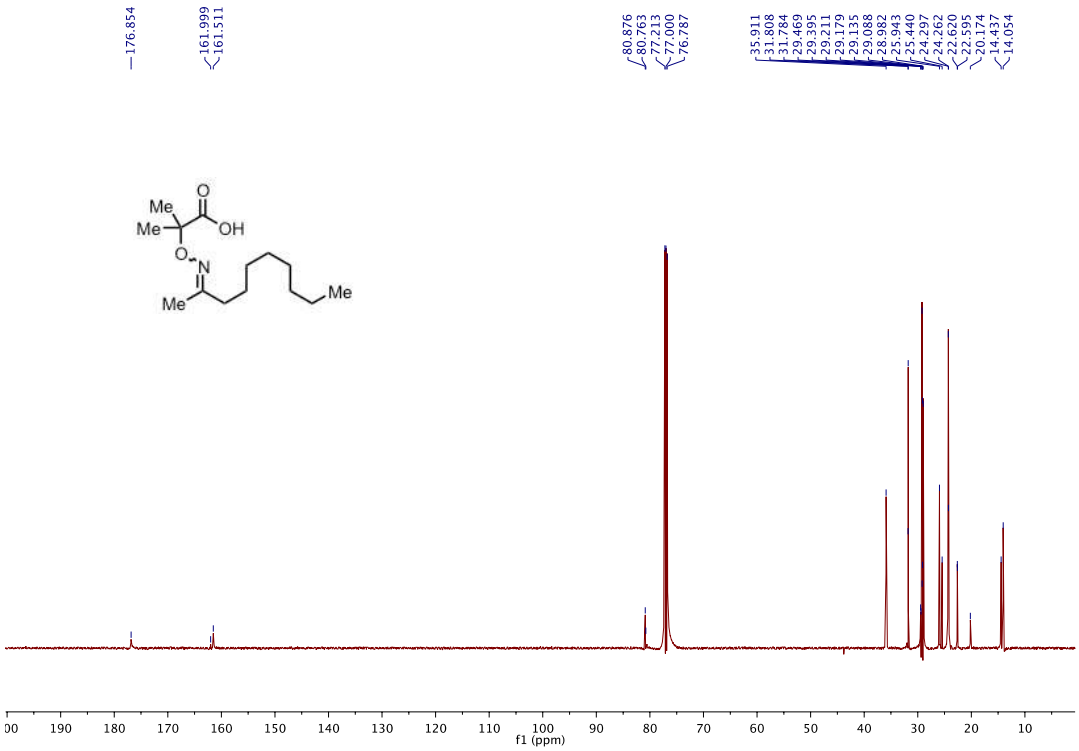
OH
O
N
Me
Me
1.00
3.03
5.99
16.40
21.06
6.14
f1 (ppm)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76.787
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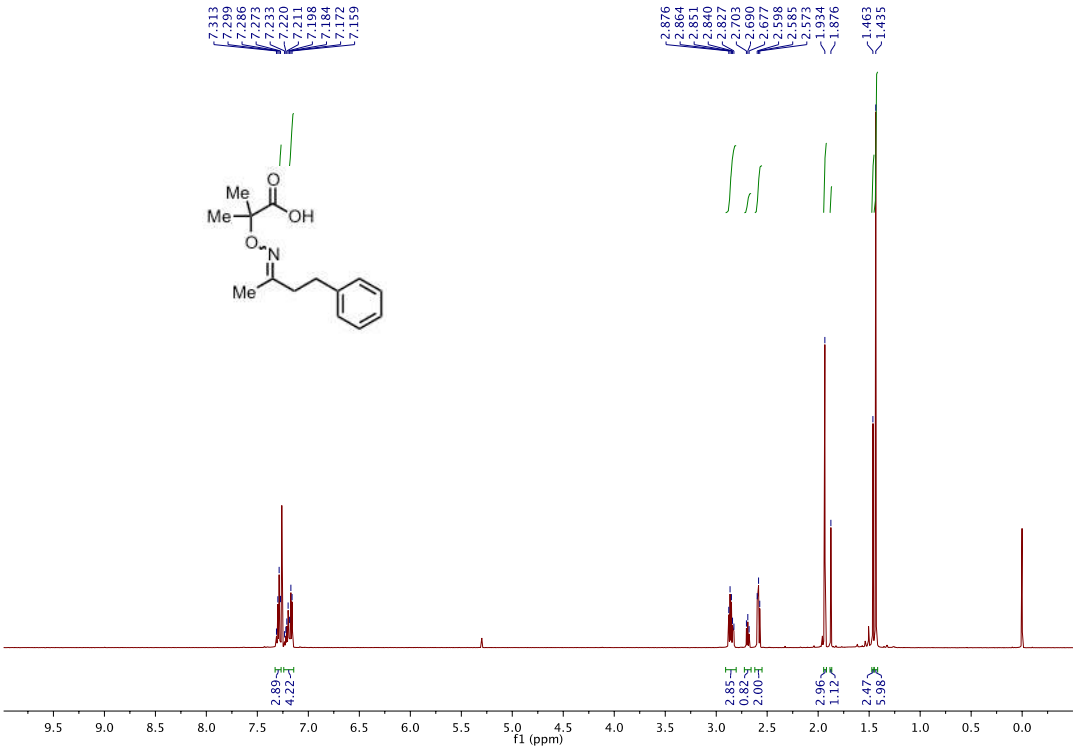
29.469
29.395
29.211
29.179
29.135
29.088
28.982
25.943
25.440
24.297
24.262
22.620
22.595
20.174
14.437
14.054
Me
Me
O
OH
O
N
Me
Me
f1 (ppm)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7.286
7.273
7.233
7.220
7.211
7.198
7.184
7.172
7.159
2.876
2.864
2.851
2.840
2.827
2.703
2.690
2.677
2.598
2.585
2.573
1.934
1.876
1.463
1.435
Me
Me
O
OH
O
N
Me
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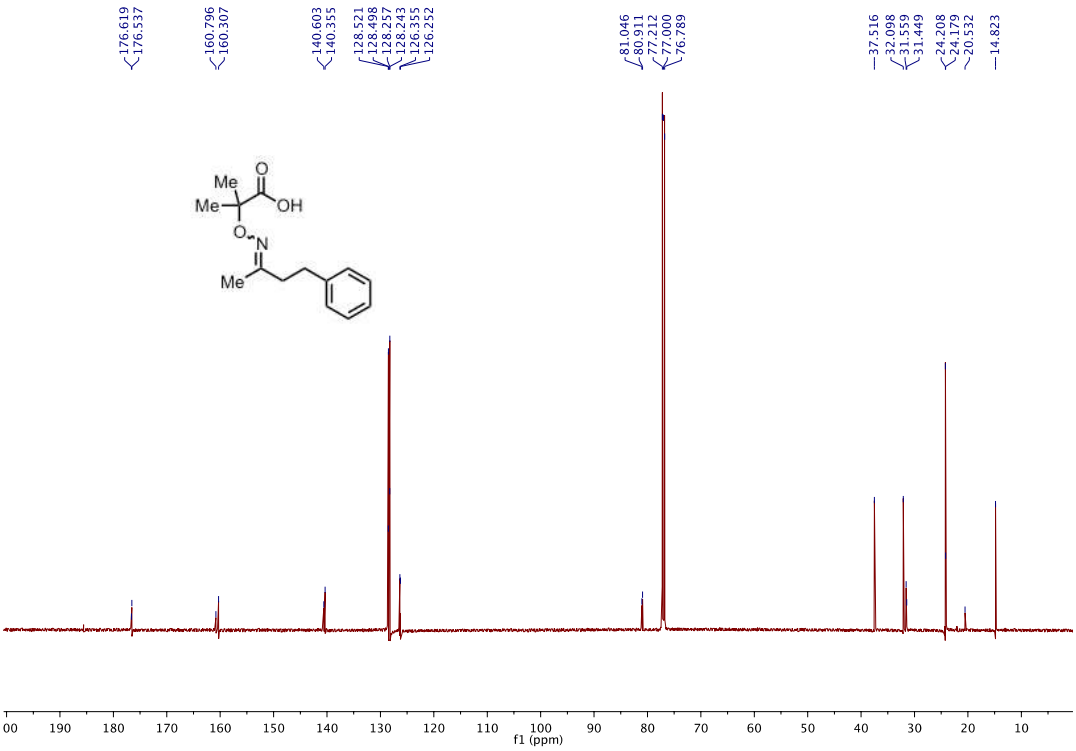
4.22
2.85
0.82
2.00
2.96
1.12
2.47
5.98
f1 (ppm)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128.498
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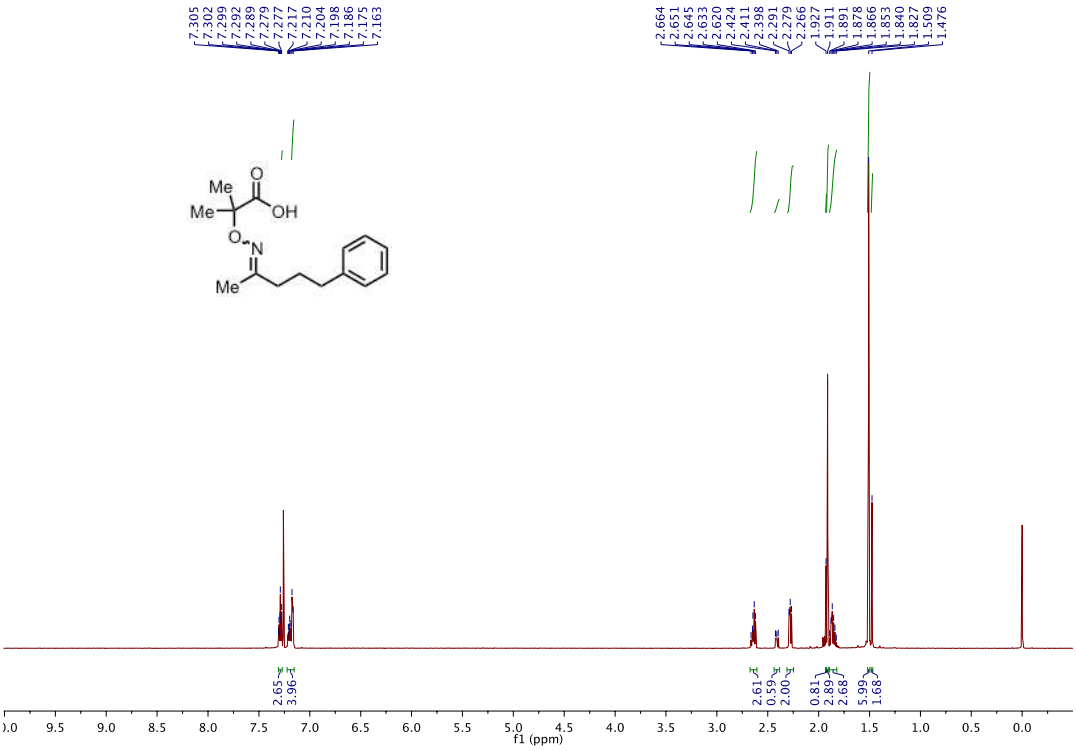
126.355
126.252
81.046
80.911
77.212
77.000
76.789
37.516
32.098
31.559
31.449
24.208
24.179
20.532
14.823
Me
Me
O
OH
O
N
Me
f1 (ppm)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7.302
7.299
7.292
7.289
7.279
7.277
7.217
7.210
7.204
7.198
7.186
7.175
7.163
2.664
2.651
2.645
2.633
2.620
2.424
2.411
2.398
2.291
2.279
2.266
1.927
1.911
1.891
1.878
1.866
1.853
1.840
1.827
1.509
1.476
Me
Me
O
OH
O
N
Me
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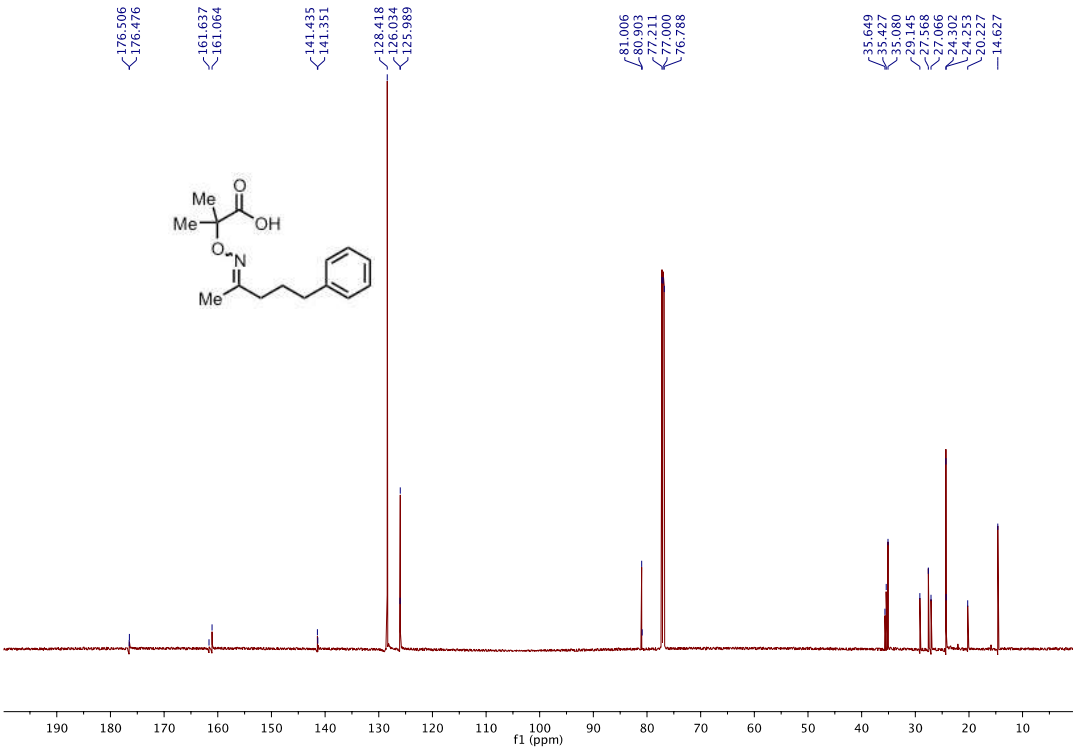
3.96
2.61
0.59
2.00
0.81
2.89
2.68
5.99
1.68
f1 (ppm)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126.034
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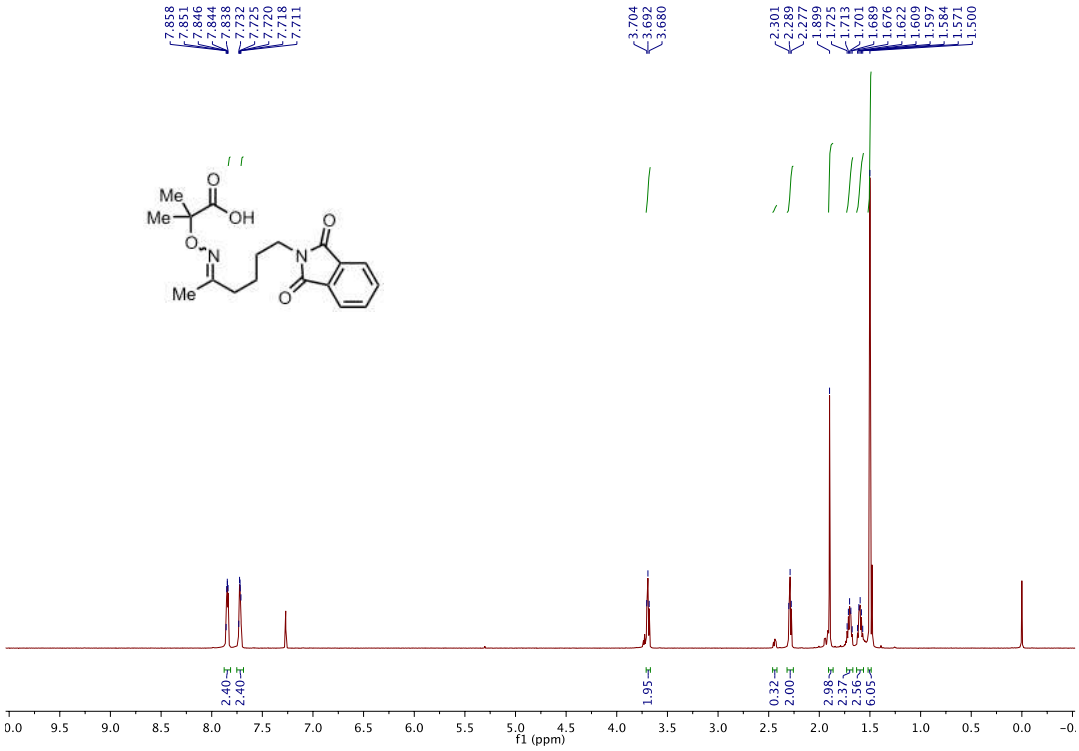
81.006
80.903
77.211
77.000
76.788
35.649
35.427
35.080
29.145
27.568
27.066
24.302
24.253
20.227
14.627
Me
Me
O
OH
O
N
Me
f1 (ppm)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7.846
7.844
7.838
7.732
7.725
7.720
7.718
7.711
3.704
3.692
3.680
2.301
2.289
2.277
1.899
1.725
1.713
1.701
1.689
1.676
1.622
1.609
1.597
1.584
1.571
1.500
Me
Me
O
OH
O
N
Me
O
N
O
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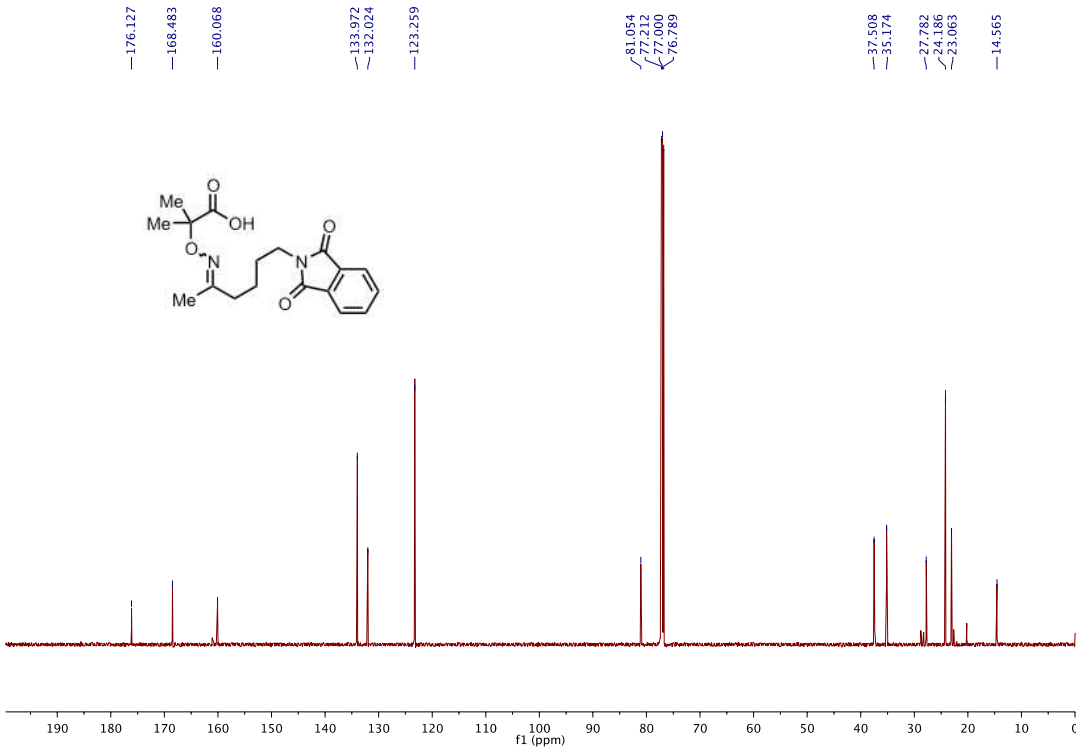
2.40
1.95
0.32
2.00
2.98
2.37
2.56
6.05
f1 (ppm)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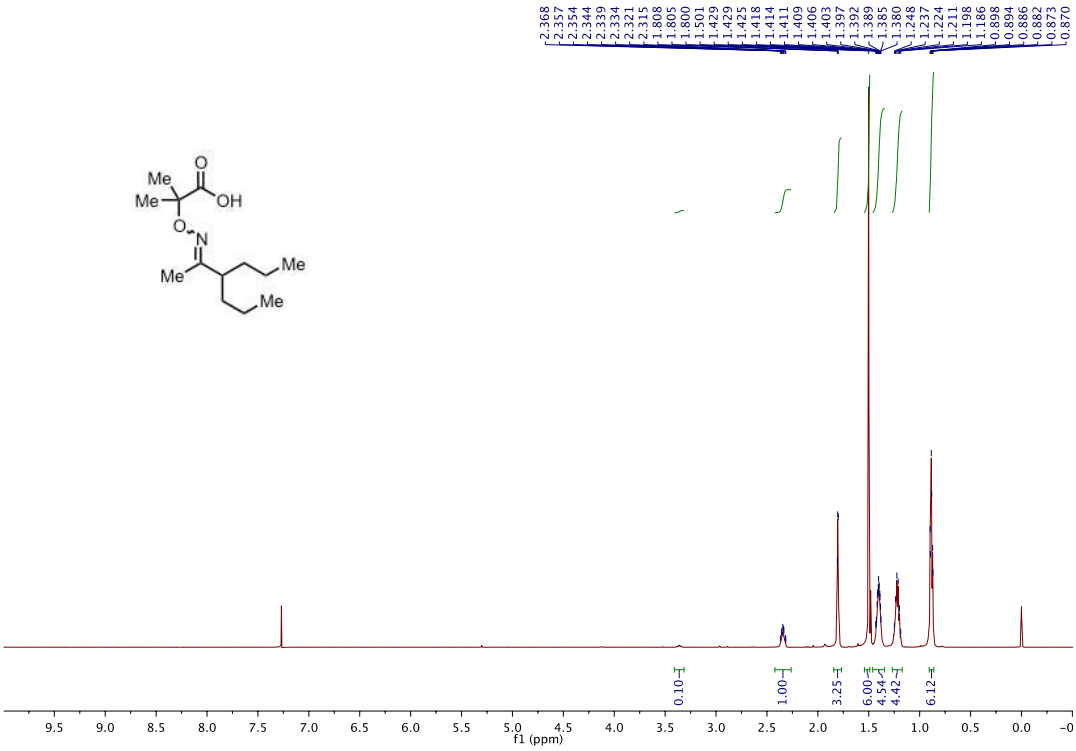
168.483
160.068
133.972
132.024
123.259
81.054
77.212
77.000
76.789
37.508
35.174
27.782
24.186
23.063
14.565
Me
Me
O
OH
O
N
Me
O
N
O
f1 (ppm)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2.354
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2.334
2.321
2.315
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1.805
1.800
1.501
1.429
1.429
1.425
1.418
1.414
1.411
1.409
1.406
1.403
1.397
1.392
1.389
1.385
1.380
1.248
1.237
1.224
1.211
1.198
1.186
0.898
0.894
0.886
0.882
0.873
0.870
Me
Me
O
OH
O
N
Me
Me
Me
0.10
1.00
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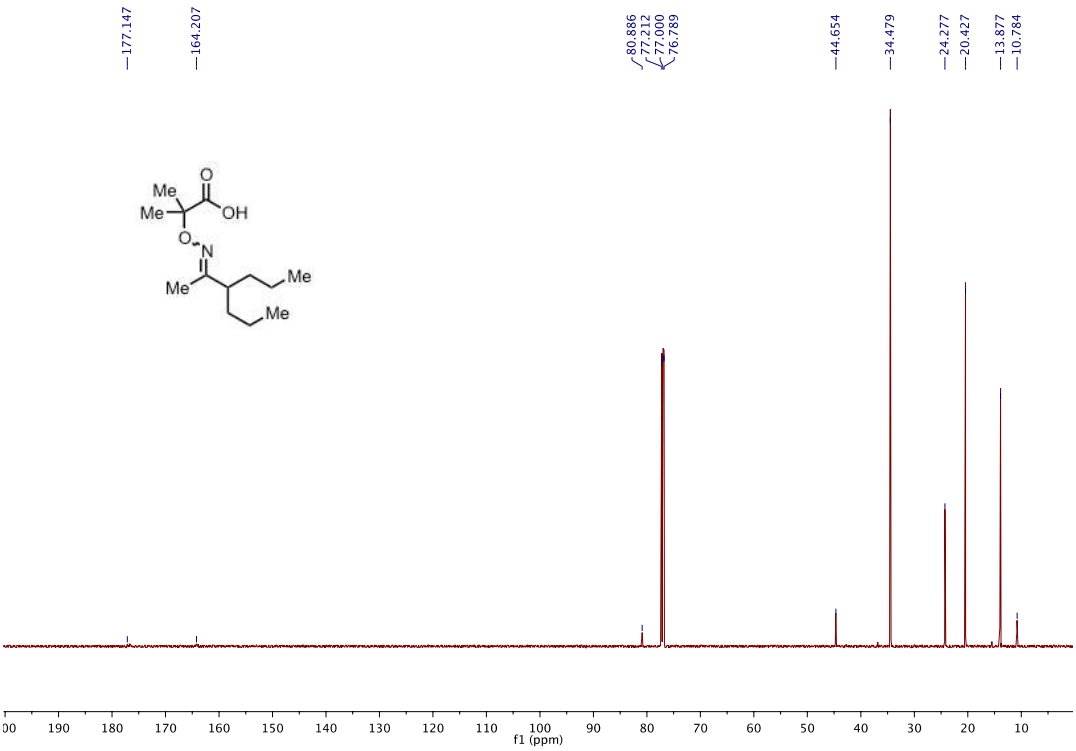
6.00
4.54
4.42
6.12
f1 (ppm)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80.886
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77.000
76.789
44.654
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13.877
10.784
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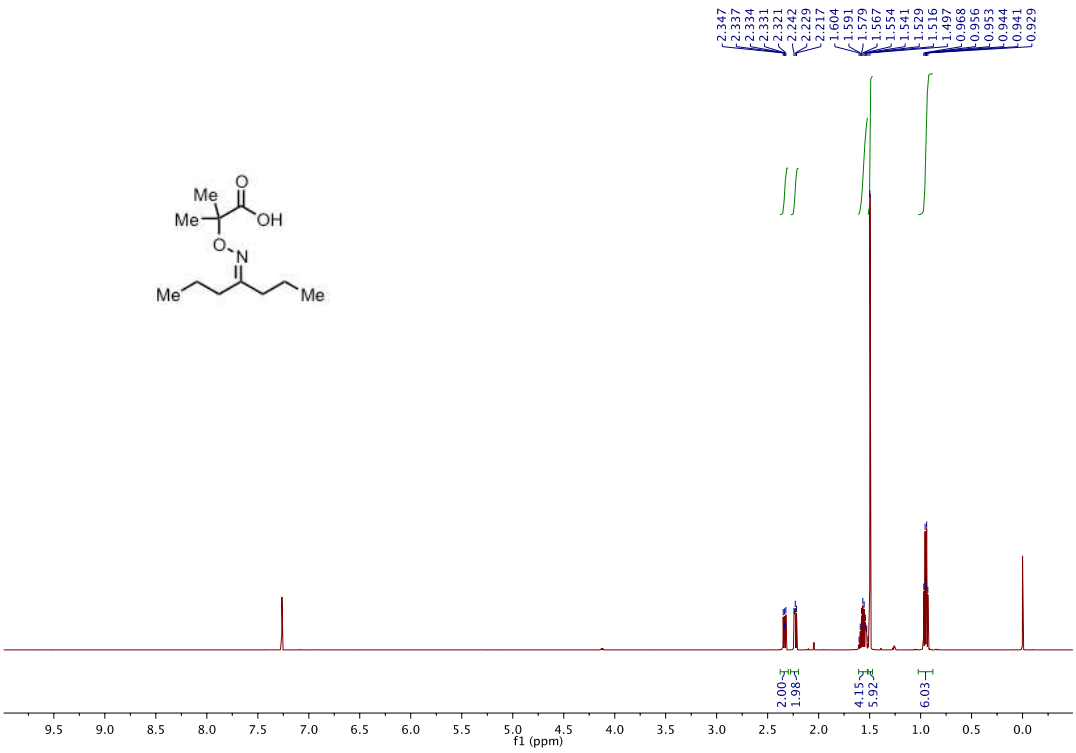
Me
O
OH
O
N
Me
Me
Me
f1 (ppm)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2.321
2.242
2.229
2.217
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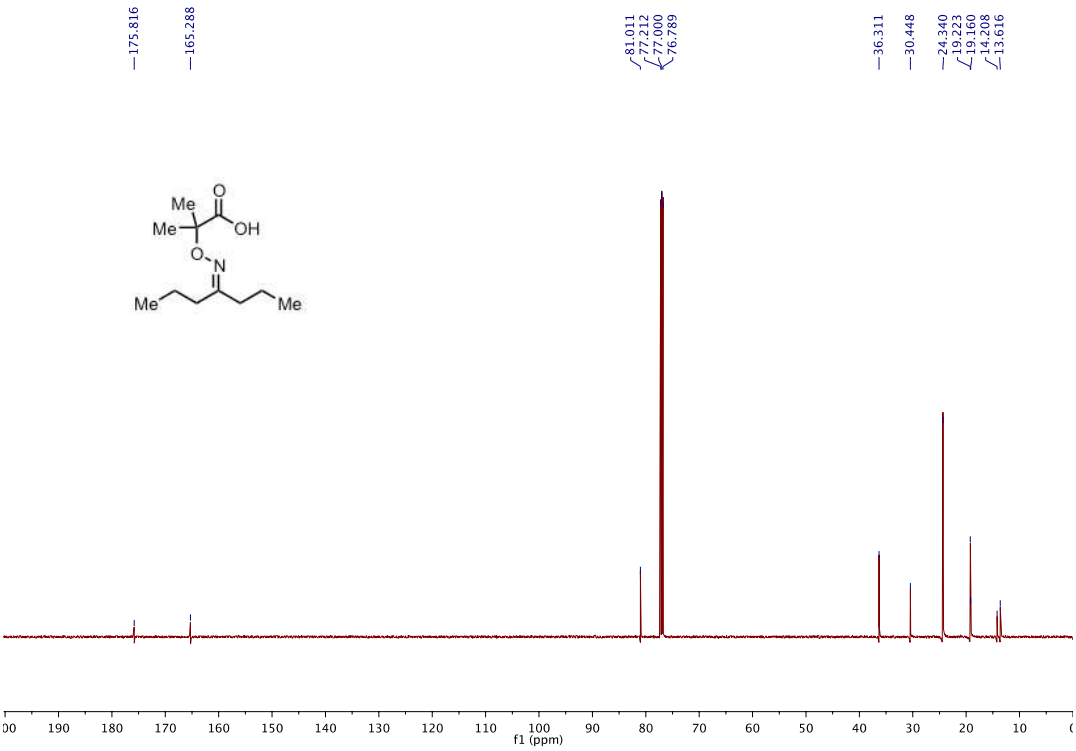
1.591
1.579
1.567
1.554
1.541
1.529
1.516
1.497
0.968
0.956
0.953
0.944
0.941
0.929
Me
Me
O
OH
O
N
Me
Me
2.00
1.98
4.15
5.92
6.03
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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76.789
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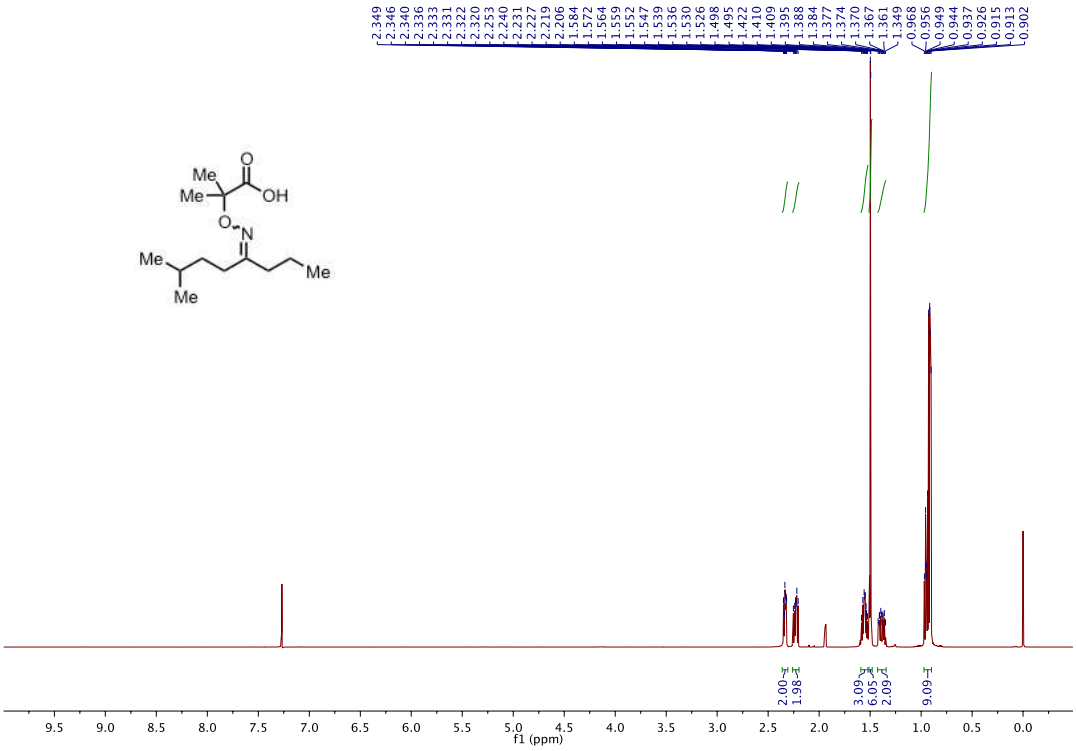
30.448
24.340
19.223
19.160
14.208
13.616
Me
Me
O
OH
O
N
Me
Me
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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2.219
2.206
1.584
1.572
1.564
1.559
1.552
1.547
1.539
1.536
1.530
1.526
1.498
1.495
1.422
1.410
1.409
1.395
1.388
1.384
1.377
1.374
1.370
1.367
1.361
1.349
0.968
0.956
0.949
0.944
0.937
0.926
0.915
0.913
0.902
Me
Me
O
OH
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N
Me
Me
Me
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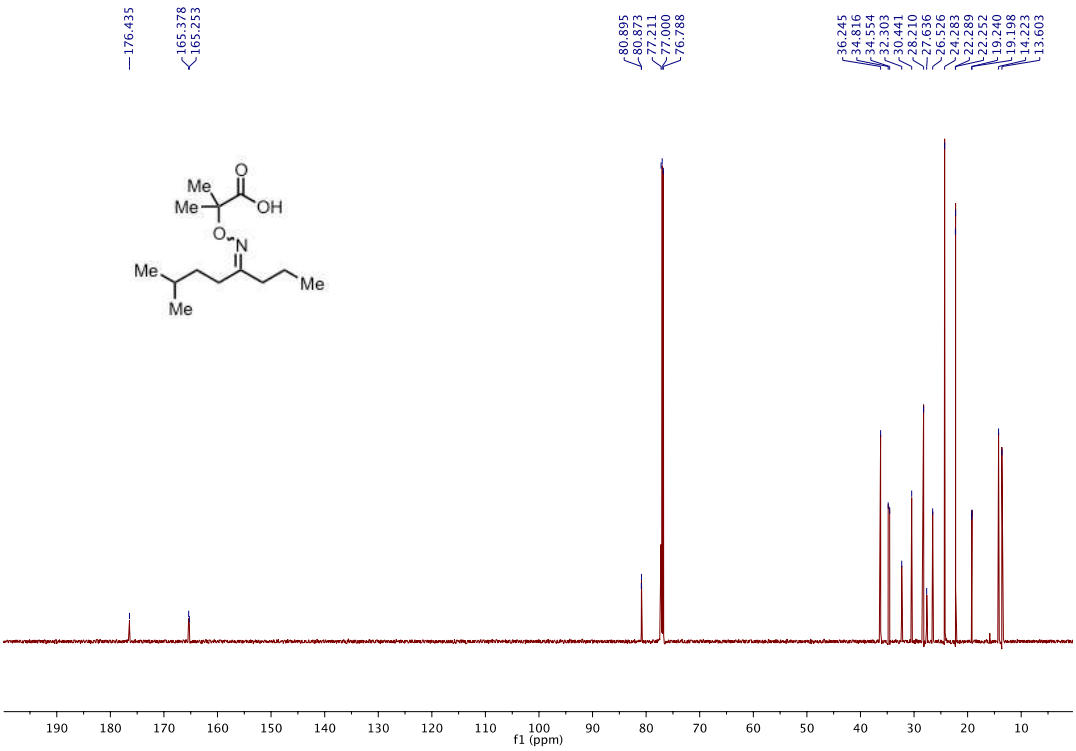
3.09
6.05
2.09
9.09
f1 (ppm)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34.554
32.303
30.441
28.210
27.636
26.526
24.283
22.289
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14.223
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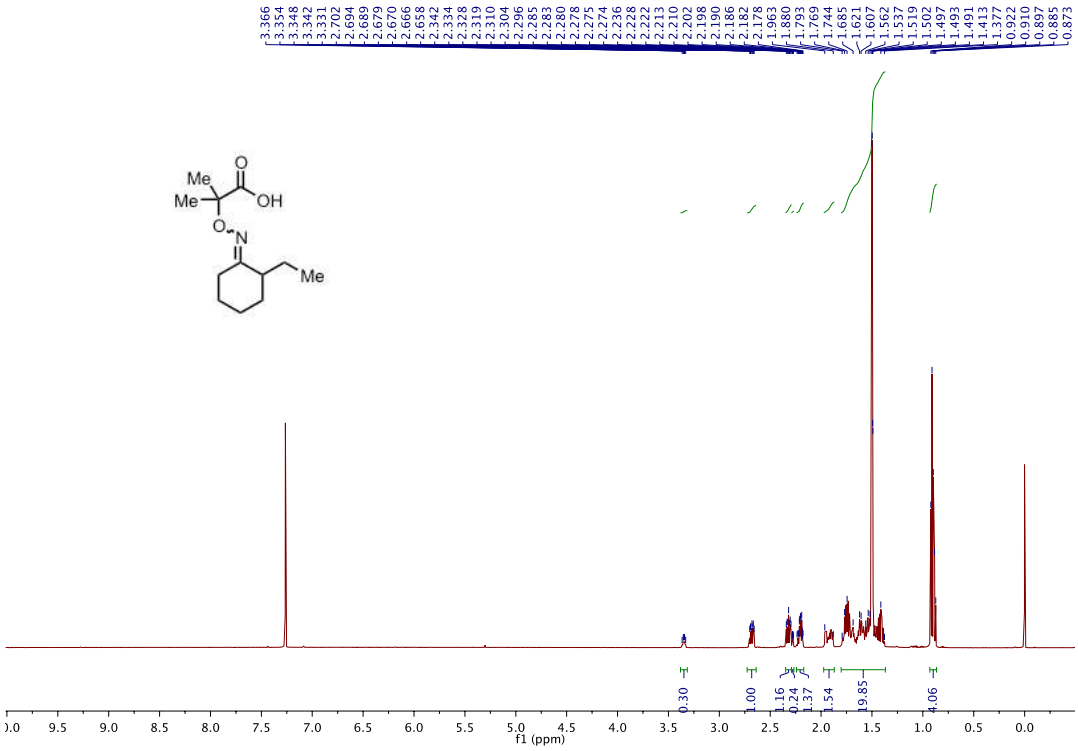
O
OH
O
N
Me
Me
Me
f1 (ppm)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2.342
2.334
2.328
2.319
2.310
2.304
2.296
2.285
2.283
2.280
2.278
2.275
2.274
2.236
2.228
2.222
2.213
2.210
2.202
2.198
2.190
2.186
2.182
2.178
1.963
1.880
1.793
1.769
1.744
1.685
1.621
1.607
1.562
1.537
1.519
1.502
1.497
1.493
1.491
1.413
1.377
0.922
0.910
0.897
0.885
0.873
Me
Me
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OH
O
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1.54
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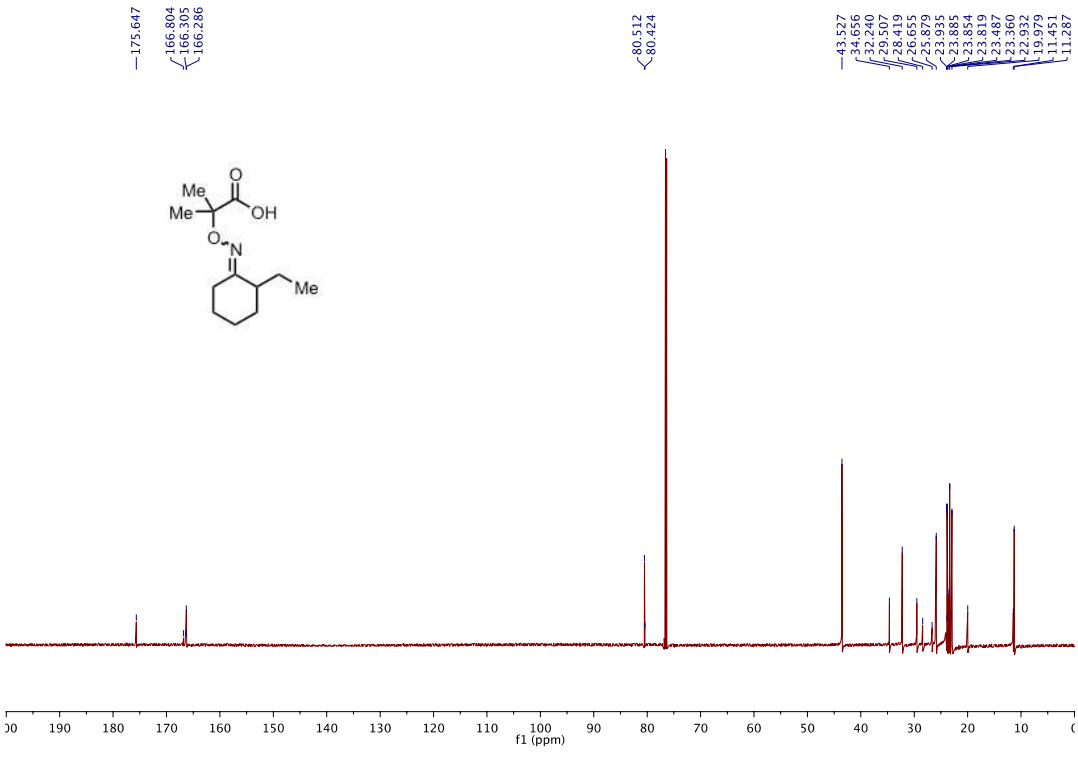
4.06
f1 (ppm)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29.507
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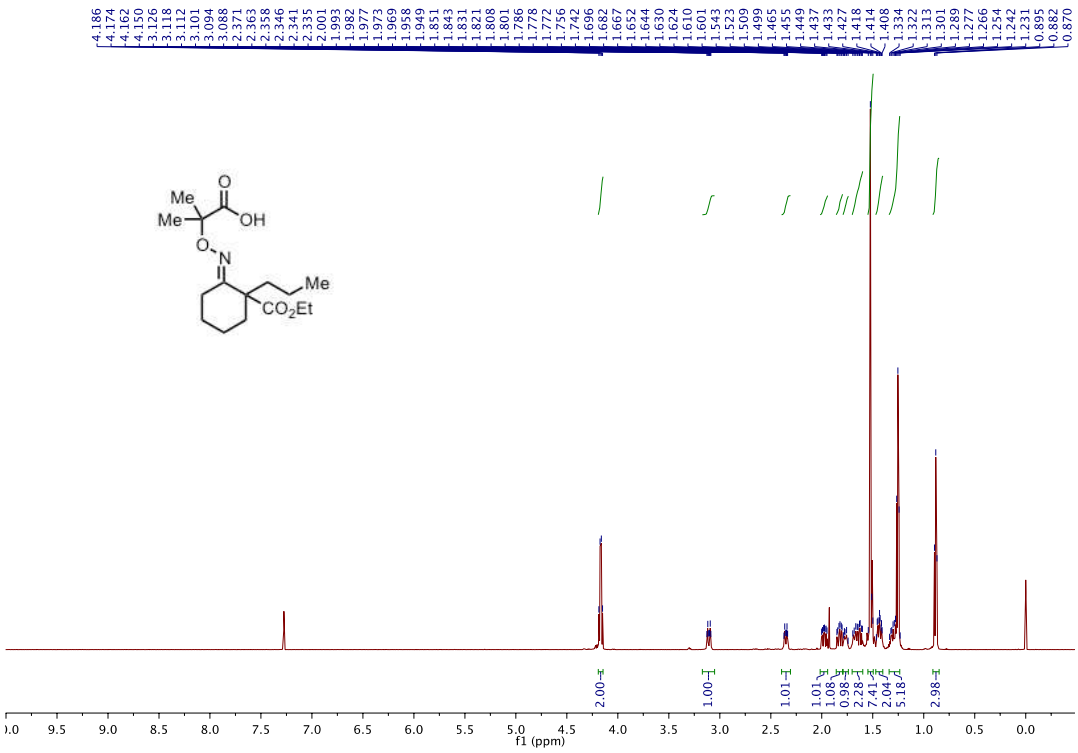
26.655
25.879
23.935
23.885
23.854
23.819
23.487
23.360
22.932
19.979
11.451
11.287
Me
Me
O
OH
O
N
Me
f1 (ppm)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3.118
3.112
3.101
3.094
3.088
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2.358
2.346
2.341
2.335
2.001
1.993
1.982
1.977
1.973
1.969
1.958
1.949
1.851
1.843
1.831
1.821
1.808
1.801
1.786
1.778
1.772
1.756
1.742
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1.682
1.667
1.652
1.644
1.630
1.624
1.610
1.601
1.543
1.523
1.509
1.499
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1.455
1.449
1.437
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1.418
1.414
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1.322
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1.289
1.277
1.266
1.254
1.242
1.231
0.895
0.882
0.870
Me
Me
O
OH
O
N
Me
CO2Et
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1.01
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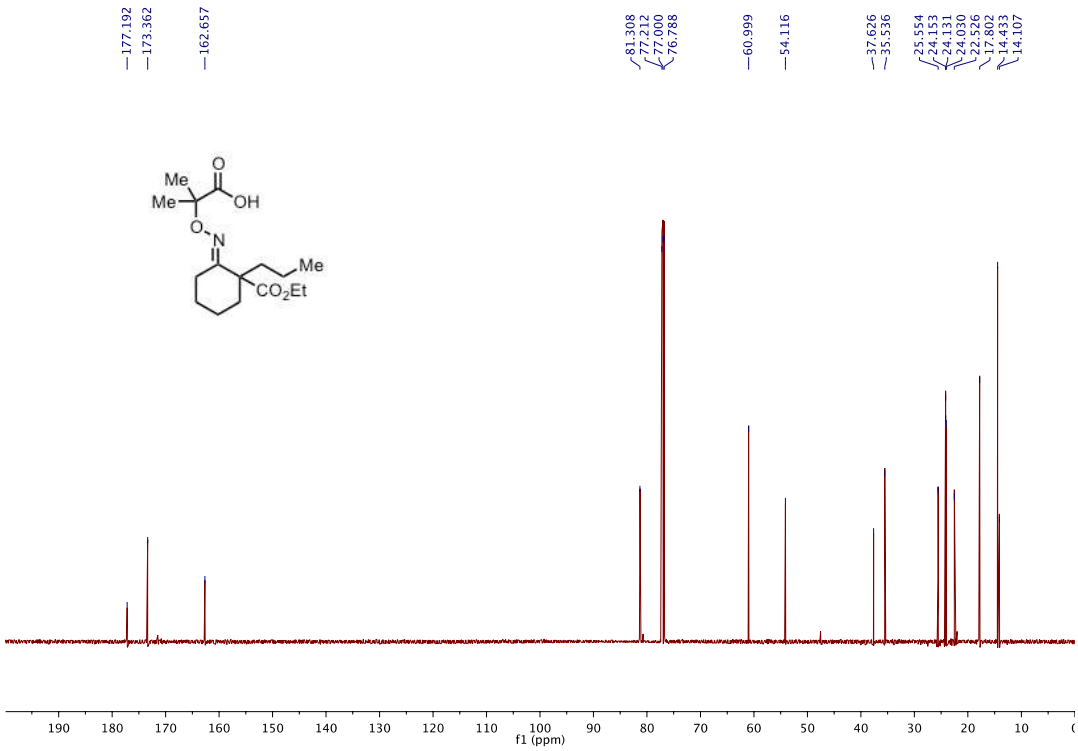
7.41
2.04
5.18
2.98
f1 (ppm)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60.999
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37.626
35.536
25.554
24.153
24.131
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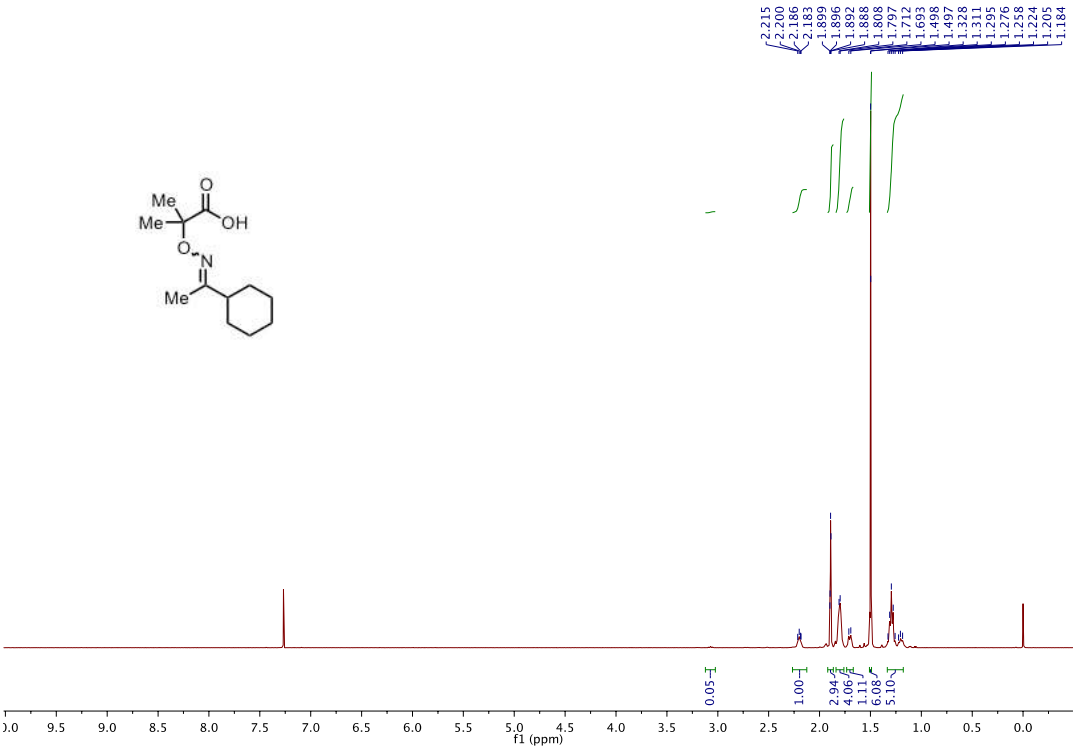
22.526
17.802
14.433
14.107
Me
Me
O
OH
O
N
Me
CO2Et
f1 (ppm)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1.888
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1.717
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1.498
1.497
1.328
1.311
1.295
1.276
1.258
1.224
1.205
1.184
Me
Me
O
OH
O
N
Me
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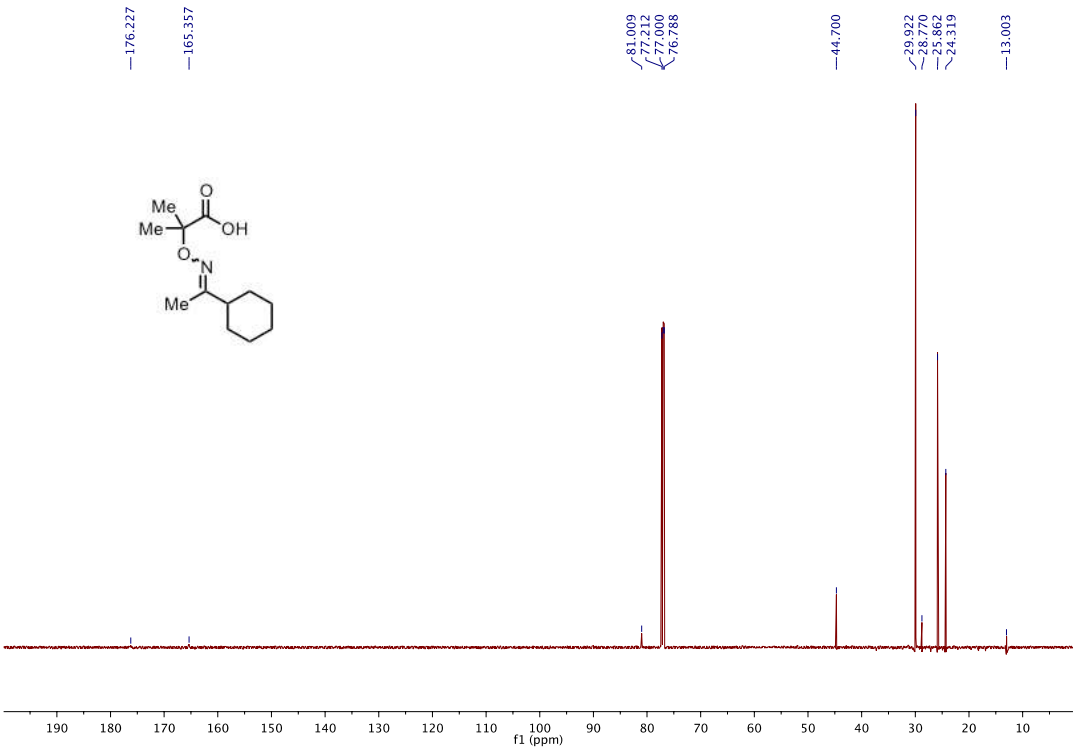
1.11
6.08
5.10
f1 (ppm)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28.770
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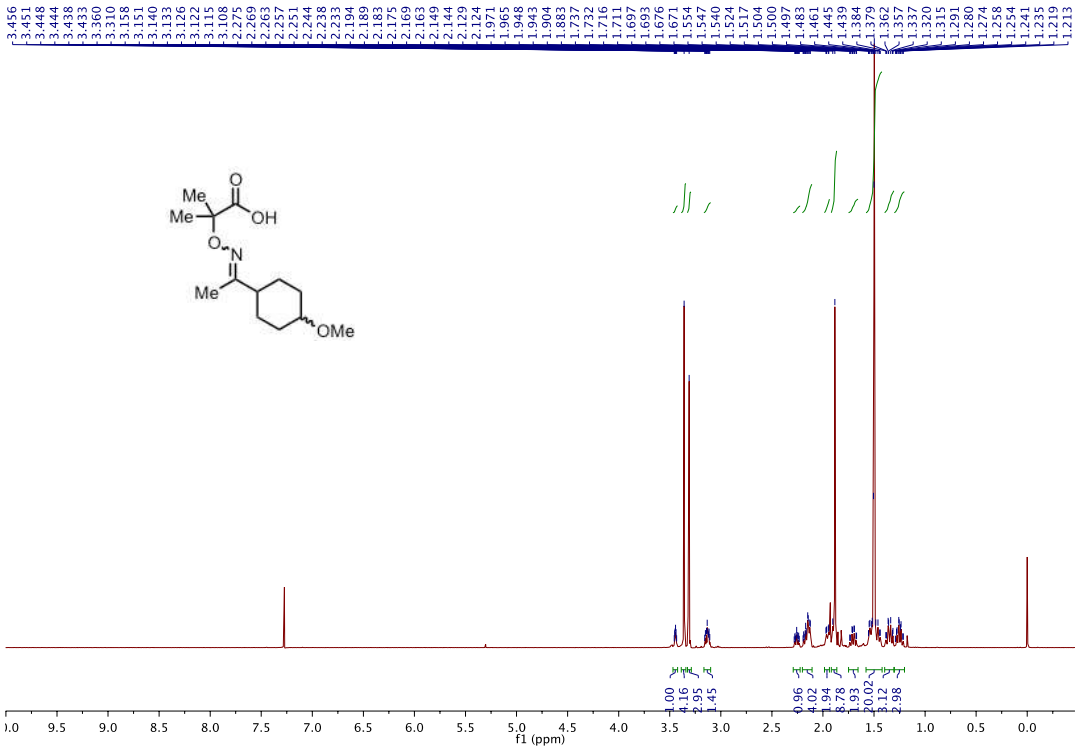
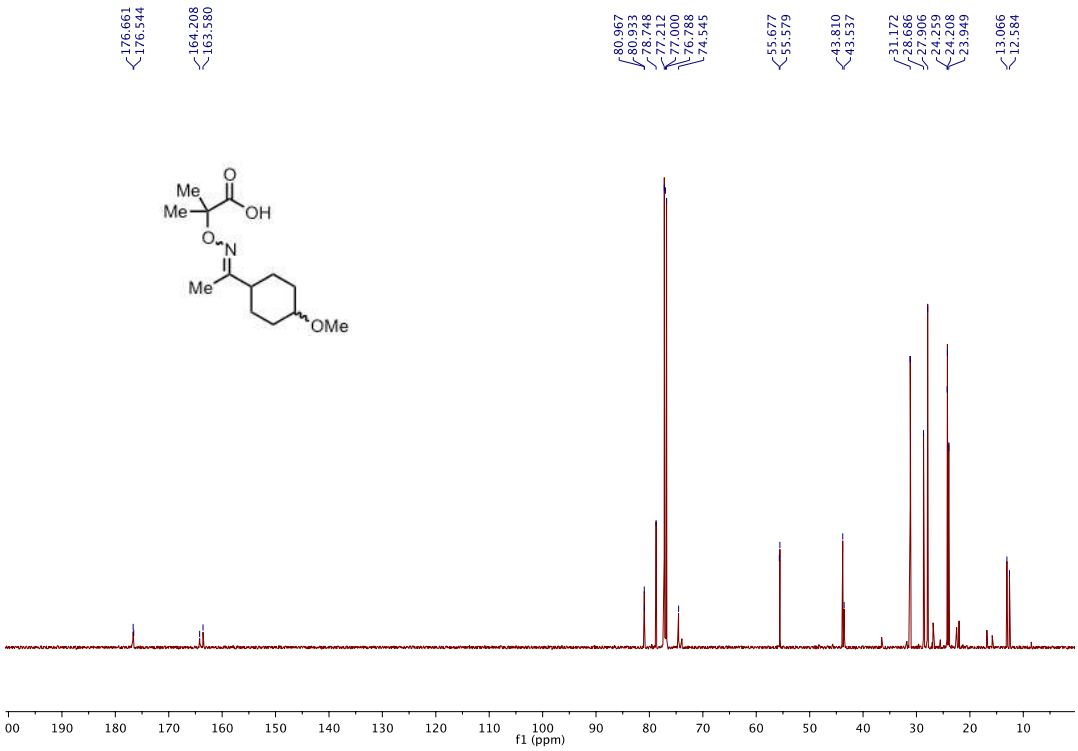
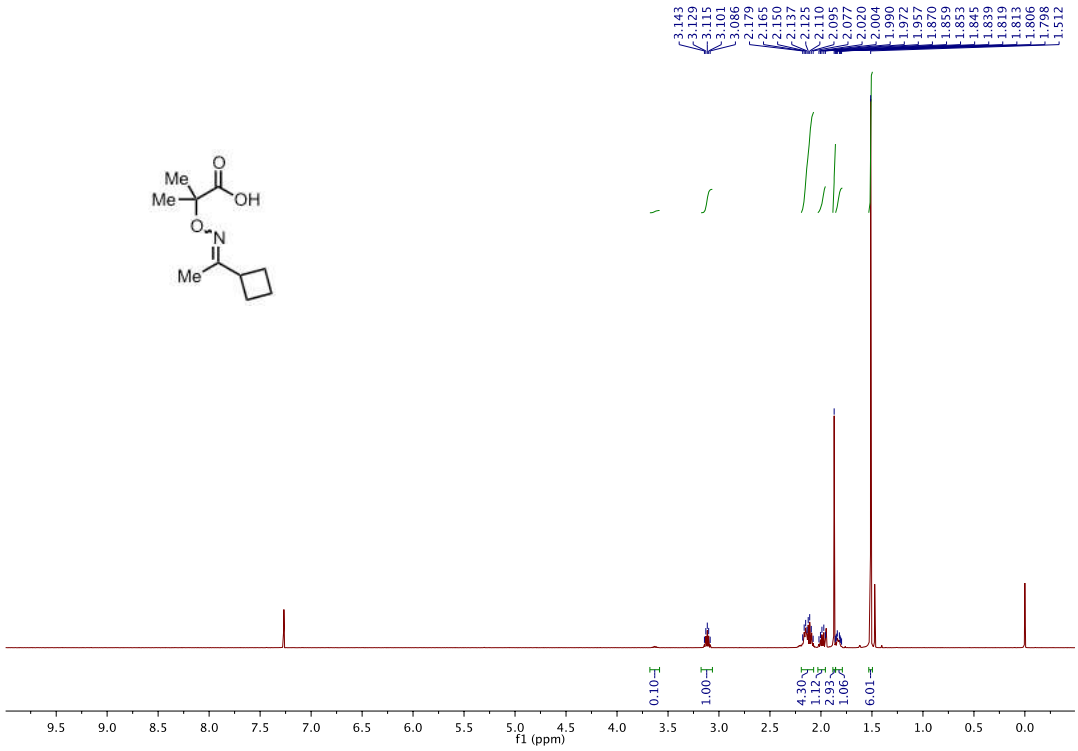
24.319
13.003
Me
Me
O
OH
O
N
Me
f1 (ppm)


Me
Me
O
OH
O
N
Me
OMe
f1 (ppm)


Me
Me
O
OH
O
N
Me
OMe
f1 (ppm)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2.020
2.004
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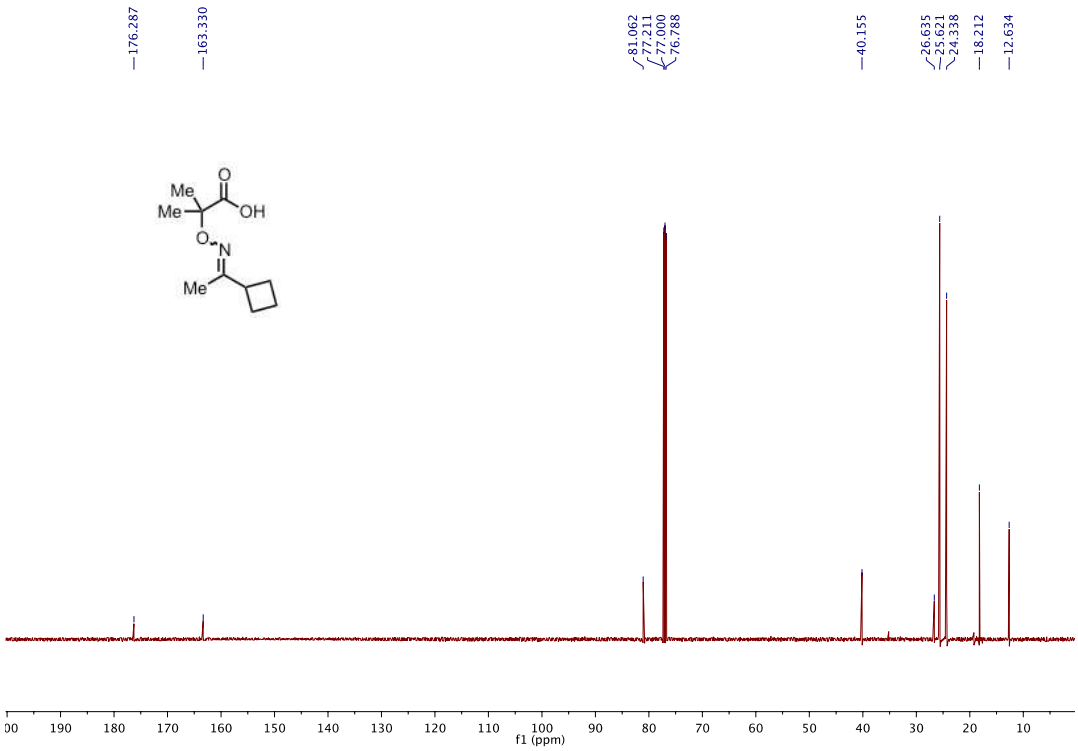
1.957
1.870
1.859
1.853
1.845
1.839
1.819
1.813
1.806
1.798
1.512
Me
Me
O
OH
O
N
Me
0.10
1.00
4.30
1.12
2.93
1.06
6.01
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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40.155
26.635
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24.338
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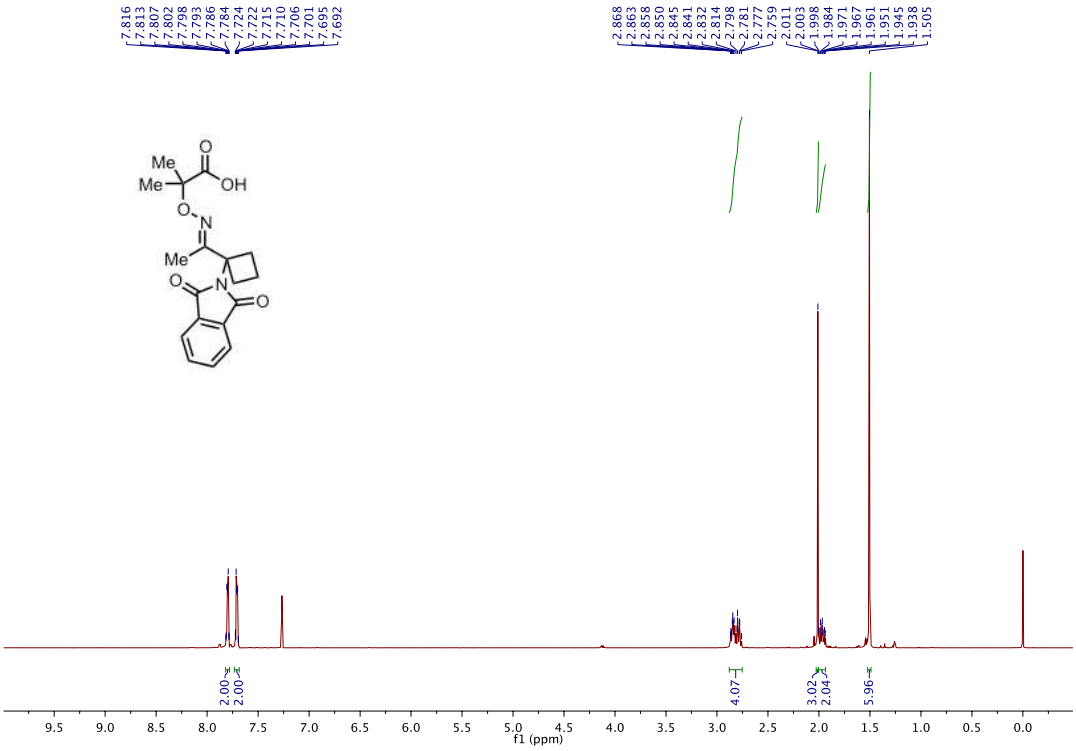
Me
Me
O
OH
O
N
Me
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)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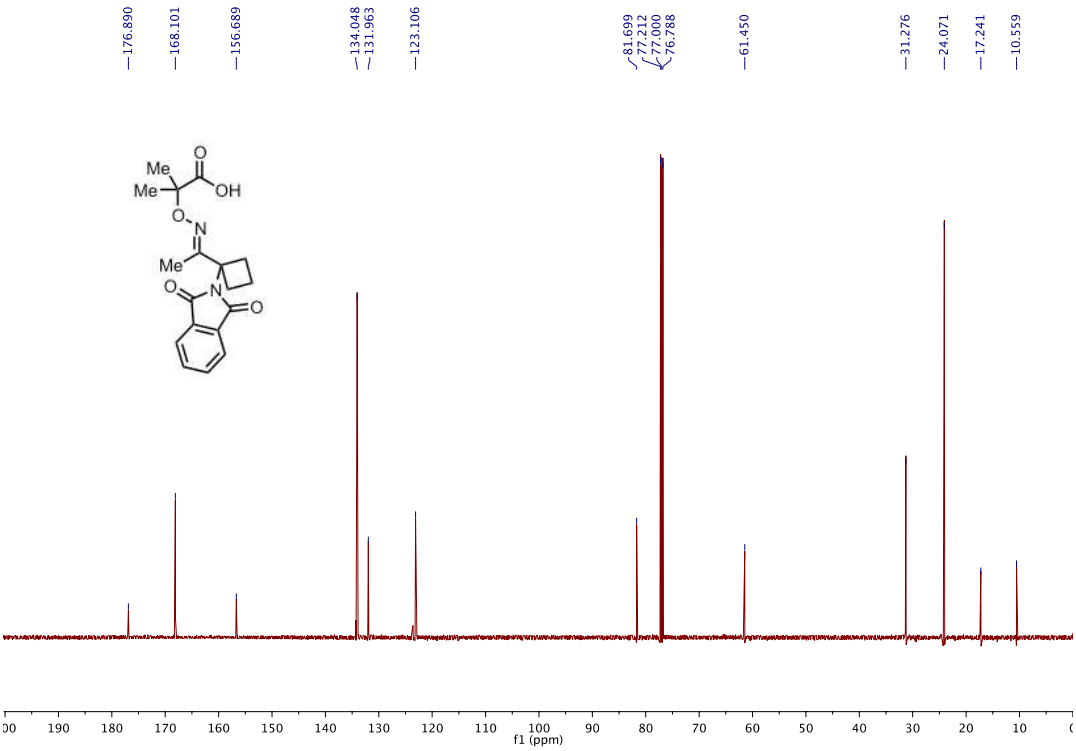
7.706
7.701
7.695
7.692
2.868
2.863
2.858
2.850
2.845
2.841
2.832
2.814
2.798
2.781
2.777
2.759
2.011
2.003
1.998
1.984
1.971
1.967
1.961
1.951
1.945
1.938
1.505
Me
Me
O
OH
O
N
Me
O
N
O
2.00
2.00
4.07
3.02
2.04
5.96
f1 (ppm)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156.689
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131.963
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81.699
77.212
77.000
76.788
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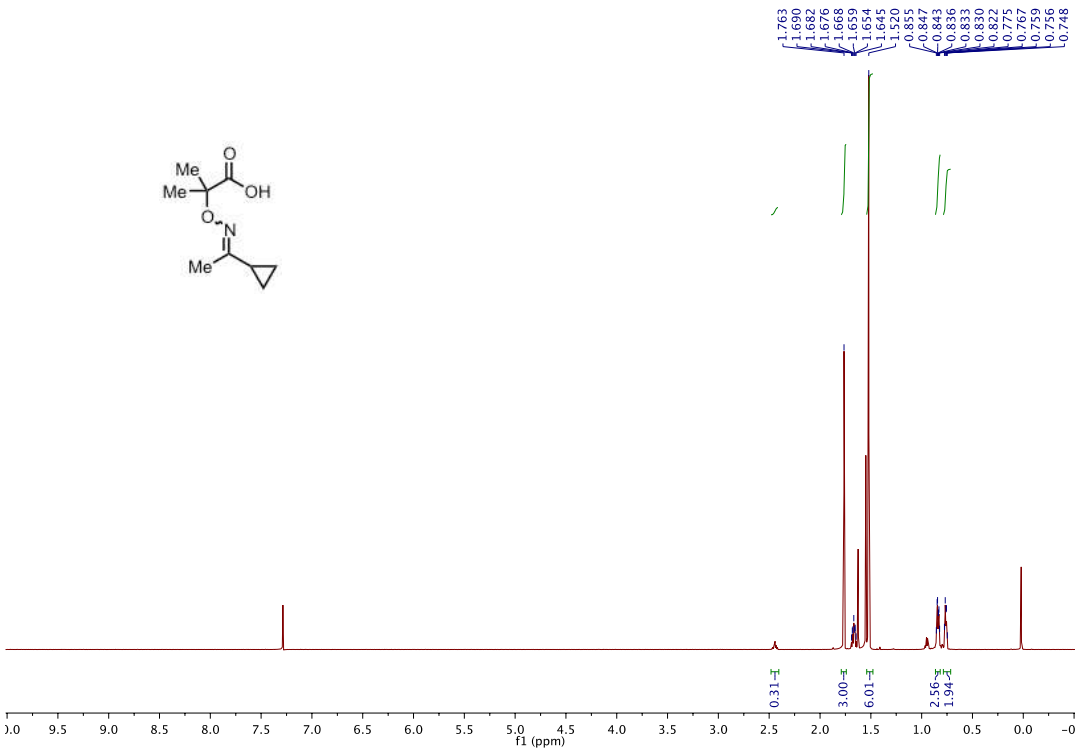
24.071
17.241
10.559
Me
Me
O
OH
O
N
Me
O
N
O
f1 (ppm)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1.682
1.676
1.668
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1.654
1.645
1.320
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0.847
0.843
0.836
0.833
0.830
0.822
0.775
0.767
0.759
0.756
0.748
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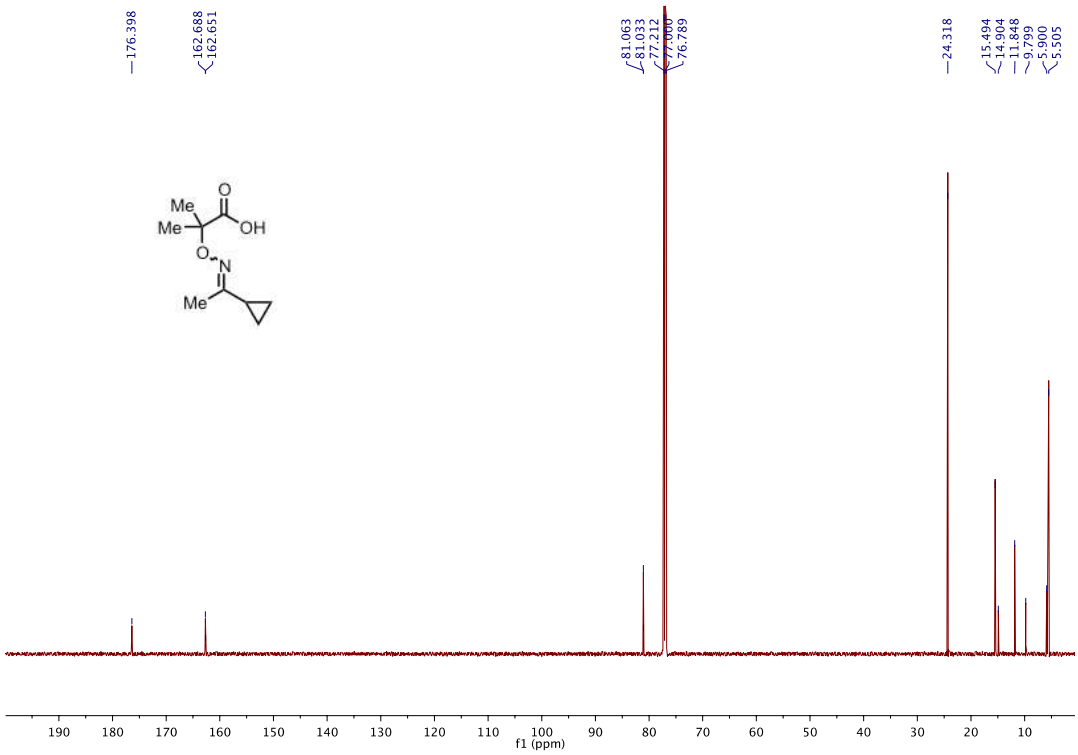
Me
O
OH
O
N
Me
0.31
3.00
6.01
2.56
1.94
f1 (ppm)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162.651
81.063
81.033
77.212
77.000
76.789
24.318
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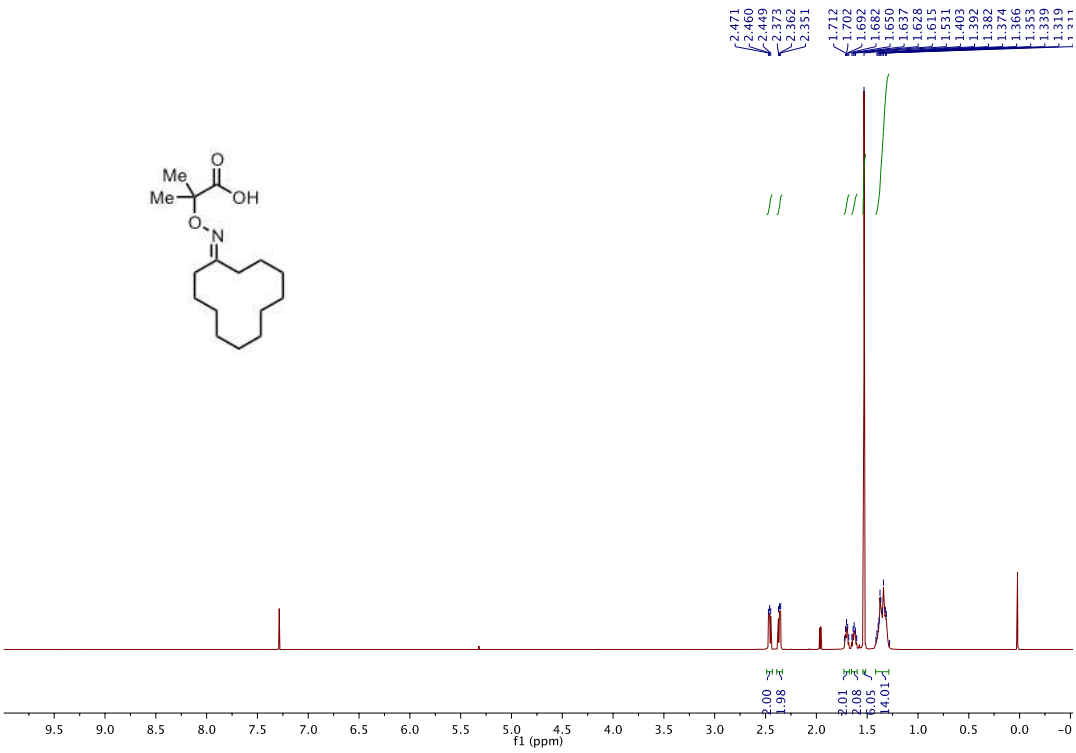
11.848
9.799
5.900
5.505
Me
Me
O
OH
O
N
Me
f1 (ppm)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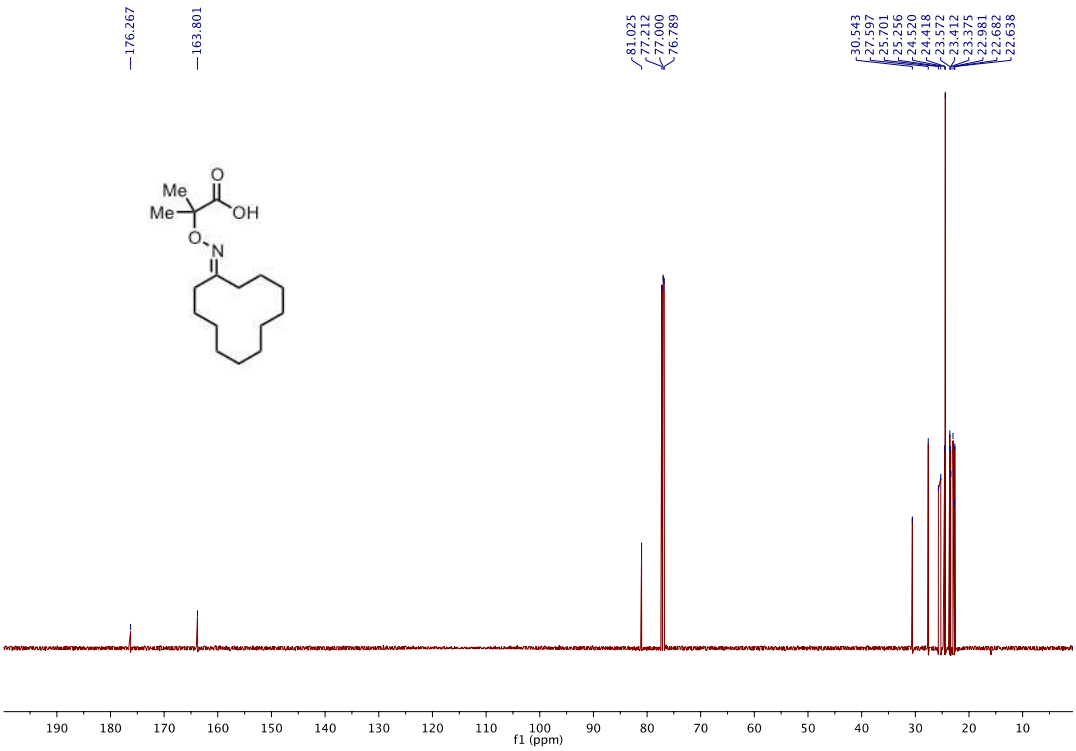
2.460
2.449
2.373
2.362
2.351
1.712
1.702
1.692
1.682
1.650
1.637
1.628
1.615
1.531
1.403
1.392
1.382
1.374
1.366
1.353
1.339
1.319
2.00
1.98
2.01
2.08
6.05
14.01
f1 (ppm)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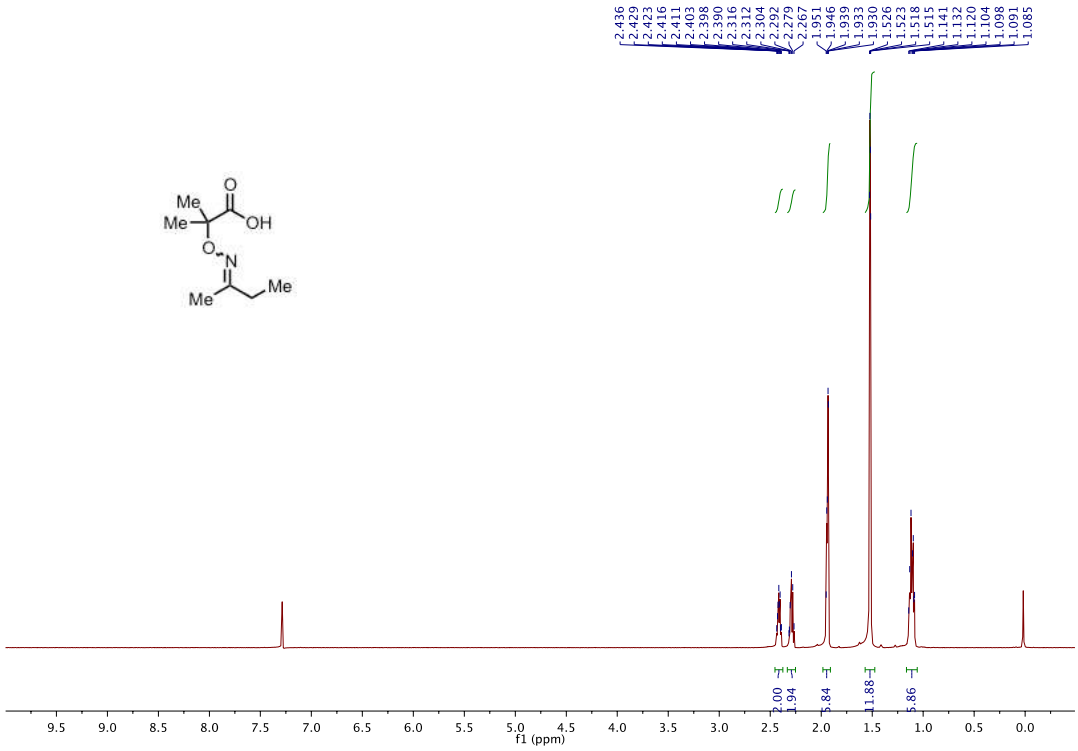
81.025
77.212
77.000
76.789
30.543
27.597
25.701
25.256
24.520
24.418
23.572
23.412
23.375
22.981
22.682
22.638
f1 (ppm)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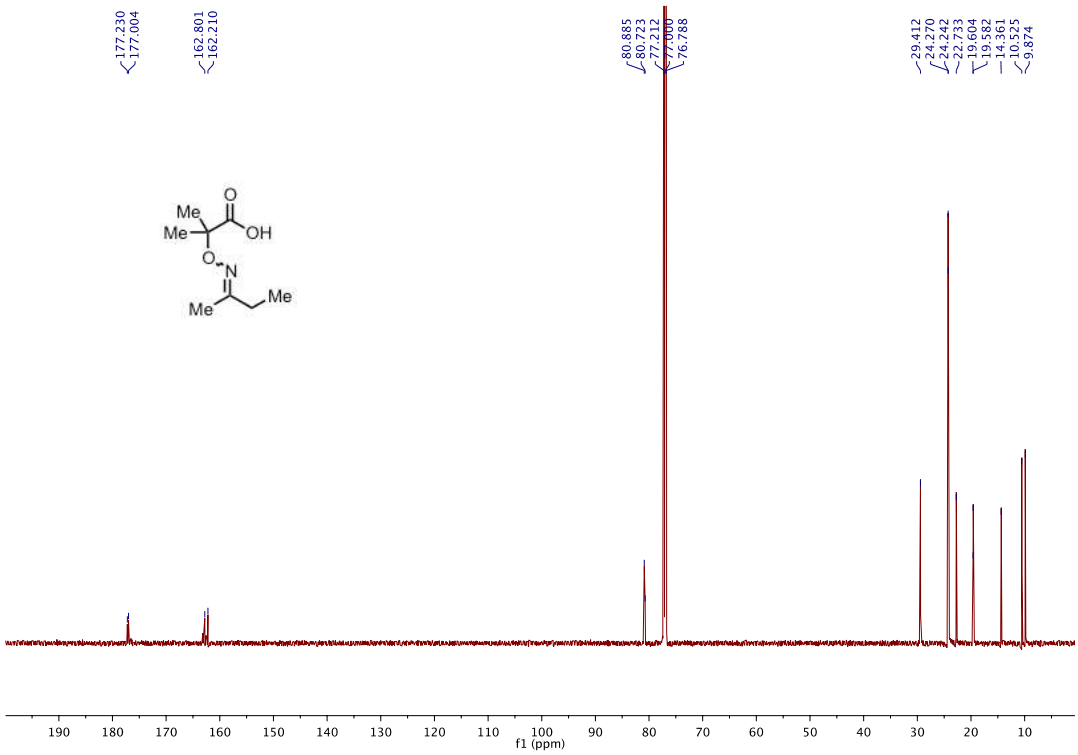
2.429
2.423
2.416
2.411
2.403
2.398
2.390
2.316
2.312
2.304
2.292
2.279
2.267
1.951
1.946
1.939
1.933
1.930
1.526
1.523
1.518
1.515
1.141
1.132
1.120
1.104
1.098
1.091
1.085
Me
Me
O
OH
O
N
Me
Me
2.00
1.94
5.84
11.88
5.86
f1 (ppm)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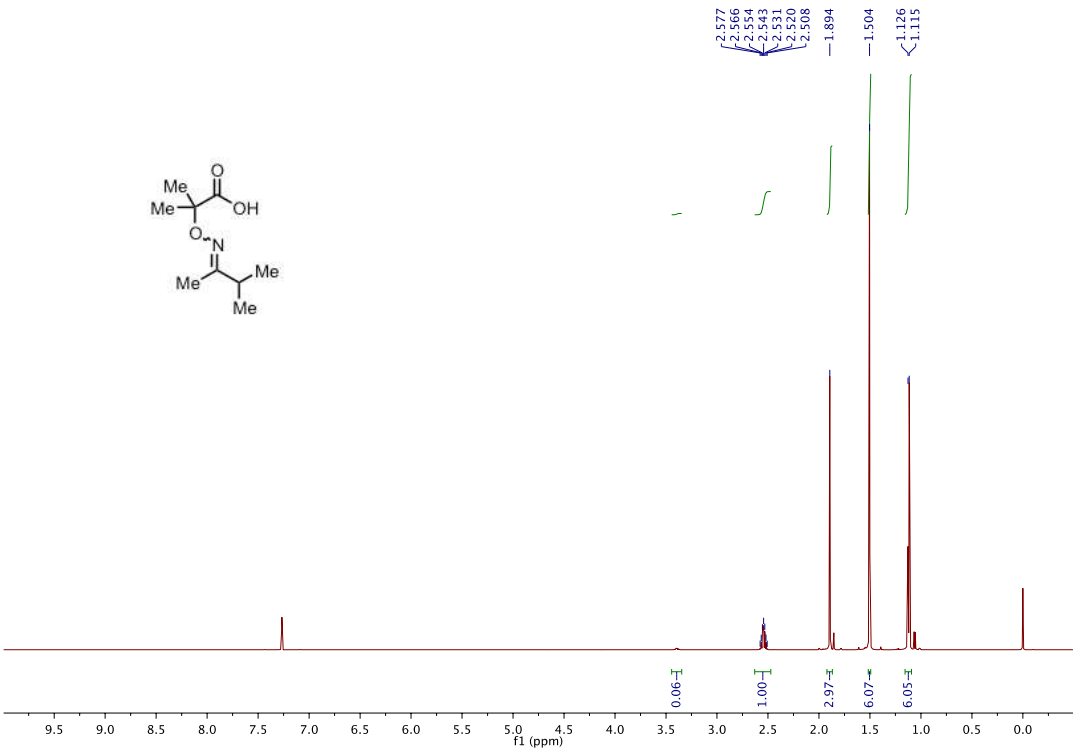
162.801
162.210
80.885
80.723
77.212
77.000
76.788
29.412
24.270
24.242
22.733
19.604
19.582
14.361
10.525
9.874
Me
Me
O
OH
O
N
Me
Me
f1 (ppm)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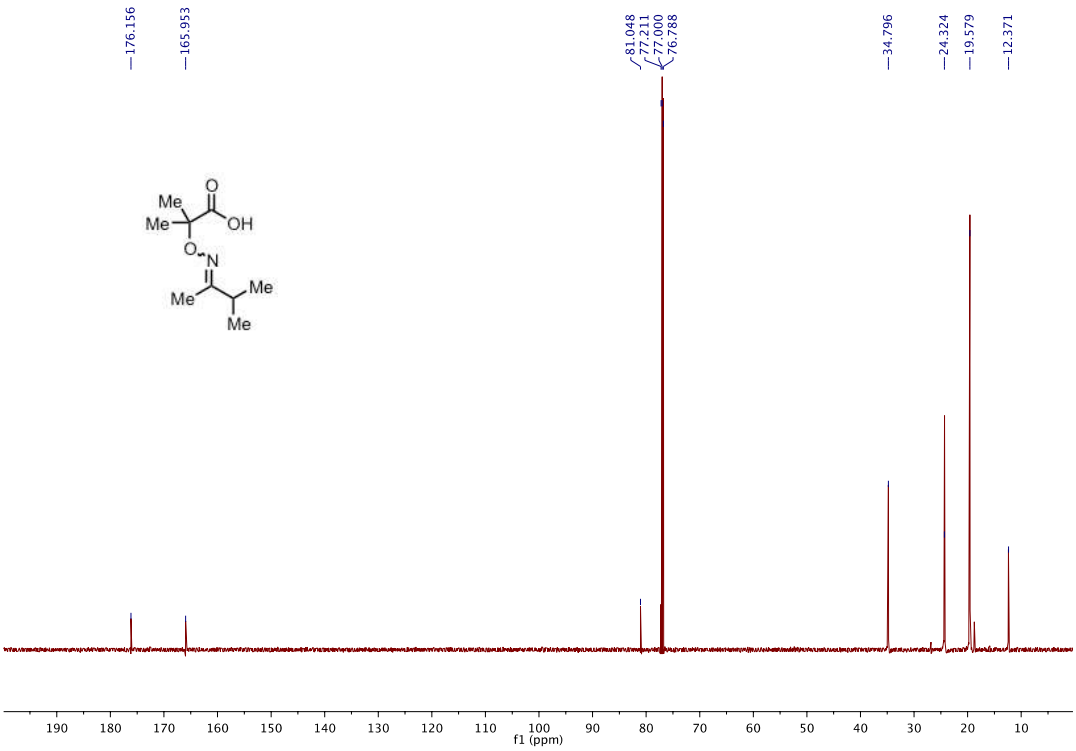
2.566
2.554
2.543
2.531
2.520
2.508
1.894
1.504
1.126
1.115
Me
Me
O
OH
O
N
Me
Me
Me
0.06
1.00
2.97
6.07
6.05
f1 (ppm)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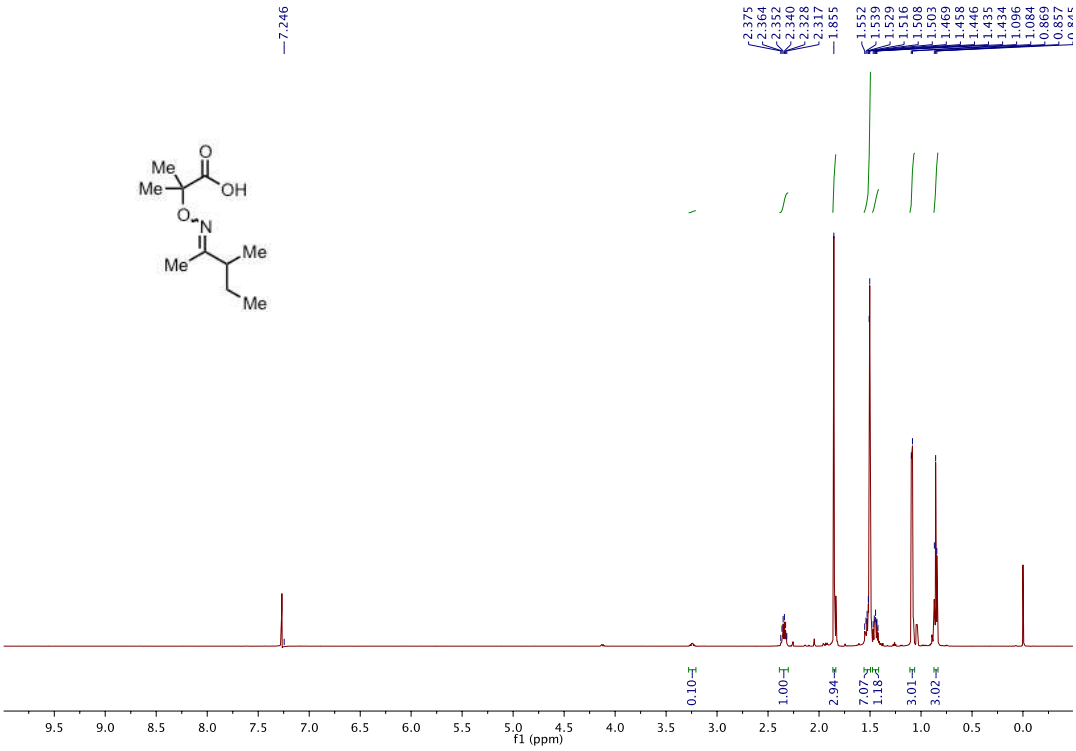
165.953
81.048
77.211
77.000
76.788
34.796
24.324
19.579
12.371
Me
Me
O
OH
O
N
Me
Me
Me
f1 (ppm)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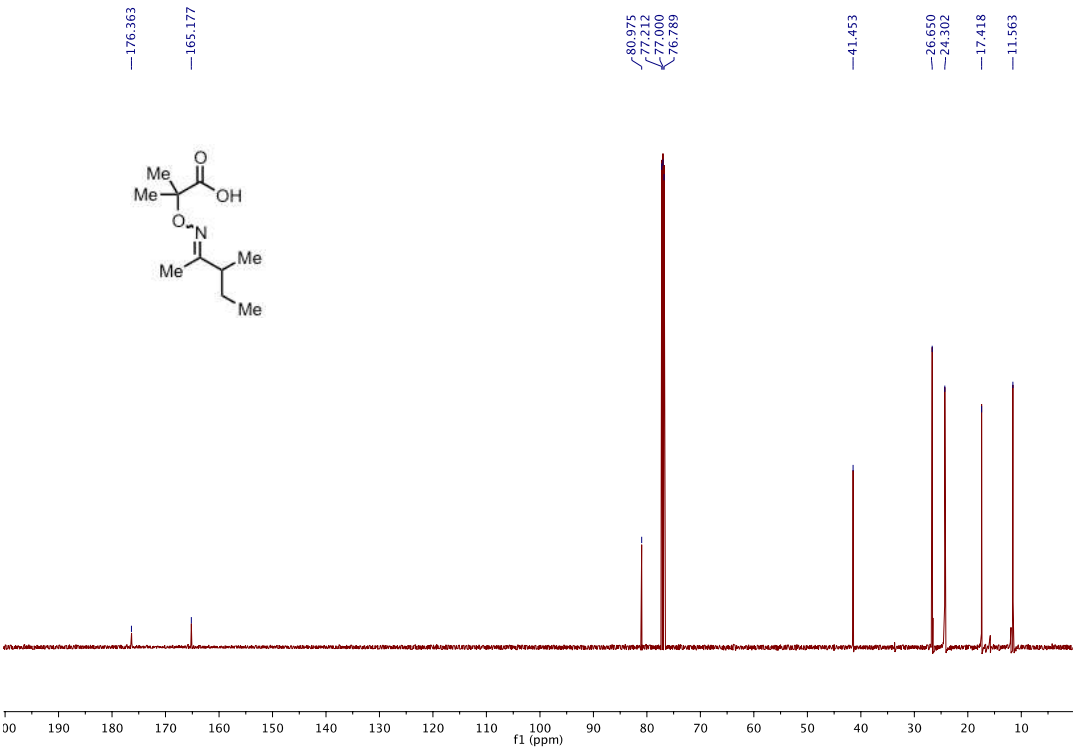
2.375
2.364
2.352
2.340
2.328
2.317
1.855
1.552
1.539
1.529
1.516
1.508
1.503
1.469
1.458
1.446
1.435
1.434
1.096
1.084
0.869
0.857
Me
Me
O
OH
O
N
Me
Me
Me
0.10
1.00
2.94
7.07
1.18
3.01
3.02
f1 (ppm)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77.212
77.000
76.789
41.453
26.650
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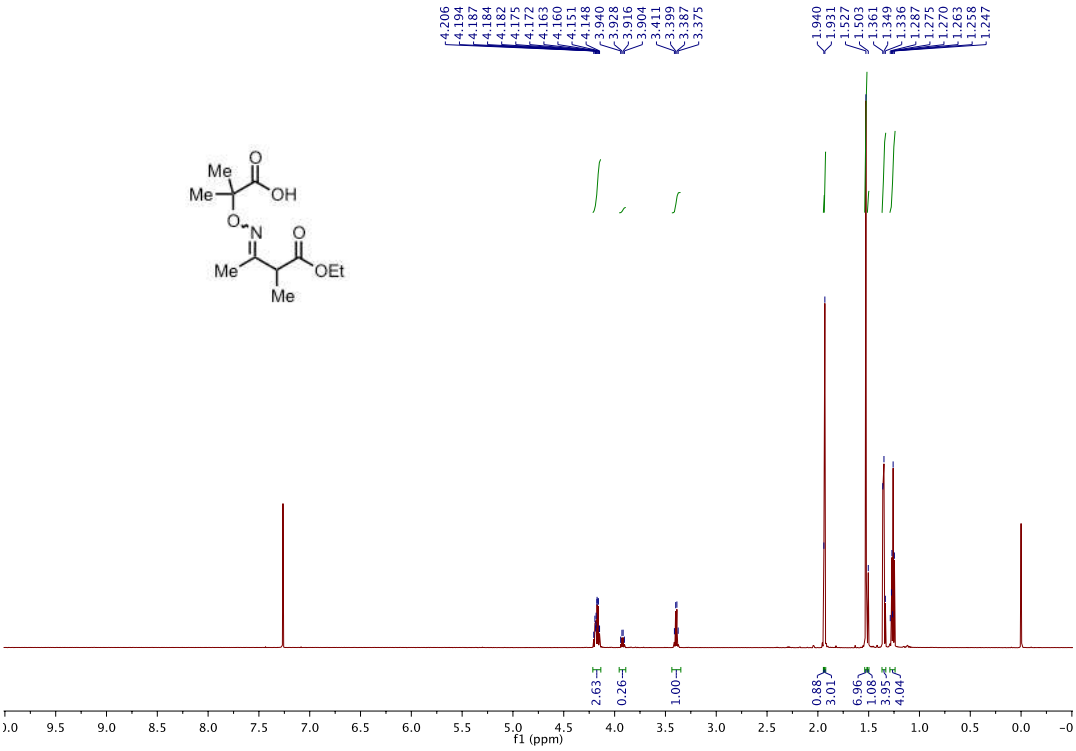
17.418
11.563
Me
Me
O
OH
O
N
Me
Me
Me
f1 (ppm)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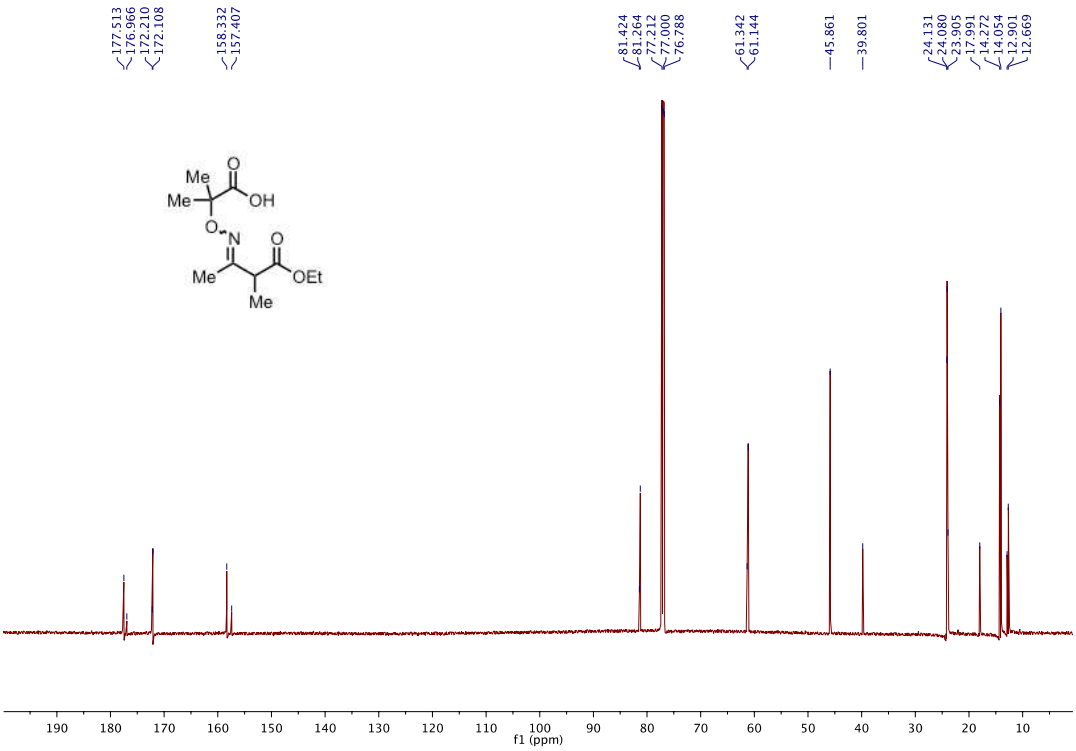
4.194
4.187
4.184
4.182
4.175
4.172
4.163
4.160
4.151
4.148
3.940
3.928
3.916
3.904
3.411
3.399
3.387
3.375
1.940
1.931
1.527
1.503
1.361
1.349
1.336
1.287
1.275
1.270
1.263
1.258
1.247
Me
Me
O
OH
O
N
Me
O
OEt
Me
2.63
0.26
1.00
0.88
3.01
6.96
1.08
3.95
4.04
f1 (ppm)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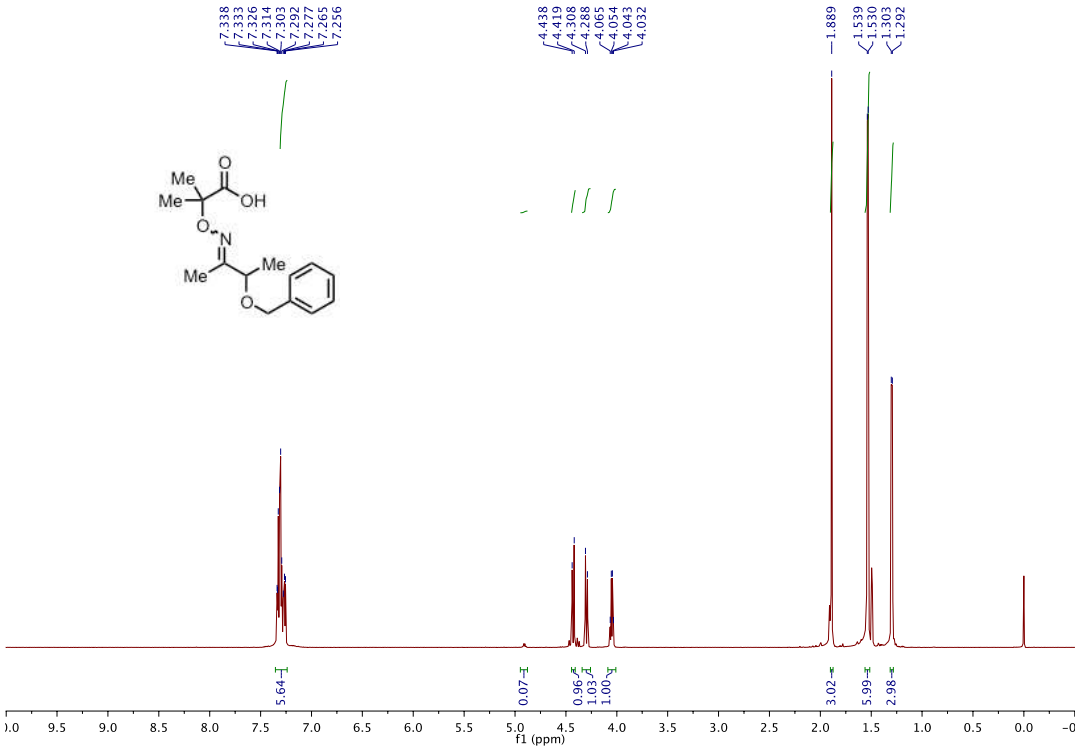
176.966
172.210
172.108
158.332
157.407
81.424
81.264
77.212
77.000
76.788
61.342
61.144
45.861
39.801
24.131
24.080
23.905
17.991
14.272
14.054
12.901
12.669
Me
Me
O
OH
O
N
Me
O
OEt
Me
f1 (ppm)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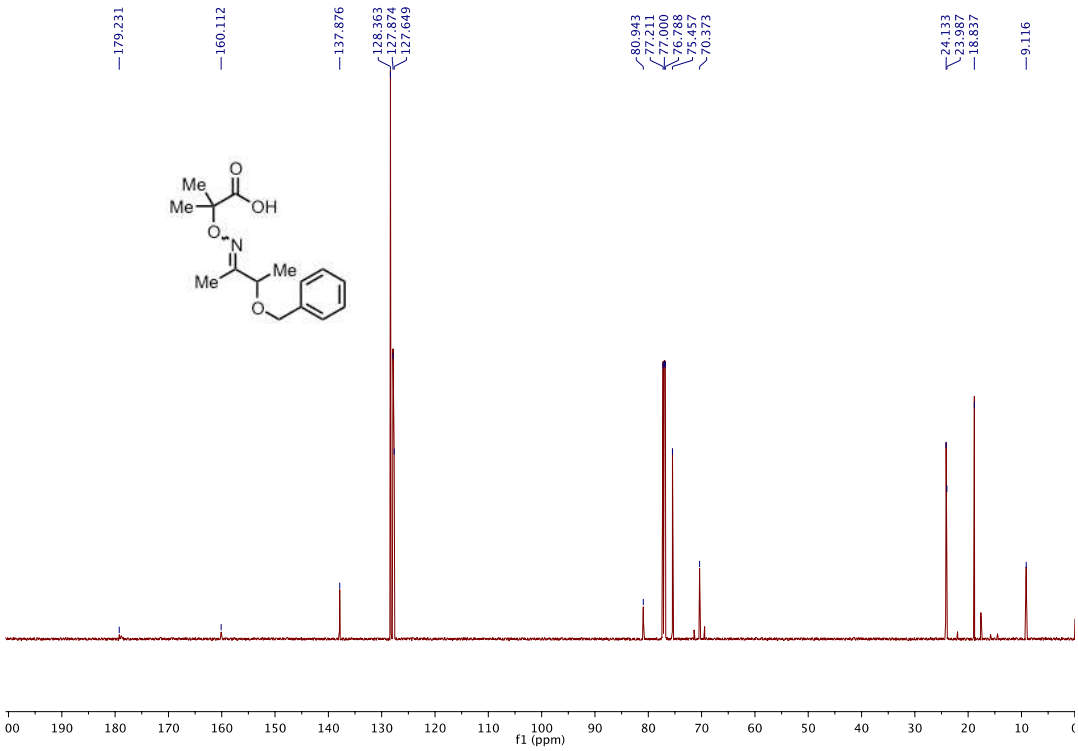
7.326
7.314
7.303
7.292
7.277
7.265
7.256
4.438
4.419
4.308
4.288
4.065
4.054
4.043
4.032
1.889
1.539
1.530
1.303
1.292
Me
Me
O
OH
O
N
Me
Me
O
5.64
0.07
0.96
1.03
1.00
3.02
5.99
2.98
f1 (ppm)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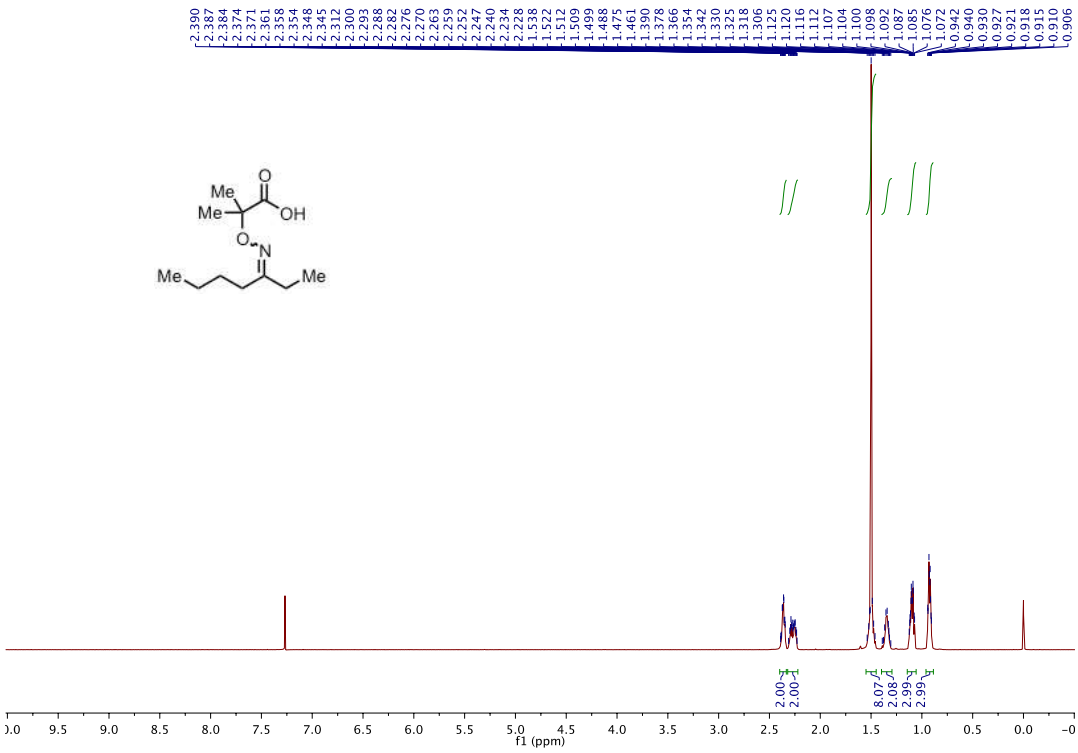
137.876
128.363
127.874
127.649
80.943
77.211
77.000
76.788
75.457
70.373
24.133
23.987
18.837
9.116
Me
Me
O
OH
O
N
Me
Me
O
f1 (ppm)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2.361
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2.354
2.348
2.345
2.312
2.300
2.293
2.288
2.282
2.276
2.270
2.263
2.259
2.252
2.247
2.240
2.234
2.228
1.538
1.522
1.512
1.509
1.499
1.488
1.475
1.461
1.390
1.378
1.366
1.354
1.342
1.330
1.325
1.318
1.306
1.125
1.120
1.116
1.112
1.107
1.104
1.100
1.098
1.092
1.087
1.085
1.076
1.072
0.942
0.940
0.930
0.927
0.921
0.918
0.915
0.910
0.906
Me
Me
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OH
O
N
Me
Me
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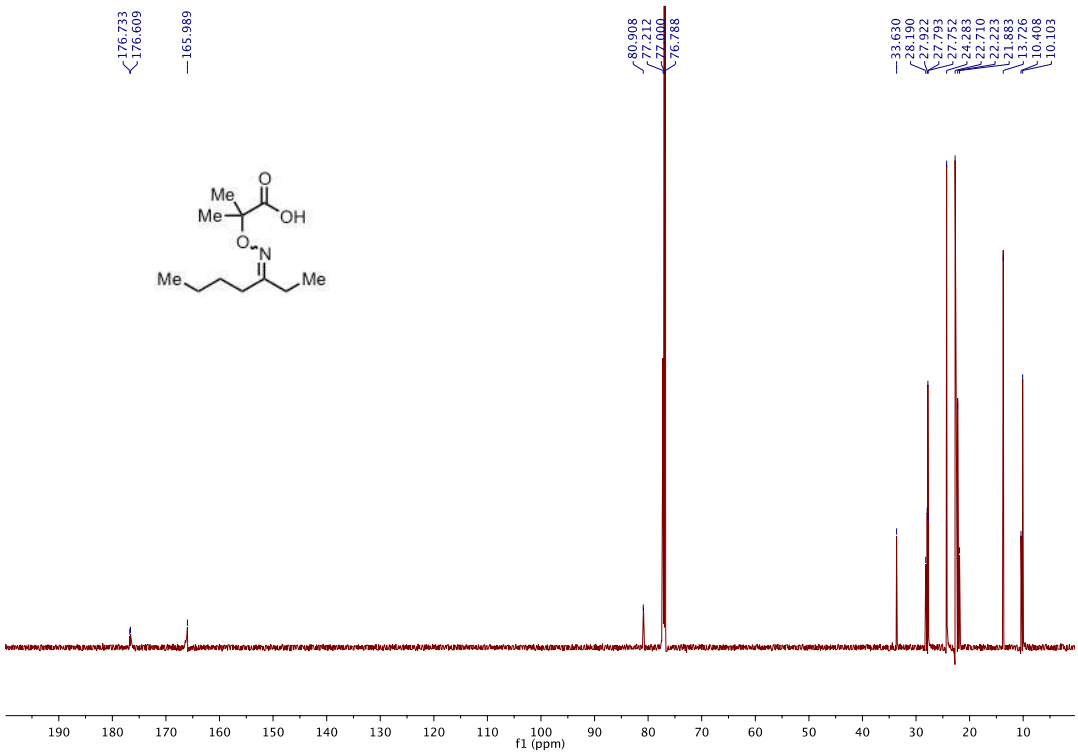
2.00
8.07
2.08
2.99
2.99
f1 (ppm)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76.788
33.630
28.190
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27.793
27.752
24.283
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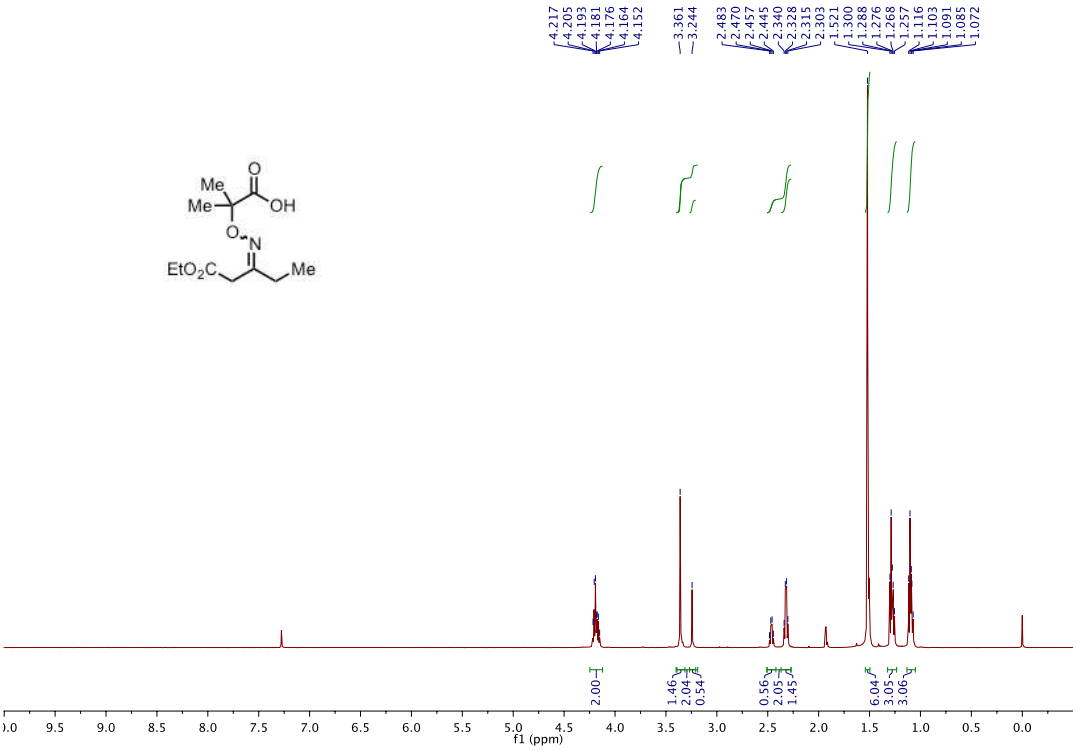
21.883
13.726
10.408
10.103
Me
Me
O
OH
O
N
Me
Me
f1 (ppm)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4.152
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2.483
2.470
2.457
2.445
2.340
2.328
2.315
2.303
1.521
1.300
1.288
1.276
1.268
1.257
1.116
1.103
1.091
1.085
1.072
Me
Me
O
OH
N
EtO2C
Me
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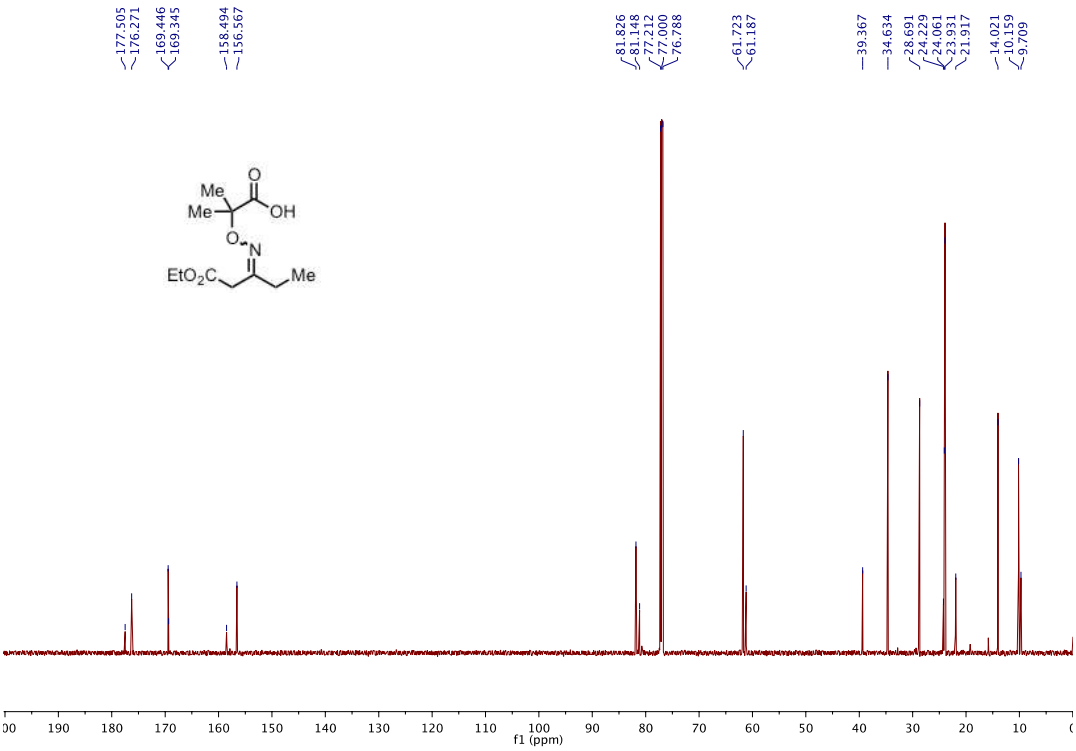
1.45
6.04
3.05
3.06
f1 (ppm)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156.567
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81.148
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77.000
76.788
61.723
61.187
39.367
34.634
28.691
24.229
24.061
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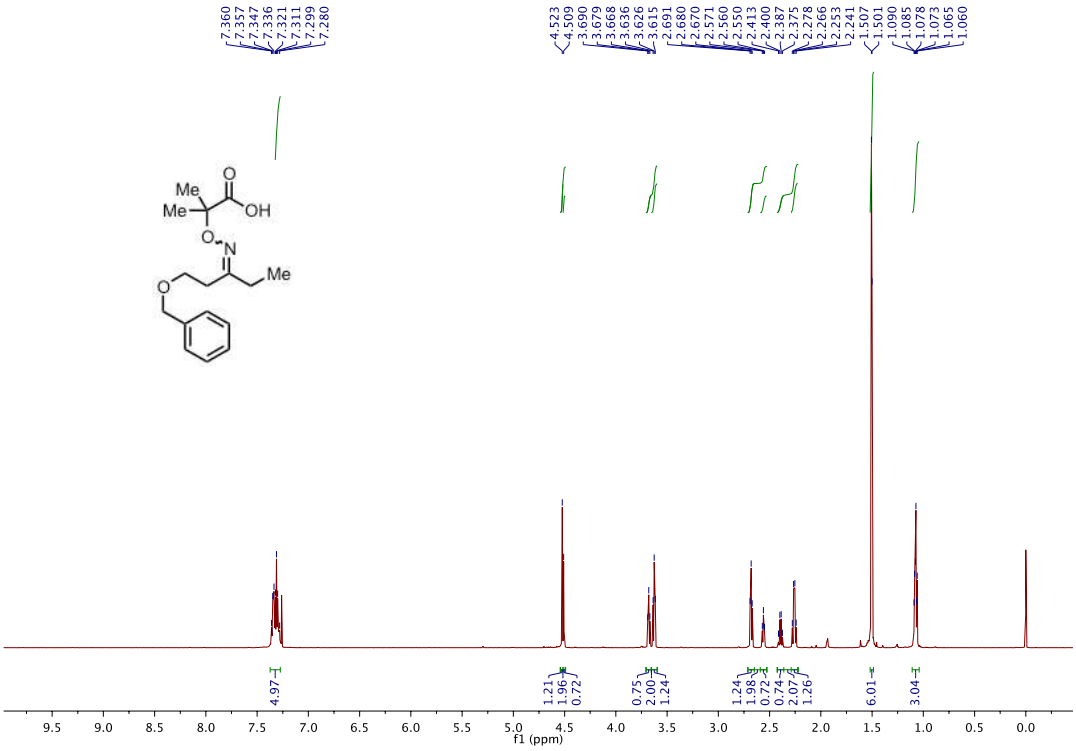
21.917
14.021
10.159
9.709
Me
Me
O
OH
N
EtO2C
Me
f1 (ppm)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7.280
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4.509
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3.679
3.668
3.636
3.626
3.615
2.691
2.680
2.670
2.571
2.560
2.550
2.413
2.400
2.387
2.375
2.278
2.266
2.253
2.241
1.507
1.501
1.090
1.085
1.078
1.073
1.065
1.060
Me
Me
O
OH
O
N
Me
O
4.97
1.21
1.96
0.72
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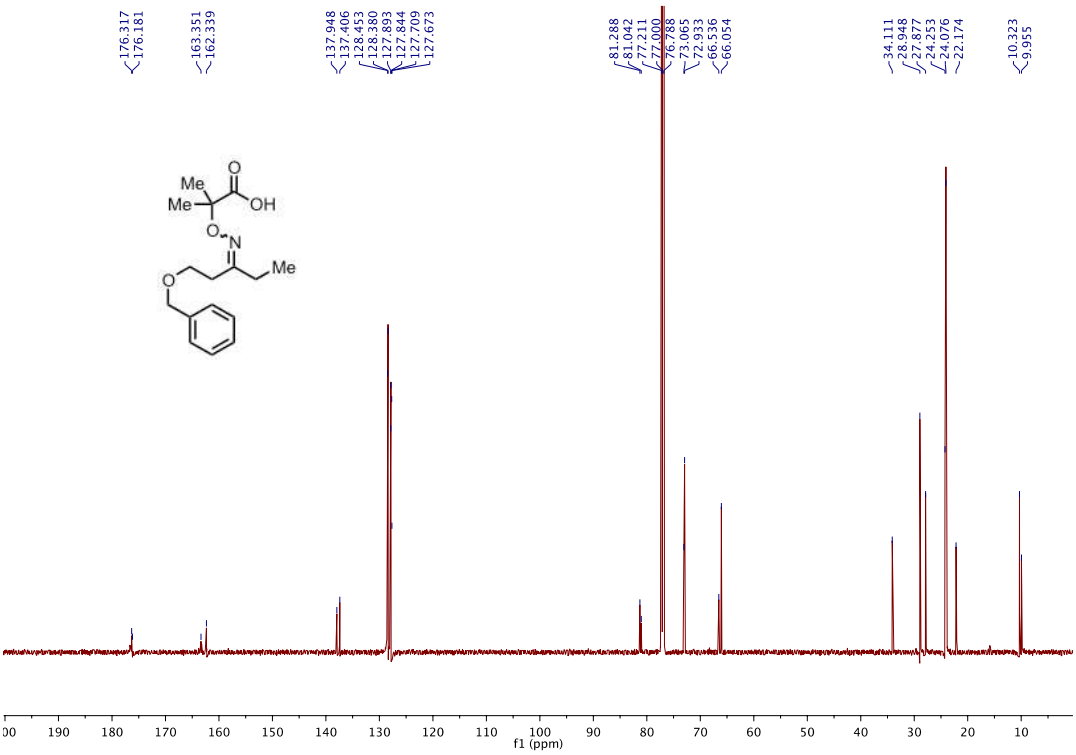
1.26
6.01
3.04
f1 (ppm)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128.380
127.893
127.844
127.709
127.673
81.288
81.042
77.211
77.000
76.788
73.065
72.933
66.336
66.054
34.111
28.948
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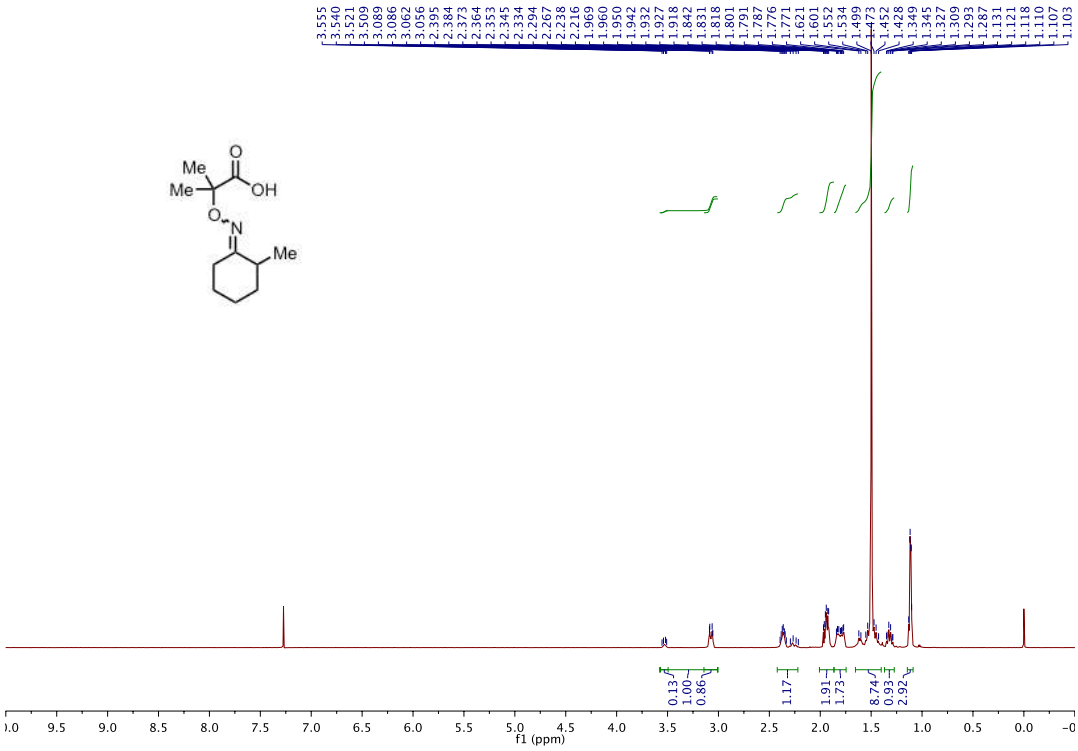
22.174
10.323
9.955
Me
Me
O
OH
O
N
Me
O
f1 (ppm)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3.086
3.062
3.056
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2.373
2.364
2.353
2.345
2.334
2.294
2.267
2.238
2.216
1.969
1.960
1.950
1.942
1.932
1.927
1.918
1.842
1.831
1.818
1.801
1.791
1.787
1.776
1.771
1.621
1.601
1.552
1.534
1.499
1.473
1.452
1.428
1.349
1.345
1.327
1.309
1.293
1.287
1.131
1.121
1.118
1.110
1.107
1.103
Me
Me
O
OH
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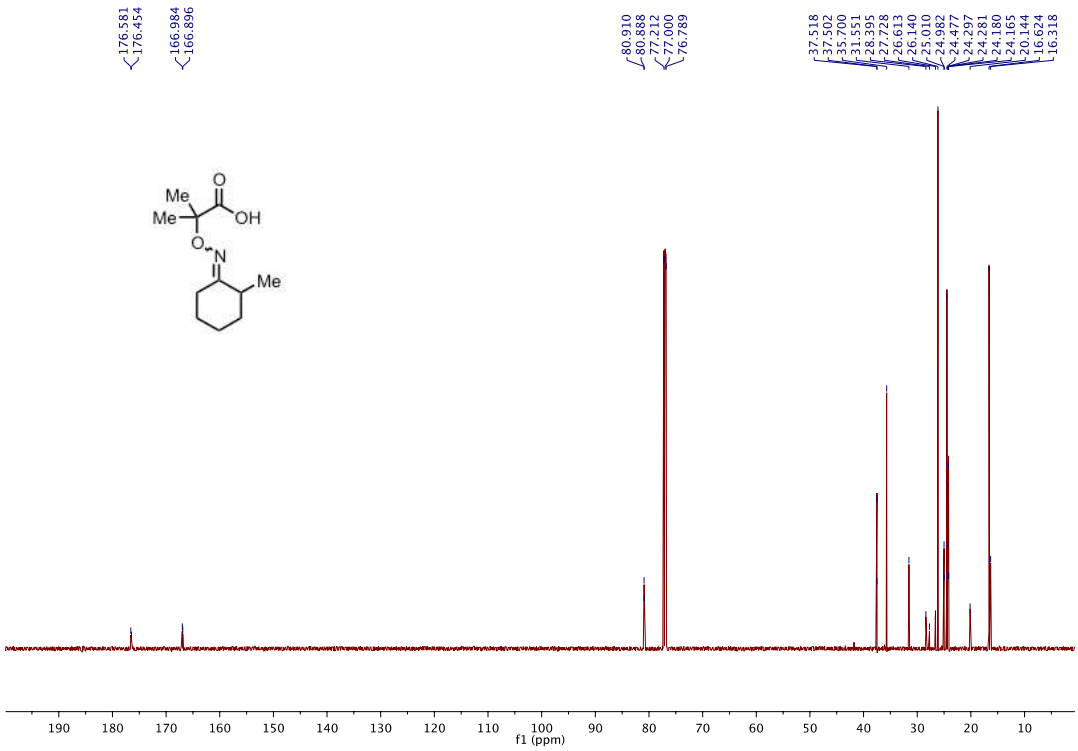
f1 (ppm)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166.896
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80.888
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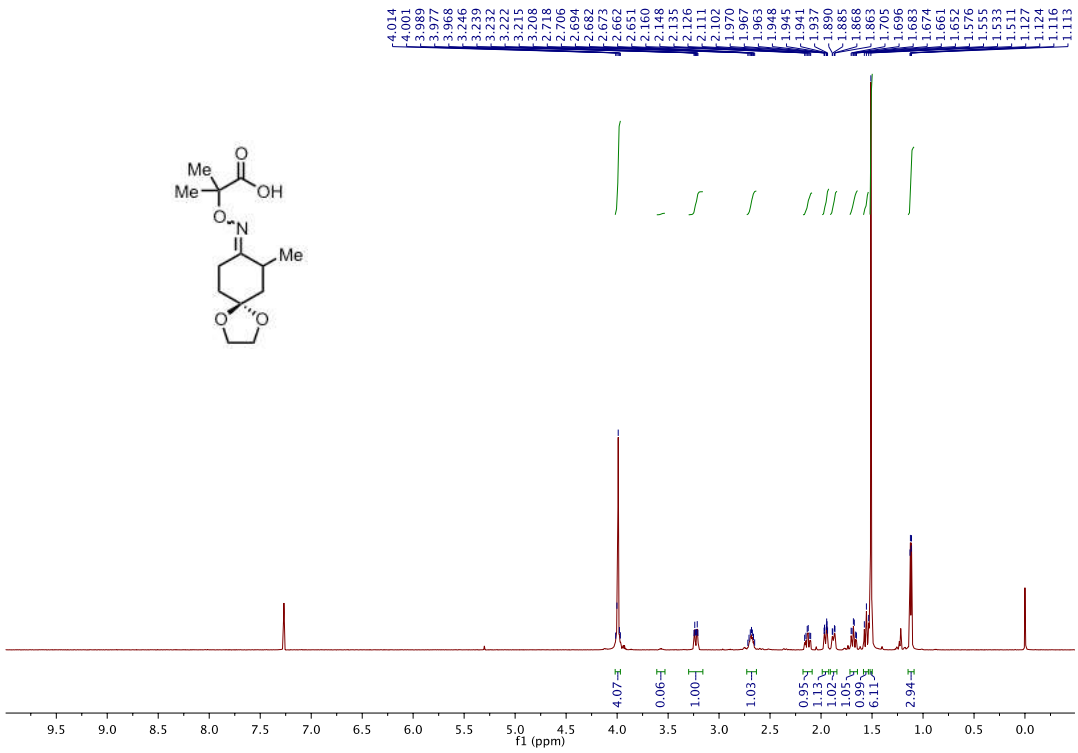
77.000
76.789
37.518
37.502
35.700
31.551
28.395
27.728
26.613
26.140
25.010
24.982
24.477
24.297
24.281
24.180
24.165
20.144
16.624
16.318
Me
Me
O
OH
O
N
Me
f1 (ppm)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3.239
3.232
3.222
3.215
3.208
2.718
2.706
2.694
2.682
2.673
2.662
2.651
2.160
2.148
2.135
2.126
2.111
2.102
1.970
1.967
1.963
1.948
1.945
1.941
1.937
1.890
1.885
1.868
1.863
1.705
1.696
1.683
1.674
1.661
1.652
1.576
1.555
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1.511
1.127
1.124
1.116
1.113
Me
Me
O
OH
O
N
Me
O
O
4.07
0.06
1.00
1.03
0.95
1.13
1.02
1.05
0.99
6.11
2.94
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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4.5
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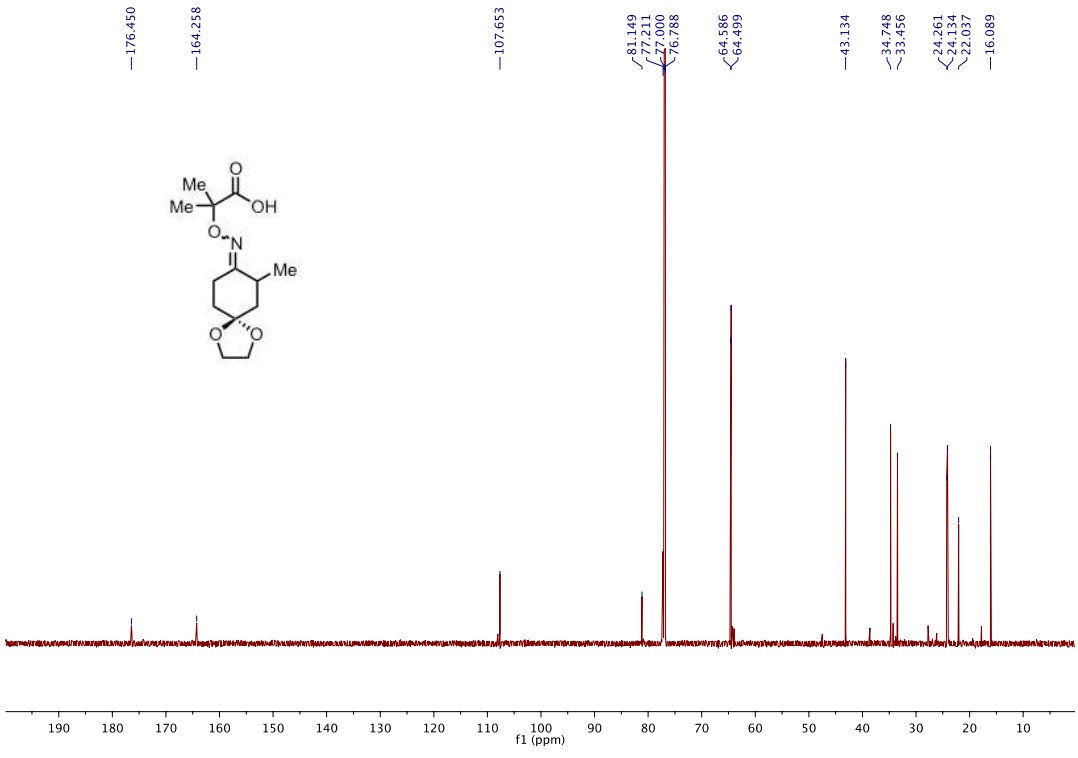
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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77.000
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64.586
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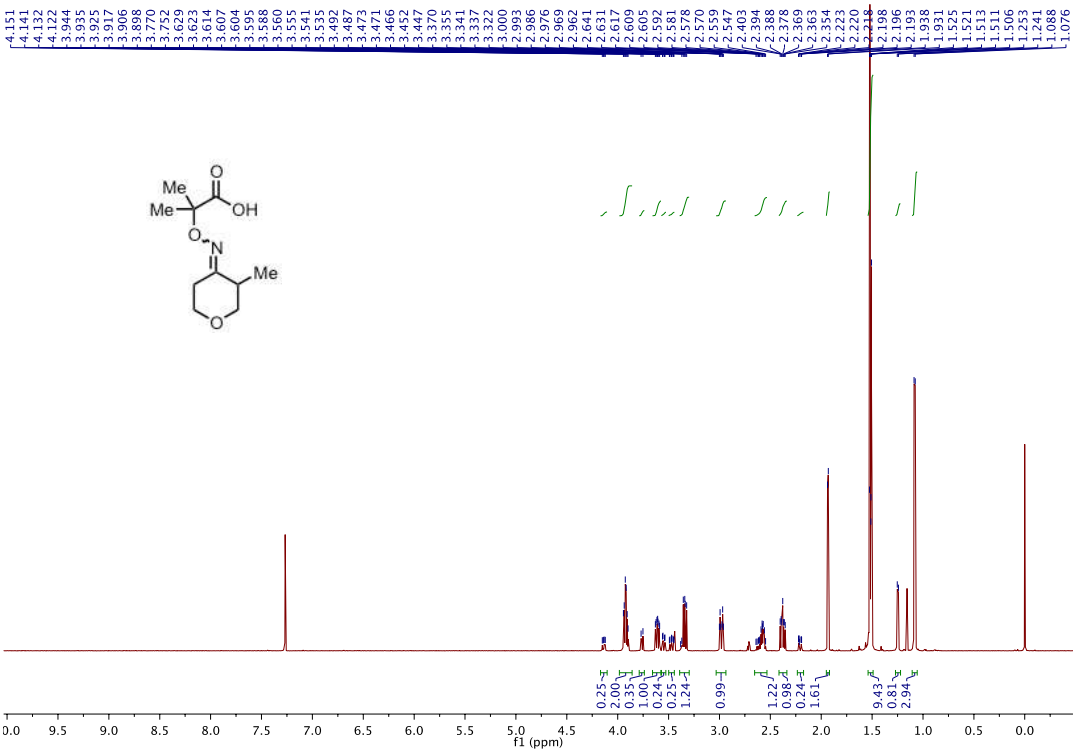
34.748
33.456
24.261
24.134
22.037
16.089
Me
Me
O
OH
O
N
Me
O
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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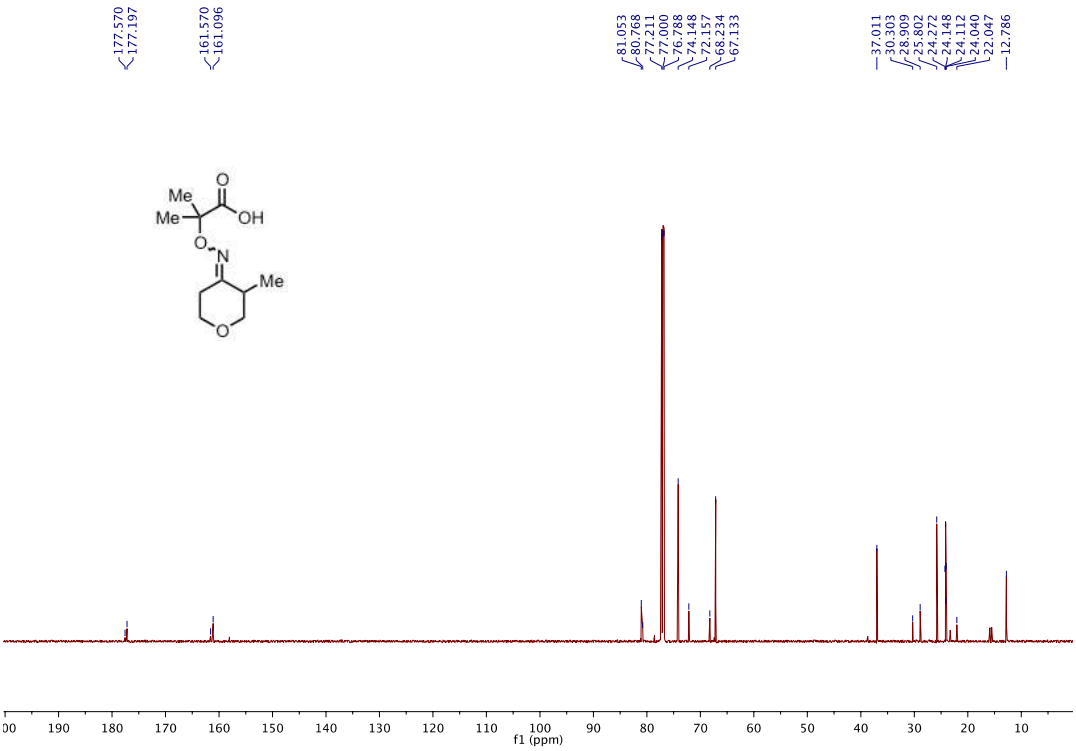
Me
O
OH
O
N
Me
O
f1 (ppm)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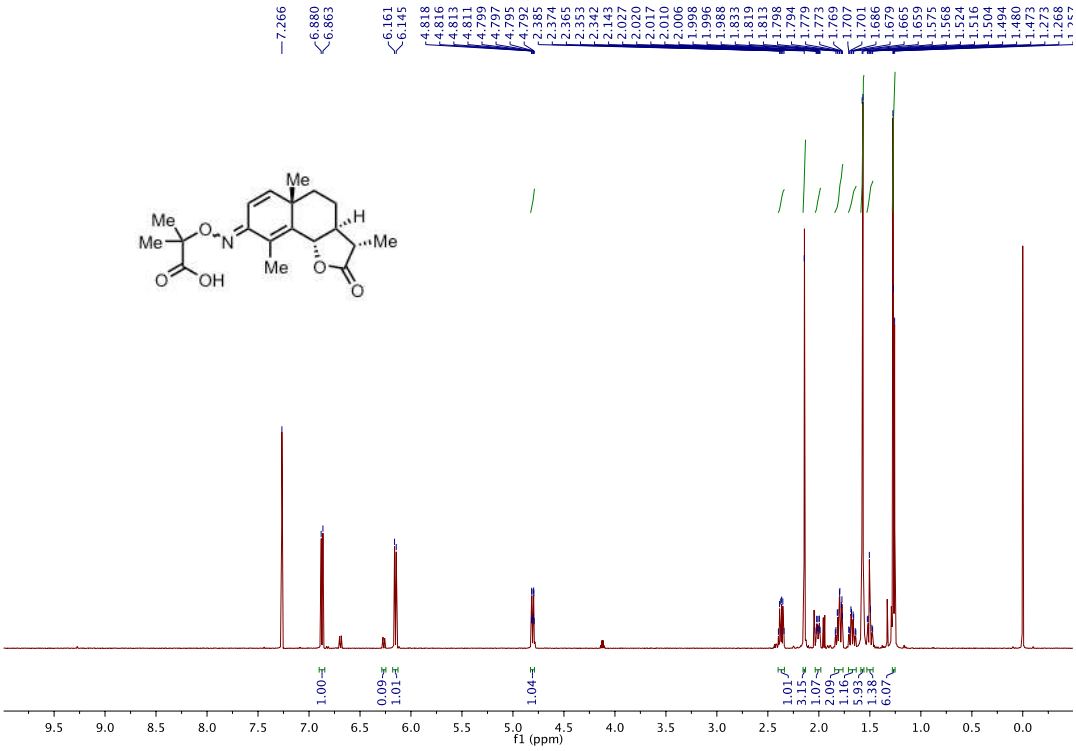
Me
O
OH
O
N
Me
O
f1 (ppm)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4.813
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4.797
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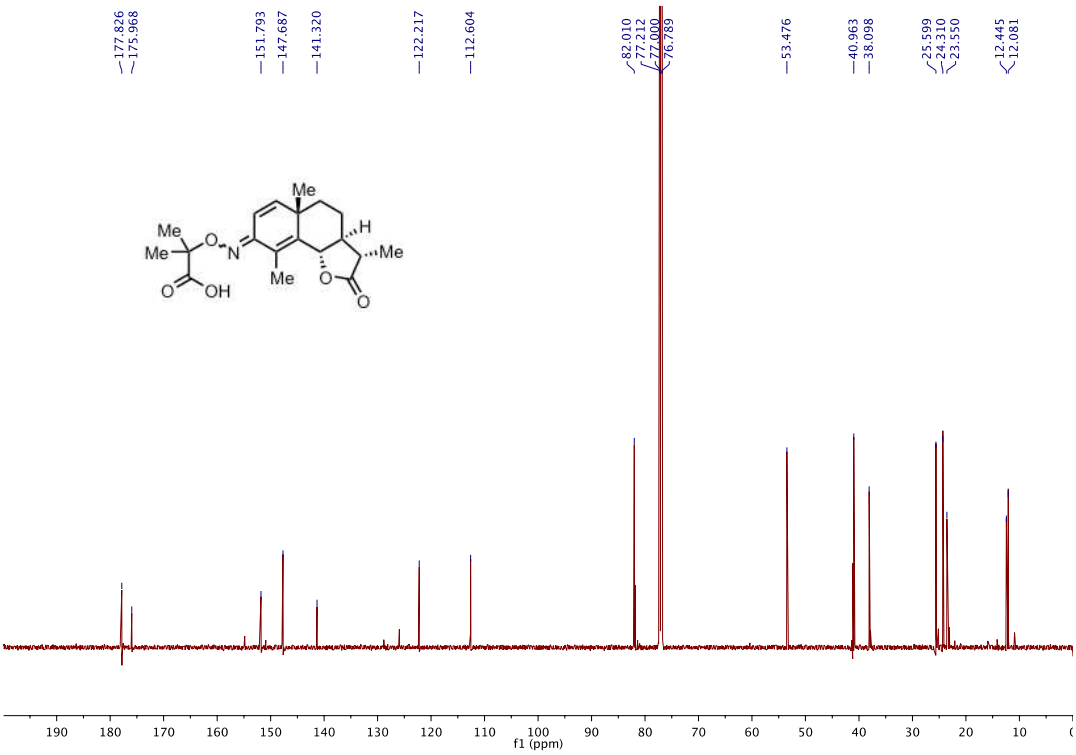
4.792
2.385
2.374
2.365
2.353
2.342
2.143
2.027
2.020
2.017
2.010
2.006
1.998
1.996
1.988
1.833
1.819
1.813
1.798
1.794
1.779
1.773
1.769
1.707
1.701
1.686
1.679
1.665
1.659
1.575
1.568
1.524
1.516
1.504
1.494
1.480
1.473
1.273
1.268
Me
Me
Me
O
N
H
Me
Me
O
O
OH
O
1.00
0.09
1.01
1.04
1.01
3.15
1.07
2.09
1.16
5.93
1.38
6.07
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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151.793
147.687
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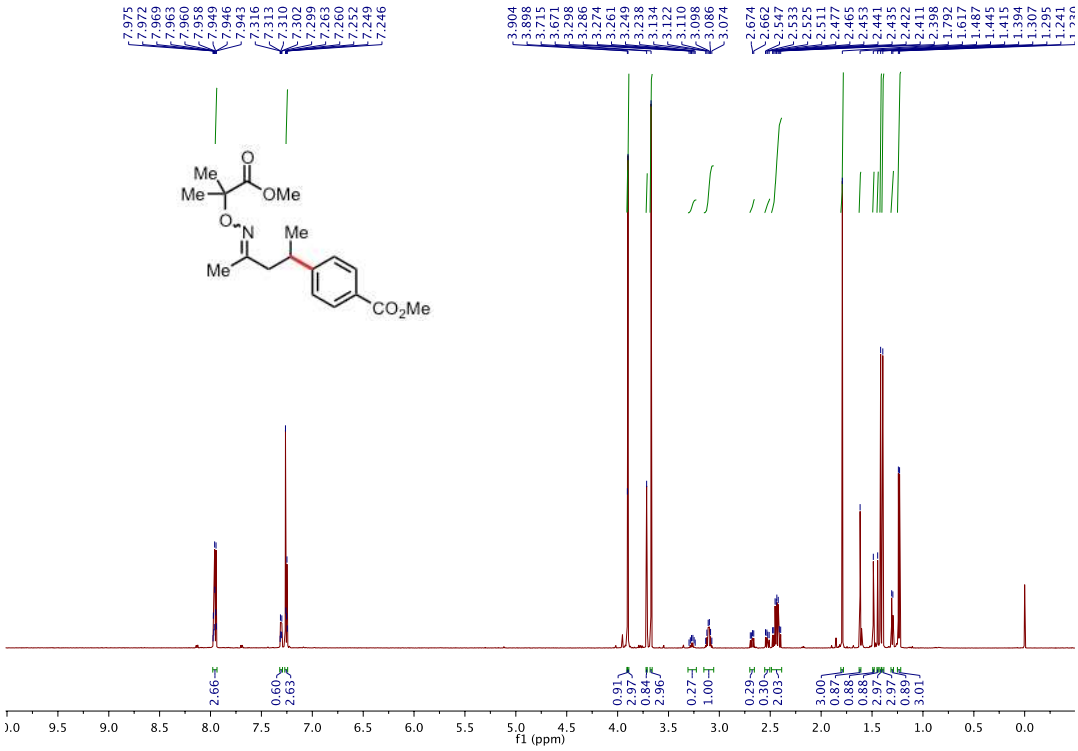
122.217
112.604
82.010
77.212
77.000
76.789
53.476
40.963
38.098
25.599
24.310
23.550
12.445
12.081
Me
Me
Me
O
N
H
Me
Me
O
O
OH
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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7.960
7.958
7.949
7.946
7.943
7.316
7.313
7.310
7.302
7.299
7.263
7.260
7.252
7.249
7.246
3.904
3.898
3.715
3.671
3.298
3.286
3.274
3.261
3.249
3.238
3.134
3.122
3.110
3.098
3.086
3.074
2.674
2.662
2.547
2.533
2.525
2.511
2.477
2.465
2.453
2.441
2.435
2.422
2.411
2.398
1.792
1.617
1.487
1.445
1.415
1.394
1.307
1.295
1.241
Me
Me
O
OMe
O
N
Me
Me
Me
CO2Me
2.66
0.60
2.63
0.91
2.97
0.84
2.96
0.27
1.00
0.29
0.30
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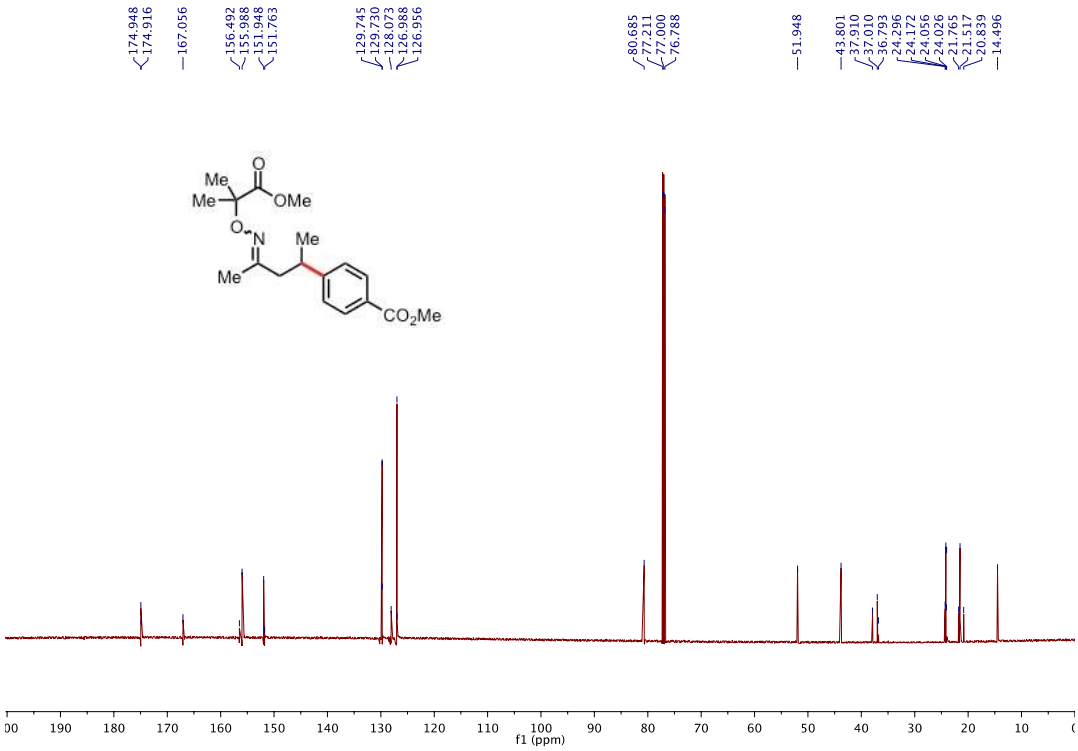
3.00
0.87
0.88
0.88
2.97
2.97
0.89
3.01
f1 (ppm)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151.948
151.763
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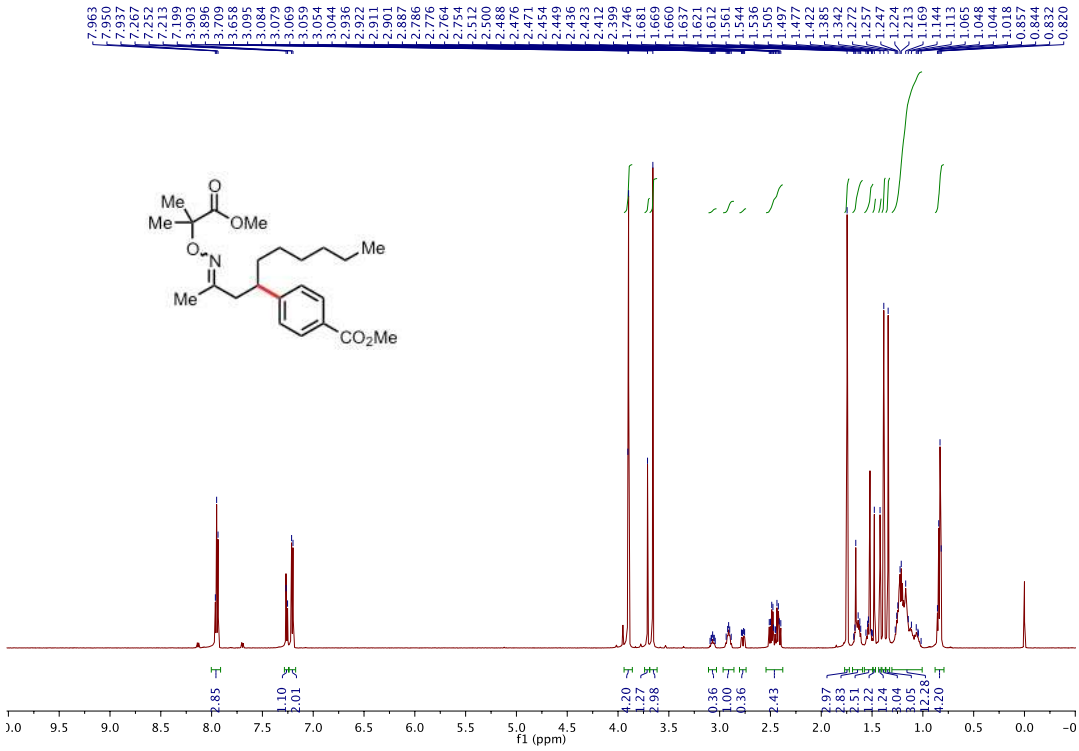
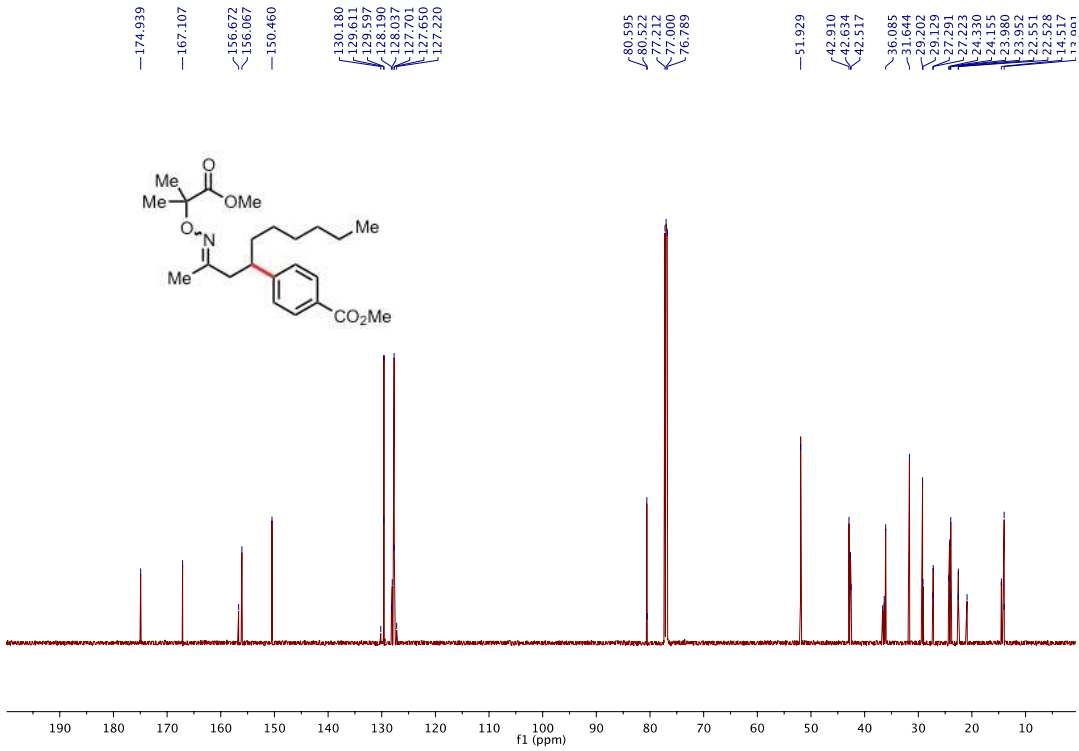
129.730
128.073
126.988
126.956
80.685
77.211
77.000
76.788
51.948
43.801
37.910
37.010
36.793
24.296
24.172
24.056
24.026
21.765
21.517
20.839
14.496
Me
Me
O
OMe
O
N
Me
Me
Me
CO2Me
f1 (ppm)


Me
Me
O
OMe
O
N
Me
Me
Me
CO2Me
f1 (ppm)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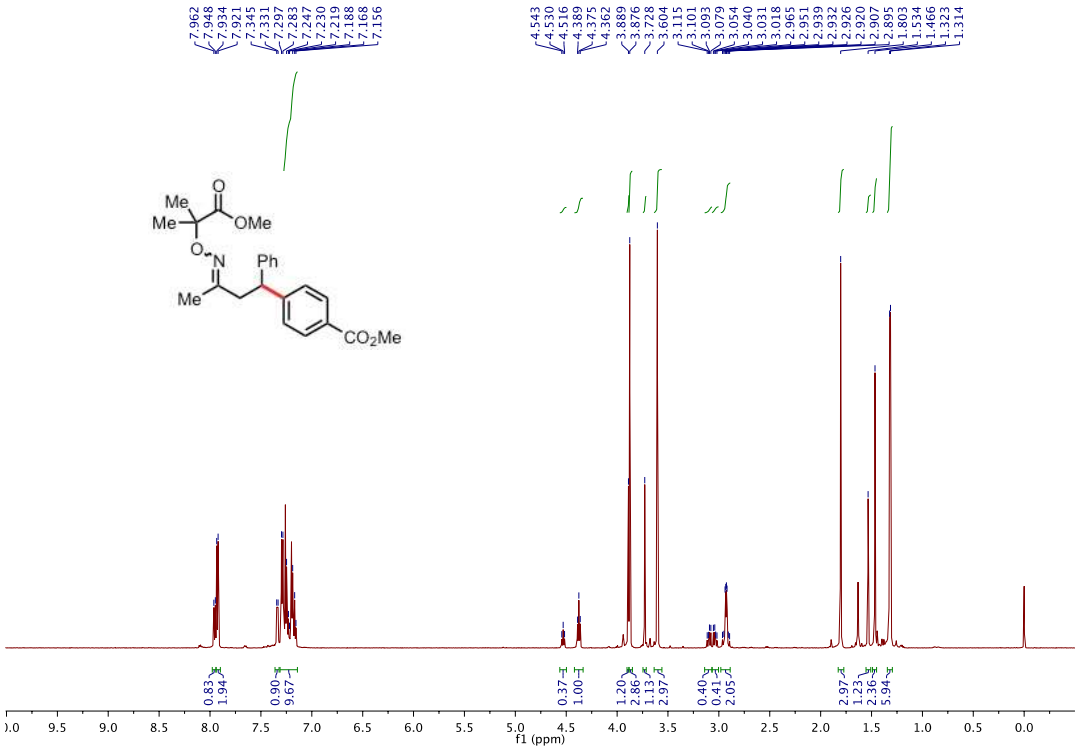
Me
O
OMe
O
N
Me
Me
CO2Me
f1 (ppm)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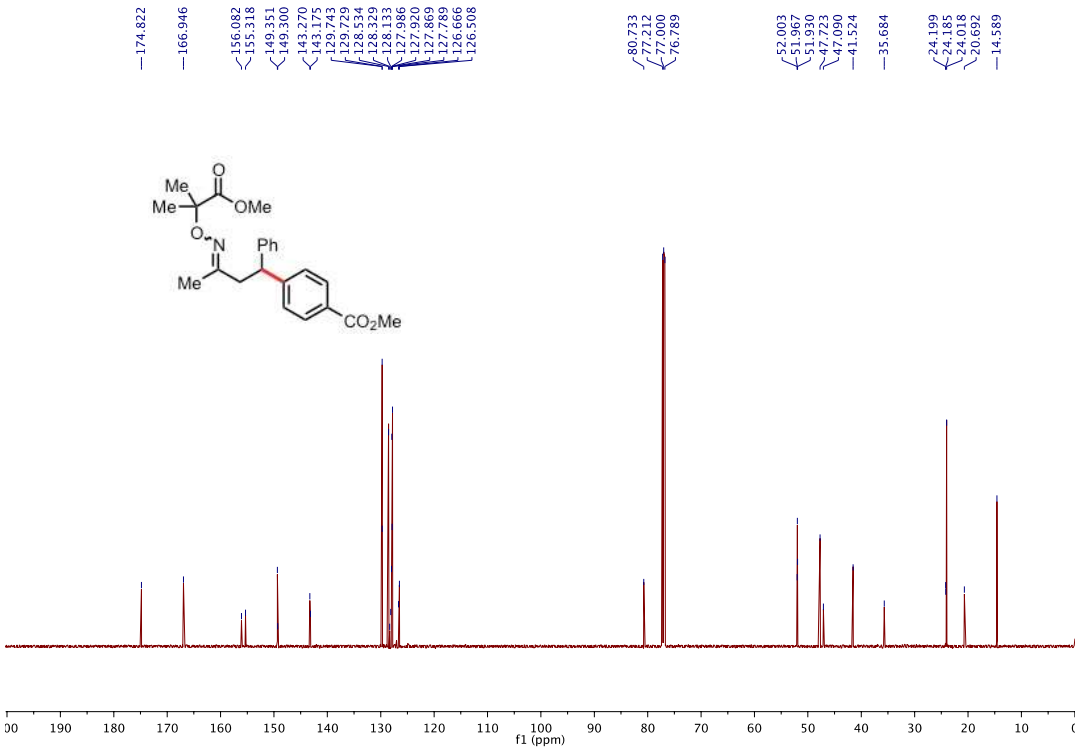
7.921
7.345
7.331
7.297
7.283
7.247
7.230
7.219
7.188
7.168
7.156
4.543
4.530
4.516
4.389
4.375
4.362
3.889
3.876
3.728
3.604
3.115
3.101
3.093
3.079
3.054
3.040
3.031
3.018
2.965
2.951
2.939
2.932
2.926
2.920
2.907
2.895
1.803
1.534
1.466
1.323
1.314
Me
Me
O
OMe
O
N
Ph
Me
CO2Me
0.83
1.94
0.90
9.67
0.37
1.00
1.20
2.86
1.13
2.97
0.40
0.41
2.05
2.97
1.23
2.36
5.94
f1 (ppm)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155.318
149.351
149.300
143.270
143.175
129.743
129.729
128.534
128.329
128.133
127.986
127.920
127.869
127.789
126.666
126.508
80.733
77.212
77.000
76.789
52.003
51.967
51.930
47.723
47.090
41.524
35.684
24.199
24.185
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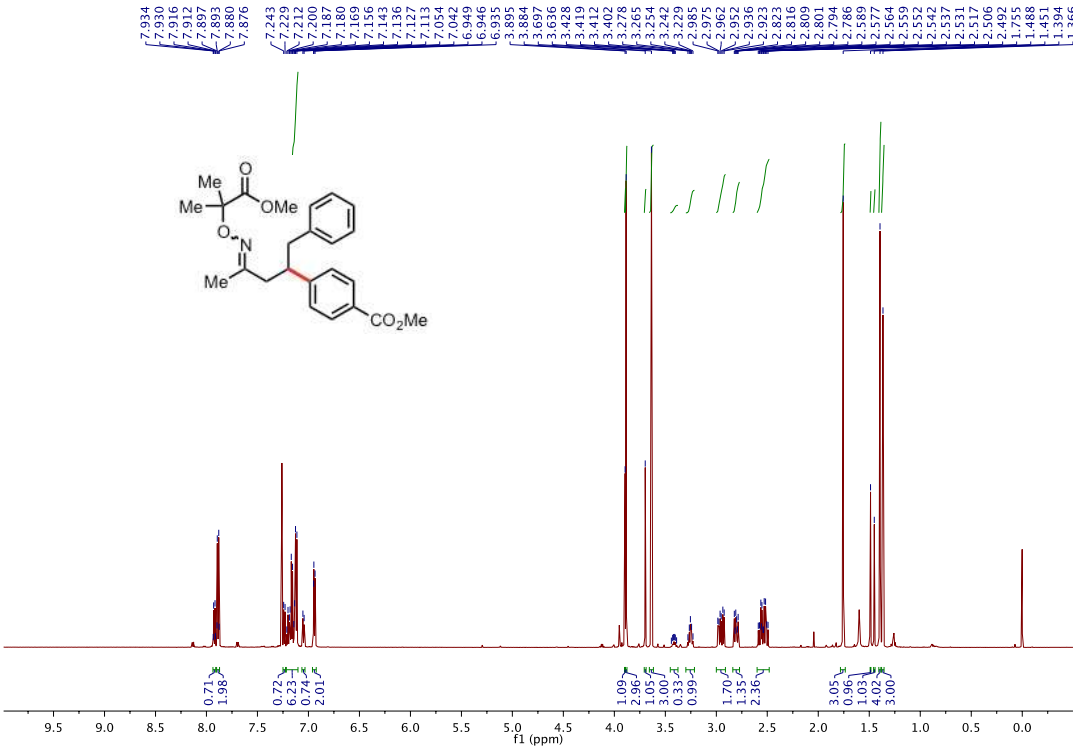
20.692
14.589
Me
Me
O
OMe
O
N
Ph
Me
CO2Me
f1 (ppm)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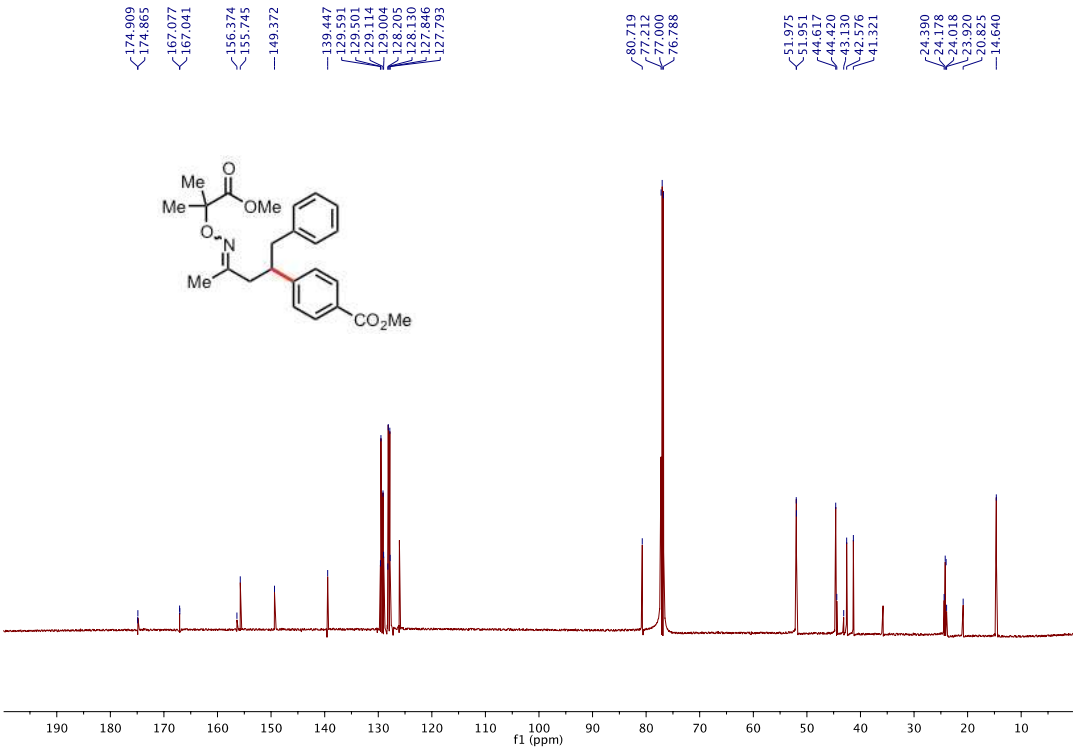
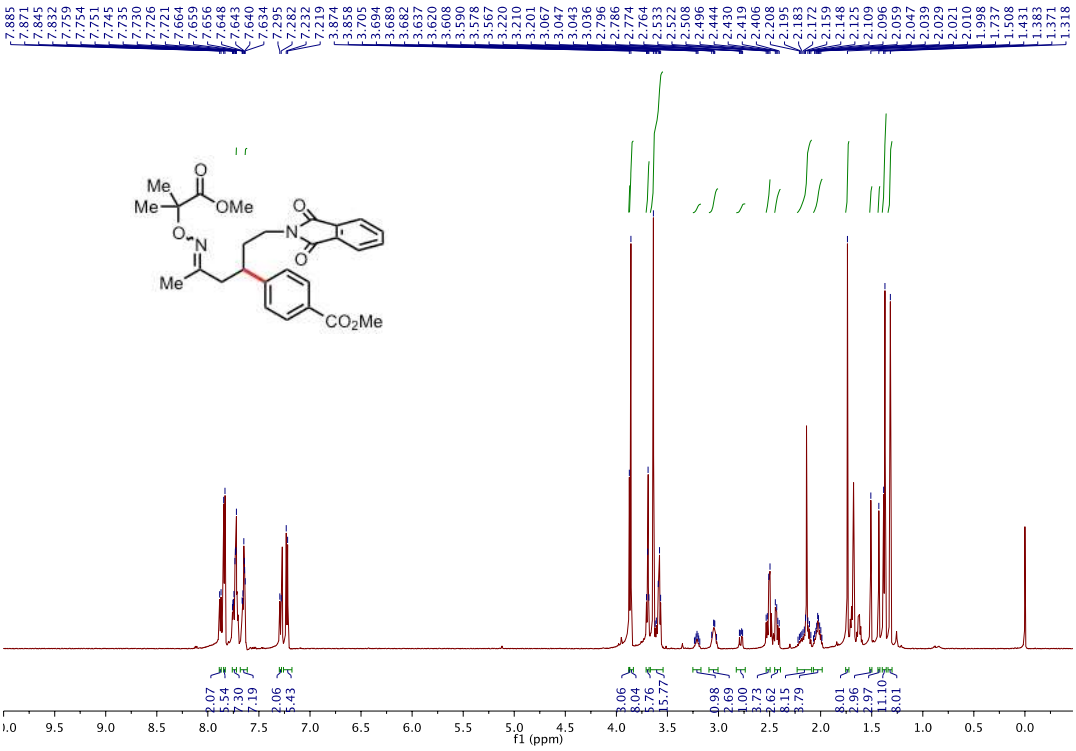
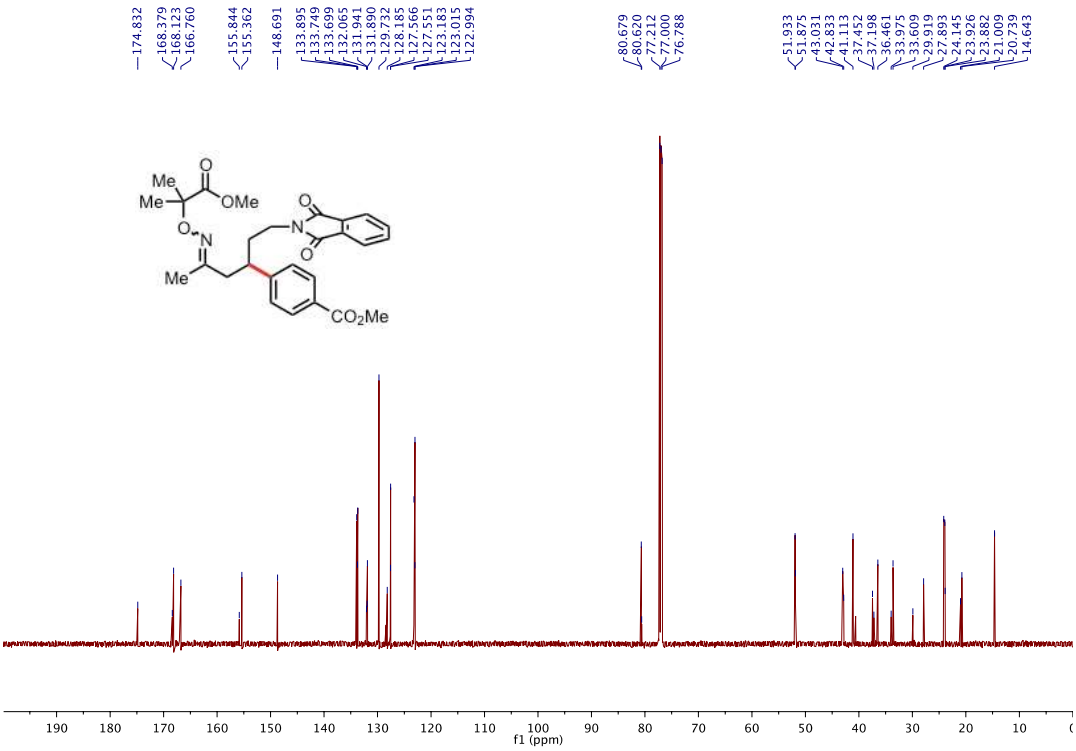
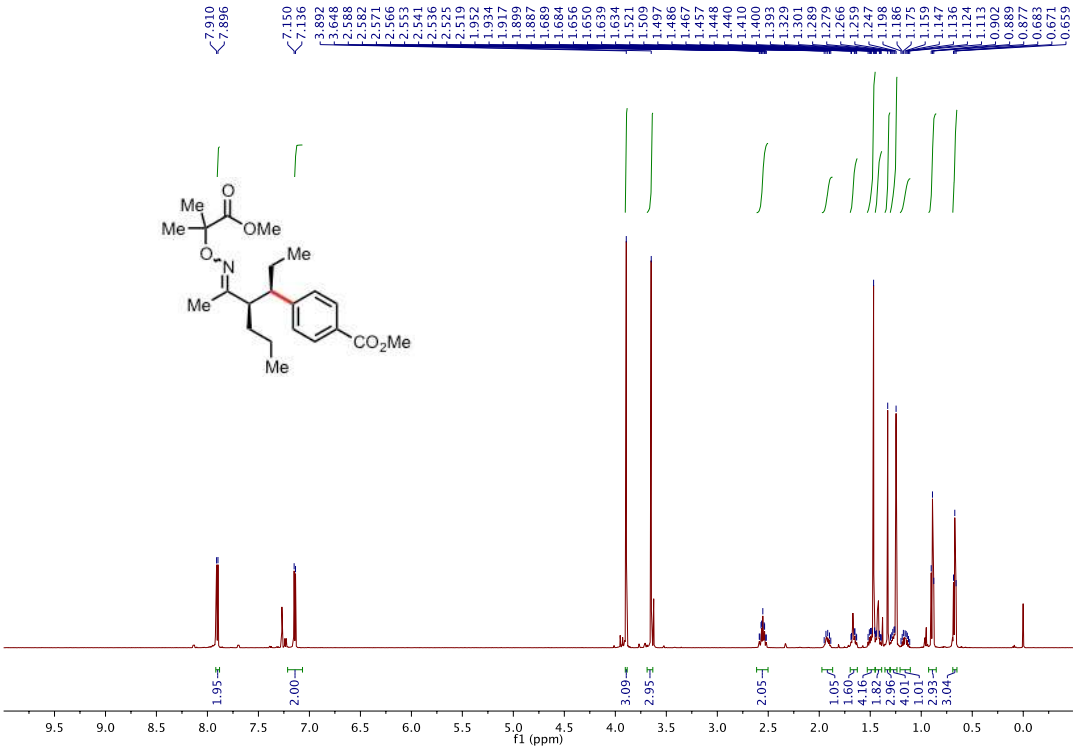
Me
O
OMe
O
N
Me
CO2Me
f1 (ppm)


Me
Me
O
OMe
O
N
Me
CO2Me
f1 (ppm)


Me
Me
OMe
O
N
Me
O
N
O
CO2Me
f1 (ppm)


Me
Me
OMe
O
N
Me
O
N
O
CO2Me
f1 (ppm)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2.541
2.536
2.525
2.519
1.952
1.934
1.917
1.899
1.887
1.689
1.684
1.656
1.650
1.639
1.634
1.521
1.509
1.497
1.486
1.467
1.457
1.448
1.440
1.410
1.400
1.393
1.329
1.301
1.289
1.279
1.266
1.259
1.247
1.198
1.186
1.175
1.159
1.147
1.136
1.124
1.113
0.902
0.889
0.877
0.683
0.671
0.659
Me
Me
O
OMe
O
N
Me
Me
Me
CO2Me
Me
1.95
2.00
3.09
2.95
2.05
1.05
1.60
4.16
1.82
2.96
4.01
1.01
2.93
3.04
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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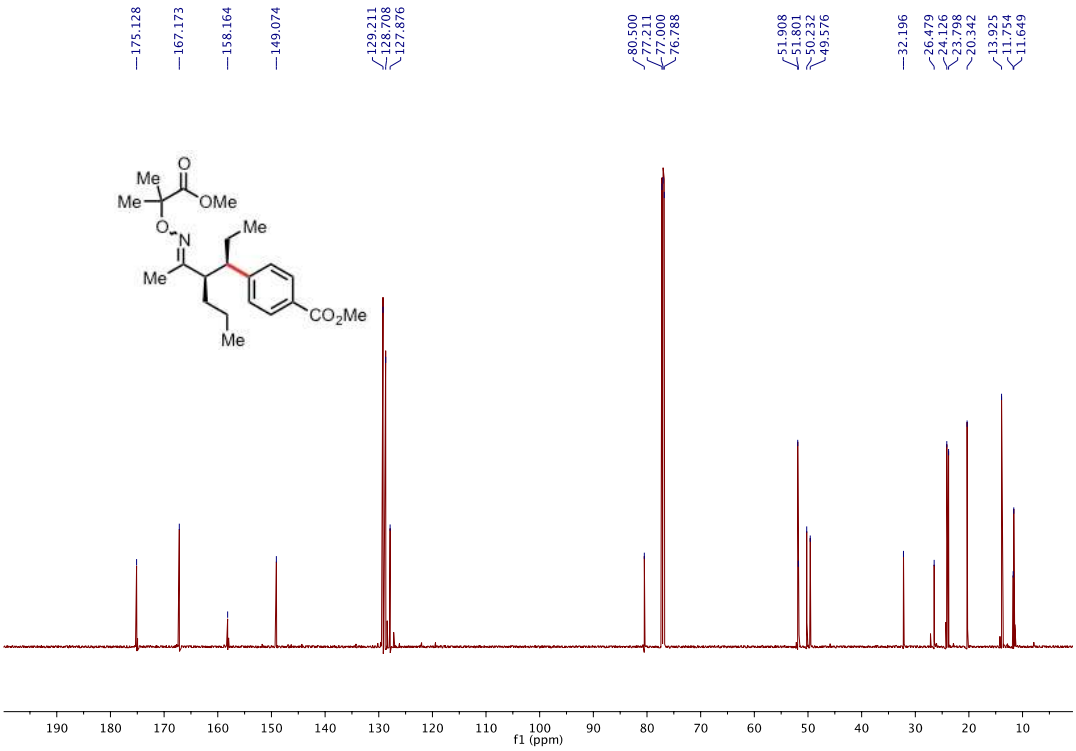
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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128.708
127.876
80.500
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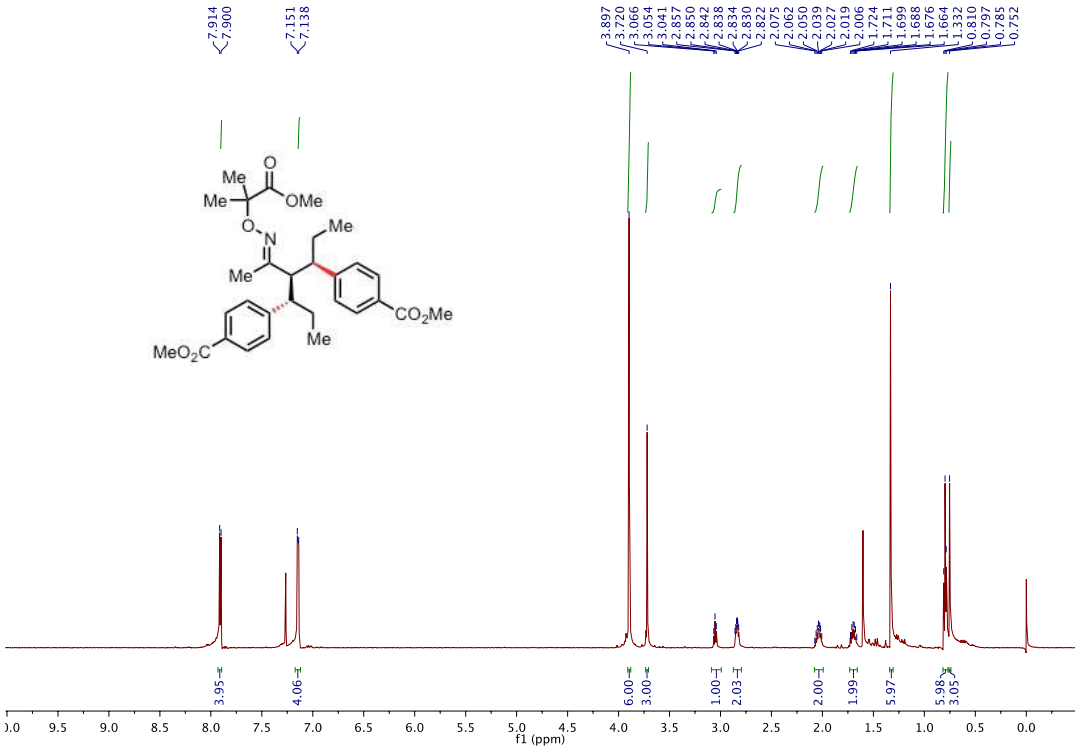
77.000
76.788
51.908
51.801
50.232
49.576
32.196
26.479
24.126
23.798
20.342
13.925
11.754
11.649
Me
Me
O
OMe
O
N
Me
Me
Me
CO2Me
Me
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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3.054
3.041
2.857
2.850
2.842
2.838
2.834
2.830
2.822
2.075
2.062
2.050
2.039
2.027
2.019
2.006
1.724
1.711
1.699
1.688
1.676
1.664
1.332
0.810
0.797
0.785
0.752
Me
O
Me
OMe
O
N
Me
Me
Me
CO2Me
MeO2C
Me
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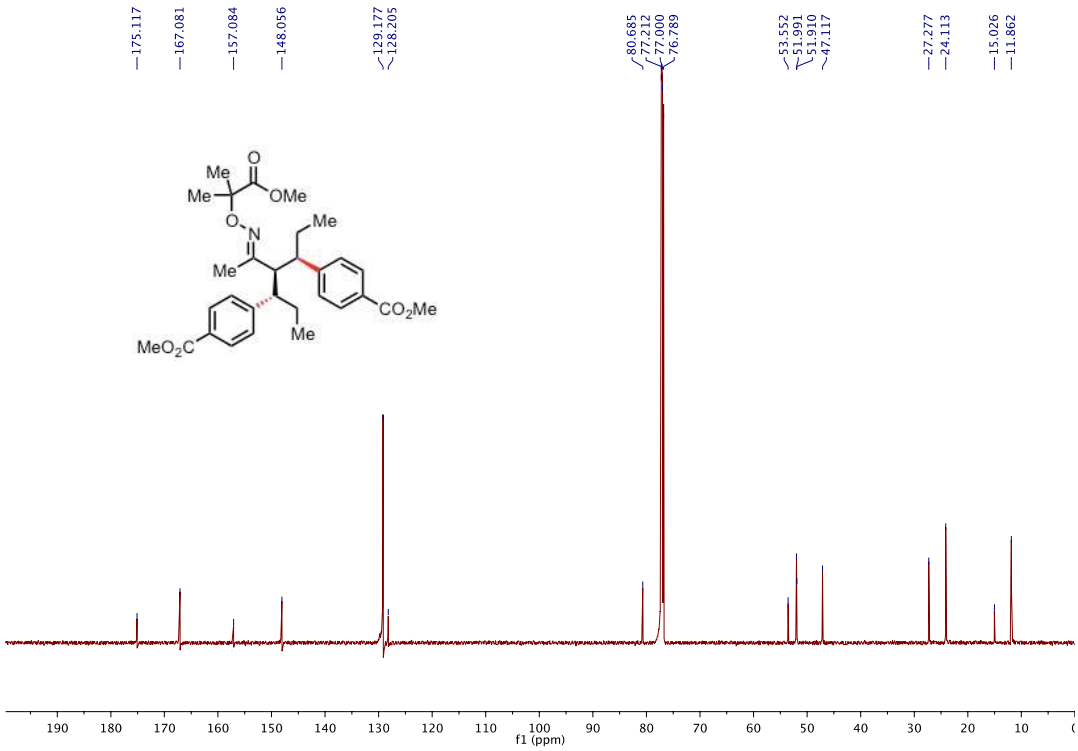
4.06
6.00
3.00
1.00
2.03
2.00
1.99
5.97
5.98
3.05
f1 (ppm)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77.212
77.000
76.789
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47.117
27.277
24.113
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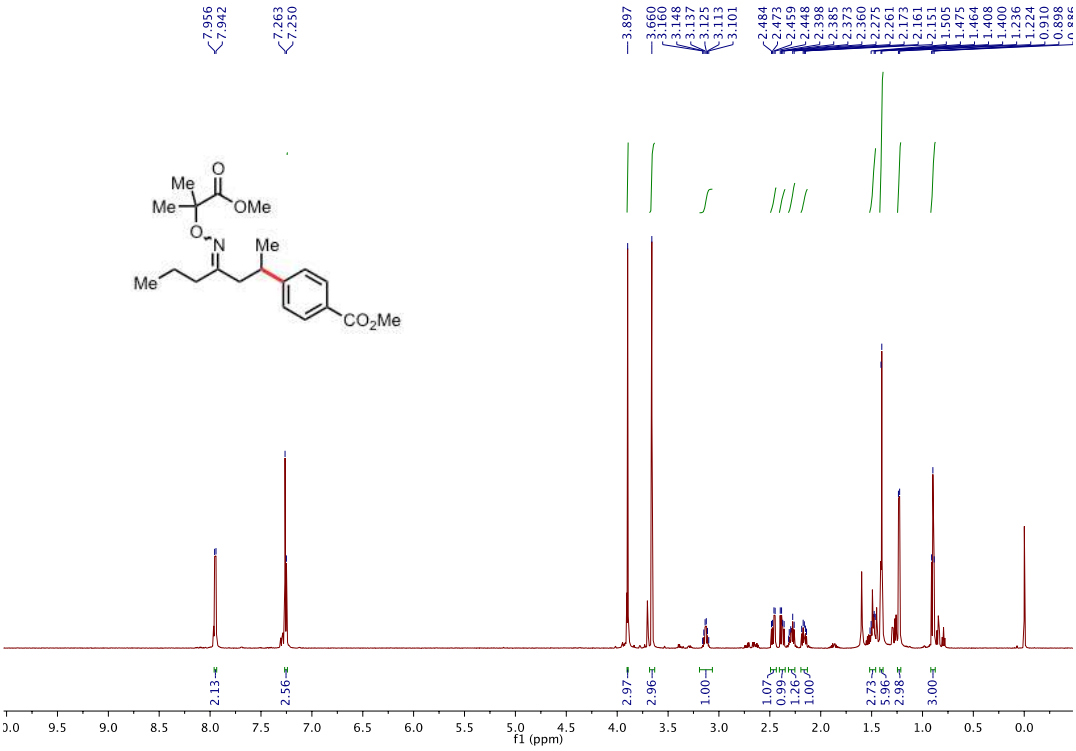
Me
O
Me
OMe
O
N
Me
Me
Me
CO2Me
MeO2C
Me
f1 (ppm)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3.148
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3.125
3.113
3.101
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2.473
2.459
2.448
2.398
2.385
2.373
2.360
2.275
2.261
2.173
2.161
2.151
1.505
1.475
1.464
1.408
1.400
1.236
1.224
0.910
0.898
Me
Me
O
OMe
N
Me
Me
CO2Me
2.13
2.56
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2.96
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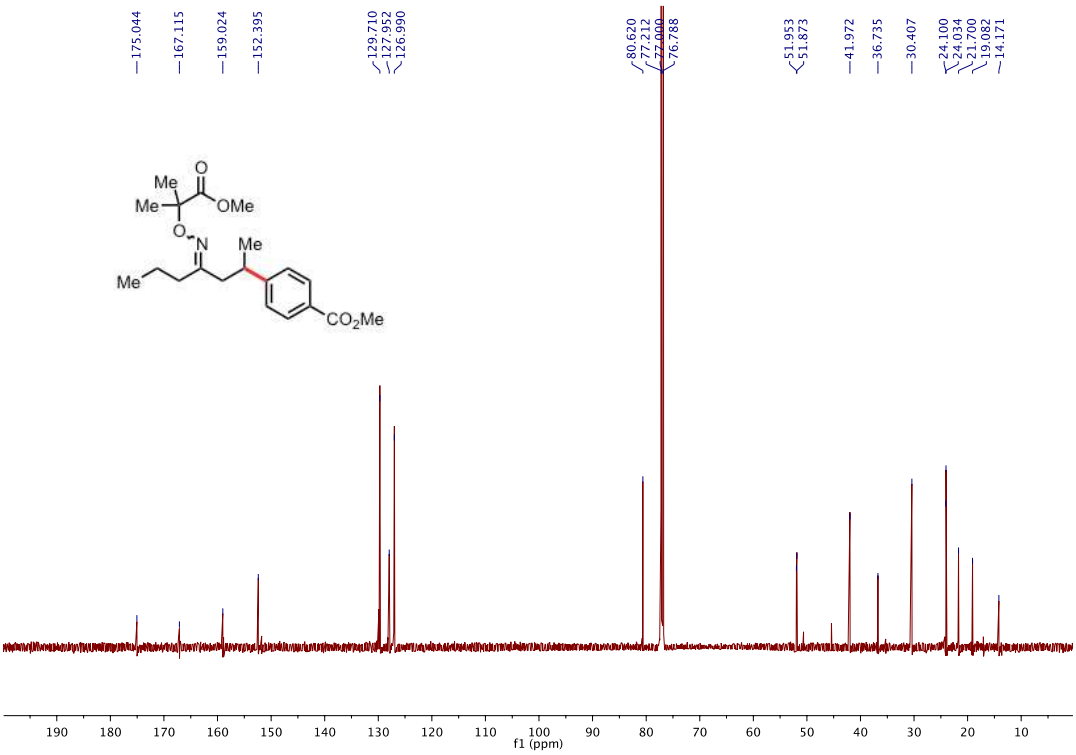
1.07
0.99
1.26
1.00
2.73
5.96
2.98
3.00
f1 (ppm)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77.000
76.788
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51.873
41.972
36.735
30.407
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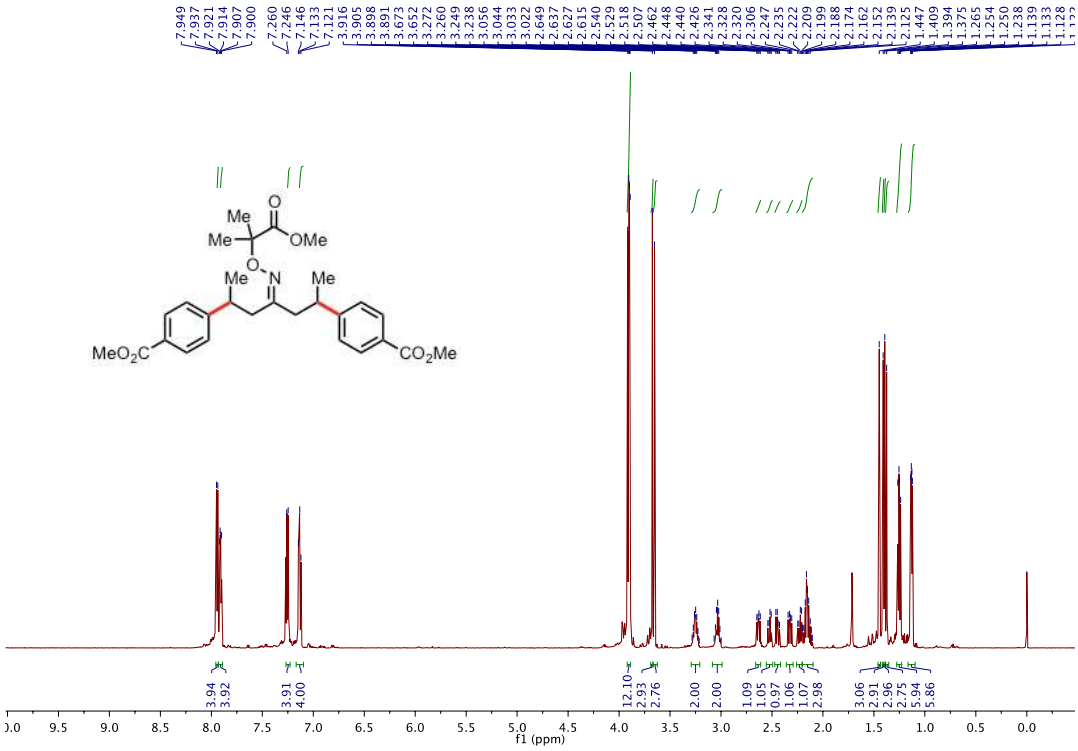
24.034
21.700
19.082
14.171
Me
Me
O
OMe
N
Me
Me
CO2Me
f1 (ppm)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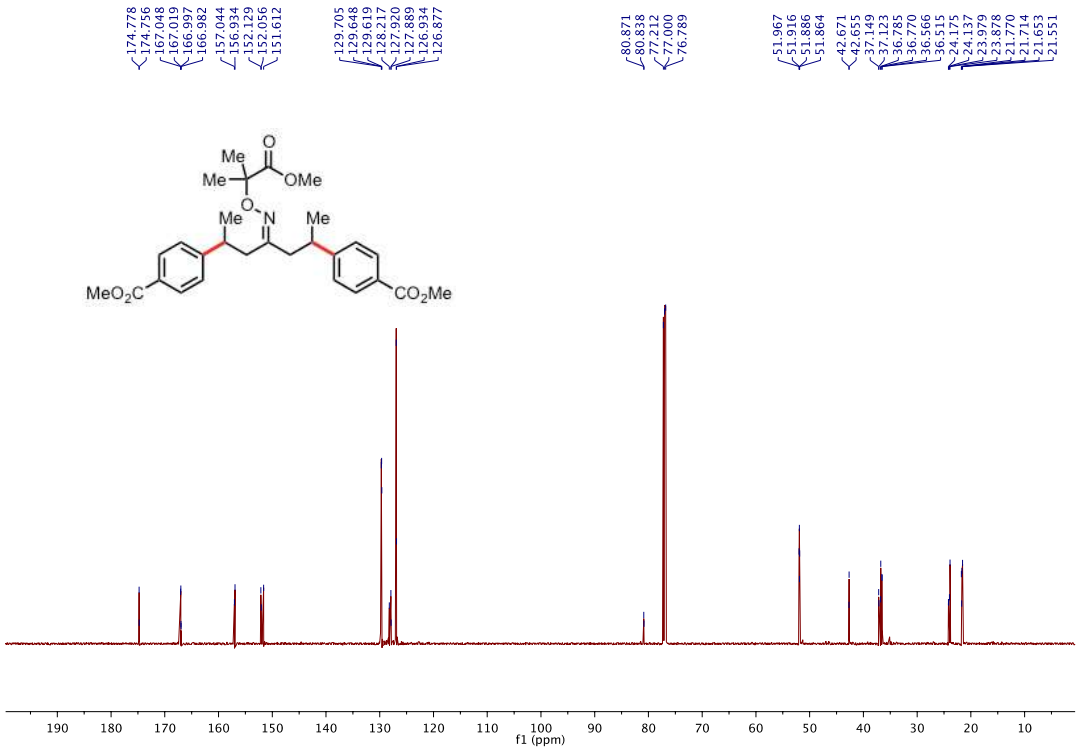
Me
O
OMe
Me
N
Me
MeO2C
CO2Me
f1 (ppm)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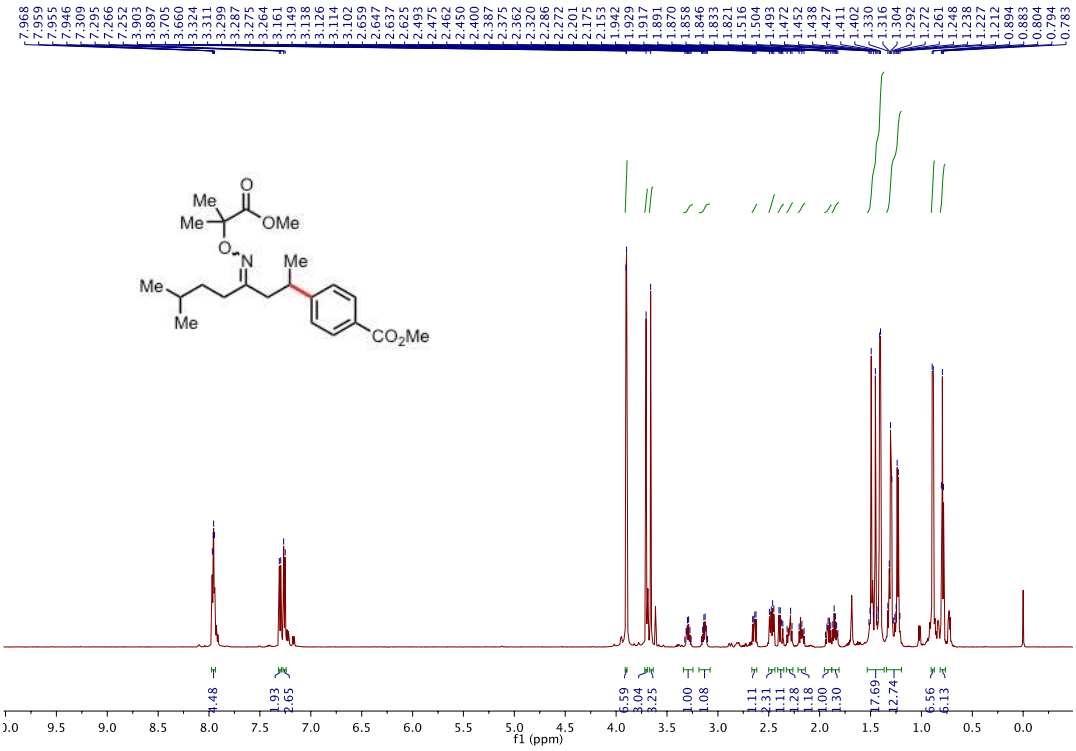
Me
O
OMe
Me
N
Me
MeO2C
CO2Me
f1 (ppm)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7.252
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3.660
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3.311
3.299
3.287
3.275
3.264
3.161
3.149
3.138
3.126
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2.625
2.493
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2.462
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2.400
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1.238
1.227
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0.804
0.794
0.783
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Me
O
OMe
O
N
Me
Me
Me
CO2Me
1.48
1.93
2.65
6.59
3.04
3.25
1.00
1.08
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1.00
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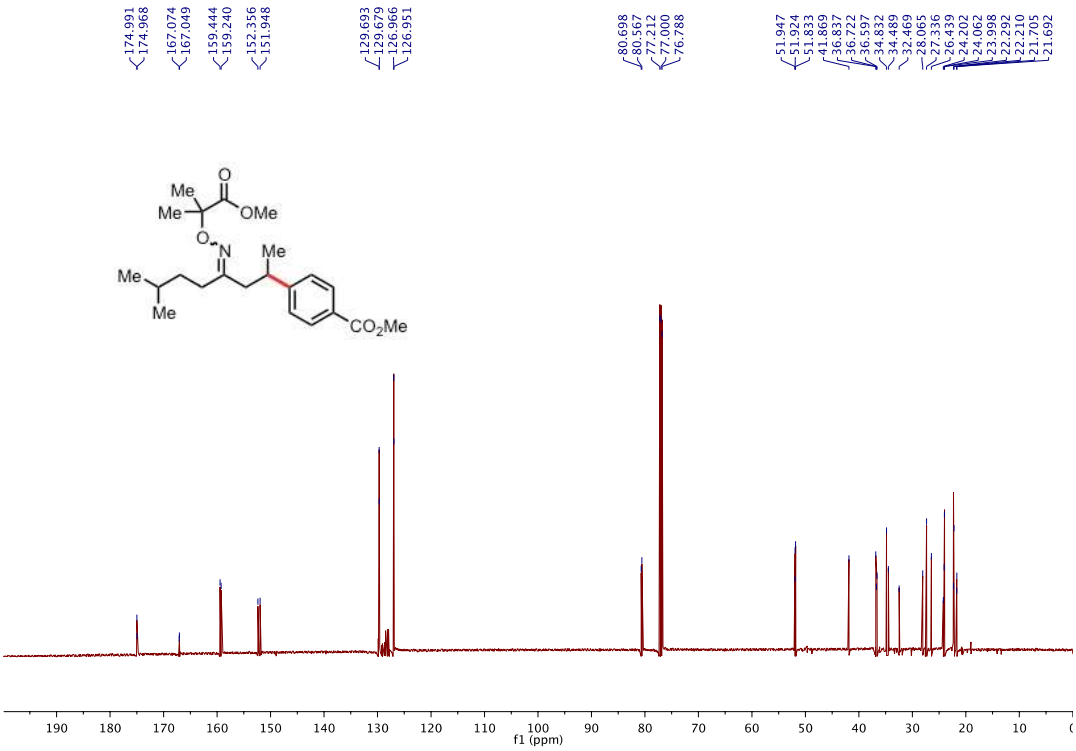
12.74
6.56
6.13
f1 (ppm)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126.951
80.698
80.567
77.212
77.000
76.788
51.947
51.924
51.833
51.869
41.869
36.937
36.722
36.537
34.832
34.489
32.469
28.965
27.336
26.439
24.202
24.062
23.998
22.292
22.210
21.705
21.692
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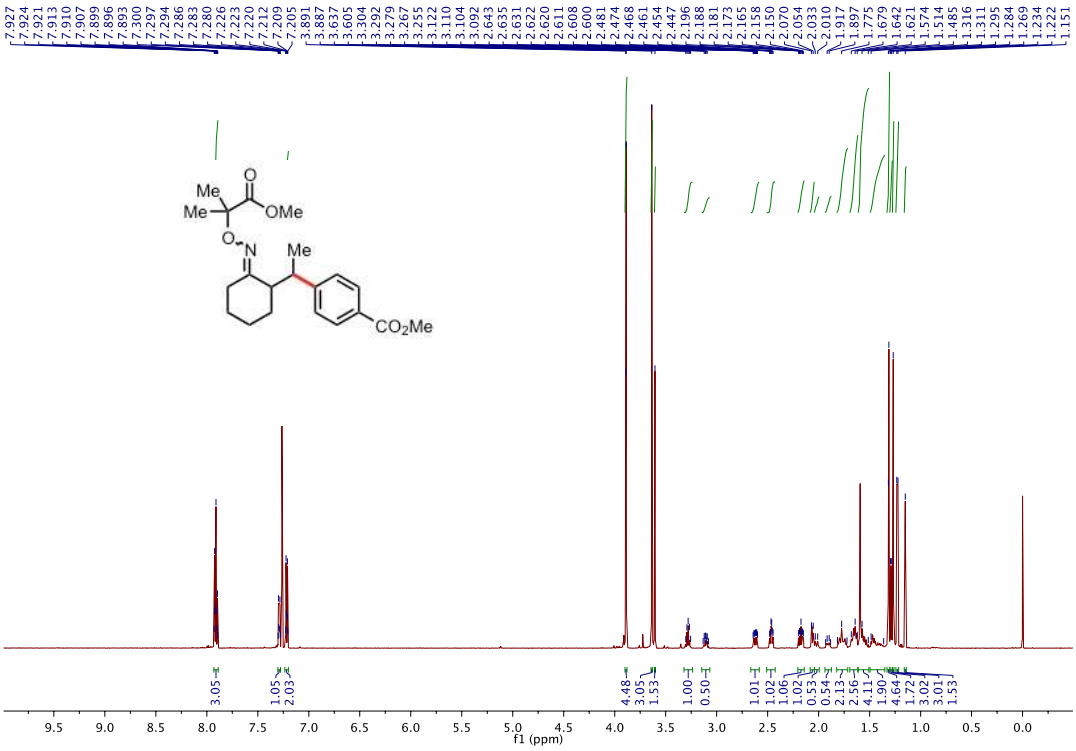
Me
O
OMe
O
N
Me
Me
Me
CO2Me
f1 (ppm)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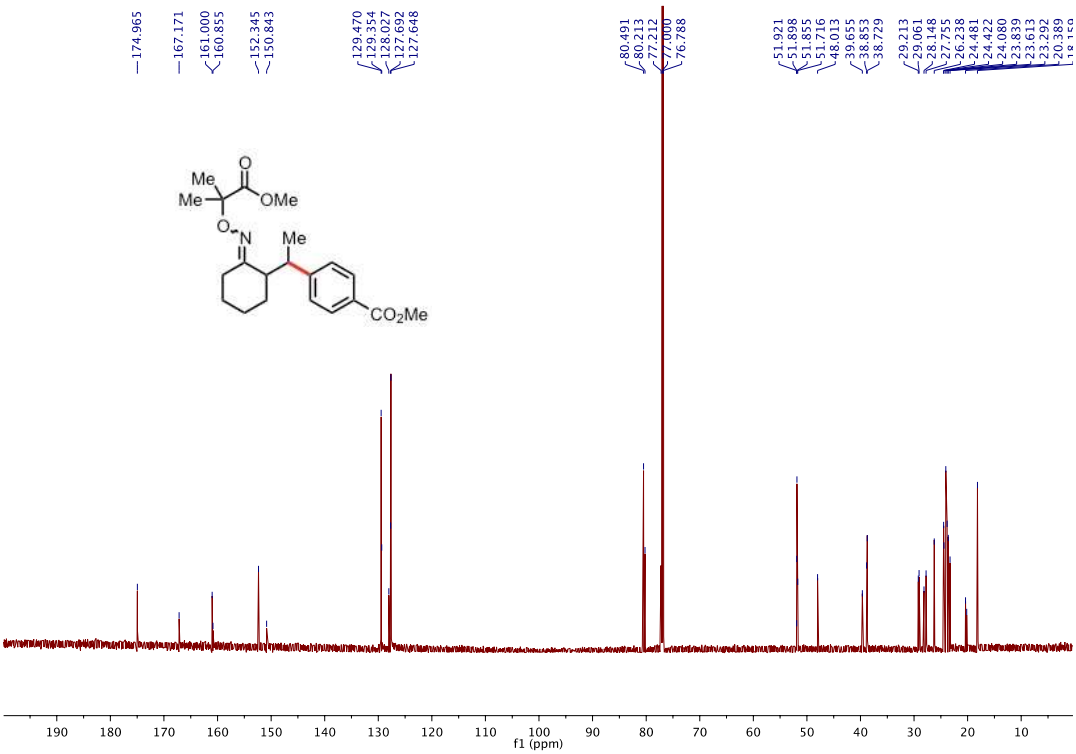
O
OMe
O
N
Me
CO2Me
f1 (ppm)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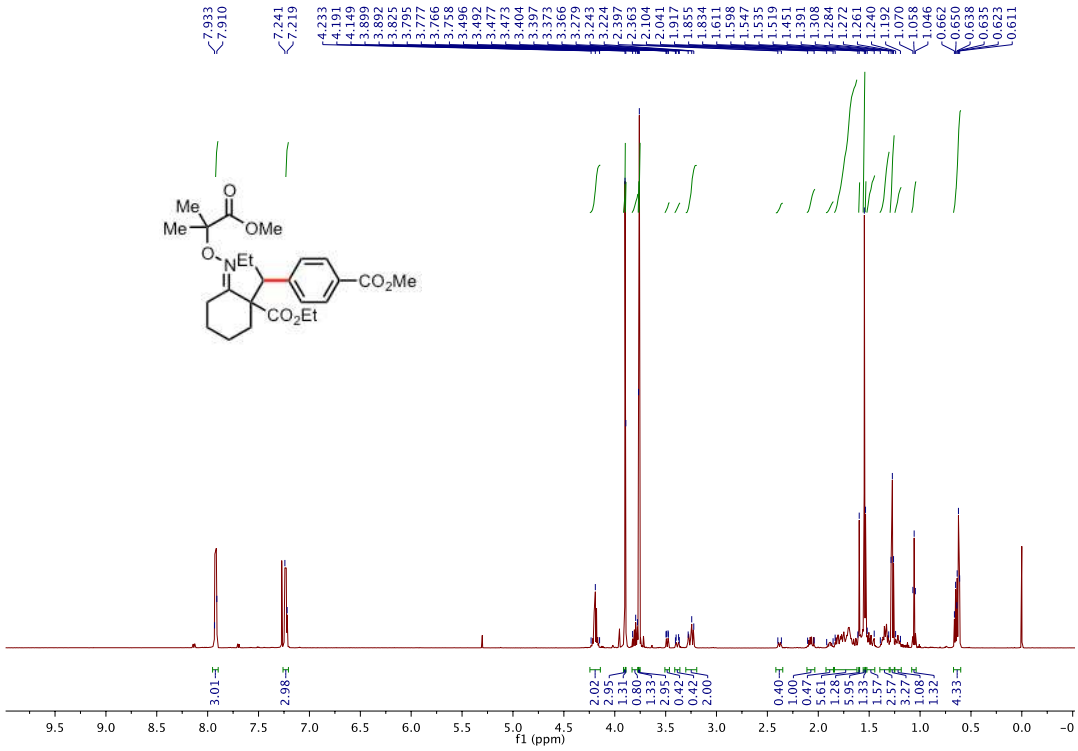
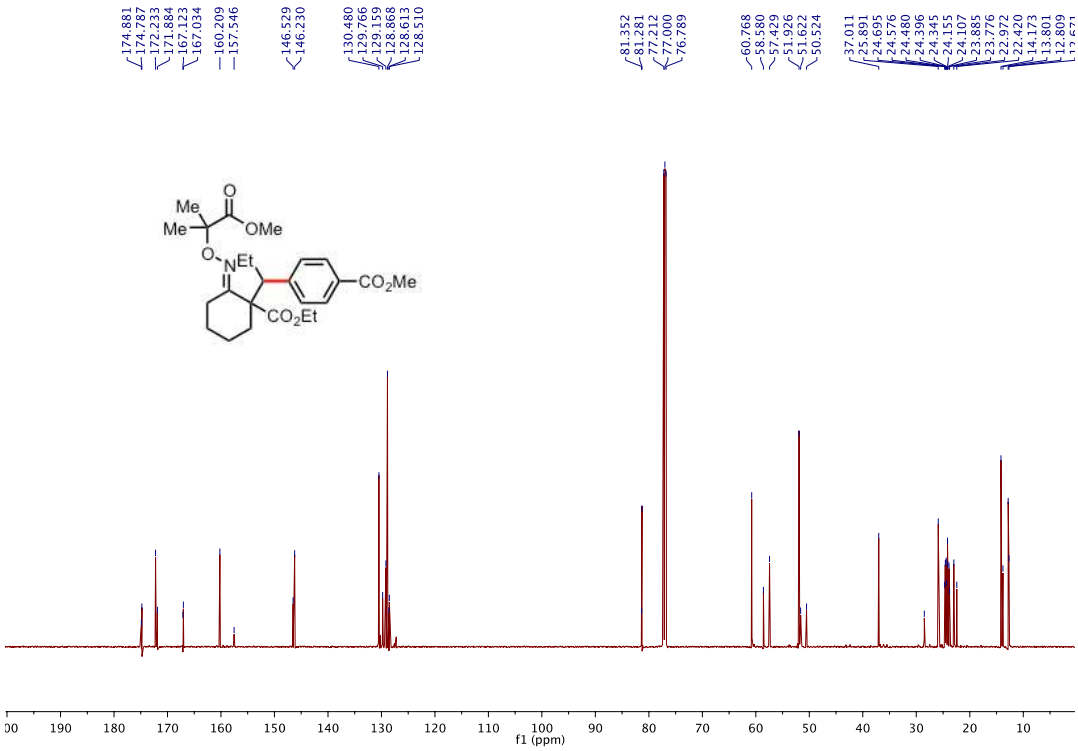
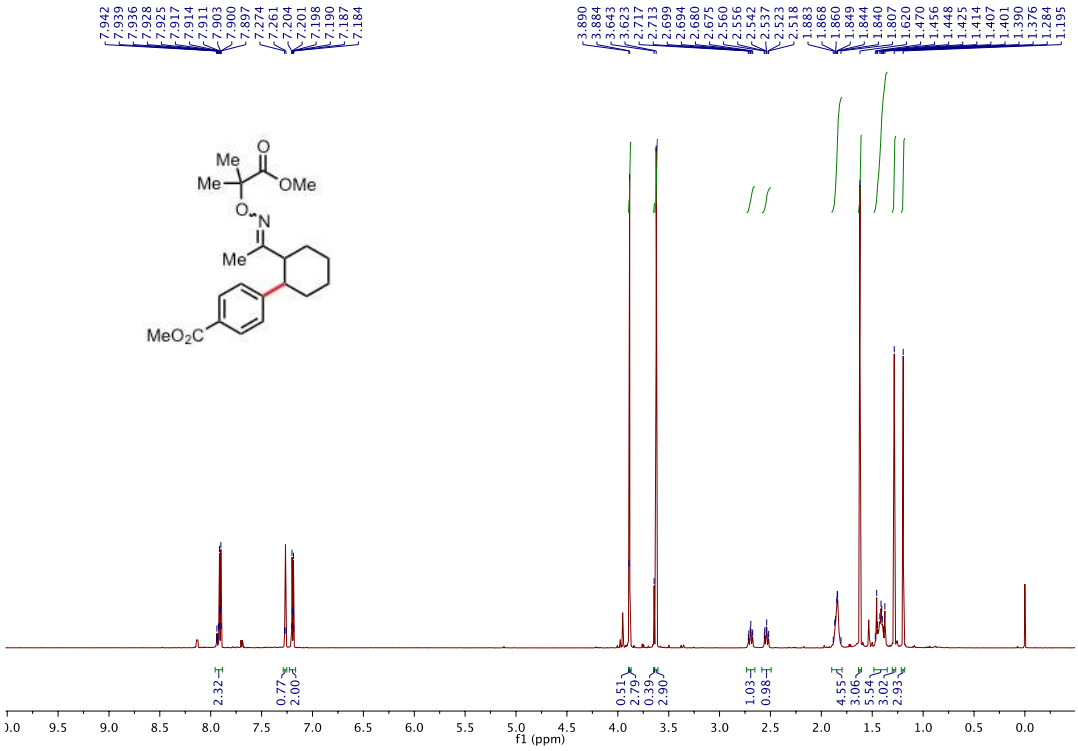
Me
O
OMe
O
N
Me
CO2Me
f1 (ppm)


Me
Me
O
OMe
O
N
Et
CO2Me
CO2Et
f1 (ppm)


Me
Me
O
OMe
O
N
Et
CO2Me
CO2Et
f1 (ppm)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7.914
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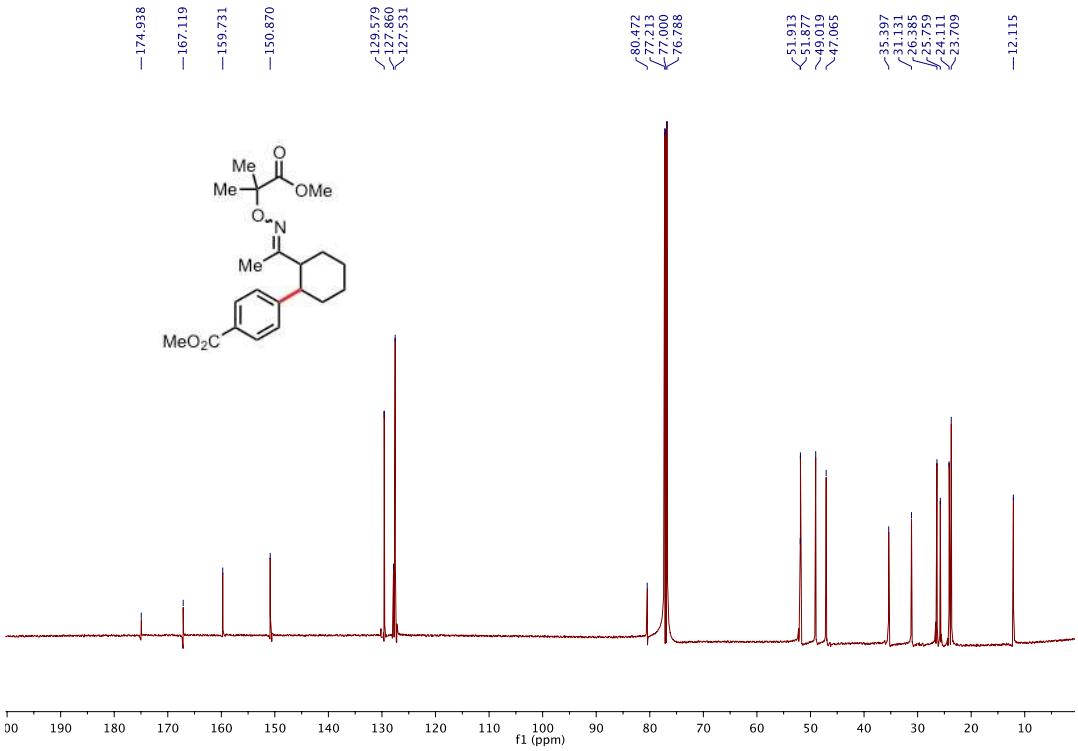
7.903
7.900
7.897
7.274
7.261
7.204
7.201
7.198
7.190
7.187
7.184
3.890
3.884
3.643
3.623
2.717
2.713
2.699
2.694
2.680
2.675
2.560
2.556
2.542
2.537
2.523
2.518
1.883
1.868
1.860
1.849
1.844
1.840
1.807
1.620
1.470
1.456
1.448
1.425
1.414
1.407
1.401
1.390
1.376
1.284
1.195
Me
Me
O
OMe
O
N
Me
MeO2C
2.32
0.77
2.00
0.51
2.79
0.39
2.90
1.03
0.98
4.55
3.06
5.54
3.02
2.93
f1 (ppm)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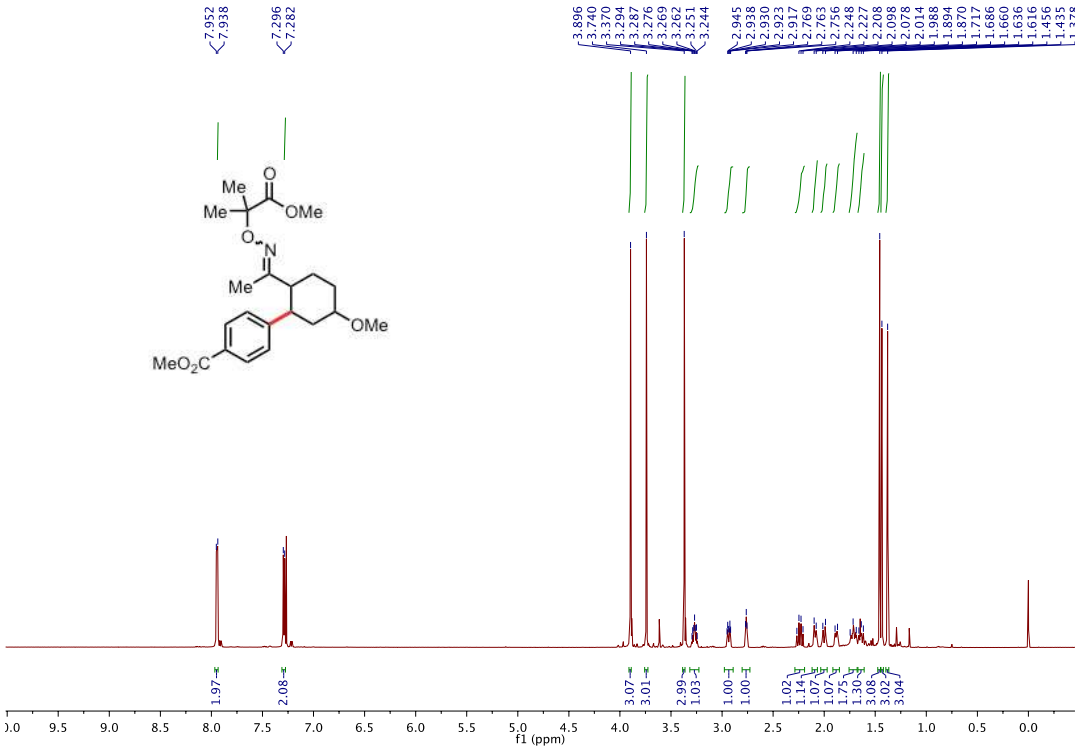
159.731
150.870
129.579
127.860
127.531
80.472
77.213
77.000
76.788
51.913
51.877
49.019
47.065
35.397
31.131
26.385
25.759
24.111
23.709
12.115
Me
Me
O
OMe
O
N
Me
MeO2C
f1 (ppm)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7.938
7.296
7.282
3.896
3.740
3.370
3.294
3.287
3.276
3.269
3.262
3.251
3.244
2.945
2.938
2.930
2.923
2.917
2.769
2.763
2.756
2.248
2.227
2.208
2.098
2.078
2.014
1.988
1.894
1.870
1.717
1.686
1.660
1.636
1.616
1.456
1.435
Me
Me
O
OMe
O
N
Me
OMe
MeO2C
1.97
2.08
3.07
3.01
2.99
1.03
1.00
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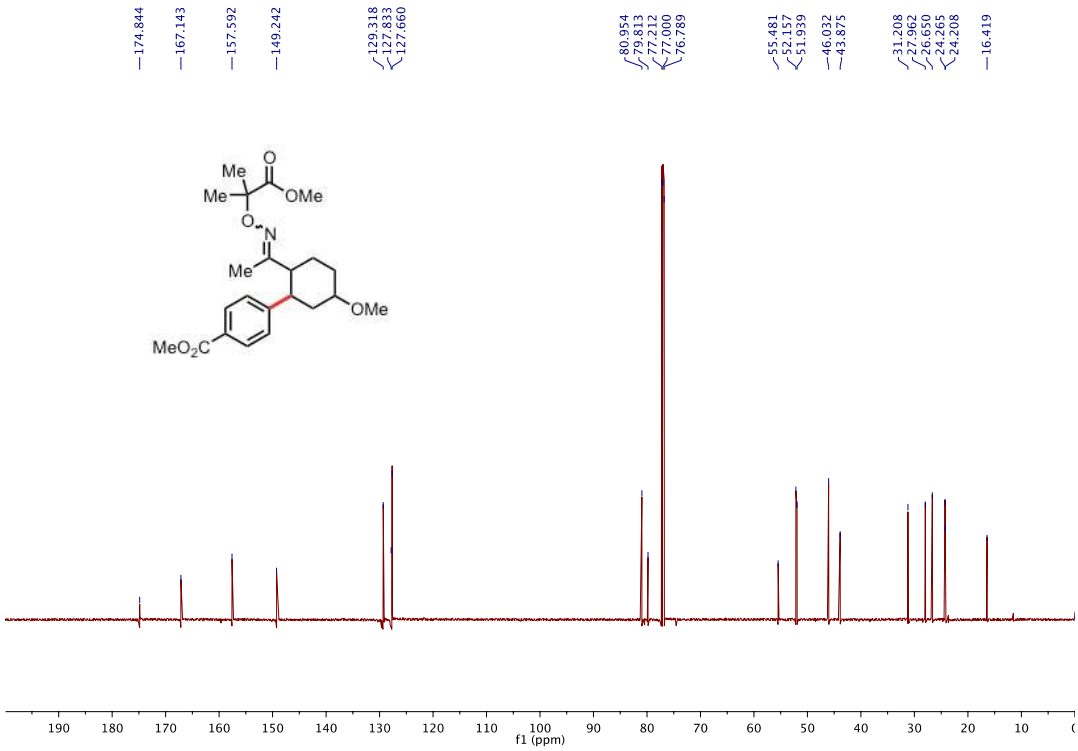
1.30
3.08
3.02
3.04
f1 (ppm)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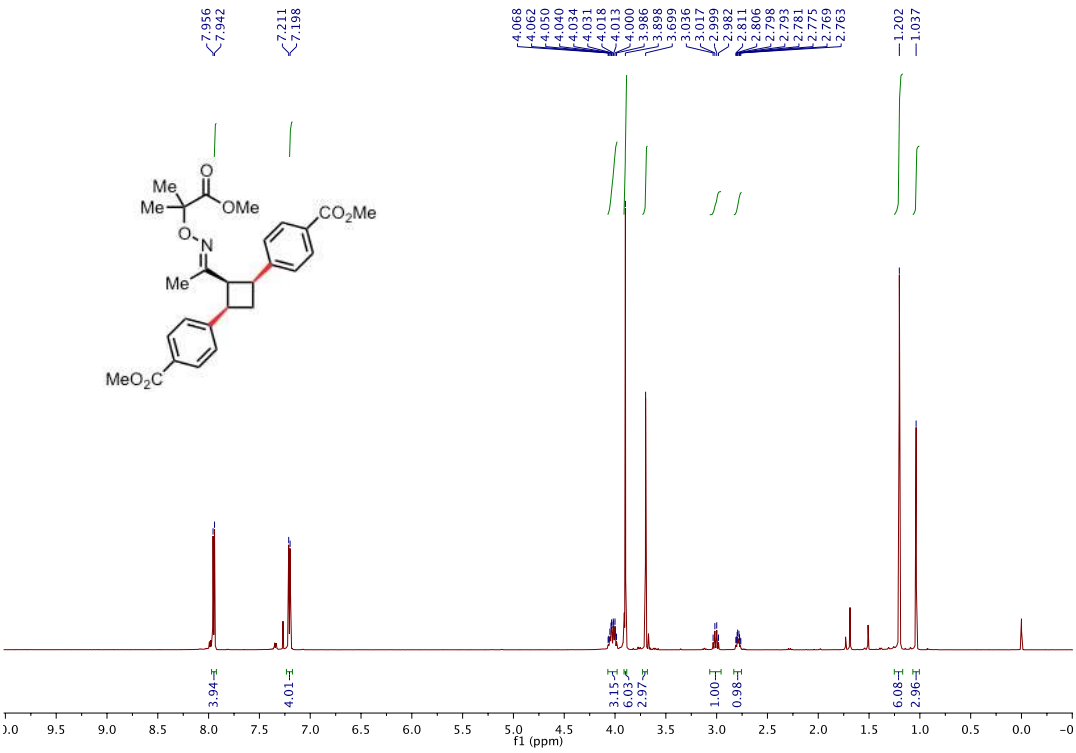
157.592
149.242
129.318
127.833
127.660
80.954
79.813
77.212
77.000
76.789
55.481
52.157
51.939
46.032
43.875
31.208
27.962
26.650
24.265
24.208
16.419
Me
Me
O
OMe
O
N
Me
OMe
MeO2C
f1 (ppm)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7.198
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4.062
4.050
4.040
4.034
4.031
4.018
4.013
4.000
3.986
3.898
3.699
3.036
3.017
2.999
2.982
2.811
2.806
2.798
2.793
2.781
2.775
2.769
2.763
1.202
1.037
Me
Me
O
OMe
O
N
Me
CO2Me
MeO2C
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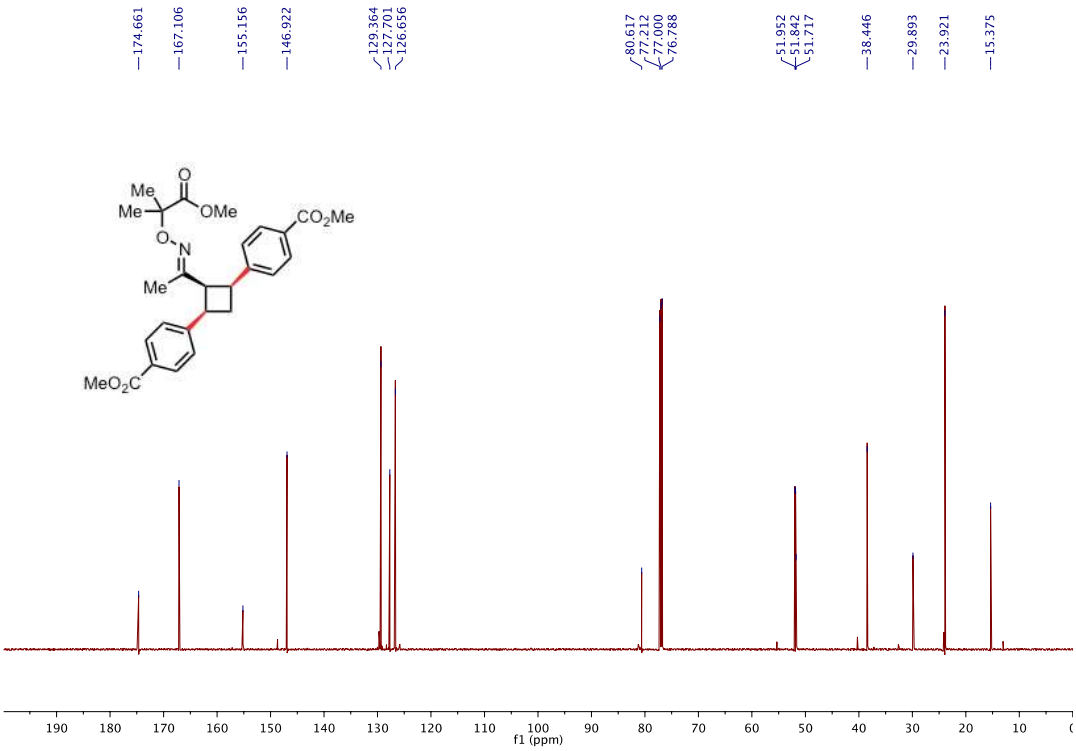
4.01
3.15
6.03
2.97
1.00
0.98
6.08
2.96
f1 (ppm)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155.156
146.922
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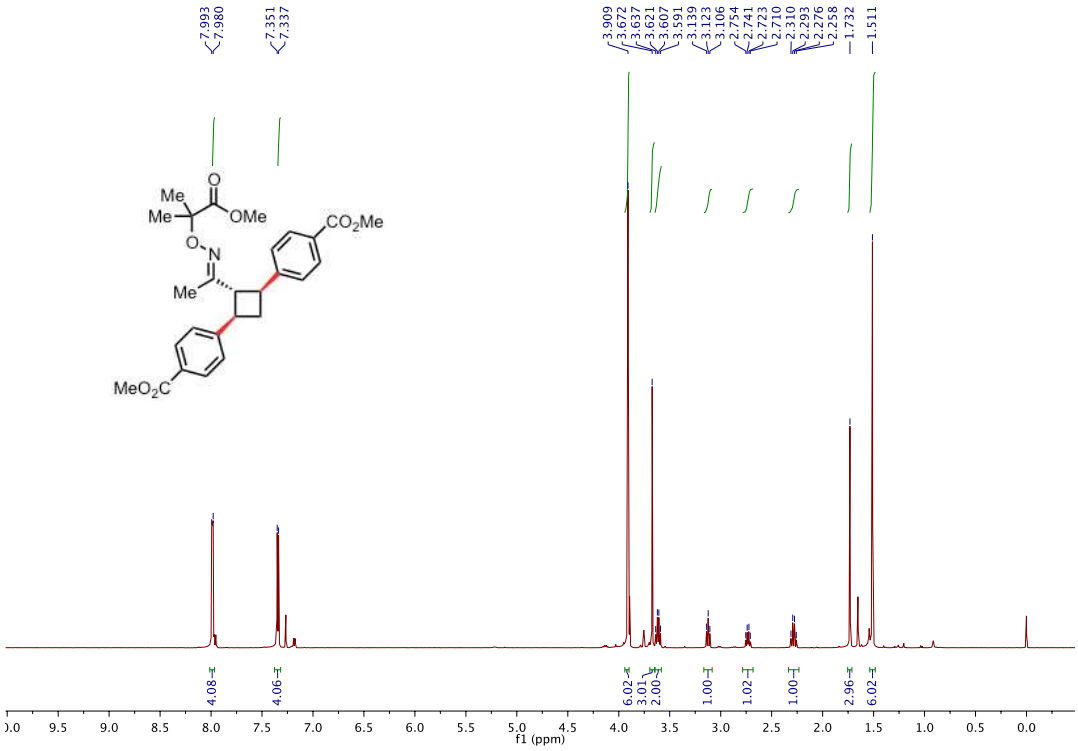
127.701
126.656
80.617
77.212
77.000
76.788
51.952
51.842
51.717
38.446
29.893
23.921
15.375
Me
Me
O
OMe
O
N
Me
CO2Me
MeO2C
f1 (ppm)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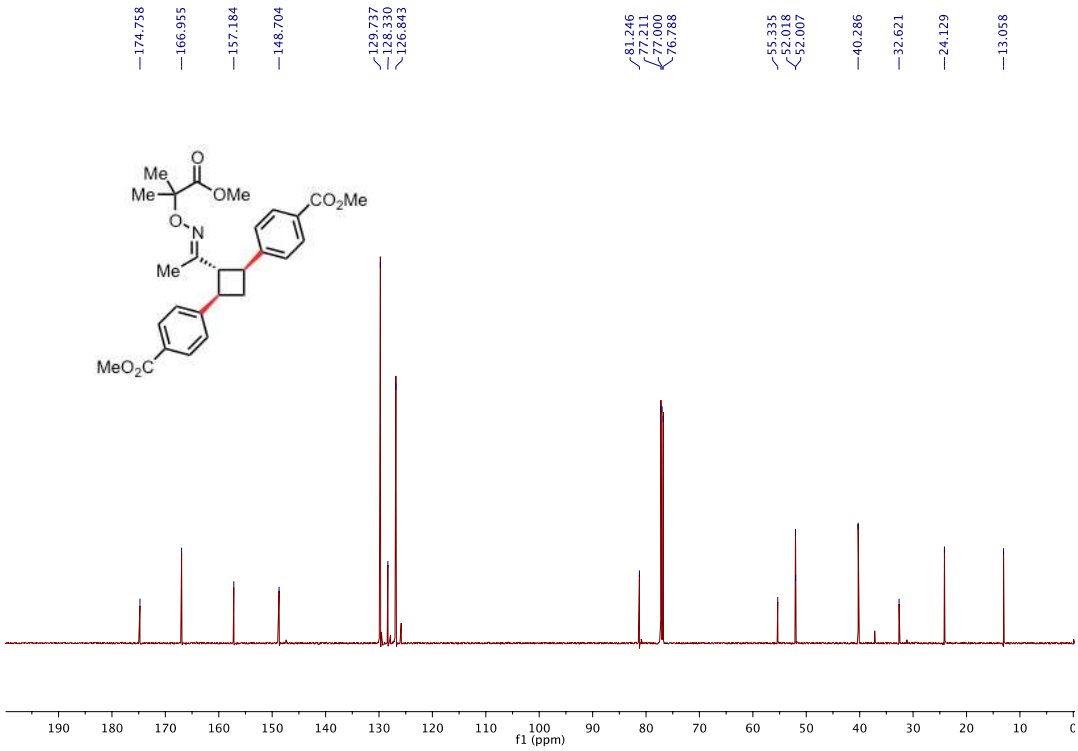
7.980
7.351
7.337
3.909
3.672
3.637
3.621
3.607
3.591
3.139
3.123
3.106
2.754
2.741
2.723
2.710
2.310
2.293
2.276
2.258
1.732
1.511
Me
Me
O
OMe
O
N
Me
CO2Me
MeO2C
4.08
4.06
6.02
3.01
2.00
1.00
1.02
1.00
2.96
6.02
f1 (ppm)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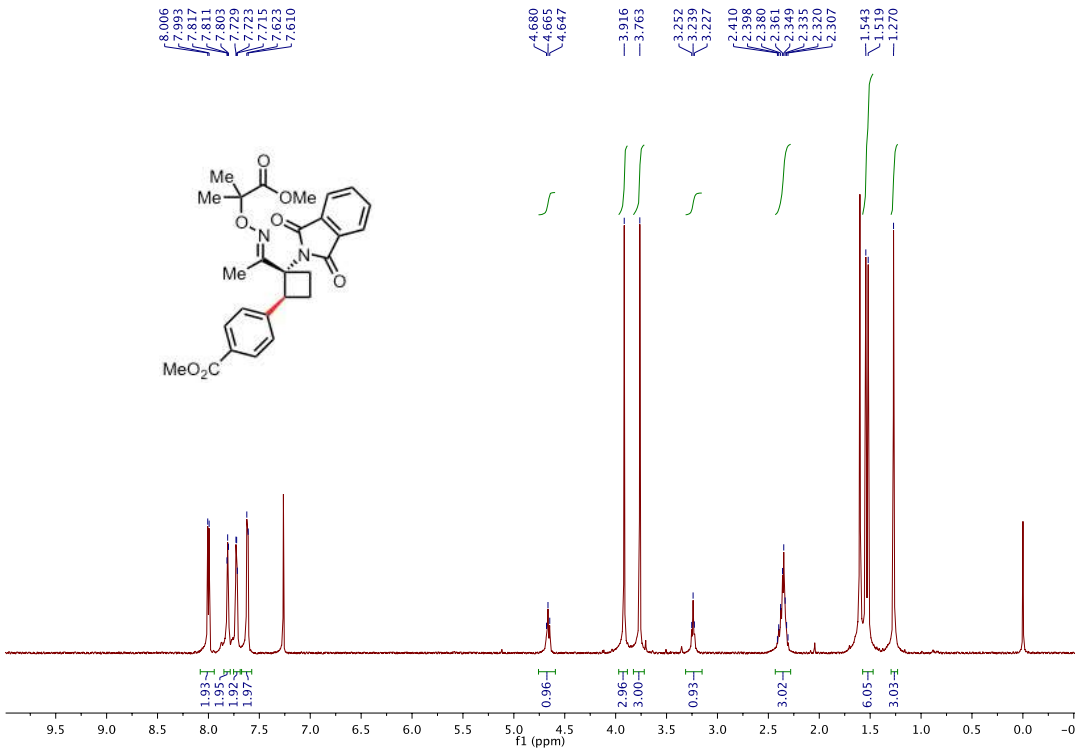
157.184
148.704
129.737
128.330
126.843
81.246
77.211
77.000
76.788
55.335
52.018
52.007
40.286
32.621
24.129
13.058
Me
Me
O
OMe
O
N
Me
CO2Me
MeO2C
f1 (ppm)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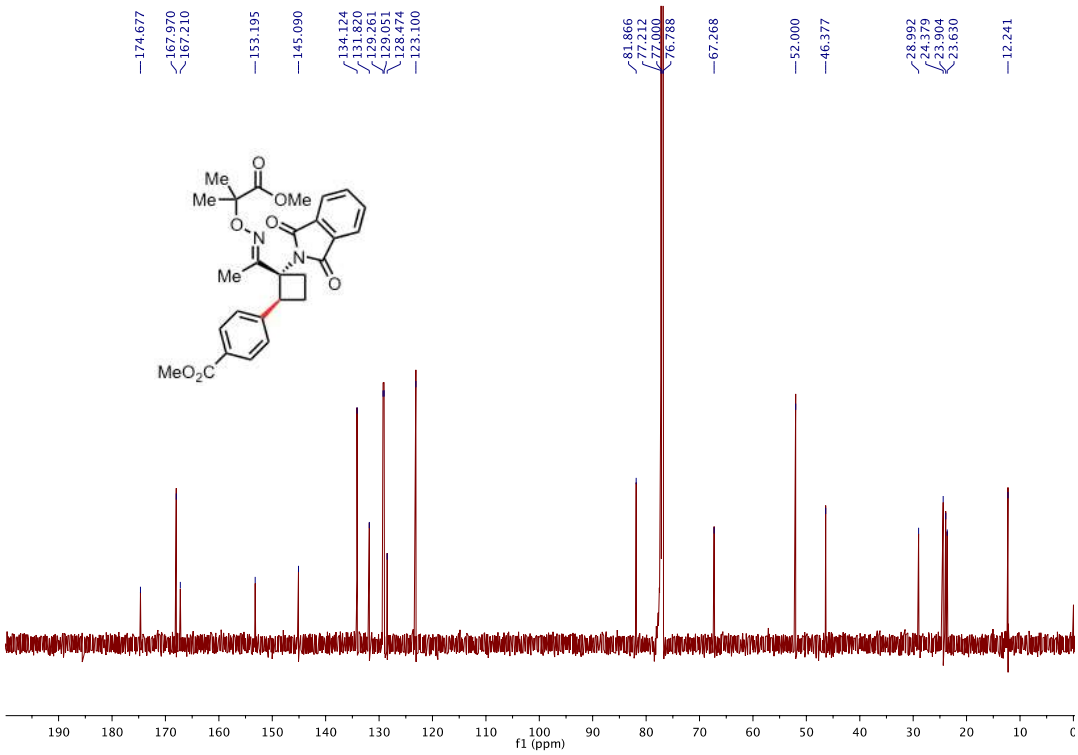
7.817
7.811
7.803
7.729
7.723
7.715
7.623
7.610
4.680
4.665
4.647
3.916
3.763
3.252
3.239
3.227
2.410
2.398
2.380
2.361
2.349
2.335
2.320
2.307
1.543
1.519
1.270
Me
Me
OMe
O
N
Me
MeO2C
1.93
1.95
1.92
1.97
0.96
2.96
3.00
0.93
3.02
6.05
3.03
f1 (ppm)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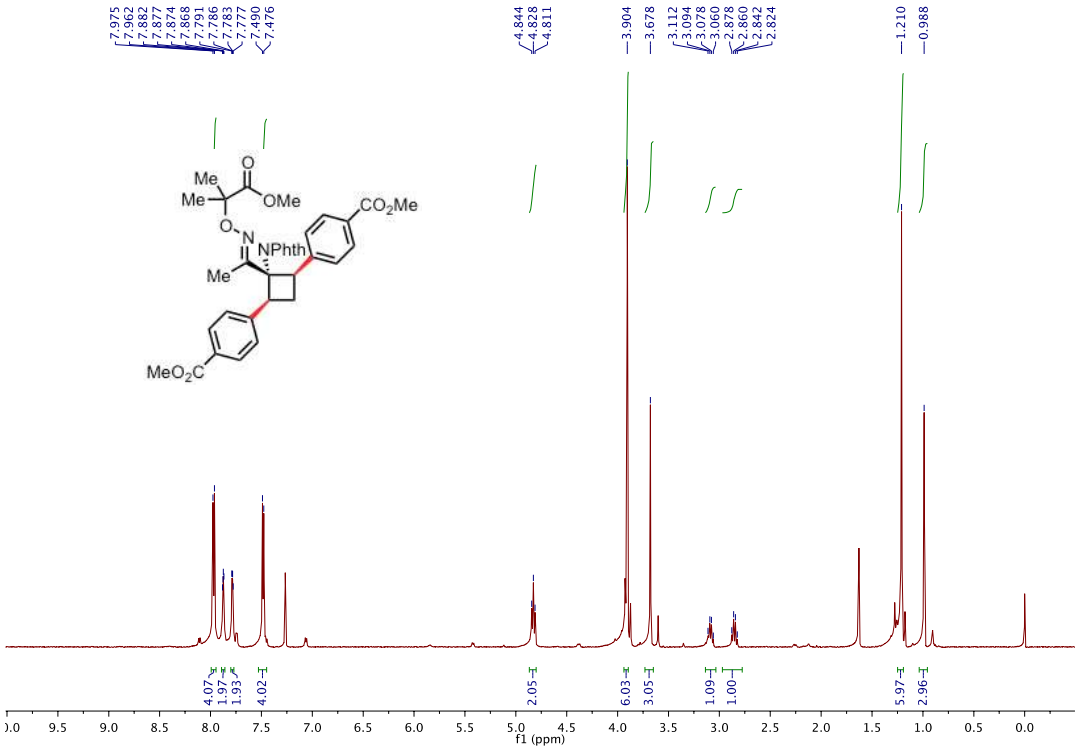
167.210
153.195
145.090
134.124
131.820
129.261
129.051
128.474
123.100
81.866
77.212
77.000
76.788
67.268
52.000
46.377
28.992
24.379
23.904
23.630
12.241
Me
Me
OMe
O
N
Me
MeO2C
f1 (ppm)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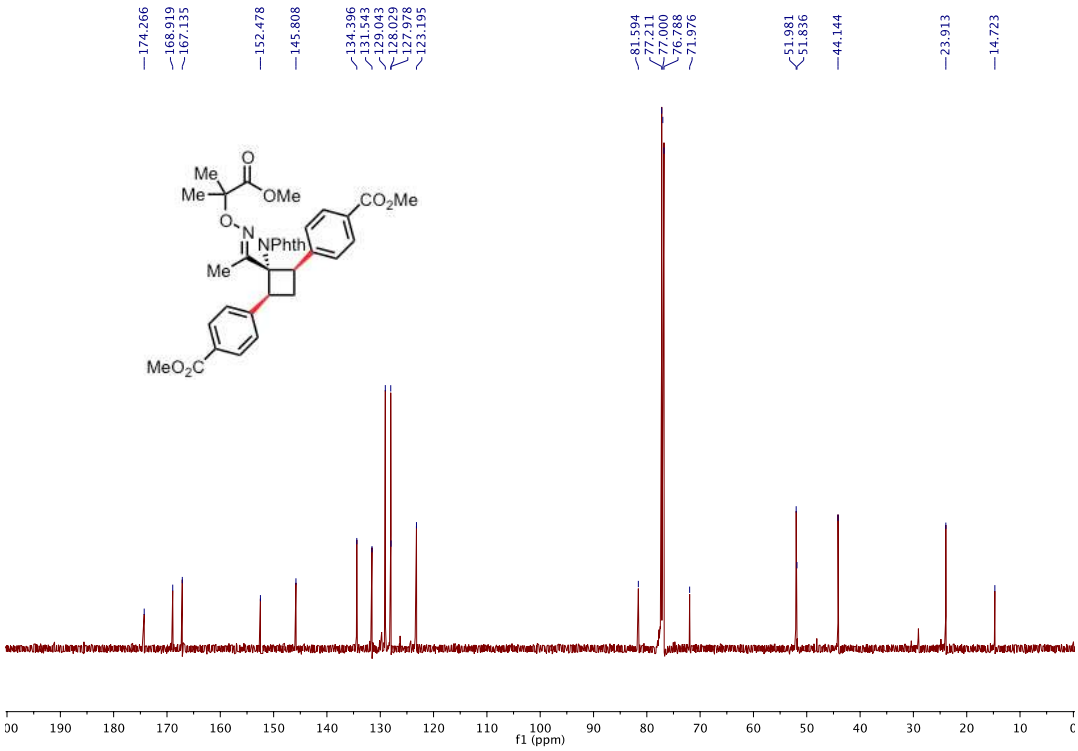
7.877
7.874
7.868
7.791
7.786
7.783
7.777
7.490
7.476
4.844
4.828
4.811
3.904
3.678
3.112
3.094
3.078
3.060
2.878
2.860
2.842
2.824
1.210
0.988
Me
Me
O
OMe
O
N
NPhth
Me
CO2Me
MeO2C
4.07
1.97
1.93
4.02
2.05
6.03
3.05
1.09
1.00
5.97
2.96
f1 (ppm)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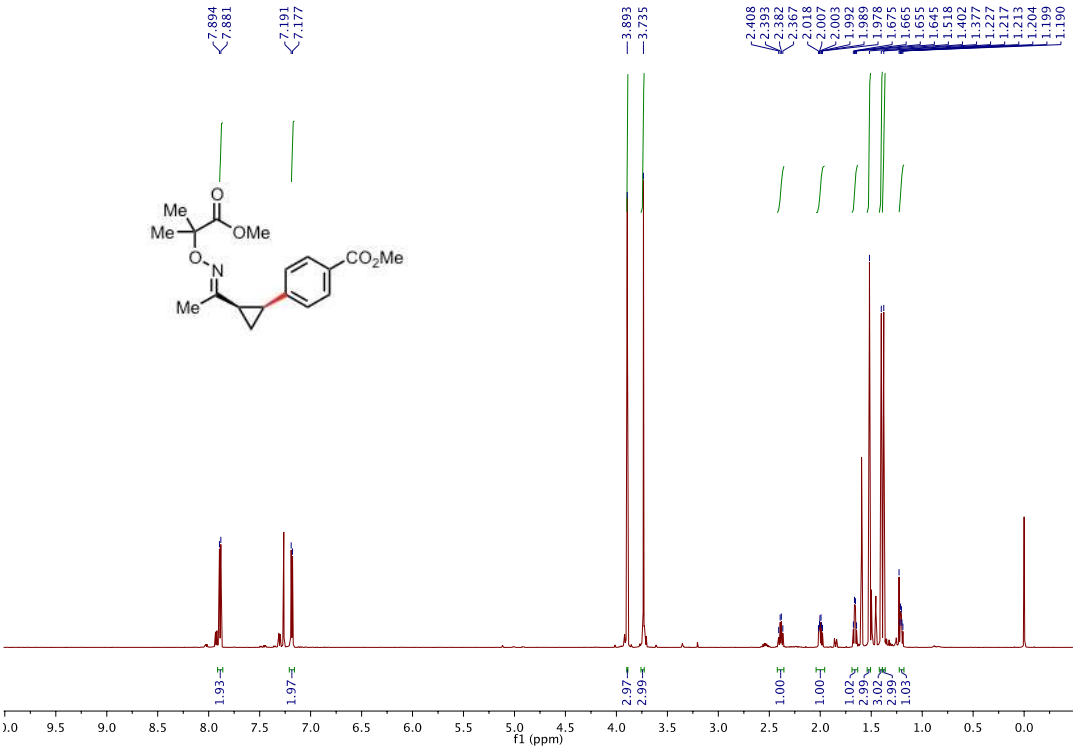
167.135
152.478
145.808
134.396
131.543
129.043
128.029
127.978
123.195
81.594
77.211
77.000
76.788
71.976
51.981
51.836
44.144
23.913
14.723
Me
Me
O
OMe
O
N
NPhth
Me
CO2Me
MeO2C
f1 (ppm)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3.735
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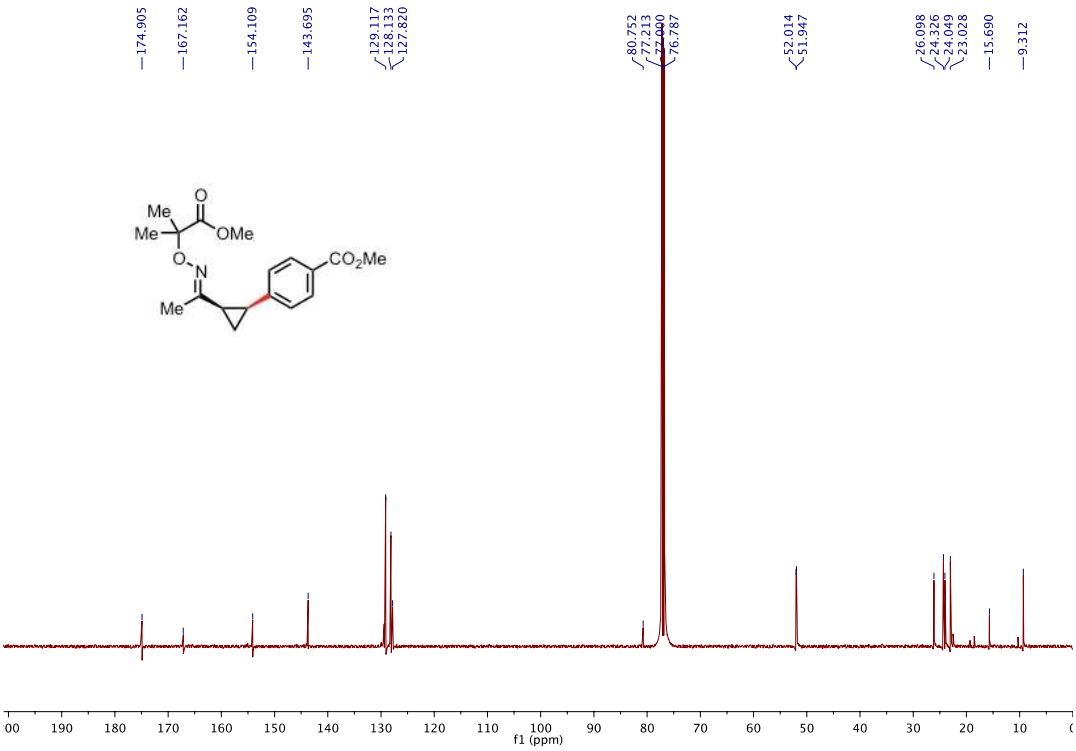
2.393
2.382
2.367
2.018
2.007
2.003
1.992
1.989
1.978
1.675
1.665
1.655
1.645
1.518
1.402
1.377
1.227
1.217
1.213
1.204
1.199
1.190
Me
Me
O
OMe
O
N
Me
CO2Me
1.93
1.97
2.97
2.99
1.00
1.00
1.02
2.99
3.02
2.99
1.03
f1 (ppm)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127.820
80.752
77.213
77.000
76.787
52.014
51.947
26.098
24.326
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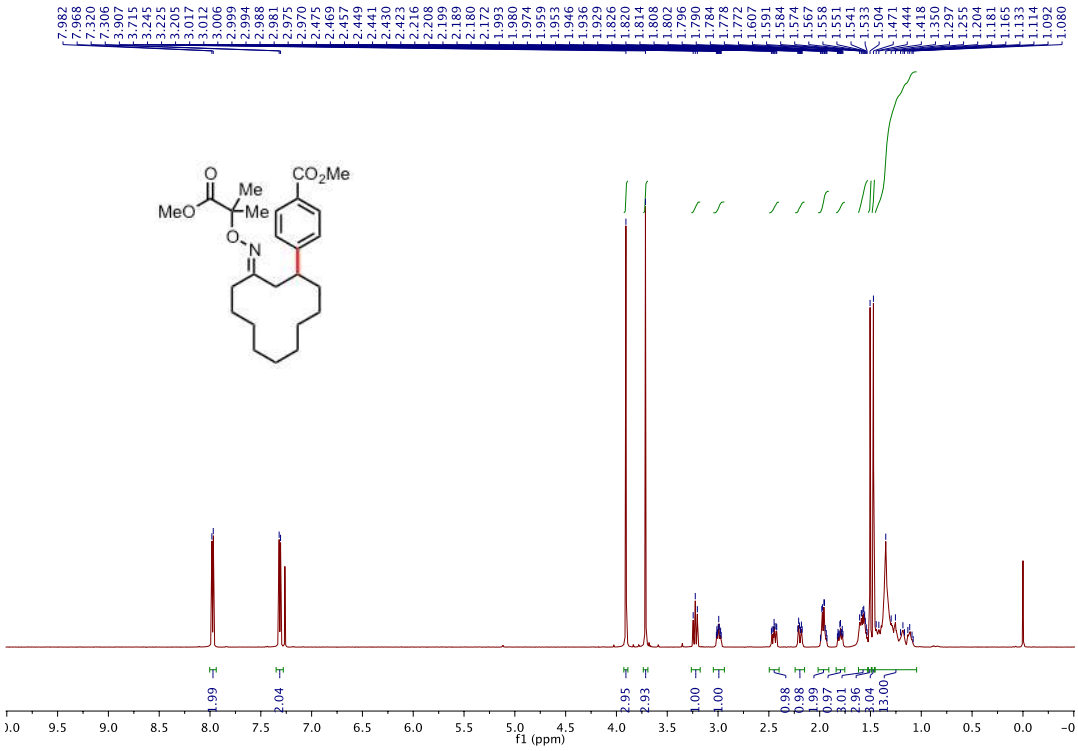
23.028
15.690
9.312
Me
Me
O
OMe
O
N
Me
CO2Me
f1 (ppm)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7.306
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3.715
3.245
3.225
3.205
3.017
3.012
3.006
2.999
2.994
2.988
2.981
2.975
2.970
2.475
2.469
2.457
2.449
2.441
2.430
2.423
2.216
2.208
2.199
2.189
2.180
2.172
1.993
1.980
1.974
1.959
1.953
1.946
1.936
1.929
1.826
1.820
1.814
1.808
1.802
1.796
1.790
1.784
1.778
1.772
1.607
1.591
1.584
1.574
1.567
1.558
1.551
1.541
1.533
1.504
1.471
1.444
1.418
1.350
1.297
1.255
1.204
1.181
1.165
1.133
1.114
1.092
1.080
O
Me
CO2Me
MeO
Me
O
N
1.99
2.04
2.95
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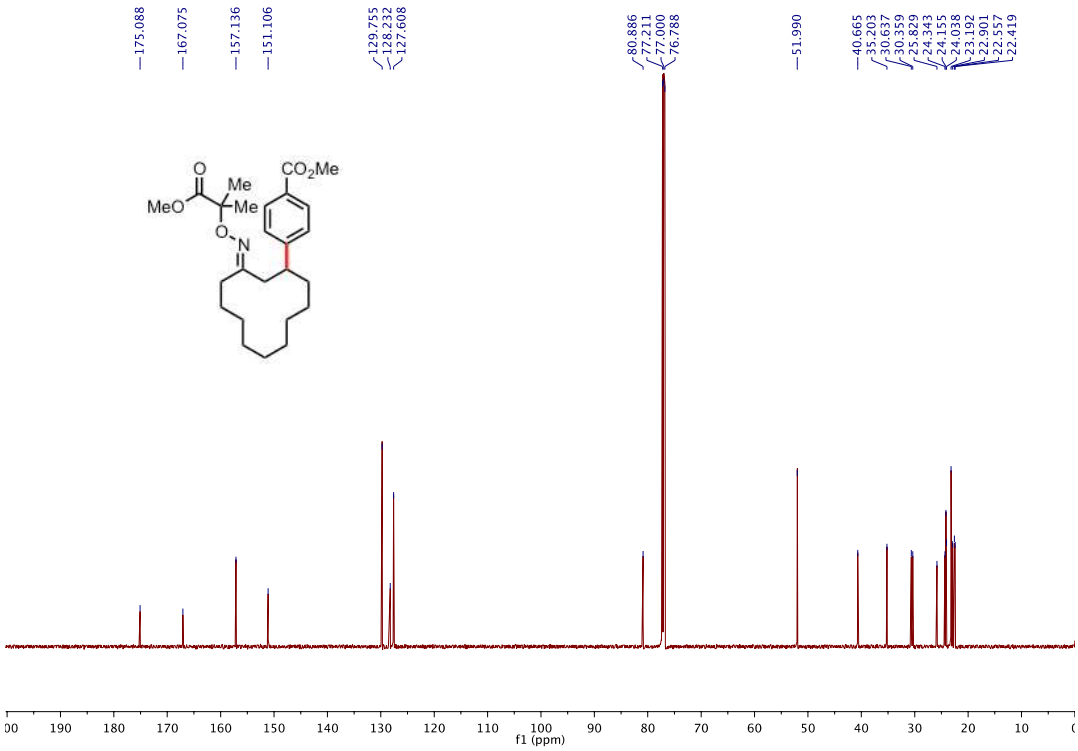
1.00
0.98
0.98
1.99
0.97
3.01
2.96
3.04
13.00
f1 (ppm)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129.755
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80.886
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77.000
76.788
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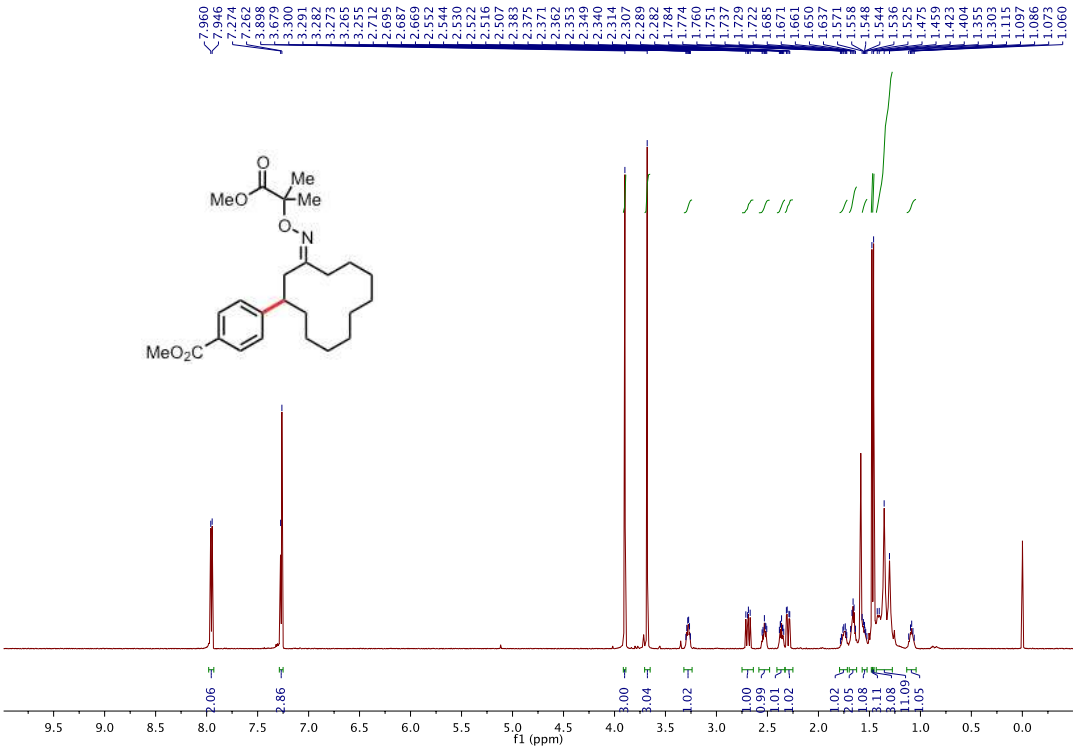
40.665
35.203
30.637
30.359
25.829
24.343
24.155
24.038
23.192
22.901
22.557
22.419
O
Me
CO2Me
MeO
Me
O
N
f1 (ppm)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3.273
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2.712
2.695
2.687
2.669
2.552
2.544
2.530
2.522
2.516
2.507
2.383
2.375
2.371
2.362
2.353
2.343
2.340
2.314
2.307
2.289
2.282
1.784
1.774
1.760
1.751
1.737
1.729
1.722
1.685
1.671
1.661
1.650
1.637
1.571
1.558
1.548
1.544
1.536
1.525
1.475
1.459
1.423
1.404
1.355
1.303
1.115
1.097
1.086
1.073
1.060
MeO
Me
Me
O
N
MeO2C
2.06
2.86
3.00
3.04
1.02
1.00
0.99
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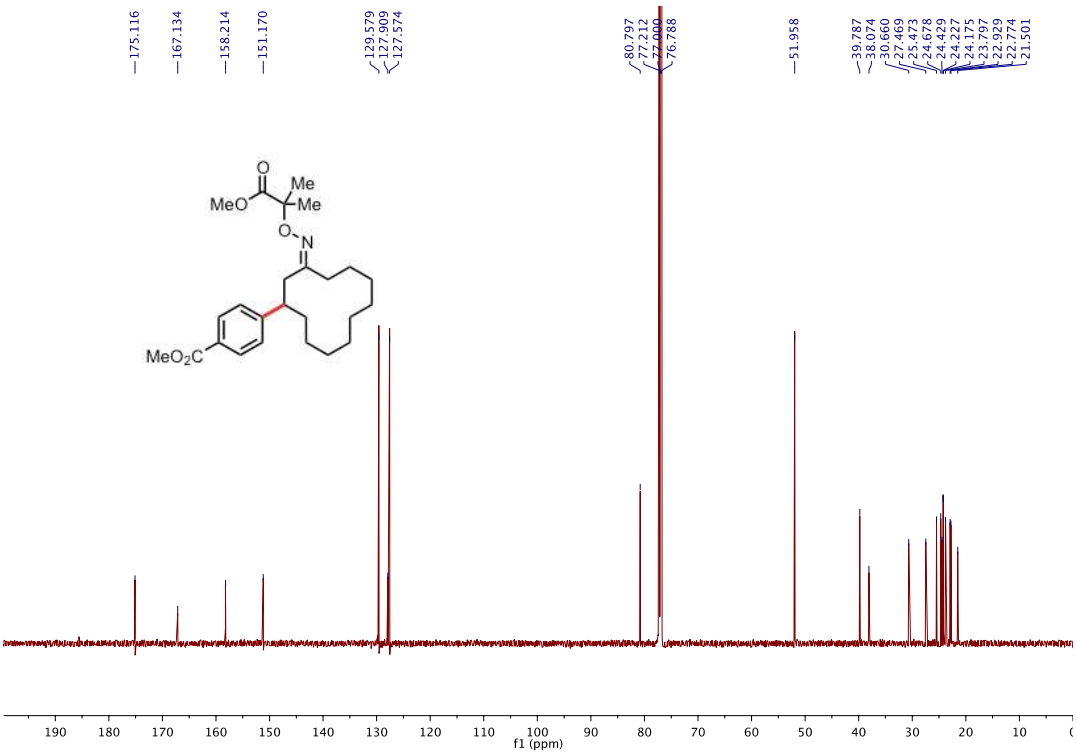
1.02
1.02
2.05
1.08
3.11
3.08
11.09
1.05
f1 (ppm)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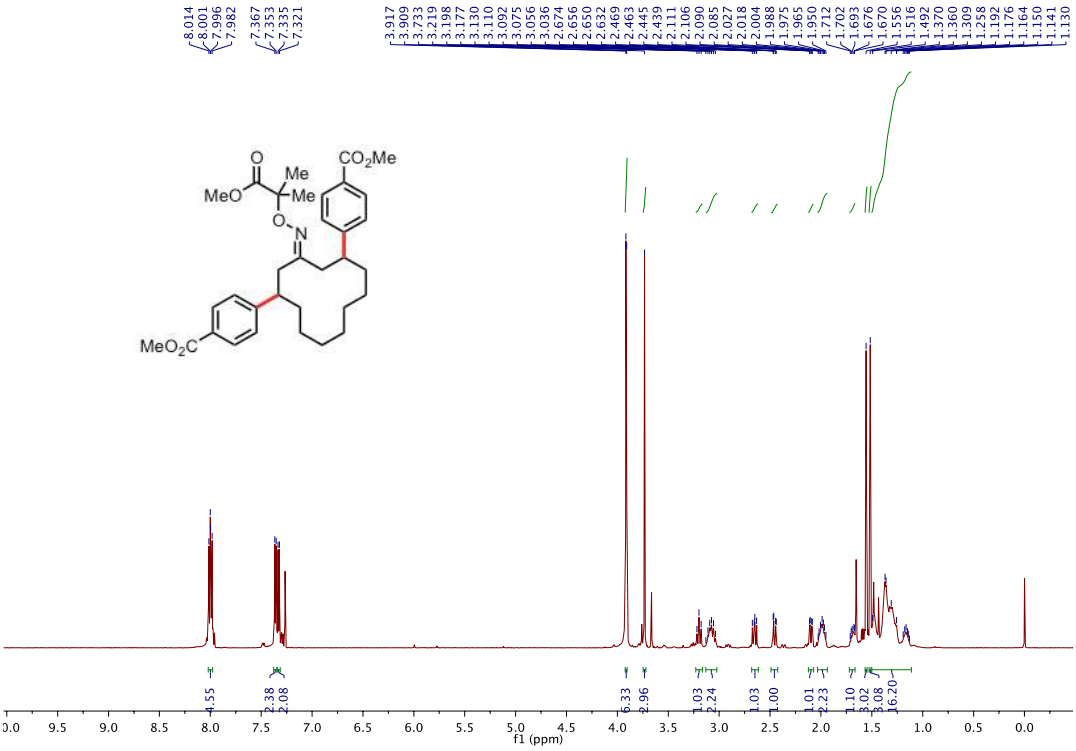
80.797
77.212
77.000
76.788
51.958
39.787
38.074
30.660
27.469
25.473
24.678
24.429
24.227
24.175
23.797
22.929
22.774
21.501
MeO
Me
Me
O
N
MeO2C
f1 (ppm)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7.321
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3.909
3.733
3.219
3.198
3.177
3.130
3.110
3.092
3.075
3.056
3.036
2.674
2.656
2.650
2.632
2.469
2.463
2.445
2.439
2.111
2.106
2.090
2.085
2.027
2.018
2.004
1.988
1.975
1.965
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1.702
1.693
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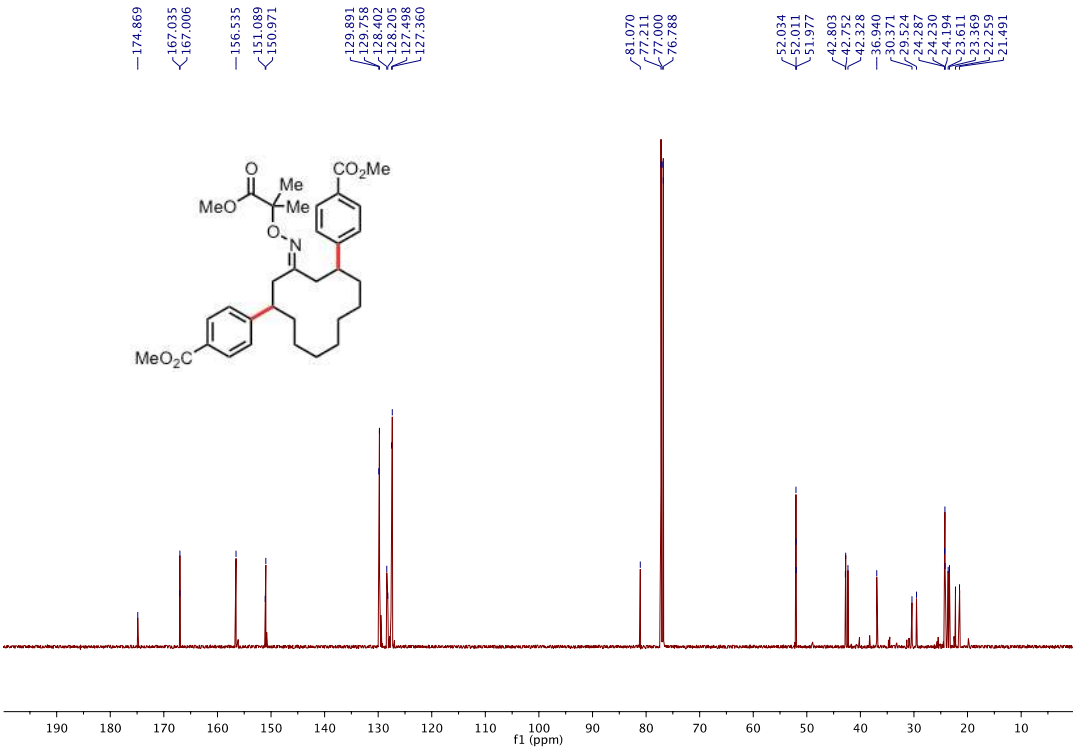
1.556
1.516
1.492
1.370
1.360
1.309
1.258
1.192
1.176
1.164
1.150
1.141
1.130
O
Me
CO2Me
MeO
Me
O
N
MeO2C
4.55
2.38
2.08
6.33
2.96
1.03
2.24
1.03
1.00
1.01
2.23
1.10
3.02
3.08
16.20
f1 (ppm)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167.006
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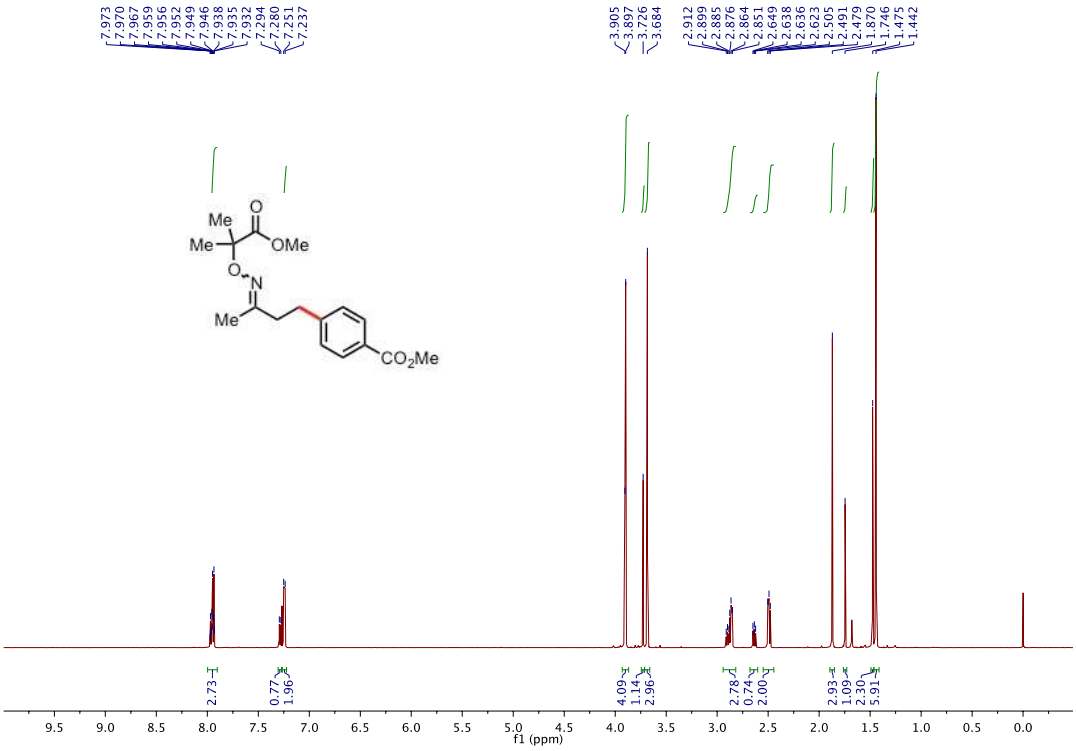
127.360
81.070
77.211
77.000
76.788
52.034
52.011
51.977
42.803
42.752
42.328
36.940
30.371
29.524
24.287
24.230
24.194
23.611
23.369
22.259
21.491
O
Me
CO2Me
MeO
Me
O
N
MeO2C
f1 (ppm)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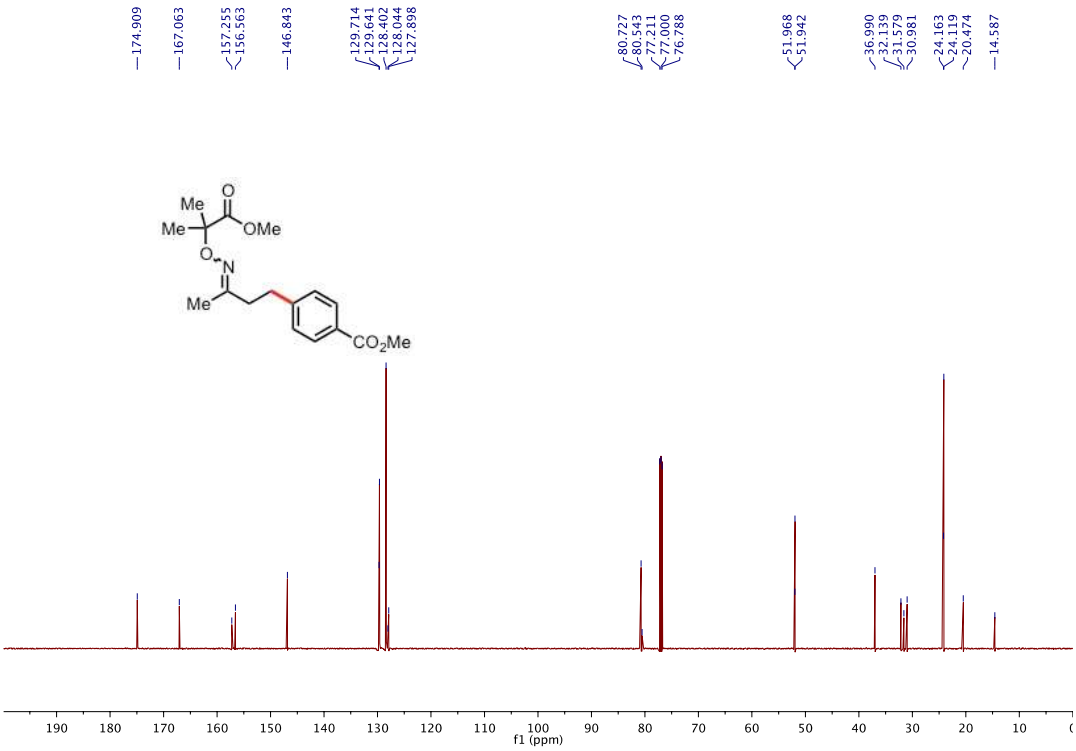
7.280
7.251
7.237
3.905
3.897
3.726
3.684
2.912
2.899
2.885
2.876
2.864
2.851
2.649
2.638
2.636
2.623
2.505
2.491
2.479
1.870
1.746
1.475
1.442
Me
O
Me
OMe
O
N
Me
CO2Me
2.73
0.77
1.96
4.09
1.14
2.96
2.78
0.74
2.00
2.93
1.09
2.30
5.91
f1 (ppm)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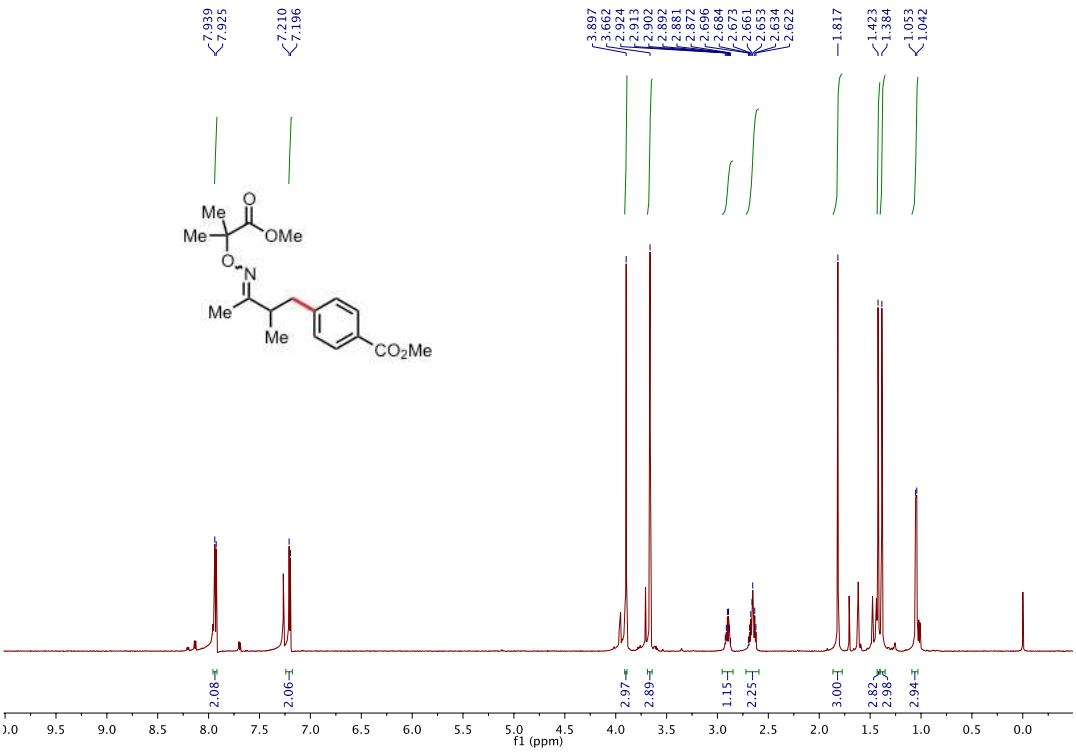
80.543
77.211
77.000
76.788
51.968
51.942
36.990
32.139
31.579
30.981
24.163
24.119
20.474
14.587
Me
O
Me
OMe
O
N
Me
CO2Me
f1 (ppm)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7.210
7.196
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2.924
2.913
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2.892
2.881
2.872
2.696
2.684
2.673
2.661
2.653
2.634
2.622
1.817
1.423
1.384
1.053
1.042
Me
Me
O
OMe
O
N
Me
Me
CO2Me
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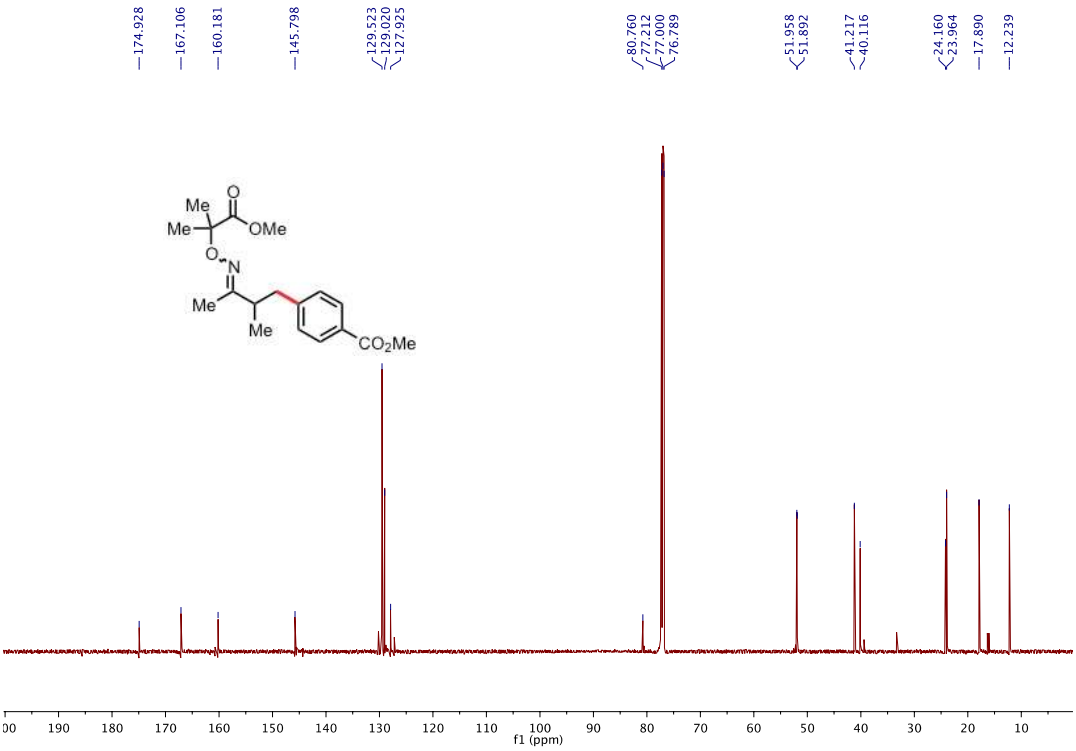
2.97
2.89
1.15
2.25
3.00
2.82
2.98
2.94
f1 (ppm)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77.000
76.789
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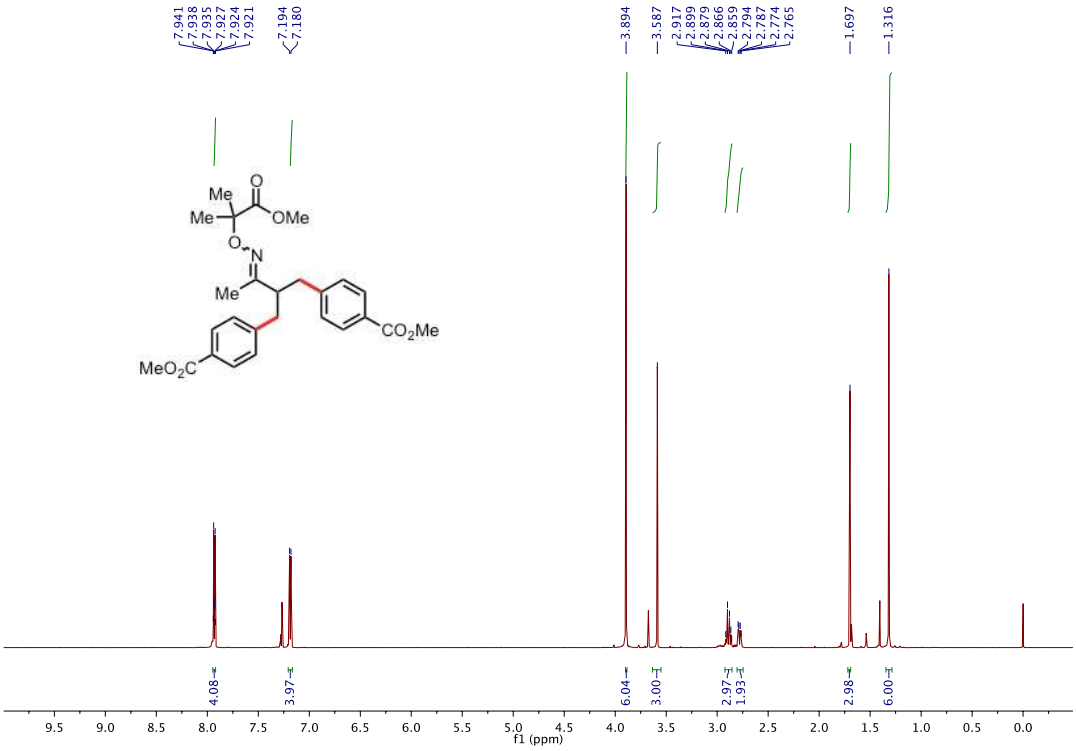
51.892
41.217
40.116
24.160
23.964
17.890
12.239
Me
Me
O
OMe
O
N
Me
Me
CO2Me
f1 (ppm)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7.935
7.927
7.924
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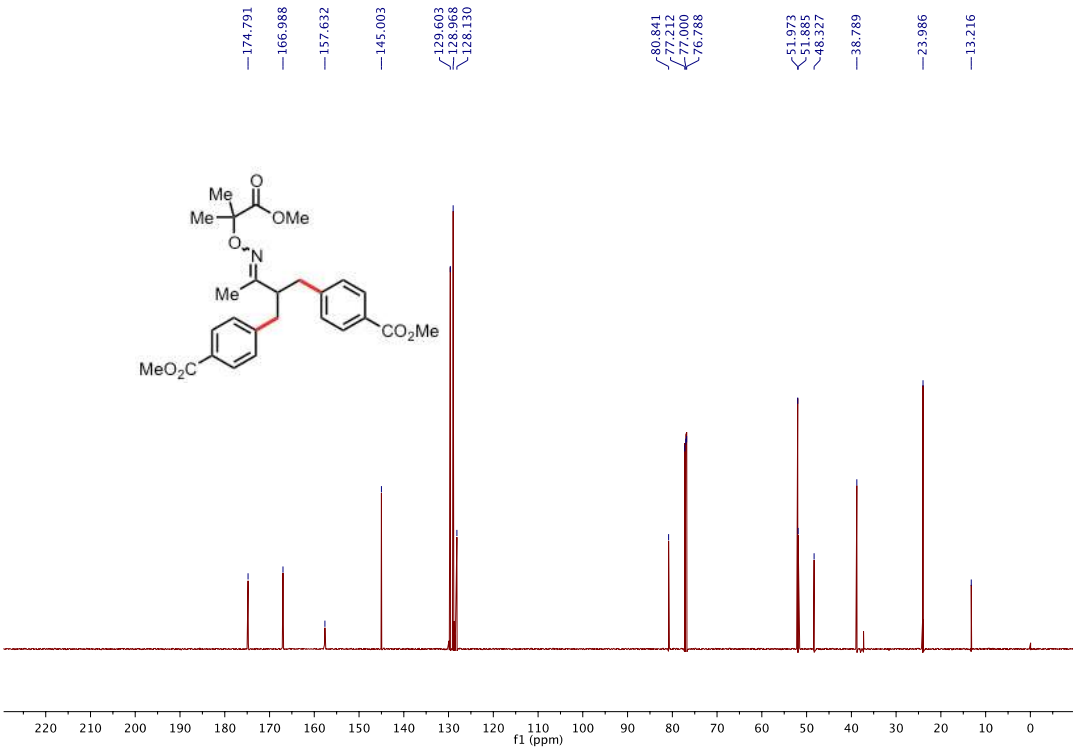
7.194
7.180
3.894
3.587
2.917
2.899
2.879
2.866
2.859
2.794
2.787
2.774
2.765
1.697
1.316
Me
Me
O
OMe
O
N
Me
CO2Me
MeO2C
4.08
3.97
6.04
3.00
2.97
1.93
2.98
6.00
f1 (ppm)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51.885
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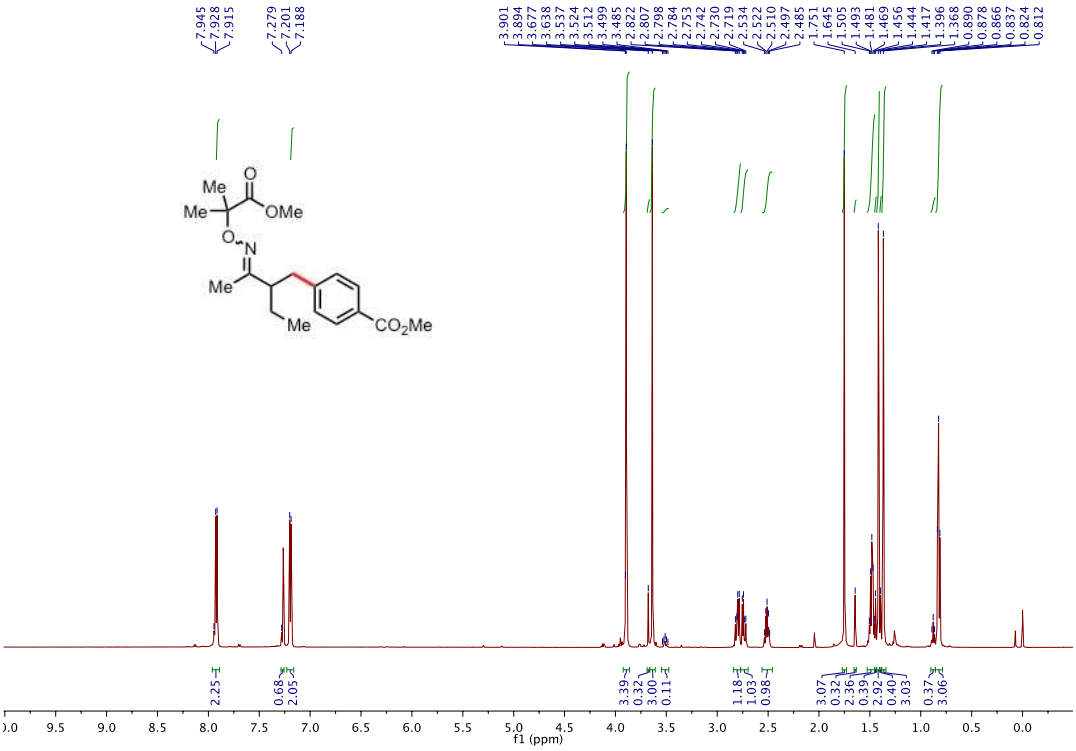
13.216
Me
Me
O
OMe
O
N
Me
CO2Me
MeO2C
f1 (ppm)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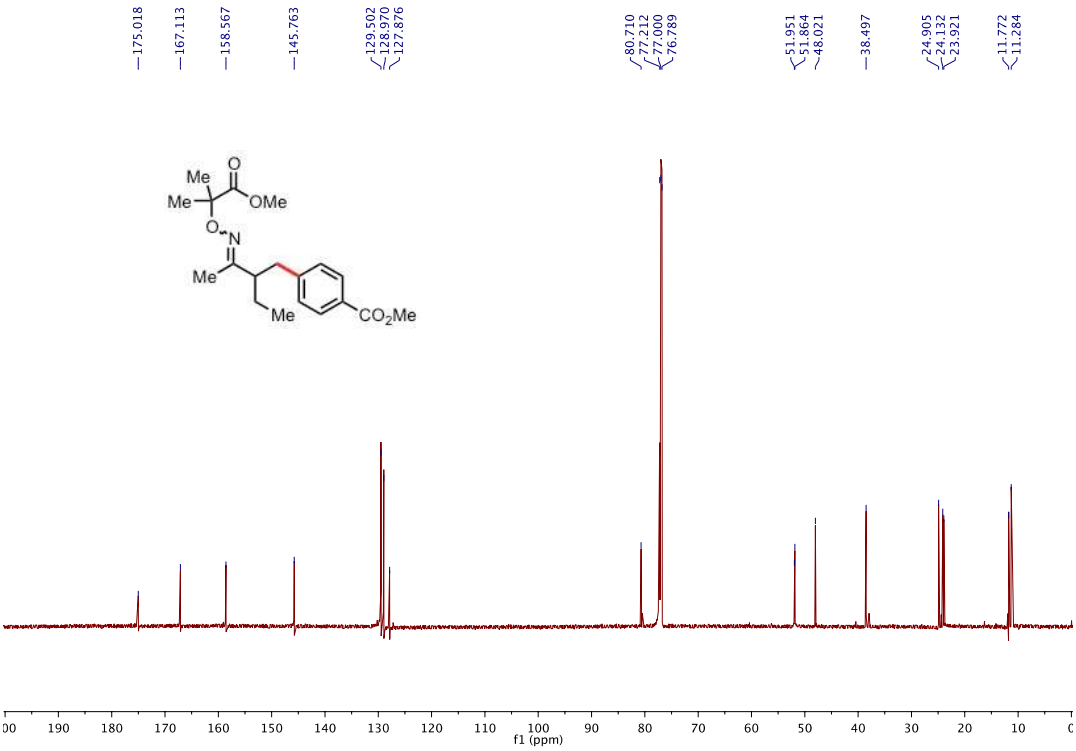
7.201
7.188
3.901
3.894
3.677
3.638
3.537
3.524
3.512
3.499
3.485
2.822
2.807
2.798
2.784
2.753
2.742
2.730
2.719
2.534
2.522
2.510
2.497
2.485
1.751
1.645
1.505
1.493
1.481
1.469
1.456
1.444
1.417
1.396
1.368
0.890
0.878
0.866
0.837
0.824
0.812
Me
Me
O
OMe
O
N
Me
Me
CO2Me
2.25
0.68
2.05
3.39
0.32
3.00
0.11
1.18
1.03
0.98
3.07
0.32
2.36
0.39
2.92
0.40
3.03
0.37
3.06
f1 (ppm)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127.876
80.710
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77.000
76.789
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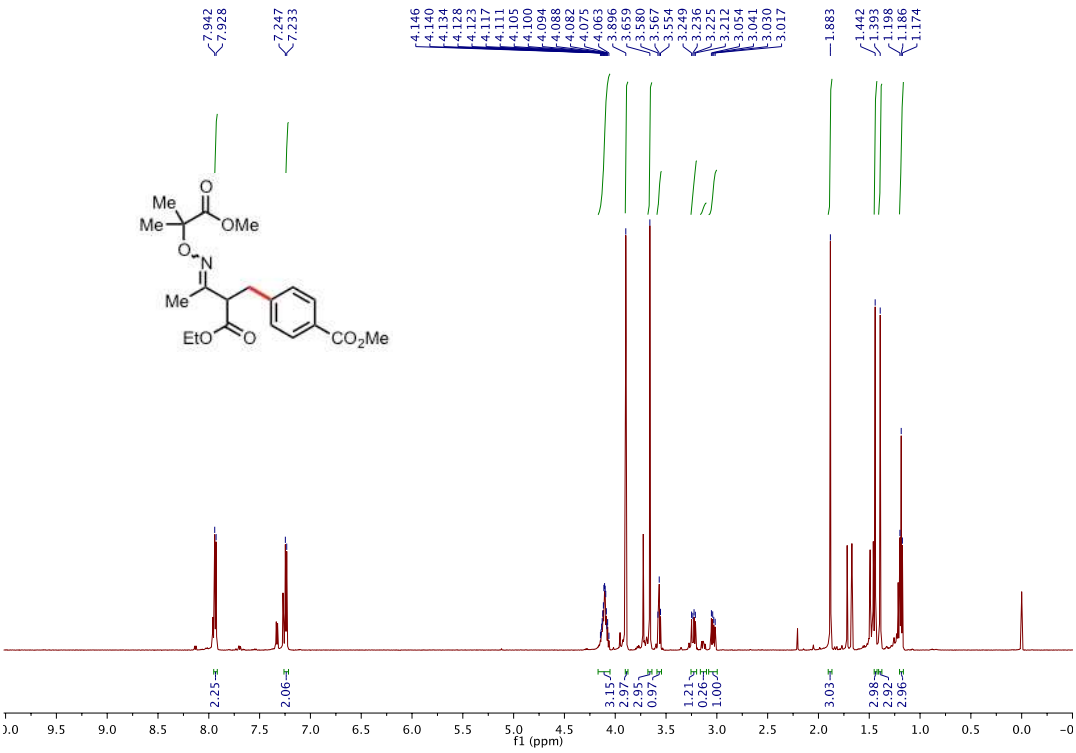
51.864
48.021
38.497
24.905
24.132
23.921
11.772
11.284
Me
Me
O
OMe
O
N
Me
Me
CO2Me
f1 (ppm)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7.233
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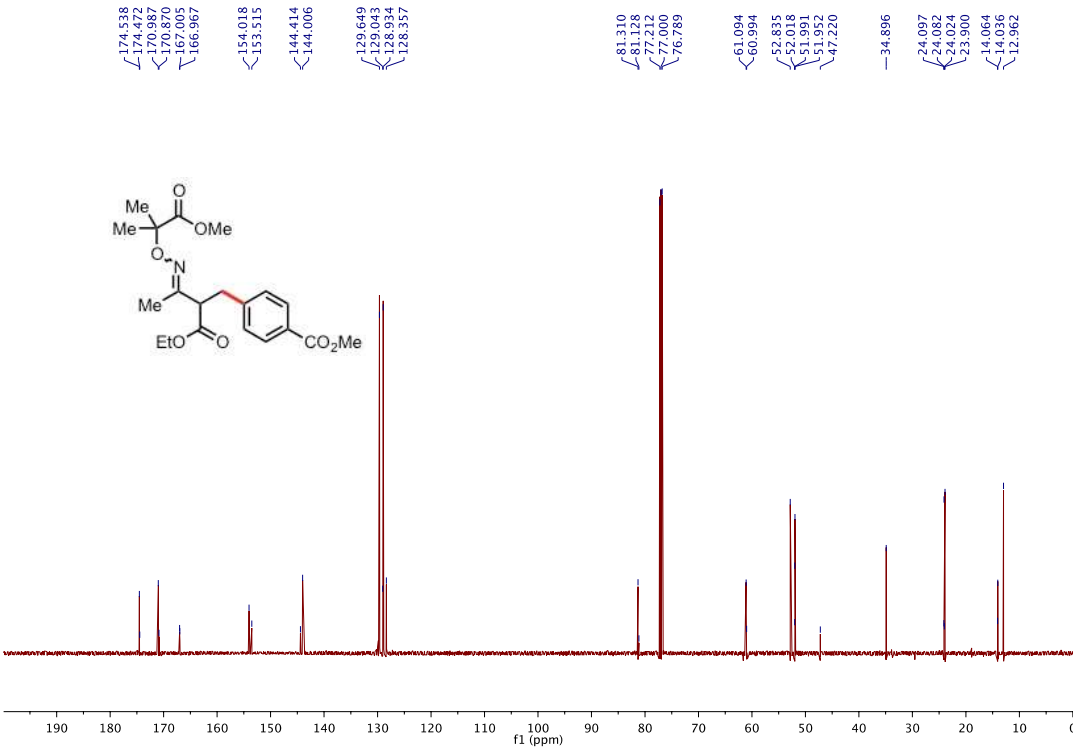
4.140
4.134
4.128
4.123
4.117
4.111
4.105
4.100
4.094
4.088
4.082
4.075
4.063
3.896
3.659
3.580
3.567
3.554
3.249
3.236
3.225
3.212
3.054
3.041
3.030
3.017
1.883
1.442
1.393
1.198
1.186
1.174
Me
Me
O
OMe
O
N
Me
EtO
O
CO2Me
2.25
2.06
3.15
2.97
2.95
0.97
1.21
0.26
1.00
3.03
2.98
2.92
2.96
f1 (ppm)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153.515
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129.043
128.934
128.357
81.310
81.128
77.212
77.000
76.789
61.094
60.994
52.835
52.018
51.991
51.952
47.220
34.896
24.097
24.082
24.024
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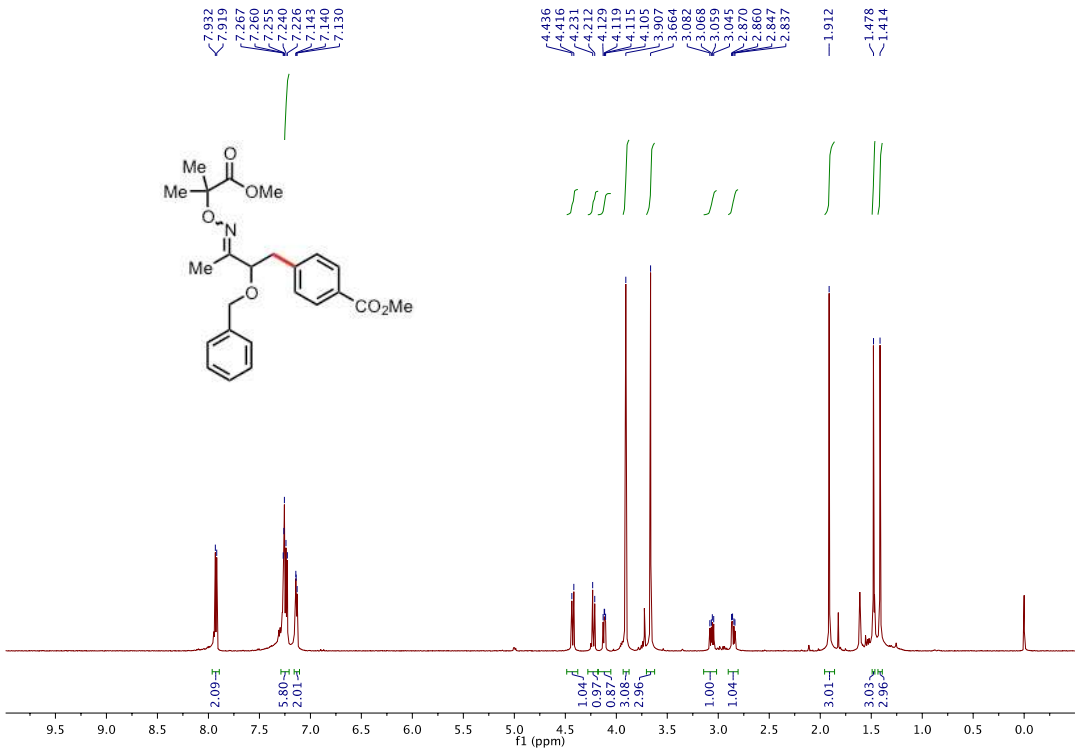
14.064
14.036
12.962
Me
Me
O
OMe
O
N
Me
EtO
O
CO2Me
f1 (ppm)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7.130
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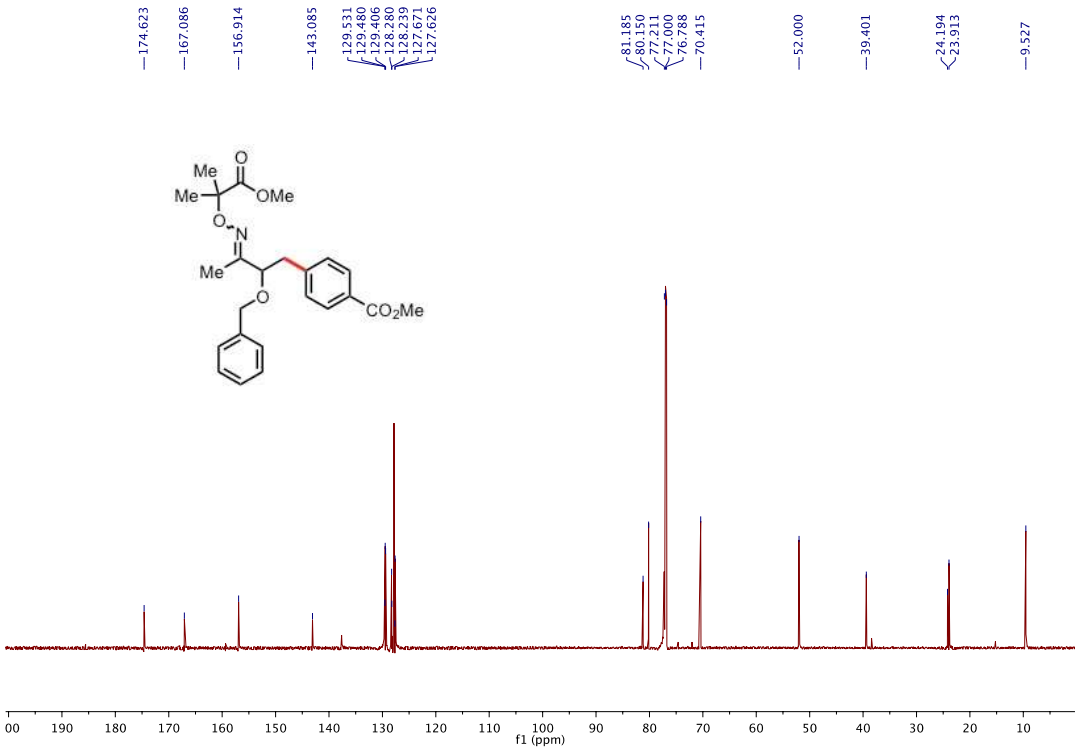
4.416
4.231
4.212
4.129
4.119
4.115
4.105
3.907
3.664
3.082
3.068
3.059
3.045
2.870
2.860
2.847
2.837
1.912
1.478
1.414
Me
Me
O
OMe
O
N
Me
O
CO2Me
2.09
5.80
2.01
1.04
0.97
0.87
3.08
2.96
1.00
1.04
3.01
3.03
2.96
f1 (ppm)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156.914
143.085
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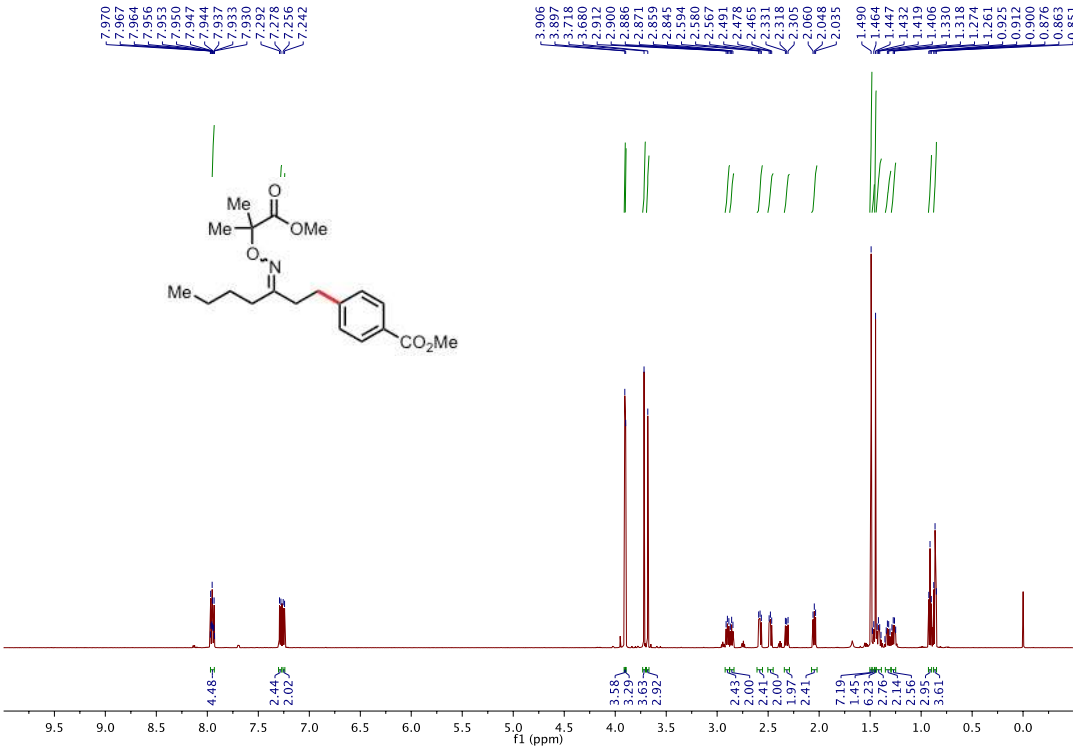
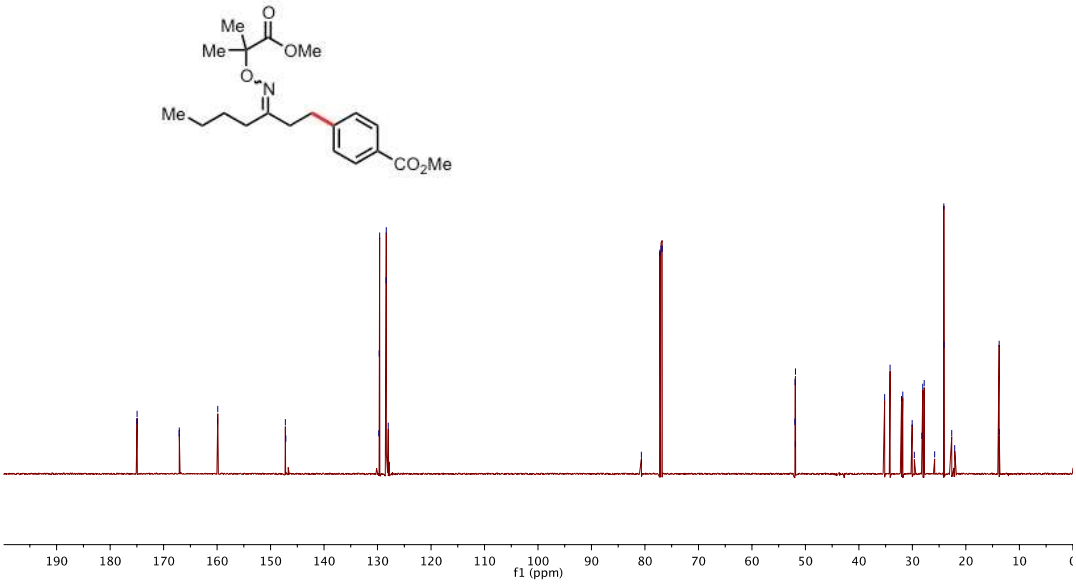
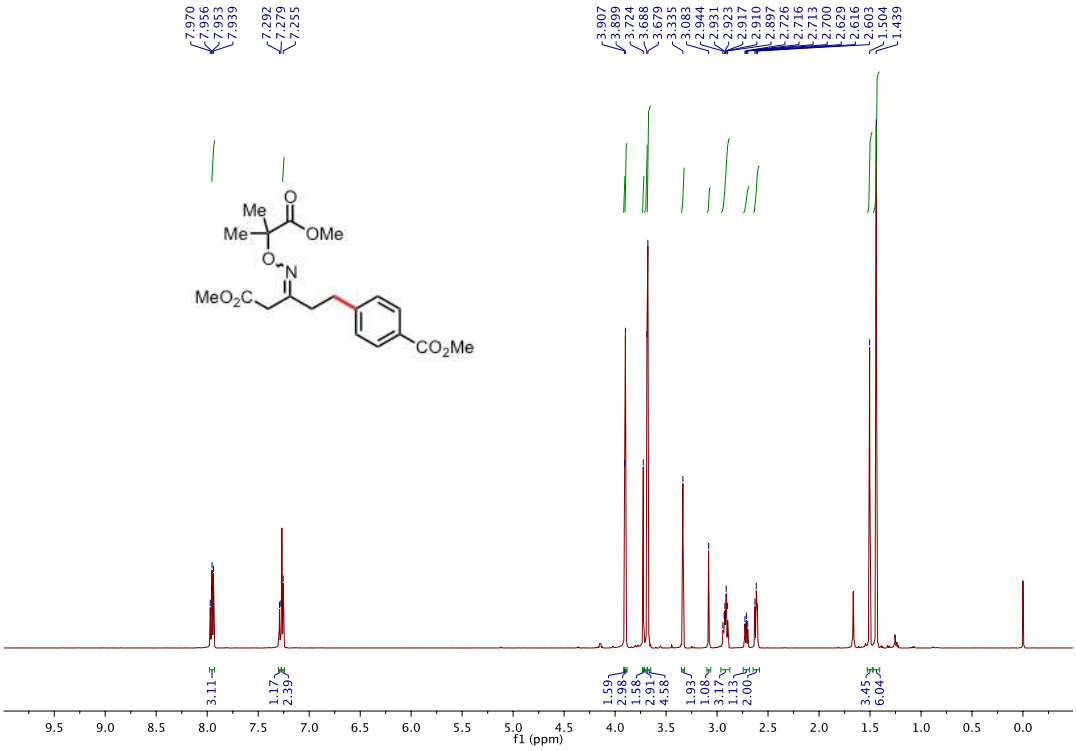
129.480
129.406
128.280
128.239
127.671
127.626
81.185
80.150
77.211
77.000
76.788
70.415
52.000
39.401
24.194
23.913
9.527
Me
Me
O
OMe
O
N
Me
O
CO2Me
f1 (ppm)


Me
Me
O
OMe
O
N
Me
CO2Me
f1 (ppm)


Me
Me
O
OMe
O
N
Me
CO2Me
f1 (ppm)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3.724
3.688
3.679
3.335
3.083
2.944
2.931
2.923
2.917
2.910
2.897
2.726
2.716
2.713
2.700
2.629
2.616
2.603
1.504
1.439
Me
Me
O
OMe
O
N
MeO2C
CO2Me
3.11
1.17
2.39
1.59
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1.58
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4.58
1.93
1.08
3.17
1.13
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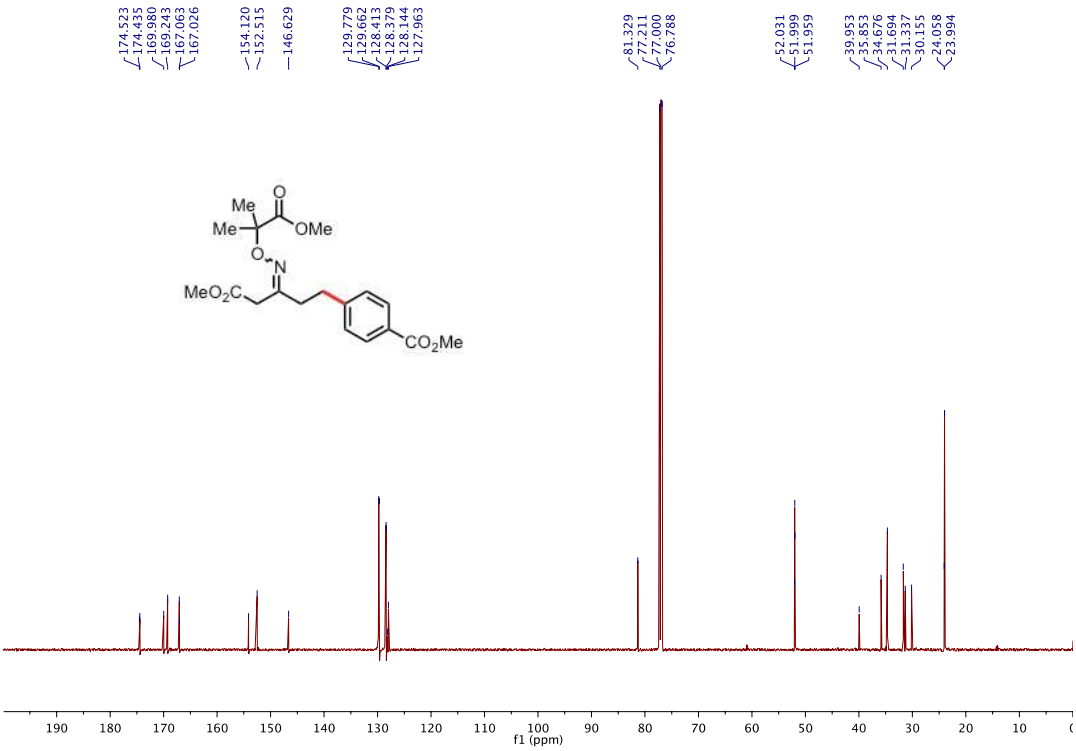
6.04
f1 (ppm)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127.963
81.329
77.211
77.000
76.788
52.031
51.999
51.959
39.953
35.853
34.676
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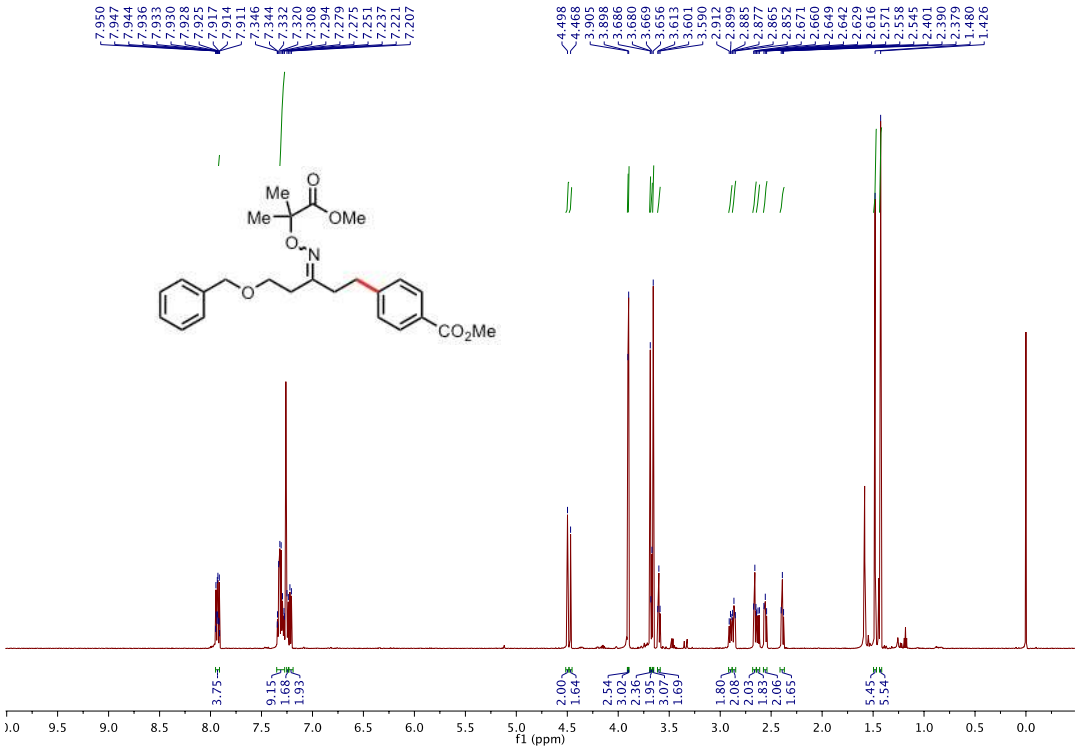
24.058
23.994
Me
Me
O
OMe
O
N
MeO2C
CO2Me
f1 (ppm)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7.925
7.917
7.914
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7.346
7.344
7.332
7.320
7.308
7.294
7.279
7.275
7.251
7.237
7.221
7.207
4.498
4.468
3.905
3.898
3.686
3.680
3.669
3.656
3.613
3.601
3.590
2.912
2.899
2.885
2.877
2.865
2.852
2.671
2.660
2.649
2.642
2.629
2.616
2.571
2.558
2.545
2.401
2.390
2.379
1.480
1.426
Me
Me
O
OMe
O
N
O
CO2Me
3.75
9.15
1.68
1.93
2.00
1.64
2.54
3.02
2.36
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1.80
2.08
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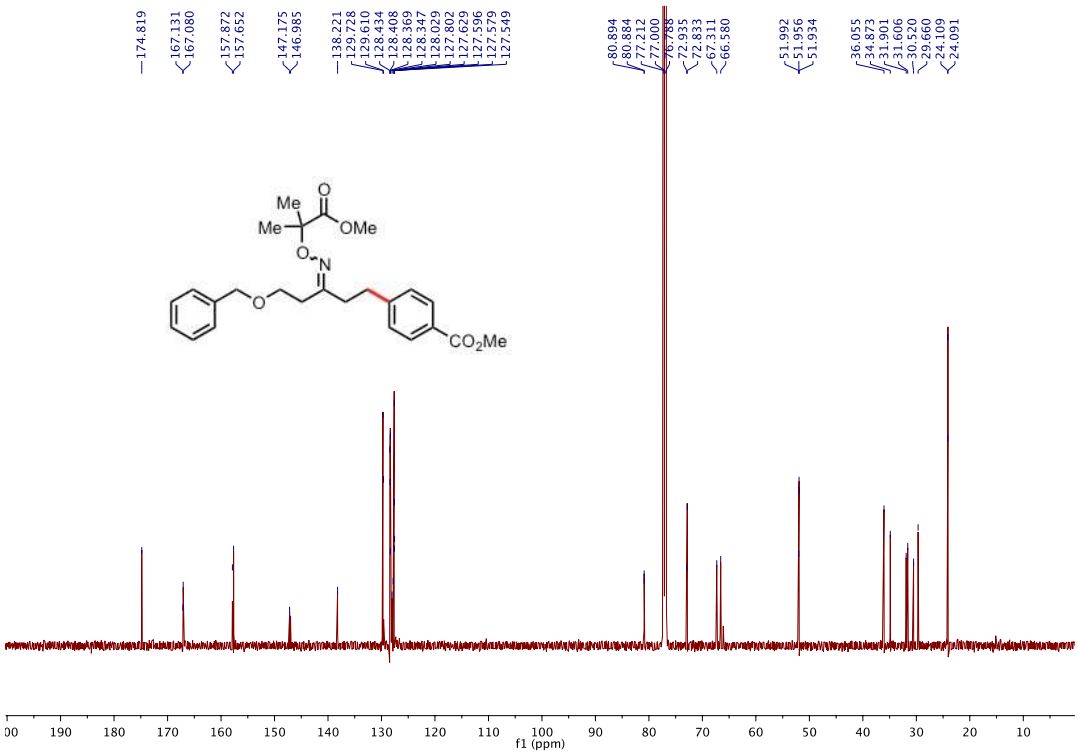
1.83
2.06
1.65
5.45
5.54
f1 (ppm)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128.347
128.029
127.802
127.629
127.596
127.579
127.549
80.894
80.884
77.212
77.000
76.788
72.935
72.833
67.311
66.580
51.992
51.956
51.934
36.055
34.873
31.901
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29.660
24.109
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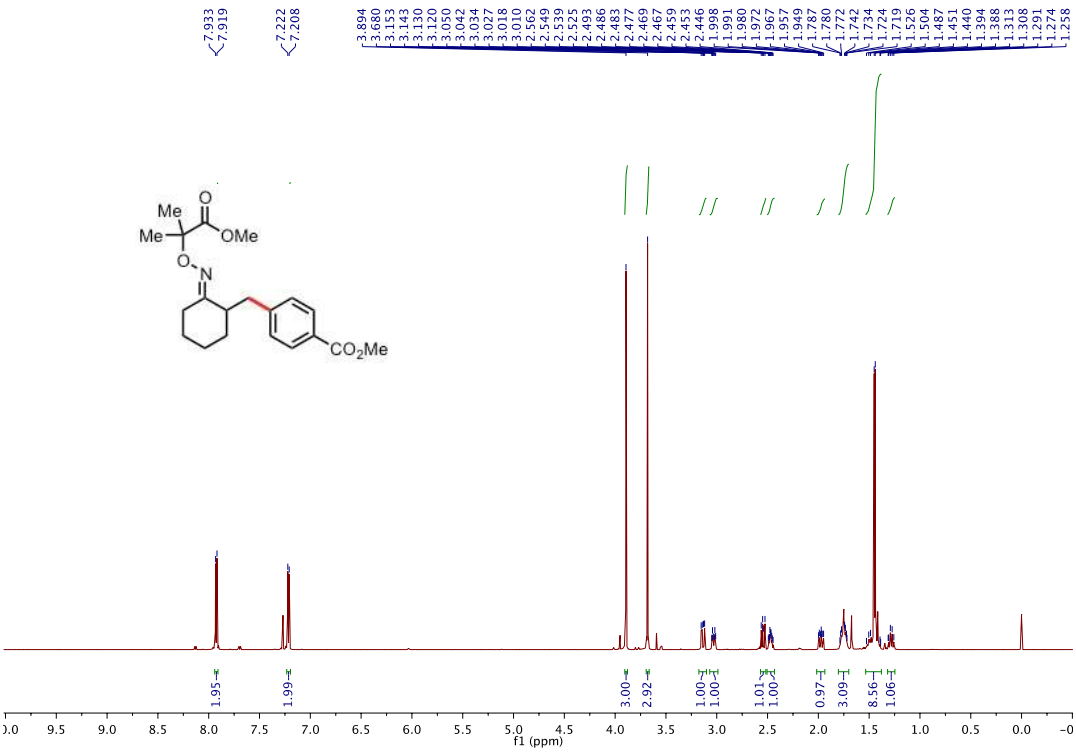
Me
Me
O
OMe
O
N
O
CO2Me
f1 (ppm)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3.143
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3.034
3.027
3.018
3.010
2.562
2.549
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2.483
2.477
2.469
2.467
2.459
2.453
2.446
1.998
1.991
1.980
1.972
1.967
1.957
1.949
1.787
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1.772
1.742
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1.504
1.487
1.451
1.440
1.394
1.388
1.313
1.308
1.291
1.274
1.258
Me
Me
O
OMe
O
N
CO2Me
1.95
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1.06
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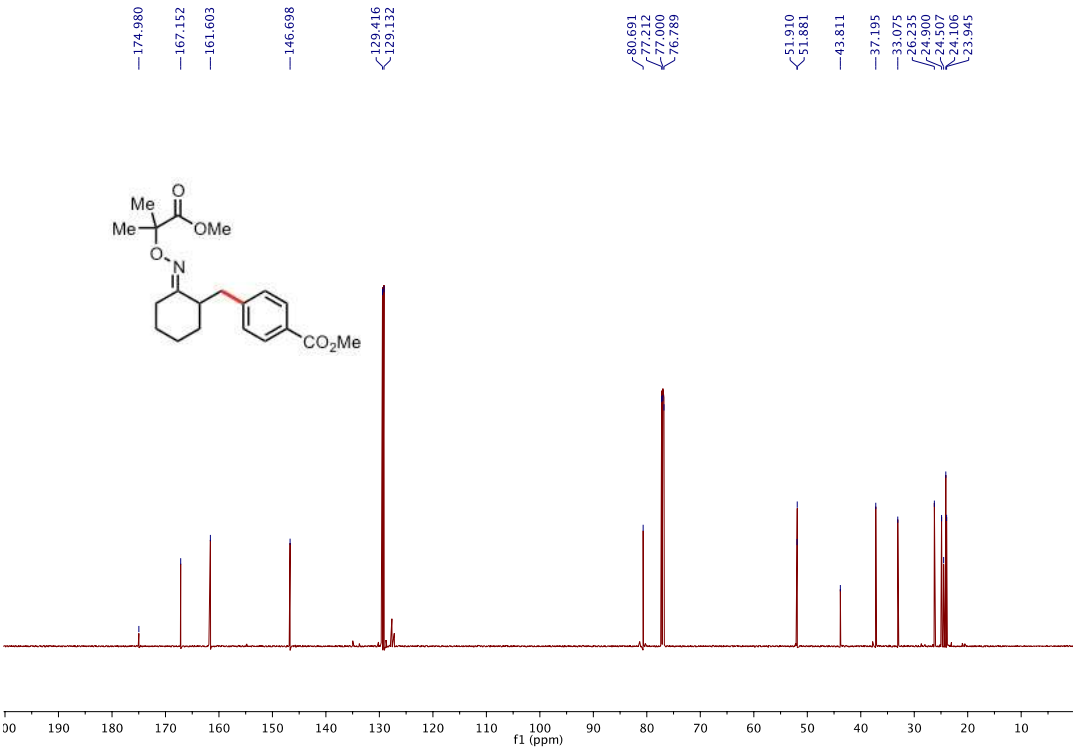
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43.811
37.195
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24.507
24.106
23.945
Me
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O
OMe
O
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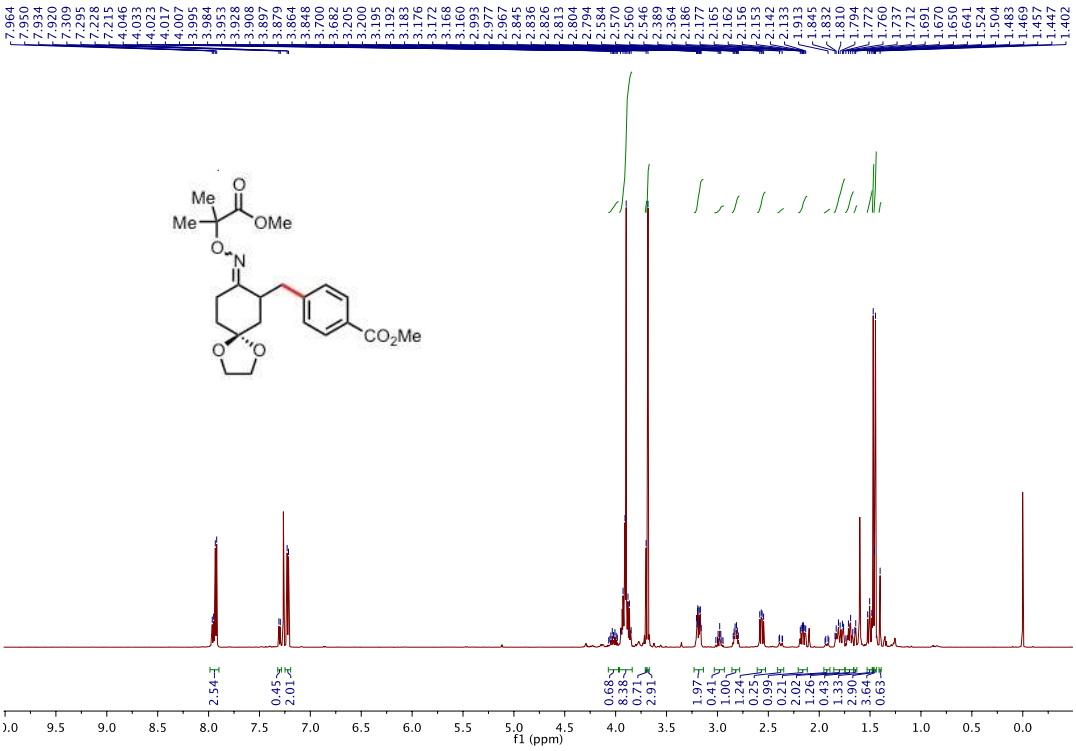
CO2Me
f1 (ppm)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3.897
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3.864
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3.200
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1.504
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1.469
1.457
1.447
1.402
Me
Me
O
OMe
O
N
CO2Me
O
O
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8.38
0.71
2.91
1.97
0.41
1.00
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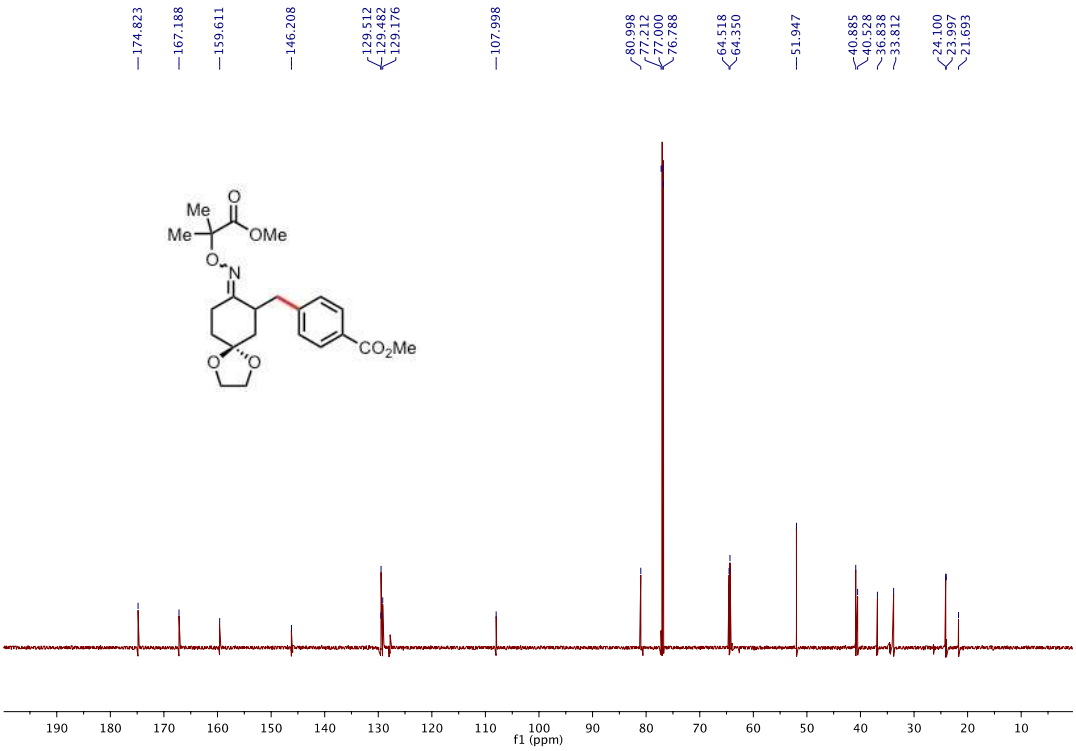
2.90
3.64
0.63
f1 (ppm)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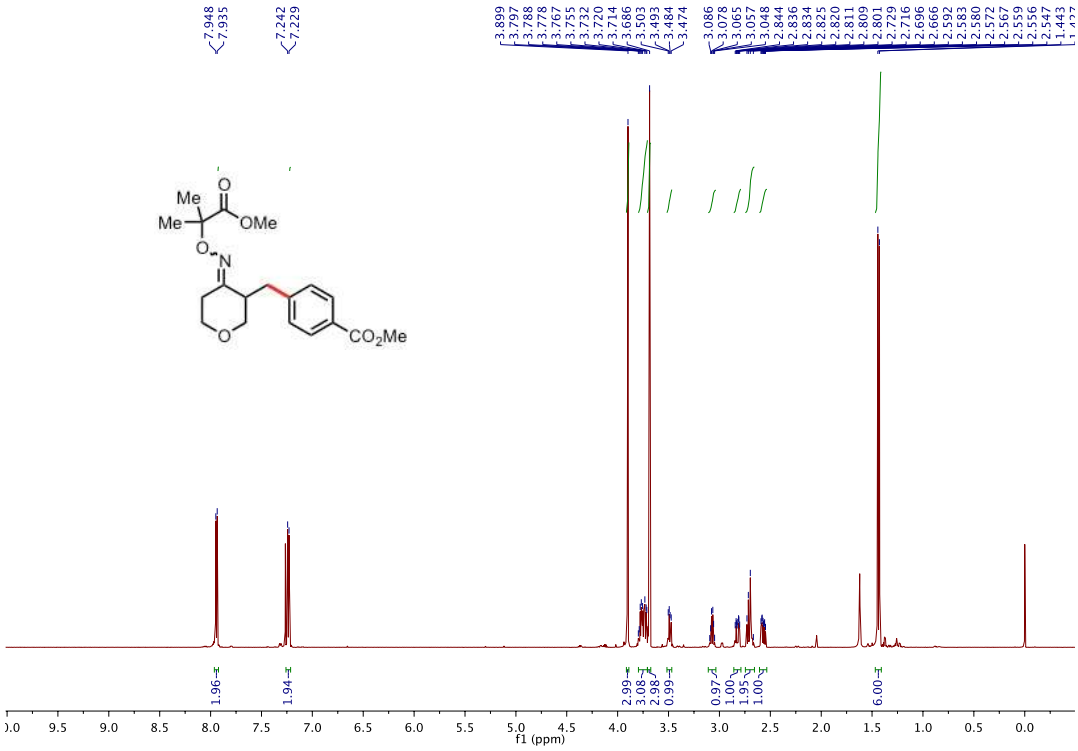
77.000
76.788
64.518
64.350
51.947
40.885
40.528
36.838
33.812
24.100
23.997
21.693
Me
Me
O
OMe
O
N
CO2Me
O
O
f1 (ppm)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3.714
3.686
3.503
3.493
3.484
3.474
3.086
3.078
3.065
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3.048
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2.696
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2.572
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2.559
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1.443
Me
Me
O
OMe
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O
CO2Me
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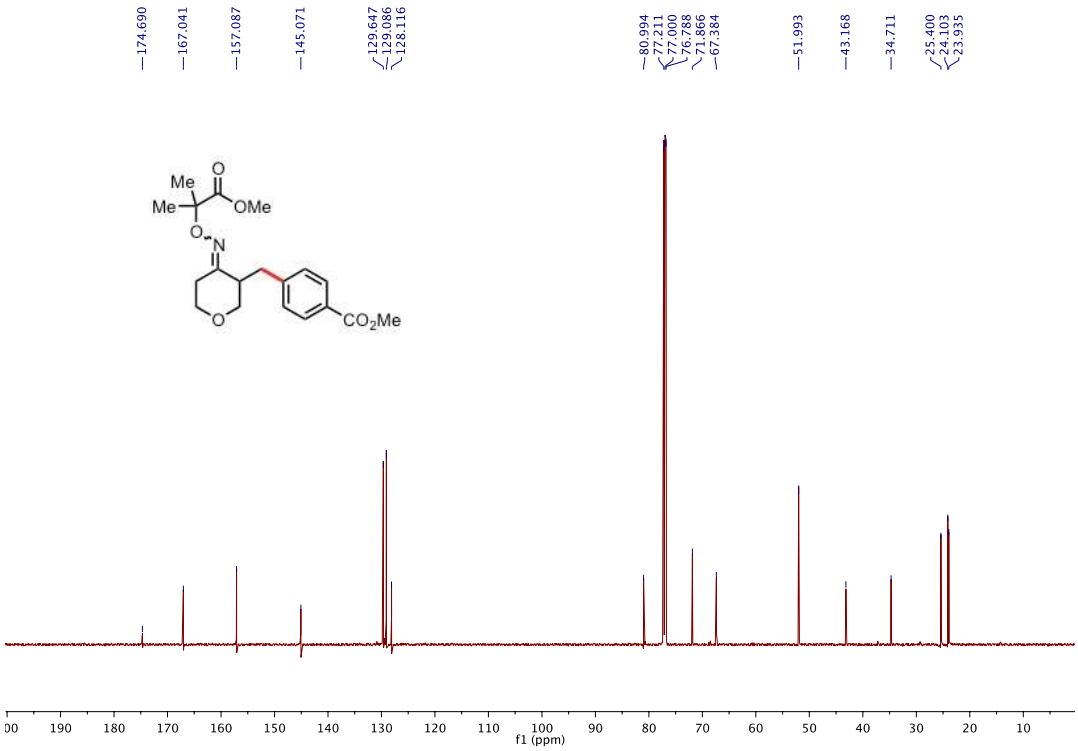
f1 (ppm)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76.788
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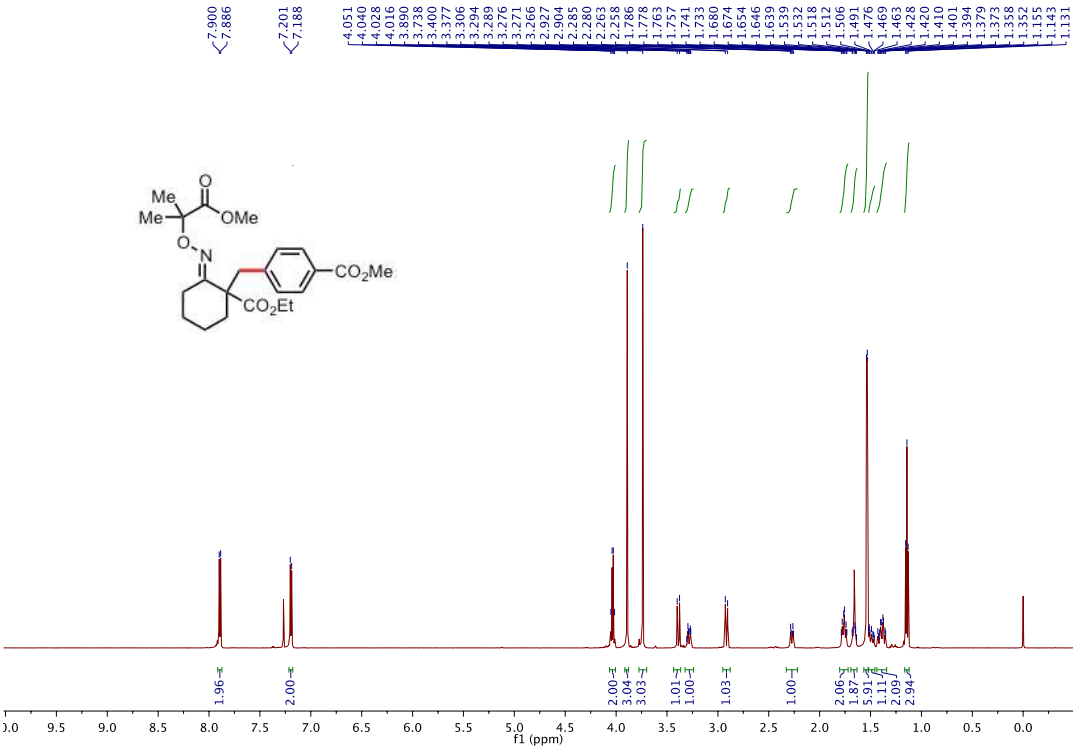
51.993
43.168
34.711
25.400
24.103
23.935
Me
Me
O
OMe
O
N
O
CO2Me
f1 (ppm)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4.016
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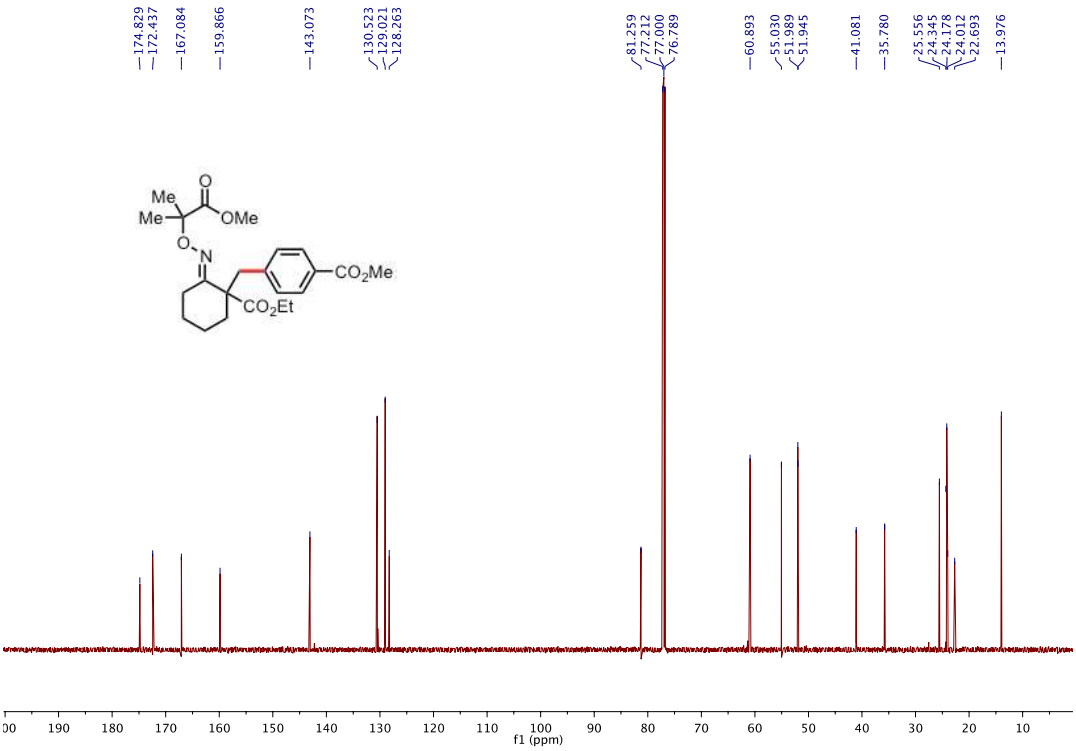
3.400
3.377
3.306
3.294
3.289
3.276
3.271
3.266
2.927
2.904
2.285
2.280
2.263
2.258
1.786
1.778
1.763
1.757
1.741
1.733
1.680
1.674
1.654
1.646
1.639
1.539
1.532
1.518
1.512
1.506
1.491
1.476
1.469
1.463
1.428
1.420
1.410
1.401
1.394
1.379
1.373
1.358
1.352
1.155
1.143
1.131
Me
Me
O
OMe
O
N
CO2Me
CO2Et
1.96
2.00
2.00
3.04
3.03
1.01
1.00
1.03
1.00
2.06
1.87
5.91
1.11
2.09
2.94
f1 (ppm)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128.263
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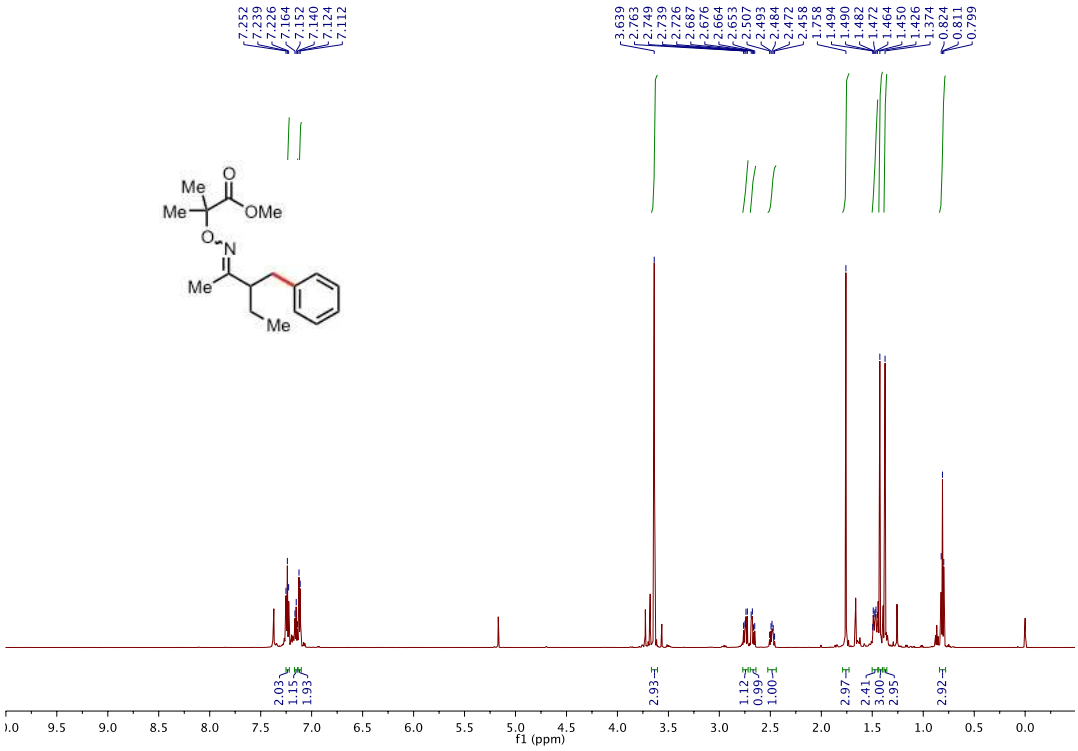
76.789
60.893
55.030
51.989
51.945
41.081
35.780
25.556
24.345
24.178
24.012
22.693
13.976
Me
Me
O
OMe
O
N
CO2Me
CO2Et
f1 (ppm)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7.226
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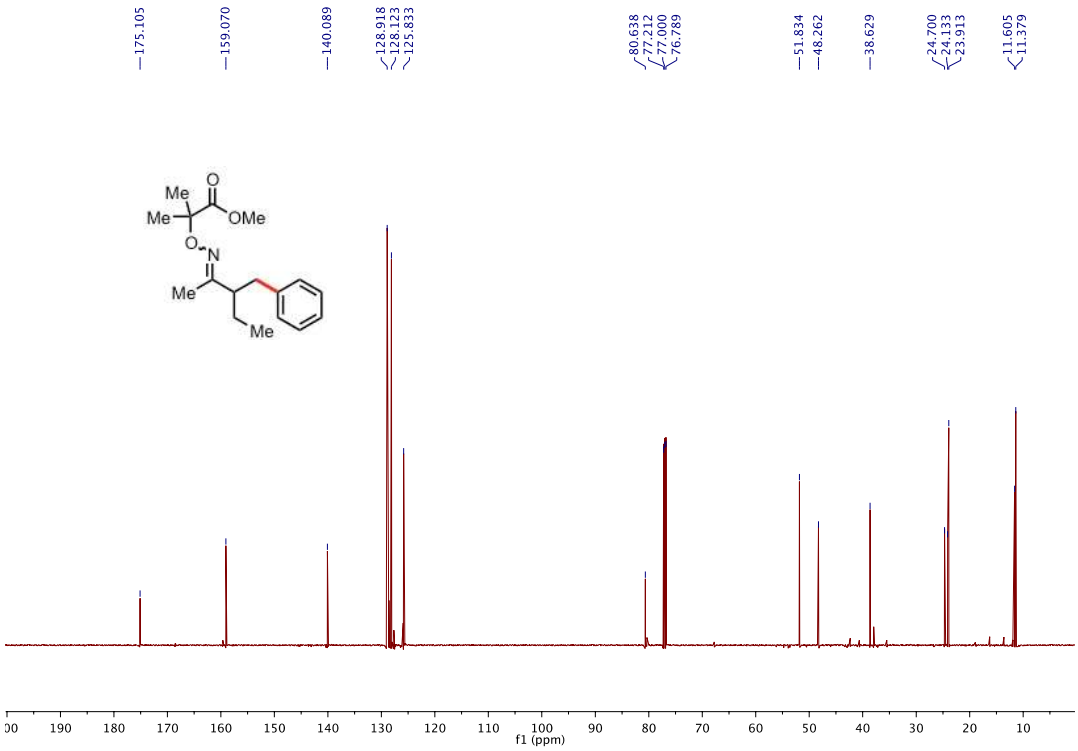
7.152
7.140
7.124
7.112
3.639
2.763
2.749
2.739
2.726
2.687
2.676
2.664
2.653
2.507
2.493
2.484
2.472
2.458
1.758
1.494
1.490
1.482
1.472
1.464
1.450
1.426
1.374
0.824
0.811
0.799
Me
Me
O
OMe
O
N
Me
Me
2.03
1.15
1.93
2.93
1.12
0.99
1.00
2.97
2.41
3.00
2.95
2.92
f1 (ppm)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159.070
140.089
128.918
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80.638
77.212
77.000
76.789
51.834
48.262
38.629
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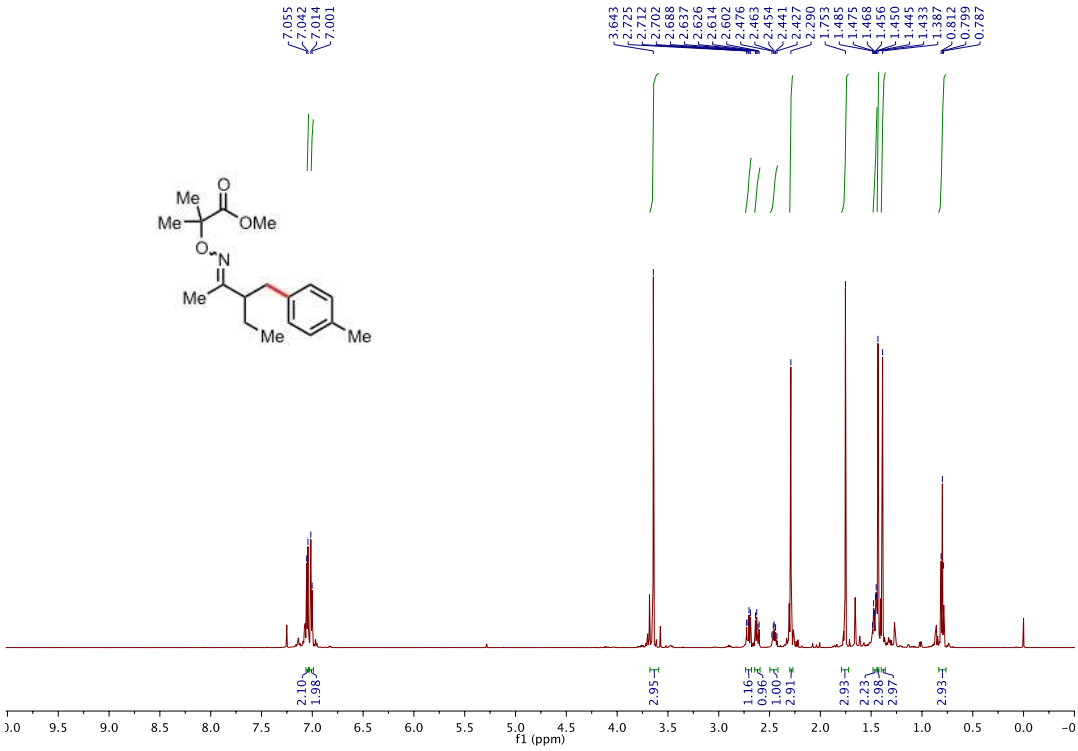
23.913
11.605
11.379
Me
Me
O
OMe
O
N
Me
Me
f1 (ppm)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7.014
7.001
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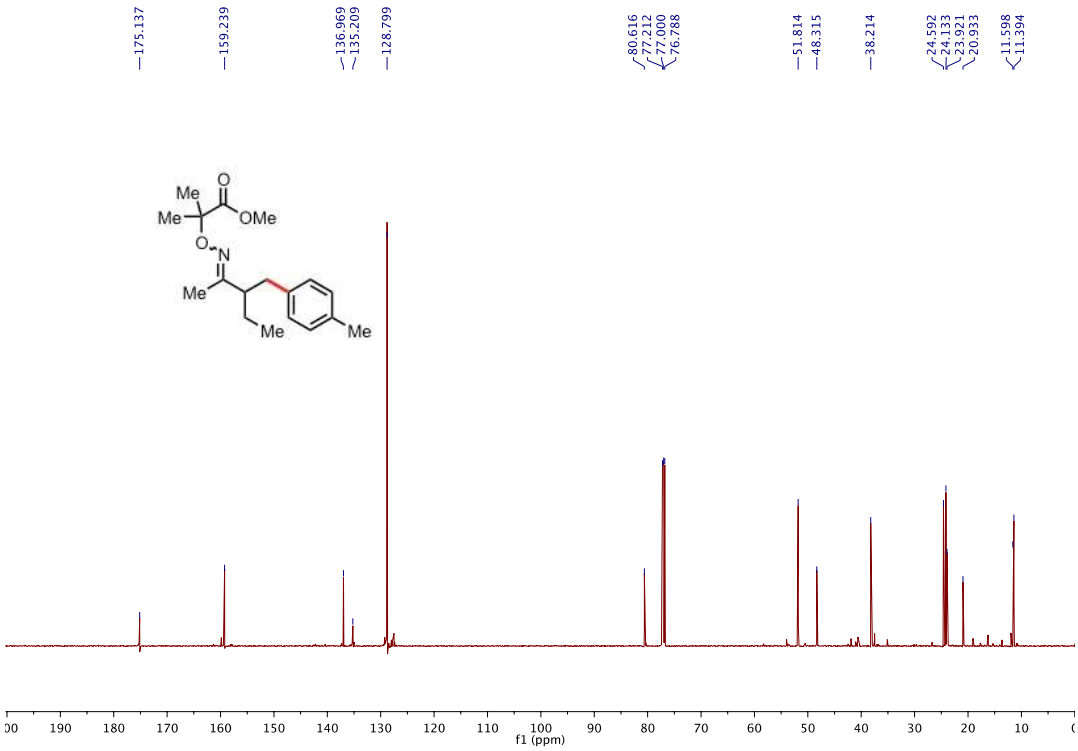
2.725
2.711
2.702
2.688
2.637
2.626
2.614
2.602
2.476
2.463
2.454
2.441
2.427
2.290
1.753
1.485
1.475
1.468
1.456
1.450
1.445
1.433
1.387
0.932
0.799
0.787
Me
O
OMe
Me
O
N
Me
Me
Me
2.10
1.98
2.95
1.16
0.96
1.00
2.91
2.93
2.23
2.98
2.97
2.93
f1 (ppm)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136.969
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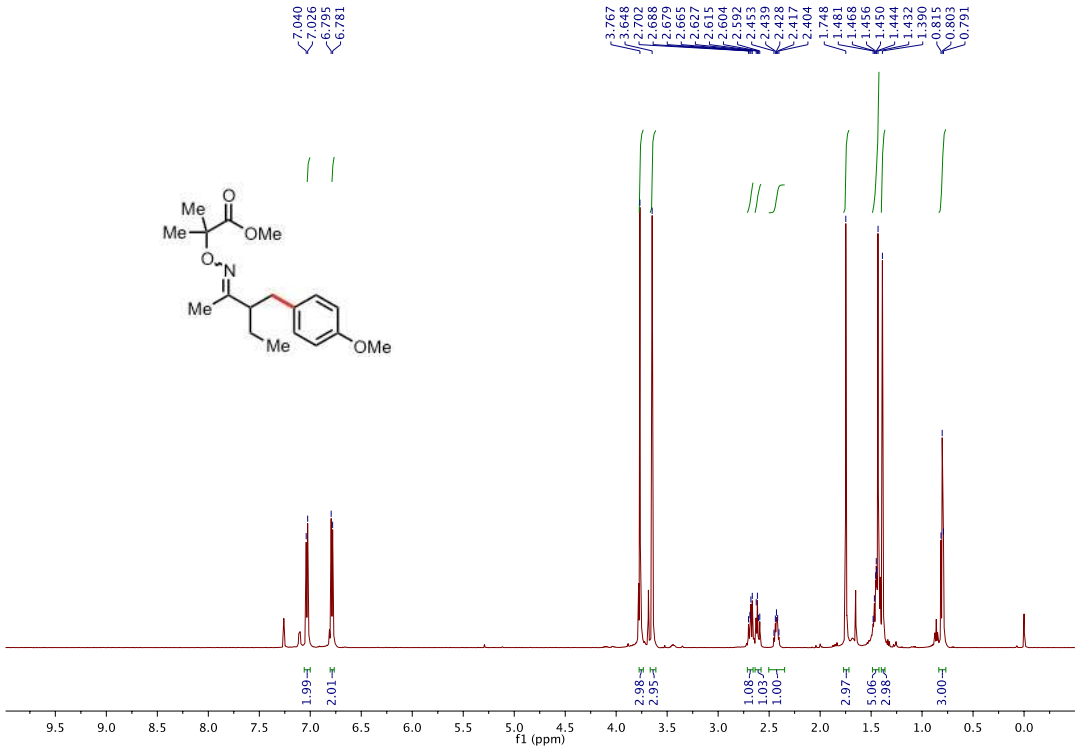
128.799
80.616
77.212
77.000
76.788
51.814
48.315
38.214
24.592
24.133
23.921
20.933
11.598
11.394
Me
O
OMe
Me
O
N
Me
Me
Me
f1 (ppm)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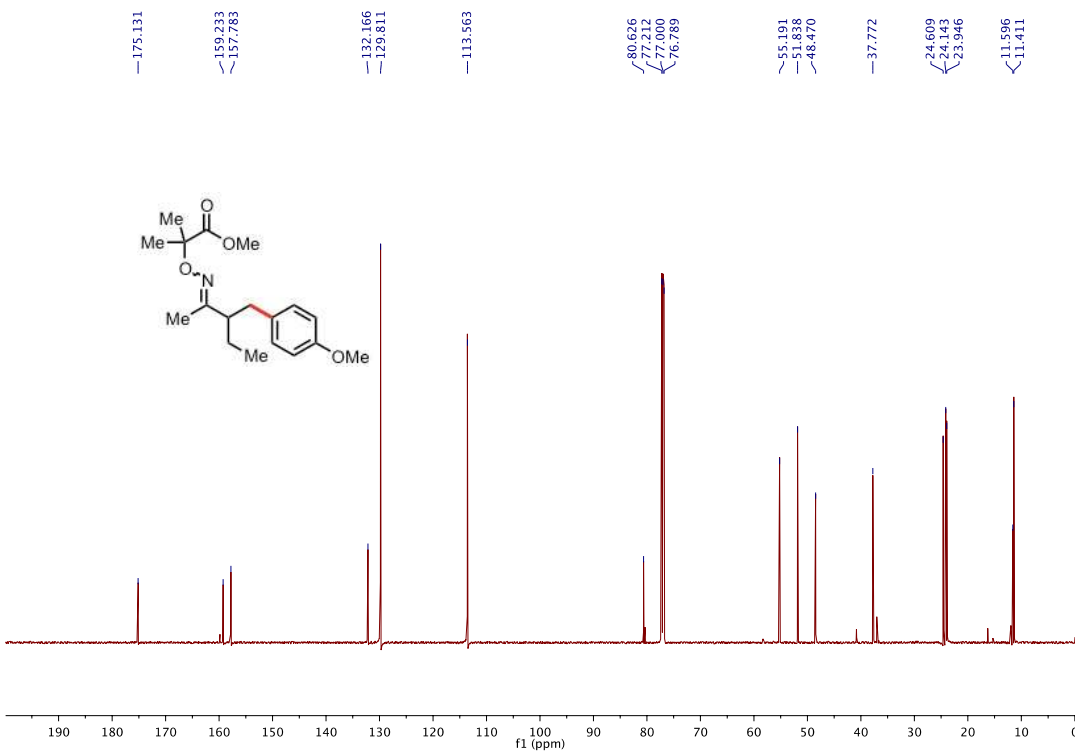
7.026
6.795
6.781
3.767
3.648
2.702
2.688
2.679
2.665
2.627
2.615
2.604
2.592
2.453
2.439
2.428
2.417
2.404
1.748
1.481
1.468
1.456
1.450
1.444
1.432
1.390
0.815
0.803
0.791
Me
Me
O
OMe
O
N
Me
Me
OMe
1.99
2.01
2.98
2.95
1.08
1.03
1.00
2.97
5.06
2.98
3.00
f1 (ppm)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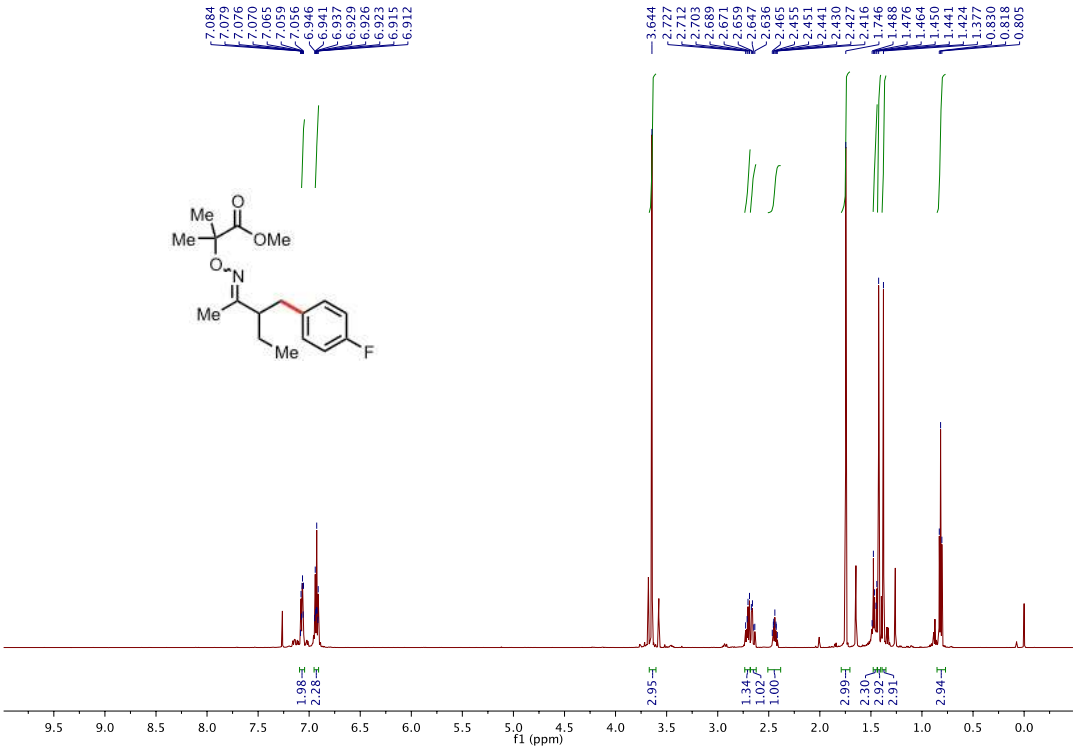
159.233
157.783
132.166
129.811
113.563
80.626
77.212
77.000
76.789
55.191
51.838
48.470
37.772
24.609
24.143
23.946
11.596
11.411
Me
Me
O
OMe
O
N
Me
Me
OMe
f1 (ppm)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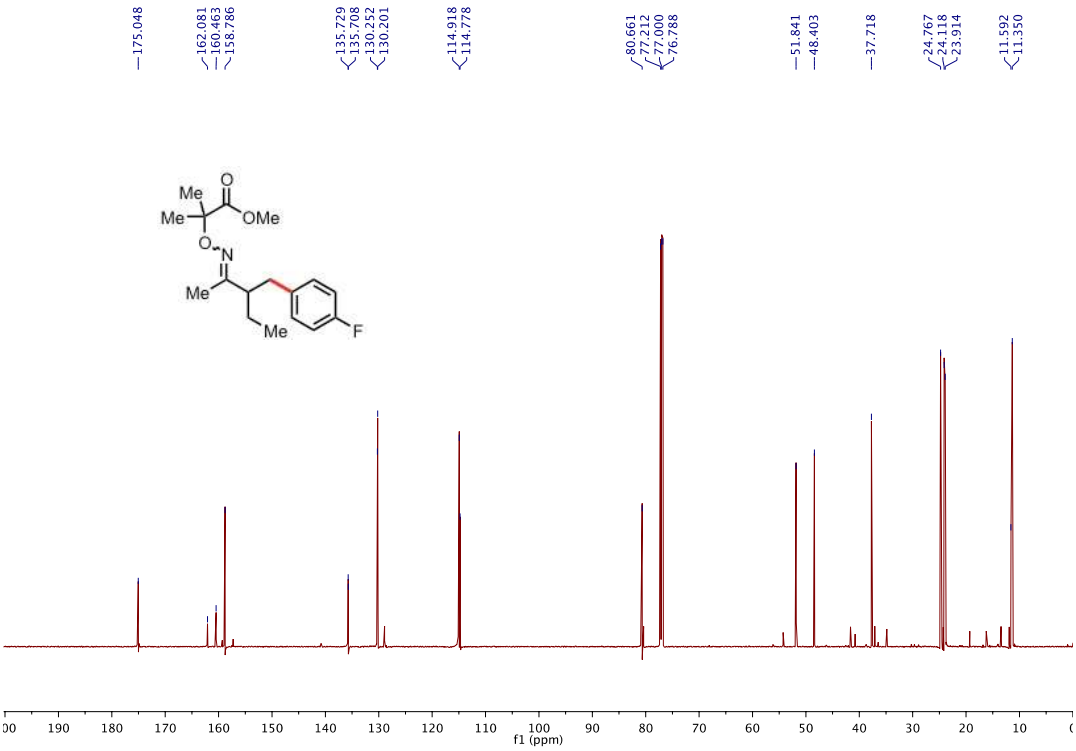
7.079
7.076
7.070
7.065
7.059
7.056
6.946
6.941
6.937
6.929
6.926
6.923
6.915
6.912
3.644
2.727
2.712
2.703
2.689
2.671
2.659
2.647
2.636
2.465
2.455
2.451
2.441
2.431
2.427
2.416
1.746
1.488
1.476
1.464
1.450
1.441
1.424
1.377
0.830
0.818
0.805
Me
Me
O
OMe
O
N
Me
Me
F
1.98
2.28
2.95
1.34
1.02
1.00
2.99
2.30
2.92
2.91
2.94
f1 (ppm)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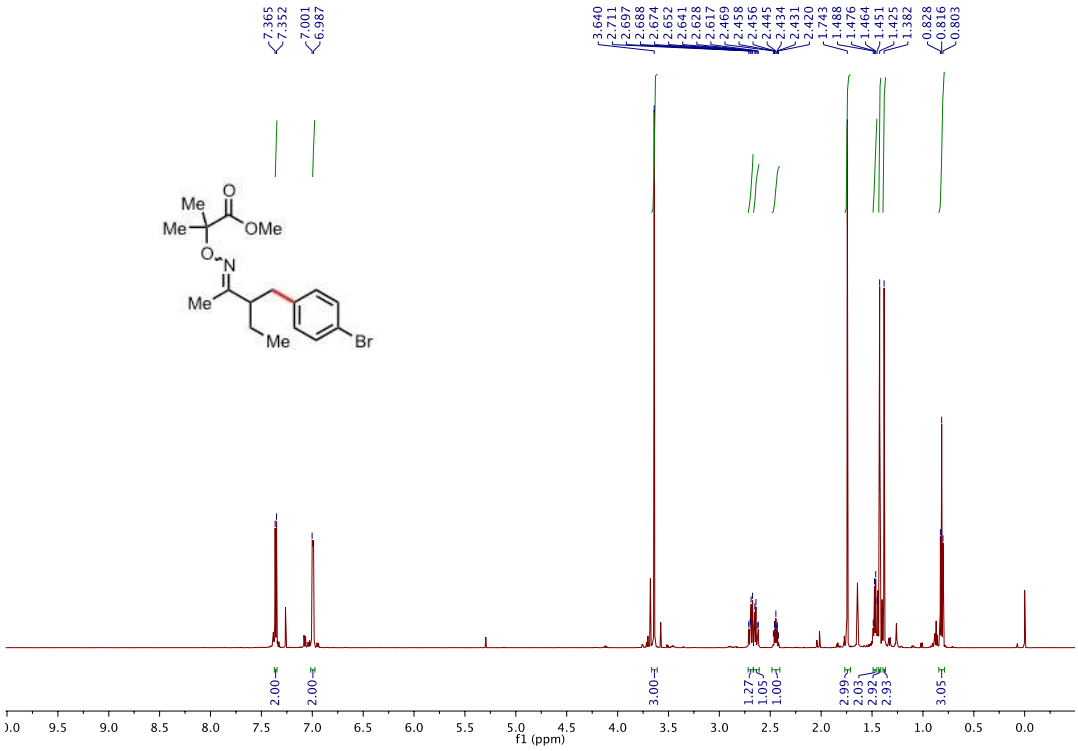
162.081
160.463
158.786
135.729
135.708
130.252
130.201
114.918
114.778
80.661
77.212
77.000
76.788
51.841
48.403
37.718
24.767
24.118
23.914
11.592
11.350
Me
Me
O
OMe
O
N
Me
Me
F
f1 (ppm)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7.352
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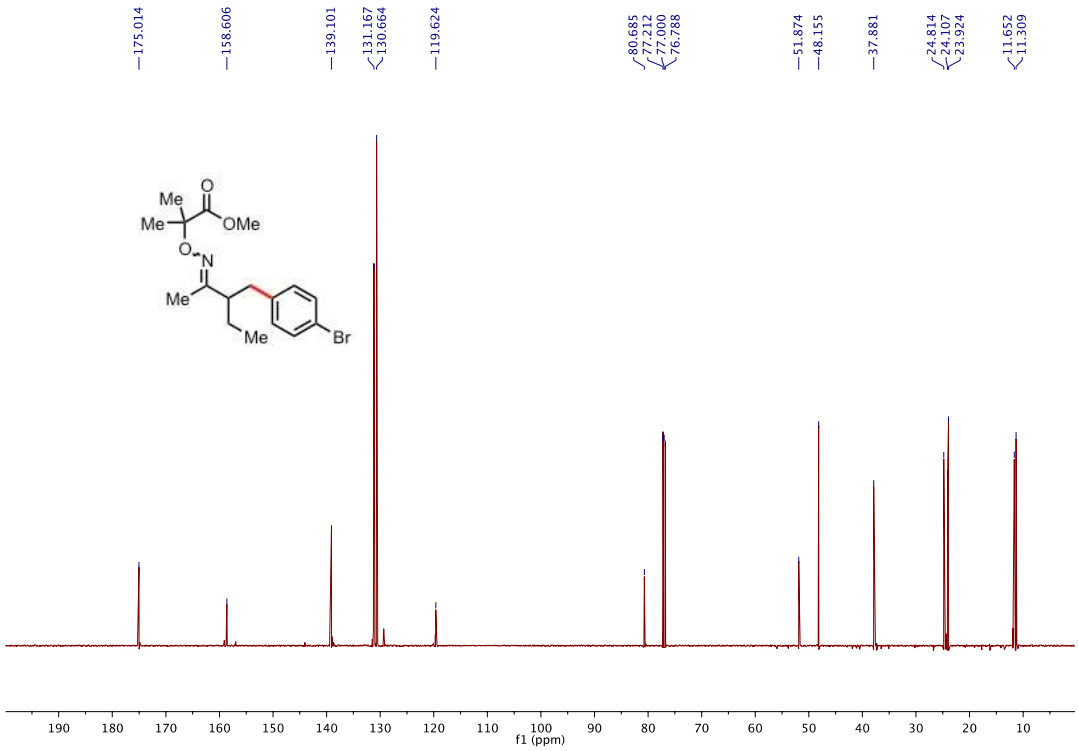
6.987
3.640
2.711
2.697
2.688
2.674
2.652
2.641
2.628
2.617
2.469
2.458
2.456
2.445
2.434
2.431
2.420
1.743
1.488
1.476
1.464
1.451
1.425
1.382
0.828
0.816
0.803
Me
Me
O
OMe
O
N
Me
Me
Br
2.00
2.00
3.00
1.27
1.05
1.00
2.99
2.03
2.92
2.93
3.05
f1 (ppm)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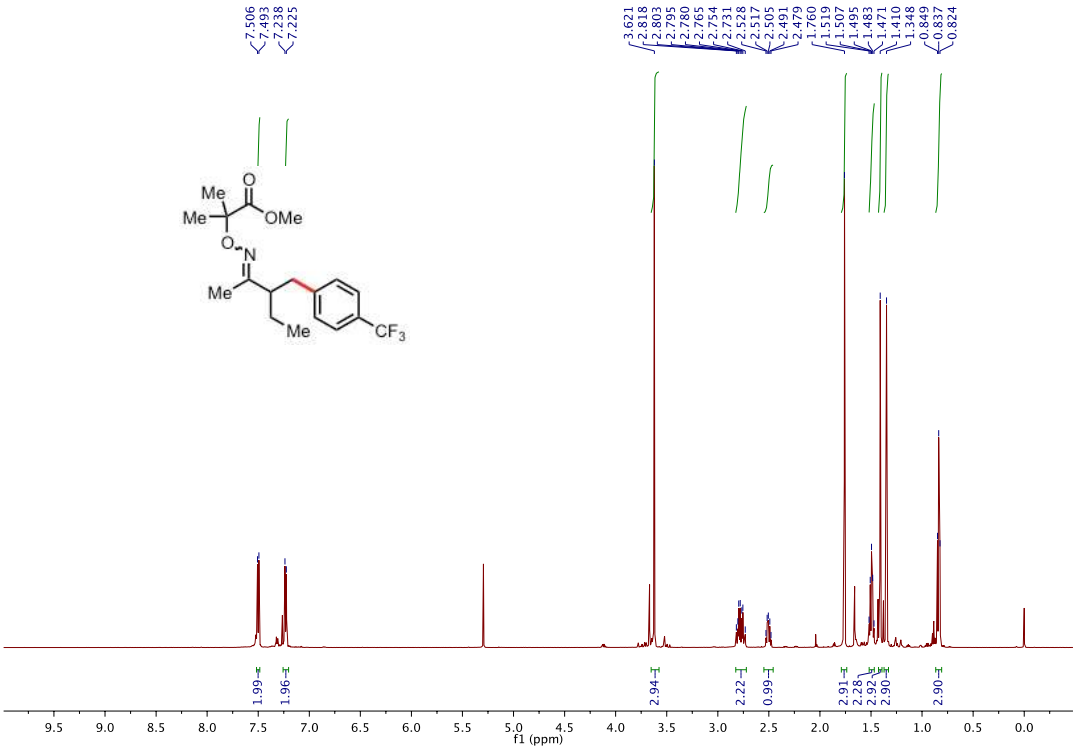
130.664
119.624
80.685
77.212
77.000
76.788
51.874
48.155
37.881
24.814
24.107
23.924
11.652
11.309
Me
Me
O
OMe
O
N
Me
Me
Br
f1 (ppm)


7.506
7.493
7.238
7.225
3.621
2.818
2.803
2.795
2.780
2.765
2.754
2.731
2.528
2.517
2.505
2.491
2.479
1.760
1.519
1.507
1.495
1.483
1.471
1.410
1.348
0.849
0.837
0.824
Me
Me
O
OMe
O
N
Me
Me
CF3
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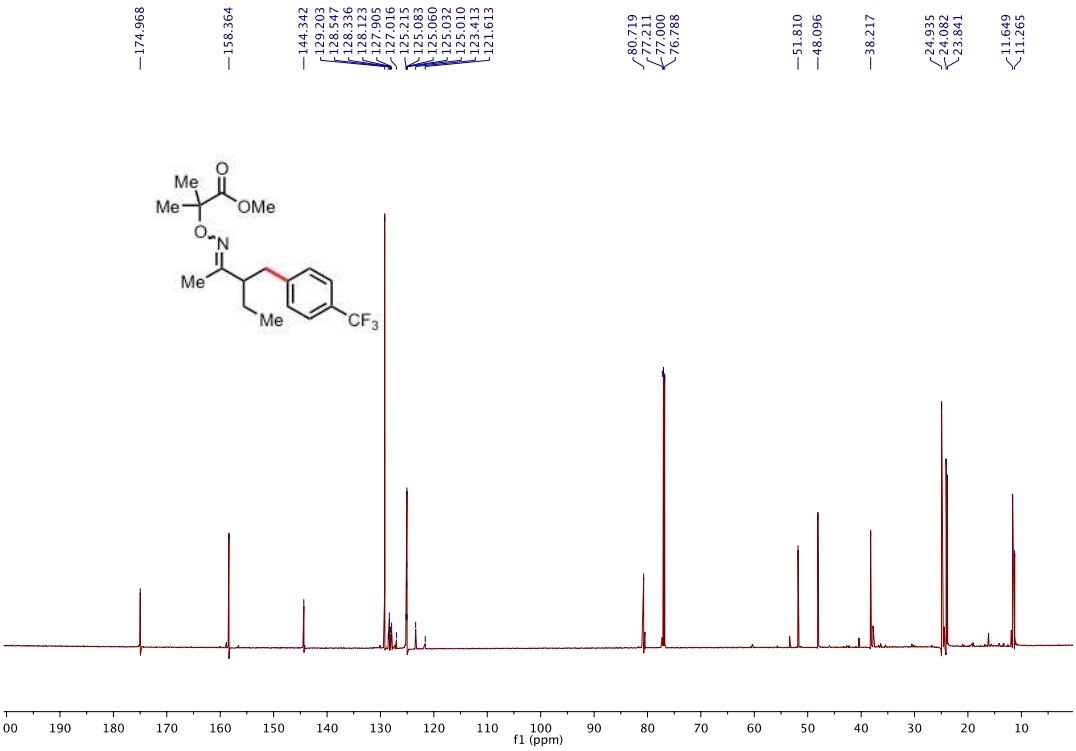
2.94
2.22
0.99
2.91
2.28
2.92
2.90
2.90
f1 (ppm)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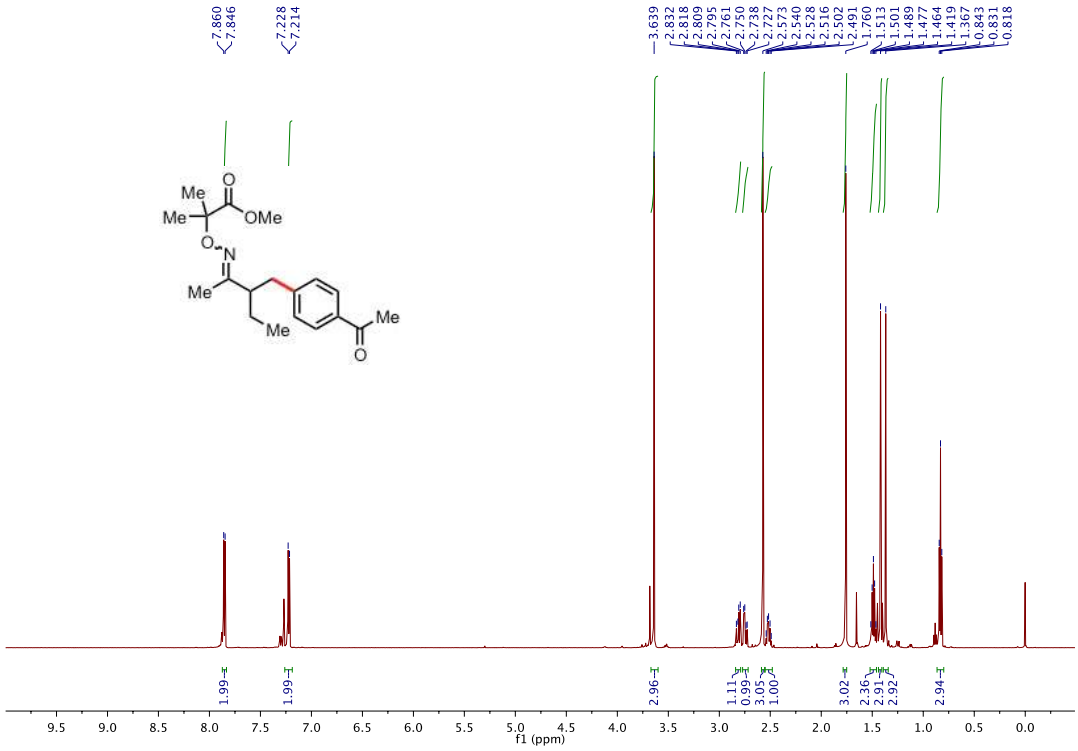
128.336
128.123
127.905
127.016
125.215
125.083
125.060
125.032
125.010
123.413
121.613
80.719
77.211
77.000
76.788
51.810
48.096
38.217
24.935
24.082
23.841
11.649
11.265
Me
Me
O
OMe
O
N
Me
Me
CF3
f1 (ppm)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2.818
2.809
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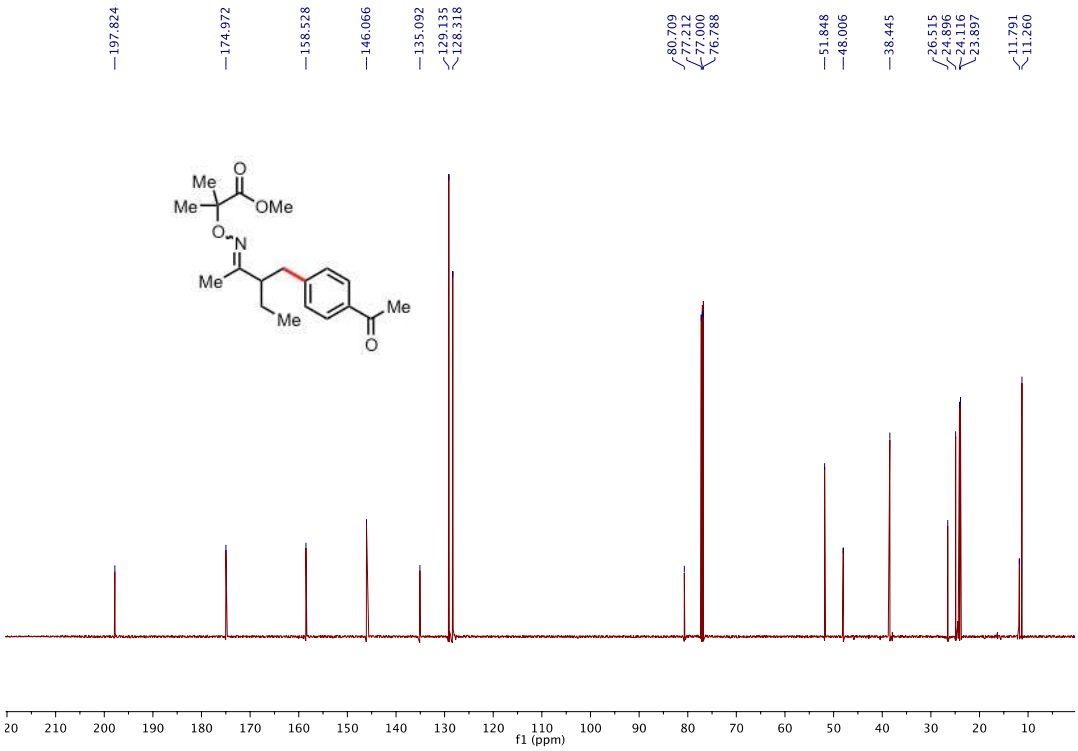
2.761
2.750
2.738
2.727
2.573
2.543
2.528
2.516
2.502
2.491
1.760
1.513
1.501
1.489
1.477
1.464
1.449
1.419
1.367
0.843
0.831
0.818
Me
Me
O
OMe
O
N
Me
Me
Me
O
1.99
1.99
2.96
1.11
0.99
3.05
1.00
3.02
2.36
2.91
2.92
2.94
f1 (ppm)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146.066
135.092
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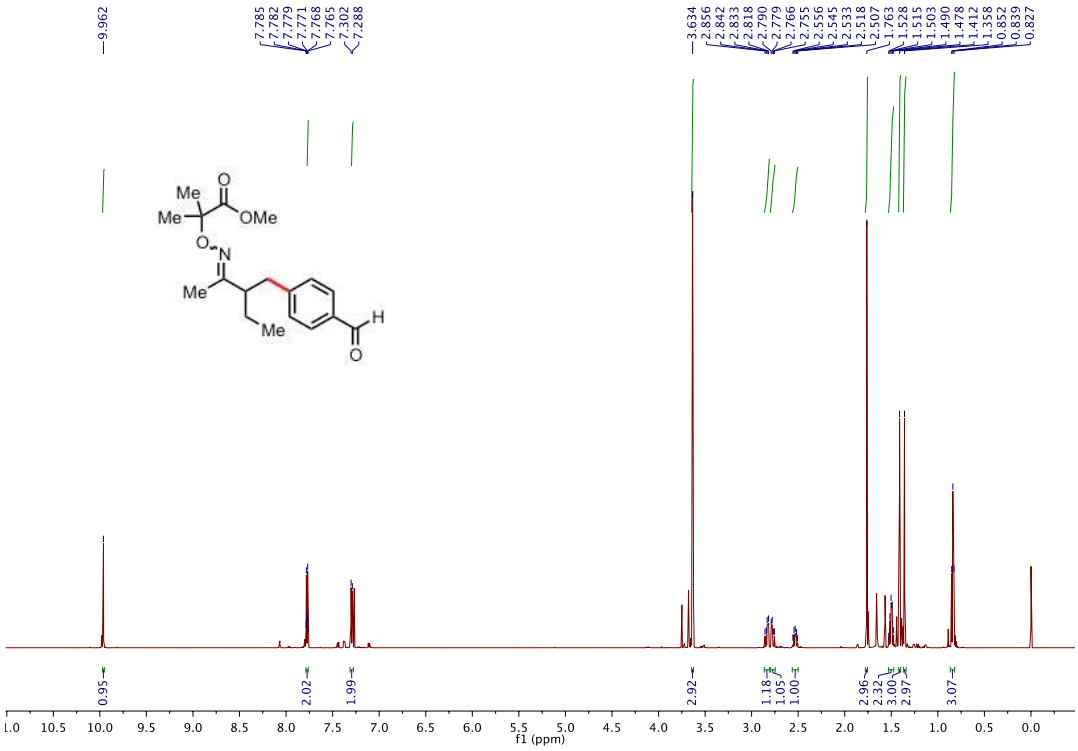
128.318
80.709
77.212
77.000
76.788
51.848
48.006
38.445
26.515
24.896
24.116
23.897
11.791
11.260
Me
Me
O
OMe
O
N
Me
Me
Me
O
f1 (ppm)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7.771
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7.302
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3.634
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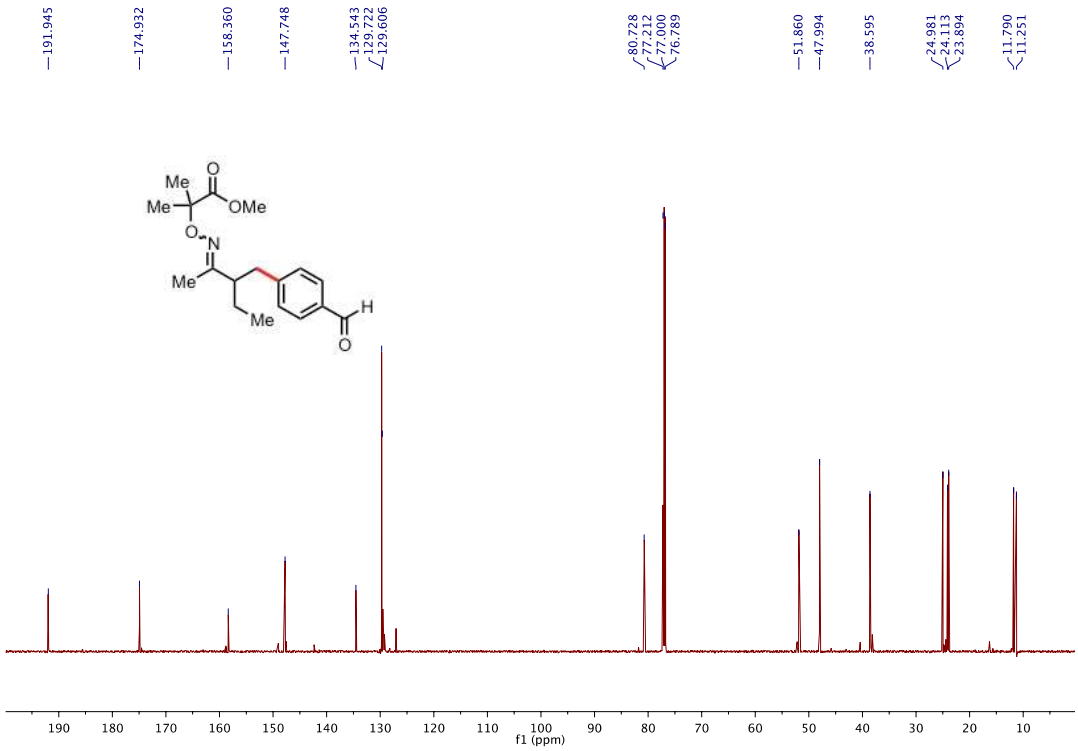
2.842
2.833
2.818
2.790
2.779
2.766
2.755
2.556
2.545
2.533
2.518
2.507
1.763
1.528
1.515
1.503
1.490
1.478
1.412
1.358
0.852
0.839
0.827
Me
Me
O
OMe
O
N
Me
Me
H
O
0.95
2.02
1.99
2.92
1.18
1.05
1.00
2.96
2.32
3.00
2.97
3.07
f1 (ppm)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134.543
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129.606
80.728
77.212
77.000
76.789
51.860
47.994
38.595
24.981
24.113
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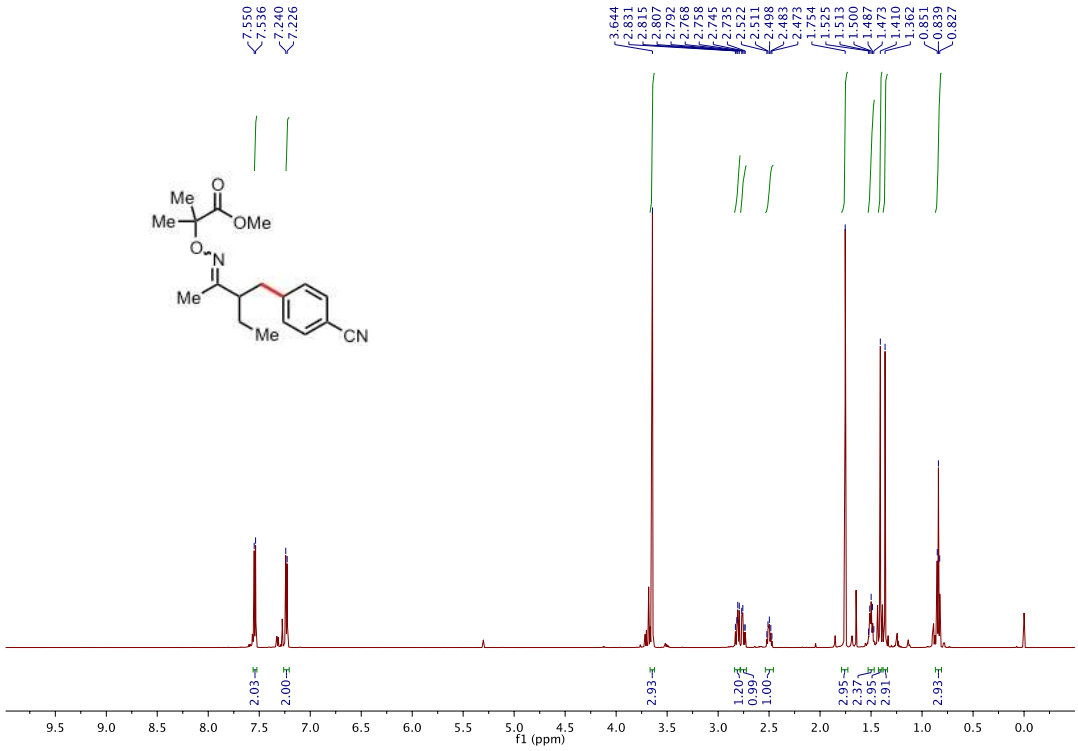
11.790
11.251
Me
Me
O
OMe
O
N
Me
Me
H
O
f1 (ppm)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3.644
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2.807
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2.768
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2.745
2.735
2.522
2.511
2.498
2.483
2.473
1.754
1.525
1.513
1.500
1.487
1.473
1.410
1.362
0.851
0.839
0.827
Me
Me
O
OMe
O
N
Me
Me
CN
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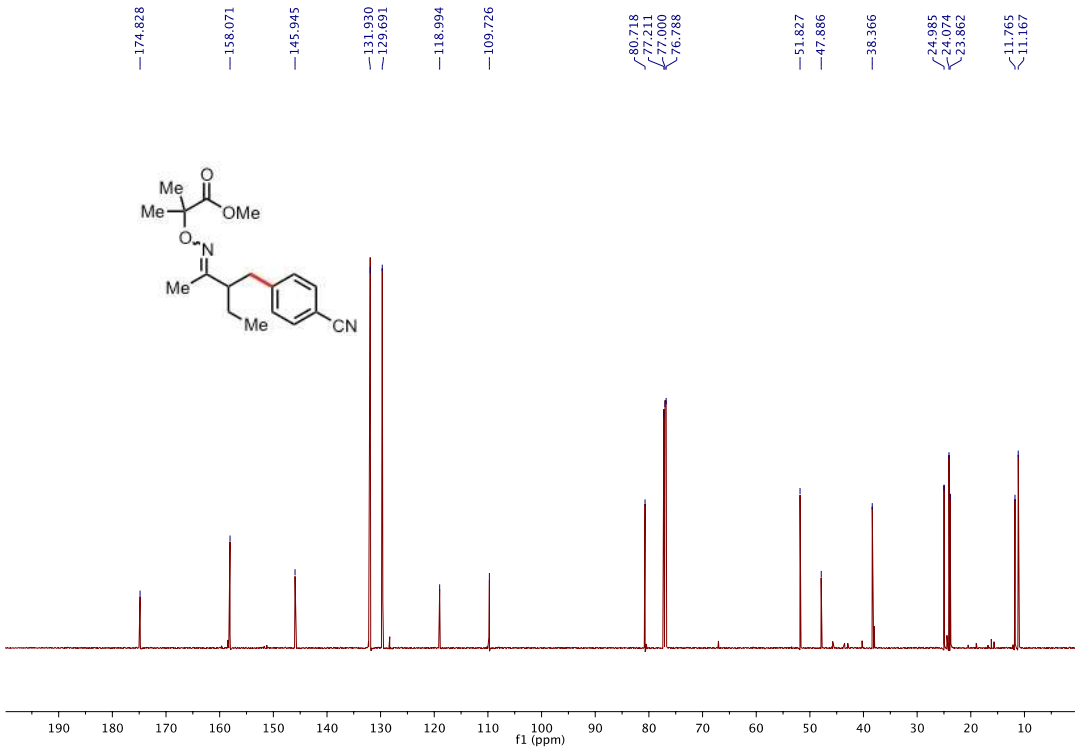
2.00
2.93
1.20
0.99
1.00
2.95
2.37
2.95
2.91
2.93
f1 (ppm)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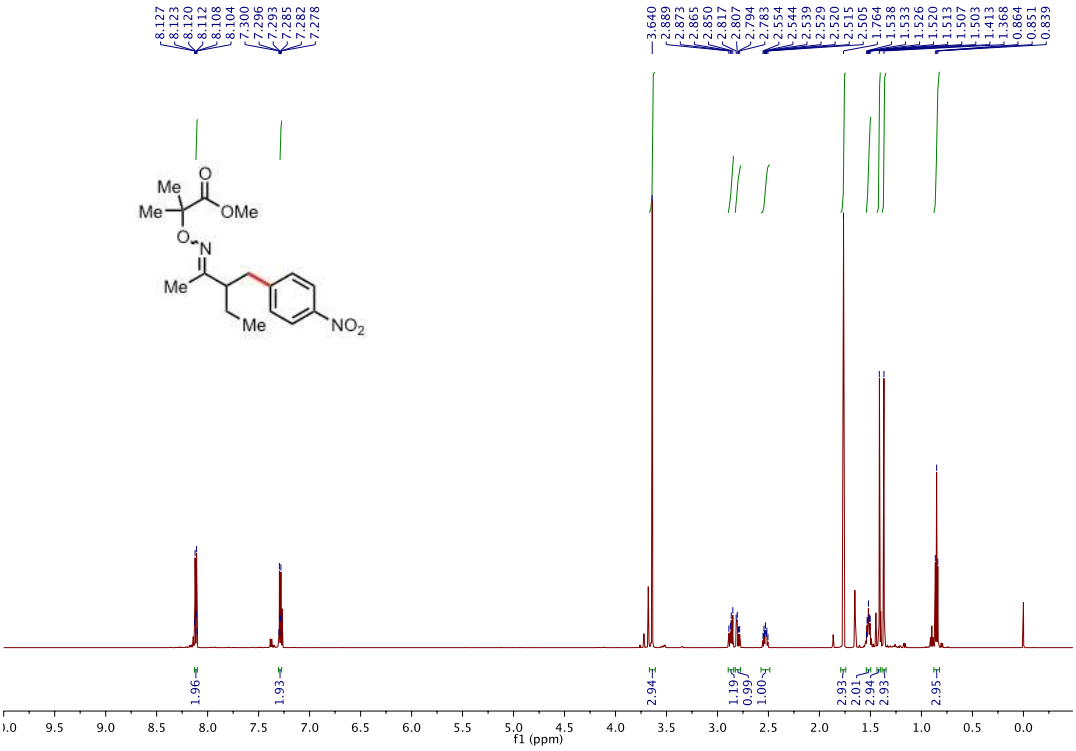
80.718
77.211
77.000
76.788
51.827
47.886
38.366
24.985
24.074
23.862
11.765
11.167
Me
Me
O
OMe
O
N
Me
Me
CN
f1 (ppm)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8.112
8.108
8.104
7.300
7.296
7.293
7.285
7.282
7.278
3.640
2.889
2.873
2.865
2.850
2.817
2.807
2.794
2.783
2.554
2.544
2.539
2.529
2.520
2.515
2.505
1.764
1.538
1.533
1.526
1.520
1.513
1.507
1.503
1.413
1.368
0.864
0.851
0.839
Me
Me
O
OMe
O
N
Me
Me
NO2
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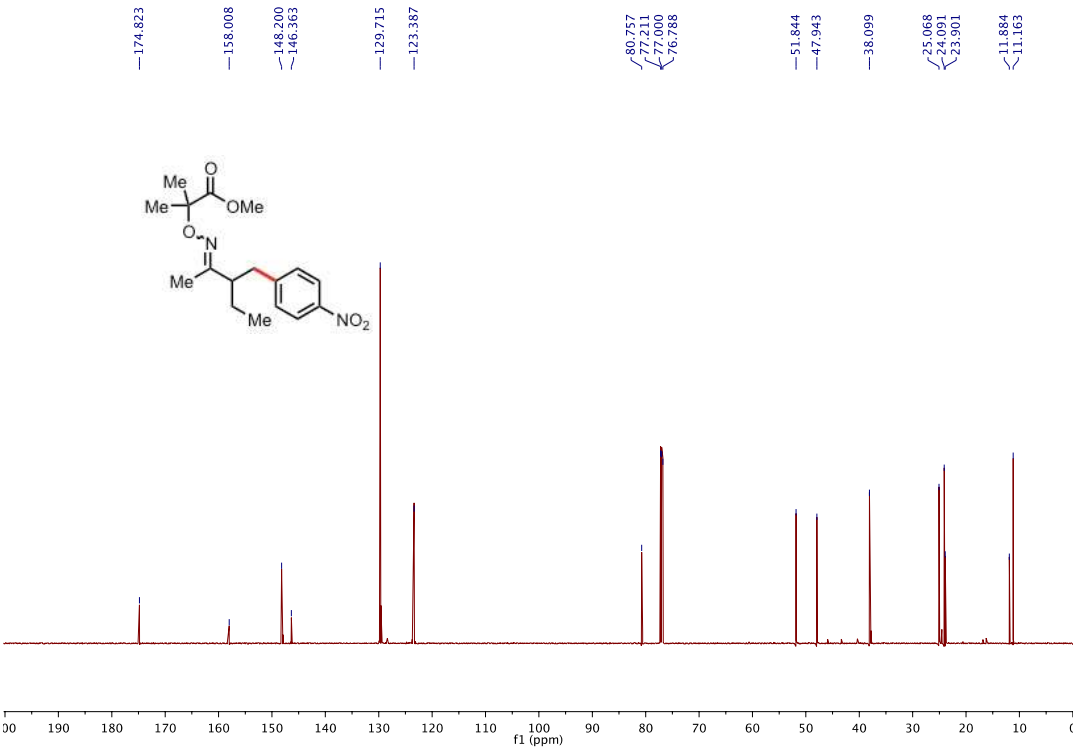
1.93
2.94
1.19
0.99
1.00
2.93
2.01
2.94
2.93
2.95
f1 (ppm)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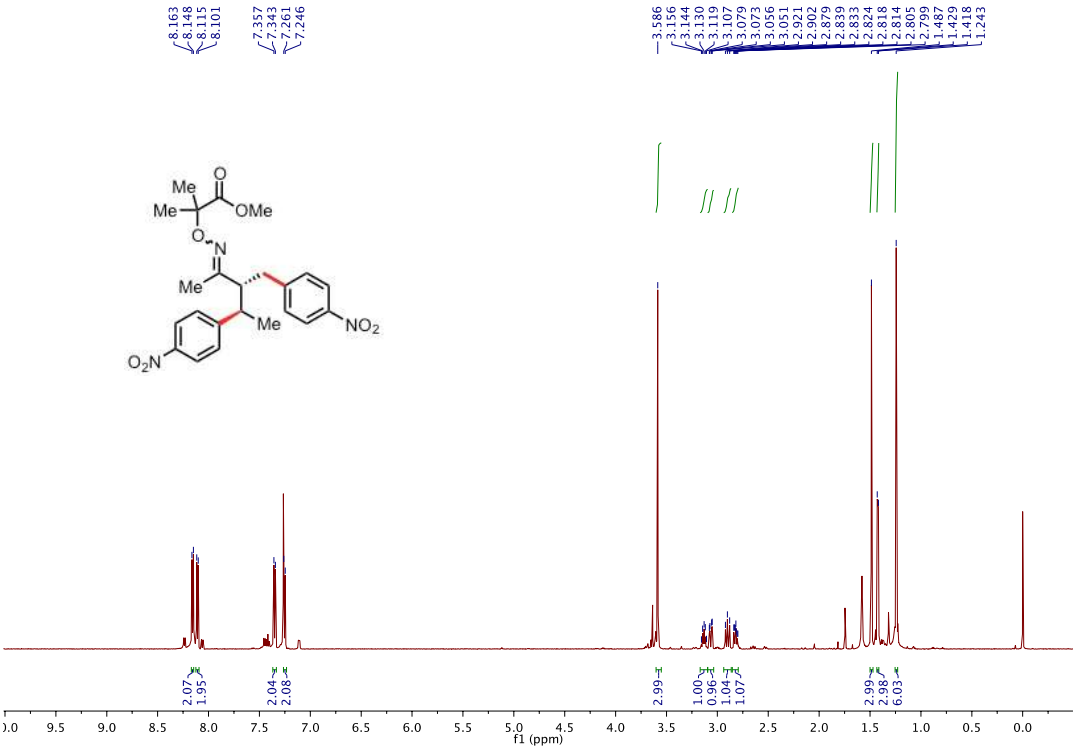
146.363
129.715
123.387
80.757
77.211
77.000
76.788
51.844
47.943
38.099
25.068
24.091
23.901
11.884
11.163
Me
Me
O
OMe
O
N
Me
Me
NO2
f1 (ppm)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8.148
8.115
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7.357
7.343
7.261
7.246
3.586
3.156
3.144
3.130
3.119
3.107
3.079
3.073
3.056
3.051
2.921
2.902
2.879
2.839
2.833
2.824
2.818
2.814
2.805
2.799
1.487
1.429
1.418
1.243
Me
Me
O
OMe
O
N
Me
Me
NO2
O2N
2.07
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1.00
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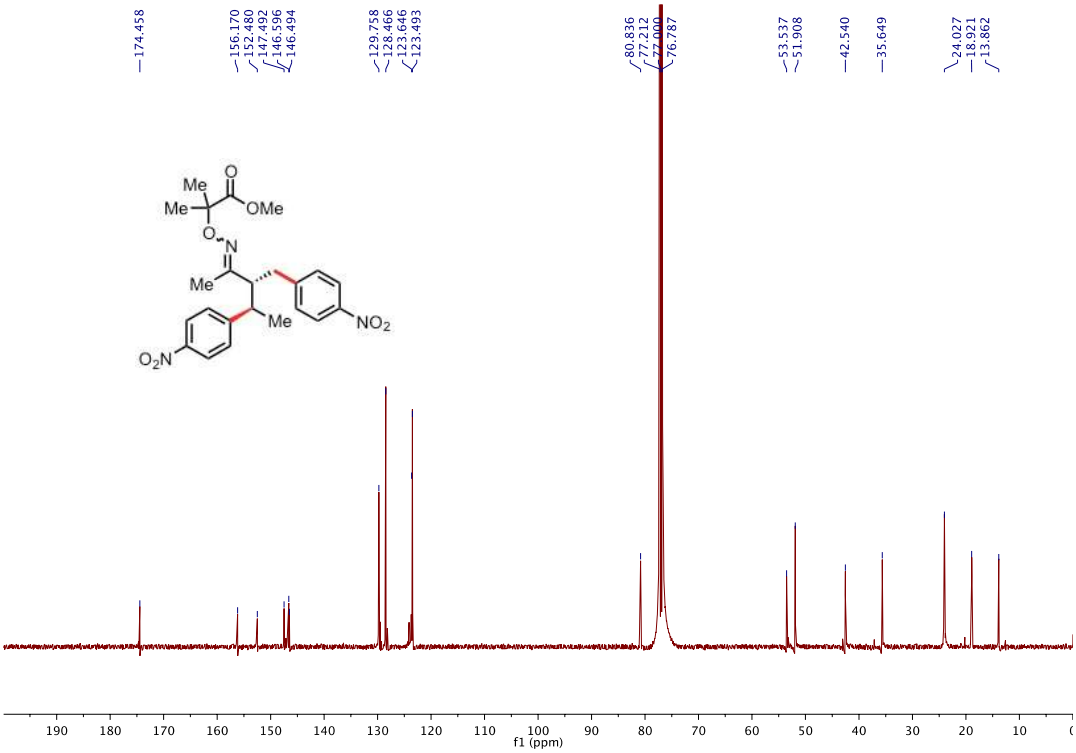
1.07
2.99
2.98
6.03
f1 (ppm)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123.493
80.836
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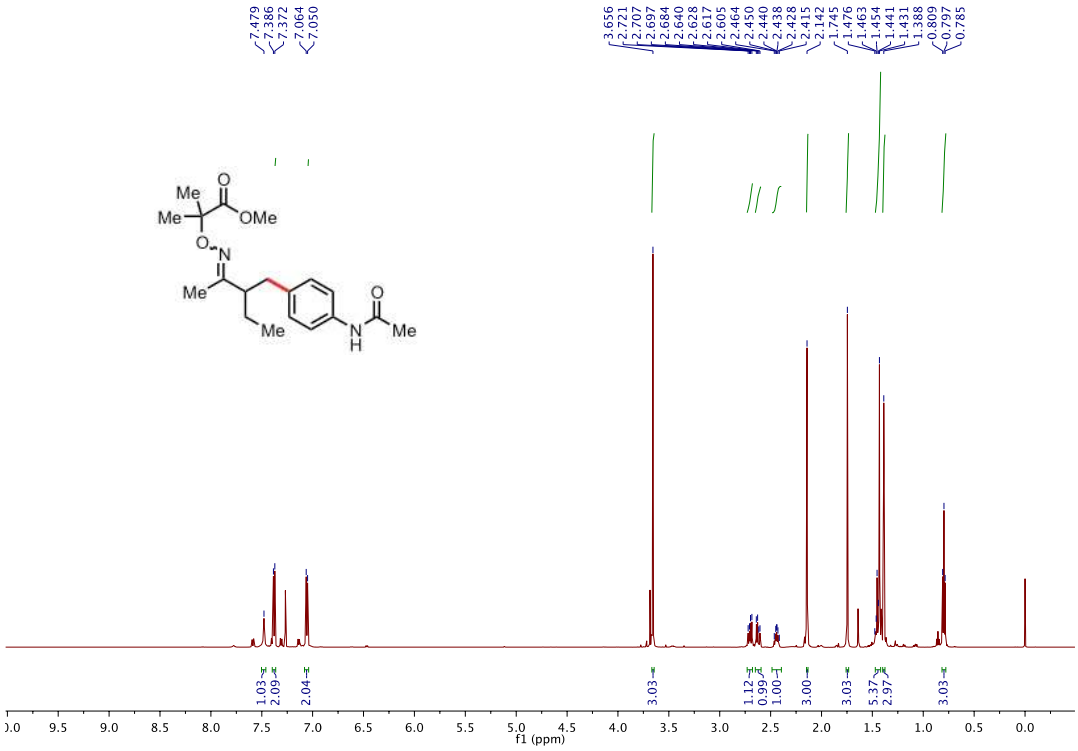
76.787
53.537
51.908
42.540
35.649
24.027
18.921
13.862
Me
Me
O
OMe
O
N
Me
Me
NO2
O2N
f1 (ppm)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2.617
2.605
2.464
2.450
2.440
2.438
2.428
2.415
2.142
1.745
1.476
1.463
1.454
1.441
1.431
1.388
0.809
0.797
0.785
Me
Me
O
OMe
O
N
Me
Me
N
H
O
Me
1.03
2.09
2.04
3.03
1.12
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1.00
3.00
3.03
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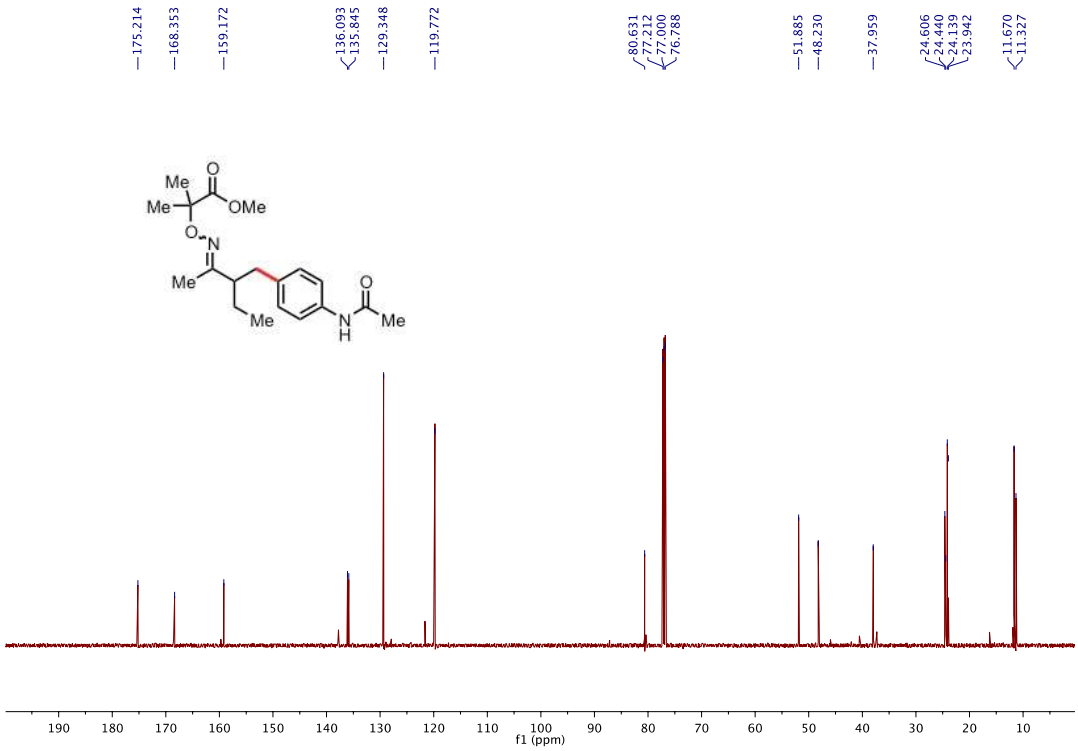
3.03
f1 (ppm)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76.788
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48.230
37.959
24.606
24.440
24.139
23.942
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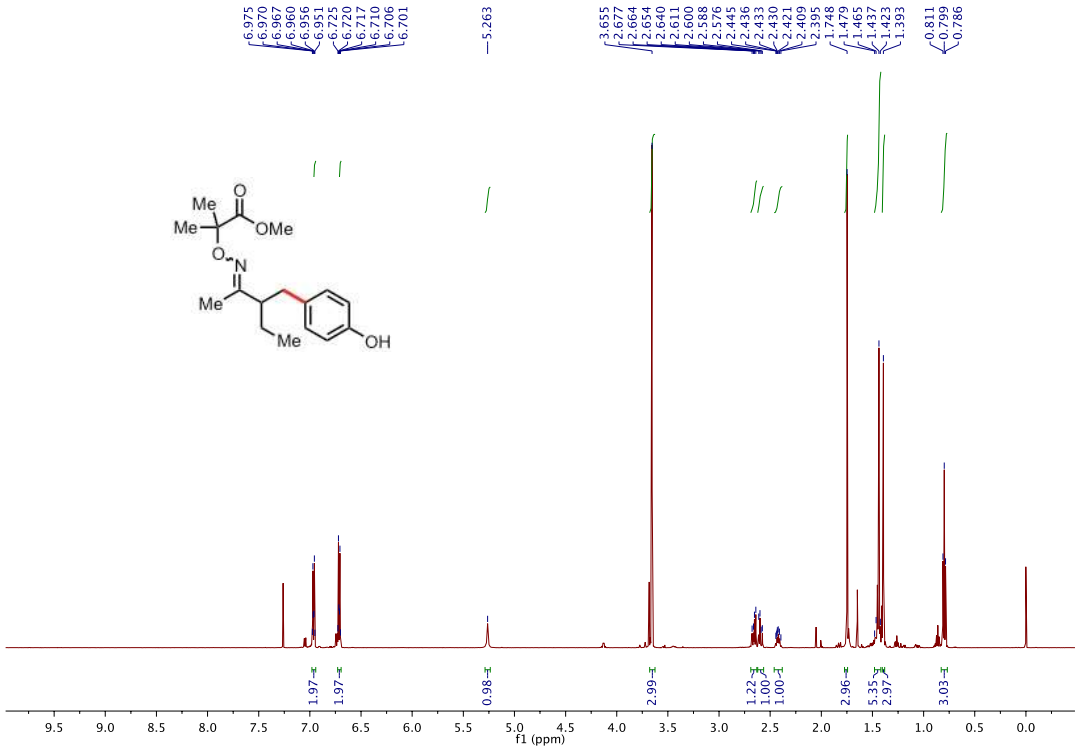
11.327
Me
Me
O
OMe
O
N
Me
Me
N
H
O
Me
f1 (ppm)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6.720
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6.710
6.706
6.701
5.263
3.655
2.677
2.664
2.654
2.640
2.611
2.600
2.588
2.576
2.445
2.436
2.433
2.430
2.421
2.409
2.395
1.748
1.479
1.465
1.437
1.423
1.393
0.811
0.799
0.786
Me
Me
O
OMe
O
N
Me
Me
OH
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1.22
1.00
1.00
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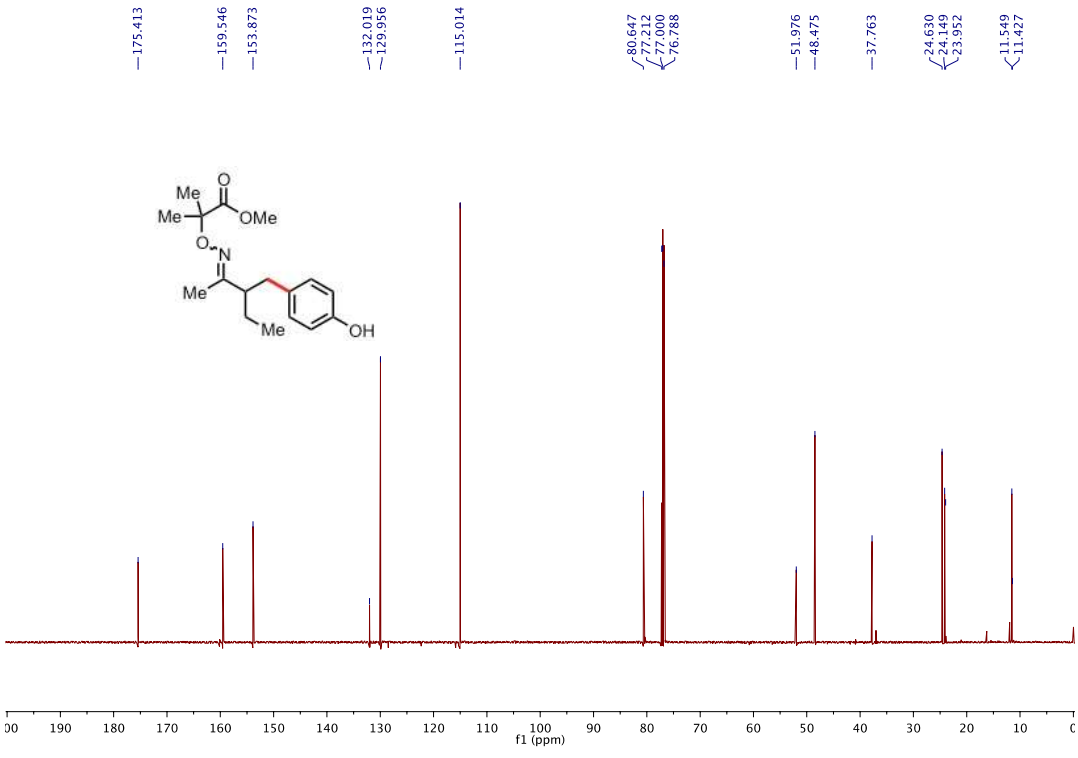
5.35
2.97
3.03
f1 (ppm)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77.212
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37.763
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23.952
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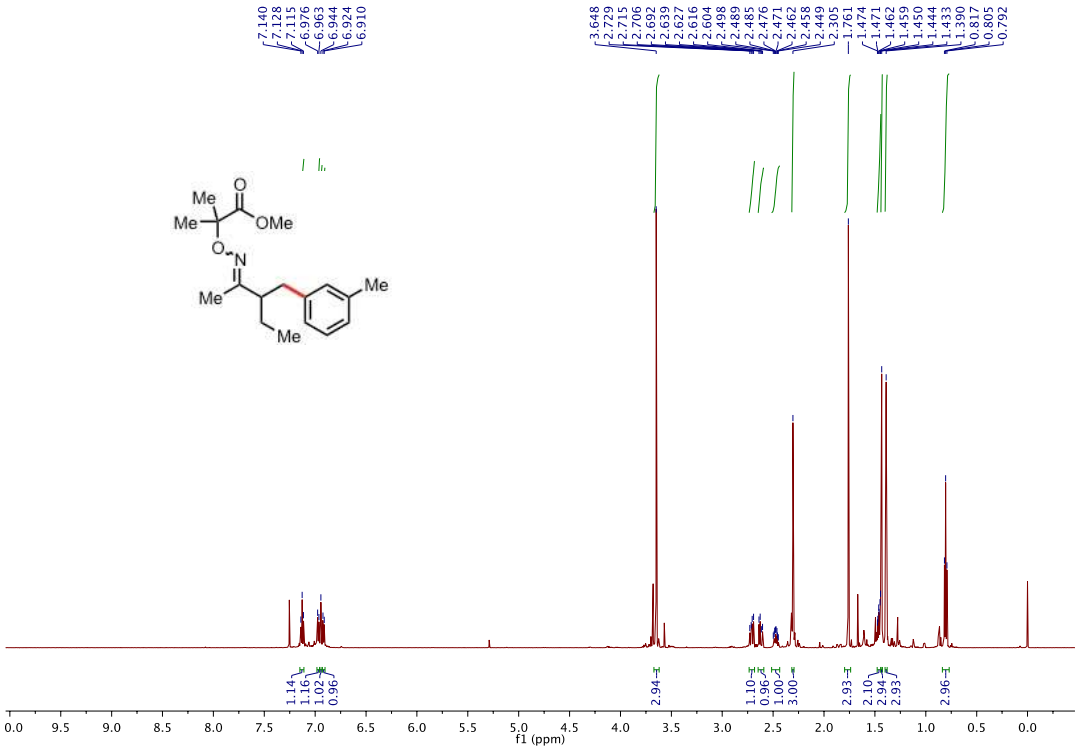
Me
O
OMe
O
N
Me
Me
OH
f1 (ppm)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6.924
6.910
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2.706
2.692
2.639
2.627
2.616
2.604
2.498
2.489
2.485
2.476
2.471
2.462
2.458
2.449
2.305
1.761
1.474
1.471
1.462
1.459
1.450
1.444
1.433
1.390
0.817
0.805
0.792
Me
Me
O
OMe
O
N
Me
Me
Me
1.14
1.16
1.02
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2.94
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0.96
1.00
3.00
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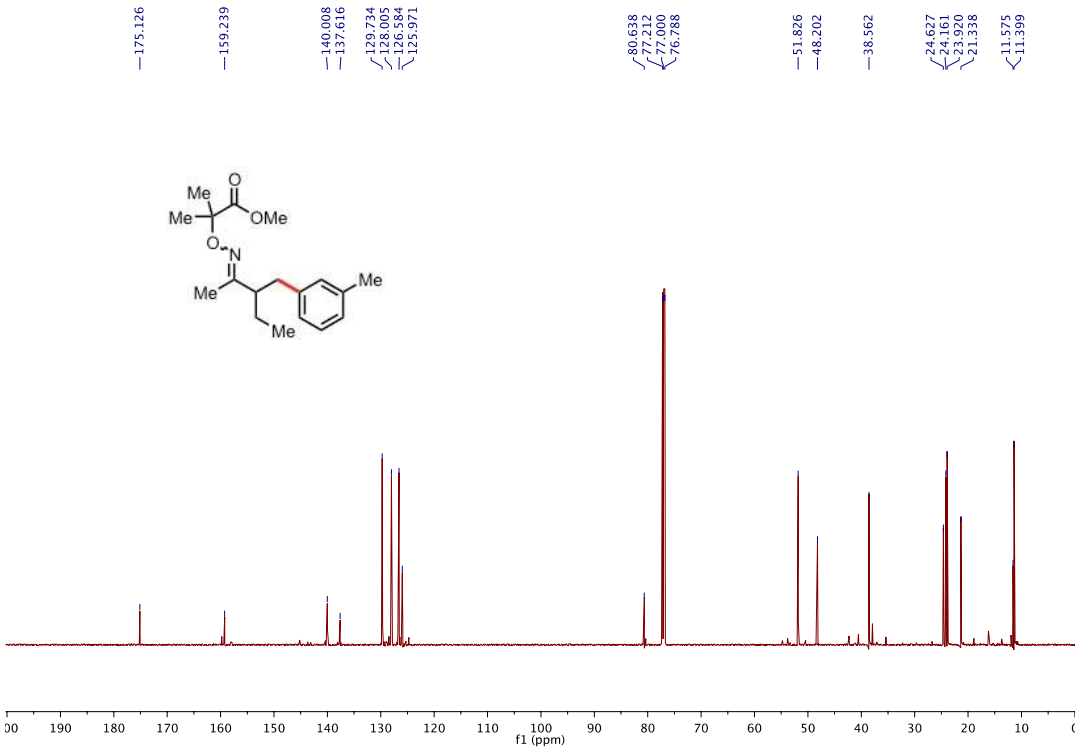
2.10
2.94
2.93
2.96
f1 (ppm)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77.000
76.788
51.826
48.202
38.562
24.627
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21.338
11.575
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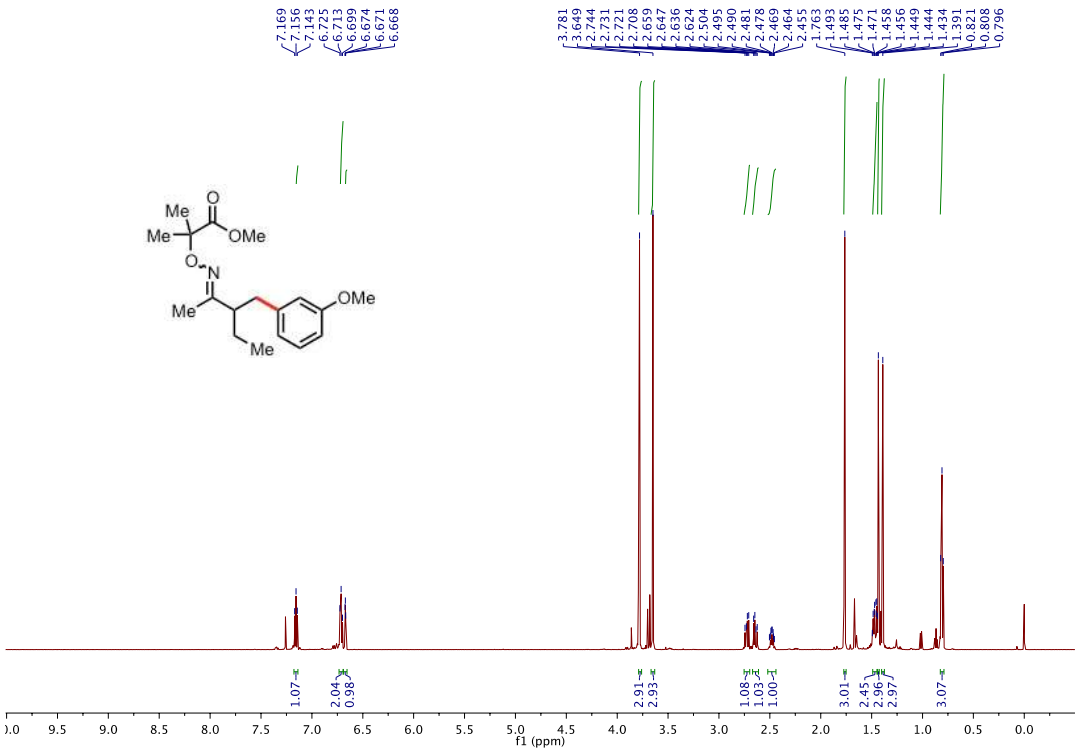
Me
O
OMe
O
N
Me
Me
Me
f1 (ppm)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6.671
6.668
3.781
3.649
2.744
2.731
2.721
2.708
2.659
2.647
2.636
2.624
2.504
2.495
2.490
2.481
2.478
2.469
2.464
2.455
1.763
1.493
1.485
1.475
1.471
1.458
1.456
1.449
1.444
1.434
1.391
0.821
0.808
0.796
Me
Me
O
OMe
O
N
Me
OMe
Me
1.07
2.04
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2.93
1.08
1.03
1.00
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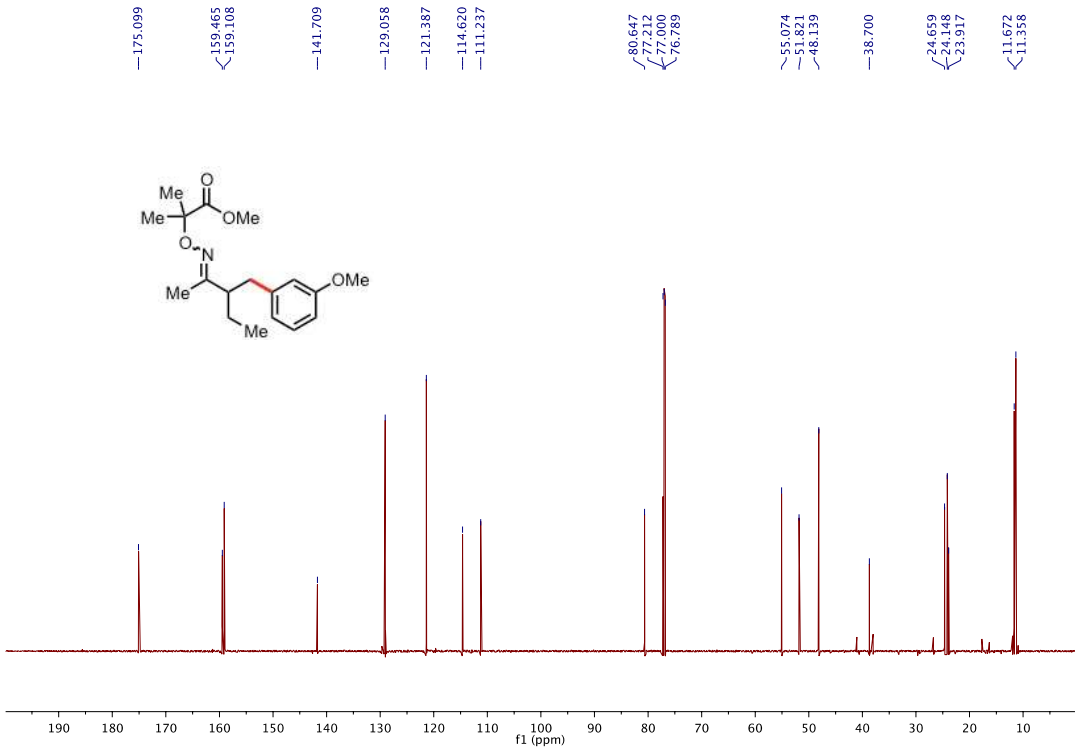
2.96
2.97
3.07
f1 (ppm)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111.237
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77.212
77.000
76.789
55.074
51.821
48.139
38.700
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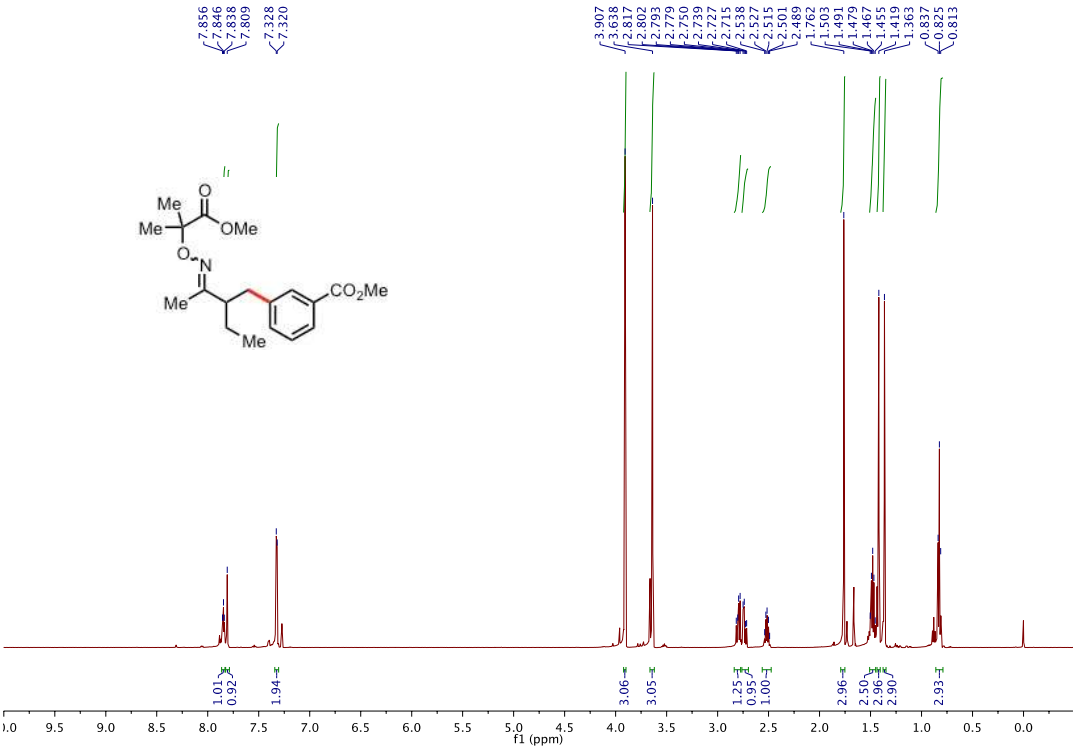
11.672
11.358
Me
Me
O
OMe
O
N
Me
OMe
Me
f1 (ppm)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2.779
2.750
2.739
2.727
2.715
2.538
2.527
2.515
2.501
2.489
1.762
1.503
1.491
1.479
1.467
1.455
1.419
1.363
0.837
0.825
0.813
Me
Me
O
OMe
O
N
Me
CO2Me
Me
1.01
0.92
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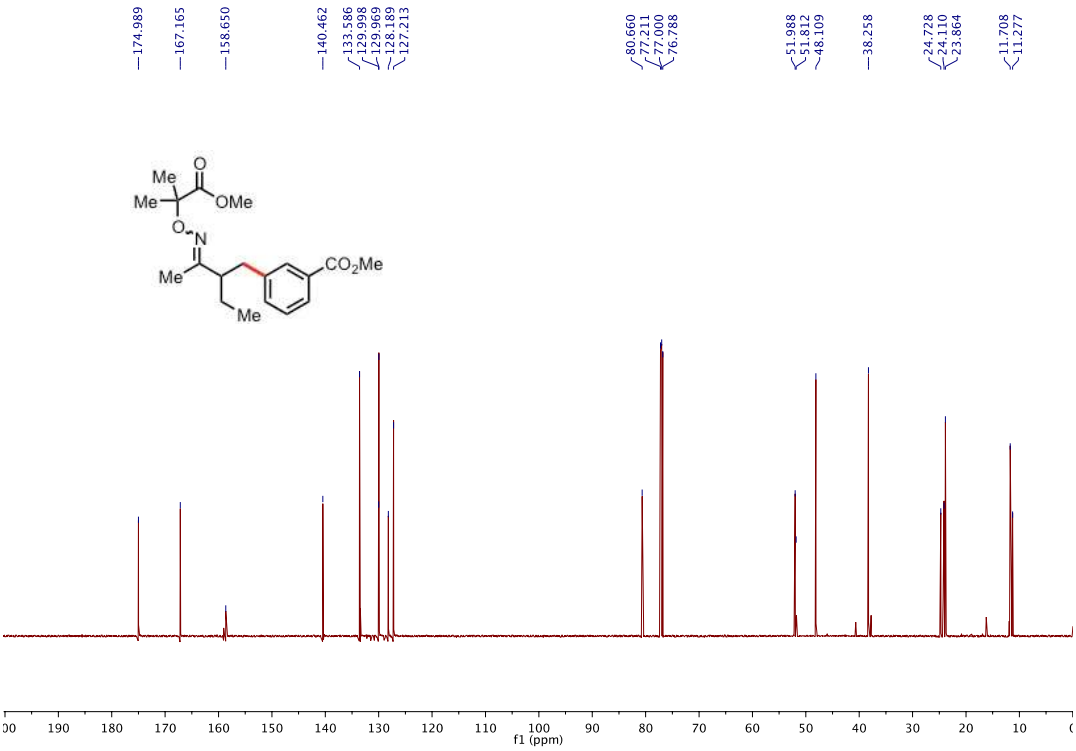
3.06
3.05
1.25
0.95
1.00
2.96
2.50
2.96
2.90
2.93
f1 (ppm)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128.189
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80.660
77.211
77.000
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51.812
48.109
38.258
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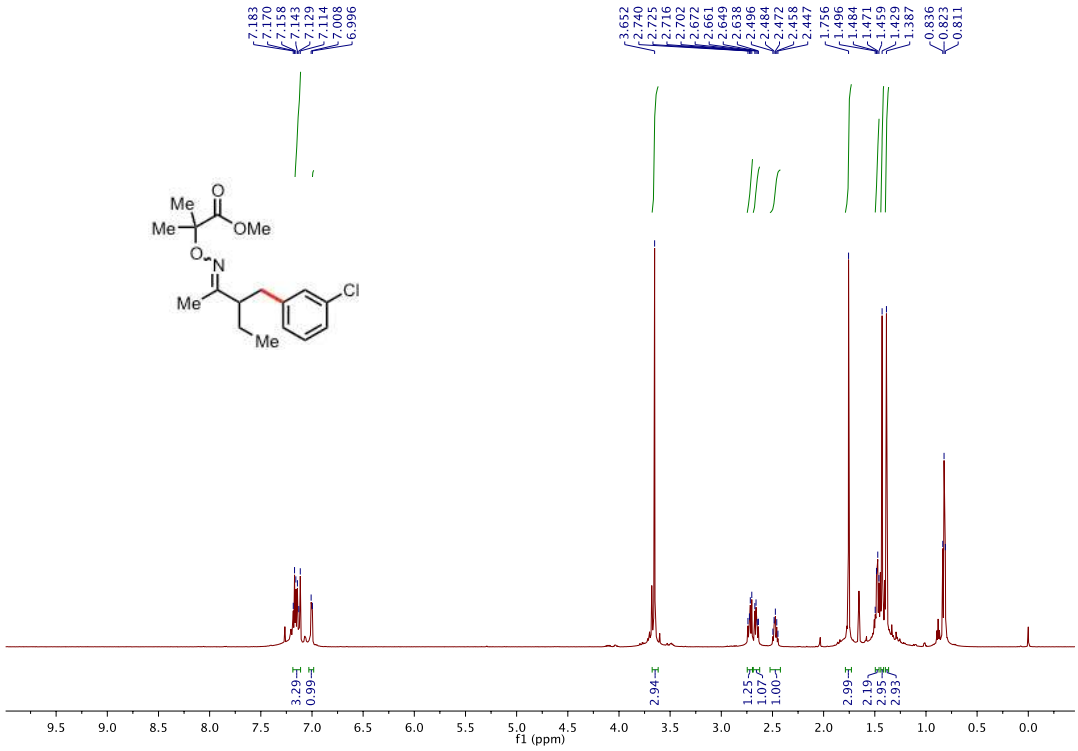
24.110
23.864
11.708
11.277
Me
Me
O
OMe
O
N
Me
CO2Me
Me
f1 (ppm)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2.725
2.716
2.702
2.672
2.661
2.649
2.638
2.496
2.484
2.472
2.458
2.447
1.756
1.496
1.484
1.471
1.459
1.429
1.387
0.836
0.823
0.811
Me
Me
O
OMe
O
N
Me
Cl
Me
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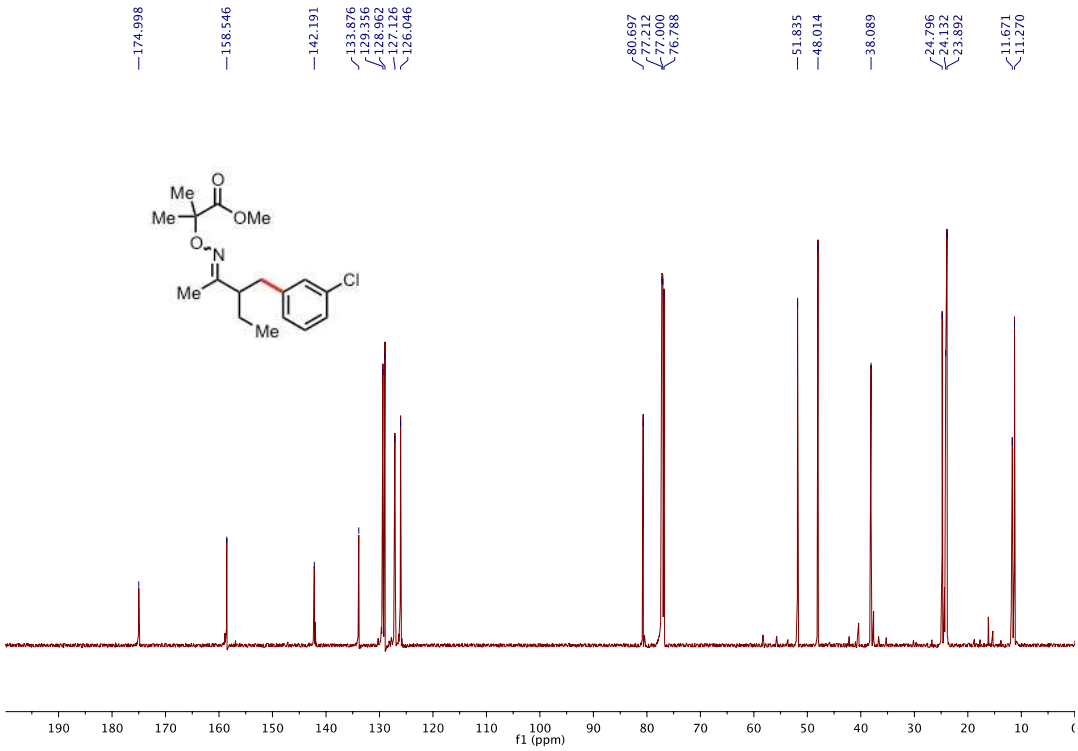
2.94
1.25
1.07
1.00
2.99
2.19
2.95
2.93
f1 (ppm)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126.046
80.697
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77.000
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51.835
48.014
38.089
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11.671
11.270
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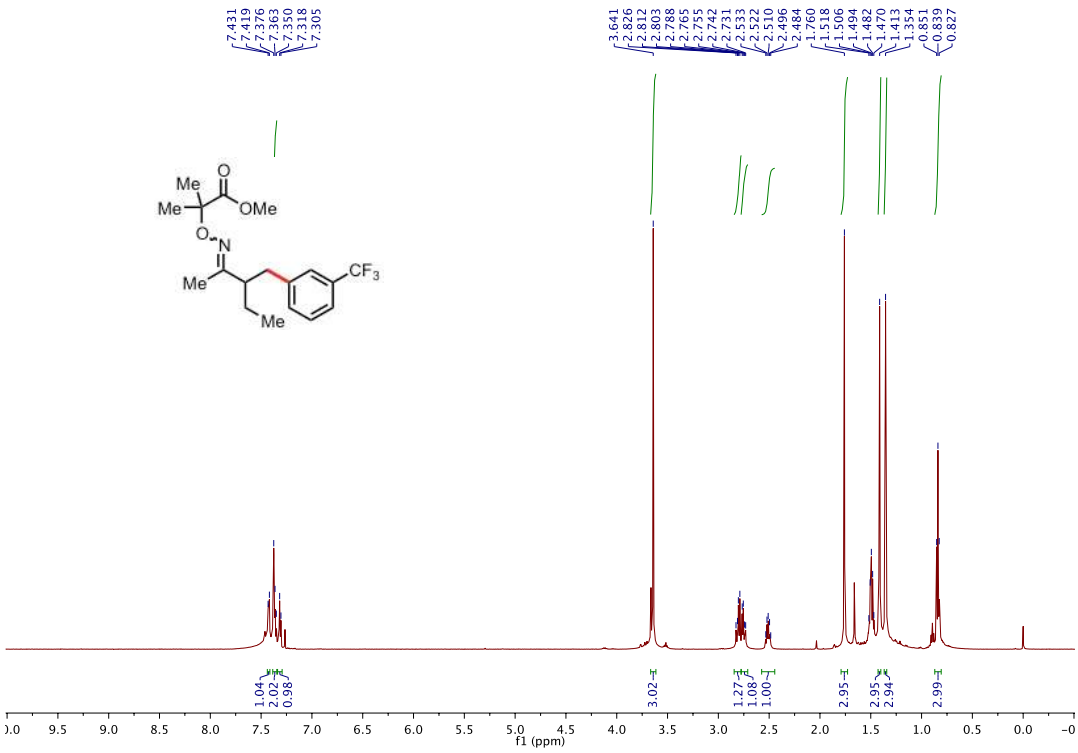
OMe
O
N
Me
Cl
Me
f1 (ppm)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2.755
2.742
2.731
2.533
2.522
2.510
2.496
2.484
1.760
1.518
1.506
1.494
1.482
1.470
1.413
1.354
0.851
0.839
0.827
Me
Me
O
OMe
O
N
Me
CF3
Me
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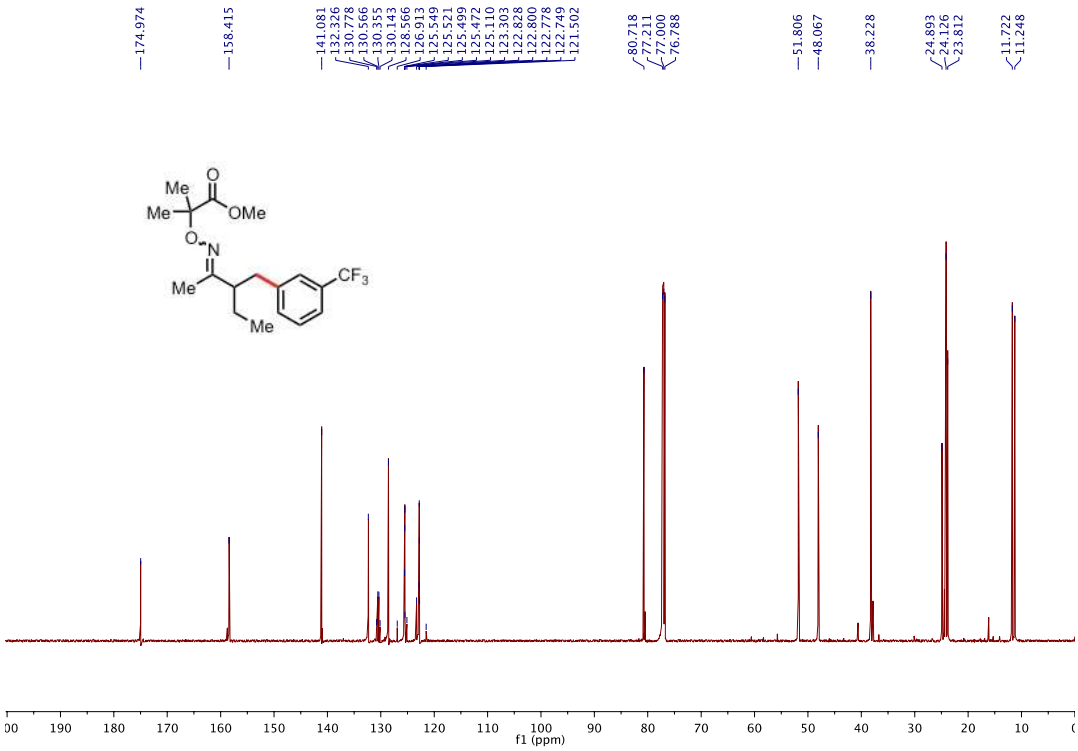
2.95
2.94
2.99
f1 (ppm)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125.499
125.472
125.110
123.303
122.828
122.800
122.778
122.749
121.502
80.718
77.211
77.000
76.788
51.806
48.067
38.228
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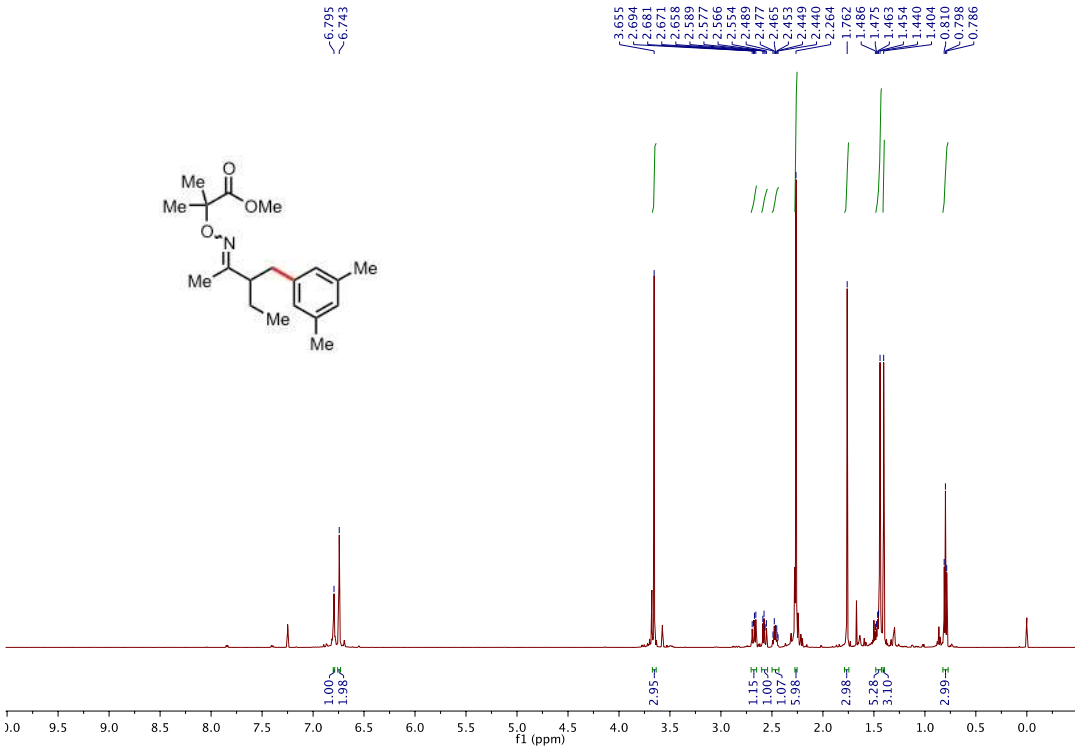
O
N
Me
CF3
Me
f1 (ppm)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2.453
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2.440
2.264
1.762
1.486
1.475
1.463
1.454
1.440
1.404
0.810
0.798
0.786
Me
Me
O
OMe
O
N
Me
Me
Me
Me
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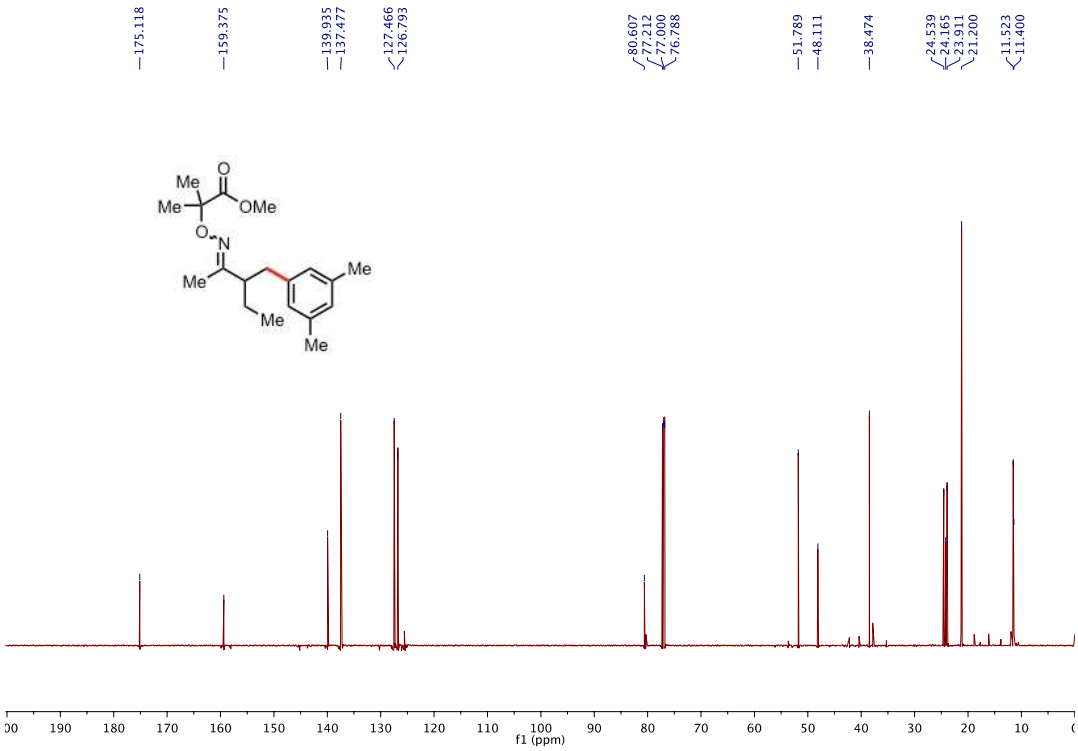
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77.212
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51.789
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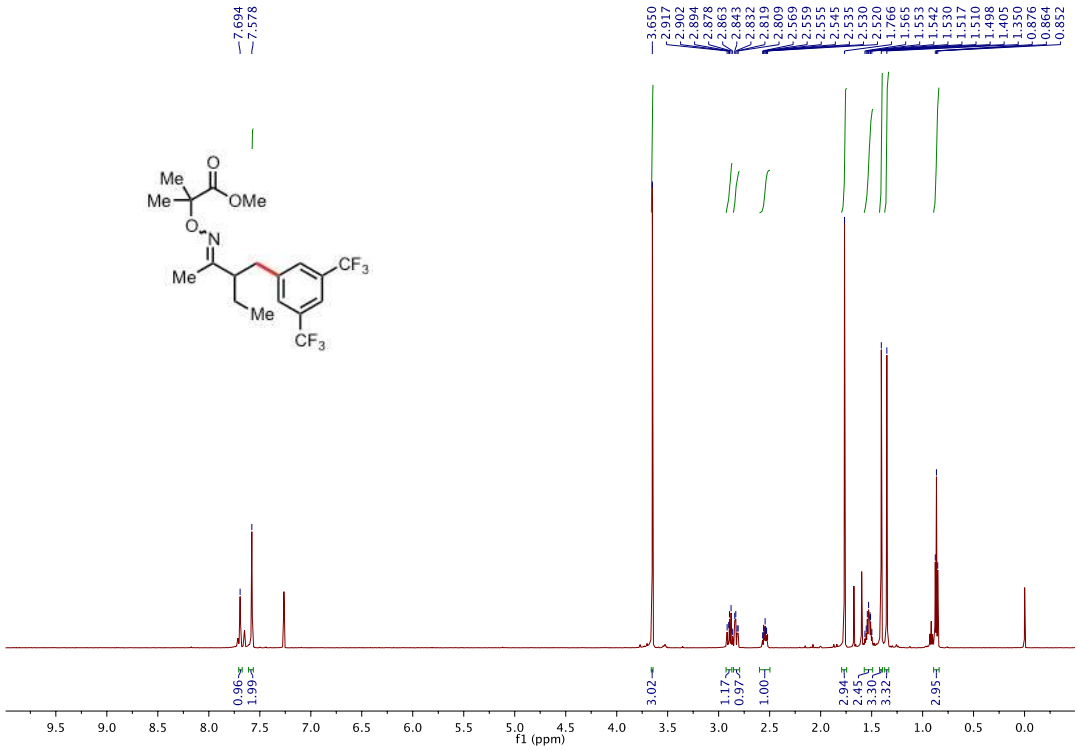
38.474
24.539
24.165
23.911
21.200
11.523
11.400
Me
Me
O
OMe
O
N
Me
Me
Me
Me
f1 (ppm)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2.545
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2.530
2.520
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1.565
1.553
1.542
1.530
1.517
1.510
1.498
1.405
1.350
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0.852
Me
Me
O
OMe
O
N
Me
CF3
Me
CF3
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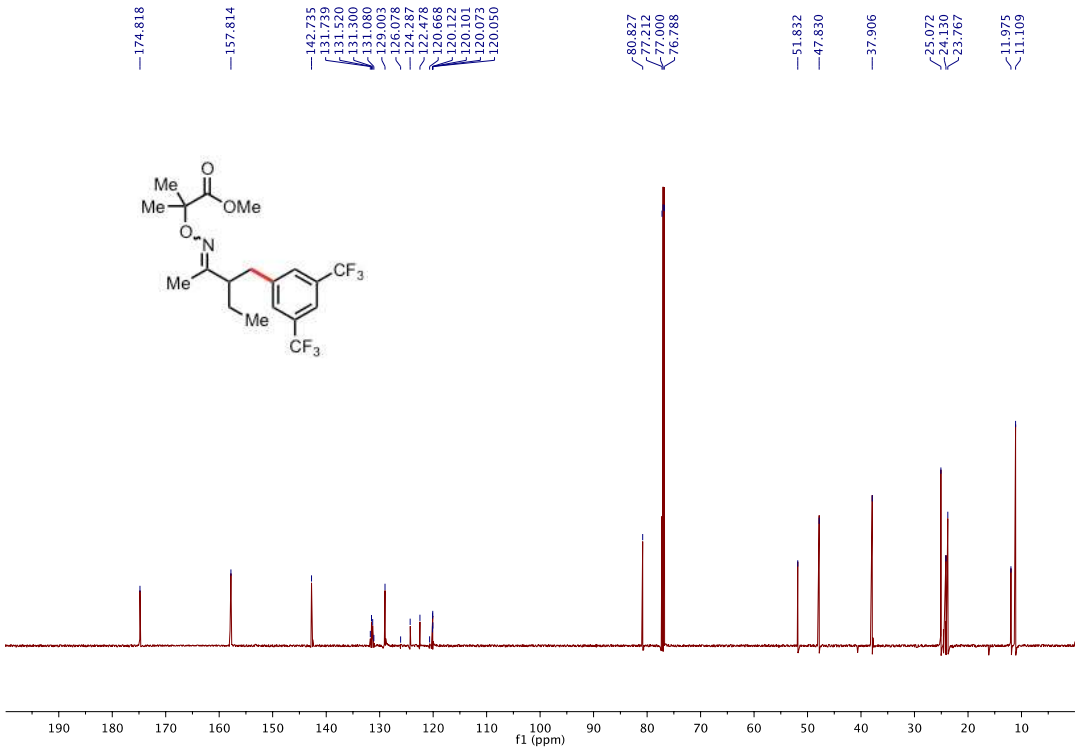
2.95
f1 (ppm)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120.668
120.122
120.101
120.073
120.050
80.827
77.212
77.000
76.788
51.832
47.830
37.906
25.072
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11.109
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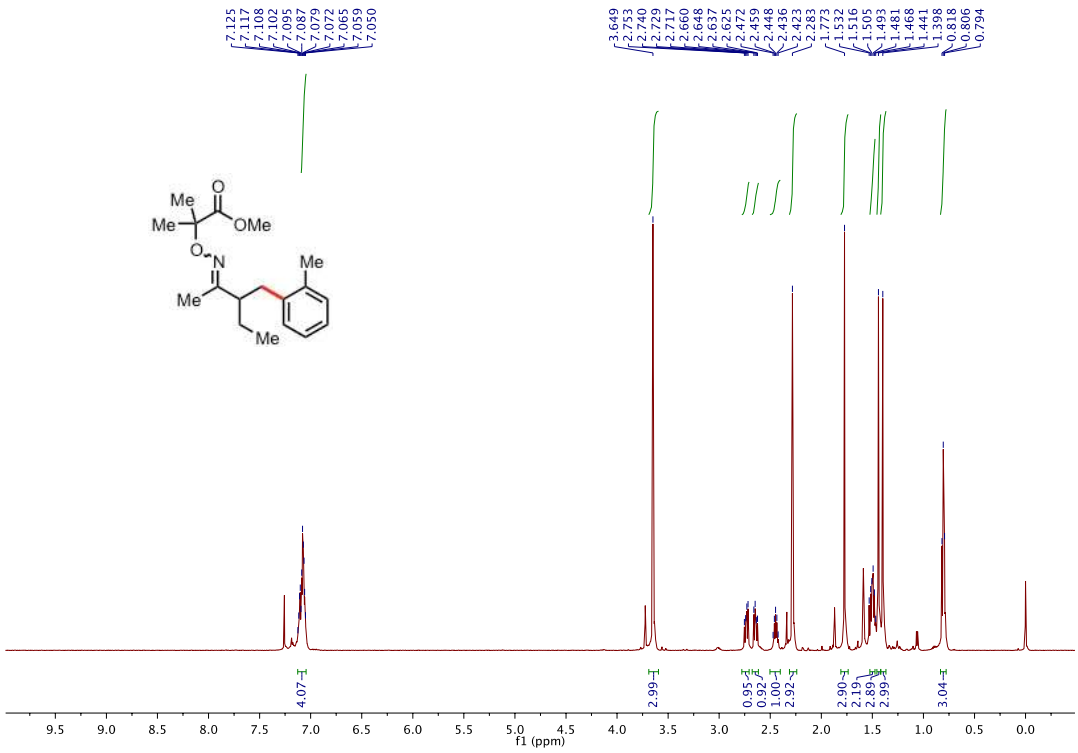
CF3
f1 (ppm)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7.059
7.050
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2.740
2.729
2.717
2.667
2.648
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2.625
2.472
2.459
2.448
2.436
2.423
2.283
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1.532
1.516
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1.493
1.481
1.468
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1.398
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0.806
0.794
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Me
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OMe
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Me
Me
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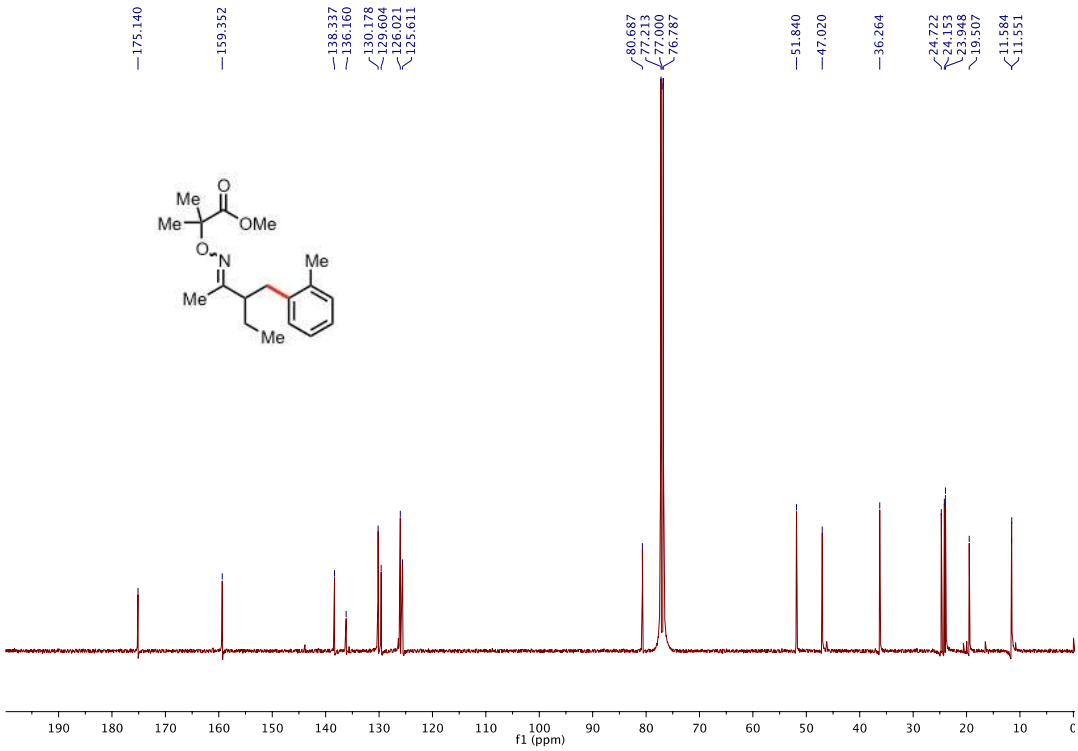
f1 (ppm)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125.611
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77.000
76.787
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47.020
36.264
24.722
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11.551
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Me
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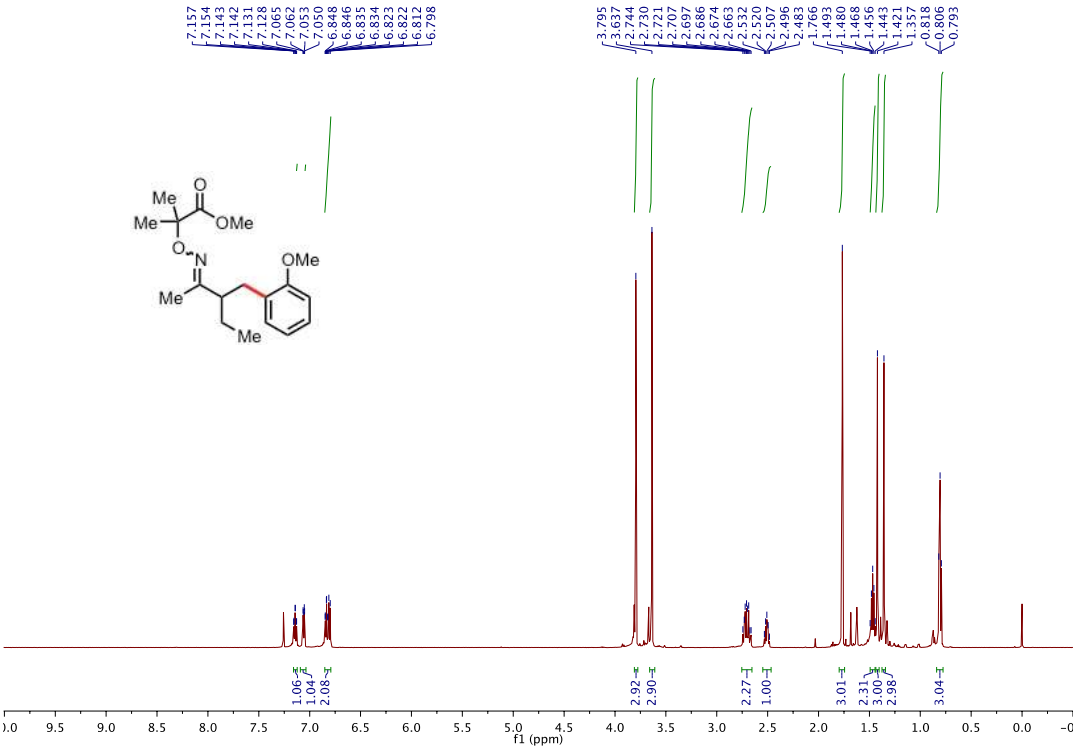
OMe
O
N
Me
Me
Me
f1 (ppm)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7.050
6.848
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6.835
6.834
6.823
6.822
6.812
6.798
3.795
3.637
2.744
2.730
2.721
2.707
2.697
2.686
2.674
2.663
2.532
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2.483
1.766
1.493
1.480
1.468
1.456
1.443
1.421
1.357
0.818
0.806
0.793
Me
O
Me
OMe
O
N
Me
OMe
Me
1.06
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2.90
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1.00
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3.00
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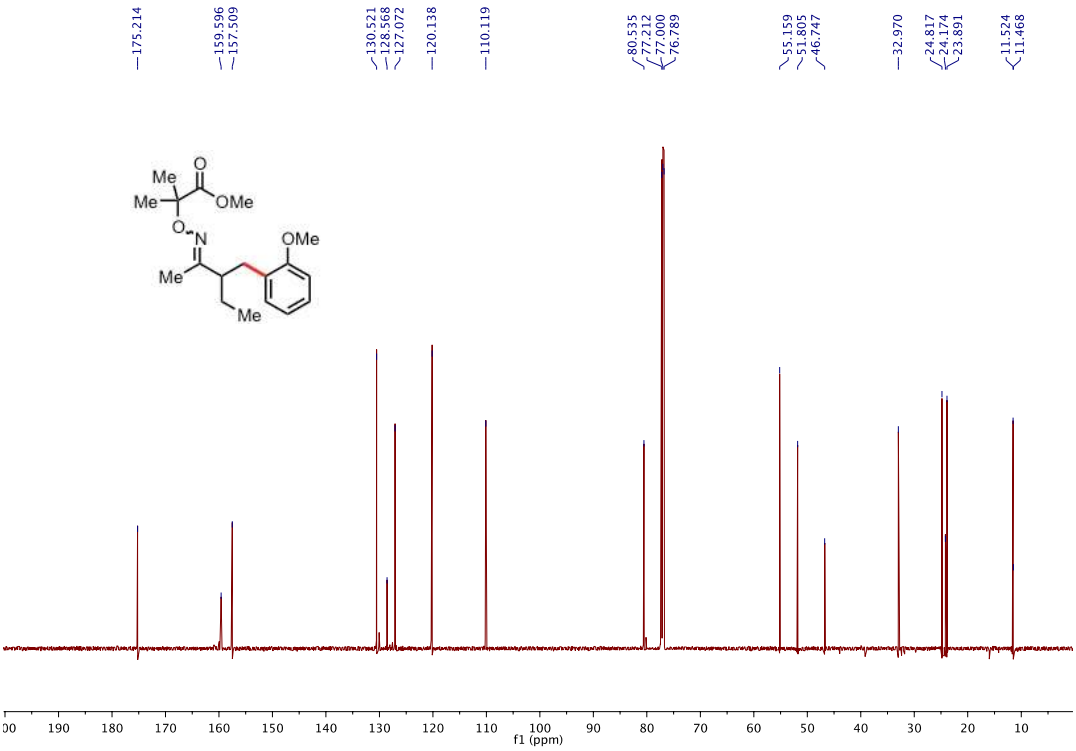
3.04
f1 (ppm)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77.000
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51.805
46.747
32.970
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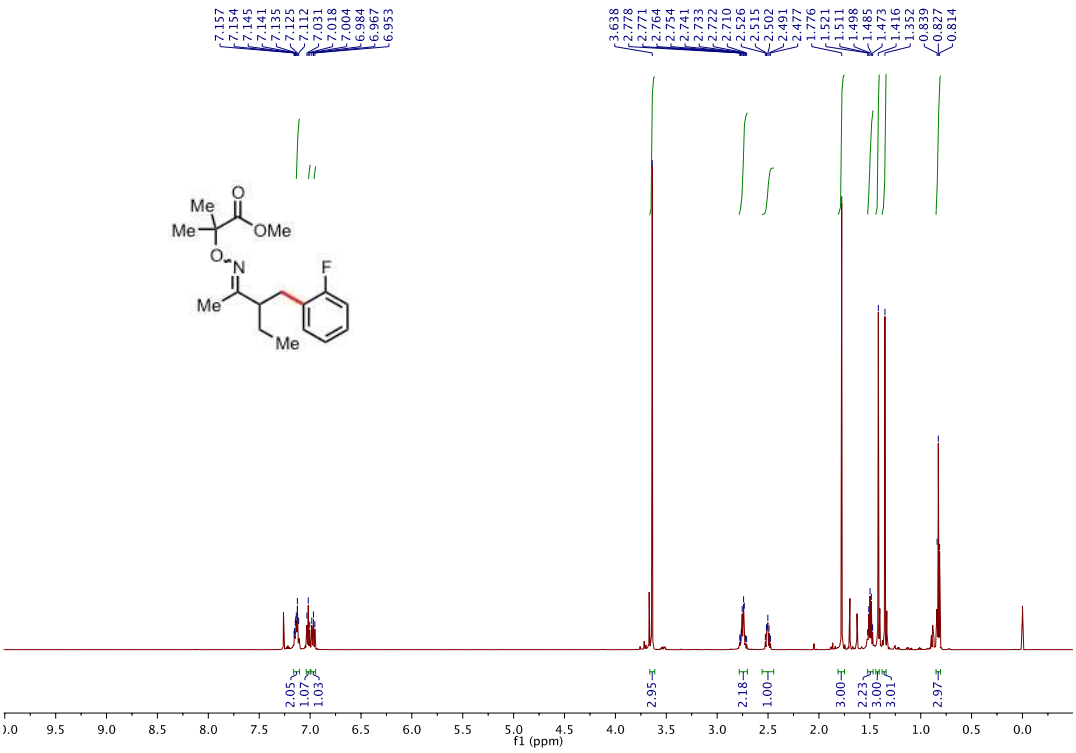
OMe
O
N
Me
OMe
Me
f1 (ppm)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3.638
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1.416
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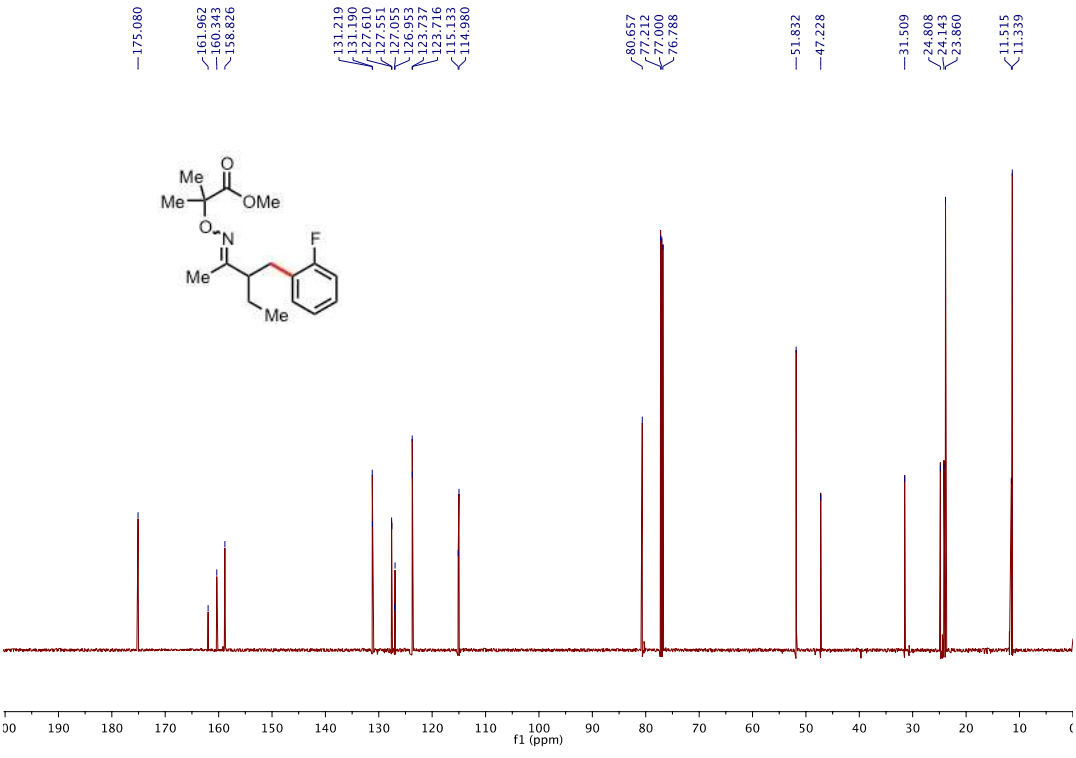
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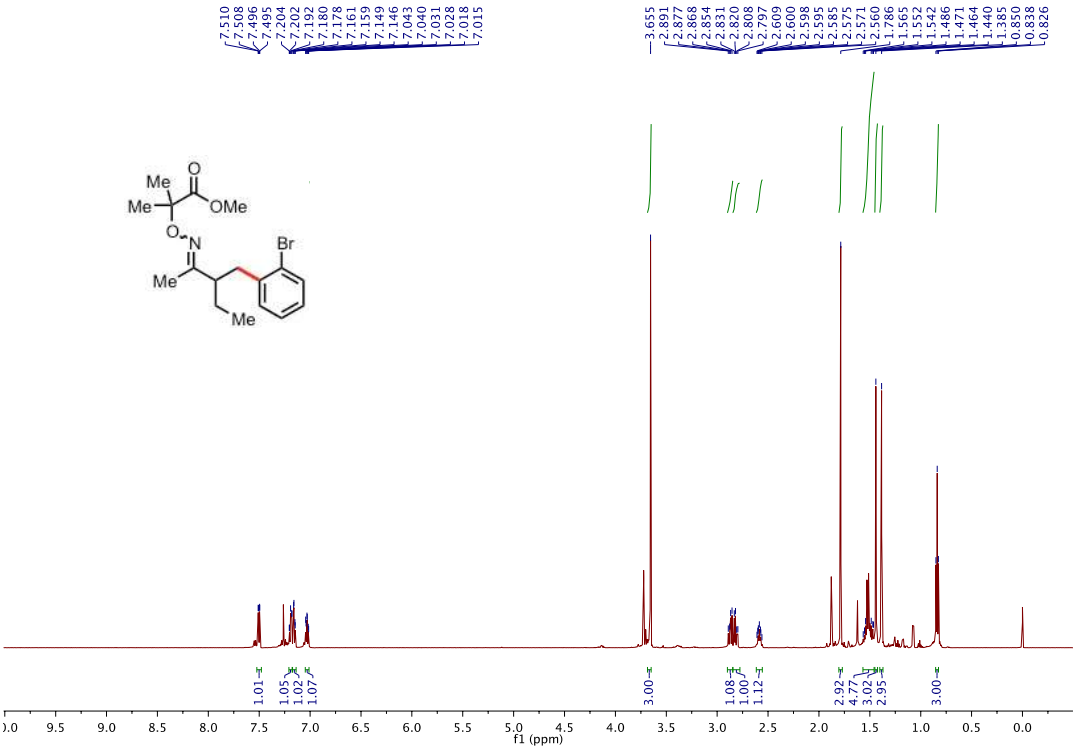
126.953
123.737
123.716
115.133
114.980
80.657
77.212
77.000
76.788
51.832
47.228
31.509
24.808
24.143
23.860
11.515
11.339
Me
Me
O
OMe
O
N
Me
F
Me
f1 (ppm)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7.202
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7.180
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7.159
7.149
7.146
7.043
7.040
7.031
7.028
7.018
7.015
3.655
2.891
2.877
2.868
2.854
2.831
2.820
2.808
2.797
2.609
2.600
2.598
2.595
2.585
2.575
2.571
2.560
1.786
1.565
1.552
1.542
1.486
1.471
1.464
1.440
1.385
0.850
0.838
0.826
Me
Me
O
OMe
O
N
Me
Br
Me
1.01
1.05
1.02
1.07
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1.08
1.00
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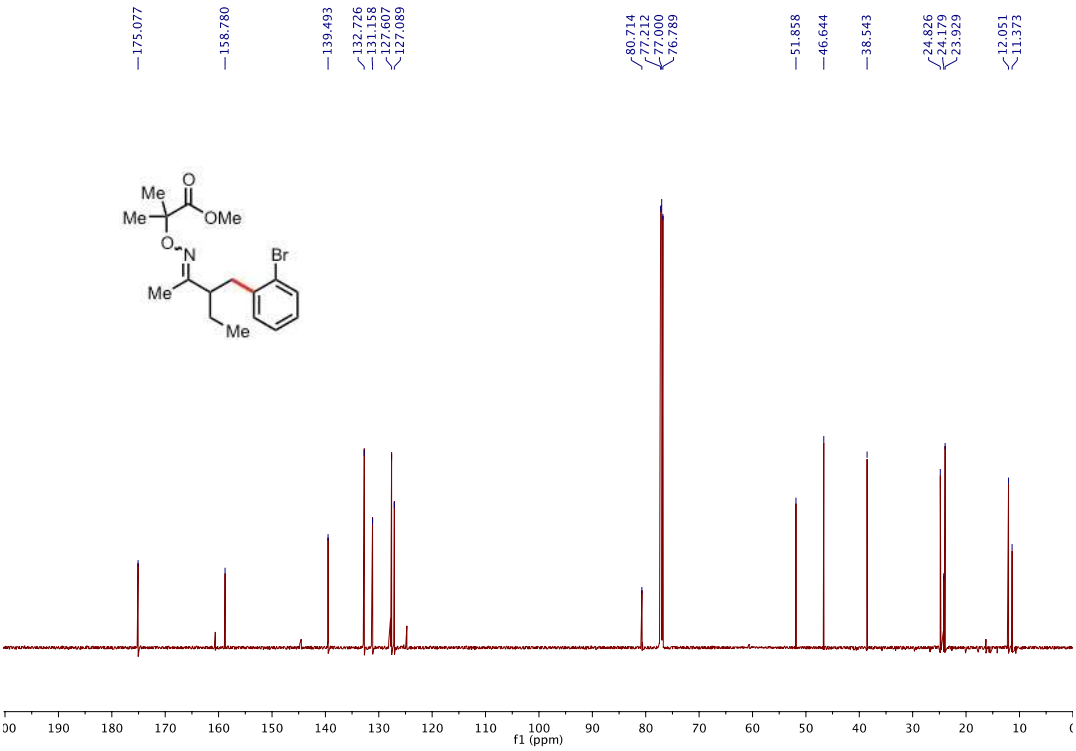
3.02
2.95
3.00
f1 (ppm)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80.714
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77.000
76.789
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46.644
38.543
24.826
24.179
23.929
12.051
11.373
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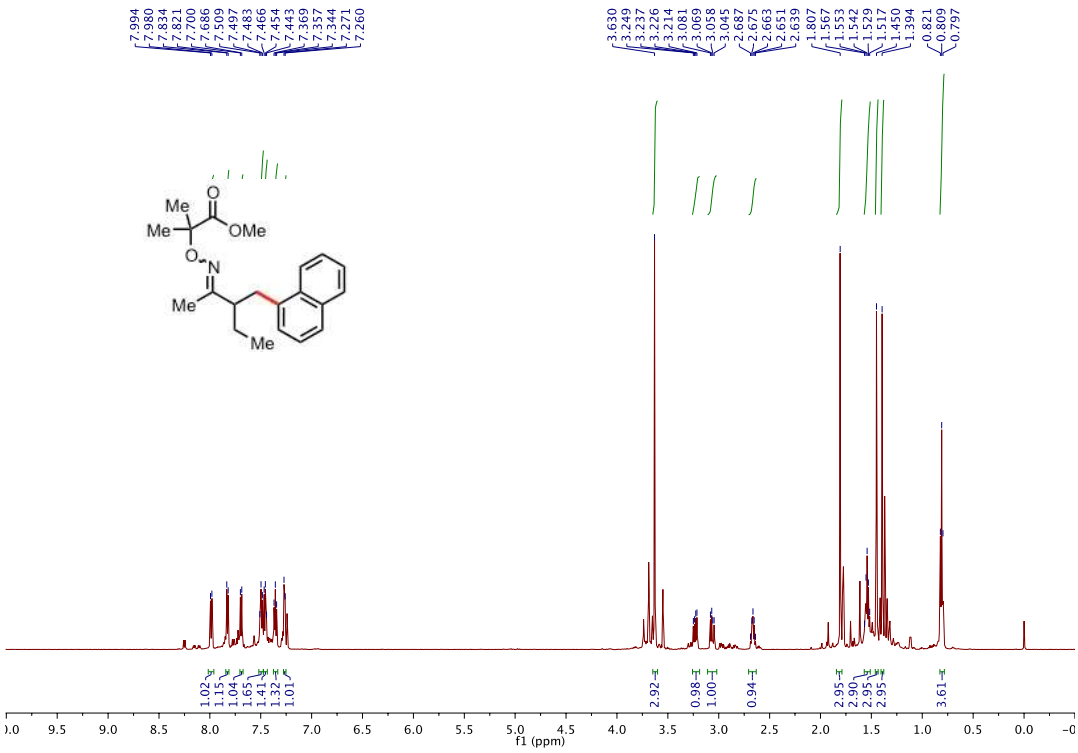
Me
O
OMe
O
N
Me
Br
Me
f1 (ppm)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7.497
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7.466
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7.443
7.369
7.357
7.344
7.271
7.260
3.630
3.249
3.237
3.226
3.214
3.081
3.069
3.058
3.045
2.687
2.675
2.663
2.651
2.639
1.807
1.567
1.553
1.542
1.529
1.517
1.450
1.394
0.821
0.809
0.797
Me
Me
O
OMe
O
N
Me
Me
1.02
1.15
1.04
1.65
1.41
1.32
1.01
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1.00
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2.95
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2.95
2.95
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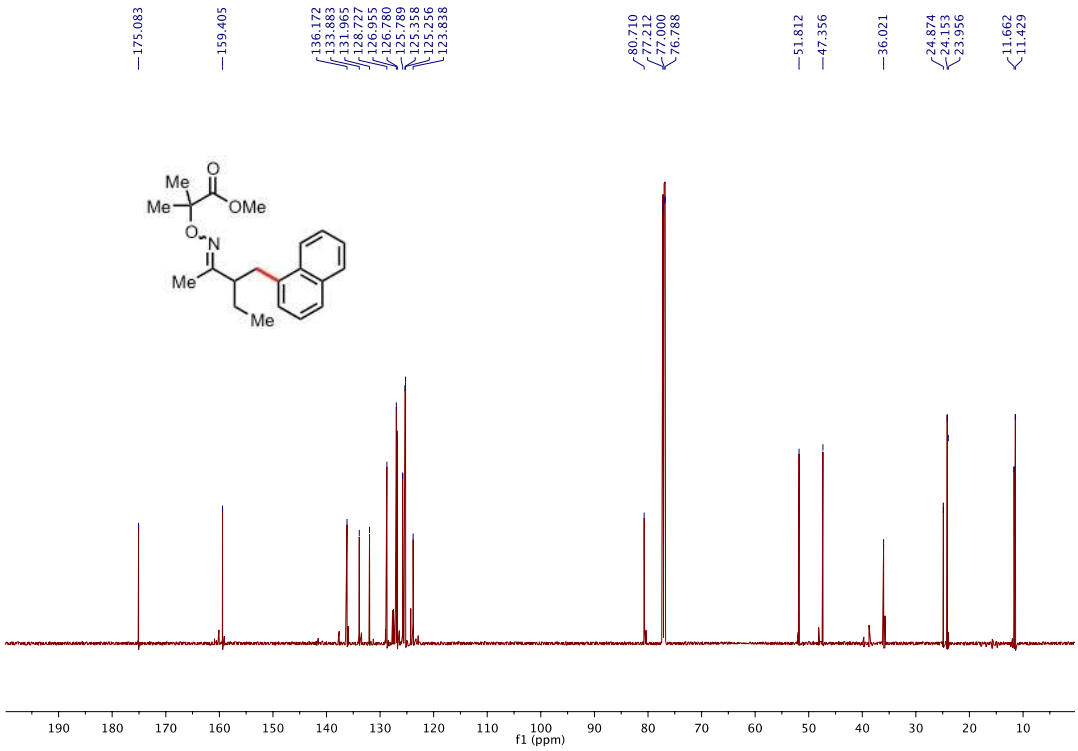
f1 (ppm)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136.172
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125.358
125.256
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80.710
77.212
77.000
76.788
51.812
47.356
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11.662
11.429
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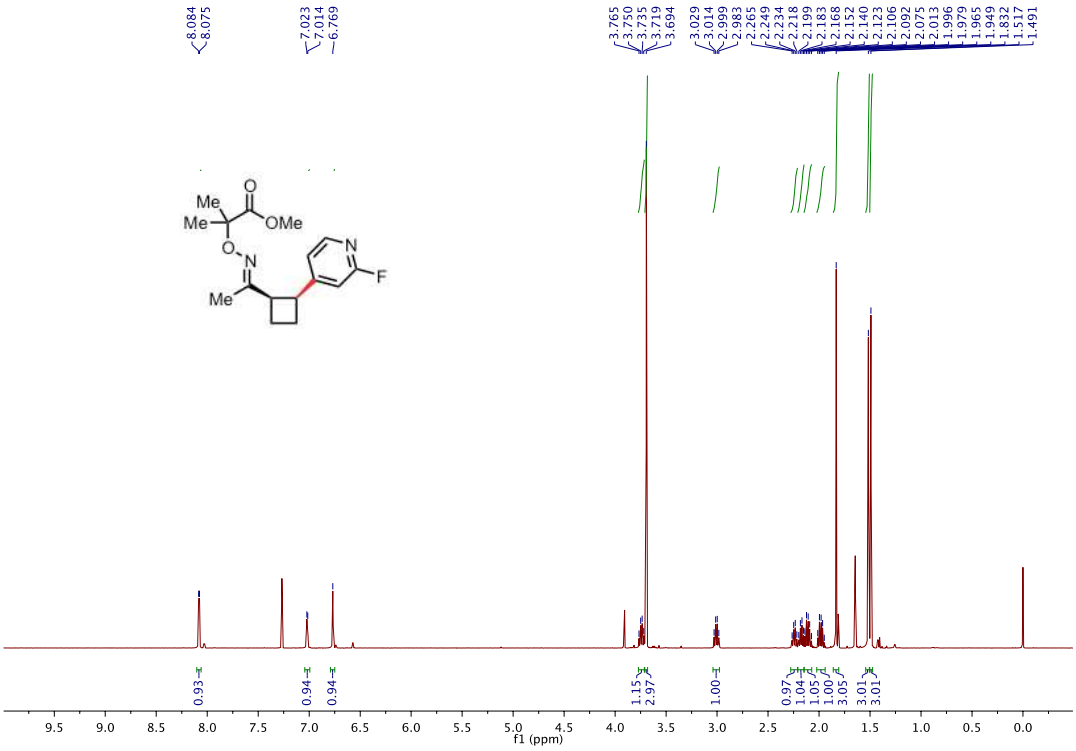
Me
O
OMe
O
N
Me
Me
f1 (ppm)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8.075
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7.014
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3.765
3.750
3.735
3.719
3.694
3.029
3.014
2.999
2.983
2.265
2.249
2.234
2.218
2.199
2.183
2.168
2.152
2.140
2.123
2.106
2.092
2.075
2.013
1.996
1.979
1.965
1.949
1.832
1.517
1.491
Me
Me
O
OMe
O
N
Me
N
F
0.93
0.94
0.94
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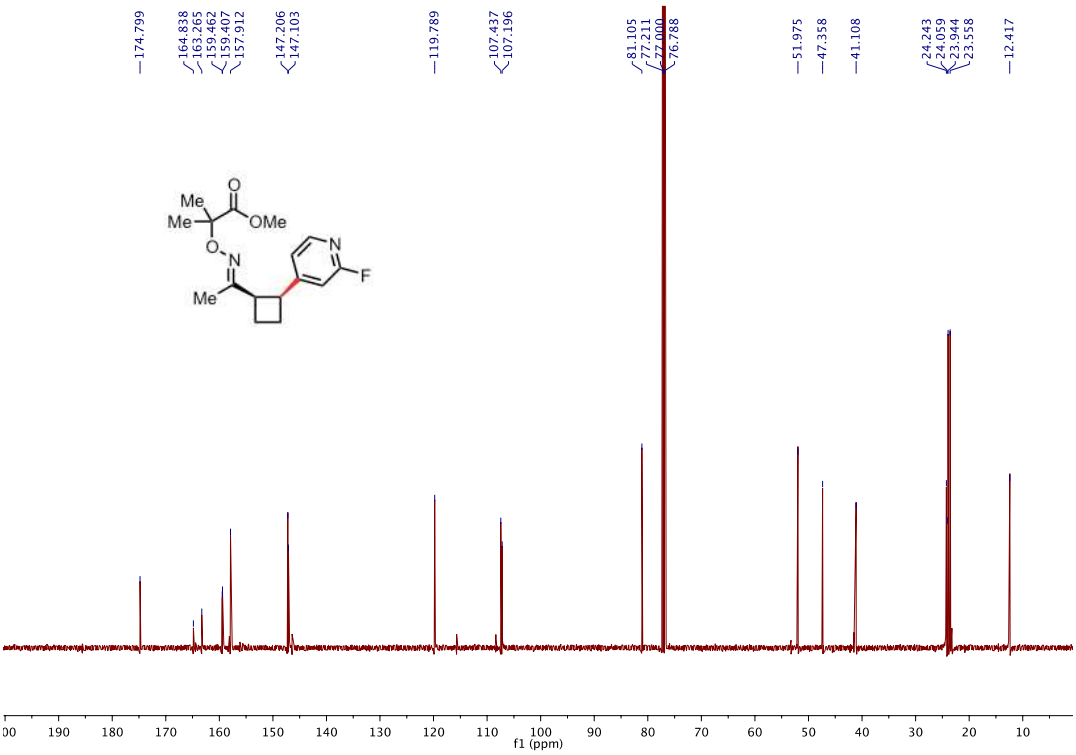
1.00
0.97
1.04
1.05
1.00
3.05
3.01
3.01
f1 (ppm)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163.265
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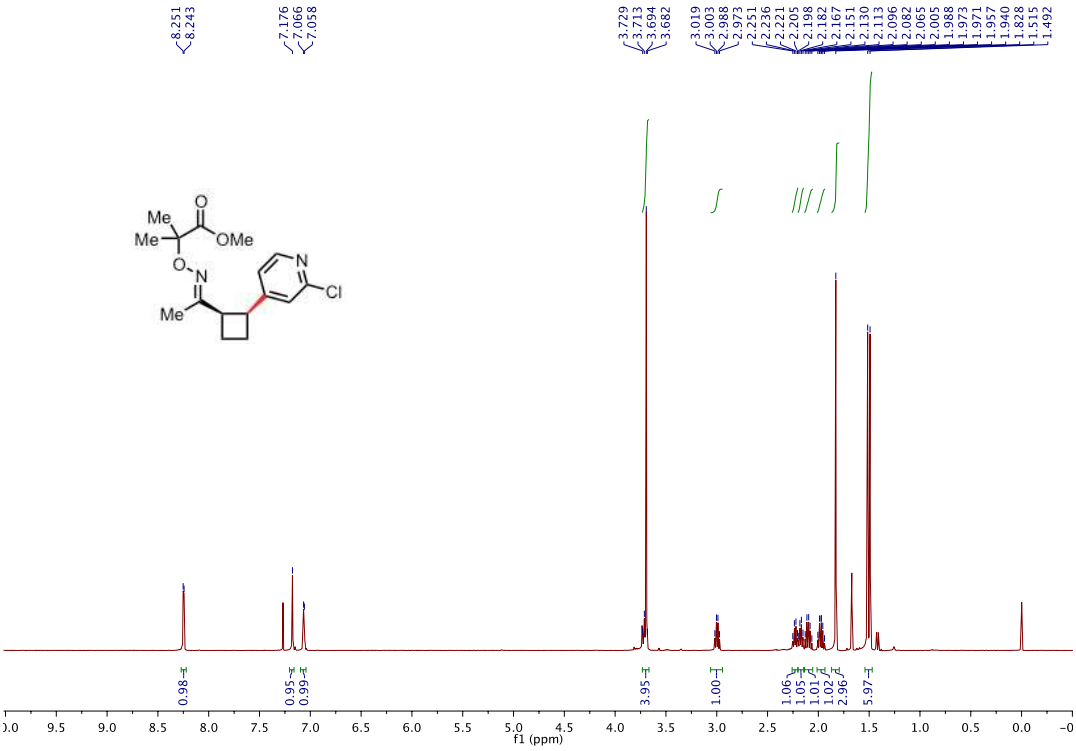
147.103
119.789
107.437
107.196
81.105
77.211
77.000
76.788
51.975
47.358
41.108
24.243
24.059
23.944
23.558
12.417
Me
Me
O
OMe
O
N
Me
N
F
f1 (ppm)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7.176
7.066
7.058
3.729
3.713
3.694
3.682
3.019
3.003
2.988
2.973
2.251
2.236
2.221
2.205
2.198
2.182
2.167
2.151
2.130
2.113
2.096
2.082
2.065
2.005
1.988
1.973
1.971
1.957
1.940
1.828
1.515
1.492
Me
Me
O
OMe
O
N
Me
N
Cl
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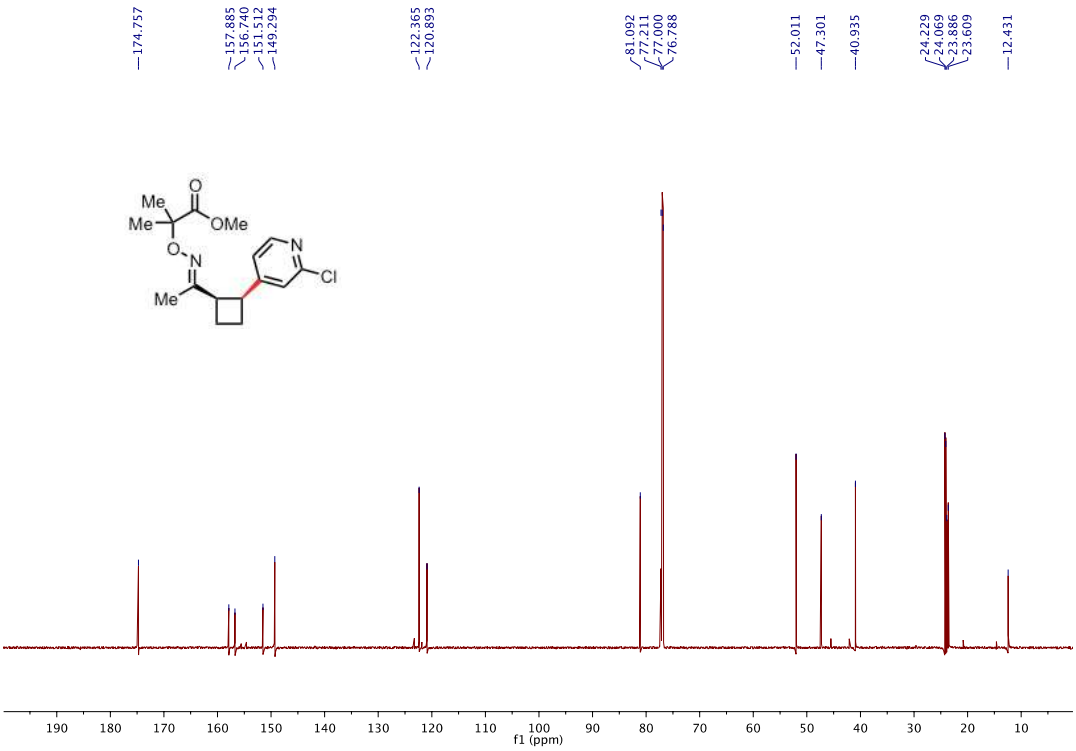
0.99
3.95
1.00
1.06
1.05
1.01
1.02
2.96
5.97
f1 (ppm)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156.740
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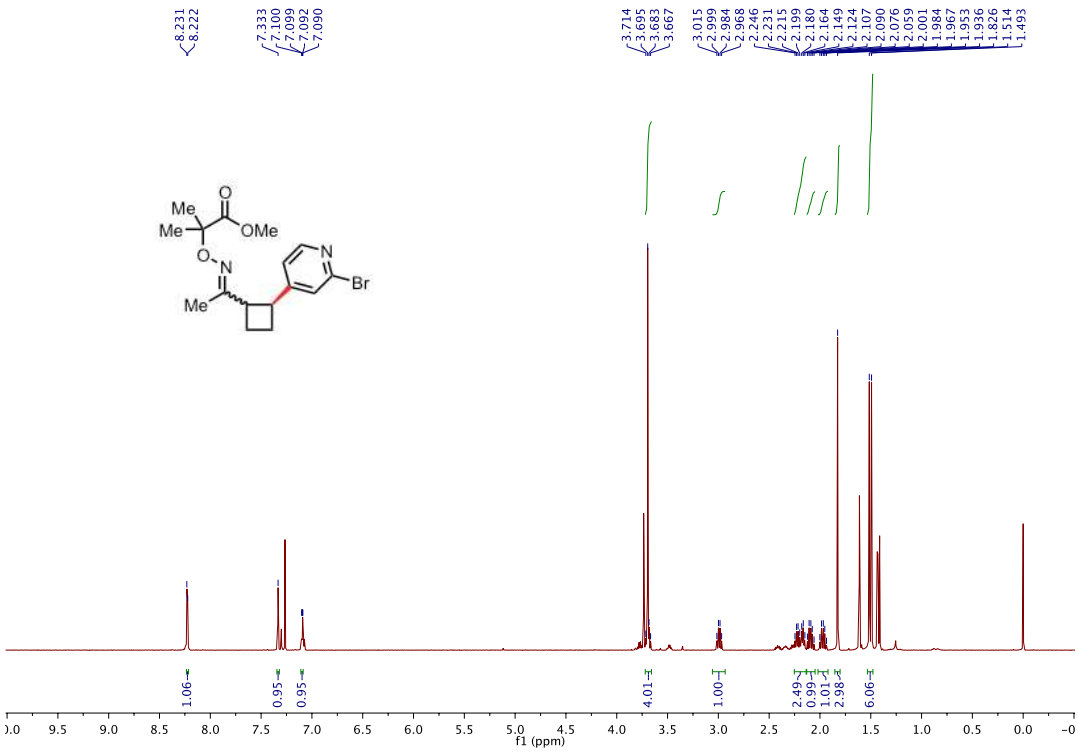
122.365
120.893
81.092
77.211
77.000
76.788
52.011
47.301
40.935
24.229
24.069
23.886
23.609
12.431
Me
Me
O
OMe
O
N
Me
N
Cl
f1 (ppm)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8.222
7.333
7.100
7.099
7.092
7.090
3.714
3.695
3.683
3.667
3.015
2.999
2.984
2.968
2.246
2.231
2.215
2.199
2.180
2.164
2.149
2.124
2.107
2.097
2.090
2.076
2.059
2.001
1.984
1.967
1.953
1.936
1.826
1.514
1.493
Me
Me
O
OMe
O
N
Me
N
Br
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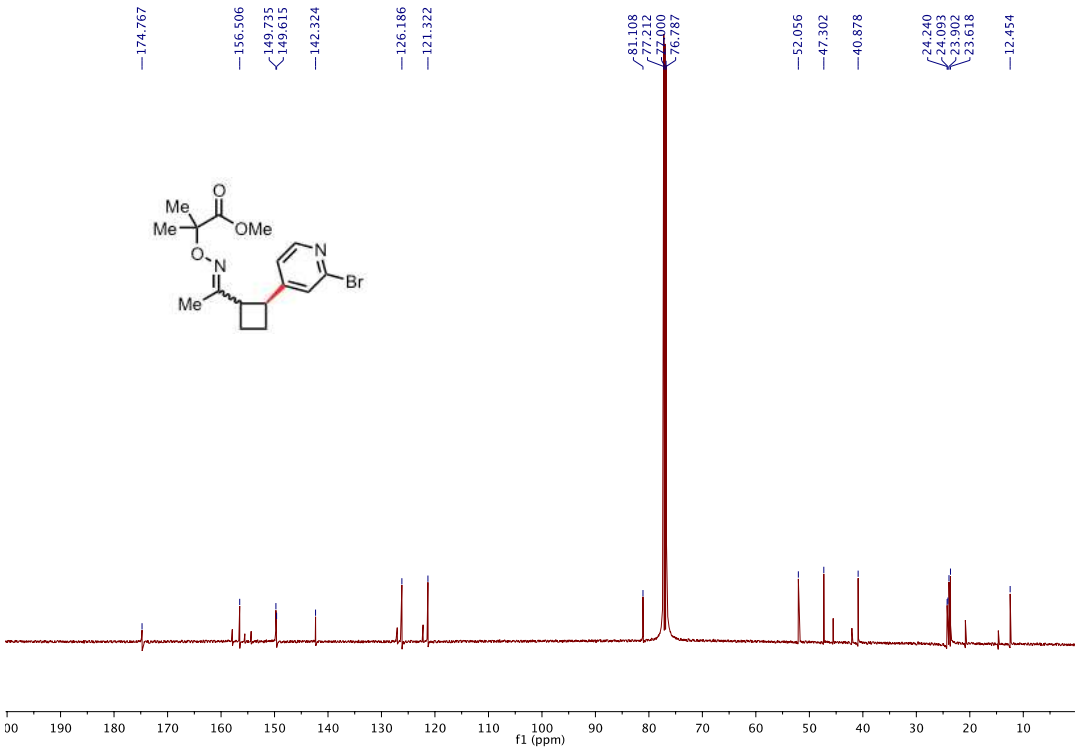
0.95
0.95
4.01
1.00
2.49
0.99
1.01
2.98
6.06
f1 (ppm)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149.735
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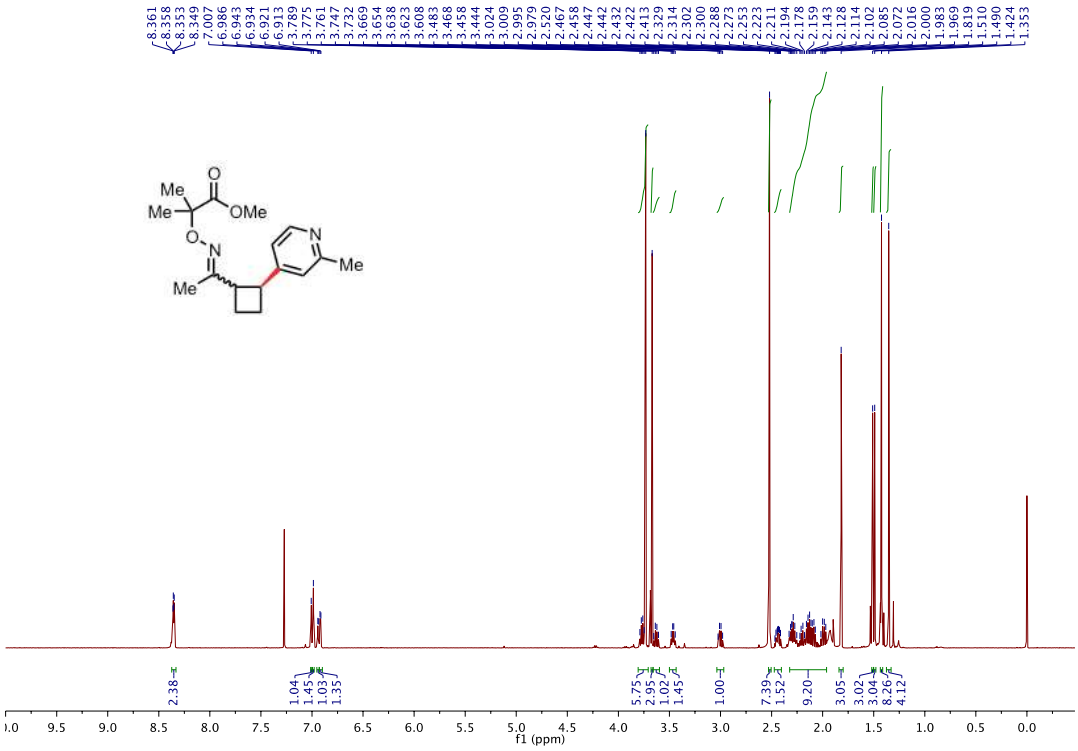
142.324
126.186
121.322
81.108
77.212
77.000
76.787
52.056
47.302
40.878
24.240
24.093
23.902
23.618
12.454
Me
Me
O
OMe
O
N
Me
N
Br
f1 (ppm)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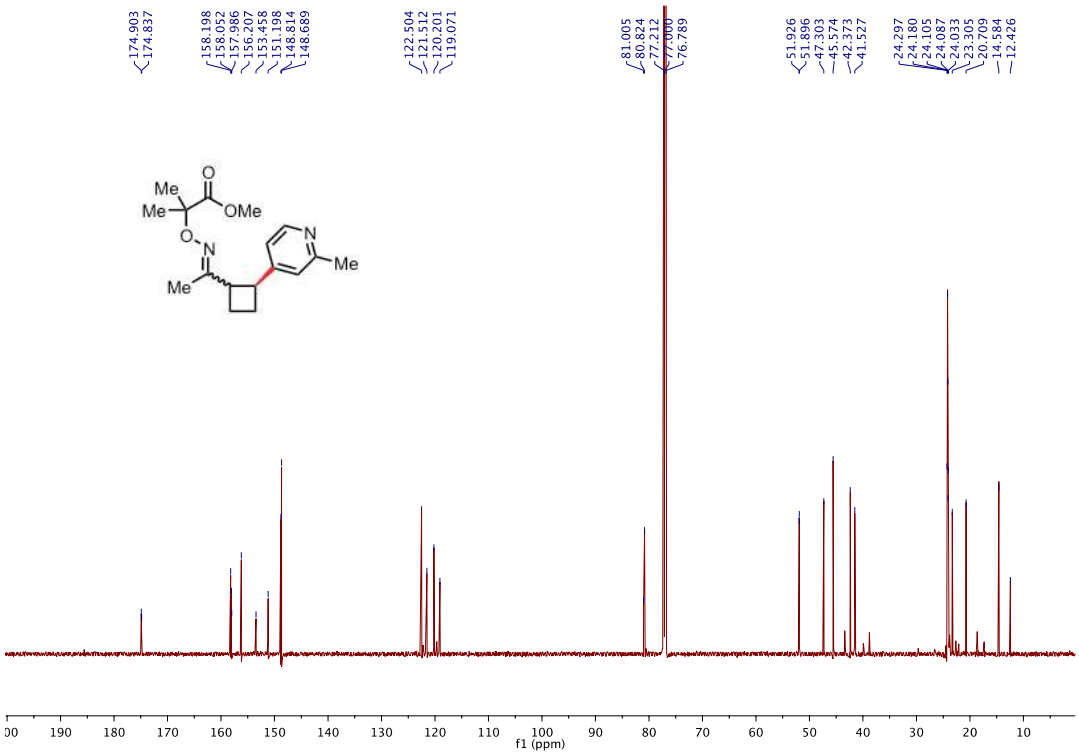
6.934
6.921
6.913
3.789
3.775
3.761
3.747
3.732
3.669
3.654
3.638
3.623
3.608
3.483
3.468
3.458
3.444
3.024
3.009
2.995
2.979
2.520
2.467
2.458
2.447
2.442
2.432
2.422
2.413
2.329
2.314
2.302
2.300
2.288
2.273
2.253
2.223
2.211
2.194
2.178
2.159
2.143
2.128
2.114
2.102
2.085
2.072
2.016
2.000
1.983
1.969
1.819
1.510
1.490
1.424
1.353
Me
Me
O
OMe
O
N
Me
Me
N
Me
2.38
1.04
1.45
1.03
1.35
5.75
2.95
1.02
1.45
1.00
7.39
1.52
9.20
3.05
3.02
3.04
8.26
4.12
f1 (ppm)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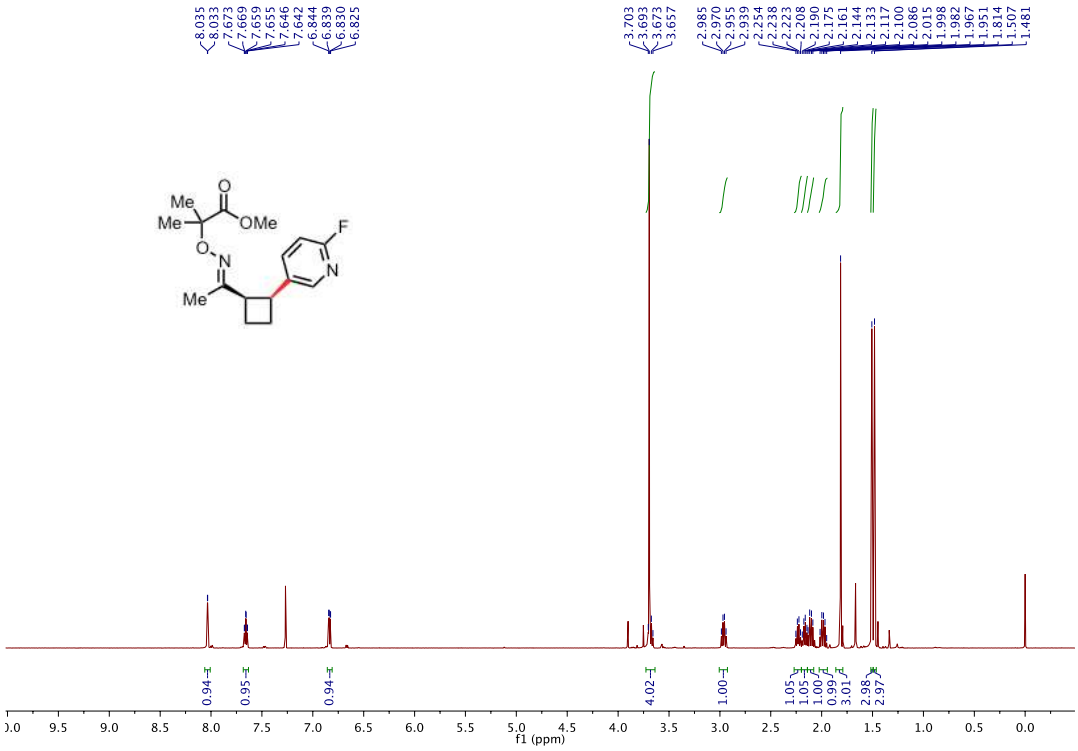
157.986
156.207
153.458
151.198
148.814
148.689
122.504
121.512
120.201
119.071
81.005
80.824
77.212
77.000
76.789
51.926
51.896
47.303
45.574
42.373
41.527
24.297
24.180
24.105
24.087
24.033
23.305
20.709
14.584
12.426
Me
Me
O
OMe
O
N
Me
Me
N
Me
f1 (ppm)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7.642
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6.839
6.830
6.825
3.703
3.693
3.673
3.657
2.985
2.970
2.955
2.939
2.254
2.238
2.223
2.208
2.190
2.175
2.161
2.144
2.133
2.117
2.100
2.086
2.015
1.998
1.982
1.967
1.951
1.814
1.507
1.481
Me
Me
O
OMe
O
N
Me
F
N
0.94
0.95
0.94
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1.00
1.05
1.05
1.00
0.99
3.01
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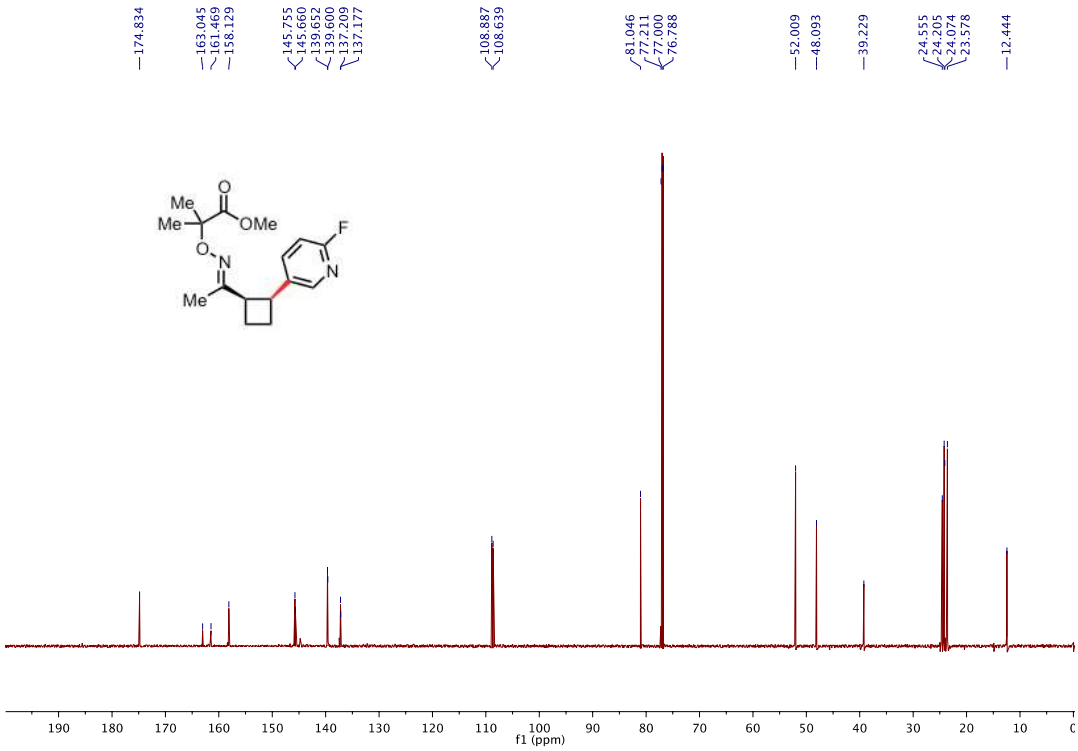
2.97
f1 (ppm)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139.600
137.209
137.177
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108.639
81.046
77.211
77.000
76.788
52.009
48.093
39.229
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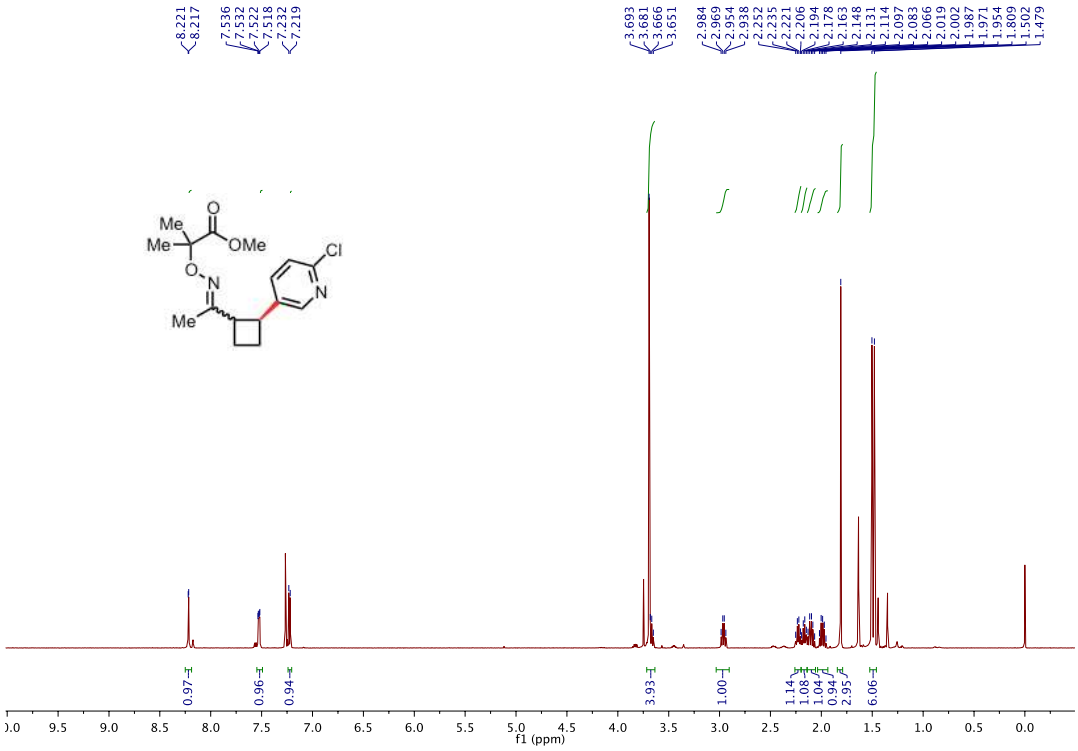
23.578
12.444
Me
Me
O
OMe
O
N
Me
F
N
f1 (ppm)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7.518
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3.666
3.651
2.984
2.969
2.954
2.938
2.252
2.235
2.221
2.206
2.194
2.178
2.163
2.148
2.131
2.114
2.097
2.083
2.066
2.019
2.002
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1.971
1.954
1.809
1.502
1.479
Me
Me
O
OMe
O
N
Me
Cl
N
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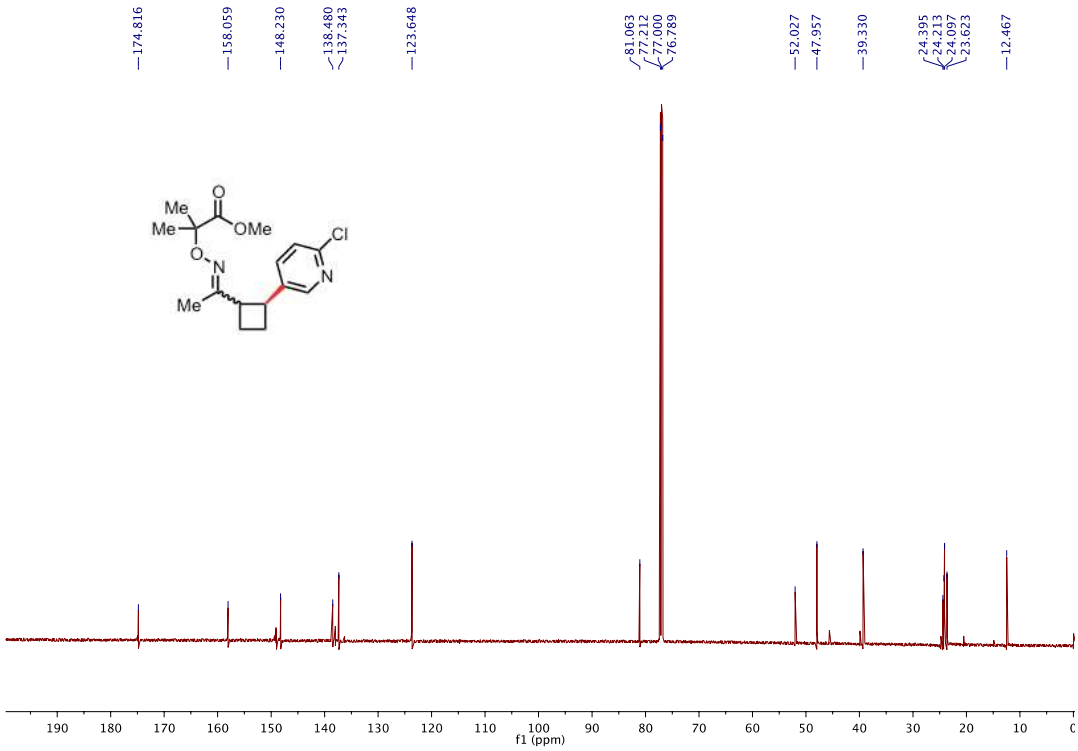
0.94
2.95
6.06
f1 (ppm)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76.789
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47.957
39.330
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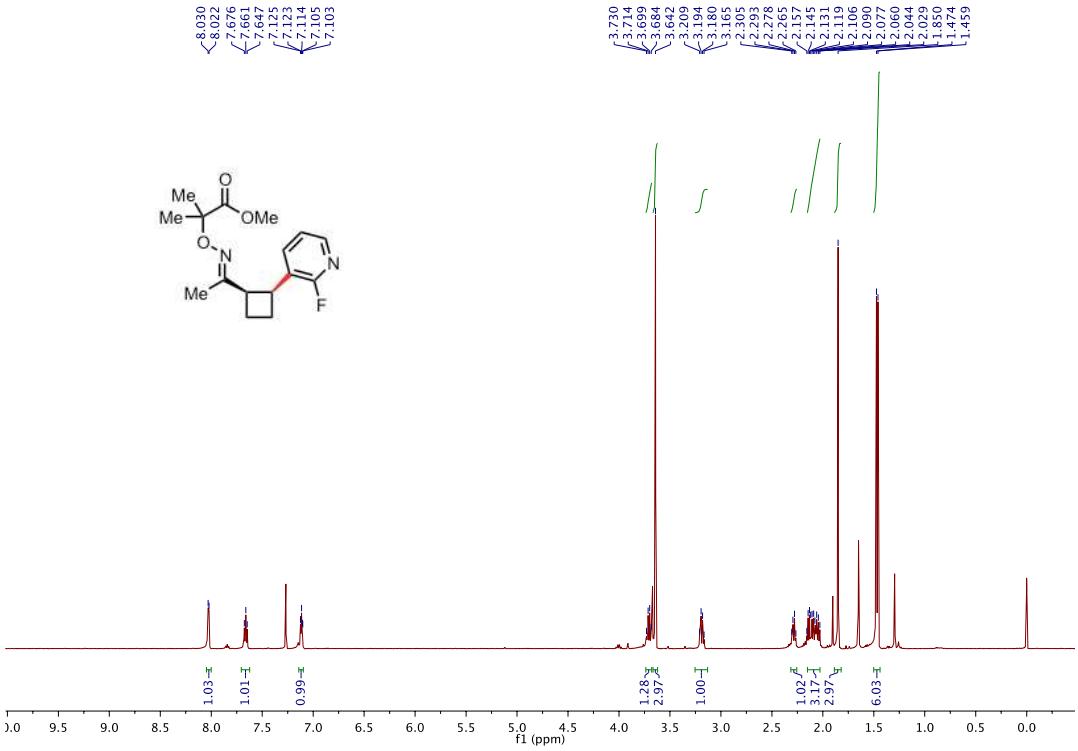
24.213
24.097
23.623
12.467
Me
Me
O
OMe
O
N
Me
Cl
N
f1 (ppm)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3.699
3.684
3.642
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2.278
2.265
2.157
2.145
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2.106
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2.029
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1.459
Me
Me
O
OMe
O
N
Me
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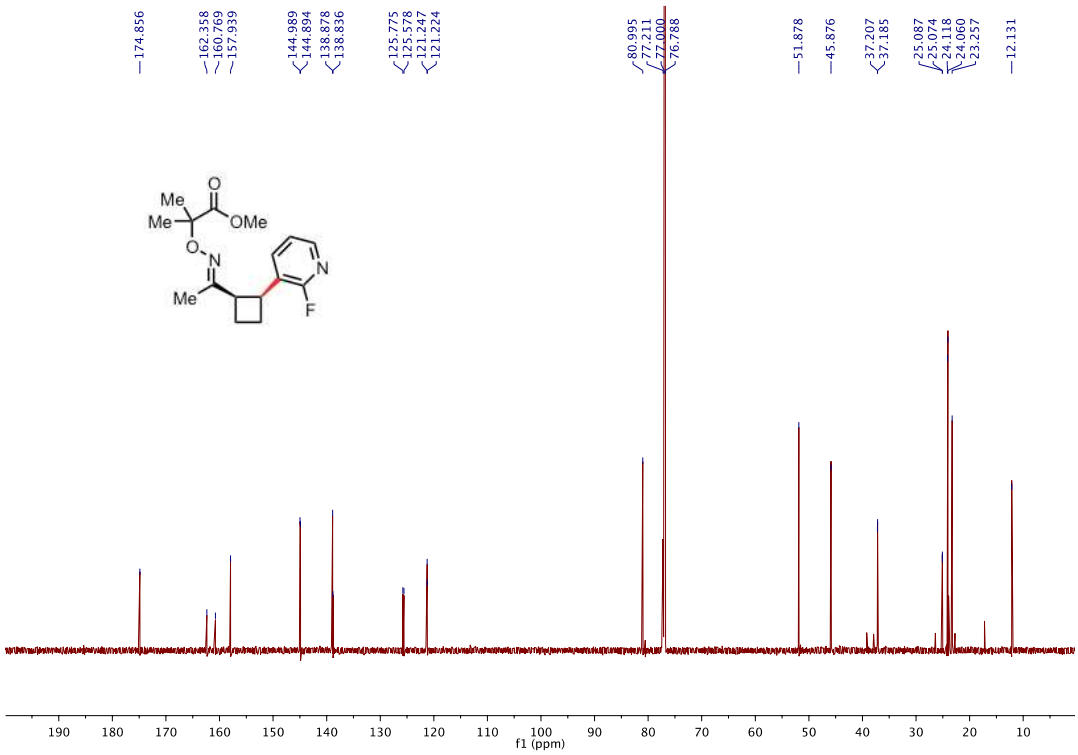
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125.578
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121.224
80.995
77.211
77.000
76.788
51.878
45.876
37.207
37.185
25.087
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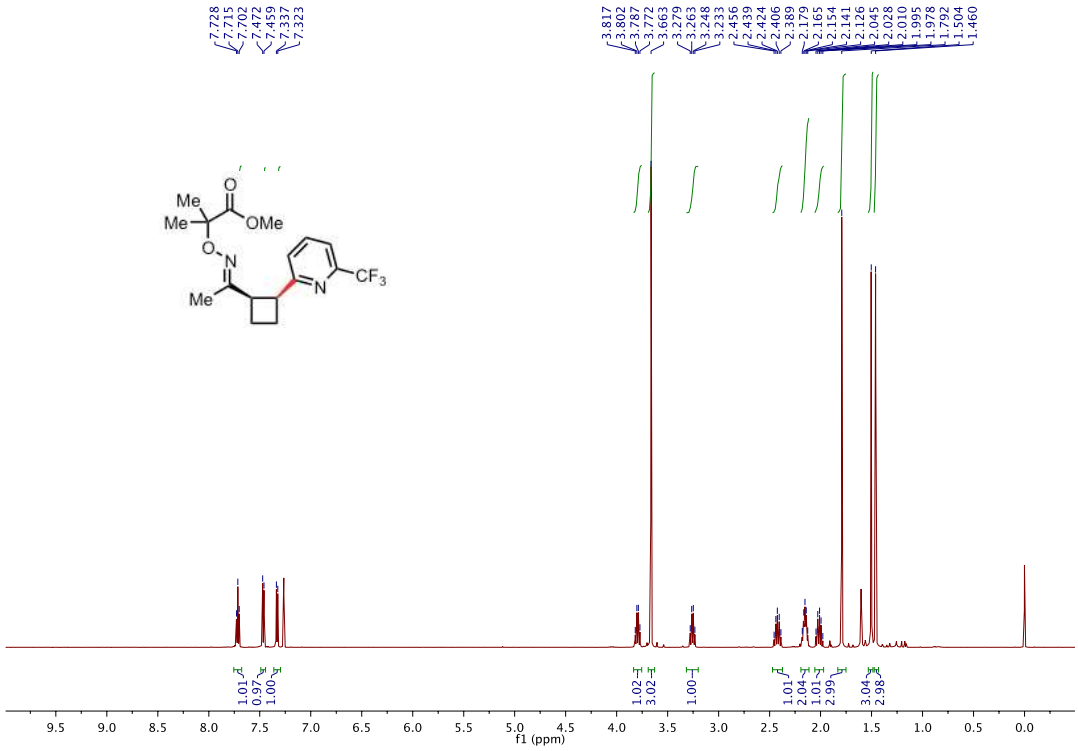
24.060
23.257
12.131
Me
Me
O
OMe
O
N
Me
N
F
f1 (ppm)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3.263
3.248
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2.389
2.179
2.165
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2.141
2.126
2.045
2.028
2.010
1.995
1.978
1.792
1.504
1.460
Me
Me
O
OMe
O
N
Me
N
CF3
1.01
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1.01
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2.98
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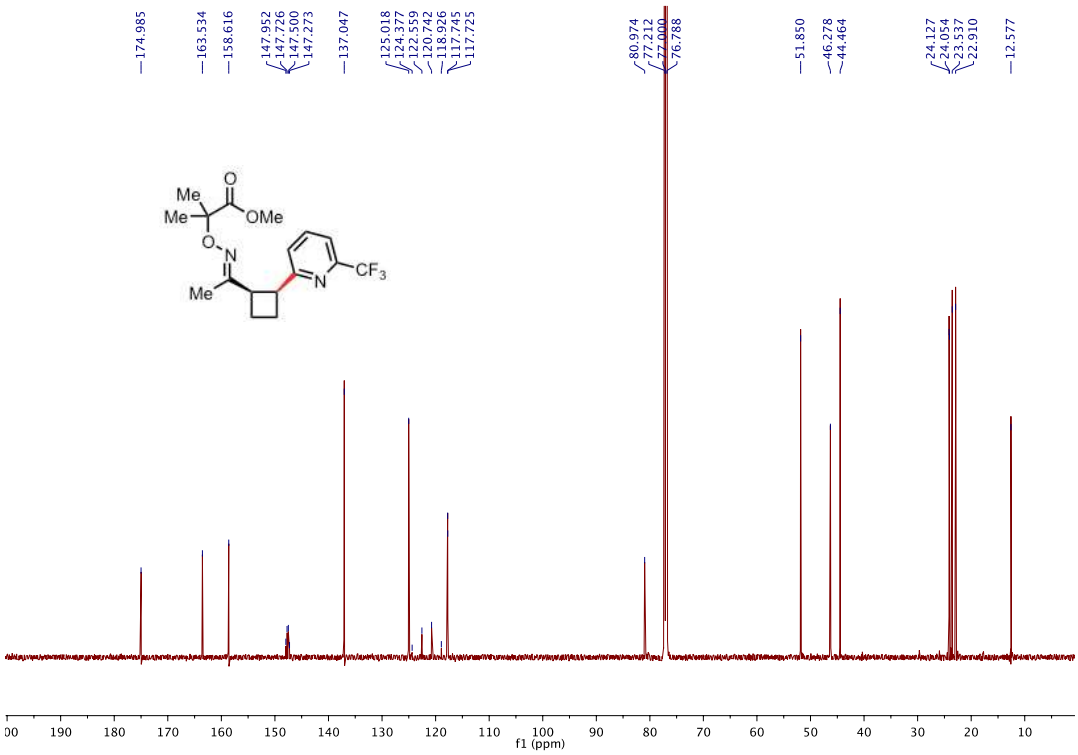
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137.047
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122.559
120.742
118.926
117.745
117.725
80.974
77.212
77.000
76.788
51.850
46.278
44.464
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22.910
12.577
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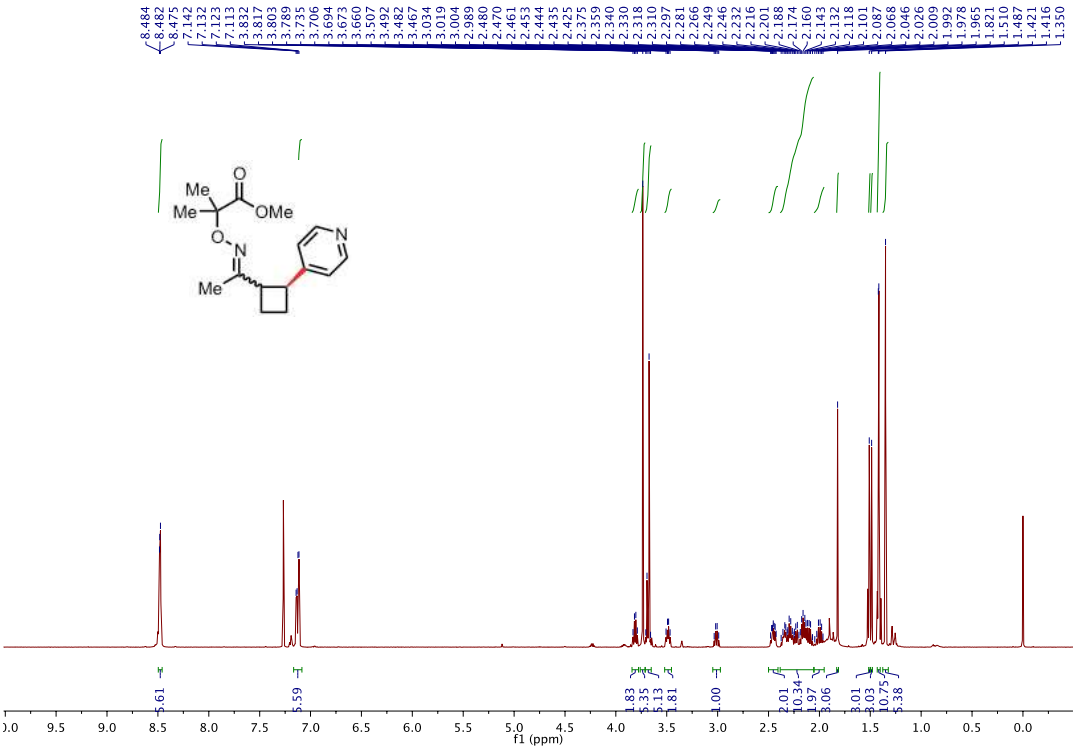
Me
O
OMe
O
N
Me
N
CF3
f1 (ppm)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3.673
3.660
3.507
3.492
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2.232
2.216
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2.188
2.174
2.160
2.143
2.132
2.118
2.101
2.087
2.068
2.046
2.026
2.009
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1.965
1.821
1.510
1.487
1.421
1.416
1.350
Me
Me
O
OMe
O
N
Me
N
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5.59
1.83
5.35
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3.03
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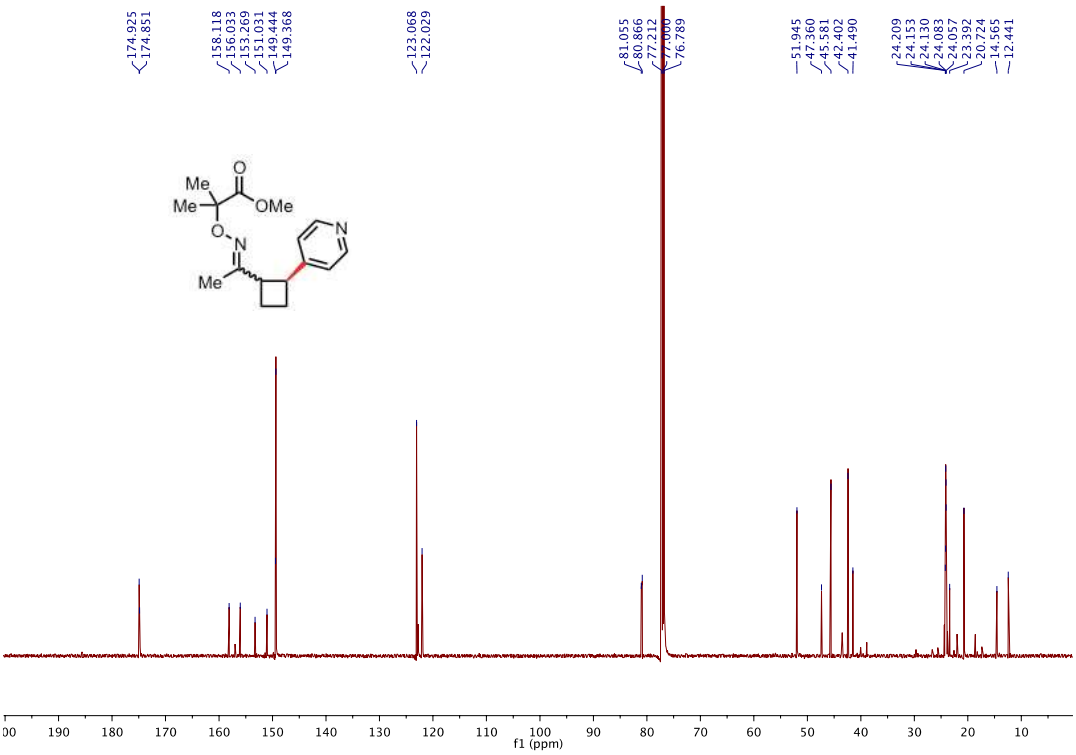
5.38
f1 (ppm)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77.000
76.789
51.945
47.360
45.581
42.402
41.490
24.209
24.153
24.130
24.083
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20.724
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OMe
O
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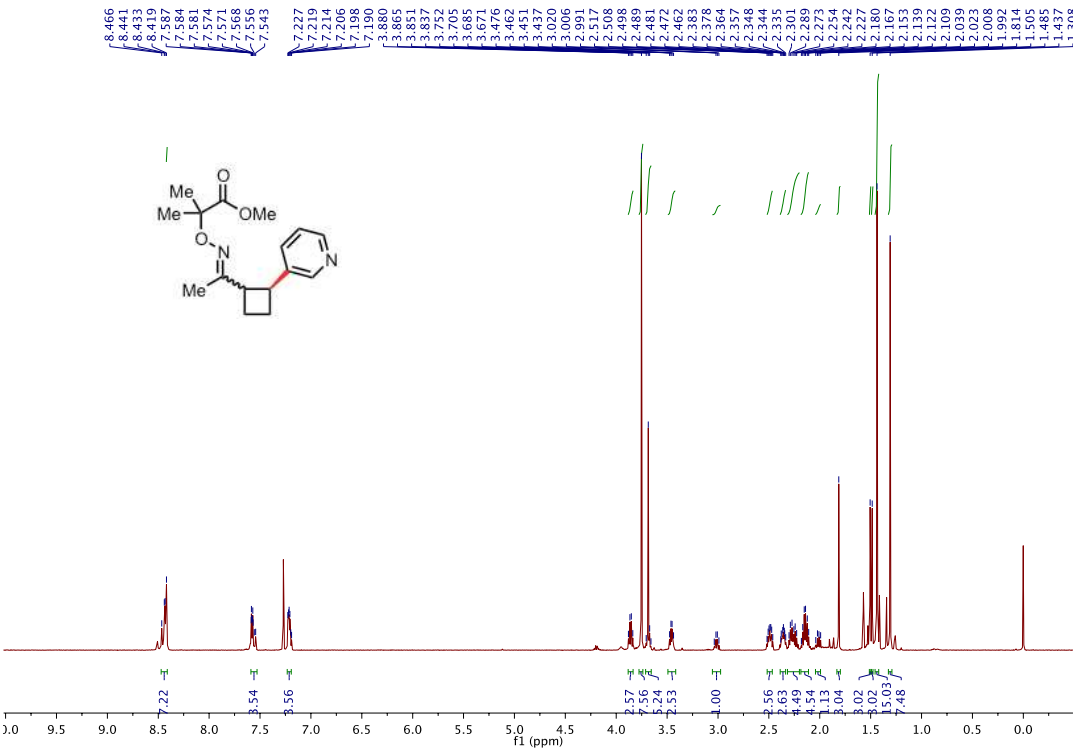
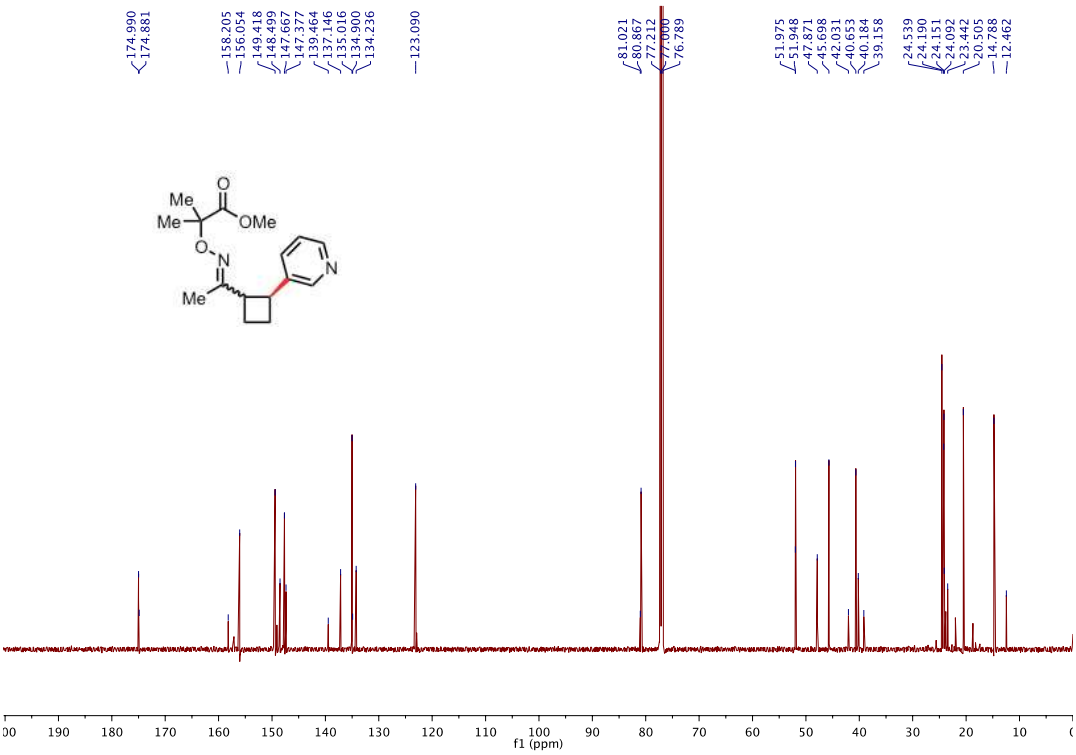
Me
N
f1 (ppm)


f1 (ppm)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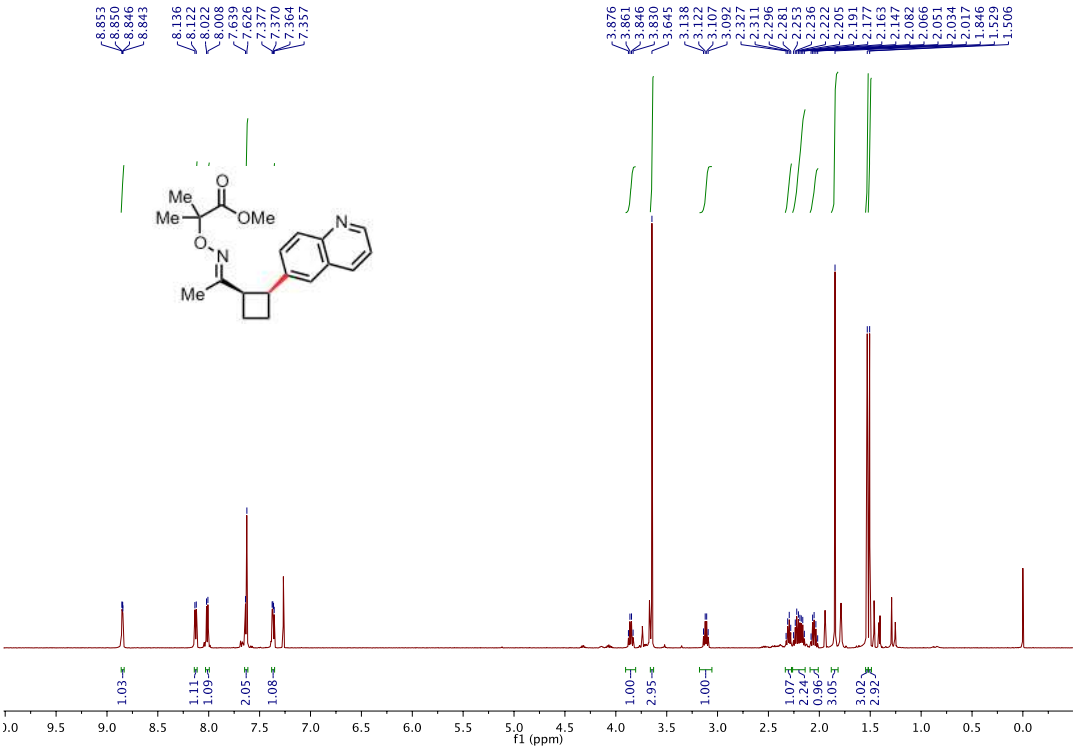
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7.357
3.876
3.861
3.846
3.830
3.645
3.138
3.122
3.107
3.092
2.327
2.311
2.296
2.281
2.253
2.236
2.222
2.205
2.191
2.177
2.163
2.147
2.082
2.066
2.051
2.034
2.017
1.846
1.529
1.506
Me
Me
O
OMe
O
N
N
Me
1.03
1.11
1.09
2.05
1.08
1.00
2.95
1.00
1.07
2.24
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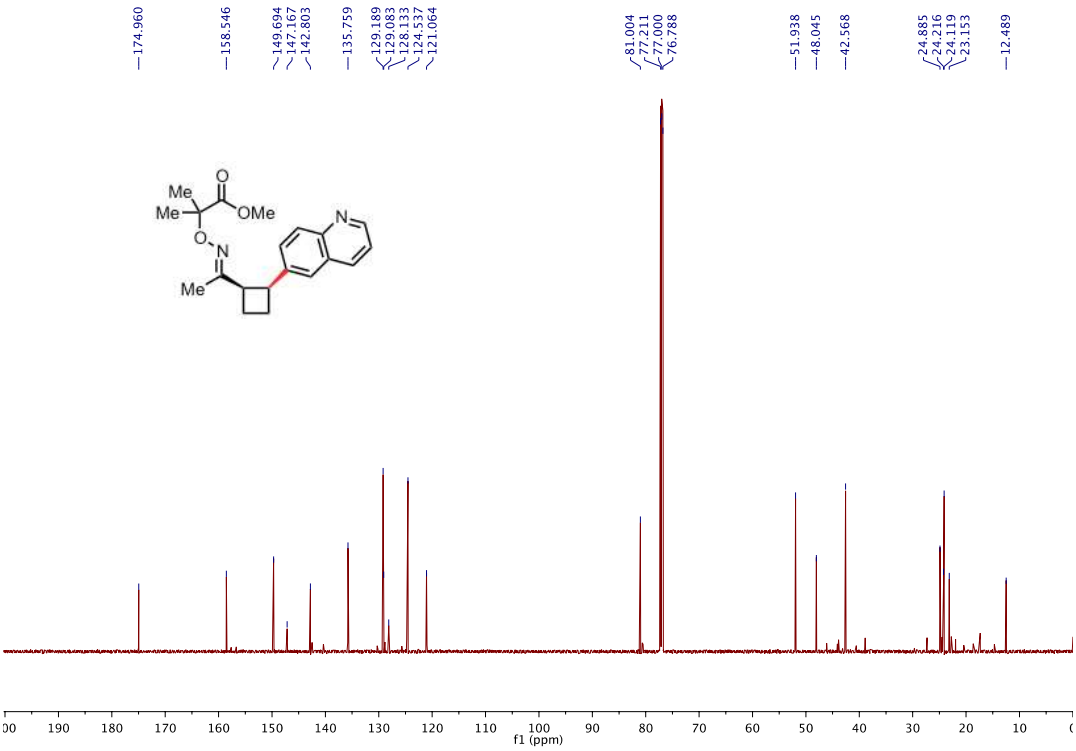
3.05
3.02
2.92
f1 (ppm)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129.083
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124.537
121.064
81.004
77.211
77.000
76.788
51.938
48.045
42.568
24.885
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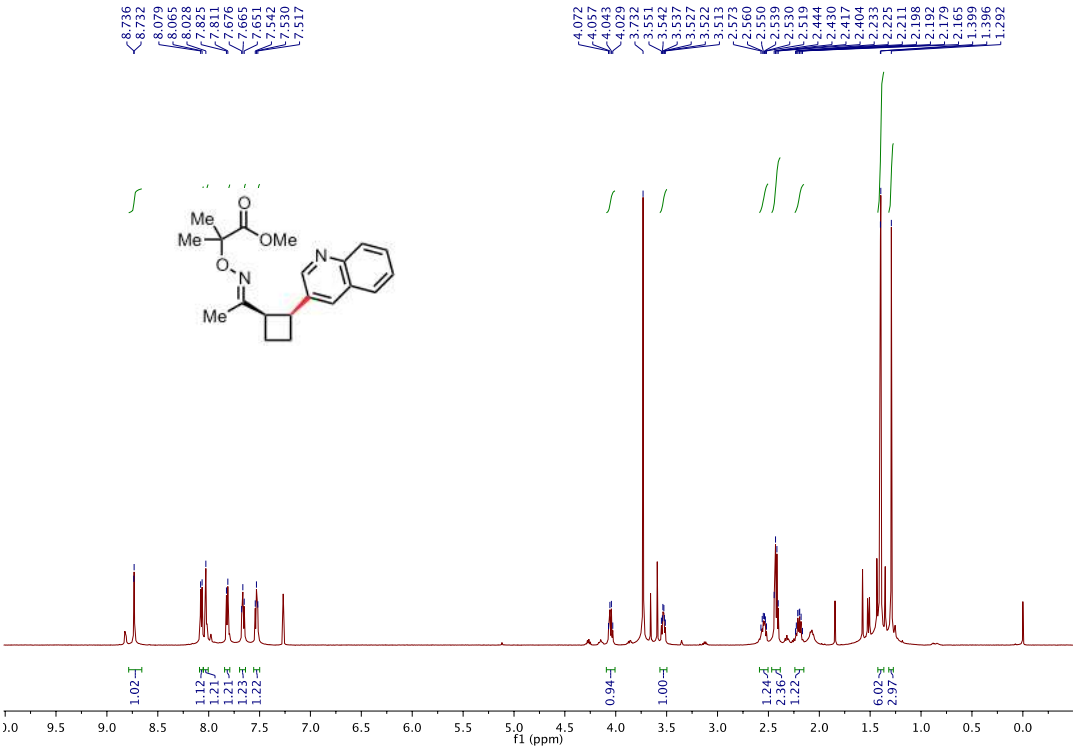
24.119
23.153
12.489
Me
Me
O
OMe
O
N
N
Me
f1 (ppm)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8.079
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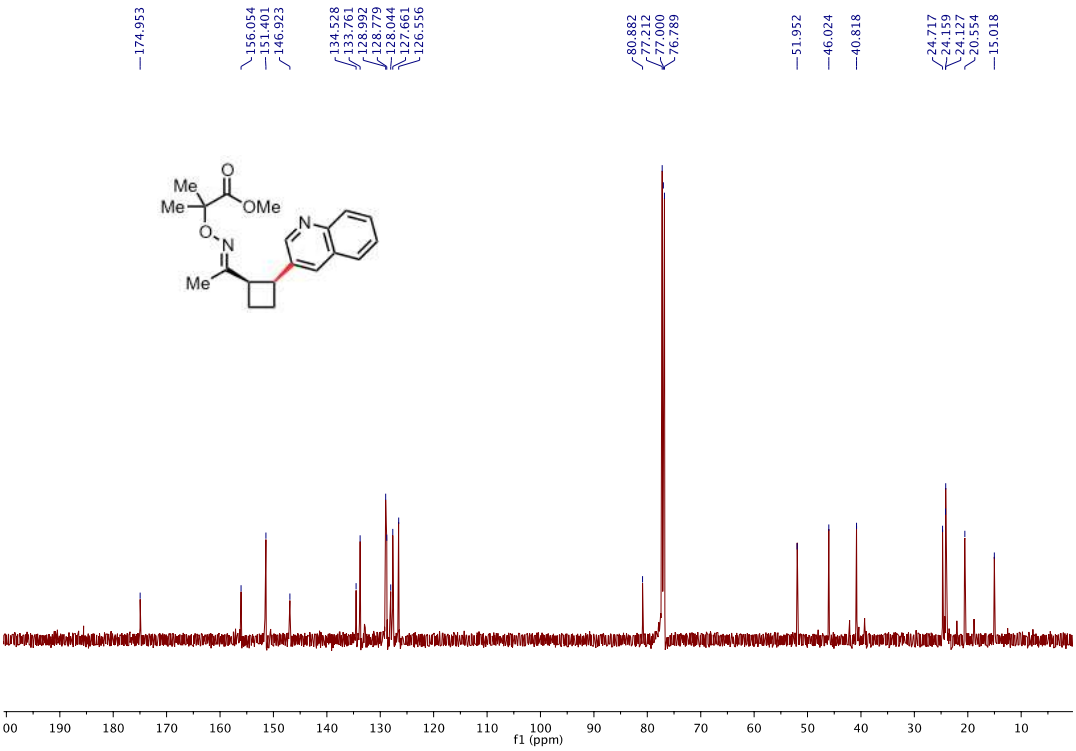
7.811
7.676
7.665
7.651
7.542
7.530
7.517
4.072
4.057
4.043
4.029
3.732
3.551
3.542
3.537
3.527
3.522
3.513
2.573
2.560
2.550
2.539
2.530
2.519
2.444
2.430
2.417
2.404
2.233
2.225
2.211
2.198
2.192
2.179
2.165
1.399
1.396
1.292
Me
Me
O
OMe
O
N
Me
N
1.02
1.12
1.21
1.21
1.23
1.22
0.94
1.00
1.24
2.36
1.22
6.02
2.97
f1 (ppm)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77.000
76.789
51.952
46.024
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24.127
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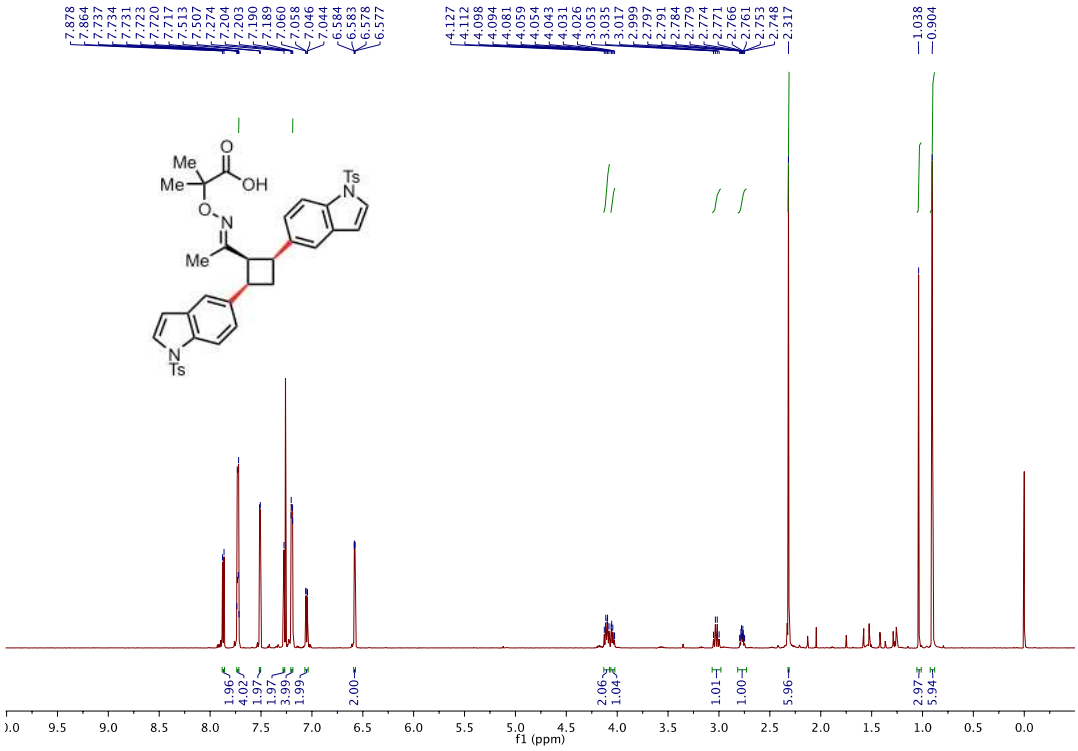
Me
O
OMe
O
N
Me
N
f1 (ppm)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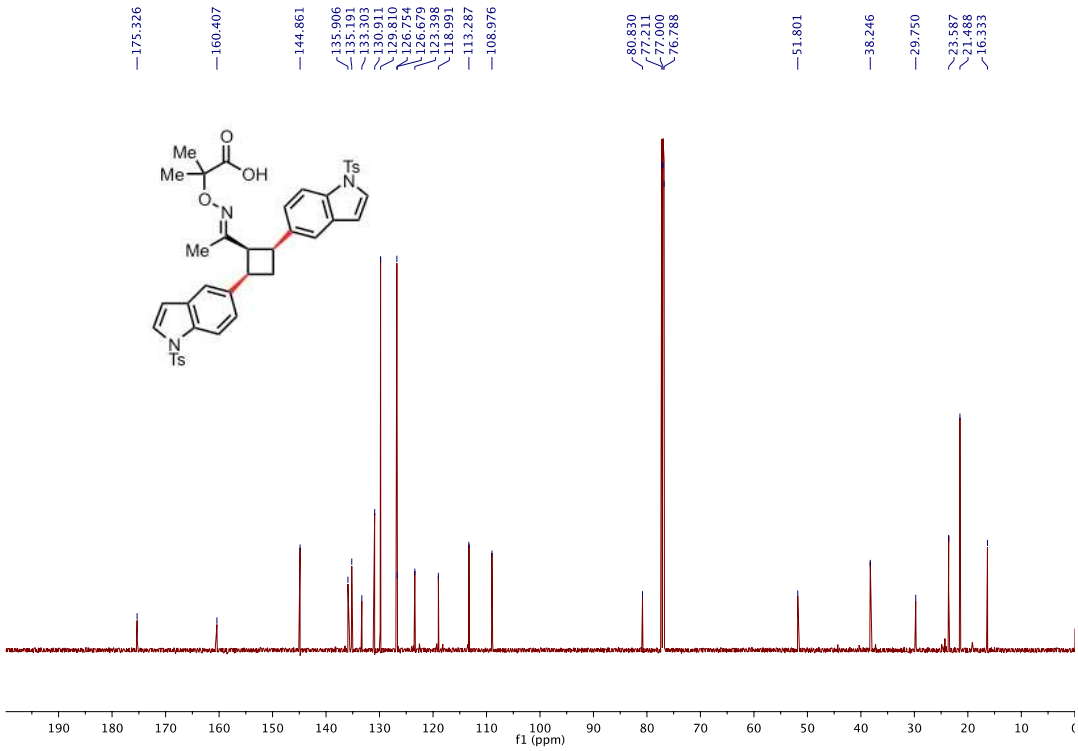
7.723
7.720
7.717
7.513
7.507
7.274
7.204
7.203
7.190
7.189
7.060
7.058
7.046
7.044
6.584
6.583
6.578
6.577
4.127
4.112
4.098
4.094
4.081
4.059
4.054
4.043
4.031
4.026
3.053
3.035
3.017
2.999
2.797
2.791
2.784
2.779
2.774
2.771
2.766
2.761
2.753
2.748
2.317
1.038
0.904
Me
Me
O
OH
O
N
Me
Ts
N
N
Ts
1.96
4.02
1.97
1.97
3.99
1.99
2.00
2.06
1.04
1.01
1.00
5.96
2.97
5.94
f1 (ppm)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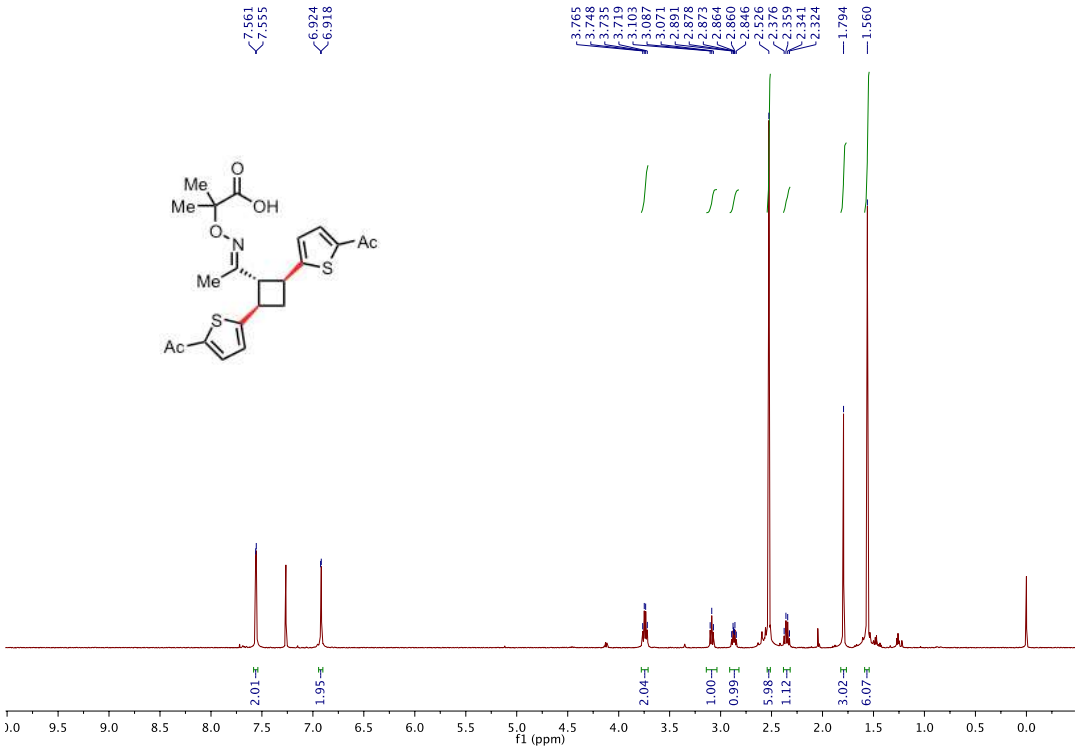
133.303
130.911
129.810
126.754
126.679
123.398
118.991
113.287
108.976
80.830
77.211
77.000
76.788
51.801
38.246
29.750
23.587
21.488
16.333
Me
Me
O
OH
O
N
Me
Ts
N
N
Ts
f1 (ppm)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7.555
6.924
6.918
3.765
3.748
3.735
3.719
3.103
3.087
3.071
2.891
2.878
2.873
2.864
2.860
2.846
2.526
2.376
2.359
2.341
2.324
1.794
1.560
Me
Me
O
OH
O
N
Me
Ac
S
S
Ac
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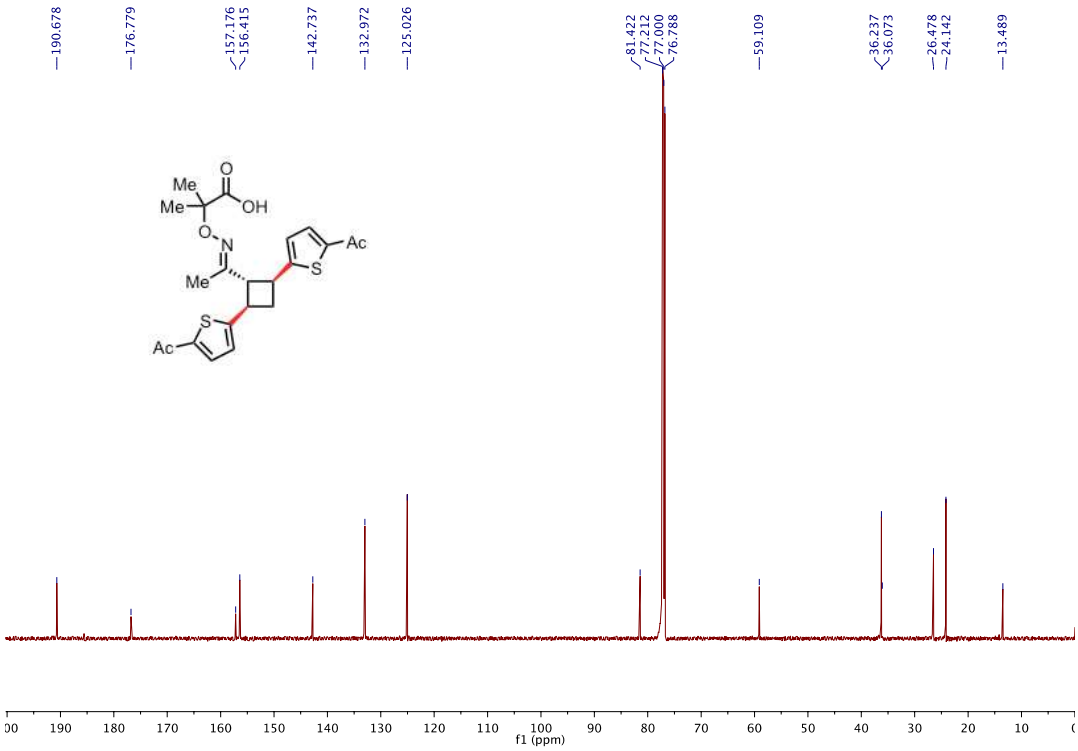
1.95
2.04
1.00
0.99
5.98
1.12
3.02
6.07
f1 (ppm)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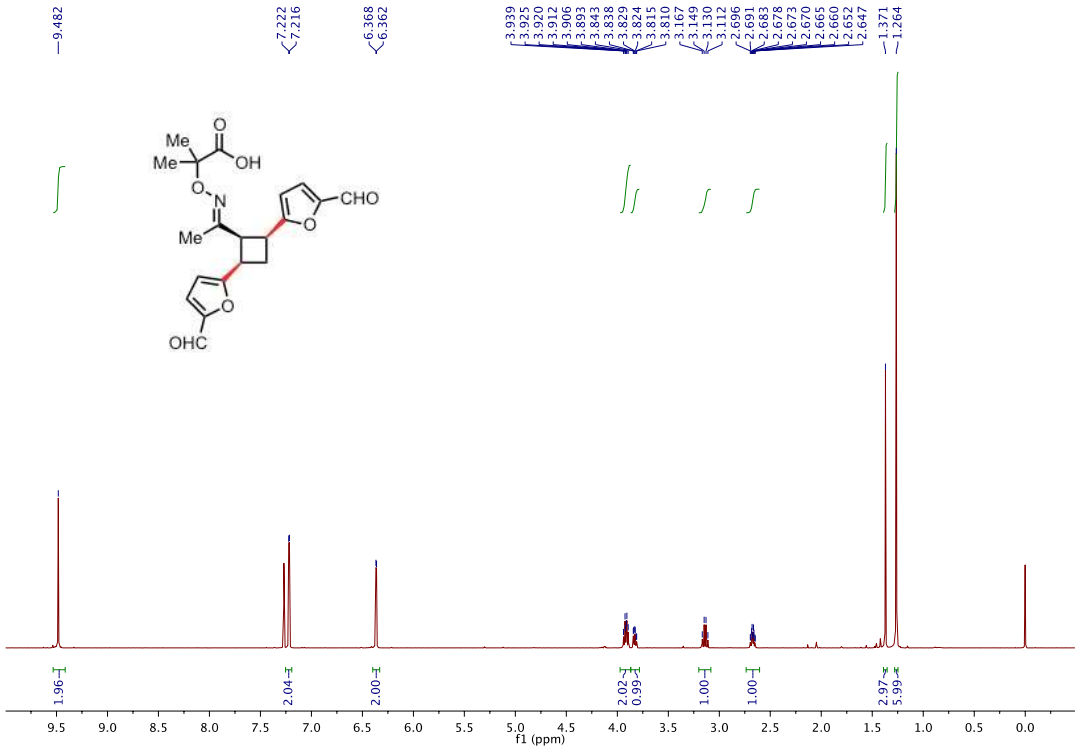
156.415
142.737
132.972
125.026
81.422
77.212
77.000
76.788
59.109
36.237
36.073
26.478
24.142
13.489
Me
Me
O
OH
O
N
Me
Ac
S
S
Ac
f1 (ppm)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7.216
6.368
6.362
3.939
3.925
3.920
3.912
3.906
3.893
3.843
3.838
3.829
3.824
3.815
3.810
3.167
3.149
3.130
3.112
2.696
2.691
2.683
2.678
2.673
2.670
2.665
2.660
2.652
2.647
1.371
1.264
Me
Me
O
OH
O
N
Me
CHO
O
O
OHC
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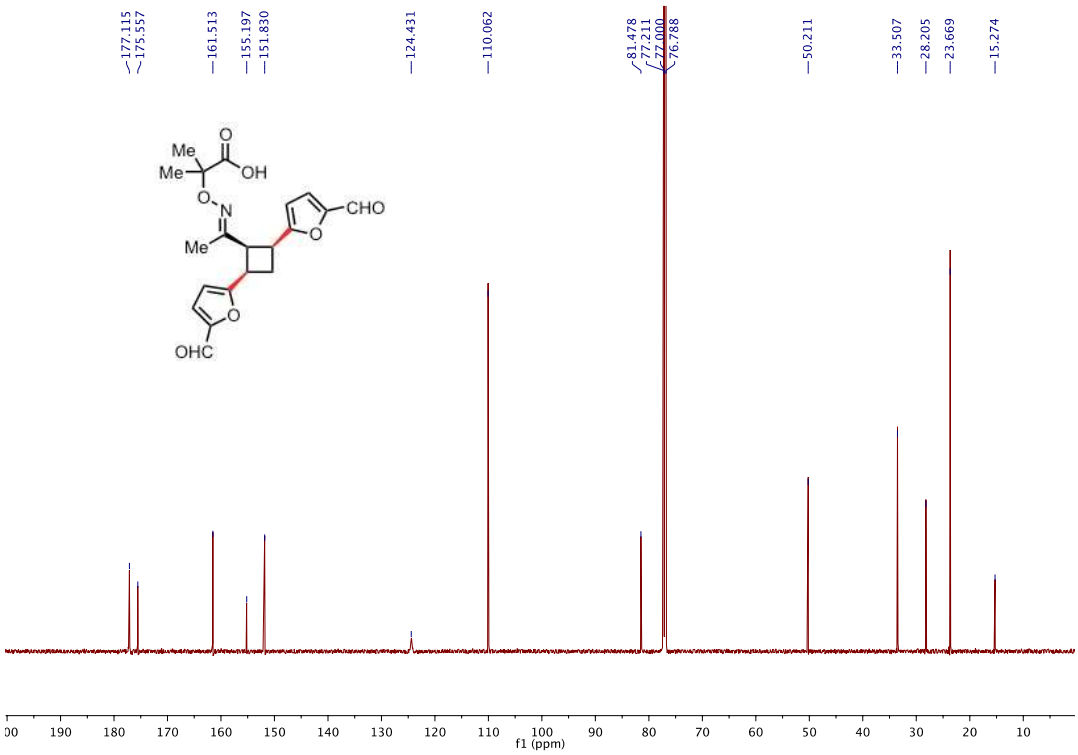
2.04
2.00
2.02
0.99
1.00
1.00
2.97
5.99
f1 (ppm)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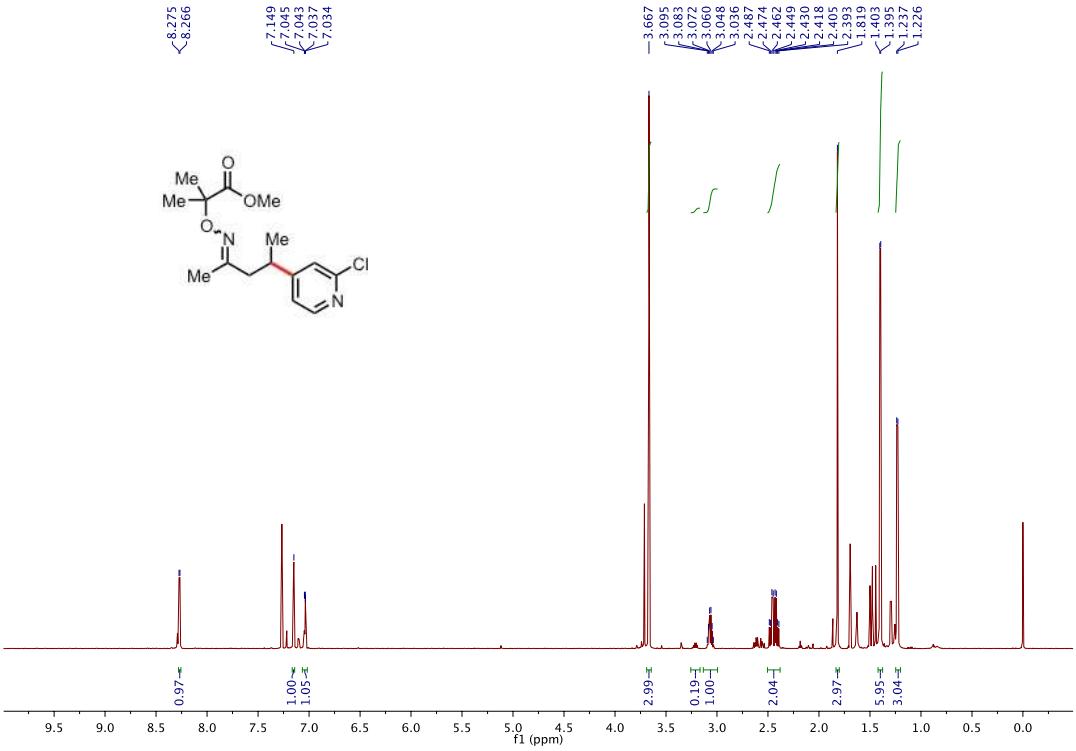
151.830
124.431
110.062
81.478
77.211
77.000
76.788
50.211
33.507
28.205
23.669
15.274
Me
Me
O
OH
O
N
Me
CHO
O
O
OHC
f1 (ppm)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7.149
7.045
7.043
7.037
7.034
3.667
3.095
3.083
3.072
3.060
3.048
3.036
2.487
2.474
2.462
2.449
2.430
2.418
2.405
2.393
1.819
1.403
1.395
1.237
1.226
Me
Me
O
OMe
O
N
Me
Me
Cl
N
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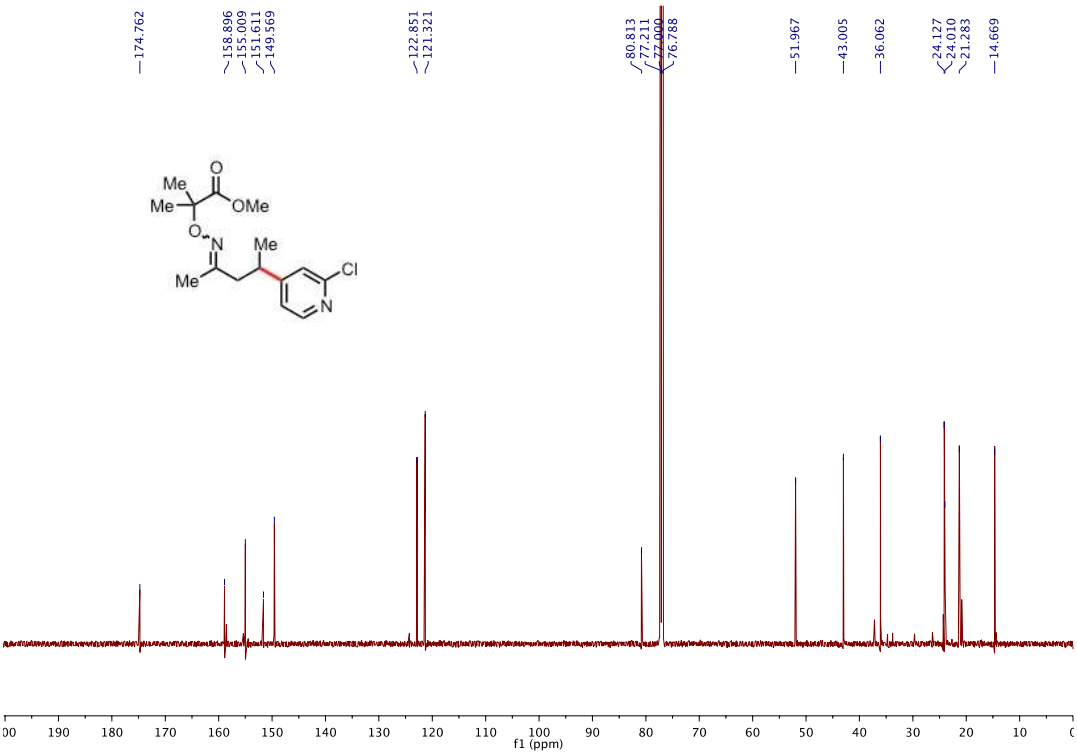
1.00
1.05
2.99
0.19
1.00
2.04
2.97
5.95
3.04
f1 (ppm)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121.321
80.813
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77.000
76.788
51.967
43.005
36.062
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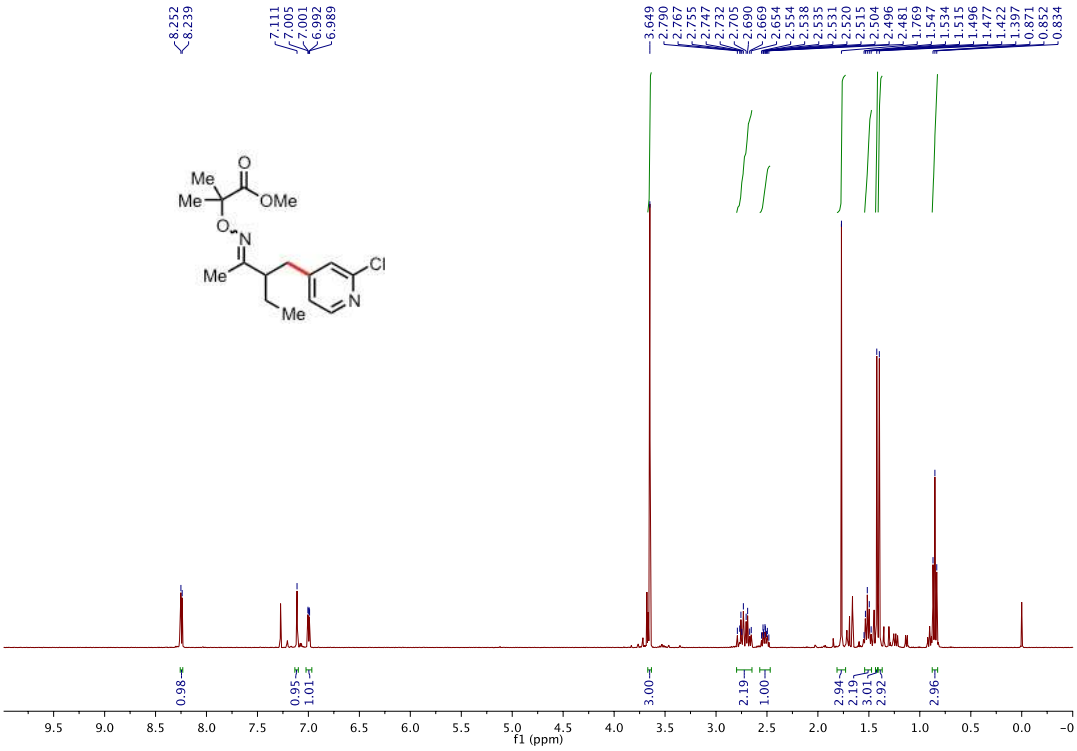
24.010
21.283
14.669
Me
Me
O
OMe
O
N
Me
Me
Cl
N
f1 (ppm)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7.005
7.001
6.992
6.989
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2.790
2.767
2.755
2.747
2.732
2.705
2.690
2.669
2.654
2.554
2.538
2.535
2.531
2.520
2.515
2.504
2.496
2.481
1.769
1.547
1.534
1.515
1.496
1.477
1.422
1.397
0.871
0.852
0.834
Me
Me
O
OMe
O
N
Me
Me
Cl
N
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1.00
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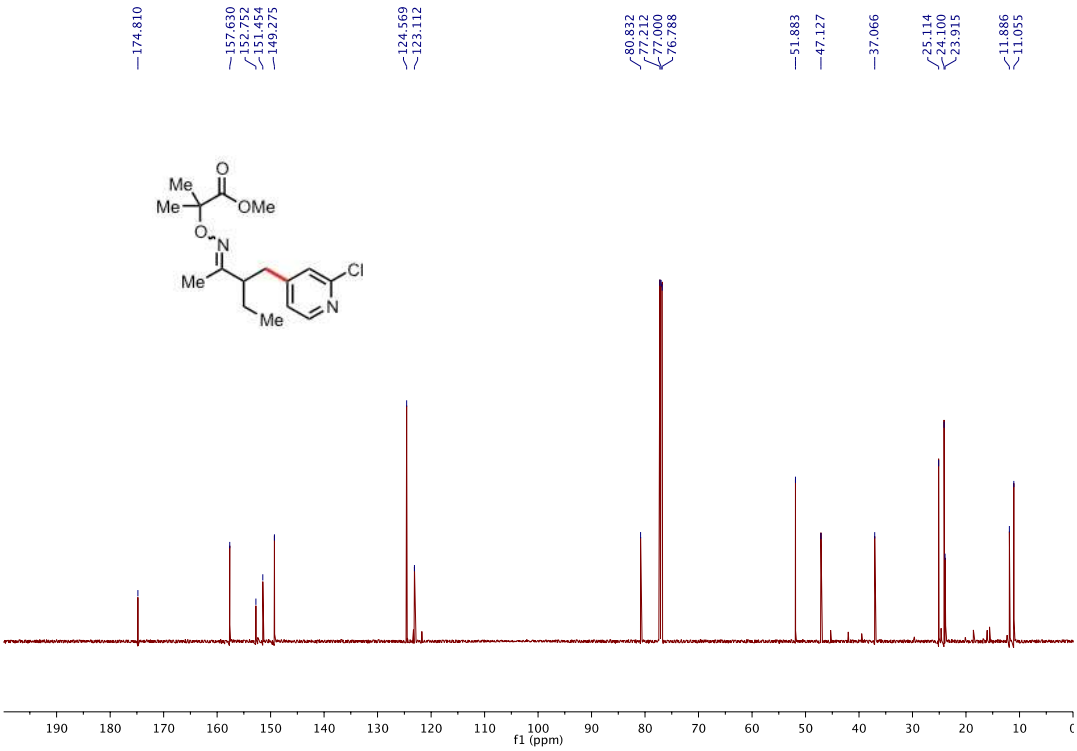
2.19
3.01
2.92
2.96
f1 (ppm)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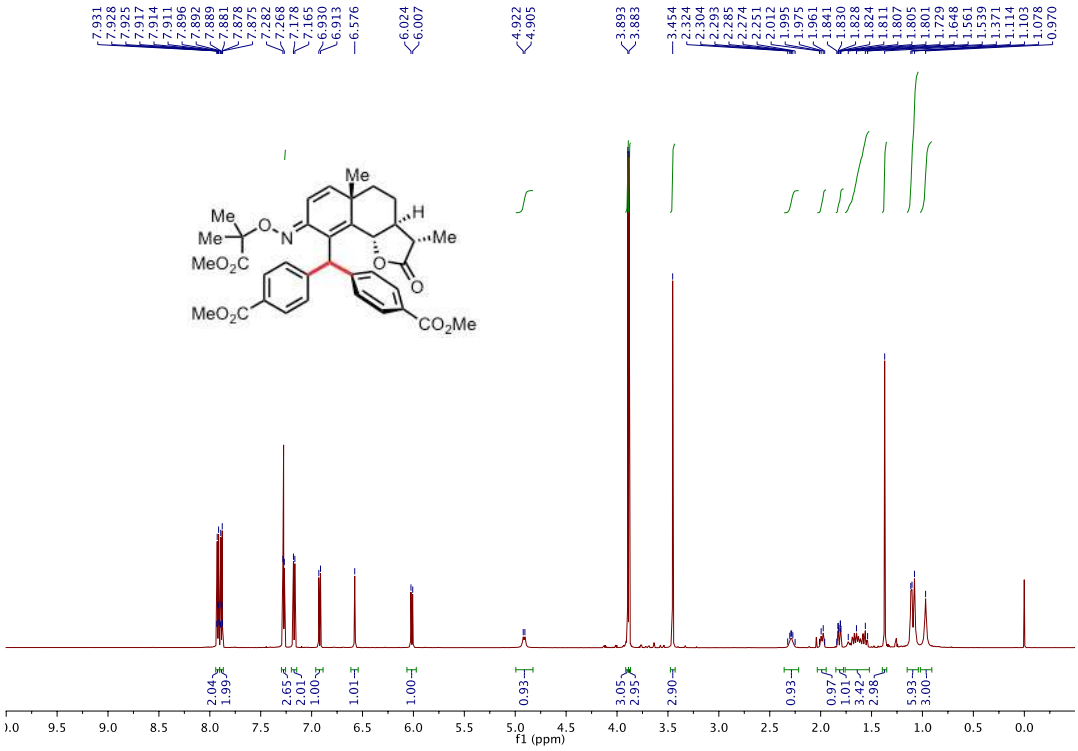
80.832
77.212
77.000
76.788
51.883
47.127
37.066
25.114
24.100
23.915
11.886
11.055
Me
Me
O
OMe
O
N
Me
Me
Cl
N
f1 (ppm)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7.917
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7.896
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7.889
7.881
7.878
7.875
7.282
7.268
7.178
7.165
6.930
6.913
6.576
6.024
6.007
4.922
4.905
3.893
3.883
3.454
2.324
2.304
2.293
2.285
2.274
2.251
2.012
1.995
1.975
1.961
1.841
1.830
1.828
1.824
1.811
1.807
1.805
1.801
1.729
1.648
1.561
1.539
1.371
1.114
1.103
1.078
0.970
Me
Me
Me
O
N
H
Me
MeO2C
O
O
MeO2C
CO2Me
2.04
1.99
2.65
2.01
1.00
1.01
1.00
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2.90
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0.97
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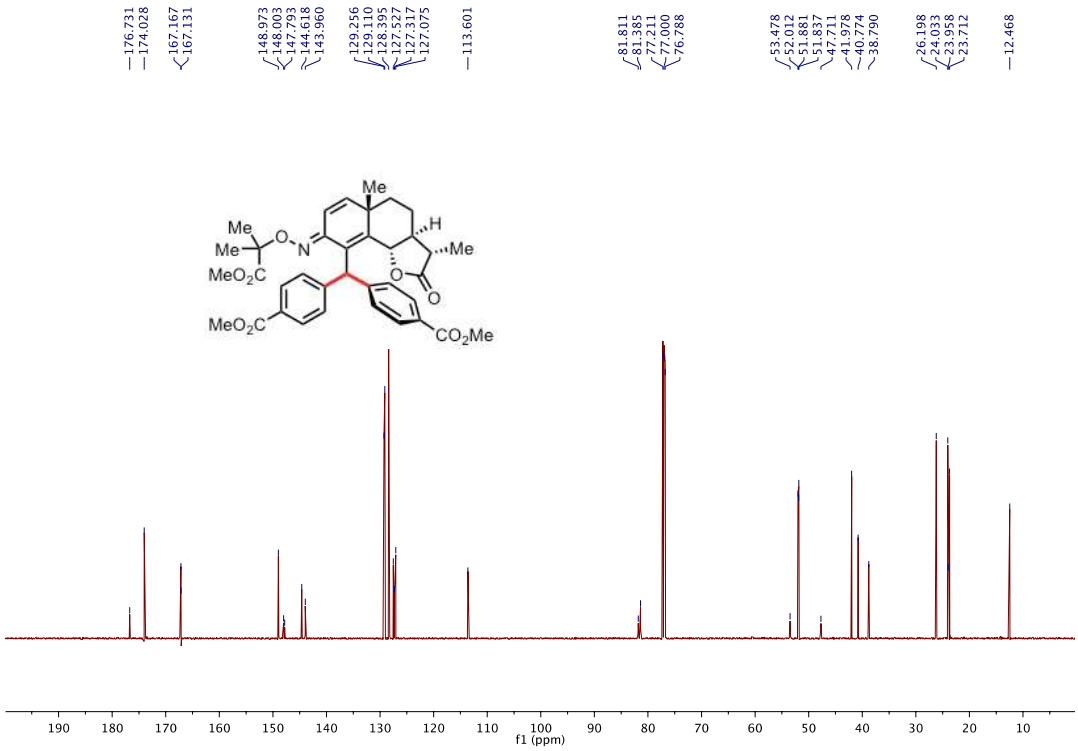
5.93
3.00
f1 (ppm)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129.110
128.395
127.527
127.317
127.075
113.601
81.811
81.385
77.211
77.000
76.788
53.478
52.012
51.881
51.837
47.711
41.978
40.774
38.790
26.198
24.033
23.958
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12.468
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Me
Me
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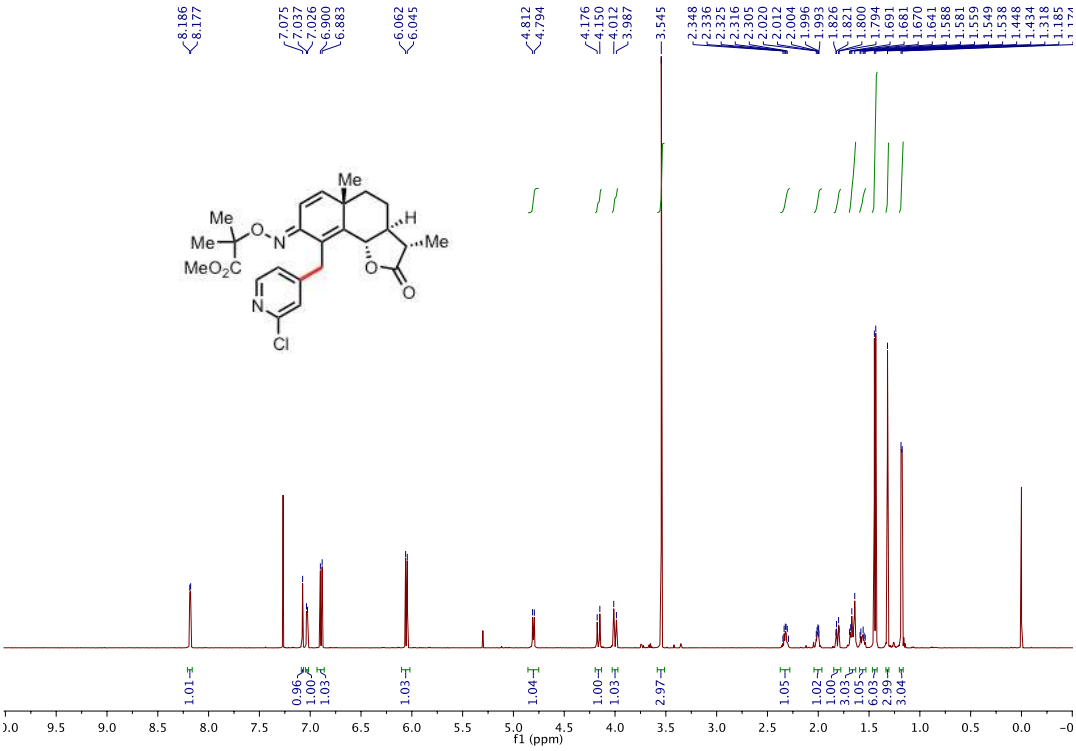
N
H
Me
MeO2C
O
O
MeO2C
CO2Me
f1 (ppm)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6.062
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4.794
4.176
4.150
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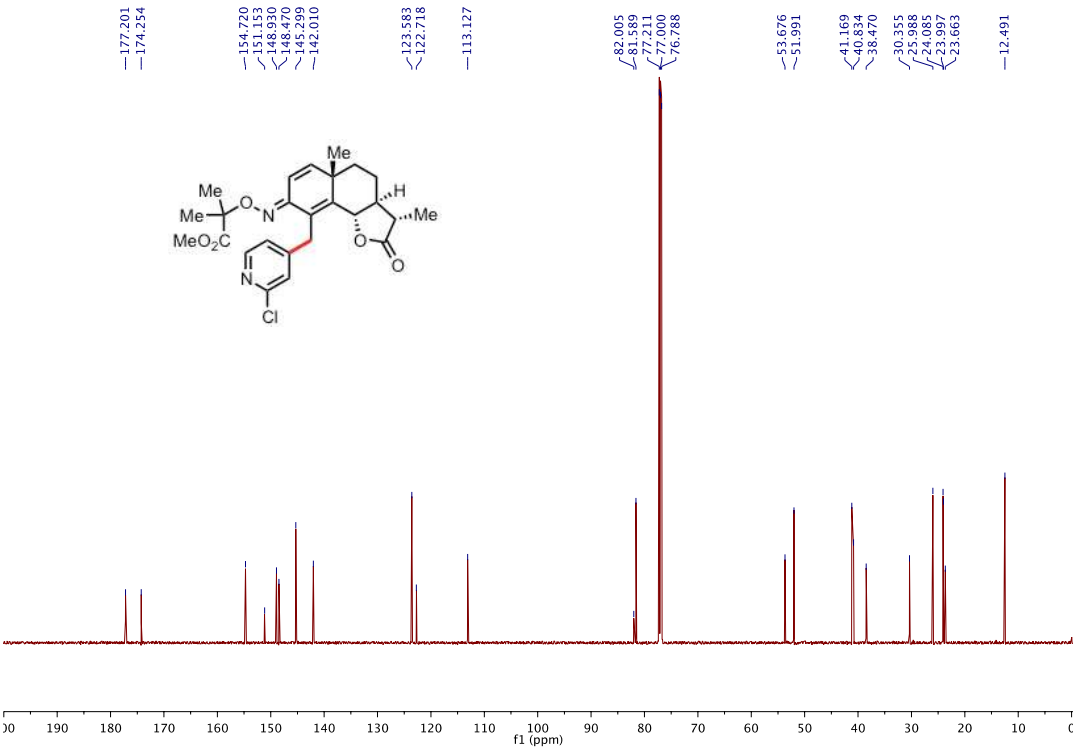
Me
Me
Me
MeO2C
O
N
H
Me
O
O
N
Cl
f1 (ppm)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122.718
113.127
82.005
81.589
77.211
77.000
76.788
53.676
51.991
41.169
40.834
38.470
30.355
25.988
24.085
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23.663
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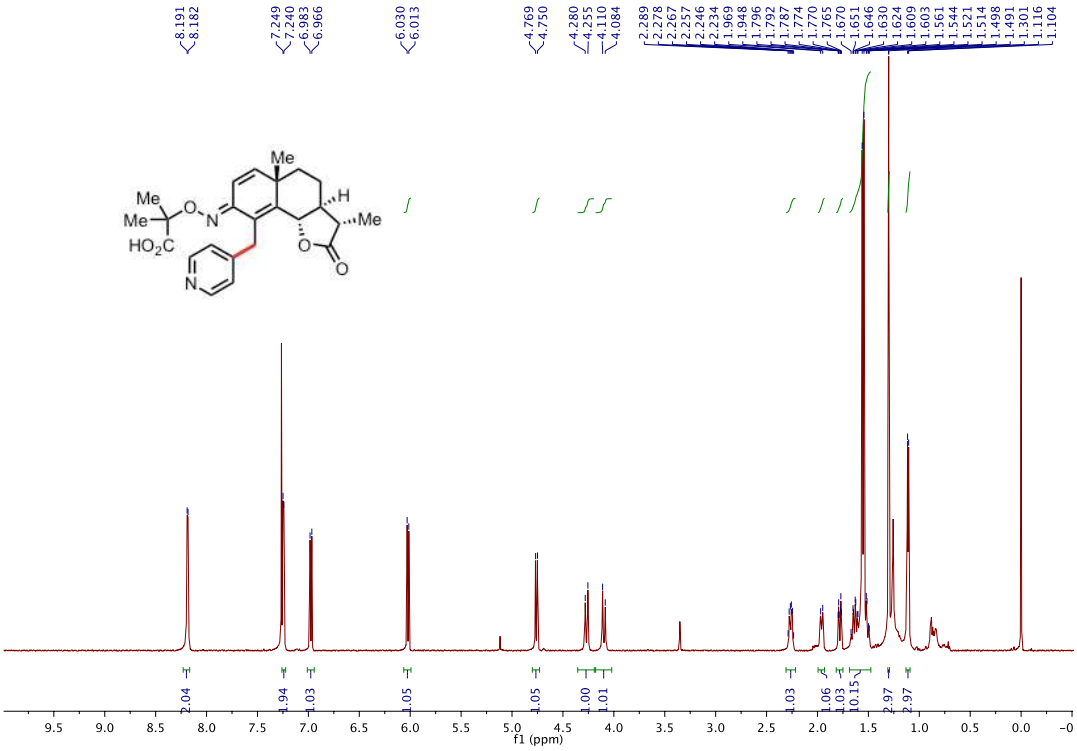
Me
Me
Me
MeO2C
O
N
H
Me
O
O
N
Cl
f1 (ppm)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4.255
4.110
4.084
2.289
2.278
2.267
2.257
2.246
2.234
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1.948
1.796
1.792
1.787
1.774
1.770
1.765
1.670
1.651
1.646
1.630
1.624
1.609
1.603
1.561
1.544
1.521
1.514
1.498
1.491
1.301
1.116
1.104
Me
Me
Me
HO2C
N
O
H
Me
O
O
N
2.04
1.94
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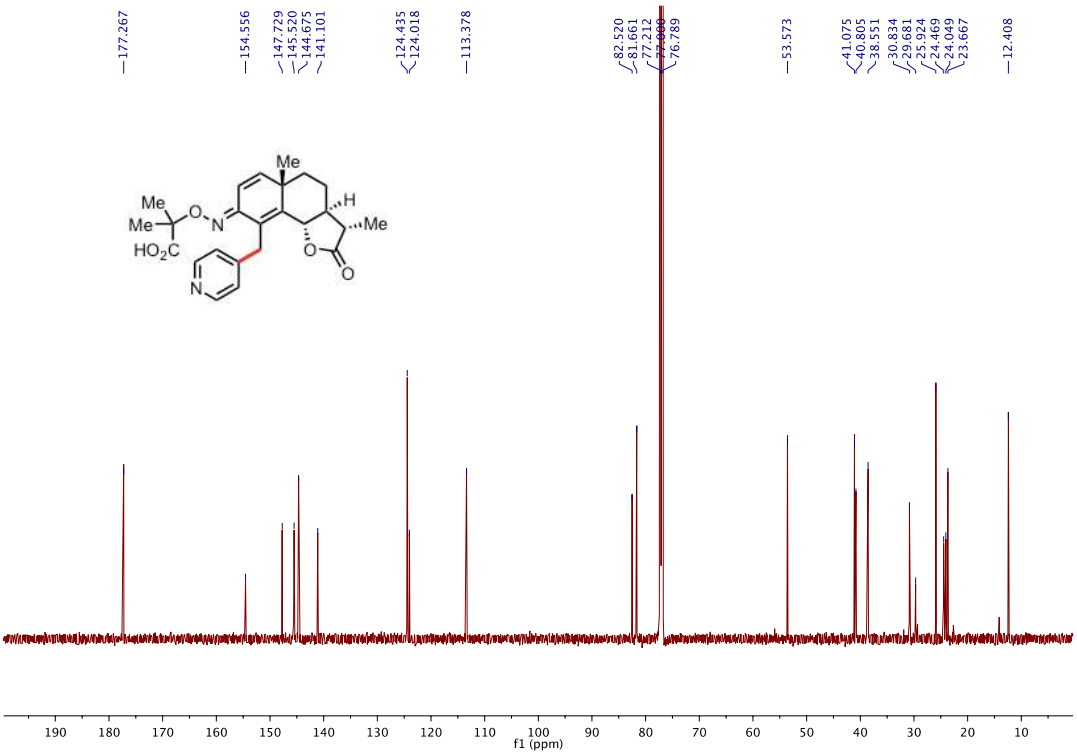
2.97
f1 (ppm)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77.000
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53.573
41.075
40.805
38.551
30.834
29.681
25.524
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12.408
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Me
Me
HO2C
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H
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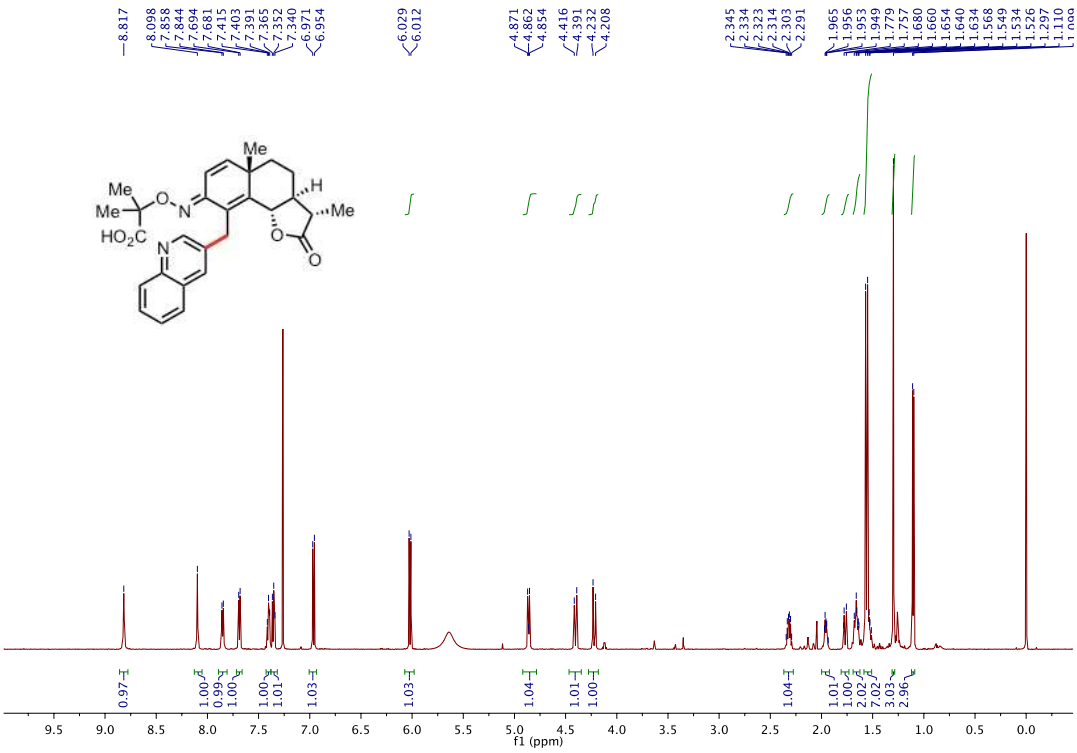
O
O
N
f1 (ppm)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4.416
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4.232
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1.534
1.526
1.297
1.110
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Me
Me
HO2C
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O
H
Me
O
O
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0.99
1.00
1.00
1.01
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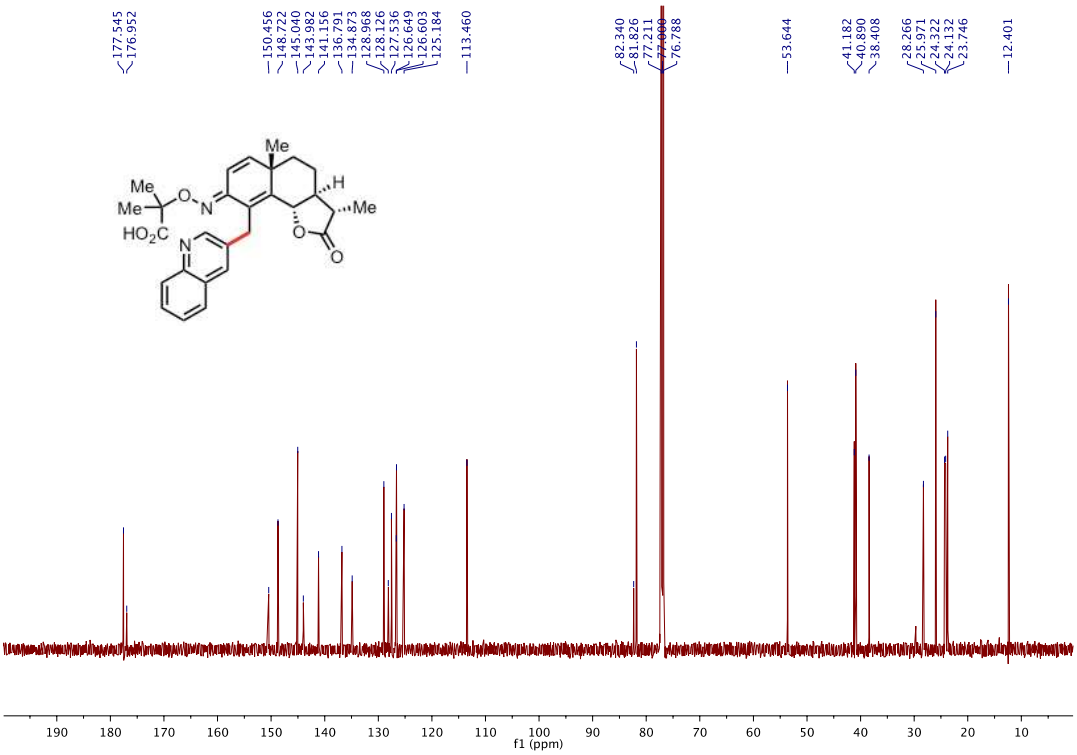
f1 (ppm)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126.649
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125.184
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82.340
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77.211
77.000
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53.644
41.182
40.890
38.408
28.266
25.371
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24.132
23.746
12.401
Me
Me
Me
HO2C
N
O
H
Me
O
O
f1 (ppm)