# Supporting Information

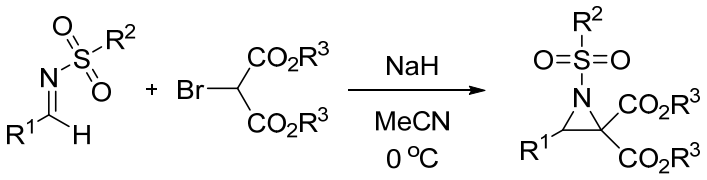
## CONTENTS:

**(A) General remarks**

$^1$H NMR spectra were recorded on commercial instruments (400 MHz). Chemical shifts were recorded in ppm relative to tetramethylsilane and with the solvent resonance as the internal standard ($CDCl_3$, δ = 7.26). Data were reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants (Hz), integration. $^{13}$C NMR data were collected on commercial instruments (100 MHz) with complete proton decoupling. Chemical shifts were reported in ppm from the tetramethylsilane with the solvent resonance as internal standard ($CDCl_3$, δ = 77.0; DMSO-$d_6$, δ = 39.5). Enantiomeric excesses were determined by chiral HPLC analysis on Daicel Chiralcel IE, ID and IA at 23 $^o$C with UV detector at 210 nm in comparison with the authentic racemates. Optical rotations were reported as follows: $[\alpha]_\lambda^T$ (c: g/100 mL, in solvent, λ). HRMS was recorded on a commercial apparatus (ESI source). All the reactions were carried out under an atmosphere of nitrogen in oven-dried apparatus. All the solvents were purified by usual methods before use. Molecular sieves were activated at 500 $^o$C for 5 h before use. All the liquid aldehydes were freshly distilled prior to use. All the solid aldehydes were used after recrystallization with petroleum ether. All the imines were prepared according to literature.[1] Chromatography: Silica gel (HG/T2354-2010) made in Qingdao Haiyang Chemical Co., Ltd; Basic aluminum oxide (pH = 9-10) made in Shanghai Ludu Chemical Co., Ltd.

**(B) Preparation of aziridines**

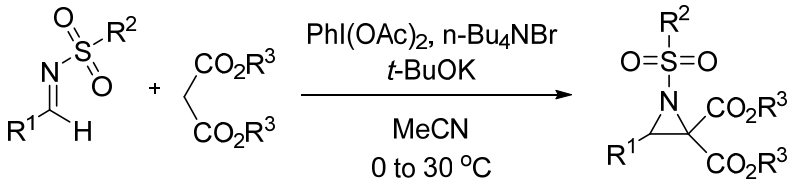
*Method A*[2a]




*General Procedure:* Under $N_2$ atmosphere, to a solution of imine (5.0 mmol) and 2-bromomalonate (5.5 mmol) in dry MeCN (50 mL) were added NaH (5.5 mmol) at 0 $^o$C. After 20 min, the mixture was filtrated through a thin layer of silica gel with

$CH_2Cl_2$. The filtrates were concentrated and quickly purified by flash chromatography (Eluent: Ethyl acetate:Petroleum ether = 1:10 - 3:7) to afford the corresponding aziridines. (Ease for gram-scale preparation)

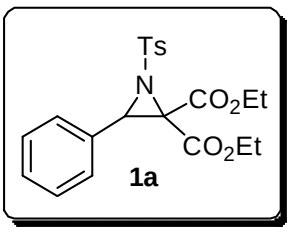
*Method B*[2b]




*General Procedure:* To a solution of imine (5.0 mmol) and $CH_2(CO_2R^3)_2$ (6.0 mmol) in anhydrous MeCN (45 mL) were added $PhI(OAc)_2$ (10.0 mmol), n-$Bu_4NBr$ (10.0 mmol) and t-BuOK (2.5 mmol) at 0 °C. The reaction mixture was warmed up to 30 °C and continuously stirred for approximately 3 h. Then the resultant suspensions were filtered, concentrated, directly purified by flash column chromatography (Eluent: Ethyl acetate:Petroleum ether = 1:10 - 3:7) to provide the corresponding aziridines.

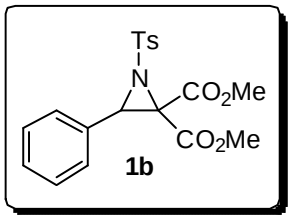
## (C) The analytical and spectral characterization data of aziridines

**Diethyl 3-phenyl-1-tosylaziridine-2, 2′-dicarboxylate (1a)**



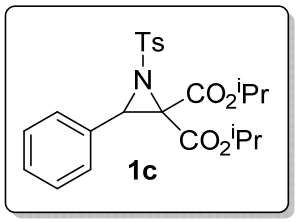

Prepared by *Method A*. Colorless oil, 86% yield. $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ = 7.96 (d, $J$ = 8.4 Hz, 2H), 7.35 (d, $J$ = 8.0 Hz, 2H), 7.28 - 7.21 (m, 5H), 4.88 (s, 1H), 4.43 - 4.35 (m, 2H), 3.95 (dd, $J$ = 7.2 Hz, 14.0 Hz, 2H), 2.44 (s, 3H), 1.37 (t, $J$ = 7.2 Hz, 3H), 0.88 (t, $J$ = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ = 163.1, 162.5, 144.7, 136.6, 131.0, 129.7, 128.8, 128.4, 127.7, 127.0, 63.4, 62.1, 57.5, 49.7, 21.7, 13.8, 13.6. HRMS (ESI-TOF) calcd for $C_{21}H_{23}KNO_6S^+$ ([M+$K^+$]) = 456.0878, Found 456.0870.

**Dimethyl 3-phenyl-1-tosylaziridine-2, 2′-dicarboxylate (1b)**



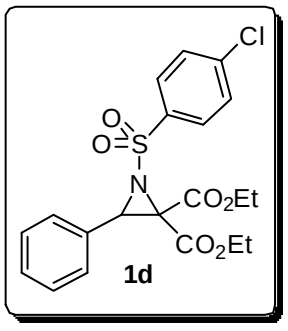

Prepared by *Method A*. Colorless oil, 80% yield. $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ = 7.94 (d, $J$ = 8.0 Hz, 2H), 7.35 (d, $J$ = 8.0 Hz, 2H), 7.29 - 7.20 (m, 5H), 4.89 (s, 1H), 3.92 (s, 3H), 3.47 (s, 3H), 2.43 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ = 163.6, 163.0, 145.0, 136.2, 130.9, 129.8, 129.0, 128.5, 127.7, 126.9, 57.3, 54.1, 53.0, 49.8, 21.7. HRMS (ESI-TOF) calcd for $C_{19}H_{19}NNaO_6S^+$ ([M+$Na^+$]) = 412.0826, Found 412.0835.

**Diisopropyl 3-phenyl-1-tosylaziridine-2, 2′-dicarboxylate (1c)**



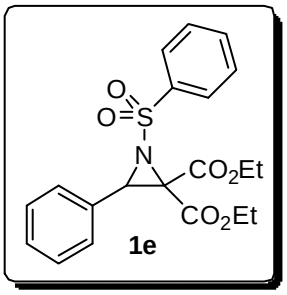

Prepared by *Method B*. Colorless oil, 42% yield. $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ = 7.99 - 7.95 (m, 2H), 7.36 - 7.32 (m, 2H), 7.27 - 7.20 (m, 5H), 5.28 - 5.20 (m, 1H), 4.88 (s, 1H), 4.83 - 4.75 (m, 1H), 2.44 (s, 3H), 1.37 (d, $J$ = 6.4 Hz, 3H), 1.33 (d, $J$ = 6.0 Hz, 3H), 1.05 (d, $J$ = 6.0 Hz, 3H), 0.72 (d, $J$ = 6.4 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ = 162.6, 161.9, 144.6, 136.9, 131.2, 129.7, 128.8, 128.3, 127.6, 127.0, 71.4, 69.9, 57.8, 49.8, 21.7, 21.4, 21.1. HRMS (ESI-TOF) calcd for $C_{23}H_{27}NNaO_6S^+$ ([M+$Na^+$]) = 468.1452, Found 468.1454.

**Diethyl 3-phenyl-1-(4-chlorobenzenesulfonyl)aziridine-2, 2′-dicarboxylate (1d)**



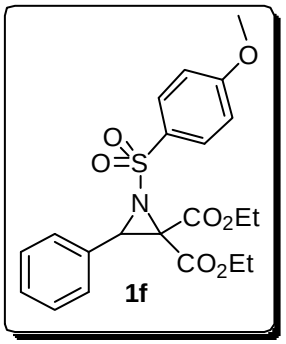

Prepared by *Method A*. Colorless oil, 66% yield. $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ = 8.03 (d, $J$ = 8.4 Hz, 2H), 7.54 (d, $J$ = 8.8 Hz, 2H), 7.30 - 7.25 (m, 3H), 7.25 - 7.20 (m, 2H), 4.93 (s, 1H), 4.40 (dd, $J$ = 6.4 Hz, 13.6 Hz, 2H), 3.96 (dd, $J$ = 6.8 Hz, 14 Hz, 2H), 1.37 (t, $J$ = 7.2 Hz, 3H), 0.89 (t, $J$ = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ = 163.0, 162.3, 140.4, 138.2, 130.8, 129.5, 129.1, 128.5, 126.9, 63.6, 62.3, 57.7, 50.1, 13.8, 13.6. HRMS (ESI-TOF) calcd for $C_{20}H_{21}{}^{34.9689}ClNO_6S^+$ ([M+$H^+$]) = 438.0773, Found 438.0774. HRMS (ESI-TOF) calcd for $C_{20}H_{21}{}^{36.9659}ClNO_6S^+$ ([M+$H^+$]) = 440.0744, Found 440.0765.

**Diethyl 3-phenyl-1-benzenesulfonylaziridine-2, 2′-dicarboxylate (1e)**



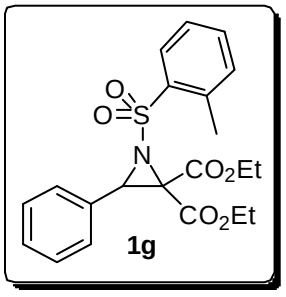

Prepared by *Method A*. Colorless oil, 91% yield. $^{1}$H NMR (400 MHz, $CDCl_3$) δ = 8.09 (d, *J* = 7.6 Hz, 2H), 7.65 (t, *J* = 7.2 Hz, 1H), 7.56 (t, *J* = 7.2 Hz, 2H), 7.29 - 7.20 (m, 5H), 4.92 (s, 1H), 4.40 (dd, *J* = 6.8 Hz, 14.0 Hz, 2H), 3.95 (dd, *J* = 7.2 Hz, 14.0 Hz, 2H), 1.37 (t, *J* = 6.8 Hz, 3H), 0.88 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.1, 162.5, 139.6, 133.8, 130.9, 129.1, 128.9, 128.4, 127.6, 127.0, 63.5, 62.2, 57.5, 49.9, 13.8, 13.6. HRMS (ESI-TOF) calcd for $C_{20}H_{21}NNaO_6S^+$ ([M+$Na^+$]) = 426.0982, Found 426.0987.

**Diethyl 3-phenyl-1-(4-methoxylbenzenesulfonyl)aziridine-2, 2′-dicarboxylate (1f)**



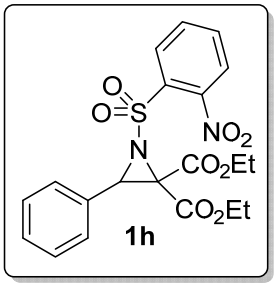

Prepared by *Method A*. Colorless oil, 98% yield. $^{1}$H NMR (400 MHz, $CDCl_3$) δ = 8.00 (d, *J* = 9.2 Hz, 2H), 7.30 - 7.20 (m, 5H), 7.01 (d, *J* = 8.8 Hz, 2H), 4.86 (s, 1H), 4.44 - 4.33 (m, 2H), 3.94 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 3.85 (s, 3H), 1.36 (t, *J* = 7.2 Hz, 3H), 0.87 (t, *J* = 6.8 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.8, 163.1, 162.5, 131.0, 130.8, 130.0, 128.8, 128.4, 127.0, 114.3, 63.3, 62.1, 57.4, 55.7, 49.6, 13.8, 13.6. HRMS (ESI-TOF) calcd for $C_{21}H_{23}NNaO_7S^+$ ([M+$Na^+$]) = 456.1088, Found 456.1088.

**Diethyl 3-phenyl-1-(2-methylbenzenesulfonyl)aziridine-2, 2′-dicarboxylate (1g)**



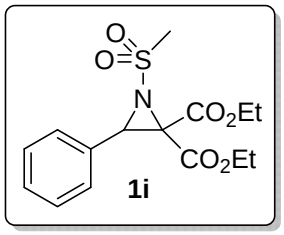

Prepared by *Method A*. Colorless oil, 46% yield. $^{1}$H NMR (400 MHz, $CDCl_3$) δ = 8.00 (d, *J* = 7.6 Hz, 1H), 7.48 (t, *J* = 7.2 Hz, 1H), 7.37 (d, *J* = 7.2 Hz, 1H), 7.30 - 7.18 (m, 6H), 4.97 (s, 1H), 4.44 - 4.27 (m, 2H), 3.98 - 3.84 (m, 2H), 2.93 (s, 3H), 1.32 (t, *J* = 7.2 Hz, 3H), 0.85 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.0, 162.6, 139.1, 137.4, 134.0, 132.7, 131.1, 129.1, 129.0, 128.4, 126.9, 126.1, 63.3, 62.1, 57.4, 49.9, 20.5, 13.7, 13.6. HRMS (ESI-TOF) calcd for $C_{21}H_{24}NO_6S^+$ ([M+$H^+$]) = 418.1319, Found 418.1321.

**Diethyl 3-phenyl-1-(2-nitrobenzenesulfonyl)aziridine-2, 2′-dicarboxylate (1h)**



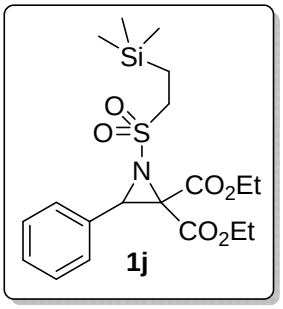

Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 74% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 8.48 - 8.32 (m, 1H), 7.94 - 7.76 (m, 3H), 7.38 - 7.27 (m, 5H), 5.12 (s, 1H), 4.42 (dd, *J* = 7.2, 14.4 Hz, 2H), 4.08 - 3.92 (m, 2H), 1.39 (t, *J* = 7.2 Hz, 3H), 0.90 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.2, 162.3, 147.9, 134.5, 133.9, 132.91, 131.0, 130.9, 129.0, 128.4, 126.9, 125.1, 63.7, 62.3, 58.4, 52.5, 13.8, 13.6. HRMS (ESI-TOF) calcd for $C_{20}H_{20}N_2NaO_8S^+$ ([M+Na$^+$]) = 471.0833, Found 471.0832.

**Diethyl 3-phenyl-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1i)**



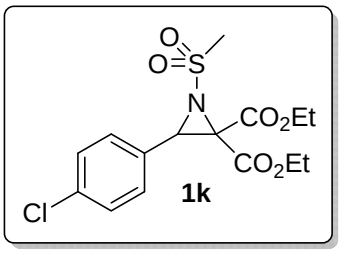

Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 76% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.42 - 7.31 (m, 5H), 4.78 (s, 1H), 4.41 - 4.32 (m, 2H), 4.02 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 3.34 (s, 3H), 1.36 (t, *J* = 7.2 Hz, 3H), 0.93 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.0, 162.4, 130.7, 129.1, 128.5, 127.1, 63.5, 62.4, 57.3, 48.3, 41.9, 13.7. HRMS (ESI-TOF) calcd for $C_{15}H_{19}NNaO_6S^+$ ([M+Na$^+$]) = 364.0826, Found 364.0829.

**Diethyl 3-phenyl-1-(2-trimethylsilylethanesulfonyl)aziridine-2, 2′-dicarboxylate (1j)**



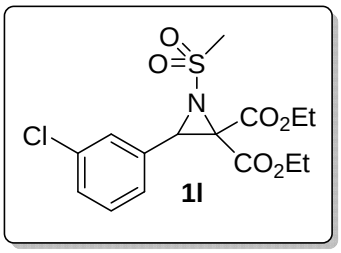

Prepared by *Method A*. Light yellow oil, 22% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.40 - 7.29 (m, 5H), 4.81 (s, 1H), 4.41 - 4.31 (m, 2H), 4.06 - 3.95 (m, 2H), 3.39 - 3.23 (m, 2H), 1.35 (t, *J* = 7.2 Hz, 3H), 1.33 - 1.20 (m, 2H), 0.94 (t, *J* = 7.2 Hz, 3H), 0.09 (s, 9H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.2, 162.6, 133.4, 131.3, 130.7, 129.2, 63.4, 62.2, 57.1, 51.5, 48.7, 13.7, 13.6, 9.8, -2.0. HRMS (ESI-TOF) calcd for $C_{19}H_{29}NNaO_6SSi^+$ ([M+Na$^+$]) = 450.1377, Found 450.1385.

**Diethyl 3-(4-chlorophenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1k)**



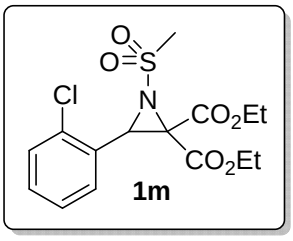

Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 74% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.39 - 7.29 (m, 4H), 4.72 (s, 1H), 4.36 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 4.11 - 3.97 (m, 2H), 3.33 (s, 3H), 1.36 (t, *J* = 7.2 Hz, 3H), 1.00 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 162.8, 162.2, 135.1, 129.3, 128.8, 128.6, 63.6, 62.6, 57.4, 47.4, 41.8, 13.8. HRMS (ESI-TOF) calcd for $C_{15}H_{18}{}^{34.9689}ClNNaO_6S^+$ ([M+Na$^+$]) = 398.0436, Found 398.0436. HRMS (ESI-TOF) calcd for $C_{15}H_{18}{}^{36.9659}ClNNaO_6S^+$ ([M+Na$^+$]) = 400.0407, Found 400.0399.

**Diethyl 3-(3-chlorophenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1l)**




Prepared by *Method A*. Colorless oil, 54% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.40 - 7.37 (m, 1H), 7.35 - 7.27 (m, 3H), 4.72 (s, 1H), 4.42 - 4.30 (m, 2H), 4.06 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 3.34 (s, 3H), 1.36 (t, *J* = 7.2 Hz, 3H), 0.99 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 162.7, 162.2, 134.5, 132.8, 129.9, 129.3, 127.1, 125.6, 63.6, 62.6, 57.2, 47.2, 41.8, 13.8, 13.7. HRMS (ESI-TOF) calcd for $C_{15}H_{18}{}^{34.9689}ClNKO_6S^+$ ([M+K$^+$]) = 414.0175, Found 414.0173. HRMS (ESI-TOF) calcd for $C_{15}H_{18}{}^{36.9659}ClNKO_6S^+$ ([M+K$^+$]) = 416.0146, Found 416.0148.

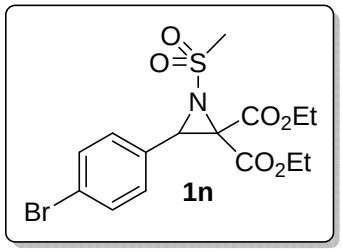
**Diethyl 3-(2-chlorophenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1m)**




Prepared by *Method A*. Colorless oil, 69% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.45 (d, *J* = 7.2 Hz, 1H), 7.37 (d, *J* = 7.6 Hz, 1H), 7.32 - 7.27 (m, 1H), 7.26 - 7.22 (m, 1H), 4.94 (s, 1H), 4.45 - 4.30 (m, 2H), 4.08 - 3.94 (m, 2H), 3.37 (s, 3H), 1.37 (t, *J* = 7.2 Hz, 3H), 0.92 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 162.7, 162.2, 134.1, 130.2, 129.2, 129.1, 128.8, 126.7, 63.5, 62.5, 56.5, 46.3, 41.5, 13.7, 13.6. HRMS (ESI-TOF) calcd for

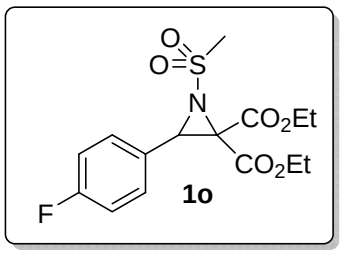
$C_{15}H_{18}{}^{34.9689}ClNNaO_6S^+$ ([M+Na$^+$]) = 398.0436, Found 398.0442. HRMS (ESI-TOF) calcd for $C_{15}H_{18}Na^{36.9659}ClNNaO_6S^+$ ([M+Na$^+$]) = 400.0407, Found 400.0418.

**Diethyl 3-(4-bromophenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1n)**



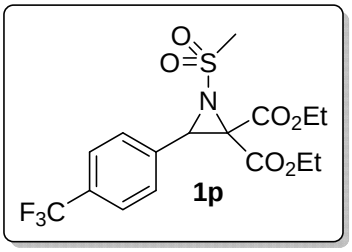

Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 58% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.48 (d, *J* = 8.8 Hz, 2H), 7.28 (d, *J* = 8.0 Hz, 2H), 4.70 (s, 1H), 4.36 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 4.11 - 3.97 (m, 2H), 3.33 (s, 3H), 1.36 (t, *J* = 7.2 Hz, 3H), 1.00 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 162.8, 162.2, 131.7, 129.8, 128.8, 123.3, 63.6, 62.6, 57.3, 47.4, 41.8, 13.8. HRMS (ESI-TOF) calcd for $C_{15}H_{18}{}^{78.9183}BrKNO_6S^+$ ([M+K$^+$]) = 457.9670, Found 457.9674. HRMS (ESI-TOF) calcd for $C_{15}H_{18}{}^{80.9163}BrKNO_6S^+$ ([M+K$^+$]) = 459.9650, Found 459.9631.

**Diethyl 3-(4-fluorophenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1o)**



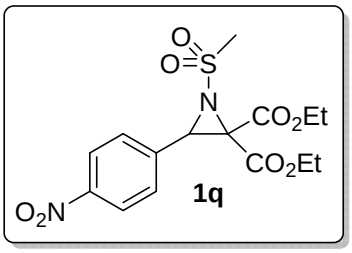

Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 66% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.38 (dd, *J* = 5.2 Hz, 8.4 Hz, 2H), 7.04 (t, *J* = 8.8 Hz, 2H), 4.73 (s, 1H), 4.36 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 4.04 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 3.33 (s, 3H), 1.36 (t, *J* = 7.2 Hz, 3H), 0.98 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.1 (d, *J* = 249.4 Hz), 162.9, 162.3, 129.0 (d, *J* = 8.5 Hz), 126.6 (d, *J* = 3.1 Hz), 115.6 (d, *J* = 22.0 Hz), 63.6, 62.5, 57.4, 47.4, 41.8, 13.8; $^{19}$F NMR (376 MHz, $CDCl_3$) δ = -112.0. HRMS (ESI-TOF) calcd for $C_{15}H_{18}FNNaO_6S^+$ ([M+Na$^+$]) = 382.0732, Found 382.0735.

**Diethyl 3-(4-trifluoromethylphenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1p)**



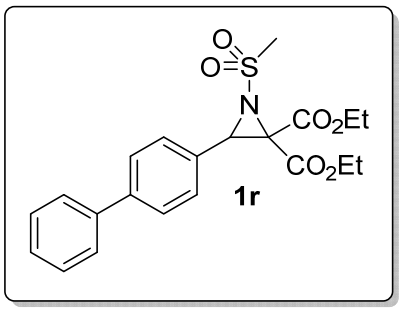

Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 77% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.61 (d, *J* = 8.0 Hz, 2H), 7.54 (d, *J* = 8.0 Hz, 2H), 4.79 (s, 1H), 4.38 (dd, *J* = 7.2 Hz, 14.4 Hz, 2H), 4.10 - 3.96 (m, 2H), 3.35 (s, 3H), 1.37 (t, *J* = 7.2 Hz, 3H), 0.95 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 162.6, 162.0, 134.9, 131.2 (q, *J* = 32.7 Hz), 127.7, 125.4 (q, *J* = 3.7 Hz), 123.8 (d, *J* = 273.3 Hz), 63.6, 62.6, 57.3, 47.2, 41.7, 13.7, 13.6; $^{19}$F NMR (376 MHz, $CDCl_3$) δ = -62.8. HRMS (ESI-TOF) calcd for $C_{16}H_{18}F_3KNO_6S^+$ ([M+K$^+$]) = 448.0439, Found 448.0436.

**Diethyl 3-(4-nitrophenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1q)**




Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 74% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 8.22 (d, *J* = 8.8 Hz, 2H), 7.61 (d, *J* = 8.8 Hz, 2H), 4.81 (s, 1H), 4.44 - 4.32 (m, 2H), 4.11 - 3.96 (m, 2H), 3.37 (s, 3H), 1.37 (t, *J* = 7.2 Hz, 3H), 1.00 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 162.4, 161.8, 148.3, 137.8, 128.4, 123.7, 63.8, 62.9, 57.4, 46.6, 41.7, 13.8. HRMS (ESI-TOF) calcd for $C_{15}H_{19}N_2O_8S^+$ ([M+H$^+$]) = 387.0857, Found 387.0866.

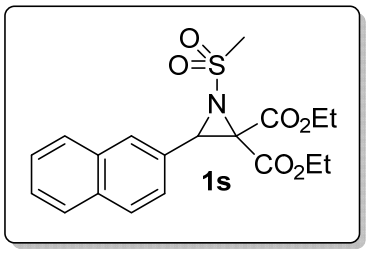
**Diethyl 3-(4-phenylphenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1r)**




Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 60% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.60 - 7.54 (m, 4H), 7.50 - 7.41 (m, 4H), 7.39 - 7.33 (m, 1H), 4.81 (s, 1H), 4.42 - 4.32 (m, 2H), 4.10 - 3.98 (m, 2H), 3.35 (s, 3H) 1.37 (t, *J* = 7.2 Hz, 3H), 0.97 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.0, 162.5, 142.0, 140.3, 129.7, 128.9, 127.7, 127.6, 127.2, 127.1, 63.5, 62.5, 57.4, 48.2, 42.0, 13.8, 13.7. HRMS (ESI-TOF) calcd

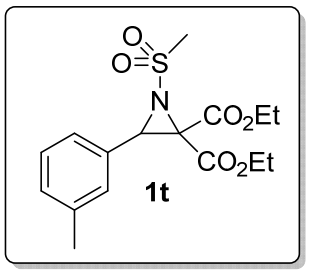
for $C_{21}H_{23}KNO_6S^+$ ([M+$K^+$]) = 456.0878, Found 456.0880.

**Diethyl 3-(2-naphthyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1s)**



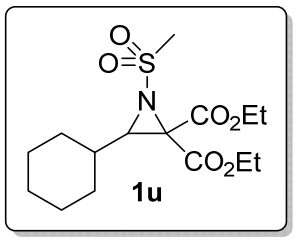

Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 55% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.89 (s, 1H), 7.87 -7.79 (m, 3H), 7.54 - 7.44 (m, 3H), 4.93 (s, 1H), 4.39 (dd, *J* = 6.8 Hz, 14.0 Hz, 2H), 4.05 - 3.88 (m, 2H), 3.38 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.87 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.0, 162.5, 133.5, 132.8, 128.4, 128.2, 128.1, 127.8, 126.8, 126.7, 126.6, 124.2, 63.6, 62.5, 57.5, 48.5, 41.9, 13.8, 13.7. HRMS (ESI-TOF) calcd for $C_{19}H_{21}NNaO_6S^+$ ([M+$Na^+$]) = 414.0982, Found 414.0987.

**Diethyl 3-(3-methylphenyl)-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1t)**




Prepared by *Method A*. Light yellow oil, 45% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.25 - 7.10 (m, 4H), 4.72 (s, 1H), 4.40 - 4.30 (m, 2H), 4.06 - 3.96 (m, 2H), 3.31 (s, 3H), 2.32 (s, 3H), 1.34 (t, *J* = 7.2 Hz, 3H), 0.94 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 162.7, 162.1, 137.9, 130.4, 129.5, 128.1, 127.3, 123.8, 63.1, 62.0, 56.9, 47.9, 41.5, 20.9, 13.3. HRMS (ESI-TOF) calcd for $C_{16}H_{21}NNaO_6S^+$ ([M+$Na^+$]) = 378.0982, Found 378.0991.

**Diethyl 3-cyclohexyl-1-methylsulfonylaziridine-2, 2′-dicarboxylate (1u)**

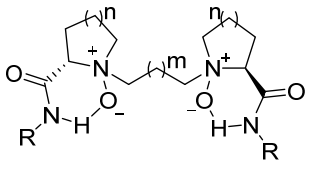



Prepared by *Method A*. White solid (Crystallized by $Et_2O$/petroleum ether), 20% yield. $^1$H NMR (400 MHz, $CDCl_3$) δ = 4.39 - 4.24 (m, 4H), 3.36 (d, *J* = 9.6 Hz, 1H), 3.22 (s, 3H), 2.00 - 1.55 (m, 6H), 1.37 - 1.11 (m, 12H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 163.8, 163.4, 63.1, 62.7, 55.5, 51.1, 41.0, 36.8, 30.8, 29.0, 25.8, 25.1, 14.1, 13.7. HRMS (ESI-TOF) calcd for

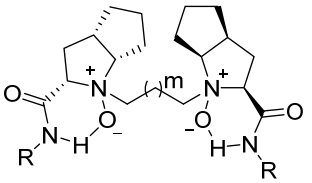
$C_{15}H_{25}NNaO_6S^+$ ([M+$Na^+$]) = 370.1295, Found 370.1296.

**(D) General procedure for chiral *N,N′*-dioxides preparation**

The *N, N′*-dioxide ligands were prepared by the similar procedure in the literatures.[3]



**L-PiPr$_2$**: R = 2,6-*i*-$Pr_2C_6H_3$, n = 2, m = 1
**L-PrPr$_2$**: R = 2,6-*i*-$Pr_2C_6H_3$, n = 1, m = 1
**L$_2$-PiPr$_2$**: R = 2,6-*i*-$Pr_2C_6H_3$, n = 2, m = 0
**L-PiPr$_3$**: R = 2,4,6-*i*-$Pr_3C_6H_2$, n = 2, m = 1
**L-PiEt$_2$**: R = 2,6-$Et_2C_6H_3$, n = 2, m = 1
**L-PiCHPh$_2$**: R = $CHPh_2$, n = 2, m = 1



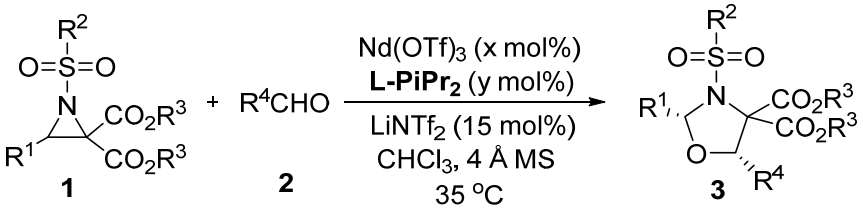
**L-RaPr$_2$**: R = 2,6-*i*-$Pr_2C_6H_3$, m = 1

**(E) General procedure for the preparation of the racemic products**

Some known racemic products (**3aa**, **3ba**, **3ca**, **3da**, **3ea**, **3fa**) were synthesized according to the literature.[4] Other racemic products were prepared as following:

To an oven-dried reaction tube were added $Nd(OTf)_3$ (10 mol%), $LiNTf_2$ (15 mol%), 4 Å molecular sieves (100 mg) and $CHCl_3$ (1.0 mL). Then to the suspensions were added aldehydes (0.3 mmol) and aziridines (0.1 mmol). Then the solutions were stirred at room temperature for 12-40 h. After the completion of the reaction, the suspensions were directly purified by flash chromatography on basic aluminum oxide (pH = 9-10) (Eluent: Ethyl acetate:Petroleum ether = 1:10 - 3:7) to provide the desired products.

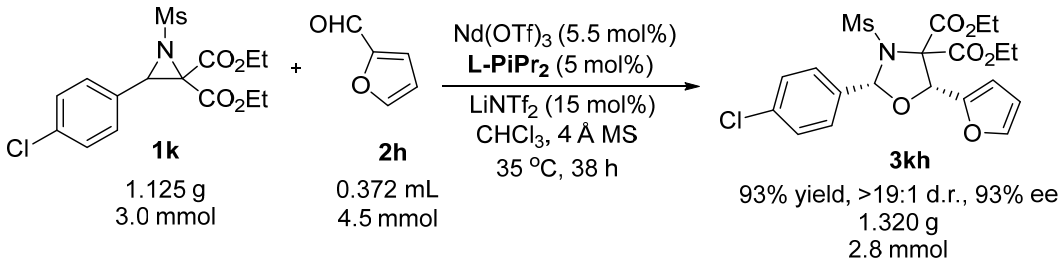
**(F) General procedure for the catalytic asymmetric transformation**




To an oven-dried reaction tube were added $Nd(OTf)_3$ (5-10 mol%), **L-PiPr$_2$** (2.5-5 mol%), $LiNTf_2$ (15 mol%), 4 Å molecular sieves (100 mg) and $CHCl_3$ (0.5 mL). The suspensions were stirred at 35 °C for 0.5 h under nitrogen atmosphere. Subsequently, aldehydes (0.15-0.3 mmol) and aziridines (0.1 mmol) in 0.25 mL of $CHCl_3$ were added. The solutions were stirred at 35 °C for the indicated time. After the completion

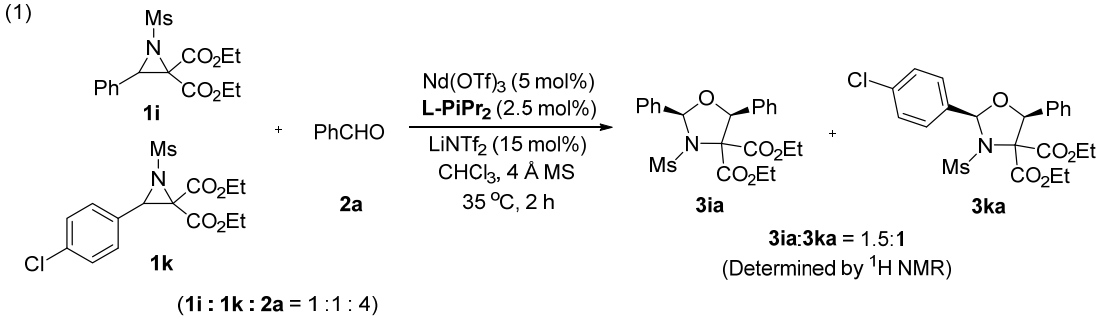
of the reactions, the suspensions were directly purified by flash chromatography on basic aluminum oxide (pH = 9-10) (Eluent: Ethyl acetate:Petroleum ether = 1:10 - 3:7) to afford the corresponding products (37-98% yield, >19:1 dr, 55-95% ee).

**(G) Experimental procedure for the scale-up reaction**




To an oven-dried 50 mL round-bottomed flask were added $Nd(OTf)_3$ (5.5 mol%), **L-PiPr$_2$** (5 mol%), $LiNTf_2$ (15 mol%), 4 Å molecular sieves (3.0 g) and $CHCl_3$ (15 mL). The suspension was stirred at 35 $^oC$ for 0.5 h under nitrogen atmosphere. Subsequently, aldehyde **2h** (0.375 mL, 4.5 mmol) and aziridine **1k** (1.125 g, 3.0 mmol) in 7.5 mL of $CHCl_3$ were added. The solution was stirred at 35 $^oC$ for 38 h. After the completion of the reaction, the suspension was directly purified by flash chromatography on basic aluminum oxide (pH = 9-10) (Eluent: Ethyl acetate:Petroleum ether = 1:14 - 1:3) to afford the desired product (1.320 g, 93% yield, >19:1 dr, 93% ee).

**(H) Control experiments**




Procedure for control experiment a: To an oven-dried reaction tube were added $Nd(OTf)_3$ (5 mol%), **L-PiPr$_2$** (2.5 mol%), $LiNTf_2$ (15 mol%), 4 Å molecular sieves (100 mg) and $CHCl_3$ (0.5 mL). The suspension was stirred at 35 $^oC$ for 0.5 h under nitrogen atmosphere. Subsequently, benzaldehyde **2a** (0.2 mmol), aziridine **1i** (0.05

mmol) and **1k** (0.05 mmol) in 0.25 mL of $CHCl_3$ were added. The solution was stirred at 35 $^oC$ for 2 h. After the completion of the reaction, the suspension was directly purified by flash chromatography on basic aluminum oxide (pH = 9-10) (Eluent: Ethyl acetate:Petroleum ether = 1:9 - 3:7) to afford the mixture of **3ia** and **3ka** (**3ia**:**3ka** = 1.5:1, determined by **$^1$H NMR**).

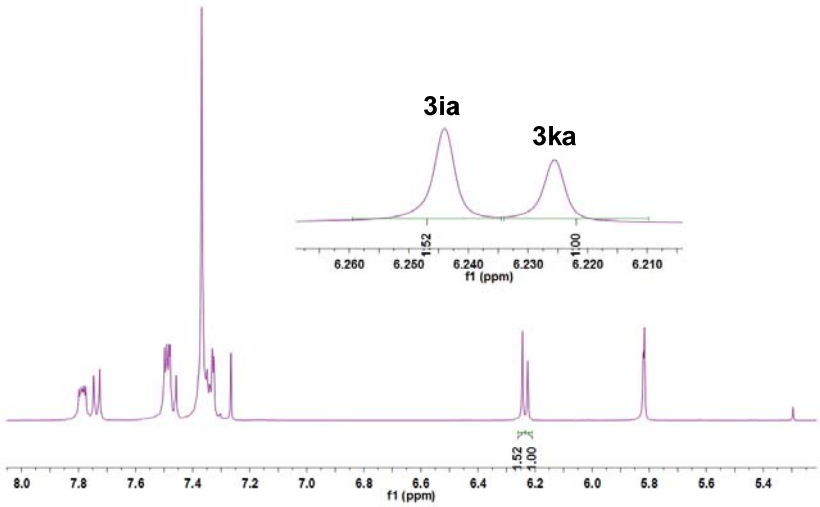
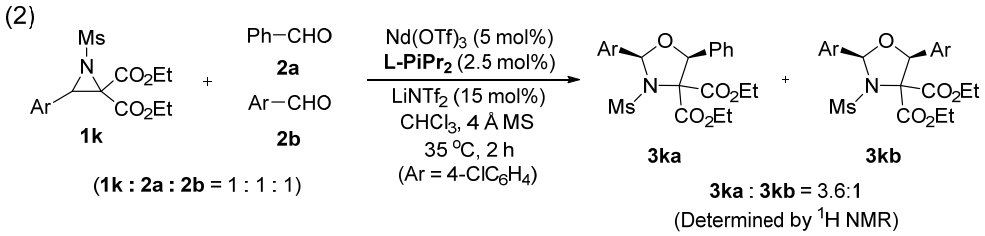



**Figure 1** The ratio of **3ia** to **3ka** determined by **$^1$H NMR**




Procedure for control experiment b: To an oven-dried reaction tube were added $Nd(OTf)_3$ (5 mol%), **L-PiPr$_2$** (2.5 mol%), $LiNTf_2$ (15 mol%), 4 Å molecular sieves (100 mg) and $CHCl_3$ (0.5 mL). The suspension was stirred at 35 $^oC$ for 0.5 h under nitrogen atmosphere. Subsequently, benzaldehyde **2a** (0.1 mmol), 4-chloro benzaldehyde **2b** (0.1 mmol), and aziridine **1k** (0.1 mmol) in 0.25 mL of $CHCl_3$ were added. The solution was stirred at 35 $^oC$ for 2 h. After the completion of the reaction, the suspension was directly purified by flash chromatography on basic aluminum oxide (pH = 9-10) (Eluent: Ethyl acetate:Petroleum ether = 1:9 - 3:7) to afford the mixture of **3ka** and **3kb** (**3ka**:**3kb** = 3.6:1, determined by **$^1$H NMR**).

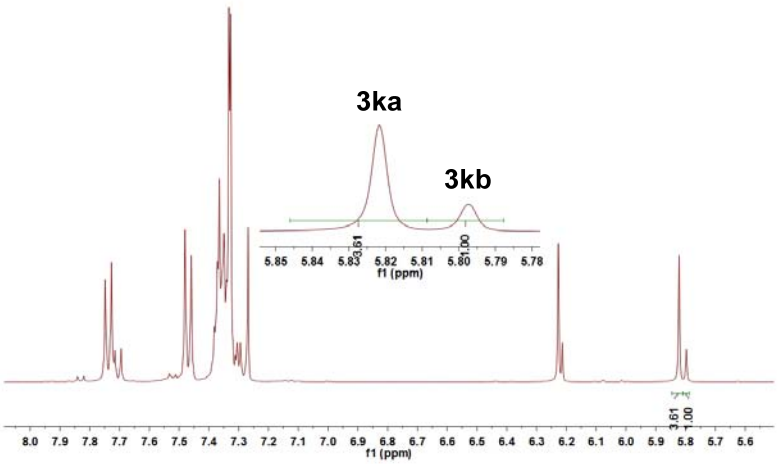



**Figure 2** The ratio of **3ka** to **3kb** determined by **$^1$H NMR**

(3) HPLC traces of catalytic asymmetric [3+2]-cycloaddition of aziridine **1k** with aldehyde **2h**.

| entry | substrate ratio (x/y) | ee of **1k** (%) | ee of **3kh** (%) |
|---|---|---|---|
| 1 | 1:2 | - | 93 |
| 2 | 1:1.5 | - | 93 |
| 3 | 1:1 | - | 93 |
| 4 | 1.5:1 | 0 | 94 |
| 5 | 2:1 | 0 | 94 |
| 6 | 3:1 | 0 | 94 |

(4) Kinetic study on catalytic asymmetric [3+2]-cycloaddition of DA aziridine **1i** with aldehyde **2a**.

| t/min | 15 mol% $LiNTf_2$ | | no $LiNTf_2$ | |
|---|---|---|---|---|
| | Conversion % | Yield % | Conversion % | Yield % |
| 15 | 58 | 37 | 21 | 2 |
| 30 | 66 | 41 | 28 | 2 |
| 45 | 72 | 50 | 31 | 9 |
| 60 | 87 | 67 | 43 | 13 |

(5) $^{1}$H NMR experiments.

(a) $LiNTf_2$ and $LiClO_4$ were selected as metal salt respectively. (mixing after 30 min)

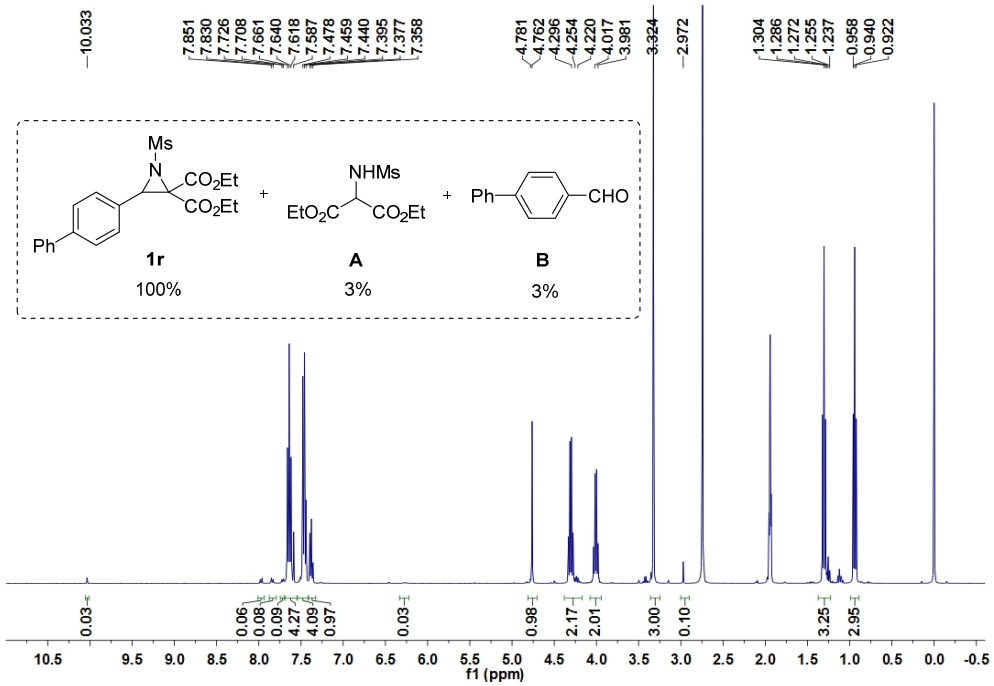



**Figure 3** The solution of $LiClO_4$ (0.1 mmol) and aziridine **1r** (0.1 mmol) in $CD_3CN$ (1 mL).

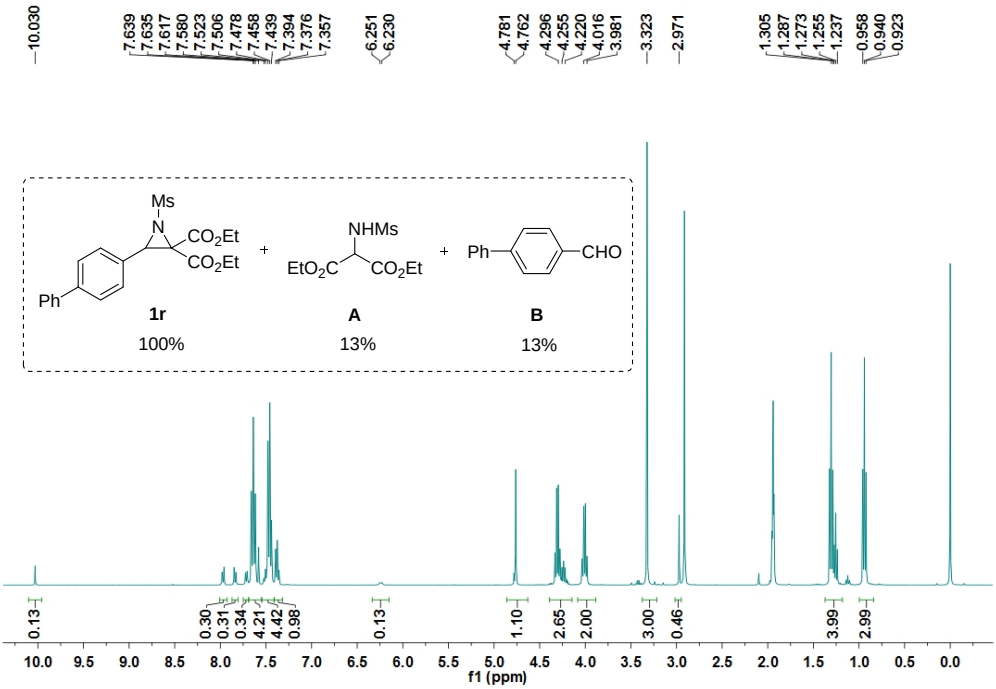



**Figure 4** The solution of $LiNTf_2$ (0.1 mmol) and aziridine **1r** (0.1 mmol) in $CD_3CN$ (1 mL).

*Note:* At first, $LiClO_4$ was selected as metal salt to detect the azomethine ylide intermediate according to previous report.[5] Instead, the side product A and B from the trapping of water were received, might for the unstable intermediate of DA *N*-sulfonylaziridines. Then the same operation

was carried out for $LiNTf_2$, proving its feature of promoting the ring-opening process more easily.

(6) HRMS experiments.

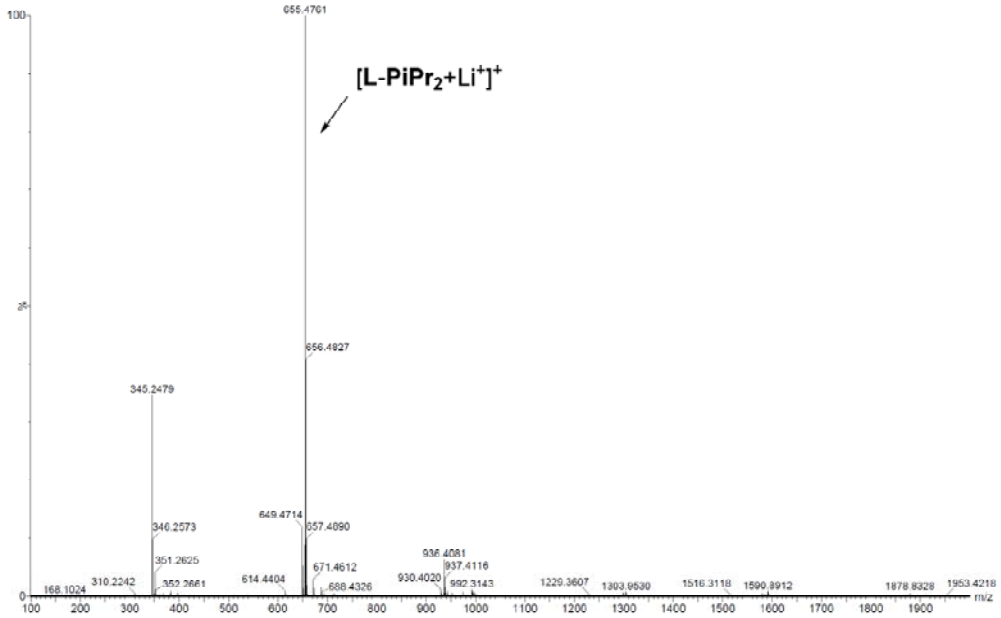



**Figure 5** ESI-MS analysis of the mixture of $LiNTf_2$ and **L-PiPr$_2$** (1:1).

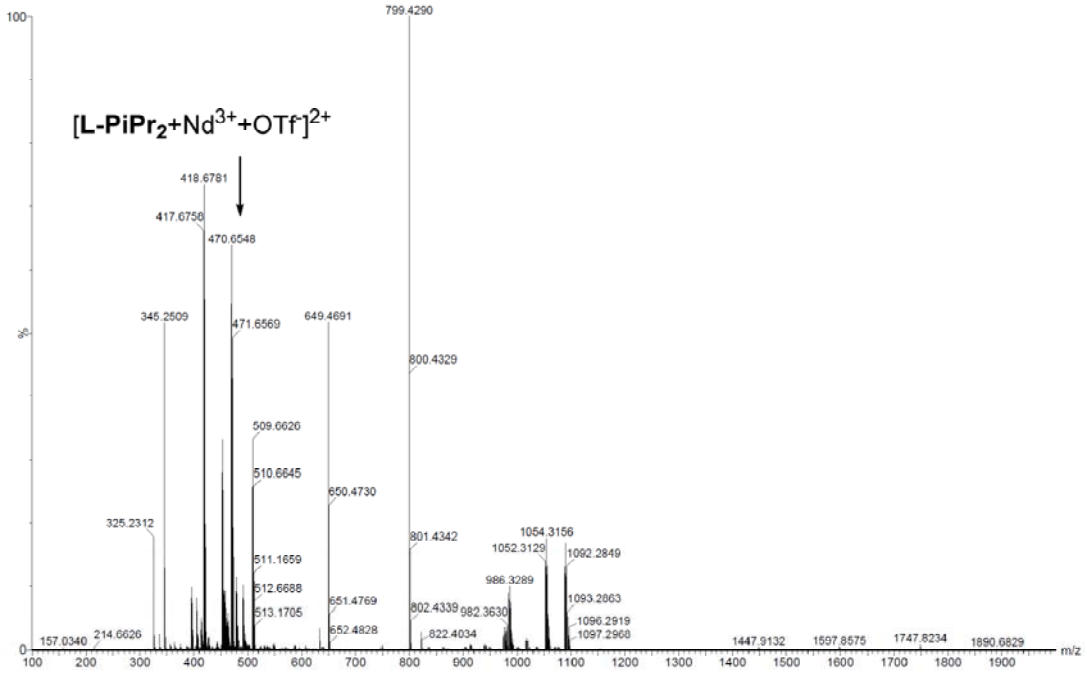



**Figure 6** ESI-MS analysis of the mixture of $Nd(OTf)_3$ and **L-PiPr$_2$** (1:1).

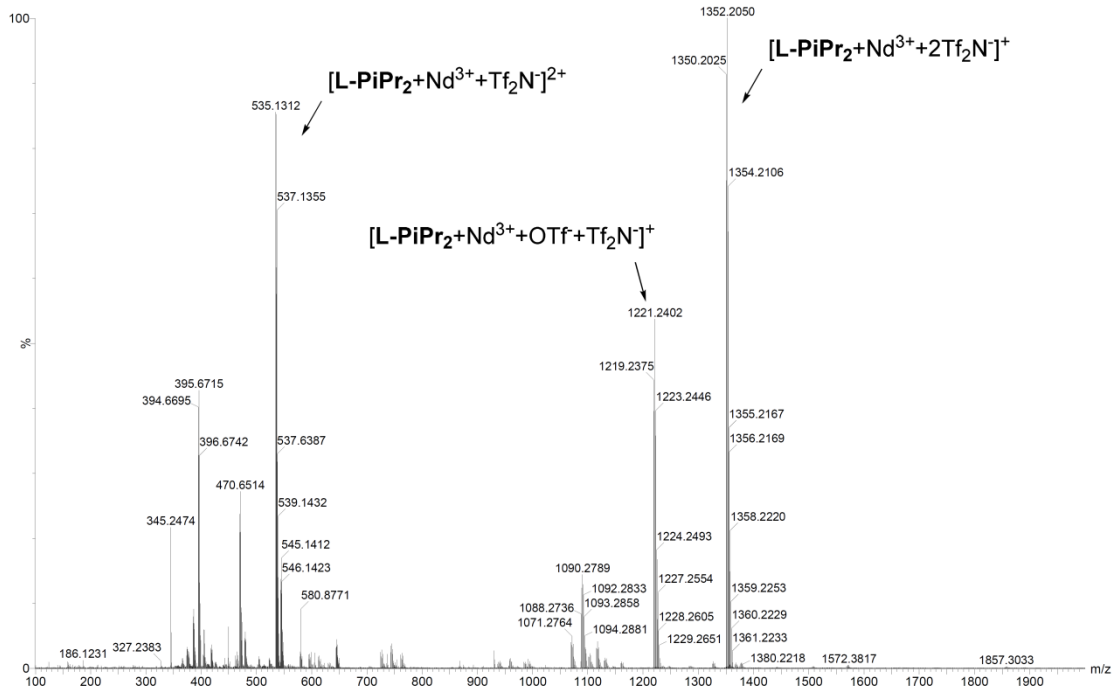
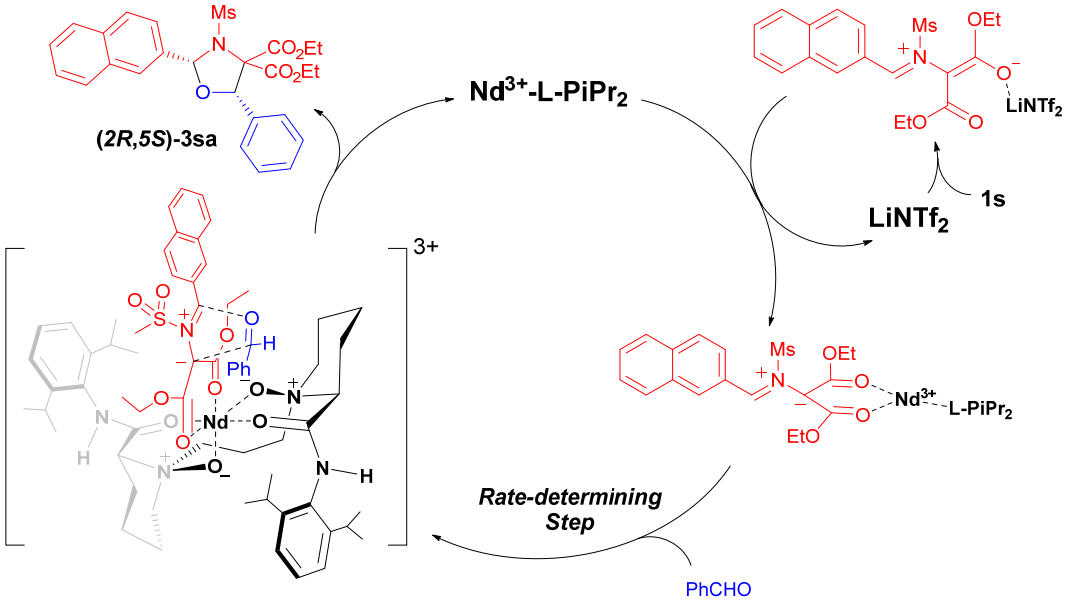
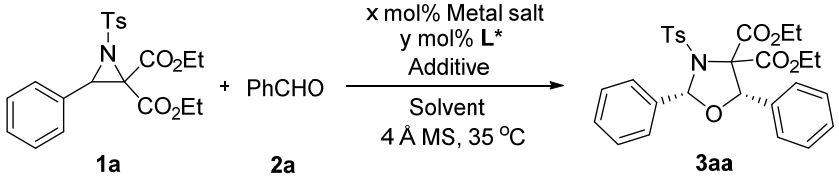



**Figure 7** ESI-MS analysis of the mixture of $Nd(OTf)_3$, **L-PiPr$_2$** and $LiNTf_2$ (1.1:1:3).

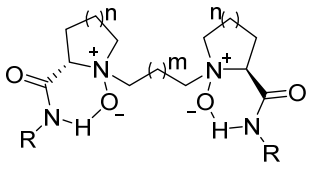
## (I) A plausible catalytic cycle



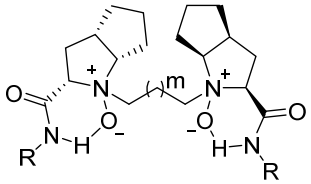
## (J) Optimization of conditions[a]




1a 2a 3aa



**L-PiPr$_2$**: R = 2,6-*i*-Pr$_2$C$_6$H$_3$, n = 2, m = 1
**L-PrPr$_2$**: R = 2,6-*i*-Pr$_2$C$_6$H$_3$, n = 1, m = 1
**L$_2$-PiPr$_2$**: R = 2,6-*i*-Pr$_2$C$_6$H$_3$, n = 2, m = 0
**L-PiPr$_3$**: R = 2,4,6-*i*-Pr$_3$C$_6$H$_2$, n = 2, m = 1
**L-PiEt$_2$**: R = 2,6-Et$_2$C$_6$H$_3$, n = 2, m = 1
**L-PiCHPh$_2$**: R = CHPh$_2$, n = 2, m = 1



**L-RiPr$_2$**: R = 2,6-*i*-Pr$_2$C$_6$H$_3$, m = 1

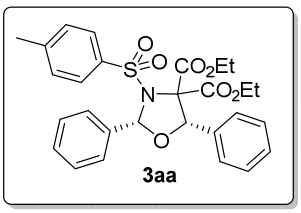
| Entry | Ligand | Metal salt | Solvent | Additive | x/y | t (h) | Yield (%)[b] | d.r.[c] | ee (%)[d] |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **L-PiPr$_2$** | Sc(OTf)$_3$ | toluene | - | 10/10 | 12 | 45 | >19:1 | 0 |
| 2 | **L-PiPr$_2$** | Ni(ClO$_4$)$_2$·6H$_2$O | toluene | - | 10/10 | 12 | 20 | >19:1 | -22 |
| 3 | **L-PiPr$_2$** | Zn(OTf)$_2$ | toluene | - | 10/10 | 12 | trace | - | - |
| 4 | **L-PiPr$_2$** | La(OTf)$_3$ | toluene | - | 10/10 | 12 | 14 | >19:1 | 36 |
| 5 | **L-PiPr$_2$** | In(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | <10 | > 19:1 | -3 |
| 6 | **L-PiPr$_2$** | La(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 24 | > 19:1 | 58 |
| 7 | **L-PiPr$_2$** | Hf(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | <10 | > 19:1 | 9 |
| 8 | **L-PiPr$_2$** | Sm(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 18 | > 19:1 | 50 |
| 9 | **L-PiPr$_2$** | Eu(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 15 | > 19:1 | 40 |
| 10 | **L-PiPr$_2$** | Gd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 22 | > 19:1 | 56 |
| 11 | **L-PiPr$_2$** | Tb(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 14 | > 19:1 | 55 |
| 12 | **L-PiPr$_2$** | Ho(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 14 | > 19:1 | 50 |
| 13 | **L-PiPr$_2$** | Er(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 15 | > 19:1 | 20 |
| 14 | **L-PiPr$_2$** | Nd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 30 | > 19:1 | 71 |
| 15 | **L-PrPr$_2$** | Nd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 31 | > 19:1 | 40 |
| 16 | **L-RiPr$_2$** | Nd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 27 | > 19:1 | 13 |
| 17 | **C2-L-PiPr$_2$** | Nd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 45 | > 19:1 | 4 |
| 18 | **L-PiPr$_3$** | Nd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 33 | > 19:1 | 56 |
| 19 | **L-PiEt$_2$** | Nd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 24 | > 19:1 | 59 |
| 20 | **L-PiCHPh$_2$** | Nd(OTf)$_3$ | toluene | LiNTf$_2$ | 10/10 | 12 | 26 | > 19:1 | -9 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 21 | **L-PiPr$_2$** | Nd(OTf)$_3$ | DCM | LiNTf$_2$ | 10/10 | 12 | 34 | > 19:1 | 75 |
| 22 | **L-PiPr$_2$** | Nd(OTf)$_3$ | DCE | LiNTf$_2$ | 10/10 | 12 | 32 | > 19:1 | 76 |
| 23 | **L-PiPr$_2$** | Nd(OTf)$_3$ | PhCl | LiNTf$_2$ | 10/10 | 12 | 32 | > 19:1 | 74 |
| 24 | **L-PiPr$_2$** | Nd(OTf)$_3$ | TCE | LiNTf$_2$ | 10/10 | 12 | 31 | > 19:1 | 80 |
| 25 | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | LiNTf$_2$ | 10/10 | 12 | 35 | > 19:1 | 85 |
| 26[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | LiNTf$_2$ | 10/10 | 12 | 47 | > 19:1 | 86 |
| 27[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | LiNTf$_2$ | 10/5 | 12 | 65 | > 19:1 | 87 |
| 28[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | LiCl | 10/5 | 12 | 55 | >19:1 | 67 |
| 29[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | $NaBAr_{F4}$ | 10/5 | 12 | 66 | >19:1 | 14 |
| 30[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | $NaNTf_2$ | 10/5 | 12 | 41 | >19:1 | 73 |
| 31[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | $LiBF_4$ | 10/5 | 12 | 51 | >19:1 | 63 |
| 32[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | $LiClO_4$ | 10/5 | 12 | 53 | >19:1 | 63 |
| 33[e] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | LiBr | 10/5 | 12 | 32 | >19:1 | 64 |
| 34[e,f] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | LiNTf$_2$ | 10/5 | 12 | 68 | >19:1 | 91 |
| 35[e,f] | **L-PiPr$_2$** | Nd(OTf)$_3$ | $CHCl_3$ | LiNTf$_2$ | 5/2.5 | 12 | 68 | >19:1 | 91 |

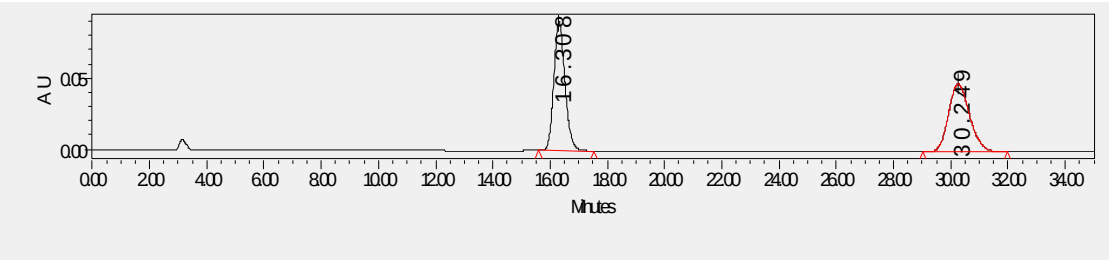
[a] Unless otherwise noted, the reactions were performed with x mol% metal, y mol% ligand, 10 mol% additive, 4 Å MS (20 mg), **1a** (0.1 mmol) and **2a** (0.15 mmol) in solvent (1 mL) under $N_2$ at 35 $^oC$ for the indicated time. [b] Isolated yield by silica gel chromatography. [c] Determined by $^1H$ NMR spectroscopy and chiral HPLC analysis (Chiralcel IE). [d] Determined by chiral HPLC analysis (Chiralcel IE). [e] x mol% metal, y mol% ligand, 15 mol% additive, 4 Å MS (100 mg), **1a** (0.1 mmol) and **2a** (0.2 mmol) in solvent (0.75 mL). [f] Isolation by basic $Al_2O_3$ chromatography.

## (K) The analytical and spectral characterization data of products

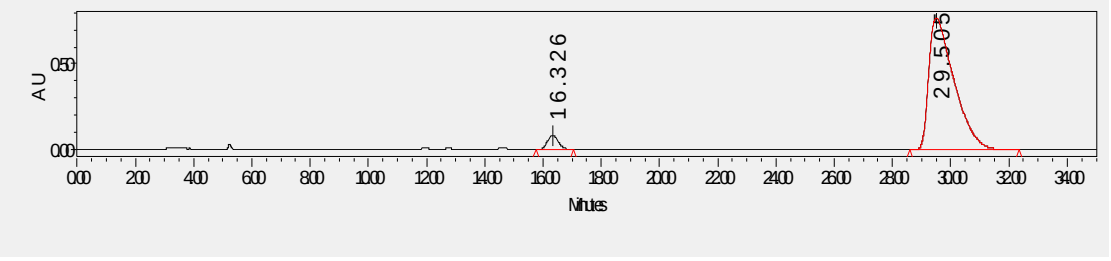
### *cis*-Diethyl 2, 5-diphenyl-3-tosyloxazolidine-4, 4′-dicarboxylate (3aa)




Colorless oil, 68% yield, 91% ee. $[\alpha]_D^{14}$ = +54.9 (*c* = 0.39 in $CH_2Cl_2$). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 29.51 min, $t_R$ (minor) = 16.33 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.49 (d, *J* = 7.2 Hz, 2H), 7.36 - 7.26 (m, 6H), 7.15 (t, *J* = 8.4 Hz, 4H), 6.90 (d, *J* = 8.0 Hz, 2H), 6.24 (s, 1H), 5.83 (s, 1H), 4.58 - 4.40 (m, 2H), 3.98 - 3.87 (m, 1H), 3.55 - 3.44 (m, 1H), 2.29 (s, 3H), 1.46 (t, *J* = 7.2 Hz, 3H), 0.80 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.4, 166.3, 142.8, 137.6, 134.6, 134.0, 129.9, 129.8, 129.0, 128.3, 128.1, 127.9, 126.6, 92.9, 87.4, 76.9, 63.1, 62.0, 21.5, 14.0, 13.3. HRMS (ESI-TOF) calcd for $C_{28}H_{29}NO_7SNa$ ([M+Na$^+$]) = 546.1557, Found 546.1554.

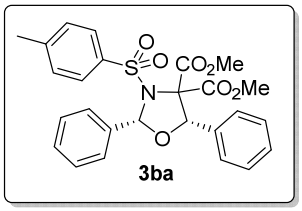



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 16.308 | 2481835 | 49.95 |
| 2 | 30.249 | 2486958 | 50.05 |

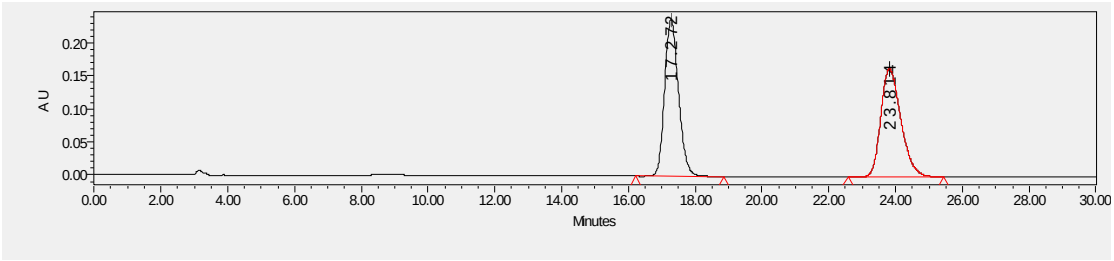



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 16.326 | 2295633 | 4.67 |
| 2 | 29.505 | 46816648 | 95.33 |

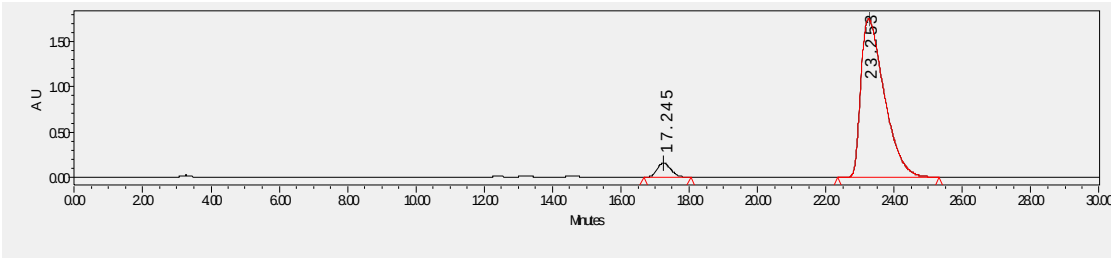
(*2R*,*5S*)-**Dimethyl 2, 5-diphenyl-3-tosyloxazolidine-4, 4′-dicarboxylate (3ba)**




Colorless oil, 62% yield, 90% ee. $[\alpha]_D^{15}$ = +55.3 (*c* = 0.55 in $CH_2Cl_2$). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 23.25 min, $t_R$ (minor) = 17.25 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.52 - 7.45 (m, 2H), 7.36 - 7.27 (m, 6H), 7.20 - 7.14 (m, 3H), 7.12 (d, *J* = 8.4 Hz, 2H), 6.91 (d, *J* = 8.0 Hz, 2H), 6.26 (s, 1H), 5.83 (s, 1H), 4.02 (s, 3H), 3.24 (s, 3H), 2.30 (s, 3H); $^{13}$C NMR (101 MHz, DMSO-$d_6$) δ = 166.8, 165.80, 143.1, 137.2, 134.0, 133.9, 130.0, 129.5, 129.1, 128.6, 128.2, 127.9, 127.3, 126.4, 92.2, 86.3, 76.1, 53.6, 52.2, 20.9. HRMS (ESI-TOF) calcd for $C_{26}H_{25}NNaO_7S^+$ ([M+$Na^+$]) = 518.1244, Found 518.1257.

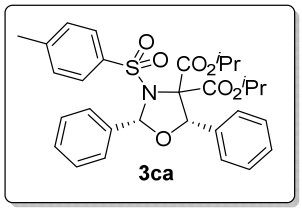



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 17.272 | 6853970 | 50.05 |
| 2 | 23.814 | 6839062 | 49.95 |



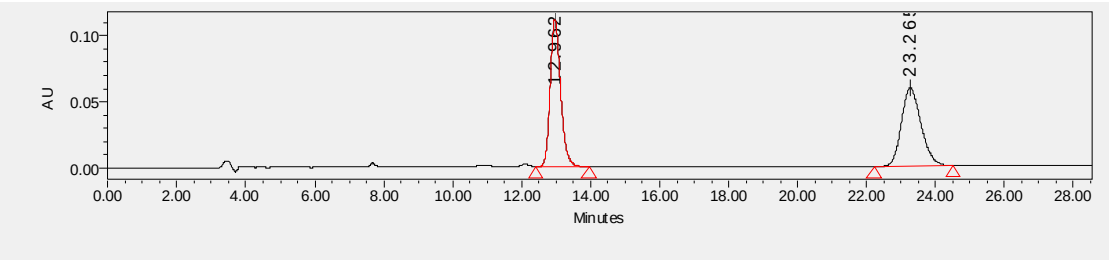

| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 17.245 | 4475915 | 5.09 |
| 2 | 23.253 | 83399621 | 94.91 |

(*2R*,*5S*)-**Diisopropyl 2, 5-diphenyl-3-tosyloxazolidine-4, 4′-dicarboxylate (3ca)**

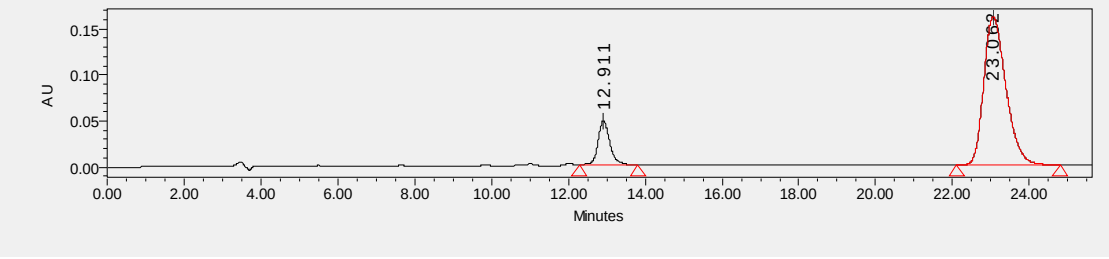


**3ca**

Colorless oil, 40% yield, 72% ee. $[\alpha]_{\lambda}^{27}$ = +181.5 (*c* = 0.54 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 23.25 min, $t_R$ (minor) = 17.25 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.47 (d, *J* = 7.6 Hz, 2H), 7.37 - 7.27 (m, 6H), 7.19 - 7.11 (m, 4H), 6.90 (d, *J* = 8.4 Hz, 2H), 6.19 (s, 1H), 5.82 (s, 1H), 5.41 - 5.31 (m, 1H), 4.68 - 4.58 (m, 1H), 2.29 (s, 3H), 1.49 - 1.42 (m, 6H), 1.08 (d, *J* = 6.0 Hz, 3H), 0.60 (d, *J* = 6.4 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.0, 165.9, 142.7, 137.8, 134.8, 134.1, 129.9, 129.8, 128.8, 128.3, 128.2, 127.9, 126.7, 92.7, 87.3, 76.8, 71.1, 70.2, 21.7, 21.4, 21.3, 20.7. HRMS (ESI-TOF) calcd for $C_{30}H_{34}NO_7S^+$ ([M+H$^+$]) = 552.2050, Found 552.2051.

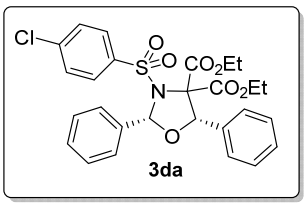



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.962 | 2333269 | 50.08 |
| 2 | 23.265 | 2325674 | 49.92 |

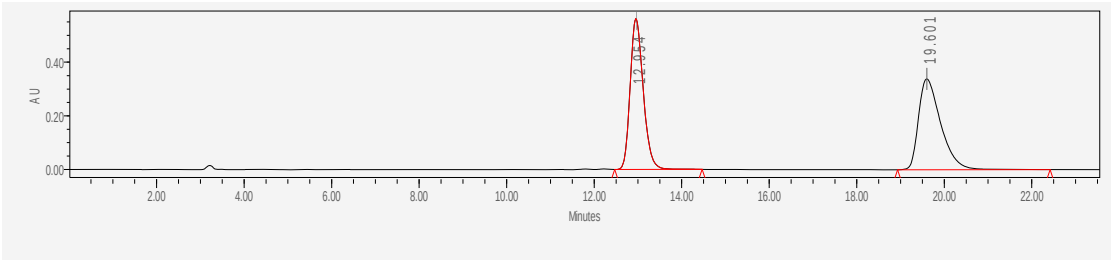



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.911 | 1047197 | 13.96 |
| 2 | 23.062 | 6455169 | 86.04 |

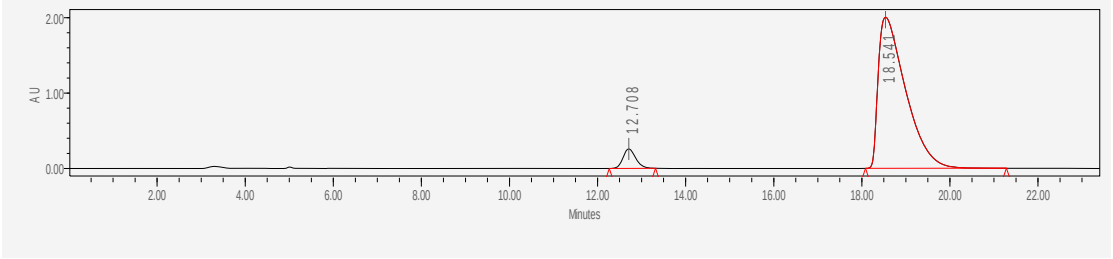
(*2R,5S*)-**Diethyl 2, 5-diphenyl-3-(4-chlorobenzenesulfonyl)oxazolidine-4, 4′-dicarboxylate (3da)**




Colorless oil, 74% yield, 89% ee. $[\alpha]_D^{14}$ = +59.6 (*c* = 0.70 in $CH_2Cl_2$). (Chiralpak IE, hexane/*i*PrOH = 80/20, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 18.54 min, $t_R$ (minor) = 12.71 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.46 (d, *J* = 7.2 Hz, 2H), 7.37 - 7.29 (m, 6H), 7.23 - 7.14 (m, 4H), 7.09 - 7.03 (m, 2H), 6.22 (s, 1H), 5.82 (s, 1H), 4.58 - 4.41 (m, 2H), 3.99 - 3.89 (m, 1H), 3.55 - 3.45 (m, 1H), 1.46 (t, *J* = 7.2 Hz, 3H), 0.80 (t, J = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.2, 166.3, 139.0, 138.6, 134.4, 133.6, 130.2, 129.9, 129.6, 129.1, 128.3, 128.1, 127.9, 126.5, 92.8, 87.5, 77.2, 63.2, 62.2, 14.0, 13.3. HRMS (ESI-TOF) calcd for $C_{27}H_{26}NO_7S^{34.9689}ClNa$ ([M+Na$^+$]) = 566.1011, Found 566.1013. HRMS (ESI-TOF) calcd for $C_{27}H_{26}NO_7S^{36.9659}ClNa$ ([M+Na$^+$]) = 568.0982, Found 568.1010

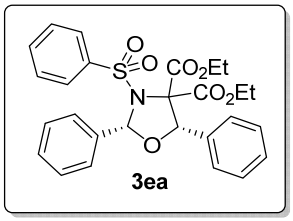



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.954 | 11628471 | 49.41 |
| 2 | 19.601 | 11904976 | 50.59 |

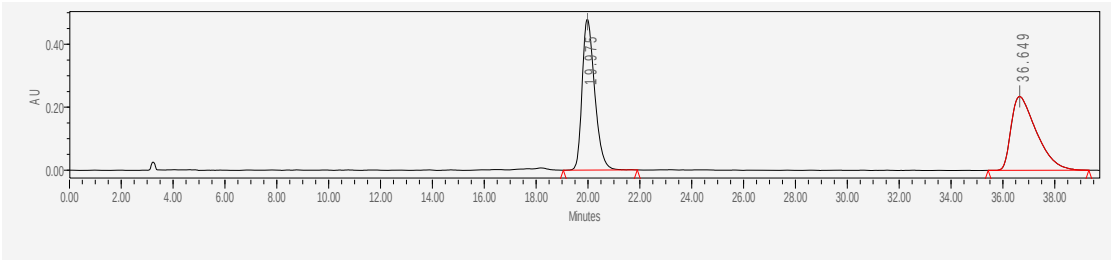



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.708 | 5133168 | 5.61 |
| 2 | 18.541 | 86387984 | 94.39 |

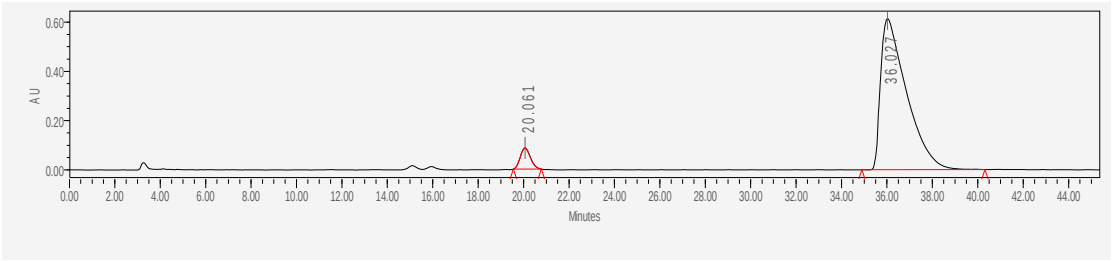
***cis*-Diethyl 2, 5-diphenyl-3-benzenesulfonyloxazolidine-4, 4′-dicarboxylate (3ea)**




Colorless oil, 70% yield, 90% ee. $[\alpha]_D^{14}$ = +49.5 (*c* = 0.59 in $CH_2Cl_2$). (Chiralpak IE, hexane/*i*PrOH = 80/20, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 36.03 min, $t_R$ (minor) = 20.06 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.48 (d, *J* = 7.6 Hz, 2H), 7.37 - 7.25 (m, 9H), 7.17 - 7.08 (m, 4H), 6.25 (s, 1H), 5.84 (s, 1H), 4.59 - 4.41 (m, 2H), 3.98 - 3.88 (m, 1H), 3.56 - 3.45 (m, 1H), 1.47 (t, *J* = 7.2 Hz, 3H), 0.81 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.3, 166.2, 140.5, 134.5, 133.8, 132.1, 130.1, 129.8, 129.0, 128.2, 128.1, 128.0, 127.7, 126.6, 92.9, 87.4, 77.0, 63.1, 62.0, 14.0, 13.3. HRMS (ESI-TOF) calcd for $C_{27}H_{27}NO_7SNa^+$ ([M+$Na^+$]) = 532.1401, Found 532.1393.

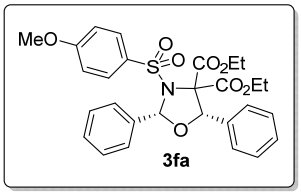



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 19.975 | 16085262 | 50.38 |
| 2 | 36.649 | 15840644 | 49.62 |

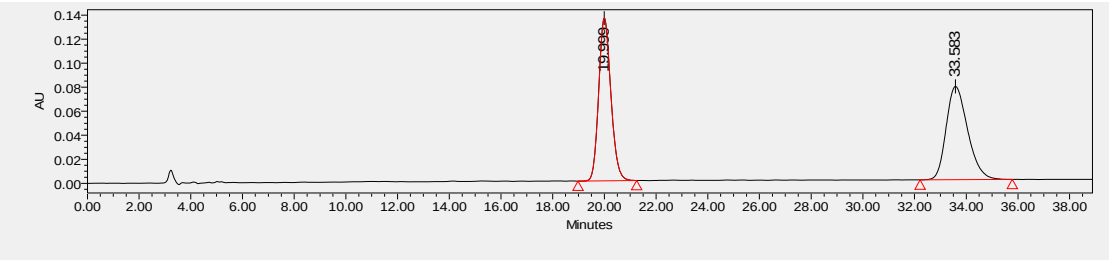



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 20.061 | 2679807 | 5.24 |
| 2 | 36.027 | 48483432 | 94.76 |

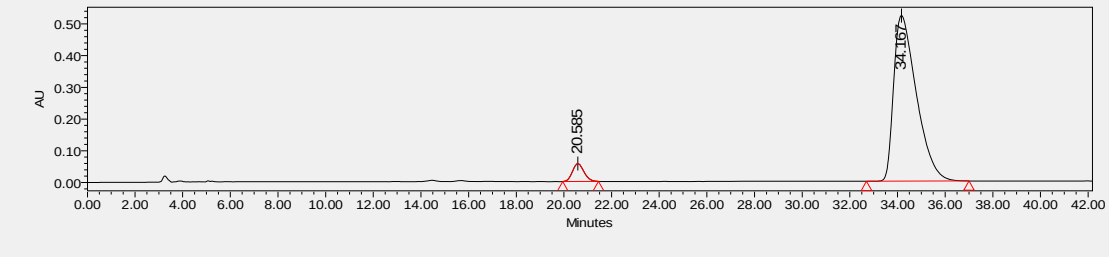
***cis*-Diethyl 2, 5-diphenyl-3-(4-methoxylbenzenesulfonyl)oxazolidine-4, 4′-dicarboxylate (3fa)**




Colorless oil, 60% yield, 90% ee. $[\alpha]_{\lambda}^{26}$ = +216.1 (*c* = 0.58 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 34.17 min, $t_R$ (minor) = 20.58 min.) $^1$H NMR (400 MHz, DMSO-$d_6$) δ = 7.48 (d, *J* = 7.2 Hz, 2H), 7.37 - 7.27 (m, 6H), 7.25 - 7.14 (m, 4H), 6.57 (d, *J* = 9.2 Hz, 2H), 6.22 (s, 1H), 5.82 (s, 1H), 4.59 - 4.40 (m, 2H), 3.98 - 3.88 (m, 1H), 3.77 (s, 3H), 3.55 - 3.45 (m, 1H), 1.46 (t, *J* = 7.2 Hz, 3H), 0.81 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, DMSO) δ = 166.3, 165.4, 162.2, 134.3, 133.9, 131.8, 130.0, 129.6, 129.4, 128.9, 128.1, 127.8, 126.4, 113.3, 92.0, 86.3, 76.0, 62.4, 61.5, 55.6, 13.7, 13.0. HRMS (ESI-TOF) calcd for $C_{28}H_{29}NNaO_8S^+$ ([M+Na$^+$]) = 562.1506, Found 562.1508.

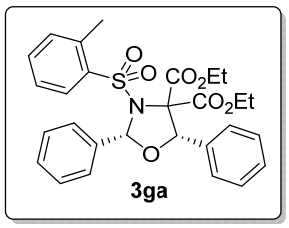



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 19.999 | 4446598 | 49.73 |
| 2 | 33.583 | 4494113 | 50.27 |



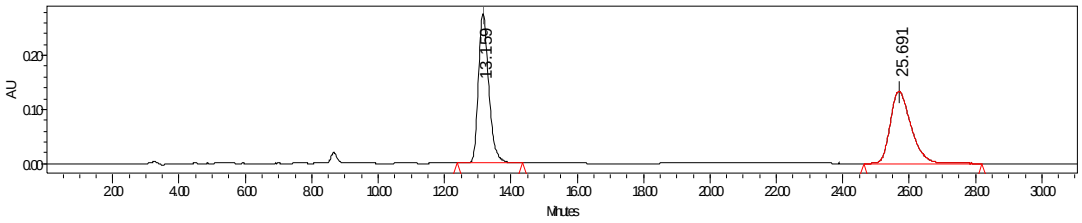

| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 20.585 | 1897845 | 5.19 |
| 2 | 34.167 | 34638368 | 94.81 |

***cis*-Diethyl 2, 5-diphenyl-3-(2-methylbenzenesulfonyl)oxazolidine-4, 4′-dicarboxylate (3ga)**

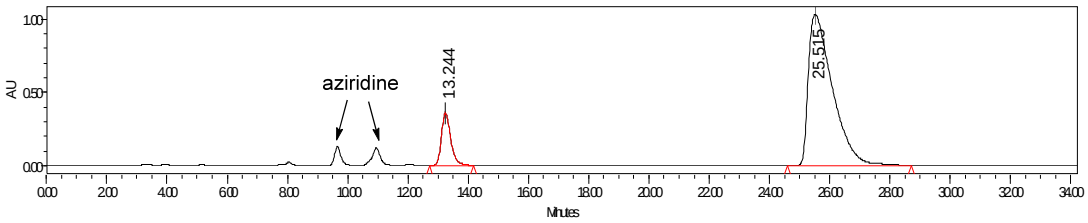


3ga

Colorless oil, 54% yield, 76% ee. (4% recovered aziridine) (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 25.51 min, $t_R$ (minor) = 13.24 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.60 (d, *J* = 7.2 Hz, 2H), 7.41 (d, *J* = 8.0 Hz, 1H), 7.38 - 7.29 (m, 5H), 7.29 - 7.23 (m, 2H), 7.19 (dd, *J* = 7.6, 15.2 Hz, 3H), 6.98 (d, *J* = 7.6 Hz, 1H), 6.91 (t, *J* = 8.0 Hz, 1H), 6.34 (s, 1H), 5.97 (s, 1H), 4.52 - 4.29 (m, 2H), 4.00 - 3.85 (m, 1H), 3.55 - 3.39 (m, 1H), 2.33 (s, 3H), 1.36 (t, *J* = 7.2 Hz, 3H), 0.79 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.5, 166.4, 138.8, 138.0, 134.6, 134.4, 132.3, 131.9, 130.2, 129.9, 129.7, 128.9, 128.2, 127.9, 126.5, 125.4, 93.7, 87.6, 76.7, 63.0, 61.9, 20.9, 13.8, 13.3. HRMS (ESI-TOF) calcd for $C_{28}H_{29}NNaO_7S^+$ ([M+$Na^+$]) = 546.1557, Found 546.1555.

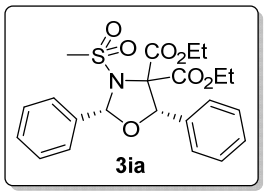



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 13.159 | 5987903 | 50.96 |
| 2 | 25.691 | 5763400 | 49.04 |



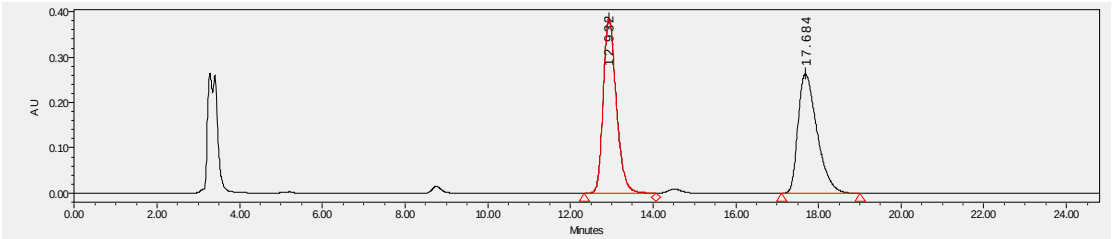

| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 13.244 | 7767003 | 11.96 |
| 2 | 25.515 | 57154166 | 88.04 |

(*2R*,*5S*)-**Diethyl 2, 5-diphenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3ia)**

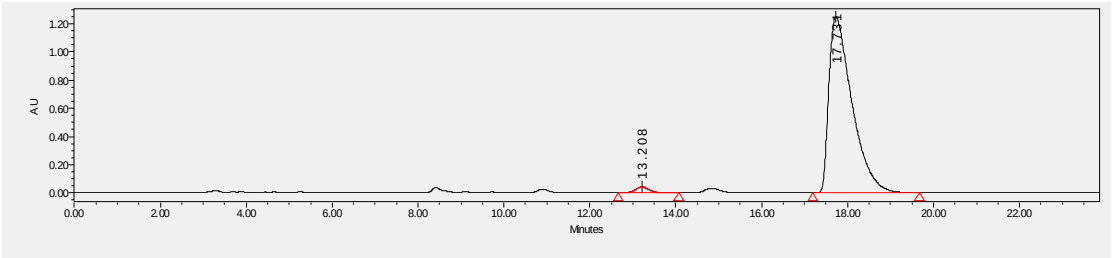


**3ia**

Colorless oil, 77% yield, 95% ee. $[\alpha]_{\lambda}^{31}$ = +58.9 (*c* = 0.43 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 17.73 min, $t_R$ (minor) = 13.21 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.82 - 7.75 (m, 2H), 7.52 - 7.46 (m, 3H), 7.37 (s, 5H), 6.25 (s, 1H), 5.82 (s, 1H), 4.50 - 4.32 (m, 2H), 4.02 - 3.90 (m, 1H), 3.63 - 3.52 (m, 1H), 2.48 (s, 3H), 1.39 (t, *J* = 7.2 Hz, 3H), 0.79 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.1, 166.9, 134.6, 134.5, 130.6, 129.7, 129.1, 128.6, 128.3, 126.4, 92.3, 87.6, 77.0, 63.2, 62.1, 43.0, 14.0, 13.2. HRMS (ESI-TOF) calcd for $C_{22}H_{25}NNaO_7S^+$ ([M+$Na^+$]) = 470.1244, Found 470.1255.

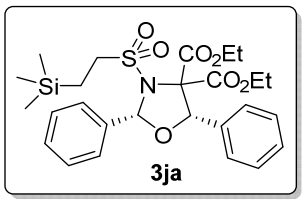



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.932 | 8488676 | 50.20 |
| 2 | 17.684 | 8422281 | 49.80 |



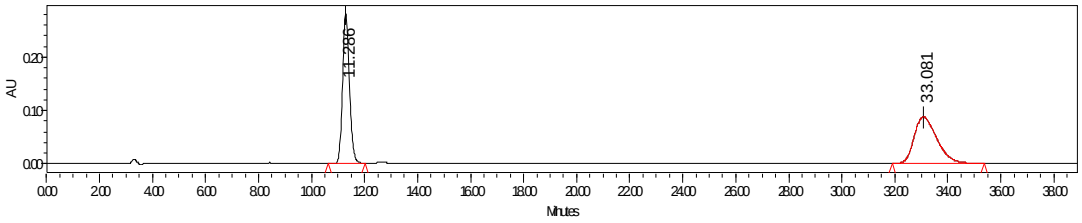

| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 13.208 | 858882 | 1.80 |
| 2 | 17.731 | 46729578 | 98.20 |

(*2R,5S*)-**Diethyl 2, 5-diphenyl-3-(2-trimethylsilylethanesulfonyl)oxazolidine-4, 4′-dicarboxylate (3ja)**

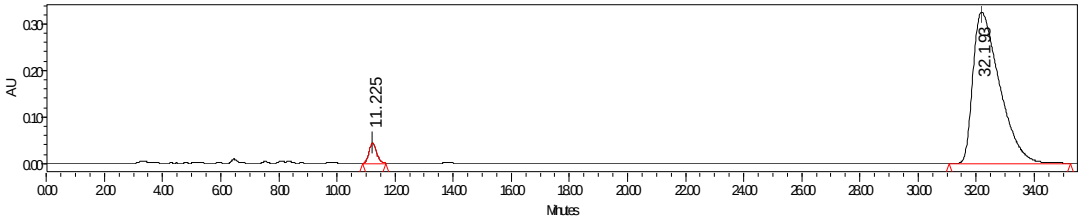


**3ja**

White solid, m.p. 108-109 °C, 66% yield, 93% ee. $[\alpha]_{\lambda}^{27}$ = +65.3 (*c* = 1.32 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 32.19 min, $t_R$ (minor) = 11.22 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.76 - 7.67 (m, 2H), 7.44 - 7.36 (m, 3H), 7.34 - 7.25 (m, 5H), 6.18 (s, 1H), 5.76 (s, 1H), 4.48 - 4.22 (m, 2H), 3.93 - 3.80 (m, 1H), 3.53 - 3.40 (m, 1H), 2.95 - 2.82 (m, 1H), 1.88 - 1.75 (m, 1H), 1.33 (t, *J* = 7.2 Hz, 3H), 0.80- 0.69 (m, 4H), 0.65 - 0.55 (m, 1H), -0.27 (s, 9H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.2, 166.8, 135.2, 134.6, 130.5, 129.6, 128.9, 128.4, 128.2, 126.4, 92.2, 87.6, 76.8, 63.0, 61.9, 51.8, 13.9, 13.2, 8.8, -2.3. HRMS (ESI-TOF) calcd for $C_{26}H_{35}NNaO_7SSi^+$ ($[M+Na^+]$) = 556.1796, Found 556.1806.

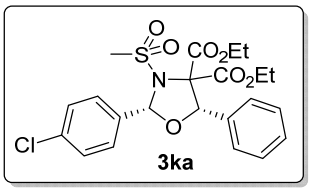



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.286 | 5149747 | 49.99 |
| 2 | 33.081 | 5150946 | 50.01 |

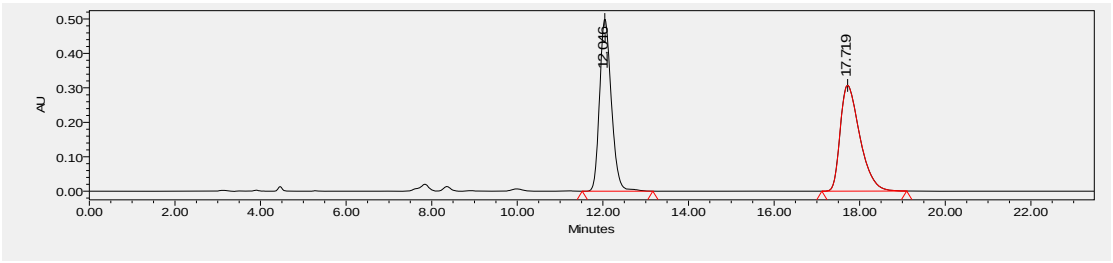



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.225 | 778015 | 3.63 |
| 2 | 32.193 | 20653020 | 96.37 |

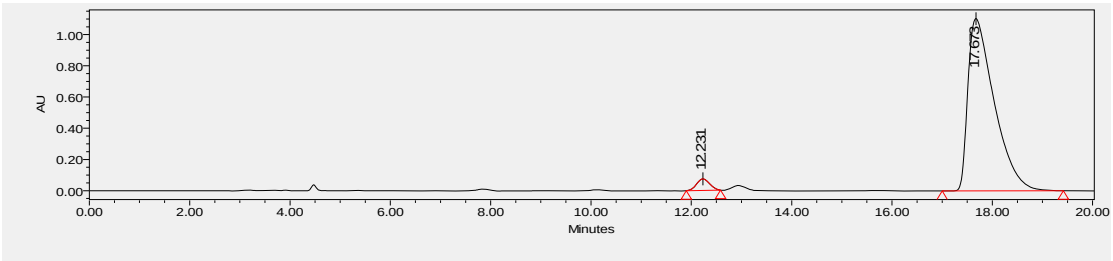
(*2R*,*5S*)-**Diethyl 2-(4-chlorophenyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3ka)**




Colorless oil, 80% yield, 94% ee. $[\alpha]_{\lambda}^{31}$ = +19.8 (*c* = 0.51 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 17.67 min, $t_R$ (minor) = 12.23 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.74 (d, *J* = 8.4 Hz, 2H), 7.47 (d, *J* = 8.0 Hz, 2H), 7.41 - 7.30 (m, 5H), 6.23 (s, 1H), 5.82 (s, 1H), 4.49 - 4.30 (m, 2H), 4.01 - 3.90 (m, 1H), 3.61 - 3.49 (m, 1H), 2.56 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.78 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.9, 166.9, 136.6, 134.3, 133.4, 131.0, 129.2, 128.9, 128.4, 126.3, 91.6, 87.7, 76.8, 63.2, 62.2, 43.2, 13.9, 13.2. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{34.9689}ClNa$ ([M+Na$^+$]) = 504.0855, Found 504.0862. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{36.9659}ClNa$ ([M+Na$^+$]) = 506.0825, Found 506.0844.

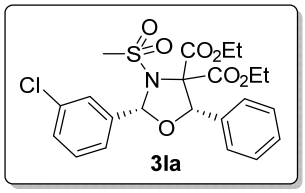



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.046 | 9489188 | 49.50 |
| 2 | 17.719 | 9681523 | 50.50 |

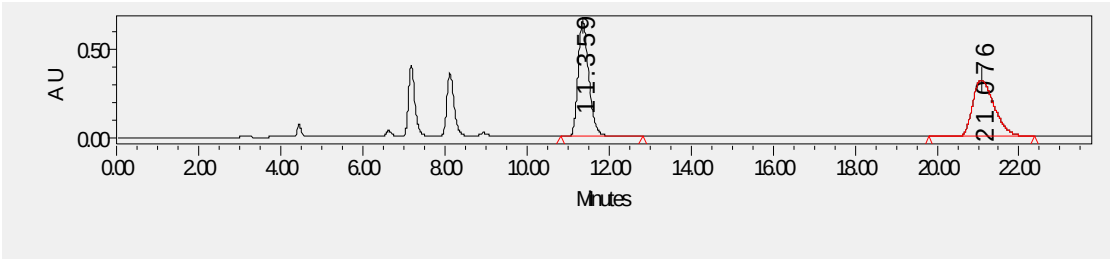



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.231 | 1346321 | 3.24 |
| 2 | 17.673 | 40206392 | 96.76 |

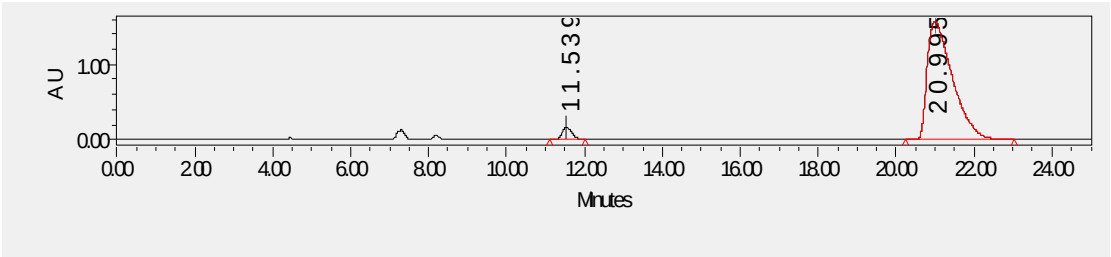
(*2R*,*5S*)-**Diethyl 2-(3-chlorophenyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3la)**




Colorless oil, 78% yield, 92% ee. $[\alpha]_{\lambda}^{25}$ = +34.6 (*c* = 0.48 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 21.0 min, $t_R$ (minor) = 11.5 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.83 - 7.77 (m, 1H), 7.71 - 7.65 (m, 1H), 7.50 - 7.30 (m, 7H), 6.21 (s, 1H), 5.82 (s, 1H), 4.48 - 4.31 (m, 2H), 4.03 - 3.92 (m, 1H), 3.65 - 3.53 (m, 1H), 2.59 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.80 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.9, 166.8, 136.9, 134.5, 134.2, 130.8, 129.9, 129.6, 129.2, 128.4, 127.9, 126.4, 91.6, 87.8, 76.8, 63.3, 62.2, 43.2, 13.9, 13.2. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{34.9689}ClNa$ ([M+Na$^+$]) = 504.0855, Found 504.0864. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{36.9659}ClNa$ ([M+Na$^+$]) = 506.0825, Found 506.0846.

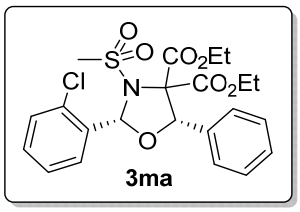



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.359 | 12113629 | 50.24 |
| 2 | 21.076 | 11995954 | 49.76 |

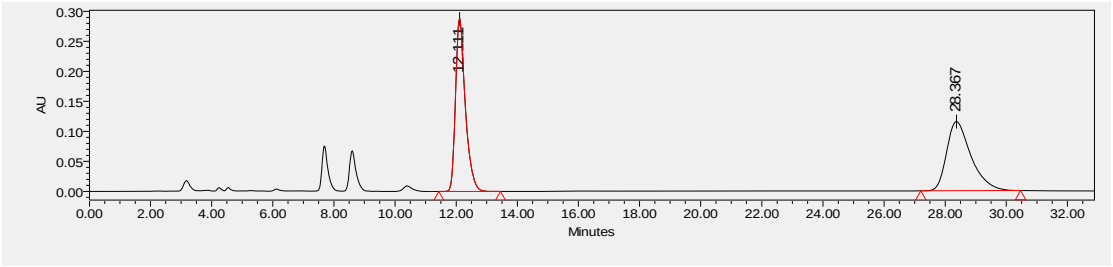



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.539 | 2842464 | 3.87 |
| 2 | 20.995 | 70607097 | 96.13 |

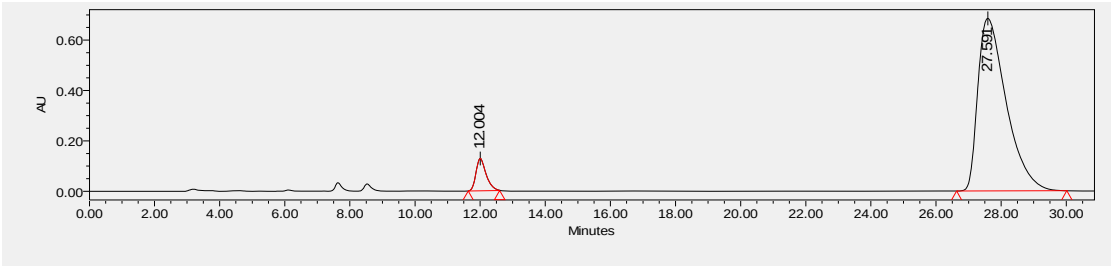
(*2R,5S*)-**Diethyl 2-(2-chlorophenyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3ma)**




Colorless oil, 71% yield, 88% ee. $[\alpha]_{\lambda}^{26}$ = +43.4 (*c* = 0.58 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak ID, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 27.6 min, $t_R$ (minor) = 12.0 min.) $^1$H NMR (400 MHz, DMSO-$d_6$) δ = 8.11 (d, *J* = 7.2 Hz, 1H), 7.63 - 7.51 (m, 3H), 7.46 - 7.37 (m, 3H), 7.37 - 7.24 (m, 2H), 6.68 (s, 1H), 5.89 (s, 1H), 4.46 - 4.17 (m, 2H), 3.94 - 3.82 (m, 1H), 3.60 - 3.50 (m, 1H), 2.80 (s, 3H), 1.30 (t, *J* = 7.2 Hz, 3H), 0.76 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, DMSO-$d_6$) δ = 166.1, 166.0, 134.2, 133.9, 132.4, 131.9, 130.9, 129.7, 129.0, 128.2, 127.6, 126.6, 87.7, 86.6, 75.9, 62.6, 61.7, 42.8, 13.6, 13.0. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{34.9689}ClNa$ ([M+$Na^+$]) = 504.0855, Found 504.0851. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{36.9659}ClNa$ ([M+$Na^+$]) = 506.0825, Found 506.0842.

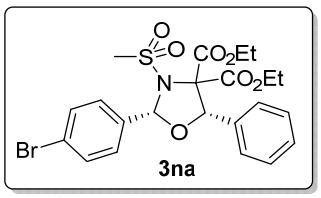



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.111 | 6375058 | 49.86 |
| 2 | 28.367 | 6410644 | 50.14 |



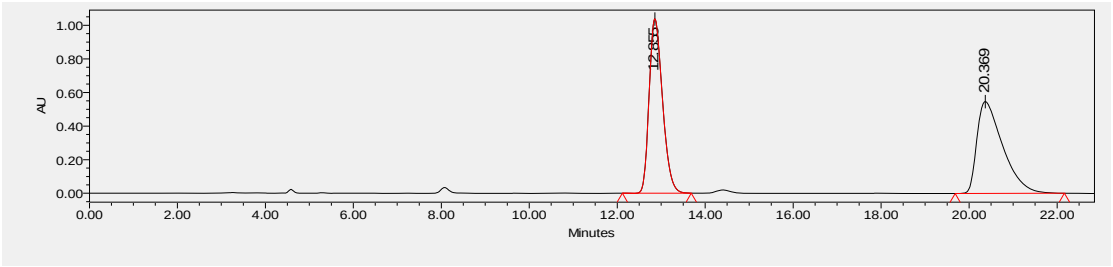

| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.004 | 2746877 | 6.21 |
| 2 | 27.591 | 41471338 | 93.79 |

(*2R,5S*)-**Diethyl 2-(4-bromophenyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3na)**

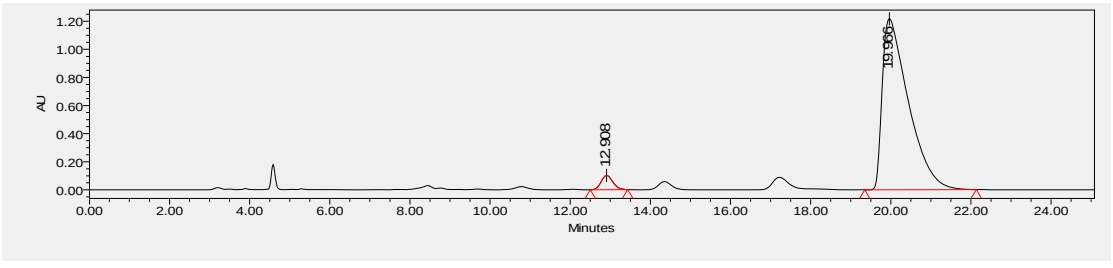


3na

Colorless oil, 70% yield, 93% ee. $[\alpha]_{\lambda}^{31}$ = +18.8 (*c* = 0.55 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 19.97 min, $t_R$ (minor) = 12.91 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.65 (dd, *J* = 8.8 Hz, 20.0 Hz, 4H), 7.43 - 7.30 (m, 5H), 6.21 (s, 1H), 5.82 (s, 1H), 4.48 - 4.30 (m, 2H), 4.01 - 3.90 (m, 1H), 3.61 - 3.49 (m, 1H), 2.57 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.78 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.9, 166.8, 134.3, 133.9, 131.8, 131.3, 129.2, 128.4, 126.4, 124.9, 91.7, 87.7, 76.8, 63.2, 62.2, 43.3, 13.9, 13.2. HRMS (ESI-TOF) calcd for $C_{22}H_{24}{}^{78.9183}BrNNaO_7S^+$ ([M+Na$^+$]) = 548.0350, Found 548.0352. HRMS (ESI-TOF) calcd for $C_{22}H_{24}{}^{80.9163}BrNNaO_7S^+$ ([M+Na$^+$]) = 550.0329, Found 550.0331.

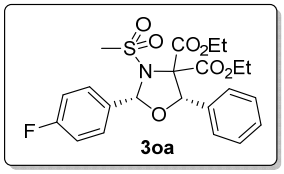



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.855 | 21959895 | 49.65 |
| 2 | 20.369 | 22270136 | 50.35 |

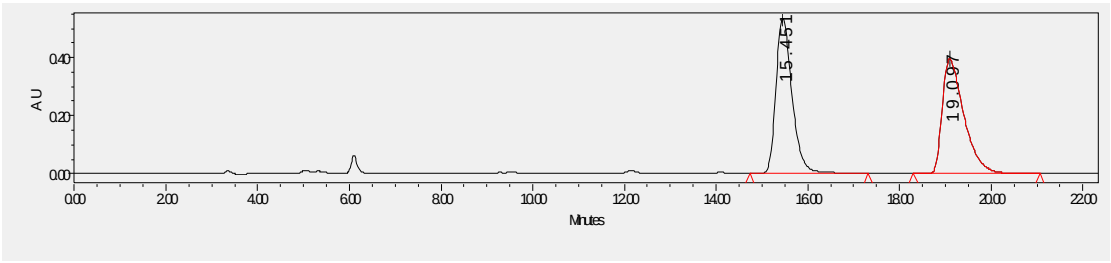



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.908 | 2090620 | 3.64 |
| 2 | 19.966 | 55326464 | 96.36 |

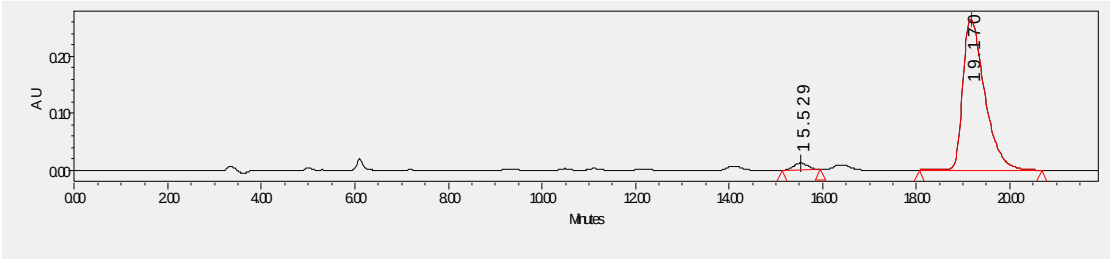
(*2R,5S*)-**Diethyl 2-(4-fluorophenyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3oa)**




Colorless oil, 66% yield, 94% ee. $[\alpha]_{\lambda}^{22}$ = +39.2 (*c* = 0.56 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 80/20, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 19.17 min, $t_R$ (minor) = 15.52 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.79 (dd, *J* = 8.4, 5.2 Hz, 2H), 7.42 - 7.31 (m, 5H), 7.18 (t, *J* = 8.4 Hz, 2H), 6.24 (s, 1H), 5.82 (s, 1H), 4.50 - 4.30 (m, 2H), 4.02 - 3.89 (m, 1H), 3.60 - 3.50 (m, 1H), 2.53 (s, 3H), 1.39 (t, *J* = 7.2 Hz, 3H), 0.78 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.0, 166.9, 164.0 (d, *J* = 251.1 Hz), 134.3, 131.6 (d, *J* = 8.7 Hz), 130.7 (d, *J* = 3.2 Hz), 129.1, 128.4, 126.3, 115.7 (*J* = 21.9 Hz), 91.6, 87.6, 76.9, 63.2, 62.2, 43.1, 13.9, 13.2; $^{19}$F NMR (376 MHz, $CDCl_3$) δ = -109.8. HRMS (ESI-TOF) calcd for $C_{22}H_{24}FNNaO_7S^+$ ([M+Na$^+$]) = 488.1150, Found 488.1156.

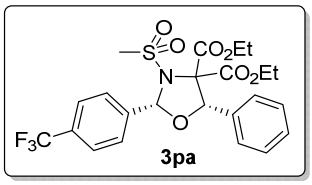



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 15.451 | 13202966 | 50.32 |
| 2 | 19.097 | 13033592 | 49.68 |

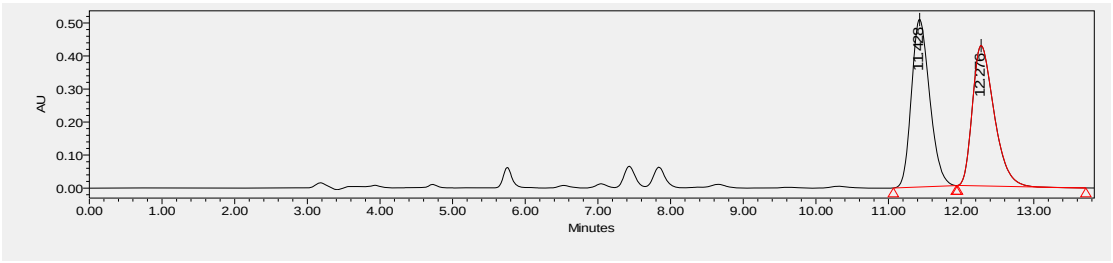



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 15.529 | 262149 | 2.97 |
| 2 | 19.170 | 8567033 | 97.03 |

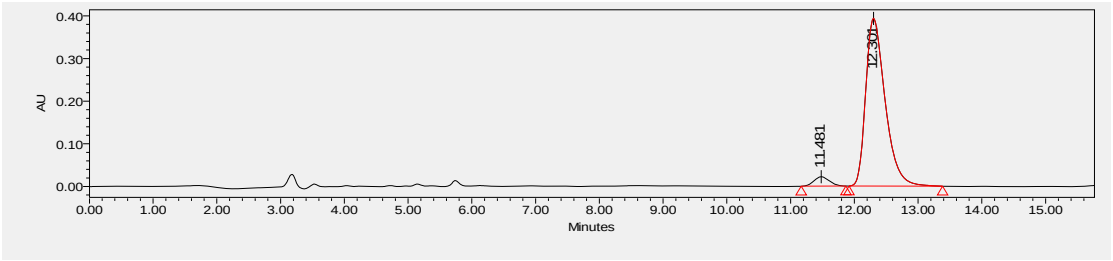
(*2R*,*5S*)-**Diethyl 2-(2-trifluoromethylphenyl)-5-phenyl-3-methylsulfonyloxazoidine-4, 4′-dicarboxylate (3pa)**




Colorless oil, 98% yield, 91% ee. $[\alpha]_{\lambda}^{25}$ = +32.2 (*c* = 0.85 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 80/20, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 12.30 min, $t_R$ (minor) = 11.48 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.94 (d, *J* = 8.0 Hz, 2H), 7.76 (d, *J* = 8.0 Hz, 2H), 7.40 - 7.32 (m, 5H), 6.31 (s, 1H), 5.87 (s, 1H), 4.51 - 4.27 (m, 2H), 4.02 - 3.91 (m, 1H), 3.61 - 3.50 (m, 1H), 2.57 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.78 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.9, 166.7, 139.0, 134.2, 132.5 (q, *J* = 32.7 Hz), 130.1, 129.2, 128.4, 126.3, 125.5 (q, *J* = 3.7 Hz), 123.8 (d, *J* = 273.5 Hz), 91.5, 87.9, 76.8, 63.3, 62.3, 43.3, 13.9, 13.2; $^{19}$F NMR (376 MHz, $CDCl_3$) δ = -62.8. HRMS (ESI-TOF) calcd for $C_{23}H_{24}F_3NNaO_7S^+$ ([M+$Na^+$]) = 538.1118, Found 538.1121.

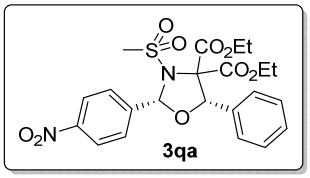



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.428 | 8849821 | 50.21 |
| 2 | 12.276 | 8774340 | 49.79 |

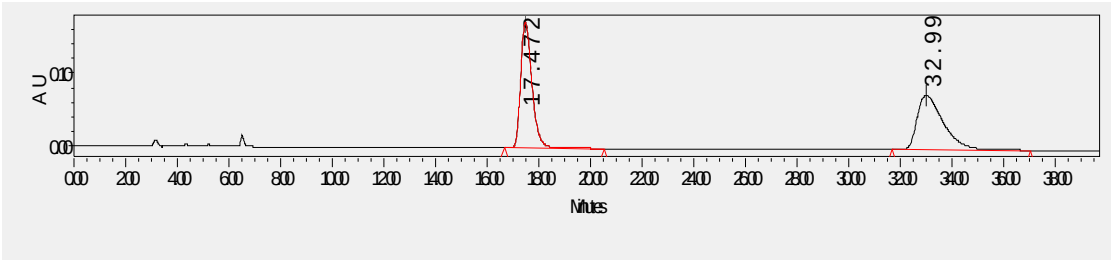



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.481 | 371533 | 4.28 |
| 2 | 12.301 | 8308964 | 95.72 |

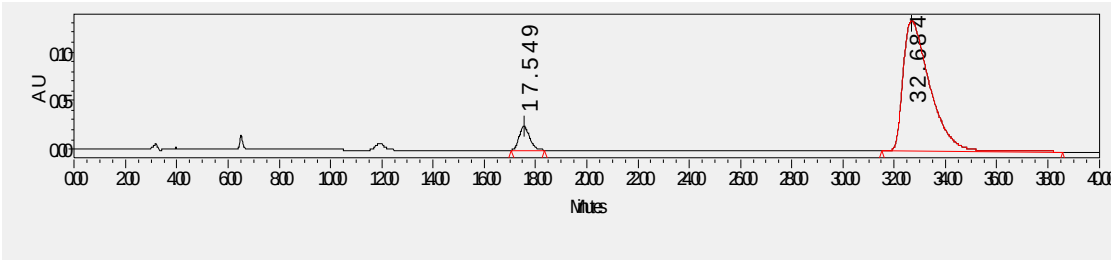
***cis*-Diethyl 2-(4-nitrophenyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3qa)**




Colorless oil, 84% yield, 87% ee. $[\alpha]_{\lambda}^{23}$ = -13.6 (*c* = 0.74 in $CH_2Cl_2$, λ = 405 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 32.68 min, $t_R$ (minor) = 17.55 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 8.35 (d, *J* = 8.8 Hz, 2H), 8.01 (d, *J* = 8.8 Hz, 2H), 7.45 - 7.30 (m, 5H), 6.35 (s, 1H), 5.91 (s, 1H), 4.50 - 4.30 (m, 2H), 4.03 - 3.93 (m, 1H), 3.60 - 3.49 (m, 1H), 2.64 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.78 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.0, 166.3, 149.1, 142.1, 133.9, 130.7, 129.3, 128.5, 126.3, 123.7, 91.1, 88.0, 76.6, 63.4, 62.4, 43.4, 13.9, 13.2. HRMS (ESI-TOF) calcd for $C_{22}H_{24}N_2NaO_9S^+$ ([M+Na$^+$]) = 515.1095, Found 515.1099.

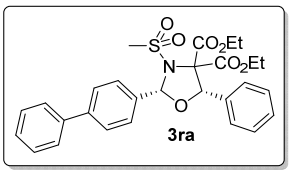



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 17.472 | 5281685 | 50.23 |
| 2 | 32.999 | 5232601 | 49.77 |

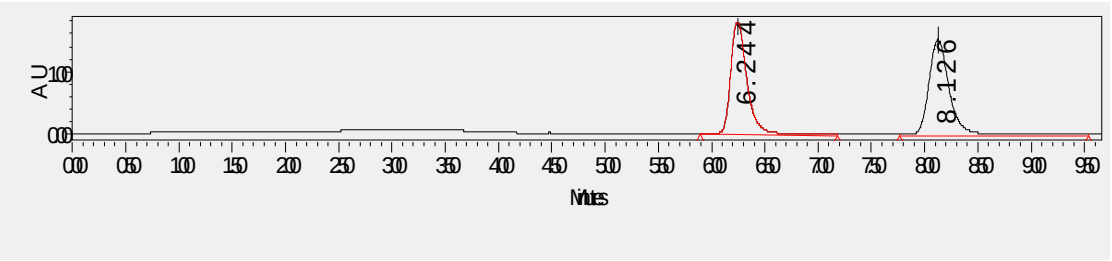



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 17.549 | 681501 | 6.59 |
| 2 | 32.684 | 9661414 | 93.41 |

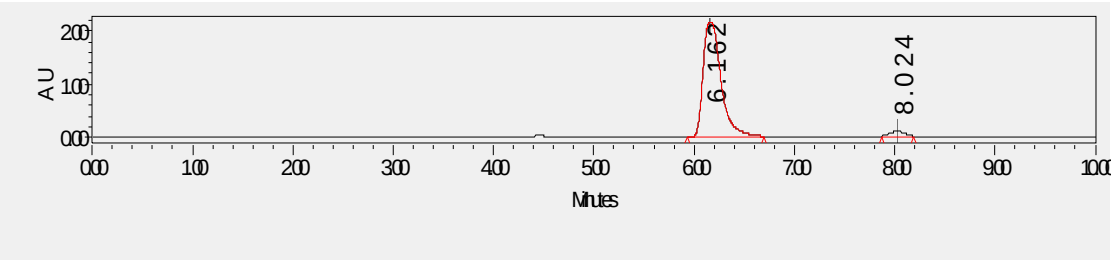
***cis*-Diethyl 2-(4-phenylphenyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3ra)**




Light yellow oil, 70% yield, 93% ee. $[\alpha]_{\lambda}^{28}$ = -31.2 (*c* = 2.30 in $CH_2Cl_2$, 365 nm). (Chiralpak IA, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 6.16 min, $t_R$ (minor) = 8.02 min.) $^1$H NMR(400 MHz, $CDCl_3$) δ = 7.86 (d, *J* = 8.4 Hz, 2H), 7.72 (d, *J* = 8.4 Hz, 2H), 7.63 (d, *J* = 7.2 Hz, 2H), 7.47 (t, *J* = 7.6 Hz, 2H), 7.41 - 7.34 (m, 6H), 6.30 (s, 1H), 5.84 (s, 1H), 4.50 - 4.33 (m, 2H), 4.02 - 3.92 (m, 1H), 3.64 - 3.53 (m, 1H), 2.57 (s, 3H), 1.40 (t, *J* = 7.2 Hz, 3H), 0.80 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.1, 167.0, 143.4, 140.2, 134.5, 133.6, 130.1, 129.1, 129.0, 128.4, 127.9, 127.3, 127.2, 126.4, 92.1, 87.7, 77.0, 63.2, 62.2, 43.2, 14.0, 13.3. HRMS (ESI-TOF) calcd for $C_{28}H_{29}NNaO_7S^+$ ([M+Na$^+$]) = 546.1557, Found 546.1564.

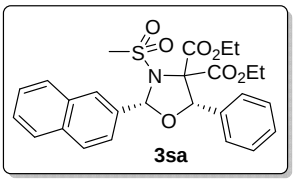



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 6.244 | 19265728 | 49.32 |
| 2 | 8.126 | 19798207 | 50.68 |



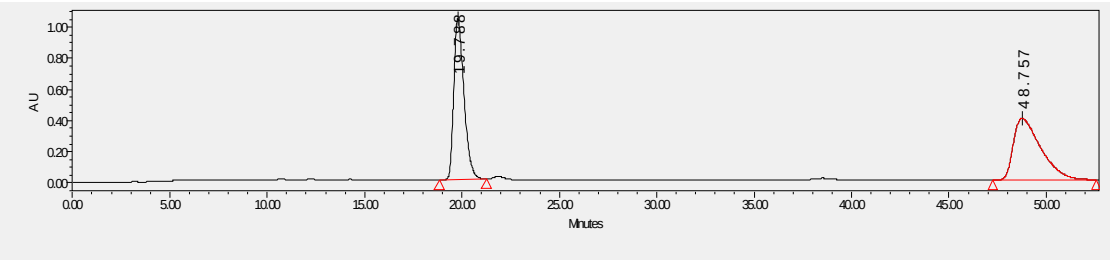

| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 6.162 | 26928620 | 96.54 |
| 2 | 8.024 | 964882 | 3.46 |

(*2R,5S*)-**Diethyl 2-(2-naphthyl)-5-phenyl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3sa)**

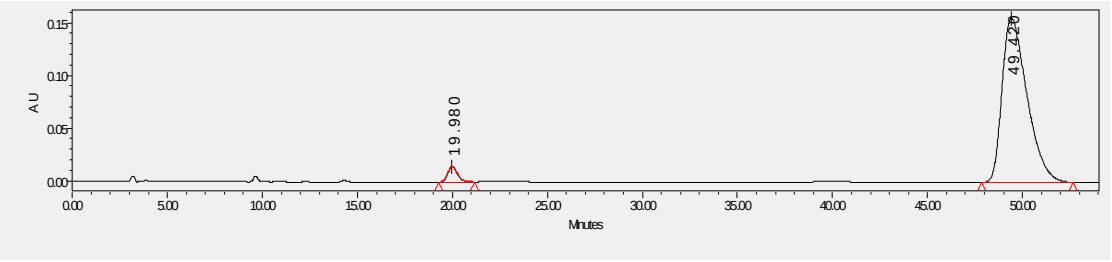


**3sa**

White solid, m.p. 146-148 °C, 94% yield, 93% ee. $[\alpha]_{\lambda}^{31}$ = -4.3 (*c* = 0.56 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: *t*R (major) = 49.42 min, *t*R (minor) = 19.98 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 8.19 (s, 1H), 8.01 - 7.87 (m, 4H), 7.60 - 7.52 (m, 2H), 7.43 - 7.35 (m, 5H), 6.42 (s, 1H), 5.87 (s, 1H), 4.54 - 4.33 (m, 2H), 4.05 - 3.94 (m, 1H), 3.67 - 3.56 (m, 1H), 2.47 (s, 3H), 1.41 (t, *J* = 7.2 Hz, 3H), 0.82 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, DMSO-$d_6$) δ = 166.3, 166.0, 134.3, 133.8, 132.1, 132.0, 130.0, 129.0, 128.4, 128.3, 128.3, 127.7, 127.4, 126.7, 126.5, 125.4, 91.7, 86.7, 76.2, 62.5, 61.7, 42.7, 13.7, 13.1. HRMS (ESI-TOF) calcd for $C_{26}H_{27}NO_7SNa$ ([M+$Na^+$]) = 520.1400, Found 520.1405.

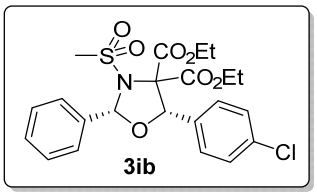



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 19.788 | 37694278 | 49.40 |
| 2 | 48.757 | 38608447 | 50.60 |

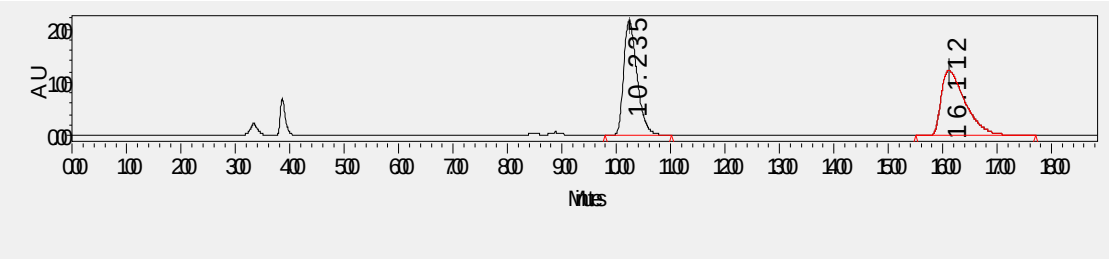



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 19.980 | 522238 | 3.54 |
| 2 | 49.420 | 14232749 | 96.46 |

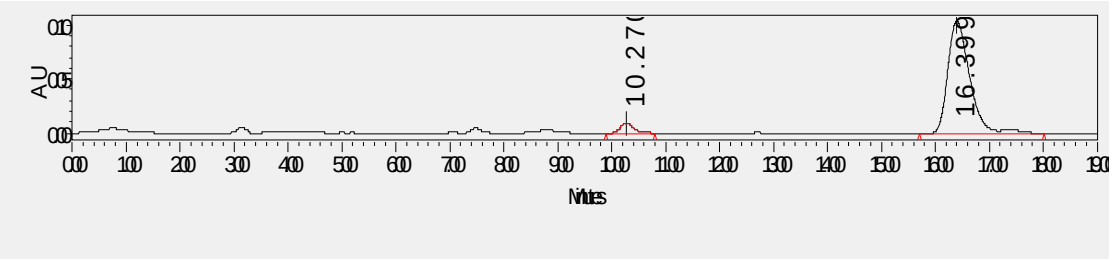
***cis*-Diethyl-2-phenyl-5-(4-chlorophenyl)-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3ib)**




Colorless oil, 70% yield, 90% ee. $[\alpha]_{\lambda}^{31}$ = +91.7 (*c* = 0.37 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 16.40 min, $t_R$ (minor) = 10.27min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.80 - 7.72 (m, 2H), 7.54 - 7.46 (m, 3H), 7.40 - 7.27 (m, 4H), 6.23 (s, 1H), 5.79 (s, 1H), 4.49 - 4.30 (m, 2H), 4.05 – 3.94 (m, 1H), 3.73 - 3.62 (m, 1H), 2.49 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.87 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.9, 166.8, 134.9, 134.4, 133.1, 130.7, 129.6, 128.6, 128.5, 127.8, 92.4, 86.9, 76.8, 63.3, 62.3, 43.0, 13.9, 13.3. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{34.9689}ClNa$ ([M+Na$^+$]) = 504.0855, Found 504.0857. HRMS (ESI-TOF) calcd for $C_{22}H_{24}NO_7S^{36.9659}ClNa$ ([M+Na$^+$]) = 506.0825, Found 506.0826.

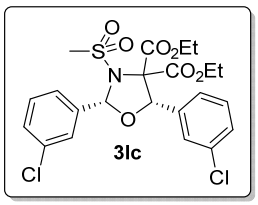



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 10.235 | 36950127 | 49.44 |
| 2 | 16.112 | 37783222 | 50.56 |

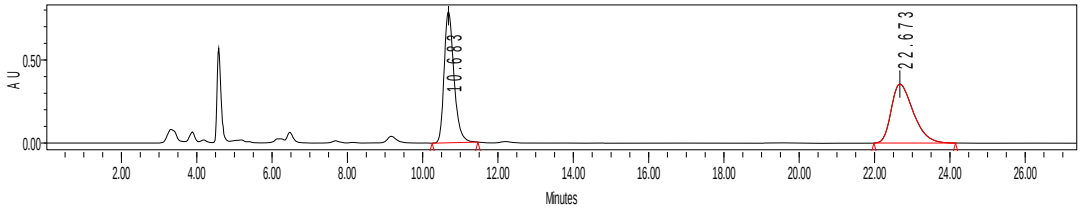



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 10.270 | 157976 | 5.06 |
| 2 | 16.399 | 2963710 | 94.94 |

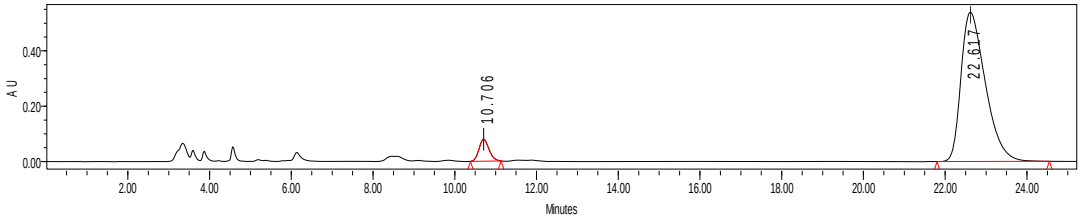
***cis*-Diethyl 2-(3-chlorophenyl)-5-(3-chlorophenyl)-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3lc)**




Colorless oil, 38% yield, 89% ee. $[\alpha]_{\lambda}^{26}$ = +13.4 (*c* = 0.30 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 22.62 min, $t_R$ (minor) = 10.71 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.77 - 7.74 (m, 1H), 7.68 - 7.63 (m, 1H), 7.51 - 7.41 (m, 2H), 7.38 - 7.29 (m, 3H), 7.25 - 7.21 (m, 1H), 6.20 (s, 1H), 5.79 (s, 1H), 4.49 - 4.31 (m, 2H), 4.06 - 3.95 (m, 1H), 3.77 - 3.66 (m, 1H), 2.61 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.88 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.6, 166.6, 136.7, 136.2, 134.6, 134.4, 130.9, 129.9, 129.7, 129.5, 129.2, 127.8, 126.5, 124.6, 91.7, 86.8, 76.6, 63.5, 62.4, 43.2, 13.9, 13.3. HRMS (ESI-TOF) calcd for $C_{22}H_{23}{}^{34.9689}Cl_2NNaO_7S^+$ ([M+Na$^+$]) = 538.0465, Found 538.0477. HRMS (ESI-TOF) calcd for $C_{22}H_{23}{}^{34.9689}Cl^{36.9659}ClNNaO_7S^+$ ([M+Na$^+$]) = 540.0435, Found 540.0454.

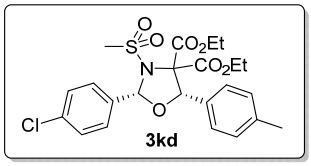



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 10.683 | 14251319 | 49.69 |
| 2 | 22.673 | 14426564 | 50.31 |

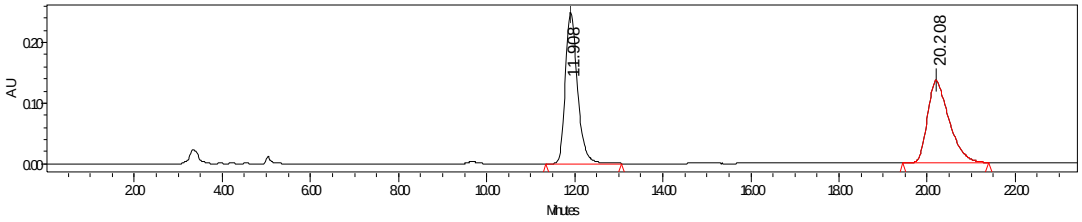



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 10.706 | 1347917 | 5.70 |
| 2 | 22.617 | 22296304 | 94.30 |

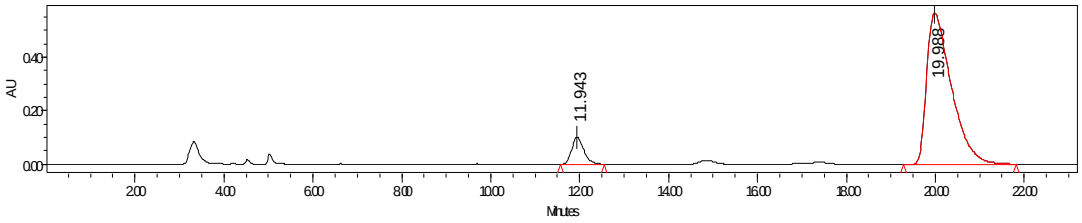
(*2R,5S*)-**Diethyl 2-(4-chlorophenyl)-5-(4-methylphenyl)-3-methylsulfonyloxazolidine-4, 4′-di-carboxylate (3kd)**




Colorless oil, 51% yield, 84% ee. $[\alpha]_{\lambda}^{32}$ = +45.1 (*c* = 0.29 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 19.99 min, $t_R$ (minor) = 11.94 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.73 (d, *J* = 8.4 Hz, 2H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.22 (d, *J* = 8.4 Hz, 2H), 7.17 (d, *J* = 8.0 Hz, 2H), 6.21 (s, 1H), 5.78 (s, 1H), 4.49 - 4.28 (m, 2H), 4.02 - 3.90 (m, 1H), 3.65 - 3.52 (m, 1H), 2.55 (s, 3H), 2.36 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.80 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.0, 166.9, 139.1, 136.5, 133.4, 131.3, 131.0, 129.0, 128.8, 126.3, 91.5, 87.8, 76.8, 63.2, 62.2, 43.2, 21.2, 13.9, 13.2. HRMS (ESI-TOF) calcd for $C_{23}H_{26}{}^{34.9689}ClNNaO_7S^+$ ([M+Na$^+$]) = 518.1011, Found 518.1019. HRMS (ESI-TOF) calcd for $C_{23}H_{26}{}^{36.9659}ClNNaO_7S^+$ ([M+Na$^+$]) = 520.0982, Found 520.0997.

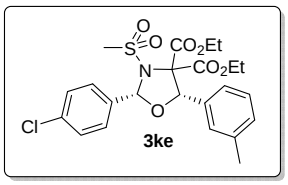



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.908 | 4758408 | 50.68 |
| 2 | 20.208 | 4629832 | 49.32 |

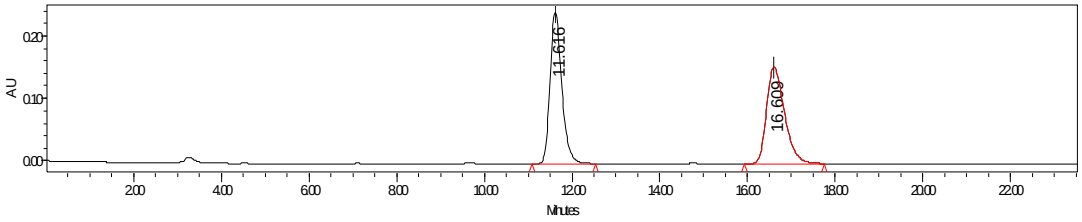



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.943 | 1904690 | 8.02 |
| 2 | 19.988 | 21836030 | 91.98 |

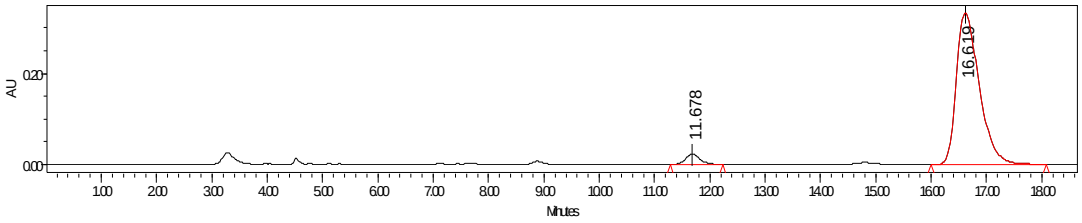
(*2R,5S*)-**Diethyl 2-(4-chlorophenyl)-5-(3-methylphenyl)-3-methylsulfonyloxazolidine-4, 4′-di-carboxylate (3ke)**




Colorless oil, 73% yield, 94% ee. $[\alpha]_{\lambda}^{32}$ = +14.9 (*c* = 0.57 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 16.55 min, $t_R$ (minor) = 11.68 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.74 (d, *J* = 8.4 Hz, 2H), 7.47 (d, *J* = 8.8 Hz, 2H), 7.25 (t, *J* = 8.0 Hz, 1H), 7.20 - 7.10 (m, 3H), 6.21 (s, 1H), 5.78 (s, 1H), 4.53 - 4.26 (m, 2H), 4.04 - 3.90 (m, 1H), 3.64 - 3.50 (m, 1H), 2.56 (s, 3H), 2.35 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.79 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.0, 166.9, 138.1, 136.5, 134.2, 133.4, 131.0, 129.9, 128.8, 128.3, 126.9, 123.5, 91.6, 87.8, 76.8, 63.2, 62.1, 43.2, 21.4, 13.9, 13.2. HRMS (ESI-TOF) calcd for $C_{23}H_{26}{}^{34.9689}ClNNaO_7S^+$ ([M+Na$^+$]) = 518.1011, Found 518.1013. HRMS (ESI-TOF) calcd for $C_{23}H_{26}{}^{36.9659}ClNNaO_7S^+$ ([M+Na$^+$]) = 520.0982, Found 520.0991.

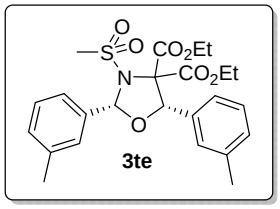



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.616 | 4478707 | 50.47 |
| 2 | 16.609 | 4395193 | 49.53 |

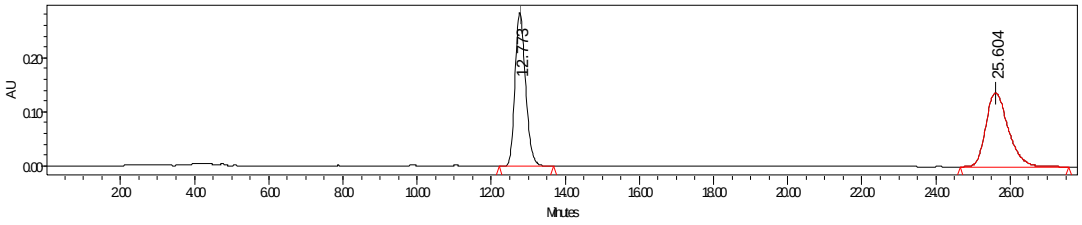



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 11.676 | 612739 | 3.22 |
| 2 | 16.546 | 18439245 | 96.78 |

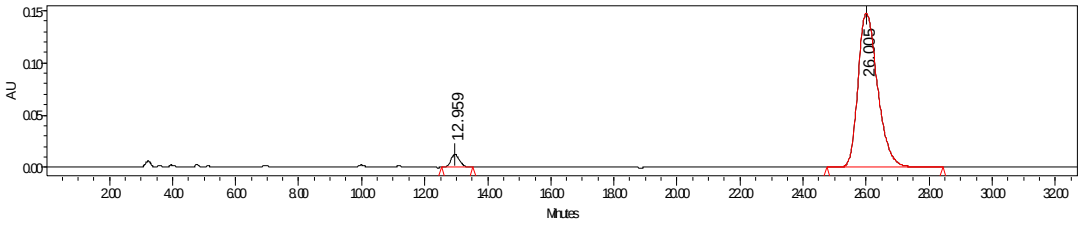
(*2R,5S*)-**Diethyl 2-(3-methylphenyl)-5-(3-methylphenyl)-3-methylsulfonyloxazolidine-4, 4′-di-carboxylate (3te)**




Colorless oil, 51% yield, 92% ee. $[\alpha]_{\lambda}^{30}$ = +44.2 (*c* = 1.00 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 26.00 min, $t_R$ (minor) = 12.96 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.61 (d, *J* = 7.6 Hz, 1H), 7.55 (s, 1H), 7.38 (t, *J* = 7.6 Hz, 1H), 7.29 (d, *J* = 7.6 Hz, 1H), 7.24 (d, *J* = 8.0 Hz, 1H), 7.19 - 7.13 (m, 3H), 6.19 (s, 1H), 5.75 (s, 1H), 4.53 - 4.28 (m, 2H), 4.02 - 3.88 (m, 1H), 3.67 - 3.55 (m, 1H), 2.51 (s, 3H), 2.43 (s, 3H), 2.35 (s, 3H), 1.40 (t, *J* = 7.2 Hz, 3H), 0.82 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.2, 166.8, 138.2, 137.9, 134.4, 131.3, 130.3, 129.7, 128.4, 128.2, 127.0, 126.6, 123.5, 92.3, 87.7, 76.9, 63.0, 62.0, 43.0, 21.4, 13.9, 13.2. HRMS (ESI-TOF) calcd for $C_{24}H_{29}NNaO_7S^+$ ([M+Na$^+$]) = 498.1557, Found 498.1566.

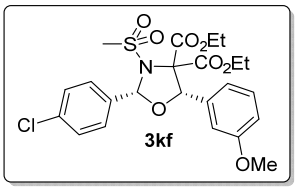



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.773 | 5663981 | 49.80 |
| 2 | 25.604 | 5710018 | 50.20 |

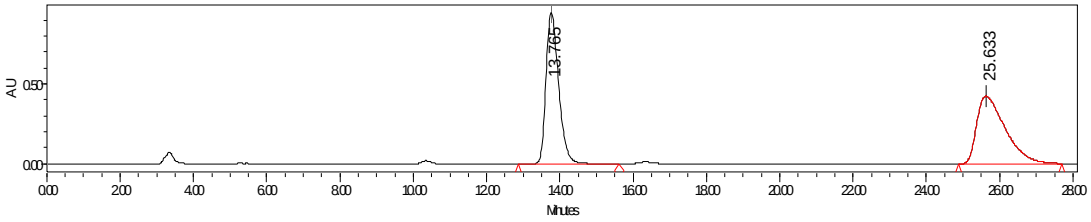



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.959 | 250292 | 3.78 |
| 2 | 26.005 | 6369513 | 96.22 |

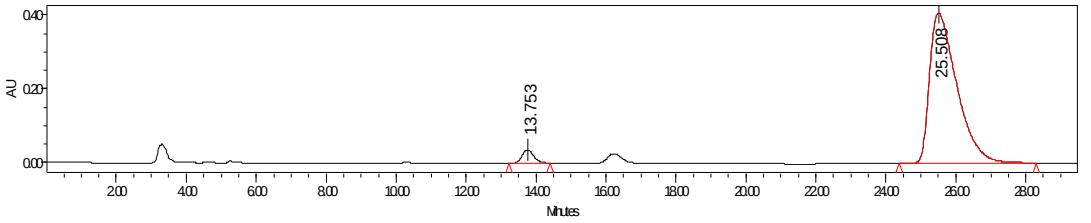
(*2R,5S*)-**Diethyl 2-(4-chlorophenyl)-5-(3-methoxylphenyl)-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3kf)**




Colorless oil, 70% yield, 93% ee. $[\alpha]_{\lambda}^{30}$ = -2.4 (*c* = 1.55 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 25.51 min, $t_R$ (minor) = 13.75 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.73 (d, *J* = 8.4 Hz, 2H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.33 - 7.27 (m, 1H), 6.97 - 6.85 (m, 3H), 6.21 (s, 1H), 5.79 (s, 1H), 4.52 - 4.25 (m, 2H), 4.03 - 3.92 (m, 1H), 3.80 (s, 3H), 3.68 - 3.57 (m, 1H), 2.56 (s, 3H), 1.38 (t, *J* = 7.2 Hz, 3H), 0.83 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 166.9, 166.8, 159.6, 136.6, 135.7, 133.4, 131.0, 129.5, 128.8, 118.8, 114.3, 112.2, 91.6, 87.5, 76.8, 63.2, 62.2, 55.3, 43.2, 13.9, 13.3. HRMS (ESI-TOF) calcd for $C_{23}H_{26}{}^{34.9689}ClNNaO_8S^+$ ([M+Na$^+$]) = 534.0960, Found 534.0962. HRMS (ESI-TOF) calcd for $C_{23}H_{26}{}^{36.9659}ClNNaO_8S^+$ ([M+Na$^+$]) = 536.0931, Found 536.0958.

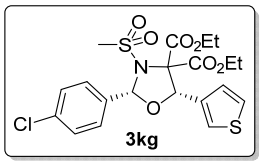



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 13.765 | 22737750 | 49.89 |
| 2 | 25.633 | 22834508 | 50.11 |

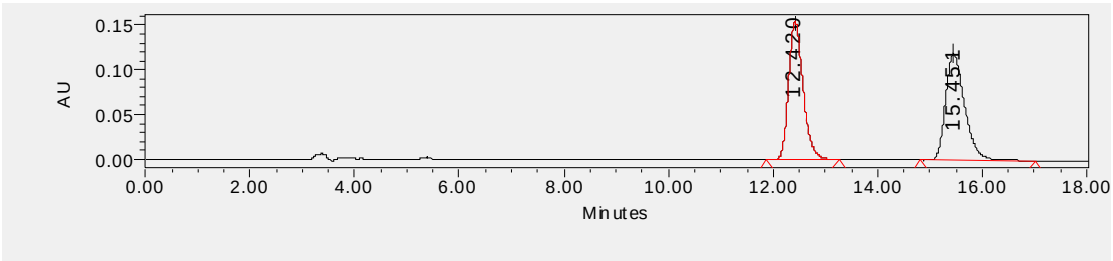



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 13.753 | 828211 | 3.64 |
| 2 | 25.508 | 21945739 | 96.36 |

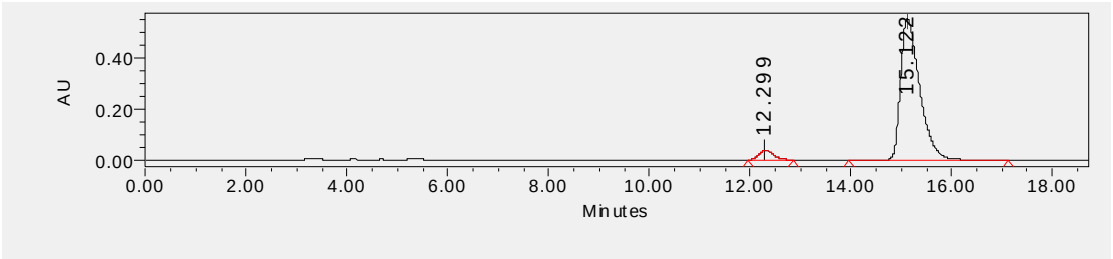
(*2R,5S*)-**Diethyl 2-(4-chlorophenyl)-5-(3-thienyl)-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3kg)**




Colorless oil, 84% yield, 91% ee. $[\alpha]_{\lambda}^{26}$ = +5.8 (*c* = 0.64 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IE, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 15.12 min, $t_R$ (minor) = 12.30 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.70 (d, *J* = 8.4 Hz, 2H), 7.45 (d, *J* = 8.4 Hz, 2H), 7.33 (d, *J* = 3.2 Hz, 2H), 7.04 (t, *J* = 3.2 Hz, 1H), 6.19 (s, 1H), 5.87 (s, 1H), 4.49 - 4.27 (m, 2H), 4.10 - 3.97 (m, 1H), 3.76 - 3.64 (m, 1H), 2.56 (s, 3H), 1.37 (t, *J* = 7.2 Hz, 3H), 0.94 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.0, 166.7, 136.5, 135.2, 133.4, 130.9, 128.8, 126.0, 125.8, 123.1, 91.6, 84.7, 76.3, 63.3, 62.4, 43.2, 13.9, 13.4. HRMS (ESI-TOF) calcd for $C_{20}H_{22}{}^{34.9689}ClNNaO_7S_2^+$ ([M+Na$^+$]) = 510.0419, Found 510.0426. HRMS (ESI-TOF) calcd for $C_{20}H_{22}{}^{36.9659}ClNNaO_7S_2^+$ ([M+Na$^+$]) = 512.0389, Found 512.0407.

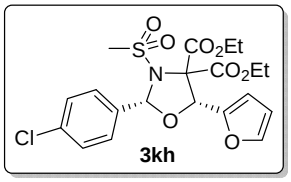



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.420 | 2991143 | 49.79 |
| 2 | 15.451 | 3016342 | 50.21 |

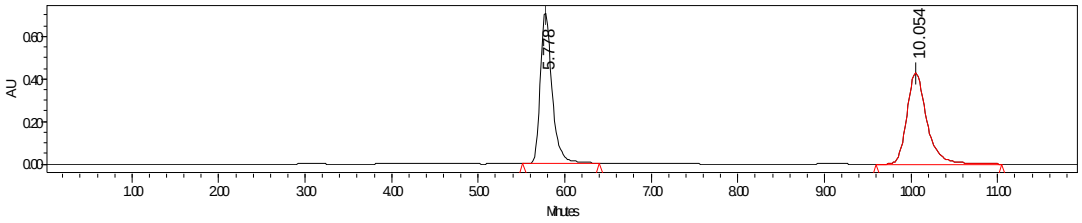



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 12.299 | 721904 | 4.74 |
| 2 | 15.122 | 14519480 | 95.26 |

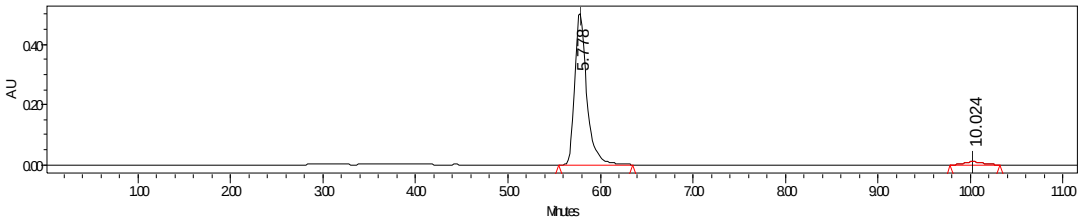
(*2R,5R*)-**Diethyl 2-(4-chlorophenyl)-5-(2-furyl)-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3kh)**




Colorless oil, 93% yield, 94% ee. $[\alpha]_{\lambda}^{32}$ = +20.1 (*c* = 0.80 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IA, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 5.78 min, $t_R$ (minor) = 10.02 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.68 (d, *J* = 8.4 Hz, 2H), 7.45 (t, *J* = 8.4 Hz, 3H), 6.45 (d, *J* = 3.2 Hz, 1H), 6.42 - 6.34 (m, 1H), 6.21 (s, 1H), 5.79 (s, 1H), 4.46 - 4.28 (m, 2H), 4.25 - 4.13 (m, 1H), 3.92 - 3.80 (m, 1H), 2.61 (s, 3H), 1.37 (t, *J* = 7.2 Hz, 3H), 1.08 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.0, 166.8, 147.2, 143.5, 136.5, 133.5, 130.9, 128.8, 110.6, 110.3, 91.8, 81.8, 75.5, 63.4, 62.8, 43.3, 13.8, 13.6. HRMS (ESI-TOF) calcd for $C_{20}H_{22}{}^{34.9689}ClNNaO_8S^+$ ([M+Na$^+$]) = 494.0647, Found 494.0659. HRMS (ESI-TOF) calcd for $C_{20}H_{22}{}^{36.9659}ClNNaO_8S^+$ ([M+Na$^+$]) = 496.0618, Found 496.0642.

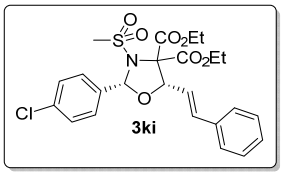



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 5.778 | 6616999 | 49.26 |
| 2 | 10.054 | 6816254 | 50.74 |

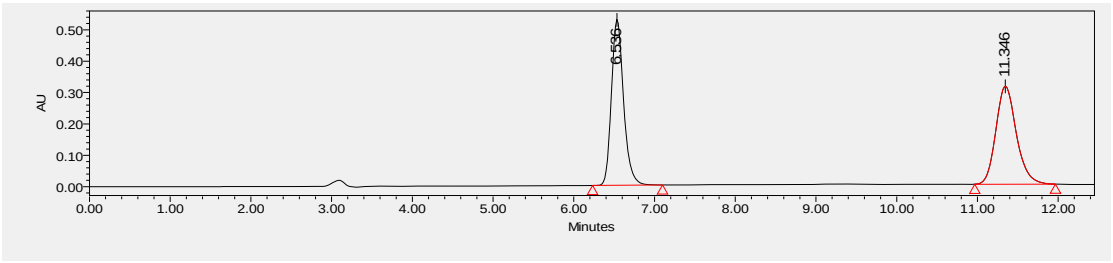



| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 5.778 | 4536714 | 96.96 |
| 2 | 10.024 | 142112 | 3.04 |

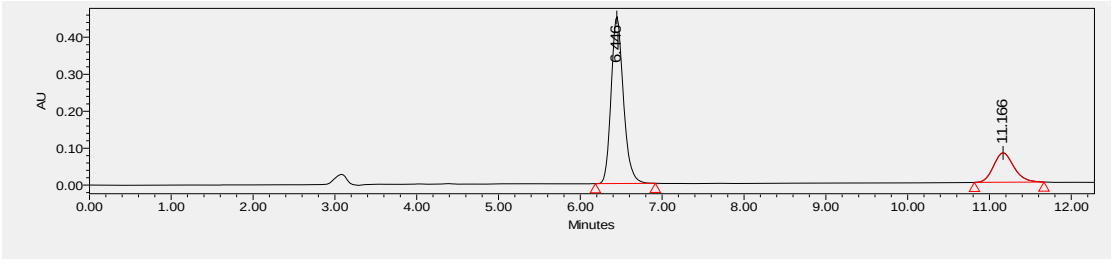
(*2R,5S*)-**Diethyl 2-(4-chlorophenyl)-5-(*E*)-styryl-3-methylsulfonyloxazolidine-4, 4′-dicarboxylate (3ki)**




Colorless oil, 84% yield, 55% ee. $[\alpha]_{\lambda}^{26}$ = -2.5 (*c* = 0.80 in $CH_2Cl_2$, λ = 365 nm). (Chiralpak IA, hexane/*i*PrOH = 70/30, flow rate = 1.0 mL/min, λ = 210 nm: $t_R$ (major) = 25.51 min, $t_R$ (minor) = 13.75 min.) $^1$H NMR (400 MHz, $CDCl_3$) δ = 7.61 (d, *J* = 8.0 Hz, 2H), 7.46 - 7.37 (m, 4H), 7.36 - 7.26 (m, 3H), 6.72 (d, *J* = 15.6 Hz, 1H), 6.28 (dd, *J* = 6.8, 15.6 Hz, 1H), 6.14 (s, 1H), 5.33 (d, *J* = 6.8 Hz, 1H), 4.46 - 4.19 (m, 4H), 2.57 (s, 3H), 1.35 (t, *J* = 7.2 Hz, 3H), 1.25 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ = 167.1, 166.5, 136.5, 135.6, 134.0, 133.5, 130.8, 128.8, 128.7, 128.6, 126.8, 121.3, 91.7, 86.9, 75.9, 63.3, 62.7, 43.2, 14.1, 13.9. HRMS (ESI-TOF) calcd for $C_{24}H_{26}{}^{34.9689}ClNNaO_7S^+$ ([M+Na$^+$]) = 530.1011, Found 530.1014. HRMS (ESI-TOF) calcd for $C_{24}H_{26}{}^{36.9659}ClNNaO_7S^+$ ([M+Na$^+$]) = 532.0982, Found 532.0988.




| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 6.536 | 5523739 | 49.99 |
| 2 | 11.346 | 5526605 | 50.01 |




| | Retention Time | Area | % Area |
|---|---|---|---|
| 1 | 6.446 | 4712372 | 77.39 |
| 2 | 11.166 | 1376722 | 22.61 |

## (L) References

1 (a) K. Y. Lee, C. G. Lee and J. N. Kim, *Tetrahedron Lett.*, 2003, **44**, 1231; (b) D.-J.

Dong, H.-H. Li and S.-K. Tian, *J. Am. Chem. Soc.*, 2010, **132**, 5018.

2 (a) X. Wu, L. Li and J. Zhang, *Adv. Synth. Catal.*, 2012, **354**, 3485; (b) R. H. Fan and Y. Ye, *Adv. Synth. Catal.*, 2008, **350**, 1526.

3 (a) Y. H. Wen, X. Huang, J. L. Huang, Y. Xiong, B. Qin and X. M. Feng, *Synlett.*, 2005, **16**, 2445; (b) X. H. Liu, L. L. Lin and X. M. Feng, *Acc. Chem. Res.*, 2011, **44**, 574; (c) X. H. Liu, L. L. Lin and X. M. Feng, *Org. Chem. Front.*, 2014, **1**, 298.

4 X. Wu, L. Li and J. Zhang, *Chem. Commun.*, 2011, **47**, 7824.

5 M. Vaultier and R. Carrie, *Tetrahedron Lett.*, 1978, **19**, 1195.

**(M) The X-ray data for 3sa**

The following single crystal **3sa** was recrystallized from $Et_2O$. CCDC-1057118 (**3sa**) contain the supplementary crystallographic data for this paper. These data can be obtained free of charge from the Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk./ data_request/cif.

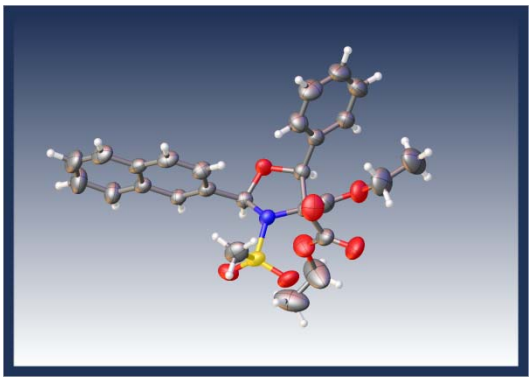
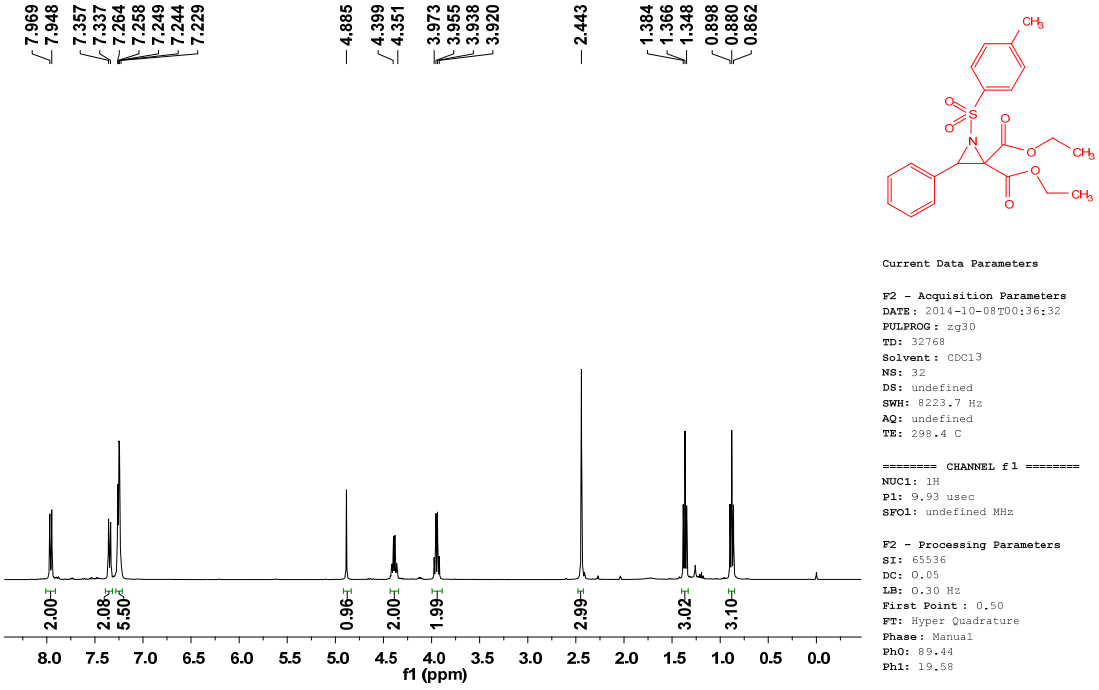


**Table 1 Crystal data and structure refinement for fxm-lyt-20150303.**

| | |
|---|---|
| Identification code | fxm-lyt-20150303 |
| Empirical formula | $C_{26}H_{27}NO_7S$ |
| Formula weight | 497.54 |
| Temperature/K | 293 |
| Crystal system | monoclinic |
| Space group | $P2_1$ |
| a/Å | 11.1671(2) |
| b/Å | 7.62440(10) |
| c/Å | 14.6056(3) |
| α/° | 90 |
| β/° | 94.103(2) |
| γ/° | 90 |

| | |
|---|---|
| Volume/$Å^3$ | 1240.37(4) |
| Z | 2 |
| $\rho_{calc}g/cm^3$ | 1.332 |
| $\mu/mm^{-1}$ | 1.552 |
| F(000) | 524.0 |
| Crystal size/$mm^3$ | 0.4 × 0.3 × 0.2 |
| Radiation | CuKα (λ = 1.54184) |
| 2Θ range for data collection/° | 9.644 to 134.112 |
| Index ranges | $-13 \leq h \leq 12$, $-9 \leq k \leq 6$, $-17 \leq l \leq 17$ |
| Reflections collected | 12899 |
| Independent reflections | 3607 [$R_{int}$ = 0.0319, $R_{sigma}$ = 0.0223] |
| Data/restraints/parameters | 3607/1/319 |
| Goodness-of-fit on $F^2$ | 1.070 |
| Final R indexes [I>=2σ (I)] | $R_1$ = 0.0526, $wR_2$ = 0.1353 |
| Final R indexes [all data] | $R_1$ = 0.0534, $wR_2$ = 0.1366 |
| Largest diff. peak/hole / e $Å^{-3}$ | 0.25/-0.39 |
| Flack parameter | 0.011(12) |

# (N) Copies of NMR spectra

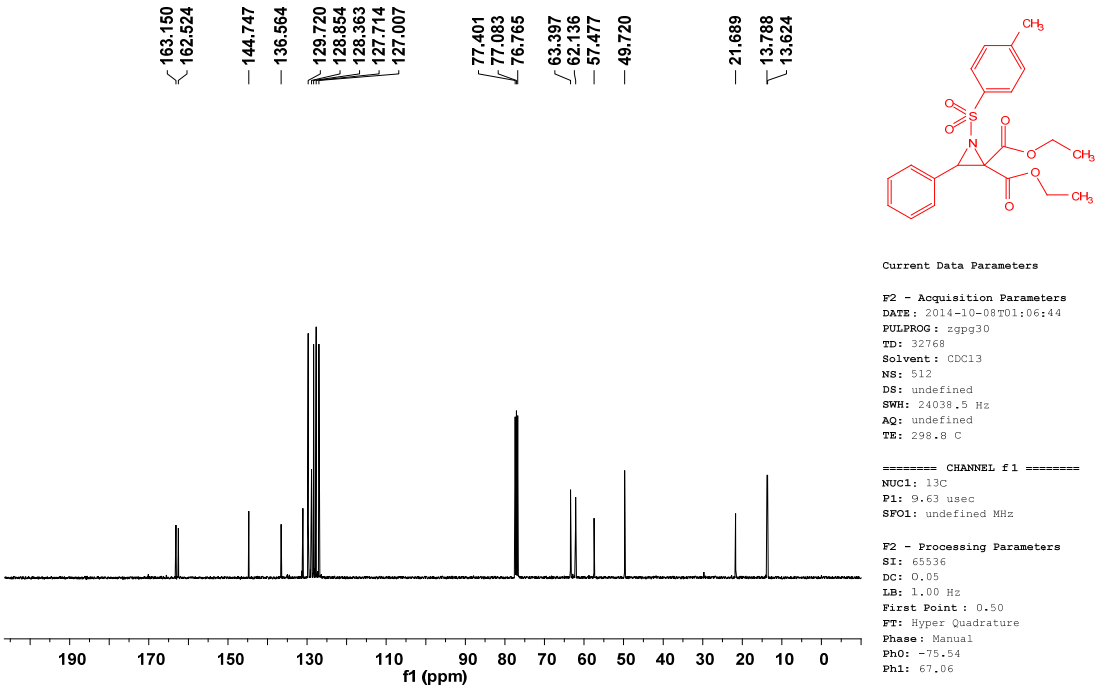



Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-10-08T00:36:32
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 298.4 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 89.44
Ph1: 19.58




Current Data Parameters

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Solvent: CDCl3
NS: 512
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 298.8 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
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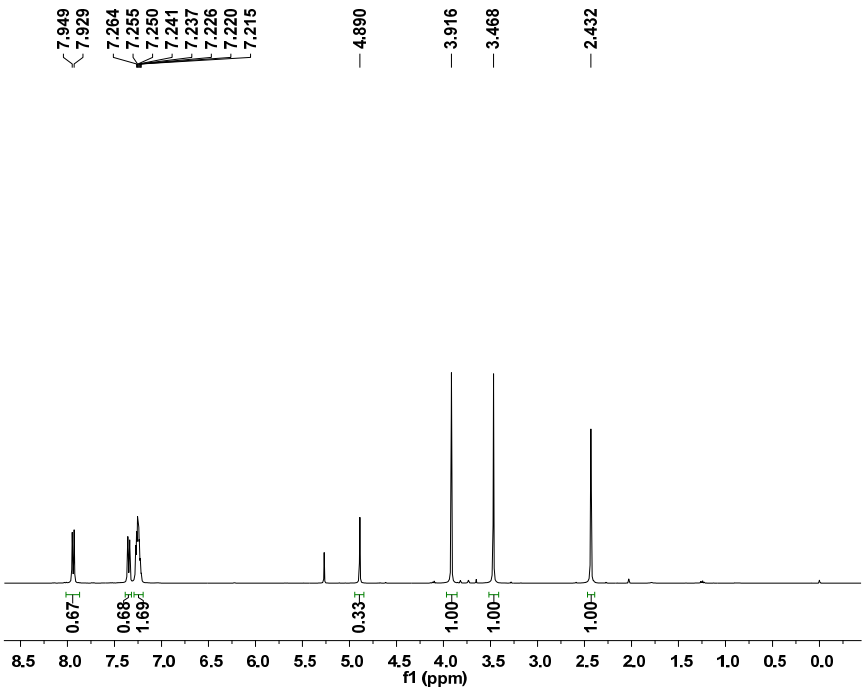
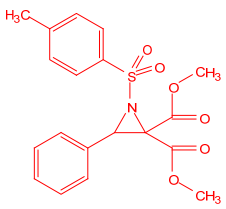
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -75.54
Ph1: 67.06




Current Data Parameters

F2 - Acquisition Parameters
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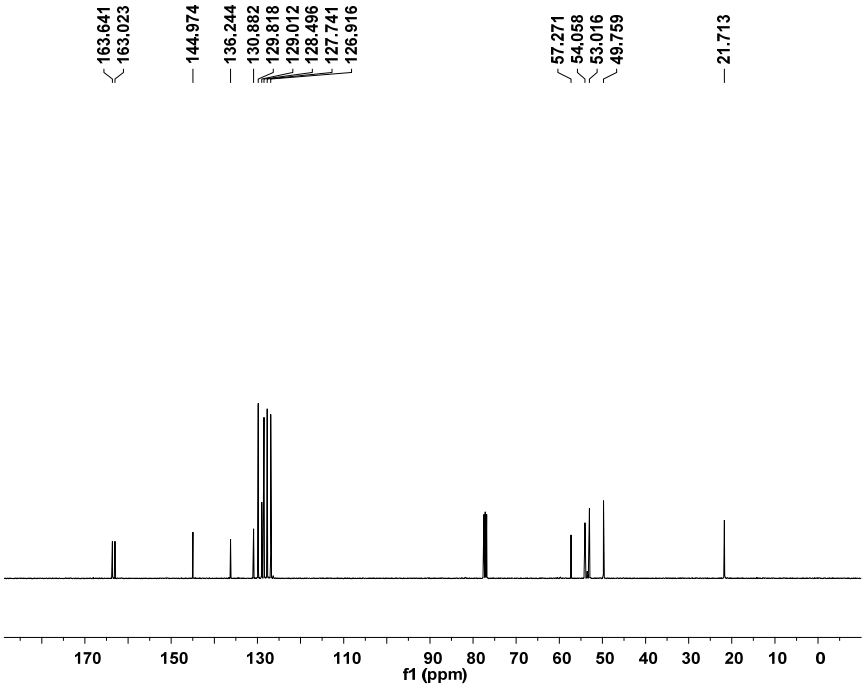
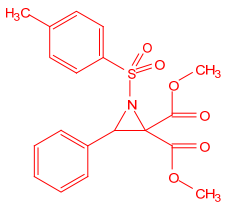
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.6 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -258.90
Ph1: 21.62




Current Data Parameters

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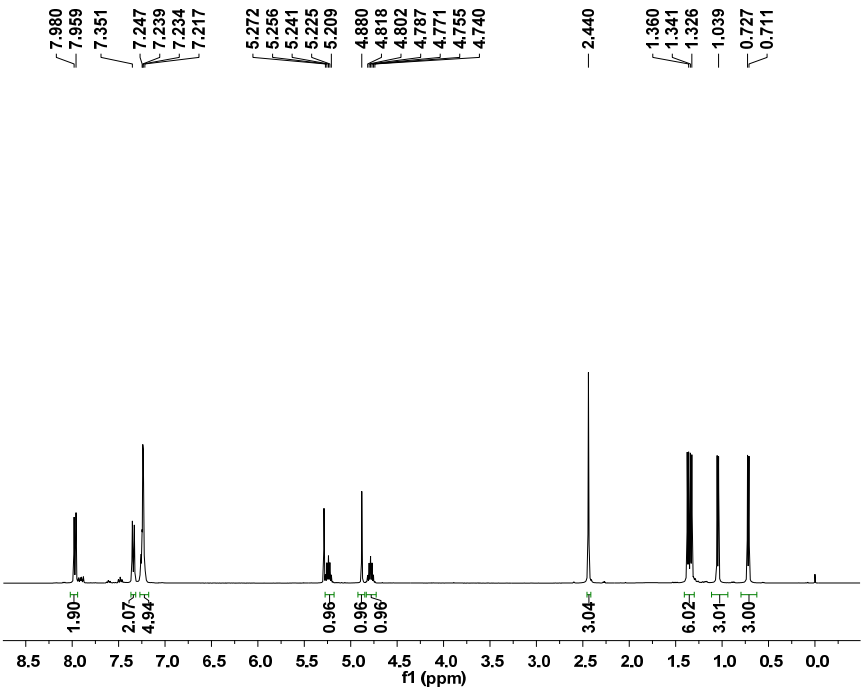
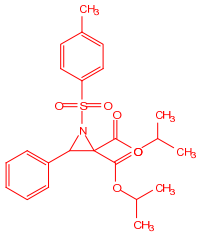
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 512
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.2 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -60.25
Ph1: 61.82



Current Data Parameters

F2 - Acquisition Parameters
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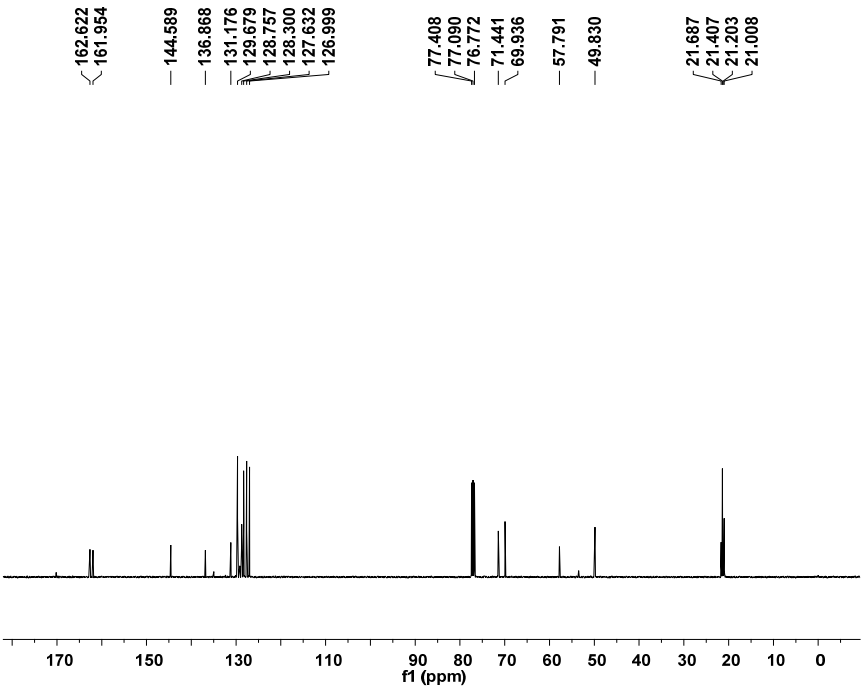
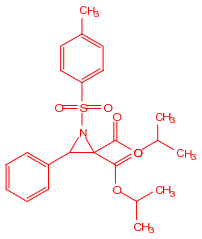
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.6 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 91.00
Ph1: 20.85



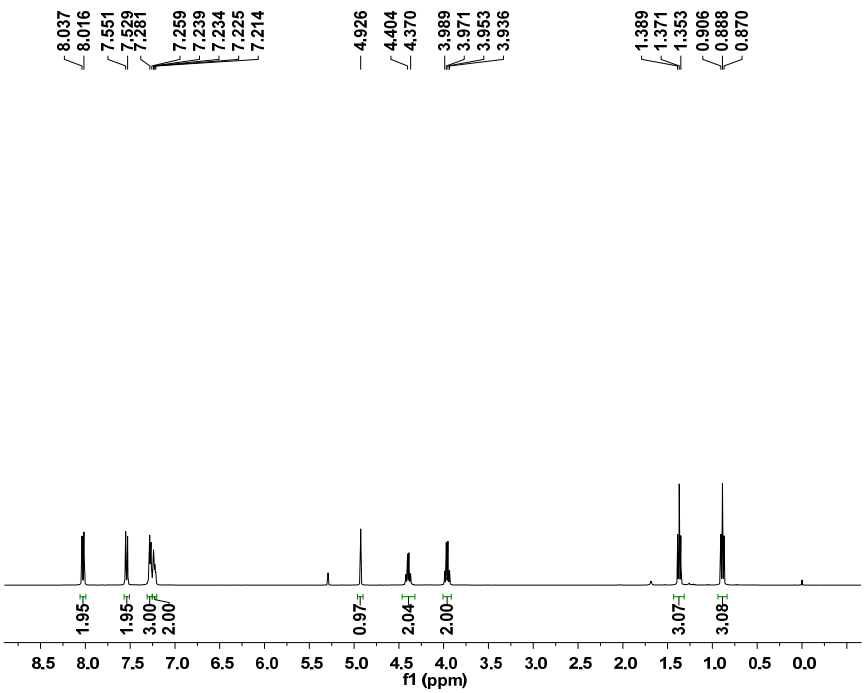



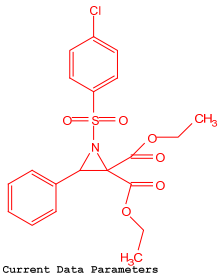
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-11-05T23:29:11
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 256
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296.1 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -70.01
Ph1: 58.69



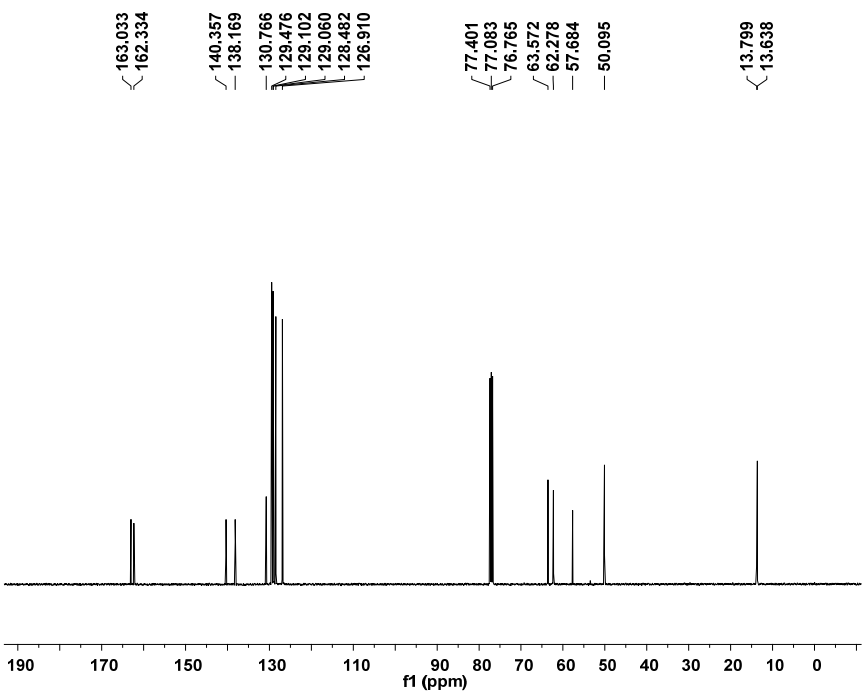



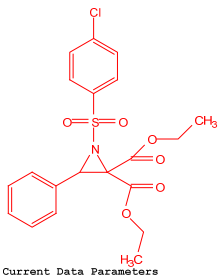

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-11-25T22:41:21
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.7 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 90.23
Ph1: 19.22



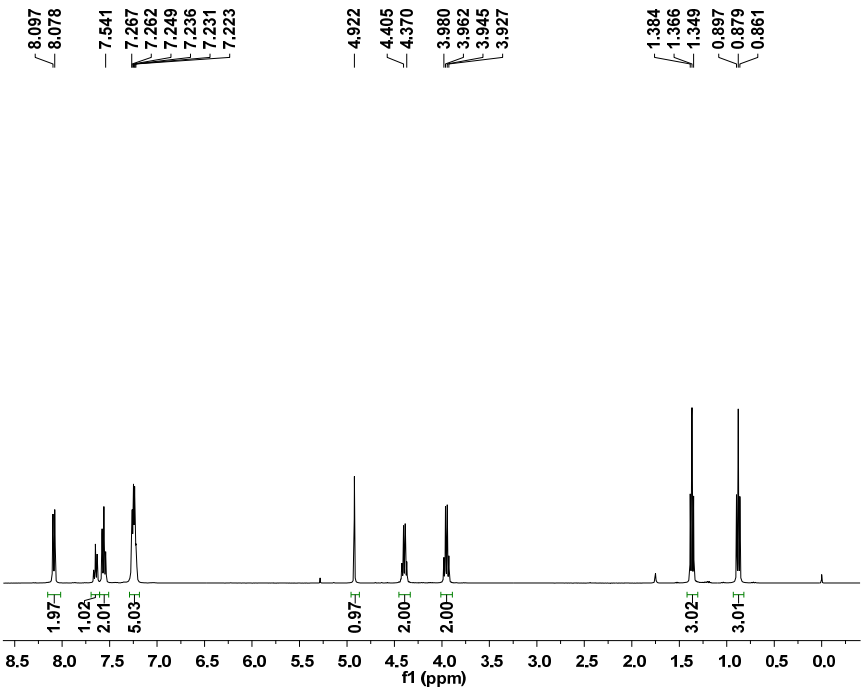



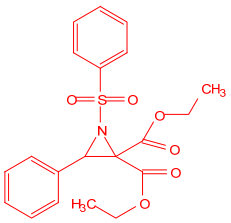

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-11-25T23:40:47
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296.1 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -66.08
Ph1: 64.59



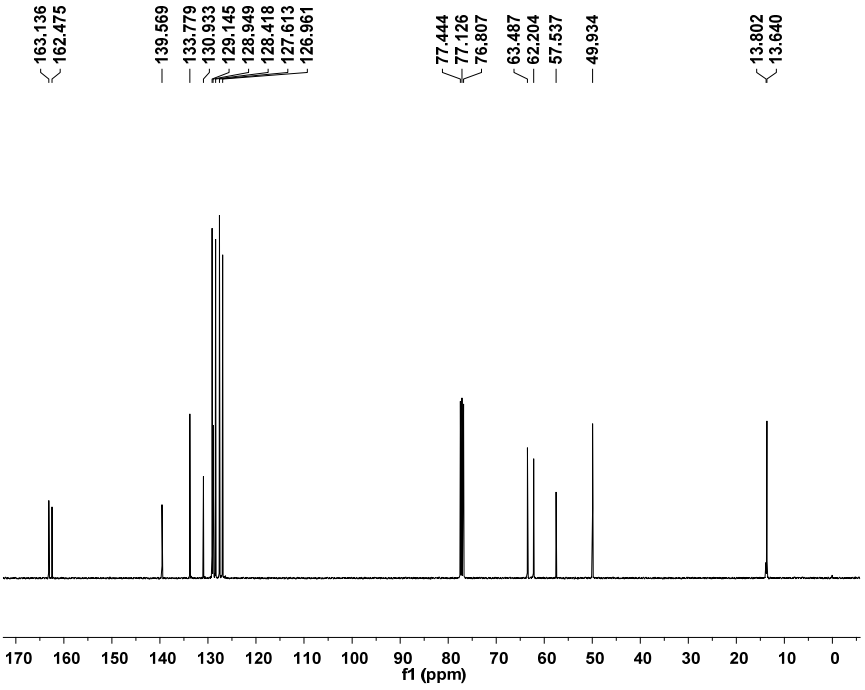



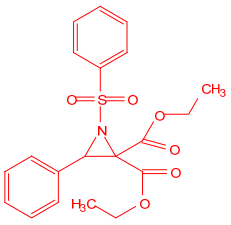
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-01-13T22:52:55
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.7 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -261.59
Ph1: 19.60



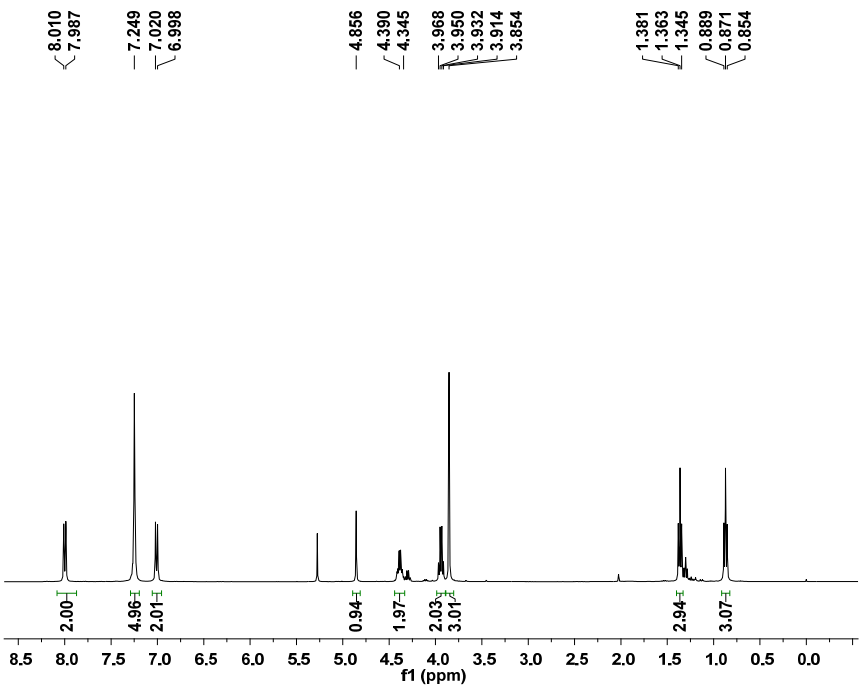



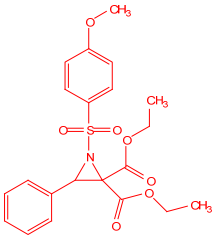
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-01-13T23:52:21
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.2 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -59.20
Ph1: 62.79



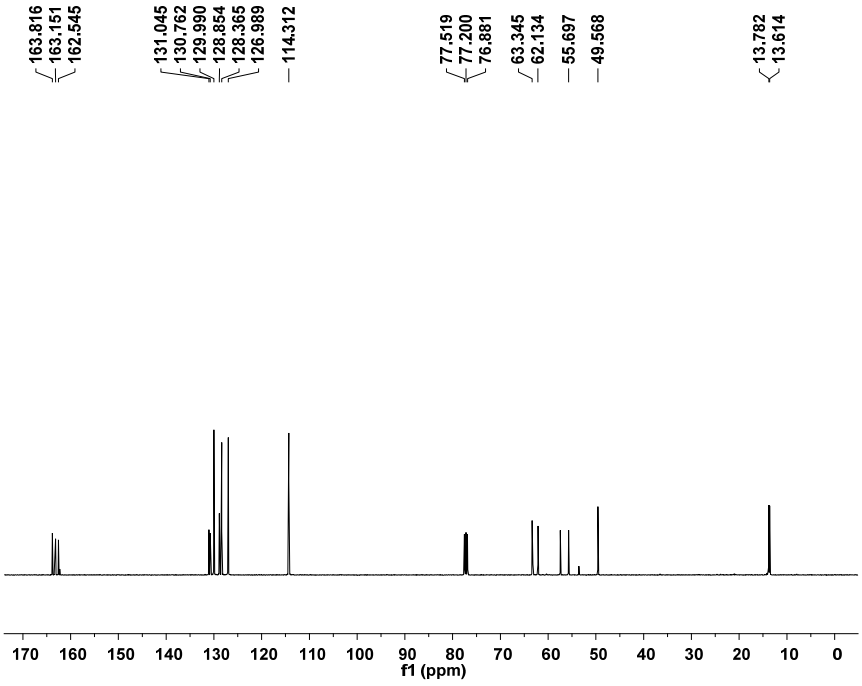



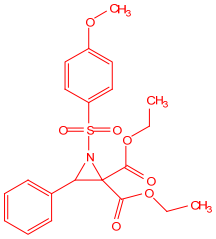
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-11-26T22:59:36
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.7 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 89.21
Ph1: 18.90



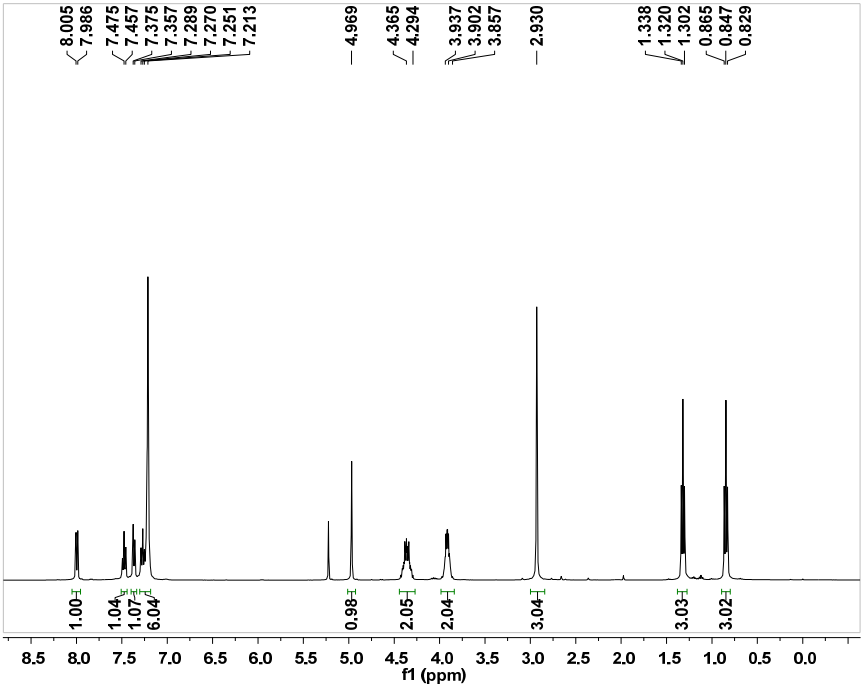



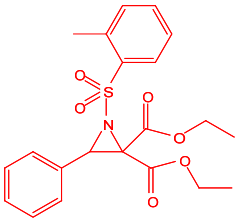
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-11-26T23:59:02
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -61.20
Ph1: 62.03



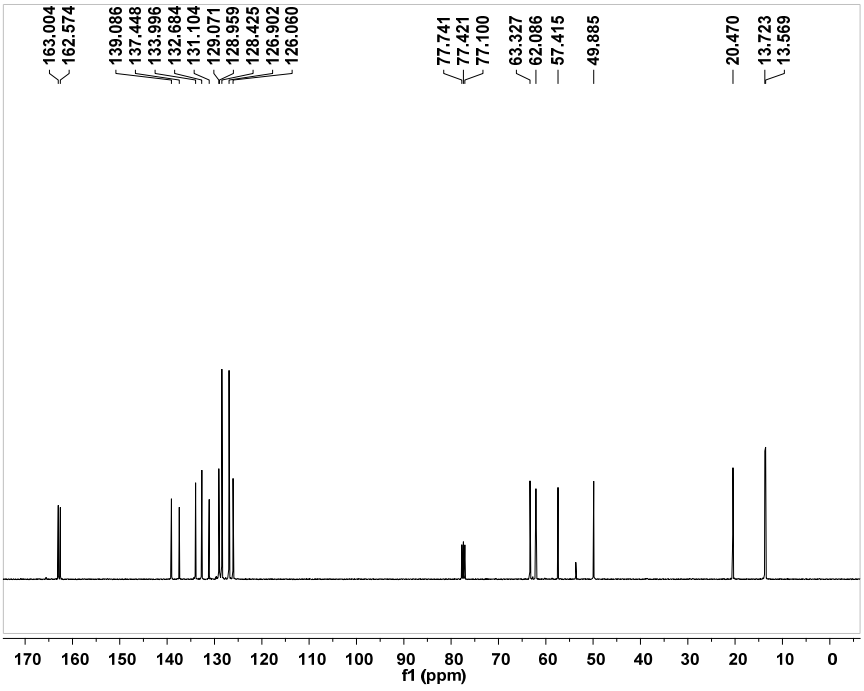



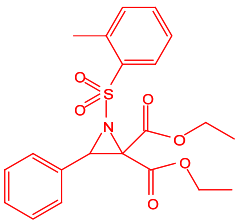
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-20T03:04:32
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.9 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 99.20
Ph1: 11.99



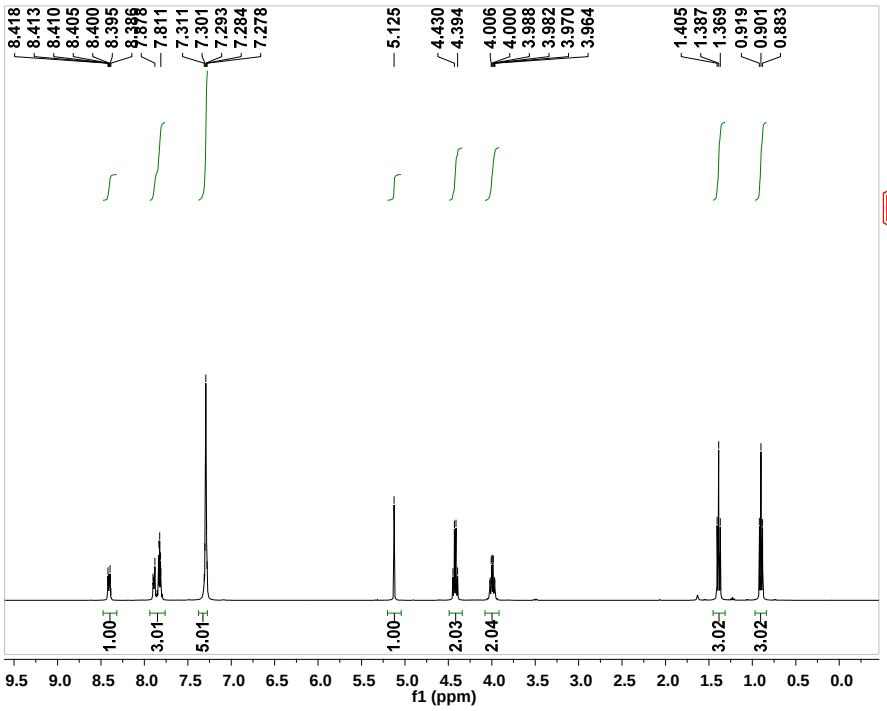



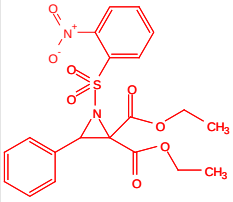
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-20T03:20:09
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 256
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296.2 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -60.96
Ph1: 60.81



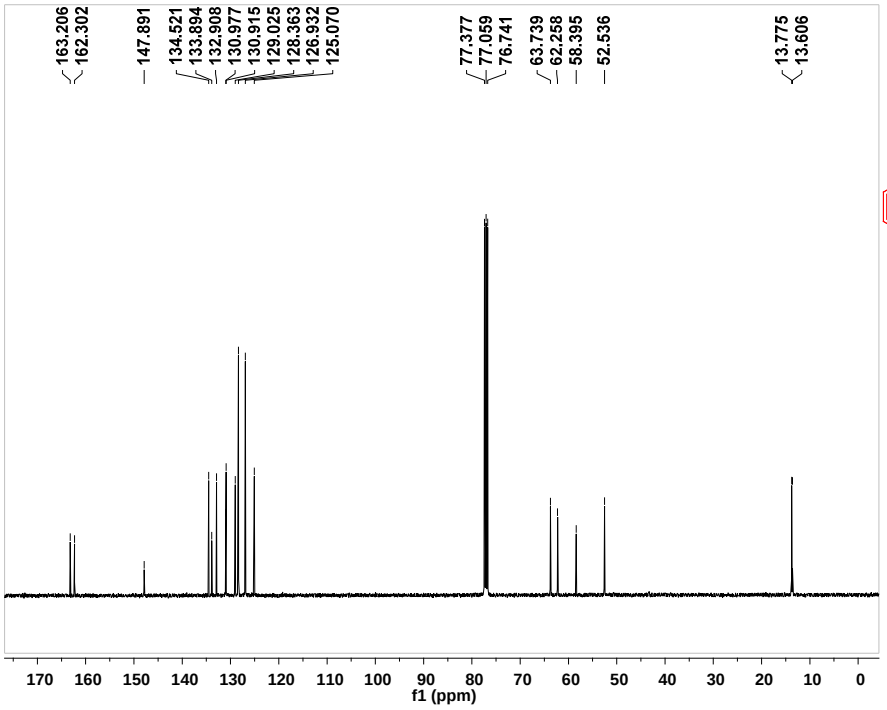



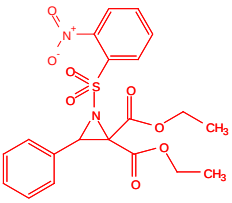
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2016-01-28T09:52:53
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 0 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 93.23
**Ph1:** 19.75



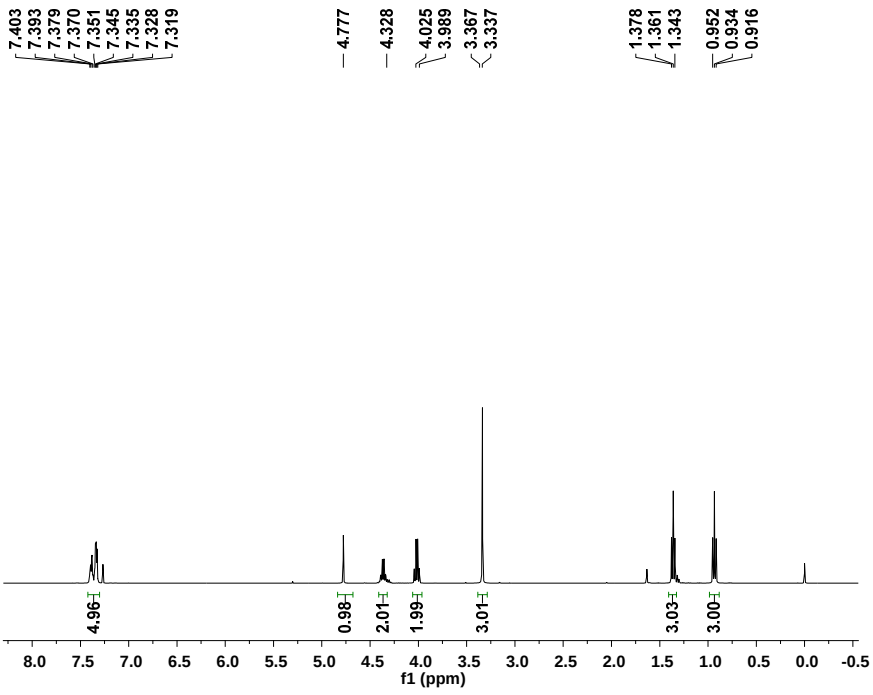



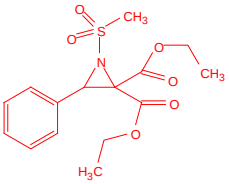
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2016-01-28T10:52:19
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 0 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -71.63
**Ph1:** 67.11



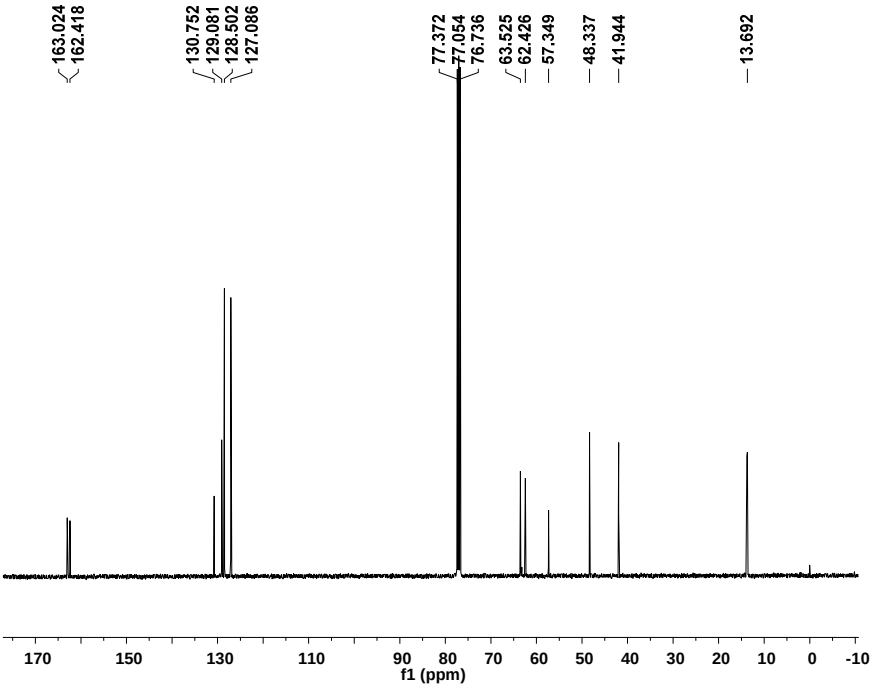



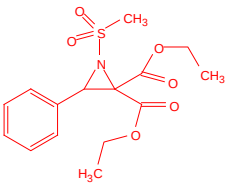

**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-01-01T15:08:53
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 291.8 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 96.89
**Ph1:** 20.97



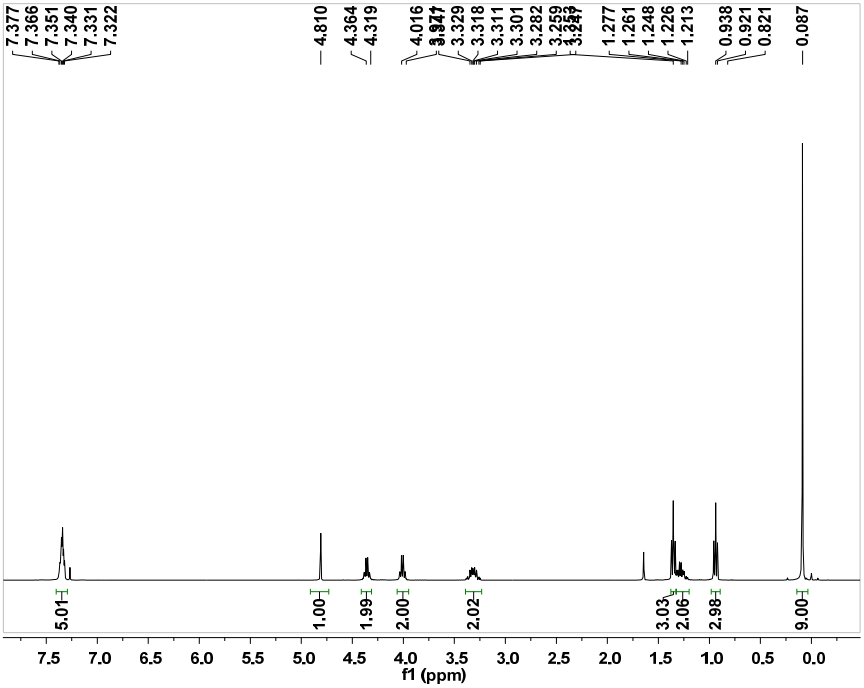



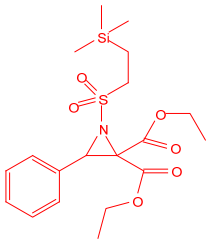

**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-01-01T16:08:18
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 292.1 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -62.47
**Ph1:** 56.90



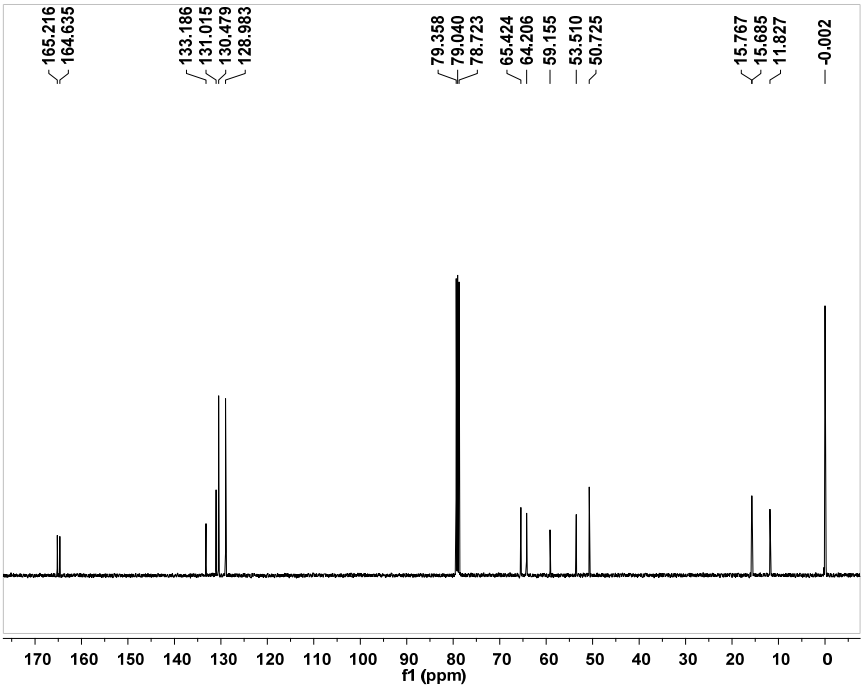



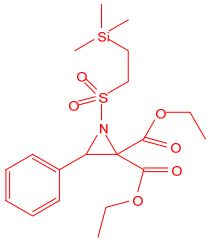
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-25T10:30:48
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -260.73
Ph1: 20.45



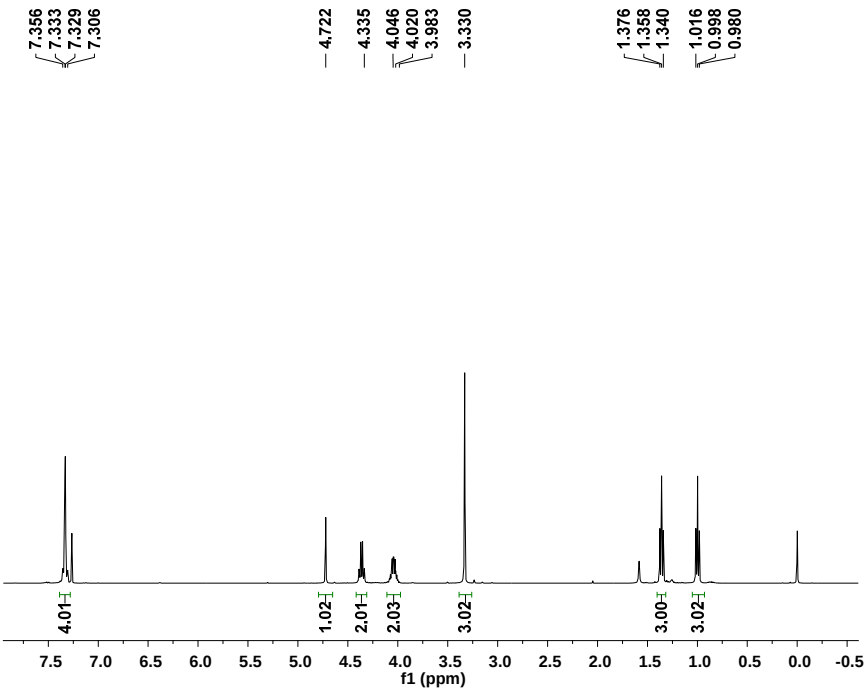



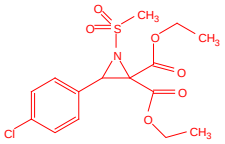
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-25T11:01:00
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 512
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.4 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -51.97
Ph1: 52.28



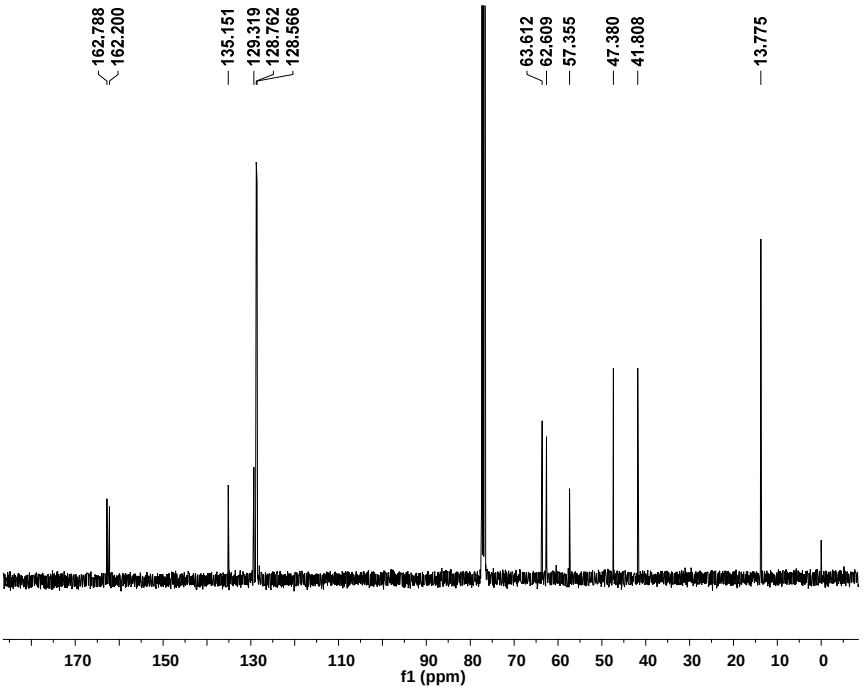



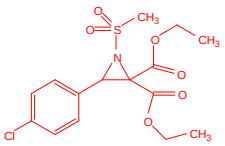
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-01-20T09:32:12
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 294.3 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 92.75
**Ph1:** 18.93



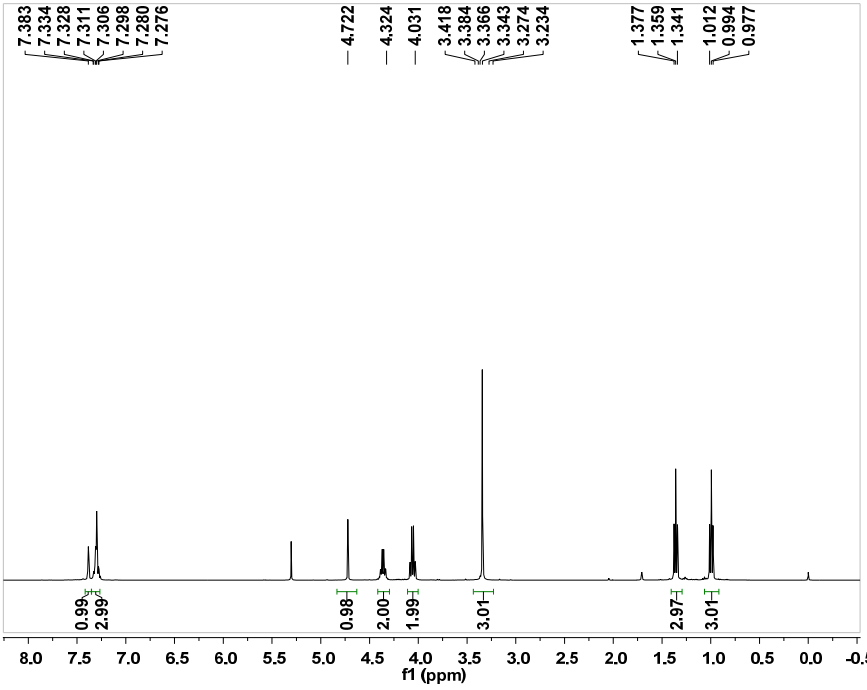



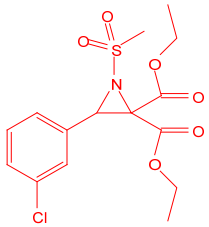
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-01-20T10:31:38
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 294.6 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -53.06
**Ph1:** 42.62



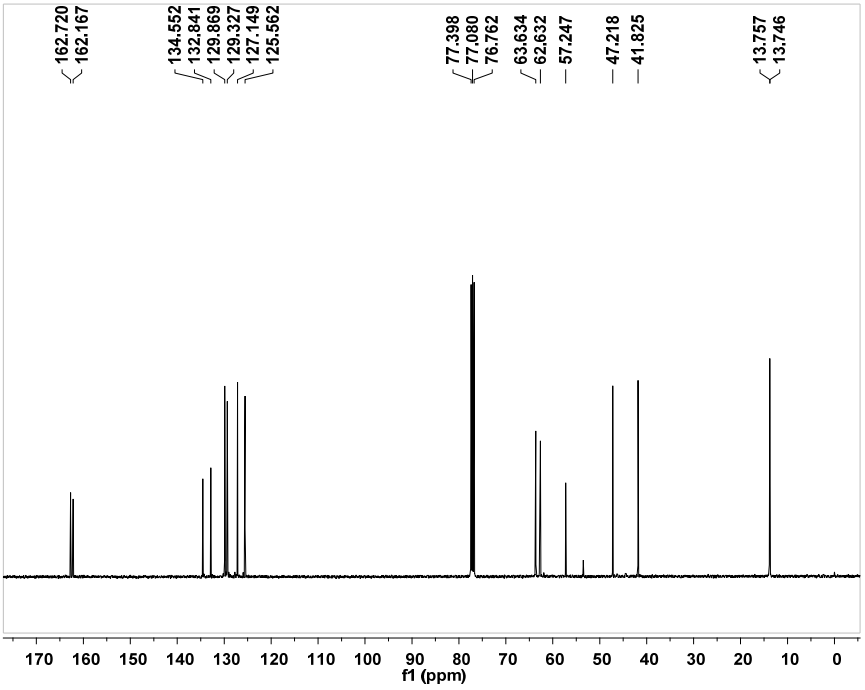



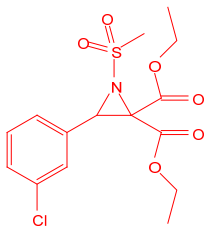

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-24T22:53:44
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 294.2 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -259.84
Ph1: 16.78



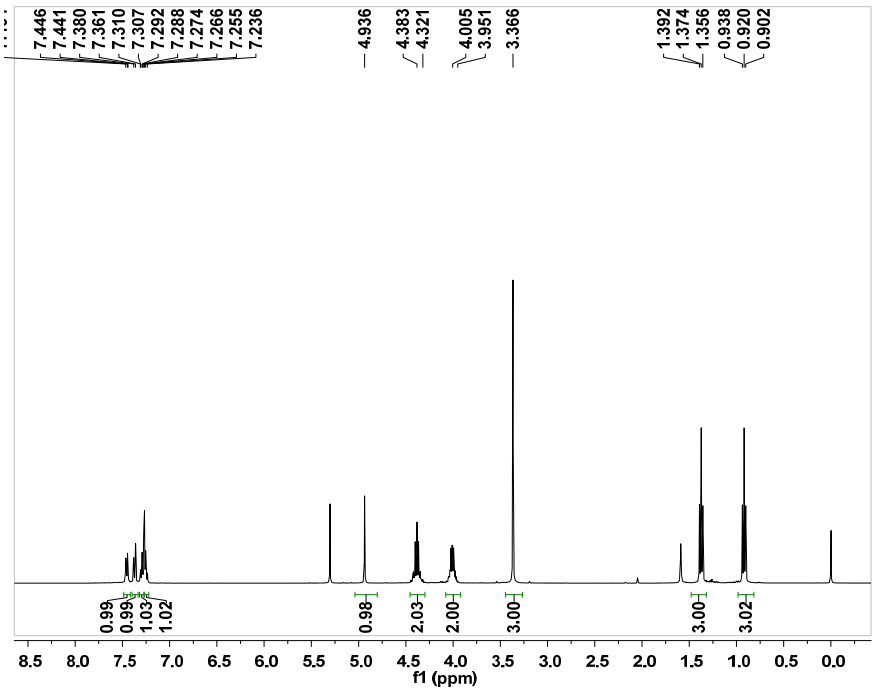



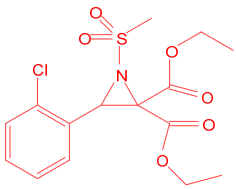

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-24T23:53:10
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.6 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -61.73
Ph1: 65.20



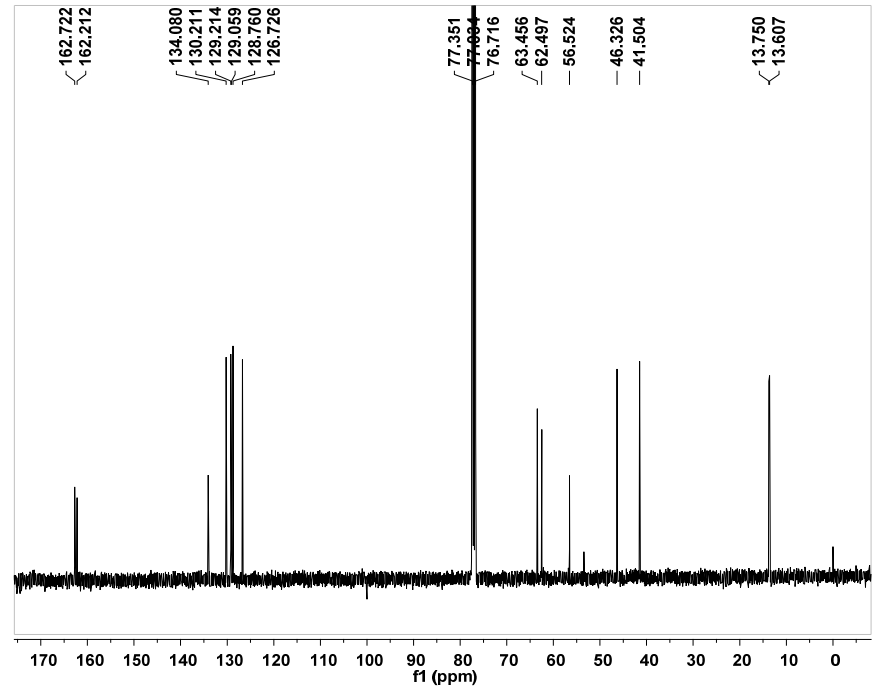



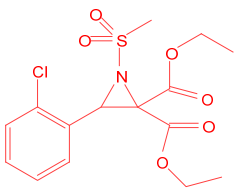

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-04-20T23:35:05
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.27
Ph1: 14.62



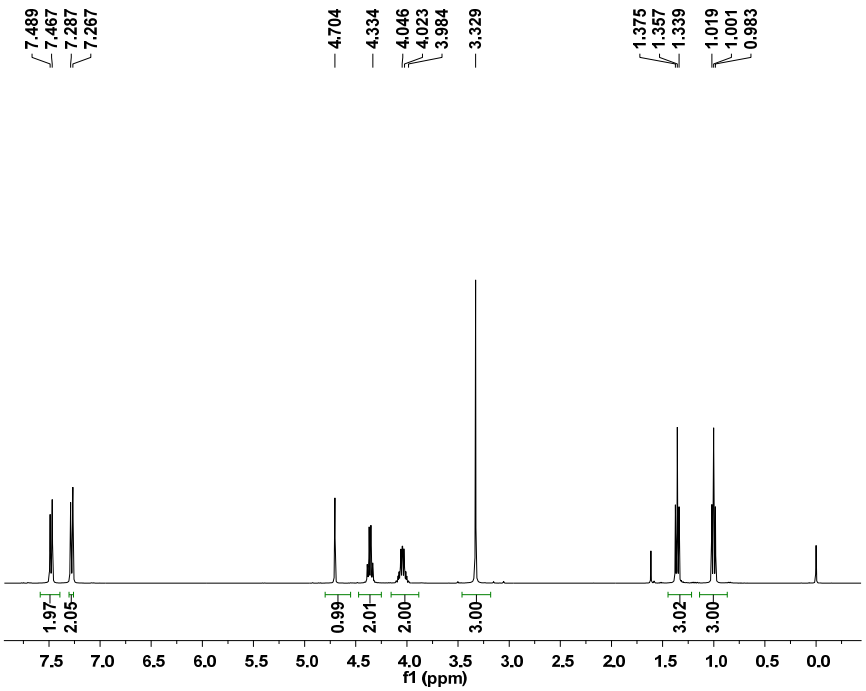



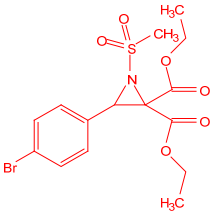

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-04-21T00:34:33
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.4 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -63.40
Ph1: 67.49



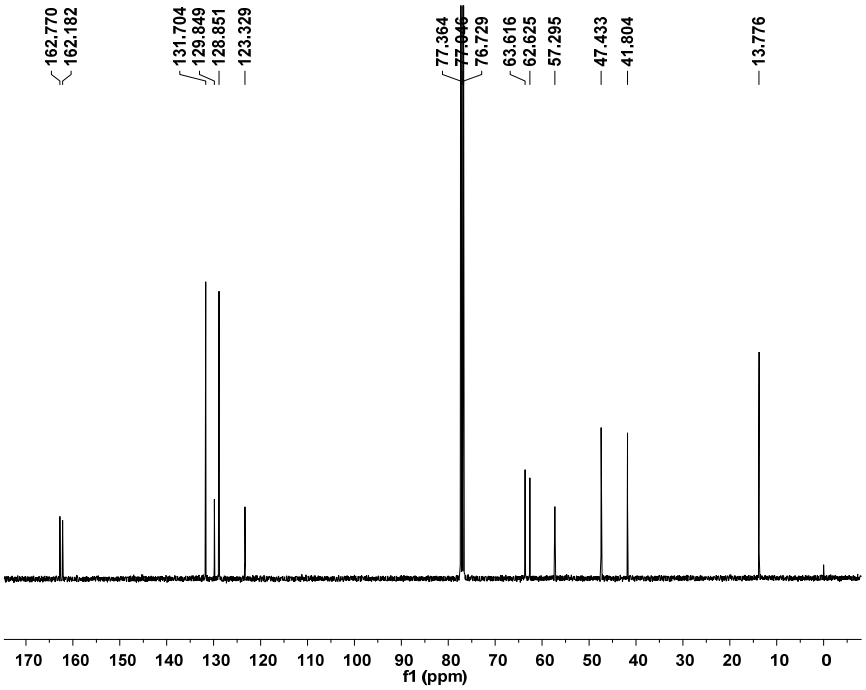



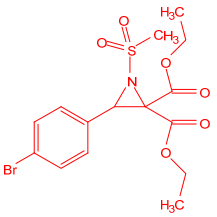

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-01-26T21:04:54
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.9 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.08
Ph1: 20.48



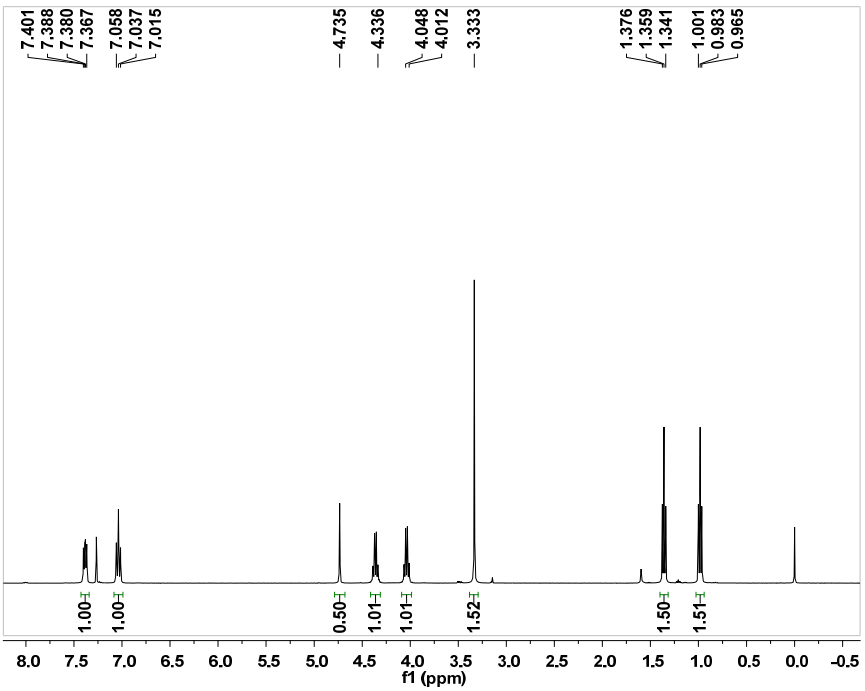



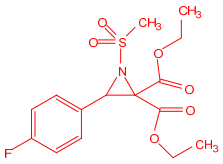

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-01-26T22:04:20
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.3 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -57.16
Ph1: 50.96



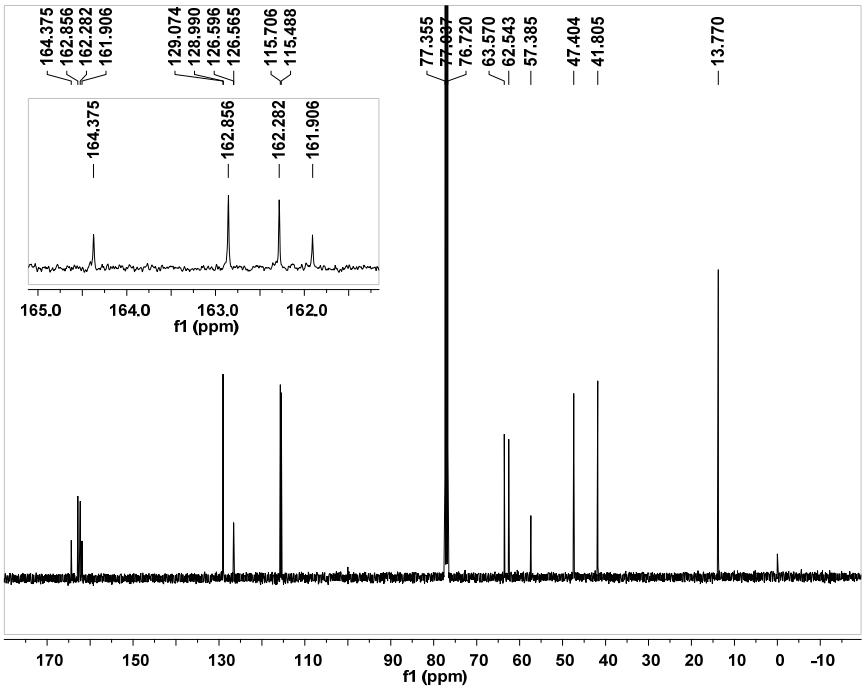



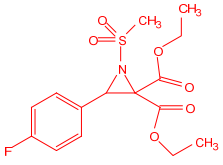
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-07T16:16:32
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.5 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.07
Ph1: 19.67



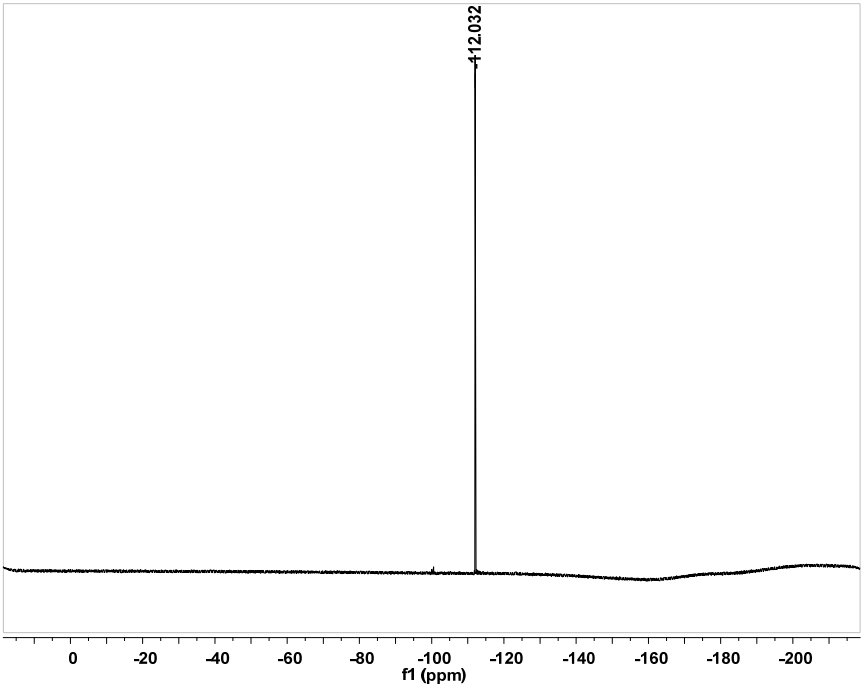



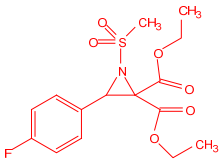
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-07T19:57:00
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.1 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -62.45
Ph1: 56.12



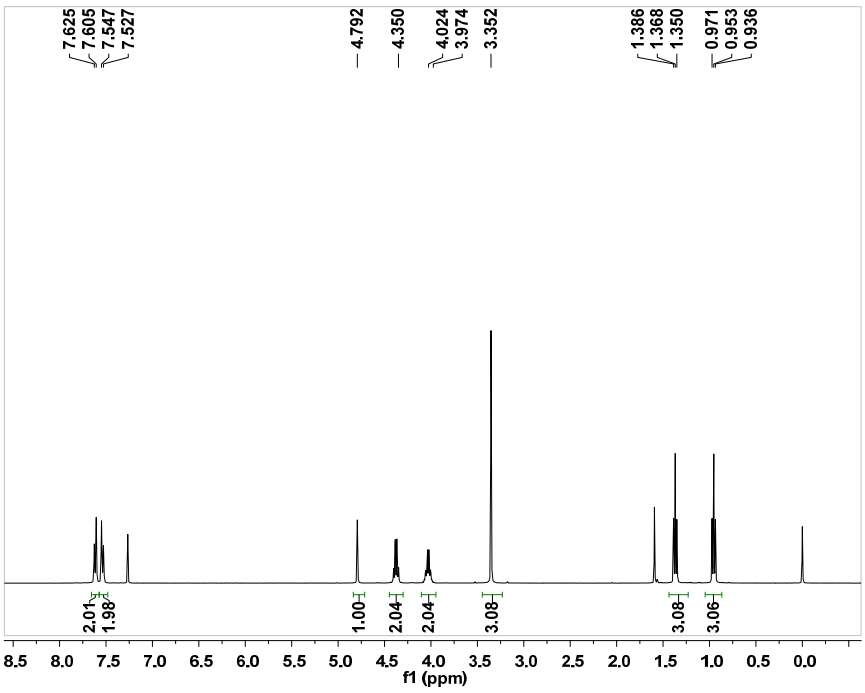



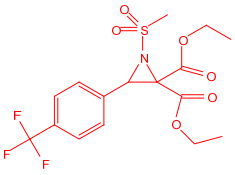

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-07T19:58:31
PULPROG: zgflqn
TD: 65536
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 89285.7 Hz
AQ: undefined
TE: 293.9 C

======== CHANNEL f1 ========
NUC1: 19F
P1: 12.75 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 131072
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 4.39
Ph1: -65.19



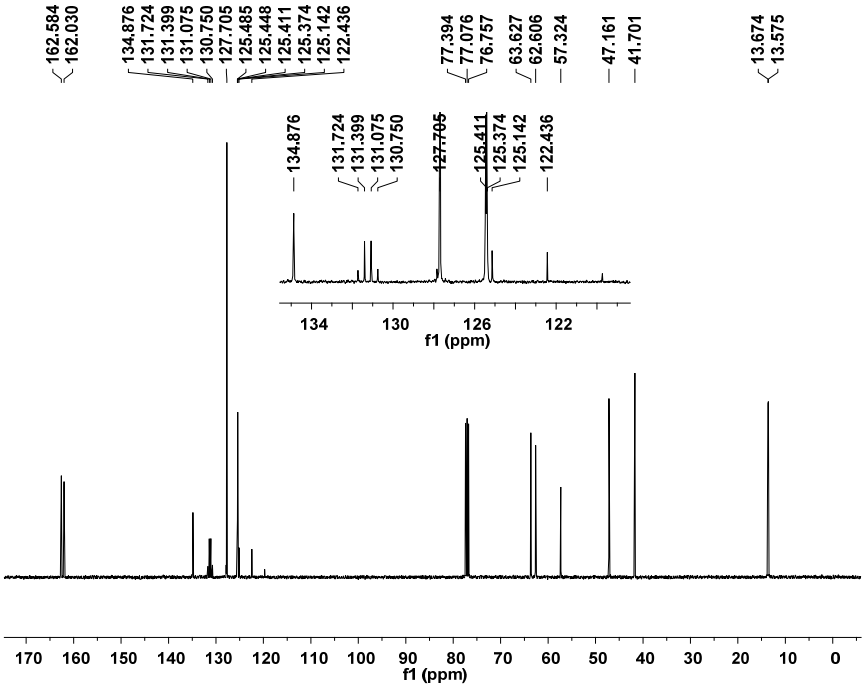



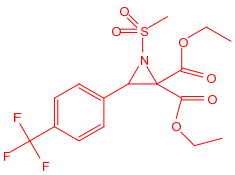
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-10T22:19:49
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.4 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 96.50
Ph1: 19.76



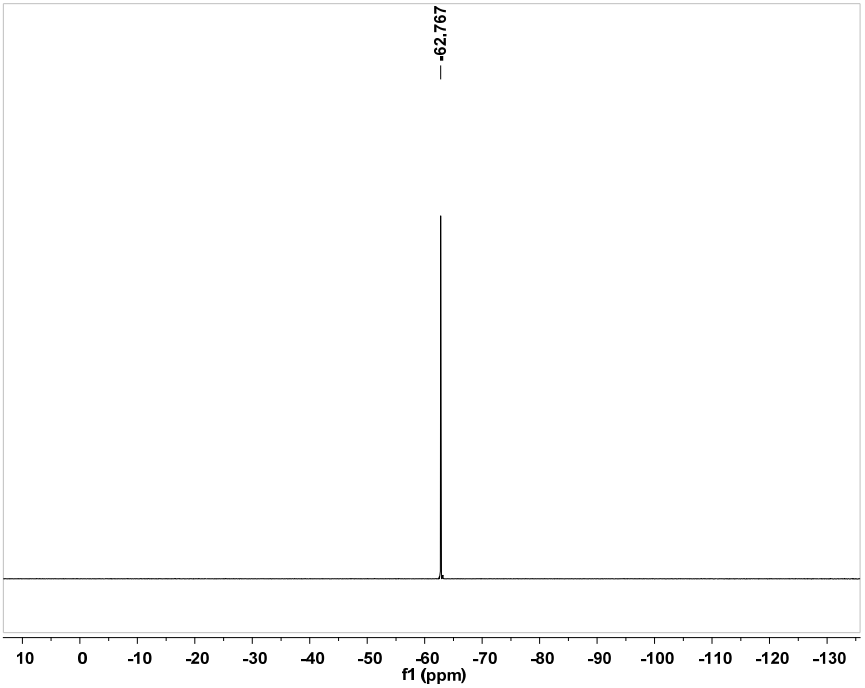



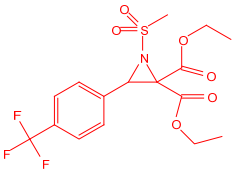
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-08-22T16:05:11
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 256
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 0 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -74.22
Ph1: 64.15



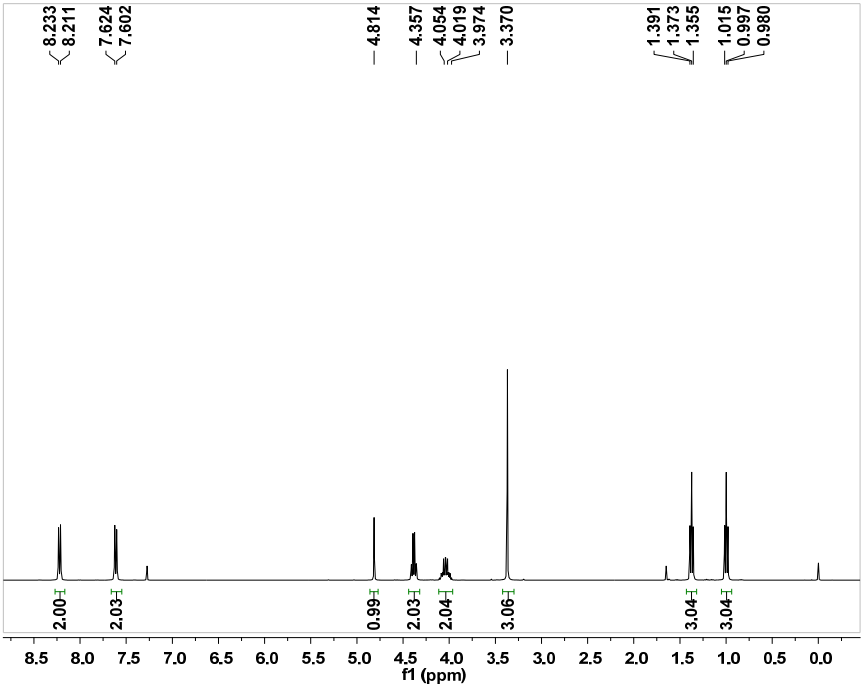



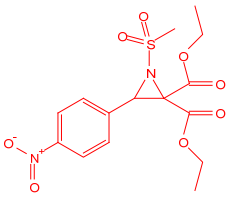

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-16T17:16:11
PULPROG: zgflqn
TD: 65536
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 89285.7 Hz
AQ: undefined
TE: 293.8 C

======== CHANNEL f1 ========
NUC1: 19F
P1: 12.75 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 131072
DC: 0.05
LB: 0.30 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -121.85
Ph1: 0.00



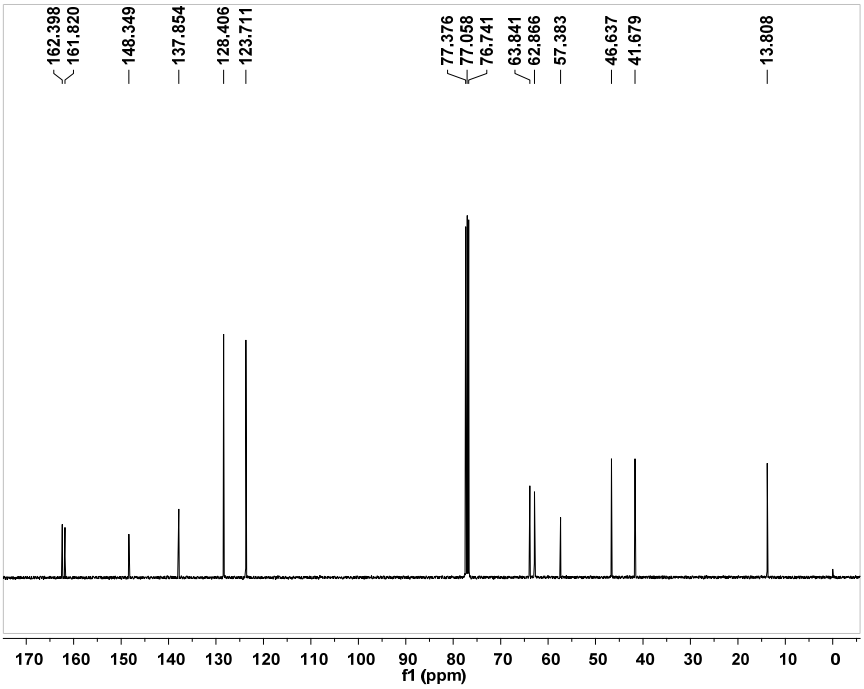



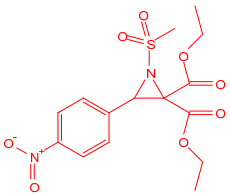
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-06T00:06:36
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.5 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 97.03
Ph1: 20.90



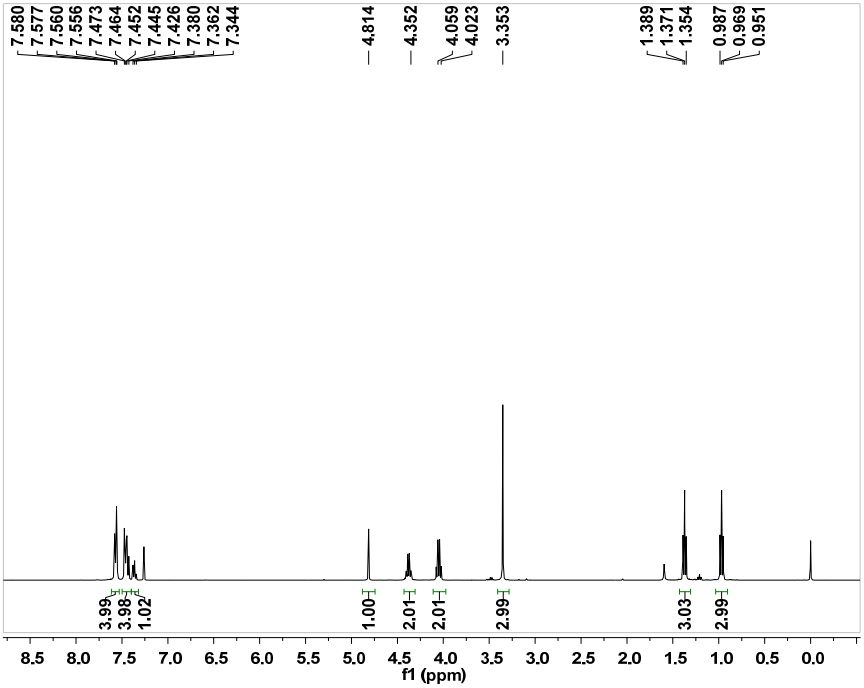



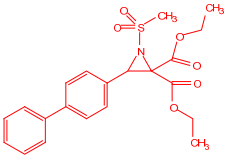
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-06T01:06:02
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 293.9 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -62.57
Ph1: 68.66



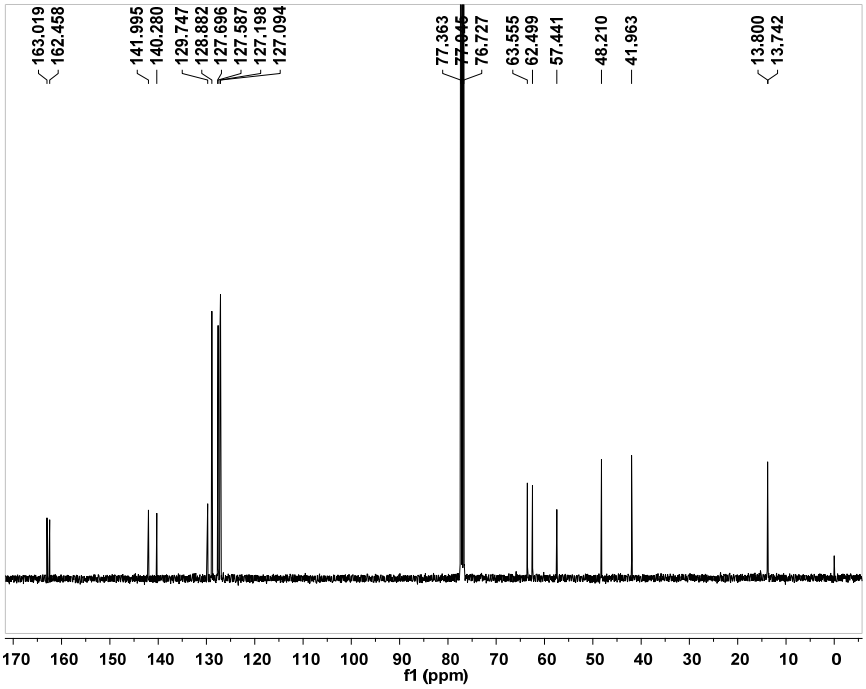



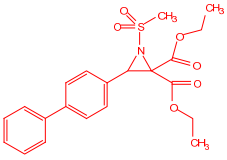
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-10T19:56:17
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.6 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 96.62
Ph1: 19.44



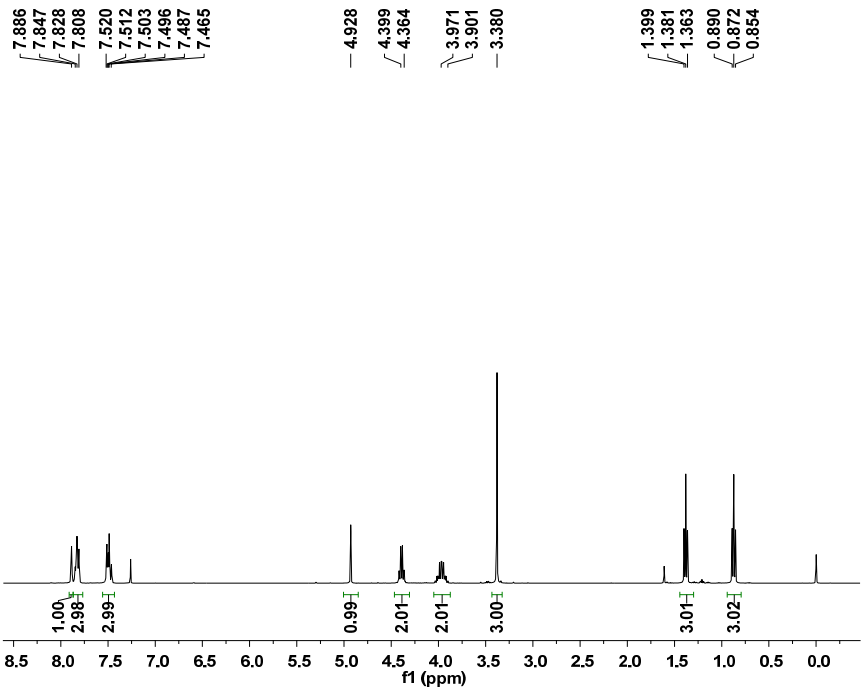



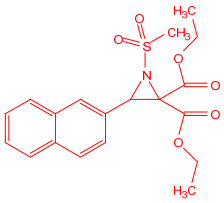
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-10T20:55:43
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 293.8 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -61.00
Ph1: 67.81



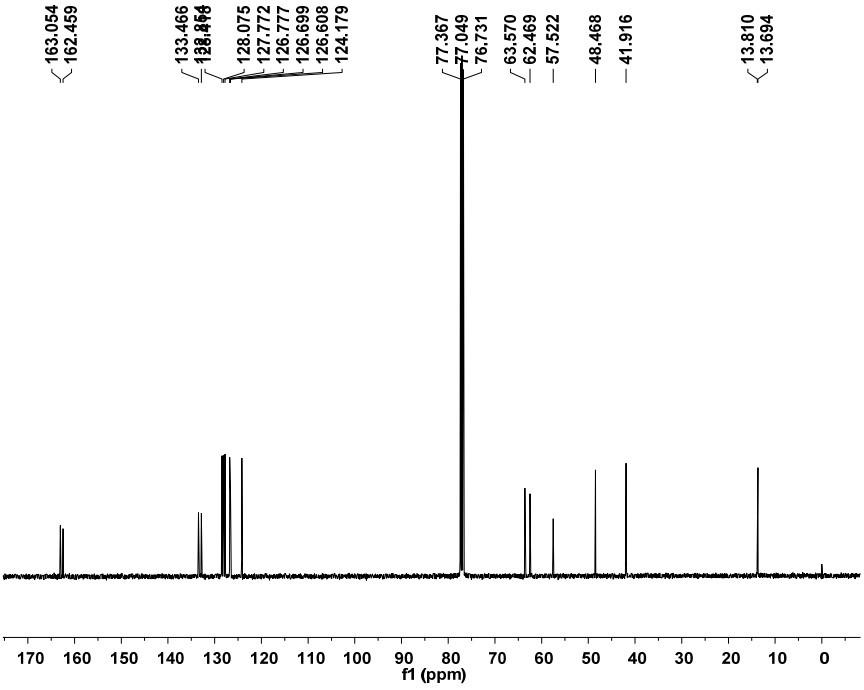



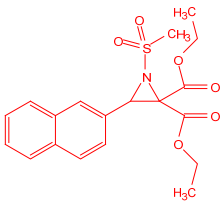
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-01-26T20:00:06
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.8 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.31
Ph1: 19.22



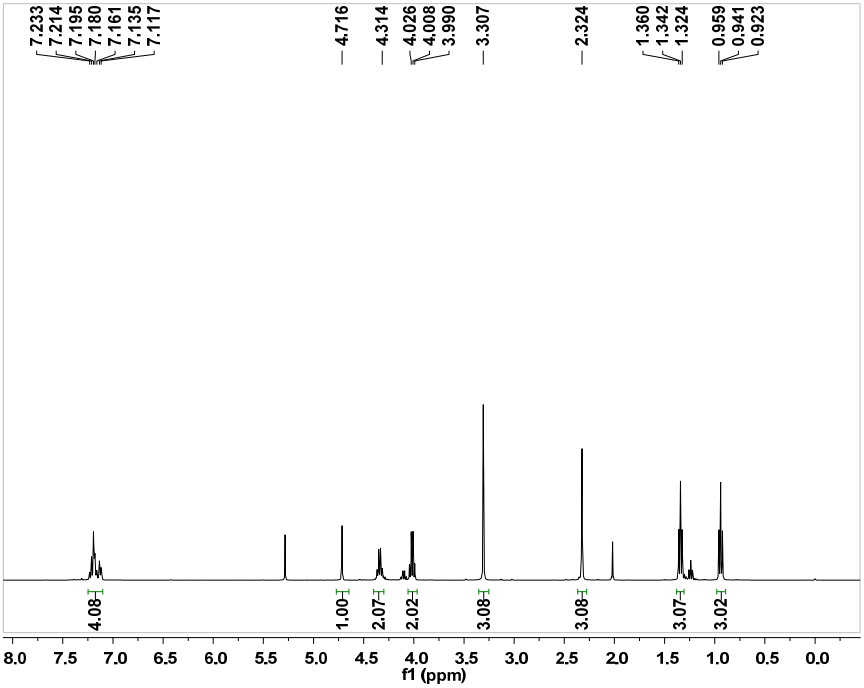



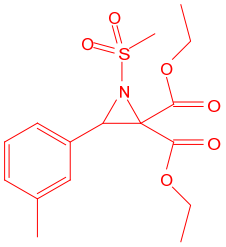
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-01-26T20:59:32
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.1 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -63.22
Ph1: 58.38



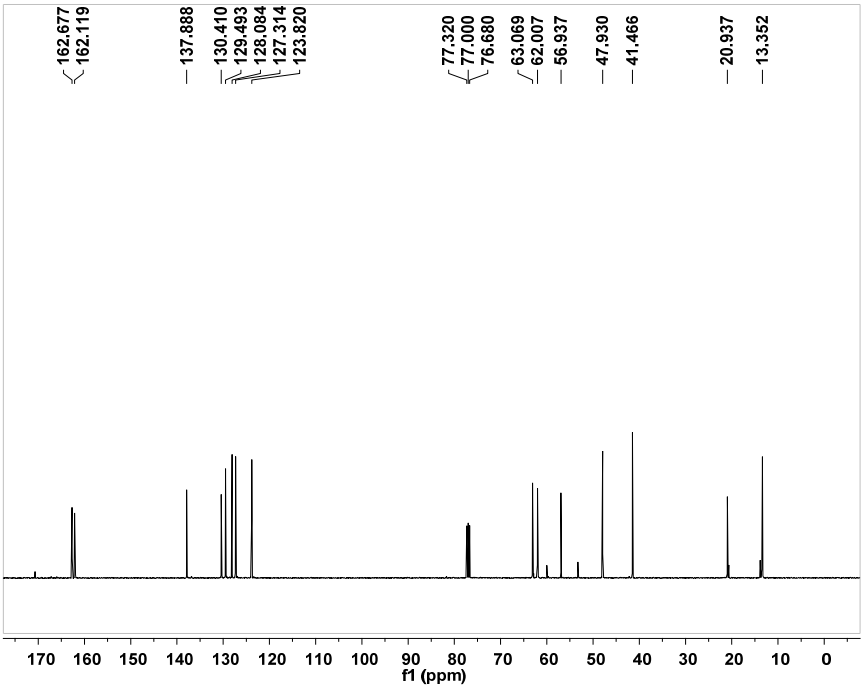



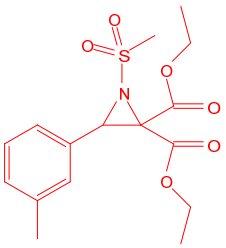

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-06-04T23:42:03
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 96.36
Ph1: 19.56



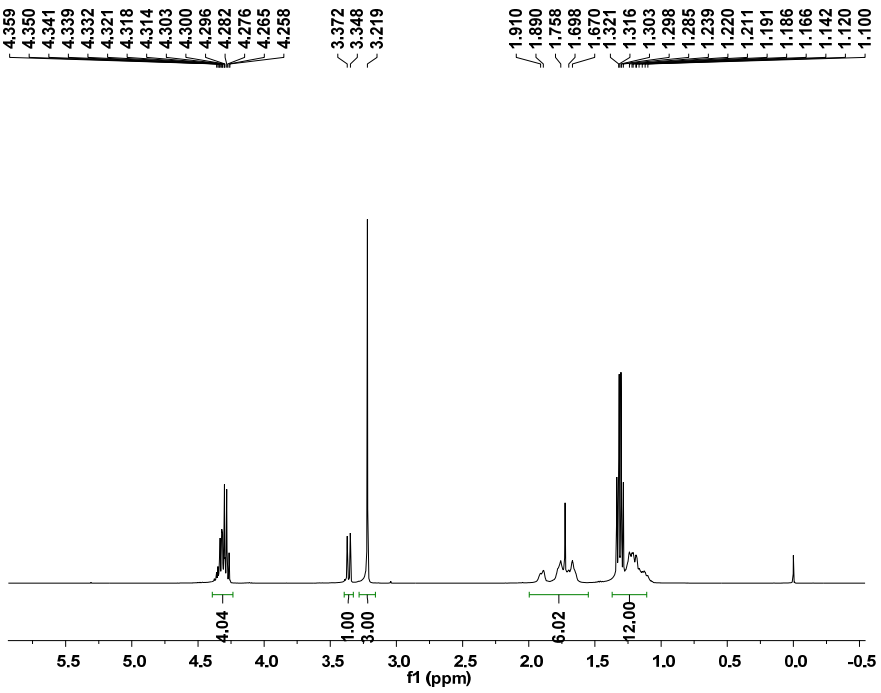



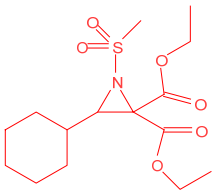

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-06-04T23:57:38
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 256
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.3 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -61.76
Ph1: 64.82



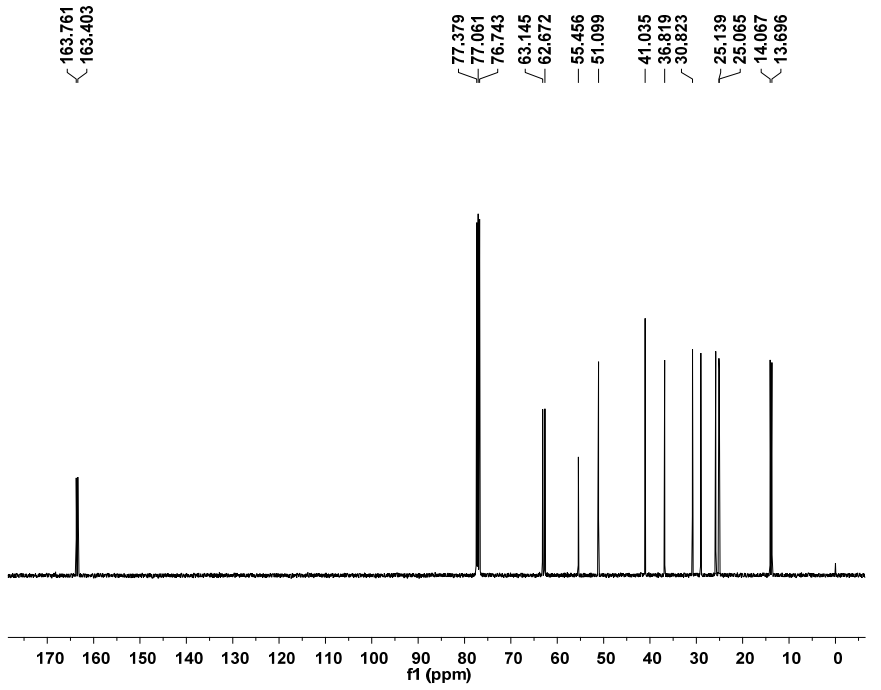



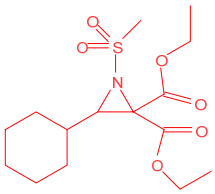
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-07-15T04:11:12
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 0 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 96.60
Ph1: 17.60



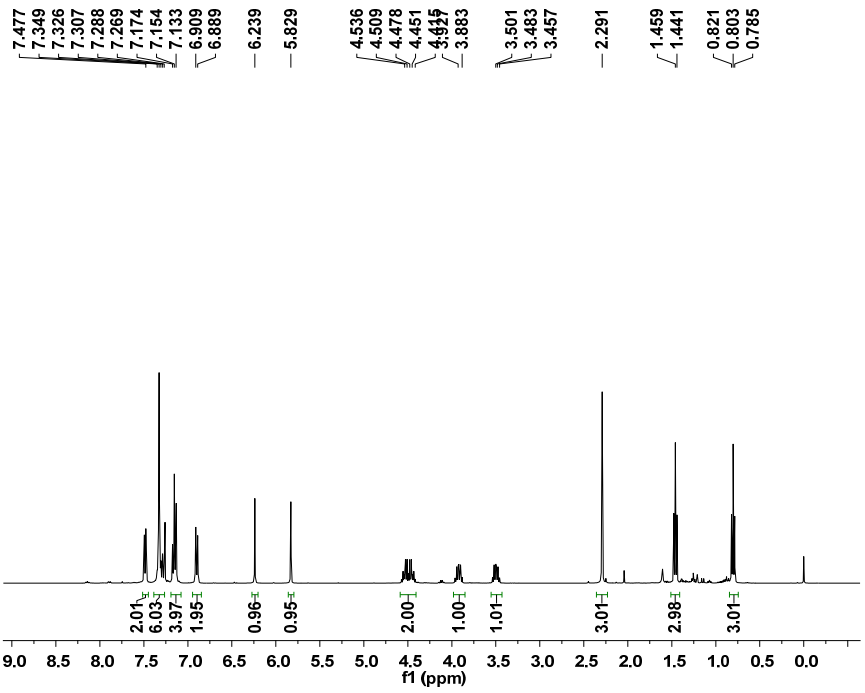



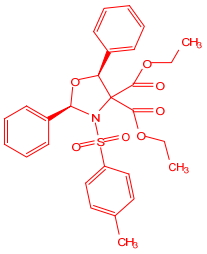
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-07-15T05:10:38
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 0 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -59.63
Ph1: 64.40



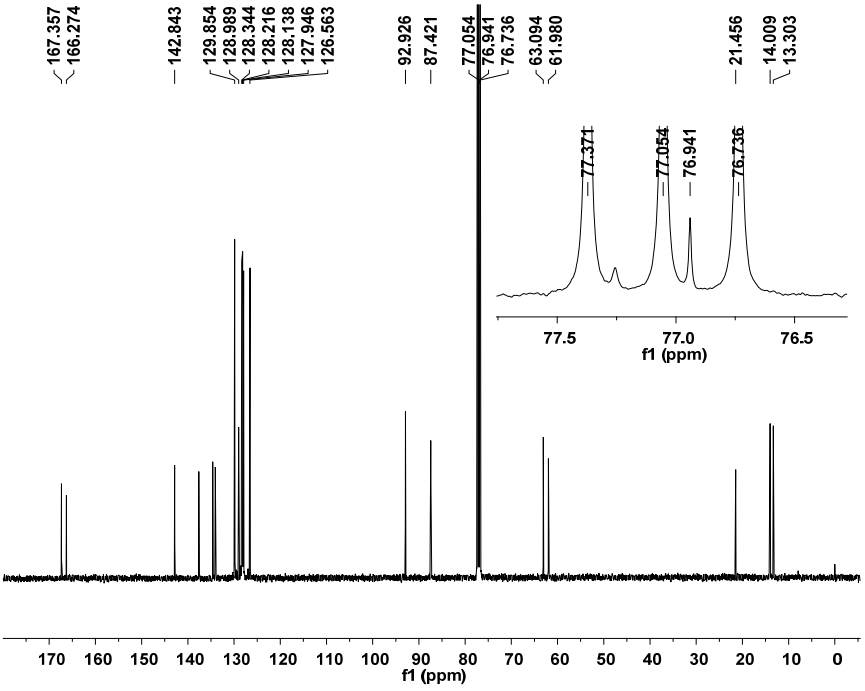



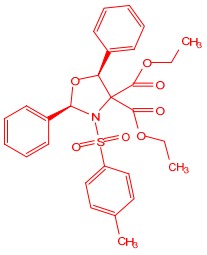
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-12-05T16:29:32
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.5 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 88.91
Ph1: 18.39



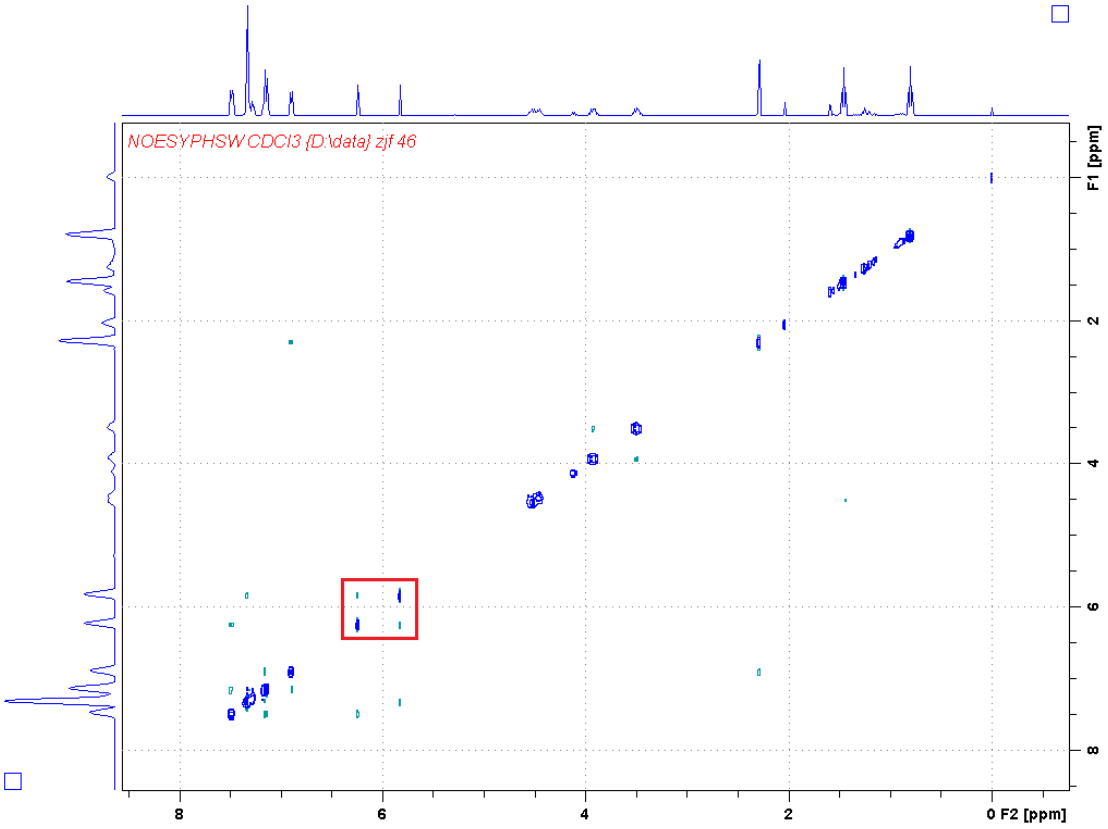



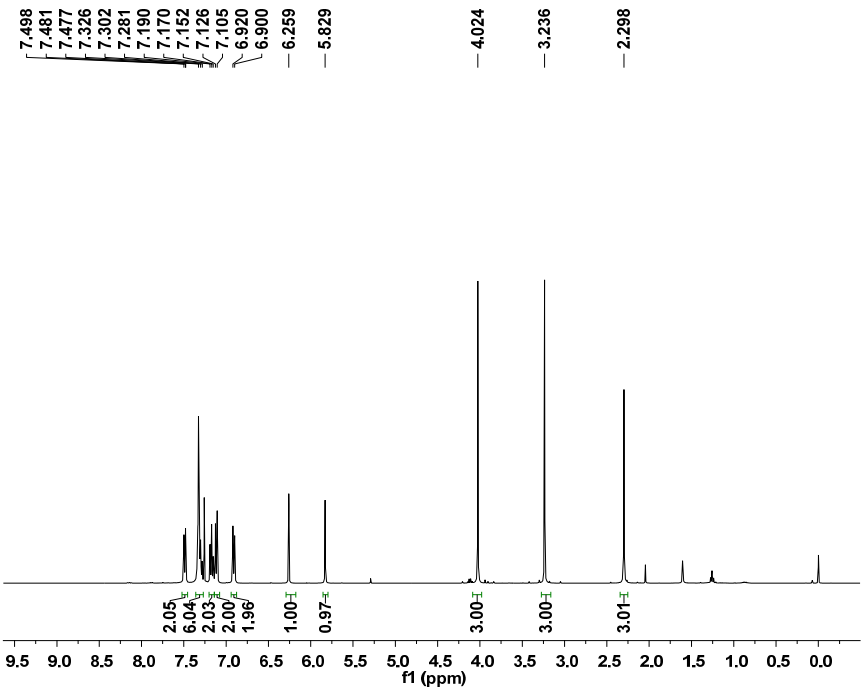
Current Data Parameters

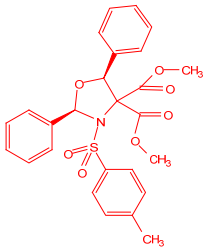
F2 - Acquisition Parameters
DATE: 2014-12-05T17:46:37
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -69.35
Ph1: 70.71


NOESYPHSW CDCl3 {D:\data} zjf 46
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



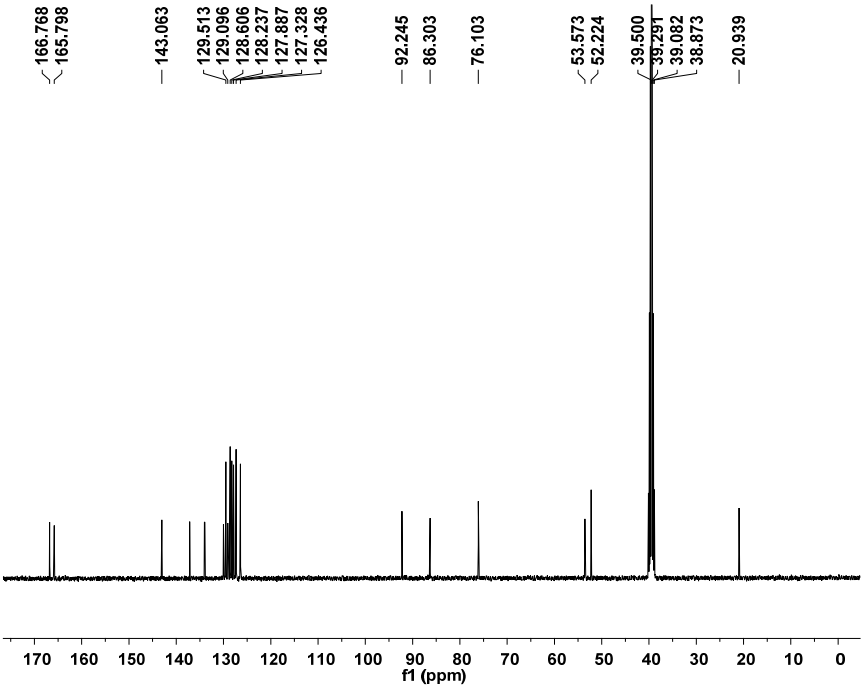



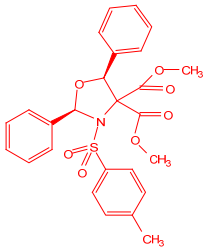
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-12-23T14:56:22
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.6 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -264.99
Ph1: 17.83



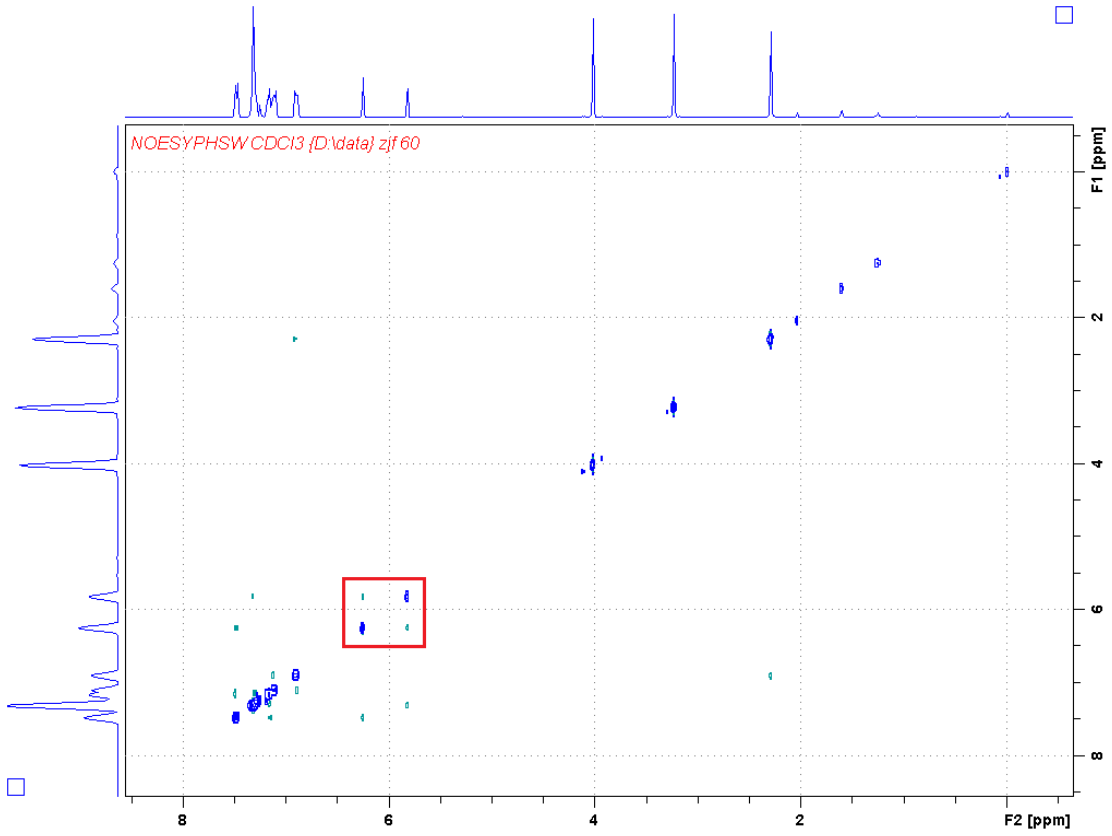



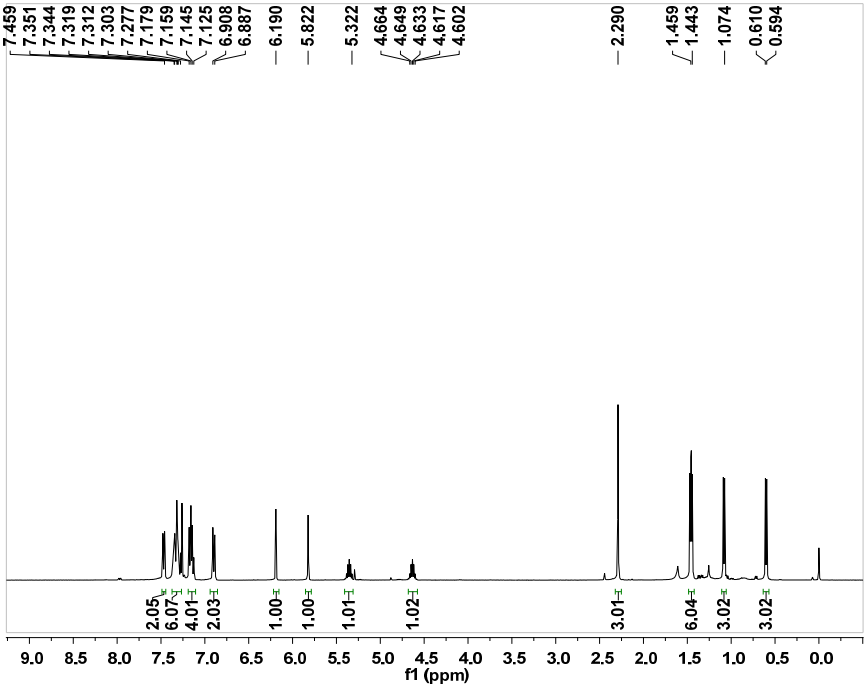
Current Data Parameters

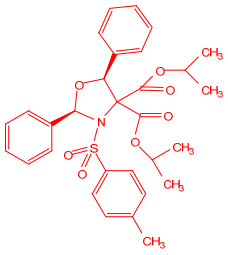
F2 - Acquisition Parameters
DATE: 2015-06-14T01:32:59
PULPROG: zgpg30
TD: 32768
Solvent: DMSO
NS: 512
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.8 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -58.73
Ph1: 60.63


NOESYPHSW CDCl3 {D:\data} zjf 60
F1 [ppm]
F2 [ppm]
2
4
6
8
8
6
4
2



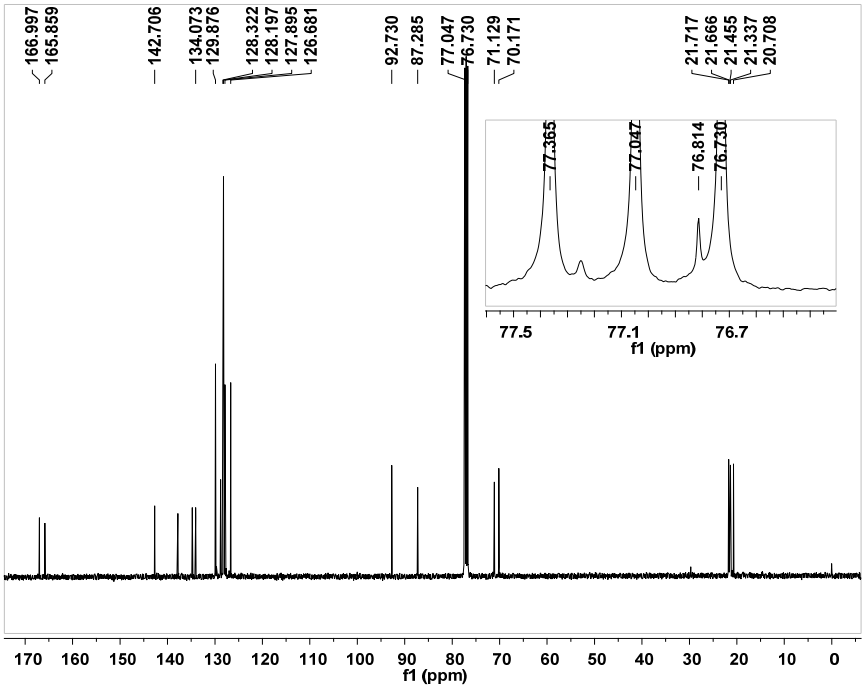



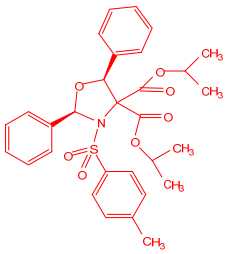
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-16T23:39:26
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.1 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.98
Ph1: 17.35



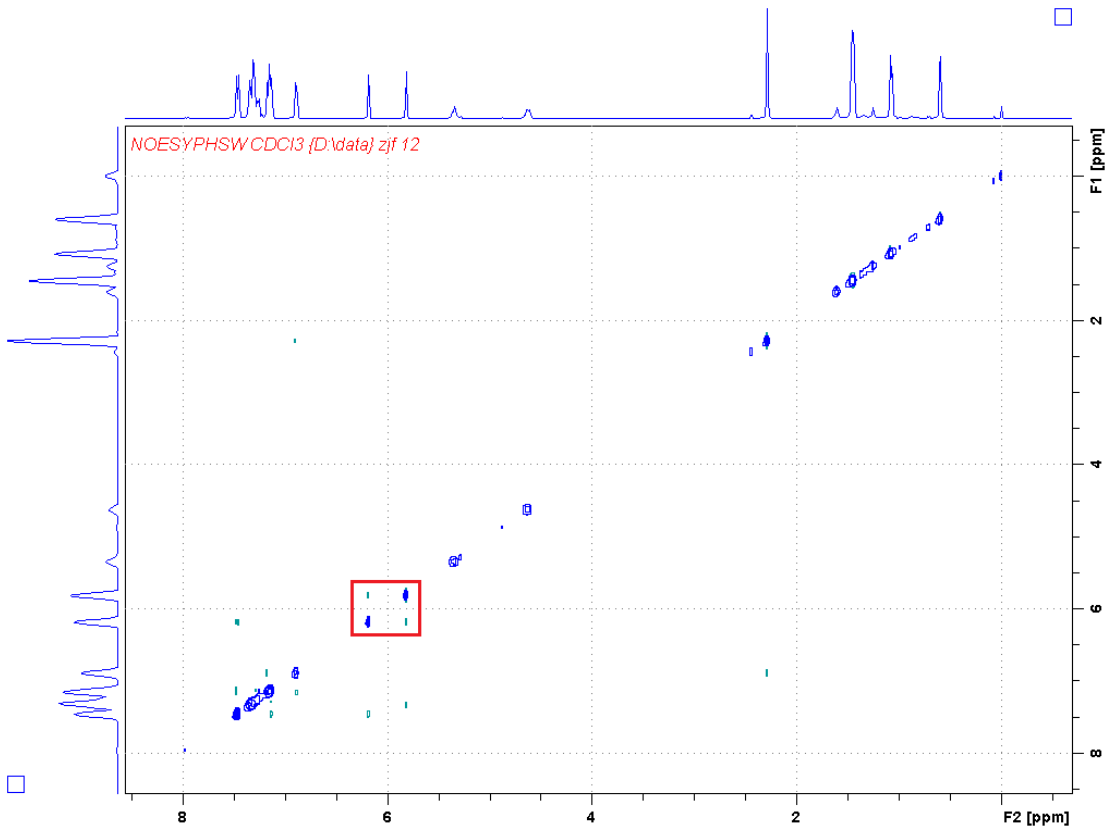



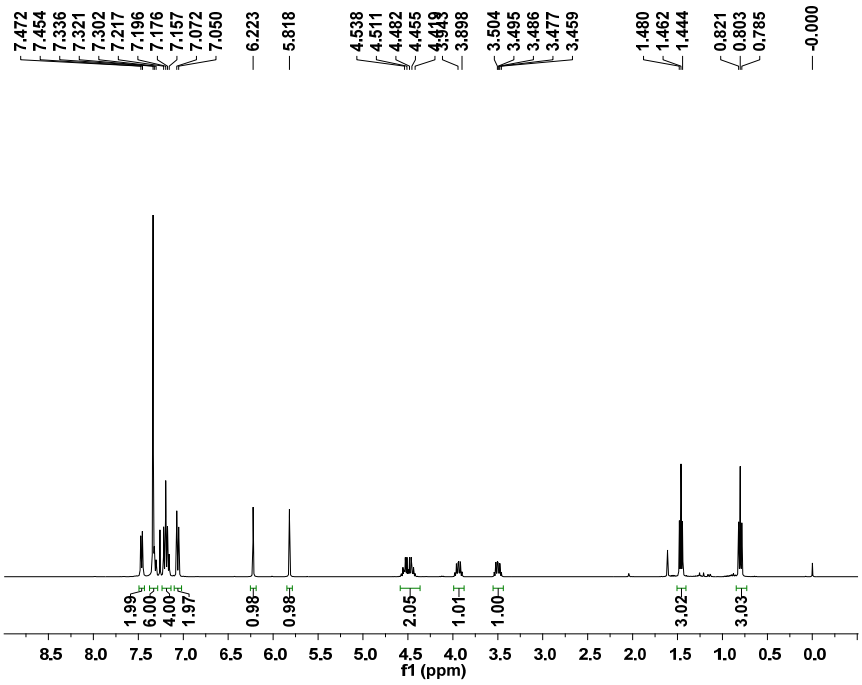
Current Data Parameters

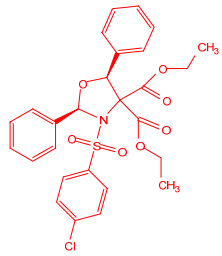
F2 - Acquisition Parameters
DATE: 2015-05-17T01:35:10
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.7 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -60.76
Ph1: 61.81


NOESYPHSWCDCl3 {D:\data} zjf 12
F1 [ppm]
2
4
6
8
8
6
4
2
F2 [ppm]



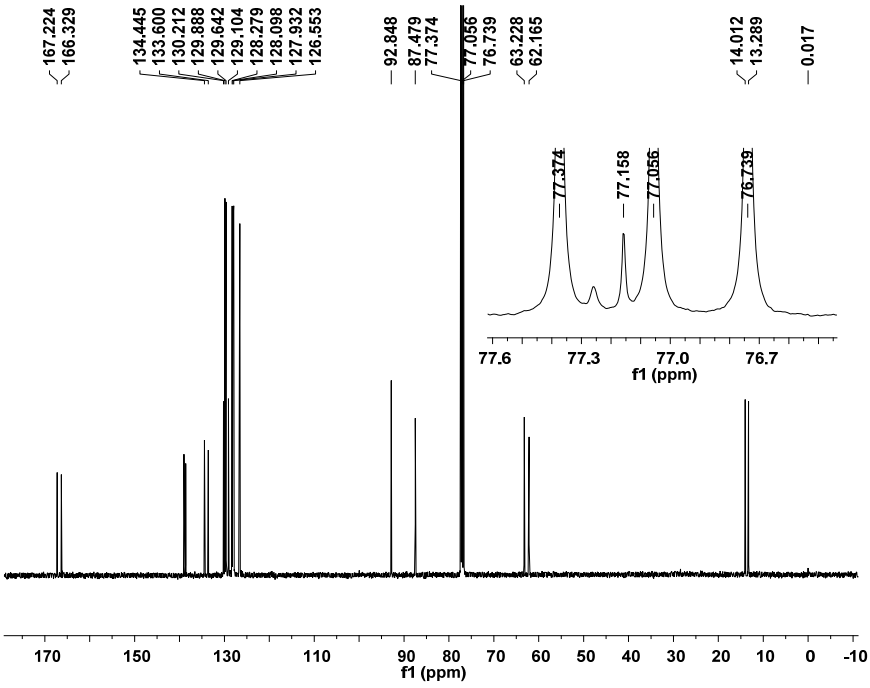



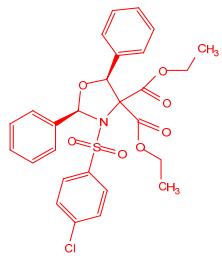

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-12-03T12:38:23
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.7 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 89.91
Ph1: 18.93



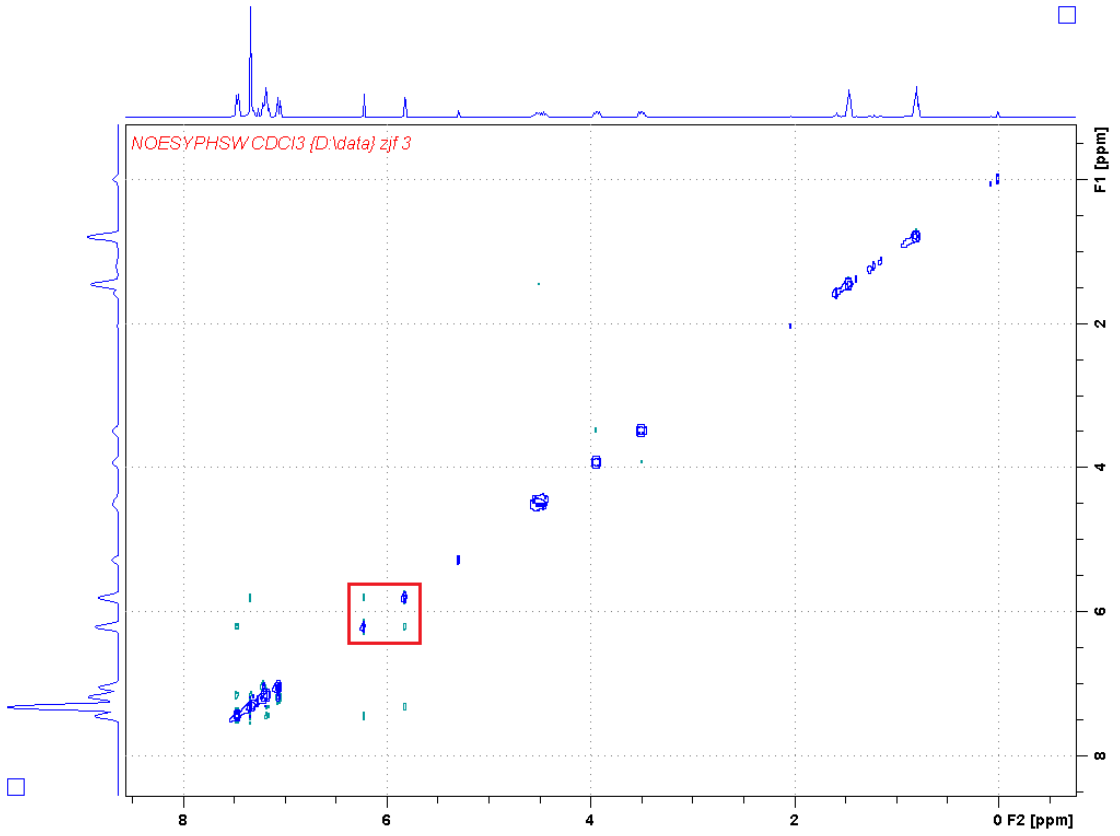



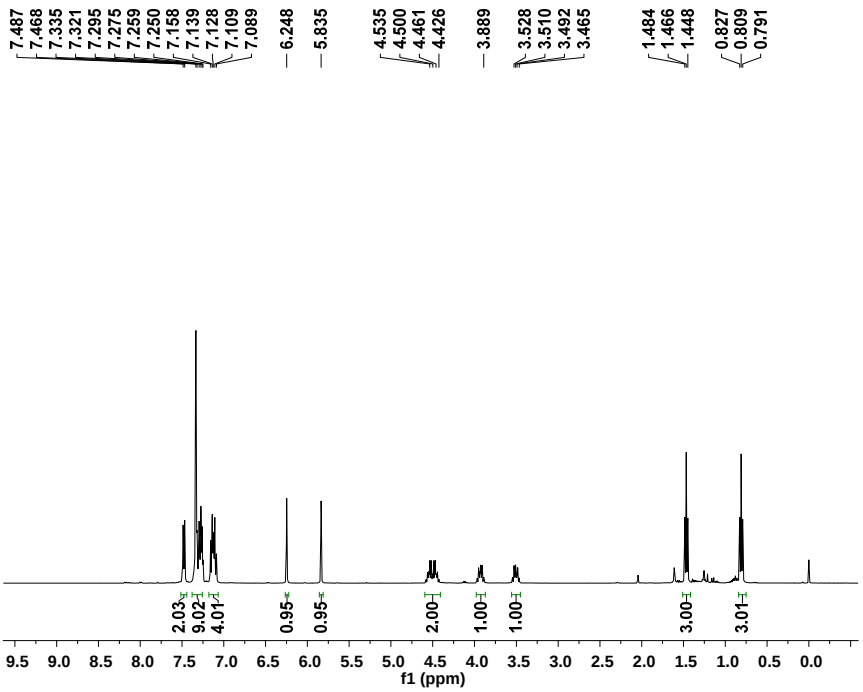

Current Data Parameters

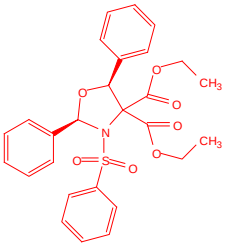
F2 - Acquisition Parameters
DATE: 2014-12-03T19:08:57
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -71.08
Ph1: 67.97


NOESYPHSWCDCl3 {D:\data} zjf 3
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



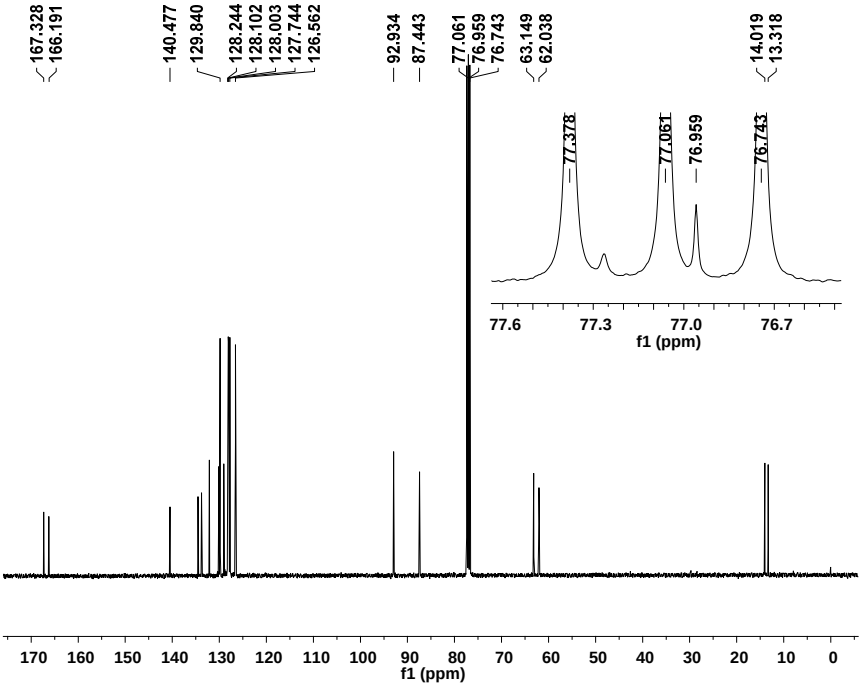



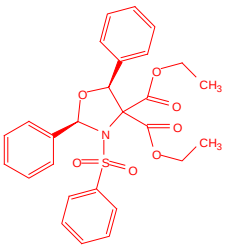
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-12-11T16:06:31
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.6 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 92.94
Ph1: 18.25



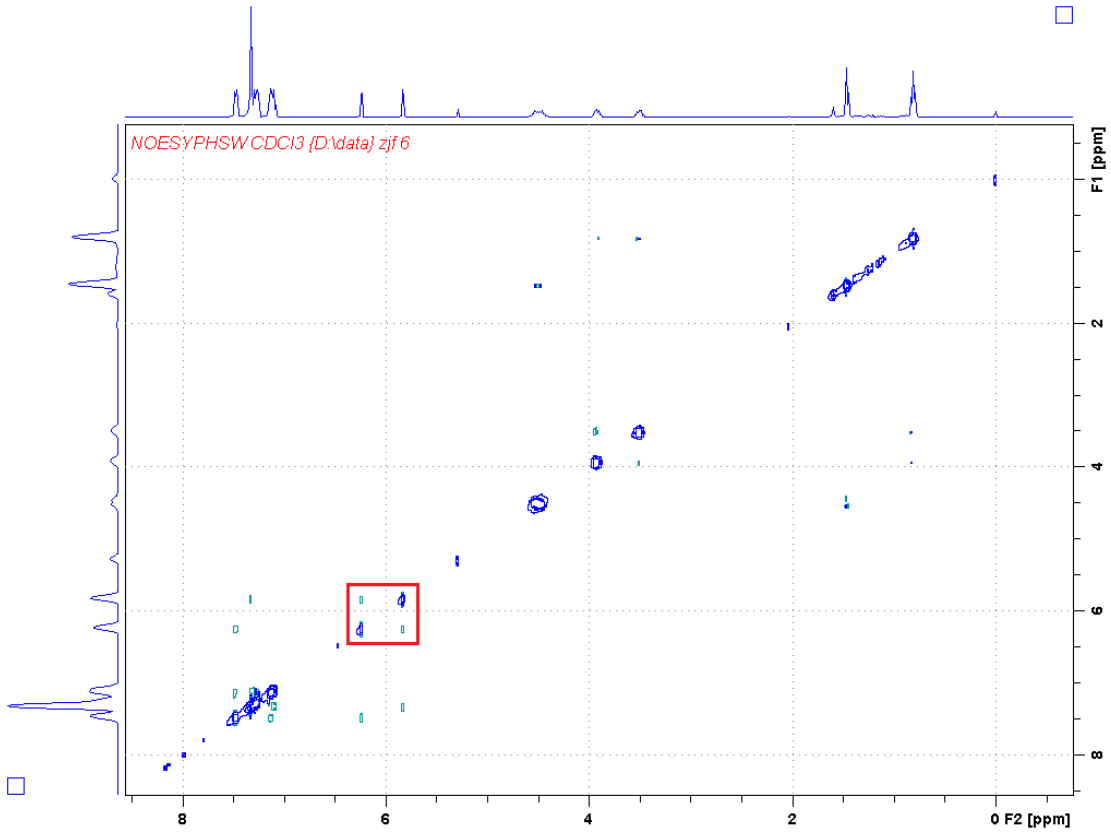



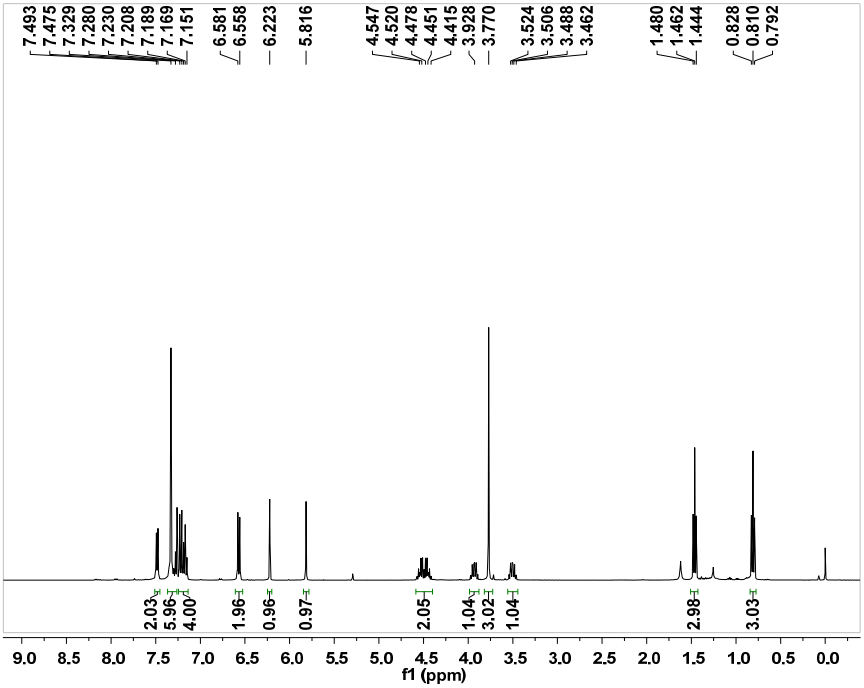
Current Data Parameters

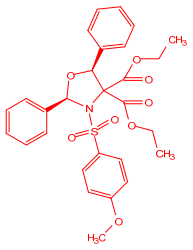
F2 - Acquisition Parameters
DATE: 2014-12-11T21:24:54
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -64.56
Ph1: 66.78


NOESYPHSW CDCl3 {D:\data} zjf 6
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



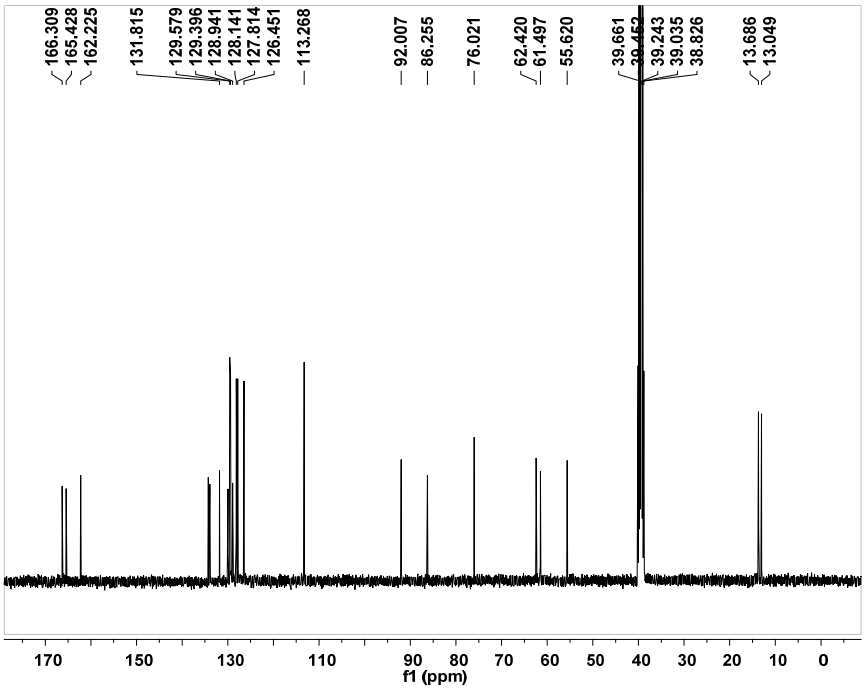



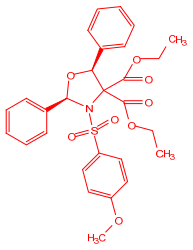
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-17T01:39:59
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.4 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -265.46
Ph1: 14.39



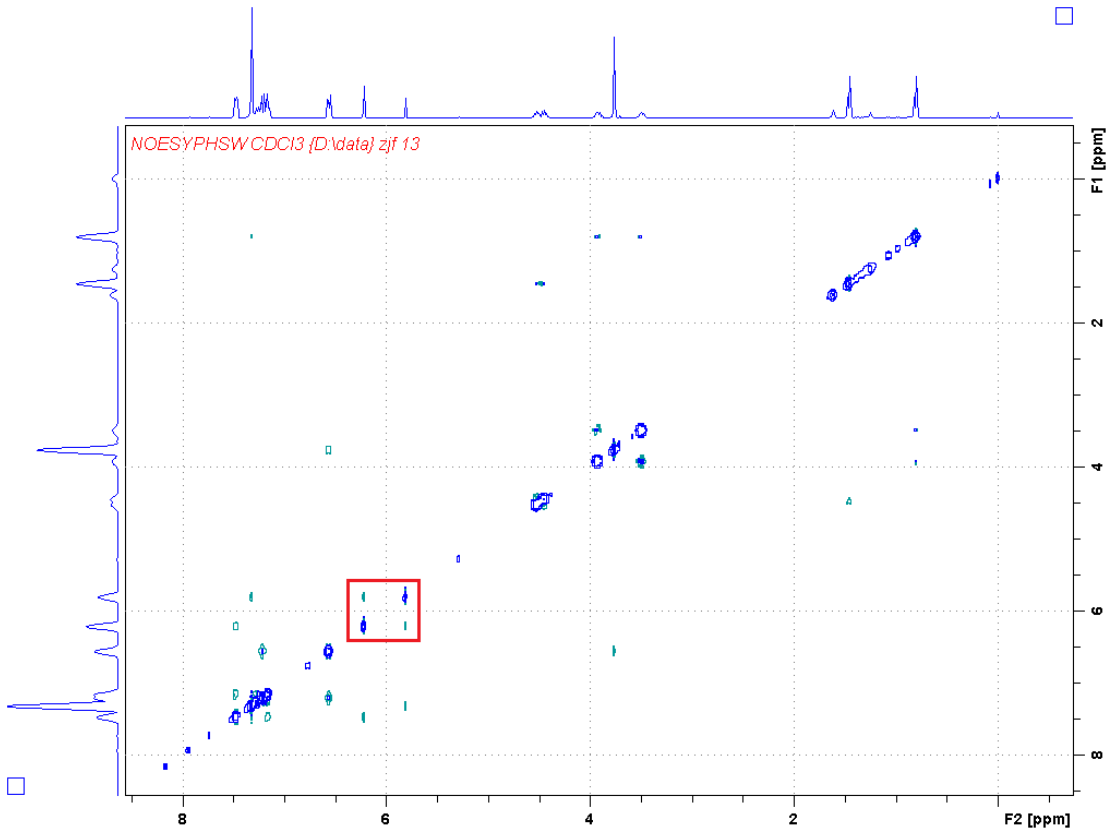



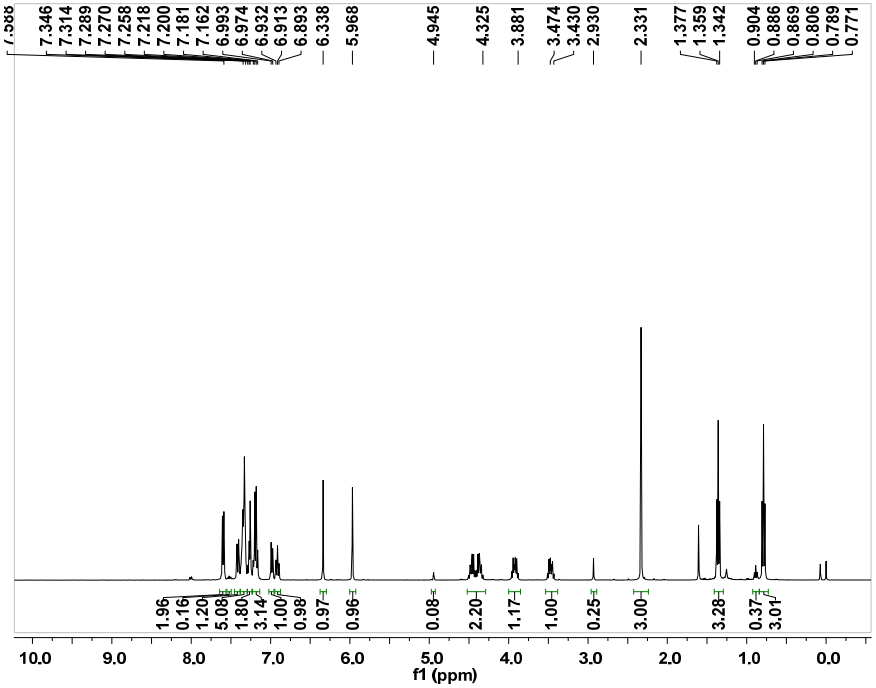
Current Data Parameters

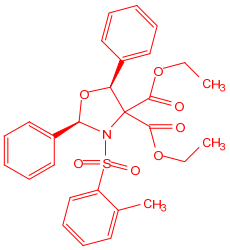
F2 - Acquisition Parameters
DATE: 2015-05-20T03:53:59
PULPROG: zgpg30
TD: 32768
Solvent: DMSO
NS: 512
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296.2 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -69.11
Ph1: 76.73


NOESYPHSW CDCl3 {D:\data} zjf 13
F1 [ppm]
F2 [ppm]
2
4
6
8
8
6
4
2



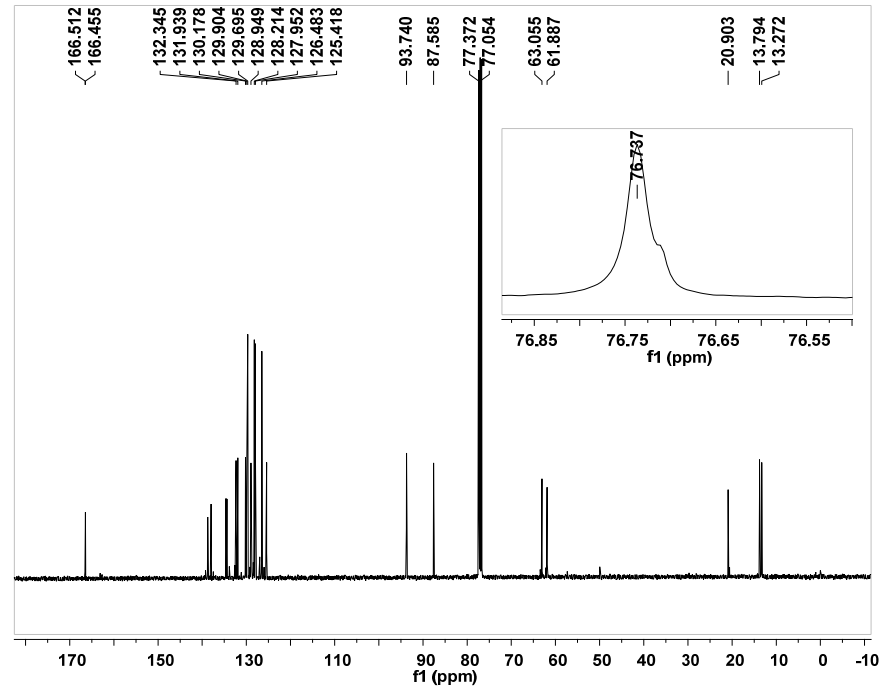



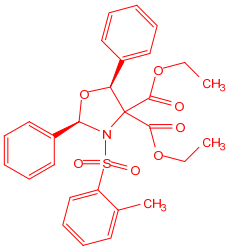
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-23T16:23:25
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.1 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -261.15
Ph1: 16.99



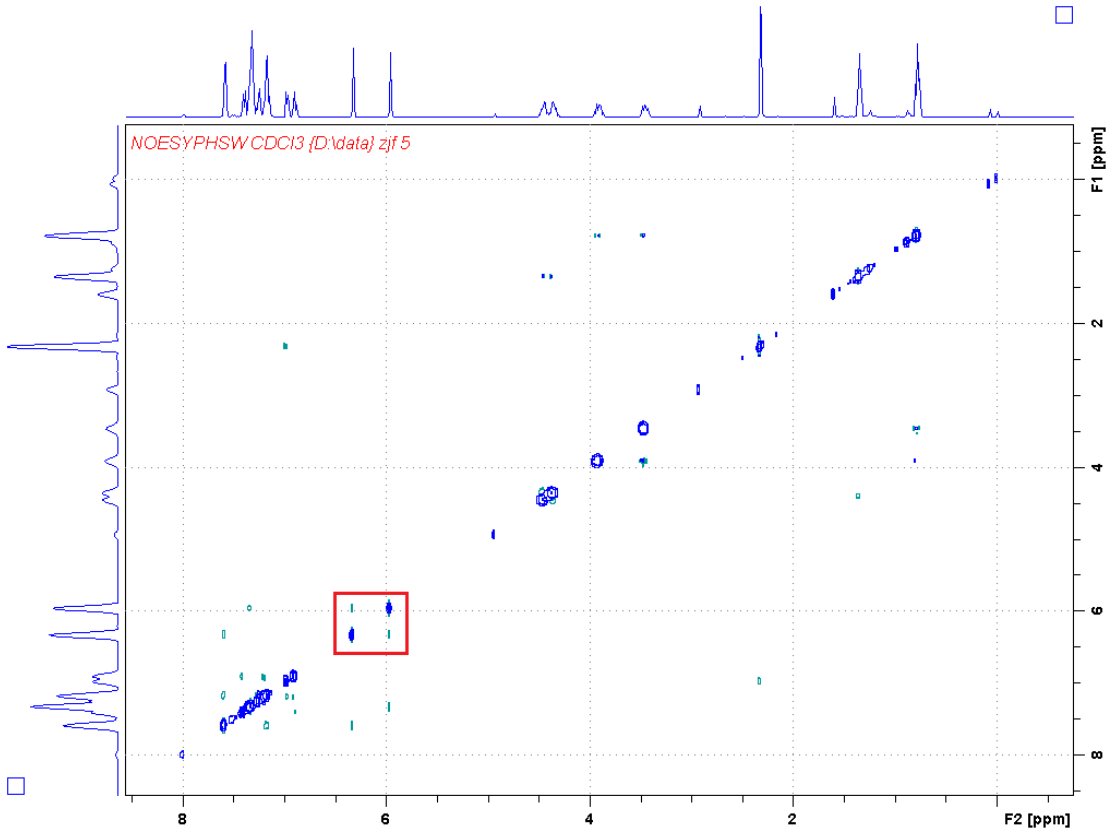



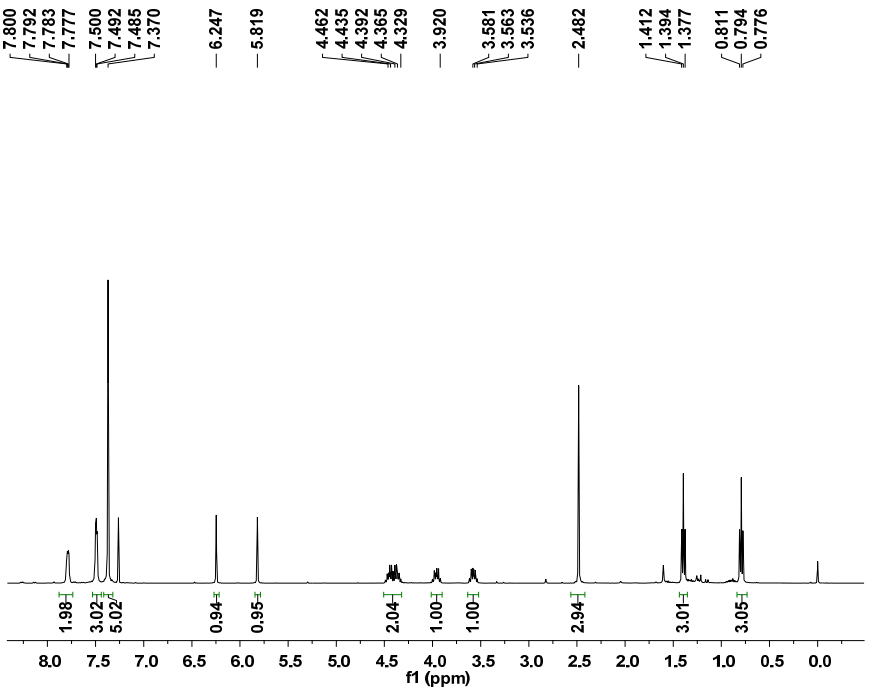
Current Data Parameters

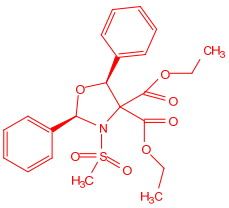
F2 - Acquisition Parameters
DATE: 2015-05-23T18:40:41
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.8 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -52.77
Ph1: 52.67


NOESYPHSW CDCl3 {D:\data} zjf 5
F1 [ppm]
F2 [ppm]
2
4
6
8
8
6
4
2



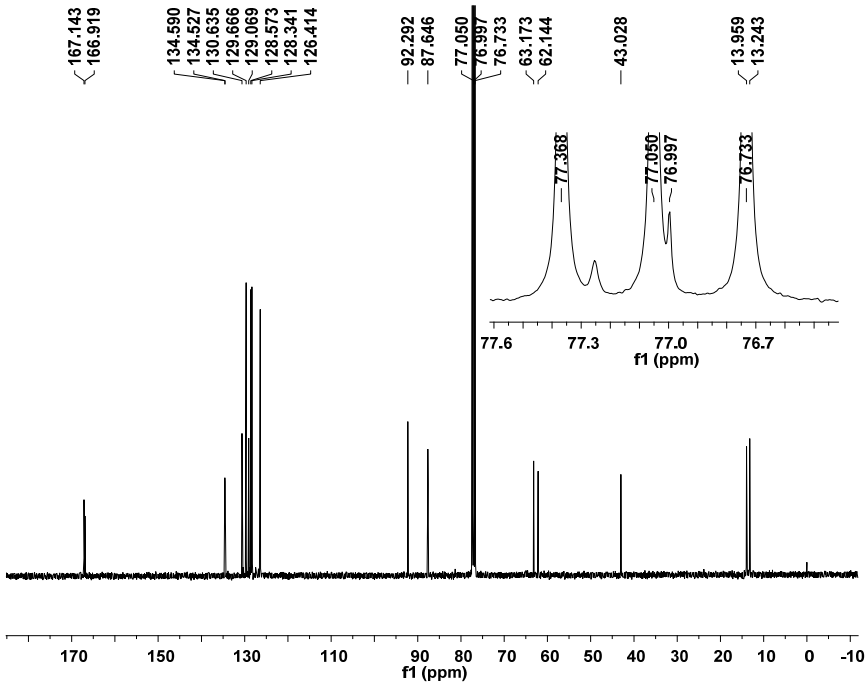



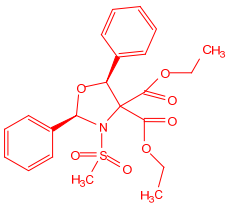

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2014-12-11T16:21:58
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.5 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 93.18
Ph1: 15.03



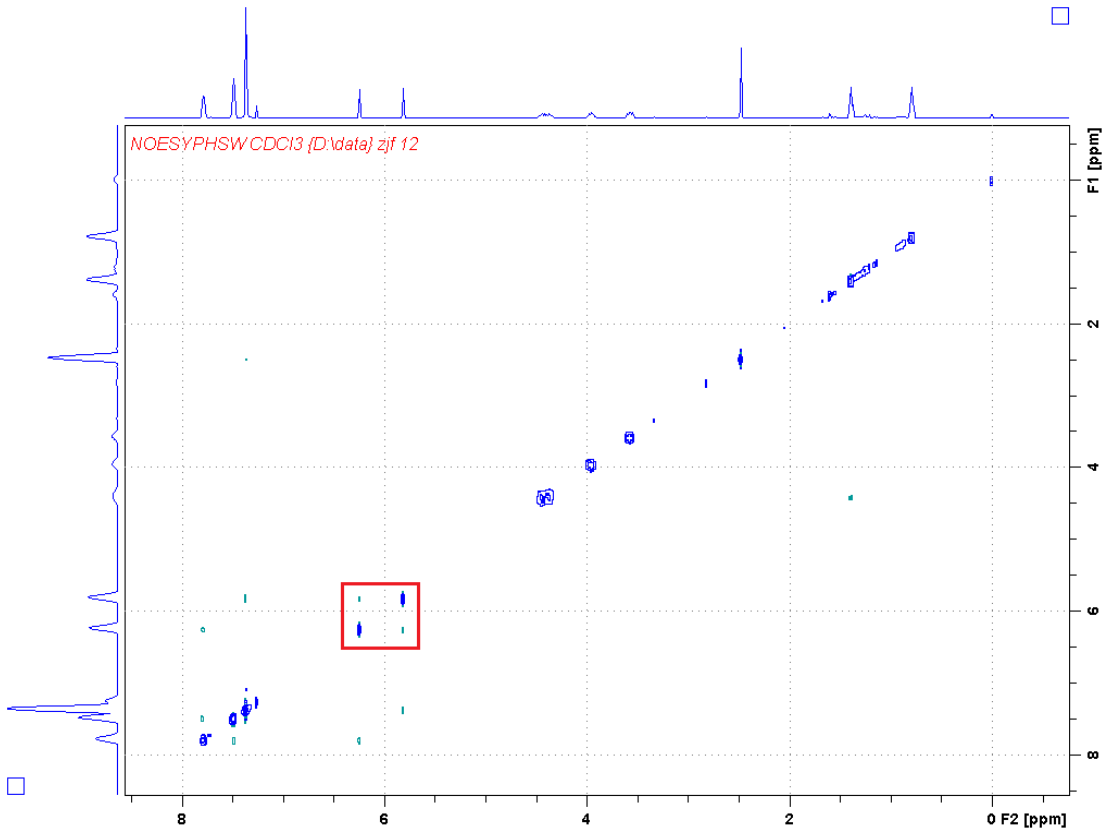



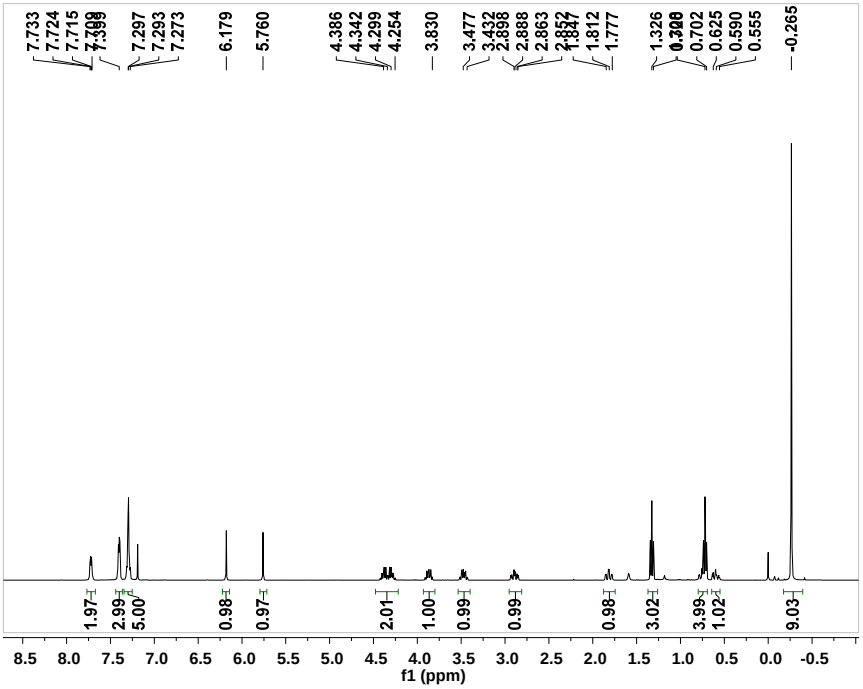

Current Data Parameters

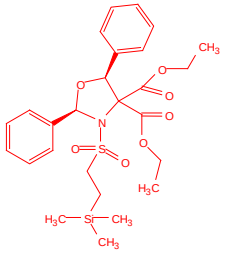
F2 - Acquisition Parameters
DATE: 2014-12-11T23:20:52
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.2 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -68.48
Ph1: 71.76


NOESYPHSWCDCl3 {D:\data} zjf 12
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



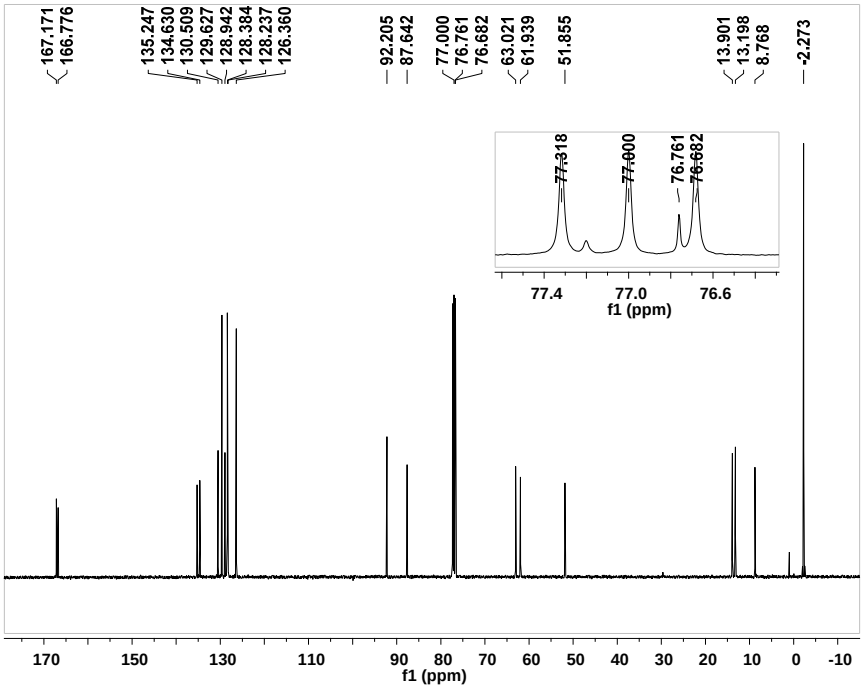



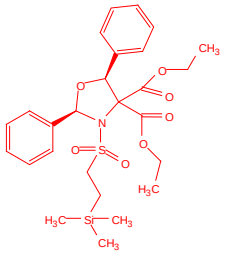
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-05-27T23:59:27
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 295.5 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -260.15
**Ph1:** 17.69



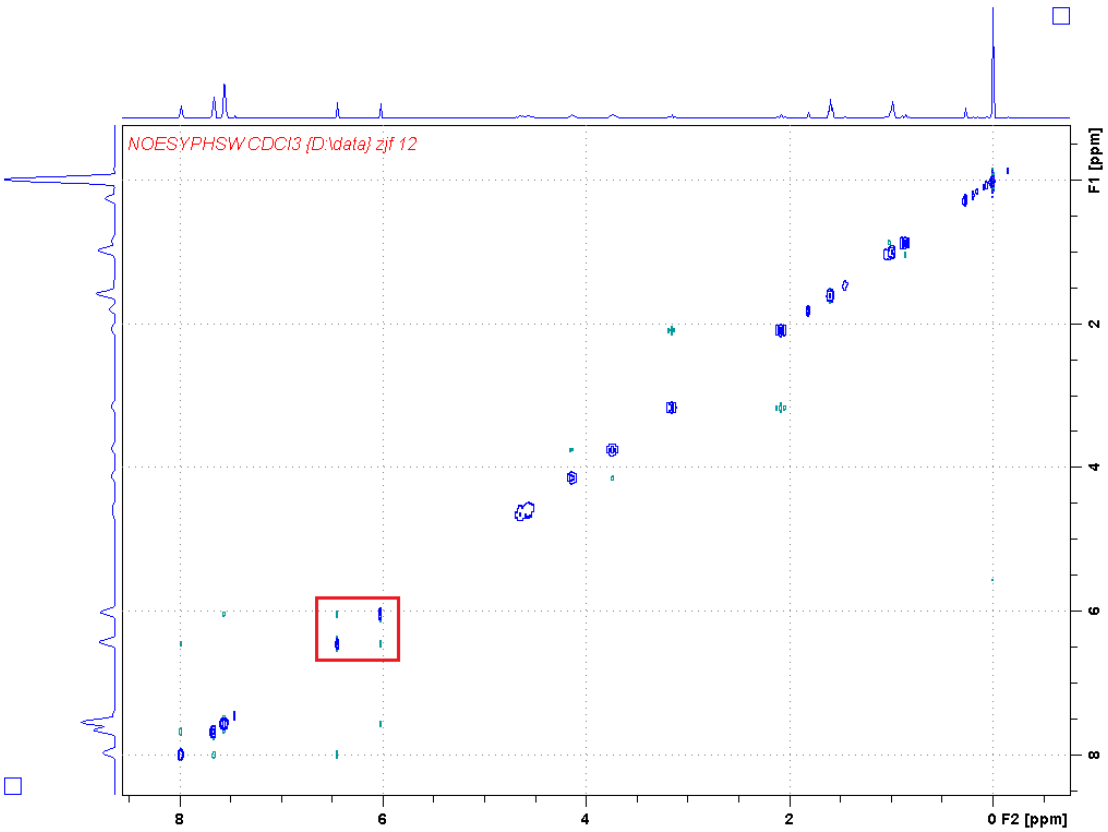



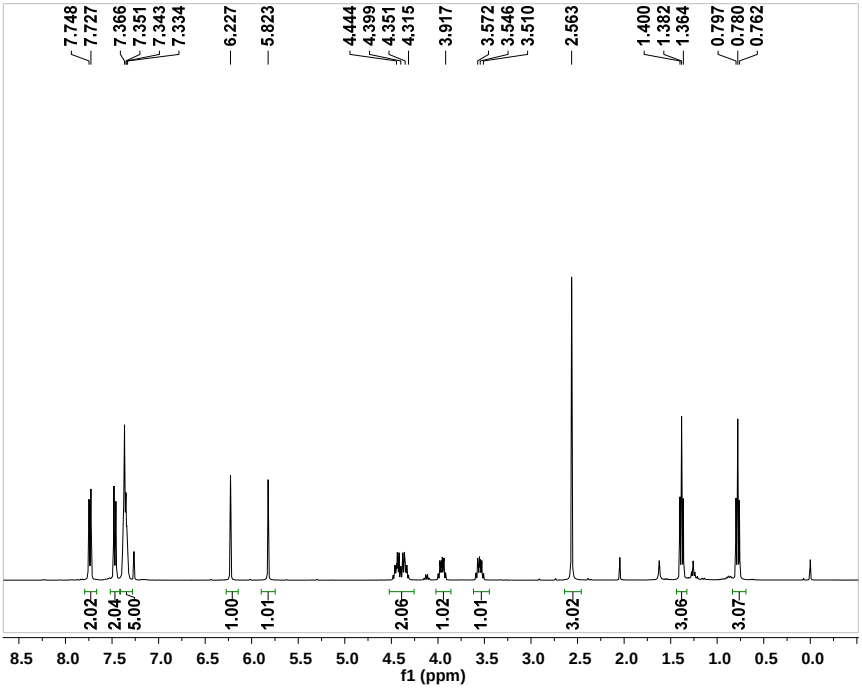
**Current Data Parameters**

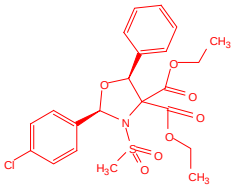
**F2 - Acquisition Parameters**
**DATE:** 2015-05-28T00:58:52
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 295.7 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -59.42
**Ph1:** 54.93


NOESYPHSW CDCl3 {D:\data} zjf 12
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



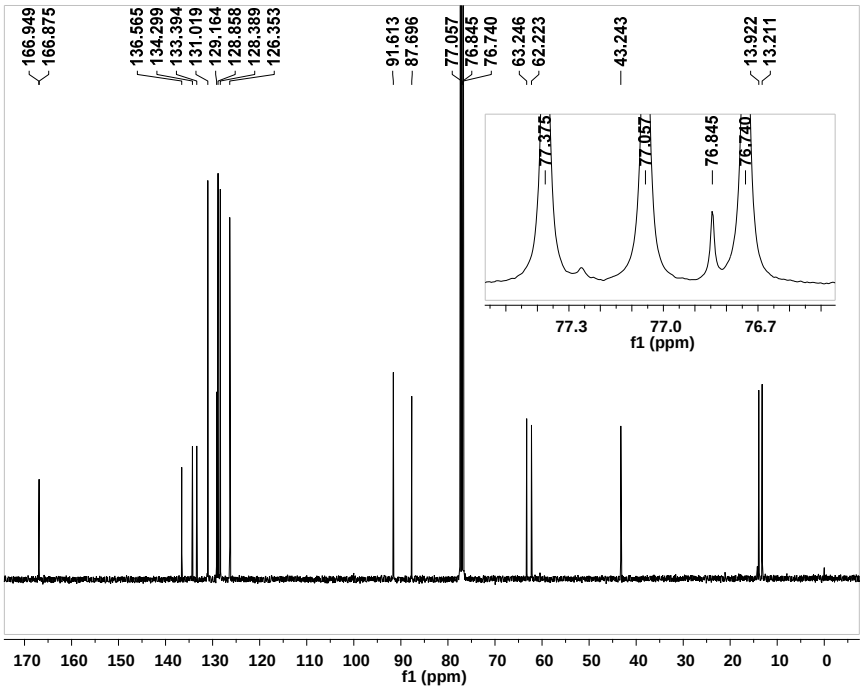



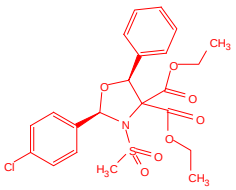

**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-02-16T14:41:27
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 293.5 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 96.72
**Ph1:** 17.55



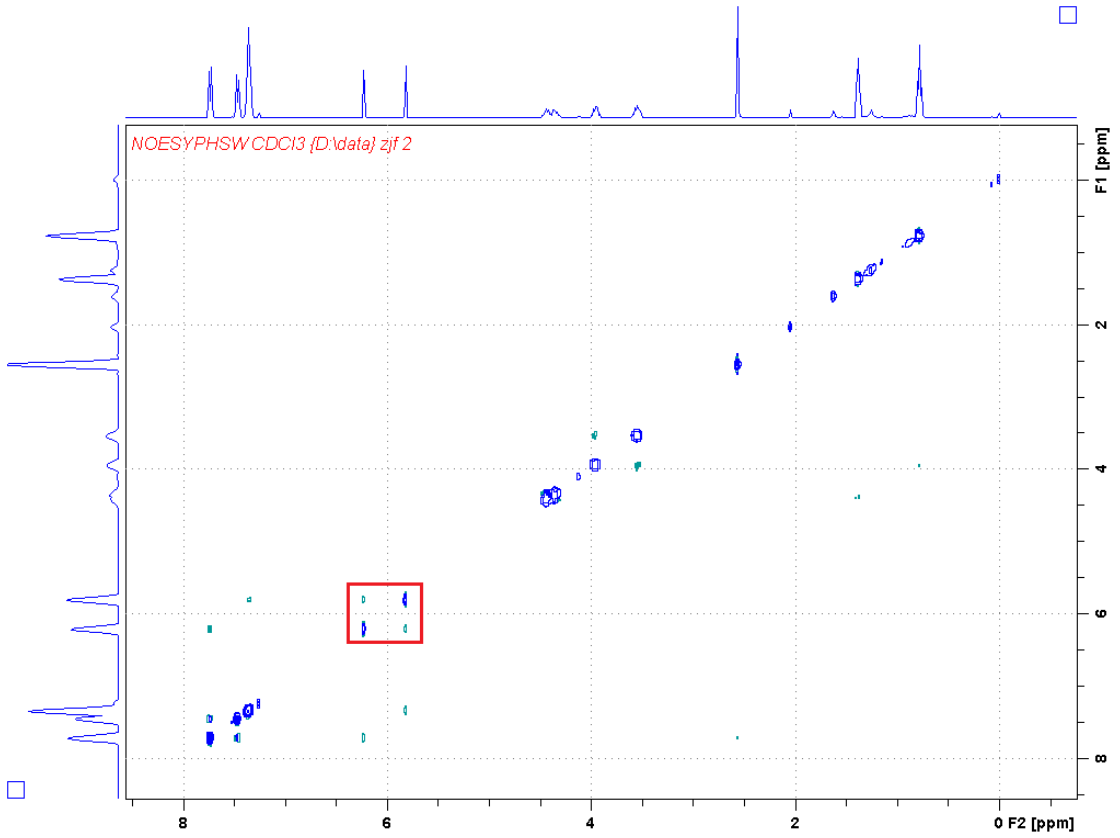



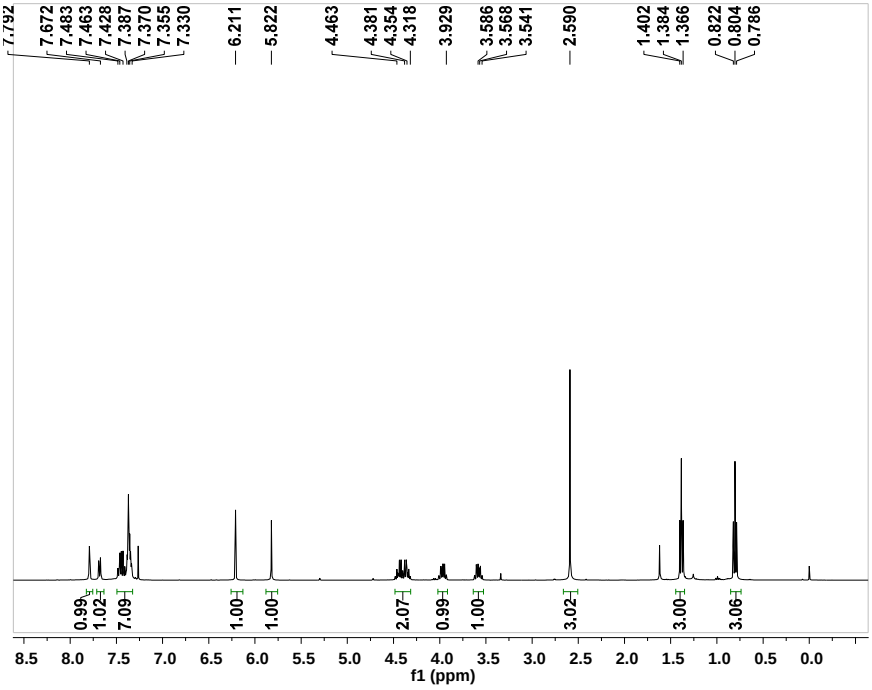

**Current Data Parameters**

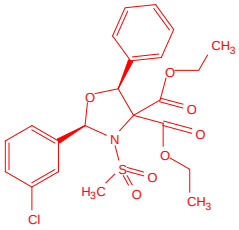
**F2 - Acquisition Parameters**
**DATE:** 2015-02-16T16:31:57
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 293.9 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -60.66
**Ph1:** 60.35


NOESYPHSW CDCl3 {D:\data} zjf 2
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



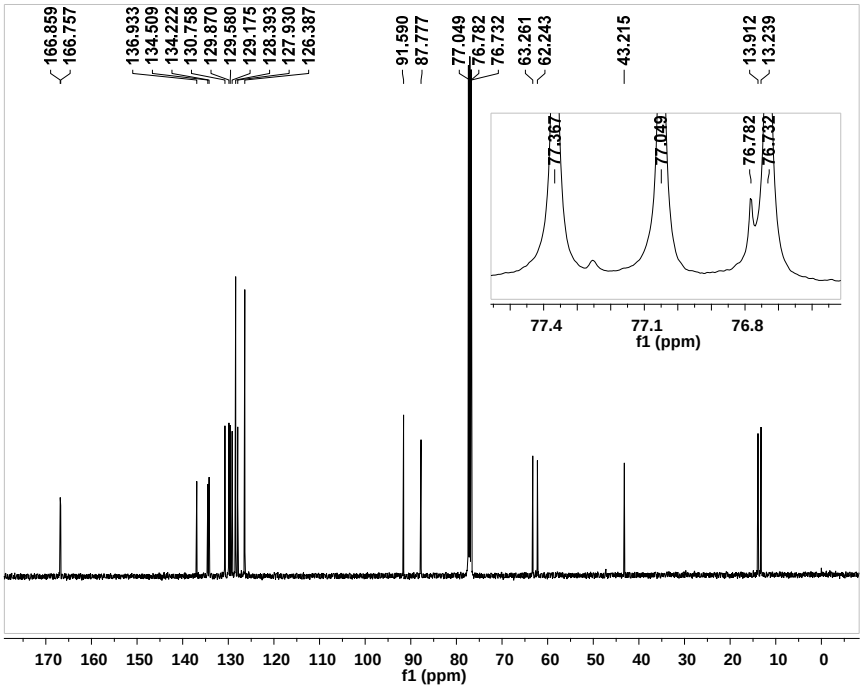



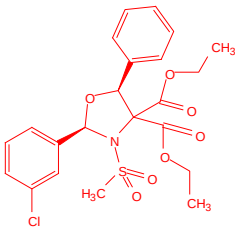

**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-04-02T10:05:50
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 295.3 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 94.69
**Ph1:** 12.79



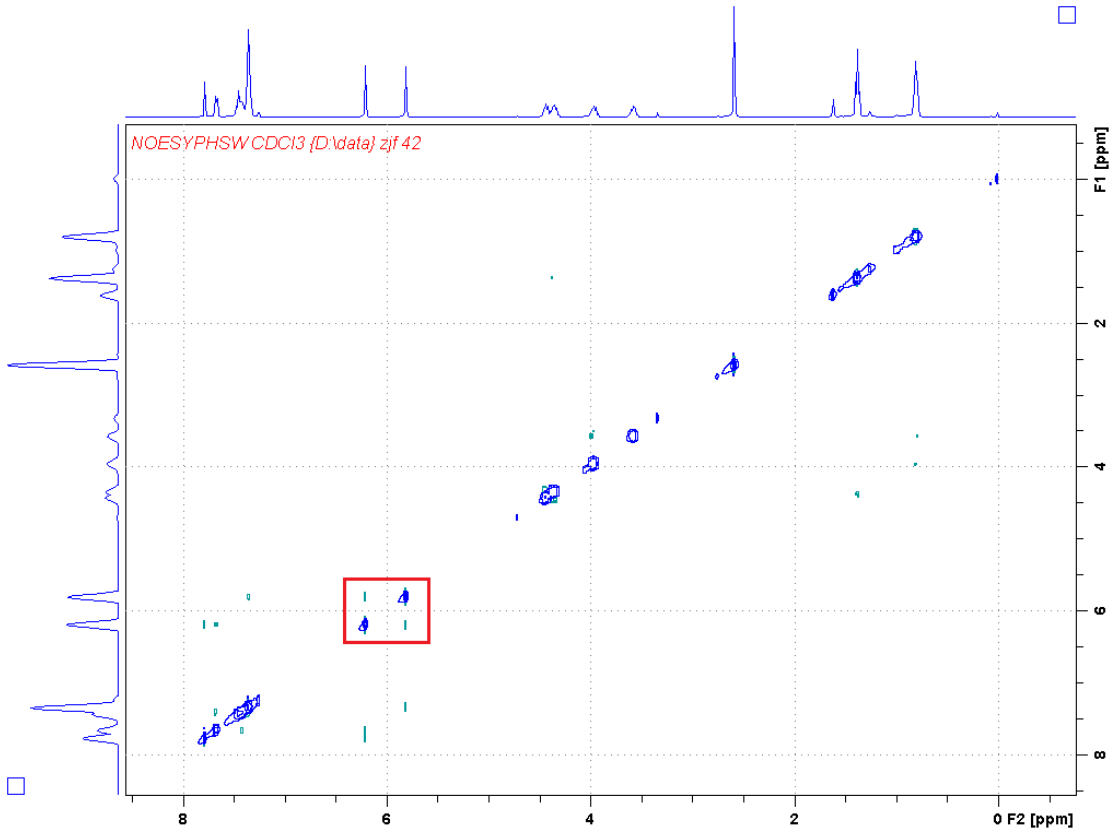



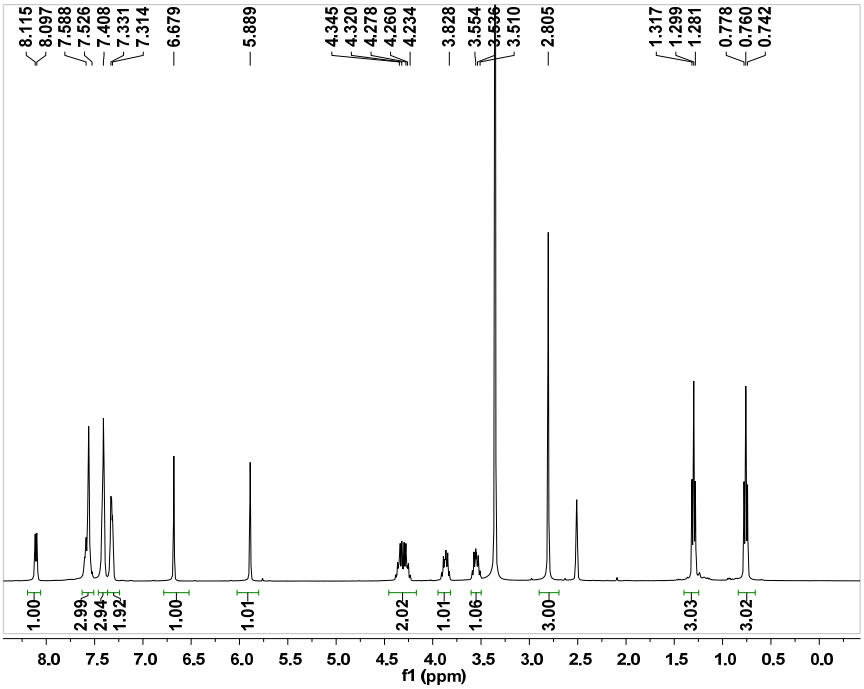

**Current Data Parameters**

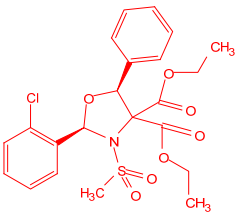
**F2 - Acquisition Parameters**
**DATE:** 2015-04-02T11:56:19
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 295.7 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -59.59
**Ph1:** 50.89


NOESYPHSW CDCl3 {D:\data} zjf 42
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



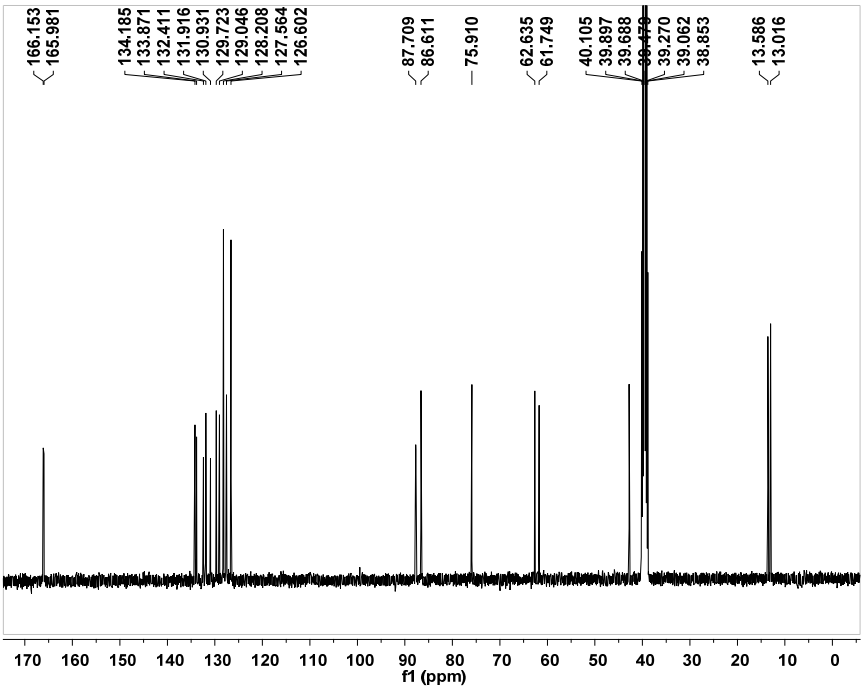



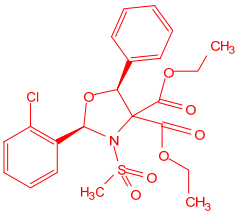

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-04-28T11:06:21
PULPROG: zg30
TD: 32768
Solvent: DMSO
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 297.8 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 86.99
Ph1: 12.57



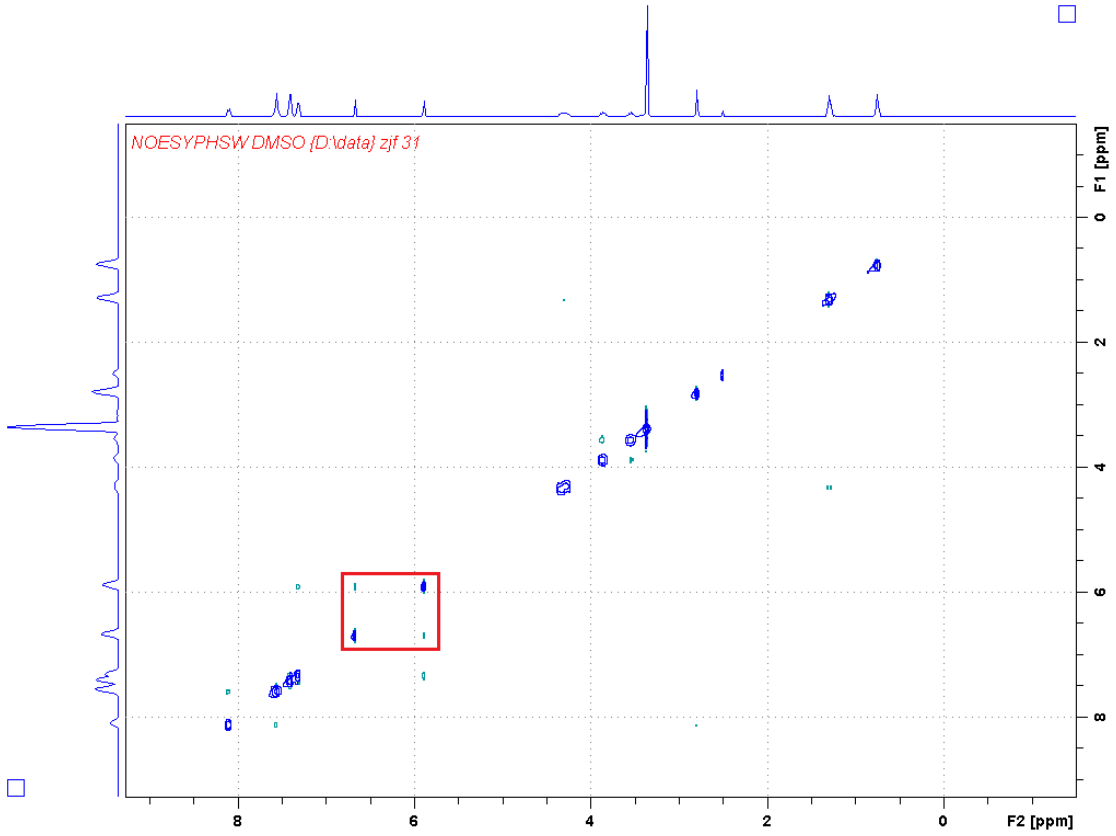



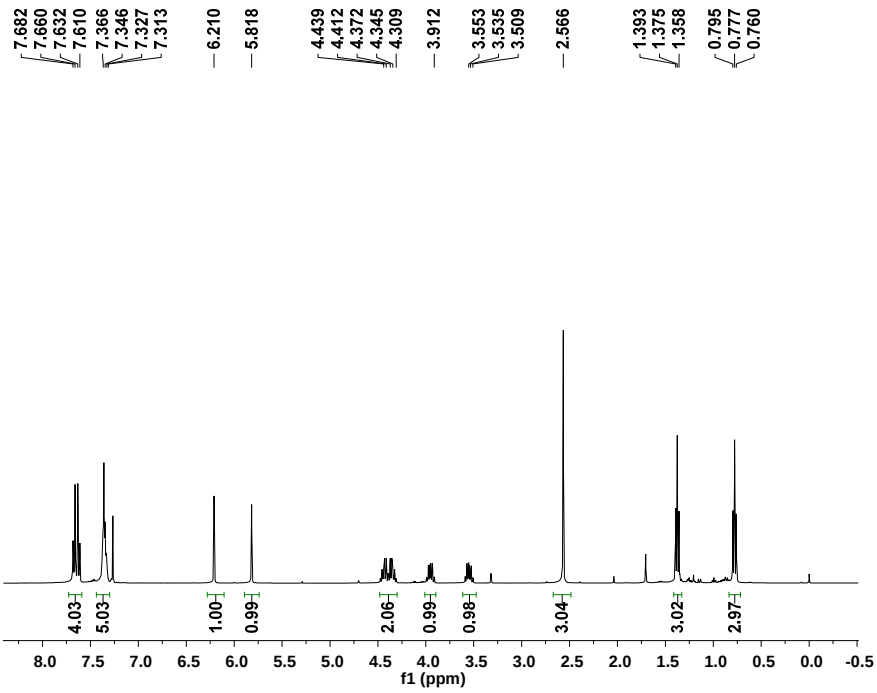

Current Data Parameters

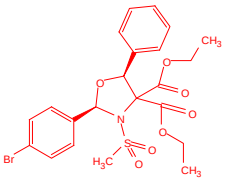
F2 - Acquisition Parameters
DATE: 2015-04-28T12:16:16
PULPROG: zgpg30
TD: 32768
Solvent: DMSO
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 297.5 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -66.51
Ph1: 63.87


NOESYPHSW DMSO {D:\data} zjf 31
F1 [ppm]
0
2
4
6
8
F2 [ppm]
8
6
4
2
0



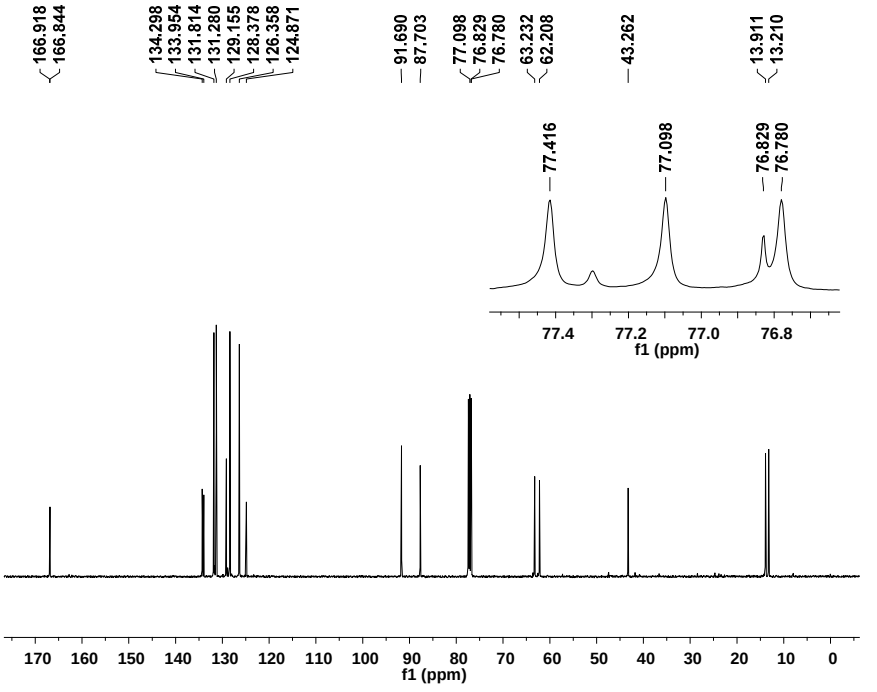



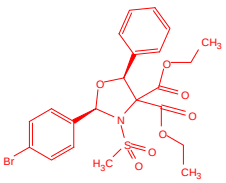
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-07-15T05:15:33
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 16
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 0 C

======== **CHANNEL f1** ========
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 94.75
**Ph1:** 15.88



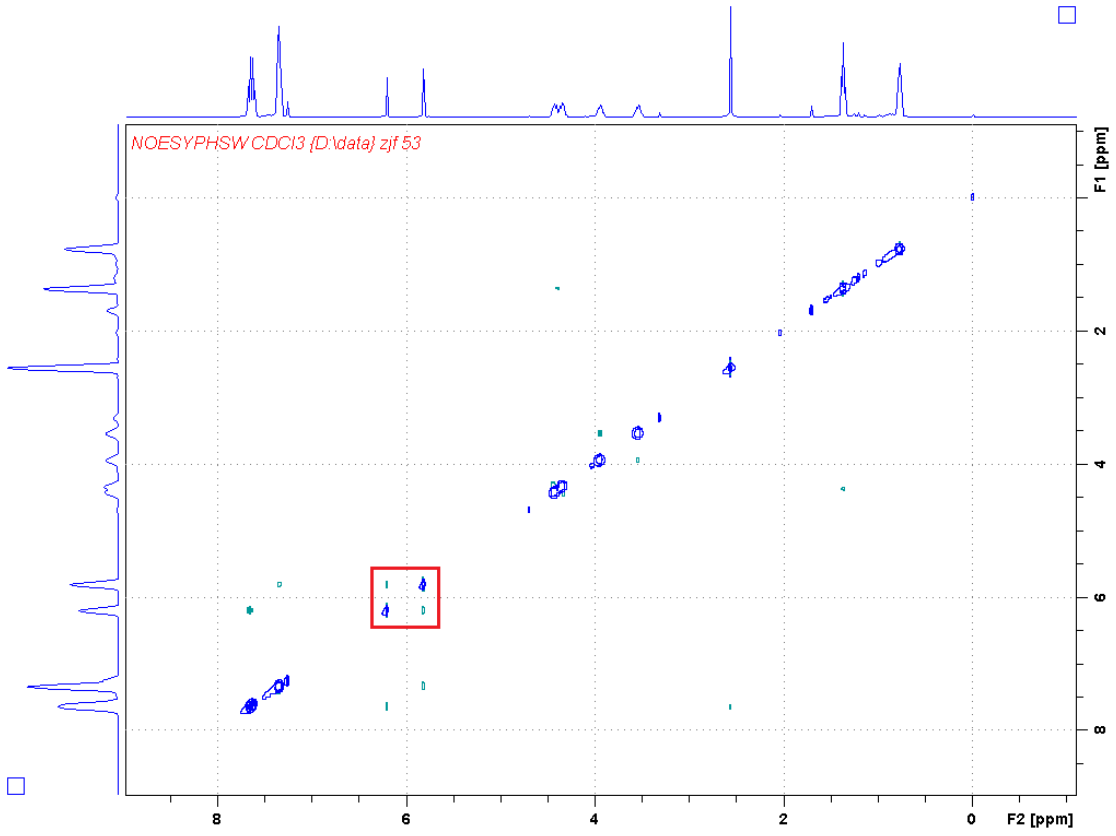



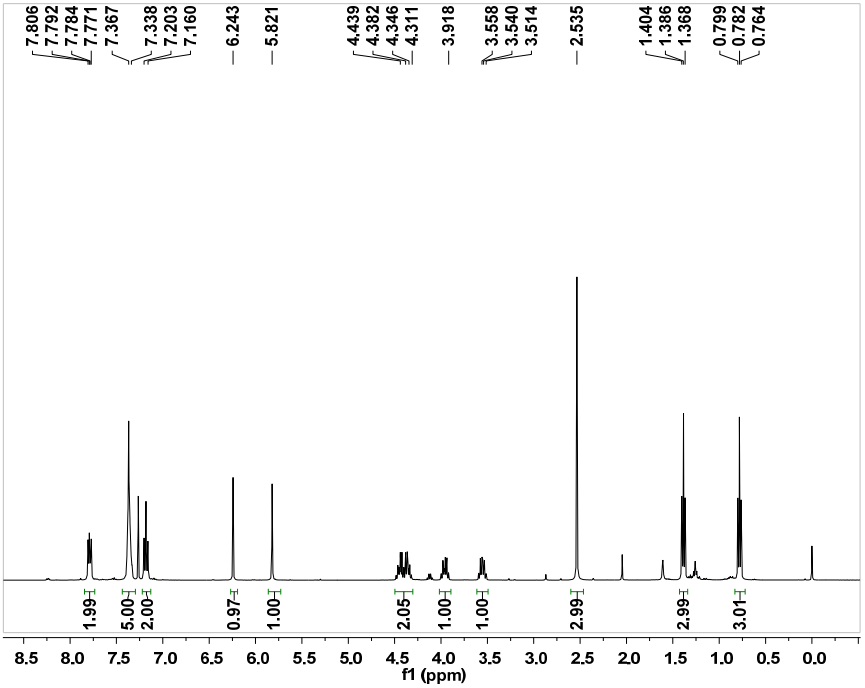
**Current Data Parameters**

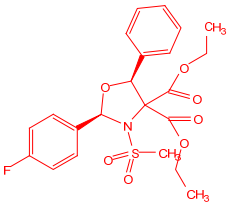
**F2 - Acquisition Parameters**
**DATE:** 2015-07-15T07:11:07
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 0 C

======== **CHANNEL f1** ========
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -58.39
**Ph1:** 63.44


NOESYPHSW CDCl3 {D:\data} zjf 53
F1 [ppm]
F2 [ppm]
8
6
4
2
0
2
4
6
8



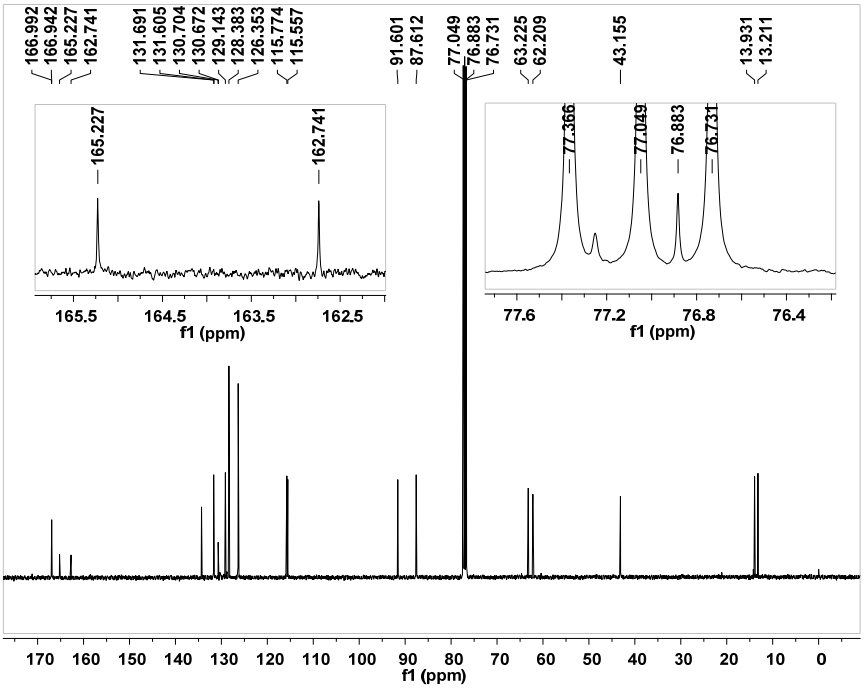



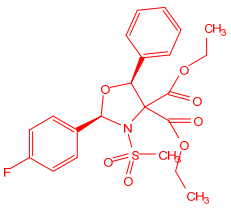
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-16T20:32:08
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.5 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 96.64
Ph1: 17.09



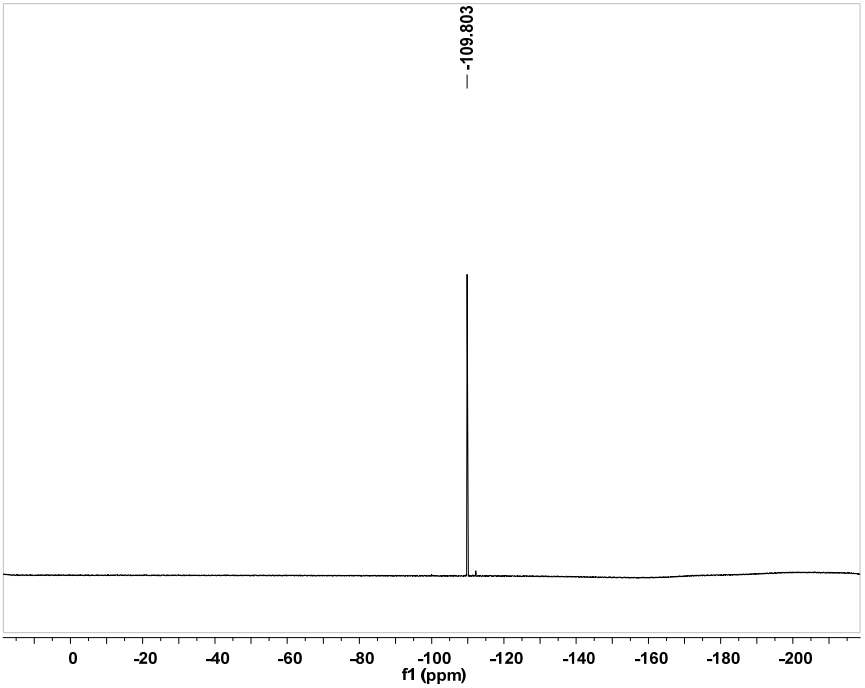



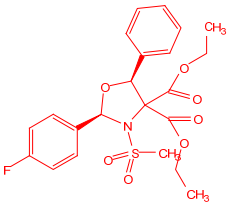
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-16T22:22:39
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 293.8 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -72.22
Ph1: 64.41



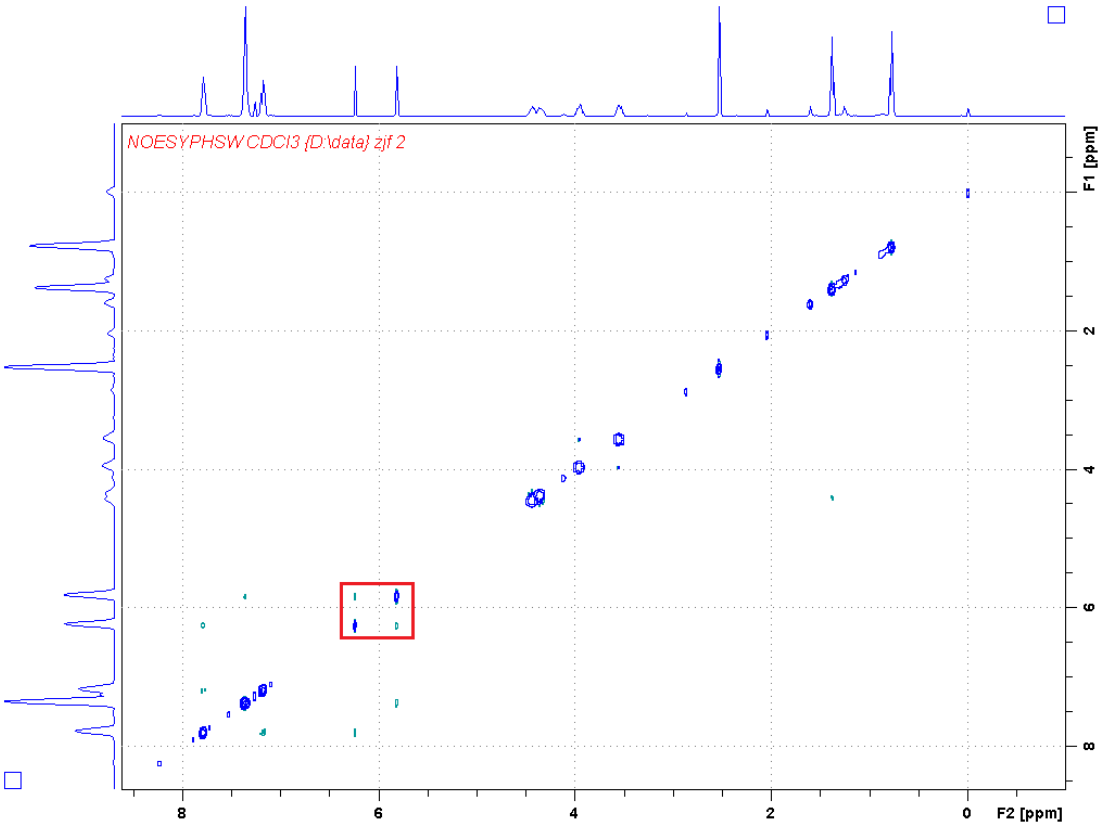



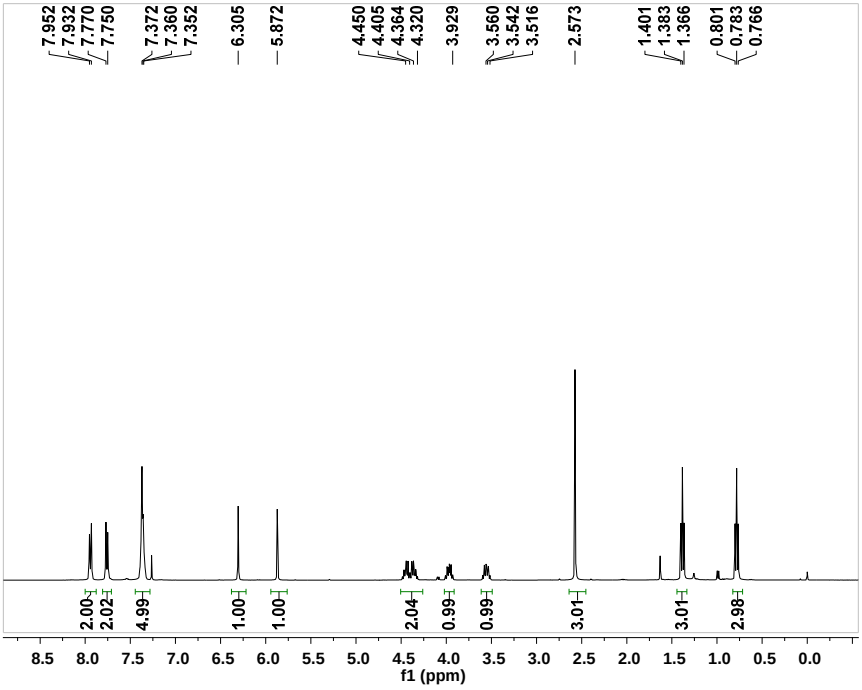

Current Data Parameters

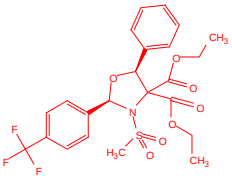
F2 - Acquisition Parameters
DATE: 2015-02-16T17:48:23
PULPROG: zgflqn
TD: 65536
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 89285.7 Hz
AQ: undefined
TE: 293.6 C

======== CHANNEL f1 ========
NUC1: 19F
P1: 12.75 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 131072
DC: 0.05
LB: 0.30 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -30.79
Ph1: 0.00





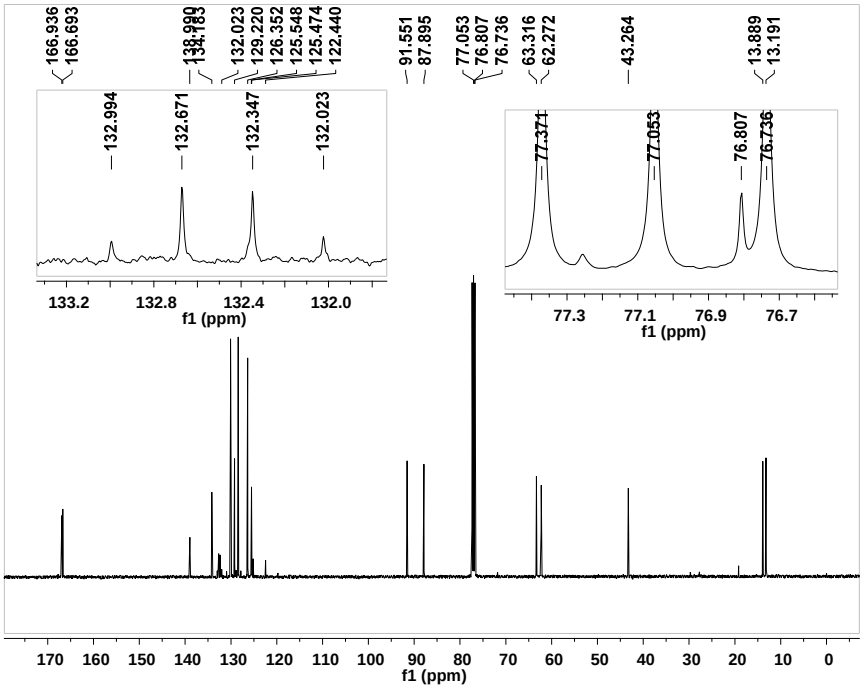



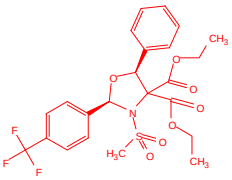
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-04-14T01:47:38
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 294.5 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 97.61
**Ph1:** 16.82



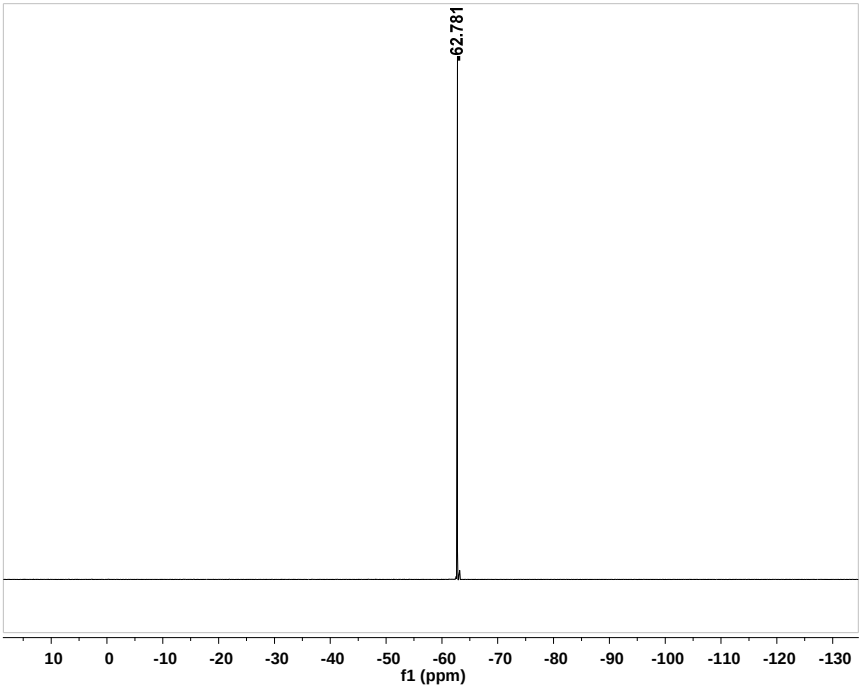



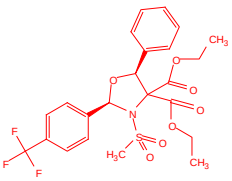
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-04-14T03:39:53
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 294.7 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -64.26
**Ph1:** 62.28



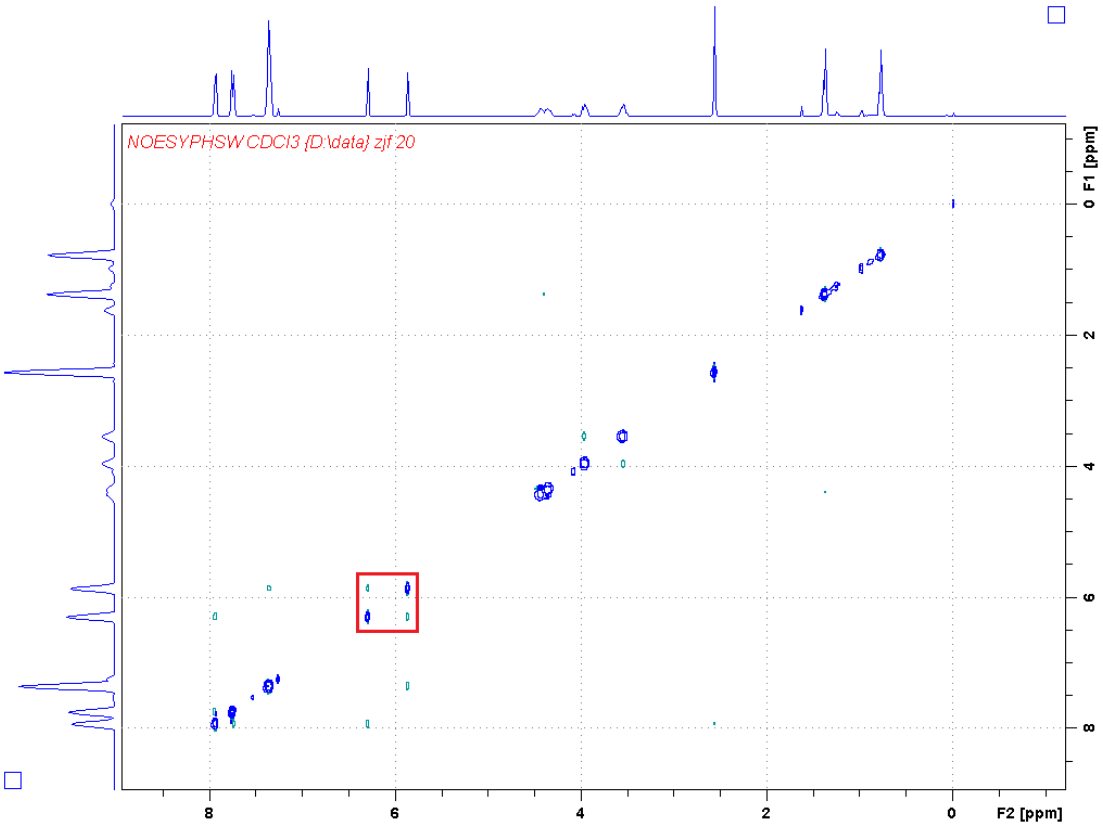



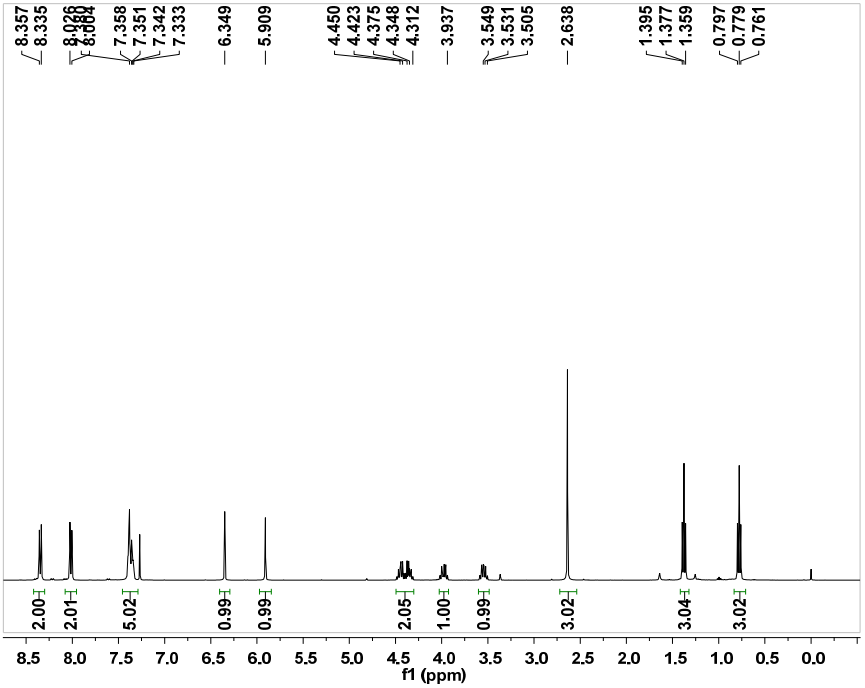

**Current Data Parameters**

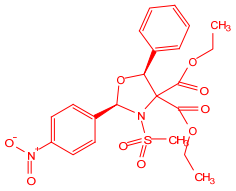
**F2 - Acquisition Parameters**
**DATE:** 2015-03-20T00:27:32
**PULPROG:** zgflqn
**TD:** 65536
**Solvent:** CDCl3
**NS:** 16
**DS:** undefined
**SWH:** 89285.7 Hz
**AQ:** undefined
**TE:** 294.2 C

**======== CHANNEL f1 ========**
**NUC1:** 19F
**P1:** 12.75 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 131072
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -115.49
**Ph1:** 0.00





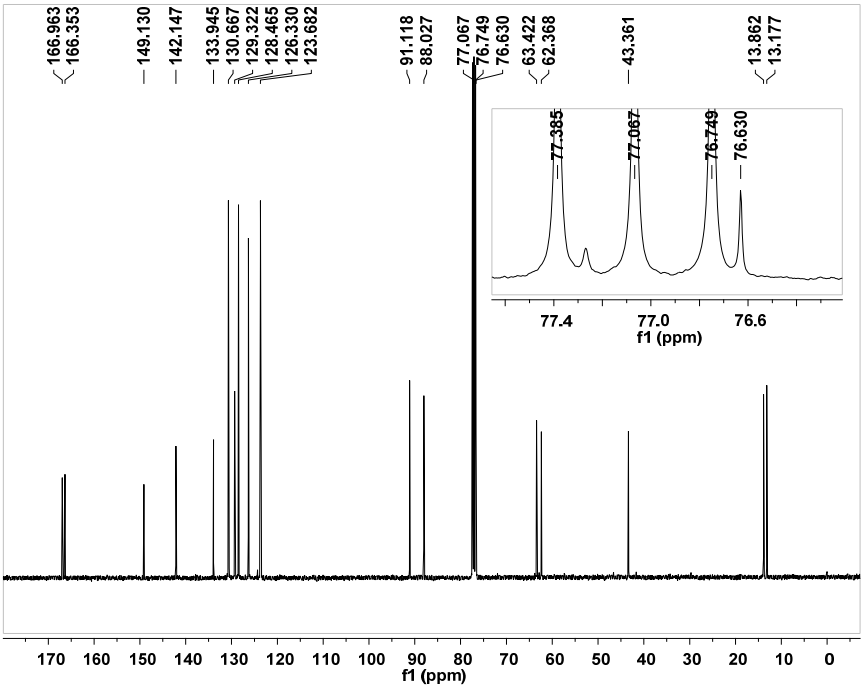



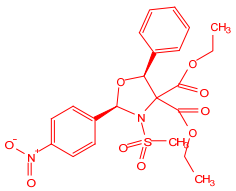
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-20T18:24:57
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 294.2 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 98.02
Ph1: 17.09



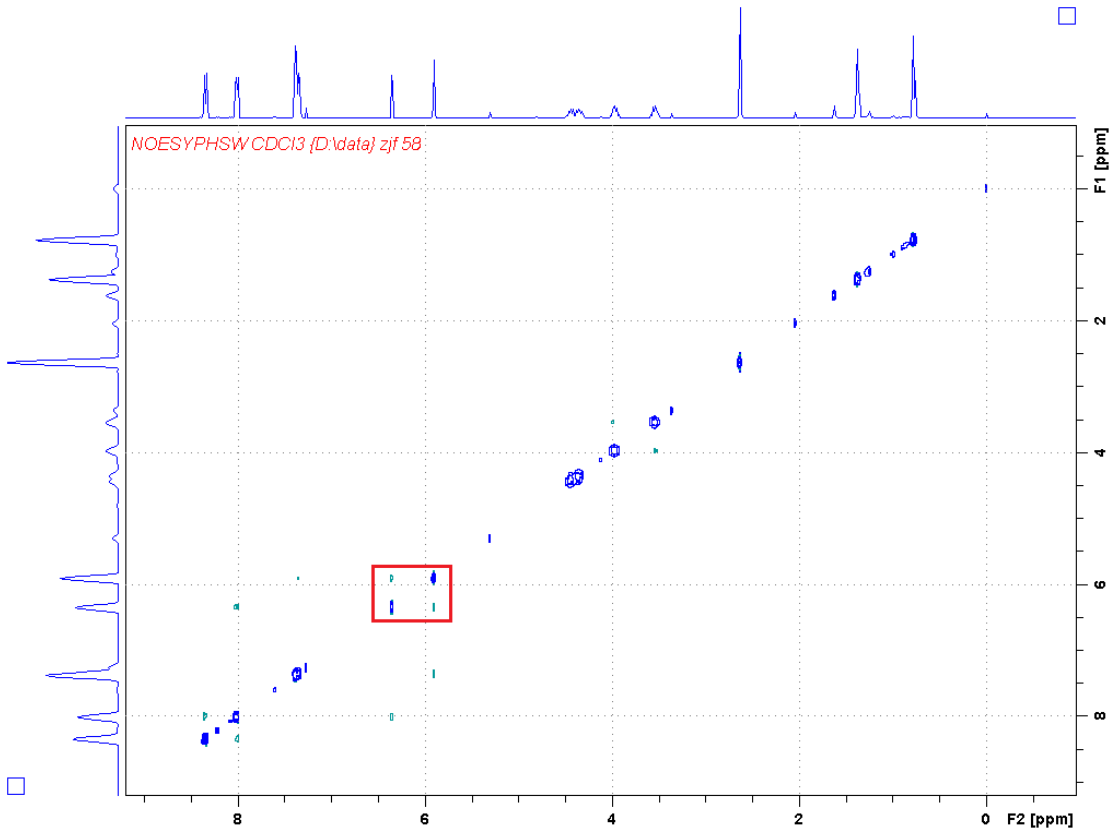



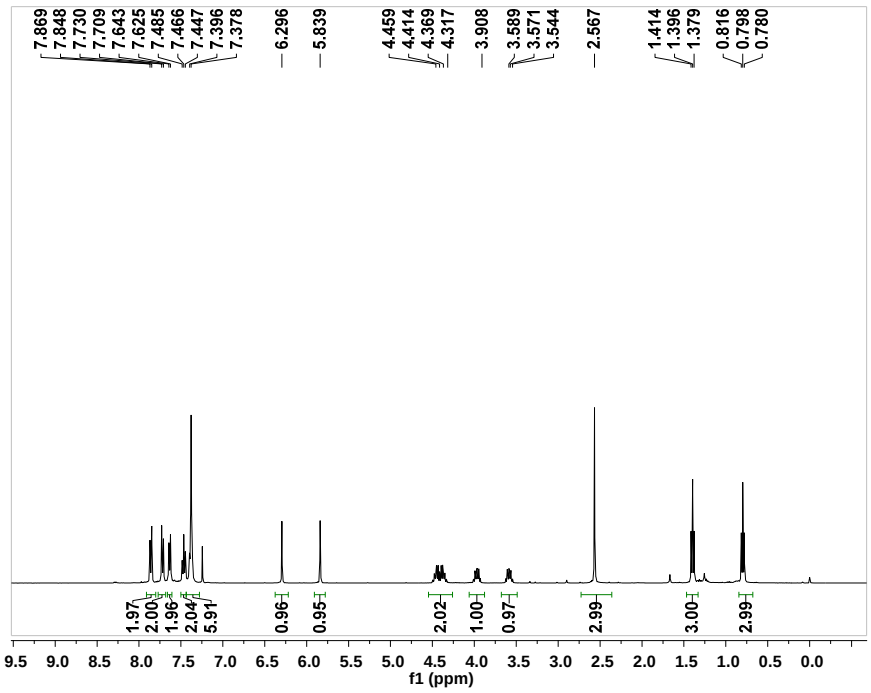
Current Data Parameters

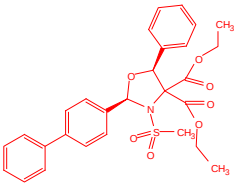
F2 - Acquisition Parameters
DATE: 2015-03-20T19:24:25
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 294.5 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -63.21
Ph1: 64.34


NOESYPHSW CDCl3 {D:\data} zjf 58
F1 [ppm]
2
4
6
8
8
6
4
2
0
F2 [ppm]



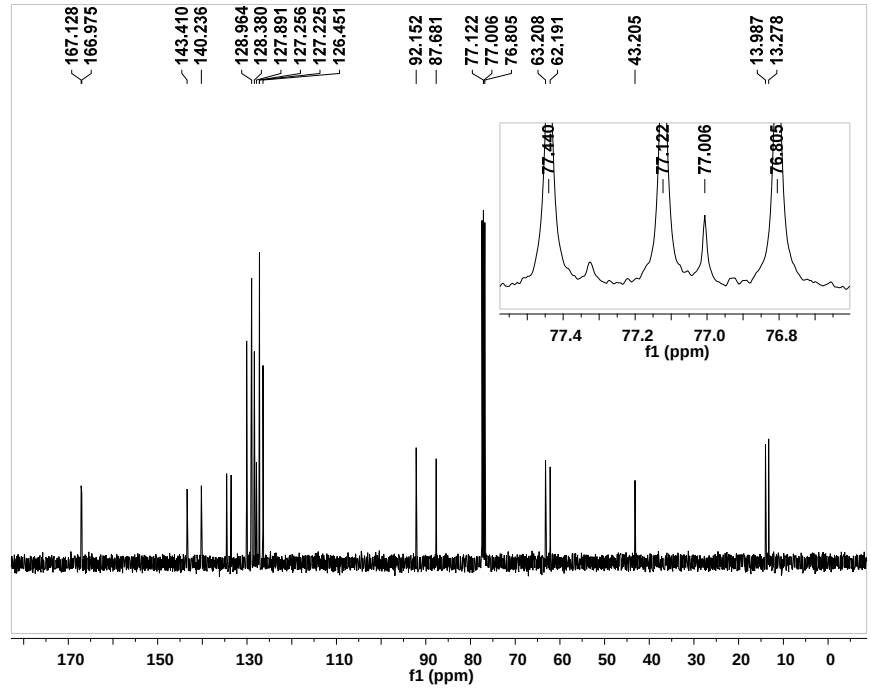



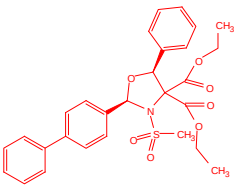
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-03-13T17:19:41
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 4
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 294.1 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 95.30
**Ph1:** 14.78



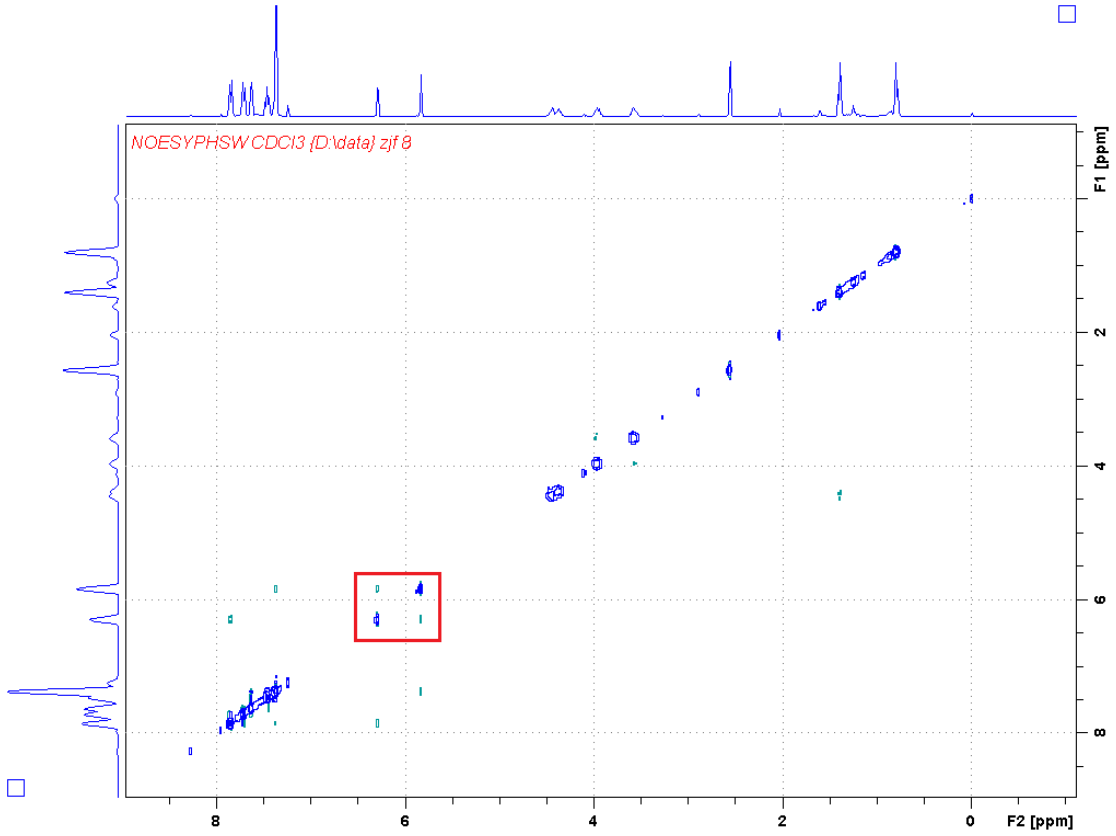



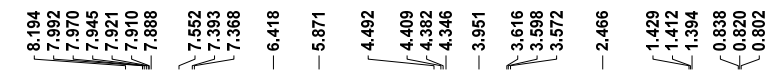
**Current Data Parameters**

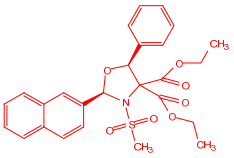
**F2 - Acquisition Parameters**
**DATE:** 2015-03-13T17:21:36
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 16
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 294.2 C

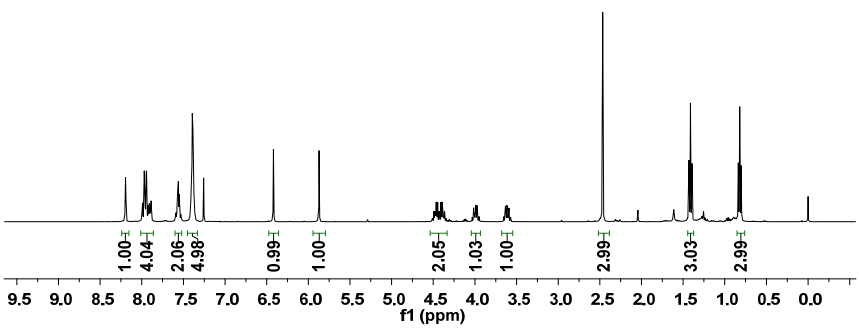
**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -58.49
**Ph1:** 53.86


NOESYPHSW CDCl3 {D:\data} zjf 8
F1 [ppm]
F2 [ppm]
8
6
4
2
0
2
4
6
8



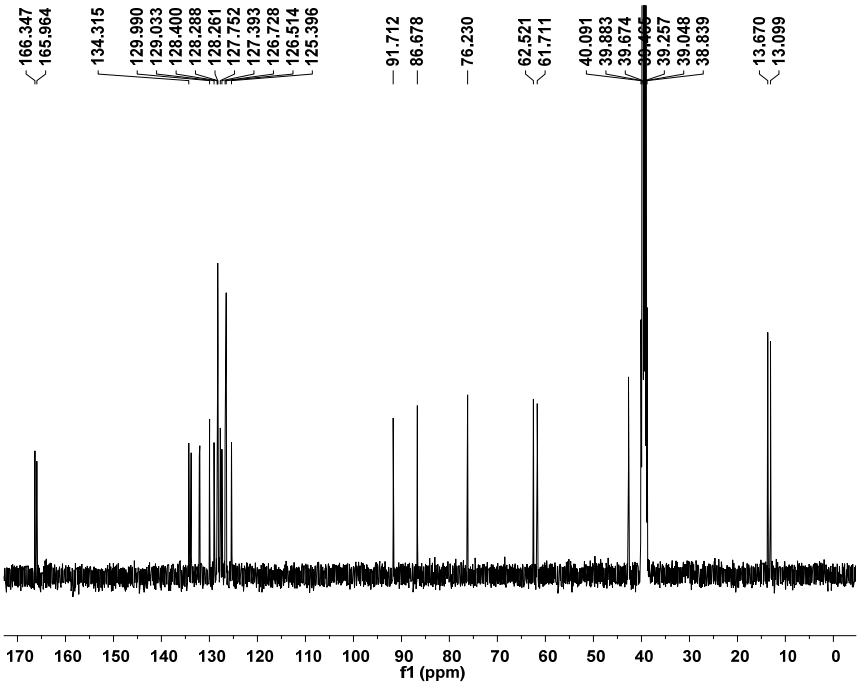


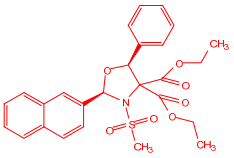

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-02-03T00:08:14
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 293.9 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 95.35
Ph1: 18.03



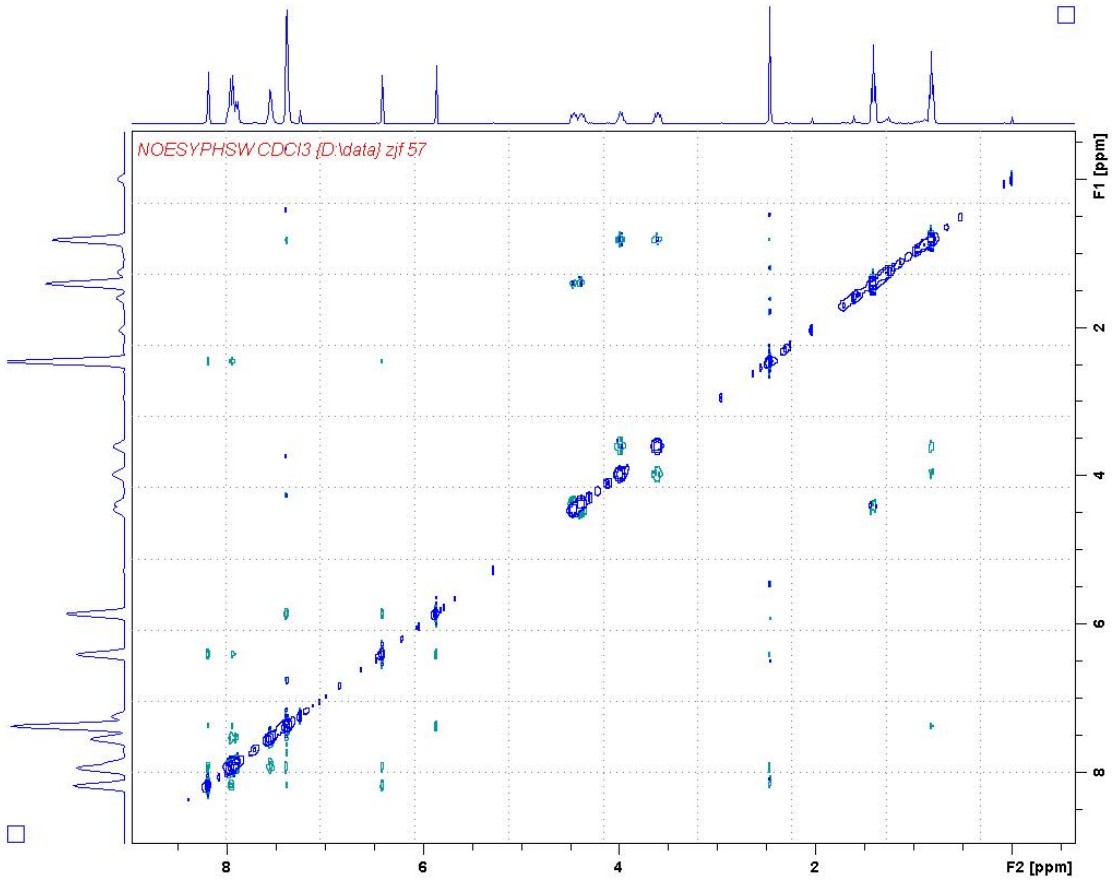



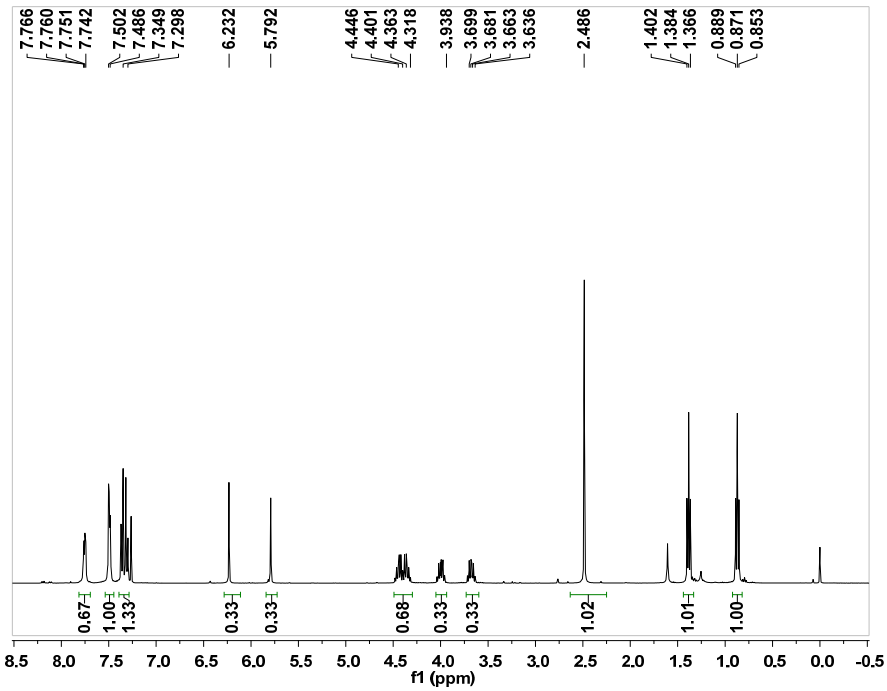
Current Data Parameters

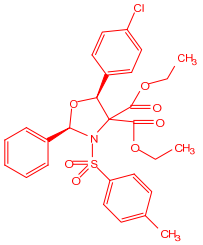
F2 - Acquisition Parameters
DATE: 2015-05-31T04:19:54
PULPROG: zgpg30
TD: 32768
Solvent: DMSO
NS: 256
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296.1 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -64.21
Ph1: 65.76


NOESYPHSW CDCl3 {D:\data} zjf 57
F1 [ppm]
F2 [ppm]
2
4
6
8



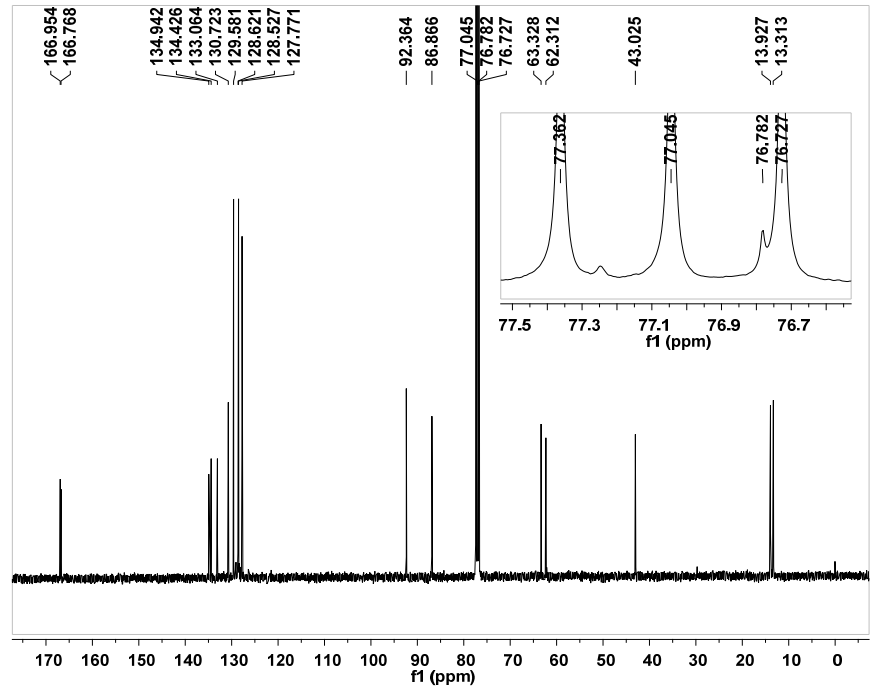



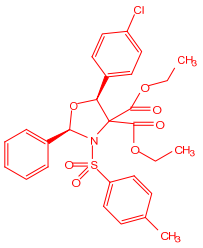

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-03-30T11:12:10
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 294.6 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 98.45
Ph1: 16.28



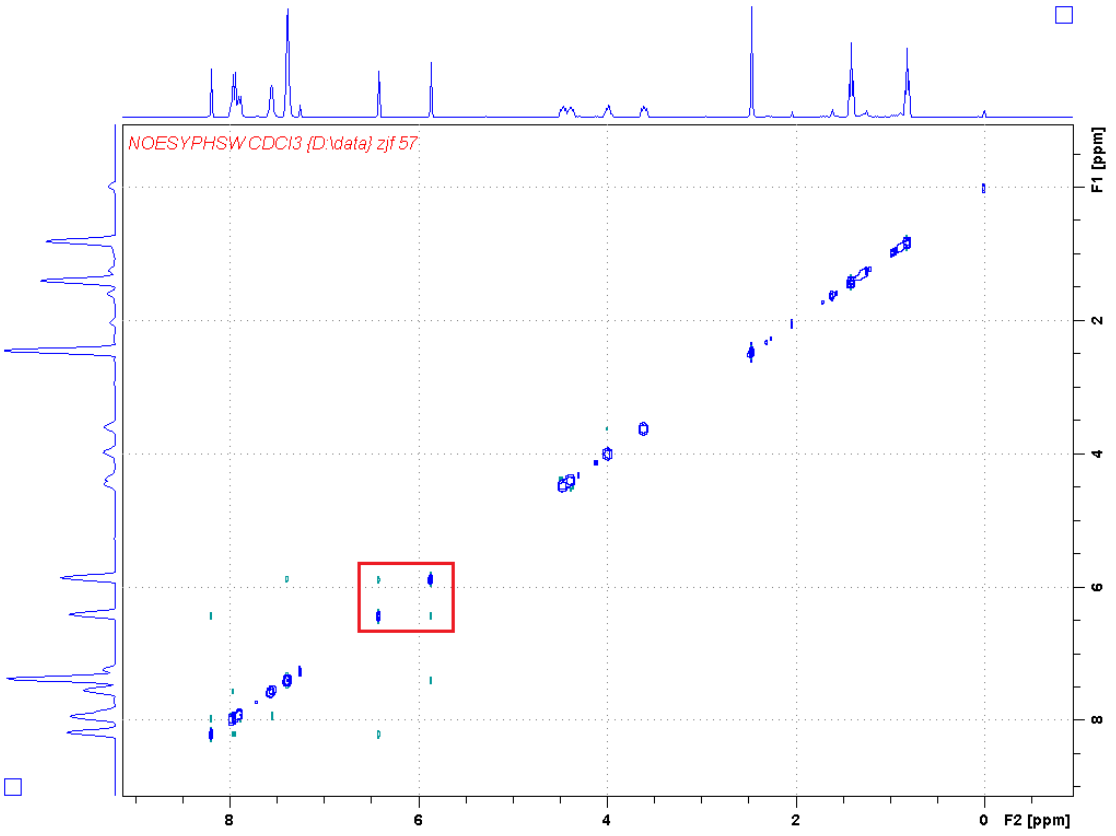



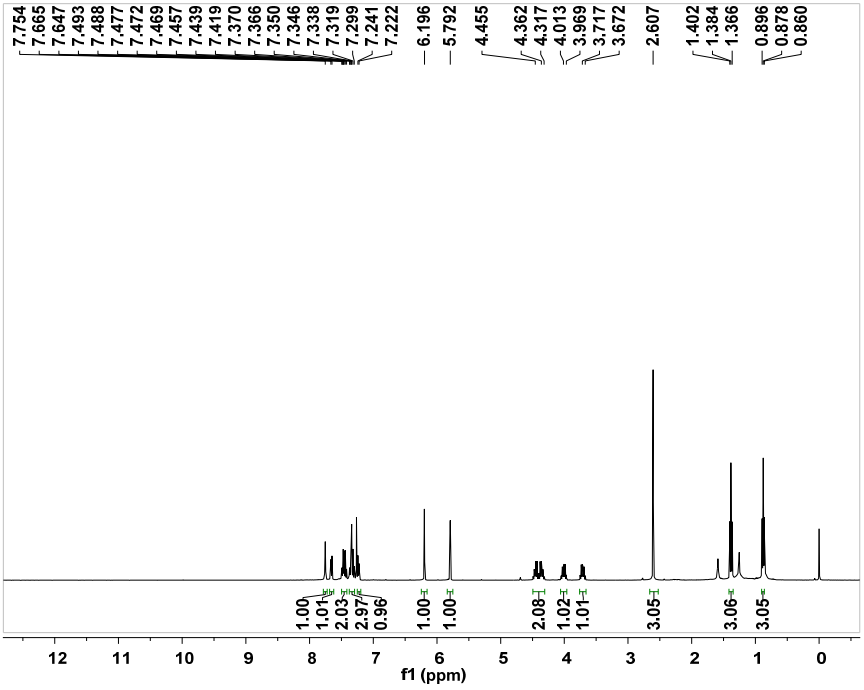

Current Data Parameters

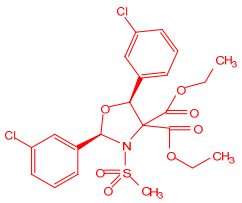
F2 - Acquisition Parameters
DATE: 2015-03-30T13:02:57
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.1 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -66.63
Ph1: 56.62


NOESYPHSW CDCl3 {D:\data} zjf 57
F1 [ppm]
2
4
6
8
8
6
4
2
0
F2 [ppm]



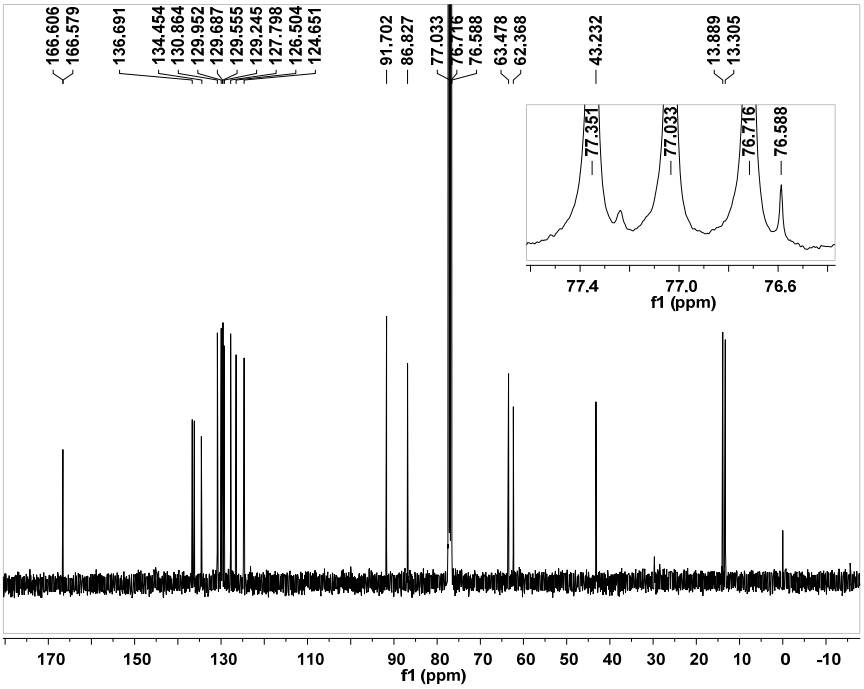



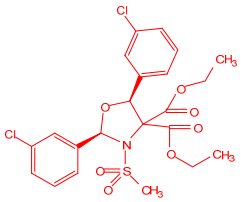

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-05T18:08:30
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.3 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
PhO: -262.23
Ph1: 10.12



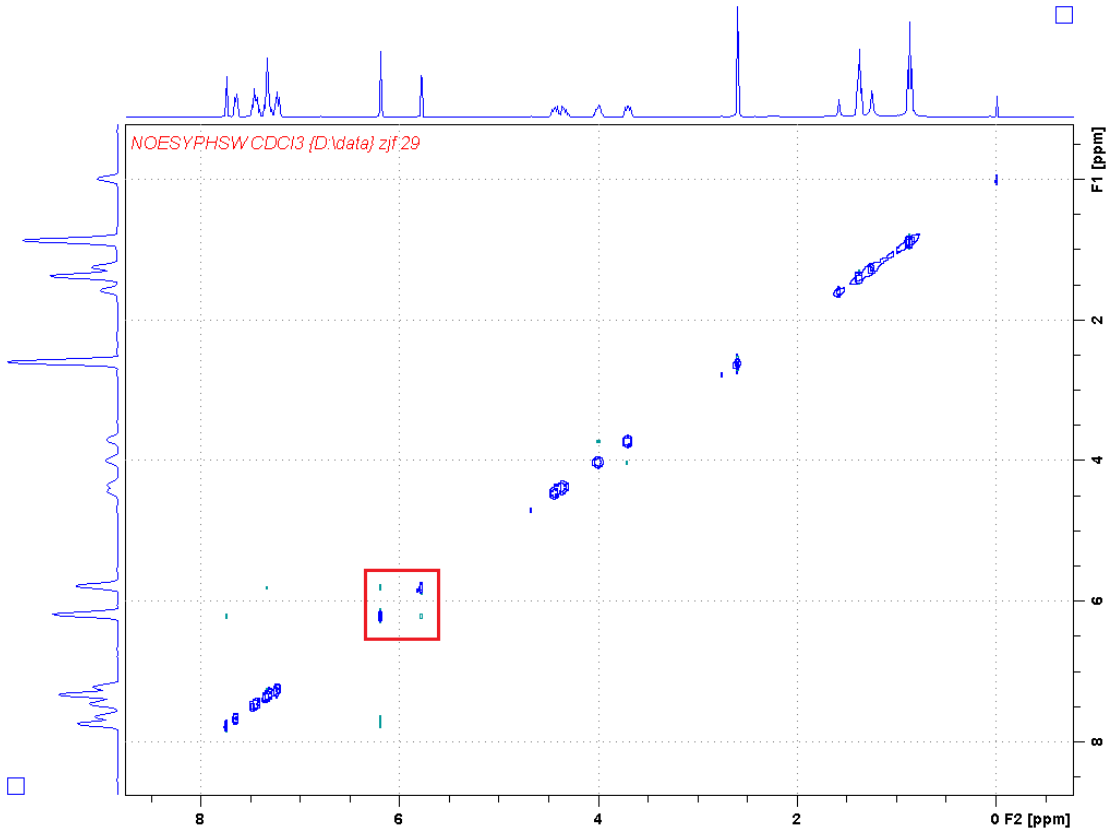



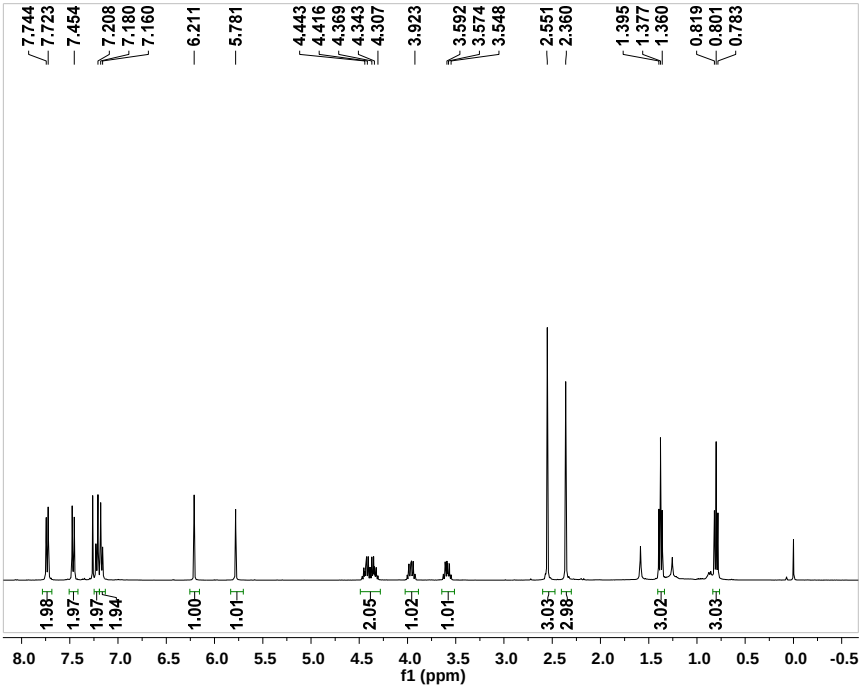

Current Data Parameters

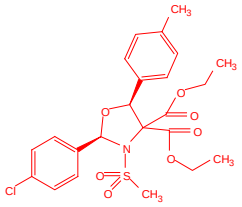
F2 - Acquisition Parameters
DATE: 2015-05-05T20:04:12
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.6 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
PhO: -48.29
Ph1: 46.88


NOESYPHSW CDCl3 {D:\data} zjf 29
F1 [ppm]
2
4
6
8
8
6
4
2
0 F2 [ppm]



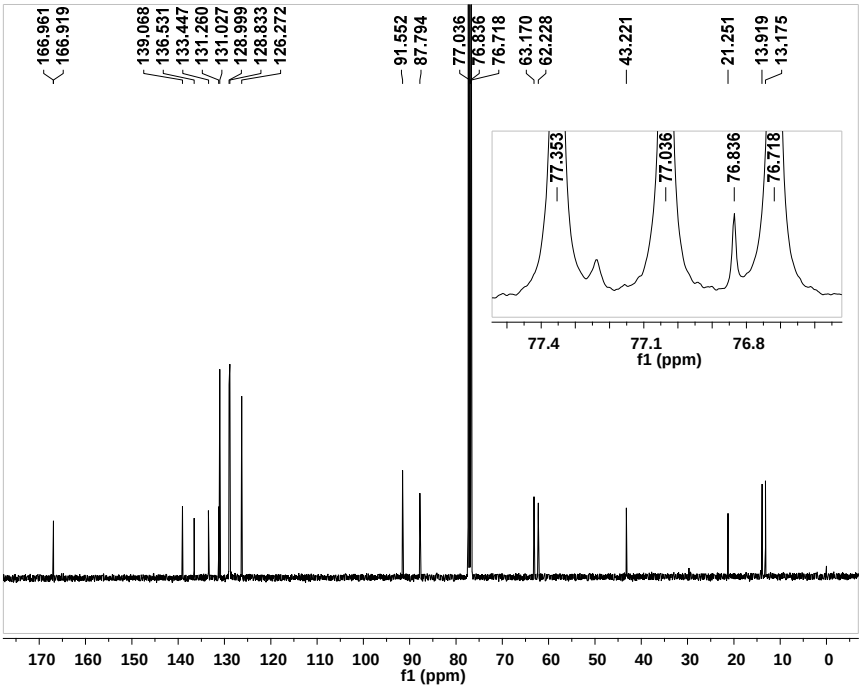



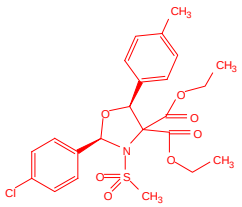
**Current Data Parameters**

**F2 - Acquisition Parameters**
**DATE:** 2015-05-01T10:36:09
**PULPROG:** zg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 32
**DS:** undefined
**SWH:** 8223.7 Hz
**AQ:** undefined
**TE:** 295.3 C

**======== CHANNEL f1 ========**
**NUC1:** 1H
**P1:** 9.93 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 0.30 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** 91.87
**Ph1:** 17.59



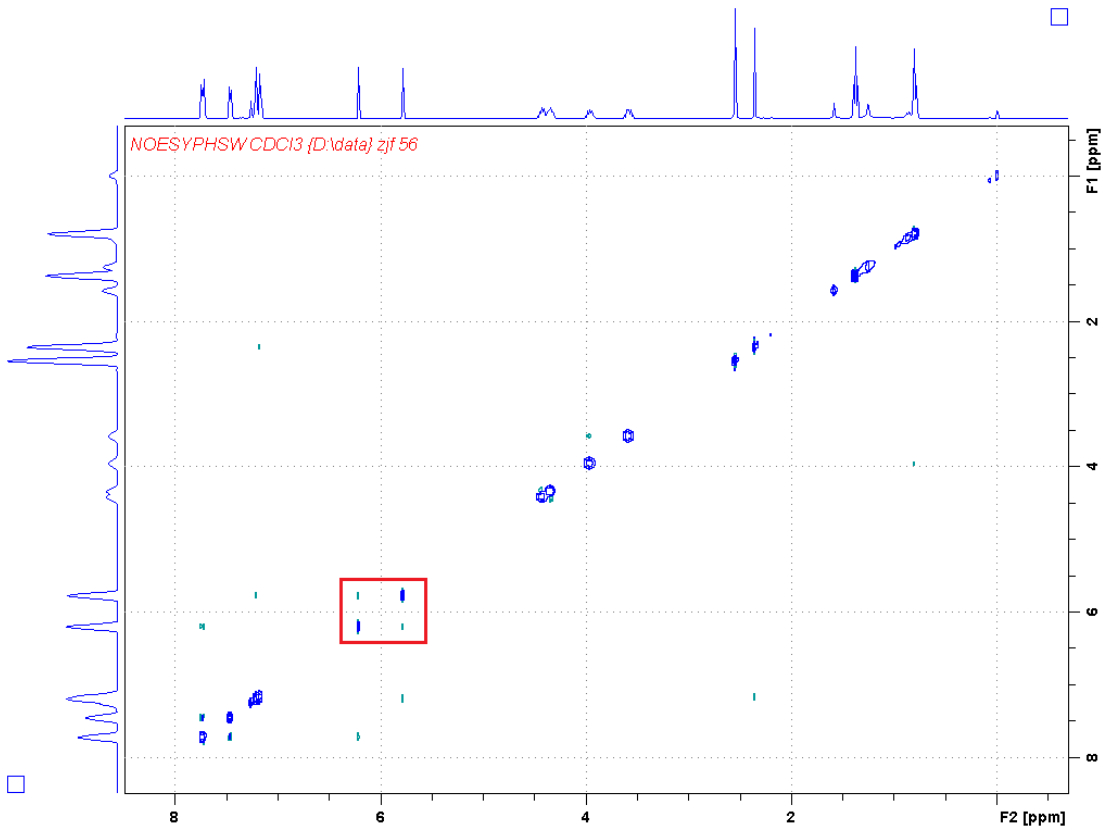



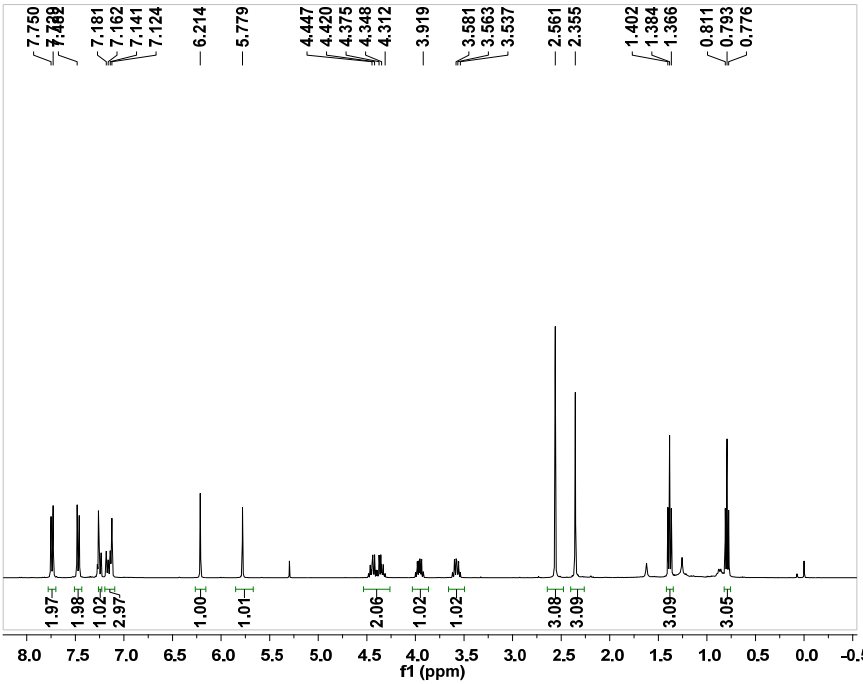
**Current Data Parameters**

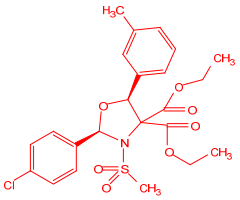
**F2 - Acquisition Parameters**
**DATE:** 2015-05-01T20:38:38
**PULPROG:** zgpg30
**TD:** 32768
**Solvent:** CDCl3
**NS:** 1024
**DS:** undefined
**SWH:** 24038.5 Hz
**AQ:** undefined
**TE:** 295.6 C

**======== CHANNEL f1 ========**
**NUC1:** 13C
**P1:** 9.63 usec
**SFO1:** undefined MHz

**F2 - Processing Parameters**
**SI:** 65536
**DC:** 0.05
**LB:** 1.00 Hz
**First Point:** 0.50
**FT:** Hyper Quadrature
**Phase:** Manual
**Ph0:** -61.33
**Ph1:** 53.29


NOESYPHSW CDCl3 {D:\data} zjf 56
F1 [ppm]
F2 [ppm]
2
4
6
8
2
4
6
8



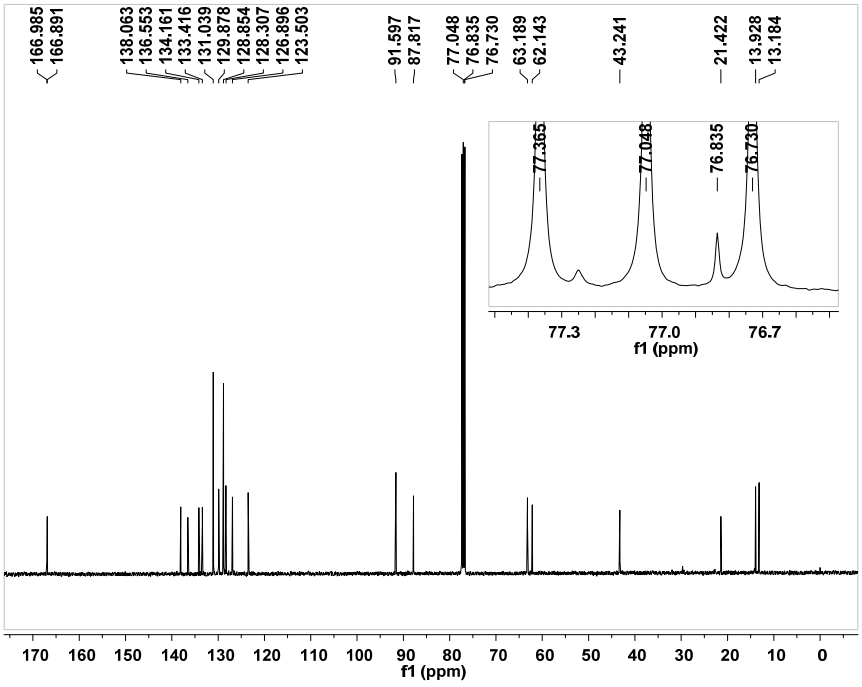



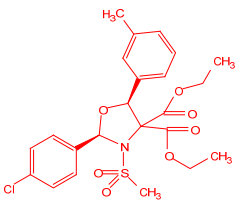
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-04T14:16:05
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.1 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.44
Ph1: 18.50



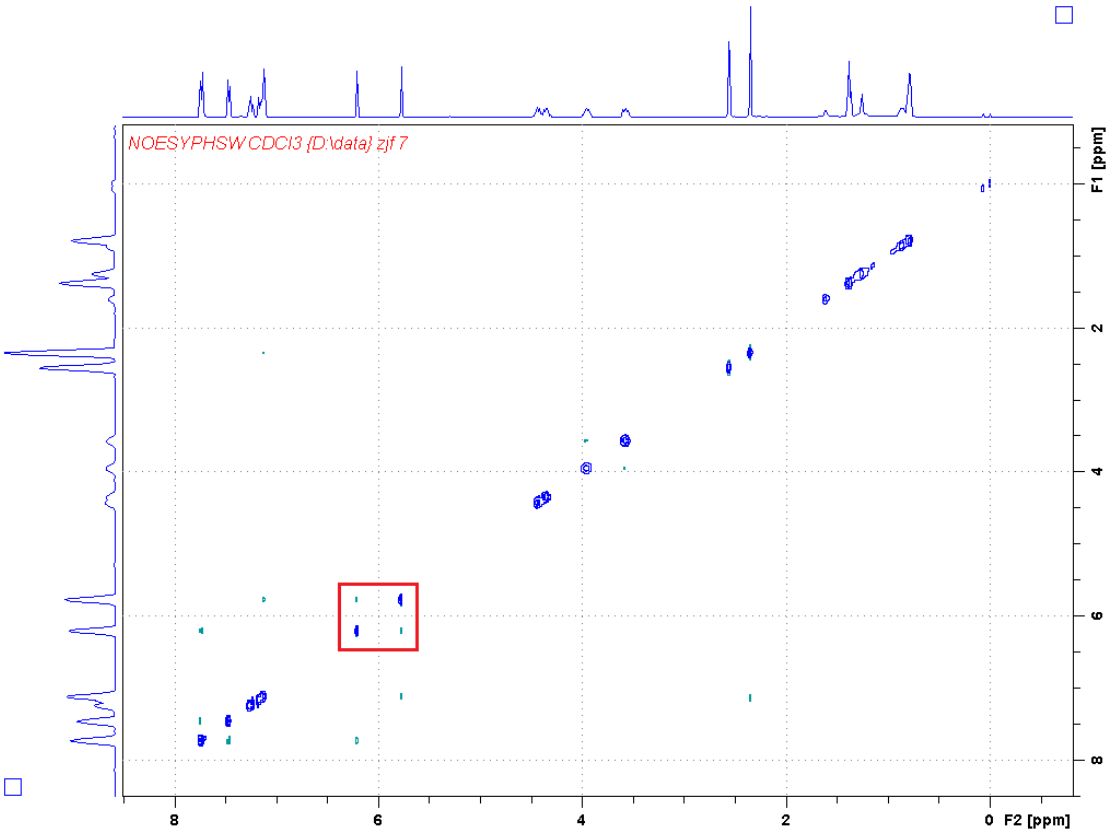



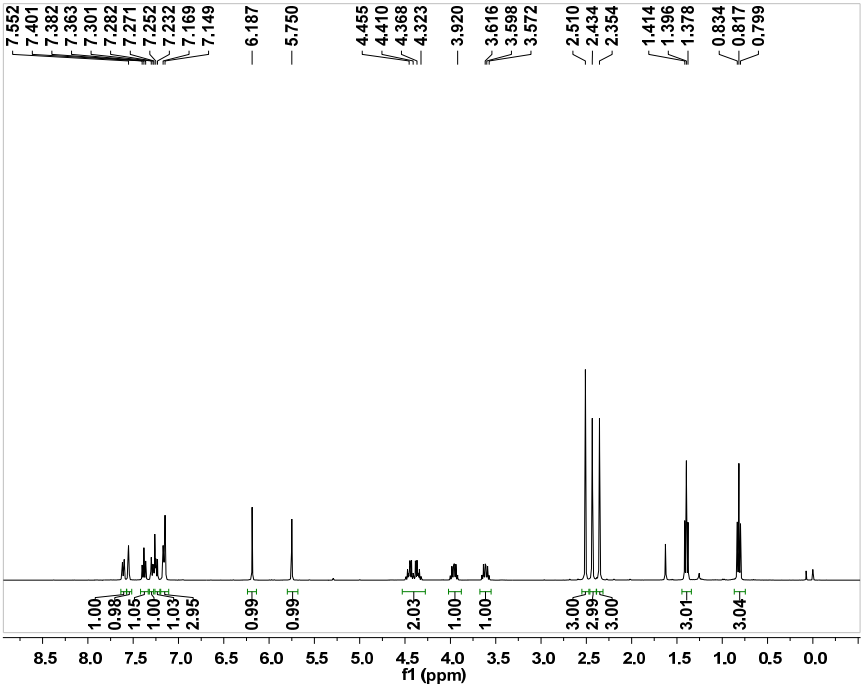
Current Data Parameters

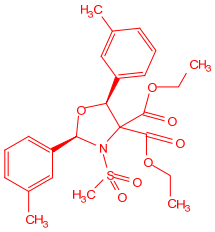
F2 - Acquisition Parameters
DATE: 2015-05-04T15:15:31
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.4 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -74.55
Ph1: 78.89


NOESYPHSW CDCl3 {D:\data} zjf 7
F1 [ppm]
F2 [ppm]
0
2
4
6
8



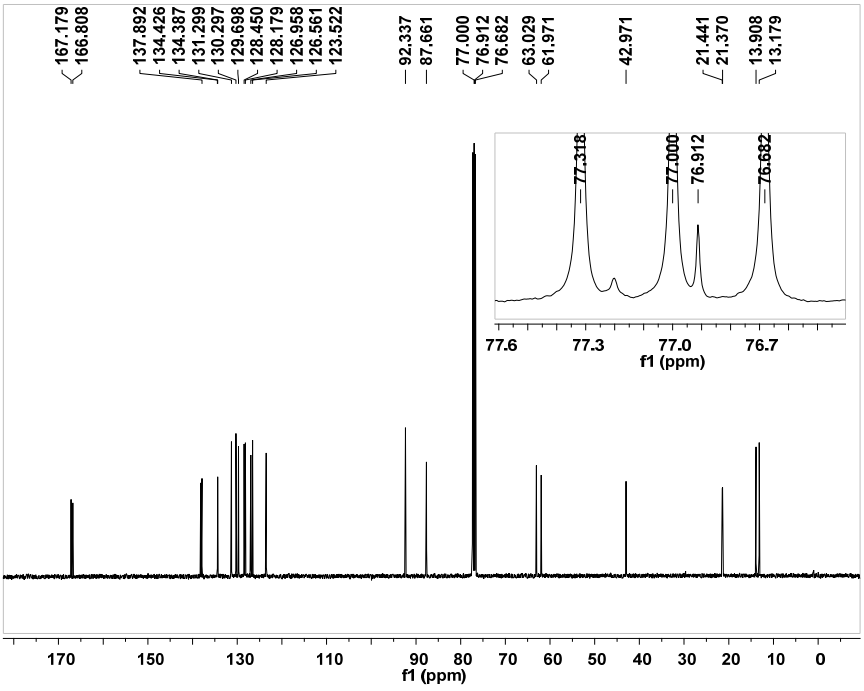



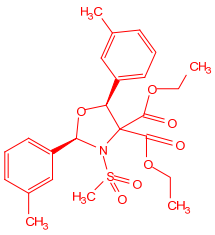
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-06-06T19:34:47
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.4 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 93.89
Ph1: 19.48



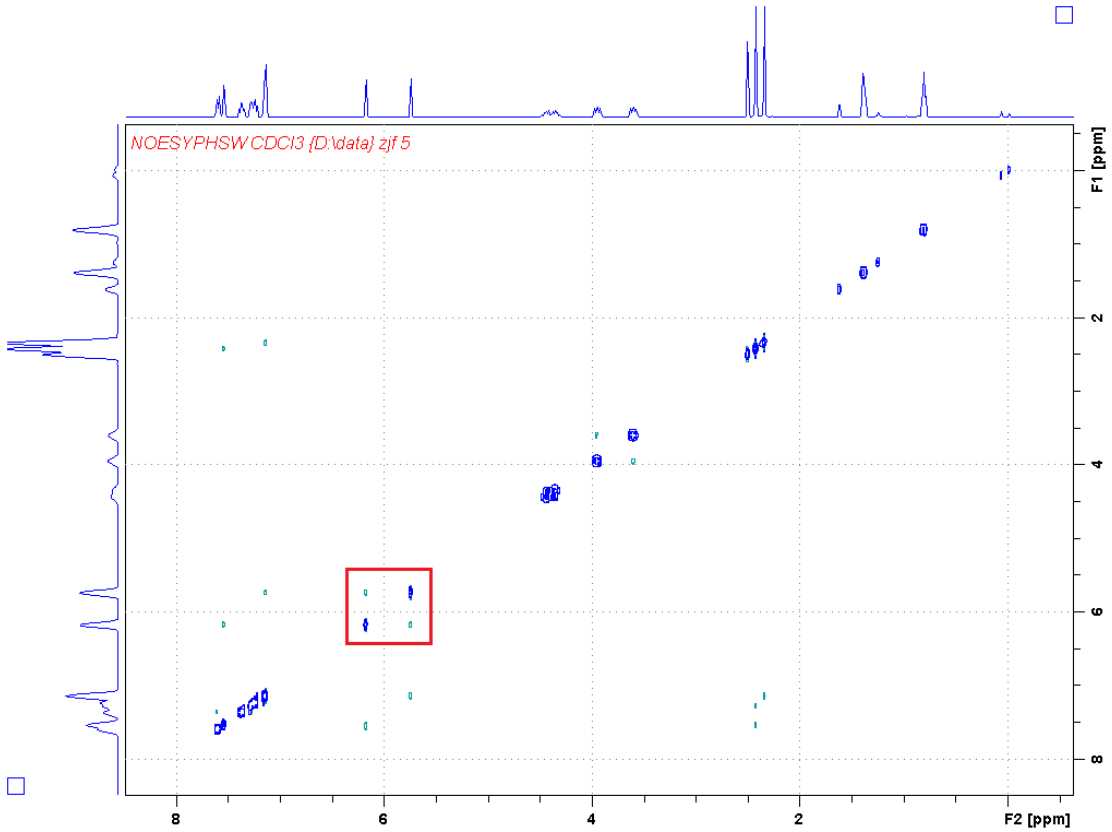



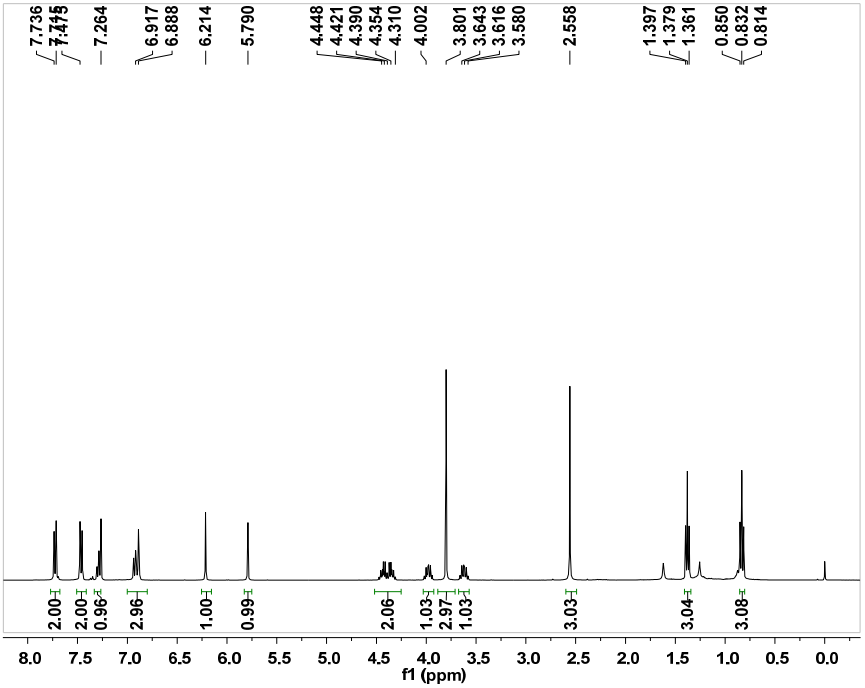
Current Data Parameters

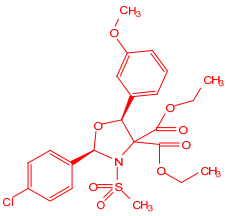
F2 - Acquisition Parameters
DATE: 2015-06-06T21:30:28
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.7 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point : 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -71.88
Ph1: 64.78


NOESYPHSW CDCl3 {D:\data} zjf 5
F1 [ppm]
2
4
6
8
8
6
4
2
F2 [ppm]



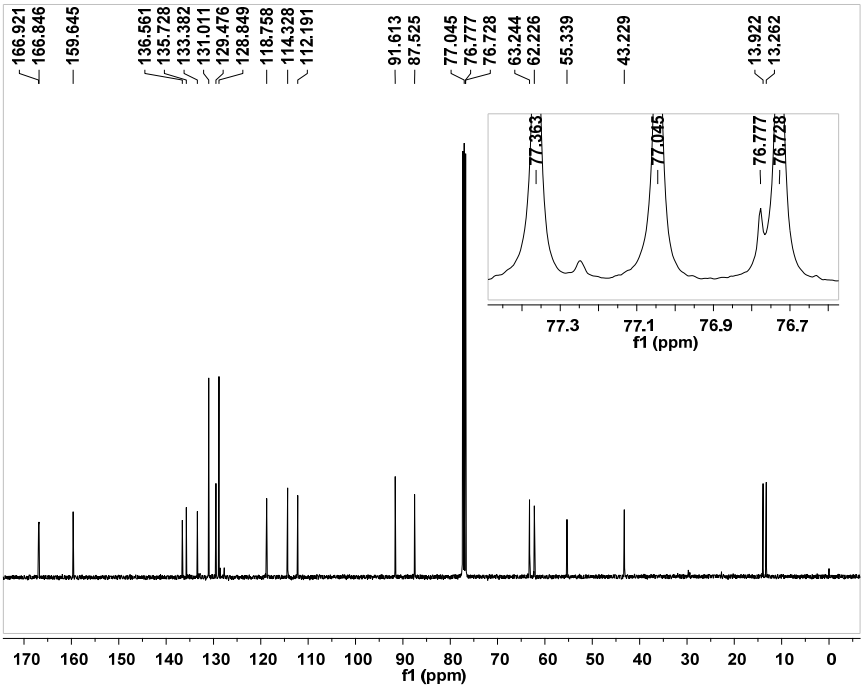



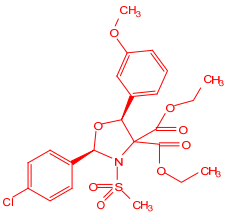
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-08T02:11:56
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 32
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.5 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.52
Ph1: 14.14



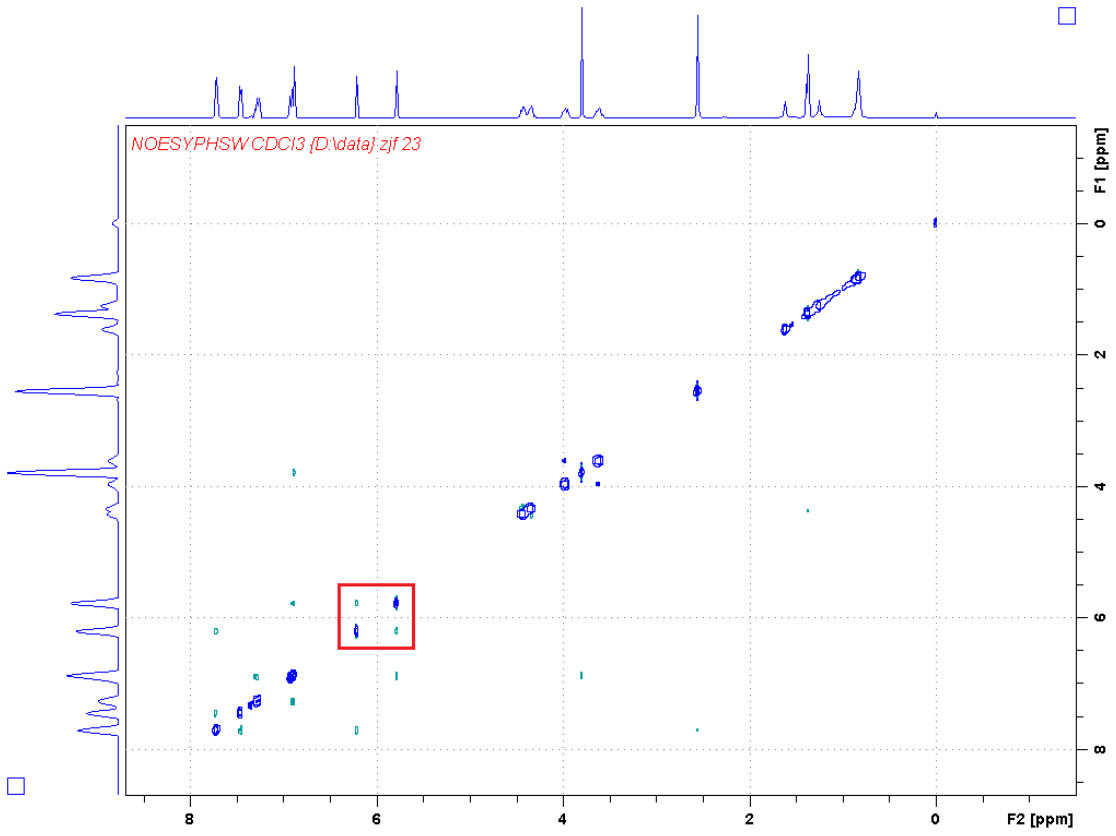



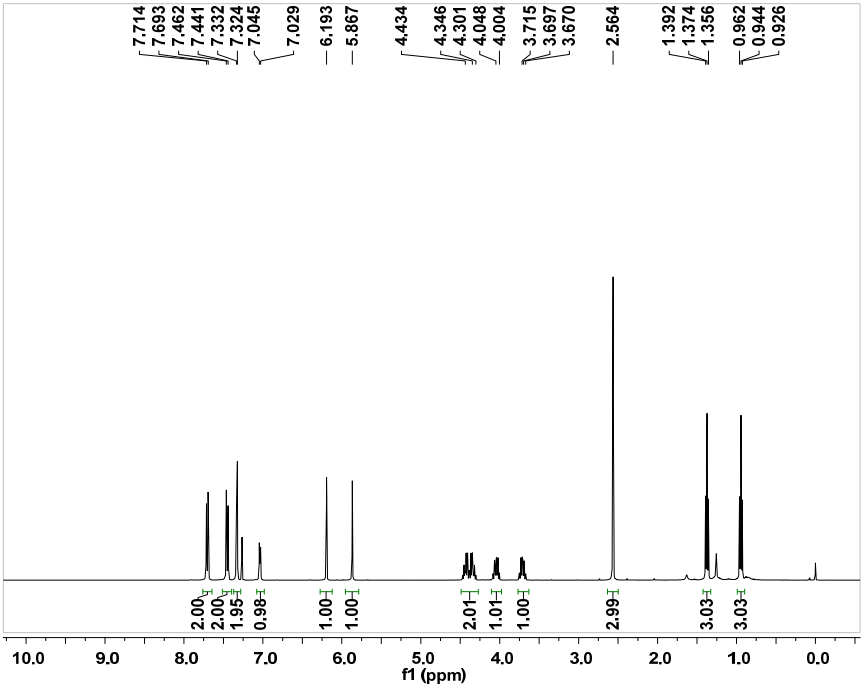
Current Data Parameters

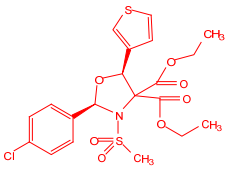
F2 - Acquisition Parameters
DATE: 2015-05-08T04:04:12
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.9 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -59.43
Ph1: 59.25


NOESYPHSW CDCl3 {D:\data} zjf 23
F1 [ppm]
F2 [ppm]
0
2
4
6
8



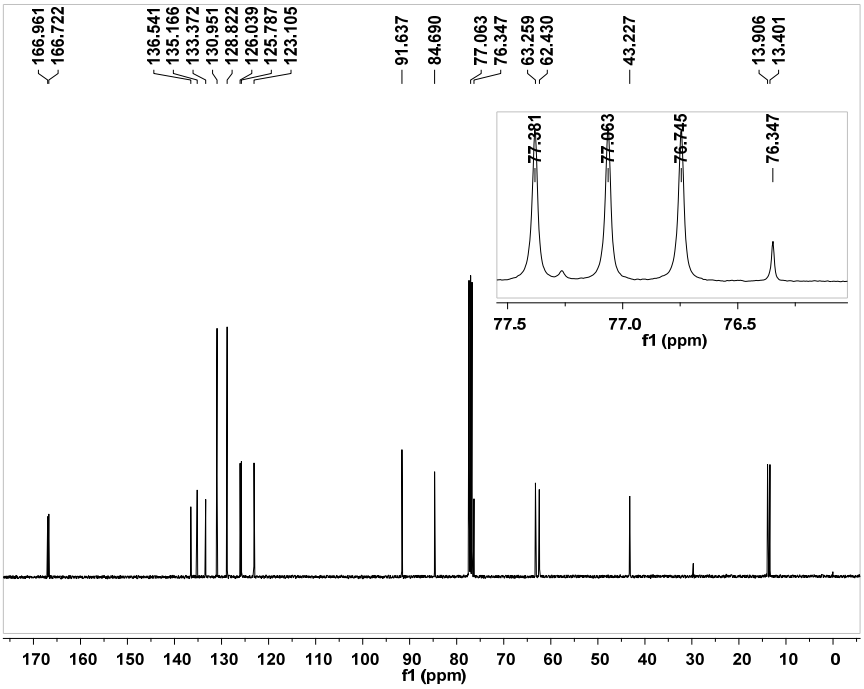



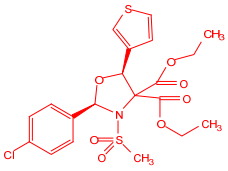

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-13T12:40:00
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.6 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 95.23
Ph1: 17.70



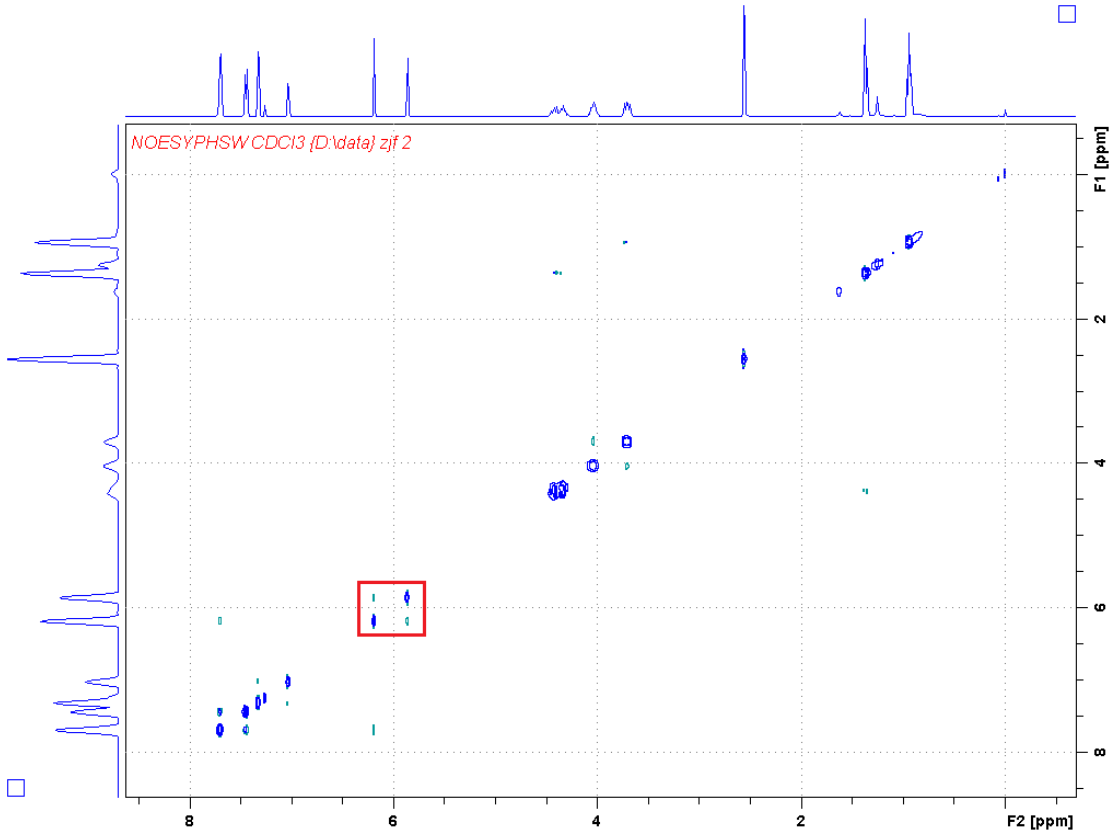



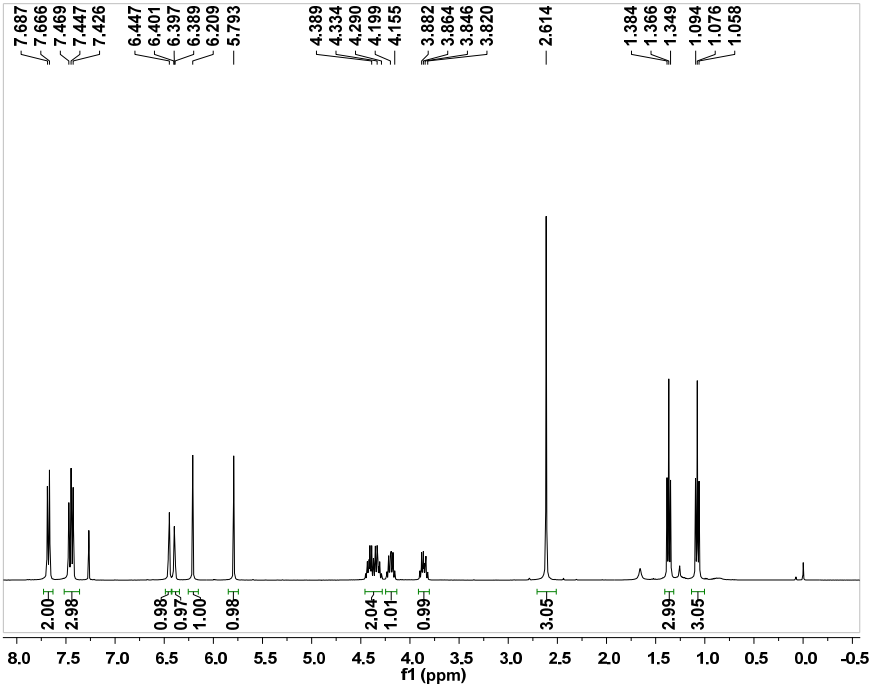

Current Data Parameters

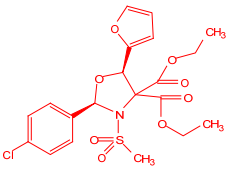
F2 - Acquisition Parameters
DATE: 2015-05-13T14:35:41
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 295.8 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -63.85
Ph1: 64.31


NOESYPHSW CDCl3 {D:\data} zjf 2
F1 [ppm]
F2 [ppm]
2
4
6
8
8
6
4
2



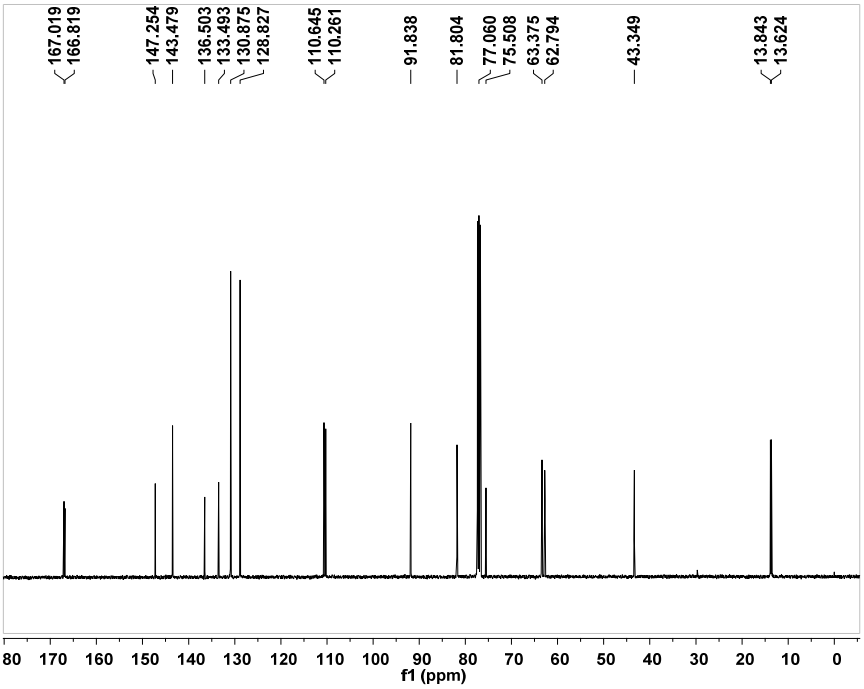



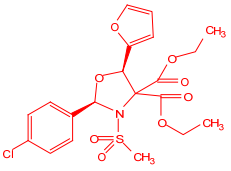
Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-15T15:36:25
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.7 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
PhO: -264.42
Ph1: 17.22



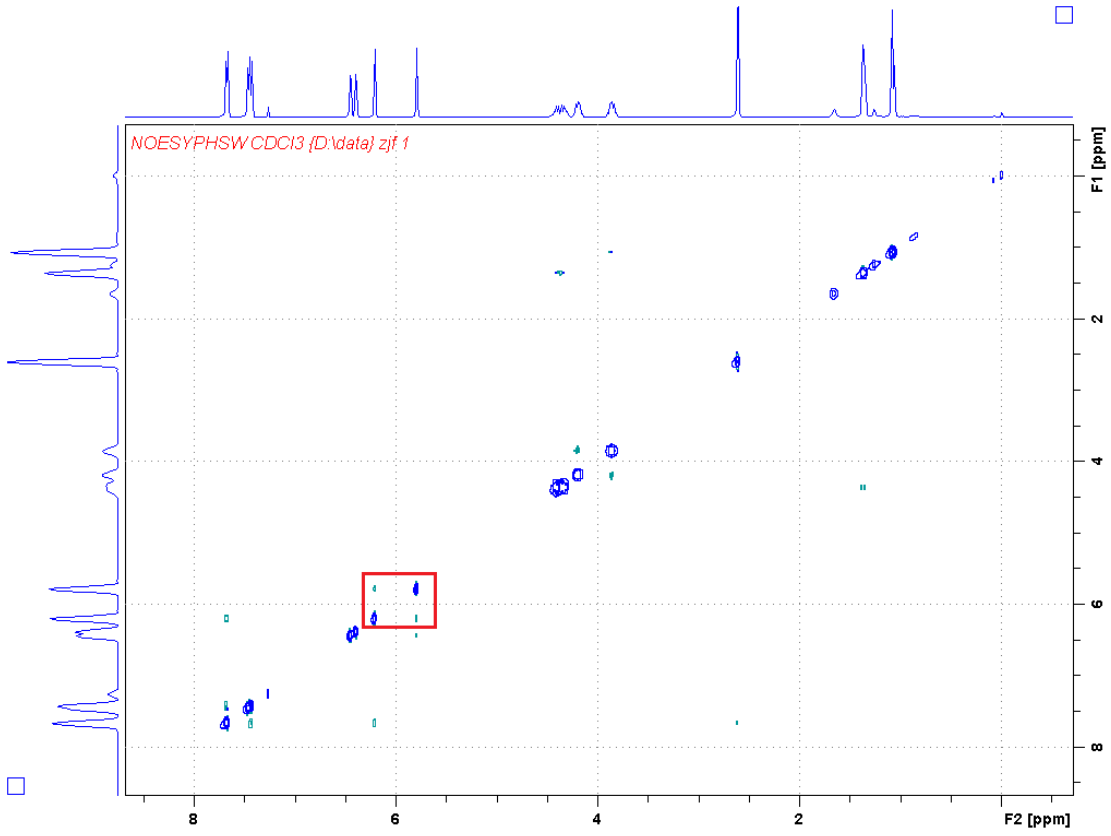



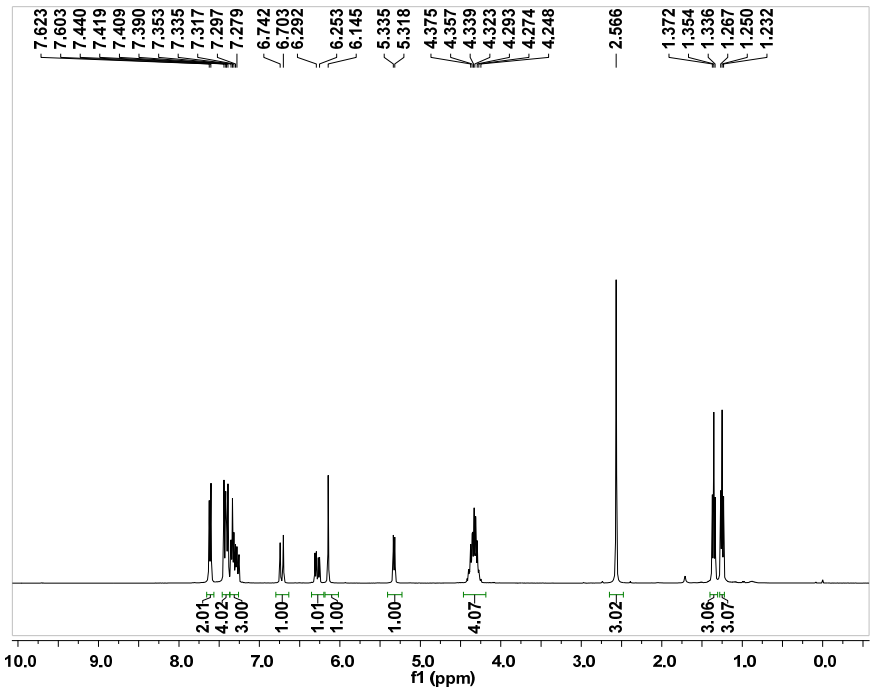
Current Data Parameters

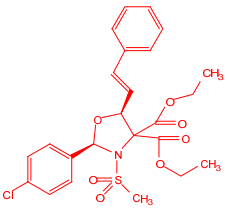
F2 - Acquisition Parameters
DATE: 2015-05-15T17:32:09
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296.4 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
PhO: -66.30
Ph1: 59.71


NOESYPHSW CDCl3 {D:\data} zjf 1
F1 [ppm]
F2 [ppm]
2
4
6
8
8
6
4
2



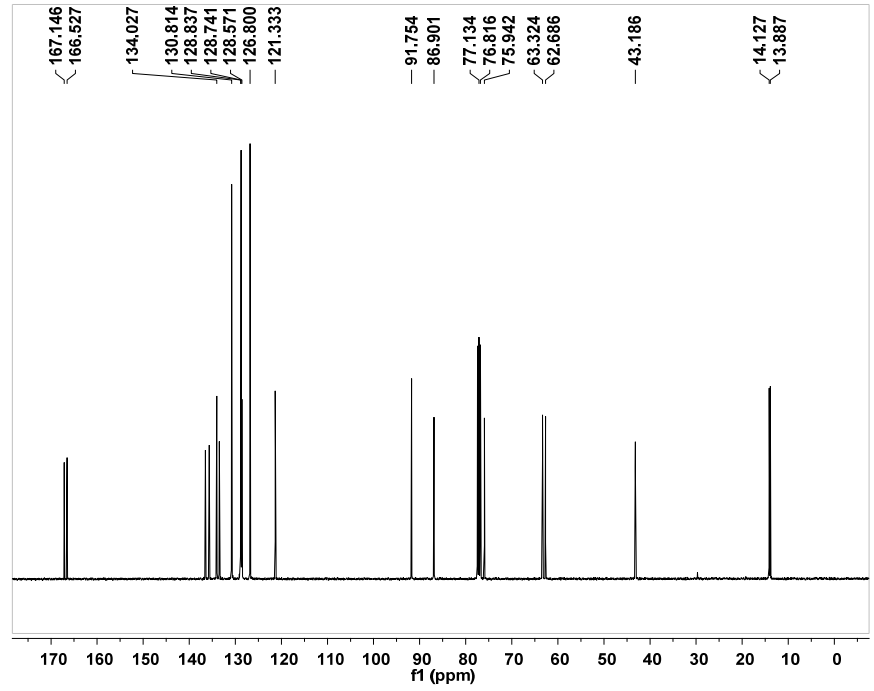



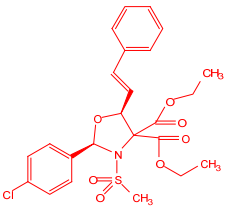

Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-09T16:46:55
PULPROG: zg30
TD: 32768
Solvent: CDCl3
NS: 16
DS: undefined
SWH: 8223.7 Hz
AQ: undefined
TE: 295.9 C

======== CHANNEL f1 ========
NUC1: 1H
P1: 9.93 usec
SFO1: undefined MHz

F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 0.30 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: 94.52
Ph1: 18.71



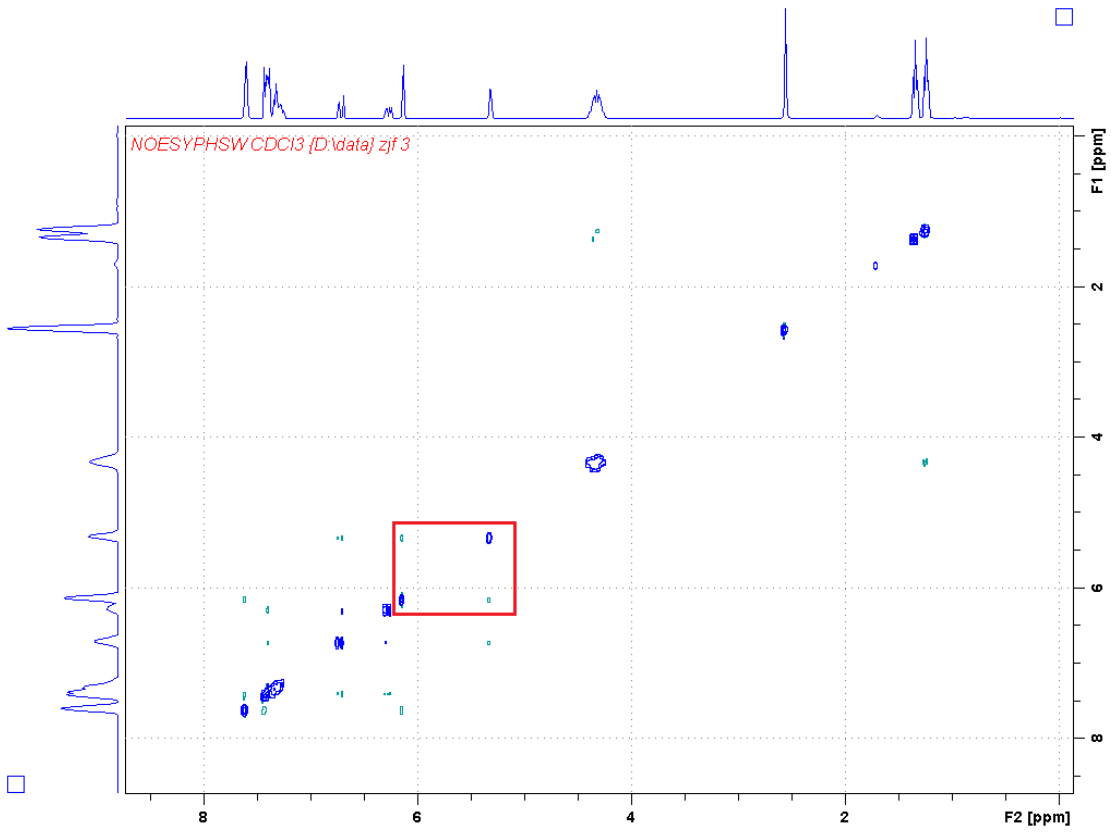




Current Data Parameters

F2 - Acquisition Parameters
DATE: 2015-05-09T18:42:31
PULPROG: zgpg30
TD: 32768
Solvent: CDCl3
NS: 1024
DS: undefined
SWH: 24038.5 Hz
AQ: undefined
TE: 296.3 C

======== CHANNEL f1 ========
NUC1: 13C
P1: 9.63 usec
SFO1: undefined MHz

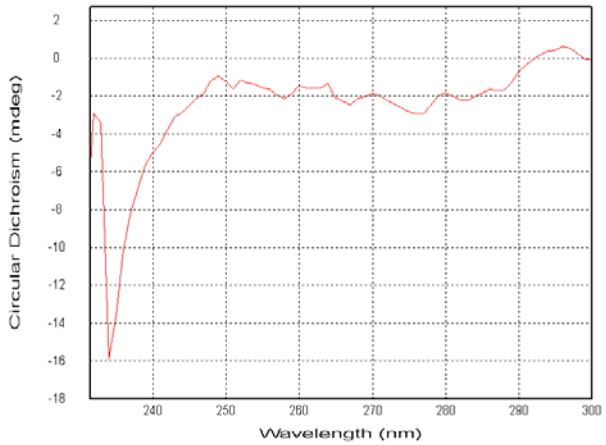
F2 - Processing Parameters
SI: 65536
DC: 0.05
LB: 1.00 Hz
First Point: 0.50
FT: Hyper Quadrature
Phase: Manual
Ph0: -60.68
Ph1: 62.33


NOESYPHSW CDCl3 {D:\data} zjf 3
F1 [ppm]
F2 [ppm]
2
4
6
8
8
6
4
2

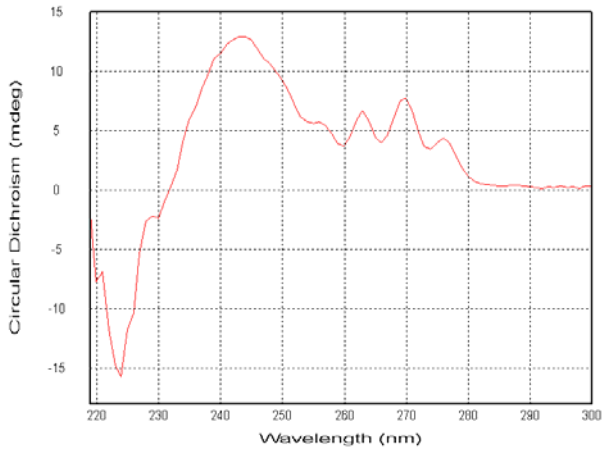
## (O) Copies of CD Spectra

a. CD Spectra for the cycloadducts in $CH_2Cl_2$, (*2R*, *5S*)-**3sa** is an authentic sample.

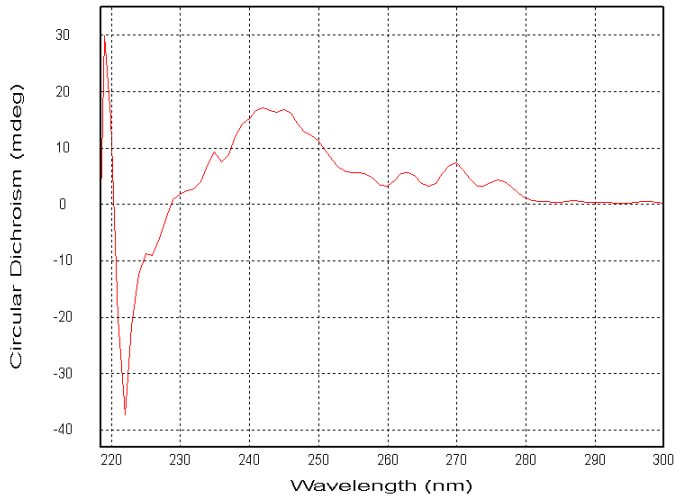
(*2R*, *5S*)-**3sa**:



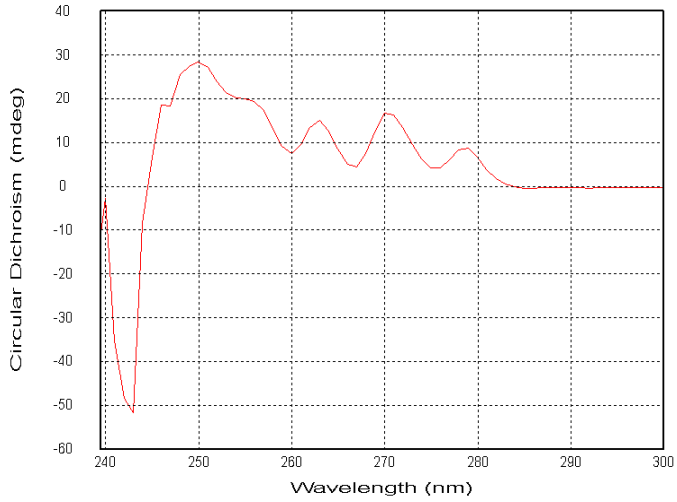

(*2R*, *5S*)-**3ba**:



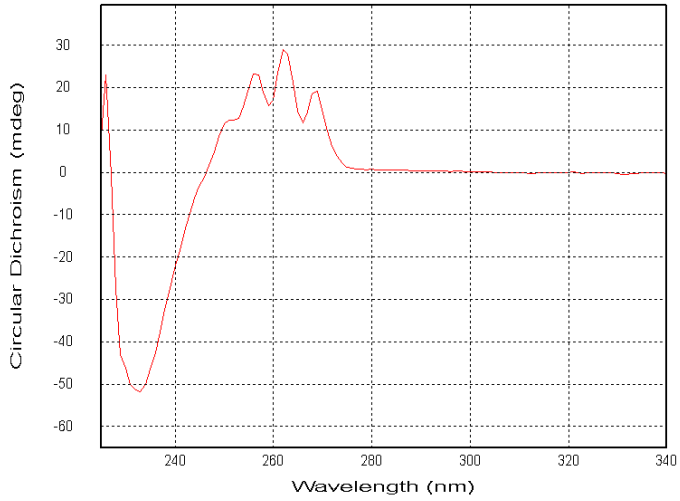

(*2R*, *5S*)-**3ca**:



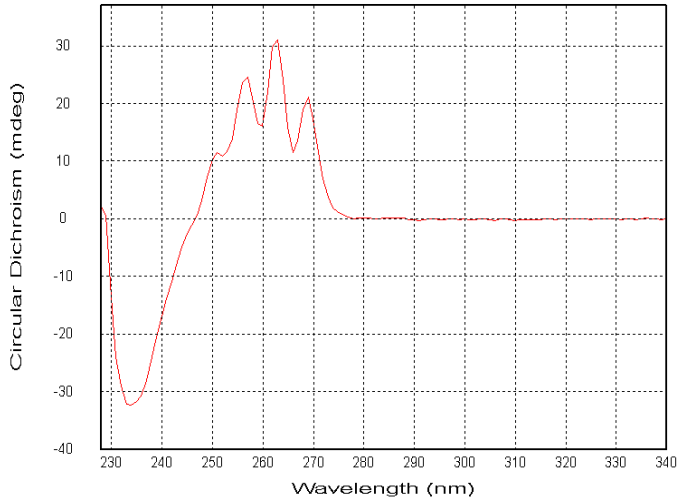
(*2R*, *5S*)-**3da**:



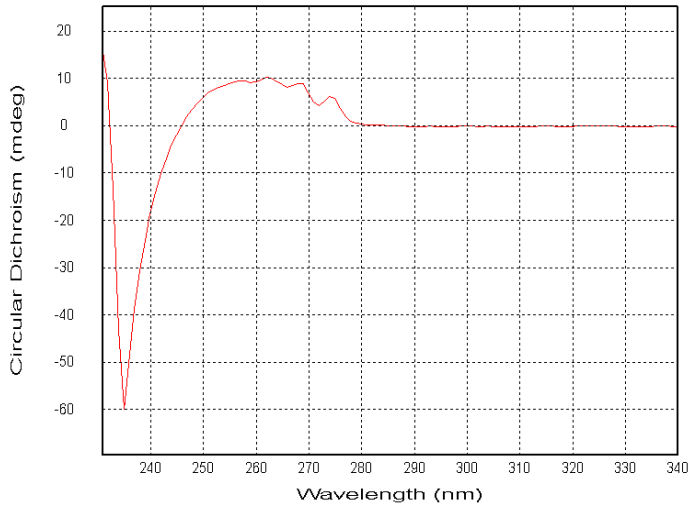

(*2R*, *5S*)-**3ia**:



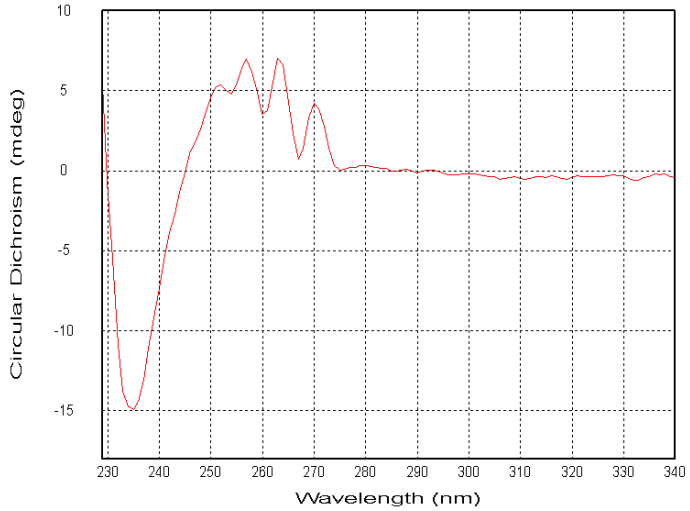

(*2R*, *5S*)-**3ja**:



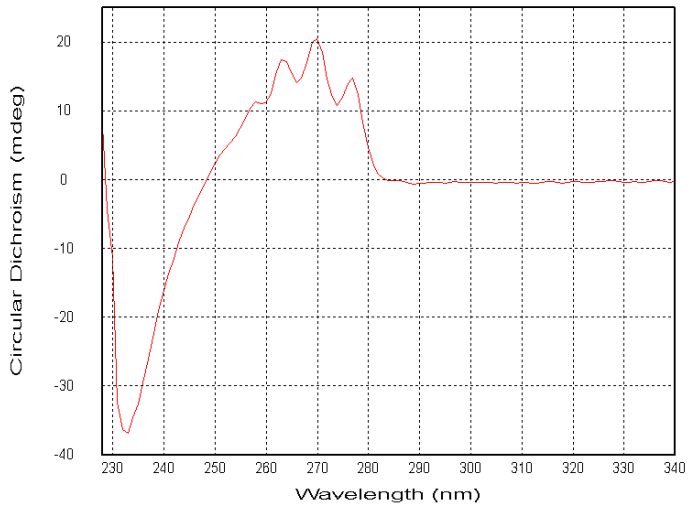
(*2R*, *5S*)-**3ka**:



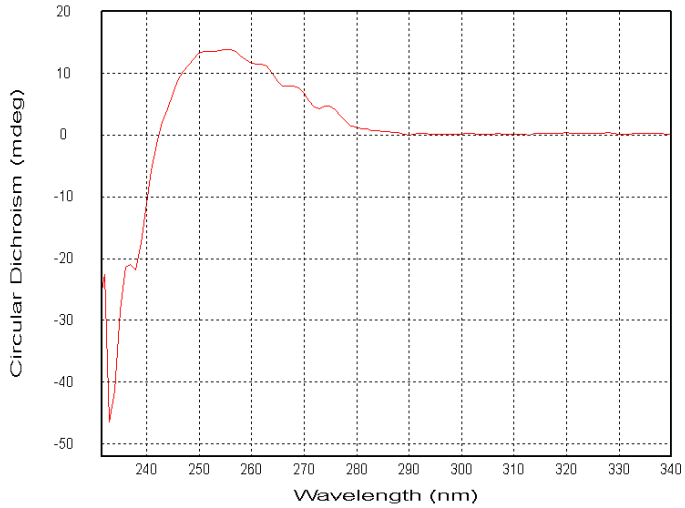

(*2R*, *5S*)-**3la**:



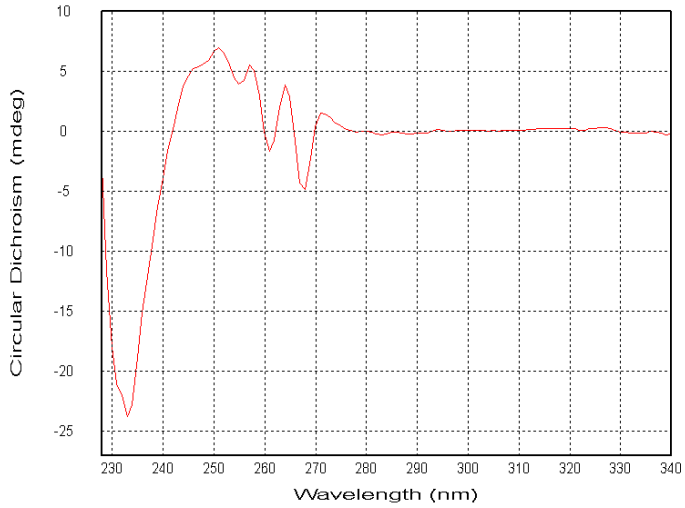

(*2R*, *5S*)-**3ma**:



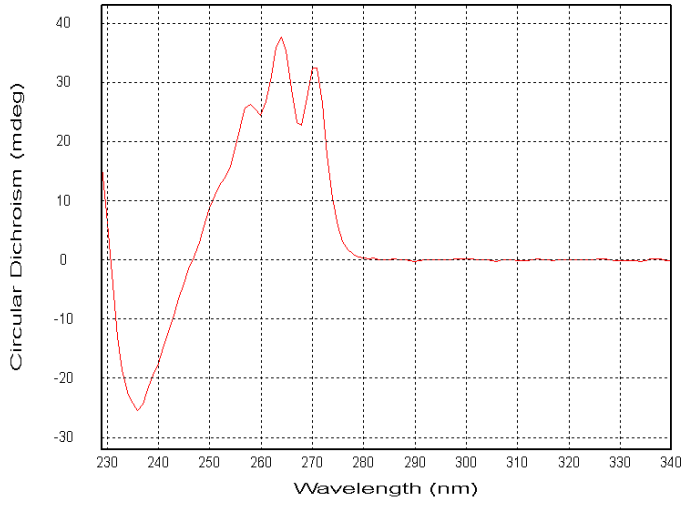
(*2R*, *5S*)-**3na**:




(*2R*, *5S*)-**3oa**:




(*2R*, *5S*)-**3pa**:



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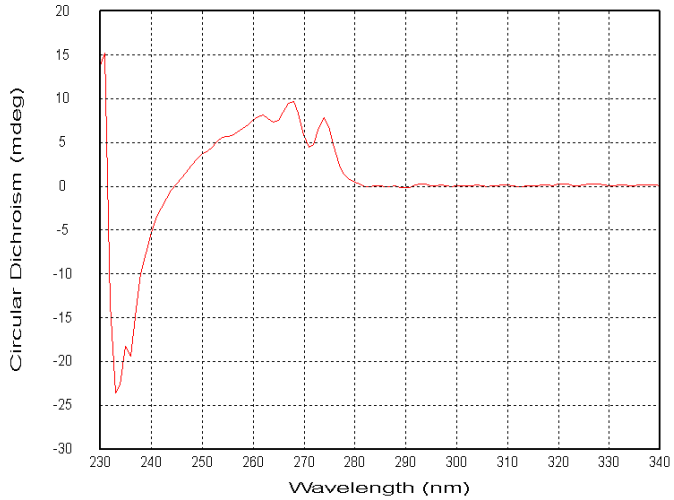


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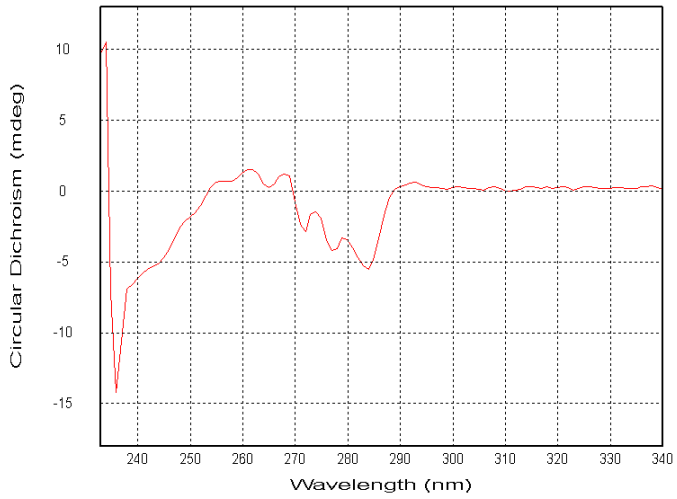
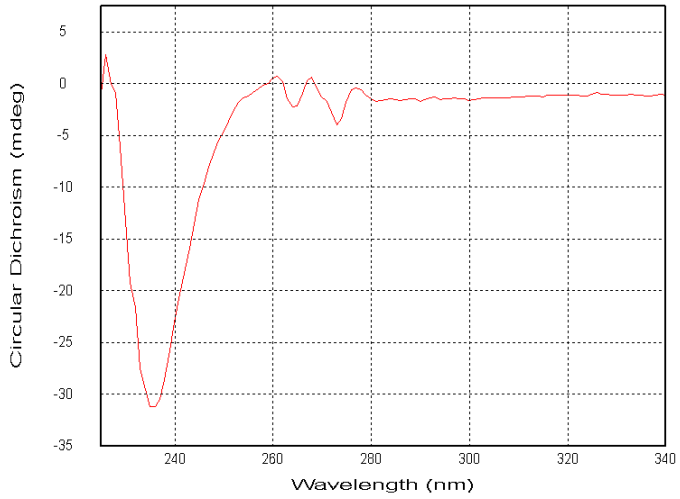



(*2R*, *5S*)-**3te**:



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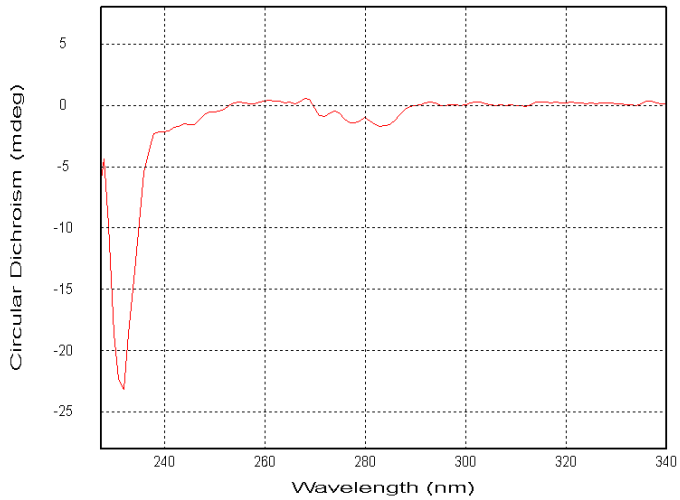


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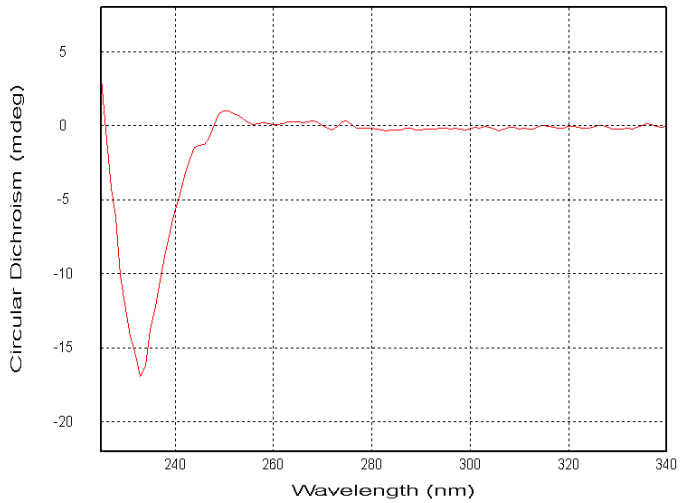


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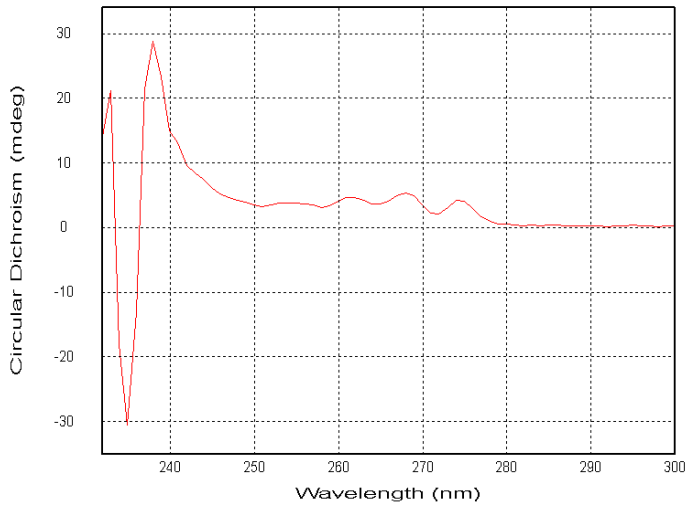
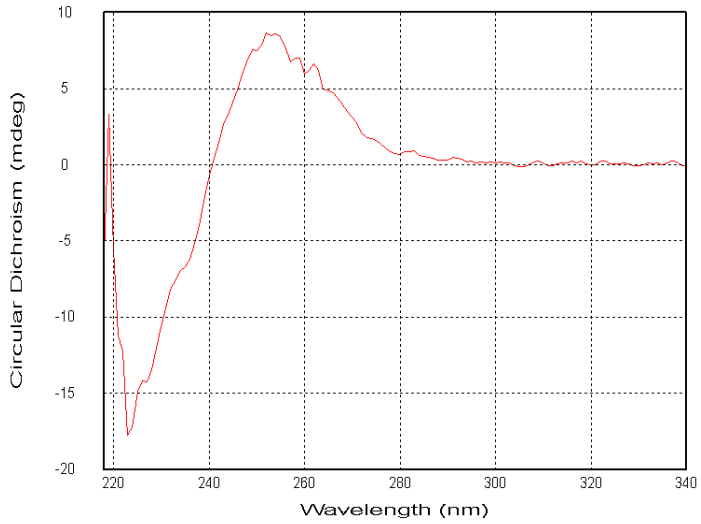


(*2R*, *5S*)-**3ki**:


10
5
0
-5
-10
-15
-20
220
240
260
280
300
320
340
Circular Dichroism (mdeg)
Wavelength (nm)