Stereoconvergent Arylations and Alkenylations of Unactivated Alkyl Electrophiles: The Catalytic Enantioselective Synthesis of Secondary Sulfonamides and Sulfones

Junwon Choi, Pablo Martín-Gago, and Gregory C. Fu*

Division of Chemistry and Chemical Engineering, California Institute of Technology
Pasadena, California 91125

Supporting Information

Table of Contents

I. General Information

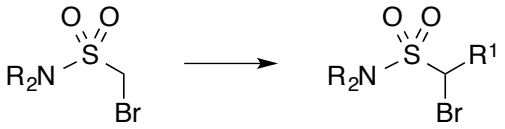
The following reagents were purchased and used as received: $NiCl_2$•glyme (Strem), ZnI_2 (Strem), and Cp_2ZrHCl (Strem). Ligands **L1** (available from Aldrich) and **L6** were prepared according to a literature procedure.[1] Grignard reagents were prepared from aryl bromides and magnesium turnings (Strem) or from aryl iodides and *i*-PrMgCl (Aldrich; 2.0 M in THF); on occasion, we have found purchased Grignard reagents to be less suitable. THF was deoxygenated and dried by sparging with argon followed by passage through an activated alumina column (S. G. Water) prior to use. All reactions were carried out in oven-dried glassware under an inert atmosphere.

^{1}H NMR data and ^{13}C NMR data were collected on a VARIAN 500 MHz spectrometer at ambient temperature. HPLC analyses were carried out on an Agilent 1100 series system with Daicel CHIRALPAK® columns or Daicel CHIRALCEL® columns (internal diameter 4.6 mm, column length 250 mm, particle size 5 μm or 3 μm). GC analyses were carried out on an Agilent 6890 series system with an HP-5 column (length 30 m, I.D. 0.25 mm).

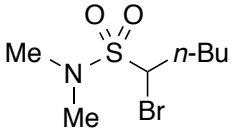
(1) Choi, J.; Fu, G. C. *J. Am. Chem. Soc.* **2012**, *134*, 9102–9105.

II. Preparation of Electrophiles

These procedures have not been optimized.



Representative experimental procedure for the preparation of α-bromosulfonamides. LDA was prepared by the dropwise addition of *n*-BuLi (1.6 M in hexanes; 13.8 mL, 22 mmol) to a solution of *i*-Pr_2NH (3.36 mL, 24.0 mmol) in THF (71 mL) in a 500-mL round-bottom flask at −78 °C. The reaction mixture was stirred at 0 °C for 15 min, and then it was cooled to −78 °C. A solution of the 1-bromomethanesulfonamide (20.0 mmol; prepared according to a literature procedure from bromomethanesulfonyl chloride[2] and a secondary amine[3]) in THF (40.0 mL) was added over 15 min to the LDA solution at −78 °C. The mixture was stirred for 30 min, and then a solution of the alkyl bromide (26.0 mmol) in THF (43.3 mL) was added over 15 min. The solution was stirred at −78 °C for 2 h, and then it was allowed to slowly warm to r.t. The reaction mixture was stirred at r.t. for 12 h, and then the reaction was quenched by the addition of saturated aqueous NH_4Cl (100 mL). The mixture was extracted with Et_2O (3 × 50 mL), and the combined organic layers were rinsed with brine (50 mL), dried over $MgSO_4$, and concentrated.



1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide. The title compound was prepared from 1-bromo-*N*,*N*-dimethylmethanesulfonamide (5.00 g, 24.7 mmol) and 1-bromobutane (3.45 mL, 32.2 mmol). The product was purified by column chromatography (3%→20% ethyl acetate/hexanes): 3.00 g (47%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.81 (dd, 1H, *J* = 10.7, 3.1 Hz), 3.03 (s, 6H), 2.34 (dddd, 1H, *J* = 14.4, 10.0, 5.5, 3.1 Hz), 2.10–2.02 (m, 1H), 1.70–1.61 (m, 1H), 1.47–1.30 (m, 3H), 0.94 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 63.3, 38.8, 32.9, 29.2, 21.9, 13.9.

FT-IR (neat) 2958, 2873, 2814, 1483, 1458, 1435, 1414, 1380, 1342, 1287, 1237, 1203, 1171, 1145, 1106, 1064, 973, 930, 782, 750, 734 cm^{-1}.

MS (EI) *m*/*z* (M^+) calcd for $C_7H_{16}BrNO_2S$: 257, found: 257.

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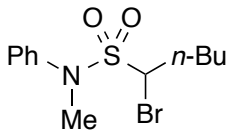
(2) Gao, F.; Yan, X.; Zahr, O.; Larsen, A.; Vong, K.; Auclair, K. *Bioorg. Med. Chem. Lett.* **2008**, *18*, 5518–5522.

(3) Brienne, M.-J.; Varech, D.; Leclercq, M.; Jacques, J.; Radembino, N.; Dessalles, M.-C.; Mahuzier, G.; Gueyouche, C.; Bories, C. Loiseau, P.; Gayral, P. *J. Med. Chem.* **1987**, *30*, 2232–2239.



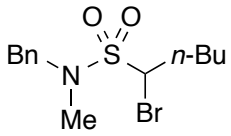
1-Bromo-*N*-methyl-*N*-phenylpentane-1-sulfonamide. The title compound was prepared from 1-bromo-*N*-methyl-*N*-phenylmethanesulfonamide (3.82 g, 14.5 mmol) and 1-bromobutane (2.02 mL, 18.8 mmol). The product was purified by column chromatography on silica gel (2%→15% ethyl acetate/hexanes) and then on C-18 silica gel (10%→100% acetonitrile/water): 3.60 g (78%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.50–7.48 (m, 2H), 7.43–7.39 (m, 2H), 7.35–7.31 (m, 1H), 4.74 (dd, 1H, *J* = 10.5, 3.1 Hz), 3.52 (s, 3H), 2.27 (dddd, 1H, *J* = 14.5, 10.2, 5.3, 3.1 Hz), 2.11–2.03 (m, 1H), 1.66–1.58 (m, 1H), 1.40–1.24 (m, 3H), 0.89 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 140.8, 129.7, 128.1, 127.3, 63.3, 42.0, 32.7, 29.1, 21.9, 13.9.

FT-IR (neat) 3062, 3039, 2957, 2931, 2872, 1595, 1493, 1466, 1453, 1436, 1351, 1270, 1237, 1183, 1143, 1106, 1068, 1026, 917, 886, 767, 725 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_{12}H_{19}BrNO_2S$: 320, found: 320.



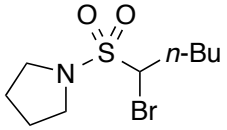
***N*-Benzyl-1-bromo-*N*-methylpentane-1-sulfonamide.** The title compound was prepared from *N*-benzyl-1-bromo-*N*-methylmethanesulfonamide (3.75 g, 13.5 mmol) and 1-bromobutane (1.88 mL, 17.5 mmol). The product was purified by column chromatography (2%→15% ethyl acetate/hexanes): 2.04 g (45%). Light-yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39–7.35 (m, 4H), 7.34–7.30 (m, 1H), 4.84 (dd, 1H, *J* = 10.7, 3.1 Hz), 4.61 (d, 1H, *J* = 14.8 Hz), 4.36 (d, 1H, *J* = 14.8 Hz), 2.88 (s, 3H), 2.40 (dddd, 1H, *J* = 14.4, 10.0, 5.6, 3.1 Hz), 2.15–2.07 (m, 1H), 1.72–1.64 (m, 1H), 1.50–1.31 (m, 3H), 0.95 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 135.8, 128.9, 128.3, 128.2, 64.1, 55.5, 35.5, 32.9, 29.3, 21.9, 13.9.

FT-IR (neat) 3088, 3064, 3031, 2958, 2931, 2872, 1605, 1587, 1496, 1467, 1455, 1338, 1278, 1212, 1196, 1151, 1106, 1077, 1029, 994, 944, 910, 858, 787, 733 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_{13}H_{21}BrNO_2S$: 334, found: 334.



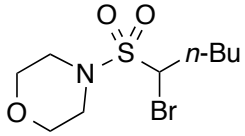
1-((1-Bromopentyl)sulfonyl)pyrrolidine. The title compound was prepared from 1-((bromomethyl)sulfonyl)pyrrolidine (3.02 g, 13.2 mmol) and 1-bromobutane (1.85 mL, 17.2 mmol). The product was purified by column chromatography (2%→15% ethyl acetate/hexanes): 1.96 g (52%). Light-yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.84 (dd, 1H, *J* = 10.7, 3.1 Hz), 3.62–3.56 (m, 2H), 3.49–3.43 (m, 2H), 2.36 (dddd, 1H, *J* = 14.4, 10.0, 5.6, 3.1 Hz), 2.11–2.03 (m, 1H), 1.99–1.94 (m, 4H), 1.70–1.61 (m, 1H), 1.48–1.30 (m, 3H), 0.94 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 63.7, 49.4, 32.7, 29.3, 26.1, 21.9, 13.9.

FT-IR (neat) 2957, 2872, 1461, 1334, 1238, 1200, 1148, 1076, 1014, 929, 781 cm^{-1}.

MS (EI) *m*/*z* (M^+) calcd for $C_9H_{18}BrNO_2S$: 283, found: 283.



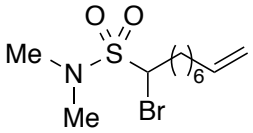
4-((1-Bromopentyl)sulfonyl)morpholine. The title compound was prepared from 4-((bromomethyl)sulfonyl)morpholine (3.01 g, 12.3 mmol) and 1-bromobutane (1.72 mL, 16.0 mmol). The product was purified by column chromatography (2%→20% ethyl acetate/hexanes): 1.28 g (35%). White solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.72 (dd, 1H, *J* = 10.7, 3.1 Hz), 3.75–3.68 (m, 4H), 3.50–3.42 (m, 4H), 2.32 (dddd, 1H, *J* = 14.3, 9.9, 5.5, 3.0 Hz), 2.05–1.97 (m, 1H), 1.67–1.58 (m, 1H), 1.45–1.27 (m, 3H), 0.92 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 67.0, 63.8, 47.3, 32.8, 29.1, 21.8, 13.8.

FT-IR (neat) 2959, 2925, 2860, 1467, 1460, 1450, 1434, 1347, 1328, 1299, 1261, 1237, 1204, 1153, 1114, 1074, 1014, 958, 846, 778, 732 cm^{-1}.

MS (EI) *m*/*z* (M^+) calcd for $C_9H_{18}BrNO_3S$: 299, found: 299.



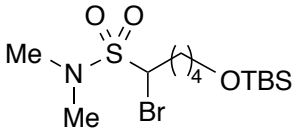
1-Bromo-*N*,*N*-dimethylnon-8-ene-1-sulfonamide. The title compound was prepared from 1-bromo-*N*,*N*-dimethylmethanesulfonamide (1.76 g, 8.71 mmol) and 8-bromo-1-octene (1.90 mL, 11.3 mmol). The product was purified by column chromatography (2%→20% ethyl acetate/hexanes): 1.30 g (48%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 5.80 (ddt, 1H, *J* = 16.9, 10.2, 6.7 Hz), 5.00 (ddt, 1H, *J* = 17.1, 2.2, 1.6 Hz), 4.94 (ddt, 1H, *J* = 10.2, 2.2, 1.2 Hz), 4.81 (dd, 1H, *J* = 10.6, 3.1 Hz), 3.03 (s, 6H), 2.33 (dddd, 1H, *J* = 14.3, 10.0, 5.8, 3.1 Hz), 2.10–2.02 (m, 3H), 1.71–1.63 (m, 1H), 1.48–1.25 (m, 7H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.0, 114.5, 63.3, 38.8, 33.8, 33.1, 28.8, 28.6, 27.1.

FT-IR (neat) 3075, 2923, 2852, 1640, 1479, 1454, 1414, 1340, 1285, 1204, 1143, 1063, 971, 907, 783 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_{11}H_{23}BrNO_2S$: 312, found: 312.



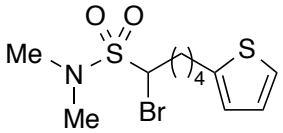
1-Bromo-5-((*tert*-butyldimethylsilyl)oxy)-*N*,*N*-dimethylpentane-1-sulfonamide. A 250-mL round-bottom flask was charged with 1-bromo-*N*,*N*-dimethylmethanesulfonamide (0.808 g, 4.00 mmol) and toluene (24 mL). *tert*-Butyl(4-iodobutoxy)dimethylsilane (5.03 g, 16.0 mmol), aqueous NaOH (50% w/v; 24 mL), and benzyltriethylammonium chloride (0.911 g, 4.00 mmol) were added to the solution at r.t. The resulting mixture was stirred at r.t. for 24 h, and then water (50 mL) was added. The organic phase was separated, and the aqueous solution was extracted with ethyl acetate (2 × 25 mL). The combined organic layers were dried over $MgSO_4$ and concentrated. The product was purified by column chromatography (hexanes→30% ethyl acetate/hexanes): 1.21 g (78%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.82 (dd, 1H, *J* = 10.7, 3.1 Hz), 3.62 (t, 2H, *J* = 6.1 Hz), 3.02 (s, 6H), 2.38–2.32 (m, 1H), 2.13–2.04 (m, 1H), 1.79–1.70 (m, 1H), 1.67–1.45 (m, 3H), 0.89 (s, 9H), 0.05 (s, 6H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 63.2, 62.6, 38.8, 33.0, 31.8, 26.1, 23.7, 18.5, –5.2.

FT-IR (neat) 2952, 2929, 2885, 2856, 1471, 1462, 1389, 1343, 1287, 1256, 1205, 1146, 1127, 1106, 1006, 973, 939, 836, 812, 776, 740 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_{13}H_{31}BrNO_3SSi$: 388, found: 388.



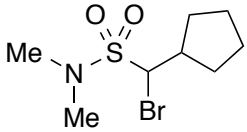
1-Bromo-*N*,*N*-dimethyl-5-(thiophen-2-yl)pentane-1-sulfonamide. The title compound was prepared from 1-bromo-*N*,*N*-dimethylmethanesulfonamide (3.00 g, 14.8 mmol) and 2-(4-bromobutyl)thiophene (4.23 g, 19.3 mmol). The product was purified by column chromatography (3%→20% ethyl acetate/hexanes): 1.44 g (29%). Light-yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.12 (dd, 1H, *J* = 5.1, 1.2 Hz), 6.92 (dd, 1H, *J* = 5.1, 3.4 Hz), 6.79 (dddd, 1H, *J* = 3.3, 1.0, 1.0, 1.0 Hz), 4.80 (dd, 1H, *J* = 10.5, 3.2 Hz), 3.02 (s, 6H), 2.92–2.82 (m, 2H), 2.40–2.34 (m, 1H), 2.14–2.07 (m, 1H), 1.80–1.69 (m, 3H), 1.56–1.47 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.8, 126.9, 124.4, 123.2, 63.0, 38.8, 33.0, 30.9, 29.7, 26.6.

FT-IR (neat) 2935, 2857, 1480, 1454, 1414, 1340, 1286, 1203, 1180, 1145, 1063, 972, 850, 784 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_{11}H_{19}BrNO_2S_2$: 340, found: 340.



1-Bromo-1-cyclopentyl-*N*,*N*-dimethylmethanesulfonamide. The title compound was prepared from 1-bromo-*N*,*N*-dimethylmethanesulfonamide (3.03 g, 15.0 mmol) and cyclopentyl

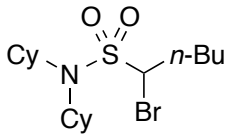
4-methylbenzenesulfonate (4.69 g, 19.5 mmol). The product was purified by column chromatography (10% ethyl acetate/hexanes): 668 mg (16%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.99 (d, 1H, *J* = 4.8 Hz), 3.00 (s, 6H), 2.66–2.59 (m, 1H), 1.99–1.88 (m, 2H), 1.75–1.55 (m, 5H), 1.54–1.45 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 68.5, 41.8, 38.7, 31.8, 30.0, 25.6, 25.5.

FT-IR (neat) 2947, 2869, 2812, 1481, 1452, 1413, 1333, 1284, 1205, 1180, 1142, 1063, 969, 898, 862, 786 cm^{-1}.

MS (EI) *m*/*z* (M^+–Br) calcd for $C_8H_{16}NO_2S$: 190, found: 190.



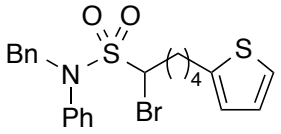
1-Bromo-*N*,*N*-dicyclohexylpentane-1-sulfonamide. The title compound was prepared from 1-bromo-*N*,*N*-dicyclohexylmethanesulfonamide (2.10 g, 6.21 mmol) and 1-bromobutane (0.867 mL, 8.07 mmol). The product was purified by column chromatography (1%→8% ethyl acetate/hexanes): 2.06 g (84%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.57 (dd, 1H, *J* = 10.6, 2.9 Hz), 3.38–3.33 (br m, 2H), 2.35 (dddd, 1H, *J* = 14.3, 10.1, 5.3, 2.9 Hz), 2.07–2.00 (m, 1H), 1.95–1.91 (m, 2H), 1.86–1.59 (m, 13H), 1.45–1.23 (m, 7H), 1.09 (qt, 2H, *J* = 13.1, 3.5 Hz), 0.92 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 66.6, 59.3, 33.9, 33.3, 32.4, 29.5, 26.6, 25.4, 22.0, 13.9.

FT-IR (neat) 2931, 2855, 1467, 1454, 1401, 1381, 1329, 1275, 1256, 1235, 1188, 1166, 1142, 1101, 1074, 1048, 1027, 997, 982, 929, 917, 895, 856, 847, 824, 801, 774, 760, 749, 733 cm^{-1}.

MS (EI) *m*/*z* (M^+) calcd for $C_{17}H_{32}BrNO_2S$: 393, found: 393.



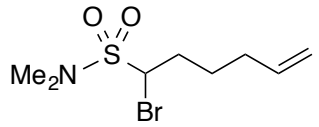
***N*-Benzyl-1-bromo-*N*-phenyl-5-(thiophen-2-yl)pentane-1-sulfonamide.** The title compound was prepared from *N*-benzyl-1-bromo-*N*-phenylmethanesulfonamide (2.70 g, 7.94 mmol) and 2-(4-bromobutyl)thiophene (2.26 g, 10.3 mmol). The product was purified by column chromatography on silica gel (2%→12% ethyl acetate/hexanes) and then preparative HPLC on C-18 silica gel (80%→100% acetonitrile/water; water was doped with 0.1% AcOH): 0.881 g (23%). White solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34–7.27 (m, 5H), 7.26–7.20 (m, 5H), 7.11 (dd, 1H, *J* = 5.1, 1.2 Hz), 6.90 (dd, 1H, *J* = 5.1, 3.4 Hz), 6.76 (dddd, 1H, *J* = 3.2, 1.0, 1.0, 1.0 Hz), 5.34 (d, 1H, *J* = 14.8 Hz), 4.75 (dd, 1H, *J* = 10.5, 3.1 Hz), 4.69 (d, 1H, *J* = 14.9 Hz), 2.88–2.78 (m, 2H), 2.38–2.31 (m, 1H), 2.21–2.13 (m, 1H), 1.79–1.65 (m, 3H), 1.51–1.43 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.8, 138.1, 136.3, 129.6, 129.4, 128.7, 128.6, 128.5, 127.9, 126.9, 124.4, 123.2, 63.3, 58.9, 32.7, 30.9, 29.6, 26.6.

FT-IR (neat) 3064, 3031, 2932, 2858, 1594, 1492, 1454, 1439, 1348, 1214, 1178, 1150, 1093, 1066, 1028, 917, 868, 822, 781 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_{22}H_{25}BrNO_2S_2$: 478, found: 478.



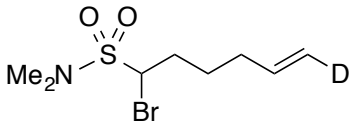
1-Bromo-*N*,*N*-dimethylhex-5-ene-1-sulfonamide. The title compound was prepared from 1-bromo-*N*,*N*-dimethylmethanesulfonamide (4.00 g, 19.8 mmol) and 5-bromo-1-pentene (3.05 mL, 25.7 mmol). The product was purified by column chromatography (3%→15% ethyl acetate/hexanes): 2.29 g (43%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 5.79 (ddt, 1H, *J* = 16.9, 10.2, 6.7 Hz), 5.05 (dq, 1H, *J* = 17.1, 1.7 Hz), 5.01 (ddt, 1H, *J* = 10.2, 1.9, 1.2 Hz), 4.82 (dd, 1H, *J* = 10.5, 3.2 Hz), 3.02 (s, 6H), 2.35 (dddd, 1H, *J* = 14.5, 10.2, 6.0, 3.2 Hz), 2.19–2.04 (m, 3H), 1.84–1.75 (m, 1H), 1.60–1.51 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.5, 115.8, 63.0, 38.8, 32.8, 32.7, 26.4.

FT-IR (neat) 3076, 2918, 1640, 1482, 1454, 1415, 1341, 1285, 1204, 1143, 1063, 970, 912, 856, 786, 738 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_8H_{17}BrNO_2S$: 270, found: 270.



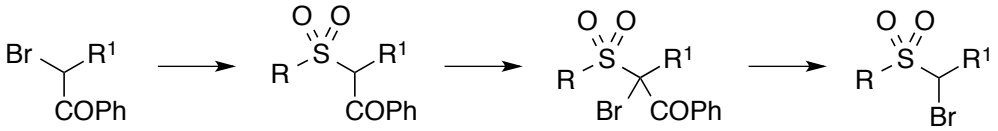
(*E*)-1-Bromo-*N*,*N*-dimethylhex-5-ene-1-sulfonamide-6-*d*. The title compound was prepared from 1-bromo-*N*,*N*-dimethylmethanesulfonamide (762 mg, 3.77 mmol) and (*E*)-pent-4-en-1-yl-5-*d* 4-methylbenzenesulfonate (1.18 g, 4.90 mmol). The product was purified by column chromatography (2%→20% ethyl acetate/hexanes): 408 mg (40%). Colorless oil.

^{1}H NMR (500 MHz, $CDCl_3$) δ 5.78 (dt, 1H, *J* = 16.9, 6.5 Hz), 5.05–5.00 (m, 1H), 4.82 (dd, 1H, *J* = 10.5, 3.2 Hz), 3.01 (s, 6H), 2.37–2.30 (m, 1H), 2.18–2.03 (m, 3H), 1.83–1.74 (m, 1H), 1.59–1.50 (m, 1H).

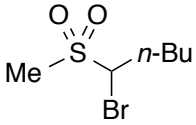
^{13}C NMR (126 MHz, $CDCl_3$) δ 137.4, 115.5 (t, *J* = 24 Hz), 63.1, 38.8, 32.8, 32.7, 26.4.

FT-IR (neat) 3028, 2949, 2862, 2264, 1621, 1483, 1455, 1435, 1414, 1342, 1287, 1204, 1183, 1144, 1064, 972, 868, 785, 744 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_8H_{16}DBrNO_2S$: 271, found: 271.



Representative experimental procedure for the preparation of α-bromosulfones. The target molecules were prepared according to literature procedures from α-bromoketones.[4,5] A 100-mL round-bottom flask was charged with the α-bromo-β-keto-sulfone (10.0 mmol) and aqueous KOH (30% w/v; 50 mL), and the mixture was stirred at r.t. for 48 h. When the reaction was complete (monitored by TLC), the reaction mixture was extracted with dichloromethane (3 × 30 mL). The combined organic layers were dried over $MgSO_4$ and concentrated.



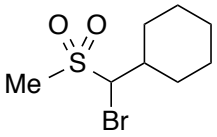
1-Bromo-1-(methylsulfonyl)pentane. The title compound was prepared from 2-bromo-2-(methylsulfonyl)-1-phenylhexan-1-one (12.0 g, 36.0 mmol). The product was purified by column chromatography (hexanes→20% ethyl acetate/hexanes): 8.08 g (98%). White solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.61 (dd, 1H, J = 11.0, 3.0 Hz), 3.09 (s, 3H), 2.43 (dddd, 1H, J = 14.4, 9.9, 5.7, 3.0 Hz), 1.96 (dddd, 1H, J = 14.2, 11.1, 9.5, 4.4 Hz), 1.72–1.64 (m, 1H), 1.50–1.31 (m, 3H), 0.94 (t, 3H, J = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 64.3, 37.6, 30.1, 29.2, 21.8, 13.8.

FT-IR (neat) 3010, 2958, 2932, 2873, 1467, 1454, 1434, 1413, 1381, 1311, 1237, 1208, 1140, 1121, 1106, 956, 928, 815, 771, 748, 735 cm^{-1}.

MS (ESI) m/z (M^++H) calcd for $C_6H_{14}BrO_2S$: 229, found: 229.



(Bromo(methylsulfonyl)methyl)cyclohexane. The bromination of 2-cyclohexyl-2-(methylsulfonyl)-1-phenylethan-1-one was conducted at 60 °C, and extra KBr and H_2O_2 were added until the reaction was complete. The title compound was prepared from 2-bromo-2-cyclohexyl-2-(methylsulfonyl)-1-phenylethan-1-one (8.13 g, 22.6 mmol). The reaction was run at 40 °C for 96 h. The product was purified by column chromatography on silica gel (5%→30% ethyl acetate/hexanes) and then on C-18 silica gel (10%→100% acetonitrile/water): 1.69 g (29%). White solid.

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(4) Suryakiran, N.; Reddy, T. S.; Ashalatha, K.; Lakshman, M.; Venkateswarlu, Y. *Tetrahedron Lett.* **2006**, *47*, 3853–3856.

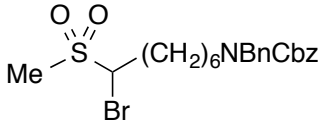
(5) Suryakiran, N.; Prabhakar, P.; Reddy, T. S.; Mahesh, K. C.; Rajesh, K.; Venkateswarlu, Y. *Tetrahedron Lett.* **2007**, *48*, 877–881.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.60 (d, 1H, J = 2.7 Hz), 3.10 (s, 3H), 2.41–2.35 (m, 1H), 2.08–2.04 (m, 1H), 1.84–1.76 (m, 2H), 1.72–1.67 (m, 1H), 1.64–1.61 (m, 1H), 1.48–1.30 (m, 4H), 1.21–1.12 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 71.0, 39.9, 37.4, 31.8, 28.5, 26.0, 25.6, 25.3.

FT-IR (neat) 3011, 2930, 2855, 1452, 1411, 1370, 1310, 1240, 1171, 1138, 1090, 1080, 1060, 1032, 968, 922, 896, 885, 848, 792, 774, 728 cm^{-1}.

MS (ESI) m/z (M^++H) calcd for $C_8H_{16}BrO_2S$: 255, found: 255.



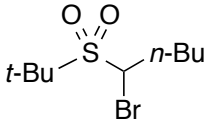
Benzyl benzyl(7-bromo-7-(methylsulfonyl)heptyl)carbamate. The title compound was prepared from benzyl benzyl(7-bromo-7-(methylsulfonyl)-8-oxo-8-phenyloctyl)carbamate (3.08 g, 5.13 mmol). The product was purified by column chromatography on silica gel (10%→50% ethyl acetate/hexanes) and then on C-18 silica gel (10%→100% acetonitrile/water): 1.57 g (62%). Viscous colorless oil.

^{1}H NMR (500 MHz, CD_2Cl_2) δ 7.39–7.20 (br m, 10H), 5.18–5.14 (m, 2H), 4.68–4.60 (m, 1H), 4.50 (s, 2H), 3.28–3.20 (m, 2H), 3.06 (s, 3H), 2.40–2.30 (br m, 1H), 1.97–1.86 (br m, 1H), 1.70–1.25 (br m, 8H).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 156.9, 156.4, 138.6, 137.6, 128.82, 128.78, 128.2, 128.05, 127.98, 127.5, 67.3, 64.7, 50.8, 50.5, 47.4, 46.7, 37.8, 30.7, 28.6, 28.3, 27.9, 27.2, 26.7.

FT-IR (neat) 3087, 3062, 3030, 2930, 2858, 1692, 1605, 1585, 1496, 1467, 1453, 1421, 1365, 1315, 1230, 1140, 1119, 1072, 1028, 955, 915, 819, 768, 733 cm^{-1}.

MS (ESI) m/z (M^++H) calcd for $C_{23}H_{31}BrNO_4S$: 496, found: 496.



1-Bromo-1-(*tert*-butylsulfonyl)pentane. A mixture of 2-bromo-1-phenylhexan-1-one (5.10 g, 20.0 mmol), 2-methyl-2-propanethiol (1.80 g, 20.0 mmol), benzyltriethylammonium bromide (0.272 g, 1.00 mmol), and NaOH (3.00 g, 75.0 mmol) in dichloromethane (40 mL) and water (40 mL) in a 250-mL round-bottom flask was stirred at r.t. for 8 h. Then, water (100 mL) was added, and the mixture was extracted with dichloromethane (3 × 50 mL). The combined organic layers were dried over $MgSO_4$ and concentrated. The residue was dissolved in MeOH (50 mL) and water (50 mL), and then oxone® (30.7 g, 100 mmol) was added. The reaction mixture was stirred at r.t. overnight, and most of the MeOH was removed under reduced pressure. The resulting aqueous mixture was extracted with dichloromethane (3 × 30 mL). The combined organic layers were dried over $MgSO_4$ and concentrated. 2-(*tert*-Butylsulfonyl)-1-phenylhexan-1-one was purified by column chromatography (5%→60% ethyl acetate/hexanes): 5.34 g (90%). White solid.

2-Bromo-2-(*tert*-butylsulfonyl)-1-phenylhexan-1-one was prepared from 2-(*tert*-butylsulfonyl)-1-phenylhexan-1-one following the described procedure.

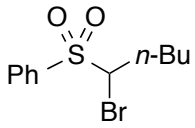
The title compound was prepared from 2-bromo-2-(*tert*-butylsulfonyl)-1-phenylhexan-1-one (2.30 g, 6.13 mmol). The reaction was conducted at 40 °C. The product was purified by column chromatography (hexanes→20% ethyl acetate/hexanes): 1.41 g (85%). White solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 4.84 (dd, 1H, *J* = 10.5, 3.0 Hz), 2.43 (dddd, 1H, *J* = 14.5, 10.2, 5.3, 2.9 Hz), 2.11–2.03 (m, 1H), 1.75–1.66 (m, 1H), 1.55 (s, 9H), 1.48–1.30 (m, 3H), 0.94 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 63.3, 59.2, 30.8, 28.8, 25.2, 22.0, 13.9.

FT-IR (neat) 2959, 2933, 2873, 1479, 1467, 1399, 1366, 1305, 1192, 1167, 1118, 1104, 1020, 986, 964, 929, 801, 733 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_9H_{19}BrNaO_2S$: 293, found: 293.



((1-Bromopentyl)sulfonyl)benzene. The title compound was prepared from 2-bromo-1-phenyl-2-(phenylsulfonyl)hexan-1-one (12.0 g, 30.4 mmol). The reaction was conducted at 60 °C. The product was purified by column chromatography (hexanes→20% ethyl acetate/hexanes): 8.50 g (96%). White solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.98–7.95 (m, 2H), 7.72–7.68 (m, 1H), 7.61–7.57 (m, 2H), 4.70 (dd, 1H, *J* = 11.1, 2.9 Hz), 2.41 (dddd, 1H, *J* = 14.3, 9.9, 5.8, 2.9 Hz), 1.89 (dddd, 1H, *J* = 14.1, 11.1, 9.4, 4.4 Hz), 1.67–1.58 (m, 1H), 1.45–1.26 (m, 3H), 0.91 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 135.5, 134.6, 130.2, 129.2, 66.0, 31.0, 29.2, 21.8, 13.8.

FT-IR (neat) 3065, 2958, 2932, 2872, 1584, 1478, 1466, 1447, 1381, 1324, 1309, 1236, 1203, 1149, 1133, 1083, 1024, 999, 929, 792, 778, 746 cm^{-1}.

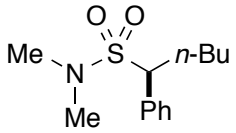
MS (ESI) *m*/*z* (M^++H) calcd for $C_{11}H_{16}BrO_2S$: 291, found: 291.

III. Enantioselective Arylations

General Procedure. An oven-dried 8-mL vial equipped with a magnetic stir bar was capped with a PTFE-lined septum cap, cooled under vacuum, and then filled with nitrogen. ZnI_2 (290 mg, 0.910 mmol) was added to the vial, and the vial was then immediately placed under vacuum and refilled with nitrogen (three cycles). Next, THF (2.73 mL) was added to the vial, followed by a solution of ArMgBr (prepared according to a literature procedure;[1] 1.00 M in THF; 0.910 mL, 0.910 mmol). The mixture was stirred at r.t. for 30 min. An oven-dried 20-mL vial equipped with a magnetic stir bar was charged with $NiCl_2$•glyme (15.4 mg, 0.070 mmol), (*R*,*R*)–**L1** (30.4 mg, 0.091 mmol), and the electrophile (0.70 mmol). The vial was sealed with a PTFE-lined septum cap, placed under vacuum, and then filled with nitrogen; this cycle was repeated three times. THF (4.14 mL) was added, and the mixture was stirred at r.t. for 20 min, at which

time it had become homogenous. Both vials were wrapped with electrical tape, attached with nitrogen-filled balloons, and cooled to –20 °C for 15 min. The heterogeneous mixture of the nucleophile was then transferred by syringe over 2 min to the vial that contained the electrophile. The nitrogen-filled balloon was removed, and the septum cap was covered with grease. The reaction mixture was stirred at –20 °C for 24 h, and then the reaction was quenched by the addition of ethanol (0.70 mL). The solution was allowed to warm to r.t., and then it was filtered through a pad of silica (eluted with Et_2O). The filtrate was concentrated, and the residue was purified by column chromatography.

A second run was conducted with (*S*,*S*)–**L1**.



(*S*)-*N*,*N*-Dimethyl-1-phenylpentane-1-sulfonamide (Table 2, Entry 1). 1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (20%→25% Et_2O/hexanes). Light-yellow solid. First run: 159 mg (89%, 96% ee). Second run: 162 mg (91%, 96% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (1% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 10.9 min (major), 13.4 min (minor).

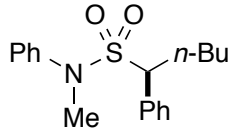
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42–7.34 (m, 5H), 4.08 (dd, 1H, *J* = 11.3, 3.8 Hz), 2.53 (s, 6H), 2.34 (dddd, 1H, *J* = 13.7, 10.2, 6.5, 3.8 Hz), 2.15 (dddd, 1H, *J* = 13.6, 11.4, 10.0, 5.1 Hz), 1.38–1.23 (m, 2H), 1.22–1.09 (m, 2H), 0.84 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 133.9, 129.6, 129.0, 128.9, 67.7, 37.8, 29.6, 28.9, 22.4, 13.9.

FT-IR (neat) 3017, 2952, 2930, 2872, 1497, 1455, 1326, 1305, 1288, 1204, 1137, 1109, 1064, 973, 820, 808 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{13}H_{21}NNaO_2S$: 278, found: 278.

$[\alpha]^{25}_D = -30°$ (c = 1.02, $CHCl_3$).



(*S*)-*N*-Methyl-*N*,1-diphenylpentane-1-sulfonamide (Table 2, Entry 2). 1-Bromo-*N*-methyl-*N*-phenylpentane-1-sulfonamide (224 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (10% Et_2O/hexanes). Light-yellow solid. First run: 211 mg (95%, 93% ee). Second run: 211 mg (95%, 95% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (2% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 10.5 min (major), 11.7 min (minor).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41–7.35 (m, 5H), 7.31–7.27 (m, 2H), 7.21–7.18 (m, 1H), 7.17–7.14 (m, 2H), 4.11 (dd, 1H, *J* = 11.4, 3.7 Hz), 2.88 (s, 3H), 2.32 (dddd, 1H, *J* = 13.6, 10.1, 6.5, 3.7

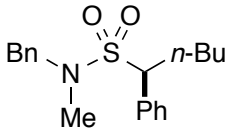
Hz), 2.14 (dddd, 1H, J = 13.4, 11.4, 9.9, 5.2 Hz), 1.34–1.18 (m, 2H), 1.17–1.03 (m, 2H), 0.80 (t, 3H, J = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 141.7, 133.7, 129.9, 129.1, 129.0, 128.8, 126.5, 125.8, 68.2, 39.2, 30.0, 28.9, 22.4, 13.9.

FT-IR (neat) 3063, 3030, 2957, 2932, 2872, 1596, 1493, 1455, 1423, 1380, 1342, 1266, 1179, 1143, 1108, 1067, 1028, 1003, 969, 917, 880, 801, 765 cm^{-1}.

MS (ESI) m/z (M^++Na) calcd for $C_{18}H_{23}NNaO_2S$: 340, found: 340.

$[\alpha]^{25}_D$ = −105° (c = 1.01, $CHCl_3$).



(*S*)-*N*-Benzyl-*N*-methyl-1-phenylpentane-1-sulfonamide (Table 2, Entry 3). *N*-Benzyl-1-bromo-*N*-methylpentane-1-sulfonamide (234 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (7% ethyl acetate/hexanes). Light-yellow solid. First run: 219 mg (94%, 94% ee). Second run: 221 mg (95%, 93% ee).

The ee was determined by HPLC on a CHIRALPAK AD-H column (2% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 25.8 min (major), 28.9 min (minor).

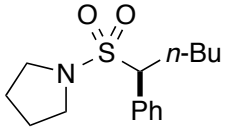
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42–7.36 (m, 5H), 7.31–7.23 (m, 3H), 7.22–7.18 (m, 2H), 4.12 (dd, 1H, J = 11.3, 3.8 Hz), 4.01 (d, 1H, J = 14.7 Hz), 3.68 (br d, 1H, J = 11.0 Hz), 2.42 (s, 3H), 2.38 (dddd, 1H, J = 13.7, 10.1, 6.2, 3.8 Hz), 2.21 (dddd, 1H, J = 13.5, 11.3, 9.8, 5.2 Hz), 1.42–1.26 (m, 2H), 1.26–1.12 (m, 2H), 0.85 (t, 3H, J = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 136.3, 133.9, 129.7, 129.0, 128.9, 128.6, 128.3, 127.9, 68.5, 54.2, 34.6, 29.6, 29.0, 22.4, 13.9.

FT-IR (neat) 3063, 3030, 2954, 2930, 2870, 1495, 1454, 1363, 1327, 1214, 1149, 1133, 1075, 1003, 944, 890, 807, 760 cm^{-1}.

MS (ESI) m/z (M^++Na) calcd for $C_{19}H_{25}NNaO_2S$: 354, found: 354.

$[\alpha]^{25}_D$ = −54° (c = 1.03, $CHCl_3$).



(*S*)-1-((1-Phenylpentyl)sulfonyl)pyrrolidine (Table 2, Entry 4). 1-((1-Bromopentyl)sulfonyl)pyrrolidine (199 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (10% ethyl acetate/hexanes). White solid. First run: 166 mg (84%, 96% ee). Second run: 170 mg (86%, 96% ee).

The ee was determined by HPLC on a CHIRALPAK AD-H column (2% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 13.8 min (minor), 20.2 min (major).

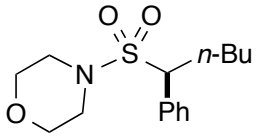
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.43–7.39 (m, 2H), 7.39–7.33 (m, 3H), 4.11 (dd, 1H, *J* = 11.3, 3.8 Hz), 3.21–3.13 (m, 2H), 2.84–2.77 (m, 2H), 2.33 (dddd, 1H, *J* = 13.8, 10.1, 6.4, 3.8 Hz), 2.17 (dddd, 1H, *J* = 13.5, 11.3, 9.6, 5.2 Hz), 1.74–1.67 (m, 2H), 1.67–1.58 (m, 2H), 1.39–1.24 (m, 2H), 1.24–1.10 (m, 2H), 0.84 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 134.3, 129.7, 128.8, 128.7, 67.7, 48.2, 29.2, 29.0, 25.9, 22.4, 13.9.

FT-IR (neat) 3436, 2957, 2887, 2872, 2857, 1498, 1467, 1456, 1325, 1294, 1240, 1198, 1143, 1128, 1084, 1015, 829, 806, 728 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{15}H_{23}NNaO_2S$: 304, found: 304.

$[\alpha]^{25}_D$ = −51° (c = 0.97, $CHCl_3$).



(*S*)-4-((1-Phenylpentyl)sulfonyl)morpholine (Table 2, Entry 5). 4-((1-Bromopentyl)sulfonyl)morpholine (210 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (20% ethyl acetate/hexanes). White solid. First run: 197 mg (95%, 98% ee). Second run: 186 mg (89%, 95% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (3% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 13.9 min (major), 16.7 min (minor).

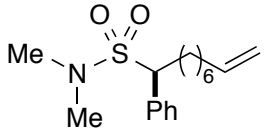
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.44–7.35 (m, 5H), 4.02 (dd, 1H, *J* = 11.3, 3.8 Hz), 3.56–3.52 (m, 2H), 3.48–3.43 (m, 2H), 3.06–3.02 (m, 2H), 2.75 (br s, 2H), 2.34 (dddd, 1H, *J* = 13.8, 10.1, 6.3, 3.8 Hz), 2.13 (dddd, 1H, *J* = 13.4, 11.3, 9.8, 5.1 Hz), 1.39–1.23 (m, 2H), 1.23–1.08 (m, 2H), 0.84 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 133.5, 129.7, 129.2, 129.0, 68.5, 67.0, 46.3, 29.7, 28.9, 22.4, 13.9.

FT-IR (neat) 2955, 2923, 2859, 1496, 1455, 1336, 1323, 1257, 1214, 1152, 1128, 1110, 1076, 955, 924, 848, 803 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{15}H_{23}NNaO_3S$: 320, found: 320.

$[\alpha]^{25}_D$ = −34° (c = 1.02, $CHCl_3$).



(*S*)-*N*,*N*-Dimethyl-1-phenylnon-8-ene-1-sulfonamide (Table 2, Entry 6). 1-Bromo-*N*,*N*-dimethylnon-8-ene-1-sulfonamide (219 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (5%→10% ethyl acetate/hexanes). Light-yellow solid. First run: 192 mg (89%, 95% ee). Second run: 189 mg (87%, 95% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (1% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 12.8 min (major), 20.6 min (minor).

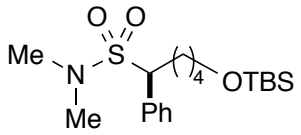
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41–7.34 (m, 5H), 5.76 (dddd, 1H, *J* = 16.9, 10.2, 6.7, 6.7 Hz), 4.96 (dddd, 1H, *J* = 17.1, 2.2, 1.6, 1.6 Hz), 4.91 (dddd, 1H, *J* = 10.2, 2.3, 1.2, 1.2 Hz), 4.08 (dd, 1H, *J* = 11.3, 3.9 Hz), 2.53 (s, 6H), 2.30 (dddd, 1H, *J* = 13.7, 10.2, 6.5, 3.9 Hz), 2.19–2.11 (m, 1H), 2.01–1.96 (m, 2H), 1.35–1.11 (m, 8H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.1, 133.9, 129.6, 129.0, 128.9, 114.4, 67.7, 37.8, 33.8, 29.8, 29.1, 28.8, 26.7.

FT-IR (neat) 3062, 2924, 2853, 1640, 1497, 1468, 1456, 1414, 1327, 1208, 1137, 1066, 977, 912, 824 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{17}H_{27}NNaO_2S$: 332, found: 332.

$[\alpha]^{25}_D$ = −19.2° (c = 0.98, $CHCl_3$).



(*S*)-5-((*tert*-Butyldimethylsilyl)oxy)-*N*,*N*-dimethyl-1-phenylpentane-1-sulfonamide (Table 2, Entry 7). 1-Bromo-5-((*tert*-butyldimethylsilyl)oxy)-*N*,*N*-dimethylpentane-1-sulfonamide (272 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (2%→20% ethyl acetate/hexanes). White solid. First run: 248 mg (92%, >99% ee). Second run: 250 mg (93%, 98% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (2% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 8.2 min (major), 11.0 min (minor).

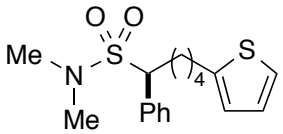
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41–7.33 (m, 5H), 4.09 (dd, 1H, *J* = 11.3, 3.9 Hz), 3.56–3.49 (m, 2H), 2.53 (s, 6H), 2.35–2.28 (m, 1H), 2.21–2.13 (m, 1H), 1.57–1.42 (m, 2H), 1.27–1.18 (m, 2H), 0.82 (s, 9H), –0.02 (s, 6H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 133.7, 129.6, 129.0, 128.9, 67.6, 62.7, 37.8, 32.4, 29.7, 26.0, 23.1, 18.4, –5.2.

FT-IR (neat) 3065, 2931, 2897, 2860, 1458, 1385, 1359, 1329, 1280, 1257, 1200, 1143, 1132, 1110, 1092, 966, 900, 872, 833, 808, 779, 736 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{19}H_{35}NNaO_3SSi$: 408, found: 408.

$[\alpha]^{25}_D$ = −15.0° (c = 0.98, $CHCl_3$).



(*S*)-*N*,*N*-Dimethyl-1-phenyl-5-(thiophen-2-yl)pentane-1-sulfonamide (Table 2, Entry 8). 1-Bromo-*N*,*N*-dimethyl-5-(thiophen-2-yl)pentane-1-sulfonamide (238 mg, 0.700 mmol) and phenylzinc iodide (1.05 mmol) were used. The product was purified by column chromatography (10%→15% ethyl acetate/hexanes). Yellow solid. First run: 128 mg (54%, 90% ee). Second run: 131 mg (55%, 91% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (5% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 18.3 min (major), 22.8 min (minor).

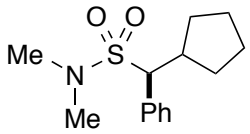
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41–7.34 (m, 5H), 7.08 (dd, 1H, *J* = 5.1, 1.2 Hz), 6.88 (dd, 1H, *J* = 5.1, 3.4 Hz), 6.71 (dddd, 1H, *J* = 3.3, 1.0, 1.0, 1.0 Hz), 4.08 (dd, 1H, *J* = 11.2, 3.9 Hz), 2.82–2.70 (m, 2H), 2.52 (s, 6H), 2.39–2.32 (m, 1H), 2.23–2.15 (m, 1H), 1.74–1.61 (m, 2H), 1.35–1.21 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 145.1, 133.8, 129.6, 129.0, 128.9, 126.8, 124.2, 123.0, 67.6, 37.8, 31.4, 29.65, 29.59, 26.2.

FT-IR (neat) 3064, 2932, 2856, 1495, 1480, 1454, 1331, 1282, 1200, 1140, 1062, 1030, 967, 849, 820 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{17}H_{23}NNaO_2S_2$: 360, found: 360.

$[\alpha]^{25}_D$ = −9.4° (c = 0.99, $CHCl_3$).



(*S*)-1-Cyclopentyl-*N*,*N*-dimethyl-1-phenylmethanesulfonamide (Table 2, Entry 9). 1-Bromo-1-cyclopentyl-*N*,*N*-dimethylmethanesulfonamide (189 mg, 0.700 mmol) and phenylzinc iodide (1.05 mmol) were used. The product was purified by column chromatography (first purification: 10% ethyl acetate/hexanes; second purification: 12%→100% dichloromethane/hexanes). White solid. First run: 86 mg (46%, >99% ee). Second run: 79 mg (42%, >99% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (1% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 12.7 min (major), 14.6 min (minor).

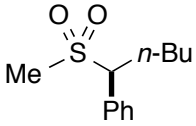
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41–7.38 (m, 2H), 7.37–7.31 (m, 3H), 3.92 (d, 1H, *J* = 10.3 Hz), 2.78–2.69 (m, 1H), 2.43 (s, 6H), 2.29–2.22 (m, 1H), 1.75–1.67 (m, 1H), 1.66–1.60 (m, 1H), 1.59–1.41 (m, 4H), 1.03–0.95 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 135.2, 129.7, 128.69, 128.67, 73.2, 41.8, 37.6, 32.3, 32.1, 25.5, 24.1.

FT-IR (neat) 3090, 3064, 3025, 2960, 2871, 2812, 1496, 1479, 1452, 1323, 1293, 1206, 1188, 1131, 1081, 1063, 1030, 1003, 969, 911, 872, 848, 807, 732 cm^{-1}.

MS (EI) *m*/*z* (M^+–SO_2NMe_2) calcd for $C_{12}H_{15}$: 159, found: 159.

$[\alpha]^{25}_D$ = −43° (c = 1.04, $CHCl_3$).



(*S*)-(1-(Methylsulfonyl)pentyl)benzene (Table 3, Entry 1). 1-Bromo-1-(methylsulfonyl)pentane (160 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (20%→30% ethyl acetate/hexanes). White solid. First run: 150 mg (95%, 94% ee). Second run: 153 mg (97%, 94% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (5% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 17.6 min (major), 20.8 min (minor).

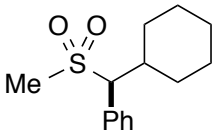
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42–7.37 (m, 5H), 3.99 (dd, 1H, *J* = 11.5, 3.7 Hz), 2.59 (s, 3H), 2.45–2.37 (m, 1H), 2.12 (dddd, 1H, *J* = 13.6, 11.5, 9.6, 5.3 Hz), 1.41–1.26 (m, 2H), 1.25–1.14 (m, 2H), 0.85 (t, 3H, *J* = 7.1 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 133.4, 129.5, 129.28, 129.27, 70.4, 38.7, 28.9, 26.7, 22.4, 13.9.

FT-IR (neat) 3088, 3065, 3051, 3011, 2931, 2869, 1496, 1468, 1456, 1417, 1379, 1292, 1277, 1263, 1211, 1158, 1130, 1107, 1072, 1036, 966, 936, 904, 805, 722 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{12}H_{18}NaO_2S$: 249, found: 249.

$[\alpha]^{25}_D$ = −6.2° (c = 1.00, $CHCl_3$).



(*S*)-(Cyclohexyl(methylsulfonyl)methyl)benzene (Table 3, Entry 2). (Bromo(methylsulfonyl)methyl)cyclohexane (179 mg, 0.700 mmol) and phenylzinc iodide (1.05 mmol) were used. The product was purified by column chromatography (10%→15% ethyl acetate/hexanes). White solid. First run: 145 mg (82%, 99% ee). Second run: 148 mg (84%, 99% ee).

The ee was determined by HPLC on a CHIRALPAK AD-H column (4% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 16.7 min (minor), 25.8 min (major).

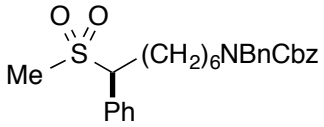
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.43–7.36 (m, 5H), 3.87 (d, 1H, *J* = 7.9 Hz), 2.53–2.45 (m, 1H), 2.46 (s, 3H), 2.29–2.24 (m, 1H), 1.80–1.74 (m, 1H), 1.67–1.56 (m, 3H), 1.42–1.33 (m, 1H), 1.28–1.18 (m, 2H), 1.14–1.05 (m, 1H), 0.93–0.85 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 133.9, 129.8, 129.2, 129.1, 75.9, 41.4, 38.1, 32.4, 30.6, 26.11, 26.06, 26.0.

FT-IR (neat) 3004, 2930, 2853, 1496, 1454, 1413, 1378, 1348, 1319, 1302, 1292, 1244, 1221, 1170, 1127, 1076, 1036, 970, 896, 854, 804, 742 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{14}H_{20}NaO_2S$: 275, found: 275.

$[\alpha]^{25}_D$ = −40° (c = 1.06, $CHCl_3$).



Benzyl (*S*)-benzyl(7-(methylsulfonyl)-7-phenylheptyl)carbamate (Table 3, Entry 3). Benzyl benzyl(7-bromo-7-(methylsulfonyl)heptyl)carbamate (199 mg, 0.400 mmol) and phenylzinc iodide (0.520 mmol) were used. The product was purified by column chromatography on silica gel (25% ethyl acetate/hexanes) and then preparative HPLC on C-18 silica gel (80%→100% acetonitrile/water; water was doped with 0.1% AcOH). Viscous colorless oil. First run: 149 mg (75%, 89% ee). Second run: 145 mg (73%, 91% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (20% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 31.5 min (major), 40.0 min (minor).

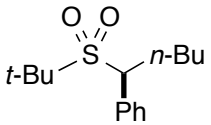
^{1}H NMR (500 MHz, CD_2Cl_2) δ 7.44–7.17 (m, 15H), 5.14–5.12 (m, 2H), 4.45 (s, 2H), 4.01–3.95 (m, 1H), 3.22–3.15 (m, 2H), 2.59 (s, 3H), 2.35–2.23 (br m, 1H), 2.12–1.99 (br m, 1H), 1.48–1.40 (br m, 2H), 1.35–1.09 (br m, 6H).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 156.9, 156.3, 138.7, 137.6, 133.6, 129.9, 129.40, 129.36, 128.8, 128.7, 128.2, 128.01, 127.95, 127.5, 70.3, 67.3, 50.8, 50.4, 47.4, 46.7, 38.9, 29.2, 28.4, 27.9, 27.4, 26.9, 26.8.

FT-IR (neat) 3088, 3063, 3031, 3007, 2931, 2858, 1697, 1605, 1586, 1496, 1468, 1454, 1422, 1366, 1305, 1232, 1137, 1086, 1071, 1029, 1002, 954, 916, 801 cm^{-1}.

MS (ESI) *m*/*z* (M^++H) calcd for $C_{29}H_{36}NO_4S$: 494, found: 494.

$[\alpha]^{25}_D$ = −0.037° (c = 4.1, $CHCl_3$).



(*S*)-(1-(*tert*-Butylsulfonyl)pentyl)benzene(Table 3, Entry 4). 1-Bromo-1-(*tert*-butylsulfonyl)pentane (190 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (15% ethyl acetate/hexanes). White solid. First run: 179 mg (95%, 99% ee). Second run: 182 mg (97%, 98% ee).

The ee was determined by HPLC on a CHIRALPAK IB-3 column (1% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 8.4 min (major), 9.9 min (minor).

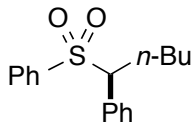
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.47–7.45 (m, 2H), 7.39–7.32 (m, 3H), 4.14 (dd, 1H, *J* = 11.6, 3.3 Hz), 2.47 (dddd, 1H, *J* = 13.6, 10.6, 6.2, 3.3 Hz), 2.06 (dddd, 1H, *J* = 13.4, 11.6, 10.2, 4.9 Hz), 1.40–1.30 (m, 1H), 1.29–1.21 (m, 1H), 1.16 (s, 9H), 1.15–1.01 (m, 2H), 0.82 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 134.9, 129.6, 129.0, 128.9, 65.3, 62.1, 28.9, 28.7, 24.4, 22.4, 13.9.

FT-IR (neat) 3032, 2986, 2954, 2872, 1497, 1466, 1455, 1366, 1279, 1190, 1115, 1100, 782 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{15}H_{24}NaO_2S$: 291, found: 291.

$[\alpha]^{25}_D$ = −20.3° (c = 1.01, $CHCl_3$).



(*S*)-((1-Phenylpentyl)sulfonyl)benzene (Table 3, Entry 5). ((1-Bromopentyl)sulfonyl)benzene (204 mg, 0.700 mmol) and phenylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (10%→20% Et_2O/hexanes). White solid. First run: 195 mg (97%, 86% ee). Second run: 193 mg (96%, 83% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (1% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 13.6 min (major), 18.7 min (minor).

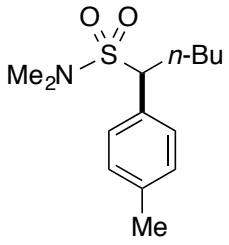
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.54–7.49 (m, 3H), 7.38–7.34 (m, 2H), 7.29–7.26 (m, 1H), 7.24–7.20 (m, 2H), 7.10–7.07 (m, 2H), 4.01 (dd, 1H, *J* = 11.6, 3.6 Hz), 2.46–2.39 (m, 1H), 2.20–2.10 (m, 1H), 1.38–1.23 (m, 2H), 1.22–1.13 (m, 2H), 0.83 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.6, 133.5, 132.6, 130.0, 129.2, 128.8, 128.7, 128.6, 71.8, 29.0, 27.1, 22.4, 13.9.

FT-IR (neat) 2952, 2926, 2857, 1584, 1496, 1467, 1455, 1447, 1379, 1316, 1304, 1294, 1214, 1147, 1084, 1070, 1037, 1024, 998, 968, 800, 758, 713 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{17}H_{20}NaO_2S$: 311, found: 311.

$[\alpha]^{25}_D = -78°$ (c = 1.08, $CHCl_3$).



(*S*)-*N*,*N*-Dimethyl-1-(*p*-tolyl)pentane-1-sulfonamide (Table 4, Entry 1). 1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and *p*-tolylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (20% Et_2O/hexanes). Light-yellow oil. First run: 172 mg (91%, 96% ee). Second run: 165 mg (87%, 95% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (2% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 8.1 min (major), 10.1 min (minor).

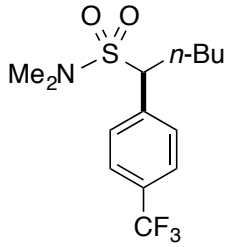
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30–7.27 (m, 2H), 7.19–7.17 (m, 2H), 4.05 (dd, 1H, *J* = 11.3, 3.8 Hz), 2.54 (s, 6H), 2.36 (s, 3H), 2.29 (dddd, 1H, *J* = 13.7, 10.1, 6.4, 3.8 Hz), 2.12 (dddd, 1H, *J* = 13.5, 11.4, 9.7, 5.3 Hz), 1.38–1.22 (m, 2H), 1.22–1.09 (m, 2H), 0.83 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 138.8, 130.8, 129.6, 129.5, 67.4, 37.8, 29.6, 28.9, 22.4, 21.3, 13.9.

FT-IR (neat) 3025, 2956, 2932, 2872, 2811, 1515, 1479, 1457, 1413, 1380, 1331, 1283, 1204, 1141, 1107, 1062, 1022, 968, 843, 832, 716 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{14}H_{23}NNaO_2S$: 292, found: 292.

$[\alpha]^{25}_D = -30°$ (c = 0.99, $CHCl_3$).



(*S*)-*N*,*N*-Dimethyl-1-(4-(trifluoromethyl)phenyl)pentane-1-sulfonamide (Table 4, Entry 2). An oven-dried 8-mL vial equipped with a magnetic stir bar was capped with a PTFE-lined septum cap, cooled under vacuum, and filled with nitrogen. 4-Iodobenzotrifluoride (248 mg,

0.910 mmol) and THF (1.35 mL) were added to the vial, followed by the dropwise addition over 1 min of *i*-PrMgCl (1.92 M in THF; 0.474 mL, 0.910 mmol), and the resulting mixture was stirred at r.t. for 1 h. An oven-dried 4-mL vial equipped with a magnetic stir bar was capped with a PTFE-lined septum cap, cooled under vacuum, and filled with nitrogen. ZnI_2 (290 mg, 0.910 mmol) was added into the vial. The vial was immediately evacuated and refilled with nitrogen (three cycles), and then THF (1.82 mL) was added to the vial. The solution of ZnI_2 was transferred by syringe to the Grignard reagent, and then the reaction mixture was stirred at r.t. for 30 min.

1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and (4-(trifluoromethyl)phenyl)zinc iodide (0.910 mmol) were used. The product was purified by column chromatography (20% Et_2O/hexanes). Light-yellow solid. First run: 209 mg (92%, 98% ee). Second run: 216 mg (95%, 98% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (3% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 8.8 min (major), 12.0 min (minor).

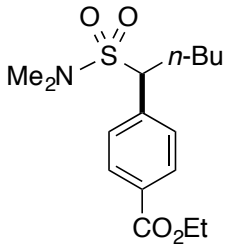
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65 (d, 2H, J = 8.2 Hz), 7.55 (d, 2H, J = 8.2 Hz), 4.14 (dd, 1H, J = 11.4, 3.8 Hz), 2.58 (s, 6H), 2.32 (dddd, 1H, J = 13.9, 10.3, 6.3, 3.9 Hz), 2.14 (dddd, 1H, J = 13.7, 11.4, 10.1, 4.9 Hz), 1.38–1.24 (m, 2H), 1.22–1.06 (m, 2H), 0.84 (t, 3H, J = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 138.2 (d, J_{CF} = 1.3 Hz), 131.1 (q, J_{CF} = 32.7 Hz), 130.0, 125.8 (q, J_{CF} = 3.7 Hz), 123.6 (q, J_{CF} = 272.2 Hz), 67.3, 37.8, 29.6, 28.8, 22.3, 13.8.

FT-IR (neat) 2958, 2875, 1325, 1167, 1122, 1069, 1019, 968, 856, 727 cm^{-1}.

MS (ESI) m/z (M^++Na) calcd for $C_{14}H_{20}F_3NNaO_2S$: 346, found: 346.

$[\alpha]^{25}_D$ = −23.3° (c = 1.02, $CHCl_3$).



Ethyl (*S*)-4-(1-(*N*,*N*-dimethylsulfamoyl)pentyl)benzoate (Table 4, Entry 3). An oven-dried 8-mL vial equipped with a magnetic stir bar was capped with a PTFE-lined septum cap, cooled under vacuum, and then filled with nitrogen. Ethyl 4-iodobenzoate (251 mg, 0.910 mmol) was added to the vial, and then the vial was evacuated and refilled with nitrogen (three cycles). Next, THF (1.31 mL) was added to the vial, and the vial was wrapped with electrical tape and fitted with a nitrogen-filled balloon. Then, the reaction mixture was cooled to –20 °C. *i*-PrMgCl (1.78 M in THF; 0.511 mL, 0.910 mmol) was added over 1 min, and the mixture was stirred at –20 °C for 2 h. An oven-dried 4-mL vial equipped with a magnetic stir bar was capped with a PTFE-lined septum cap, cooled under vacuum, and filled with nitrogen. ZnI_2 (291 mg, 0.910 mmol) was added to the vial. The vial was immediately placed under vacuum and then filled with nitrogen. This evacuation-refill cycle was repeated three times, and then THF (1.82 mL) was added to the vial. The solution of ZnI_2 was transferred by syringe to the Grignard reagent,

and then the reaction mixture was stirred at –20 °C for 30 min. The reaction mixture was allowed to warm to r.t. and stirred for an additional 30 min.

1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and (4-(ethoxycarbonyl)phenyl)zinc iodide (0.910 mmol) were used. The product was purified by column chromatography (20% ethyl acetate/hexanes). Colorless oil. First run: 229 mg (>99%, 97% ee). Second run: 229 mg (>99%, 97% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (5% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 8.7 min (major), 11.4 min (minor).

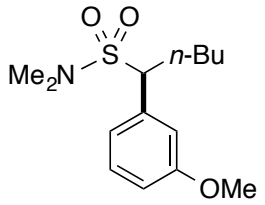
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.07–8.05 (m, 2H), 7.50–7.48 (m, 2H), 4.38 (q, 2H, *J* = 7.1 Hz), 4.14 (dd, 1H, *J* = 11.3, 3.8 Hz), 2.55 (s, 6H), 2.32 (dddd, 1H, *J* = 14.0, 10.2, 6.2, 3.8 Hz), 2.16 (dddd, 1H, *J* = 13.6, 11.3, 10.0, 4.8 Hz), 1.40 (t, 3H, *J* = 7.1 Hz), 1.37–1.21 (m, 2H), 1.21–1.05 (m, 2H), 0.82 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 166.2, 139.0, 131.1, 130.0, 129.6, 67.5, 61.4, 37.9, 29.6, 28.9, 22.4, 14.5, 13.9.

FT-IR (neat) 2956, 2934, 2872, 2813, 1718, 1611, 1576, 1507, 1477, 1457, 1417, 1367, 1334, 1278, 1182, 1143, 1110, 1063, 1021, 968, 867, 799, 776, 753, 712 cm^{-1}.

MS (ESI) *m*/*z* (M^+ – SO_2NMe_2) calcd for $C_{14}H_{19}O_2$: 219, found: 219.

$[\alpha]^{25}_D$ = −36° (c = 1.00, $CHCl_3$).



(*S*)-1-(3-Methoxyphenyl)-*N*,*N*-dimethylpentane-1-sulfonamide (Table 4, Entry 4). 1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and (3-methoxyphenyl)zinc iodide (0.910 mmol) were used. The product was purified by column chromatography (15% ethyl acetate/hexanes). White solid. First run: 175 mg (88%, 95% ee). Second run: 174 mg (87%, 96% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (3% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 10.5 min (major), 12.9 min (minor).

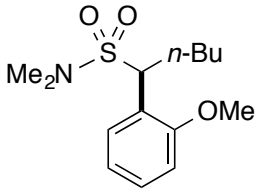
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30–7.27 (m, 1H), 6.99–6.97 (m, 2H), 6.90–6.88 (m, 1H), 4.05 (dd, 1H, *J* = 11.3, 3.8 Hz), 3.82 (s, 3H), 2.56 (s, 6H), 2.29 (dddd, 1H, *J* = 13.6, 10.2, 6.6, 3.8 Hz), 2.12 (dddd, 1H, *J* = 13.5, 11.3, 9.8, 5.2 Hz), 1.38–1.23 (m, 2H), 1.23–1.10 (m, 2H), 0.84 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 159.9, 135.4, 129.8, 122.0, 115.2, 114.2, 67.6, 55.5, 37.8, 29.7, 28.9, 22.4, 13.9.

FT-IR (neat) 3002, 2956, 2873, 2839, 1601, 1585, 1489, 1456, 1438, 1380, 1330, 1262, 1204, 1142, 1111, 1049, 968, 888, 806 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{14}H_{23}NNaO_3S$: 308, found: 308.

$[\alpha]^{25}_D$ = −28° (c = 1.00, $CHCl_3$).



(*S*)-1-(2-Methoxyphenyl)-*N*,*N*-dimethylpentane-1-sulfonamide (Table 4, Entry 5). 1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and (2-methoxyphenyl)zinc iodide (1.05 mmol) were used. The product was purified by column chromatography on silica gel (10%→15% ethyl acetate/hexanes) and then on C-18 silica gel (10%→100% acetonitrile/water). Light-yellow oil. First run: 125 mg (63%, 96% ee). Second run: 128 mg (64%, 96% ee).

The ee was determined by HPLC on a CHIRALPAK AS-H column (5% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 16.6 min (major), 19.3 min (minor).

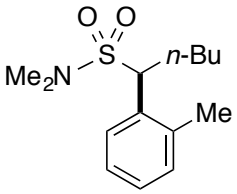
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.59 (dd, 1H, *J* = 7.8, 1.7 Hz), 7.30 (ddd, 1H, *J* = 8.2, 7.4, 1.7 Hz), 7.00 (ddd, 1H, *J* = 7.6, 7.6, 1.1 Hz), 6.91 (dd, 1H, *J* = 8.3, 1.1 Hz), 4.87 (dd, 1H, *J* = 11.4, 3.9 Hz), 3.87 (s, 3H), 2.51 (s, 6H), 2.32 (dddd, 1H, *J* = 13.7, 10.2, 6.4, 3.9 Hz), 2.13–2.05 (m, 1H), 1.36–1.22 (m, 2H), 1.22–1.07 (m, 2H), 0.83 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.7, 129.7, 129.6, 122.2, 121.1, 110.5, 57.3, 55.8, 37.6, 29.7, 28.6, 22.4, 13.9.

FT-IR (neat) 3070, 3005, 2957, 2873, 1601, 1587, 1494, 1463, 1442, 1380, 1330, 1290, 1247, 1202, 1142, 1124, 1090, 1052, 1026, 967, 796, 756, 726 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{14}H_{23}NNaO_3S$: 308, found: 308.

$[\alpha]^{25}_D$ = +40° (c = 1.03, $CHCl_3$).



(*S*)-*N*,*N*-Dimethyl-1-(*o*-tolyl)pentane-1-sulfonamide (Table 4, Entry 6). 1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and *o*-tolylzinc iodide (1.05 mmol) were used. The product was purified by column chromatography (5%→10% ethyl acetate/hexanes). Light-yellow oil. First run: 148 mg (78%, 97% ee). Second run: 149 mg (79%, 97% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (2% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 9.8 min (major), 11.9 min (minor).

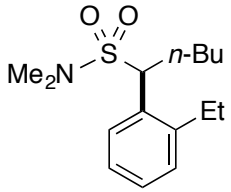
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62–7.58 (m, 1H), 7.25–7.19 (m, 3H), 4.43 (dd, 1H, *J* = 11.3, 3.8 Hz), 2.60 (s, 6H), 2.39 (s, 3H), 2.33 (dddd, 1H, *J* = 13.6, 10.1, 6.1, 3.8 Hz), 2.16–2.08 (m, 1H), 1.37–1.22 (m, 2H), 1.21–1.06 (m, 2H), 0.83 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.4, 132.3, 130.7, 128.4, 128.3, 126.6, 63.2, 38.0, 30.7, 28.7, 22.6, 20.1, 13.9.

FT-IR (neat) 3064, 3023, 2957, 2872, 2813, 1604, 1493, 1461, 1380, 1329, 1283, 1203, 1178, 1141, 1119, 1063, 967, 834, 802 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{14}H_{23}NNaO_2S$: 292, found: 292.

$[\alpha]^{25}_D$ = +7.9° (c = 1.05, $CHCl_3$).



(*S*)-1-(2-Ethylphenyl)-*N*,*N*-dimethylpentane-1-sulfonamide (Table 4, Entry 7). 1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol), (2-ethylphenyl)zinc iodide (1.40 mmol), $NiCl_2$•glyme (30.8 mg, 0.140 mmol), and (*R*,*R*)–**L1** (60.9 mg, 0.182 mmol) were used. The product was purified by column chromatography (first purification: 10% ethyl acetate/hexanes; second purification: 15%→90% dichloromethane/hexanes). Light-yellow oil. First run: 178 mg (90%, 97% ee). Second run: 165 mg (83%, 97% ee).

The ee was determined by HPLC on a CHIRALPAK IC column (15% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 16.9 min (minor), 22.7 min (major).

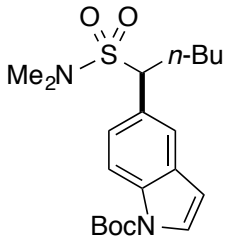
^{1}H NMR (500 MHz, CD_2Cl_2) δ 7.57–7.54 (m, 1H), 7.30–7.22 (m, 3H), 4.46 (dd, 1H, *J* = 11.1, 4.0 Hz), 2.79 (dq, 1H, *J* = 14.9, 7.5 Hz), 2.68 (dq, 1H, *J* = 15.2, 7.6 Hz), 2.62 (s, 6H), 2.29–2.22 (m, 1H), 2.15–2.07 (m, 1H), 1.39–1.24 (m, 2H), 1.22 (t, 3H, *J* = 7.6 Hz), 1.24–1.15 (m, 1H), 1.13–1.04 (m, 1H), 0.84 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 144.1, 131.9, 129.2, 128.7, 128.5, 126.5, 62.8, 38.0, 30.8, 29.3, 26.0, 23.0, 15.7, 13.9.

FT-IR (neat) 3063, 3021, 2959, 2933, 2873, 2813, 1490, 1455, 1378, 1330, 1282, 1201, 1177, 1141, 1120, 1062, 968, 803, 760 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{15}H_{25}NNaO_2S$: 306, found: 306.

$[\alpha]^{25}_D$ = +8.9° (c = 1.03, $CHCl_3$).



***tert*-Butyl (*S*)-5-(1-(*N*,*N*-dimethylsulfamoyl)pentyl)-1*H*-indole-1-carboxylate (Table 4, Entry 8).** An oven-dried 8-mL vial equipped with a magnetic stir bar was capped with a PTFE-lined septum cap, cooled under vacuum, and filled with nitrogen. *tert*-Butyl 5-iodo-1*H*-indole-1-carboxylate (360 mg, 1.05 mmol) was added to the vial, and then the vial was evacuated and refilled with nitrogen (three cycles). THF (1.56 mL) was added to the vial, and the vial was

wrapped with electrical tape and fitted with a nitrogen-filled balloon. Then, the reaction mixture was cooled to –20 °C. *i*-PrMgCl (1.93 M in THF; 0.544 mL, 1.05 mmol) was added over 1 min, and the mixture was stirred at –20 °C for 2 h. An oven-dried 4-mL vial equipped with a magnetic stir bar was capped with a PTFE-lined septum cap, cooled under vacuum, and filled with nitrogen. ZnI_2 (338 mg, 1.06 mmol) was added to the vial. The vial was immediately placed under vacuum and then filled with nitrogen. This evacuation-refill cycle was repeated three times, and then THF (2.10 mL) was added to the vial. The solution of ZnI_2 was transferred by syringe to the Grignard reagent, and then the reaction mixture was stirred at –20 °C for 30 min. The reaction mixture was allowed to warm to r.t. and stirred for an additional 30 min.

1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (181 mg, 0.700 mmol) and (1-(*tert*-butoxycarbonyl)-1*H*-indol-5-yl)zinc iodide (1.05 mmol) were used. The product was purified by column chromatography on silica gel (10%→15% ethyl acetate/hexanes) and then on C-18 silica gel (10%→100% acetonitrile/water). Yellow solid. First run: 180 mg (65%, 88% ee). Second run: 200 mg (72%, 90% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (2% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 11.7 min (major), 15.4 min (minor).

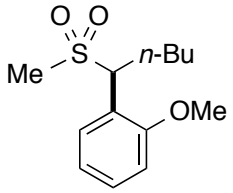
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.14 (d, 1H, *J* = 8.5 Hz), 7.63–7.62 (m, 2H), 7.33 (dd, 1H, *J* = 8.6, 1.8 Hz), 6.58 (dd, 1H, *J* = 3.7, 0.8 Hz), 4.18 (dd, 1H, *J* = 11.4, 3.8 Hz), 2.51 (s, 6H), 2.36 (dddd, 1H, *J* = 13.7, 10.2, 6.4, 3.8 Hz), 2.20 (dddd, 1H, *J* = 13.6, 11.4, 10.0, 5.0 Hz), 1.68 (s, 9H), 1.38–1.23 (m, 2H), 1.22–1.08 (m, 2H), 0.82 (t, 3H, *J* = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 149.7, 135.4, 130.9, 128.0, 126.9, 125.7, 121.9, 115.4, 107.4, 84.2, 67.6, 37.9, 29.9, 28.9, 28.3, 22.4, 13.9.

FT-IR (neat) 3152, 3120, 2956, 2934, 2873, 1736, 1536, 1470, 1445, 1374, 1351, 1329, 1256, 1218, 1193, 1164, 1138, 1107, 1084, 1042, 1024, 968, 841, 768, 729 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{20}H_{30}N_2NaO_4S$: 417, found: 417.

$[\alpha]^{25}_D$ = −23.7° (c = 1.04, $CHCl_3$).



(*S*)-1-Methoxy-2-(1-(methylsulfonyl)pentyl)benzene (Table 4, Entry 9). 1-Bromo-1-(methylsulfonyl)pentane (160 mg, 0.700 mmol) and (2-methoxyphenyl)zinc iodide (0.910 mmol) were used. The product was purified by column chromatography (20%→25% ethyl acetate/hexanes). Colorless oil. First run: 148 mg (82%, 96% ee). Second run: 154 mg (86%, 96% ee).

The ee was determined by HPLC on a CHIRALCEL OD-H column (5% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 17.6 min (minor), 18.9 min (major).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.52 (dd, 1H, *J* = 7.8, 1.7 Hz), 7.34 (ddd, 1H, *J* = 8.3, 7.4, 1.7 Hz), 7.04 (ddd, 1H, *J* = 7.6, 7.6, 1.1 Hz), 6.93 (dd, 1H, *J* = 8.3, 1.1 Hz), 4.81 (dd, 1H, *J* = 11.5, 3.9 Hz),

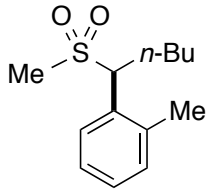
3.87 (s, 3H), 2.58 (s, 3H), 2.40 (dddd, 1H, J = 13.5, 9.6, 6.9, 3.9 Hz), 2.05 (dddd, 1H, J = 13.5, 11.5, 9.4, 5.3 Hz), 1.38–1.24 (m, 2H), 1.23–1.12 (m, 2H), 0.84 (t, 3H, J = 7.3 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.6, 130.1, 129.2, 121.7, 121.6, 110.9, 60.4, 55.9, 38.6, 28.7, 25.9, 22.4, 13.9.

FT-IR (neat) 3009, 2957, 2872, 1601, 1587, 1494, 1464, 1440, 1412, 1380, 1296, 1247, 1192, 1164, 1137, 1090, 1051, 1025, 956, 792, 755 cm^{-1}.

MS (ESI) m/z (M^++Na) calcd for $C_{13}H_{20}NaO_3S$: 279, found: 279.

$[\alpha]^{25}_D$ = +61° (c = 1.00, $CHCl_3$).



(*S*)-1-Methyl-2-(1-(methylsulfonyl)pentyl)benzene (Table 4, Entry 10). 1-Bromo-1-(methylsulfonyl)pentane (160 mg, 0.700 mmol) and *o*-tolylzinc iodide (0.910 mmol) were used. The product was purified by column chromatography (15%→20% ethyl acetate/hexanes). Colorless oil. First run: 137 mg (81%, 97% ee). Second run: 134 mg (80%, 97% ee).

The ee was determined by HPLC on a CHIRALPAK AS-H column (10% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 18.4 min (minor), 28.0 min (major).

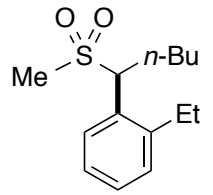
^{1}H NMR (500 MHz, CD_2Cl_2) δ 7.52–7.50 (m, 1H), 7.30–7.23 (m, 3H), 4.37 (dd, 1H, J = 11.4, 3.7 Hz), 2.61 (s, 3H), 2.40 (s, 3H), 2.37–2.31 (m, 1H), 2.12–2.04 (m, 1H), 1.40–1.24 (m, 2H), 1.24–1.10 (m, 2H), 0.84 (t, 3H, J = 7.3 Hz).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 138.4, 132.0, 131.2, 129.0, 127.9, 127.1, 65.0, 38.7, 29.1, 28.5, 22.8, 20.3, 13.9.

FT-IR (neat) 3025, 2957, 2931, 2872, 1493, 1464, 1411, 1380, 1294, 1224, 1208, 1177, 1138, 1113, 1051, 958, 825, 796, 771, 736 cm^{-1}.

MS (ESI) m/z (M^++Na) calcd for $C_{13}H_{20}NaO_2S$: 263, found: 263.

$[\alpha]^{25}_D$ = +24.2° (c = 0.99, $CHCl_3$).



(*S*)-1-Ethyl-2-(1-(methylsulfonyl)pentyl)benzene (Table 4, Entry 11). 1-Bromo-1-(methylsulfonyl)pentane (160 mg, 0.700 mmol), (2-ethylphenyl)zinc iodide (1.40 mmol), $NiCl_2$•glyme (30.8 mg, 0.140 mmol), and (*R*,*R*)–**L1** (60.9 mg, 0.182 mmol) were used. The product was purified by column chromatography (15% ethyl acetate/hexanes). Light-yellow oil. First run: 145 mg (81%, 98% ee). Second run: 146 mg (82%, 98% ee).

The ee was determined by HPLC on a CHIRALPAK AS-H column (10% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 13.1 min (minor), 22.1 min (major).

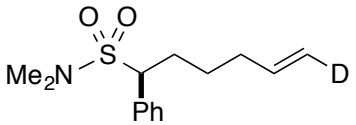
^{1}H NMR (500 MHz, CD_2Cl_2) δ 7.52–7.51 (m, 1H), 7.34–7.26 (m, 3H), 4.41 (dd, 1H, *J* = 11.2, 3.9 Hz), 2.82–2.75 (m, 1H), 2.73–2.66 (m, 1H), 2.62 (s, 3H), 2.35 (dddd, 1H, *J* = 13.5, 11.0, 5.7, 3.8 Hz), 2.12–2.04 (m, 1H), 1.41–1.20 (m, 3H), 1.23 (t, 3H, *J* = 7.6 Hz), 1.19–1.09 (m, 1H), 0.85 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 144.4, 131.2, 129.6, 129.1, 127.9, 126.9, 64.5, 38.8, 29.3, 28.7, 26.2, 23.0, 15.7, 13.9.

FT-IR (neat) 3063, 3026, 2960, 2932, 2873, 1491, 1453, 1411, 1379, 1294, 1218, 1176, 1138, 1113, 1061, 958, 831, 797, 757 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{14}H_{22}NaO_2S$: 277, found: 277.

$[\alpha]^{25}_D$ = +24.1° (c = 1.01, $CHCl_3$).



(*S*,*E*)-*N*,*N*-Dimethyl-1-phenylhex-5-ene-1-sulfonamide-6-*d* (eq 3). White solid.

The ee was determined by HPLC on a CHIRALCEL OD-H column (1% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 13.9 min (major), 17.4 min (minor).

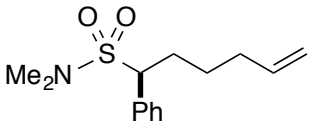
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42–7.34 (m, 5H), 5.70 (dt, 1H, *J* = 17.0, 6.5 Hz), 4.95 (dt, 1H, *J* = 17.1, 1.6 Hz), 4.09 (dd, 1H, *J* = 11.2, 3.9 Hz), 2.53 (s, 6H), 2.32 (dddd, 1H, *J* = 13.9, 10.3, 6.4, 3.9 Hz), 2.20–2.12 (m, 1H), 2.10–1.98 (m, 2H), 1.36–1.22 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.8, 134.0, 129.6, 129.0, 128.9, 115.0 (t, *J* = 24 Hz), 67.8, 37.8, 33.3, 29.5, 26.2.

FT-IR (neat) 3088, 3065, 3024, 2926, 2860, 2822, 2261, 1623, 1496, 1480, 1456, 1436, 1326, 1292, 1256, 1200, 1140, 1064, 1043, 984, 970, 917, 906, 822, 799, 778, 745 cm^{-1}.

MS (EI) *m*/*z* ($M^+-SO_2NMe_2$) calcd for $C_{12}H_{14}D$: 160, found: 160.

$[\alpha]^{25}_D$ = −34° (c = 0.99, $CHCl_3$); 96% ee.



(*S*)-*N*,*N*-Dimethyl-1-phenylhex-5-ene-1-sulfonamide (Figure 1). White solid.

The ee was determined by HPLC on a CHIRALCEL OD-H column (1% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 14.1 min (major), 17.8 min (minor).

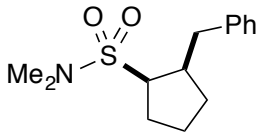
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42–7.34 (m, 5H), 5.70 (ddt, 1H, *J* = 17.0, 10.3, 6.7 Hz), 4.98–4.92 (m, 2H), 4.09 (dd, 1H, *J* = 11.2, 3.9 Hz), 2.53 (s, 6H), 2.32 (dddd, 1H, *J* = 14.1, 10.3, 6.3, 3.9 Hz), 2.20–2.12 (m, 1H), 2.10–1.98 (m, 2H), 1.36–1.22 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 138.0, 134.0, 129.6, 129.0, 128.9, 115.3, 67.8, 37.8, 33.4, 29.5, 26.2.

FT-IR (neat) 3067, 3033, 2934, 2908, 2868, 2821, 1640, 1497, 1480, 1455, 1417, 1329, 1282, 1199, 1141, 1063, 1043, 993, 966, 916, 906, 870, 814, 781, 746, 735 cm^{-1}.

MS (EI) *m*/*z* ($M^+ - SO_2NMe_2$) calcd for $C_{12}H_{15}$: 159, found: 159.

$[\alpha]^{25}_D = -33°$ (c = 0.82, $CHCl_3$); 97% ee.



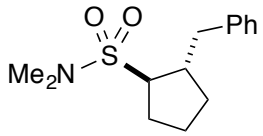
***syn*-2-Benzyl-*N*,*N*-dimethylcyclopentane-1-sulfonamide (Figure 1).** White solid.

^1H NMR (500 MHz, CD_2Cl_2) δ 7.30–7.26 (m, 2H), 7.20–7.16 (m, 3H), 3.54 (ddd, 1H, *J* = 8.7, 8.7, 6.3 Hz), 3.31–3.25 (m, 1H), 2.89 (s, 6H), 2.60–2.52 (m, 2H), 2.15–2.07 (m, 1H), 2.04–1.97 (m, 1H), 1.95–1.87 (m, 1H), 1.66–1.44 (m, 3H).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 141.8, 129.4, 128.6, 126.2, 62.8, 44.7, 37.8, 35.7, 29.7, 26.8, 22.7.

FT-IR (neat) 3084, 3060, 3024, 2922, 2874, 2850, 2806, 1602, 1583, 1495, 1473, 1452, 1332, 1273, 1195, 1136, 1073, 1058, 1029, 958, 845, 822, 727 cm^{-1}.

MS (EI) *m*/*z* (M^+) calcd for $C_{14}H_{21}NO_2S$: 267, found: 267.



***anti*-2-Benzyl-*N*,*N*-dimethylcyclopentane-1-sulfonamide (Figure 1).** Colorless oil.

^1H NMR (500 MHz, CD_2Cl_2) δ 7.32–7.28 (m, 2H), 7.22–7.19 (m, 3H), 3.20 (ddd, 1H, *J* = 8.9, 6.1, 6.1 Hz), 2.97 (dd, 1H, *J* = 12.6, 4.9 Hz), 2.78 (s, 6H), 2.65–2.53 (m, 2H), 2.08–1.95 (m, 2H), 1.82–1.74 (m, 1H), 1.73–1.61 (m, 2H), 1.42–1.35 (m, 1H).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 140.7, 129.6, 128.7, 126.5, 64.5, 43.6, 41.3, 37.8, 32.1, 28.5, 24.9.

FT-IR (neat) 3084, 3060, 3025, 2917, 2849, 1602, 1583, 1494, 1461, 1453, 1435, 1315, 1199, 1136, 1082, 1059, 1029, 960, 882, 849, 733 cm^{-1}.

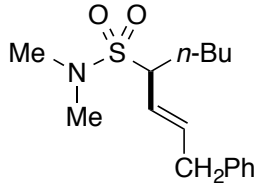
MS (EI) *m*/*z* (M^+) calcd for $C_{14}H_{21}NO_2S$: 267, found: 267.

IV. Enantioselective Alkenylations

General Procedure. Cp_2ZrHCl (Schwartz's reagent; 258 mg, 1.00 mmol) was added to an oven-dried 4-mL vial equipped with a magnetic stir bar, and then the vial was capped with a PTFE-lined septum cap. The vial was evacuated and refilled with nitrogen (three cycles). 1,2-Dimethoxyethane (1.00 ml) was added to the vial, followed by the alkyne (1.00 mmol). The reaction mixture was stirred at r.t. for 1.5 h, at which time it had become homogenous. An oven-dried 20-mL vial equipped with a magnetic stir bar was charged with $NiCl_2$•glyme (11.0 mg, 0.050 mmol), (3*R*,8*S*)–**L6** (23.3 mg, 0.065 mmol), and the electrophile (0.500 mmol). The vial

was sealed with a PTFE-lined septum cap, placed under vacuum, and then filled with nitrogen. This evacuation-refill cycle was repeated three times. 1,2-Dimethoxyethane (2.57 mL) was added, and the mixture was stirred at r.t. for 1 h. The solution of the nucleophile was transferred by syringe over 2 min to the vial that contained the electrophile. The reaction mixture was stirred at r.t. for 24 h, and then the reaction was quenched by the addition of ethanol (0.50 mL). The solution was filtered through a pad of silica (eluted with Et_2O). The filtrate was concentrated, and the resulting residue was purified by column chromatography.

A second run was conducted with (3*S*,8*R*)–**L6**.



(*S*,*E*)-*N*,*N*-Dimethyl-1-phenyloct-2-ene-4-sulfonamide (Table 5, Entry 1). 1-Bromo-*N*,*N*-dimethylpentane-1-sulfonamide (129 mg, 0.500 mmol) and (*E*)-(3-phenylprop-1-en-1-yl)zirconium reagent (1.00 mmol) were used. The product was purified by column chromatography on silica gel (15% ethyl acetate/hexanes). Colorless oil. First run: 116 mg (79%, 91% ee). Second run: 122 mg (83%, 90% ee).

The ee was determined by HPLC on a CHIRALCEL OJ-H column (5% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 18.2 min (major), 20.9 min (minor).

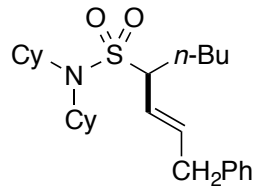
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32–7.28 (m, 2H), 7.24–7.20 (m, 1H), 7.18–7.15 (m, 2H), 5.87 (dddd, 1H, *J* = 15.3, 6.9, 6.9, 0.4 Hz), 5.44 (dddd, 1H, *J* = 15.3, 9.7, 1.5, 1.5 Hz), 3.57 (ddd, 1H, *J* = 10.5, 10.5, 3.5 Hz), 3.49–3.39 (m, 2H), 2.82 (s, 6H), 2.04–1.97 (m, 1H), 1.75–1.68 (m, 1H), 1.41–1.18 (m, 4H), 0.89 (t, 3H, *J* = 7.1 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.3, 136.9, 128.7, 128.6, 126.5, 125.1, 65.8, 39.1, 38.3, 28.8, 28.7, 22.4, 14.0.

FT-IR (neat) 3061, 3027, 2954, 2930, 2871, 1663, 1603, 1494, 1453, 1379, 1329, 1281, 1198, 1139, 1076, 1062, 1029, 966, 804, 747, 730 cm^{-1}.

MS (EI) *m*/*z* (M^+–SO_2NMe_2) calcd for $C_{14}H_{19}$: 187, found: 187.

$[\alpha]^{25}_D$ = +22.9° (c = 1.01, $CHCl_3$).



(*S*,*E*)-*N*,*N*-Dicyclohexyl-1-phenyloct-2-ene-4-sulfonamide (Table 5, Entry 2). 1-Bromo-*N*,*N*-dicyclohexylpentane-1-sulfonamide (197 mg, 0.500 mmol) and (*E*)-(3-phenylprop-1-en-1-yl)zirconium reagent (1.00 mmol) were used. The product was purified by column chromatography on silica gel (5% Et_2O/hexanes) and then on C-18 silica gel (10%→100%

acetonitrile/water). Viscous light-yellow oil. First run: 179 mg (83%, 95% ee). Second run: 180 mg (83%, 94% ee).

The ee was determined by HPLC on a CHIRALPAK AD-H column (1% *i*-PrOH/hexanes, 0.6 mL/min) with t_r = 16.6 min (major), 17.7 min (minor).

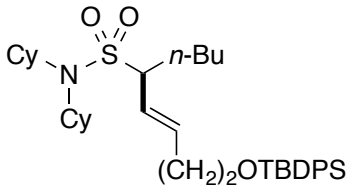
^{1}H NMR (500 MHz, CD_2Cl_2) δ 7.31–7.28 (m, 2H), 7.22–7.17 (m, 3H), 5.80 (dddd, 1H, *J* = 15.3, 7.4, 6.0, 0.4 Hz), 5.42 (dddd, 1H, *J* = 15.4, 9.8, 1.5, 1.5 Hz), 3.48–3.38 (m, 2H), 3.33 (ddd, 1H, *J* = 10.8, 10.0, 3.2 Hz), 3.17–3.10 (m, 2H), 2.04–1.97 (m, 1H), 1.79–1.56 (m, 15H), 1.41–1.16 (m, 8H), 1.08 (qt, 2H, *J* = 13.1, 3.4 Hz), 0.89 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 140.1, 136.6, 128.9, 128.8, 126.6, 126.0, 69.0, 58.4, 39.2, 34.0, 33.1, 29.5, 29.3, 26.99, 26.97, 25.8, 22.7, 14.1.

FT-IR (neat) 3084, 3062, 3027, 2931, 2855, 1603, 1495, 1466, 1453, 1401, 1381, 1322, 1274, 1256, 1188, 1164, 1139, 1108, 1074, 1047, 1028, 981, 895, 854, 823, 750 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{26}H_{41}NNaO_2S$: 454, found: 454.

$[\alpha]^{25}_D$ = −6.9° (c = 1.02, $CHCl_3$).



(*S*,*E*)-1-((*tert*-Butyldiphenylsilyl)oxy)-*N*,*N*-dicyclohexylnon-3-ene-5-sulfonamide (Table 5, Entry 3). 1-Bromo-*N*,*N*-dicyclohexylpentane-1-sulfonamide (197 mg, 0.500 mmol) and (*E*)-(4-((*tert*-butyldiphenylsilyl)oxy)but-1-en-1-yl)zirconium reagent (1.00 mmol) were used. The product was purified by column chromatography on silica gel (3% ethyl acetate/hexanes) and then on C-18 silica gel (10%→100% acetonitrile/water). Viscous light-yellow oil. First run: 254 mg (81%, 95% ee). Second run: 259 mg (83%, 94% ee).

The ee was determined by HPLC on a CHIRALPAK AD-H column (0.5% *i*-PrOH/hexanes, 0.8 mL/min) with t_r = 14.6 min (minor), 17.9 min (major).

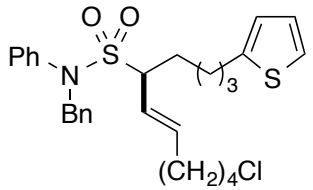
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67–7.64 (m, 4H), 7.45–7.41 (m, 2H), 7.40–7.36 (m, 4H), 5.69 (ddd, 1H, *J* = 15.5, 6.4, 6.4 Hz), 5.42 (dddd, 1H, *J* = 15.5, 9.7, 1.4, 1.4 Hz), 3.75–3.68 (m, 2H), 3.26 (ddd, 1H, *J* = 10.6, 9.5, 3.2 Hz), 3.15–3.09 (m, 2H), 2.39–2.29 (m, 2H), 2.08–2.01 (m, 1H), 1.76–1.57 (m, 14H), 1.39–1.14 (m, 9H), 1.12–1.02 (m, 2H), 1.05 (s, 9H), 0.86 (t, 3H, *J* = 7.2 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 135.7, 135.6, 134.3, 133.9, 133.8, 129.79, 129.78, 127.79, 127.78, 126.10, 69.5, 63.2, 58.2, 36.0, 33.9, 32.8, 29.3, 29.0, 26.9, 26.7, 25.5, 22.5, 19.3, 14.0.

FT-IR (neat) 3071, 3048, 2931, 2856, 1590, 1471, 1453, 1428, 1389, 1323, 1257, 1221, 1188, 1164, 1138, 1110, 1048, 1028, 998, 980, 939, 895, 854, 822, 764, 738 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{37}H_{57}NNaO_3SSi$: 646, found: 646.

$[\alpha]^{25}_D$ = +1.7° (c = 0.99, $CHCl_3$).



(*S*,*E*)-*N*-Benzyl-11-chloro-*N*-phenyl-1-(thiophen-2-yl)undec-6-ene-5-sulfonamide (Table 5, Entry 4). *N*-Benzyl-1-bromo-*N*-phenyl-5-(thiophen-2-yl)pentane-1-sulfonamide (239 mg, 0.500 mmol) and (*E*)-(6-chlorohex-1-en-1-yl)zirconium reagent (1.00 mmol) were used. The product was purified by column chromatography (first purification: 5% ethyl acetate/hexanes; second purification: 15% cyclopentyl methyl ether/hexanes). Viscous light-yellow oil. First run: 165 mg (64%, 80% ee). Second run: 156 mg (60%, 81% ee).

The ee was determined by HPLC on a CHIRALPAK AD-H column (10% *i*-PrOH/hexanes, 0.8 mL/min) with t_r = 17.5 min (major), 23.8 min (minor).

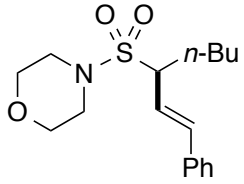
^{1}H NMR (500 MHz, CD_2Cl_2) δ 7.32–7.28 (m, 2H), 7.27–7.19 (m, 8H), 7.12 (dd, 1H, *J* = 5.1, 1.2 Hz), 6.91 (dd, 1H, *J* = 5.1, 3.4 Hz), 6.77 (dddd, 1H, *J* = 3.3, 1.0, 1.0, 1.0 Hz), 5.80 (ddd, 1H, *J* = 15.3, 6.8, 6.8 Hz), 5.46 (dddd, 1H, *J* = 15.4, 9.7, 1.5, 1.5 Hz), 4.99 (d, 1H, *J* = 15.1 Hz), 4.67 (d, 1H, *J* = 15.1 Hz), 3.60–3.55 (m, 1H), 3.58 (t, 2H, *J* = 6.6 Hz), 2.87–2.76 (m, 2H), 2.26–2.13 (m, 2H), 2.04 (dddd, 1H, *J* = 13.6, 9.9, 6.3, 3.4 Hz), 1.86–1.72 (m, 3H), 1.72–1.56 (m, 4H), 1.50–1.41 (m, 1H), 1.32–1.22 (m, 1H).

^{13}C NMR (126 MHz, CD_2Cl_2) δ 145.6, 139.7, 139.0, 137.3, 129.4, 129.3, 128.7, 128.6, 127.9, 127.8, 127.0, 124.5, 124.2, 123.2, 66.7, 56.7, 45.4, 32.5, 32.2, 31.6, 29.9, 29.2, 26.5, 26.2.

FT-IR (neat) 3064, 3032, 2933, 2860, 1595, 1493, 1454, 1337, 1216, 1145, 1093, 1065, 1028, 976, 916, 862, 775 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{28}H_{34}ClNNaO_2S_2$: 538, found: 538.

$[\alpha]^{25}_D$ = −23.0° (c = 1.03, $CHCl_3$).



(*S*,*E*)-4-((1-Phenylhept-1-en-3-yl)sulfonyl)morpholine (Table 5, Entry 5). 4-((1-Bromopentyl)sulfonyl)morpholine (150 mg, 0.500 mmol), and (*E*)-styrylzirconium reagent (1.00 mmol) were used. The product was purified by column chromatography (15% ethyl acetate/hexanes). White solid. First run: 110 mg (68%, 97% ee). Second run: 110 mg (68%, 95% ee).

The ee was determined by HPLC on a CHIRALPAK AS-H column (10% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 18.7 min (minor), 30.1 min (major).

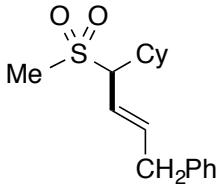
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42–7.39 (m, 2H), 7.38–7.34 (m, 2H), 7.32–7.29 (m, 1H), 6.62 (d, 1H, *J* = 15.9 Hz), 6.06 (dd, 1H, *J* = 15.9, 9.8 Hz), 3.70–3.62 (m, 5H), 3.38–3.30 (m, 4H), 2.17–2.10 (m, 1H), 1.87–1.79 (m, 1H), 1.45–1.22 (m, 4H), 0.90 (t, 3H, *J* = 7.0 Hz).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.0, 135.7, 129.0, 128.7, 126.7, 122.7, 67.1, 67.0, 46.8, 29.0, 28.8, 22.4, 14.0.

FT-IR (neat) 2958, 2923, 2859, 1450, 1339, 1324, 1260, 1148, 1114, 1073, 955, 743 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{17}H_{25}NNaO_3S$: 346, found: 346.

$[\alpha]^{25}_D$ = −82° (c = 0.98, $CHCl_3$).



(*S*,*E*)-(4-Cyclohexyl-4-(methylsulfonyl)but-2-en-1-yl)benzene (Table 5, Entry 6). (Bromo(methylsulfonyl)methyl)cyclohexane (179 mg, 0.700 mmol), (*E*)-(3-phenylprop-1-en-1-yl)zirconium reagent (1.40 mmol), and (*R*,*R*)–**L1** (30.4 mg, 0.091 mmol) were used. The product was purified by column chromatography (15% ethyl acetate/hexanes). Light-yellow oil. First run: 109 mg (53%, 93% ee). Second run: 98 mg (48%, 93% ee).

The ee was determined by HPLC on a CHIRALPAK IB-3 column (5% *i*-PrOH/hexanes, 1.0 mL/min) with t_r = 13.0 min (minor), 22.9 min (major).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33–7.30 (m, 2H), 7.25–7.21 (m, 1H), 7.18–7.16 (m, 2H), 5.89 (ddd, 1H, *J* = 15.2, 6.9, 6.9 Hz), 5.71 (dddd, 1H, *J* = 15.3, 10.4, 1.4, 1.4 Hz), 3.48 (d, 2H, *J* = 6.9 Hz), 3.29 (dd, 1H, *J* = 10.4, 3.8 Hz), 2.76 (s, 3H), 2.32 (tq, 1H, *J* = 11.9, 3.5 Hz), 2.08–2.02 (m, 1H), 1.78–1.72 (m, 2H), 1.70–1.61 (m, 2H), 1.40–1.26 (m, 2H), 1.23–1.07 (m, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.2, 139.0, 128.8, 128.6, 126.6, 122.6, 73.2, 39.8, 39.3, 36.0, 32.2, 28.9, 26.4, 26.1, 26.0.

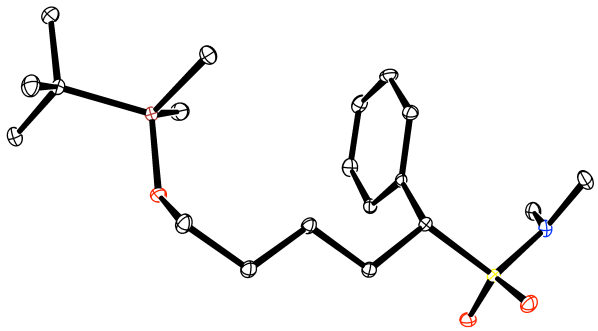
FT-IR (neat) 3083, 3060, 3026, 2927, 2852, 1660, 1602, 1494, 1452, 1411, 1351, 1295, 1240, 1173, 1133, 1077, 1029, 978, 894, 852, 784, 751, 700 cm^{-1}.

MS (ESI) *m*/*z* (M^++Na) calcd for $C_{17}H_{24}NaO_2S$: 315, found: 315.

$[\alpha]^{25}_D$ = +60.8° (c = 1.00, $CHCl_3$).

V. Determination of Absolute Stereochemistry

Product from entry 7 of Table 2 (run with (*S,S*)–L1). (*R*)-5-((*tert*-Butyldimethylsilyl)oxy)-*N,N*-dimethyl-1-phenylpentane-1-sulfonamide. A crystal suitable for X-ray crystallography was grown by vapor diffusion with dichloromethane and pentane.



A suitable crystal of $C_{19}H_{35}NO_3SSi$ was selected for analysis. All measurements were made on a Bruker SMART 1000 CCD with filtered Mo-Kα radiation at a temperature of 100 K. Using Olex2,[6] the structure was solved with the ShelXS[7] structure solution program using Direct Methods and refined with the ShelXL[7] refinement package using Least Squares minimization. The absolute stereochemistry was determined on the basis of the absolute structure parameter.

(6) Dolomanov, O. V.; Bourhis, L. J.; Gildea, R. J.; Howard, J. A. K.; Puschmann, H. *J. Appl. Crystallogr.* **2009**, *42*, 339–341.

(7) Sheldrick, G. M. *Acta Cryst.* **2008**, *A64*, 112–122.

Table S–1. Crystal data and structure refinement for crystal01.

Identification code	crystal01	
Empirical formula	$C_{19}H_{35}NO_3SSi$	
Formula weight	385.63	
Temperature	100 K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	$P2_1$	
Unit cell dimensions	a = 5.9209(6) Å	α = 90°.
	b = 10.6607(12) Å	β = 99.2230(10)°.
	c = 17.0647(19) Å	γ = 90°.
Volume	1063.2(2) $Å^3$	
Z	2	
Density (calculated)	1.205 Mg/m^3	
Absorption coefficient	0.226 mm^{-1}	
F(000)	420	
Crystal size	0.4 x 0.4 x 0.1 mm^3	
Theta range for data collection	1.209 to 29.107°.	
Index ranges	-7<=h<=8, -13<=k<=14, -22<=l<=23	
Reflections collected	16770	
Independent reflections	5160 [R(int) = 0.0236]	
Completeness to theta = 25.000°	100.0 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	1.0000 and 0.9257	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	5160 / 1 / 233	
Goodness-of-fit on F^2	1.098	
Final R indices [I>2sigma(I)]	R1 = 0.0279, wR2 = 0.0669	
R indices (all data)	R1 = 0.0308, wR2 = 0.0690	
Absolute structure parameter	0.02(2)	
Largest diff. peak and hole	0.325 and -0.163 $e/Å^{-3}$	

Table S–2. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters ($Å^2$ x 10^3)
for crystal01. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
S(1)	-4031(1)	5489(1)	517(1)	14(1)
Si(1)	2618(1)	1014(1)	3465(1)	14(1)
O(1)	-3746(3)	5244(1)	-291(1)	20(1)
O(2)	-6212(2)	5232(1)	755(1)	19(1)
O(3)	648(2)	432(2)	2769(1)	19(1)
N(1)	-3503(3)	6967(2)	689(1)	16(1)
C(1)	-4272(4)	7610(2)	1361(1)	20(1)
C(2)	-1459(4)	7506(2)	435(1)	22(1)
C(3)	-1857(3)	4582(2)	1132(1)	12(1)
C(4)	-2416(3)	3172(2)	1032(1)	15(1)
C(5)	-552(3)	2381(2)	1521(1)	16(1)
C(6)	-952(4)	967(2)	1416(1)	18(1)
C(7)	820(4)	204(2)	1957(1)	21(1)
C(8)	-1531(3)	5030(2)	1983(1)	12(1)
C(9)	508(3)	5621(2)	2311(1)	17(1)
C(10)	842(3)	6027(2)	3095(1)	21(1)
C(11)	-835(4)	5849(2)	3558(1)	21(1)
C(12)	-2858(4)	5251(2)	3243(1)	20(1)
C(13)	-3211(3)	4849(2)	2456(1)	16(1)
C(14)	1116(4)	2120(2)	4054(1)	24(1)
C(15)	4837(4)	1893(2)	3029(1)	27(1)
C(16)	3960(3)	-312(2)	4110(1)	15(1)
C(17)	5647(4)	216(2)	4811(1)	23(1)
C(18)	2103(4)	-1074(2)	4431(1)	22(1)
C(19)	5248(4)	-1178(2)	3614(1)	24(1)

Table S–3. Bond lengths [Å] and angles [°] for crystal01.

S(1)-O(1)	1.4394(15)
S(1)-O(2)	1.4405(15)
S(1)-N(1)	1.6247(18)
S(1)-C(3)	1.8048(19)
Si(1)-O(3)	1.6471(14)
Si(1)-C(14)	1.865(2)
Si(1)-C(15)	1.863(2)
Si(1)-C(16)	1.886(2)
O(3)-C(7)	1.426(2)
N(1)-C(1)	1.469(3)
N(1)-C(2)	1.466(3)
C(3)-C(4)	1.543(3)
C(3)-C(8)	1.512(3)
C(4)-C(5)	1.526(3)
C(5)-C(6)	1.532(3)
C(6)-C(7)	1.517(3)
C(8)-C(9)	1.396(3)
C(8)-C(13)	1.391(3)
C(9)-C(10)	1.390(3)
C(10)-C(11)	1.378(3)
C(11)-C(12)	1.387(3)
C(12)-C(13)	1.393(3)
C(16)-C(17)	1.537(3)
C(16)-C(18)	1.537(3)
C(16)-C(19)	1.535(3)

O(1)-S(1)-O(2)	118.93(9)
O(1)-S(1)-N(1)	107.45(9)
O(1)-S(1)-C(3)	106.10(9)
O(2)-S(1)-N(1)	106.79(9)
O(2)-S(1)-C(3)	108.81(9)
N(1)-S(1)-C(3)	108.40(9)
O(3)-Si(1)-C(14)	106.44(9)
O(3)-Si(1)-C(15)	111.35(9)
O(3)-Si(1)-C(16)	108.79(9)

C(14)-Si(1)-C(16)	110.66(10)
C(15)-Si(1)-C(14)	108.96(11)
C(15)-Si(1)-C(16)	110.57(10)
C(7)-O(3)-Si(1)	127.79(13)
C(1)-N(1)-S(1)	121.23(14)
C(2)-N(1)-S(1)	118.06(14)
C(2)-N(1)-C(1)	114.98(17)
C(4)-C(3)-S(1)	109.70(13)
C(8)-C(3)-S(1)	111.03(13)
C(8)-C(3)-C(4)	113.95(16)
C(5)-C(4)-C(3)	110.75(15)
C(4)-C(5)-C(6)	113.27(16)
C(7)-C(6)-C(5)	112.19(16)
O(3)-C(7)-C(6)	110.46(17)
C(9)-C(8)-C(3)	119.76(17)
C(13)-C(8)-C(3)	121.38(17)
C(13)-C(8)-C(9)	118.86(18)
C(10)-C(9)-C(8)	120.46(18)
C(11)-C(10)-C(9)	120.29(19)
C(10)-C(11)-C(12)	119.91(19)
C(11)-C(12)-C(13)	120.06(19)
C(8)-C(13)-C(12)	120.41(19)
C(17)-C(16)-Si(1)	109.87(14)
C(17)-C(16)-C(18)	109.15(17)
C(18)-C(16)-Si(1)	110.21(14)
C(19)-C(16)-Si(1)	109.22(14)
C(19)-C(16)-C(17)	109.34(17)
C(19)-C(16)-C(18)	109.03(17)

Table S–4. Anisotropic displacement parameters ($Å^2 x\ 10^3$) for crystal01. The anisotropic displacement factor exponent takes the form: $-2\pi^2[\ h^2\ a^{*2}U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}\ ]$

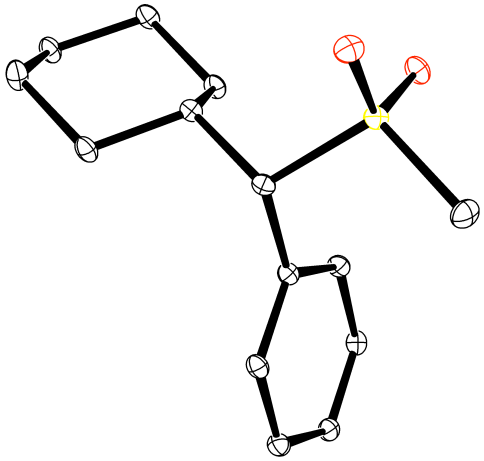
	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
S(1)	14(1)	14(1)	12(1)	1(1)	-1(1)	0(1)
Si(1)	14(1)	12(1)	15(1)	2(1)	1(1)	-1(1)
O(1)	26(1)	21(1)	13(1)	0(1)	-2(1)	0(1)
O(2)	14(1)	19(1)	23(1)	1(1)	-1(1)	-1(1)
O(3)	21(1)	20(1)	14(1)	2(1)	-2(1)	-6(1)
N(1)	20(1)	13(1)	16(1)	2(1)	4(1)	1(1)
C(1)	24(1)	14(1)	22(1)	0(1)	5(1)	3(1)
C(2)	27(1)	17(1)	24(1)	2(1)	8(1)	-6(1)
C(3)	12(1)	13(1)	11(1)	1(1)	1(1)	2(1)
C(4)	18(1)	13(1)	12(1)	-2(1)	1(1)	0(1)
C(5)	19(1)	14(1)	13(1)	-1(1)	-1(1)	2(1)
C(6)	24(1)	15(1)	14(1)	-1(1)	-2(1)	0(1)
C(7)	27(1)	15(1)	18(1)	-1(1)	-1(1)	4(1)
C(8)	15(1)	10(1)	12(1)	1(1)	1(1)	1(1)
C(9)	14(1)	20(1)	18(1)	1(1)	3(1)	0(1)
C(10)	18(1)	20(1)	22(1)	-5(1)	-5(1)	-1(1)
C(11)	30(1)	19(1)	14(1)	-3(1)	0(1)	5(1)
C(12)	24(1)	21(1)	16(1)	0(1)	8(1)	2(1)
C(13)	18(1)	14(1)	15(1)	1(1)	2(1)	0(1)
C(14)	23(1)	20(1)	29(1)	-5(1)	0(1)	4(1)
C(15)	23(1)	28(1)	29(1)	12(1)	2(1)	-8(1)
C(16)	16(1)	14(1)	15(1)	2(1)	1(1)	1(1)
C(17)	23(1)	25(1)	20(1)	5(1)	-4(1)	-2(1)
C(18)	24(1)	17(1)	24(1)	5(1)	4(1)	-2(1)
C(19)	24(1)	21(1)	29(1)	1(1)	5(1)	6(1)

Table S–5. Hydrogen coordinates (x 10^4) and isotropic displacement parameters ($Å^2$ x 10^3) for crystal01.

	x	y	z	U(eq)
H(1A)	-5587	7185	1497	30
H(1B)	-4669	8461	1216	30
H(1C)	-3064	7603	1809	30
H(2A)	-208	7483	869	33
H(2B)	-1761	8359	270	33
H(2C)	-1070	7027	-1	33
H(3)	-413	4726	934	15
H(4A)	-3873	3002	1201	18
H(4B)	-2546	2944	476	18
H(5A)	-473	2592	2077	19
H(5B)	911	2591	1368	19
H(6A)	-2463	763	1529	22
H(6B)	-902	741	869	22
H(7A)	586	-681	1840	25
H(7B)	2340	428	1861	25
H(9)	1649	5743	2003	20
H(10)	2205	6421	3308	25
H(11)	-611	6130	4081	26
H(12)	-3980	5118	3558	24
H(13)	-4578	4458	2246	19
H(14A)	483	2801	3721	36
H(14B)	2183	2444	4490	36
H(14C)	-93	1686	4254	36
H(15A)	5788	1311	2802	40
H(15B)	5761	2371	3437	40
H(15C)	4107	2449	2624	40
H(17A)	6824	681	4613	35
H(17B)	6325	-463	5136	35
H(17C)	4846	759	5121	35
H(18A)	1374	-556	4777	32
H(18B)	2791	-1786	4721	32

H(18C)	986	-1356	3996	32
H(19A)	4214	-1474	3160	37
H(19B)	5860	-1880	3931	37
H(19C)	6475	-722	3439	37

Product from entry 2 of Table 3: (*S*)-(Cyclohexyl(methylsulfonyl)methyl)benzene (from a reaction using (*R,R*)–L1). A crystal suitable for X-ray crystallography was grown by vapor diffusion with dichloromethane and pentane.



A suitable crystal of $C_{14}H_{20}O_2S$ was selected for analysis. All measurements were made on a Bruker APEX-II CCD with filtered Mo-Kα radiation at a temperature of 100 K. Using Olex2,[6] the structure was solved with the ShelXS[7] structure solution program using Direct Methods and refined with the ShelXL[7] refinement package using Least Squares minimization. The absolute stereochemistry was determined on the basis of the absolute structure parameter.

Table S–6. Crystal data and structure refinement for crystal03.

Identification code	crystal03	
Empirical formula	$C_{14}H_{20}O_2S$	
Formula weight	252.36	
Temperature	100.15 K	
Wavelength	0.71073 Å	
Crystal system	Orthorhombic	
Space group	$P2_12_12_1$	
Unit cell dimensions	a = 6.2283(3) Å	α = 90°.
	b = 13.7866(7) Å	β = 90°.
	c = 15.3937(8) Å	γ = 90°.
Volume	1321.81(12) $Å^3$	
Z	4	
Density (calculated)	1.268 Mg/m^3	
Absorption coefficient	0.233 mm^{-1}	
F(000)	544	
Crystal size	0.62 x 0.16 x 0.09 mm^3	
Theta range for data collection	1.983 to 33.731°.	
Index ranges	-9<=h<=9, -21<=k<=20, -23<=l<=23	
Reflections collected	39471	
Independent reflections	4910 [R(int) = 0.0621]	
Completeness to theta = 25.000°	100.0 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	1.0000 and 0.8575	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	4910 / 0 / 155	
Goodness-of-fit on F^2	1.141	
Final R indices [I>2sigma(I)]	R1 = 0.0540, wR2 = 0.1115	
R indices (all data)	R1 = 0.0741, wR2 = 0.1179	
Absolute structure parameter	0.01(3)	
Largest diff. peak and hole	0.692 and -0.385 $e/Å^{-3}$	

Table S–7. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters ($Å^2$ x 10^3) for crystal03. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
S(1)	7502(1)	3757(1)	4892(1)	17(1)
O(1)	6971(3)	3206(1)	5662(1)	21(1)
O(2)	9662(3)	4136(1)	4836(1)	21(1)
C(1)	5566(4)	4731(2)	4817(2)	14(1)
C(2)	5963(4)	5465(2)	5570(2)	14(1)
C(3)	7759(4)	6208(2)	5418(2)	17(1)
C(4)	8064(4)	6849(2)	6224(2)	20(1)
C(5)	5993(4)	7371(2)	6464(2)	21(1)
C(6)	4161(4)	6651(2)	6587(2)	23(1)
C(7)	3868(4)	5994(2)	5790(2)	19(1)
C(8)	5392(4)	5139(2)	3904(2)	15(1)
C(9)	7131(4)	5552(2)	3461(2)	17(1)
C(10)	6869(4)	5905(2)	2620(2)	18(1)
C(11)	4895(4)	5840(2)	2207(2)	18(1)
C(12)	3168(4)	5434(2)	2644(2)	19(1)
C(13)	3419(4)	5081(2)	3483(2)	17(1)
C(14)	7027(5)	3018(2)	3977(2)	23(1)

Table S–8. Bond lengths [Å] and angles [°] for crystal03.

S(1)-O(1)	1.4458(19)
S(1)-O(2)	1.4461(19)
S(1)-C(1)	1.809(2)
S(1)-C(14)	1.763(3)
C(1)-H(1)	1.0000
C(1)-C(2)	1.557(3)
C(1)-C(8)	1.518(3)
C(2)-H(2)	1.0000
C(2)-C(3)	1.535(3)
C(2)-C(7)	1.533(3)
C(3)-H(3A)	0.9900
C(3)-H(3B)	0.9900
C(3)-C(4)	1.536(3)
C(4)-H(4A)	0.9900
C(4)-H(4B)	0.9900
C(4)-C(5)	1.523(4)
C(5)-H(5A)	0.9900
C(5)-H(5B)	0.9900
C(5)-C(6)	1.524(4)
C(6)-H(6A)	0.9900
C(6)-H(6B)	0.9900
C(6)-C(7)	1.536(4)
C(7)-H(7A)	0.9900
C(7)-H(7B)	0.9900
C(8)-C(9)	1.401(3)
C(8)-C(13)	1.391(4)
C(9)-H(9)	0.9500
C(9)-C(10)	1.393(3)
C(10)-H(10)	0.9500
C(10)-C(11)	1.387(4)
C(11)-H(11)	0.9500
C(11)-C(12)	1.386(4)
C(12)-H(12)	0.9500
C(12)-C(13)	1.390(4)
C(13)-H(13)	0.9500

C(14)-H(14A)	0.9800
C(14)-H(14B)	0.9800
C(14)-H(14C)	0.9800

O(1)-S(1)-O(2)	116.89(12)
O(1)-S(1)-C(1)	106.82(11)
O(1)-S(1)-C(14)	108.23(11)
O(2)-S(1)-C(1)	110.34(10)
O(2)-S(1)-C(14)	108.51(13)
C(14)-S(1)-C(1)	105.43(13)
S(1)-C(1)-H(1)	105.6
C(2)-C(1)-S(1)	109.22(16)
C(2)-C(1)-H(1)	105.6
C(8)-C(1)-S(1)	112.41(17)
C(8)-C(1)-H(1)	105.6
C(8)-C(1)-C(2)	117.36(18)
C(1)-C(2)-H(2)	107.1
C(3)-C(2)-C(1)	115.9(2)
C(3)-C(2)-H(2)	107.1
C(7)-C(2)-C(1)	109.8(2)
C(7)-C(2)-H(2)	107.1
C(7)-C(2)-C(3)	109.60(18)
C(2)-C(3)-H(3A)	109.5
C(2)-C(3)-H(3B)	109.5
C(2)-C(3)-C(4)	110.6(2)
H(3A)-C(3)-H(3B)	108.1
C(4)-C(3)-H(3A)	109.5
C(4)-C(3)-H(3B)	109.5
C(3)-C(4)-H(4A)	109.4
C(3)-C(4)-H(4B)	109.4
H(4A)-C(4)-H(4B)	108.0
C(5)-C(4)-C(3)	111.3(2)
C(5)-C(4)-H(4A)	109.4
C(5)-C(4)-H(4B)	109.4
C(4)-C(5)-H(5A)	109.5
C(4)-C(5)-H(5B)	109.5
C(4)-C(5)-C(6)	110.9(2)

H(5A)-C(5)-H(5B)	108.1
C(6)-C(5)-H(5A)	109.5
C(6)-C(5)-H(5B)	109.5
C(5)-C(6)-H(6A)	109.2
C(5)-C(6)-H(6B)	109.2
C(5)-C(6)-C(7)	111.9(2)
H(6A)-C(6)-H(6B)	107.9
C(7)-C(6)-H(6A)	109.2
C(7)-C(6)-H(6B)	109.2
C(2)-C(7)-C(6)	110.9(2)
C(2)-C(7)-H(7A)	109.5
C(2)-C(7)-H(7B)	109.5
C(6)-C(7)-H(7A)	109.5
C(6)-C(7)-H(7B)	109.5
H(7A)-C(7)-H(7B)	108.1
C(9)-C(8)-C(1)	123.1(2)
C(13)-C(8)-C(1)	118.2(2)
C(13)-C(8)-C(9)	118.7(2)
C(8)-C(9)-H(9)	119.9
C(10)-C(9)-C(8)	120.2(2)
C(10)-C(9)-H(9)	119.9
C(9)-C(10)-H(10)	119.7
C(11)-C(10)-C(9)	120.5(2)
C(11)-C(10)-H(10)	119.7
C(10)-C(11)-H(11)	120.3
C(12)-C(11)-C(10)	119.4(2)
C(12)-C(11)-H(11)	120.3
C(11)-C(12)-H(12)	119.8
C(11)-C(12)-C(13)	120.4(2)
C(13)-C(12)-H(12)	119.8
C(8)-C(13)-H(13)	119.6
C(12)-C(13)-C(8)	120.8(2)
C(12)-C(13)-H(13)	119.6
S(1)-C(14)-H(14A)	109.5
S(1)-C(14)-H(14B)	109.5
S(1)-C(14)-H(14C)	109.5
H(14A)-C(14)-H(14B)	109.5

H(14A)-C(14)-H(14C) 109.5
H(14B)-C(14)-H(14C) 109.5

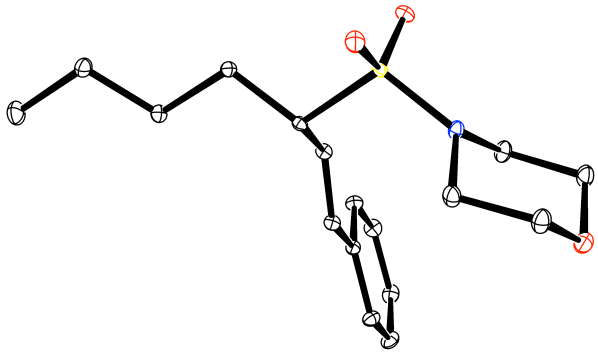
Table S–9. Anisotropic displacement parameters ($Å^2 x\ 10^3$) for crystal03. The anisotropic displacement factor exponent takes the form: $-2\pi^2[\ h^2\ a^{*2}U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}\ ]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
S(1)	19(1)	13(1)	18(1)	1(1)	-1(1)	-1(1)
O(1)	26(1)	17(1)	20(1)	2(1)	-1(1)	-2(1)
O(2)	17(1)	16(1)	29(1)	2(1)	0(1)	0(1)
C(1)	11(1)	15(1)	17(1)	1(1)	-1(1)	-3(1)
C(2)	14(1)	11(1)	18(1)	2(1)	-1(1)	-2(1)
C(3)	11(1)	17(1)	24(1)	-2(1)	0(1)	-3(1)
C(4)	15(1)	16(1)	28(1)	-2(1)	-3(1)	-2(1)
C(5)	18(1)	15(1)	29(1)	-4(1)	-1(1)	2(1)
C(6)	17(1)	22(1)	31(2)	-6(1)	4(1)	0(1)
C(7)	12(1)	18(1)	26(1)	-2(1)	0(1)	0(1)
C(8)	15(1)	12(1)	18(1)	1(1)	0(1)	0(1)
C(9)	14(1)	17(1)	20(1)	0(1)	-1(1)	-3(1)
C(10)	19(1)	14(1)	20(1)	1(1)	4(1)	-1(1)
C(11)	22(1)	14(1)	18(1)	0(1)	-1(1)	3(1)
C(12)	18(1)	18(1)	21(1)	-2(1)	-3(1)	2(1)
C(13)	12(1)	17(1)	21(1)	0(1)	1(1)	-2(1)
C(14)	32(2)	14(1)	22(1)	-3(1)	-2(1)	-1(1)

Table S–10. Hydrogen coordinates (x 10^4) and isotropic displacement parameters ($Å^2$ x 10^3) for crystal03.

	x	y	z	U(eq)
H(1)	4140	4428	4942	17
H(2)	6373	5077	6093	17
H(3A)	7392	6620	4912	21
H(3B)	9117	5865	5286	21
H(4A)	8533	6442	6719	23
H(4B)	9203	7333	6109	23
H(5A)	5613	7837	6000	25
H(5B)	6210	7741	7009	25
H(6A)	2812	7011	6695	28
H(6B)	4457	6244	7103	28
H(7A)	2725	5513	5908	22
H(7B)	3415	6392	5286	22
H(9)	8494	5592	3736	20
H(10)	8051	6192	2327	21
H(11)	4728	6071	1629	22
H(12)	1806	5398	2368	23
H(13)	2229	4797	3773	20
H(14A)	7233	3400	3447	34
H(14B)	5551	2773	3996	34
H(14C)	8032	2471	3980	34

Product from entry 5 of Table 5 (run with (3*R*,8*S*)–L6). (*S*,*E*)-4-((1-Phenylhept-1-en-3-yl)sulfonyl)morpholine. A crystal suitable for X-ray crystallography was grown by vapor diffusion with Et_2O and pentane.



A suitable crystal of $C_{17}H_{25}NO_3S$ was selected for analysis. All measurements were made on a Bruker APEX-II CCD with filtered Mo-Kα radiation at a temperature of 100 K. Using Olex2,[6] the structure was solved with the ShelXS[7] structure solution program using Direct Methods and refined with the ShelXL[7] refinement package using Least Squares minimization. The absolute stereochemistry was determined on the basis of the absolute structure parameter.

Table S–11. Crystal data and structure refinement for crystal02.

Identification code	crystal02	
Empirical formula	$C_{17}H_{25}NO_3S$	
Formula weight	323.44	
Temperature	100 K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	$P2_1$	
Unit cell dimensions	a = 12.8350(6) Å	α = 90°.
	b = 5.6272(3) Å	β = 113.133(2)°.
	c = 12.9187(6) Å	γ = 90°.
Volume	858.03(7) $Å^3$	
Z	2	
Density (calculated)	1.252 Mg/m^3	
Absorption coefficient	0.201 mm^{-1}	
F(000)	348	
Crystal size	0.5 x 0.12 x 0.12 mm^3	
Theta range for data collection	1.714 to 31.552°.	
Index ranges	-18<=h<=18, -8<=k<=8, -19<=l<=19	
Reflections collected	57330	
Independent reflections	5731 [R(int) = 0.0344]	
Completeness to theta = 25.242°	100.0 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	1.0000 and 0.8839	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	5731 / 1 / 200	
Goodness-of-fit on F^2	1.073	
Final R indices [I>2sigma(I)]	R1 = 0.0258, wR2 = 0.0683	
R indices (all data)	R1 = 0.0273, wR2 = 0.0695	
Absolute structure parameter	0.019(11)	
Largest diff. peak and hole	0.444 and -0.190 $e/Å^{-3}$	

Table S–12. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters ($Å^2$x 10^3) for crystal02. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
S(1)	4726(1)	7787(1)	3347(1)	12(1)
O(1)	4294(1)	10123(2)	2942(1)	19(1)
O(2)	5535(1)	7480(2)	4482(1)	18(1)
O(3)	6358(1)	4985(2)	1135(1)	21(1)
N(1)	5344(1)	6838(2)	2534(1)	14(1)
C(1)	3537(1)	5903(2)	3176(1)	11(1)
C(2)	3067(1)	6643(2)	4055(1)	13(1)
C(3)	2154(1)	4910(2)	4061(1)	14(1)
C(4)	1833(1)	5268(3)	5067(1)	18(1)
C(5)	944(1)	3484(3)	5081(1)	25(1)
C(6)	2671(1)	6069(2)	1991(1)	13(1)
C(7)	2415(1)	4264(2)	1261(1)	13(1)
C(8)	1574(1)	4329(2)	93(1)	12(1)
C(9)	797(1)	6196(2)	-325(1)	16(1)
C(10)	21(1)	6194(3)	-1441(1)	19(1)
C(11)	9(1)	4336(3)	-2156(1)	20(1)
C(12)	764(1)	2453(3)	-1748(1)	20(1)
C(13)	1539(1)	2453(2)	-630(1)	16(1)
C(14)	4862(1)	7376(2)	1320(1)	18(1)
C(15)	5820(1)	7255(3)	909(1)	21(1)
C(16)	6847(1)	4566(3)	2317(1)	21(1)
C(17)	5947(1)	4555(3)	2806(1)	19(1)

Table S–13. Bond lengths [Å] and angles [°] for crystal02.

S(1)-O(1)	1.4424(10)
S(1)-O(2)	1.4360(9)
S(1)-N(1)	1.6356(11)
S(1)-C(1)	1.7985(12)
O(3)-C(15)	1.4267(18)
O(3)-C(16)	1.4241(17)
N(1)-C(14)	1.4733(16)
N(1)-C(17)	1.4694(17)
C(1)-C(2)	1.5379(17)
C(1)-C(6)	1.5001(15)
C(2)-C(3)	1.5265(17)
C(3)-C(4)	1.5241(18)
C(4)-C(5)	1.525(2)
C(6)-C(7)	1.3364(17)
C(7)-C(8)	1.4711(16)
C(8)-C(9)	1.4021(17)
C(8)-C(13)	1.3993(17)
C(9)-C(10)	1.3937(16)
C(10)-C(11)	1.391(2)
C(11)-C(12)	1.393(2)
C(12)-C(13)	1.3954(17)
C(14)-C(15)	1.5194(19)
C(16)-C(17)	1.5189(19)

O(1)-S(1)-N(1)	106.16(6)
O(1)-S(1)-C(1)	107.85(6)
O(2)-S(1)-O(1)	120.05(6)
O(2)-S(1)-N(1)	106.10(6)
O(2)-S(1)-C(1)	107.05(6)
N(1)-S(1)-C(1)	109.34(6)
C(16)-O(3)-C(15)	109.98(11)
C(14)-N(1)-S(1)	120.64(9)
C(17)-N(1)-S(1)	118.32(9)
C(17)-N(1)-C(14)	113.32(11)
C(2)-C(1)-S(1)	108.03(8)

C(6)-C(1)-S(1)	109.94(8)
C(6)-C(1)-C(2)	112.83(10)
C(3)-C(2)-C(1)	110.77(10)
C(4)-C(3)-C(2)	112.63(10)
C(3)-C(4)-C(5)	112.19(12)
C(7)-C(6)-C(1)	123.45(11)
C(6)-C(7)-C(8)	125.69(11)
C(9)-C(8)-C(7)	122.55(11)
C(13)-C(8)-C(7)	118.95(11)
C(13)-C(8)-C(9)	118.50(11)
C(10)-C(9)-C(8)	120.60(12)
C(11)-C(10)-C(9)	120.30(13)
C(10)-C(11)-C(12)	119.73(12)
C(11)-C(12)-C(13)	119.96(12)
C(12)-C(13)-C(8)	120.90(12)
N(1)-C(14)-C(15)	107.67(11)
O(3)-C(15)-C(14)	111.21(11)
O(3)-C(16)-C(17)	111.08(11)
N(1)-C(17)-C(16)	108.16(11)

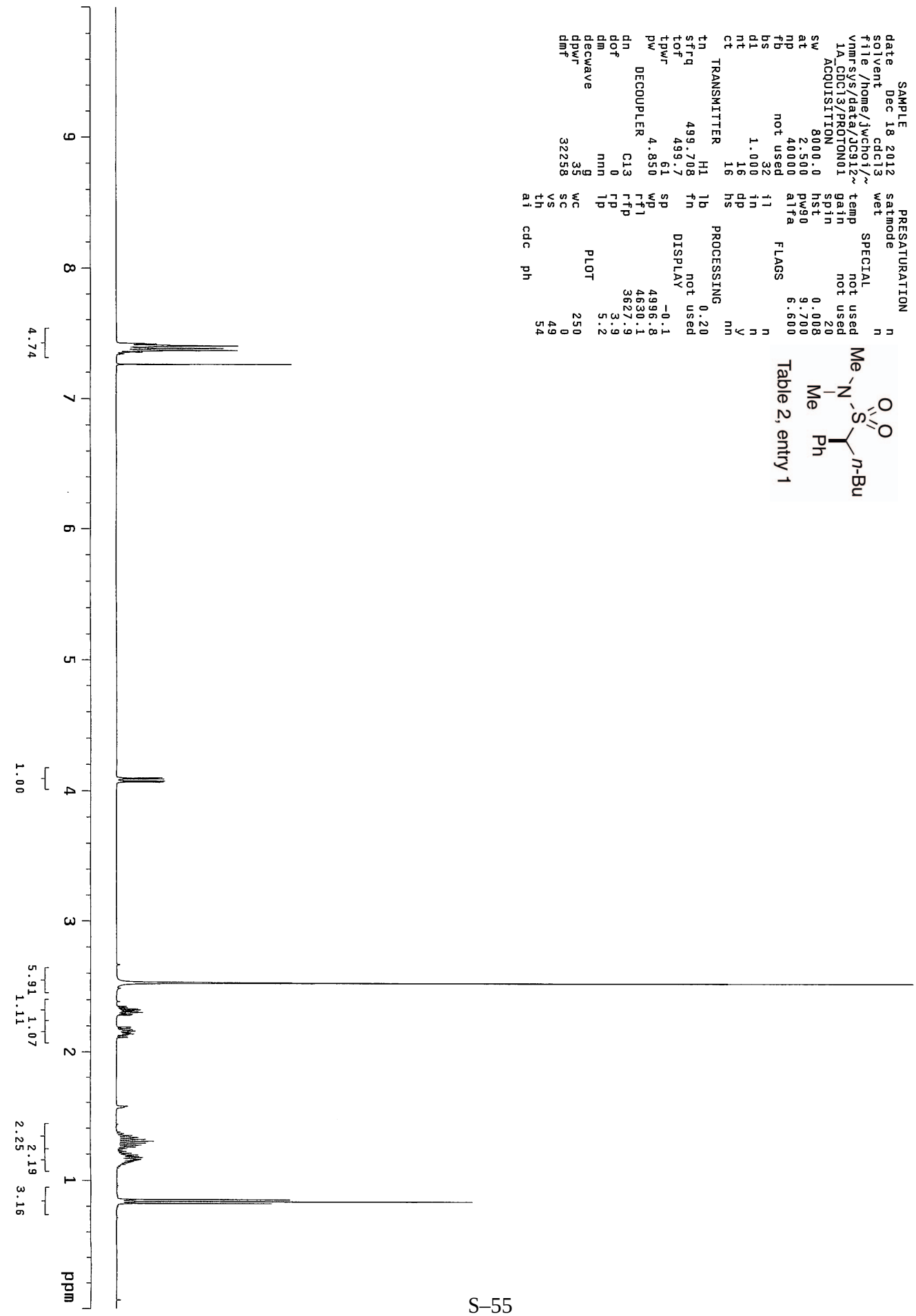
Table S–14. Anisotropic displacement parameters ($Å^2 x\ 10^3$) for crystal02. The anisotropic displacement factor exponent takes the form: $-2\pi^2[\ h^2\ a^{*2}U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}\ ]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
S(1)	12(1)	11(1)	11(1)	-1(1)	4(1)	-3(1)
O(1)	24(1)	11(1)	23(1)	0(1)	11(1)	-2(1)
O(2)	15(1)	26(1)	12(1)	-3(1)	2(1)	-7(1)
O(3)	22(1)	22(1)	21(1)	0(1)	12(1)	1(1)
N(1)	16(1)	16(1)	13(1)	3(1)	7(1)	2(1)
C(1)	10(1)	10(1)	11(1)	0(1)	3(1)	-1(1)
C(2)	12(1)	12(1)	13(1)	-1(1)	5(1)	0(1)
C(3)	11(1)	16(1)	14(1)	1(1)	4(1)	0(1)
C(4)	18(1)	20(1)	19(1)	-2(1)	10(1)	-1(1)
C(5)	22(1)	29(1)	28(1)	2(1)	15(1)	-4(1)
C(6)	11(1)	13(1)	12(1)	1(1)	2(1)	0(1)
C(7)	11(1)	14(1)	12(1)	0(1)	2(1)	0(1)
C(8)	11(1)	14(1)	11(1)	-2(1)	3(1)	-2(1)
C(9)	15(1)	16(1)	14(1)	-1(1)	3(1)	1(1)
C(10)	15(1)	21(1)	16(1)	2(1)	2(1)	2(1)
C(11)	16(1)	29(1)	12(1)	-2(1)	2(1)	-4(1)
C(12)	18(1)	26(1)	15(1)	-7(1)	6(1)	-3(1)
C(13)	13(1)	18(1)	17(1)	-4(1)	5(1)	0(1)
C(14)	18(1)	23(1)	13(1)	4(1)	7(1)	3(1)
C(15)	24(1)	23(1)	19(1)	4(1)	12(1)	1(1)
C(16)	18(1)	24(1)	23(1)	4(1)	10(1)	4(1)
C(17)	21(1)	16(1)	22(1)	7(1)	12(1)	4(1)

Table S–15. Hydrogen coordinates (x 10^4) and isotropic displacement parameters ($Å^2$ x 10^3) for crystal02.

	x	y	z	U(eq)
H(1)	3809	4223	3327	13
H(2A)	3691	6680	4811	15
H(2B)	2742	8262	3881	15
H(3A)	1471	5115	3359	16
H(3B)	2431	3264	4072	16
H(4A)	1536	6898	5045	22
H(4B)	2520	5104	5770	22
H(5A)	764	3776	5741	37
H(5B)	1241	1868	5118	37
H(5C)	257	3664	4395	37
H(6)	2285	7535	1747	16
H(7)	2810	2813	1519	15
H(9)	800	7474	156	19
H(10)	-503	7467	-1715	23
H(11)	-513	4352	-2920	24
H(12)	752	1170	-2231	24
H(13)	2051	1161	-356	19
H(14A)	4520	8982	1187	22
H(14B)	4266	6206	911	22
H(15A)	5514	7563	89	25
H(15B)	6385	8503	1288	25
H(16A)	7412	5819	2689	25
H(16B)	7245	3017	2467	25
H(17A)	5409	3231	2480	23
H(17B)	6304	4338	3632	23

VI. ^{1}H NMR Spectra



JC9153A CDCl3

exp23 PROTON

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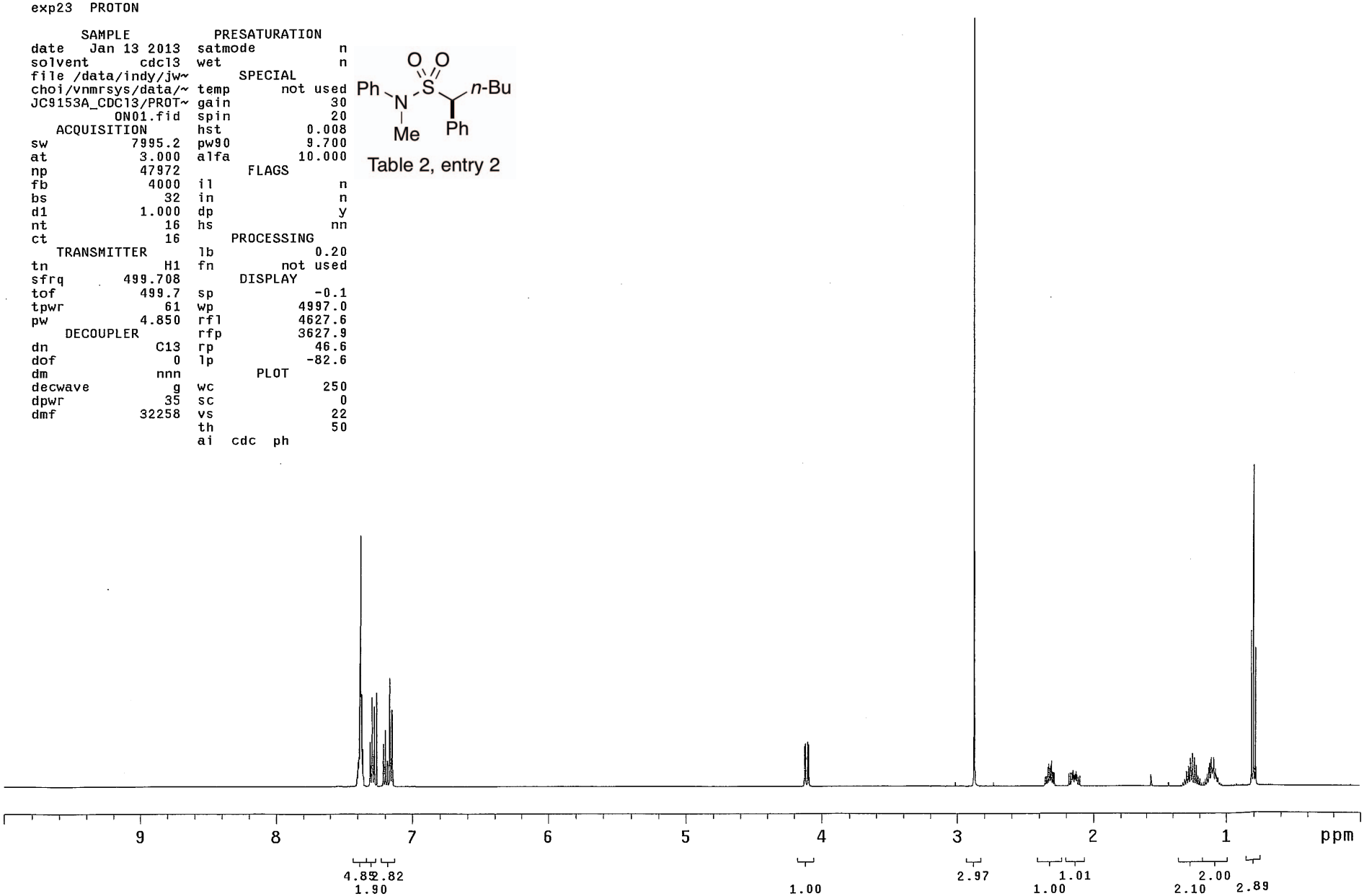
	ON01.fid	spin	20
ACQUISITION		hst	0.008
sw	7995.2	pw90	9.700
at	3.000	alfa	10.000
np	47972	FLAGS	
fb	4000	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4997.0
pw	4.850	rfl	4627.6
DECOUPLER		rfp	3627.9
dn	C13	rp	46.6
dof	0	lp	-82.6
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	22
		th	50
		ai	cdc ph

Table 2, entry 2



JC9149B 1H CDCl3

exp23 PROTON

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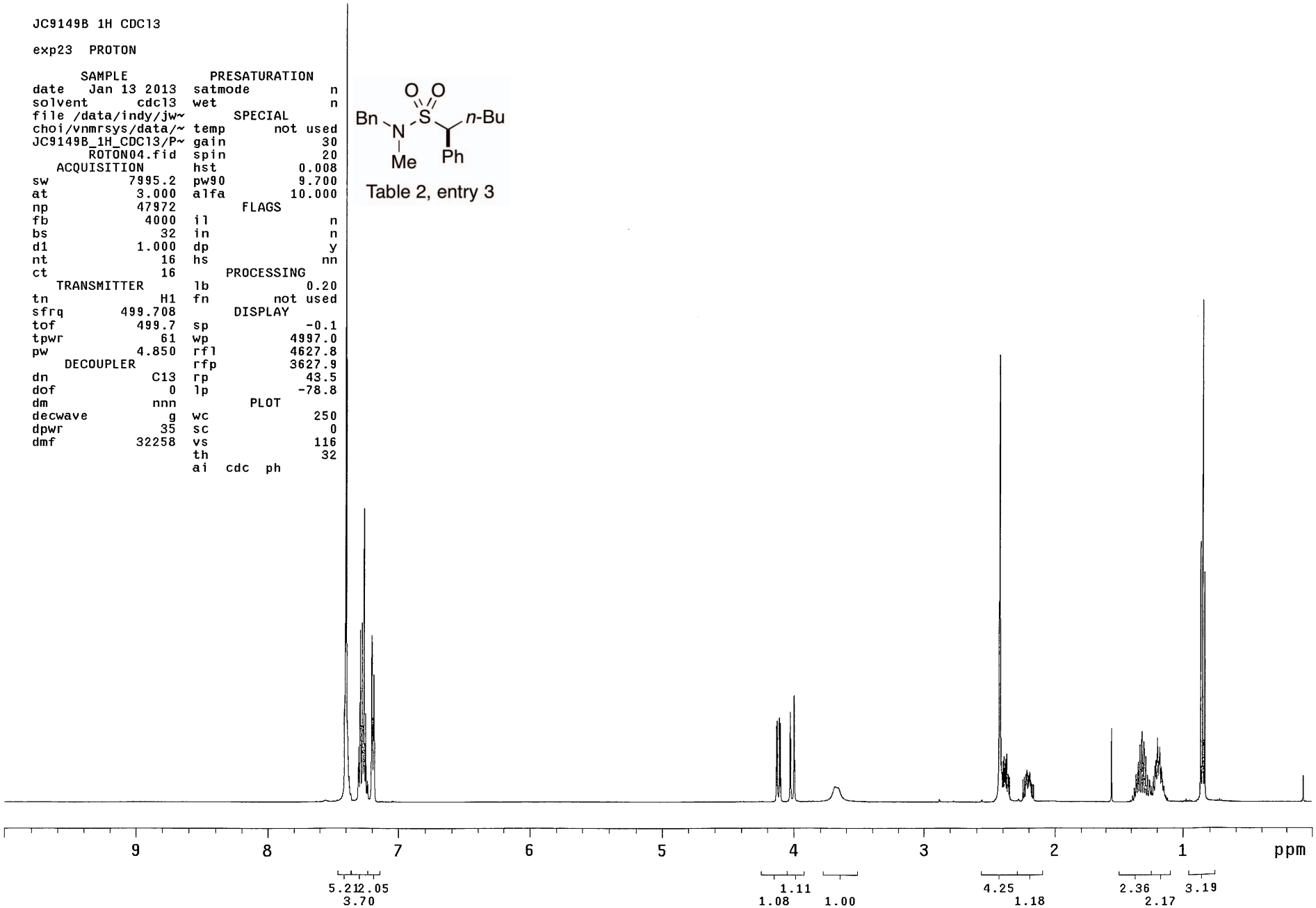
ROTON04.fid		spin	20
ACQUISITION		hst	0.008
sw	7995.2	pw90	9.700
at	3.000	alfa	10.000
np	47972	FLAGS	
fb	4000	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4997.0
pw	4.850	rfl	4627.8
DECOUPLER		rfp	3627.9
dn	C13	rp	43.5
dof	0	lp	-78.8
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	116
		th	32
		ai	cdc ph

Table 2, entry 3



JC9147A 1H CDCl3

exp23 PROTON

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choi/vnmrsys/data/~		temp	not used
JC9147A_1H_CDCl3/P~		gain	46
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sw	7995.2	pw90	9.700
at	3.000	alfa	10.000
np	47972	FLAGS	
fb	4000	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4997.0
pw	4.850	rfl	4627.6
DECOUPLER		rfp	3627.9
dn	C13	rp	47.0
dof	0	lp	-86.6
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	24
		th	35
		ai	cdc ph

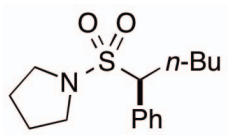
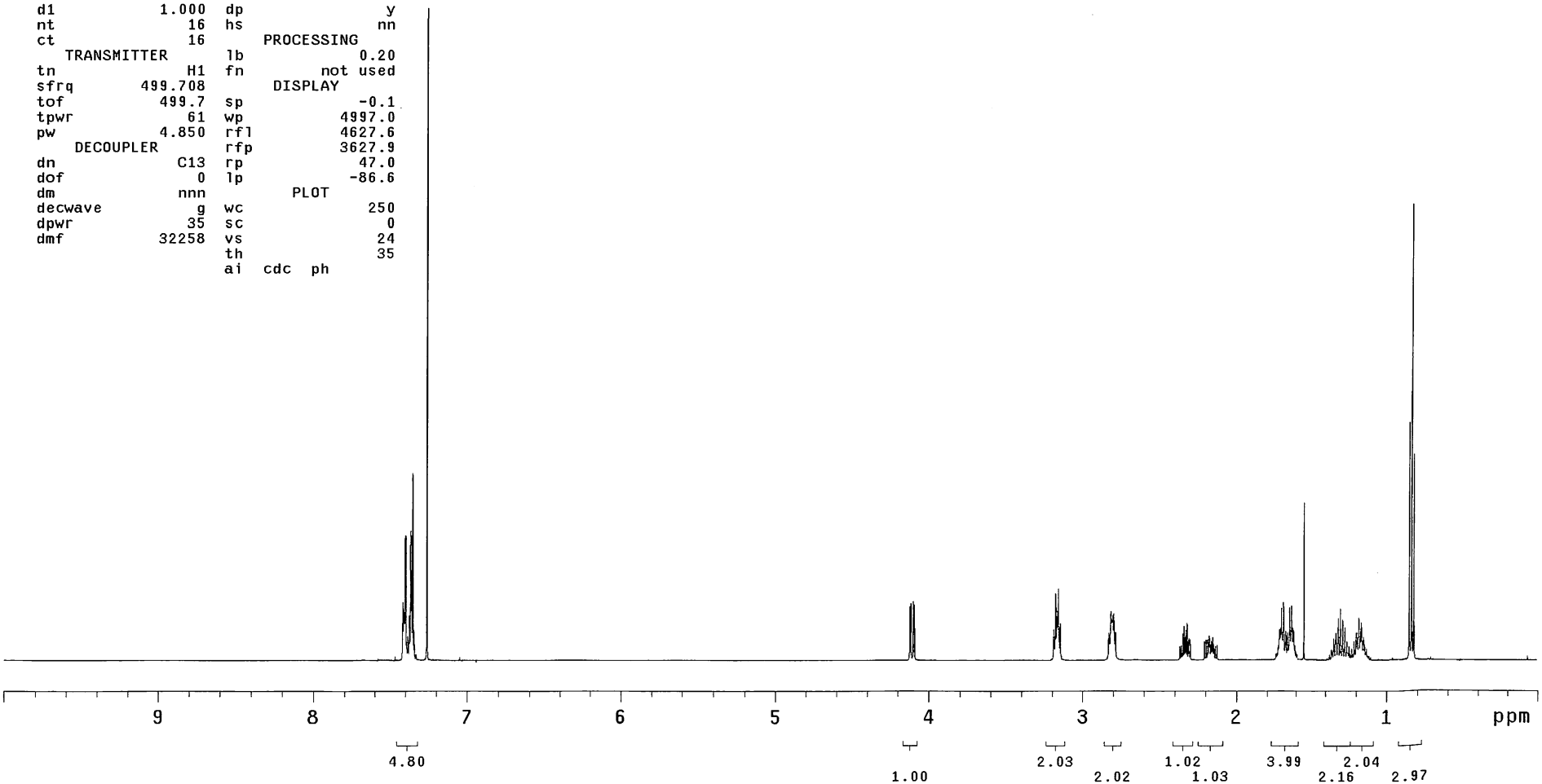


Table 2, entry 4



JC9155 1H CDCl3

exp23 PROTON

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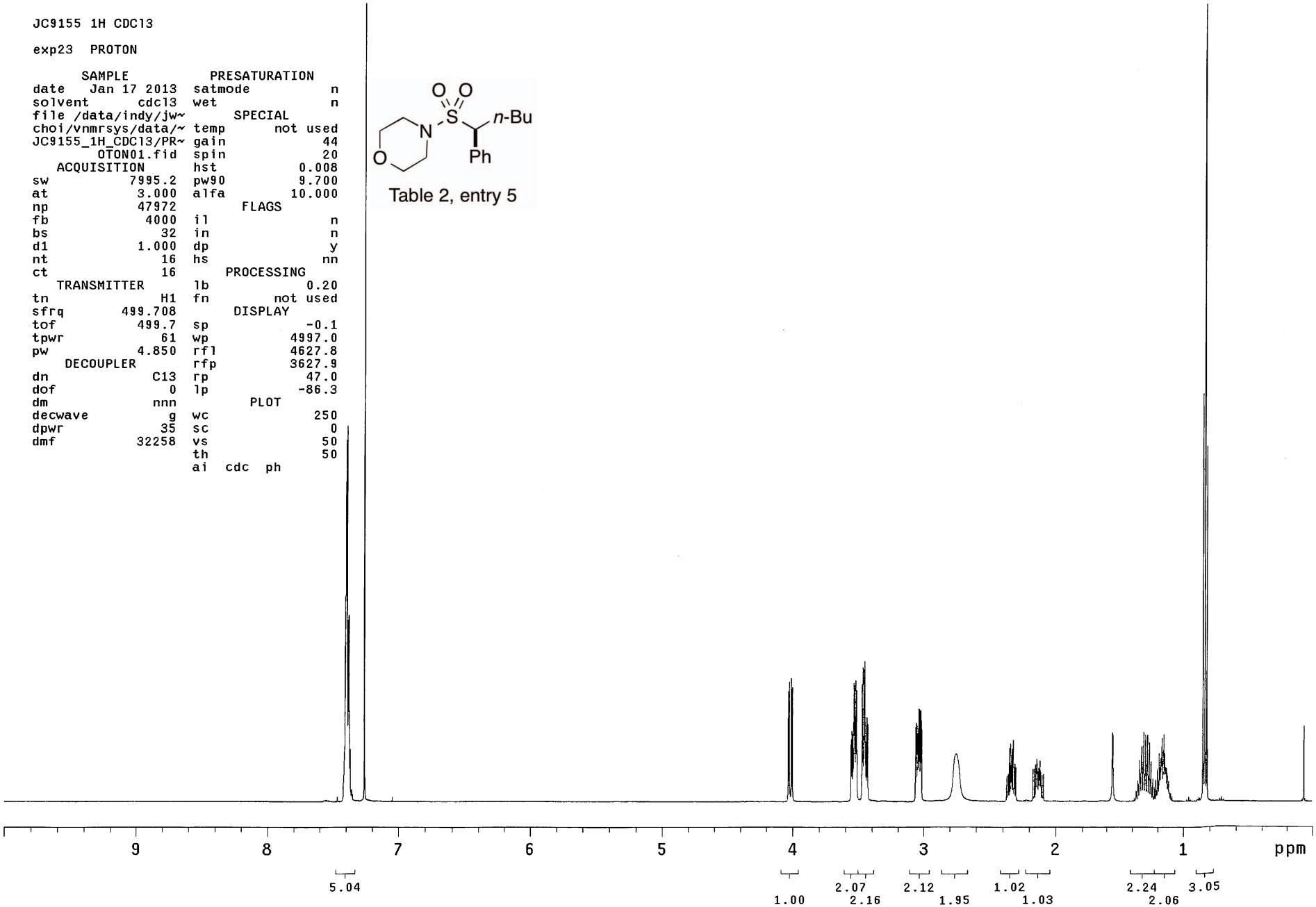
choi/vnmrsys/data/~		temp	not used
JC9155_1H_CDCl3/PR~		gain	44
	OTON01.fid	spin	20
ACQUISITION		hst	0.008
sw	7995.2	pw90	9.700
at	3.000	alfa	10.000
np	47972	FLAGS	
fb	4000	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4997.0
pw	4.850	rfl	4627.8
DECOUPLER		rfp	3627.9
dn	C13	rp	47.0
dof	0	lp	-86.3
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	50
		th	50
		ai	cdc ph

Table 2, entry 5



JC10093B 1H CDCl3

exp24 PROTON

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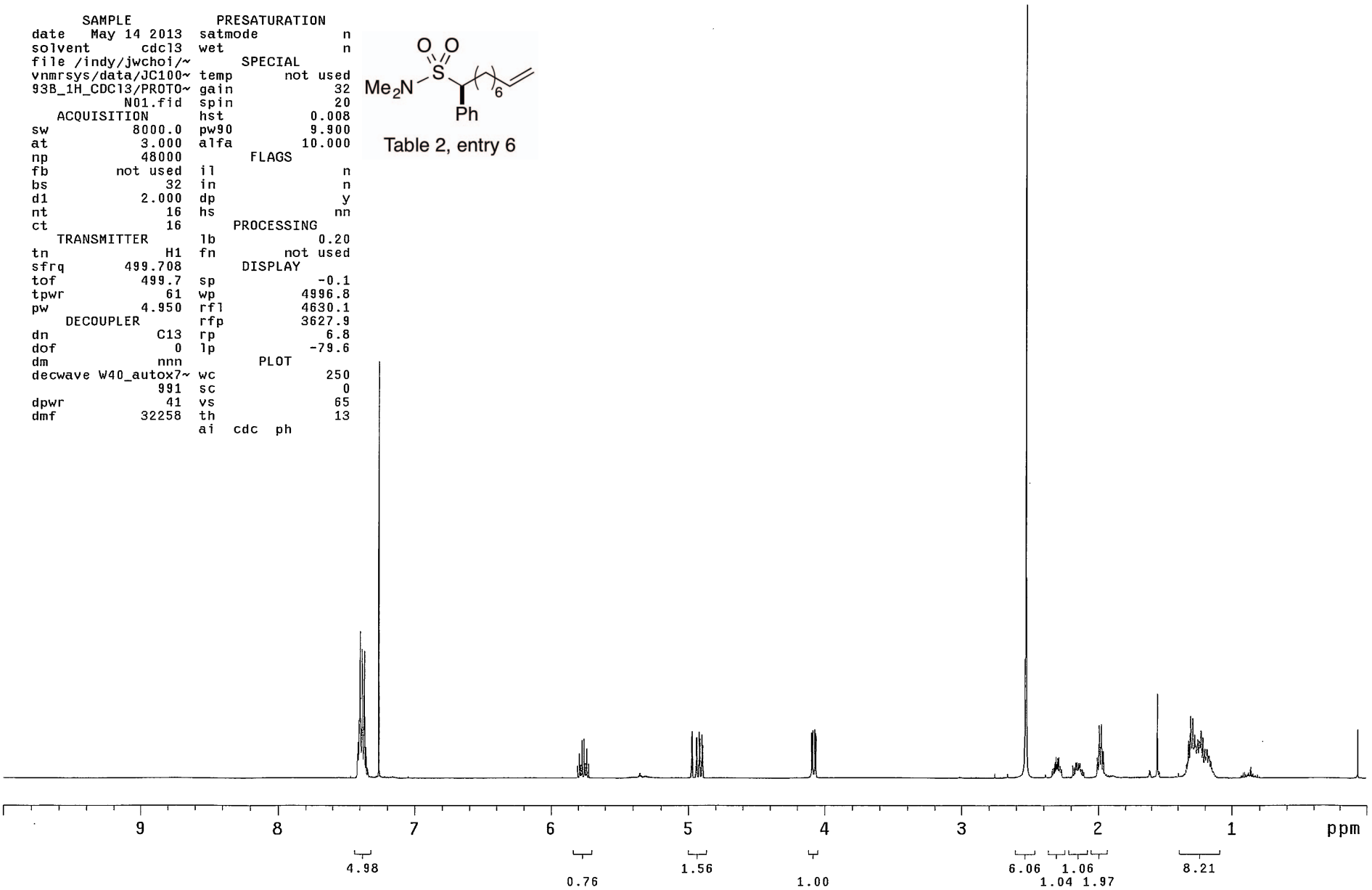
vnmrsys/data/JC100~		temp	not used
93B_1H_CDCl3/PROTO~		gain	32
	N01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4630.1
DECOUPLER		rfp	3627.9
dn	C13	rp	6.8
dof	0	lp	-79.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	65
dmf	32258	th	13
		ai cdc ph	

Table 2, entry 6



PM2-21A 1H CDCl3

exp30 PROTON

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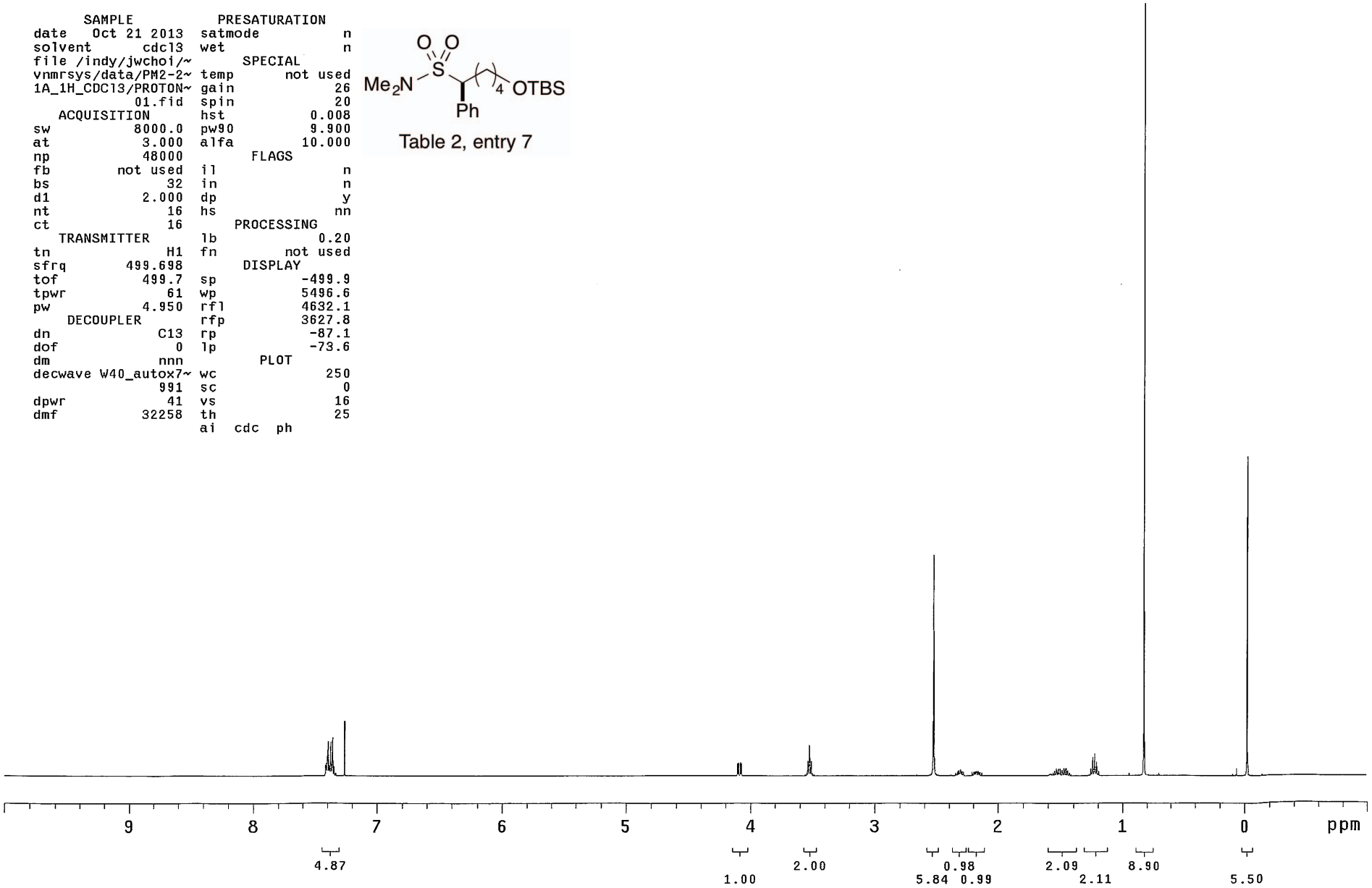
1A_1H_CDCl3/PROTON~		gain	26
	01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-499.9
tpwr	61	wp	5496.6
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-87.1
dof	0	lp	-73.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	16
dmf	32258	th	25
		ai cdc ph	

Table 2, entry 7

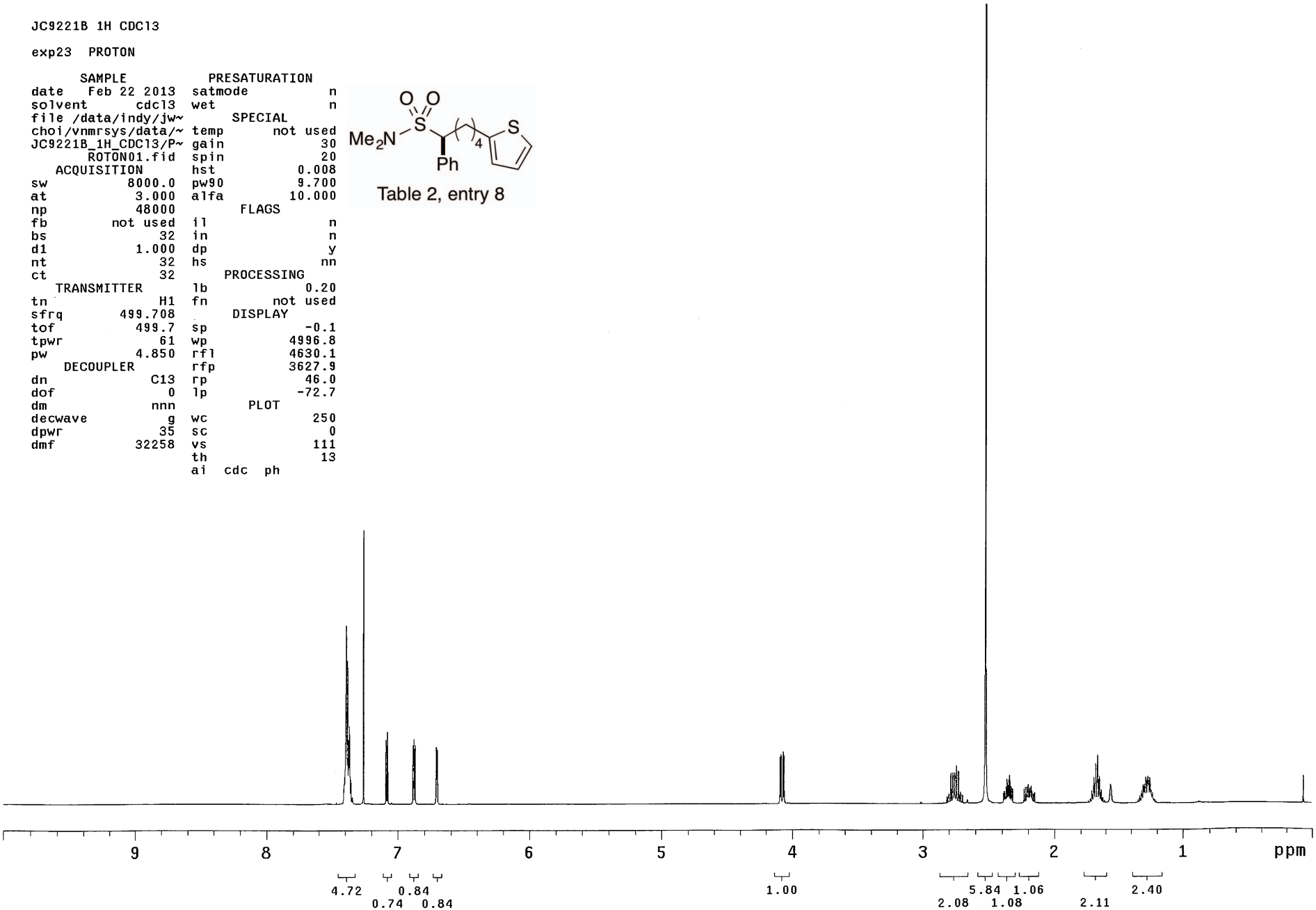


JC9221B 1H CDCl3

exp23 PROTON

SAMPLE		PRESATURATION	
date	Feb 22 2013	satmode	n
solvent	cdcl3	wet	n
file	/data/indy/jw~	SPECIAL	
choi/vnmrsys/data/~		temp	not used
JC9221B_1H_CDCl3/P~		gain	30
	ROTON01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.700
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	1.000	dp	y
nt	32	hs	nn
ct	32	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.850	rfl	4630.1
DECOUPLER		rfp	3627.9
dn	C13	rp	46.0
dof	0	lp	-72.7
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	111
		th	13
		ai	cdc ph

Table 2, entry 8

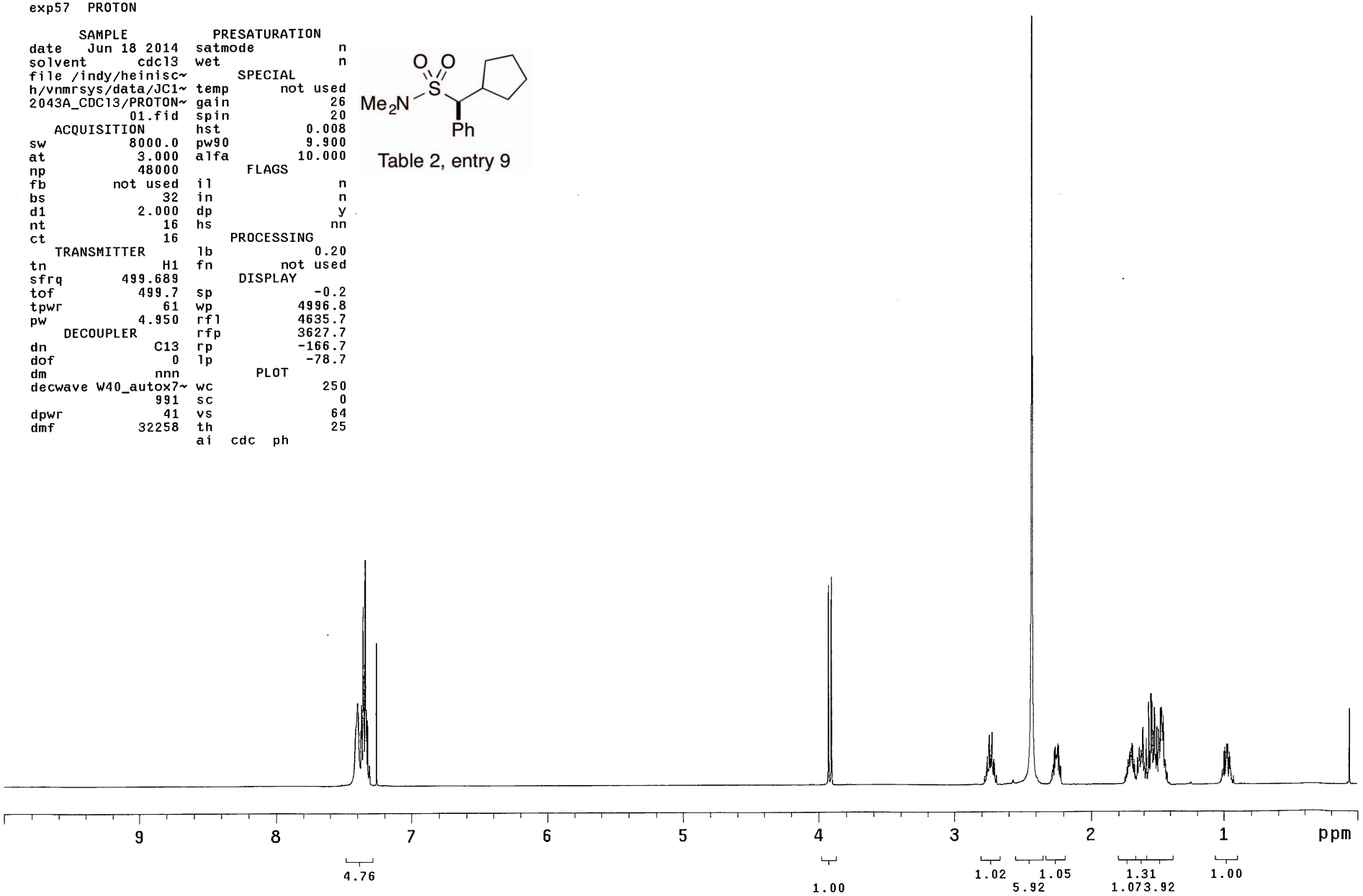


JC12043A CDCl3

exp57 PROTON

SAMPLE		PRESATURATION	
date	Jun 18 2014	satmode	n
solvent	cdcl3	wet	n
file	/indy/heinisc~	SPECIAL	
h/vnmrsys/data/JC1~		temp	not used
2043A_CDCl3/PROTON~		gain	26
	01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.689	DISPLAY	
tof	499.7	sp	-0.2
tpwr	61	wp	4996.8
pw	4.950	rfl	4635.7
DECOUPLER		rfp	3627.7
dn	C13	rp	-166.7
dof	0	lp	-78.7
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	64
dmf	32258	th	25
		ai cdc ph	

Table 2, entry 9

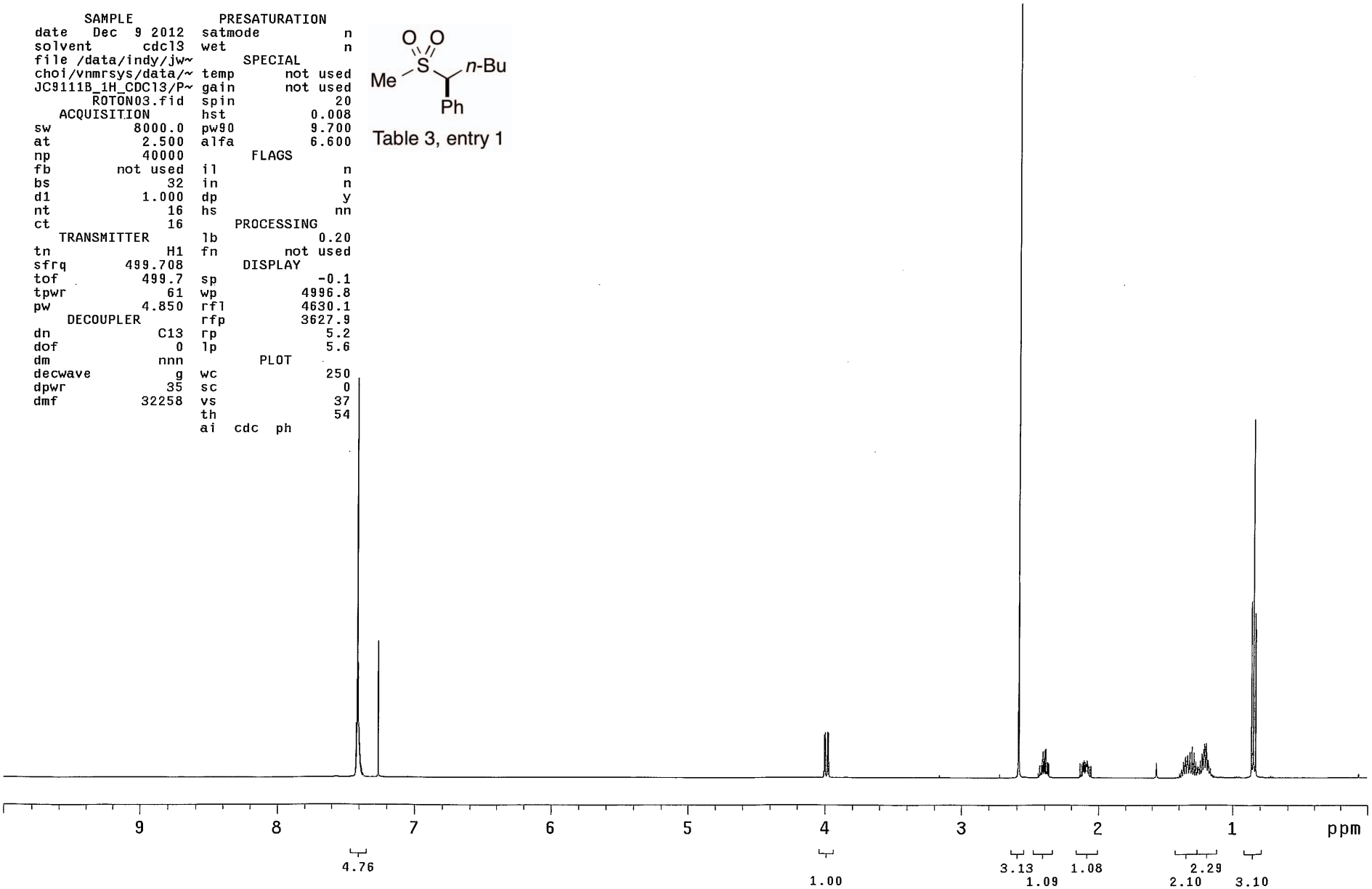


JC9111B 1H CDCl3

exp23 PROTON

SAMPLE		PRESATURATION	
date	Dec 9 2012	satmode	n
solvent	cdcl3	wet	n
file	/data/indy/jw~	SPECIAL	
choi/vnmrsys/data/~		temp	not used
JC9111B_1H_CDCl3/P~		gain	not used
	ROTON03.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.700
at	2.500	alfa	6.600
np	40000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.850	rfl	4630.1
DECOUPLER		rfp	3627.9
dn	C13	rp	5.2
dof	0	lp	5.6
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	37
		th	54
		ai cdc ph	

Table 3, entry 1

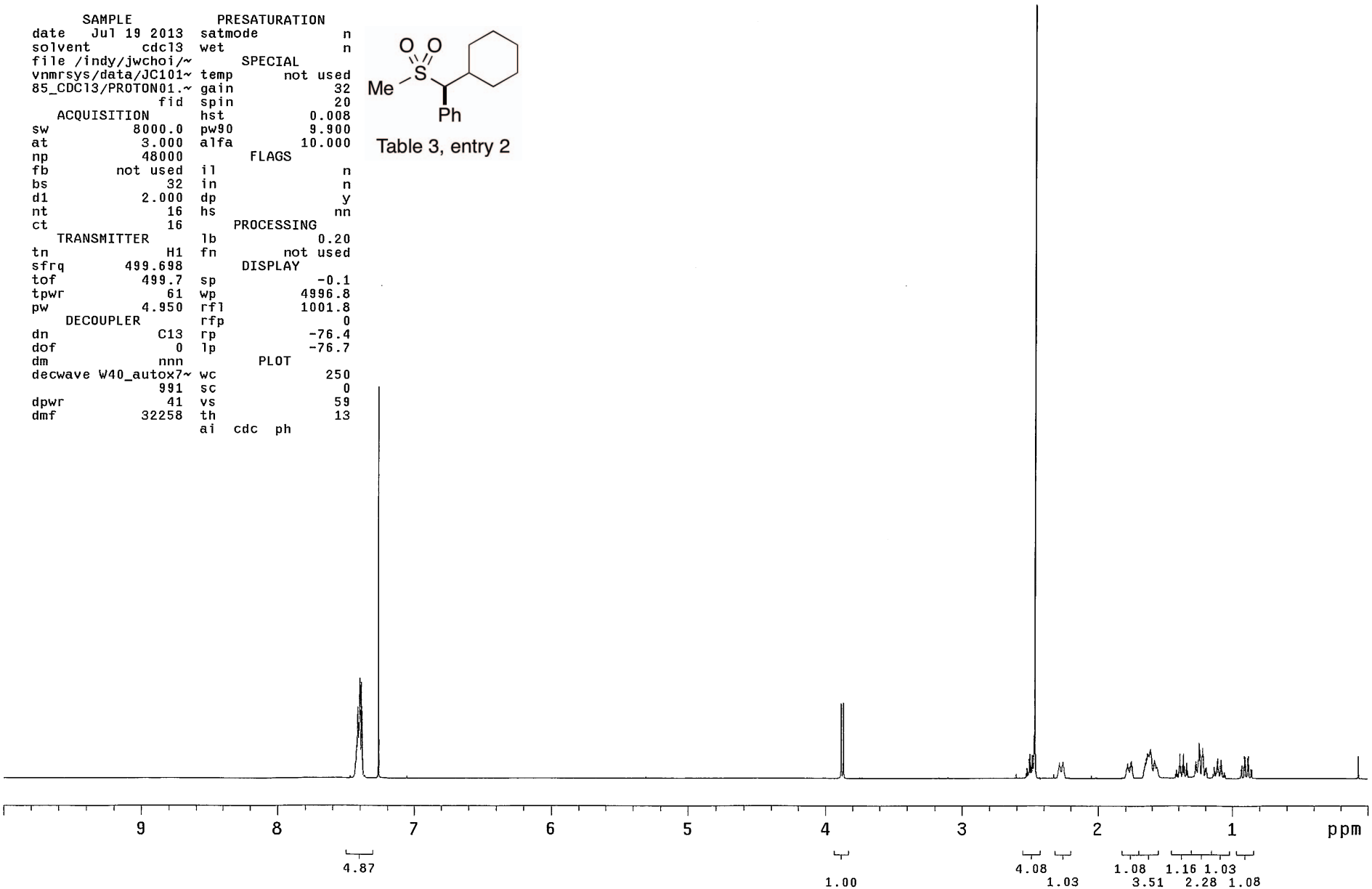


JC10185 CDCl3

exp23 PROTON

SAMPLE		PRESATURATION	
date	Jul 19 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC101~		temp	not used
85_CDCl3/PROTON01.~		gain	32
	fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	1001.8
DECOUPLER		rfp	0
dn	C13	rp	-76.4
dof	0	lp	-76.7
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	59
dmf	32258	th	13
		ai cdc ph	

Table 3, entry 2



JC10181 CD2Cl2

exp2 PROTON

SAMPLE		PRESATURATION	
date	Aug 7 2013	satmode	n
solvent	cd2cl2	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC101~		temp	not used
81_CD2Cl2/PROTON02~		gain	20
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	5.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.699	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	3669.9
DECOUPLER		rfp	2658.4
dn	C13	rp	-67.4
dof	0	lp	-76.2
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	284
dmf	32258	th	41
		ai cdc ph	

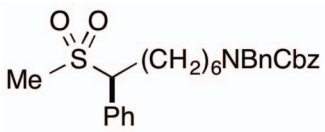
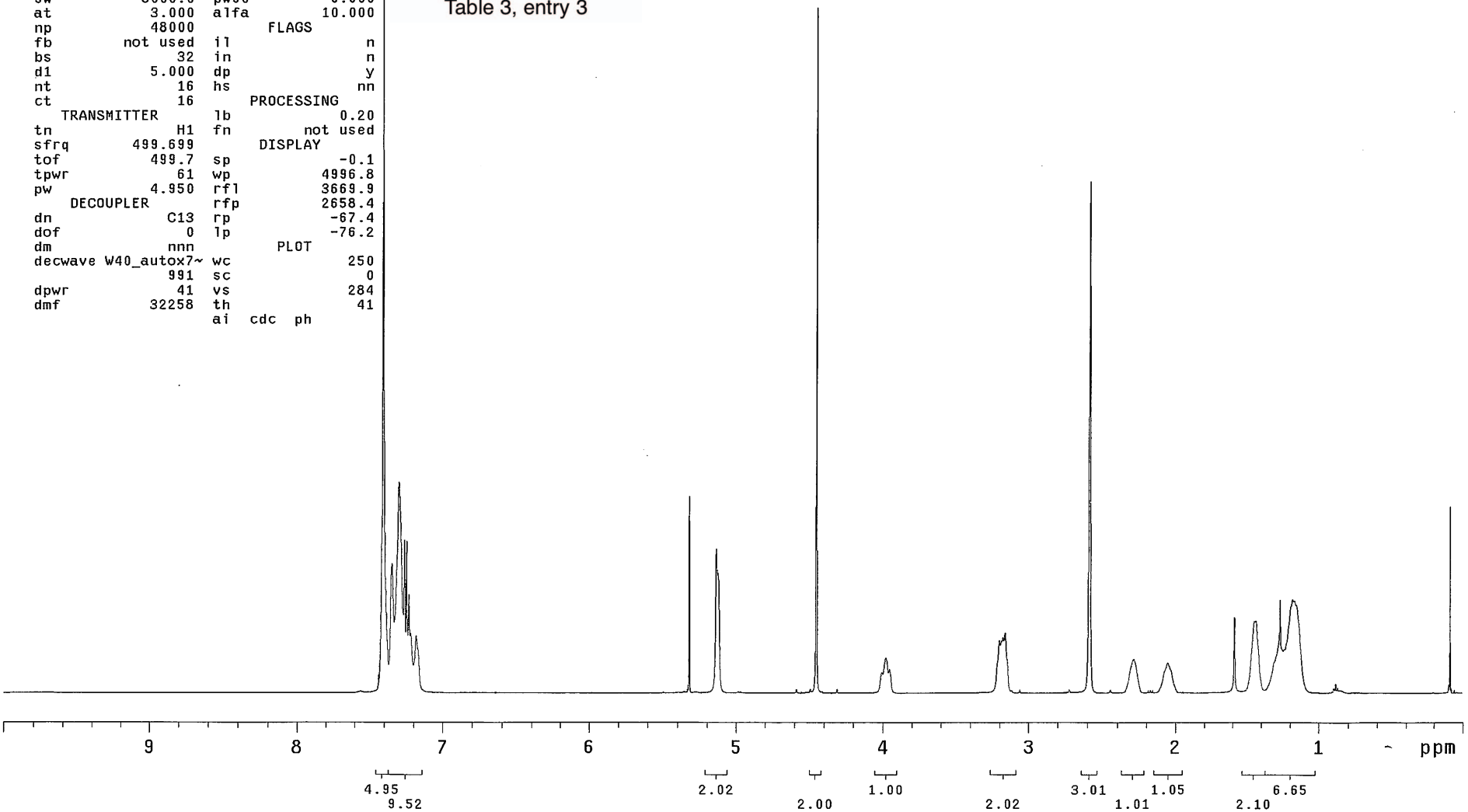


Table 3, entry 3

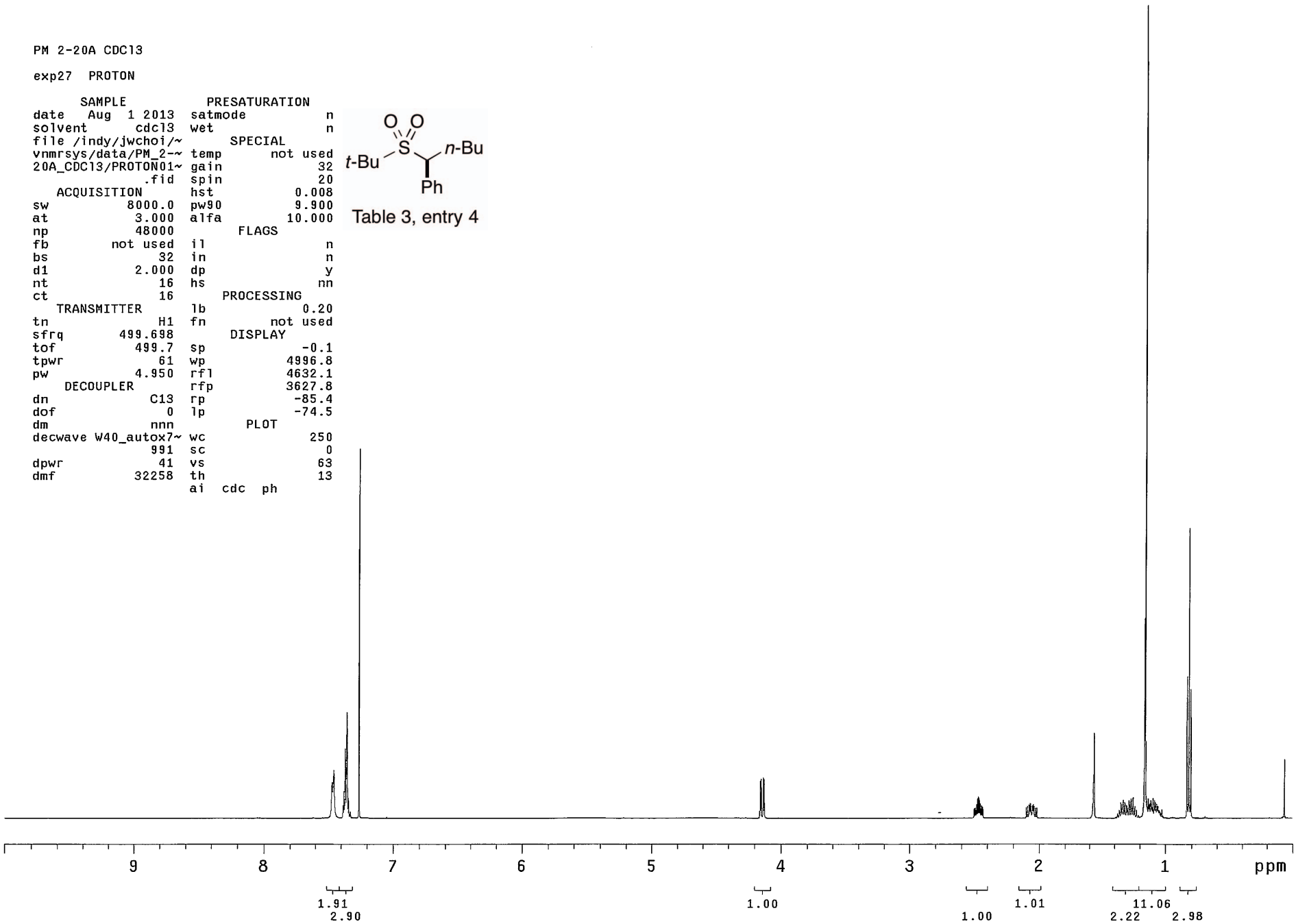


PM 2-20A CDCl3

exp27 PROTON

SAMPLE		PRESATURATION	
date	Aug 1 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/PM_2-~		temp	not used
20A_CDCl3/PROTON01~		gain	32
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-85.4
dof	0	lp	-74.5
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	63
dmf	32258	th	13
		ai cdc ph	

Table 3, entry 4



JC9119A CDCl3

exp30 PROTON

SAMPLE		PRESATURATION	
date	Dec 14 2012	satmode	n
solvent	cdcl3	wet	n
file	/data/indy/jw~	SPECIAL	
choi/vnmrsys/data/~		temp	not used
JC9119A_CDCl3/PROT~		gain	not used
	ON01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.700
at	2.500	alfa	6.600
np	40000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.850	rfl	4630.1
DECOUPLER		rfp	3627.9
dn	C13	rp	4.4
dof	0	lp	2.1
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	122
		th	2
		ai	cdc ph

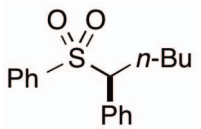
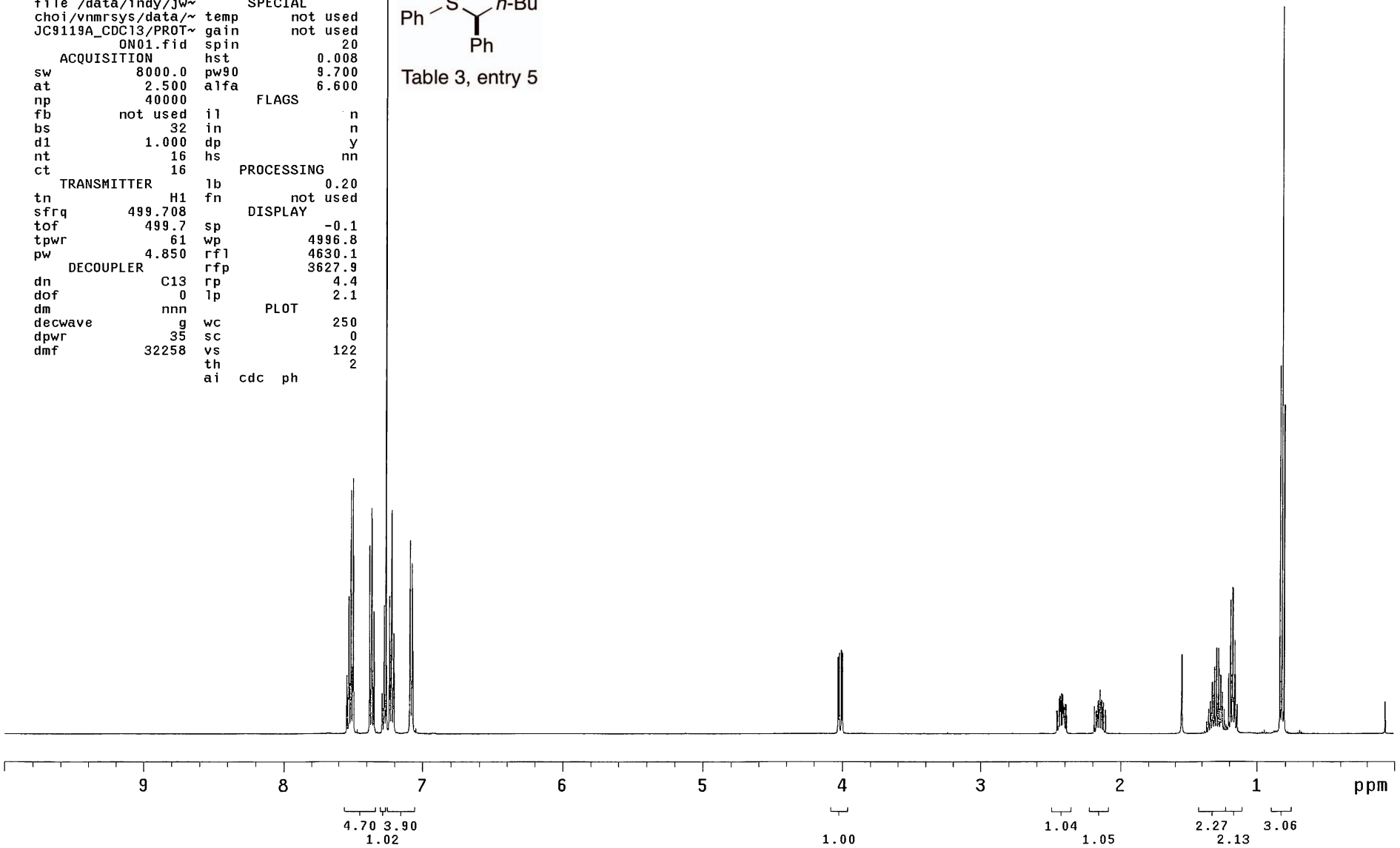


Table 3, entry 5

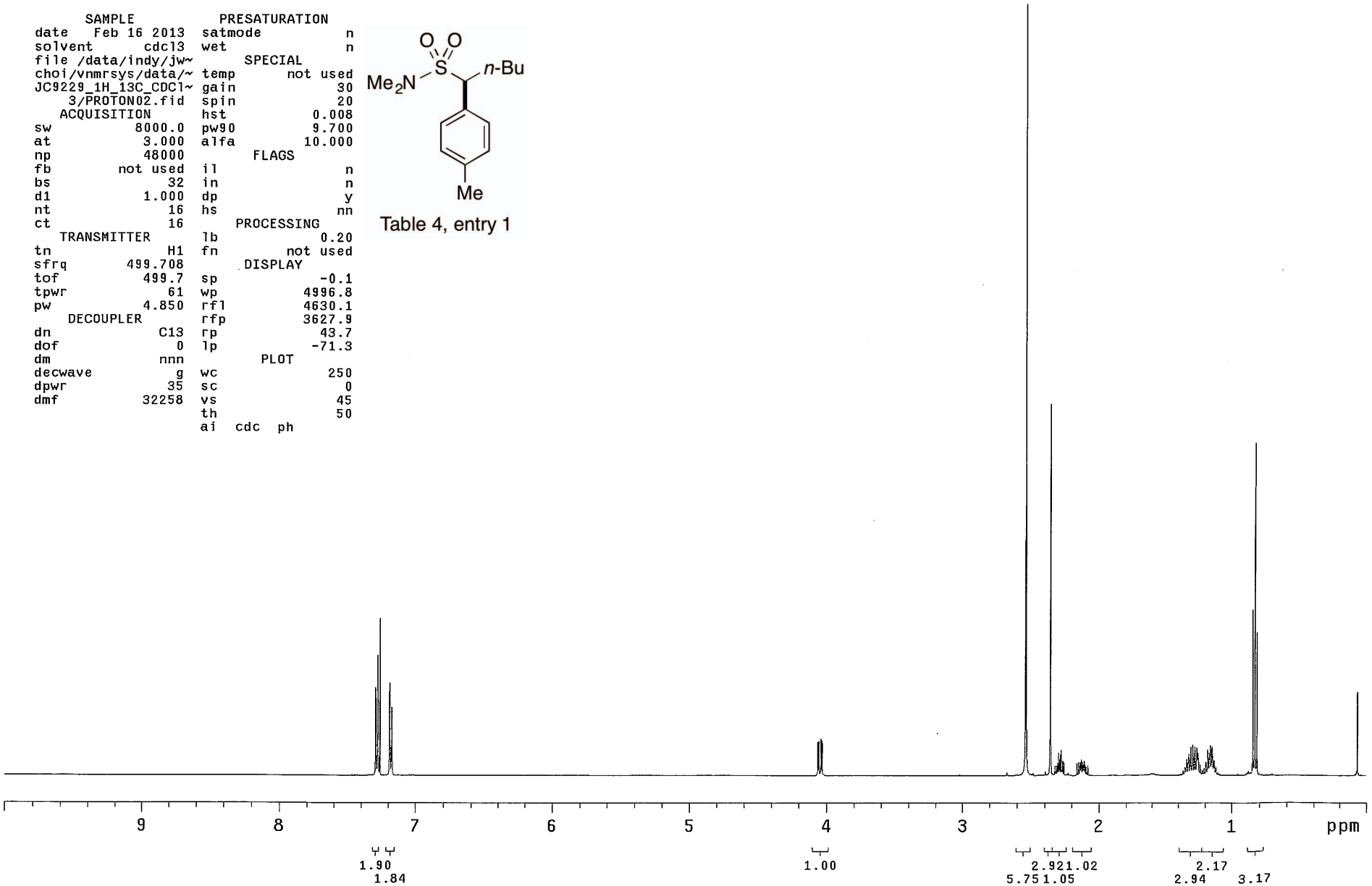


JC9229 CDCl3

exp23 PROTON

SAMPLE		PRESATURATION	
date	Feb 16 2013	satmode	n
solvent	cdcl3	wet	n
file	/data/indy/jw~	SPECIAL	
choi/vnmrsys/data/~		temp	not used
JC9229_1H_13C_CDCl~		gain	30
3/PROTON02.fid		spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.700
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.850	rfl	4630.1
DECOUPLER		rfp	3627.9
dn	C13	rp	43.7
dof	0	lp	-71.3
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	45
		th	50
		ai	cdc ph

Table 4, entry 1

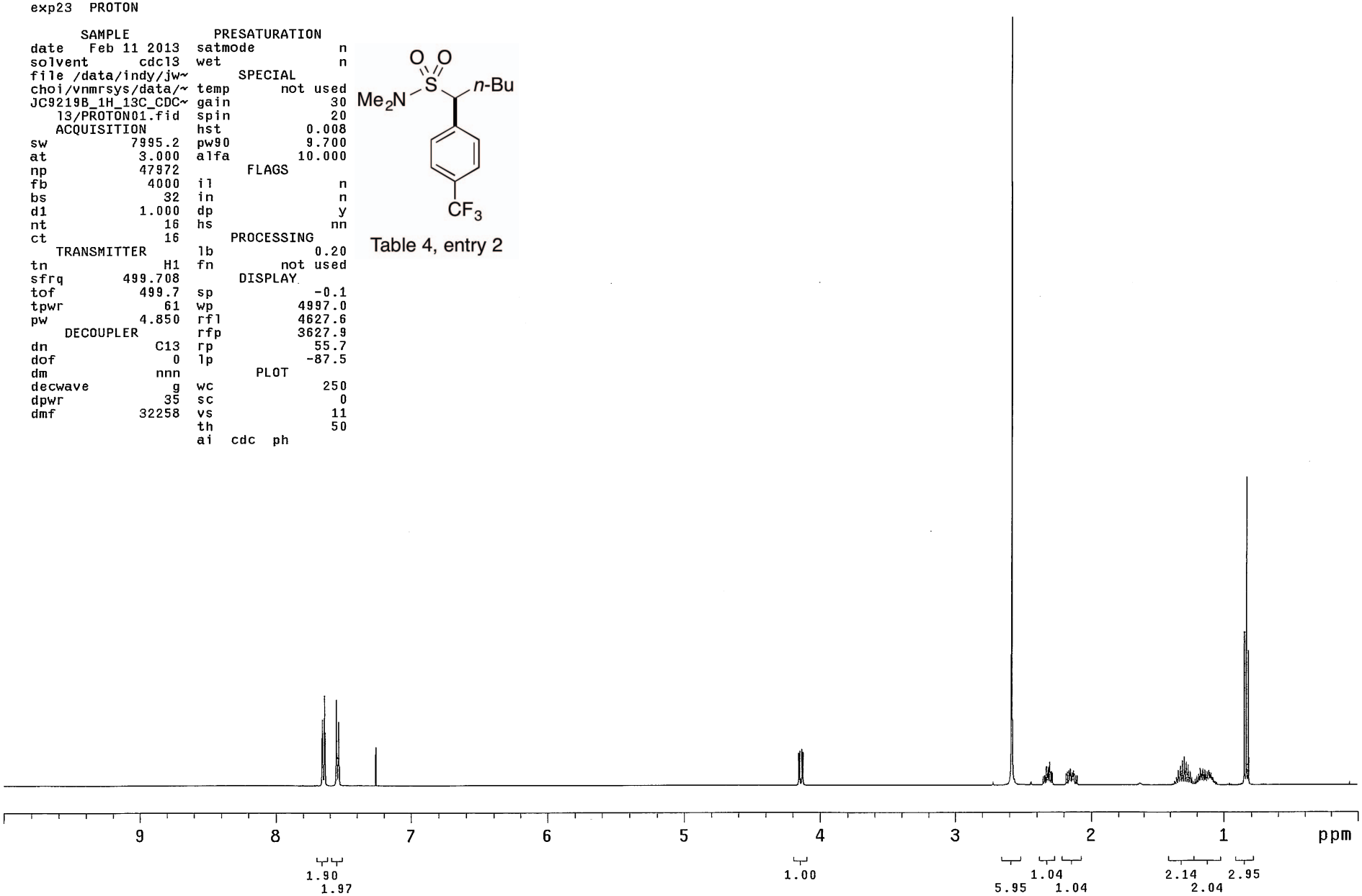


JC9219B CDCl3

exp23 PROTON

SAMPLE		PRESATURATION	
date	Feb 11 2013	satmode	n
solvent	cdcl3	wet	n
file	/data/indy/jw~	SPECIAL	
choi/vnmrsys/data/~		temp	not used
JC9219B_1H_13C_CDC~		gain	30
l3/PROTON01.fid		spin	20
ACQUISITION		hst	0.008
sw	7995.2	pw90	9.700
at	3.000	alfa	10.000
np	47972	FLAGS	
fb	4000	il	n
bs	32	in	n
d1	1.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.708	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4997.0
pw	4.850	rfl	4627.6
DECOUPLER		rfp	3627.9
dn	C13	rp	55.7
dof	0	lp	-87.5
dm	nnn	PLOT	
decwave	g	wc	250
dpwr	35	sc	0
dmf	32258	vs	11
		th	50
		ai	cdc ph

Table 4, entry 2



JC12077B 1H CDCl3

exp64 PROTON

SAMPLE		PRESATURATION	
date	Aug 3 2014	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC120~		temp	25.0
77B_CDCl3/PROTON02~		gain	26
	.fid	spin	0
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.689	DISPLAY	
tof	499.7	sp	-0.2
tpwr	61	wp	5996.1
pw	4.950	rfl	1001.9
DECOUPLER		rfp	0
dn	C13	rp	-172.0
dof	0	lp	-73.1
dm	nnn	PLOT	
decwave	W40_autox7~	wc	234
	991	sc	8
dpwr	41	vs	55
dmf	32258	th	22
		ai cdc ph	

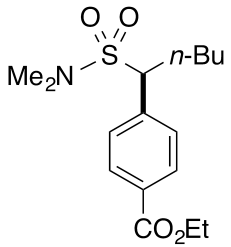
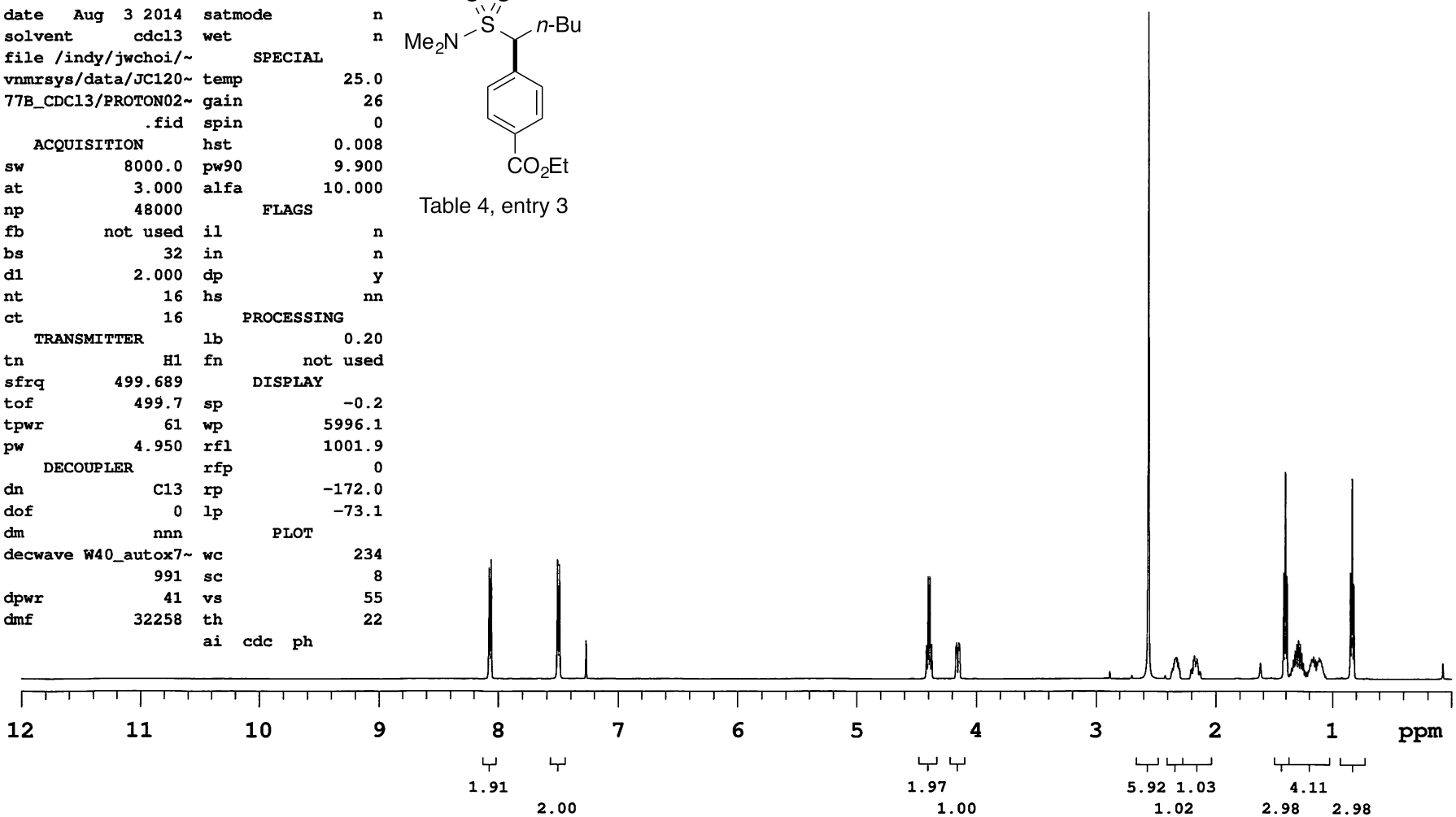


Table 4, entry 3



JC9159B CDCl3

exp23 PROTON

SAMPLE	
date	Jan 17 2013
solvent	cdcl3
file	/data/indy/jw~
choi/vnmrsys/data/~	
JC9159B_CDCl3/PROT~	
	ON01.fid

ACQUISITION	
sw	7995.2
at	3.000
np	47972
fb	4000
bs	32
d1	1.000
nt	16
ct	16

TRANSMITTER	
tn	H1
sfrq	499.708
tof	499.7
tpwr	61
pw	4.850

DECOUPLER	
dn	C13
dof	0
dm	nnn
decwave	g
dpwr	35
dmf	32258

PRESATURATION	
satmode	n
wet	n

SPECIAL	
temp	not used
gain	30
spin	20
hst	0.008
pw90	9.700
alfa	10.000

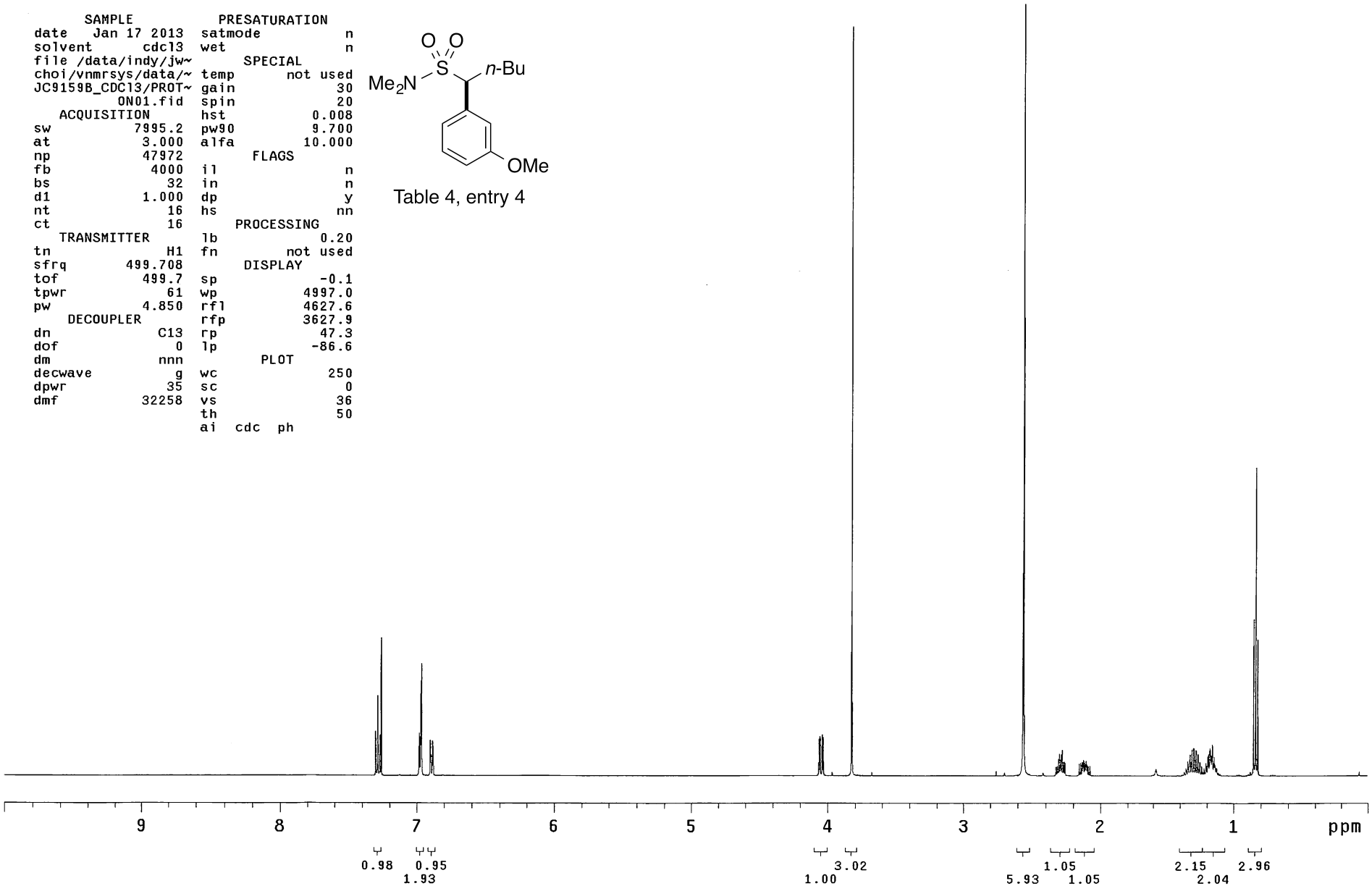
FLAGS	
il	n
in	n
dp	y
hs	nn

PROCESSING	
lb	0.20
fn	not used

DISPLAY	
sp	-0.1
wp	4997.0
rfl	4627.6
rfp	3627.9
rp	47.3
lp	-86.6

PLOT	
wc	250
sc	0
vs	36
th	50
ai	cdc ph

Table 4, entry 4

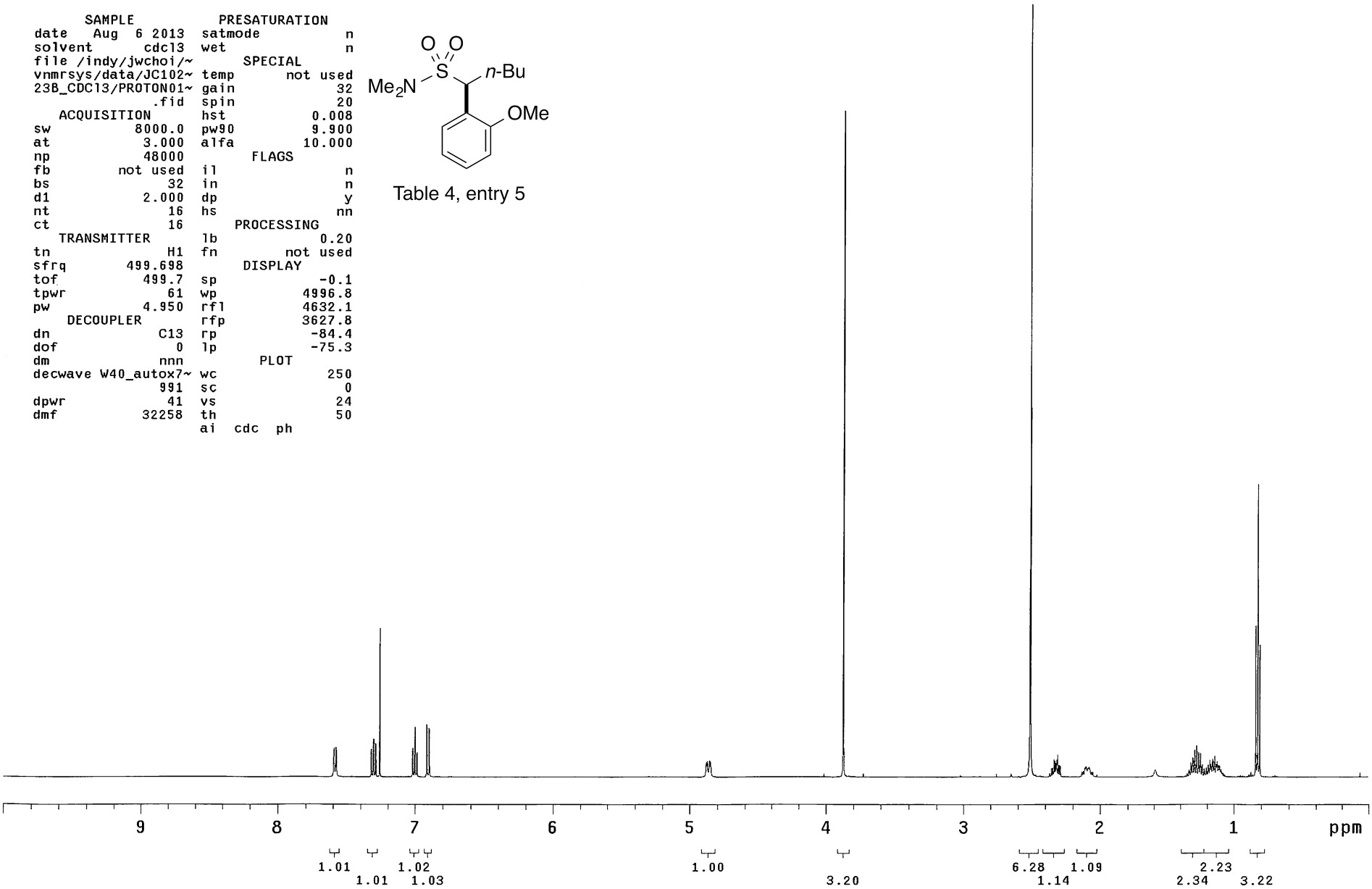


JC10223B CDCl3

exp28 PROTON

SAMPLE		PRESATURATION	
date	Aug 6 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC102~		temp	not used
23B_CDCl3/PROTON01~		gain	32
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-84.4
dof	0	lp	-75.3
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	24
dmf	32258	th	50
		ai cdc ph	

Table 4, entry 5

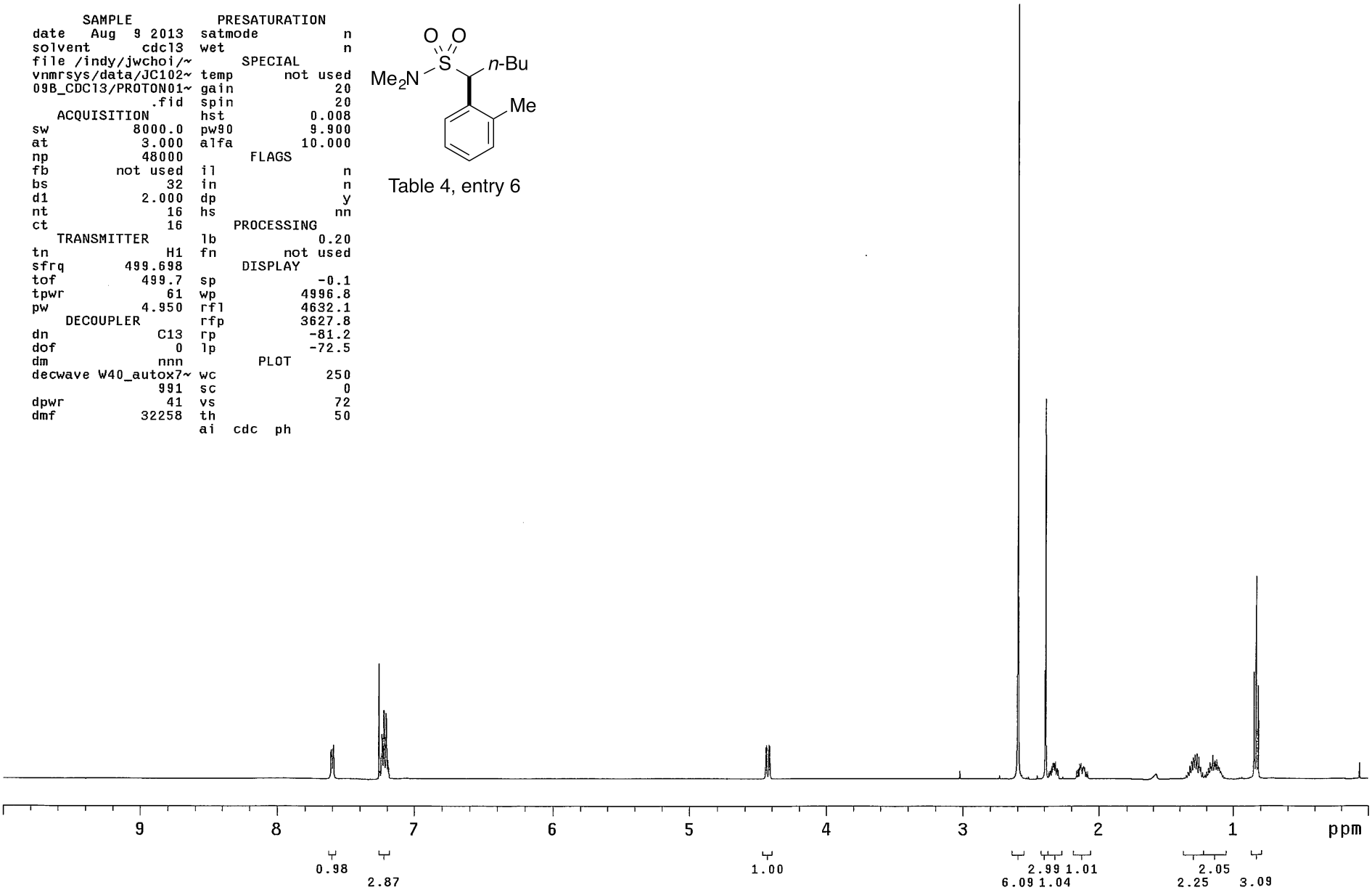


JC10209B CDCl3

exp28 PROTON

SAMPLE		PRESATURATION	
date	Aug 9 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC102~		temp	not used
09B_CDCl3/PROTON01~		gain	20
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-81.2
dof	0	lp	-72.5
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	72
dmf	32258	th	50
		ai cdc ph	

Table 4, entry 6

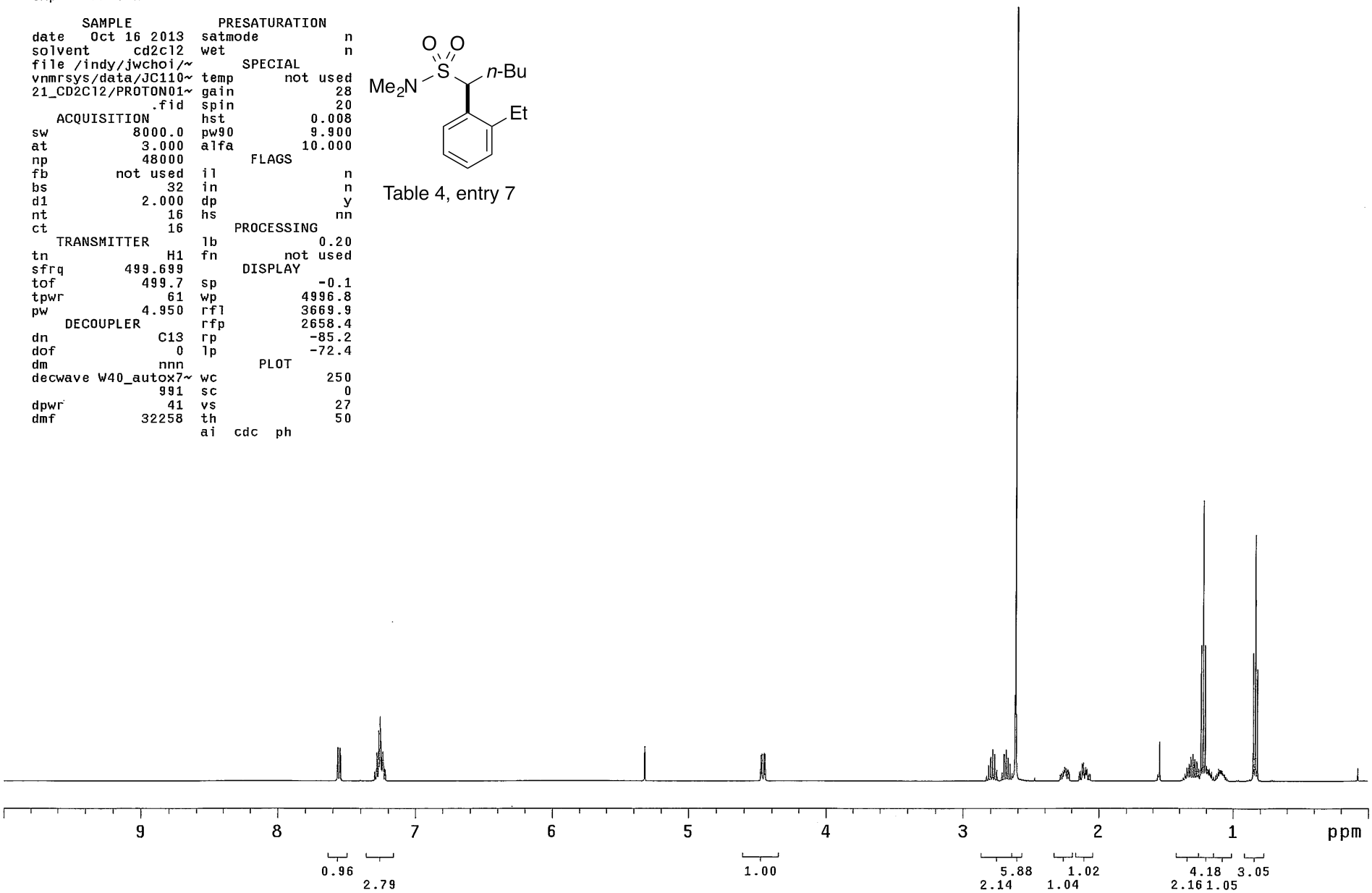


JC11021 CD2Cl2

exp30 PROTON

SAMPLE		PRESATURATION	
date	Oct 16 2013	satmode	n
solvent	cd2cl2	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC110~		temp	not used
21_CD2Cl2/PROTON01~		gain	28
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.699	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	3669.9
DECOUPLER		rfp	2658.4
dn	C13	rp	-85.2
dof	0	lp	-72.4
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	27
dmf	32258	th	50
		ai cdc ph	

Table 4, entry 7

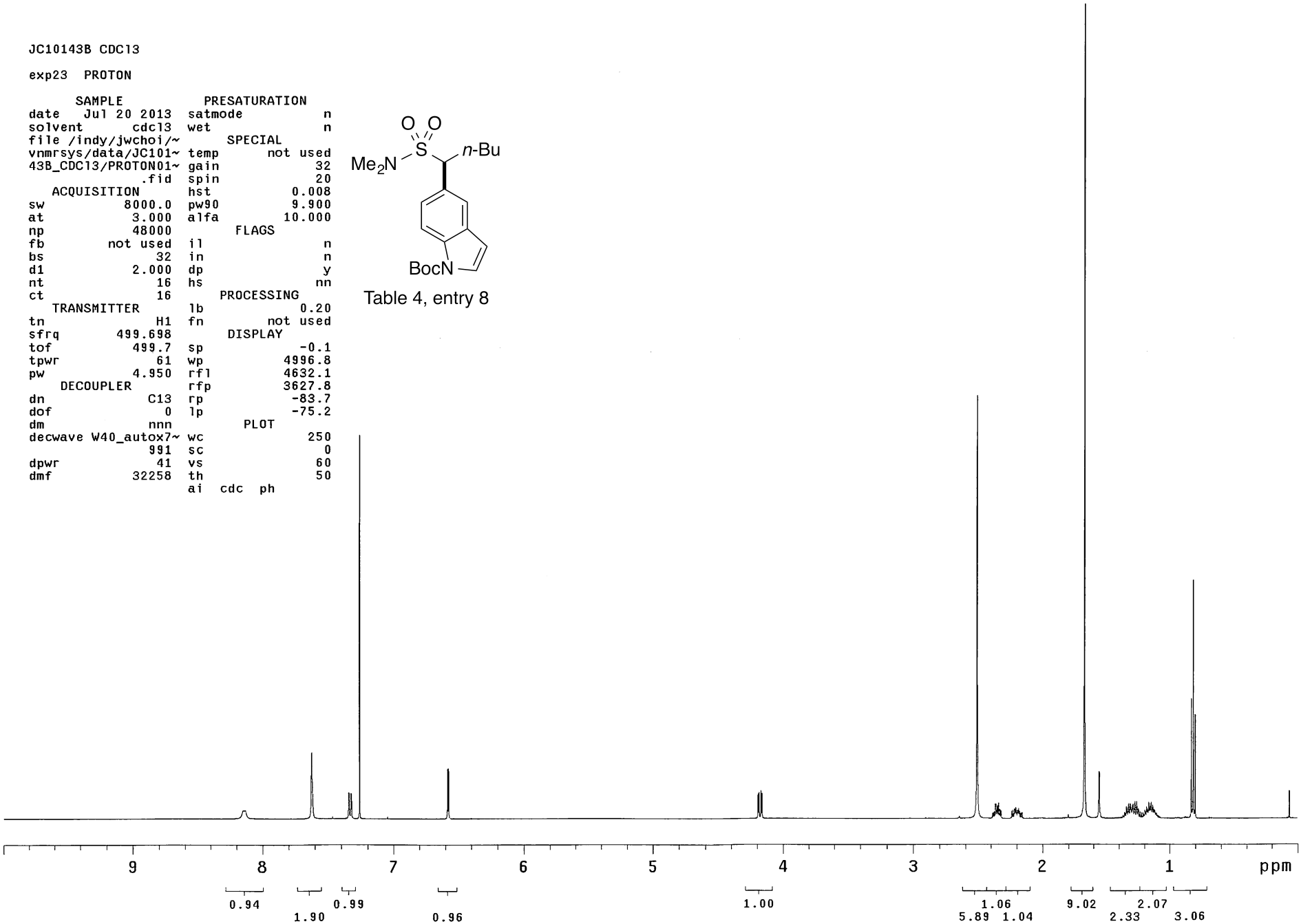


JC10143B CDCl3

exp23 PROTON

SAMPLE		PRESATURATION	
date	Jul 20 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC101~		temp	not used
43B_CDCl3/PROTON01~		gain	32
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-83.7
dof	0	lp	-75.2
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	60
dmf	32258	th	50
		ai cdc ph	

Table 4, entry 8

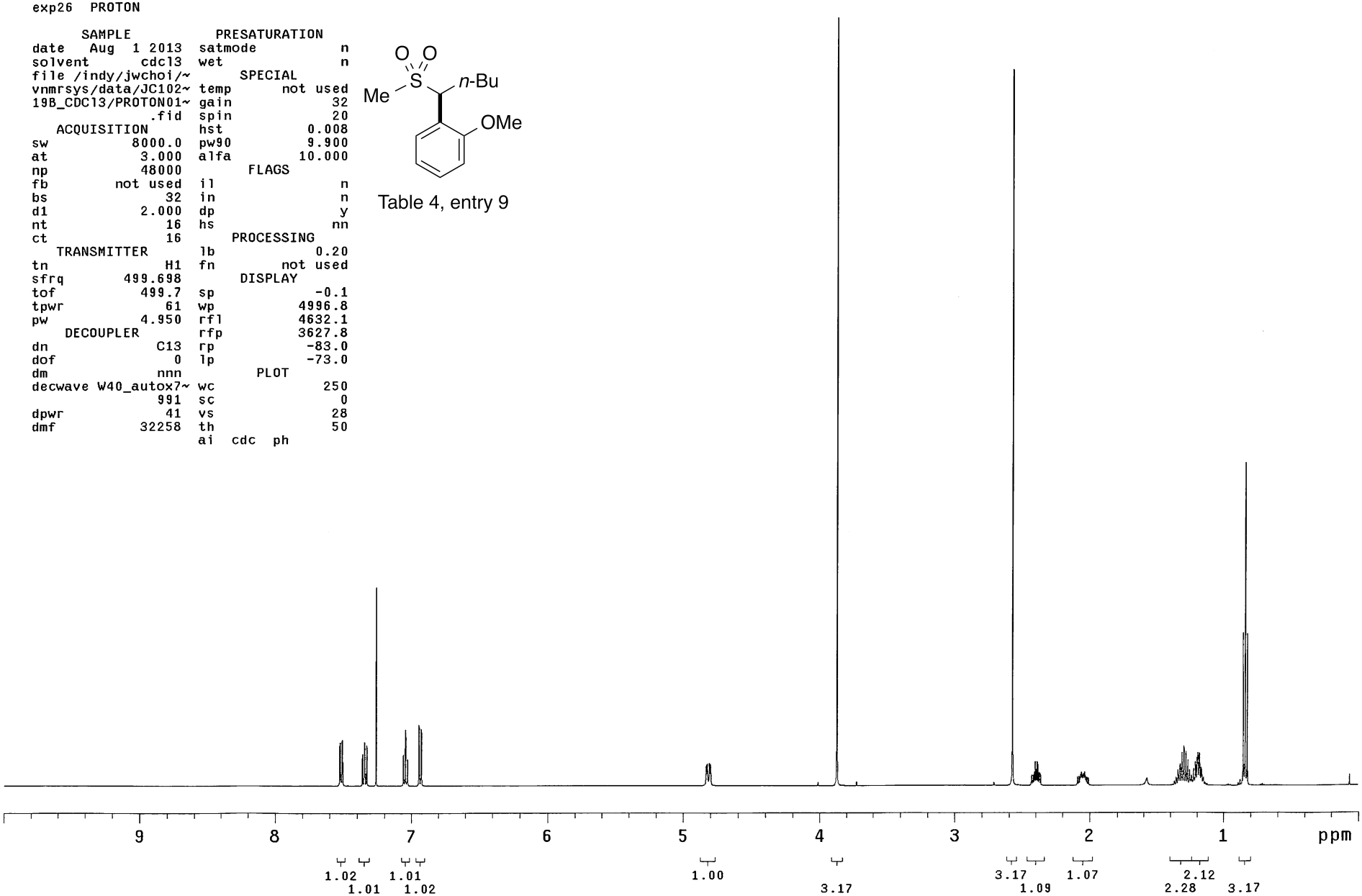


JC10219B CDCl3

exp26 PROTON

SAMPLE		PRESATURATION	
date	Aug 1 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC102~		temp	not used
19B_CDCl3/PROTON01~		gain	32
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-83.0
dof	0	lp	-73.0
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	28
dmf	32258	th	50
		ai cdc ph	

Table 4, entry 9

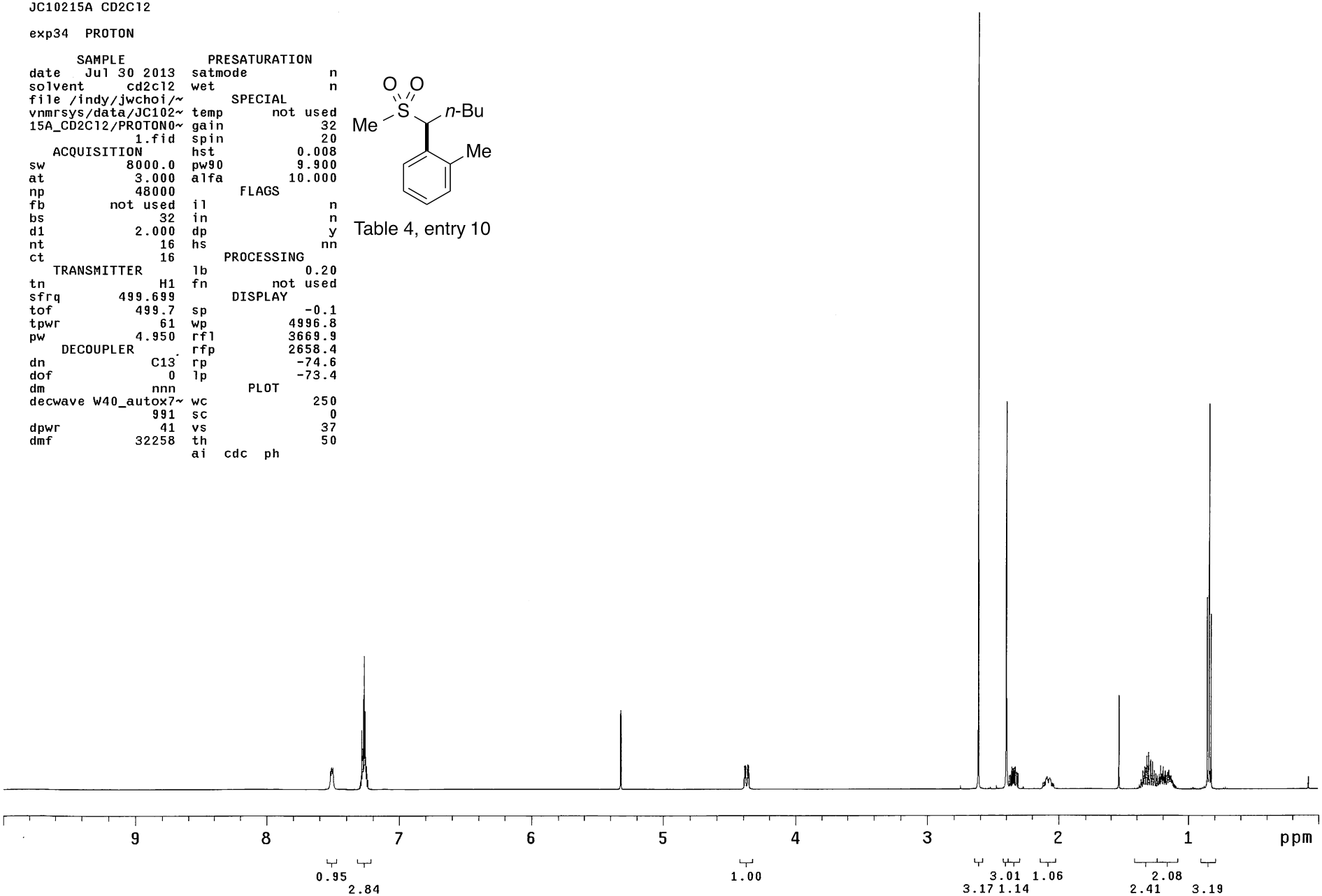


JC10215A CD2Cl2

exp34 PROTON

SAMPLE		PRESATURATION	
date	Jul 30 2013	satmode	n
solvent	cd2cl2	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC102~		temp	not used
15A_CD2Cl2/PROTON0~		gain	32
	1.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.699	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	3669.9
DECOUPLER		rfp	2658.4
dn	C13	rp	-74.6
dof	0	lp	-73.4
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	37
dmf	32258	th	50
		ai cdc ph	

Table 4, entry 10

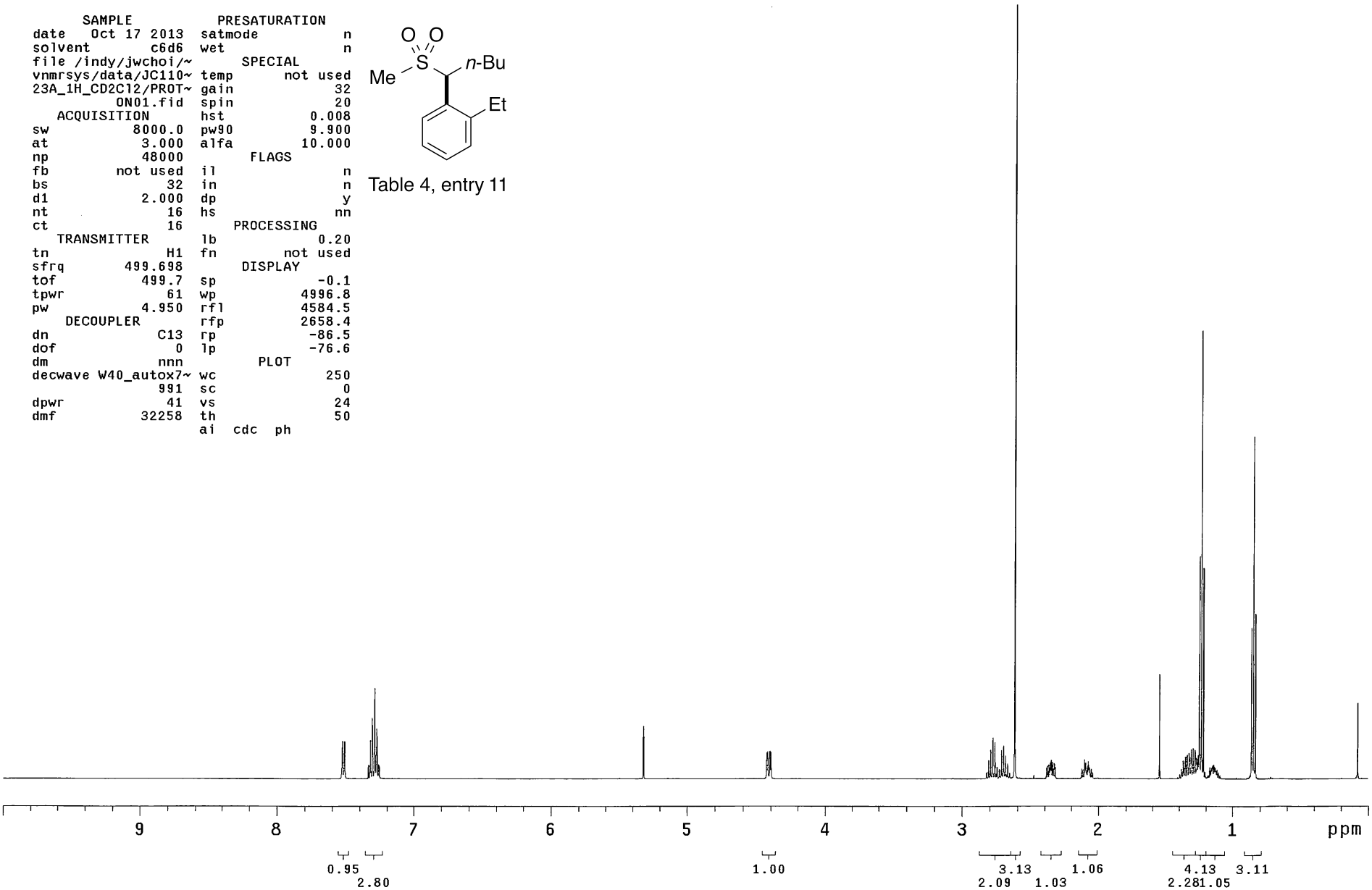


JC11023A 1H CD2Cl2

exp30 PROTON

SAMPLE		PRESATURATION	
date	Oct 17 2013	satmode	n
solvent	c6d6	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC110~		temp	not used
23A_1H_CD2Cl2/PROT~		gain	32
	ON01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4584.5
DECOUPLER		rfp	2658.4
dn	C13	rp	-86.5
dof	0	lp	-76.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	24
dmf	32258	th	50
		ai cdc ph	

Table 4, entry 11

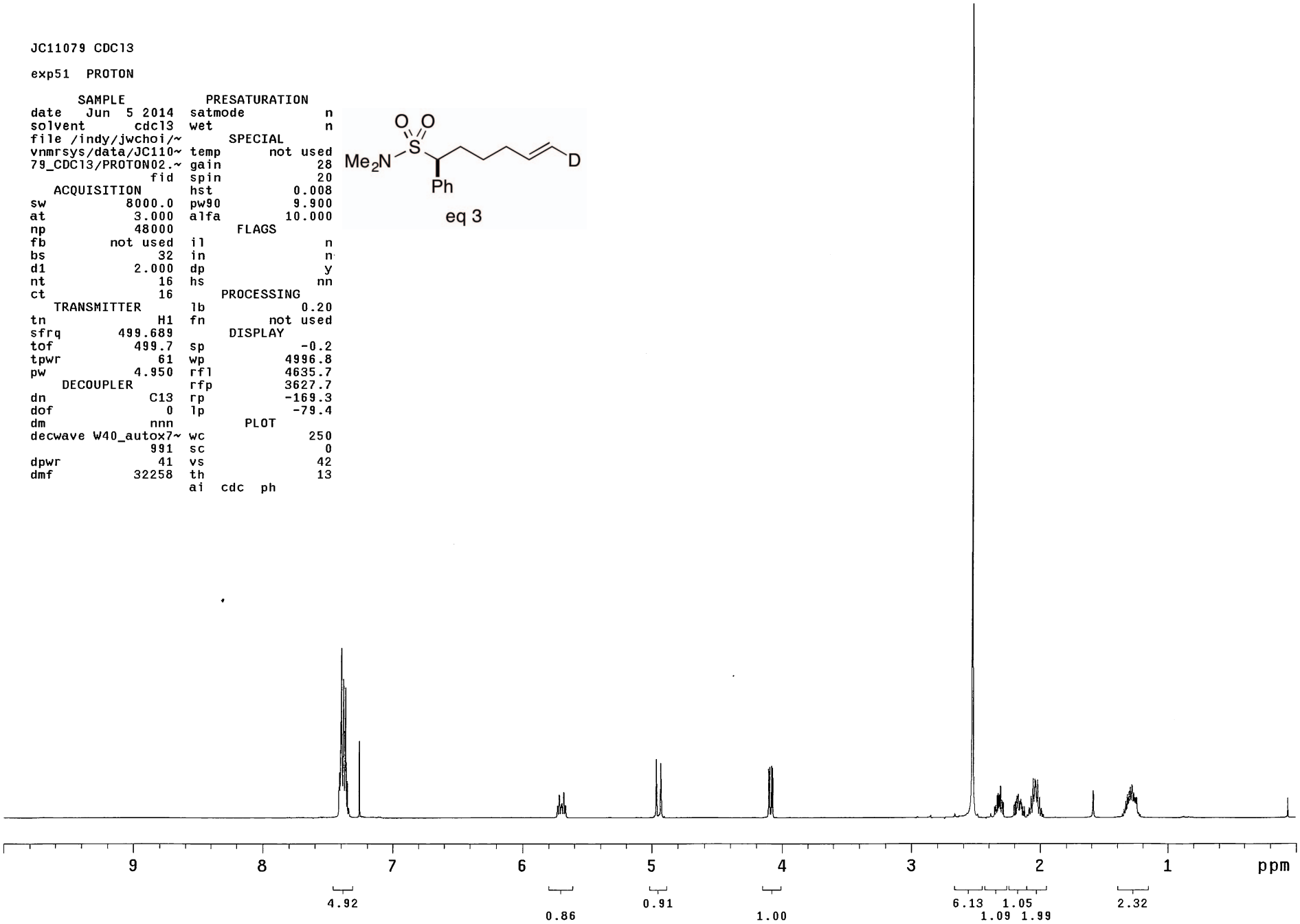


JC11079 CDCl3

exp51 PROTON

SAMPLE		PRESATURATION	
date	Jun 5 2014	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC110~		temp	not used
79_CDCl3/PROTON02.~		gain	28
	fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.689	DISPLAY	
tof	499.7	sp	-0.2
tpwr	61	wp	4996.8
pw	4.950	rfl	4635.7
DECOUPLER		rfp	3627.7
dn	C13	rp	-169.3
dof	0	lp	-79.4
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	42
dmf	32258	th	13
		ai cdc ph	

eq 3

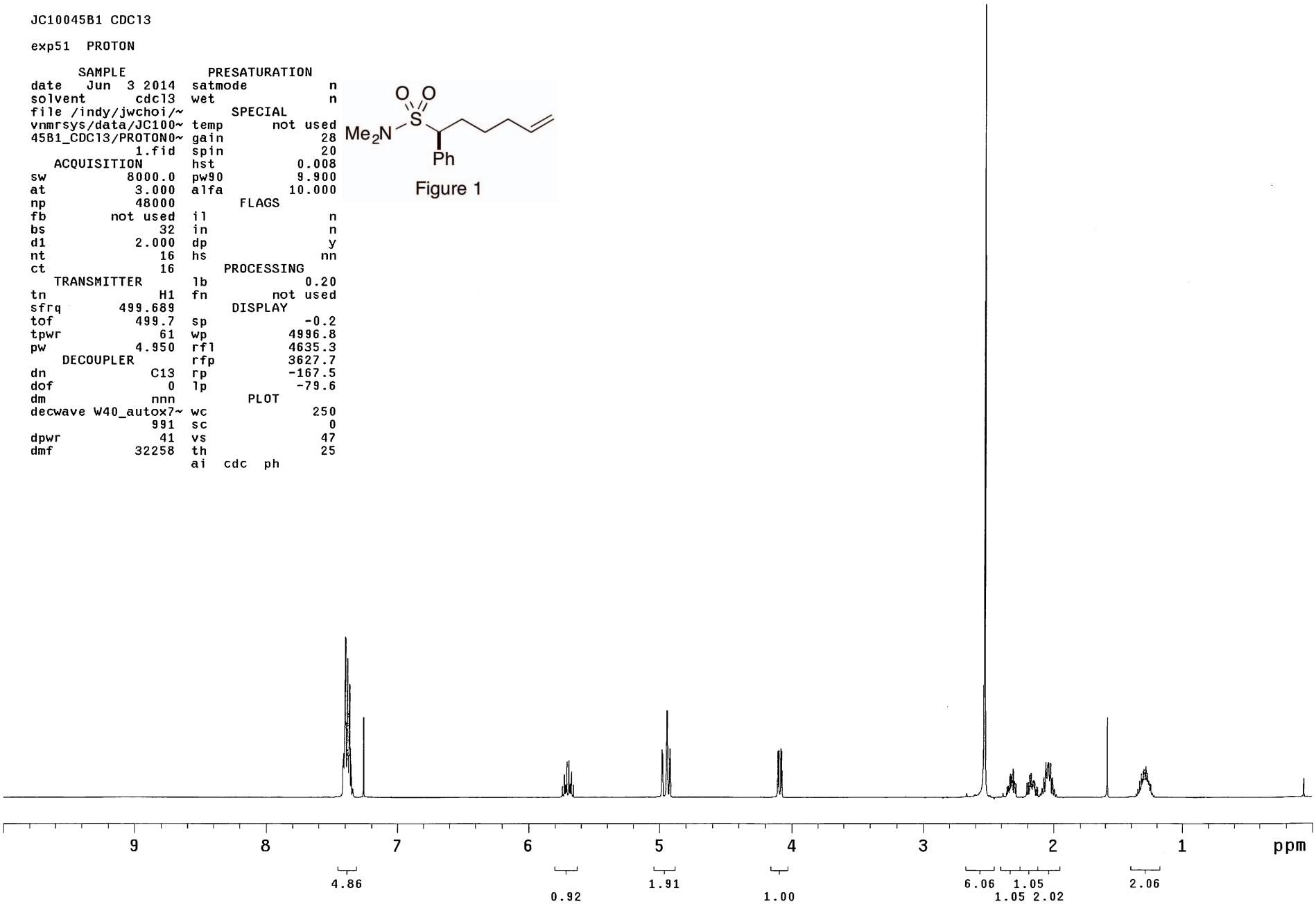


JC10045B1 CDCl3

exp51 PROTON

SAMPLE		PRESATURATION	
date	Jun 3 2014	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC100~		temp	not used
45B1_CDCl3/PROTON0~		gain	28
	1.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.689	DISPLAY	
tof	499.7	sp	-0.2
tpwr	61	wp	4996.8
pw	4.950	rfl	4635.3
DECOUPLER		rfp	3627.7
dn	C13	rp	-167.5
dof	0	lp	-79.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	47
dmf	32258	th	25
		ai cdc ph	

Figure 1

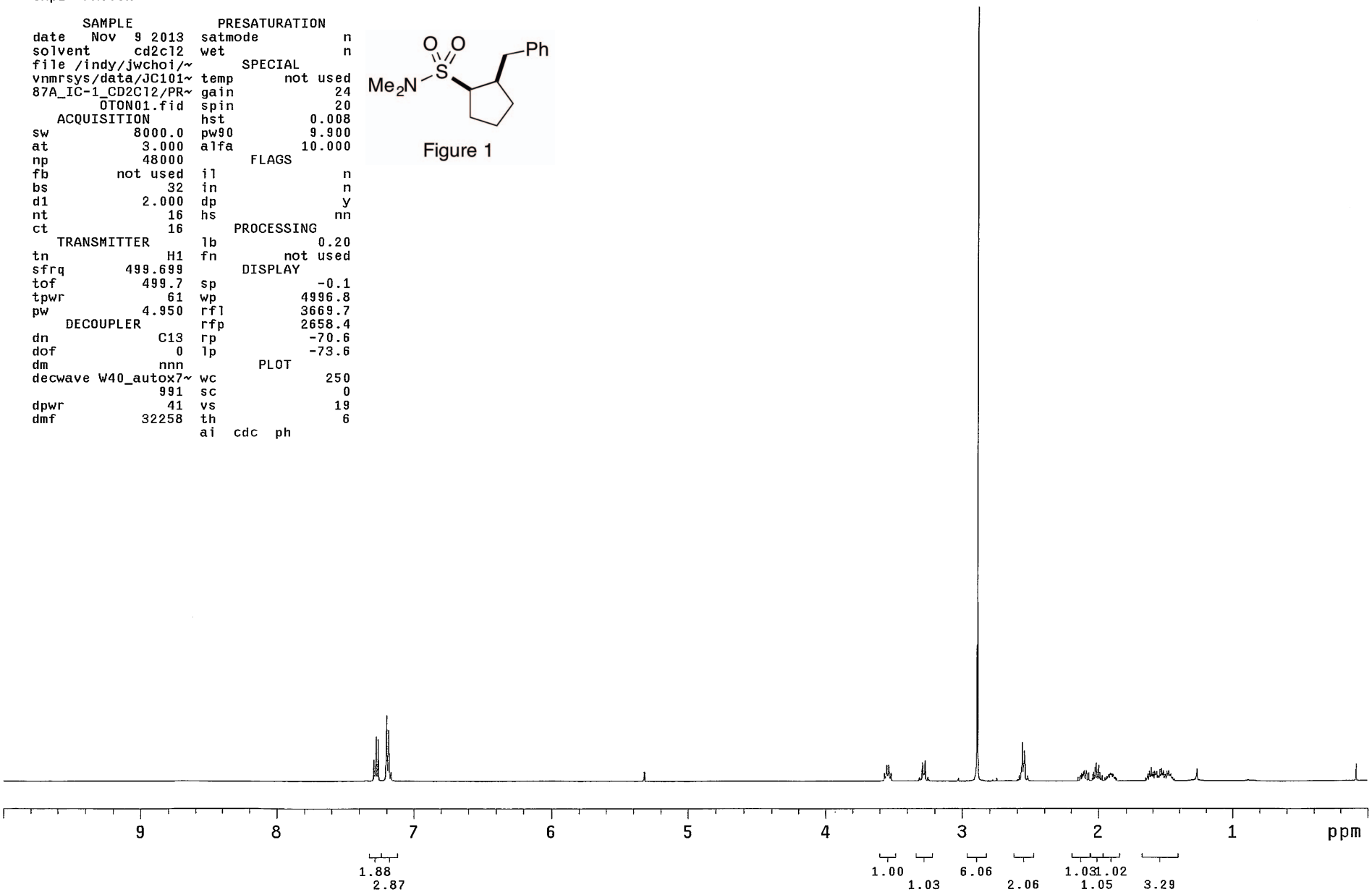


JC10187A IC-1 CD2Cl2

exp1 PROTON

SAMPLE		PRESATURATION	
date	Nov 9 2013	satmode	n
solvent	cd2cl2	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC101~		temp	not used
87A_IC-1_CD2Cl2/PR~		gain	24
	OTON01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.699	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	3669.7
DECOUPLER		rfp	2658.4
dn	C13	rp	-70.6
dof	0	lp	-73.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	19
dmf	32258	th	6
		ai cdc ph	

Figure 1

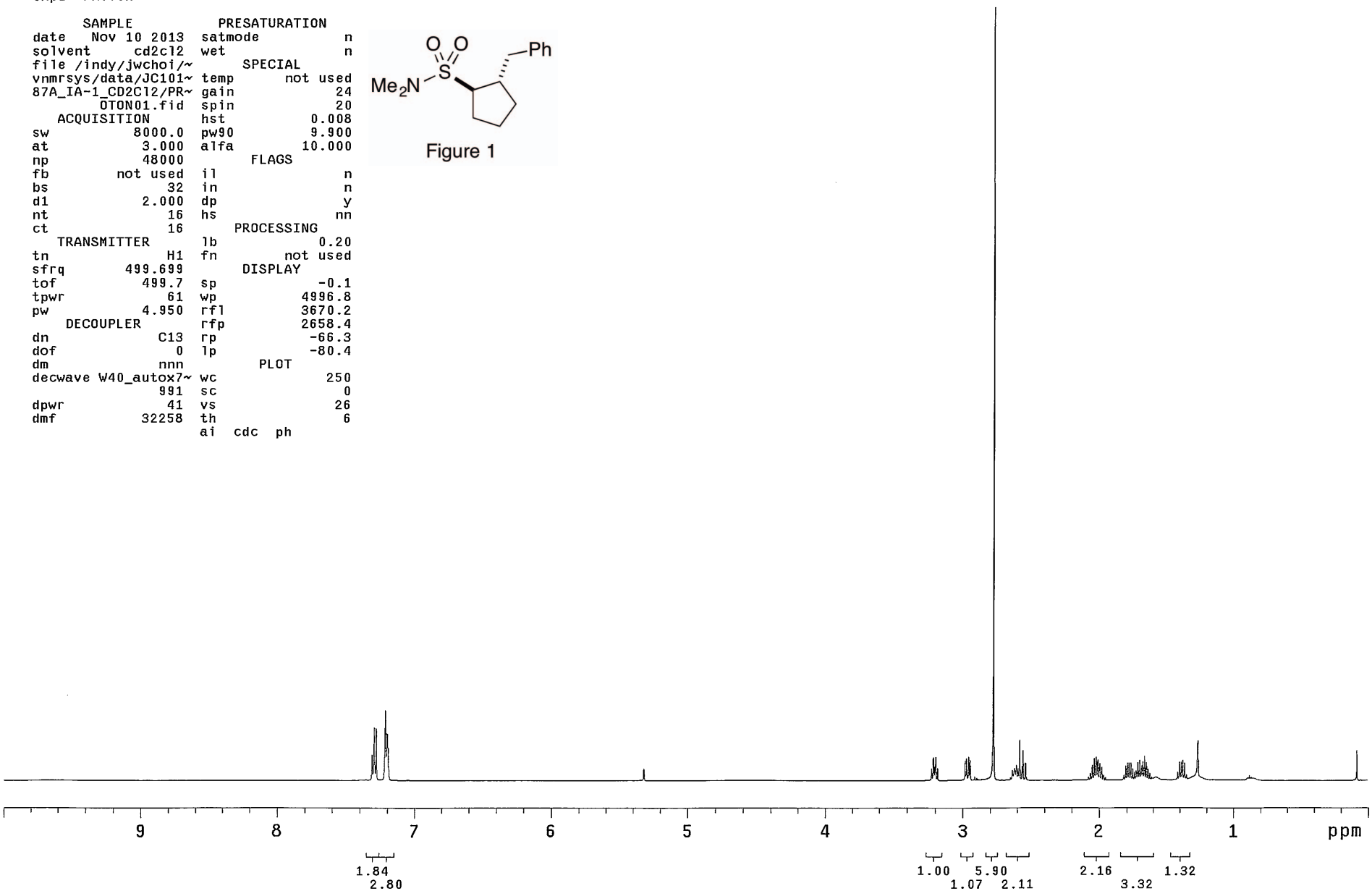


JC10187A IA-1 CD2Cl2

exp1 PROTON

SAMPLE		PRESATURATION	
date	Nov 10 2013	satmode	n
solvent	cd2cl2	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC101~		temp	not used
87A_IA-1_CD2Cl2/PR~		gain	24
	OTON01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.699	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	3670.2
DECOUPLER		rfp	2658.4
dn	C13	rp	-66.3
dof	0	lp	-80.4
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	26
dmf	32258	th	6
		ai cdc ph	

Figure 1

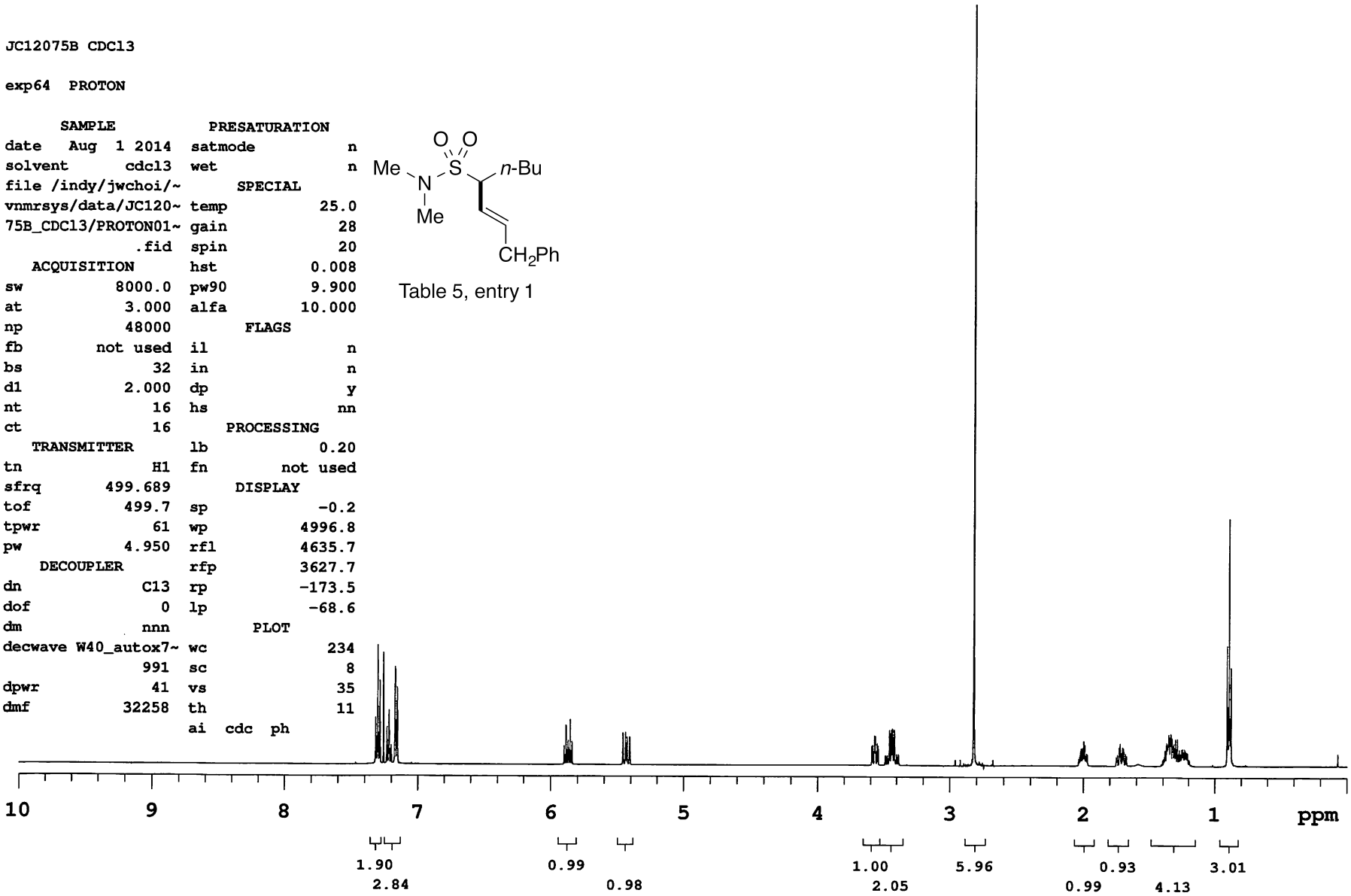


JC12075B CDCl3

exp64 PROTON

SAMPLE		PRESATURATION	
date	Aug 1 2014	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC120~		temp	25.0
75B_CDCl3/PROTON01~		gain	28
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.689	DISPLAY	
tof	499.7	sp	-0.2
tpwr	61	wp	4996.8
pw	4.950	rfl	4635.7
DECOUPLER		rfp	3627.7
dn	C13	rp	-173.5
dof	0	lp	-68.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	234
	991	sc	8
dpwr	41	vs	35
dmf	32258	th	11
		ai cdc ph	

Table 5, entry 1



JC10275 CD2Cl2

exp30 PROTON

SAMPLE		PRESATURATION	
date	Sep 5 2013	satmode	n
solvent	cd2cl2	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC102~		temp	not used
75_CD2Cl2/PROTON01~		gain	28
	.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.699	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	3669.9
DECOUPLER		rfp	2658.4
dn	C13	rp	-71.9
dof	0	lp	-76.8
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	131
dmf	32258	th	50
		ai cdc ph	

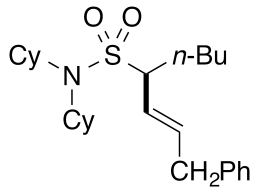
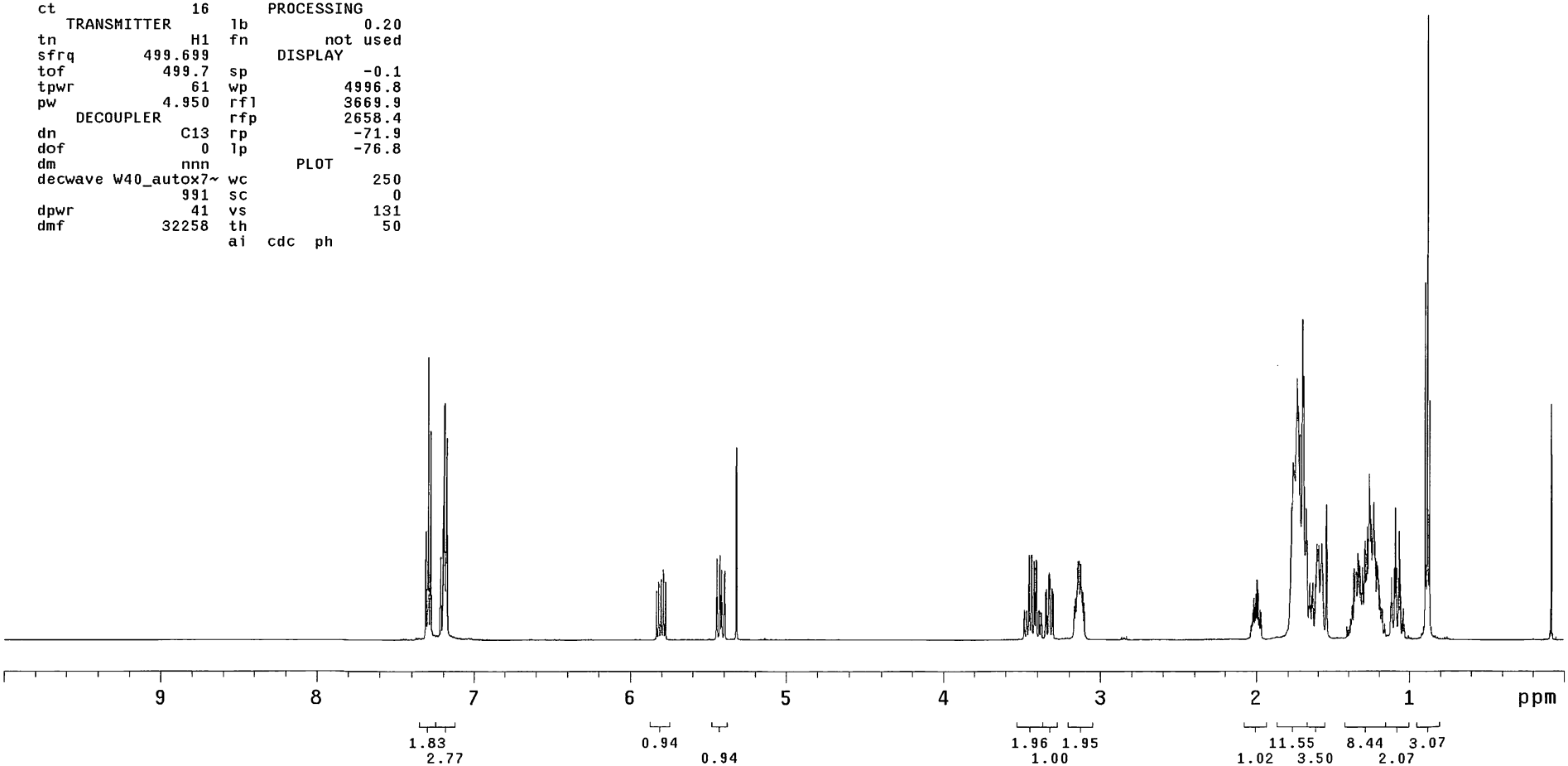


Table 5, entry 2

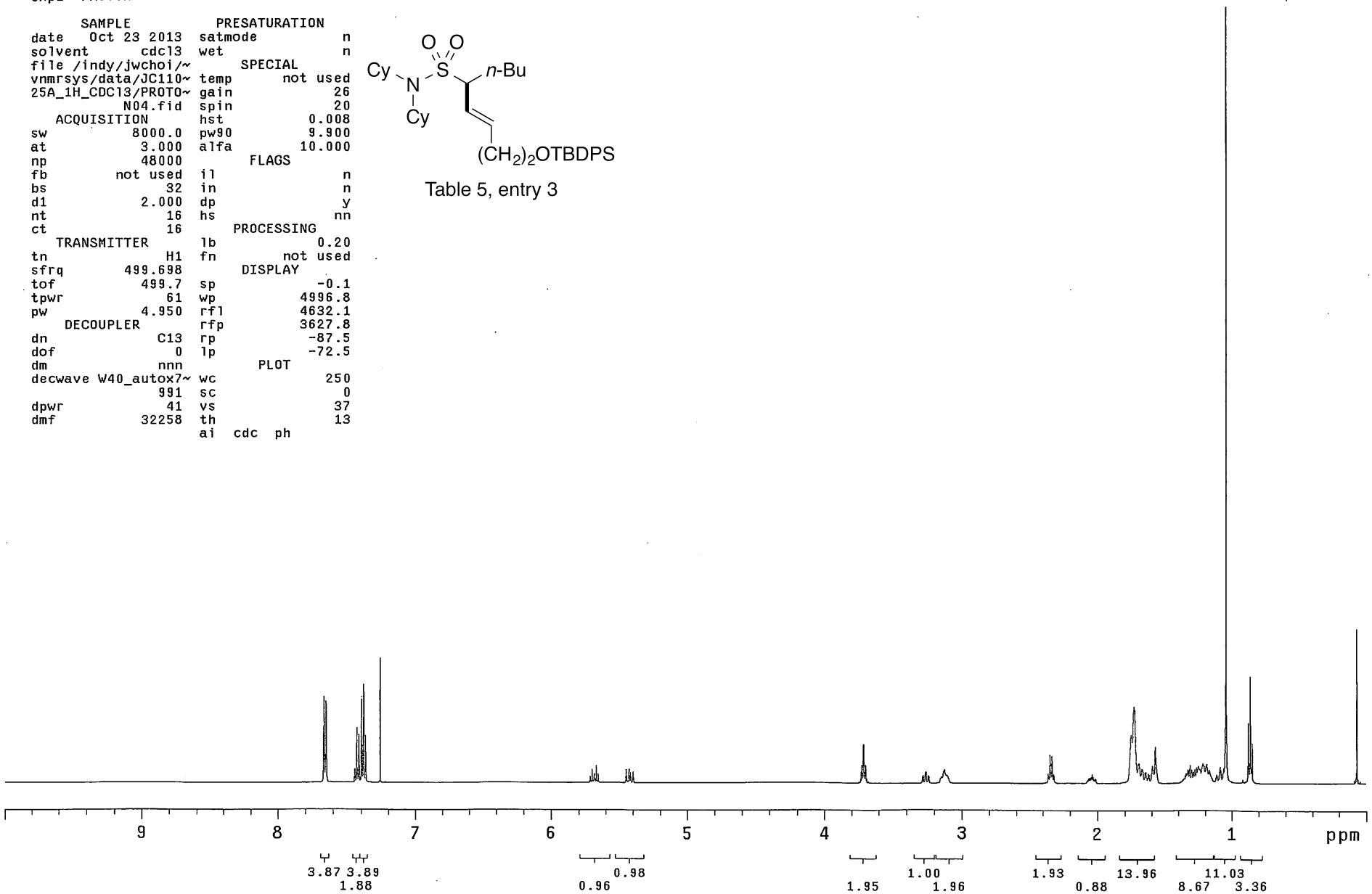


JC11025A 1H CDCl3

exp1 PROTON

SAMPLE		PRESATURATION	
date	Oct 23 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC110~		temp	not used
25A_1H_CDCl3/PROTO~		gain	26
	N04.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-87.5
dof	0	lp	-72.5
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	37
dmf	32258	th	13
		ai cdc ph	

Table 5, entry 3



JC10279A CD2Cl2

exp30 PROTON

SAMPLE		PRESATURATION	
date	Sep 16 2013	satmode	n
solvent	cd2cl2	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC102~		temp	not used
79A_CD2Cl2/PROTON0~		gain	24
	1.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.699	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	3669.9
DECOUPLER		rfp	2658.4
dn	C13	rp	-68.2
dof	0	lp	-78.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	80
dmf	32258	th	38
		ai cdc ph	

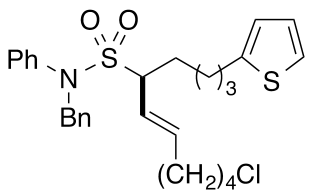
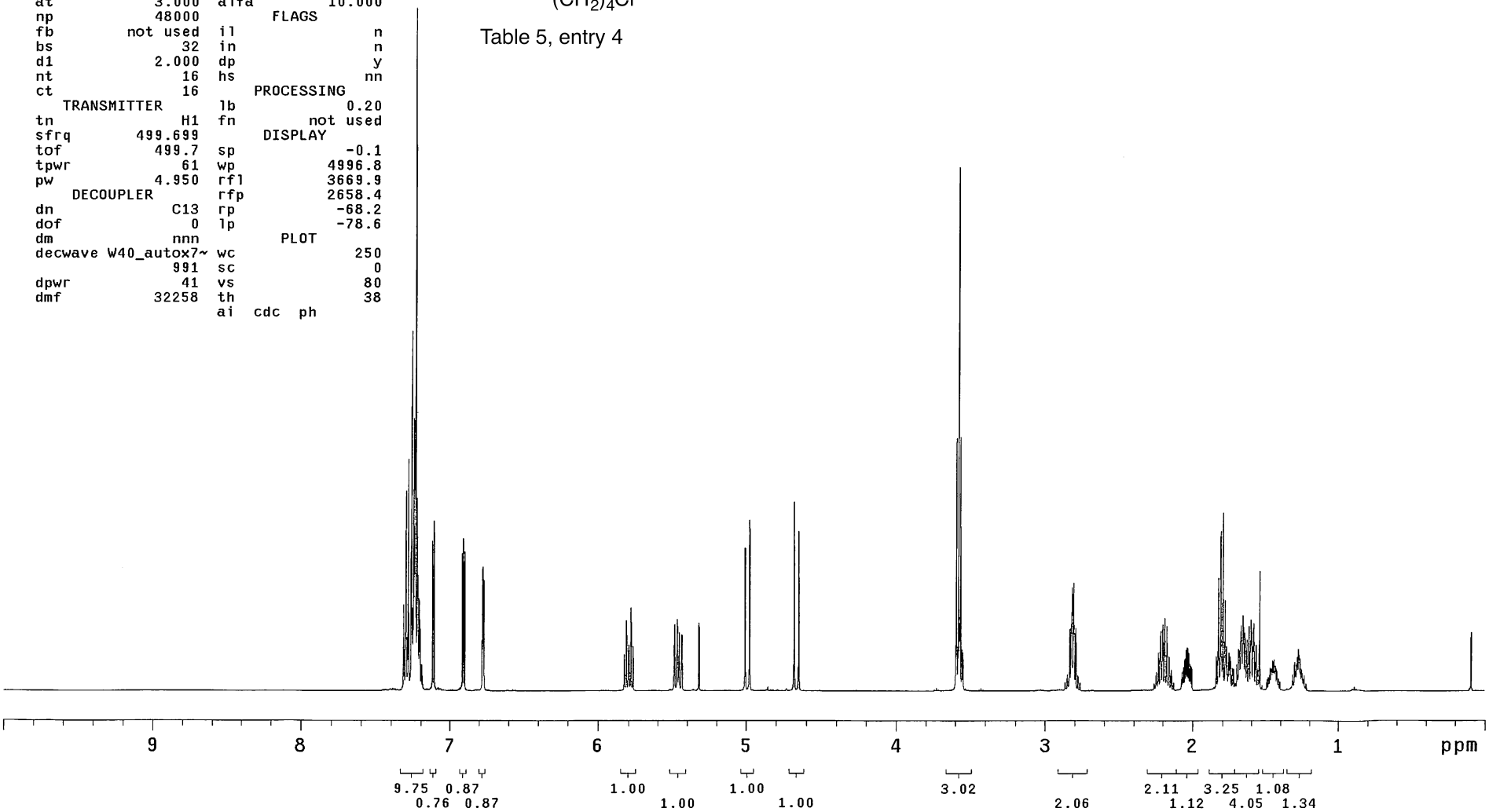


Table 5, entry 4

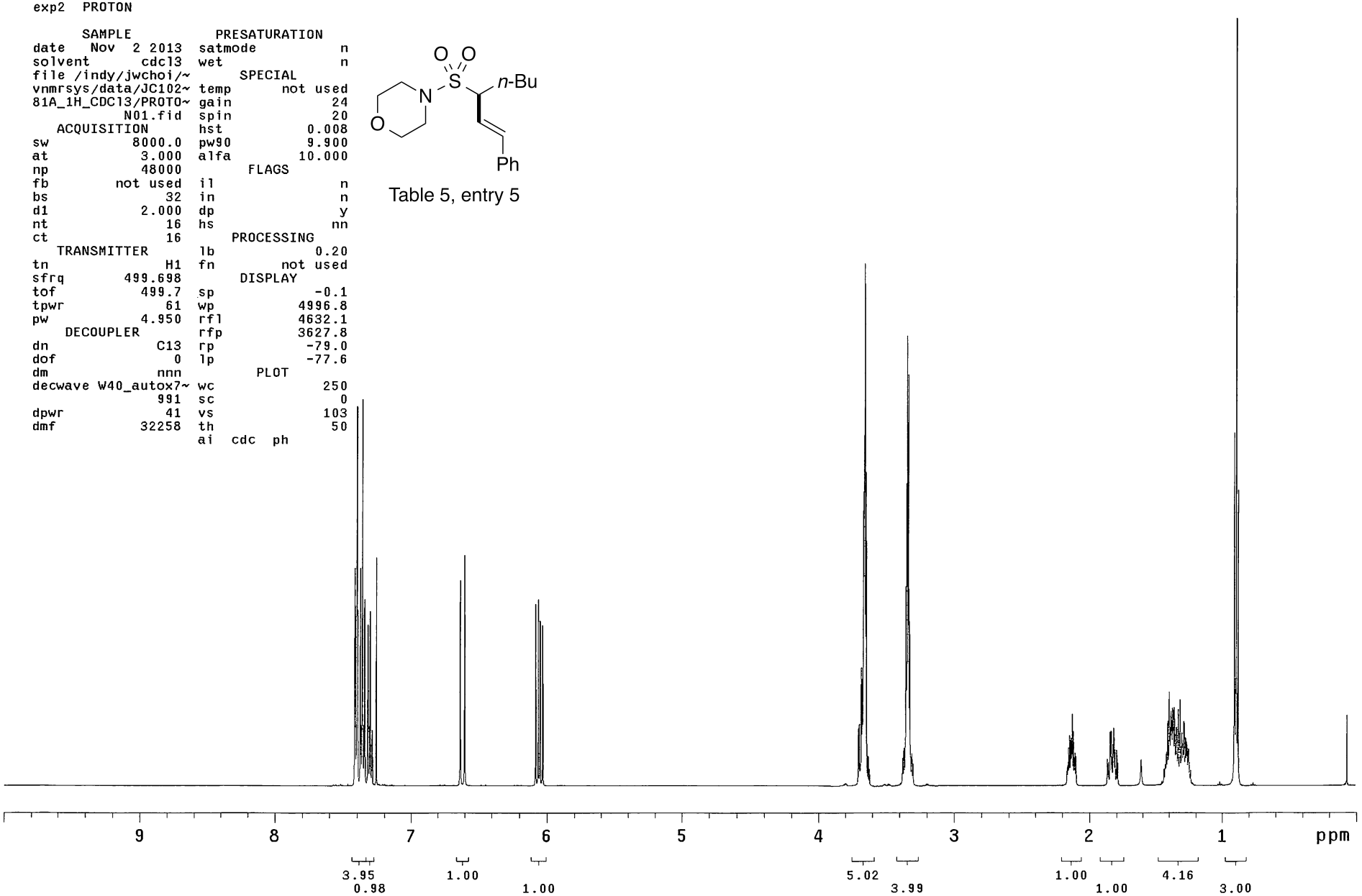


JC10281A 1H CDCl3

exp2 PROTON

SAMPLE		PRESATURATION	
date	Nov 2 2013	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC102~		temp	not used
81A_1H_CDCl3/PROTO~		gain	24
	N01.fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-79.0
dof	0	lp	-77.6
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	103
dmf	32258	th	50
		ai cdc ph	

Table 5, entry 5

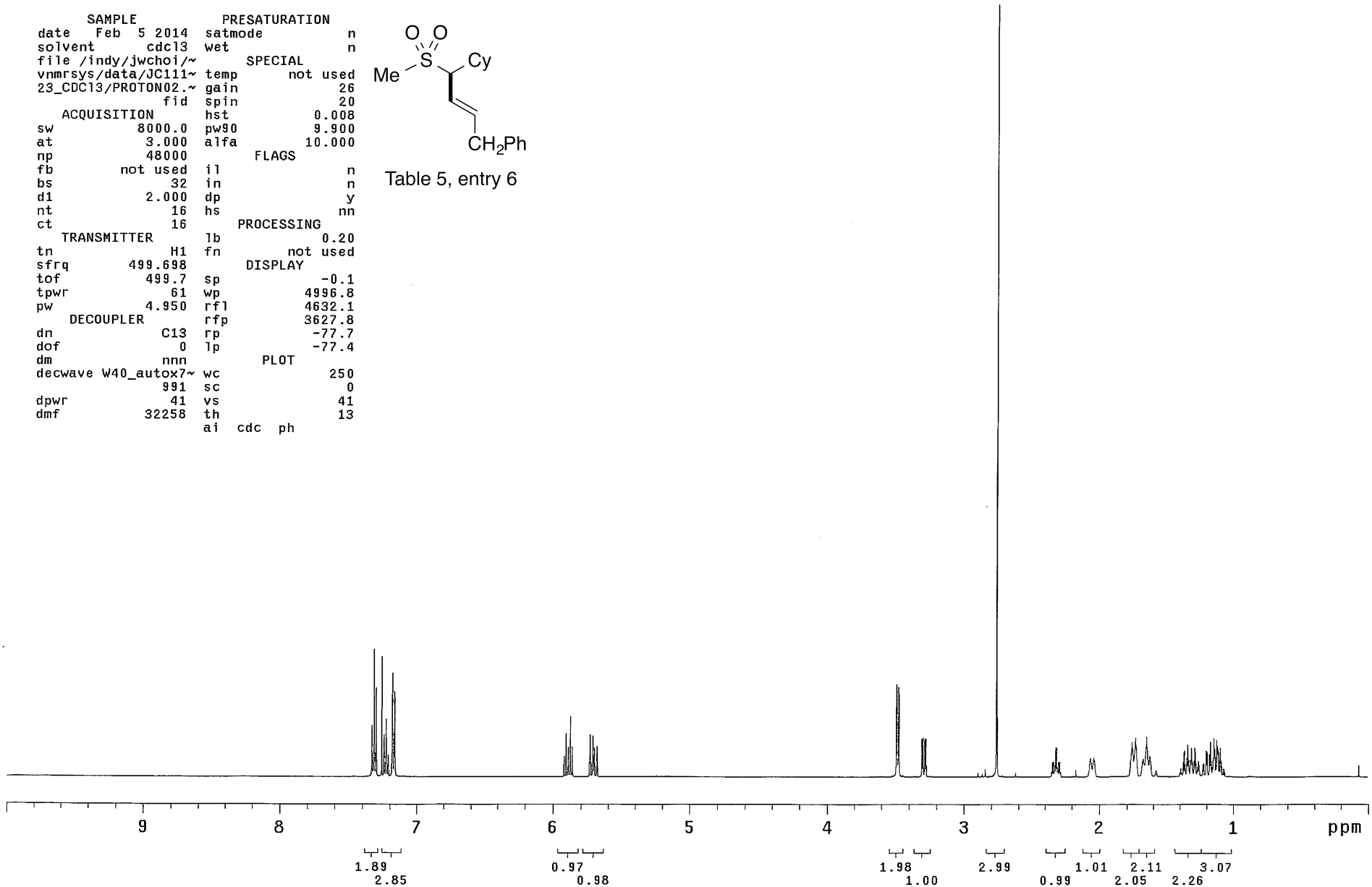


JC11123 CDCl3

exp37 PROTON

SAMPLE		PRESATURATION	
date	Feb 5 2014	satmode	n
solvent	cdcl3	wet	n
file	/indy/jwchoi/~	SPECIAL	
vnmrsys/data/JC111~		temp	not used
23_CDCl3/PROTON02.~		gain	26
	fid	spin	20
ACQUISITION		hst	0.008
sw	8000.0	pw90	9.900
at	3.000	alfa	10.000
np	48000	FLAGS	
fb	not used	il	n
bs	32	in	n
d1	2.000	dp	y
nt	16	hs	nn
ct	16	PROCESSING	
TRANSMITTER		lb	0.20
tn	H1	fn	not used
sfrq	499.698	DISPLAY	
tof	499.7	sp	-0.1
tpwr	61	wp	4996.8
pw	4.950	rfl	4632.1
DECOUPLER		rfp	3627.8
dn	C13	rp	-77.7
dof	0	lp	-77.4
dm	nnn	PLOT	
decwave	W40_autox7~	wc	250
	991	sc	0
dpwr	41	vs	41
dmf	32258	th	13
		ai cdc ph	

Table 5, entry 6



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==================================================================
Injection Date  : 12/18/2012 2:33:11 PM          Seq. Line :   1
Sample Name     : JC9121A                         Location : Vial 4
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-40.M
Last changed    : 12/18/2012 2:48:17 PM by CE
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 4:56:50 PM by MK
                  (modified after loading)
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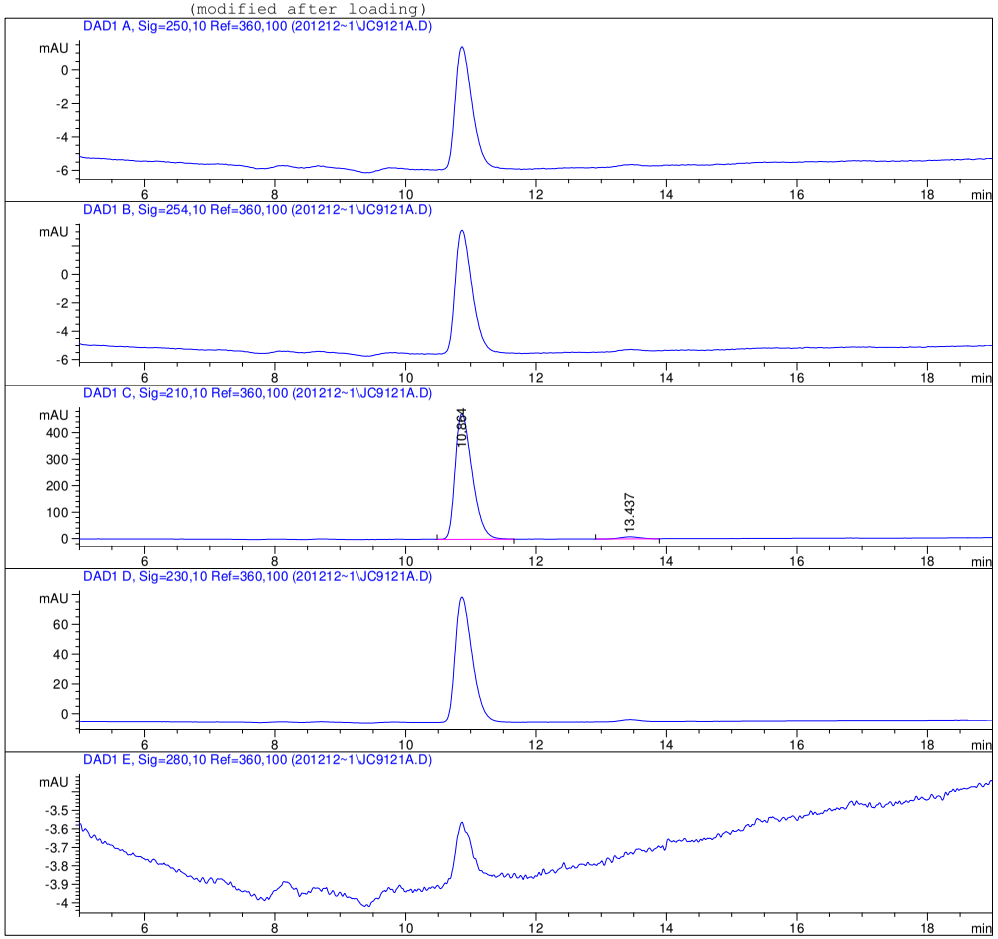


VII. HPLC Data


```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.864 BB    0.2815 8588.73828  473.84717  98.0169
   2  13.437 PV    0.2756  173.77281    7.93276   1.9831

Totals :                  8762.51109  481.77993

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

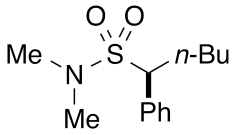
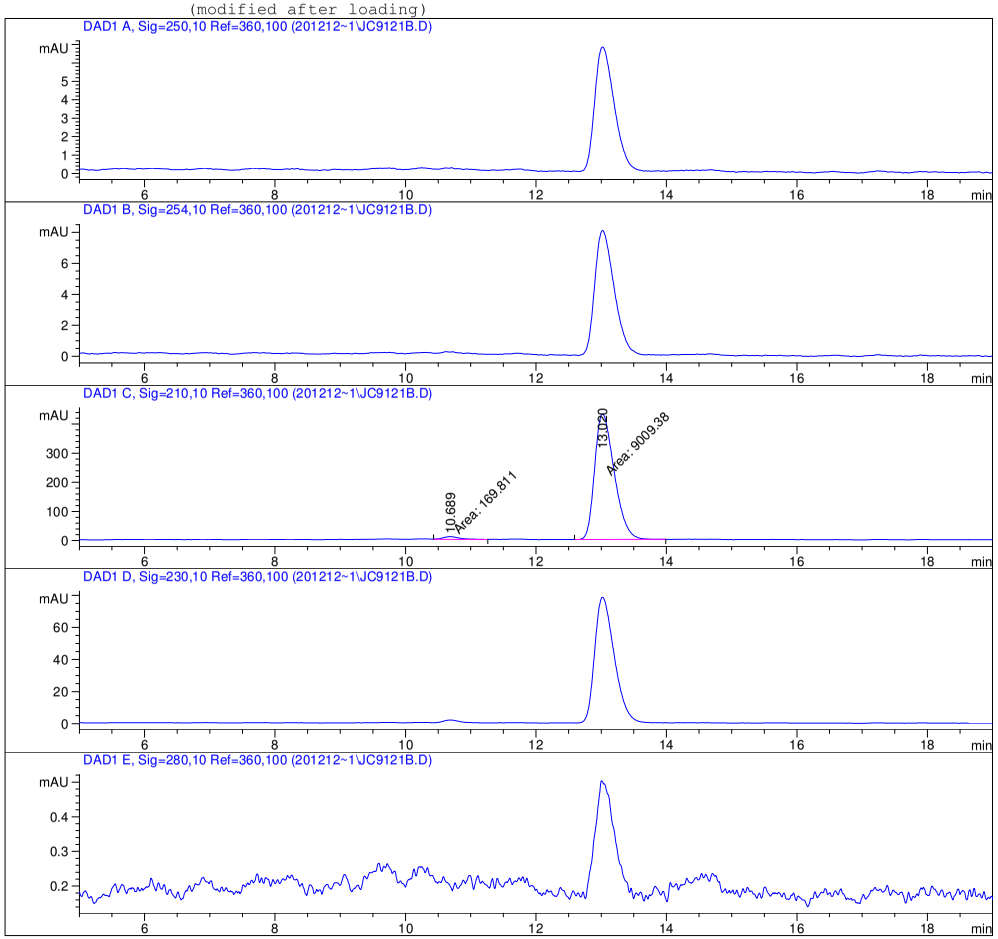


Table 2, entry 1
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 12/18/2012 3:04:38 PM          Seq. Line :   2
Sample Name     : JC9121B                         Location : Vial 5
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-30.M
Last changed    : 4/7/2011 2:40:51 AM by CC
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 8:33:12 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201212~1\JC9121B.D Sample Name: JC9121B

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.689 FM    0.2978  169.81142    9.50396   1.8500
   2  13.020 MM    0.3481 9009.37891  431.37000  98.1500

Totals :                  9179.19032  440.87395

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

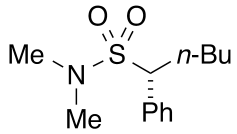
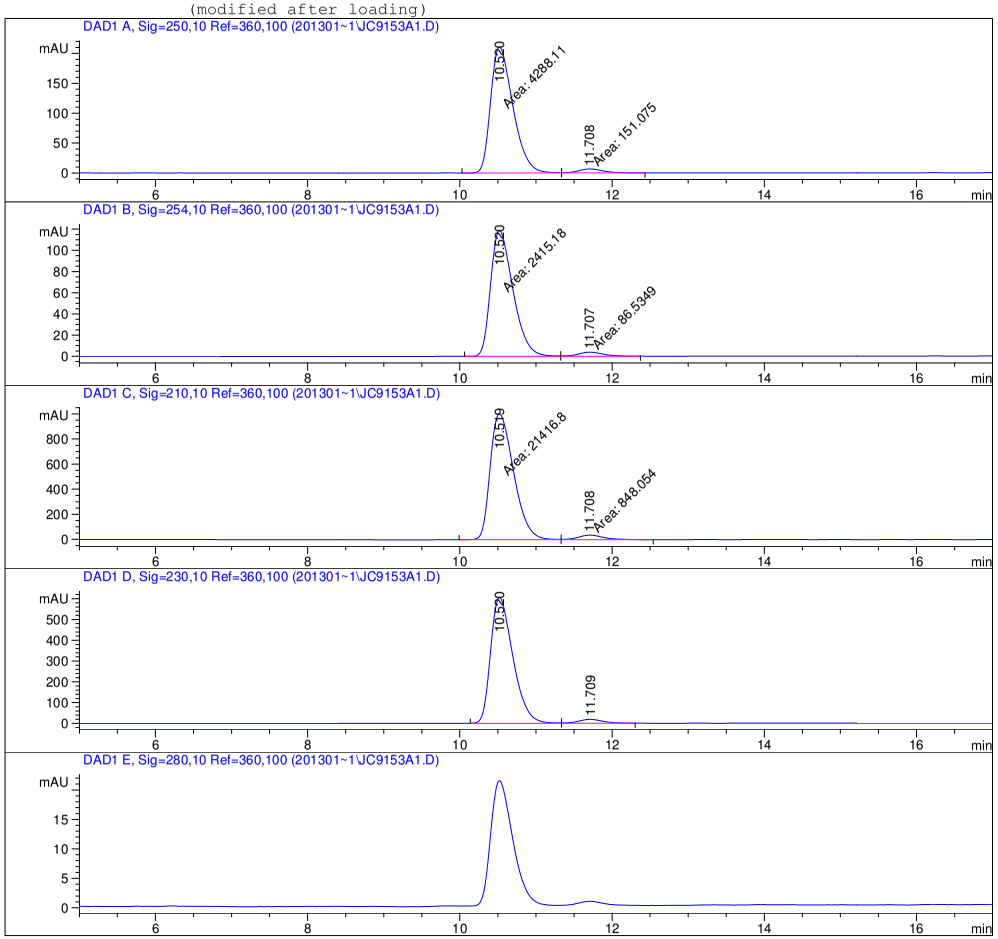


Table 2, entry 1
with (*S*,*S*)-**L1**

S–91

```
==================================================================
Injection Date  : 1/13/2013 11:37:20 PM          Seq. Line :   2
Sample Name     : JC9153A                         Location : Vial 3
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-40.M
Last changed    : 8/9/2012 4:54:01 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 4:55:19 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.520 MF    0.3390 4288.11475  210.79234  96.5968
   2  11.708 FM    0.3773  151.07475    6.67396   3.4032

Totals :                  4439.18950  217.46631

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.520 MF    0.3389 2415.18042  118.77131  96.5410
   2  11.707 FM    0.3774   86.53488    3.82184   3.4590

Totals :                  2501.71530  122.59315

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.519 MF    0.3557 2.14168e4  1003.47882  96.1911
   2  11.708 FM    0.3883  848.05426   36.40364   3.8089

Totals :                  2.22649e4  1039.88247

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.520 BB    0.3125 1.22823e4   606.00146  96.7746
   2  11.709 BB    0.3369  409.36346   18.58926   3.2254

Totals :                  1.26917e4   624.59073

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

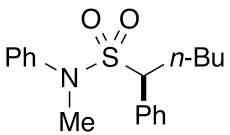
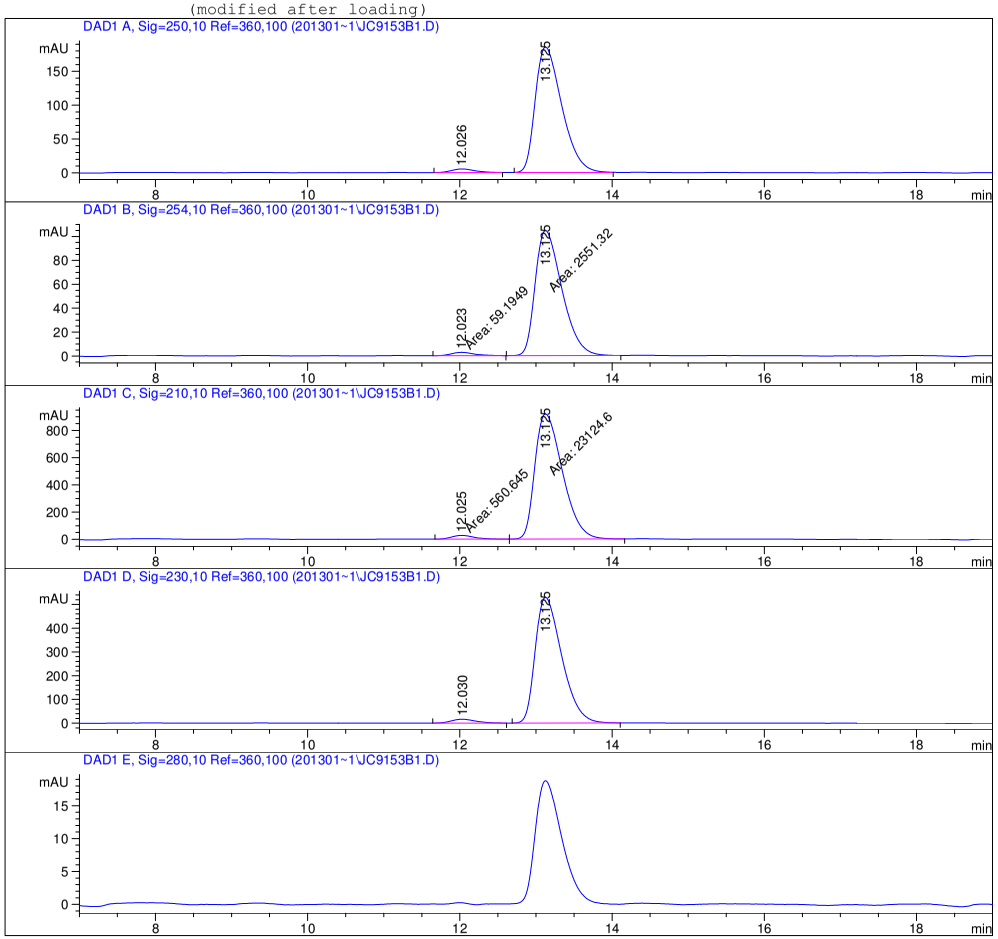


Table 2, entry 2 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 1/13/2013 9:26:32 PM          Seq. Line :   3
Sample Name     : JC9153B                        Location : Vial 4
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-30.M
Last changed    : 4/19/2010 4:08:56 PM by sz
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:08:32 PM by MK
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.026 BP    0.3146  113.62238    5.33121   2.4632
   2  13.125 BB    0.3752 4499.24658  185.38203  97.5368

Totals :                  4612.86896  190.71324

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.023 MM    0.3532   59.19486    2.79296   2.2676
   2  13.125 MM    0.4060 2551.31982  104.72879  97.7324

Totals :                  2610.51468  107.52175

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.025 MM    0.3401  560.64459   27.47764   2.3671
   2  13.125 MM    0.4189 2.31246e4   919.98969  97.6329

Totals :                  2.36852e4   947.46732

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.030 BP    0.3344  358.89542   16.20137   2.7223
   2  13.125 BB    0.3746 1.28247e4   529.39978  97.2777

Totals :                  1.31836e4   545.60115

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

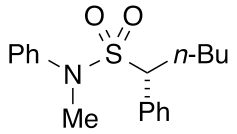
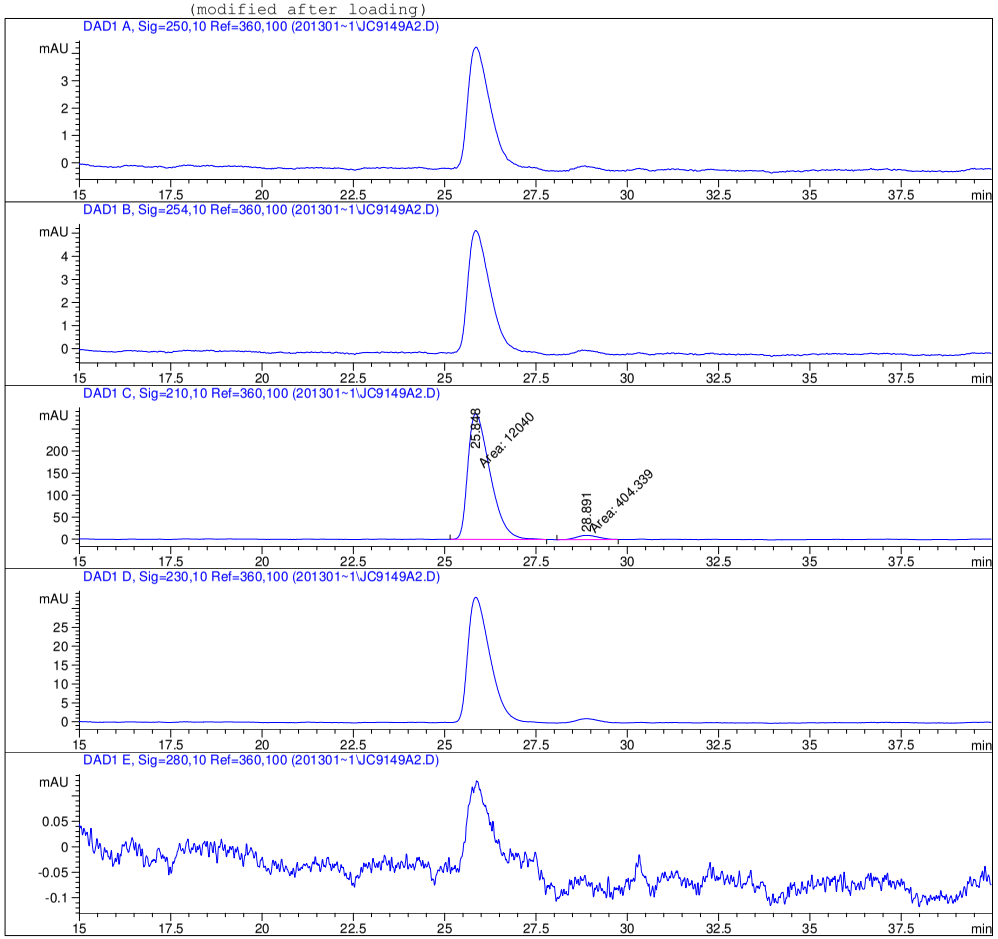


Table 2, entry 2 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 1/5/2013 12:33:05 AM          Seq. Line :   6
Sample Name     : JC9149A                        Location : Vial 6
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-02-40.M
Last changed    : 1/4/2013 10:05:27 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 4:58:11 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  25.848 MM    0.7041 1.20400e4   285.00970  96.7508
   2  28.891 MM    0.7018  404.33865    9.60306   3.2492

Totals :                  1.24443e4   294.61277

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

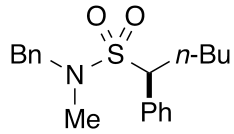
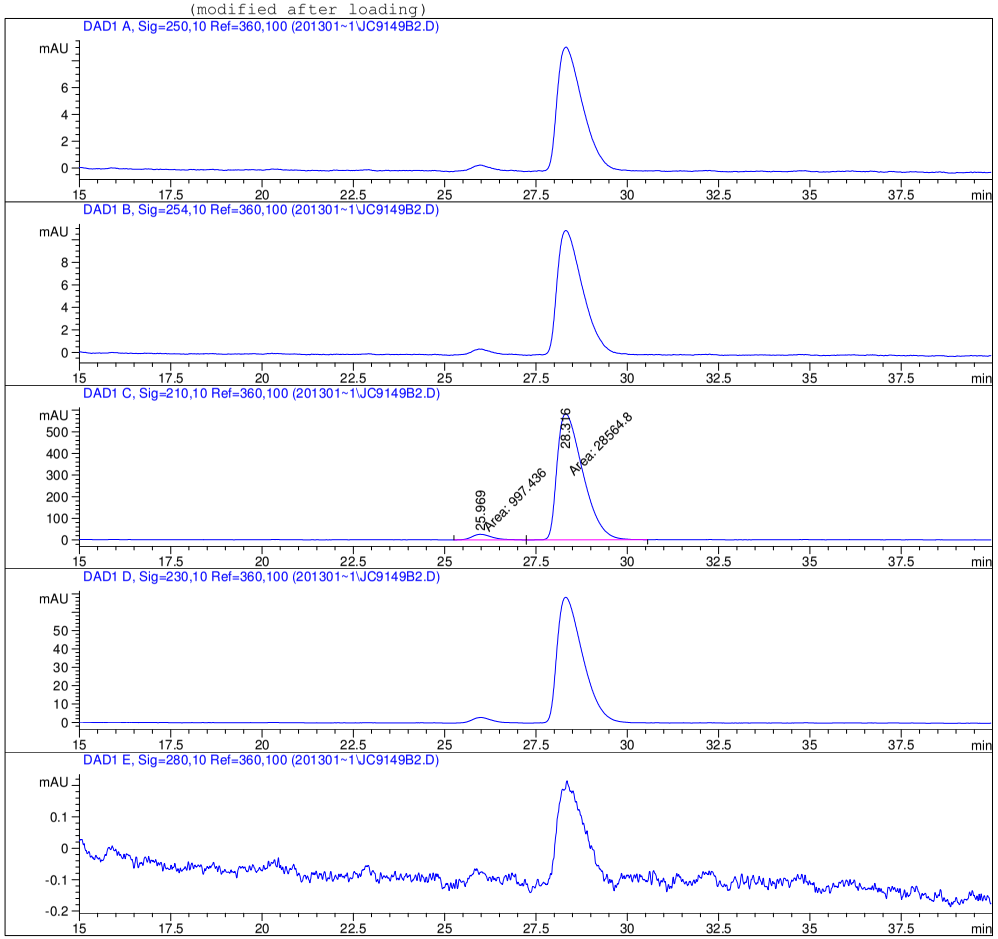


Table 2, entry 3
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 1/5/2013 1:14:21 AM            Seq. Line :   7
Sample Name     : JC9149B                         Location : Vial 7
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-02-40.M
Last changed    : 1/4/2013 10:05:27 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:12:30 PM by MK
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  25.969 MM    0.6423  997.43585   25.88220   3.3740
   2  28.316 MM    0.8177 2.85648e4   582.20422  96.6260

Totals :                  2.95622e4   608.08643

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

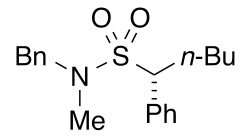
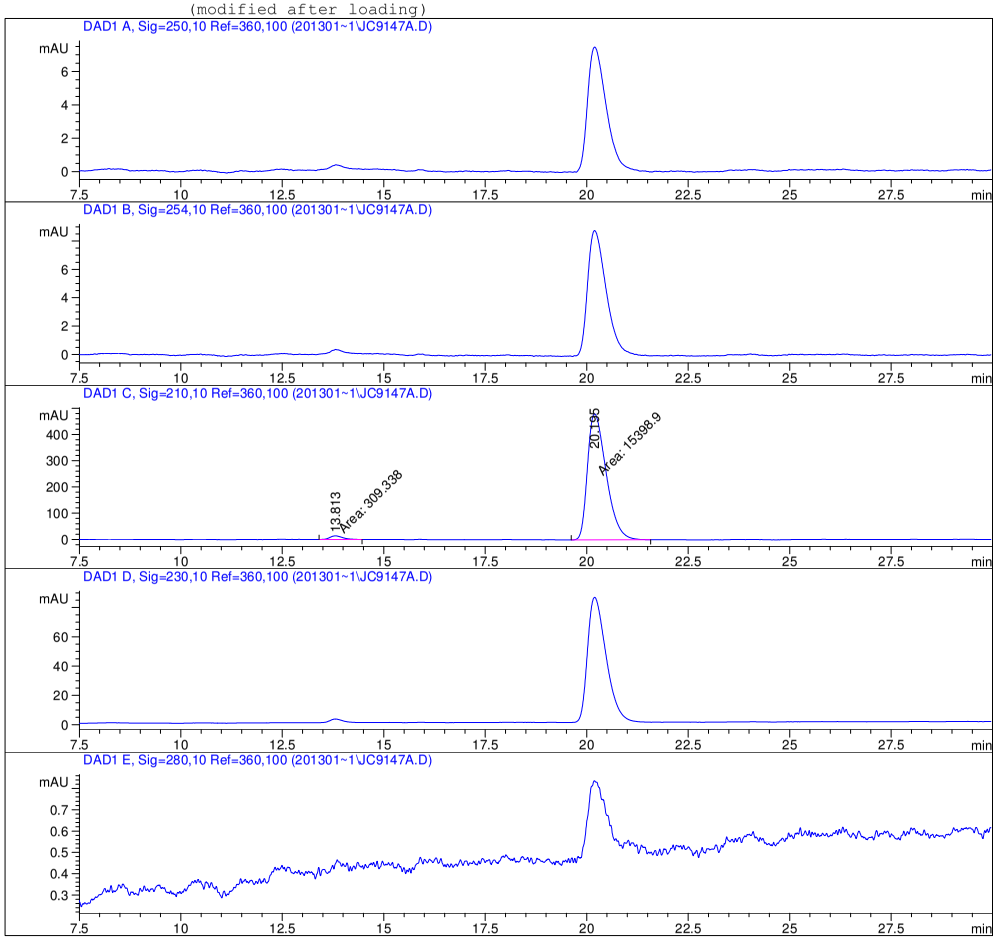


Table 2, entry 3
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 1/3/2013 5:51:12 PM          Seq. Line :   2
Sample Name     : JC9147A                       Location : Vial  4
Acq. Operator   : CE                               Inj :   1
Acq. Instrument : Instrument 1                Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-02-30.M
Last changed    : 1/3/2013 5:29:04 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 5:00:07 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201301~1\JC9147A.D Sample Name: JC9147A

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width      Area       Height      Area
  #   [min]        [min]    [mAU*s]      [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  13.813 MM    0.3644  309.33765   14.14928   1.9693
   2  20.195 MM    0.5342 1.53989e4   480.47076  98.0307

Totals :                  1.57082e4   494.62004

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

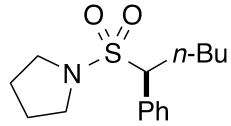
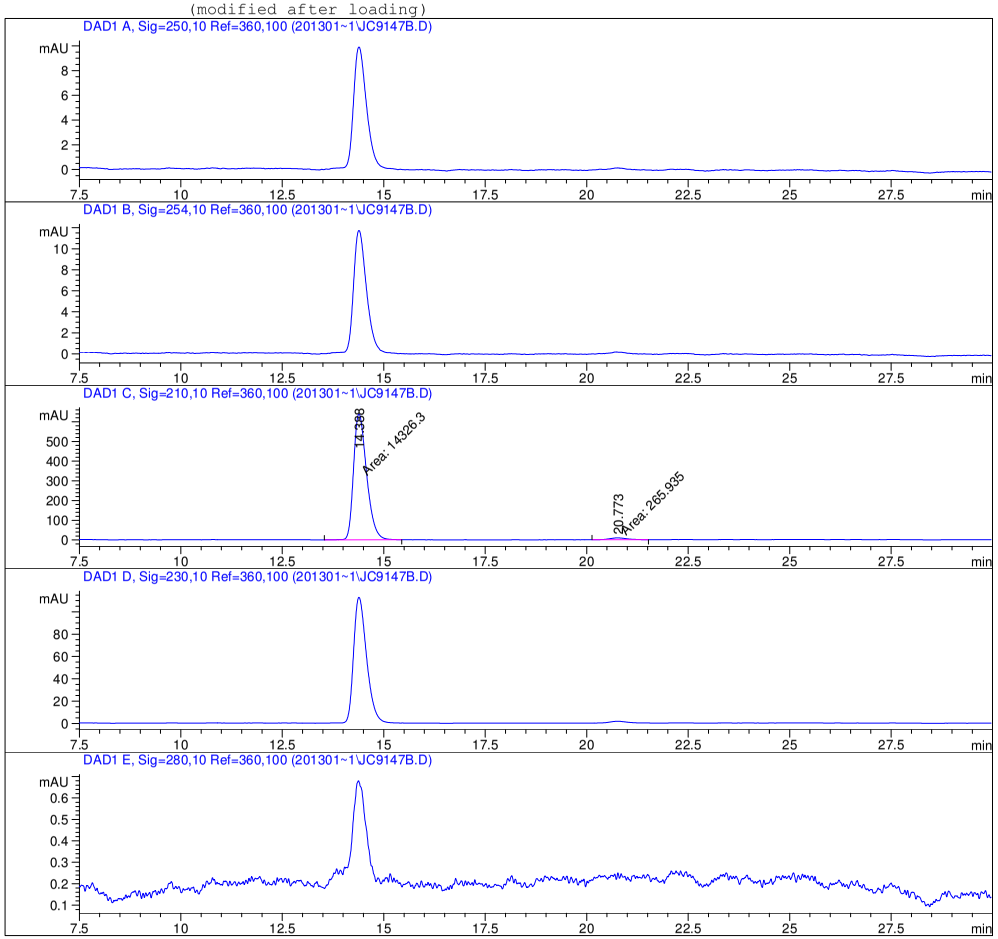


Table 2, entry 4
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 1/3/2013 6:22:31 PM            Seq. Line :   3
Sample Name     : JC9147B                         Location : Vial 5
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-02-30.M
Last changed    : 1/3/2013 5:29:04 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:14:55 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.388 MM    0.3734 1.43263e4   639.37732  98.1776
   2  20.773 MM    0.4779  265.93488    9.27401   1.8224

Totals :                  1.45922e4   648.65133

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

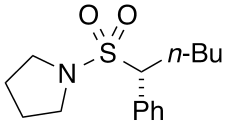
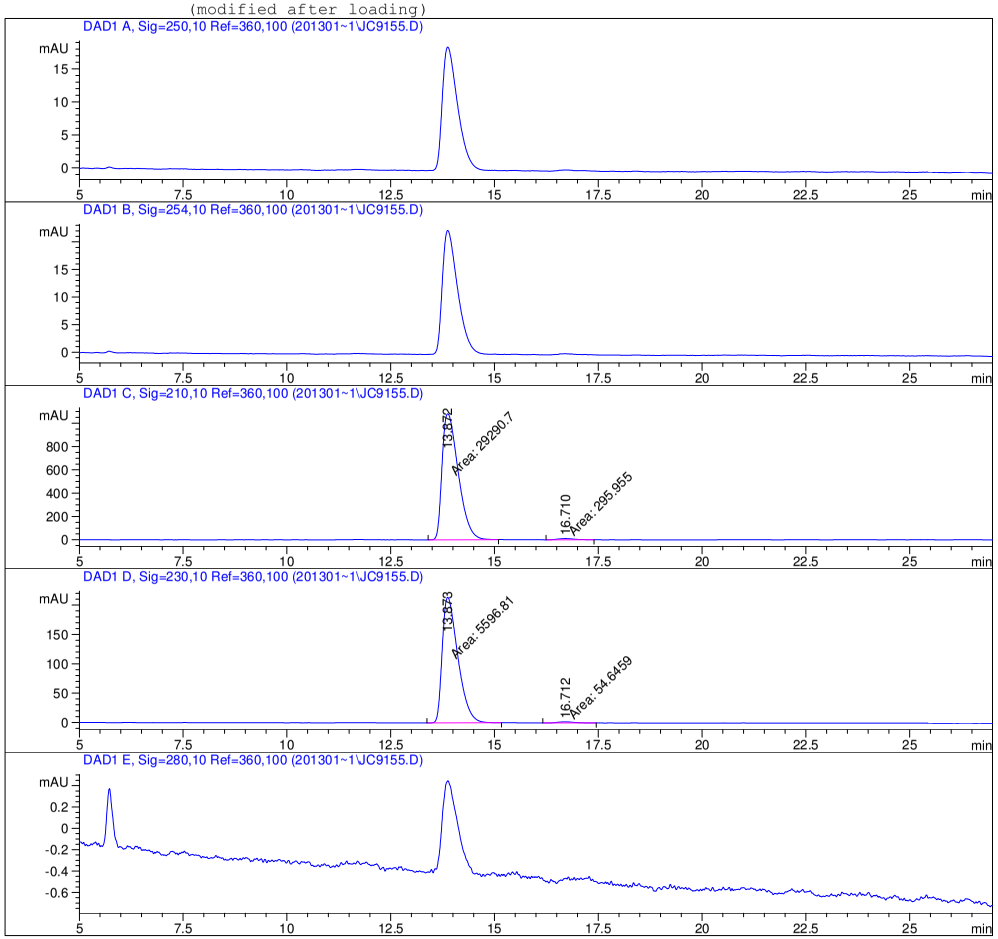


Table 2, entry 4
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 1/17/2013 6:42:19 PM          Seq. Line :   4
Sample Name     : JC9155                         Location : Vial 3
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-03-30.M
Last changed    : 12/31/2012 2:58:25 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 5:02:27 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.872 MM    0.4517 2.92907e4  1080.68958  98.9997
   2  16.710 MM    0.4686  295.95520   10.52571   1.0003

Totals :                  2.95866e4  1091.21529

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.873 MM    0.4361 5596.80615  213.91138  99.0331
   2  16.712 MM    0.4778   54.64594    1.90619   0.9669

Totals :                  5651.45210  215.81756

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

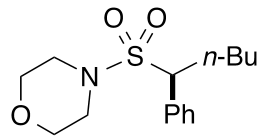
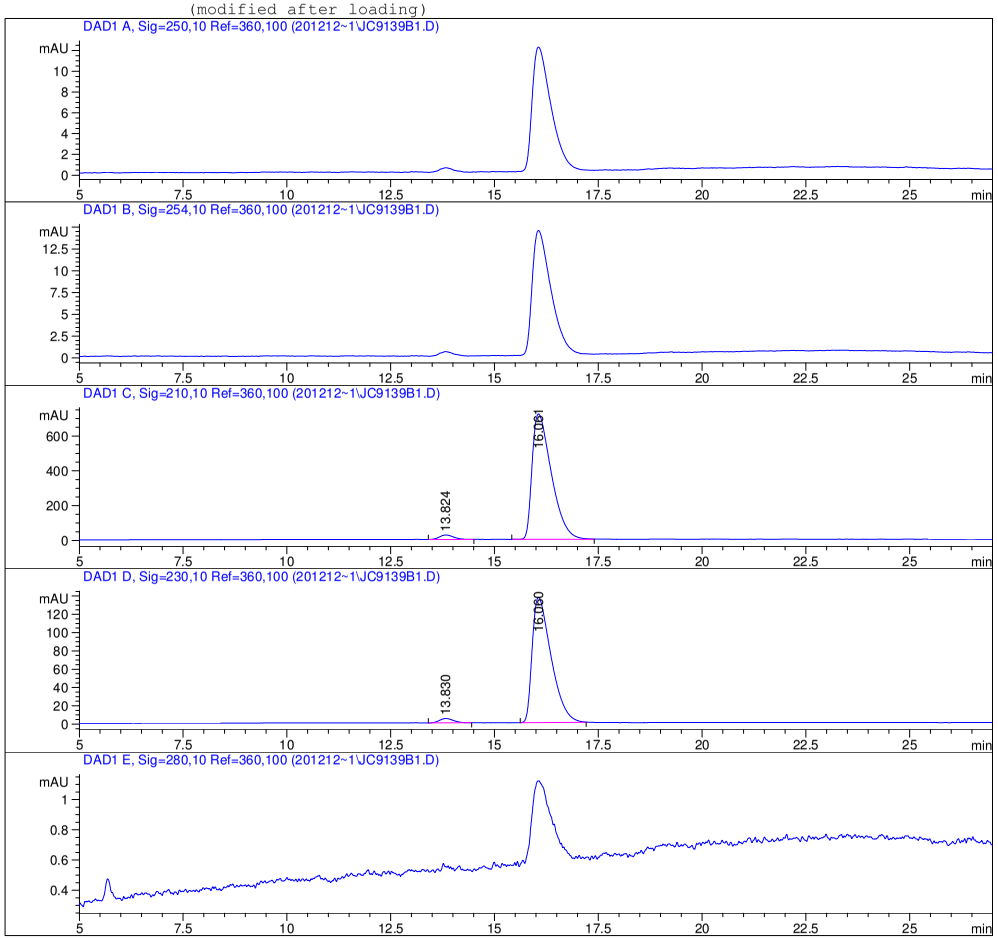


Table 2, entry 5
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 12/31/2012 3:20:37 PM          Seq. Line :   2
Sample Name     : JC9139B                         Location : Vial 3
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-03-30.M
Last changed    : 12/31/2012 2:58:25 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:17:34 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201212~1\JC9139B1.D Sample Name: JC9139B

```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.824 PB    0.3375  612.77722   25.76346   2.5717
   2  16.061 PB    0.4739 2.32153e4   720.54395  97.4283

Totals :                  2.38281e4   746.30741

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.830 BP    0.3511  110.67741    4.72843   2.4877
   2  16.060 BB    0.4794 4338.34521  137.02046  97.5123

Totals :                  4449.02262  141.74889

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

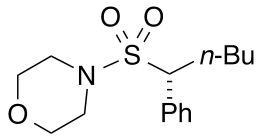
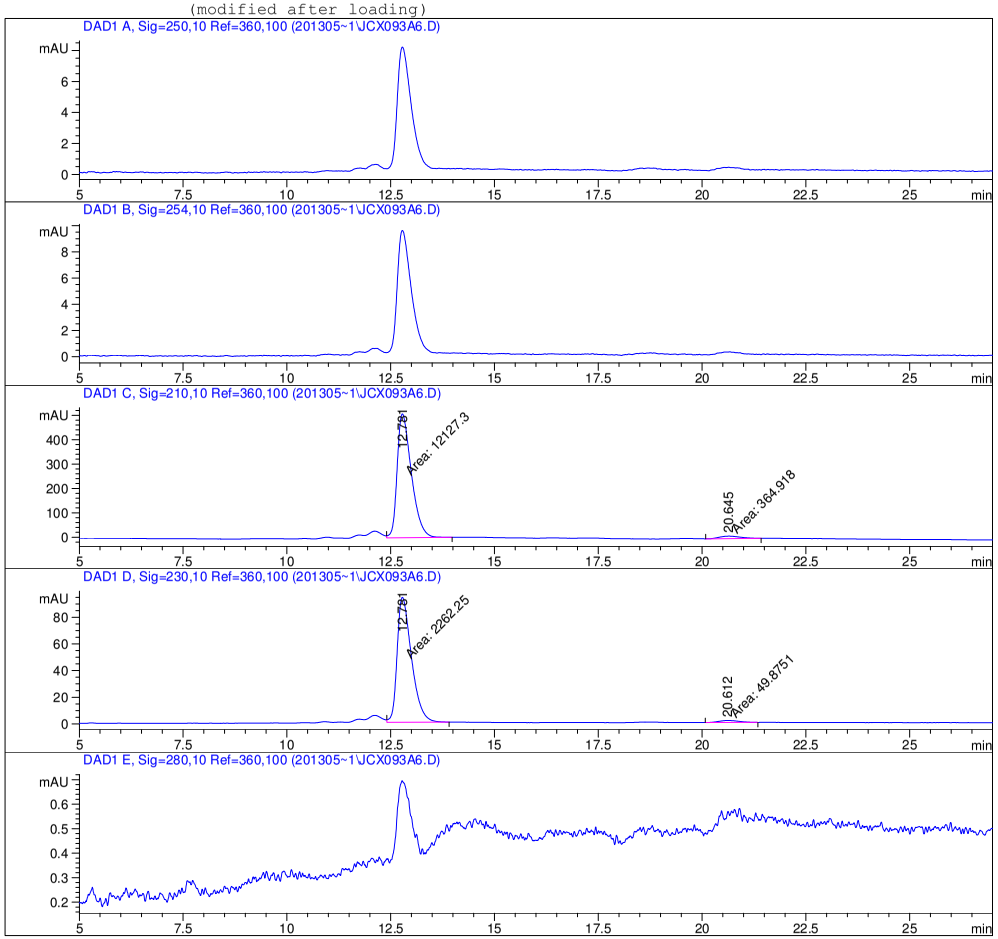


Table 2, entry 5
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 5/19/2013 5:16:09 PM          Seq. Line :   2
Sample Name     : JC10093A                       Location : Vial 41
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-40.M
Last changed    : 12/18/2012 2:31:36 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 5:05:01 PM by MK
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|-------|
   1  12.781 FM    0.3974 1.21273e4   508.56665  97.0788
   2  20.645 MM    0.5908  364.91779   10.29492   2.9212

Totals :                  1.24922e4   518.86157

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|-------|
   1  12.781 FM    0.4017 2262.25317   93.85459  97.8429
   2  20.612 MM    0.5479   49.87514    1.51723   2.1571

Totals :                  2312.12832   95.37182

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

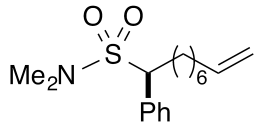
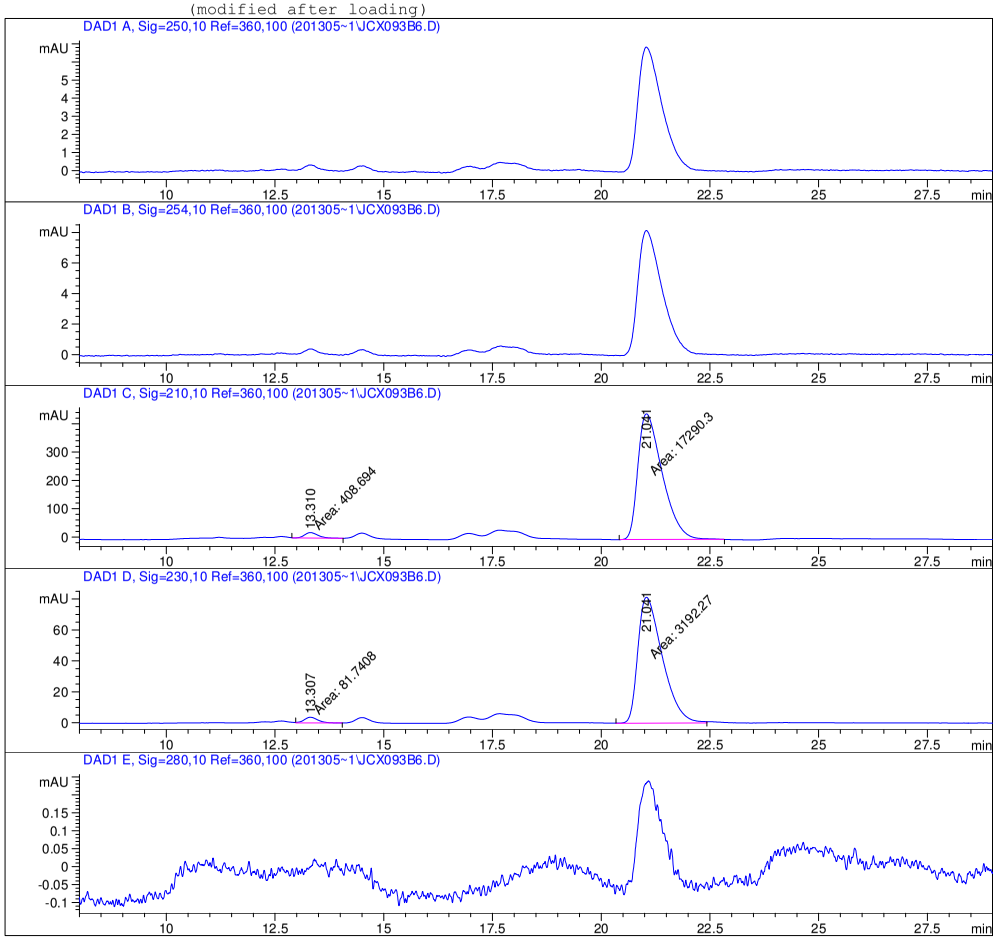


Table 2, entry 6
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 5/19/2013 5:57:27 PM          Seq. Line :   3
Sample Name     : JC10093B                       Location : Vial 42
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-40.M
Last changed    : 12/18/2012 2:31:36 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 9:01:58 PM by MK
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.310 MM    0.3540  408.69366   19.24129   2.3091
   2  21.041 MM    0.6492 1.72903e4   443.91245  97.6909

Totals :                  1.76990e4   463.15373

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.307 FM    0.3703   81.74083    3.67898   2.4967
   2  21.041 MF    0.6541 3192.27197   81.33752  97.5033

Totals :                  3274.01280   85.01650

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

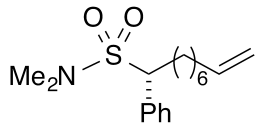
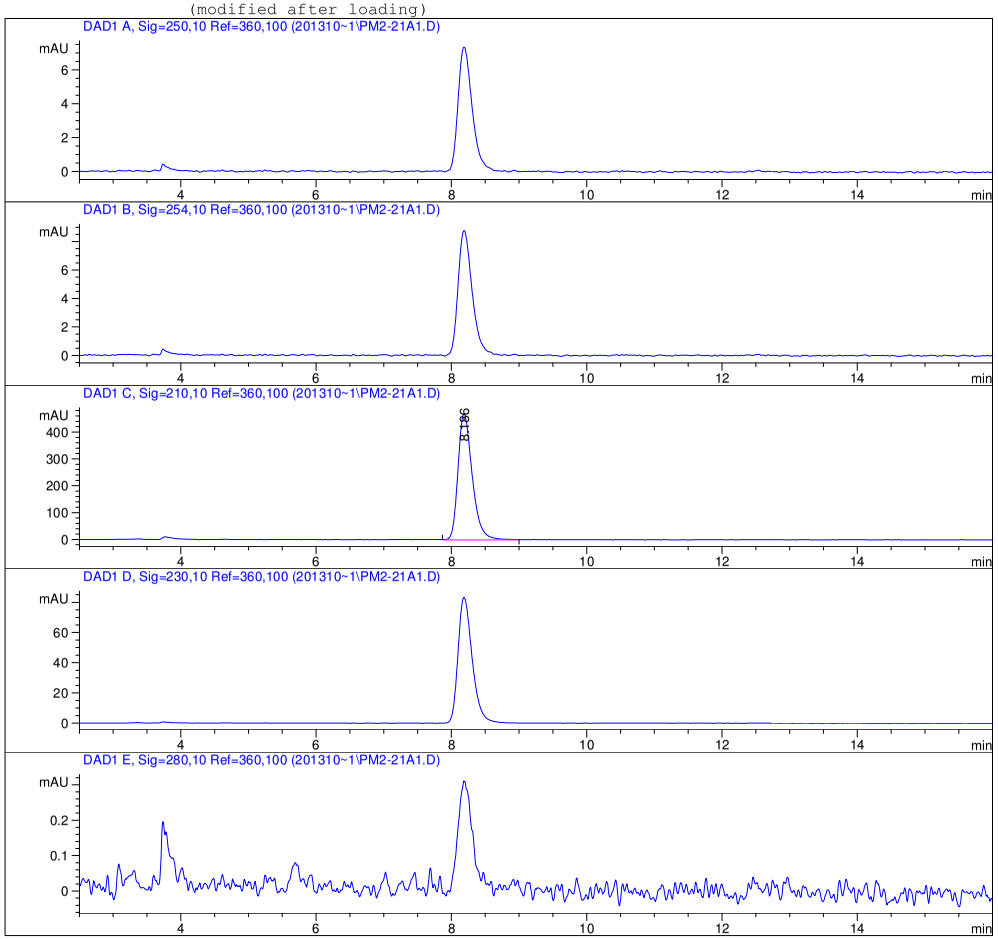


Table 2, entry 6
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 10/23/2013 1:57:18 PM          Seq. Line :   2
Sample Name     : PM2-21A                         Location : Vial 13
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-30.M
Last changed    : 9/13/2013 12:42:31 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 5:07:11 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201310~1\PM2-21A1.D Sample Name: PM2-21A

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.186 VB    0.2249 6870.03662  468.96442 100.0000

Totals :                  6870.03662  468.96442

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

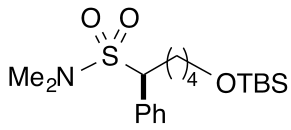
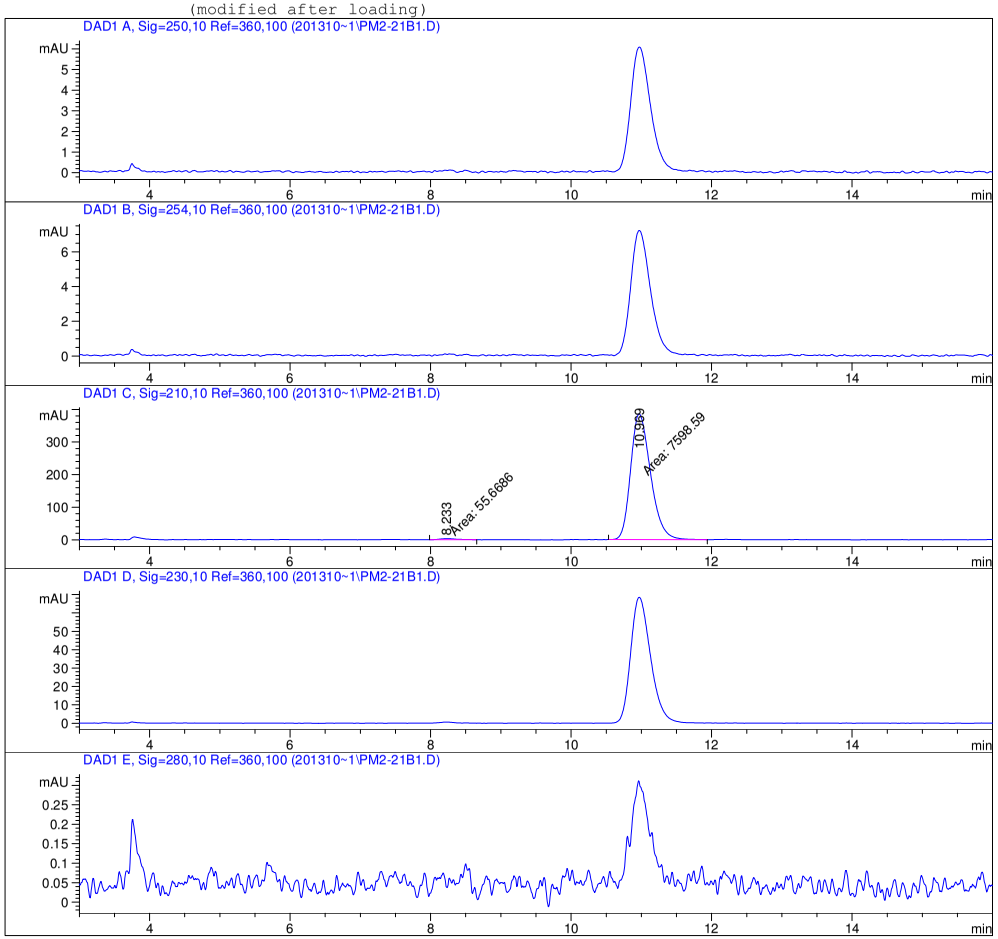


Table 2, entry 7
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 10/23/2013 2:28:36 PM          Seq. Line :   3
Sample Name     : PM2-21B                         Location : Vial 14
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-30.M
Last changed    : 9/13/2013 12:42:31 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:25:57 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.233 MM    0.2711   55.66857    3.42192   0.7273
   2  10.969 MM    0.3284 7598.58594  385.60574  99.2727

Totals :                  7654.25451  389.02767

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

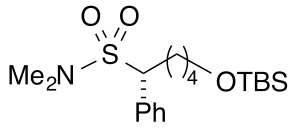
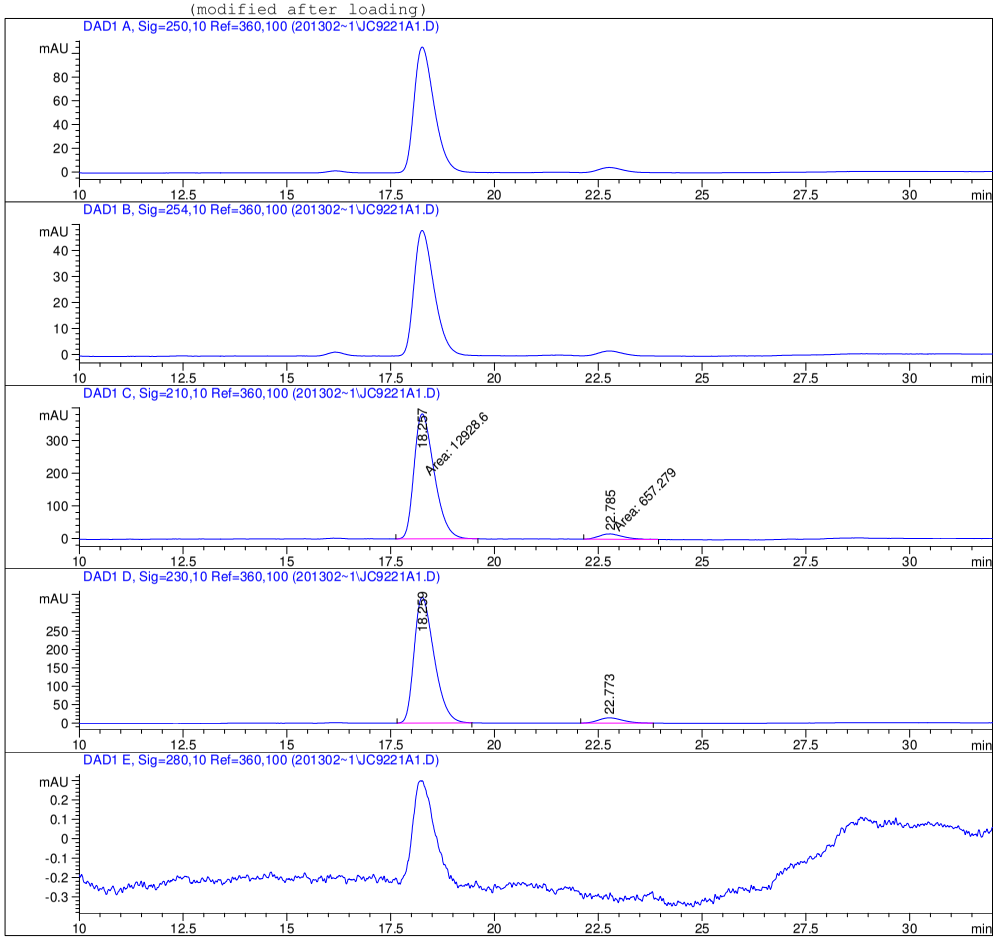


Table 2, entry 7
with (*S*,*S*)-**L1**

```
==================================================================
Injection Date  : 2/22/2013 11:28:27 AM          Seq. Line :   2
Sample Name     : JC9221A                         Location : Vial 9
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 4/7/2011 5:39:35 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 5:09:46 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.257 MM    0.5628 1.29286e4   382.84482  95.1621
   2  22.785 MM    0.6684  657.27887   16.39051   4.8379

Totals :                  1.35859e4   399.23533

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.259 BB    0.5223 1.15049e4   342.18851  95.1596
   2  22.773 BB    0.5728  585.20709   14.37923   4.8404

Totals :                  1.20901e4   356.56774

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

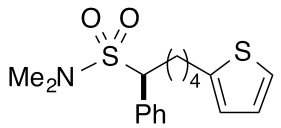
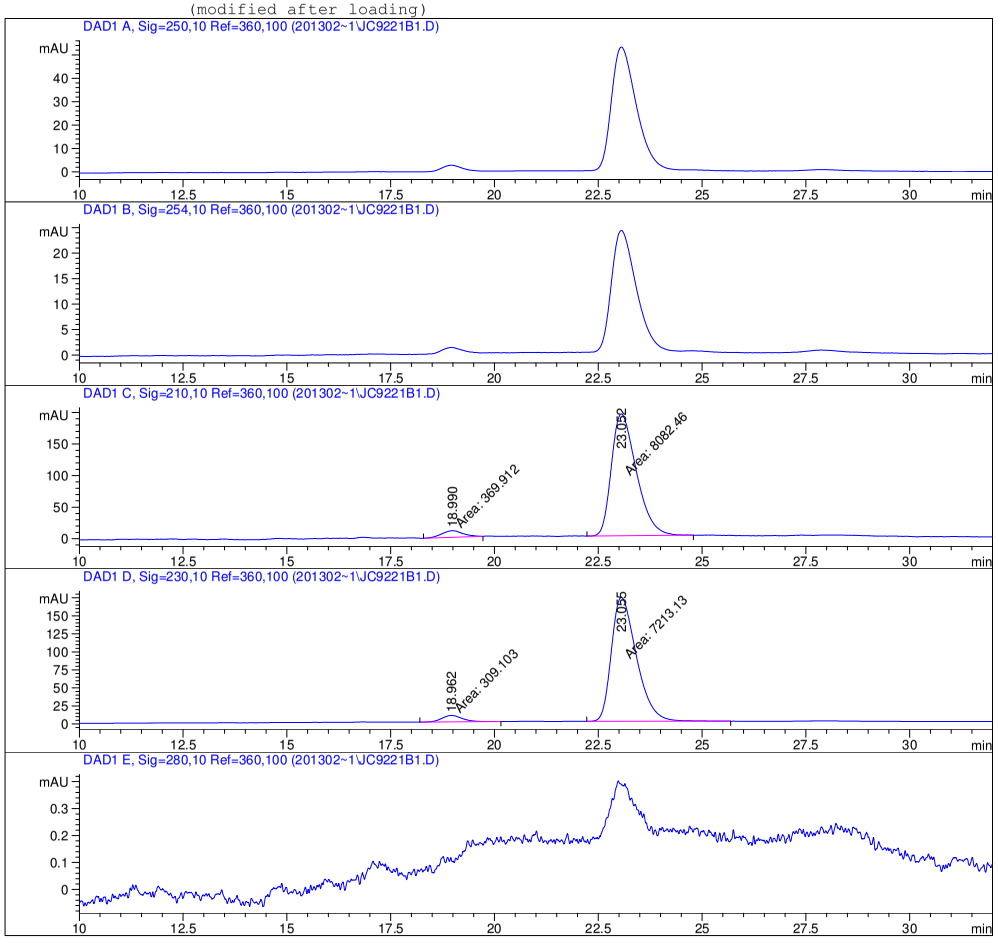


Table 2, entry 8
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 2/22/2013 12:09:44 PM          Seq. Line :   3
Sample Name     : JC9221B                         Location : Vial 10
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 4/7/2011 5:39:35 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 9:04:09 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width      Area       Height      Area
  #   [min]        [min]   [mAU*s]      [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  18.990 MM    0.5818  369.91183   10.59696   4.3764
   2  23.052 MM    0.6975 8082.46289  193.11874  95.6236

Totals :                  8452.37473  203.71571

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width      Area       Height      Area
  #   [min]        [min]   [mAU*s]      [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  18.962 MM    0.5785  309.10349    8.90468   4.1092
   2  23.055 MM    0.6991 7213.12598  171.96364  95.8908

Totals :                  7522.22946  180.86832

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

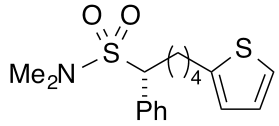
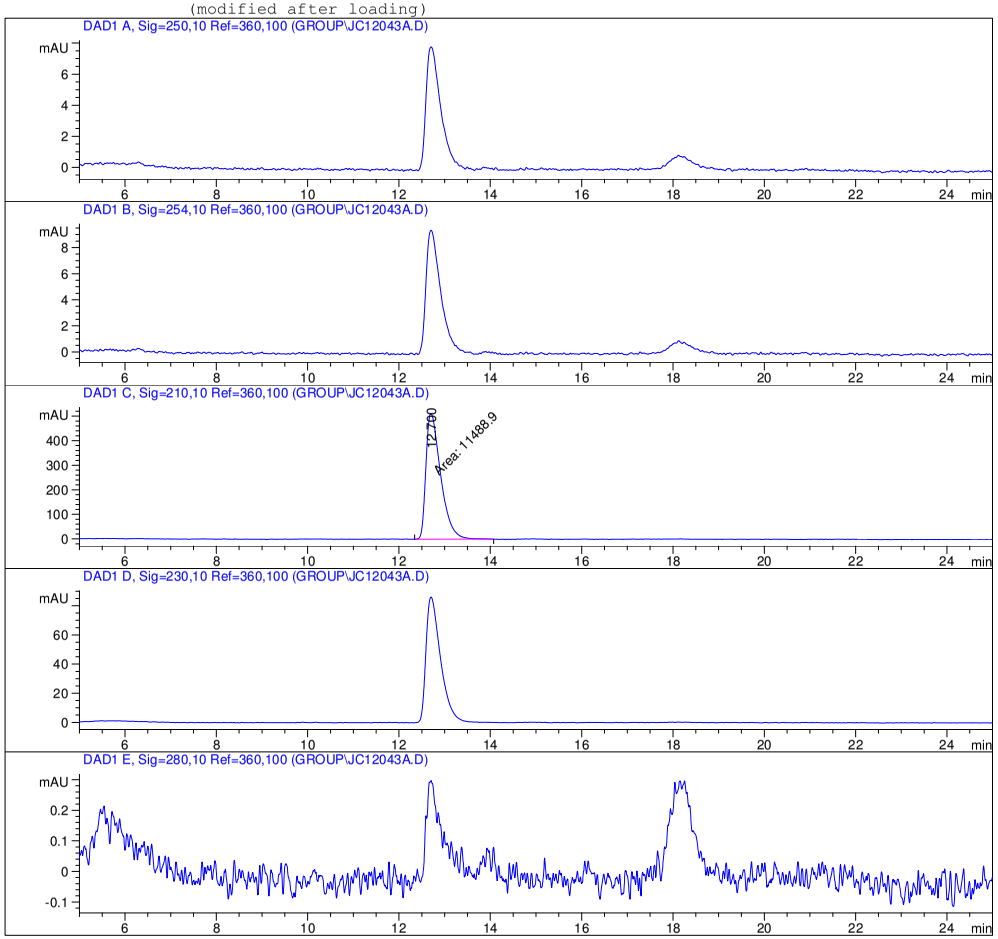


Table 2, entry 8
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 6/16/2014 7:47:41 PM          Seq. Line :   4
Sample Name     : JC12043A                       Location : Vial 11
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 6 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-30.M
Last changed    : 6/16/2014 7:51:29 PM by MK
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 6:54:33 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.700 MM    0.3740 1.14889e4   512.01752 100.0000

Totals :                  1.14889e4   512.01752

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

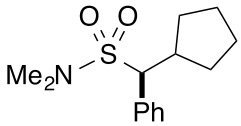
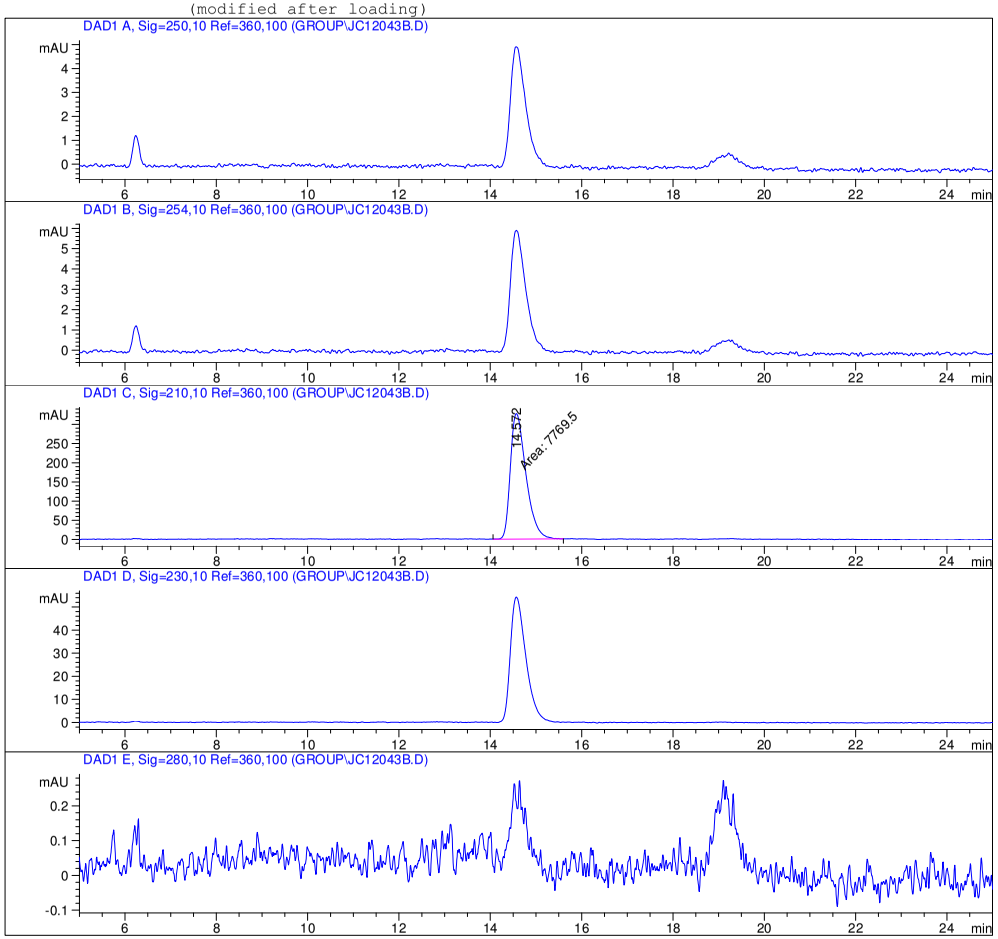


Table 2, entry 9
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 6/16/2014 8:19:00 PM          Seq. Line :   5
Sample Name     : JC12043B                       Location : Vial 12
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 6 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-30.M
Last changed    : 6/16/2014 7:51:29 PM by MK
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:32:53 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.572 MM    0.3958 7769.50049  327.13113 100.0000

Totals :                  7769.50049  327.13113

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

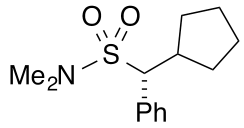
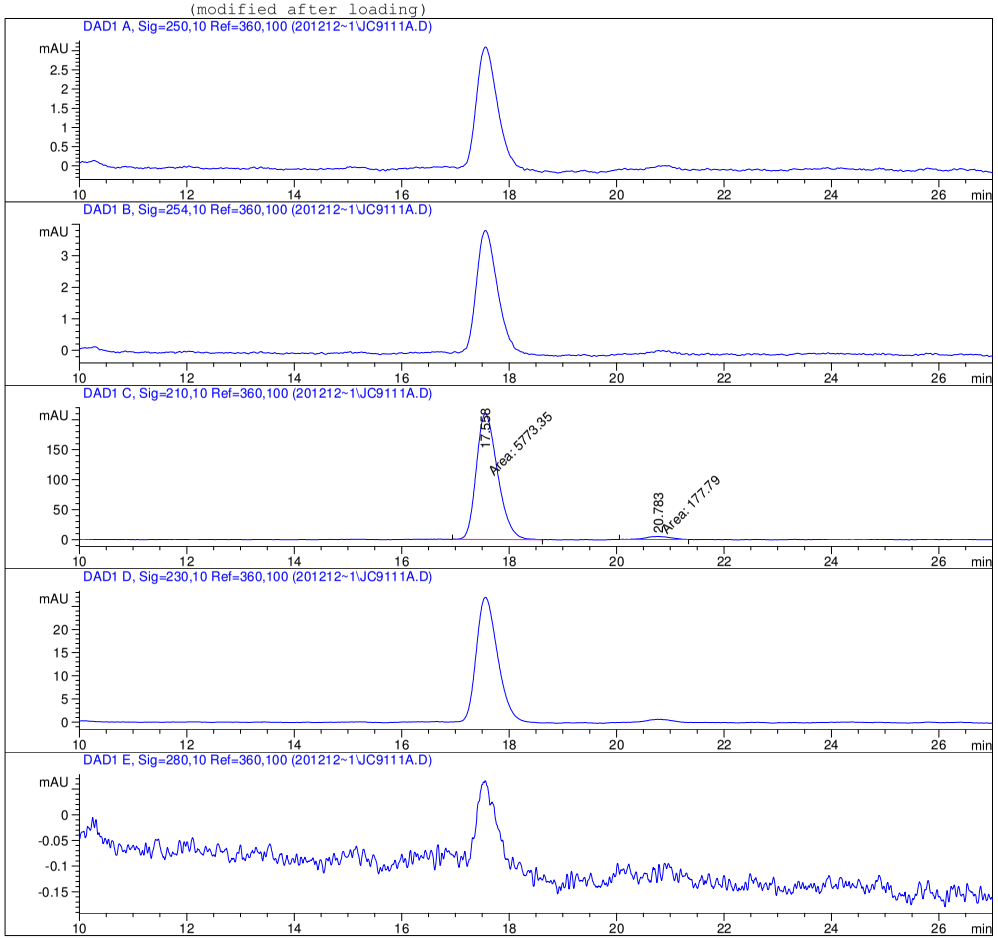


Table 2, entry 9
with (*S*,*S*)–**L1**

```
Injection Date  : 12/7/2012 3:31:19 PM          Seq. Line :   3
Sample Name     : JC9111A                        Location : Vial 35
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 4/7/2011 5:39:35 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 6:56:15 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201212~1\JC9111A.D Sample Name: JC9111A

Area Percent Report

```
Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.558 MM    0.4595 5773.34912  209.42706  97.0125
   2  20.783 MM    0.5738  177.79001    5.16444   2.9875

Totals :                  5951.13913  214.59150

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100
```

*** End of Report ***

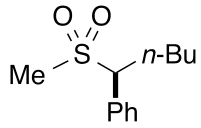
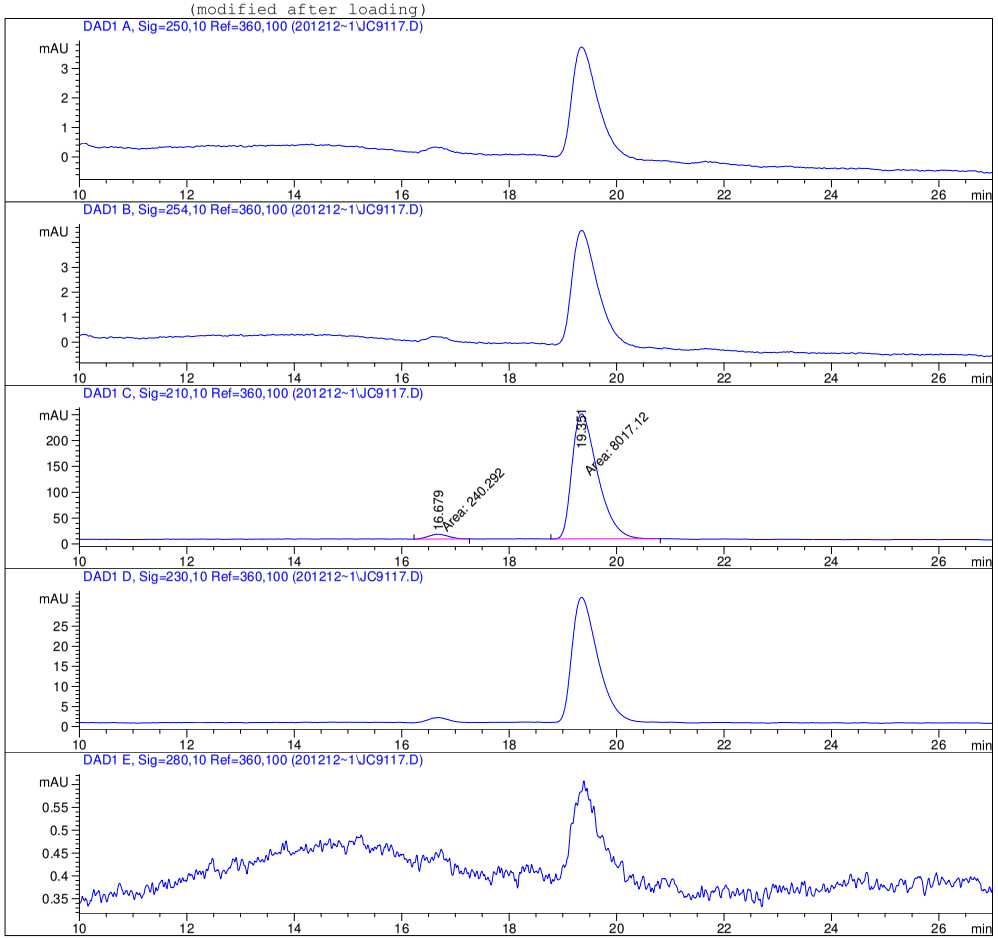


Table 3, entry 1 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 12/14/2012 4:31:29 PM          Seq. Line :   2
Sample Name     : JC9117                          Location : Vial 21
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 4/7/2011 5:39:35 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:34:56 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201212~1\JC9117.D Sample Name: JC9117

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.679 MM    0.4290  240.29202    9.33470   2.9100
   2  19.351 MM    0.5532 8017.11914  241.52242  97.0900

Totals :                  8257.41116  250.85712

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

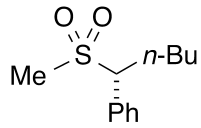
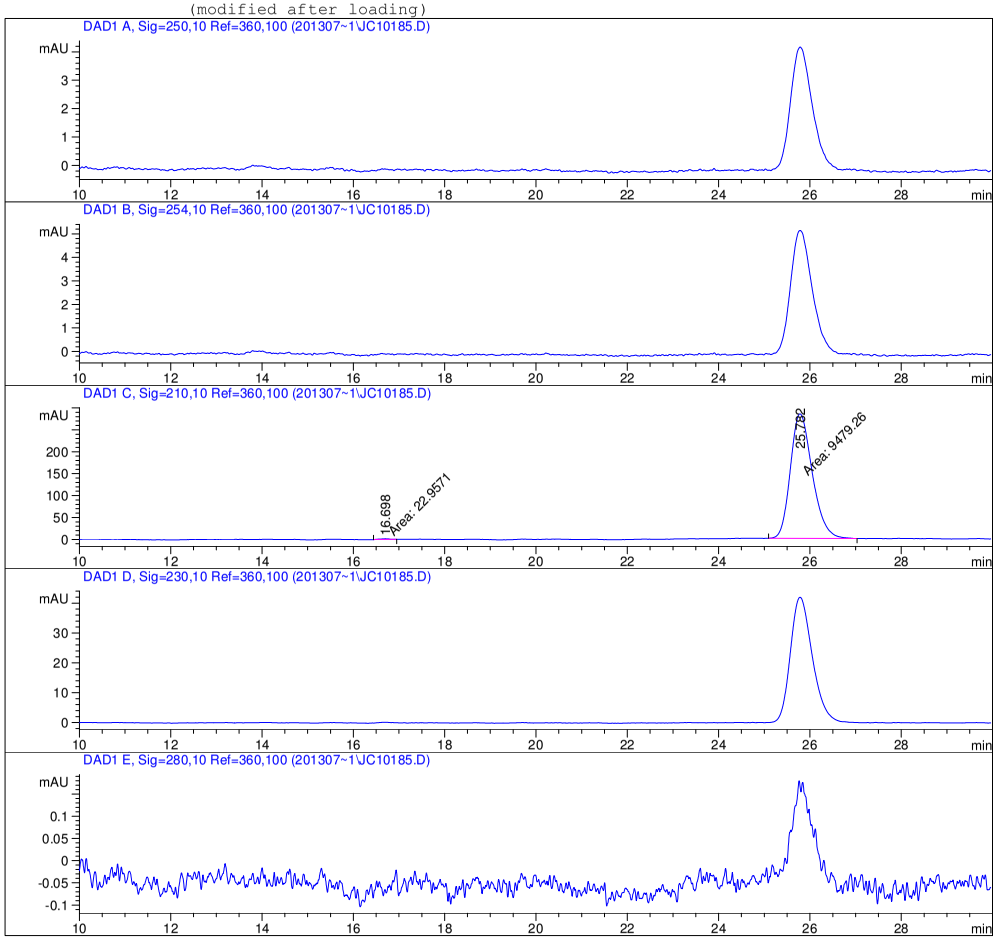


Table 3, entry 1
with (*S*,*S*)–**L1**

```
==========================================================================
Injection Date  : 7/20/2013 9:37:03 AM          Seq. Line :  34
Sample Name     : JC10185                        Location : Vial 82
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-04-30.M
Last changed    : 11/29/2010 7:04:08 PM by JTM
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 6:59:32 PM by MK
                  (modified after loading)
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.698 MM    0.2409   22.95708    1.58850   0.2416
   2  25.782 MM    0.5562 9479.26074  284.07181  99.7584

Totals :                  9502.21782  285.66031

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==========================================================================
                          *** End of Report ***
```

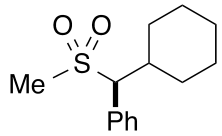
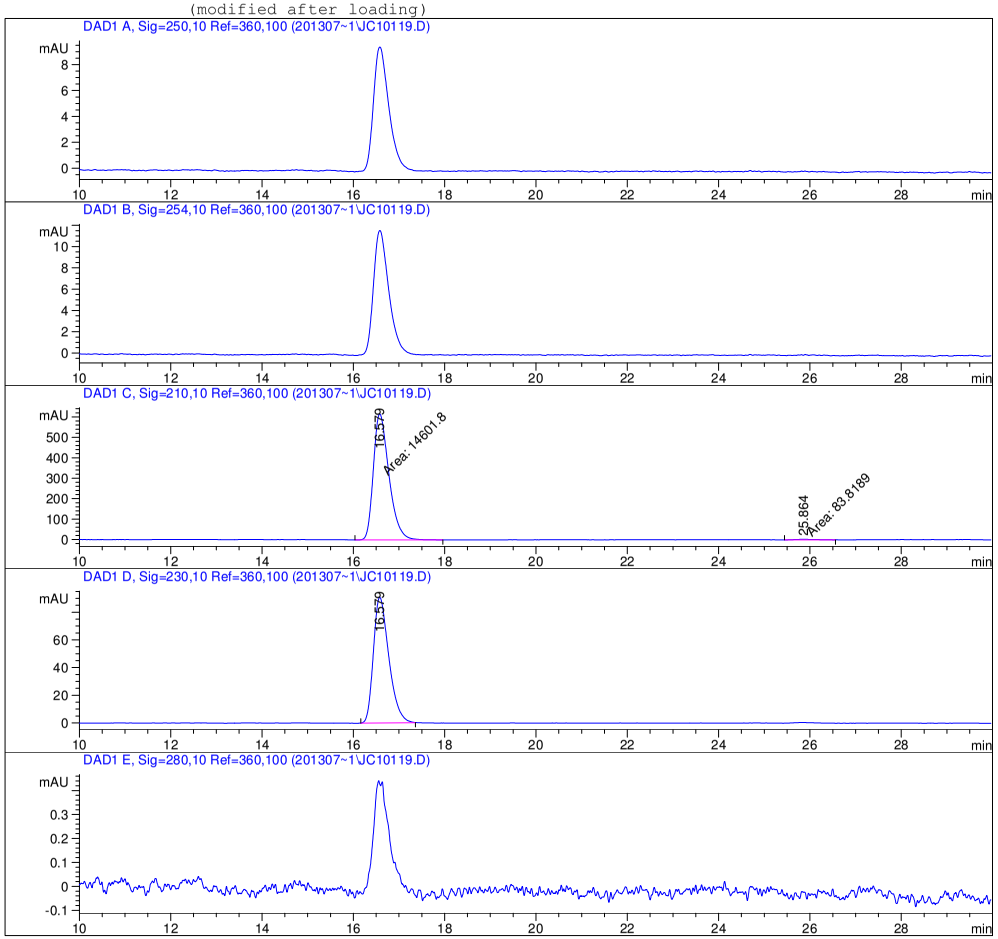


Table 3, entry 2 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 7/20/2013 9:05:45 AM          Seq. Line :  33
Sample Name     : JC10119B                       Location : Vial 81
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-04-30.M
Last changed    : 11/29/2010 7:04:08 PM by JTM
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:37:12 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.579 MM    0.3945 1.46018e4   616.82446  99.4292
   2  25.864 MM    0.5283   83.81888    2.64443   0.5708

Totals :                  1.46856e4   619.46889

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.579 BB    0.3588 2140.25293   90.87717 100.0000

Totals :                  2140.25293   90.87717

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

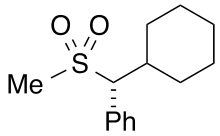
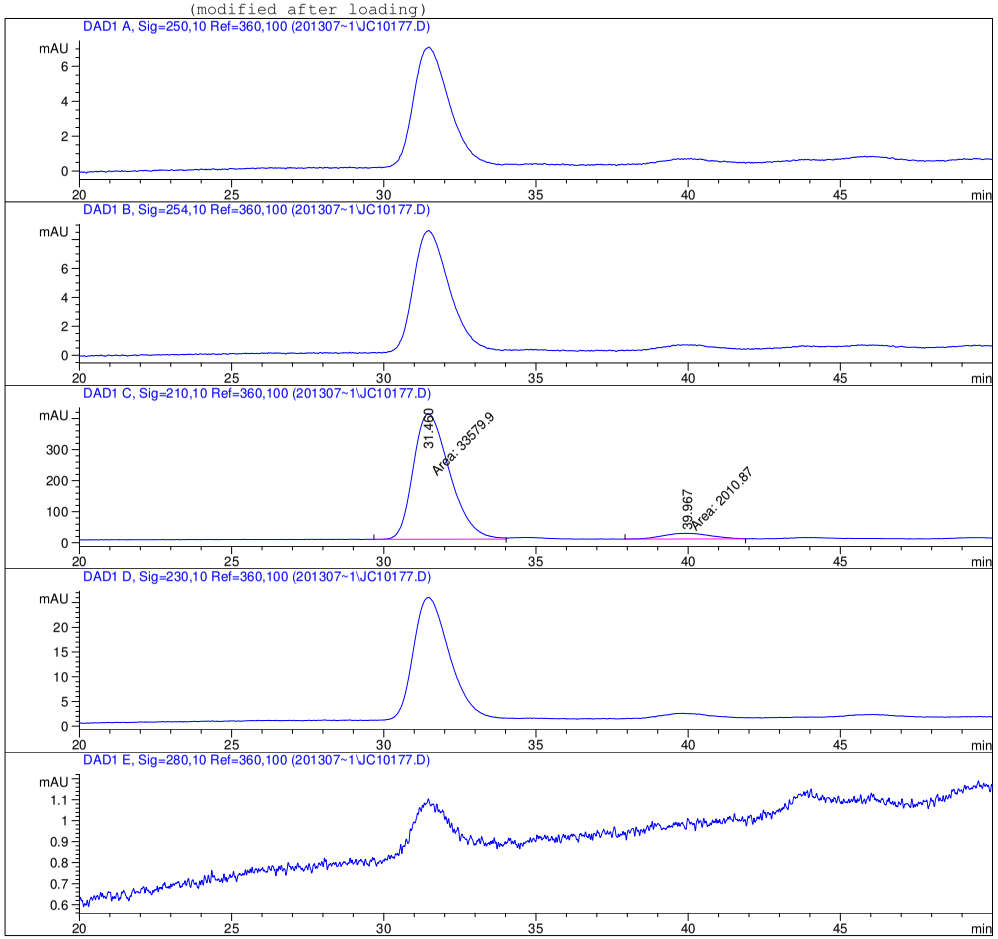


Table 3, entry 2 with (*S*,*S*)-**L1**

```
==================================================================
Injection Date  : 7/11/2013 9:50:27 AM          Seq. Line :   2
Sample Name     : JC10177                        Location : Vial 1
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-20-60.M
Last changed    : 6/28/2013 4:31:36 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:02:19 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  31.460 MF    1.3866 3.35799e4   403.62396  94.3500
   2  39.967 MM    1.8199 2010.86841   18.41513   5.6500

Totals :                  3.55907e4   422.03910

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

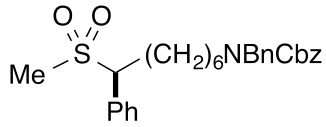
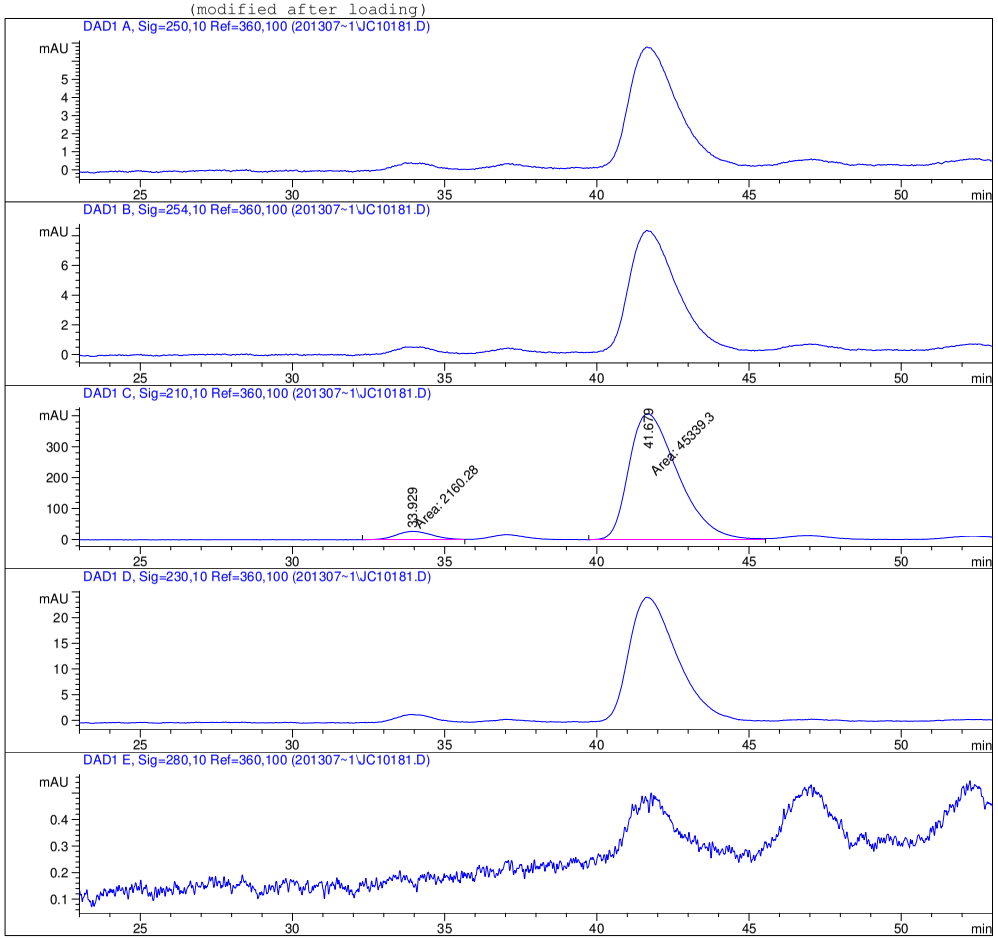


Table 3, entry 3
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 7/20/2013 7:21:29 AM          Seq. Line :  30
Sample Name     : JC10181                        Location : Vial 10
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-20-60.M
Last changed    : 6/28/2013 4:31:36 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:39:47 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  33.929 MF    1.3461 2160.27637   26.74717   4.5480
   2  41.679 MF    1.8592 4.53393e4   406.43207  95.4520

Totals :                  4.74996e4   433.17924

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

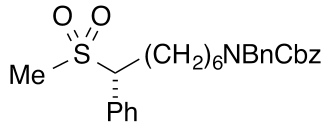
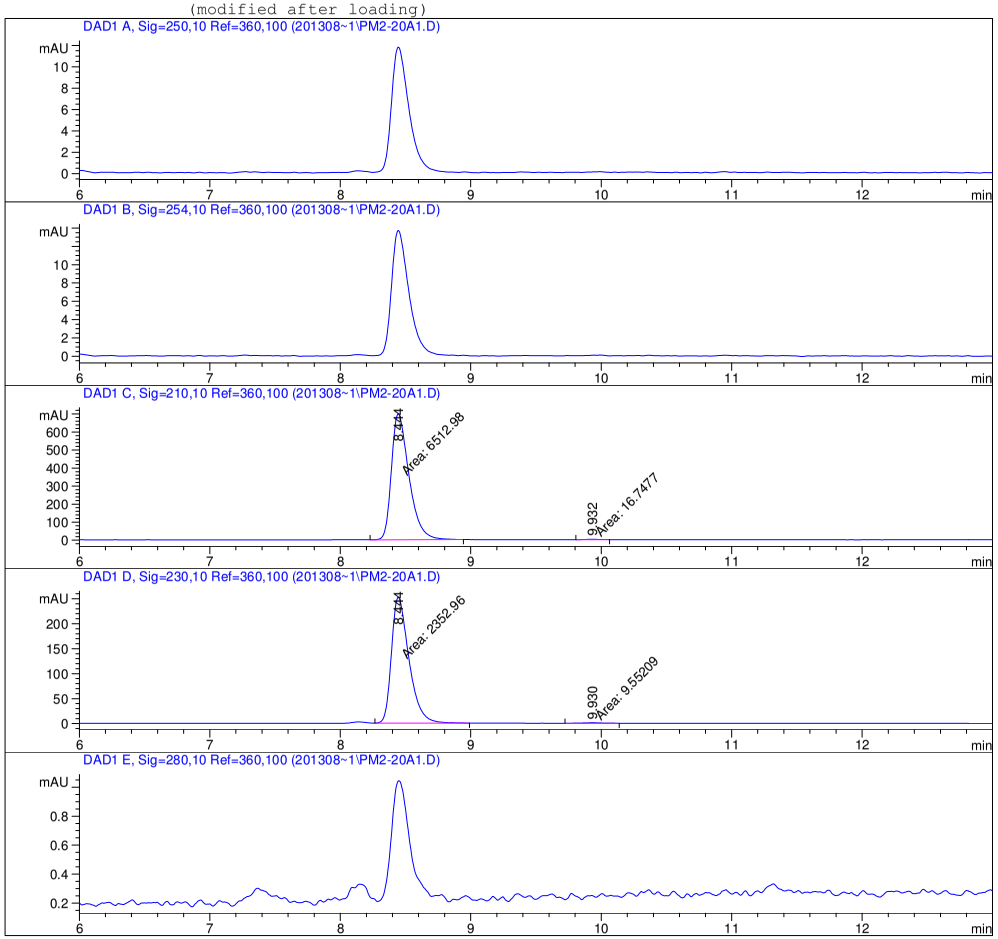


Table 3, entry 3
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 8/2/2013 10:41:10 AM          Seq. Line :   2
Sample Name     : PM2-20A                        Location : Vial 77
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\IB-01-20.M
Last changed    : 3/19/2012 12:43:39 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:04:50 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.444 MM    0.1553 6512.97803  698.96423  99.7435
   2   9.932 MM    0.1343   16.74774    2.07831   0.2565

Totals :                  6529.72577  701.04255

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.444 FM    0.1553 2352.96094  252.45752  99.5957
   2   9.930 MM    0.1630    9.55209 9.76556e-1   0.4043

Totals :                  2362.51303  253.43408

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

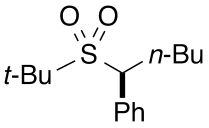
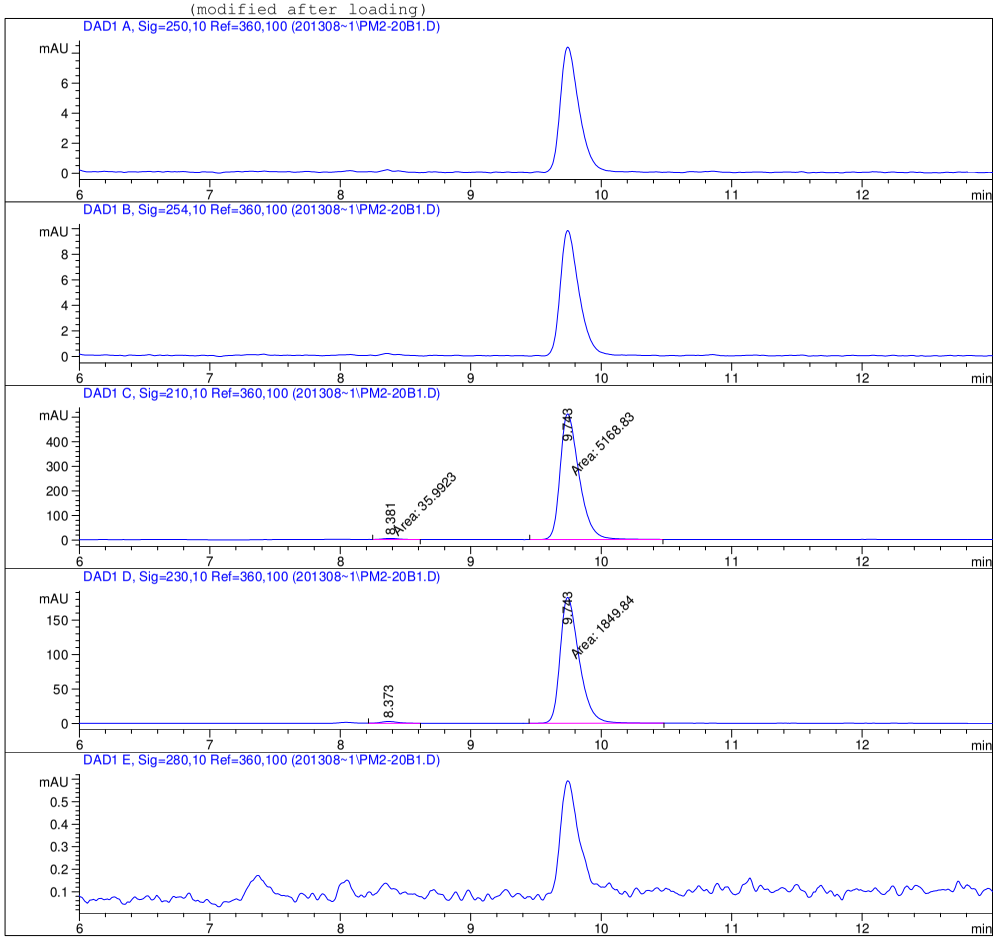


Table 3, entry 4 with (*R*,*R*)–**L1**

```
Injection Date  : 8/2/2013 11:02:26 AM          Seq. Line :   3
Sample Name     : PM2-20B                       Location : Vial 78
Acq. Operator   : CE                               Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\IB-01-20.M
Last changed    : 3/19/2012 12:43:39 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:41:35 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201308~1\PM2-20B1.D Sample Name: PM2-20B

Area Percent Report

```
Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.381 MM    0.1398   35.99226    4.28965   0.6915
   2   9.743 MM    0.1683 5168.82764  511.87228  99.3085

Totals :                  5204.81990  516.16193

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.373 VB    0.1312   22.56680    2.60208   1.2052
   2   9.743 MM    0.1686 1849.83777  182.89543  98.7948

Totals :                  1872.40457  185.49751

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100
```

*** End of Report ***

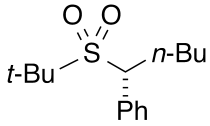
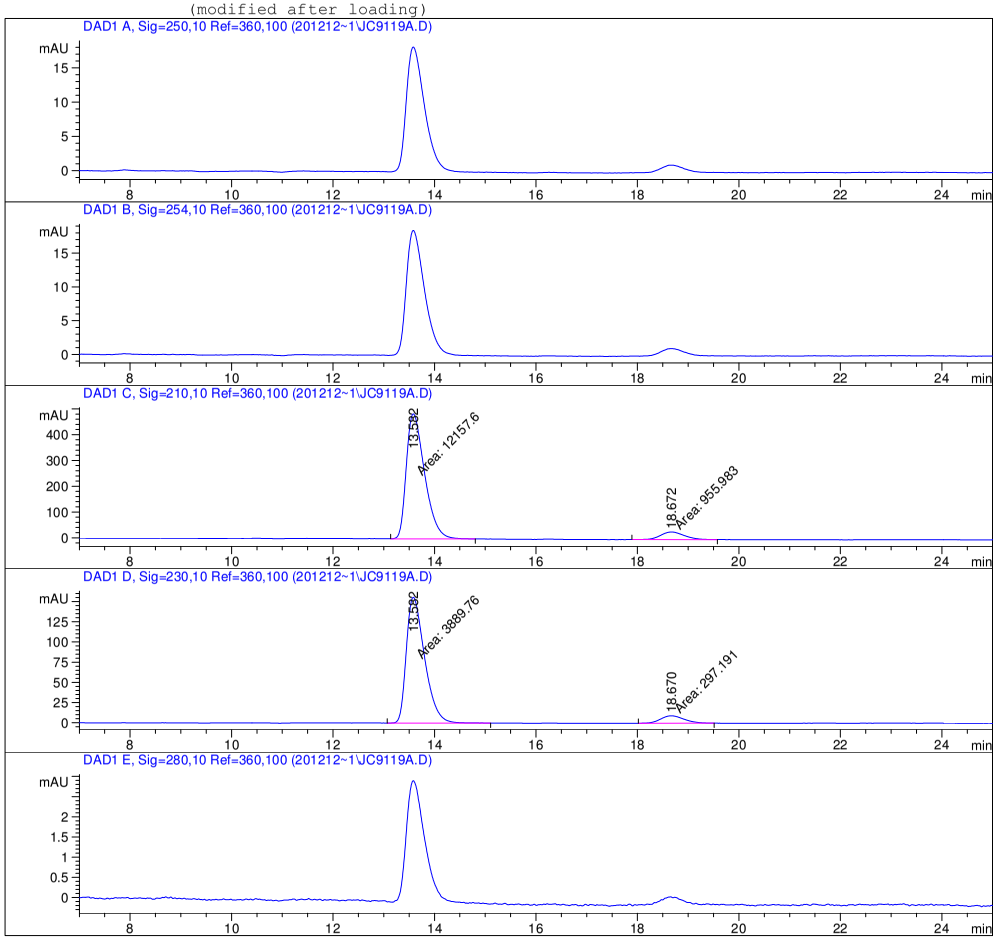


Table 3, entry 4 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 12/14/2012 5:34:16 PM          Seq. Line :   4
Sample Name     : JC9119A                         Location : Vial 22
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-40.M
Last changed    : 8/17/2010 4:39:48 PM by JTM
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:15:04 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|-------|
   1  13.582 MM    0.4179 1.21576e4   484.81223  92.7100
   2  18.672 MM    0.5410  955.98328   29.44996   7.2900

Totals :                  1.31136e4   514.26218

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|-------|
   1  13.582 MM    0.4166 3889.75903  155.62090  92.9020
   2  18.670 MM    0.5358  297.19092    9.24424   7.0980

Totals :                  4186.94995  164.86513

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

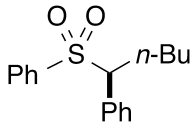
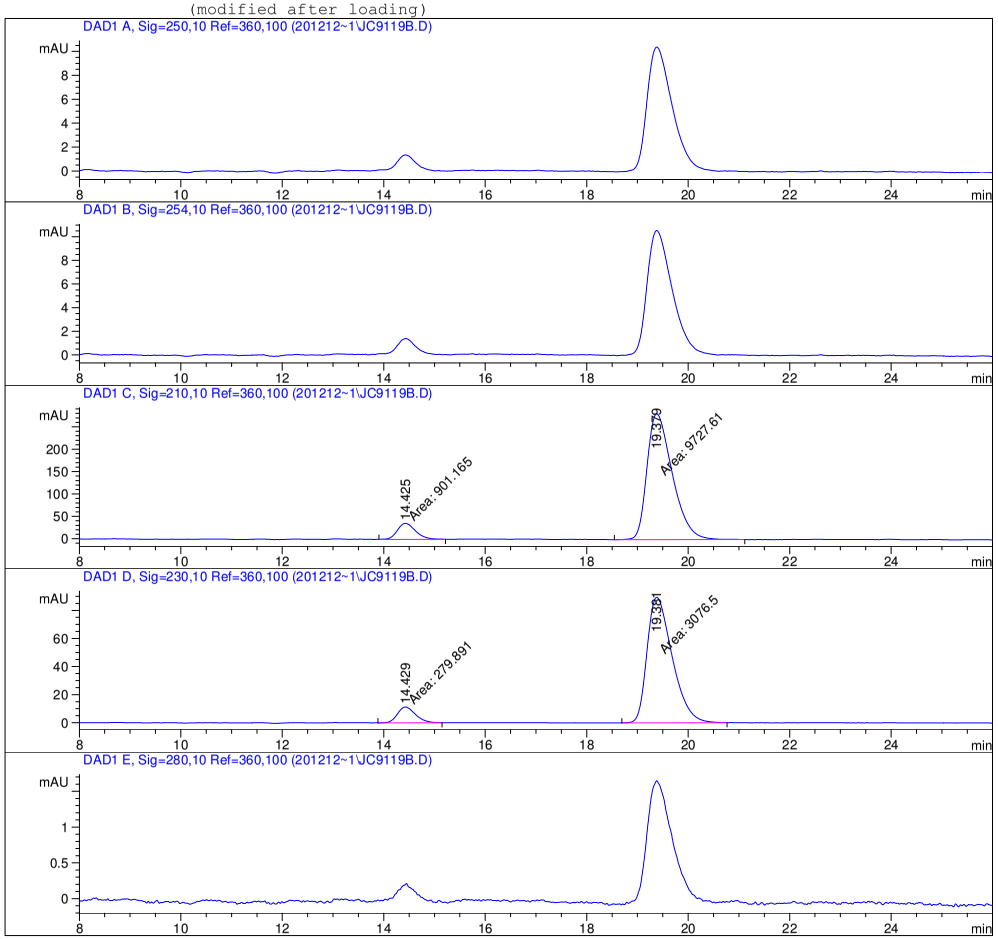


Table 3, entry 5
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 12/14/2012 6:15:28 PM          Seq. Line :   5
Sample Name     : JC9119B                         Location : Vial 23
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-40.M
Last changed    : 8/17/2010 4:39:48 PM by JTM
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 10:20:42 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.425 MM    0.4183  901.16510   35.90579   8.4785
   2  19.379 MM    0.5770 9727.60840  280.98239  91.5215

Totals :                  1.06288e4   316.88818

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.429 MM    0.4146  279.89063   11.25042   8.3390
   2  19.381 MM    0.5735 3076.50317   89.40532  91.6610

Totals :                  3356.39380  100.65574

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

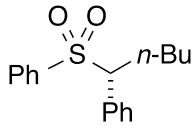
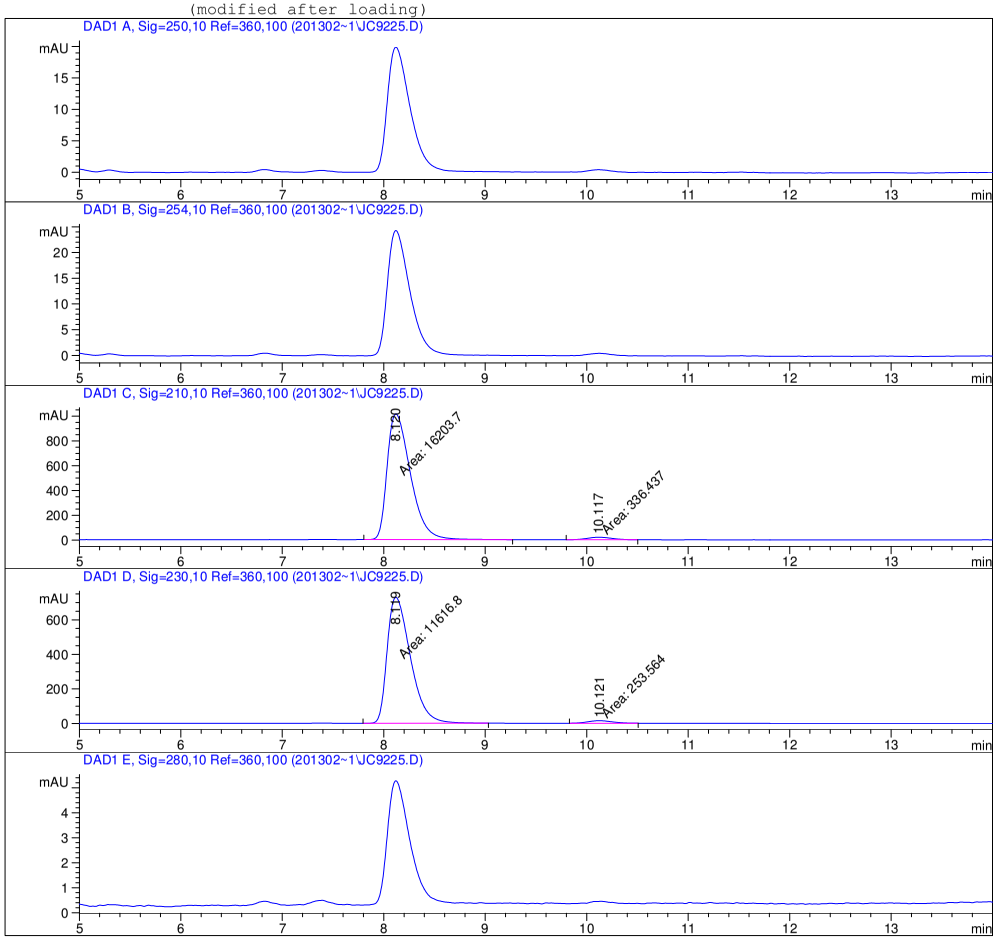


Table 3, entry 5
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 2/16/2013 5:08:58 PM          Seq. Line :   2
Sample Name     : JC9225                         Location : Vial 7
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-30.M
Last changed    : 2/16/2013 4:45:43 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:16:00 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.120 MM    0.2662 1.62037e4  1014.59381  97.9659
   2  10.117 MM    0.2798  336.43698   20.03921   2.0341

Totals :                  1.65402e4  1034.63302

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.119 MM    0.2655 1.16168e4   729.36182  97.8639
   2  10.121 MM    0.2835  253.56413   14.90512   2.1361

Totals :                  1.18703e4   744.26694

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

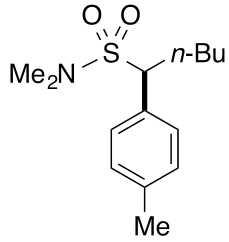
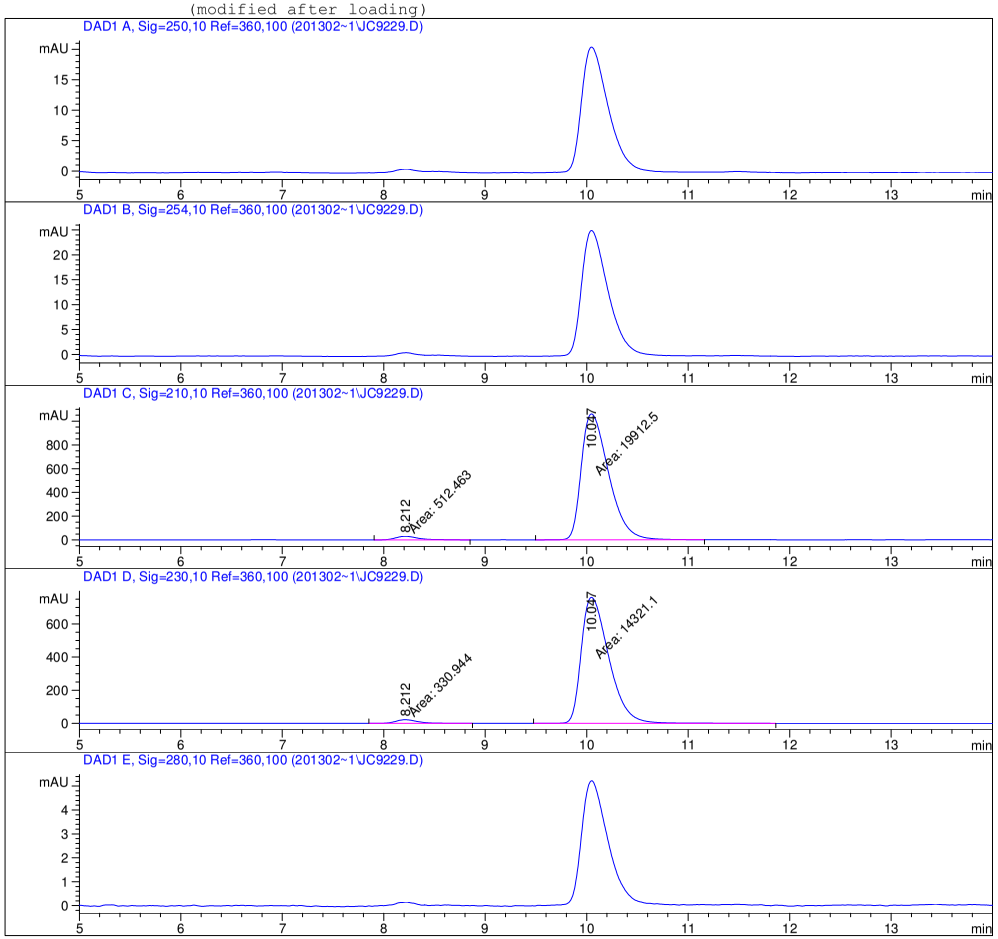


Table 4, entry 1 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 2/16/2013 5:40:14 PM          Seq. Line :   3
Sample Name     : JC9229                         Location : Vial 8
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-30.M
Last changed    : 2/16/2013 4:45:43 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:49:11 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.212 MM    0.2747  512.46289   31.09460   2.5090
   2  10.047 MM    0.3127 1.99125e4  1061.17505  97.4910

Totals :                  2.04249e4  1092.26965

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.212 MM    0.2489  330.94400   22.15661   2.2587
   2  10.047 MM    0.3138 1.43211e4   760.68982  97.7413

Totals :                  1.46520e4   782.84643

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

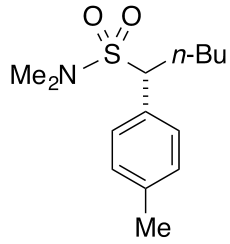
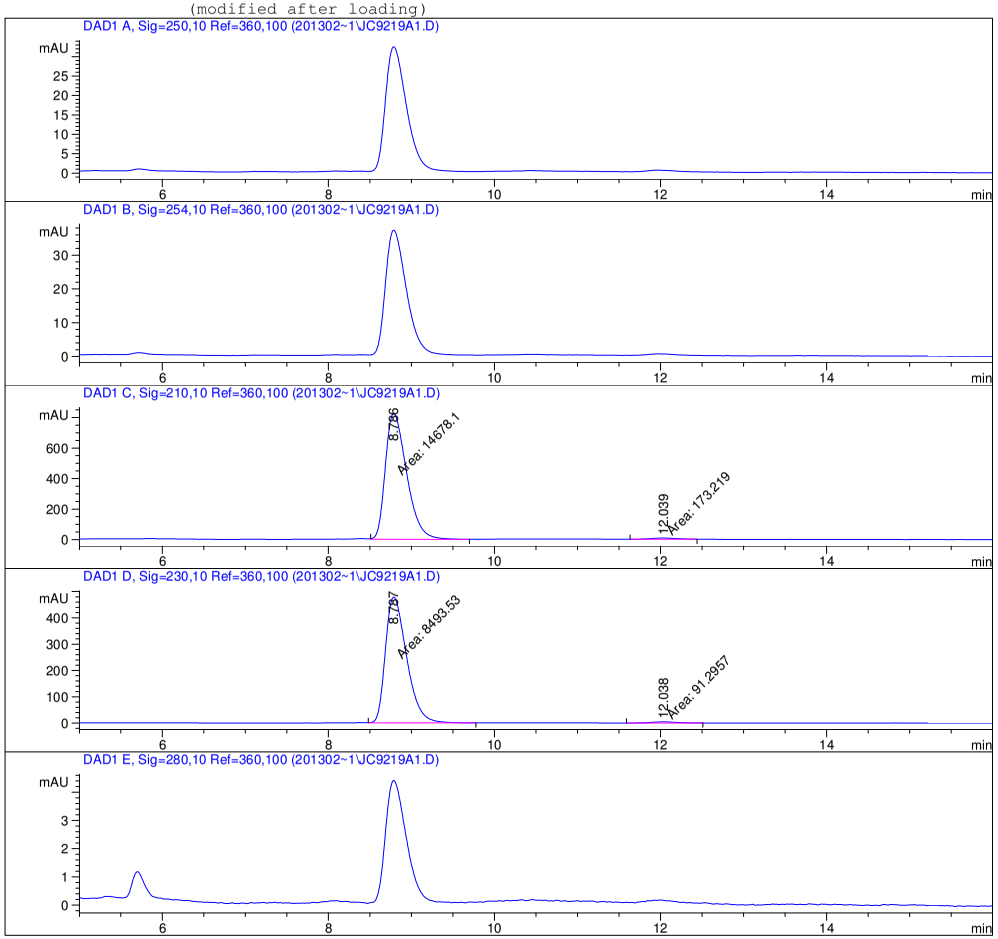


Table 4, entry 1 with (*S*,*S*)-**L1**

```
================================================================
Injection Date  : 2/11/2013 7:19:54 PM          Seq. Line :   6
Sample Name     : JC9219A                        Location : Vial 5
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-03-40.M
Last changed    : 2/11/2013 7:37:52 PM by CE
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:18:31 PM by MK
                  (modified after loading)
```




```
================================================================
                      Area Percent Report
================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.786 FM    0.2972 1.46781e4   823.10712  98.8336
   2  12.039 MM    0.3704  173.21939    7.79425   1.1664

Totals :                  1.48513e4   830.90137

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.787 FM    0.2959 8493.53320  478.45062  98.9365
   2  12.038 MM    0.3593   91.29572    4.23473   1.0635

Totals :                  8584.82892  482.68535

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

================================================================
                      *** End of Report ***
```

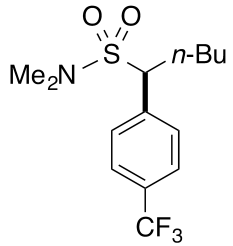
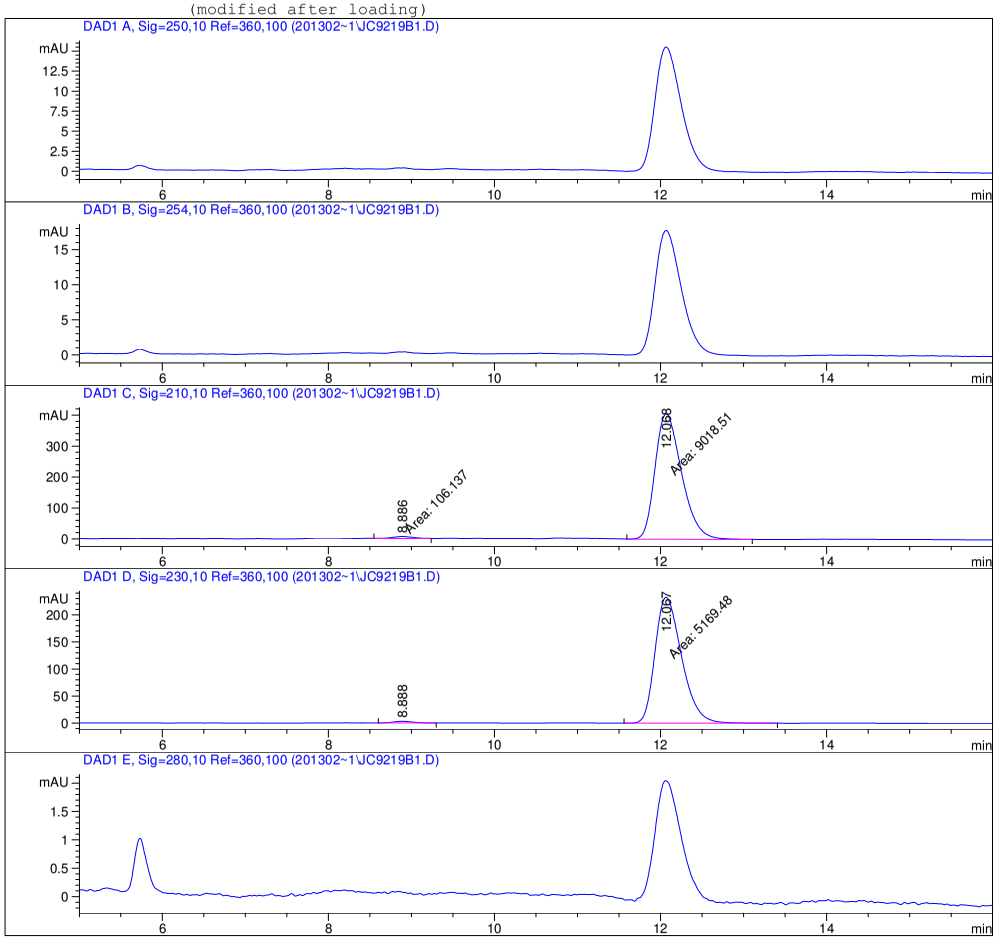


Table 4, entry 2 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 2/11/2013 7:51:20 PM          Seq. Line :   7
Sample Name     : JC9219B                        Location : Vial 6
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-03-30.M
Last changed    : 12/31/2012 2:58:25 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:50:49 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201302~1\JC9219B1.D Sample Name: JC9219B

```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.886 MM    0.2858  106.13663    6.19042   1.1632
   2  12.068 MM    0.3709 9018.51172  405.22449  98.8368

Totals :                  9124.64835  411.41491

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.888 PP    0.2387   46.58376    2.97409   0.8931
   2  12.067 MM    0.3708 5169.47754  232.32732  99.1069

Totals :                  5216.06130  235.30141

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

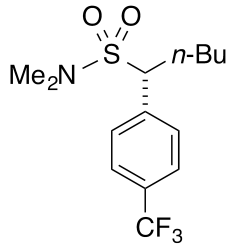
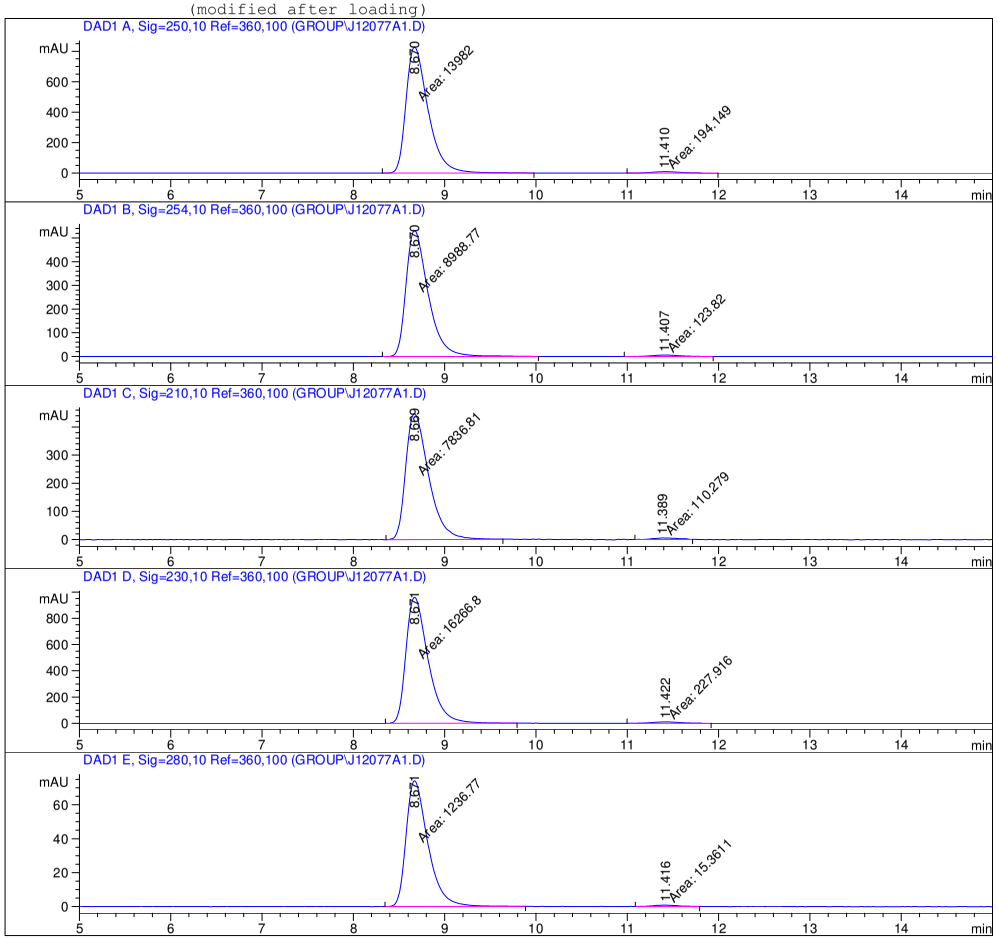


Table 4, entry 2 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 8/2/2014 11:04:39 AM          Seq. Line :   2
Sample Name     : JC12077A                       Location : Vial 17
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 12/28/2013 3:19:26 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:57:50 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.670 MM    0.2815 1.39820e4   827.70404  98.6305
   2  11.410 MM    0.3566  194.14923    9.07509   1.3695

Totals :                  1.41762e4   836.77913

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.670 MM    0.2817 8988.77344  531.88464  98.6412
   2  11.407 MM    0.3539  123.82027    5.83146   1.3588

Totals :                  9112.59371  537.71610

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.669 MM    0.2922 7836.80811  447.05707  98.6123
   2  11.389 MM    0.3057  110.27897    6.01225   1.3877

Totals :                  7947.08707  453.06932

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.671 MM    0.2825 1.62668e4   959.65015  98.6183
   2  11.422 MM    0.3601  227.91589   10.54932   1.3817

Totals :                  1.64948e4   970.19947

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.671 MM    0.2779 1236.76501   74.16629  98.7732
   2  11.416 MM    0.3130   15.36111 8.18057e-1   1.2268

Totals :                  1252.12613   74.98435

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

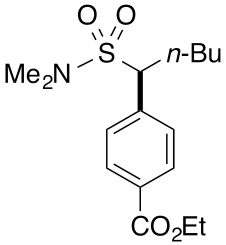
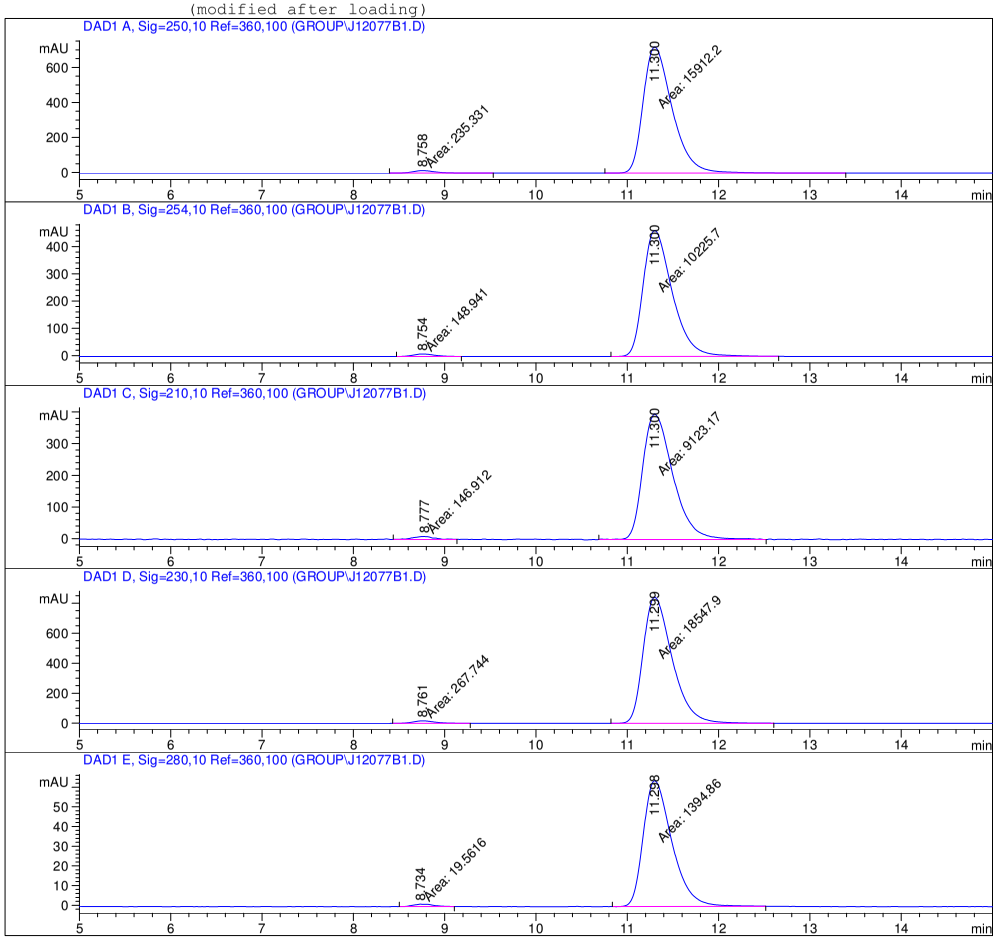


Table 4, entry 3 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 8/2/2014 11:46:00 AM          Seq. Line :   3
Sample Name     : JC12077B                       Location : Vial 18
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 12/28/2013 3:19:26 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:57:50 PM by MK
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.758 MM    0.2769  235.33102   14.16449   1.4574
   2  11.300 MM    0.3687 1.59122e4   719.25024  98.5426

Totals :                  1.61475e4   733.41473

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.754 MM    0.2731  148.94130    9.09059   1.4356
   2  11.300 MM    0.3685 1.02257e4   462.43088  98.5644

Totals :                  1.03746e4   471.52147

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.777 MM    0.2656  146.91231    9.21852   1.5848
   2  11.300 MM    0.3831 9123.17285  396.85388  98.4152

Totals :                  9270.08516  406.07240

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.761 MM    0.2672  267.74371   16.69801   1.4230
   2  11.299 MM    0.3680 1.85479e4   840.07916  98.5770

Totals :                  1.88156e4   856.77717

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.734 MM    0.2625   19.56164    1.24219   1.3830
   2  11.298 MM    0.3636 1394.85559   63.93124  98.6170

Totals :                  1414.41723   65.17344

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

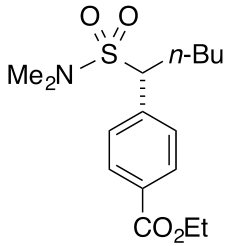
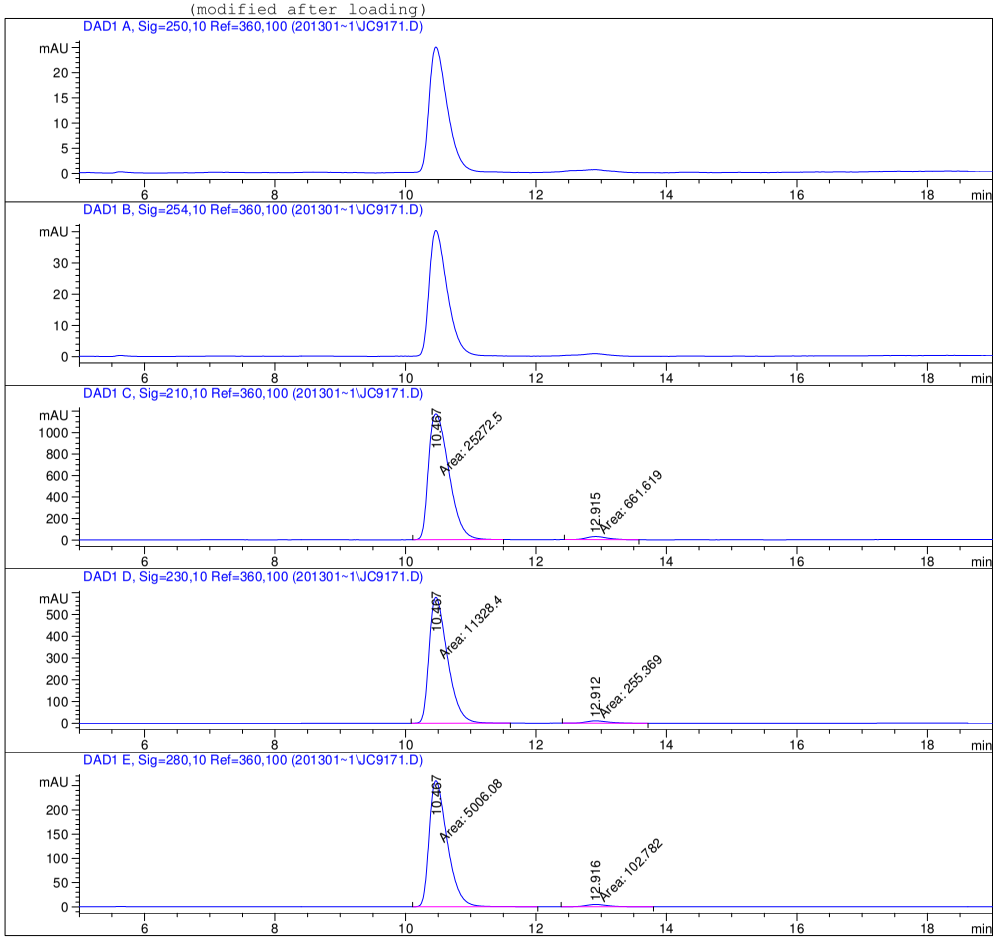


Table 4, entry 3 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 1/24/2013 2:01:50 PM          Seq. Line :   3
Sample Name     : JC9171                         Location : Vial 4
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-03-30.M
Last changed    : 12/31/2012 2:58:25 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 10:57:44 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.467 MM    0.3598 2.52725e4  1170.62231  97.4488
   2  12.915 MM    0.3802  661.61938   29.00374   2.5512

Totals :                  2.59342e4  1199.62605

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.467 MM    0.3264 1.13284e4   578.50757  97.7955
   2  12.912 MM    0.3912  255.36906   10.87842   2.2045

Totals :                  1.15838e4   589.38598

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.467 MM    0.3209 5006.08350  260.03439  97.9882
   2  12.916 MM    0.3720  102.78178    4.60473   2.0118

Totals :                  5108.86527  264.63913

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

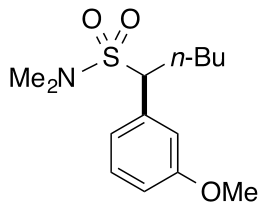
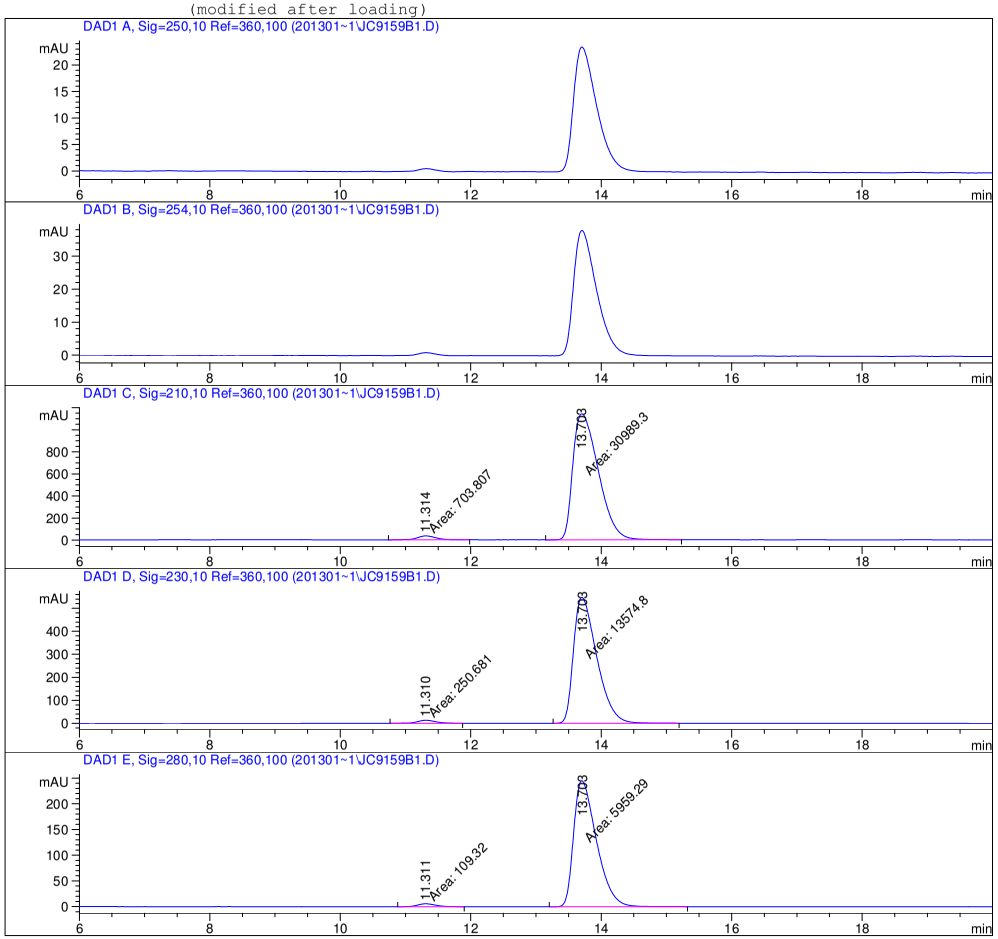


Table 4, entry 4 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 1/17/2013 6:11:02 PM          Seq. Line :   3
Sample Name     : JC9159B                        Location : Vial 5
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-03-30.M
Last changed    : 12/31/2012 2:58:25 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:54:28 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.314 MM    0.3282  703.80688   35.73879   2.2207
   2  13.703 MM    0.4525 3.09893e4  1141.28613  97.7793

Totals :                  3.16931e4  1177.02492

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.310 MM    0.3180  250.68091   13.13707   1.8132
   2  13.703 MM    0.4130 1.35748e4   547.84503  98.1868

Totals :                  1.38255e4   560.98210

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.311 MM    0.3191  109.32001    5.70986   1.8014
   2  13.703 MM    0.4053 5959.28662  245.05873  98.1986

Totals :                  6068.60663  250.76859

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

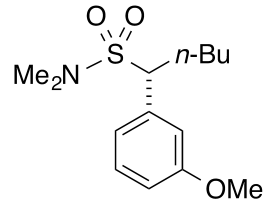
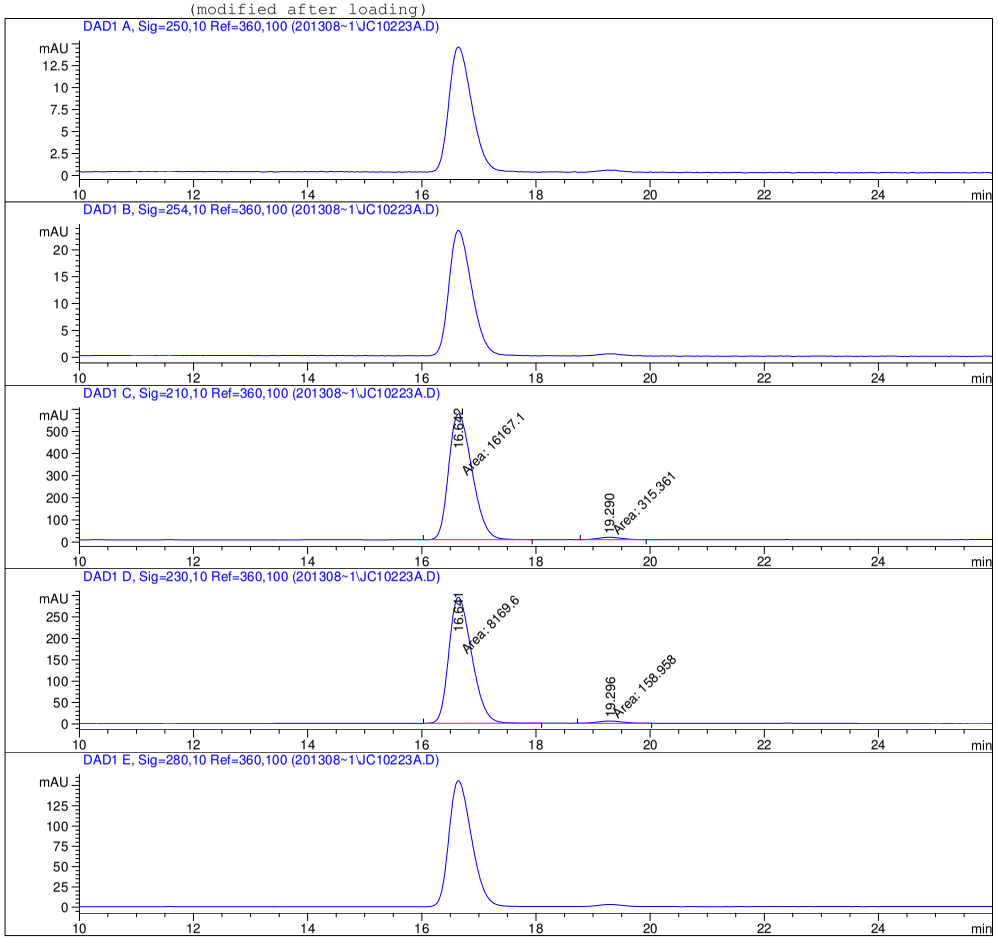


Table 4, entry 4 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 8/5/2013 11:54:59 PM          Seq. Line :   2
Sample Name     : JC10223A                       Location : Vial 94
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-05-40.M
Last changed    : 4/7/2011 5:40:42 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:21:45 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.642 MM    0.4739 1.61671e4   568.63507  98.0867
   2  19.290 MM    0.4751  315.36053   11.06335   1.9133

Totals :                  1.64825e4   579.69842

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.641 MM    0.4629 8169.60059  294.14471  98.0914
   2  19.296 MM    0.5049  158.95808    5.24689   1.9086

Totals :                  8328.55867  299.39160

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

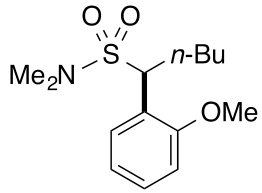
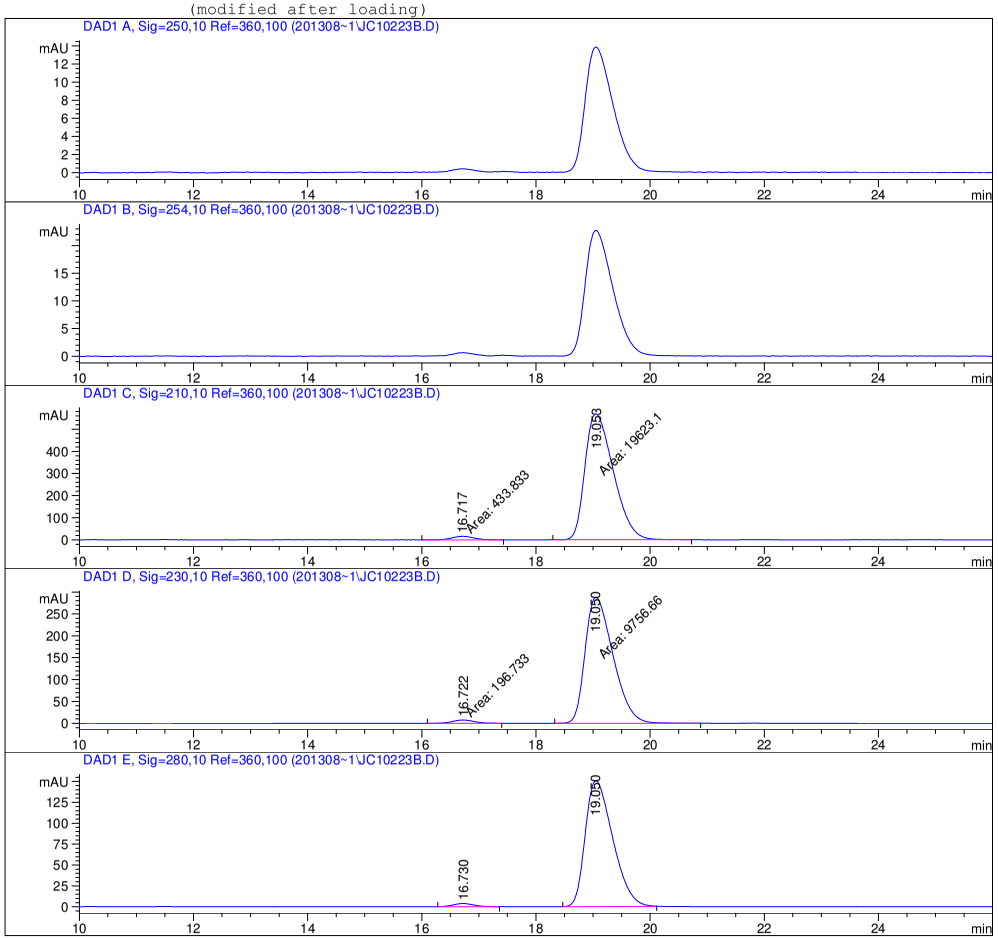


Table 4, entry 5 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 8/6/2013 12:36:17 AM          Seq. Line :   3
Sample Name     : JC10223B                       Location : Vial 95
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-05-40.M
Last changed    : 4/7/2011 5:40:42 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:56:57 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.717 MM    0.4488  433.83279   16.11137   2.1630
   2  19.053 MM    0.5754 1.96231e4   568.36749  97.8370

Totals :                  2.00569e4   584.47886

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.722 MM    0.4358  196.73267    7.52359   1.9765
   2  19.050 MM    0.5650 9756.66211  287.81458  98.0235

Totals :                  9953.39478  295.33817

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.730 BP    0.3569   92.86021    3.75030   1.8070
   2  19.050 BB    0.5188 5045.99463  150.64299  98.1930

Totals :                  5138.85484  154.39329

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

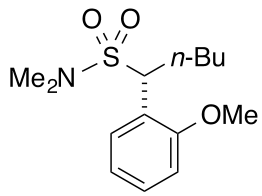
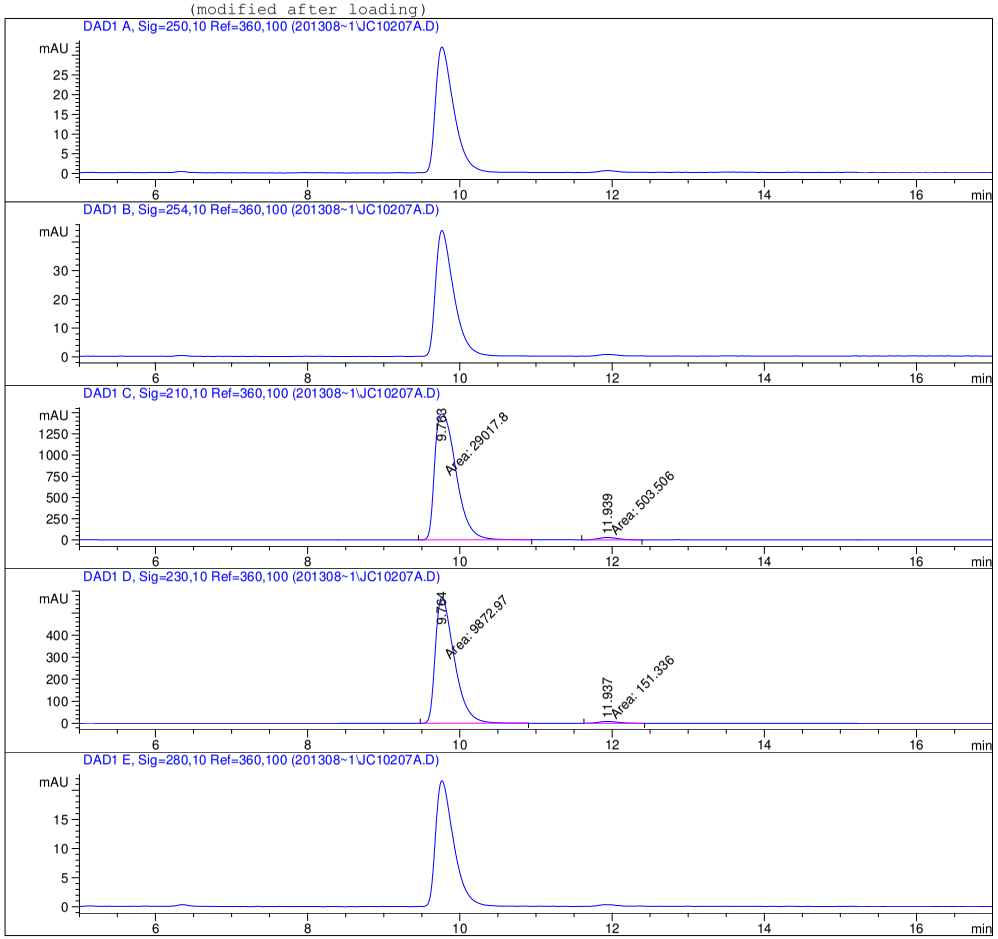


Table 4, entry 5 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 8/9/2013 1:39:02 AM            Seq. Line :   6
Sample Name     : JC10207A                        Location : Vial 42
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-30.M
Last changed    : 2/16/2013 4:45:43 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 11:04:53 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.763 MM    0.3255 2.90178e4  1485.83618  98.2944
   2  11.939 MM    0.2984  503.50601   28.12491   1.7056

Totals :                  2.95213e4  1513.96109

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.764 MM    0.2880 9872.96777  571.38434  98.4903
   2  11.937 MM    0.2972  151.33591    8.48584   1.5097

Totals :                  1.00243e4   579.87018

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

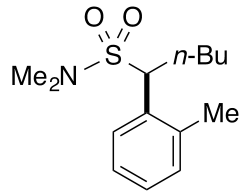
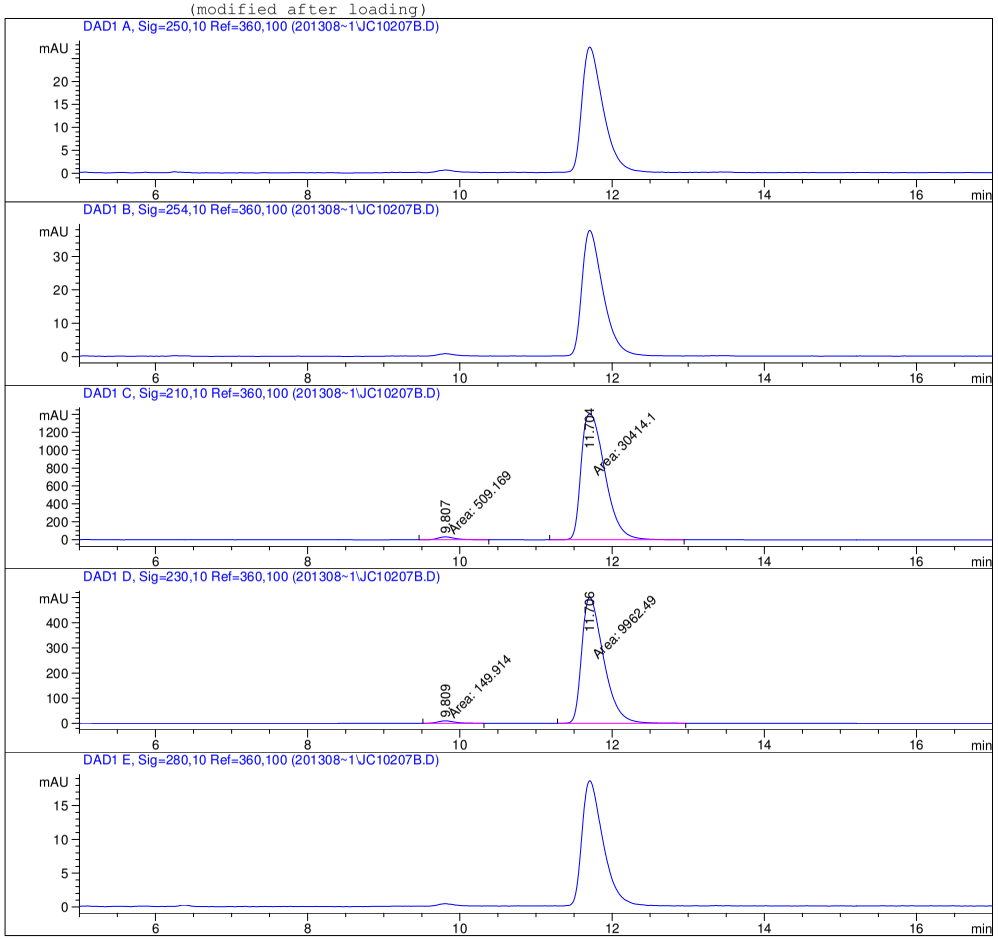


Table 4, entry 6 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 8/9/2013 2:10:20 AM            Seq. Line :   7
Sample Name     : JC10207B                        Location : Vial 43
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-30.M
Last changed    : 2/16/2013 4:45:43 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/1/2014 11:59:09 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.807 MM    0.2614  509.16885   32.46480   1.6466
   2  11.704 MM    0.3607 3.04141e4  1405.28198  98.3534

Totals :                  3.09233e4  1437.74678

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.809 MM    0.2538  149.91431    9.84457   1.4825
   2  11.706 MM    0.3315 9962.49023  500.87515  98.5175

Totals :                  1.01124e4  510.71973

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

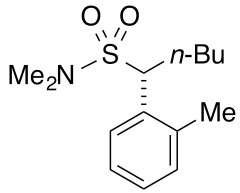
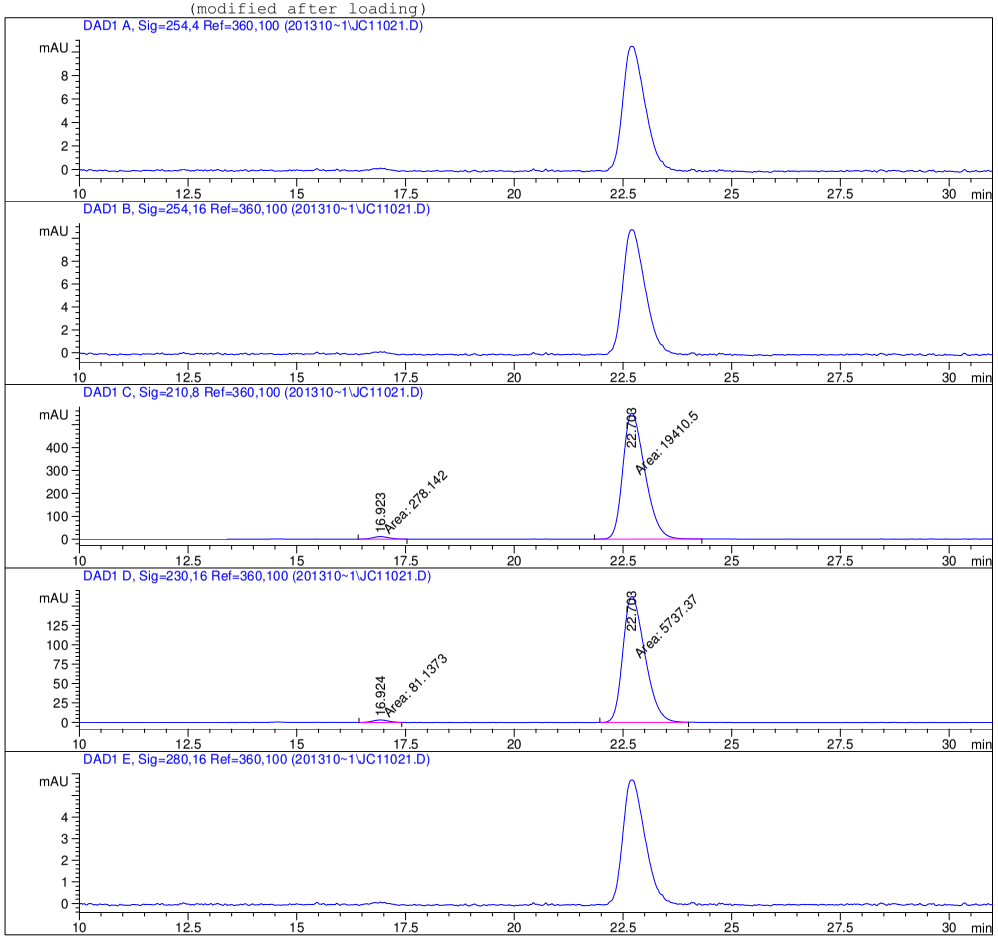


Table 4, entry 6
with (*S*,*S*)-**L1**

```
==================================================================
Injection Date  : 10/16/2013 10:17:19 PM         Seq. Line :   3
Sample Name     : JC11021                         Location : Vial 12
Acq. Operator   : TMB                                Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\IC-1540.M
Last changed    : 5/17/2012 7:45:15 PM by JTM
Analysis Method : C:\HPCHEM\1\METHODS\ODH-0440.M
Last changed    : 7/30/2014 7:44:57 PM by TMB
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100


Signal 2: DAD1 B, Sig=254,16 Ref=360,100


Signal 3: DAD1 C, Sig=210,8 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.923 MM    0.4228  278.14233   10.96450   1.4127
   2  22.703 MM    0.5880 1.94105e4   550.20209  98.5873

Totals :                  1.96886e4   561.16659

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.924 MM    0.4149   81.13730    3.25970   1.3945
   2  22.703 MM    0.5891 5737.36523  162.31212  98.6055

Totals :                  5818.50253  165.57181

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,16 Ref=360,100

==================================================================
                        *** End of Report ***
```

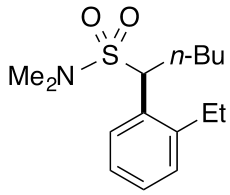
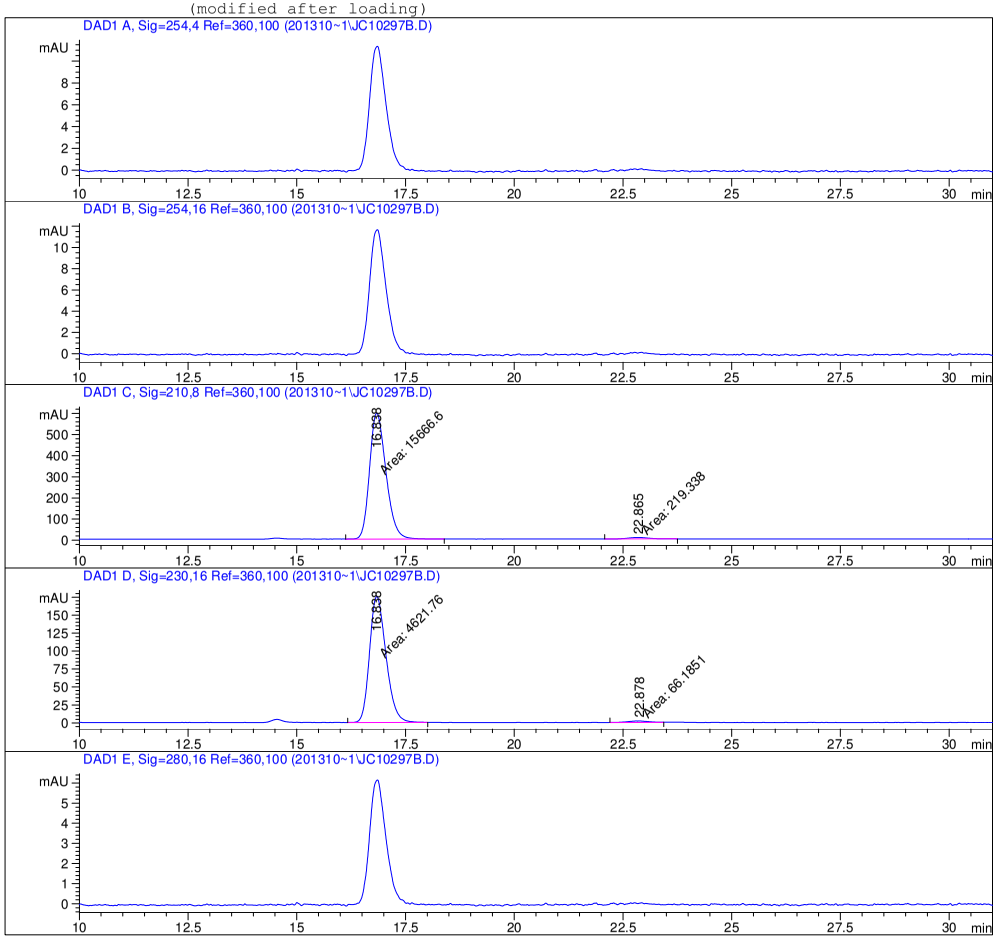


Table 4, entry 7 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 10/16/2013 9:36:03 PM          Seq. Line :   2
Sample Name     : JC10297B                        Location : Vial 11
Acq. Operator   : TMB                                Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\IC-1540.M
Last changed    : 5/17/2012 7:45:15 PM by JTM
Analysis Method : C:\HPCHEM\1\METHODS\ODH-0440.M
Last changed    : 8/2/2014 12:24:05 AM by TMB
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100


Signal 2: DAD1 B, Sig=254,16 Ref=360,100


Signal 3: DAD1 C, Sig=210,8 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.838 MM    0.4381 1.56666e4   596.02325  98.6193
   2  22.865 MM    0.5524  219.33803    6.61832   1.3807

Totals :                  1.58860e4   602.64157

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.838 MM    0.4396 4621.76465  175.22726  98.5882
   2  22.878 MM    0.5719   66.18513    1.92889   1.4118

Totals :                  4687.94978  177.15616

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,16 Ref=360,100

==================================================================
                      *** End of Report ***
```

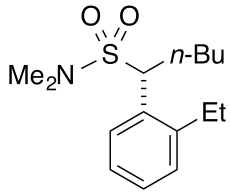
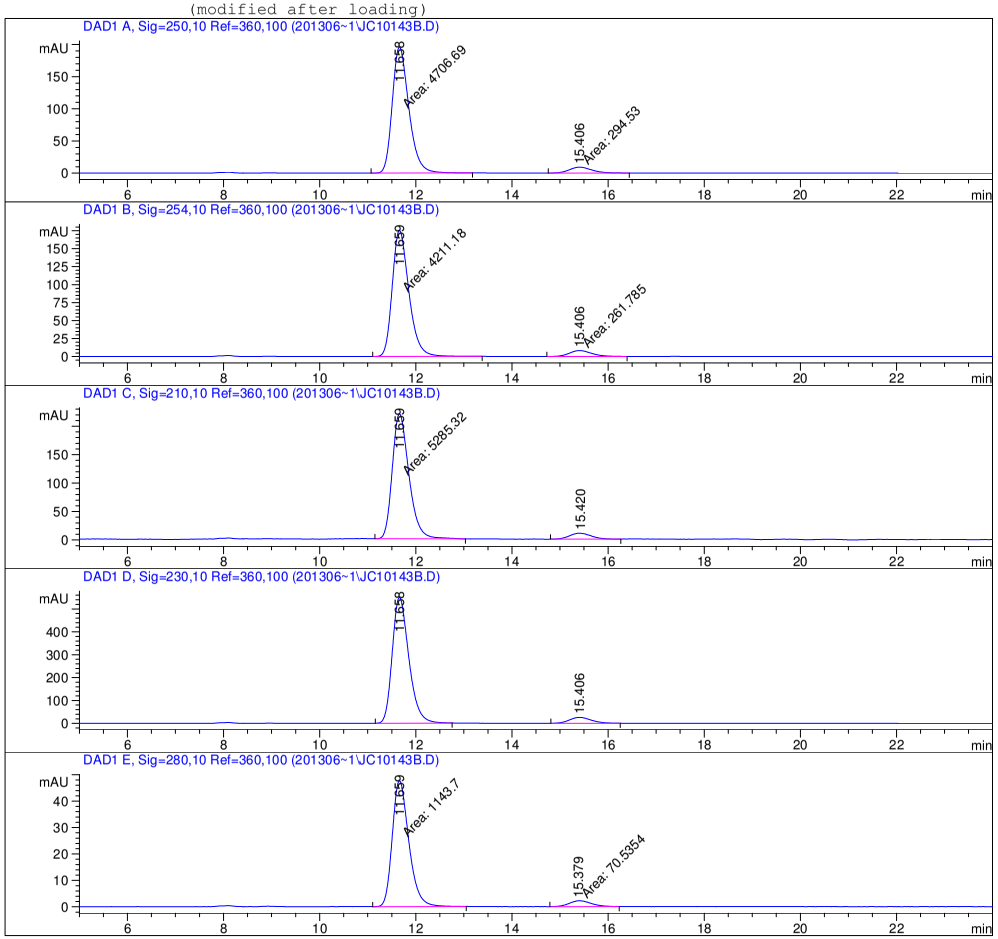


Table 4, entry 7 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 6/15/2013 12:06:30 AM          Seq. Line :   4
Sample Name     : JC10143B                        Location : Vial 32
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 2 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-40.M
Last changed    : 2/22/2013 10:06:44 AM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:30:18 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.658 MM    0.4004 4706.68896  195.89636  94.1108
   2  15.406 MM    0.5371  294.53040    9.13878   5.8892

Totals :                  5001.21936  205.03514

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.659 MM    0.4006 4211.17676  175.21336  94.1474
   2  15.406 MM    0.5364  261.78525    8.13331   5.8526

Totals :                  4472.96201  183.34668

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.659 MM    0.4013 5285.31982  219.49617  94.0588
   2  15.420 PV    0.3792  333.84775   10.60698   5.9412

Totals :                  5619.16757  230.10315

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.658 BB    0.3701 1.32119e4   550.22070  94.1265
   2  15.406 BB    0.4979  824.42981   25.86081   5.8735

Totals :                  1.40364e4   576.08152

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.659 MM    0.4000 1143.70020   47.65256  94.1910
   2  15.379 MM    0.5311   70.53535    2.21331   5.8090

Totals :                  1214.23555   49.86587

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

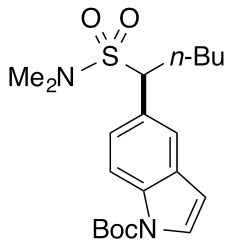
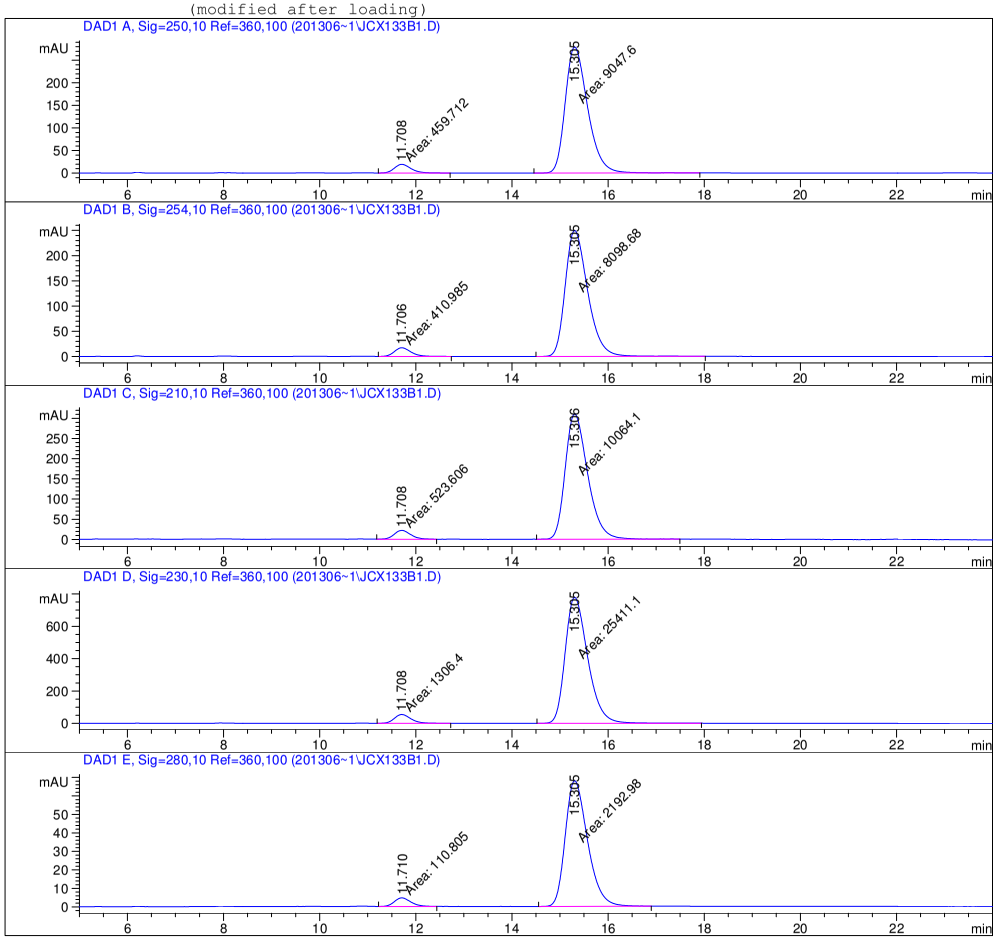


Table 4, entry 8
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 6/14/2013 11:25:16 PM          Seq. Line :   3
Sample Name     : JC10133B                        Location : Vial 31
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 2 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-02-40.M
Last changed    : 2/22/2013 10:06:44 AM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:07:02 AM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.708 MM    0.4004  459.71191   19.13779   4.8354
   2  15.305 MM    0.5404 9047.59863  279.01901  95.1646

Totals :                  9507.31055  298.15680

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.706 MM    0.4003  410.98477   17.11033   4.8296
   2  15.305 MM    0.5407 8098.67578  249.64102  95.1704

Totals :                  8509.66055  266.75135

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.708 MM    0.4001  523.60632   21.81178   4.9454
   2  15.306 MM    0.5401 1.00641e4   310.58426  95.0546

Totals :                  1.05877e4   332.39604

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.708 MM    0.4006 1306.40112   54.35100   4.8897
   2  15.305 MM    0.5438 2.54111e4   778.85779  95.1103

Totals :                  2.67175e4   833.20879

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.710 MM    0.3975  110.80473    4.64648   4.8097
   2  15.305 MM    0.5379 2192.98193   67.95478  95.1903

Totals :                  2303.78667   72.60126

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

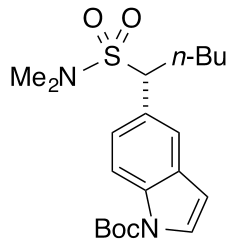
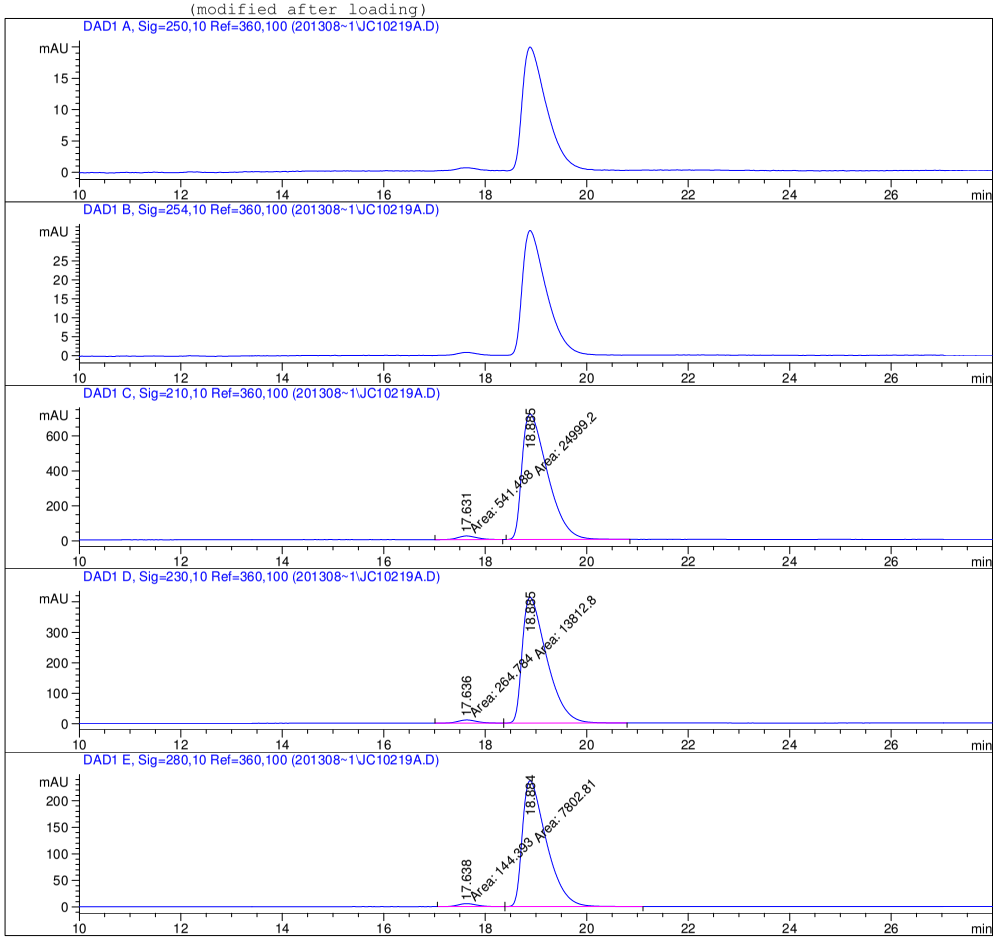


Table 4, entry 8
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 8/1/2013 10:52:58 AM          Seq. Line :   2
Sample Name     : JC10219A                       Location : Vial 79
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 4/7/2011 5:39:35 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:32:55 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.631 MM    0.4328  541.48834   20.85328   2.1201
   2  18.885 MM    0.5805 2.49992e4   717.76105  97.8799

Totals :                  2.55407e4   738.61432

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.636 MM    0.4283  264.78415   10.30480   1.8809
   2  18.885 MM    0.5576 1.38128e4   412.84863  98.1191

Totals :                  1.40776e4   423.15343

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.638 MM    0.4283  144.39316    5.61829   1.8169
   2  18.884 MM    0.5489 7802.81396  236.90977  98.1831

Totals :                  7947.20712  242.52807

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

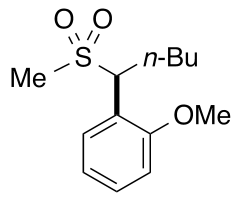
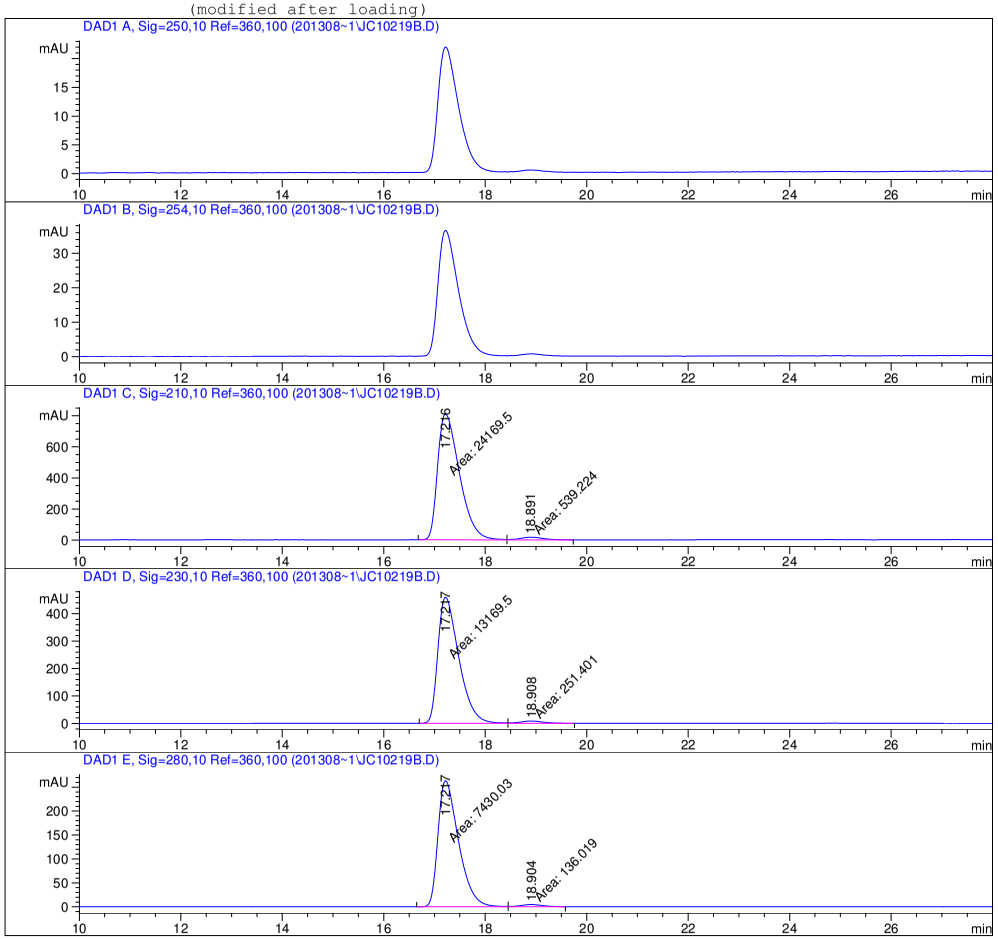


Table 4, entry 9 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 8/1/2013 11:34:20 AM          Seq. Line :   3
Sample Name     : JC10219B                       Location : Vial 80
Acq. Operator   : CE                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-05-40.M
Last changed    : 4/7/2011 5:39:35 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:10:26 AM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201308~1\JC10219B.D Sample Name: JC10219B

```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.216 MF    0.4968 2.41695e4   810.78070  97.8177
   2  18.891 FM    0.5248  539.22418   17.12366   2.1823

Totals :                  2.47087e4   827.90436

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.217 MF    0.4777 1.31695e4   459.48663  98.1268
   2  18.908 FM    0.5063  251.40105    8.27497   1.8732

Totals :                  1.34209e4   467.76160

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.217 MF    0.4700 7430.02881  263.47412  98.2022
   2  18.904 FM    0.5030  136.01933    4.50659   1.7978

Totals :                  7566.04814  267.98071

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

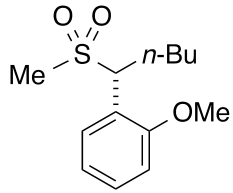
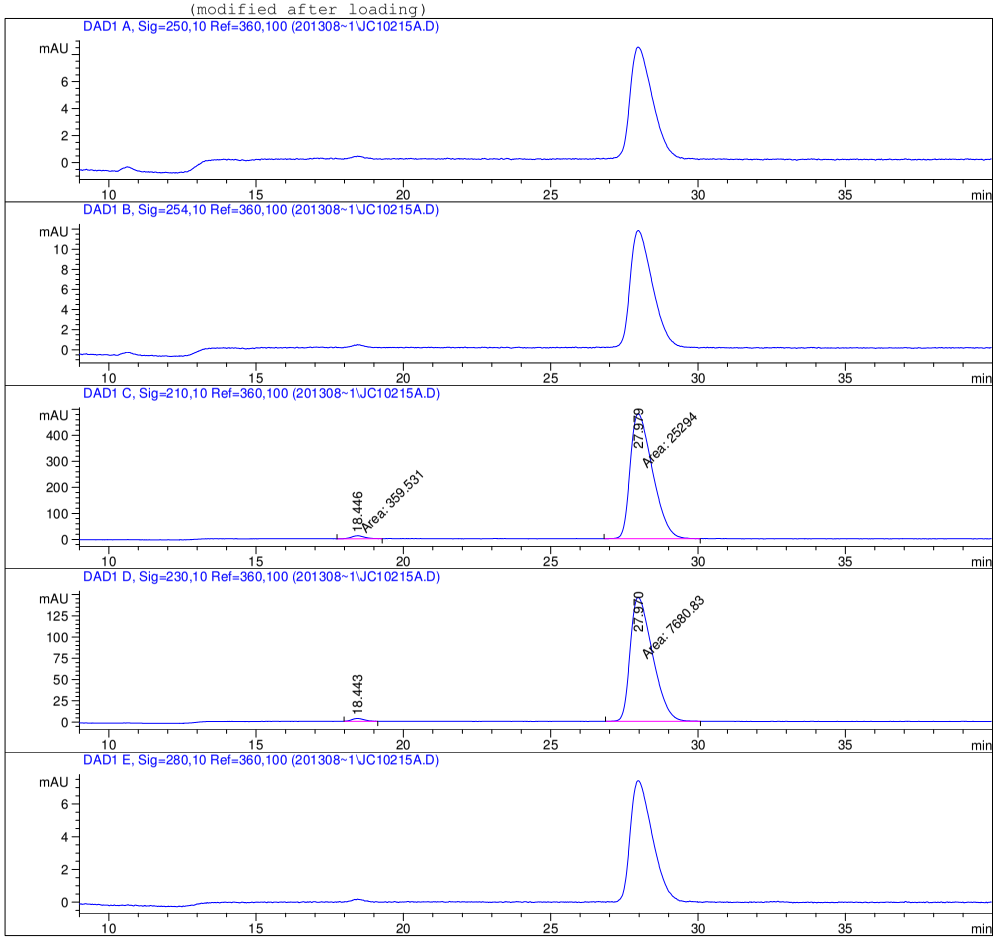


Table 4, entry 9
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 8/1/2013 2:28:49 AM            Seq. Line :  18
Sample Name     : JC10215A                        Location : Vial 79
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-10-40.M
Last changed    : 4/6/2011 9:32:30 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 7:34:25 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.446 MM    0.5153  359.53079   11.62884   1.4015
   2  27.979 MM    0.8786 2.52940e4   479.81430  98.5985

Totals :                  2.56535e4   491.44314

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.443 BB    0.3614   96.55293    3.35807   1.2415
   2  27.970 MM    0.8773 7680.83154  145.92509  98.7585

Totals :                  7777.38447  149.28317

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

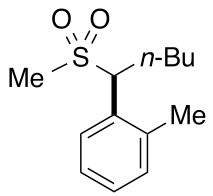
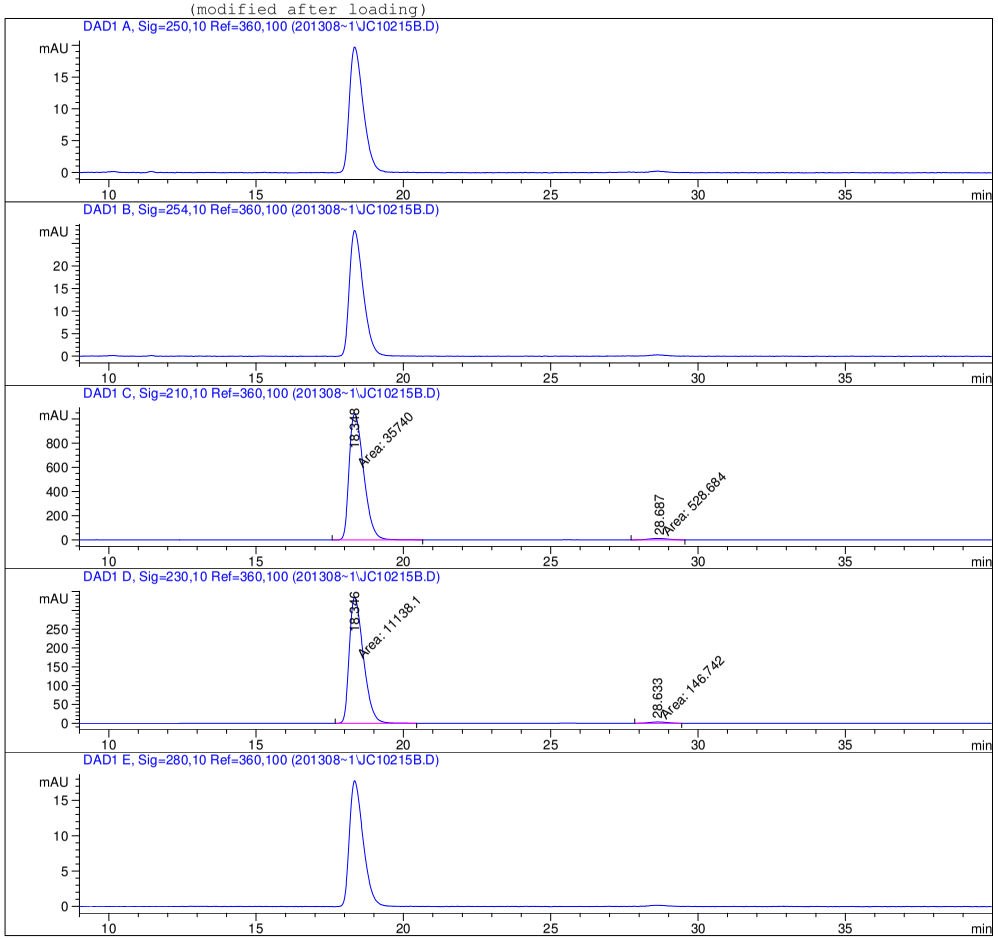


Table 4, entry 10 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 8/1/2013 3:10:07 AM            Seq. Line :  19
Sample Name     : JC10215B                        Location : Vial 80
Acq. Operator   : CE                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-10-40.M
Last changed    : 4/6/2011 9:32:30 PM by CC
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:12:31 AM by MK
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.348 MM    0.5711 3.57400e4  1042.94275  98.5423
   2  28.687 MM    0.7471  528.68359   11.79463   1.4577

Totals :                  3.62687e4  1054.73737

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.346 MM    0.5543 1.11381e4   334.92871  98.6997
   2  28.633 MM    0.6968  146.74203    3.50967   1.3003

Totals :                  1.12849e4   338.43838

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

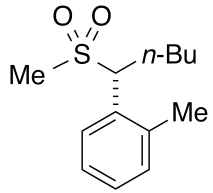
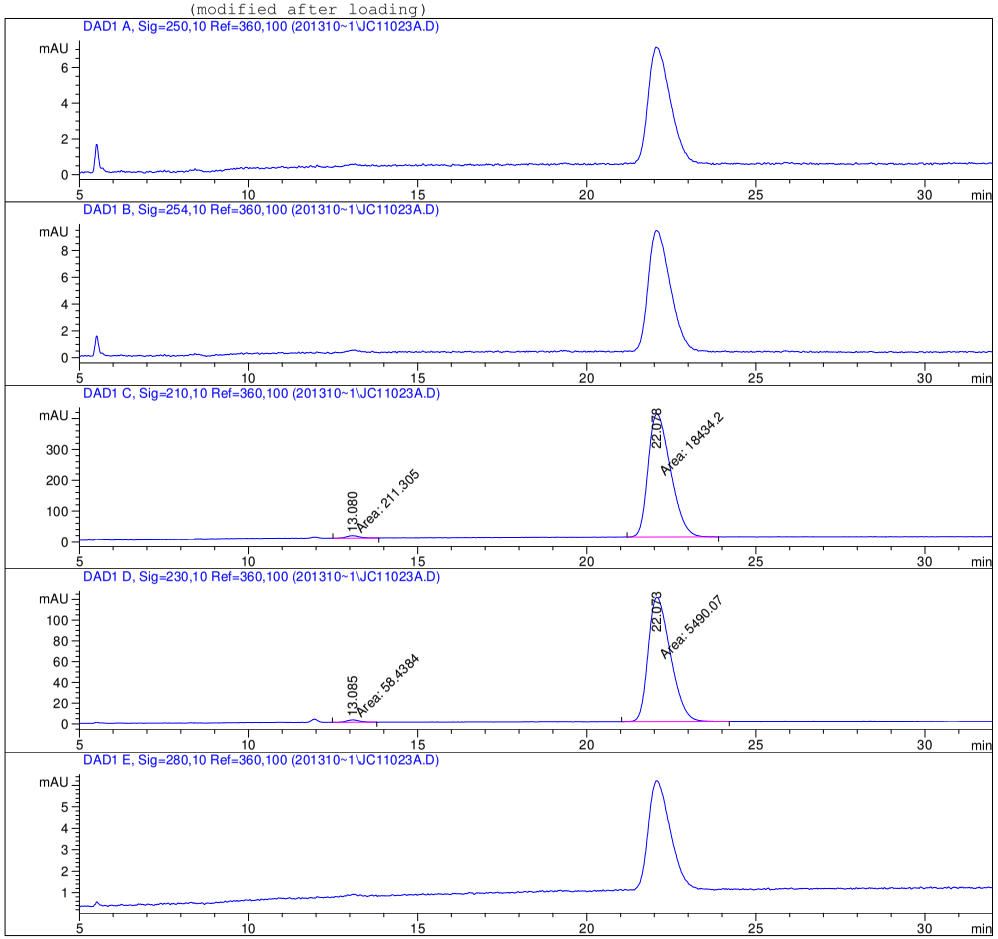


Table 4, entry 10 with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 10/16/2013 10:37:14 PM         Seq. Line :   2
Sample Name     : JC11023A                        Location : Vial 91
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-10-40.M
Last changed    : 9/3/2013 3:07:57 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:15:46 AM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.080 MM    0.4495  211.30522    7.83469   1.1333
   2  22.078 MM    0.7688 1.84342e4   399.62811  98.8667

Totals :                  1.86455e4   407.46281

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.085 MM    0.4251   58.43836    2.29142   1.0532
   2  22.073 MM    0.7638 5490.07422  119.79153  98.9468

Totals :                  5548.51258  122.08295

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

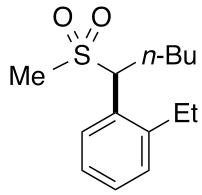
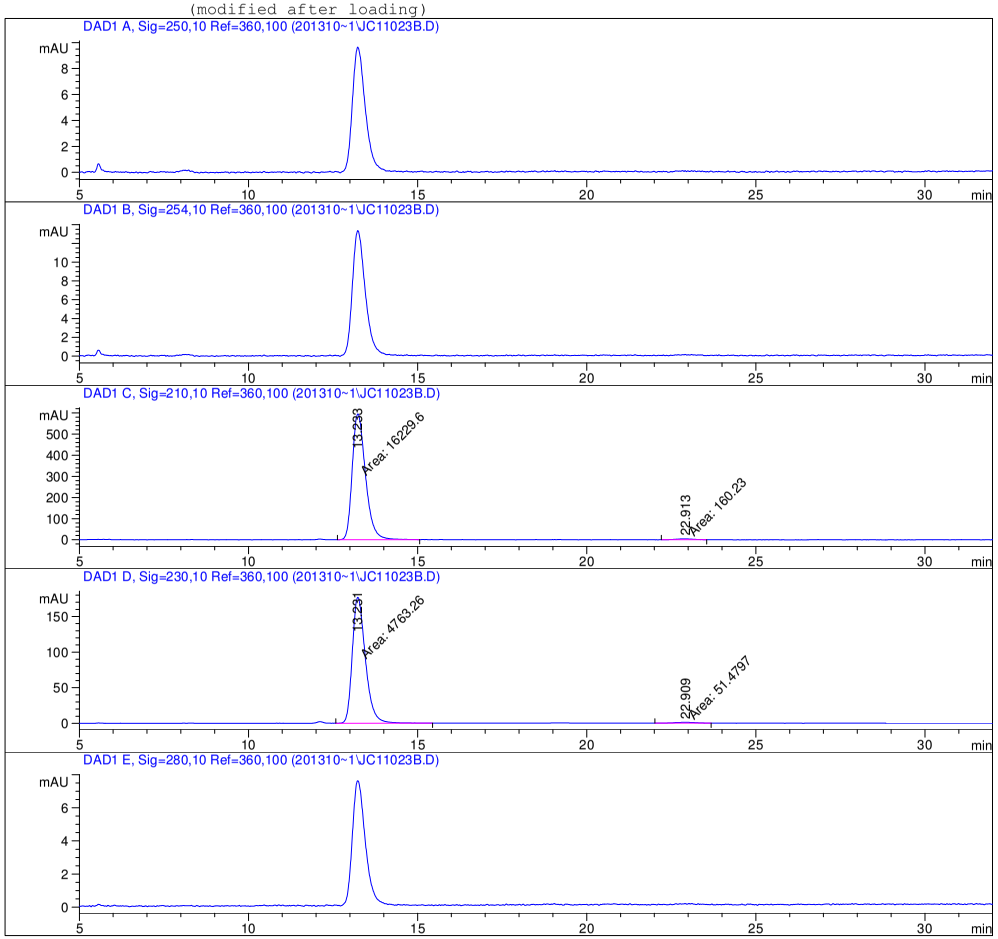


Table 4, entry 11 with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 10/16/2013 11:18:31 PM         Seq. Line :   3
Sample Name     : JC11023B                        Location : Vial 92
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-10-40.M
Last changed    : 9/3/2013 3:07:57 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:15:46 AM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.233 MM    0.4545 1.62296e4   595.18054  99.0224
   2  22.913 MM    0.6434  160.23030    4.15061   0.9776

Totals :                  1.63899e4   599.33115

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.231 MM    0.4491 4763.26123  176.78093  98.9308
   2  22.909 MM    0.6799   51.47974    1.26191   1.0692

Totals :                  4814.74097  178.04284

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

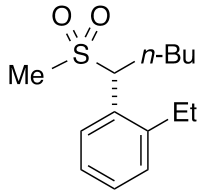
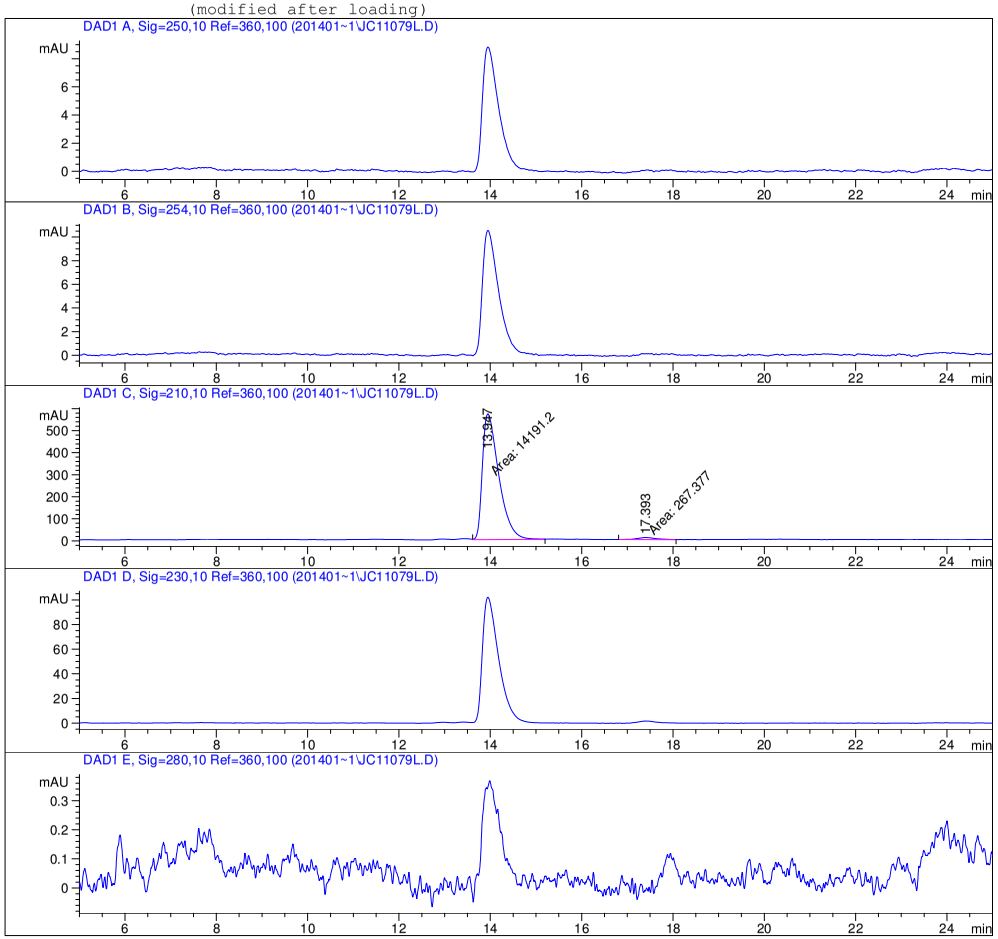


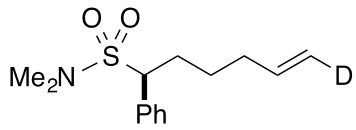
Table 4, entry 11
with (*S*,*S*)–**L1**

```
==================================================================
Injection Date  : 1/31/2014 1:15:03 PM          Seq. Line :   9
Sample Name     : JC11079 LINEAR                 Location : Vial 10
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OD-01-40.M
Last changed    : 12/28/2013 4:11:34 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 11:58:47 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201401~1\JC11079L.D Sample Name: JC11079 LINEAR

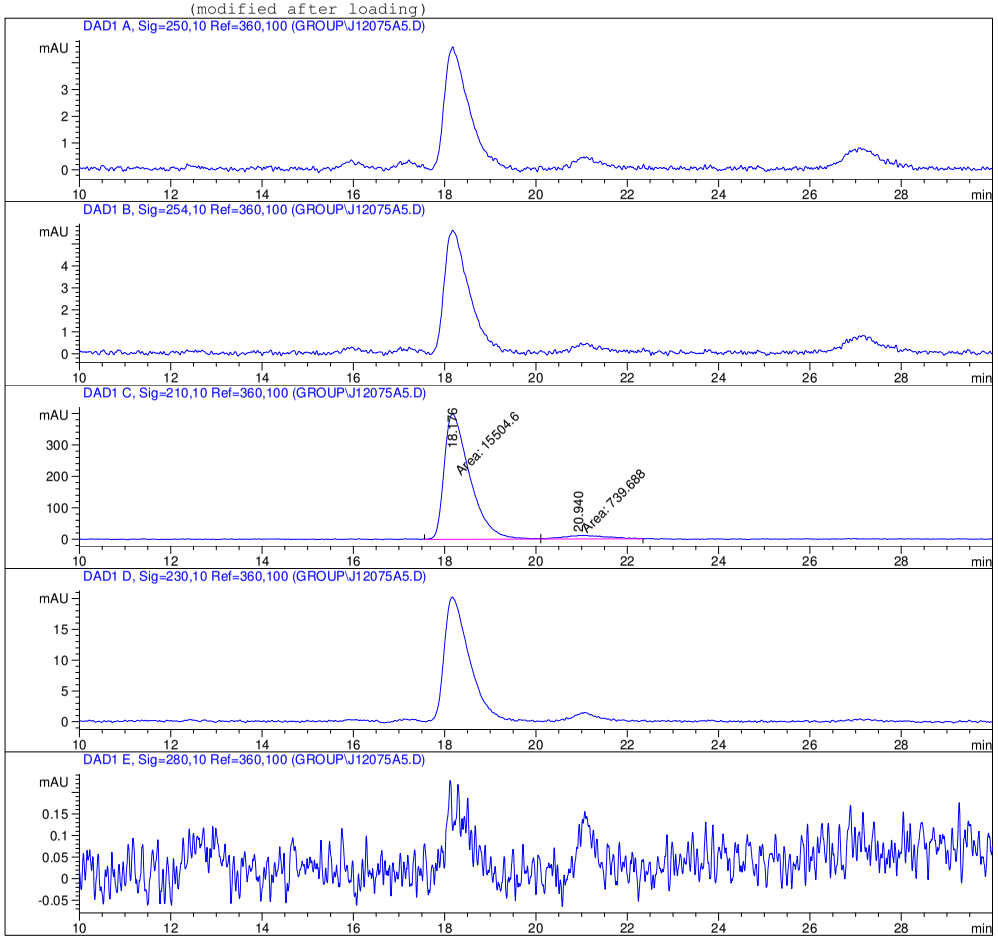
```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.947 FM    0.4147 1.41912e4   570.28912  98.1507
   2  17.393 MM    0.4723  267.37726    9.43601   1.8493

Totals :                  1.44586e4   579.72513

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```



eq 3
with (*R*,*R*)–**L1**

S–140

```
==================================================================
Injection Date  : 8/1/2014 10:06:30 PM          Seq. Line :   2
Sample Name     : JC12075A                       Location : Vial 19
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 4 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OJ-05-30.M
Last changed    : 8/1/2014 10:12:37 PM by MK
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:51:14 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width      Area       Height      Area
  #   [min]        [min]   [mAU*s]      [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  18.176 MF    0.6470 1.55046e4   399.41086  95.4465
   2  20.940 FM    1.0783  739.68774   11.43283   4.5535

Totals :                  1.62443e4   410.84368

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

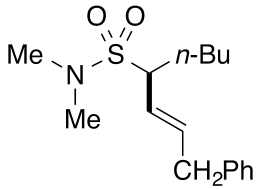
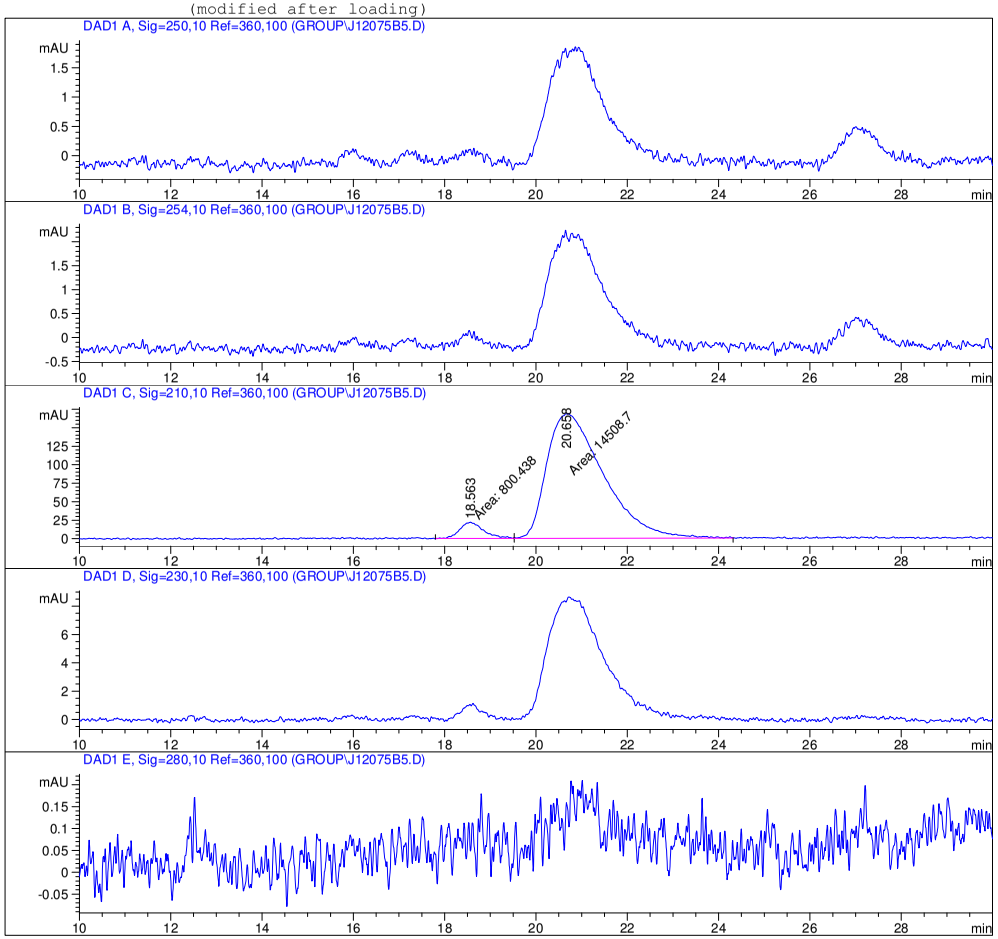


Table 5, entry 1
with (3*R*,8*S*)–**L6**

```
==================================================================
Injection Date  : 8/1/2014 10:47:48 PM          Seq. Line :   3
Sample Name     : JC12075B                       Location : Vial 20
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 4 µl
Acq. Method     : C:\HPCHEM\1\METHODS\OJ-05-30.M
Last changed    : 8/1/2014 10:12:37 PM by MK
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:51:14 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\GROUP\J12075B5.D Sample Name: JC12075B

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]      [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.563 MF    0.6055  800.43811   22.03275   5.2285
   2  20.658 FM    1.4329 1.45087e4   168.75829  94.7715

Totals :                  1.53092e4   190.79103

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

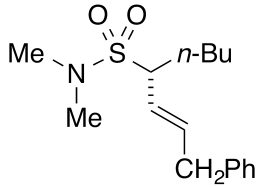
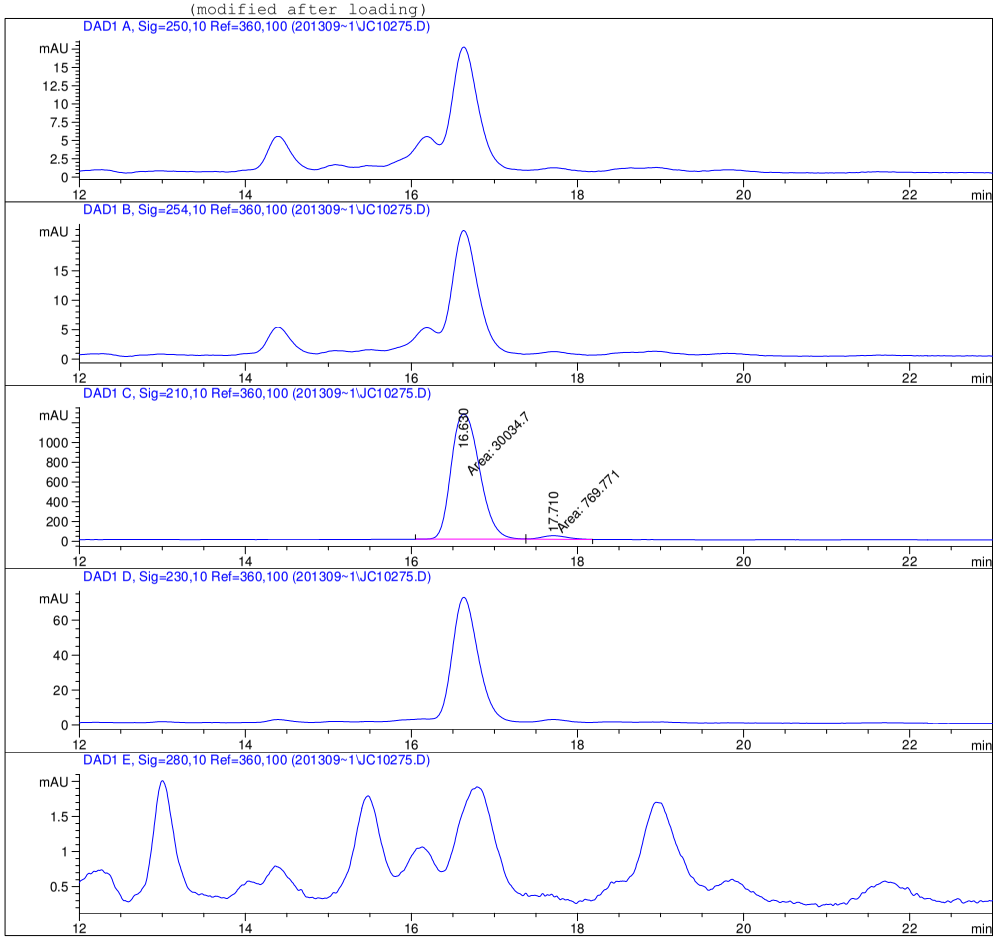


Table 5, entry 1
with (3*S*,8*R*)–**L6**

```
==================================================================
Injection Date  : 9/4/2013 1:38:06 PM            Seq. Line :  11
Sample Name     : JC10275                         Location : Vial 9
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\JC-AD01A.M
Last changed    : 11/14/2012 10:39:31 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/3/2014 12:34:42 AM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.630 MM    0.3948 3.00347e4  1267.95288  97.5011
   2  17.710 MM    0.3597  769.77063   35.66695   2.4989

Totals :                  3.08045e4  1303.61983

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

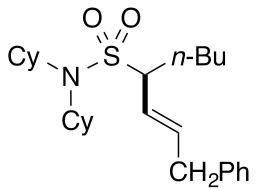
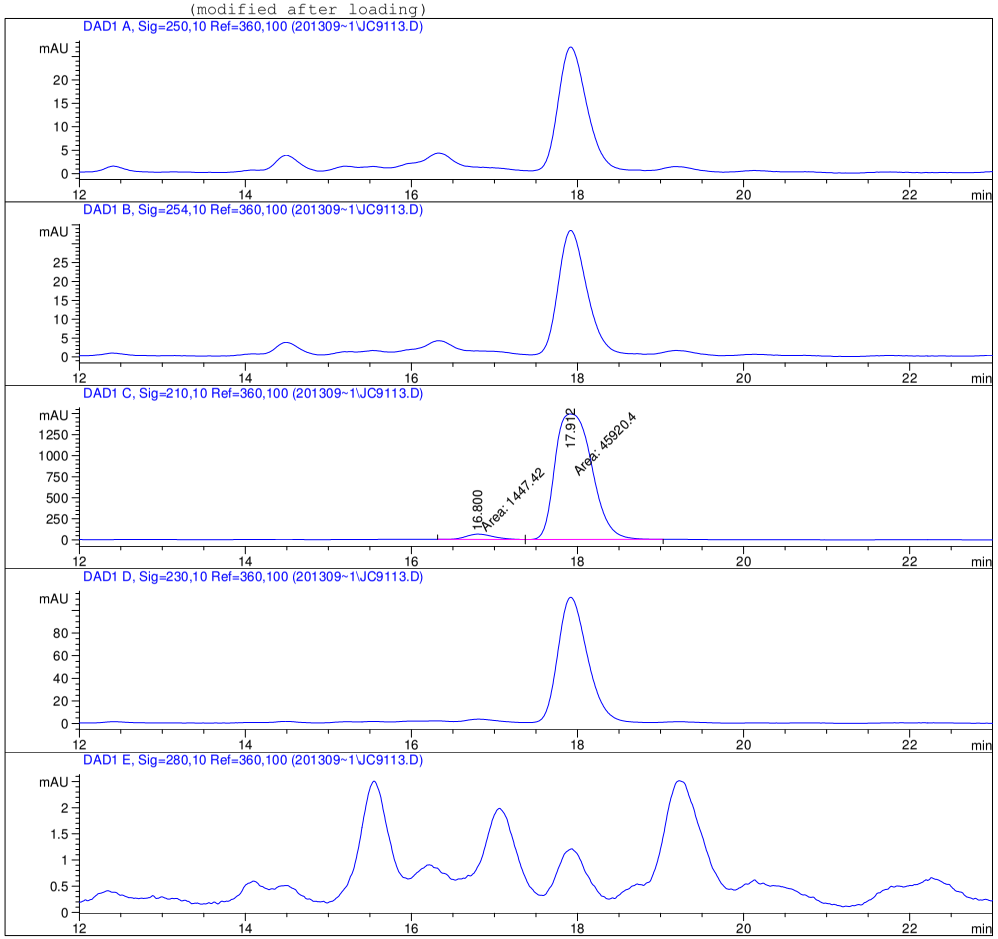


Table 5, entry 2
with (3*R*,8*S*)–**L6**

```
==================================================================
Injection Date  : 9/4/2013 2:19:25 PM          Seq. Line :  12
Sample Name     : JC9113                        Location : Vial 10
Acq. Operator   : MK                               Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\JC-AD01A.M
Last changed    : 11/14/2012 10:39:31 PM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:18:32 AM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201309~1\JC9113.D Sample Name: JC9113

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.800 MM    0.3820 1447.42444   63.15571   3.0557
   2  17.912 MM    0.5129 4.59204e4  1492.23425  96.9443

Totals :                  4.73678e4  1555.38996

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

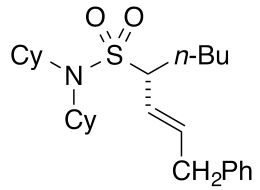
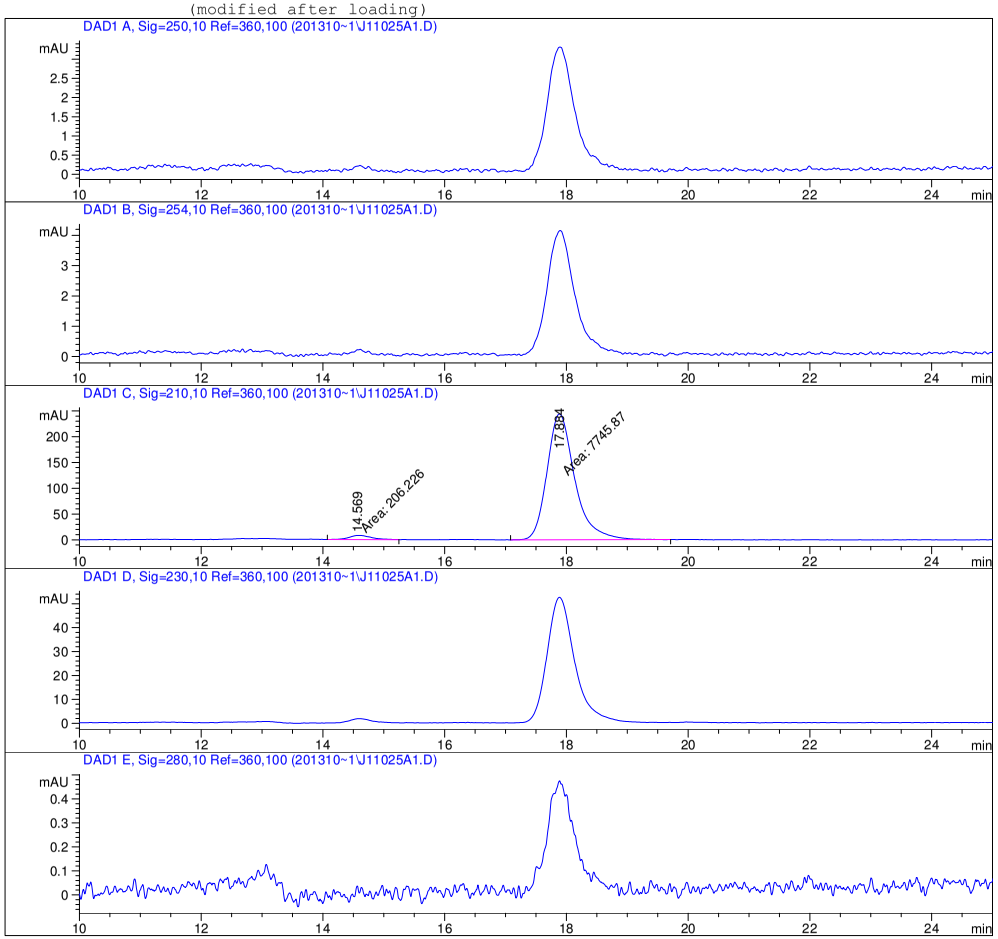


Table 5, entry 2
with (3*S*,8*R*)–**L6**

```
==================================================================
Injection Date  : 10/22/2013 5:01:30 PM          Seq. Line :   8
Sample Name     : JC11025A                        Location : Vial 9
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 10/22/2013 9:47:57 AM by MK
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 10:35:34 PM by MK
                  (modified after loading)
```



Data File C:\HPCHEM\1\DATA\201310~1\J11025A1.D Sample Name: JC11025A

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.569 MM    0.4233  206.22578    8.11952   2.5934
   2  17.884 MM    0.5286 7745.87012  244.24510  97.4066

Totals :                  7952.09590  252.36462

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

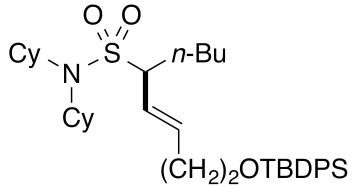
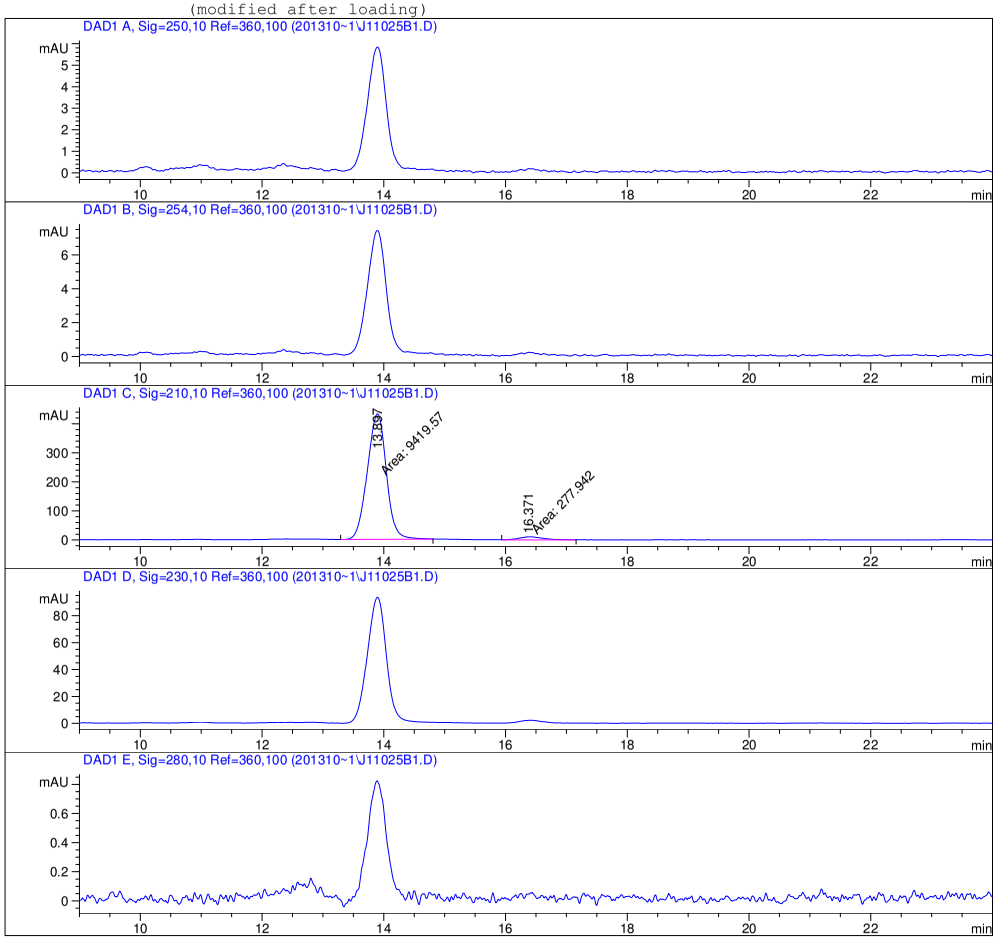


Table 5, entry 3
with (3*R*,8*S*)–**L6**

```
==================================================================
Injection Date  : 10/22/2013 5:42:45 PM          Seq. Line :   9
Sample Name     : JC11025B                        Location : Vial 10
Acq. Operator   : MK                                 Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 10/22/2013 9:47:57 AM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:21:07 AM by MK
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.897 MM    0.3634 9419.56641  432.00473  97.1339
   2  16.371 MM    0.4602  277.94183   10.06597   2.8661

Totals :                  9697.50824  442.07070

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100


Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                        *** End of Report ***
```

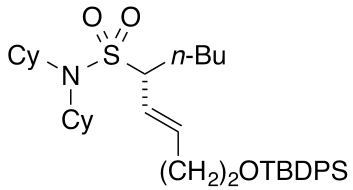
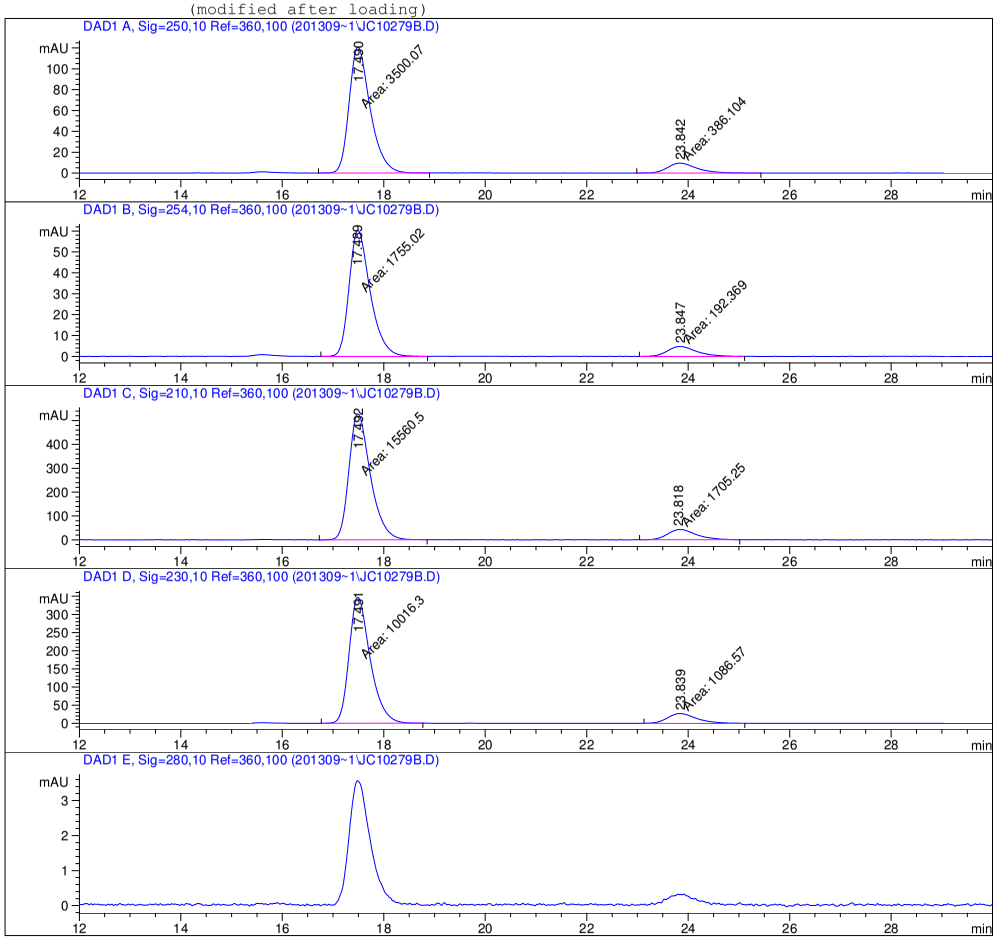


Table 5, entry 3
with (3*S*,8*R*)–**L6**

```
Injection Date  : 9/16/2013 1:56:44 PM          Seq. Line :   9
Sample Name     : JC10279B                      Location : Vial 95
Acq. Operator   : MK                               Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 1 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-10-40.M
Last changed    : 7/12/2012 11:12:25 AM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/3/2014 12:46:07 AM by MK
                  (modified after loading)
```




```
                        Area Percent Report

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.490 MM    0.4828 3500.07324  120.82352  90.0647
   2  23.842 MM    0.6752  386.10425    9.53050   9.9353

Totals :                  3886.17749  130.35402

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.489 MM    0.4850 1755.02209   60.31308  90.1217
   2  23.847 MM    0.6731  192.36926    4.76325   9.8783

Totals :                  1947.39136   65.07632

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.492 MM    0.4910 1.55605e4   528.16541  90.1235
   2  23.818 MM    0.6559 1705.25134   43.32966   9.8765

Totals :                  1.72657e4   571.49507

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.491 MM    0.4814 1.00163e4   346.80835  90.2137
   2  23.839 MM    0.6694 1086.56787   27.05270   9.7863

Totals :                  1.11029e4   373.86105

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

                        *** End of Report ***
```

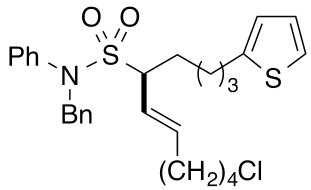
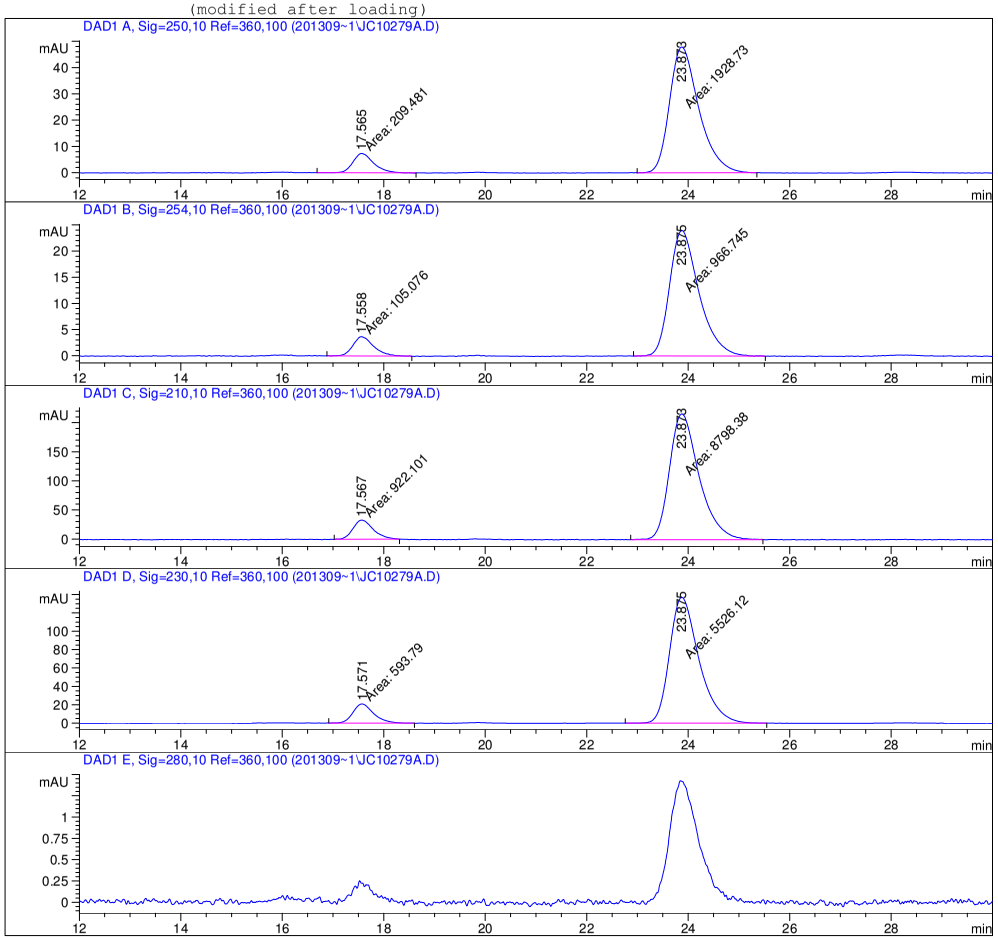


Table 5, entry 4
with (3*R*,8*S*)–**L6**

```
==================================================================
Injection Date  : 9/16/2013 1:15:30 PM          Seq. Line :   8
Sample Name     : JC10279A                       Location : Vial 94
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 1 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AD-10-40.M
Last changed    : 7/12/2012 11:12:25 AM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:24:51 AM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.565 MM    0.4749  209.48149    7.35103   9.7971
   2  23.873 MM    0.6716 1928.72815   47.86718  90.2029

Totals :                  2138.20964   55.21821

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.558 MM    0.4747  105.07636    3.68929   9.8035
   2  23.875 MM    0.6715  966.74506   23.99374  90.1965

Totals :                  1071.82142   27.68303

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.567 MM    0.4652  922.10120   33.03711   9.4862
   2  23.873 MM    0.6781 8798.38086  216.24049  90.5138

Totals :                  9720.48206  249.27760

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.571 MM    0.4736  593.79047   20.89495   9.7026
   2  23.875 MM    0.6721 5526.11816  137.03973  90.2974

Totals :                  6119.90863  157.93469

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

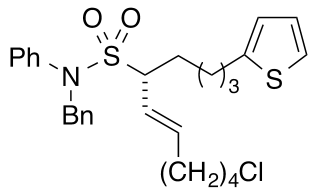
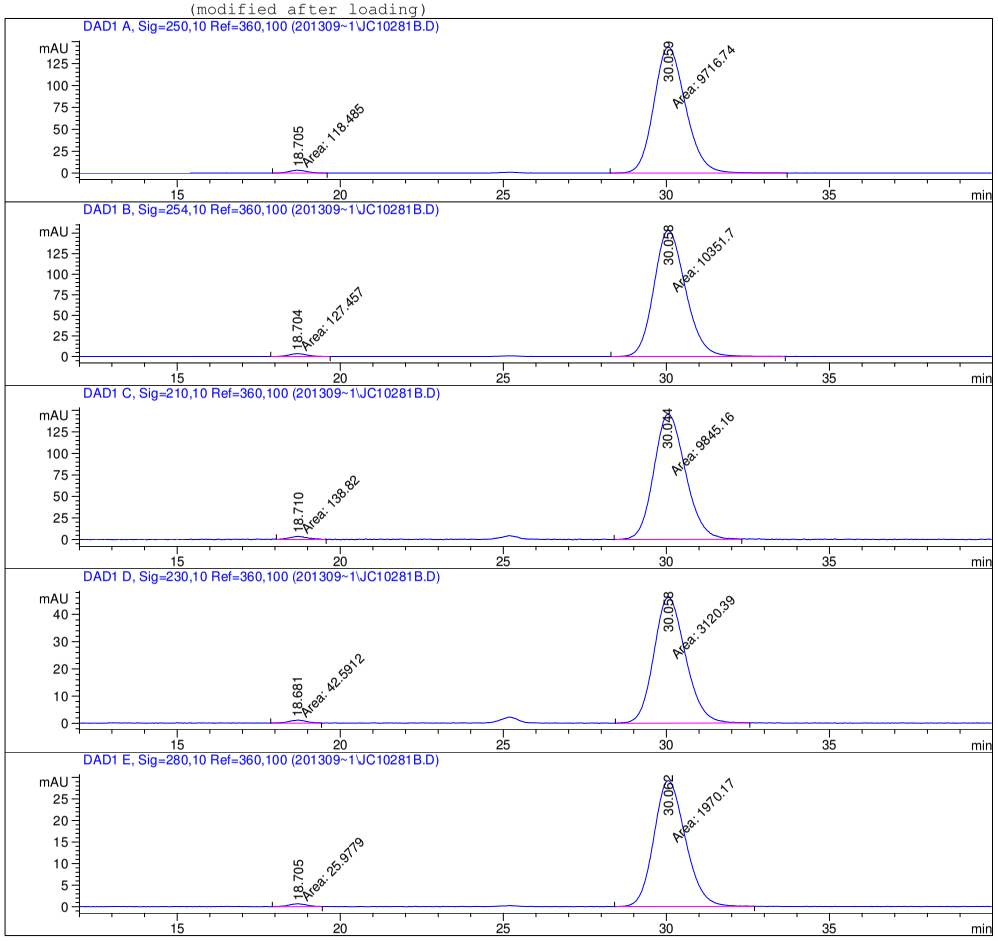


Table 5, entry 4
with (3*S*,8*R*)–**L6**

```
==================================================================
Injection Date  : 9/17/2013 5:04:56 AM          Seq. Line :  24
Sample Name     : JC10281B                       Location : Vial 97
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 6 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-10-40.M
Last changed    : 9/3/2013 3:07:57 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 10:40:14 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.705 MM    0.6218  118.48459    3.17571   1.2047
   2  30.059 MM    1.1259 9716.74219  143.83633  98.7953

Totals :                  9835.22678  147.01204

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.704 MM    0.6262  127.45731    3.39228   1.2163
   2  30.058 MM    1.1261 1.03517e4   153.21146  98.7837

Totals :                  1.04792e4   156.60374

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.710 MM    0.6299  138.81970    3.67318   1.3904
   2  30.044 MM    1.1245 9845.16113  145.92497  98.6096

Totals :                  9983.98083  149.59815

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.681 MM    0.6396   42.59124    1.10979   1.3466
   2  30.058 MM    1.1261 3120.39331   46.18145  98.6534

Totals :                  3162.98455   47.29125

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.705 MM    0.6513   25.97787 6.64763e-1   1.3014
   2  30.062 MM    1.1250 1970.16589   29.18823  98.6986

Totals :                  1996.14376   29.85299

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

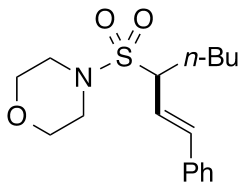
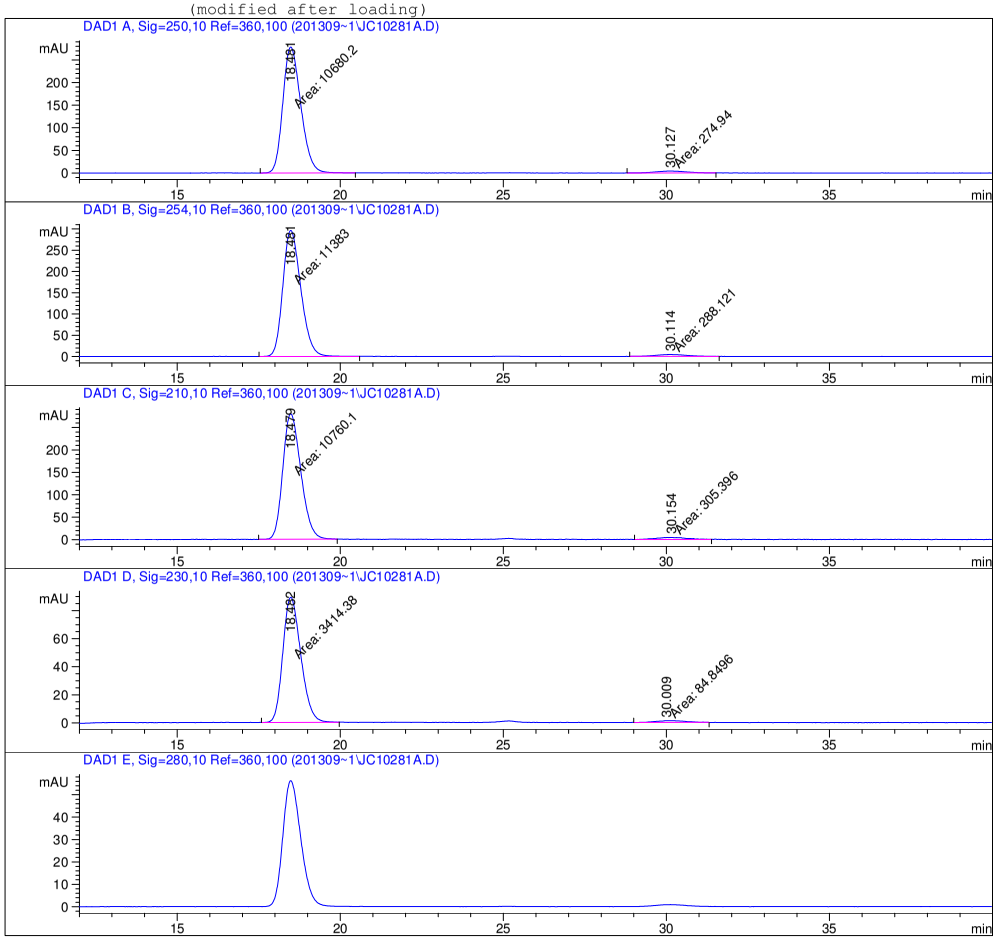


Table 5, entry 5 with (3*R*,8*S*)–**L6**

```
==========================================================================
Injection Date  : 9/17/2013 4:23:37 AM          Seq. Line :  23
Sample Name     : JC10281A                       Location : Vial 96
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 3 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AS-10-40.M
Last changed    : 9/3/2013 3:07:57 PM by MK
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:27:30 AM by MK
                  (modified after loading)
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.481 MM    0.6395 1.06802e4   278.33743  97.4903
   2  30.127 MM    1.1077  274.94009    4.13675   2.5097

Totals :                  1.09552e4   282.47418

 Results obtained with enhanced integrator!

Signal 2: DAD1 B, Sig=254,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.481 MM    0.6401 1.13830e4   296.37387  97.5313
   2  30.114 MM    1.0968  288.12051    4.37829   2.4687

Totals :                  1.16711e4   300.75216

 Results obtained with enhanced integrator!

Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.479 MM    0.6415 1.07601e4   279.53766  97.2401
   2  30.154 MM    1.0830  305.39581    4.69971   2.7599

Totals :                  1.10655e4   284.23737

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.482 MM    0.6382 3414.37500   89.16418  97.5752
   2  30.009 MM    1.0444   84.84958    1.35400   2.4248

Totals :                  3499.22458   90.51818

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==========================================================================
                        *** End of Report ***
```

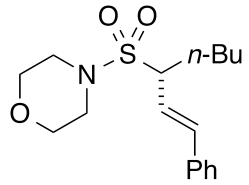
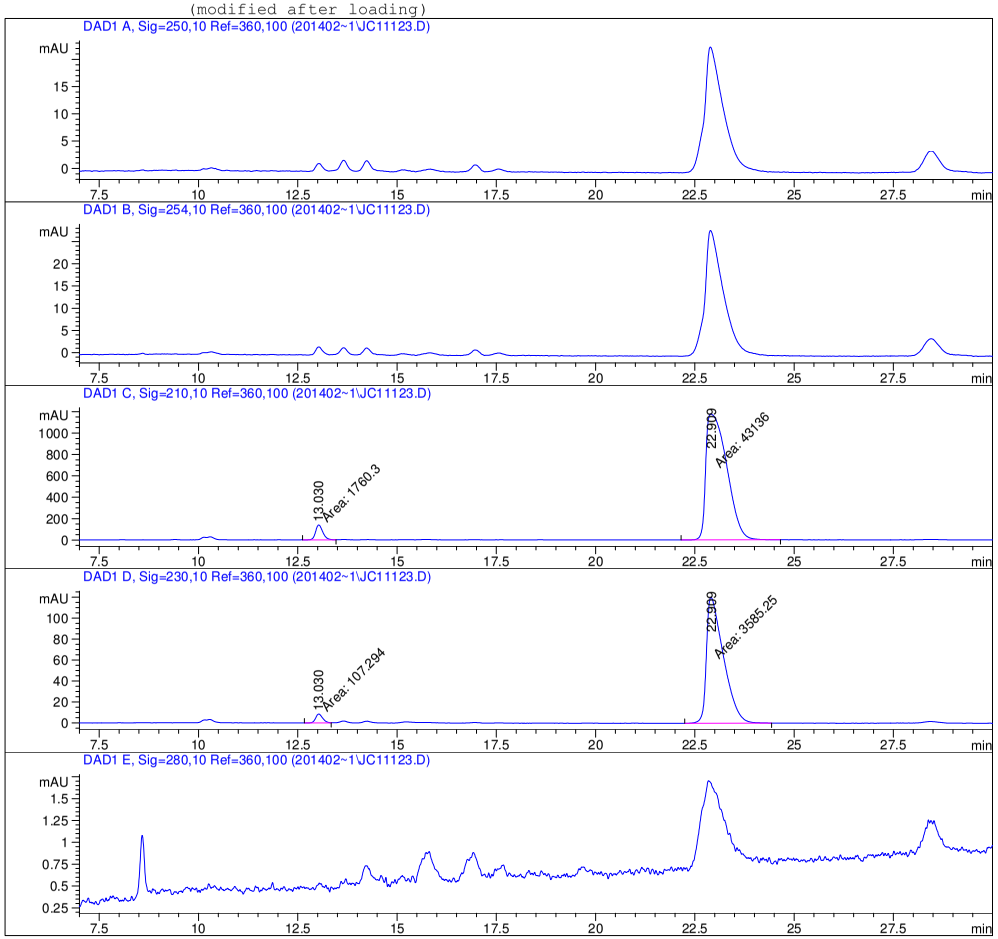


Table 5, entry 5 with (3*S*,8*R*)–**L6**

```
==================================================================
Injection Date  : 2/5/2014 11:58:40 PM          Seq. Line :   2
Sample Name     : JC11123                        Location : Vial 31
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\IB-05-40.M
Last changed    : 7/6/2013 9:54:10 AM by CE
Analysis Method : C:\HPCHEM\1\METHODS\OD-02-20.M
Last changed    : 7/30/2014 10:42:05 PM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.030 MF    0.2116 1760.29651  138.68036   3.9208
   2  22.909 MM    0.6103 4.31360e4  1177.93591  96.0792

Totals :                  4.48962e4  1316.61627

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.030 MF    0.2092  107.29430    8.54649   2.9057
   2  22.909 MM    0.4974 3585.25415  120.13020  97.0943

Totals :                  3692.54845  128.67670

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

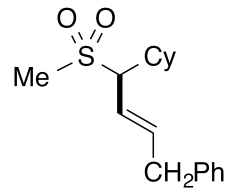
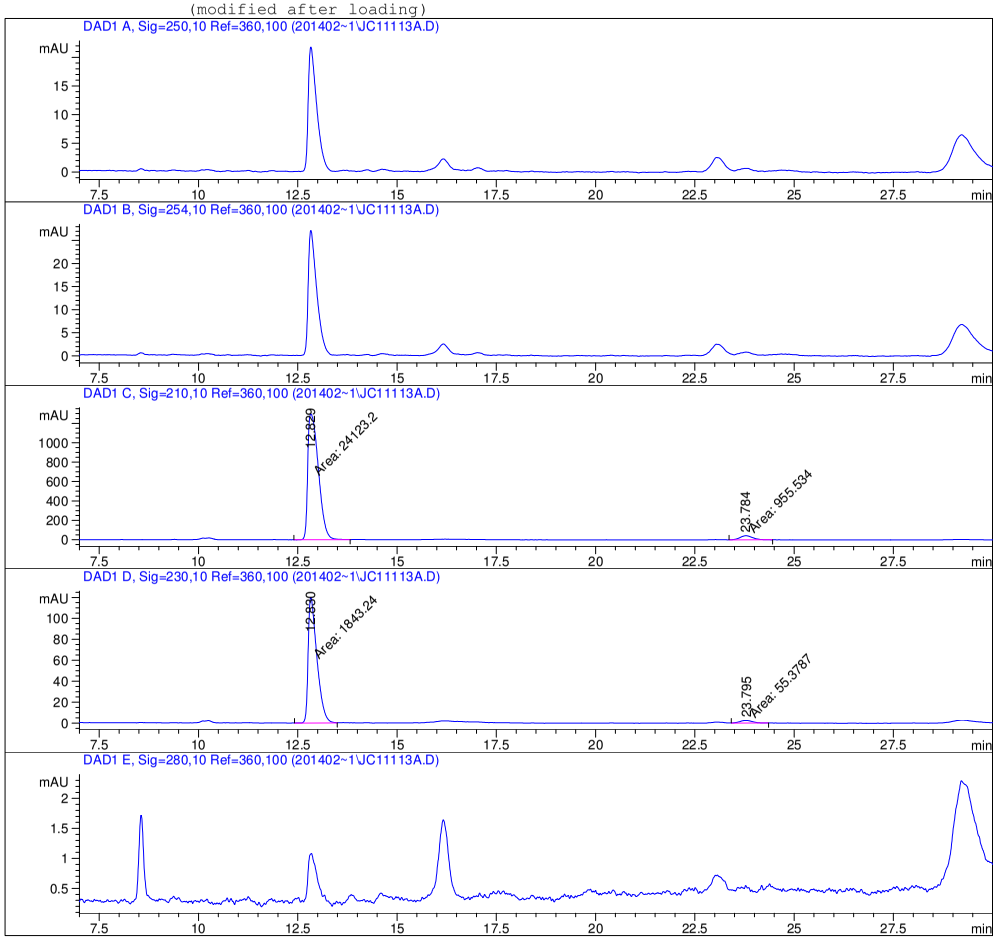


Table 5, entry 6
with (*R*,*R*)–**L1**

```
==================================================================
Injection Date  : 2/6/2014 12:39:55 AM          Seq. Line :   3
Sample Name     : JC11113                        Location : Vial 32
Acq. Operator   : MK                                Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 15 µl
Different Inj Volume from Sequence !     Actual Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\IB-05-40.M
Last changed    : 7/6/2013 9:54:10 AM by CE
Analysis Method : C:\HPCHEM\1\METHODS\AD005-40.M
Last changed    : 8/2/2014 12:33:23 AM by MK
                  (modified after loading)
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=250,10 Ref=360,100


Signal 2: DAD1 B, Sig=254,10 Ref=360,100


Signal 3: DAD1 C, Sig=210,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.829 MF    0.3098 2.41232e4  1297.61914  96.1899
   2  23.784 FM    0.3747  955.53381   42.49660   3.8101

Totals :                  2.50787e4  1340.11574

 Results obtained with enhanced integrator!

Signal 4: DAD1 D, Sig=230,10 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.830 MF    0.2556 1843.23779  120.16679  97.0832
   2  23.795 FM    0.3695   55.37868    2.49811   2.9168

Totals :                  1898.61647  122.66490

 Results obtained with enhanced integrator!

Signal 5: DAD1 E, Sig=280,10 Ref=360,100

==================================================================
                      *** End of Report ***
```

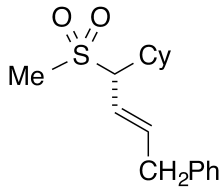


Table 5, entry 6
with (*S*,*S*)–**L1**