Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Supporting Information

Enantioselective palladium-catalyzed arylation of *N*-tosylarylimines with arylboronic acids using a chiral 2,2'-bipyridine ligand

Email: ygzhou@dicp.ac.cn

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1. General: Commercially available reagents were used without further purification. Solvents were treated prior to use according to the standard methods. ^{1}H NMR and ^{13}C NMR spectra were recorded at room temperature in $CDCl_3$ or DMSO-*d6* on 400 MHz instrument with TMS (tetramethylsilane) as internal standard. Enantiomeric excess was determined by HPLC analysis, using chiral column described below in detail. Optical rotations were measured by polarimeter. Flash column chromatography was performed on silica gel (200-300 mesh).

2. General Procedure for Synthesis of *N*-Tosylarylimines 1

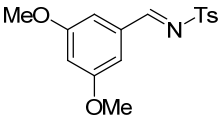
N-Tosylarylimines **1** can be conveniently synthesized according to the known literature procedures.[1] **1a-1l** are the known compounds[2,3,4] except (*E*)-*N*-(3,5-dimethoxybenzylidene)-4-methylbenzenesulfonamide (**1i**) and (*E*)-*N*-(2-bromo-4,5-dimethoxybenzylidene)-4-methylbenzenesulfonamide (**1k**).

Synthesis of (*E*)-*N*-(3,5-Dimethoxybenzylidene)-4-methylbenzenesulfonamide (1i)

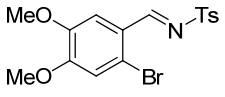
Following a known literature report,[1] the aldehyde (0.848 g, 5.1 mmol), *p*-toluenesulfonamides (0.856 g, 5.0 mmol) and $Si(OEt)_4$ (1.20 mL, 5.4 mmol) were combined in a flask equipped with a still head and heated at 160 ^{o}C under nitrogen for 5 h, during which time ethanol was collected in a receiving flask. On cooling, the reaction mixture was dissolved in warm ethyl acetate (50 mL) and treated with petroleum ether (60-90 ^{o}C, 100 mL), and allowed to stand at room temperature for 1 hour. During this time crestals formed, which were colleceted by filtration, washed with petroleum ether and dried to afford *N*- tosylarylimine **1i**.

1

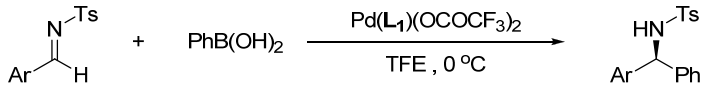
(*E*)-*N*-(3,5-Dimethoxybenzylidene)-4-methylbenzenesulfonamide (1i): Yellow solid, m.p. = 132-133 ^{o}C, unknown compound, Yield: 53%. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.92 (s, 1H), 7.88 (d, *J* = 8.3 Hz, 2H), 7.35 (d, *J* = 8.3 Hz, 2H), 7.05 (d, *J* = 2.3 Hz, 2H), 6.68 (t, *J* = 2.3 Hz, 1H), 3.81 (s, 6H), 2.44 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.4, 161.4, 144.9, 135.3, 134.4, 130.0, 128.4, 108.9, 108.0, 55.9, 21.9. HRMS Calculated for $C_{16}H_{18}NO_4S$ $(M+H)^+$ 320.0951, found: 320.0948.



(*E*)-*N*-(2-Bromo-4,5-dimethoxybenzylidene)-4-methylbenzenesulfonamide (1k): White solid, m.p. = 176-177 ^{o}C, unknown compound, yield: 57%. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.28 (s, 1H), 7.89 (d, *J* = 8.2 Hz, 2H), 7.59 (s, 1H), 7.35 (d, *J* = 8.1 Hz, 2H), 7.06 (s, 1H), 3.94 (s, 3H), 3.88 (s, 3H), 2.44 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.0, 155.4, 149.0, 144.7, 135.3, 130.0, 128.4, 123.7, 122.9, 115.7, 111.3, 56.7, 56.5, 21.8. HRMS Calculated for $C_{16}H_{17}BrNO_4S$ $(M+H)^+$ 398.0056, found: 398.0051.



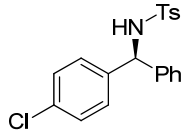
3. Palladium-catalyzed Asymmetric Addition of Arylboronic Acids to *N*-Tosylarylimines



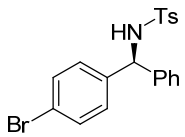
1 **2a** **3**

General Procedure: Pd((*R*$_a$,*S*,*S*)-C3-ACBP **L$_1$**)(OCOCF$_3$)$_2$ (5.9 mg, 0.01 mmol, 5 mol%) in trifluoroethanol (TFE, 3 mL) was srirred at 0 °C for 10 minutes, arylboronic acids and *N*-tosylarylimines were added sequentially to the solution. The mixture was kept stirring until the reaction completed indicated by TLC. Then the resulting mixture was concentrated under vacuum and purified by silica gel chromatography using petroleum ether/ethyl acetate as eluent, the enantiomeric excess of the products were determined by HPLC with chiral columns.

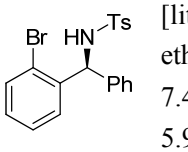
(*S*)-*N*-((4-Chlorophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3aa): White solid, known compound,[2] m.p. = 120-121 °C, yield: 99%, ee: 89%, $[\alpha]^{20}_D$ = -4.91 (*c* 1.10, $CHCl_3$) [lit.[2]: $[\alpha]^{20}_D$ = -3.4 (*c* 0.91, $CHCl_3$) for 90% ee], R_f = 0.45 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 8.3 Hz, 2H), 7.23-7.10 (m, 7H), 7.09-6.99 (m, 4H), 5.53 (d, *J* = 7.3 Hz, 1H), 5.32 (d, *J* = 7.2 Hz, 1H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ143.6, 140.3, 139.3, 137.5, 133.6, 129.6, 129.0, 128.9, 128.8, 128.0, 127.5, 127.4, 61.0, 21.7. HPLC (OD-H column, ^{i}PrOH/hexane 30/70, 0.70 mL/min, 230 nm): t_1 = 8.2 min (major), t_2 = 10.2 min.



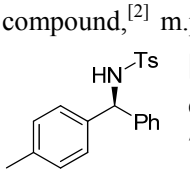
(*S*)-*N*-((4-Bromophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3ba): White solid, known compound,[3] m.p. = 133-134 °C, yield: 96%, ee: 89%, $[\alpha]^{20}_D$ = -6.60 (*c* 1.00, $CHCl_3$) [lit.[3]: $[\alpha]^{20}_D$ = -8.9 (*c* 0.94, $CHCl_3$) for 95% ee], R_f = 0.45 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (d, *J* = 8.1 Hz, 2H), 7.30 (d, *J* = 8.3 Hz, 2H), 7.24-6.91 (m, 9H), 5.51 (d, *J* = 7.1 Hz, 1H), 5.40 (brs, 1H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.6, 140.2, 139.8, 137.4, 131.8, 129.6, 129.3, 128.9, 128.0, 127.5, 127.4, 121.8, 61.0, 21.7. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 11.3 min (major), t_2 = 15.1 min.



(*S*)-*N*-((2-Bromophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3ca): White solid, known compound,[2] m.p. = 174-175 °C, yield: 90%, ee: 90%, $[\alpha]^{20}_D$ = +23.00 (*c* 0.30, $CHCl_3$) [lit.[2]: $[\alpha]^{20}_D$ = +14.5 (*c* 0.765, $CHCl_3$) for 84% ee], R_f = 0.40 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, *J* = 8.3 Hz, 2H), 7.41 (dd, *J* = 8.0, 1.1 Hz, 1H), 7.35 (dd, *J* = 7.8, 1.6 Hz, 1H), 7.24-6.98 (m, 9H), 5.93 (d, *J* = 7.3 Hz, 1H), 5.62 (d, *J* = 7.3 Hz, 1H), 2.35 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 143.6, 139.5, 139.3, 137.2, 133.4, 129.8, 129.7, 129.3, 128.9, 128.1, 127.8, 127.7, 127.5, 123.3, 60.8, 21.7. HPLC (AD-H column, ^{i}PrOH/hexane 10/90, 0.7 mL/min, 230 nm): t_1 = 26.4 min (major), t_2 = 28.8 min.

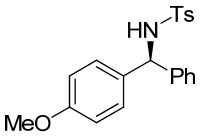


(*S*)-4-Methyl-*N*-(phenyl(p-tolyl)methyl)benzenesulfonamide (3da): White solid, known compound,[2] m.p. = 150-151 °C, yield: 91%, ee: 90%, $[\alpha]^{20}_D$ = -10.00 (*c* 1.00, $CHCl_3$) [lit.[2]: $[\alpha]^{20}_D$ = -9.1 (*c* 0.91, $CHCl_3$) for 90% ee], R_f = 0.50 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.2 Hz, 2H), 7.22-7.05 (m, 7H), 6.98 (q, *J* = 8.3 Hz, 4H), 5.52 (d, *J* = 7.2 Hz, 1H), 5.30 (brs, 1H), 2.36 (s,

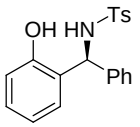


3H), 2.26 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 143.3, 140.9, 137.9, 137.7, 137.5, 129.5, 129.4, 128.7, 127.6, 127.5, 127.5, 127.4, 61.3, 21.6, 21.2. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 9.6 min (major), t_2 = 12.8 min.

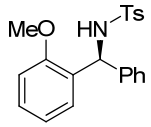
(*S*)-*N*-((4-Methoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3ea): White solid, known compound,[2] m.p. = 114-115 °C, yield: 99%, ee: 91%, $[\alpha]^{20}_D$ = -17.5 (*c* 1.00, $CHCl_3$) [lit.[2]: $[\alpha]^{20}_D$ = -11.8 (*c* 0.75, $CHCl_3$) for 88% ee], R_f = 0.30 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.3 Hz, 2H), 7.25-7.06 (m, 7H), 7.04-6.96 (m, 2H), 6.79-6.66 (m, 2H), 5.53 (d, *J* = 7.3 Hz, 1H), 5.39 (brs, 1H), 3.74 (s, 3H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 159.1, 143.2, 141.0, 137.7, 133.0, 129.5, 128.8, 128.6, 127.6, 127.5, 127.4, 114.1, 61.0, 55.4, 21.6. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 12.7 min (major), t_2 = 19.0 min.



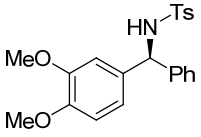
(-)-*N*-((2-Hydroxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3fa): White solid, unknown compound, m.p. = 154-155 °C, yield: 76%, ee: 91%, $[\alpha]^{20}_D$ = -5.67 (*c* 0.97, $CHCl_3$), R_f = 0.35 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (d, *J* = 8.2 Hz, 2H), 7.25-7.12 (m, 5H), 7.10-6.95 (m, 3H), 6.86 (dd, *J* = 7.5, 1.2 Hz, 1H), 6.76-6.57 (m, 2H), 6.05 (brs, 1H), 5.94 (d, *J* = 8.9 Hz, 1H), 5.64 (d, *J* = 8.9 Hz, 1H), 2.31 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.3, 143.4, 140.0, 137.1, 129.8, 129.5, 129.3, 128.5, 127.6, 127.3, 127.1, 126.1, 120.9, 116.7, 59.3, 21.6. HRMS Calculated for $C_{20}H_{19}NNaO_3S$ $(M+Na)^+$ 376.0978, found: 376.0984. HPLC of the product after being protected by benzoyl chloride (OD-H column, ^{i}PrOH/hexane 30/70, 0.70 mL/min, 230 nm): t_1 = 10.5 min, t_2 = 12.1 min (major).



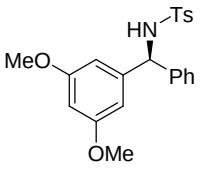
(*S*)-*N*-((2-Methoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3ga): White solid, known compound,[2] m.p. = 115-116 °C, yield: 95%, ee: 91%, $[\alpha]^{20}_D$ = -24.30 (*c* 1.00, $CHCl_3$) [lit.[2]: $[\alpha]^{20}_D$ = -23.6 (*c* 0.65, $CHCl_3$) for 92% ee], R_f = 0.45 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51 (d, *J* = 8.2 Hz, 2H), 7.23-7.09 (m, 6H), 7.07-6.94 (m, 3H), 6.76 (t, *J* = 7.4 Hz, 1H), 6.66 (d, *J* = 8.2 Hz, 1H), 5.89 (d, *J* = 9.2 Hz, 1H), 5.67 (d, *J* = 9.2 Hz, 1H), 3.57 (s, 3H), 2.30 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.5, 142.9, 140.8, 137.8, 129.7, 129.2, 129.1, 128.3, 128.0, 127.2, 127.2, 127.0, 120.8, 111.3, 59.1, 55.4, 21.6. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 9.8 min, t_2 = 11.1 min (major).



(-)-*N*-((3,4-Dimethoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3ha): White solid, unknown compound, m.p. = 146-147 °C, yield: 94%, ee: 92%, $[\alpha]^{20}_D$ = -17.00 (*c* 1.00, $CHCl_3$), R_f = 0.10 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.2 Hz, 2H), 7.25-7.06 (m, 7H), 6.73-6.63 (m, 1H), 6.62-6.52 (m, 2H), 5.53 (d, *J* = 7.2 Hz, 1H), 5.33 (d, *J* = 7.2 Hz, 1H), 3.81 (s, 3H), 3.69 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.2, 148.7, 143.3, 140.9, 137.8, 133.3, 129.5, 128.7, 127.7, 127.5, 127.4, 120.0, 111.2, 110.8, 61.3, 56.1, 55.9, 21.6. HRMS Calculated for $C_{22}H_{23}NNaO_4S$ $(M+Na)^+$ 420.1240, found: 420.1233. HPLC (IA column, ^{i}PrOH/hexane 10/90, 1.0 mL/min, 230 nm): t_1 = 27.9 min (major), t_2 = 36.0 min.

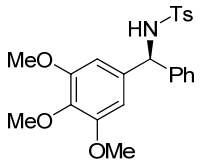


(-)-*N*-((3,5-Dimethoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3ia): White solid, unknown compound, m.p. = 139-140 °C, yield: 90%, ee: 90%, $[\alpha]^{20}_D$ = -3.40 (*c* 1.00,



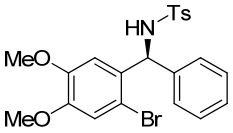
$CHCl_3$), R_f = 0.30 (petroleum ether/diethyl ether 1:1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.57 (d, *J* = 8.2 Hz, 2H), 7.25-7.05 (m, 7H), 6.30-6.20 (m, 3H), 5.55 (d, *J* = 7.5 Hz, 1H), 5.49 (d, *J* = 7.5 Hz, 1H), 3.65 (s, 6H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.0, 143.3, 143.0, 140.5, 137.6, 129.5, 128.7, 127.7, 127.5, 127.4, 105.6, 99.7, 61.6, 55.4, 21.6. HRMS Calculated for $C_{22}H_{24}NO_4S$ $(M+H)^+$ 398.1421, found: 398.1421. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.7 mL/min, 230 nm): t_1 = 11.9 min, t_2 = 14.5 min (major).

(-)-4-Methyl-*N*-(phenyl(3,4,5-trimethoxyphenyl)methyl)benzenesulfonamide (3ja): White solid, unknown compound, m.p. = 100-101 °C, yield: 99%, ee: 92%, $[\alpha]^{20}_D$ = -14.50 (*c* 0.80,



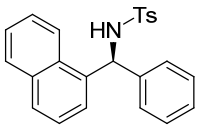
$CHCl_3$), R_f = 0.20 (petroleum ether/diethyl ether 1:1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.3 Hz, 2H), 7.24-7.05 (m, 7H), 5.75 (d, *J* = 7.7 Hz, 1H), 5.51 (d, *J* = 7.7 Hz, 1H), 3.76 (s, 3H), 3.65 (s, 6H), 2.35 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.3, 143.3, 140.7, 137.7, 137.4, 136.1, 129.4, 128.7, 127.8, 127.4, 127.4, 104.7, 61.7, 60.9, 56.1, 21.6. HRMS Calculated for $C_{23}H_{25}NNaO_5S$ $(M+Na)^+$ 450.1346, found: 450.1335. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 14.2 min, t_2 = 16.4 min (major).

(-)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (3ka): White solid, unknown compound, m.p. = 142-143 °C, yield: 99%, ee: 93%, $[\alpha]^{20}_D$ = -1.87



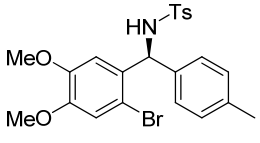
(*c* 1.07, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.3 Hz, 2H), 7.25-7.18 (m, 3H), 7.15-7.08 (m, 4H), 6.86 (s, 1H), 6.75 (s, 1H), 5.88 (d, *J* = 7.1 Hz, 1H), 5.58 (d, *J* = 7.1 Hz, 1H), 3.82 (s, 3H), 3.71 (s, 3H), 2.37 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.2, 148.8, 143.6, 139.8, 137.3, 131.2, 129.6, 128.9, 128.0, 127.5, 127.4, 115.8, 113.3, 112.1, 60.6, 56.4, 56.2, 21.7. HRMS Calculated for $C_{22}H_{22}BrNNaO_4S$ $(M+Na)^+$ 498.0345, found: 498.0344. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 12.2 min, t_2 = 16.6 min (major).

(*S*)-4-Methyl-*N*-(naphthalen-1-yl(phenyl)methyl)benzenesulfonamide (3la): White solid, known compound,[3] m.p. = 80-82 °C, yield: 99%, ee: 90%. $[\alpha]^{20}_D$ = -9.70 (*c* 1.00, $CHCl_3$) [lit.[3]:



$[\alpha]^{20}_D$ = -8.7 (*c* 0.85, $CHCl_3$) for 95% ee]. R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.92-7.78 (m, 2H), 7.76-7.66 (m, 1H), 7.54-7.36 (m, 4H), 7.32-7.25 (m, 2H), 7.24-7.11 (m, 5H), 7.02 (d, *J* = 8.1 Hz, 2H), 6.35 (d, *J* = 7.4 Hz, 1H), 5.52 (d, *J* = 7.4 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.2, 140.4, 137.5, 135.7, 134.1, 130.7, 129.4, 129.0, 128.7, 128.7, 127.7, 127.7, 127.3, 126.7, 126.3, 125.9, 125.2, 123.6, 58.6, 21.6. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 17.2 min, t_2 = 20.3 min (major).

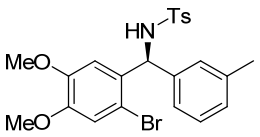
(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(*p*-tolyl)methyl)-4-methylbenzenesulfonamide (3kb): White solid, unknown compound, m.p. = 158-159 °C, yield: 98%, ee: 93%, $[\alpha]^{20}_D$ = +9.29



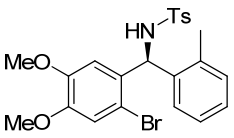
(*c* 0.93, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.2 Hz, 2H), 7.14 (d, *J* = 8.1 Hz, 2H), 7.01 (q, *J* = 8.3 Hz, 4H), 6.85 (s, 1H), 6.78 (s, 1H), 5.84 (d, *J* = 7.0 Hz, 1H), 5.58 (d, *J* = 7.0 Hz, 1H), 3.81 (s, 3H), 3.71 (s, 3H), 2.37 (s, 3H), 2.27 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.1, 148.8, 143.5, 137.7, 137.3, 136.9, 131.4, 129.5,

129.5, 127.5, 127.4, 115.7, 113.2, 112.0, 60.3, 56.4, 56.1, 21.6, 21.2. HRMS Calculated for $C_{23}H_{24}BrNNaO_4S$ $(M+Na)^+$ 512.0502, found: 512.0489. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 10.9 min, t_2 = 19.7 min (major).

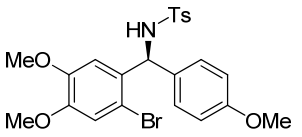
(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(*m*-tolyl)methyl)-4-methylbenzenesulfonamide (3kc): Colorless oil, unknown compound, yield: 99%, ee: 93%, $[\alpha]^{20}_D$ = +3.96 (*c* 0.96, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.2 Hz, 2H), 7.18-7.05 (m, 3H), 7.01 (d, *J* = 7.6 Hz, 1H), 6.94-6.82 (m, 3H), 6.76 (s, 1H), 5.85 (d, *J* = 7.1 Hz, 1H), 5.60 (brs, 1H), 3.81 (s, 3H), 3.71 (s, 3H), 2.37 (s, 3H), 2.23 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.1, 148.7, 143.5, 139.8, 138.5, 137.3, 131.4, 129.5, 128.7, 128.1, 127.5, 124.4, 115.7, 113.3, 112.1, 60.5, 56.4, 56.2, 21.6, 21.6. HRMS Calculated for $C_{23}H_{24}BrNNaO_4S$ $(M+Na)^+$ 512.0502, found: 512.0495. HPLC (OD-H column, ^{i}PrOH/hexane 10/90, 1.0 mL/min, 230 nm): t_1 = 15.9 min, t_2 = 19.9 min (major).



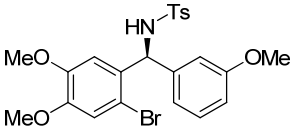
(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(*o*-tolyl)methyl)-4-methylbenzenesulfonamide (3kd): Colorless oil, unknown compound, yield: 97%, ee: 94%, $[\alpha]^{20}_D$ = +39.44 (*c* 0.90, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 7.6 Hz, 2H), 7.18-7.08 (m, 4H), 7.04-6.96 (m, 1H), 6.94-6.81 (m, 2H), 6.73 (s, 1H), 6.06 (d, *J* = 6.1 Hz, 1H), 5.06 (brs, 1H), 3.82 (s, 3H), 3.61 (s, 3H), 2.36 (s, 3H), 2.32 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.0, 148.4, 143.6, 137.6, 137.6, 137.0, 131.1, 130.8, 129.5, 128.2, 127.6, 127.4, 126.3, 115.8, 113.5, 112.4, 57.8, 56.4, 56.0, 21.6, 19.3. HRMS Calculated for $C_{23}H_{24}BrNNaO_4S$ $(M+Na)^+$ 512.0502, found: 512.0498. HPLC (IA column, ^{i}PrOH/hexane 15/85, 1.0 mL/min, 230 nm): t_1 = 15.5 min (major), t_2 = 22.6 min.



(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(4-methoxyphenyl)methyl)-4-methylbenzenesulfonamide (3ke): White solid, unknown compound, m.p. = 148-149 °C, yield: 98%, ee: 92%, $[\alpha]^{20}_D$ = +13.02 (*c* 0.96, $CHCl_3$), R_f = 0.10 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 8.3 Hz, 2H), 7.13 (d, *J* = 8.1 Hz, 2H), 7.02 (d, *J* = 8.7 Hz, 2H), 6.85 (s, 1H), 6.81-6.69 (m, 3H), 5.82 (d, *J* = 7.1 Hz, 1H), 5.62 (d, *J* = 7.1 Hz, 1H), 3.81 (s, 3H), 3.74 (s, 3H), 3.71 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.3, 149.0, 148.7, 143.5, 137.3, 131.9, 131.5, 129.5, 128.7, 127.4, 115.7, 114.2, 113.2, 111.9, 60.1, 56.4, 56.1, 55.4, 21.6. HRMS Calculated for $C_{23}H_{24}BrNNaO_5S$ $(M+Na)^+$ 528.0451, found: 528.0443. HPLC (OD-H column, ^{i}PrOH/hexane 30/70, 0.70 mL/min, 230 nm): t_1 = 10.9 min, t_2 = 22.2 min (major).



(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(3-methoxyphenyl)methyl)-4-methylbenzenesulfonamide (3kf): Colorless oil, unknown compound, yield: 99%, ee: 93%, $[\alpha]^{20}_D$ = +2.40 (*c* 0.96, $CHCl_3$), R_f = 0.10 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.3 Hz, 2H), 7.17-7.07 (m, 3H), 6.84 (s, 1H), 6.81-6.66 (m, 4H), 5.94 (d, *J* = 7.6 Hz, 1H), 5.87 (d, *J* = 7.6 Hz, 1H), 3.80 (s, 3H), 3.68 (s, 3H), 3.67 (s, 3H), 2.35 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.9, 149.1, 148.8, 143.5, 141.4, 137.2, 131.4, 129.8, 129.5, 127.4, 119.6, 115.6, 113.3, 113.2, 113.1, 111.8, 60.3, 56.3, 56.1, 55.3, 21.6. HRMS Calculated for



$C_{23}H_{24}BrNNaO_5S$ $(M+Na)^+$ 528.0451, found: 528.0445. HPLC (OD-H column, ^{i}PrOH/hexane 10/90, 0.70 mL/min, 230 nm): t_1 = 23.3 min, t_2 = 30.1 min (major).

(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(2-methoxyphenyl)methyl)-4-methylbenzenesulfonamide (3kg): White solid, unknown compound, m.p. = 94-95 °C, yield: 99%, ee: 94%, $[\alpha]^{20}_D$ = +2.72 (*c* 0.92, $CHCl_3$), R_f = 0.10 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.3 Hz, 2H), 7.22-7.10 (m, 3H), 7.09-7.00 (m, 2H), 6.89 (s, 1H), 6.82-6.68 (m, 2H), 6.01 (d, *J* = 6.6 Hz, 1H), 5.64 (d, *J* = 6.5 Hz, 1H), 3.81 (s, 3H), 3.74 (s, 3H), 3.63 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.7, 148.9, 148.3, 143.2, 137.4, 131.5, 129.5, 129.4, 129.3, 127.6, 127.5, 120.7, 115.6, 113.3, 112.6, 111.0, 57.3, 56.3, 56.1, 55.3, 21.6. HRMS Calculated for $C_{23}H_{24}BrNNaO_5S$ $(M+Na)^+$ 528.0451, found: 528.0458. HPLC (OD-H column, ^{i}PrOH/hexane 30/70, 0.70 mL/min, 230 nm): t_1 = 10.3 min (major), t_2 = 12.2 min.

(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(4-fluorophenyl)methyl)-4-methylbenzenesulfonamide (3kh): White solid, unknown compound, m.p. = 197-198 °C, yield: 99%, ee: 94%, $[\alpha]^{20}_D$ = +0.36 (*c* 0.84, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, DMSO-*d6*) δ 8.70 (d, *J* = 9.8 Hz, 1H), 7.44 (d, *J* = 8.2 Hz, 2H), 7.27-7.04 (m, 6H), 6.94 (d, *J* = 2.2 Hz, 2H), 5.82 (d, *J* = 9.7 Hz, 1H), 3.71 (s, 3H), 3.59 (s, 3H), 2.26 (s, 3H). ^{13}C NMR (100 MHz, DMSO-d6) δ 162.3 (d, *J* = 243 Hz), 148.6 (d, *J* = 16 Hz), 142.3, 138.0, 136.6 (d, *J* = 3 Hz), 130.9, 129.2 (d, *J* = 8 Hz), 129.0, 126.3, 115.3, 115.1, 115.0, 112.5, 111.6, 58.8, 56.0, 55.6, 20.8. ^{19}F NMR (376 MHz, $CDCl_3$) δ -110.49. HRMS Calculated for $C_{22}H_{21}BrFNNaO_4S$ $(M+Na)^+$ 516.0251, found: 516.0256. HPLC (OD-H column, ^{i}PrOH/hexane 30/70, 0.70 mL/min, 230 nm): t_1 = 8.4 min, t_2 = 15.0 min (major).

(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(4-bromophenyl)methyl)-4-methylbenzenesulfonamide (3ki): White solid, unknown compound, m.p. = 163-164 °C, yield: 95%, ee: 93%, $[\alpha]^{20}_D$ = +5.00 (*c* 1.20, $CHCl_3$), R_f = 0.20 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.2 Hz, 2H), 7.33 (d, *J* = 8.5 Hz, 2H), 7.11 (d, *J* = 8.1 Hz, 2H), 7.03 (d, *J* = 8.5 Hz, 2H), 6.84 (s, 1H), 6.69 (s, 1H), 6.01 (d, *J* = 8.0 Hz, 1H), 5.84 (d, *J* = 8.0 Hz, 1H), 3.81 (s, 3H), 3.69 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.3, 148.9, 143.7, 139.0, 137.1, 131.9, 130.7, 129.6, 129.1, 127.3, 122.0, 115.7, 113.2, 111.7, 60.0, 56.4, 56.2, 21.6. HRMS Calculated for $C_{22}H_{21}Br_2NNaO_4S$ $(M+Na)^+$ 575.9450, found: 575.9444. HPLC (OD-H column, ^{i}PrOH/hexane 30/70, 0.70 mL/min, 230 nm): t_1 = 9.6 min, t_2 = 21.3 min (major).

(+)-*N*-((4-(Benzyloxy)phenyl)(2-bromo-4,5-dimethoxyphenyl)methyl)-4-methylbenzenesulfonamide (3kj): White solid, unknown compound, m.p. = 90-91 °C, yield: 99%, ee: 92%, $[\alpha]^{20}_D$ = +15.50 (*c* 1.20, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 8.2 Hz, 2H), 7.43-7.27 (m, 5H), 7.13 (d, *J* = 8.1 Hz, 2H), 7.02 (d, *J* = 8.7 Hz, 2H), 6.88-6.79 (m, 3H), 6.77 (s, 1H), 5.82 (d, *J* = 6.9 Hz, 1H), 5.55 (d, *J* = 6.9 Hz, 1H), 4.99 (s, 2H), 3.81 (s, 3H), 3.70 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.5, 149.1, 148.8, 143.5, 137.3, 137.0, 132.2, 131.4, 129.5, 128.8, 128.8, 128.2, 127.6, 127.5, 115.7, 115.1, 113.2, 111.9, 70.2, 60.1, 56.4, 56.1, 21.6. HRMS Calculated for $C_{29}H_{28}BrNNaO_5S$

$(M+Na)^+$ 604.0764, found: 604.0755. HPLC (IA column, ^{i}PrOH/hexane 20/80, 1.0 mL/min, 230 nm): t_1 = 20.7 min (major), t_2 = 29.9 min.

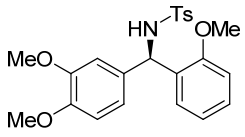
(+)-*N*-((2-Bromo-4,5-dimethoxyphenyl)(naphthalen-1-yl)methyl)-4-methylbenzenesulfonamide (3kk): White solid, unknown compound, m.p. = 183-184 °C, yield: 99%, ee: 92%, $[\alpha]^{20}_D$ = +67.67 (*c* 1.12, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14-8.04 (m, 1H), 7.89-7.80 (m, 1H), 7.73 (d, *J* = 8.2 Hz, 1H), 7.56-7.43 (m, 4H), 7.25-7.18 (m, 1H), 7.06 (d, *J* = 8.1 Hz, 2H), 7.00 (d, *J* = 7.1 Hz, 1H), 6.92 (s, 1H), 6.78 (s, 1H), 6.68 (d, *J* = 6.2 Hz, 1H), 5.33 (d, *J* = 6.2 Hz, 1H), 3.82 (s, 3H), 3.61 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.1, 148.4, 143.6, 137.3, 135.1, 134.2, 131.1, 130.7, 129.5, 129.2, 129.0, 127.5, 127.1, 126.3, 126.2, 125.2, 123.4, 115.8, 113.6, 112.5, 57.4, 56.4, 56.0, 21.6. HRMS Calculated for $C_{28}H_{23}BrNNaO_4S$ $(M+Na)^+$ 548.0502, found: 548.0490. HPLC (OD-H column, ^{i}PrOH/hexane 30/70, 0.70 mL/min, 230 nm): t_1 = 10.8 min (major), t_2 = 21.2 min.

(*S*)-*N*-((4-Methoxyphenyl)(*p*-tolyl)methyl)-4-methylbenzenesulfonamide (3db): White solid, known compound,[3] m.p. = 118-119 °C, yield: 87%, ee: 90%, $[\alpha]^{20}_D$ = -5.74 (*c* 0.94, $CHCl_3$) [lit.[3]: $[\alpha]^{20}_D$ = -7.9 (*c* 0.96, $CHCl_3$) for 95% ee], R_f = 0.35 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.3 Hz, 2H), 7.13 (d, *J* = 8.1 Hz, 2H), 7.07-6.91 (m, 6H), 6.78-6.65 (m, 2H), 5.47 (d, *J* = 6.9 Hz, 1H), 5.05 (d, *J* = 6.9 Hz, 1H), 3.74 (s, 3H), 2.38 (s, 3H), 2.27 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.2, 143.3, 138.1, 137.7, 137.4, 133.2, 129.5, 129.4, 128.8, 127.5, 127.4, 114.1, 60.8, 55.5, 21.7, 21.2. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 15.5 min (major), t_2 = 17.4 min.

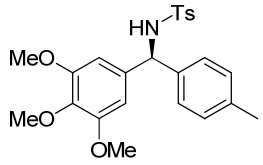
(*R*)-*N*-((2-Methoxyphenyl)(4-methoxyphenyl)methyl)-4-methylbenzenesulfonamide (3dg): White solid, known compound,[4] m.p. = 134-135 °C, yield: 77%, ee: 90%, $[\alpha]^{20}_D$ = +104.87 (*c* 0.80, $CHCl_3$) [lit.[4]: $[\alpha]^{20}_D$ = -14.9 (*c* 1.00, $CHCl_3$) for 99% ee (S)], R_f = 0.35 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (d, *J* = 8.2 Hz, 2H), 7.21-7.01 (m, 5H), 6.97 (dd, *J* = 7.4, 1.3 Hz, 1H), 6.82-6.70 (m, 3H), 6.67 (d, *J* = 8.2 Hz, 1H), 5.75 (d, *J* = 8.9 Hz, 1H), 5.62 (d, *J* = 8.9 Hz, 1H), 3.74 (s, 3H), 3.60 (s, 3H), 2.32 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.9, 156.6, 142.9, 137.8, 133.0, 129.6, 129.2, 129.0, 128.3, 128.1, 127.2, 120.8, 113.7, 111.3, 58.7, 55.5, 55.4, 21.6. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.70 mL/min, 230 nm): t_1 = 12.4 min (major), t_2 = 19.7 min.

(-)-*N*-((3,4-Dimethoxyphenyl)(*p*-tolyl)methyl)-4-methylbenzenesulfonamide (3hb): Yield: 98%, colorless oil, unknown compound, ee: 90%, $[\alpha]^{20}_D$ = -8.02 (*c* 0.91, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.3 Hz, 2H), 7.12 (d, *J* = 8.1 Hz, 2H), 7.07-6.94 (m, 4H), 6.70-6.64 (d, *J* = 8.9 Hz, 1H), 6.62-6.54 (m, 2H), 5.48 (d, *J* = 7.1 Hz, 1H), 5.24 (d, *J* = 7.1 Hz, 1H), 3.81 (s, 3H), 3.69 (s, 3H), 2.37 (s, 3H), 2.28 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.1, 148.6, 143.3, 138.0, 137.8, 137.5, 133.5, 129.5, 129.4, 127.4, 127.4, 120.0, 111.2, 110.7, 61.1, 56.1, 55.9, 21.6, 21.2. HRMS Calculated for $C_{23}H_{25}NNaO_4S$ $(M+Na)^+$ 434.1397, found: 434.1392. HPLC (IA column, ^{i}PrOH/hexane 10/90, 1.0 mL/min, 230 nm): t_1 = 27.4 min (major), t_2 = 34.4 min.

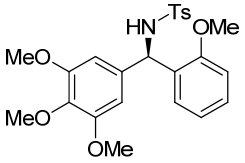
(+)-*N*-((3,4-Dimethoxyphenyl)(2-methoxyphenyl)methyl)-4-methylbenzenesulfonamide (3hg): Colorless oil, unknown compound, yield: 80%, ee: 90%, $[\alpha]^{20}_{D}$ = +6.02 (*c* 0.93, $CHCl_3$), R_f = 0.15 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 8.2 Hz, 2H), 7.20-7.10 (m, 1H), 7.05 (d, *J* = 8.1 Hz, 2H), 6.99 (dd, *J* = 7.5, 1.6 Hz, 1H), 6.84-6.74 (m, 2H), 6.72-6.62 (m, 2H), 6.58 (dd, *J* = 8.4, 1.8 Hz, 1H), 5.84 (d, *J* = 9.0 Hz, 1H), 5.63 (d, *J* = 9.0 Hz, 1H), 3.80 (s, 3H), 3.74 (s, 3H), 3.62 (s, 3H), 2.32 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.5, 148.9, 148.3, 142.9, 137.8, 133.4, 129.6, 129.2, 129.1, 128.0, 127.2, 120.8, 119.3, 111.2, 110.9, 110.6, 58.8, 56.0, 55.9, 55.4, 21.6. HRMS Calculated for $C_{23}H_{25}NNaO_4S$ $(M+Na)^+$ 450.1346, found: 450.1347. HPLC (IA column, ^{i}PrOH/hexane 20/80, 1.0 mL/min, 230 nm): t_1 = 16.2 min (major), t_2 = 20.8 min.



(+)-4-Methyl-*N*-(*p*-tolyl(3,4,5-trimethoxyphenyl)methyl)benzenesulfonamide (3jb): White solid, unknown compound, m.p. = 103-104 °C, yield: 99%, ee: 92%, $[\alpha]^{20}_{D}$ = +1.94 (*c* 0.98, $CHCl_3$), R_f = 0.10 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.3 Hz, 2H), 7.11 (d, *J* = 8.1 Hz, 2H), 7.02 (s, 4H), 6.27 (s, 2H), 5.51 (d, *J* = 7.4 Hz, 1H), 5.47 (d, *J* = 7.4 Hz, 1H), 3.77 (s, 3H), 3.66 (s, 6H), 2.36 (s, 3H), 2.28 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.3, 143.3, 137.8, 137.8, 137.6, 137.4, 136.3, 129.4, 127.4, 127.4, 104.7, 61.5, 60.9, 56.1, 21.6, 21.2. HRMS Calculated for $C_{24}H_{27}NNaO_5S$ $(M+Na)^+$ 464.1502, found: 464.1501. HPLC (OD-H column, ^{i}PrOH/hexane 20/80, 0.7 mL/min, 230 nm): t_1 = 13.6 min, t_2 = 21.6 min (major).



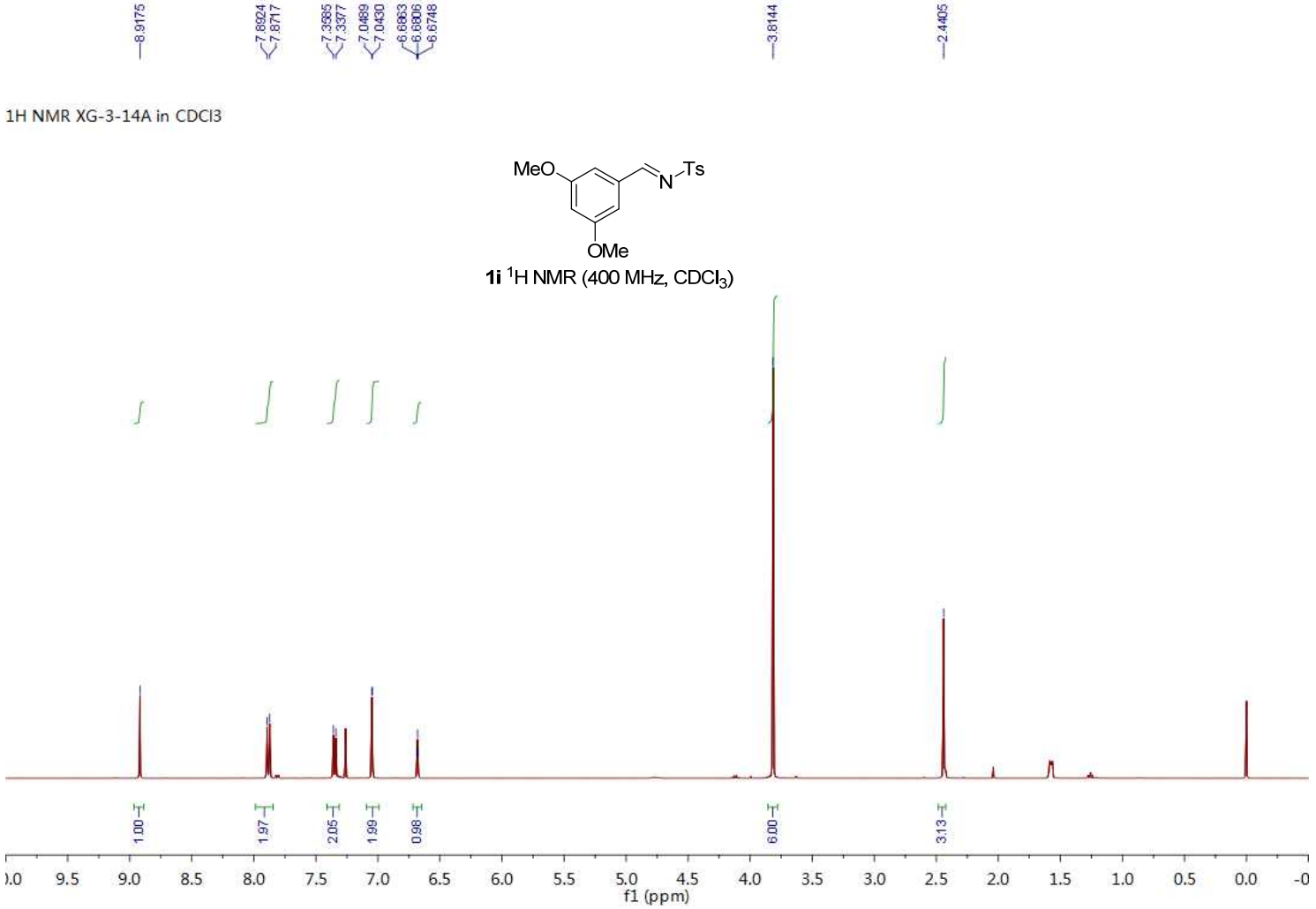
(+)-*N*-((2-Methoxyphenyl)(3,4,5-trimethoxyphenyl)methyl)-4-methylbenzenesulfonamide (3jg): Colorless oil, unknown compound, yield: 99%, ee: 90%, $[\alpha]^{20}_{D}$ = +8.79 (*c* 0.91, $CHCl_3$), R_f = 0.10 (petroleum ether/diethyl ether 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (d, *J* = 8.3 Hz, 2H), 7.20-7.10 (m, 1H), 7.06 (d, *J* = 8.0 Hz, 2H), 7.00 (dd, *J* = 7.5, 1.6 Hz, 1H), 6.85-6.75 (m, 1H), 6.70 (d, *J* = 8.2 Hz, 1H), 6.39 (s, 2H), 5.90 (d, *J* = 8.9 Hz, 1H), 5.64 (d, *J* = 8.9 Hz, 1H), 3.78 (s, 3H), 3.68 (s, 6H), 3.65 (s, 3H), 2.32 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.5, 153.1, 143.0, 137.8, 137.2, 136.4, 129.5, 129.2, 127.9, 127.2, 120.9, 111.2, 104.4, 60.9, 59.0, 56.1, 55.5, 21.6. HRMS Calculated for $C_{24}H_{27}NNaO_6S$ $(M+Na)^+$ 480.1451, found: 480.1442. HPLC (IA column, ^{i}PrOH/hexane 20/80, 1.0 mL/min, 230 nm): t_1 = 15.9 min (major), t_2 = 36.0 min.

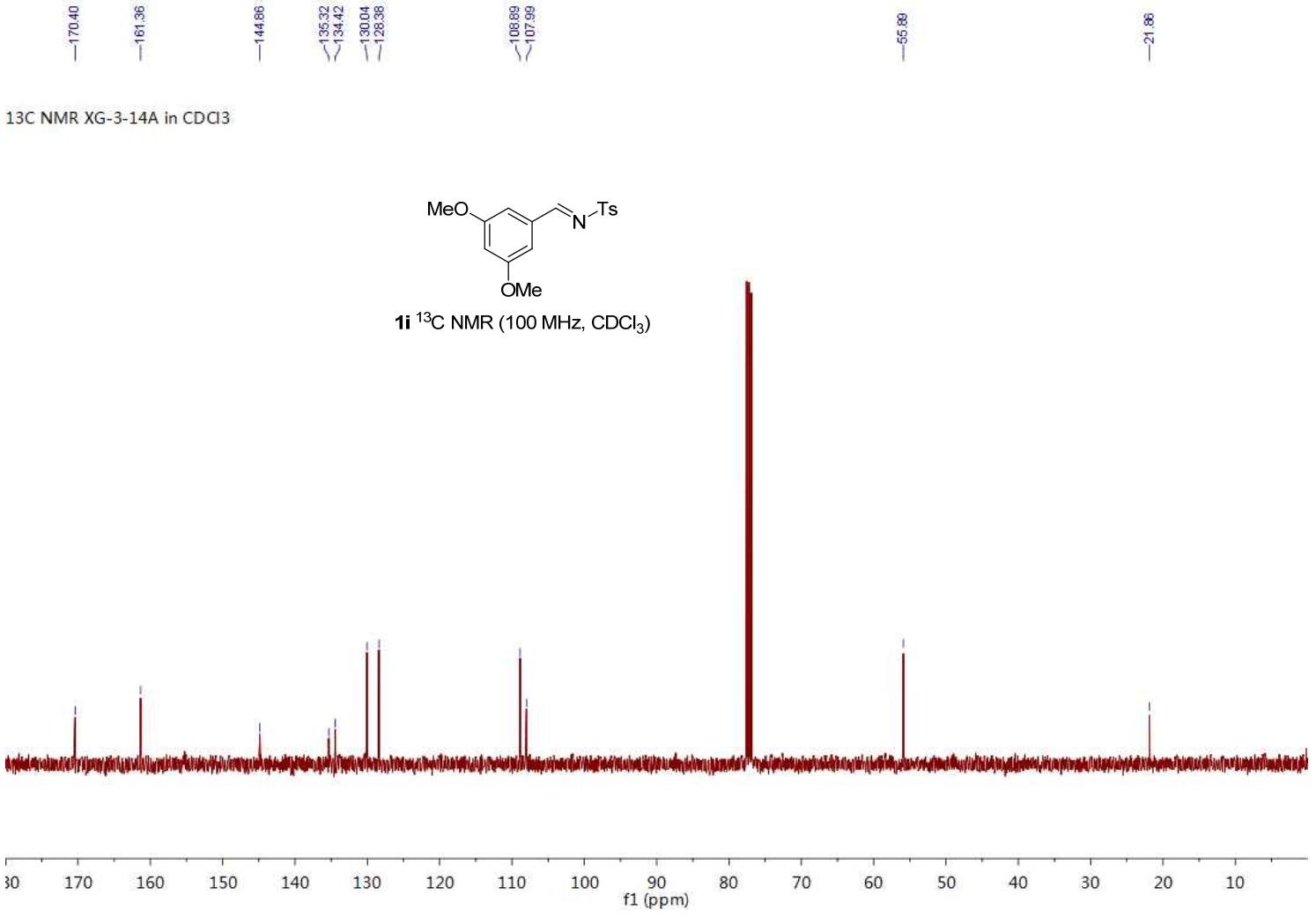


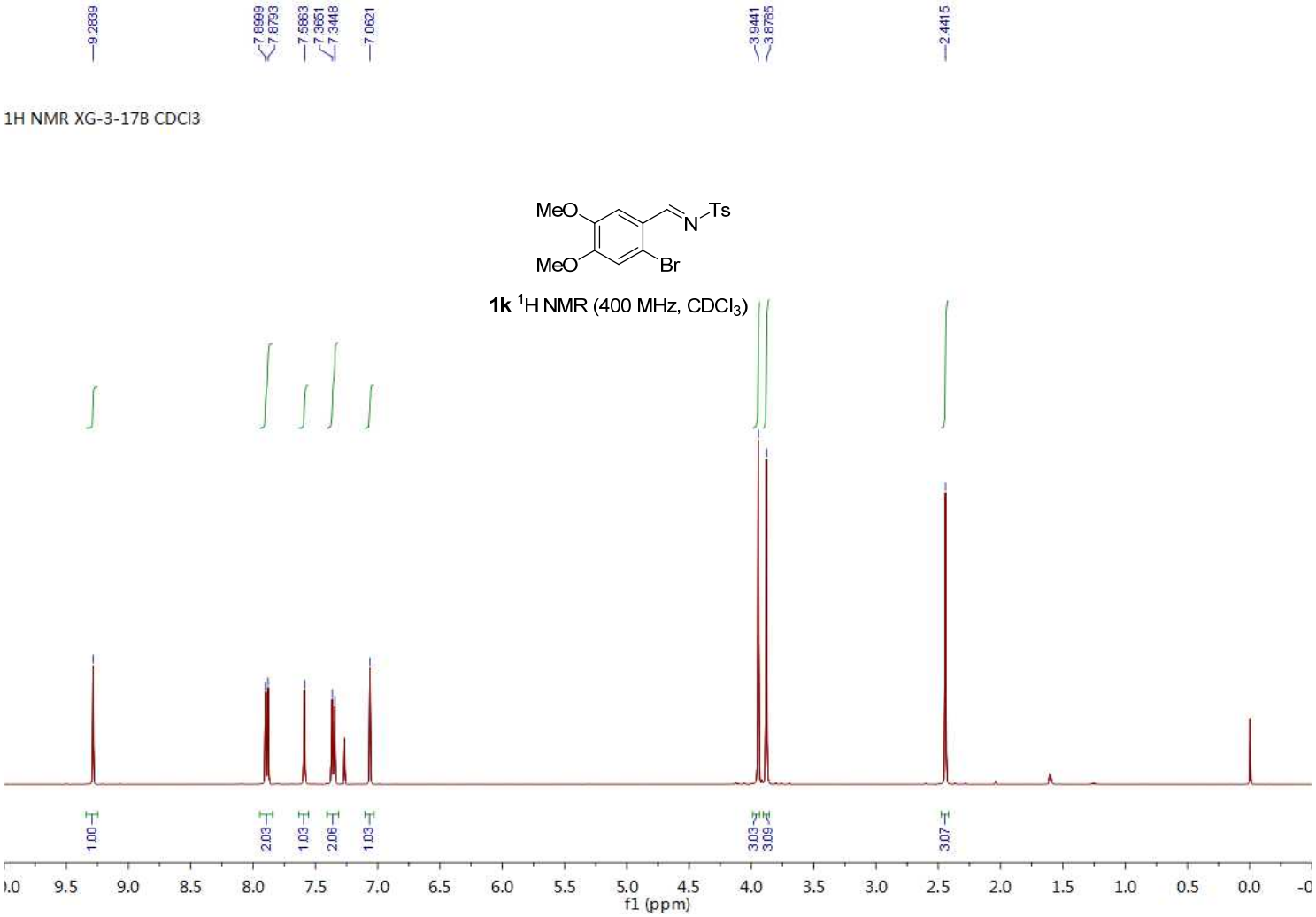
4. References

1) Love. B. E.; Raje, P. S.; Walliams II, T. C. *Synlett*, **1994**, 493.
2) Ma, G.-N.; Zhang, T.; Shi, M. *Org. Lett.* **2009**, *11*, 875.
3) Shao, C.; Yu, H.-J.; Wu, N.-Y.; Feng, C.-G.; Lin, G.-Q. *Org. Lett.* **2010**, *12*, 3820.
4) Zhang, Z.-Q.; Feng, C. G.; Xu, M.-H.; Lin, G.-Q. *J. Am. Chem. Soc.* **2007**, *129*, 5336.

5. Copy of NMR, HRMS and HPLC for racemic and chiral compounds

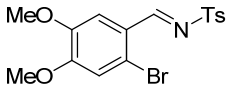



170.40
161.36
144.66
135.32
134.42
130.04
128.38
108.89
107.99
55.89
21.86
13C NMR XG-3-14A in CDCl3
MeO
N
Ts
OMe
1i 13C NMR (100 MHz, CDCl3)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

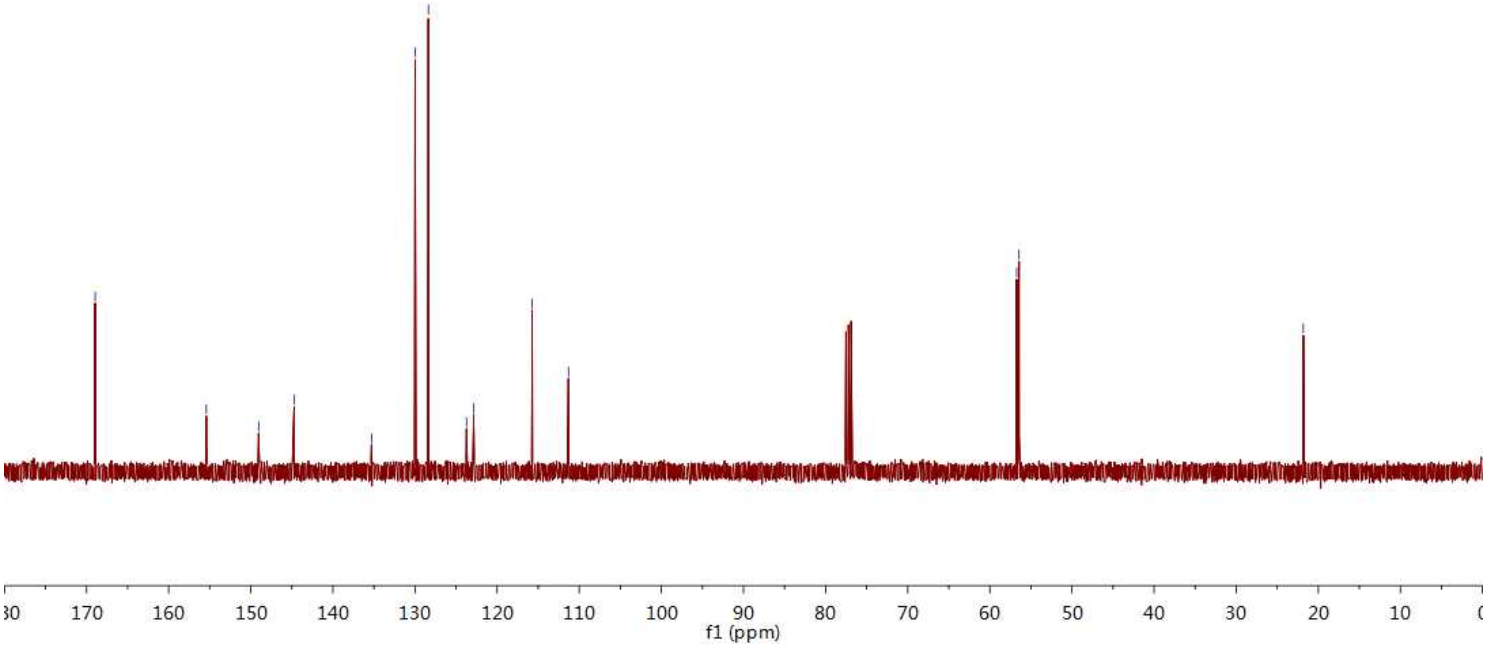


1k ^{1}H NMR (400 MHz, $CDCl_3$)

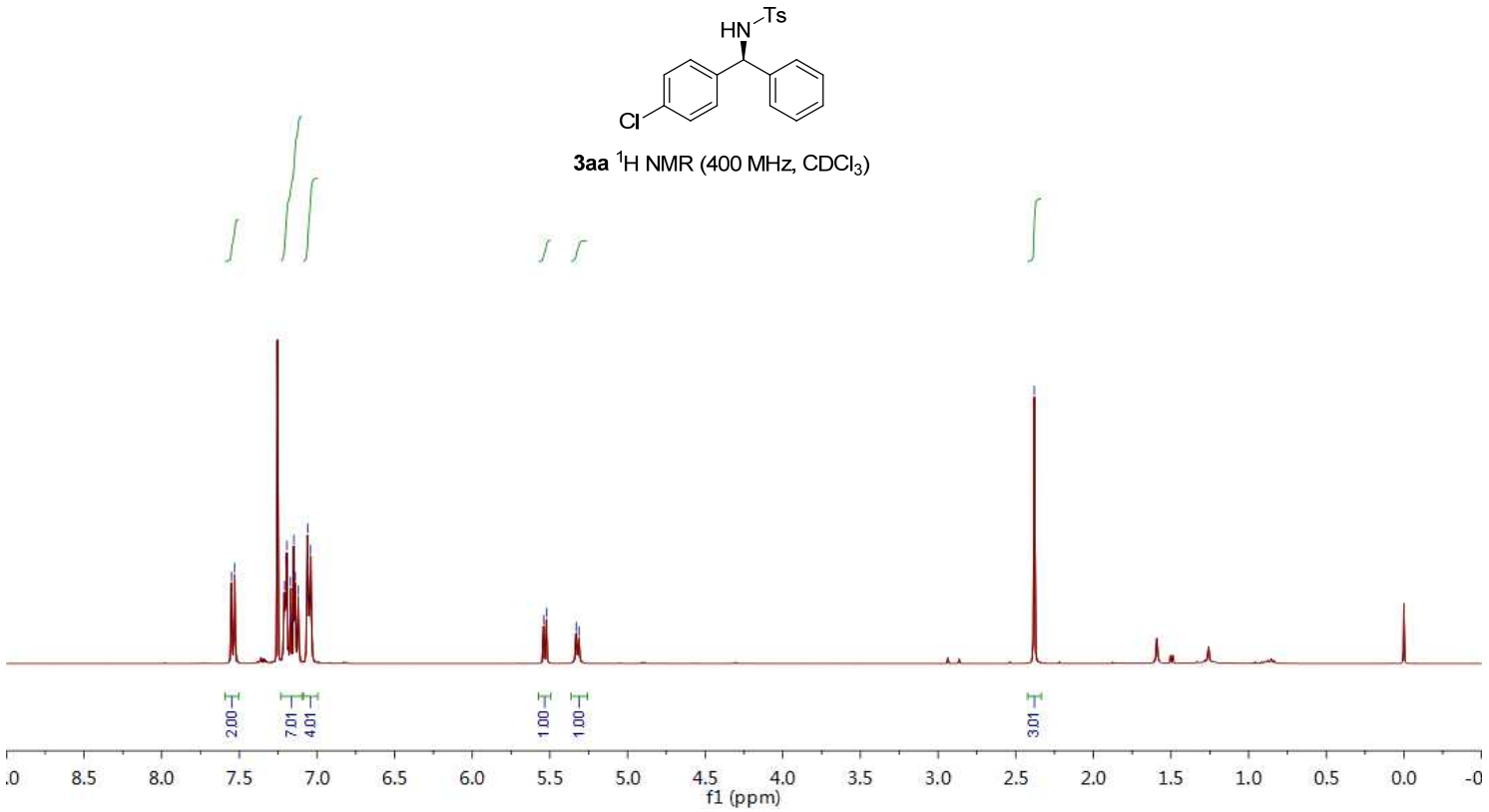
13C NMR XG-3-17B CDCl3



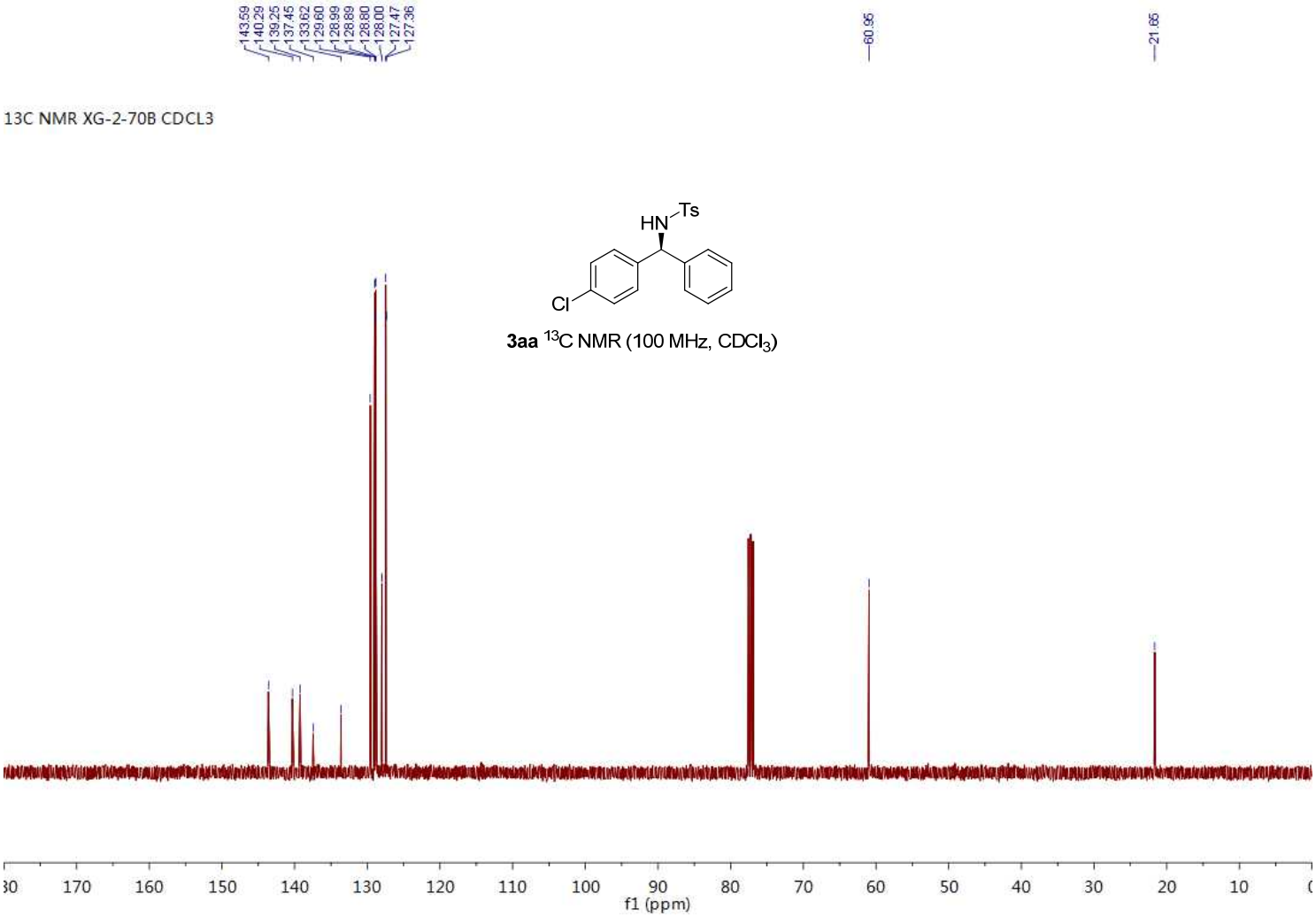
1k ^{13}C NMR (100 MHz, $CDCl_3$)



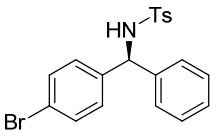
1H NMR XG-2-59 in CDCl3



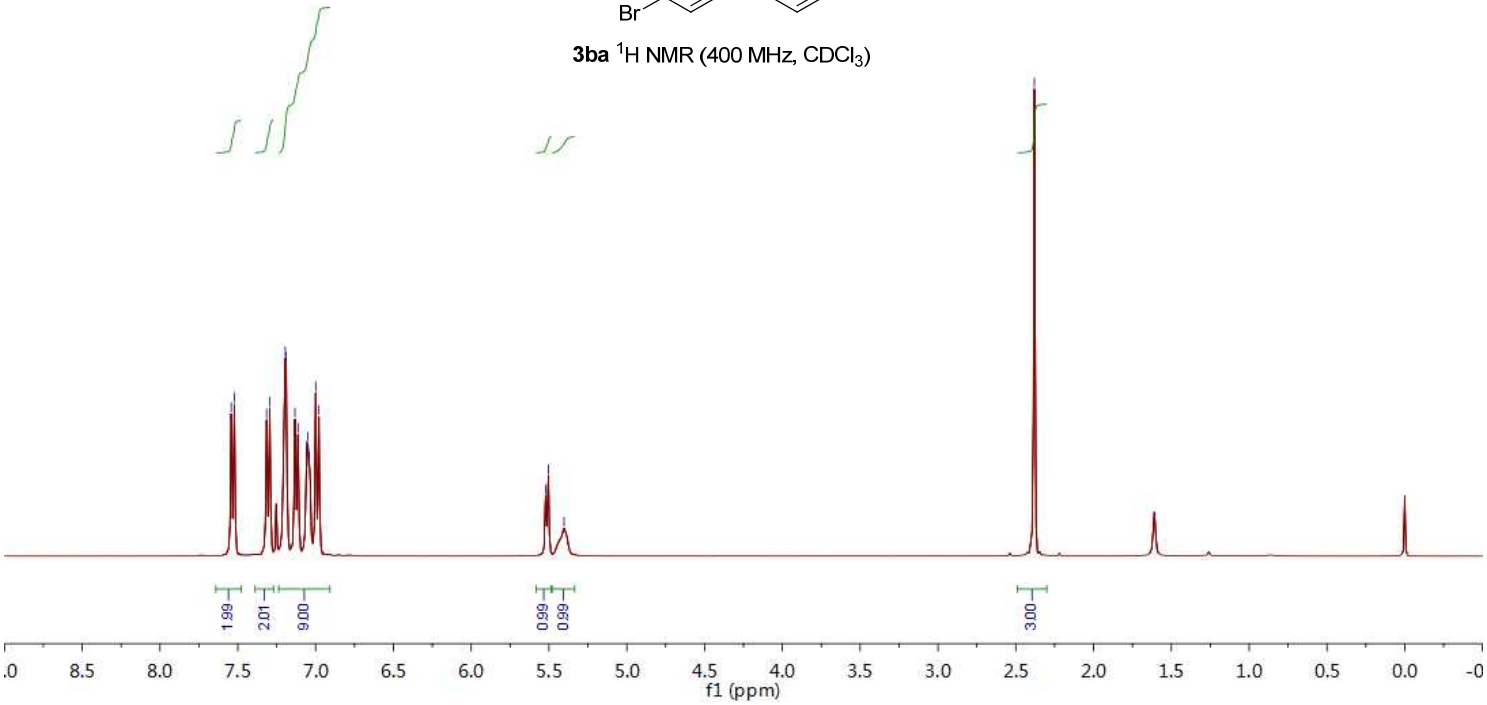
3aa ^{1}H NMR (400 MHz, $CDCl_3$)

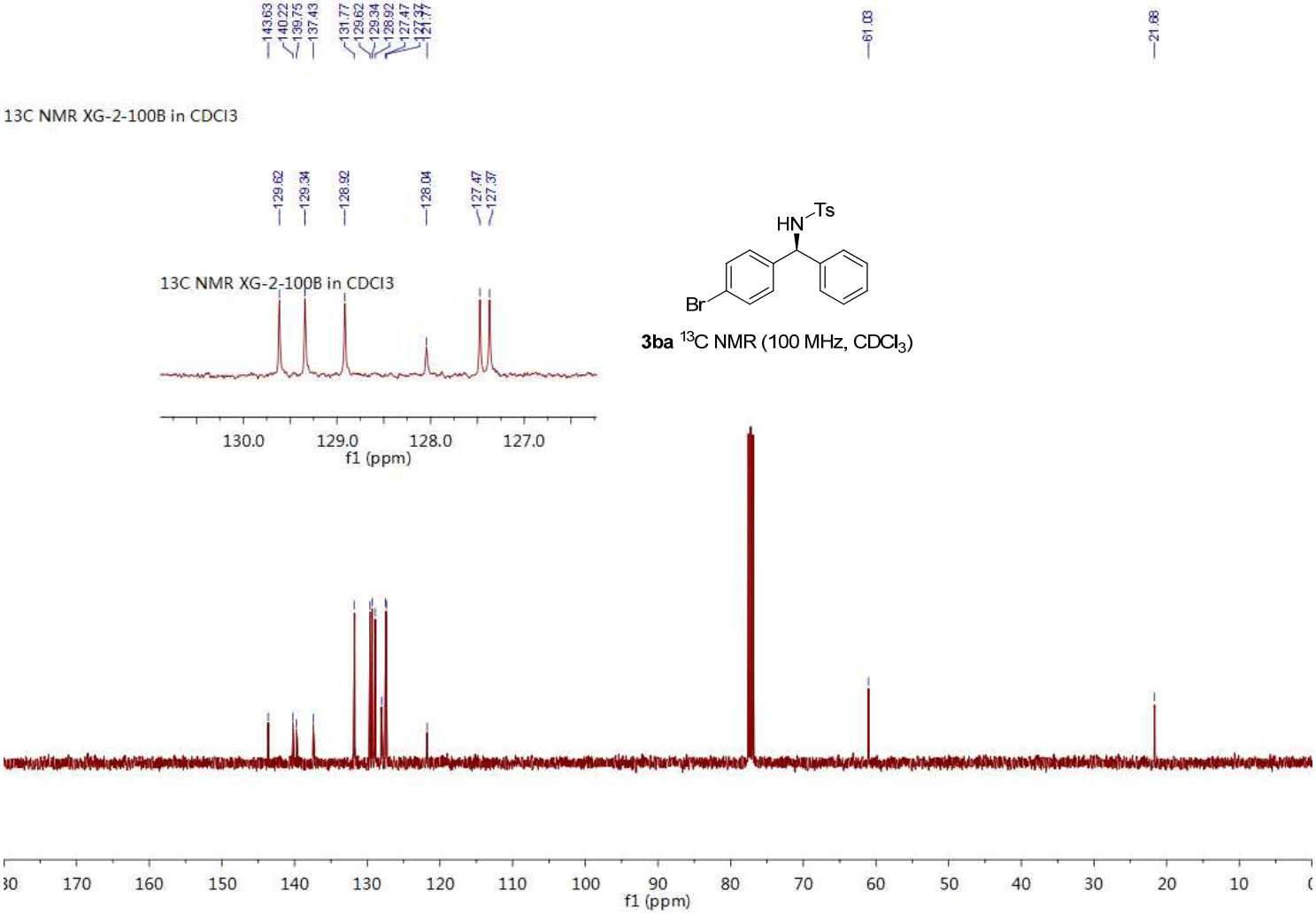

143.59
140.29
139.25
137.45
133.62
129.60
128.99
128.89
128.80
128.00
127.47
127.36
60.95
21.65
13C NMR XG-2-70B CDCL3
HN
Ts
Cl
3aa 13C NMR (100 MHz, CDCl3)
f1 (ppm)

1H NMR XG-2-100B in CDCl3

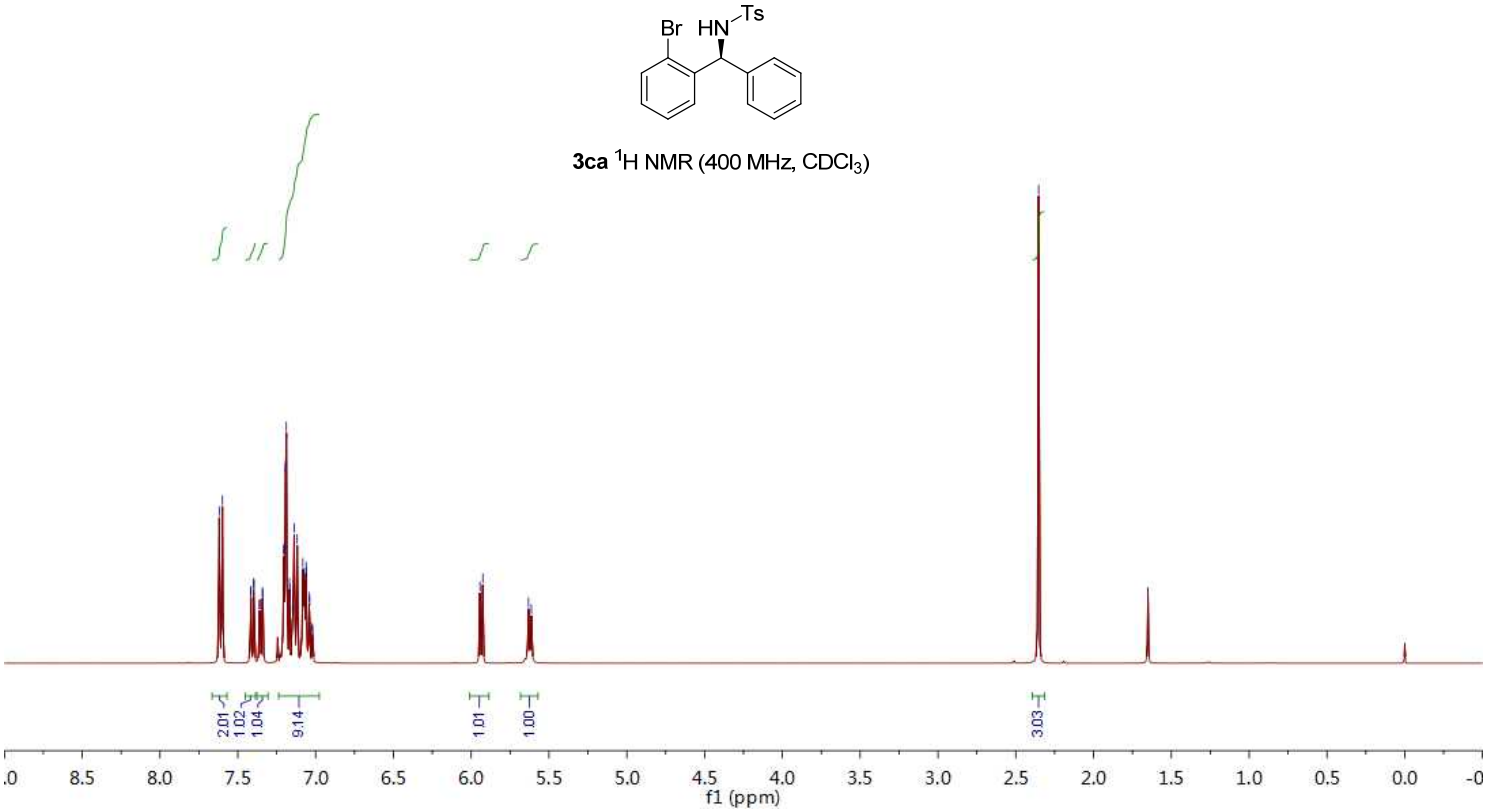


3ba ^{1}H NMR (400 MHz, $CDCl_3$)

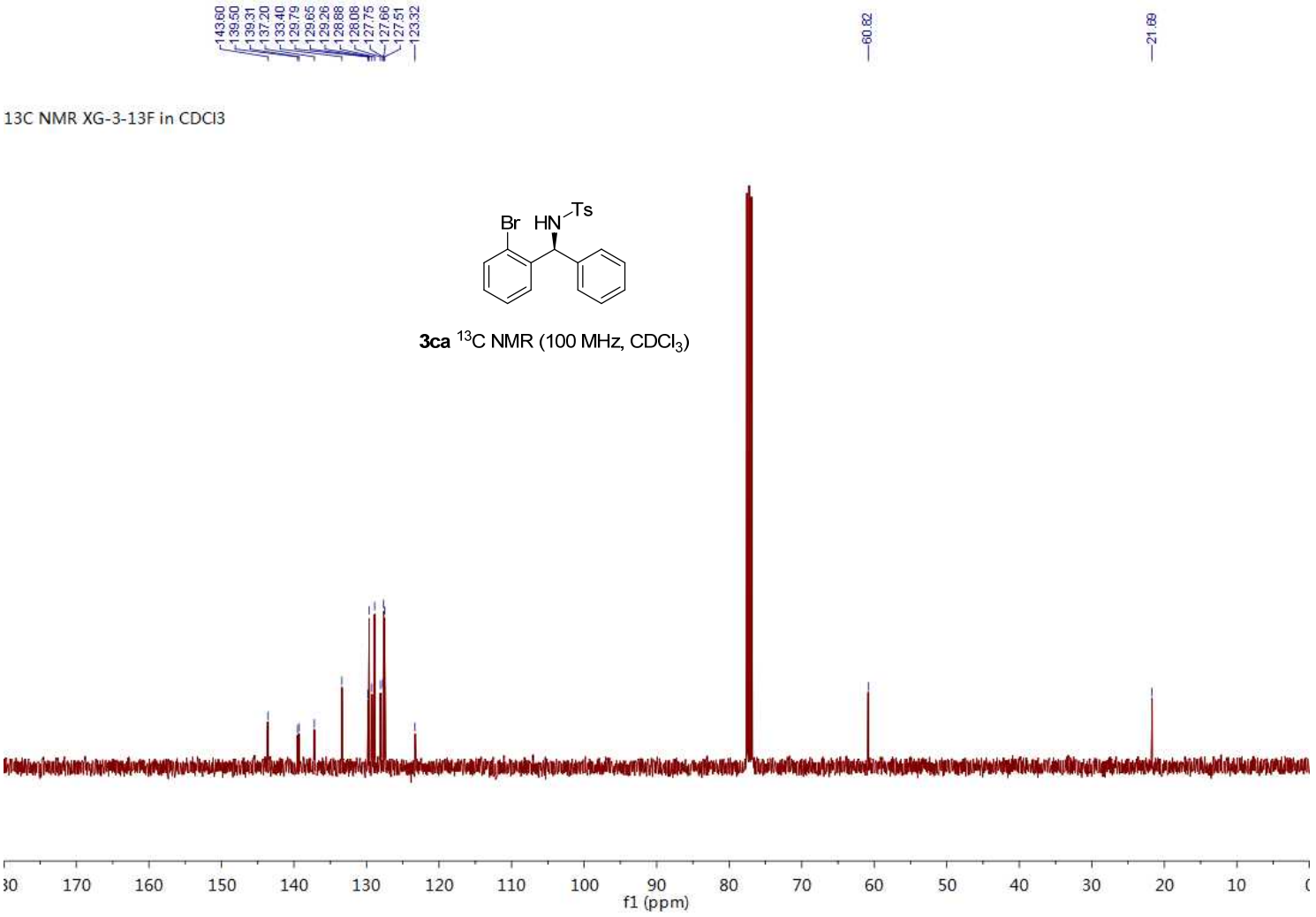



143.63
140.22
139.75
137.43
131.77
129.62
129.34
128.92
127.47
127.37
121.77
61.03
21.68
13C NMR XG-2-100B in CDCl3
129.62
129.34
128.92
128.04
127.47
127.37
13C NMR XG-2-100B in CDCl3
130.0
129.0
128.0
127.0
f1 (ppm)
HN
Ts
Br
3ba 13C NMR (100 MHz, CDCl3)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

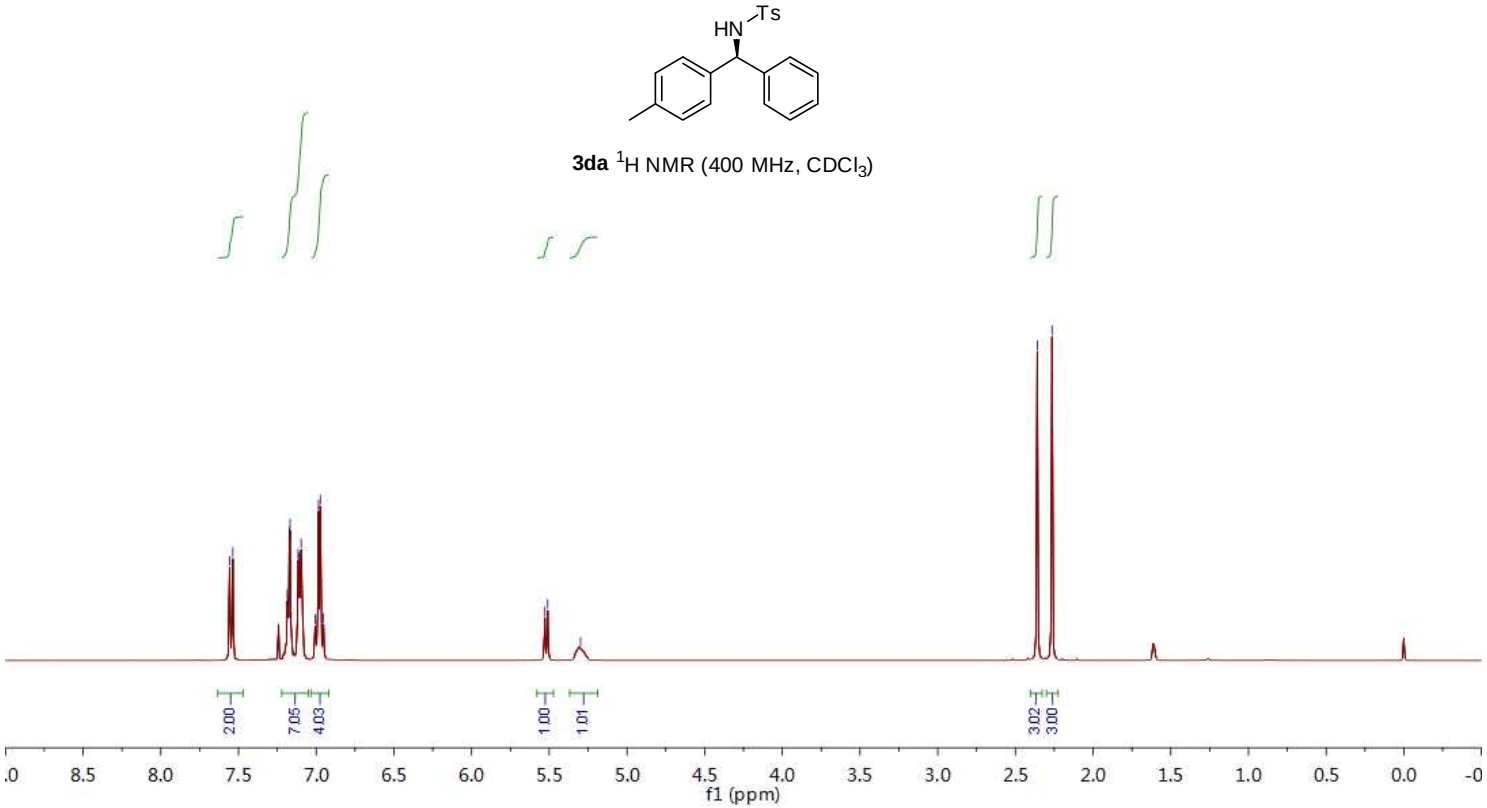
1H NMR XG-3-13F in CDCl3



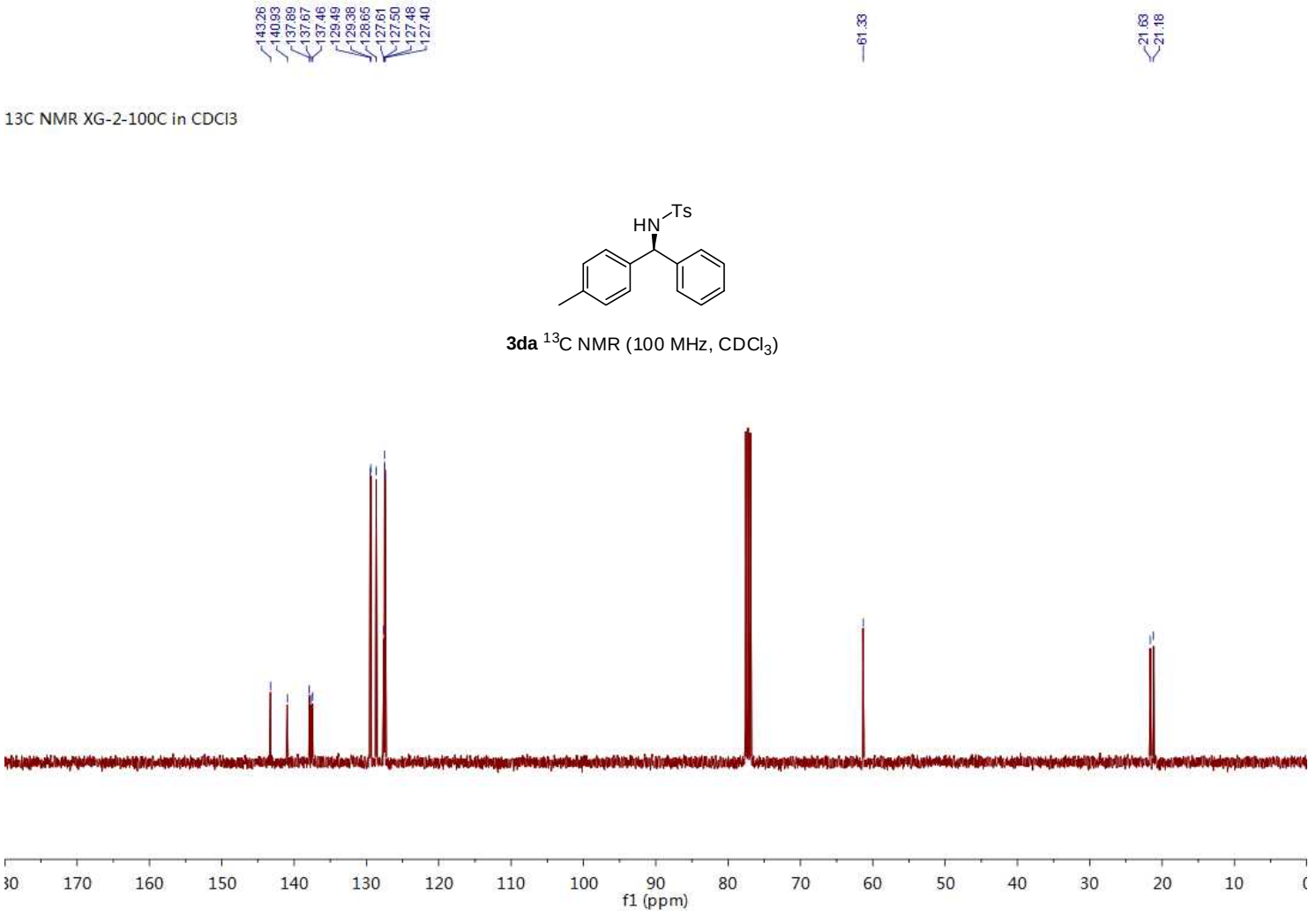
3ca ^{1}H NMR (400 MHz, $CDCl_3$)


143.60
139.50
139.31
137.20
133.40
129.79
129.65
129.26
128.88
128.08
127.75
127.66
127.51
123.32
60.82
21.69
13C NMR XG-3-13F in CDCl3
Br
HN
Ts
3ca 13C NMR (100 MHz, CDCl3)
f1 (ppm)

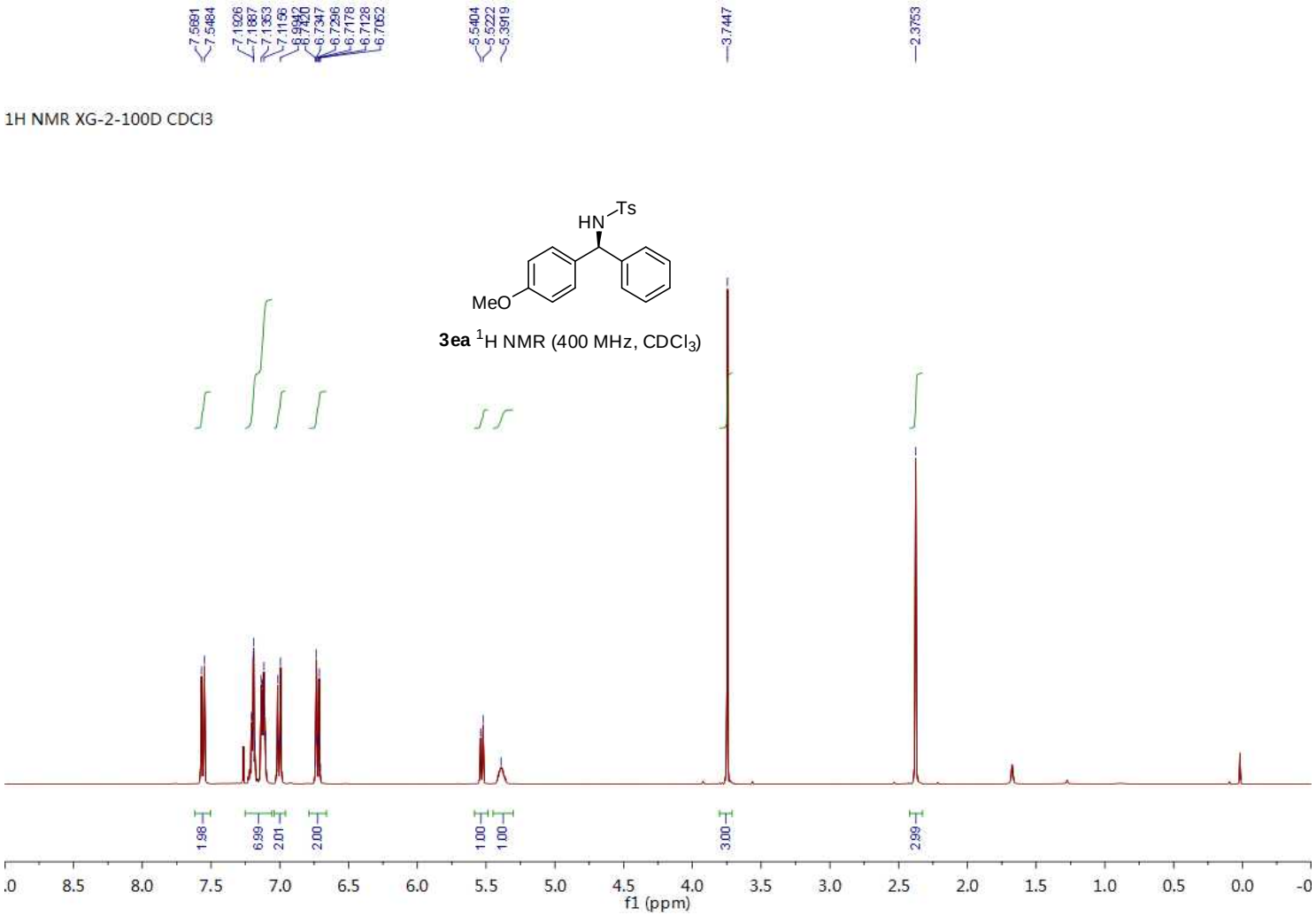
1H NMR XG-2-100C in CDCl3

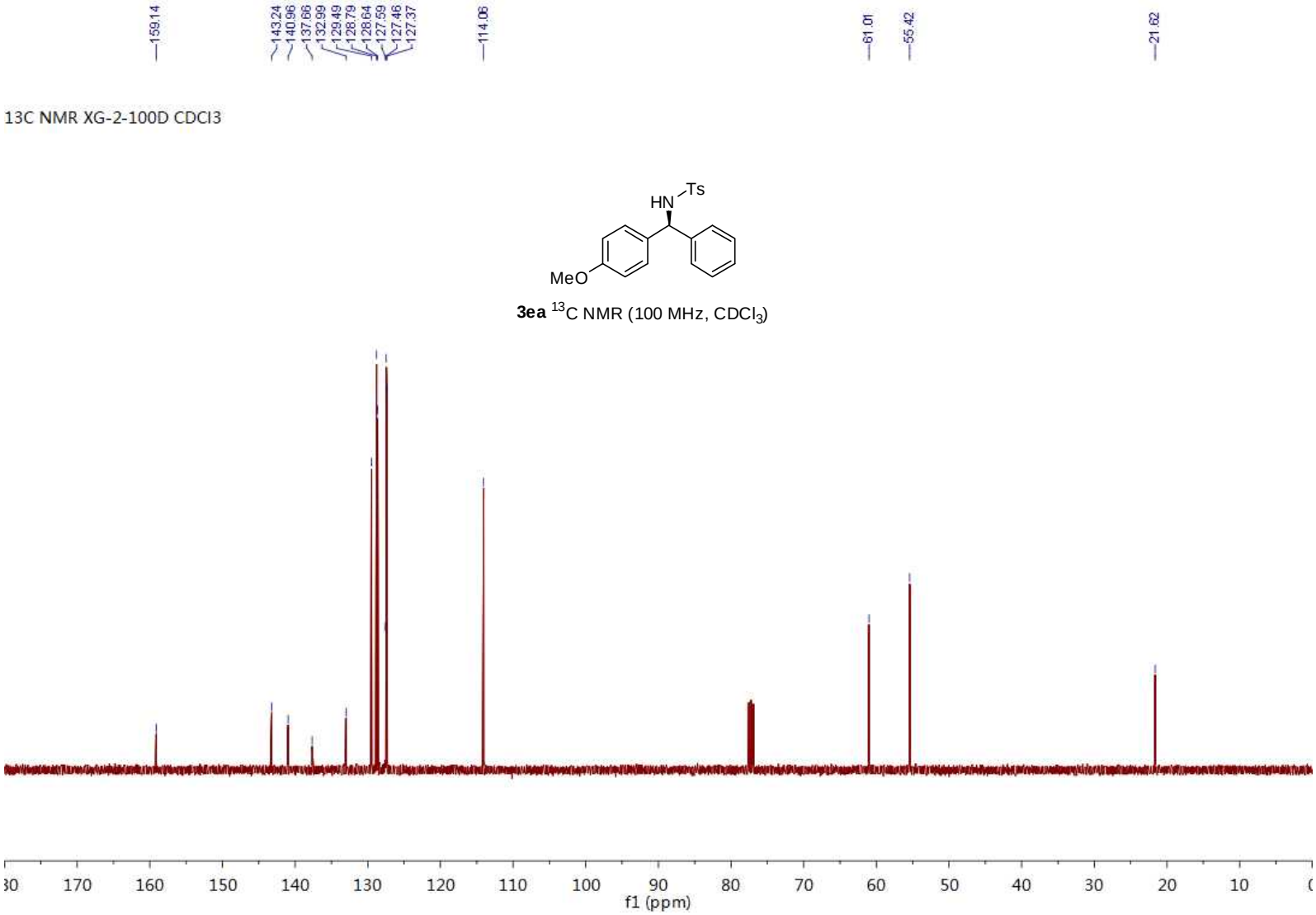


3da ^{1}H NMR (400 MHz, $CDCl_3$)

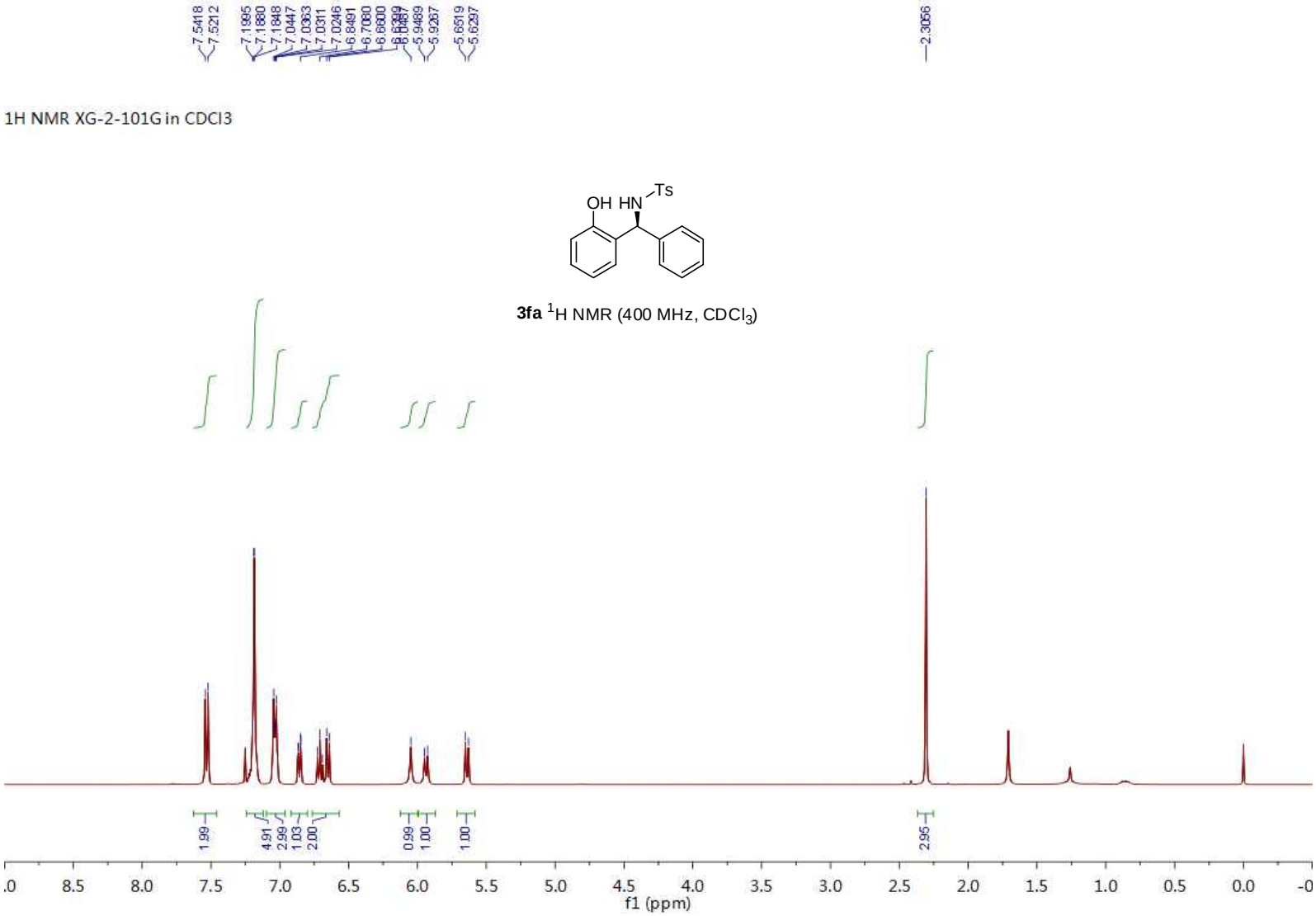


3da ^{13}C NMR (100 MHz, $CDCl_3$)

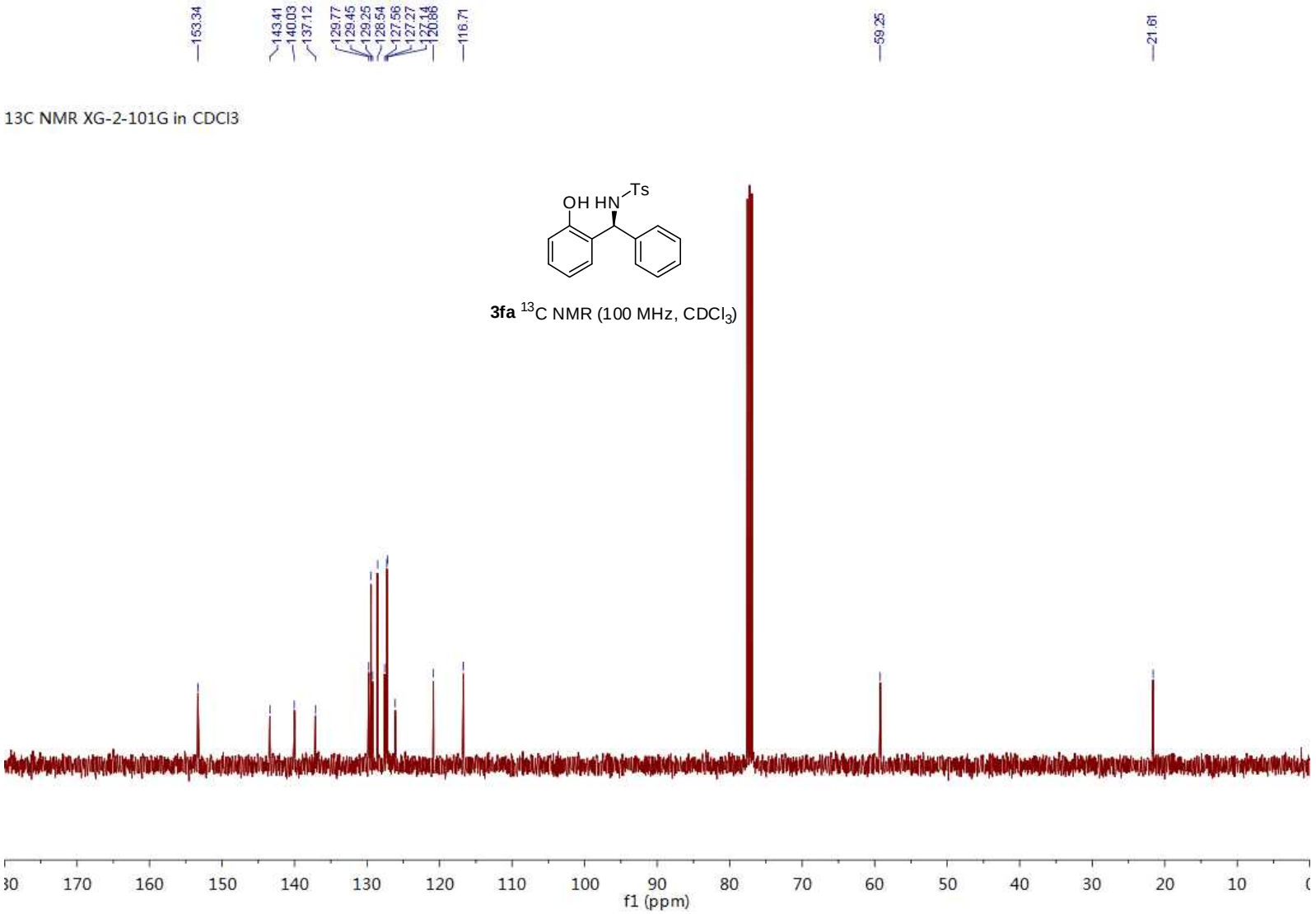

7.5691
7.5484
7.1926
7.1887
7.1353
7.1156
6.7347
6.7296
6.7178
6.7128
6.7052
5.5404
5.5222
5.3919
3.7447
2.3753
1H NMR XG-2-100D CDCl3
HN
Ts
MeO
3ea 1H NMR (400 MHz, CDCl3)
1.98
6.99
2.01
2.00
1.00
1.00
3.00
2.99
f1 (ppm)



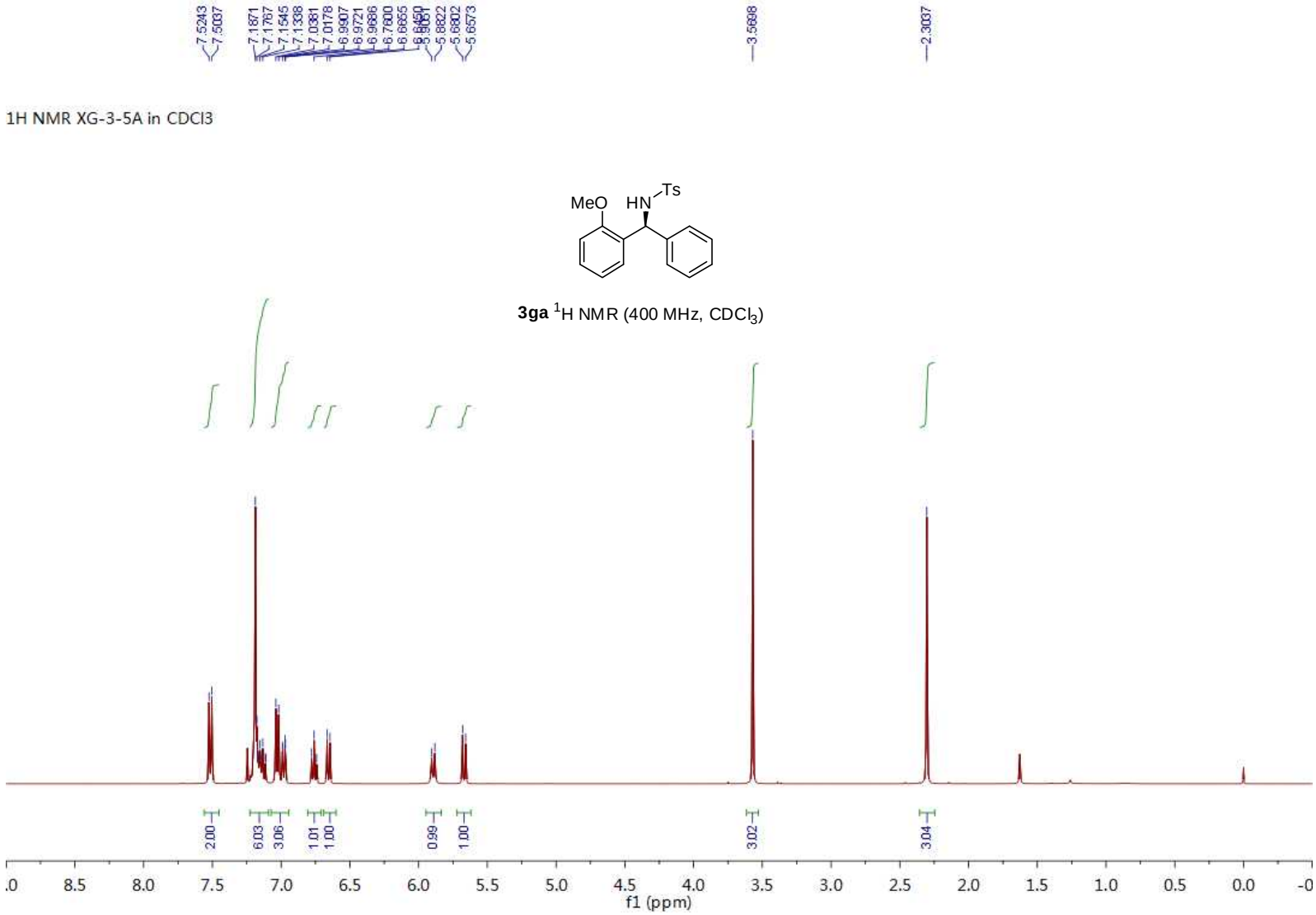
3ea ^{13}C NMR (100 MHz, $CDCl_3$)



3fa ^{1}H NMR (400 MHz, $CDCl_3$)

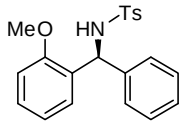


3fa ^{13}C NMR (100 MHz, $CDCl_3$)

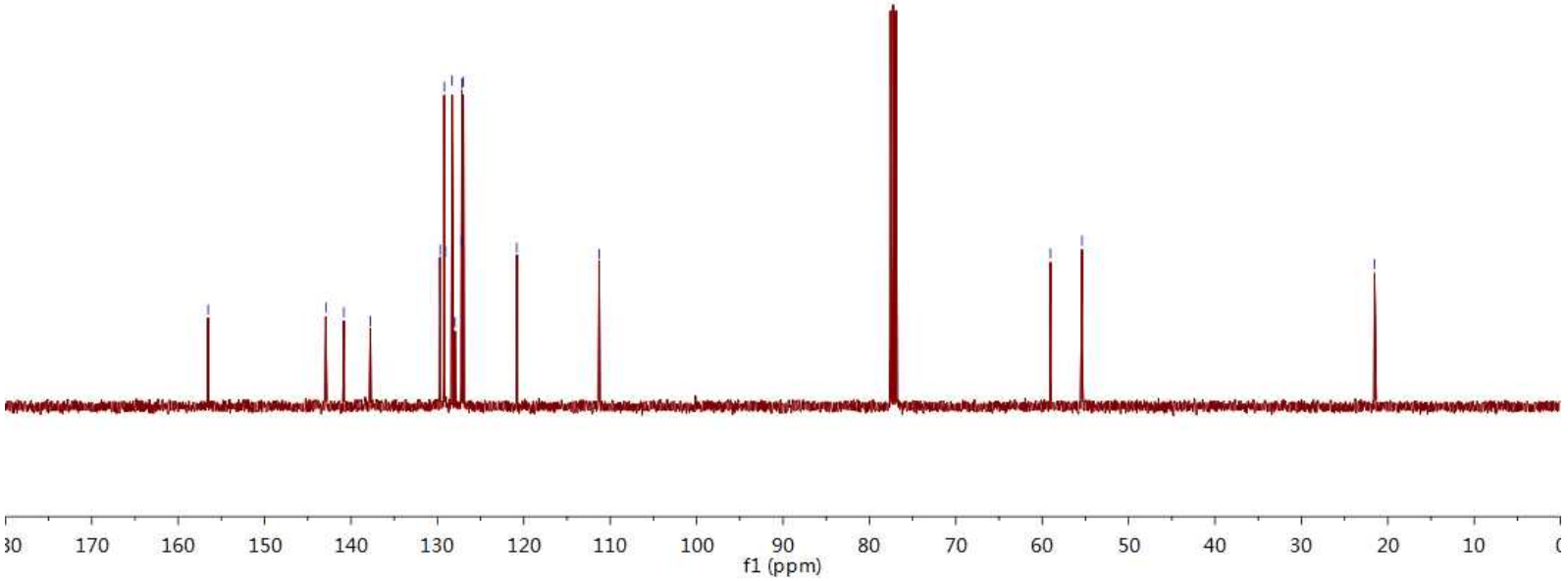


3ga ^{1}H NMR (400 MHz, $CDCl_3$)

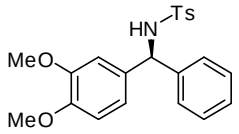
13C NMR XG-3-5A in CDCl3



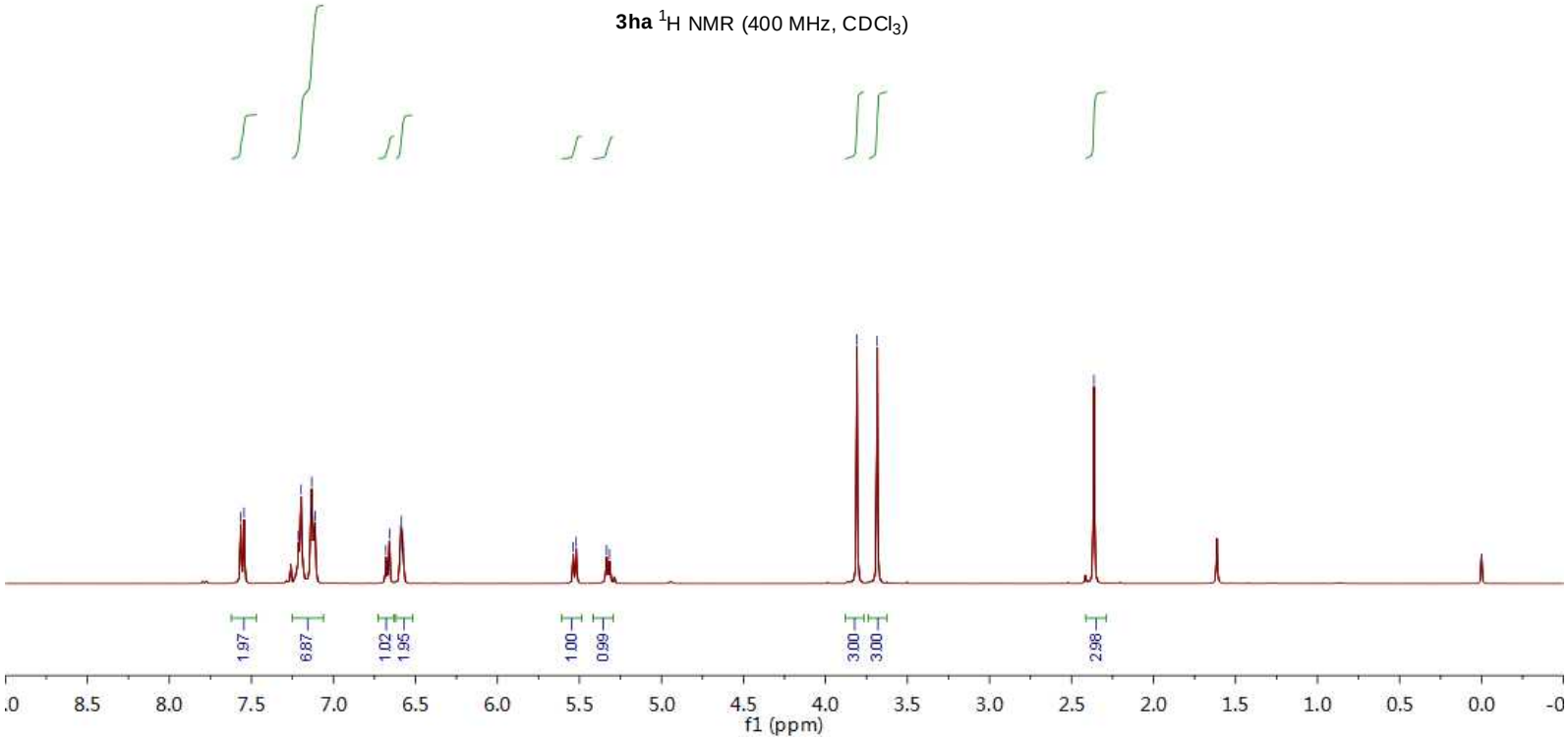
3ga ^{13}C NMR (100 MHz, $CDCl_3$)

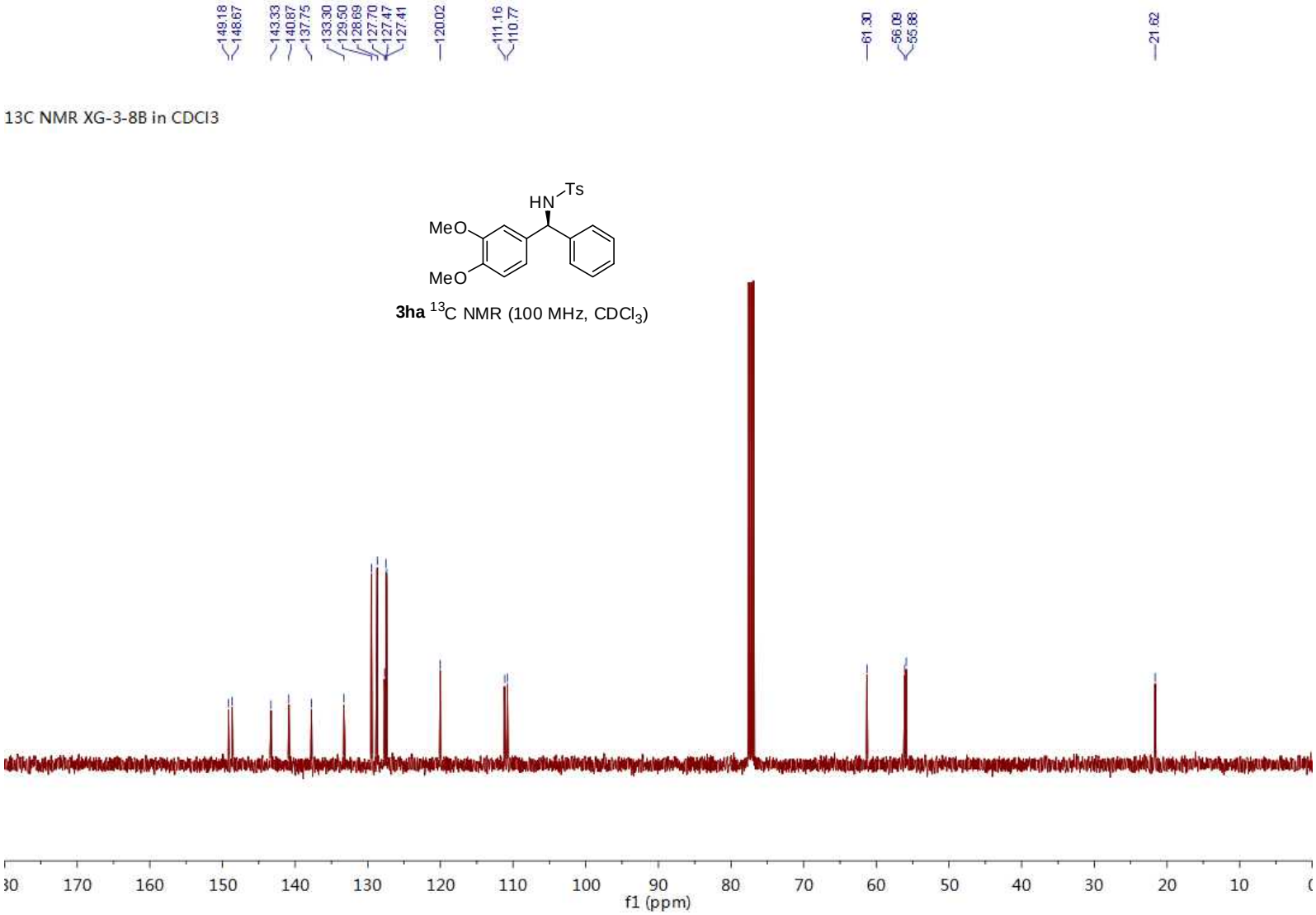


1H NMR XG-3-8B in CDCl3

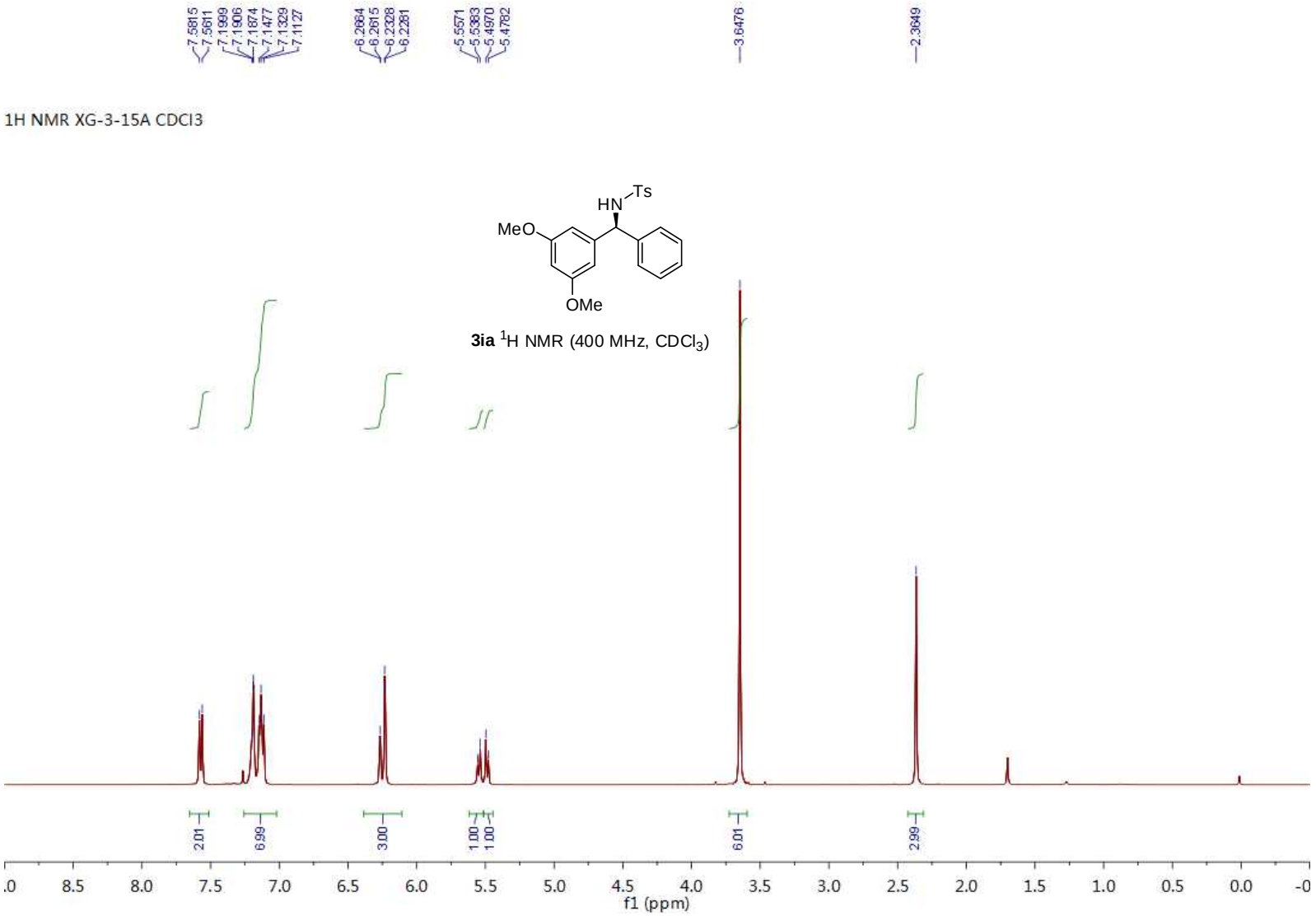


3ha ^{1}H NMR (400 MHz, $CDCl_3$)

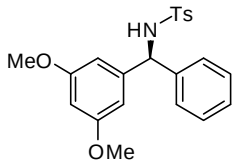




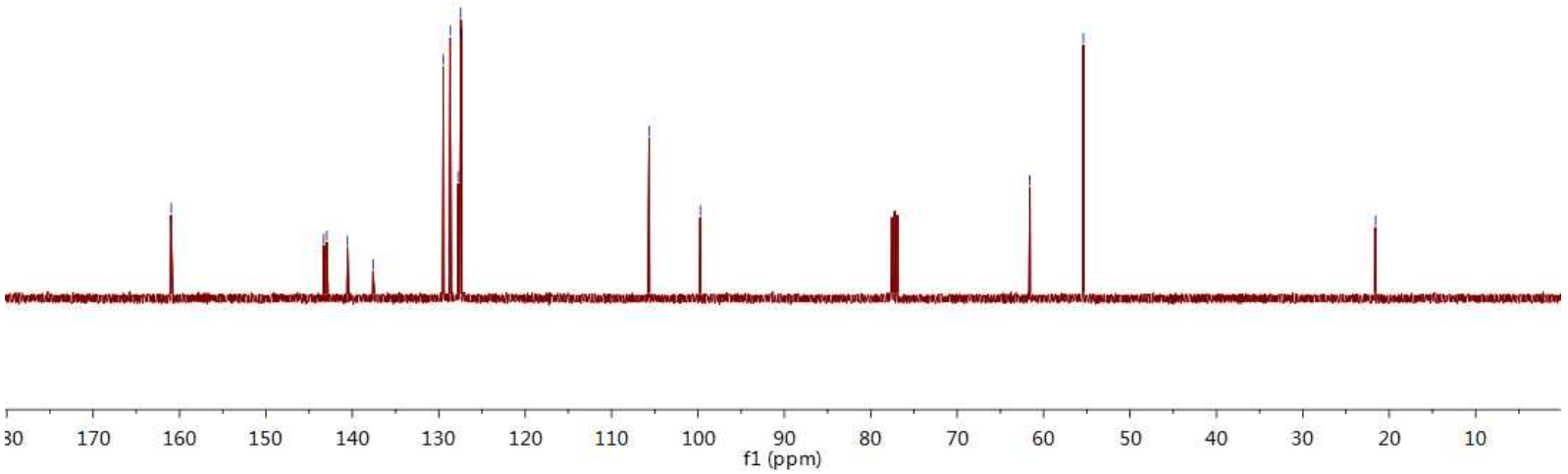
3ha ^{13}C NMR (100 MHz, $CDCl_3$)

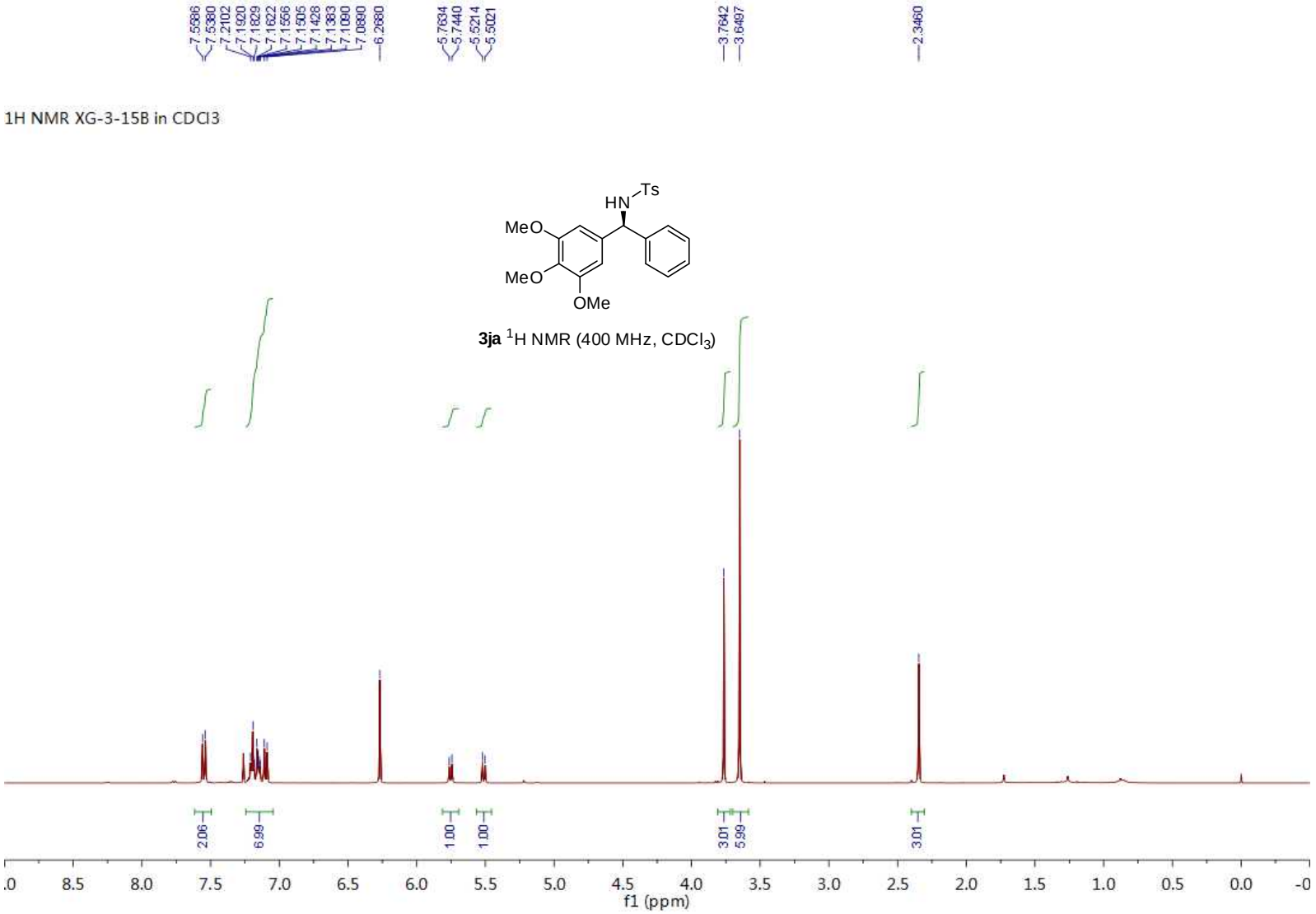

7.5815
7.5611
7.1999
7.1906
7.1674
7.1477
7.1329
7.1127
6.2664
6.2615
6.2308
6.2261
5.5571
5.5383
5.4970
5.4782
3.6476
2.3649
1H NMR XG-3-15A CDCl3
HN
Ts
MeO
OMe
3ia 1H NMR (400 MHz, CDCl3)
2.01
6.99
3.00
1.00
1.00
6.01
2.99
f1 (ppm)

13C NMR XG-3-15A CDCl3



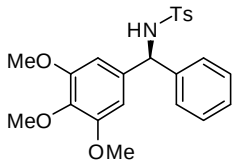
3ia ^{13}C NMR (100 MHz, $CDCl_3$)



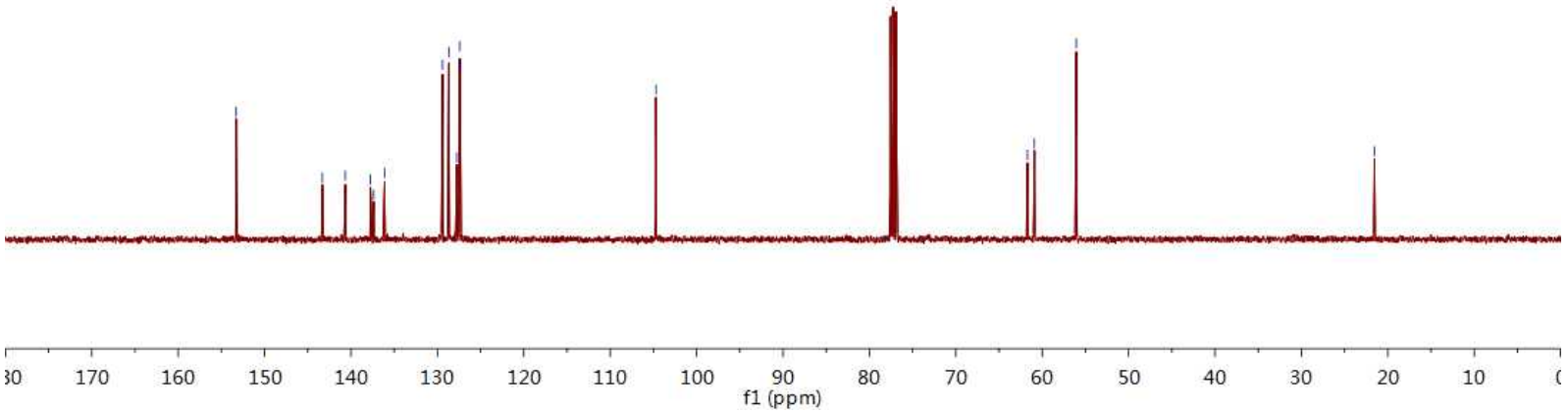


3ja ^{1}H NMR (400 MHz, $CDCl_3$)

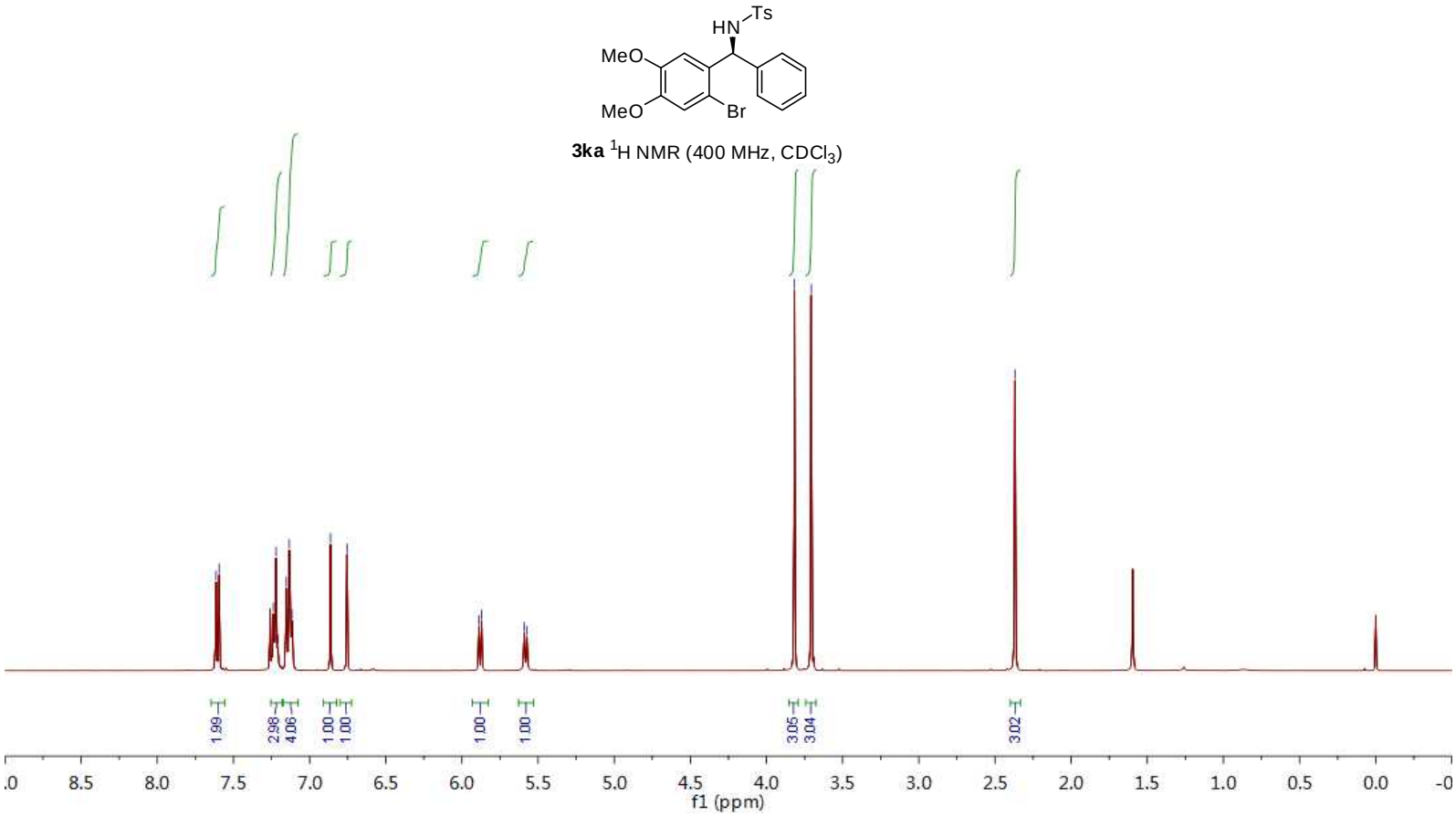
13C NMR XG-3-15B in CDCl3



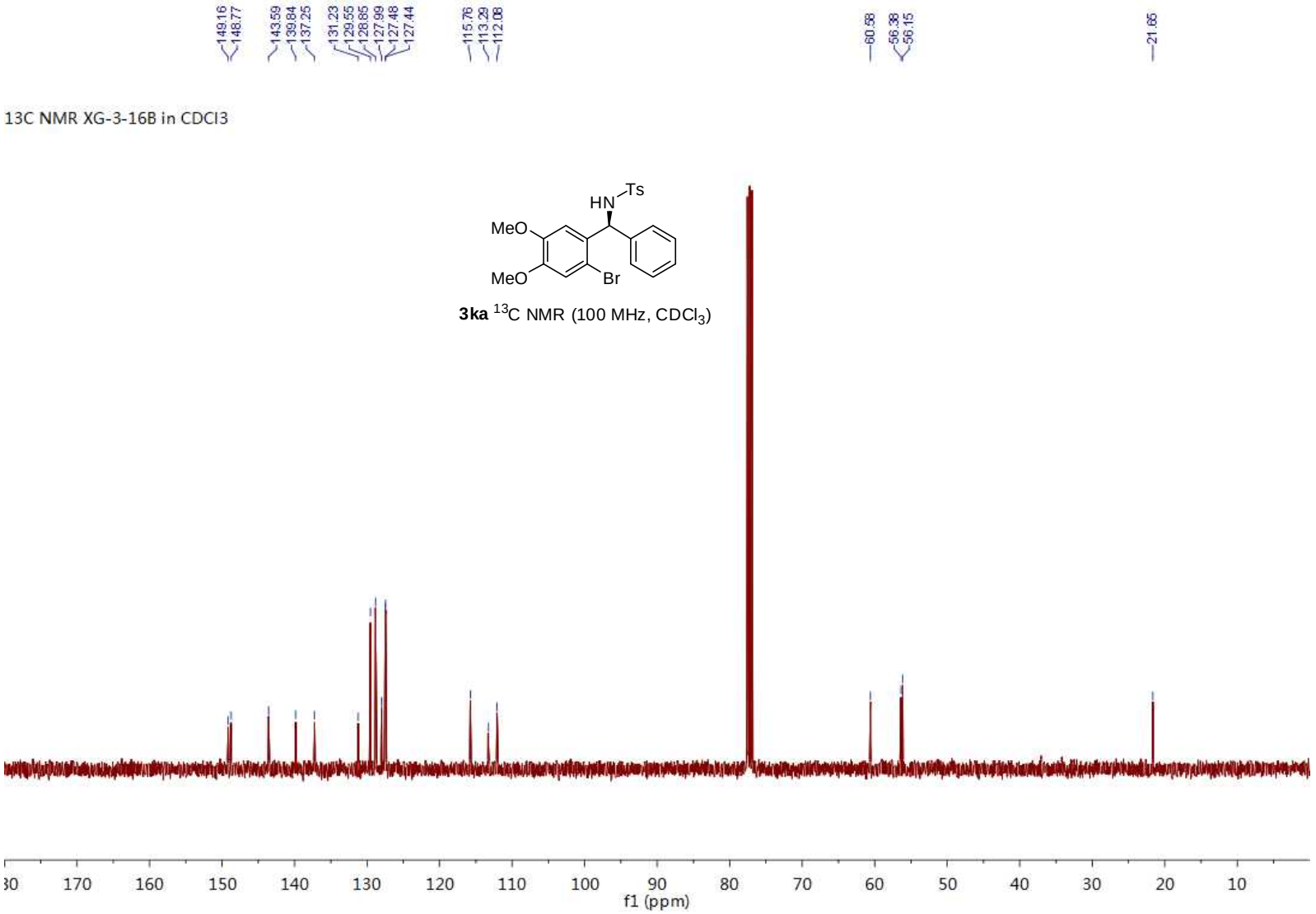
3ja ^{13}C NMR (100 MHz, $CDCl_3$)



1H NMR XG-3-16B in CDCl3

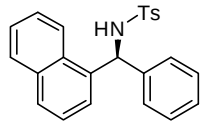


3ka ^{1}H NMR (400 MHz, $CDCl_3$)

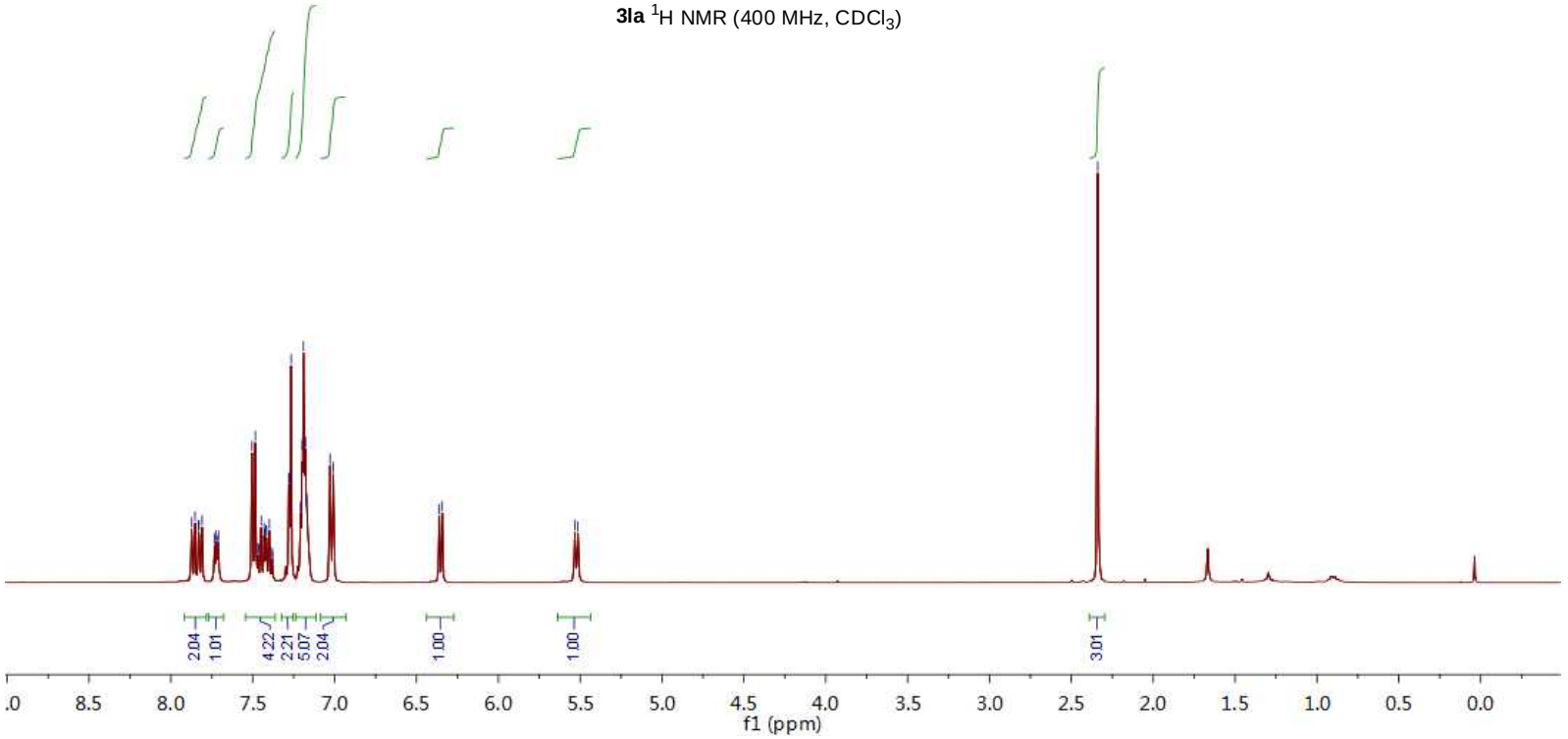


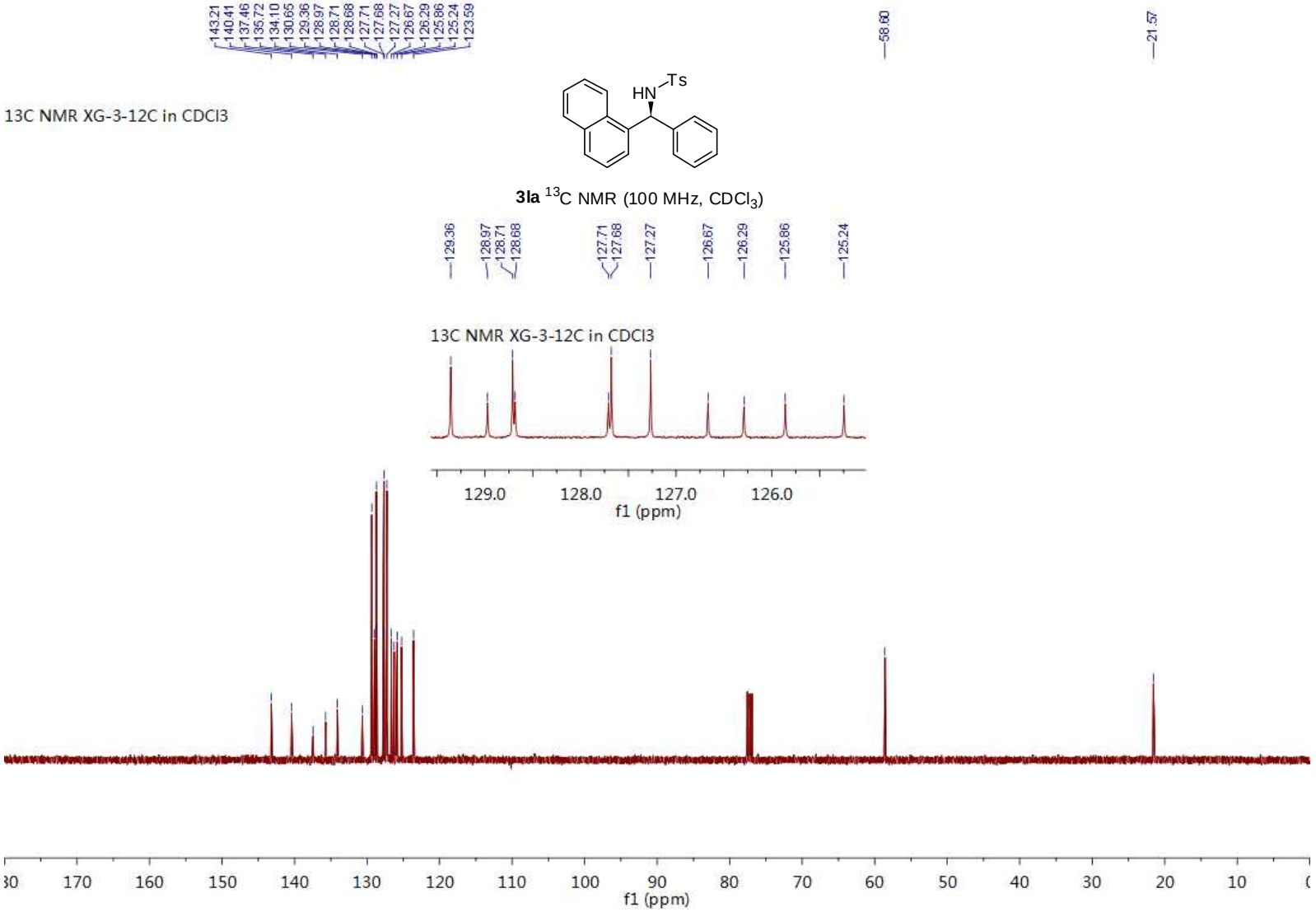
3ka ^{13}C NMR (100 MHz, $CDCl_3$)

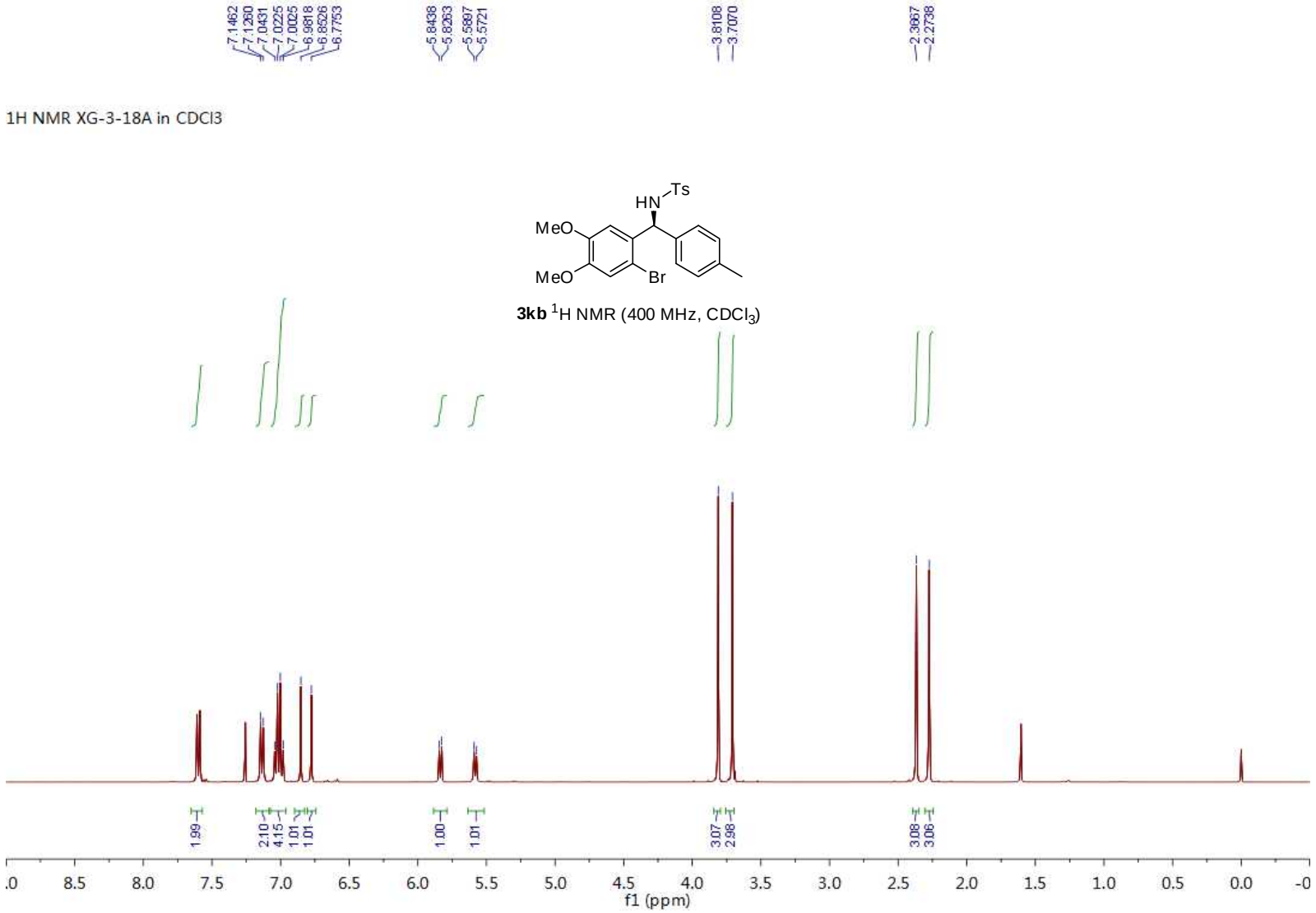
1H NMR XG-3-12C CDCL3

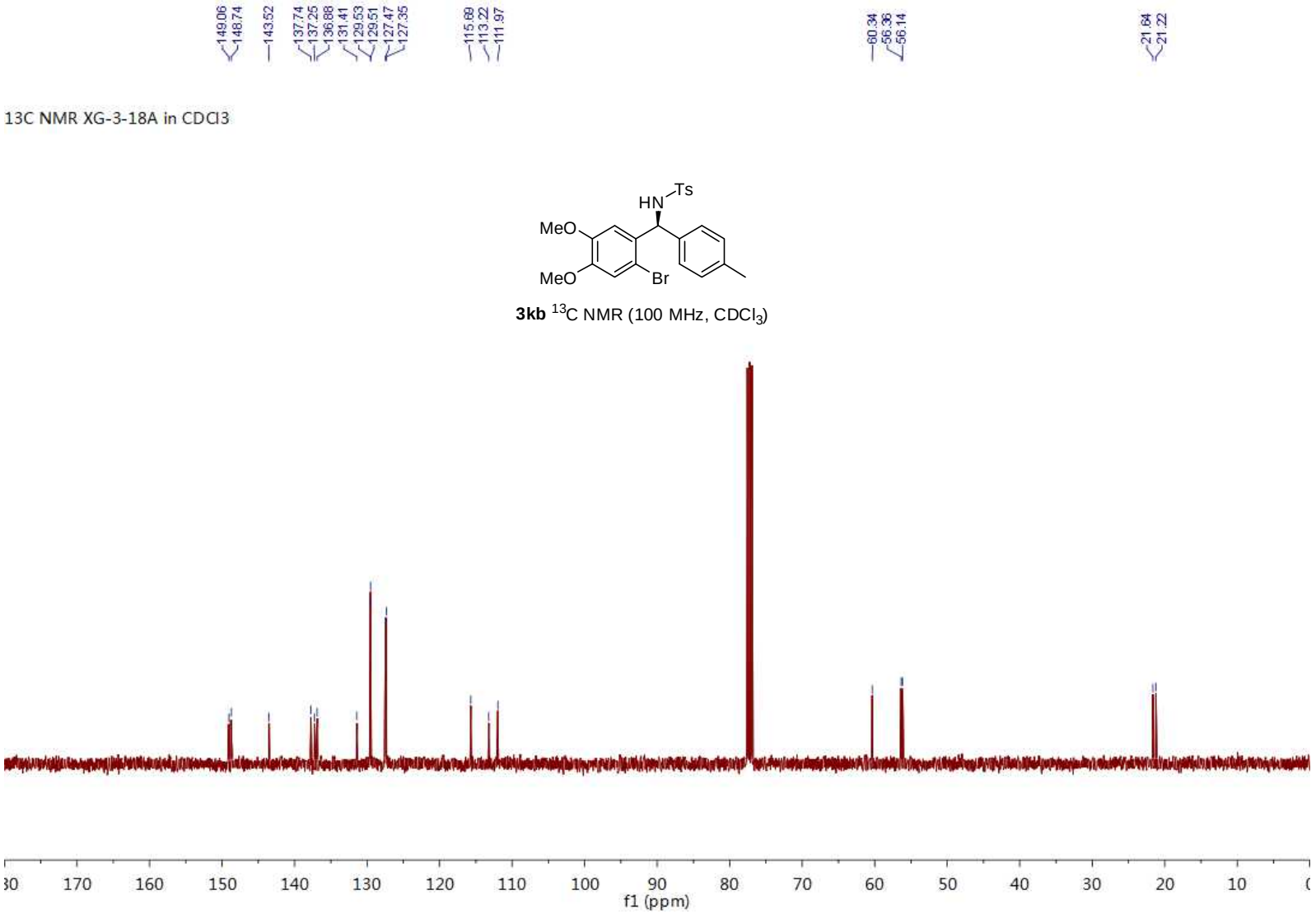


3la ^{1}H NMR (400 MHz, $CDCl_3$)

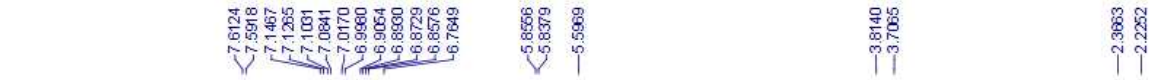



143.21
140.41
137.46
135.72
134.10
130.65
129.36
128.97
128.71
128.68
127.71
127.68
127.27
126.67
126.29
125.86
125.24
123.59
58.60
21.57
13C NMR XG-3-12C in CDCl3
HN
Ts
3la 13C NMR (100 MHz, CDCl3)
129.36
128.97
128.71
128.68
127.71
127.68
127.27
126.67
126.29
125.86
125.24
13C NMR XG-3-12C in CDCl3
129.0
128.0
127.0
126.0
f1 (ppm)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

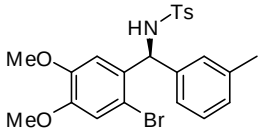

7.1462
7.1260
7.0431
7.0225
7.0025
6.9818
6.8526
6.7753
5.8438
5.8263
5.5897
5.5721
3.8108
3.7070
2.3667
2.2738
1H NMR XG-3-18A in CDCl3
HN
Ts
MeO
MeO
Br
3kb 1H NMR (400 MHz, CDCl3)
1.99
2.10
4.15
1.01
1.01
1.00
1.01
3.07
2.98
3.08
3.06
f1 (ppm)



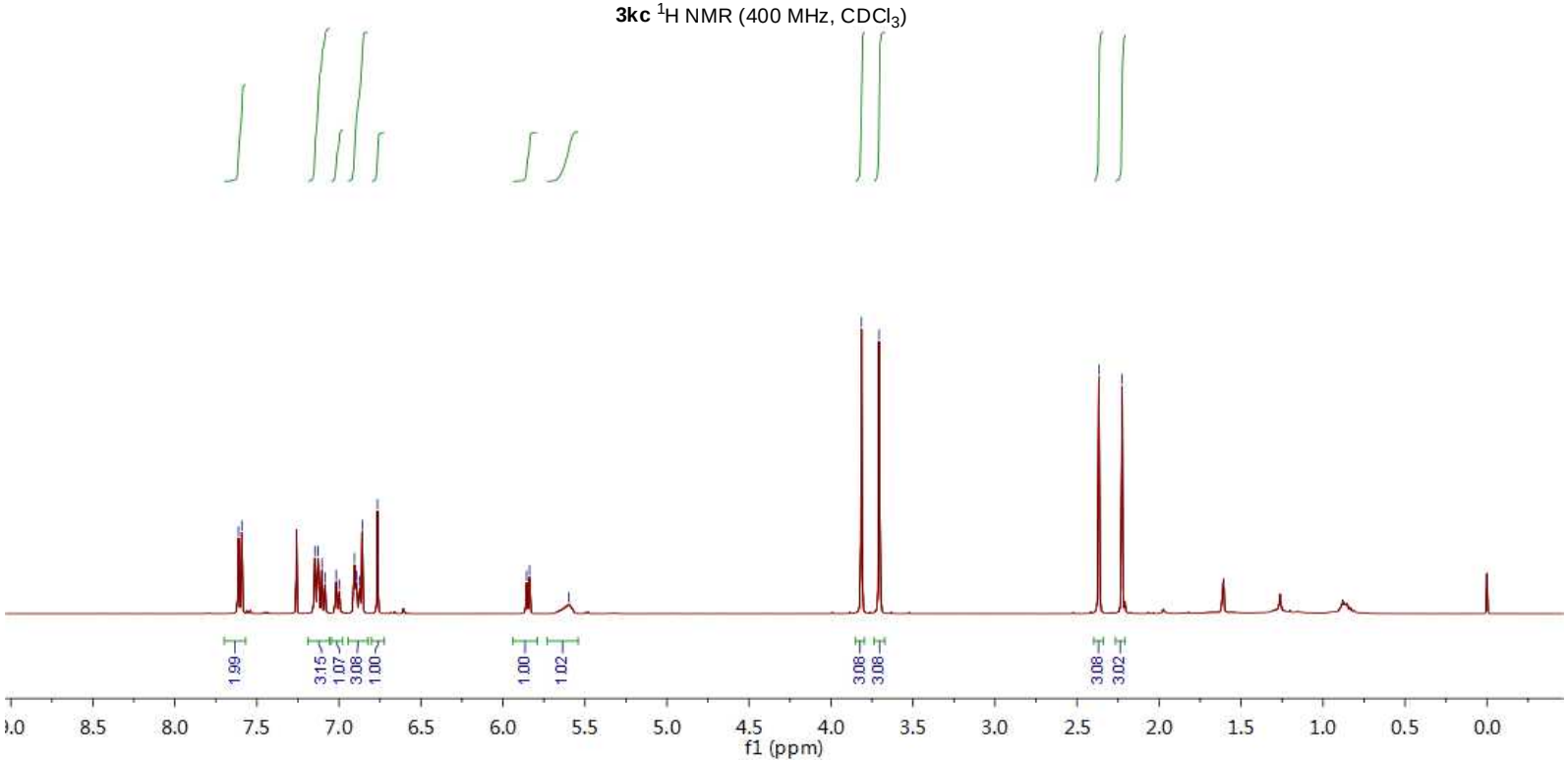
3kb ^{13}C NMR (100 MHz, $CDCl_3$)

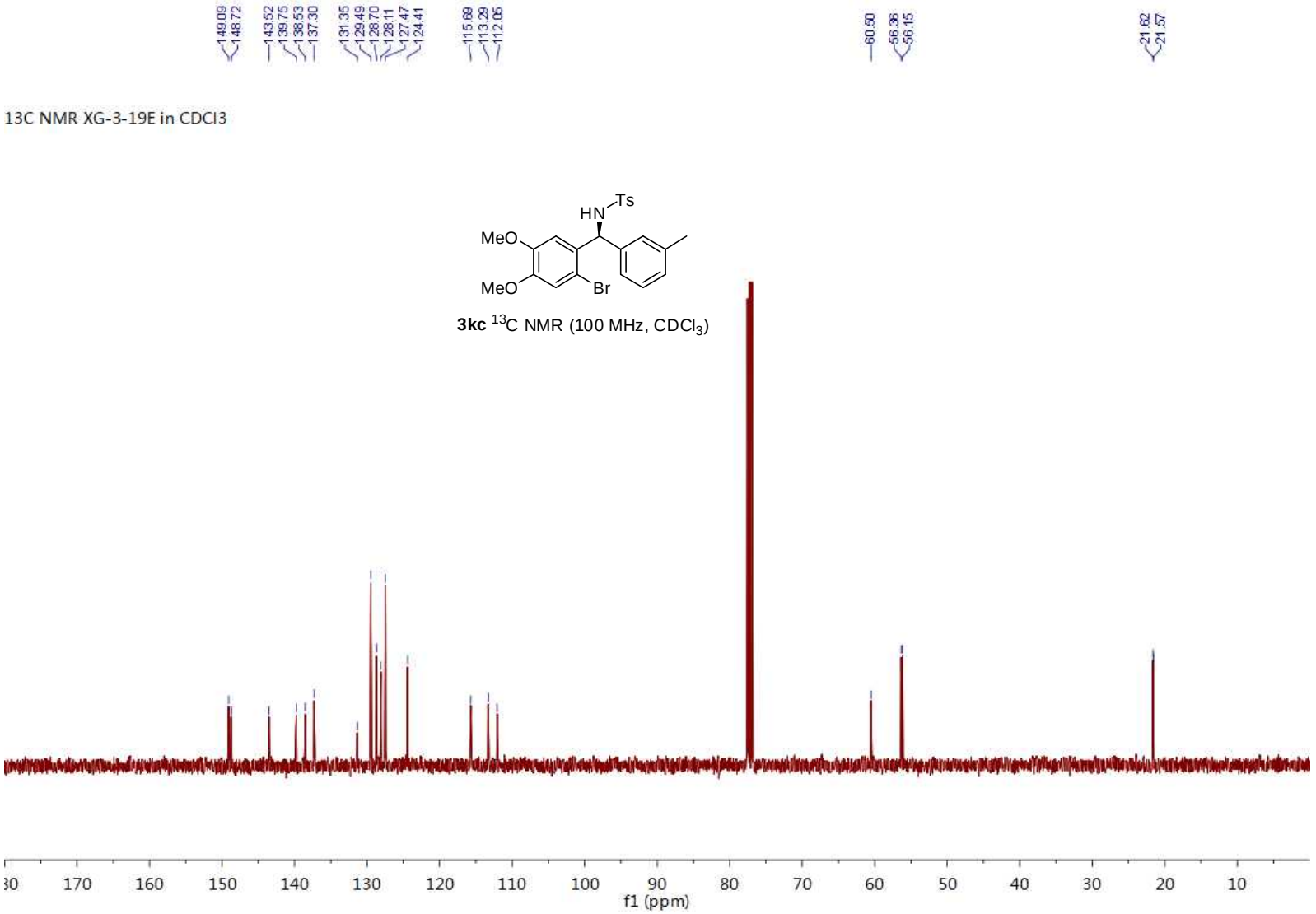


1H NMR XG-3-19E in CDCl3

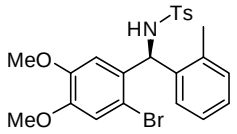


3kc ^{1}H NMR (400 MHz, $CDCl_3$)

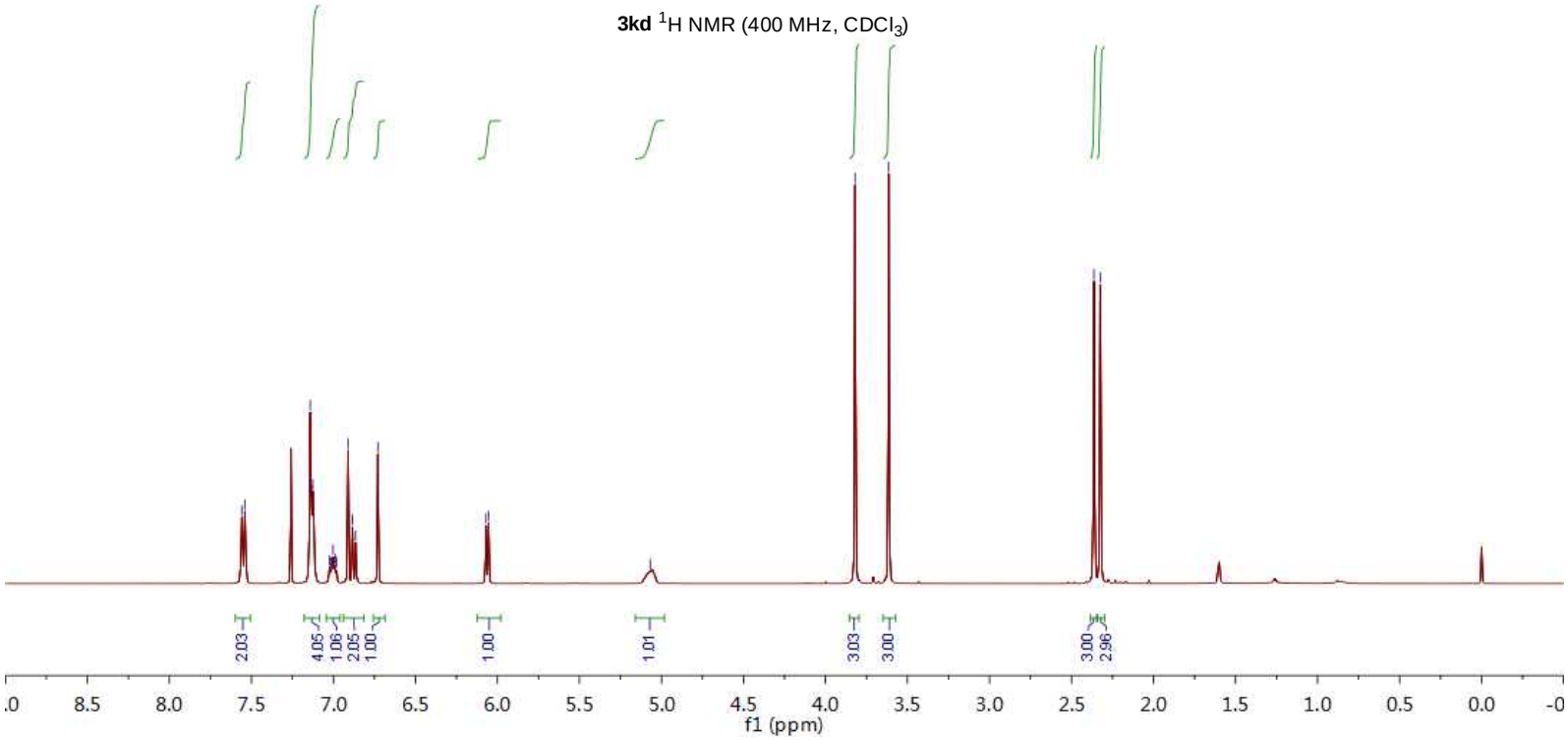


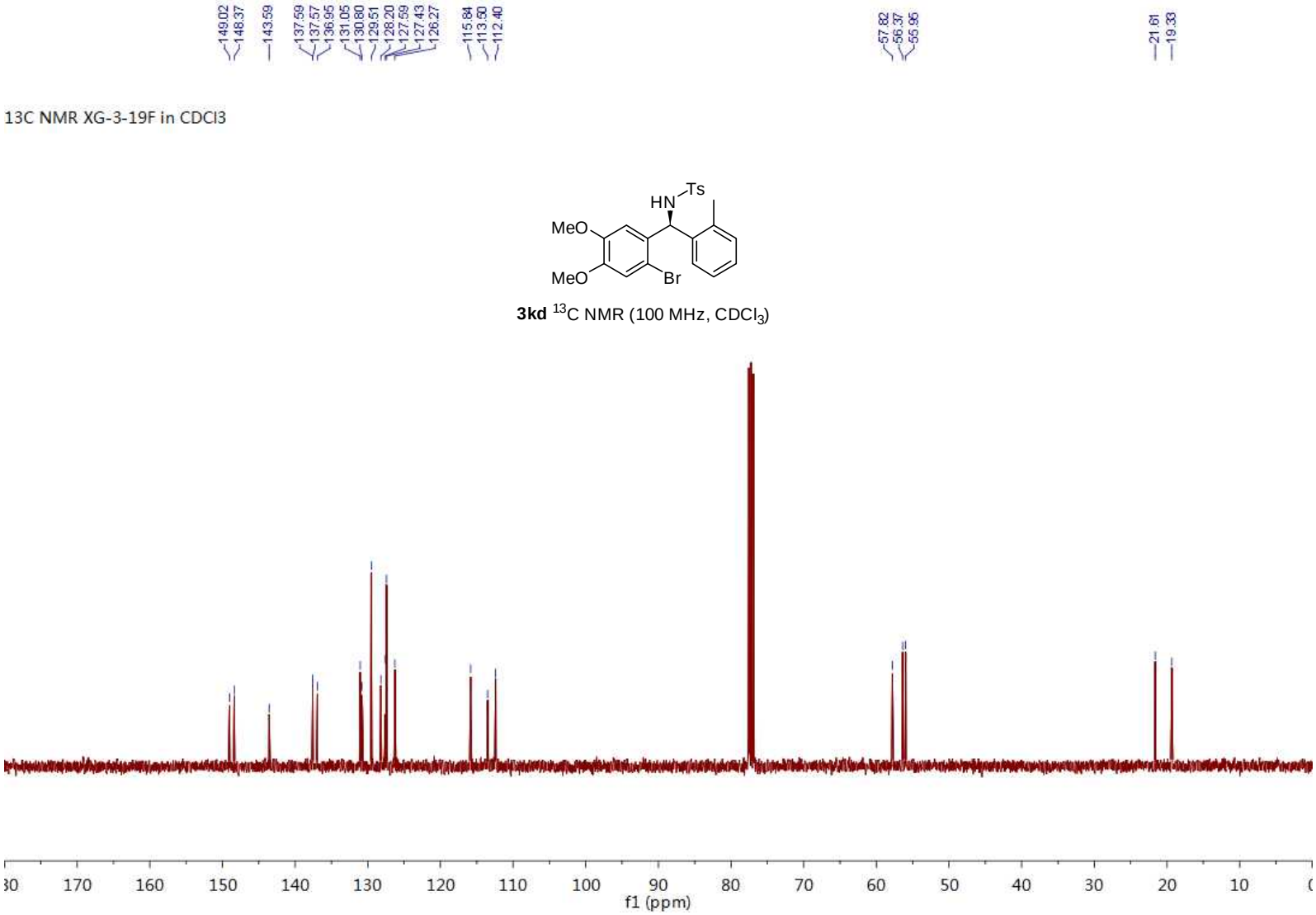

149.09
148.72
143.52
139.75
138.53
137.30
131.35
129.49
128.70
128.11
127.47
124.41
115.69
113.29
112.05
60.50
56.36
56.15
21.62
21.57
13C NMR XG-3-19E in CDCl3
HN
Ts
MeO
MeO
Br
3kc 13C NMR (100 MHz, CDCl3)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

1H NMR XG-3-19F in CDCl3

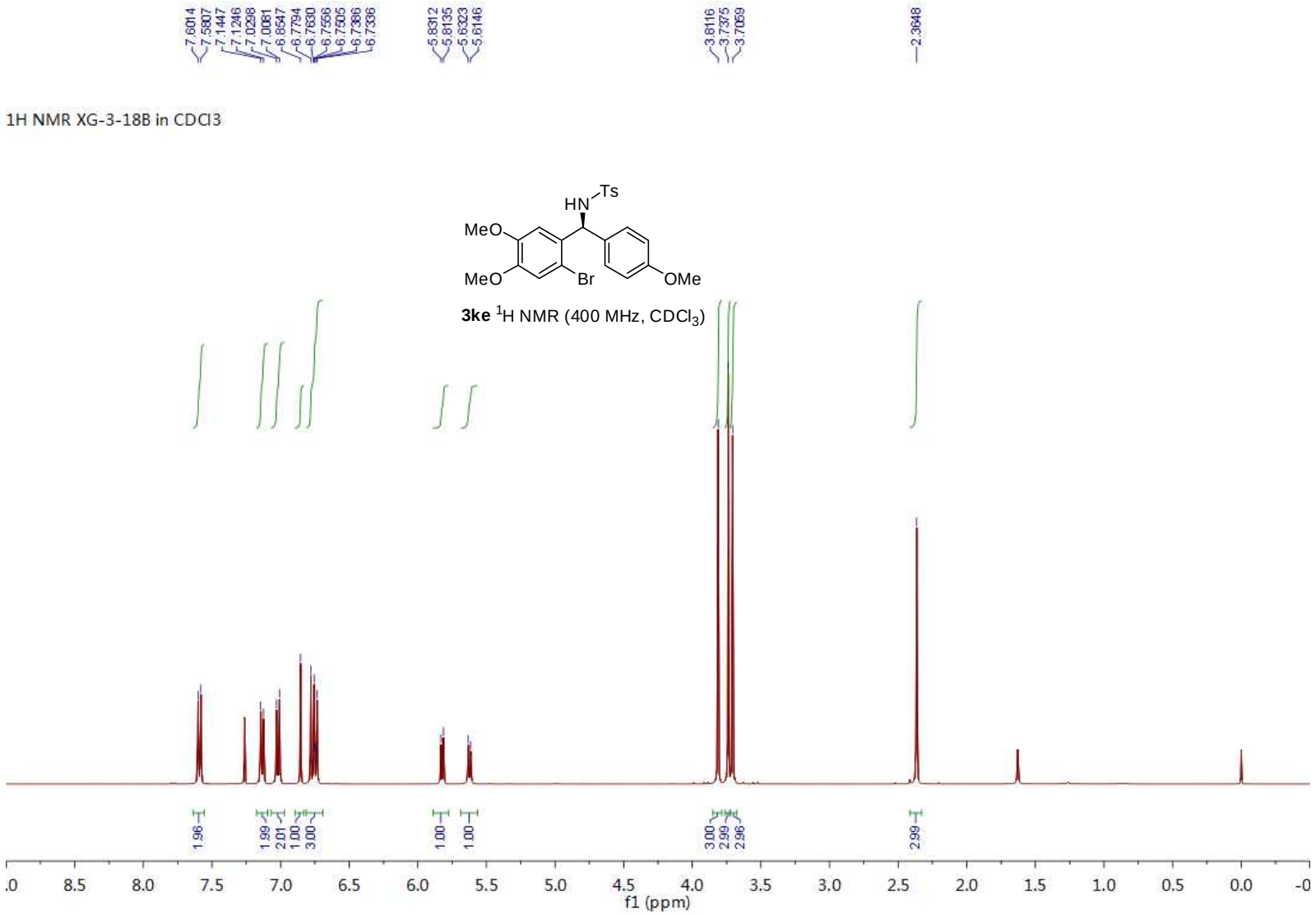


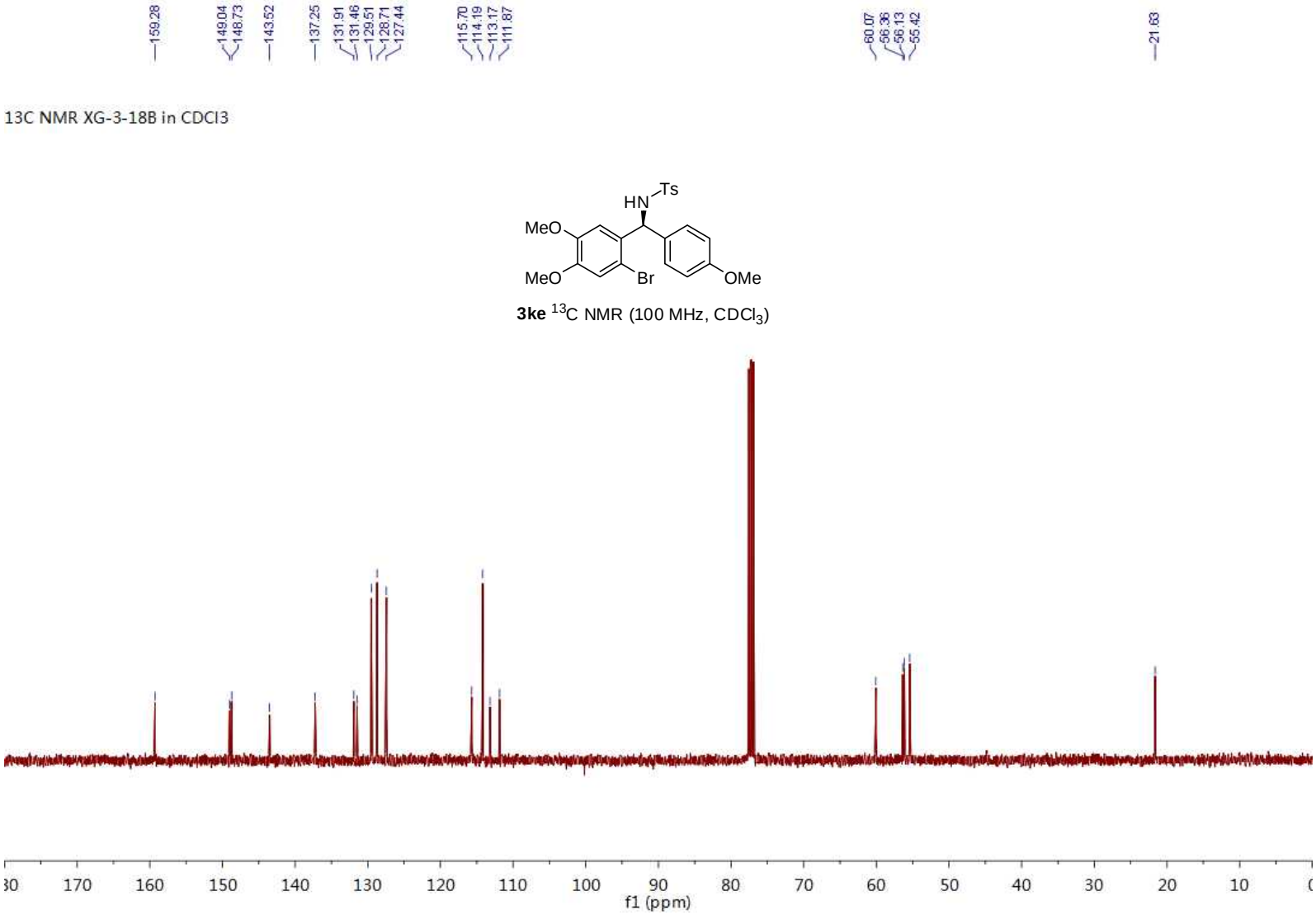
3kd ^{1}H NMR (400 MHz, $CDCl_3$)





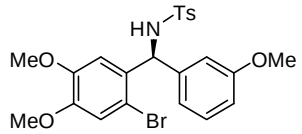
3kd ^{13}C NMR (100 MHz, $CDCl_3$)


7.6014
7.5807
7.1447
7.1246
7.0298
7.0061
6.8547
6.7794
6.7630
6.7556
6.7505
6.7366
6.7336
5.8312
5.8135
5.6323
5.6146
3.8116
3.7375
3.7069
2.3648
1H NMR XG-3-18B in CDCl3
HN
Ts
MeO
MeO
Br
OMe
3ke 1H NMR (400 MHz, CDCl3)
1.96
1.99
2.01
1.00
3.00
1.00
1.00
3.00
2.99
2.96
2.99
f1 (ppm)

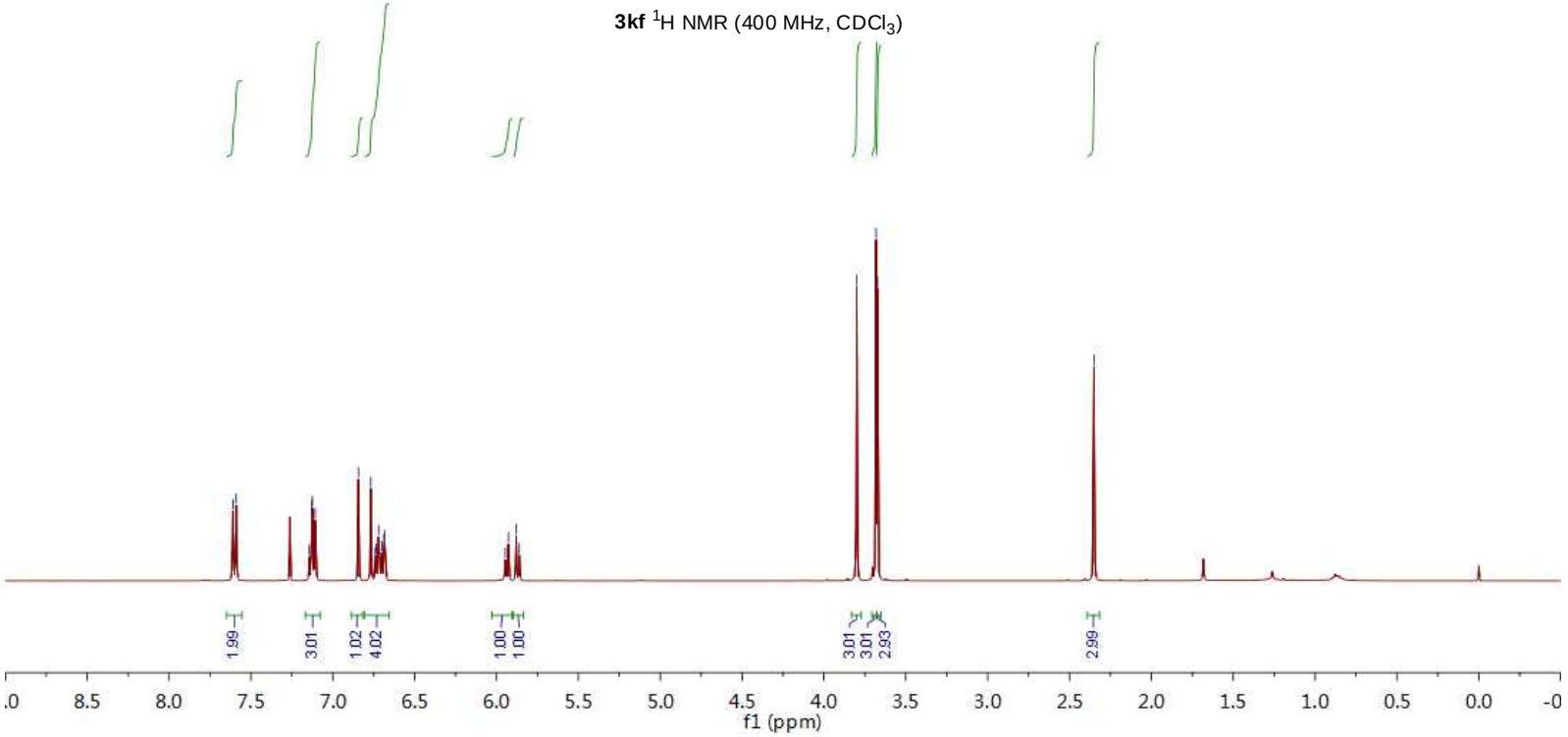


3ke ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR XG-3-19G in CDCl3

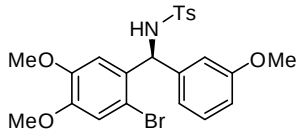


3kf ^{1}H NMR (400 MHz, $CDCl_3$)

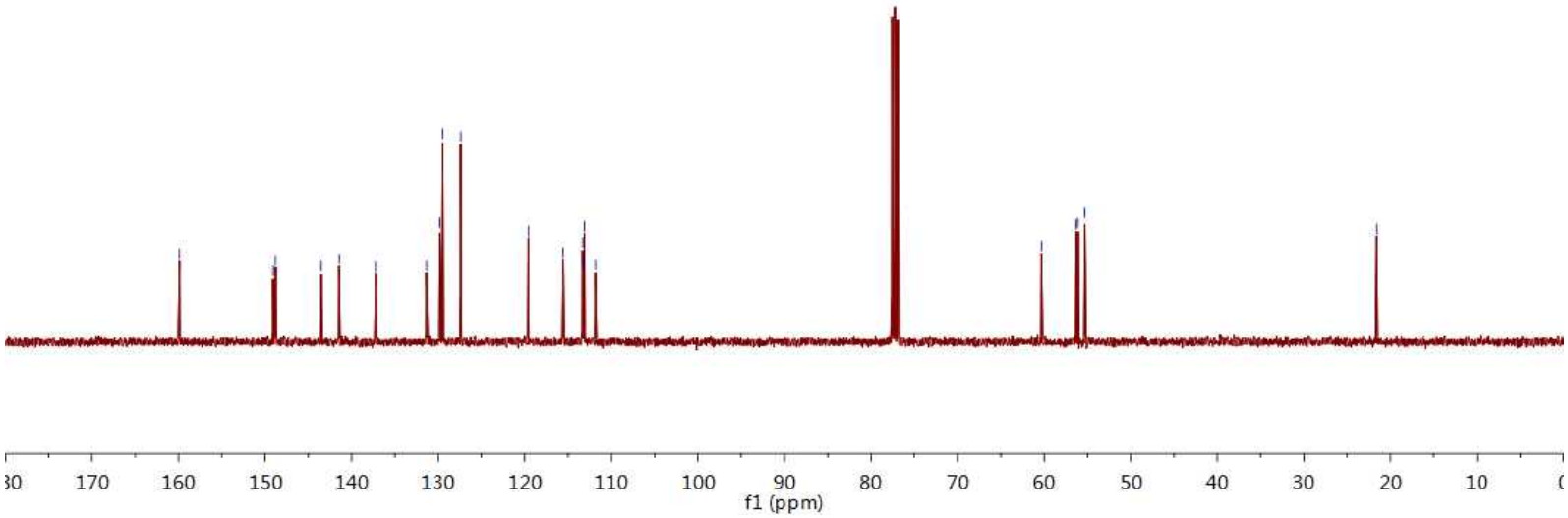


159.90
149.07
148.79
143.50
141.44
137.21
131.36
129.80
129.48
127.39
119.57
115.56
113.30
113.22
113.09
111.83
60.31
56.31
56.09
55.30
21.68

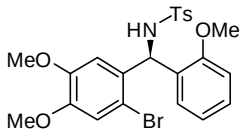
13C NMR XG-3-19G in CDCl3



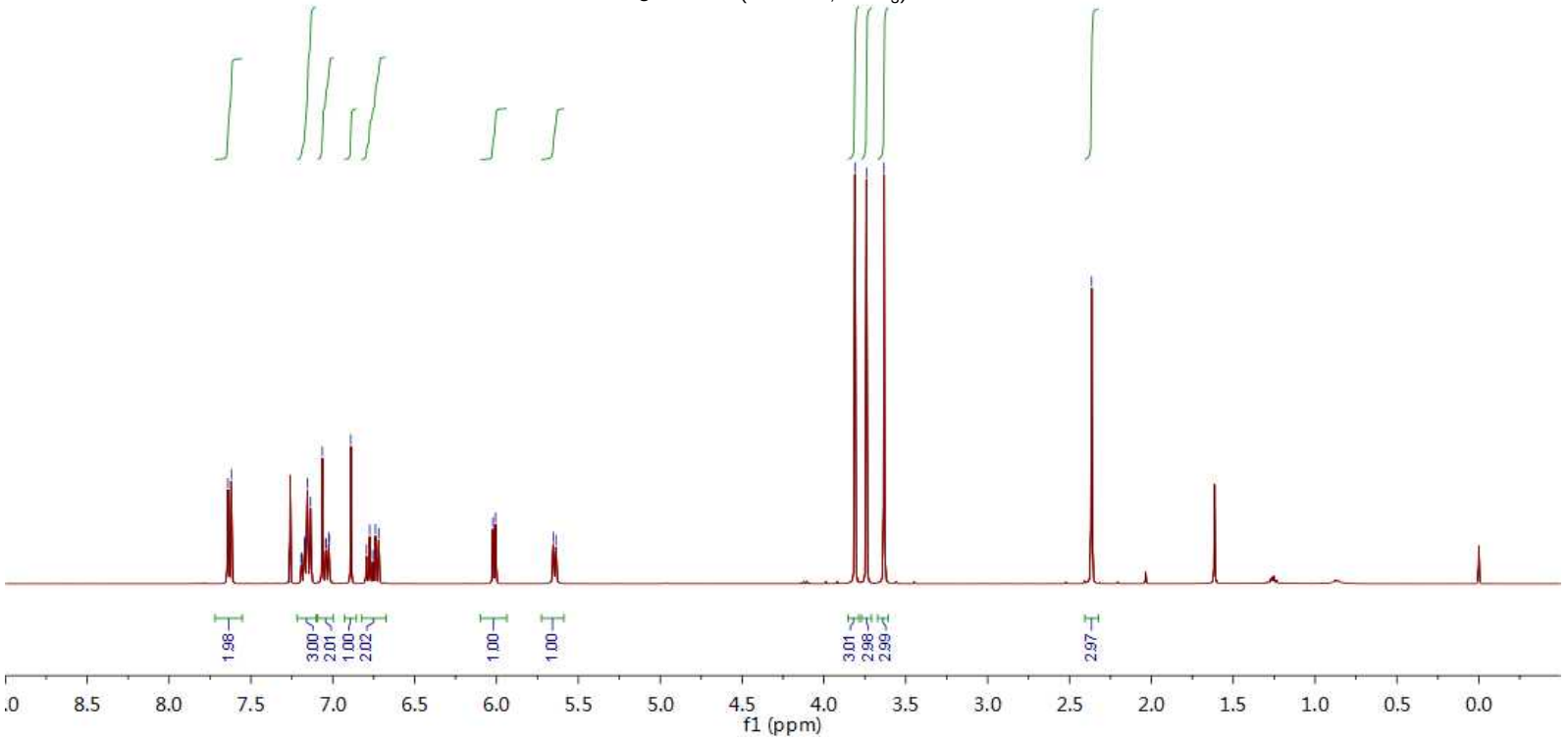
3kf ^{13}C NMR (100 MHz, $CDCl_3$)



1H NMR XG-3-20H in CDCl3

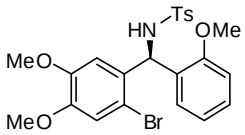


3kg ^{1}H NMR (400 MHz, $CDCl_3$)

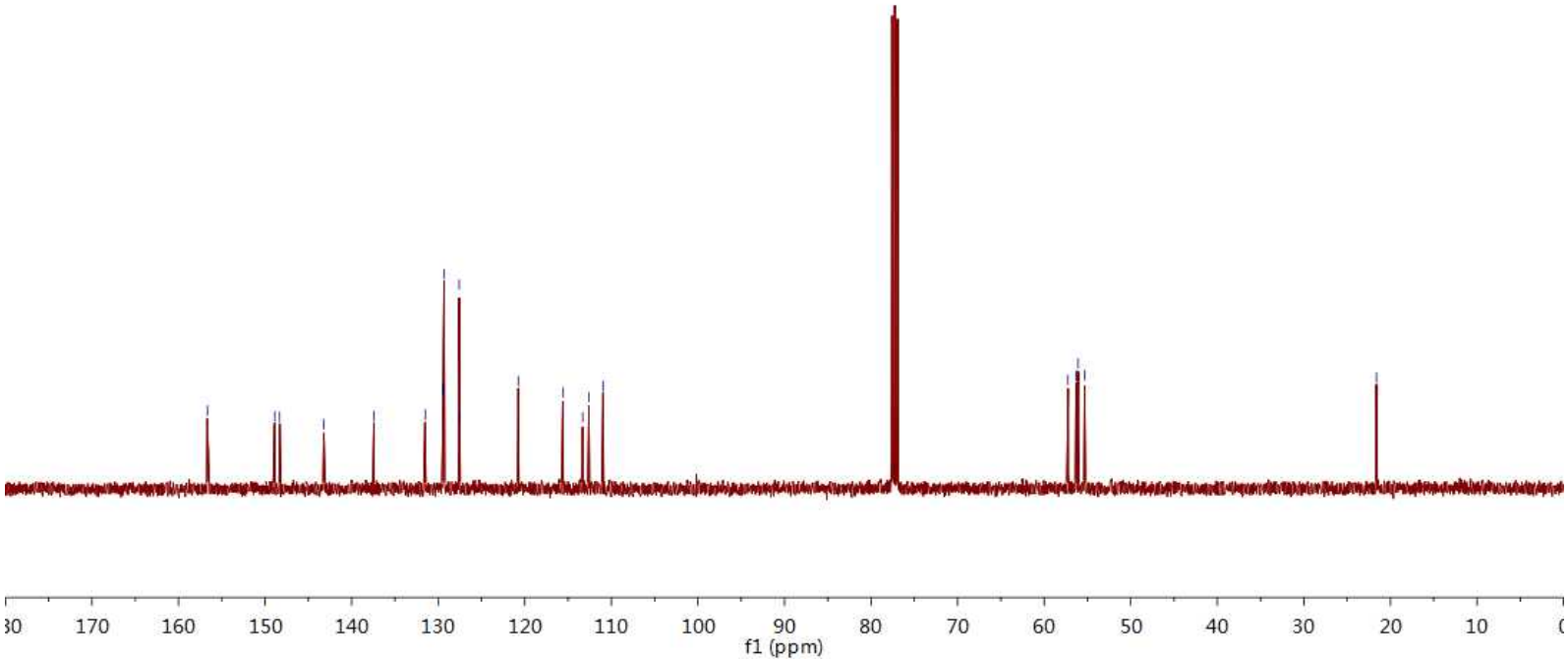


156.67
148.89
148.31
143.22
137.43
131.50
129.48
129.42
129.32
127.58
127.48
120.74
115.60
113.31
112.59
110.97
57.26
56.31
56.08
55.32
21.61

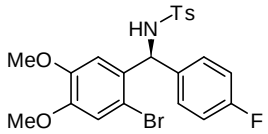
13C NMR XG-3-20H in CDCl3



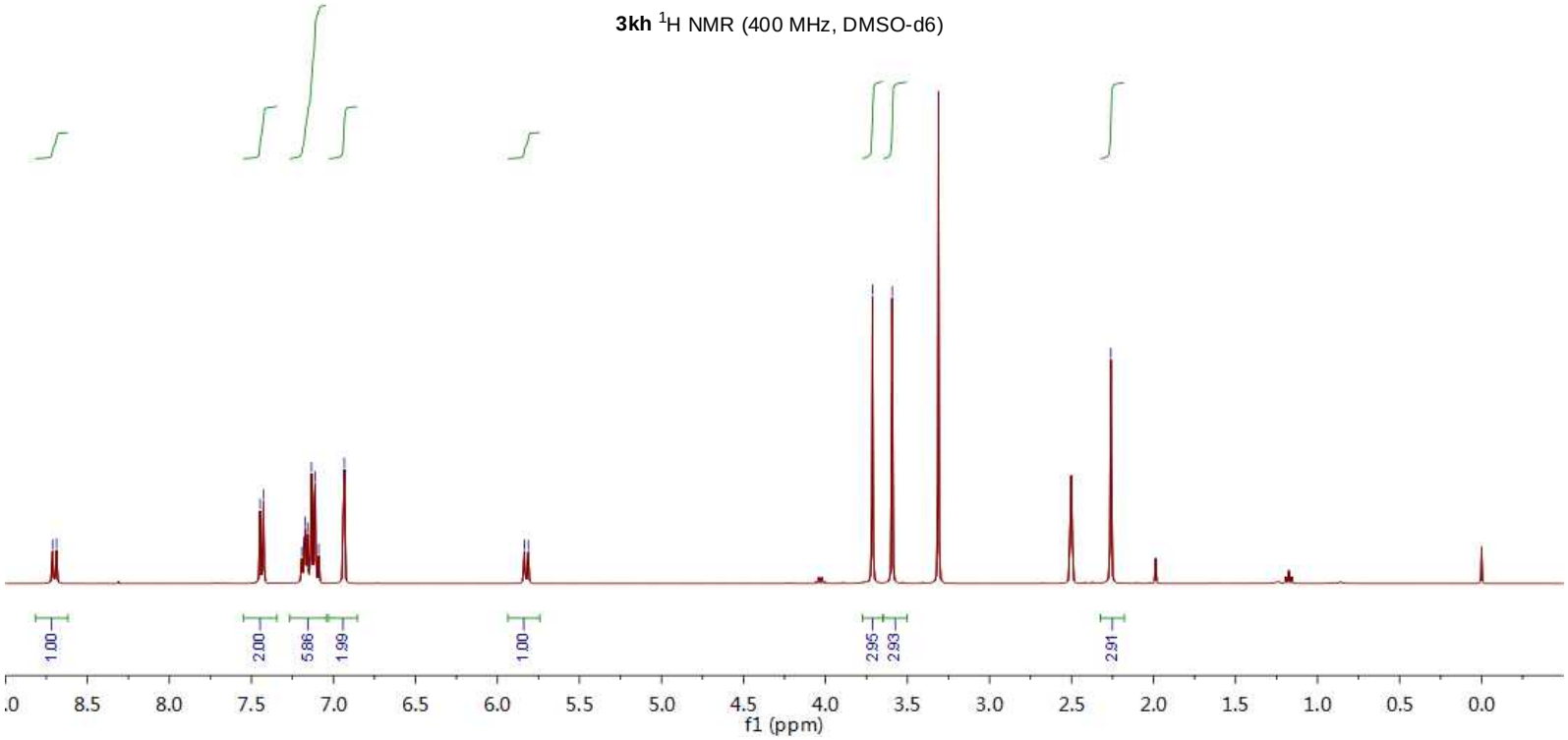
3kg ^{13}C NMR (100 MHz, $CDCl_3$)



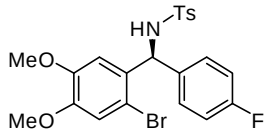
1H NMR XG-3-18C in DMSO-d6



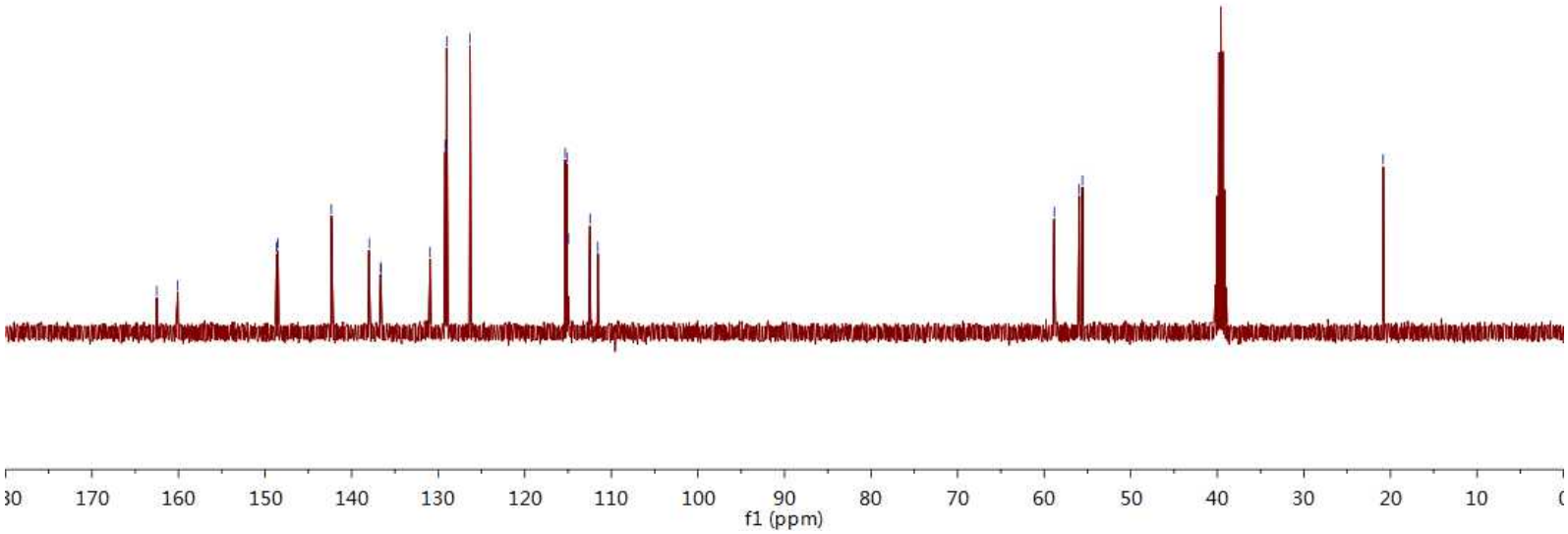
3kh ^{1}H NMR (400 MHz, DMSO-d6)

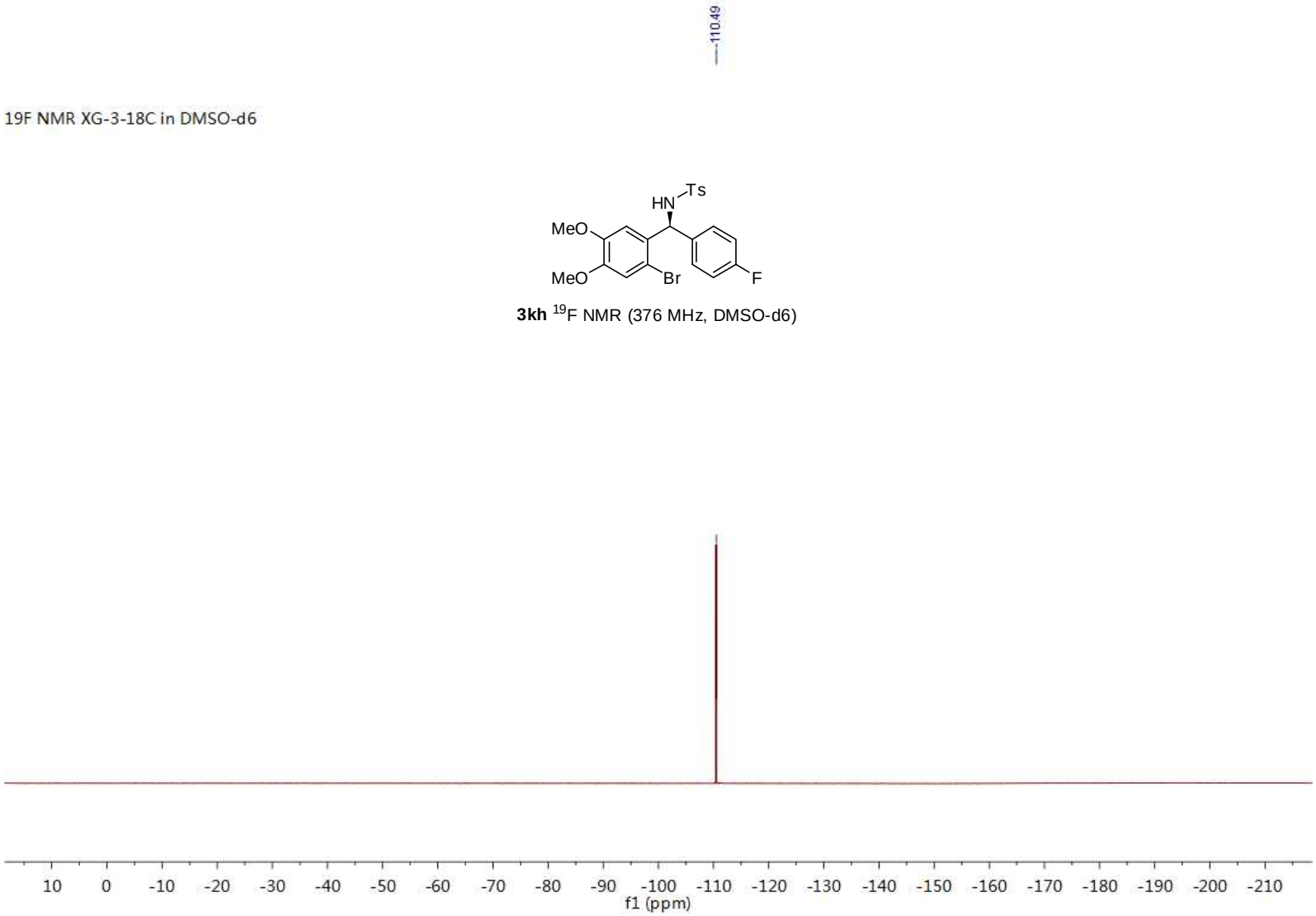


13C NMR XG-3-18C in DMSO

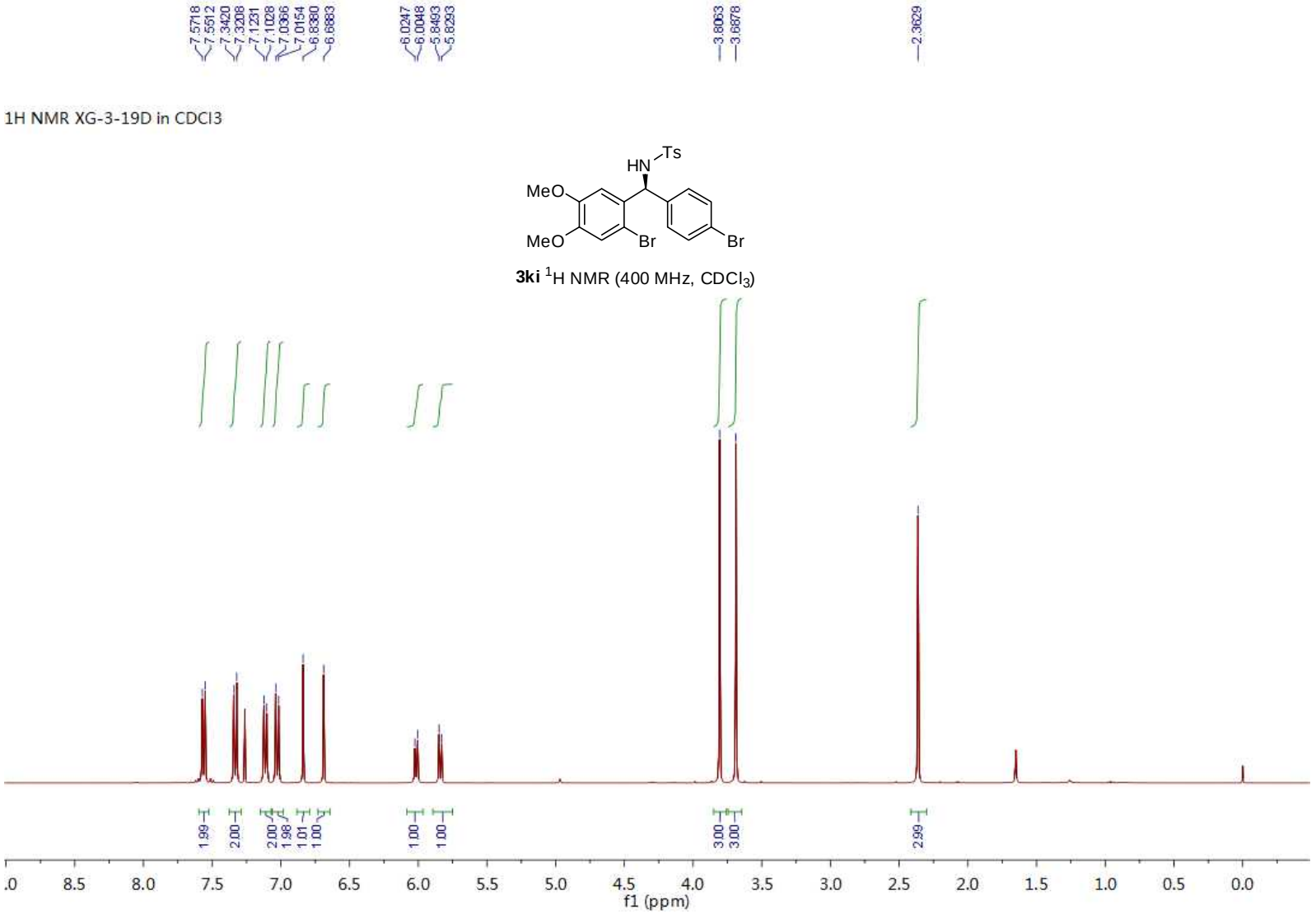


3kh ^{13}C NMR (100 MHz, DMSO-d6)

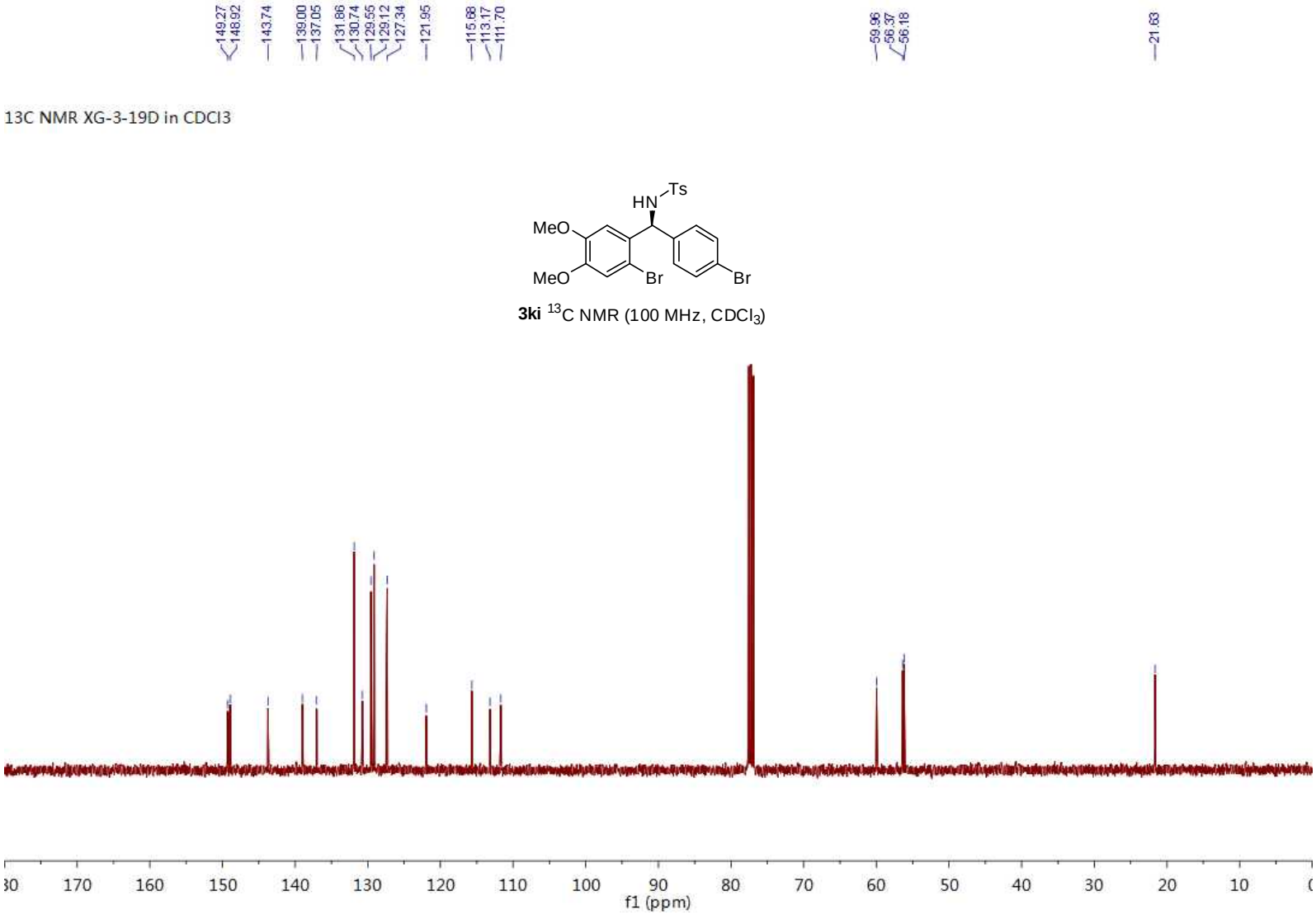




3kh ^{19}F NMR (376 MHz, DMSO-d6)

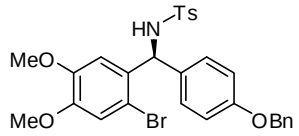


3ki ^{1}H NMR (400 MHz, $CDCl_3$)

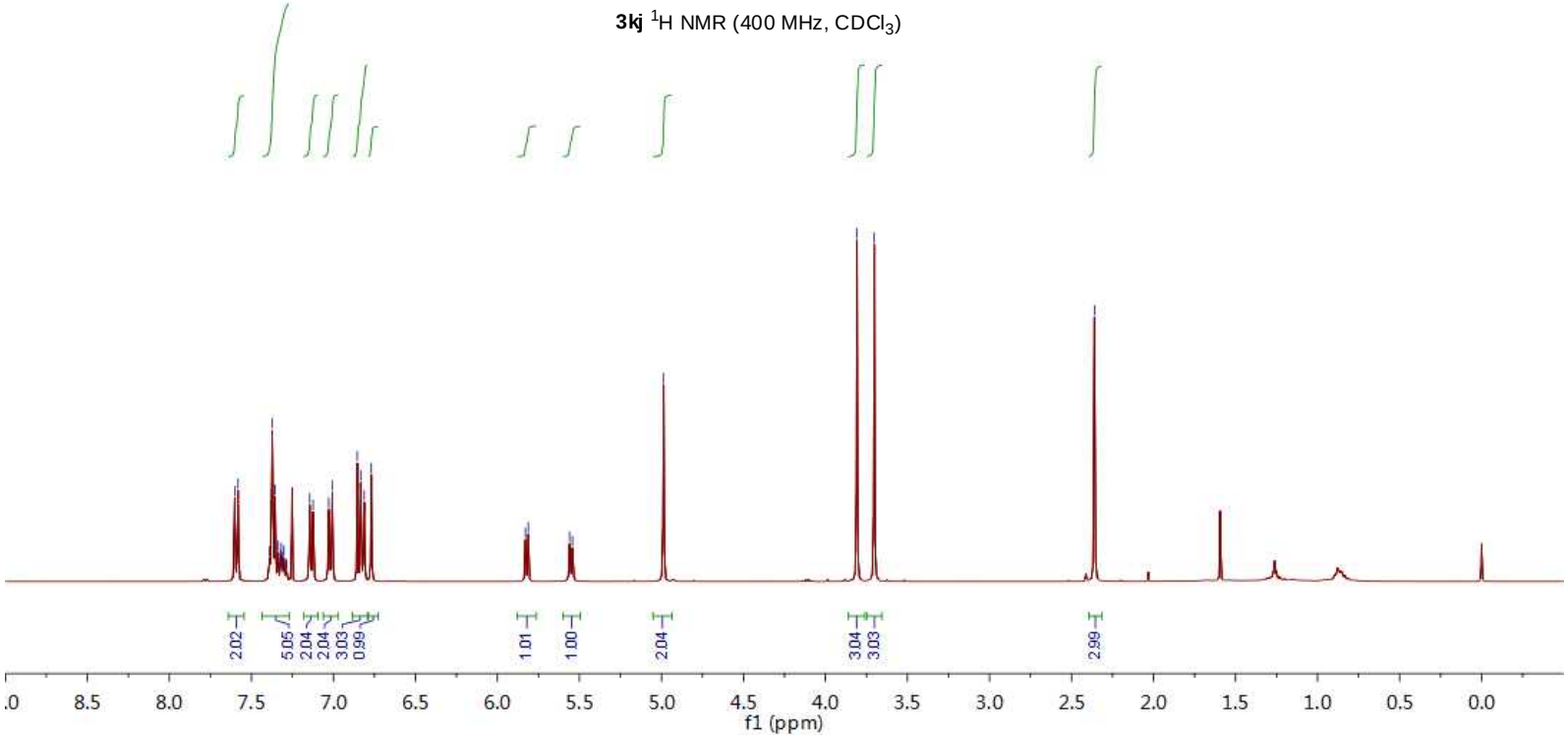


3ki ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR XG-3-20J in CDCl3

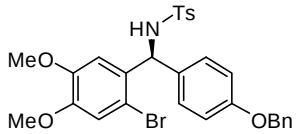


3kj ^{1}H NMR (400 MHz, $CDCl_3$)

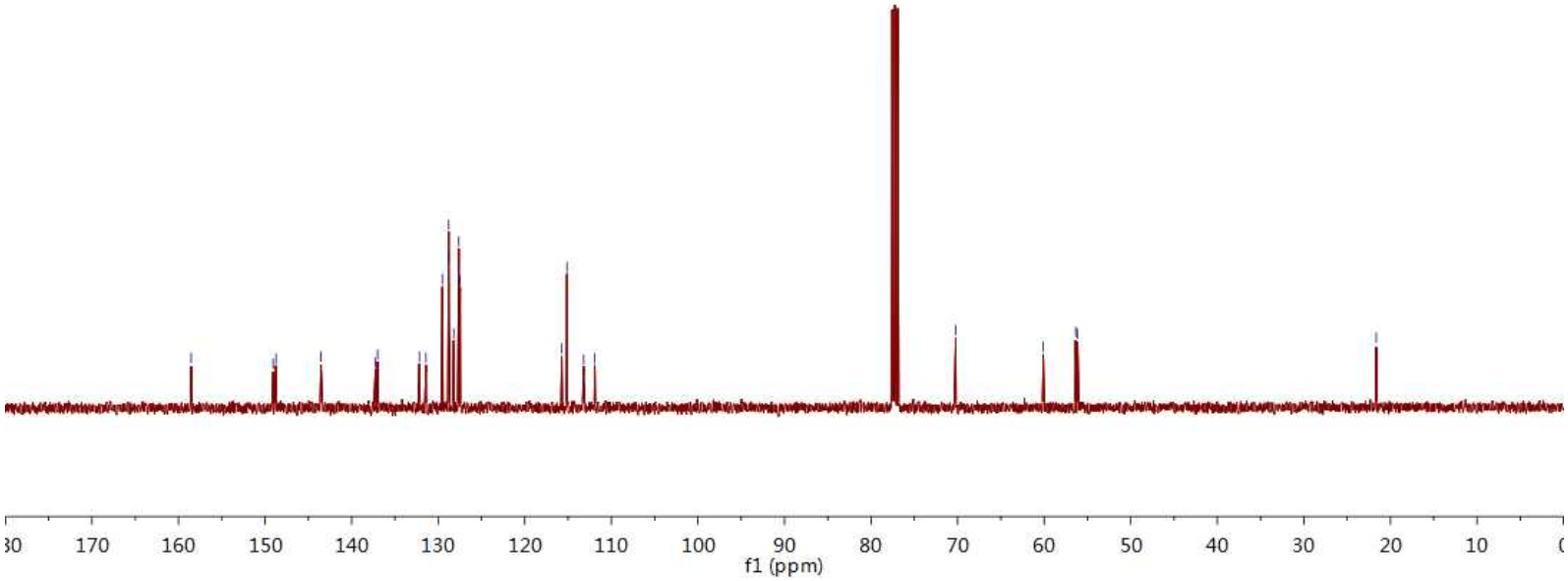


158.54
149.07
148.74
143.54
137.25
136.99
132.18
131.41
129.52
128.78
128.76
128.20
127.62
127.46
115.72
115.12
113.20
111.91
70.22
60.10
56.36
56.14
21.64

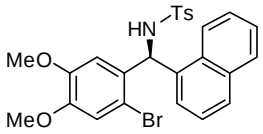
13C NMR XG-3-20J in CDCl3



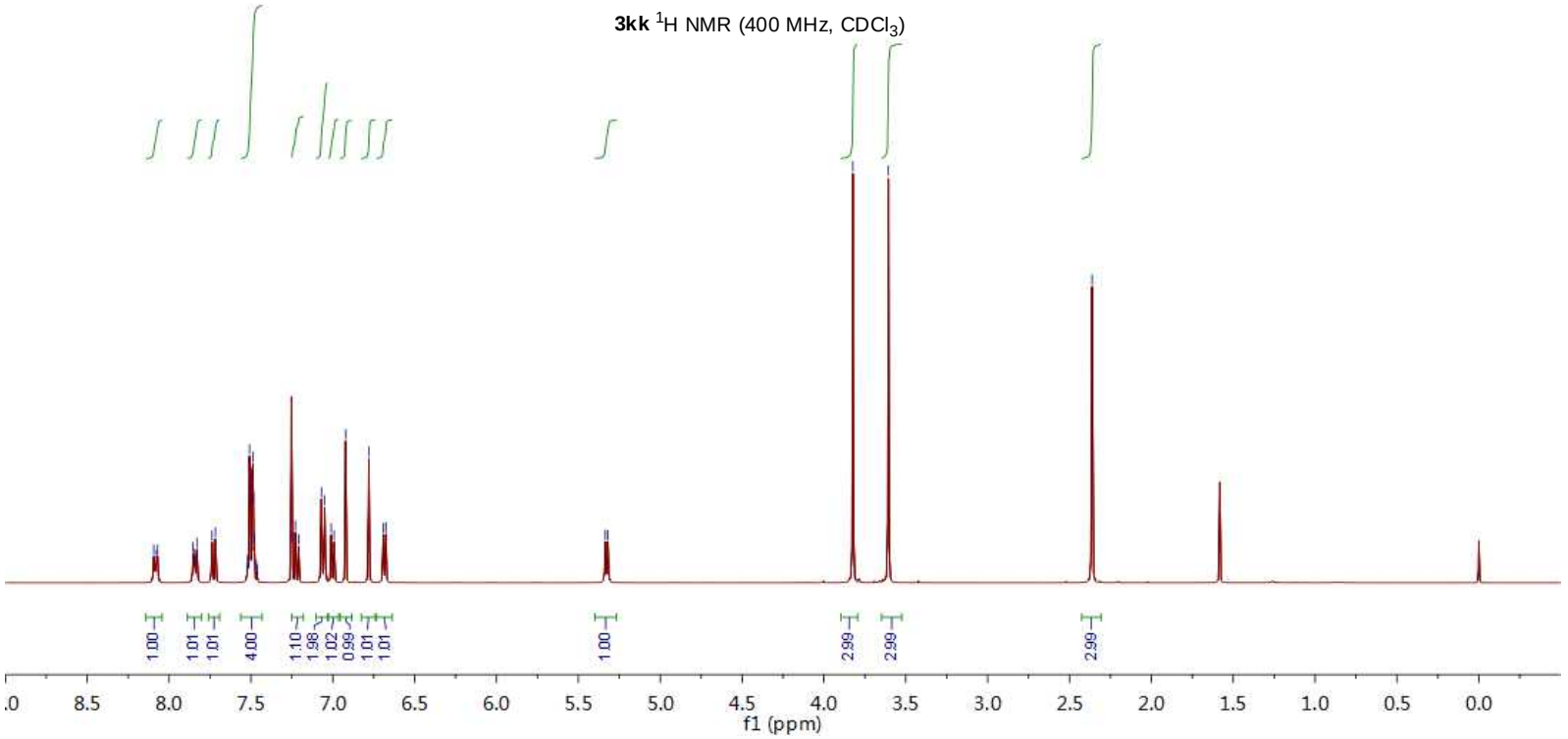
3kj ^{13}C NMR (100 MHz, $CDCl_3$)

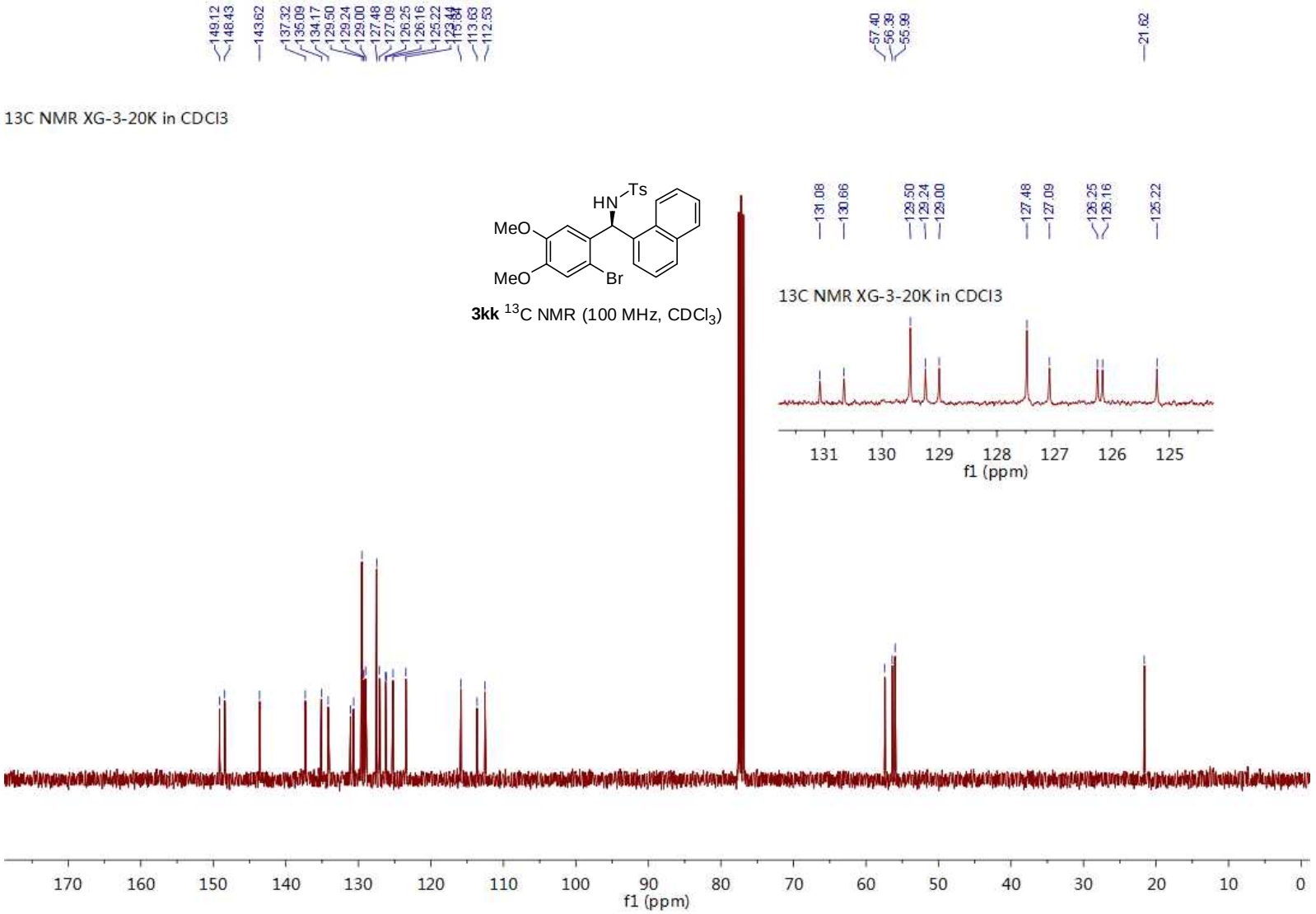


1H NMR XG-3-20K in CDCl3



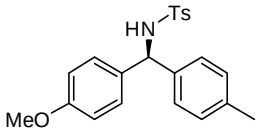
3kk ^{1}H NMR (400 MHz, $CDCl_3$)



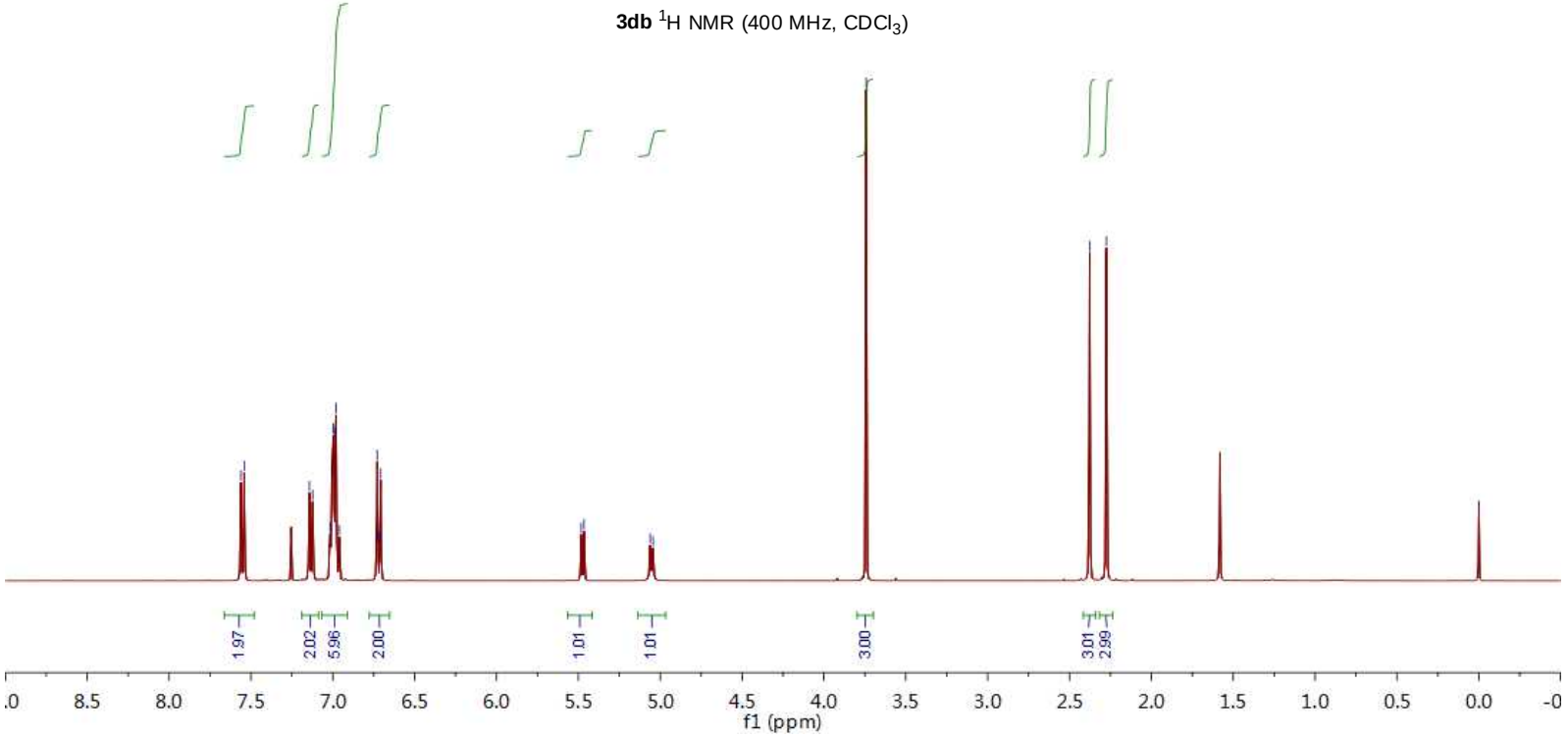

149.12
148.43
143.62
137.32
135.09
134.17
129.50
129.24
129.00
127.48
127.09
126.25
126.16
125.22
113.63
112.53
57.40
56.39
55.99
21.62
13C NMR XG-3-20K in CDCl3
HN
Ts
MeO
MeO
Br
3kk 13C NMR (100 MHz, CDCl3)
131.08
130.66
129.50
129.24
129.00
127.48
127.09
126.25
126.16
125.22
13C NMR XG-3-20K in CDCl3
131
130
129
128
127
126
125
f1 (ppm)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

7.5613
7.5406
7.1426
7.0071
6.9966
6.9850
6.7238
6.7119
6.7070
5.4828
5.4654
5.0613
5.0440
3.7421
2.3765
2.2747

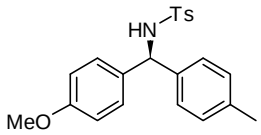
1H NMR XG-3-22B in CDCl3



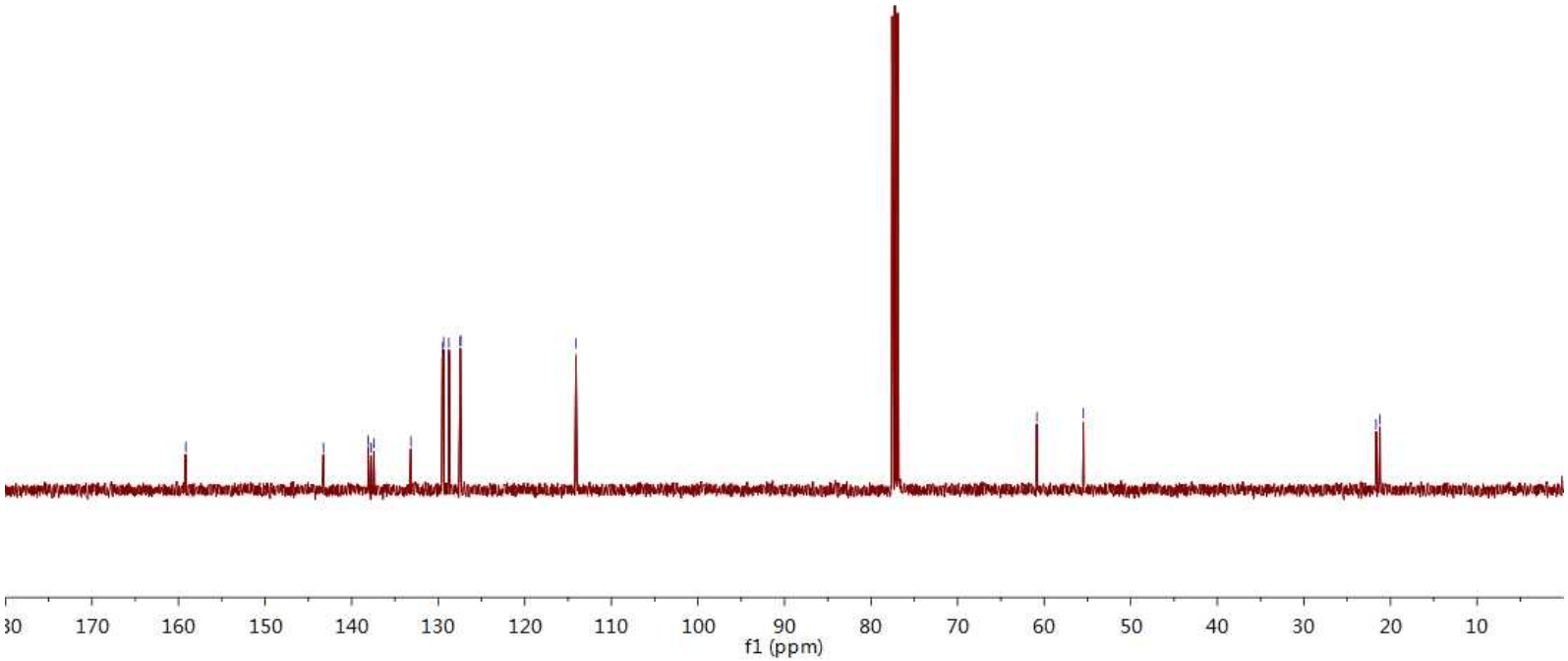
3db ^{1}H NMR (400 MHz, $CDCl_3$)

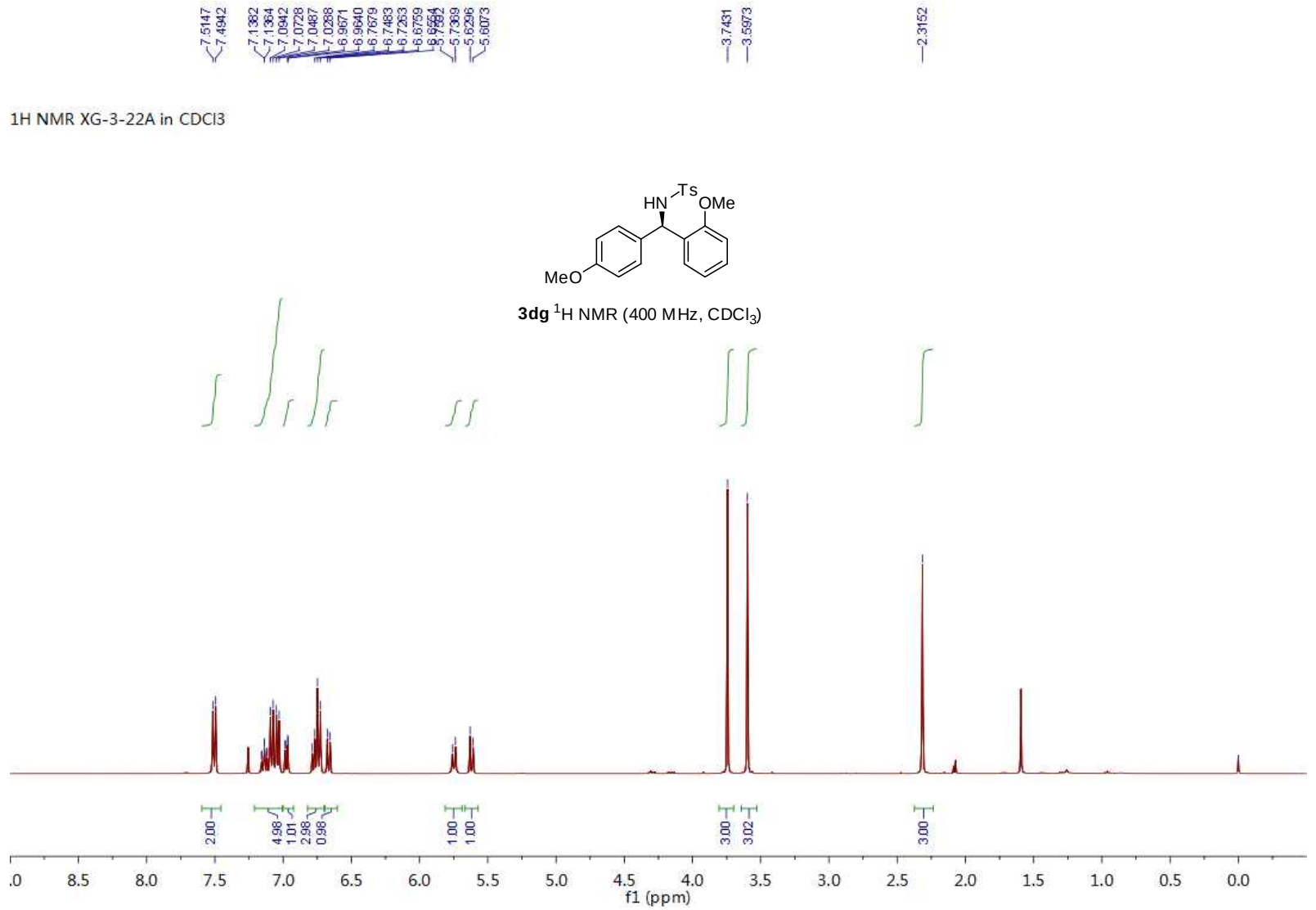


13C NMR XG-3-22B in CDCl3



3db ^{13}C NMR (100 MHz, $CDCl_3$)

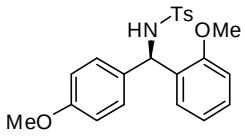




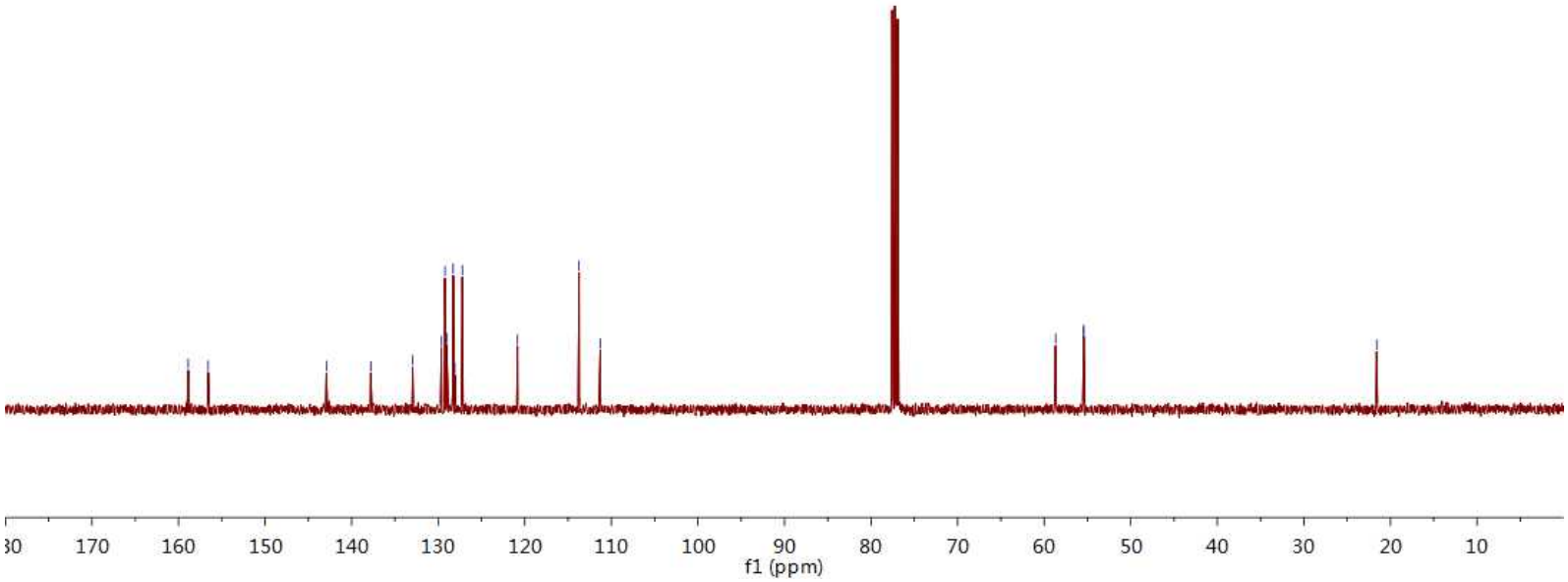
3dg ^{1}H NMR (400 MHz, $CDCl_3$)

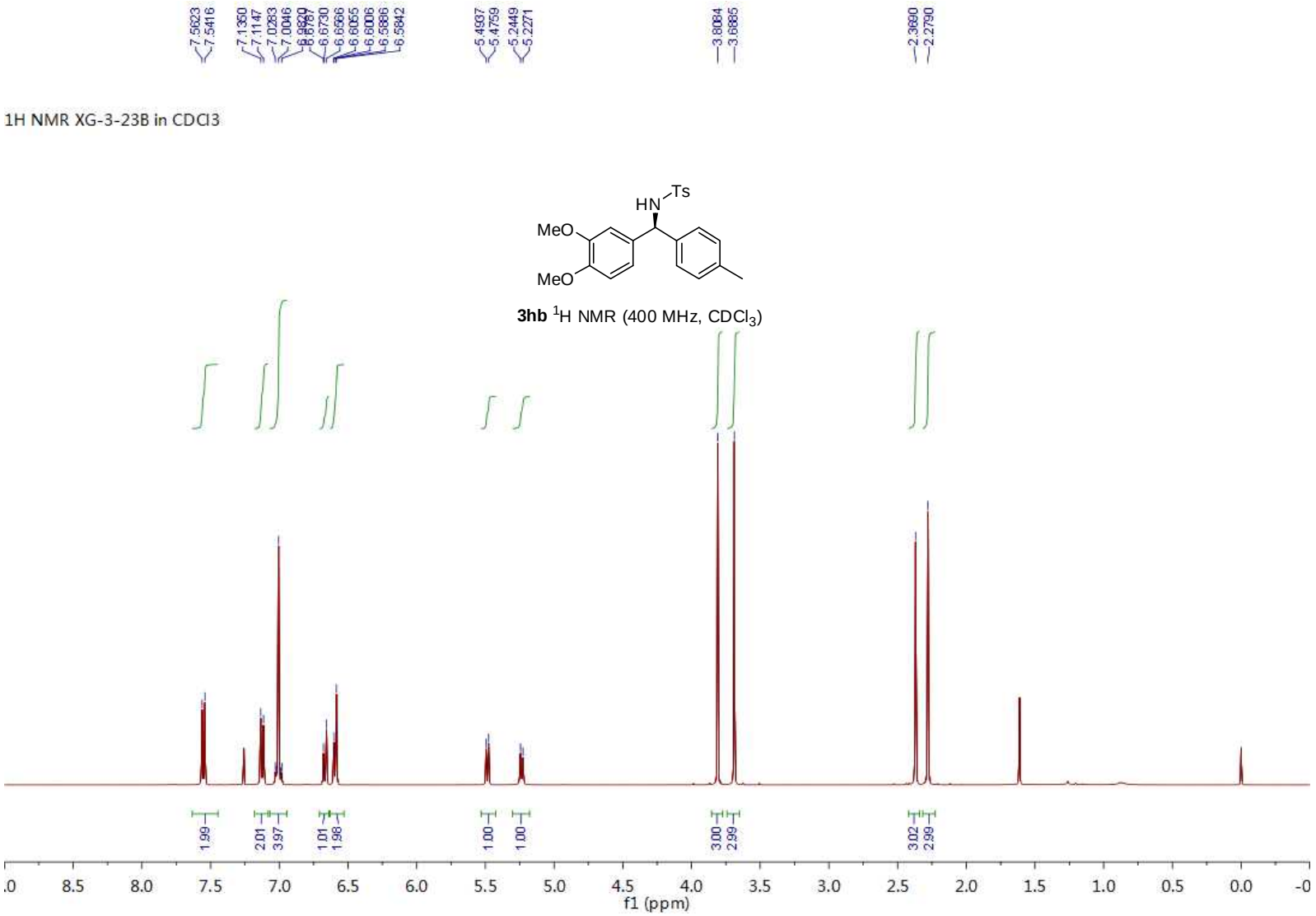
158.88
156.58
142.91
137.79
132.95
129.63
129.21
129.02
128.27
128.08
127.21
120.84
113.73
111.28
58.68
55.45
55.43
21.68

13C NMR XG-3-22A in CDCl3



3dg ^{13}C NMR (100 MHz, $CDCl_3$)

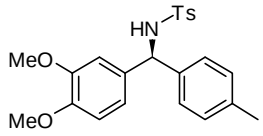




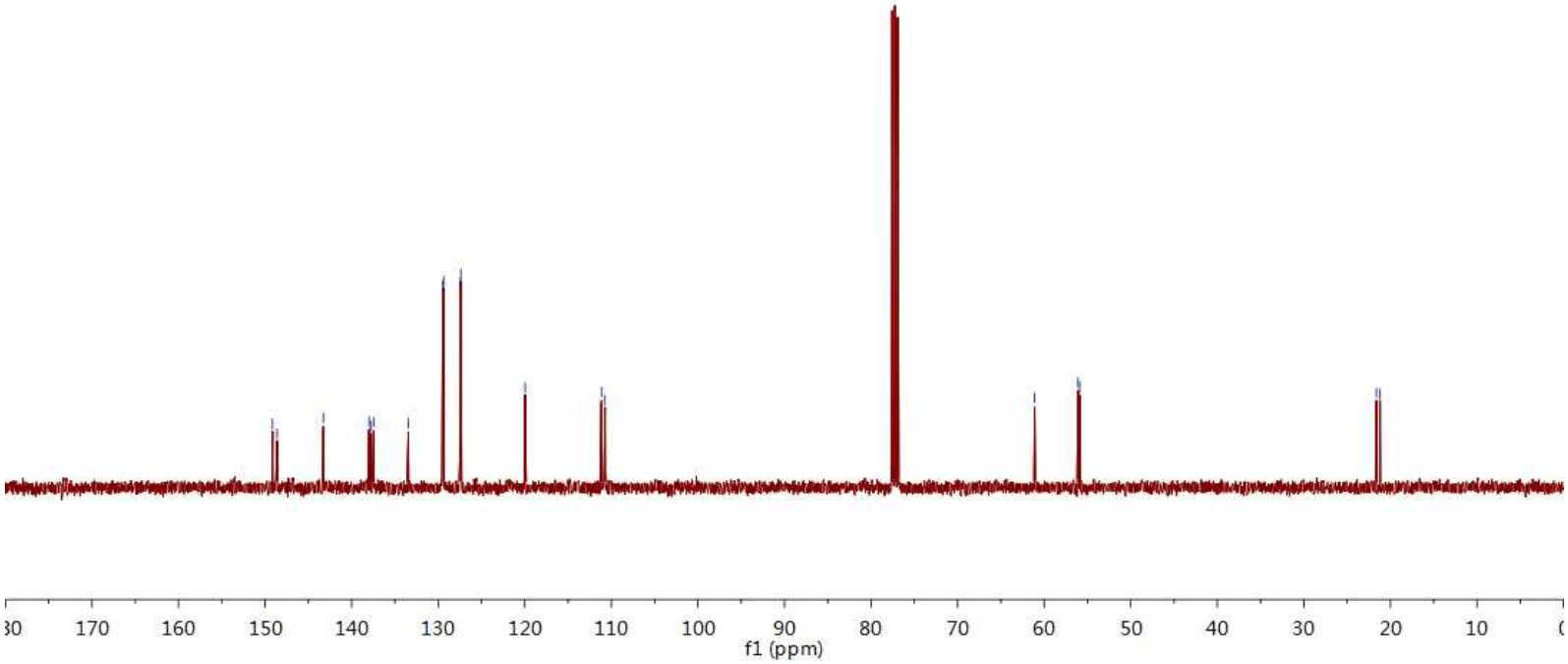
3hb ^{1}H NMR (400 MHz, $CDCl_3$)

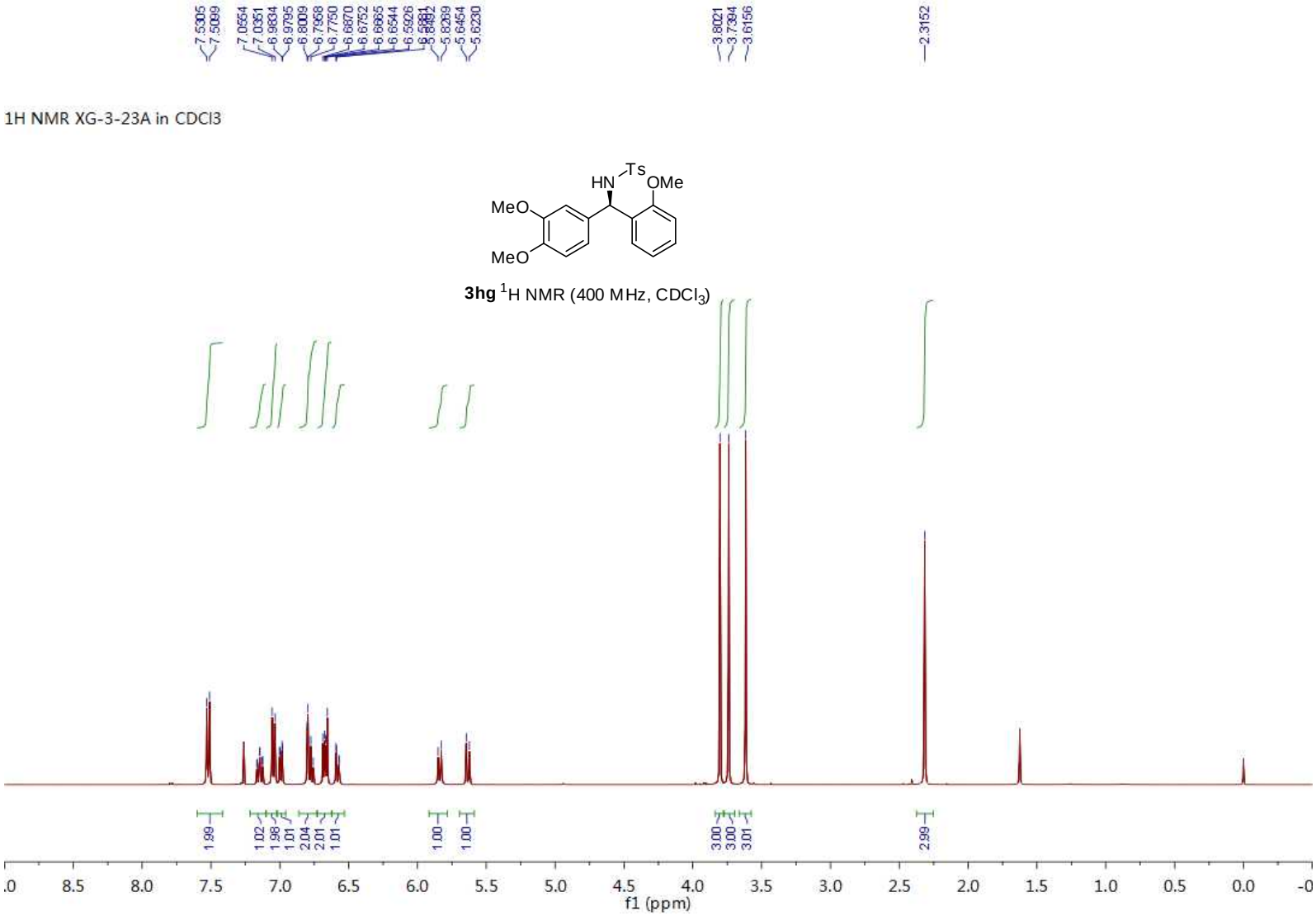
149.14
148.60
143.27
137.97
137.80
137.46
133.45
129.47
129.37
127.43
127.39
119.95
111.15
110.74
61.09
56.09
55.88
21.62
21.19

13C NMR XG-3-23B in CDCl3

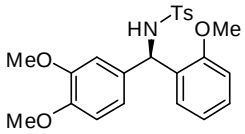


3hb ^{13}C NMR (100 MHz, $CDCl_3$)

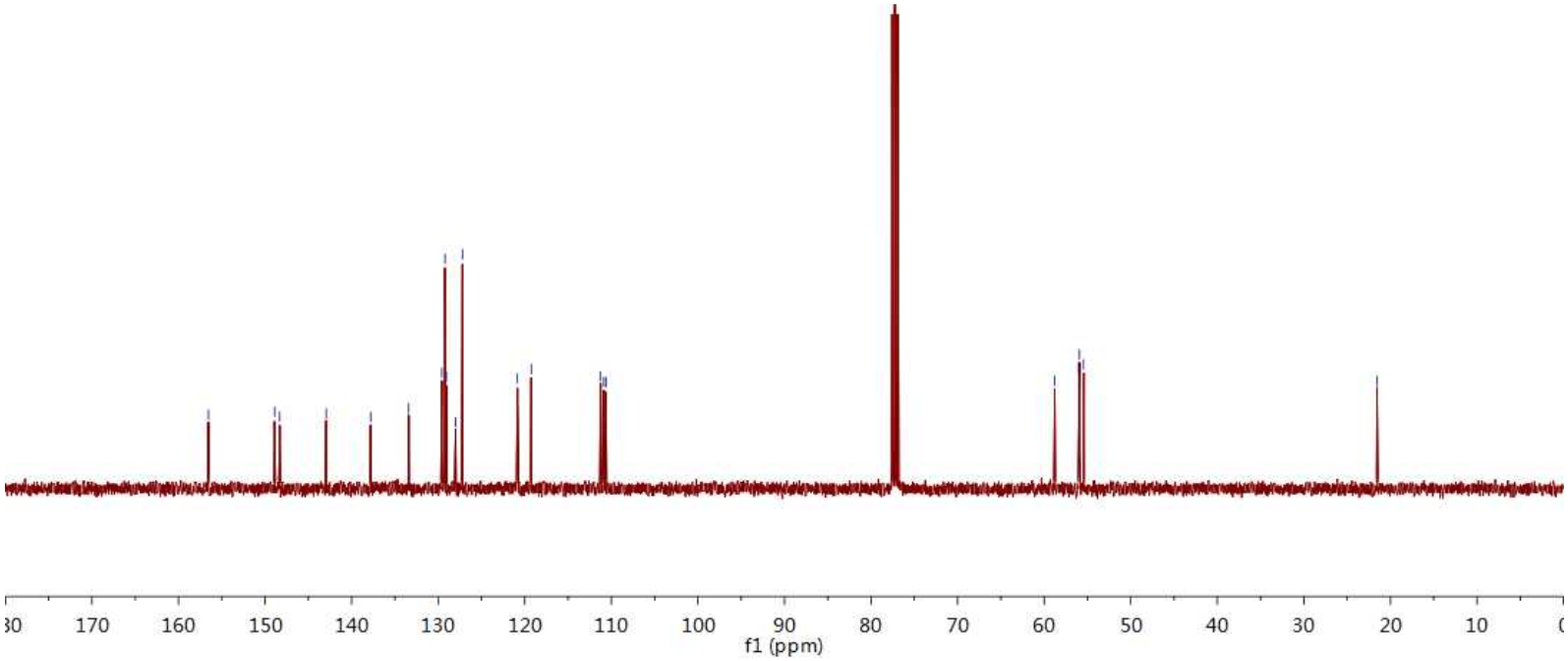


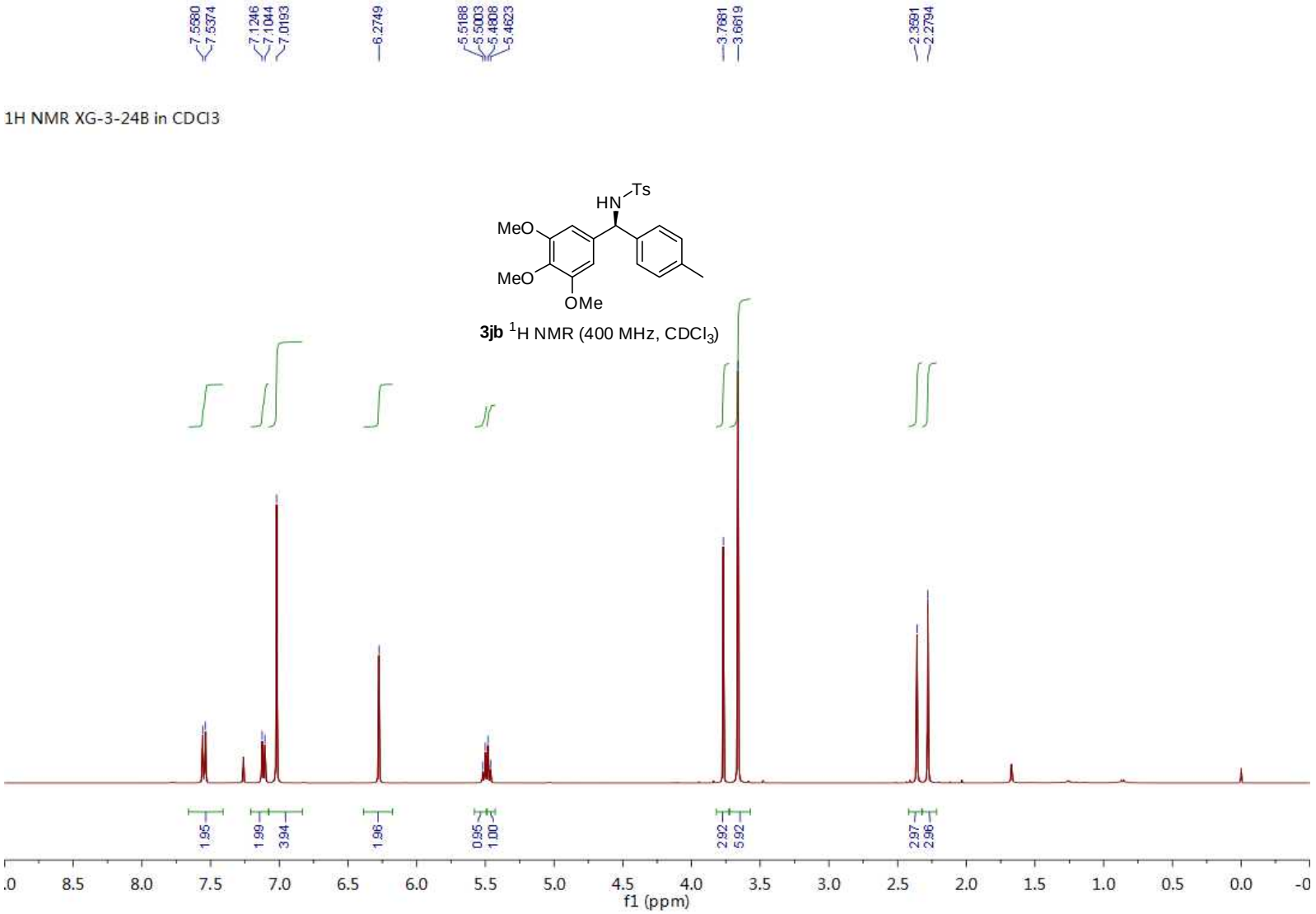

7.5305
7.5099
7.0554
7.0351
6.9834
6.9795
6.8009
6.7968
6.7750
6.6870
6.6752
6.6665
6.6544
6.5926
5.8269
5.6454
5.6230
3.8021
3.7394
3.6156
2.3152
1H NMR XG-3-23A in CDCl3
HN
Ts
OMe
MeO
MeO
3hg 1H NMR (400 MHz, CDCl3)
1.99
1.02
1.98
1.01
2.04
2.01
1.01
1.00
1.00
3.00
3.00
3.01
2.99
f1 (ppm)

13C NMR XG-3-23A in CDCl3

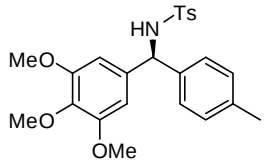


3hg ^{13}C NMR (100 MHz, $CDCl_3$)

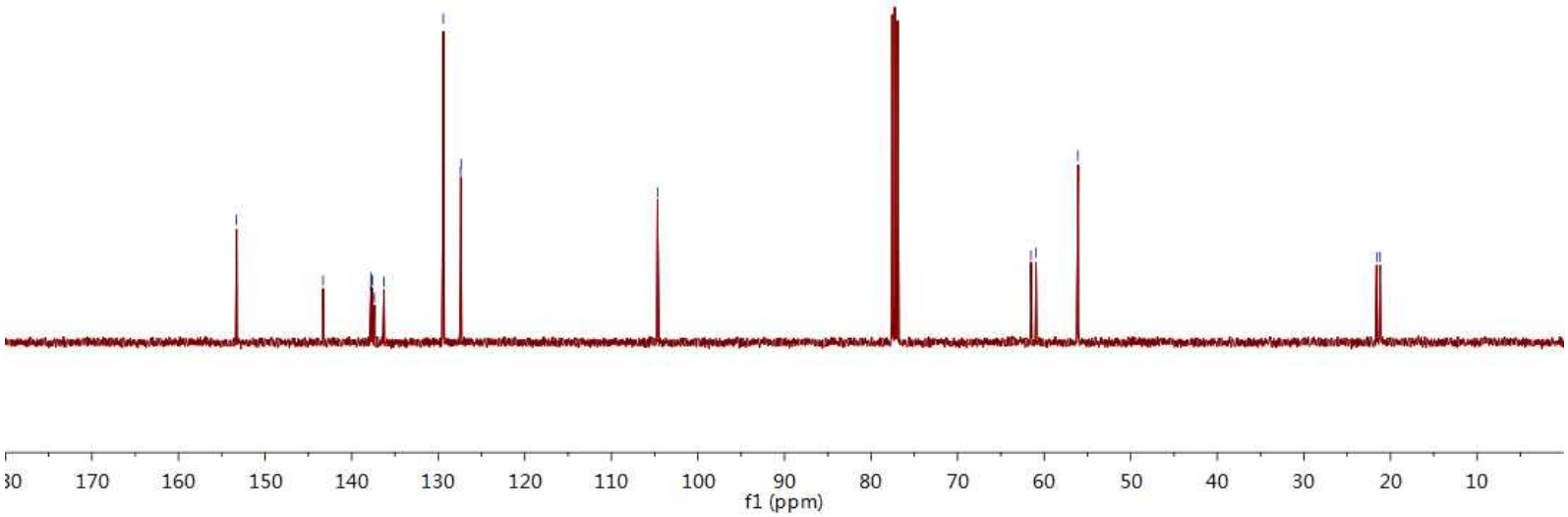


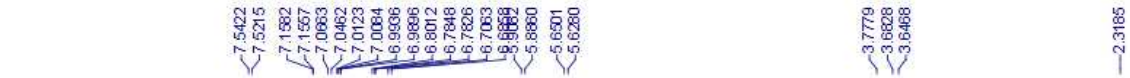

7.5680
7.5374
7.1246
7.1044
7.0193
6.2749
5.5188
5.5003
5.4808
5.4623
3.7681
3.6619
2.3691
2.2794
1H NMR XG-3-24B in CDCl3
HN
Ts
MeO
MeO
OMe
3jb 1H NMR (400 MHz, CDCl3)
1.95
1.99
3.94
1.96
0.95
1.00
2.92
5.92
2.97
2.96
f1 (ppm)

13C NMR XG-3-24B in CDCl3

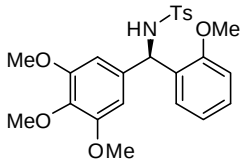


3hb ^{13}C NMR (100 MHz, $CDCl_3$)

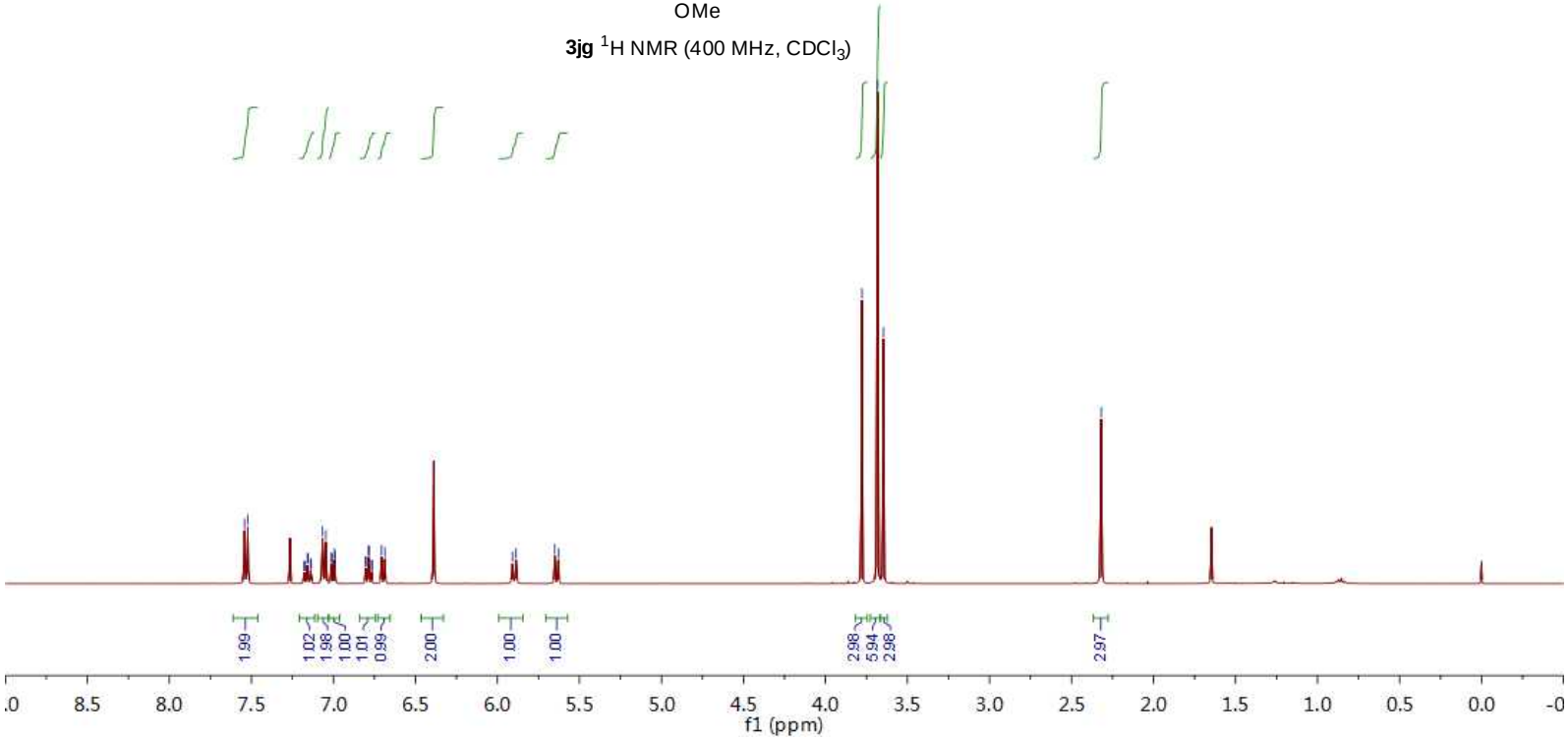




1H NMR XG-3-24A in CDCl3

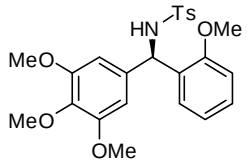


3jg ^{1}H NMR (400 MHz, $CDCl_3$)

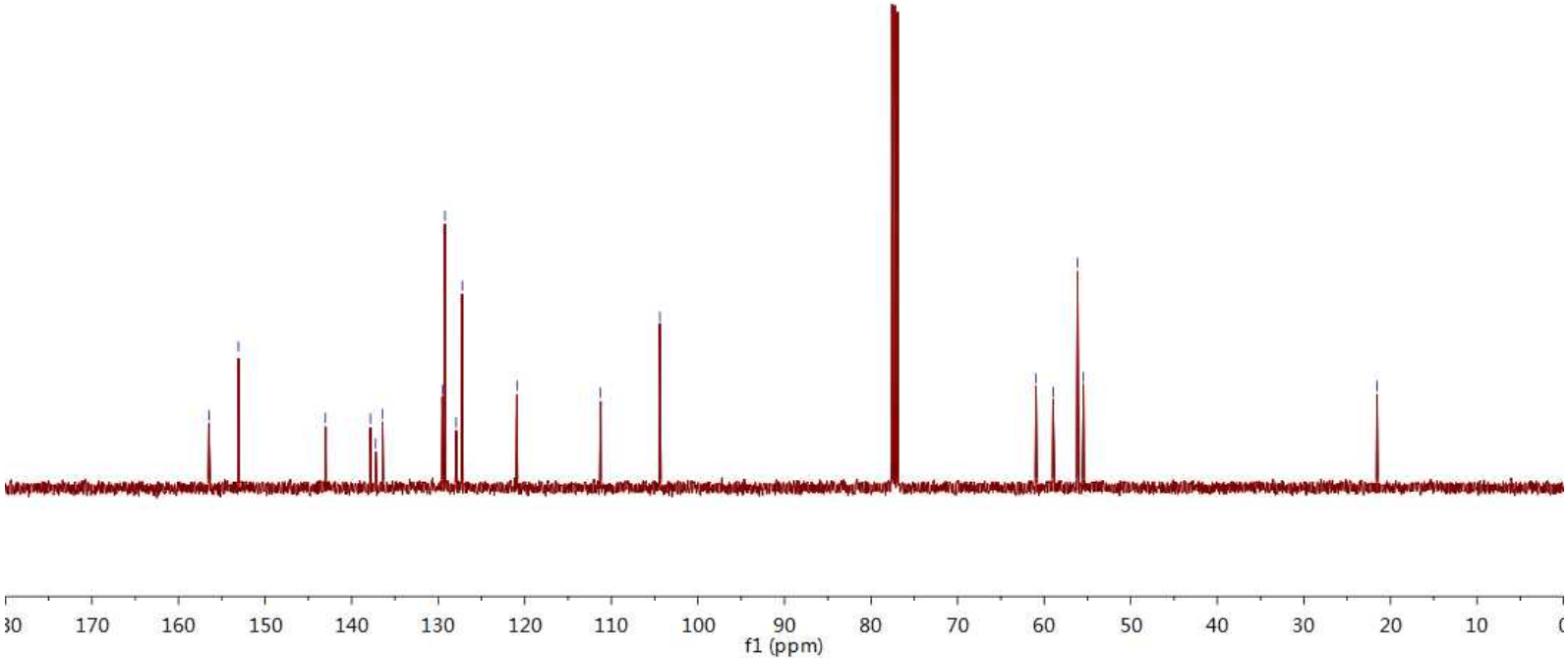


156.48
153.08
143.02
137.83
137.22
136.42
129.51
129.22
127.92
127.22
120.90
111.24
104.39
60.94
58.97
56.14
55.47
21.55

13C NMR XG-3-24A in CDCl3

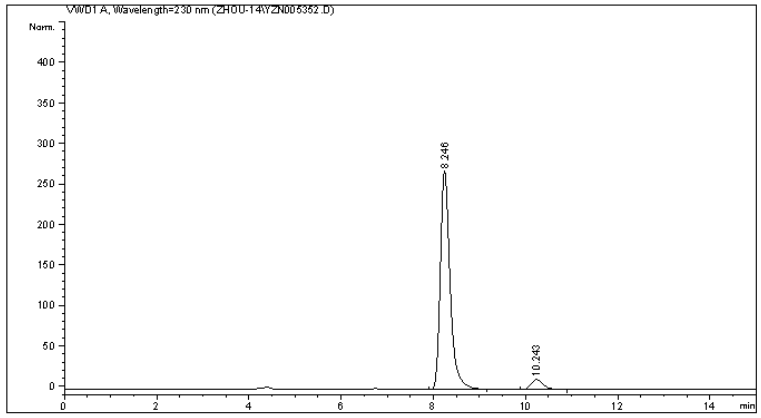


3jg ^{13}C NMR (100 MHz, $CDCl_3$)

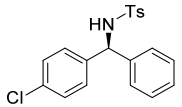


Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005352.D
Sample Name: XG-2-95

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/21/2014 3:33:07 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 6/21/2014 3:17:06 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 2:46:07 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



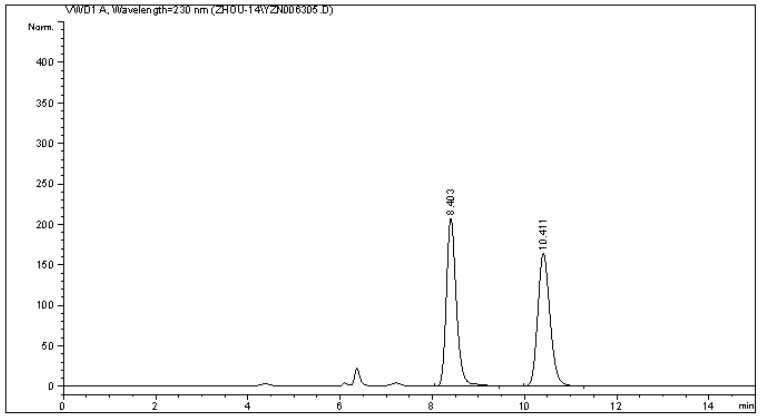

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.246 BB    0.2246 3974.63037  269.27280  94.4607
   2  10.243 BB    0.2838  233.07684   12.54256   5.5393

Totals :                  4207.70721  281.81535

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



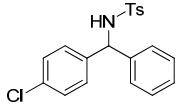
(*S*)-**3aa**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN006305.D
Sample Name: XG-2-95+-

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 10/28/2014 10:48:04 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2014 10:07:15 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2014 1:44:47 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



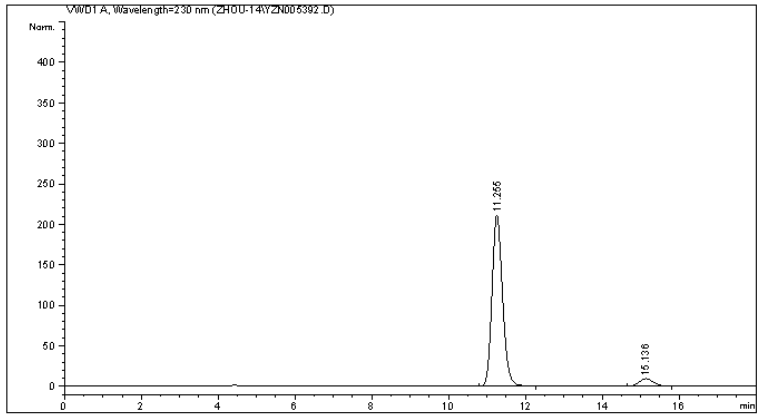

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.403 VB    0.2282 3101.31641  207.58504  50.6644
   2  10.411 BB    0.2835 3019.97388  163.79091  49.3356

Totals :                  6121.29028  371.37595

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



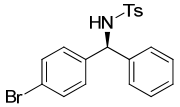
(+/-)-**3aa**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005392.D
Sample Name: XG-2-100B

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/26/2014 2:22:25 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 6/26/2014 2:18:44 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 2:48:38 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



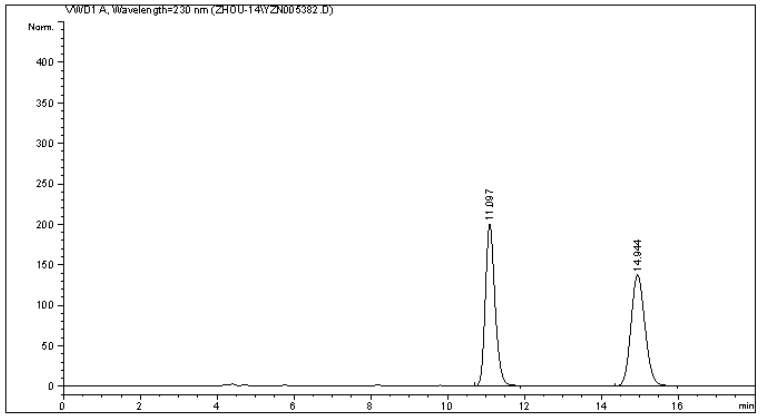

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1  11.255 BB    0.2938 4022.19580  210.96710  94.3814
   2  15.136 BB    0.3963  239.44289    9.39742   5.6186

Totals :                 4261.63869  220.36452

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



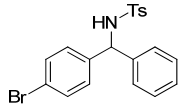
(*S*)-**3ba**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005382.D
Sample Name: XG-2-100B(+/-)

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/25/2014 7:51:53 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 6/25/2014 7:48:12 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 2:48:38 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



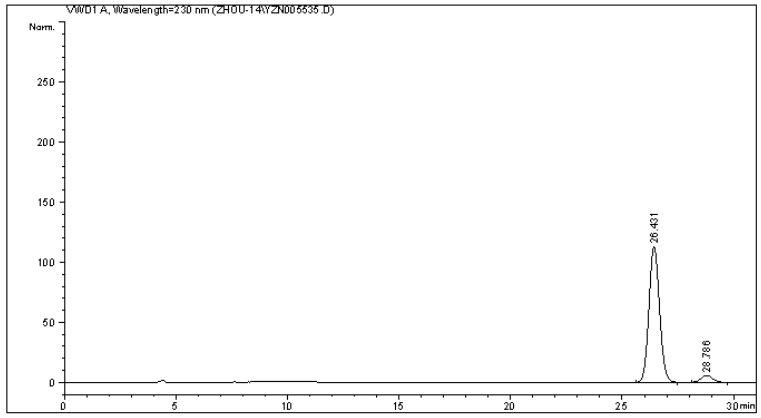

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1  11.097 BB    0.2619 3466.32617  199.95967  49.8979
   2  14.944 BB    0.3914 3480.51831  137.51115  50.1021

Totals :                 6946.84448  337.47083

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



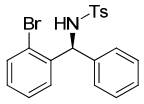
(+/-)-**3ba**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005535.D
Sample Name: XG-3-13F

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/15/2014 4:04:15 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/15/2014 3:37:55 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:18:51 PM by Z
                  (modified after loading)
Sample Info     : AD-H , H/i-PrOH = 90/10, 0.6 mL/min, 30 oC, 230 nm
```




```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  26.431 BB    0.5144 3723.44458  112.88479  94.8013
   2  28.786 BB    0.5539  204.18535    5.75226   5.1987

Totals :                  3927.62993  118.63705

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



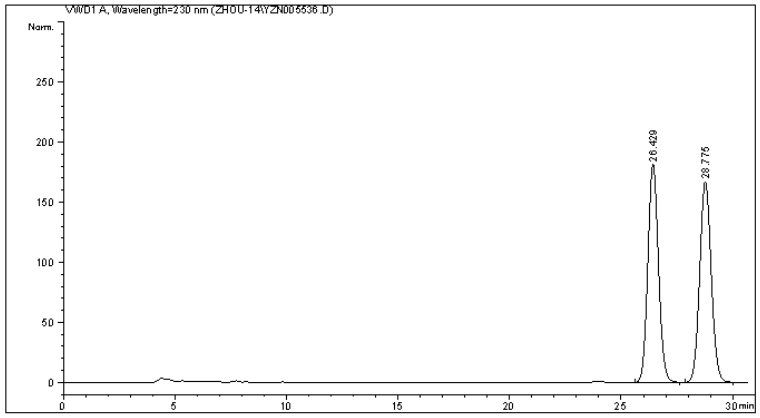
(*S*)-**3ca**

Instrument 1 10/26/2014 3:19:58 PM Z

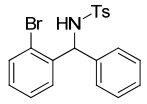
Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005536.D
Sample Name: XG-3-13F(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/15/2014 4:39:07 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/15/2014 4:37:11 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:18:51 PM by Z
                  (modified after loading)
Sample Info     : AD-H , H/i-PrOH = 90/10, 0.6 mL/min, 30 oC, 230 nm
```




```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  26.429 BB    0.5129 6002.84668  181.30800  50.0505
   2  28.775 BB    0.5580 5990.73682  167.09714  49.9495

Totals :                  1.19936e4   348.40514

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



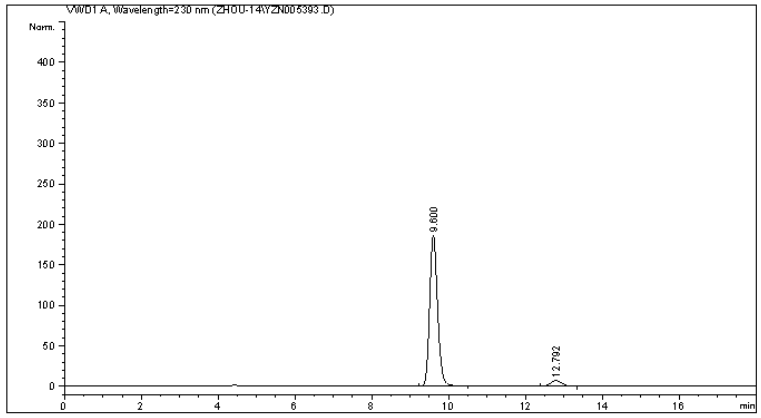
(+/-)-**3ca**

Instrument 1 10/26/2014 3:19:00 PM Z

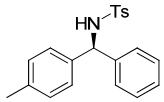
Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005393.D
Sample Name: XG-2-100C

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/26/2014 2:52:39 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 6/26/2014 2:49:25 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 2:48:38 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```




```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   9.600 VB    0.2215 2673.72021  186.06273  94.7285
   2  12.792 BB    0.3201  148.79001    7.18998   5.2715

Totals :                  2822.51022  193.25271

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

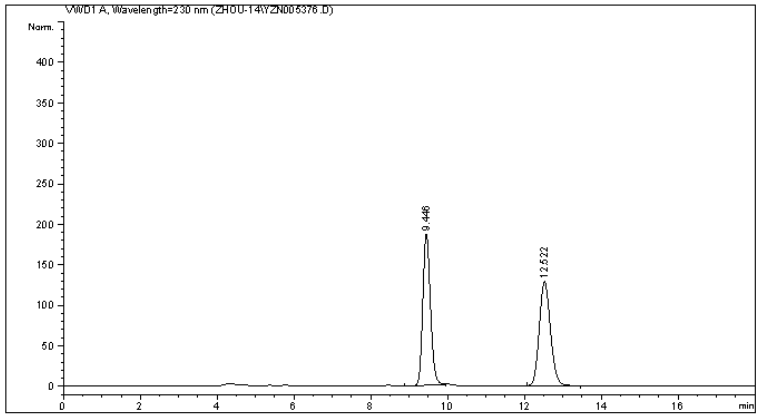


(*S*)-**3da**

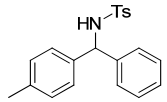
Instrument 1 10/26/2014 2:54:10 PM Z Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005376.D
Sample Name: XG-2-100C(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/25/2014 2:14:24 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 6/25/2014 2:10:29 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 2:48:38 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```




```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   9.446 VB    0.2139 2584.00659  186.68997  49.6770
   2  12.522 VB    0.3142 2617.60693  128.83852  50.3230

Totals :                  5201.61353  315.52849

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

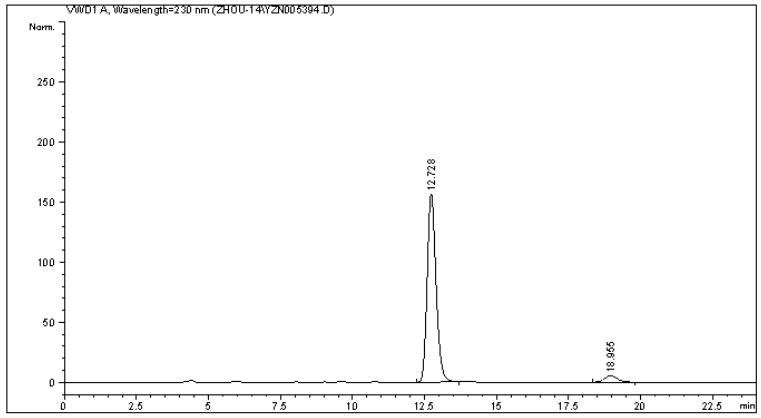


(+/-)-**3da**

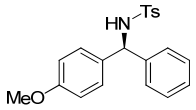
Instrument 1 10/26/2014 2:53:18 PM Z Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005394.D
Sample Name: XG-2-100D

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/26/2014 3:36:36 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 6/26/2014 3:24:01 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 2:55:51 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



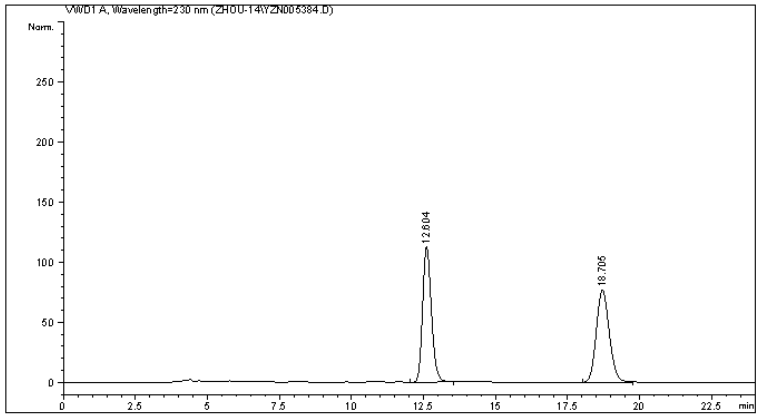

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  12.728 BB    0.3302 3356.14478  156.56738  95.2701
   2  18.955 BB    0.4899  166.62212    5.24685   4.7299

Totals :                  3522.76689  161.81423

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



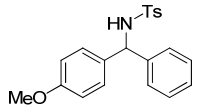
(*S*)-**3ea**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005384.D
Sample Name: XG-2-100D(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/25/2014 9:18:54 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 6/25/2014 9:15:55 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 2:55:51 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



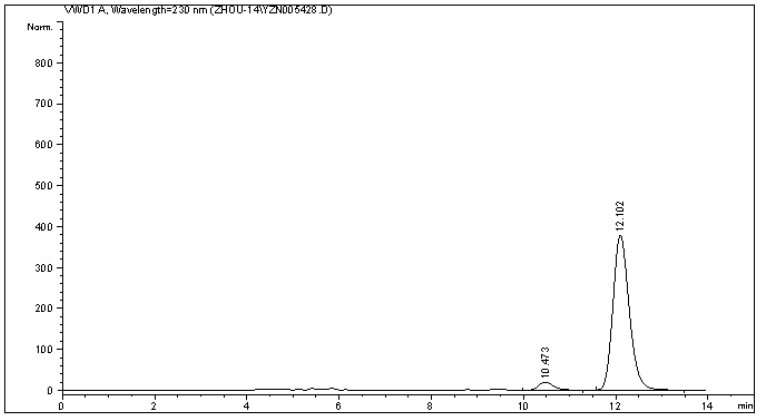

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  12.604 VB    0.3289 2398.68262  112.44901  49.9346
   2  18.705 BB    0.4862 2404.96313   76.79391  50.0654

Totals :                  4803.64575  189.24291

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



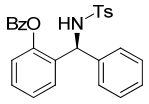
(+/-)-**3ea**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005428.D
Sample Name: XG-2-101G

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/1/2014 4:45:45 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/1/2014 4:45:06 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:02:57 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



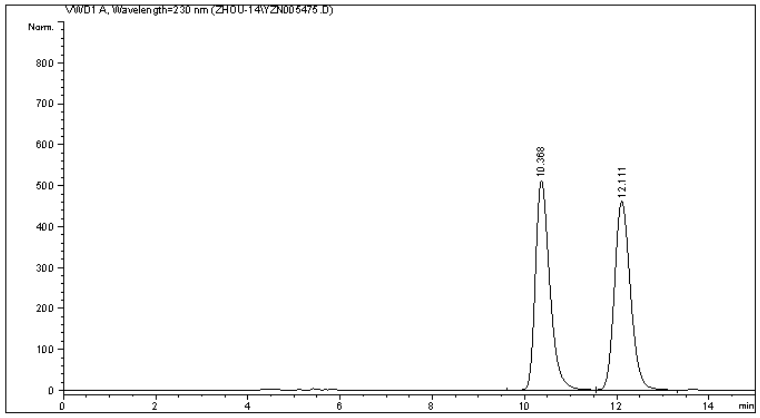

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  10.473 VB    0.3505  452.91052   19.85701   4.6566
   2  12.102 BB    0.3792 9273.20996  378.26114  95.3434

Totals :                  9726.12048  398.11815

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



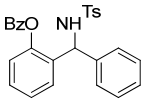
(-)-3fa'

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005475.D
Sample Name: XG-2-101G(+/-)

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/7/2014 9:04:13 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/7/2014 8:25:55 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:02:57 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



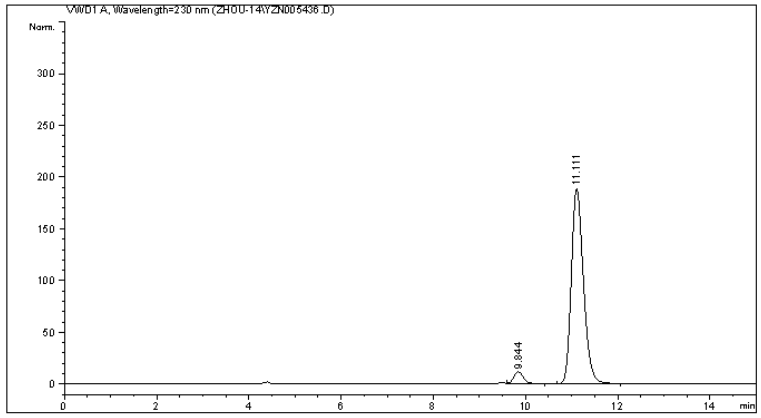

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  10.368 BV    0.3313 1.10674e4   511.02350  49.9023
   2  12.111 VB    0.3712 1.11108e4   461.34305  50.0977

Totals :                  2.21782e4   972.36655

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



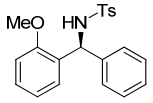
(+/-)-3fa'

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005436.D
Sample Name: XG-3-2A

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/2/2014 3:18:59 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/2/2014 3:15:29 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:06:47 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



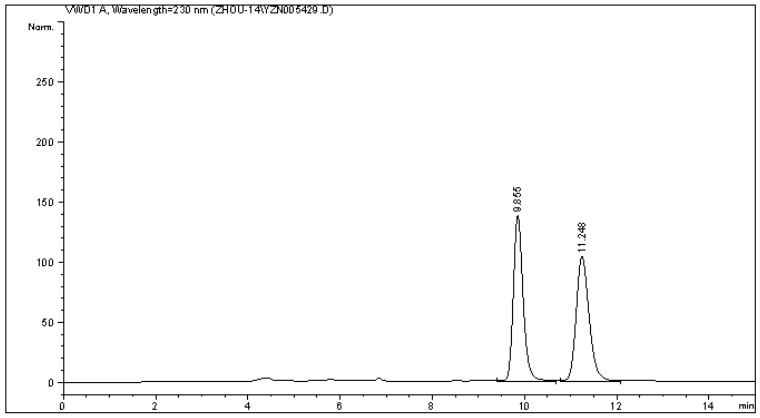

```
==========================================================================
                          Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|----------|--------|
   1   9.844 VB    0.2273  171.16779   11.51236   4.7384
   2  11.111 BB    0.2801 3441.17310  188.38029  95.2616

Totals :                  3612.34088  199.89266

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



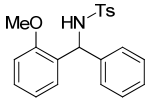
(*S*)-**3ga**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005429.D
Sample Name: XG-3-2A(+/-)

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/2/2014 9:03:04 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/2/2014 8:31:28 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:05:32 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



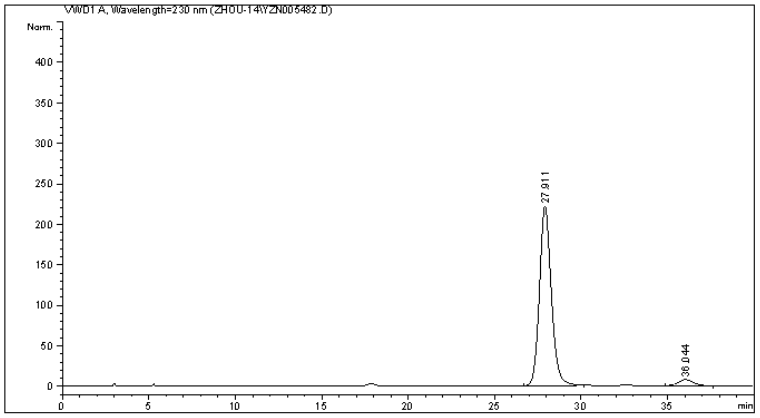

```
==========================================================================
                          Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|----------|--------|
   1   9.855 VB    0.2257 2029.90002  137.81155  49.9445
   2  11.248 BB    0.2998 2034.41455  103.88252  50.0555

Totals :                  4064.31458  241.69408

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



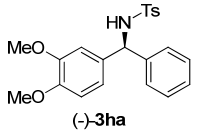
(+/-)-**3ga**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005482.D
Sample Name: XG-3-8B

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/8/2014 9:31:24 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/8/2014 8:54:17 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:11:38 PM by Z
                  (modified after loading)
Sample Info     : IA , H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 230 nm
```



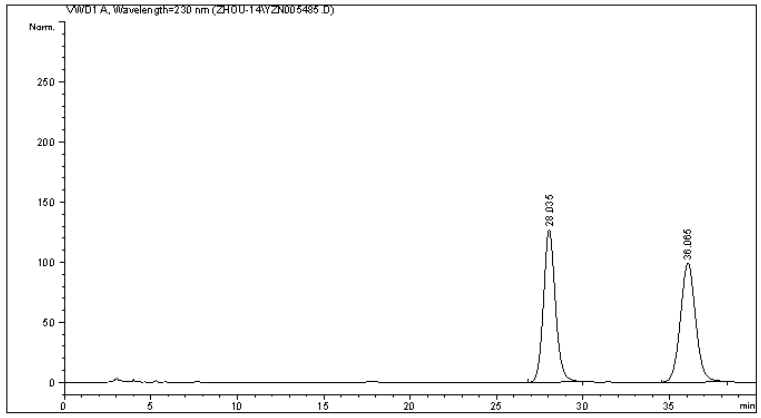

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  27.911 BB    0.7236 1.05684e4   221.69336  95.8313
   2  36.044 BB    0.9194  459.73584    7.54145   4.1687

Totals :                  1.10282e4   229.23481

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



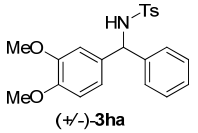
(-)-**3ha**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005485.D
Sample Name: XG-3-8B(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/9/2014 9:24:33 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/9/2014 9:02:20 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:10:21 PM by Z
                  (modified after loading)
Sample Info     : IA , H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 230 nm
```



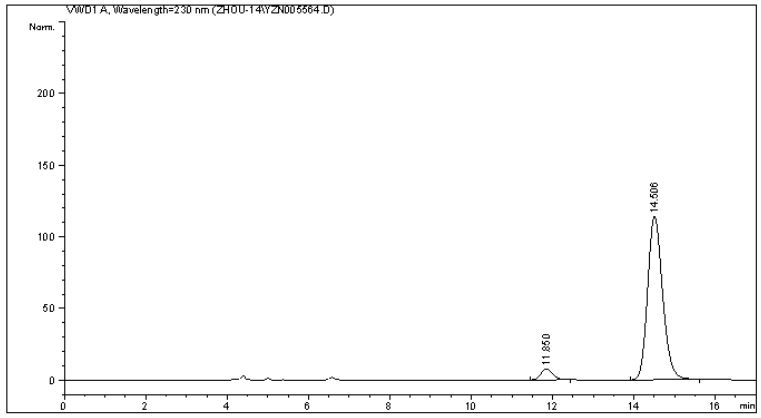

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  28.035 BB    0.7260 6066.37500  127.02946  49.9744
   2  36.065 BB    0.9376 6072.60010   98.91083  50.0256

Totals :                  1.21390e4   225.94029

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



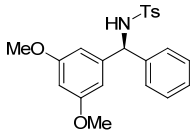
(+/-)-**3ha**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005564.D
Sample Name: XG-3-15A

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/17/2014 6:22:48 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/17/2014 5:49:32 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:23:49 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



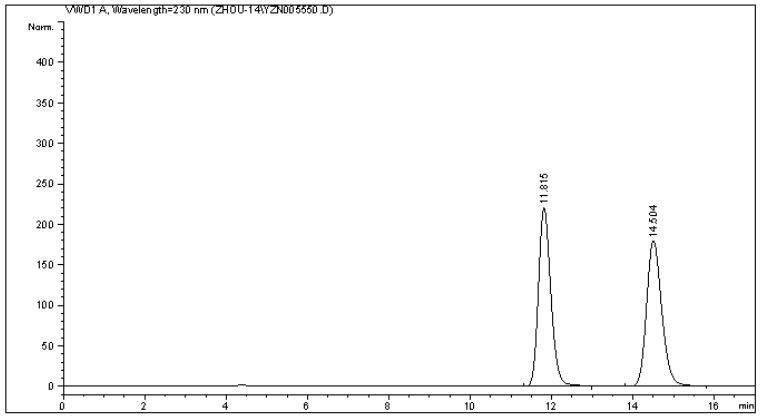

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  11.850 BB    0.3174  160.71346    7.80620   5.2086
   2  14.506 BB    0.3970 2924.85498  113.96184  94.7914

Totals :                  3085.56844  121.76804

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



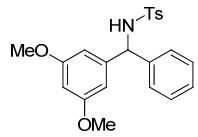
(-)-**3ia**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005550.D
Sample Name: XG-3-15A(+/-)

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/16/2014 5:17:52 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/16/2014 5:14:48 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:22:32 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



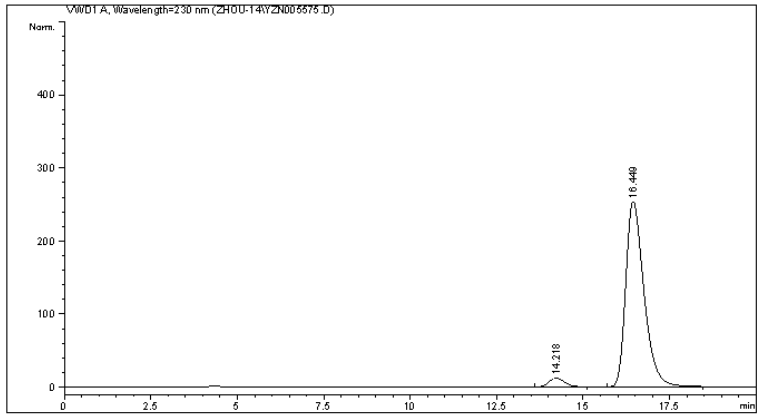

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  11.815 BB    0.3251 4656.75244  220.38519  50.0335
   2  14.504 VB    0.3992 4650.51660  179.84248  49.9665

Totals :                  9307.26904  400.22768

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



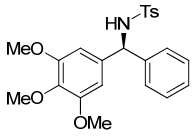
(+/-)-**3ia**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005575.D
Sample Name: XG-3-15B

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/18/2014 10:01:27 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/18/2014 9:54:31 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:26:29 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



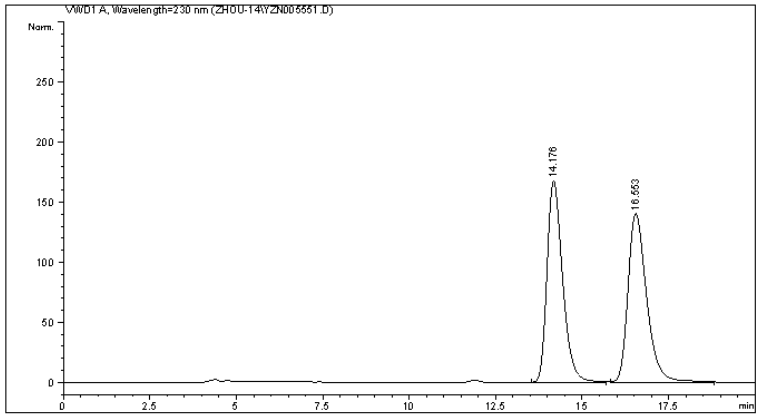

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  14.218 VB    0.4881  384.30466   12.20865   3.9633
   2  16.449 BB    0.5616 9312.31348  254.06387  96.0367

Totals :                  9696.61813  266.27252

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



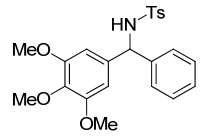
(-)-3ja

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005551.D
Sample Name: XG-3-15B(+/-)

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/16/2014 5:52:11 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/16/2014 5:48:12 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:25:08 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



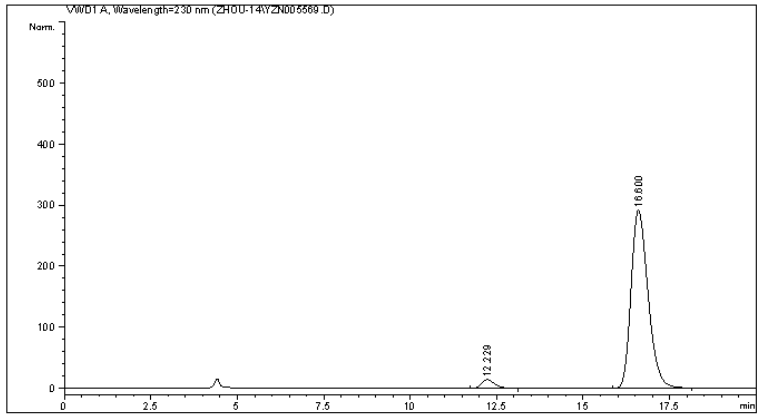

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  14.176 BB    0.4788 5247.18164  167.60249  49.9465
   2  16.553 BB    0.5740 5258.43018  140.34819  50.0535

Totals :                  1.05056e4   307.95068

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



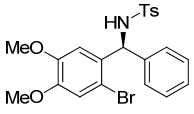
(+/-)-3ja

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005569.D
Sample Name: XG-3-16B

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/17/2014 9:11:52 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/17/2014 9:09:48 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:29:18 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



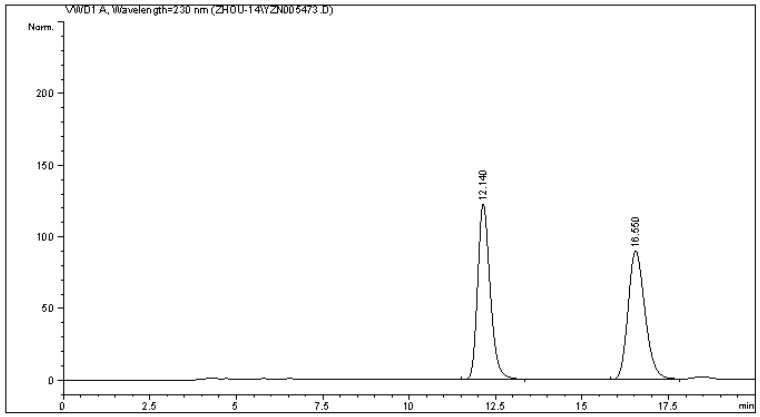

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  12.229 BB    0.4148  386.63855   14.21762   3.7121
   2  16.600 BB    0.5306 1.00290e4   291.73975  96.2879

Totals :                1.04156e4   305.95737

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



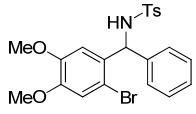
(-)-**3ka**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005473.D
Sample Name: XG-3-2C(+/-)

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/7/2014 7:30:33 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/7/2014 6:49:17 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:28:10 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



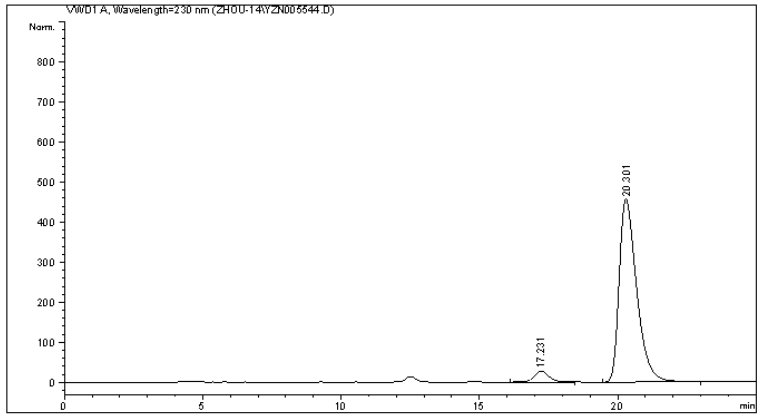

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  12.140 VB    0.3862 3075.40430  122.44308  49.9693
   2  16.550 BB    0.5294 3079.18628   89.84679  50.0307

Totals :                6154.59058  212.28987

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



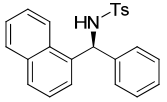
(+/-)-**3ka**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005544.D
Sample Name: XG-3-12C

```
==================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/16/2014 11:08:58 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/16/2014 11:05:58 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 10/25/2015 9:21:21 PM
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



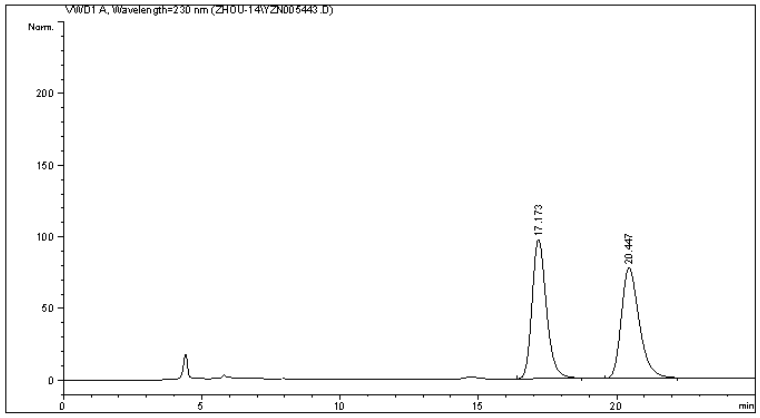

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  17.231 BB    0.5768 1045.30579   27.53718   4.9490
   2  20.301 BB    0.6719 2.00762e4   456.38904  95.0510

Totals :                 2.11215e4   483.92622

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



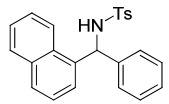
(*S*)-**3la**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005443.D
Sample Name: XG-3-2E(+/-)

```
==================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/3/2014 11:04:40 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/3/2014 10:22:21 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:14:03 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



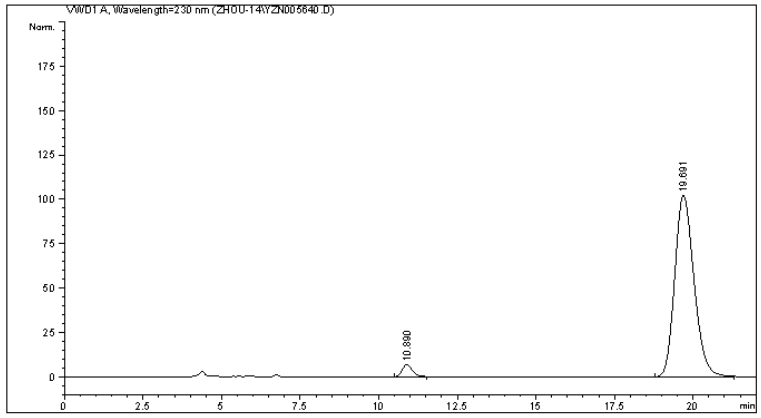

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  17.173 BB    0.5525 3500.22754   97.21790  50.2653
   2  20.447 BB    0.6836 3463.27783   77.18501  49.7347

Totals :                 6963.50537  174.40290

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



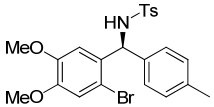
(+/-)-**3la**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005640.D
Sample Name: XG-3-18A

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/23/2014 10:37:59 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/23/2014 10:07:16 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:37:14 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



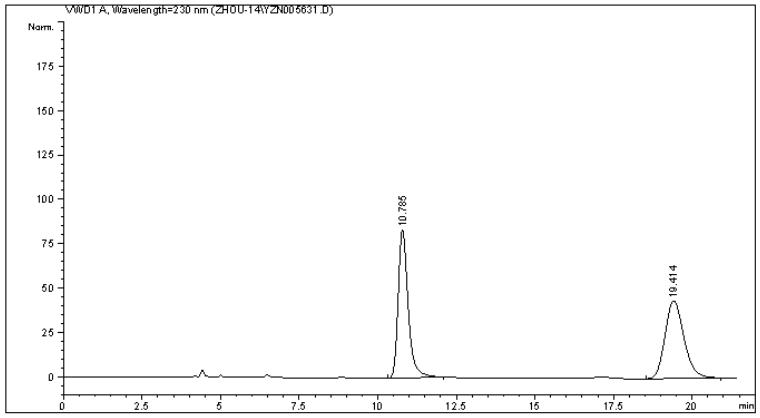

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1  10.890 BB    0.3426  155.02534    6.96692   3.4294
   2  19.691 BB    0.6593 4365.46729  102.32998  96.5706

Totals :                  4520.49263  109.29690

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



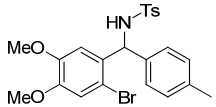
(+)-**3kb**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005631.D
Sample Name: XG-3-18A(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/22/2014 2:41:00 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/22/2014 2:23:57 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:37:14 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



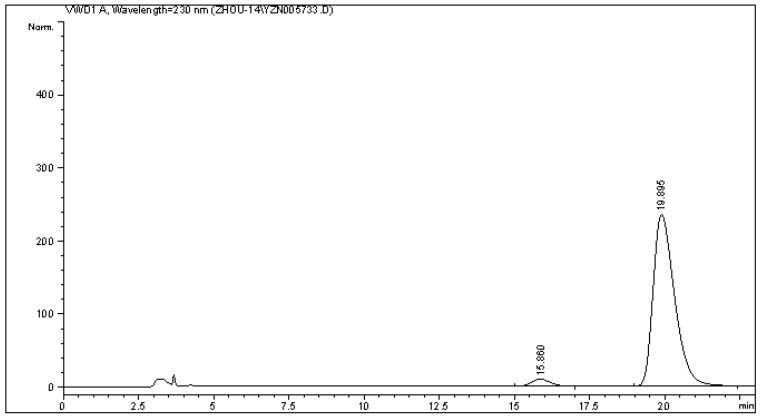

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1  10.785 BB    0.3357 1840.04651   83.50512  49.9792
   2  19.414 BB    0.6461 1841.57776   43.82162  50.0208

Totals :                  3681.62427  127.32674

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



(+/-)-**3kb**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005733.D
Sample Name: XG-3-19E

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 7/26/2014 9:08:21 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 7/26/2014 8:51:16 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 10/26/2014 3:48:45 PM by Z
(modified after loading)
Sample Info : OD-H , H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 230 nm

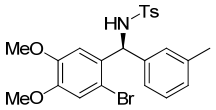


Area Percent Report

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

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	15.860	BB	0.6578	428.59454	9.95981	3.5433
2	19.895	BB	0.7621	1.16673e4	235.22879	96.4567
Totals :				1.20959e4	245.18860	

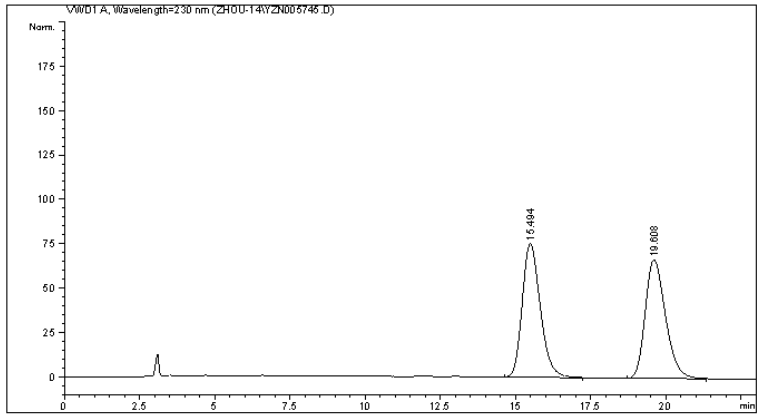


(+)-**3kc**

*** End of Report ***

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005745.D
Sample Name: XG-3-19E(+/-)

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 7/27/2014 3:14:34 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 7/27/2014 3:04:54 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 10/26/2014 3:47:35 PM by Z
(modified after loading)
Sample Info : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm

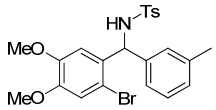


Area Percent Report

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

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	15.494	BB	0.6457	3153.64478	75.32347	50.0773
2	19.608	BB	0.7245	3143.90552	66.89845	49.9227
Totals :				6297.55029	142.22192	

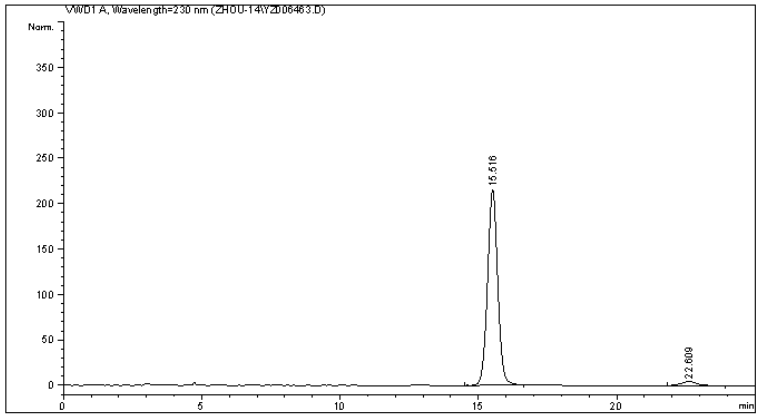


(+/-)-**3kc**

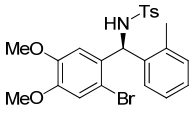
*** End of Report ***

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006463.D
Sample Name: XG-3-19F

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/2/2014 8:17:27 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 8/2/2014 8:05:33 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:14:39 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 85/15, 1.0 mL/min, 30 oC, 230 nm
```



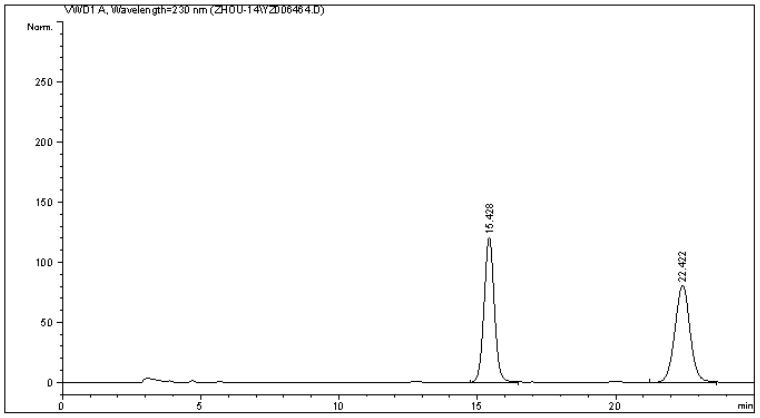

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min] mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  15.516 BB    0.3917 5503.13721  215.08493  97.0054
   2  22.609 BB    0.5790  169.88359    4.43910   2.9946

Totals :                  5673.02080  219.52403

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



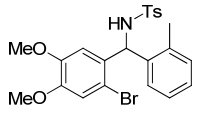
(+)-**3kd**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006464.D
Sample Name: XG-3-19F(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/2/2014 8:46:05 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 8/2/2014 8:42:52 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:12:44 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 85/15, 1.0 mL/min, 30 oC, 230 nm
```



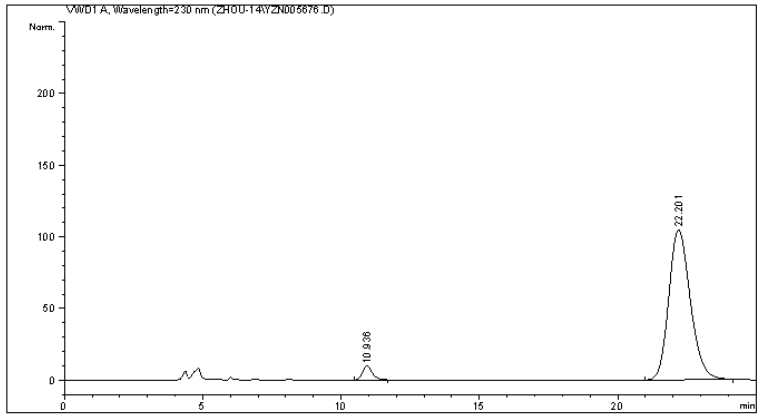

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min] mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  15.428 BB    0.3981 3100.12427  120.34335  50.2629
   2  22.422 VB    0.5905 3067.69287   80.71541  49.7371

Totals :                  6167.81714  201.05876

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



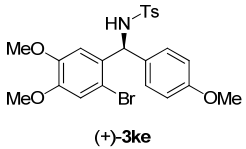
(+/-)-**3kd**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005676.D
Sample Name: XG-3-18B1

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/24/2014 6:36:39 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/24/2014 6:08:08 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 10/25/2015 9:47:32 PM
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.70 mL/min, 30 oC, 230 nm
```




```
Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  10.936 BB    0.3840  236.17111    9.52361   3.9942
   2  22.201 BB    0.8326 5676.60645  104.84789  96.0058

Totals :                 5912.77756  114.37151
```

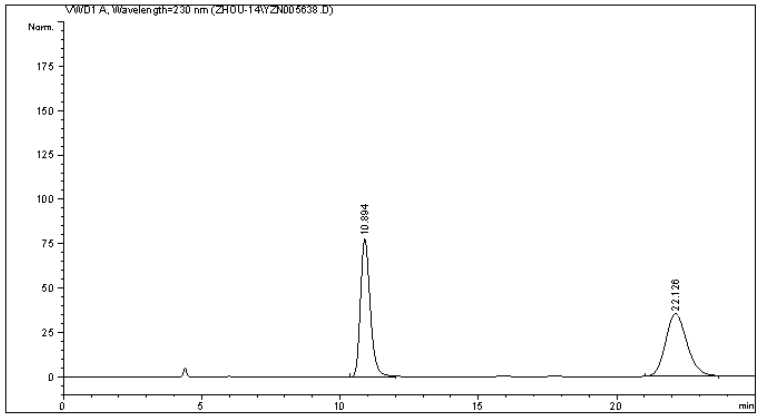


(+)-3ke

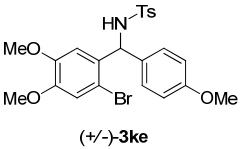
```
*** End of Report ***
```


Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005638.D
Sample Name: XG-3-18B(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/23/2014 9:07:19 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/23/2014 8:38:08 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:39:38 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```




```
Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  10.894 BB    0.3734 1895.38916   77.69145  50.1635
   2  22.126 BB    0.8281 1883.03259   35.10719  49.8365

Totals :                 3778.42175  112.79865
```

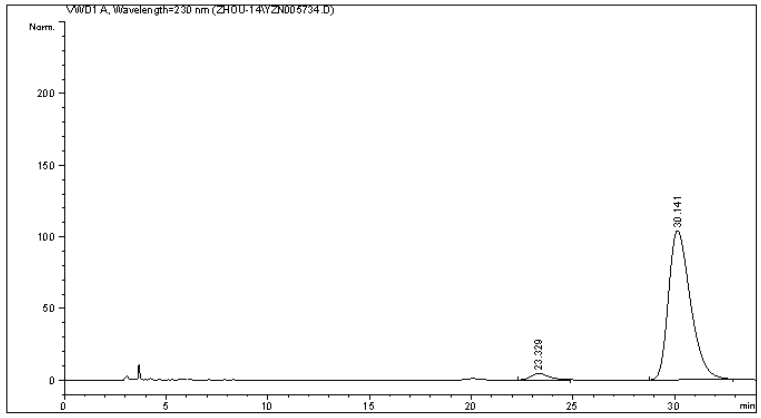


(+/-)-3ke

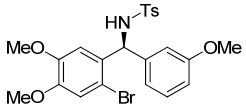
```
*** End of Report ***
```

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005734.D
Sample Name: XG-3-19G

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/26/2014 9:41:03 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/26/2014 9:31:20 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:51:39 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 230 nm
```



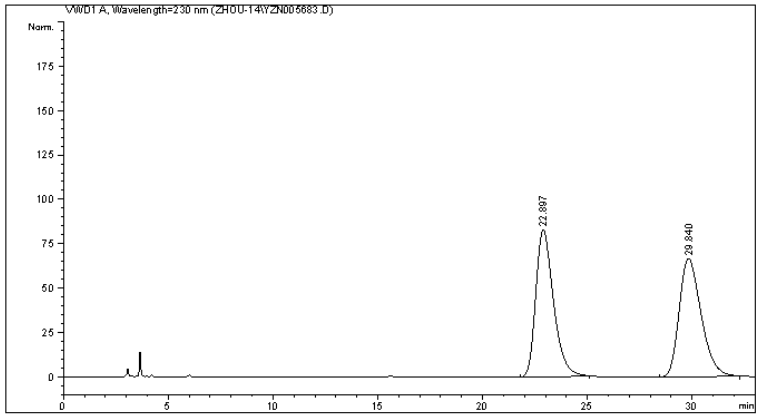

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  23.329 BB    0.8833  281.59406    4.46246   3.4813
   2  30.141 BB    1.1468 7807.20264  104.15491  96.5187

Totals :                 8088.79669  108.61738

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



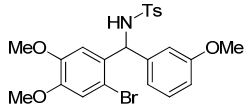
(+)-**3kf**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005683.D
Sample Name: XG-3-19G(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/24/2014 9:55:24 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/24/2014 9:47:46 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:50:11 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 230 nm
```



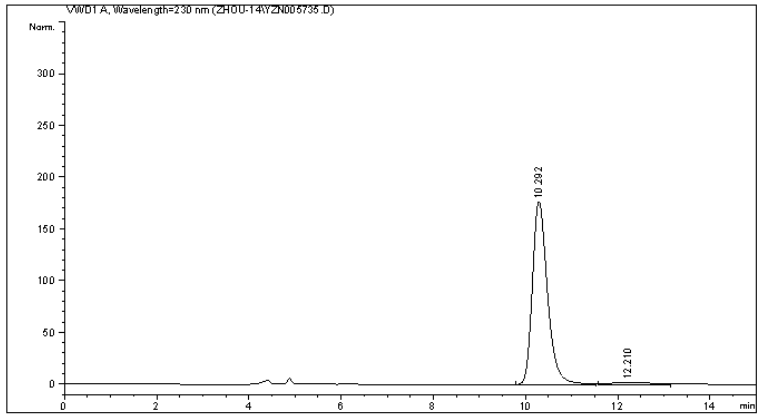

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  22.897 BB    0.9021 4880.71729   82.92573  50.1546
   2  29.840 BB    1.1217 4850.62598   66.73828  49.8454

Totals :                 9731.34326  149.66401

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



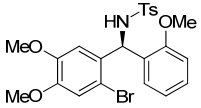
(+/-)-**3kf**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005735.D
Sample Name: XG-3-20H

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/26/2014 10:41:06 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/26/2014 10:16:29 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:53:08 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```




```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  10.292 BB    0.3472 4025.69067  176.79790  96.7903
   2  12.210 BV    0.8002  133.49887    2.30730   3.2097

Totals :                  4159.18954  179.10520
```

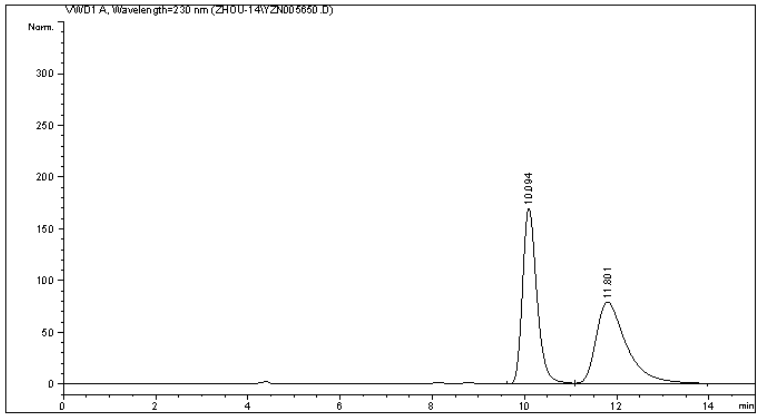


(+)-**3kg**

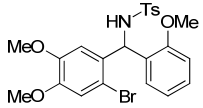
```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005650.D
Sample Name: XG-3-20H(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/23/2014 9:14:19 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/23/2014 9:11:30 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:53:08 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```




```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  10.094 BV    0.3308 3678.03589  170.14691  50.4532
   2  11.801 VB    0.6823 3611.96021   79.16192  49.5468

Totals :                  7289.99609  249.30883
```

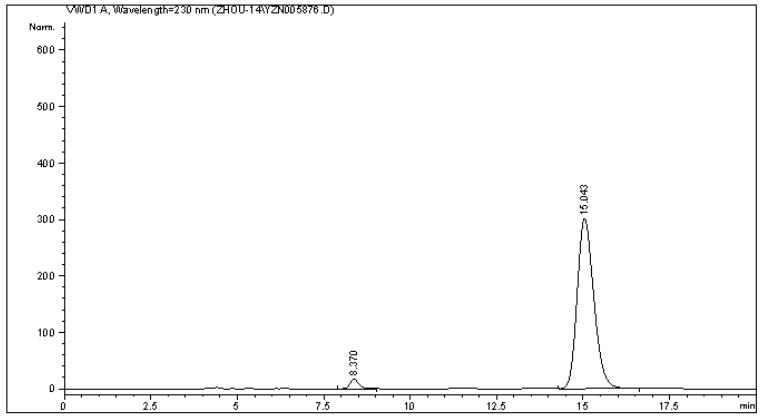


(+/-)-**3kg**

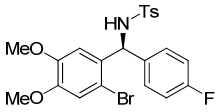
```
                          *** End of Report ***
```

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005876.D
Sample Name: XG-3-18C

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/22/2014 3:48:19 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/22/2014 3:45:08 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:43:25 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



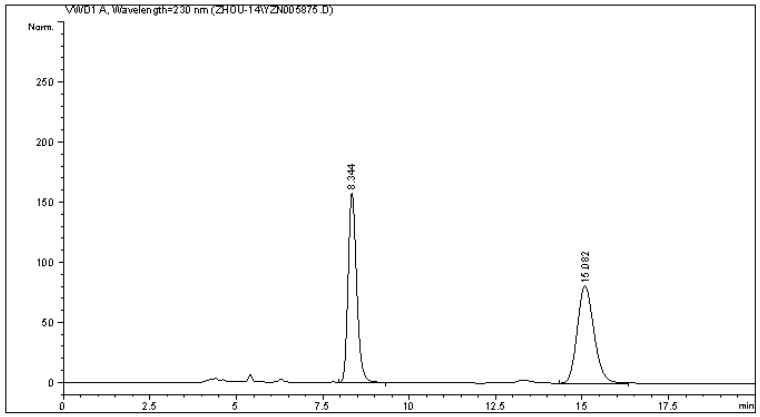

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.370 BB    0.2716  306.70395   17.24198   2.9535
   2  15.043 VB    0.5170 1.00776e4   301.20364  97.0465

Totals :                 1.03843e4   318.44562

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



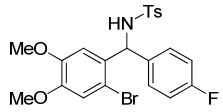
(+)-**3kh**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005875.D
Sample Name: XG-3-18C(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/22/2014 3:19:56 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/22/2014 3:01:13 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:42:10 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



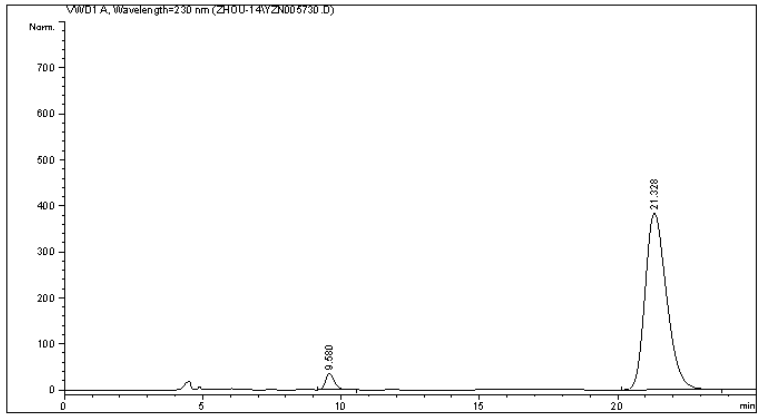

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.344 VB    0.2631 2714.34180  157.96738  49.9776
   2  15.082 BB    0.5189 2716.76978   80.80166  50.0224

Totals :                 5431.11157  238.76904

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



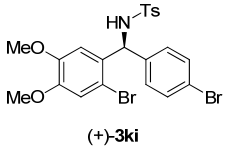
(+/-)-**3kh**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005730.D
Sample Name: XG-3-19D

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/26/2014 7:28:01 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/26/2014 7:24:48 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:46:04 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



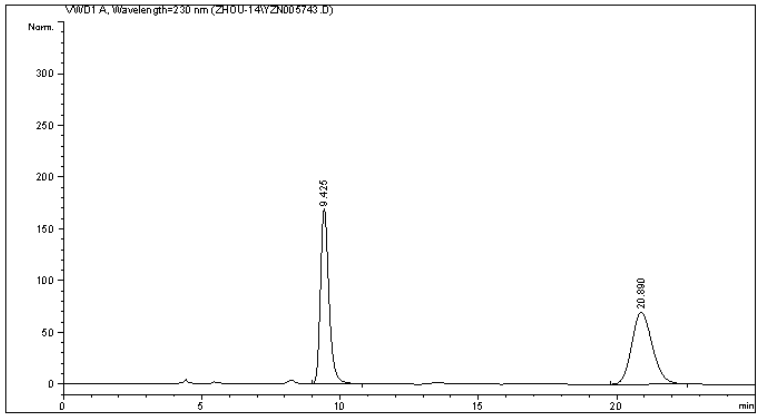

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1   9.580 BB    0.3427  805.05560   35.96141   3.7392
   2  21.328 BB    0.8381 2.07249e4   383.85754  96.2608

Totals :                 2.15300e4   419.81896

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



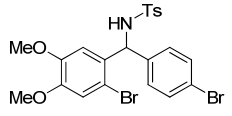
(+)-**3ki**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005743.D
Sample Name: XG-3-19D(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/27/2014 2:13:48 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/27/2014 2:10:11 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:45:00 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



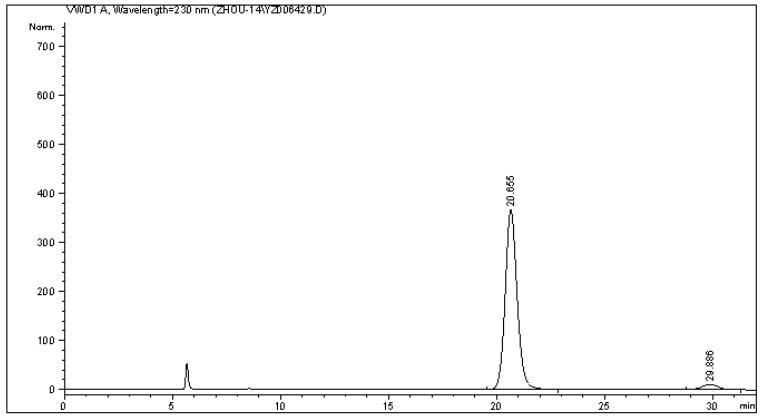

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1   9.425 VB    0.3266 3613.43042  169.01599  50.0399
   2  20.890 BB    0.7956 3607.66357   69.74969  49.9601

Totals :                 7221.09399  238.76568

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



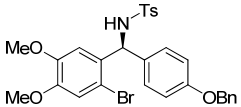
(+/-)-**3ki**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006429.D
Sample Name: XG-3-20J

```
=====================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/27/2014 1:42:28 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/27/2014 1:28:41 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:17:03 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 80/20, 1.0 mL/min, 30 oC, 230 nm
```



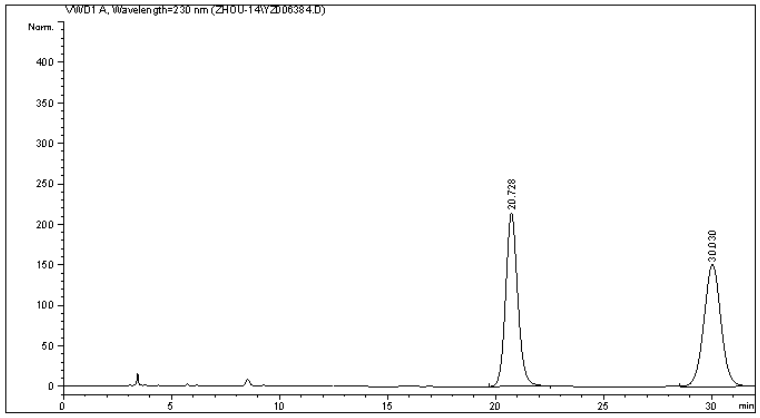

```
=====================================================================
                        Area Percent Report
=====================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  20.655 BB    0.5840 1.41074e4   366.86124  96.0850
   2  29.886 BB    0.7908  574.80951   10.83477   3.9150

Totals :                 1.46822e4   377.69600

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



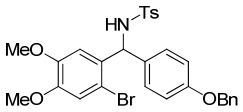
(+)-**3kj**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006384.D
Sample Name: XG-3-20J(+/-)

```
=====================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/25/2014 12:50:28 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/25/2014 12:39:41 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:24:52 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 80/20, 1.0 mL/min, 30 oC, 230 nm
```



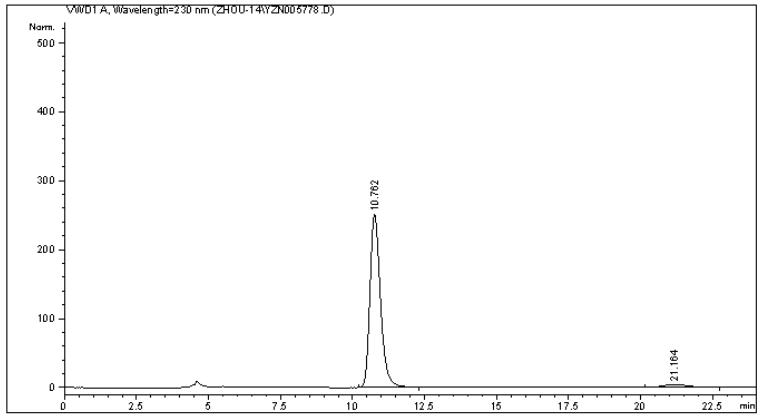

```
=====================================================================
                        Area Percent Report
=====================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  20.728 BB    0.5900 8304.26563   213.80824  50.1225
   2  30.030 VB    0.8453 8263.66016   150.28954  49.8775

Totals :                 1.65679e4   364.09778

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



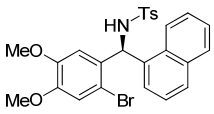
(+/-)-**3kj**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005778.D
Sample Name: XG-3-20K

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/30/2014 3:29:00 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/30/2014 3:24:30 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:56:44 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30 0.7 mL/min, 30 oC, 230 nm
```



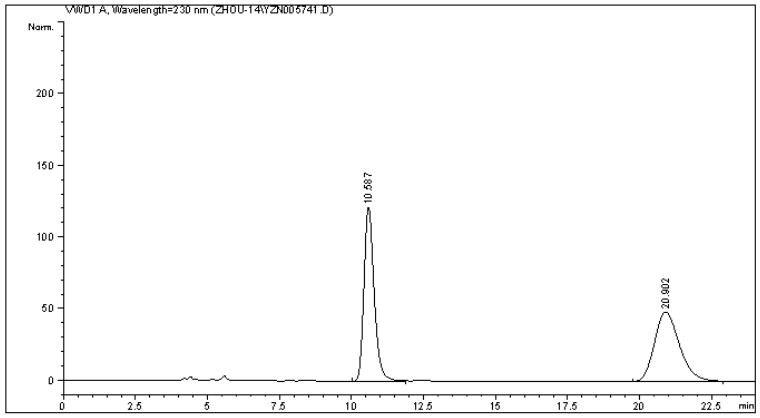

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  10.762 BB    0.3907 6400.00586  250.98370  96.0820
   2  21.164 BB    0.9075  260.97815    4.25665   3.9180

Totals :                 6660.98401  255.24036

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



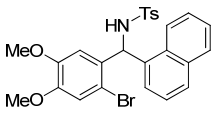
(+)-**3kk**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005741.D
Sample Name: XG-3-18C(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/27/2014 1:22:01 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/27/2014 1:01:48 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:55:37 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 230 nm
```



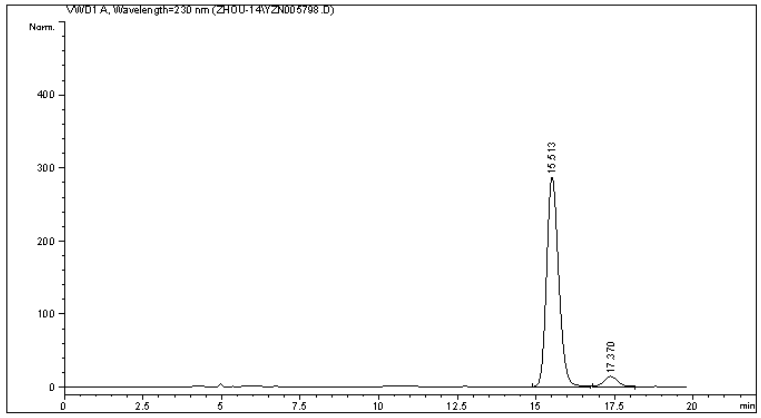

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  10.587 BB    0.3783 2998.15332  121.45504  50.5055
   2  20.902 BB    0.9365 2938.13599   48.52050  49.4945

Totals :                 5936.28931  169.97554

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



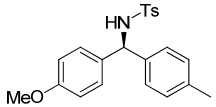
(+/-)-**3kk**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005798.D
Sample Name: XG-3-22B

```
==================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/1/2014 10:02:00 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/1/2014 10:01:16 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:59:57 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



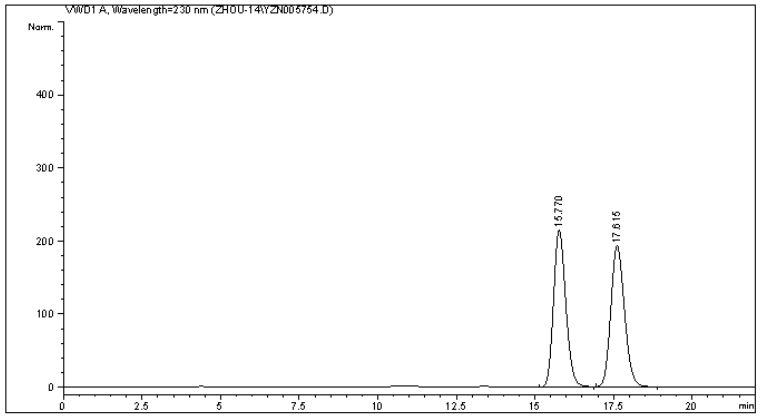

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1  15.513 BB    0.4128 7644.81934  286.86798  94.7655
   2  17.370 BB    0.4710  422.26831   14.00966   5.2345

Totals :                 8067.08765  300.87764

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



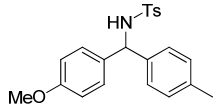
(*S*)-**3db**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005754.D
Sample Name: XG-3-22B(+/-)

```
==================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/28/2014 9:58:01 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/28/2014 9:55:27 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:59:57 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



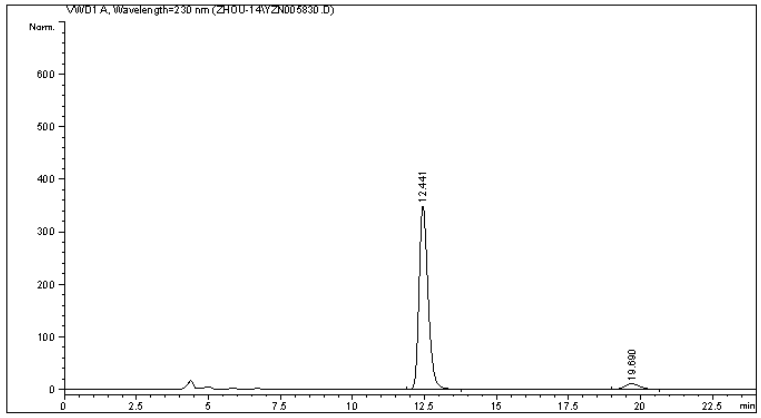

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1  15.770 BB    0.4225 5844.70410  214.65431  49.9712
   2  17.615 BB    0.4703 5851.44141  192.94443  50.0288

Totals :                 1.16961e4   407.59874

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



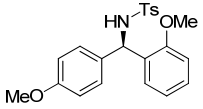
(+/-)-**3db**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005830.D
Sample Name: XG-3-22A

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/15/2014 9:24:50 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/15/2014 8:50:02 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:58:45 PM by Z
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



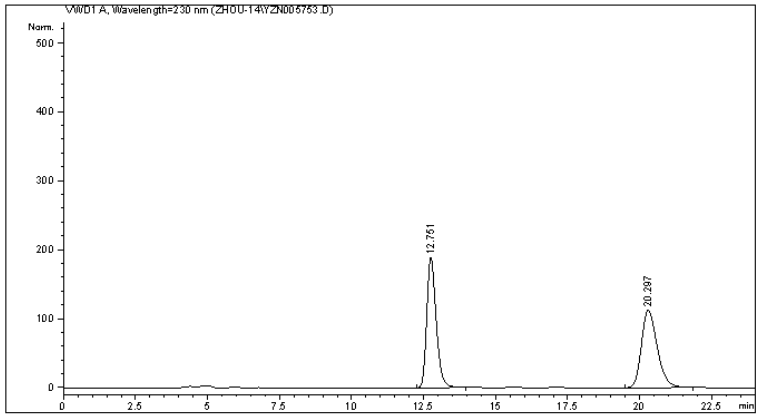

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  12.441 VB    0.3331 7582.75342  349.67377  95.1173
   2  19.690 BB    0.5625  389.24573   10.74280   4.8827

Totals :                  7971.99915  360.41657

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



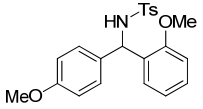
(*R*)-**3dg**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005753.D
Sample Name: XG-3-22A(+/-)

```
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/28/2014 9:20:51 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/28/2014 9:12:23 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 3:56:44 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



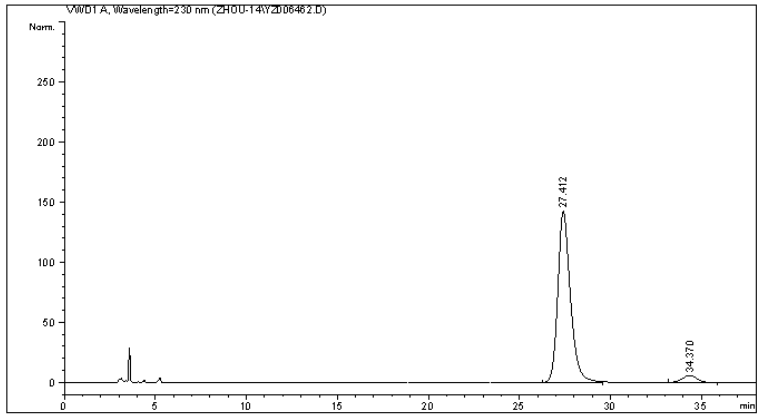

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  12.751 BB    0.3484 4285.79199  188.41444  50.0584
   2  20.297 BB    0.5857 4275.79492  112.60605  49.9416

Totals :                  8561.58691  301.02049

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



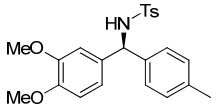
(+/-)-**3dg**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006462.D
Sample Name: XG-3-23B

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/2/2014 7:19:47 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 8/2/2014 7:16:22 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:22:12 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 230 nm
```



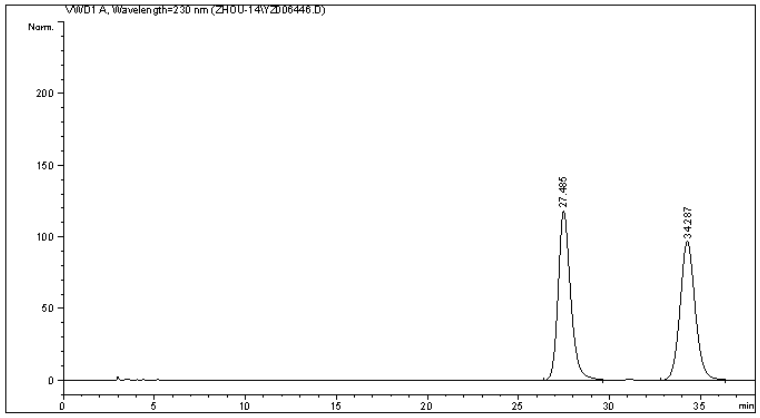

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  27.412 BB    0.7149 6810.91553  142.48419  95.2230
   2  34.370 BB    0.8415  341.68216    5.95242   4.7770

Totals :                 7152.59769  148.43661

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



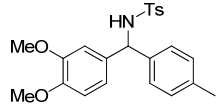
(-)-3hb

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006446.D
Sample Name: XG-3-23b(+/-)

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/30/2014 2:22:13 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/30/2014 2:15:24 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:21:05 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 230 nm
```



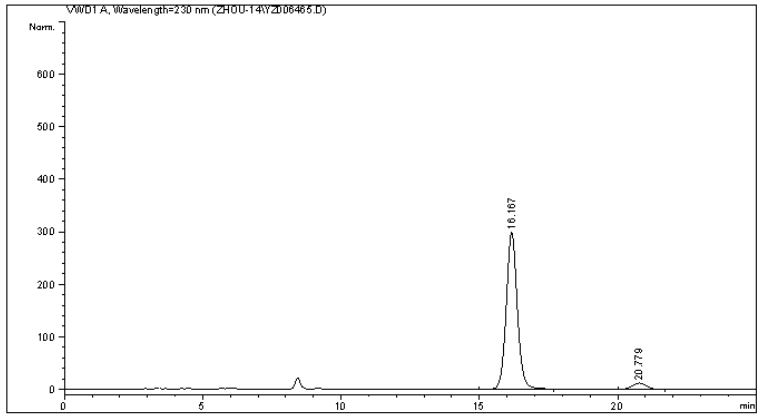

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  27.485 BB    0.7146 5618.24219  118.21407  50.2146
   2  34.287 BB    0.8794 5570.21777   96.82361  49.7854

Totals :                 1.11885e4   215.03767

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



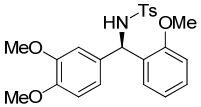
(+/-)-3hb

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006465.D
Sample Name: XG-3-23A

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/2/2014 9:30:32 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 8/2/2014 9:15:18 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:19:51 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 80/20, 1.0 mL/min, 30 oC, 230 nm
```



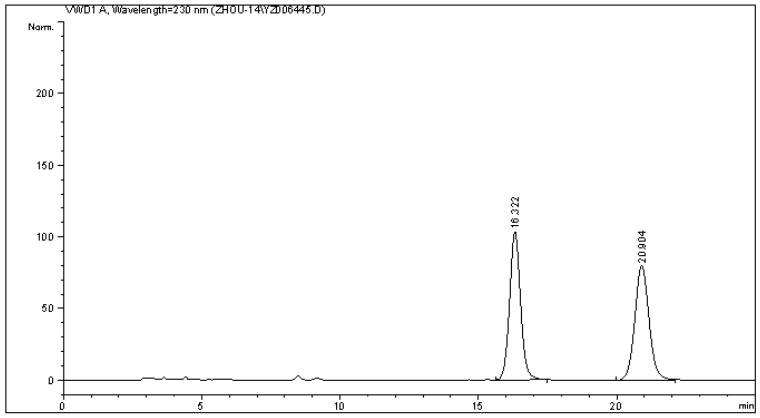

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  16.167 BB    0.4232 8301.06836  298.75171  95.1609
   2  20.779 BB    0.5479  422.12491   11.77357   4.8391

Totals :                 8723.19327  310.52528

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



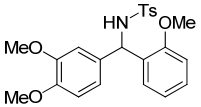
(+)-3hg

Data File C:\CHEM32\1\DATA\ZHOU-14\YZ006445.D
Sample Name: XG-3-23A(+/-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/30/2014 1:49:57 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/30/2014 1:47:42 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:18:27 PM by Z
                  (modified after loading)
Sample Info     : IA, H/i-PrOH = 80/20, 1.0 mL/min, 30 oC, 230 nm
```



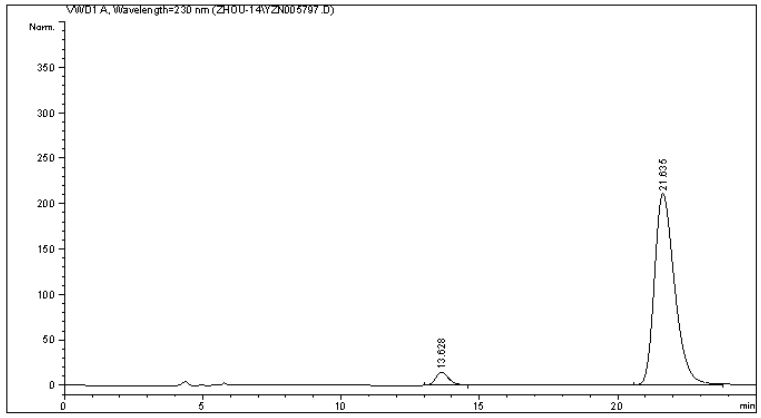

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  16.322 BB    0.4206 2852.52686  103.49867  49.9489
   2  20.904 BB    0.5493 2858.35791   79.72751  50.0511

Totals :                 5710.88477  183.22618

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



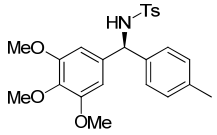
(+/-)-3hg

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005797.D
Sample Name: XG-3-24B

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/1/2014 9:34:19 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/1/2014 9:07:07 AM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:04:32 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



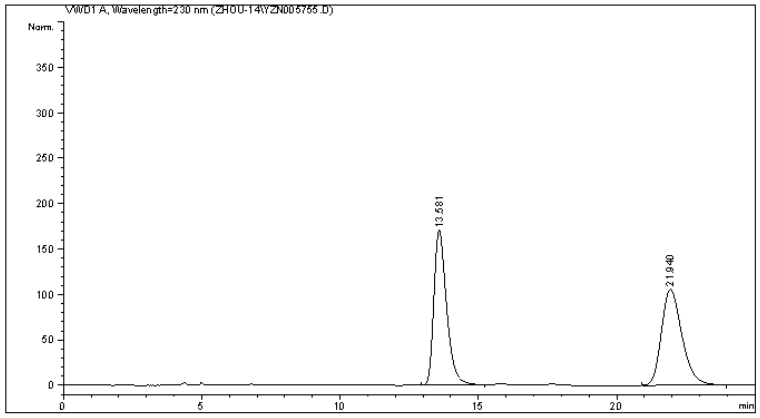

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  13.628 BB    0.5052  466.29727   14.15384   4.2254
   2  21.635 BB    0.7732 1.05694e4   210.12764  95.7746

Totals :                 1.10357e4   224.28148

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



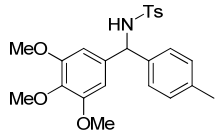
(+)-**3jb**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005755.D
Sample Name: XG-3-24B(+/-)

```
==========================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/28/2014 10:27:25 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/28/2014 10:24:54 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:04:32 PM by Z
                  (modified after loading)
Sample Info     : OD-H , H/i-PrOH = 80/20, 0.7 mL/min, 30 oC, 230 nm
```



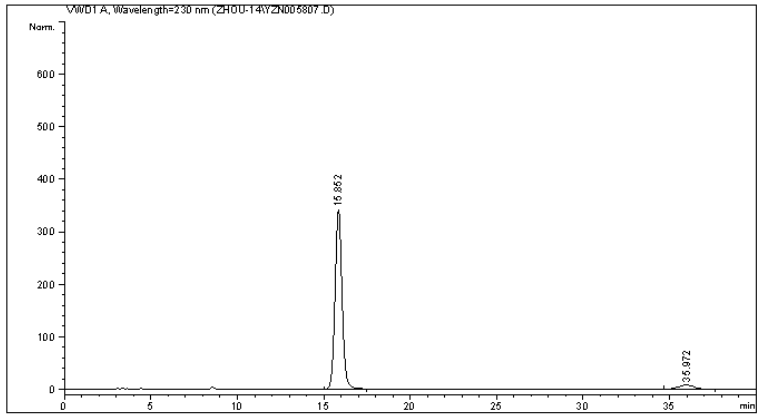

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|--------|
   1  13.581 BB    0.4886 5452.67529  170.28455  50.0988
   2  21.940 BB    0.7894 5431.17871  105.59211  49.9012

Totals :                 1.08839e4   275.87666

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



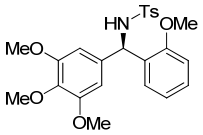
(+/-)-**3jb**

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005807.D
Sample Name: XG-3-24A

```
==================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/13/2014 9:08:06 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/13/2014 6:58:49 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:03:25 PM by Z
                  (modified after loading)
Sample Info     : IA , H/i-PrOH = 80/20, 1.0 mL/min, 30 oC, 230 nm
```



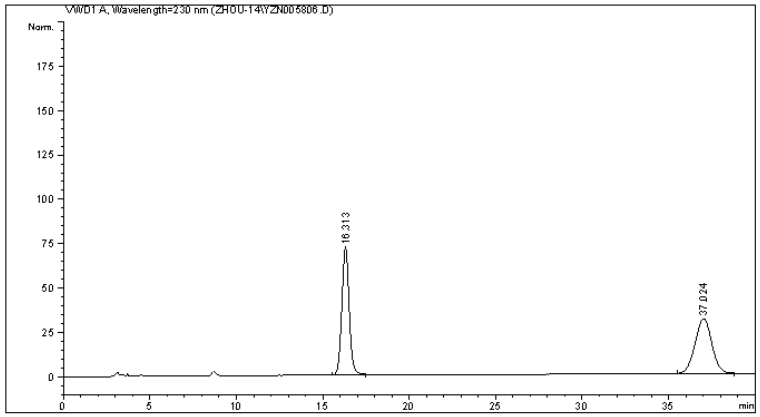

```
==================================================================
                        Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  15.852 BB    0.4319 9639.58789  342.35397  94.8889
   2  35.972 BB    0.9844  519.23175    8.04576   5.1111

Totals :                1.01588e4   350.39973

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



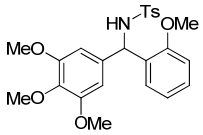
(+)-3jg

Data File C:\CHEM32\1\DATA\ZHOU-14\YZN005806.D
Sample Name: XG-3-24A(+/-)

```
==================================================================
Acq. Operator   : Z
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/13/2014 4:08:16 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/13/2014 3:38:55 PM by Z
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/26/2014 4:02:28 PM by Z
                  (modified after loading)
Sample Info     : IA , H/i-PrOH = 80/20, 1.0 mL/min, 30 oC, 230 nm
```




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

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


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  16.313 BB    0.4501 2110.30298   71.91239  50.1974
   2  37.024 BB    1.0391 2093.70776   31.02753  49.8026

Totals :                4204.01074  102.93992

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



(+/-)-3jg