Supporting Information for:

Synthesis of chiral fluorinated acyclic quaternary carbon center via stereodefined polysubstituted silyl enolates

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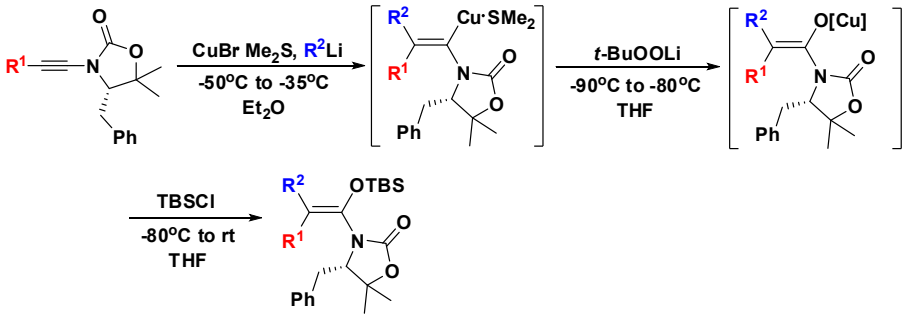
1. General information

All reactions were carried out in a flame-dried glassware under positive pressure of argon in dry solvents using standard Schlenk techniques unless otherwise indicated. Progress of the reactions was monitored by analytical TLC using glass plates pre-coated with silica gel with F254 indicator (Merck). Visualization of spots was done using UV light (254 nm), iodine, *p*-anisaldehyde, phosphomolybdic acid (PMA), and Hanessian's (cerium ammonium molybdate) stains. All organometallic compounds, dry solvents and reagents were transferred using plastic single-use graduated syringes and ovendried stainless steel needles. Purification of crude mixtures was accomplished by preparative flash column chromatography on silica gel 60A (GraceResolv), aluminum oxide 90 neutral (Merck) or Florisil® Adsorbent 100-200 mesh (Fluka) using gradient mixtures of ethyl acetate / *n*hexane (unless otherwise indicated). ^{1}H and ^{13}C NMR spectra were measured on Bruker Avance 200 (200 MHz ^{1}H, 50 MHz ^{13}C), Bruker Avance 300 (300 MHz ^{1}H, 75 MHz ^{13}C) or Bruker Avance AV 400 (400 MHz ^{1}H, 100 MHz ^{13}C) spectrometers. Chemical shifts values (δ) are reported in ppm (calibration of spectra to the residual peak of chloroform: δ = 7.26 ppm (s) for ^{1}H NMR; δ = 77.00 ppm for ^{13}C NMR). All the proton spectra reported as following: δ value (multiplicity, J coupling constant (in Hz), number of nuclei). Multiplicity contractions used: (s) – singlet, (d) – doublet, (dd) – doublet of doublet, (t) – triplet, (q) – quartet, (m) – multiplet, and (br) – broad signal. Optical specific rotations are measured with an UniPol L 1000. High performance liquid chromatography (HPLC) spectra were recorded on AgilentTM 1100 Series equipment with a variable wavelength UV analytical detector. MS and HRMS mass spectrometry was carried out on a APCI instrument by Maxis Impact (Bruker) and on a LCT Premier (Waters).

All solvents were purified and dried immediately prior to use: THF and diethyl ether (HPLC grade, non-stabilized, BioLab) were dried using Innovative TechnologyPureSolv PS-MD-2 solvent purifier (aluminum oxide columns) and kept under positive pressure of nitrogen (99.9999% purity grade); toluene was distilled from sodium metal under argon; dichloromethane was distilled from calcium hydride under argon. Methyllithium solution in diethyl ether (1.60 M), *n*-butyllithium solution in hexane (1.60 M), *n*-pentyllithium solution in heptane (2.20M), and *n*-hexyllithium solution in hexane (2.30M) were purchased from Aldrich and used as received. *tert*-Butylhydroperoxide (TBHP) solution in nonane (5.5 M, over 4Å MS) and terminal alkynes, *N*-bromosuccinimide, silver nitrate, (*S*)-4-benzyl-2-oxazolidinone, copper (I) bromide – dimethylsulfide complex, copper(II) sulfate pentahydrate, 1,10-phenanthroline, trimethylchlorosilane (TMSCl), triethylchlorosilane (TESCl), *tert*-butyldimethylsilyl chloride

(TBSCl), were purchased from commercial suppliers. (*S*)-5,5-dimethyl-4-benzyl -2-oxazolidinone (SuperQuat) and (*S*)-5,5-diethyl-4-benzyl -2-oxazolidinone was prepared from commercially available starting materials and reagents according to published procedure [1]. All starting chiral ynamides were prepared on a multi-gram scale according to a modified literature procedure[2].

2. General procedure for the preparation of silyl enol ether derivatives



CuBr•Me_2S complex (1.10 mmol, 1.1 equiv) was placed into a flame-dried three-necked round-bottomed flask equipped with a magnetic stirring bar and connected to an argon line. Dry diethyl ether (10.0 ml) was added through a septum, and the system was cooled to -50 °C using acetone-liquid nitrogen bath. A solution of alkyllithium (1.30 mmol, 1.3 equiv), was added dropwise, and the reaction mixture was allowed to warm to -40 °C and stirred for 30 min at this temperature to form a bright yellow opaque solution in case of methyllithium, dark-yellow in case of *n*-butyllithium, orange to dark-brown in case of *n*-pentyl and *n*-hexyllithium. The reaction mixture was cooled to -50 °C and a solution of the starting alkynyl carbamate (1.00 mmol, 1.0 equiv) in 3 ml of diethyl ether was added dropwise; the reaction mixture was allowed to warm to -40 °C, and stirred at this temperature for 1 h (monitored by TLC on silica gel using 20% ethyl acetate in hexane as eluent) to form a solution of vinylcuprate.

In a separate flask connected to an argon line, a solution of 1.54 mmol (1.54 equiv) of *t*-BuOOLi was prepared as follow. Dry THF (5.0 ml) was added to flame dried three-necked round-bottomed flask *via* a syringe followed by addition of a solution of *tert*-butyl hydroperoxide in nonane (0.28 ml of commercially available 5.5 M solution; 1.54 equiv, 1.54 mmol). The resulting solution was cooled to –90 °C and a solution of methyllithium (1.60 M in diethyl ether, 1.80 mmol, 1.80 equiv) was added dropwise keeping the indicated temperature. The resulting solution of lithium *tert*butylperoxide was allowed to warm to -80 °C and stir for 10 min prior to use in the following reaction step. Upon completion of the first step, the reaction mixture was cooled to -90 °C and the freshly prepared solution of lithium *tert*-butylperoxide in THF (1.54 mmol, 1.54 equiv) was transferred *via* a cannula. The resulting reaction mixture was allowed to warm up slowly to -80 °C and stirred at the indicated temperature for 2 h (monitored by TLC on

silica gel using 20% ethyl acetate in hexane as eluent) to form a brown opaque solution.

Upon completion of the second step, *tert*-butyldimethylsilyl chloride (TBSCl) (3.2 mmol, 3 equiv) in 5 ml THF was added to the reaction mixture at -80 °C and then warm up to room temperature. The mixture was stirred for about 3 hours (monitored by TLC on silica gel using 20% ethyl acetate in hexane as eluent). The reaction mixture was filtered through prewashed short pad of silica, and then washed thoroughly with 20% ethyl acetate in hexane. The solvent was evaporated and pure product silyl enol ether was obtained by flash column chromatography (SiO_2, eluting with 50:1 to 15:1 hexane/ethyl acetate).

3. General procdure for the fluorination reaction

1.5 ml solvent was added to a flame-dried tube contained silyl enol ether (0.1 mmol), and then stirred at the indicated temperature. “F” scource (1.4 eq) was added to the reaction mixture, and then slowly warm up to room temperature overnight. After the starting material was consumed completely (monitored by TLC), 2 ml water (2 ml) was added to the reaction mixture to quench the reaction. The aqueous solution was extracted with diethyl ether (3 × 5 mL) and the organic layer was combined, dried (anhydrous Na_2SO_4) and concentrated in vacuo. The dr was determined by ^{19}F NMR of the crude product, and pure product was obtained by column chromatography.

Screening of additives (LiCl, AcOLi, LiF, CsF, $Sm(OTf)_3$, $Zn(OTf)_2$, $Sc(OTf)_3$) experiments give no better results.

4. Analytical datas of silyl enol ether derivatives and fluorination products

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-methylhex-1-enyl)-5,5-dimethyloxazolidin-2-one **($1g_a$)**

Purification was performed with hexane/ethyl acetate = 25/1 to provide **$1G_a$** in 65% yield as colorless oil. ^1H NMR (400 MHz, $CDCl_3$): δ 0.08-0.14 (m, 6H), 0.83-0.88 (m, 3H), 0.91 (s, 9H), 1.00 (s, 3H), 1.21-1.29 (m, 4H), 1.34 (s, 3H), 1.41-1.48 (m, 1H), 1.59 (s, 3H), 1.94-2.03 (m, 1H), 2.48 (dd, *J* = 14.0, 10.4 Hz, 1H), 3.00 (dd, *J* = 14.0, 4.0 Hz, 1H), 3.93 (dd, *J* = 10.4, 4.0 Hz, 1H), 7.02-7.25 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.2, -3.9, 14.1, 15.1, 18.0, 22.5, 23.0, 25.7, 27.3, 30.0, 32.0, 33.7, 65.1, 81.5, 118.0, 126.7, 128.6, 128.9, 131.9, 136.8, 154.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.2; $[MH]^+$ Calcd. for $C_{25}H_{42}NO_3Si$ 432.2928; found: 432.2933

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-methyloct-1-enyl)-5,5-dimethyloxazolidin-2-one **($1g_b$)**

Purification was performed with hexane/ethyl acetate = 25/1 to provide **$1G_b$** in 72% yield as colorless oil. ^1H NMR (400 MHz, $CDCl_3$): δ 0.08 (s, 3H), 0.13 (s, 3H), 0.82 (s, 3H), 0.90-1.02 (m, 12H), 1.05-1.25 (m, 7H), 1.34 (s, 3H), 1.42-1.52 (m, 1H), 1.59 (s, 3H), 1.85-2.05 (m, 2H), 2.45-2.53 (m, 1H), 2.96-3.05 (m, 1H), 3.91-3.95 (m, 1H), 7.05-7.25 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.2, -3.9, 14.1, 15.1, 18.0, 22.4, 22.6, 25.7, 27.3, 27.8, 29.6, 31.8, 32.3, 33.7, 65.0, 81.5, 118.0, 126.7, 128.6, 128.8, 132.0, 136.8, 154.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.2; $[MH]^+$ Calcd. for $C_{27}H_{46}NO_3Si$ 460.3241; found: 460.3304

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-ethyloct-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_c$)**

Purification was performed with hexane/ethyl acetate = 25/1 to provide **1g$_c$** in 56% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.09 (s, 3H), 0.15 (s, 3H), 0.80-1.00 (m, 18H), 1.15-1.30 (m, 7H), 1.34 (s, 3H), 1.40-1.52 (m, 1H), 1.85-2.05 (m, 3H), 2.08-2.20 (m, 1H), 2.48 (dd, *J* = 13.2, 10.8 Hz, 1H), 3.01 (dd, *J* = 14.0, 3.2 Hz, 1H), 3.94 (dd, *J* = 10.8, 3.2 Hz, 1H), 6.90-7.30 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.4, -3.8, 12.3, 14.0, 18.0, 21.5, 22.5, 22.7, 25.7, 27.3, 27.8, 29.7, 29.9, 31.8, 33.4, 65.1, 81.5, 124.0, 126.8, 128.7, 128.9, 131.7, 136.9, 154.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 21.5; $[MH]^+$ Calcd. for $C_{28}H_{48}NO_3Si$ 474.3403; found: 474.3396

(*S,E*)-4-benzyl-3-(2-butyl-1-(tert-butyldimethylsilyloxy)oct-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_d$)**

Purification was performed with hexane/ethyl acetate = 25/1 to provide **1g$_d$** in 58% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.09 (s, 3H), 0.15 (s, 3H), 0.80-0.85 (m, 6H), 0.92 (s, 9H), 0.96 (s, 3H), 1.15-1.30 (m, 11H), 1.34 (s, 3H), 1.40-1.50 (m, 1H), 1.85-2.12 (m, 3H), 2.10-2.20 (m, 1H), 2.47 (dd, *J* = 14.0, 10.8 Hz, 1H), 3.00 (dd, *J* = 14.0, 3.6 Hz, 1H), 3.93 (dd, *J* = 10.8, 4.0 Hz, 1H), 7.07-7.26 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.4, -3.9, 14.0, 14.1, 18.0, 22.4, 22.6, 23.0, 25.7, 27.3, 27.8, 28.2, 29.8, 29.9, 30.0, 31.7, 33.3, 65.1, 81.5, 122.8, 126.8, 128.7, 128.8, 131.9, 136.9, 154.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 21.6; $[MH]^+$ Calcd. for $C_{30}H_{52}NO_3Si$ 502.3711; found: 502.3734

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-methyl-4-phenylbut-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_e$)**

Purification was performed with hexane/ethyl acetate = 15/1 to provide **1g$_e$** in 61% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.09 (s, 3H), 0.16 (s, 3H), 0.92 (s, 9H), 0.95 (s, 3H), 1.25 (s, 3H), 1.67 (s, 3H), 2.07-2.13 (m, 1H), 2.20-2.27 (m, 1H), 2.28-2.38 (m, 1H), 2.60-2.70 (m, 1H), 2.75-2.83 (m, 2H), 3.89 (dd, *J* = 10.4, 4.0 Hz, 1H), 7.00-7.24 (m, 10H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.2, -4.0, 15.2, 18.0, 22.4, 25.7, 27.2, 33.1, 34.1, 35.0, 64.9, 81.7, 116.7, 125.8, 126.6, 128.3, 128.5, 128.5, 128.8, 132.8, 136.7, 142.5, 154.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.6; $[MH]^+$ Calcd. for $C_{29}H_{42}NO_3Si$ 480.2934; found: 480.2963

(*S,Z*)-4-benzyl-3-(2-butyl-1-(tert-butyldimethylsilyloxy)oct-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_f$)**

Purification was performed with hexane/ethyl acetate = 25/1 to provide **1g$_f$** in 48% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.09 (s, 3H), 0.15 (s, 3H), 0.76-0.80 (m, 3H), 0.83-0.88 (m, 3H), 0.92 (s, 9H), 0.97 (s, 3H), 1.15-1.30 (m, 11H), 1.34 (s, 3H), 1.40-1.50 (m, 1H), 1.85-1.95 (m, 2H), 1.95-2.05 (m, 1H), 2.11-2.20 (m, 1H), 2.47 (dd, *J* = 14.0, 10.8 Hz, 1H), 3.00 (dd, *J* = 14.0, 3.6 Hz, 1H), 3.93 (dd, *J* = 10.8, 4.0 Hz, 1H), 7.08-7.26 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.4, -3.9, 14.0, 14.0, 18.0, 22.6, 23.2, 25.7, 27.3, 27.6, 28.5, 29.6, 29.8, 30.1, 31.8, 33.3, 65.2, 81.5, 122.8, 126.8, 128.7, 128.8, 131.9, 136.8, 154.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 21.6; $[MH]^+$ Calcd. for $C_{30}H_{52}NO_3Si$ 502.3711; found: 502.3707

(*S,Z*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-isopropyloct-1-enyl)-5,5-dimethyloxazolidin-2-

one **(1g$_g$)**

Purification was performed with hexane/ethyl acetate = 25/1 to provide **1g$_g$** in 45% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.09 (s, 3H), 0.15 (s, 3H), 0.78-0.85 (m, 4H), 0.89-0.97 (m, 17H), 1.15-1.25 (m, 7H), 1.30-1.38 (m, 3H), 1.45-1.55 (m, 1H), 1.92 (t, *J* = 8.0 Hz, 2H), 2.51 (dd, *J* = 14.0, 10.8 Hz, 1H), 2.88 (m, 1H), 2.99 (dd, *J* = 14.0, 3.6 Hz, 1H), 3.93 (dd, *J* = 10.8, 4.0 Hz, 1H), 7.05-7.25 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.6, -3.7, 14.0, 18.0, 20.2, 21.8, 22.7, 25.7, 27.1, 28.0, 30.0, 30.4, 31.6, 65.4, 81.5, 126.8, 127.6, 128.7, 128.8, 132.0, 136.8, 154.9; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 21.1; $[MH]^+$ Calcd. for $C_{29}H_{50}NO_3Si$ 488.3554; found: 488.3544

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-cyclopropylprop-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_h$)**

Purification was performed with hexane/ethyl acetate = 15/1 to provide **1g$_h$** in 52% yield as white solid . ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.09 (s, 3H), 0.13 (s, 3H), 0.33-0.40 (m, 1H), 0.45-0.55 (m, 2H), 0.58-0.65 (m, 1H), 0.89 (s, 9H), 1.06 (s, 3H), 1.27 (s, 3H), 1.35 (s, 3H), 1.53-1.65 (m, 1H), 2.58 (dd, *J* = 14.0, 4.0 Hz, 1H), 3.03 (dd, *J* = 10.4, 4.0 Hz, 1H), 3.98 (dd, *J* = 10.4, 4.0 Hz, 1H), 7.06-7.24 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.1, -4.0, 3.6, 3.7, 10.9, 11.9, 18.0, 22.6, 25.7 27.4, 33.8, 65.2, 81.5, 117.3, 126.6, 128.5, 128.9, 132.8, 136.9, 154.6; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.1; $[MH]^+$ Calcd. for $C_{24}H_{38}NO_3Si$ 416.2621; found: 416.2650

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-phenylprop-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_i$)**

Purification was performed with hexane/ethyl acetate = 15/1 to provide **1g$_i$** in 48% yield as white solid. ^{1}H NMR (400 MHz, $CDCl_3$): 0.14 (s, 3H), 0.25 (s, 3H), 0.79 (s, 3H), 0.87 (s, 3H), 0.94 (s, 9H), 1.93 (s, 3H), 2.14-2.19 (m, 1H), 2.81-2.86 (m, 1H), 3.82-3.85 (m, 1H), 7.12-7.26 (m, 10H); δ ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.1, -4.0, 18.1, 18.4, 21.3, 25.7, 26.4, 32.9, 65.9, 81.8, 120.2, 126.5, 126.7, 127.8, 128.0, 128.5, 128.7, 133.9, 136.6, 140.7, 155.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.8; $[M]^+$ Calcd. for $C_{27}H_{37}NO_3Si$ 451.2543; found: 451.2520

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-phenylbut-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_j$)**

Purification was performed with hexane/ethyl acetate = 15/1 to provide **1g$_j$** in 46% yield as colorless oil.^{1}H NMR (400 MHz, $CDCl_3$): δ 0.14 (s, 3H), 0.27 (s, 3H), 0.72 (s, 3H), 0.83 (s, 3H), 0.86 (t, *J* = 7.6 Hz, 3H), 0.94 (s, 9H), 2.18 (dd, *J* = 14.0, 10.8 Hz, 1H), 2.25-2.35 (m, 1H), 2.40-2.50 (m, 1H), 2.91 (dd, *J* = 14.0, 3.6 Hz, 1H), 3.82 (dd, *J* = 10.8, 3.6 Hz, 1H), 7.05-7.35 (m, 10H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.2, -4.0, 12.3, 18.0, 21.1, 24.7, 25.6, 26.4, 32.7, 65.8, 81.8, 126.4, 126.5, 126.7, 127.7, 128.6, 128.7, 128.7, 133.3, 136.7, 139.1, 155.4; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.1; $[MH]^+$ Calcd. for $C_{28}H_{40}NO_3Si$ 466.2777; found: 466.2770

(*S,E*)-4-benzyl-3-(1-(tert-butyldimethylsilyloxy)-2-phenylhex-1-enyl)-5,5-dimethyloxazolidin-2-one **(1g$_k$)**

Purification was performed with hexane/ethyl acetate = 20/1 to provide **1g$_k$** in 57% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.14 (s, 3H), 0.28 (s, 3H), 0.75 (s, 3H), 0.77 (t, *J* = 6.4 Hz, 3H), 0.83 (s, 3H), 0.95 (s, 9H), 1.19-1.24 (m, 4H), 2.22 (dd, *J* = 14.0, 10.4 Hz, 1H),

2.28-2.35 (m, 1H), 2.47-2.45 (m, 1H), 2.94 (dd, *J* = 14.0, 4.0 Hz, 1H), 3.82 (dd, *J* = 10.4, 4.0 Hz, 1H), 7.15-7.30 (m, 10H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.1, -3.8, 14.0, 18.1, 21.2, 22.8, 25.7, 26.5, 29.9, 31.5, 32.8, 65.8, 81.8, 125.2, 126.5, 127.8, 128.7, 128.7, 128.8, 133.6, 136.8, 139.5, 155.2; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.2; $[M]^+$ Calcd. for $C_{30}H_{43}NO_3Si$ 493.3012; found: 493.3015

(*S,E*)-4-benzyl-3-(11,11-diisopropyl-2,2,3,3,6,12-hexamethyl-4,10-dioxa-3,11-disilatridec-5-en-5-yl)-5,5-dimethyloxazolidin-2-one **(1g$_l$)**

Purification was performed with hexane/ethyl acetate = 30/1 to provide **1g$_l$** in 54% yield as colorless oil .^{1}H NMR (400 MHz, $CDCl_3$): δ 0.08 (s, 3H), 0.13 (s, 3H), 0.91 (s, 9H), 0.96-1.01 (m, 24 H), 1.33 (s, 3H), 1.52-1.58 (m, 1H), 1.61 (s, 3H), 1.65-1.75 (m, 1H), 1.95-2.15 (m, 2H), 2.49 (dd, *J* = 14.0, 4.0 Hz, 1H), 3.99 (dd, *J* = 10.4, 4.0 Hz, 1H), 3.58-3.70 (m, 2H), 3.93 (dd, *J* = 10.4, 4.0 Hz, 1H), 7.05-7.25 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.2, -4.0, 12.0 15.1, 18.0 18.0, 22.4, 25.7, 27.3, 28.9, 31.3, 33.7, 63.7, 65.0, 81.5, 117.5, 126.7, 128.6, 128.8, 132.2, 136.8, 154.7; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 12.4, 22.3; $[MH]^+$ Calcd. for $C_{33}H_{60}NO_3Si_2$ 590.4055; found: 590.4039

(*S,E*)-5-(4-benzyl-5,5-dimethyl-2-oxooxazolidin-3-yl)-5-(tert-butyldimethylsilyloxy)-4-methylpent-4-enyl pivalate **(1g$_m$)**

Purification was performed with hexane/ethyl acetate = 15/1 to provide **1g$_m$** in 64% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.08 (s, 3H), 0.13 (s, 3H), 0.91 (s, 9H), 1.01 (s, 3H), 1.13 (s, 9H), 1.34 (s, 3H), 1.61 (s, 3H), 1.62-1.75 (m, 1H), 1.75-1.85 (m, 1H), 1.94-2.04 (m, 1H), 2.05-2.18 (m, 1H), 2.50 (dd, *J* = 14.0, 10.0 Hz, 1H), 2.99 (dd, *J* = 14.0, 4.4 Hz, 1H), 3.90-4.07 (m, 3H), 7.05-7.25 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.2, -4.0, 15.1, 18.0, 22.5, 25.7, 27.0, 27.2, 27.3, 29.1, 33.7, 38.7, 64.5, 64.9, 81.6, 116.6, 126.7, 128.6, 128.8, 132.7, 136.6, 154.7, 178.5; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.7; $[MH]^+$ Calcd. for $C_{29}H_{48}NO_5Si$ 518.3302; found: 518.3363

(*S,E*)-5-(4-benzyl-5,5-dimethyl-2-oxooxazolidin-3-yl)-5-(tert-butyldimethylsilyloxy)-4-methylpent-4-enyl benzoate **(1g$_n$)**

Purification was performed with hexane/ethyl acetate = 12/1 to provide **1g$_n$** in 64% yield as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.08 (s, 3H), 0.14 (s, 3H), 0.91 (s, 9H), 0.97 (s, 3H), 1.21 (s, 3H), 1.64 (s, 3H), 1.77-1.86 (m, 1H), 1.92-2.00 (m, 1H), 2.06-2.15 (m, 1H), 2.15-2.25 (m, 1H), 2.44 (d, *J* = 14.0, 10.0 Hz, 1H), 2.96 (dd, *J* = 14.0, 4.4 Hz, 1H), 3.92 (dd, *J* = 10.0, 4.4 Hz, 1H), 4.20-4.35 (m, 2H), 7.00-7.05 (m, 2H), 7.10-7.15 (m, 1H), 7.17-7.22 (m, 2H), 7.32-7.37 (m, 2H), 7.42-7.50 (m, 1H), 7.95-8.02 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$): δ -5.2, -4.0, 15.0, 18.0, 22.4, 25.7, 27.0, 27.2, 29.1, 33.6, 64.9, 65.0, 81.6, 116.5, 126.7, 128.3, 128.5, 128.7, 129.6, 132.8, 154.7, 166.6; ^{29}Si NMR (80 MHz, $CDCl_3$): δ 22.7; $[MH]^+$ Calcd. for $C_{31}H_{44}NO_5Si$ 538.2989; found: 538.2986

(*S*)-4-benzyl-3-((*R*)-2-fluoro-2-methylhexanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_a$)**

Purification was performed with hexane/ethyl acetate = 15/1 to provide **2g$_a$** as colorless oil, yield 90%, dr 93:7. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.83 (t, *J* = 6.8 Hz, 3H), 1.27-1.31 (m, 10H), 1.62 (d, *J* = 22 Hz, 3H), 1.79-1.95 (m, 1H), 2.07-2.25 (m, 1H), 2.85 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.09 (14.4, 4.0 Hz, 1H), 4.42 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.20-7.35 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ

13.6, 22.1, 22.3(d, J_{C-F} = 24.2 Hz), 22.6, 25.2 (d, J_{C-F} = 3.5 Hz), 28.0, 35.1, 36.6, 36.8, 65.4, 82.6, 97.7 (d, J_{C-F} = 184.3 Hz), 126.9, 128.7, 129.1, 136.6, 151.0, 172.7 (d, J_{C-F} = 26.8 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -148.5(m, 1F, major diastereomer), -148.0 (m, 1F, minor diastereomer); HRMS: $[MH]^+$ Calcd. for $C_{19}H_{27}NO_3F$ 336.1975; found: 336.1976.

(*S*)-4-benzyl-3-((*R*)-2-fluoro-2-methyloctanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_b$)**
Purification was performed with hexane/ethyl acetate = 15/1 to provide **2g$_b$** as colorless oil, yield 81%, dr 92:8. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.80 (t, *J* = 6.8 Hz, 3H), 1.25-1.50 (m, 14H), 1.62 (d, *J* = 22 Hz, 3H), 1.84-1.88 (m, 1H), 2.10-2.22 (m, 1H), 2.85 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.10 (dd, *J* = 14.4, 4.0 Hz, 1H), 4.42 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.16-7.24 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 14.0, 22.2, 22.3, 22.5, 23.1 (d, J_{C-F} = 3.6 Hz), 28.0, 29.2, 31.6, 35.2, 37.0 (d, J_{C-F} = 22.3 Hz), 65.4, 82.6, 97.8 (d, J_{C-F} =184.3 Hz), 126.9, 128.7, 129.1, 136.6, 151.0, 172.8 (d, J_{C-F}= 26.8 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -148.4(m, 1F, major diastereomer), -147.9 (m, 1F, minor diastereomer); HRMS: $[MH]^+$ Calcd. for $C_{21}H_{31}NO_3F$ 364.2272; found: 364.2282.

(*S*)-4-benzyl-3-((*R*)-2-ethyl-2-fluorooctanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_c$)**
Purification was performed with hexane/ethyl acetate = 15/1 to provide **2g$_c$** as colorless oil, yield 76%, dr 90:10. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.80 (t, *J* = 6.8 Hz, 3H), 0.87 (t, *J* = 6.8 Hz, 3H), 1.18-1.27 (m, 13H), 1.28-1.32 (m, 1H), 1.78-2.00 (m, 2H), 2.15-2.28 (m, 2H), 2.82 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.11 (dd, *J* = 14.4, 4.0 Hz, 1H), 4.48 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.18-7.26 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 7.8 (d, J_{C-F}= 5.0 Hz), 14.0, 22.2, 22.5, 23.1 (d, J_{C-F}= 3.6 Hz), 28.1, 28.4 (d, J_{C-F}= 23.1 Hz), 29.3, 31.6, 35.1, 35.2 (d, J_{C-F} = 22.4 Hz), 65.6, 82.4, 101.0 (d, J_{C-F} = 185.8 Hz), 126.9, 128.7, 129.1, 136.7, 151.0, 172.2 (d, J_{C-F} = 26.8 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -156.3 (m, 1F); HRMS: $[MH]^+$ Calcd. for $C_{22}H_{33}NO_3F$ 378.2444; found: 378.2441.

(*S*)-4-benzyl-3-((*R*)-2-butyl-2-fluorooctanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_d$)**
Purification was performed with hexane/ethyl acetate = 15/1 to provide **2g$_d$** as colorless oil, yield 74%, dr 84:16. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.76-0.86 (m, 6H), 1.05-1.31 (m, 16H), 1.33-1.47 (m, 2H), 1.80-1.95 (m, 2H), 2.11-2.33 (m, 2H), 2.83 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.11 (dd, *J* = 14.4, 4.0 Hz, 1H), 4.48 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.15-7.28 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 13.9, 14.0, 22.3, 22.5, 22.7, 23.1 (d, J_{C-F} = 3.5 Hz), 25.7 (d, J_{C-F} = 3.7 Hz), 28.1, 29.3, 31.6, 35.1 (d, J_{C-F} = 21.8 Hz), 35.2, 35.5 (d, J_{C-F} = 22.4 Hz), 65.6, 82.4, 100.8 (d, J_{C-F} = 185.4 Hz), 126.9, 128.7, 129.1, 136.7, 151.0, 172.2 (d, J_{C-F} = 26.7 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -153.9 (m, 1F); HRMS: $[MH]^+$ Calcd. for $C_{24}H_{37}NO_3F$ 406.2752; found: 406.2748.

(*S*)-4-benzyl-3-((*R*)-2-fluoro-2-methyl-4-phenylbutanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_e$)**
Purification was performed with hexane/ethyl acetate = 12/1 to provide **2g$_e$** as colorless oil, yield 75%, dr 92:8. ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.28 (s, 3H), 1.30 (s, 3H), 1.68 (d, *J* = 22.0 Hz, 3H), 2.15-2.25 (m, 1H), 2.45-2.65 (m, 2H), 2.70-2.75 (m, 1H), 2.81 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.05 (dd, *J* = 14.4, 4.0 Hz, 1H), 4.41 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.10-7.25 (m, 10H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 22.1, 22.3 (d, J_{C-F} = 24.0 Hz), 28.0, 29.4 (d, J_{C-F} = 4.2 Hz), 35.1, 38.8 (d, J_{C-F} = 22.4 Hz), 65.4, 82.7, 97.3 (d, J_{C-F} = 185.1 Hz), 126.0, 126.9, 128.4,128.4, 128.6, 129.1, 136.5, 140.9, 151.0, 172.2 (d, J_{C-F} = 26.7 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -149.0 (m, 1F); HRMS: $[MH]^+$ Calcd. for $C_{23}H_{27}NO_3F$ 384.1975; found: 384.2010.

(*S*)-4-benzyl-3-((*S*)-2-butyl-2-fluorooctanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_f$)**

Purification was performed with hexane/ethyl acetate = 20/1 to provide **2g$_f$** as colorless oil, yield 69%, dr 87:13. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.75-0.87 (m, 6H), 1.06-1.33 (m, 16 H), 1.34-1.46 (m, 2H), 1.80-1.95 (m, 2H), 2.11-2.35 (m, 2H), 2.83 (dd, J = 14.4, 9.6 Hz, 1H), 3.13 (dd, J = 14.4, 4.0 Hz, 1H), 4.48 (dd, J = 9.6, 4.0 Hz, 1H), 7.15-7.25 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 13.9, 14.0, 22.2, 22.5, 22.7, 23.5 (d, J_{C-F} = 3.7 Hz), 25.3 (d, J_{C-F} = 3.5 Hz), 28.1, 29.2, 31.6, 35.2, 35.3 (d, J_{C-F} = 21.9 Hz), 35.3 (d, J_{C-F} = 22.6 Hz), 65.6, 82.4, 100.7 (d, J_{C-F} = 185.4 Hz), 126.9, 128.7, 129.1, 136.7, 151.0, 172.2 (d, J_{C-F}= 26.7 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -153.9 (m, 1F); HRMS: $[MH]^+$ Calcd. for $C_{24}H_{37}NO_3F$ 406.2757; found: 406.2764.

(*S*)-4-benzyl-3-((*S*)-2-fluoro-2-isopropyloctanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_g$)**

Purification was performed with hexane/ethyl acetate = 20/1 to provide **2g$_g$** as colorless oil, yield 61%, dr 71:29. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.79 (t, J = 6.8 Hz, 3H), 0.83-0.95 (m, 6H), 0.98-1.10 (m, 1H), 1.15-1.29 (m, 12H), 1.32-1.45 (m, 1H), 1.76-1.95 (m, 1H), 2.15-2.45 (m, 1H), 2.52-2.76 (m, 1H), 2.82 (dd, J = 14.4, 9.6 Hz, 1H), 3.13-3.18 (m, 1H), 4.45-4.49 (m, 1H), 7.23-7.25 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 14.0 (13.9), 15.9 (d, J_{C-F} = 4.2 Hz) (15.8), 17.1 (d, J_{C-F} = 4.6 Hz), 22.2 (22.3), 22.5 (22.4), 23.5 (d, J_{C-F} = 3.5 Hz) (23.9), 28.0 (28.2), 29.3 (29.3), 31.5 (31.9), 31.7 (31.8), 32.7 (d, J_{C-F} = 22.7 Hz) (32.8), 35.1, 65.8 (65.6), 82.3 (82.3), 102.9 (d, J_{C-F} = 189.3 Hz), 126.8, 128.7, 129.0 (129.0), 136.8 (136.8), 151.0 (151.0), 172.0 (d, J_{C-F} = 26.9 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -167.5 (m, 1F, major diastereomer), -167.9 (m, 1F, minor diastereomer); HRMS: $[MH]^+$ Calcd. for $C_{23}H_{35}NO_3F$ 392.2601; found: 392.2696.

(*S*)-4-benzyl-3-((*R*)-2-cyclopropyl-2-fluoropropanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_h$)**

Purification was performed with hexane/ethyl acetate = 20/1 to provide **2g$_h$** as colorless oil, yield 70%, dr 86:14. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.34-0.55 (m, 4H), 1.30 (s, 3H), 1.33 (s, 3H), 1.66 (d, J = 25.6 Hz, 3H), 1.75-1.90 (m, 1H), 2.88 (dd, J = 14.4, 9.6 Hz, 1H), 3.08 (dd, J = 14.4, 4.0 Hz, 1H), 4.46 (dd, J = 9.6, 4.0 Hz, 1H), 7.15-7.24 (m, 5H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 0.8 (d, J_{C-F} = 3.8 Hz), 1.1 (d, J_{C-F} = 6.2 Hz), 16.0 (d, J_{C-F} = 22.2 Hz), 21.8 (d, J_{C-F} = 24.6 Hz), 22.1, 28.1, 35.1, 65.4, 82.6, 95.4 (d, J_{C-F} = 185.0 Hz), 126.9, 128.7, 129.1, 136.6, 151.1, 172.5 (d, J_{C-F} = 28.0 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -161.1 (m, 1F, major diastereomer), -159.3 (m, 1F, minor diastereomer); HRMS: $[MH]^+$ Calcd. for $C_{18}H_{23}NO_3F$ 320.1656; found: 320.1655

(*S*)-4-benzyl-3-((*R*)-2-fluoro-2-phenylpropanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_i$)**

Purification was performed with hexane/ethyl acetate = 12/1 to provide **2g$_i$** as colorless oil, yield 83%, dr 97:3. ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.17 (s, 3H), 1.29 (s, 3H), 1.80 (d, J = 22.4 Hz, 3H), 2.78 (dd, J = 14.4, 9.6 Hz, 1H), 3.06 (dd, J = 14.4, 4.0 Hz, 1H), 4.50 (dd, J = 9.6, 4.0 Hz, 1H), 7.15-7.35 (m, 10 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 22.1, 26.6 (d, J_{C-F} = 25.4 Hz), 28.1, 35.1, 64.6, 82.2, 97.1 (d, J_{C-F} = 188.2 Hz), 124.4 (d, J_{C-F} = 6.8 Hz), 126.9, 128.2, 128.3 (d, J_{C-F} = 1.1 Hz), 128.7, 129.2, 136.4, 138.4 (d, J_{C-F} = 21.2 Hz), 149.8, 171.3 (d, J_{C-F} = 28.0 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -146.0 (m, 1F, major diastereomer), -142.1 (m, 1F, minor diastereomer); HRMS: $[MH]^+$ Calcd. for $C_{21}H_{23}NO_3F$ 356.1662; found: 356.1650.

(*S*)-4-benzyl-3-((*R*)-2-fluoro-2-phenylbutanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_j$)**

Purification was performed with hexane/ethyl acetate = 15/1 to provide **2g$_j$** as colorless oil, yield 85%, dr 96:4. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.88 (t, *J* = 9.6 Hz, 3H), 1.15 (s, 3H), 1.36 (s, 3H), 2.10-2.25 (m, 1H), 2.35-2.52 (m, 1H), 2.78 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.21 (dd, *J* = 14.4, 4.0 Hz, 1H), 4.57 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.25-7.35 (m, 10H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 7.5 (d, J_{C-F} = 3.6 Hz), 22.2, 27.9, 33.3 (d, J_{C-F} = 19.2 Hz), 34.7, 64.7, 82.1, 99.4 (d, J_{C-F} = 154.9 Hz), 124.7, 124.8, 126.9, 128.0, 128.7, 129.1, 136.3, 136.9 (d, J_{C-F} = 17.1 Hz), 150.0, 171.8 (d, J_{C-F} = 22.8 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -163.8 (m, 1F, major diastereomer), -162.2 (m, 1F, minor diastereomer); HRMS: $[MH]^+$ Calcd. for $C_{22}H_{25}NO_3F$ 370.1813; found: 370.1758.

(*S*)-4-benzyl-3-((*R*)-2-fluoro-2-phenylhexanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_k$)**
Purification was performed with hexane/ethyl acetate = 15/1 to provide **2g$_k$** as colorless oil, yield 85%, dr 95:5. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.88 (t, *J* = 9.6 Hz, 3H), 1.18 (s, 3H), 1.28-1.32 (m, 4H), 1.39 (s, 3H), 2.08-2.21 (m, 1H), 2.25-2.50 (m, 1H), 2.81 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.23 (dd, *J* = 14.4, 4.0 Hz, 1H), 4.59 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.24-7.48 (m, 10H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 13.8, 22.2, 22.6, 25.1 (d, J_{C-F} = 2.6 Hz), 27.9, 34.7, 39.9 (d, J_{C-F} = 18.7 Hz), 64.7, 82.2, 99.2 (d, J_{C-F} = 154.5 Hz), 124.7, 124.8, 126.9, 128.0 (d, J_{C-F} = 5.1 Hz), 128.7, 129.1, 136.3, 137.2 (d, J_{C-F} = 17.1 Hz), 150.0, 171.9 (d, J_{C-F} = 22.8 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -161.4 (m, 1F, major diastereomer), -159.6 (m, 1F, minor diastereomer); HRMS: $[MH]^+$ Calcd. for $C_{24}H_{29}NO_3F$ 398.2126; found: 398.2135

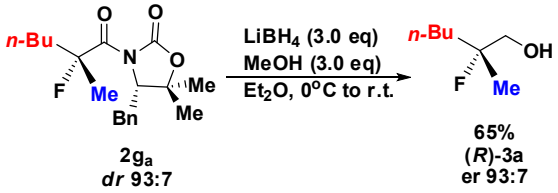
(*S*)-4-benzyl-3-((*R*)-2-fluoro-2-methyl-5-(triisopropylsilyloxy)pentanoyl)-5,5-dimethyloxazolidin-2-one **(2g$_l$)**
Purification was performed with hexane/ethyl acetate = 18/1 to provide **2g$_l$** as colorless oil, yield 52%, dr 90:10. ^{1}H NMR (400 MHz, $CDCl_3$): δ 0.95-1.05 (m, 21H), 1.28 (s, 3H), 1.31 (s, 3H), 1.42-1.55 (m, 1H), 1.58-1.70 (m, 4H), 1.90-2.05 (m, 1H), 2.20-2.37 (m, 1H), 2.84 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.10 (dd, *J* = 14.4, 4.0 Hz, 1H), 3.63 (t, *J* = 6.4 Hz, 2H), 4.42 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.19-7.24 (m, 5H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 11.9, 18.0, 22.2, 22.4 (d, J_{C-F} = 24.1 Hz), 26.9 (d, J_{C-F} = 3.3 Hz), 28.0, 33.6 (d, J_{C-F} = 22.4 Hz), 35.2, 62.9, 65.4, 82.5, 97.7 (d, J_{C-F} = 184.6 Hz), 126.9, 128.7, 129.1, 136.6, 150.9, 172.7 (d, J_{C-F} = 26.8 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -148.8 (d, J = 5.4 Hz, 1F, major diastereomer), -148.7 (m, 1F, minor diastereomer); ^{29}Si NMR (80 MHz, $CDCl_3$): δ 12.5; $[MH]^+$ Calcd. for $C_{27}H_{45}NO_3FSi$ 494.3096; found: 494.3079

(*R*)-5-((*S*)-4-benzyl-5,5-dimethyl-2-oxooxazolidin-3-yl)-4-fluoro-4-methyl-5-oxopentyl pivalate **(2g$_m$)**
Purification was performed with hexane/ethyl acetate = 10/1 to provide **2g$_m$** as colorless oil, yield 82%, dr 94:6. ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.12 (s, 9H), 1.13 (s, 3H), 1.29 (s, 3H), 1.45-1.77 (s, 5H), 1.85-2.03 (m, 1H), 2.18-2.35 (m, 1H), 2.86 (dd, *J* = 14.4, 9.6 Hz, 1H), 3.10 (dd, *J* = 14.4, 4.0 Hz, 1H), 3.99 (t, *J* = 6.4 Hz, 2H), 4.42 (dd, *J* = 9.6, 4.0 Hz, 1H), 7.10-7.29 (m, 5H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 22.1, 22.3 (d, J_{C-F} = 24.0 Hz), 22.7 (d, J_{C-F} = 3.8 Hz), 27.1, 27.9, 33.6 (d, J_{C-F} = 22.6 Hz), 35.1, 38.7, 63.7, 65.3, 82.7, 97.3 (d, J_{C-F} = 185.3 Hz), 126.9, 128.6, 129.1, 136.5, 150.9, 172.2 (d, J_{C-F} = 26.6 Hz), 178.4; ^{19}F NMR (100 MHz, $CDCl_3$): δ -149.4 (m, 1F, major diastereomer), -148.5 (m, 1F, minor diastereomer); $[MH]^+$ Calcd. for $C_{23}H_{33}FNO_5$ 422.2343; found: 422.2352.

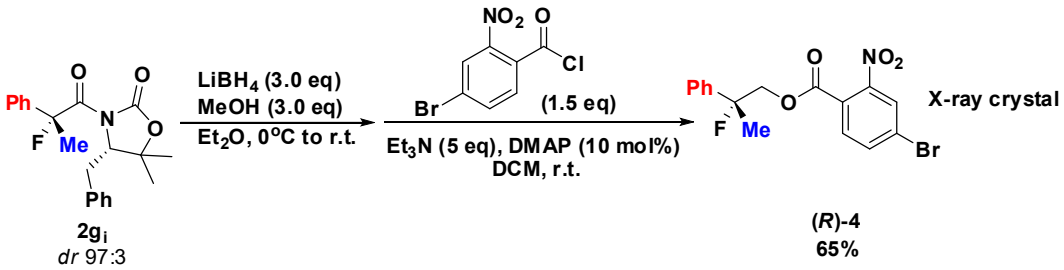
(*R*)-5-((*S*)-4-benzyl-5,5-dimethyl-2-oxooxazolidin-3-yl)-4-fluoro-4-methyl-5-oxopentyl benzoate **(2g$_n$)**

Purification was performed with hexane/ethyl acetate = 12/1 to provide **2g$_n$** as colorless oil, yield 82%, dr 93:7. ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.29 (s, 3H), 1.30 (s, 3H), 1.64-1.73 (m, 4H), 1.80-1.95 (m, 1H), 1.95-2.10 (m, 1H), 2.30-2.45 (m, 1H), 2.84 (dd, J = 14.4, 9.6 Hz, 1H), 3.09 (dd, J = 14.4, 4.0 Hz, 1H), 4.20-4.30 (m, 1H), 4.42 (dd, J = 9.6, 4.0 Hz, 1H),7.12-7.22 (m, 5H), 7.32-7.40 (m, 2H), 7.46-7.50 (m, 1H), 7.96-7.99 (m, 2H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 22.1, 22.3 (d, J_{C-F} = 23.9 Hz), 22.8 (d, J_{C-F} = 3.9 Hz), 27.9, 33.7 (d, J_{C-F} = 22.5), 35.1, 64.4, 65.3, 82.7, 97.3 (d, J_{C-F} = 185.2 Hz), 126.9, 128.3, 128.6, 129.1, 129.5, 130.2, 132.9, 136.4, 150.9, 166.4, 172.2 (d, J_{C-F} = 26.6 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -149.5 (m, 1F, major diastereomer), -149.0 (m, 1F, minor diastereomer); $[MH]^+$ Calcd. for $C_{25}H_{29}FNO_5$ 442.2030; found: 422.2048.

5. Derivative of fluorinated product **2g$_a$** and **2g$_j$**



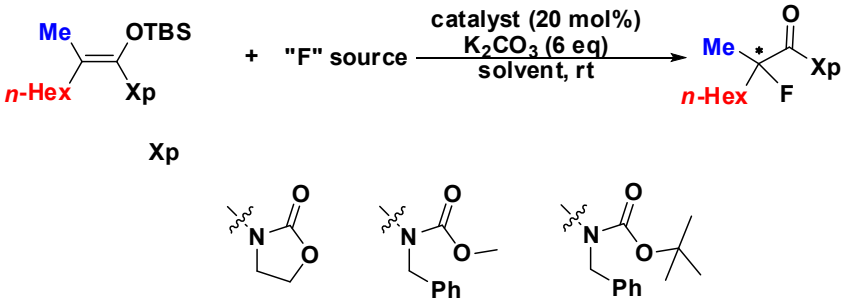
(*R*)-3a was prepared according to the previously published procedure[3]. To a stirred solution of **2h$_a$** (0.6 mmol, 1.0 equiv, *d.r.* 93:7) in dry diethyl ether (5 ml) at 0 °C was added abs. methanol (3.0 equiv) followed by solid LiBH4 (1.8 mmol, 3.0 equiv). The resulting mixture was stirred at 0 °C for 1 h then was allowed to warm to room temperature and stirred for additional one hour. After completion of the reaction (monitored by TLC on silica gel using 20% diethyl ether in hexane as eluent), the reaction was quenched by slow addition of water. The organic phase was separated and the aqueous phase was extracted with diethyl ether (3x10 ml). The combined organic phases were dried over anhydrous Na_2SO_4, concentrated under reduced pressure, and the residue was purified by column chromatography (solvent gradient 0-10% diethyl ether in hexane) providing **(*R*)-3a** in 65% yield (53 mg, 0.39 mmol) as a colourless oil.^{1}H NMR (400 MHz, $CDCl_3$): δ 0.83-0.87 (m, 3H), 1.12-1.32 (m, 7H), 1.50-1.64 (m, 2H), 1.85-1.98 (m, 1H), 3.42-3.58 (m, 2H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 13.9, 20.7 (d, J_{C-F} = 24.3 Hz), 23.1, 25.5 (d, J_{C-F} = 6.1 Hz), 35.9 (d, J_{C-F} = 22.1 Hz), 68.1 (d, J_{C-F} = 23.9 Hz), 97.7 (d, J_{C-F} = 165.7 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -154.7 (m, 1F).



To a stirred solution of **2g$_j$** (0.4 mmol, 1.0 equiv, *d.r.* 97:3) in dry diethyl ether (5 ml) at 0 °C was added abs. methanol (3.0 equiv) followed by solid LiBH4 (1.2 mmol, 3.0 equiv). The resulting mixture was stirred at 0 °C for 1 h then was allowed to warm to room temperature and

stirred for additional one hour. After completion of the reaction (monitored by TLC on silica gel using 20% diethyl ether in hexane as eluent), the reaction was quenched by slow addition of water. The organic phase was separated and the aqueous phase was extracted with diethyl ether (3x10 ml). The combined organic phases were dried over anhydrous Na_2SO_4, concentrated under reduced pressure to get the crude product without further purification. Add the crude product to a dry flask containing solution of Et_3N (5 eq), DMAP (0.1 eq) in DCM (5 ml), followed by adding 4-bromo-2-nitrobenzoyl chloride (1.5 eq). After completion of the reaction (monitored by TLC on silica gel using 20% diethyl ether in hexane as eluent), the reaction was quenched by slow addition of water. The organic phase was separated and the aqueous phase was extracted with DCM (3x10 ml). The combined organic phases were dried over anhydrous Na_2SO_4, concentrated under reduced pressure, and the residue was purified by column chromatography (solvent gradient 0-30% diethyl ether in hexane) providing **(*R*)-4** in 65% yield as white solid. The produt was recrystallized in pentane/ethyl acetate and affoeded colorless needles. ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.73 (d, J = 22.4 Hz, 3H), 4.42-4.65 (m, 2H), 7.30-7.42 (m, 5H), 7.50 (d, J = 8.0 Hz, 1H), 7.76 (dd, J = 8.0, 2.0 Hz, 1H), 7.99 (d, J = 2.0 Hz, 1H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 23.5 (d, $J_{C\text{-}F}$ = 24.5 Hz), 71.0 (d, $J_{C\text{-}F}$ = 24.9 Hz), 95.2 (d, $J_{C\text{-}F}$ = 175.9 Hz), 124.4 (d, $J_{C\text{-}F}$ = 9.1 Hz), 125.4, 126.0, 127.0, 128.2 (d, $J_{C\text{-}F}$ = 1.0 Hz), 128.5 (d, $J_{C\text{-}F}$ = 1.3 Hz), 131.3, 135.8, 140.5 (d, $J_{C\text{-}F}$ = 21.4 Hz), 148.8, 163.9; ^{19}F NMR (100 MHz, $CDCl_3$): δ -153.5 (m, 1F);

6. Screening for asymmetric catalytic formation of fluorinated acyclic quaternary carbon center



Entry	*Xp*	*F*$^+$	*catalyst*	*Solvent*	*T(°C)*	*Yield(%)*	*Ee(%)*
1	A	selectfluor	quinine	toluene	rt	48	0
2	A	NFSI	quinine	toluene	rt	58	15
3	A	NFSI	quinine	CH_3CN	rt	50	25
4	A	NFSI	-	CH_3CN	rt	trace	-
5	A	NFSI	$(DHQ)_2PHAL$	CH_3CN	-40°C to rt	80	37
6	A	NFSI	$(DHQ)_2AQN$	CH_3CN	-40°C to rt	65	25
7	**B**	**NFSI**	**$(DHQ)_2PHAL$**	**CH_3CN**	**-40°C to rt**	**75**	**60**
8	B	NFSI	$(DHQ)_2AQN$	CH_3CN	-40°C to rt	77	46
9	B	NFSI	$(DHQ)_2Pyr$	CH_3CN	-40°C to rt	74	31
10	B	NFSI	$(DHQD)_2PHAL$	CH_3CN	-40°C to rt	75	23
11	B	NFSI	$(DHQ)_2PHAL$	$CH_3(CH_2)_2CN$	-40°C to rt	trace	-
12	B	NFSI	$(DHQ)_2PHAL$	hexane	-40°C to rt	trace	-
13	C	NFSI	$(DHQ)_2PHAL$	hexane	-40°C to rt	80	58

General procedure[4]: catalyst (20 mol%) and "F" source (1.2 equiv) in solvent (1.0 ml) were stirred under nitrogen atmosphere at room temperature for 30 min. K_2CO_3 (6.0 equiv) was then

added to the solution, and the reaction mixture was stirred for 30 min at –40 °C. A solution of silyl enol ether (0.1 mmol) in solvent (1.0 ml) was added to the catalyst solution. The reaction was stirred at the temperature for 1 to 4 days while monitoring by TLC. The reaction was stopped by addition of aqueous solution of 1N HCl. The reaction mixture was then diluted with AcOEt, washed with saturated aqueous sodium bicarbonate solution, brine, dried over Na_2SO_4 and the solvent was evaporated under reduced pressure. The residue was purified by column chromatography on silica gel eluting with Hexane/AcOE = 20/1. The ee of the product was determined by chiral HPLC.

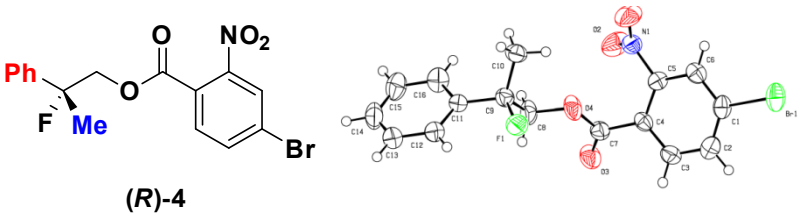
methyl benzyl(2-fluoro-2-methyloctanoyl)carbamate **(2g$_o$)**

colorless oil (82%),^{1}H NMR (400 MHz, $CDCl_3$): δ 0.86 (t, J = 7.2 Hz, 3H), 0.92-1.05 (m, 1H), 1.10-1.35 (m, 7H), 1.60 (d, J = 20.8 Hz, 3H), 1.68-1.82 (m, 1H), 1.92-2.08 (m, 1H), 3.78 (s, 3H), 4.79 (s, 2H), 7.20-7.40 (m, 5H); ^{13}C NMR (100 Hz, $CDCl_3$): δ 14.0, 22.4, 22.8 (d, $J_{C\text{-}F}$ = 3.5 Hz), 24.1 (d, $J_{C\text{-}F}$ = 23.0 Hz), 29.1, 31.5, 40.1 (d, $J_{C\text{-}F}$ = 22.5 Hz), 50.0, 53.9, 99.2 (d, $J_{C\text{-}F}$ = 190.4 Hz), 127.6, 128.2, 128.4, 136.8, 155.9, 177.5 (d, $J_{C\text{-}F}$ = 24.8 Hz); ^{19}F NMR (100 MHz, $CDCl_3$): δ -155.5 (m, 1F); HPLC: (AD-H, Hexane/ *i*PrOH=99/1, 1.0 ml/ min, 254 nm) tR (minor-isomer)=5.68 min, tR(major-isomer)=5.91 min (59% ee)

7. References

1. A. T. Herrmann, L. L. Smith, A. Zakarian, *J. Am. Chem. Soc*., 2012, **134**, 6976.
2. (a)Y. Minko, M. Pasco, L. Lercher, M. Botoshansky, I. Marek, *Nature*, 2012, ***490***, 522; (b) M. O. Frederick, J. A. Mulder, M. R. Tracey, R. P. Hsung, J. Huang, K. C. Kurtz, L. Shen, C. J. Douglas, *J. Am. Chem, Soc.* 2003, ***125***, 2368.
3. M. Körner, M. Hiersemann, *Org. Lett.* 2007, ***9***, 4979.
4. T. Ishimaru, N. Shibata, T, Horikawa, N. Yasuda, S. Nakamura, T. Toru, M. Shiro, *Angew. Chem. Int. Ed*., 2008, ***47***, 4157.

8. X-ray crystallographic analysis data



(*R*)-4

Crystallographic data for the title structure **(*R*)-4** have been deposited with the Cambridge Crystallographic Data Centre, accession number CCDC 1574441.

Table 1. Crystal data and structure refinement for Marek135.

Identification code	Marek135 (Jian Qiang Huang)
Empirical formula	C16 H13 Br F N O4

Formula weight	382.18
Temperature	293(2) K
Wavelength	0.71073 A
Crystal system, space group	Orthorhombic, P 21 21 2
Unit cell dimensions	a = 29.8490(2) A alpha = 90 deg. b = 7.0020(2) A beta = 90 deg. c = 7.6880(8) A gamma = 90 deg.
Volume	1606.81(17) A^3
Z, Calculated density	4, 1.580 Mg/m^3
Absorption coefficient	2.587 mm^-1
F(000)	768
Crystal size	0.33 x 0.24 x 0.18 mm
Theta range for data collection	1.36 to 24.38 deg.
Limiting indices	0<=h<=34, 0<=k<=8, 0<=l<=8
Reflections collected / unique	1551 / 1551 [R(int) = 0.0720]
Completeness to theta = 24.38	98.9 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.6531 and 0.4623
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	1551 / 0 / 129
Goodness-of-fit on F^2	1.122
Final R indices [I>2sigma(I)]	R1 = 0.0485, wR2 = 0.1317
R indices (all data)	R1 = 0.0580, wR2 = 0.1449
Absolute structure parameter	0.00
Largest diff. peak and hole	1.249 and -0.792 e.A^-3

Table 2. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters (A^2 x 10^3) for shelxl. U(eq) is defined as one third of the trace of the orthogonalized Uij tensor.

	x	y	z	U(eq)
Br(1)	4461(1)	2238(1)	7151(1)	60(1)
F(1)	6147(1)	8037(7)	396(5)	54(1)
O(1)	6230(2)	3545(12)	5714(8)	78(2)
O(2)	6311(2)	1486(10)	3692(9)	70(2)
O(3)	5721(2)	2222(9)	-430(6)	58(1)
O(4)	6045(2)	4340(8)	1346(6)	54(1)
N(1)	6083(2)	2554(10)	4562(7)	45(2)

C(1)	4861(2)	2396(10)	5260(9)	41(2)
C(2)	4696(2)	2360(10)	3580(10)	48(2)
C(3)	4993(2)	2476(10)	2184(8)	45(2)
C(4)	5450(2)	2627(9)	2468(8)	37(1)
C(5)	5598(2)	2598(10)	4193(8)	36(1)
C(6)	5314(2)	2511(10)	5588(8)	41(2)
C(7)	5754(2)	2975(11)	965(9)	41(2)
C(8)	6367(2)	4861(12)	40(8)	49(2)
C(9)	6529(2)	6845(10)	480(9)	39(2)
C(10)	6709(2)	7068(11)	2329(8)	46(2)
C(11)	6861(2)	7486(11)	-898(8)	40(2)
C(12)	6765(3)	9000(11)	-2011(9)	51(2)
C(13)	7060(3)	9500(14)	-3308(10)	59(2)
C(14)	7450(3)	8502(15)	-3524(11)	63(2)
C(15)	7559(3)	7073(13)	-2411(11)	60(2)
C(16)	7270(3)	6534(11)	-1109(11)	51(2)

Table 3. Bond lengths [A] and angles [deg] for shelxl.

Br(1)-C(1)	1.884(6)
F(1)-C(9)	1.415(8)
O(1)-N(1)	1.208(8)
O(2)-N(1)	1.213(8)
O(3)-C(7)	1.199(9)
O(4)-C(7)	1.324(8)
O(4)-C(8)	1.439(8)
N(1)-C(5)	1.474(8)
C(1)-C(6)	1.377(9)
C(1)-C(2)	1.383(10)
C(2)-C(3)	1.394(10)
C(2)-H(2)	0.9300
C(3)-C(4)	1.387(10)
C(3)-H(3)	0.9300
C(4)-C(5)	1.398(9)
C(4)-C(7)	1.488(9)
C(5)-C(6)	1.369(9)
C(6)-H(6)	0.9300
C(8)-C(9)	1.509(11)
C(8)-H(8A)	0.9700
C(8)-H(8B)	0.9700
C(9)-C(11)	1.518(9)

C(9)-C(10)	1.528(9)
C(10)-H(10A)	0.9600
C(10)-H(10B)	0.9600
C(10)-H(10C)	0.9600
C(11)-C(12)	1.392(10)
C(11)-C(16)	1.402(10)
C(12)-C(13)	1.375(11)
C(12)-H(12)	0.9300
C(13)-C(14)	1.369(13)
C(13)-H(13)	0.9300
C(14)-C(15)	1.355(13)
C(14)-H(14)	0.9300
C(15)-C(16)	1.373(11)
C(15)-H(15)	0.9300
C(16)-H(16)	0.9300

C(7)-O(4)-C(8)	117.9(5)
O(1)-N(1)-O(2)	123.6(6)
O(1)-N(1)-C(5)	119.1(6)
O(2)-N(1)-C(5)	117.3(6)
C(6)-C(1)-C(2)	121.5(6)
C(6)-C(1)-Br(1)	118.9(5)
C(2)-C(1)-Br(1)	119.6(5)
C(1)-C(2)-C(3)	119.4(6)
C(1)-C(2)-H(2)	120.3
C(3)-C(2)-H(2)	120.3
C(4)-C(3)-C(2)	120.7(6)
C(4)-C(3)-H(3)	119.7
C(2)-C(3)-H(3)	119.7
C(3)-C(4)-C(5)	117.3(6)
C(3)-C(4)-C(7)	119.3(6)
C(5)-C(4)-C(7)	123.2(6)
C(6)-C(5)-C(4)	123.3(6)
C(6)-C(5)-N(1)	117.1(5)
C(4)-C(5)-N(1)	119.5(5)
C(5)-C(6)-C(1)	117.8(6)
C(5)-C(6)-H(6)	121.1
C(1)-C(6)-H(6)	121.1
O(3)-C(7)-O(4)	124.7(7)
O(3)-C(7)-C(4)	124.9(6)
O(4)-C(7)-C(4)	110.2(6)
O(4)-C(8)-C(9)	106.9(6)
O(4)-C(8)-H(8A)	110.3
C(9)-C(8)-H(8A)	110.3

O(4)-C(8)-H(8B)	110.3
C(9)-C(8)-H(8B)	110.3
H(8A)-C(8)-H(8B)	108.6
F(1)-C(9)-C(8)	106.0(6)
F(1)-C(9)-C(11)	108.7(6)
C(8)-C(9)-C(11)	108.9(6)
F(1)-C(9)-C(10)	105.5(5)
C(8)-C(9)-C(10)	114.5(6)
C(11)-C(9)-C(10)	112.9(6)
C(9)-C(10)-H(10A)	109.5
C(9)-C(10)-H(10B)	109.5
H(10A)-C(10)-H(10B)	109.5
C(9)-C(10)-H(10C)	109.5
H(10A)-C(10)-H(10C)	109.5
H(10B)-C(10)-H(10C)	109.5
C(12)-C(11)-C(16)	118.0(6)
C(12)-C(11)-C(9)	121.3(6)
C(16)-C(11)-C(9)	120.6(6)
C(13)-C(12)-C(11)	120.5(8)
C(13)-C(12)-H(12)	119.7
C(11)-C(12)-H(12)	119.7
C(14)-C(13)-C(12)	120.2(8)
C(14)-C(13)-H(13)	119.9
C(12)-C(13)-H(13)	119.9
C(15)-C(14)-C(13)	120.3(7)
C(15)-C(14)-H(14)	119.9
C(13)-C(14)-H(14)	119.9
C(14)-C(15)-C(16)	120.8(8)
C(14)-C(15)-H(15)	119.6
C(16)-C(15)-H(15)	119.6
C(15)-C(16)-C(11)	120.1(8)
C(15)-C(16)-H(16)	120.0
C(11)-C(16)-H(16)	120.0

Table 4. Anisotropic displacement parameters (A^2 x 10^3) for shelxl.
The anisotropic displacement factor exponent takes the form:
-2 pi^2 [h^2 a*^2 U11 + ... + 2 h k a* b* U12]

	U11	U22	U33	U23	U13	U12

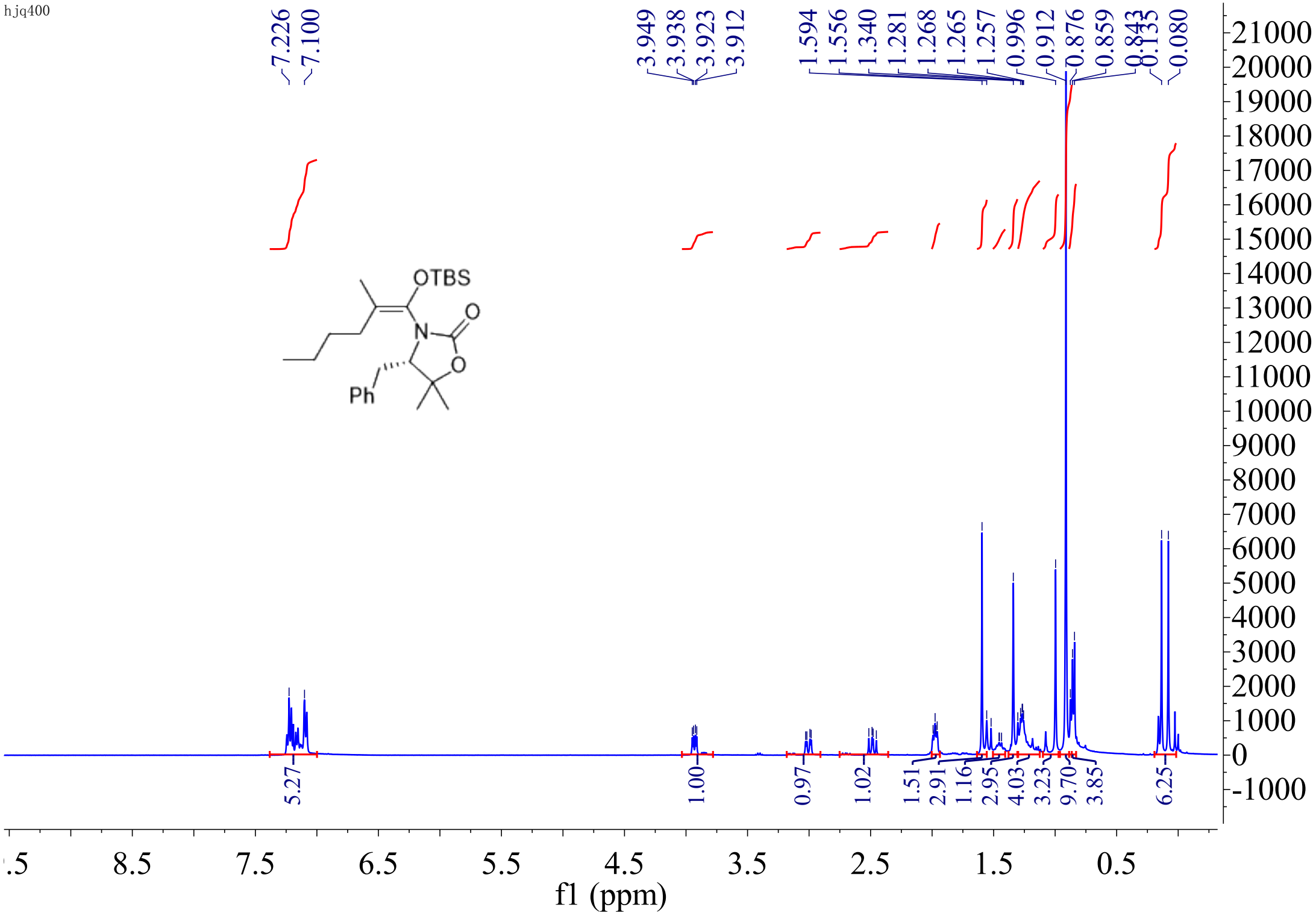
Br(1)	54(1)	64(1)	63(1)	0(1)	26(1)	2(1)
F(1)	40(2)	70(3)	50(2)	6(2)	2(2)	11(2)
O(1)	59(3)	125(6)	49(3)	-32(4)	-7(3)	-19(4)
O(2)	43(3)	92(5)	74(4)	-22(4)	2(3)	17(3)
O(3)	73(3)	63(4)	37(3)	-8(3)	6(2)	-19(3)
O(4)	70(3)	63(3)	28(2)	-11(3)	15(2)	-26(3)
N(1)	41(3)	63(4)	32(3)	-5(3)	2(2)	0(3)
C(1)	40(3)	37(4)	46(3)	-3(4)	13(3)	4(3)
C(2)	39(3)	42(4)	63(4)	3(4)	3(3)	-1(3)
C(3)	49(4)	47(4)	39(3)	8(4)	-6(3)	0(3)
C(4)	48(3)	30(3)	31(3)	2(3)	0(3)	-2(3)
C(5)	34(3)	37(3)	38(3)	-6(3)	-1(2)	2(3)
C(6)	52(4)	36(4)	35(3)	-4(3)	2(3)	0(3)
C(7)	46(4)	42(4)	35(4)	-1(3)	-3(3)	-7(3)
C(8)	55(5)	56(4)	36(4)	-7(4)	15(3)	-19(4)
C(9)	37(3)	43(4)	36(3)	3(3)	2(3)	4(3)
C(10)	47(4)	54(4)	36(3)	1(4)	-6(3)	2(3)
C(11)	37(3)	50(4)	33(3)	4(3)	-4(2)	-6(3)
C(12)	45(4)	56(4)	50(4)	12(4)	-5(3)	-8(3)
C(13)	54(5)	73(5)	51(4)	16(4)	-4(4)	-16(4)
C(14)	65(5)	75(6)	49(4)	-4(5)	15(4)	-32(5)
C(15)	51(4)	60(5)	68(5)	-11(5)	20(4)	-4(4)
C(16)	52(4)	43(4)	60(5)	0(4)	8(4)	5(3)

Table 5. Hydrogen coordinates (x 10^4) and isotropic displacement parameters (A^2 x 10^3) for shelxl.

	x	y	z	U(eq)
H(2)	4389	2260	3383	57
H(3)	4883	2452	1052	54
H(6)	5423	2530	6721	49
H(8A)	6230	4846	-1104	59
H(8B)	6616	3970	44	59
H(10A)	6788	8379	2529	68
H(10B)	6970	6279	2471	68
H(10C)	6484	6685	3147	68
H(12)	6499	9678	-1877	61

H(13)	6994	10520	-4040	71
H(14)	7641	8805	-4437	76
H(15)	7832	6451	-2531	72
H(16)	7347	5537	-367	62

9. NMR spectra and HPLC spectra of fluorination products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7.226
7.100
3.949
3.938
3.923
3.912
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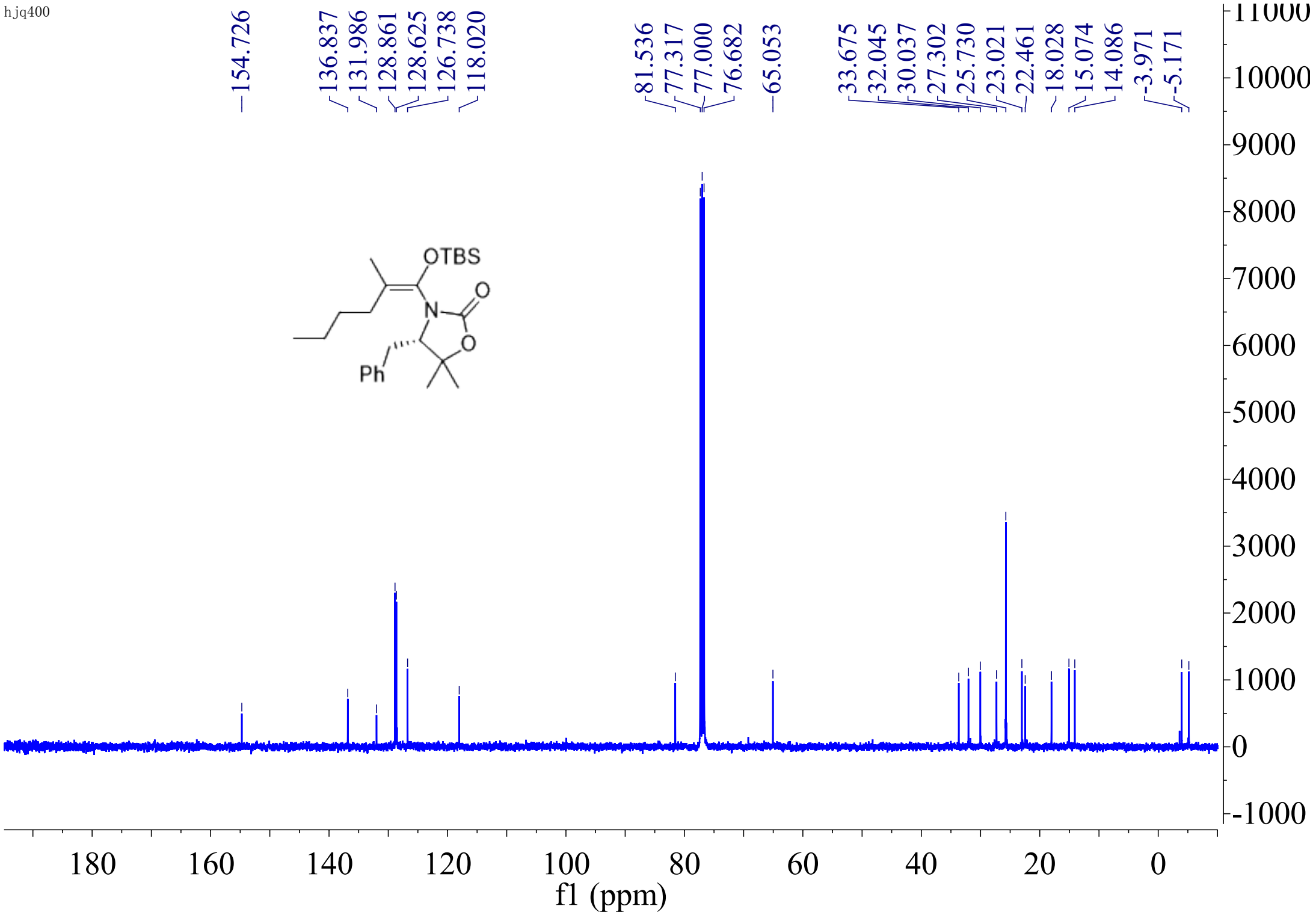
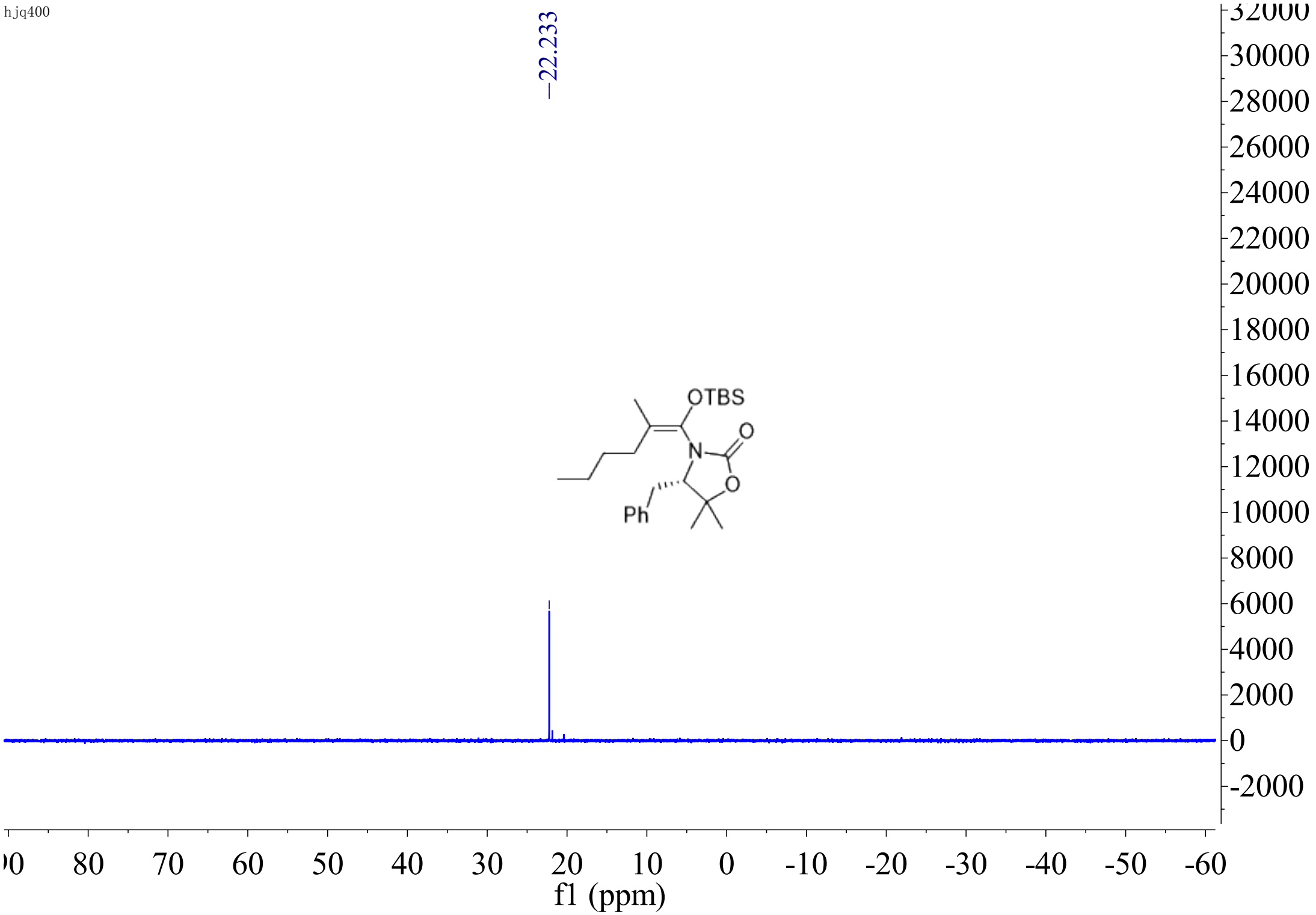
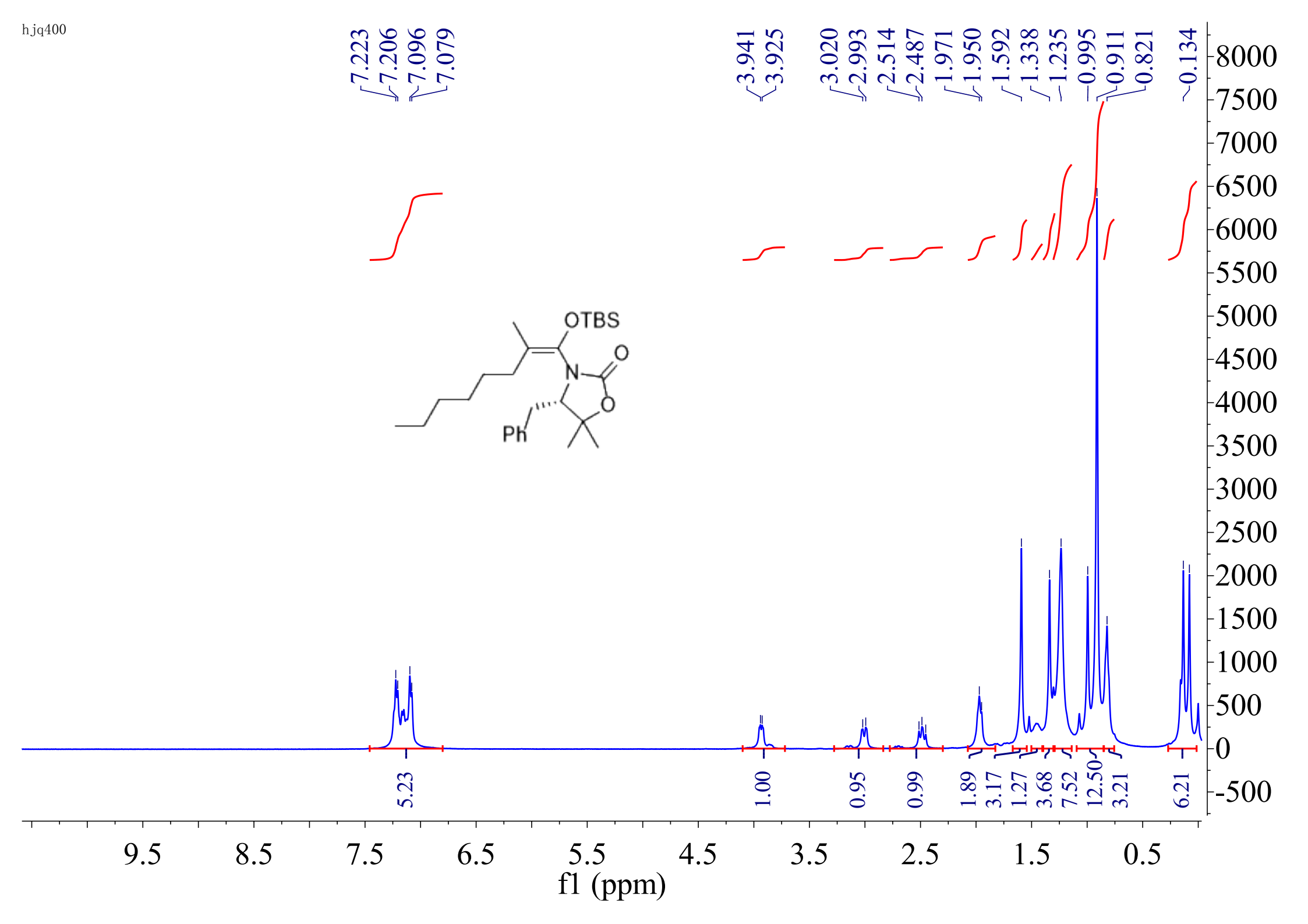
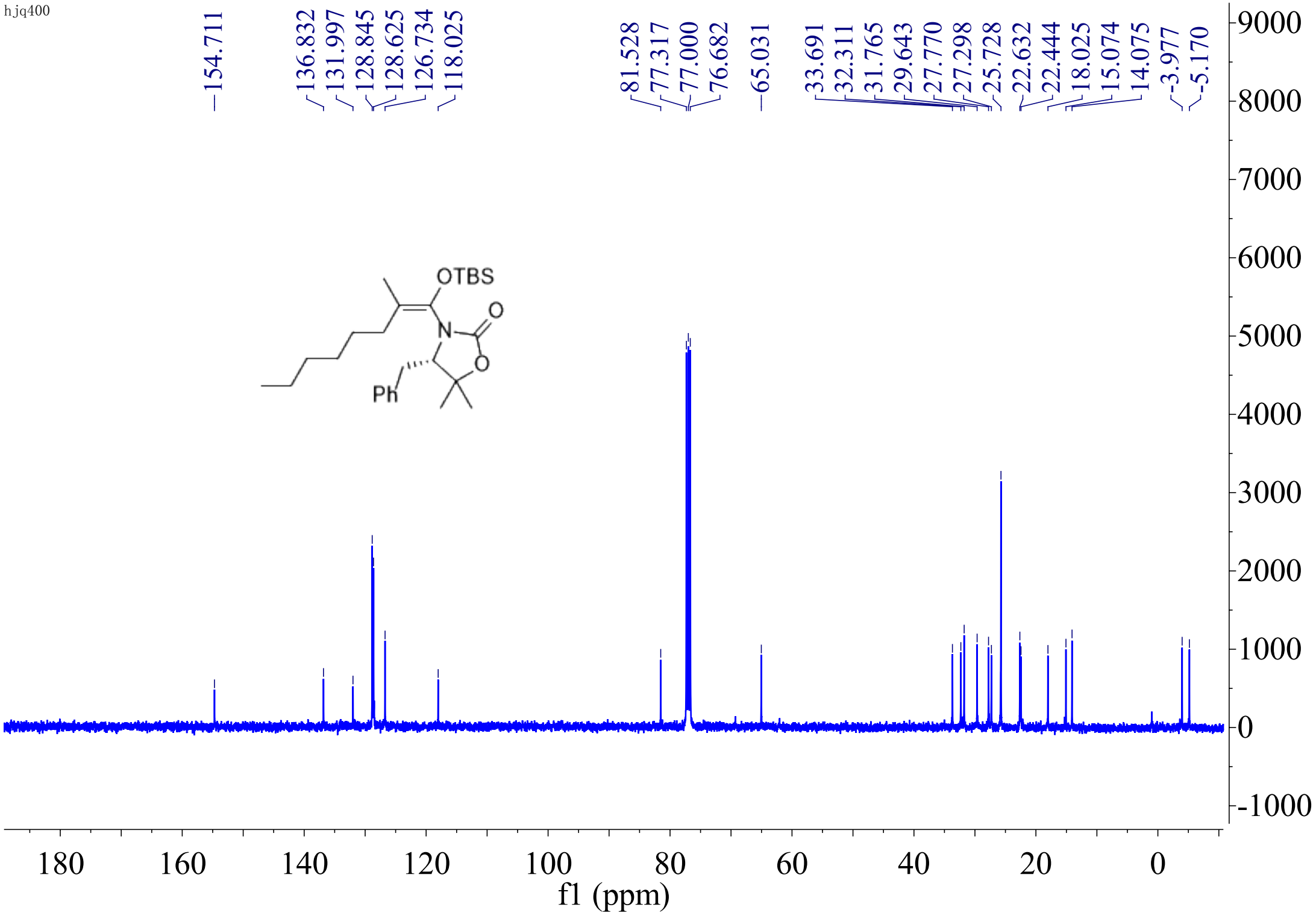
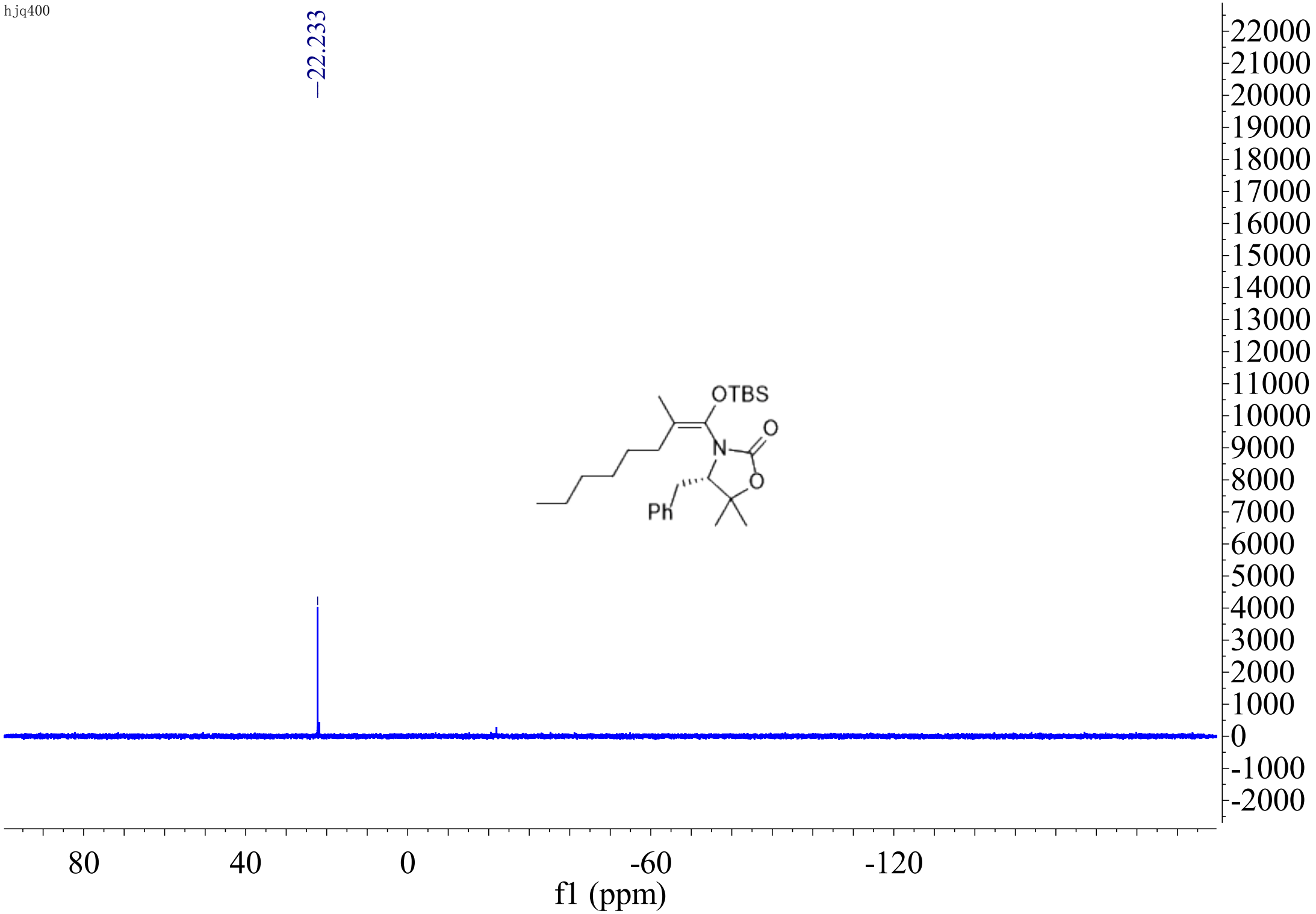
1.556
1.340
1.281
1.268
1.265
1.257
0.996
0.912
0.876
0.859
0.843
0.135
0.080
OTBS
N
O
O
Ph
5.27
1.00
0.97
1.02
1.51
2.91
1.16
2.95
4.03
3.23
9.70
3.85
6.25
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
f1 (ppm)

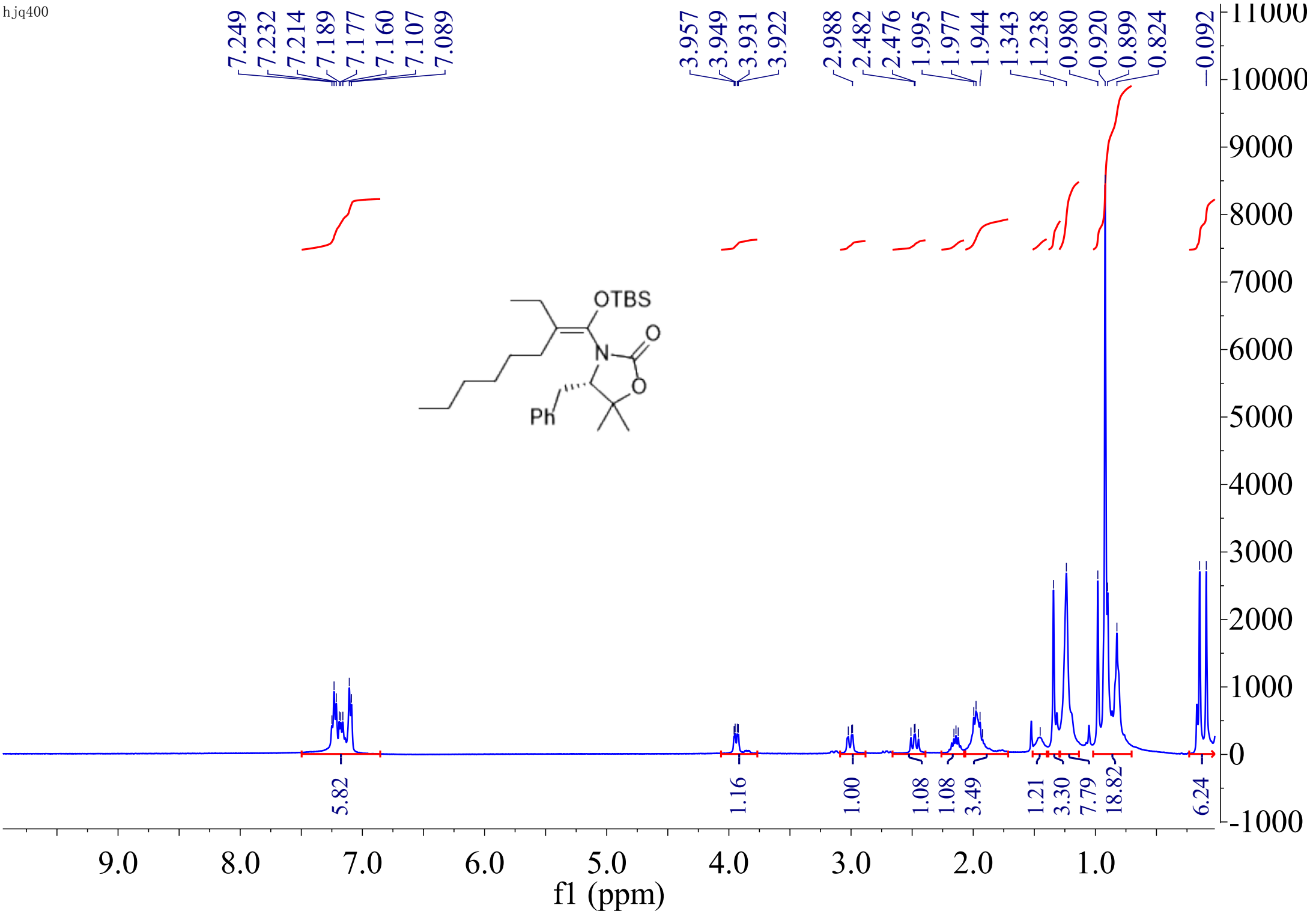

hjq400
154.726
136.837
131.986
128.861
128.625
126.738
118.020
81.536
77.317
77.000
76.682
65.053
33.675
32.045
30.037
27.302
25.730
23.021
22.461
18.028
15.074
14.086
-3.971
-5.171
OTBS
N
O
O
Ph
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

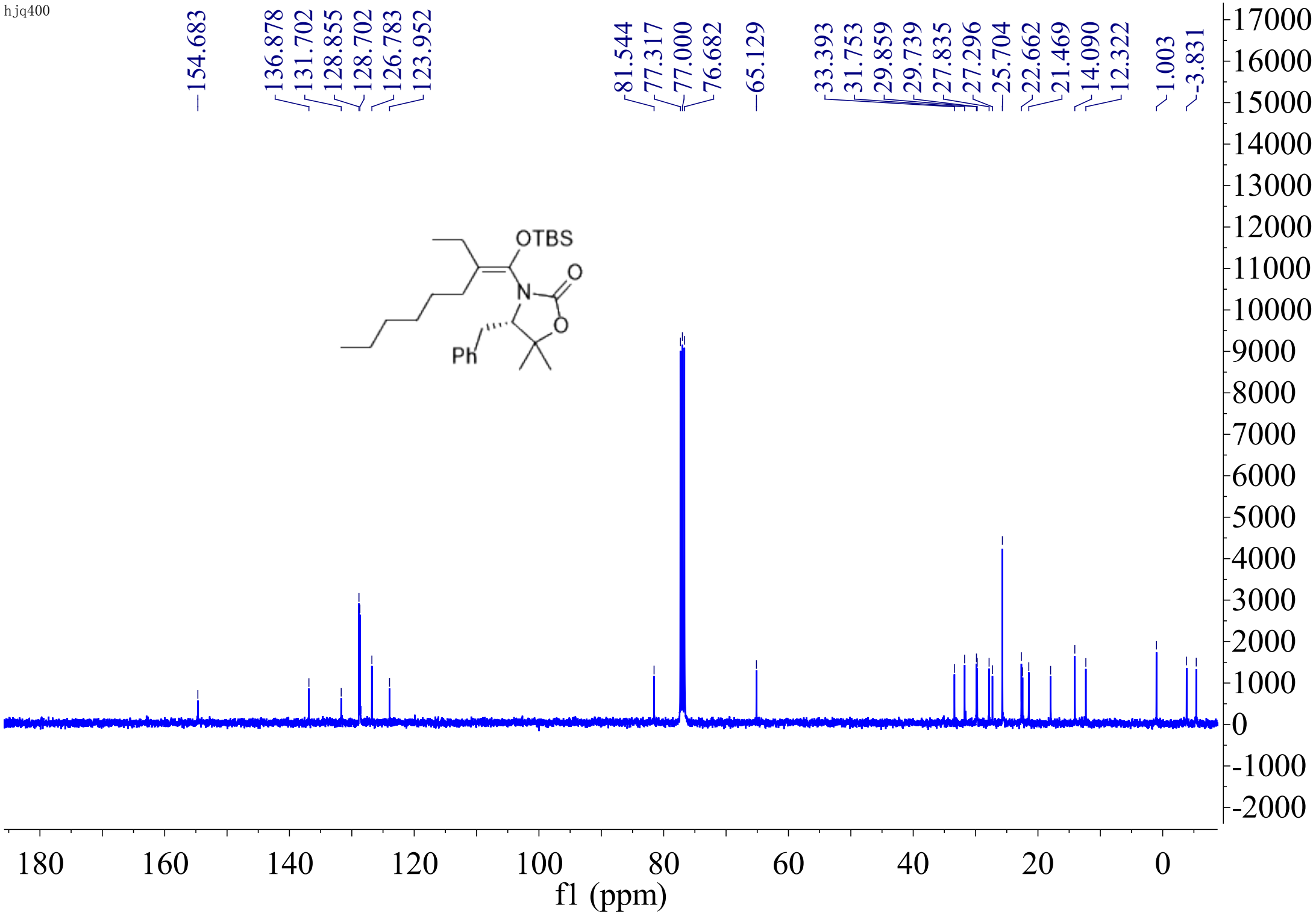

hjq400
22.233
OTBS
O
N
O
Ph
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
f1 (ppm)

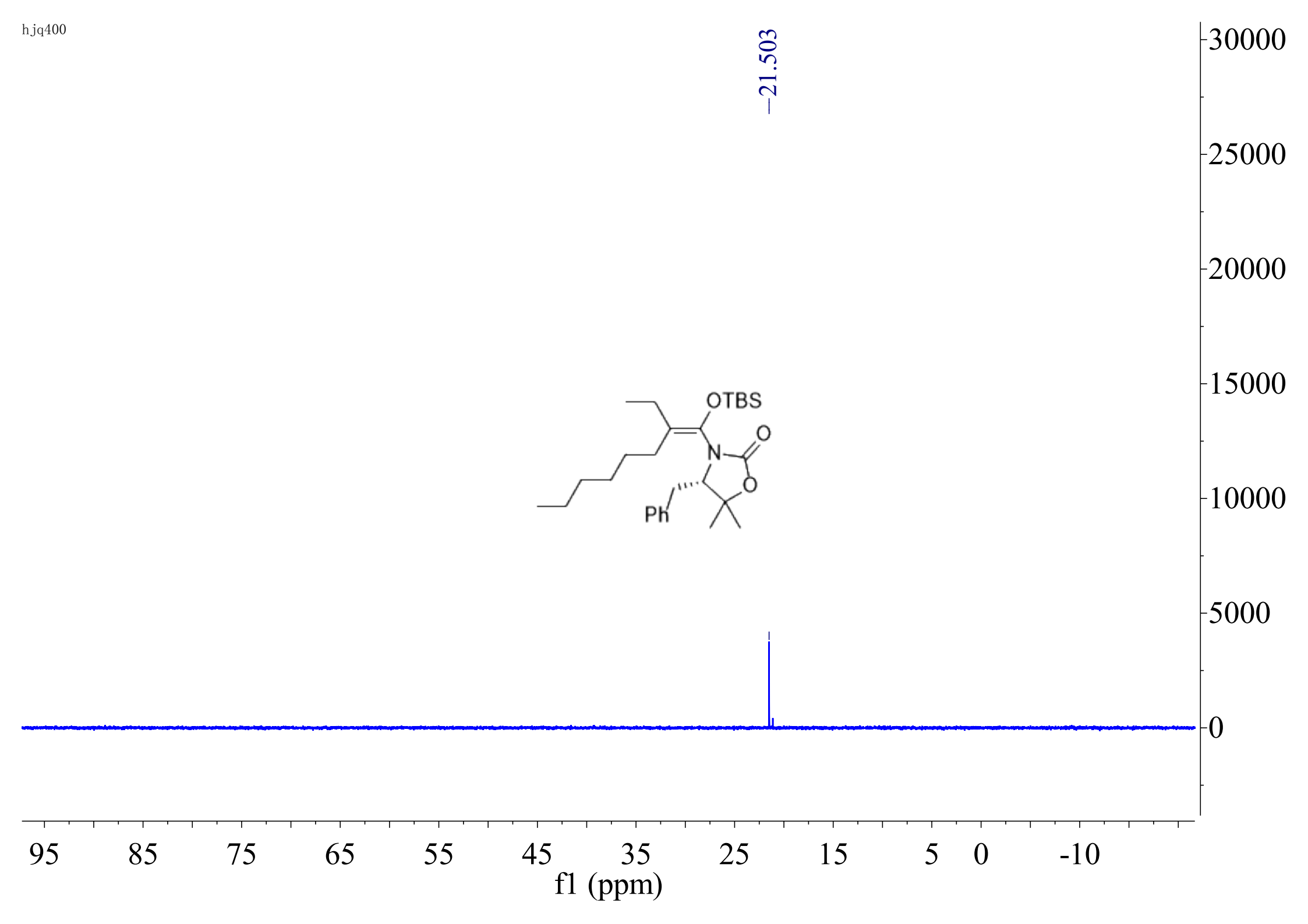

hjq400
7.223
7.206
7.096
7.079
3.941
3.925
3.020
2.993
2.514
2.487
1.971
1.950
1.592
1.338
1.235
0.995
0.911
0.821
0.134
OTBS
O
N
O
Ph
5.23
1.00
0.95
0.99
1.89
3.17
1.27
3.68
7.52
12.50
3.21
6.21
f1 (ppm)

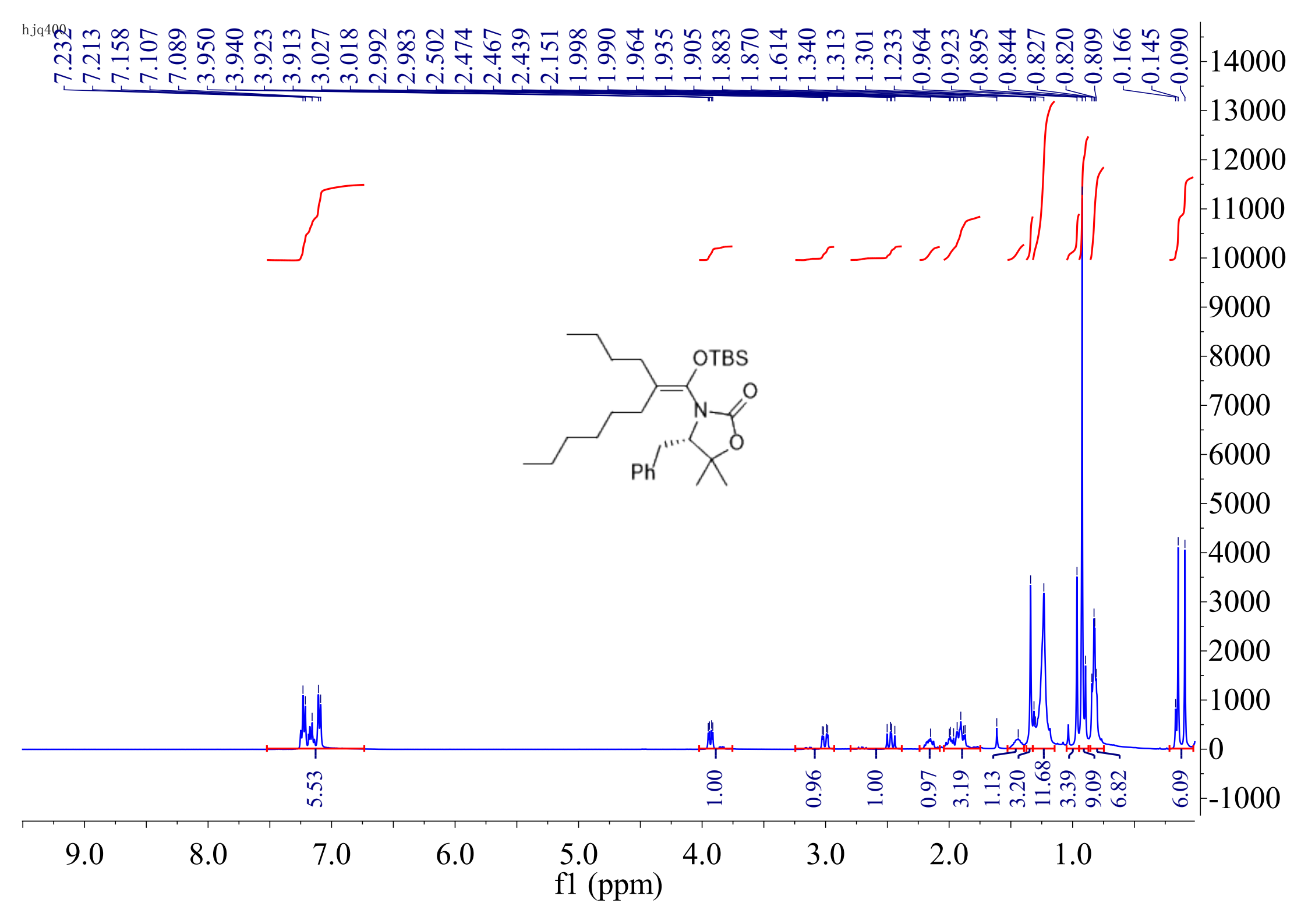

hjq400
154.711
136.832
131.997
128.845
128.625
126.734
118.025
81.528
77.317
77.000
76.682
65.031
33.691
32.311
31.765
29.643
27.770
27.298
25.728
22.632
22.444
18.025
15.074
14.075
-3.977
-5.170
OTBS
O
N
O
Ph
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

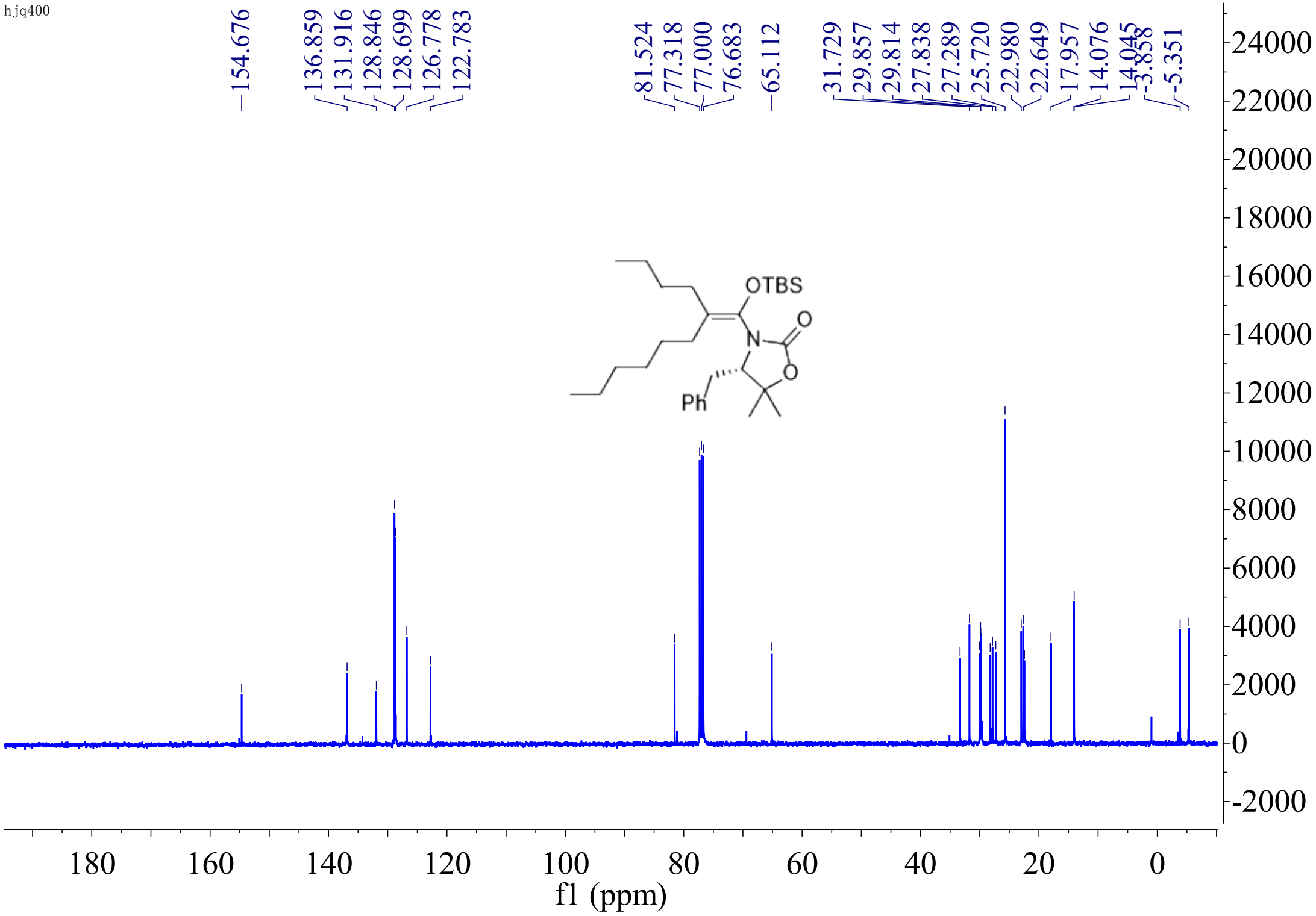

hjq400
-22.233
OTBS
O
N
O
Ph
22000
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
80
40
0
-60
-120
f1 (ppm)


hjq400
7.249
7.232
7.214
7.189
7.177
7.160
7.107
7.089
3.957
3.949
3.931
3.922
2.988
2.482
2.476
1.995
1.977
1.944
1.343
1.238
0.980
0.920
0.899
0.824
0.092
OTBS
N
O
O
Ph
5.82
1.16
1.00
1.08
1.08
3.49
1.21
3.30
7.79
18.82
6.24
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)

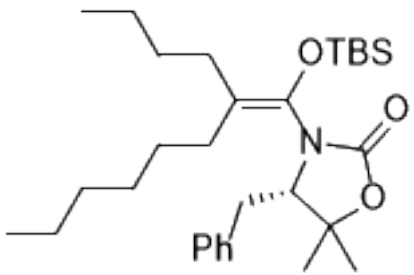

hjq400
154.683
136.878
131.702
128.855
128.702
126.783
123.952
81.544
77.317
77.000
76.682
65.129
33.393
31.753
29.859
29.739
27.835
27.296
25.704
22.662
21.469
14.090
12.322
1.003
-3.831
OTBS
N
O
O
Ph
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
180
160
140
120
100
80
60
40
20
0
f1 (ppm)


hjq400
−21.503
OTBS
O
N
O
Ph
30000
25000
20000
15000
10000
5000
0
95
85
75
65
55
45
35
25
15
5
0
-10
f1 (ppm)

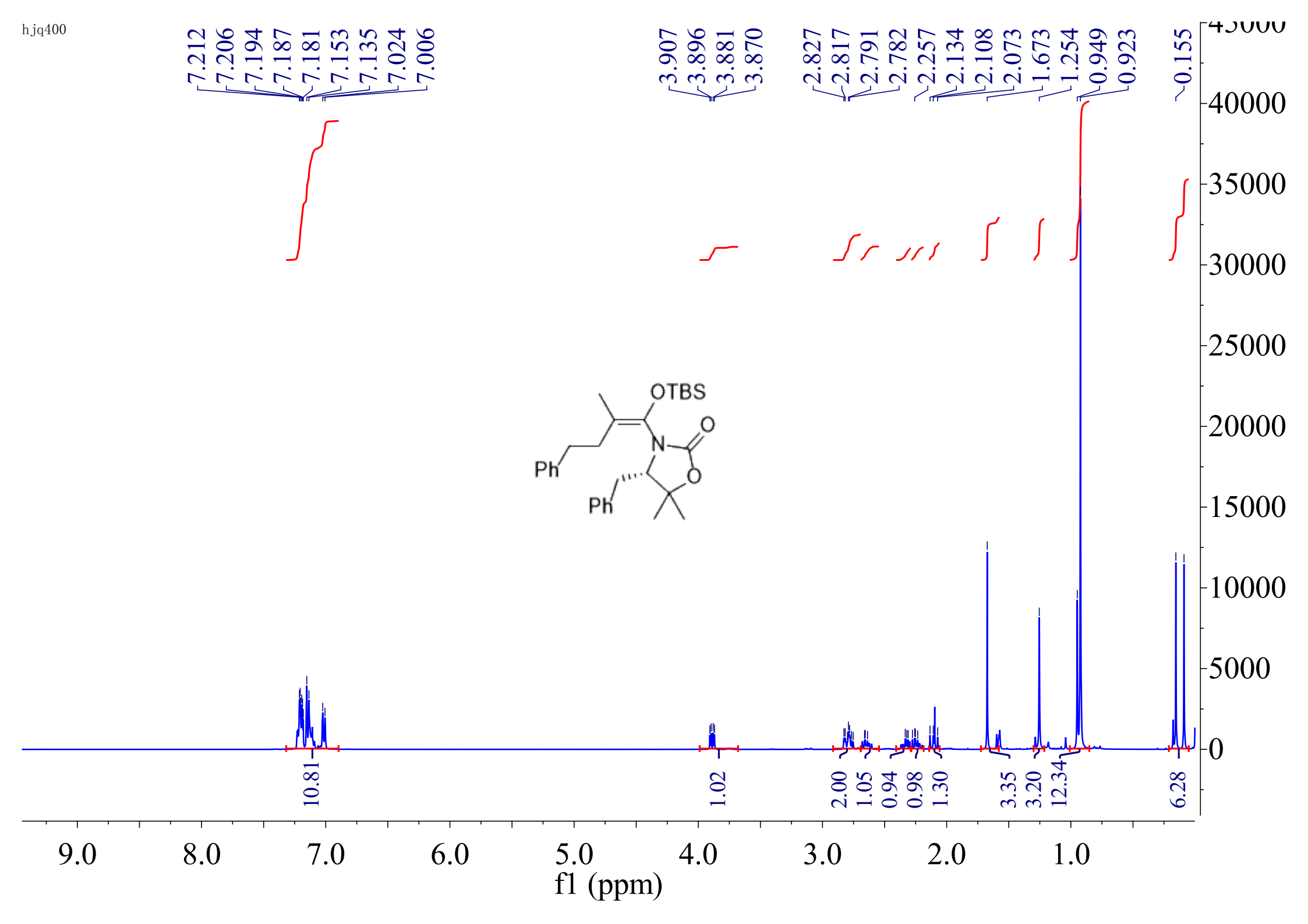

hjq400
7.232
7.213
7.158
7.107
7.089
3.950
3.940
3.923
3.913
3.027
3.018
2.992
2.983
2.502
2.474
2.467
2.439
2.151
1.998
1.990
1.964
1.935
1.905
1.883
1.870
1.614
1.340
1.313
1.301
1.233
0.964
0.923
0.895
0.844
0.827
0.820
0.809
0.166
0.145
0.090
OTBS
O
N
O
Ph
5.53
1.00
0.96
1.00
0.97
3.19
1.13
3.20
11.68
3.39
9.09
6.82
6.09
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)

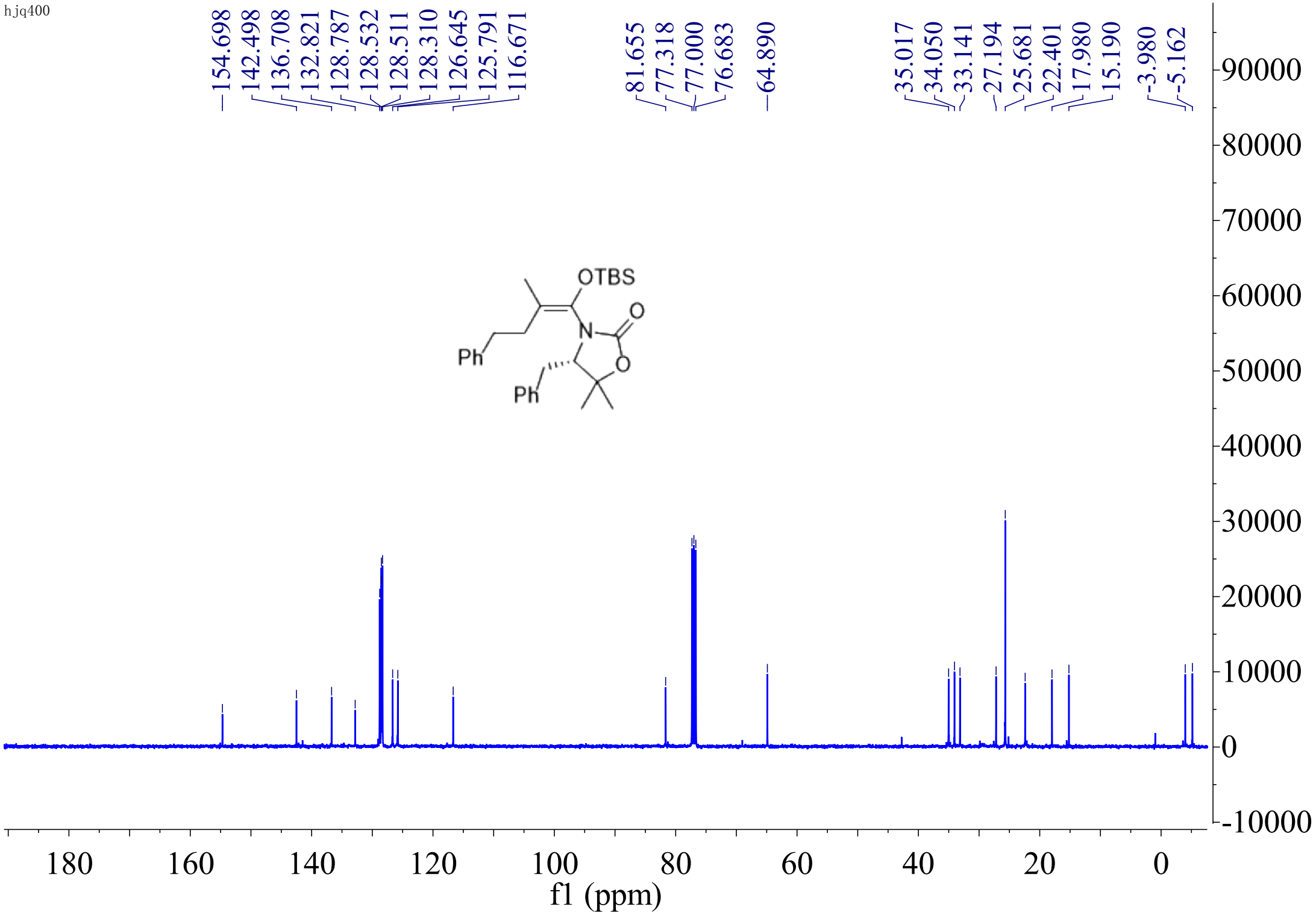

hjq400
154.676
136.859
131.916
128.846
128.699
126.778
122.783
81.524
77.318
77.000
76.683
65.112
31.729
29.857
29.814
27.838
27.289
25.720
22.980
22.649
17.957
14.076
14.045
-3.858
-5.351
OTBS
O
N
O
Ph
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

hjq400

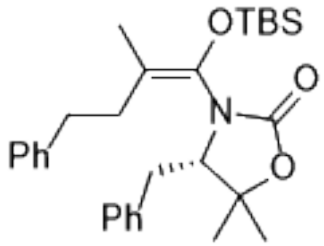

OTBS
O
N
O
Ph

-21.581
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
-15
f1 (ppm)

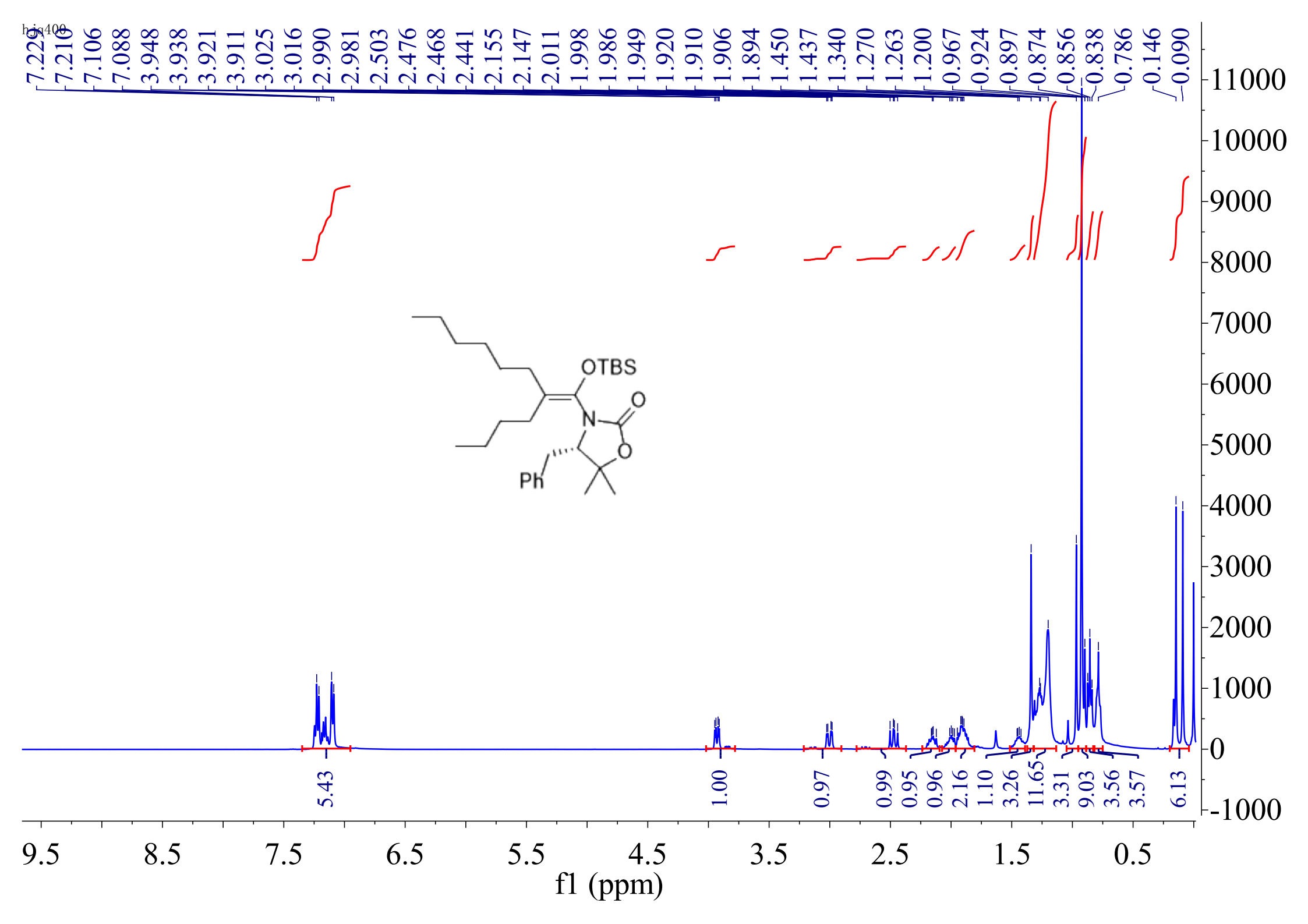

hjq400
7.212
7.206
7.194
7.187
7.181
7.153
7.135
7.024
7.006
3.907
3.896
3.881
3.870
2.827
2.817
2.791
2.782
2.257
2.134
2.108
2.073
1.673
1.254
0.949
0.923
0.155
OTBS
O
N
O
Ph
Ph
10.81
1.02
2.00
1.05
0.94
0.98
1.30
3.35
3.20
12.34
6.28
40000
35000
30000
25000
20000
15000
10000
5000
0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)

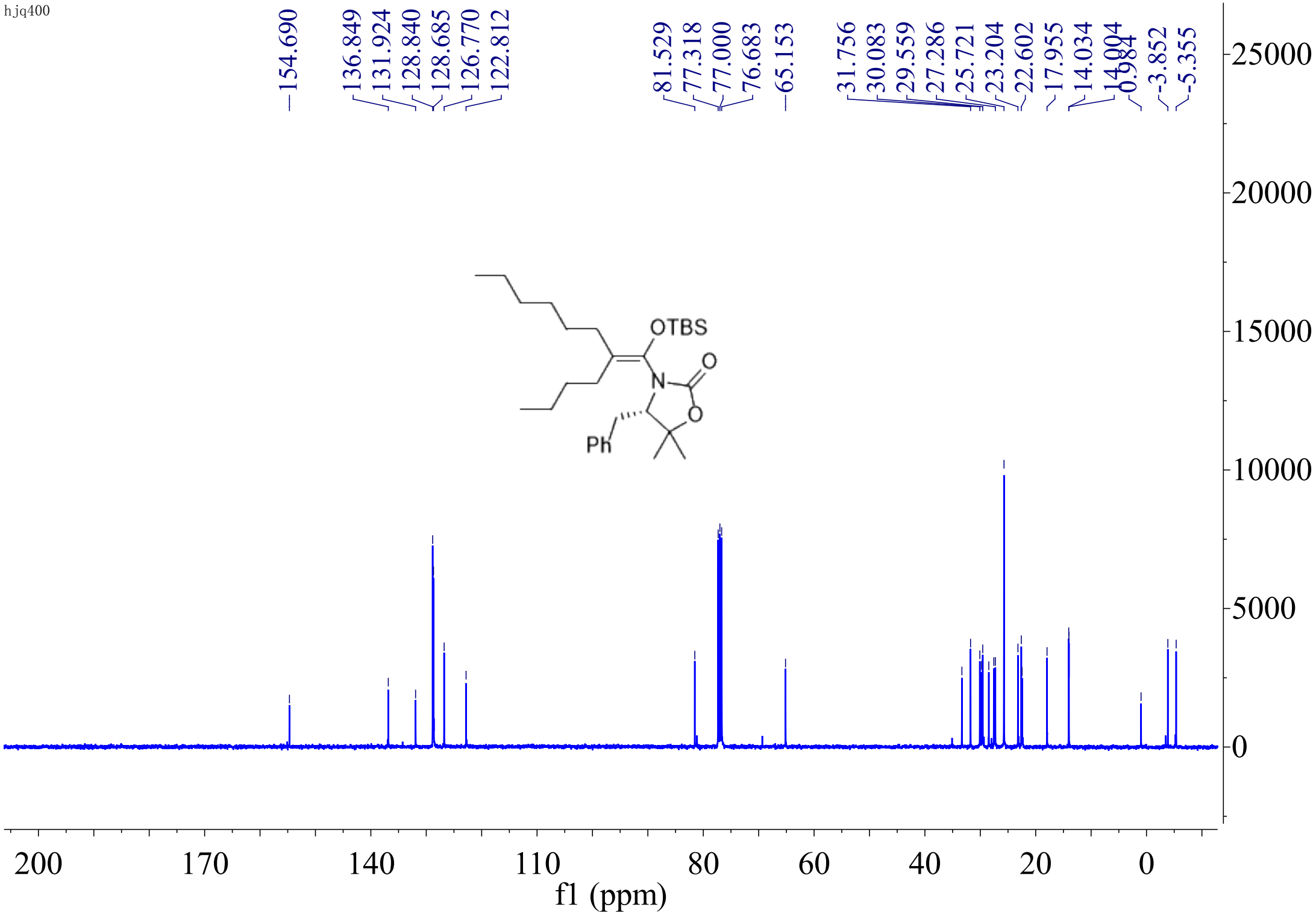

hjq400
154.698
142.498
136.708
132.821
128.787
128.532
128.511
128.310
126.645
125.791
116.671
81.655
77.318
77.000
76.683
64.890
35.017
34.050
33.141
27.194
25.681
22.401
17.980
15.190
-3.980
-5.162
OTBS
O
N
O
Ph
Ph
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

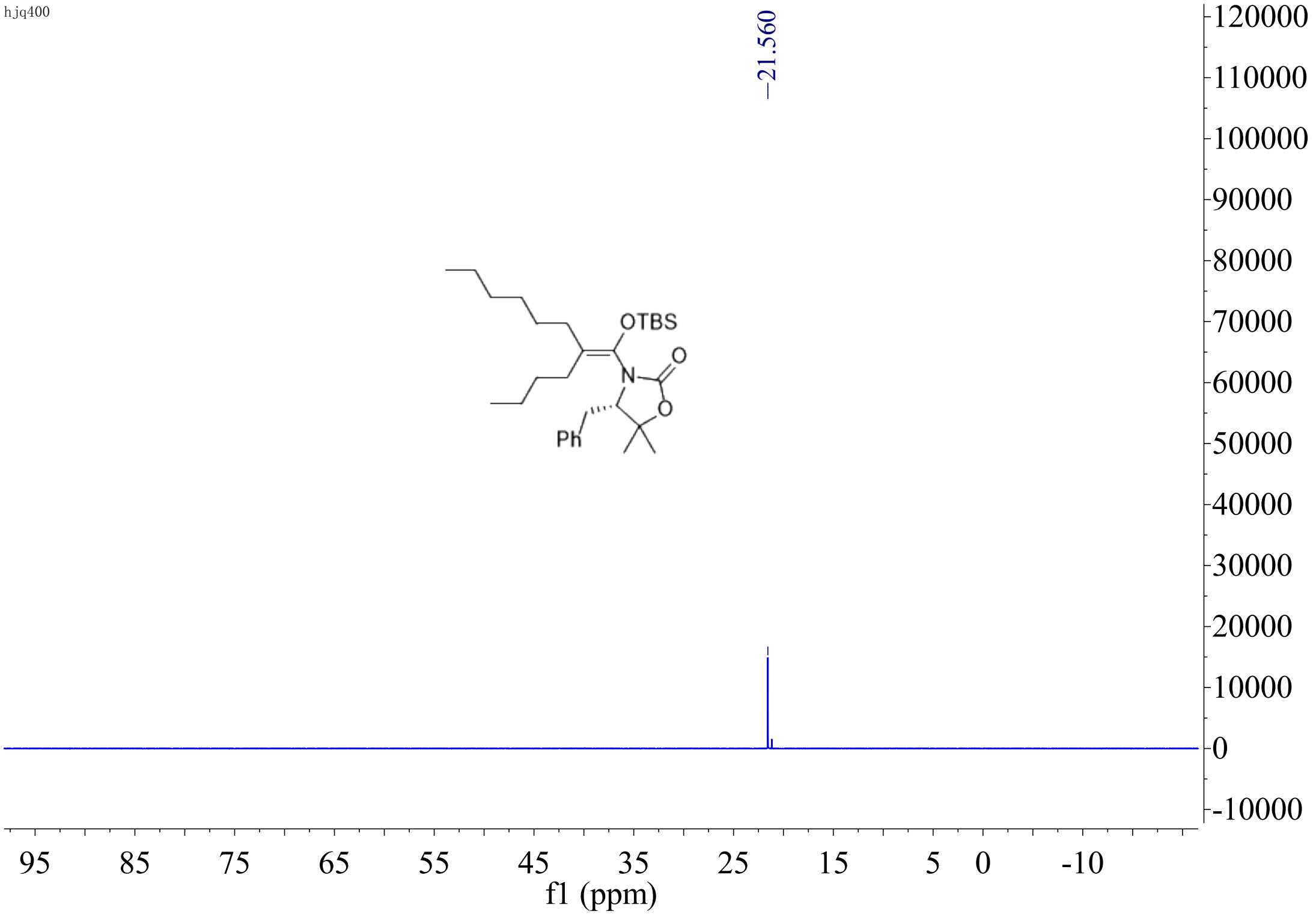
hjq400

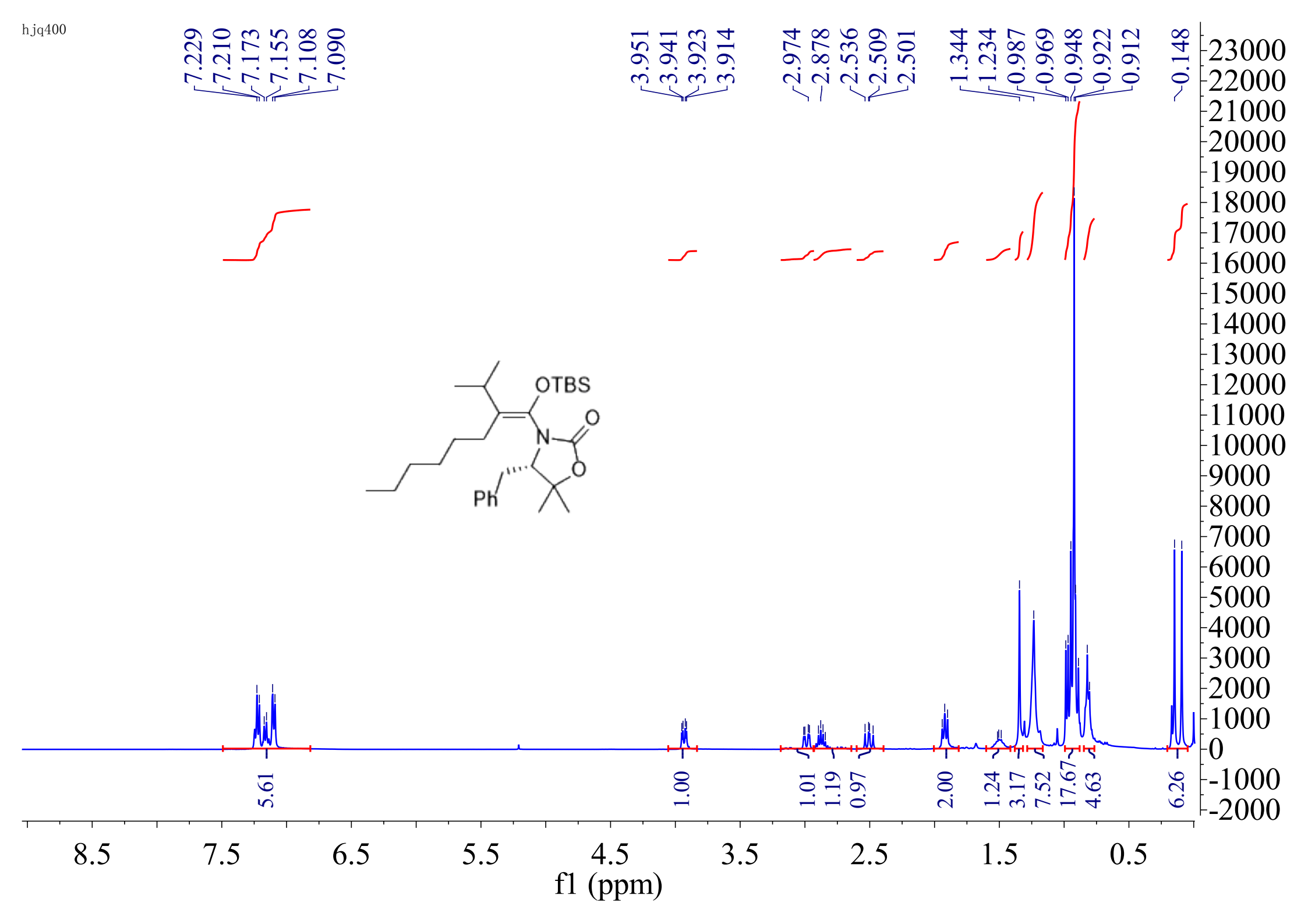

OTBS
O
N
O
Ph
Ph

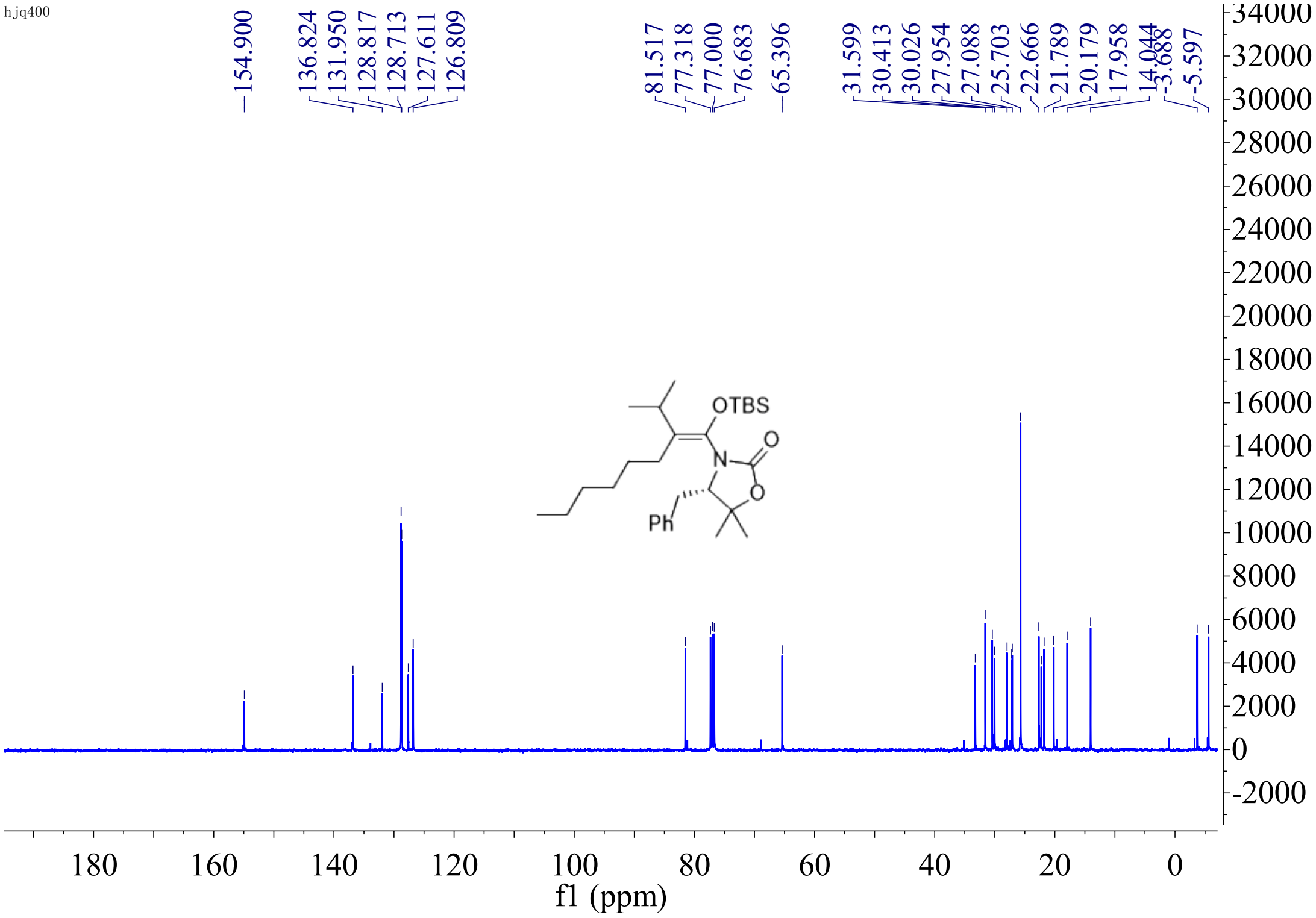
22.643
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
85
75
65
55
45
35
25
15
5
0
-10
f1 (ppm)

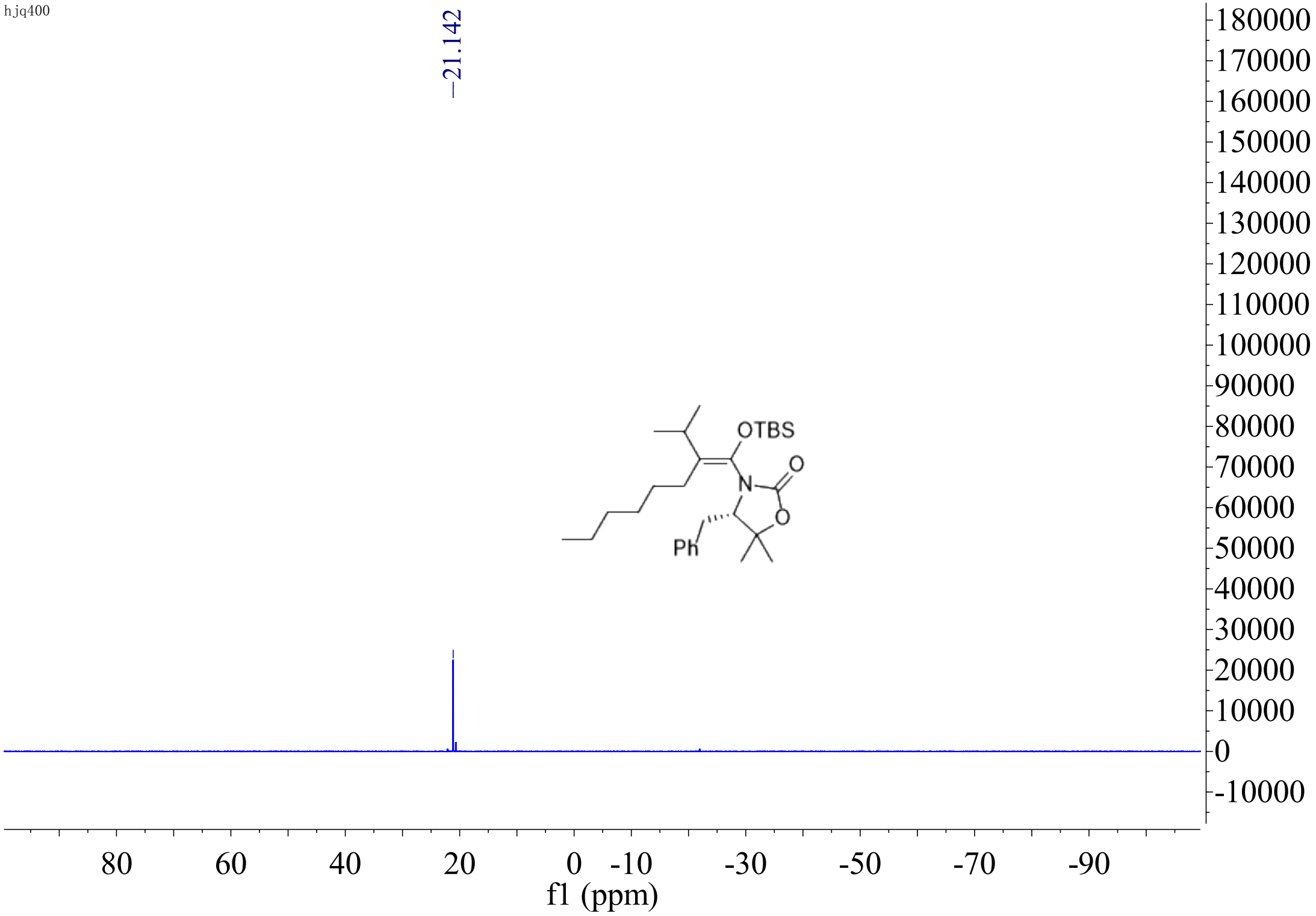

hjq400
7.225
7.210
7.106
7.088
3.948
3.938
3.921
3.911
3.025
3.016
2.990
2.981
2.503
2.476
2.468
2.441
2.155
2.147
2.011
1.998
1.986
1.949
1.920
1.910
1.906
1.894
1.450
1.437
1.340
1.270
1.263
1.200
0.967
0.924
0.897
0.874
0.856
0.838
0.786
0.146
0.090
OTBS
O
N
O
Ph
5.43
1.00
0.97
0.99
0.95
0.96
2.16
1.10
3.26
11.65
3.31
9.03
3.56
3.57
6.13
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
f1 (ppm)

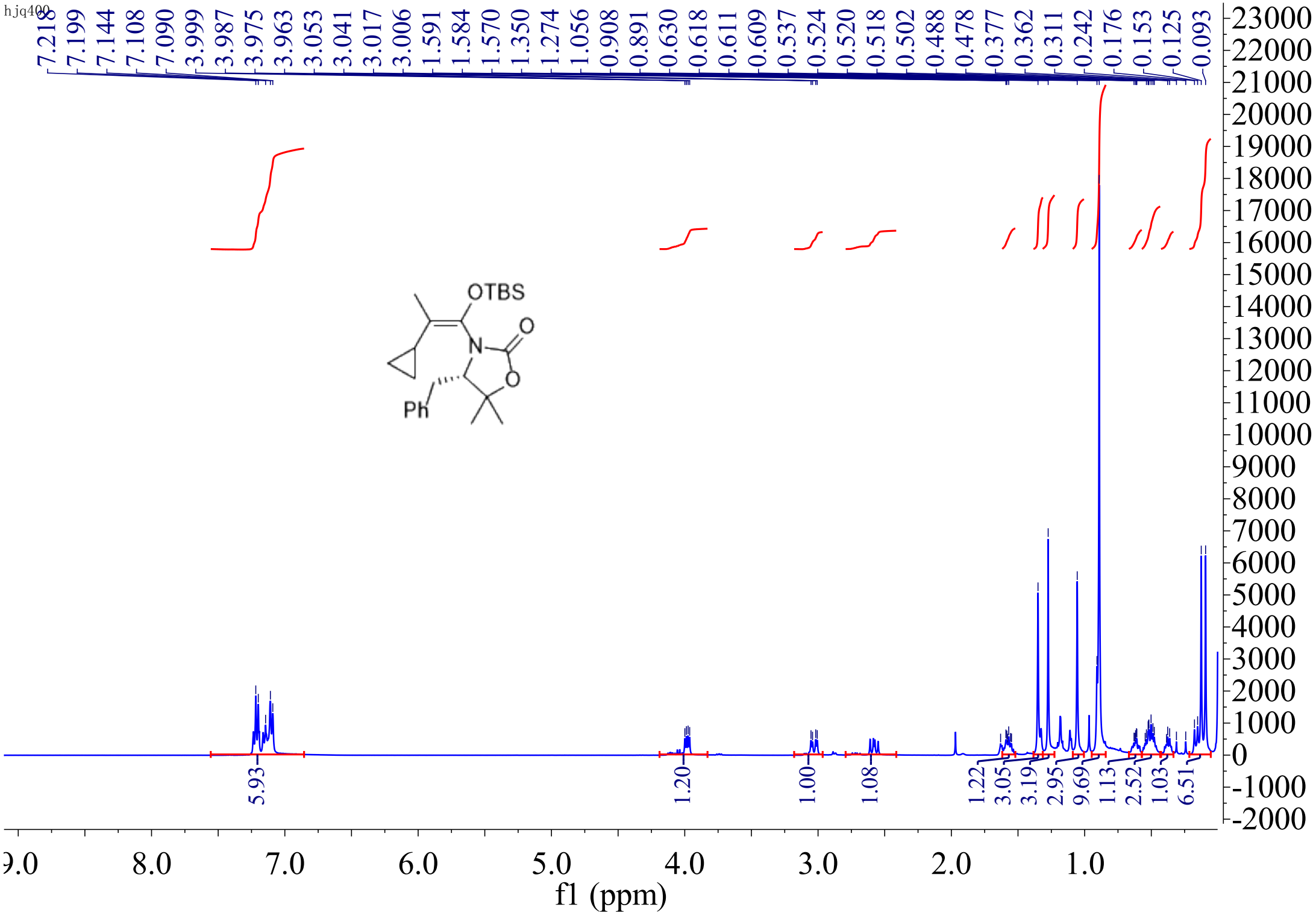

hjq400
154.690
136.849
131.924
128.840
128.685
126.770
122.812
81.529
77.318
77.000
76.683
65.153
31.756
30.083
29.559
27.286
25.721
23.204
22.602
17.955
14.034
14.004
0.984
-3.852
-5.355
OTBS
O
N
O
Ph
25000
20000
15000
10000
5000
0
200
170
140
110
80
60
40
20
0
f1 (ppm)

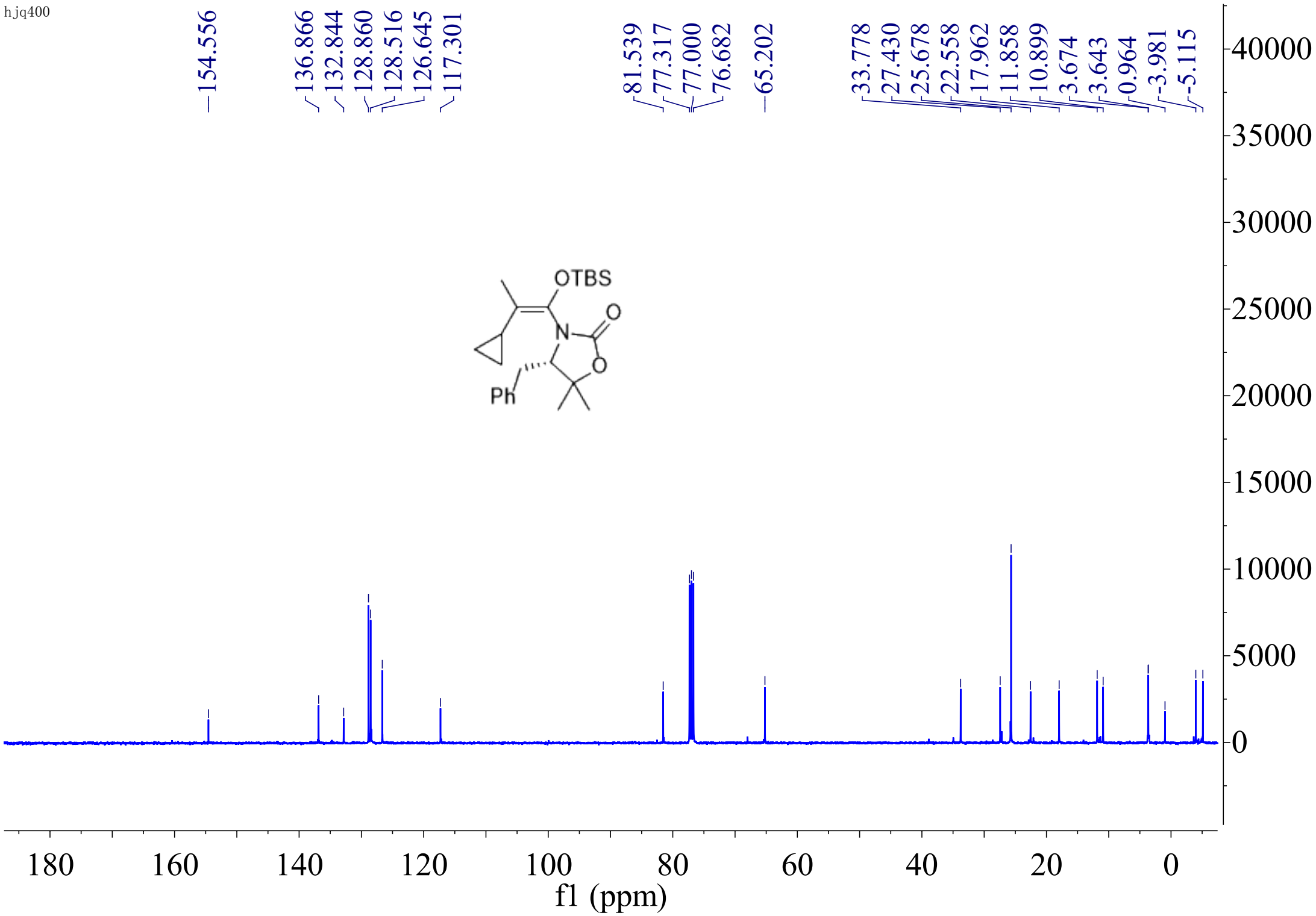

hjq400
−21.560
OTBS
O
N
O
Ph
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
95
85
75
65
55
45
35
25
15
5
0
-10
f1 (ppm)

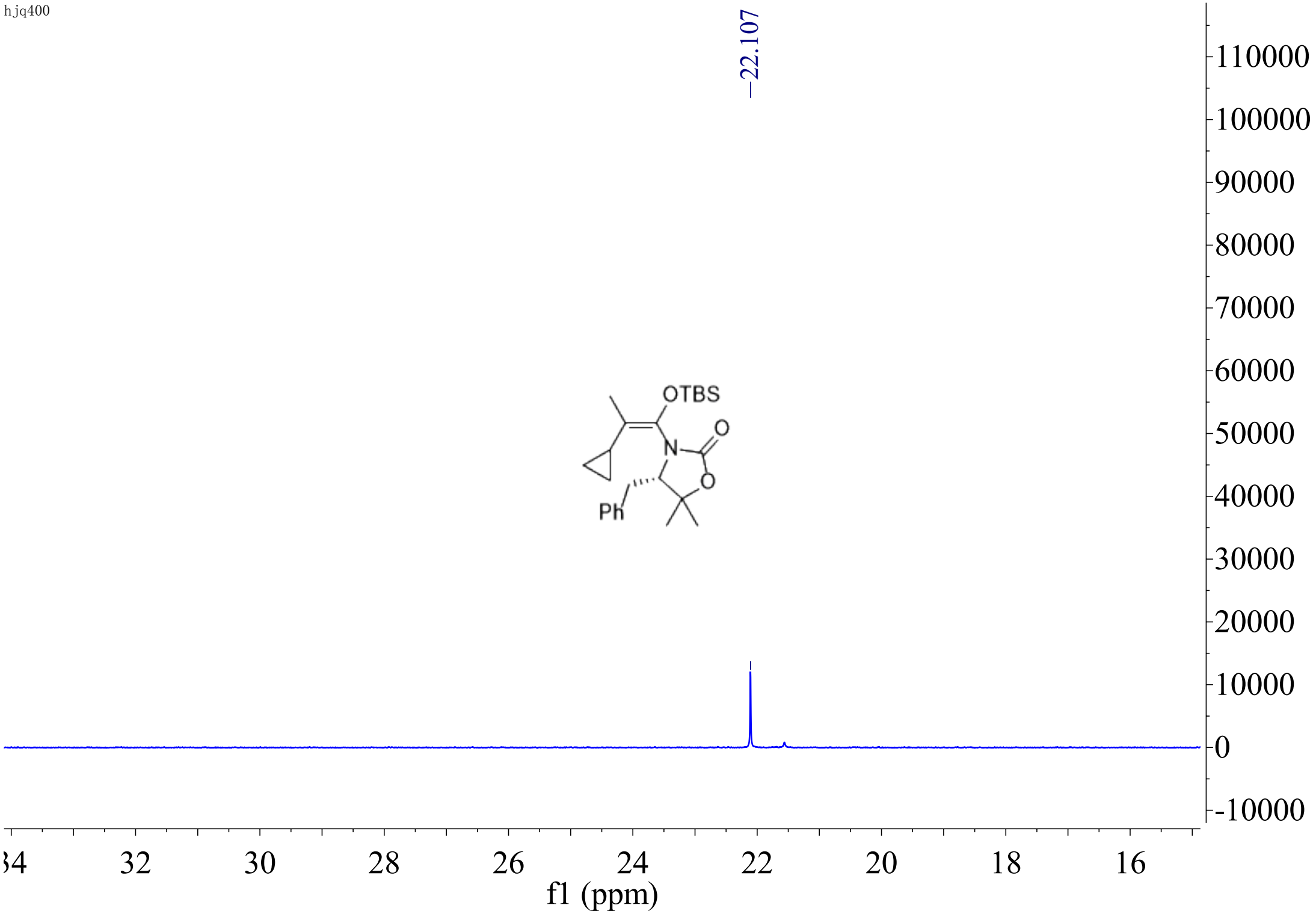

hjq400
7.229
7.210
7.173
7.155
7.108
7.090
3.951
3.941
3.923
3.914
2.974
2.878
2.536
2.509
2.501
1.344
1.234
0.987
0.969
0.948
0.922
0.912
0.148
OTBS
O
N
O
Ph
5.61
1.00
1.01
1.19
0.97
2.00
1.24
3.17
7.52
17.67
4.63
6.26
f1 (ppm)

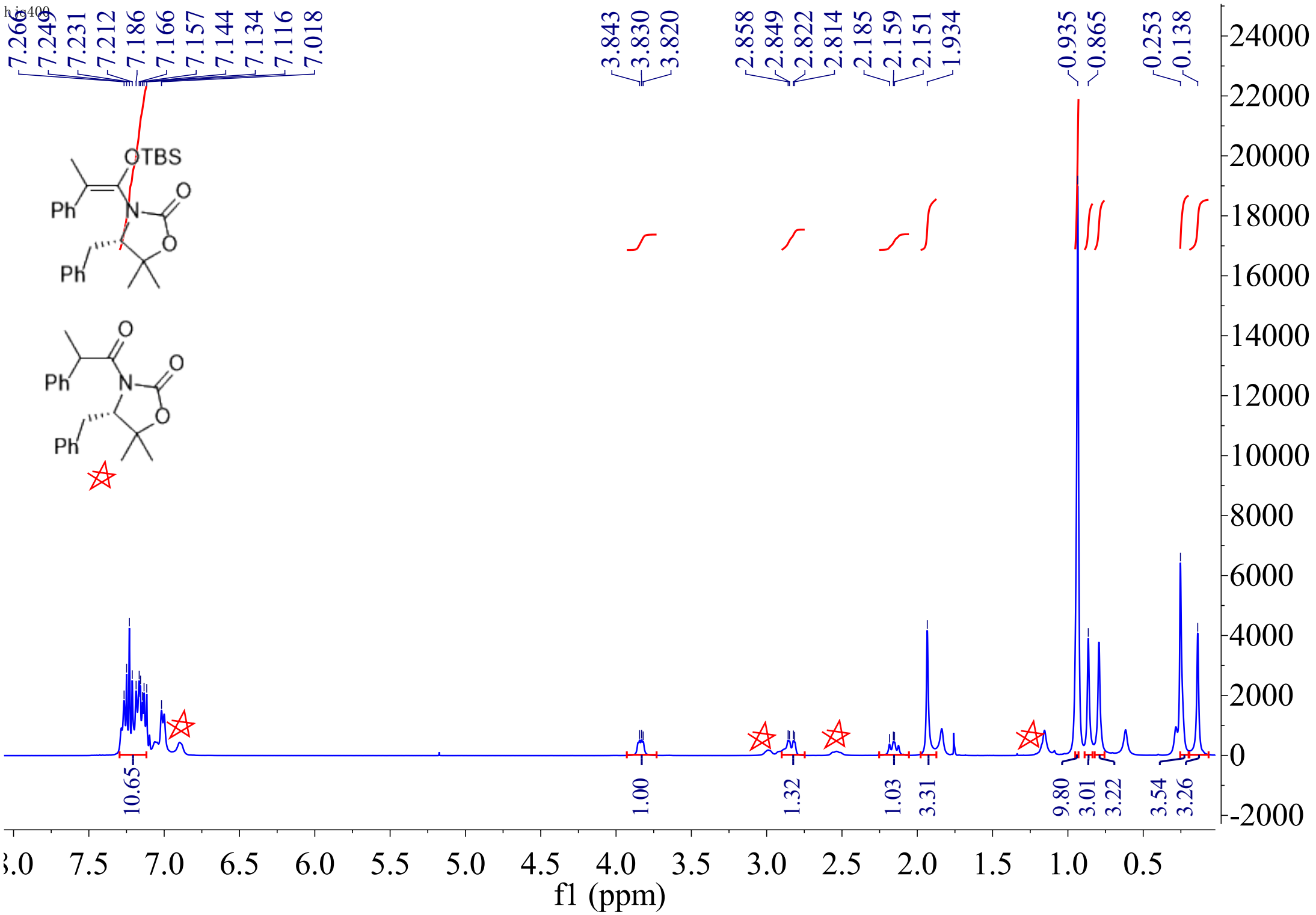

hjq400
154.900
136.824
131.950
128.817
128.713
127.611
126.809
81.517
77.318
77.000
76.683
65.396
31.599
30.413
30.026
27.954
27.088
25.703
22.666
21.789
20.179
17.958
14.044
-3.688
-5.597
OTBS
N
O
O
Ph
f1 (ppm)

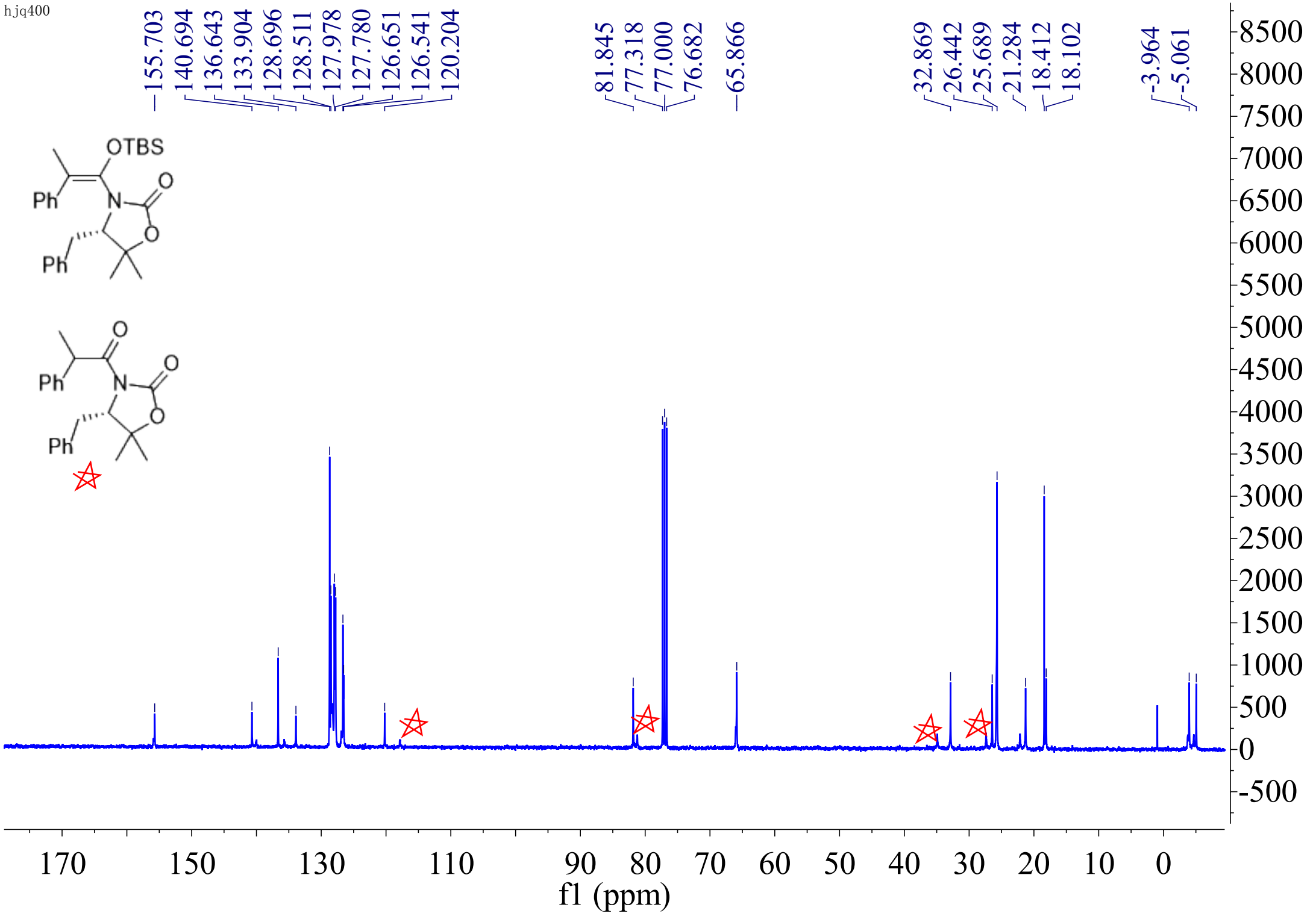

hjq400
-21.142
OTBS
O
N
O
Ph
180000
170000
160000
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
80
60
40
20
0
-10
-30
-50
-70
-90
f1 (ppm)


hjq400
7.218
7.199
7.144
7.108
7.090
3.999
3.987
3.975
3.963
3.053
3.041
3.017
3.006
1.591
1.584
1.570
1.350
1.274
1.056
0.908
0.891
0.630
0.618
0.611
0.609
0.537
0.524
0.520
0.518
0.502
0.488
0.478
0.377
0.362
0.311
0.242
0.176
0.153
0.125
0.093
OTBS
O
N
O
Ph
5.93
1.20
1.00
1.08
1.22
3.05
3.19
2.95
9.69
1.13
2.52
1.03
6.51
f1 (ppm)

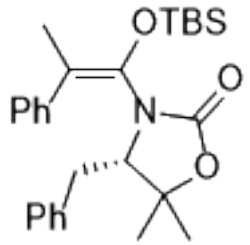

hjq400
154.556
136.866
132.844
128.860
128.516
126.645
117.301
81.539
77.317
77.000
76.682
65.202
33.778
27.430
25.678
22.558
17.962
11.858
10.899
3.674
3.643
0.964
-3.981
-5.115
OTBS
O
N
O
Ph
40000
35000
30000
25000
20000
15000
10000
5000
0
180
160
140
120
100
80
60
40
20
0
f1 (ppm)


hjq400
22.107
OTBS
O
N
O
Ph
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
34
32
30
28
26
24
22
20
18
16
f1 (ppm)


hjs400
7.266
7.249
7.231
7.212
7.186
7.166
7.157
7.144
7.134
7.116
7.018
3.843
3.830
3.820
2.858
2.849
2.822
2.814
2.185
2.159
2.151
1.934
0.935
0.865
0.253
0.138
OTBS
Ph
N
O
O
Ph
O
Ph
N
O
O
Ph
10.65
1.00
1.32
1.03
3.31
9.80
3.01
3.22
3.54
3.26
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
3.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)


hjq400
155.703
140.694
136.643
133.904
128.696
128.511
127.978
127.780
126.651
126.541
120.204
81.845
77.318
77.000
76.682
65.866
32.869
26.442
25.689
21.284
18.412
18.102
-3.964
-5.061
OTBS
Ph
N
O
O
Ph
O
Ph
N
O
O
Ph
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

hjq400

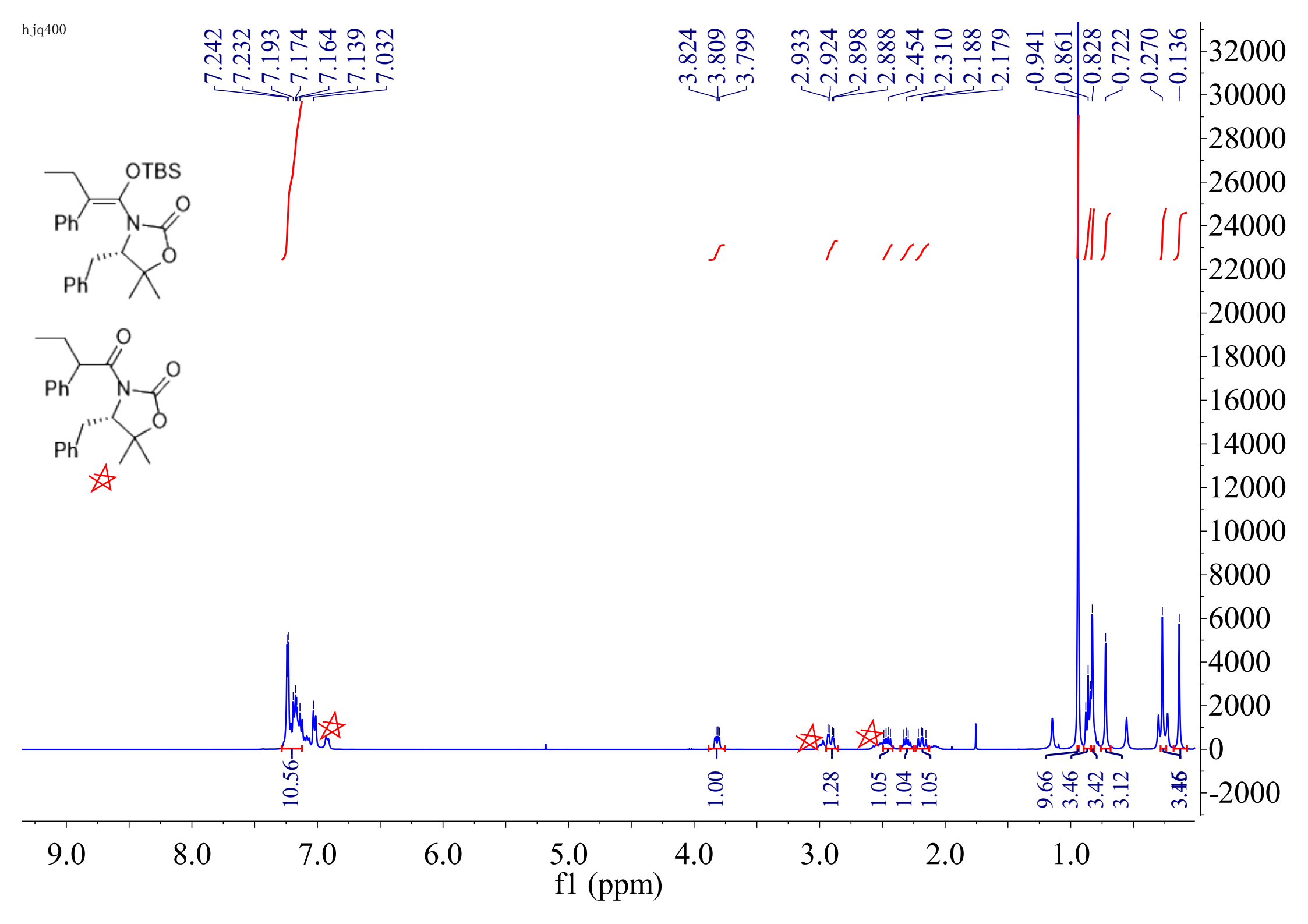


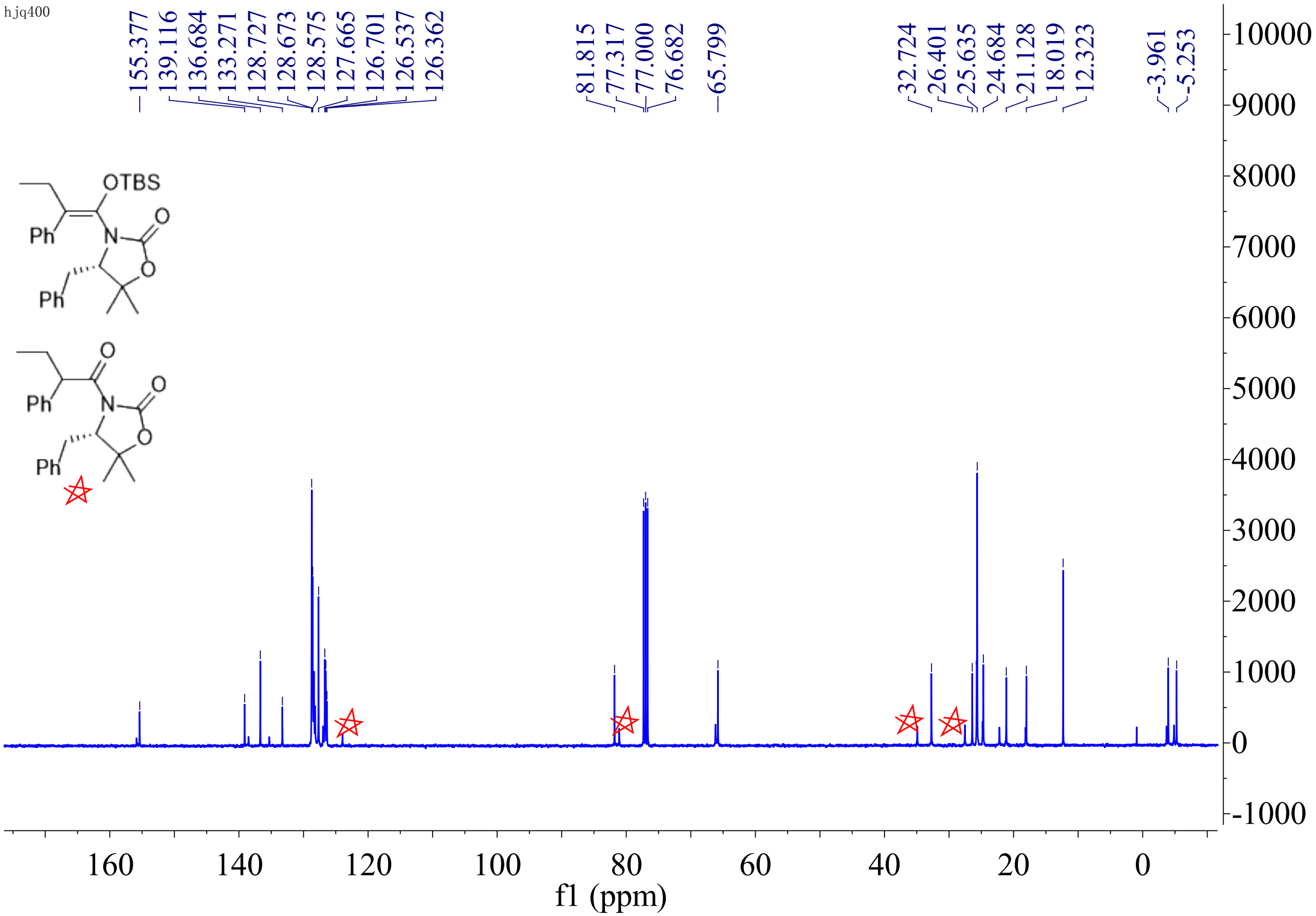
−22.812

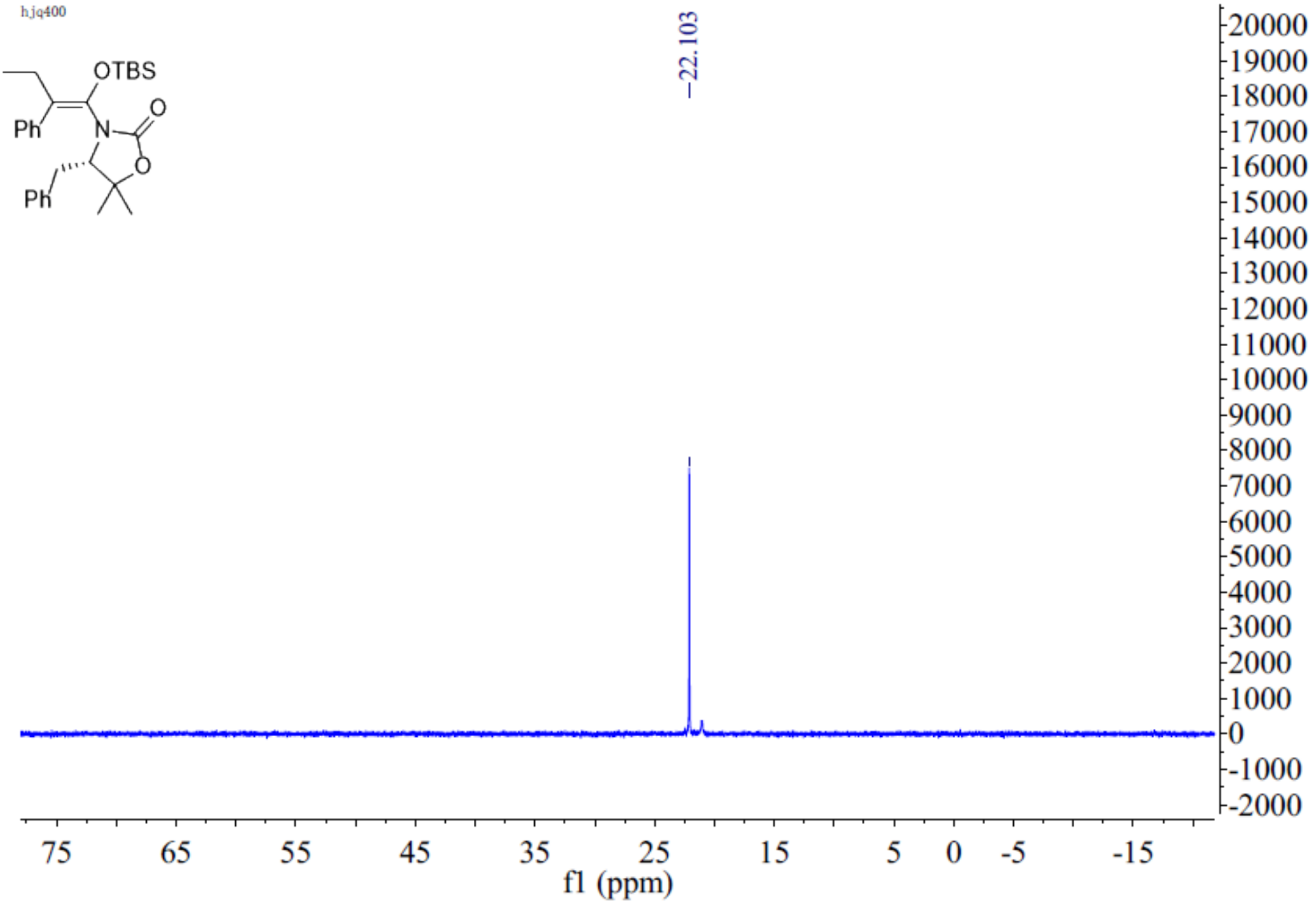
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000

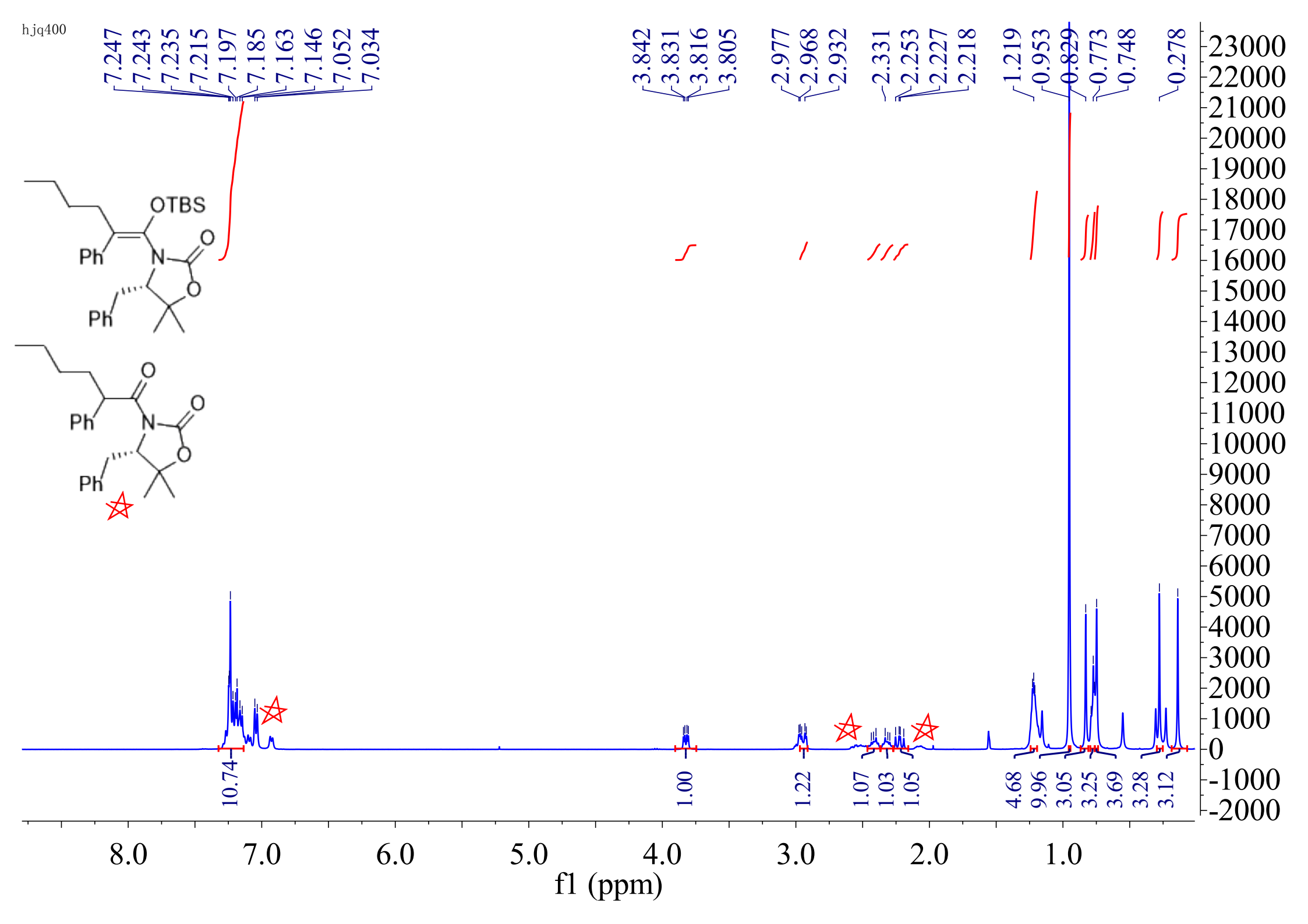
75 65 55 45 35 25 15 5 0 -5 -15

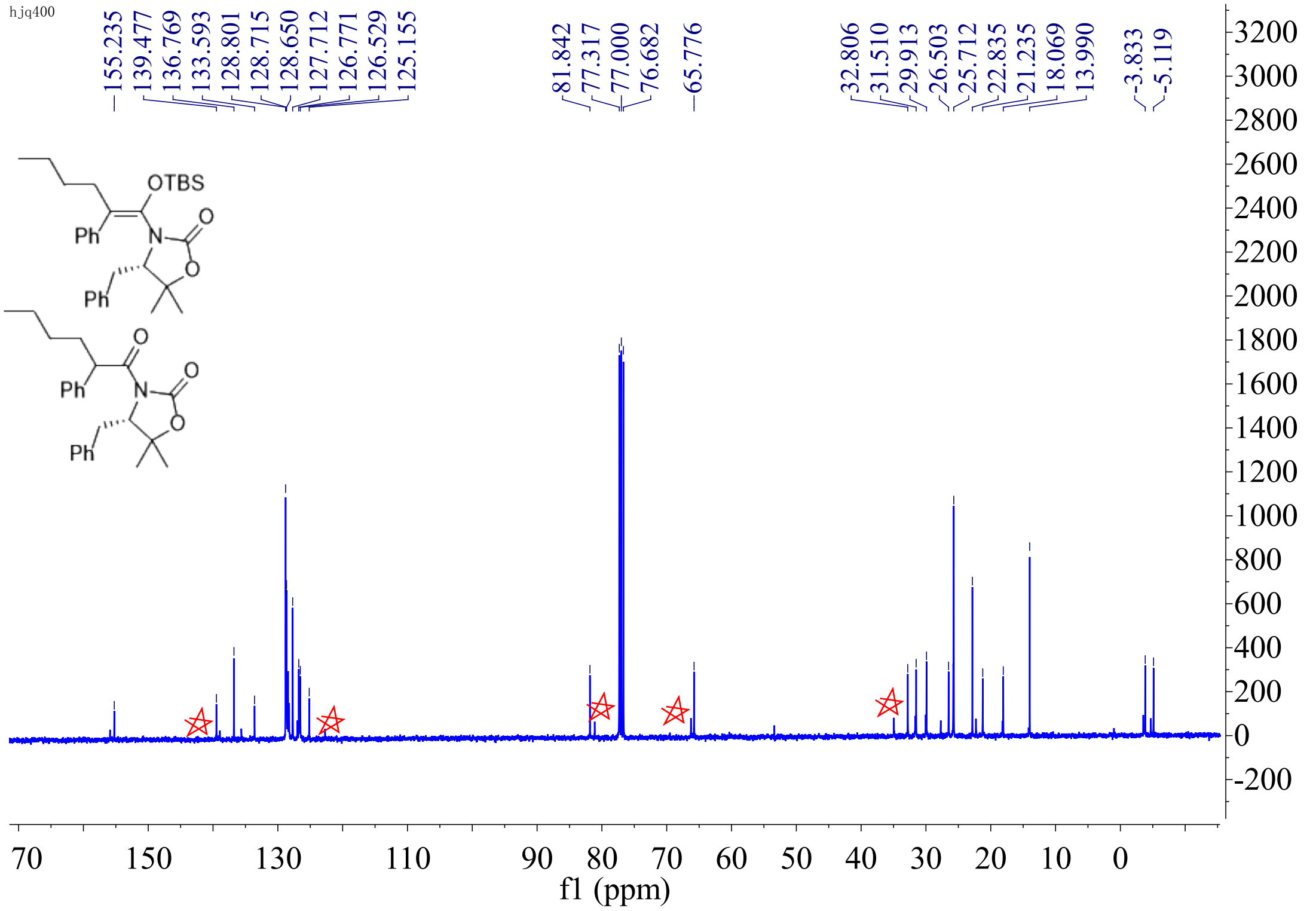
f1 (ppm)


hjq400
7.242
7.232
7.193
7.174
7.164
7.139
7.032
3.824
3.809
3.799
2.933
2.924
2.898
2.888
2.454
2.310
2.188
2.179
0.941
0.861
0.828
0.722
0.270
0.136
OTBS
Ph
N
O
O
Ph
O
Ph
N
O
O
Ph
10.56
1.00
1.28
1.05
1.04
1.05
9.66
3.46
3.42
3.12
3.46
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)

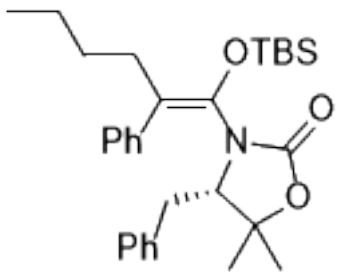

hjq400
155.377
139.116
136.684
133.271
128.727
128.673
128.575
127.665
126.701
126.537
126.362
81.815
77.317
77.000
76.682
65.799
32.724
26.401
25.635
24.684
21.128
18.019
12.323
-3.961
-5.253
OTBS
Ph
N
O
Ph
O
Ph
N
O
Ph
O
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
160
140
120
100
80
60
40
20
0
f1 (ppm)


hjq400
OTBS
Ph
N
O
O
Ph
-22.103
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
75
65
55
45
35
25
15
5
0
-5
-15
f1 (ppm)


hjq400
7.247
7.243
7.235
7.215
7.197
7.185
7.163
7.146
7.052
7.034
3.842
3.831
3.816
3.805
2.977
2.968
2.932
2.331
2.253
2.227
2.218
1.219
0.953
0.829
0.773
0.748
0.278
OTBS
Ph
N
O
Ph
O
Ph
N
O
Ph
10.74
1.00
1.22
1.07
1.03
1.05
4.68
9.96
3.05
3.25
3.69
3.28
3.12
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
155.235
139.477
136.769
133.593
128.801
128.715
128.650
127.712
126.771
126.529
125.155
81.842
77.317
77.000
76.682
65.776
32.806
31.510
29.913
26.503
25.712
22.835
21.235
18.069
13.990
-3.833
-5.119
OTBS
Ph
N
O
Ph
O
Ph
N
O
Ph
O
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
70
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

hjq400

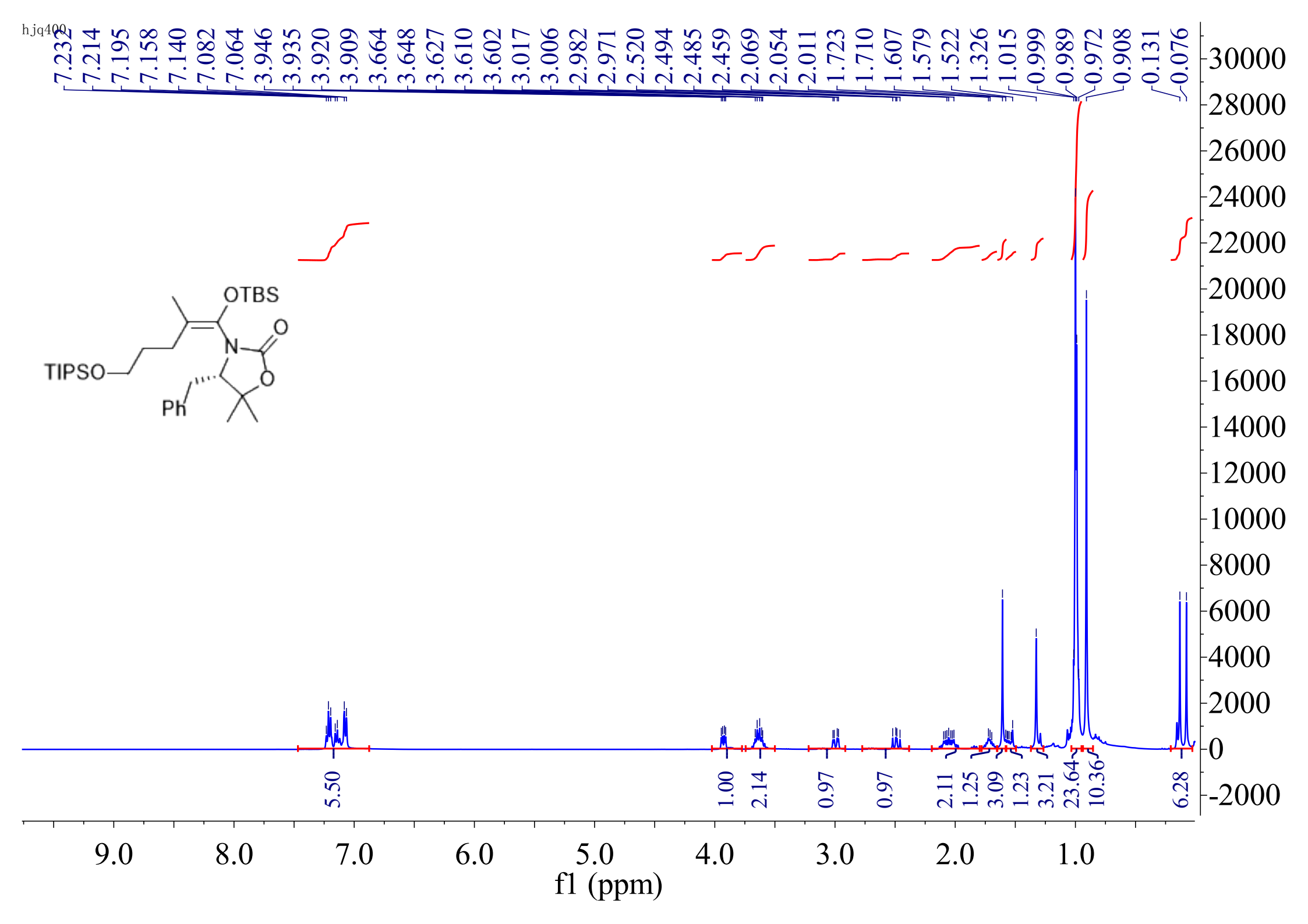


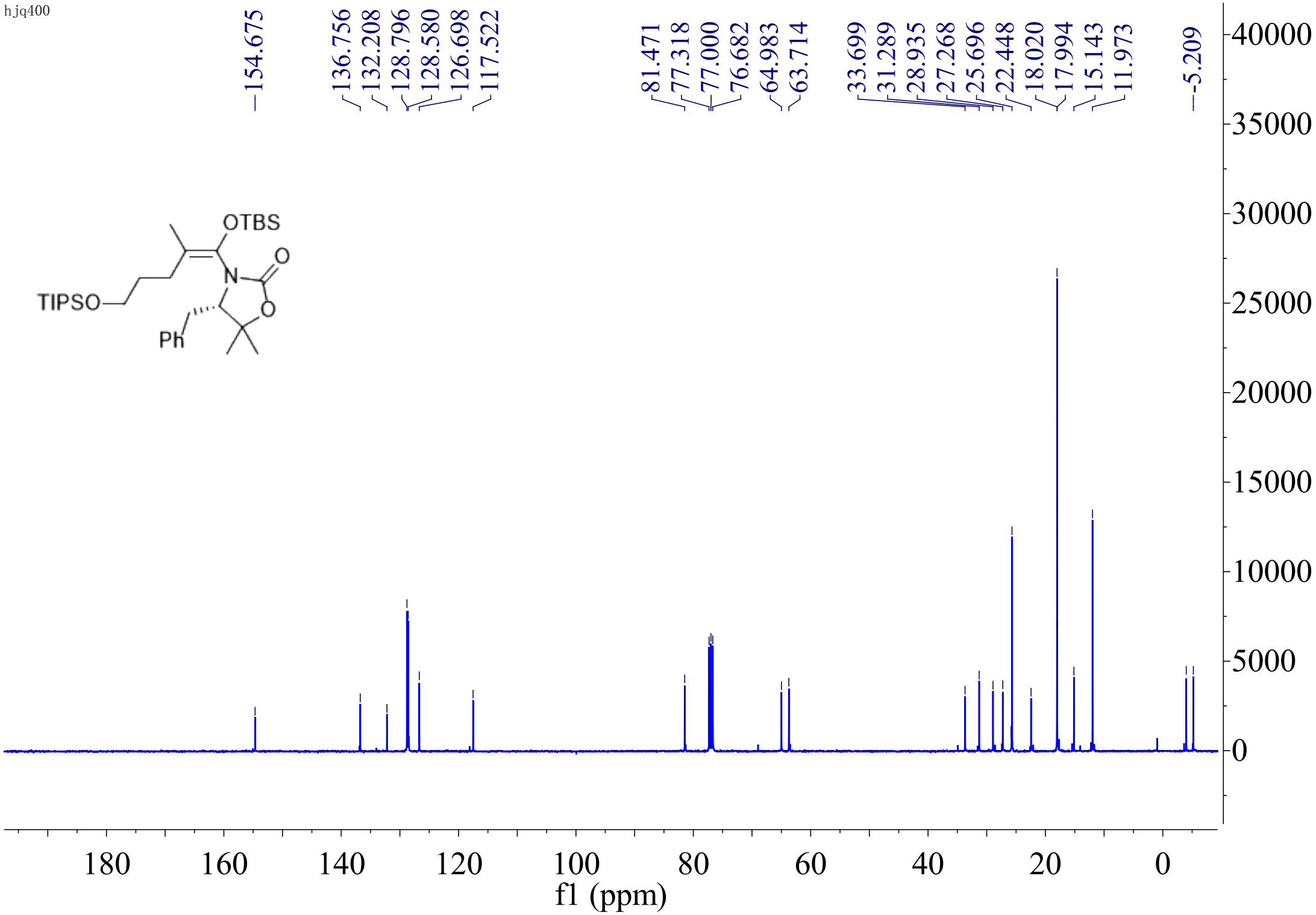
−22.179

8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
-1000

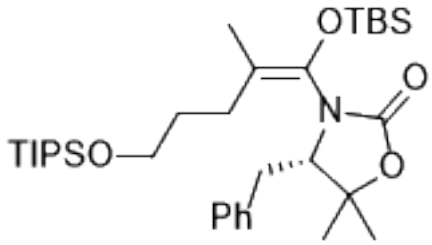
80 60 40 20 0 -10 -30 -50 -70 -90

f1 (ppm)


hjq400
7.232
7.214
7.195
7.158
7.140
7.082
7.064
3.946
3.935
3.920
3.909
3.664
3.648
3.627
3.610
3.602
3.017
3.006
2.982
2.971
2.520
2.494
2.485
2.459
2.069
2.054
2.011
1.723
1.710
1.607
1.579
1.522
1.326
1.015
0.999
0.989
0.972
0.908
0.131
0.076
OTBS
O
N
O
TIPSO
Ph
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
5.50
1.00
2.14
0.97
0.97
2.11
1.25
3.09
1.23
3.21
23.64
10.36
6.28
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
154.675
136.756
132.208
128.796
128.580
126.698
117.522
81.471
77.318
77.000
76.682
64.983
63.714
33.699
31.289
28.935
27.268
25.696
22.448
18.020
17.994
15.143
11.973
-5.209
OTBS
O
N
O
TIPSO
Ph
40000
35000
30000
25000
20000
15000
10000
5000
0
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

hjq400



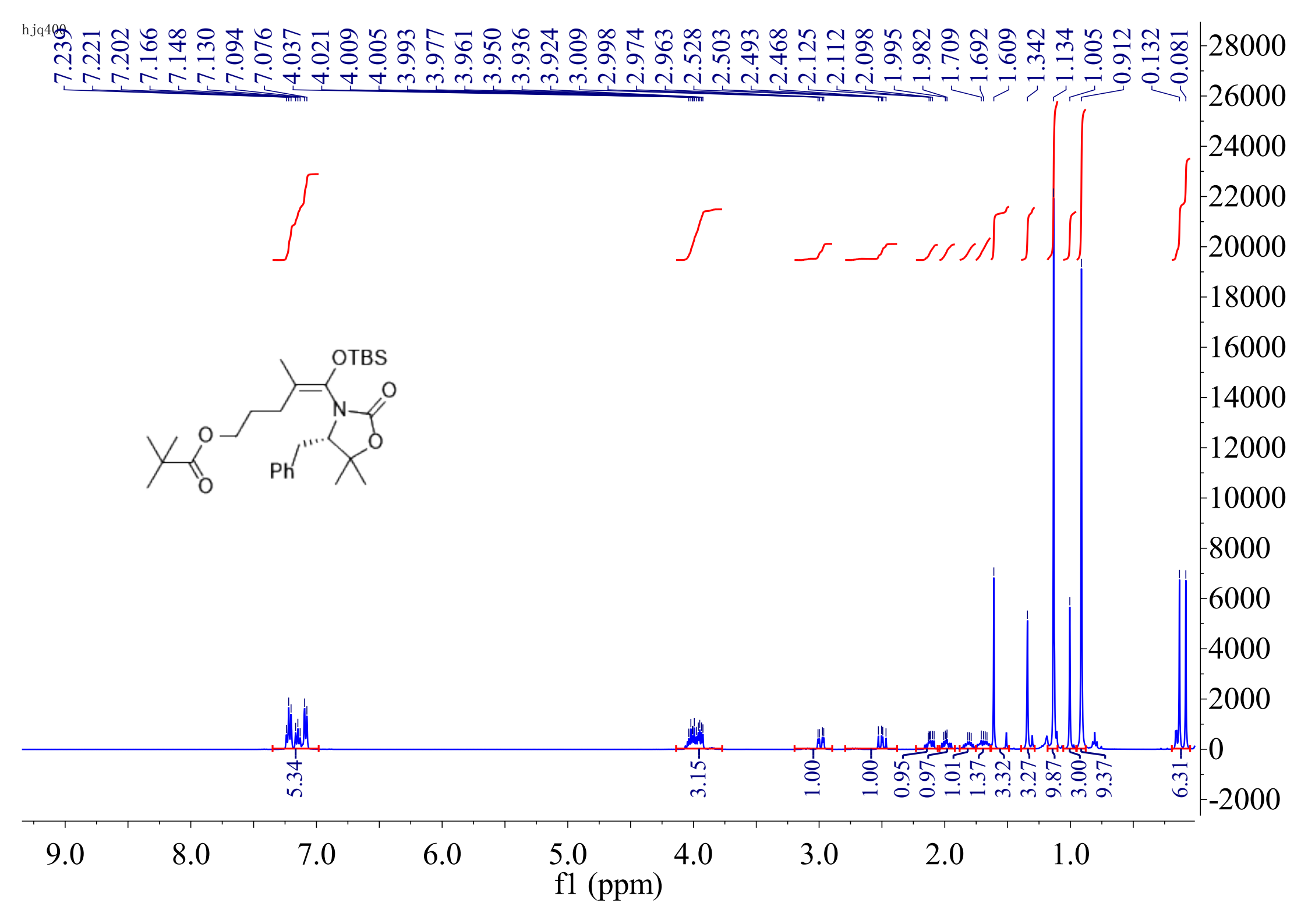
22.291

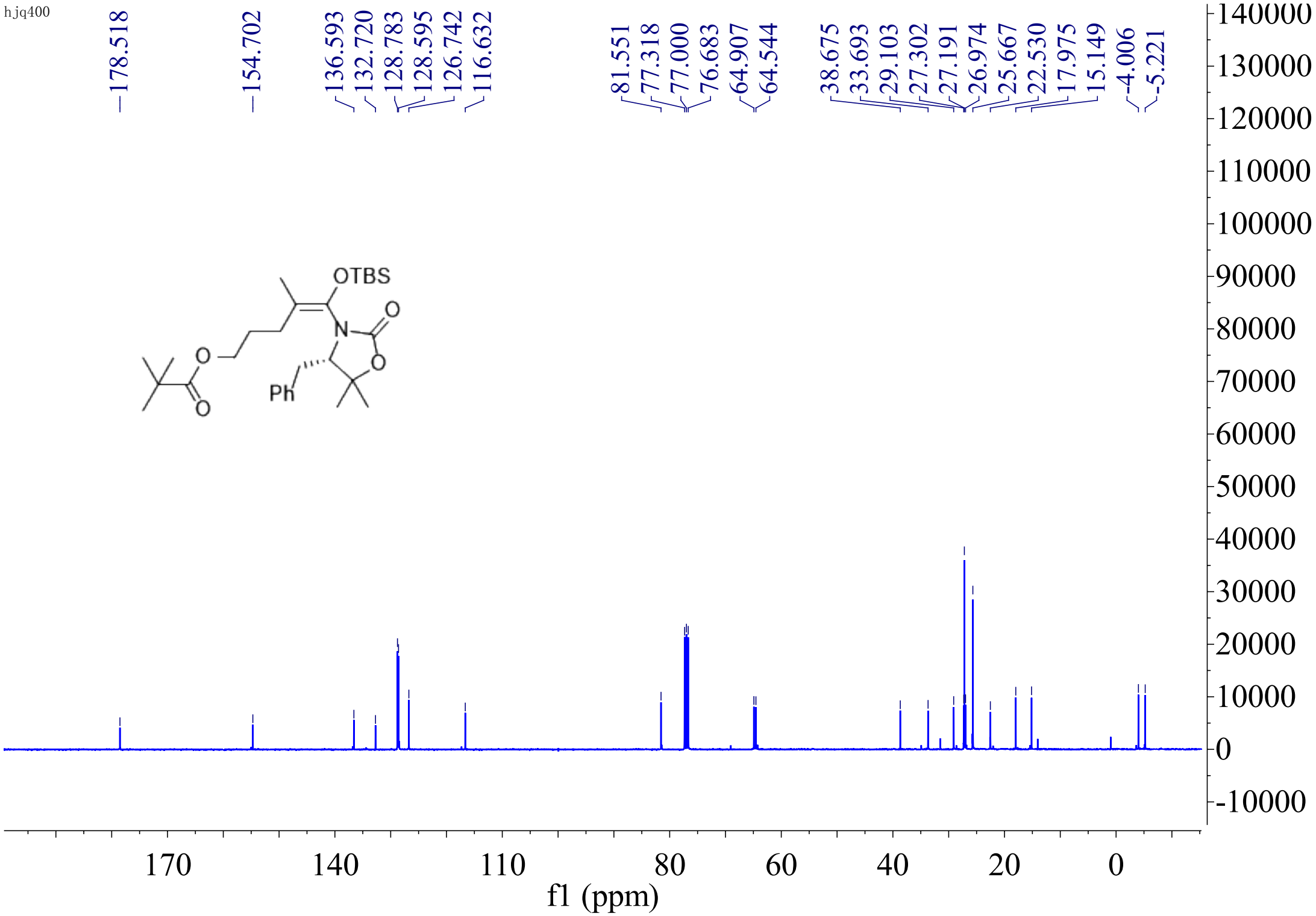
12.378

50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000

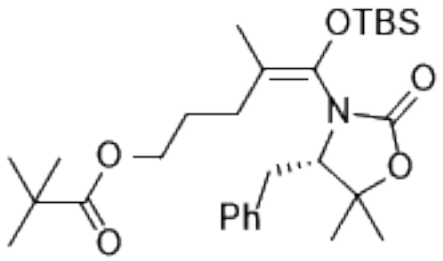
65 55 45 35 25 15 5 0 -5 -15

f1 (ppm)


hjq400
7.239
7.221
7.202
7.166
7.148
7.130
7.094
7.076
4.037
4.021
4.009
4.005
3.993
3.977
3.961
3.950
3.936
3.924
3.009
2.998
2.974
2.963
2.528
2.503
2.493
2.468
2.125
2.112
2.098
1.995
1.982
1.709
1.692
1.609
1.342
1.134
1.005
0.912
0.132
0.081
OTBS
N
O
O
O
O
Ph
5.34
3.15
1.00
1.00
0.95
0.97
1.01
1.37
3.32
3.27
9.87
3.00
9.37
6.31
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
178.518
154.702
136.593
132.720
128.783
128.595
126.742
116.632
81.551
77.318
77.000
76.683
64.907
64.544
38.675
33.693
29.103
27.302
27.191
26.974
25.667
22.530
17.975
15.149
-4.006
-5.221
OTBS
N
O
O
O
O
Ph
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
170
140
110
80
60
40
20
0
f1 (ppm)

hjq400

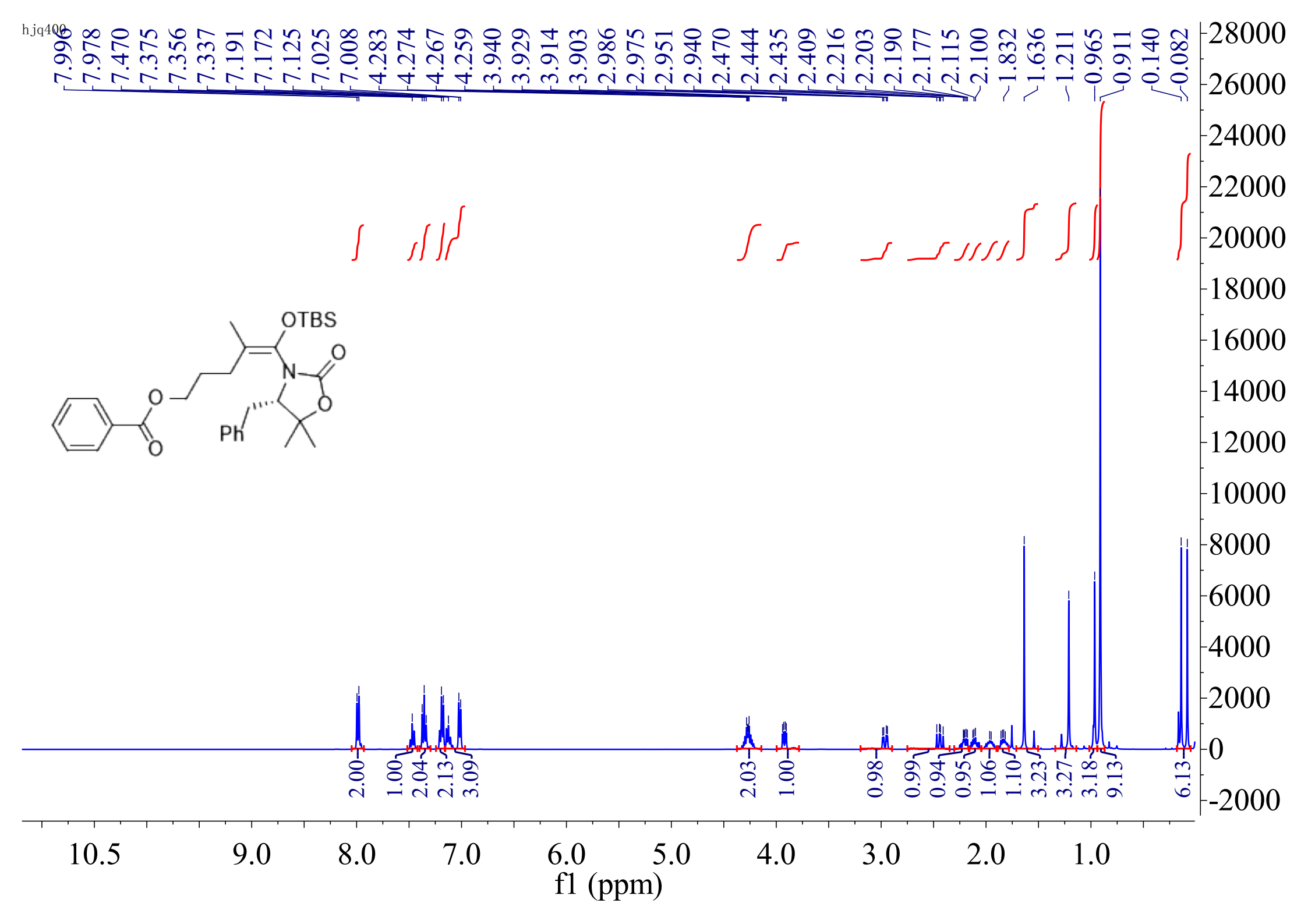


22.657

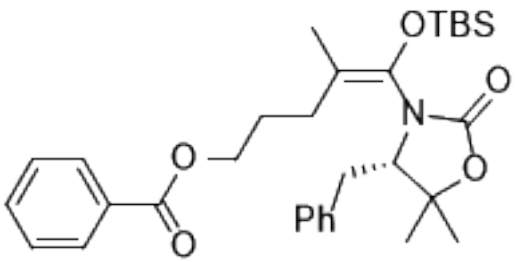
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000

95 85 75 65 55 45 35 25 15 5 0 -10

f1 (ppm)


hjq400
7.998
7.978
7.470
7.375
7.356
7.337
7.191
7.172
7.125
7.025
7.008
4.283
4.274
4.267
4.259
3.940
3.929
3.914
3.903
2.986
2.975
2.951
2.940
2.470
2.444
2.435
2.409
2.216
2.203
2.190
2.177
2.115
2.100
1.832
1.636
1.211
0.965
0.911
0.140
0.082
OTBS
O
N
O
O
O
O
Ph
2.00
1.00
2.04
2.13
3.09
2.03
1.00
0.98
0.99
0.94
0.95
1.06
1.10
3.23
3.27
3.18
9.13
6.13
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
10.5
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)

hjq400



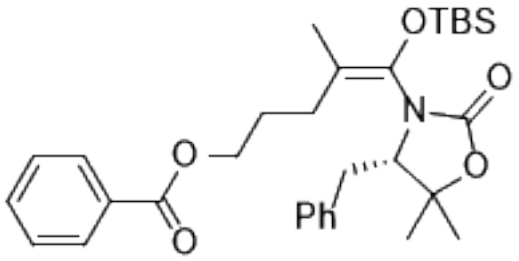
166.609
154.723
132.753
129.557
128.746
128.543
128.251
126.691
118.468
81.588
77.317
77.000
76.682
65.041
64.890
33.571
29.053
27.213
26.972
25.654
22.404
17.965
15.003
-4.009
-5.225

240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
-20000

180
160
140
120
100
80
60
40
20
0

f1 (ppm)

hjq400

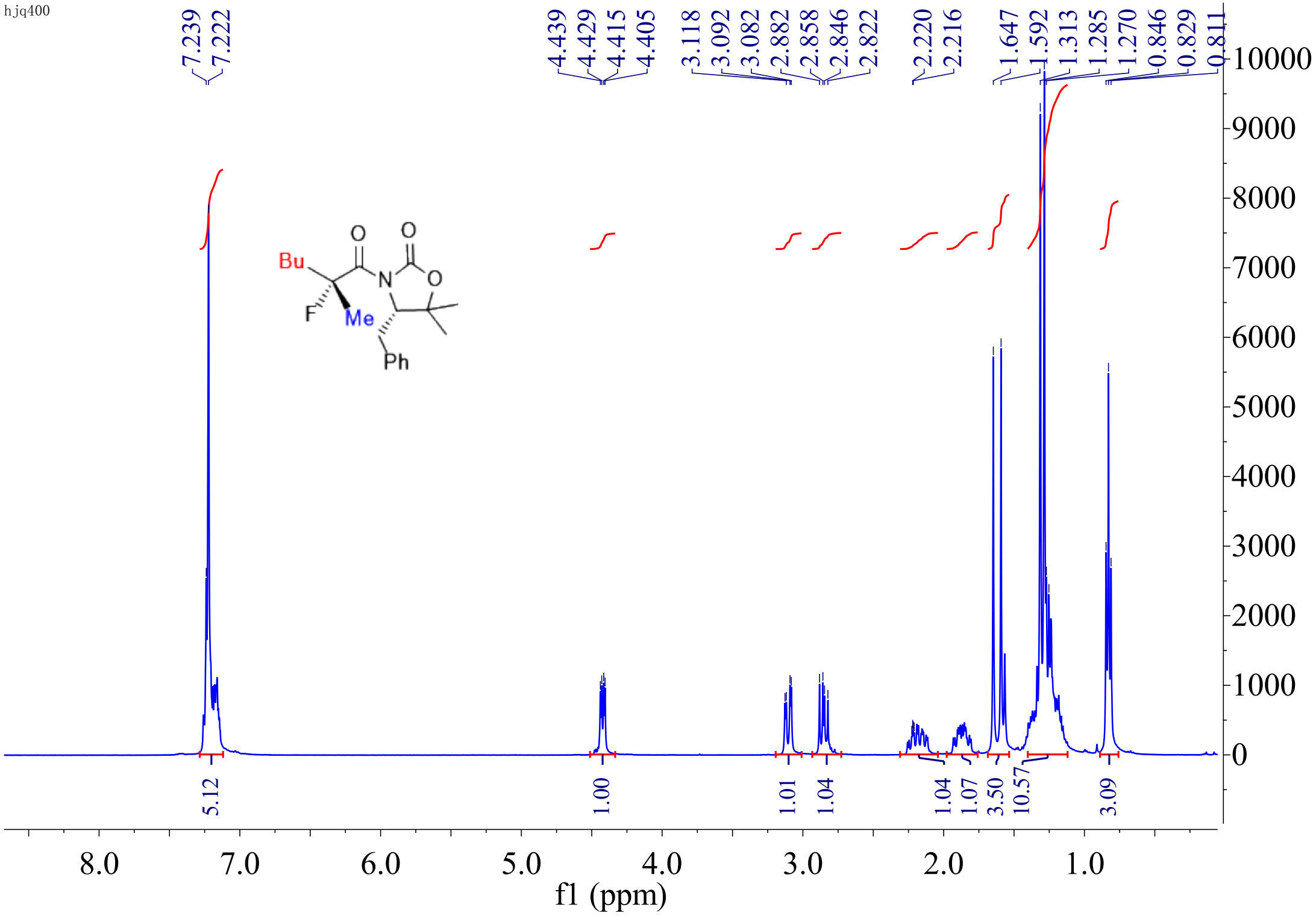


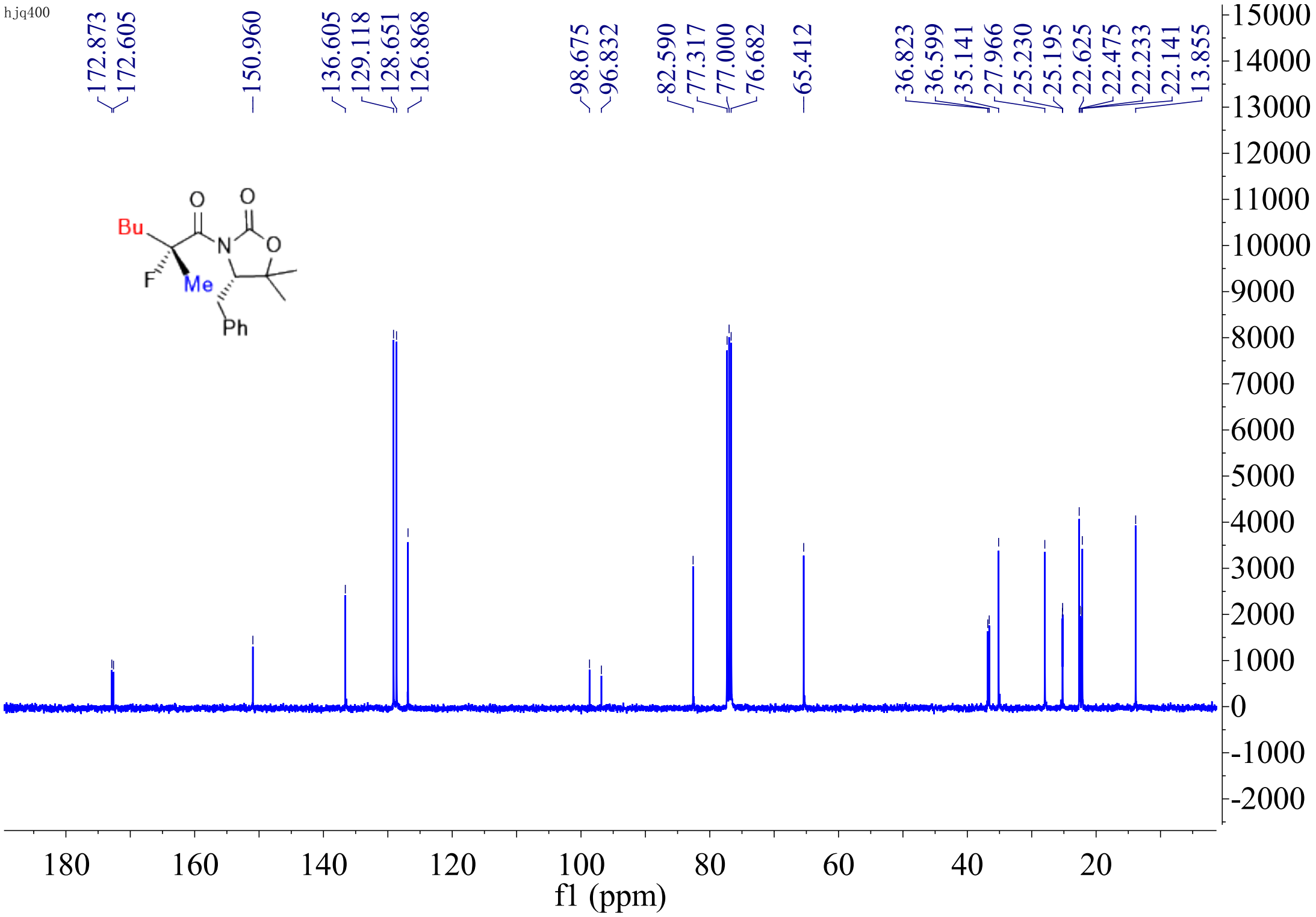
22.701

150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000

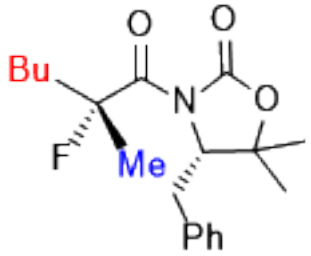
95 85 75 65 55 45 35 25 15 5 0 -10

f1 (ppm)


hjq400
7.239
7.222
4.439
4.429
4.415
4.405
3.118
3.092
3.082
2.882
2.858
2.846
2.822
2.220
2.216
1.647
1.592
1.313
1.285
1.270
0.846
0.829
0.811
Bu
F
Me
N
O
O
O
Ph
5.12
1.00
1.01
1.04
1.04
1.07
3.50
10.57
3.09
f1 (ppm)


hjq400
172.873
172.605
150.960
136.605
129.118
128.651
126.868
98.675
96.832
82.590
77.317
77.000
76.682
65.412
36.823
36.599
35.141
27.966
25.230
25.195
22.625
22.475
22.233
22.141
13.855
Bu
F
Me
Ph
O
O
N
O
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
180
160
140
120
100
80
60
40
20
f1 (ppm)

第三本
c



-148.031

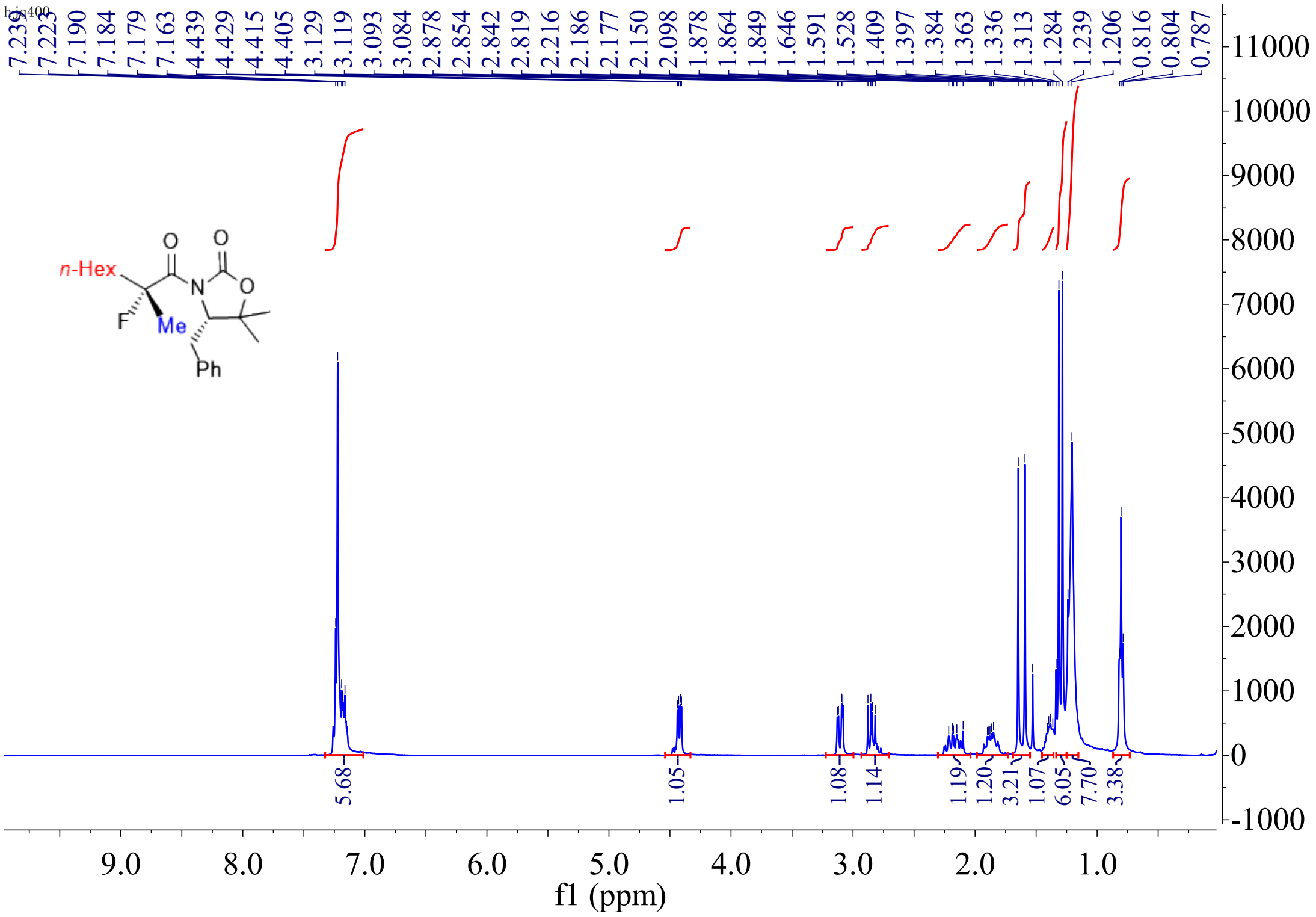
-148.526

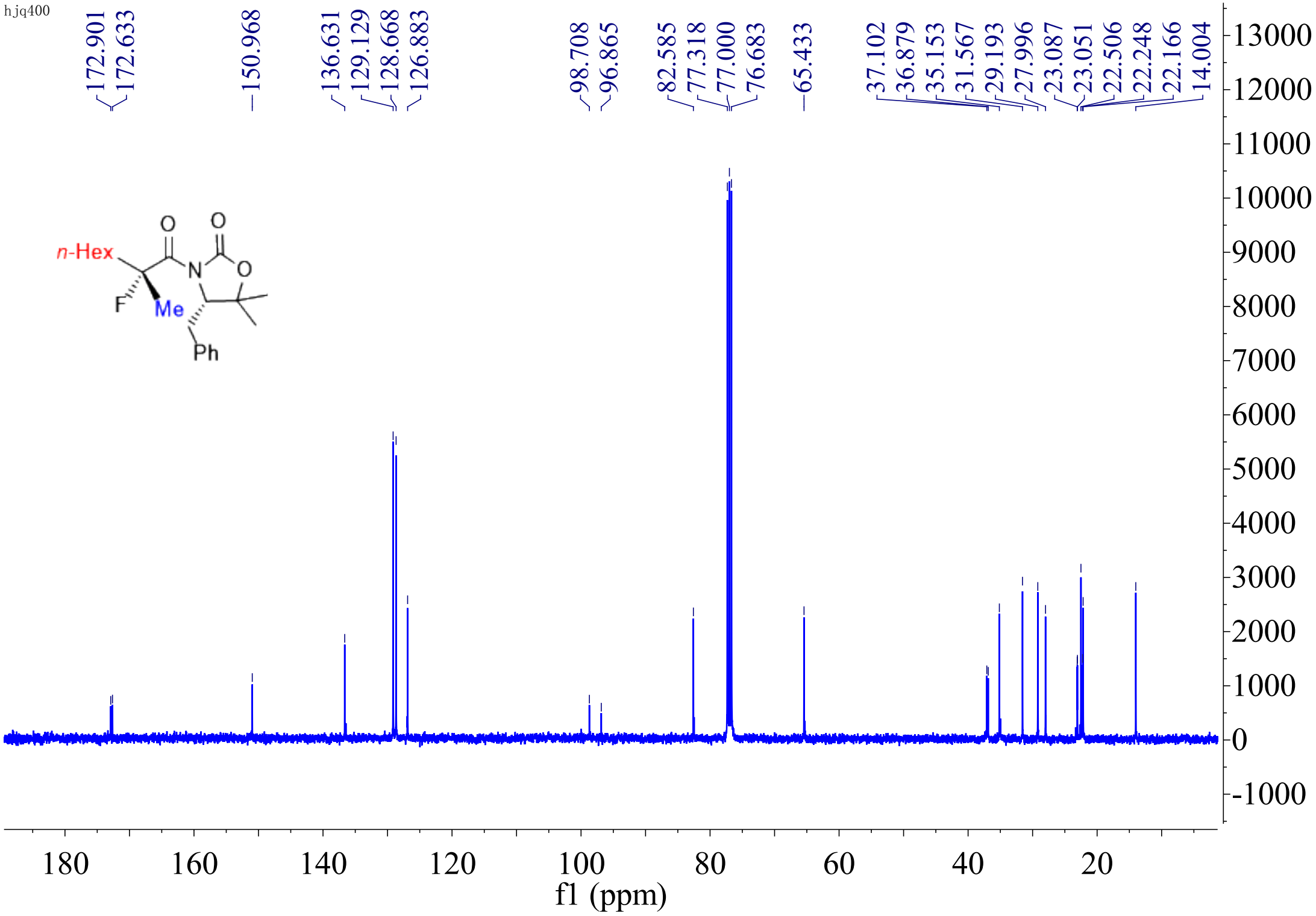
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000

1.00

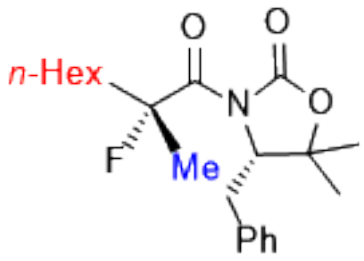
13.34

f1 (ppm)

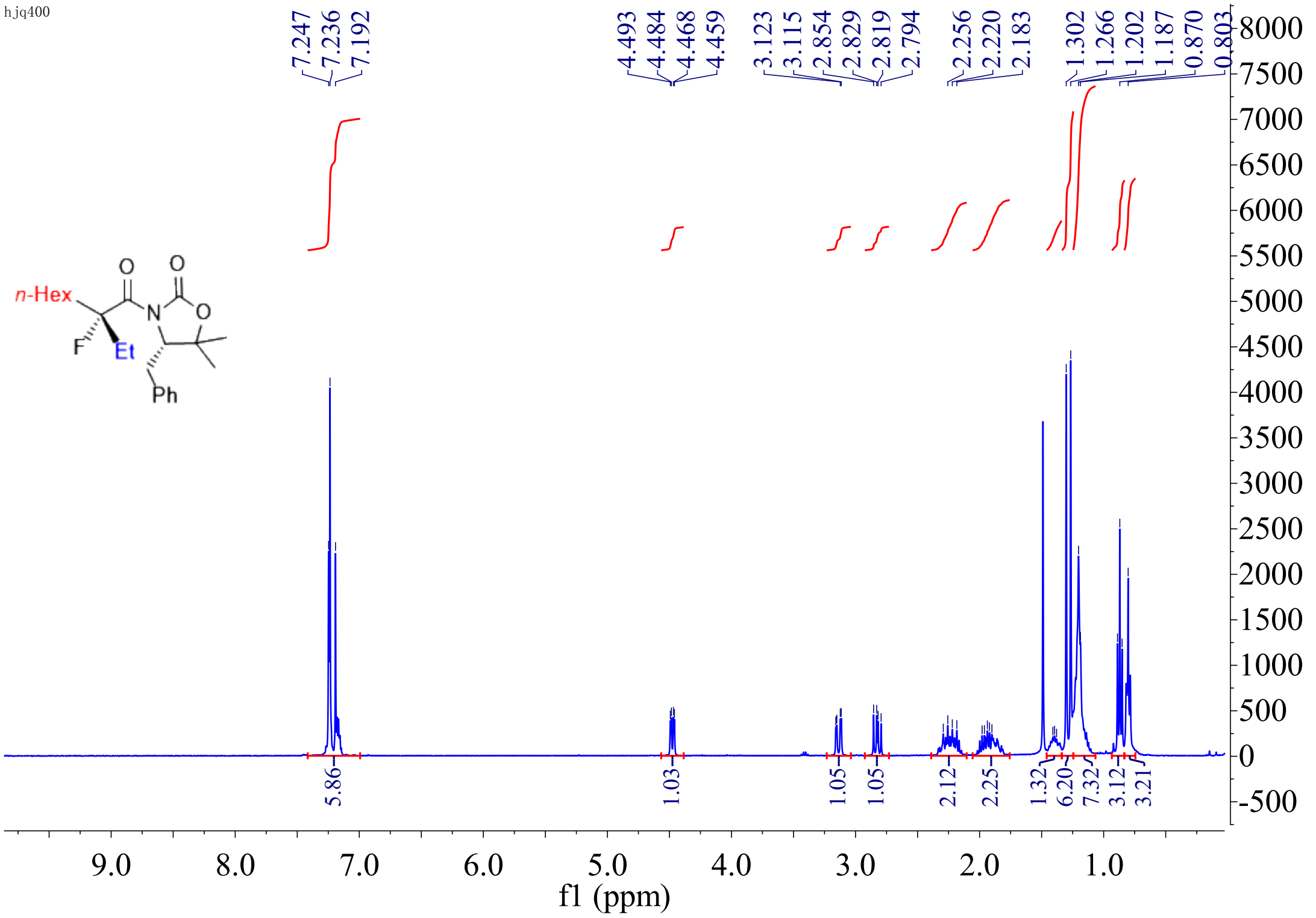

hjq400
7.237
7.223
7.190
7.184
7.179
7.163
4.439
4.429
4.415
4.405
3.129
3.119
3.093
3.084
2.878
2.854
2.842
2.819
2.216
2.186
2.177
2.150
2.098
1.878
1.864
1.849
1.646
1.591
1.528
1.409
1.397
1.384
1.363
1.336
1.313
1.284
1.239
1.206
0.816
0.804
0.787
n-Hex
F
Me
Ph
O
O
N
O
5.68
1.05
1.08
1.14
1.19
1.20
3.21
1.07
6.05
7.70
3.38
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)

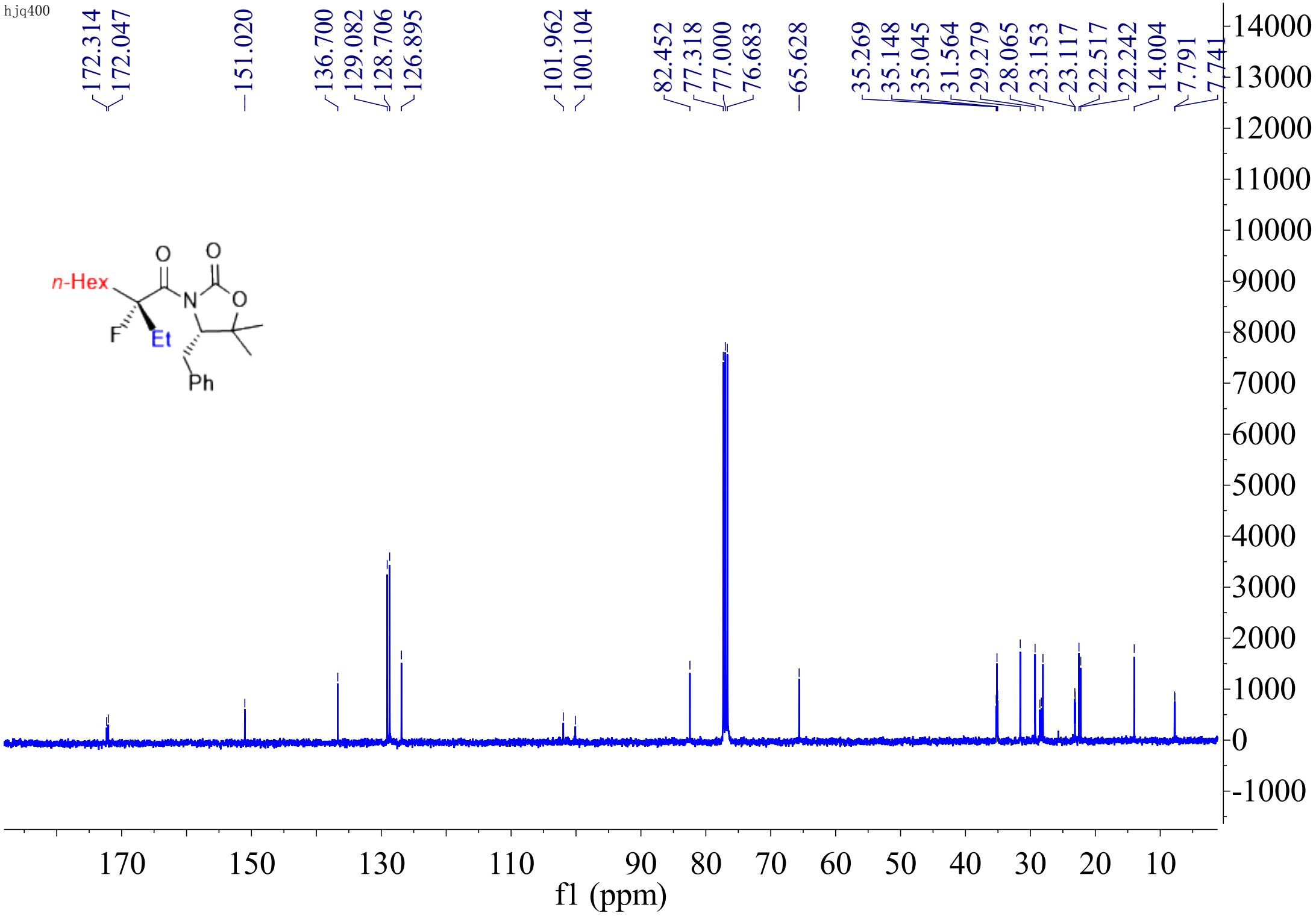

hjq400
172.901
172.633
150.968
136.631
129.129
128.668
126.883
98.708
96.865
82.585
77.318
77.000
76.683
65.433
37.102
36.879
35.153
31.567
29.193
27.996
23.087
23.051
22.506
22.248
22.166
14.004
n-Hex
F
Me
Ph
O
N
O
O
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
180
160
140
120
100
80
60
40
20
f1 (ppm)

第三本
c

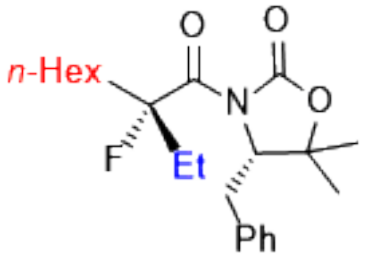


-147.936
-148.413
1.00
11.28
4000
3500
3000
2500
2000
1500
1000
500
0
-144.5
-145.5
-146.5
-147.5
-148.5
-149.5
-150.5
f1 (ppm)


hjq400
7.247
7.236
7.192
4.493
4.484
4.468
4.459
3.123
3.115
2.854
2.829
2.819
2.794
2.256
2.220
2.183
1.302
1.266
1.202
1.187
0.870
0.803
n-Hex
F
Et
O
O
N
O
Ph
5.86
1.03
1.05
1.05
2.12
2.25
1.32
6.20
7.32
3.12
3.21
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
172.314
172.047
151.020
136.700
129.082
128.706
126.895
101.962
100.104
82.452
77.318
77.000
76.683
65.628
35.269
35.148
35.045
31.564
29.279
28.065
23.153
23.117
22.517
22.242
14.004
7.791
7.741
n-Hex
O
O
N
O
F
Et
Ph
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
170
150
130
110
90
80
70
60
50
40
30
20
10
f1 (ppm)

hjq400



-156.278

1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
-200

-115
-125
-135
-145
-155
-165
-175
-185

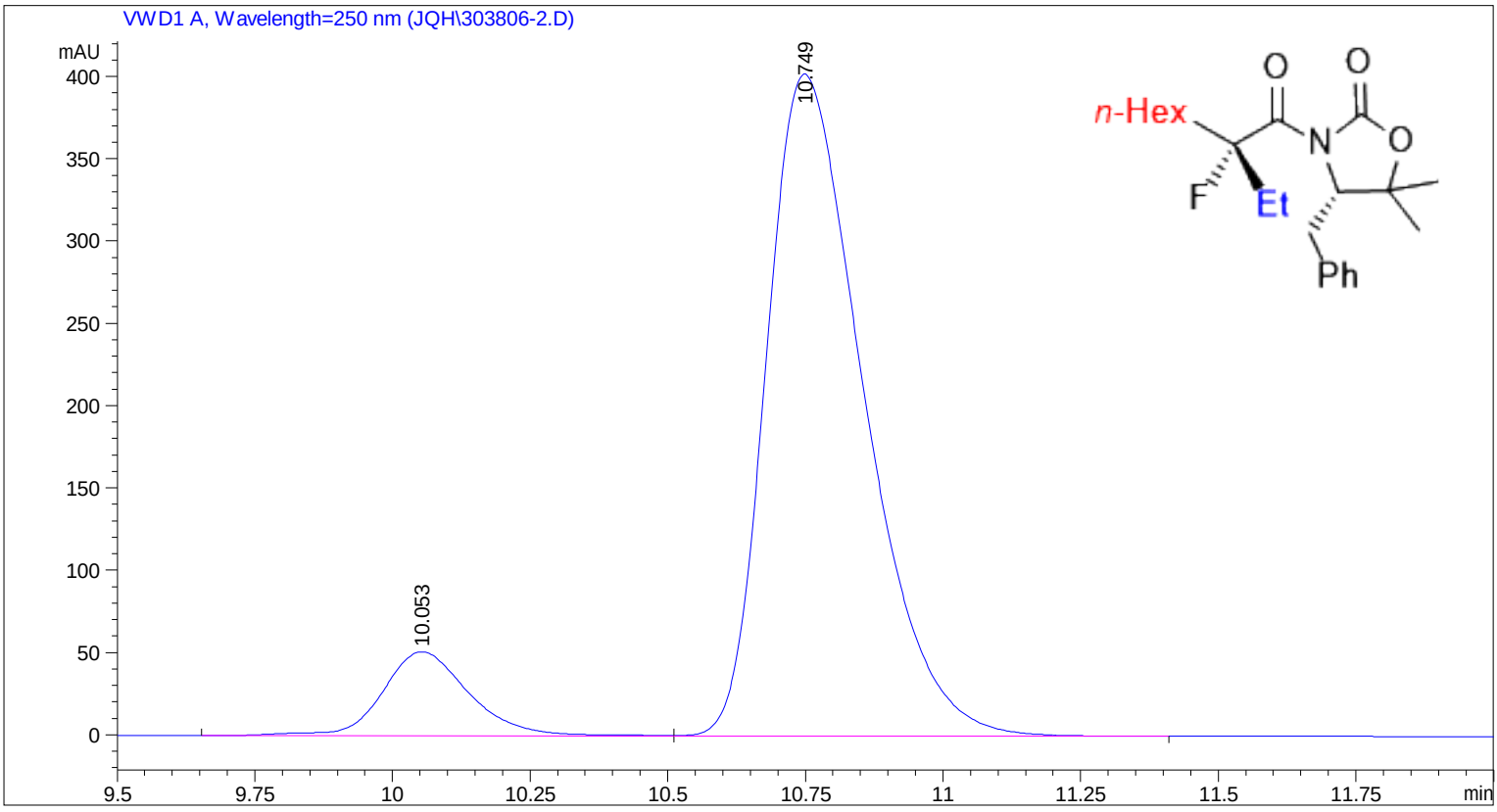
f1 (ppm)

Data File C:\Chem32\1\Data\JQH\303806-2.D
Sample Name: 303806-2

==========

Acq. Operator : SYSTEM
Location : 20
Injection Date : 12/28/2016 8:46:52 AM
Acq. Method : DEF_LC.M
Analysis Method : C:\Chem32\1\Methods\DEF_LC.M
Last changed : 8/31/2017 9:52:09 AM by SYSTEM
(modified after loading)
Sample Info : ad-h
96
0.5 ml.min

Additional Info : Peak(s) manually integrated



==========

Area Percent Report

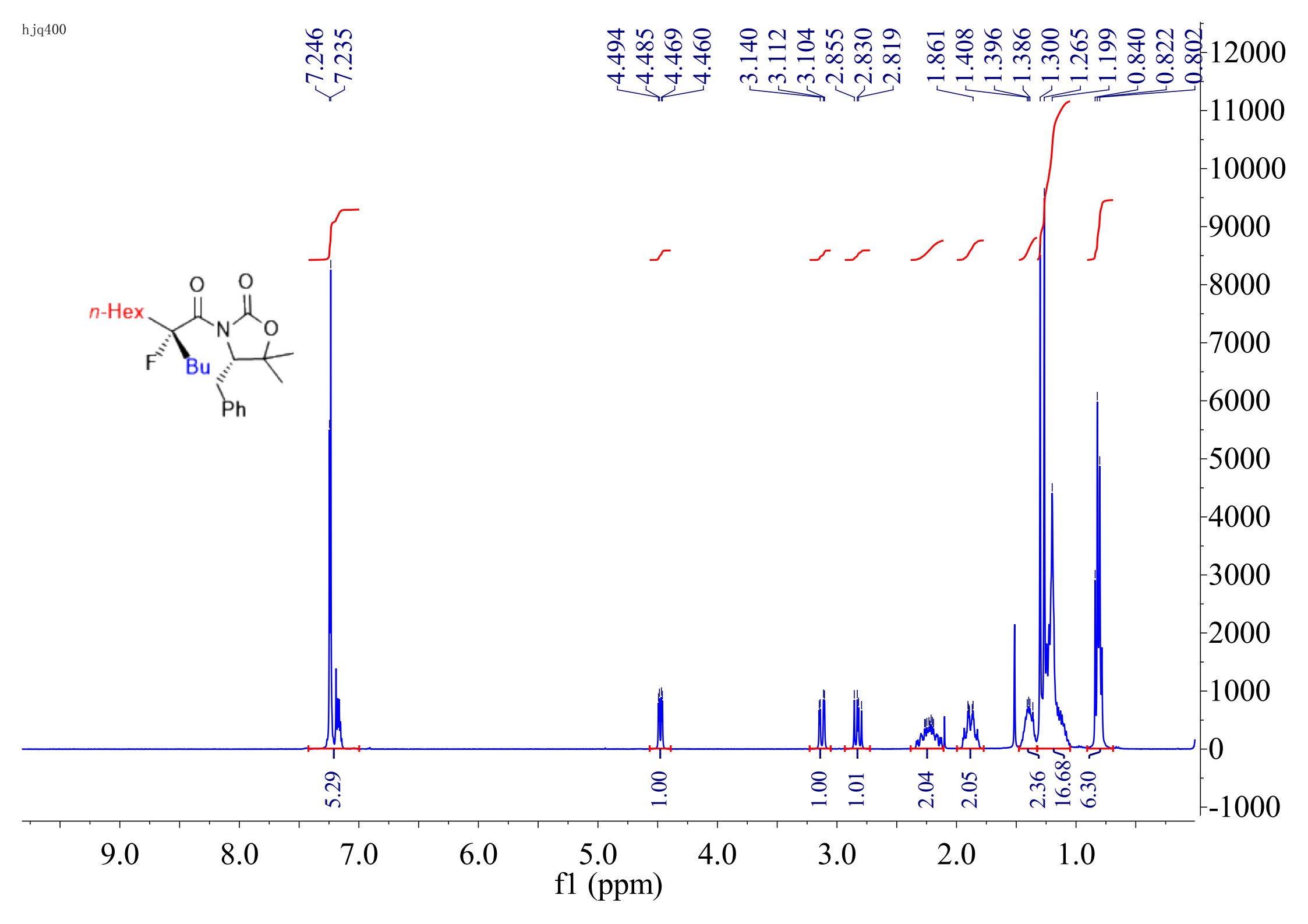
==========

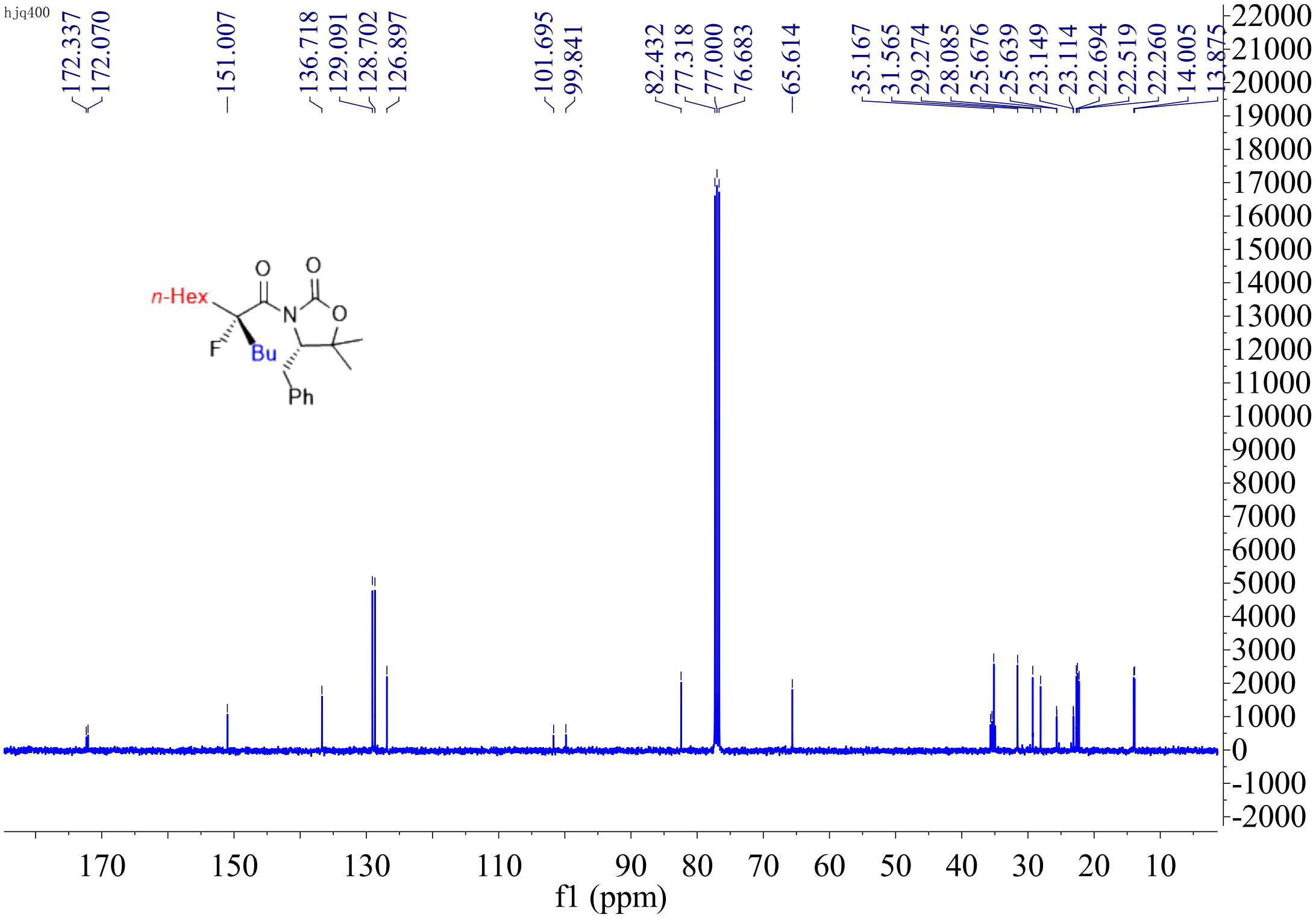
Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=250 nm

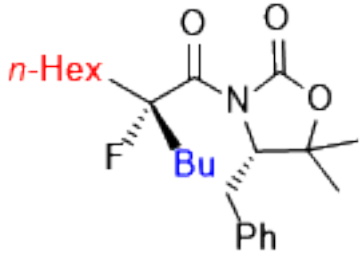
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.053	BV	0.1660	559.56885	51.00288	10.2229
2	10.749	VB	0.1885	4914.08545	402.26038	89.7771

Totals : 5473.65430 453.26326


hjq400
7.246
7.235
4.494
4.485
4.469
4.460
3.140
3.112
3.104
2.855
2.830
2.819
1.861
1.408
1.396
1.386
1.300
1.265
1.199
0.840
0.822
0.802
n-Hex
F
Bu
O
N
O
O
Ph
5.29
1.00
1.00
1.01
2.04
2.05
2.36
16.68
6.30
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
172.337
172.070
151.007
136.718
129.091
128.702
126.897
101.695
99.841
82.432
77.318
77.000
76.683
65.614
35.167
31.565
29.274
28.085
25.676
25.639
23.149
23.114
22.694
22.519
22.260
14.005
13.875
n-Hex
Bu
Ph
F
O
N
22000
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
170
150
130
110
90
80
70
60
50
40
30
20
10
f1 (ppm)

hjq400



-153.925

1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
-200
-300

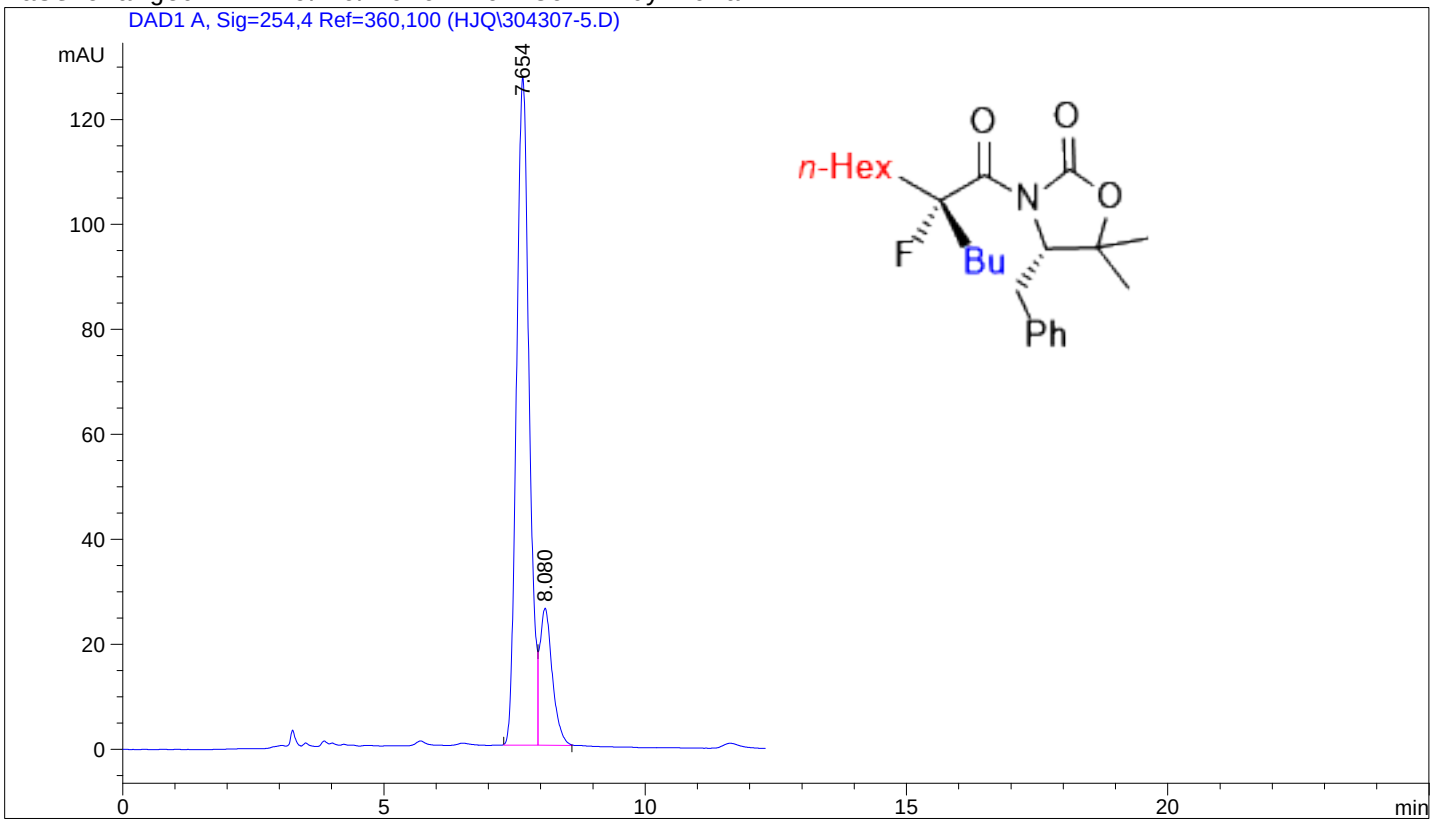
15
-125
-135
-145
-155
-165
-175

f1 (ppm)

OD
99% Hexane
1 ml/min
D406821 large scale

==========

Injection Date : 9/14/2016 9:31:48 PM
Sample Name : 304307-5 Location : Vial 1
Acq. Operator : jianqianghuang
Inj Volume : 5 µl
Acq. Method : C:\HPCHEM\1\METHODS\ZACK.M
Last changed : 9/14/2016 9:32:01 PM by jianqianghuang
(modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ZACK.M
Last changed : 9/26/2016 2:02:36 PM by Kumar



==========

Area Percent Report

==========

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

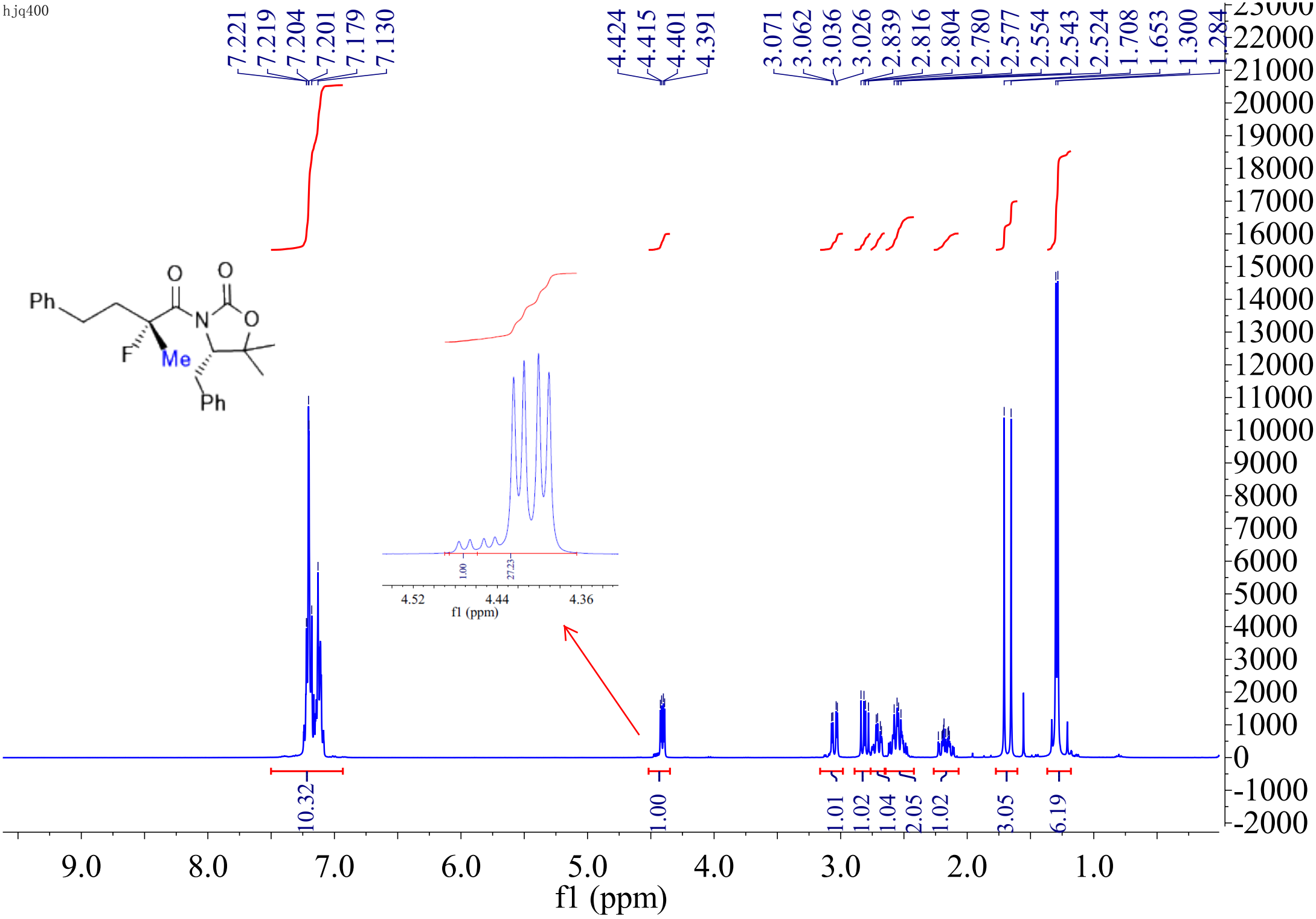
Signal 1: DAD1 A, Sig=254,4 Ref=360,100

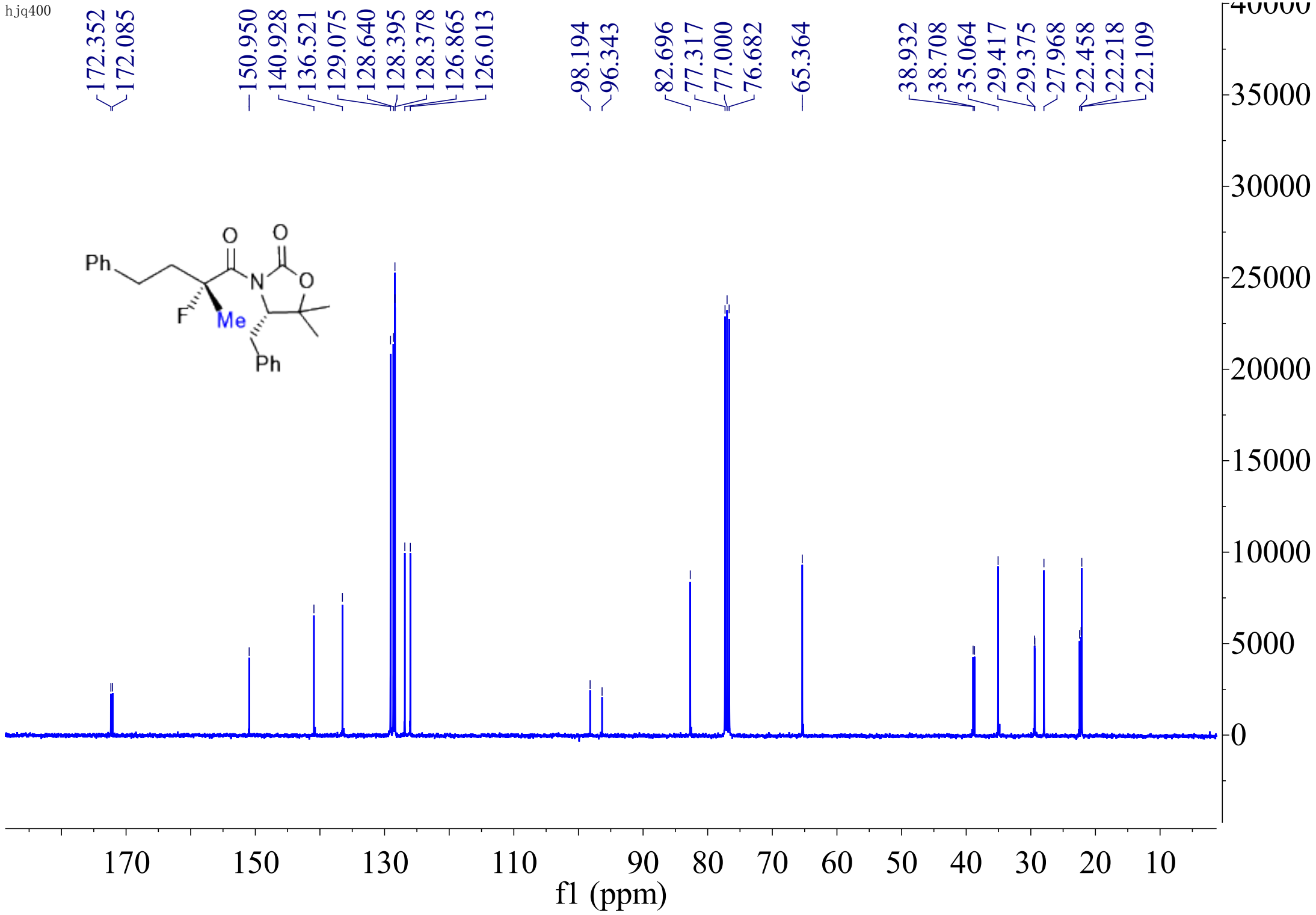
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.654	BV	0.2581	2142.07593	127.44568	83.1714
2	8.080	VB	0.2432	433.41922	26.16926	16.8286
Totals :				2575.49515	153.61494	

Results obtained with enhanced integrator!

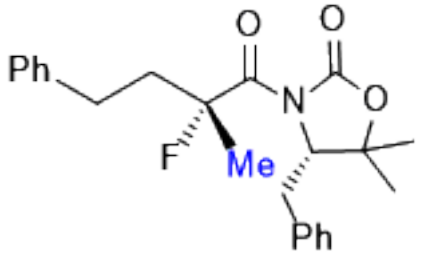
==========

*** End of Report ***


hjq400
7.221
7.219
7.204
7.201
7.179
7.130
4.424
4.415
4.401
4.391
3.071
3.062
3.036
3.026
2.839
2.816
2.804
2.780
2.577
2.554
2.543
2.524
1.708
1.653
1.300
1.284
Ph
O
O
N
O
F
Me
Ph
1.00
27.23
4.52
4.44
4.36
f1 (ppm)
10.32
1.00
1.01
1.02
1.04
2.05
1.02
3.05
6.19
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
172.352
172.085
150.950
140.928
136.521
129.075
128.640
128.395
128.378
126.865
126.013
98.194
96.343
82.696
77.317
77.000
76.682
65.364
38.932
38.708
35.064
29.417
29.375
27.968
22.458
22.218
22.109
Ph
O
O
N
O
F
Me
Ph
35000
30000
25000
20000
15000
10000
5000
0
170
150
130
110
90
80
70
60
50
40
30
20
10
f1 (ppm)

hjq400

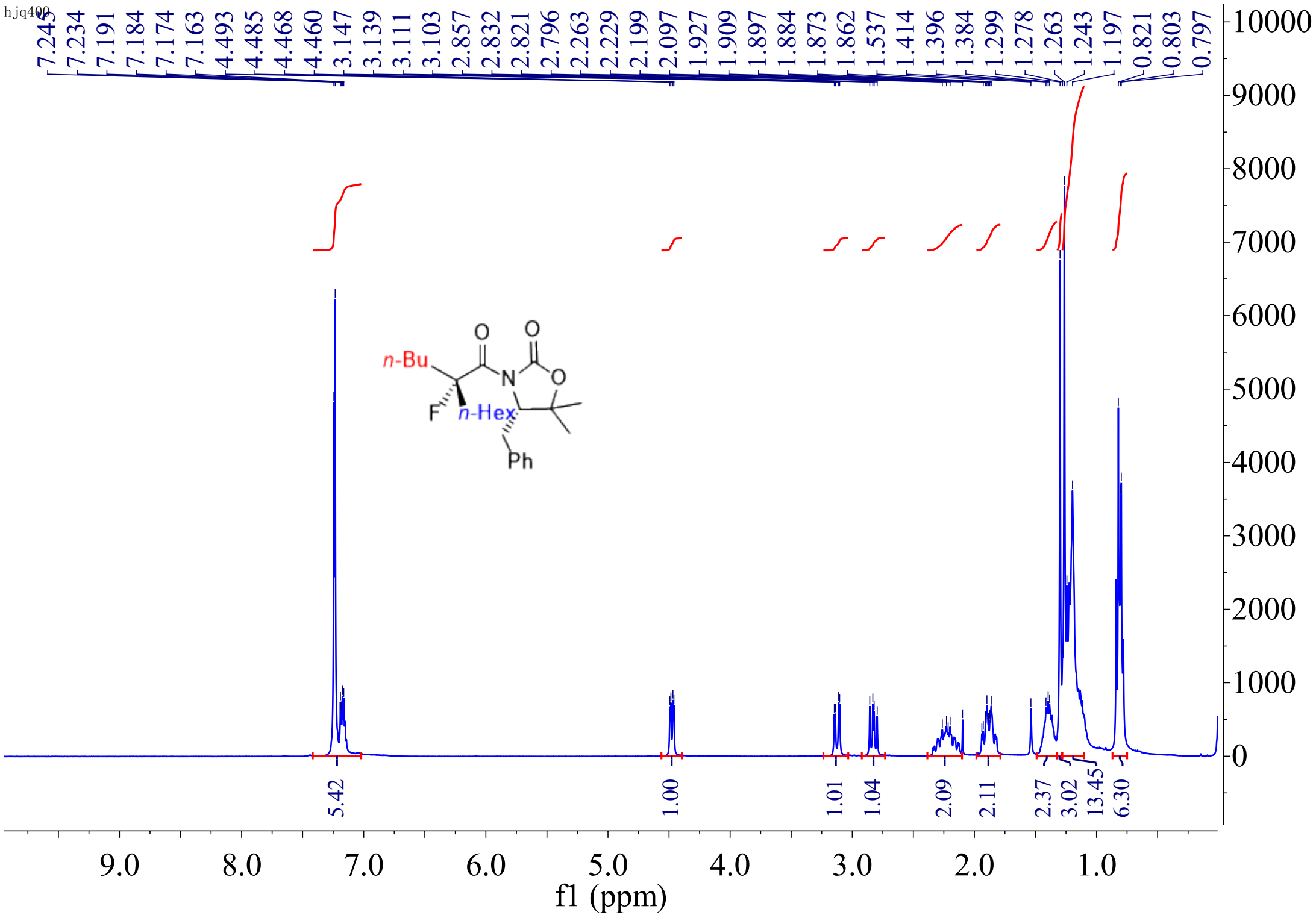


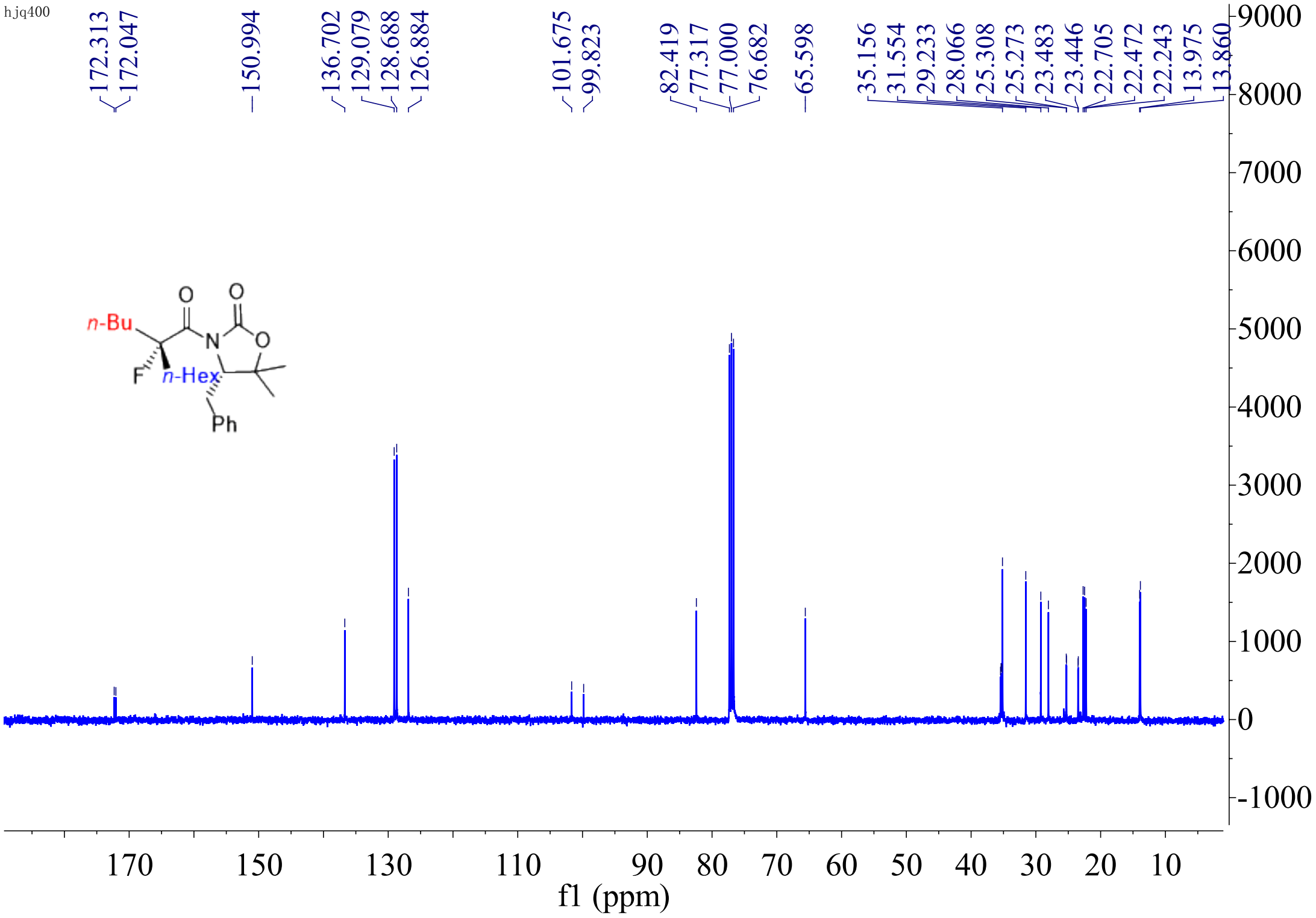
-148.968

2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
-200

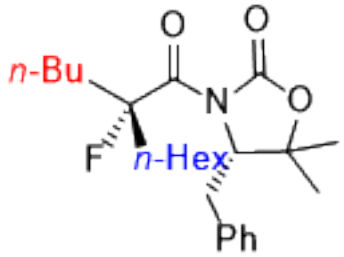
-130 -135 -140 -145 -150 -155 -160 -165 -170 -175

f1 (ppm)


hjq400
7.245
7.234
7.191
7.184
7.174
7.163
4.493
4.485
4.468
4.460
3.147
3.139
3.111
3.103
2.857
2.832
2.821
2.796
2.263
2.229
2.199
2.097
1.927
1.909
1.897
1.884
1.873
1.862
1.537
1.414
1.396
1.384
1.299
1.278
1.263
1.243
1.197
0.821
0.803
0.797
n-Bu
n-Hex
Ph
F
O
N
5.42
1.00
1.01
1.04
2.09
2.11
2.37
3.02
13.45
6.30
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0


hjq400
172.313
172.047
150.994
136.702
129.079
128.688
126.884
101.675
99.823
82.419
77.317
77.000
76.682
65.598
35.156
31.554
29.233
28.066
25.308
25.273
23.483
23.446
22.705
22.472
22.243
13.975
13.860
n-Bu
n-Hex
Ph
F
O
N
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
170
150
130
110
90
80
70
60
50
40
30
20
10
f1 (ppm)

hjq400



-153.901

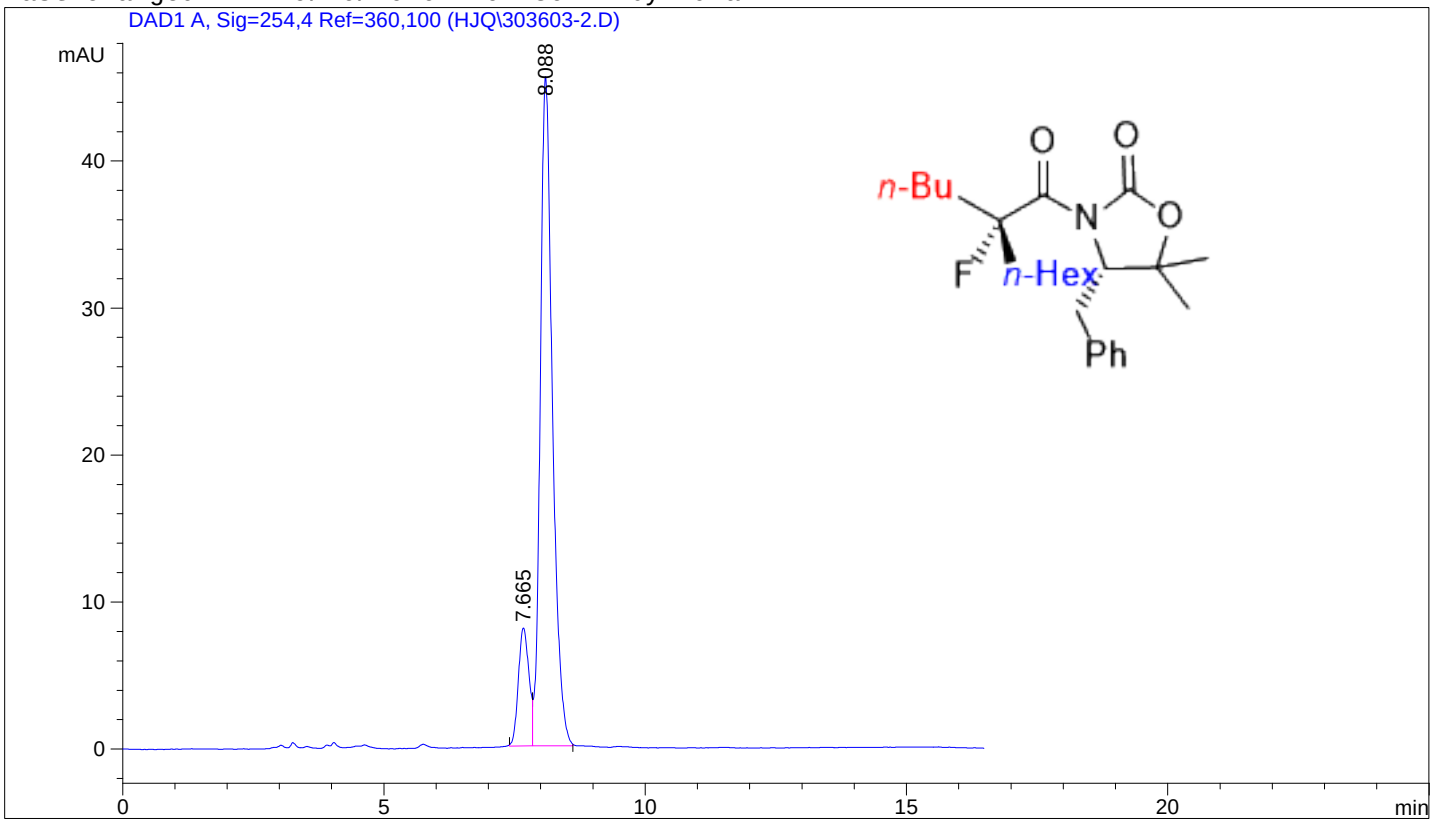
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200

-100
-120
-140
-160
-180
-200

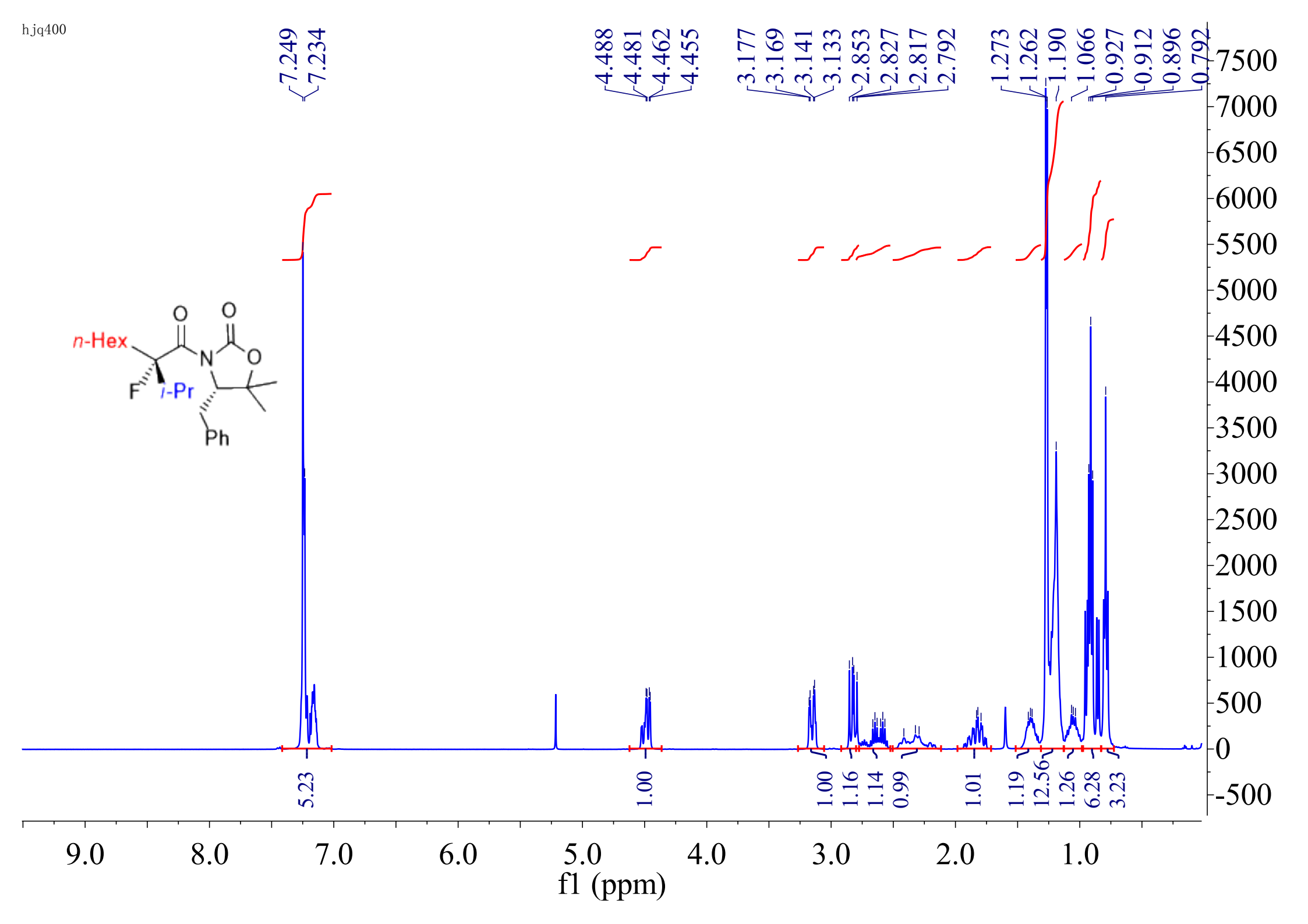
f1 (ppm)

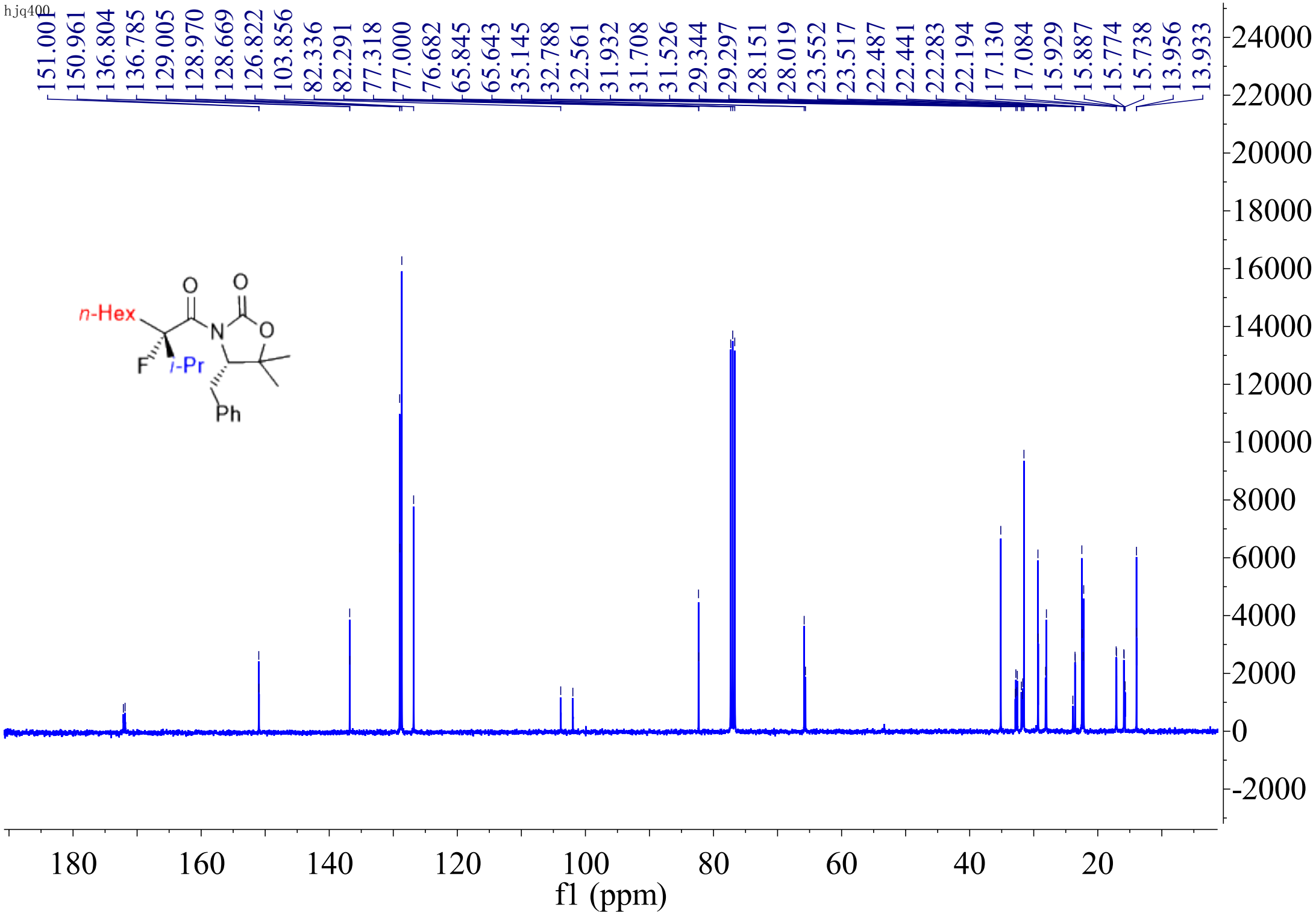
OD
99% Hexane
1 ml/min
D406821 large scale

```
==========================================================================
Injection Date  : 9/14/2016 9:47:08 PM
Sample Name     : 303603-2                        Location : Vial 2
Acq. Operator   : jianqianghuang
                                                  Inj Volume : 5 µl
Acq. Method     : C:\HPCHEM\1\METHODS\ZACK.M
Last changed    : 9/14/2016 9:32:01 PM by jianqianghuang
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ZACK.M
Last changed    : 9/26/2016 2:02:36 PM by Kumar
```

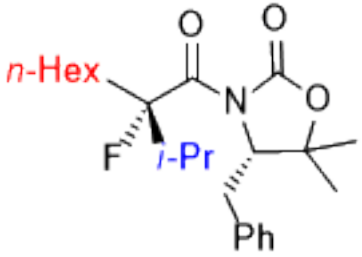



```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount         :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.665 BV    0.2179  114.22311    8.03265  13.4324
   2   8.088 VB    0.2446  736.13391   45.54849  86.5676

Totals :                   850.35702   53.58115

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```


hjq400
7.249
7.234
4.488
4.481
4.462
4.455
3.177
3.169
3.141
3.133
2.853
2.827
2.817
2.792
1.273
1.262
1.190
1.066
0.927
0.912
0.896
0.792
n-Hex
F
i-Pr
Ph
O
N
O
O
5.23
1.00
1.00
1.16
1.14
0.99
1.01
1.19
12.56
1.26
6.28
3.23
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500


hjq400
151.001
150.961
136.804
136.785
129.005
128.970
128.669
126.822
103.856
82.336
82.291
77.318
77.000
76.682
65.845
65.643
35.145
32.788
32.561
31.932
31.708
31.526
29.344
29.297
28.151
28.019
23.552
23.517
22.487
22.441
22.283
22.194
17.130
17.084
15.929
15.887
15.774
15.738
13.956
13.933
n-Hex
F
i-Pr
Ph
O
O
N
O
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
180
160
140
120
100
80
60
40
20
f1 (ppm)

hjq400



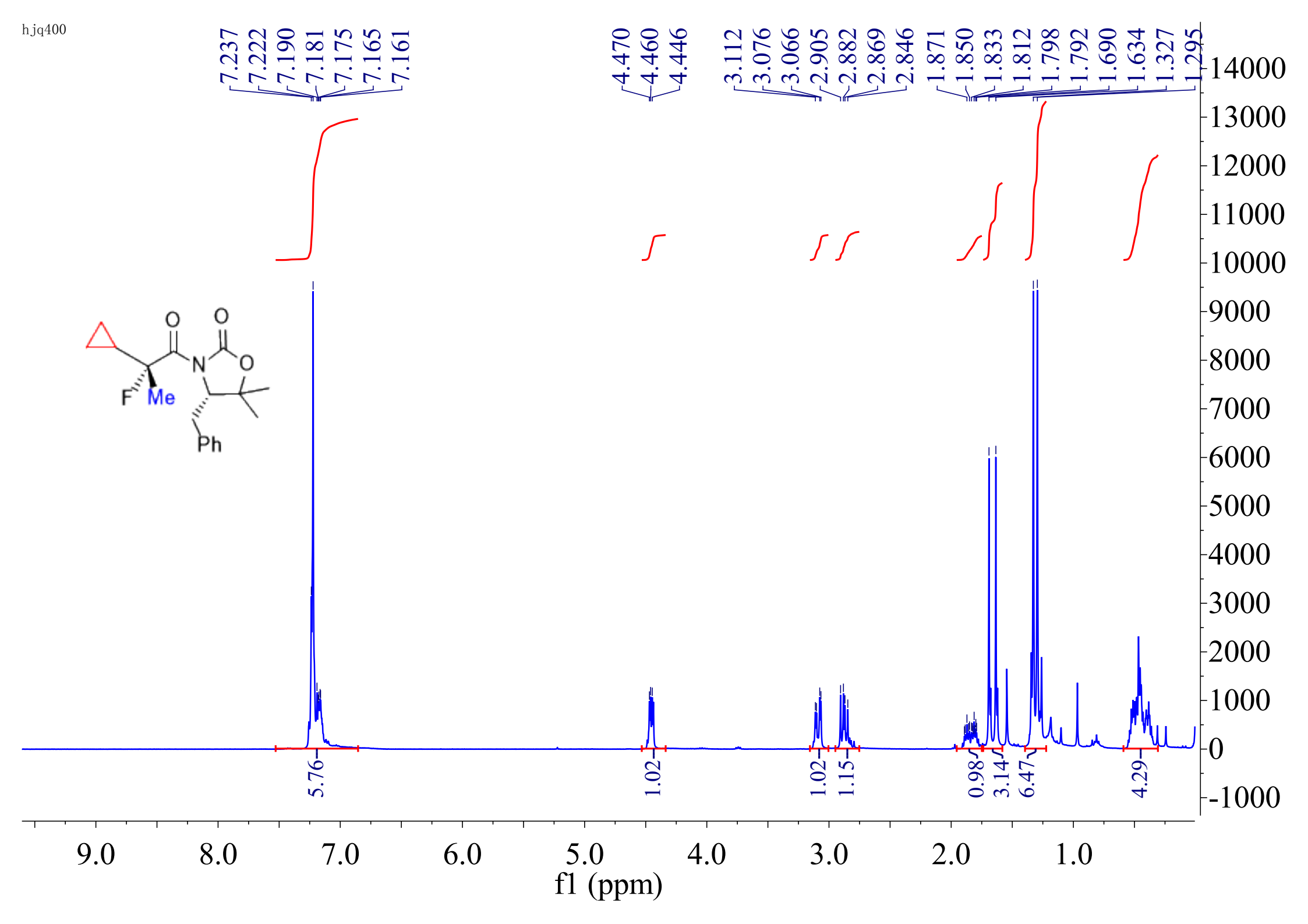
-167.502
-167.859

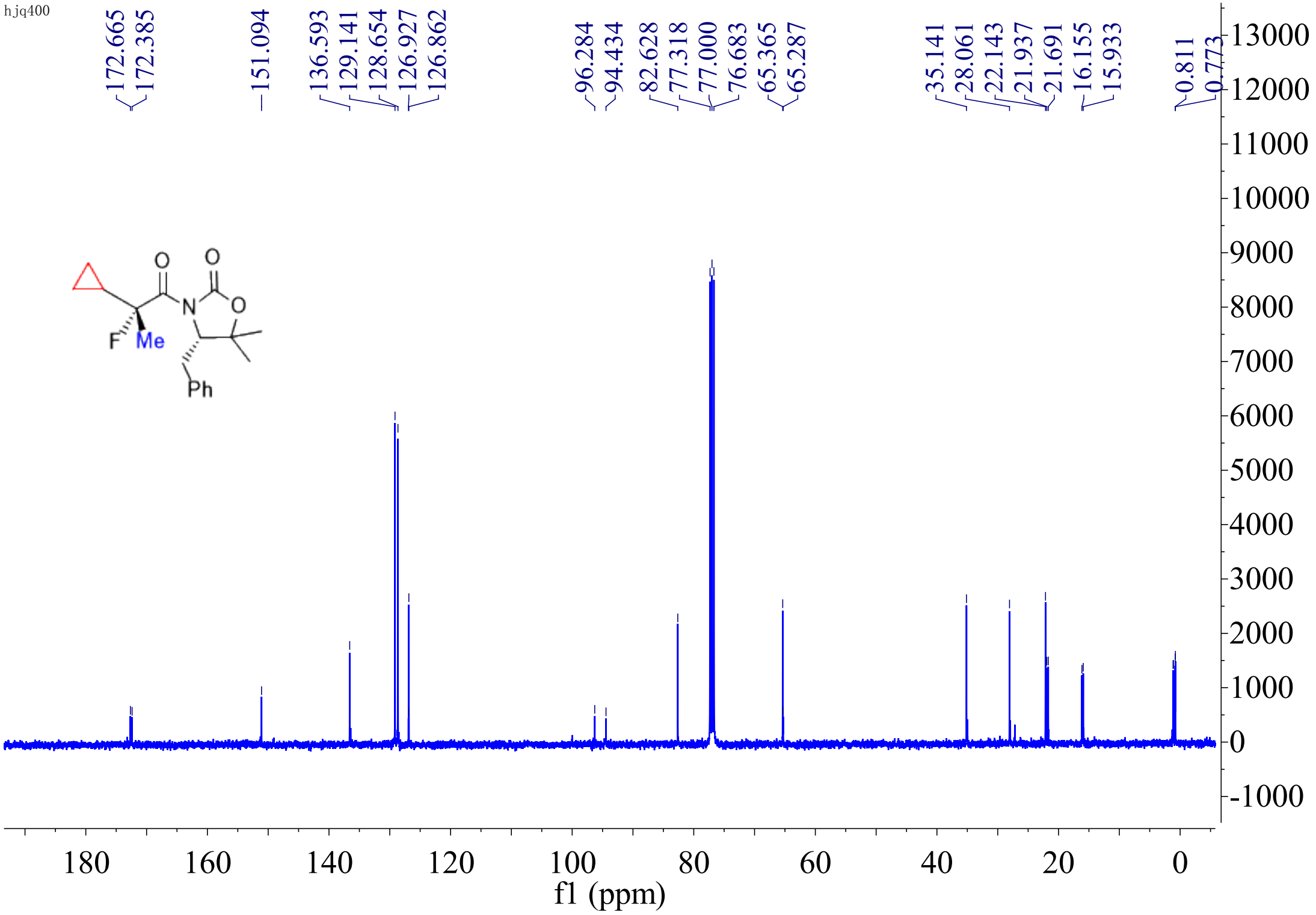
2.39
1.00

5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500

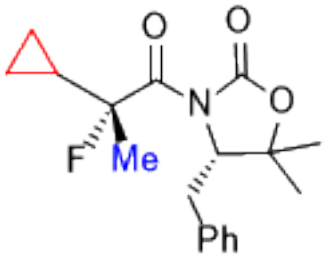
-120
-130
-140
-150
-160
-170
-180
-190
-200

f1 (ppm)


hjq400
7.237
7.222
7.190
7.181
7.175
7.165
7.161
4.470
4.460
4.446
3.112
3.076
3.066
2.905
2.882
2.869
2.846
1.871
1.850
1.833
1.812
1.798
1.792
1.690
1.634
1.327
1.295
O
O
N
O
F
Me
Ph
5.76
1.02
1.02
1.15
0.98
3.14
6.47
4.29
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
172.665
172.385
151.094
136.593
129.141
128.654
126.927
126.862
96.284
94.434
82.628
77.318
77.000
76.683
65.365
65.287
35.141
28.061
22.143
21.937
21.691
16.155
15.933
0.811
0.773
O
O
N
O
F
Me
Ph
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

第三本
c



-159.298

-161.073

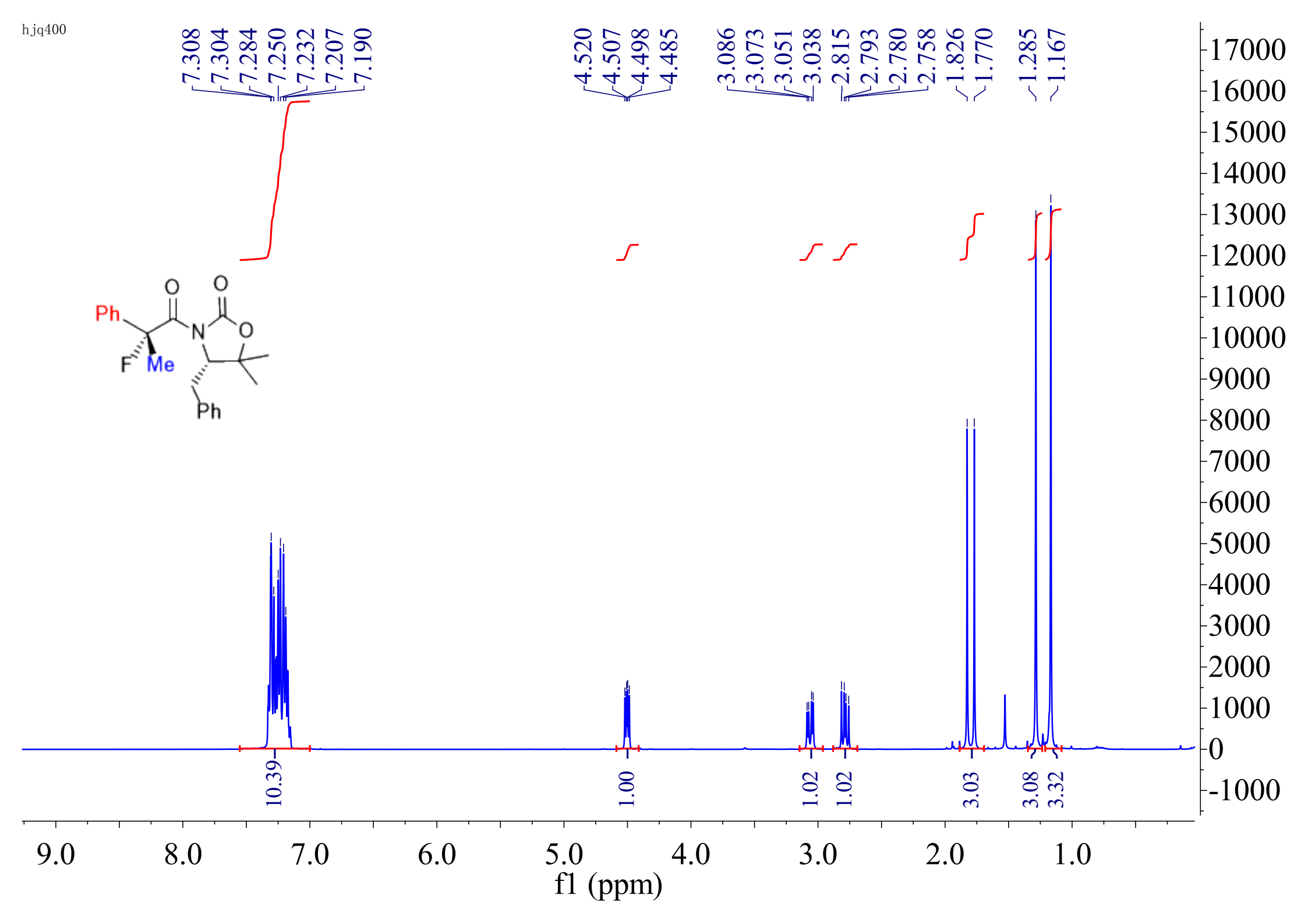
1.00

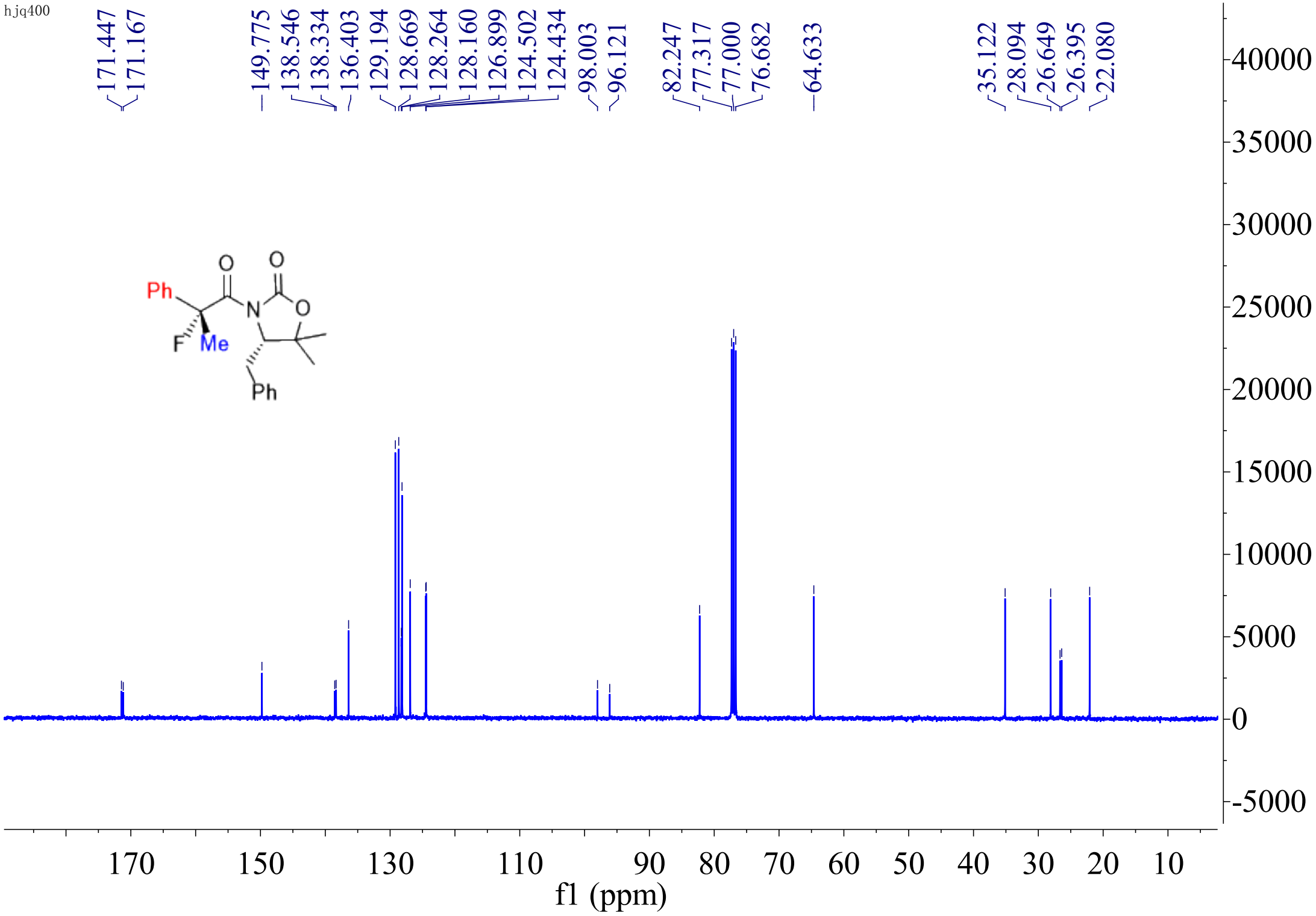
5.90

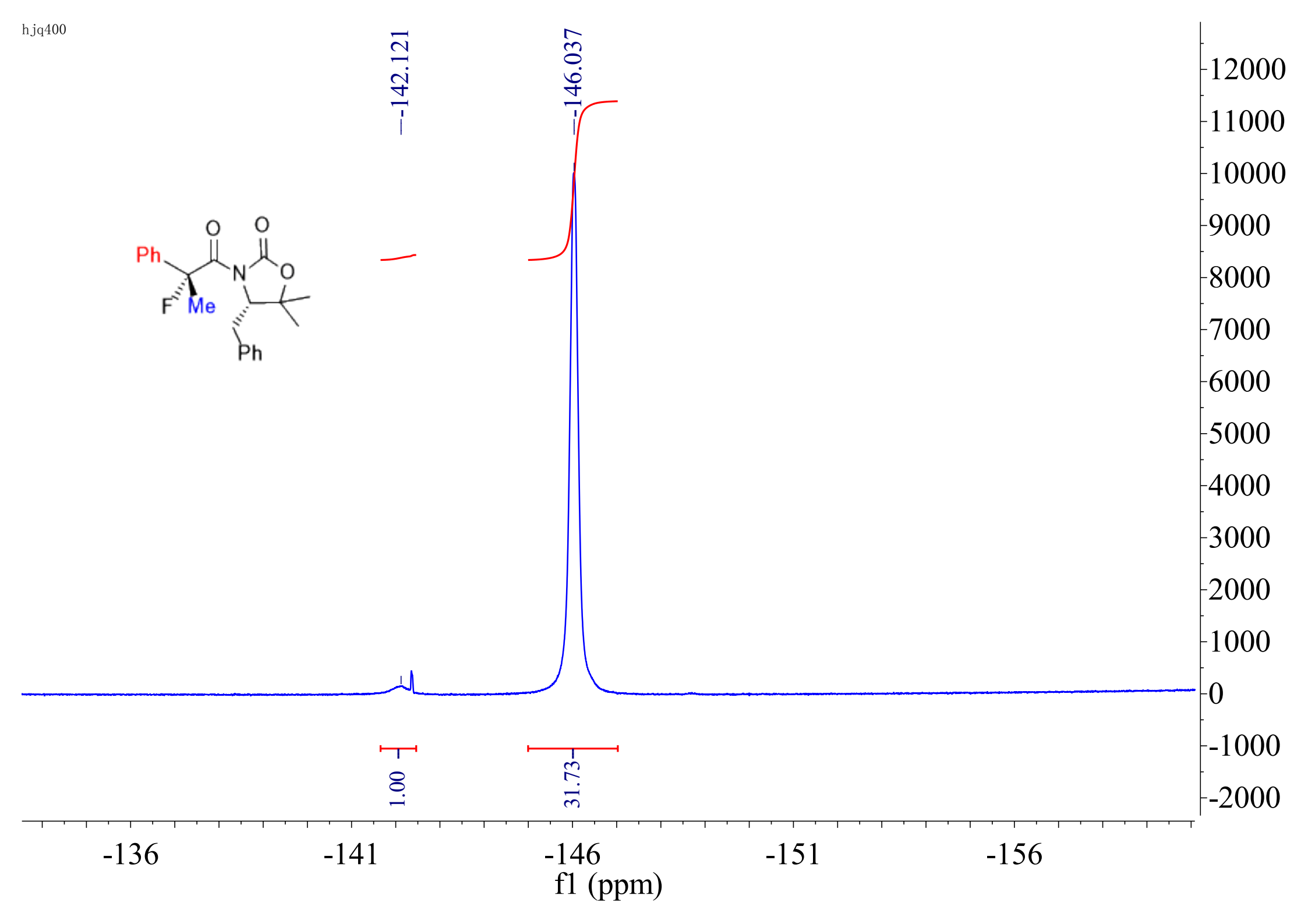
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000

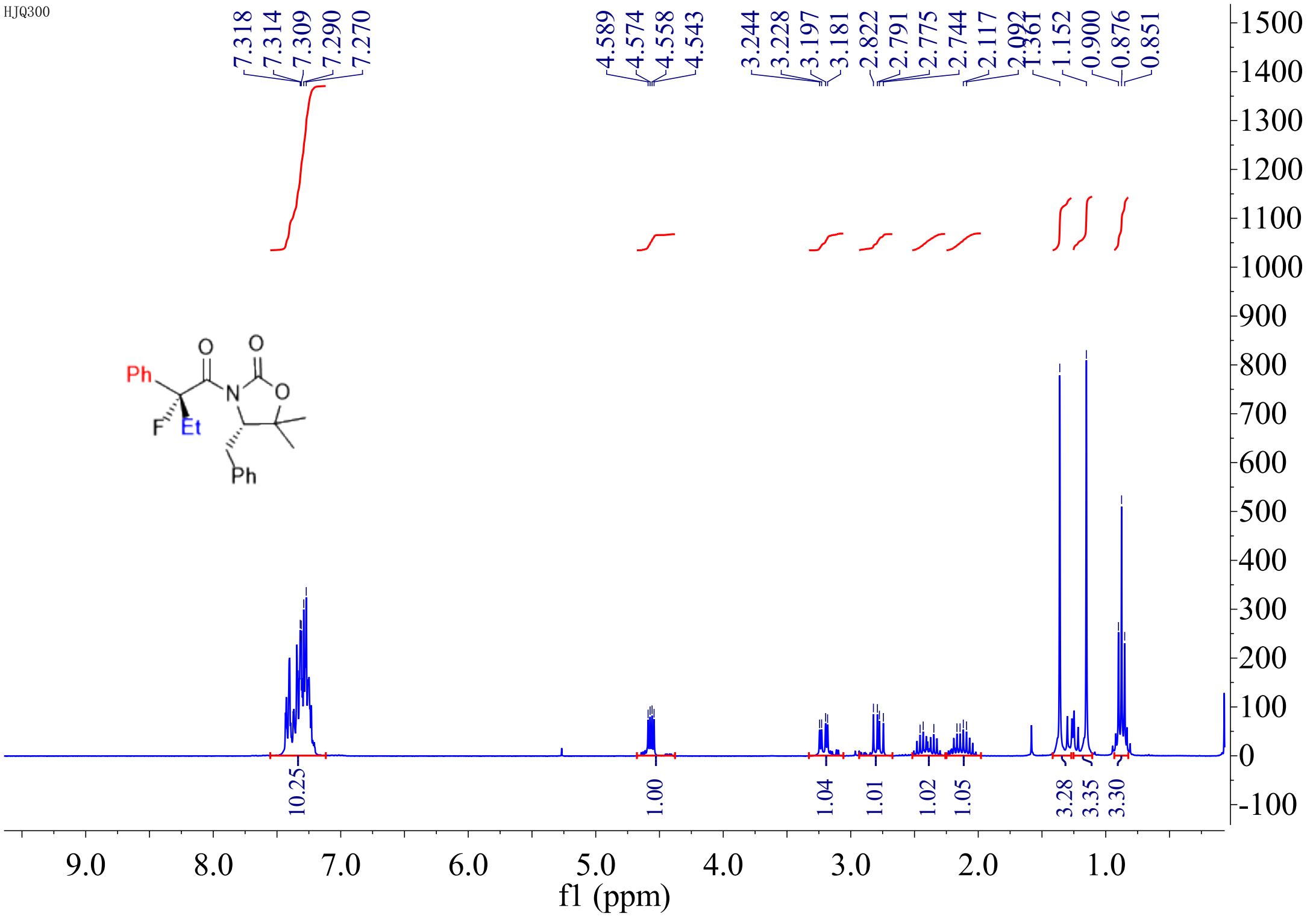
-156
-158
-160
-162
-164
-166
-168

f1 (ppm)

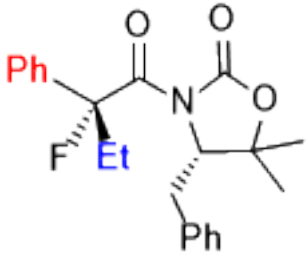

hjq400
7.308
7.304
7.284
7.250
7.232
7.207
7.190
4.520
4.507
4.498
4.485
3.086
3.073
3.051
3.038
2.815
2.793
2.780
2.758
1.826
1.770
1.285
1.167
Ph
O
O
N
O
F
Me
Ph
10.39
1.00
1.02
1.02
3.03
3.08
3.32
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
171.447
171.167
149.775
138.546
138.334
136.403
129.194
128.669
128.264
128.160
126.899
124.502
124.434
98.003
96.121
82.247
77.317
77.000
76.682
64.633
35.122
28.094
26.649
26.395
22.080
Ph
F
Me
O
O
N
O
Ph
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
170
150
130
110
90
80
70
60
50
40
30
20
10
f1 (ppm)


hjq400
-142.121
-146.037
Ph
F
Me
O
O
N
O
Ph
1.00
31.73
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
-136
-141
-146
-151
-156
f1 (ppm)

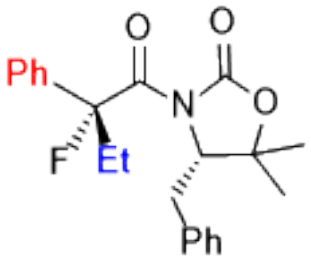

HJQ300
7.318
7.314
7.309
7.290
7.270
4.589
4.574
4.558
4.543
3.244
3.228
3.197
3.181
2.822
2.791
2.775
2.744
2.117
2.092
1.361
1.152
0.900
0.876
0.851
Ph
O
O
N
O
F
Et
Ph
10.25
1.00
1.04
1.01
1.02
1.05
3.28
3.35
3.30
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)

JianQiang200
308302011



f1 (ppm)

JianQiang200
c



-162.184

-163.753

1.00

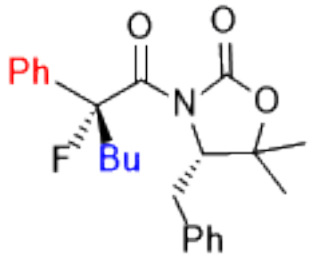
22.21

380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
-40

-156
-159
-162
-165
-168
-171
-174

f1 (ppm)

JianQiang200
30830501



7.443 7.428 7.383 7.368 7.353 7.338 7.323 7.309 7.295 7.279 7.267 7.260 7.246

4.601 4.591 4.582 4.573

3.244 3.235 3.216 3.207

2.830 2.811 2.802 2.783 2.098

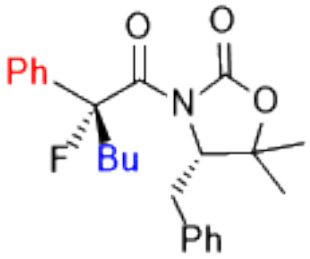
1.386 1.302 1.288 1.179 0.890 0.876

10.90 0.95 0.96 0.96 0.96 1.04 3.41 4.51 3.07 3.30

f1 (ppm)

JianQiang200
30830501

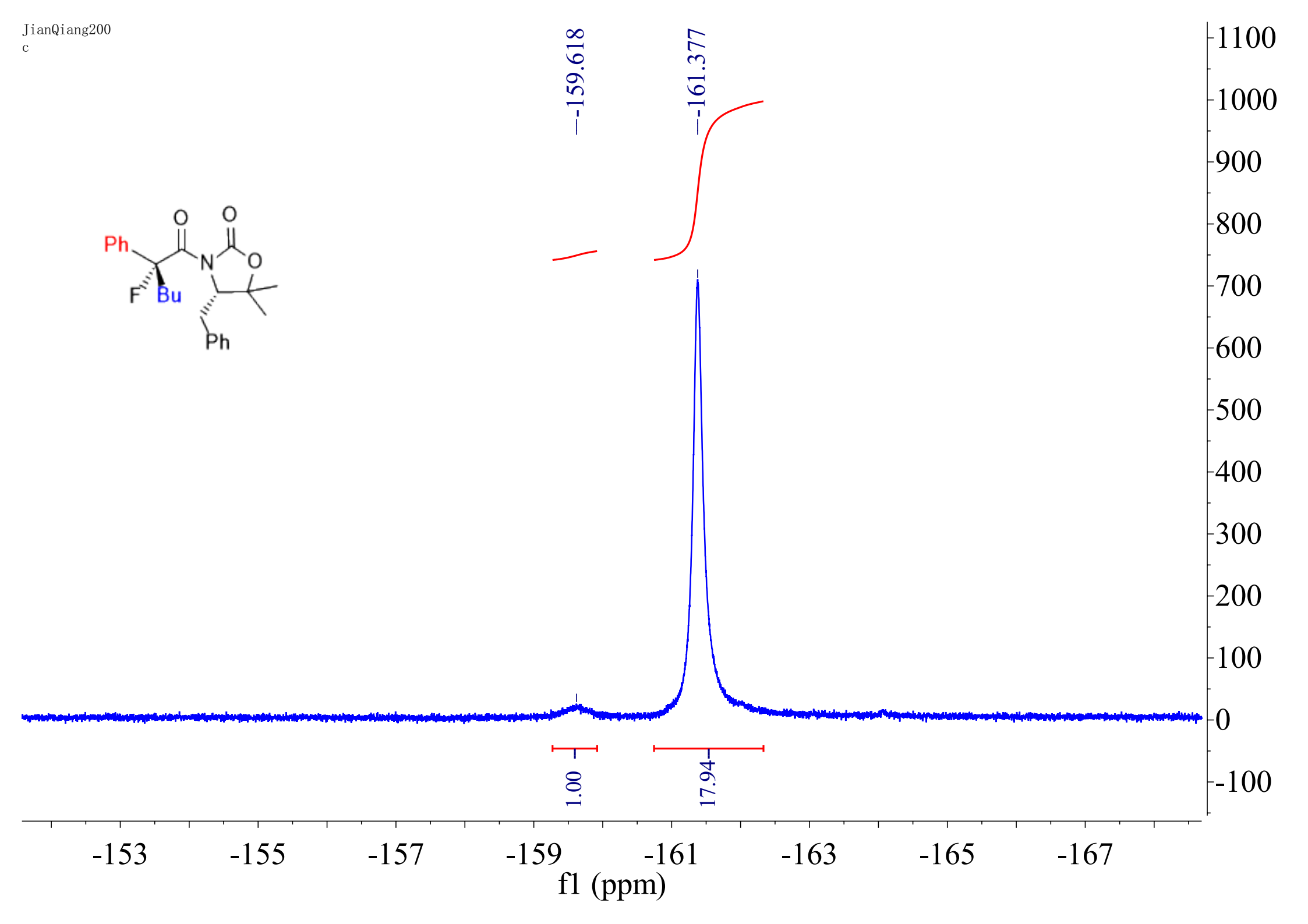
171.975
171.747
149.964
136.338
129.131
128.700
128.061
128.010
126.924
124.750
124.690
100.812
98.467
82.165
77.254
77.000
76.745
64.749
39.975
39.788
34.712
27.926
25.123
25.097
22.558
22.191
13.847

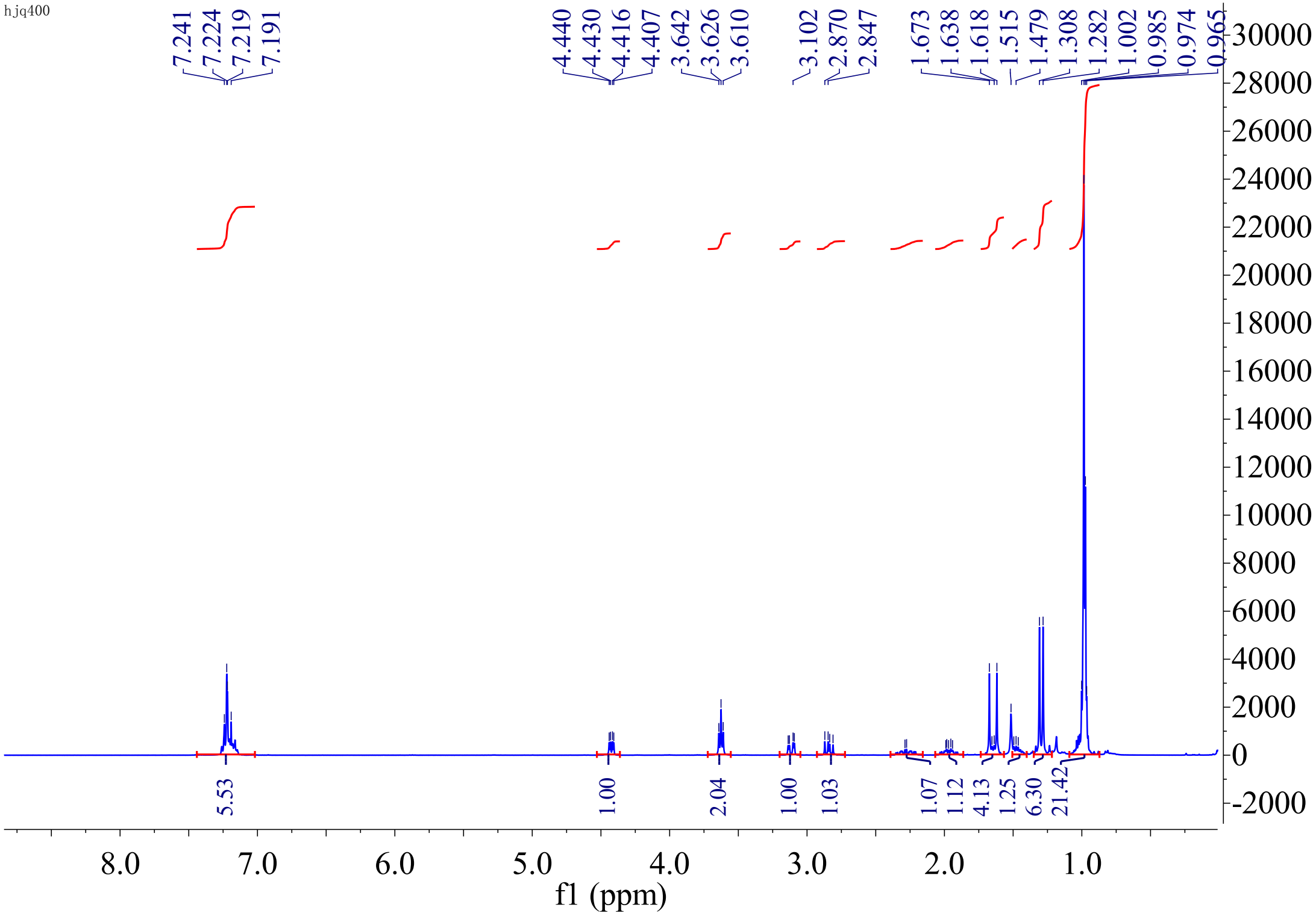


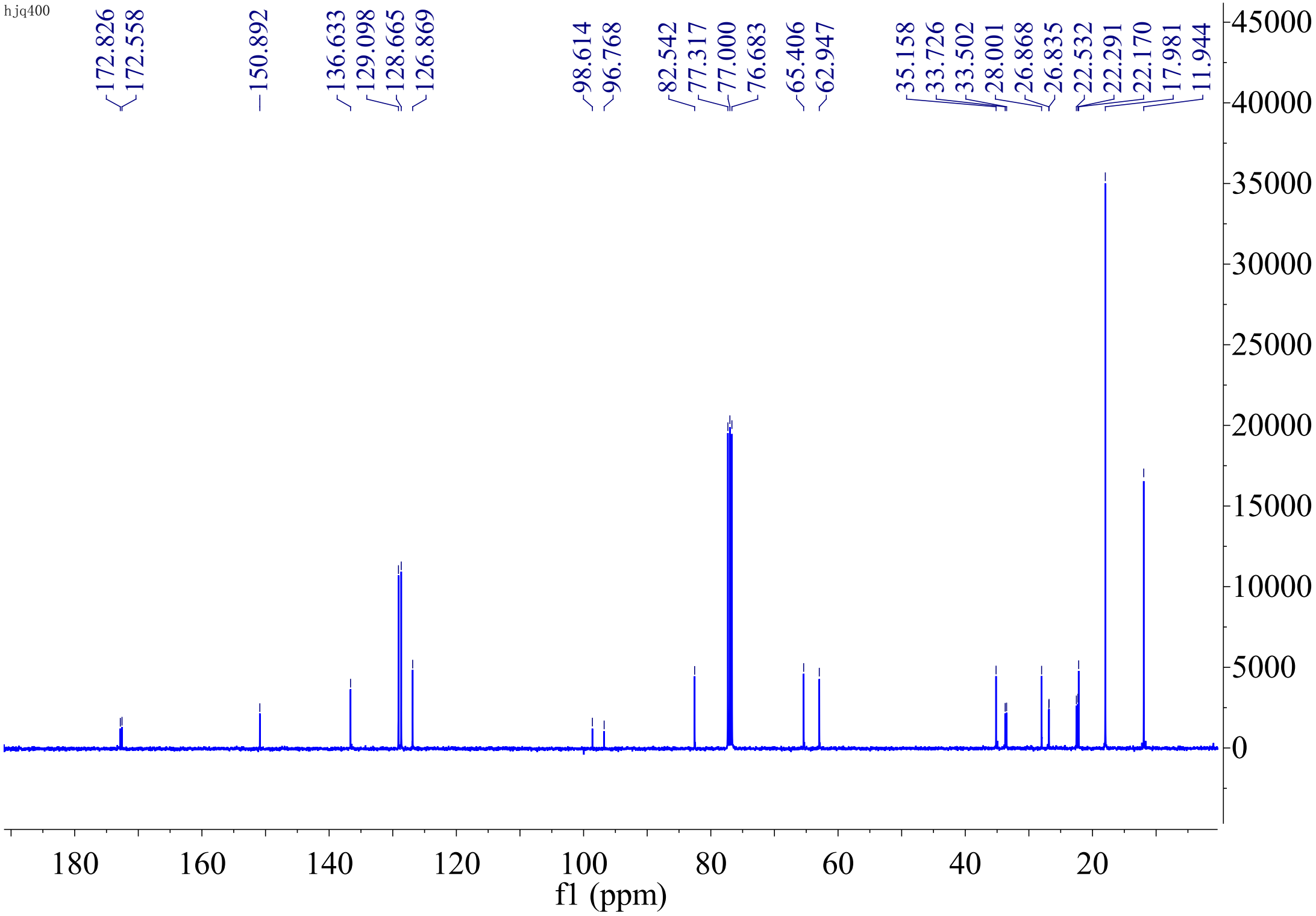
4000
3500
3000
2500
2000
1500
1000
500
0

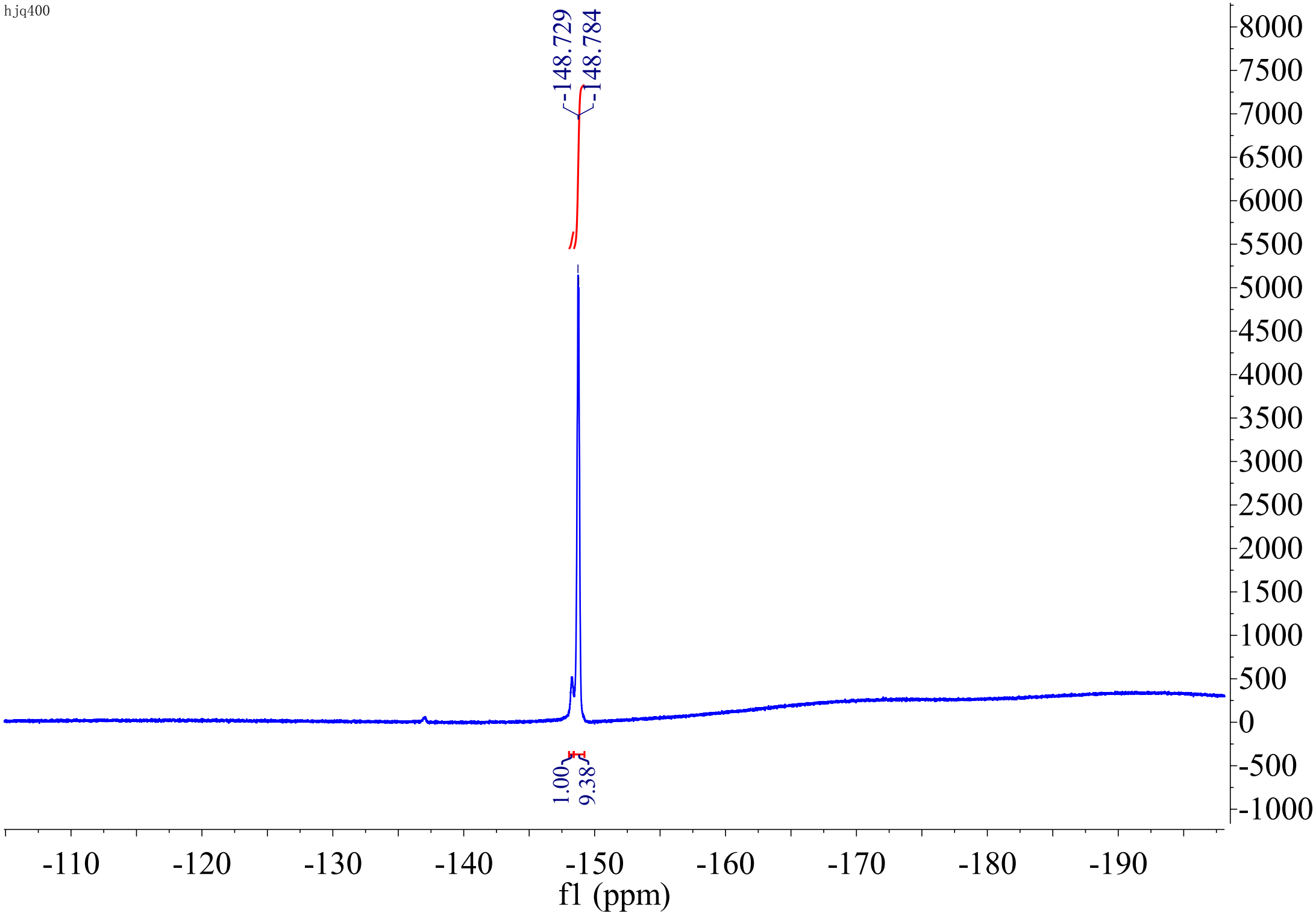
00
180
160
140
120
100
80
60
40
20

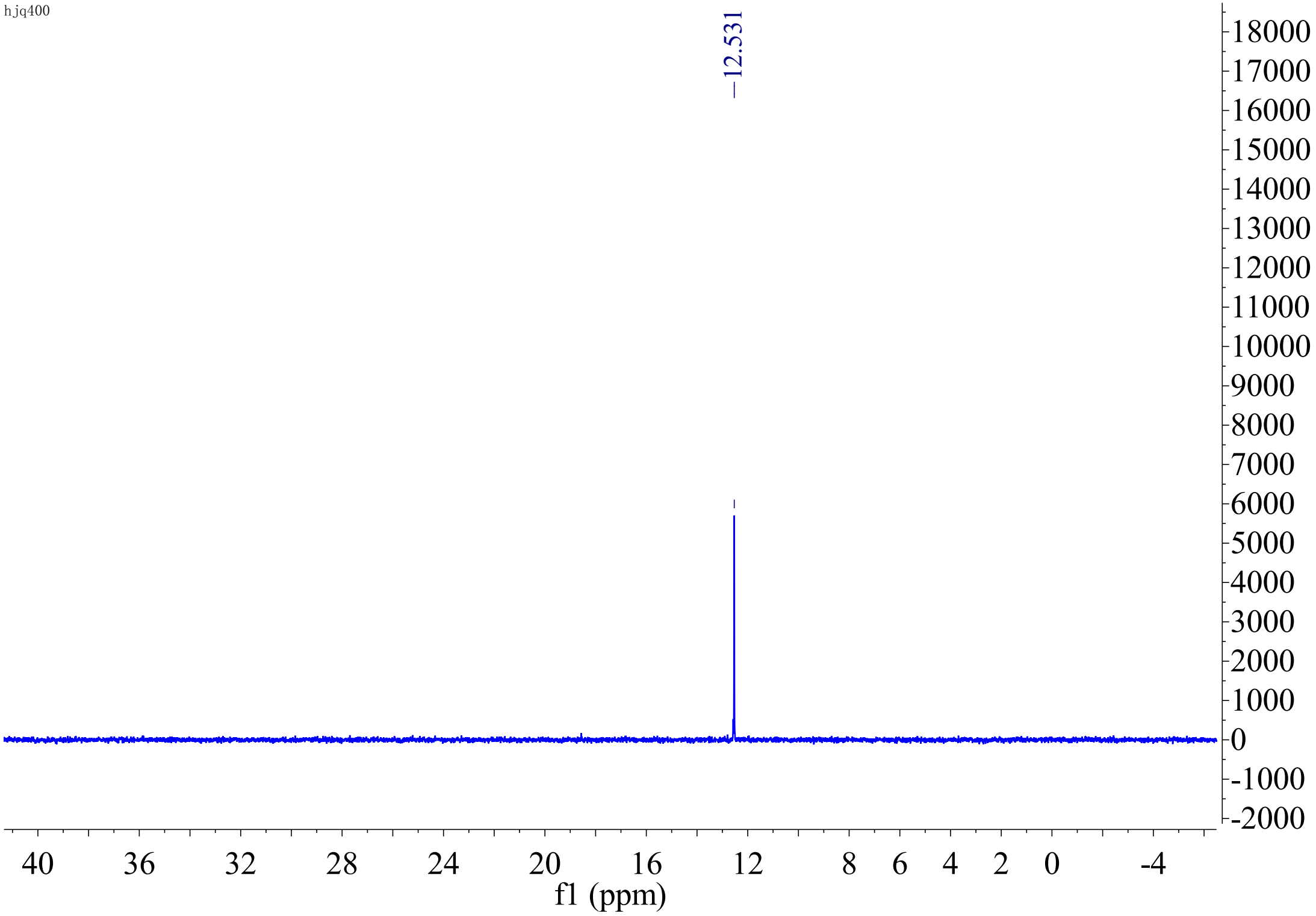
f1 (ppm)

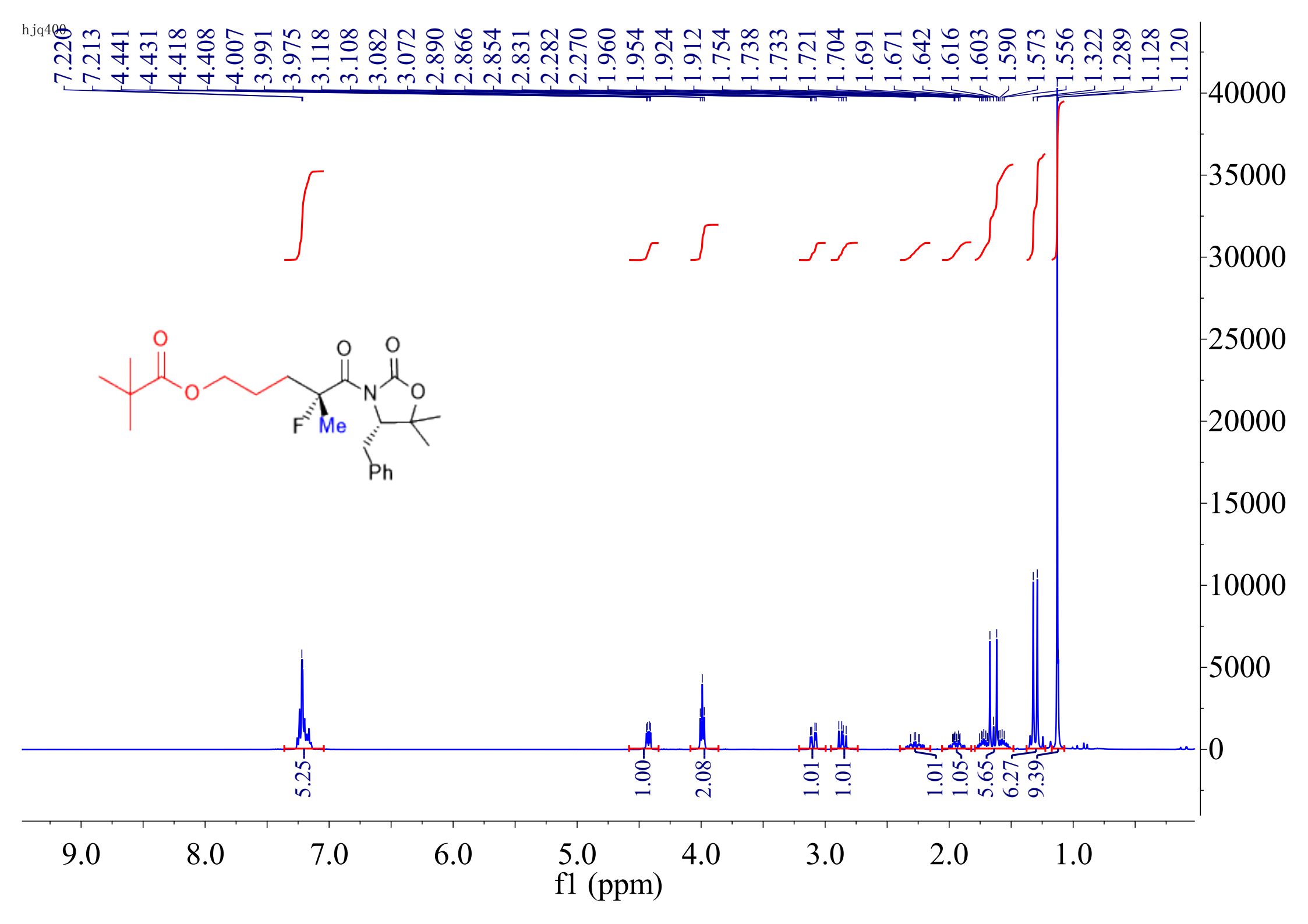

JianQiang200
c
-159.618
-161.377
Ph
O
O
N
O
F
Bu
Ph
1.00
17.94
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
-153
-155
-157
-159
-161
-163
-165
-167
f1 (ppm)

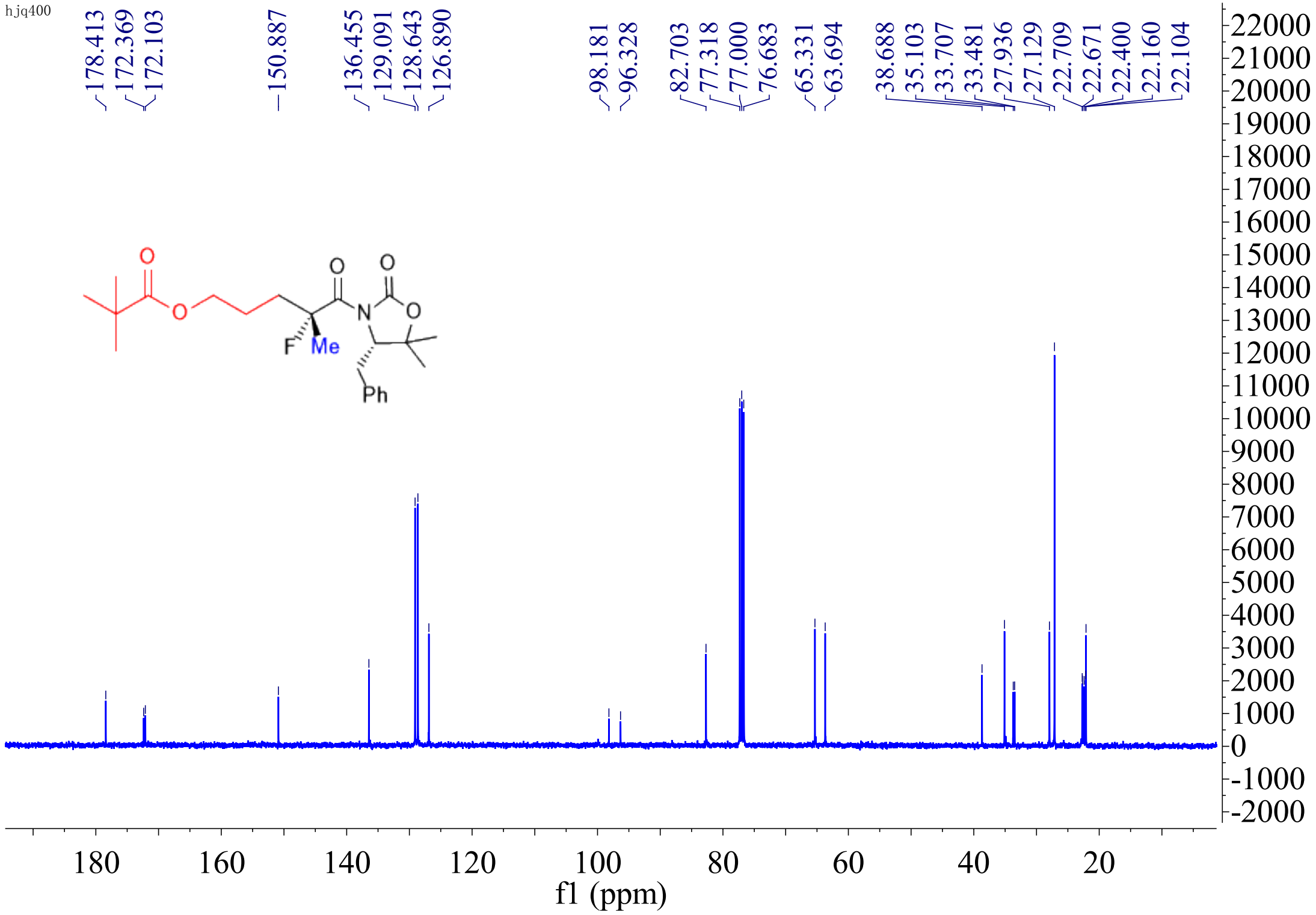

hjq400
7.241
7.224
7.219
7.191
4.440
4.430
4.416
4.407
3.642
3.626
3.610
3.102
2.870
2.847
1.673
1.638
1.618
1.515
1.479
1.308
1.282
1.002
0.985
0.974
0.965
5.53
1.00
2.04
1.00
1.03
1.07
1.12
4.13
1.25
6.30
21.42
f1 (ppm)

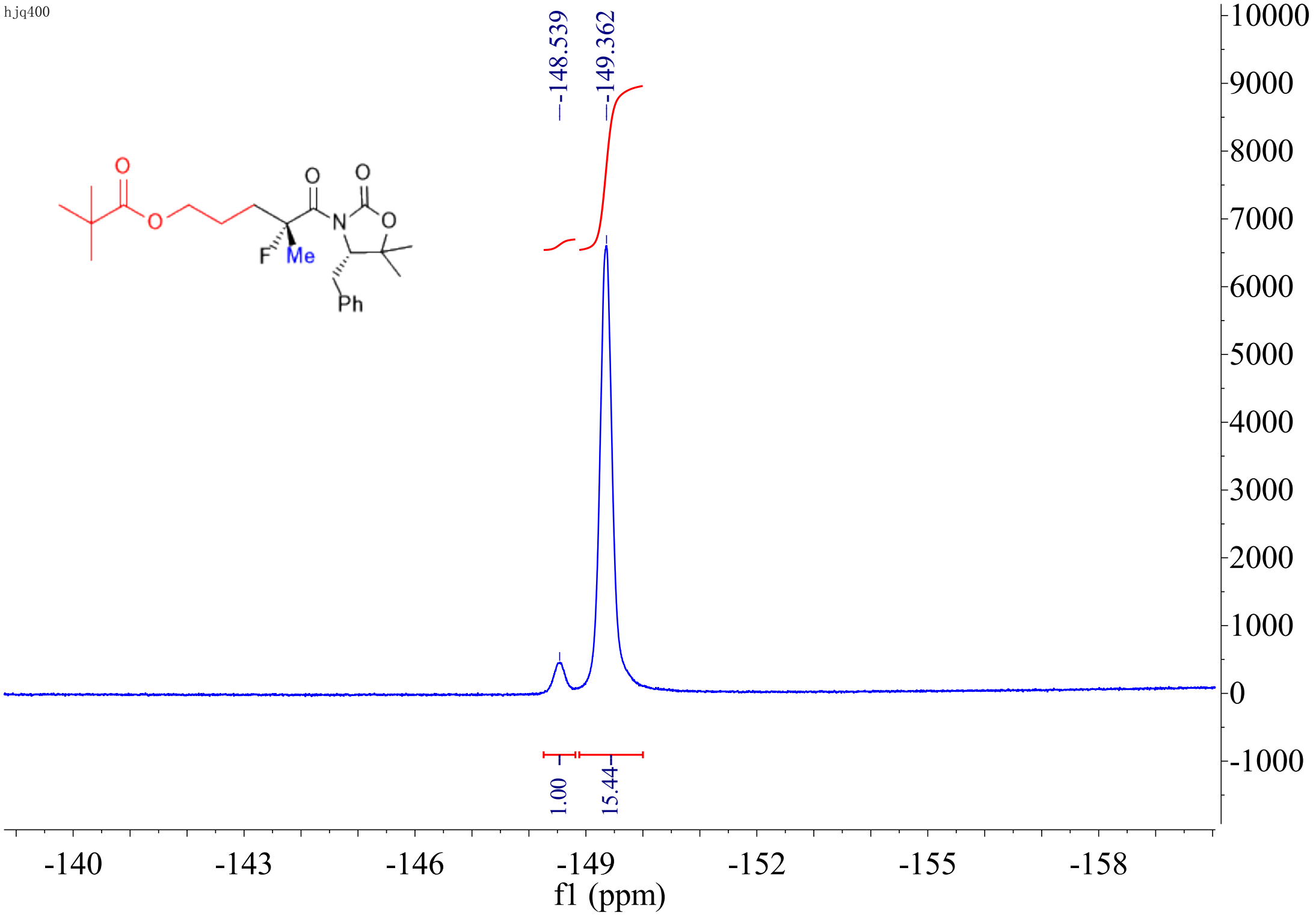

hjq400
172.826
172.558
150.892
136.633
129.098
128.665
126.869
98.614
96.768
82.542
77.317
77.000
76.683
65.406
62.947
35.158
33.726
33.502
28.001
26.868
26.835
22.532
22.291
22.170
17.981
11.944
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
180
160
140
120
100
80
60
40
20
f1 (ppm)

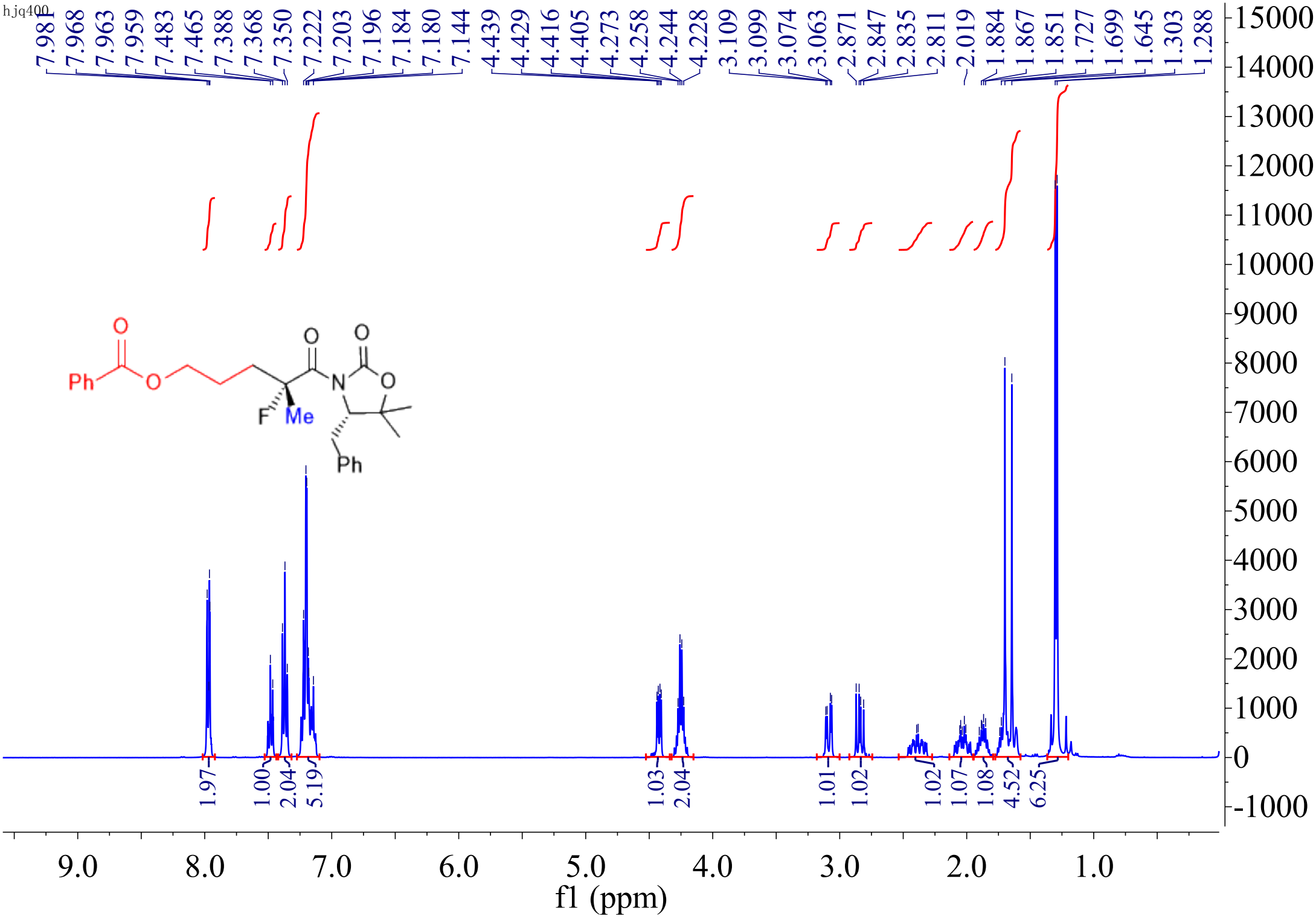

hjq400
-148.729
-148.784
1.00
9.38
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
-110
-120
-130
-140
-150
-160
-170
-180
-190
f1 (ppm)

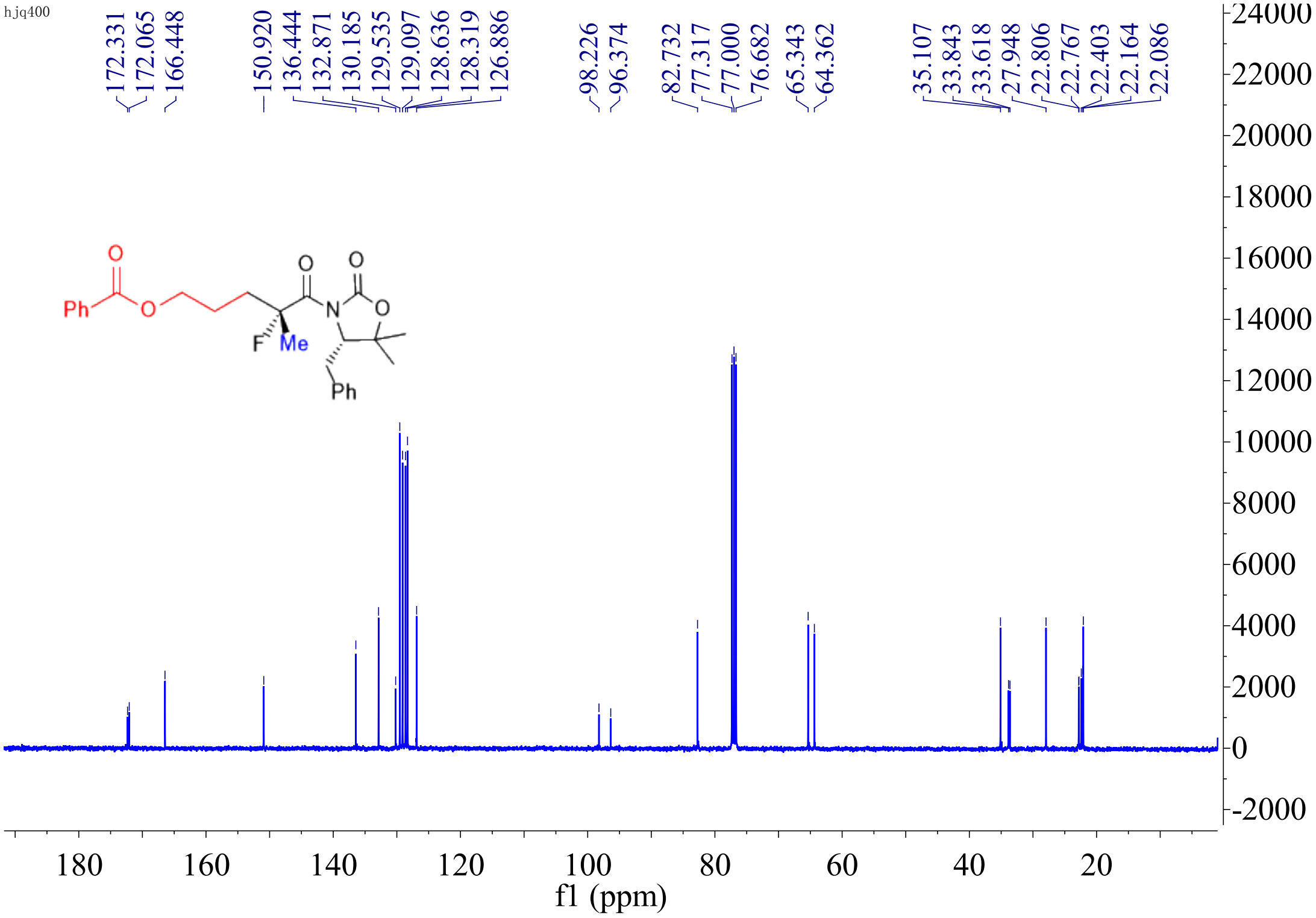

hjq400
12.531
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
40
36
32
28
24
20
16
12
8
6
4
2
0
-4
f1 (ppm)


hjq400
7.220
7.213
4.441
4.431
4.418
4.408
4.007
3.991
3.975
3.118
3.108
3.082
3.072
2.890
2.866
2.854
2.831
2.282
2.270
1.960
1.954
1.924
1.912
1.754
1.738
1.733
1.721
1.704
1.691
1.671
1.642
1.616
1.603
1.590
1.573
1.556
1.322
1.289
1.128
1.120
O
O
O
O
N
O
F
Me
Ph
40000
35000
30000
25000
20000
15000
10000
5000
0
5.25
1.00
2.08
1.01
1.01
1.01
1.05
5.65
6.27
9.39
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
178.413
172.369
172.103
150.887
136.455
129.091
128.643
126.890
98.181
96.328
82.703
77.318
77.000
76.683
65.331
63.694
38.688
35.103
33.707
33.481
27.936
27.129
22.709
22.671
22.400
22.160
22.104
O
O
O
O
N
O
F
Me
Ph
22000
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
180
160
140
120
100
80
60
40
20
f1 (ppm)


hjq400
-148.539
-149.362
1.00
15.44
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-140
-143
-146
-149
-152
-155
-158
f1 (ppm)
O
O
O
O
N
O
F
Me
Ph


hjq400
7.981
7.968
7.963
7.959
7.483
7.465
7.388
7.368
7.350
7.222
7.203
7.196
7.184
7.180
7.144
4.439
4.429
4.416
4.405
4.273
4.258
4.244
4.228
3.109
3.099
3.074
3.063
2.871
2.847
2.835
2.811
2.019
1.884
1.867
1.851
1.727
1.699
1.645
1.303
1.288
Ph
O
O
O
N
O
O
F
Me
Ph
1.97
1.00
2.04
5.19
1.03
2.04
1.01
1.02
1.02
1.07
1.08
4.52
6.25
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
172.331
172.065
166.448
150.920
136.444
132.871
130.185
129.535
129.097
128.636
128.319
126.886
98.226
96.374
82.732
77.317
77.000
76.682
65.343
64.362
35.107
33.843
33.618
27.948
22.806
22.767
22.403
22.164
22.086
Ph
O
O
O
N
O
O
F
Me
Ph
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
180
160
140
120
100
80
60
40
20
f1 (ppm)

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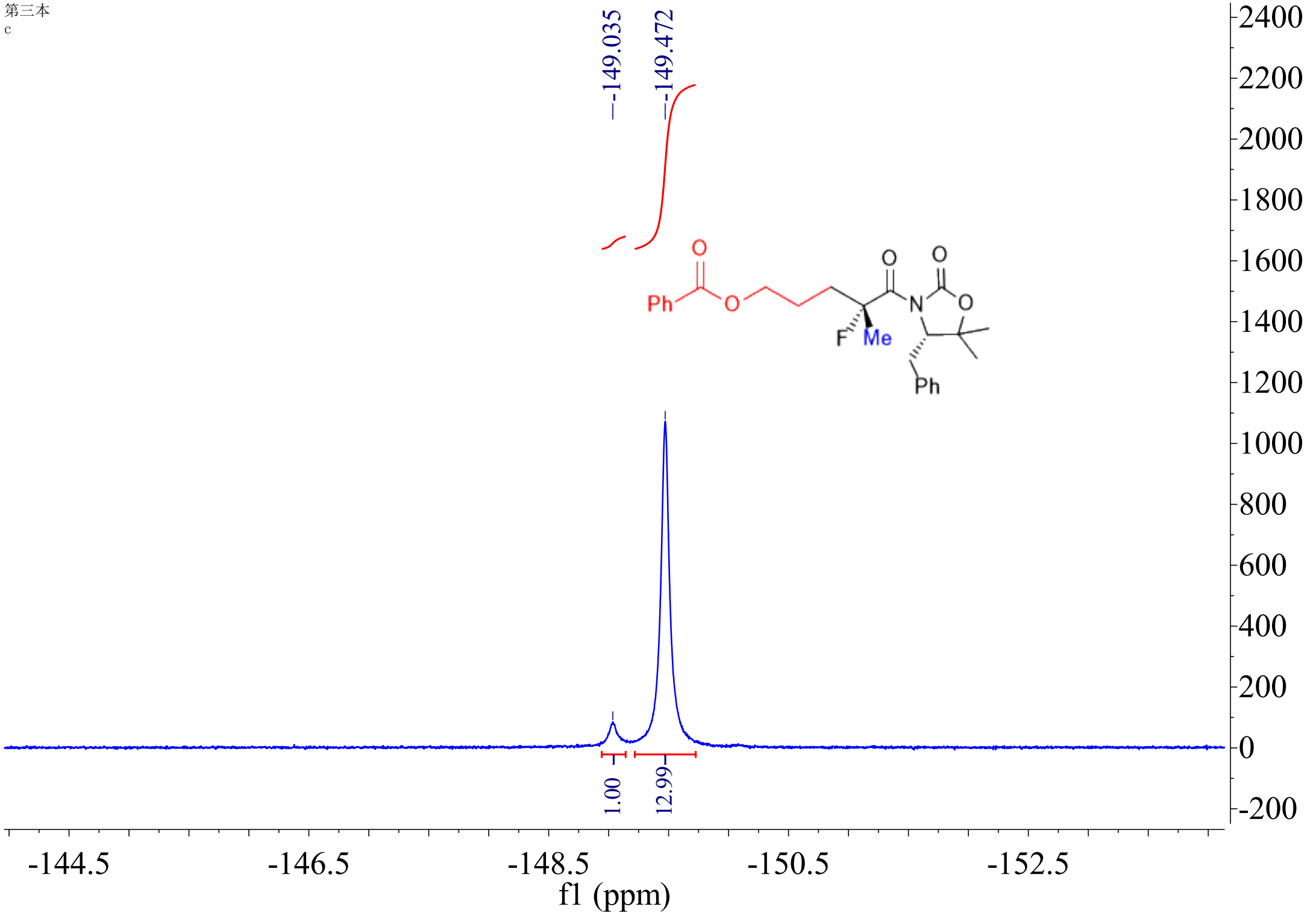
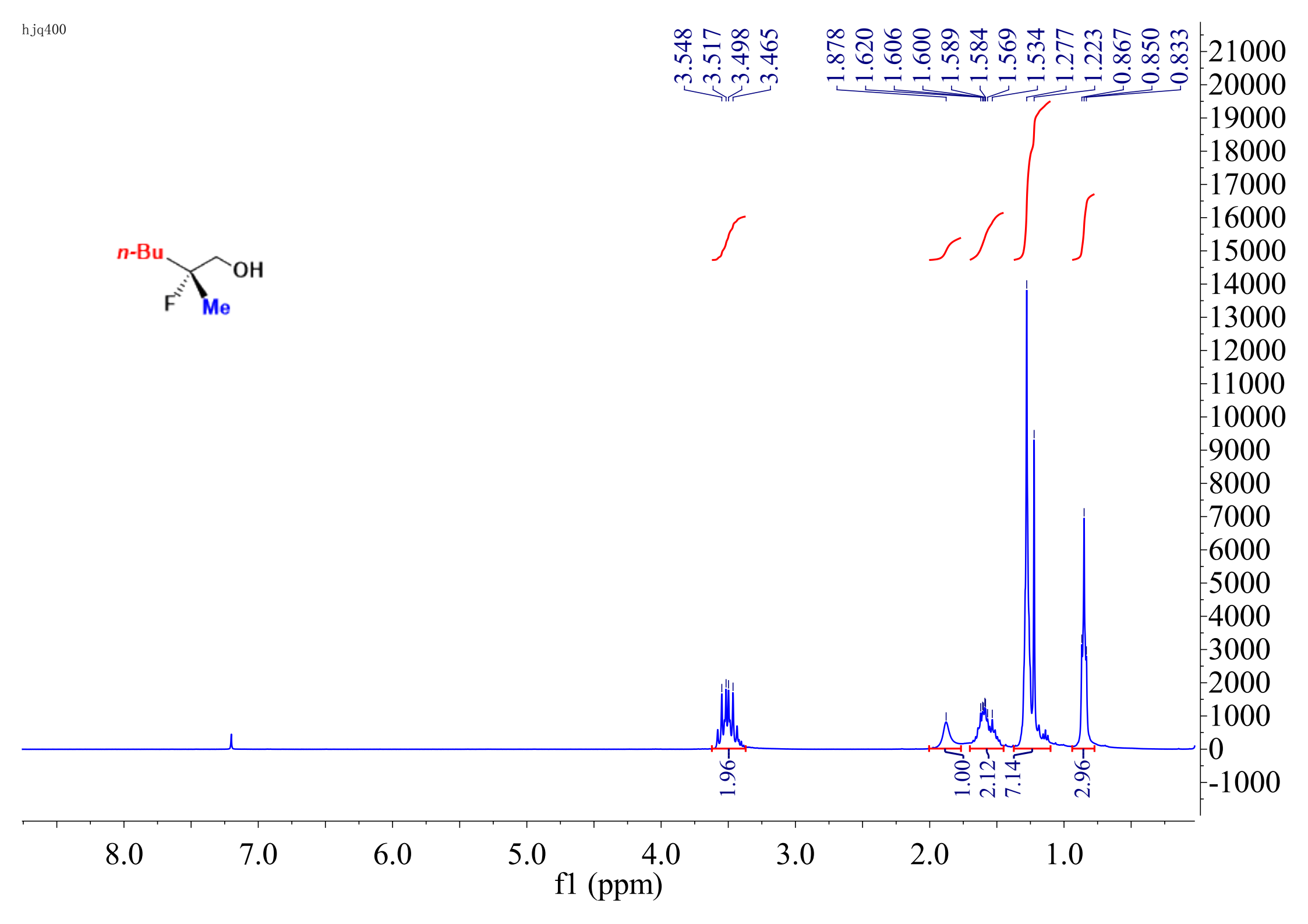
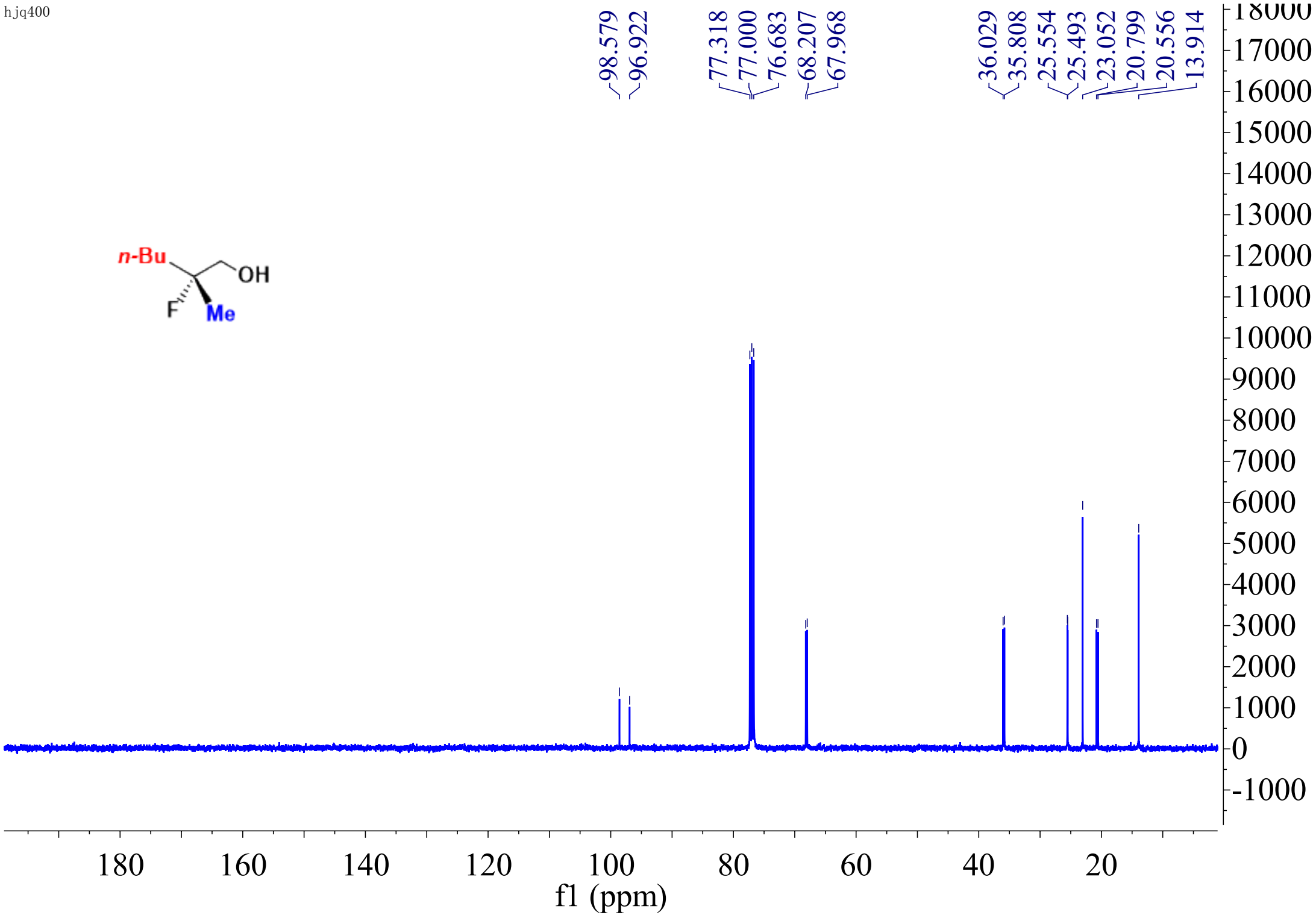
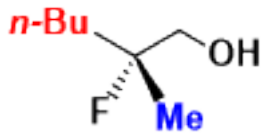
c


-149.035
-149.472
Ph
O
O
O
N
O
O
F
Me
Ph
1.00
12.99
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
-144.5
-146.5
-148.5
-150.5
-152.5
f1 (ppm)


hjq400
3.548
3.517
3.498
3.465
1.878
1.620
1.606
1.600
1.589
1.584
1.569
1.534
1.277
1.223
0.867
0.850
0.833
n-Bu
OH
F
Me
1.96
1.00
2.12
7.14
2.96
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
98.579
96.922
77.318
77.000
76.683
68.207
67.968
36.029
35.808
25.554
25.493
23.052
20.799
20.556
13.914
n-Bu
OH
F
Me
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
180
160
140
120
100
80
60
40
20
f1 (ppm)

hjq400

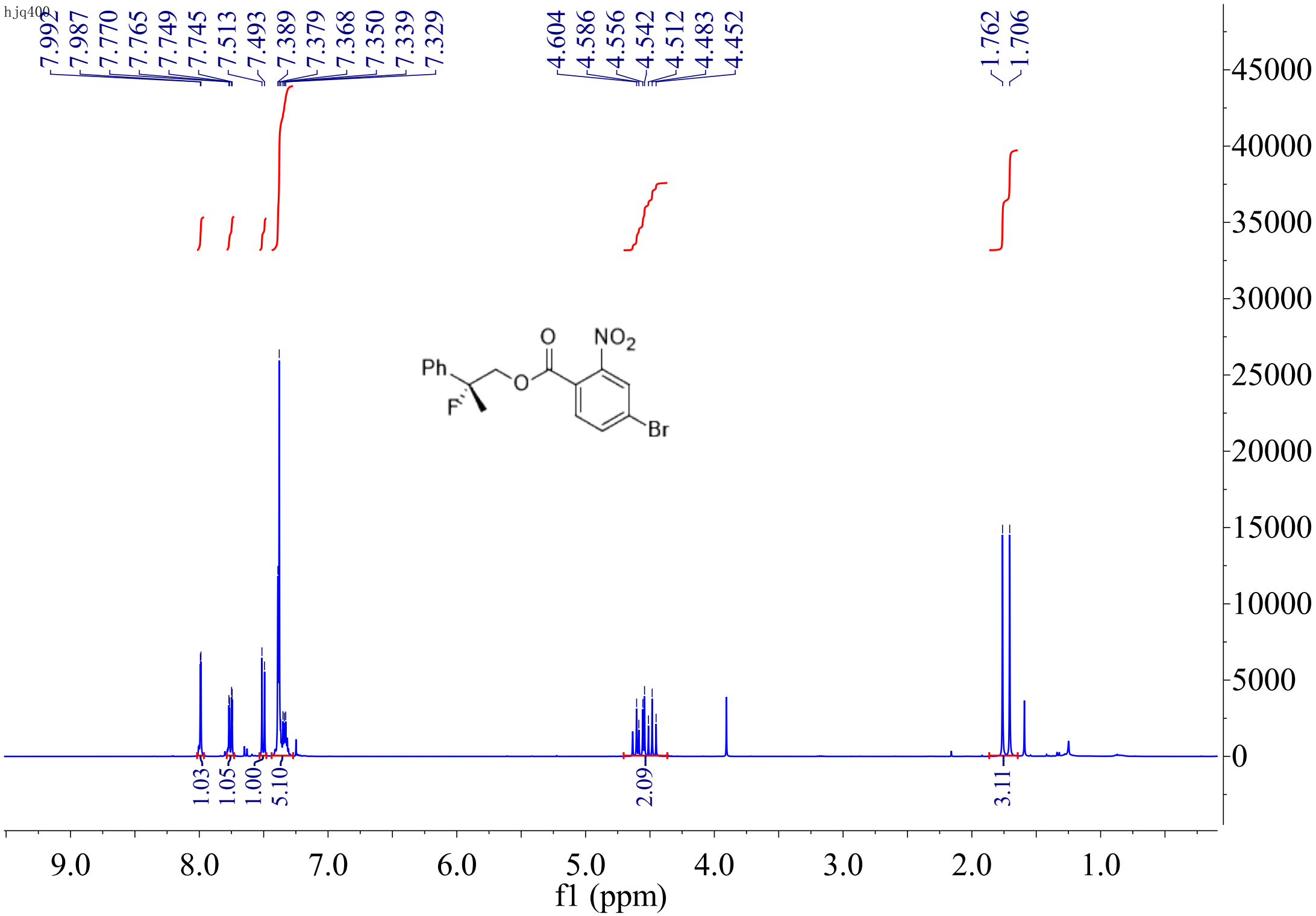


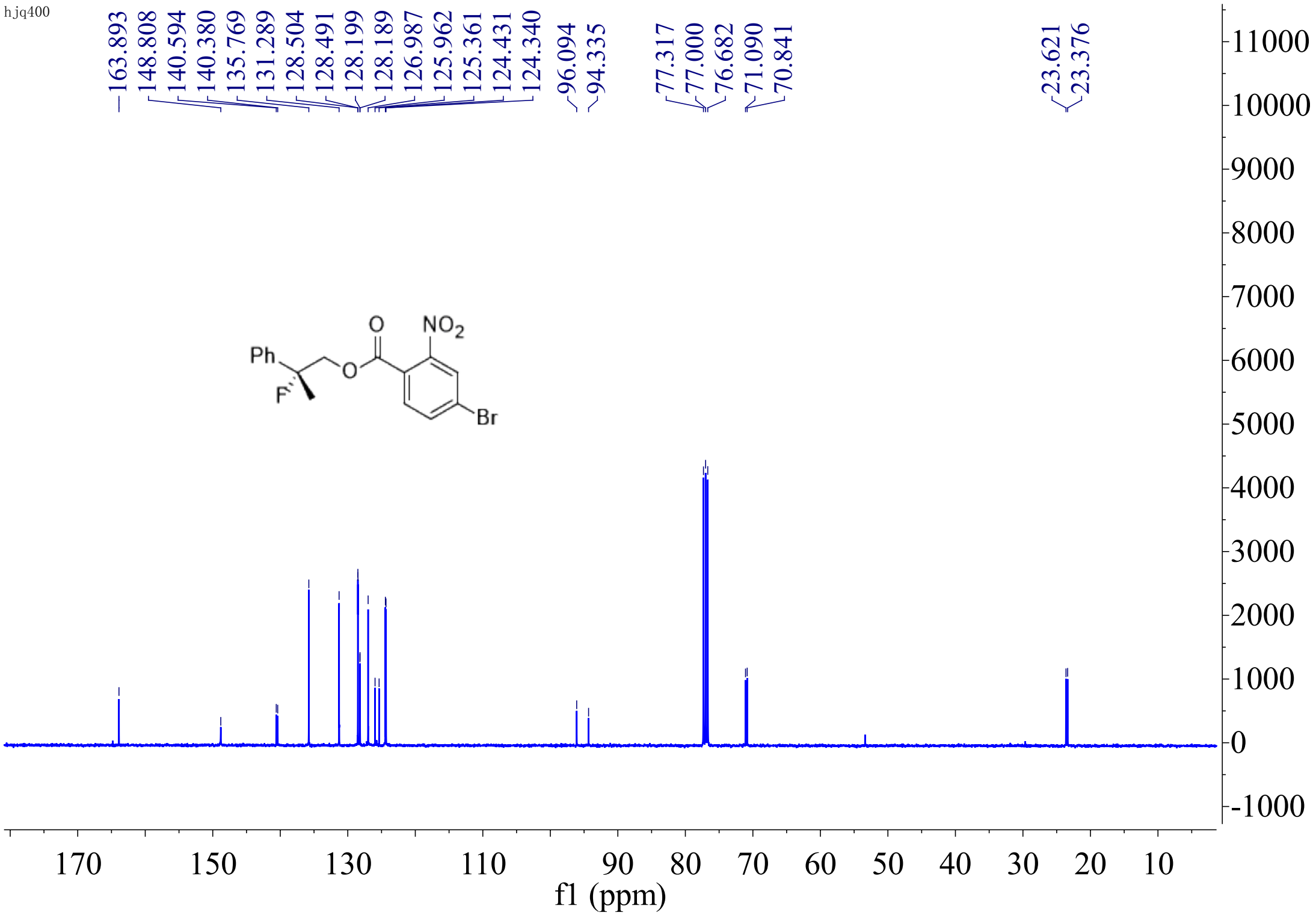
-154.708

6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500

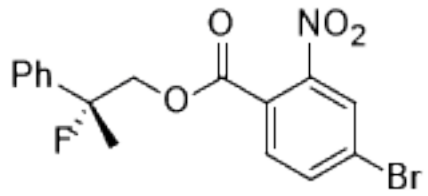
-40 -60 -80 -100 -120 -140 -160 -180 -200

f1 (ppm)


hjq400
7.992
7.987
7.770
7.765
7.749
7.745
7.513
7.493
7.389
7.379
7.368
7.350
7.339
7.329
4.604
4.586
4.556
4.542
4.512
4.483
4.452
1.762
1.706
O
NO2
Ph
F
O
Br
1.03
1.05
1.00
5.10
2.09
3.11
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
163.893
148.808
140.594
140.380
135.769
131.289
128.504
128.491
128.199
128.189
126.987
125.962
125.361
124.431
124.340
96.094
94.335
77.317
77.000
76.682
71.090
70.841
23.621
23.376
O
NO2
Ph
F
O
Br
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
170
150
130
110
90
80
70
60
50
40
30
20
10
f1 (ppm)

hjq400

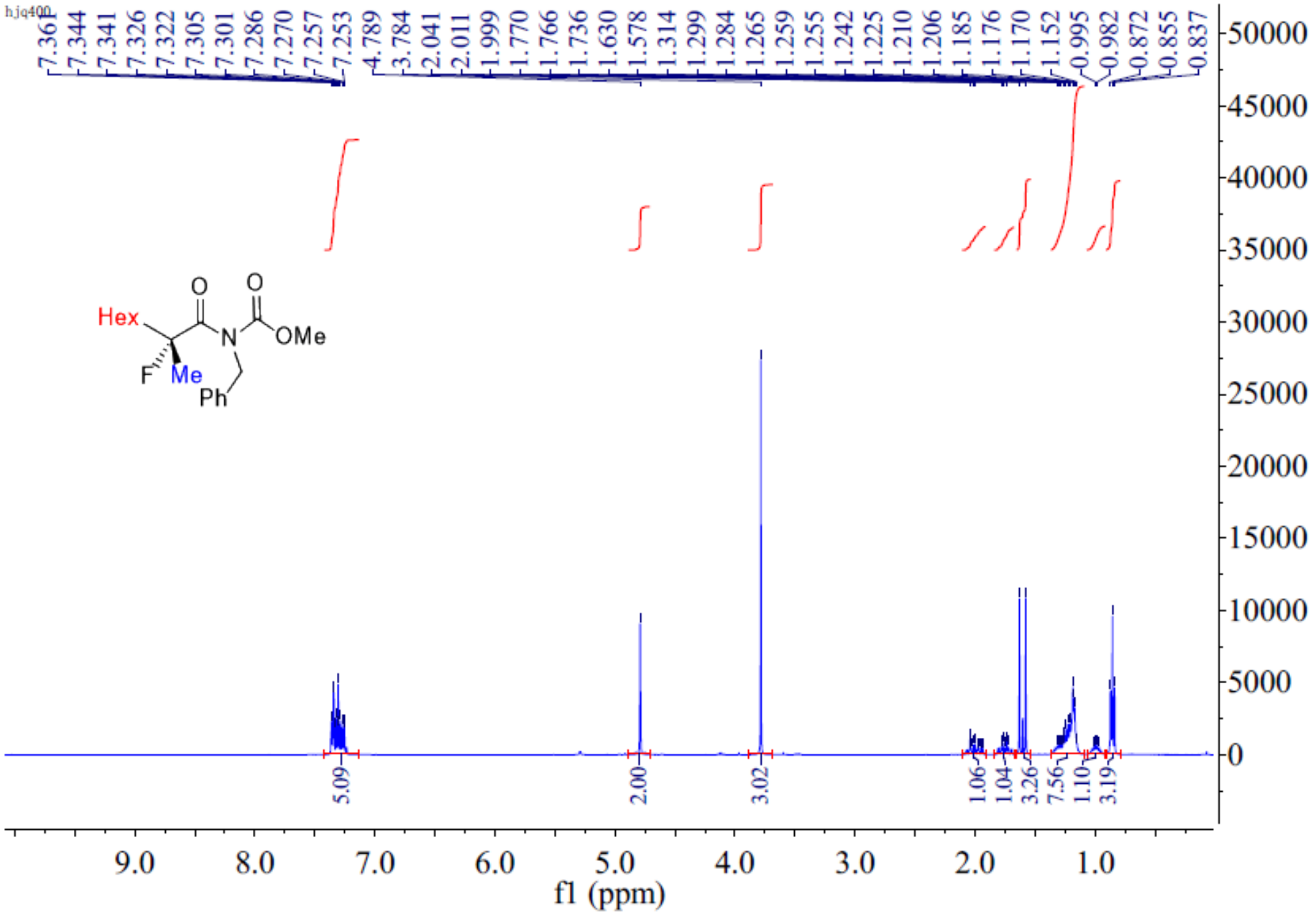


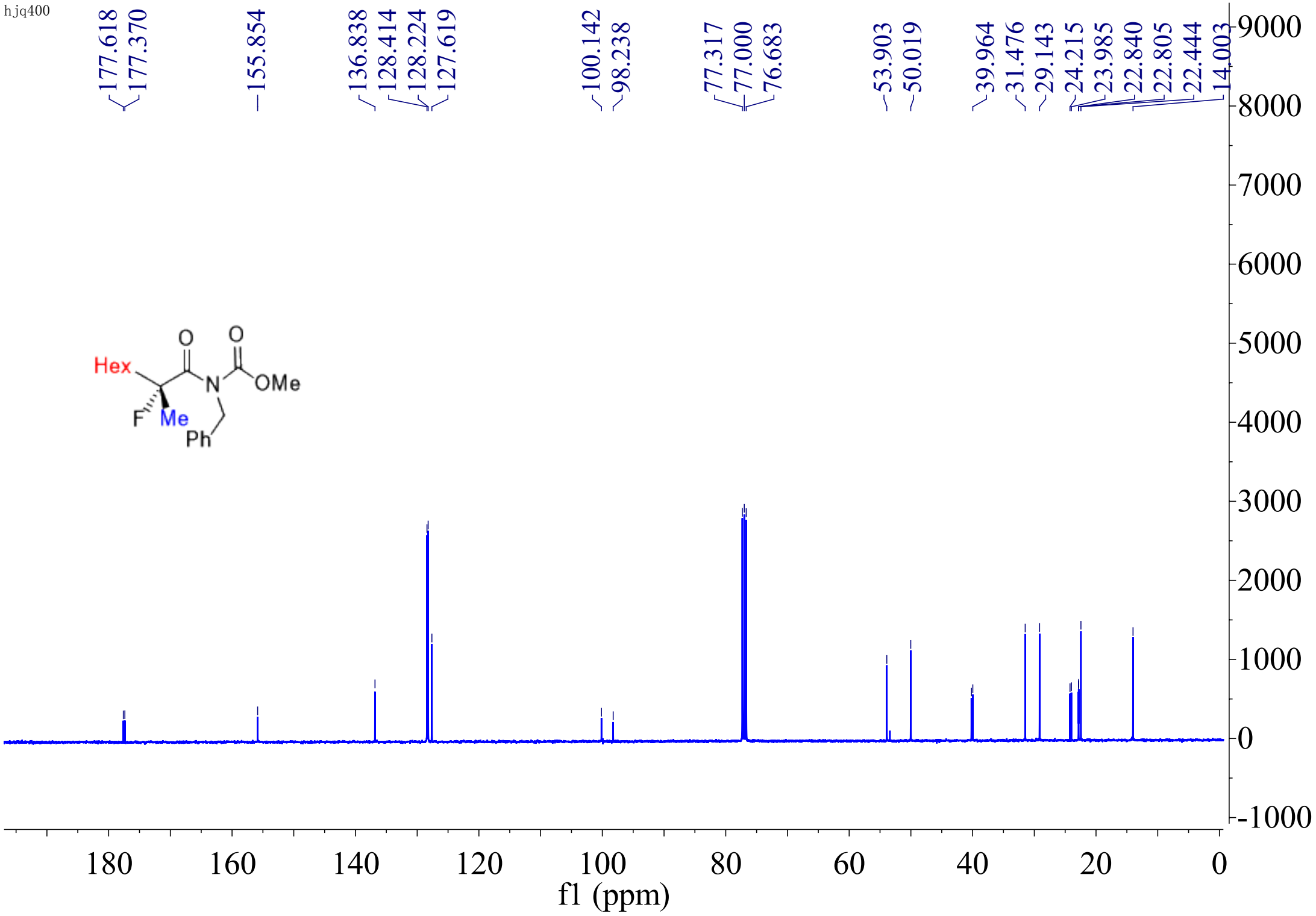
-153.459

55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
-10000

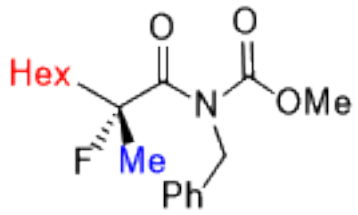
0
-30
-90
-150
-230

f1 (ppm)


hjq400
7.361
7.344
7.341
7.326
7.322
7.305
7.301
7.286
7.270
7.257
7.253
4.789
3.784
2.041
2.011
1.999
1.770
1.766
1.736
1.630
1.578
1.314
1.299
1.284
1.265
1.259
1.255
1.242
1.225
1.210
1.206
1.185
1.176
1.170
1.152
0.995
0.982
0.872
0.855
0.837
Hex
O
O
N
OMe
F
Me
Ph
5.09
2.00
3.02
1.06
1.04
3.26
7.56
1.10
3.19
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
f1 (ppm)


hjq400
177.618
177.370
155.854
136.838
128.414
128.224
127.619
100.142
98.238
77.317
77.000
76.683
53.903
50.019
39.964
31.476
29.143
24.215
23.985
22.840
22.805
22.444
14.003
Hex
O
O
N
OMe
F
Me
Ph
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

hjq400



-155.474

11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000

-95
-115
-140
-165
-190

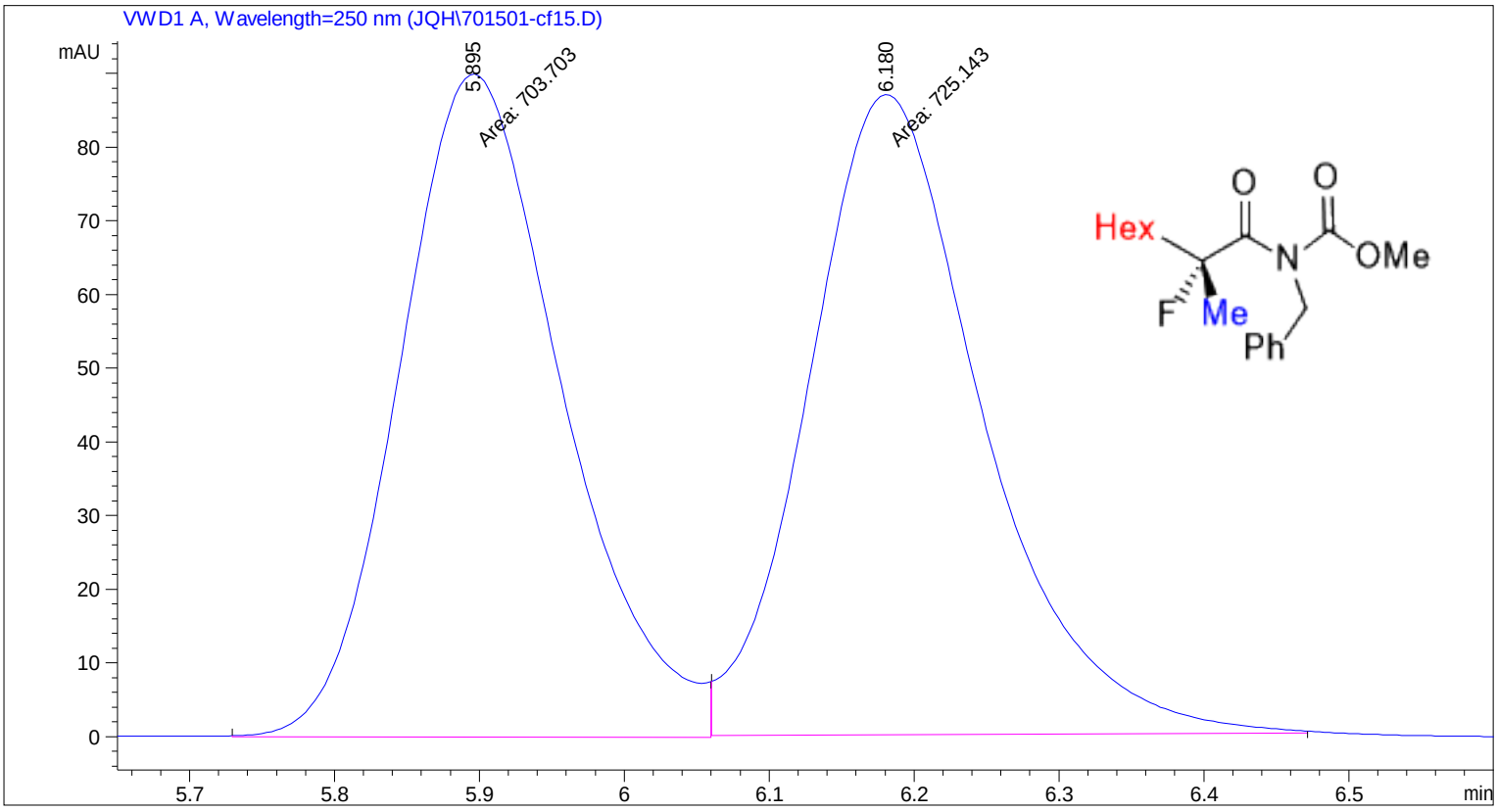
f1 (ppm)

Data File C:\Chem32\1\Data\JQH\701501-cf15.D
Sample Name: 701501-cf15

==========

Acq. Operator : SYSTEM
Location : 11
Injection Date : 2/26/2017 11:29:00 AM
Acq. Method : DEF_LC.M
Analysis Method : C:\Chem32\1\Methods\DEF_LC.M
Last changed : 9/6/2017 1:28:58 PM by SYSTEM
(modified after loading)
Sample Info : ad-h ql046 add
99/1
1

Additional Info : Peak(s) manually integrated



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Area Percent Report

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

Signal 1: VWD1 A, Wavelength=250 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.895	MM	0.1303	703.70343	89.99191	49.2498
2	6.180	MM	0.1390	725.14276	86.97044	50.7502
Totals :				1428.84619	176.96235	

Data File C:\Chem32\1\Data\JQH\701103-5.D
Sample Name: 701103-5

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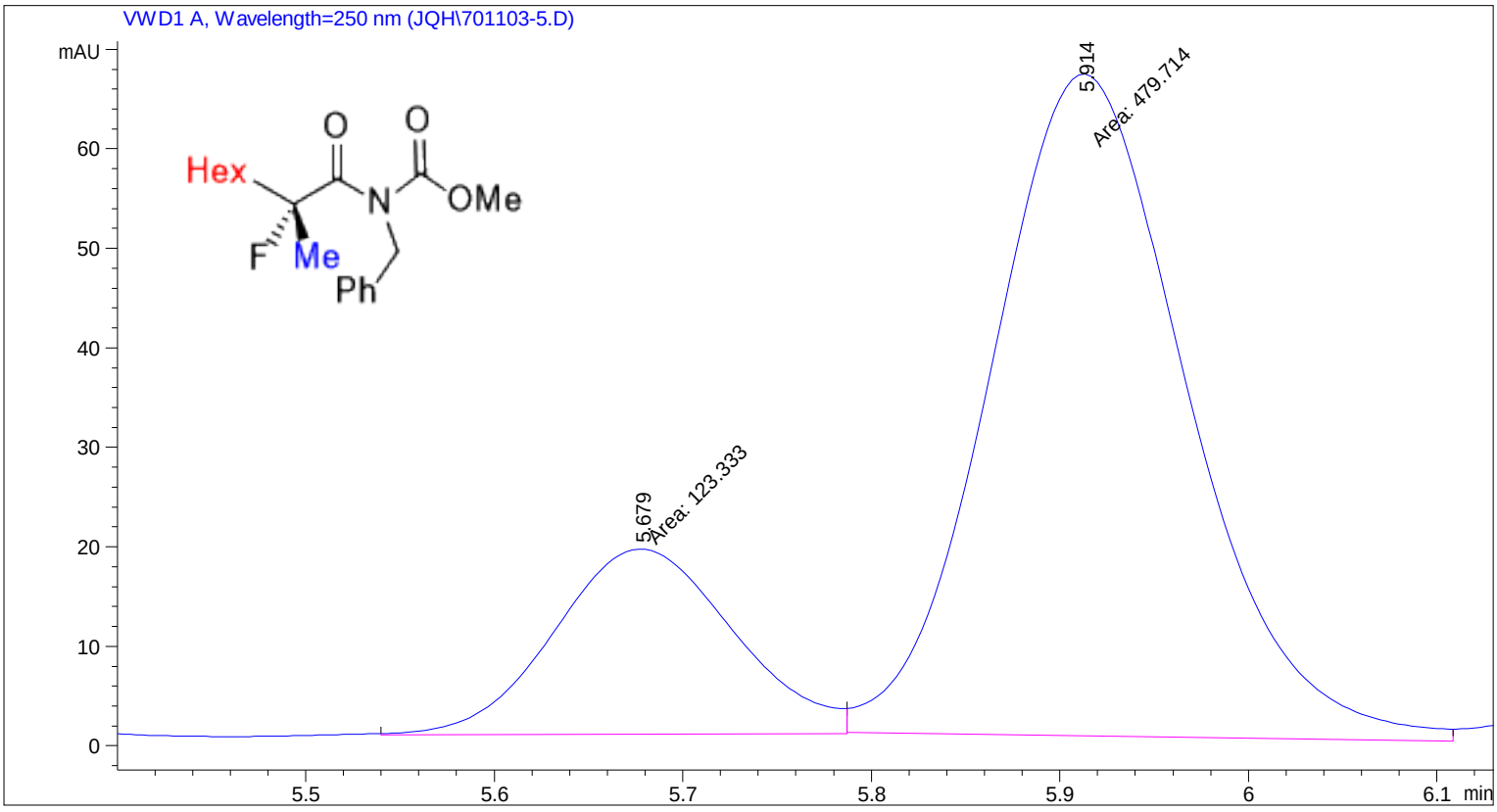
Acq. Operator : SYSTEM
Location : 13
Injection Date : 1/8/2017 11:09:20 AM
Acq. Method : DEF_LC.M
Analysis Method : C:\Chem32\1\Methods\DEF_LC.M
Last changed : 9/6/2017 1:25:10 PM by SYSTEM
(modified after loading)
Sample Info : ad-h
99
1.0

Additional Info : Peak(s) manually integrated



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Area Percent Report

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

Signal 1: VWD1 A, Wavelength=250 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.679	MM	0.1104	123.33300	18.62747	20.4516
2	5.914	MM	0.1202	479.71408	66.49714	79.5484
Totals :				603.04708	85.12461	