Supporting Information

Radical-mediated remote migration of quinoxalinones

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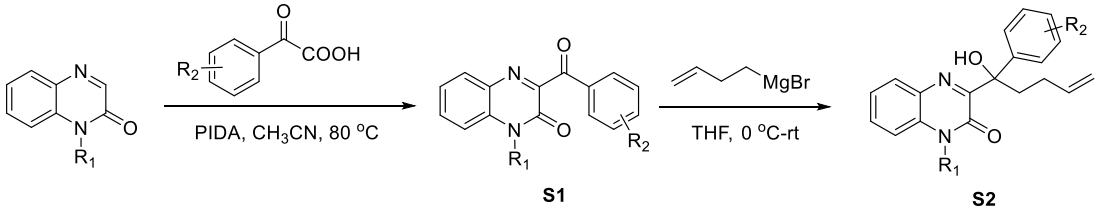
1. General experimental details

All reactions were maintained under a nitrogen atmosphere unless otherwise stated. Commercially available reagents were used without further purification. Infrared (FT-IR) spectra were recorded on a BRUKER VERTEX 70, ν_{max} in cm-1. ^{1}H-NMR spectra were recorded on a BRUKER AVANCE III HD (400 MHz) spectrometer. Chemical shifts are reported in ppm from tetramethylsilane with the solvent resonance as internal standard ($CDCl_3$: δ 7.26, DMSO-*d*6: δ 2.50, CD_3OD: δ 3.31, acetone-*d*6: δ 2.05). Data are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quadruplet, br = broad, m = multiplet), coupling constants (Hz) and integration. ^{13}C-NMR spectra were recorded on a BRUKER AVANCE III HD (100 MHz) spectrometer with complete proton decoupling. Chemical shifts are reported in ppm from tetramethylsilane with the solvent resonance as the internal standard ($CDCl_3$: δ 77.16). ^{19}F-NMR spectra were recorded on a BRUKER AVANCE III HD (376 MHz) spectrometer. Mass spectra were measured with an Agilent Technologies 6120 Quadrupole LC/MS. High resolution mass spectrometry (HRMS) were measured with a GCT Premier^{TM} and BRUKER micrOTF-Q III. Melting points were measured using INESA WRR and values are uncorrected.

2. General procedures for synthesis of starting materials

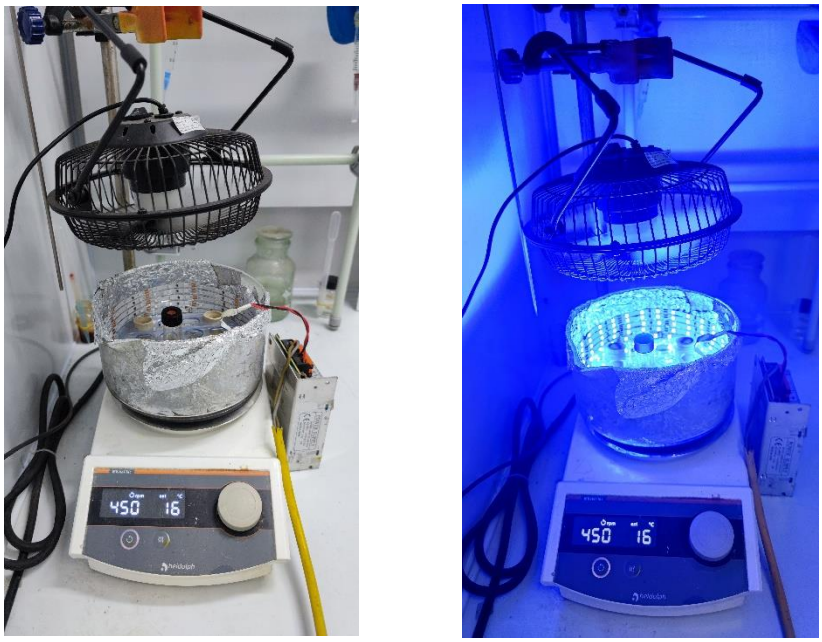
Starting materials **1a-1k** were prepared according to the following procedures:



Step 1: To a dry round bottom flask was added 2-quinoxalinone (1.0 equiv.), benzoylformic acid (2.0 equiv.) and PIDA (1.5 equiv.) in CH_3CN (20 mL) at rt under N_2. The reaction mixture was stirred at 80 °C overnight and quenched with saturated $NaHCO_3$ solution. The reaction was extracted with ethyl acetate, and the combined organic layer was washed with brine, dried over $MgSO_4$, filtered, concentrated in vacuum, and purified by flash column chromatography on silica gel (eluent: ethyl acetate/ petroleum ether) to give **S1** with 50-60% yield as yellow solid.

Step 2: To a dry round bottom flask was added **S1** (1.0 equiv.) in dry THF (20 mL), then 3-butenylmagnesium bromide in THF (10 mL) was added dropwised at 0 °C under N_2. The reaction mixture was stirred at room temperature for 3h and quenched with saturated NH_4Cl solution. The reaction was extracted with ethyl acetate, concentrated in vacuum, and purified by flash column chromatography on silica gel (eluent: ethyl acetate/ petroleum ether) to give **S2** with 40-50% yield as yellow solid.

3. General procedures for radical-mediated migration of quinoxalinones



Light off **Light on**

Figure S1 Reaction apparatus

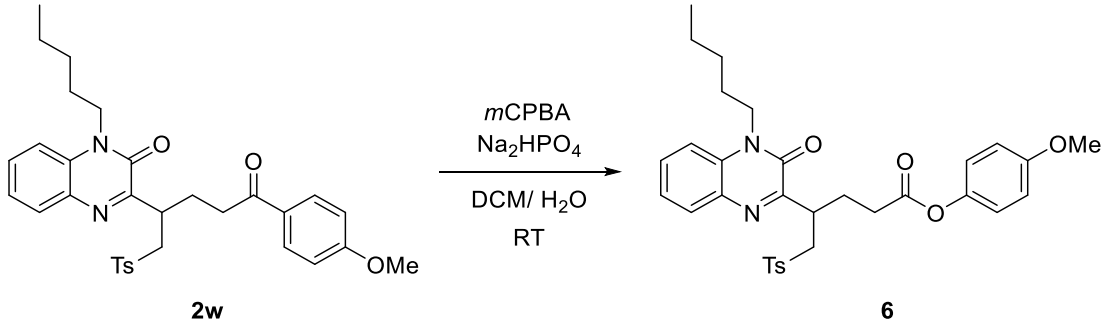
Formation of product 2: To a reaction flask was added **1** (0.2 mmol), TsCl (1.5 equiv.), Na_2CO_3 (1.0 equiv.) and *fac*-Ir-$(ppy)_3$ (3 mol %) under N_2, then CH_3CN (2.0 mL) was added to the mixture via syringe and the mixture was stirred under 18W blue LEDs irradiation for 12h. The reaction was extracted with ethyl acetate, and the combined organic layer was washed with brine, dried over $MgSO_4$, filtered, concentrated in vacuum, and purified by flash column chromatography on silica gel to give product **2**.

Formation of product 3: To a reaction flask was added **1** (0.2 mmol), Togni's reagent II (2.0 equiv.) and CuI (20 mol %) under N_2, then $CHCl_3$ (2.0 mL) was added to the mixture via syringe and the mixture was stirred at rt for 12h. The reaction was extracted with ethyl acetate, and the combined organic layer was washed with brine, dried over $MgSO_4$, filtered, concentrated in vacuum, and purified by flash column chromatography on silica gel to give product **3**.

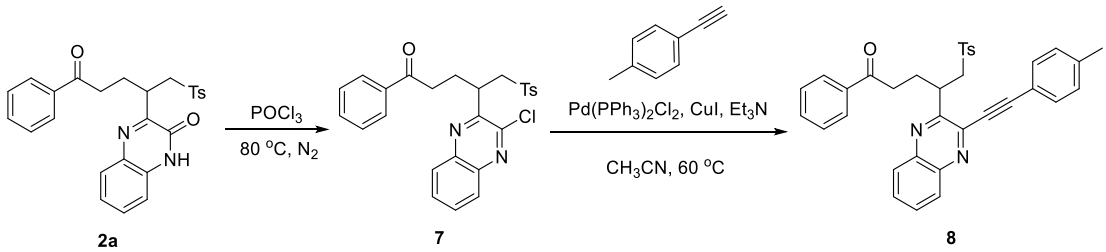
Formation of product 4: To a reaction flask was added **1** (0.2 mmol), $BrCF_2CO_2Et$ or $BrCHFCO_2Et$ (2.0 equiv.), K_2CO_3 (1.0 equiv.) and *fac*-Ir$(ppy)_3$ (3 mol %) under N_2, then CH_3CN (2.0 mL) was added to the mixture via syringe and the mixture was stirred under 30W blue LEDs irradiation for 12h. The reaction was extracted with ethyl acetate, and the combined organic layer was washed with brine, dried over $MgSO_4$, filtered, concentrated in vacuum, and purified by flash column chromatography on silica gel to give product **4**.

Formation of product 5: To a reaction flask was added **1** (0.2 mmol) and PIFA (2.0 equiv.) under N_2, then CH_3CN (2.0 mL) was added to the mixture via syringe, and then $TMSN_3$ (4.0 equiv.) was added to the reaction in the mixing state. The mixture was stirred at rt for 4h. The reaction was extracted with ethyl acetate, and the combined organic layer was washed with brine, dried over $MgSO_4$, filtered, concentrated in vacuum, and purified by flash column chromatography on silica gel to give product **5**.

4. General procedures for product transformations



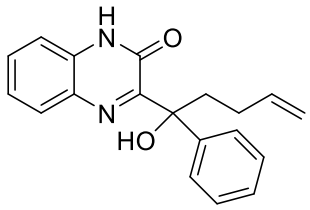
To a reaction flask was added **2w** (90.0 mg, 1.0 equiv.), *m*CPBA (41.0 mg, 1.5 equiv.) and Na_2HPO_4 (34.0 mg, 1.5 equiv.) followed by co-solvent DCM/ H_2O (1.0 mL/ 0.1 mL) at RT under N_2. The reaction mixture was stirred overnight and quenched with saturated NH_4Cl solution. The reaction was extracted with ethyl acetate, and the combined organic layer was washed with brine, dried over MgSO4, filtered, concentrated in vacuum, and purified by flash column chromatography on silica gel to give **6** with 80% yield.



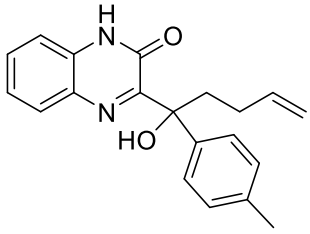
Step 1: To a reaction flask was added **2a** (70.0 mg, 0.15 mmol) and $POCl_3$ (0.45 mL) under N_2, and the mixture was stirred at 80 ℃ for 3h. After ambient temperature was reached, the reaction mixture was quenched by water, and extracted with DCM. The combined organic layer was washed with 1M $KHSO_4$ solution, saturated $NaHCO_3$ solution, and brine, dried over anhydrous $NagSO_4$, filtered, concentrated, and purified by flash column chromatography on silica gel to afford product **7** as a yellow solid with 85% yield.

Step 2: To a reaction flask was added **7** (47.8 mg, 0.1 mmol), 4-ethynyl toluene (13.9 uL, 0.11 mmol), CuI (1.0 mg, 5 mol %), $Pd(PPh_3)_2Cl_2$ (3.5 mg, 5 mol %), Et_3N (0.25 mL) and CH_3CN (0.4 mL) at rt under N_2. The mixture was stirred overnight. The resulting mixture was extracted with EtOAc. The combined organic extracts were washed by brine, dried over anhydrous $NagSO_4$, filtered, concentrated, and purified by flash column chromatography on silica gel to give **8** with 82% yield.

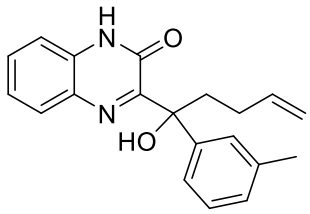
5. Characterization of starting materials



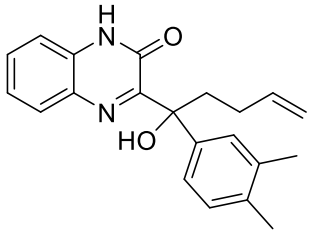
1a: 453.1 mg, 74%, yellow solid, m.p. 122-123 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1).^{1}H NMR (400 MHz, $CDCl_3$) δ 12.2 (s, 1H), 7.96 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.58-7.49 (m, 3H), 7.46-7.38 (m, 1H), 7.30 (dd, *J* = 10.4, 4.8 Hz, 2H), 7.24-7.18 (m, 1H), 7.06 (dd, *J* = 8.0, 0.8 Hz, 1H), 6.14 (s, 1H), 5.93-5.81(m, 1H), 5.05-4.84 (m, 2H), 2.76-2.66 (m, 1H), 2.51-2.41 (m, 1H), 2.27-2.05 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.5, 156.2, 144.0, 139.0, 131.9, 130.8, 130.8, 129.5, 128.1, 127.1, 125.6, 124.9, 115.6, 114.3, 79.3, 38.4, 27.9. FT-IR: ν (cm^{-1}) 3171, 2973 1659, 1612, 1934. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{19}H_{18}N_2O_2Na$ 329.1260; found 329.1278.



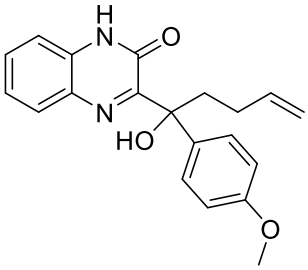
1b: 408.3 mg, 64%, yellow solid, m.p. 135-136 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 11.4 (s, 1H), 7.95 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.57-7.48 (m, 1H), 7.44-7.38 (m, 3H), 7.10 (d, *J* = 8.0 Hz, 3H), 5.96-5.77 (m, 1H), 5.03-4.95 (m, 1H), 4.93-4.87 (m, 1H), 2.73-2.63 (m, 1H), 2.49-2.38 (m, 1H), 2.28 (s, 3H), 2.24-2.05 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.8, 155.7, 140.9, 139.1, 136.7, 131.9, 130.8, 130.6, 129.5, 128.8, 125.6, 124.8, 115.4, 114.2, 79.2, 38.4, 28.0, 21.0. FT-IR: ν (cm^{-1}) 3424, 3070, 2850, 1651, 1382. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{20}H_{20}N_2O_2Na$ 343.1417; found 343.1424.



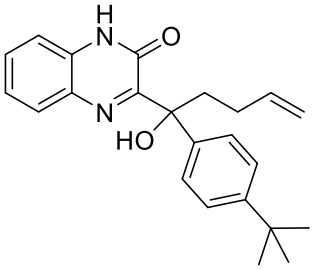
1c: 122 mg, 47%, yellow solid, m.p. 130-131 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.0 (s, 1H), 7.96 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.57-7.49 (m, 1H), 7.46-7.38 (m, 1H), 7.37-7.30 (m, 2H), 7.18 (t, *J* = 7.6 Hz, 1H), 7.10-6.99 (m, 2H), 6.09 (s, 1H), 5.93-5.81 (m, 1H), 5.04-4.86 (m, 2H), 2.76-2.64 (m, 1H), 2.50-2.38 (m, 1H), 2.32 (s, 3H), 2.26-2.04 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.7, 156.0, 143.9, 139.1, 137.6, 131.9, 130.9, 130.7, 129.5, 127.9, 126.2, 124.8, 122.8, 115.5, 114.2, 79.3, 38.5, 29.7, 28.0, 21.7. FT-IR: ν (cm-1) 3423, 3141, 2915, 1676, 1554. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{20}H_{20}N_2O_2Na$ 343.1417; found 343.1428.



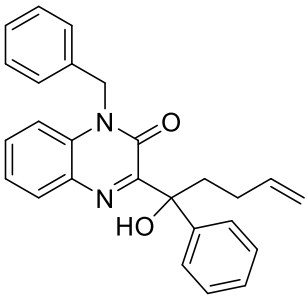
1d: 350 mg, 52%, yellow solid, m.p. 142-143 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.96 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.58-7.48 (m, 1H), 7.44-7.39 (m, 1H), 7.31-7.26 (m, 2H), 7.14-7.03 (m, 2H), 6.10 (s, 1H), 5.95-5.81 (m, 1H), 5.03-4.89 (m, 2H), 2.75-2.65 (m, 1H), 2.50-2.38 (m, 1H), 2.22 (s, 3H), 2.19 (s, 3H), 2.17-2.06 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ159.7, 156.2, 141.4, 139.2, 136.2, 135.4, 132.0, 130.9, 130.6, 129.5, 129.4, 126.8, 124.8, 123.1, 115.6, 114.2, 79.1, 38.4, 28.0, 20.0, 19.4. FT-IR: ν (cm^{-1}) 3423, 2969, 1648, 1553, 1380. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{21}H_{22}N_2O_2Na$ 357.1573; found 357.1572.



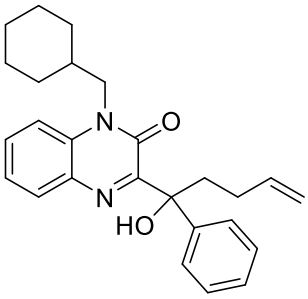
1e: 355.8 mg, 53%, yellow solid, m.p. 124-125 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 11.8 (s, 1H), 7.94 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.55-7.50 (m, 1H), 7.49-7.44 (m, 2H), 7.43-7.38 (m, 1H), 7.08 (dd, *J* = 8.0, 1.2 Hz, 1H), 6.85-6.80 (m, 2H), 6.12 (s, 1H), 5.92-5.80 (m, 1H), 5.03-4.95 (m, 1H), 4.92-4.86 (m, 1H), 3.74 (s, 3H), 2.76-2.65 (m, 1H), 2.49-2.38 (m, 1H), 2.24-2.06 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.8, 158.7, 155.6, 139.1, 135.9, 131.8, 130.9, 130.7, 129.5, 126.9, 124.8, 115.3, 114.2, 113.4, 78.9, 55.2, 38.4, 28.0. FT-IR: ν (cm^{-1}) 3447, 3076, 2836, 1651, 1652, 1253. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{20}H_{20}N_2O_3Na$ 359.1366; found 359.1364.



1f: 195.7 mg, 27%, yellow solid, m.p. 193-195 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.2 (s, 1H), 7.95 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.57-7.51 (m, 1H), 7.50-7.45 (m, 2H), 7.44-7.38 (m, 1H), 7.33-7.27 (m, 2H), 7.15 (dd, *J* = 8.0, 0.8 Hz, 1H), 6.20 (s, 1H), 5.94-5.81 (m, 1H), 5.03-4.96 (m, 1H), 4.94-4.86 (m, 1H), 2.79-2.68 (m, 1H), 2.51-2.40 (m, 1H), 2.25-2.07 (m, 2H), 1.24 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.6, 156.2, 149.9, 140.8, 139.1, 131.9, 130.9, 130.7, 129.4, 125.4, 124.9, 124.8, 115.6, 114.2, 79.2, 38.4, 34.4, 31.3, 28.0. FT-IR: ν (cm-1) 3275, 3168, 3101, 2857, 1638, 1370. FT-IR: ν (cm^{-1}) 3453, 3300, 2965, 1650, 1610, 1379. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{23}H_{26}N_2O_2Na$ 385.1886; found 385.1869.

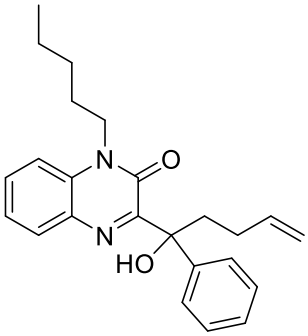


1g: 158.2 mg, 23%, yellow solid, m.p. 103-104 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 (dd, *J* = 7.6, 1.2 Hz, 1H), 7.58-7.52 (m, 2H), 7.50-7.43 (m, 1H), 7.42-7.35 (m, 1H), 7.35-7.29 (m, 2H), 7.29-7.26 (m, 2H), 7.25-7.22 (m, 3H), 7.13-7.07 (m, 2H), 6.23 (s, 1H), 5.94-5.82 (m, 1H), 5.52-5.28 (m, 2H), 5.04-4.97 (m, 1H), 4.93-4.88 (m, 1H), 2.76-2.63 (m, 1H), 2.56-2.38 (m, 1H), 2.32-2.20 (m, 1H), 2.14-2.02 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.3, 154.5, 144.2, 139.2, 134.7, 132.4, 132.1, 130.7, 130.6, 129.0, 128.1, 127.8, 127.1, 126.7, 125.4, 124.2, 114.5, 114.2, 79.6, 45.7, 38.8, 28.0. FT-IR: ν (cm^{-1}) 3422, 2975, 1636, 1598, 1395, 1314. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{26}H_{24}N_2O_2Na$ 419.1730; found 419.1738.

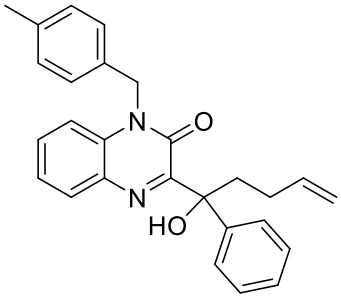


1h: 80 mg, 24%, yellow solid, m.p. 128-129 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.62-7.54 (m, 1H), 7.53-7.47 (m, 2H), 7.44-7.37 (m, 1H), 7.36-7.27 (m, 3H), 7.23-7.16 (m, 1H), 6.27 (s, 1H), 5.93-5.81 (m, 1H), 5.06-4.86 (m, 2H), 4.13-3.93 (m, 2H), 2.71-2.61 (m, 1H), 2.47-2.37 (m, 1H), 2.27-2.18 (m, 1H), 2.10-2.01 (m, 1H), 1.86-1.76 (m, 1H), 1.69-1.59 (m, 3H), 1.50-1.44 (m, 1H), 1.30-1.22 (m, 2H), 1.16-1.05 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.2, 154.6, 144.2, 139.3, 132.6, 132.1, 130.8, 130.4, 128.0,

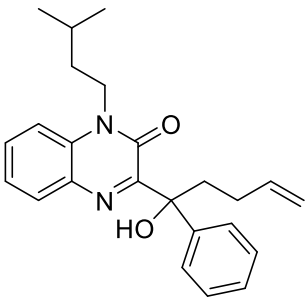
126.9, 125.4, 123.9, 114.2, 114.1, 79.5, 47.7, 38.7, 36.4, 30.7, 28.0, 26.1, 25.7. FT-IR: ν (cm^{-1}) 3365, 2921, 1635, 1599, 1396, 1276, 1145. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{26}H_{30}N_2O_2Na$ 425.2199; found 425.2181.



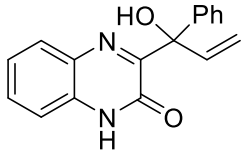
1i: 572.8 mg, 52%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 10/1). ^1H NMR (400 MHz, $CDCl_3$) δ 8.0 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.61-7.56 (m, 1H), 7.55-7.51 (m, 2H), 7.44-7.39 (m, 1H), 7.35-7.27 (m, 3H), 7.24-7.18 (m, 1H), 6.33 (s, 1H), 5.94-5.80 (m, 1H), 5.04-4.95 (m, 1H), 4.93-4.86 (m, 1H), 4.24-4.05 (m, 2H), 2.71-2.60 (m, 1H), 2.49-2.38 (m, 1H), 2.30-2.18 (m, 1H), 2.12-2.00 (m, 1H), 1.72-1.63 (m, 2H), 1.48-1.15 (m, 4H), 0.90-0.84 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.1, 154.2, 144.3, 139.3, 132.3, 132.2, 130.8, 130.6, 128.0, 127.0, 125.4, 123.9, 114.1, 113.8, 79.6, 42.2, 38.9, 29.0, 28.0, 26.9, 22.3, 13.9. FT-IR: ν (cm^{-1}) 3402, 3081, 2857, 1634, 1600, 1489, 1384. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{24}H_{28}N_2O_2Na$ 399.2043; found 399.2050.



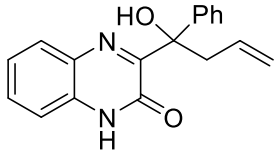
1j: 242.9 mg, 33%, yellow solid, m.p. 147-148 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 10/1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.95 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.52 (d, *J* = 6.8 Hz, 2H), 7.47-7.40 (m, 1H), 7.37-7.26 (m, 3H), 7.26-7.16 (m, 2H), 7.08-6.92 (m, 4H), 6.22 (s, 1H), 5.92-5.79 (m, 1H), 5.44-5.21 (m, 2H), 5.02-4.83 (m, 2H), 2.72- 2.61 (m, 1H), 2.50-2.38 (m, 1H), 2.25 (s, 3H), 2.31-2.18 (m, 1H), 2.11-1.99 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.3, 154.5, 144.2, 139.2, 137.6, 132.4, 132.1, 131.7, 130.6, 130.6, 129.6, 128.1, 127.1, 126.8, 125.5, 124.1, 114.6, 114.2, 79.6, 45.5, 38.8, 28.0, 21.1. FT-IR: ν (cm-1) 3446, 2976, 1637, 1599, 1588, 1373. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{27}H_{26}N_2O_2Na$ 433.1886; found 433.1882.



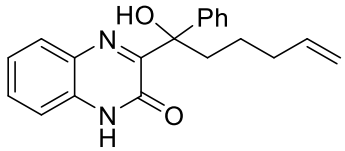
1k: 293.2 mg, 43%, yellow solid, m.p. 81-82 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 10/1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.99 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.62-7.56 (m, 1H), 7.55-7.50 (m, 2H), 7.44-7.38 (m, 1H), 7.33-7.26 (m, 3H), 7.24-7.18 (m, 1H), 6.31 (s, 1H), 5.92-5.80 (m, 1H), 5.02-4.95 (m, 1H), 4.93-4.86 (m, 1H), 4.26-4.17 (m, 1H), 4.15-4.05 (m, 1H), 2.69-2.59 (m, 1H), 2.47-2.37 (m, 1H), 2.28-2.17 (m, 1H), 2.09-2.01 (m, 1H), 1.74-1.65 (m, 1H), 1.29-1.22 (m, 2H), 0.98 (dd, *J* = 6.8, 1.2 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.0, 154.1, 144.3, 139.3, 132.2, 132.2, 130.8, 130.6, 128.0, 127.0, 125.4, 123.9, 114.1, 113.7, 79.6, 40.9, 38.9, 35.6, 28.0, 26.5, 22.4. FT-IR: ν (cm^{-1}) 3372, 2956, 2926, 2868, 1633, 1598, 1397. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{24}H_{28}N_2O_2Na$ 399.2043; found 399.2052.



9: 280.0 mg, 70%, yellow solid, m.p. 175-177 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.5 (s, 1H), 7.91 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.52-7.45 (m, 3H), 7.41-7.35 (m, 1H), 7.33-7.26 (m, 2H), 7.25-7.20 (m, 1H), 7.07-6.98 (m, 1H), 6.95 (dd, *J* = 8.0, 0.8 Hz, 1H), 6.11 (s, 1H), 5.67 (dd, *J* = 17.2, 1.6 Hz, 1H), 5.38 (dd, *J* = 10.8, 1.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.0, 155.7, 143.2, 138.8, 131.4, 131.3, 130.9, 129.2, 128.2, 127.5, 126.4, 124.8, 115.8, 115.5, 78.9. FT-IR: ν (cm^{-1}) 3447, 3060, 2961, 2849, 1650, 1551, 1379. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{17}H_{14}N_2NaO_2$ 301.0947; found 301.0956.

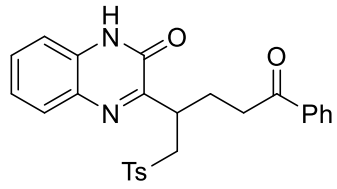


10: 290.2 mg, 67%, yellow solid, m.p. 171-174 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.5 (s, 1H), 7.99-7.91 (m, 1H), 7.60-7.48 (m, 3H), 7.45-7.38 (m, 1H), 7.34-7.26 (m, 2H), 7.25-7.18 (m, 1H), 7.08-7.02 (m, 1H), 6.15 (s, 1H), 5.94-5.80 (m, 1H), 5.19-5.09 (m, 1H), 5.05-4.95 (m, 1H), 3.53-3.43 (m, 1H), 3.18-3.08 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.1, 156.2, 143.7, 133.8, 131.8, 130.9, 130.9, 129.4, 128.1, 127.3, 125.7, 124.9, 118.1, 115.7, 79.0, 43.6. FT-IR: ν (cm^{-1}) 3447, 3062, 2962, 2847, 1652, 1597, 1495, 1361. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{18}H_{16}N_2O_2Na$ 315.1104; found 315.1112.

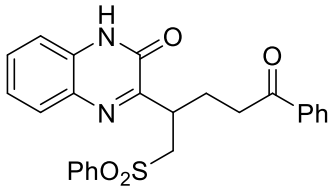


11: 272.7 mg, 57%, yellow solid, m.p. 105-107 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.6 (s, 1H), 7.96 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.60-7.48 (m, 3H), 7.45-7.39 (m, 1H), 7.34-7.27 (m, 2H), 7.24-7.18 (m, 1H), 7.09 (dd, *J* = 8.4, 1.2 Hz, 1H), 6.17 (s, 1H), 5.88-5.75 (m, 1H), 5.06-4.90 (m, 2H), 2.69-2.59 (m, 1H), 2.43-2.33 (m, 1H), 2.18-2.06 (m, 2H), 1.58-1.42 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.6, 156.3, 144.2, 139.0, 132.0, 130.9, 130.8, 129.5, 128.0, 127.1, 125.7, 124.8, 115.8, 114.4, 79.5, 38.8, 34.1, 22.8. FT-IR: ν (cm-1) 3447, 3060, 2961, 2849, 1650, 1551, 1379. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{20}H_{20}N_2O_2Na$ 343.1417; found 343.1428.

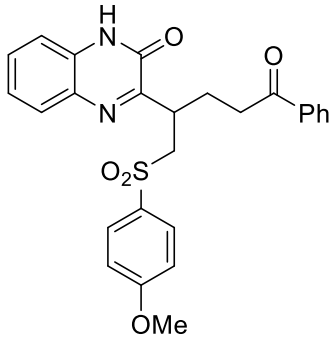
6. Characterization of products



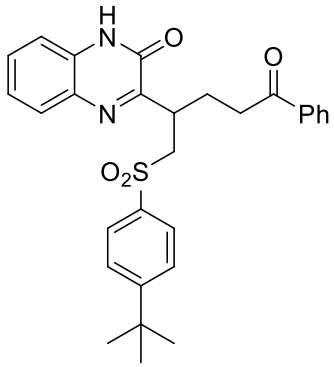
2a: 68.0 mg, 74%, yellow solid, m.p. 161-167 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.85-7.76 (m, 2H), 7.73-7.61 (m, 3H), 7.55-7.42 (m, 2H), 7.40-7.26 (m, 4H), 7.06 (d, *J* = 10.8 Hz, 2H), 4.41-4.30 (m, 1H), 4.22-4.12 (m, 1H), 3.52-3.40 (m, 1H), 3.16-2.90 (m, 2H), 2.39-2.22 (m, 2H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 159.3, 156.0, 144.6, 136.6, 136.1, 133.1, 132.4, 130.8, 130.5, 129.6, 128.9, 128.5, 128.2, 127.9, 124.2, 115.6, 58.7, 36.2, 35.4, 28.3, 21.4. FT-IR: ν (cm^{-1}) 2919, 1661, 1495, 1449, 1288, 1210. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{26}H_{24}N_2O_4SNa$ 483.1349; found 483.1355.



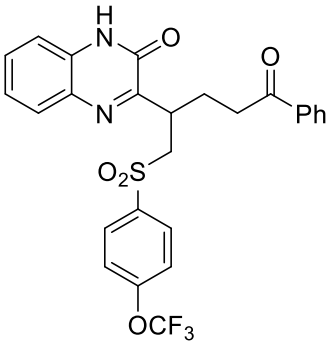
2b: 60.0 mg, 67%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.5 (s, 1H), 7.85-7.78 (m, 4H), 7.70-7.66 (m, 1H), 7.54-7.37 (m, 3H), 7.37-7.27 (m, 6H), 4,42-4.34 (m, 1H), 4.24-4.14 (m, 1H), 3.50 (dd, *J* = 14.0, 2.8 Hz, 1H), 3.15-2.91 (m, 2H), 2.37-2.21 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 159.4, 156.1, 139.1, 136.6, 133.4, 133.1, 132.4, 130.8, 130.5, 129.0, 128.9, 128.5, 128.2, 127.9, 124.2, 115.7, 58.7, 36.1, 35.4, 28.2. FT-IR: ν (cm^{-1}) 3060, 2902, 2253, 1659, 1497, 1368, 1209. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{25}H_{22}N_2O_4SNa$ 469.1192; found 469.1208.



2c: 38.2 mg, 40%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.2 (s, 1H), 7.83-7.79 (m, 2H), 7.75-7.65 (m, 3H), 7.53-7.43 (m, 2H), 7.38-7.26 (m, 4H), 6.74-6.69 (m, 2H), 4.39-4.31 (m, 1H), 4.19-4.10 (m, 1H), 3.66 (s, 3H), 3.46 (dd, *J* = 14.0, 2.8 Hz, 1H), 3.14-3.04 (m, 1H), 3.02-2.91 (m, 1H), 2.36-2.21 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 163.5, 159.5, 155.9, 136.6, 133.1, 132.4, 130.7, 130.6, 130.4, 128.9, 128.5, 127.9, 124.2, 115.5, 114.1, 58.9, 55.5, 36.3, 35.5, 28.3. FT-IR: ν (cm^{-1}) 2963, 2921, 2253, 1659, 1594, 1496, 1315, 1208. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{26}H_{24}N_2O_5SNa$ 499.1298; found 499.1284.

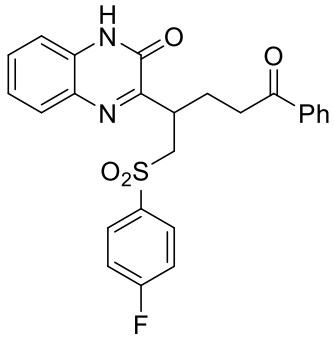


2d: 27.7 mg, 30%, yellow solid, m.p. 103-104 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.2 (s, 1H), 8.17-8.15 (m, 1H), 7.86-7.81 (m, 2H), 7.78-7.69 (m, 3H), 7.54-7.48 (m, 4H), 7.38-7.31 (m, 3H), 4.47-4.38 (m, 1H), 4.21-4.14 (m, 1H), 3.52-3.45 (m, 1H), 3.13-2.97 (m, 2H), 2.34-2.22 (m, 2H), 1.16 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 157.4, 156.0, 136.6, 135.9, 133.6, 133.1, 132.4, 130.4, 130.1, 128.5, 128.4, 128.2, 127.9, 125.9, 124.4, 115.7, 58.3, 36.2, 35.5, 35.0, 30.9, 28.3. FT-IR: ν (cm^{-1}) 3065, 2924, 2558, 1671, 1583, 1495, 1421, 1290. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{29}H_{30}N_2O_4SNa$ 525.1818; found 525.1820.

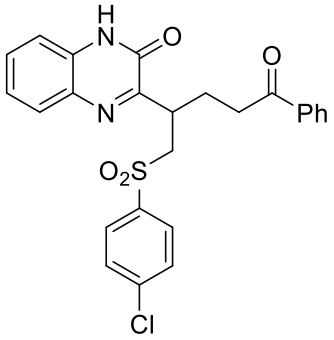


2e: 76.3 mg, 72%, yellow solid, m.p. 137-140 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, DMSO-*d*6) δ 12.3 (s, 1H), 7.94-7.89 (m, 2H), 7.86-7.79 (m, 2H), 7.62-7.57 (m, 2H), 7.51-7.40 (m, 5H), 7.28-7.21 (m, 2H), 4.26-4.16 (m, 1H), 3.93-3.81 (m, 2H), 3.14-2.90 (m, 2H), 2.14-2.00 (m, 2H); ^{13}C NMR (100 MHz, DMSO-*d*6) δ 199.5, 160.7, 154.7, 152.1 (q, $J_{C\text{-}F}$ = 1.6 Hz), 138.3, 137.0, 133.4, 132.1, 131.6, 131.0, 130.4, 129.0, 128.6, 128.2, 123.5, 121.5, 120.1 (q, $J_{C\text{-}F}$ = 257.1 Hz), 115.6, 57.4, 36.1, 35.4, 27.7; ^{19}F NMR (376 MHz, DMSO-*d*6) δ -56.8 (s). FT-IR: ν (cm^{-1}) 3395, 2919, 2849, 1612, 1560, 1469,

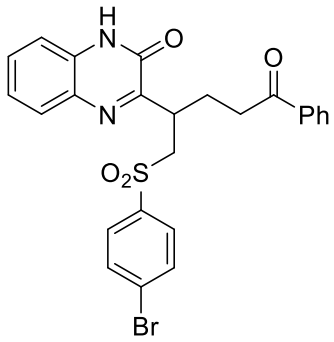
1373, 1288, 1206. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{26}H_{21}N_2O_5SF_3Na$ 553.1015; found 553.1011.



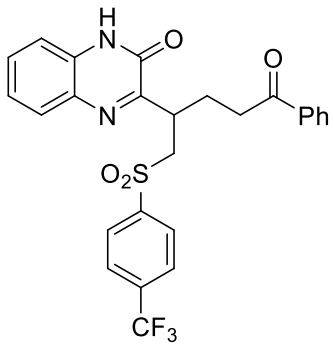
2f: 39.6 mg, 45%, yellow solid, m.p. 128-135 ºC. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, DMSO-*d*6) δ 12.4 (s, 1H), 7.86-7.80 (m, 4H), 7.62-7.57 (m, 2H), 7.51-7.44 (m, 3H), 7.31-7.23 (m, 4H), 4.21-4.11 (m, 1H), 3.88-3.78 (m, 2H), 3.13-3.03 (m, 1H), 3.00-2.91 (m, 1H), 2.13-2.01 (m, 2H); ^{13}C NMR (100 MHz, DMSO-*d*6) δ 199.6, 165.3 (d, J_{C-F} = 251.3 Hz), 160.8, 154.7, 137.0, 135.9 (d, J_{C-F} = 2.7 Hz), 133.5, 132.1, 131.7, 131.5 (d, J_{C-F} = 9.9 Hz), 130.4, 129.0, 128.7, 128.2, 123.5, 116.8 (d, J_{C-F} = 22.6 Hz) , 115.6, 57.7, 36.2, 35.4, 27.7. ^{19}F NMR (376 MHz, DMSO-d6) δ -104.96 (s). FT-IR: ν (cm^{-1}) 3395, 2919, 2256, 1683, 1589, 1433, 1369, 1225. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{25}H_{21}FN_2O_4SNa$ 487.1098; found 487.1096.



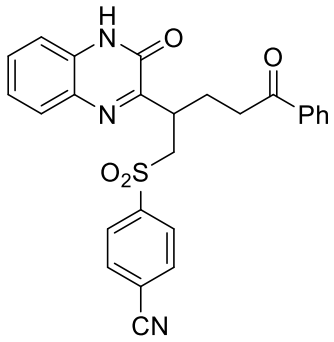
2g: 26.2 mg, 40%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, DMSO-*d*6) δ 12.3 (s, 1H), 7.87-7.80 (m, 2H), 7.78-7.73 (m, 2H), 7.62-7.56 (m, 2H), 7.52-7.43 (m, 5H), 7.29-7.23 (m, 2H), 4.23-4.14 (m, 1H), 3.89-3.80 (m, 2H), 3.15-2.89 (m, 2H), 2.13-2.01 (m, 2H); ^{13}C NMR (100 MHz, DMSO-*d*6) δ 199.5, 160.6, 154.7, 139.2, 138.3, 137.0, 133.4, 132.1, 131.7, 130.4, 130.1, 129.7, 129.0, 128.6, 128.2, 123.5, 115.6, 57.6, 36.2, 35.4, 27.8. FT-IR: ν (cm^{-1}) 3404, 2921, 2851, 1685, 1579, 1470, 1411, 1370，1243. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{25}H_{21}N_2O_4SClNa$ 503.0803; found 503.0819.



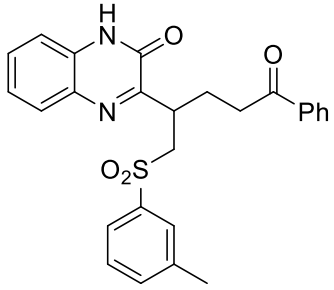
2h: 48.6 mg, 47%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, DMSO-*d*6) δ 12.3 (s, 1H), 7.84-7.79 (m, 2H), 7.69-7.53 (m, 6H), 7.51-7.42 (m, 3H), 7.34-7.21 (m, 2H), 4.25-4.11 (m, 1H), 3.86-3.77 (m, 2H), 3.16-2.84 (m, 2H), 2.12-1.98 (m, 2H); ^{13}C NMR (100 MHz, DMSO-*d*6) δ 199.6, 160.6, 154.6, 138.7, 137.0, 133.5, 132.7, 132.1, 131.6, 130.4, 130.2, 129.0, 128.6, 128.3, 128.2, 123.5, 115.7, 57.5, 36.2, 35.4, 27.7. FT-IR: ν (cm^{-1}) 3374, 2924, 1682, 1573, 1503, 1448, 1371, 1245. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{25}H_{21}N_2O_4SBrNa$ 547.0298; found 547.0289.



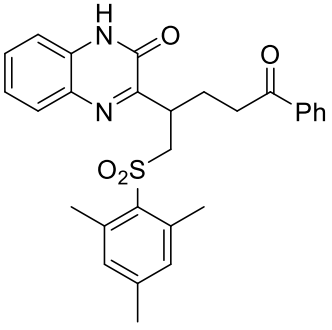
2i: 49.6 mg, 50%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, DMSO-*d*6) δ 12.3 (s, 1H), 7.96 (d, *J* = 8.0 Hz, 2H), 7.85-7.81 (m, 2H), 7.76 (d, *J* = 8.4 Hz, 2H), 7.62-7.56 (m, 1H), 7.54-7.51 (m, 1H), 7.49-7.43 (m, 3H), 7.25-7.18 (m, 2H), 4.31-4.22 (m, 1H), 3.96-3.83 (m, 2H), 3.16-2.90 (m, 2H), 2.15-2.01 (m, 2H); ^{13}C NMR (100 MHz, DMSO-*d*6) δ 199.5, 160.4, 154.6, 143.3 (q, J_{C-F} = 0.9 Hz), 137.0, 133.5 (q, J_{C-F} = 32.1 Hz), 133.5, 132.0, 131.5, 130.4, 129.3, 129.0, 128.5, 128.2, 126.7 (q, J_{C-F}= 3.6 Hz), 125.8 (q, J_{C-F} = 271.5 Hz), 123.5, 115.6, 57.3, 36.1, 35.4, 27.8; ^{19}F NMR (376 MHz, DMSO-*d*6) δ -61.86 (s). FT-IR: ν (cm^{-1}) 3397, 2918, 2852, 1674, 1402, 1232, 1211. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{26}H_{21}N_2O_4SF_3Na$ 537.1066; found 537.1072.



2j: 28.3 mg, 30%, yellow solid, m.p. 189-191 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, DMSO-*d*6) δ 12.3 (s, 1H), 7.94-7.81 (m, 6H), 7.62-7.43 (m, 5H), 7.29-7.23 (m, 2H), 4.29-4.19 (m, 1H), 3.97-3.82 (m, 2H), 3.16-2.92 (m, 2H), 2.16-2.02 (m, 2H); ^{13}C NMR (100 MHz, DMSO-*d*6) δ 199.5, 160.4, 154.7, 143.6, 137.0, 133.6, 133.5, 132.1, 131.5, 130.6, 129.0, 129.0, 128.7, 128.2, 123.5, 117.8, 116.2, 115.6, 57.4, 36.1, 35.4, 27.7. FT-IR: ν (cm^{-1}) 3405, 2958, 2851, 1669, 1486, 1399, 1284, 1209. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{26}H_{21}N_3O_4SNa$ 494.1145; found 494.1148.

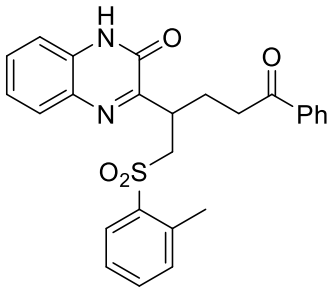


2k: 56.3 mg, 61%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.83-7.79 (m, 2H), 7.69-7.59 (m, 2H), 7.56 (s, 1H), 7.53-7.43 (m, 2H), 7.38-7.26 (m, 4H), 7.18-7.09 (m, 2H), 4.43-4.34 (m, 1H), 4.23-4.13 (m, 1H), 3.48 (dd, *J* = 14.4, 2.8 Hz, 1H), 3.16-3.05 (m, 1H), 3.02-2.92 (m, 1H), 2.35-2.21 (m, 2H), 2.16 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 159.3, 156.0, 139.3, 138.9, 136.6, 134.1, 133.1, 132.3, 130.7, 130.5, 128.9, 128.9, 128.6, 128.5, 127.9, 125.3, 124.2, 115.6, 58.7, 36.1, 35.4, 28.3, 21.0. FT-IR: ν (cm^{-1}) 2921, 2850, 1659, 1561, 1368, 1209. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{26}H_{24}N_2O_4SNa$ 483.1349; found 483.1334.

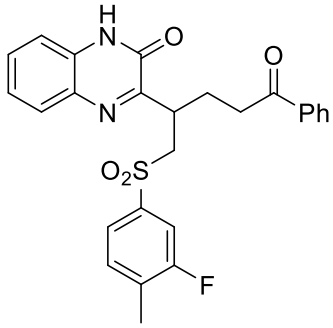


2l: 34.3 mg, 35%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.85-7.80 (m, 2H), 7.68-7.64 (m, 1H), 7.51-7.44 (m, 2H), 7.38-7.29 (m, 3H), 7.26-7.23 (m, 1H), 6.53 (s, 2H), 4.57-4.49 (m, 1H), 4.30-4.21 (m, 1H), 3.41-3.35 (m, 1H), 3.21-3.10 (m, 1H), 3.04-2.95 (m, 1H), 2.57 (s, 6H), 2.34-2.24 (m, 2H), 1.99 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 159.2, 155.8, 143.2, 140.1, 136.7, 133.1, 132.6, 132.2, 132.0, 130.8,

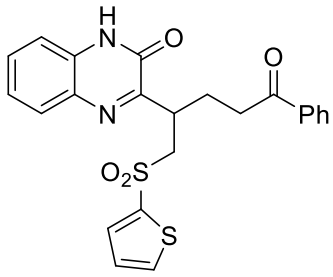
130.3, 128.8, 128.5, 127.9, 124.2, 115.5, 58.4, 36.0, 35.5, 28.6, 22.9, 20.8. FT-IR: ν (cm^{-1}) 3674, 2972, 2901, 1978, 1596, 1307, 1277. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{28}H_{28}N_2O_4SNa$ 511.1662; found 511.1672.



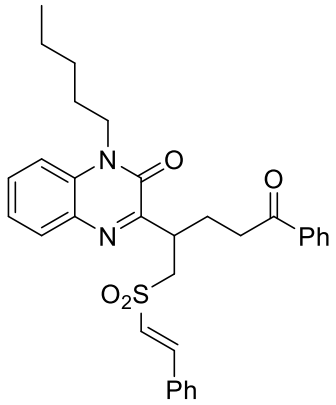
2m: 42.2 mg, 48%, yellow solid, m.p. 153-155 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.4 (s, 1H), 7.87-7.83 (m, 3H), 7.70-7.68 (m, 1H), 7.57-7.45 (m, 3H), 7.38-7.33 (m, 3H), 7.22-7.17 (m, 1H), 7.09-7.04 (m, 1H), 6.94-6.90 (m, 1H), 4.54-4.45 (m, 1H), 4.27-4.21 (m, 1H), 3.53-3.48 (m, 1H), 3.18-3.11 (m, 1H), 3.05-2.98 (m, 1H), 2.64 (s, 3H), 2.34-2.27 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 159.3, 156.0, 138.3, 136.9, 136.6, 133.3, 133.1, 132.3, 132.2, 130.8, 130.5, 130.2, 128.7, 128.5, 127.9, 126.3, 124.2, 115.7, 57.6, 35.8, 35.5, 28.5, 20.4; FT-IR: ν (cm^{-1}) 2971, 2917, 2359, 1698, 1521, 1287, 1210. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{26}H_{24}N_2O_4SNa$ 483.1349; found 483.1339.



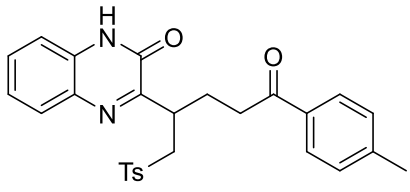
2n: 52.6 mg, 55%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.5 (s, 1H), 7.86-7.78 (m, 2H), 7.68-7.63 (m, 1H), 7.55-7.42 (m, 4H), 7.37-7.28 (m, 4H), 7.12-7.04 (m, 1H), 4.43-4.32 (m, 1H), 4.24-4.14 (m, 1H), 3.47 (dd, J = 14.4, 2.8 Hz, 1H), 3.16-2.88 (m, 2H), 2.34-2.22 (m, 2H), 2.08 (d, J = 1.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 160.6 (d, $J_{C\text{-}F}$ = 249.1 Hz), 159.1, 156.1, 138.3 (d, $J_{C\text{-}F}$ = 6.5 Hz), 136.6, 133.1, 132.3, 132.1 (d, $J_{C\text{-}F}$ = 4.8 Hz), 131.8 (d, $J_{C\text{-}F}$ = 17.2 Hz), 130.7, 130.6, 128.9, 128.5, 127.9, 124.3, 123.8 (d, $J_{C\text{-}F}$ = 3.6 Hz), 115.7, 115.2 (d, $J_{C\text{-}F}$ = 25.2 Hz), 58.7, 36.0, 35.3, 28.4, 14.6 (d, $J_{C\text{-}F}$ = 3.5 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ -113.67 (s). FT-IR: ν (cm^{-1}) 3064, 2925, 1664, 1582, 1449, 1317, 1231. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{26}H_{23}N_2O_4SFNa$ 501.1255; found 501.1246.



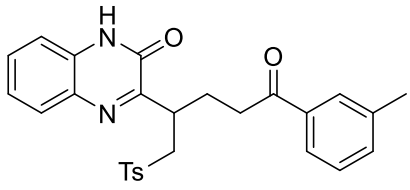
2o: 60.0 mg, 66%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.4 (s, 1H), 7.85-7.78 (m, 2H), 7.74-7.69 (m, 1H), 7.62 (dd, J = 3.6, 1.2 Hz, 1H), 7.53-7.44 (m, 3H), 7.38-7.28 (m, 4H), 6.90 (dd, J = 4.8, 3.6 Hz, 1H), 4.51-4.43 (m, 1H), 4.27-4.18 (m, 1H), 3.58 (dd, J = 14.4, 3.2 Hz, 1H), 3.17-2.93 (m, 2H), 2.38-2.24 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 159.2, 156.1, 140.2, 136.6, 134.6, 134.1, 133.1, 132.4, 130.8, 130.5, 129.0, 128.5, 127.9, 127.7, 124.3, 115.7, 59.9, 36.4, 35.4, 28.2. FT-IR: ν (cm^{-1}) 3090, 2917, 2850, 2252, 1658, 1504, 1448, 1312, 1211. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{23}H_{20}N_2O_4S_2Na$ 475.0757; found 475.0760.



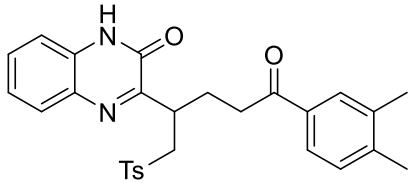
2p: 45.5 mg, 42%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89-7.80 (m, 3H), 7.55-7.49 (m, 2H), 7.43-7.32 (m, 5H), 7.28-7.23 (m, 2H), 7.23-7.18 (m, 2H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.65 (d, *J* = 15.6 Hz, 1H), 4.33-4.24 (m, 1H), 4.23-4.16 (m, 1H), 4.07-3.87 (m, 2H), 3.47-3.40 (m, 1H), 3.16-2.96 (m, 2H), 2.42-2.24 (m, 2H), 1.59-1.47 (m, 2H), 1.39-1.32 (m, 4H), 0.94-0.89 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 159.5, 154.2, 144.6, 136.7, 133.1, 132.7, 132.2, 132.1, 131.1, 130.3, 130.1, 128.9, 128.5, 128.4, 128.0, 125.1, 123.5, 113.7, 57.7, 42.3, 37.0, 35.8, 29.0, 28.1, 26.7, 22.3, 14.0. FT-IR: ν (cm^{-1}) 3058, 2924, 2854, 2251, 1683, 1489, 1398, 1244. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{32}H_{34}N_2O_4SNa$ 565.2131; found 565.2134.



2q: 51.0 mg, 60%, yellow solid, m.p. 174-176 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.74-7.64 (m, 5H), 7.52-7.47 (m, 1H), 7.34-7.27 (m, 2H), 7.12 (d, *J* = 8.0 Hz, 2H), 7.05 (d, *J* = 8.4 Hz, 2H), 4.39-4.32 (m, 1H), 4.18-4.11 (m, 1H), 3.46 (dd, *J* = 14.4, 2.8 Hz, 1H), 3.09-3.01 (m, 1H), 2.98-2.89 (m, 1H), 2.31 (s, 3H), 2.30-2.19 (m, 2H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.5, 159.4, 156.0, 144.6, 143.9, 136.1, 134.1, 132.3, 130.8, 130.4, 129.6, 129.2, 128.9, 128.2, 128.0, 124.2, 115.6, 58.7, 36.2, 35.3, 28.4, 21.6, 21.4. FT-IR: ν (cm^{-1}) 2924, 2854, 2253, 1669, 1404, 1285, 1208. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{27}H_{26}N_2O_4SNa$ 497.1505; found 497.1490.

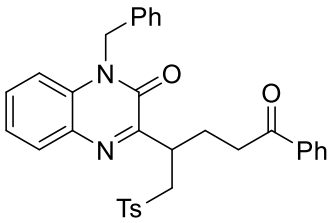


2r: 56.2 mg, 60%, yellow solid, m.p. 146-148 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.4 (s, 1H), 7.69-7.58 (m, 5H), 7.53-7.47 (m, 1H), 7.35-7.27 (m, 3H), 7.25-7.20 (m, 1H), 7.08-7.03 (m, 2H), 4.40-4.32 (m, 1H), 4.21-4.13 (m, 1H), 3.47 (dd, *J* = 14.0, 2.8 Hz, 1H), 3.12-2.90 (m, 2H), 2.37-2.31 (m, 1H), 2.30 (s, 3H), 2.27-2.21 (m, 1H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.1, 159.3, 156.0, 144.6, 138.3, 136.7, 136.1, 133.8, 132.3, 130.8, 130.4, 129.6, 128.9, 128.4, 128.2, 125.1, 124.2, 115.6, 58.6, 36.2, 35.5, 28.3, 21.4, 21.3. FT-IR: ν (cm^{-1}) 3629, 2959, 2360, 1672, 1488, 1286, 1232. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{27}H_{26}N_2O_4SNa$ 497.1505; found 497.1502.

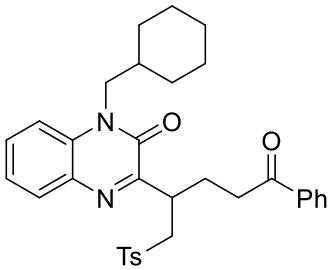


2s: 33.5 mg, 40%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.4 (s, 1H), 7.69-7.63 (m, 3H), 7.58-7.46 (m, 3H), 7.34-7.27 (m, 2H), 7.10-7.02 (m, 3H), 4.40-4.32 (m, 1H), 4.19-4.11 (m, 1H), 3.46 (dd, *J* = 14.4, 2.8 Hz, 1H), 3.11-2.87 (m, 2H), 2.35-2.23 (m, 2H), 2.21 (s, 3H), 2.19 (s, 3H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 159.4, 156. 0, 144.6, 142.6, 136.8, 136.1, 134.6, 132.3, 130.8, 130.4, 129.7, 129.6, 129.0, 128.9, 128.2, 125.7, 124.1, 115.6, 58.6, 36.3, 35.3, 28.4, 21.4, 19.9, 19.7. FT-IR: ν (cm^{-1}) 2922, 2853, 1662, 1501, 1431, 1360, 1284, 1206. HRMS [ESI] m/z:

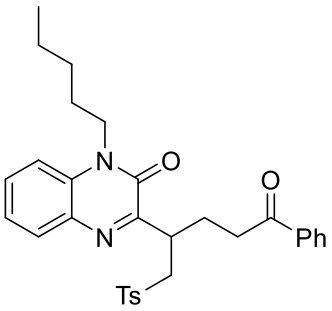
[M+Na]$^+$ calcd for $C_{28}H_{28}N_2O_4SNa$ 511.1662; found 511.1671.



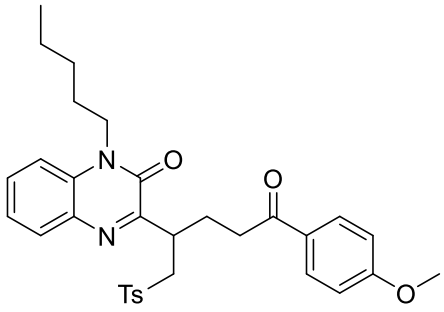
2t: 88.0 mg, 80%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.77 (m, 2H), 7.73-7.63 (m, 3H), 7.53-7.48 (m, 1H), 7.41-7.26 (m, 8H), 7.25-7.18 (m, 2H), 7.06 (d, *J* = 8.0 Hz, 2H), 5.49-5.37 (m, 2H), 4.39-4.32 (m, 1H), 4.18-4.09 (m, 1H), 3.46-3.39 (m, 1H), 3.11-2.90 (m, 2H), 2.37-2.18 (m, 2H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 159.2, 154.6, 144.3, 136.6, 136.2, 135.2, 133.1, 132.5, 132.2, 130.2, 130.0, 129.6, 129.0, 128.5, 128.3, 127.9, 127.7, 127.0, 123.6, 114.3, 58.6, 45.9, 36.8, 35.6, 28.3, 21.4. FT-IR: ν (cm^{-1}) 3061, 2924, 1683, 1600, 1449, 1367, 1288, 1207. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{33}H_{30}N_2O_4SNa$ 573.1818; found 573.1819.



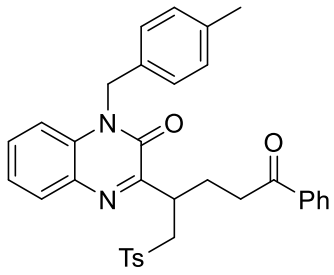
2u: 80.1 mg, 72%, yellow solid, m.p. 136-138 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84-7.76 (m, 2H), 7.71-7.65 (m, 3H), 7.53-7.45 (m, 2H), 7.42-7.34 (m, 2H), 7.32-7.26 (m, 1H), 7.25-7.20 (m, 1H), 7.09 (d, *J* = 8.4 Hz, 2H), 4.38-4.28 (m, 1H), 4.19-3.93 (m, 3H), 3.43-3.34 (m, 1H), 3.08-2.97 (m, 1H), 2.93-2.83 (m, 1H), 2.20 (s, 3H), 2.17-2.11 (m, 1H), 1.78-1.56 (m, 6H), 1.26-1.08 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 159.0, 154.6, 144.3, 136.6, 136.2, 133.0, 132.5, 132.5, 130.2, 130.0, 129.5, 128.5, 128.4, 127.9, 123.3, 113.9, 58.6, 48.1, 36.6, 35.7, 30.9, 30.8, 28.4, 26.2, 25.8, 21.4. FT-IR: ν (cm^{-1}) 2922, 2850, 1684, 1488, 1399, 1288, 1208. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{33}H_{36}N_2O_4SNa$ 579.2288; found 579.2296.



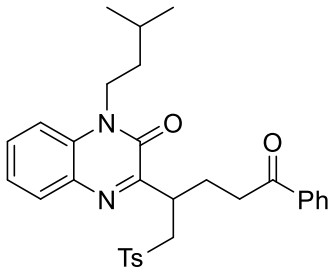
2v: 84.5 mg, 81%, yellow solid, m.p. 97-98 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83-7.76 (m, 2H), 7.68-7.63 (m, 3H), 7.52-7.47 (m, 2H), 7.41-7.34 (m, 2H), 7.30-7.26 (m, 1H), 7.25-7.19 (m, 1H), 7.04 (d, *J* = 8.0 Hz, 2H), 4.38-4.29 (m, 1H), 4.17-4.02 (m, 3H), 3.42-3.36 (m, 1H), 3.09-2.85 (m, 2H),2.33-2.19 (m, 1H), 2.16 (s, 3H), 2.14-2.04 (m, 1H), 1.74-1.61 (m, 2H), 1.46-1.36 (m, 4H), 0.96-0.89 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 158.8, 153.9, 144.2, 136.6, 136.2, 133.0, 132.4, 132.1, 130.2, 130.1, 129.5, 128.5, 128.3, 127.9, 123.3, 113.4, 58.4, 42.4, 36.8, 35.7, 29.1, 28.2, 26.9, 22.4, 21.4, 14.0. FT-IR: ν (cm^{-1}) 2924, 2852, 1684, 1600, 1468, 1301, 1245, 1208. HRMS [ESI] m/z: [M+Na]$^+$ calcd for $C_{31}H_{34}N_2O_4SNa$ 553.2131; found 553.2134.



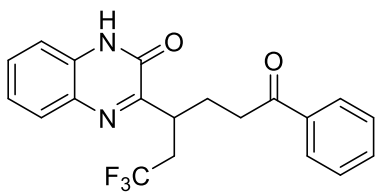
2w: 46.3 mg, 43%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.77 (m, 2H), 7.69-7.64 (m, 3H), 7.54-7.47 (m, 1H), 7.31-7.27 (m, 1H), 7.72-7.20 (m, 1H), 7.05 (d, *J* = 8.0 Hz, 2H), 6.89-6.82 (m, 2H), 4.33 (dd, *J* = 14.4, 10.0 Hz, 1H), 4.20-4.09 (m, 2H), 4.09- 4.01 (m, 1H), 3.84 (s, 3H), 3.39 (dd, *J* = 14.4, 3.2 Hz, 1H), 3.03-2.81 (m, 2H), 2.48-2.32 (m, 1H), 2.17 (s, 3H), 2.14-2.00 (m , 1H), 1.76-1.66 (m, 2H), 1.50- 1.34 (m, 4H), 0.93 (t, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.5, 163.4, 158.9, 153.9, 144.2, 136.2, 132.5, 132.1, 130.2, 130.2, 130.1, 129.7, 129.5, 128.4, 123.3, 113.6, 113.4, 58.3, 55.4, 42.4, 36.9, 35.3, 29.1, 28.4, 26.9, 22.4, 21.4, 14.0. FT-IR: ν (cm^{-1}) 3064, 2933, 1599, 1652, 1143. HRMS [ESI] m/z: $[M+H]^+$ calcd for $C_{32}H_{37}N_2O_5S$ 561.2418; found 561.2413.



2x: 76.5 mg, 70%, yellow solid, m.p. 160-161 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84-7.77 (m, 2H), 7.73-7.62 (m, 3H), 7.54-7.48 (m, 1H), 7.43-7.33 (m, 3H), 7.26-7.15 (m, 4H), 7.14-7.09 (m, 2H), 7.08-7.03 (m, 2H), 5.47-5.29 (m, 2H), 4.40-4.31 (m, 1H), 4.18-4.09 (m, 1H), 3.46-3.39 (m, 1H), 3.12-2.88 (m, 2H), 2.30 (s, 3H), 2.28-2.18 (m, 2H), 2.16 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 159.1, 154.5, 144.3, 137.5, 136.6, 136.2, 133.1, 132.5, 132.3, 132.2, 130.2, 130.0, 129.6, 129.6, 128.5, 128.4, 128.0, 127.0, 123.5, 114.3, 58.6, 45.7, 36.8, 35.7, 28.3, 21.4, 21.1. FT-IR: ν (cm^{-1}) 2923, 2252, 1683, 1599, 1469, 1368, 1288, 1207. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{34}H_{32}N_2O_4SNa$ 587.1975; found 587.1977.

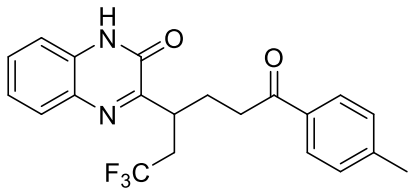


2y: 59.7 mg, 60%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83-7.77 (m, 2H), 7.68-7.63 (m, 3H), 7.54-7.46 (m, 2H), 7.42-7.34 (m, 2H), 7.31-7.26 (m, 1H), 7.21 (d, *J* = 8.4 Hz, 1H), 7.04 (d, *J* = 8.0 Hz, 2H), 4.38-4.29 (m, 1H), 4.20-4.02 (m, 3H), 3.43-3.36 (m, 1H), 3.07-2.85 (m, 2H), 2.27-2.18 (m, 1H), 2.16 (s, 3H), 2.14-2.02 (m, 1H), 1.79-1.75 (m, 1H), 1.61-1.48 (m, 2H), 1.03 (t, *J* = 5.6 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 158.8, 153.9, 144.2, 136.6, 136.2, 133.0, 132.5, 132.1, 130.2, 129.5, 128.5, 128.4, 127.9, 123.3, 113.3, 58.3, 41.0, 36.9, 35.7, 35.7, 28.2, 26.5, 22.5, 22.5, 21.4. FT-IR: ν (cm^{-1}) 2923, 2851, 1684, 1488, 1398, 1366, 1288, 1208. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{26}H_{24}N_2O_4SNa$ 553.2131; found 553.2114.

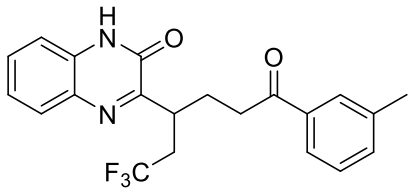


3a: 53.8 mg, 72%, yellow solid, m.p. 105-106 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.8 (s, 1H), 7.86-7.78 (m, 3H), 7.54-7.49 (m, 1H), 7.46-7.40 (m, 1H), 7.37-7.29 (m, 4H), 4.07-3.98 (m, 1H), 3.15-2.95 (m, 3H), 2.62-2.46 (m, 1H), 2.41-2.29 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.1, 160.5, 156.5,

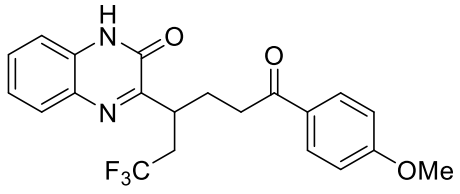
136.7, 133.0, 132.6, 130.8, 130.5, 129.0, 128.5, 127.9, 126.7 (q, J_{C-F} = 266.0 Hz), 124.3, 115.8, 36.6 (q, J_{C-F} = 27.7 Hz), 35.6, 34.7 (q, J_{C-F} = 2.5 Hz), 28.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ -64.18 (s). FT-IR: ν (cm^{-1}) 2925, 1659, 1598, 1484, 1373, 1251, 1208. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{20}H_{17}F_3N_2O_2Na$ 397.1134; found 397.1123.



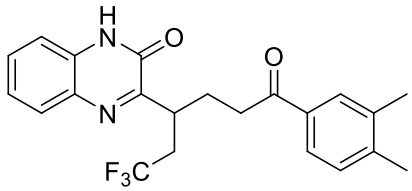
3b: 52.6 mg, 67%, yellow solid, m.p. 105-106 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.86-7.78 (m, 1H), 7.77-7.72 (m, 2H), 7.54-7.48 (m, 1H), 7.37-7.28 (m, 2H), 7.13 (d, J = 8.0 Hz, 2H), 4.02-3.91 (m, 1H), 3.16-2.90 (m, 3H), 2.58-2.46 (m, 1H), 2.42-2.34 (m, 2H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 160.4, 156.4, 143.8, 134.2, 132.7, 130.6, 130.4, 129.2, 129.1, 128.0, 126.8 (q, J_{C-F} = 275.4 Hz), 124.4, 115.8, 36.6 (q, J_{C-F} = 27.8 Hz), 35.5, 34.8 (q, J_{C-F} = 3.0 Hz), 28.1, 21.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -64.18 (s). FT-IR: ν (cm^{-1}) 2920, 2850, 1681, 1558, 1504, 1325, 1293, 1249. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{21}H_{19}F_3N_2O_2Na$ 411.1291; found 411.1281.



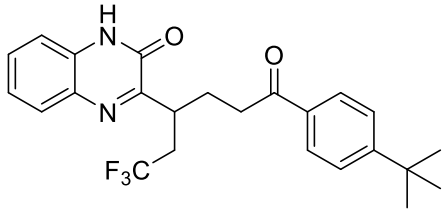
3c: 59.8 mg, 77%, yellow solid, m.p. 107-109 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.80 (dd, J = 8.0, 0.8 Hz, 1H), 7.65-7.59 (m, 2H), 7.54-7.48 (m, 1H), 7.37-7.28 (m, 2H), 7.26-7.18 (m, 2H), 4.06-3.96 (m, 1H), 3.14-2.90 (m, 3H), 2.60-2.49 (m, 1H), 2.42-2.30 (m, 2H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.4, 160.6, 156.2, 138.3, 136.8, 133.7, 132.6, 130.8, 130.4, 129.0, 128.4, 128.3, 126.8 (q, J_{C-F} = 275.6 Hz), 125.1, 124.3, 115.7, 36.7 (q, J_{C-F} = 27.8 Hz), 35.6, 34.8 (q, J_{C-F} = 2.0 Hz), 28.1, 21.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ -64.15 (s). FT-IR: ν (cm^{-1}) 2905, 2852, 1659, 1586, 1498, 1485, 1252. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{21}H_{19}F_3N_2O_2Na$ 411.1291; found 411.1281.



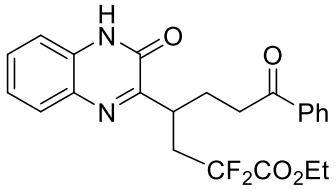
3d: 38.8 mg, 48%, yellow solid, m.p. 113-114 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.85-7.79 (m, 3H), 7.54-7.48 (m, 1H), 7.38-7.28 (m, 2H), 6.83-6.77 (m, 2H), 4.02-3.93 (m, 1H), 3.78 (s, 3H), 3.15-2.90 (m, 3H), 2.60-2.48 (m, 1H), 2.38-2.26 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.7, 163.4, 160.5, 156.3, 141.8, 132.7, 130.5, 130.2, 129.8, 129.1, 126.8 (q, J_{C-F} = 275.3 Hz), 124.4, 115.8, 113.6, 55.4, 36.8 (q, J_{C-F} = 27.9 Hz), 35.3, 34.9, 28.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -64.18 (s). FT-IR: ν (cm^{-1}) 3013, 2955, 2849, 1662, 1576, 1467, 1374, 1294, 1205. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{21}H_{19}F_3N_2O_3Na$ 427.1240; found 427.1251.



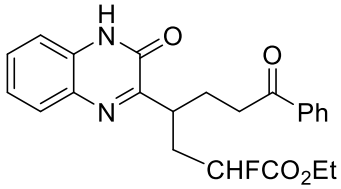
3e: 76.4 mg, 95%, yellow solid, m.p. 108-109 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.9 (s, 1H), 7.79 (dd, *J* = 8.0, 1.2 Hz ,1H), 7.61-7.56 (m, 2H), 7.51-7.46 (m, 1H), 7.35-7.31 (m, 1H), 7.20-7.17 (m, 1H), 7.09 (d, *J* = 7.6 Hz, 1H), 3.98-3.91 (m, 1H), 3.08-2.90 (m, 3H), 2.55-2.48 (m, 1H), 2.35-2.27 (m, 2H), 2.23 (s, 3H), 2.20(s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.1, 142.5, 141.8, 136.8, 134.7, 133.3, 131.8, 130.5, 129.7, 129.1, 129.1, 127.8, 126.6 (q, J_{C-F} = 265.9 Hz), 125.7, 124.5, 115.8, 36.4 (q, J_{C-F} = 28.1 Hz), 35.5, 34.9 (q, J_{C-F} = 2.6 Hz), 29.7, 28.2, 19.8 (q, J_{C-F} = 23.7 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ -64.18 (s). FT-IR: ν (cm^{-1}) 2962, 2924, 1662, 1608, 1498, 1408, 1375, 1258. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{22}H_{21}F_3N_2O_2Na$ 425.1447; found 425.1451.



3f: 64.2 mg, 74%, yellow solid, m.p. 157-158 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.4 (s, 1H), 8.08-7.99 (m, 1H), 7.83-7.77 (m, 3H), 7.54-7.49 (m, 1H), 7.39-7.34 (m, 3H), 4.03-3.96 (m, 1H), 3.12-2.94 (m, 3H), 2.59-2.49 (m, 1H), 2.38-2.27 (m, 2H), 1.27 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 160.5, 156.8, 141.8, 134.2, 132.7, 131.8, 130.5, 129.1, 127.9, 126.8 (q, J_{C-F} = 275.3 Hz), 125.5, 124.5, 115.8, 36.6 (q, *J* = 27.9 Hz), 35.5, 34.90 (q, *J* = 1.7 Hz), 35.0, 31.0, 28.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -64.17 (s). FT-IR: ν (cm^{-1}) 2962, 2852, 1683, 1605, 1503, 1324, 1259. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{24}H_{25}F_3N_2O_2Na$ 453.1760; found 453.1770.

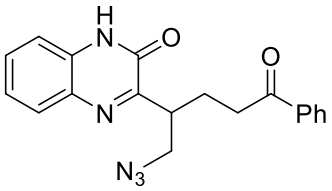


4a: 52.2 mg, 61%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.38 (s, 1H), 7.89-7.75 (m, 3H), 7.52-7.42 (m, 2H), 7.37-7.29 (m, 4H), 4.21-4.13 (m, 2H), 4.05-3.95 (m, 1H), 3.17-2.93 (m, 3H), 2.58-2.44 (m, 1H), 2.41-2.25 (m, 2H), 1.26 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.0, 163.9 (t, J_{C-F}= 31.8 Hz), 161.0, 156.1, 136.6, 132.7, 132.4, 130.6, 130.1, 128.7, 128.3, 127.7, 124.0, 115.6 (t, J_{C-F}= 256.5 Hz), 115.6, 62.7, 37.2 (t, J_{C-F}= 22.6 Hz), 35.6, 34.1, 28.4, 13.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -103.24 (d, *J* = 260.6 Hz), -104.53 (d, *J* = 260.6 Hz). FT-IR: ν (cm^{-1}) 2922, 2852, 1763, 1664, 1449, 1233. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{23}H_{22}F_2N_2NaO_4$ 451.1440; found 451.1444.

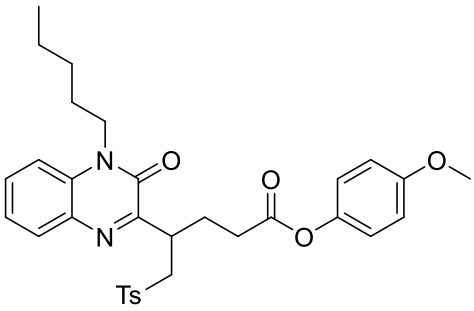


4b: 57.4 mg, 70%, *d.r.* = 1:1, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.5 (s, 1H, two isomers), 7.97-7.75 (m, 3H, two isomers), 7.57-7.41 (m, 2H, two isomers), 7.38-7.28 (m, 4H, two isomers), 5.20-4.84 (m, 1H, two isomers), 4.27-4.11 (m, 2H, two isomers), 3.97-3.83 (m, 1H, two isomers), 3.10-2.98 (m, 2H, two isomers), 2.84-2.57 (m, 1H, two isomers), 2.46-2.22 (m, 3H, two isomers), 1.30-1.22 (m, 3H, two isomers); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.6 & 199.6 (two isomers), 169.9 (d, *J* = 234.0 Hz) & 169.8 (d, *J* = 234.0 Hz) (two isomers), 161.8 & 161.3 (two isomers), 156.6 & 156.5 (two isomers),

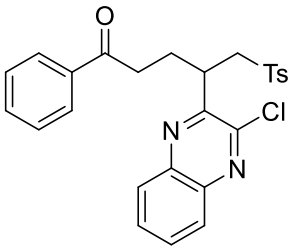
136.8 & 136.8 (two isomers) , 132.9 & 132.9 (overlap, two isomers), 132.7 & 132.7 (overlap, two isomers), 130.8 & 130.8 (two isomers), 130.3 & 130.2 (two isomers), 129.0 & 128.9 (two isomers), 128.5 & 128.5 (overlap, two isomers), 128.0 & 128.0 (two isomers), 124.2 & 124.2 (two isomers), 115.8 & 115.8 (two isomers), 88.1 (d, *J* = 183.2 Hz) & 87.5 (d, *J* = 182.9 Hz) (two isomers), 61.6 & 61.6 (overlap, two isomers), 36.6 & 36.5 (two isomers), 36.0 (d, *J* = 144.0 Hz) & 35.9 (d, *J* = 105.0 Hz) (two isomers), 35.4 & 35.2 (two isomers), 28.1 & 27.4 (two isomers), 14.1 & 14.1 (two isomers); ^{19}F NMR (376 MHz, $CDCl_3$) δ -189.39 (s), -191.03 (s). FT-IR: ν (cm^{-1}) 2925, 2853, 2255, 1737, 1664, 1598, 1261. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{23}H_{23}FN_2NaO_4$ 433.1534; found 433.1524.



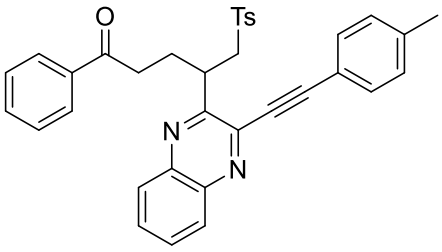
5: 38.2 mg, 55%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.3 (s, 1H), 7.92-7.86 (m, 2H), 7.84 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.54-7.43 (m, 2H), 7.39-7.28 (m, 4H), 3.99-3.83 (m, 2H), 3.77-3.65 (m, 1H), 3.14-2.99 (m, 2H), 2.43-2.23 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.4, 160.1, 156.4, 136.8, 133.0, 132.7, 130.8, 130.5, 129.2, 128.5, 128.0, 124.3, 115.8, 53.9, 40.7, 35.9, 25.4. FT-IR: ν (cm^{-1}) 3082, 2103, 1682, 1656, 1596. HRMS [ESI] m/z: $[M+Na]^+$ calcd for $C_{19}H_{17}N_5O_2Na$ 370.1274; found 370.1279.



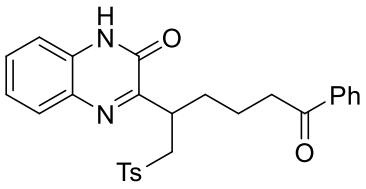
6: 74.5 mg, 80%, yellow oil. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 3/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.68 (d, *J* = 8.4 Hz, 2H), 7.55-7.49 (m, 1H), 7.35-7.28 (m, 1H), 7.24 (d, *J* = 8.4 Hz, 1H), 7.08 (d, *J* = 8.0 Hz, 2H), 6.87-6.77 (m, 4H), 4.30 (dd, *J* = 14.3, 10.0 Hz, 1H), 4.14 (t, *J* = 8.0 Hz, 2H), 4.10-4.02 (m, 1H), 3.76 (s, 3H), 3.39 (dd, *J* = 14.4, 3.2 Hz, 1H), 2.61-2.41 (m, 2H), 2.29-2.21 (m, 1H), 2.20 (s, 3H), 2.18-2.10 (m, 1H), 1.77-1.63 (m, 2H), 1.49-1.34 (m, 4H), 0.93 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.4, 158.4, 157.2, 153.9, 144.3, 144.0, 136.2, 132.5, 132.2, 130.3, 130.2, 129.5, 128.4, 123.4, 122.2, 114.3, 113.5, 58.2, 55.6, 42.4, 36.7, 31.3, 29.1, 28.6, 26.9, 22.4, 21.4, 14.0. FT-IR: ν (cm^{-1}) 2931, 2858, 1753, 1648, 1300. HRMS [ESI] m/z: $[M+H]^+$ calcd for $C_{32}H_{37}N_2O_6S$ 577.2367; found 577.2365.



7: 53.4 mg, 85%, yellow solid, m.p. 173-175 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96-7.88 (m, 1H), 7.85-7.76 (m, 3H), 7.75-7.67 (m, 2H), 7.57-7.49 (m, 3H), 7.44-7.36 (m, 2H), 6.89 (d, *J* = 8.0 Hz, 2H), 4.41 (dd, *J* = 14.4, 10.4 Hz, 1H), 4.32-4.21 (m, 1H), 3.49 (dd, *J* = 14.4, 2.0 Hz, 1H), 3.14-3.00 (m, 1H), 2.94-2.80 (m, 1H), 2.25 (dd, *J* = 14.4, 7.2 Hz, 2H), 2.03 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.3, 153.7, 147.2, 144.3, 140.8, 140.3, 136.4, 136.0, 133.2, 130.7, 130.1, 129.5, 128.6, 128.0, 127.9, 127.8, 59.2, 37.7, 34.9, 29.6, 21.2. FT-IR: ν (cm^{-1}) 2922, 1682, 1596, 1326. HRMS [ESI] m/z: $[M+H]^+$ calcd for $C_{26}H_{24}ClN_2O_3S$ 479.1191; found 479.1203.

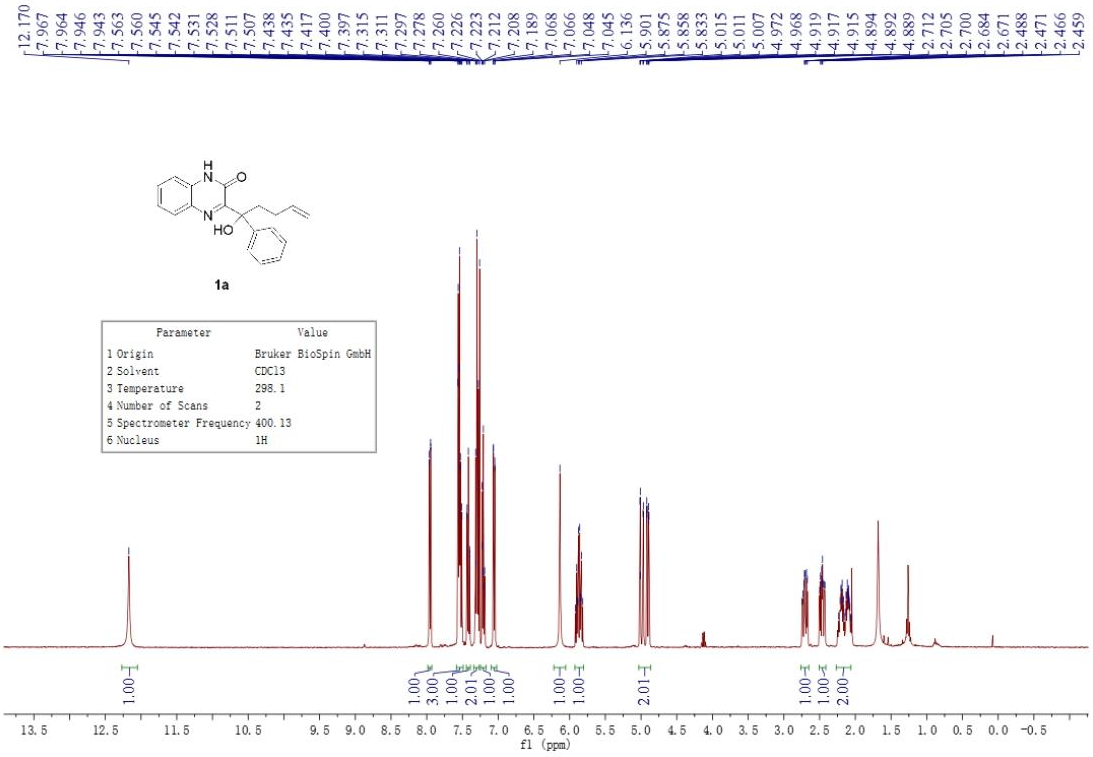


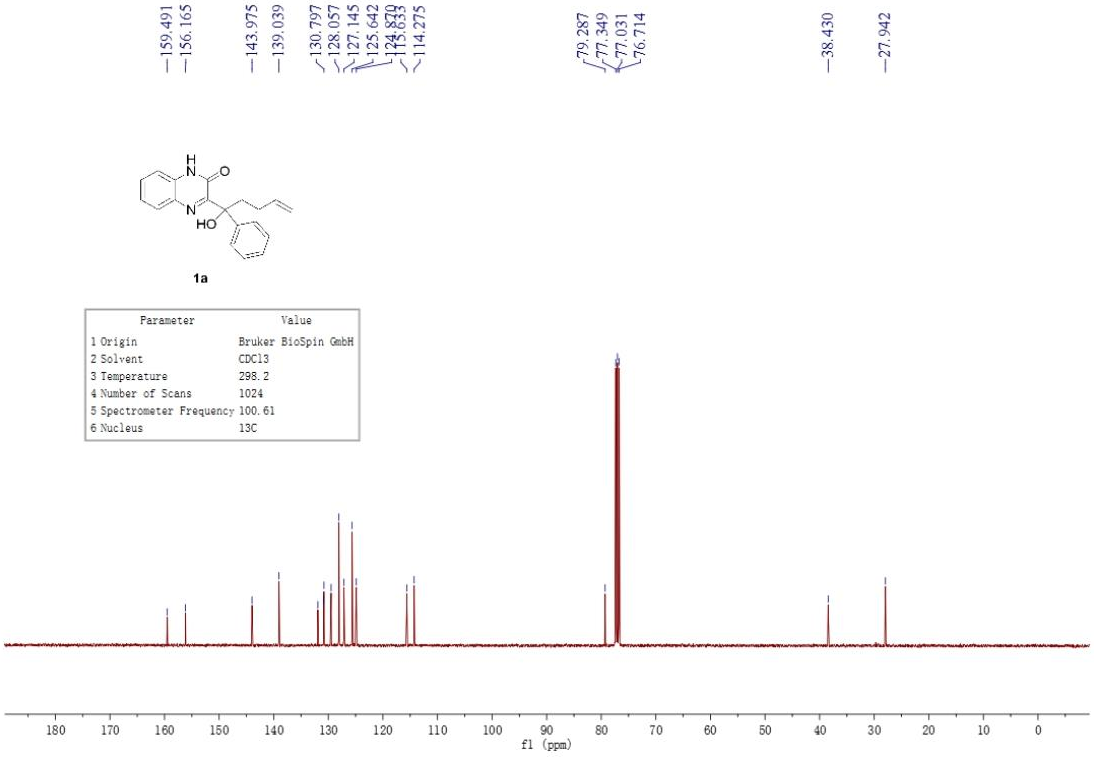
8: 34.3 mg, 82%, white solid, m.p. 166-167 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 2/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04-7.95 (m, 1H), 7.83-7.76 (m, 1H), 7.74-7.63 (m, 4H), 7.60-7.50 (m, 4H), 7.45 (t, *J* = 7.2 Hz, 1H), 7.34-7.26 (m, 2H), 7.21 (d, *J* = 8.0 Hz, 2H), 6.82 (d, *J* = 8.0 Hz, 2H), 4.50-4.36 (m, 2H), 3.61-3.50 (m, 1H), 3.09-2.95 (m, 1H), 2.88-2.76 (m, 1H), 2.42 (s, 3H), 2.39-2.31 (m, 1H), 2.30-2.19 (m, 1H), 2.00 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.3, 156.5, 144.1, 140.8, 140.4, 140.2, 139.7, 136.4, 135.9, 133.0, 132.4, 130.2, 130.1, 129.4, 129.3, 128.7, 128.7, 128.4, 127.9, 127.9, 118.2, 97.0, 85.8, 59.7, 38.4, 35.0, 30.2, 21.7, 21.2. FT-IR: ν (cm^{-1}) 3059, 2204, 1677, 1301. HRMS [ESI] m/z: $[M+H]^+$ calcd for $C_{35}H_{31}N_2O_3S$ 559.2050; found 559.2059.



14: 37.8 mg, 82%, white solid, m.p. 72-74 °C. Purification by flash column chromatography on silica gel (eluent: EtOAc/Petroleum ether = 1/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 11.8 (s, 1H), 7.92-7.88 (m, 2H), 7.73-7.66 (m, 3H), 7.55-7.39 (m, 4H), 7.35-7.30 (m, 1H), 7.28-7.26 (m, 1H), 7.06 (d, *J* = 8.0 Hz, 2H), 4.35-4.26 (m, 1H), 4.14-4.06 (m, 1H), 3.46-3.39 (m, 1H), 3.04-2.91 (m, 2H), 2.18 (s, 3H), 1.98-1.90 (m, 1H), 1.84-1.74 (m, 2H), 1.32-1.24 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.5, 159.8, 155.7, 144.5, 136.8, 136.2, 133.0, 132.4, 130.7, 130.3, 129.6, 129.0, 128.6, 128.3, 128.0, 124.2, 115.4, 58.3, 37.8, 36.2, 33.5, 21.4, 21.1. FT-IR: ν (cm^{-1}) 3447, 3060, 2961, 2849, 1650, 1483, 1379. HRMS [ESI] m/z: $[M+H]^+$ calcd for $C_{27}H_{26}N_2O_4SNa$ 497.1505; found 497.1507.

7. ^{1}H, ^{13}C, ^{19}F NMR spectra

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125.642
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77.349
77.031
76.714
38.430
27.942
1a
Parameter Value
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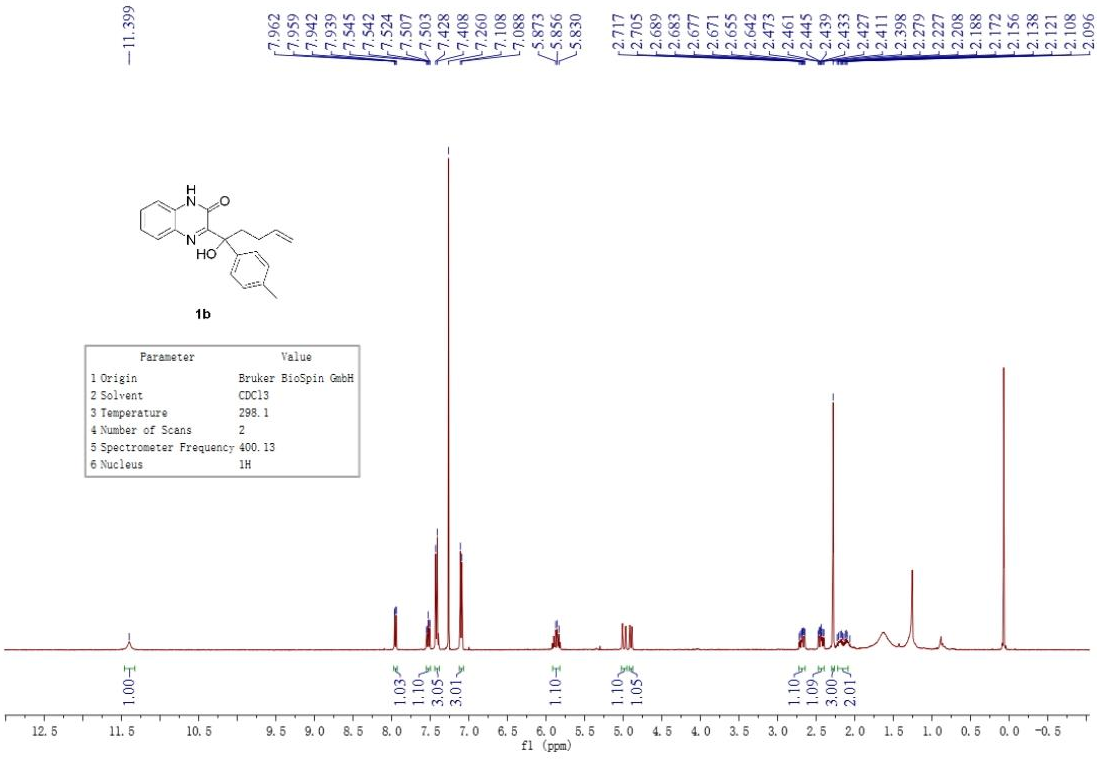
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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7.088
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5.830
2.717
2.705
2.689
2.683
2.677
2.671
2.655
2.642
2.473
2.461
2.445
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2.427
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2.279
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2.208
2.188
2.172
2.156
2.138
2.121
2.108
2.096
1b
Parameter Value
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2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
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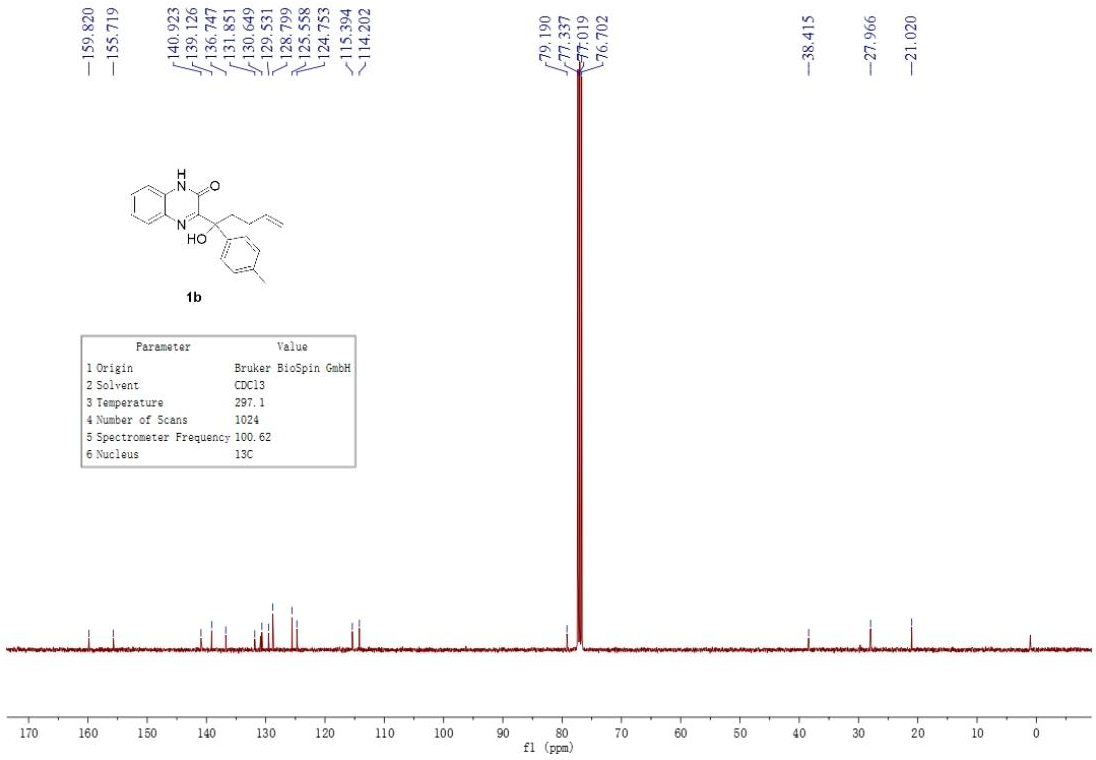
3.01
1.10
1.10
1.05
1.10
1.09
3.00
2.01
f1 (ppm)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130.649
129.531
128.799
125.558
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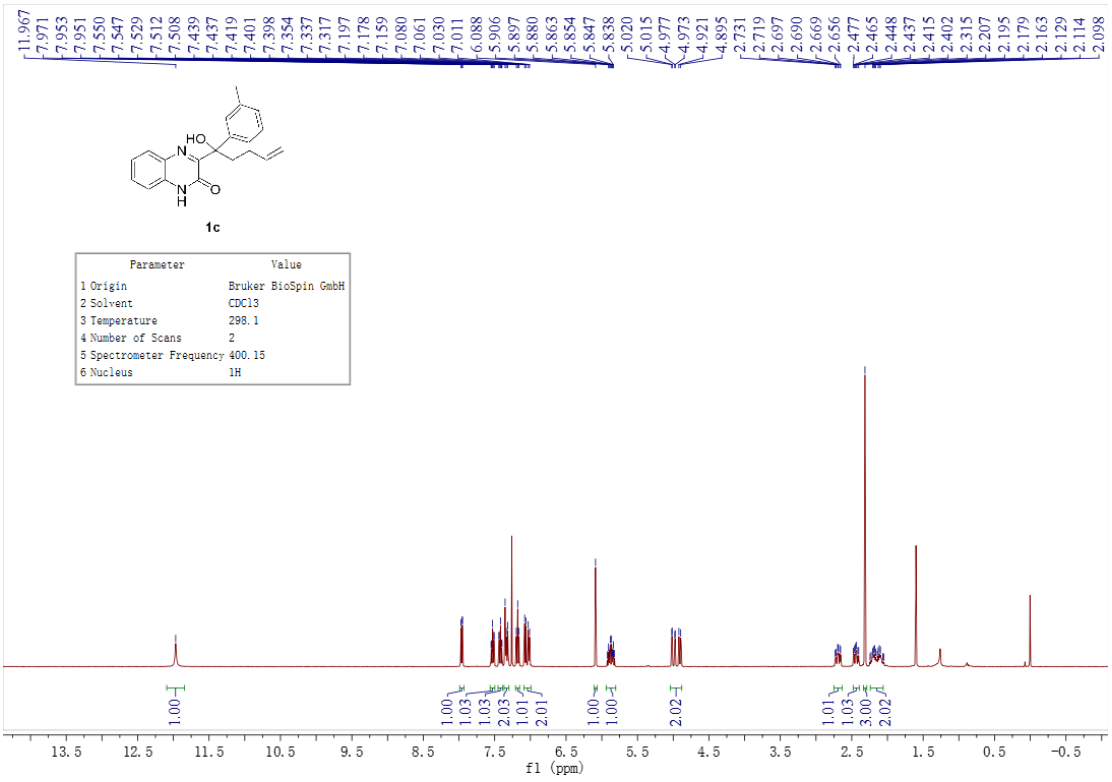
115.394
114.202
79.190
77.337
77.019
76.702
38.415
27.966
21.020
1b
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 297.1
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)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7.439
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7.401
7.398
7.354
7.337
7.317
7.197
7.178
7.159
7.080
7.061
7.030
7.011
6.088
5.906
5.897
5.880
5.863
5.854
5.847
5.838
5.020
5.015
4.977
4.973
4.921
4.895
2.731
2.719
2.697
2.690
2.669
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2.195
2.179
2.163
2.129
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2.098
1c
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
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1.00
1.03
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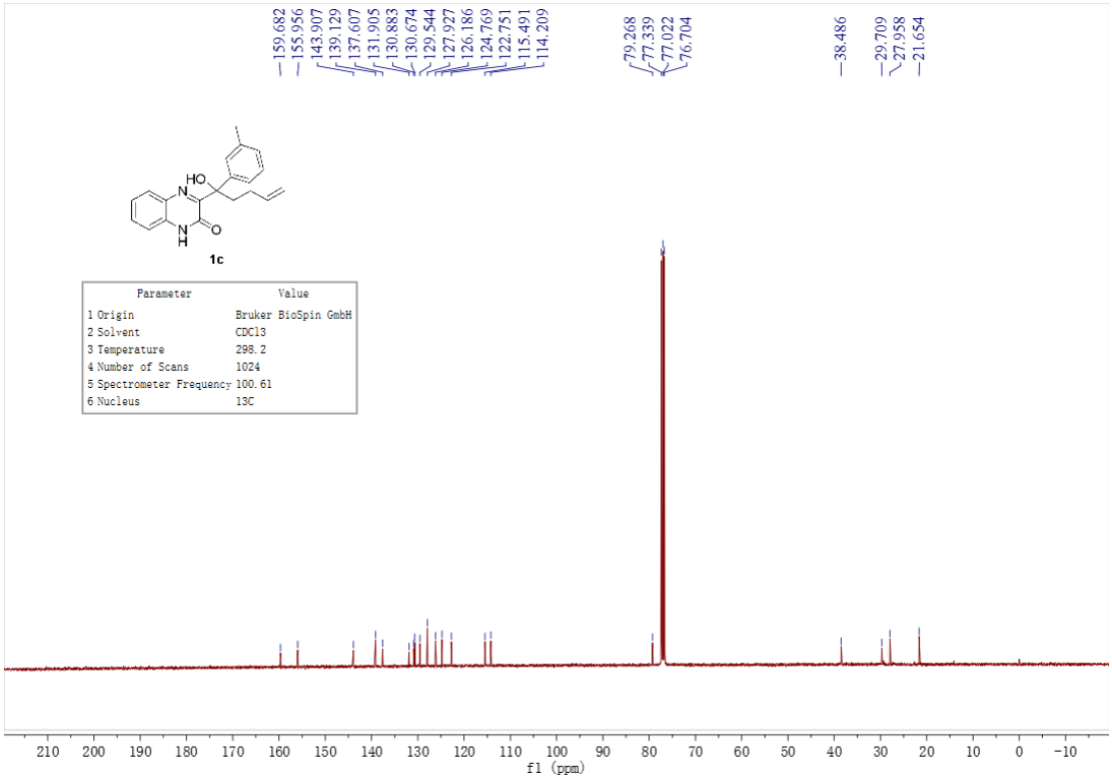
1.03
3.00
2.02
f1 (ppm)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115.491
114.209
79.268
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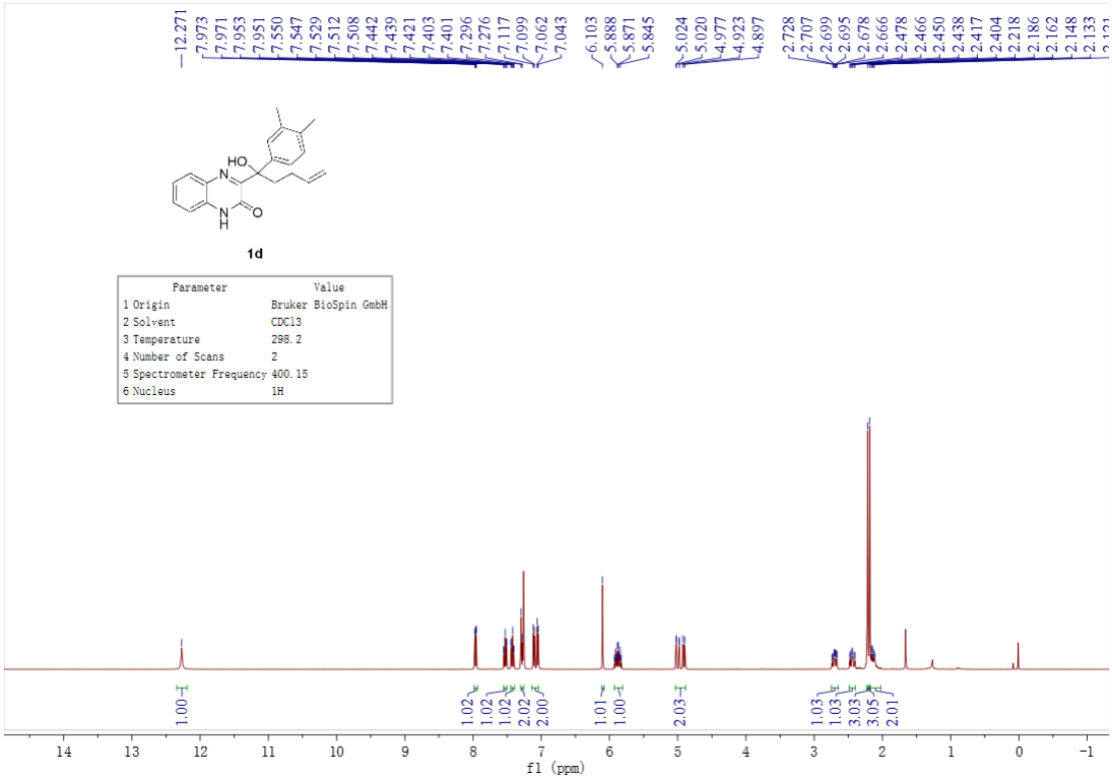
76.704
38.486
29.709
27.958
21.654
HO
N
O
N
H
1c
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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7.439
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7.403
7.401
7.296
7.276
7.117
7.099
7.062
7.043
6.103
5.888
5.871
5.845
5.024
5.020
4.977
4.923
4.897
2.728
2.707
2.699
2.695
2.678
2.666
2.478
2.466
2.450
2.438
2.417
2.404
2.218
2.186
2.162
2.148
2.133
HO
N
O
N
H
1d
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
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1.02
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1.03
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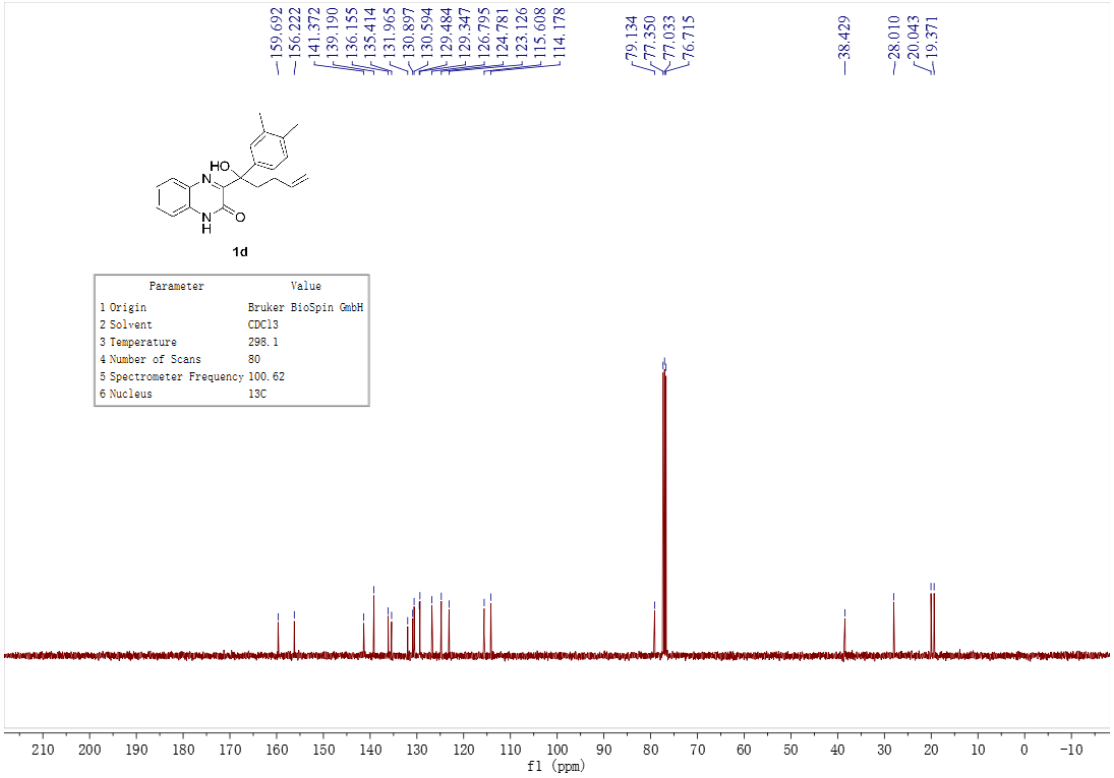
3.05
2.01
f1 (ppm)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123.126
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114.178
79.134
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28.010
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19.371
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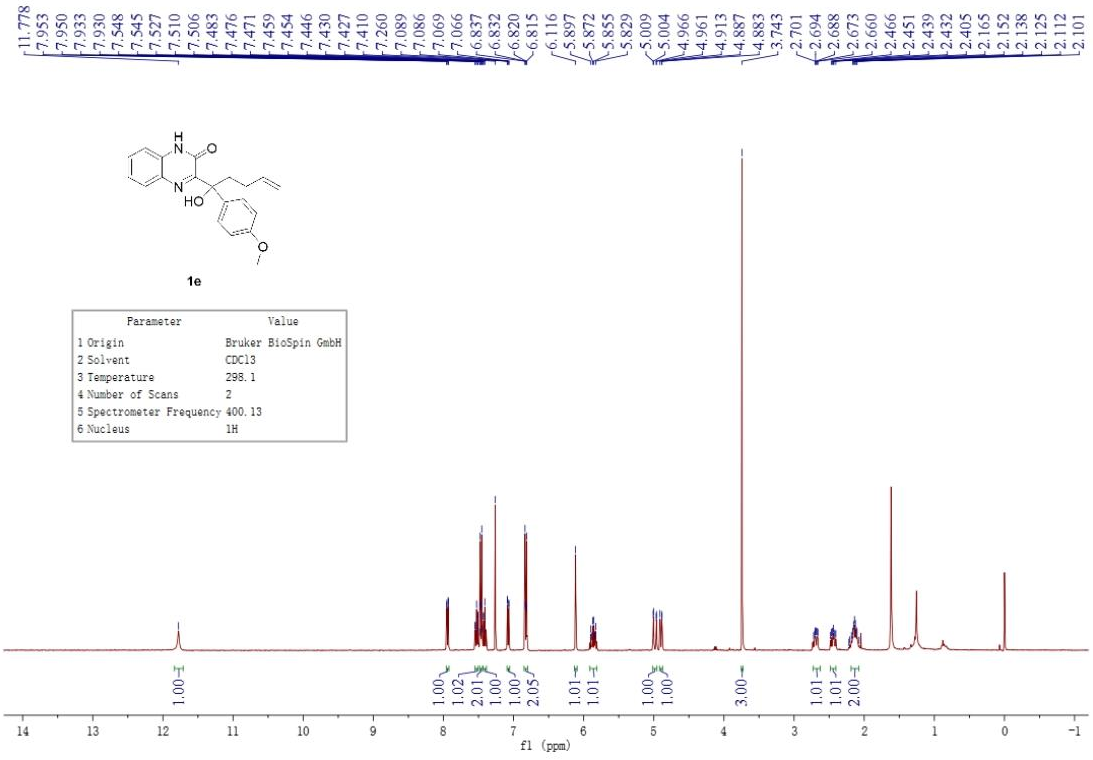
N
H
O
1d
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)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4.883
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2.660
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2.405
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2.152
2.138
2.125
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H
O
N
HO
O
1e
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
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1.00
1.02
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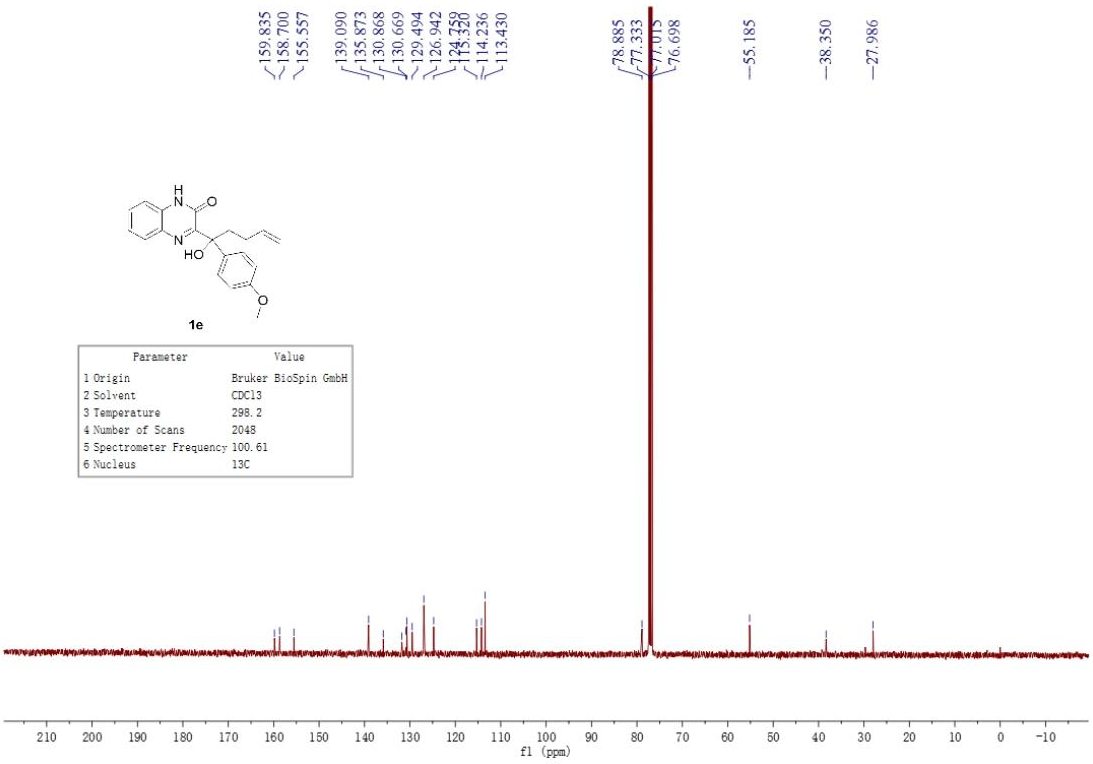
2.00
f1 (ppm)



1e

Parameter	Value
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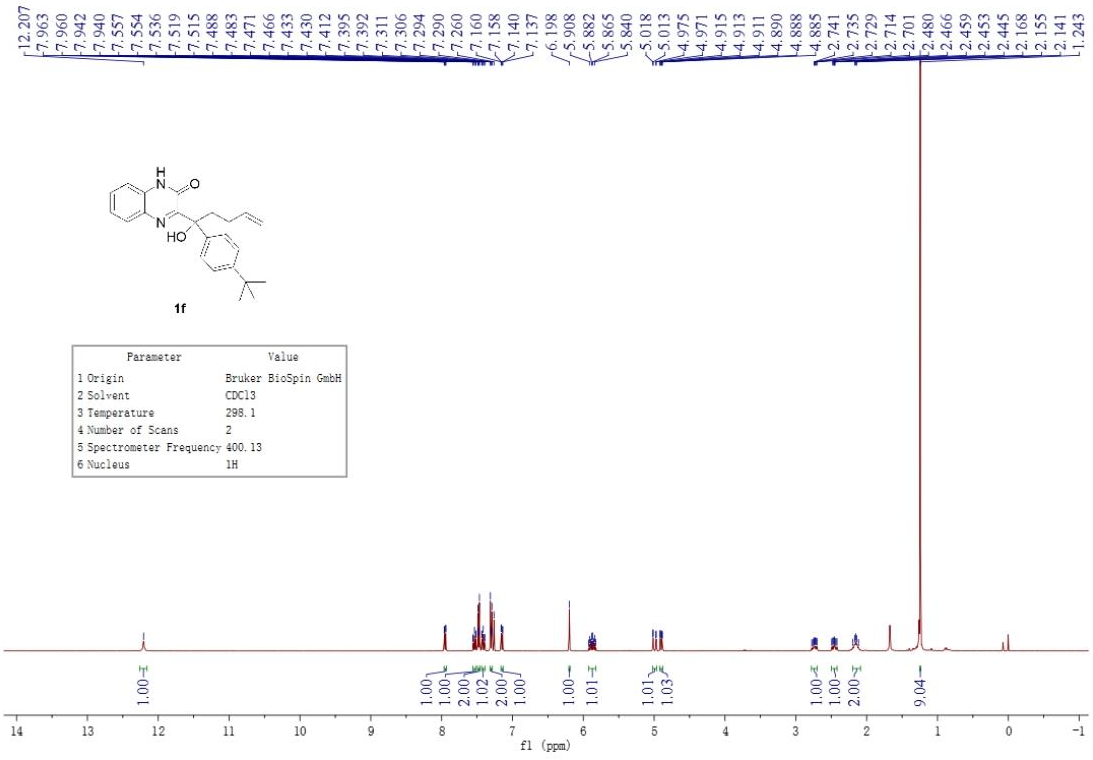
5 Spectrometer Frequency	100.61
6 Nucleus	13C



1f

Parameter	Value
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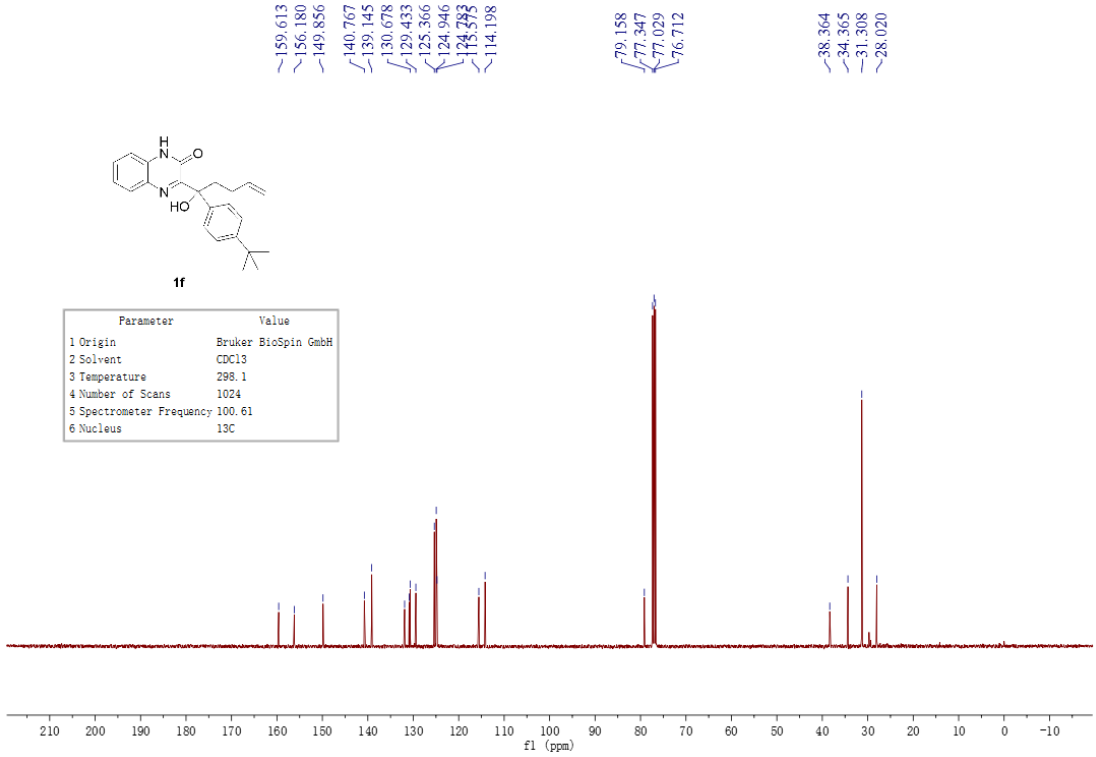
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	2
5 Spectrometer Frequency	400.13
6 Nucleus	1H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76.712
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34.365
31.308
28.020
1f
Parameter Value
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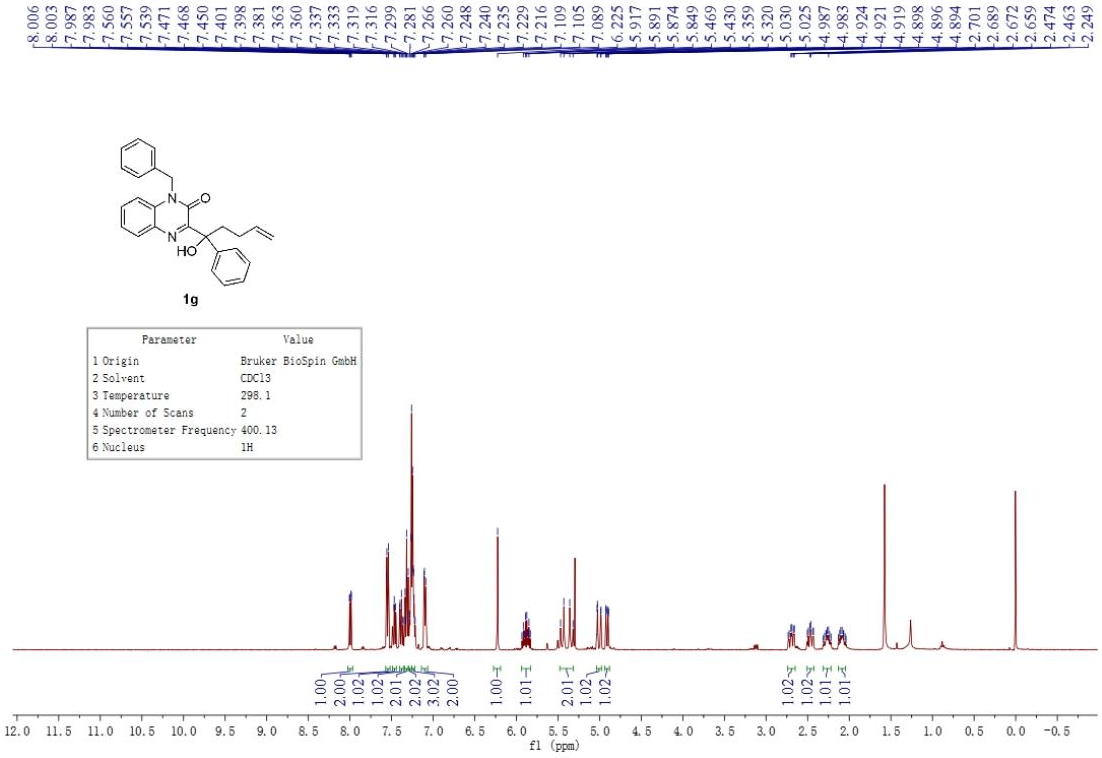
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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7.337
7.333
7.319
7.316
7.299
7.281
7.266
7.260
7.248
7.240
7.235
7.229
7.216
7.109
7.105
7.089
6.225
5.917
5.891
5.874
5.849
5.469
5.430
5.359
5.320
5.030
5.025
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4.983
4.924
4.921
4.919
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4.896
4.894
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2.689
2.672
2.659
2.474
2.463
2.249
1g
Parameter Value
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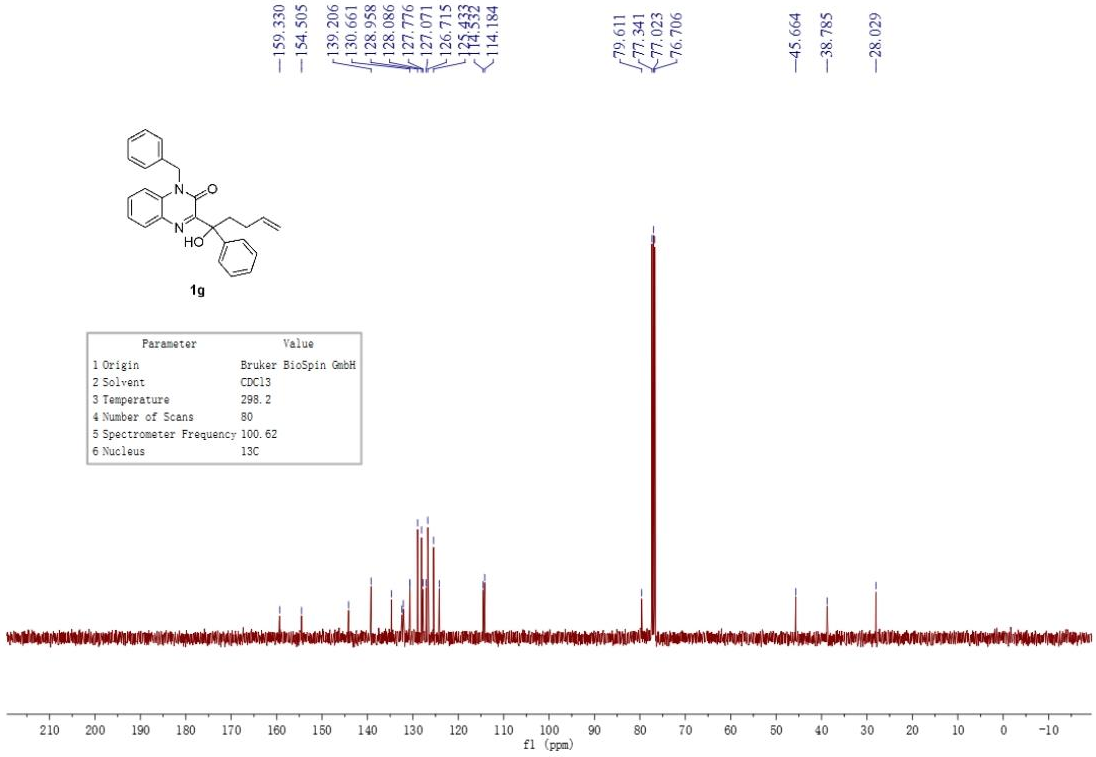
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
f1 (ppm)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79.611
77.341
77.023
76.706
45.664
38.785
28.029
1g
Parameter Value
1 Origin Bruker BioSpin GmbH
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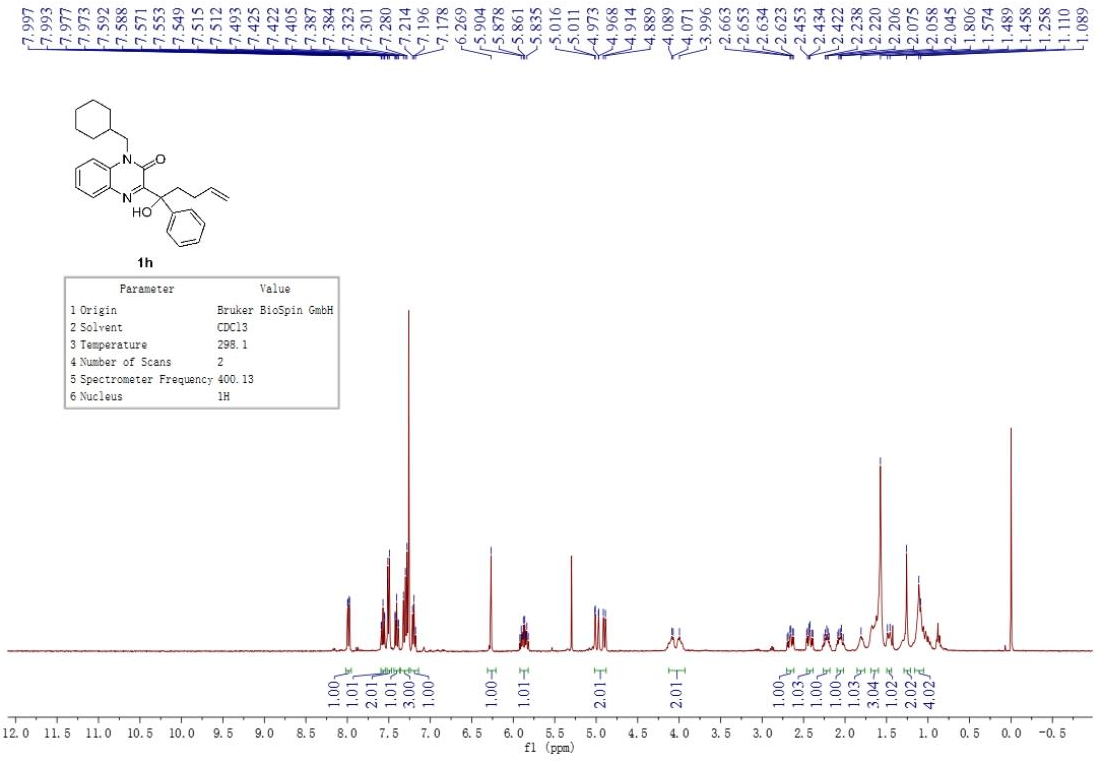
3 Temperature 298.2
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)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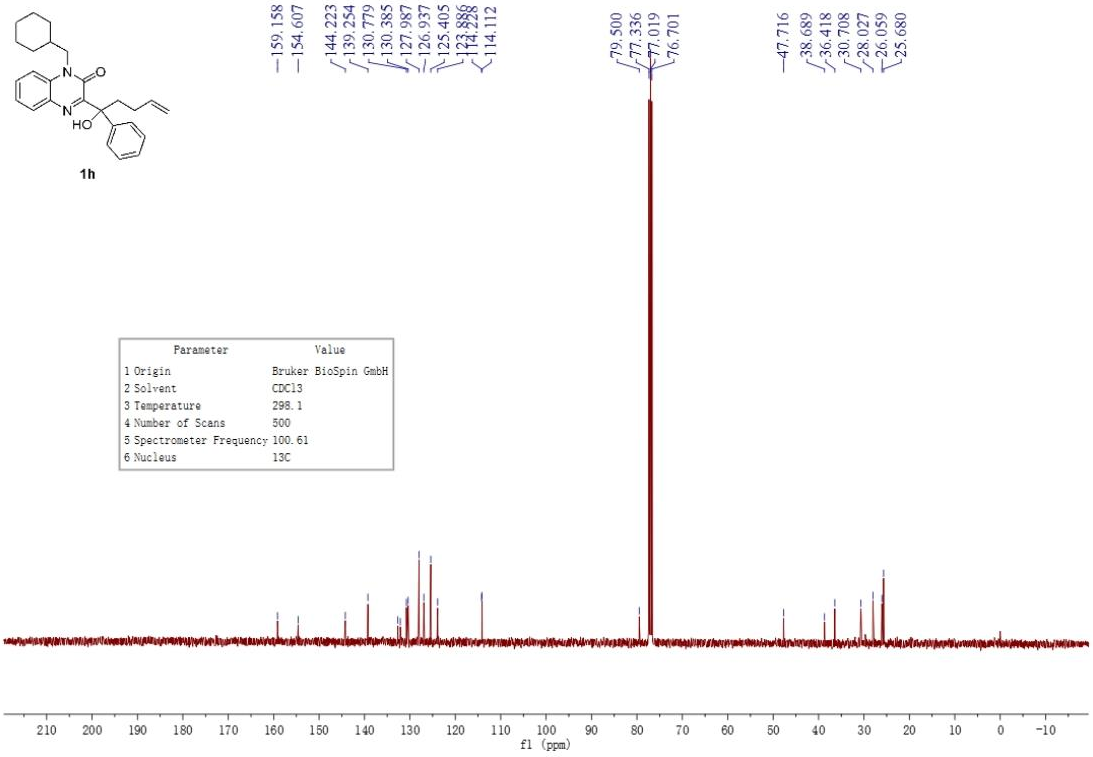
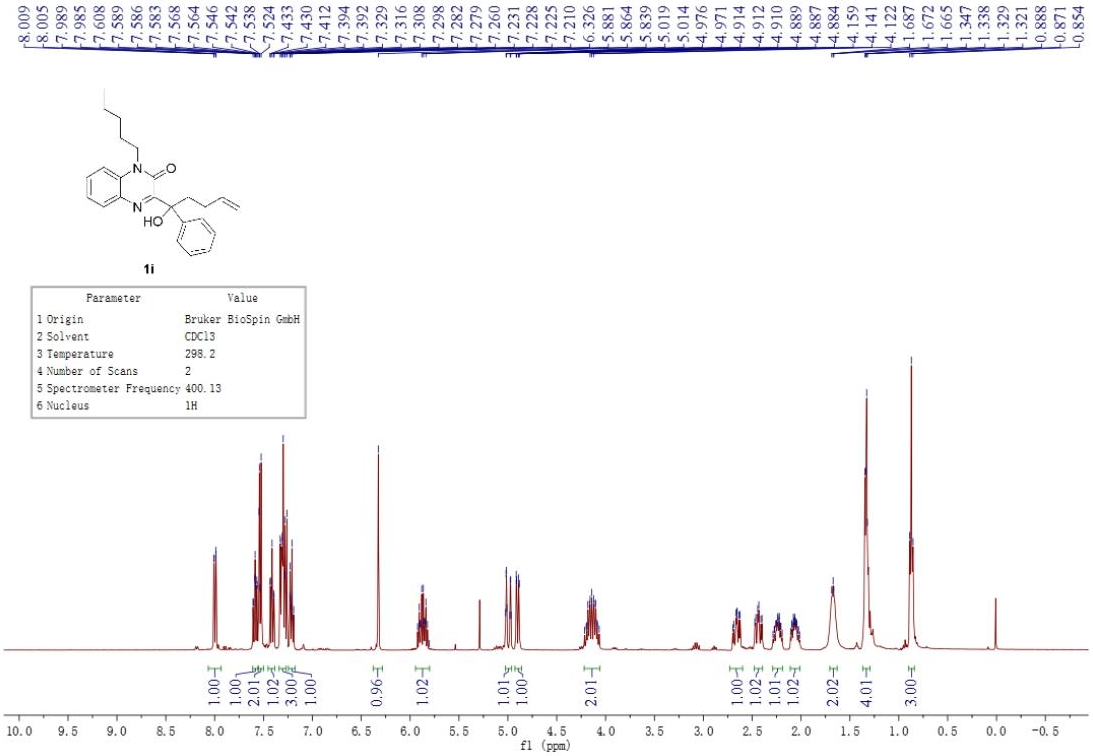
1.458
1.258
1.110
1.089
1h
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.00
1.01
2.01
1.01
3.00
1.00
1.00
1.01
2.01
2.01
1.00
1.03
1.00
1.00
1.03
3.04
1.02
2.02
4.02
f1 (ppm)


1h
159.158
154.607
144.223
139.254
130.779
130.385
127.987
126.937
125.405
123.886
114.228
114.112
79.500
77.336
77.019
76.701
47.716
38.689
36.418
30.708
28.027
26.059
25.680
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 500
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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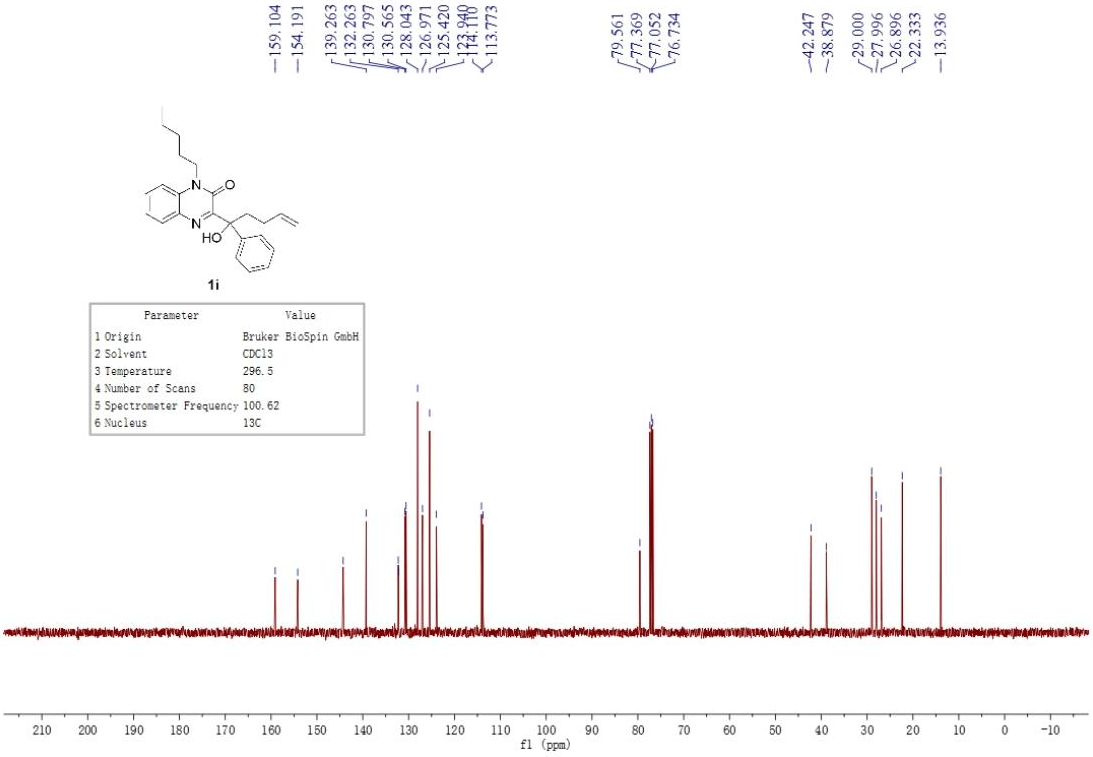
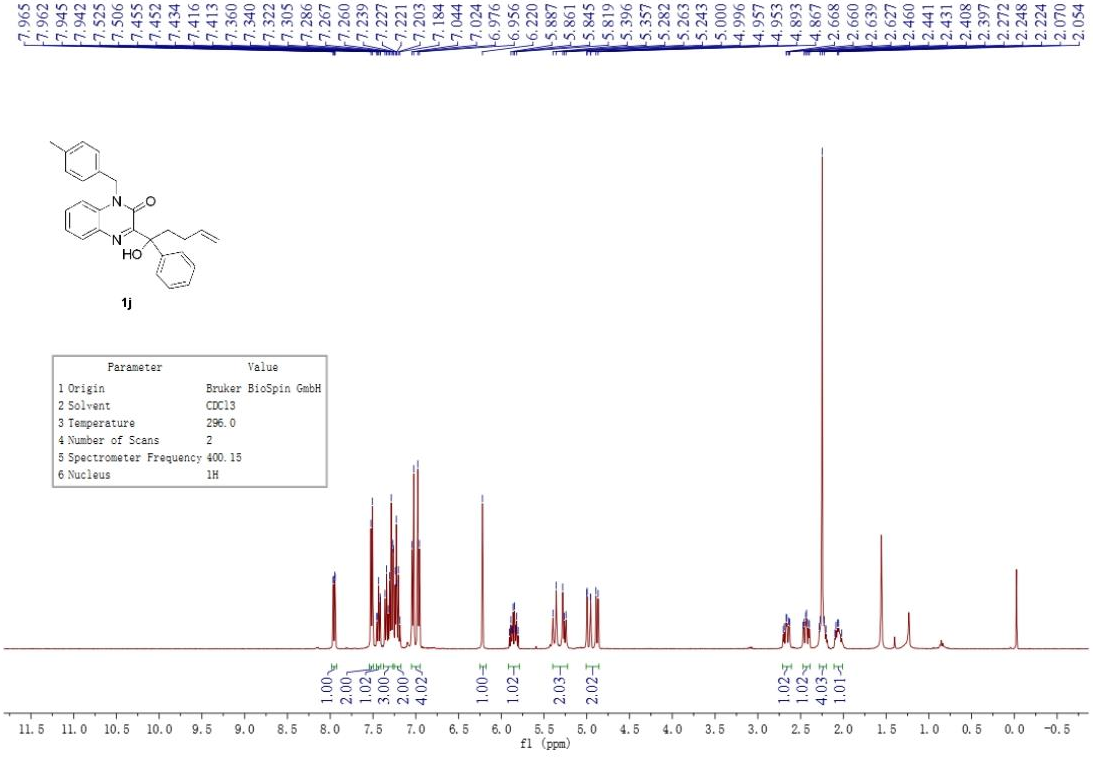
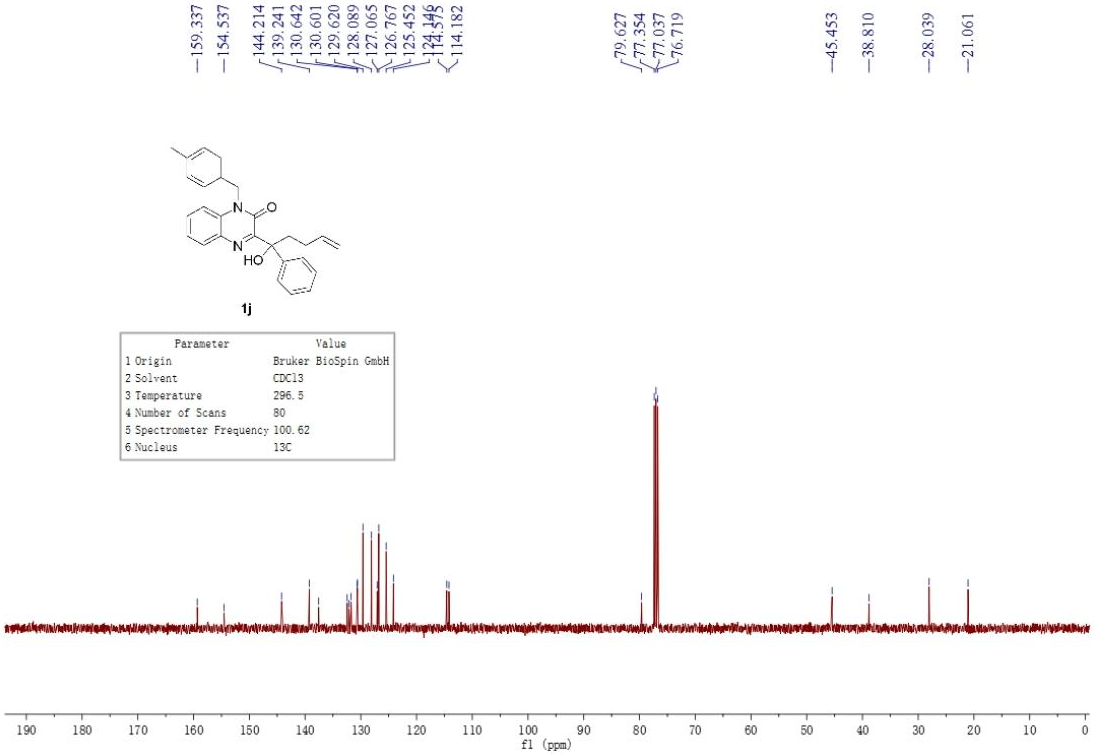
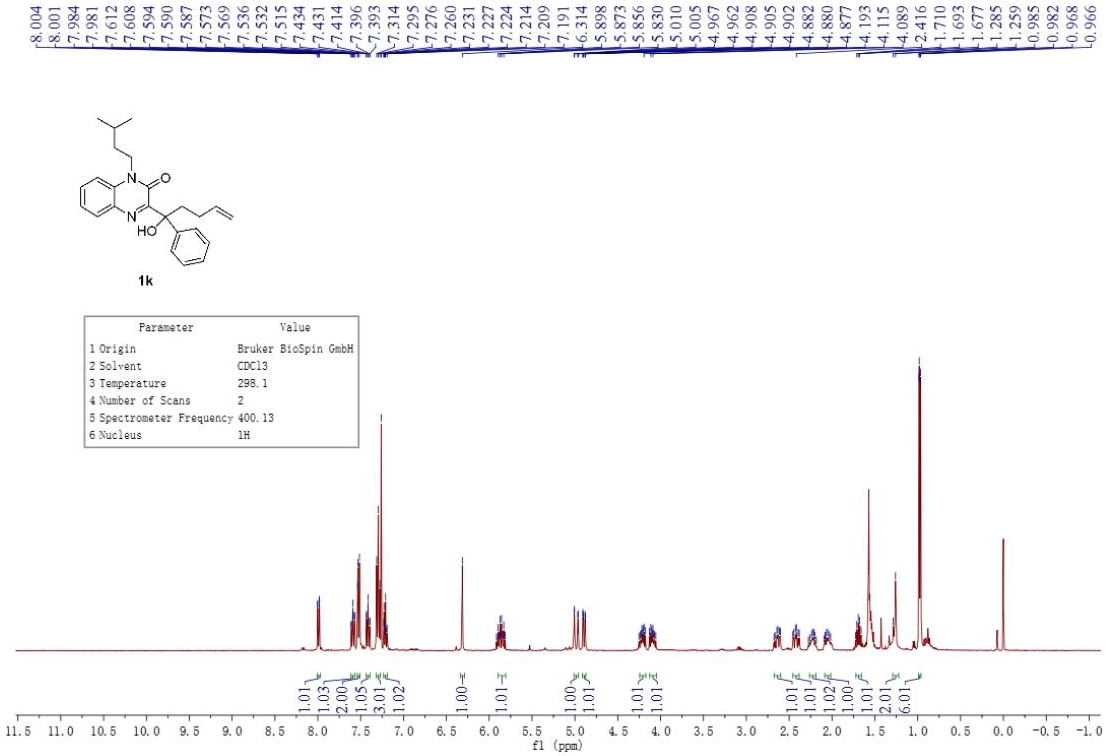
7.985
7.608
7.589
7.586
7.583
7.568
7.564
7.546
7.542
7.538
7.524
7.433
7.430
7.412
7.394
7.392
7.329
7.316
7.308
7.298
7.282
7.279
7.260
7.231
7.228
7.225
7.210
6.326
5.881
5.864
5.839
5.019
5.014
4.976
4.971
4.914
4.912
4.910
4.889
4.887
4.884
4.159
4.141
4.122
1.687
1.672
1.665
1.347
1.338
1.329
1.321
0.888
0.871
0.854
1i
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.00
1.00
2.01
1.02
3.00
1.00
0.96
1.02
1.01
1.00
2.01
1.00
1.02
1.01
1.02
2.02
4.01
3.00
f1 (ppm)


159.104
154.191
139.263
132.263
130.797
130.565
128.043
126.971
125.420
123.940
114.110
113.773
79.561
77.369
77.052
76.734
42.247
38.879
29.000
27.996
26.896
22.333
13.936
1i
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.5
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)


7.965
7.962
7.945
7.942
7.525
7.506
7.455
7.452
7.434
7.416
7.413
7.360
7.340
7.322
7.305
7.286
7.267
7.260
7.239
7.227
7.221
7.203
7.184
7.044
7.024
6.976
6.956
6.220
5.887
5.861
5.845
5.819
5.396
5.357
5.282
5.263
5.243
5.000
4.996
4.957
4.953
4.893
4.867
2.668
2.660
2.639
2.627
2.460
2.441
2.431
2.408
2.397
2.272
2.248
2.224
2.070
2.054
1j
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.0
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
1.00
2.00
1.02
3.00
2.00
4.02
1.00
1.02
2.03
2.02
1.02
1.02
4.03
1.01
f1 (ppm)


159.337
154.537
144.214
139.241
130.642
130.601
129.620
128.089
127.065
126.767
125.452
114.182
79.627
77.354
77.037
76.719
45.453
38.810
28.039
21.061
1j
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.5
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)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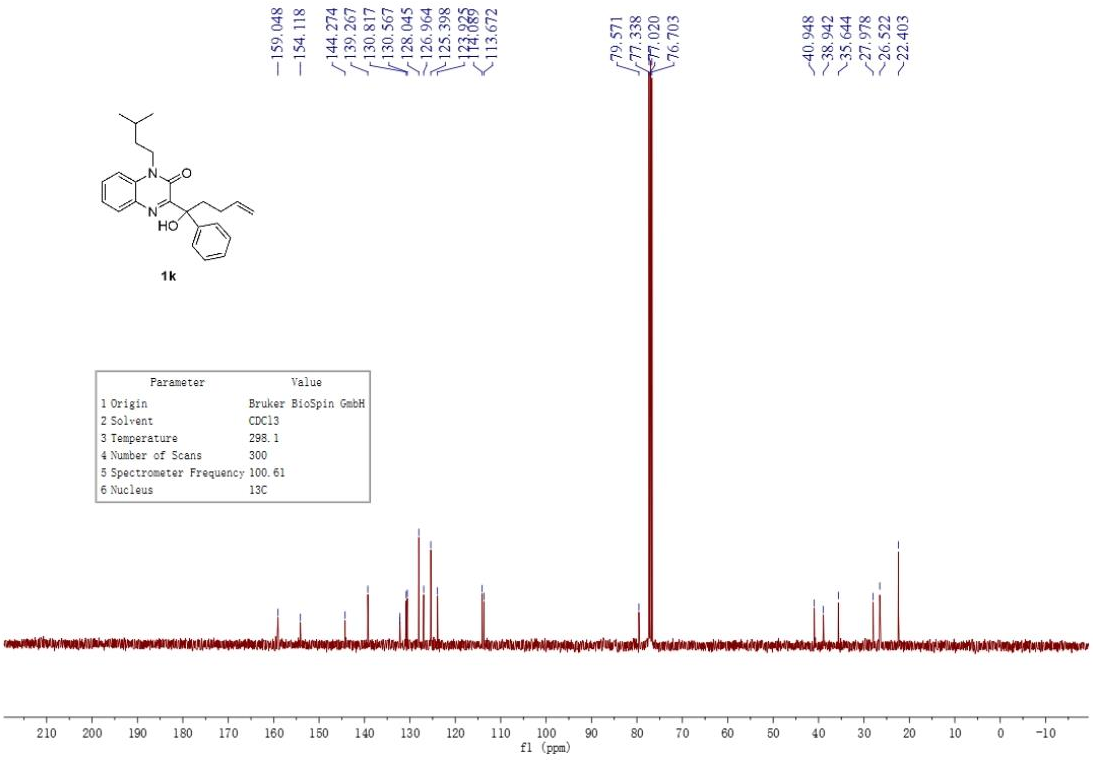
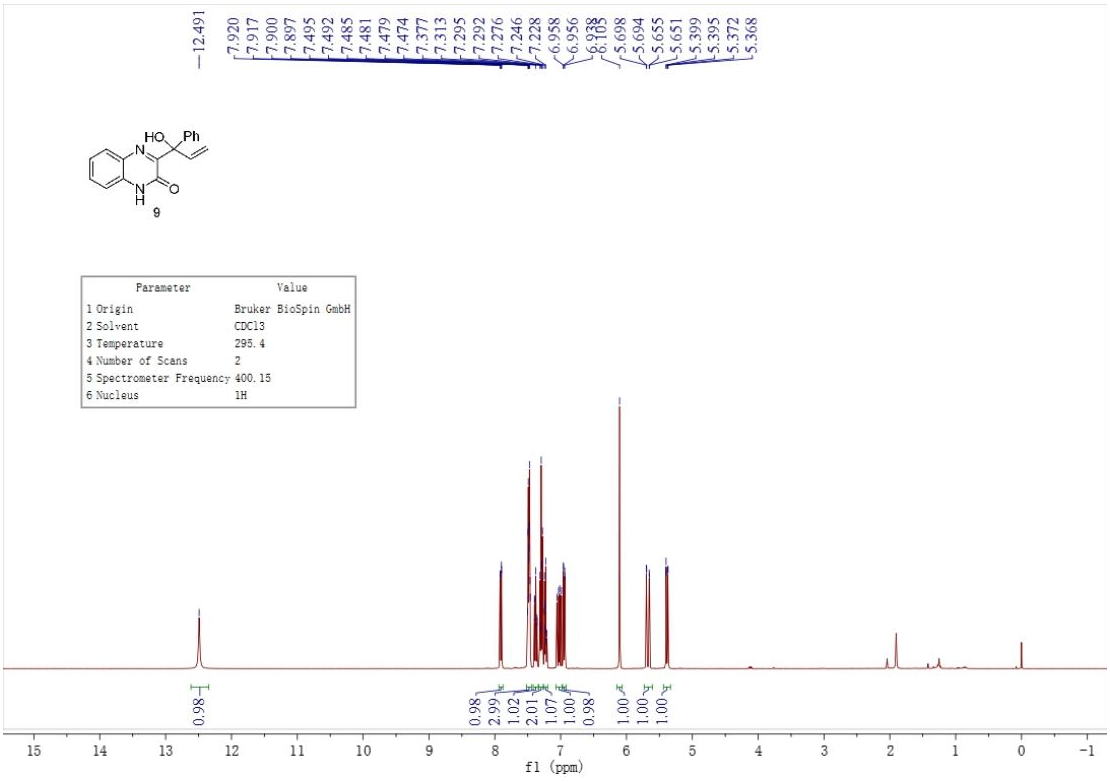
8.001
7.984
7.981
7.612
7.608
7.594
7.590
7.587
7.573
7.569
7.536
7.532
7.515
7.434
7.431
7.414
7.396
7.393
7.314
7.295
7.276
7.260
7.231
7.227
7.224
7.214
7.209
7.191
6.314
5.898
5.873
5.856
5.830
5.010
5.005
4.967
4.962
4.908
4.905
4.902
4.882
4.880
4.877
4.193
4.115
4.089
2.416
1.710
1.693
1.677
1.285
1.259
0.985
0.982
0.968
0.966
1k
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.01
1.03
2.00
1.05
3.01
1.02
1.00
1.01
1.00
1.01
1.01
1.01
1.01
1.01
1.02
1.00
1.01
2.01
6.01
f1 (ppm)


159.048
154.118
144.274
139.267
130.817
130.567
128.045
126.964
125.398
123.925
114.089
113.672
79.571
77.338
77.020
76.703
40.948
38.942
35.644
27.978
26.522
22.403
1k
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 300
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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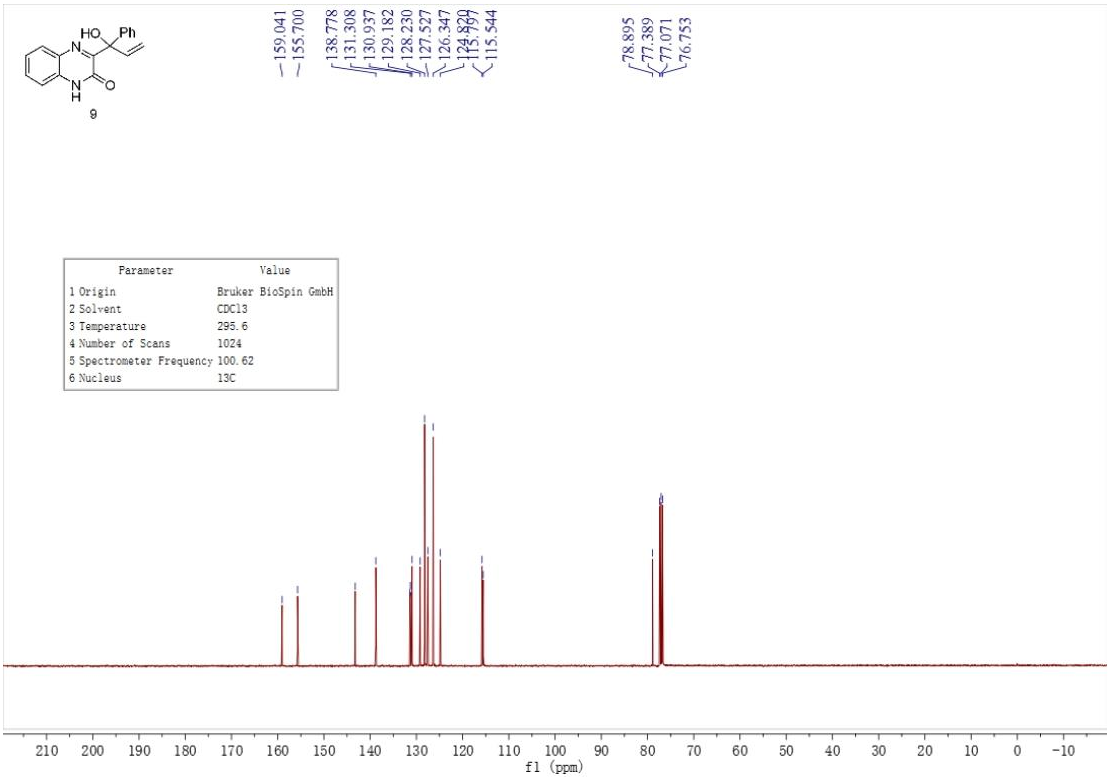
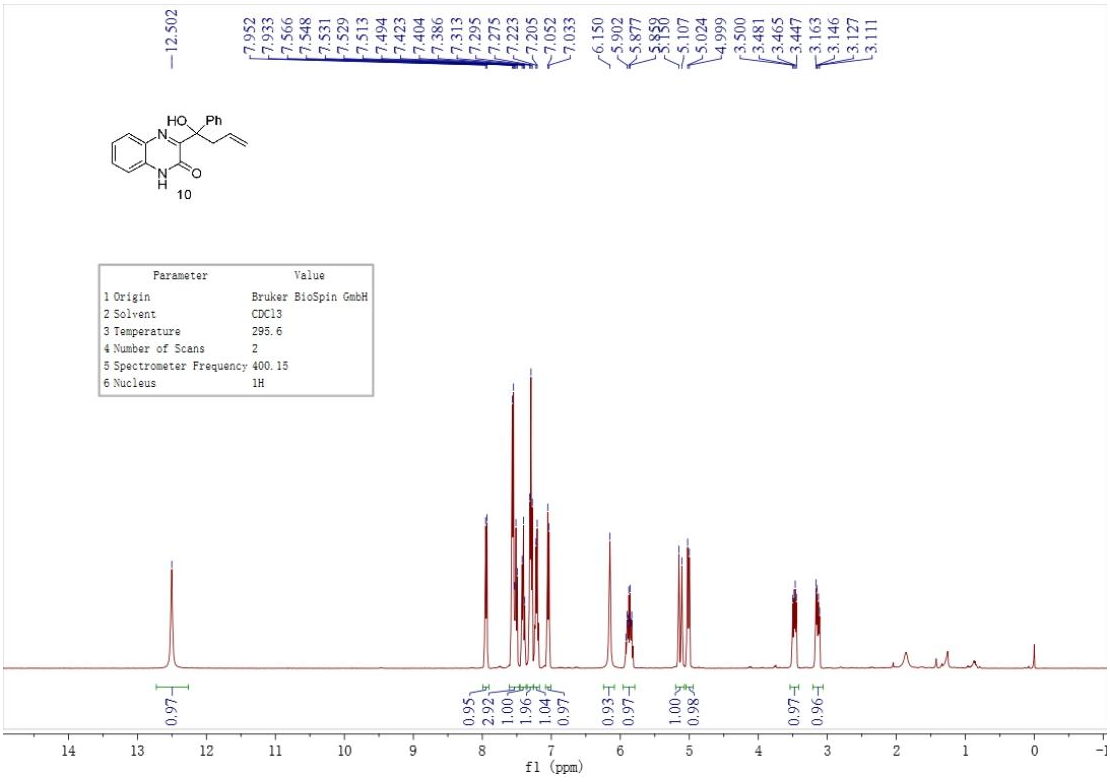
7.920
7.917
7.900
7.897
7.495
7.492
7.485
7.481
7.479
7.474
7.377
7.313
7.295
7.292
7.276
7.246
7.228
6.958
6.956
6.938
6.105
5.698
5.694
5.655
5.651
5.399
5.395
5.372
5.368
HO
Ph
9
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.4
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
0.98
0.98
2.99
1.02
2.01
1.07
1.00
0.98
1.00
1.00
1.00
f1 (ppm)


HO
Ph
N
N
H
O
9
159.041
155.700
138.778
131.308
130.937
129.182
128.230
127.527
126.347
115.544
78.895
77.389
77.071
76.753
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.6
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)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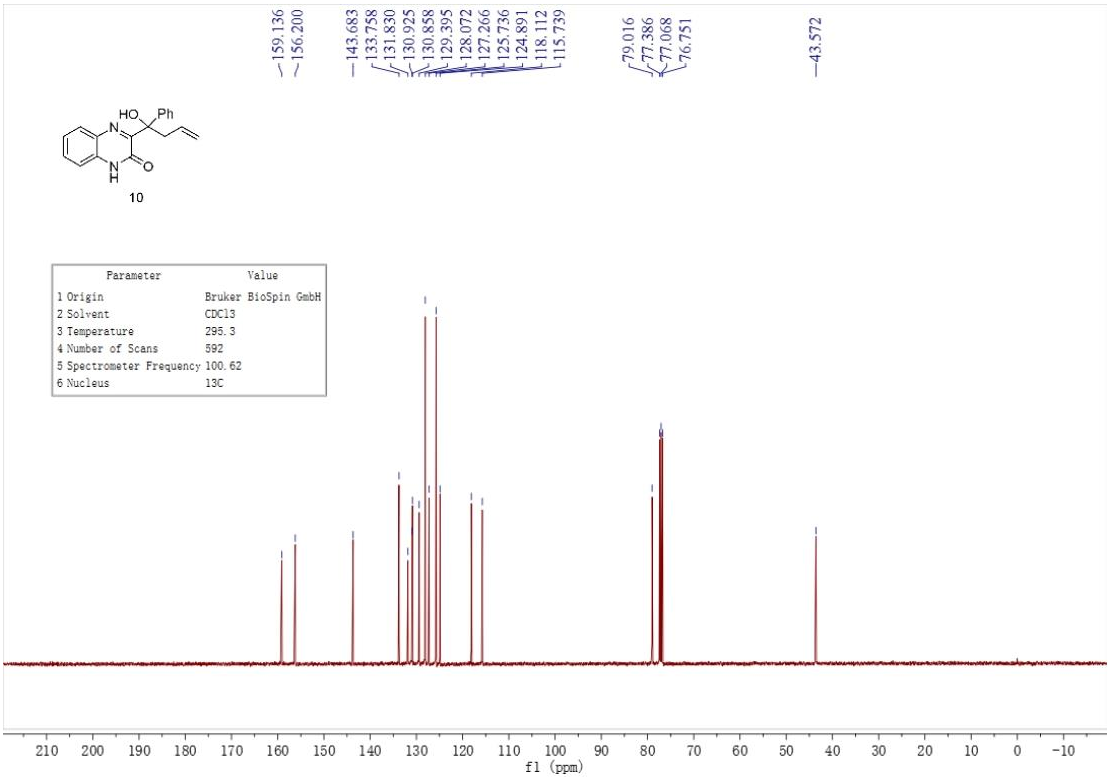
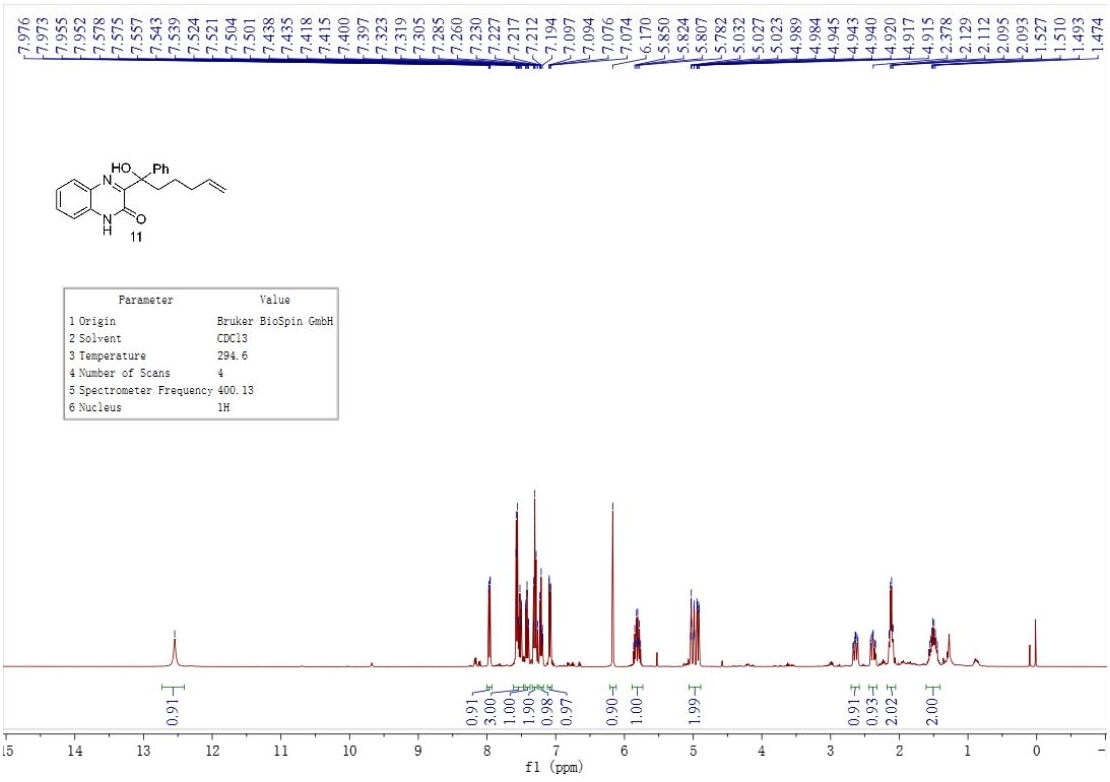
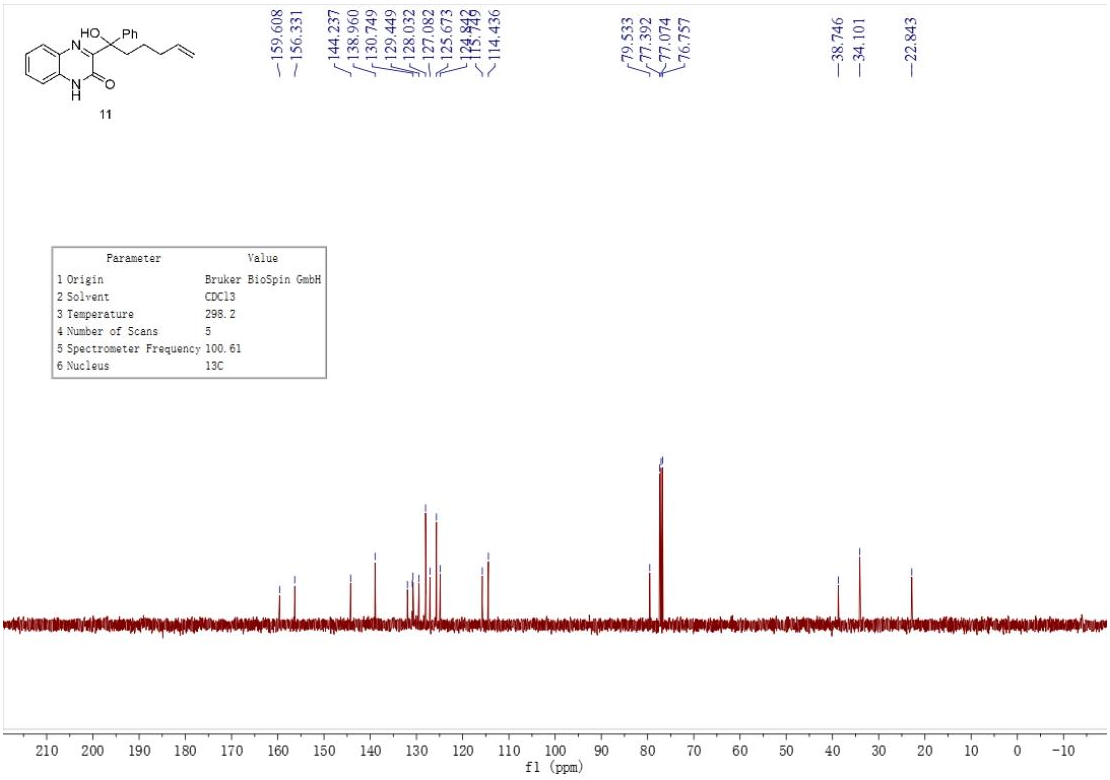
7.933
7.566
7.548
7.531
7.529
7.513
7.494
7.423
7.404
7.386
7.313
7.295
7.275
7.223
7.205
7.052
7.033
6.150
5.902
5.877
5.859
5.150
5.107
5.024
4.999
3.500
3.481
3.465
3.447
3.163
3.146
3.127
3.111
HO
Ph
N
N
H
O
10
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.6
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
0.97
0.95
2.92
1.00
1.96
1.04
0.97
0.93
0.97
1.00
0.98
0.97
0.96
f1 (ppm)


159.136
156.200
143.683
133.758
131.830
130.925
130.858
129.395
128.072
127.266
125.736
124.891
118.112
115.739
79.016
77.386
77.068
76.751
43.572
HO
Ph
N
O
H
10
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.3
4 Number of Scans 592
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)


7.976
7.973
7.955
7.952
7.578
7.575
7.557
7.543
7.539
7.524
7.521
7.504
7.501
7.438
7.435
7.418
7.415
7.400
7.397
7.323
7.319
7.305
7.285
7.260
7.230
7.227
7.217
7.212
7.194
7.097
7.094
7.076
7.074
6.170
5.850
5.824
5.807
5.782
5.032
5.027
5.023
4.989
4.984
4.945
4.943
4.940
4.920
4.917
4.915
2.378
2.129
2.112
2.095
2.093
1.527
1.510
1.493
1.474
HO
Ph
N
O
H
11
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 294.6
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
0.91
0.91
3.00
1.00
1.90
0.98
0.97
0.90
1.00
1.99
0.91
0.93
2.02
2.00
f1 (ppm)


HO
Ph
N
H
O
11
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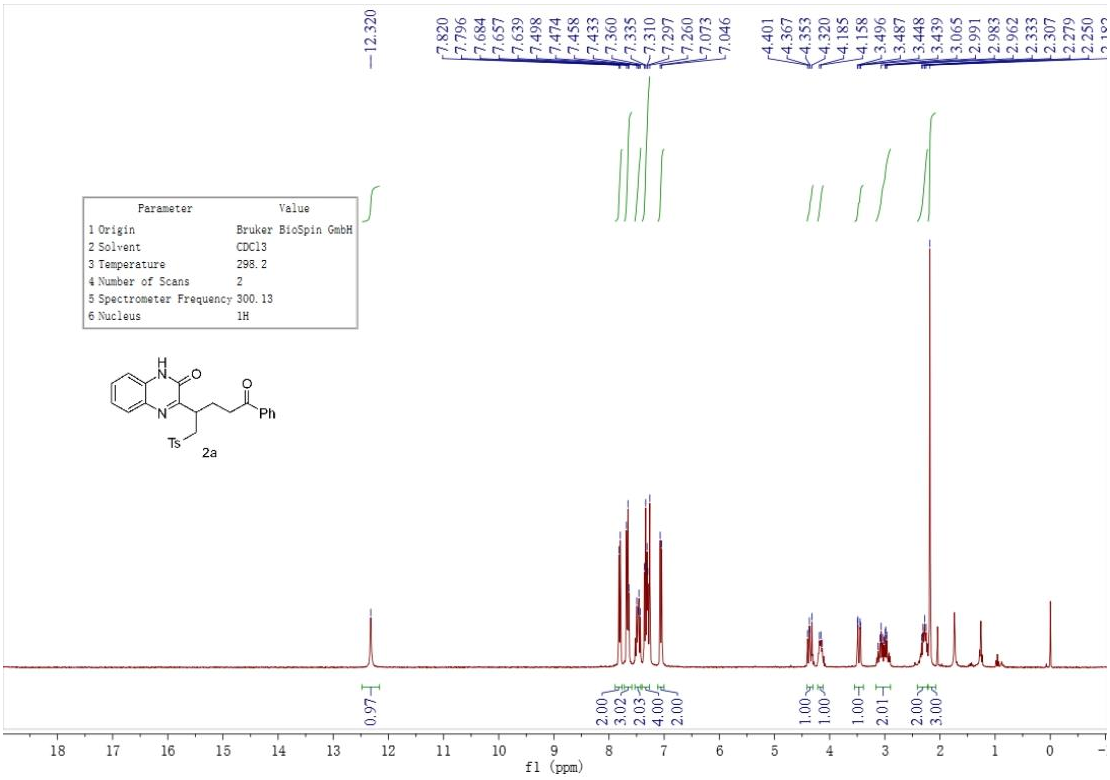
144.237
138.960
130.749
129.449
128.032
127.082
125.673
114.436
79.533
77.392
77.074
76.757
38.746
34.101
22.843
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 5
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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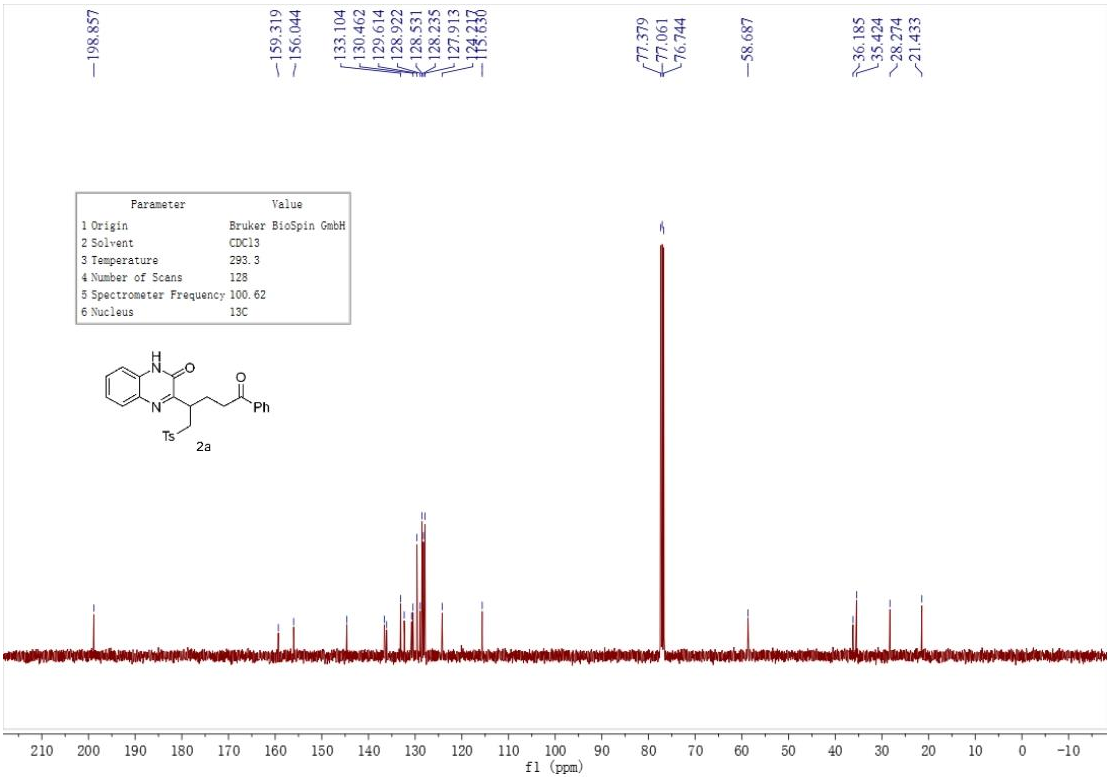
7.796
7.684
7.657
7.639
7.498
7.474
7.458
7.433
7.360
7.335
7.310
7.297
7.260
7.073
7.046
4.401
4.367
4.353
4.320
4.185
4.158
3.496
3.487
3.448
3.439
3.065
2.991
2.983
2.962
2.333
2.307
2.279
2.250
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 300.13
6 Nucleus 1H
H
N
O
N
O
Ph
Ts
2a
0.97
2.00
3.02
2.03
4.00
2.00
1.00
1.00
1.00
2.01
2.00
3.00
f1 (ppm)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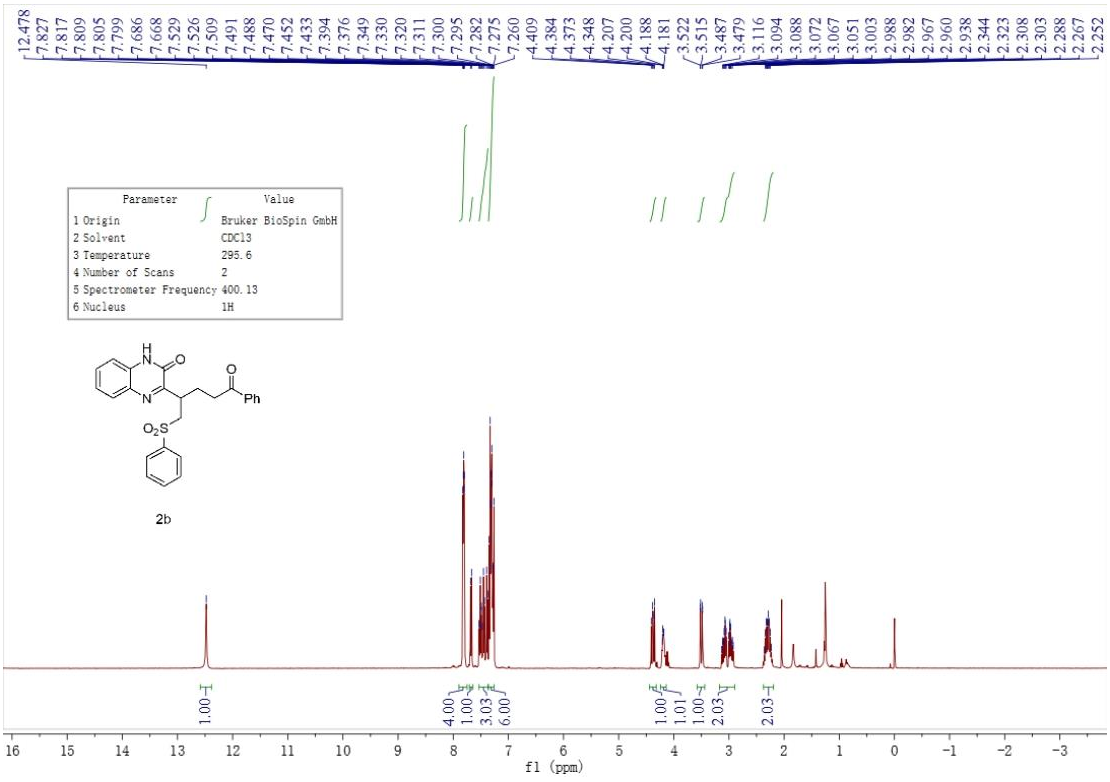
130.462
129.614
128.922
128.531
128.235
127.913
124.217
115.630
77.379
77.061
76.744
58.687
36.185
35.424
28.274
21.433
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 293.3
4 Number of Scans 128
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ph
Ts
2a
f1 (ppm)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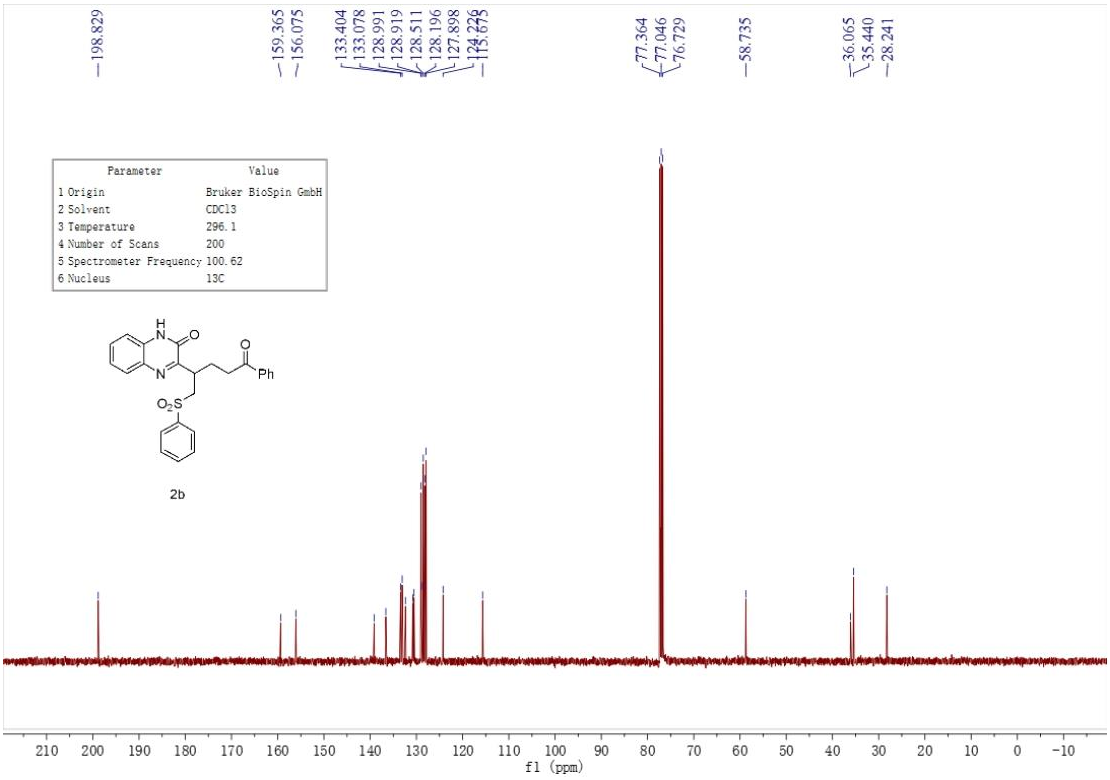
7.817
7.809
7.805
7.799
7.686
7.668
7.529
7.526
7.509
7.491
7.488
7.470
7.452
7.433
7.394
7.376
7.349
7.330
7.320
7.311
7.300
7.295
7.282
7.275
7.260
4.409
4.384
4.373
4.348
4.207
4.200
4.188
4.181
3.522
3.515
3.487
3.479
3.116
3.094
3.088
3.072
3.067
3.051
3.003
2.988
2.982
2.967
2.960
2.938
2.344
2.323
2.308
2.303
2.288
2.267
2.252
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.6
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
Ph
O2S
2b
1.00
4.00
1.00
3.03
6.00
1.00
1.01
1.00
2.03
2.03
f1 (ppm)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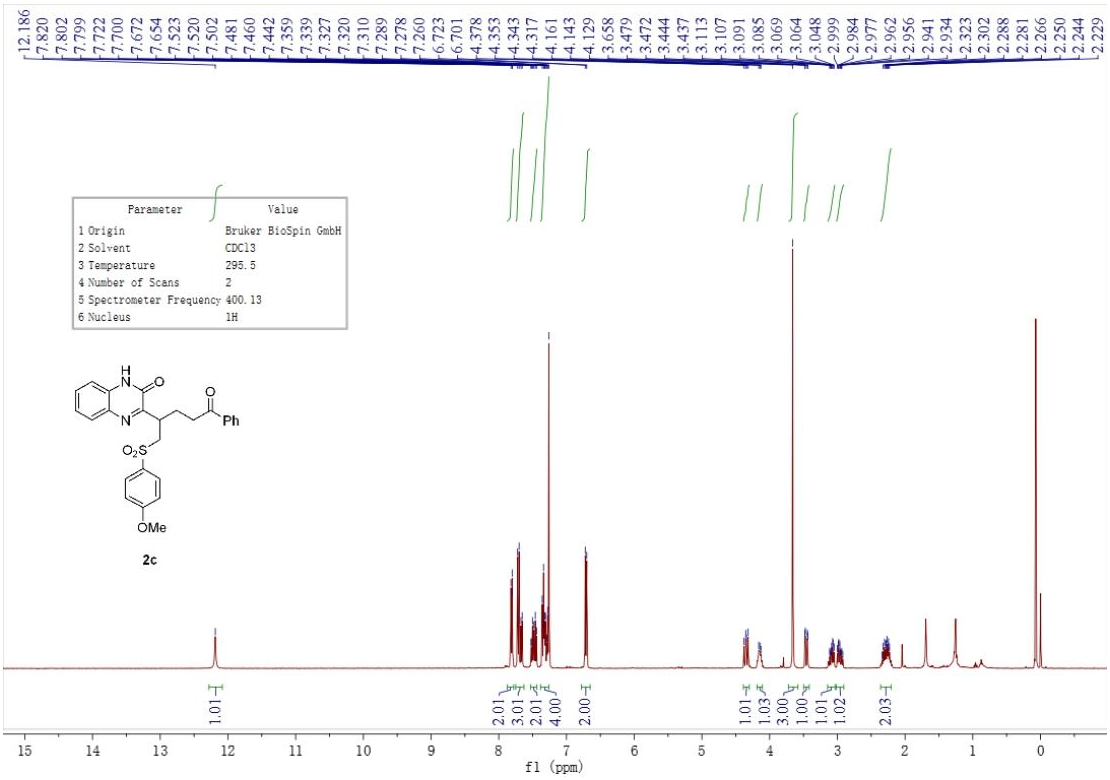
156.075
133.404
133.078
128.991
128.919
128.511
128.196
127.898
124.226
115.675
77.364
77.046
76.729
58.735
36.065
35.440
28.241
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.1
4 Number of Scans 200
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ph
2b
f1 (ppm)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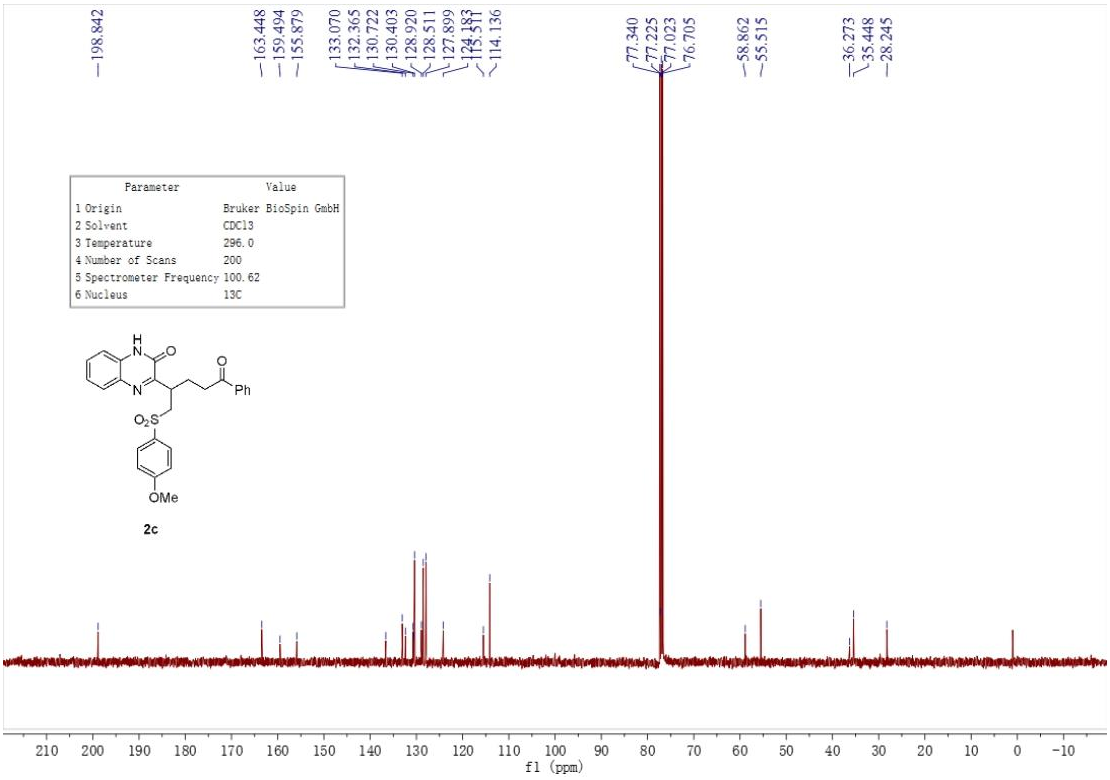
7.802
7.799
7.722
7.700
7.672
7.654
7.523
7.520
7.502
7.481
7.460
7.442
7.359
7.339
7.327
7.320
7.310
7.289
7.278
7.260
6.723
6.701
4.378
4.353
4.343
4.317
4.161
4.143
4.129
3.658
3.479
3.472
3.444
3.437
3.113
3.107
3.091
3.085
3.069
3.064
3.048
2.999
2.984
2.977
2.962
2.956
2.941
2.934
2.323
2.302
2.288
2.281
2.266
2.250
2.244
2.229
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.5
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
Ph
OMe
2c
1.01
2.01
3.01
2.01
4.00
2.00
1.01
1.03
3.00
1.00
1.01
1.02
2.03
f1 (ppm)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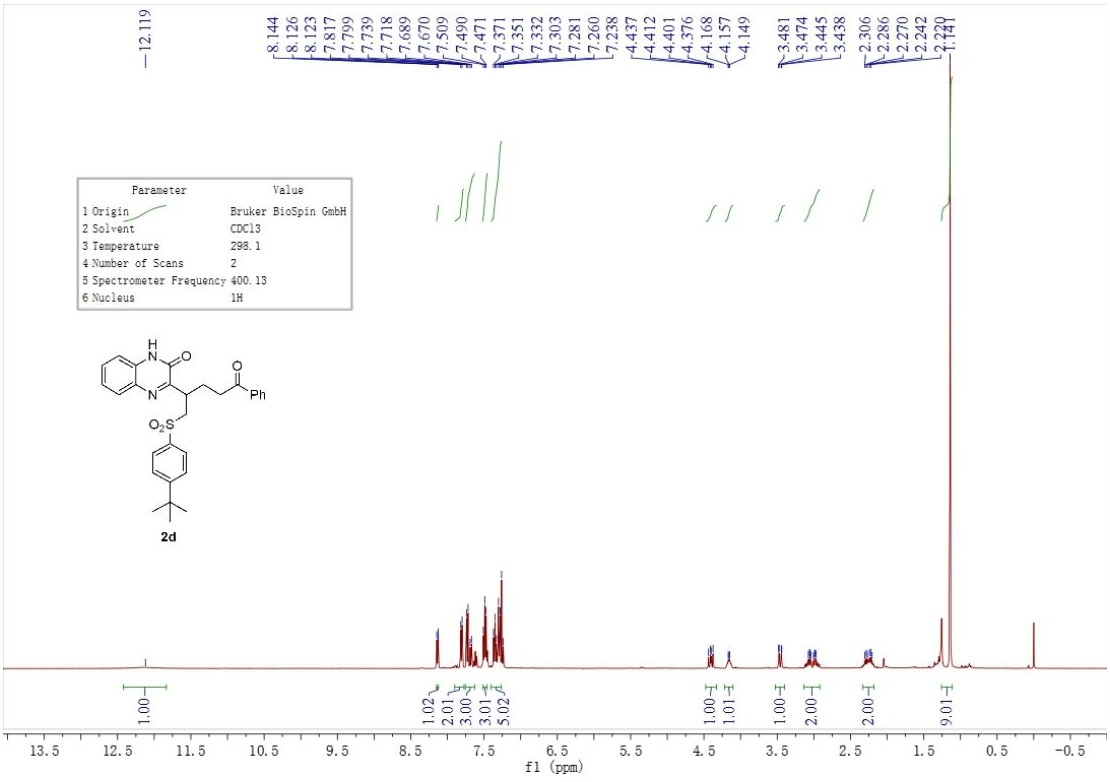
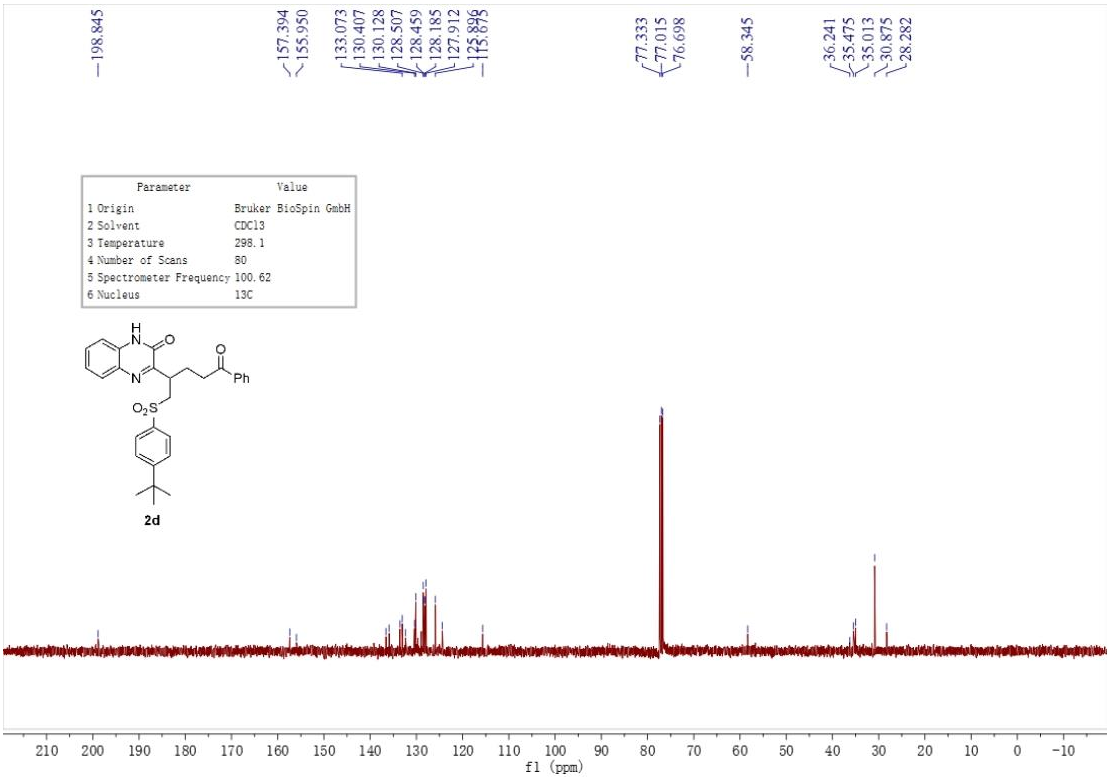
159.494
155.879
133.070
132.365
130.722
130.403
128.920
128.511
127.899
124.183
115.511
114.136
77.340
77.225
77.023
76.705
58.862
55.515
36.273
35.448
28.245
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.0
4 Number of Scans 200
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2c
f1 (ppm)


12.119
8.144
8.126
8.123
7.817
7.799
7.739
7.718
7.689
7.670
7.509
7.490
7.471
7.371
7.351
7.332
7.303
7.281
7.260
7.238
4.437
4.412
4.401
4.376
4.168
4.157
4.149
3.481
3.474
3.445
3.438
2.306
2.286
2.270
2.242
2.220
1.141
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2d
1.00
1.02
2.01
3.00
3.01
5.02
1.00
1.01
1.00
2.00
2.00
9.01
f1 (ppm)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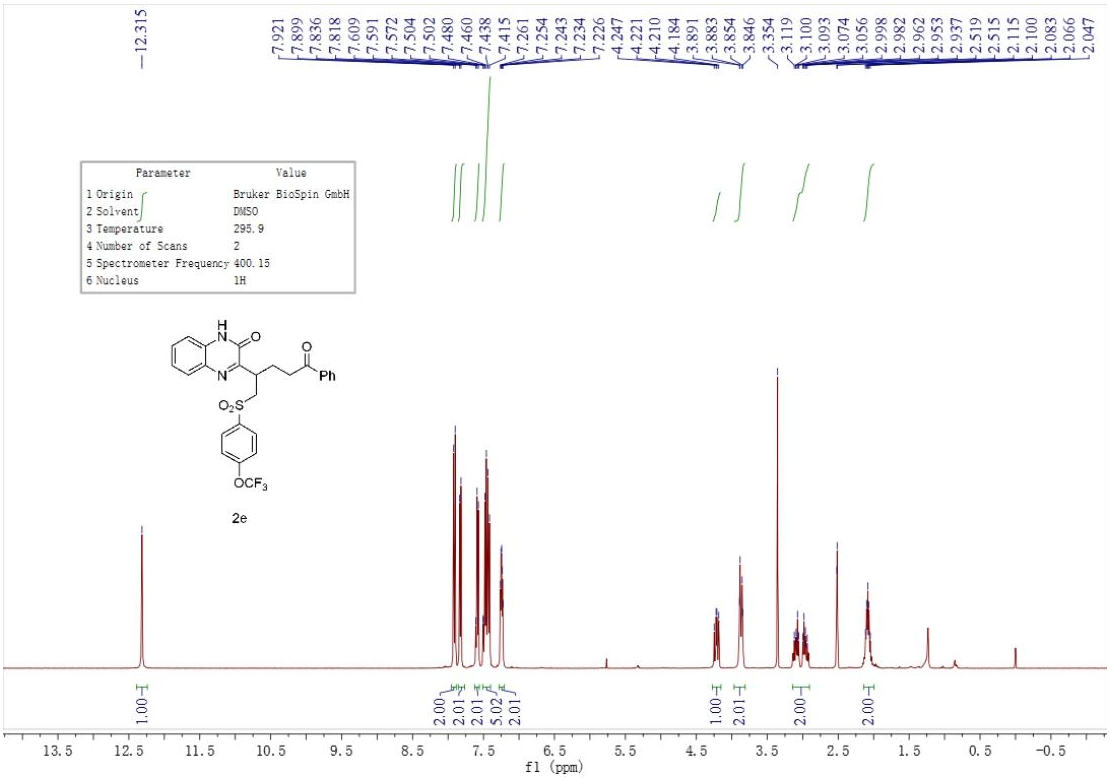
155.950
133.073
130.407
130.128
128.507
128.459
128.185
127.912
125.896
125.673
77.333
77.015
76.698
58.345
36.241
35.475
35.013
30.875
28.282
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2d
f1 (ppm)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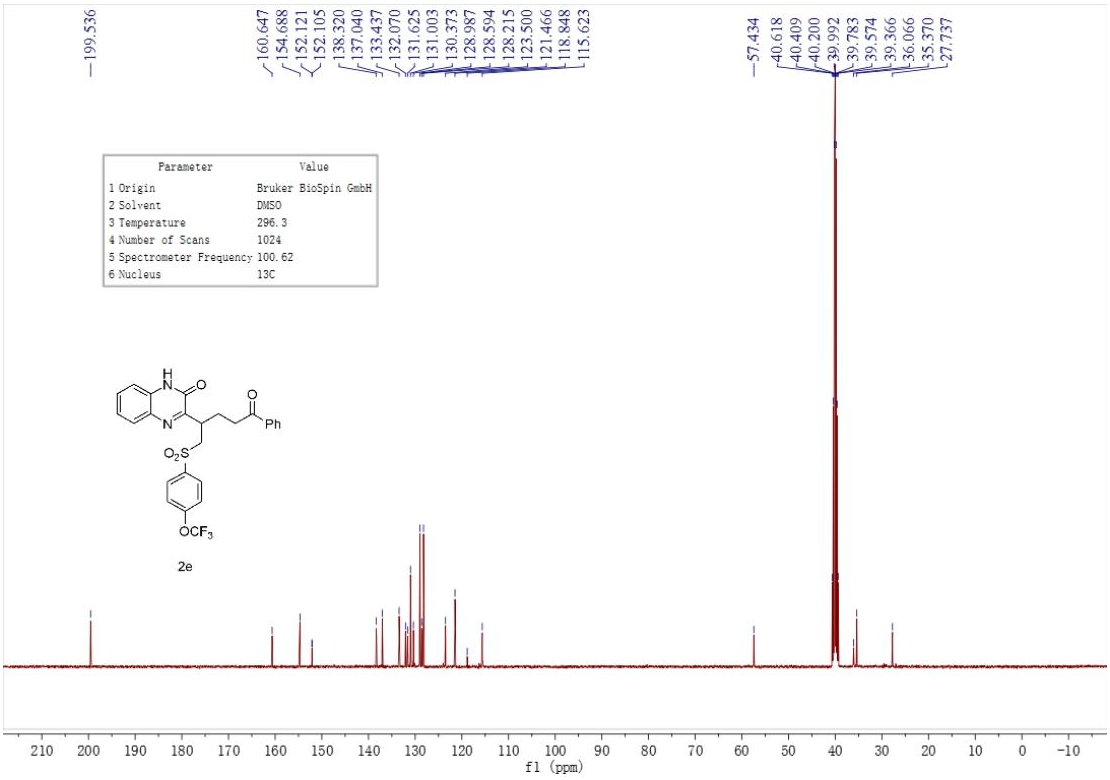
7.899
7.836
7.818
7.609
7.591
7.572
7.504
7.502
7.480
7.460
7.438
7.415
7.261
7.254
7.243
7.234
7.226
4.247
4.221
4.210
4.184
3.891
3.883
3.854
3.846
3.354
3.119
3.100
3.093
3.074
3.056
2.998
2.982
2.962
2.953
2.937
2.519
2.515
2.115
2.100
2.083
2.066
2.047
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.9
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
2e
1.00
2.00
2.01
2.01
5.02
2.01
1.00
2.01
2.00
2.00
f1 (ppm)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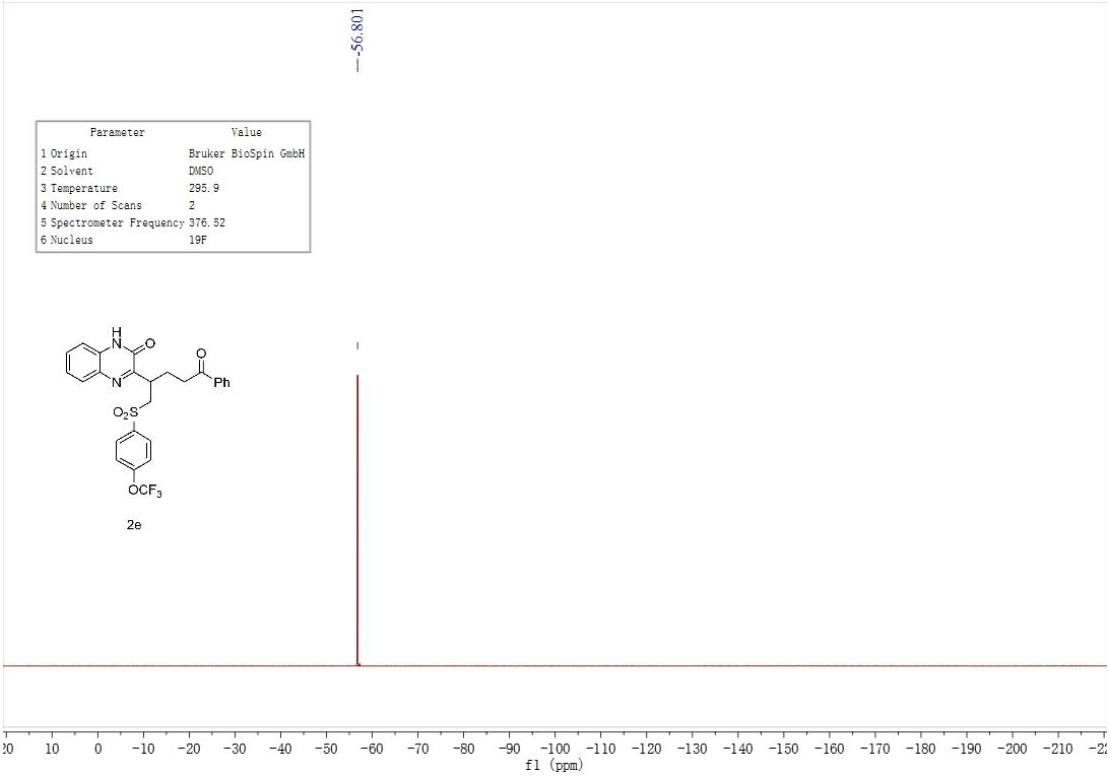
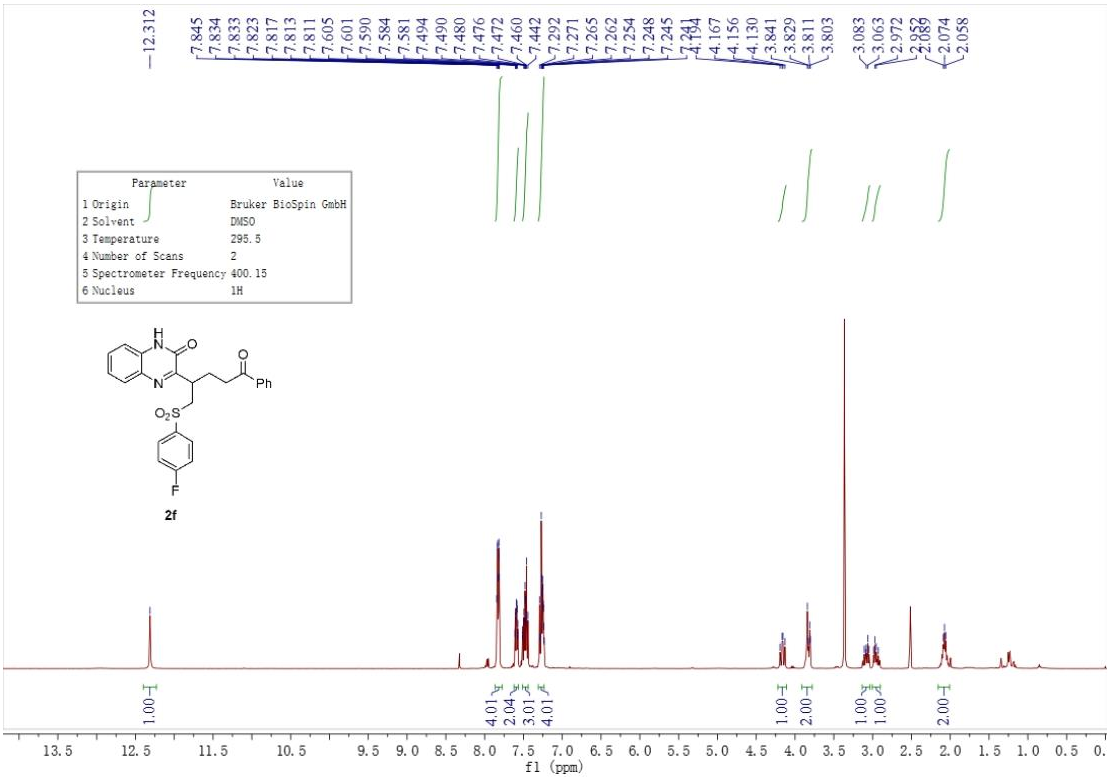
160.647
154.688
152.121
152.105
138.320
137.040
133.437
132.070
131.625
131.003
130.373
128.987
128.594
128.215
123.500
121.466
118.848
115.623
57.434
40.618
40.409
40.200
39.992
39.783
39.574
39.366
36.066
35.370
27.737
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 296.3
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ph
OCF3
2e
f1 (ppm)


56.801
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.9
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
Ph
OCF3
2e
f1 (ppm)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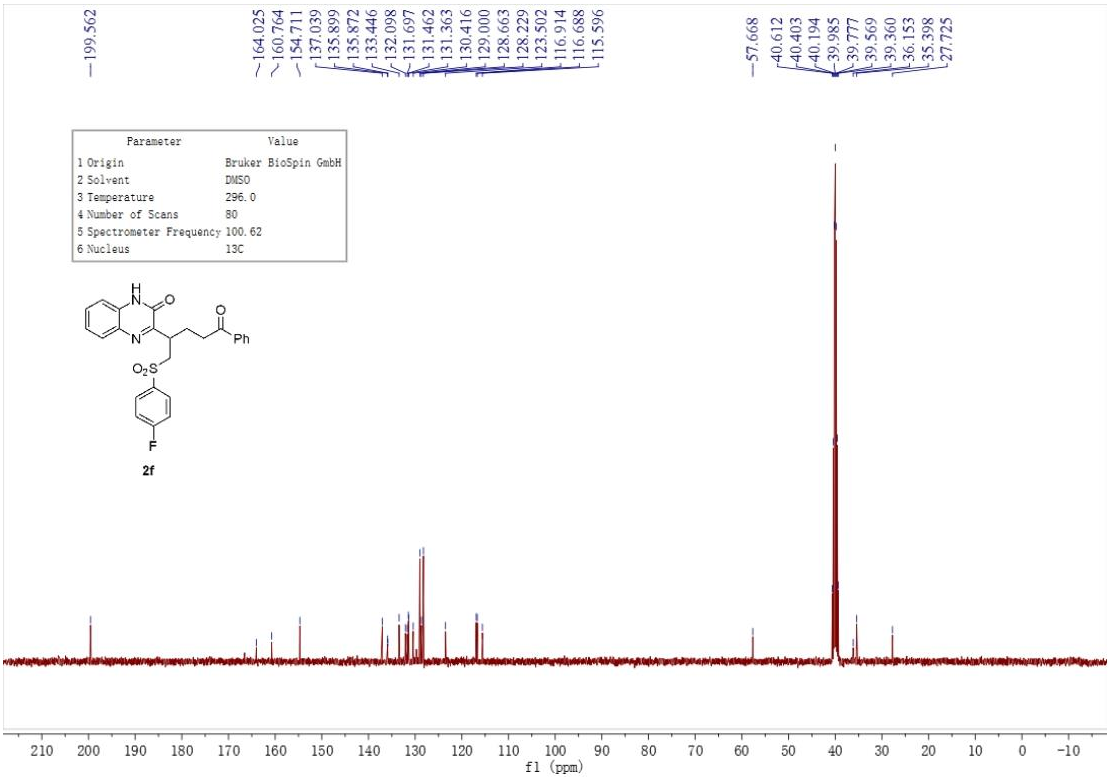
7.845
7.834
7.833
7.823
7.817
7.813
7.811
7.605
7.601
7.590
7.584
7.581
7.494
7.490
7.480
7.476
7.472
7.460
7.442
7.292
7.271
7.265
7.262
7.254
7.248
7.245
7.241
4.167
4.156
4.130
3.841
3.829
3.811
3.803
3.083
3.063
2.972
2.089
2.074
2.058
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.5
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
2f
1.00
4.01
2.04
3.01
4.01
1.00
2.00
1.00
1.00
2.00
f1 (ppm)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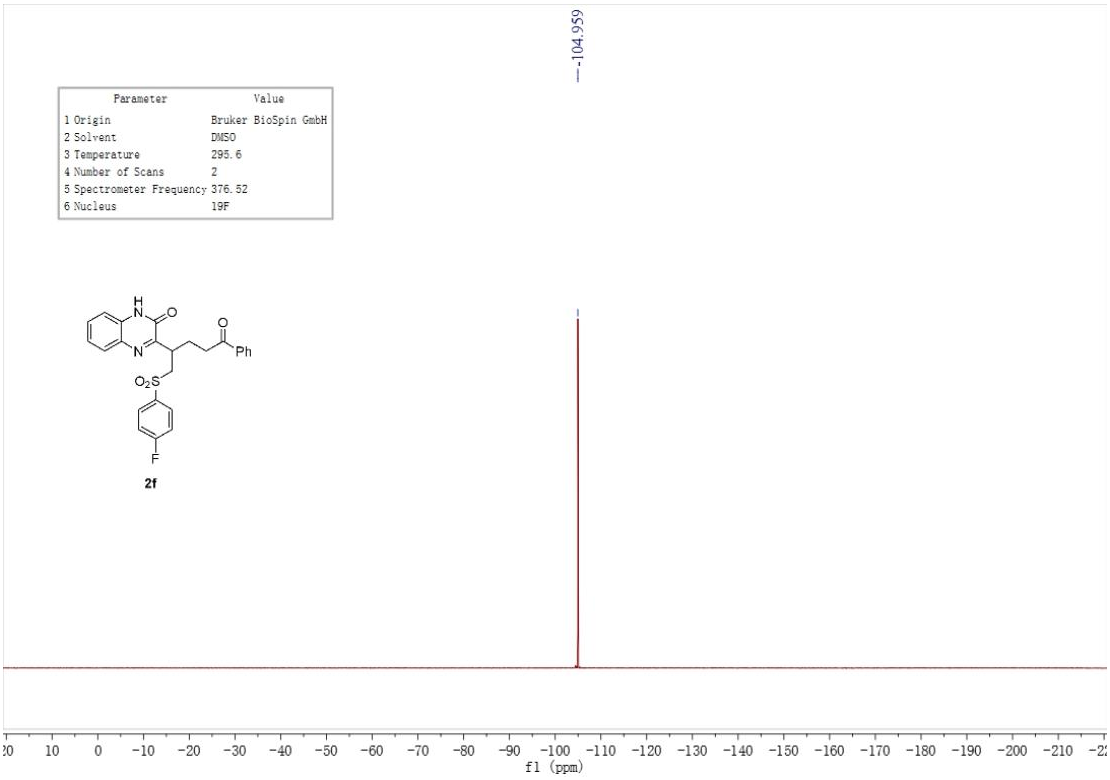
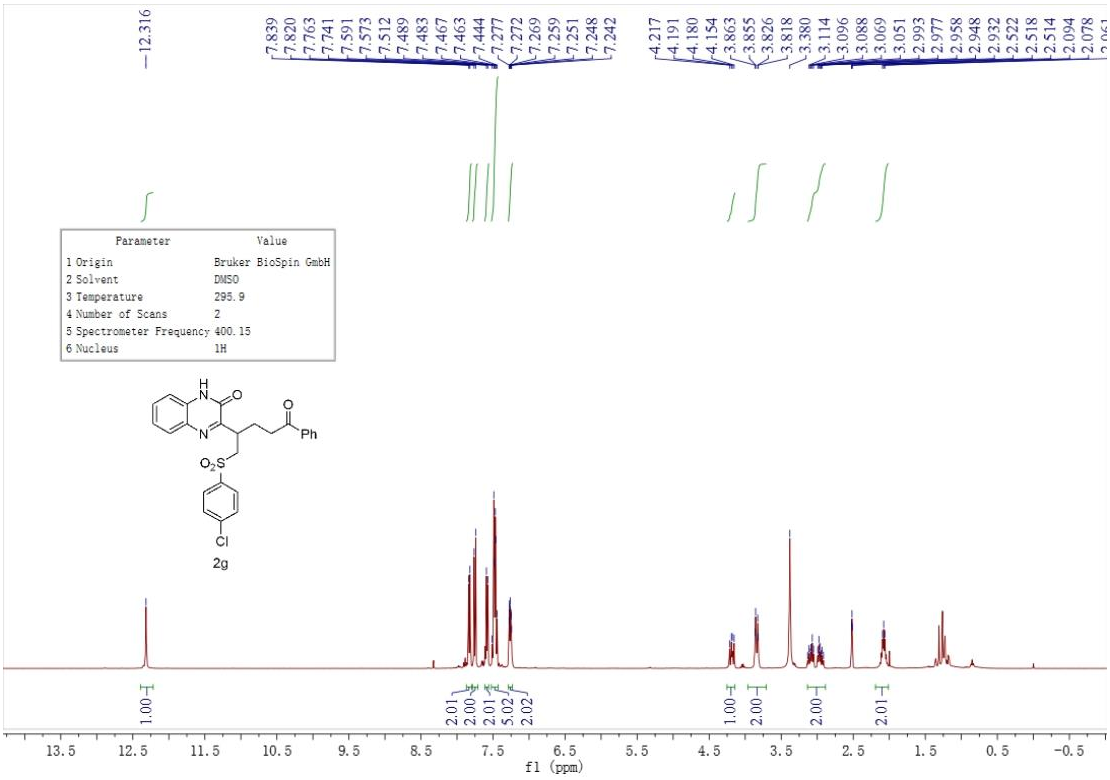
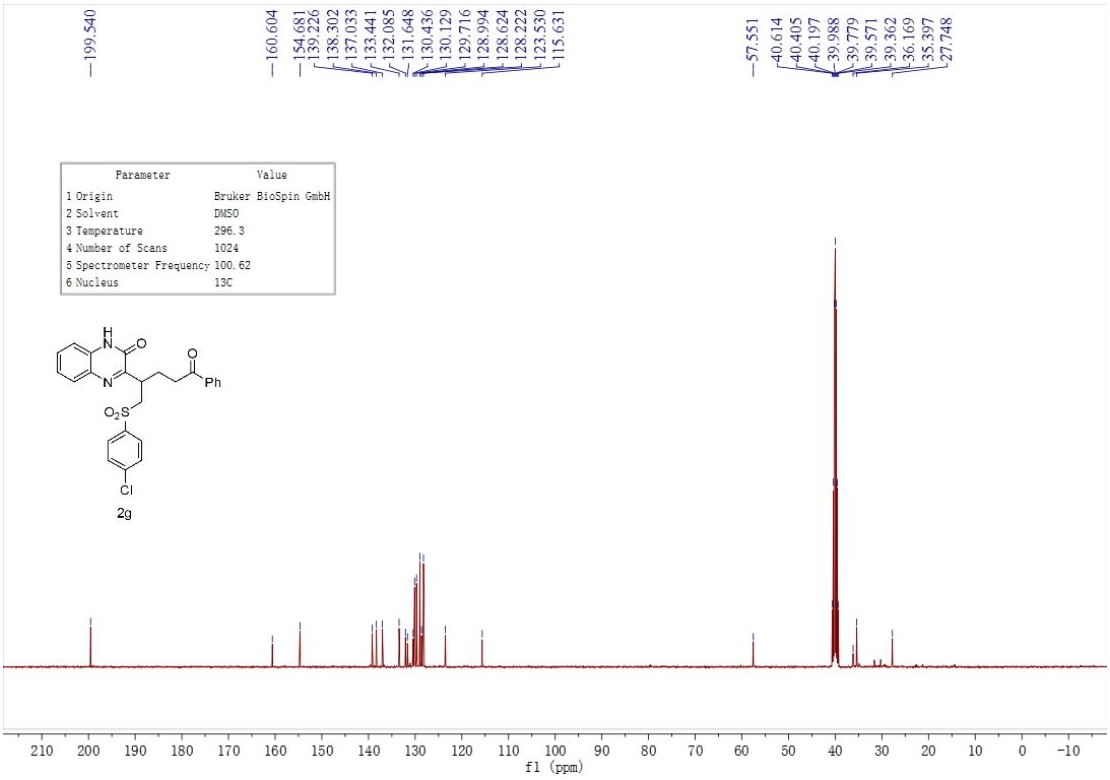
164.025
160.764
154.711
137.039
135.899
135.872
133.446
132.098
131.697
131.462
131.363
130.416
129.000
128.663
128.229
123.502
116.914
116.688
115.596
57.668
40.612
40.403
40.194
39.985
39.777
39.569
39.360
36.153
35.398
27.725
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 296.0
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2f
f1 (ppm)


-104.959
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.6
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
2f
f1 (ppm)


12.316
7.839
7.820
7.763
7.741
7.591
7.573
7.512
7.489
7.483
7.467
7.463
7.444
7.277
7.272
7.269
7.259
7.251
7.248
7.242
4.217
4.191
4.180
4.154
3.863
3.855
3.826
3.818
3.380
3.114
3.096
3.088
3.069
3.051
2.993
2.977
2.958
2.948
2.932
2.522
2.518
2.514
2.094
2.078
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.9
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
2g
1.00
2.01
2.00
2.01
5.02
2.02
1.00
2.00
2.00
2.01
f1 (ppm)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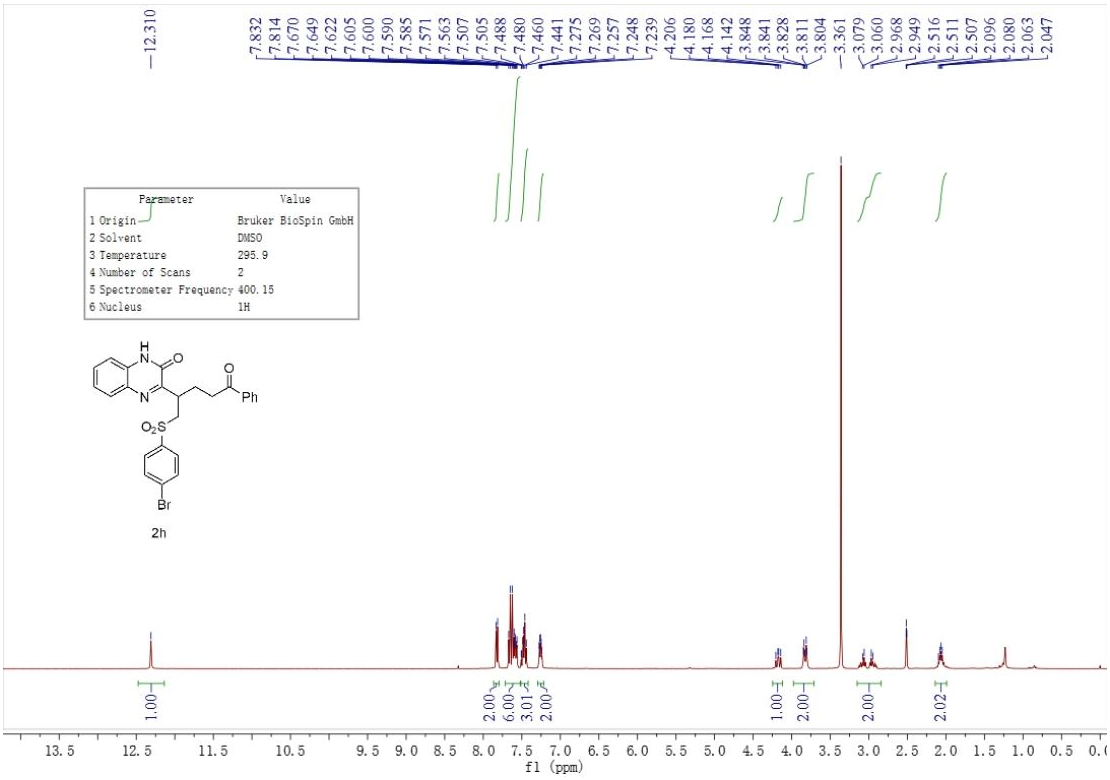
160.604
154.681
139.226
138.302
137.033
133.441
132.085
131.648
130.436
130.129
129.716
128.994
128.624
128.222
123.530
115.631
57.551
40.614
40.405
40.197
39.988
39.779
39.571
39.362
36.169
35.397
27.748
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 296.3
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2g
f1 (ppm)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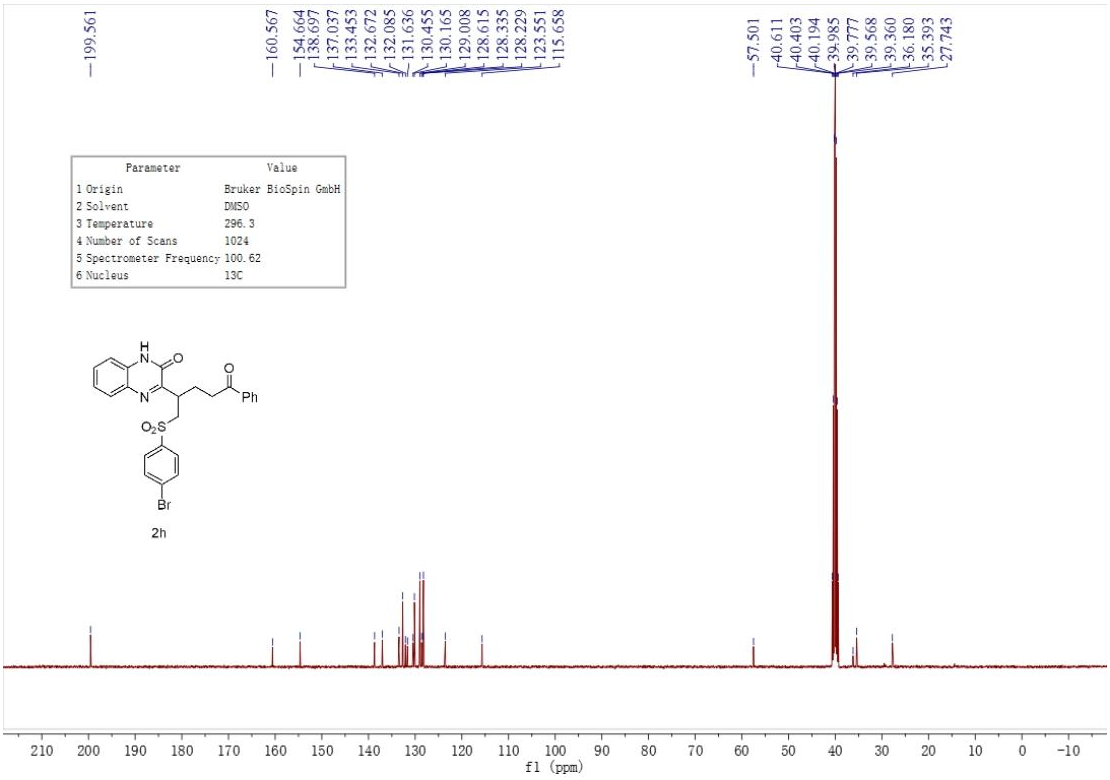
7.814
7.670
7.649
7.622
7.605
7.600
7.590
7.585
7.571
7.563
7.507
7.505
7.488
7.480
7.460
7.441
7.275
7.269
7.257
7.248
7.239
4.206
4.180
4.168
4.142
3.848
3.841
3.828
3.811
3.804
3.361
3.079
3.060
2.968
2.949
2.516
2.511
2.507
2.096
2.080
2.063
2.047
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.9
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
2h
1.00
2.00
6.00
3.01
2.00
1.00
2.00
2.00
2.02
f1 (ppm)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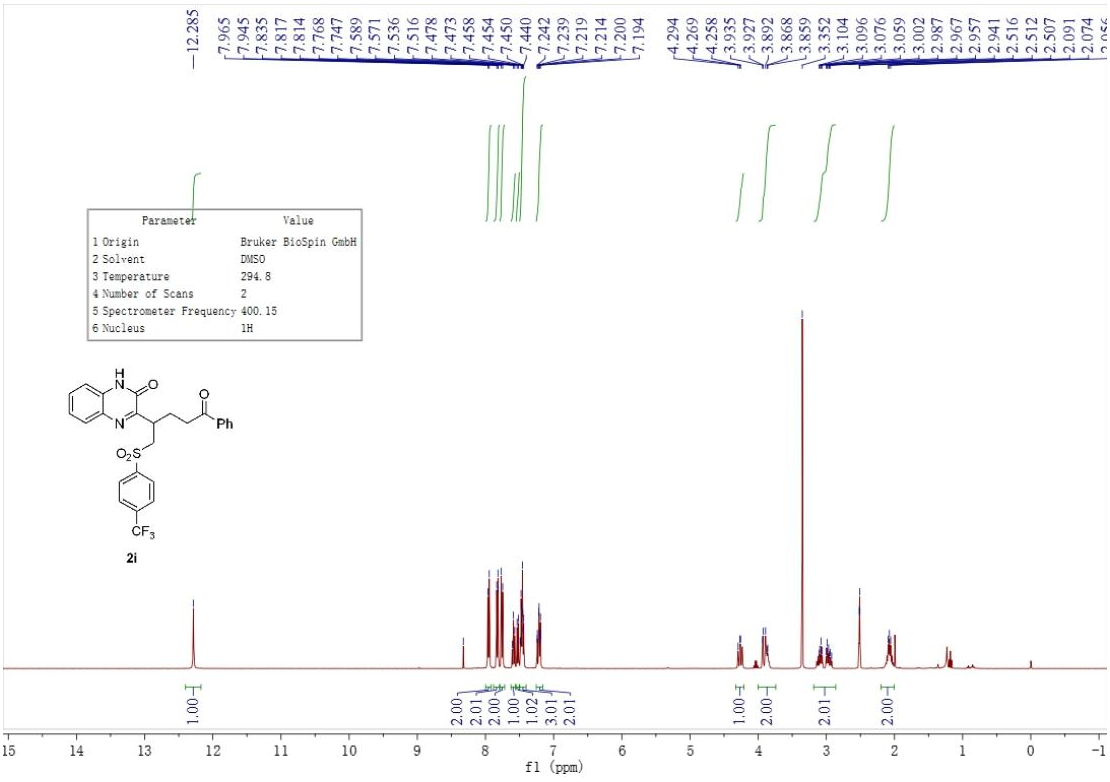
128.615
128.335
128.229
123.551
115.658
57.501
40.611
40.403
40.194
39.985
39.777
39.568
39.360
36.180
35.393
27.743
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 296.3
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ph
Br
2h
f1 (ppm)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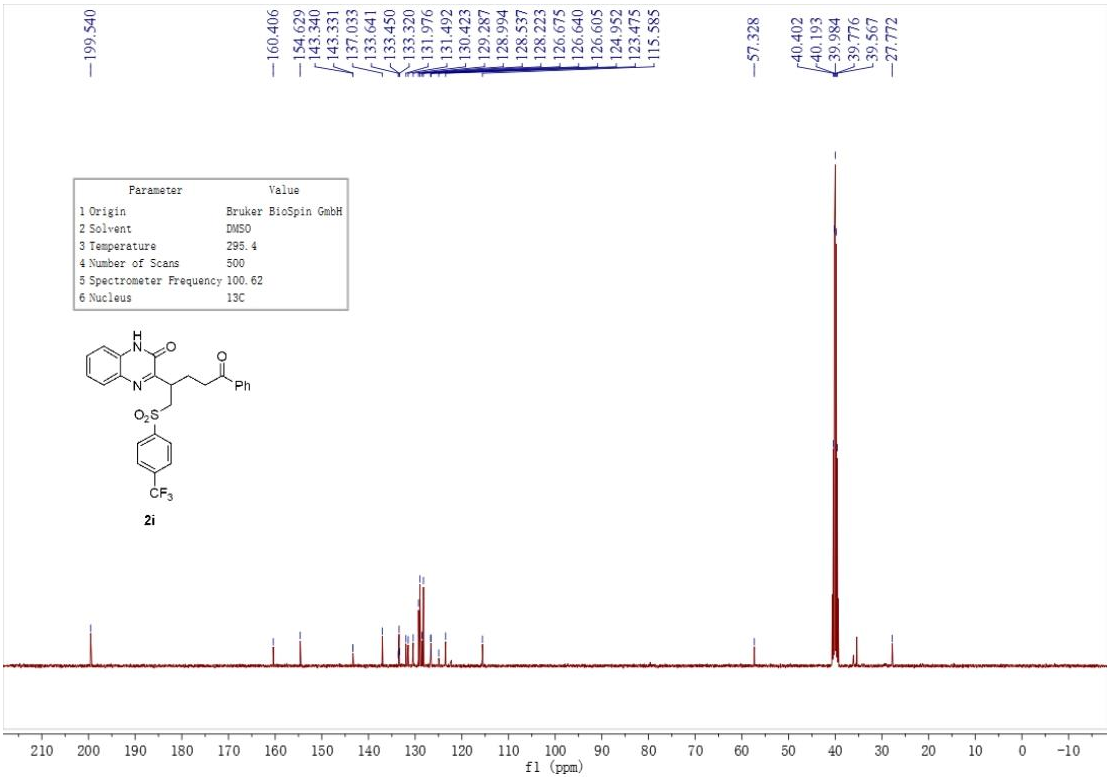
7.814
7.768
7.747
7.589
7.571
7.536
7.516
7.478
7.473
7.458
7.454
7.450
7.440
7.242
7.239
7.219
7.214
7.200
7.194
4.294
4.269
4.258
3.935
3.927
3.892
3.868
3.859
3.352
3.104
3.096
3.076
3.059
3.002
2.987
2.967
2.957
2.941
2.516
2.512
2.507
2.091
2.074
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 294.8
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
Ph
CF3
2i
1.00
2.00
2.01
2.00
1.00
1.02
3.01
2.01
1.00
2.00
2.01
2.00
f1 (ppm)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154.629
143.340
143.331
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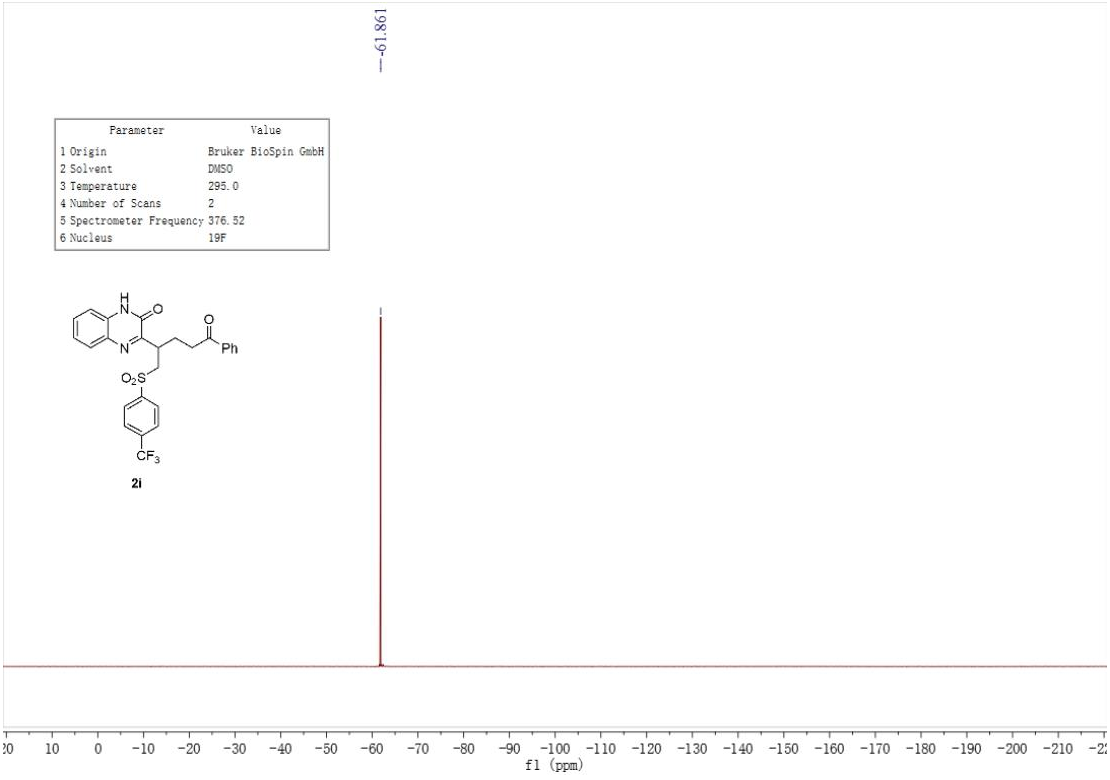
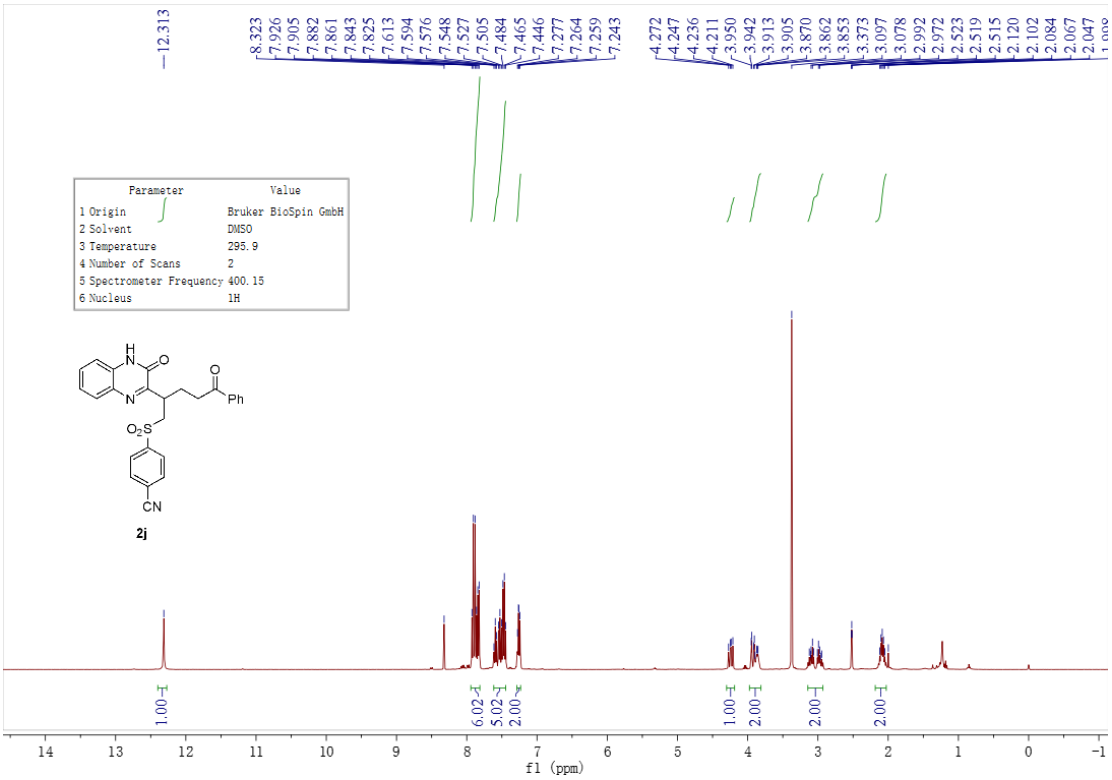
133.641
133.450
133.320
131.976
131.492
130.423
129.287
128.994
128.537
128.223
126.675
126.640
126.605
124.952
123.475
115.585
57.328
40.402
40.193
39.984
39.776
39.567
27.772
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.4
4 Number of Scans 500
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2i
f1 (ppm)


61.861
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.0
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
2i
f1 (ppm)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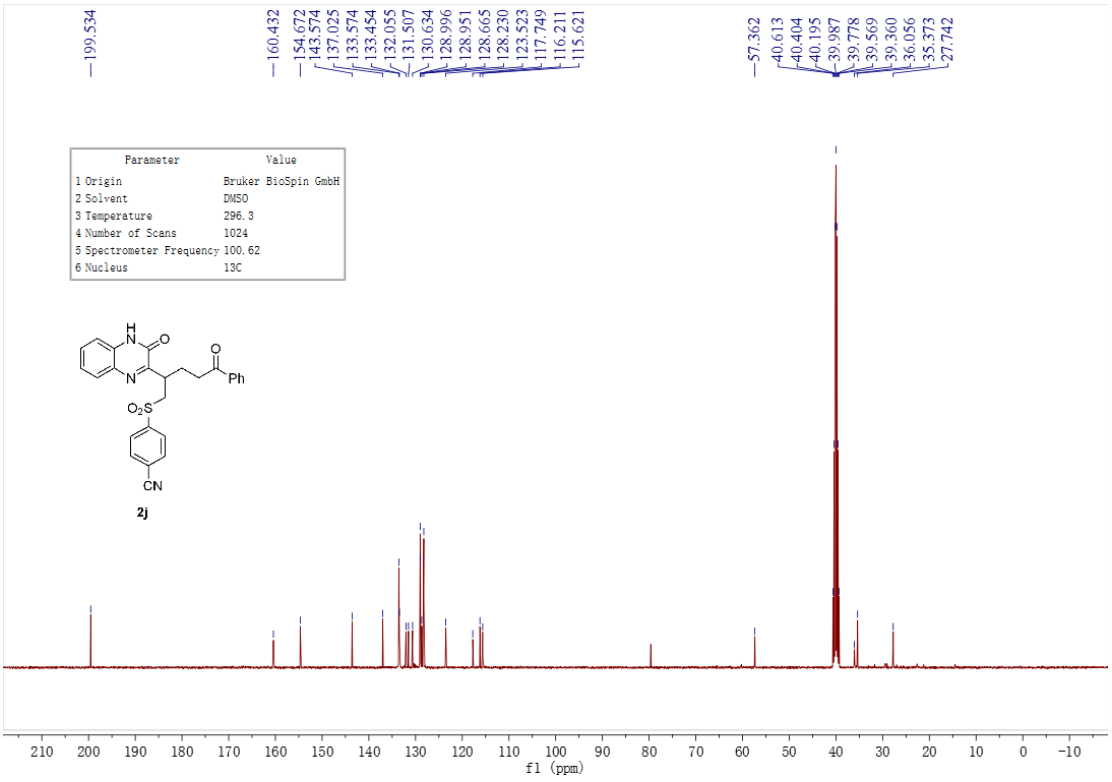
7.613
7.594
7.576
7.548
7.527
7.505
7.484
7.465
7.446
7.277
7.264
7.259
7.243
4.272
4.247
4.236
4.211
3.950
3.942
3.913
3.905
3.870
3.862
3.853
3.373
3.097
3.078
2.992
2.972
2.523
2.519
2.515
2.120
2.102
2.084
2.067
2.047
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 295.9
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
2j
1.00
6.02
5.02
2.00
1.00
2.00
2.00
2.00
f1 (ppm)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154.672
143.574
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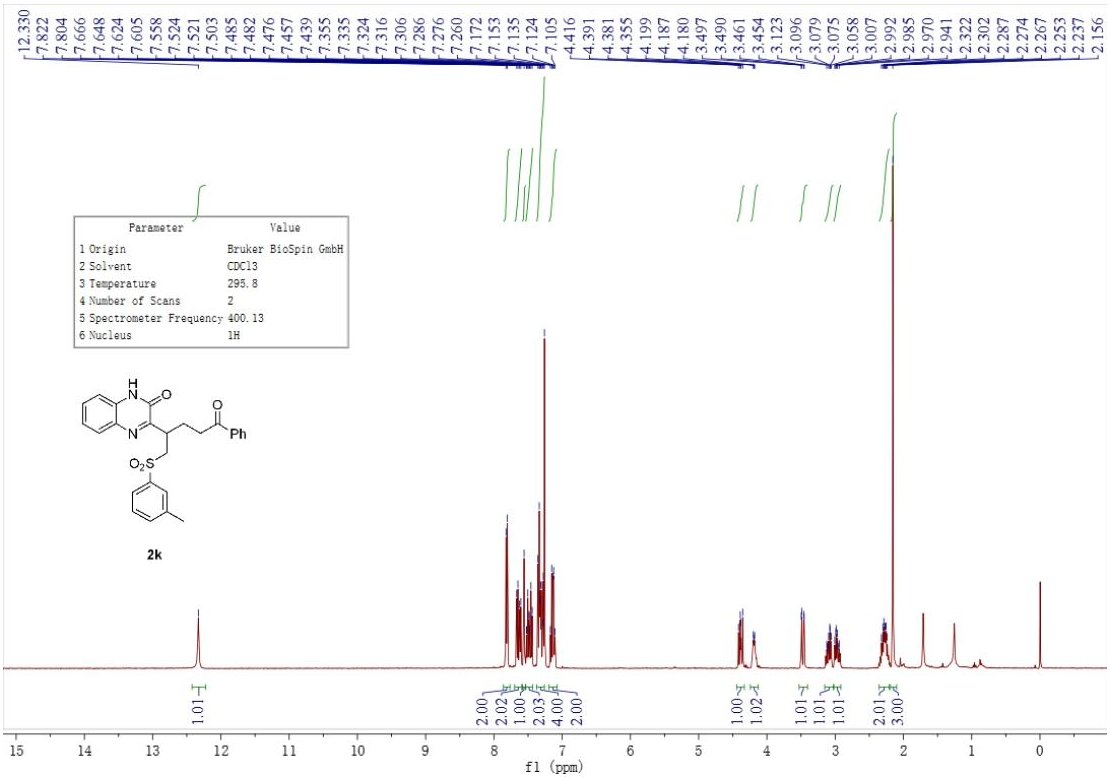
133.454
132.055
131.507
130.634
128.996
128.951
128.665
128.230
123.523
117.749
116.211
115.621
57.362
40.613
40.404
40.195
39.987
39.778
39.569
39.360
36.056
35.373
27.742
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent DMSO
3 Temperature 296.3
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2j
f1 (ppm)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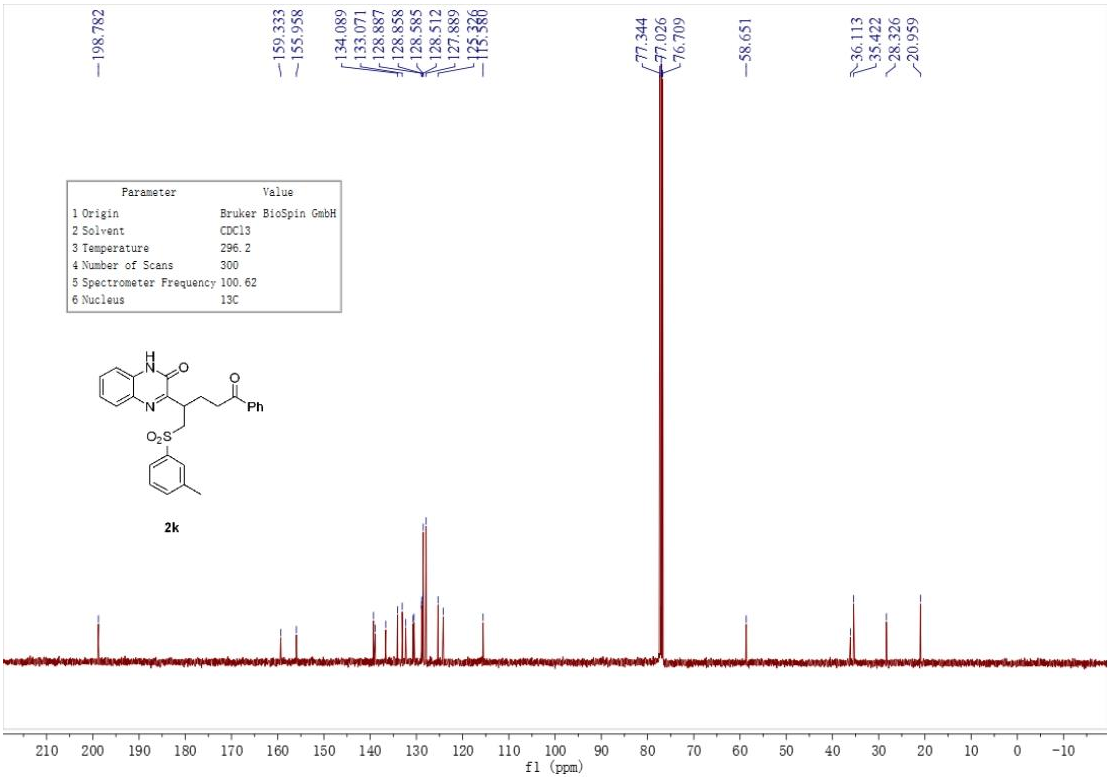
7.804
7.666
7.648
7.624
7.605
7.558
7.524
7.521
7.503
7.485
7.482
7.476
7.457
7.439
7.355
7.335
7.324
7.316
7.306
7.286
7.276
7.260
7.172
7.153
7.135
7.124
7.105
4.416
4.391
4.381
4.355
4.199
4.187
4.180
3.497
3.490
3.461
3.454
3.123
3.096
3.079
3.075
3.058
3.007
2.992
2.985
2.970
2.941
2.322
2.302
2.287
2.274
2.267
2.253
2.237
2.156
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.8
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2k
1.01
2.00
2.02
1.00
2.03
4.00
2.00
1.00
1.02
1.01
1.01
1.01
2.01
3.00
f1 (ppm)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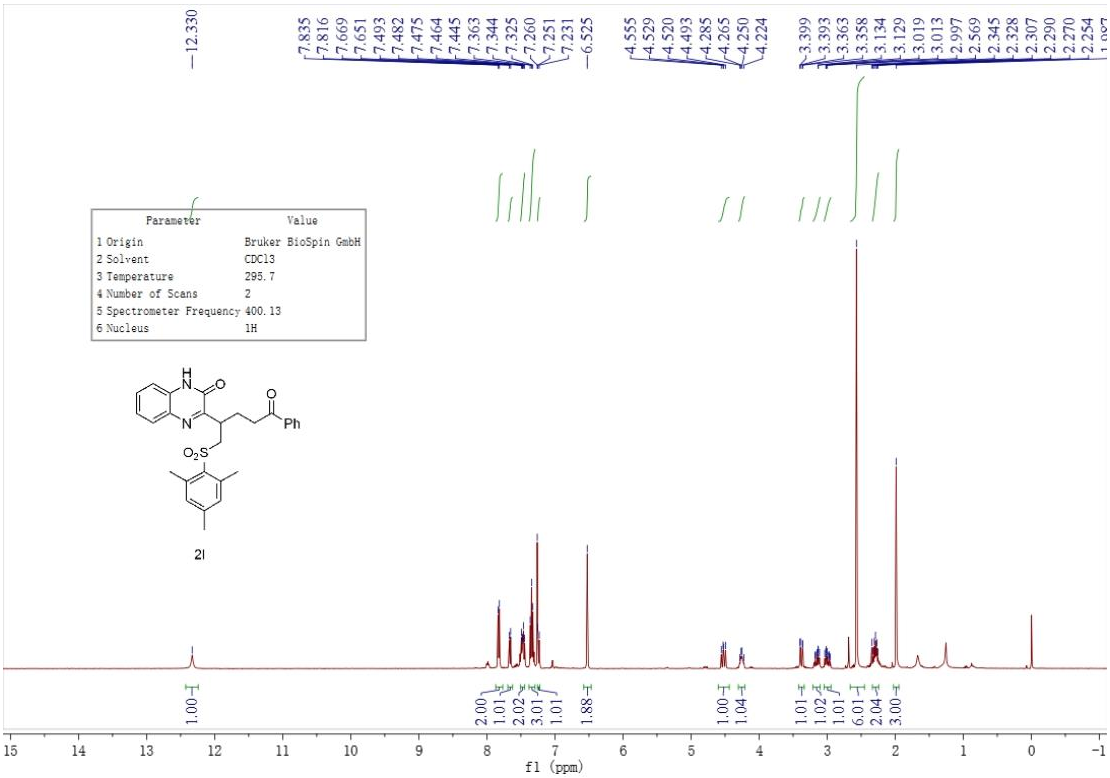
128.887
128.858
128.585
128.512
127.889
125.326
125.380
77.344
77.026
76.709
58.651
36.113
35.422
28.326
20.959
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.2
4 Number of Scans 300
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2k
f1 (ppm)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7.835
7.816
7.669
7.651
7.493
7.482
7.475
7.464
7.445
7.363
7.344
7.325
7.260
7.251
7.231
6.525
4.555
4.529
4.520
4.493
4.285
4.265
4.250
4.224
3.399
3.393
3.363
3.358
3.134
3.129
3.019
3.013
2.997
2.569
2.345
2.328
2.307
2.290
2.270
2.254
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.7
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2l
1.00
2.00
1.01
2.02
3.01
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1.04
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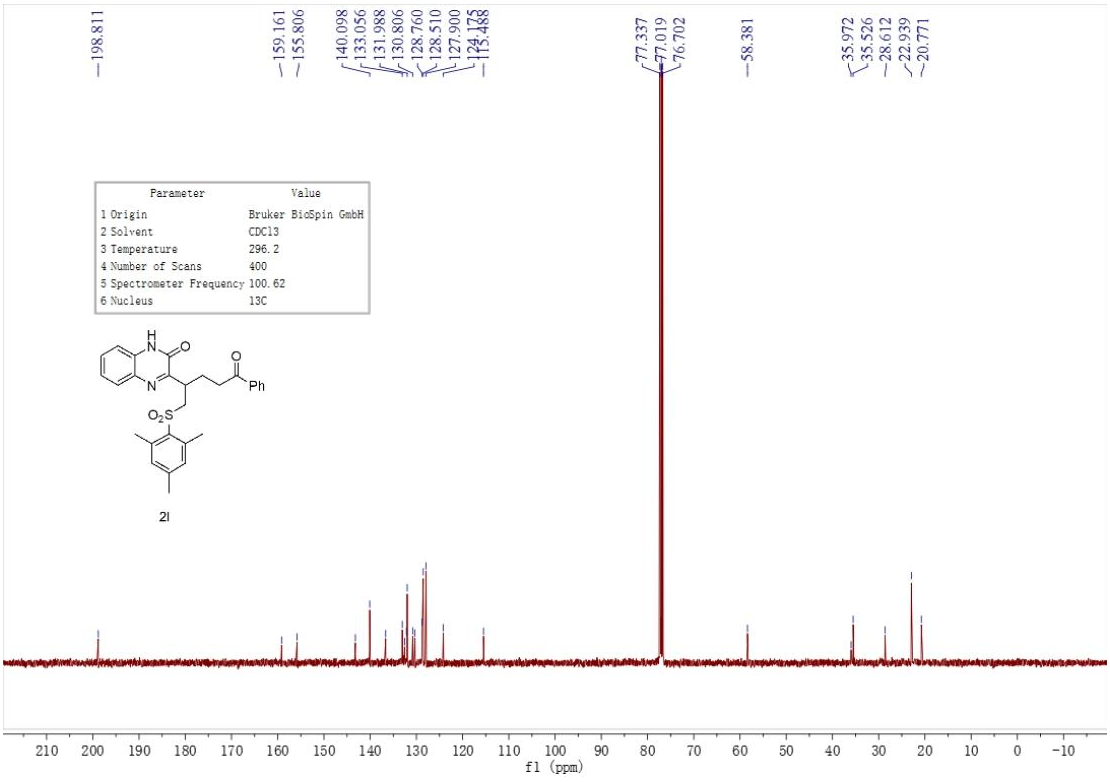
1.02
1.01
6.01
2.04
3.00
f1 (ppm)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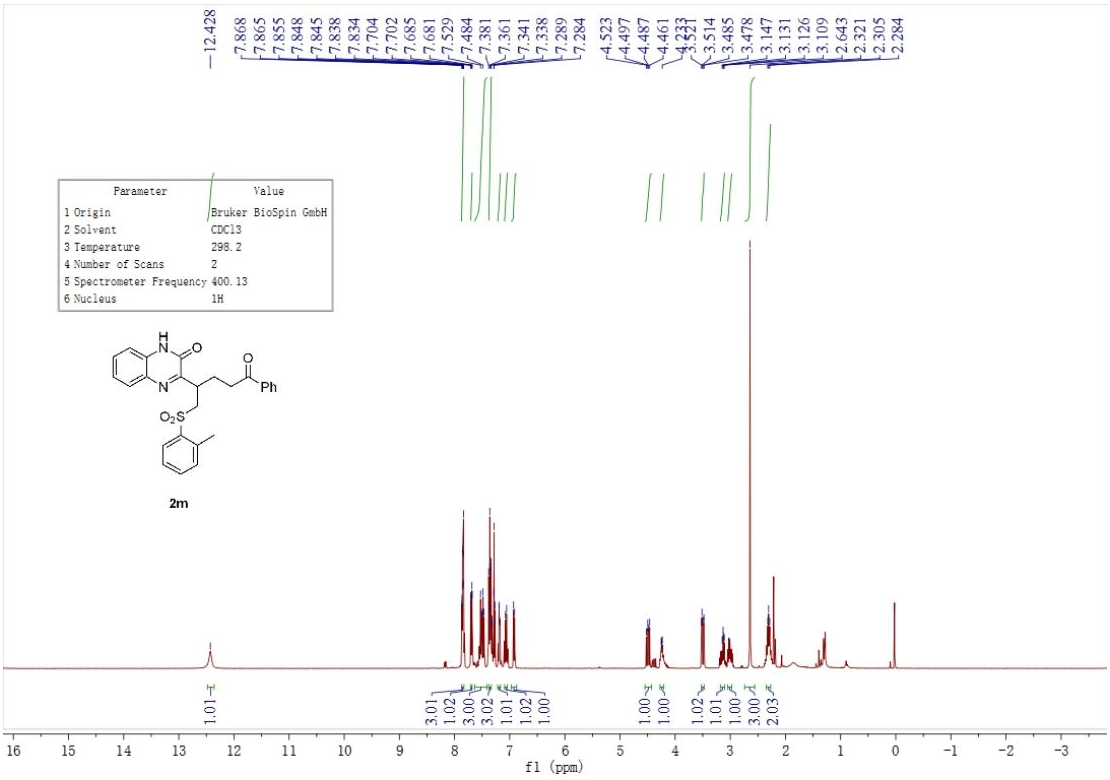
140.098
133.056
131.988
130.806
128.760
128.510
127.900
124.175
115.488
77.337
77.019
76.702
58.381
35.972
35.526
28.612
22.939
20.771
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.2
4 Number of Scans 400
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2l
f1 (ppm)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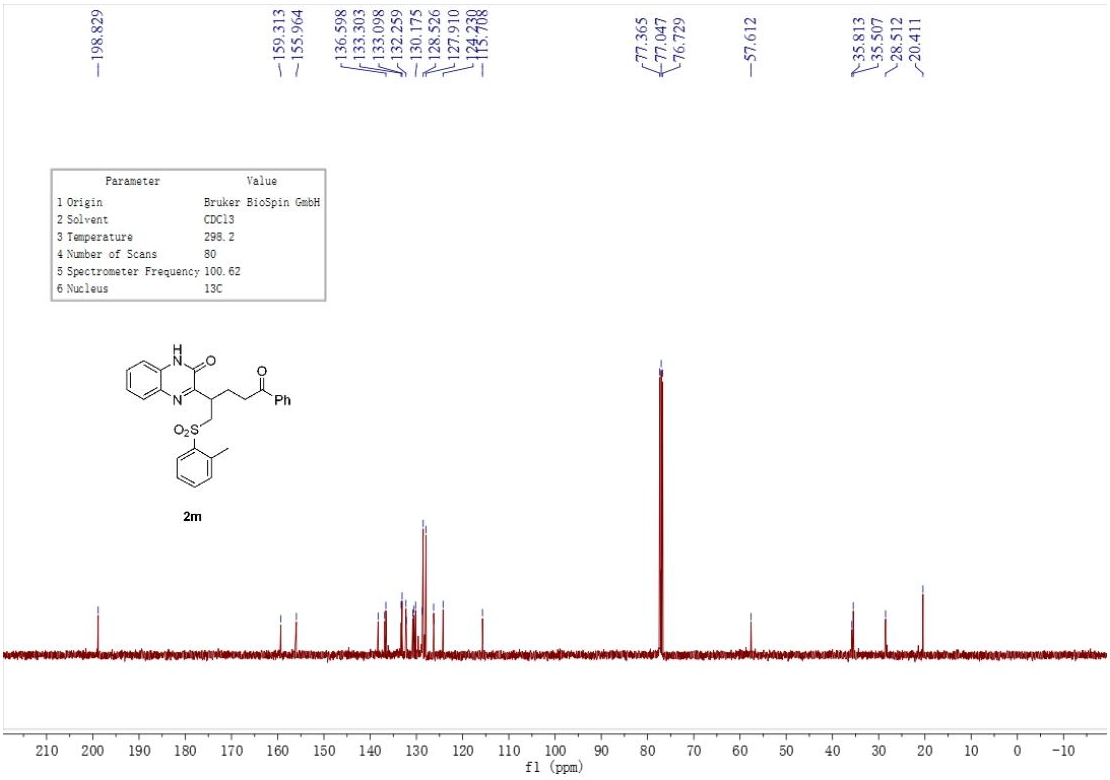
7.834
7.704
7.702
7.685
7.681
7.529
7.484
7.381
7.361
7.341
7.338
7.289
7.284
4.523
4.497
4.487
4.461
4.233
3.521
3.514
3.485
3.478
3.147
3.131
3.126
3.109
2.643
2.321
2.305
2.284
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2m
1.01
3.01
1.02
3.00
3.02
1.01
1.02
1.00
1.00
1.00
1.02
1.01
1.00
3.00
2.03
f1 (ppm)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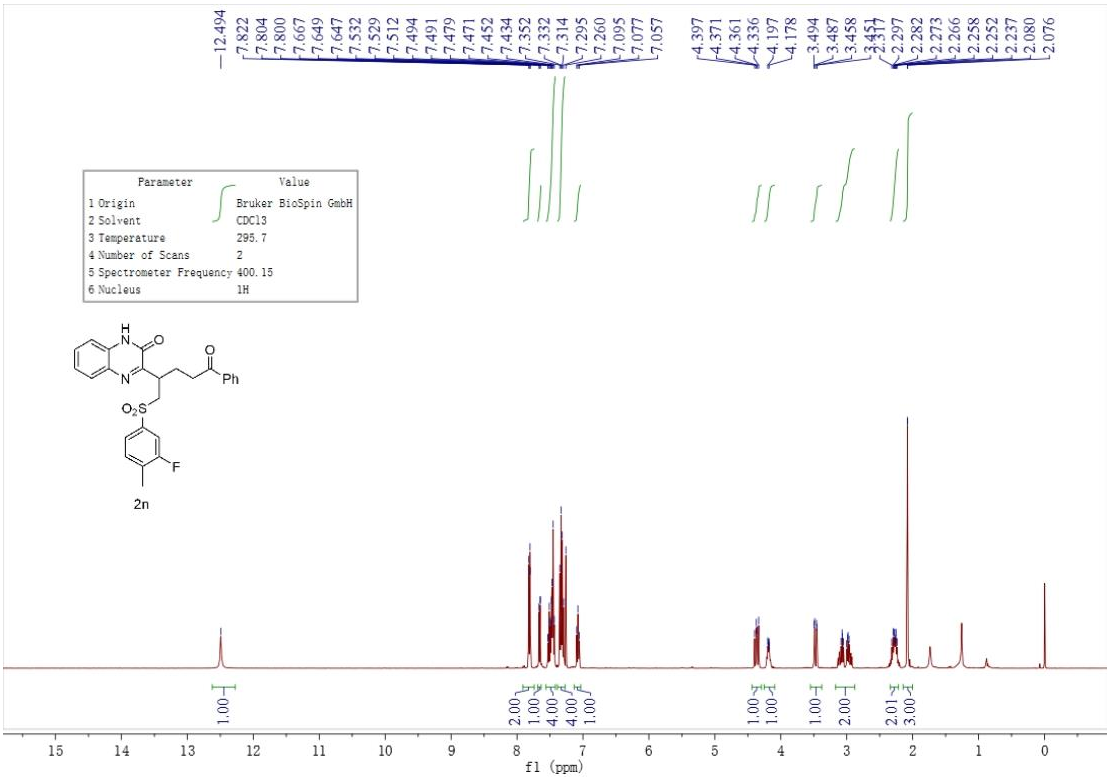
159.313
155.964
136.598
133.303
133.098
132.259
130.175
128.526
127.910
124.230
115.768
77.365
77.047
76.729
57.612
35.813
35.507
28.512
20.411
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2m
f1 (ppm)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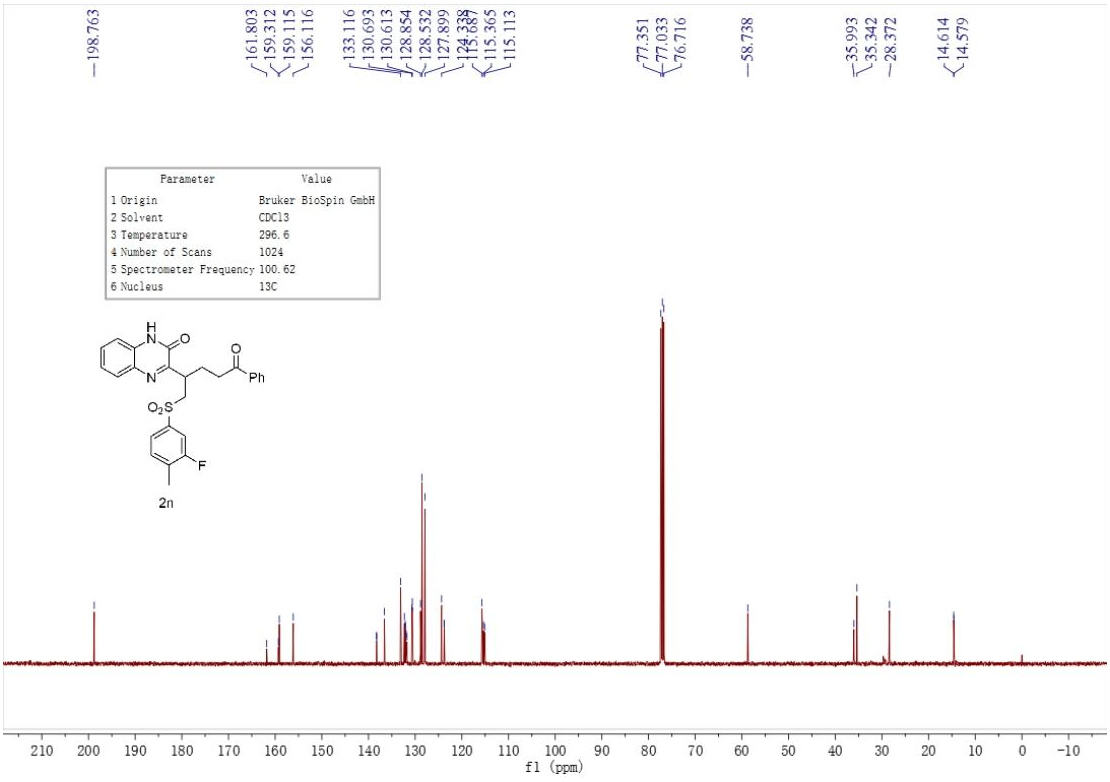
7.804
7.800
7.667
7.649
7.647
7.532
7.529
7.512
7.494
7.491
7.479
7.471
7.452
7.434
7.352
7.332
7.314
7.295
7.260
7.095
7.077
7.057
4.397
4.371
4.361
4.336
4.197
4.178
3.494
3.487
3.458
3.451
2.297
2.282
2.273
2.266
2.258
2.252
2.237
2.080
2.076
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.7
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
2n
1.00
2.00
1.00
4.00
4.00
1.00
1.00
1.00
1.00
2.00
2.01
3.00
f1 (ppm)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130.693
130.613
128.854
128.532
127.899
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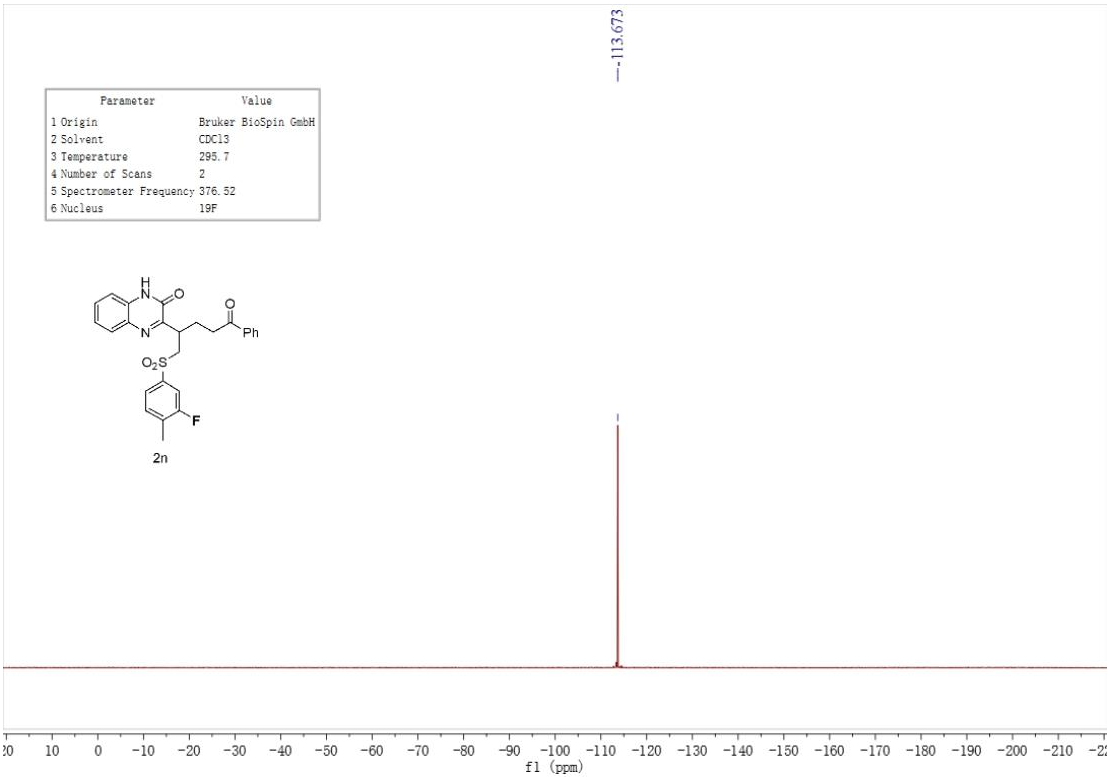
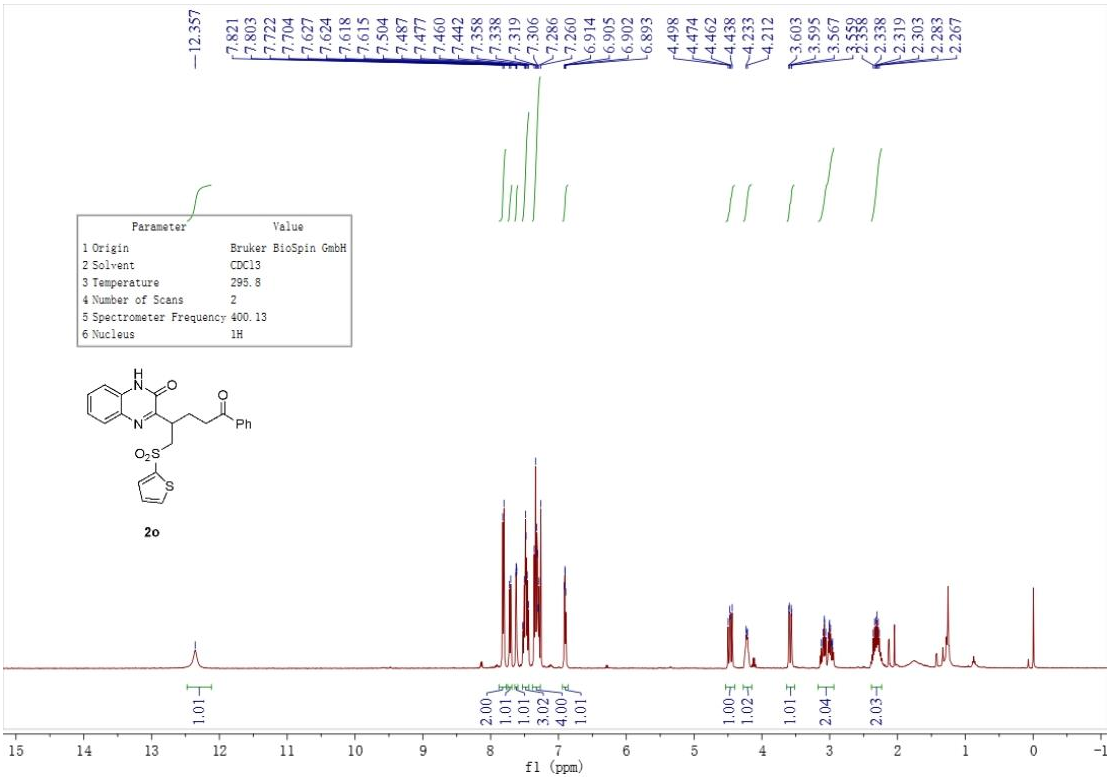
115.365
115.113
77.351
77.033
76.716
58.738
35.993
35.342
28.372
14.614
14.579
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.6
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2n
f1 (ppm)


-113.673
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.7
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
2n
f1 (ppm)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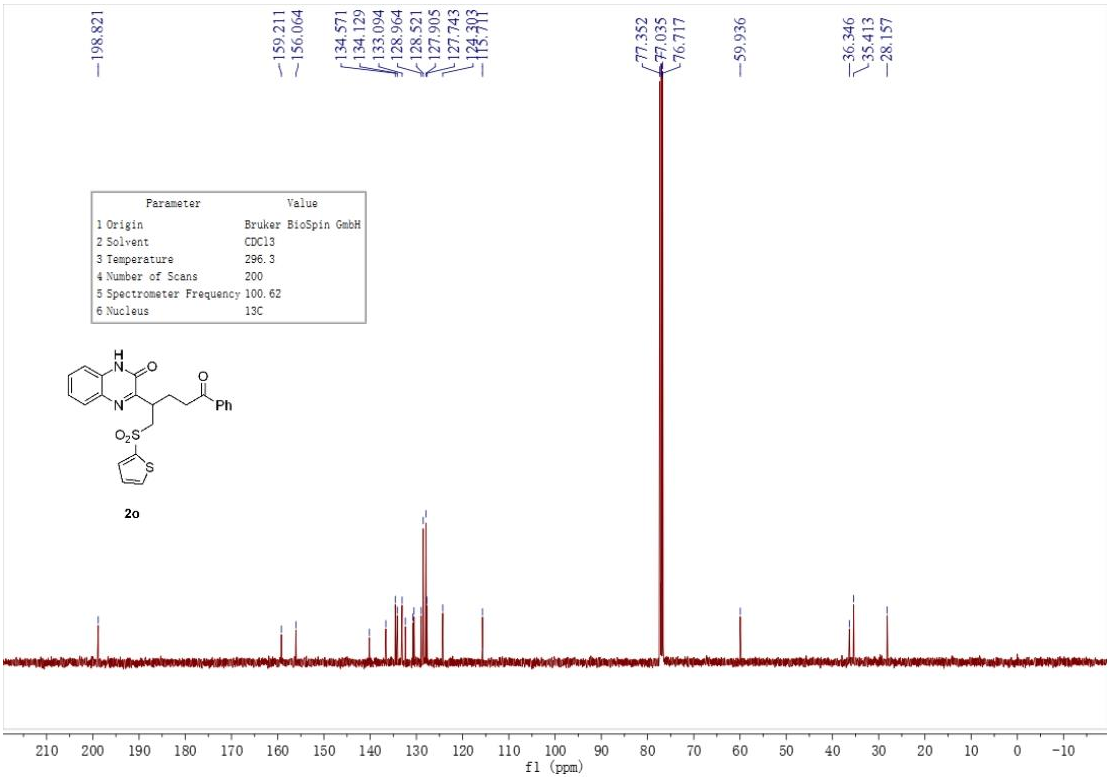
7.803
7.722
7.704
7.627
7.624
7.618
7.615
7.504
7.487
7.477
7.460
7.442
7.358
7.338
7.319
7.306
7.286
7.260
6.914
6.905
6.902
6.893
4.498
4.474
4.462
4.438
4.233
4.212
3.603
3.595
3.567
3.559
3.558
2.338
2.319
2.303
2.283
2.267
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.8
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2o
1.01
2.00
1.01
1.01
3.02
4.00
1.01
1.00
1.02
1.01
2.04
2.03
f1 (ppm)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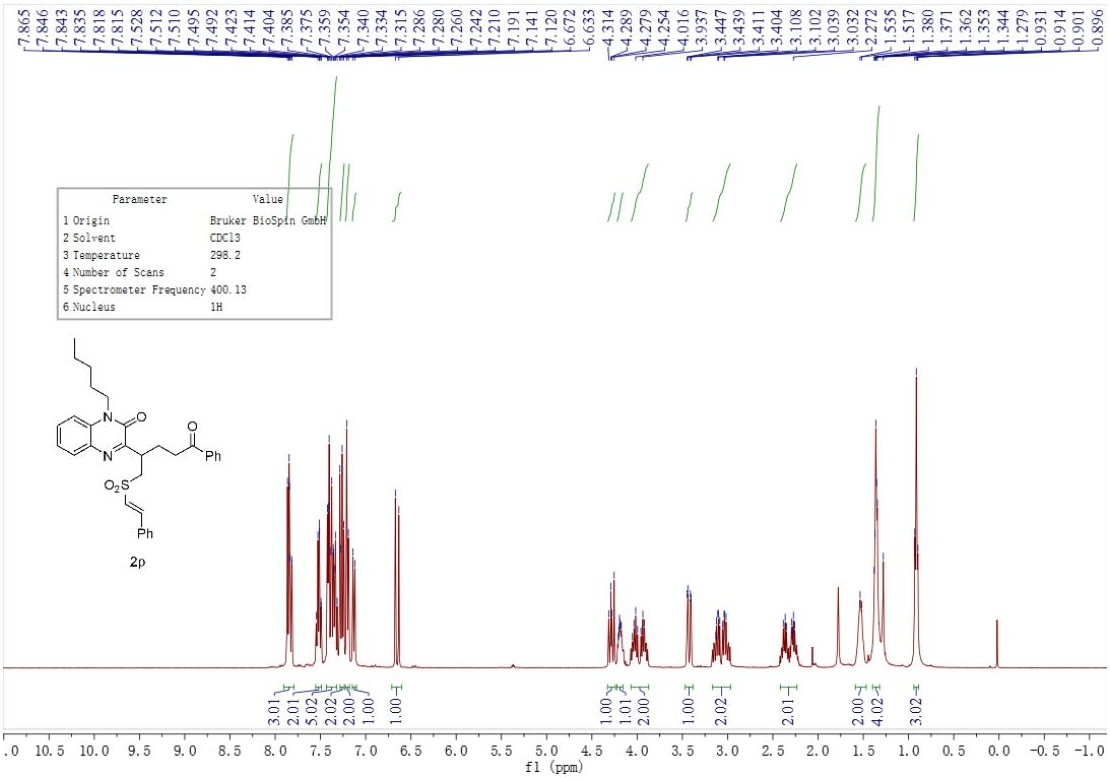
156.064
134.571
134.129
133.094
128.964
128.521
127.905
127.743
124.303
115.711
77.352
77.035
76.717
59.936
36.346
35.413
28.157
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.3
4 Number of Scans 200
5 Spectrometer Frequency 100.62
6 Nucleus 13C
2o
f1 (ppm)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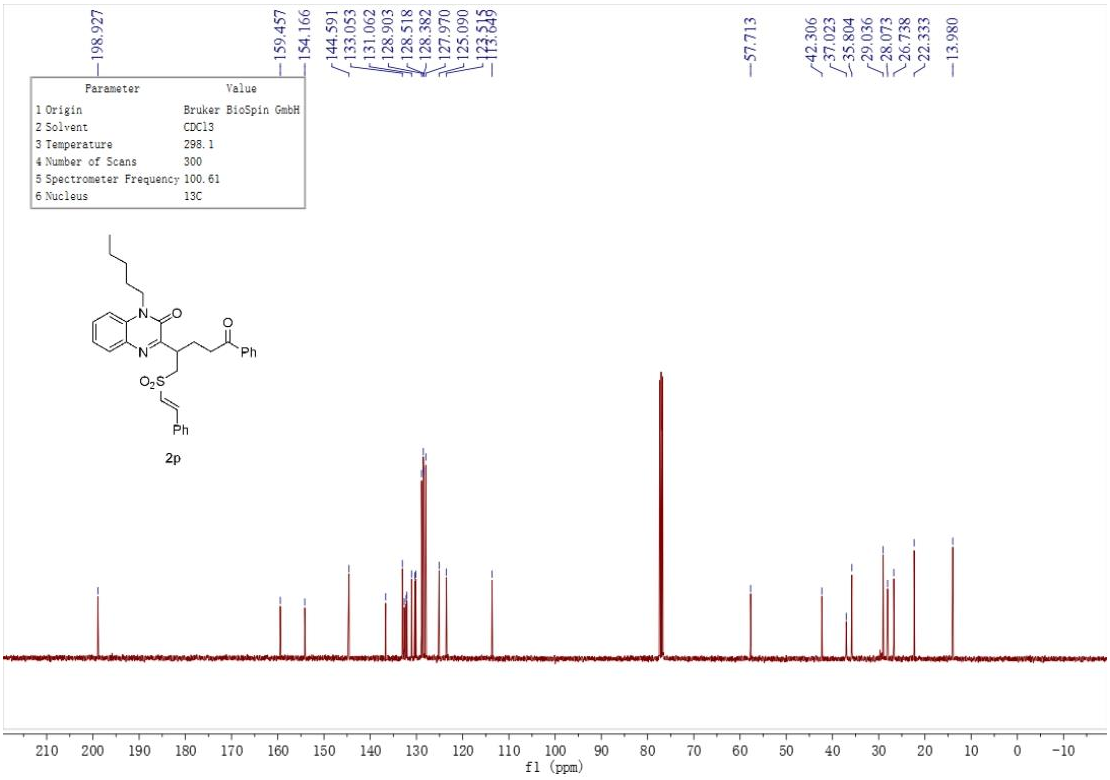
7.846
7.843
7.835
7.818
7.815
7.528
7.512
7.510
7.495
7.492
7.423
7.414
7.404
7.385
7.375
7.359
7.354
7.340
7.334
7.315
7.286
7.280
7.260
7.242
7.210
7.191
7.141
7.120
6.672
6.633
4.314
4.289
4.279
4.254
4.016
3.937
3.447
3.439
3.411
3.404
3.108
3.102
3.039
3.032
2.272
1.535
1.517
1.380
1.371
1.362
1.353
1.344
1.279
0.931
0.914
0.901
0.896
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2p
f1 (ppm)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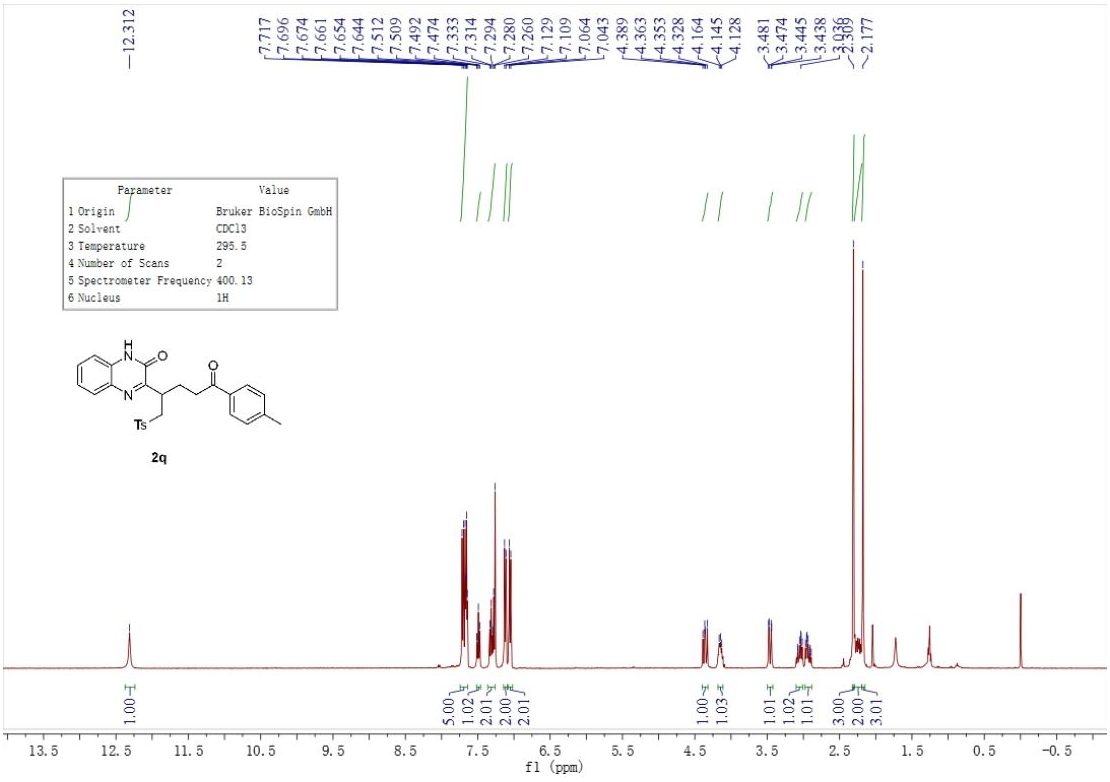
154.166
144.591
133.053
131.062
128.903
128.518
128.382
127.970
125.090
123.515
113.649
57.713
42.306
37.023
35.804
29.036
28.073
26.738
22.333
13.980
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 300
5 Spectrometer Frequency 100.61
6 Nucleus 13C
2p
f1 (ppm)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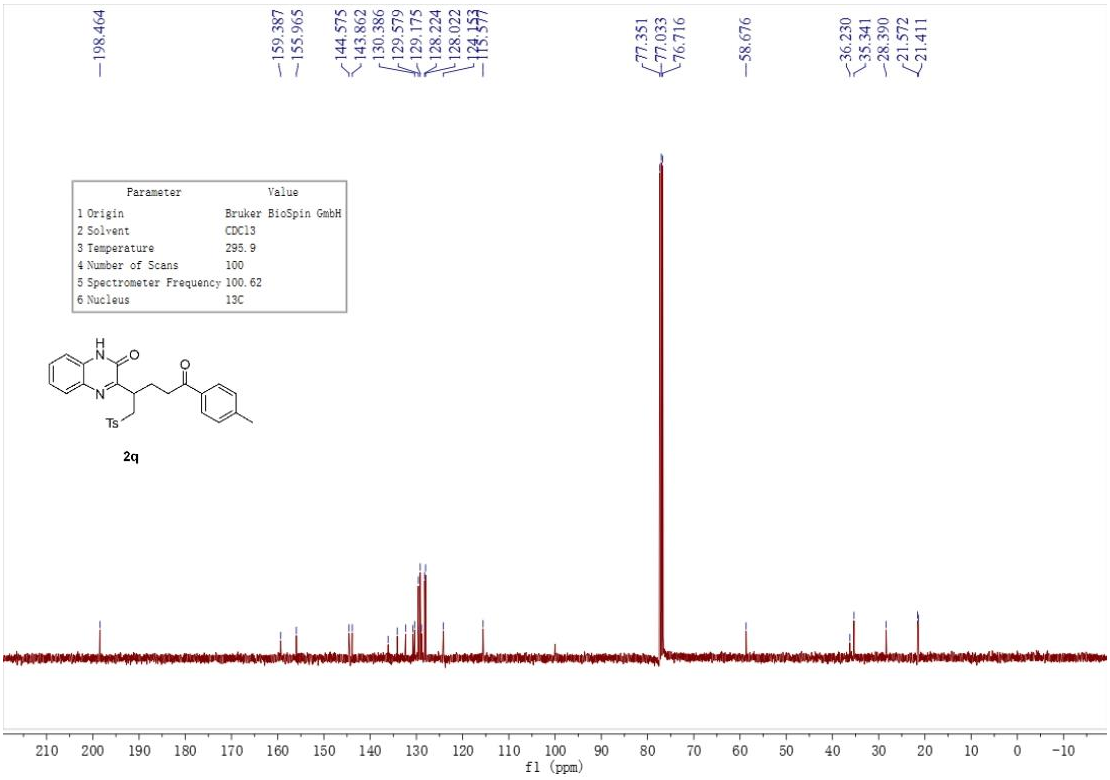
7.696
7.674
7.661
7.654
7.644
7.512
7.509
7.492
7.474
7.333
7.314
7.294
7.280
7.260
7.129
7.109
7.064
7.043
4.389
4.363
4.353
4.328
4.164
4.145
4.128
3.481
3.474
3.445
3.438
3.036
2.308
2.177
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.5
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
Ts
2q
1.00
5.00
1.02
2.01
2.00
2.01
1.00
1.03
1.01
1.02
1.01
3.00
2.00
3.01
f1 (ppm)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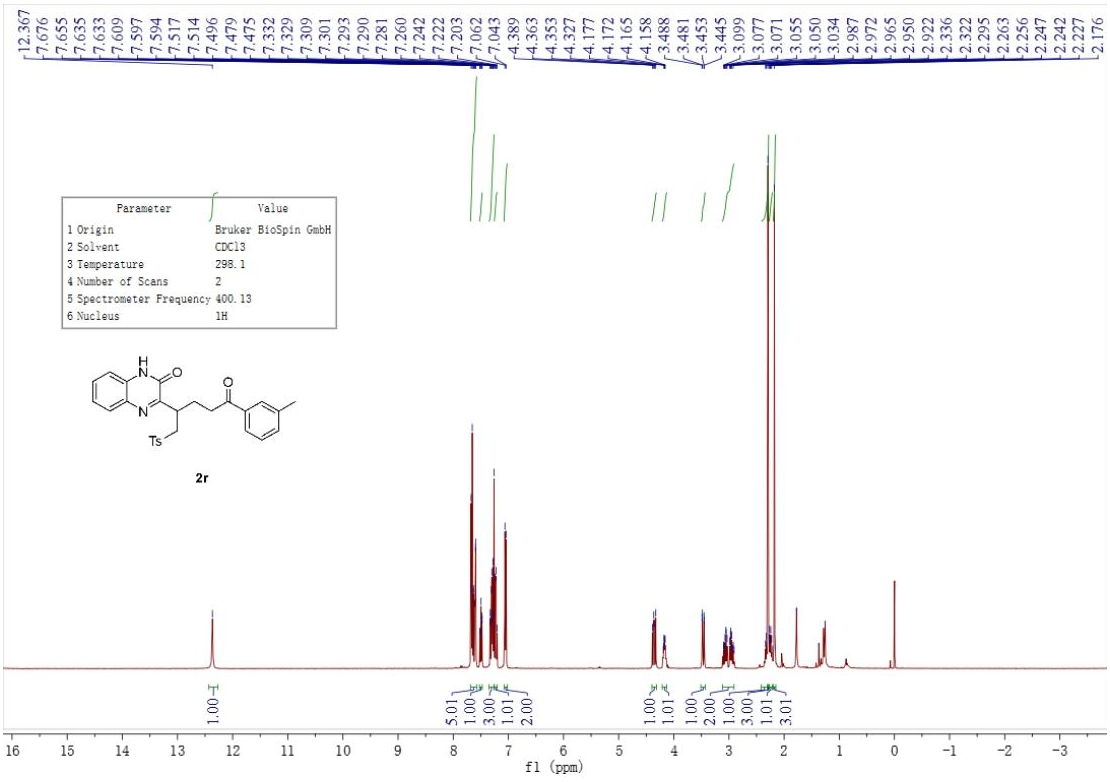
159.387
155.965
144.575
143.862
130.386
129.579
129.175
128.224
128.022
124.153
115.577
77.351
77.033
76.716
58.676
36.230
35.341
28.390
21.572
21.411
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.9
4 Number of Scans 100
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ts
f1 (ppm)

2q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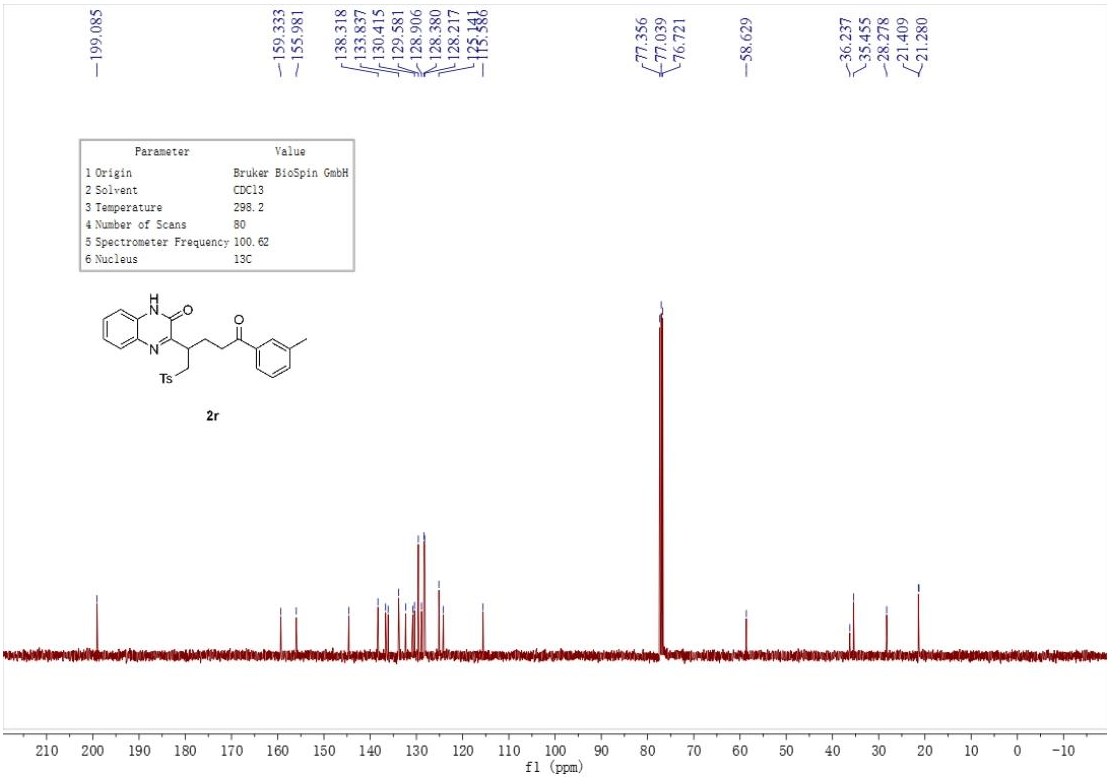
7.635
7.633
7.609
7.597
7.594
7.517
7.514
7.496
7.479
7.475
7.332
7.329
7.309
7.301
7.293
7.290
7.281
7.260
7.242
7.222
7.203
7.062
7.043
4.389
4.363
4.353
4.327
4.177
4.172
4.165
4.158
3.488
3.481
3.453
3.445
3.099
3.077
3.071
3.055
3.050
3.034
2.987
2.972
2.965
2.950
2.922
2.336
2.322
2.295
2.263
2.256
2.247
2.242
2.227
2.176
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
Ts
1.00
5.01
1.00
3.00
1.01
2.00
1.00
1.01
1.00
2.00
1.00
3.00
1.01
3.01
f1 (ppm)

2r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155.981
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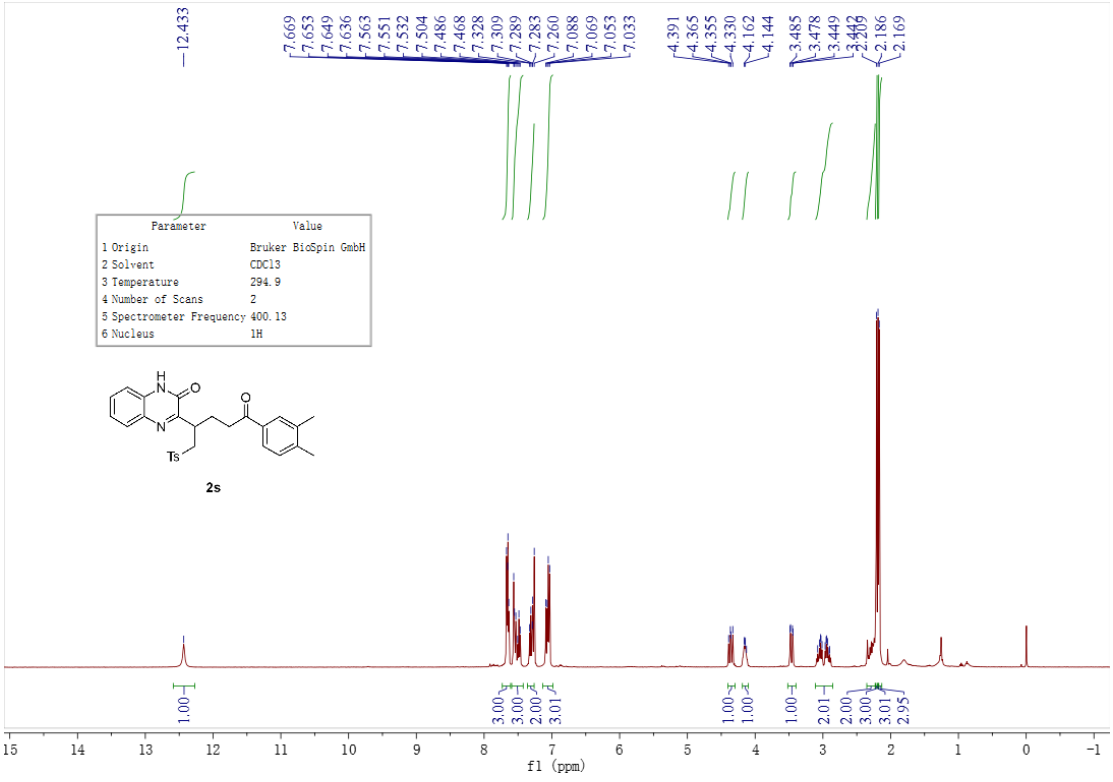
128.906
128.380
128.217
125.141
115.586
77.356
77.039
76.721
58.629
36.237
35.455
28.278
21.409
21.280
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ts
2r
f1 (ppm)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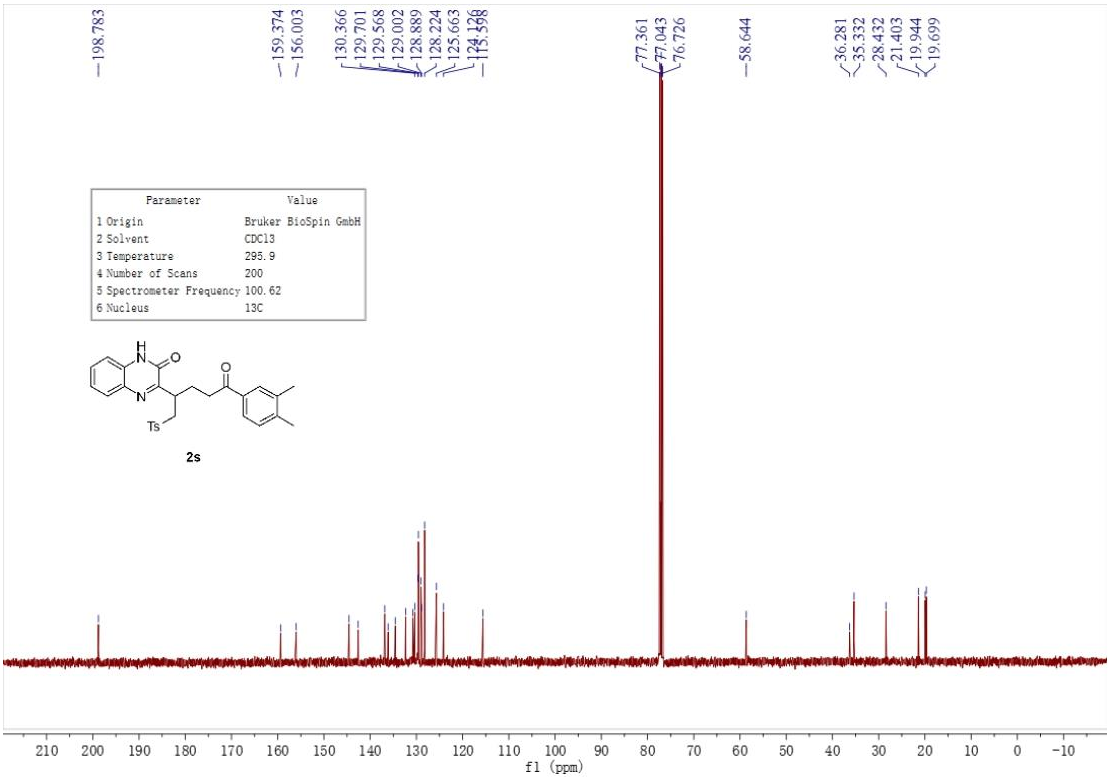
7.563
7.551
7.532
7.504
7.486
7.468
7.328
7.309
7.289
7.283
7.260
7.088
7.069
7.053
7.033
4.391
4.365
4.355
4.330
4.162
4.144
3.485
3.478
3.449
2.186
2.169
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 294.9
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
Ts
2s
1.00
3.00
3.00
2.00
3.01
1.00
1.00
1.00
2.01
2.00
3.00
3.01
2.95
f1 (ppm)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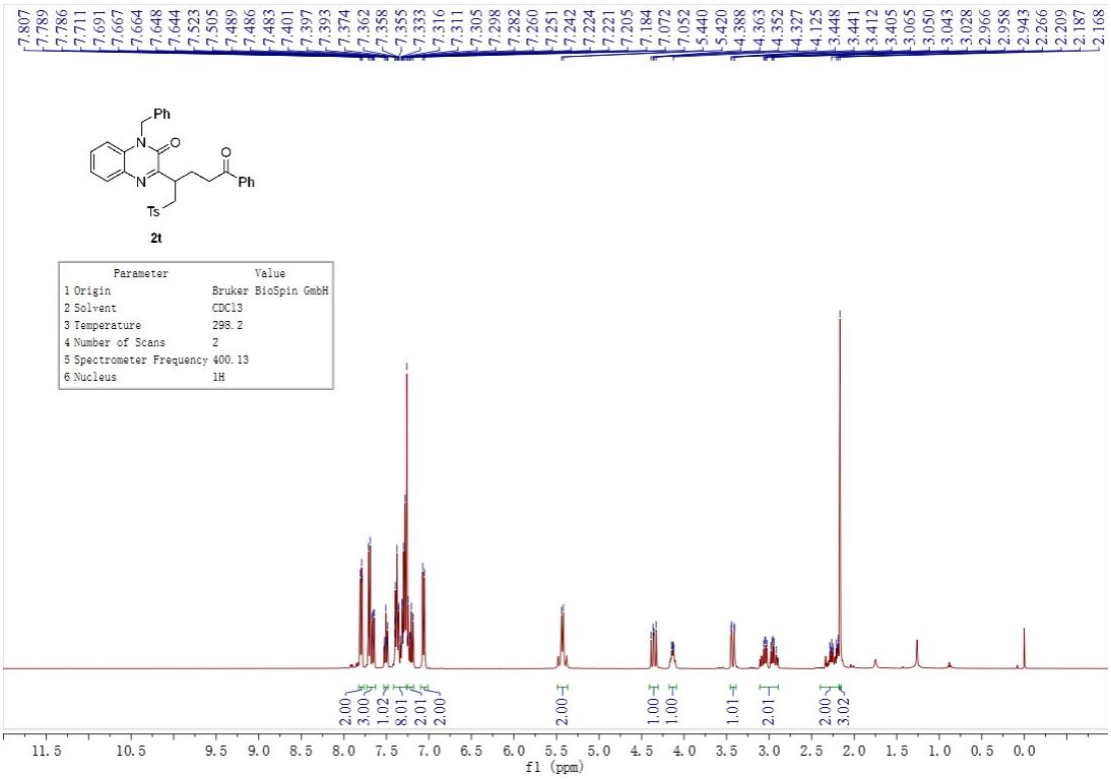
128.889
128.224
125.663
124.126
115.598
77.361
77.043
76.726
58.644
36.281
35.332
28.432
21.403
19.944
19.699
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.9
4 Number of Scans 200
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ts
2s
f1 (ppm)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7.648
7.644
7.523
7.505
7.489
7.486
7.483
7.401
7.397
7.393
7.374
7.362
7.358
7.355
7.333
7.316
7.311
7.305
7.298
7.282
7.260
7.251
7.242
7.224
7.221
7.205
7.184
7.072
7.052
5.440
5.420
4.388
4.363
4.352
4.327
4.125
3.448
3.441
3.412
3.405
3.065
3.050
3.043
3.028
2.966
2.958
2.943
2.266
2.209
2.187
2.168
Ph
Ts
2t
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.00
3.00
1.02
8.01
2.01
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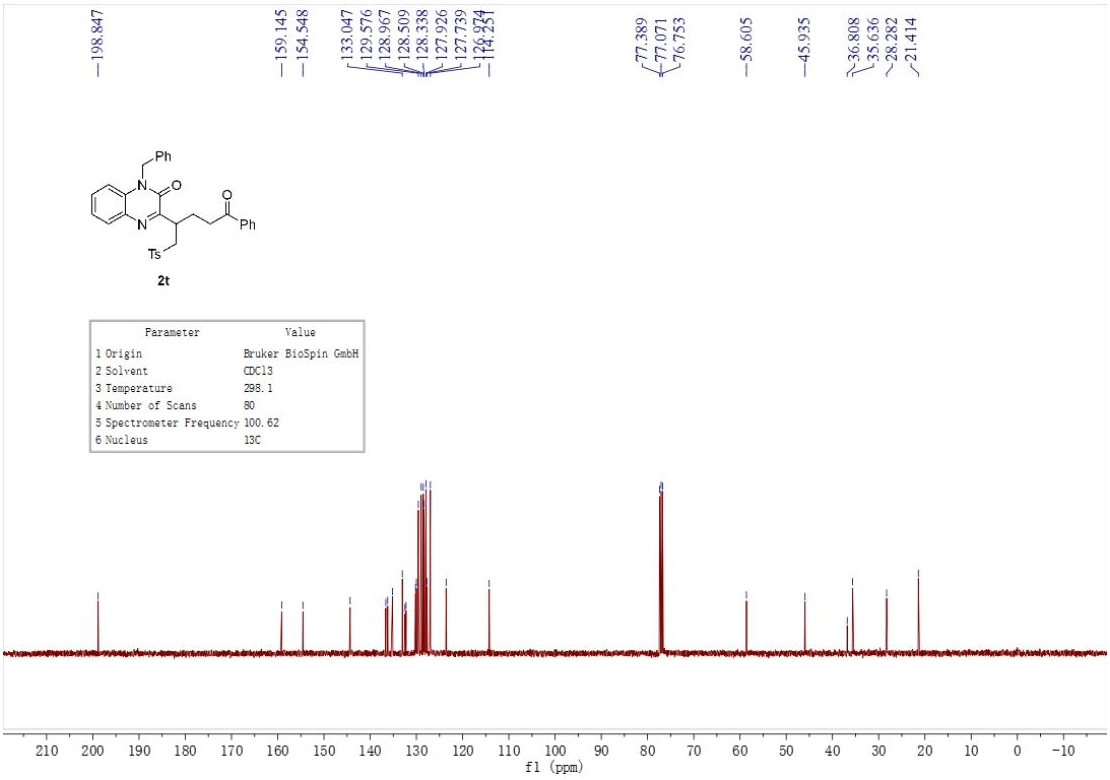
1.00
1.00
1.01
2.01
2.00
3.02
f1 (ppm)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128.338
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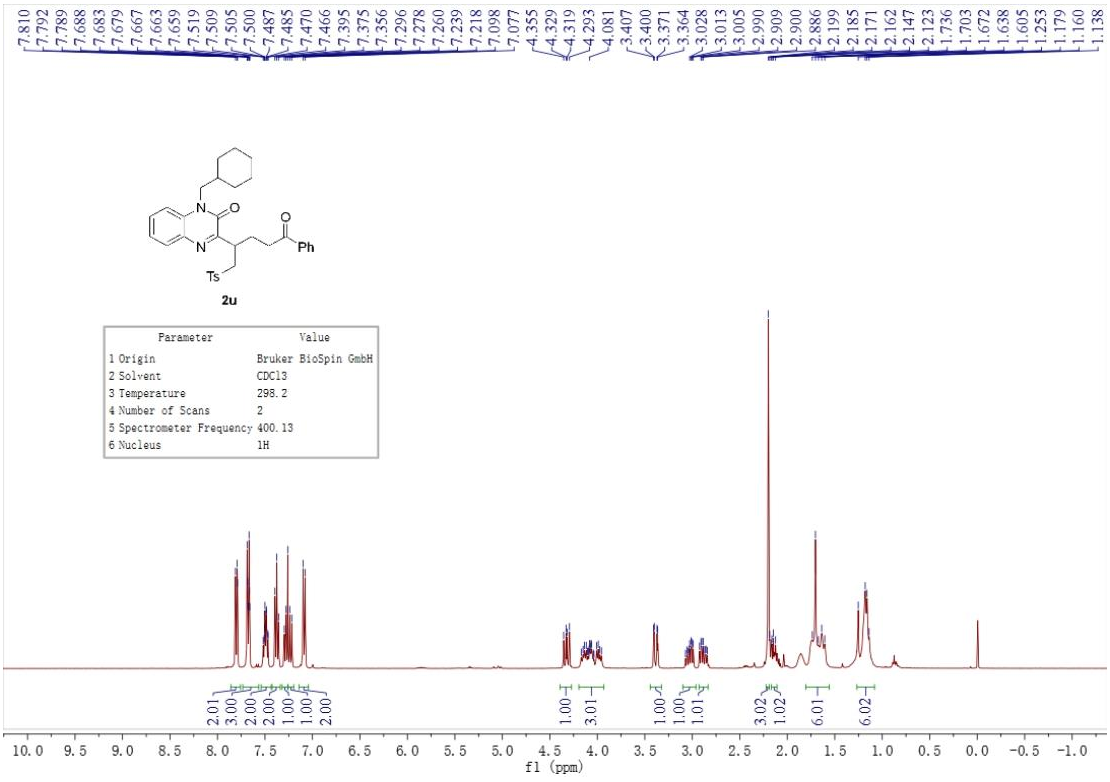
127.739
126.234
114.251
77.389
77.071
76.753
58.605
45.935
36.808
35.636
28.282
21.414
Ph
O
N
N
O
Ph
Ts
2t
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)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7.519
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7.505
7.500
7.487
7.485
7.470
7.466
7.395
7.375
7.356
7.296
7.278
7.260
7.239
7.218
7.098
7.077
4.355
4.329
4.319
4.293
4.081
3.407
3.400
3.371
3.364
3.028
3.013
3.005
2.990
2.909
2.900
2.886
2.199
2.185
2.171
2.162
2.147
2.123
1.736
1.703
1.672
1.638
1.605
1.253
1.179
1.160
1.138
N
O
N
O
Ph
Ts
2u
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.01
3.00
2.00
2.00
1.00
1.00
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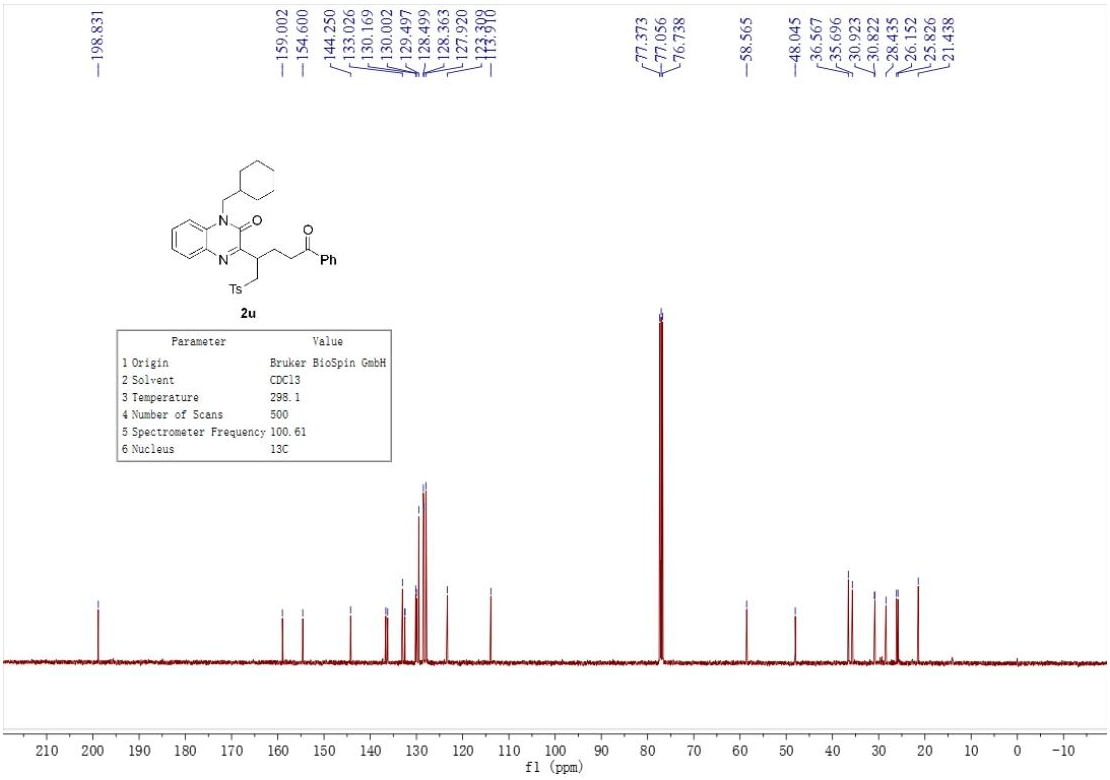
1.02
6.01
6.02
f1 (ppm)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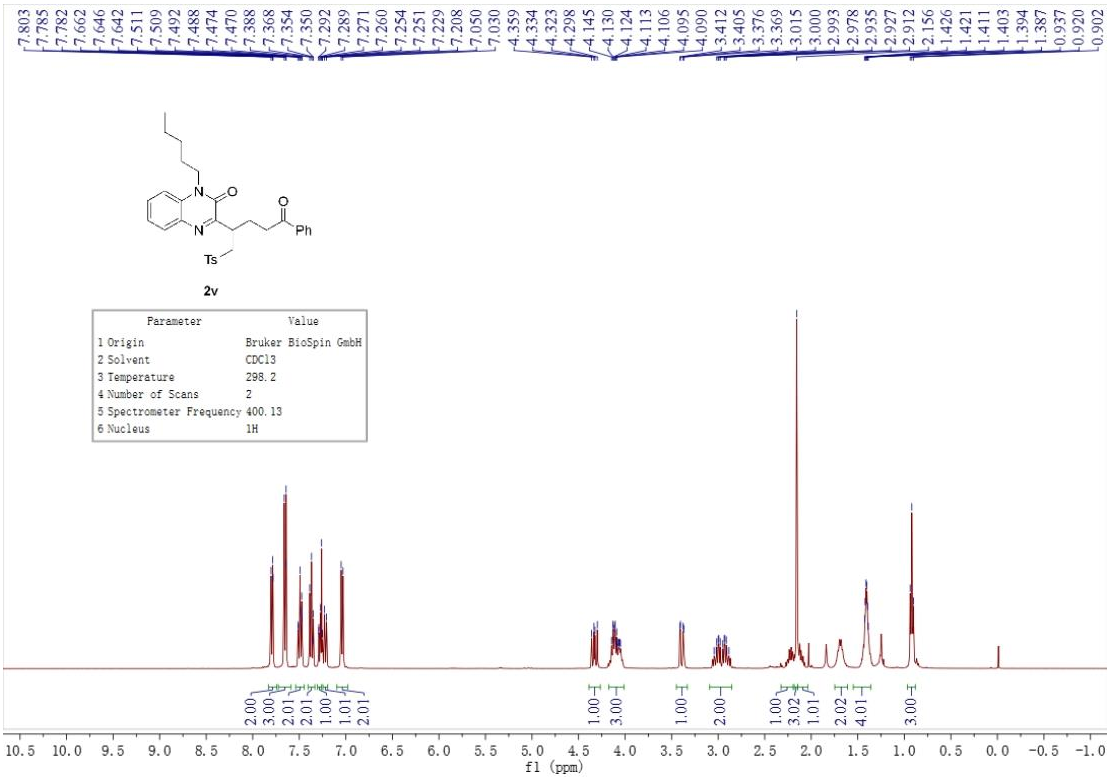
128.363
127.920
123.309
113.910
77.373
77.056
76.738
58.565
48.045
36.567
35.696
30.923
30.822
28.435
26.152
25.826
21.438
Ts
Ph
2u
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 500
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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7.642
7.511
7.509
7.492
7.488
7.474
7.470
7.388
7.368
7.354
7.350
7.292
7.289
7.271
7.260
7.254
7.251
7.229
7.208
7.050
7.030
4.359
4.334
4.323
4.298
4.145
4.130
4.124
4.113
4.106
4.095
4.090
3.412
3.405
3.376
3.369
3.015
3.000
2.993
2.978
2.935
2.927
2.912
2.156
1.426
1.421
1.411
1.403
1.394
1.387
0.937
0.920
0.902
Ts
Ph
2v
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.00
3.00
2.01
2.01
1.00
1.01
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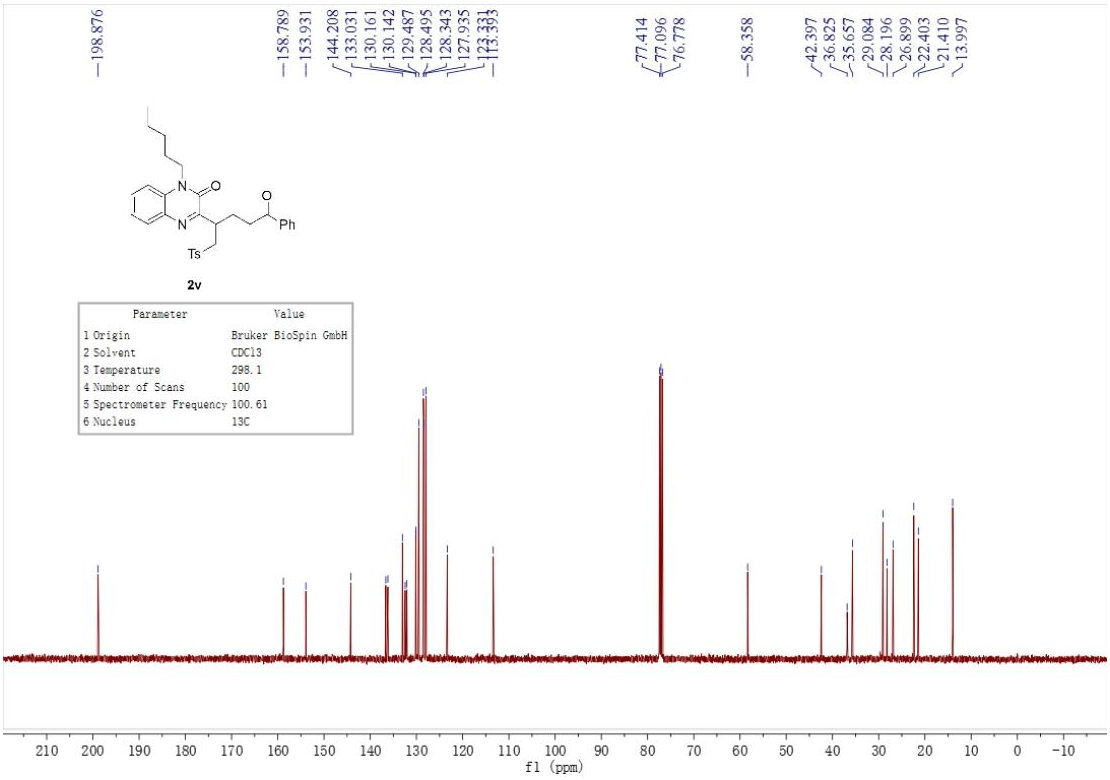
4.01
3.00
f1 (ppm)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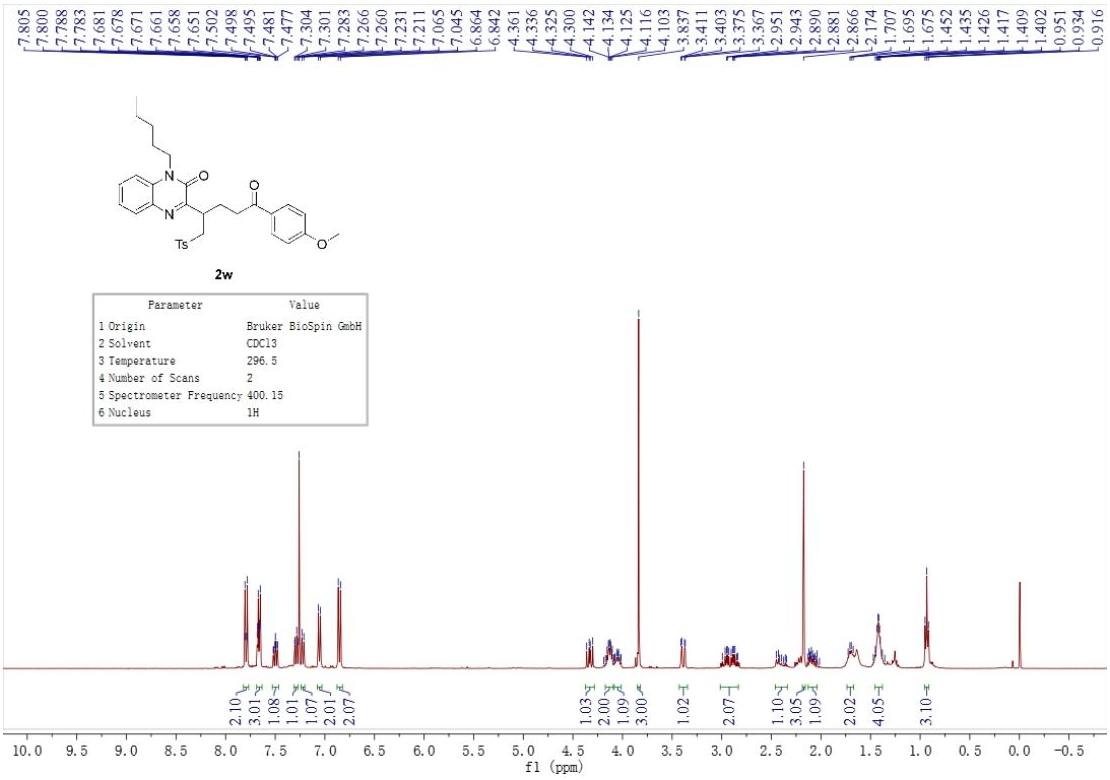
123.331
113.393
77.414
77.096
76.778
58.358
42.397
36.825
35.657
29.084
28.196
26.899
22.403
21.410
13.997
Ph
Ts
2v
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 100
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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7.651
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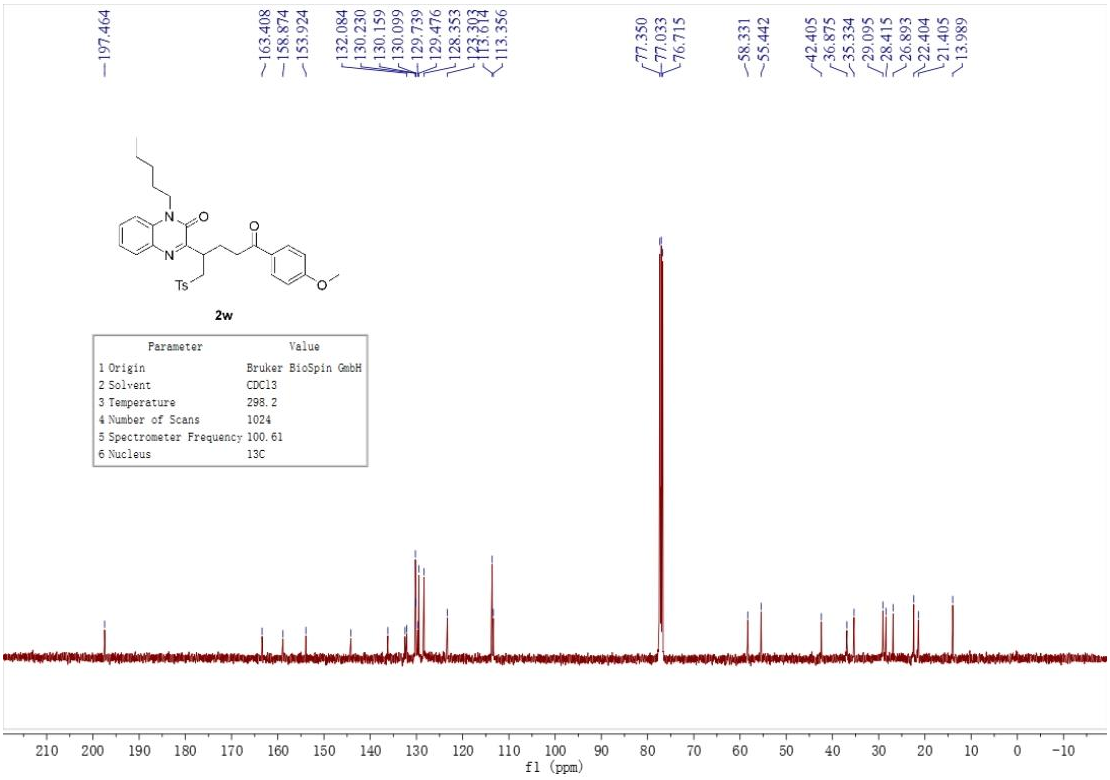
7.498
7.495
7.481
7.477
7.304
7.301
7.283
7.266
7.260
7.231
7.211
7.065
7.045
6.864
6.842
4.361
4.336
4.325
4.300
4.142
4.134
4.125
4.116
4.103
3.837
3.411
3.403
3.375
3.367
2.951
2.943
2.890
2.881
2.866
2.174
1.707
1.695
1.675
1.452
1.435
1.426
1.417
1.409
1.402
0.951
0.934
0.916
Ts
2w
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.5
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
f1 (ppm)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153.924
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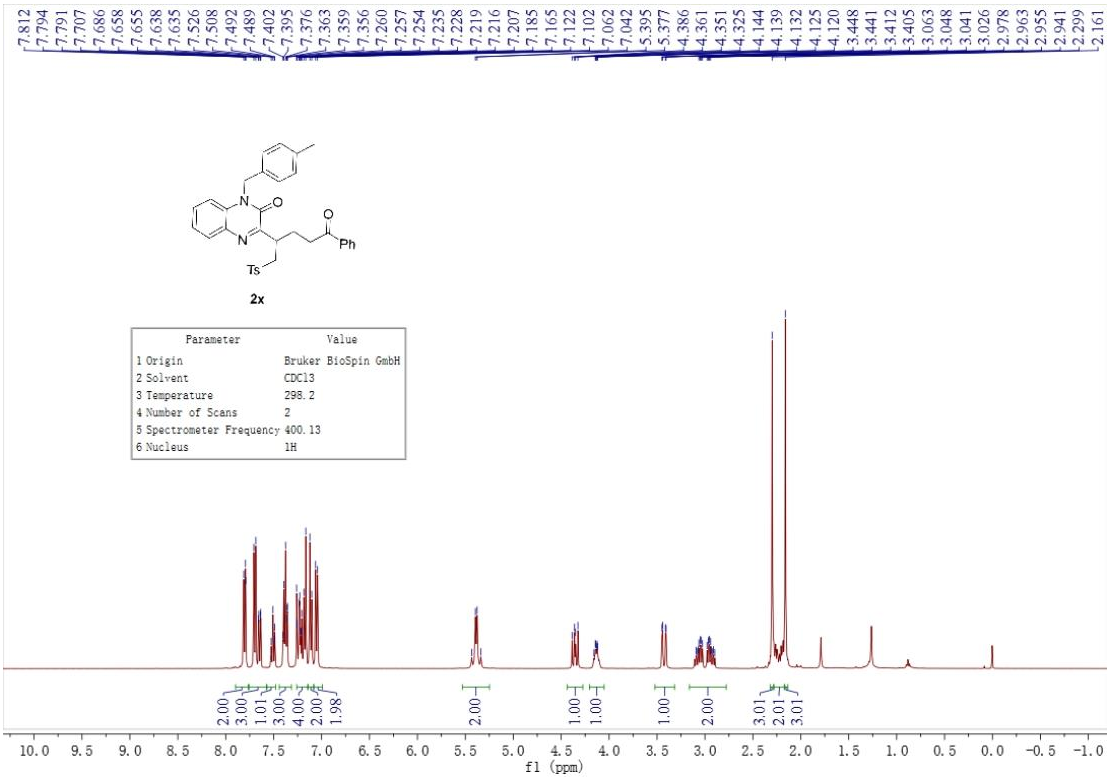
130.230
130.159
130.099
129.739
129.476
128.353
123.303
113.614
113.356
77.350
77.033
76.715
58.331
55.442
42.405
36.875
35.334
29.095
28.415
26.893
22.404
21.405
13.989
Ts
O
2w
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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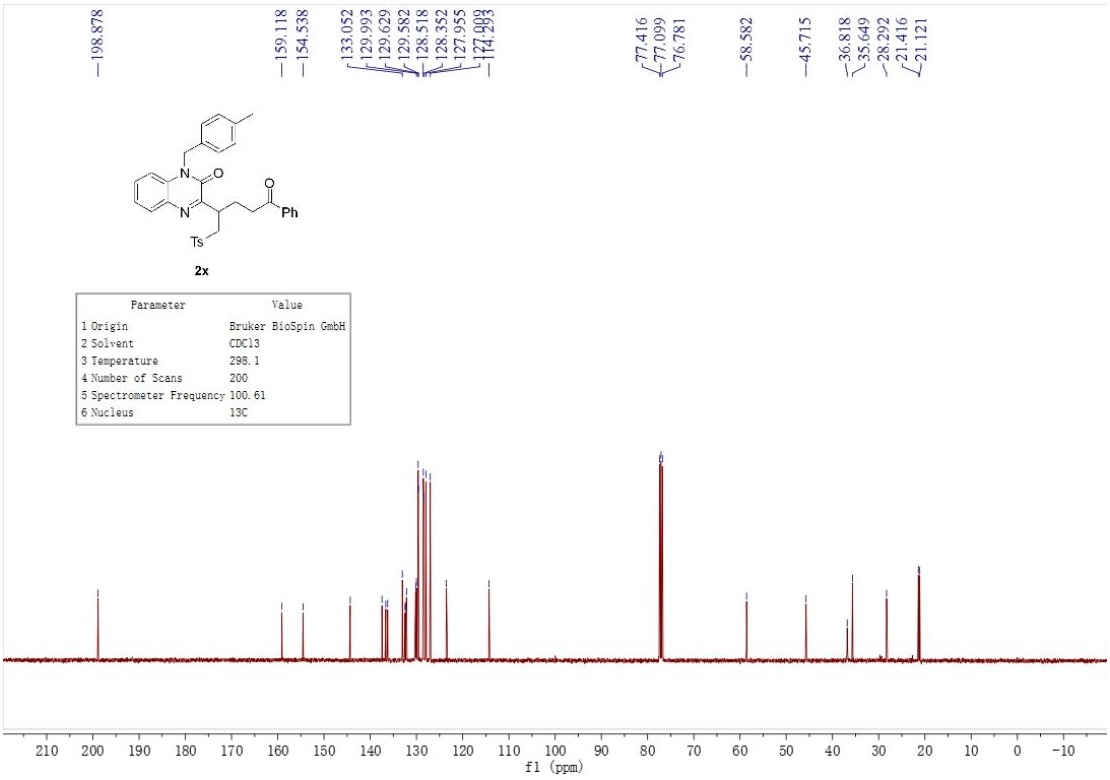
7.791
7.707
7.686
7.658
7.655
7.638
7.635
7.526
7.508
7.492
7.489
7.402
7.395
7.376
7.363
7.359
7.356
7.260
7.257
7.254
7.235
7.228
7.219
7.216
7.207
7.185
7.165
7.122
7.102
7.062
7.042
5.395
5.377
4.386
4.361
4.351
4.325
4.144
4.139
4.132
4.125
4.120
3.448
3.441
3.412
3.405
3.063
3.048
3.041
3.026
2.978
2.963
2.955
2.941
2.299
2.161
Ts
Ph
O
2x
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.00
3.00
1.01
3.00
4.00
2.00
1.98
2.00
1.00
1.00
1.00
2.00
3.01
2.01
3.01
f1 (ppm)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154.538
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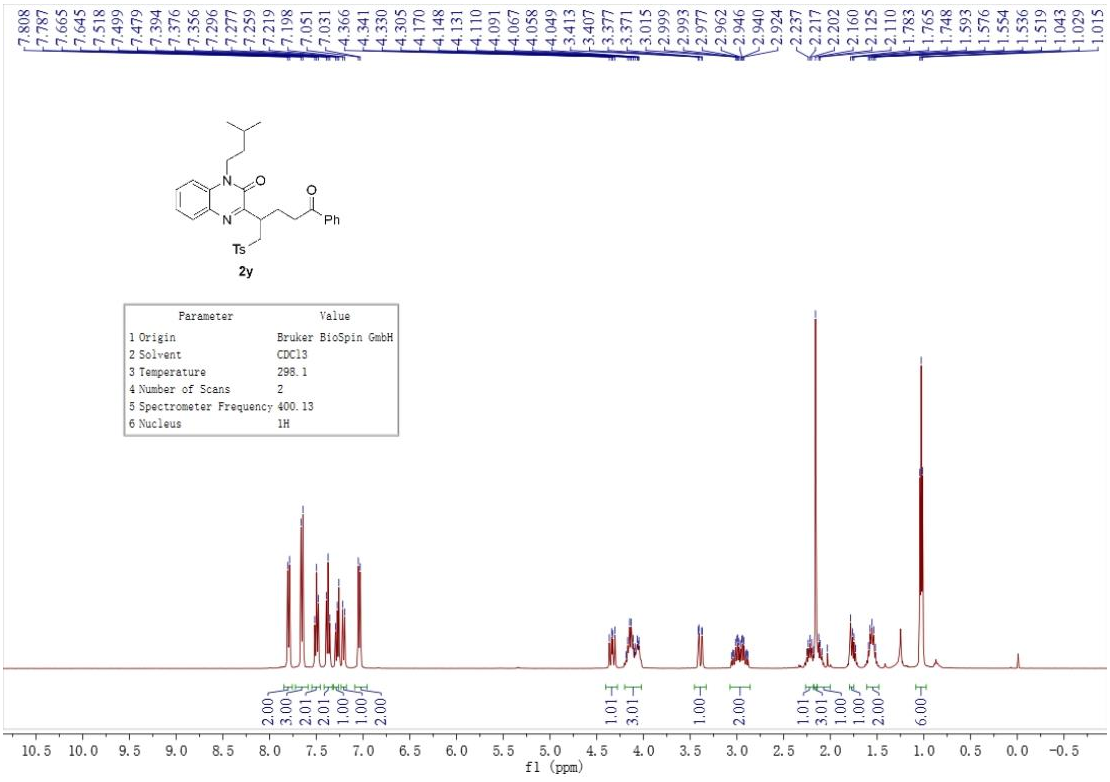
129.993
129.629
129.582
128.518
128.352
127.955
77.416
77.099
76.781
58.582
45.715
36.818
35.649
28.292
21.416
21.121
Ts
Ph
2x
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 200
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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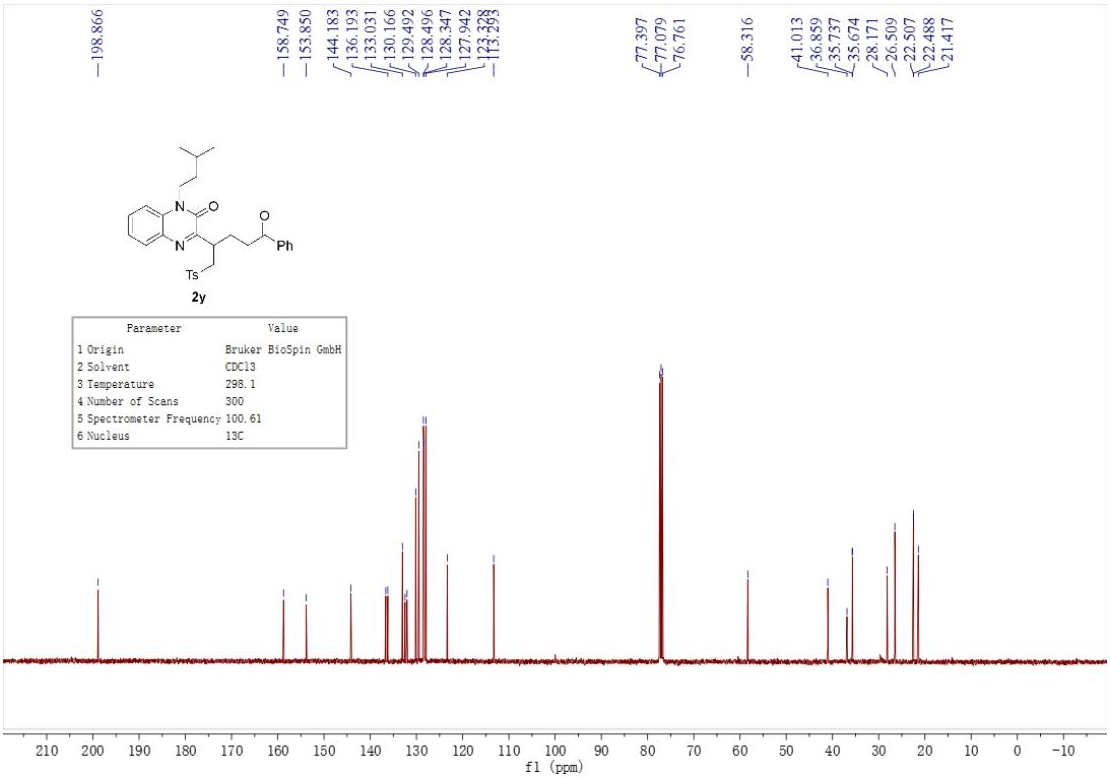
7.665
7.645
7.518
7.499
7.479
7.394
7.376
7.356
7.296
7.277
7.259
7.219
7.198
7.051
7.031
4.366
4.341
4.330
4.305
4.170
4.148
4.131
4.110
4.091
4.067
4.058
4.049
3.413
3.407
3.377
3.371
3.015
2.999
2.993
2.977
2.962
2.946
2.940
2.924
2.237
2.217
2.202
2.160
2.125
2.110
1.783
1.765
1.748
1.593
1.576
1.554
1.536
1.519
1.043
1.029
1.015
Ts
Ph
2y
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
f1 (ppm)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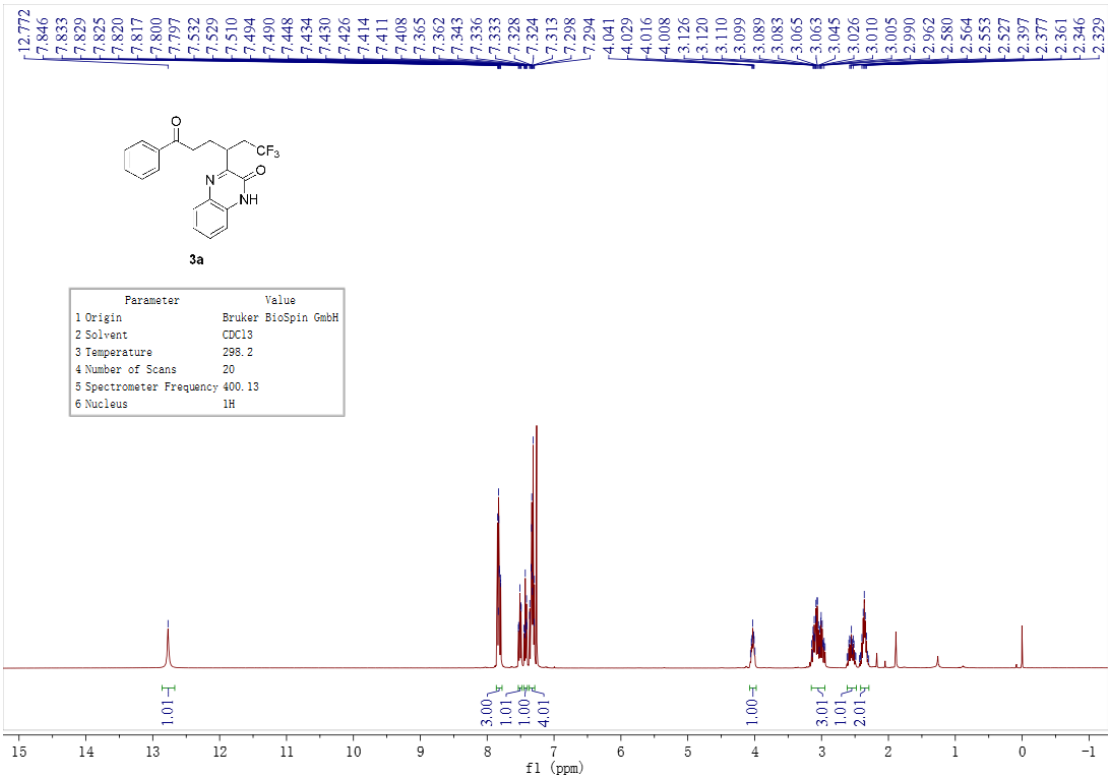
153.850
144.183
136.193
133.031
130.166
129.492
128.496
128.347
127.942
123.328
113.293
77.397
77.079
76.761
58.316
41.013
36.859
35.737
35.674
28.171
26.509
22.507
22.488
21.417
Ts
Ph
2y
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 300
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)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7.833
7.829
7.825
7.820
7.817
7.800
7.797
7.532
7.529
7.510
7.494
7.490
7.448
7.434
7.430
7.426
7.414
7.411
7.408
7.365
7.362
7.343
7.336
7.333
7.328
7.324
7.313
7.298
7.294
4.041
4.029
4.016
4.008
3.126
3.120
3.110
3.099
3.089
3.083
3.065
3.063
3.045
3.026
3.010
3.005
2.990
2.962
2.580
2.564
2.553
2.527
2.397
2.377
2.361
2.346
2.329
CF3
NH
3a
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 20
5 Spectrometer Frequency 400.13
6 Nucleus 1H
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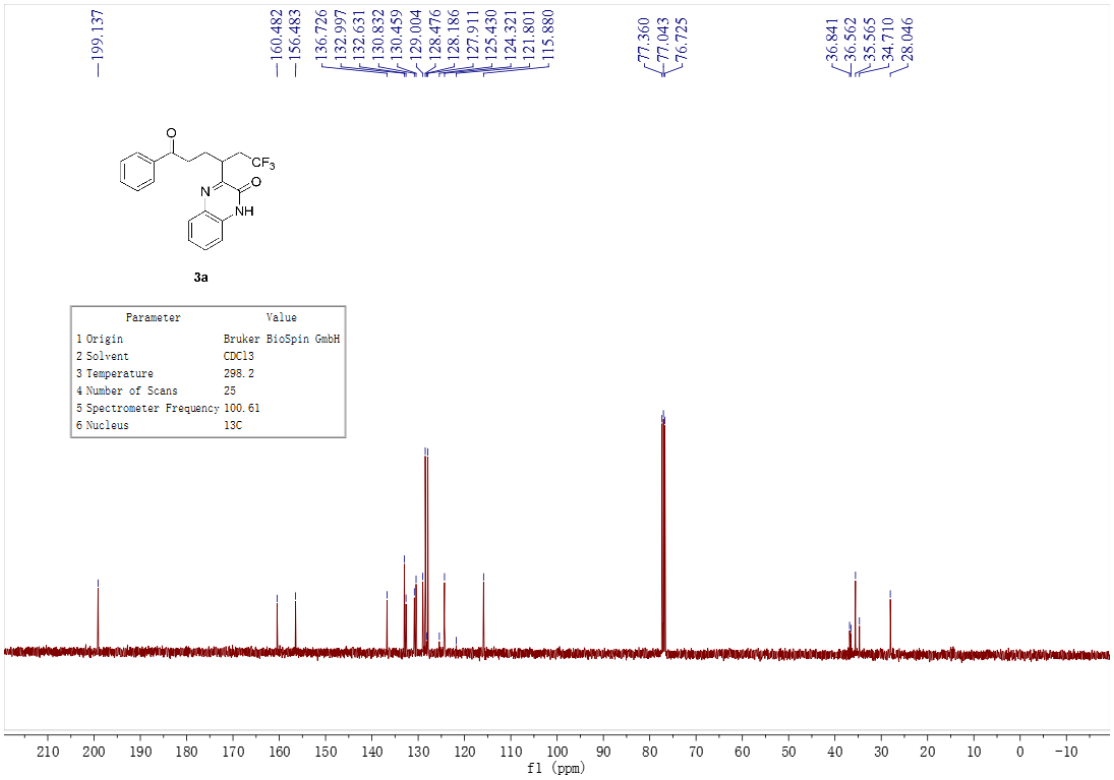
3.00
1.01
1.00
4.01
1.00
3.01
1.01
2.01
f1 (ppm)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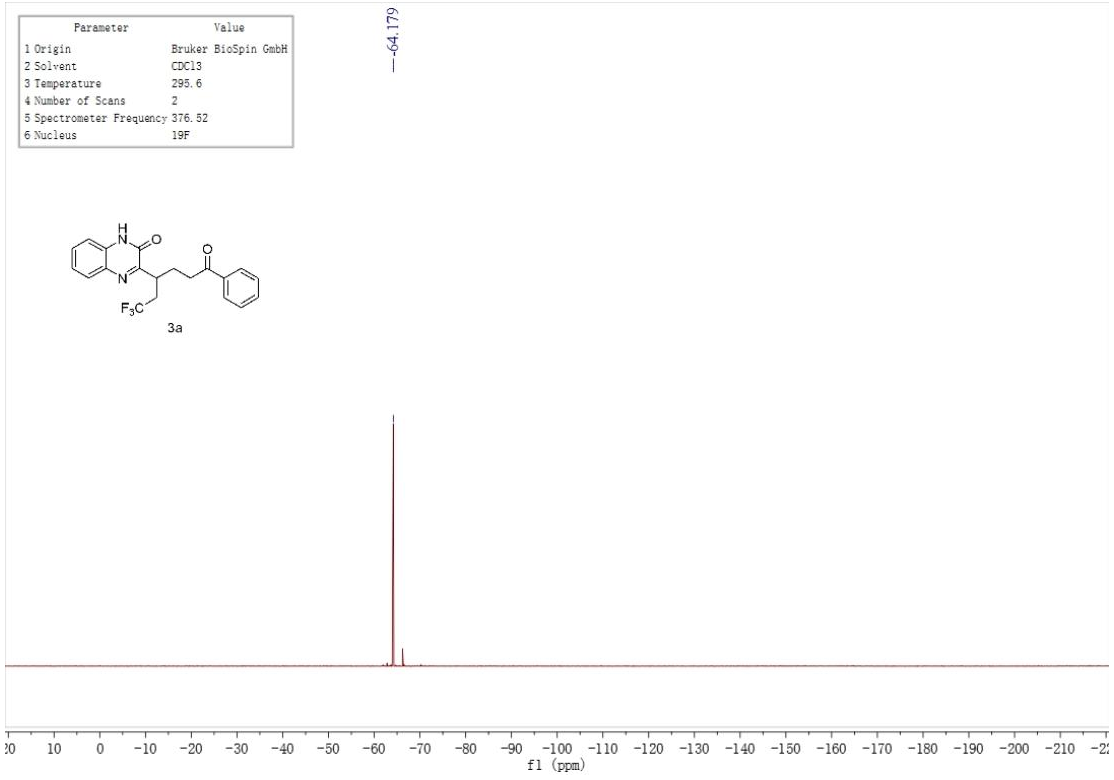
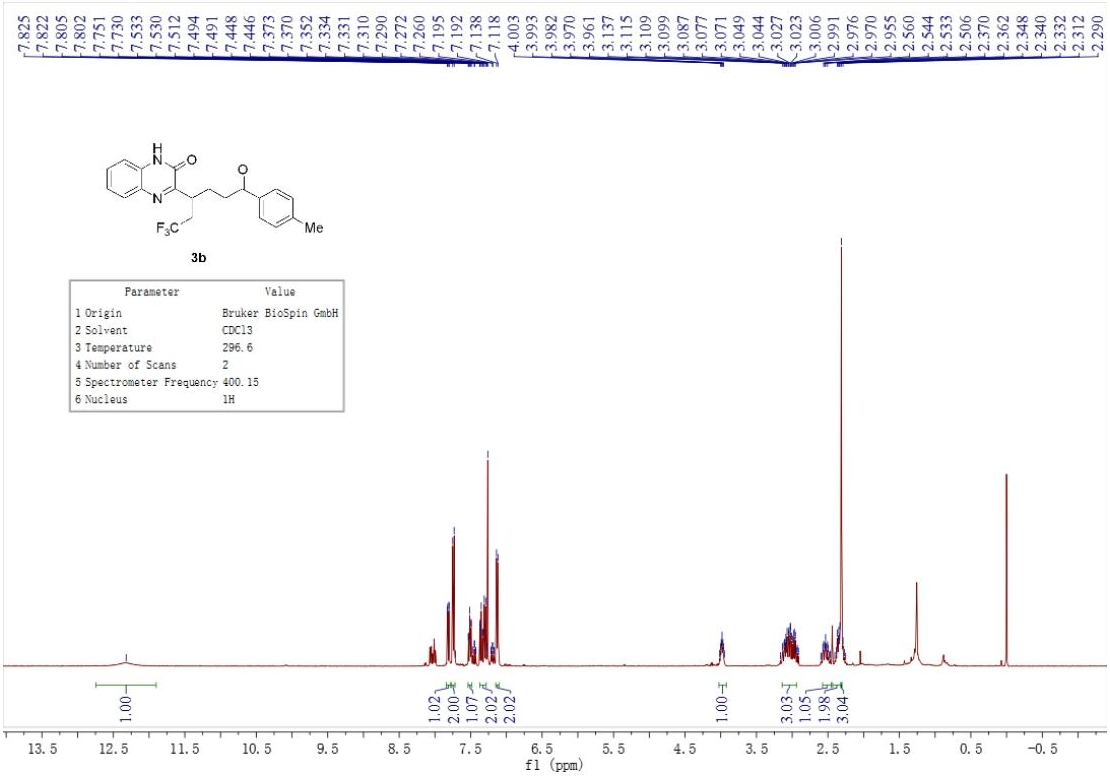
160.482
156.483
136.726
132.997
132.631
130.832
130.459
129.004
128.476
128.186
127.911
125.430
124.321
121.801
115.880
77.360
77.043
76.725
36.841
36.562
35.565
34.710
28.046
O
CF3
N
O
NH
3a
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 25
5 Spectrometer Frequency 100.61
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.6
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
-64.179
H
N
O
N
O
F3C
3a
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -22
f1 (ppm)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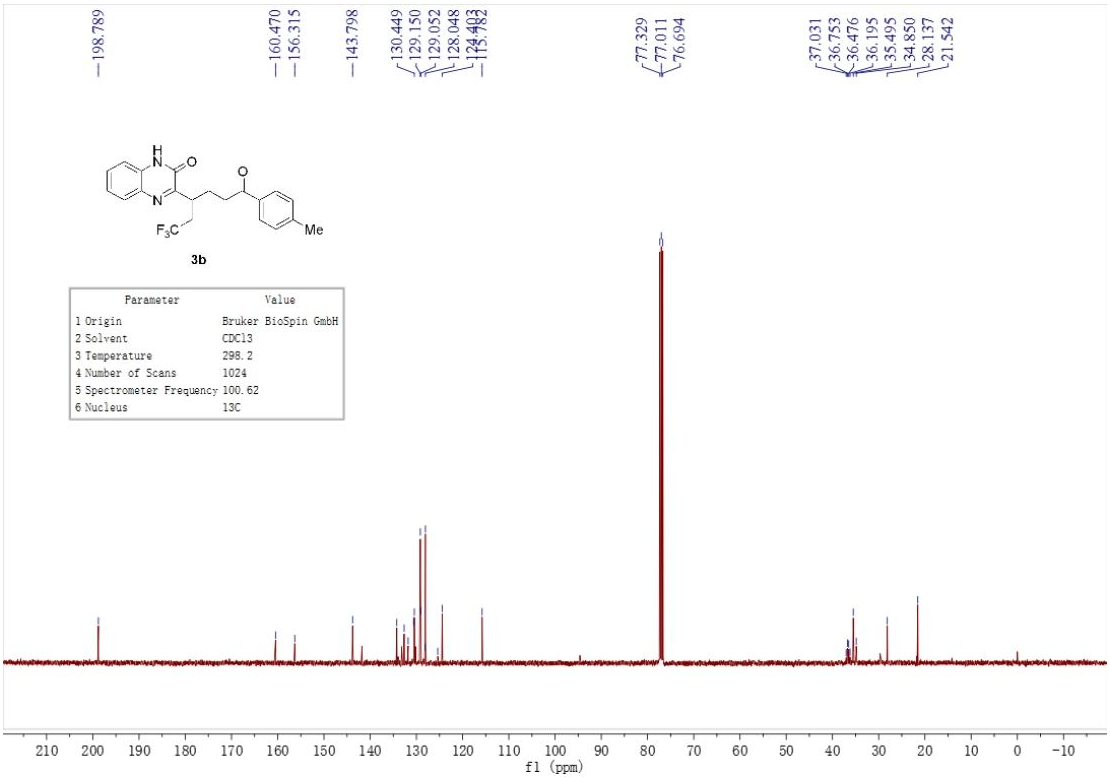
7.822
7.805
7.802
7.751
7.730
7.533
7.530
7.512
7.494
7.491
7.448
7.446
7.373
7.370
7.352
7.334
7.331
7.310
7.290
7.272
7.260
7.195
7.192
7.138
7.118
4.003
3.993
3.982
3.970
3.961
3.137
3.115
3.109
3.099
3.087
3.077
3.071
3.049
3.044
3.027
3.023
3.006
2.991
2.976
2.970
2.955
2.560
2.544
2.533
2.506
2.370
2.362
2.348
2.340
2.332
2.312
2.290
3b
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.6
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
1.00
1.02
2.00
1.07
2.02
2.02
1.00
3.03
1.05
1.98
3.04
f1 (ppm)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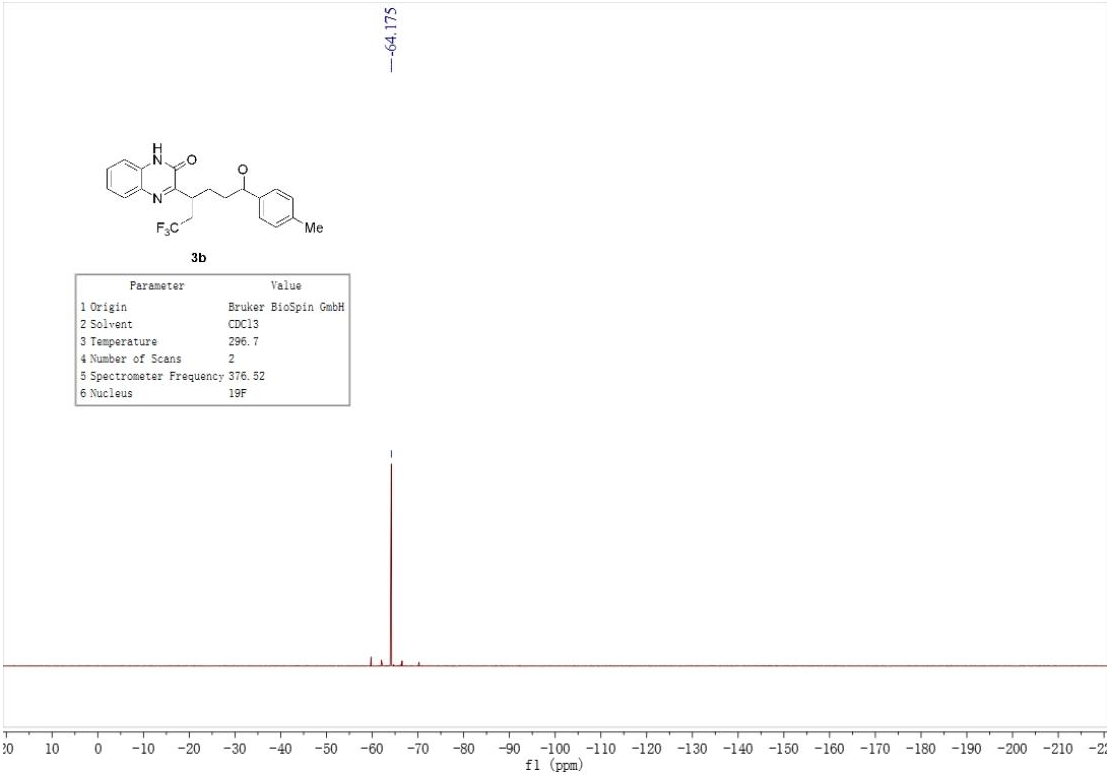
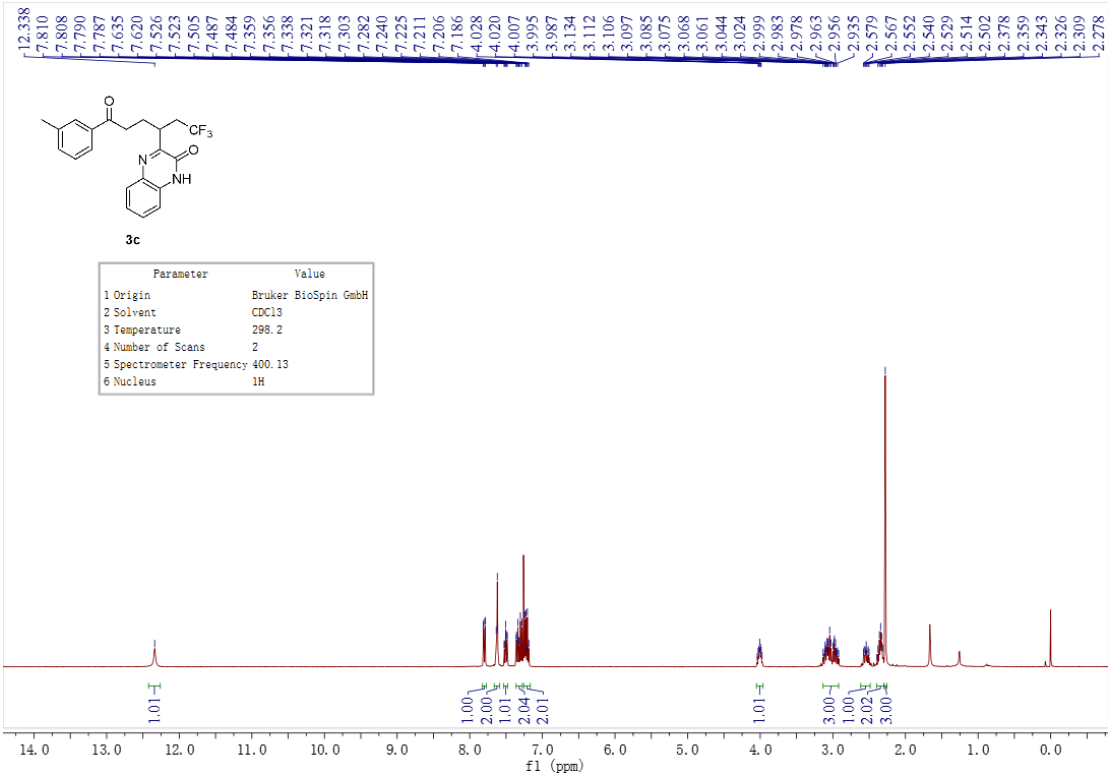
130.449
129.150
129.052
128.048
124.403
115.782
77.329
77.011
76.694
37.031
36.753
36.476
36.195
35.495
34.850
28.137
21.542
3b
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)


-64.175
3b
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.7
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
f1 (ppm)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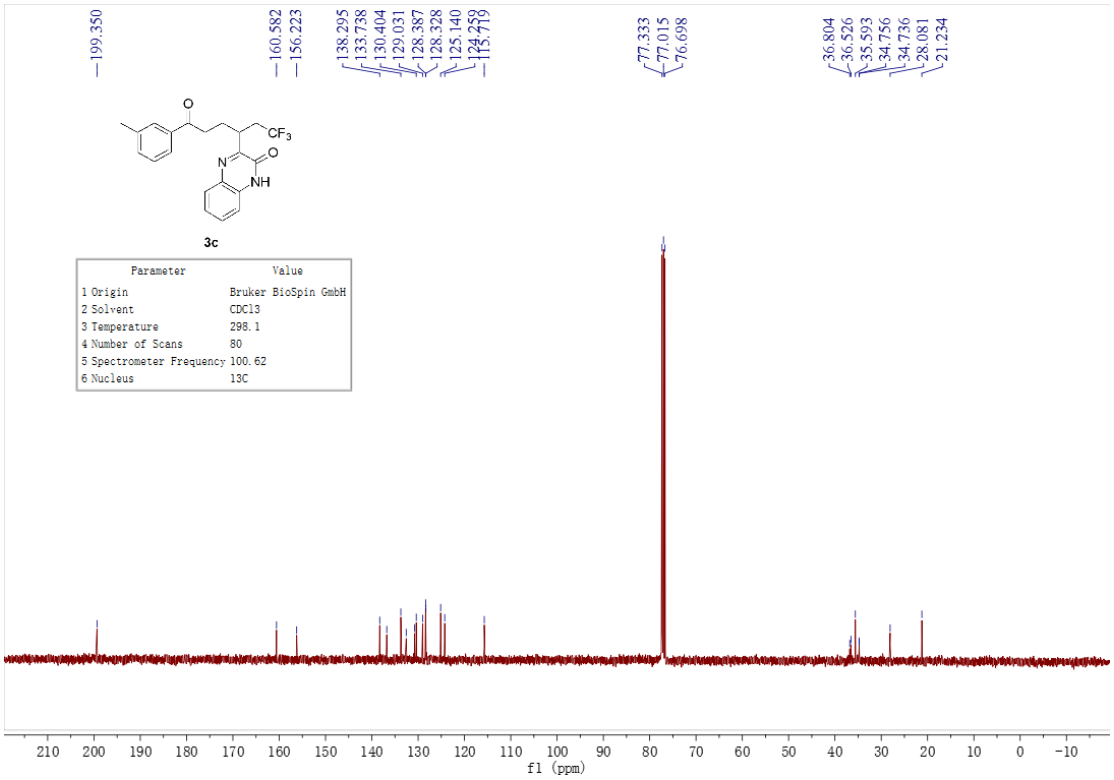
7.787
7.635
7.620
7.526
7.523
7.505
7.487
7.484
7.359
7.356
7.338
7.321
7.318
7.303
7.282
7.240
7.225
7.211
7.206
7.186
4.028
4.020
4.007
3.995
3.987
3.134
3.112
3.106
3.097
3.085
3.075
3.068
3.061
3.044
3.024
2.999
2.983
2.978
2.963
2.956
2.935
2.579
2.567
2.552
2.540
2.529
2.514
2.502
2.378
2.359
2.343
2.326
2.309
2.278
3c
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.01
1.00
2.00
1.01
2.04
2.01
1.01
3.00
1.00
2.02
3.00
f1 (ppm)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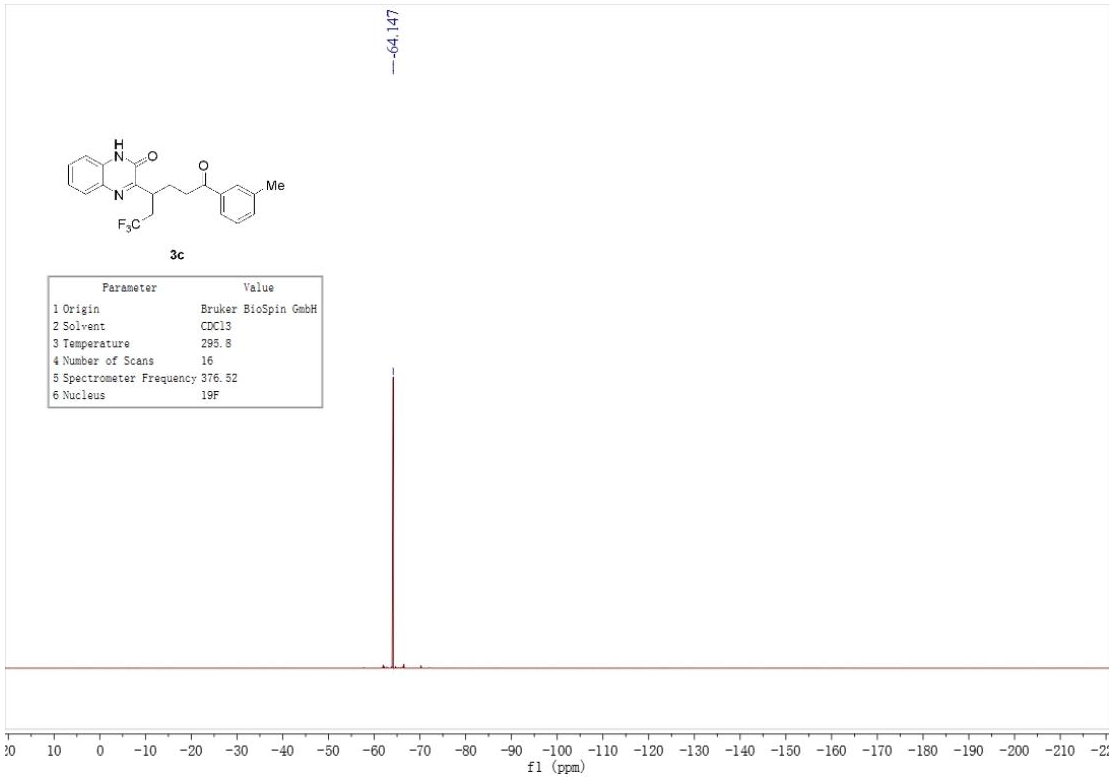
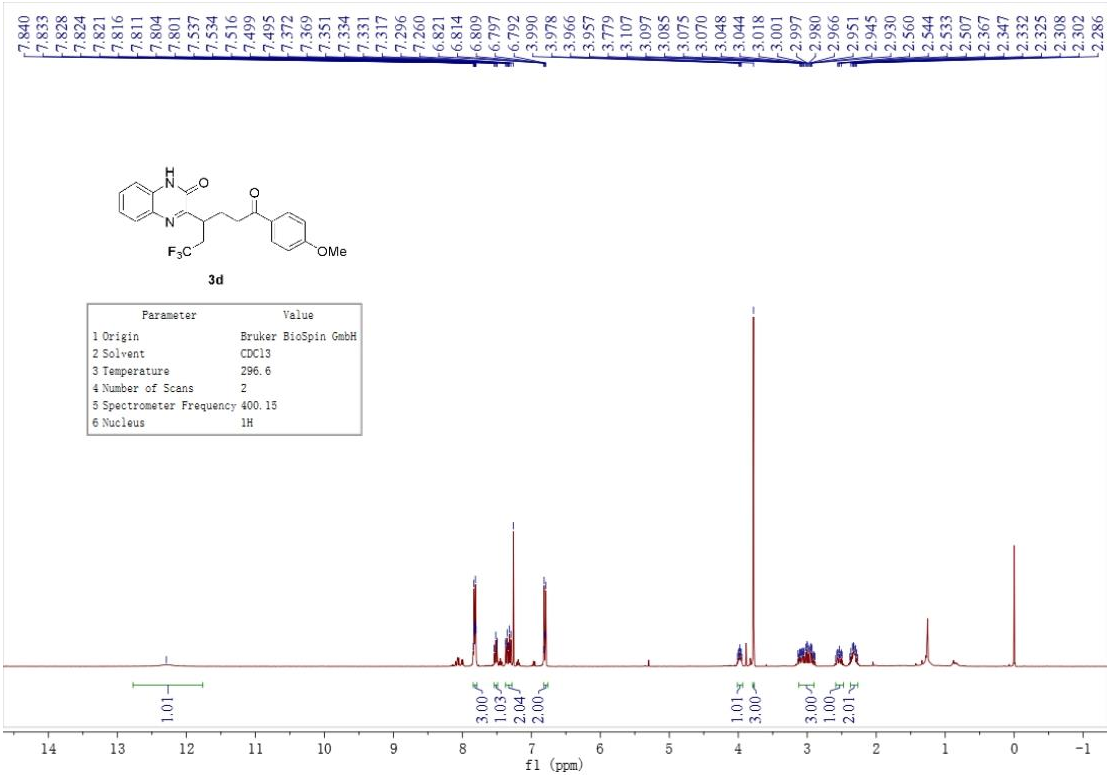
156.223
138.295
133.738
130.404
129.031
128.387
128.328
125.140
124.259
115.719
77.333
77.015
76.698
36.804
36.526
35.593
34.756
34.736
28.081
21.234
CF3
O
N
O
NH
3c
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 80
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)


64.147
H
N
O
O
N
Me
F3C
3c
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.8
4 Number of Scans 16
5 Spectrometer Frequency 376.52
6 Nucleus 19F
f1 (ppm)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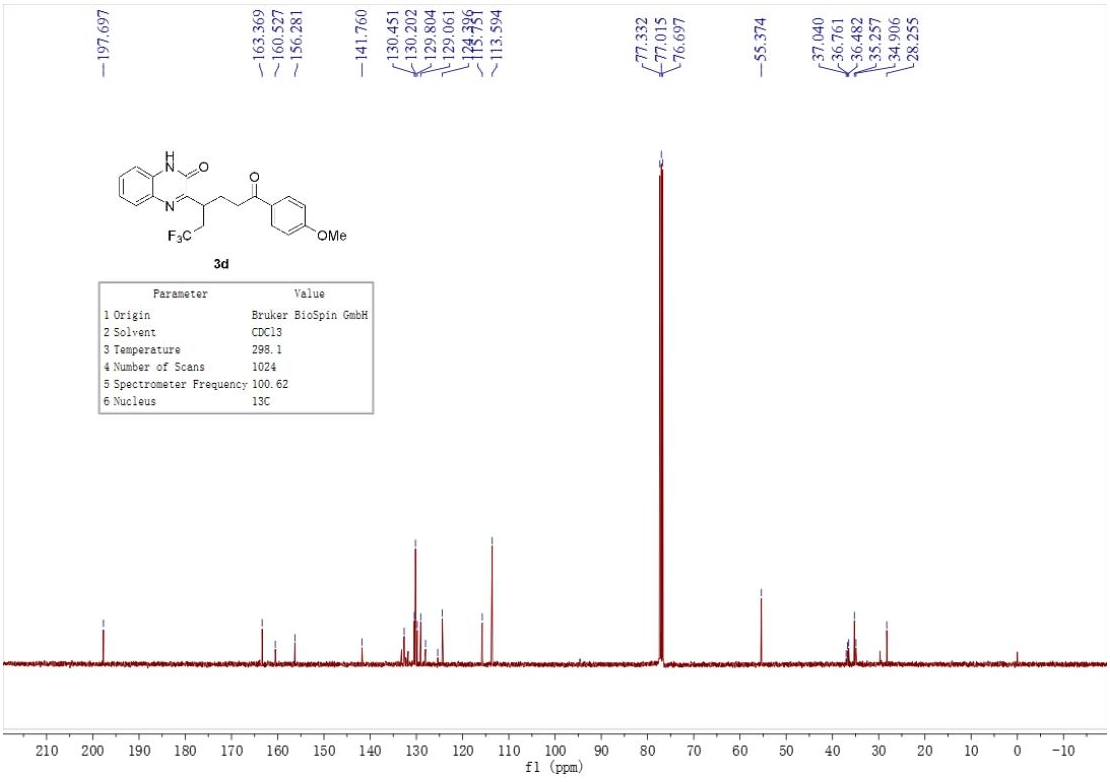
7.816
7.811
7.804
7.801
7.537
7.534
7.516
7.499
7.495
7.372
7.369
7.351
7.334
7.331
7.317
7.296
7.260
6.821
6.814
6.809
6.797
6.792
3.990
3.978
3.966
3.957
3.779
3.107
3.097
3.085
3.075
3.070
3.048
3.044
3.018
3.001
2.997
2.980
2.966
2.951
2.945
2.930
2.560
2.544
2.533
2.507
2.367
2.347
2.332
2.325
2.308
2.302
2.286
3d
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.6
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
1.01
3.00
1.03
2.04
2.00
1.01
3.00
3.00
1.00
2.01
f1 (ppm)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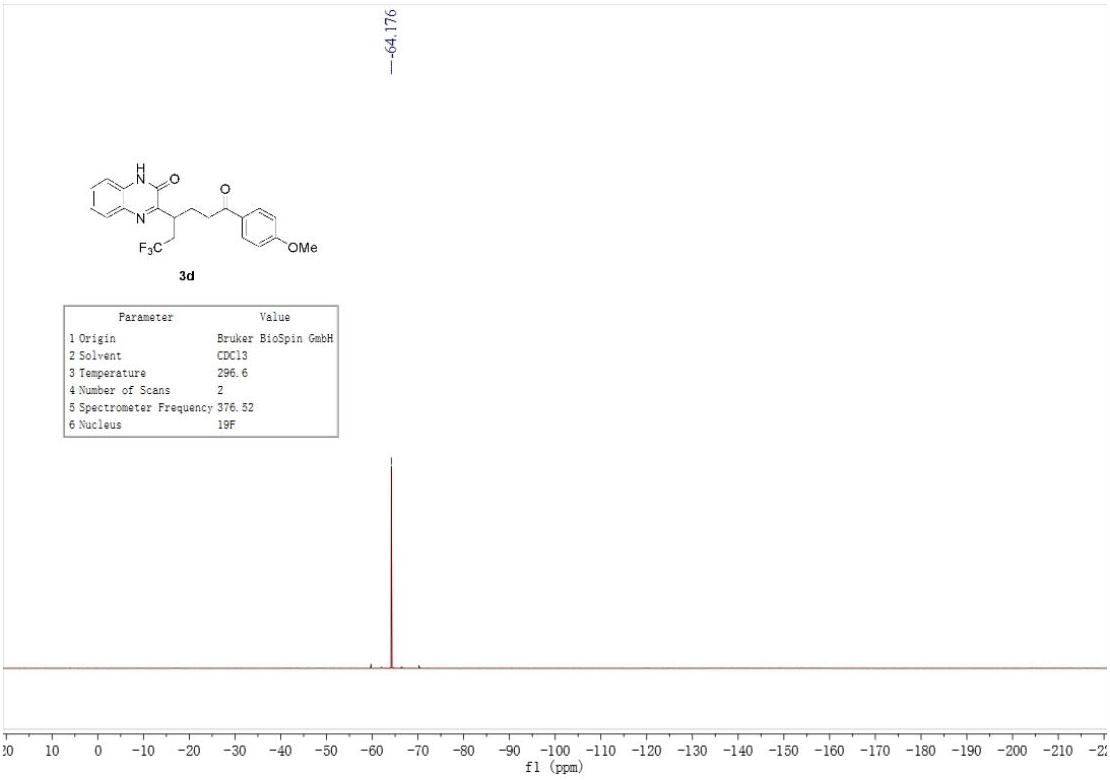
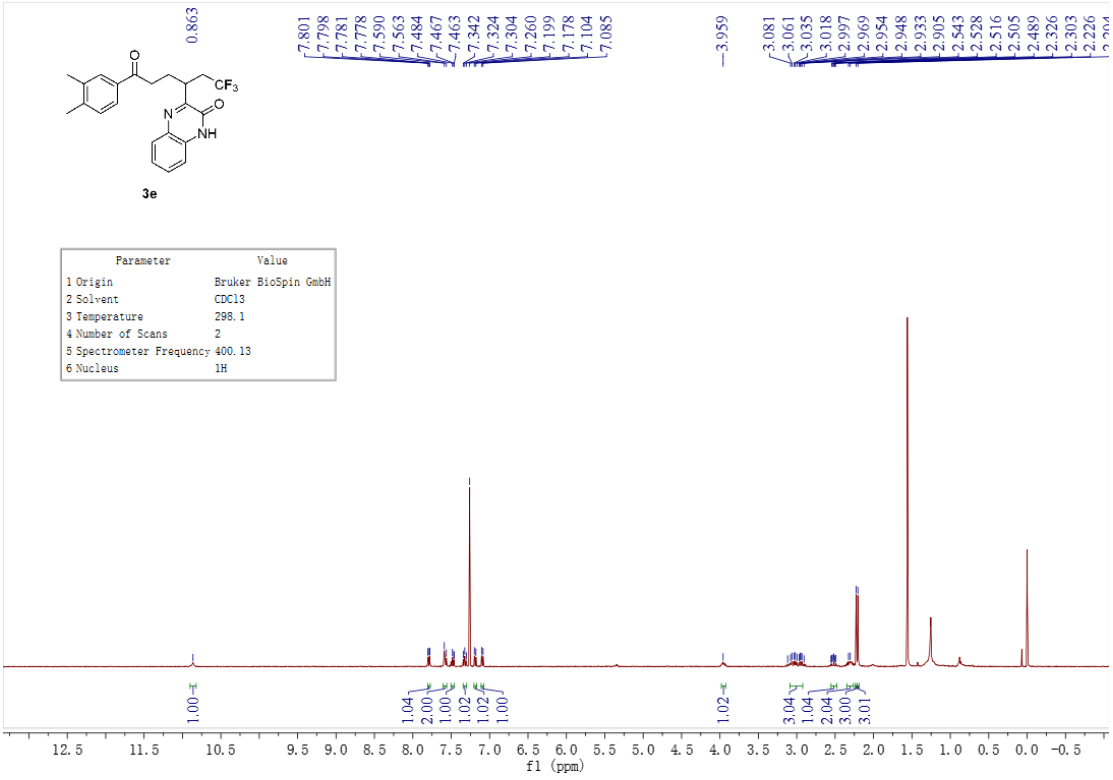
156.281
141.760
130.451
130.202
129.804
129.061
124.386
115.751
113.594
77.332
77.015
76.697
55.374
37.040
36.761
36.482
35.257
34.906
28.255
3d
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)


-64.176
3d
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.6
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
f1 (ppm)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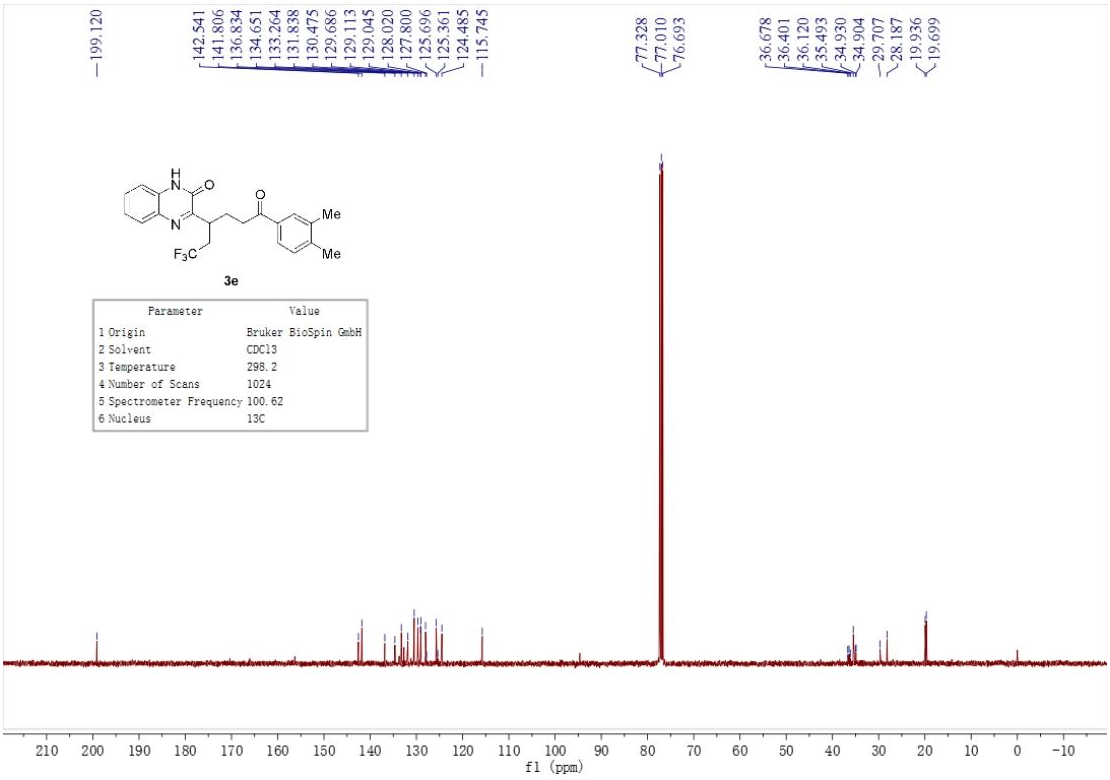
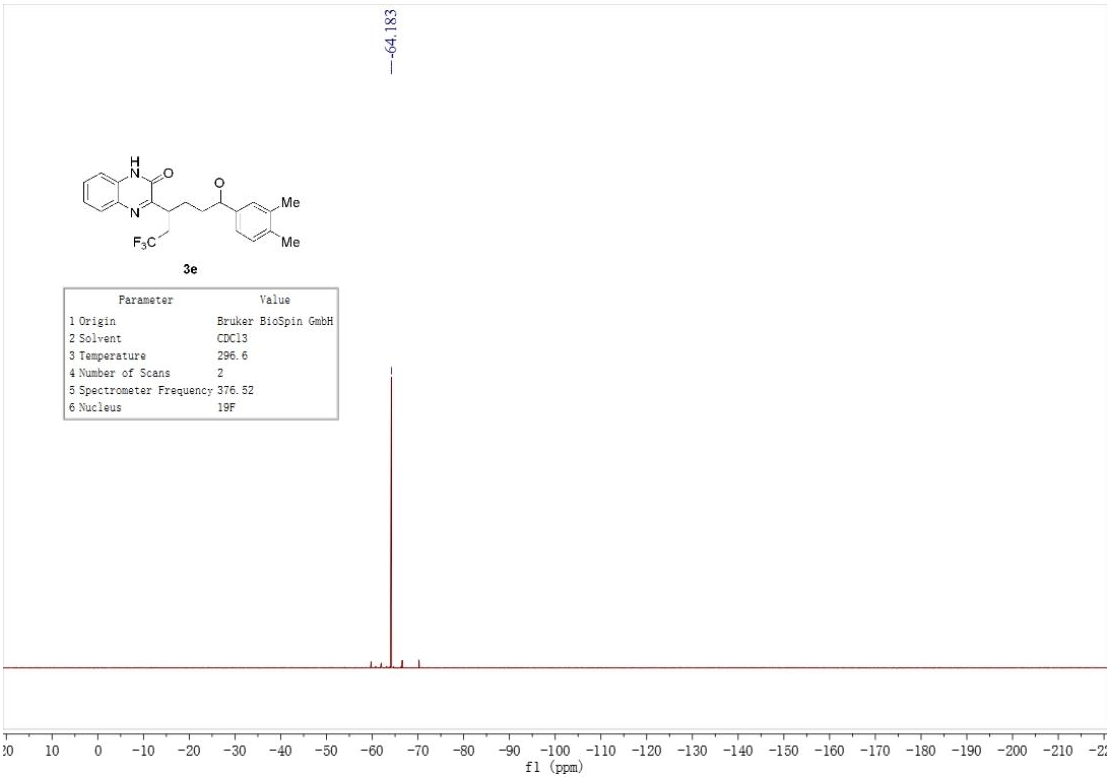
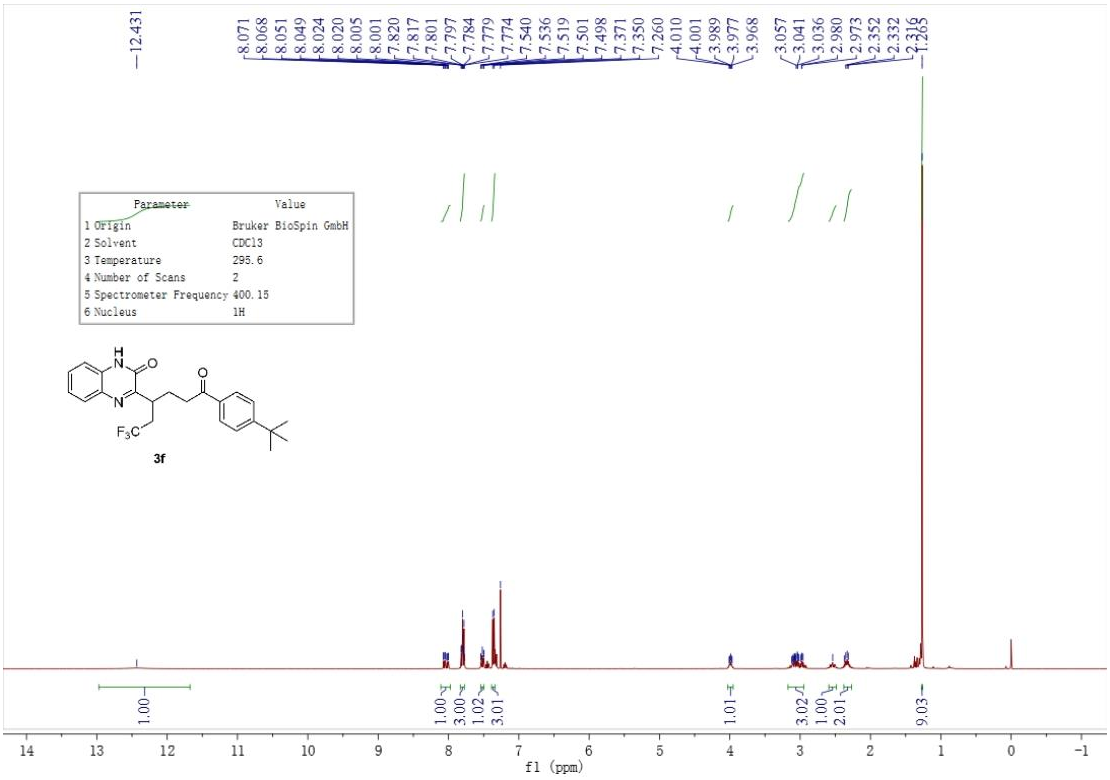
7.590
7.563
7.484
7.467
7.463
7.342
7.324
7.304
7.260
7.199
7.178
7.104
7.085
3.959
3.081
3.061
3.035
3.018
2.997
2.969
2.954
2.948
2.933
2.905
2.543
2.528
2.516
2.505
2.489
2.326
2.303
2.226
3e
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.00
1.04
2.00
1.00
1.02
1.02
1.00
1.02
3.04
1.04
2.04
3.00
3.01
f1 (ppm)



Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	1024
5 Spectrometer Frequency	100.62
6 Nucleus	13C



Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	296.6
4 Number of Scans	2
5 Spectrometer Frequency	376.52
6 Nucleus	19F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8.068
8.051
8.049
8.024
8.020
8.005
8.001
7.820
7.817
7.801
7.797
7.784
7.779
7.774
7.540
7.536
7.519
7.501
7.498
7.371
7.350
7.260
4.010
4.001
3.989
3.977
3.968
3.057
3.041
3.036
2.980
2.973
2.352
2.332
1.265
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.6
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
3f
1.00
1.00
3.00
1.02
3.01
1.01
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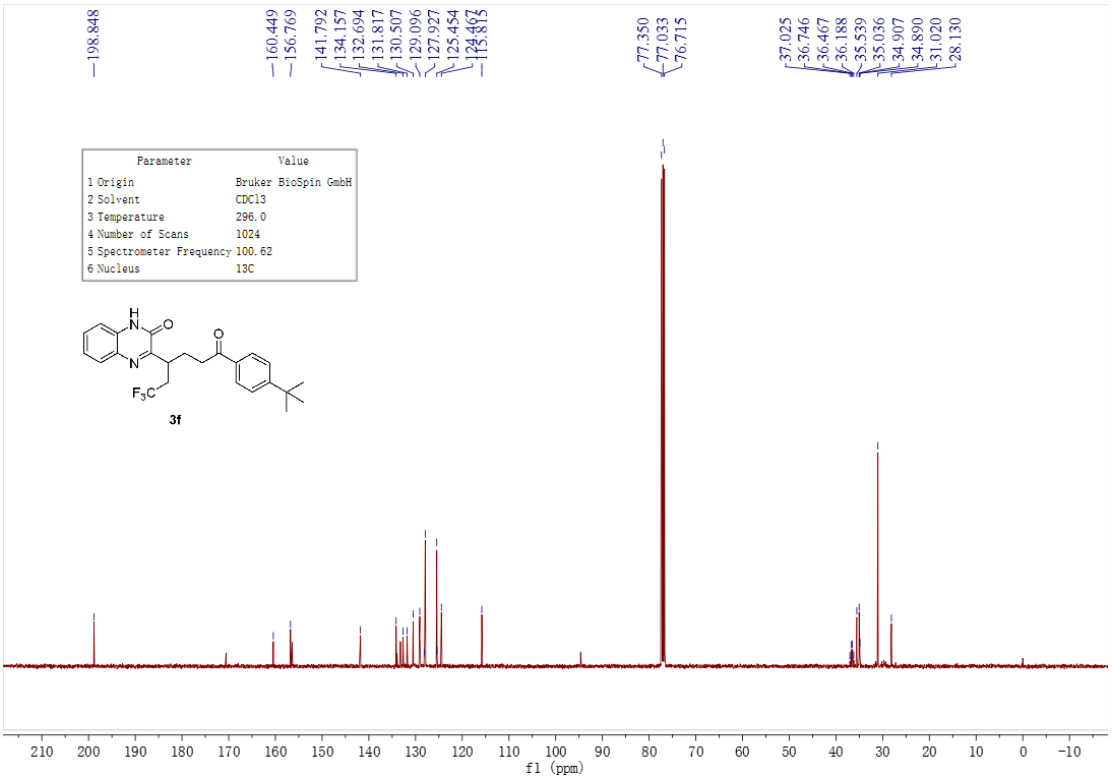
1.00
2.01
9.03
f1 (ppm)


198.848
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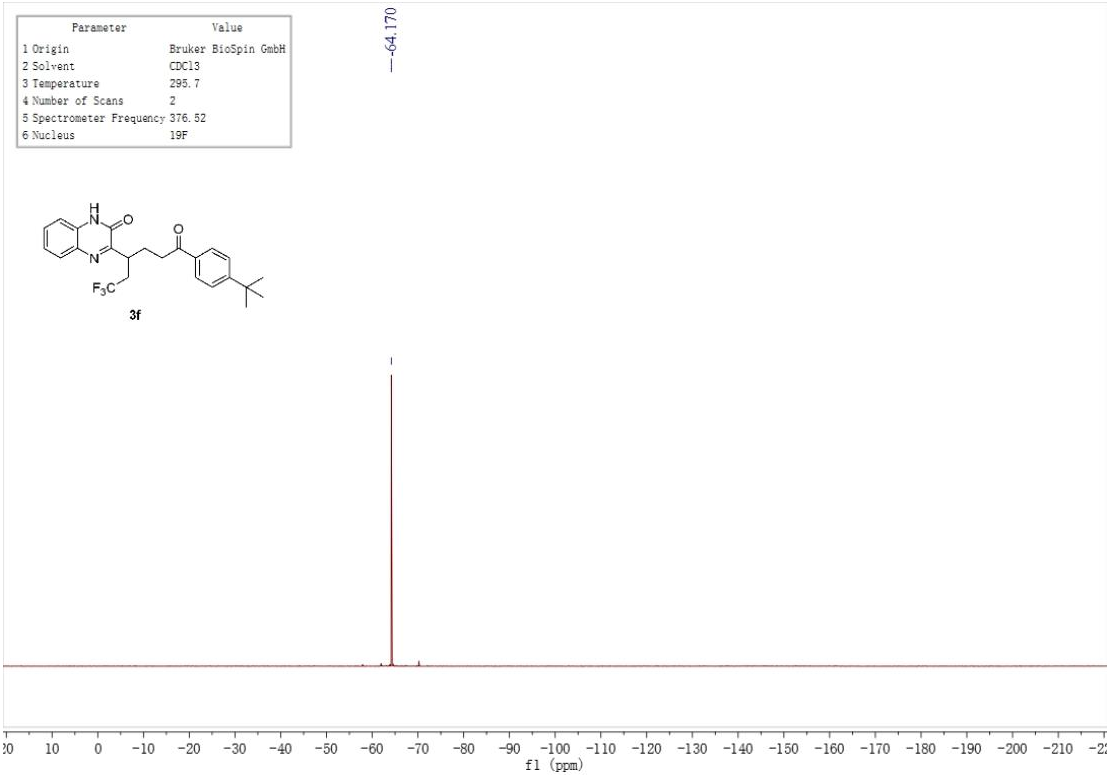
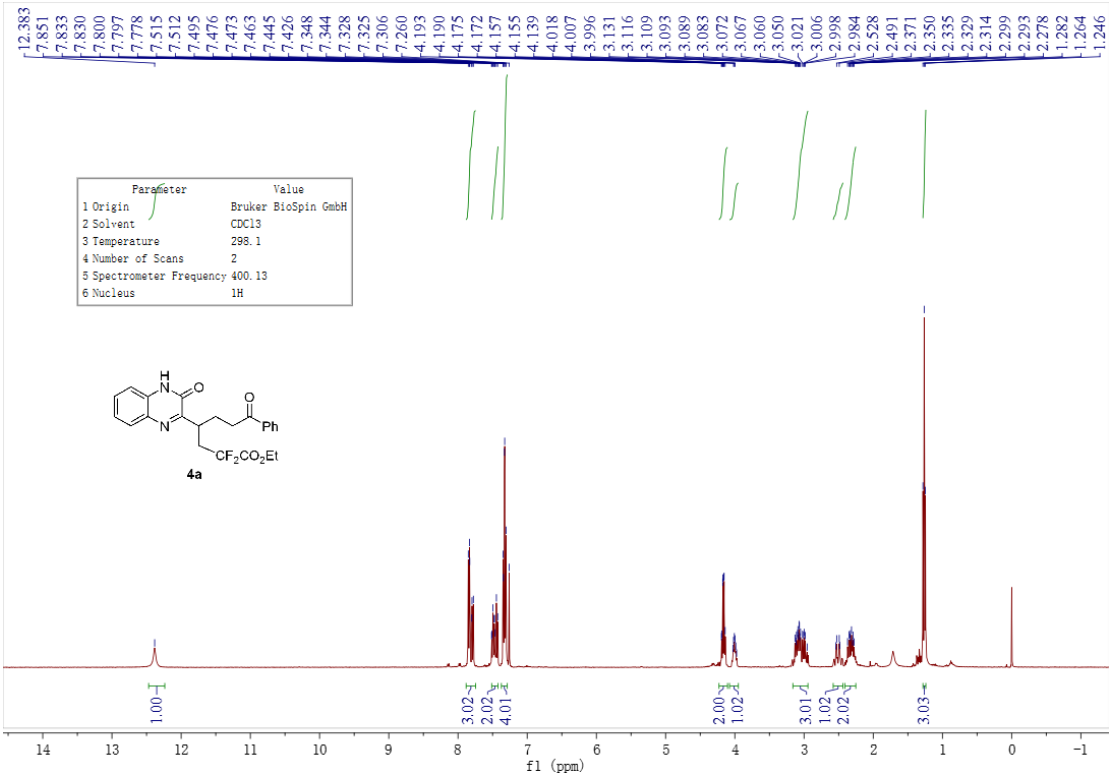
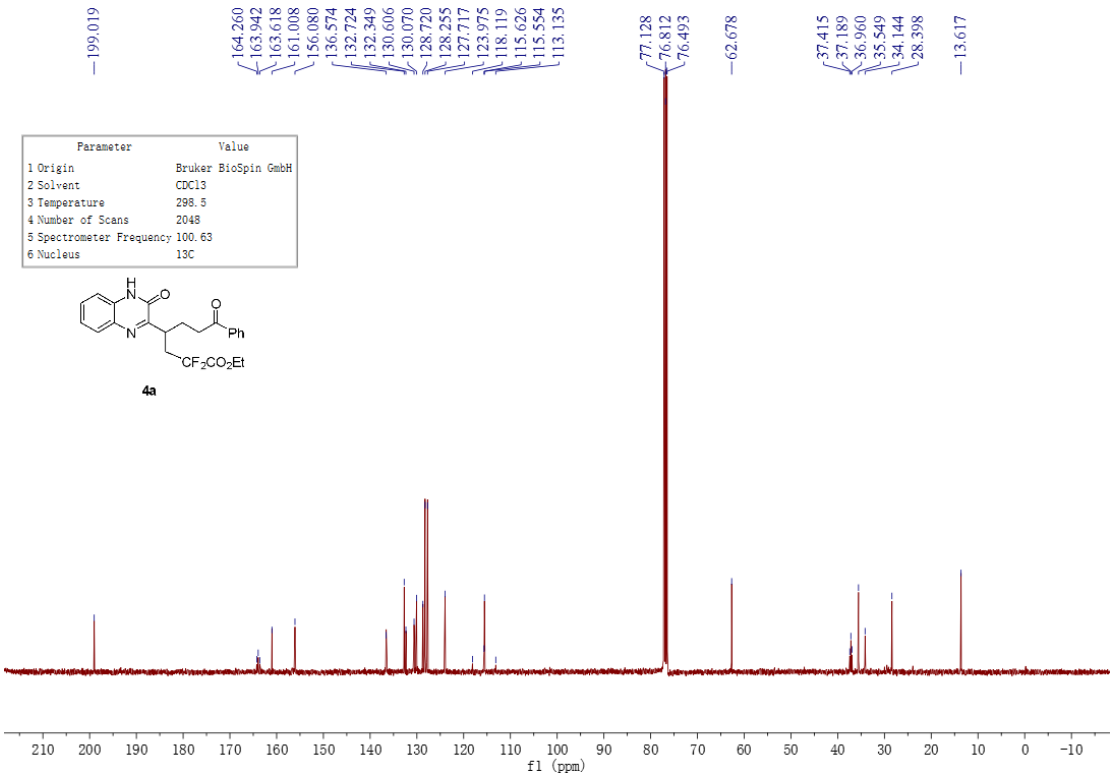
156.769
141.792
134.157
132.694
131.817
130.507
129.096
127.927
125.454
124.467
115.815
77.350
77.033
76.715
37.025
36.746
36.467
36.188
35.539
35.036
34.907
34.890
31.020
28.130
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.0
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
3f
f1 (ppm)


Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.7
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
-64.170
3f
f1 (ppm)


Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
4a
f1 (ppm)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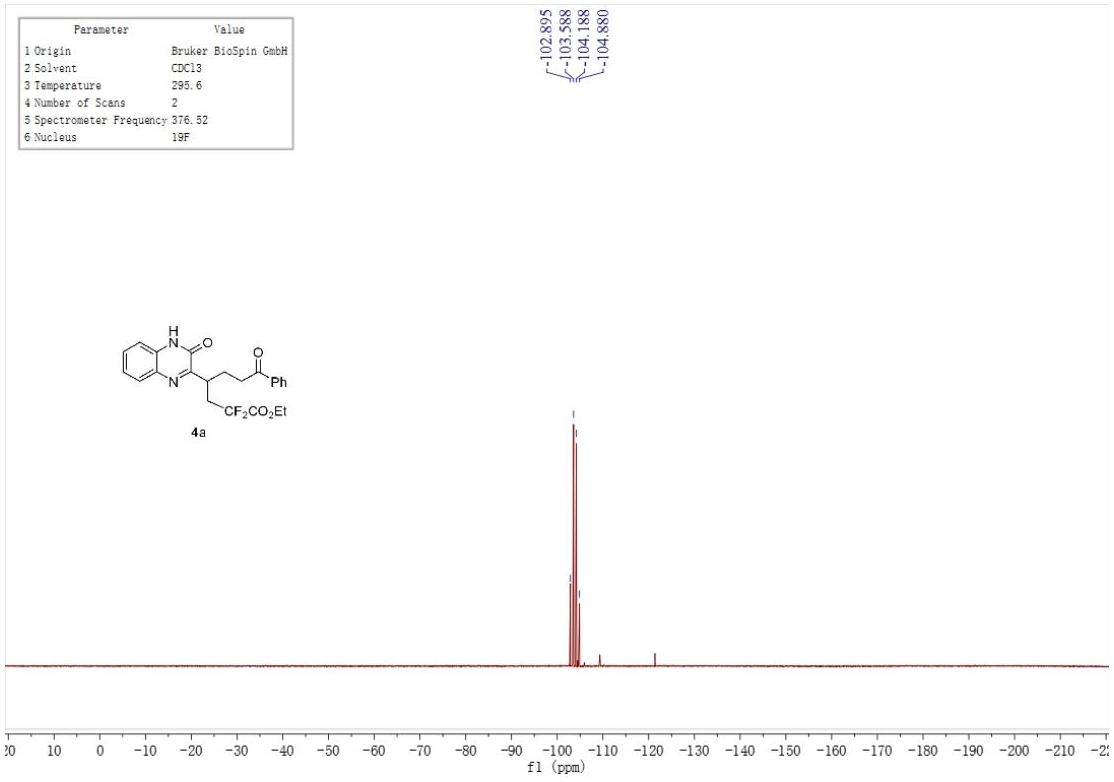
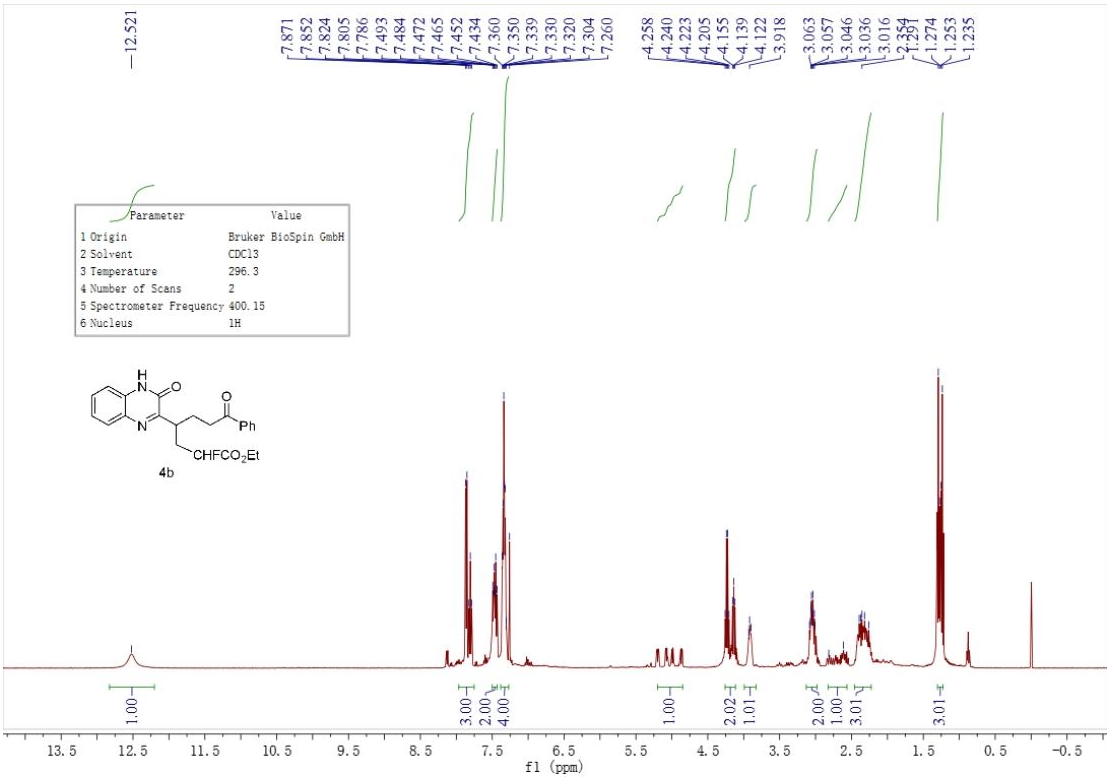
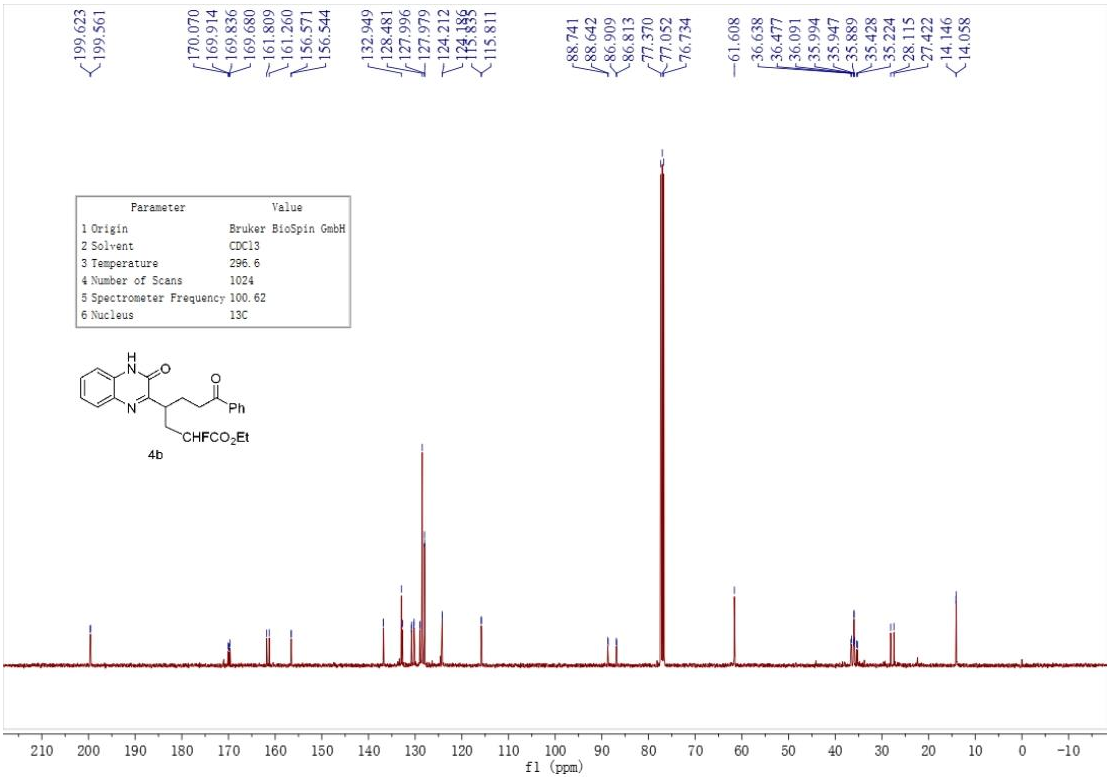
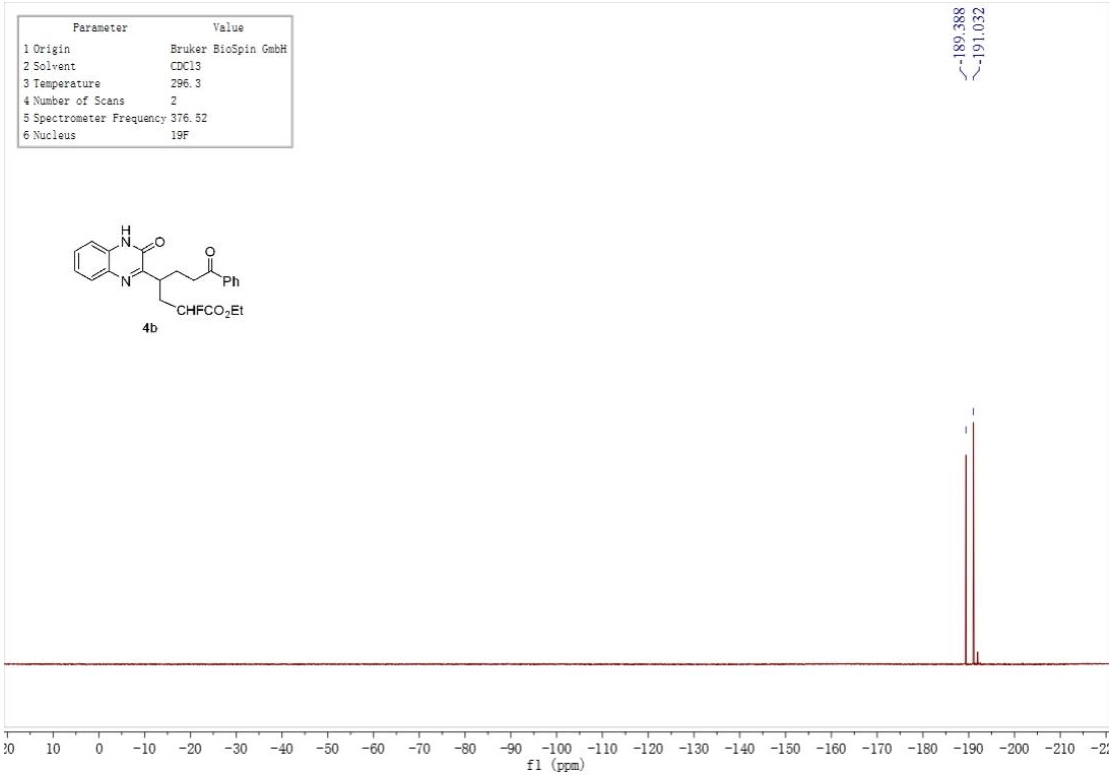
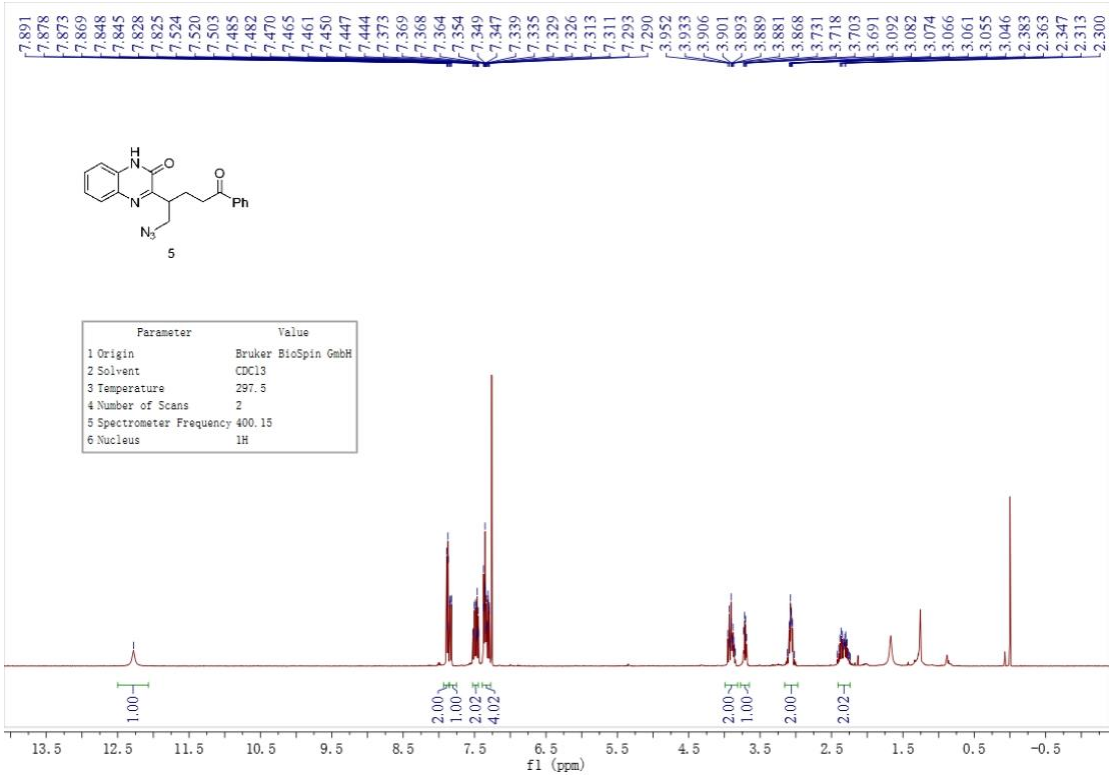
164.260
163.942
163.618
161.008
156.080
136.574
132.724
132.349
130.606
130.070
128.720
128.255
127.717
123.975
118.119
115.626
115.554
113.135
77.128
76.812
76.493
62.678
37.415
37.189
36.960
35.549
34.144
28.398
13.617
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.5
4 Number of Scans 2048
5 Spectrometer Frequency 100.63
6 Nucleus 13C
Ph
CF2CO2Et
4a
f1 (ppm)

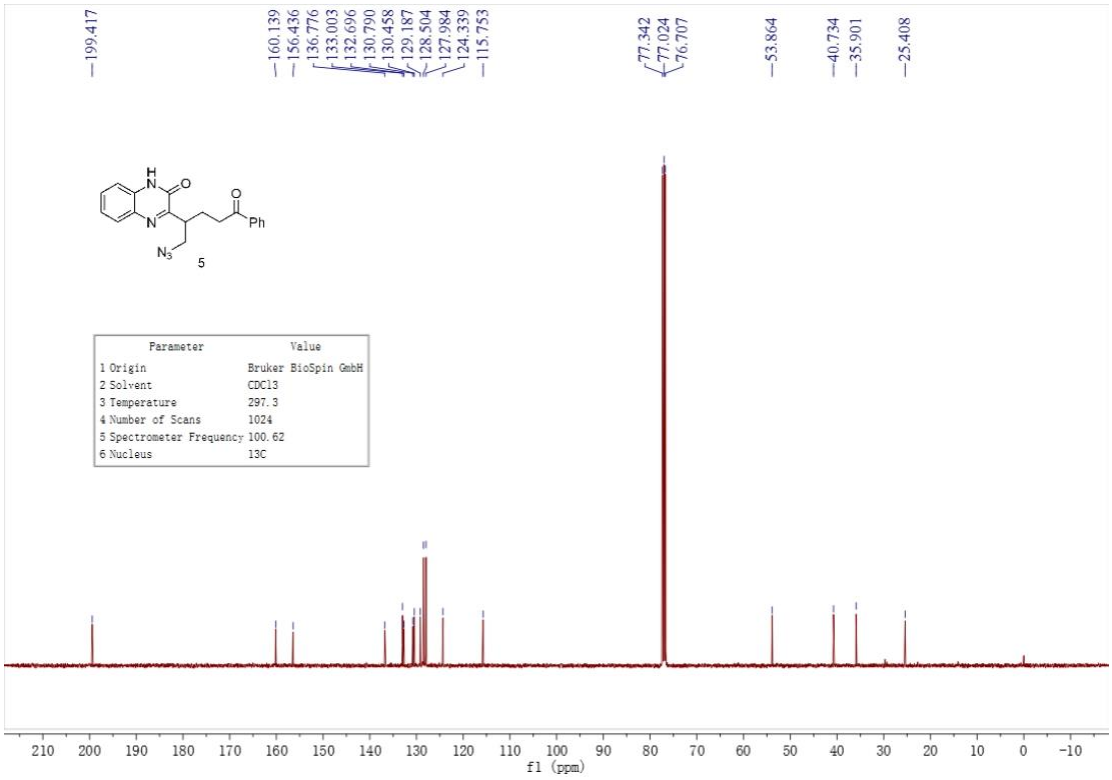

-102.895
-103.588
-104.188
-104.880
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 295.6
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
Ph
CF2CO2Et
4a
f1 (ppm)

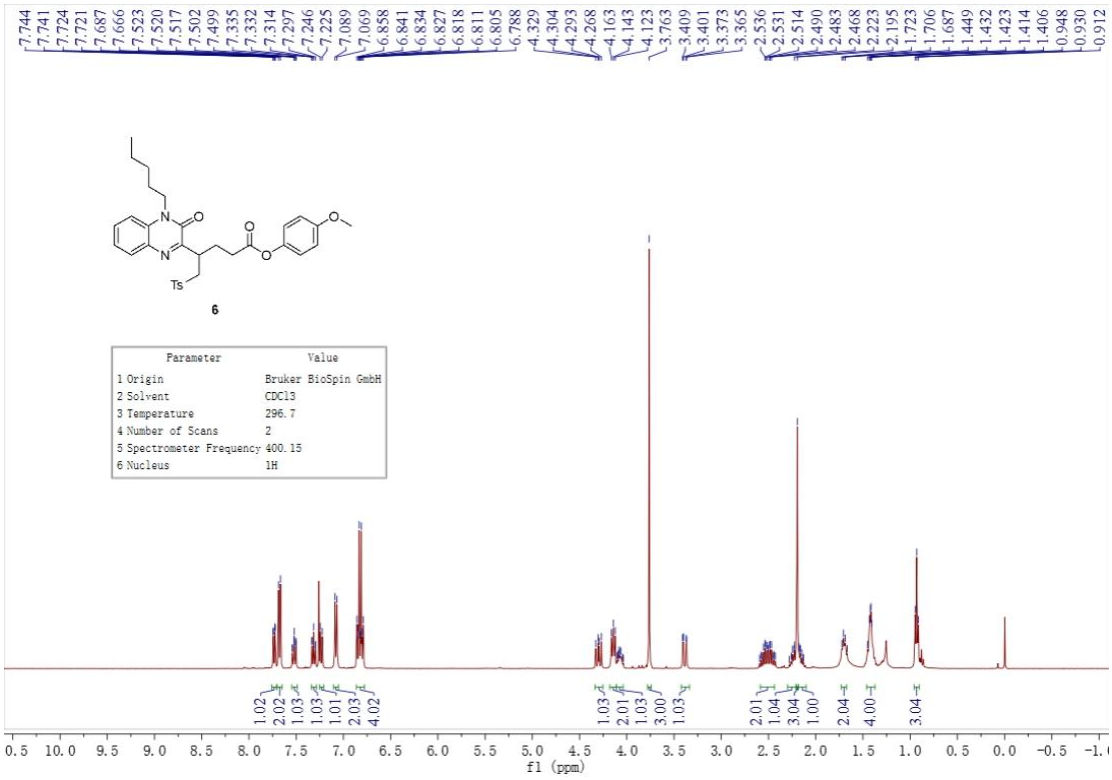

12.521
7.871
7.852
7.824
7.805
7.786
7.493
7.484
7.472
7.465
7.452
7.434
7.360
7.350
7.339
7.330
7.320
7.304
7.260
4.258
4.240
4.223
4.205
4.155
4.139
4.122
3.918
3.063
3.057
3.046
3.036
3.016
2.354
2.291
1.274
1.253
1.235
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.3
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
Ph
CHFCO2Et
4b
1.00
3.00
2.00
4.00
1.00
2.02
1.01
2.00
1.00
3.01
3.01
f1 (ppm)

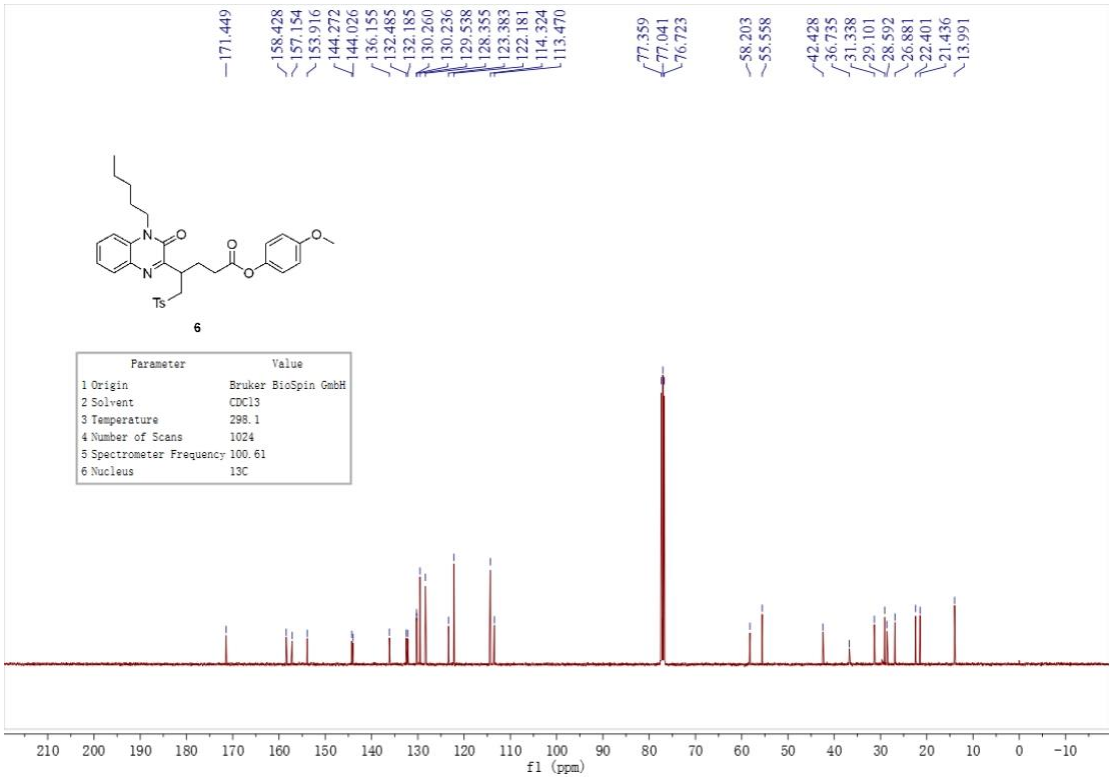

199.623
199.561
170.070
169.914
169.836
169.680
161.809
161.260
156.571
156.544
132.949
128.481
127.996
127.979
124.212
115.811
88.741
88.642
86.909
86.813
77.570
77.052
76.734
61.608
36.638
36.477
36.091
35.994
35.947
35.889
35.428
35.224
28.115
27.422
14.146
14.058
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.6
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
Ph
CHFCO2Et
4b
f1 (ppm)

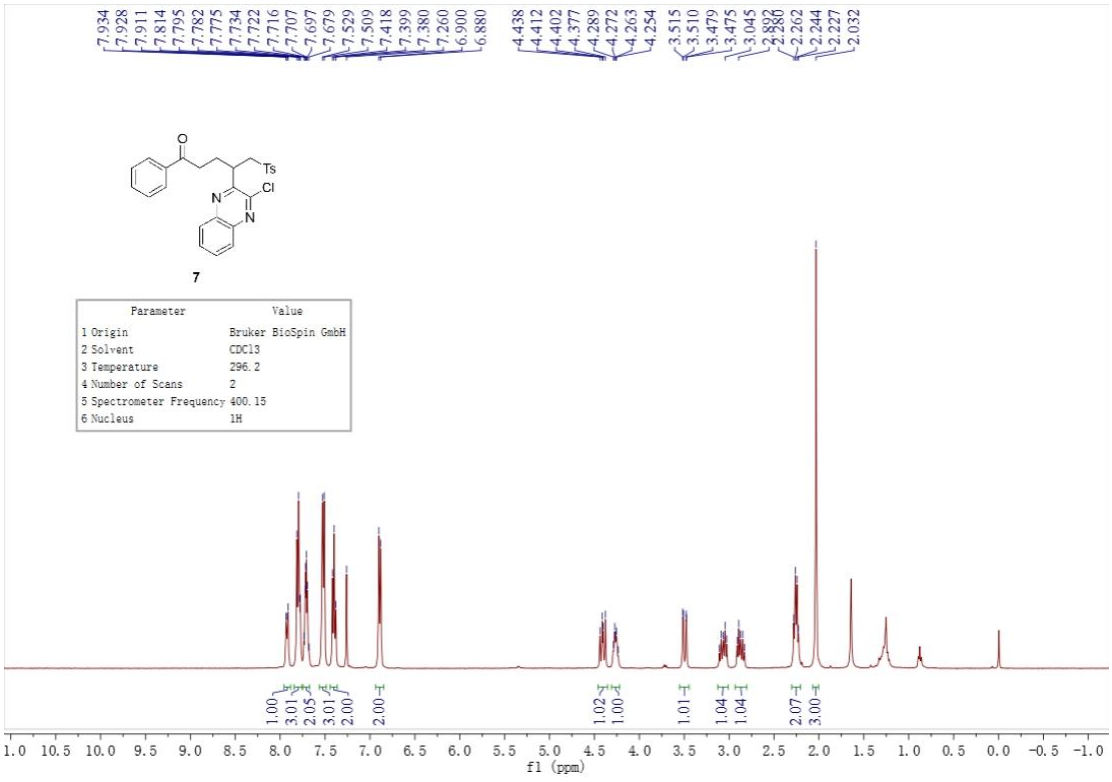

Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.3
4 Number of Scans 2
5 Spectrometer Frequency 376.52
6 Nucleus 19F
-189.388
-191.032
Ph
CHFCO2Et
4b
f1 (ppm)


7.891
7.878
7.873
7.869
7.848
7.845
7.828
7.825
7.524
7.520
7.503
7.485
7.482
7.470
7.465
7.461
7.450
7.447
7.444
7.373
7.369
7.368
7.364
7.354
7.349
7.347
7.339
7.335
7.329
7.326
7.313
7.311
7.293
7.290
3.952
3.933
3.906
3.901
3.893
3.889
3.881
3.868
3.731
3.718
3.703
3.691
3.092
3.082
3.074
3.066
3.061
3.055
3.046
2.383
2.363
2.347
2.313
2.300
Ph
N3
5
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 297.5
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
1.00
2.00
1.00
2.02
4.02
2.00
1.00
2.00
2.02
f1 (ppm)


199.417
160.139
156.436
136.776
133.003
132.696
130.790
130.458
129.187
128.504
127.984
124.339
115.753
77.342
77.024
76.707
53.864
40.734
35.901
25.408
5
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 297.3
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)


7.744
7.741
7.724
7.721
7.687
7.666
7.523
7.520
7.517
7.502
7.499
7.335
7.332
7.314
7.297
7.246
7.225
7.089
7.069
6.858
6.841
6.834
6.827
6.818
6.811
6.805
6.788
4.329
4.304
4.293
4.268
4.163
4.143
4.123
3.763
3.409
3.401
3.373
3.365
2.536
2.531
2.514
2.490
2.483
2.468
2.223
2.195
1.723
1.706
1.687
1.449
1.432
1.423
1.414
1.406
0.948
0.930
0.912
6
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.7
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
1.02
2.02
1.03
1.03
1.01
2.03
4.02
1.03
2.01
1.03
3.00
1.03
2.01
1.04
3.04
1.00
2.04
4.00
3.04
f1 (ppm)


171.449
158.428
157.154
153.916
144.272
144.026
136.155
132.485
132.185
130.260
130.236
129.538
128.355
123.383
122.181
114.324
113.470
77.359
77.041
76.723
58.203
55.558
42.428
36.735
31.338
29.101
28.592
26.881
22.401
21.436
13.991
O
N
O
O
O
N
Ts
6
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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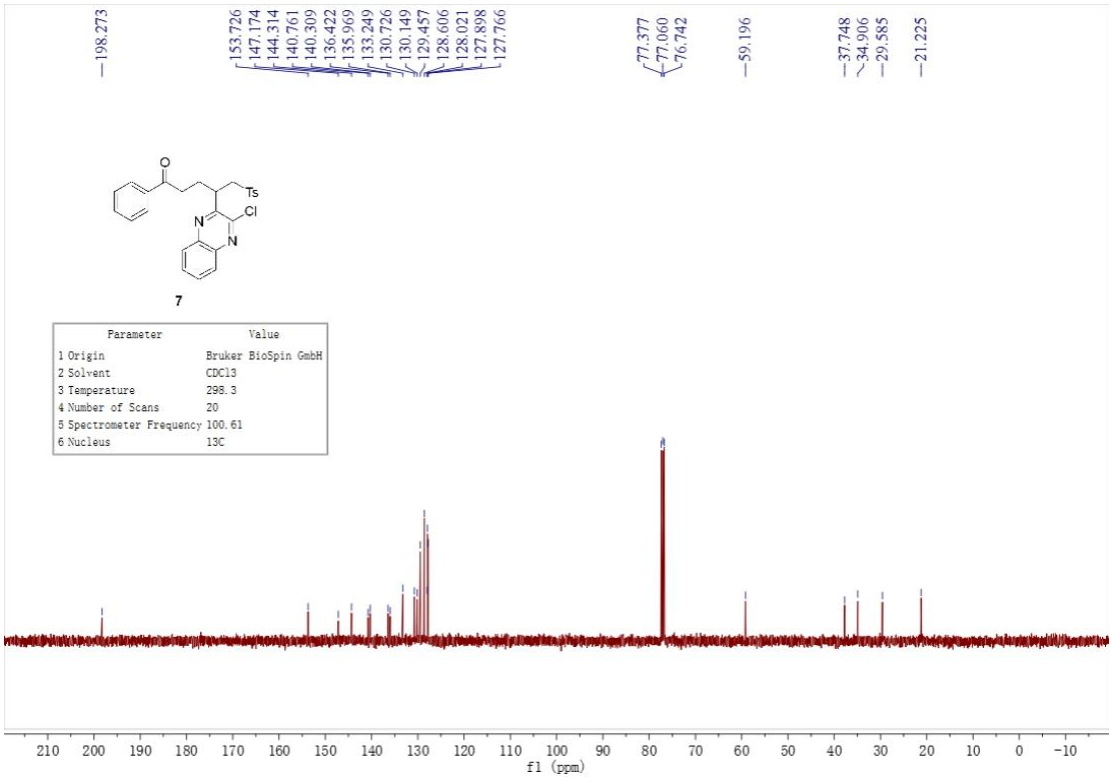
7.928
7.911
7.814
7.795
7.782
7.775
7.734
7.722
7.716
7.707
7.697
7.679
7.529
7.509
7.418
7.399
7.380
7.260
6.900
6.880
4.438
4.412
4.402
4.377
4.289
4.272
4.263
4.254
3.515
3.510
3.479
3.475
3.045
2.892
2.880
2.262
2.244
2.227
2.032
O
Ts
Cl
N
N
7
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.2
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
1.00
3.01
2.05
3.01
2.00
2.00
1.02
1.00
1.01
1.04
1.04
2.07
3.00
1.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)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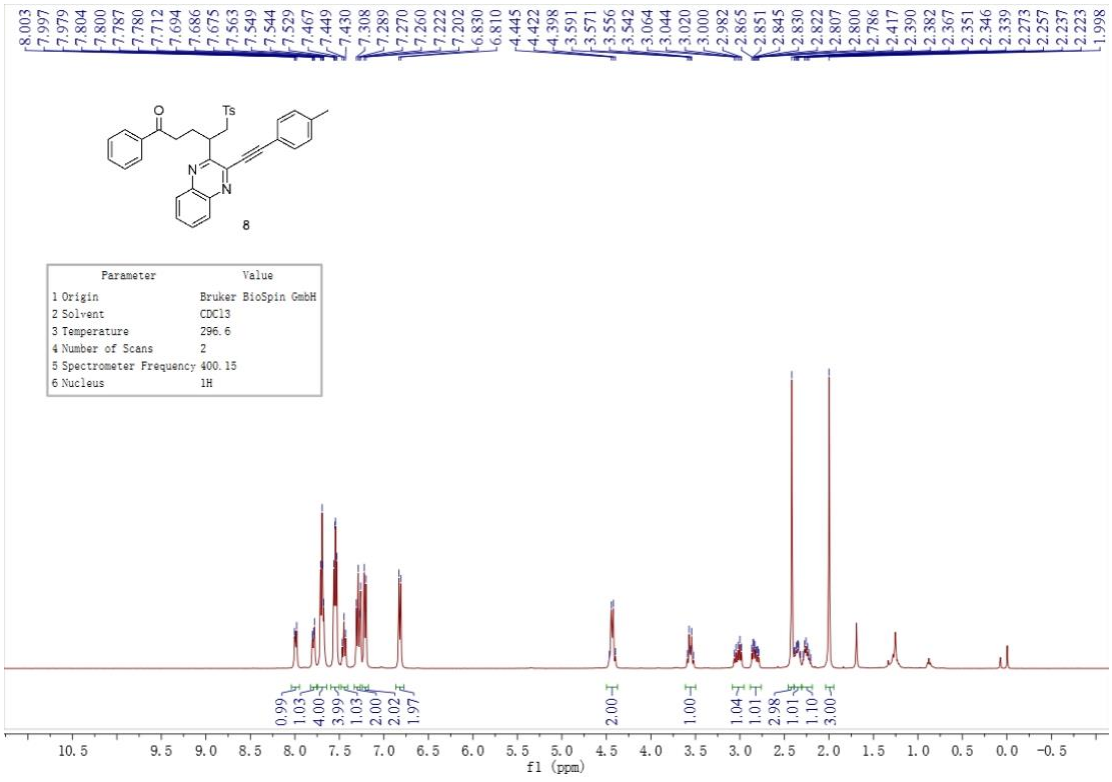
153.726
147.174
144.314
140.761
140.309
136.422
135.969
133.249
130.726
130.149
129.457
128.606
128.021
127.898
127.766
77.377
77.060
76.742
59.196
37.748
34.906
29.585
21.225
O
Ts
Cl
N
N
7
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.3
4 Number of Scans 20
5 Spectrometer Frequency 100.61
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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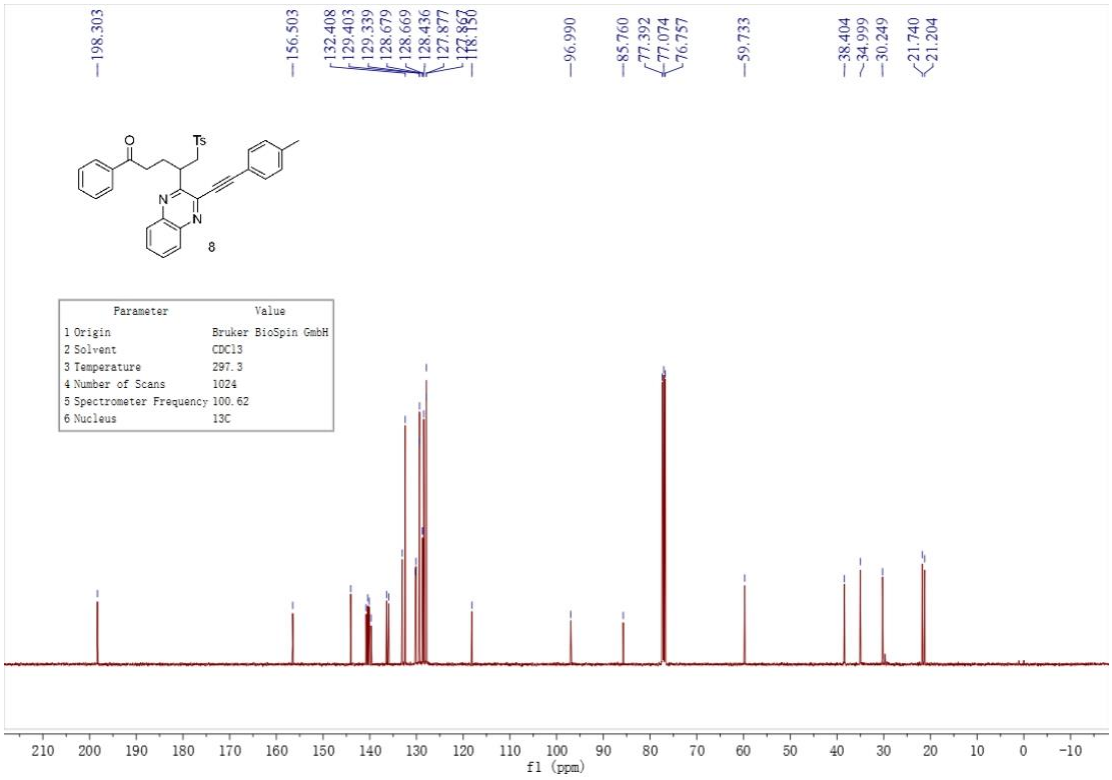
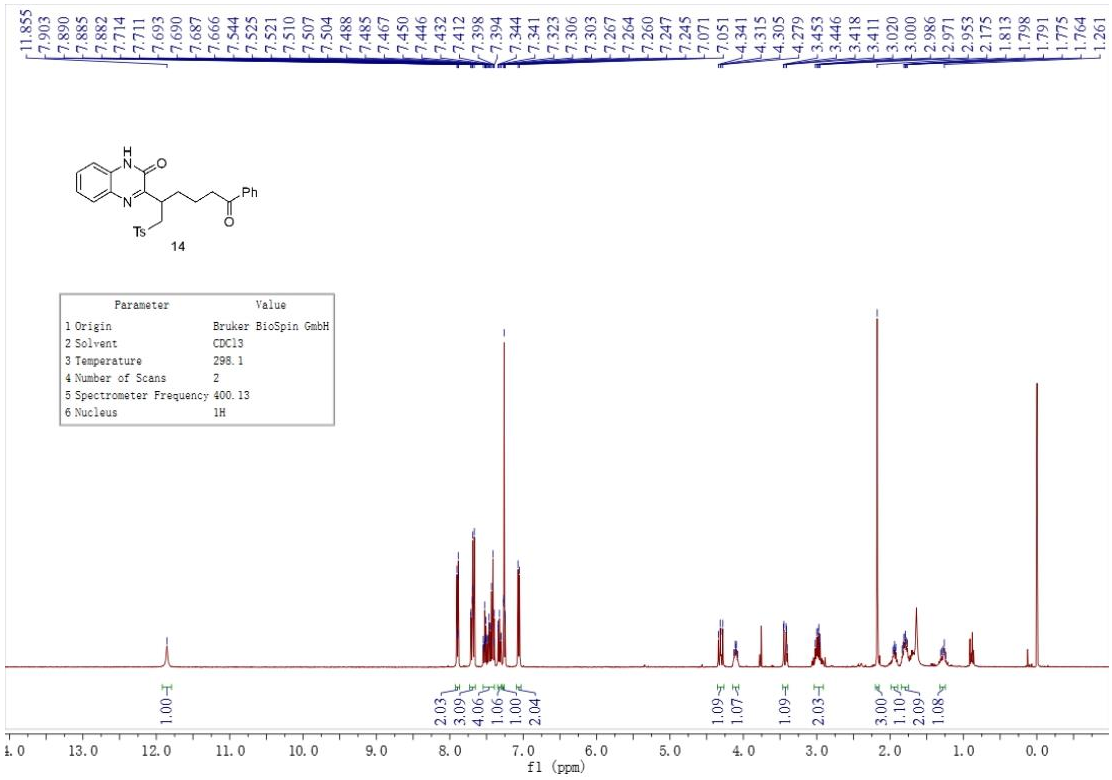
7.804
7.800
7.787
7.780
7.712
7.694
7.686
7.675
7.563
7.549
7.544
7.529
7.467
7.449
7.430
7.308
7.289
7.270
7.260
7.222
7.202
6.830
6.810
4.445
4.422
4.398
3.591
3.571
3.556
3.542
3.064
3.044
3.020
3.000
2.982
2.865
2.851
2.845
2.830
2.822
2.807
2.800
2.786
2.417
2.390
2.382
2.367
2.351
2.346
2.339
2.273
2.257
2.237
2.223
1.998
O
Ts
N
N
8
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 296.6
4 Number of Scans 2
5 Spectrometer Frequency 400.15
6 Nucleus 1H
0.99
1.03
4.00
3.99
1.03
2.00
2.02
1.97
2.00
1.00
1.04
1.01
2.98
1.01
1.10
3.00
10.5 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


198.303
156.503
132.408
129.403
129.339
128.679
128.669
128.436
127.877
127.867
118.150
96.990
85.760
77.392
77.074
76.757
59.733
38.404
34.999
30.249
21.740
21.204
Ts
N
N
O
8
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 297.3
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)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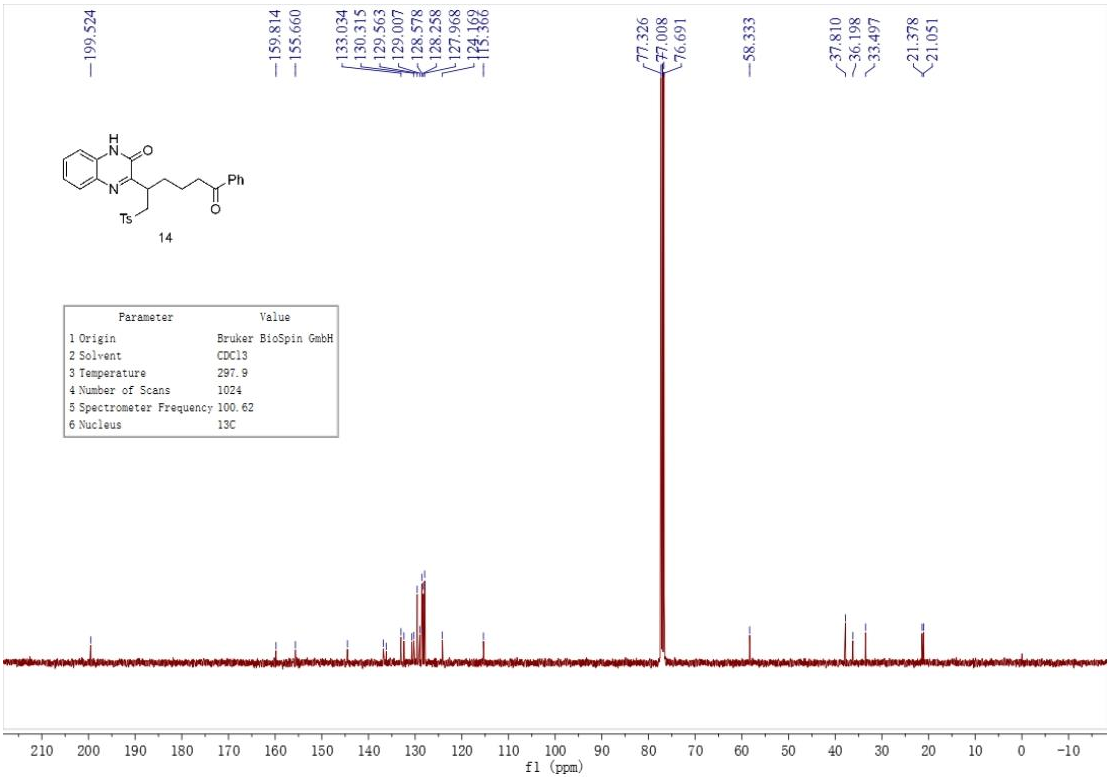
7.711
7.693
7.690
7.687
7.666
7.544
7.525
7.521
7.510
7.507
7.504
7.488
7.485
7.467
7.450
7.446
7.432
7.412
7.398
7.394
7.344
7.341
7.323
7.306
7.303
7.267
7.264
7.260
7.247
7.245
7.071
7.051
4.341
4.315
4.305
4.279
3.453
3.446
3.418
3.411
3.020
3.000
2.986
2.971
2.953
2.175
1.813
1.798
1.791
1.775
1.764
1.261
H
N
O
N
Ph
O
Ts
14
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.00
2.03
3.09
4.06
1.06
1.00
2.04
1.09
1.07
1.09
2.03
3.00
1.10
2.09
1.08
f1 (ppm)


199.524
159.814
155.660
133.034
130.315
129.563
129.007
128.578
128.258
127.968
124.169
115.366
77.326
77.008
76.691
58.333
37.810
36.198
33.497
21.378
21.051
Ph
Ts
14
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 297.9
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)