Supporting Information

Photoinitiated Three Component α-Perfluoroalkyl-β-Heteroarylation of Unactivated Alkenes via Electron Catalysis

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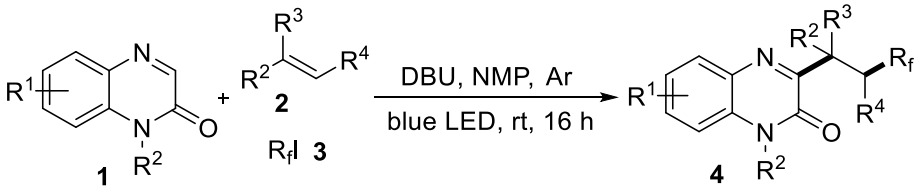
1. General Experimental Methods

All reactions involving air- or moisture-sensitive reagents or intermediates were carried out in pre-heated glassware under an argon atmosphere using standard *Schlenk* techniques. All commercially available reagents were purchased from TCI, Sigma-Aldrich, Alfa Aesar, Acros or ABCR in the highest purity grade and used directly without further purification. Thin layer chromatography (TLC) was performed on Merck silica gel 60 F-254 plates and visualized by fluorescence quenching under UV light or staining with the standard solution of $KMnO_4$. Column chromatography was performed on Merck or Fluka silica gel 60 (40-63 μm) using a forced flow of 0.5 bar. ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra were recorded on *DPX* 300, *AV 400 or 600* at 300 K. Chemical shifts were expressed in parts per million (ppm) with respect to the residual solvent peak. Coupling constants were reported as Hertz (Hz), signal shapes and splitting patterns were indicated as follows: s, singlet; brs, broad singlet; d, doublet; t, triplet; q, quartet; m, multiplet. Mass spectra were recorded on a *Finnigan MAT 4200S*, a *Bruker Daltonics Micro Tof*, a *Waters-Micromass Quatro LCZ* (ESI); peaks are given in *m/z* (% of basis peak).

2. General experimental procedure

Quinoxalin-2(1*H*)-ones **1aa-1am**[1], **1an**[2] were prepared according to the reported procedures.

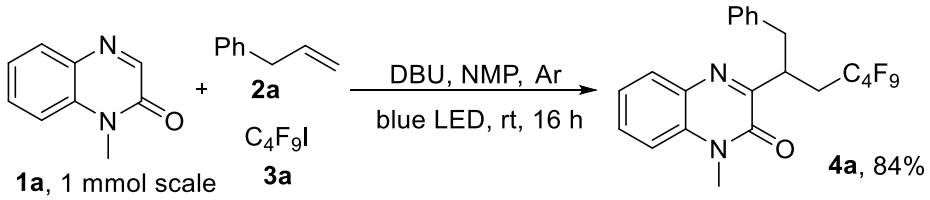
General experimental procedure for the reaction of quinoxalin-2(1*H*)-ones **1,** alkenes **2** and perfluoroalkyl iodides **3**



A Schlenk-tube equipped with a magnetic stir bar was charged with a quinoxalin-2(1*H*)-one **1** (0.2 mmol) and then evacuated and backfilled with Ar 3 times. Afterwards, NMP (0.5 mL), an alkene **2** (2.5 equiv, 0.50 mmol), a perfluoroalkyl iodide **3** (2.0 equiv, 0.4 mmol) and DBU (3.0 equiv, 0.6 mmol) were added by syringe under Ar atmosphere.

The tightly sealed tube was then irradiated with a 5 W blue LEDs (the distance between the tube and the light source was about 5 cm) and simultaneously cooled by a fan to keep the reaction temperature at 25 ℃. After 16 hours, the mixture was transferred into a 100 mL separating funnel which contained 20 mL H_2O. The mixture was extracted twice with Et_2O (20 mL each) and the combined organic layer was washed with brine (20 mL) once and dried by Na_2SO_4. After filtration, the filtrate was concentrated under reduced pressure to give the crude product, which was purified by flash chromatography on silica gel (EtOAc:pentane = 1:8 to 1:1) to give the product **4**.

Scaled-up synthesis of compound **4a**

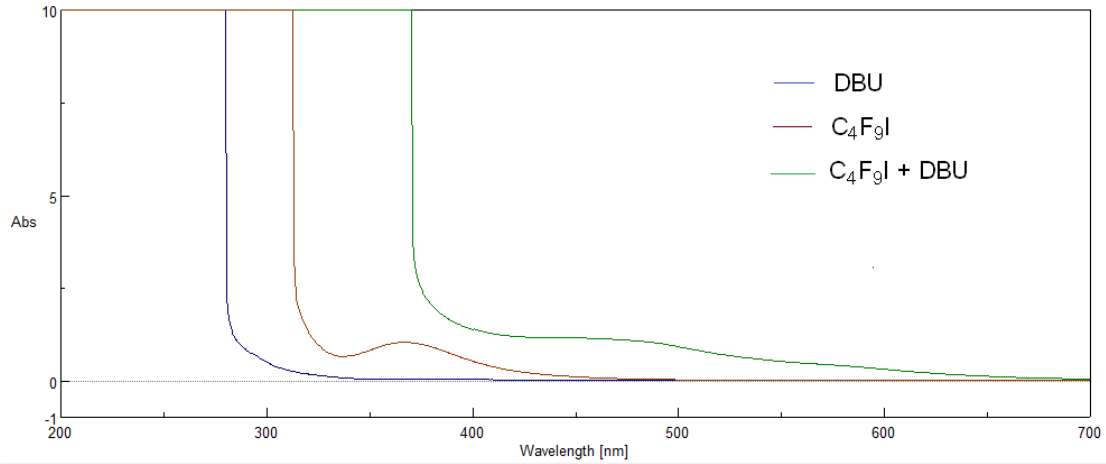


A Schlenk-tube equipped with a magnetic stir bar was charged with a quinoxalin-2(1*H*)-one **1** (1 mmol, 160 mg) and then evacuated and backfilled with Ar 3 times. Afterwards, NMP (2.5 mL), allylbenzene **2a** (2.5 equiv, 2.50 mmol, 295mg), perfluorobutyl iodide **3** (2.0 equiv, 2 mmol, 692 mg) and DBU (3.0 equiv, 3 mmol, 456 mg) were added by syringe under Ar atmosphere. The tightly sealed tube was then irradiated with a 5 W blue LEDs (the distance between the tube and the light source was about 5 cm) and simultaneously cooled by a fan to keep the reaction temperature at 25 ℃. After 16 hours, the mixture was transferred into a 100 mL separating funnel which contained 30 mL H_2O. The mixture was extracted twice with Et_2O (30 mL each) and the combined organic layer was washed with brine (30 mL) once and dried by Na_2SO_4. After filtration, the filtrate was concentrated under reduced pressure to give the crude product, which was purified by flash chromatography on silica gel (EtOAc:pentane = 1:8) to give the product **4a** as a colloidal solid in 84% yield (415.6 mg).

3. UV/Vis absorption spectra

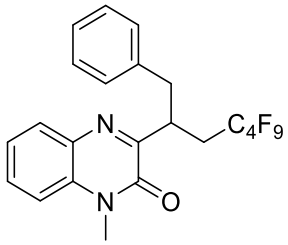
The UV/Vis absorption spectra of NMP solutions of DBU (0.1 M), C_4F_9I (0.1 M), and

a mixture of C_4F_9I and DBU are shown in Figure S1. A bathochromic shift can be observed, indicating the formation of an EDA complex.

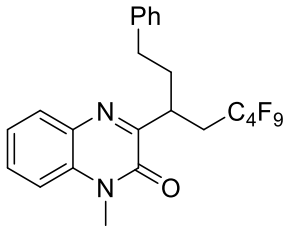


Reference:

1. A. Carrër, J.-D. Brion, S. Messaoudi, and M. Alami, *Org. Lett.*, 2013, **15**, 5606.
2. M. Kaftory, V. Shteiman, T. Lavy, J. R. Scheffer, J. Yang, and V. Enkelmann, *Eur. J. Org. Chem.*, 2005, 847.

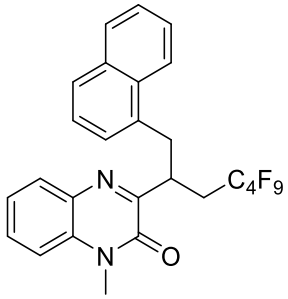


1-Methyl-3-(7,7,7,7,7,7,7,7,7-nonafluoro-1-phenyl-7λ^{12}-hepta-4,6-diyn-2-yl)quinoxalin-2(1*H*)-one (**4a**): According to the General Procedure, **4a** (87.6 mg, 88%) was prepared as a colloidal solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.52 – 7.42 (m, 1H), 7.31 – 7.09 (m, 7H), 4.26 – 4.17 (m, 1H), 3.62 (s, 3H), 3.27 – 2.93 (m, 2H), 2.73 (dd, *J* = 13.6, 8.9 Hz, 1H), 2.22 (dd, *J* = 37.6, 17.7 Hz, 1H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.28, 154.26, 138.42, 133.09, 132.46, 130.14, 129.96, 129.23, 128.50, 126.60, 123.64, 113.61, 39.82, 36.41, 31.71 (s), 31.44 (t, J = 21.0 Hz), 29.15, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.09 (tt, *J* = 9.7, 3.1 Hz, 3F), -112.47 (t, *J* = 12.7 Hz, 2F), -124.45 (m, 2F), -125.71 – -126.12 (m, 2F); FTIR (neat): ṽ = 2951, 1652, 1603, 1474, 1216, 1131, 1100, 749, 701; HRMS (ESI): Calcd for $[C_{22}H_{17}F_9N_2O+Na]^+$: 519.1089, found: 519.1082.

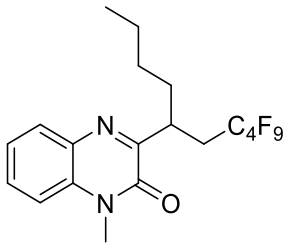


1-Methyl-3-(8,8,8,8,8,8,8,8,8-nonafluoro-1-phenyl-8λ^{12}-octa-5,7-diyn-3-yl)quinoxalin-2(1*H*)-one (**4b**): According to the General Procedure, **4b** (98.3 mg, 97%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.75 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.45 (td, *J* = 8.7, 1.5 Hz, 1H), 7.25 (td, *J* = 8.0, 1.2 Hz, 1H), 7.21 – 6.96 (m, 6H), 4.04 – 3.91 (m, 1H), 3.58 (s, 3H), 3.20 – 2.95 (m, 1H), 2.72 – 2.11 (m, 4H), 1.95 (m, 1H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.05 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.44 – -114.09 (m, 2F), -124.42 (dd, *J* = 18.2, 8.9 Hz, 2F), -125.59 – -125.99 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.6, 154.3, 141.2, 133.1, 132.4, 130.1, 129.7, 128.3, 128.2, 125.8, 123.6, 113.5, 35.7, 35.0, 33.3, 32.8 (t, *J* = 20.25 Hz), 32.6, 29.1, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2940, 1653, 1603, 1474, 1217,

1199, 1165, 1131, 878, 751, 698; HRMS (ESI): Calcd for $[C_{23}H_{19}F_9N_2O+Na]^+$: 533.1246, found: 533.1238.

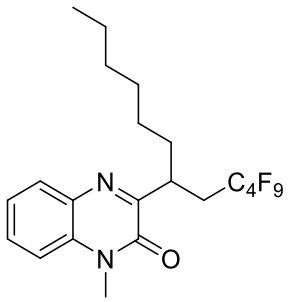


1-Methyl-3-(7,7,7,7,7,7,7,7,7-nonafluoro-1-(naphthalen-1-yl)-7λ^{12}-hepta-4,6-diyn-2-yl)quinoxalin-2(1*H*)-one (**4c**): According to the General Procedure, **4c** (82.8 mg, 76%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.48 (d, *J* = 8.4 Hz, 1H), 7.95 – 7.84 (m, 2H), 7.79 (dd, *J* = 7.3, 2.1 Hz, 1H), 7.68 – 7.49 (m, 3H), 7.29 – 7.45 (m, 4H), 4.63 – 4.46 (m, 1H), 3.89 – 3.70 (m, 4H), 3.50 – 3.09 (m, 2H), 2.37 (dd, *J* = 37.8, 17.9 Hz, 1H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.11 (tt, *J* = 9.7, 3.1 Hz, 3F), -112.35 (s, 2F), -124.30 – -124.70 (m, 2F), -125.80 – -126.10 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.4, 154.4, 134.4, 134.0, 133.1, 132.5, 132.2, 130.1, 129.9, 128.7, 127.74, 127.70, 126.3, 125.7, 125.1, 124.0, 123.6, 113.6, 37.3, 35.6, 31.6, 31.3 (t, *J* = 20.3 Hz), 29.2, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2951, 1651, 1603, 1474, 1219, 1166, 1133, 1101, 778, 754, 723; HRMS (ESI): Calcd for $[C_{26}H_{19}F_9N_2O+Na]^+$: 569.1246, found: 569.1237.

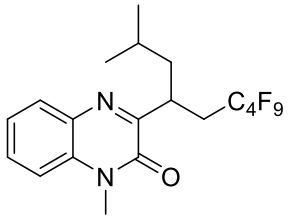


1-Methyl-3-(10,10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4d**): According to the General Procedure, **4d** (86.9 mg, 94%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, J = 7.9, 1.5 Hz, 1H), 7.50 – 7.40 (m, 1H), 7.31 – 7.17 (m, 2H), 3.89 (m, 1H), 3.63 (s, 3H), 3.21 – 2.94

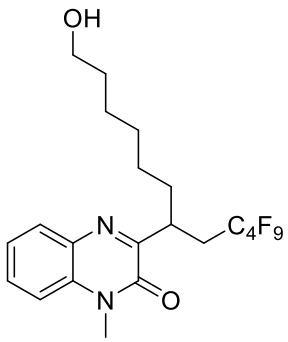
(m, 1H), 2.37 – 2.14 (m, 1H), 1.85 – 1.50 (m, 2H), 1.35 – 1.11 (m, 4H), 0.79 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, CDCl3) δ -81.10 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.41 – -114.33 (m, 2F), -124.49 (m, 2F), -125.67 – -126.10 (m); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.1, 154.4, 133.0, 132.4, 129.96, 129.92, 123.5, 113.5, 34.5, 34.1, 32.5 (t, *J* = 21.0 Hz), 29.1, 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2960, 2937, 1656, 1604, 1475, 1217, 1132, 1088, 877, 752, 722; HRMS (ESI): Calcd for $[C_{19}H_{19}F_9N_2O+Na]^+$: 485.1246, found: 485.1250.



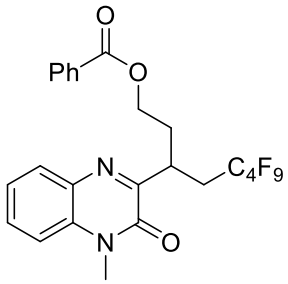
1-Methyl-3-(1,1,1,1,1,1,1,1,1-nonafluoro-1λ^{12}-dodeca-1,3-diyn-6-yl)quinoxalin-2(1*H*)-one (**4e**): According to the General Procedure, **4e** (90.2 mg, 92%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.87 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.57 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.42 – 7.28 (m, 2H), 3.95 – 4.04 (m, 1H), 3.75 (s, 3H), 3.08 – 3.29 (m, 1H), 2.55 – 2.23 (m, 1H), 2.03 – 1.61 (m, 2H), 1.48 – 1.20 (m, 8H), 0.88 (t, *J* = 9.1 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.10 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.53 – -114.31 (m, 2F), -124.53 – -124.44 (m, 2F), -125.95 – -125.84 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.1, 154.4, 133.0, 132.4, 129.96, 129.92, 123.5, 113.5, 34.6, 34.3, 32.57 (t, *J* = 21.0 Hz), 31.6, 29.1, 26.9, 22.5, 13.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2929, 1655, 1603, 1474, 1217, 1132, 1166, 1089, 881, 751, 722; HRMS (ESI): Calcd for $[C_{21}H_{23}F_9N_2O+Na]^+$: 513.1559, found: 513.1533.



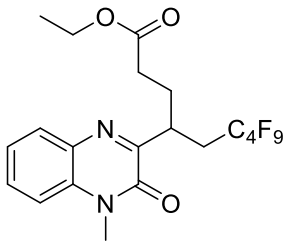
1-Methyl-3-(9,9,9,9,9,9,9,9,9-nonafluoro-2-methyl-9λ^{12}-nona-6,8-diyn-4-yl)quinoxalin-2(1*H*)-one (**4f**): According to the General Procedure, **4f** (90.7 mg, 98%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.75 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.46 (ddd, *J* = 8.6, 7.5, 1.5 Hz, 1H), 7.30 – 7.17 (m, 2H), 4.05 – 3.89 (m, 1H), 3.64 (s, 3H), 3.20 – 2.93 (m, 1H), 2.37 – 2.10 (m, 1H), 1.78 – 1.32 (m, 3H), 0.89 (d, *J* = 6.3 Hz, 3H), 0.88(d, *J* = 6.3 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.08 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.32 – -114.55 (m, 2F), -123.97 – -125.28 (m, 2F), -125.55 – -126.32 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.4, 154.3, 133.0, 132.5, 129.96, 129.90, 123.5, 113.5, 43.6, 32.87 (t, *J* = 21.0 Hz), 29.1, 25.9, 22.6, 22.2, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ῦ = 2960, 1654, 1604, 1474, 1216, 1165, 1132, 1089, 881, 752, 723; HRMS (ESI): Calcd for $[C_{19}H_{19}F_9N_2O+Na]^+$: 485.1246, found: 485.1256.



1-Methyl-3-(1,1,1,1,1,1,1,1,1-nonafluoro-12-hydroxy-1λ^{12}-dodeca-1,3-diyn-6-yl)quinoxalin-2(1*H*)-one (**4g**): According to the General Procedure, **4g** (99.0 mg, 98%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.52 – 7.42 (m, 1H), 7.33 – 7.18 (m, 2H), 3.96 – 3.80 (m, 1H), 3.64 (s, 3H), 3.59 – 3.47 (m, 2H), 2.97 – 3.18 (m, 1H), 2.37 – 2.13 (m, 1H), 1.74 – 1.84 (m, 1H), 1.60 – 1.14 (m, 10H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.09 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.51 – -114.11 (m, 2F), -124.52 – -124.43 (m, 2F), -125.94 – 125.86 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.0, 154.4, 133.0, 132.4, 130.0, 129.9, 123.6, 113.6, 62.7, 34.4, 34.1, 32.8, 32.5, 29.1, 29.0, 26.8, 25.3, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ῦ = 2933, 2860, 1651, 1603, 1217, 1131, 1086, 753, 722; HRMS (ESI): Calcd for $[C_{21}H_{23}F_9N_2O_2+Na]^+$: 529.1508, found: 529.1503.

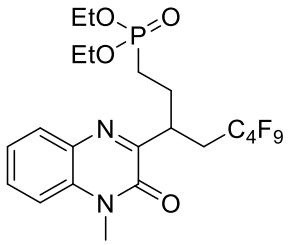


8,8,8,8,8,8,8,8,8-Nonafluoro-3-(4-methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)-8λ^{12}-octa-5,7-diyn-1-yl benzoate (**4h**): According to the General Procedure, **4h** (60.1 mg, 54%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.74 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.69 – 7.62 (m, 2H), 7.48 – 7.32 (m, 2H), 7.29 – 7.21 (m, 1H), 7.21 – 7.02 (m, 3H), 4.42 – 4.24 (m, 2H), 4.17 – 4.05 (m, 1H), 3.44 (s, 3H), 3.23 – 2.93 (m, 1H), 2.55 – 2.12 (m, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.05 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.30 – -114.49 (m, 2F), -124.06 – -124.60 (m, 2F), -125.86 (t, *J* = 10.2 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 166.0, 160.0, 154.3, 133.0, 132.70 (s), 132.4, 130.1, 129.98, 129.90, 129.2, 128.1, 123.6, 113.5, 62.8, 33.2 (t, *J* = 21.0 Hz), 33.0, 32.9, 28.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2955, 1721, 1655, 1604, 1273, 1233, 1133, 1115, 712; HRMS (ESI): Calcd for $[C_{24}H_{19}F_9N_2O_3+Na]^+$: 577.1144, found: 577.1144.

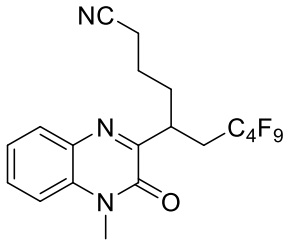


Ethyl 9,9,9,9,9,9,9,9,9-nonafluoro-4-(4-methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)-9λ^{12}-nona-6,8-diynoate (**4i**): According to the General Procedure, **4i** (91.8 mg, 91%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.48 (ddd, *J* = 8.6, 7.5, 1.5 Hz, 1H), 7.23 – 7.30 (m, 2H), 4.03 – 3.87 (m, 3H), 3.64 (s, 3H), 3.19 – 2.92 (m, 1H), 2.40 – 2.00 (m, 5H), 1.11 (t, *J* = 7.1 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.07 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.53 – -114.58 (m, 2F), -124.15 – -124.71 (m, 2F), -125.94 – -125.85 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 172.6, 159.9, 154.3, 133.1, 132.3, 130.2, 130.0, 123.6, 113.6, 60.4, 34.0, 32.99 (t, *J* = 21.0 Hz),

31.5, 29.1, 28.9, 14.0, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2984, 1732, 1653, 1604, 1474, 1216, 1164, 1131, 1107, 754; HRMS (ESI): Calcd for $[C_{20}H_{19}F_9N_2O_3+Na]^+$: 529.1144, found: 529.1135.

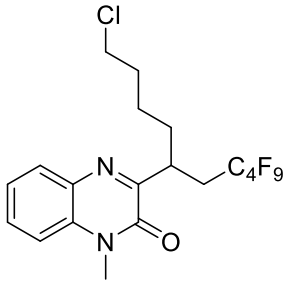


Diethyl (8,8,8,8,8,8,8,8,8-nonafluoro-3-(4-methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)-8λ^{12}-octa-5,7-diyn-1-yl)phosphonate (**4j**): According to the General Procedure, **4j** (101.8 mg, 89%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.53 – 7.45 (m, 1H), 7.32 – 7.20 (m, 2H), 4.04 – 3.91 (m, 5H), 3.64 (s, 3H), 3.15 – 2.86 (m, 1H), 2.32 – 1.98 (m, 4H), 1.86 – 1.52 (m, 2H), 1.21 (td, *J* = 7.1, 2.7 Hz, 6H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.10 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.30 – -114.54 (m, 2F), -124.31 – -124.68 (m, 2F), -125.94 – 125.87 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.5, 154.3, 133.0, 132.3, 130.4, 130.0, 123.7, 113.6, 61.6 (d, *J* = 6.5 Hz), 34.8 (d, *J* = 18.4 Hz), 32.68 (t, *J* = 21.0 Hz), 29.2, 26.78 (d, *J* = 4.0 Hz), 24.0, 22.1, 16.33 (d, *J* = 5.9 Hz) , ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2984, 1651, 1603, 1218, 1132, 1055, 1024, 959, 756, 722; HRMS (ESI): Calcd for $[C_{21}H_{24}F_9N_2PO_4+Na]^+$: 593.1222, found: 593.1219.

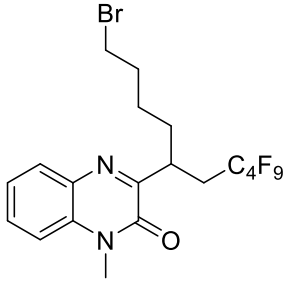


10,10,10,10,10,10,10,10,10-Nonafluoro-5-(4-methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)-10λ^{12}-deca-7,9-diynenitrile (**4k**): According to the General Procedure, **4k** (57.9 mg, 61%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.55 – 7.46 (m, 1H), 7.34 – 7.23 (m, 2H), 3.89 – 3.98 (m, 1H), 3.65 (s,

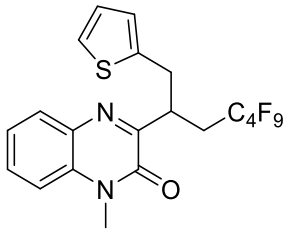
3H), 3.17 – 2.88 (m, 1H), 2.39 – 2.16 (m, 3H), 2.08 – 1.90 (m, 1H), 1.74 – 1.86 (m, 1H), 1.72 – 1.51 (m, 2H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.05 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.44 – -114.44 (m, 2F), -123.91 – -124.69 (m, 2F), -125.91 – -125.83 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.7, 154.3, 133.0, 132.3, 130.4, 130.0, 123.8, 119.1, 113.7, 33.7, 33.1, 33.0 (t, *J* = 21.0 Hz), 29.2, 22.9, 16.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2943, 1653, 1604, 1220, 1133, 880, 755, 723; HRMS (ESI): Calcd for $[C_{19}H_{16}F_9N_3O+Na]^+$: 496.1042, found: 496.1034.



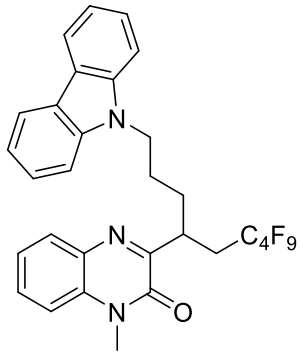
3-(1-Chloro-10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)-1-methylquinoxalin-2(1*H*)-one (**4l**): According to the General Procedure, **4l** (84.3 mg, 85%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.48 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.22 – 7.30 (m, 2H), 4.00 – 3.83 (m, 1H), 3.64 (s, 3H), 3.43 (t, *J* = 6.6 Hz, 2H), 3.21 – 2.94 (m, 1H), 2.43 – 2.13 (m, 1H), 1.94 – 1.30 (m, 6H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.07 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.43 – -114.41 (m, 2F), -124.27 – -124.62 (m, 2F), -125.89 (t, *J* = 10.6 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.6, 154.3, 133.0, 132.4, 130.1, 129.9, 123.6, 113.6, 44.5, 34.3, 33.3, 32.6 (t, *J* = 21.7 Hz), 32.2, 29.1, 24.1, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2950, 1652, 1603, 1217, 1131, 880, 753, 722; HRMS (ESI): Calcd for $[C_{19}H_{18}ClF_9N_2O+Na]^+$: 519.0856, found: 519.0856.



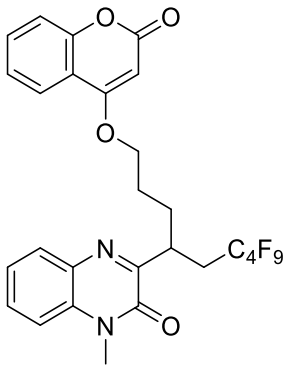
3-(1-Bromo-10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)-1-methylquinoxalin-2(1*H*)-one (**4m**): According to the General Procedure, **4m** (56.9 mg, 53%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.48 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.23 – 7.31 (m, 2H), 3.97 – 3.83 (m, 1H), 3.65 (s, 3H), 3.30 (t, *J* = 6.7 Hz, 2H), 3.21 – 2.92 (m, 1H), 2.45 – 2.12 (m, 1H), 1.88 – 1.31 (m, 7H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.05 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.48 – -114.12 (m, 2F), -124.27 – -124.62 (m, 2F), -125.87 (t, *J* = 10.5 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.5, 154.3, 133.0, 132.4, 130.1, 129.9, 123.6, 113.6, 34.3, 33.2, 33.1, 32.63 (t, *J* = 21.0 Hz), 32.3, 29.2, 25.3, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2941, 1652, 1604, 1474, 1218, 1132, 880, 754, 722; HRMS (ESI): Calcd for $[C_{19}H_{18}BrF_9N_2O+Na]^+$: 563.0351, found: 563.0345.



1-Methyl-3-(7,7,7,7,7,7,7,7,7-nonafluoro-1-(thiophen-2-yl)-7λ^{12}-hepta-4,6-diyn-2-yl)quinoxalin-2(1*H*)-one (**4n**): According to the General Procedure, **4n** (59.0 mg, 57%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.65 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.42 – 7.32 (m, 1H), 7.11 – 7.19 (m, 2H), 6.91 (dd, *J* = 5.1, 1.1 Hz, 1H), 6.64 – 6.71 (m, 2H), 4.09 (ddd, *J* = 12.0, 9.8, 3.8 Hz, 1H), 3.52 (s, 3H), 3.25 (dd, *J* = 14.7, 6.4 Hz, 1H), 3.10 – 2.79 (m, 2H), 2.39 – 2.11 (m, 1H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.06 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.30 – -113.66 (m, 2F), -124.16 – -124.64 (m, 2F), -125.72 – -126.05 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.6, 154.2, 140.6, 133.1, 132.4, 130.2, 130.0, 126.8, 126.1, 124.2, 123.6, 113.6, 36.9, 33.5, 31.7 (d, *J* = 21.0 Hz), 29.1, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2952, 1652, 1603, 1474, 1217, 1132, 1095, 884, 752, 726; HRMS (ESI): Calcd for $[C_{20}H_{15}F_9N_2O+Na]^+$: 525.0654, found: 525.0652.

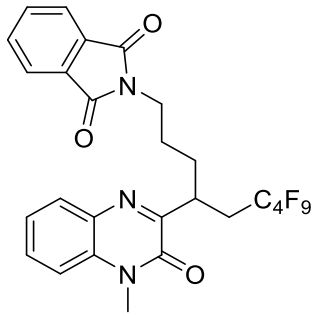


3-(1-(9*H*-Carbazol-9-yl)-9,9,9,9,9,9,9,9,9-nonafluoro-9λ^{12}-nona-6,8-diyn-4-yl)-1-methylquinoxalin-2(1*H*)-one (**4o**): According to the General Procedure, **4o** (85.0 mg, 70%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.96 (d, *J* = 7.7 Hz, 2H), 7.67 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.43 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.35 – 7.05 (m, 8H), 4.29 – 3.83 (m, 2H), 4.05 – 3.89 (m, 1H), 3.57 (s, 3H), 3.09 – 2.88 (m, 1H), 2.35 – 1.63 (m, 5H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.02 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.31 – -114.14 (m, 2F), -124.22 – -124.61 (m, 2F), -125.88 – -125.81 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.2, 154.3, 140.3, 133.0, 132.4, 130.2, 130.0, 125.6, 123.6, 122.8, 120.3, 118.8, 113.6, 108.6, 42.6, 34.2, 33.13 (t, *J* = 21.0 Hz), 31.6, 29.1, 25.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): $\tilde{\nu}$ = 2950, 1649, 1602, 1464, 1217, 1132, 748, 723; HRMS (ESI): Calcd for $[C_{30}H_{24}F_9N_3O+Na]^+$: 636.1668, found: 636.1671.

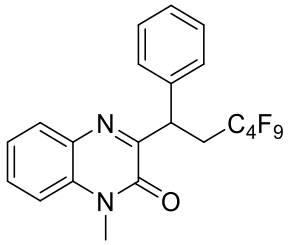


1-Methyl-3-(9,9,9,9,9,9,9,9,9-nonafluoro-1-((2-oxo-2*H*-chromen-4-yl)oxy)-9λ^{12}-nona-6,8-diyn-4-yl)quinoxalin-2(1*H*)-one (**4p**): According to the General Procedure, **4p** (111.2 mg, 92%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.61 (ddd, *J* = 17.7, 7.9, 1.5 Hz, 2H), 7.43 – 7.28 (m, 2H), 7.21 – 7.01 (m, 4H), 5.39 (s, 1H), 4.00 – 3.85 (m, 3H), 3.51 (s, 3H), 3.14 – 2.78 (m, 1H), 1.96 – 2.34 m, 2H), 1.85 – 1.68

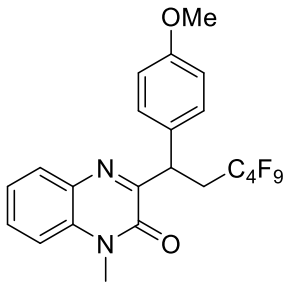
(m, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.06 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.34 – -114.21 (m, 2F), -124.24 – -124.72 (m, 2F), -125.91 – -125.83 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 165.4, 162.7, 160.1, 154.3, 153.3, 133.0, 132.3, 132.2, 130.4, 129.9, 123.7, 122.9, 116.6, 115.6, 113.6, 90.4, 68.6, 34.3, 33.05 (t, *J* = 21.0 Hz) , 30.2, 29.2, 25.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2956, 1722, 1653, 1624, 1236, 1184, 1133, 1109, 752; HRMS (ESI): Calcd for $[C_{27}H_{21}F_9N_2O_4+Na]^+$: 631.1250, found: 631.1255.



2-(9,9,9,9,9,9,9,9,9-Nonafluoro-4-(4-methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)-9λ^{12}-nona-6,8-diyn-1-yl)isoindoline-1,3-dione (**4q**): According to the General Procedure, **4q** (112.5 mg, 97%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.75 – 7.66 (m, 3H), 7.64 – 7.55 (m, 2H), 7.50 – 7.41 (m, 1H), 7.19 – 7.26 (m, 2H), 3.89 – 3.96 (m, 1H), 3.67 – 3.53 (m, 5H), 3.17 – 2.91 (m, 1H), 2.16 – 2.35 (m, 1H), 1.92 – 1.79 (m, 1H), 1.80 – 1.48 (m, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.08 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.28 – -114.27 (m, 2F), -124.29 – -124.66 (m, 2F), -125.89 (t, *J* = 10.8 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.2, 160.2, 154.3, 133.8, 133.0, 132.4, 132.1, 130.1, 129.9, 123.5, 123.1, 113.6, 37.76 (s), 34.29 (s), 32.88 (t, *J* = 21.1 Hz), 31.5, 29.1, 25.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2942, 1710, 1653, 1604, 1397, 1219, 1133, 755, 720; HRMS (ESI): Calcd for $[C_{26}H_{20}F_9N_3O_3+Na]^+$: 616.1253, found: 616.1255.

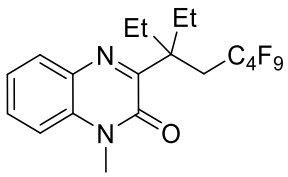


1-Methyl-3-(6,6,6,6,6,6,6,6,6-nonafluoro-1-phenyl-6λ^{12}-hexa-3,5-diyn-1-yl)quinoxalin-2(1*H*)-one (**4r**): According to the General Procedure, **4r** (32.8 mg, 34%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.85 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.47 (ddd, *J* = 8.7, 7.4, 1.5 Hz, 1H), 7.38 – 7.41 (m, 2H), 7.34 – 7.25 (m, 1H), 7.25 – 7.09 (m, 4H), 5.15 (dd, *J* = 8.4, 4.9 Hz, 1H), 3.69 – 3.43 (m, 1H), 3.56 (s, 3H), 2.75 – 2.49 (m, 1H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.02 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.15 – -114.79 (m, 2F), -124.45 (d, *J* = 9.4 Hz, 2F), -125.85 - -125.73 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 158.6, 154.0, 139.8, 133.2, 132.3, 130.2, 130.1, 128.7, 128.4, 127.3, 123.6, 113.6, 39.7, 34.32 (t, *J* = 21.0 Hz), 29.1, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2956, 1654, 1604, 1474, 1218, 1132, 1076, 879, 753, 699; HRMS (ESI): Calcd for $[C_{21}H_{15}F_9N_2O+Na]^+$: 505.0933, found: 505.0931.

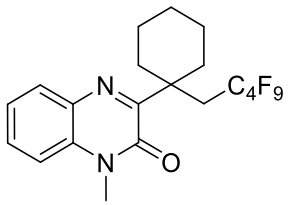


1-Methyl-3-(6,6,6,6,6,6,6,6,6-nonafluoro-1-(4-methoxyphenyl)-6λ^{12}-hexa-3,5-diyn-1-yl)quinoxalin-2(1*H*)-one (**4s**): According to the General Procedure, **4s** (73.6 mg, 72%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.95 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.62 – 7.51 (m, 1H), 7.47 – 7.36 (m, 3H), 7.34 – 7.25 (m, 1H), 6.90 – 6.82 (m, 2H), 5.21 (dd, *J* = 8.3, 5.1 Hz, 1H), 3.78 (s, 3H), 3.71 – 3.52 (m, 1H), 3.67 (s, 3H), 2.61 – 2.81 (m, 1H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.04 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.03 – -114.82 (m, 2F), -124.47 (d, *J* = 9.2 Hz, 2F), -125.64 – -126.01 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 158.87, 158.80, 154.0, 133.1, 132.3, 131.7, 130.1, 129.4, 123.6, 114.1, 113.5, 55.1, 38.9, 34.3 (t, *J* = 21.0 Hz), 29.1, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could

not be assigned; FTIR (neat): ṽ = 2957, 1656, 1604, 1512, 1231, 1180, 1133, 1095, 1036, 879, 751; HRMS (ESI): Calcd for $[C_{22}H_{17}F_9N_2O_2+Na]^+$: 535.1039, found: 535.1033.

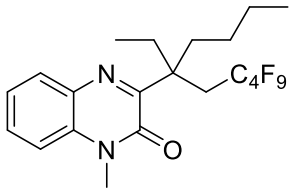


3-(3-Ethyl-8,8,8,8,8,8,8,8,8-nonafluoro-8λ^{12}-octa-5,7-diyn-3-yl)-1-methylquinoxalin-2(1*H*)-one (**4t**): According to the General Procedure, **4t** (80.8 mg, 87%) was prepared as a white solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.79 (dd, *J* = 7.9, 1.4 Hz, 1H), 7.49 – 7.39 (m, 1H), 7.18 – 7.28 (m, 2H), 3.59 (s, 3H), 2.99 (t, *J* = 21.6 Hz, 2H), 2.20 – 2.32 (m, 2H), 1.92 – 2.04 (m, 2H), 0.70 (t, *J* = 7.5 Hz, 6H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.11 (tt, *J* = 9.9, 2.9 Hz, 3F), -111.55 (t, *J* = 13.1 Hz, 2F), -124.65 – -124.55 (m, 2F), -125.51 – -126.02 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.2, 153.7, 133.0, 132.0, 130.4, 129.8, 123.3, 113.3, 47.2, 32.33 (t, *J* = 19.2 Hz), 28.8, 25.6, 7.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2969, 1652, 1473, 1217, 1130, 1081, 877, 751, 717; HRMS (ESI): Calcd for $[C_{19}H_{19}F_9N_2O+Na]^+$: 485.1246, found: 485.1247.

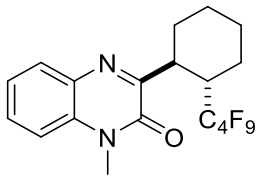


1-Methyl-3-(1-(5,5,5,5,5,5,5,5,5-nonafluoro-5λ^{12}-penta-2,4-diyn-1-yl)cyclohexyl)quinoxalin-2(1*H*)-one (**4u**): According to the General Procedure, **4u** (88.5 mg, 93%) was prepared as a white solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.80 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.45 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.30 – 7.17 (m, 2H), 3.59 (s, 3H), 3.01 (t, *J* = 21.6 Hz, 2H), 2.53 – 2.35 (m, 2H), 1.93 – 1.75 (m, 2H), 1.38 – 1.62 (m, 6H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.13 (tt, *J* = 9.8, 3.0 Hz, 3F), -110.60 – -111.81 (m, 2F), -124.53 – -124.5 (m, 2F), -125.55 – -126.01 (m, 2F); ^{13}C NMR (75

MHz, $CDCl_3$) δ 161.2, 153.8, 133.1, 132.2, 130.3, 129.9, 123.3, 113.3, 44.2, 35.41 (t, *J* = 19.5), 34.8, 28.8, 26.2, 22.2, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2942, 1650, 1603, 1591, 1218, 1130, 1081, 878, 751, 724; HRMS (ESI): Calcd for $[C_{20}H_{19}F_9N_2O+Na]^+$: 497.1246, found: 497.1242.

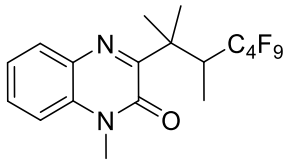


3-(5-Ethyl-10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)-1-methylquinoxalin-2(1*H*)-one (**4v**): According to the General Procedure, **4v** (86.7 mg, 88%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.91 (dd, *J* = 7.9, 1.3 Hz, 1H), 7.61 – 7.51 (m, 1H), 7.42 – 7.28 (m, 2H), 3.71 (s, 3H), 3.28 – 2.94 (m, 2H), 2.46 – 1.97 (m, 4H), 1.43 – 1.00 (m, 4H), 0.92 (t, *J* = 7.3 Hz, 3H), 0.83 (t, *J* = 7.5 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.13 (tt, *J* = 9.8, 2.8 Hz, 3F), -111.55 (t, *J* = 12.8 Hz, 2F), -124.57 – -124.68 (m, 2F), -125.50 – -125.96 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.3, 153.7, 133.0, 132.0, 130.4, 129.8, 123.2, 113.3, 47.0, 33.0, 32.66 (t, *J* = 19.0 Hz), 28.8, 26.2, 25.6, 23.1, 13.9, 7.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2960, 1652, 1472, 1230, 1216, 1130, 1080, 877, 752, 19; HRMS (ESI): Calcd for $[C_{21}H_{23}F_9N_2O+Na]^+$: 513.1559, found: 513.1563.

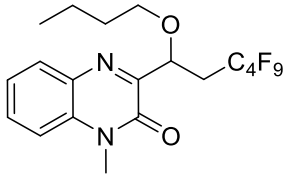


1-Methyl-3-(2-(4,4,4,4,4,4,4,4,4-nonafluoro-4λ^{12}-buta-1,3-diyn-1-yl)cyclohexyl)quinoxalin-2(1*H*)-one (**4w**): According to the General Procedure, **4w** (49.0 mg, 53%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.83 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.55 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.41 – 7.29 (m, 2H), 3.82 – 3.66 (m, 1H), 3.73 (s, 3H), 3.51 – 3.25 (m, 1H), 2.16 – 1.43 (m, 8H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.95 (tt, *J* = 10.2, 2.9 Hz, 3F), -106.80 (dt, *J* = 279.4, 22.4 Hz, 2F), -

117.38 – -128.15 (m, 4F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 162.3, 154.2, 132.9, 132.6, 129.6, 123.5, 113.5, 41.70 (dd, *J* = 20.5, 16.5 Hz), 39.2, 31.7, 29.1, 25.0, 24.9, 24.5, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2937, 1653, 1603, 1474, 1232, 1212, 1131, 752, 738, 721; HRMS (ESI): Calcd for $[C_{19}H_{17}F_9N_2O+Na]^+$: 483.1089, found: 483.1089.

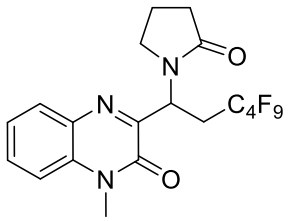


1-Methyl-3-(7,7,7,7,7,7,7,7,7-nonafluoro-2,3-dimethyl-7λ^{12}-hepta-4,6-diyn-2-yl)quinoxalin-2(1*H*)-one (**4x**): According to the General Procedure, **4x** (38.5 mg, 43%) was prepared as a white solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.50 – 7.40 (m, 1H), 7.31 – 7.18 (m, 2H), 4.37 – 4.12 (m, 1H), 3.60 (s, 3H), 1.49 (s, 3H), 1.41 (s, 3H), 1.12 (d, *J* = 7.1 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.97 (tt, *J* = 10.2, 3.0 Hz, 3F), -107.32 – -117.10 (m, 2F), -121.20 – -121.15 (m, 2F), -123.67 – -127.93 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 163.4, 153.8, 133.1, 132.1, 130.3, 129.7, 123.3, 113.3, 45.1, 38.22 (t, *J* = 18.75 Hz), 28.8, 24.7, 21.9, 9.4, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2987, 1652, 1604, 1232, 1217, 1166, 1131, 1081, 839, 752, 721; HRMS (ESI): Calcd for $[C_{18}H_{17}F_9N_2O+Na]^+$: 471.1089, found: 471.1093.

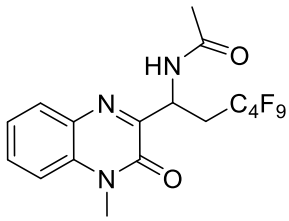


3-(1-Butoxy-6,6,6,6,6,6,6,6,6-nonafluoro-6λ^{12}-hexa-3,5-diyn-1-yl)-1-methylquinoxalin-2(1H)-one (**4y**): According to the General Procedure, **4y** (93.5 mg, 98%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.88 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.52 (ddd, *J* = 8.7, 7.4, 1.5 Hz, 1H), 7.25 – 7.33 (m, 2H), 5.28 (dd, *J* = 7.2, 4.9 Hz, 1H), 3.74 – 3.37 (m, 2H), 3.65 (s, 3H), 3.06 – 2.40 (m, 2H), 1.61 – 1.20 (m,

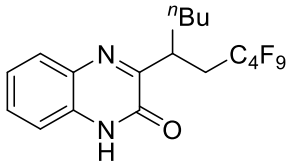
4H), 0.93 – 0.73 (m, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.09 (tt, *J* = 9.7, 3.2 Hz, 3F), -110.91 – -114.24 (m, 2F), -124.49 (dd, *J* = 17.7, 9.4 Hz, 2F), -125.91 – -125.84 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.5, 154.2, 133.4, 132.4, 130.9, 130.7, 123.8, 113.6, 71.2, 70.6, 34.08 (t, *J* = 21.0 Hz), 31.8, 29.0, 19.0, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2962, 1657, 1603, 1470, 1218, 1132, 1028, 882, 752; HRMS (ESI): Calcd for $[C_{19}H_{19}F_9N_2O_2+Na]^+$: 501.1195, found: 501.1186.



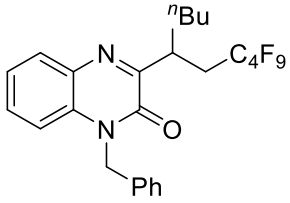
1-Methyl-3-(6,6,6,6,6,6,6,6,6-nonafluoro-1-(2-oxopyrrolidin-1-yl)-6λ^{12}-hexa-3,5-diyn-1-yl)quinoxalin-2(1*H*)-one (**4z**): According to the General Procedure, **4z** (94.9 mg, 98%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.90 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.67 – 7.55 (m, 1H), 7.44 – 7.31 (m, 2H), 5.86 (dd, *J* = 9.1, 4.3 Hz, 1H), 3.79 – 3.54 (m, 2H), 3.72 (s, 3H), 3.35 – 2.85 (m, 2H), 2.40 (t, *J* = 8.0 Hz, 2H), 2.08 (dd, *J* = 14.4, 7.1 Hz, 2H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.02 (tt, *J* = 9.7, 3.1 Hz, 3F), -112.87 – -115.47 (m, 2F), -124.00 – -124.64 (m, 2F), -125.53 – -126.06 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.0, 154.5, 153.6, 133.5, 131.9, 130.9, 130.5, 123.7, 113.6, 47.6, 46.0, 31.1, 29.3, 29.1, 18.6, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2970, 1685, 1649, 1603, 1420, 1216, 1131, 1092, 879, 758, 734; HRMS (ESI): Calcd for $[C_{19}H_{16}F_9N_3O_2+Na]^+$: 512.0991, found: 512.0987.



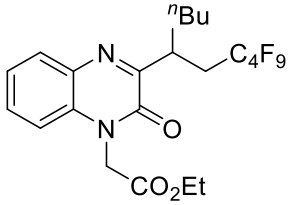
N-(6,6,6,6,6,6,6,6,6-nonafluoro-1-(4-methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)-6λ^{12}-hexa-3,5-diyn-1-yl)acetamide (**4aa**): According to the General Procedure, **4aa** (69.6 mg, 75%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.93 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.69 – 7.59 (m, 1H), 7.48 – 7.35 (m, 2H), 7.07 (d, *J* = 8.2 Hz, 1H), 5.86 (dt, *J* = 8.2, 5.7 Hz, 1H), 3.75 (s, 3H), 3.13 – 2.88 (m, 2H), 2.11 (s, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.08 (tt, *J* = 9.7, 2.9 Hz, 3F), -111.04 – -114.82 (m, 2F), -124.21 – -124.72 (m, 2F), -125.92 (t, *J* = 10.9 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 169.2, 155.1, 153.7, 133.2, 132.0, 131.0, 130.3, 124.1, 113.8, 47.1, 32.43 (t, *J* = 19.7 Hz), 29.0, 23.3, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 3277, 1658, 1604, 1474, 1232, 1220, 1133, 881, 755; HRMS (ESI): Calcd for $[C_{17}H_{14}F_9N_3O_2+Na]^+$: 486.0835, found: 486.0860.



3-(10,10,10,10,10,10,10,10,10-Nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4ab**): According to the General Procedure, **4ab** (47.9 mg, 53%) was prepared as a white solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 12.53 (s, 1H), 7.82 – 7.72 (m, 1H), 7.51 – 7.39 (m, 1H), 7.25 – 7.30 (m, 2H), 4.08 – 3.88 (m, 1H), 3.29 – 2.95 (m, 1H), 2.31 (dt, *J* = 26.7, 14.5 Hz, 1H), 1.90 – 1.59 (m, 2H), 1.18 – 1.36 (m, 4H), 0.80 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.07 (tt, *J* = 9.7, 3.1 Hz, 3F), -112.75 (dt, *J* = 25.4, 11.7 Hz, 2F), -124.27 – -124.72 (m, 2F), -125.84 – -125.93 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.6, 156.3, 132.7, 130.8, 130.1, 128.9, 124.2, 115.6, 34.2, 33.7, 32.94 (d, *J* = 21.7 Hz), 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2961, 1662, 1611, 1218, 1132, 1095, 877, 754, 721; HRMS (ESI): Calcd for $[C_{18}H_{17}F_9N_2O+Na]^+$: 471.1089, found: 471.1094.

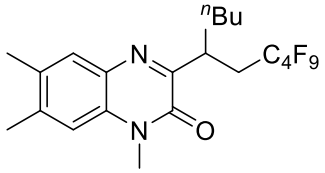


1-Benzyl-3-(10,10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4ac**): According to the General Procedure, **4ac** (101.1 mg, 94%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.36 – 7.26 (m, 1H), 7.26 – 7.07 (m, 7H), 5.51 – 5.35 (m, 2H), 4.05 – 3.86 (m, 1H), 3.26 – 2.95 (m, 1H), 2.46 – 2.15 (m, 1H), 1.94 – 1.55 (m, 2H), 1.44 – 1.08 (m, 4H), 0.79 (t, *J* = 7.0 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.05 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.45 – -113.93 (m, 2F), -124.27 – -124.74 (m, 2F), -125.91 – -125.83 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.3, 154.5, 135.2, 132.7, 132.3, 130.0, 129.9, 128.9, 127.6, 126.7, 123.6, 114.4, 45.8, 34.7, 34.2, 32.86 (t, *J* = 21.0 Hz), 29.2, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2933, 1653, 1604, 1217, 1132, 1096, 878, 751, 695; HRMS (ESI): Calcd for $[C_{25}H_{23}F_9N_2O+Na]^+$: 561.1559, found: 561.1551.

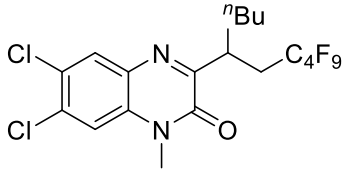


Ethyl 2-(3-(10,10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)-2-oxoquinoxalin-1(2*H*)-yl)acetate (**4ad**): According to the General Procedure, **4ad** (98.0 mg, 92%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.78 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.43 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.31 – 7.22 (m, 1H), 7.00 (dd, *J* = 8.4, 0.8 Hz, 1H), 5.02 (d, *J* = 17.2 Hz, 1H), 4.89 (d, *J* = 17.2 Hz, 1H), 4.14 (q, *J* = 7.1 Hz, 2H), 3.83 – 3.92 (m, 1H), 3.26 – 2.86 (m, 1H), 2.43 – 2.13 (m, 1H), 1.58 – 1.82 (m, 2H), 1.28 – 1.08 (m, 7H), 0.79 (t, *J* = 9.1, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.11 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.48 – -114.06 (m, 2F), -124.35 – -124.74 (m, 2F), -125.95 – -125.88 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 166.9, 161.0, 154.0, 132.5, 132.1,

130.2, 130.1, 123.8, 113.0, 62.0, 43.6, 34.5, 34.1, 32.6, 29.0, 22.5, 13.9, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): $\tilde{\nu}$ = 2934, 1751, 1658, 1605, 1214, 1178, 1133, 1099, 1022, 878, 753, 721; HRMS (ESI): Calcd for $[C_{22}H_{23}F_9N_2O_3+Na]^+$: 557.1457, found: 557.1458.

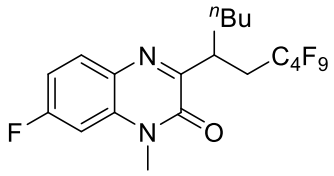


1,6,7-Trimethyl-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4ae**): According to the General Procedure, **4ae** (94.2 mg, 96%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.51 (s, 1H), 6.99 (s, 1H), 3.82 – 3.90 (m, 1H), 3.60 (s, 3H), 3.19 – 2.91 (m, 1H), 2.35 (s, 3H), 2.29 – 2.08 (m, 1H), 2.26 (s, 3H), 1.87 – 1.49 (m, 2H), 1.33 – 1.11 (m, 4H), 0.78 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.11 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.55 – -114.41 (m, 2F), -124.47 (dd, *J* = 18.4, 9.2 Hz, 2F), -125.77 – -126.09 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.8, 154.4, 139.7, 132.4, 131.0, 130.9, 130.0, 114.1, 34.4, 34.1, 32.65 (t, *J* = 21.0 Hz), 29.07, 29.04, 22.5, 20.4, 19.0, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): $\tilde{\nu}$ = 2932, 1652, 1622, 1470, 1217, 1182, 1132, 1078, 1006, 880, 845, 734, 721; HRMS (ESI): Calcd for $[C_{21}H_{23}F_9N_2O+Na]^+$: 513.1559, found: 513.1566.

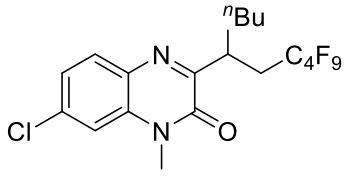


6,7-Dichloro-1-methyl-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4af**): According to the General Procedure, **4af** (90.0 mg, 85%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.83 (s, 1H), 7.31 (s, 1H), 3.92 – 3.79 (m, 1H), 3.59 (s, 3H), 3.13 – 2.88 (m, 1H), 2.16 – 12.34 (m, 1H), 1.84 – 1.48 (m, 2H), 1.34 – 1.15 (m, 4H), 0.79 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282

MHz, $CDCl_3$) δ -81.10 (tt, *J* = 9.7, 3.2 Hz, 3F), -112.56 – -112.99 (m, 2F), -124.33 – -124.76 (m, 2F), -125.91 (t, *J* = 12.8 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 162.8, 153.8, 134.1, 132.4, 131.4, 130.6, 127.4, 115.1, 34.5, 34.0, 32.57 (t, *J* = 21.0 Hz), 29.4, 29.0, 22.5, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2933, 1662, 1599, 1465, 1217, 1181, 1132, 1094, 1019, 879, 845, 719; HRMS (ESI): Calcd for $[C_{19}H_{17}Cl_2F_9N_2O+Na]^+$: 553.0466, found: 553.0471.

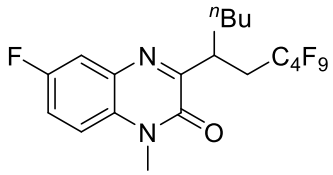


7-Fluoro-1-methyl-3-(10,10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4ag**): According to the General Procedure, **4ag** (75.0 mg, 78%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.83 (dd, *J* = 8.8, 6.0 Hz, 1H), 7.13 – 6.98 (m, 2H), 3.91 – 4.00 (m, 1H), 3.70 (s, 3H), 3.04 – 3.25 (m, 1H), 2.35 (dt, *J* = 15.1, 13.9 Hz, 1H), 1.98 – 1.58 (m, 2H), 1.44 – 1.23 (m, 4H), 0.89 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.13 (tt, *J* = 9.7, 3.1 Hz, 3F), -107.74 (s, 1F), -111.57 – -114.28 (m, 2F), -124.32 – -124.85 (m, 2F), -125.96 (t, *J* = 11.1 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 163.2 (d, *J* = 250.4 Hz), 159.9 (d, *J* = 3.5 Hz), 154.2, 134.46 (d, *J* = 11.6 Hz), 131.76 (d, *J* = 10.4 Hz), 129.20 (d, *J* = 2.2 Hz), 111.3 (d, *J* = 23.4 Hz), 100.5 (d, *J* = 27.8 Hz), 34.4, 34.0, 32.52 (t, *J* = 20.9 Hz), 29.3, 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2935, 1657, 1502, 1215, 1163, 1131, 1082, 877, 720; HRMS (ESI): Calcd for $[C_{19}H_{18}F_{10}N_2O+Na]^+$: 503.1152, found: 503.1157.

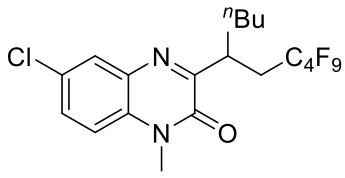


7-Chloro-1-methyl-3-(10,10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4ah**): According to the General Procedure, **4ah** (85.6 mg,

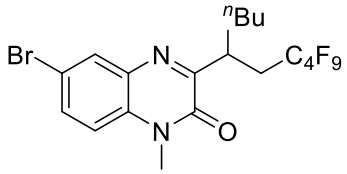
86%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.85 – 7.71 (m, 1H), 7.29 – 7.34 (m, 2H), 3.92 – 4.01 (m, 1H), 3.71 (s, 3H), 3.04 – 3.25 (m, 1H), 2.26 – 2.45 (m, 1H), 1.95 – 1.58 (m, 2H), 1.45 – 1.24 (m, 4H), 0.90 (t, *J* = 9.1, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.09 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.59 – -114.11 (m, 2F), -124.20 – -124.79 (m, 2F), -125.73 – -126.19 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.3, 154.1, 135.9, 133.9, 130.9, 123.9, 113.6, 34.5, 34.0, 32.56 (t, *J* = 21.0 Hz), 29.3, 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2936, 1659, 1601, 1217, 1184, 1132, 1084, 877, 733, 720; HRMS (ESI): Calcd for $[C_{19}H_{18}ClF_9N_2O+Na]^+$: 519.0856, found: 519.0856.



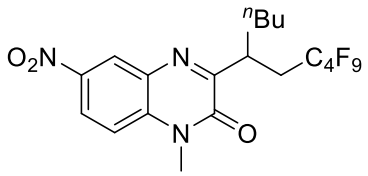
6-Fluoro-1-methyl-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4ai**): According to the General Procedure, **4ai** (68.0 mg, 71%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.60 – 7.51 (m, 1H), 7.34 – 7.27 (m, 2H), 4.06 – 3.92 (m, 1H), 3.74 (s, 3H), 3.30 – 2.97 (m, 1H), 2.51 – 2.22 (m, 1H), 1.97 – 1.60 (m, 2H), 1.42 – 1.16 (m, 4H), 0.90 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.11 (tt, *J* = 9.7, 3.2 Hz, 3F), -112.76 (dt, *J* = 46.0, 12.7 Hz, 2F), -119.18 (s, 1F), -124.33 – -124.64 (m, 2F), -125.76 – -126.07 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 162.8, 158.6 (d, *J* = 242.3 Hz), 154.0, 133.0 (d, *J* = 11.2 Hz), 129.7, 117.6 (d, *J* = 24.0 Hz), 115.3 (d, *J* = 22.5 Hz), 114.6 (d, *J* = 8.7 Hz), 34.6, 34.0, 32.5 (t, *J* = 21.0 Hz), 29.4, 29.0, 22.5, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2937, 1654, 1502, 1217, 1162, 1130, 1089, 877, 810, 720; HRMS (ESI): Calcd for $[C_{19}H_{18}F_{10}N_2O+Na]^+$: 503.1152, found: 503.1160.



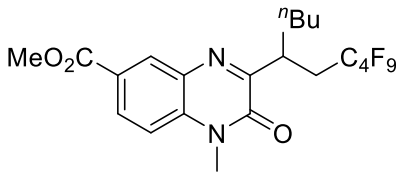
6-Chloro-1-methyl-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4aj**): According to the General Procedure, **4aj** (78.9 mg, 80%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, *J* = 2.4 Hz, 1H), 7.42 (dd, *J* = 8.9, 2.4 Hz, 1H), 7.15 – 7.19 (m, 1H), 3.95 – 3.83 (m, 1H), 3.62 (s, 3H), 2.94 – 3.15 (m, 1H), 2.38 – 2.10 (m, 1H), 1.86 – 1.53 (m, 2H), 1.33 – 1.16 (m, 4H), 0.79 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.08 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.56 – -114.16 (m, 2F), -124.27 – -124.66 (m, 2F), -125.90 (dd, *J* = 12.6, 9.8 Hz, 2F);^{13}C NMR (75 MHz, $CDCl_3$) δ 162.7, 154.0, 132.9, 131.7, 129.9, 129.2, 128.9, 114.7, 34.5, 34.0, 32.5, 29.3, 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2934, 1657, 1491, 1216, 1182, 1132, 1096, 879, 808, 719; HRMS (ESI): Calcd for $[C_{19}H_{18}ClF_9N_2O+Na]^+$: 519.0856, found: 519.0857.



6-Bromo-1-methyl-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4ak**): According to the General Procedure, **4ak** (70 mg, 65%) was prepared as a white solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.91 (d, *J* = 2.6 Hz, 1H), 7.55 (dd, *J* = 8.9, 2.3 Hz, 1H), 7.10 (d, *J* = 8.9 Hz, 1H), 3.94 – 3.80 (m, 1H), 3.62 (s, 3H), 2.93 – 3.14 (m, 1H), 2.40 – 2.11 (m, 1H), 1.85 – 1.54 (m, 2H), 1.31 – 1.15 (m, 4H), 0.79 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.08 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.56 – -114.18 (m, 2F), -124.30 – -124.65 (m, 2F), -125.92 (dd, *J* = 17.6, 7.7 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 162.6, 154.0, 133.2, 132.7, 132.3, 132.1, 116.1, 115.0, 34.5, 34.1, 32.56 (t, *J* = 21.0 Hz), 29.3, 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2936, 1657, 1487, 1217, 1133, 1093, 879, 806, 718; HRMS (ESI): Calcd for $[C_{19}H_{18}BrF_9N_2O+Na]^+$: 563.0351, found: 563.0357.

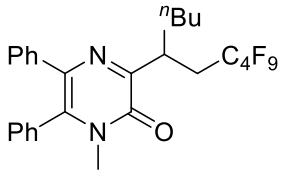


1-Methyl-6-nitro-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxalin-2(1*H*)-one (**4al**): According to the General Procedure, **4al** (41.6 mg, 41%) was prepared as a yellow solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.64 (d, *J* = 2.6 Hz, 1H), 8.32 (dd, *J* = 9.2, 2.6 Hz, 1H), 7.34 (d, *J* = 9.2 Hz, 1H), 3.98 – 3.84 (m, 1H), 3.70 (s, 3H), 3.20 – 2.92 (m, 1H), 2.40 – 2.12 (m, 1H), 1.88 – 1.54 (m, 2H), 1.35 – 1.15 (m, 4H), 0.80 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.06 (tt, *J* = 9.7, 3.1 Hz, 3F), -112.69 (d, *J* = 6.6 Hz, 2F), -124.48 – -124.38 (m, 2F), -125.68 – -126.17 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 164.1, 153.9, 143.4, 137.6, 131.5, 125.5, 124.5, 114.2, 34.5, 34.1, 32.60 (t, *J* = 20.5 Hz), 29.8, 29.0, 22.4, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): $\tilde{\nu}$ = 2961, 1667, 1614, 1341, 1218, 1132, 1077, 820, 727; HRMS (ESI): Calcd for $[C_{19}H_{18}F_9N_3O_3+Na]^+$: 530.1097, found: 530.1091.

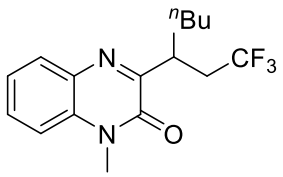


Methyl 1-methyl-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)-2-oxo-1,2-dihydroquinoxaline-6-carboxylate (**4am**): According to the General Procedure, **4am** (74.0 mg, 71%) was prepared as a white solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.43 (d, *J* = 2.0 Hz, 1H), 8.12 (dd, *J* = 8.8, 2.0 Hz, 1H), 7.27 (d, *J* = 8.8 Hz, 1H), 3.96 – 3.84 (m, 1H), 3.89 (s, 3H), 3.66 (s, 3H), 3.22 – 2.88 (m, 1H), 2.42 – 2.08 (m, 1H), 1.87 – 1.51 (m, 2H), 1.17 – 1.26 (m, 4H), 0.79 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.09 (tt, *J* = 9.7, 3.2 Hz, 3F), -111.58 – -114.19 (m, 2F), -124.32 – -124.68 (m, 2F), -125.92 (t, *J* = 11.3 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 166.0, 162.2, 154.3, 136.3, 131.7, 131.6, 130.7, 125.5, 113.6, 52.2, 34.4, 34.1, 32.56 (t, *J* = 21.0 Hz), 29.4, 29.0, 22.5, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned;

FTIR (neat): ṽ = 2959, 1723, 1662, 1611, 1437, 1286, 1215, 1132, 1105, 878, 766, 734; HRMS (ESI): Calcd for $[C_{21}H_{21}F_9N_2O_3+Na]^+$: 543.1301, found: 543.1310.

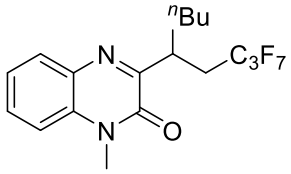


1-Methyl-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)-5,6-diphenylpyrazin-2(1*H*)-one (**4an**): According to the General Procedure, **4an** (101.6 mg, 90%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.52 – 7.31 (m, 4H), 7.16 – 7.20 (m, 6H), 3.91 – 3.99 (m, 1H), 3.37 (s, 3H), 3.10 – 3.32 (m, 1H), 2.53 – 2.22 (m, 1H), 2.01 – 1.61 (m, 2H), 1.51 – 1.29 (m, 4H), 0.94 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.03 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.43 – -114.47 (m, 2F), -124.43 (dd, *J* = 17.7, 8.7 Hz, 2F), -125.68 – -126.11 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 157.7, 155.1, 137.8, 136.7, 132.6, 131.9, 130.1, 129.4, 129.2, 128.9, 127.6, 126.8, 34.3, 34.0, 33.9, 32.14 (t, *J* = 21.0 Hz), 29.2, 22.6, 13.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2959, 1647, 1586, 1417, 1216, 1131, 877, 703; HRMS (ESI): Calcd for $[C_{27}H_{25}F_9N_2O+Na]^+$: 587.1715, found: 587.1741.

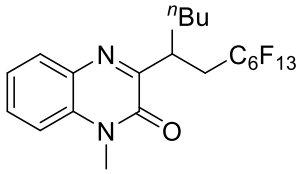


1-Methyl-3-(1,1,1-trifluoroheptan-3-yl)quinoxalin-2(1*H*)-one (**4ao**): According to the General Procedure, **4ao** (52.0mg, 83%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.51 – 7.42 (m, 1H), 7.22 – 7.29 (m, 2H), 3.82 – 3.69 (m, 1H), 3.63 (s, 3H), 2.90 – 3.03 (m, 1H), 2.24 – 2.42 (m, 1H), 1.84 – 1.55 (m, 2H), 1.32 – 1.13 (m, 4H), 0.78 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -64.39 (s); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.9, 154.4, 133.0, 132.5, 129.99, 129.96, 126.9 (q, *J* = 277.5), 123.5, 113.5, 36.0, 35.8 (q, *J* = 27.7 Hz), 33.5, 29.1, 29.0,

22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): $\tilde{\nu}$ = 2959, 2933, 1653, 1603, 1474, 1258, 1149, 1118, 1086, 754; HRMS (ESI): Calcd for $[C_{16}H_{19}F_3N_2O+Na]^+$: 335.1342, found: 335.1354.

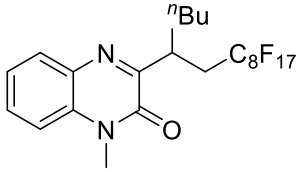


3-(1,1,1,1,1,1,1-Heptafluoro-1λ^8-non-2-yn-5-yl)-1-methylquinoxalin-2(1*H*)-one (**4ap**): According to the General Procedure, **4ap** (79.1 mg, 96%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.87 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.62 – 7.51 (m, 1H), 7.32 – 7.40 (m, 2H), 3.95 – 4.04 (m, 1H), 3.75 (s, 3H), 3.33 – 3.02 (m, 1H), 2.51 – 2.22 (m, 1H), 2.00 – 1.64 (m, 2H), 1.45 – 1.27 (m, 4H), 0.90 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.47 (t, *J* = 9.7 Hz, 3F), -112.28 – -114.85 (m, 2F), -127.81 (s, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.1, 154.4, 133.0, 132.4, 129.98, 129.92, 123.5, 113.5, 34.5, 34.0, 32.4 (*t*, J = 21.0 Hz), 29.1, 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): $\tilde{\nu}$ = 2936, 1653, 1603, 1474, 1352, 1218, 1170, 1110, 1086, 752, 729; HRMS (ESI): Calcd for $[C_{18}H_{19}F_7N_2O+Na]^+$: 453.1278, found: 453.1268.

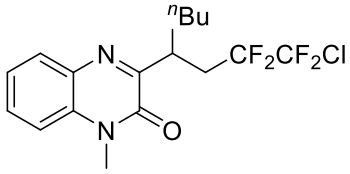


1-Methyl-3-(12,12,12,12,12,12,12,12,12,12,12,12,12-tridecafluoro-12λ^{16}-dodeca-7,9,11-triyn-5-yl)quinoxalin-2(1*H*)-one (**4aq**): According to the General Procedure, **4aq** (102 mg, 95%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.75 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.51 – 7.40 (m, 1H), 7.21 – 7.28 (m, 2H), 3.85 – 3.93 (m, 1H), 3.63 (s, 3H), 3.22 – 2.93 (m, 1H), 2.22 – 2.31 (m, 1H), 1.87 – 1.51 (m, 2H), 1.30 – 1.13 (m, 4H), 0.78 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.92 (tt, *J* = 10.0, 2.5 Hz, 3F), -111.34 – -113.94 (m, 2F), -121.81 (s, 2F), -122.88 (s, 2F), -123.29 – -

124.00 (m, 2F), -125.99 – -126.37 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.1, 154.4, 133.0, 132.5, 129.94, 129.91, 123.5, 113.5, 34.5, 34.1, 32.69 (t, *J* = 21.0 Hz), 29.1, 29.0, 22.5, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2960, 1655, 1604, 1234, 1189, 1143, 1120, 1087, 752, 731, 707; HRMS (ESI): Calcd for $[C_{21}H_{19}F_{13}N_2O+Na]^+$: 585.1182, found: 585.1193.

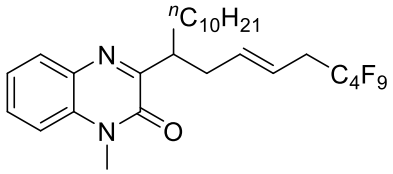


3-(14,14,14,14,14,14,14,14,14,14,14,14,14,14,14,14,14-Heptadecafluoro-14λ^{20}-tetradeca-7,9,11,13-tetrayn-5-yl)-1-methylquinoxalin-2(1*H*)-one (**4ar**): According to the General Procedure, **4ar** (112.5 mg, 85%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.50 – 7.42 (m, 1H), 7.30 – 7.20 (m, 2H), 3.85 – 3.92 (m, 1H), 3.64 (s, 3H), 3.05 – 3.10 (m, 1H), 2.43 – 2.12 (m, 1H), 1.87 – 1.51 (m, 2H), 1.34 – 1.13 (m, 4H), 0.79 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.77 – -80.97 (m, 3F), -111.07 – -113.85 (m, 2F), -121.75 (d, *J* = 88.3 Hz, 6F), -122.72 (s, 2F), -123.53 (s, 2F), -126.14 (t, *J* = 12.8 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.1, 154.4, 133.0, 132.5, 129.95, 129.92, 123.5, 113.5, 34.5, 34.1, 32.71 (t, J = 21.0 Hz), 29.1, 29.0, 22.5, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2936, 1655, 1604, 1474, 1237, 1200, 1145, 1088, 752, 734, 656; HRMS (ESI): Calcd for $[C_{23}H_{19}F_{17}N_2O+Na]^+$: 685.1118, found: 685.1129.

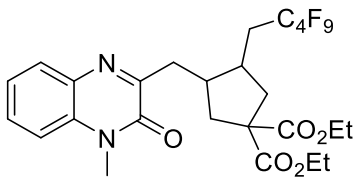


3-(1-Chloro-1,1,2,2-tetrafluorooctan-4-yl)-1-methylquinoxalin-2(1*H*)-one (**4as**): According to the General Procedure, **4as** (54.0 mg, 71%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.87 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.57 (ddd, *J* = 8.6, 7.4, 1.5 Hz, 1H), 7.42 – 7.30 (m, 2H), 3.94 – 4.03 (m, 1H), 3.75 (s, 3H), 3.30 – 3.02 (m,

1H), 2.52 – 2.26 (m, 1H), 1.98 – 1.60 (m, 2H), 1.46 – 1.22 (m, 4H), 0.89 (t, *J* = 6.9 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -71.21 – -71.18 (m, 2F), -111.16 – -113.42 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.2, 154.4, 133.0, 132.5, 129.95, 129.92, 123.5, 113.5, 35.0, 34.0, 32.54 (t, *J* = 21.0 Hz), 29.1, 29.0, 22.5, 13.8, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2960, 1655, 1603, 1474, 1150, 1084, 936, 753; HRMS (ESI): Calcd for $[C_{17}H_{19}ClF_4N_2O+Na]^+$: 401.1014, found: 401.1022.

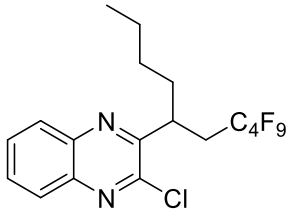


(*E*)-1-Methyl-3-(1,1,1,1,1,1,1,1,1-nonafluoro-1λ^{12}-nonadeca-6-en-1,3-diyn-9-yl)quinoxalin-2(1*H*)-one (**6**): According to the General Procedure, **6** (16.4 mg, 14%) was prepared as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.79 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.49 – 7.42 (m, 1H), 7.31 – 7.19 (m, 2H), 5.64 (dt, *J* = 14.6, 7.1 Hz, 1H), 5.36 – 5.19 (m, 1H), 3.61 (s, 3H), 3.48 – 3.58 (m, 1H), 2.36 – 2.69 (m, 3H), 1.88 – 1.49 (m, 3H), 1.15 -1.19 (m, 16H), 0.79 (t, *J* = 6.7 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.09 (tt, *J* = 9.5, 3.3 Hz, 3F), -113.66 – -113.48 (m, 2F), -123.85 – -124.35 (m, 2F), -126.18 – -126.04 (m, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 163.0, 154.8, 136.9, 132.8. 132.6, 129.7, 129.6, 123.4, 117.9, 113.4, 41.2, 36.3, 34.68 (t, *J* = 21.7 Hz), 32.8, 31.8, 29.7, 29.5, 29.4, 29.3, 29.0, 27.3, 22.6, 14.0, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2929, 2857, 1657, 1603, 1474, 1234, 1134, 752; HRMS (ESI): Calcd for $[C_{28}H_{35}F_9N_2O+Na]^+$: 609.2458, found: 609.2501.

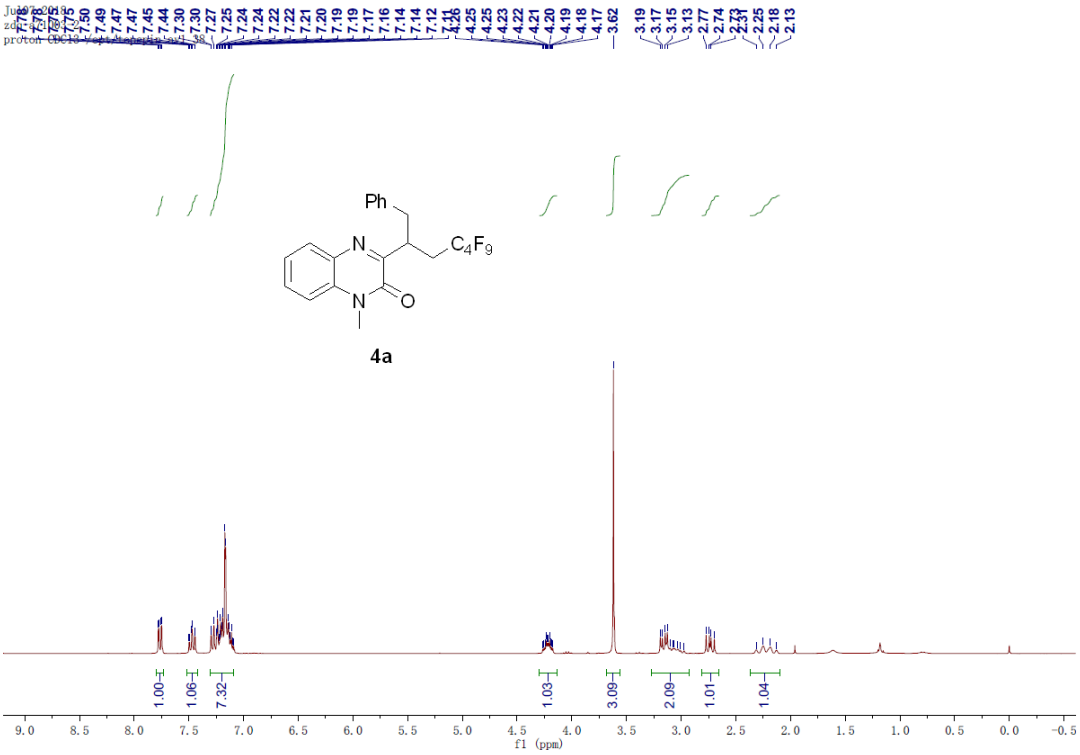


Diethyl 3-((4-methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)methyl)-4-(5,5,5,5,5,5,5,5,5-nonafluoro-5λ^{12}-penta-2,4-diyn-1-yl)cyclopentane-1,1-dicarboxylate (**8**): According to the General Procedure, **8** (24.5 mg, 20%, dr = 22:1) was prepared as a colorless oil. ^{1}H

NMR (300 MHz, $CDCl_3$) δ 7.83 (dd, *J* = 7.9, 1.3 Hz, 1H), 7.56 (ddd, *J* = 8.7, 7.4, 1.5 Hz, 1H), 7.40 – 7.30 (m, 2H), 4.31 – 4.12 (m, 4H), 3.72 (s, 3H), 3.06 – 2.79 (m, 3H), 2.69 – 2.05 (m, 7H), 1.27 (td, *J* = 6.9, 1.8 Hz, 6H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.05 (tt, *J* = 9.6, 3.2 Hz, 3F), -111.62 – -115.01 (m, 2F), -124.35 (d, *J* = 9.1 Hz, 2F), -125.85 (dd, *J* = 13.9, 8.6 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 172.4, 172.3, 170.4, 158.8, 154.8, 133.0, 132.6, 129.8, 123.6, 113.5, 61.62, 61.55, 58.7, 39.6, 39.0, 38.6, 34.7, 33.4, 29.0, 13.9, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 1644, 1601, 1474, 1318, 1159, 1069, 755, 731; HRMS (ESI): Calcd for $[C_{26}H_{27}F_9N_2O_5+Na]^+$: 641.1668, found: 641.1683.



2-Chloro-3-(10,10,10,10,10,10,10,10,10-nonafluoro-10λ^{12}-deca-7,9-diyn-5-yl)quinoxaline (**9**): 9 was prepared with the reaction of **4ab** (448.0 mg, 1mmol), $POCl_3$ (0.11 mL, 1.2 mmol), and pyridine (0.08 mL, 1.0 mL, 1.0 mmol) under 160 ^oC for 2 hours. ^1H NMR (300 MHz, $CDCl_3$) δ 8.13 – 8.01 (m, 2H), 7.76 – 7.80 (M, 2H), 4.17 – 4.04 (m, 1H), 3.17 – 3.38 (m, 1H), 2.60 – 2.35 (m, 1H), 2.00 – 1.71 (m, 2H), 1.49 – 1.15 (m, 4H), 0.89 (t, *J* = 7.1 Hz, 3H); ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.19 (tt, *J* = 9.7, 3.1 Hz, 3F), -111.37 – -114.39 (m, 2F), -124.57 (dd, *J* = 17.7, 9.3 Hz, 2F), -126.02 (t, *J* = 10.4 Hz, 2F); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.4, 147.2, 140.9, 140.8, 130.4, 130.1, 128.7, 128.1, 35.7, 35.5, 33.98 (t, *J* = 21.0 Hz), 28.8, 22.4, 13.7, ^{13}C-NMR for $CF_2CF_2CF_2CF_3$ could not be assigned; FTIR (neat): ṽ = 2935, 1353, 1217, 1185, 1129, 1035, 878, 760, 719, 596; HRMS (ESI): Calcd for $[C_{18}H_{16}ClF_9N_2+Na]^+$: 489.0751, found: 489.0759.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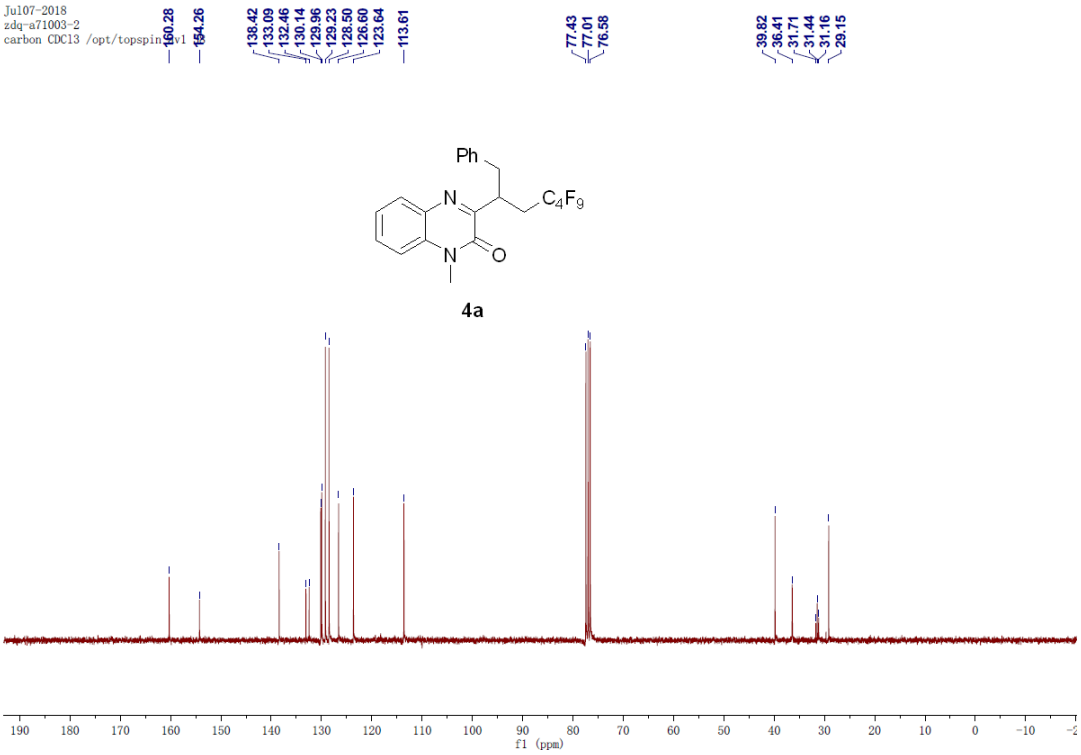
f1 (ppm)

4a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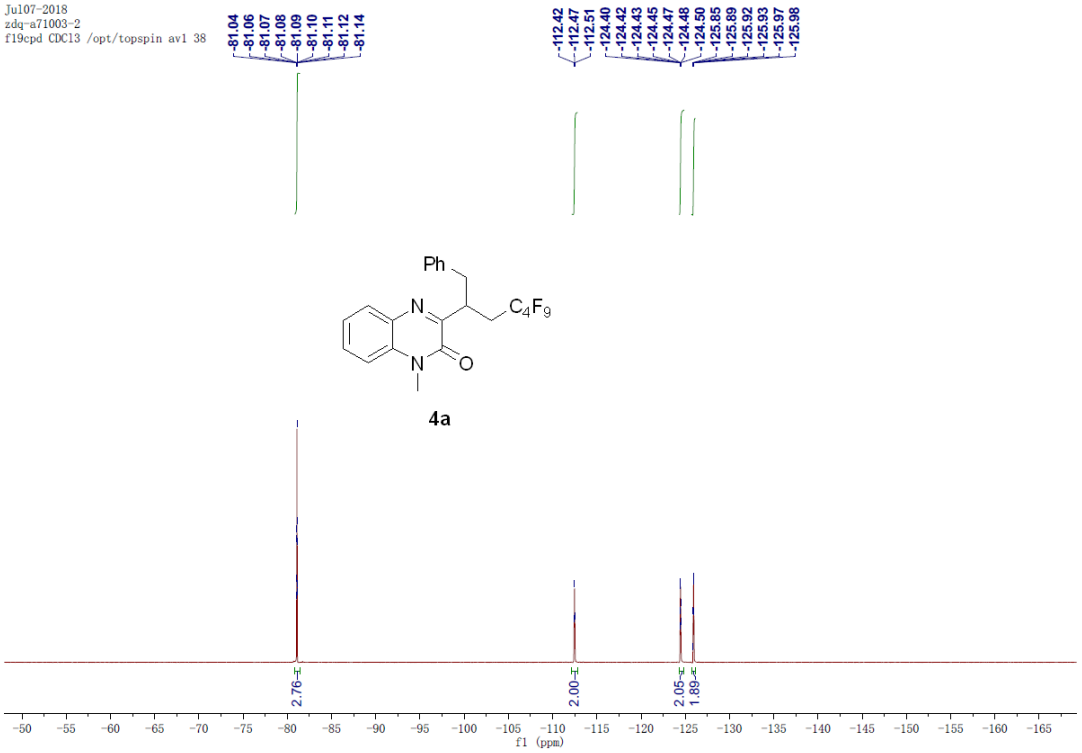
O
f1 (ppm)

4a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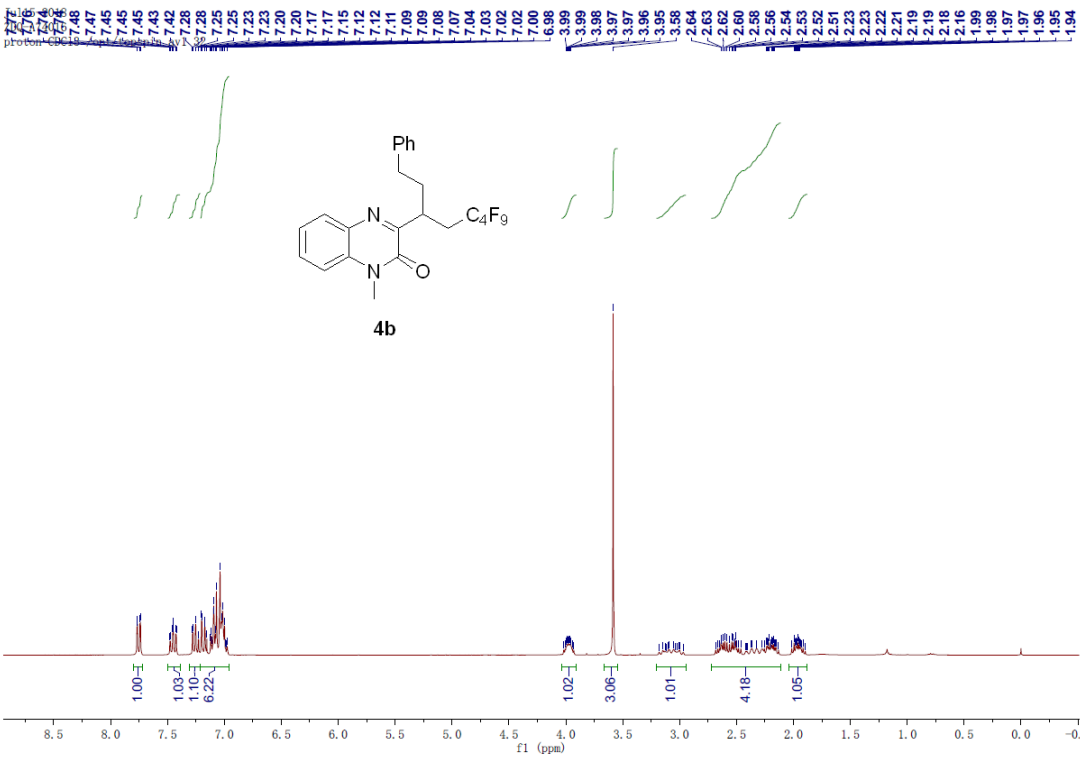
4a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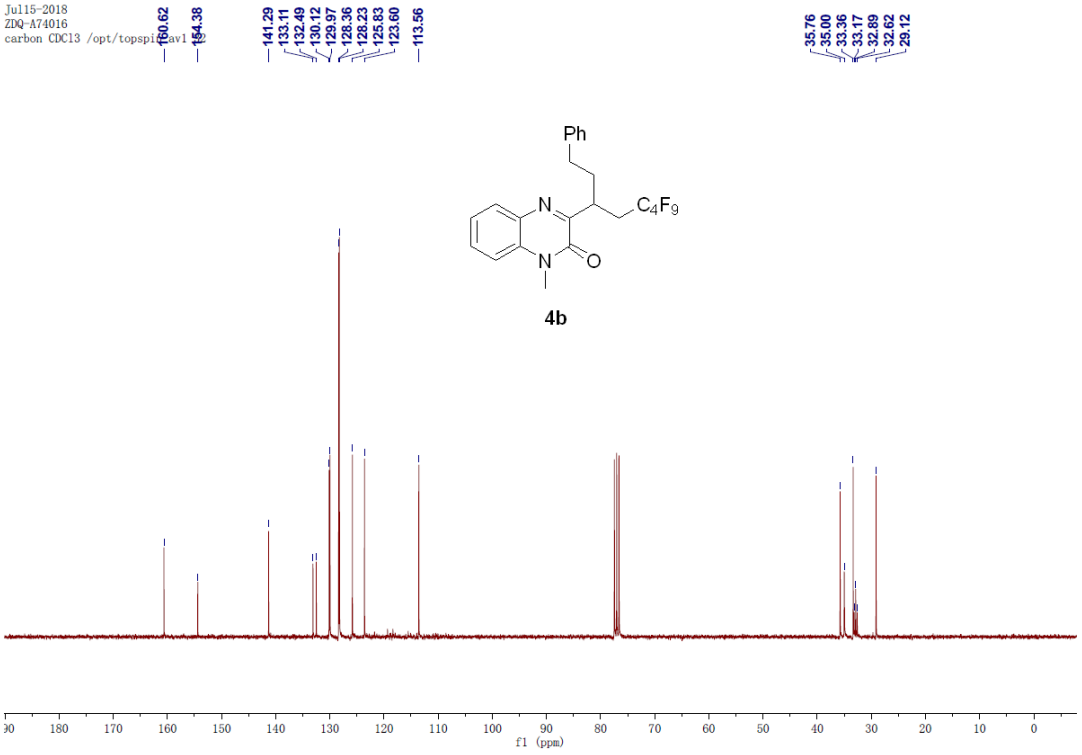
f1 (ppm)

4b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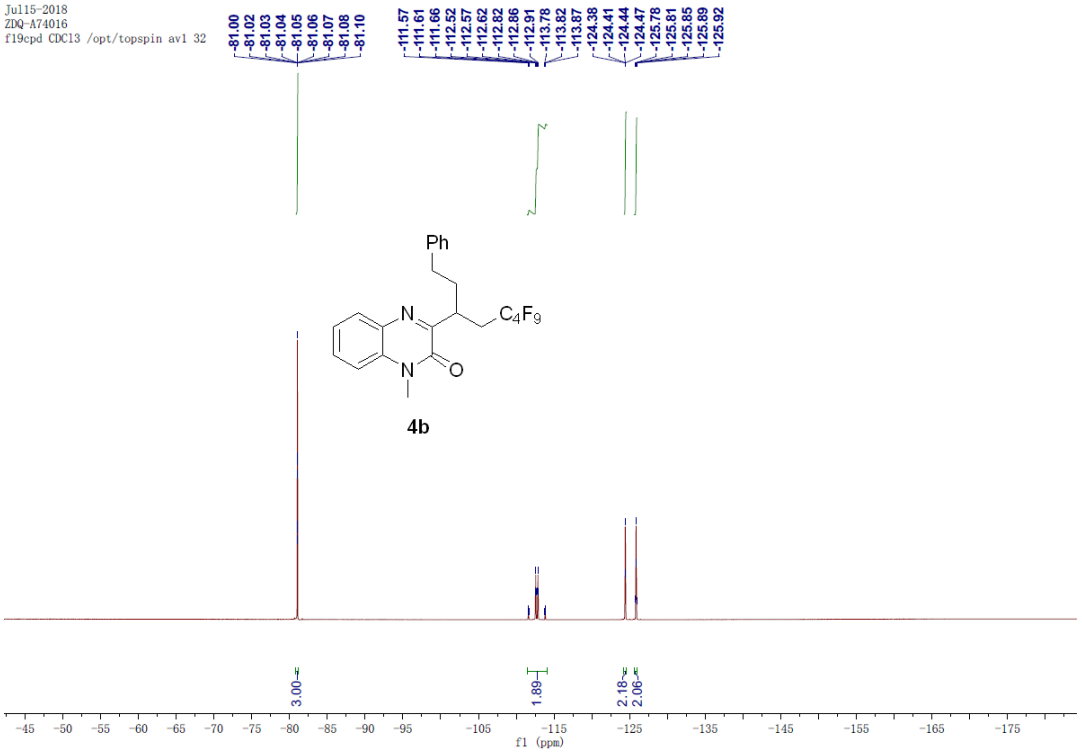
f1 (ppm)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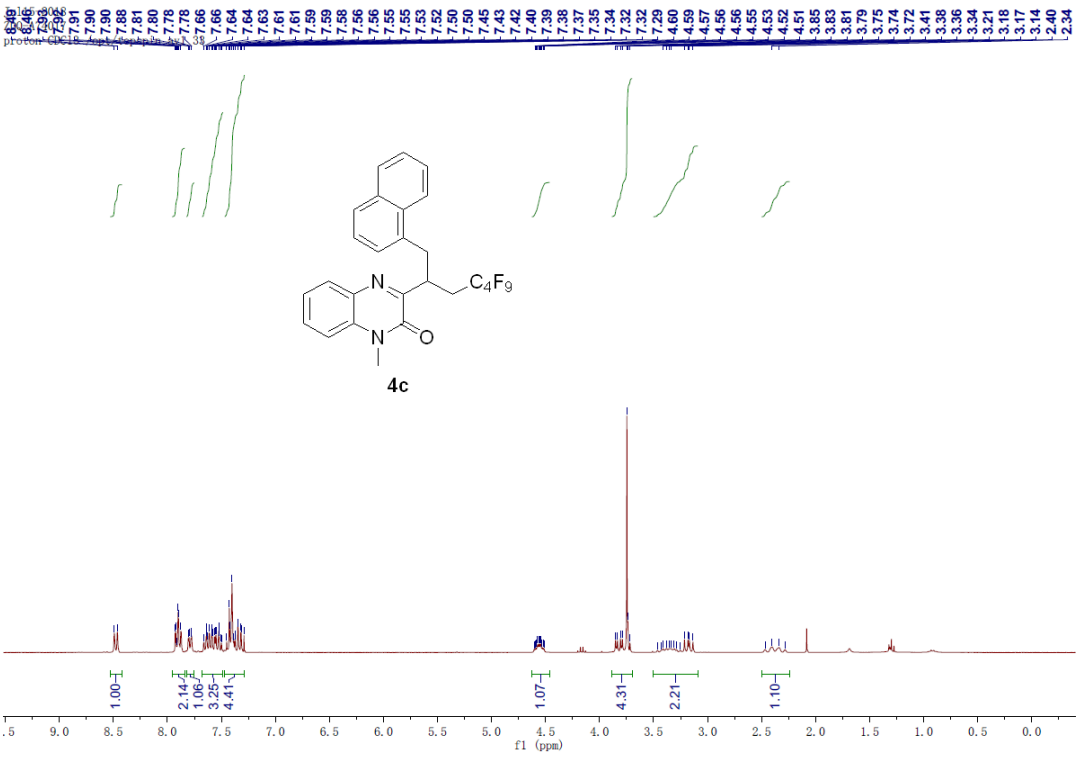
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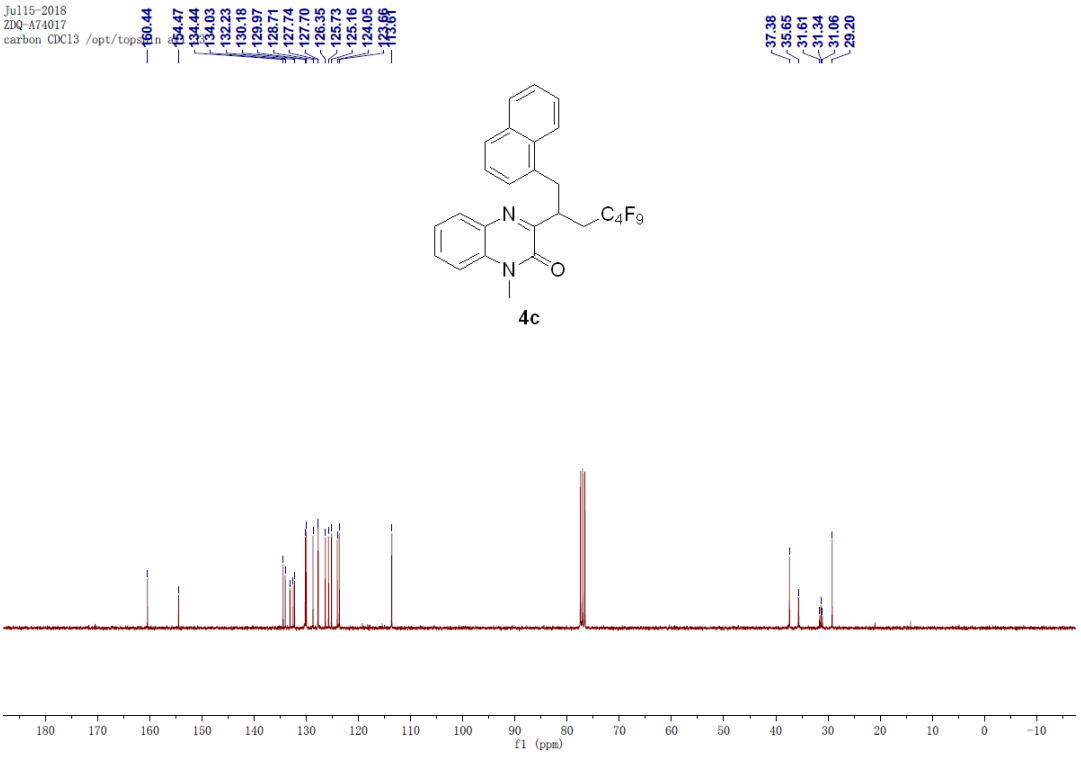
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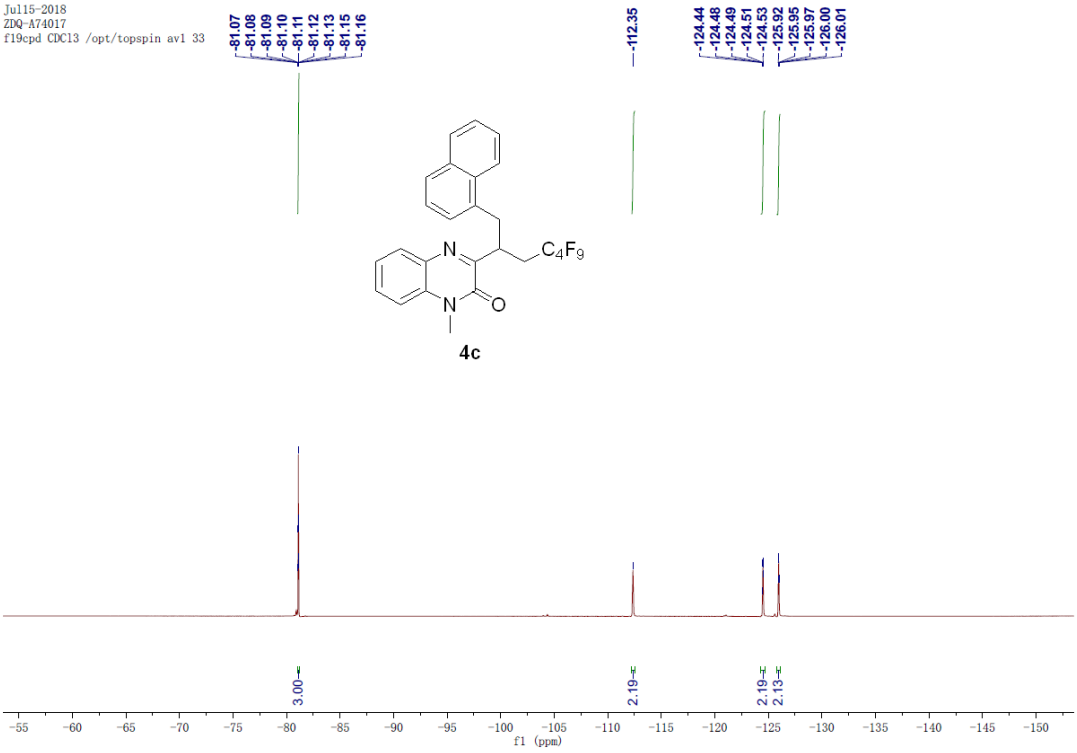
f1 (ppm)


Jul15-2018
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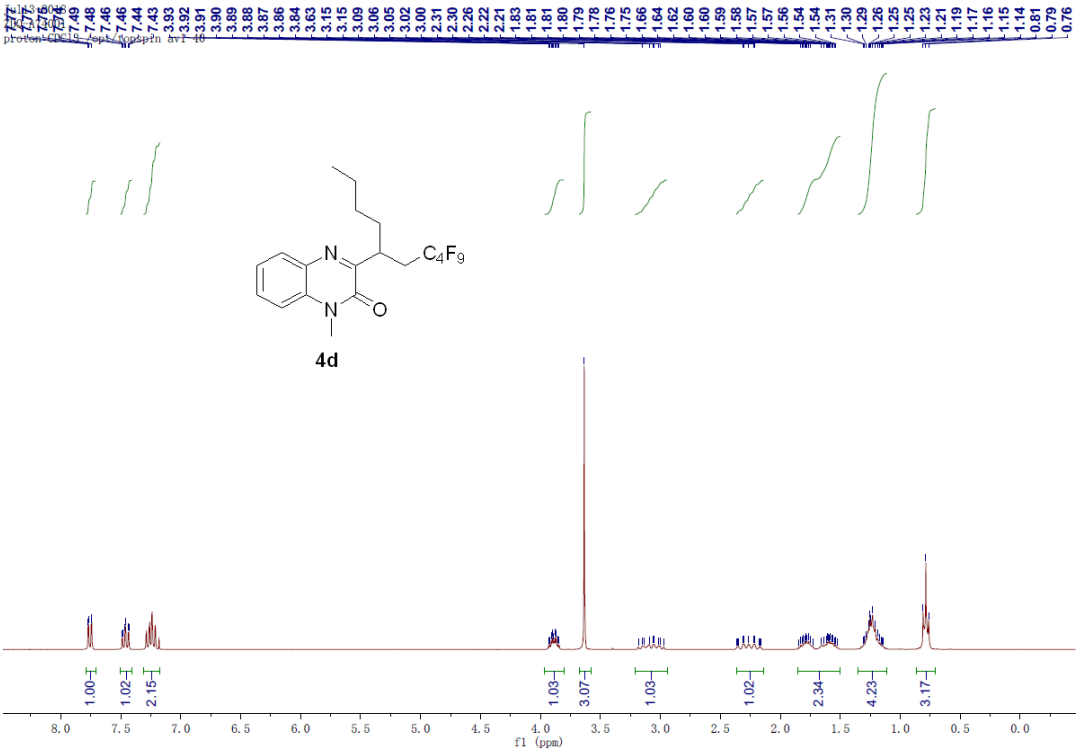
4c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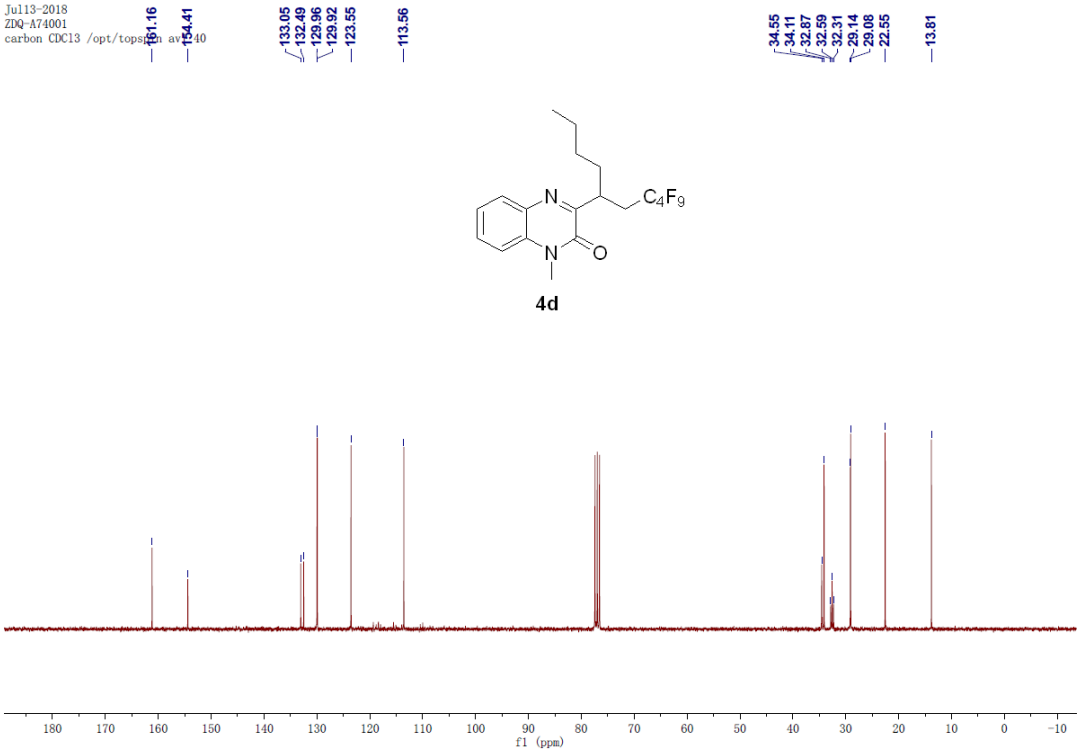
4d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4d
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70
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30
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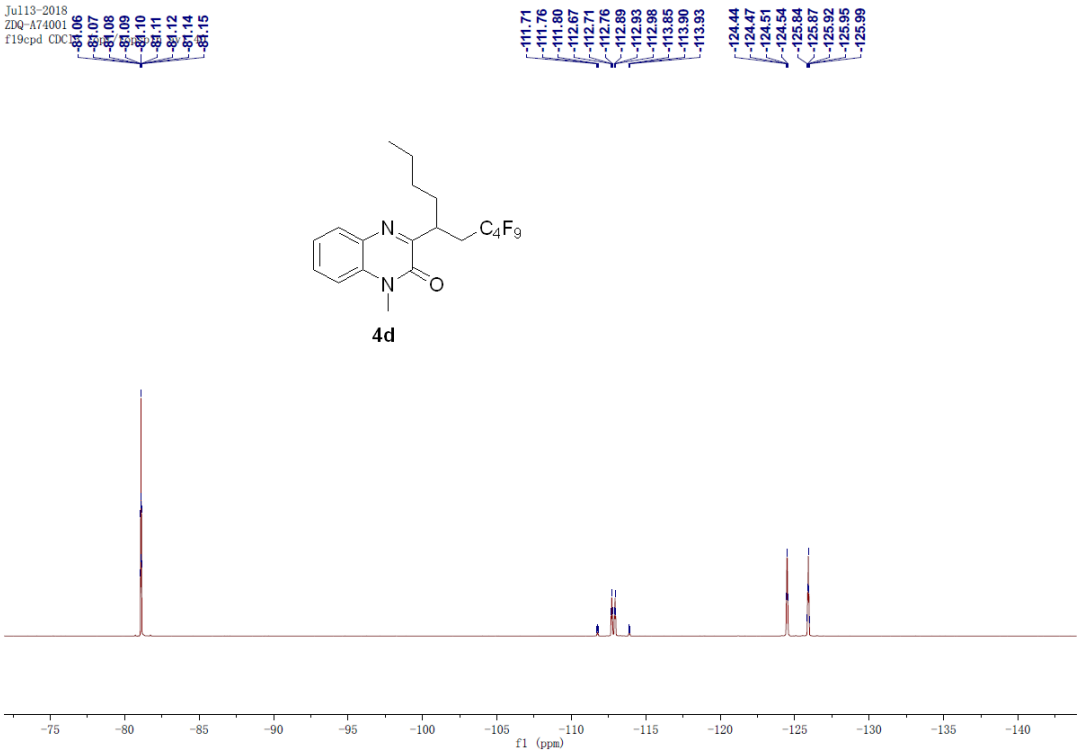
0
−10
f1 (ppm)


Jul13-2018
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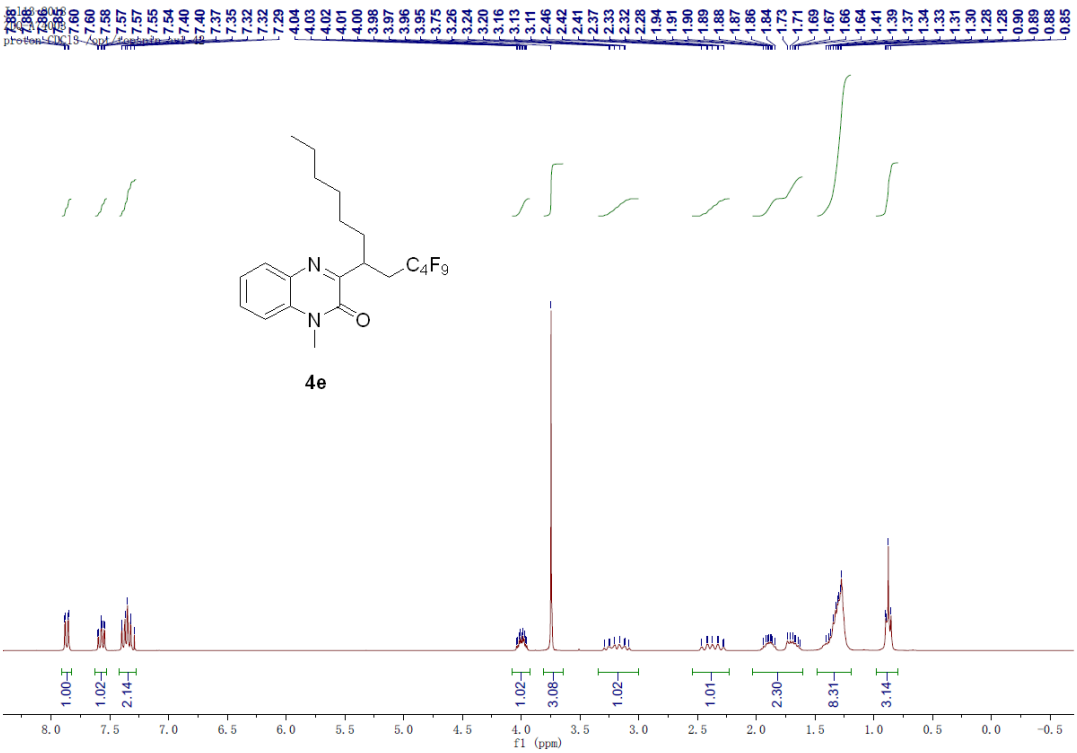
f1 (ppm)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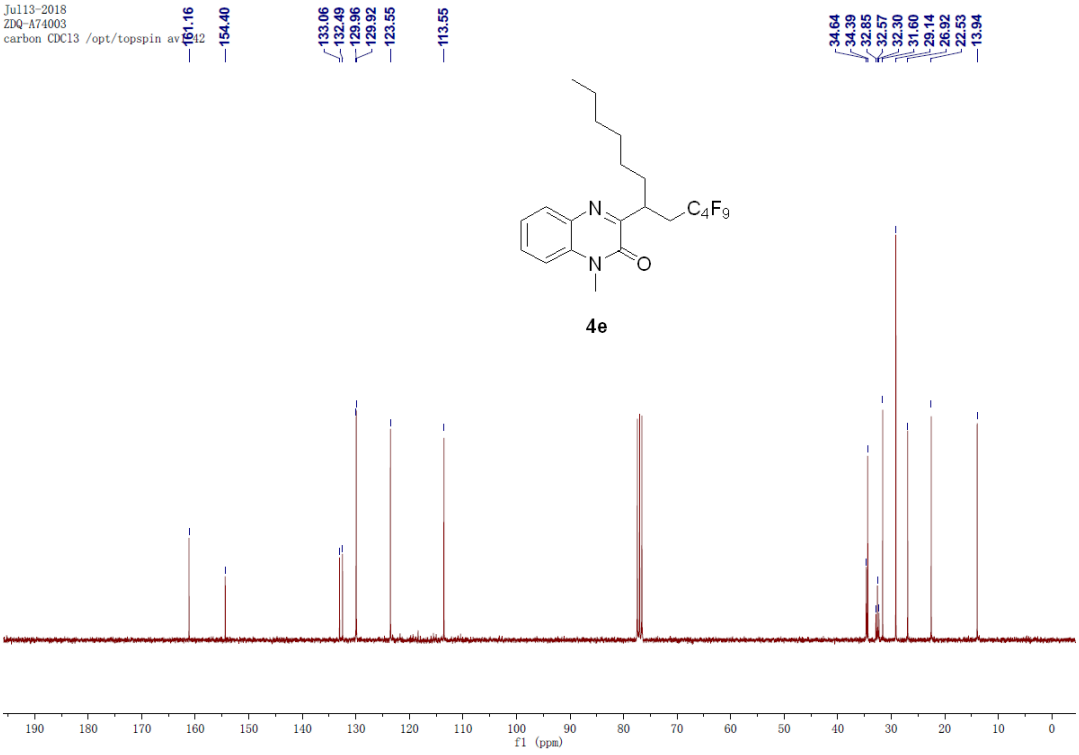
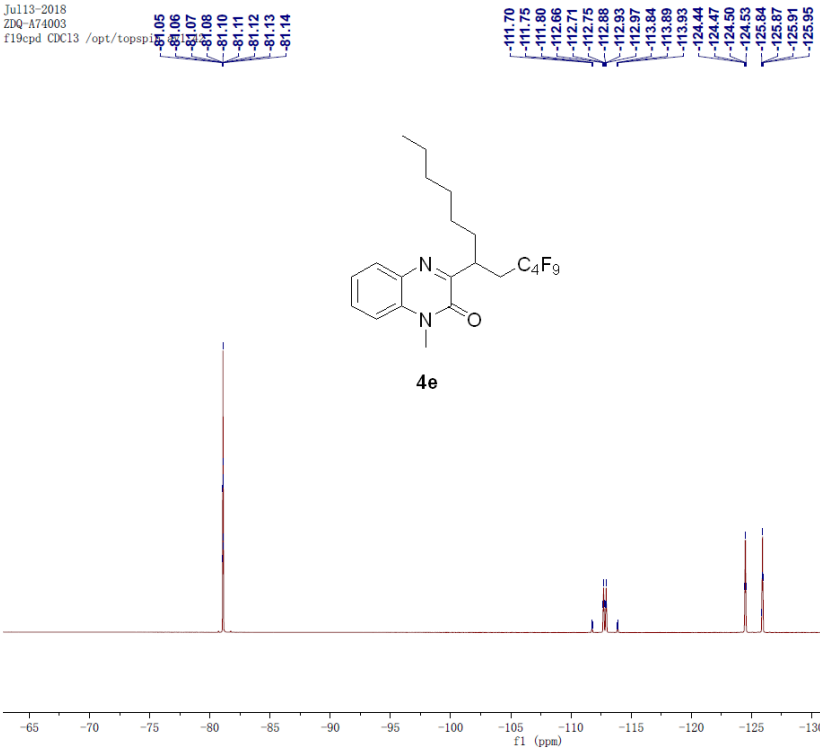
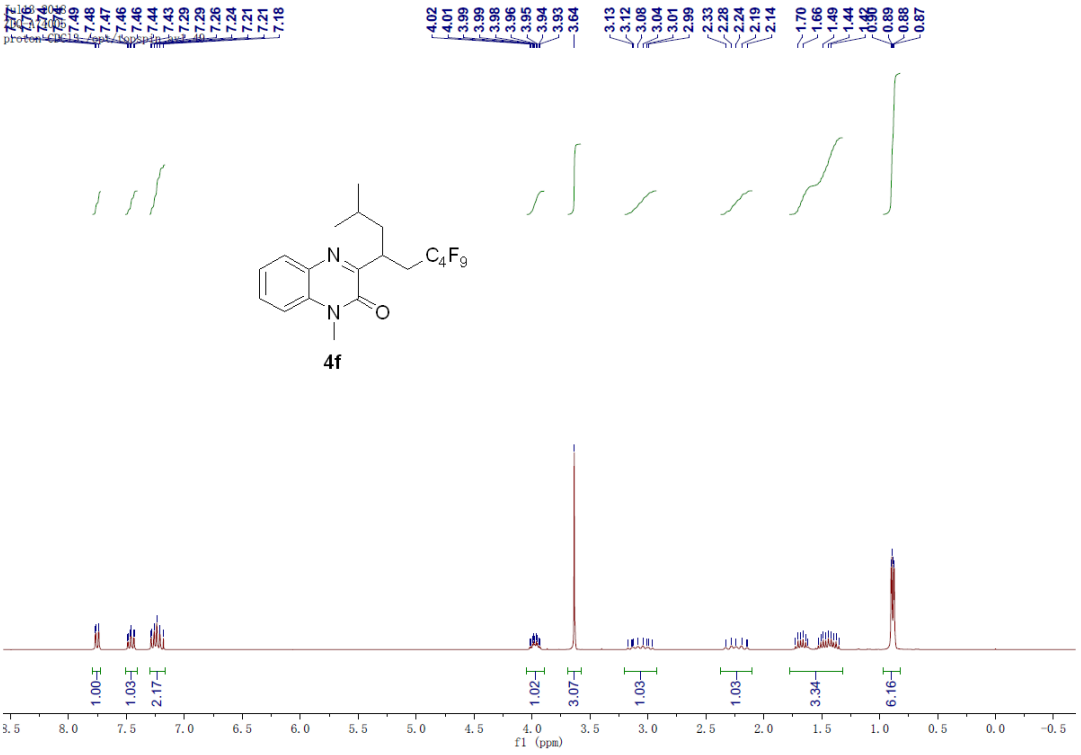
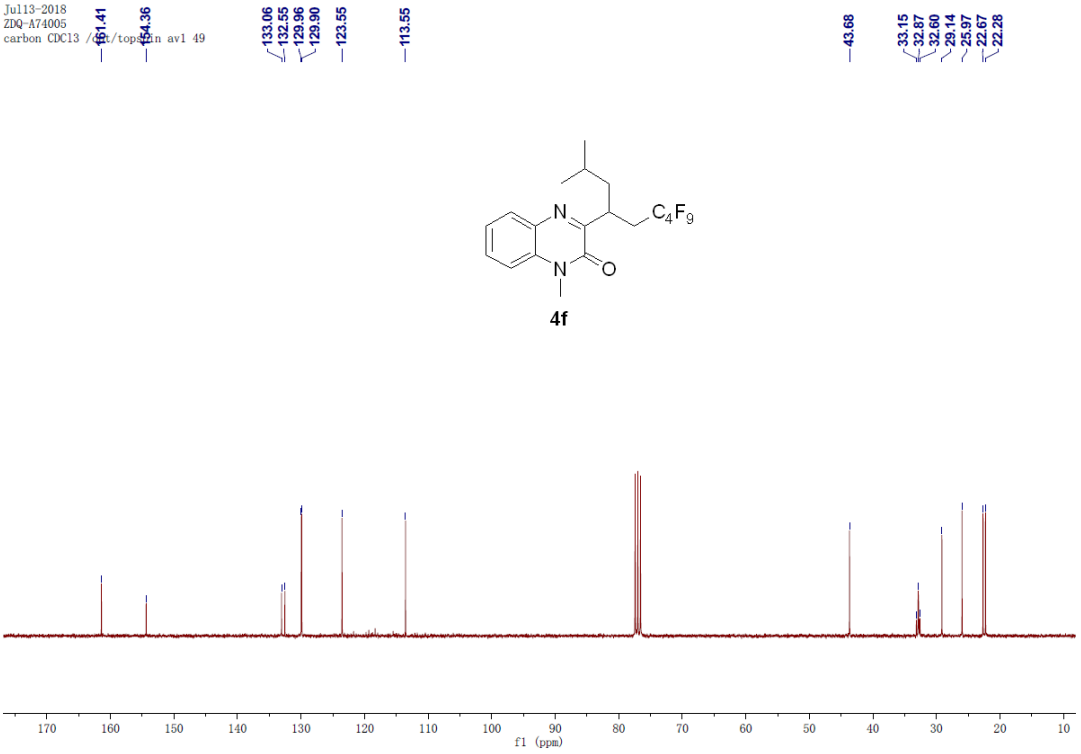
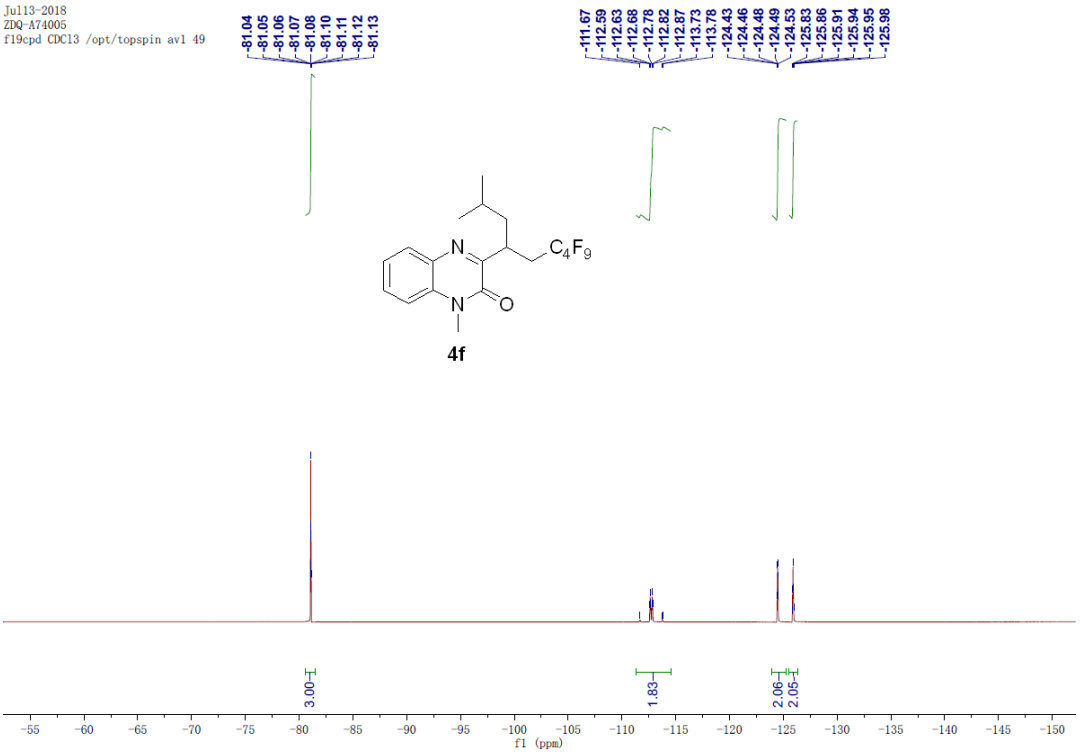
C4F9
N
O
4e
1.00 1.02 2.14 1.02 3.08 1.02 1.01 2.30 8.31 3.14
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

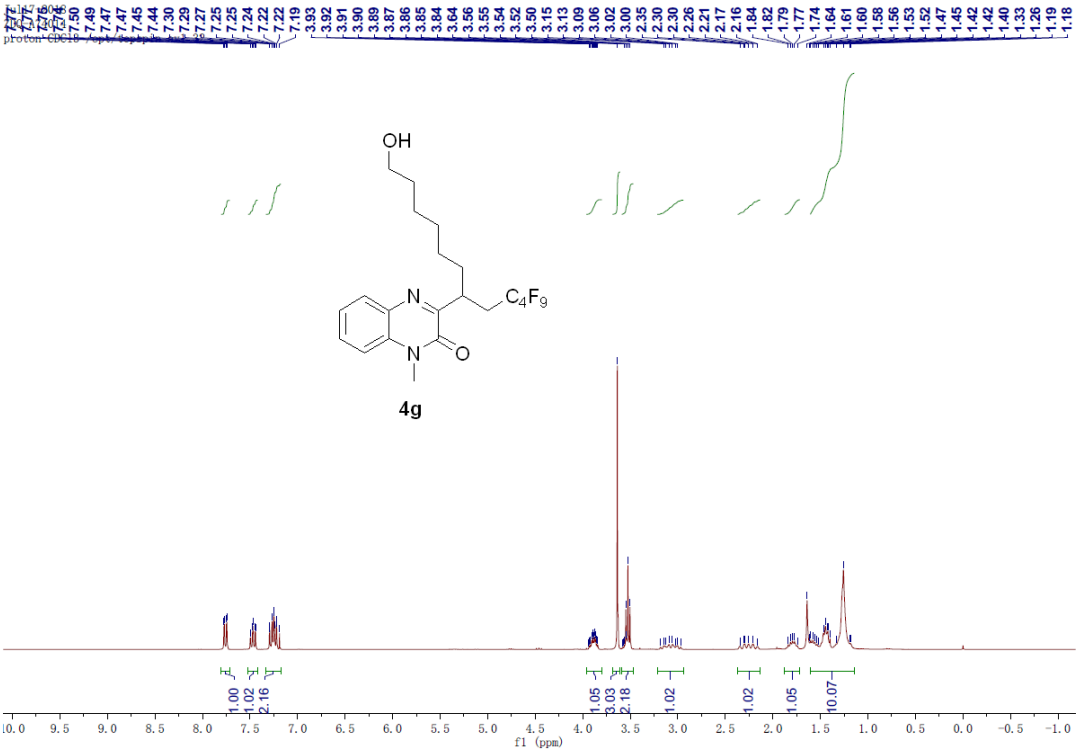

Jul13-2018
ZDQ-A74003
carbon CDC13 /opt/topspin av
161.16 154.40 133.06 132.49 129.96 129.92 123.55 113.55
34.64 34.39 32.85 32.57 32.30 31.60 29.14 26.92 22.53 13.94
N
C4F9
N
O
4e
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

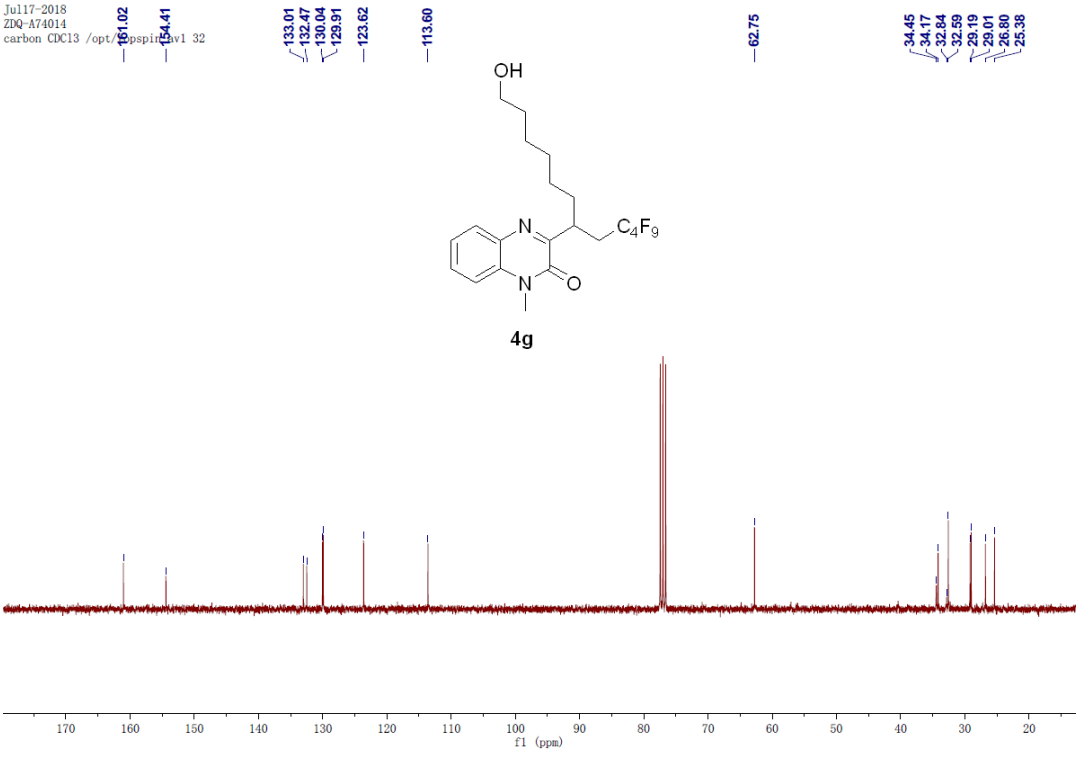

Jul13-2018
ZDQ-A74003
f19cpd CDCl3 /opt/topspin
-81.05
-81.06
-81.07
-81.08
-81.10
-81.11
-81.12
-81.13
-81.14
-111.70
-111.75
-111.80
-112.66
-112.71
-112.75
-112.88
-112.93
-112.97
-113.84
-113.89
-113.93
-124.44
-124.47
-124.50
-124.53
-125.84
-125.87
-125.91
-125.95
N
N
O
C4F9
4e
-65
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
-145
-150
f1 (ppm)

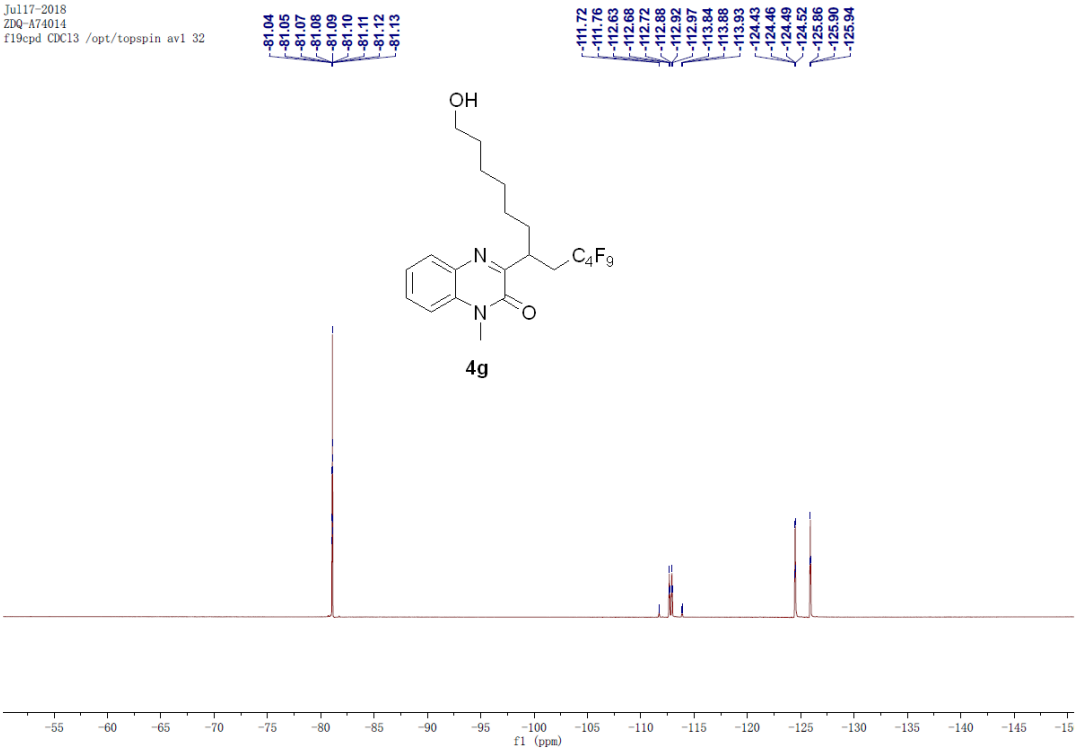

7.49
7.48
7.47
7.46
7.46
7.44
7.43
7.29
7.29
7.26
7.24
7.21
7.21
7.18
4.02
4.01
3.99
3.99
3.98
3.96
3.95
3.94
3.93
3.64
3.13
3.12
3.08
3.04
3.01
2.99
2.33
2.28
2.24
2.19
2.14
1.70
1.66
1.49
1.44
0.89
0.88
0.87
N
N
O
C4F9
4f
1.00
1.03
2.17
1.02
3.07
1.03
1.03
3.34
6.16
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)


Jul13-2018
ZDQ-A74005
carbon CDC13 /opt/topspin av1 49
161.41
154.36
133.06
132.55
129.96
129.90
123.55
113.55
43.68
33.15
32.87
32.60
29.14
25.97
22.67
22.28
N
N
O
C4F9
4f
f1 (ppm)

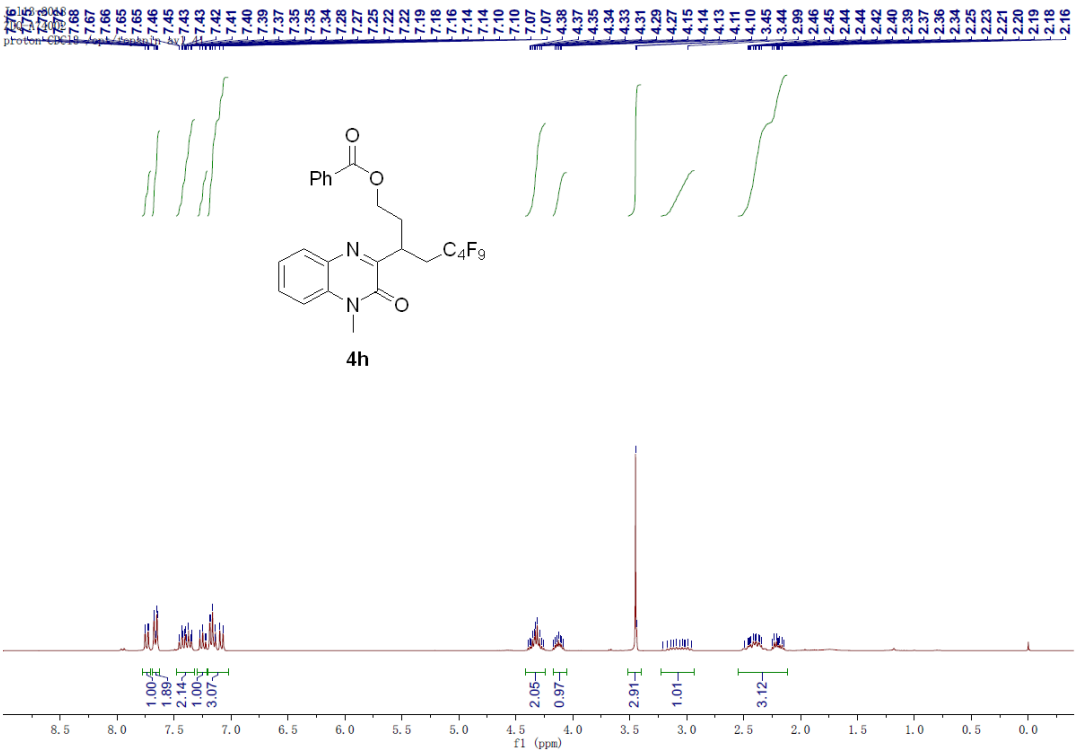

Jul13-2018
ZDQ-A74005
f19cpd CDC13 /opt/topspin av1 49
-81.04
-81.05
-81.06
-81.07
-81.08
-81.10
-81.11
-81.12
-81.13
-111.67
-112.59
-112.63
-112.68
-112.78
-112.82
-112.87
-113.73
-113.78
-124.43
-124.46
-124.48
-124.49
-124.53
-125.83
-125.86
-125.91
-125.94
-125.95
-125.98
N
N
O
C4F9
4f
3.00
1.83
2.06
2.05
f1 (ppm)


OH
N
C_4F_9
N
O
4g
1.00
1.02
2.16
1.05
3.03
2.18
1.02
1.02
1.05
10.07
f1 (ppm)

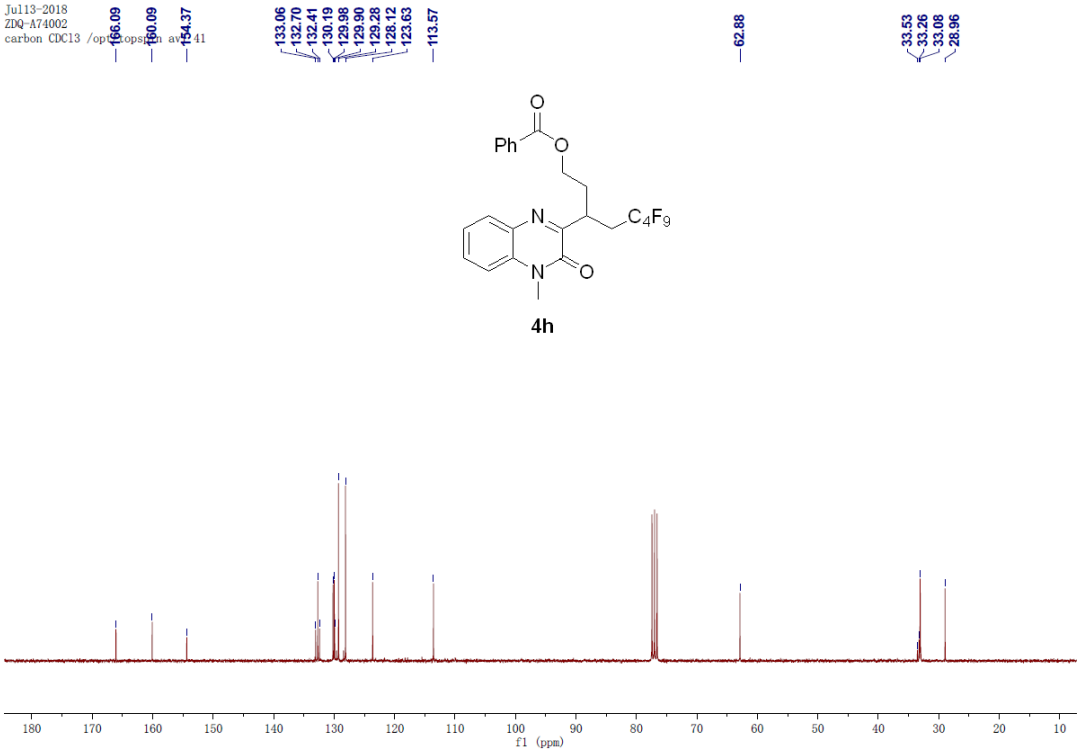

Jul17-2018
ZDQ-A74014
161.02
154.41
133.01
132.47
130.04
129.91
123.62
113.60
62.75
34.45
34.17
32.84
32.59
29.19
29.01
26.80
25.38
OH
N
C_4F_9
N
O
4g
f1 (ppm)

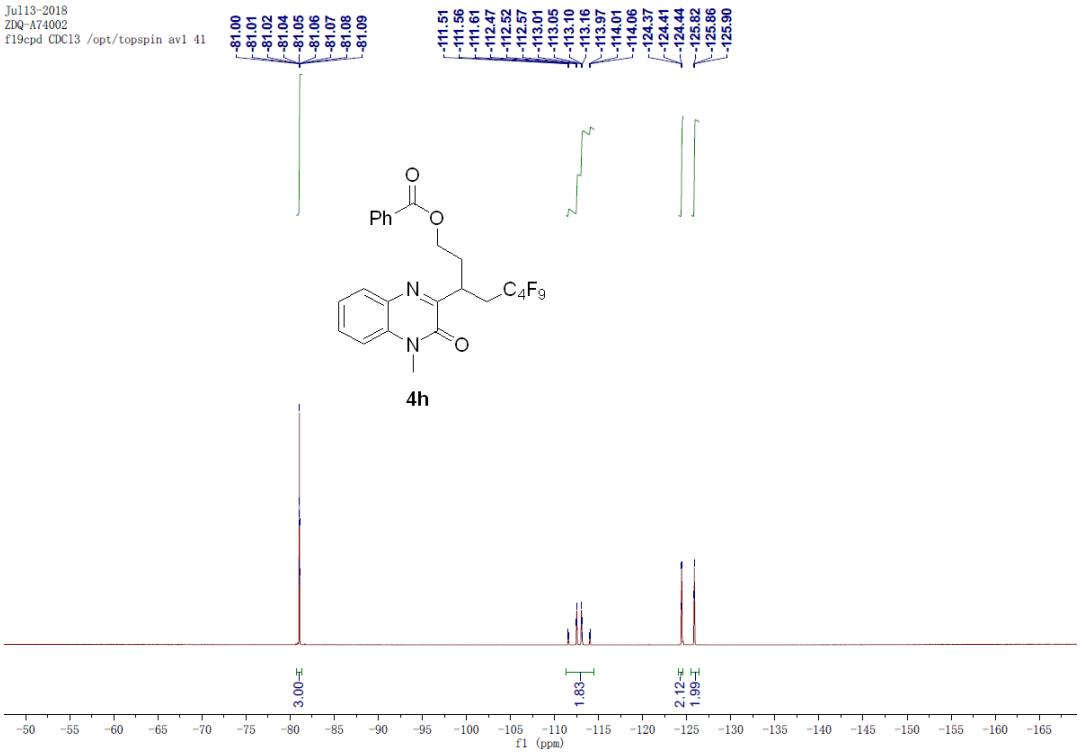

Jul17-2018
ZDQ-A74014
f19cpd CDCl3 /opt/topspin av1 32
-81.04
-81.05
-81.07
-81.08
-81.09
-81.10
-81.11
-81.12
-81.13
-111.72
-111.76
-112.63
-112.68
-112.72
-112.88
-112.92
-112.97
-113.84
-113.88
-113.93
-124.43
-124.46
-124.49
-124.52
-125.86
-125.90
-125.94
OH
N
C4F9
N
O
f1 (ppm)

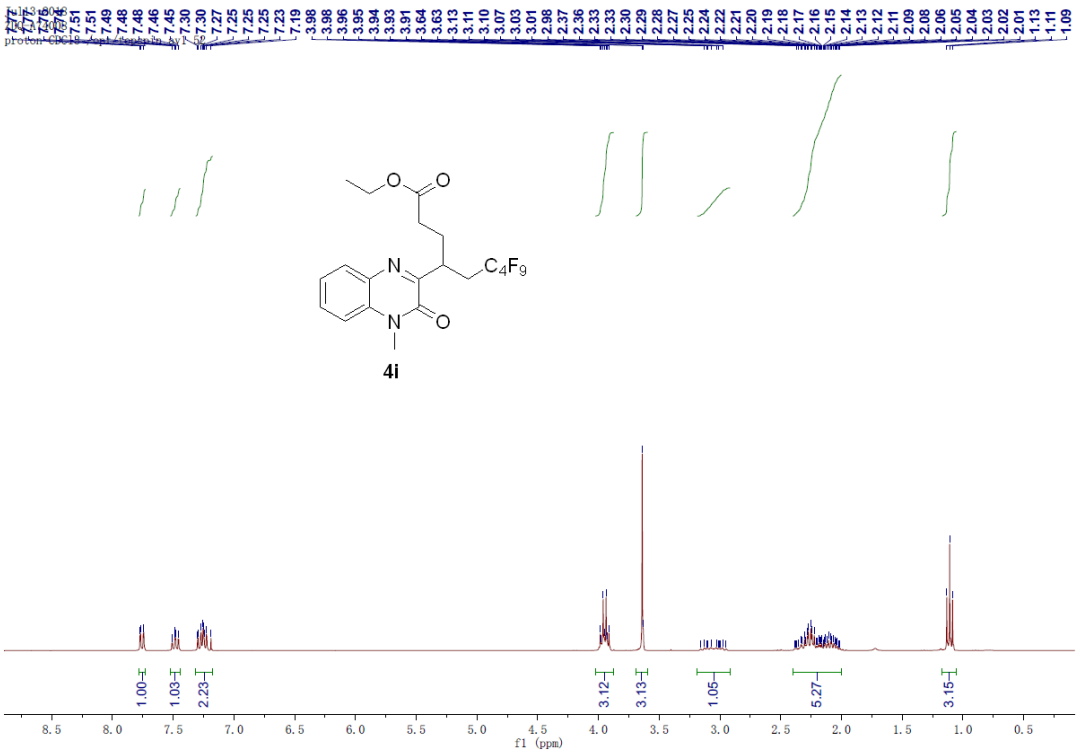
4g

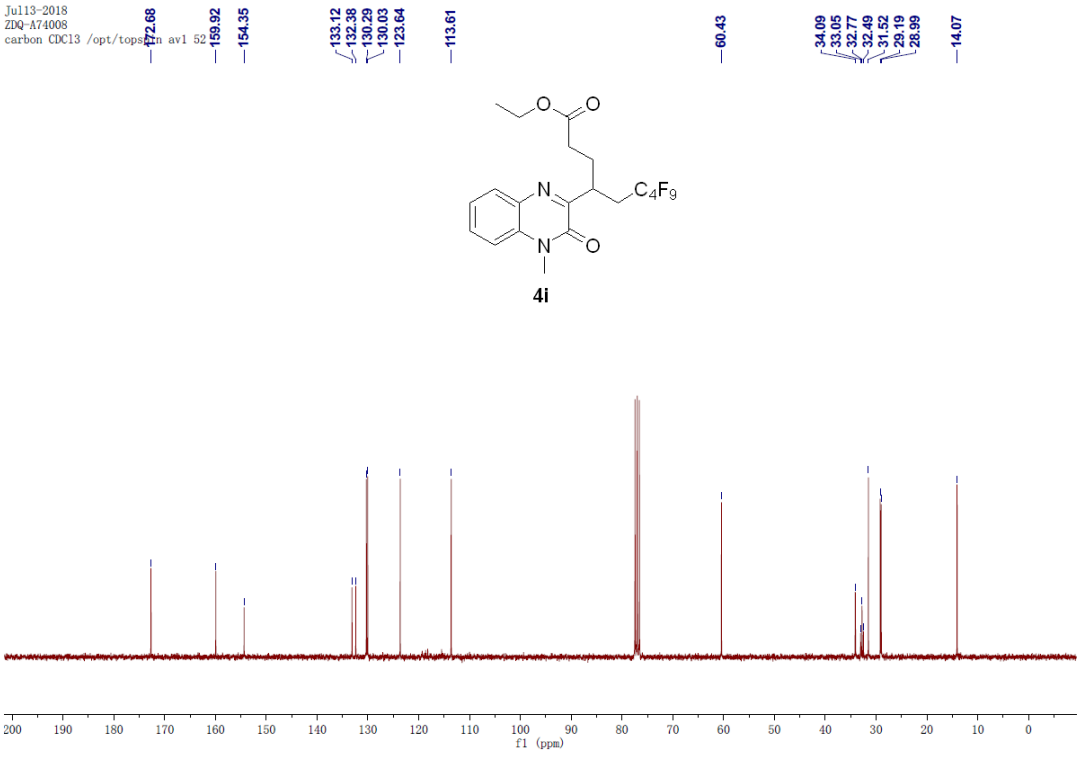

Ph
O
O
N
C4F9
N
O
1.00
1.89
2.14
1.00
3.07
2.05
0.97
2.91
1.01
3.12
f1 (ppm)

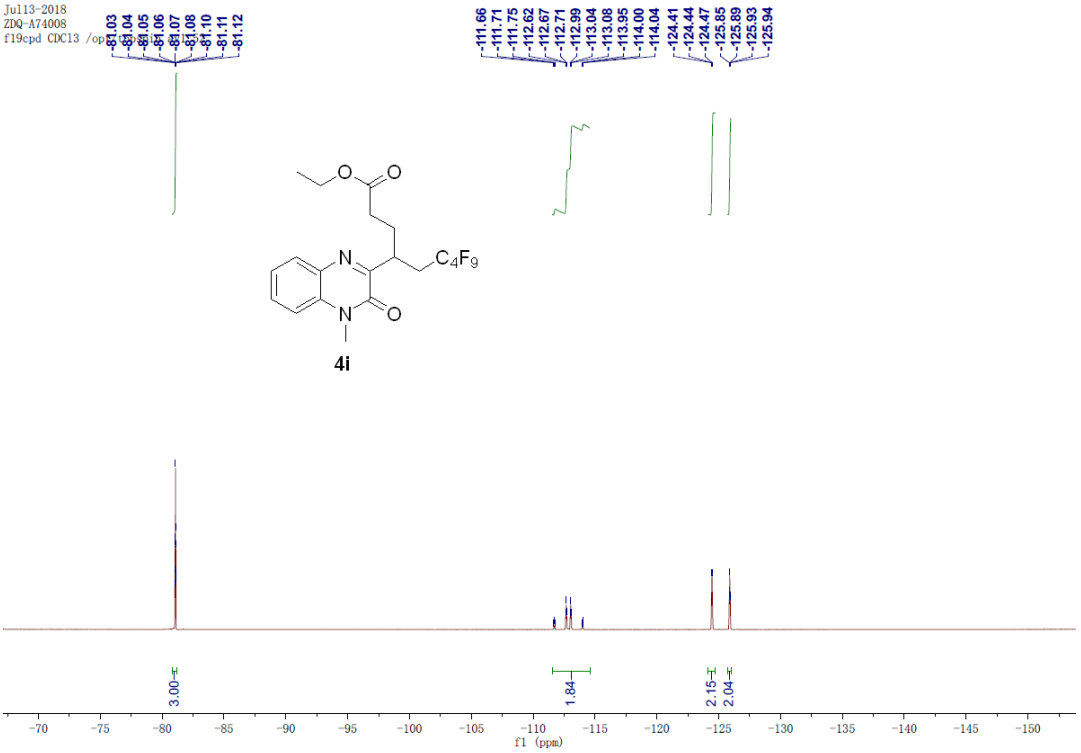
4h


Jul13-2018
ZDQ-A74002
carbon CDC13 /opt/topspin av1 41
166.09
160.09
154.37
133.06
132.70
132.41
130.19
129.98
129.90
129.28
128.12
123.63
113.57
62.88
33.53
33.26
33.08
28.96
Ph
O
O
N
N
O
C4F9
4h
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

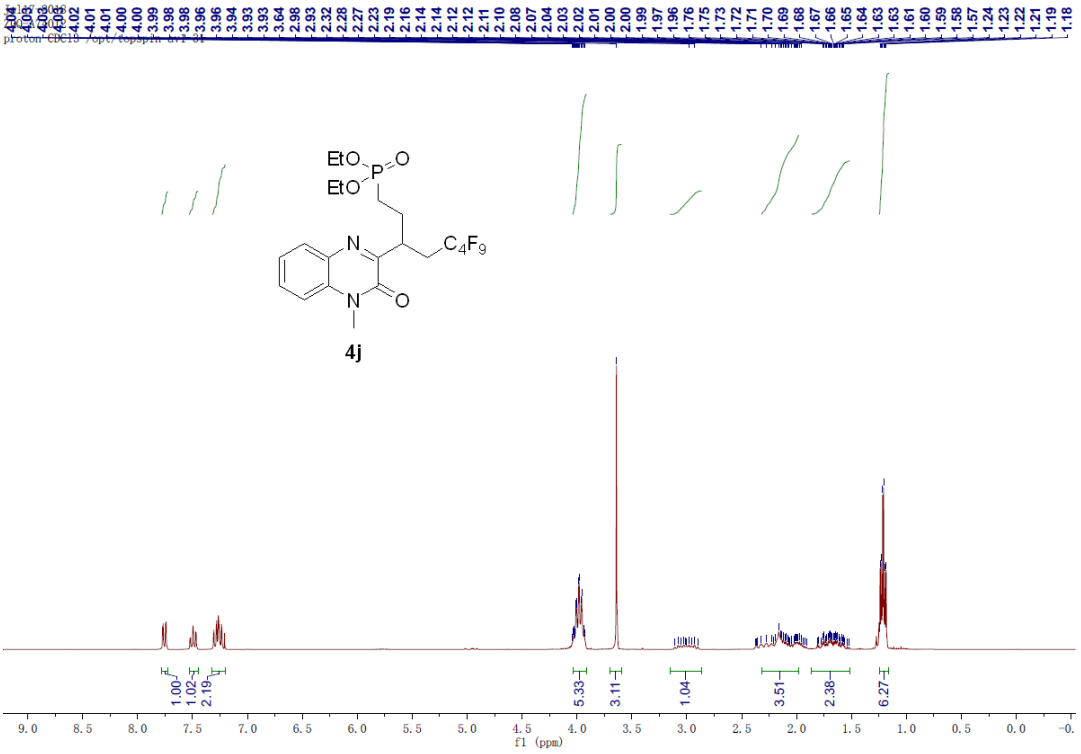

Jul13-2018
ZDQ-A74002
f19cpd CDC13 /opt/topspin av1 41
-81.00
-81.01
-81.02
-81.04
-81.05
-81.06
-81.07
-81.08
-81.09
-111.51
-111.56
-111.61
-112.47
-112.52
-112.57
-113.01
-113.05
-113.10
-113.16
-113.97
-114.01
-114.06
-124.37
-124.41
-124.44
-125.82
-125.86
-125.90
Ph
O
O
N
N
O
C4F9
4h
3.00
1.83
2.12
1.99
−50
−55
−60
−65
−70
−75
−80
−85
−90
−95
−100
−105
−110
−115
−120
−125
−130
−135
−140
−145
−150
−155
−160
−165
f1 (ppm)


proton CDCl3
7.51
7.49
7.48
7.46
7.45
7.30
7.27
7.25
7.25
7.23
7.19
3.98
3.96
3.95
3.94
3.93
3.91
3.64
3.63
3.13
3.11
3.10
3.07
3.03
3.01
2.98
2.37
2.36
2.33
2.33
2.30
2.29
2.28
2.27
2.25
2.24
2.22
2.21
2.20
2.19
2.18
2.17
2.16
2.15
2.14
2.13
2.12
2.11
2.09
2.08
2.06
2.05
2.04
2.03
2.02
2.01
1.13
1.11
1.09
O
O
N
C4F9
N
O
4i
1.00
1.03
2.23
3.12
3.13
1.05
5.27
3.15
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
f1 (ppm)

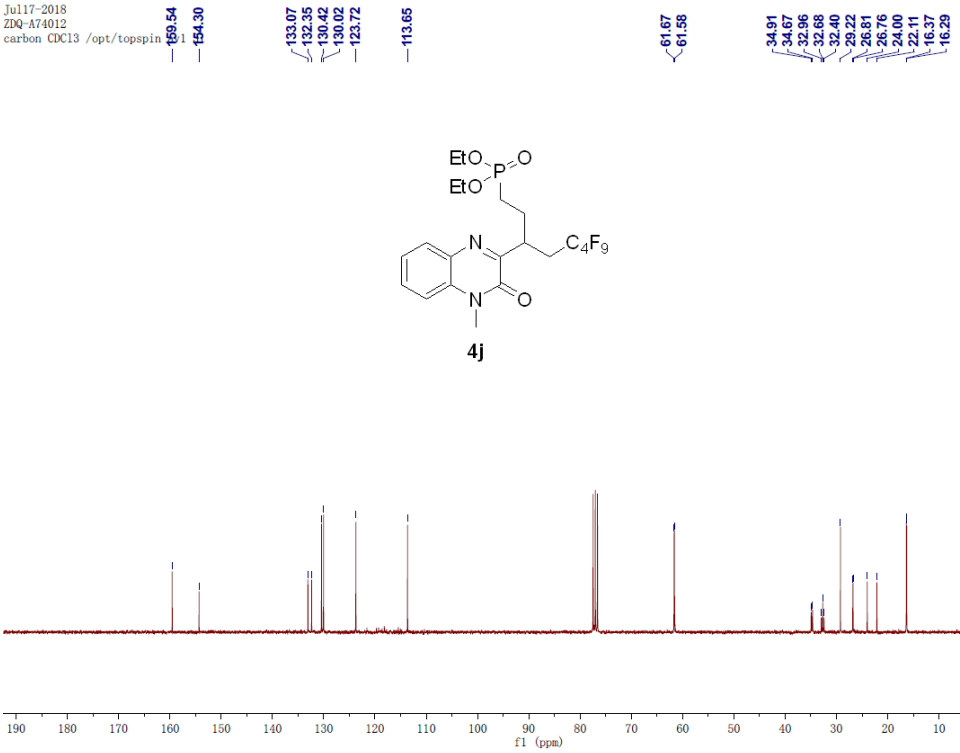

Jul13-2018
ZDQ-A74008
carbon CDCl3 /opt/topspin av1 52
172.68
159.92
154.35
133.12
132.38
130.29
130.03
123.64
113.61
60.43
34.09
33.05
32.77
32.49
31.52
29.19
28.99
14.07
O
O
N
C4F9
N
O
4i
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

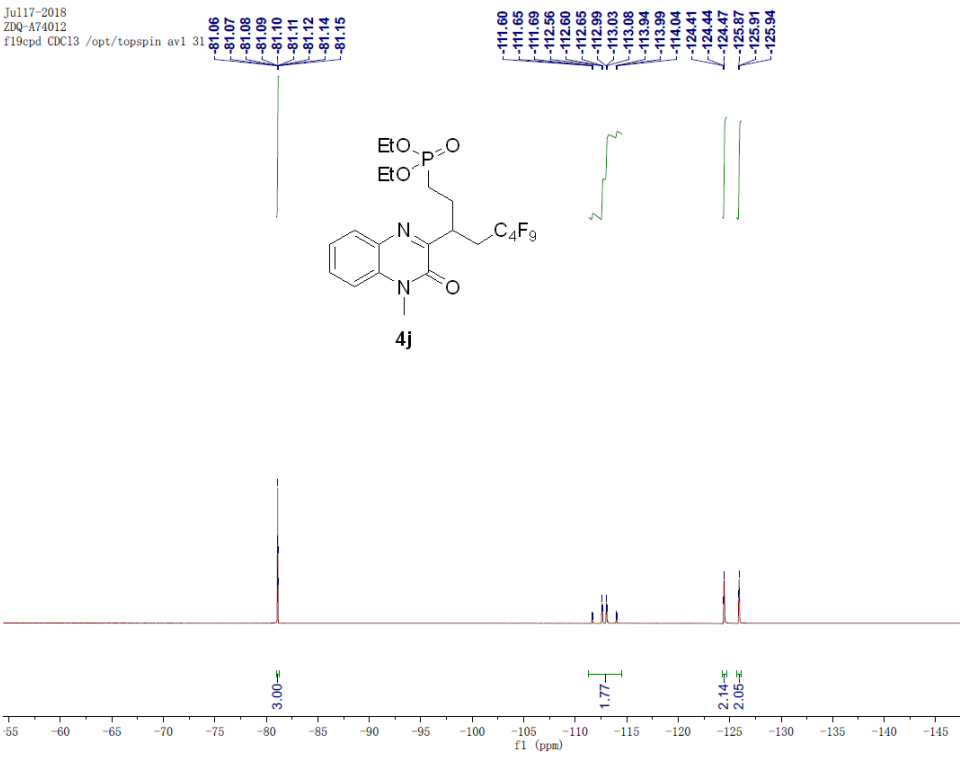

Jul13-2018
ZDQ-A74008
f19cpd CDCl3 /opt/
-81.03
-81.04
-81.05
-81.06
-81.07
-81.08
-81.10
-81.11
-81.12
-111.66
-111.71
-111.75
-112.62
-112.67
-112.71
-112.99
-113.04
-113.08
-113.95
-114.00
-114.04
-124.41
-124.44
-124.47
-125.85
-125.89
-125.93
-125.94
O
O
N
C4F9
N
O
3.00
1.84
2.15
2.04
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
-145
-150
f1 (ppm)

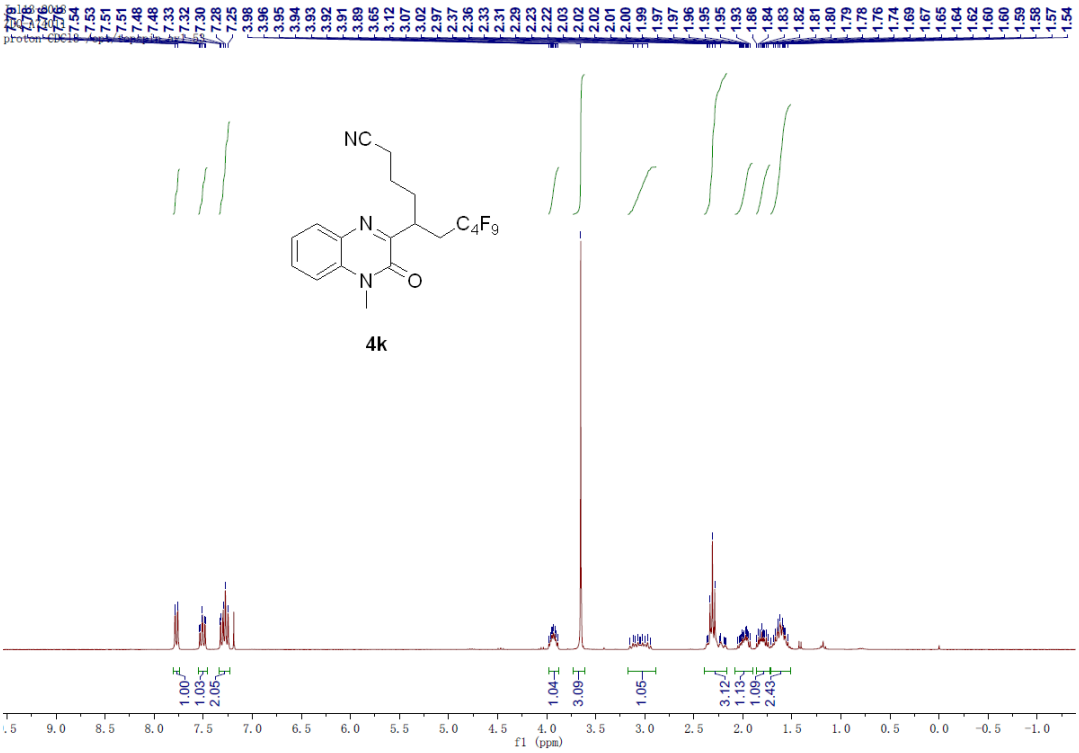
4i

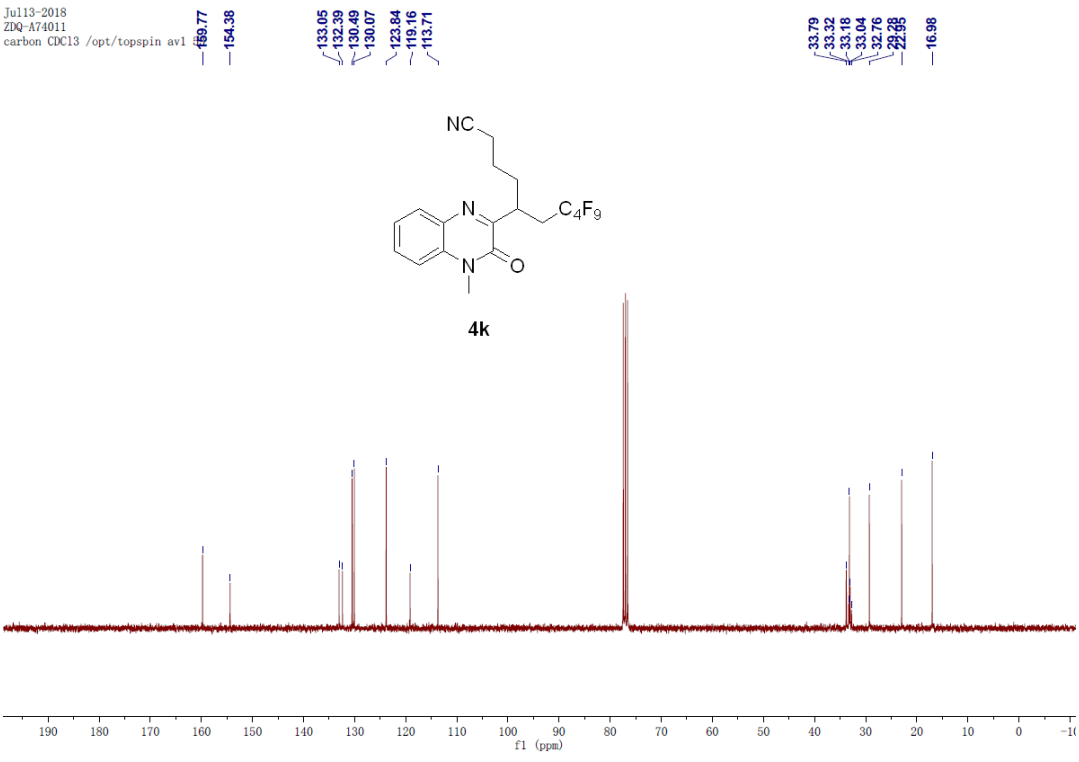

EtO
EtO
P
O
N
C4F9
N
O
1.00
1.02
2.19
5.33
3.11
1.04
3.51
2.38
6.27
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

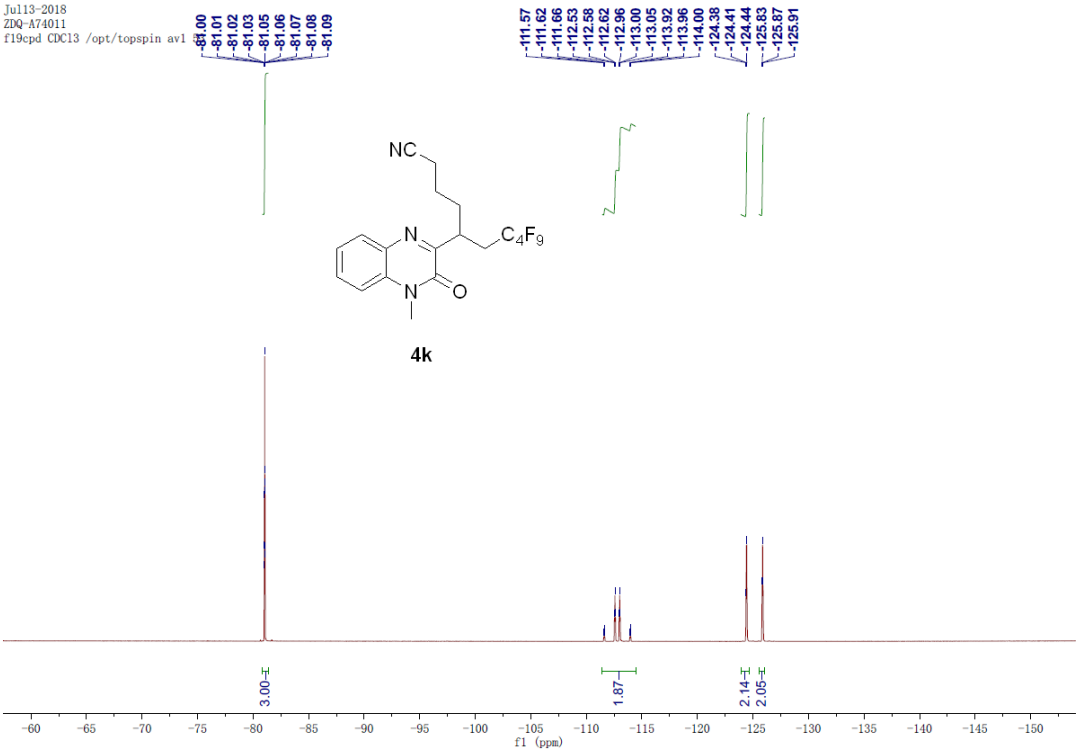
4j


Jul17-2018
ZDQ-A74012
carbon CDCl3 /opt/topspin
169.54
154.30
133.07
132.35
130.42
130.02
123.72
113.65
61.67
61.58
34.91
34.67
32.96
32.68
32.40
29.22
26.81
26.76
24.00
22.11
16.37
16.29
EtO
EtO
P
O
N
C4F9
N
O
4j
f1 (ppm)

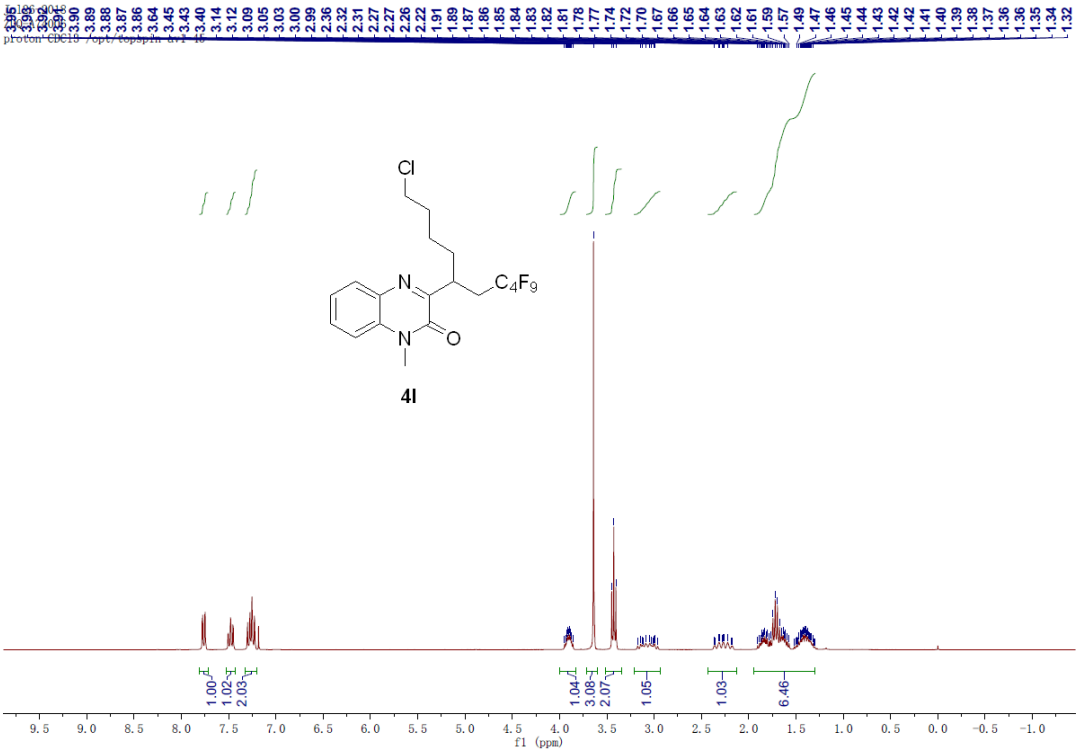

Jul17-2018
ZDQ-A74012
f19cpd CDCl3 /opt/topspin
-81.06
-81.07
-81.08
-81.09
-81.10
-81.11
-81.12
-81.14
-81.15
-111.60
-111.65
-111.69
-112.56
-112.60
-112.65
-112.99
-113.03
-113.08
-113.94
-113.99
-114.04
-124.41
-124.44
-124.47
-125.87
-125.91
-125.94
EtO
EtO
P
O
N
C4F9
N
O
4j
3.00
1.77
2.14
2.05
f1 (ppm)


NC
N
C4F9
N
O
4k
1.00
1.03
2.05
1.04
3.09
1.05
3.12
1.13
1.09
2.43
f1 (ppm)

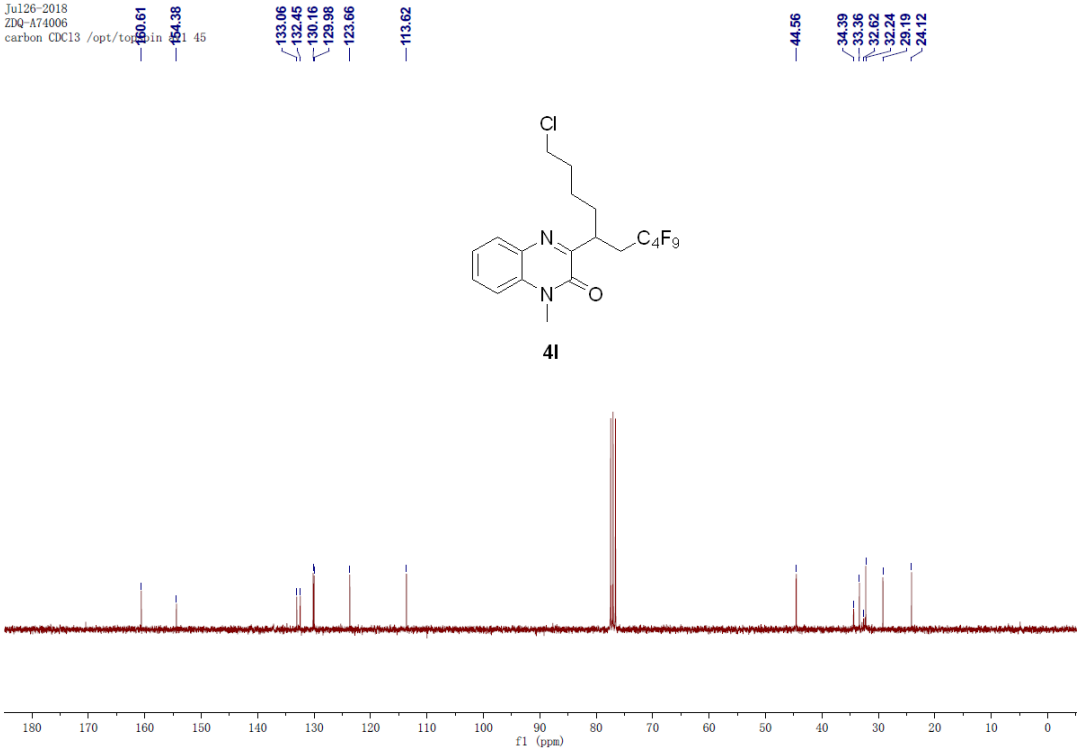

Jul13-2018
ZDQ-A74011
carbon CDCl3 /opt/topspin av1
159.77
154.38
133.05
132.39
130.49
130.07
123.84
119.16
113.71
33.79
33.32
33.18
33.04
32.76
16.98
NC
N
C4F9
N
O
4k
f1 (ppm)


Jul13-2018
ZDQ-A74011
f19cpd CDCl3 /opt/topspin av1
-81.00
-81.01
-81.02
-81.03
-81.05
-81.06
-81.07
-81.08
-81.09
-111.57
-111.62
-111.66
-112.53
-112.58
-112.62
-112.96
-113.00
-113.05
-113.92
-113.96
-114.00
-124.38
-124.41
-124.44
-125.83
-125.87
-125.91
NC
N
C4F9
N
O
3.00
1.87
2.14
2.05
f1 (ppm)

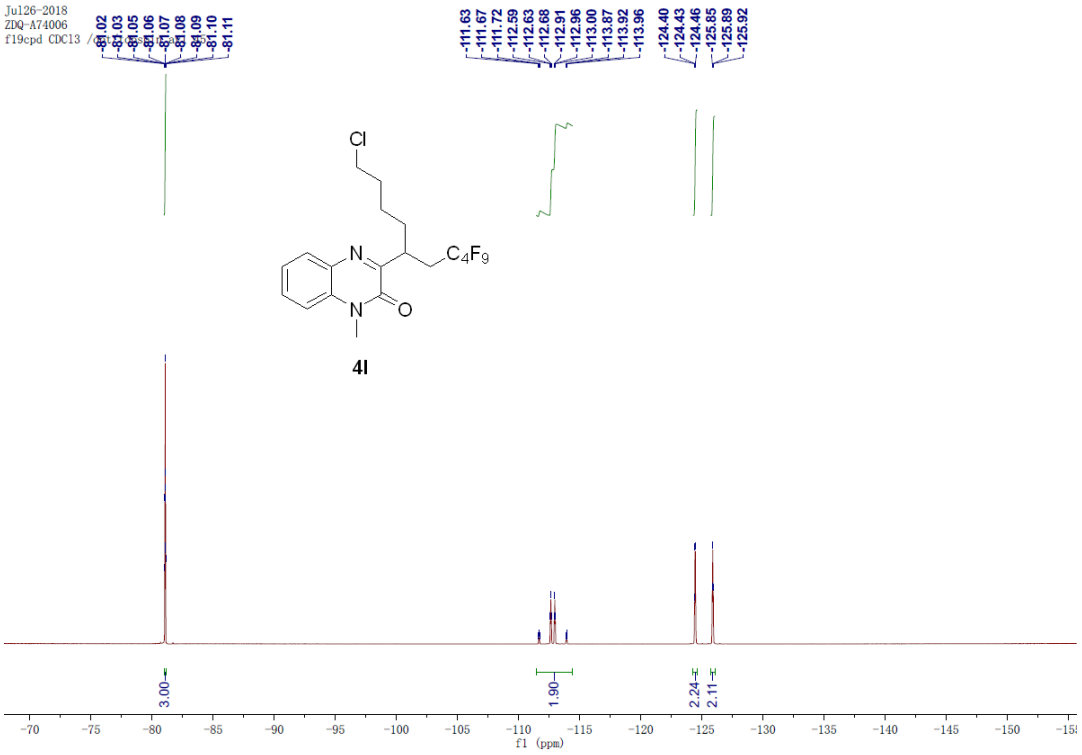
4k


Cl
N
C4F9
N
O
1.00
1.02
2.03
1.04
3.08
2.07
1.05
1.03
6.46
f1 (ppm)

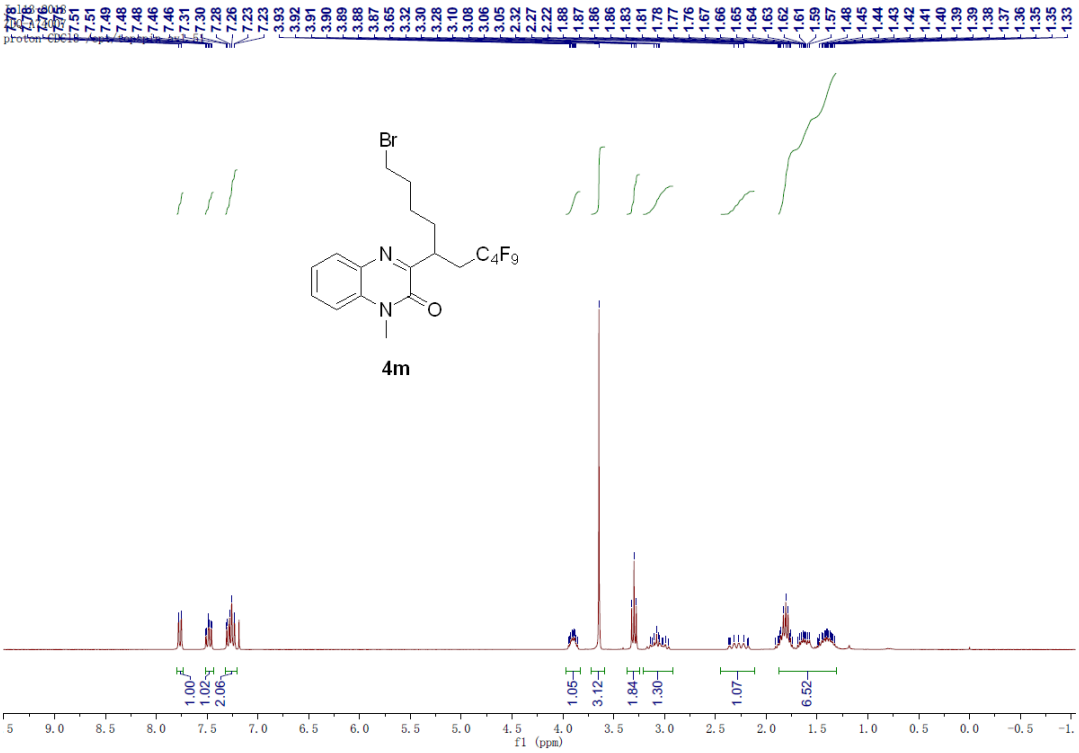
4l

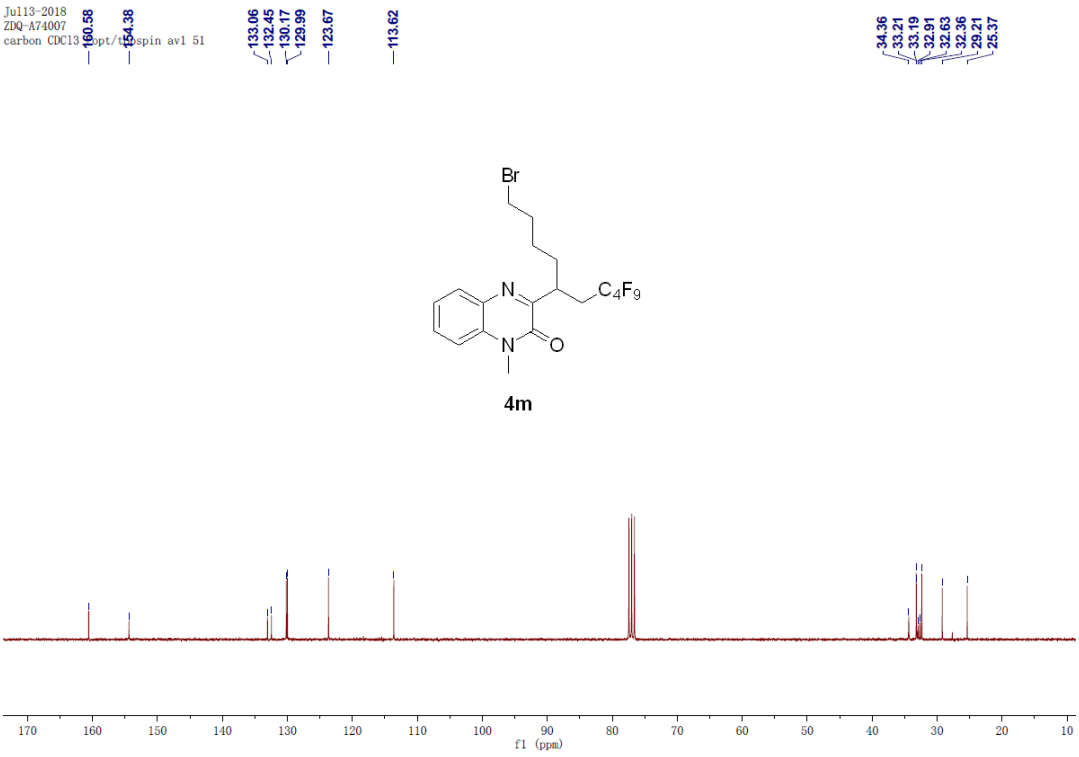

Jul26-2018
ZDQ-A74006
carbon CDC13 /opt/topspin
160.61
154.38
133.06
132.45
130.16
129.98
123.66
113.62
44.56
34.39
33.36
32.62
32.24
29.19
24.12
Cl
N
C4F9
N
O
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

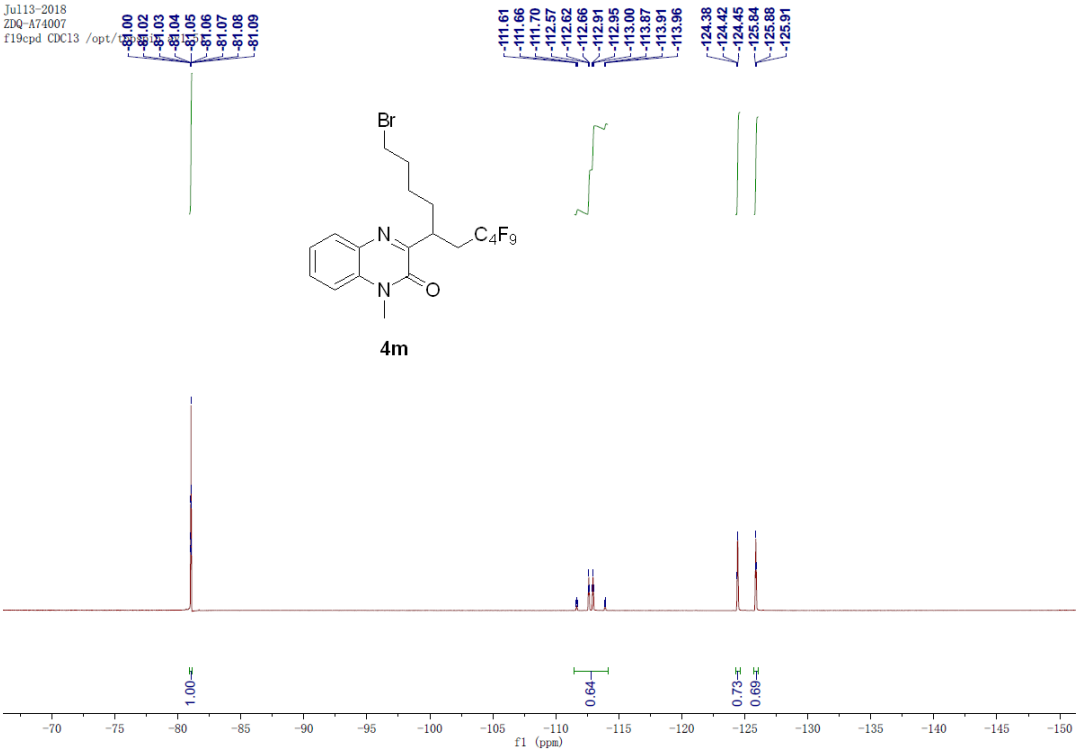
4l


Jul26-2018
ZDQ-A74006
-81.02
-81.03
-81.05
-81.06
-81.07
-81.08
-81.09
-81.10
-81.11
-111.63
-111.67
-111.72
-112.59
-112.63
-112.68
-112.91
-112.96
-113.00
-113.87
-113.92
-113.96
-124.40
-124.43
-124.46
-125.85
-125.89
-125.92
Cl
N
C4F9
N
O
3.00
1.90
2.24
2.11
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
-145
-150
f1 (ppm)

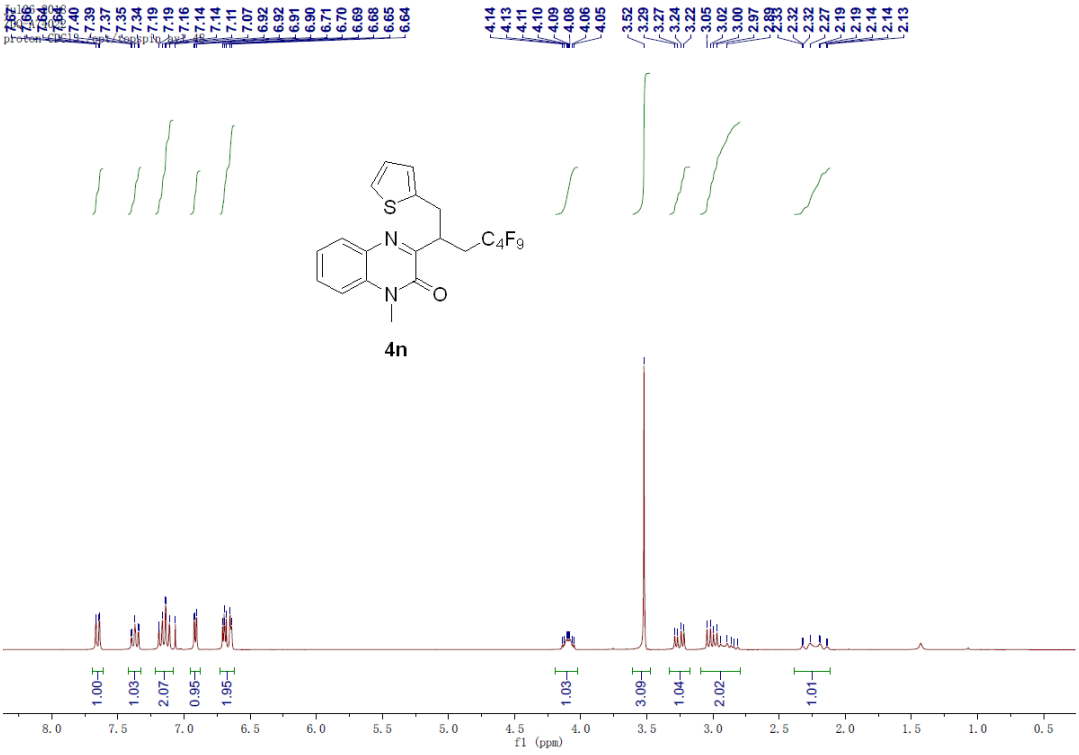
4l


Br
N
C4F9
N
O
4m
1.00
1.02
2.06
1.05
3.12
1.84
1.30
1.07
6.52
f1 (ppm)

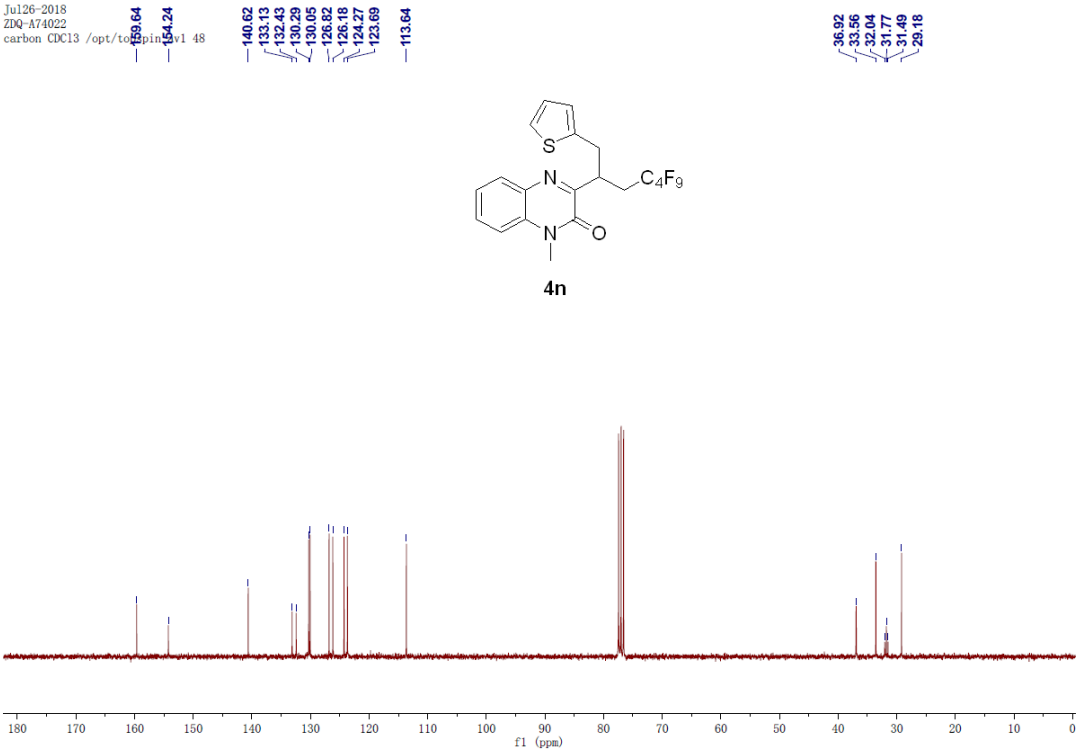

Jul13-2018
ZDQ-A74007
160.58
154.38
133.06
132.45
130.17
129.99
123.67
113.62
34.36
33.21
33.19
32.91
32.63
32.36
29.21
25.37
Br
N
C4F9
N
O
4m
f1 (ppm)


Jul13-2018
ZDQ-A74007
f19cpd CDCl3 /opt/
-81.00
-81.02
-81.03
-81.04
-81.05
-81.06
-81.07
-81.08
-81.09
-111.61
-111.66
-111.70
-112.57
-112.62
-112.66
-112.91
-112.95
-113.00
-113.87
-113.91
-113.96
-124.38
-124.42
-124.45
-125.84
-125.88
-125.91
Br
N
C4F9
N
O
1.00
0.64
0.73
0.69
−70
−75
−80
−85
−90
−95
−100
−105
−110
−115
−120
−125
−130
−135
−140
−145
−150
f1 (ppm)

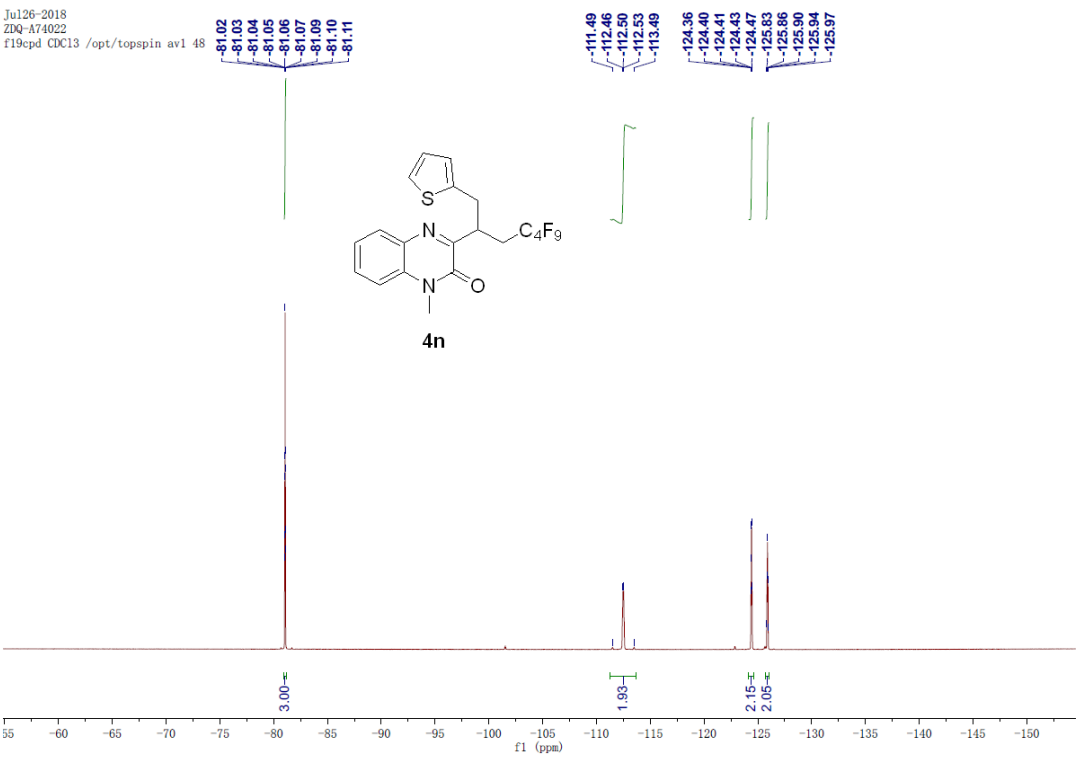
4m


7.40
7.39
7.37
7.35
7.34
7.19
7.19
7.16
7.14
7.14
7.11
7.07
6.92
6.91
6.90
6.71
6.70
6.69
6.68
6.65
6.64
4.14
4.13
4.11
4.10
4.09
4.08
4.06
4.05
3.52
3.29
3.27
3.24
3.22
3.05
3.02
3.00
2.97
2.32
2.27
2.19
2.19
2.14
2.14
2.13
S
N
C4F9
N
O
1.00
1.03
2.07
0.95
1.95
1.03
3.09
1.04
2.02
1.01
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
f1 (ppm)

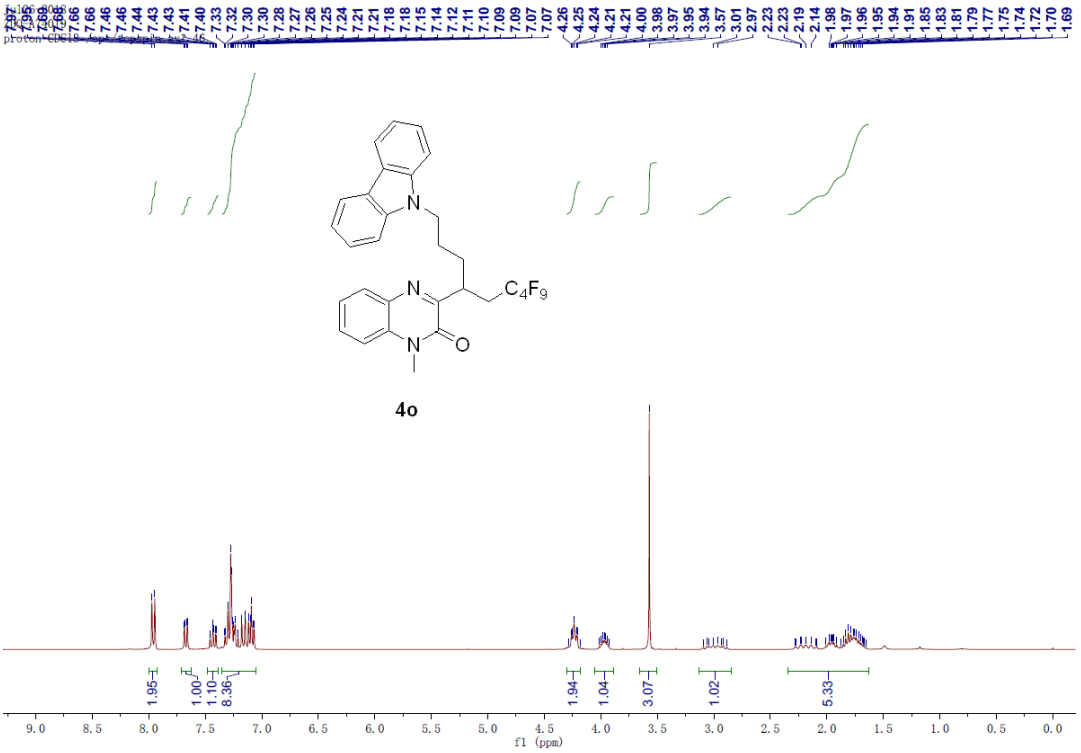
4n

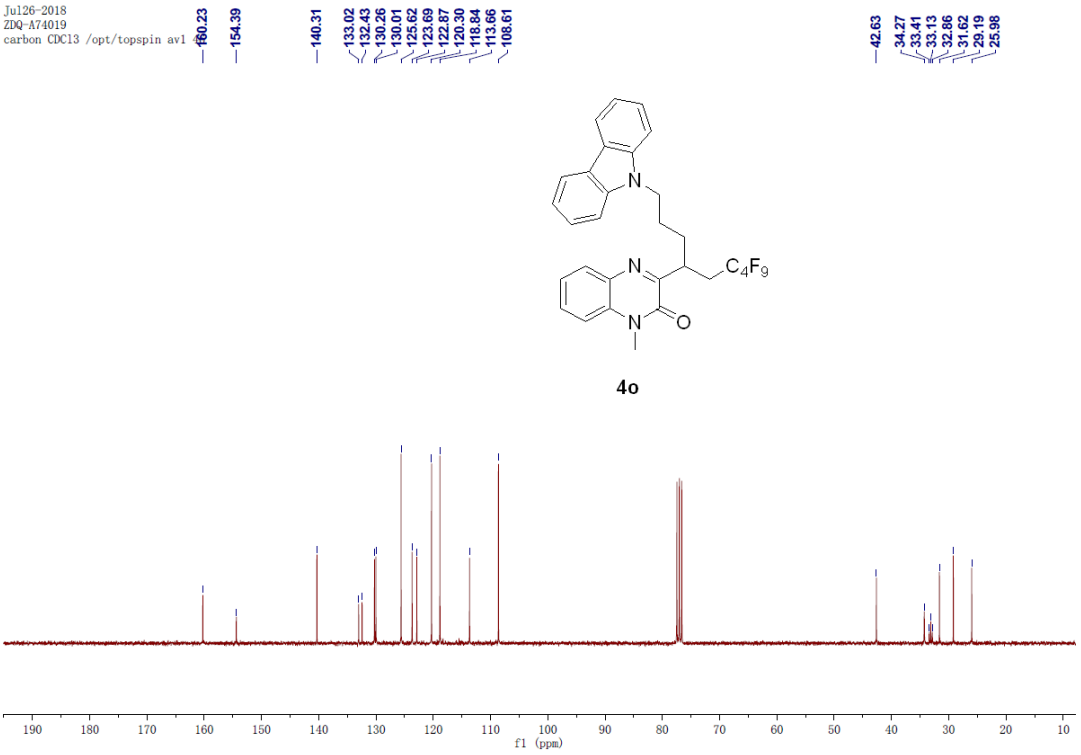

Jul26-2018
ZDQ-A74022
carbon CDC13 /opt/topspin av1 48
159.64
154.24
140.62
133.13
132.43
130.29
130.05
126.82
126.18
124.27
123.69
113.64
36.92
33.56
32.04
31.77
31.49
29.18
S
N
N
O
C4F9
f1 (ppm)

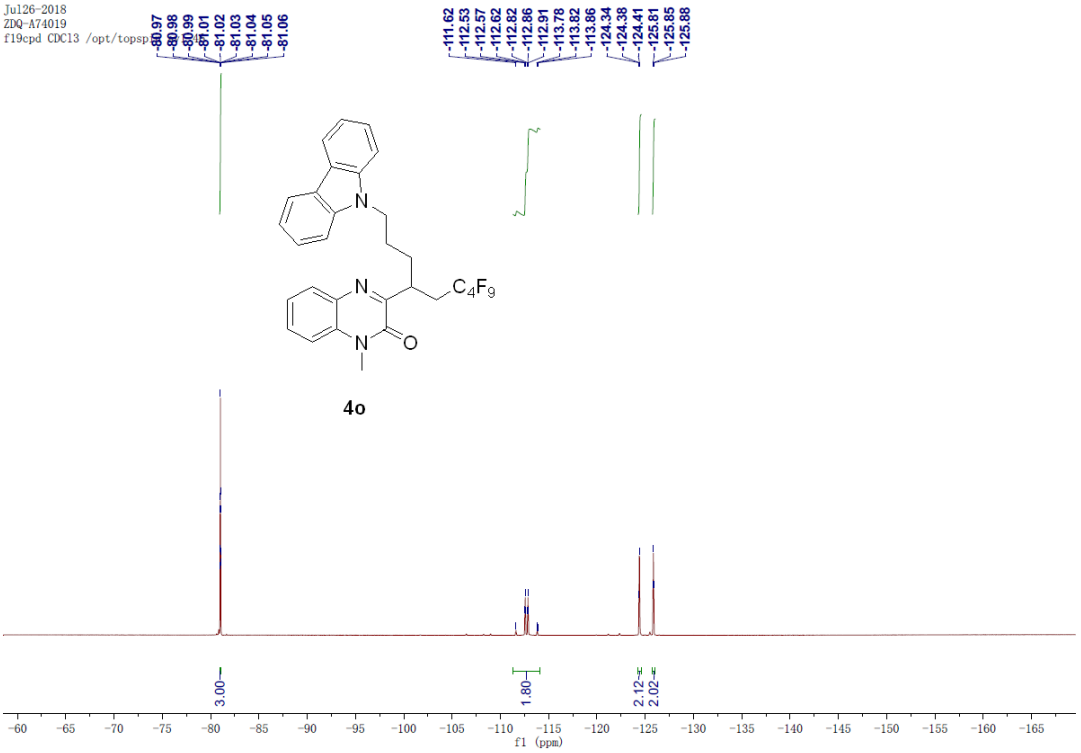
4n


Jul26-2018
ZDQ-A74022
f19cpd CDC13 /opt/topspin av1 48
-81.02
-81.03
-81.04
-81.05
-81.06
-81.07
-81.09
-81.10
-81.11
-111.49
-112.46
-112.50
-112.53
-113.49
-124.36
-124.40
-124.41
-124.43
-124.47
-125.83
-125.86
-125.90
-125.94
-125.97
S
N
N
O
C4F9
3.00
1.93
2.15
2.05
f1 (ppm)

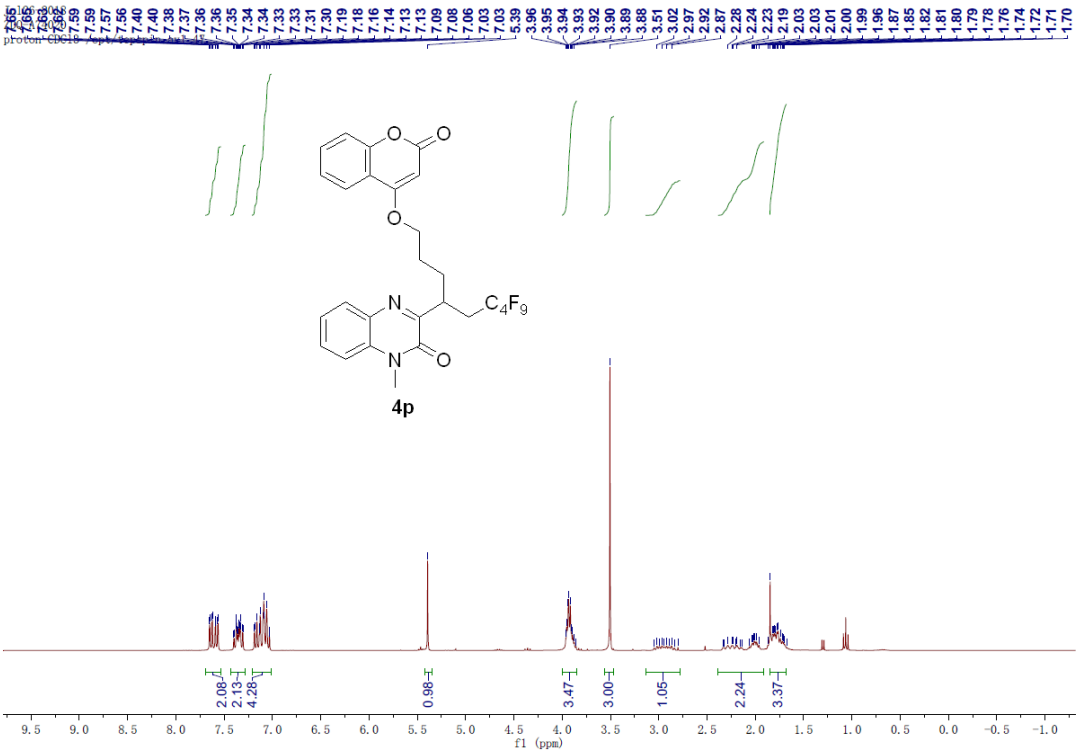
4n


4o
1.95
1.00
1.10
8.36
1.94
1.04
3.07
1.02
5.33
f1 (ppm)

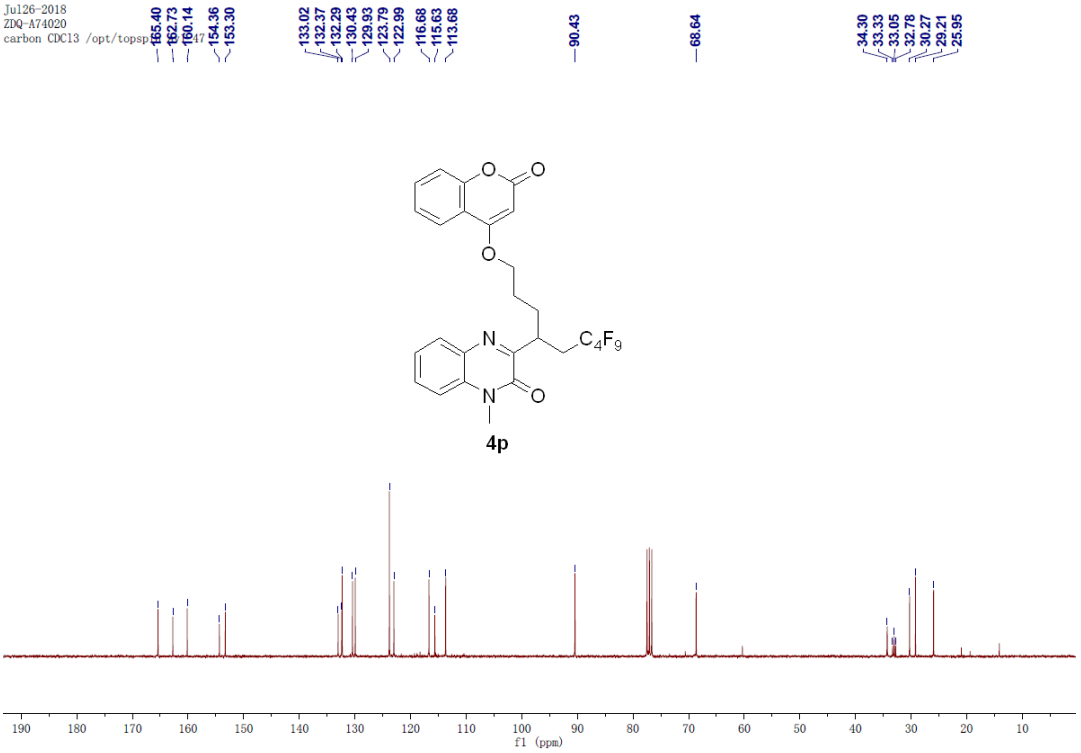

Jul26-2018
ZDQ-A74019
carbon CDCl3 /opt/topspin av1
4o
f1 (ppm)

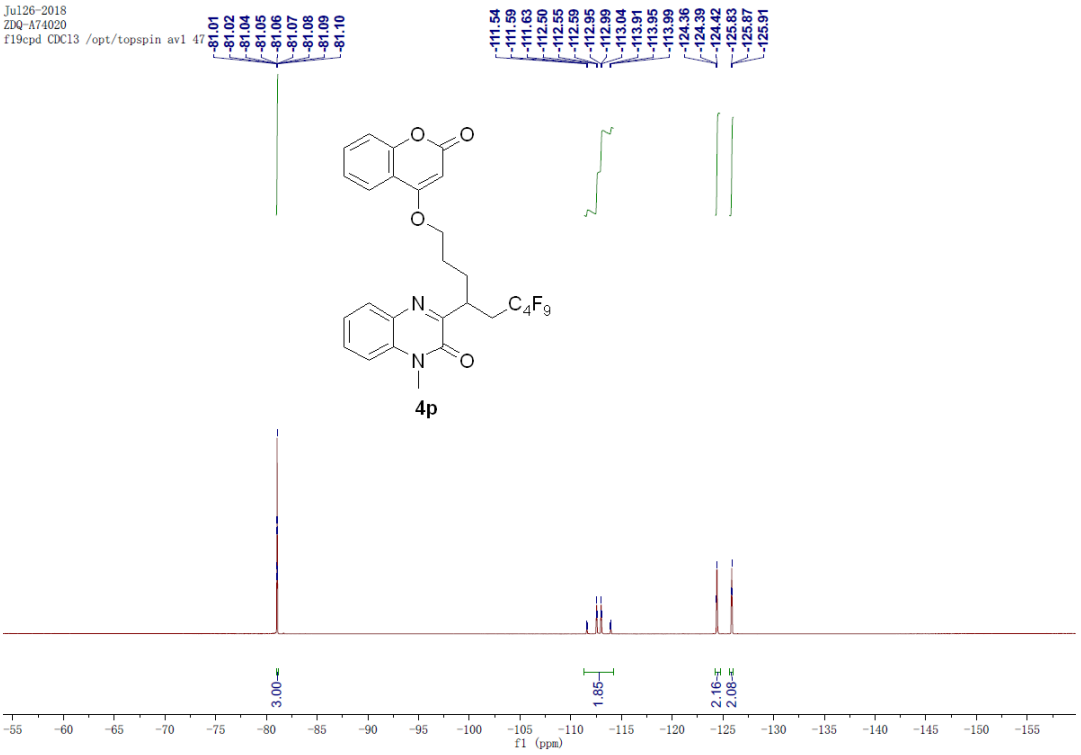

Jul26-2018
ZDQ-A74019
f19cpd CDCl3 /opt/topsp
-80.97
-80.98
-80.99
-81.01
-81.02
-81.03
-81.04
-81.05
-81.06
-111.62
-112.53
-112.57
-112.62
-112.82
-112.86
-112.91
-113.78
-113.82
-113.86
-124.34
-124.38
-124.41
-125.81
-125.85
-125.88
N
N
N
O
C4F9
3.00
1.80
2.12
2.02
-60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135 -140 -145 -150 -155 -160 -165
f1 (ppm)

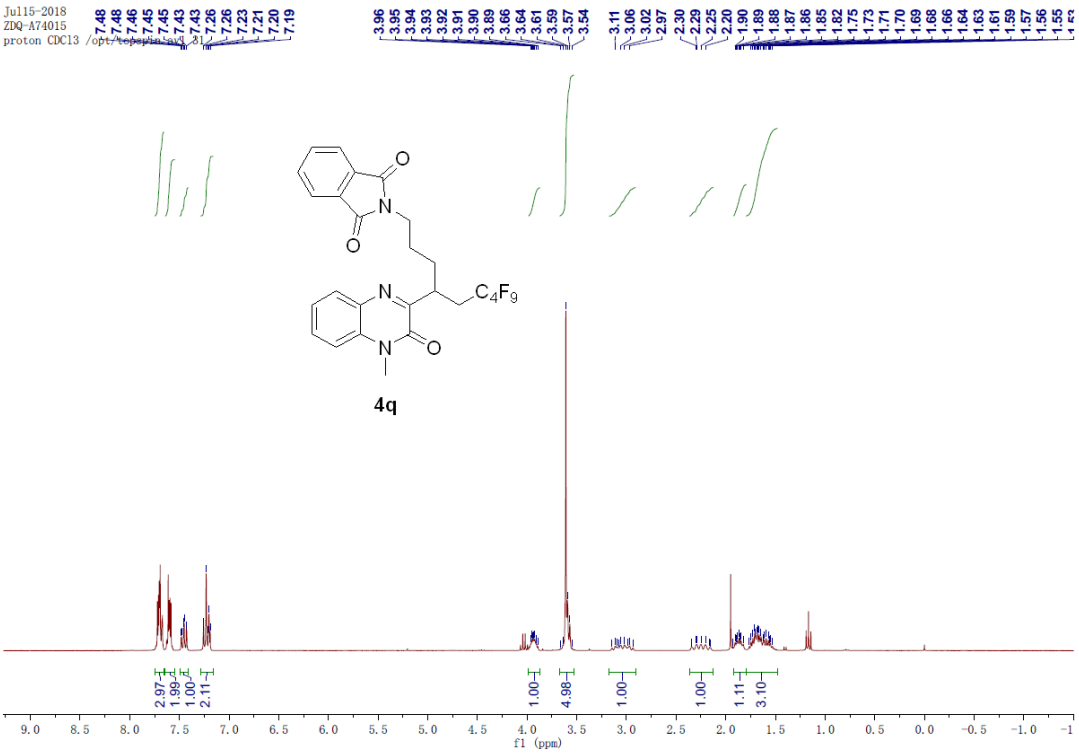
4o


O
O
O
N
N
O
C4F9
2.08
2.13
4.28
0.98
3.47
3.00
1.05
2.24
3.37
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)

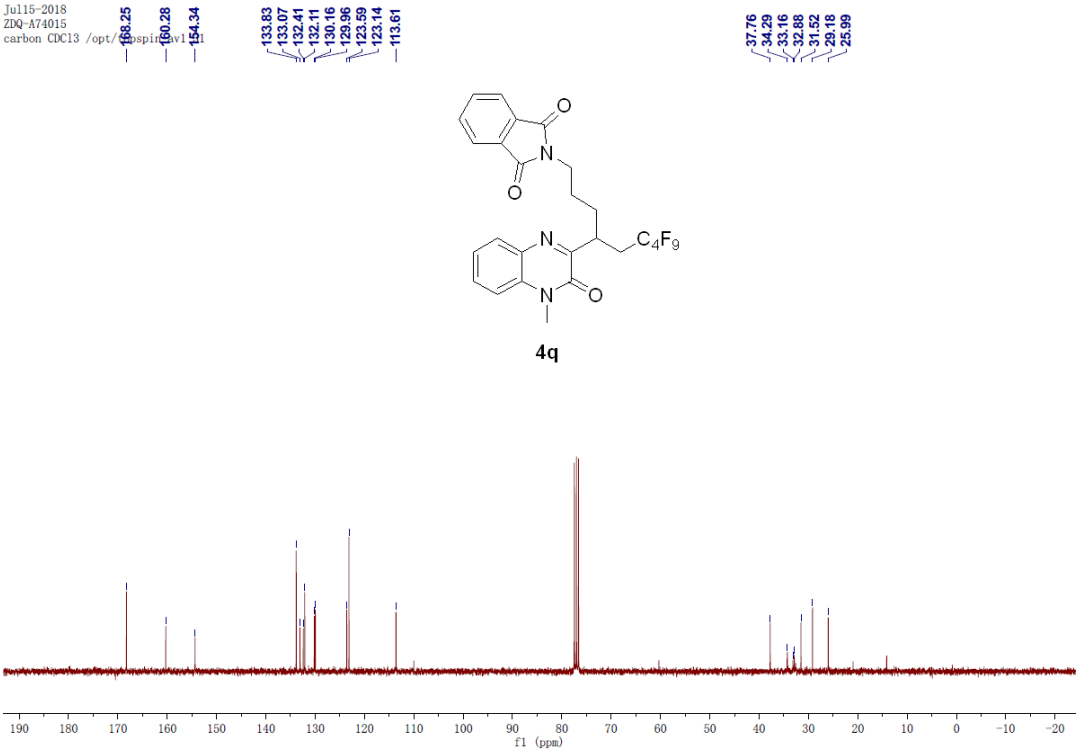
4p


Jul26-2018
ZDQ-A74020
carbon CDC13 /opt/topsp
165.40
162.73
160.14
154.36
153.30
133.02
132.37
132.29
130.43
129.93
123.79
122.99
116.68
115.63
113.68
90.43
68.64
34.30
33.33
33.05
32.78
30.27
29.21
25.95
O
O
O
N
C4F9
N
O
4p
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

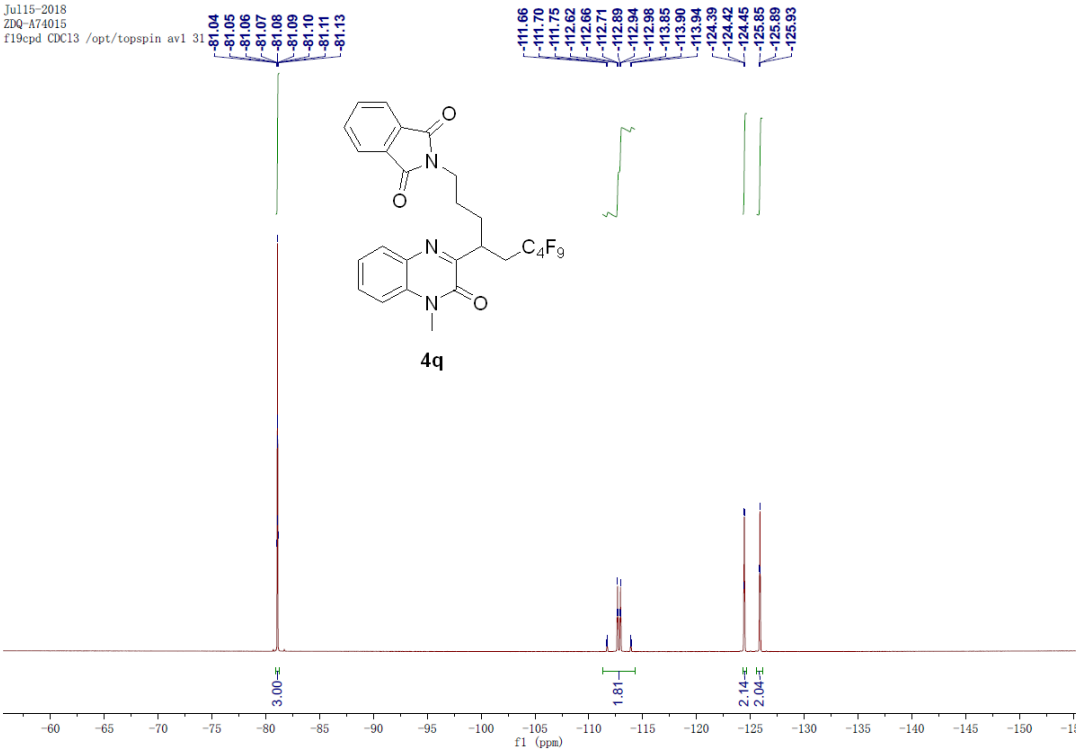

Jul26-2018
ZDQ-A74020
f19cpd CDC13 /opt/topspin av1 47
-81.01
-81.02
-81.04
-81.05
-81.06
-81.07
-81.08
-81.09
-81.10
-111.54
-111.59
-111.63
-112.50
-112.55
-112.59
-112.95
-112.99
-113.04
-113.91
-113.95
-113.99
-124.36
-124.39
-124.42
-125.83
-125.87
-125.91
O
O
O
N
C4F9
N
O
4p
3.00
1.85
2.16
2.08
-55
-60
-65
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
-145
-150
-155
f1 (ppm)


Jul15-2018
ZDQ-A74015
proton CDC13
7.48 7.48 7.46 7.45 7.45 7.43 7.43 7.26 7.26 7.23 7.21 7.20 7.19
3.96 3.95 3.94 3.93 3.92 3.91 3.90 3.89 3.66 3.64 3.61 3.59 3.57 3.54
3.11 3.06 3.02 2.97 2.30 2.29 2.25 2.20 1.90 1.89 1.88 1.87 1.86 1.85 1.82 1.75 1.73 1.71 1.70 1.69 1.68 1.66 1.64 1.63 1.61 1.59 1.57 1.56 1.55
O
N
O
N
C4F9
O
N
2.97 1.99 1.00 2.11 1.00 4.98 1.00 1.00 1.11 3.10
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 -1
f1 (ppm)

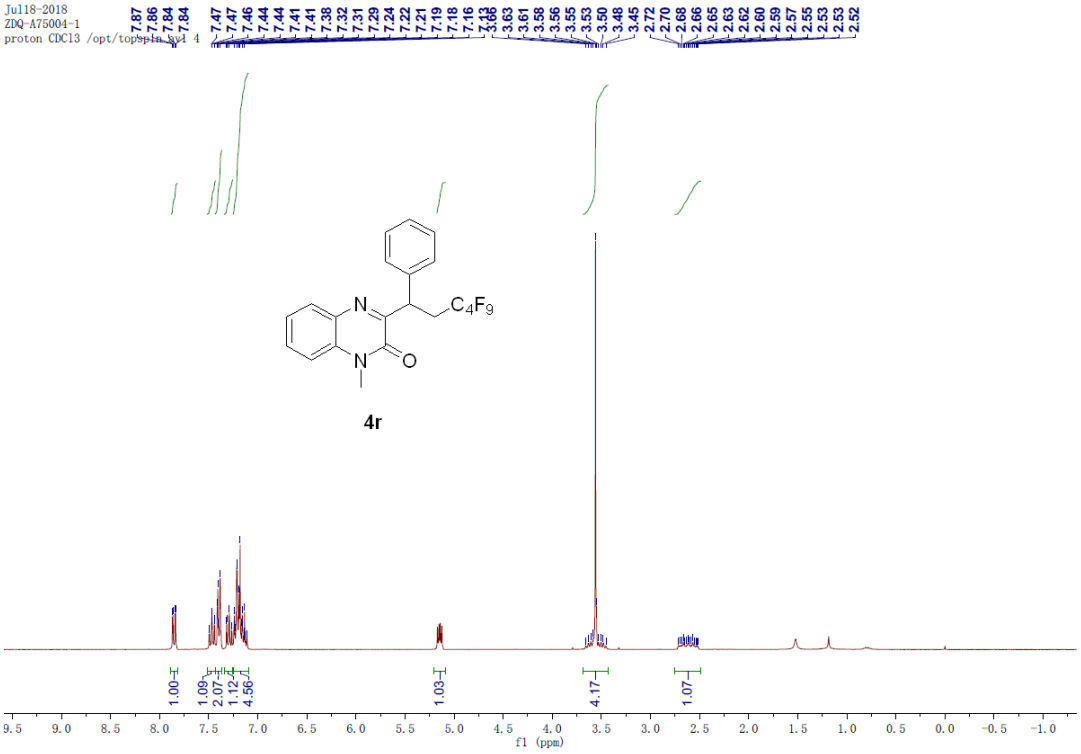
4q


Jul15-2018
ZDQ-A74015
carbon CDC13
168.25 160.28 154.34
133.83 133.07 132.41 132.11 130.16 129.96 123.59 123.14 113.61
37.76 34.29 33.16 32.88 31.52 29.18 25.99
O
N
O
N
C4F9
O
N
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20
f1 (ppm)

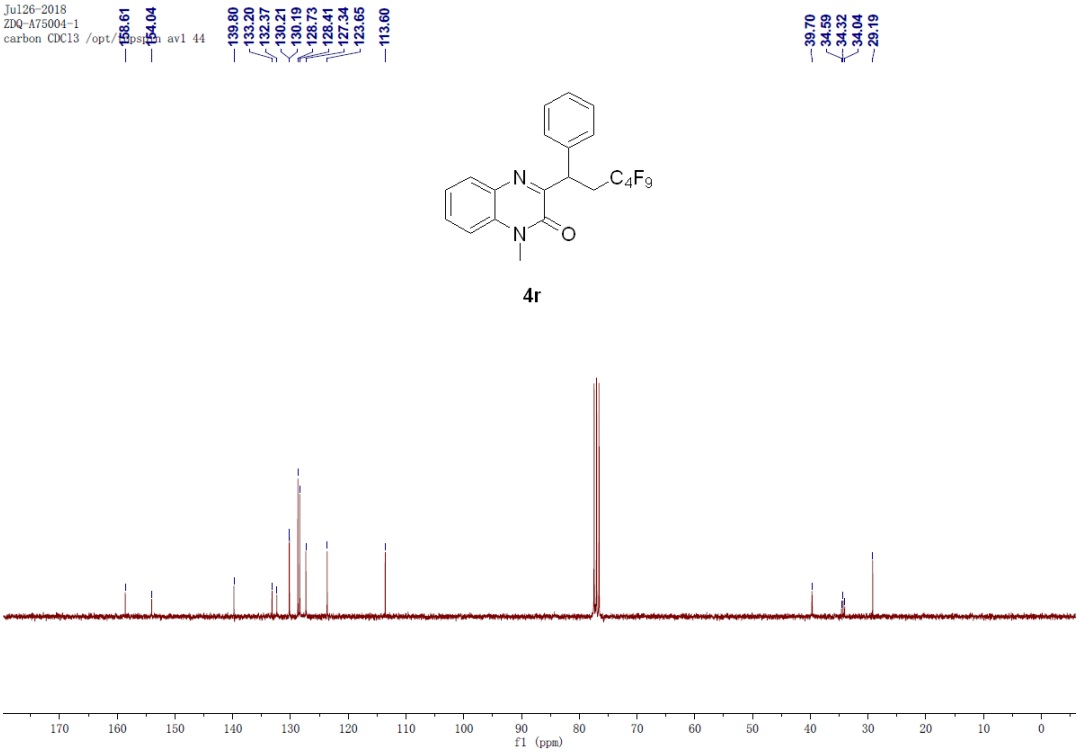
4q

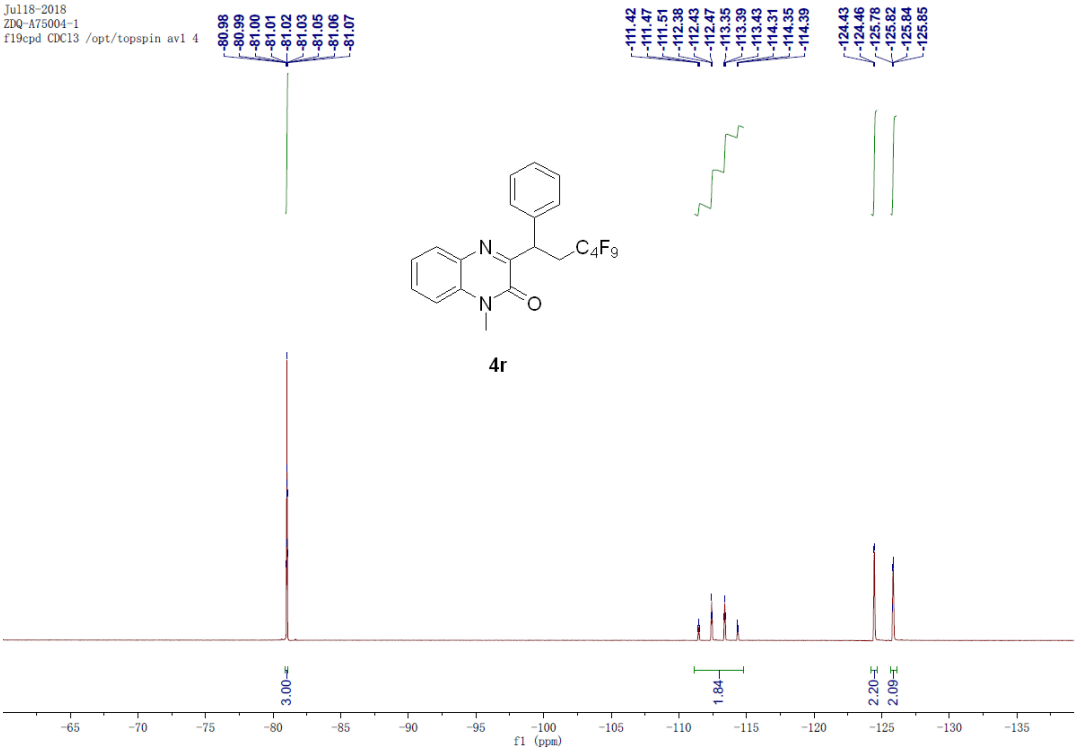

Jul15-2018
ZDQ-A74015
f19cpd CDCl3 /opt/topspin av1 31
-81.04
-81.05
-81.06
-81.07
-81.08
-81.09
-81.10
-81.11
-81.13
-111.66
-111.70
-111.75
-112.62
-112.66
-112.71
-112.89
-112.94
-112.98
-113.85
-113.90
-113.94
-124.39
-124.42
-124.45
-125.85
-125.89
-125.93
O
N
O
N
C4F9
O
N
3.00
1.81
2.14
2.04
−60 −65 −70 −75 −80 −85 −90 −95 −100 −105 −110 −115 −120 −125 −130 −135 −140 −145 −150
f1 (ppm)

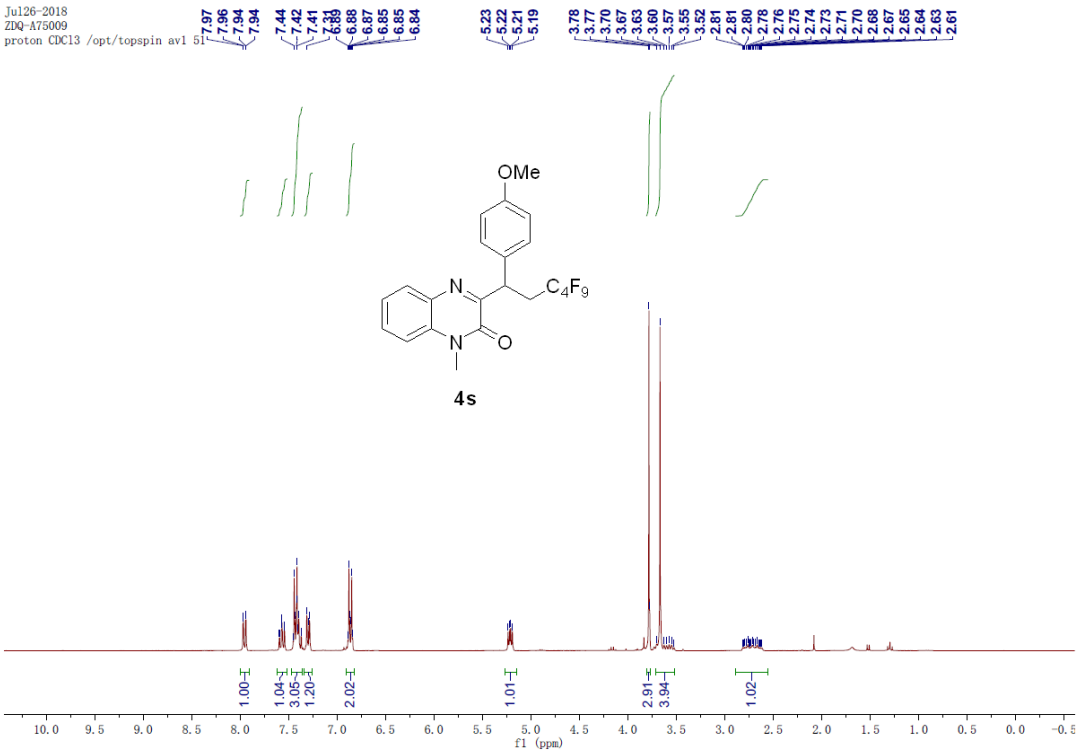
4q


Jul18-2018
ZDQ-A75004-1
proton CDCl3 /opt/topspin av1 4
7.87
7.86
7.84
7.84
7.47
7.47
7.46
7.44
7.44
7.41
7.41
7.38
7.32
7.31
7.29
7.24
7.22
7.21
7.19
7.18
7.16
7.13
3.66
3.63
3.61
3.58
3.56
3.55
3.53
3.50
3.48
3.45
2.72
2.70
2.68
2.66
2.65
2.63
2.62
2.60
2.59
2.57
2.55
2.53
2.53
2.52
N
C4F9
N
O
1.00
1.09
2.07
1.12
4.56
1.03
4.17
1.07
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)

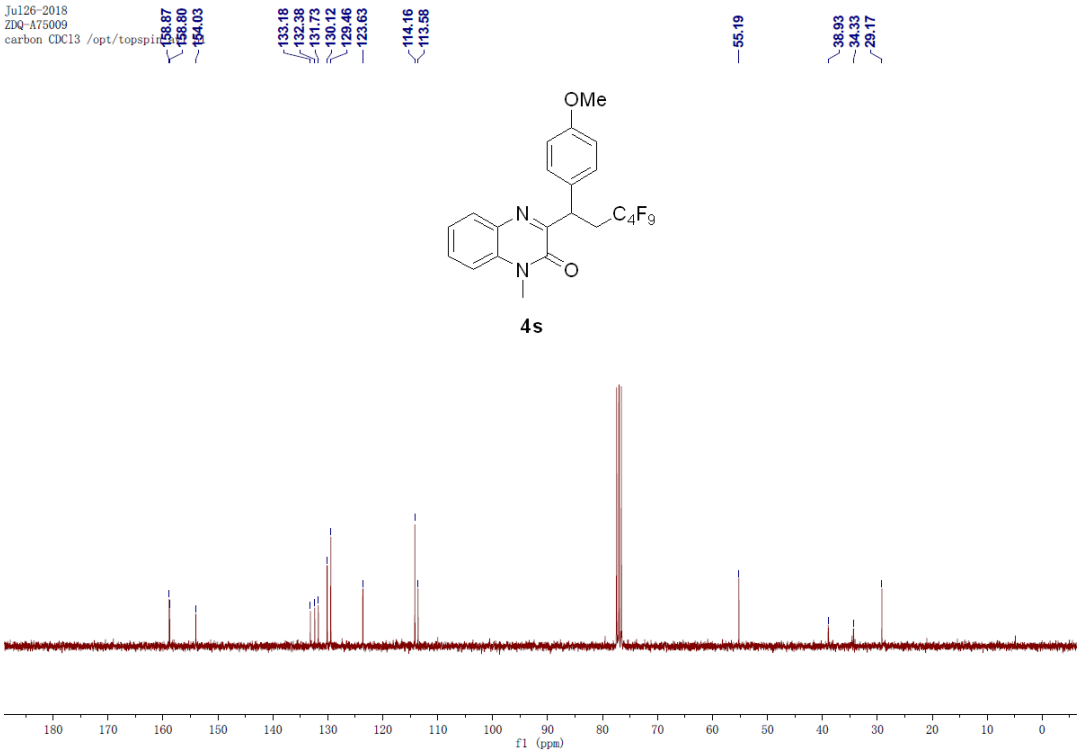
4r


Jul26-2018
ZDQ-A75004-1
carbon CDCl3 /opt/topspin avl 44
158.61
154.04
139.80
133.20
132.37
130.21
130.19
128.73
128.41
127.34
123.65
113.60
39.70
34.59
34.32
34.04
29.19
N
N
O
C4F9
4r
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

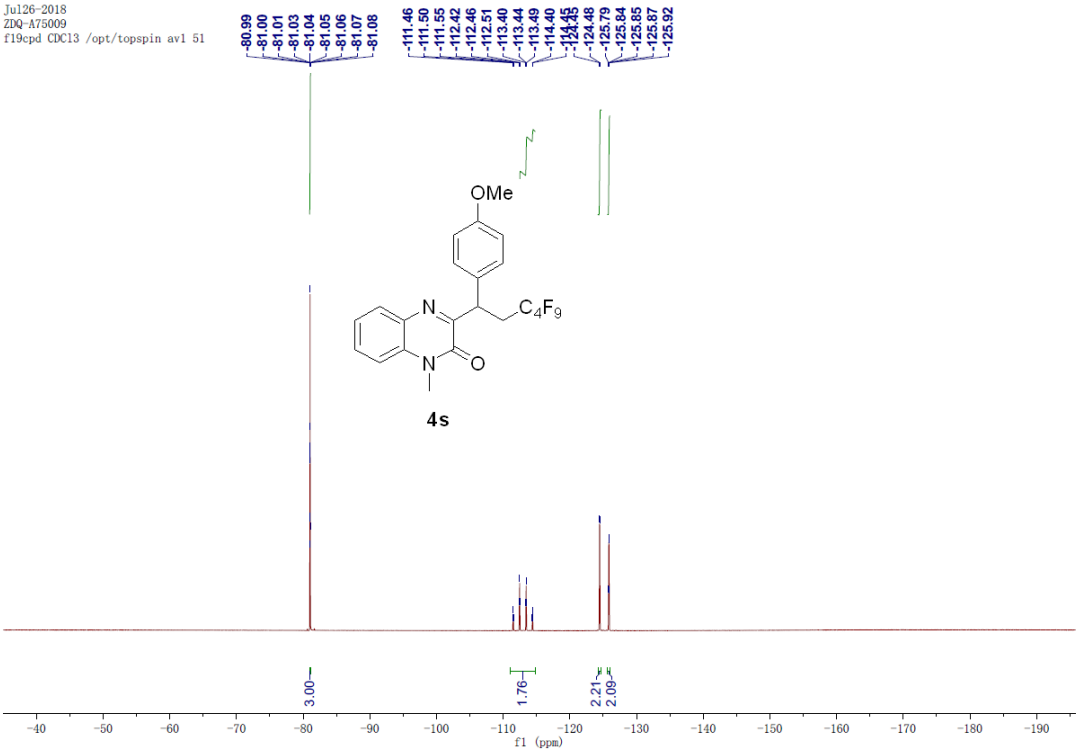

Jul18-2018
ZDQ-A75004-1
f19cpd CDCl3 /opt/topspin avl 4
-80.98
-80.99
-81.00
-81.01
-81.02
-81.03
-81.05
-81.06
-81.07
-111.42
-111.47
-111.51
-112.38
-112.43
-112.47
-113.35
-113.39
-113.43
-114.31
-114.35
-114.39
-124.43
-124.46
-125.78
-125.82
-125.84
-125.85
N
N
O
C4F9
4r
3.00
1.84
2.20
2.09
-65
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
f1 (ppm)

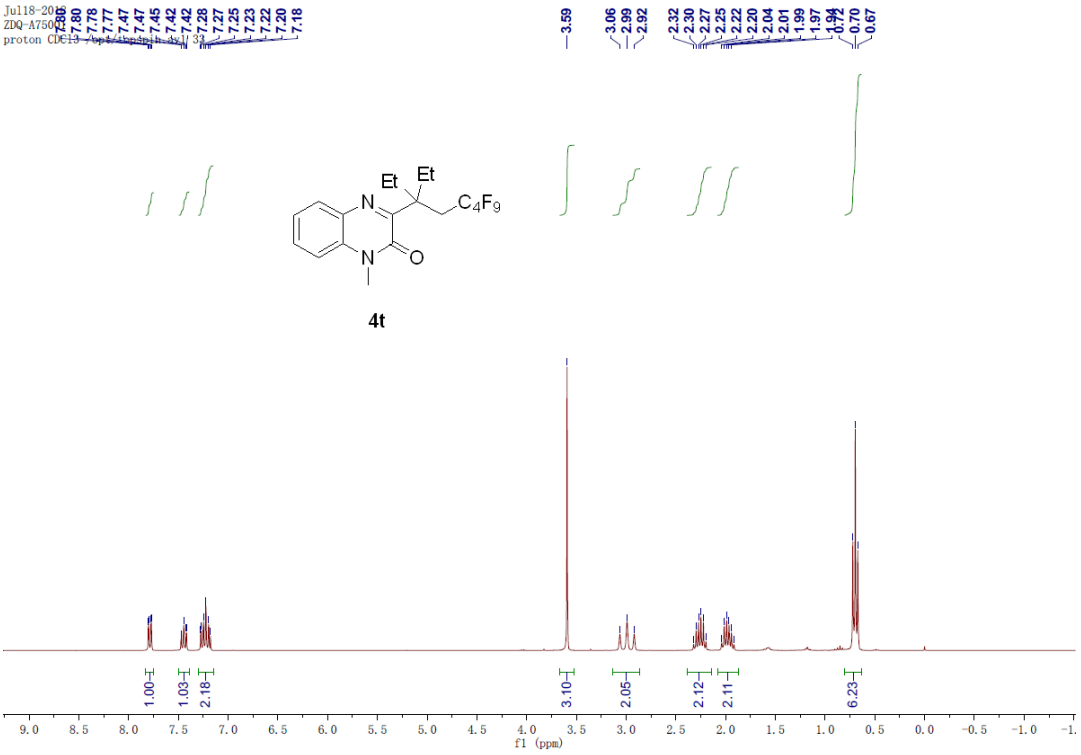

Jul26-2018
ZDQ-A75009
proton CDCl3 /opt/topspin avl 5l
7.97
7.96
7.94
7.94
7.44
7.42
7.41
7.31
6.89
6.88
6.87
6.85
6.85
6.84
5.23
5.22
5.21
5.19
3.78
3.77
3.70
3.67
3.63
3.60
3.57
3.55
3.52
2.81
2.80
2.78
2.76
2.75
2.74
2.73
2.71
2.70
2.68
2.67
2.65
2.64
2.63
2.61
OMe
N
C4F9
N
O
1.00
1.04
3.05
1.20
2.02
1.01
2.91
3.94
1.02
f1 (ppm)

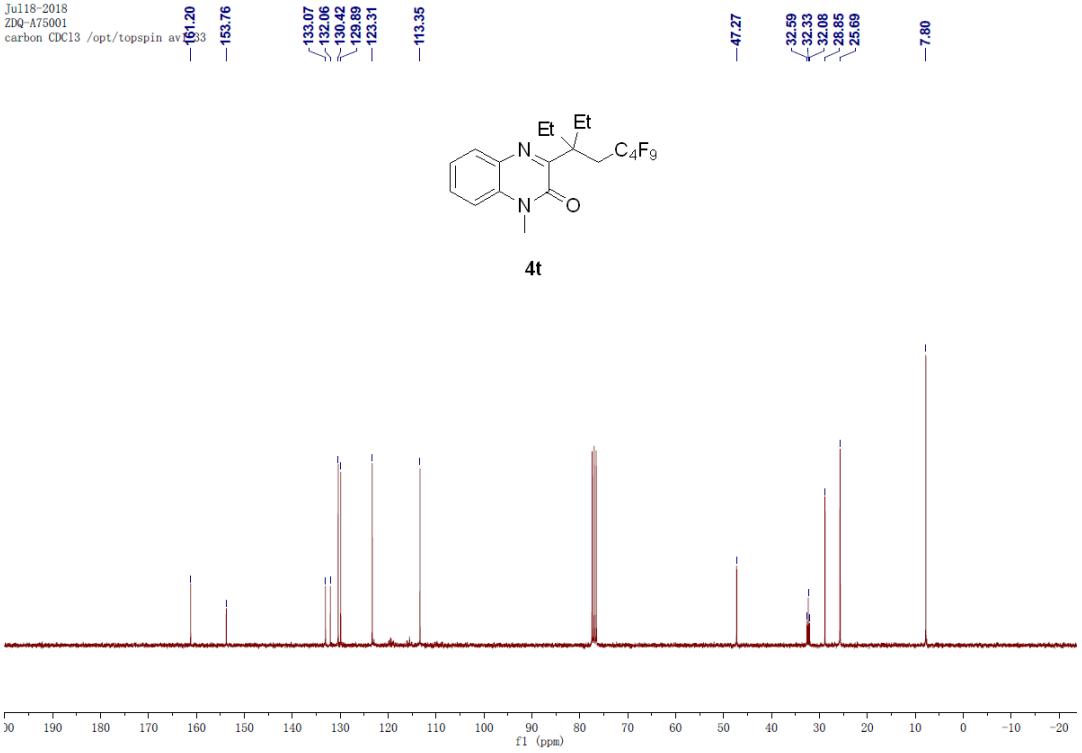
4s


Jul26-2018
ZDQ-A75009
carbon CDCl3 /opt/topspin
158.87
158.80
154.03
133.18
132.38
131.73
130.12
129.46
123.63
114.16
113.58
55.19
38.93
34.33
29.17
OMe
N
C4F9
N
O
f1 (ppm)

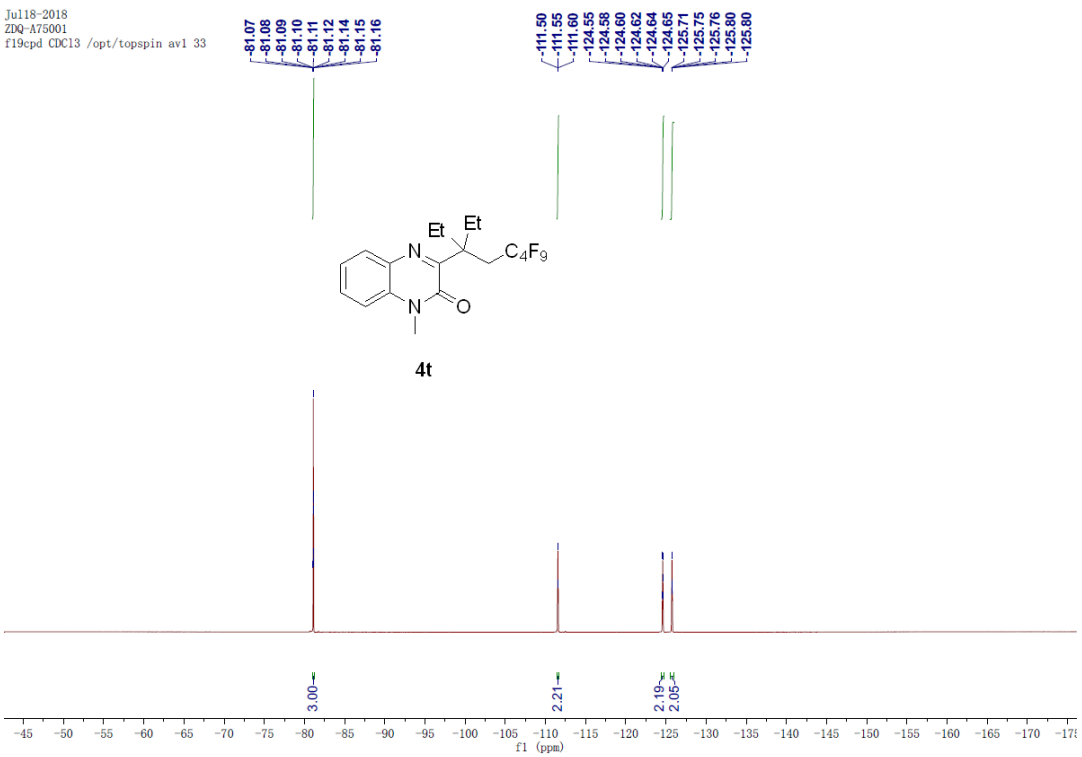
4s


Jul26-2018
ZDQ-A75009
f19cpd CDCl3 /opt/topspin av1 51
OMe
N
C4F9
N
O
4s
f1 (ppm)

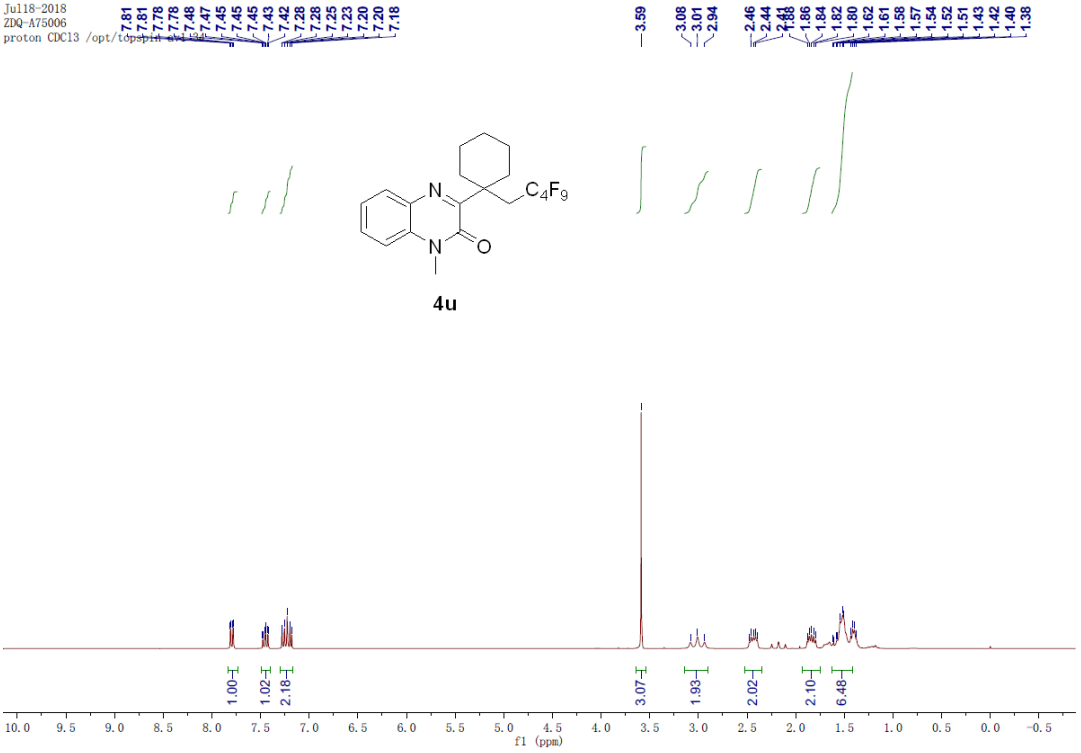

Et
Et
N
C4F9
N
O
4t
f1 (ppm)


Jul18-2018
ZDQ-A75001
carbon CDCl3 /opt/topspin av1 33
161.20
153.76
133.07
132.06
130.42
129.89
123.31
113.35
47.27
32.59
32.33
32.08
28.85
25.69
7.80
Et
Et
N
N
O
C4F9
f1 (ppm)

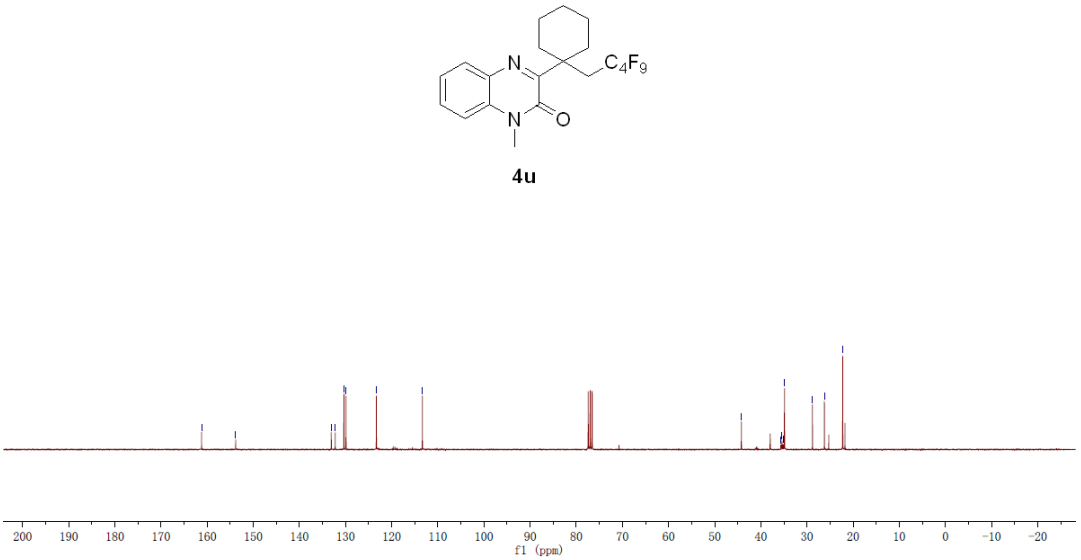
4t


Jul18-2018
ZDQ-A75001
f19cpd CDCl3 /opt/topspin av1 33
-81.07
-81.08
-81.09
-81.10
-81.11
-81.12
-81.14
-81.15
-81.16
-111.50
-111.55
-111.60
-124.55
-124.58
-124.60
-124.62
-124.64
-124.65
-125.71
-125.75
-125.76
-125.80
-125.80
Et
Et
N
N
O
C4F9
3.00
2.21
2.19
2.05
f1 (ppm)

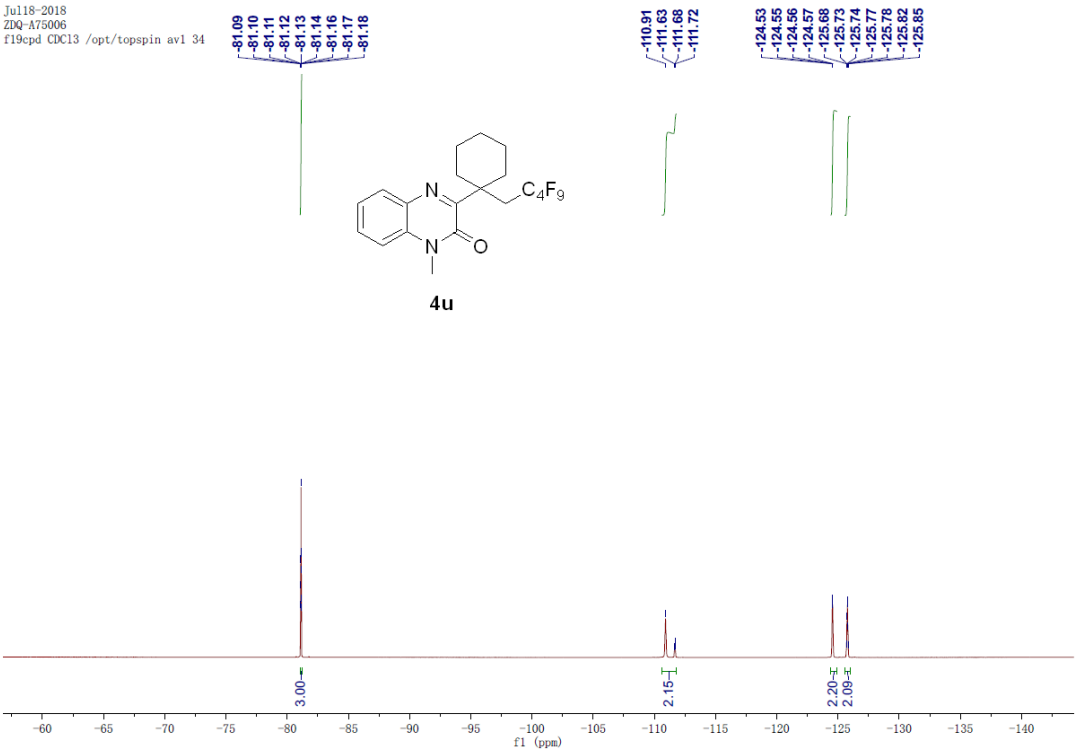
4t


Jul18-2018
ZDQ-A75006
proton CDCl3 /opt/topspin av1 dat
7.81 7.81 7.78 7.78 7.48 7.47 7.45 7.45 7.43 7.42 7.28 7.25 7.23 7.20 7.20 7.18
3.59 3.08 3.01 2.94 2.46 2.44 1.86 1.84 1.82 1.80 1.62 1.61 1.58 1.57 1.54 1.52 1.51 1.43 1.42 1.40 1.38
N
N
O
C4F9
1.00 1.02 2.18 3.07 1.93 2.02 2.10 6.48
f1 (ppm)

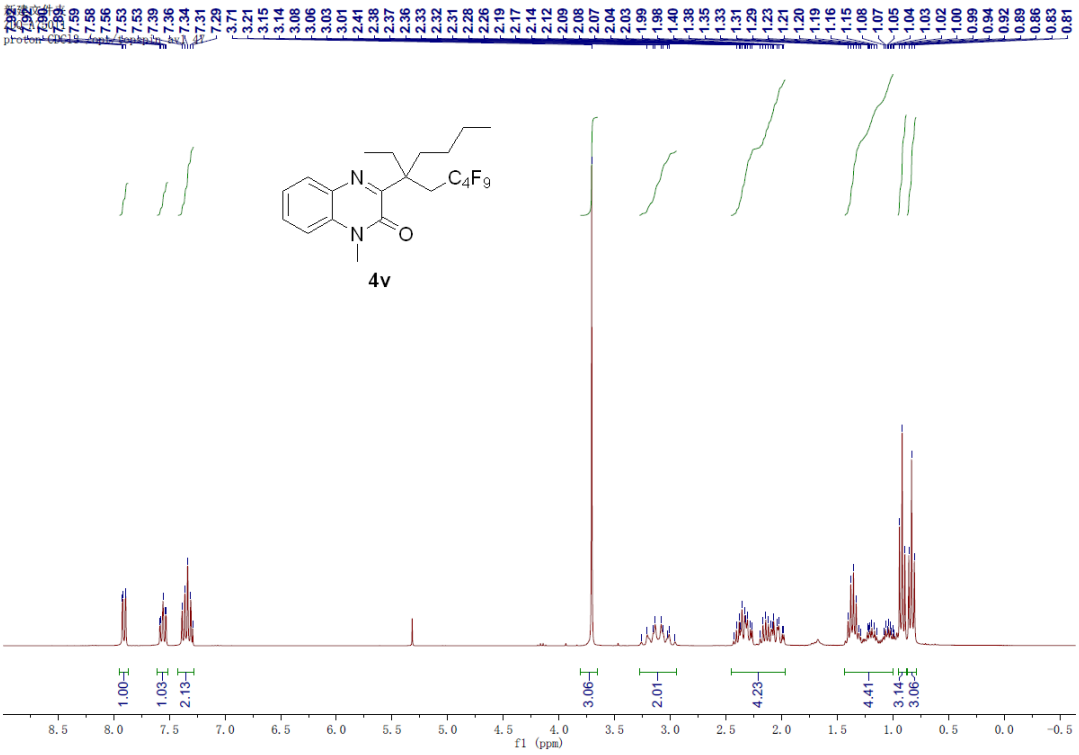
4u


Jul18-2018
ZDQ-A75006
carbon CDCl3 /opt/topspin av1
161.20 153.82 133.10 132.24 130.36 129.91 123.33 113.35 44.22 35.67 35.41 35.15 34.87 28.82 26.23 22.26
N
N
O
C4F9
f1 (ppm)

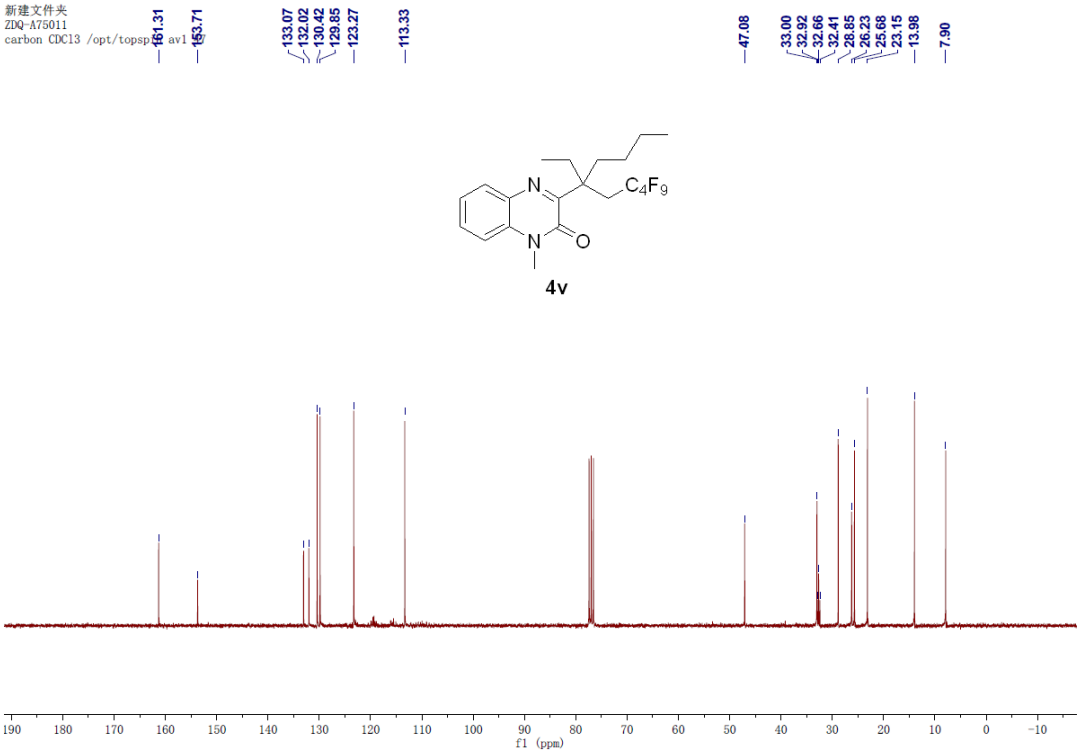
4u

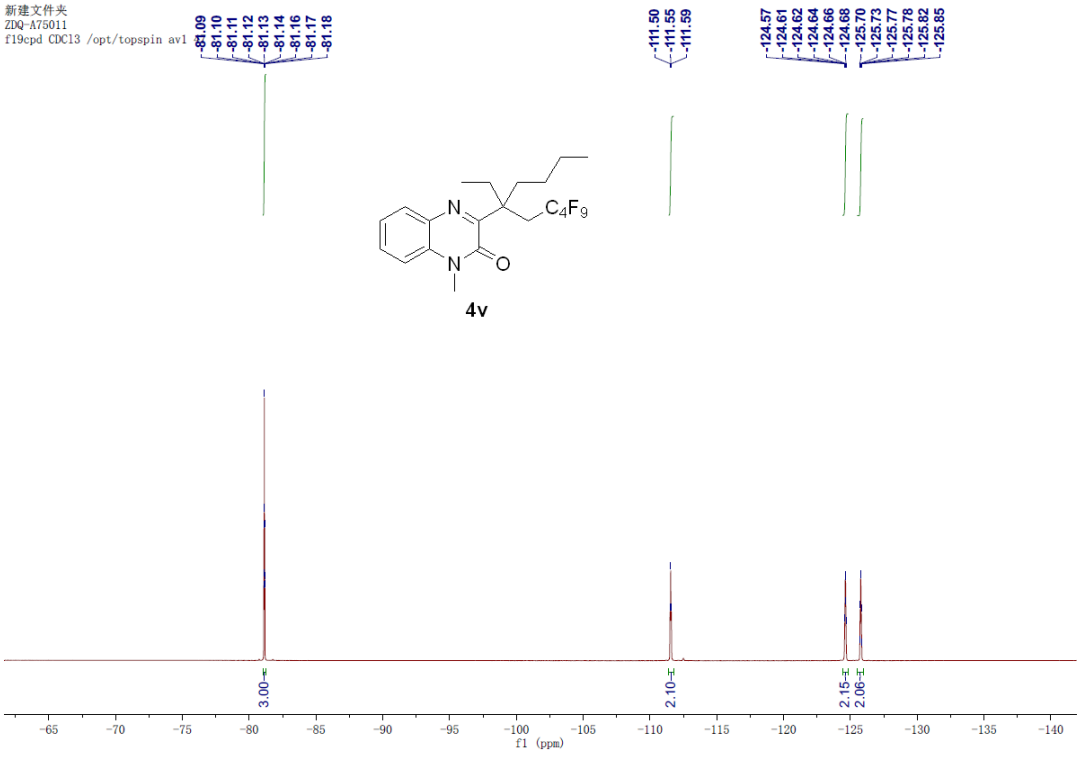

Jul18-2018
ZDQ-A75006
f19cpd CDCl3 /opt/topspin av1 34
-81.09
-81.10
-81.11
-81.12
-81.13
-81.14
-81.16
-81.17
-81.18
-110.91
-111.63
-111.68
-111.72
-124.53
-124.55
-124.56
-124.57
-125.68
-125.73
-125.74
-125.77
-125.78
-125.82
-125.85
N
N
O
C4F9
3.00
2.15
2.20
2.09
f1 (ppm)

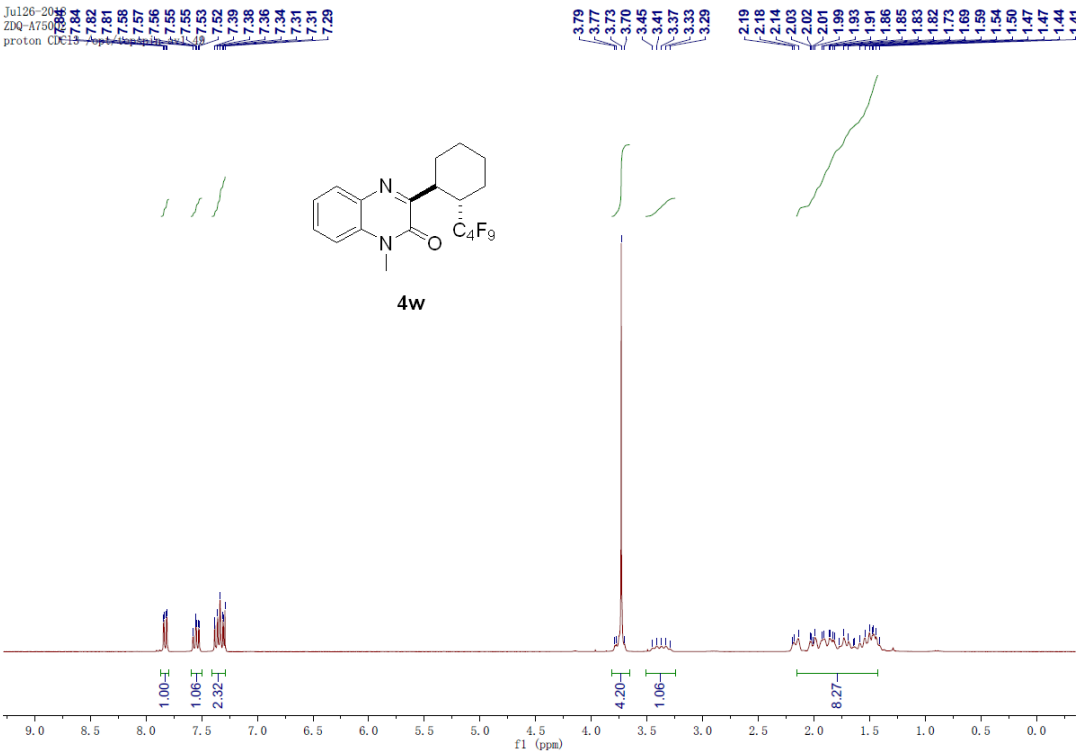
4u

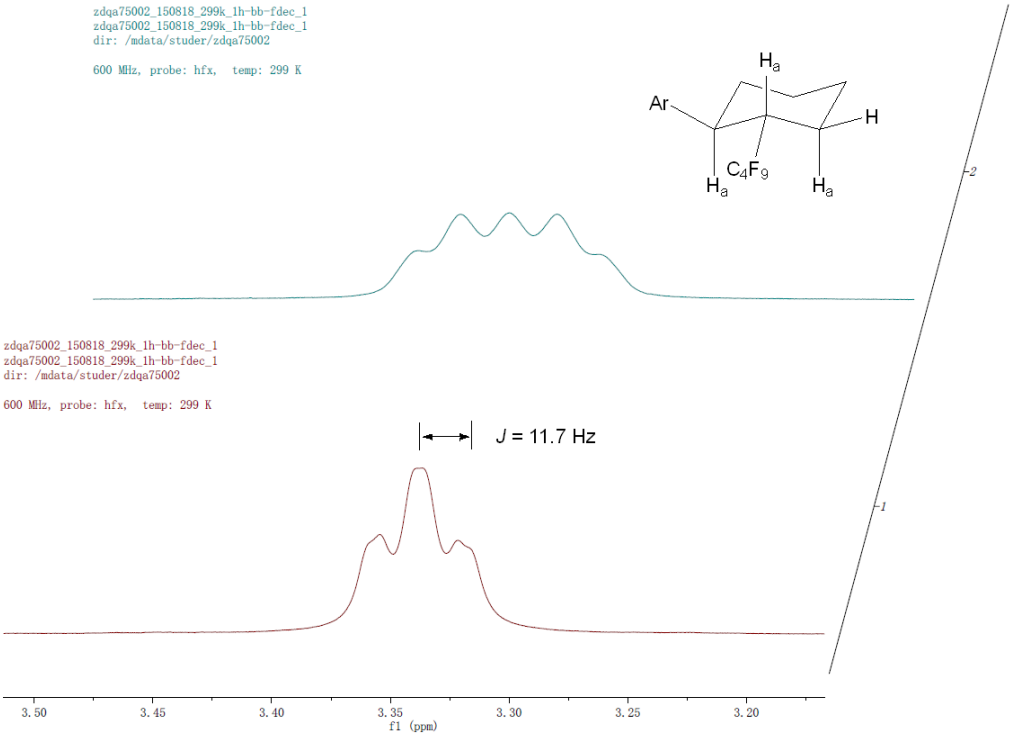

7.59
7.58
7.56
7.53
7.53
7.39
7.36
7.34
7.31
7.29
3.71
3.21
3.15
3.14
3.08
3.06
3.03
3.01
2.41
2.38
2.37
2.36
2.33
2.32
2.31
2.28
2.26
2.19
2.17
2.14
2.12
2.09
2.08
2.07
2.04
2.03
2.00
1.99
1.98
1.40
1.38
1.35
1.33
1.31
1.29
1.23
1.21
1.20
1.19
1.16
1.15
1.08
1.07
1.05
1.04
1.03
1.02
1.00
0.99
0.94
0.92
0.89
0.86
0.83
0.81
N
N
O
C4F9
1.00
1.03
2.13
3.06
2.01
4.23
4.41
3.14
3.06
f1 (ppm)

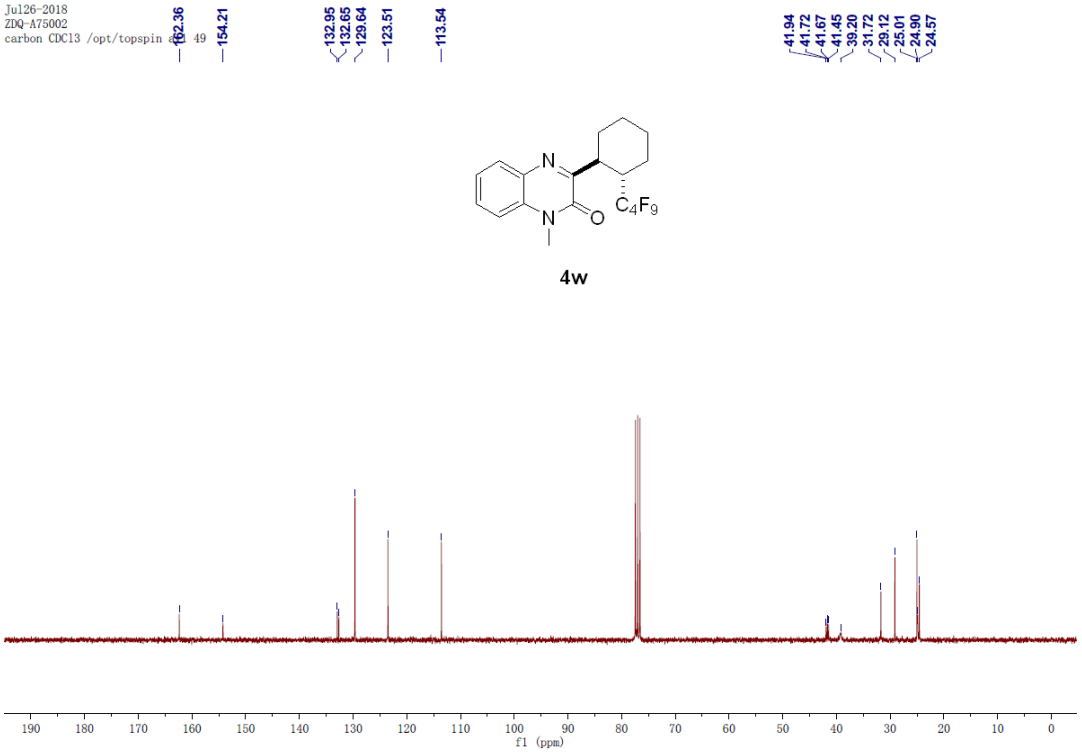
4v

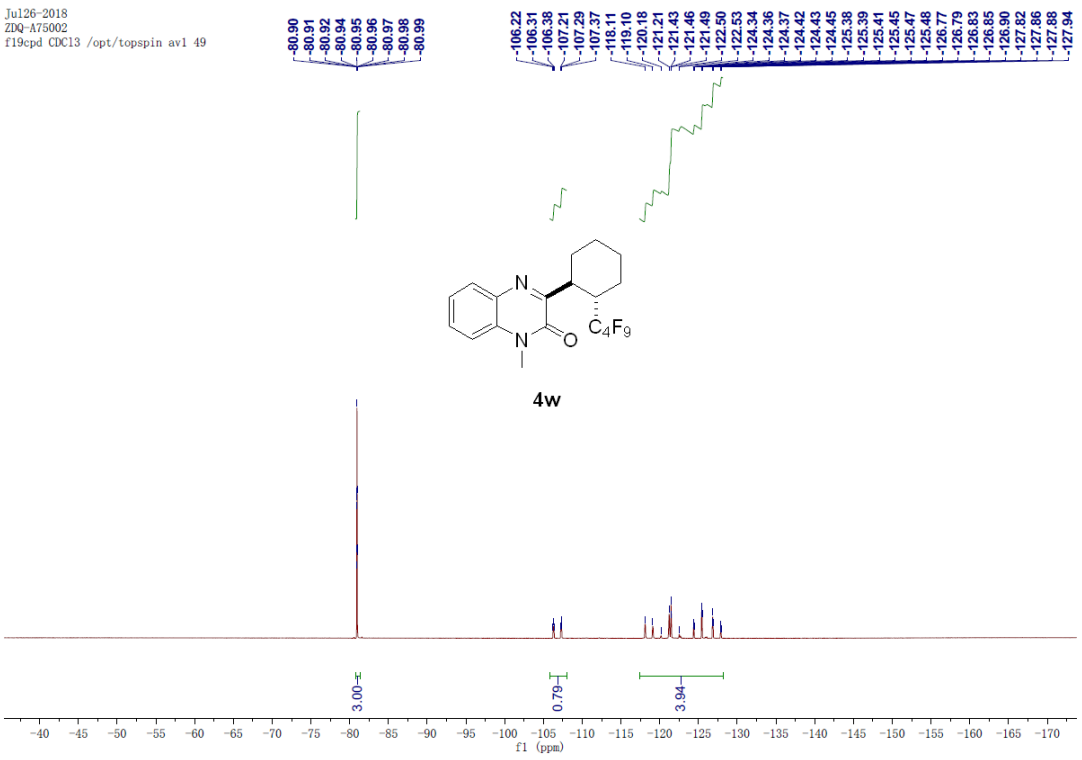

新建文件夹
ZDQ-A75011
carbon CDC13 /opt/topspin av1
161.31
153.71
133.07
132.02
130.42
129.85
123.27
113.33
47.08
33.00
32.92
32.66
32.41
28.85
26.23
25.68
23.15
13.98
7.90
N
N
O
C4F9
4v
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

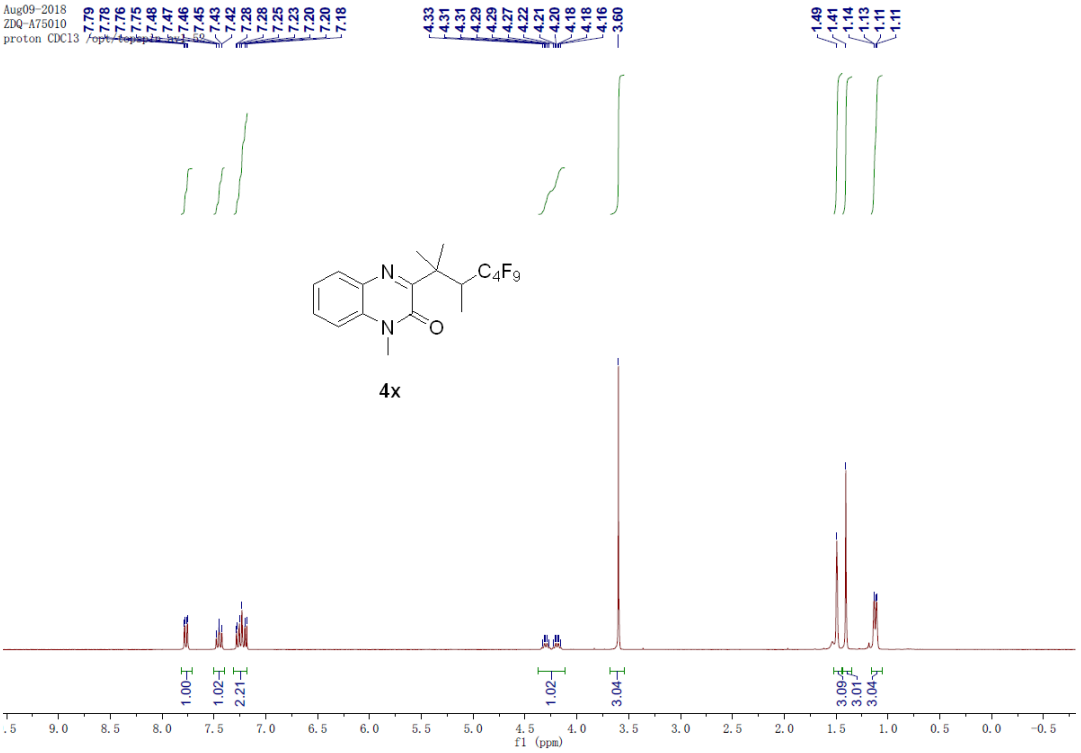

新建文件夹
ZDQ-A75011
f19cpd CDC13 /opt/topspin av1
-81.09
-81.10
-81.11
-81.12
-81.13
-81.14
-81.16
-81.17
-81.18
-111.50
-111.55
-111.59
-124.57
-124.61
-124.62
-124.64
-124.66
-124.68
-125.70
-125.73
-125.77
-125.78
-125.82
-125.85
N
N
O
C4F9
4v
3.00
2.10
2.15
2.06
-65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135 -140
f1 (ppm)


4w
1.00
1.06
2.32
4.20
1.06
8.27
f1 (ppm)

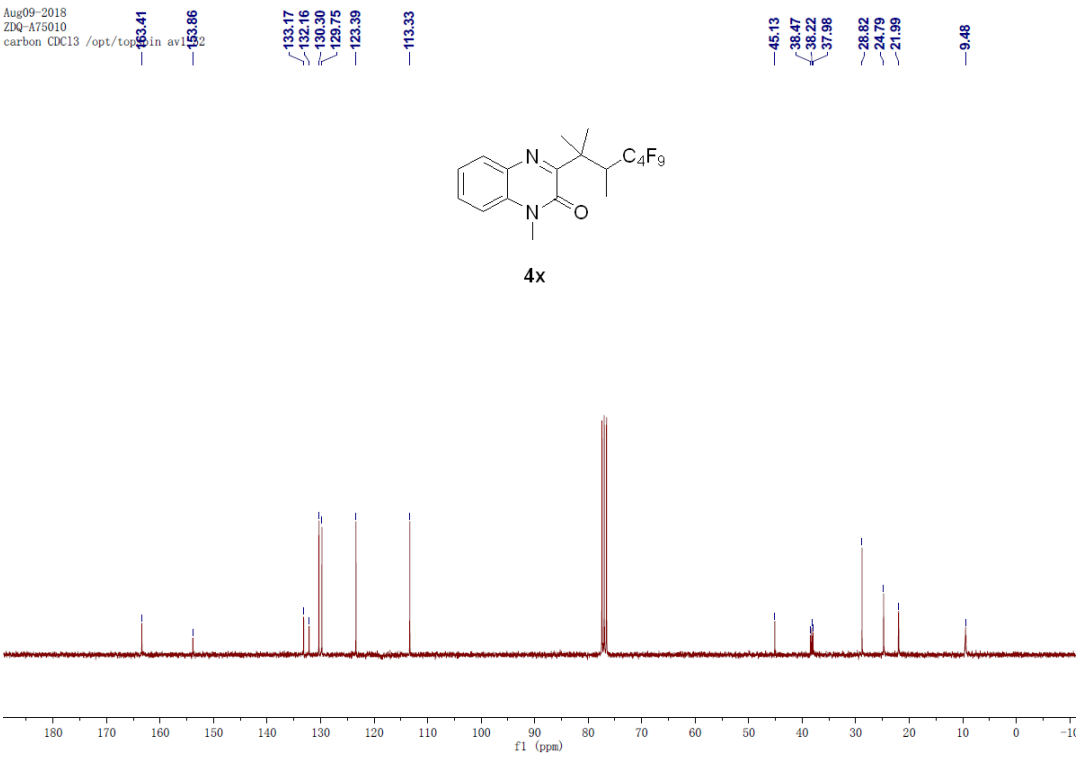

zdqa75002_150818_299k_1h-bb-fdec_1
zdqa75002_150818_299k_1h-bb-fdec_1
dir: /mdata/studer/zdqa75002
600 MHz, probe: hfx, temp: 299 K
Ar
H
J = 11.7 Hz
f1 (ppm)


Jul26-2018
ZDQ-A75002
carbon CDCl3 /opt/topspin
49
162.36
154.21
132.95
132.65
129.64
123.51
113.54
41.94
41.72
41.67
41.45
39.20
31.72
29.12
25.01
24.90
24.57
N
N
O
C4F9
4w
f1 (ppm)

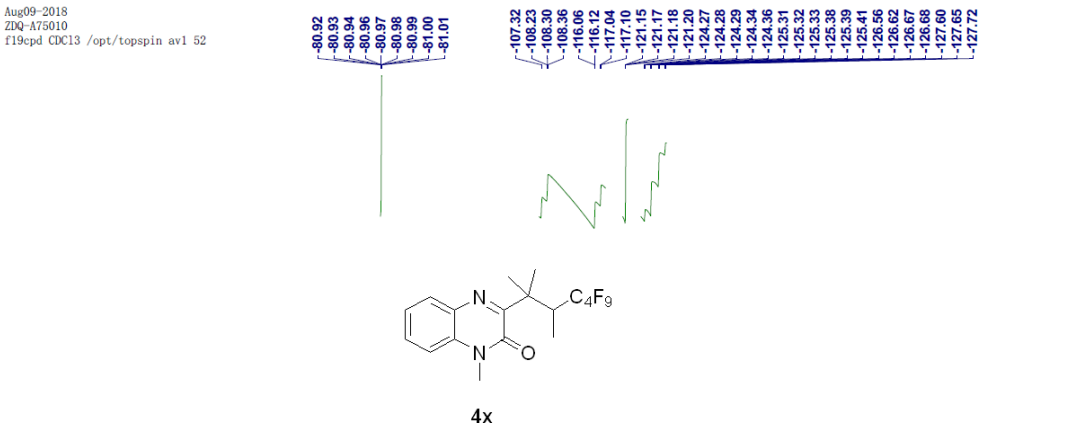

Jul26-2018
ZDQ-A75002
f19cpd CDCl3 /opt/topspin av1
49
-80.90
-80.91
-80.92
-80.94
-80.95
-80.96
-80.97
-80.98
-80.99
-106.22
-106.31
-106.38
-107.21
-107.29
-107.37
-118.11
-119.10
-120.18
-121.21
-121.43
-121.46
-121.49
-122.50
-122.53
-124.34
-124.36
-124.37
-124.42
-124.43
-124.45
-125.38
-125.39
-125.41
-125.45
-125.47
-125.48
-126.77
-126.79
-126.83
-126.85
-126.90
-127.82
-127.86
-127.88
-127.94
N
N
O
C4F9
4w
3.00
0.79
3.94
f1 (ppm)


Aug09-2018
ZDQ-A75010
proton CDC13
7.79
7.78
7.76
7.75
7.48
7.47
7.46
7.45
7.43
7.42
7.28
7.25
7.23
7.20
7.18
4.33
4.31
4.29
4.27
4.22
4.21
4.20
4.18
4.16
3.60
1.49
1.41
1.14
1.13
1.11
1.11
N
C4F9
N
O
1.00
1.02
2.21
1.02
3.04
3.09
3.01
3.04
f1 (ppm)

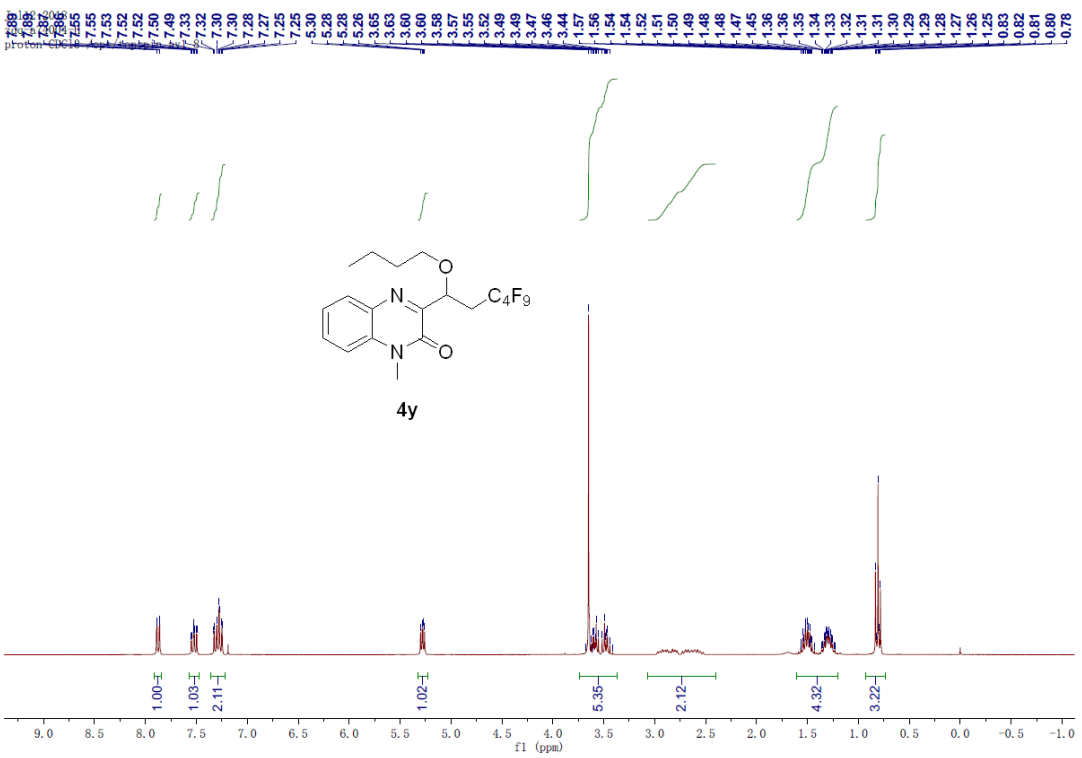
4x


Aug09-2018
ZDQ-A75010
carbon CDC13 /opt/top
163.41
153.86
133.17
132.16
130.30
129.75
123.39
113.33
45.13
38.47
38.22
37.98
28.82
24.79
21.99
9.48
N
C4F9
N
O
f1 (ppm)

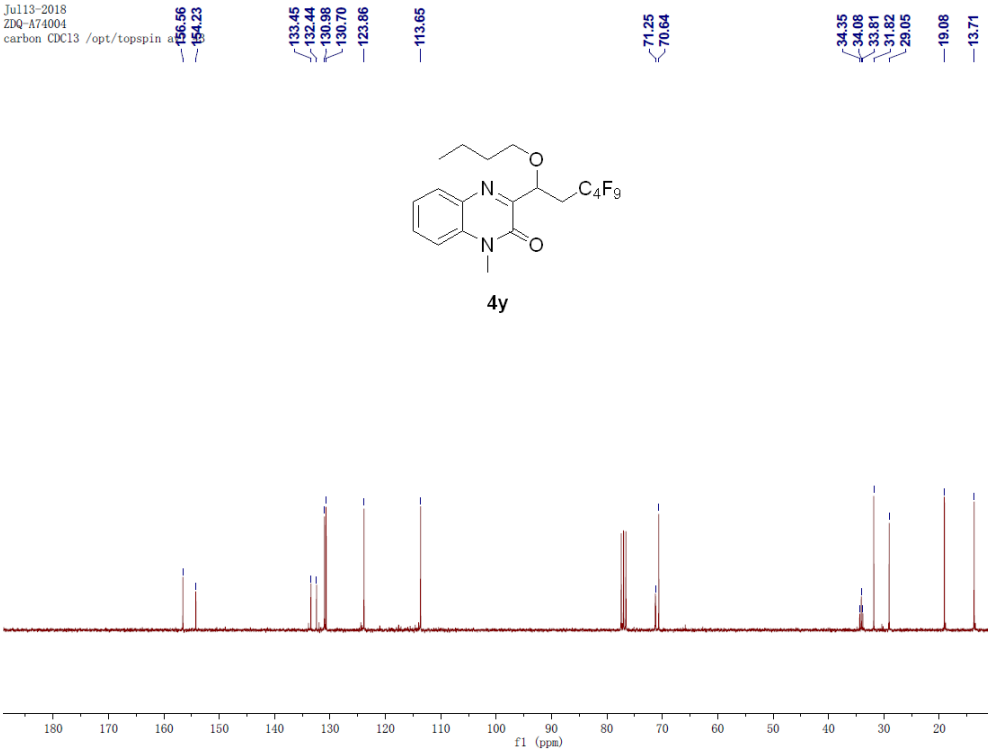
4x


Aug09-2018
ZDQ-A75010
f19cpd CDCl3 /opt/topspin av1 52
-80.92
-80.93
-80.94
-80.96
-80.97
-80.98
-80.99
-81.00
-81.01
-107.32
-108.23
-108.30
-108.36
-116.06
-116.12
-117.04
-117.10
-121.15
-121.17
-121.18
-121.20
-124.27
-124.28
-124.29
-124.34
-124.36
-125.31
-125.32
-125.33
-125.38
-125.39
-125.41
-126.56
-126.62
-126.67
-126.68
-127.60
-127.65
-127.72
N
N
O
C4F9
3.00
0.61
2.09
1.57
f1 (ppm)

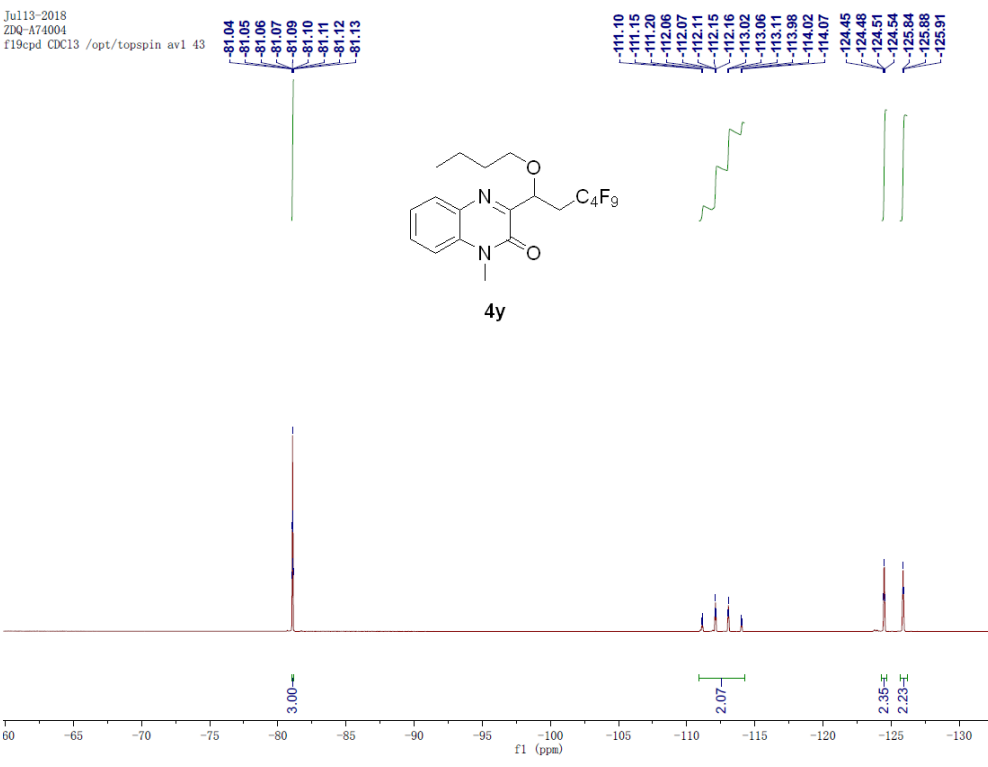
4x


7.55
7.53
7.52
7.52
7.50
7.49
7.33
7.32
7.30
7.30
7.28
7.27
7.25
7.25
5.30
5.28
5.28
5.26
3.65
3.63
3.60
3.60
3.58
3.57
3.55
3.52
3.49
3.49
3.47
3.46
3.44
1.57
1.56
1.54
1.54
1.52
1.51
1.50
1.49
1.48
1.48
1.47
1.45
1.36
1.36
1.35
1.34
1.33
1.32
1.31
1.31
1.30
1.29
1.29
1.28
1.27
1.26
1.25
0.83
0.82
0.81
0.80
0.78
O
N
N
O
C4F9
1.00
1.03
2.11
1.02
5.35
2.12
4.32
3.22
f1 (ppm)

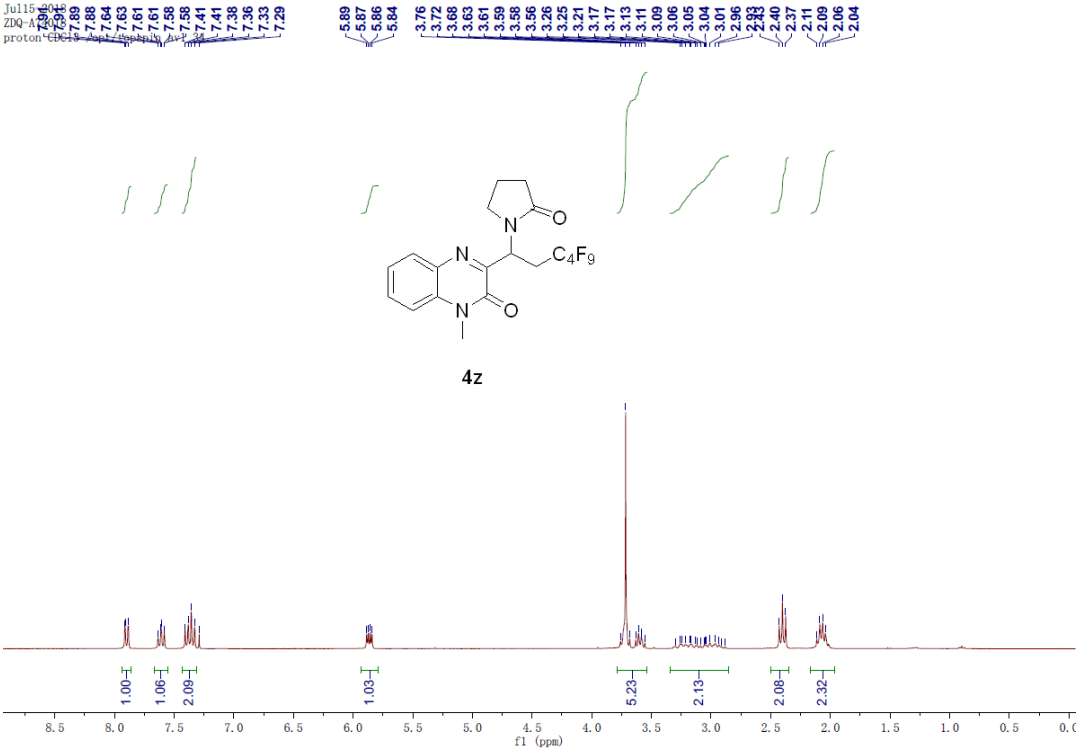
4y


Jul13-2018
ZDQ-A74004
carbon CDCl3 /opt/topspin a
156.56
154.23
133.45
132.44
130.98
130.70
123.86
113.65
71.25
70.64
34.35
34.08
33.81
31.82
29.05
19.08
13.71
O
N
C4F9
N
O
f1 (ppm)

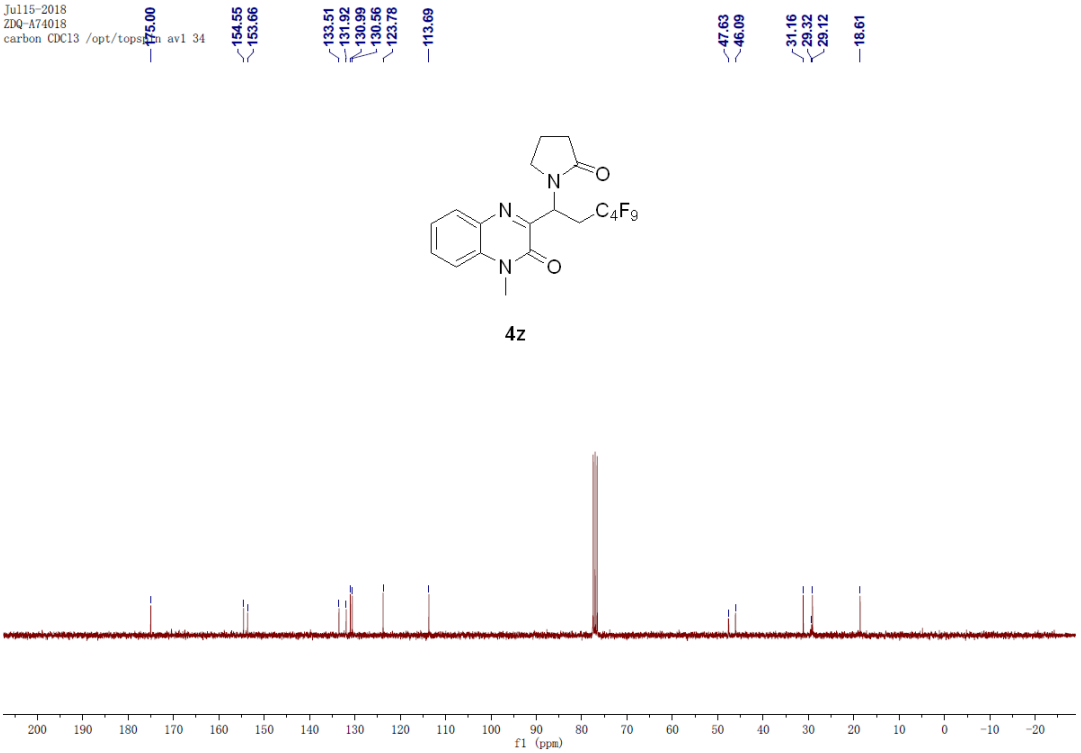
4y


Jul13-2018
ZDQ-A74004
f19cpd CDCl3 /opt/topspin av1 43
-81.04
-81.05
-81.06
-81.07
-81.09
-81.10
-81.11
-81.12
-81.13
-111.10
-111.15
-111.20
-112.06
-112.07
-112.11
-112.15
-112.16
-113.02
-113.06
-113.11
-113.98
-114.02
-114.07
-124.45
-124.48
-124.51
-124.54
-125.84
-125.88
-125.91
O
N
C4F9
N
O
3.00
2.07
2.35
2.23
f1 (ppm)

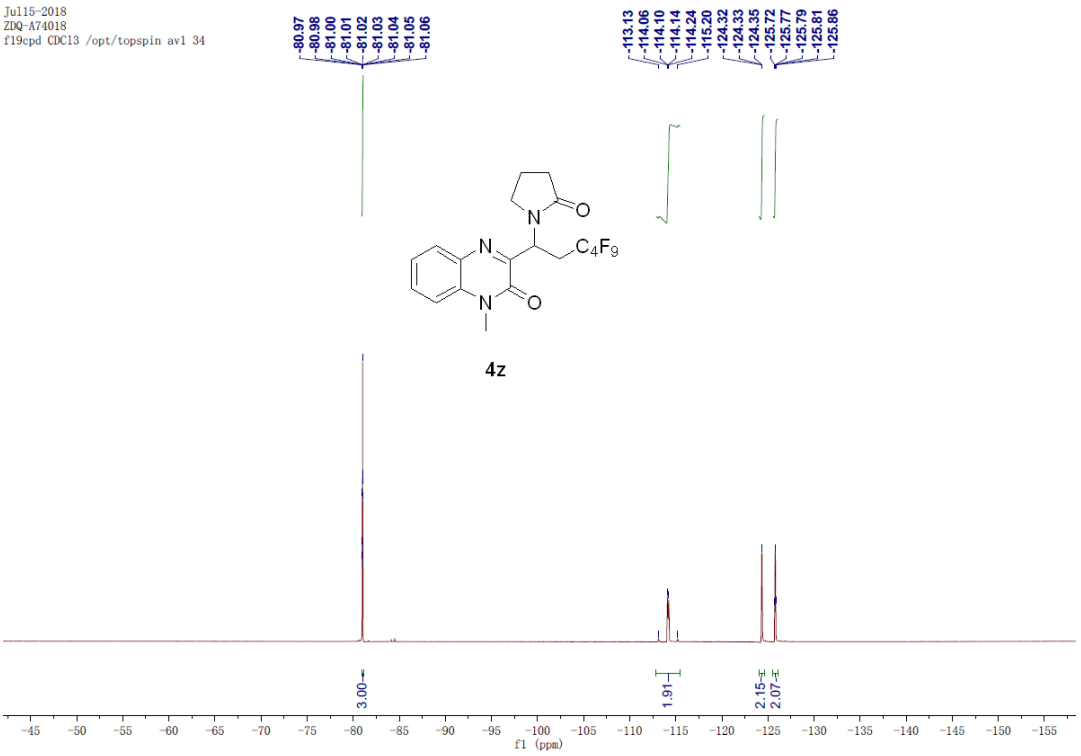
4y

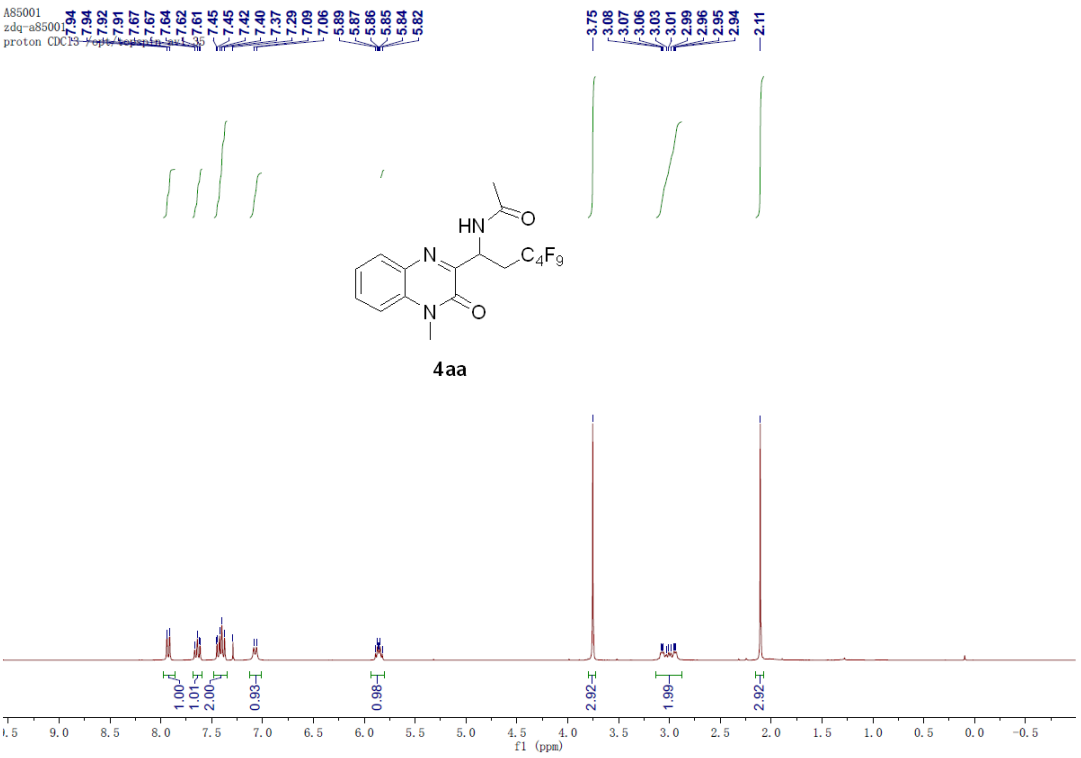

Jul15-2018
ZDQ-A74018
proton CDCl3 /opt/topspin av1 34
7.94
7.89
7.88
7.64
7.63
7.61
7.61
7.58
7.58
7.41
7.41
7.38
7.36
7.33
7.29
5.89
5.87
5.86
5.84
3.76
3.72
3.68
3.63
3.61
3.59
3.58
3.56
3.26
3.25
3.21
3.17
3.17
3.13
3.11
3.09
3.06
3.05
3.04
3.01
2.96
2.93
2.40
2.37
2.11
2.09
2.06
2.04
N
O
N
C4F9
N
O
1.00
1.06
2.09
1.03
5.23
2.13
2.08
2.32
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
f1 (ppm)

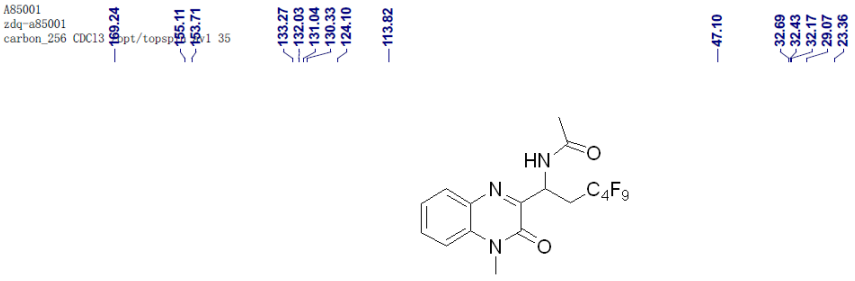
4z


Jul15-2018
ZDQ-A74018
carbon CDCl3 /opt/topspin av1 34
175.00
154.55
153.66
133.51
131.92
130.99
130.56
123.78
113.69
47.63
46.09
31.16
29.32
29.12
18.61
N
O
N
C4F9
N
O
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
f1 (ppm)

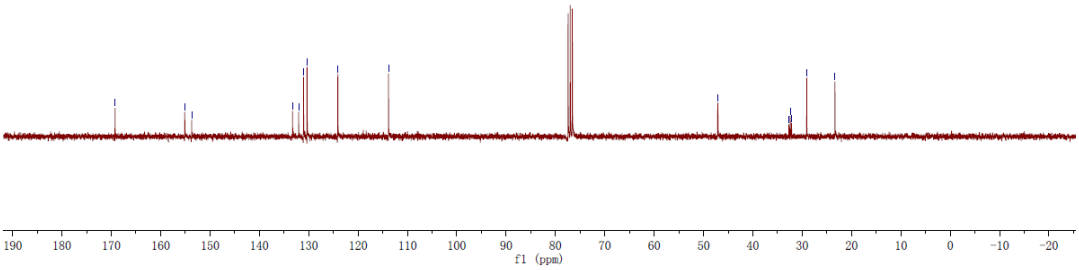
4z

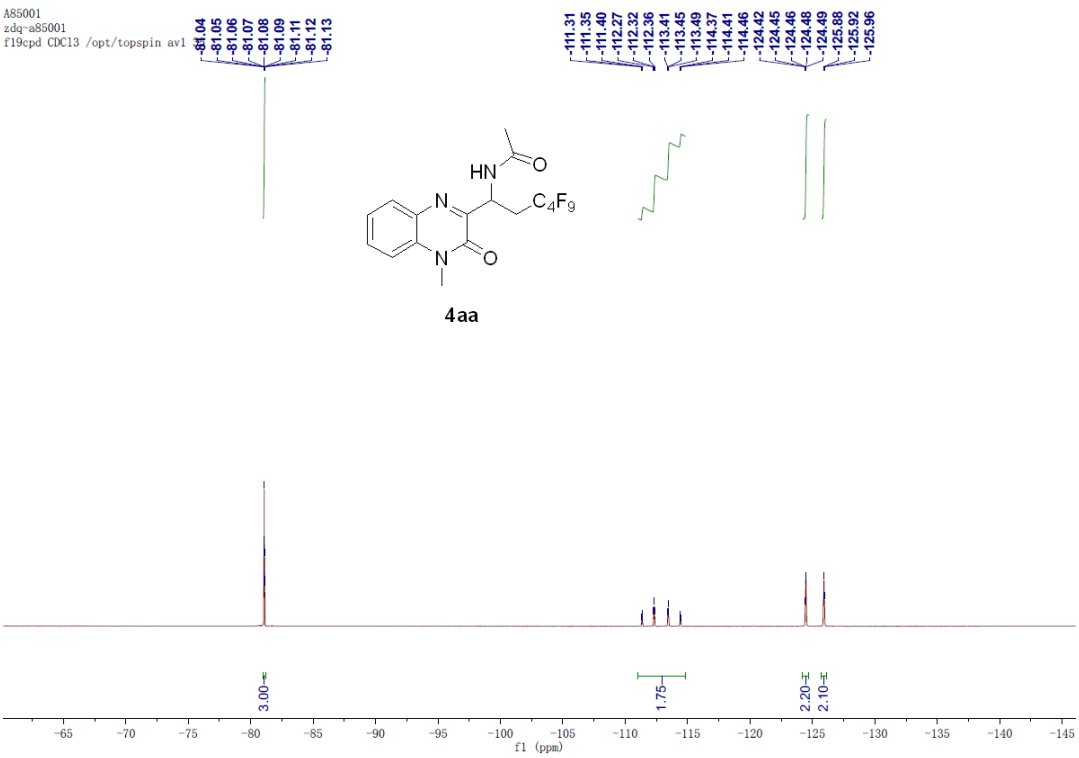

Jul15-2018
ZDQ-A74018
f19cpd CDCl3 /opt/topspin av1 34
-80.97
-80.98
-81.00
-81.01
-81.02
-81.03
-81.04
-81.05
-81.06
-113.13
-114.06
-114.10
-114.14
-114.24
-115.20
-124.32
-124.33
-124.35
-125.72
-125.77
-125.79
-125.81
-125.86
O
N
N
C4F9
O
N
4z
3.00
1.91
2.15
2.07
f1 (ppm)


A85001
zdq-a85001
proton CDCl3
7.94
7.94
7.92
7.91
7.67
7.67
7.64
7.62
7.61
7.45
7.45
7.42
7.40
7.37
7.29
7.09
7.06
5.89
5.87
5.86
5.85
5.84
5.82
3.75
3.08
3.07
3.06
3.03
3.01
2.99
2.96
2.95
2.94
2.11
HN
O
N
C4F9
N
O
4aa
1.00
1.01
2.00
0.93
0.98
2.92
1.99
2.92
f1 (ppm)

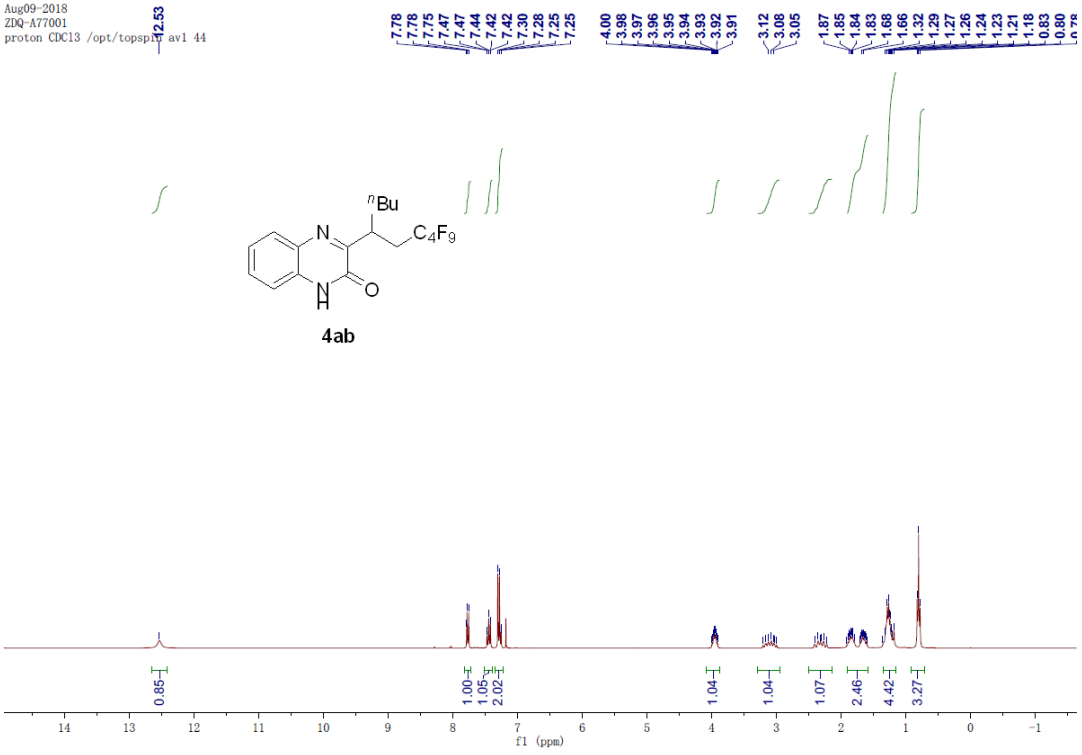

A85001
zdq-a85001
carbon_256 CDCl3 /opt/topspin av1 35
169.24
155.11
153.71
133.27
132.03
131.04
130.33
124.10
113.82
47.10
32.69
32.43
32.17
29.07
23.36
HN
O
N
C4F9
N
O

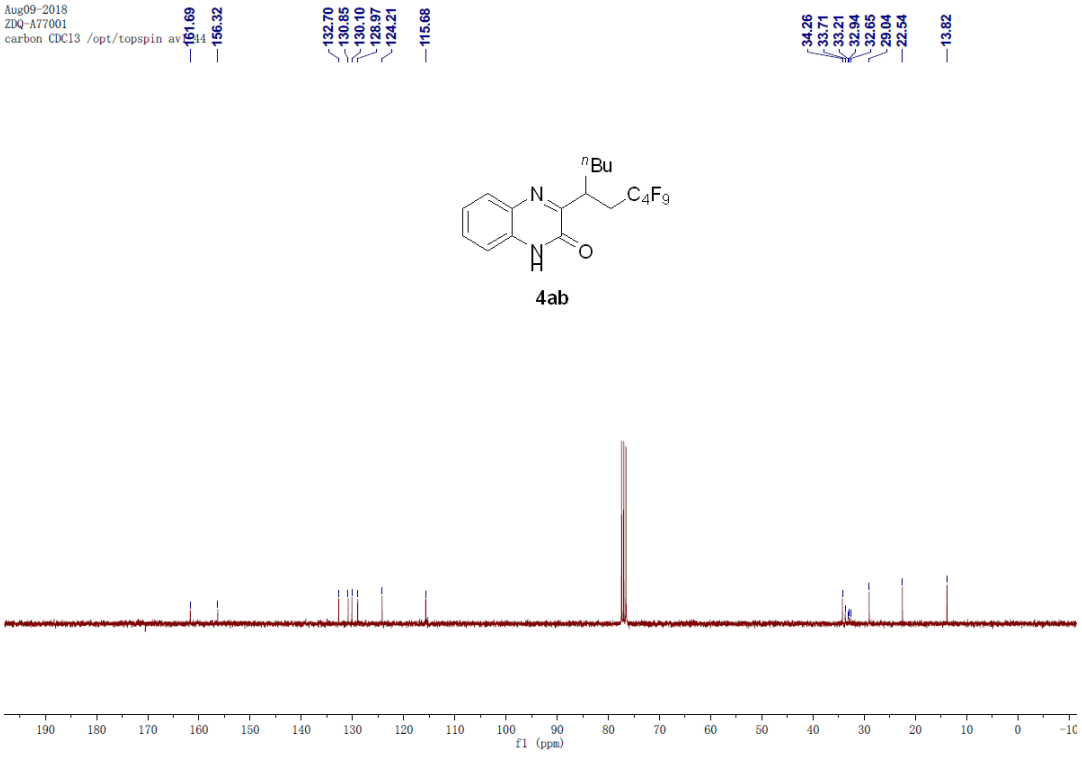
4aa

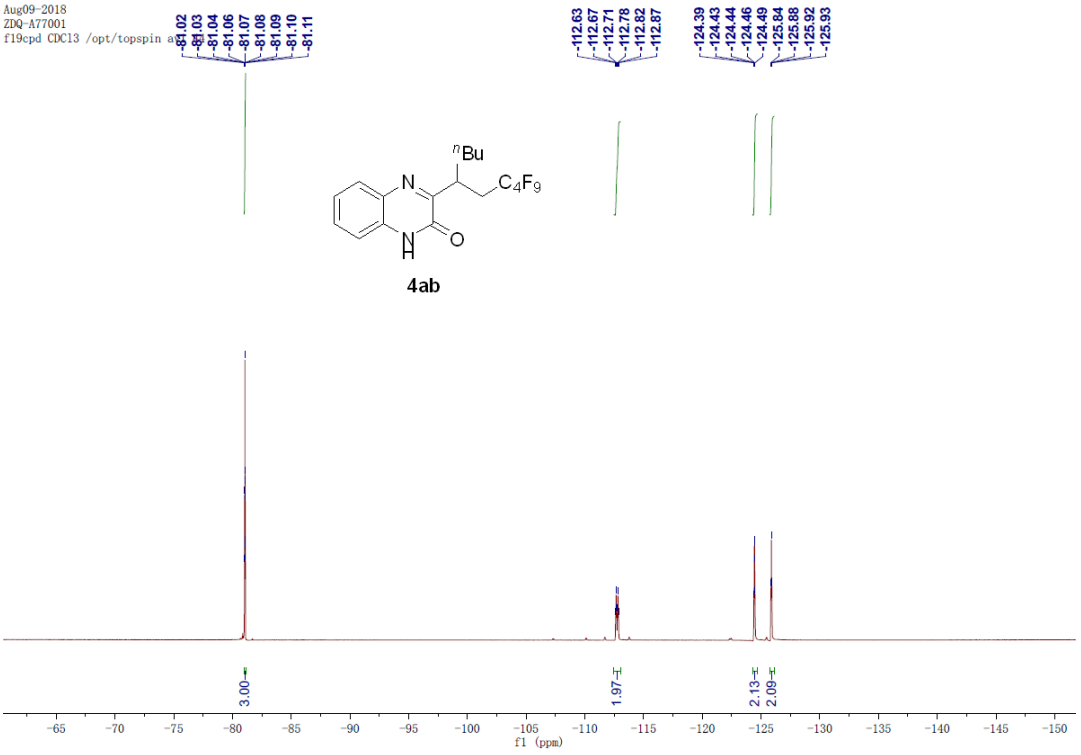

190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20
f1 (ppm)


A85001
zdq-a85001
f19cpd CDCl3 /opt/topspin av1
-81.04
-81.05
-81.06
-81.07
-81.08
-81.09
-81.11
-81.12
-81.13
-111.31
-111.35
-111.40
-112.27
-112.32
-112.36
-113.41
-113.45
-113.49
-114.37
-114.41
-114.46
-124.42
-124.45
-124.46
-124.48
-124.49
-125.88
-125.92
-125.96
HN
O
N
C4F9
N
O
3.00
1.75
2.20
2.10
-65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135 -140 -145
f1 (ppm)

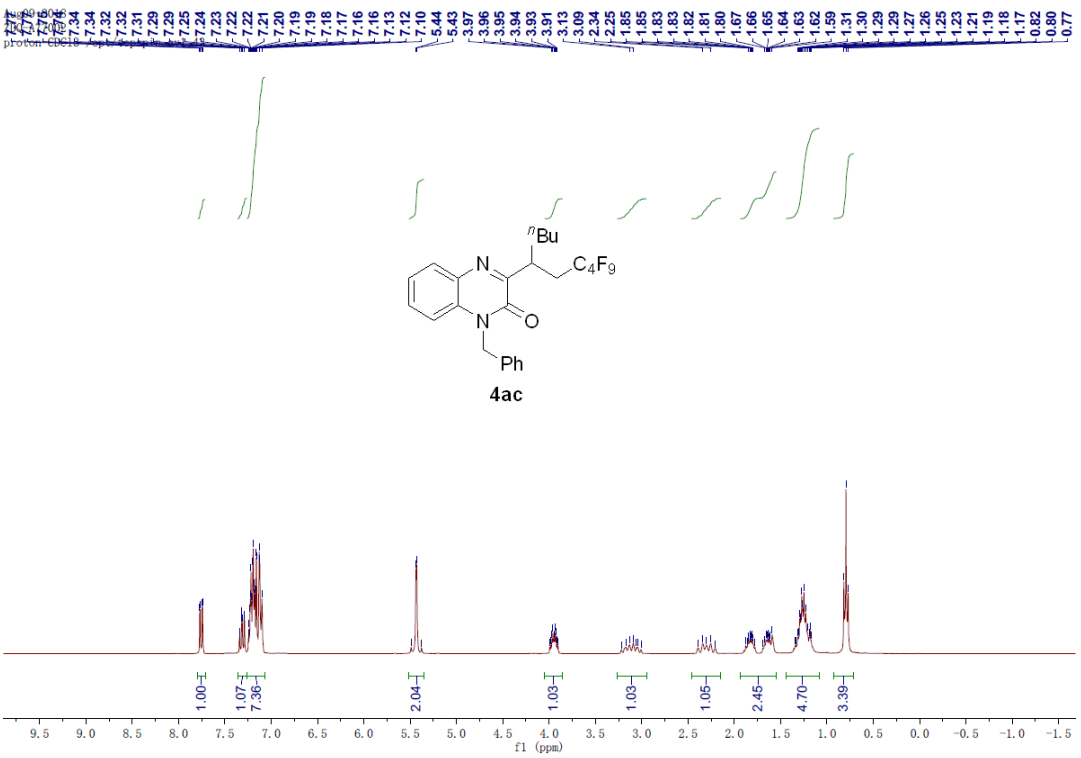
4aa


Aug09-2018
ZDQ-A77001
proton CDC13 /opt/topspin av1 44
12.53
7.78 7.78 7.75 7.47 7.47 7.44 7.42 7.42 7.30 7.28 7.25 7.25
4.00 3.98 3.97 3.96 3.95 3.94 3.93 3.92 3.91
3.12 3.08 3.05
1.87 1.85 1.84 1.83 1.68 1.66 1.32 1.29 1.27 1.26 1.24 1.23 1.21 1.18 0.83 0.80
nBu
C4F9
N
N
H
O
4ab
0.85 1.00 1.05 2.02 1.04 1.04 1.07 2.46 4.42 3.27
14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 −1
f1 (ppm)

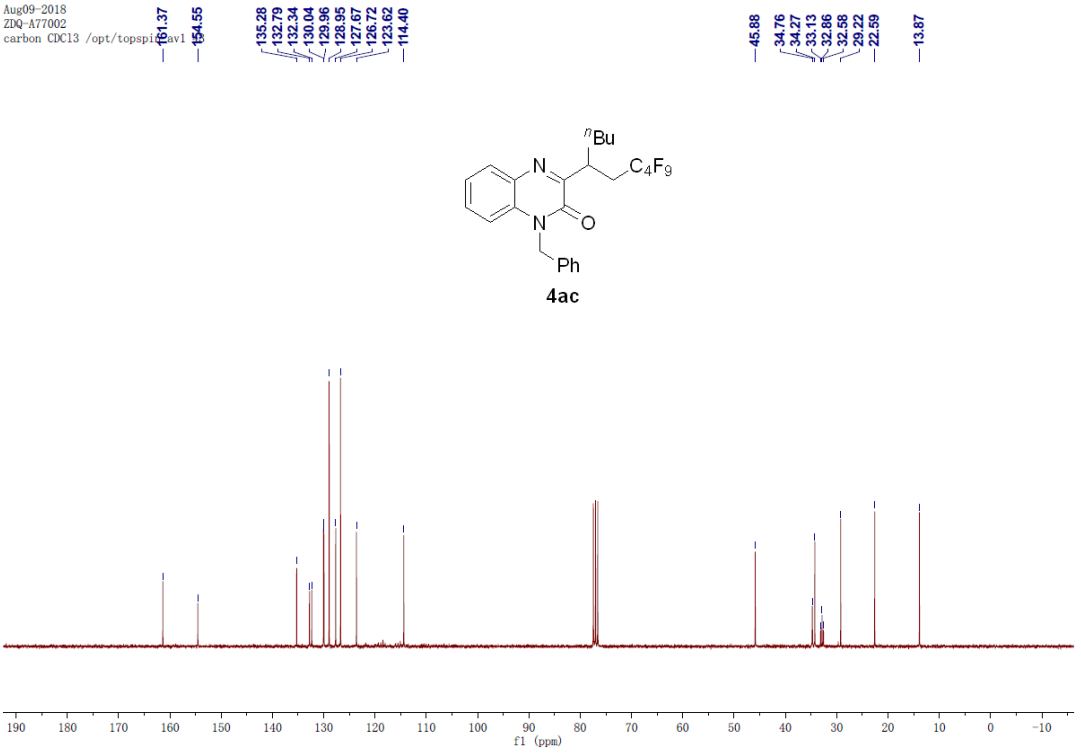

Aug09-2018
ZDQ-A77001
carbon CDC13 /opt/topspin av1 44
161.69
156.32
132.70 130.85 130.10 128.97 124.21
115.68
34.26 33.71 33.21 32.94 32.65 29.04 22.54
13.82
nBu
C4F9
N
N
H
O
4ab
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

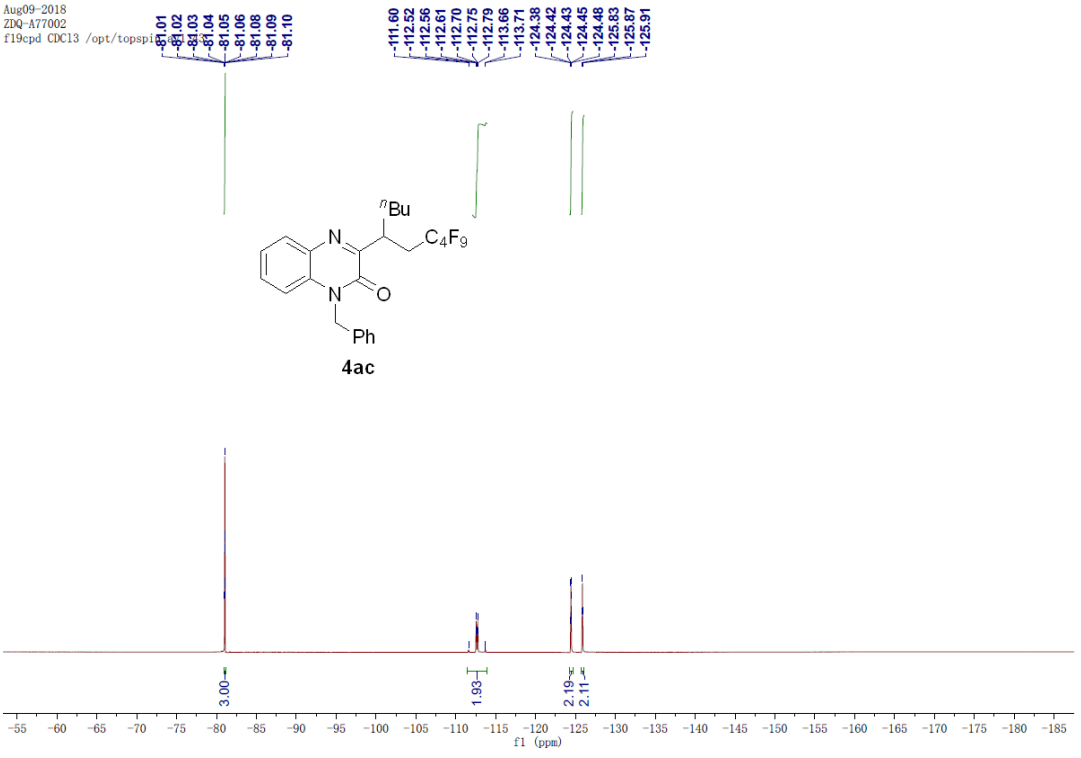

Aug09-2018
ZDQ-A77001
f19cpd CDCl3 /opt/topspin a
-81.02
-81.03
-81.04
-81.06
-81.07
-81.08
-81.09
-81.10
-81.11
-112.63
-112.67
-112.71
-112.78
-112.82
-112.87
-124.39
-124.43
-124.44
-124.46
-124.49
-125.84
-125.88
-125.92
-125.93
nBu
N
C4F9
N
H
O
3.00
1.97
2.13
2.09
f1 (ppm)

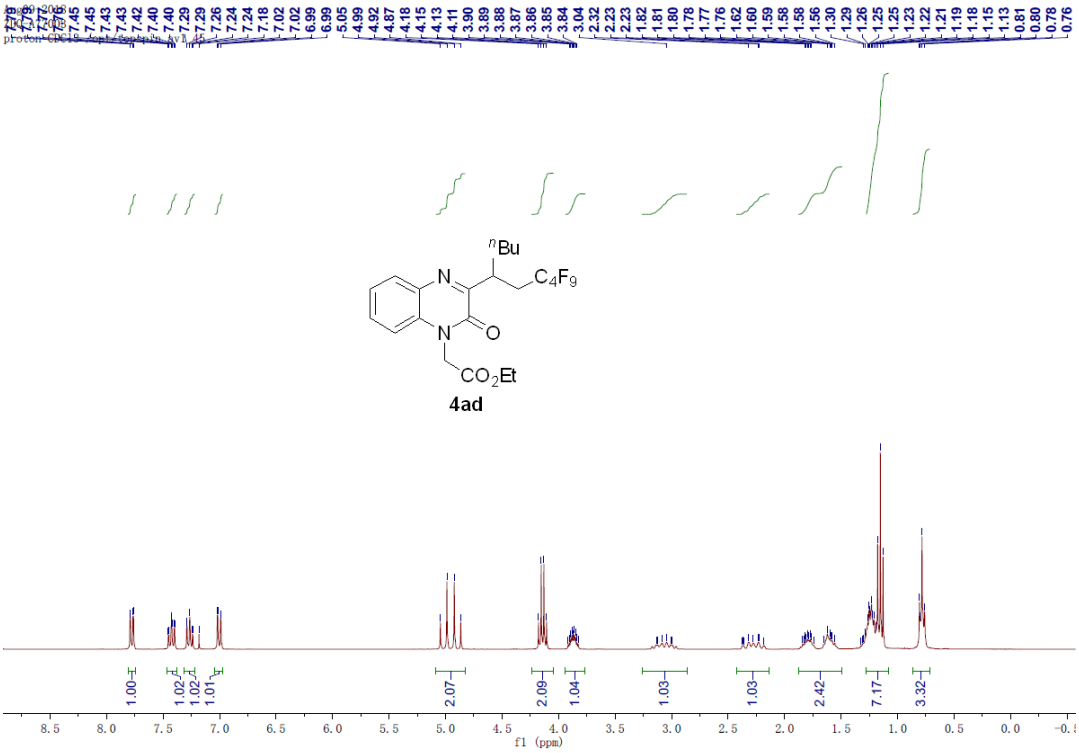
4ab


nBu
N
C4F9
N
O
Ph
1.00
1.07
7.36
2.04
1.03
1.03
1.05
2.45
4.70
3.39
f1 (ppm)

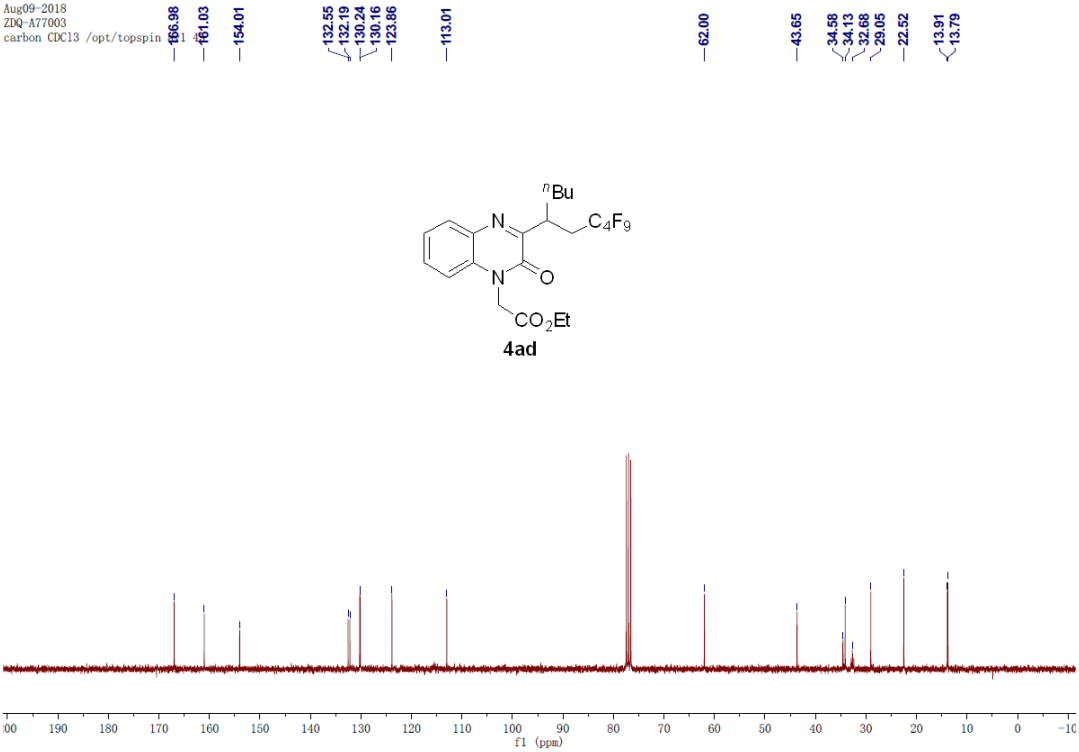
4ac


Aug09-2018
ZDQ-A77002
carbon CDCl3 /opt/topspin4av1
161.37
154.55
135.28
132.79
132.34
130.04
129.96
128.95
127.67
126.72
123.62
114.40
45.88
34.76
34.27
33.13
32.86
32.58
29.22
22.59
13.87
nBu
C4F9
N
N
O
Ph
4ac
f1 (ppm)

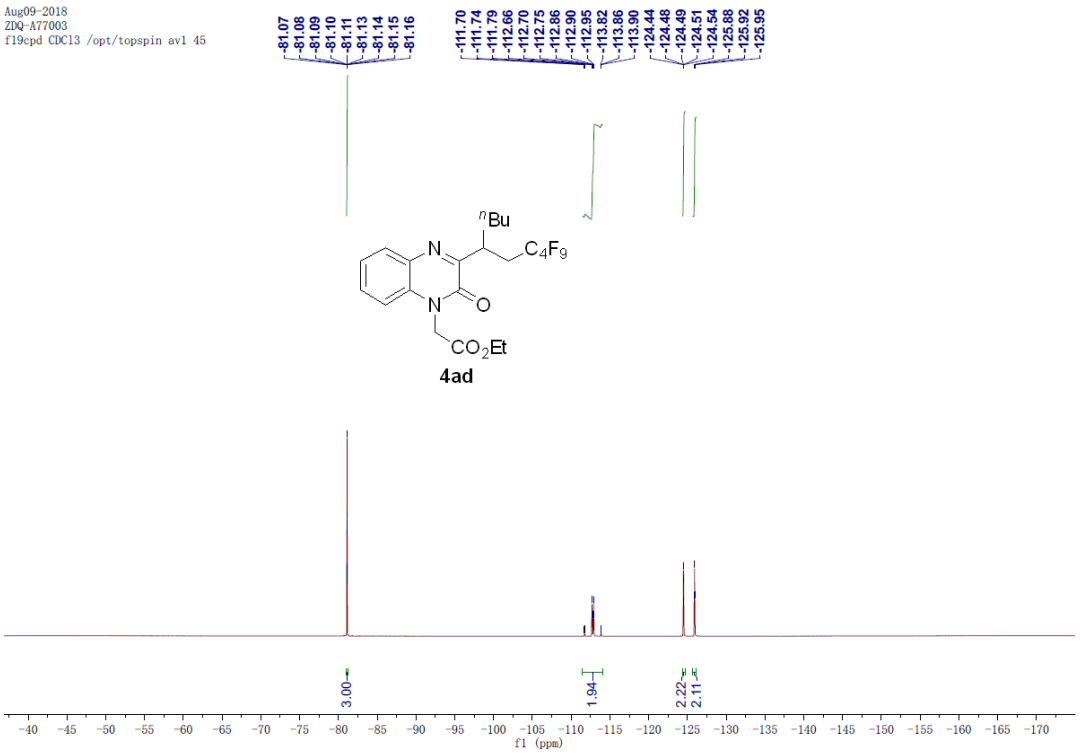

Aug09-2018
ZDQ-A77002
f19cpd CDCl3 /opt/topspin4
-81.01
-81.02
-81.03
-81.04
-81.05
-81.06
-81.08
-81.09
-81.10
-111.60
-112.52
-112.56
-112.61
-112.70
-112.75
-112.79
-113.66
-113.71
-124.38
-124.42
-124.43
-124.45
-124.48
-125.83
-125.87
-125.91
nBu
C4F9
N
N
O
Ph
4ac
3.00
1.93
2.19
2.11
f1 (ppm)

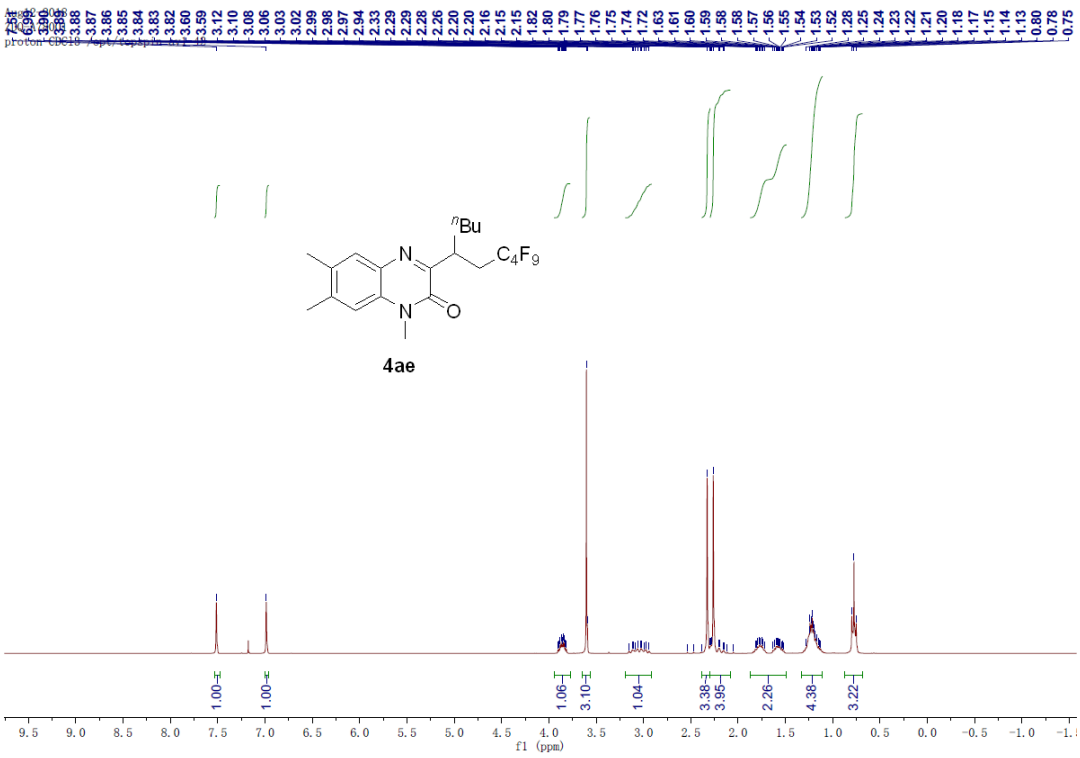

nBu
C4F9
N
N
O
CO2Et
1.00
1.02
1.02
1.01
2.07
2.09
1.04
1.03
1.03
2.42
7.17
3.32
f1 (ppm)

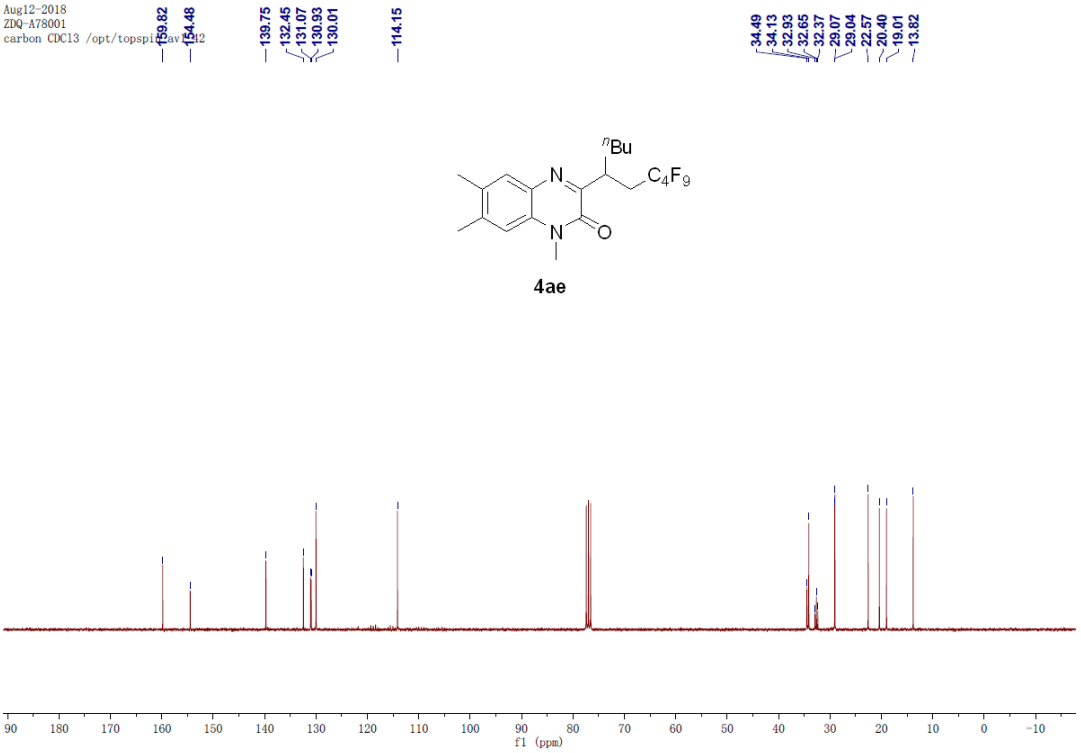
4ad

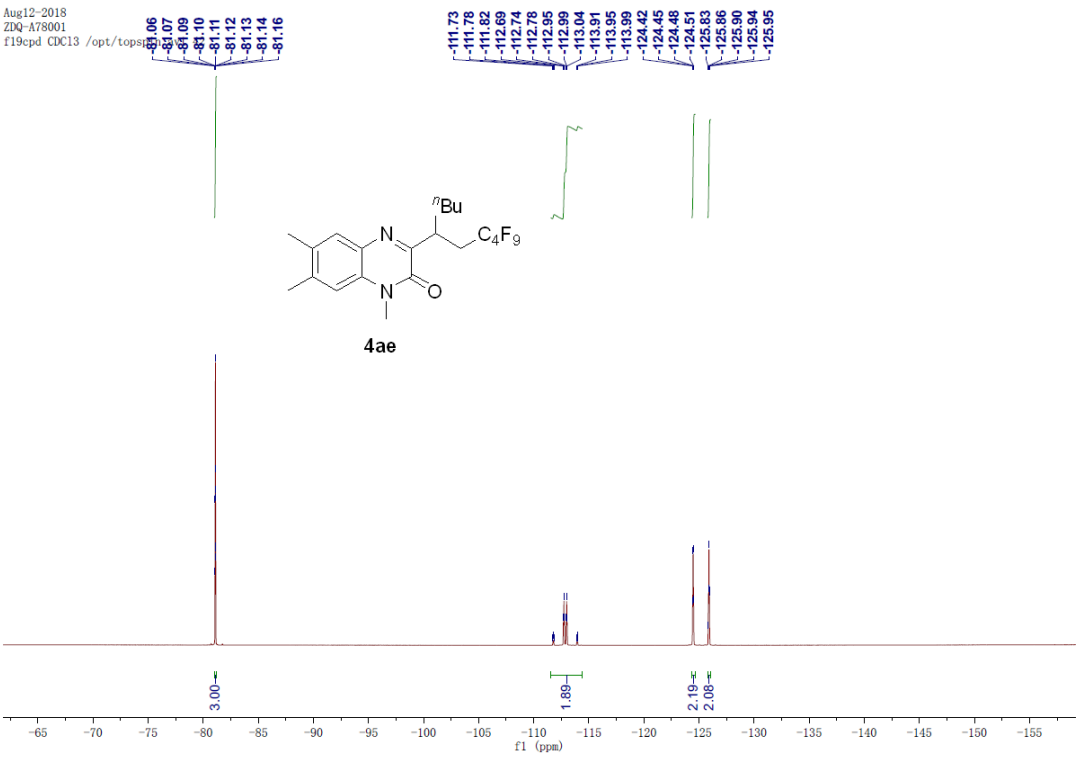

Aug09-2018
ZDQ-A77003
carbon CDCl3 /opt/topspin
166.98
161.03
154.01
132.55
132.19
130.24
130.16
123.86
113.01
62.00
43.65
34.58
34.13
32.68
29.05
22.52
13.91
13.79
nBu
C4F9
N
N
O
CO2Et
f1 (ppm)

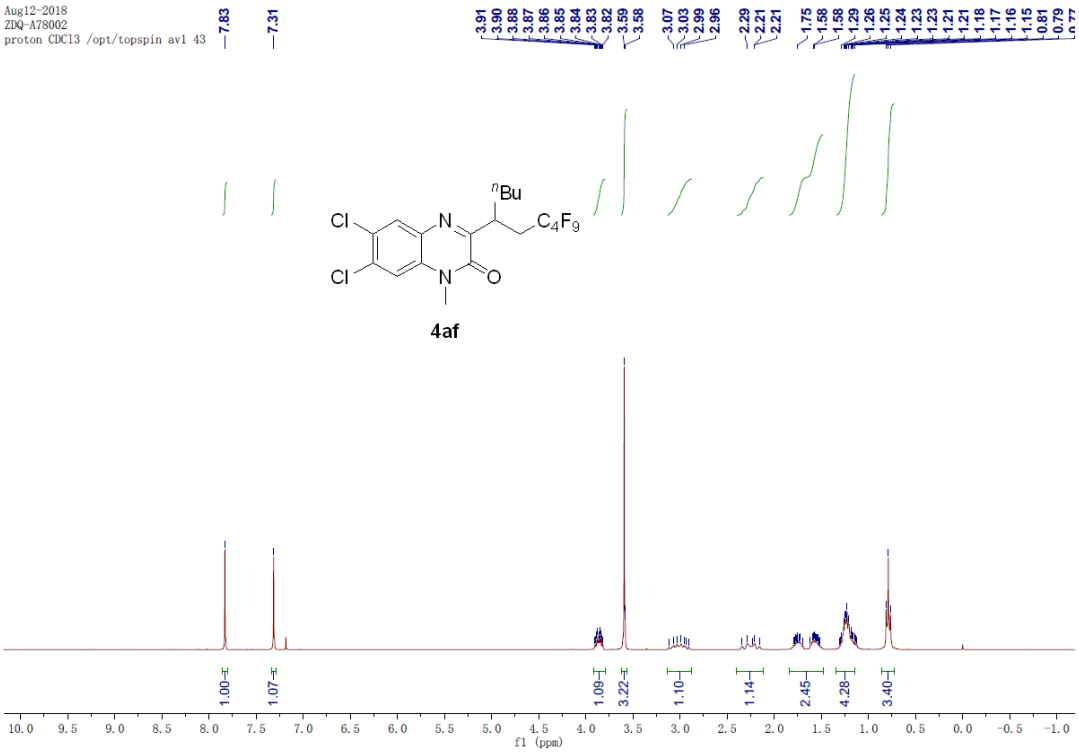
4ad

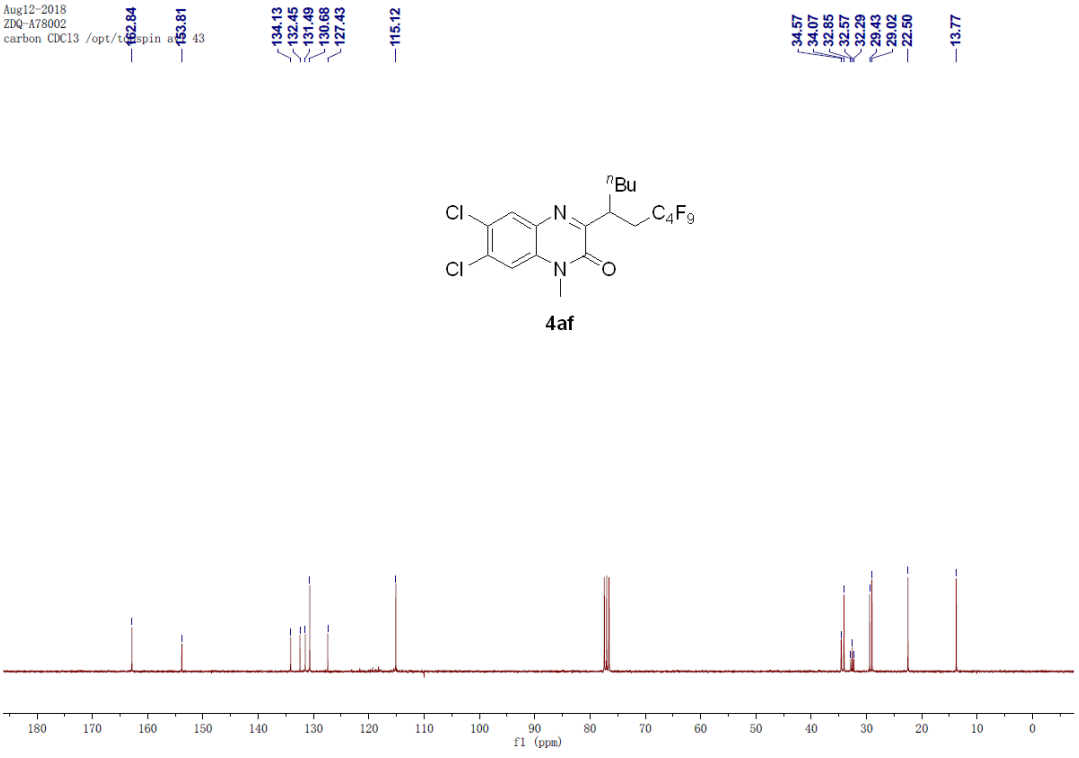

Aug09-2018
ZDQ-A77003
f19cpd CDCl3 /opt/topspin av1 45
-81.07
-81.08
-81.09
-81.10
-81.11
-81.13
-81.14
-81.15
-81.16
-111.70
-111.74
-111.79
-112.66
-112.70
-112.75
-112.86
-112.90
-112.95
-113.82
-113.86
-113.90
-124.44
-124.48
-124.49
-124.51
-124.54
-125.88
-125.92
-125.95
nBu
C4F9
N
N
O
CO2Et
4ad
3.00
1.94
2.22
2.11
f1 (ppm)

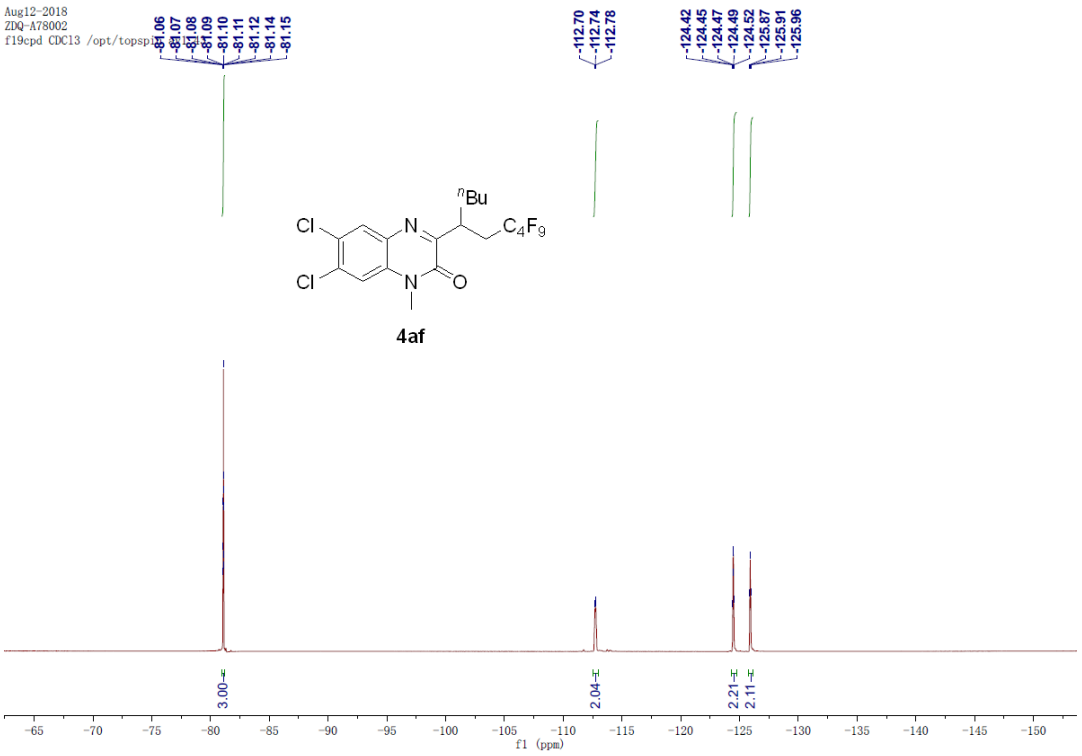

nBu
C4F9
N
N
O
4ae
1.00
1.00
1.06
3.10
1.04
3.38
3.95
2.26
4.38
3.22
f1 (ppm)


Aug12-2018
ZDQ-A78001
carbon CDC13 /opt/topspin4av1/d12
159.82
154.48
139.75
132.45
131.07
130.93
130.01
114.15
34.49
34.13
32.93
32.65
32.37
29.07
23.04
22.57
20.40
19.01
13.82
nBu
C4F9
N
N
O
4ae
90 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

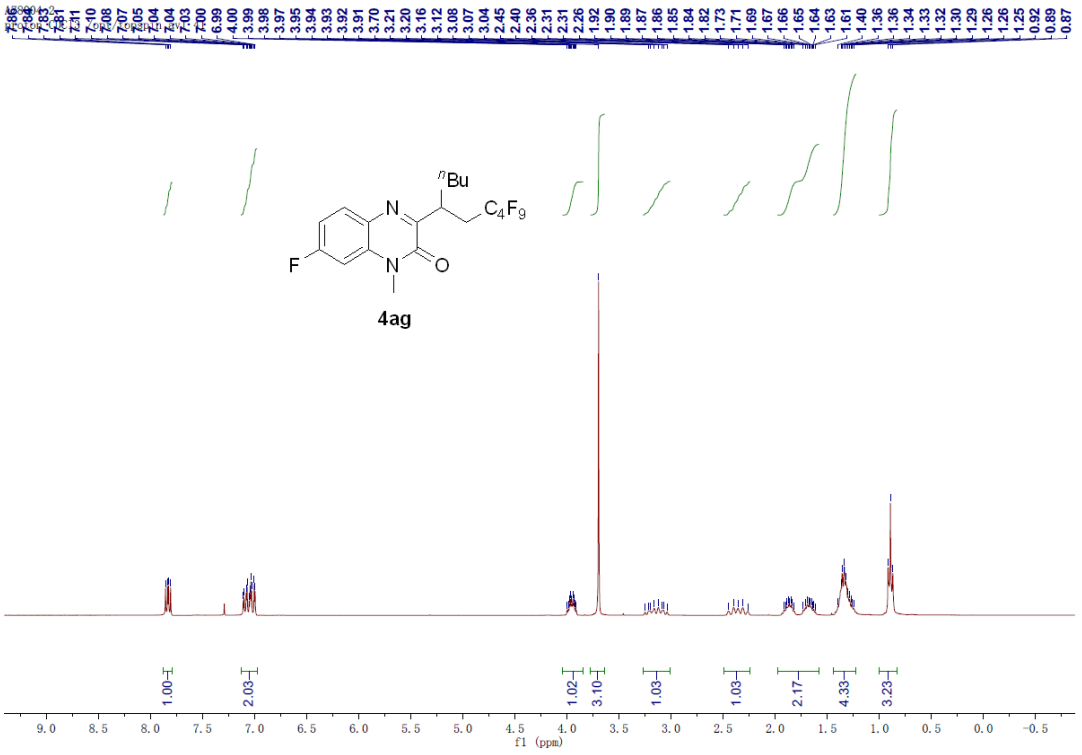

Aug12-2018
ZDQ-A78001
f19cpd CDC13 /opt/topspin4av1/d12
-81.06
-81.07
-81.09
-81.10
-81.11
-81.12
-81.13
-81.14
-81.16
-111.73
-111.78
-111.82
-112.69
-112.74
-112.78
-112.95
-112.99
-113.04
-113.91
-113.95
-113.99
-124.42
-124.45
-124.48
-124.51
-125.83
-125.86
-125.90
-125.94
-125.95
nBu
C4F9
N
N
O
4ae
3.00
1.89
2.19
2.08
-65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135 -140 -145 -150 -155
f1 (ppm)


Aug12-2018
ZDQ-A78002
proton CDCl3 /opt/topspin av1 43
7.83
7.31
3.91
3.90
3.88
3.87
3.86
3.85
3.84
3.83
3.82
3.59
3.58
3.07
3.03
2.99
2.96
2.29
2.21
2.21
1.75
1.58
1.58
1.29
1.26
1.25
1.24
1.23
1.23
1.21
1.21
1.18
1.17
1.16
1.15
0.81
0.79
nBu
Cl
Cl
N
N
O
C4F9
4af
1.00
1.07
1.09
3.22
1.10
1.14
2.45
4.28
3.40
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)

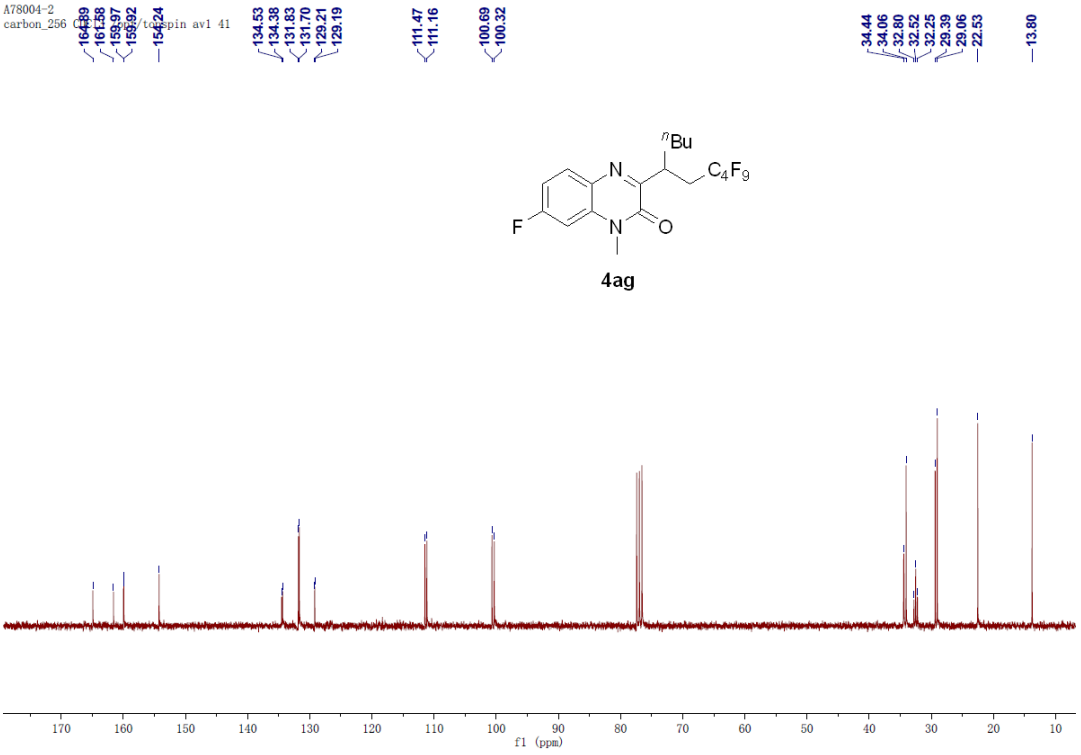

Aug12-2018
ZDQ-A78002
carbon CDCl3 /opt/topspin av1 43
162.84
153.81
134.13
132.45
131.49
130.68
127.43
115.12
34.57
34.07
32.85
32.57
32.29
29.43
29.02
22.50
13.77
nBu
Cl
Cl
N
N
O
C4F9
4af
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

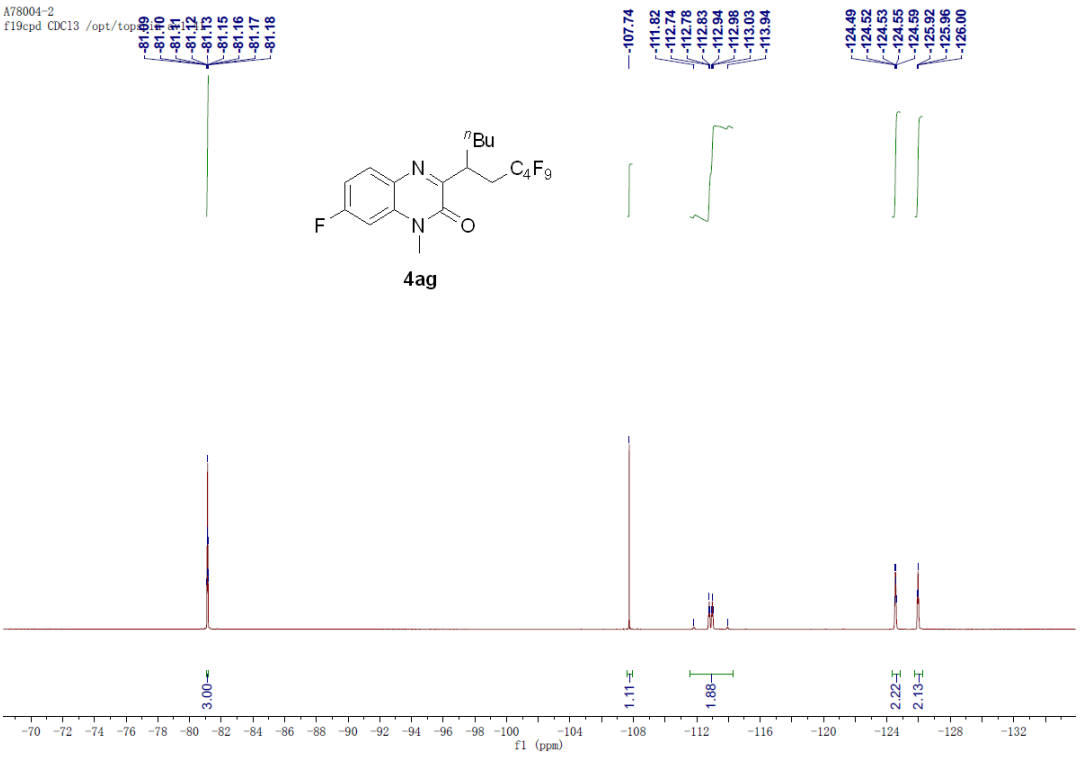

Aug12-2018
ZDQ-A78002
f19cpd CDCl3 /opt/topspin
-81.06
-81.07
-81.08
-81.09
-81.10
-81.11
-81.12
-81.14
-81.15
-112.70
-112.74
-112.78
-124.42
-124.45
-124.47
-124.49
-124.52
-125.87
-125.91
-125.96
nBu
C4F9
Cl
Cl
N
N
O
3.00
2.04
2.21
2.11
f1 (ppm)

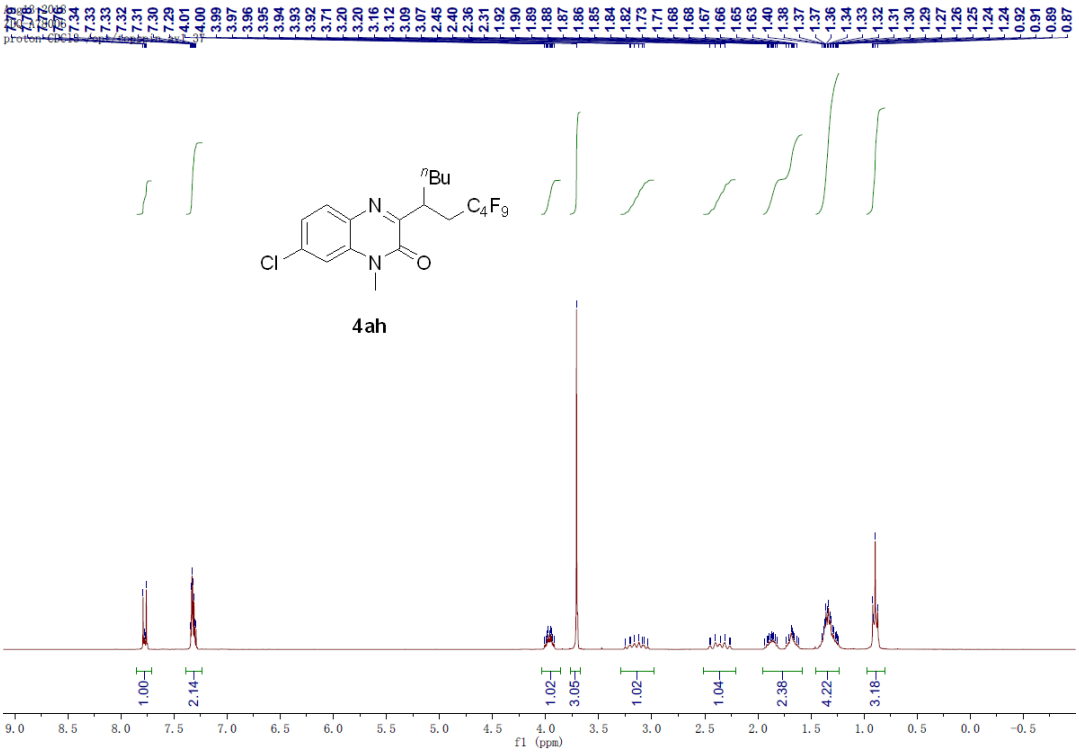
4af


nBu
C4F9
F
N
N
O
1.00
2.03
1.02
3.10
1.03
1.03
2.17
4.33
3.23
f1 (ppm)

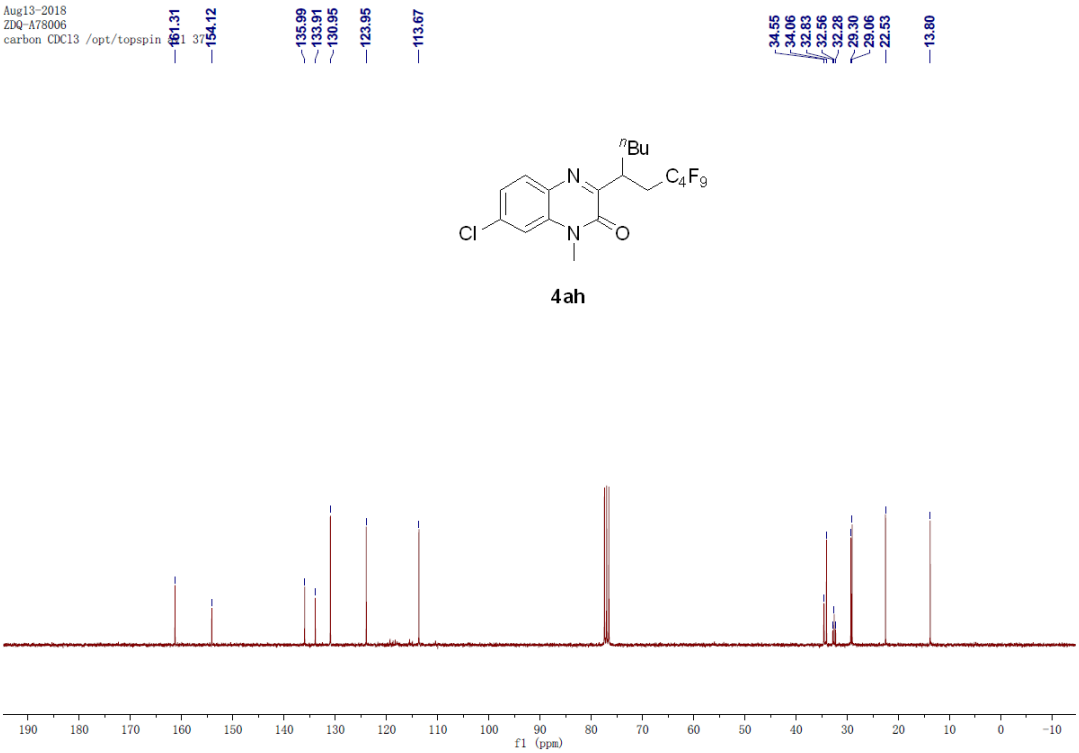
4ag


A78004-2
carbon_256 CDCl3 /opt/topspin av1 41
164.89
161.58
159.97
159.92
154.24
134.53
134.38
131.83
131.70
129.21
129.19
111.47
111.16
100.69
100.32
34.44
34.06
32.80
32.52
32.25
29.39
29.06
22.53
13.80
nBu
N
C4F9
F
N
O
4ag
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

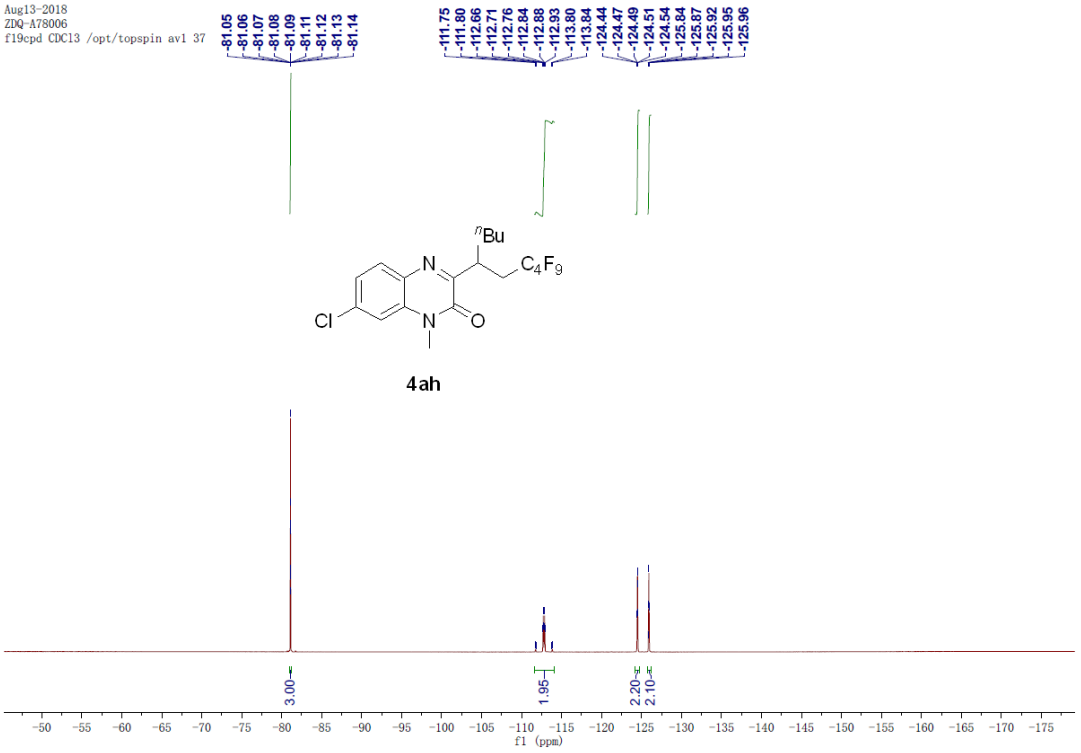

A78004-2
f19cpd CDCl3 /opt/topspin
-81.09
-81.10
-81.11
-81.12
-81.13
-81.15
-81.16
-81.17
-81.18
-107.74
-111.82
-112.74
-112.78
-112.83
-112.94
-112.98
-113.03
-113.94
-124.49
-124.52
-124.53
-124.55
-124.59
-125.92
-125.96
-126.00
nBu
N
C4F9
F
N
O
4ag
3.00
1.11
1.88
2.22
2.13
-70
-72
-74
-76
-78
-80
-82
-84
-86
-88
-90
-92
-94
-96
-98
-100
-104
-108
-112
-116
-120
-124
-128
-132
f1 (ppm)


7.34
7.33
7.32
7.31
7.30
7.29
4.01
4.00
3.99
3.97
3.96
3.95
3.94
3.93
3.92
3.71
3.20
3.16
3.12
3.09
3.07
2.45
2.40
2.36
2.31
1.92
1.90
1.89
1.88
1.87
1.86
1.85
1.84
1.82
1.73
1.71
1.68
1.67
1.66
1.65
1.63
1.40
1.38
1.37
1.36
1.34
1.33
1.32
1.31
1.30
1.29
1.27
1.26
1.25
1.24
1.24
0.92
0.91
0.89
0.87
nBu
C4F9
N
Cl
N
O
1.00
2.14
1.02
3.05
1.02
1.04
2.38
4.22
3.18
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)

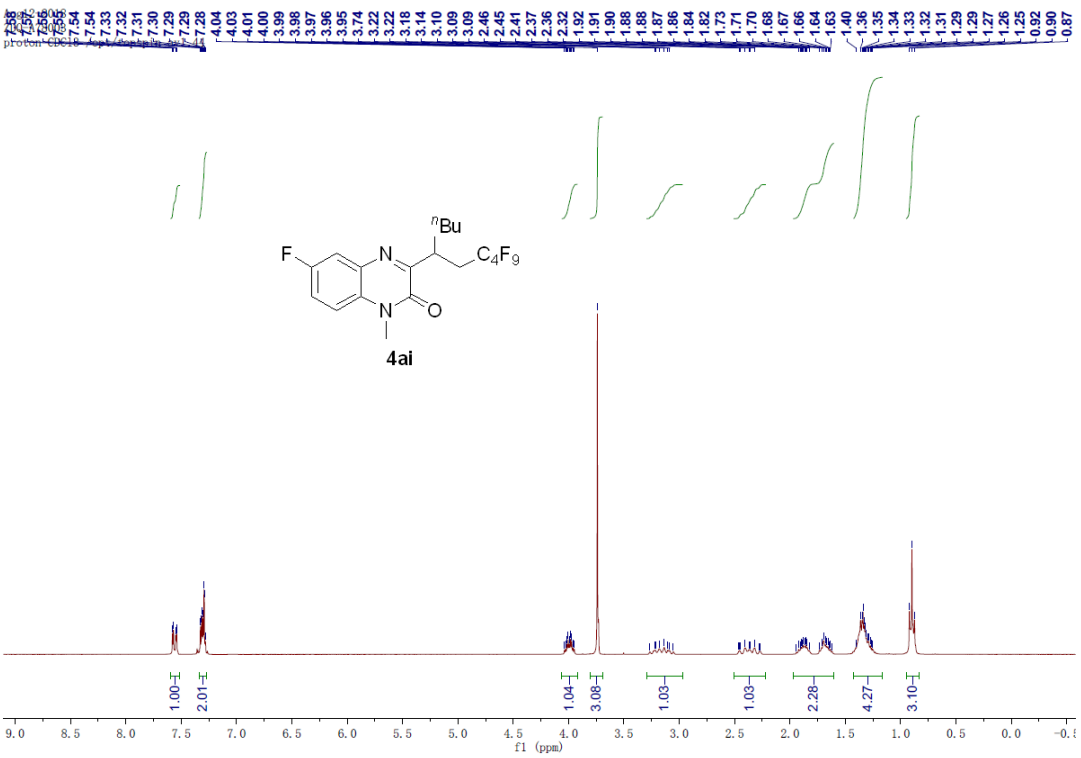
4ah


Aug13-2018
ZDQ-A78006
carbon CDCl3 /opt/topspin
161.31
154.12
135.99
133.91
130.95
123.95
113.67
34.55
34.06
32.83
32.56
32.28
29.30
29.06
22.53
13.80
nBu
C4F9
N
Cl
N
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

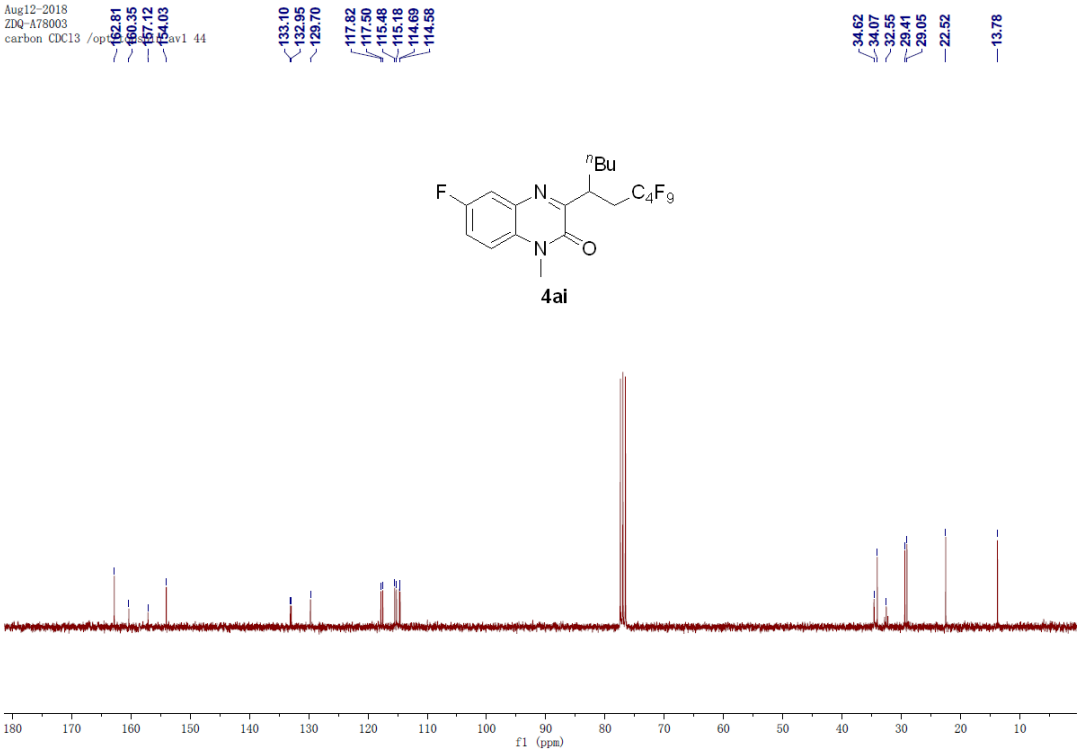
4ah

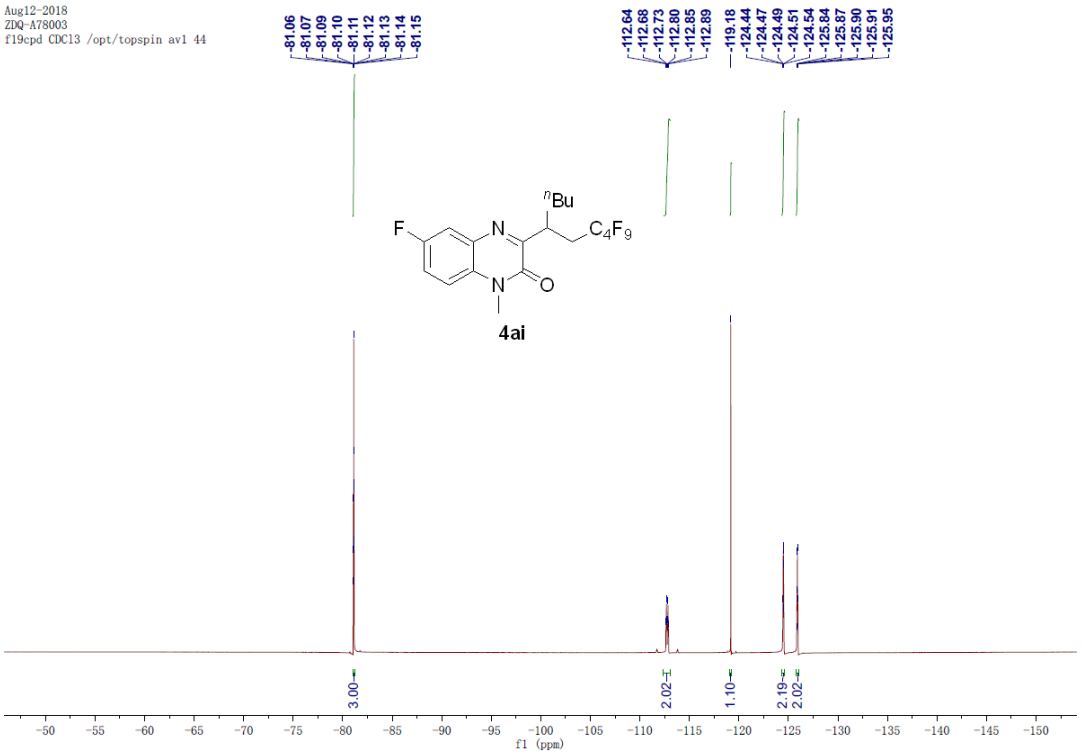

Aug13-2018
ZDQ-A78006
f19cpd CDCl3 /opt/topspin av1 37
-81.05
-81.06
-81.07
-81.08
-81.09
-81.11
-81.12
-81.13
-81.14
-111.75
-111.80
-112.66
-112.71
-112.76
-112.84
-112.88
-112.93
-113.80
-113.84
-124.44
-124.47
-124.49
-124.51
-124.54
-125.84
-125.87
-125.92
-125.95
-125.96
nBu
N
C4F9
Cl
N
O
3.00
1.95
2.20
2.10
f1 (ppm)

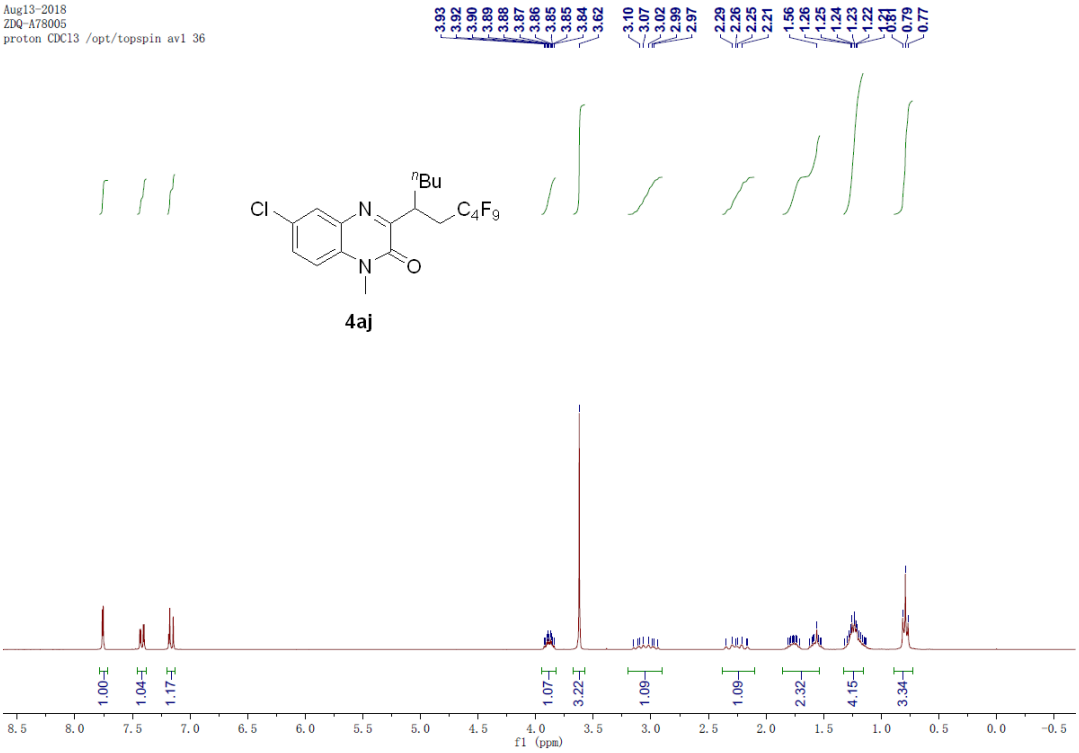
4ah


nBu
F
N
C4F9
N
O
1.00
2.01
1.04
3.08
1.03
1.03
2.28
4.27
3.10
f1 (ppm)

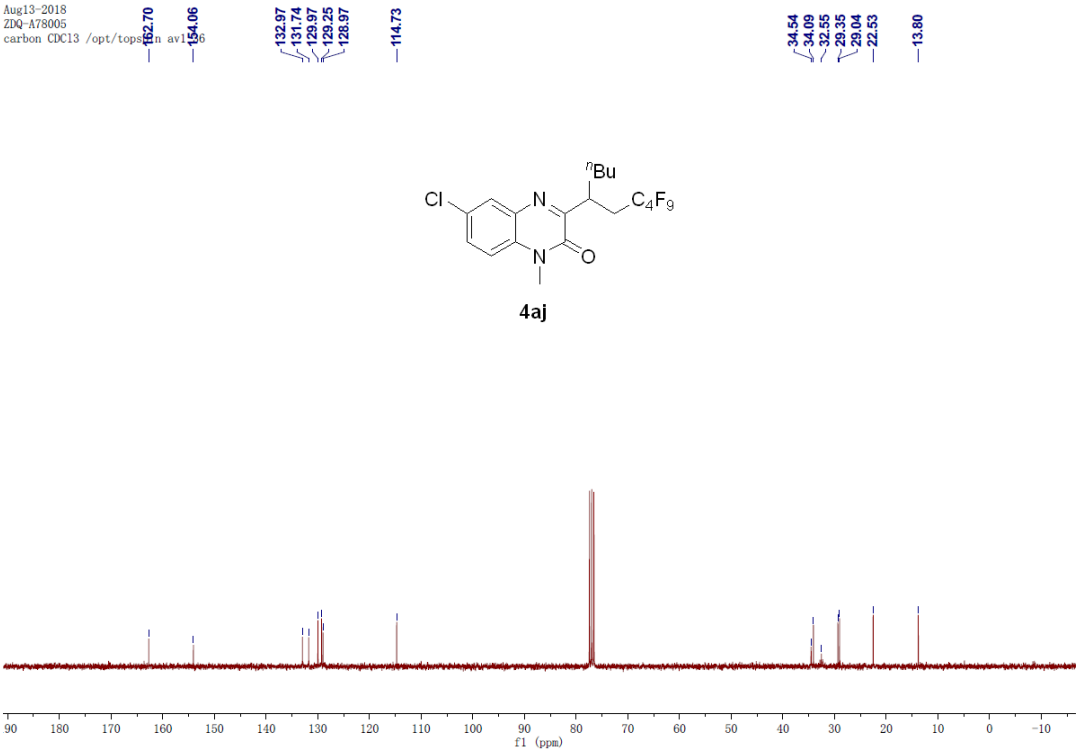
4ai


Aug12-2018
ZDQ-A78003
carbon CDC13 /opt
av1 44
162.81
160.35
157.12
154.03
133.10
132.95
129.70
117.82
117.50
115.48
115.18
114.69
114.58
34.62
34.07
32.55
29.41
29.05
22.52
13.78
nBu
F
N
C4F9
N
O
4ai
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

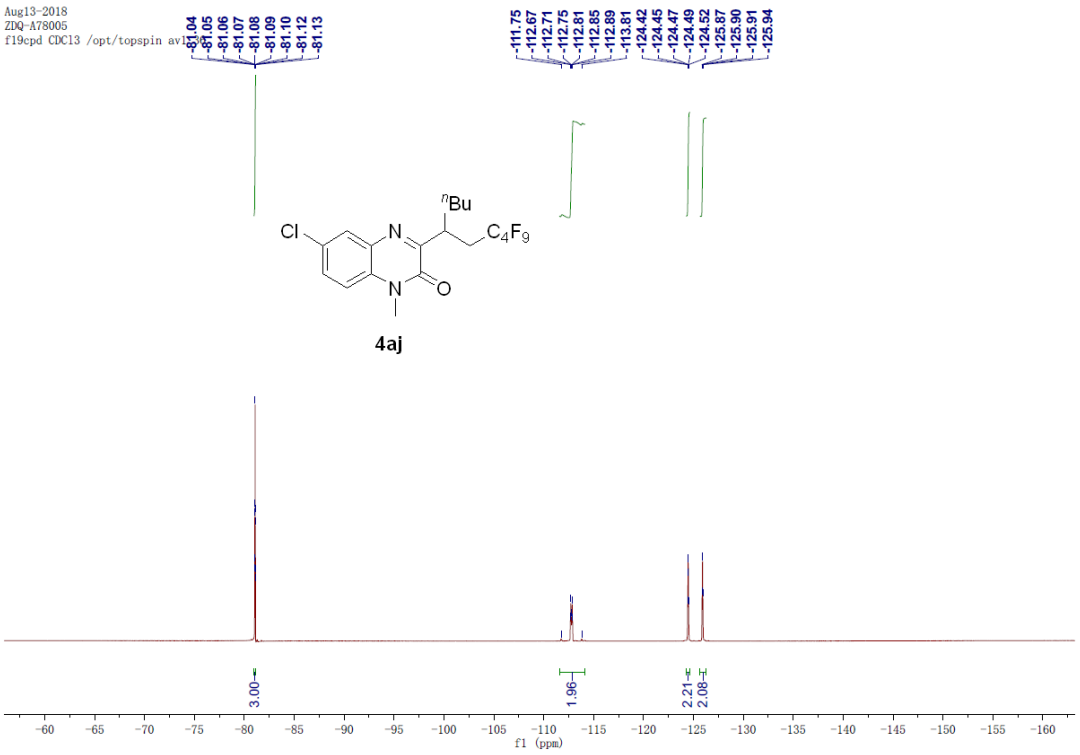

Aug12-2018
ZDQ-A78003
f19cpd CDC13 /opt/topspin av1 44
-81.06
-81.07
-81.09
-81.10
-81.11
-81.12
-81.13
-81.14
-81.15
-112.64
-112.68
-112.73
-112.80
-112.85
-112.89
-119.18
-124.44
-124.47
-124.49
-124.51
-124.54
-125.84
-125.87
-125.90
-125.91
-125.95
nBu
F
N
C4F9
N
O
4ai
3.00
2.02
1.10
2.19
2.02
−50 −55 −60 −65 −70 −75 −80 −85 −90 −95 −100 −105 −110 −115 −120 −125 −130 −135 −140 −145 −150
f1 (ppm)

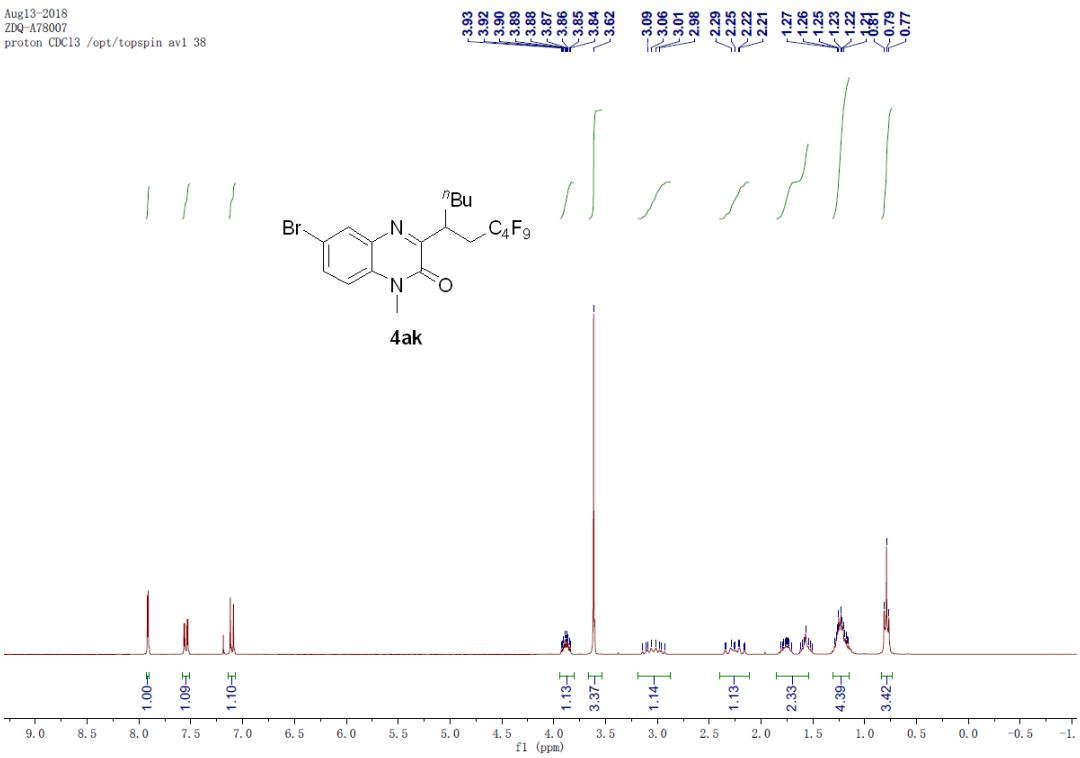

Aug13-2018
ZDQ-A78005
proton CDCl3 /opt/topspin av1 36
3.93
3.92
3.90
3.89
3.88
3.87
3.86
3.85
3.85
3.84
3.62
3.10
3.07
3.02
2.99
2.97
2.29
2.26
2.25
2.21
1.56
1.26
1.25
1.24
1.23
1.22
0.81
0.79
0.77
Cl
N
nBu
C4F9
N
O
1.00
1.04
1.17
1.07
3.22
1.09
1.09
2.32
4.15
3.34
f1 (ppm)

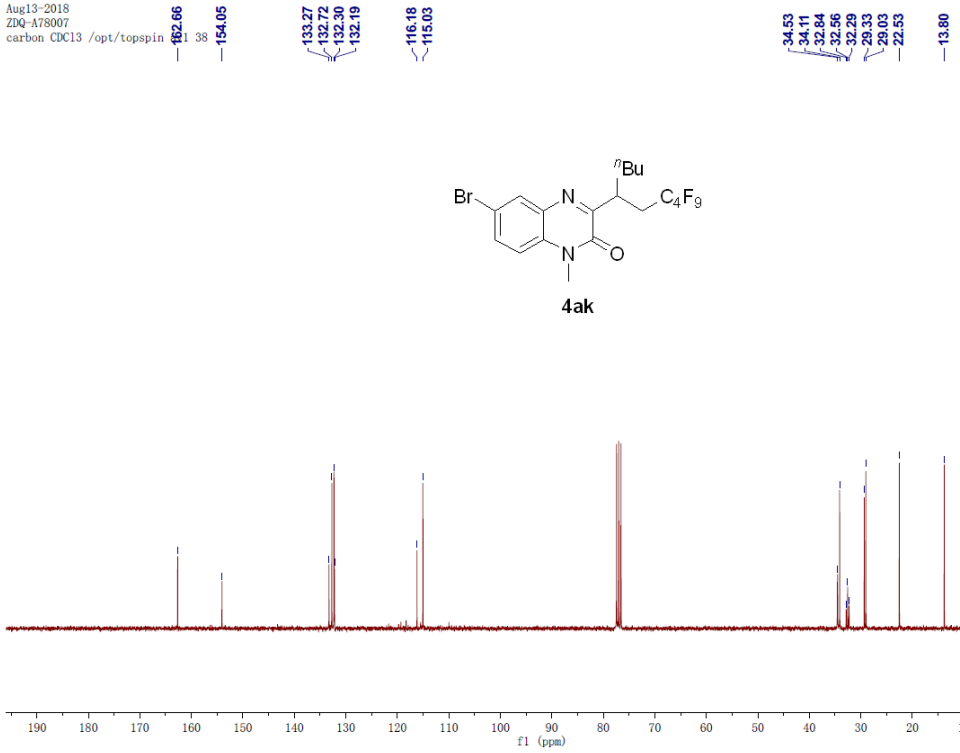
4aj

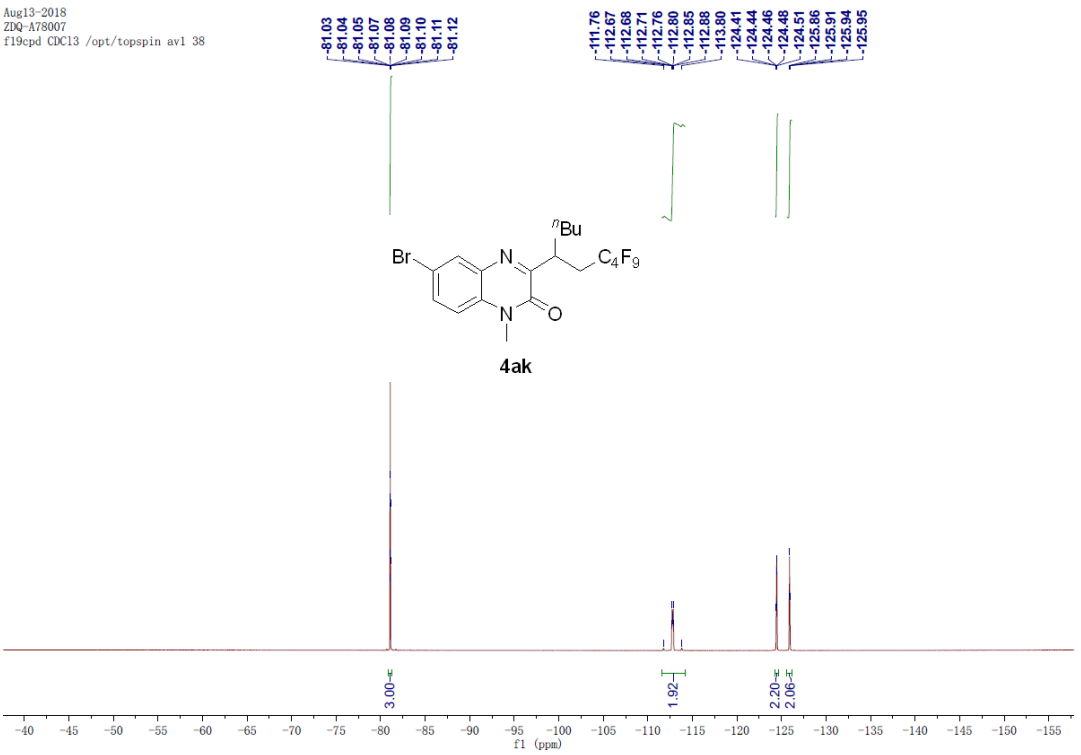

Aug13-2018
ZDQ-A78005
carbon CDCl3 /opt/topspin av1 36
162.70
154.06
132.97
131.74
129.97
129.25
128.97
114.73
34.54
34.09
32.55
29.35
29.04
22.53
13.80
Cl
N
nBu
C4F9
N
O
f1 (ppm)

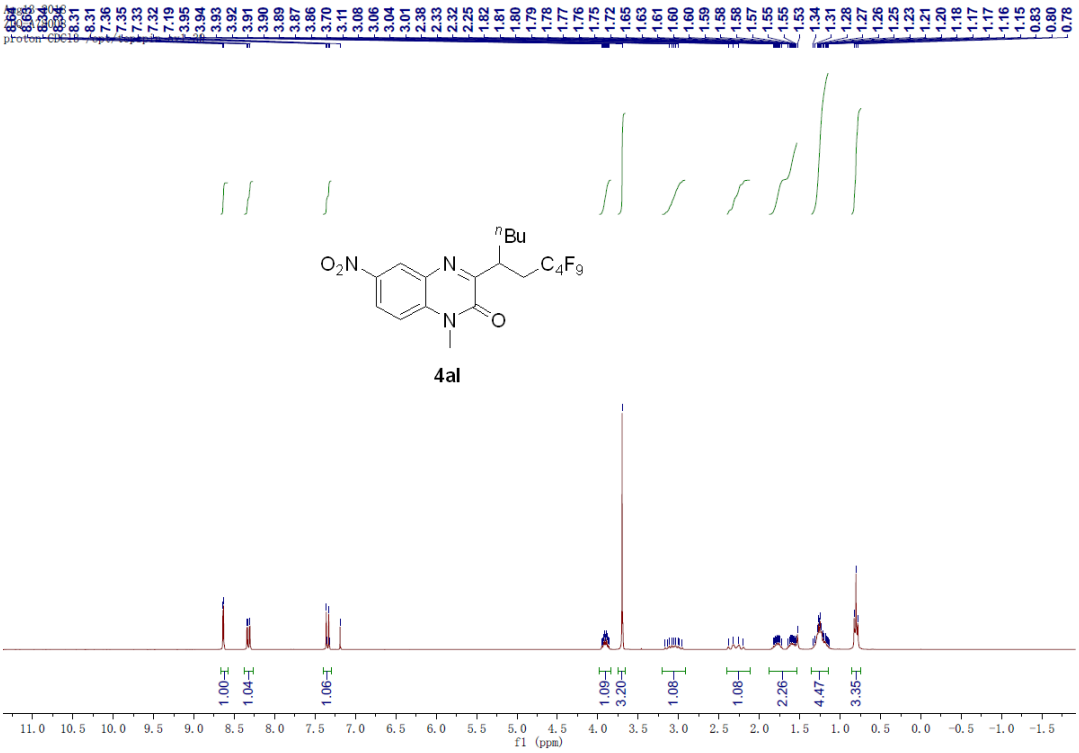
4aj


Aug13-2018
ZDQ-A78005
f19cpd CDCl3 /opt/topspin av1 34
-81.04
-81.05
-81.06
-81.07
-81.08
-81.09
-81.10
-81.12
-81.13
-111.75
-112.67
-112.71
-112.75
-112.81
-112.85
-112.89
-113.81
-124.42
-124.45
-124.47
-124.49
-124.52
-125.87
-125.90
-125.91
-125.94
nBu
Cl
N
C4F9
N
O
4aj
3.00
1.96
2.21
2.08
f1 (ppm)

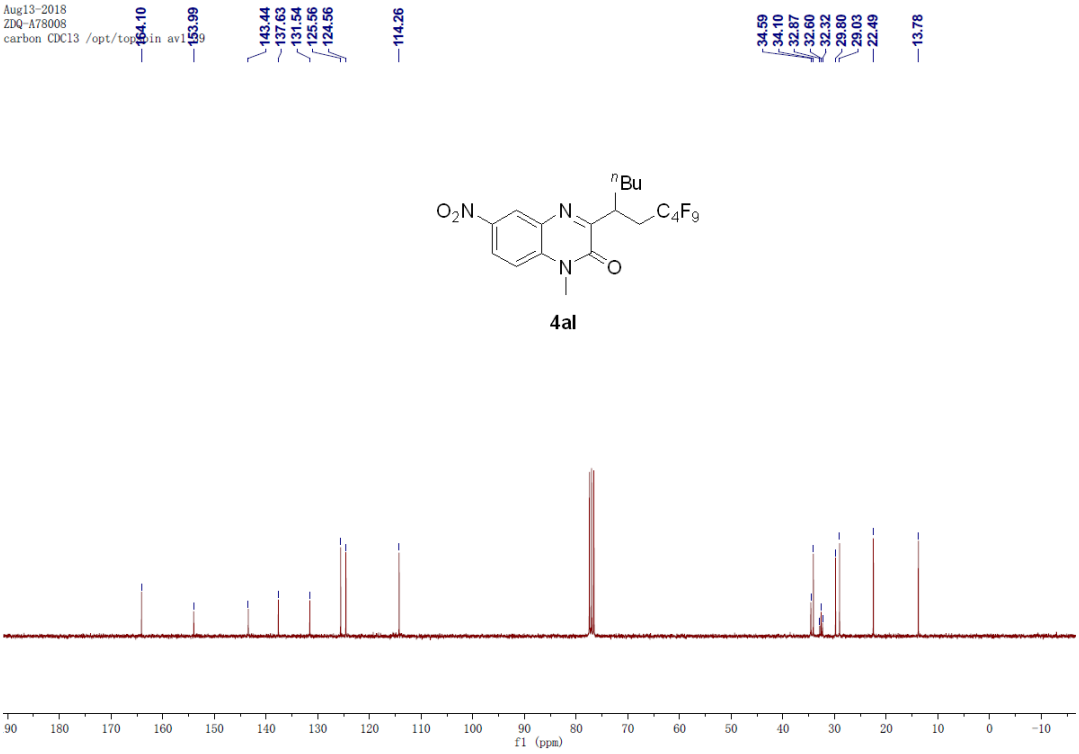

Aug13-2018
ZDQ-A78007
proton CDCl3 /opt/topspin av1 38
3.93
3.92
3.90
3.89
3.88
3.87
3.86
3.85
3.84
3.62
3.09
3.06
3.01
2.98
2.29
2.25
2.22
2.21
1.27
1.26
1.25
1.23
1.22
0.81
0.79
0.77
nBu
Br
N
C4F9
N
O
4ak
1.00
1.09
1.10
1.13
3.37
1.14
1.13
2.33
4.39
3.42
f1 (ppm)


Aug13-2018
ZDQ-A78007
carbon CDC13 /opt/topspin av1 38
162.66
154.05
133.27
132.72
132.30
132.19
116.18
115.03
34.53
34.11
32.84
32.56
32.29
29.33
29.03
22.53
13.80
Br
N
nBu
C4F9
N
O
4ak
f1 (ppm)

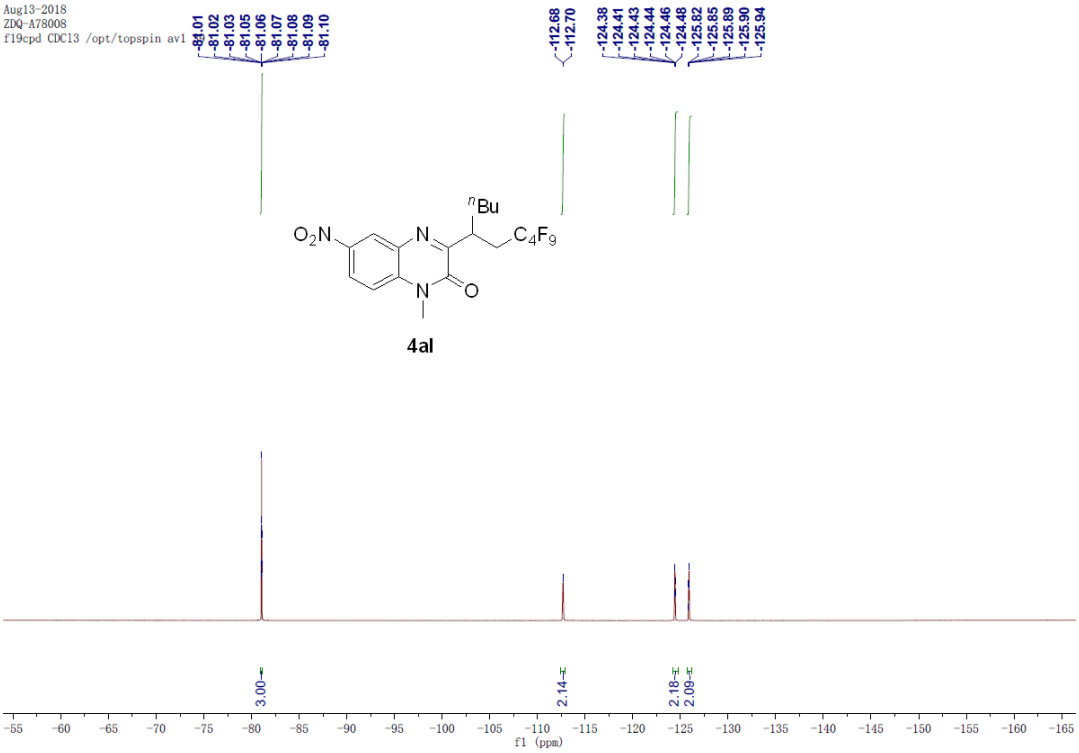

Aug13-2018
ZDQ-A78007
f19cpd CDC13 /opt/topspin av1 38
-81.03
-81.04
-81.05
-81.07
-81.08
-81.09
-81.10
-81.11
-81.12
-111.76
-112.67
-112.68
-112.71
-112.76
-112.80
-112.85
-112.88
-113.80
-124.41
-124.44
-124.46
-124.48
-124.51
-125.86
-125.91
-125.94
-125.95
Br
N
nBu
C4F9
N
O
4ak
3.00
1.92
2.20
2.06
f1 (ppm)


nBu
O2N
N
C4F9
N
O
1.00
1.04
1.06
1.09
3.20
1.08
1.08
2.26
4.47
3.35
f1 (ppm)

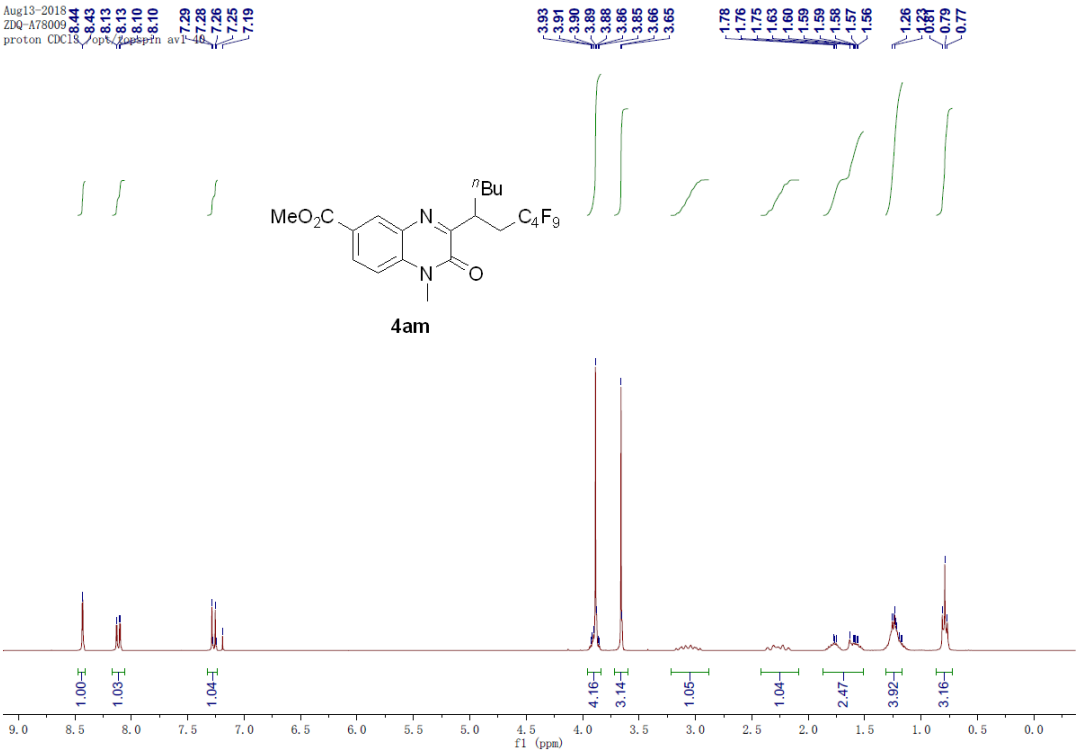
4al


Aug13-2018
ZDQ-A78008
carbon CDCl3 /opt/topspin av
164.10
153.99
143.44
137.63
131.54
125.56
124.56
114.26
34.59
34.10
32.87
32.60
32.32
29.80
29.03
22.49
13.78
nBu
O2N
N
C4F9
N
O
f1 (ppm)

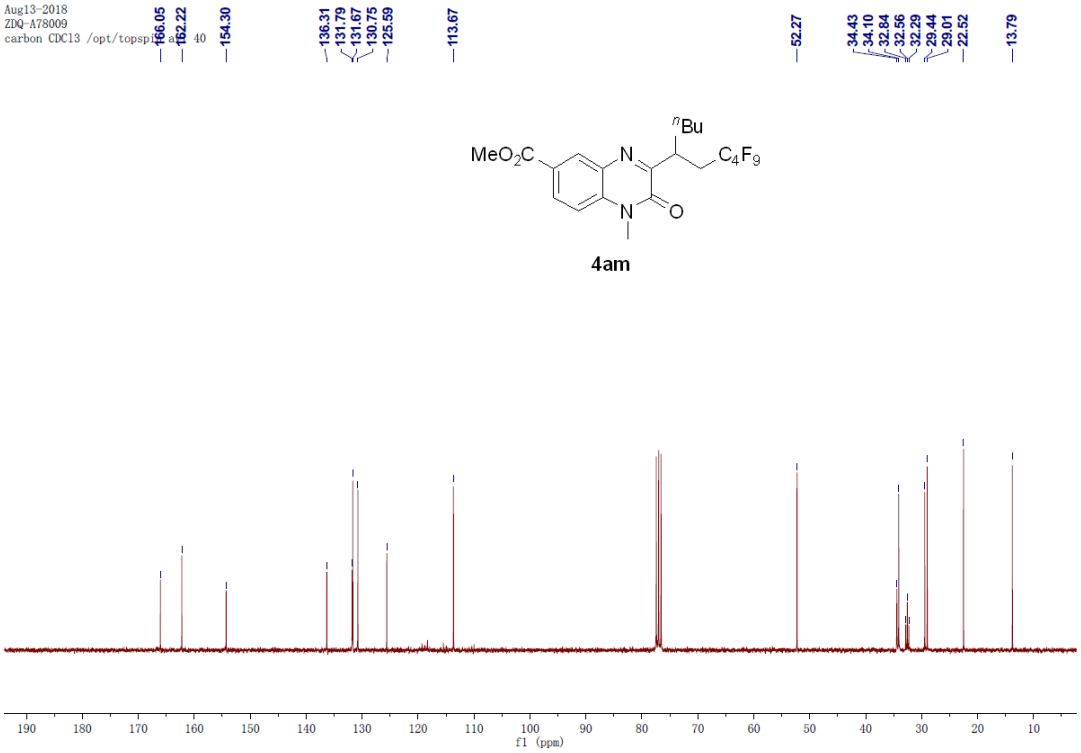
4al

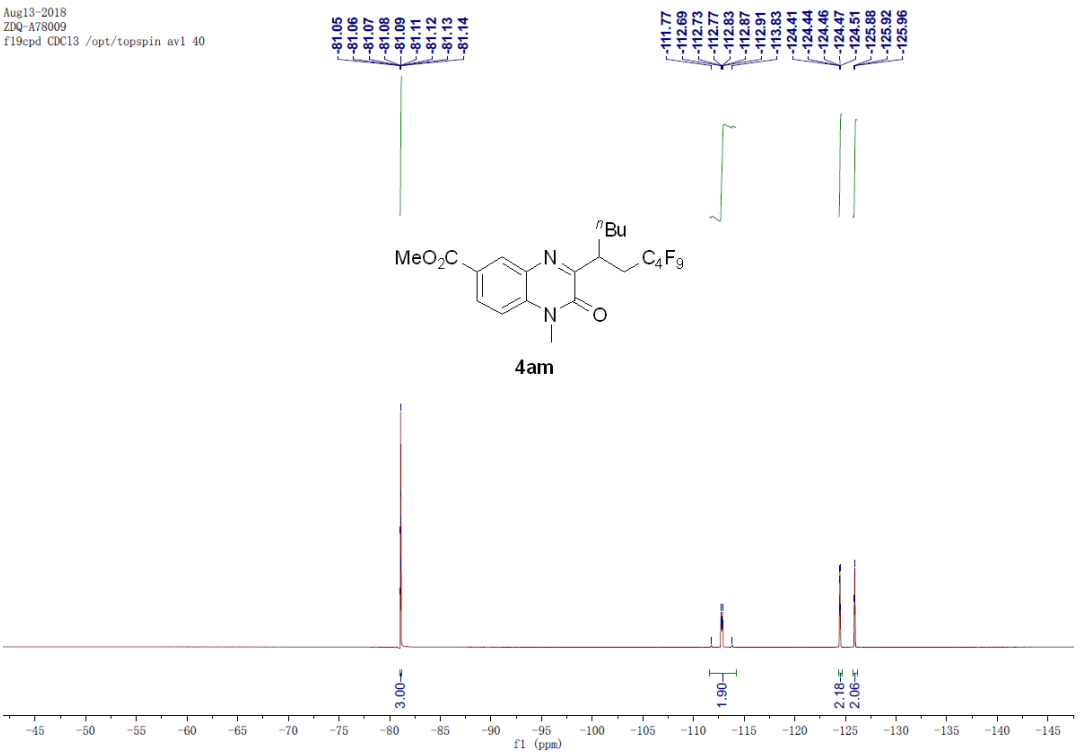

Aug13-2018
ZDQ-A78008
f19cpd CDCl3 /opt/topspin av1
-81.01
-81.02
-81.03
-81.05
-81.06
-81.07
-81.08
-81.09
-81.10
-112.68
-112.70
-124.38
-124.41
-124.43
-124.44
-124.46
-124.48
-125.82
-125.85
-125.89
-125.90
-125.94
nBu
O2N
N
C4F9
N
O
3.00
2.14
2.18
2.09
f1 (ppm)

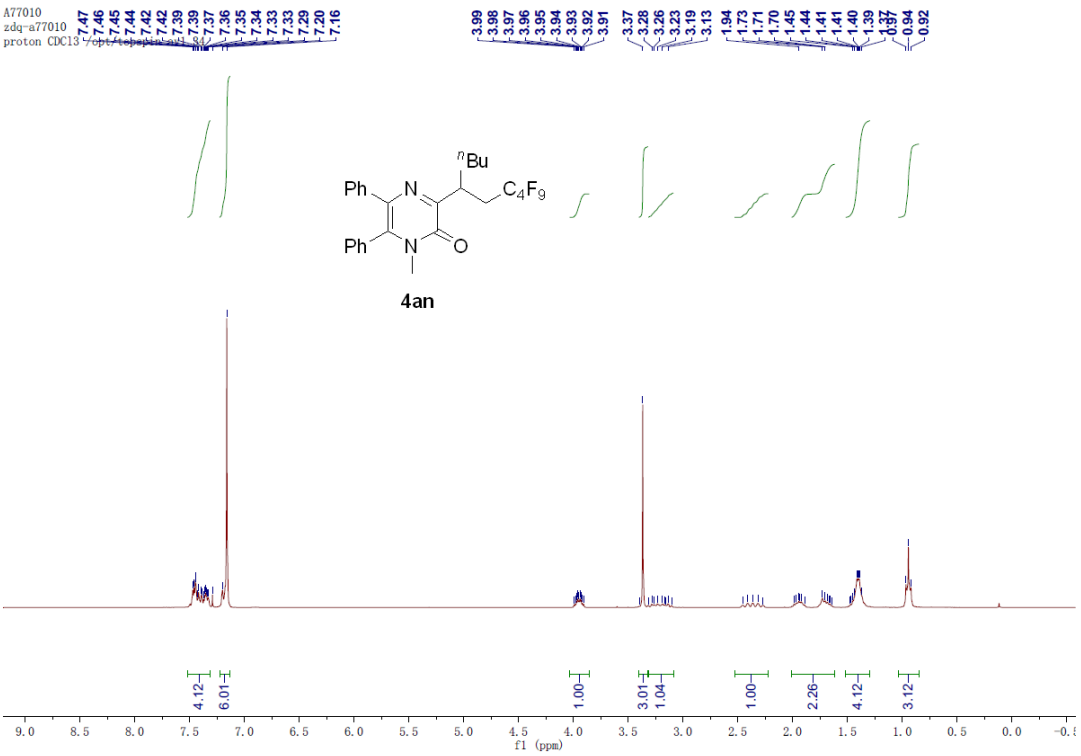
4al

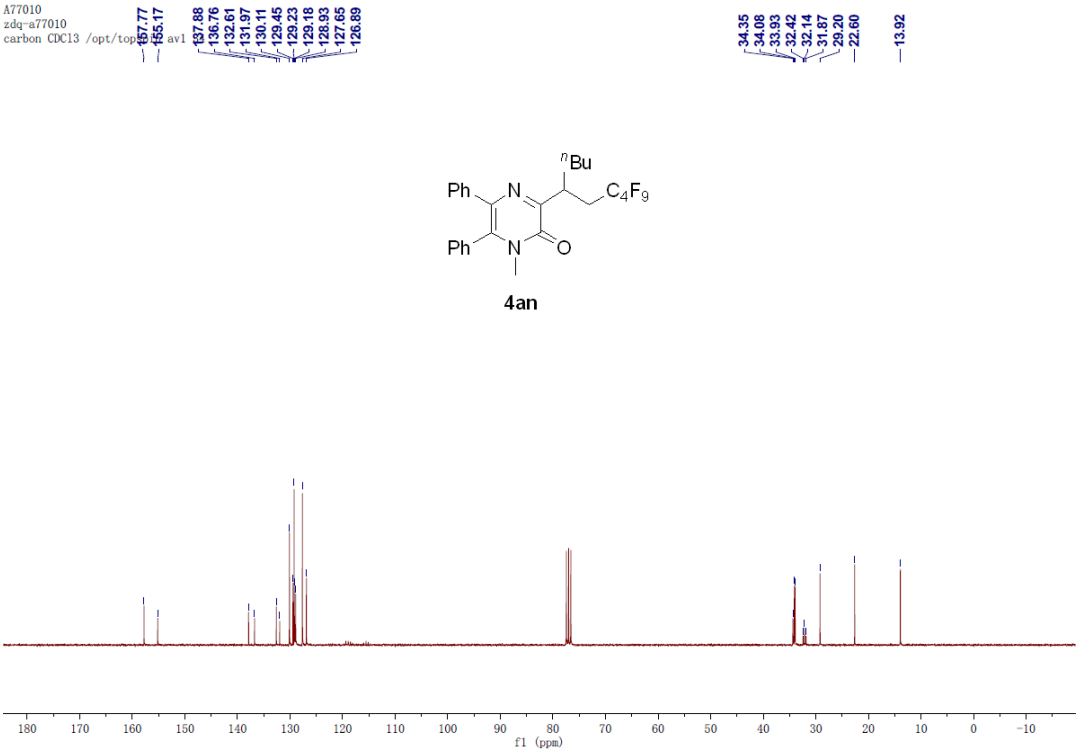

Aug13-2018
ZDQ-A78009
proton CDCl3 /opt/topspin av1-48
8.44
8.43
8.13
8.13
8.10
8.10
7.29
7.28
7.26
7.25
7.19
3.93
3.91
3.90
3.89
3.88
3.86
3.85
3.66
3.65
1.78
1.76
1.75
1.63
1.60
1.59
1.59
1.58
1.57
1.56
1.26
1.23
0.81
0.79
0.77
nBu
MeO2C
N
C4F9
N
O
1.00
1.03
1.04
4.16
3.14
1.05
1.04
2.47
3.92
3.16
f1 (ppm)

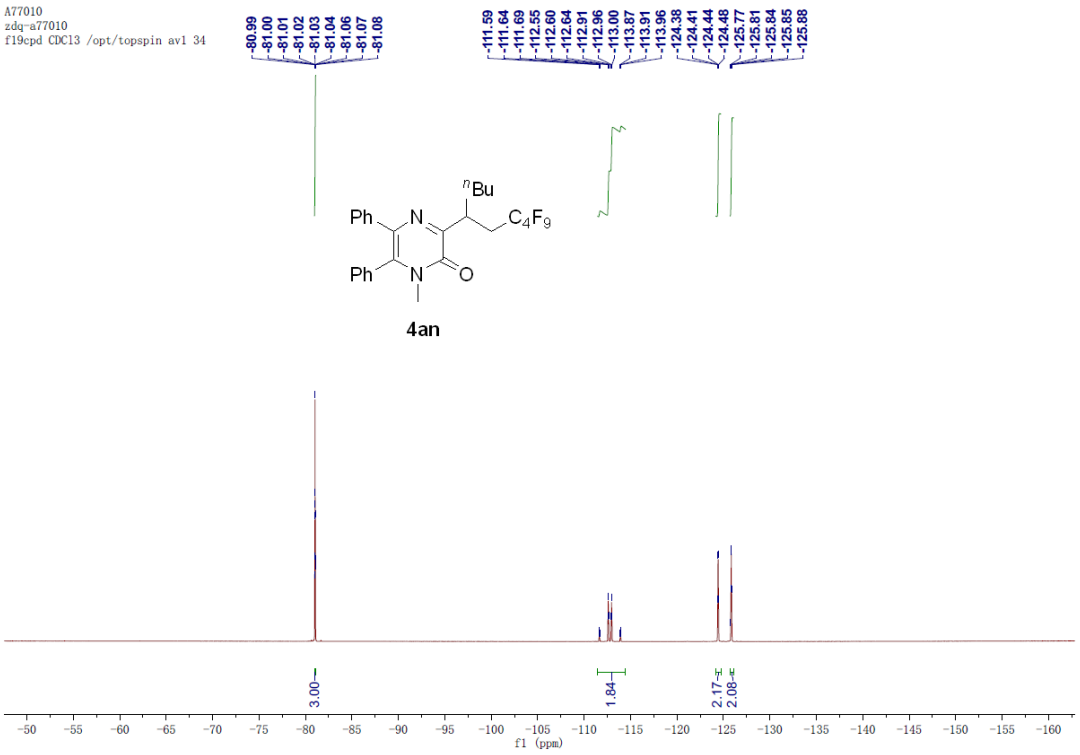
4am

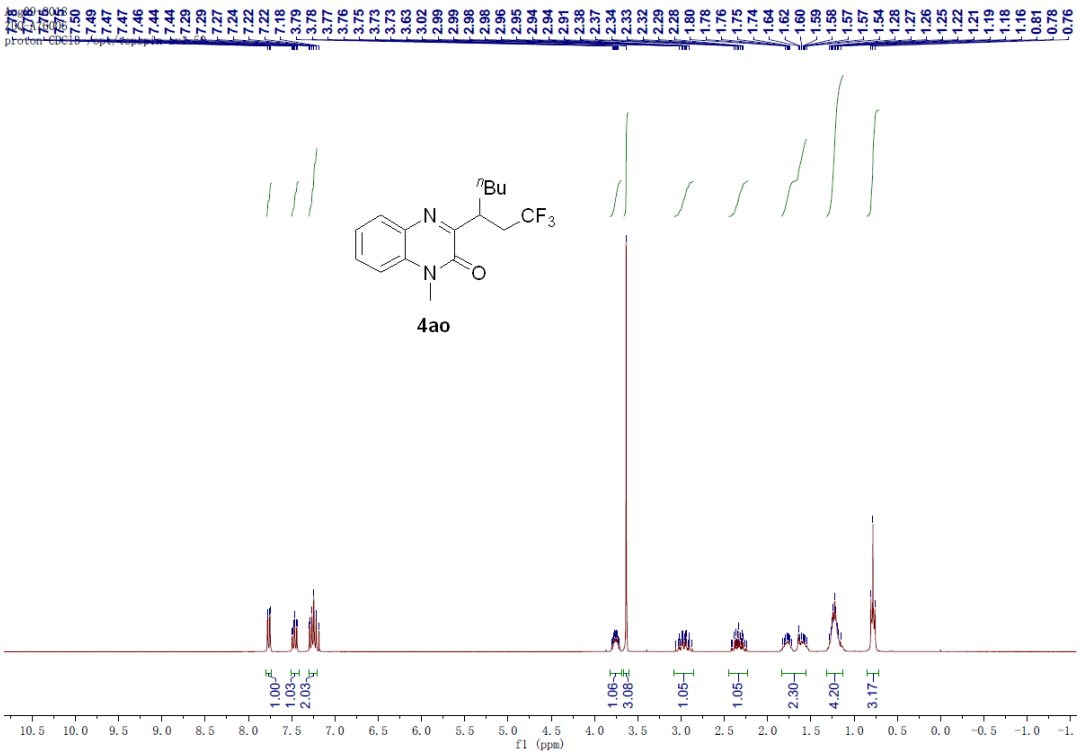

Aug13-2018
ZDQ-A78009
carbon CDC13 /opt/topspin av1 40
166.05
162.22
154.30
136.31
131.79
131.67
130.75
125.59
113.67
52.27
34.43
34.10
32.84
32.56
32.29
29.44
29.01
22.52
13.79
nBu
MeO2C
N
C4F9
N
O
4am
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

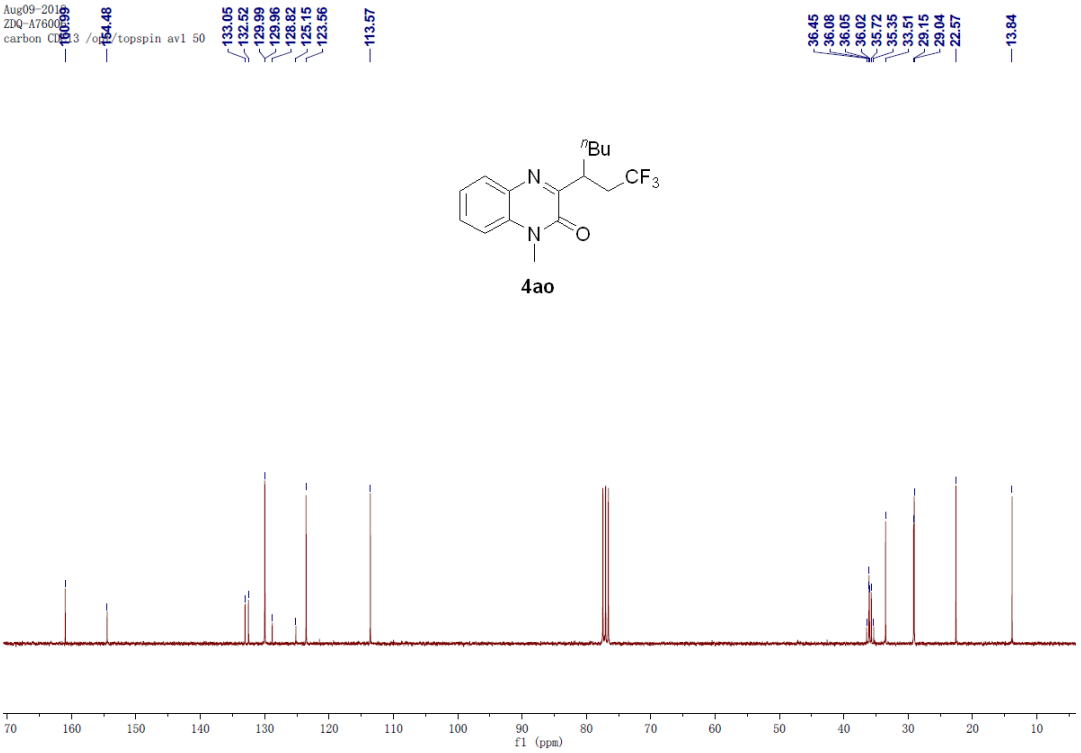

Aug13-2018
ZDQ-A78009
f19cpd CDC13 /opt/topspin av1 40
-81.05
-81.06
-81.07
-81.08
-81.09
-81.11
-81.12
-81.13
-81.14
-111.77
-112.69
-112.73
-112.77
-112.83
-112.87
-112.91
-113.83
-124.41
-124.44
-124.46
-124.47
-124.51
-125.88
-125.92
-125.96
nBu
MeO2C
N
C4F9
N
O
4am
3.00
1.90
2.18
2.06
-45
-50
-55
-60
-65
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
-145
f1 (ppm)

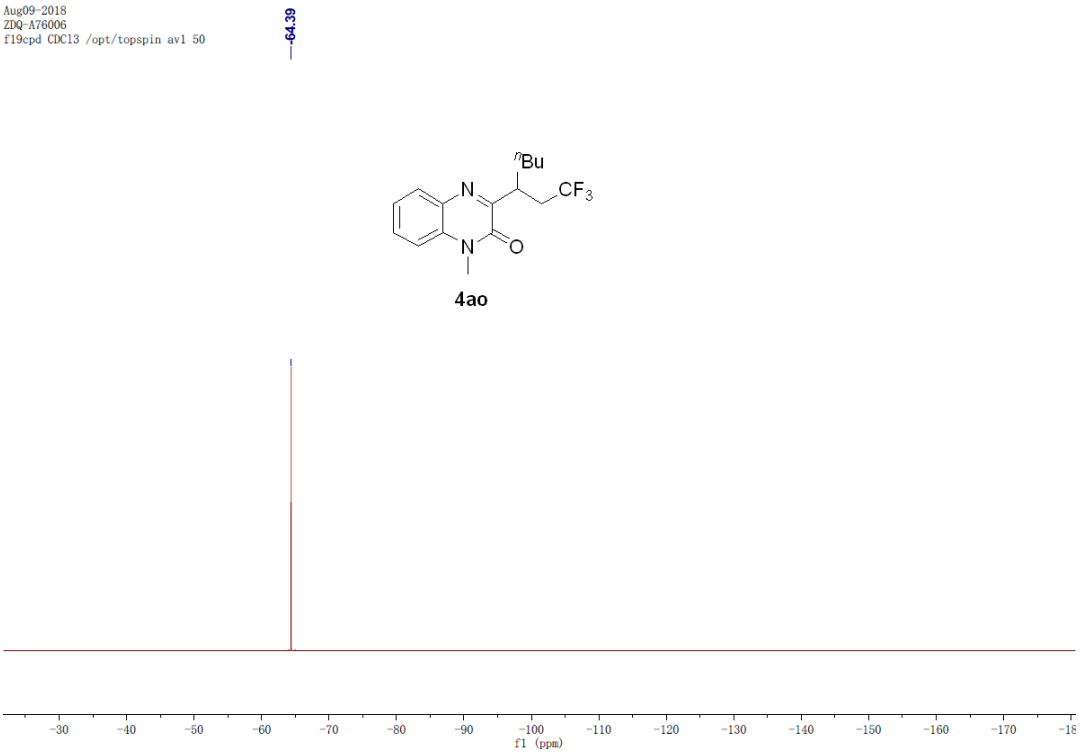

A77010
zdq-a77010
proton CDC13
7.47
7.46
7.45
7.44
7.42
7.42
7.39
7.39
7.37
7.36
7.35
7.34
7.33
7.33
7.29
7.20
7.16
3.99
3.98
3.97
3.96
3.95
3.94
3.93
3.92
3.91
3.37
3.28
3.26
3.23
3.19
3.13
1.94
1.73
1.71
1.70
1.45
1.44
1.41
1.41
1.40
1.39
0.97
0.94
0.92
nBu
Ph
N
C4F9
Ph
N
O
4an
4.12
6.01
1.00
3.01
1.04
1.00
2.26
4.12
3.12
f1 (ppm)

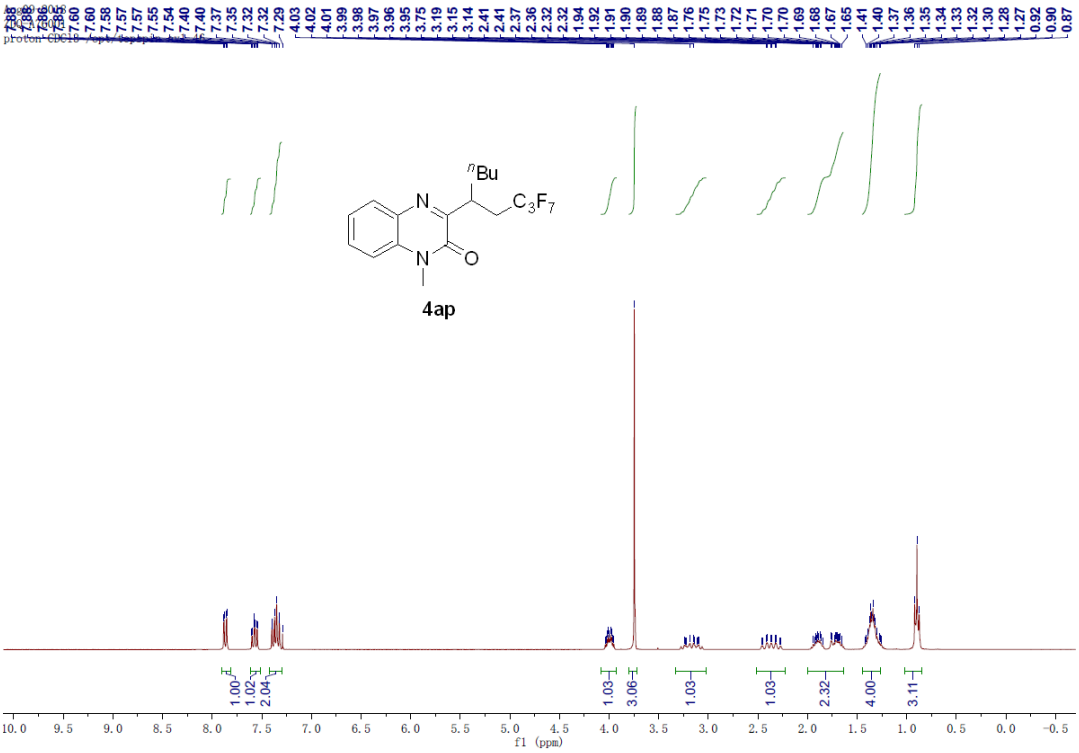

A77010
zdq-a77010
carbon CDC13 /opt/top
157.77
155.17
137.88
136.76
132.61
131.97
130.11
129.45
129.23
129.18
128.93
127.65
126.89
34.35
34.08
33.93
32.42
32.14
31.87
29.20
22.60
13.92
nBu
Ph
N
C4F9
Ph
N
O
4an
f1 (ppm)

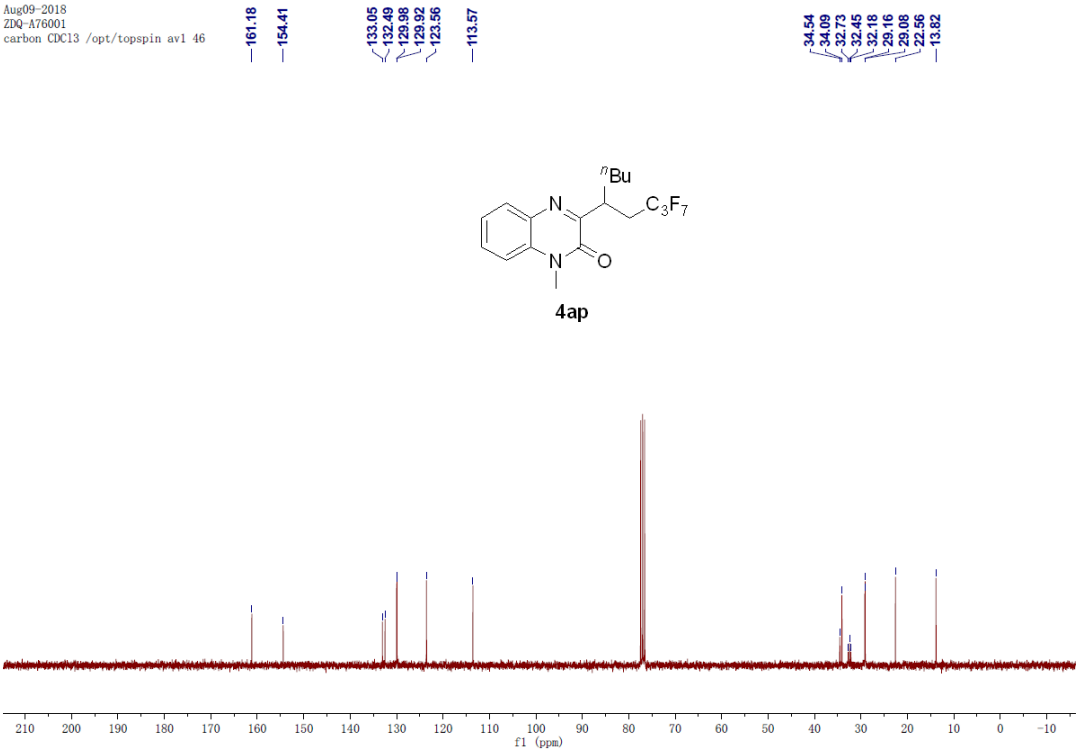

A77010
zdq-a77010
f19cpd CDCl3 /opt/topspin av1 34
-80.99
-81.00
-81.01
-81.02
-81.03
-81.04
-81.06
-81.07
-81.08
-111.59
-111.64
-111.69
-112.55
-112.60
-112.64
-112.91
-112.96
-113.00
-113.87
-113.91
-113.96
-124.38
-124.41
-124.44
-124.48
-125.77
-125.81
-125.84
-125.85
-125.88
nBu
Ph
N
C4F9
Ph
N
O
4an
3.00
1.84
2.17
2.08
f1 (ppm)

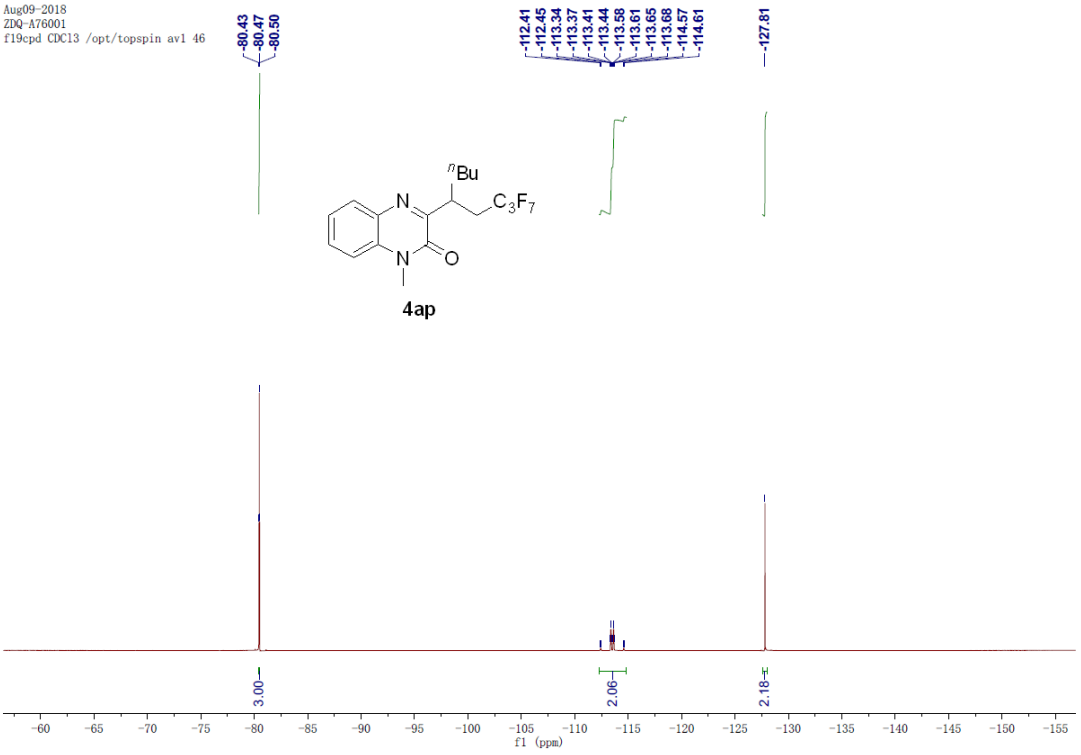

nBu
N
CF3
N
O
4ao
1.00
1.03
2.03
1.06
3.08
1.05
1.05
2.30
4.20
3.17
f1 (ppm)


Aug09-2018
ZDQ-A76006
carbon CDCl3 /opt/topspin av1 50
160.99
154.48
133.05
132.52
129.99
129.96
128.82
125.15
123.56
113.57
36.45
36.08
36.05
36.02
35.72
35.35
33.51
29.15
29.04
22.57
13.84
nBu
CF3
N
N
O
4ao
70
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

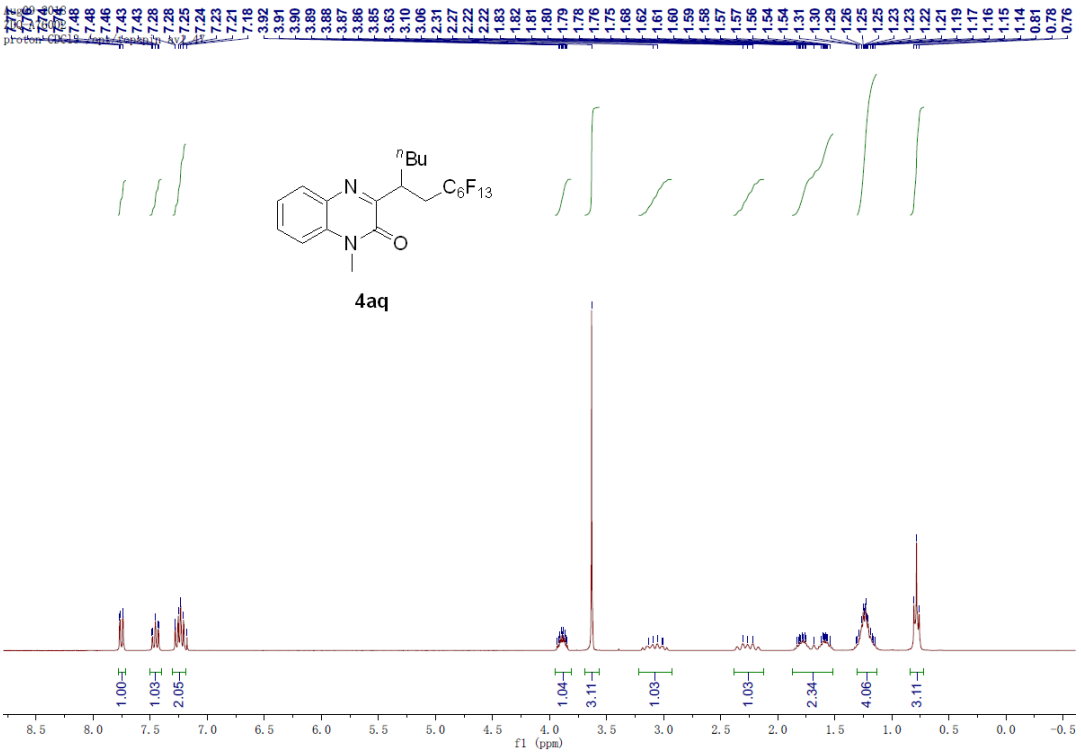

Aug09-2018
ZDQ-A76006
f19cpd CDCl3 /opt/topspin av1 50
64.39
nBu
CF3
N
N
O
4ao
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
f1 (ppm)


4ap
f1 (ppm)


Aug09-2018
ZDQ-A76001
carbon CDCl3 /opt/topspin av1 46
4ap
f1 (ppm)

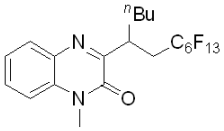

Aug09-2018
ZDQ-A76001
f19cpd CDCl3 /opt/topspin av1 46
-80.43
-80.47
-80.50
-112.41
-112.45
-113.34
-113.37
-113.41
-113.44
-113.58
-113.61
-113.65
-113.68
-114.57
-114.61
-127.81
nBu
C3F7
N
N
O
3.00
2.06
2.18
f1 (ppm)

4ap

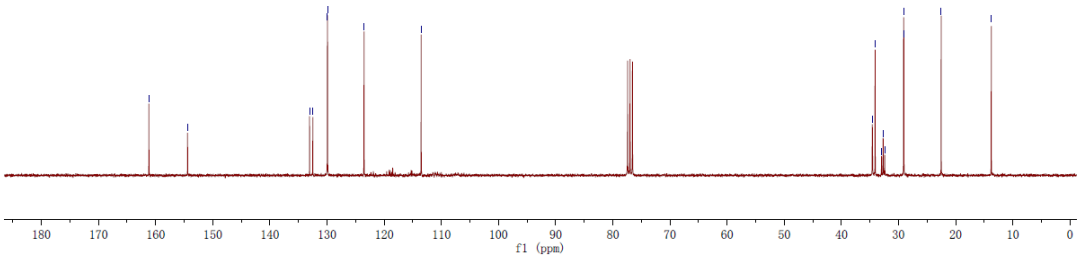

nBu
C6F13
N
N
O
1.00
1.03
2.05
1.04
3.11
1.03
1.03
2.34
4.06
3.11
f1 (ppm)

4aq

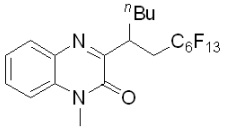

Aug09-2018
ZDQ-A76002
carbon CDC13 /opt/topspin av1 47
161.18
154.41
133.06
132.50
129.94
129.91
123.53
113.54
34.59
34.10
32.97
32.69
32.42
29.12
29.08
22.54
13.77


nBu
N
C6F13
N
O

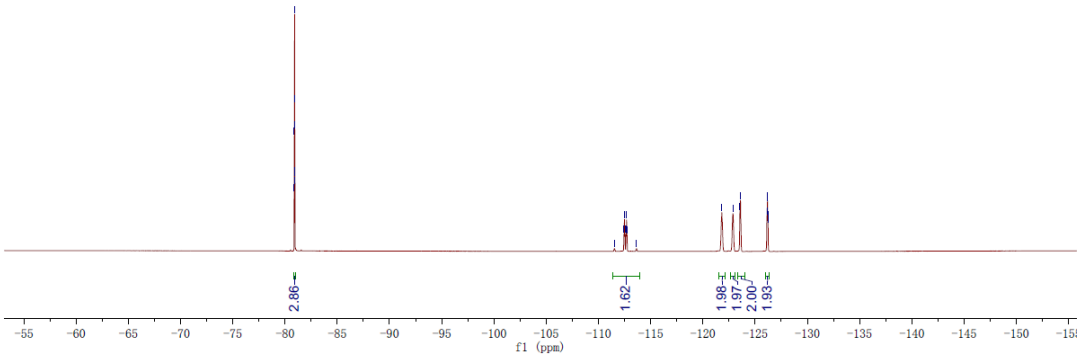
4aq

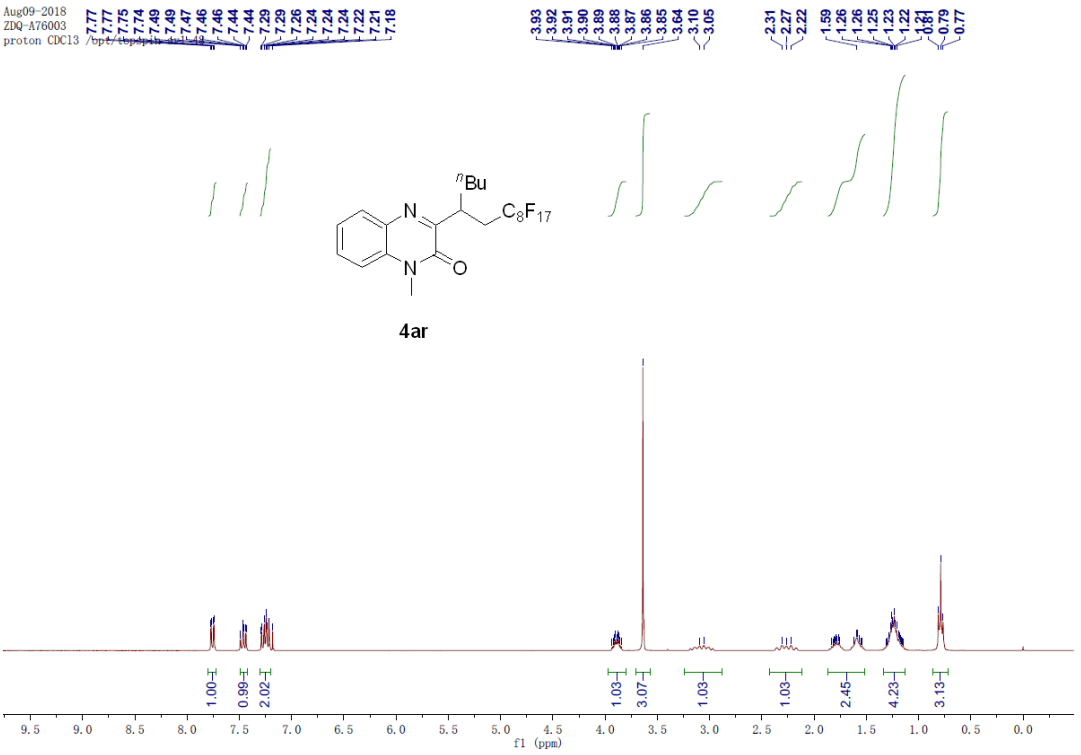

180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


Aug09-2018
ZDQ-A76002
f19cpd CDC13 /opt/topspin av1 47
-80.87
-80.88
-80.89
-80.91
-80.92
-80.92
-80.94
-80.95
-80.96
-111.53
-112.44
-112.49
-112.54
-112.64
-112.69
-112.74
-113.65
-121.81
-122.88
-123.54
-123.59
-123.60
-126.14
-126.17
-126.19
-126.22
-126.24

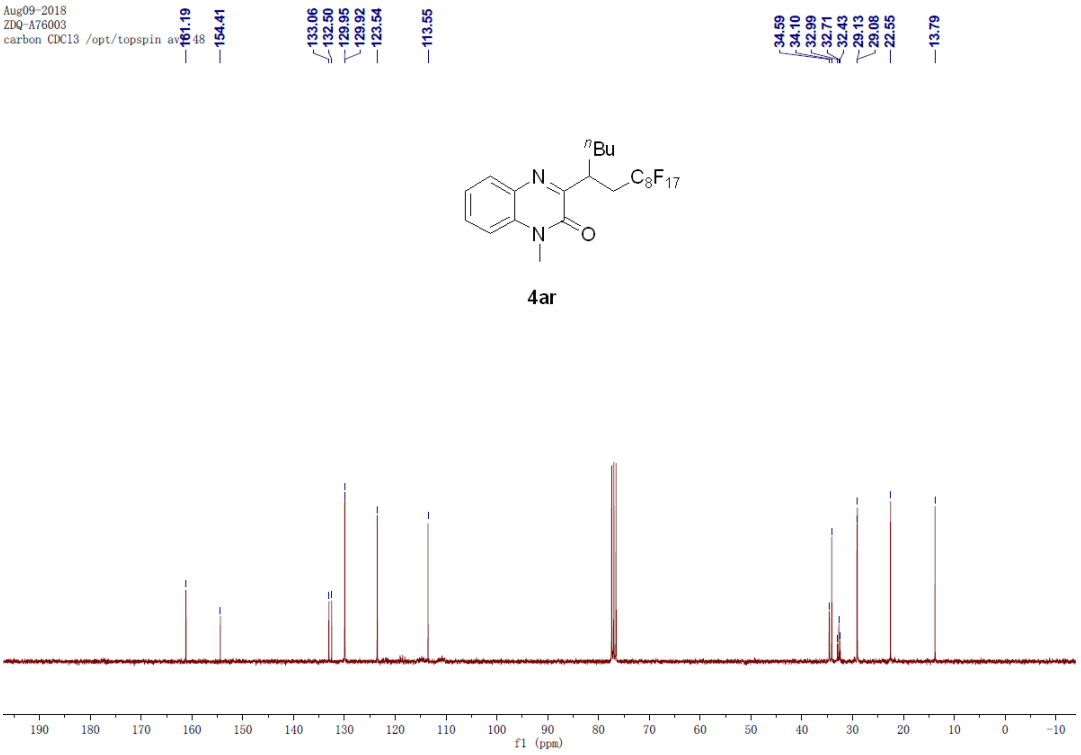

nBu
N
C6F13
N
O

4aq

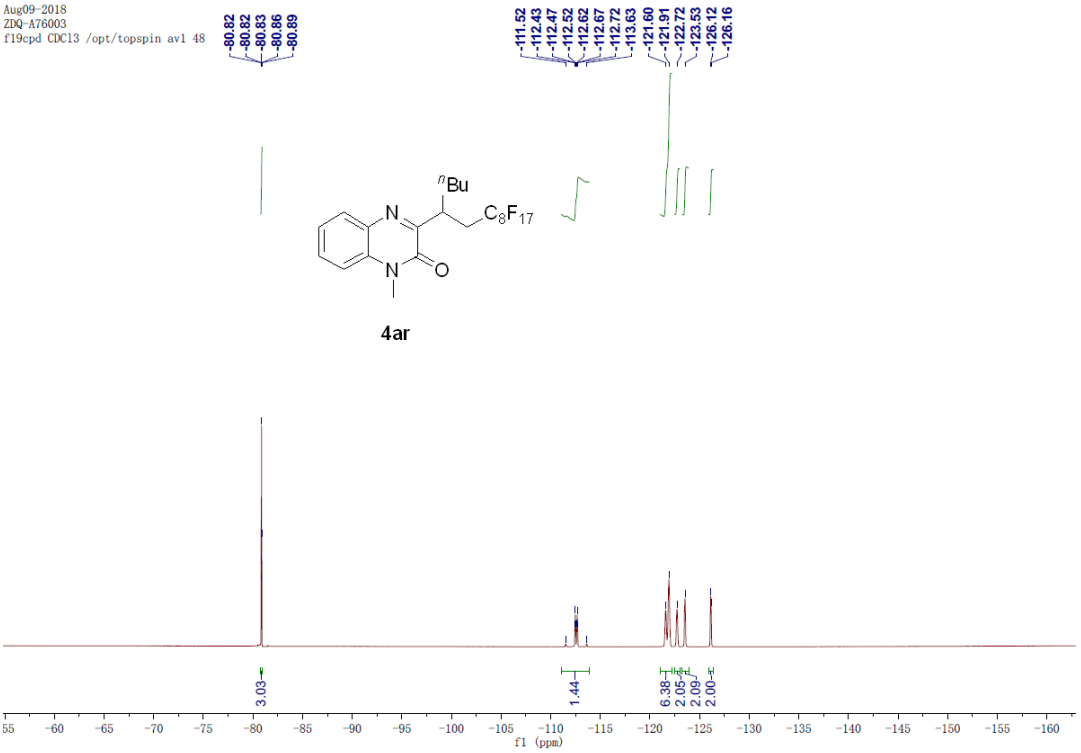

2.86
1.62
1.98
1.97
2.00
1.93
-55
-60
-65
-70
-75
-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
-145
-150
f1 (ppm)


Aug09-2018
ZDQ-A76003
proton CDC13 /opt/topspin
7.77 7.77 7.75 7.74 7.49 7.49 7.47 7.46 7.46 7.44 7.44 7.29 7.26 7.24 7.24 7.24 7.22 7.21 7.18
3.93 3.92 3.91 3.90 3.89 3.88 3.87 3.86 3.85 3.64 3.10 3.05
2.31 2.27 2.22
1.59 1.26 1.26 1.25 1.23 1.22 1.21 0.81 0.79 0.77
nBu
C8F17
N
O
1.00 0.99 2.02 1.03 3.07 1.03 1.03 2.45 4.23 3.13
f1 (ppm)

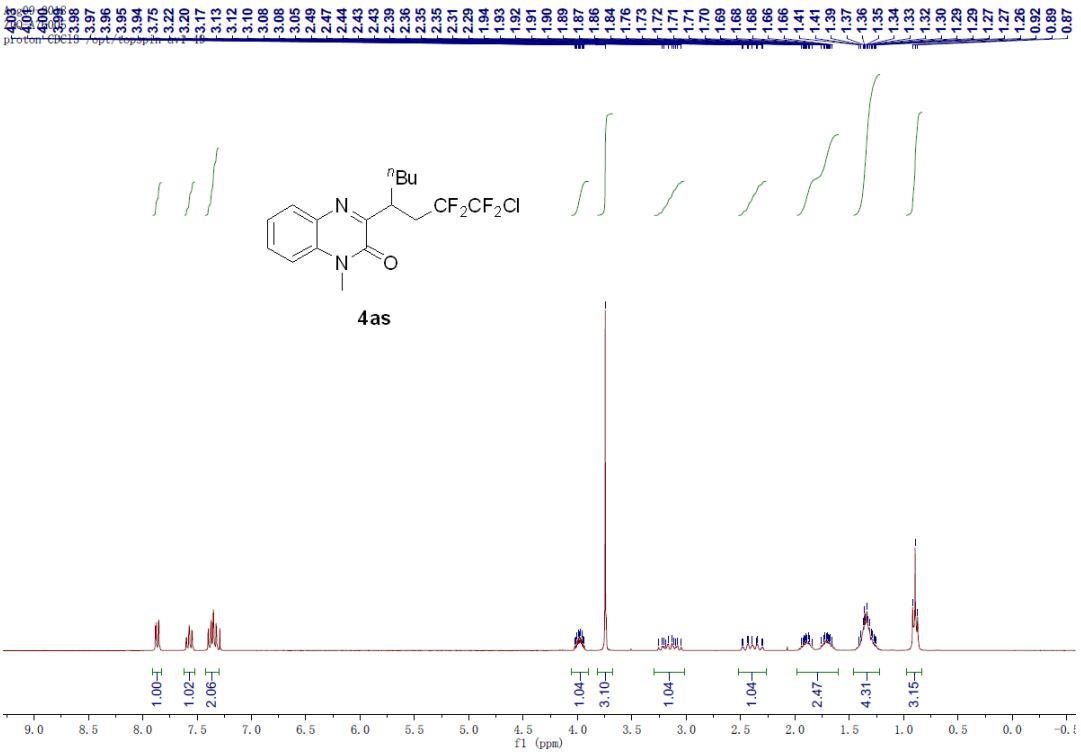
4ar


Aug09-2018
ZDQ-A76003
carbon CDC13 /opt/topspin
161.19 154.41 133.06 132.50 129.95 129.92 123.54 113.55
34.59 34.10 32.99 32.71 32.43 29.13 29.08 22.55 13.79
nBu
C8F17
N
O
f1 (ppm)

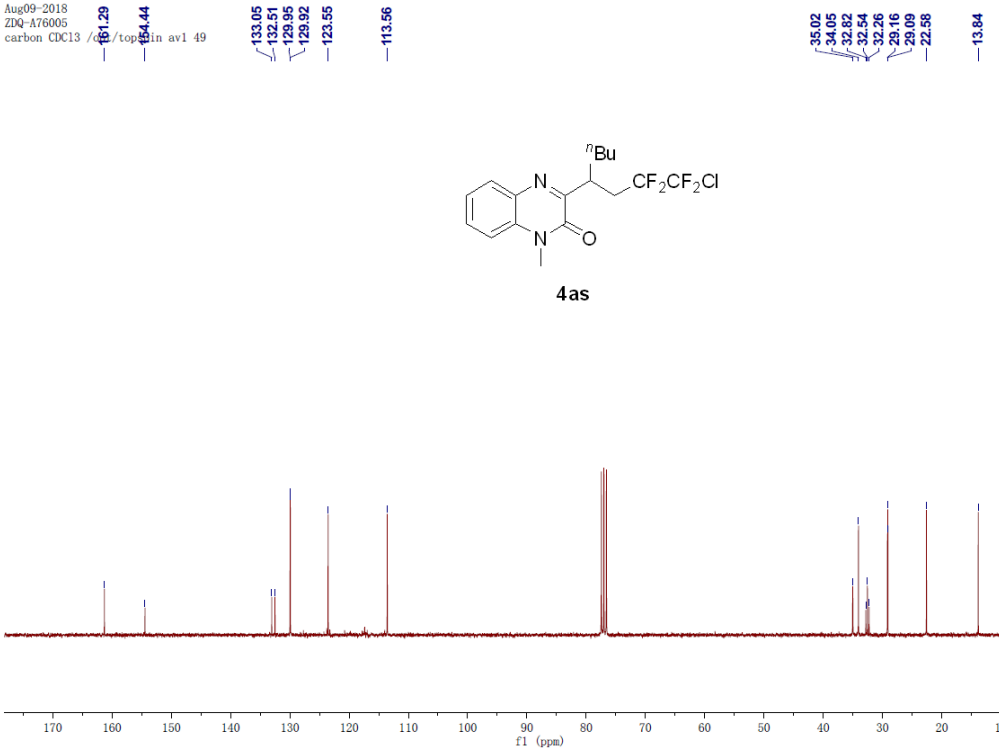
4ar


Aug09-2018
ZDQ-A76003
f19cpd CDCl3 /opt/topspin av1 48
-80.82
-80.82
-80.83
-80.86
-80.89
-111.52
-112.43
-112.47
-112.52
-112.62
-112.67
-112.72
-113.63
-121.60
-121.91
-122.72
-123.53
-126.12
-126.16
nBu
C8F17
N
N
O
3.03
1.44
6.38
2.05
2.09
2.00
f1 (ppm)

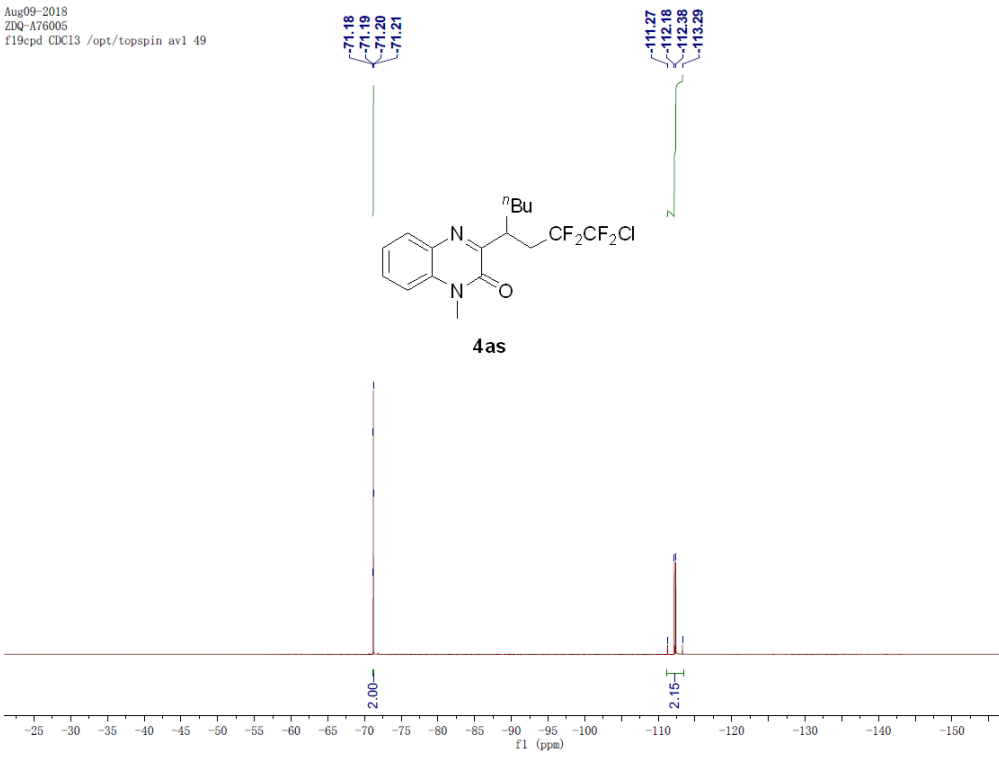
4ar


nBu
CF2CF2Cl
N
N
O
1.00
1.02
2.06
1.04
3.10
1.04
1.04
2.47
4.31
3.15
f1 (ppm)

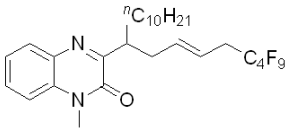
4as


Aug09-2018
ZDQ-A76005
carbon CDC13 /opt/topspin av1 49
161.29
154.44
133.05
132.51
129.95
129.92
123.55
113.56
35.02
34.05
32.82
32.54
32.26
29.16
29.09
22.58
13.84
nBu
N
CF2CF2Cl
N
O
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

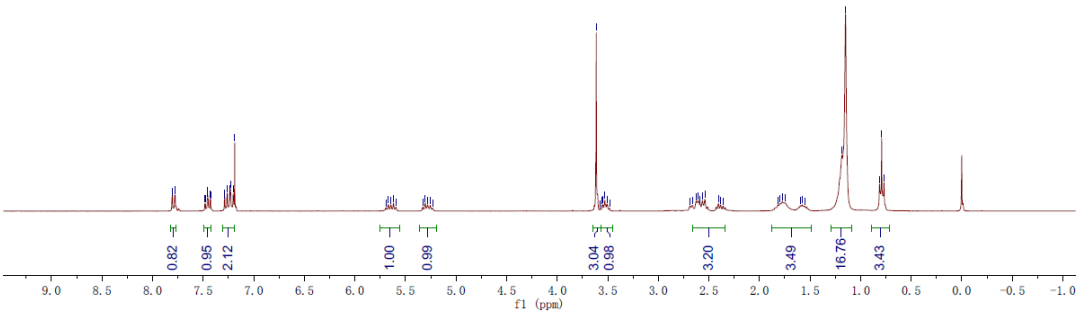
4as

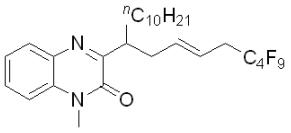

Aug09-2018
ZDQ-A76005
f19cpd CDC13 /opt/topspin av1 49
-71.18
-71.19
-71.20
-71.21
-111.27
-112.18
-112.38
-113.29
nBu
N
CF2CF2Cl
N
O
2.00
2.15
-25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -110 -120 -130 -140 -150 -160
f1 (ppm)

4as

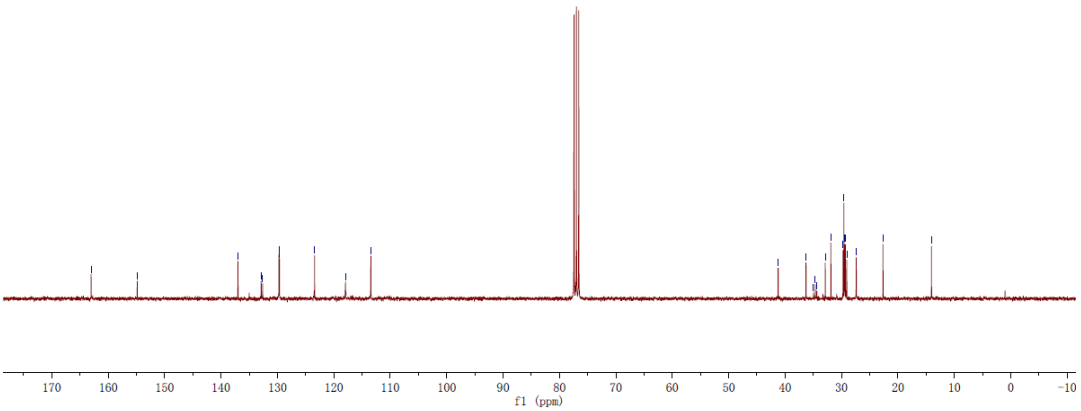


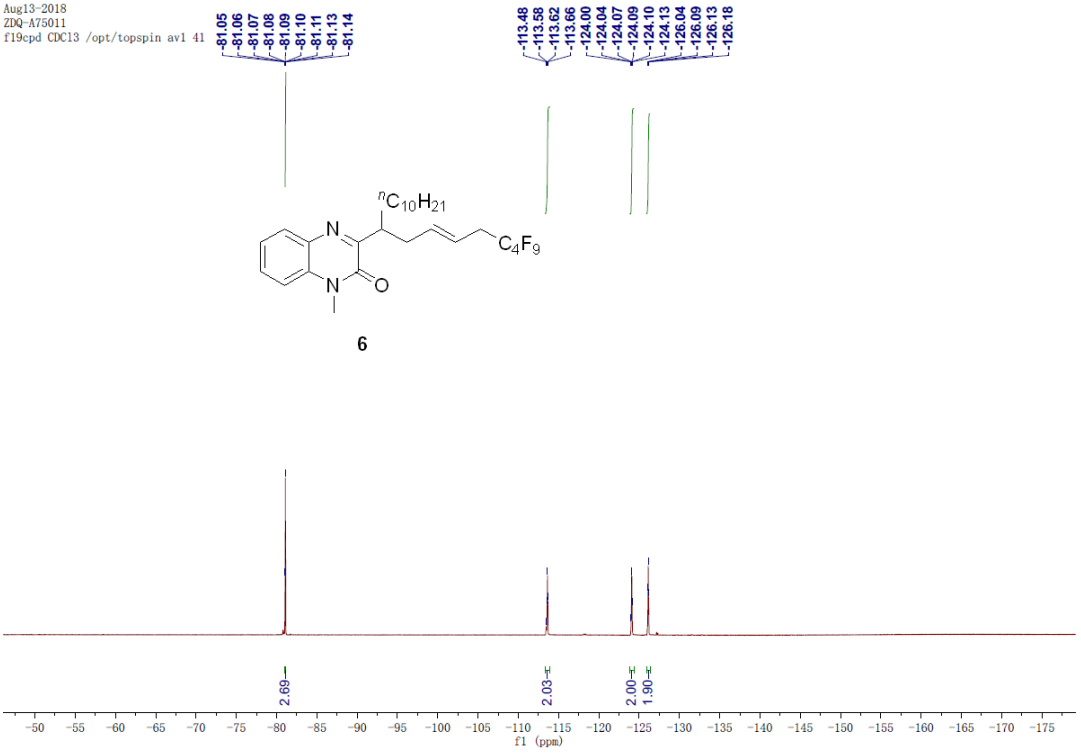
6



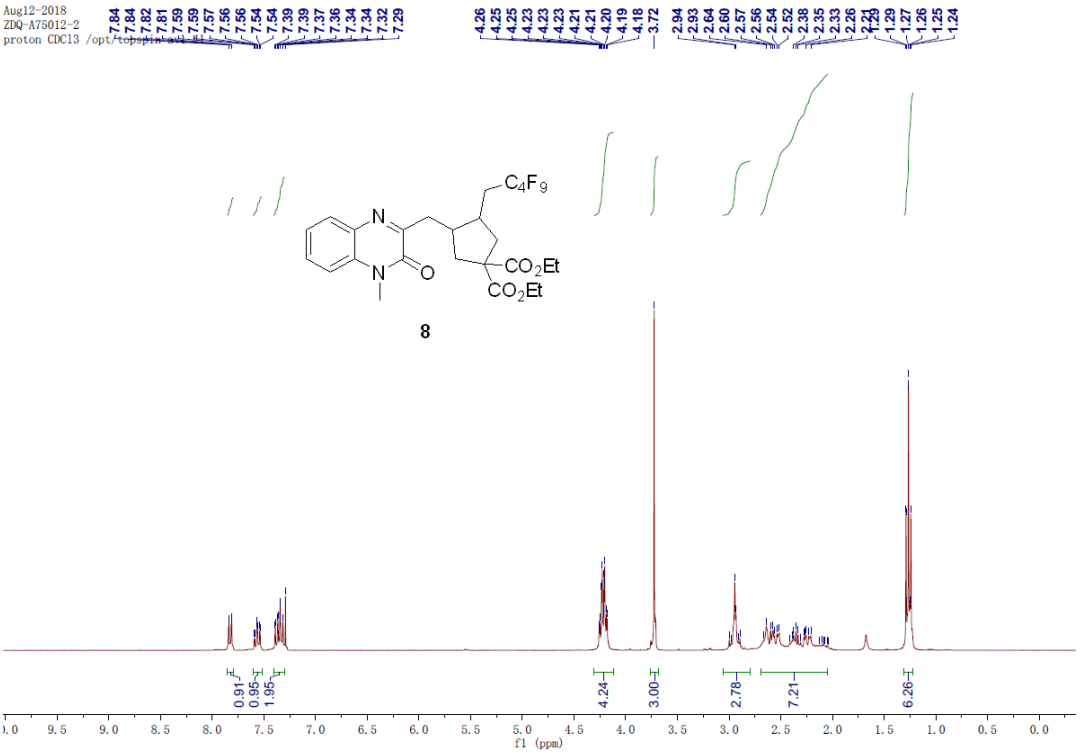


6

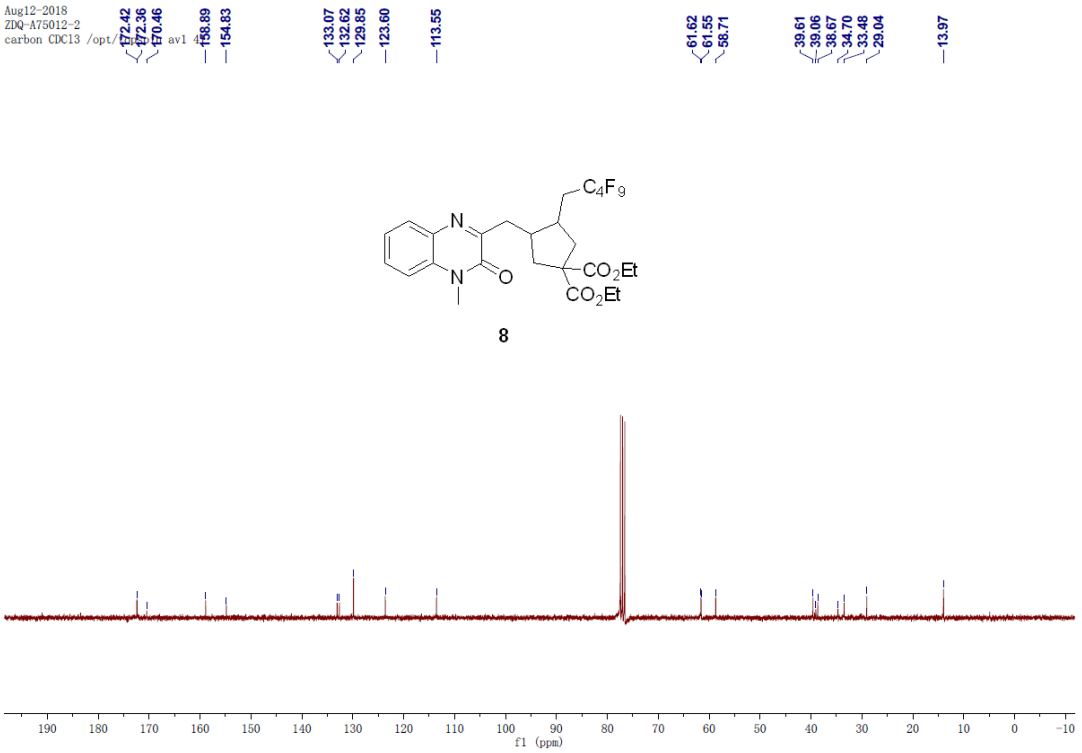



Aug13-2018
ZDQ-A75011
f19cpd CDCl3 /opt/topspin av1 41
-81.05
-81.06
-81.07
-81.08
-81.09
-81.10
-81.11
-81.13
-81.14
-113.48
-113.58
-113.62
-113.66
-124.00
-124.04
-124.07
-124.09
-124.10
-124.13
-126.04
-126.09
-126.13
-126.18
$^{n}C_{10}H_{21}$
C_4F_9
N
N
O
2.69
2.03
2.00
1.90
f1 (ppm)

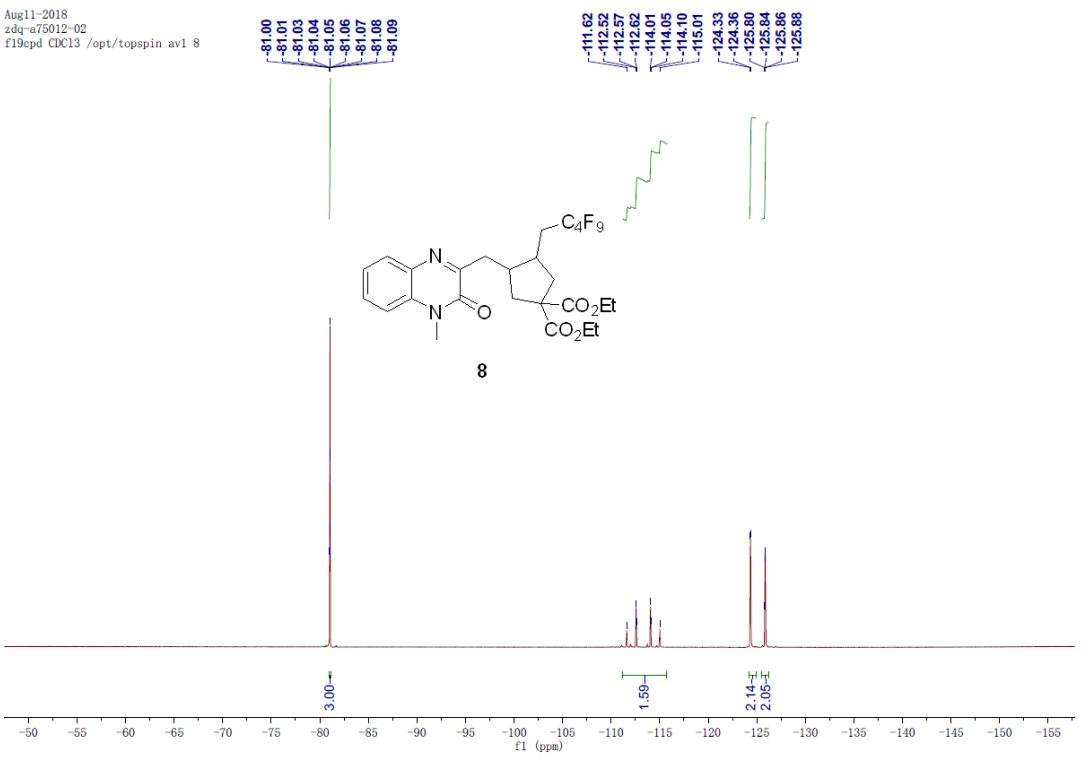
6


Aug12-2018
ZDQ-A75012-2
proton CDCl3 /opt/topspin av1 41
7.84
7.84
7.82
7.81
7.59
7.59
7.57
7.56
7.56
7.54
7.54
7.39
7.39
7.37
7.36
7.34
7.34
7.32
7.29
4.26
4.25
4.25
4.23
4.23
4.21
4.21
4.20
4.19
4.18
3.72
2.94
2.93
2.64
2.60
2.57
2.56
2.54
2.52
2.38
2.35
2.33
2.26
1.29
1.27
1.26
1.25
1.24
C_4F_9
N
N
O
CO_2Et
CO_2Et
0.91
0.95
1.95
4.24
3.00
2.78
7.21
6.26
f1 (ppm)

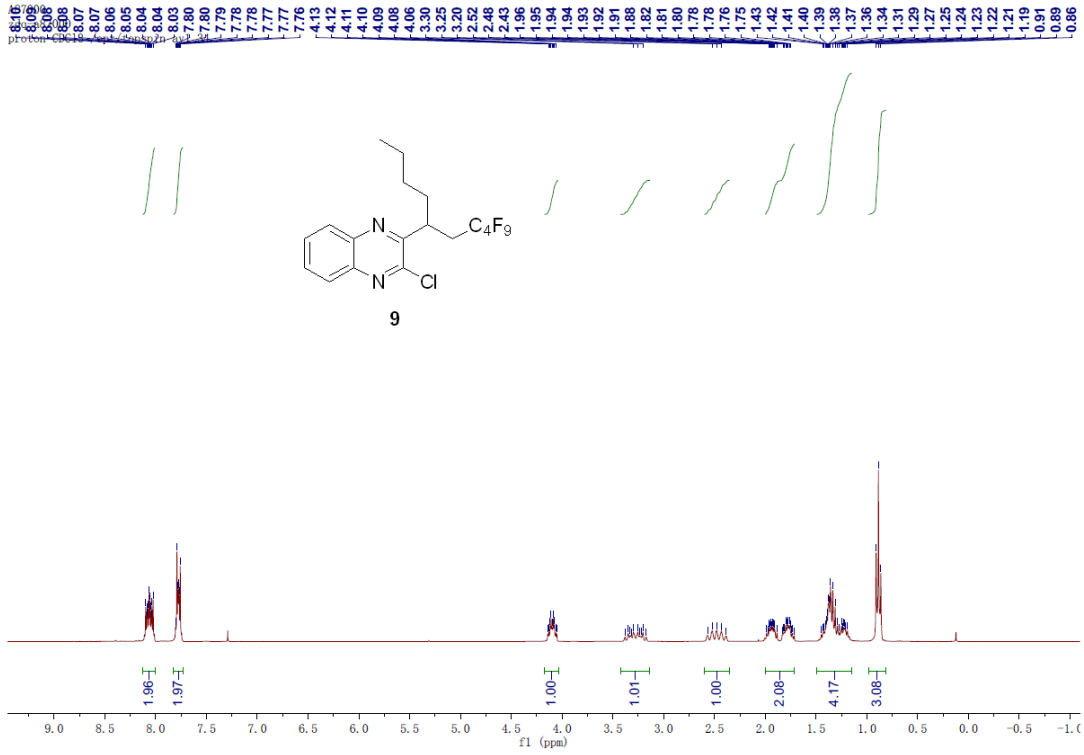
8


Aug12-2018
ZDQ-A75012-2
carbon CDCl3 /opt/topspin avl 4
172.42
172.36
170.46
158.89
154.83
133.07
132.62
129.85
123.60
113.55
61.62
61.55
58.71
39.61
39.06
38.67
34.70
33.48
29.04
13.97
C_4F_9
N
N
O
CO_2Et
CO_2Et
f1 (ppm)

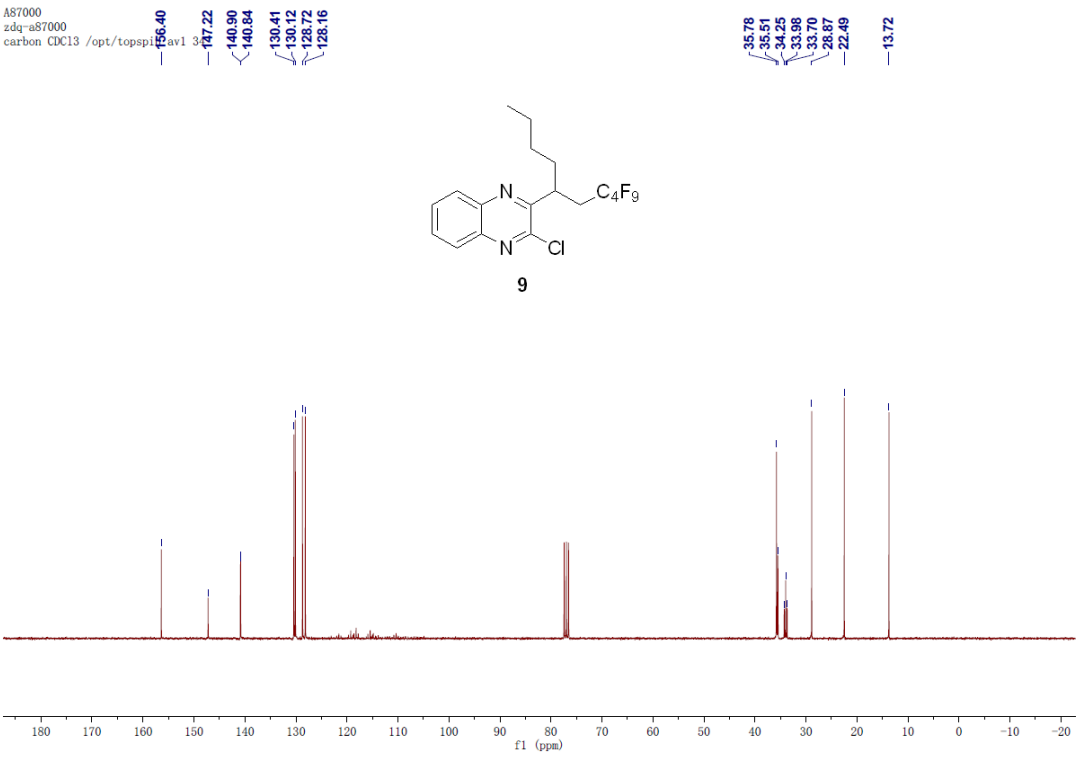
8


Aug11-2018
zdq-a75012-02
f19cpd CDCl3 /opt/topspin avl 8
-81.00
-81.01
-81.03
-81.04
-81.05
-81.06
-81.07
-81.08
-81.09
-111.62
-112.52
-112.57
-112.62
-114.01
-114.05
-114.10
-115.01
-124.33
-124.36
-125.80
-125.84
-125.86
-125.88
C_4F_9
N
N
O
CO_2Et
CO_2Et
3.00
1.59
2.14
2.05
f1 (ppm)

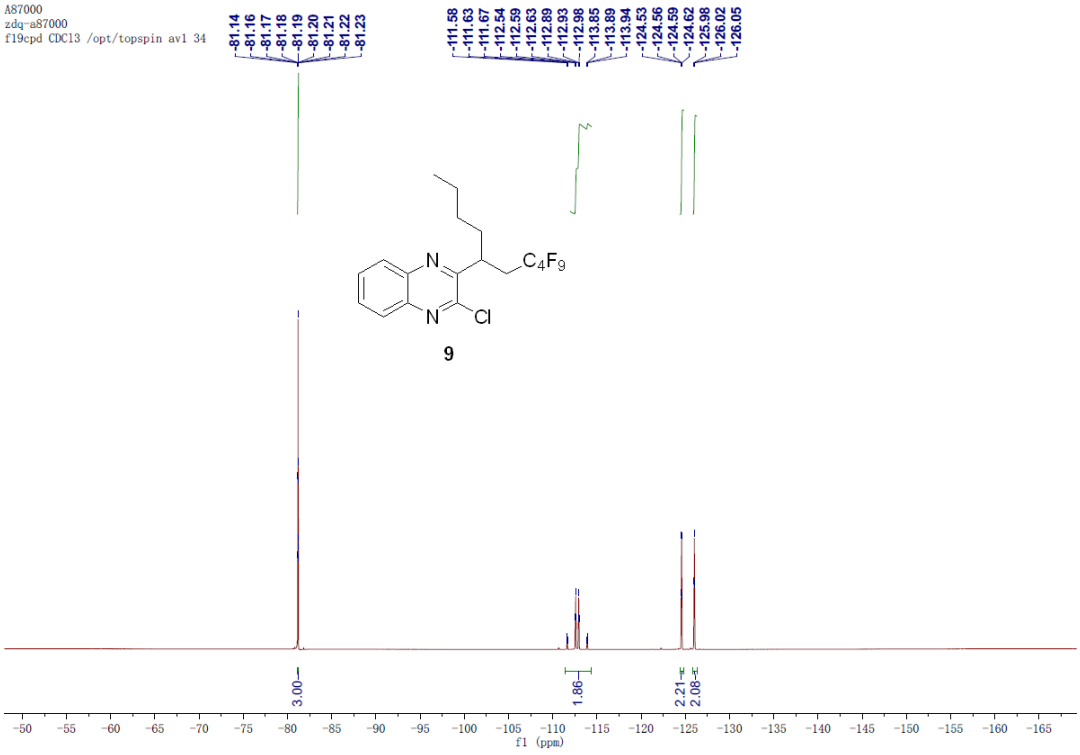
8


N
N
Cl
C_4F_9
1.96
1.97
1.00
1.01
1.00
2.08
4.17
3.08
f1 (ppm)

9


A87000
zdq-a87000
carbon CDCl3 /opt/topspin4/exp/stan/nmr/lists/pp/standard_pulseprogram
156.40
147.22
140.90
140.84
130.41
130.12
128.72
128.16
35.78
35.51
34.25
33.98
33.70
28.87
22.49
13.72
N
N
Cl
C_4F_9
f1 (ppm)

9


A87000
zdq-a87000
f19cpd CDCl3 /opt/topspin av1 34
-81.14
-81.16
-81.17
-81.18
-81.19
-81.20
-81.21
-81.22
-81.23
-111.58
-111.63
-111.67
-112.54
-112.59
-112.63
-112.89
-112.93
-112.98
-113.85
-113.89
-113.94
-124.53
-124.56
-124.59
-124.62
-125.98
-126.02
-126.05
N
N
Cl
C4F9
9
3.00
1.86
2.21
2.08
-50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135 -140 -145 -150 -155 -160 -165
f1 (ppm)