Electronic Supplementary Material (ESI) for ChemComm.

Supporting Information

Copper-catalyzed tandem *cis*-carbometallation/cyclization of imine-ynamides with arylboronic acids

Hao-Ran Wang, En-He Huang, Chen Luo, Wen-Feng Luo, Yin Xu, Peng-Cheng Qian,* Jin-Mei Zhou, and Long-Wu Ye*

State Key Laboratory of Physical Chemistry of Solid Surfaces and Key Laboratory for Chemical Biology of Fujian Province, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, China

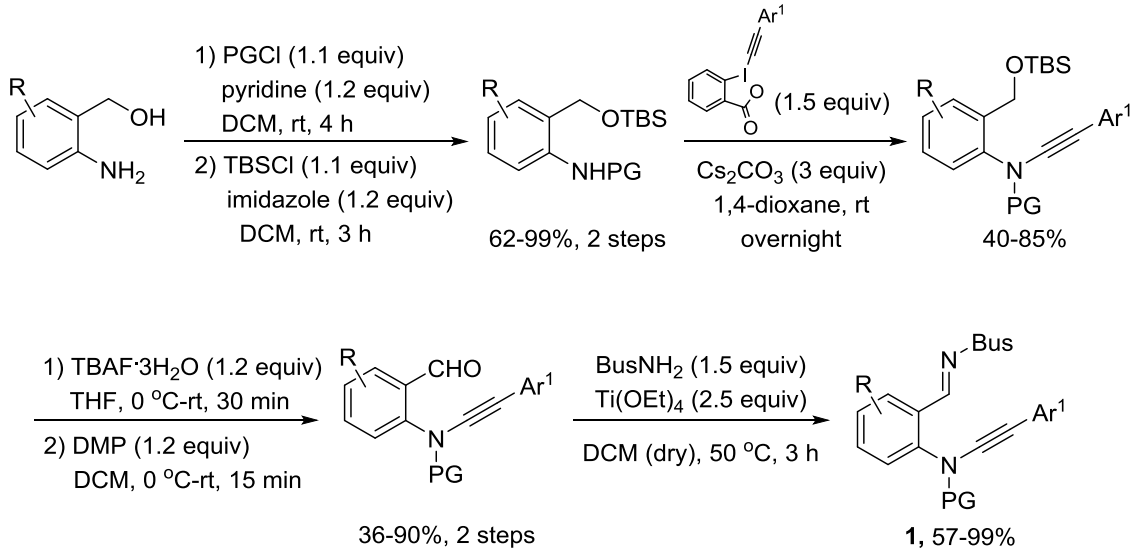
E-mail: qpc@wzu.edu.cn; longwuye@xmu.edu.cn

General Information.

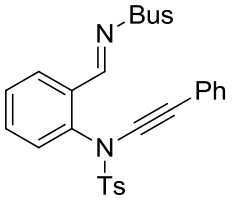
Ethyl acetate (ACS grade) and hexanes (ACS grade) were obtained commercially and used without further purification. Methanol, methylene chloride, tetrahydrofuran and diethyl ether were purified according to standard methods unless otherwise noted. Commercially available reagents were used without further purification. Reactions were monitored by thin layer chromatography (TLC) using silicycle pre-coated silica gel plates. Flash column chromatography was performed over silica gel (300-400 mesh). Infrared spectra were recorded on a Nicolet AVATER FTIR330 spectrometer as thin film and are reported in reciprocal centimeter (cm^{-1}). Mass spectra were recorded with Micromass QTOF2 Quadrupole/Time-of-Flight Tandem mass spectrometer using electron spray ionization.

^{1}H NMR spectra were recorded on a Bruker AV-400 spectrometer and a Bruker AV-500 spectrometer in chloroform-d_3. Chemical shifts are reported in ppm with the internal TMS signal at 0.0 ppm as a standard. The data is being reported as (s = singlet, d = doublet, t = triplet, m = multiplet or unresolved, brs = broad singlet, brt = broad triplet, coupling constant(s) in Hz, integration). ^{13}C NMR spectra were recorded on a Bruker AV-400 spectrometer, a Bruker AV-500 spectrometer and a Bruker AV-600 spectrometer in chloroform-d_3. Chemical shifts are reported in ppm with the internal chloroform signal at 77.0 ppm as a standard.

Ynamides **1** were prepared according to the following procedures.[1,2]



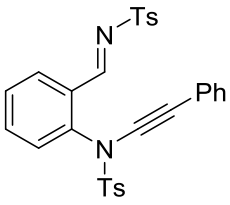
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-4-methyl-*N*-(phenylethynyl)benzenesulfonamide (1a)



1a

Pale yellow soild (mp 128–129 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.27 (s, 1H), 8.28 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.64 (d, *J* = 8.4 Hz, 2H), 7.62 – 7.57 (m, 1H), 7.55 – 7.50 (m, 1H), 7.41 – 7.37 (m, 2H), 7.35 (d, *J* = 8.0 Hz, 2H), 7.32 – 7.27 (m, 3H), 7.22 (d, *J* = 8.4 Hz, 1H), 2.47 (s, 3H), 1.48 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.2, 146.1, 141.2, 134.9, 131.8, 131.7, 130.7, 129.9, 129.5, 129.4, 128.5, 128.4(4), 128.4(3), 128.2, 121.8, 82.7, 70.9, 58.5, 24.0, 21.7; IR (neat): 2925, 2240, 1609(s), 1596, 1452, 1307, 1175, 811, 692, 585; HRESIMS Calcd for $[C_{26}H_{26}N_2NaO_4S_2]^+$ (M + Na^+) 517.1226, found 517.1238.

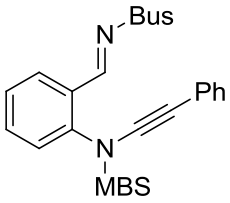
(*E*)-4-methyl-*N*-(phenylethynyl)-*N*-(2-((tosylimino)methyl)phenyl)benzenesulfonamide (1a')



1a'

White solild (mp 133–134 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.27 (s, 1H), 8.20 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.84 (d, *J* = 8.4 Hz, 2H), 7.61 (d, *J* = 8.4 Hz, 2H), 7.56 – 7.52 (m, 1H), 7.46 – 7.28 (m, 10H), 7.15 (d, *J* = 8.0 Hz, 1H), 2.47 (s, 3H), 2.38 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.3, 146.1, 144.6, 141.1, 134.9, 134.4, 131.6, 131.5, 130.4, 129.8, 129.7, 129.4, 128.4(0), 128.3(8), 128.3, 128.2, 128.1, 121.7, 82.8, 70.9, 21.7, 21.5; IR (neat): 2924, 2240, 1597, 1374, 1161, 813, 774, 687, 543; HRESIMS Calcd for $[C_{29}H_{24}N_2NaO_4S_2]^+$ (M + Na^+) 551.1070, found 551.1060.

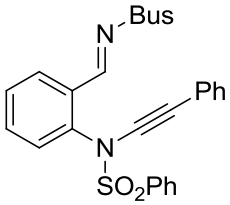
(*E*)-*N*-(2-(((tert-butylsulfonyl)imino)methyl)phenyl)-4-methoxy-*N*-(phenylethynyl)benzenesulfonamide (1b)



1b

Pale yellow soild (mp 132–133 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.19 (s, 1H), 8.19 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.60 (d, *J* = 8.8 Hz, 2H), 7.55 – 7.49 (m, 1H), 7.45 – 7.42 (m, 1H), 7.30 (m, 2H), 7.22 – 7.14 (m, 4H), 6.92 (d, *J* = 9.2 Hz, 2H), 3.81 (s, 3H), 1.39 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.2, 164.5, 141.3, 135.0, 131.7, 130.8, 130.7, 129.5, 129.3, 128.5, 128.4, 128.2, 125.9, 121.8, 114.5, 82.9, 70.9, 58.4, 55.7, 23.9; IR (neat): 2240, 1596, 1497, 1374, 1267, 1166, 810, 776, 692, 545; HRESIMS Calcd for $[C_{26}H_{26}N_2NaO_5S_2]^+$ (M + Na^+) 533.1175, found 533.1178.

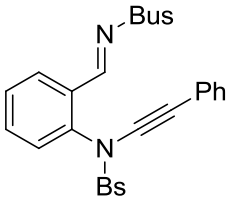
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-*N*-(phenylethynyl)benzenesulfonamide (1c)



1c

White soild (mp 125–126 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.30 (s, 1H), 8.29 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.78 (m, 2H), 7.76 – 7.71 (m, 1H), 7.63 – 7.50 (m, 4H), 7.41 – 7.37 (m, 2H), 7.32 – 7.29 (m, 3H), 7.20 (dd, *J* = 8.0, 1.2 Hz, 1H), 1.48 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.2, 141.2, 134.9, 134.8, 134.7, 131.9, 130.9, 129.6, 129.5, 129.3, 128.6, 128.4, 128.3, 121.7, 82.5, 71.1, 58.6, 24.0; IR (neat): 2925, 2240, 1605, 1589, 1458, 1367, 1170, 813, 712, 603; HRESIMS Calcd for $[C_{25}H_{24}N_2NaO_4S_2]^+$ (M + Na^+) 503.1070, found 503.1077.

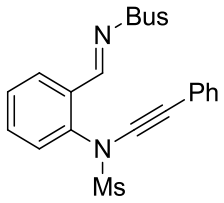
(*E*)-4-bromo-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-*N*-(phenylethynyl)benzenesulfonamide (1d)



1d

Pale yellow soild (mp 84–85 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.33 (s, 1H), 8.31 (d, *J* = 8.0 Hz, 1H), 7.72 (d, *J* = 7.6 Hz, 2H), 7.65 – 7.59 (m, 3H), 7.59 – 7.53 (m, 1H), 7.42 – 7.37 (m, 2H), 7.35 – 7.29 (m, 3H), 7.19 (d, *J* = 8.0 Hz, 1H), 1.50 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.0, 140.9, 135.0, 133.5, 132.6, 131.9, 130.9, 130.2, 129.9, 129.8, 129.7, 128.7, 128.4, 128.2, 121.5, 82.2, 71.4, 58.6, 24.1; IR (neat): 2925, 2240, 1608, 1596, 1453, 1307, 1175, 812, 692, 586; HRESIMS Calcd for $[C_{25}H_{23}BrN_2NaO_4S_2]^+$ (M + Na^+) 581.0175, found 581.0177.

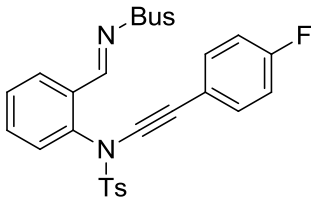
(*E*)-2-methyl-*N*-(2-(*N*-(phenylethynyl)methylsulfonamido)benzylidene)propane-2-sulfonamide (1e)



1e

Pale yellow soild (mp 135–136 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.42 (s, 1H), 8.28 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.79 – 7.69 (m, 2H), 7.61 – 7.55 (m, 1H), 7.49 – 7.43 (m, 2H), 7.34 – 7.32 (m, 3H), 3.31 (s, 3H), 1.50 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.3, 140.7, 135.4, 131.8, 130.5, 130.0, 129.7, 128.6, 128.3, 127.7, 121.4, 81.7, 71.4, 58.5, 37.2, 23.9; IR (neat): 2928, 2240, 1646, 1453, 1367, 1304, 1168, 1125, 756, 691, 466; HRESIMS Calcd for $[C_{20}H_{22}N_2NaO_4S_2]^+$ (M + Na^+) 441.0913, found 441.0908.

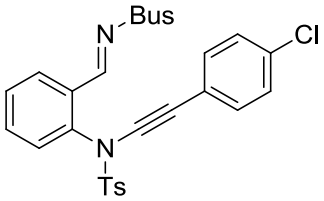
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-*N*-((4-fluorophenyl)ethynyl)-4-methylbenzenesulfonamide (1f)



1f

Pale yellow soild (mp 68–69 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.23 (s, 1H), 8.28 (d, *J* = 7.2 Hz, 1H), 7.66 – 7.58 (m, 3H), 7.57 – 7.51 (m, 1H), 7.43 – 7.33 (m, 4H), 7.23 (d, *J* = 8.0 Hz, 1H), 7.03 – 6.96 (m, 2H), 2.48 (s, 3H), 1.48 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.0, 162.6 (d, *J* = 248.6 Hz), 146.1, 141.1, 135.0, 134.0 (d, *J* = 8.4 Hz), 131.6, 130.6, 129.9, 129.6, 129.3, 128.5, 128.3, 117.7 (d, *J* = 3.5 Hz), 115.5 (d, *J* = 22.0 Hz), 82.4, 69.8, 58.4, 23.9, 21.7; IR (neat): 2924, 2239, 1608(s), 1596, 1452, 1306, 1185, 812, 693, 585; HRESIMS Calcd for $[C_{26}H_{25}FN_2NaO_4S_2]^+$ (M + Na^+) 535.1132, found 535.1136.

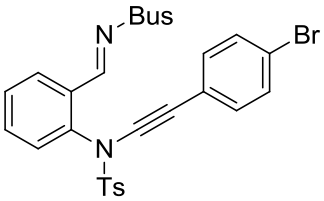
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-*N*-((4-chlorophenyl)ethynyl)-4-methylbenzenesulfonamide (1g)



1g

Pale yellow soild (mp 145–146 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.24 (s, 1H), 8.27 (d, *J* = 8.0 Hz, 1H), 7.65 – 7.58 (m, 3H), 7.57 – 7.50 (m, 1H), 7.39 – 7.22 (m, 7H), 2.48 (s, 3H), 1.48 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.9, 146.2, 140.9, 135.0, 134.4, 132.9, 131.6, 130.6, 129.9, 129.6, 129.3, 128.5, 128.4, 128.3, 120.2, 83.5, 69.8, 58.4, 23.9, 21.7; IR (neat): 2923, 2240, 1609(s), 1596, 1453, 1307, 1185, 811, 693, 585; HRESIMS Calcd for $[C_{26}H_{25}ClN_2NaO_4S_2]^+$ (M + Na^+) 551.0836, found 551.0834.

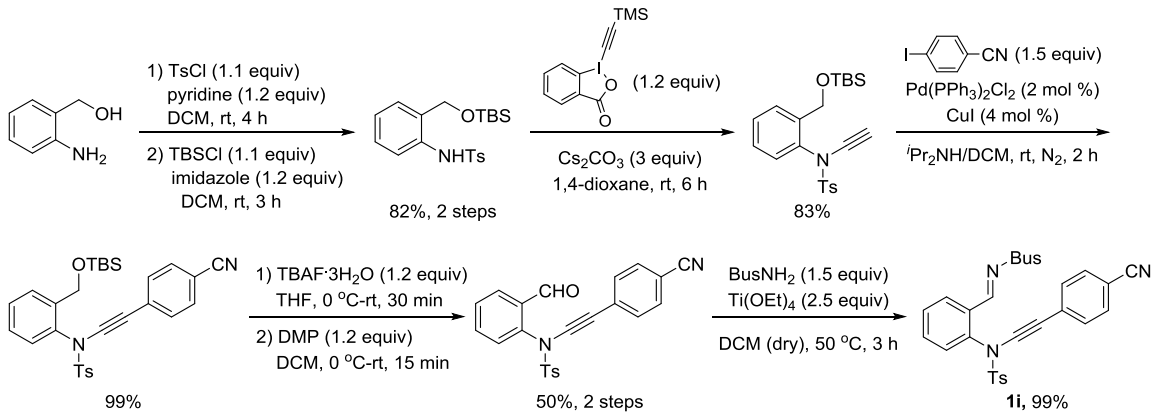
(*E*)-*N*-((4-bromophenyl)ethynyl)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-4-methylbenzenesulfonamide (1h)



1h

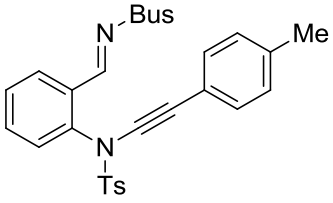
Pale yellow soild (mp 119–120 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.22 (s, 1H), 8.27 (d, *J* = 7.2 Hz, 1H), 7.66 – 7.58 (m, 3H), 7.57 – 7.50 (m, 1H), 7.42 (d, *J* = 8.0 Hz, 2H), 7.35 (d, *J* = 8.0 Hz, 2H), 7.29 – 7.20 (m, 3H), 2.47 (s, 3H), 1.47 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.0, 146.2, 140.9, 135.0, 133.1, 131.5, 130.6, 129.9, 129.6, 129.4, 128.5, 128.3, 122.6, 120.7, 83.7, 69.9, 58.4, 23.9, 21.7; IR (neat): 2924, 2240, 1609(s), 1596, 1453, 1185, 811, 689, 584; HRESIMS Calcd for $[C_{26}H_{25}BrN_2NaO_4S_2]^+$ (M + Na^+) 595.0331, found 595.0335.

(*E*)-*N*-(2-(((tert-butylsulfonyl)imino)methyl)phenyl)-*N*-((4-cyanophenyl)ethynyl)-4-methylbenzenesulfonamide (1i)



Compound **1i** was prepared according to the above known procedures.[1, 2] Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.20 (s, 1H), 8.29 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.71 – 7.53 (m, 6H), 7.50 – 7.34 (m, 4H), 7.22 (dd, *J* = 8.0, 1.2 Hz, 1H), 2.48 (s, 3H), 1.47 (s, 9H); ^{13}C NMR (100 Hz, $CDCl_3$) δ 168.7, 146.4, 140.4, 135.1, 131.9, 131.6, 130.6, 130.0, 129.9, 129.5, 128.6, 128.3, 127.0, 118.3, 111.2, 87.0, 69.9, 58.5, 23.9, 21.7; IR (neat): 2986, 2226, 1666, 1375, 1303, 1175, 1126, 902, 739, 579; HRESIMS Calcd for $[C_{27}H_{25}N_3NaO_4S_2]^+$ (M + Na^+) 542.1179, found 542.1180.

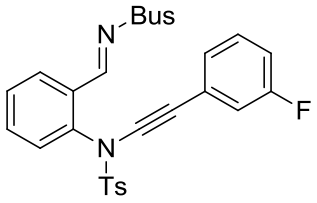
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-4-methyl-*N*-(*p*-tolylethynyl)benzenesulfonamide (1j)



1j

Pale yellow soild (mp 86–87 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.30 (s, 1H), 8.27 (d, *J* = 7.2 Hz, 1H), 7.62 – 7.55 (m, 3H), 7.54 – 7.48 (m, 1H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.31 – 7.25 (m, 2H), 7.20 (d, *J* = 7.6 Hz, 1H), 7.09 (d, *J* = 7.6 Hz, 2H), 2.46 (s, 3H), 2.32 (s, 3H), 1.48 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.2, 145.9, 141.2, 138.6, 134.9, 131.7, 131.5, 130.6, 129.7, 129.4, 129.2, 128.9, 128.3, 128.2, 118.5, 82.0, 70.9, 58.3, 23.9, 21.6, 21.3; IR (neat): 2924, 2240, 1608(s), 1596, 1453, 1185, 811, 690, 583; HRESIMS Calcd for $[C_{27}H_{28}N_2NaO_4S_2]^+$ (M + Na^+) 531.1383, found 531.1383.

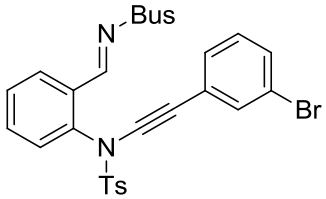
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-*N*-((3-fluorophenyl)ethynyl)-4-methylbenzenesulfonamide (1k)



1k

Pale yellow soild (mp 89–90 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.21 (s, 1H), 8.28 (dd, *J* = 7.8, 1.6 Hz, 1H), 7.68 – 7.58 (m, 3H), 7.56 – 7.52 (m, 1H), 7.37 (d, *J* = 8.0 Hz, 2H), 7.28 – 7.22 (m, 2H), 7.18 – 7.16 (m, 1H), 7.08 – 6.99 (m, 2H), 2.48 (s, 3H), 1.47 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.0, 162.3 (d, *J* = 240.0 Hz), 146.3, 141.0, 135.0, 131.8, 130.8, 130.0(3), 129.9 (d, *J* = 9.0 Hz), 129.6 (d, *J* = 16.0 Hz), 128.7, 128.5, 127.6 (d, *J* = 3.0 Hz), 123.8 (d, *J* = 10.0 Hz), 118.4 (d, *J* = 23.0 Hz), 115.7 (d, *J* = 21.0 Hz), 83.6, 70.0, 58.5, 24.0, 21.8; IR (neat): 2928, 2242, 1612(s), 1593, 1450, 1307, 1193, 813, 696, 581; HRESIMS Calcd for $[C_{26}H_{25}FN_2NaO_4S_2]^+$ (M + Na^+) 535.1132, found 535.1131.

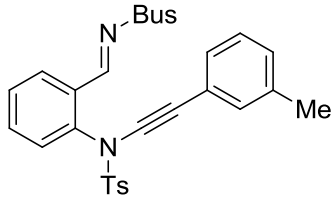
(*E*)-*N*-((3-bromophenyl)ethynyl)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-4-methylbenzenesulfonamide (1l)



1l

Pale yellow soild (mp 86–87 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.19 (s, 1H), 8.28 (d, *J* = 7.8 Hz, 1H), 7.65 – 7.51 (m, 6H), 7.44 – 7.31 (m, 3H), 7.26 – 7.15 (m, 2H), 2.49 (s, 3H), 1.47 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.9, 146.3, 140.9, 135.0, 134.3, 131.7, 131.5, 130.8, 130.2, 130.1, 129.8, 129.7, 129.5, 128.7, 128.5, 123.9, 122.0, 84.0, 69.7, 58.5, 24.0, 21.8; IR (neat): 2926, 2240, 1605(s), 1600, 1456, 1190, 821, 679, 577; HRESIMS Calcd for $[C_{26}H_{25}BrN_2NaO_4S_2]^+$ (M + Na^+) 595.0331, found 595.0328.

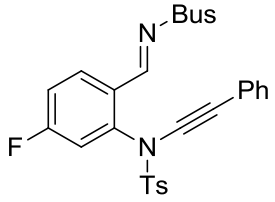
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-4-methyl-*N*-(*m*-tolylethynyl)benzenesulfonamide (1m)



1m

Pale yellow soild (mp 76–77 ℃). ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.29 (s, 1H), 8.27 (d, *J* = 6.0 Hz, 1H), 7.63 (d, *J* = 8.0 Hz, 2H), 7.62 – 7.57 (m, 1H), 7.54 – 7.49 (m, 1H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.23 – 7.15 (m, 4H), 7.11 (d, *J* = 6.5 Hz, 1H), 2.47 (s, 3H), 2.30 (s, 3H), 1.48 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.2, 146.0, 141.2, 137.9, 134.9, 132.3, 131.6, 130.7, 129.8, 129.5, 129.3, 128.8, 128.4, 128.3, 128.1, 121.5, 82.4, 71.0, 58.4, 23.9, 21.7, 21.0; IR (neat): 2925, 2240, 1596(s), 1376, 1309, 1176, 810, 789, 586; HRESIMS Calcd for $[C_{27}H_{28}N_2NaO_4S_2]^+$ (M + Na^+) 531.1383, found 531.1385.

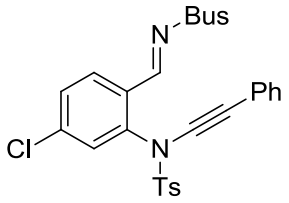
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)-5-fluorophenyl)-4-methyl-*N*-(phenylethynyl)benzenesulfonamide (1n)



1n

Pale yellow soild (mp 148–149 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.19 (s, 1H), 8.32 (dd, *J* = 8.8 Hz, 6.0 Hz, 1H), 7.66 (d, *J* = 8.4 Hz, 2H), 7.43 – 7.35 (m, 4H), 7.34 – 7.29 (m, 3H), 7.27 – 7.22 (m, 1H), 6.96 (dd, *J* = 8.8 Hz, 2.4 Hz, 1H), 2.49 (s, 3H), 1.47 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.9, 165.9 (d, *J* = 258.4 Hz), 146.4, 143.1 (d, *J* = 10.1 Hz), 131.9, 131.5 (d, *J* = 10.0 Hz), 131.2, 130.0, 128.7, 128.4, 128.3, 127.2 (d, *J* = 3.4 Hz), 121.3, 117.2 (d, *J* = 21.5 Hz), 115.8 (d, *J* = 23.7 Hz), 82.0, 71.4, 58.5, 23.9, 21.7; IR (neat): 2927, 2240, 1597(s), 1492, 1379, 1189, 789, 678, 583; HRESIMS Calcd for $[C_{26}H_{25}FN_2NaO_4S_2]^+$ (M + Na^+) 535.1132, found 535.1130.

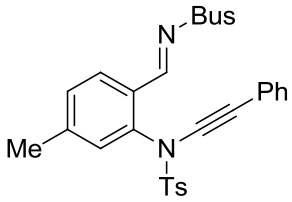
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)-5-chlorophenyl)-4-methyl-*N*-(phenylethynyl)benzenesulfonamide (1o)



1o

Pale yellow soild (mp 162–163 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.96 (s, 1H), 7.97 (d, *J* = 8.8 Hz, 1H), 7.40 (d, *J* = 8.0 Hz, 2H), 7.25 (dd, *J* = 8.4 Hz, 1.2 Hz, 1H), 7.15 – 7.12 (m, 4H), 7.05 – 7.03 (m, 3H), 6.95 (d, *J* = 1.6 Hz, 1H), 2.23 (s, 3H), 1.22 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.8, 146.4, 141.8, 140.7, 131.7, 131.0, 130.2, 129.9, 129.8, 129.0, 128.5, 128.4, 128.2, 128.1, 121.2, 81.9, 71.3, 58.3, 23.7, 21.6; IR (neat): 2927, 2241, 1597(s), 1377, 1308, 1174, 811, 779, 578; HRESIMS Calcd for $[C_{26}H_{25}ClN_2NaO_4S_2]^+$ (M + Na^+) 551.0836, found 551.0840.

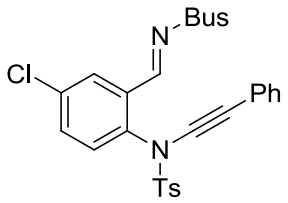
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)-5-methylphenyl)-4-methyl-*N*-(phenylethynyl)benzenesulfonamide (1p)



1p

Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.23 (s, 1H), 8.16 (d, *J* = 8.0 Hz, 1H), 7.64 (d, *J* = 8.0 Hz, 2H), 7.41 – 7.31 (m, 5H), 7.30 – 7.26 (m, 3H), 7.00 (s, 1H), 2.47 (s, 3H), 2.36 (s, 3H), 1.46 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 146.7, 145.9, 140.8, 131.5, 131.3, 130.3, 129.6, 128.9, 128.7, 128.2, 128.1, 128.0, 127.6, 121.5, 82.6, 70.6, 58.0, 23.7, 21.4, 21.3; IR (neat): 2927, 2239, 1599(s), 1376, 1307, 1175, 811, 679, 584; HRESIMS Calcd for $[C_{27}H_{28}N_2NaO_4S_2]^+$ (M + Na^+) 531.1383, found 531.1386.

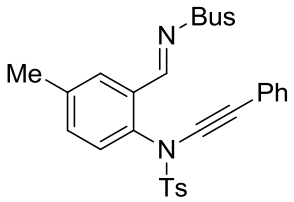
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)-4-chlorophenyl)-4-methyl-*N*-(phenylethynyl)benzenesulfonamide (1q)



1q

Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.17 (s, 1H), 8.23 (d, *J* = 2.4 Hz, 1H), 7.65 (d, *J* = 8.4 Hz, 2H), 7.54 (dd, *J* = 8.4, 2.4 Hz, 1H), 7.41 – 7.34 (m, 4H), 7.34 – 7.28 (m, 3H), 7.18 (d, *J* = 8.8 Hz, 1H), 2.48 (s, 3H), 1.48 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.0, 146.3, 139.7, 135.9, 134.7, 132.2, 131.9, 130.1, 129.9, 129.1, 128.6, 128.5, 128.3, 121.6, 82.4, 71.4, 58.7, 24.0, 21.8; IR (neat): 2930, 2240, 1614, 1478, 1378, 1310, 1173, 1088, 928, 893, 722, 665, 570; HRESIMS Calcd for $[C_{26}H_{25}ClN_2NaO_4S_2]^+$ (M + Na^+) 551.0836, found 551.0835.

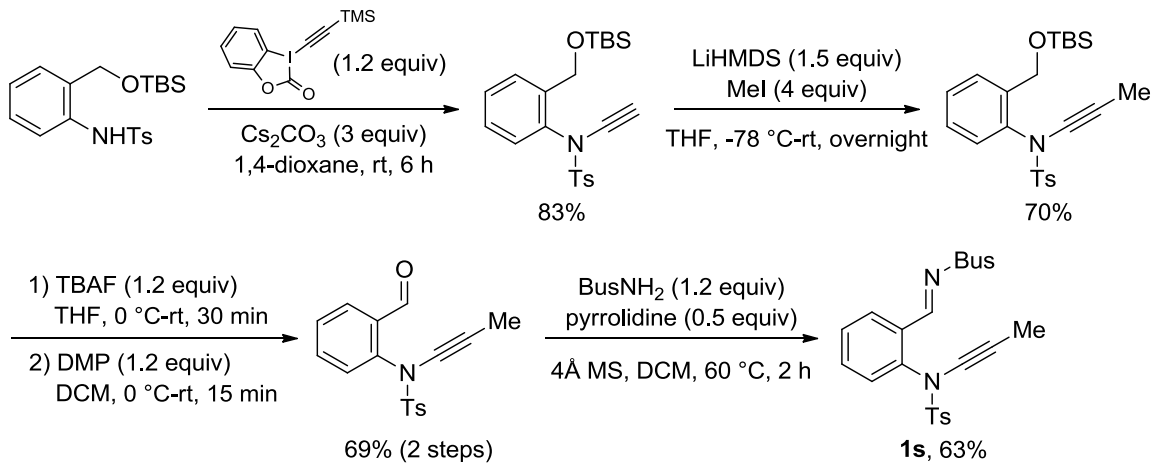
(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)-4-methylphenyl)-4-methyl-*N*-(phenylethynyl)benzenesulfonamide (1r)



1r

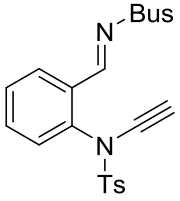
Pale yellow soild (mp 168–169 ℃). ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.24 (s, 1H), 8.07 (s, 1H), 7.64 (d, *J* = 8.0 Hz, 2H), 7.41 – 7.36 (m, 3H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.30 – 7.26 (m, 3H), 7.08 (d, *J* = 8.0 Hz, 1H), 2.47 (s, 3H), 2.43 (s, 3H), 1.48 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.4, 145.9, 140.0, 138.7, 135.8, 131.7, 131.6, 130.2, 129.8, 129.5, 128.4, 128.3, 128.2, 128.1, 121.8, 82.8, 70.6, 58.4, 23.9, 21.6, 21.0; IR (neat): 2928, 2240, 1598(s), 1374, 1306, 1175, 810, 676, 585; HRESIMS Calcd for $[C_{27}H_{28}N_2NaO_4S_2]^+$ (M + Na^+) 531.1383, found 531.1384.

(*E*)-*N*-(2-(((*tert*-butylsulfonyl)imino)methyl)phenyl)-4-methyl-*N*-(prop-1-yn-1-yl)benzenesulfonamide (1s)



Compound **1s** was prepared according to the above known procedures.[1, 2] Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.23 (s, 1H), 8.24 (d, *J* = 7.6 Hz, 1H), 7.61 – 7.53 (m, 3H), 7.52 – 7.45 (m, 1H), 7.33 (d, *J* = 7.6 Hz, 2H), 7.11 (d, *J* = 7.6 Hz, 1H), 2.47 (s, 3H), 1.90 (s, 3H), 1.49 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.5, 145.6, 141.5, 134.8, 131.7, 130.6, 129.7, 129.2, 129.1, 128.3, 128.1, 72.9, 66.6, 58.4, 23.9, 21.6, 3.1; IR (neat): 2983, 2923, 2259, 1608(s), 1597, 1372, 1127, 786, 670, 582; HRESIMS Calcd for $[C_{21}H_{24}N_2NaO_4S_2]^+$ (M + Na^+) 455.1070, found 455.1078.

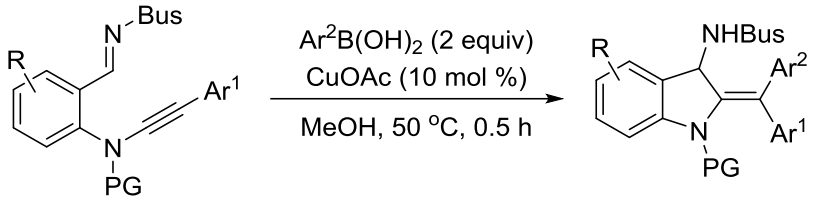
(*E*)-*N*-(2-(((tert-butylsulfonyl)imino)methyl)phenyl)-*N*-ethynyl-4-methylbenzenesulfonamide (1t)



1t

Pale yellow soild (mp 97–98 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.18 (s, 1H), 8.26 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.61 – 7,51 (m, 4H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.14 (dd, *J* = 8.0, 1.2 Hz, 1H), 2.87 (s, 1H), 2.48 (s, 3H), 1.49 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.1, 146.2, 140.5, 134.9, 131.7, 130.8, 129.9, 129.7, 129.5, 128.5, 128.4, 76.4, 59.7, 58.5, 24.0, 21.7. IR (neat): 2981, 2932, 2133, 1610, 1610, 1597, 1176, 1126, 672, 583, 539; HRESIMS Calcd for $[C_{20}H_{22}N_2NaO_4S_2]^+$ (M + Na^+) 441.0913, found 441.0912.

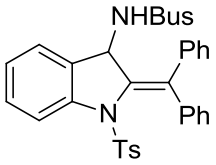
General procedure for the synthesis of 2,3-disubstituted indolines 3



1 **3**

CuOAc (0.02 mmol, 2.5 mg) was added in the mixture of arylboronic acid **2** (0.40 mmol) and ynamide-imine **1** (0.20 mmol) at room temperature, The Schlenk tube was evacuated and backfilled with argon, then capped with a rubber septum. Dry MeOH (0.5 mL) was injected under argon, then the septum was replaced by a screwcap and the mixture was stirred at 50 ℃ (preheated oil bath) until disappearance of the starting material by TLC (generally 0.5 h). After cooling, the mixture was diluted with DCM and the solvent evaporated under reduced pressure. The residue was purified by flash chromatography (PE/ EtOAc = 5/ 1) to afford the desired product **3**.

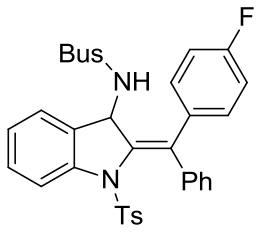
***N*-(2-(diphenylmethylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3a)**



3a

Compound **3a** was prepared in 89% yield (101.7 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 187–188 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.6 Hz, 1H), 7.57 (d, *J* = 8.0 Hz, 1H), 7.47 (d, *J* = 8.4 Hz, 2H), 7.42 – 7.30 (m, 4H), 7.28 – 7.19 (m, 8H), 7.16 (d, *J* = 8.0 Hz, 2H), 4.94 (d, *J* = 9.0 Hz, 1H), 3.46 (d, *J* = 9.0 Hz, 1H), 2.36 (s, 3H), 1.12 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.2, 142.6, 141.5, 140.0, 139.0, 134.4, 134.1, 133.7, 129.8, 129.7, 129.5, 128.7, 128.4, 127.9, 127.7, 127.5, 127.1, 126.5, 119.5, 59.8, 56.2, 23.8, 21.5; IR (neat): 2923, 1647(s), 1540, 1463, 1372, 1318, 1173, 1126, 704, 661, 556; HRESIMS Calcd for $[C_{32}H_{32}N_2NaO_4S_2]^+$ (M + Na^+) 595.1696, found 595.1698.

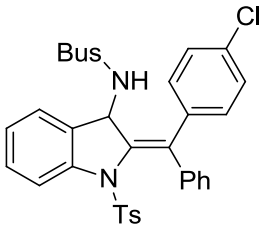
(*E*)-*N*-(2-((4-fluorophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3b)



3b

Compound **3b** was prepared in 70% yield (82.6 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 173–174 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 – 7.63 (m, 1H), 7.51 (d, *J* = 8.0 Hz, 1H), 7.45 (d, *J* = 8.4 Hz, 2H), 7.40 – 7.35 (m, 1H), 7.28 – 7.23 (m, 6H), 7.18 – 7.15 (m, 4H), 7.03 – 7.08 (m, 2H), 4.97 (d, *J* = 8.8 Hz, 1H), 3.68 (d, *J* = 8.8 Hz, 1H), 2.37 (s, 3H), 1.18 (s, 9H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 162.8 (d, *J* = 246.0 Hz), 145.2, 141.6, 141.5, 140.0, 135.0 (d, *J* = 3.0 Hz), 134.4, 133.7, 131.7 (d, *J* = 7.5 Hz), 129.9, 129.8, 129.6, 128.0, 127.8, 127.7, 126.9, 126.6, 119.5, 115.7 (d, *J* = 21.0 Hz), 59.9, 56.1, 23.9, 21.6; IR (neat): 2922, 1632, 1465, 1370, 1309, 1174, 1127, 1090, 749, 665, 561; HRESIMS Calcd for $[C_{32}H_{31}FN_2NaO_4S_2]^+$ (M + Na^+) 613.1601, found 613.1617.

(*E*)-*N*-(2-((4-chlorophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3c)

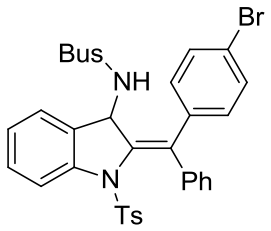


3c

Compound **3c** was prepared in 53% yield (63.8 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 105–106 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 7.2 Hz, 1H), 7.50 (d, *J* = 8.0 Hz, 1H), 7.44 (d, *J* = 8.0 Hz, 2H), 7.40 – 7.31 (m, 3H), 7.26 – 7.13 (m, 10H), 4.96 (d, *J* = 9.2 Hz, 1H), 3.63 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.18 (s, 9H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 145.3, 141.5, 141.4, 139.7, 137.5, 134.7,

134.6, 134.4, 133.8, 131.3, 129.9, 129.8, 129.6, 128.9, 128.1, 127.9, 127.8, 127.0, 126.7, 119.5, 59.9, 56.1, 23.9, 21.6; IR (neat): 2921, 1595, 1463, 1371, 1307, 1173, 1174, 1127, 1090, 749, 665, 561; HRESIMS Calcd for $[C_{32}H_{31}ClN_2NaO_4S_2]^+$ (M + Na^+) 629.1306, found 629.1310.

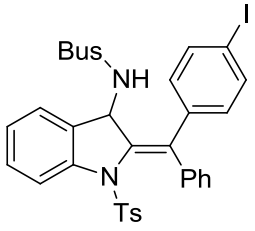
(*E*)-*N*-(2-((4-bromophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3d)



3d

Compound **3d** was prepared in 53% yield (68.7 mg) according to the general procedure (Scheme 2). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.6 Hz, 1H), 7.51– 7.48 (m, 3H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.35 – 7.39 (m, 1H), 7.26 – 7.11 (m, 10H), 4.96 (d, *J* = 9.0 Hz, 1H), 3.62 (d, *J* = 9.0 Hz, 1H), 2.36 (s, 3H), 1.17 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.3, 141.4, 141.3, 139.6, 137.9, 134.6, 134.3, 133.7, 131.9, 131.5, 129.9, 129.8, 129.6, 128.0, 127.9, 127.8, 127.0, 126.7, 122.8, 119.5, 59.9, 56.1, 23.8, 21.6; IR (neat): 2921, 1595, 1463, 1371, 1308, 1173, 1127, 1088, 694, 665, 557; HRESIMS Calcd for $[C_{32}H_{31}BrN_2NaO_4S_2]^+$ (M + Na^+) 673.0801, found 673.0808.

(*E*)-*N*-(2-((4-iodophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3e)

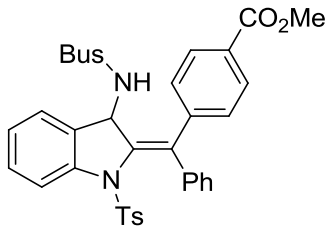


3e

Compound **3e** was prepared in 44% yield (61.9 mg) according to the general procedure (Scheme 2). Pale pink oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 – 7.66 (m, 3H), 7.50 (d, *J*

= 8.0 Hz, 1H), 7.43 (d, *J* = 8.0 Hz, 2H), 7.39 – 7.34 (m, 1H), 7.26 – 7.13 (m, 8H), 7.03 (d, *J* = 8.4 Hz, 2H), 4.95 (d, *J* = 8.8 Hz, 1H), 3.59 (d, *J* = 8.8 Hz, 1H), 2.36 (s, 3H), 1.16 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.3, 141.5, 141.4, 139.6, 138.6, 137.8, 134.6, 134.3, 133.8, 131.6, 129.9, 129.8, 129.6, 128.0, 127.9, 127.7, 127.1, 126.6, 119.4, 94.5, 59.9, 56.1, 23.8, 21.6; IR (neat): 2926, 1648, 1463, 1371, 1318, 1173, 1172, 1126, 1090, 1009, 849, 755, 663, 586; HRESIMS Calcd for $[C_{32}H_{31}IN_2NaO_4S_2]^+$ (M + Na^+) 721.0662, found 721.0670.

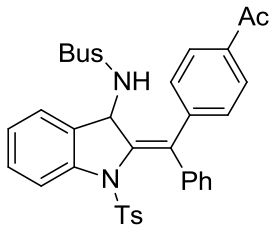
(*E*)-methyl 4-((3-(1,1-dimethylethylsulfonamido)-1-tosylindolin-2-ylidene)(phenyl) methyl)benzoate (3f)



3f

Compound **3f** was prepared in 96% yield (122.0 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 109–110 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 8.4 Hz, 2H), 7.65 (d, *J* = 7.6 Hz, 1H), 7.56 – 7.34 (m, 7H), 7.26 – 7.13 (m, 7H), 4.94 (d, *J* = 9.2 Hz, 1H), 3.92 (s, 3H), 3.55 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.15 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.6, 145.3, 143.7, 141.6, 141.5, 139.5, 135.1, 134.2, 133.8, 130.1, 129.9(4), 129.9(2), 129.8(9), 129.8(4), 129.7, 128.0, 127.9, 127.8, 127.1, 126.7, 119.4, 59.9, 56.1, 52.2, 23.9, 21.6; IR (neat): 2923, 1723, 1636, 1278, 1173, 1127, 1019, 701, 665, 557; HRESIMS Calcd for $[C_{34}H_{34}N_2NaO_6S_2]^+$ (M + Na^+) 653.1750, found 653.1773.

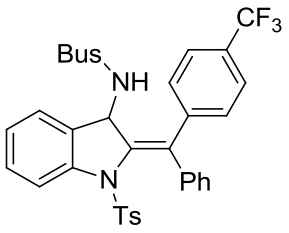
(*E*)-*N*-(2-((4-acetylphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3g)



3g

Compound **3g** was prepared in 98% yield (120.8 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 105–106 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.95 (d, *J* = 8.4 Hz, 2H), 7.63 (d, *J* = 7.6 Hz, 1H), 7.56 – 7.32 (m, 7H), 7.26 – 7.15 (m, 7H), 4.96 (d, *J* = 9.2 Hz, 1H), 3.64 (d, *J* = 9.2 Hz, 1H), 2.60 (s, 3H), 2.37 (s, 3H), 1.16 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.5, 145.3, 143.8, 141.5, 141.4, 139.5, 136.8, 135.2, 134.2, 133.8, 130.2, 129.9, 129.8, 129.7, 128.6, 128.1, 127.9, 127.8, 127.0, 126.7, 119.5, 59.9, 56.0, 26.7, 23.9, 21.6; IR (neat): 2919, 1683, 1645, 1368, 1307, 1173, 1126, 1089, 665, 574; HRESIMS Calcd for $[C_{34}H_{34}N_2NaO_5S_2]^+$ (M + Na^+) 637.1801, found 637.1807.

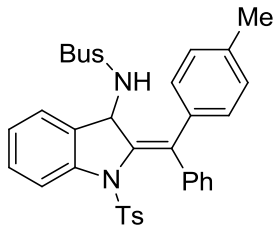
(*E*)-2-methyl-*N*-(2-(phenyl(4-(trifluoromethyl)phenyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3h)



3h

Compound **3h** was prepared in 64% yield (81.8 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 102–103 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 – 7.60 (m, 3H), 7.53 (d, *J* = 8.0 Hz, 1H), 7.47 – 7.37 (m, 5H), 7.28 – 7.15 (m, 8H), 4.92 (d, *J* = 9.2 Hz, 1H), 3.49 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.13 (s, 9H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 145.4, 142.7, 141.5, 141.1, 139.4, 135.3, 134.1, 133.7, 130.7 (q, *J* = 33.0 Hz), 130.2, 129.9, 129.8, 129.8, 128.0, 127.9, 127.1, 126.8, 125.8 (q, *J* = 3.0 Hz), 124.8 (q, *J* = 270.0 Hz), 119.5, 59.9, 56.1, 23.8, 21.6; IR (neat): 2926, 1597, 1463, 1370, 1325, 1171, 1126, 1067, 846, 664, 576; HRESIMS Calcd for $[C_{33}H_{31}F_3N_2NaO_4S_2]^+$ (M + Na^+) 663.1570, found 663.1591.

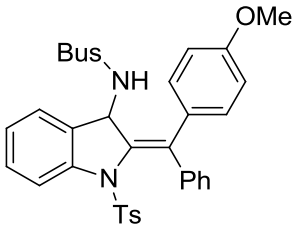
(*E*)-2-methyl-*N*-(2-(phenyl(*p*-tolyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3i)



3i

Compound **3i** was prepared in 62% yield (72.6 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 147–148 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 7.6 Hz, 1H), 7.53 (d, *J* = 7.6 Hz, 1H), 7.45 (d, *J* = 8.4 Hz, 2H), 7.39 – 7.35 (m, 1H), 7.25 – 7.18 (m, 6H), 7.17 – 7.13 (m, 6H), 4.96 (d, *J* = 8.8 Hz, 1H), 3.58 (d, *J* = 8.8 Hz, 1H), 2.36 (s, 3H), 2.35 (s, 3H), 1.15 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.1, 142.7, 141.6, 140.3, 138.3, 136.2, 134.7, 133.9, 133.8, 129.9, 129.8, 129.7, 129.5, 129.3, 128.1, 127.7, 127.5, 127.2, 126.5, 119.5, 59.9, 56.4, 23.9, 21.6, 21.3; IR (neat): 2922, 1634, 1463, 1371, 1318, 1173, 1127, 1089, 1017, 664, 561; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_4S_2]^+$ ($M + Na^+$) 609.1852, found 609.1843.

(*E*)-*N*-(2-((4-methoxyphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3j)

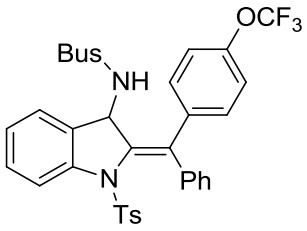


3j

Compound **3j** was prepared in 53% yield (63.8 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 137–138 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.2 Hz, 1H), 7.49 (d, *J* = 8.0 Hz, 1H), 7.44 (d, *J* = 8.0 Hz, 2H), 7.39 – 7.33 (m, 1H), 7.25 – 7.12 (m, 10H), 6.87 (d, *J* = 8.8 Hz, 2H), 5.00 (d, *J* = 8.6 Hz, 1H), 3.81 (s, 3H), 3.73 (d, *J* = 8.6 Hz, 1H), 2.36 (s, 3H), 1.19 (s, 9H); ^{13}C NMR (100 Hz, $CDCl_3$) δ 159.8,

145.1, 142.5, 141.6, 140.4 ,134.8, 134.0, 133.4, 131.5, 131.2, 130.0, 129.8, 129.4, 128.1, 127.7, 127.5, 127.1, 126.5, 119.4, 114.1, 59.9, 56.4, 55.3, 23.9, 21.6; IR (neat): 2922, 1606, 1492, 1367, 1306, 1249, 1126, 1032, 695, 562; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_5S_2]^+$ (M + Na^+) 625.1801, found 625.1798.

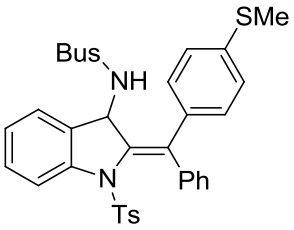
(*E*)-2-methyl-*N*-(2-(phenyl(4-(trifluoromethoxy)phenyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3k)



3k

Compound **3k** was prepared in 64% yield (84.3 mg) according to the general procedure (Scheme 2). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.6 Hz, 1H), 7.53 (d, *J* = 8.0 Hz, 1H), 7.45 (d, *J* = 8.4 Hz, 2H), 7.40 – 7.36 (m, 1H), 7.32 (d, *J* = 8.8 Hz, 2H), 7.26 – 7.14 (m, 10H), 4.95 (d, *J* = 9.2 Hz, 1H), 3.53 (d, *J* = 9.2 Hz, 1H), 2.36 (s, 3H), 1.15 (s, 9H); ^{13}C NMR (213 MHz, $CDCl_3$) δ 149.2, 145.3, 141.5, 141.2, 139.7, 137.6, 134.8, 134.1, 133.7, 133.4, 131.4, 129.9, 129.8, 129.7, 128.3 (q, *J* = 25.6 Hz), 128.0, 127.9, 127.8, 121.1, 120.3 (q, *J* = 213.0 Hz), 119.5, 59.8, 56.1, 23.8, 21.6; IR (neat): 2925, 1698, 1597, 1506, 1463, 1372, 1257, 1170, 1125, 1090, 706; HRESIMS Calcd for $[C_{33}H_{31}F_3N_2NaO_5S_2]^+$ (M + Na^+) 679.1519, found 679.1523.

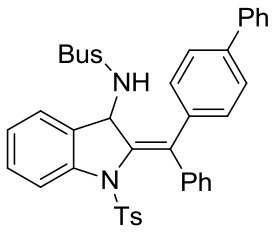
(*E*)-2-methyl-*N*-(2-((4-(methylthio)phenyl)(phenyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3l)



3l

Compound **3l** was prepared in 78% yield (96.5 mg) according to the general procedure (Scheme 2). Pale pink oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 7.6 Hz, 1H), 7.51 (d, *J* = 8.0 Hz, 1H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.39 – 7.35 (m, 1H), 7.24 – 7.14 (m, 12H), 4.98 (d, *J* = 8.8 Hz, 1H), 3.62 (d, *J* = 8.8 Hz, 1H), 2.48 (s, 3H), 2.37 (s, 3H), 1.17 (s, 9H); ^{13}C NMR (214 MHz, $CDCl_3$) δ 145.2, 142.2, 141.5, 140.0, 139.3, 135.6, 134.6, 134.0, 133.8, 130.2, 130.0, 129.8, 129.5, 128.0, 127.8, 127.6, 127.1, 126.6, 126.3, 119.4, 59.9, 56.3, 23.9, 21.6, 15.4; IR (neat): 2923, 1646, 1464, 1307, 1172, 1126, 1090, 1033, 762, 664, 560; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_4S_3]^+$ (M + Na^+) 641.1573, found 641.1578.

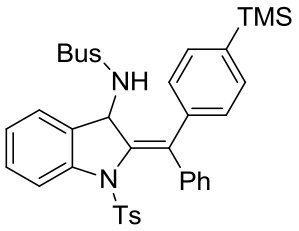
(*E*)-*N*-(2-([1,1'-biphenyl]-4-yl(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3m)



3m

Compound **3m** was prepared in 63% yield (81.4 mg) according to the general procedure (Scheme 2). Colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, *J* = 7.6 Hz, 1H), 7.57 (m, 5H), 7.50 – 7.32 (m, 9H), 7.30 – 7.26 (m, 4H), 7.24 – 7.14 (m, 3H), 5.01 (d, *J* = 9.2 Hz, 1H), 3.49 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.13 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.3, 142.3, 141.6, 141.3, 140.5, 140.1, 138.1, 134.5, 134.2, 133.9, 130.2, 130.0, 129.9, 129.6, 128.8, 128.0, 127.8, 127.6, 127.5, 127.4, 127.3, 127.1, 126.6, 119.5, 59.9, 56.5, 23.8, 21.6; IR (neat): 2920, 1635, 1463, 1370, 1318, 1126, 1089, 763, 696, 558; HRESIMS Calcd for $[C_{38}H_{36}N_2NaO_4S_2]^+$ (M + Na^+) 671.2009, found 671.2030.

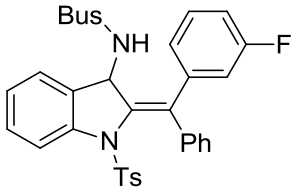
(*E*)-2-methyl-*N*-(2-(phenyl(4-(trimethylsilyl)phenyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3n)



3n

Compound **3n** was prepared in 90% yield (116.2 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 158–159 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.58 (d, *J* = 8.0 Hz, 1H), 7.51 – 7.44 (m, 5H), 7.28 – 7.13 (m, 10H), 4.90 (d, *J* = 9.2 Hz, 1H), 3.27 (d, *J* = 9.2 Hz, 1H), 2.35 (s, 3H), 1.08 (s, 9H), 0.26 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.2, 142.6, 141.6, 140.6, 140.1, 139.5, 134.4, 133.9, 133.8, 133.7, 129.8, 129.7, 129.5, 128.7, 127.9, 127.7, 127.5, 127.4, 126.6, 119.4, 59.8, 56.5, 23.8, 21.6, -1.2; IR (neat): 2955, 1698, 1597, 1463, 1372, 1320, 1249, 1173, 1127, 1090, 848, 759, 664, 574; HRESIMS Calcd for $[C_{35}H_{40}N_2NaO_4S_2Si]^+$ (M + Na^+) 667.2091, found 667.2089.

(*E*)-*N*-(2-((3-fluorophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3o)

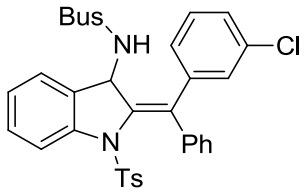


3o

Compound **3o** was prepared in 64% yield (75.4 mg) according to the general procedure (Scheme 2). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.6 Hz, 1H), 7.56 (d, *J* = 8.0 Hz, 1H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.42 – 7.30 (m, 3H), 7.24 – 7.14 (m, 7H), 7.09 – 7.03 (m, 2H), 6.99 – 6.97 (m, 1H), 4.93 (d, *J* = 9.2 Hz, 1H), 3.42 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.16 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.6 (d, *J* = 246.0 Hz), 145.3, 141.5, 141.3 (d, *J* = 2.0 Hz), 141.0 (d, *J* = 7.0 Hz), 139.5, 134.8, 130.4 (d, *J* = 9.0 Hz), 134.2, 133.7, 129.9, 129.8, 129.7, 128.0, 127.9, 127.8, 127.1, 126.7, 125.5 (d, *J* = 3.0 Hz), 119.5, 117.1 (d, *J* = 22.0 Hz), 115.4 (d, *J* = 21.0 Hz), 59.9, 56.1, 23.8, 21.6; IR

(neat): 2924, 1610, 1582, 1463, 1370, 1308, 1172, 1127, 706, 662, 559; HRESIMS Calcd for $[C_{32}H_{31}FN_2NaO_4S_2]^+$ (M + Na^+) 613.1601, found 613.1607.

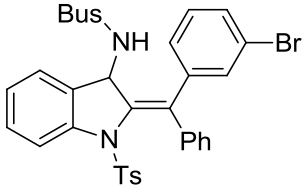
(*E*)-*N*-(2-((3-chlorophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3p)



3p

Compound **3p** was prepared in 80% yield (97.0 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 163–164 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 7.6 Hz, 1H), 7.58 (d, *J* = 8.0 Hz, 1H), 7.46 (d, *J* = 8.0 Hz, 2H), 7.41 – 7.37 (m, 1H), 7.34 – 7.30 (m, 2H), 7.28 – 7.16 (m, 10H), 4.89 (d, *J* = 9.2 Hz, 1H), 3.30 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.13 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.4, 141.5, 141.0, 140.8, 139.5, 134.9, 134.6, 134.1, 133.7, 130.2, 129.9, 129.7(3), 129.7(1), 129.6(8), 128.6, 127.9, 127.9, 127.8, 127.2, 126.7, 119.5, 59.8, 56.2, 23.8, 21.6; IR (neat): 2922, 1595, 1463, 1372, 1318, 1173, 1126, 1089, 704, 664, 557; HRESIMS Calcd for $[C_{32}H_{31}ClN_2NaO_4S_2]^+$ (M + Na^+) 629.1306, found 629.1304.

(*E*)-*N*-(2-((3-bromophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3q)

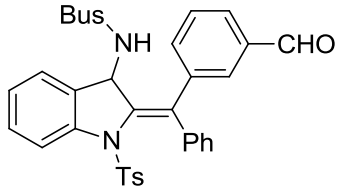


3q

Compound **3q** was prepared in 70% yield (90.8 mg) according to the general procedure (Scheme 2). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 7.6 Hz, 1H), 7.58 (d, *J* = 8.0 Hz, 1H), 7.49 – 7.34 (m, 5H), 7.30 – 7.17 (m, 12H), 4.89 (d, *J* = 9.2 Hz, 1H), 3.27 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.12 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.4,

141.6, 141.1, 140.9, 139.5, 135.0, 134.1, 133.7, 132.5, 131.5, 130.5, 129.9, 129.7, 128.4, 128.0, 127.9, 127.8, 127.2, 126.7, 122.9, 119.5, 59.8, 56.2, 23.8, 21.6; IR (neat): 2923, 1594, 1463, 1372, 1318, 1174, 1127, 1090, 704, 664, 557; HRESIMS Calcd for $[C_{32}H_{31}BrN_2NaO_4S_2]^+$ (M + Na^+) 673.0801, found 673.0799.

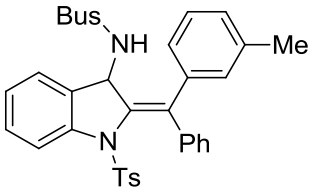
(*E*)-*N*-(2-((3-formylphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3r)



3r

Compound **3r** was prepared in 90% yield (108.1 mg) according to the general procedure (Scheme 2). Colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.02 (s, 1H), 7.91 – 7.85 (m, 1H), 7.77 (s, 1H), 7.61 – 7.47 (m, 6H), 7.43 – 7.32 (m, 2H), 7.27 – 7.17 (m, 7H), 4.92 (d, *J* = 8.8 Hz, 1H), 3.55 (d, *J* = 8.8 Hz, 1H), 2.37 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (213 MHz, $CDCl_3$) δ 192.0, 145.3, 141.5, 141.0, 139.9, 136.6, 135.6, 135.3, 134.0, 133.6, 131.2, 129.9, 129.8, 129.7, 129.6, 129.4, 128.0, 127.9, 127.9, 126.8, 126.7, 119.6, 59.7, 55.9, 23.8, 21.6; IR (neat): 2925, 1748, 1668, 1558, 1385, 1033, 967, 833, 660; HRESIMS Calcd for $[C_{33}H_{32}N_2NaO_5S_2]^+$ (M + Na^+) 623.1645, found 623.1655.

(*E*)-2-methyl-*N*-(2-(phenyl(*m*-tolyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3s)

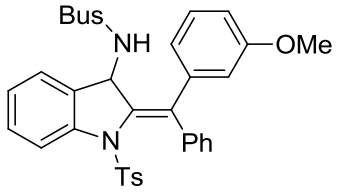


3s

Compound **3s** was prepared in 68% yield (79.4 mg) according to the general procedure (Scheme 2). White soild (mp 88–89 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.6 Hz, 1H), 7.58 (d, *J* = 8.0 Hz, 1H), 7.46 (d, *J* = 8.0 Hz, 2H), 7.40 – 7.36 (m, 1H), 7.25 –

7.21 (m, 6H), 7.17 – 7.13 (m, 4H), 7.05 (d, *J* = 8.8 Hz, 2H), 4.92 (d, *J* = 8.8 Hz, 1H), 3.39 (d, *J* = 8.8 Hz, 1H), 2.36 (s, 3H), 2.34 (s, 3H), 1.09 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.2, 142.6, 141.7, 140.1, 139.0, 138.4, 134.5, 134.0, 133.9, 130.1, 129.8, 129.8, 129.5, 129.2, 128.7, 128.0, 127.8, 127.5, 127.2, 126.8, 126.5, 119.5, 59.8, 56.3, 23.8, 21.6, 21.4; IR (neat): 2923, 1598, 1463, 1376, 1307, 1172, 1127, 1090, 662, 558; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_4S_2]^+$ (M + Na^+) 609.1852, found 609.1848.

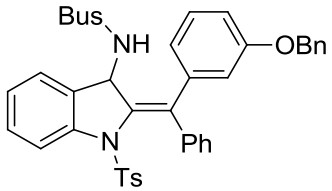
(*E*)-*N*-(2-((3-methoxyphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3t)



3t

Compound **3t** was prepared in 66% yield (80.1 mg) according to the general procedure (Scheme 2). Pale pink oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, *J* = 7.6 Hz, 1H), 7.61 (d, *J* = 8.0 Hz, 1H), 7.46 (d, *J* = 8.0 Hz, 2H), 7.40 – 7.37 (m, 1H), 7.27 – 7.23 (m, 7H), 7.16 (d, *J* = 8.0 Hz, 2H), 6.91 – 6.83 (m, 2H), 6.71 (s, 1H), 4.91 (d, *J* = 9.0 Hz, 1H), 3.76 (s, 3H), 3.24 (d, *J* = 9.0 Hz, 1H), 2.36 (s, 3H), 1.09 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.7, 145.3, 142.2, 141.7, 140.3, 139.9, 134.3, 134.1, 133.8, 129.9, 129.8, 129.7, 129.5, 127.9, 127.8, 127.6, 127.3, 126.6, 122.0, 119.5, 115.7, 113.3, 59.8, 56.3, 55.2, 23.7, 21.6; IR (neat): 2926, 1637, 1463, 1367, 1276, 1171, 1126, 750, 664, 474; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_5S_2]^+$ (M + Na^+) 625.1801, found 625.1797.

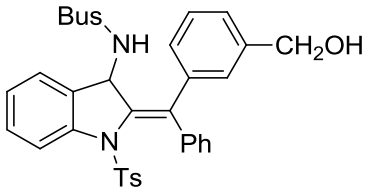
(*E*)-*N*-(2-((3-(benzyloxy)phenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3u)



3u

Compound **3u** was prepared in 81% yield (110.0 mg) according to the general procedure (Scheme 2). White soild (mp 179–180 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, *J* = 7.6 Hz, 1H), 7.59 (d, *J* = 8.0 Hz, 1H), 7.45 (d, *J* = 8.4 Hz, 2H), 7.41 – 7.19 (m, 13H), 7.15 (d, *J* = 8.0 Hz, 2H), 6.95 – 6.90 (m, 2H), 6.82 – 6.76 (m, 1H), 5.05 – 4.97 (m, 2H), 4.93 (d, *J* = 9.2 Hz, 1H), 3.30 (d, *J* = 9.2 Hz, 1H), 2.35 (s, 3H), 1.09 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.9, 145.2, 142.2, 141.6, 140.3, 139.8, 136.7, 134.4, 134.1, 133.7, 129.9, 129.8, 129.7, 129.5, 128.5, 128.0, 127.9, 127.8, 127.6, 127.3, 126.6, 122.4, 119.5, 116.5, 114.3, 70.0, 59.8, 56.3, 23.8, 21.6; IR (neat): 2982, 1637, 1597, 1463, 1370, 1318, 1172, 1126, 1089, 738, 697, 663; HRESIMS Calcd for $[C_{39}H_{38}N_2NaO_5S_2]^+$ (M + Na^+) 701.2114, found 701.2116.

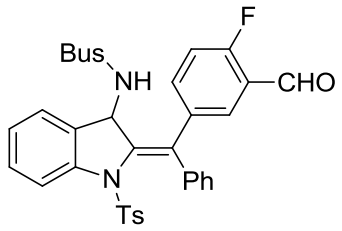
(*E*)-*N*-(2-((3-(hydroxymethyl)phenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3v)



3v

Compound **3v** was prepared in 68% yield (81.9 mg) according to the general procedure (Scheme 2). Pale yellow oil. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.58 (d, *J* = 8.0 Hz, 1H), 7.51 (d, *J* = 8.5 Hz, 2H), 7.46 (d, *J* = 7.5 Hz, 1H), 7.41 – 7.37 (m, 1H), 7.28 (d, *J* = 7.0 Hz, 2H), 7.23 – 7.18 (m, 4H), 7.16 – 7.14 (m, 4H), 6.85 – 6.83 (m, 1H), 5.01 (d, *J* = 7.5 Hz, 1H), 4.77 (d, *J* = 5.5 Hz, 2H), 4.15 (d, *J* = 7.5 Hz, 1H), 3.29 (brt, *J* = 5.5 Hz, 1H), 2.35 (s, 3H), 1.16 (s, 9H); ^{13}C NMR (214 MHz, $CDCl_3$) δ 145.0, 142.0, 141.8, 139.0, 134.3, 133.8, 129.9, 129.8, 129.6, 128.7, 128.4, 128.3, 127.9, 127.7, 127.6, 127.1, 126.3, 126.2, 119.9, 64.7, 59.9, 55.7, 24.0, 21.6; IR (neat): 2965, 1647, 1558, 1276, 1028, 834, 751, 697, 629; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_5S_2]^+$ (M + Na^+) 625.1801, found 625.1793.

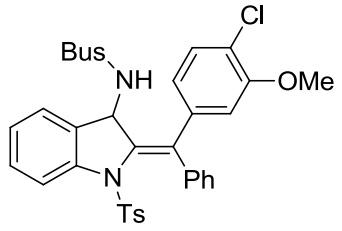
(*E*)-*N*-(2-((4-fluoro-3-formylphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3w)



3w

Compound **3w** was prepared in 61% yield (75.3 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 150–151 ℃). ^{1}H NMR (500 MHz, $CDCl_3$) δ 10.34 (s, 1H), 7.69 (dd, *J* = 6.4, 2.4 Hz, 1H), 7.59 – 7.56 (m, 3H), 7.48 (d, *J* = 8.0 Hz, 2H), 7.41 – 7.38 (m, 1H), 7.26 – 7.17 (m, 9H), 4.90 (d, *J* = 9.2 Hz, 1H), 3.51 (d, *J* = 9.2 Hz, 1H), 2.36 (s, 3H), 1.13 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 186.8, 164.3 (d, *J* = 258.8 Hz), 145.4, 141.5, 140.1, 139.3, 137.8 (d, *J* = 8.8 Hz), 135.7, 135.6, 133.7 (d, *J* = 26.3 Hz), 130.3, 129.9, 129.8, 129.7, 128.0, 128.0, 126.7, 126.7, 124.2 (d, *J* = 8.8 Hz), 119.6, 117.3 (d, *J* = 21.3 Hz), 59.7, 55.8, 23.8, 21.6; IR (neat): 2359, 1959, 1634, 1464, 1371, 1313, 1126, 1090, 953, 699, 665; HRESIMS Calcd for $[C_{33}H_{31}FN_2NaO_5S_2]^+$ (M + Na^+) 641.1551, found 641.1560.

(*E*)-*N*-(2-((4-chloro-3-methoxyphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3x)

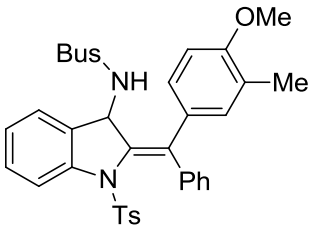


3x

Compound **3x** was prepared in 64% yield (81.1 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 138–139 ℃). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.5 Hz, 1H), 7.56 (d, *J* = 8.0 Hz, 1H), 7.44 (d, *J* = 8.0 Hz, 2H), 7.41 – 7.35 (m, 2H), 7.28 – 7.21 (m, 6H), 7.16 (d, *J* = 8.0 Hz, 2H), 6.94 (d, *J* = 8.0 Hz, 1H), 6.65 (s, 1H), 4.96 (d, *J* = 8.8 Hz, 1H), 3.81 (s, 3H), 3.47 (d, *J* = 8.8 Hz, 1H), 2.36 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 155.2, 145.3, 141.6, 141.2, 139.5, 138.7, 134.8, 134.2, 133.8, 130.4, 129.8, 129.7, 129.6, 127.9, 127.8, 127.7, 127.1, 126.6, 123.0, 119.5, 113.0, 59.8,

56.2, 23.7, 21.6; IR (neat): 2931, 1959, 1645, 1596, 1463, 1398, 1370, 1173, 1091, 1064, 817, 665; HRESIMS Calcd for $[C_{33}H_{33}ClN_2NaO_5S_2]^+$ (M + Na^+) 659.1412, found 659.1420.

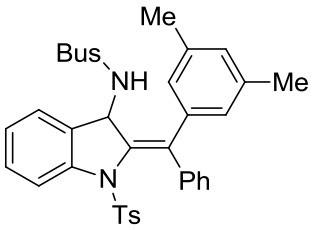
(*E*)-*N*-(2-((4-methoxy-3-methylphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3y)



3y

Compound **3y** was prepared in 76% yield (93.2 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 132–133 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.2 Hz, 1H), 7.52 (d, *J* = 8.0 Hz, 1H), 7.44 (d, *J* = 8.0 Hz, 2H), 7.39 – 7.33 (m, 1H), 7.25 – 7.09 (m, 9H), 6.96 (s, 1H), 6.79 (d, *J* = 8.4 Hz, 1H), 4.98 (d, *J* = 8.4 Hz, 1H), 3.82 (s, 3H), 3.61 (d, *J* = 8.4 Hz, 1H), 2.36 (s, 3H), 2.18 (s, 3H), 1.13 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 158.0, 145.0, 142.6, 141.7, 140.5, 134.8, 134.0, 133.4, 131.8, 131.0, 129.9, 129.8, 129.4, 128.5, 128.0, 127.7, 127.4, 127.1, 126.9, 126.4, 119.4, 109.9, 59.7, 56.4, 55.3, 23.8, 21.6, 16.2; IR (neat): 2928, 1605, 1503, 1464, 1369, 1319, 1248, 1172, 1128, 1089, 1032, 814, 695, 664; HRESIMS Calcd for $[C_{34}H_{36}N_2NaO_5S_2]^+$ (M + Na^+) 639.1958, found 639.1956.

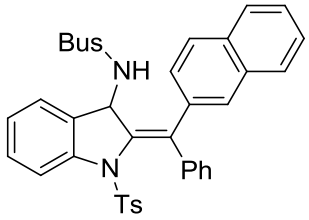
(*E*)-*N*-(2-((3,5-dimethylphenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3z)



3z

Compound **3z** was prepared in 58% yield (69.2 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 159–160 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.6 Hz, 1H), 7.59 (d, *J* = 8.0 Hz, 1H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.41 – 7.35 (m, 1H), 7.25 – 7.15 (m, 8H), 6.95 (s, 1H), 6.83 (s, 2H), 4.91 (d, *J* = 8.6 Hz, 1H), 3.31 (d, *J* = 8.6 Hz, 1H), 2.36 (s, 3H), 2.30 (s, 6H), 1.05 (s, 9H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 145.2, 142.6, 141.8, 140.2, 138.9, 138.3, 134.5, 133.9, 133.8, 130.1, 129.8, 129.7, 129.5, 127.9, 127.8, 127.5, 127.2, 127.1, 126.5, 119.5, 59.6, 56.3, 23.6, 21.6, 21.3; IR (neat): 2922, 1598, 1463, 1370, 1320, 1172, 1127, 1090, 705, 664, 574, 558; HRESIMS Calcd for $[C_{34}H_{36}N_2NaO_4S_2]^+$ (M + Na^+) 623.2009, found 623.2011.

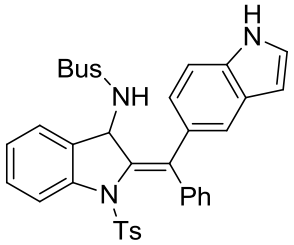
(*E*)-2-methyl-*N*-(2-(naphthalen-2-yl(phenyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3aa)



3aa

Compound **3aa** was prepared in 68% yield (85.4 mg) according to the general procedure (Scheme 2). Pale yellow soild (mp 185–186 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 – 7.88 (m, 2H), 7.82 – 7.77 (m, 2H), 7.67 (d, *J* = 7.6 Hz, 1H), 7.60 (d, *J* = 8.0 Hz, 1H), 7.52 – 7.50 (m, 4H), 7.42 – 7.35 (m, 1H), 7.26 – 7.18 (m, 9H), 4.97 (d, *J* = 8.8 Hz, 1H), 3.47 (d, *J* = 8.8 Hz, 1H), 2.37 (s, 3H), 0.94 (s, 9H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 145.3, 142.4, 141.7, 140.0, 136.4, 134.5, 134.3, 133.8, 133.2, 133.1, 130.0, 129.9, 129.6, 129.3, 128.6, 128.4, 128.0, 127.9, 127.7, 127.2, 126.9, 126.6, 126.5, 126.4, 119.5, 59.7, 56.6, 23.6, 21.6; IR (neat): 2922, 1597, 1463, 1369, 1318, 1173, 1126, 1089, 818, 664, 558; HRESIMS Calcd for $[C_{36}H_{34}N_2NaO_4S_2]^+$ (M + Na^+) 645.1852, found 645.1861.

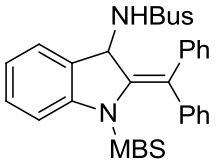
(*E*)-*N*-(2-((1*H*-indol-5-yl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3ab)



3ab

Compound **3ab** was prepared in 85% yield (104.0 mg) according to the general procedure (Scheme 2). Pale pink soild (mp 160–161 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.32 (s, 1H), 7.70 (d, *J* = 7.6 Hz, 1H), 7.59 (d, *J* = 7.6 Hz, 2H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.39 – 7.34 (m, 1H), 7.30 – 7.13 (m, 10H), 6.92 (dd, *J* = 8.4, 1.4 Hz, 1H), 6.59 – 6.44 (m, 1H), 4.95 (d, *J* = 9.0 Hz, 1H), 3.50 (d, *J* = 9.0 Hz, 1H), 2.36 (s, 3H), 1.01 (s, 9H); ^{13}C NMR (213 MHz, $CDCl_3$) δ 145.2, 141.6, 135.7, 134.9, 133.8, 132.9, 130.6, 130.0, 129.8, 129.4, 128.0, 127.8, 127.6, 127.3, 127.2, 126.5, 125.0, 123.4, 122.6, 119.5, 111.5, 102.9, 59.8, 56.8, 23.6, 21.6; IR (neat): 2925, 1683, 1595, 1490, 1463, 1360, 1166, 1025, 813, 763, 665, 579; HRESIMS Calcd for $[C_{34}H_{33}N_3NaO_4S_2]^+$ (M + Na^+) 634.1805, found 634.1809.

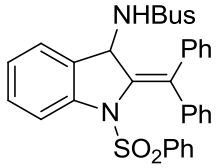
***N*-(2-(diphenylmethylene)-1-((4-methoxyphenyl)sulfonyl)indolin-3-yl)-2-methylpropane-2-sulfonamide (3ac)**



3ac

Compound **3ac** was prepared in 81% yield (94.9 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 162–163 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.2 Hz, 1H), 7.58 – 7.49 (m, 3H), 7.40 – 7.33 (m, 4H), 7.25 – 7.18 (m, 8H), 6.85 – 6.78 (m, 2H), 4.94 (d, *J* = 9.0 Hz, 1H), 3.82 (s, 3H), 3.61 (d, *J* = 9.0 Hz, 1H), 1.15 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.8, 142.5, 141.7, 140.0, 139.0, 134.6, 134.2, 130.2, 129.8, 129.7, 129.5, 128.7, 128.4, 128.0, 127.7, 127.5, 127.2, 126.5, 119.6, 114.4, 59.9, 56.2, 55.6, 23.8; IR (neat): 2980, 1593, 1496, 1367, 1312, 1167, 1148, 1023, 735, 699, 558; HRESIMS Calcd for $[C_{32}H_{32}N_2NaO_5S_2]^+$ (M + Na^+) 611.1645, found 611.1650.

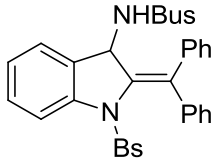
***N*-(2-(diphenylmethylene)-1-(phenylsulfonyl)indolin-3-yl)-2-methylpropane-2-sulfonamide (3ad)**



3ad

Compound **3ad** was prepared in 61% yield (67.7 mg) according to the general procedure (Scheme 3). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.6 Hz, 1H), 7.59 – 7.50 (m, 5H), 7.40 – 7.34 (m, 6H), 7.28 – 7.22 (m, 7H), 4.97 (d, *J* = 8.8 Hz, 1H), 3.58 (d, *J* = 8.8 Hz, 1H), 1.14 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.7, 141.5, 140.0, 139.0, 137.0, 134.5, 134.1, 134.0, 129.9, 129.7, 129.5, 129.2, 128.7, 128.5, 128.0, 127.9, 127.6, 127.2, 126.6, 119.3, 60.0, 56.2, 24.0; IR (neat): 2980, 1577, 1489, 1365, 1305, 1177, 1033, 1012, 745, 687, 543; HRESIMS Calcd for $[C_{31}H_{30}N_2NaO_4S_2]^+$ (M + Na^+) 581.1539, found 581.1540.

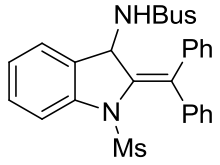
***N*-(1-((4-bromophenyl)sulfonyl)-2-(diphenylmethylene)indolin-3-yl)-2-methylpropane-2-sulfonamide (3ae)**



3ae

Compound **3ae** was prepared in 52% yield (66.2 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 152–153 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.6 Hz, 1H), 7.52 – 7.33 (m, 9H), 7.24 – 7.20 (m, 6H), 7.09 – 7.06 (m, 2H), 5.04 (d, *J* = 8.2 Hz, 1H), 4.26 (d, *J* = 8.2 Hz, 1H), 1.24 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.7, 141.1, 139.6, 138.8, 135.9, 135.1, 134.4, 132.3, 129.9, 129.8, 129.7, 129.6, 129.4, 128.7, 127.9, 127.7, 127.1, 126.8, 119.7, 59.9, 56.0, 24.0; IR (neat): 2923, 1573, 1463, 1373, 1309, 1173, 1126, 1087, 742, 613, 559; HRESIMS Calcd for $[C_{31}H_{29}BrN_2NaO_4S_2]^+$ (M + Na^+) 659.0644, found 659.0650.

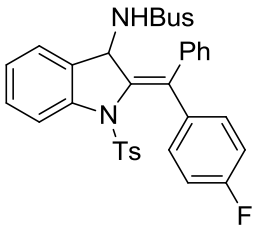
***N*-(2-(diphenylmethylene)-1-(methylsulfonyl)indolin-3-yl)-2-methylpropane-2-sulfonamide (3af)**



3af

Compound **3af** was prepared in 82% yield (81.1 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 108–109 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 7.6 Hz, 1H), 7.43 – 7.29 (m, 12H), 7.21 – 7.17 (m, 1H), 5.18 (d, *J* = 5.6 Hz, 1H), 5.11 (d, *J* = 5.6 Hz, 1H), 2.40 (s, 3H), 1.26 (s, 9H); ^{13}C NMR (100 MHz, CDCl3) δ 141.7, 139.7, 139.6, 138.3, 136.5, 134.5, 130.1, 129.5, 129.3, 128.7, 128.6, 128.5, 128.2, 126.9, 125.9, 119.4, 59.9, 55.4, 41.5, 24.0; IR (neat): 2928, 1602, 1464, 1338, 1305, 1149, 1126, 966, 699, 650, 541 HRESIMS Calcd for $[C_{26}H_{28}N_2NaO_4S_2]^+$ ($M + Na^+$) 519.1383, found 519.1394.

(*Z*)-*N*-(2-((4-fluorophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3ag)

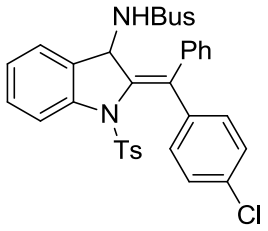


3ag

Compound **3ag** was prepared in 87% yield (102.8 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 183–184 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 18.8 Hz, 7.6 Hz, 2H), 7.49 (d, *J* = 8.0 Hz, 2H), 7.39 – 7.34 (m, 5H), 7.24 – 7.16 (m, 6H), 6.94 – 6.90 (m, 2H), 4.91 (d, *J* = 9.0 Hz, 1H), 3.38 (d, *J* = 9.0 Hz, 1H), 2.36 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.9 (d, *J* = 247.0), 145.4, 141.5, 141.4, 138.8, 136.1, 136.0, 134.2, 134.2, 133.7, 131.6 (d, *J* = 8.0), 129.8, 129.7, 129.6, 128.8, 128.5, 127.9, 127.1, 126.6, 119.5, 114.7 (d, *J* = 21.0), 59.8, 56.2, 23.8, 21.6; IR (neat):

2983, 1601, 1506, 1464, 1369, 1227, 1174, 1126, 836, 737, 583; HRESIMS Calcd for $[C_{32}H_{31}FN_2NaO_4S_2]^+$ (M + Na^+) 613.1601, found 613.1606.

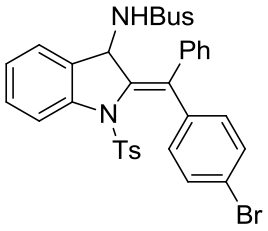
(*Z*)-*N*-(2-((4-chlorophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3ah)



3ah

Compound **3ah** was prepared in 78% yield (94.9 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 180–181 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 18.8 Hz, 7.6 Hz, 2H), 7.48 (d, *J* = 8.0 Hz, 2H), 7.41 – 7.36 (m, 4H), 7.25 – 7.11 (m, 9H), 4.92 (d, *J* = 8.8 Hz, 1H), 3.47 (d, *J* = 8.8 Hz, 1H), 2.38 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.4, 141.4, 141.2, 138.5, 138.5, 134.7, 134.2, 133.7, 133.4, 131.2, 129.9, 129.7, 129.6, 128.8, 128.6, 128.0, 127.9, 127.1, 126.6, 119.6, 59.8, 56.2, 23.8, 21.6; IR (neat): 2981, 1596, 1463, 1369, 1311, 1173, 1126, 1014, 711, 671, 593, 557; HRESIMS Calcd for $[C_{32}H_{31}ClN_2NaO_4S_2]^+$ (M + Na^+) 629.1306, found 629.1307.

(*Z*)-*N*-(2-((4-bromophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3ai)

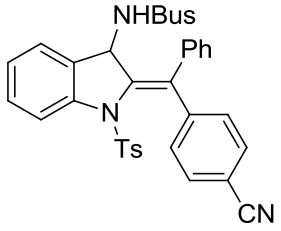


3ai

Compound **3ai** was prepared in 76% yield (98.8 mg) according to the general procedure (Scheme 3). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.2 Hz, 1H), 7.61 (d, *J* = 8.0 Hz, 1H), 7.47 (d, *J* = 8.0 Hz, 2H), 7.42 – 7.31 (m, 6H), 7.27 – 7.16 (m, 5H), 7.07 (d, *J* = 8.4 Hz, 2H), 4.93 (d, *J* = 8.8 Hz, 1H), 3.51 (d, *J* = 8.8 Hz, 1H), 2.38 (s, 3H),

1.12 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 145.4, 141.4, 141.1, 138.9, 138.5, 134.8, 134.3, 133.7, 131.5, 130.9, 129.9, 129.7, 129.6, 128.8, 128.6, 127.9, 127.1, 126.6, 121.8, 119.6, 59.8, 56.2, 23.8, 21.6; IR (neat): 2924, 1639, 1486, 1463, 1370, 1319, 1173, 1126, 1091, 1011, 703, 670, 557; HRESIMS Calcd for $[C_{32}H_{31}BrN_2NaO_4S_2]^+$ (M + Na^+) 673.0801, found 673.0809.

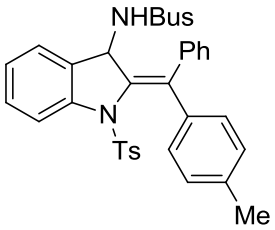
(*Z*)-*N*-(2-((4-cyanophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3aj)



3aj

Compound **3aj** was prepared in 77% yield (92.4 mg) according to the general procedure (Scheme 3). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (dd, *J* = 13.2, 7.6 Hz, 2H), 7.55 (d, *J* = 8.4 Hz, 2H), 7.47 (d, *J* = 8.4 Hz, 2H), 7.39 (d, *J* = 7.6 Hz, 6H), 7.28 – 7.19 (m, 5H), 4.93 (d, *J* = 9.2 Hz, 1H), 3.05 (d, *J* = 9.2 Hz, 1H), 2.39 (s, 3H), 1.07 (s, 9H); ^{13}C NMR (213 MHz, $CDCl_3$) δ 145.8, 145.1, 141.2, 140.4, 137.8, 136.1, 133.6, 133.5, 131.6, 130.4, 130.1, 129.8, 129.6, 129.1, 128.9, 127.7, 127.2, 126.9, 119.4, 118.8, 110.9, 59.9, 56.1, 23.7, 21.6; IR (neat): 2324, 1636, 1370, 1316, 1173, 1126, 1091, 1018, 706, 672, 661; HRESIMS Calcd for $[C_{33}H_{31}N_3NaO_4S_2]^+$ (M + Na^+) 620.1648, found 620.1652.

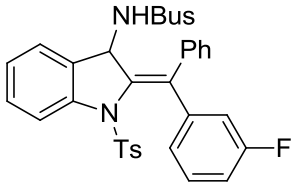
(*Z*)-2-methyl-*N*-(2-(phenyl(*p*-tolyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3ak)



3ak

Compound **3ak** was prepared in 86% yield (101.2 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 159–160 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 17.2, 7.6 Hz, 2H), 7.48 (d, *J* = 8.0 Hz, 2H), 7.42 – 7.30 (m, 4H), 7.25 – 7.19 (m, 3H), 7.18 – 7.01 (m, 6H), 4.91 (d, *J* = 8.8 Hz, 1H), 3.39 (d, *J* = 8.8 Hz, 1H), 2.36 (s, 3H), 2.33 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.1, 142.6, 141.6, 139.2, 137.4, 137.2, 134.4, 133.8, 133.6, 129.7, 129.6(9), 129.6(8), 129.5, 128.7, 128.5, 128.3, 127.9, 127.1, 126.5, 119.5, 59.8, 56.3, 23.8, 21.6, 21.3; IR (neat): 2923, 1597, 1463, 1369, 1307, 1173, 1126, 817, 737, 703, 584; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_4S_2]^+$ (M + Na^+) 609.1852, found 609.1850.

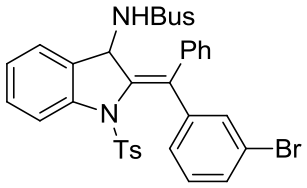
(*Z*)-*N*-(2-((3-fluorophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3al)



3al

Compound **3al** was prepared in 92% yield (108.9 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 151–152 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.6 Hz, 1H), 7.60 (d, *J* = 8.0 Hz, 1H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.42 – 7.33 (m, 4H), 7.24 – 7.17 (m, 6H), 7.06 (d, *J* = 8.0 Hz, 1H), 6.95 – 6.80 (m, 2H), 4.93 (d, *J* = 9.0 Hz, 1H), 3.52 (d, *J* = 9.0 Hz, 1H), 2.37 (s, 3H), 1.12 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.3 (d, *J* = 243.0 Hz), 145.5, 142.1 (d, *J* = 8.0 Hz), 141.3, 141.2, 138.4, 135.0, 134.3, 133.5, 129.9, 129.6, 129.1 (d, *J* = 9.0 Hz), 128.9, 128.6, 128.0, 127.1, 126.7, 125.6 (d, *J* = 3.0 Hz), 119.7, 116.8 (d, *J* = 22.0 Hz), 114.4 (d, *J* = 20.0 Hz), 59.8, 56.2, 23.8, 21.6; IR (neat): 2923, 1583, 1463, 1369, 1308, 1172, 1126, 1089, 737, 706, 661, 568; HRESIMS Calcd for $[C_{32}H_{31}FN_2NaO_4S_2]^+$ (M + Na^+) 613.1601, found 613.1608.

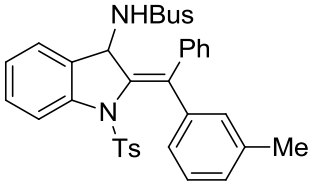
(*Z*)-*N*-(2-((3-bromophenyl)(phenyl)methylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3am)



3am

Compound **3am** was prepared in 76% yield (98.5 mg) according to the general procedure (Scheme 3). Pale orange soild (mp 109–110 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.6 Hz, 1H), 7.50 (d, *J* = 8.0 Hz, 3H), 7.44 – 7.30 (m, 6H), 7.28 – 7.16 (m, 6H), 7.13 (d, *J* = 7.6 Hz, 1H), 4.95 (d, *J* = 8.8 Hz, 1H), 3.76 (d, *J* = 8.8 Hz, 1H), 2.40 (s, 3H), 1.16 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.5, 142.0, 141.4, 140.9, 138.3, 135.3, 134.5, 133.7, 132.7, 130.5, 129.9, 129.7, 129.6, 129.3, 128.9, 128.7, 128.6, 128.2, 127.1, 126.7, 121.9, 119.7, 59.9, 56.1, 23.9, 21.7; IR (neat): 2982, 1595, 1471, 1369, 1308, 1173, 1126, 1089, 735, 704, 670, 557; HRESIMS Calcd for $[C_{32}H_{31}BrN_2NaO_4S_2]^+$ (M + Na^+) 673.0801, found 673.0803.

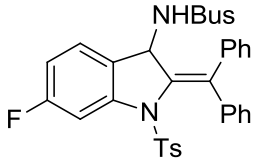
(*Z*)-2-methyl-*N*-(2-(phenyl(*m*-tolyl)methylene)-1-tosylindolin-3-yl)propane-2-sulfonamide (3an)



3an

Compound **3an** was prepared in 84% yield (98.8 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 158–159 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.6 Hz, 1H), 7.56 (d, *J* = 8.0 Hz, 1H), 7.50 (d, *J* = 8.4 Hz, 2H), 7.43 – 7.35 (m, 4H), 7.30 (d, *J* = 2.0 Hz, 1H), 7.27 – 7.20 (m, 2H), 7.17 – 7.12 (m, 3H), 7.03 (d, *J* = 8.0 Hz, 2H), 6.97 (s, 1H), 4.93 (d, *J* = 8.6 Hz, 1H), 3.61 (d, *J* = 8.6 Hz, 1H), 2.37 (s, 3H), 2.26 (s, 3H), 1.14 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.0, 142.6, 141.6, 139.9, 139.1, 137.1, 134.5, 134.0, 133.9, 130.4, 129.7, 129.6, 129.4, 128.6, 128.3, 128.0, 127.6, 127.1, 127.0, 126.4, 119.4, 59.8, 56.2, 23.8, 21.6, 21.4; IR (neat): 2922, 1599, 1463, 1370, 1318, 1172, 1127, 1089, 705, 661, 557; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_4S_2]^+$ (M + Na^+) 609.1852, found 609.1848.

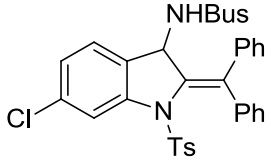
***N*-(2-(diphenylmethylene)-6-fluoro-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3ao)**



3ao

Compound **3ao** was prepared in 98% yield (115.3 mg) according to the general procedure (Scheme 3). Pale yellow soild (mp 180–181 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (dd, *J* = 8.4, 5.6 Hz, 1H), 7.49 (d, *J* = 8.0 Hz, 2H), 7.40 – 7.30 (m, 4H), 7.26 – 7.18 (m, 9H), 6.94 – 6.89 (m, 1H), 4.87 (d, *J* = 9.2 Hz, 1H), 3.30 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.1 (d, *J* = 246.0 Hz), 145.5, 143.1, 142.9 (d, *J* = 9.0 Hz), 139.9, 138.9, 134.0, 133.5, 130.1 (d, *J* = 3.0 Hz), 130.0, 129.7, 129.6, 128.7, 128.5 (d, *J* = 9.0 Hz), 128.4, 127.9, 127.8, 127.7, 113.6 (d, *J* = 23.0 Hz), 107.3 (d, *J* = 26.0 Hz), 59.8, 55.9, 23.7, 21.6; IR (neat): 2983, 1602, 1489, 1373, 1314, 1174, 1126, 1090, 695, 664, 586, 540; HRESIMS Calcd for $[C_{32}H_{31}FN_2NaO_4S_2]^+$ (M + Na^+) 613.1601, found 613.1618.

***N*-(6-chloro-2-(diphenylmethylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3ap)**

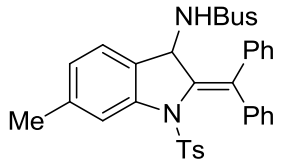


3ap

Compound **3ap** was prepared in 74% yield (89.7 mg) according to the general procedure (Scheme 3). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (dd, *J* = 5.2, 3.2 Hz, 2H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.34 – 7.36 (m, 3H), 7.27 – 7.22 (m, 5H), 7.25 – 7.17 (m, 5H), 4.88 (d, *J* = 9.2 Hz, 1H), 3.40 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.6, 143.1, 142.7, 139.8, 138.9, 135.2, 133.6, 133.5, 132.9, 130.0, 129.8, 129.7, 128.8, 128.5, 128.1, 128.0, 127.8, 127.7, 126.8, 119.9, 59.9, 55.9, 23.8, 21.6;

IR (neat): 2924, 1597, 1492, 1368, 1125, 1033, 752, 664, 591, 473; HRESIMS Calcd for $[C_{32}H_{31}ClN_2NaO_4S_2]^+$ (M + Na^+) 629.1306, found 629.1311.

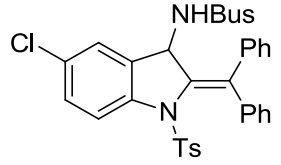
***N*-(2-(diphenylmethylene)-6-methyl-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3aq)**



3aq

Compound **3aq** was prepared in 76% yield (89.1 mg) according to the general procedure (Scheme 3). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 8.0 Hz, 3H), 7.41 (d, *J* = 8.0 Hz, 1H), 7.36 – 7.32 (m, 3H), 7.25 – 7.14 (m, 10H), 4.89 (d, *J* = 8.8 Hz, 1H), 3.49 (d, *J* = 8.8 Hz, 1H), 2.36 (s, 3H), 2.35 (s, 3H), 1.13 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.1, 142.4, 140.1, 139.1, 136.5, 134.5, 134.4, 133.8, 130.3, 129.9, 129.8, 129.7, 128.7, 128.4, 128.1, 127.7, 127.6, 127.5, 119.2, 59.8, 56.3, 23.9, 21.6, 21.3; IR (neat): 2923, 1597, 1453, 1377, 1313, 1176, 1128, 1090, 708, 662, 556; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_4S_2]^+$ (M + Na^+) 609.1852, found 609.1843.

***N*-(5-chloro-2-(diphenylmethylene)-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3ar)**

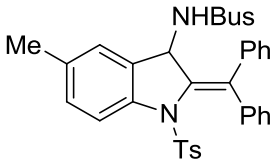


3ar

Compound **3ar** was prepared in 61% yield (73.9 mg) according to the general procedure (Scheme 3). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, *J* = 2.0 Hz, 1H), 7.52 (d, *J* = 8.8 Hz, 1H), 7.47 (d, *J* = 8.4 Hz, 2H), 7.38 – 7.33 (m, 4H), 7.25 – 7.23 (m, 5H), 7.21 – 7.16 (m, 4H), 4.88 (d, *J* = 9.2 Hz, 1H), 3.42 (d, *J* = 9.2 Hz, 1H), 2.37 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.5, 143.2, 140.2, 139.8, 138.8, 136.1, 133.6, 133.5, 132.0, 130.0, 129.8, 129.7, 129.6, 128.8, 128.5, 128.0, 127.8, 127.7, 127.5, 120.6,

59.9, 56.2, 23.8, 21.6; IR (neat): 2102, 1636, 1463, 1373, 1313, 1171, 1126, 661, 579, 468; HRESIMS Calcd for $[C_{32}H_{31}ClN_2NaO_4S_2]^+$ (M + Na^+) 629.1306, found 629.1301.

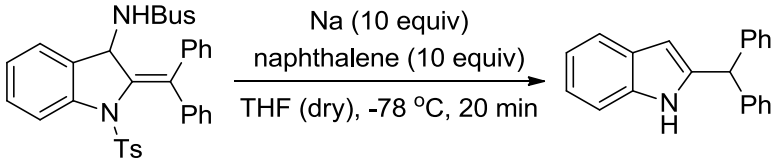
_N_-(2-(diphenylmethylene)-5-methyl-1-tosylindolin-3-yl)-2-methylpropane-2-sulfonamide (3as)



3as

Compound **3as** was prepared in 93% yield (108.7 mg) according to the general procedure (Scheme 3). Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 7.6 Hz, 1H), 7.48 (d, *J* = 8.0 Hz, 2H), 7.43 (s, 1H), 7.35 – 7.32 (m, 3H), 7.27 – 7.15 (m, 9H), 7.04 (d, *J* = 7.6 Hz, 1H), 4.88 (d, *J* = 9.2 Hz, 1H), 3.42 (d, *J* = 9.2 Hz, 1H), 2.42 (s, 3H), 2.35 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.1, 142.4, 141.6, 140.1, 139.8, 139.1, 134.4, 133.9, 131.5, 129.9, 129.8, 129.7, 128.7, 128.3, 128.0, 127.7, 127.5, 127.4, 126.7, 120.0, 59.7, 56.2, 23.8, 21.7, 21.6; IR (neat): 2926, 1597, 1492, 1368, 1307, 1171, 1125, 1089, 814, 778, 664, 587; HRESIMS Calcd for $[C_{33}H_{34}N_2NaO_4S_2]^+$ (M + Na^+) 609.1852, found 609.1855.

2-benzhydryl-1*H*-indole (4a)



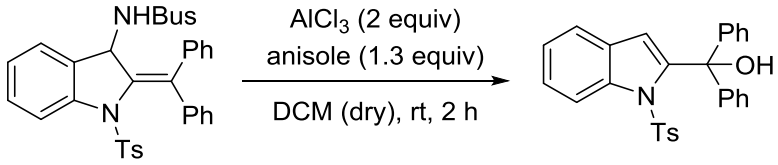
3a **4a**, 76%

Compound **4a** was prepared in 76% yield (27.9 mg) according to the following known procedure.[4] Sodium (30 mg, 1.3 mmol), naphthalene (167 mg, 1.3 mmol) and magnetic stirring bar were added successively in an oven-dried bottle, evacuated and backfilled with argon trice, then capped with a rubber septum. Dry THF (5 mL) was added into the bottle and the mixture underwent ultrasonic treatment for 30 min, given sodium naphthalenide, which must be used instantly. **3a** (74.5 mg, 0.13 mmol) in THF (2 mL)

was added under –78 ℃. The mixture was stirred for 20 min at this temperature and quenched with saturated NH_4Cl (aq) and saturated $NaHCO_3$ (aq), then extracted with EtOAc. The combined organic layers were dried over $MgSO_4$. The concentration of the filtrate under reduced pressure gave the crude product, purified by silica-gel column chromatography (PE : EtOAc = 10 : 1).

Black oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 (s, 1H), 7.49 (d, *J* = 7.6 Hz, 1H), 7.35 – 7.16 (m, 11H), 7.12 – 7.03 (m, 2H), 6.08 (s, 1H), 5.56 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.1, 140.8, 136.2, 129.0, 128.6, 126.9, 121.5, 120.2, 119.7, 110.6, 102.8, 51.0; IR (neat): 1635, 1494, 1456, 1290, 1181, 1030, 747, 610, 594, 427; HRESIMS Calcd for $[C_{21}H_{17}NNa]^+$ (M + Na^+) 306.1253, found 306.1257.

diphenyl(1-tosyl-1*H*-indol-2-yl)methanol (5a)



3a **5a**, 57%

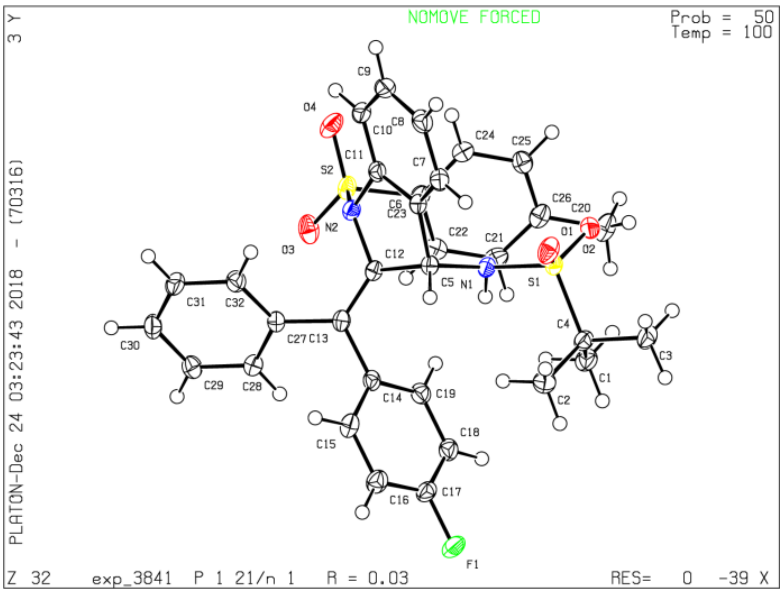
Compound **5a** was prepared in 57% yield (25.9 mg) according to the following known procedure.[3] Compound **3a** (0.1 mmol, 57.3 mg) and anisole (0.13 mmol, 14 uL) were dissolved in dry DCM (2 mL). $AlCl_3$ (0.2 mmol, 26.7 mg) was added successively in one portion to the reaction mixture. After stirring for 2 h at room temperature, the resulting dark red solution was diluted with moderate DCM. 10% NaOH (aq) was then added dropwise under stirring until soilds are dissolved. The aqueous layer was extracted 4 times with DCM. The combined organic layers were dried over $MgSO_4$, filtered and concentrated under vacuum. The crude product was purified by silica-gel column chromatography (PE : EtOAc = 3 : 1).

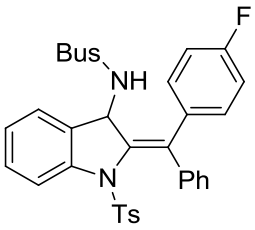
White soild (mp 150–151 ℃). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (d, *J* = 8.4 Hz, 1H), 7.57 (d, *J* = 8.4 Hz, 2H), 7.35 – 7.30 (m, 10H), 7.27 – 7.21 (m, 2H), 7.18 – 7.11 (m, 3H), 5.96 (s, 1H), 5.87 (d, *J* = 0.8 Hz, 1H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 146.6, 145.9, 144.8, 137.7, 135.7, 129.7, 127.9, 127.8, 127.5, 126.7, 125.2, 123.7, 121.3, 116.3, 115.0, 79.0, 21.5; IR (neat): 1637, 1449, 1349, 1173, 1146, 1015, 750, 702, 672, 585; HRESIMS Calcd for $[C_{28}H_{23}NNaO_3S]^+$ (M + Na^+) 476.1291, found 476.1289.

Reference:

1. (a) Chen, C. C.; Waser, J. *Org. Lett.* **2015**, *17*, 736. (b) Tokimizu, Y.; Wieteck, M.; Rudolph, M.; Oishi, S.; Fujii, N.; Hashmi, A. S. K.; Ohno, H. *Org. Lett.* **2015**, *17*, 604. (c) Alayrac, C.; Schollmeyer, D.; Witulski, B. *Chem. Commun.* **2009**, *45*, 1464. (d) DiLauro, A. M.; Seo, W.; Phillips, S. T. *J. Org. Chem.* **2011**, *76*, 7352.
2. (a) Zhou, B.; Li, L.; Zhu, X.-Q.; Yan, J.-Z.; Guo, Y.-L.; Ye, L.-W. *Angew. Chem., Int. Ed.* **2017**, *56*, 4015. (b) Morales, S.; Guijarro F. G.; Ruano J. G.; Cid, M. B. *J. Am. Chem. Soc.* **2014**, *136*, 1082.
3. (a) Li, B.; Zhang, J.; Zhang, Z.; Gridnev, I. D.; Zhang, W. *Angew. Chem., Int. Ed.* **2019**, *58*, 7329. (b) Enders, D.; Seppelt, M.; Beck, T. *Adv. Synth. Catal.* **2010**, *352*, 1413. (c) Mita, T.; Higuchi, Y.; Sato, Y. *Chem. - Eur. J.* **2013**, *19*, 1123. (d) Mita, T.; Sugawara, M.; Saito, K.; Sato, Y. *Org. Lett.* **2014**, *16*, 3028. (e) Sun, P.; Weinreb, S. M. *J. Org. Chem.* **1997**, *62*, 8604.
4. Yuan, H.; Guo, Z; Luo, T. *Org. Lett.* **2017**, *19*, 624.

Crystal data and structure refinement for 3b. CCDC Number = 1977528





Bond precision: C-C = 0.0021 A Wavelength=1.54184

Cell: a=11.5515(1) b=15.2491(2) c=15.9658(2)
alpha=90 beta=91.512(1) gamma=90
Temperature: 100 K

	Calculated	Reported
Volume	2811.40(6)	2811.40(6)
Space group	P 21/n	P 1 21/n 1
Hall group	-P 2yn	-P 2yn
Moiety formula	C32 H31 F N2 O4 S2	C32 H31 F N2 O4 S2
Sum formula	C32 H31 F N2 O4 S2	C32 H31 F N2 O4 S2
Mr	590.71	590.71
Dx,g cm-3	1.396	1.396
Z	4	4
Mu (mm-1)	2.120	2.120
F000	1240.0	1240.0
F000'	1246.16	
h,k,lmax	13,18,19	13,18,19
Nref	5010	4988
Tmin,Tmax	0.809,0.899	0.904,1.000
Tmin'	0.809	

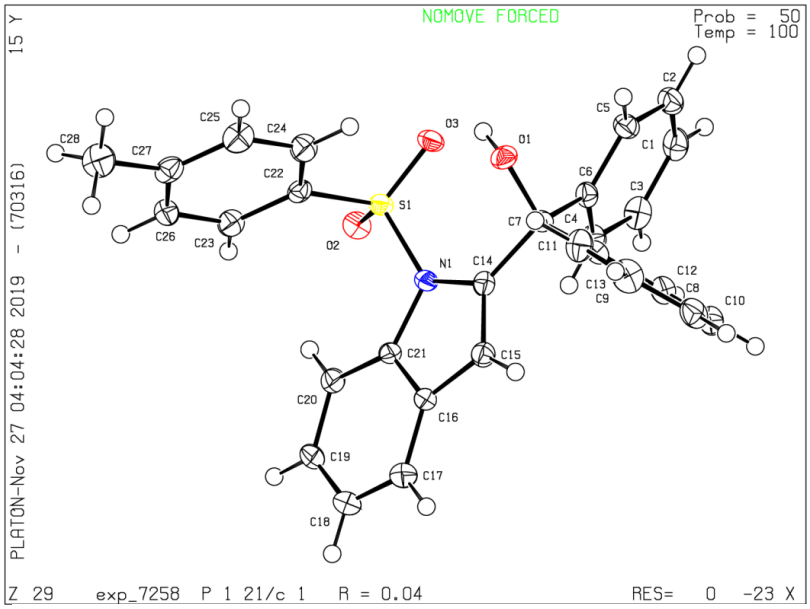
Correction method= # Reported T Limits: Tmin=0.904 Tmax=1.000
AbsCorr = MULTI-SCAN

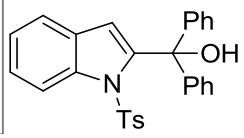
Data completeness= 0.996 Theta(max)= 67.078

R(reflections)= 0.0345(4629) wR2(reflections)= 0.0933(4988)

S = 1.038 Npar= 374

Crystal data and structure refinement for 5a. CCDC Number = 1977529





Bond precision: C-C = 0.0027 A Wavelength=1.54184

Cell: a=12.7799(1) b=10.1536(1) c=18.2019(2)
alpha=90 beta=108.934(1) gamma=90
Temperature: 100 K

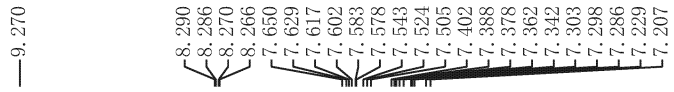
	Calculated	Reported
Volume	2234.12(4)	2234.12(4)
Space group	P 21/c	P 1 21/c 1
Hall group	-P 2ybc	-P 2ybc
Moiety formula	C28 H23 N O3 S	C28 H23 N O3 S
Sum formula	C28 H23 N O3 S	C28 H23 N O3 S
Mr	453.53	453.53
Dx,g cm-3	1.348	1.348
Z	4	4
Mu (mm-1)	1.537	1.537
F000	952.0	952.0
F000'	955.96	
h,k,lmax	15,12,22	15,12,22
Nref	4501	4263
Tmin,Tmax	0.912,0.926	0.764,1.000
Tmin'	0.858	

Correction method= # Reported T Limits: Tmin=0.764 Tmax=1.000
AbsCorr = MULTI-SCAN

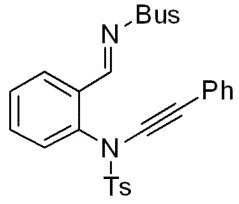
Data completeness= 0.947 Theta(max)= 73.454

R(reflections)= 0.0378(3907) wR2(reflections)= 0.1112(4263)

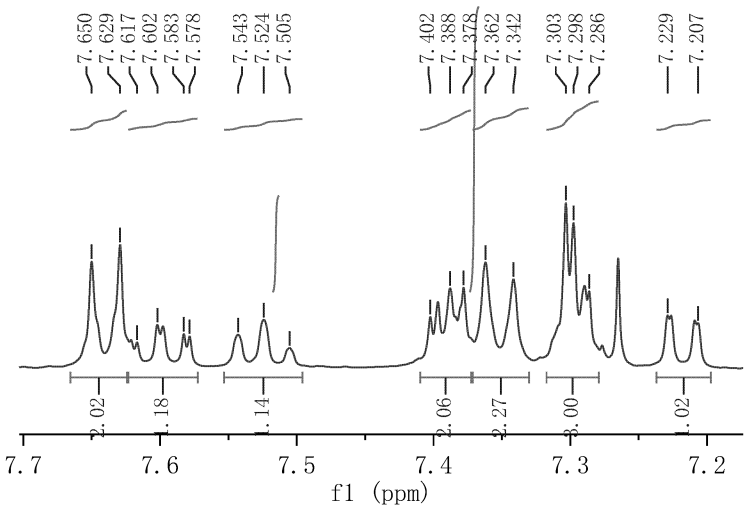
S = 1.104 Npar= 300

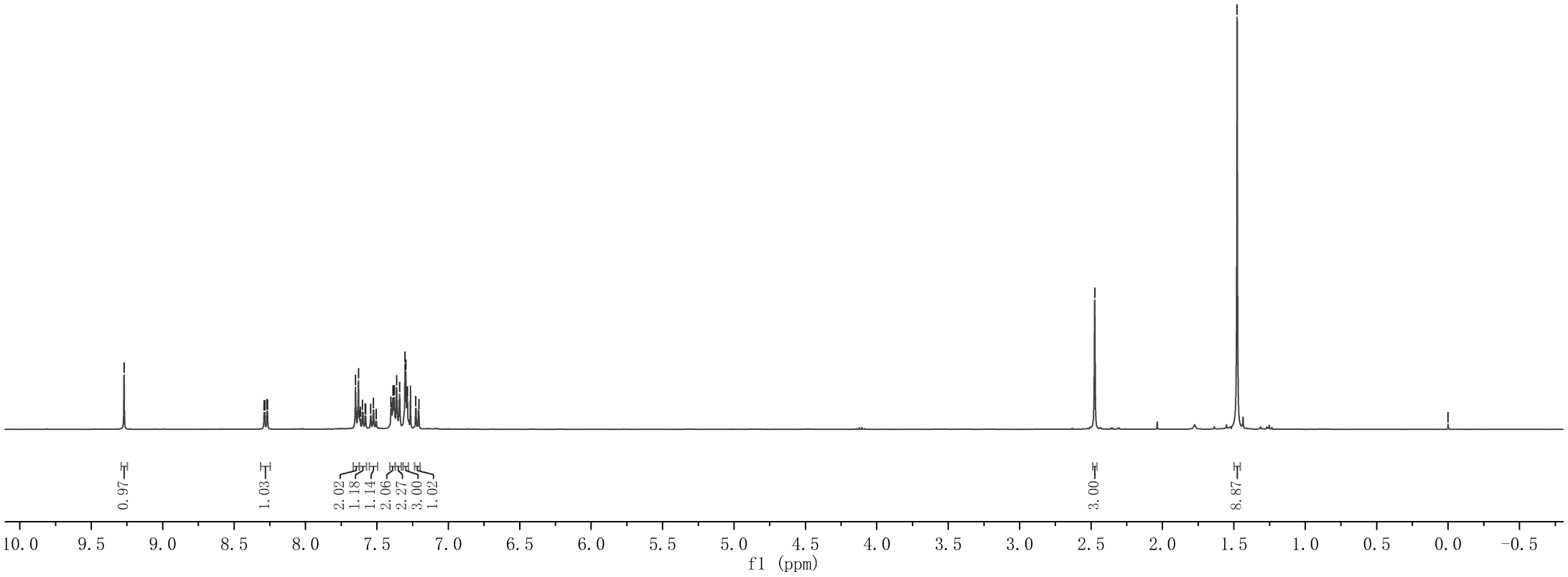


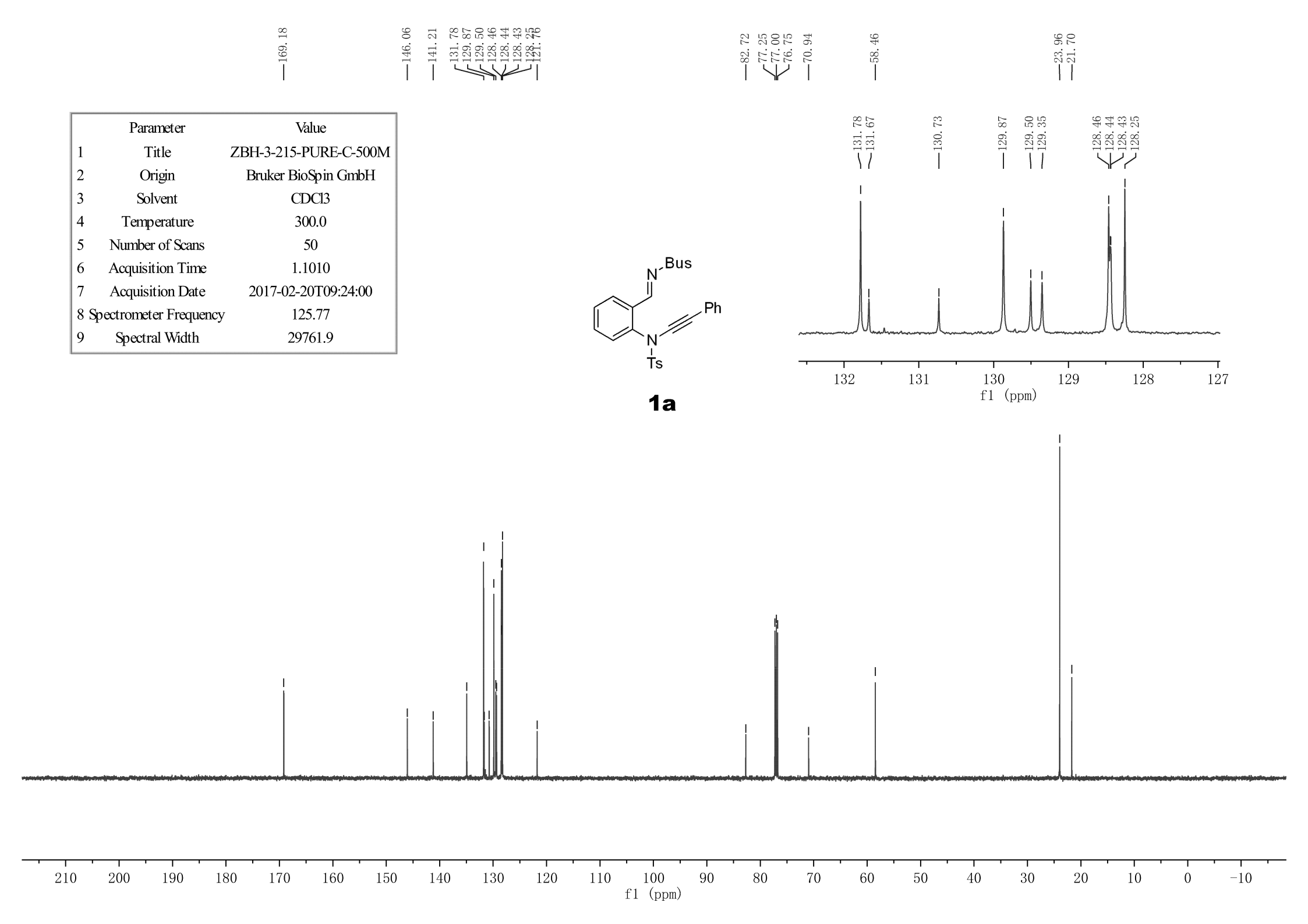
	Parameter	Value
1	Title	zbh-3-215-pure-H-400M-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	294.5
5	Number of Scans	10
6	Acquisition Time	3.9846
7	Acquisition Date	2017-02-20T09:02:20
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



1a

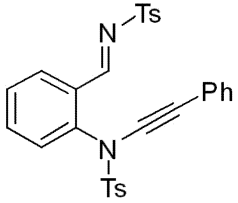




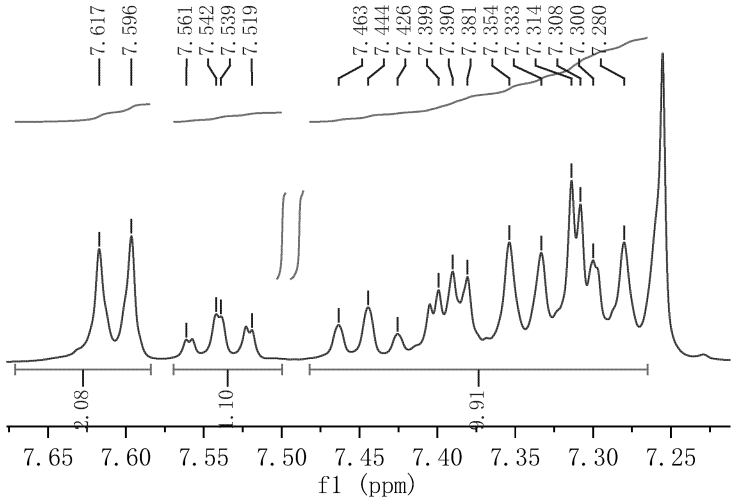


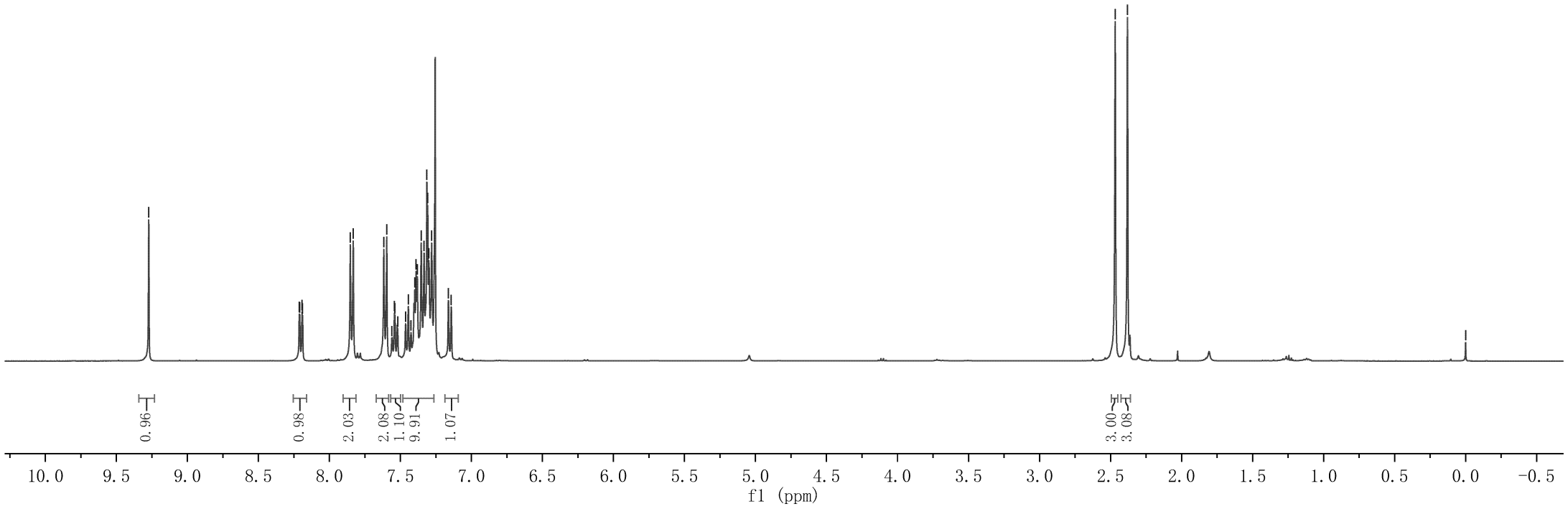
	Parameter	Value
1	Title	ZBH-3-215-PURE-C-500M
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	50
6	Acquisition Time	1.1010
7	Acquisition Date	2017-02-20T09:24:00
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9

	Parameter	Value
1	Title	zzx-8-190-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	13
6	Acquisition Time	4.0894
7	Acquisition Date	2020-03-18T17:36:03
8	Spectrometer Frequency	400.13
9	Spectral Width	8012.8

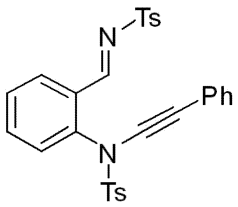


1a'

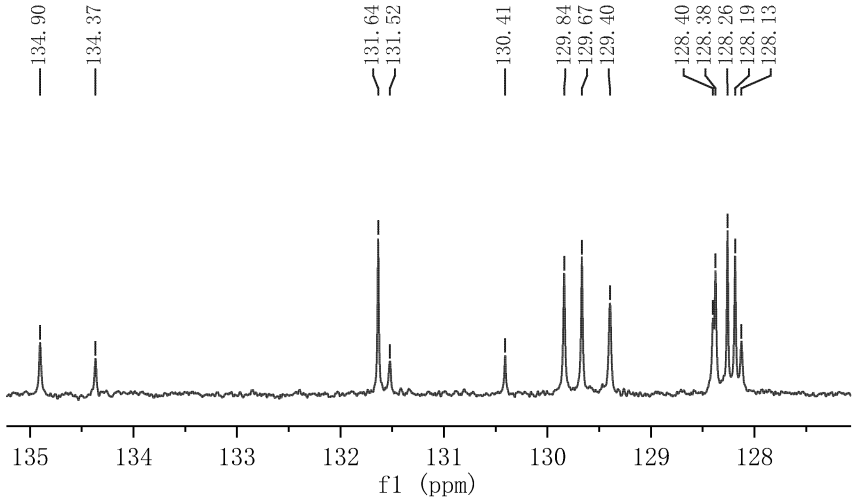


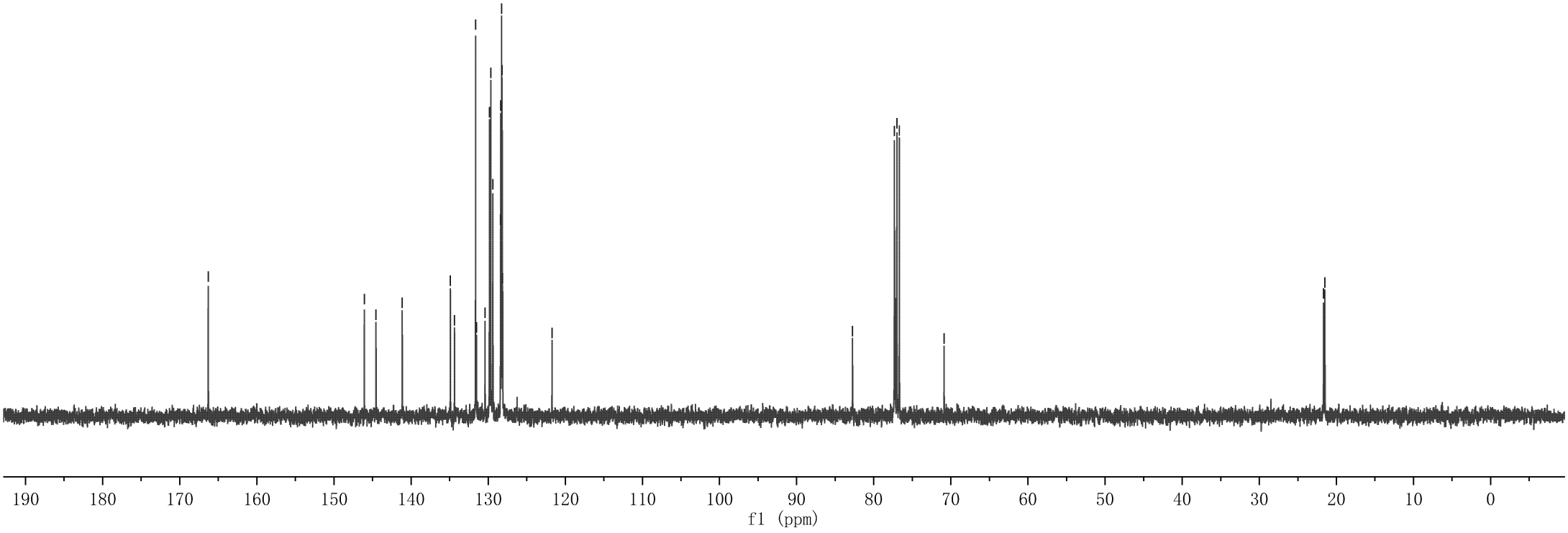


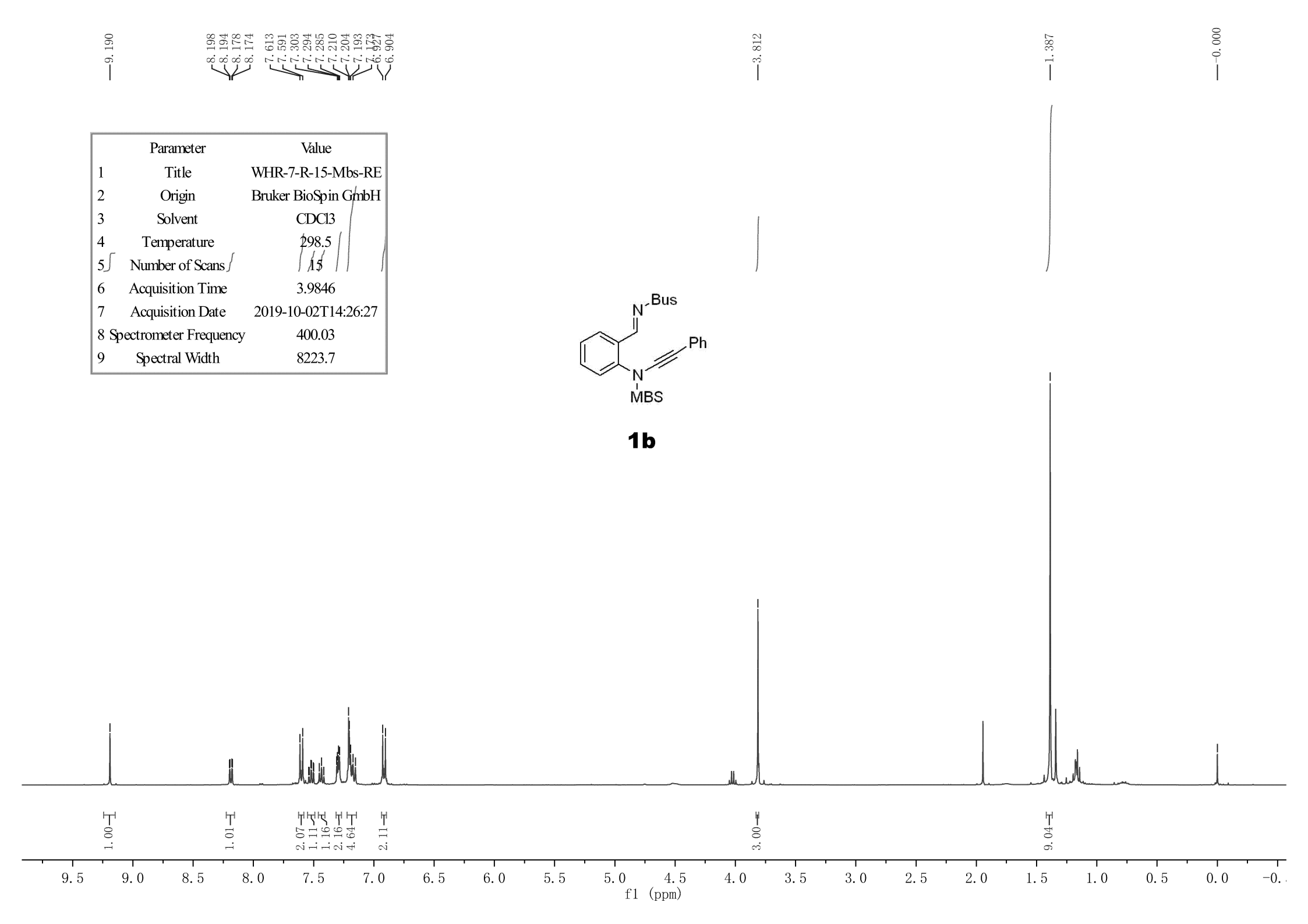
	Parameter	Value
1	Title	zzx-8-190-C
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	13
6	Acquisition Time	1.3631
7	Acquisition Date	2020-03-18T17:38:38
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



1a'



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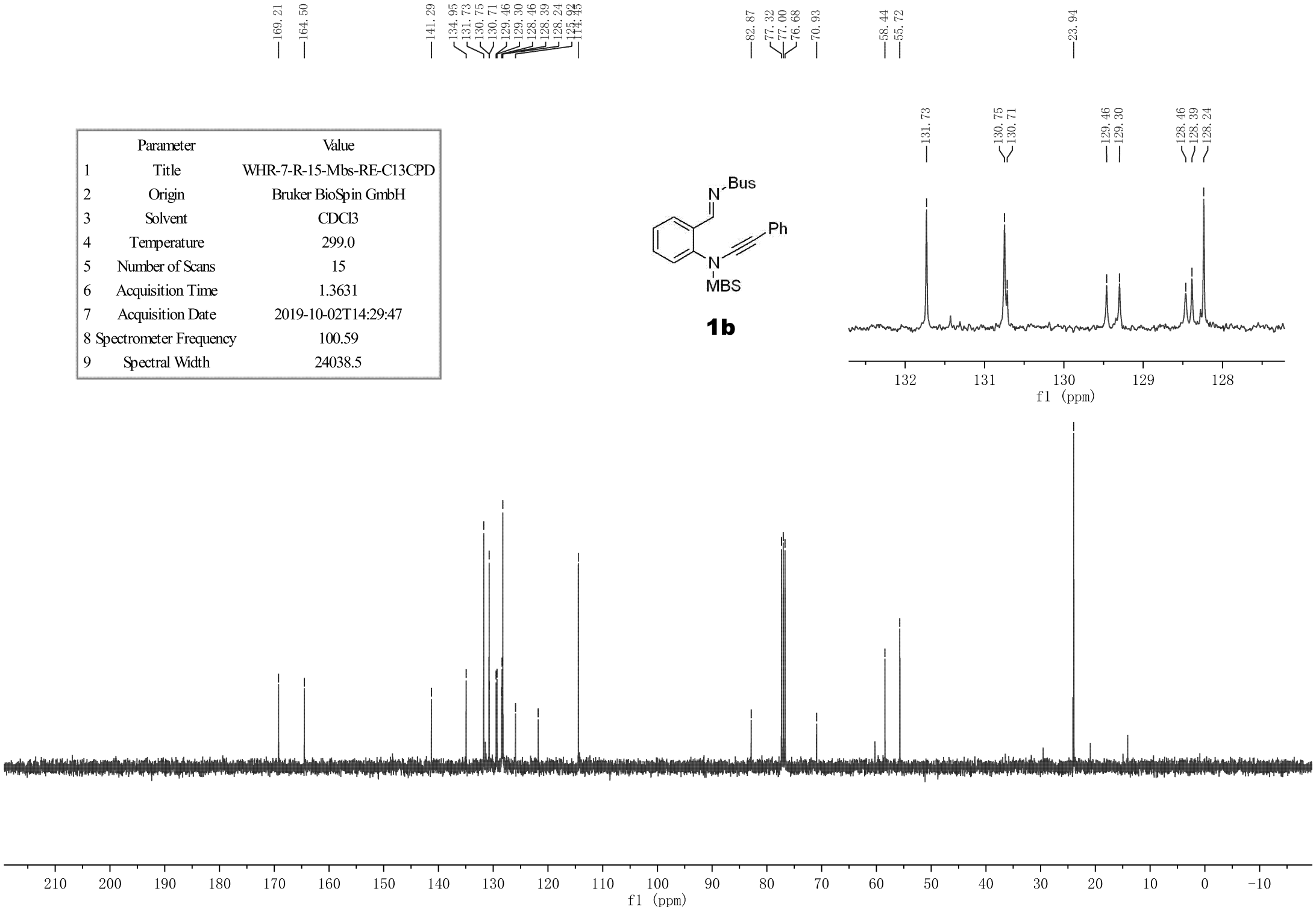
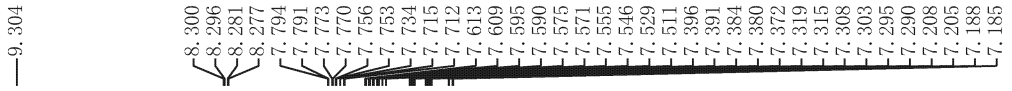
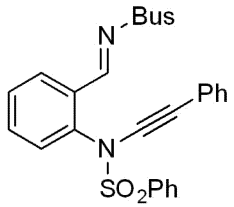
7.613
7.591
7.303
7.294
7.285
7.210
7.204
7.193
6.927
6.904
3.812
1.387
0.000
Parameter Value
1 Title WHR-7-R-15-Mbs-RE
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.5
5 Number of Scans 15
6 Acquisition Time 3.9846
7 Acquisition Date 2019-10-02T14:26:27
8 Spectrometer Frequency 400.03
9 Spectral Width 8223.7
N
Bus
Ph
N
MBS
1b
1.00
1.01
2.07
1.11
1.16
2.16
4.64
2.11
3.00
9.04
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
f1 (ppm)



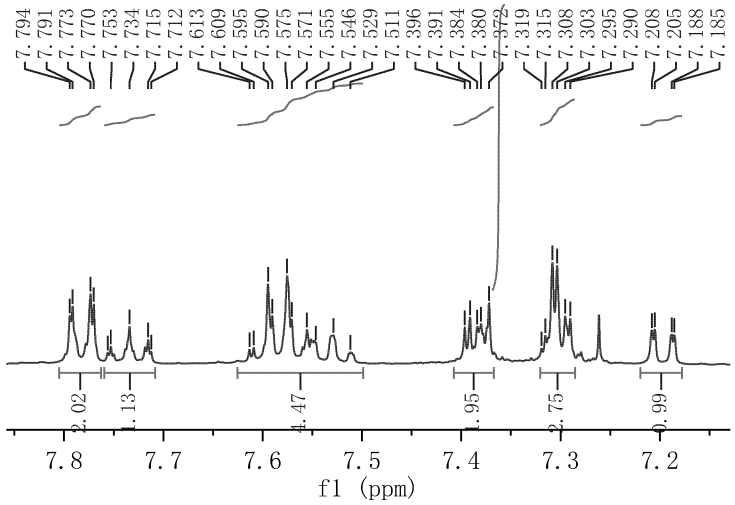
	Parameter	Value
1	Title	WHR-7-R-15-Mbs-RE-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	299.0
5	Number of Scans	15
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-02T14:29:47
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5

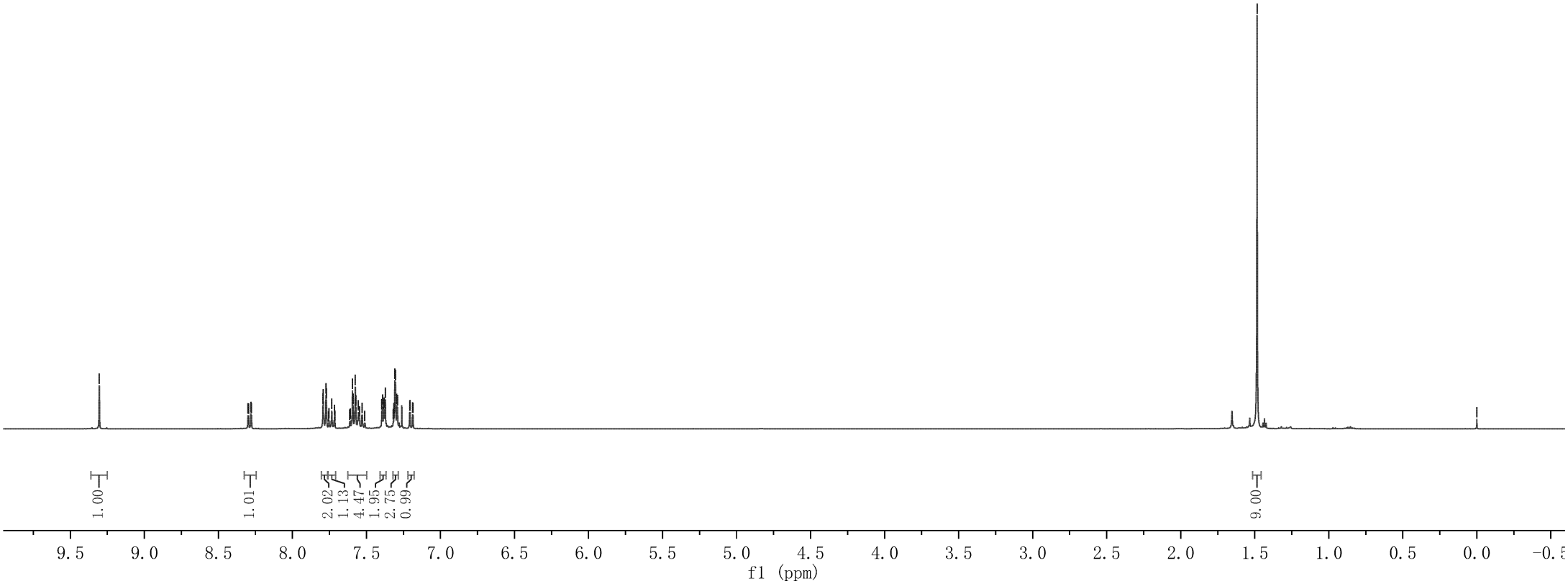


	Parameter	Value
1	Title	WHR-4-R-26-H-SO2Ph
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.5
5	Number of Scans	15
6	Acquisition Time	3.9846
7	Acquisition Date	2019-09-25T14:38:36
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7

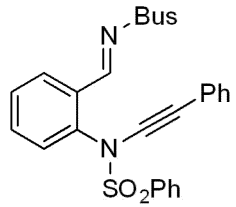


1c





	Parameter	Value
1	Title	WHR-4-R-26-C13CPD-SO2Ph
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	88
6	Acquisition Time	1.3631
7	Acquisition Date	2019-09-25T14:38:36
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



1c

9.346
8.315
8.296
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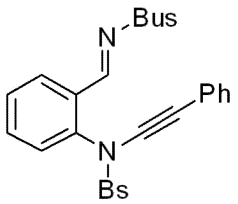
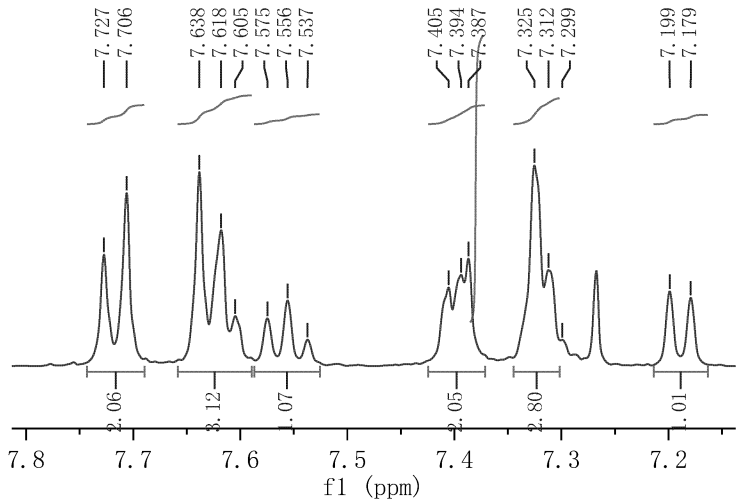
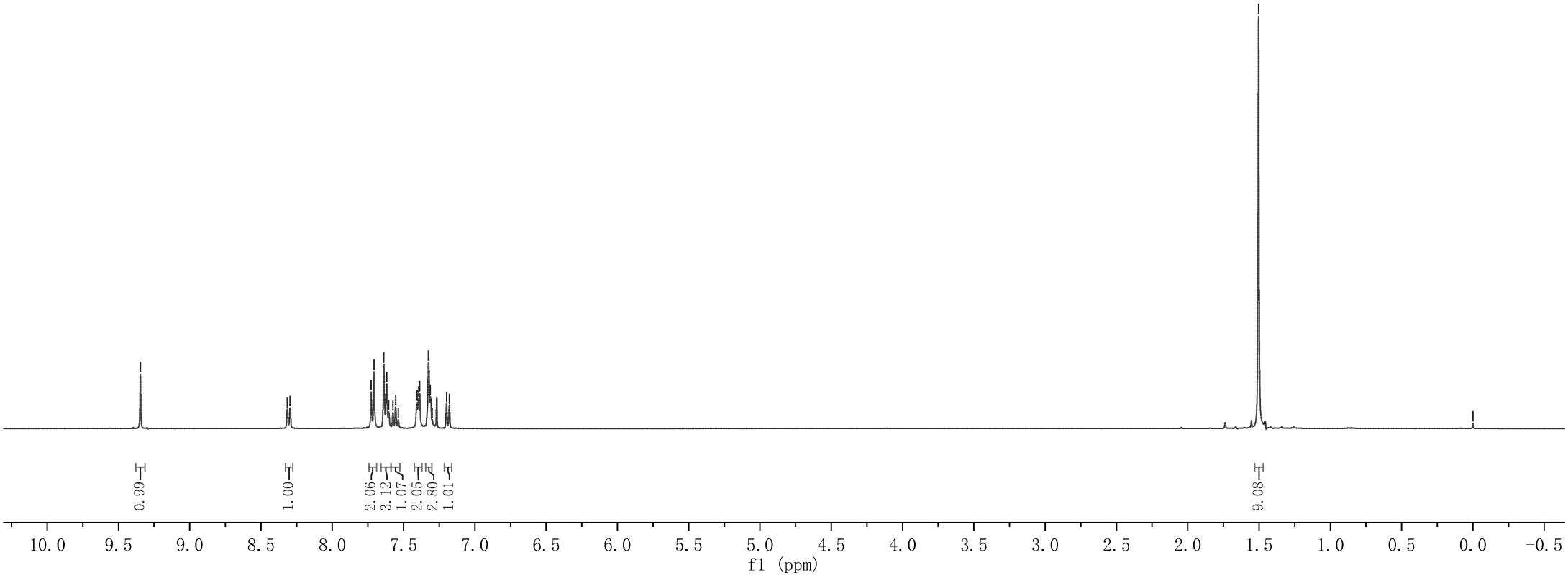
7.706
7.638
7.618
7.605
7.575
7.556
7.537
7.405
7.394
7.387
7.325
7.312
7.299
7.199
7.179

	Parameter	Value
1	Title	ZBH-3-246-PURE-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	291.3
5	Number of Scans	19
6	Acquisition Time	3.9846
7	Acquisition Date	2017-03-02T14:04:19
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



1d





	Parameter	Value
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3	Solvent	CDCl3
4	Temperature	302.1
5	Number of Scans	75
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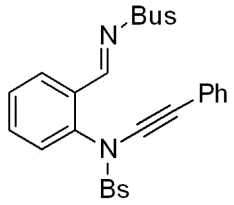
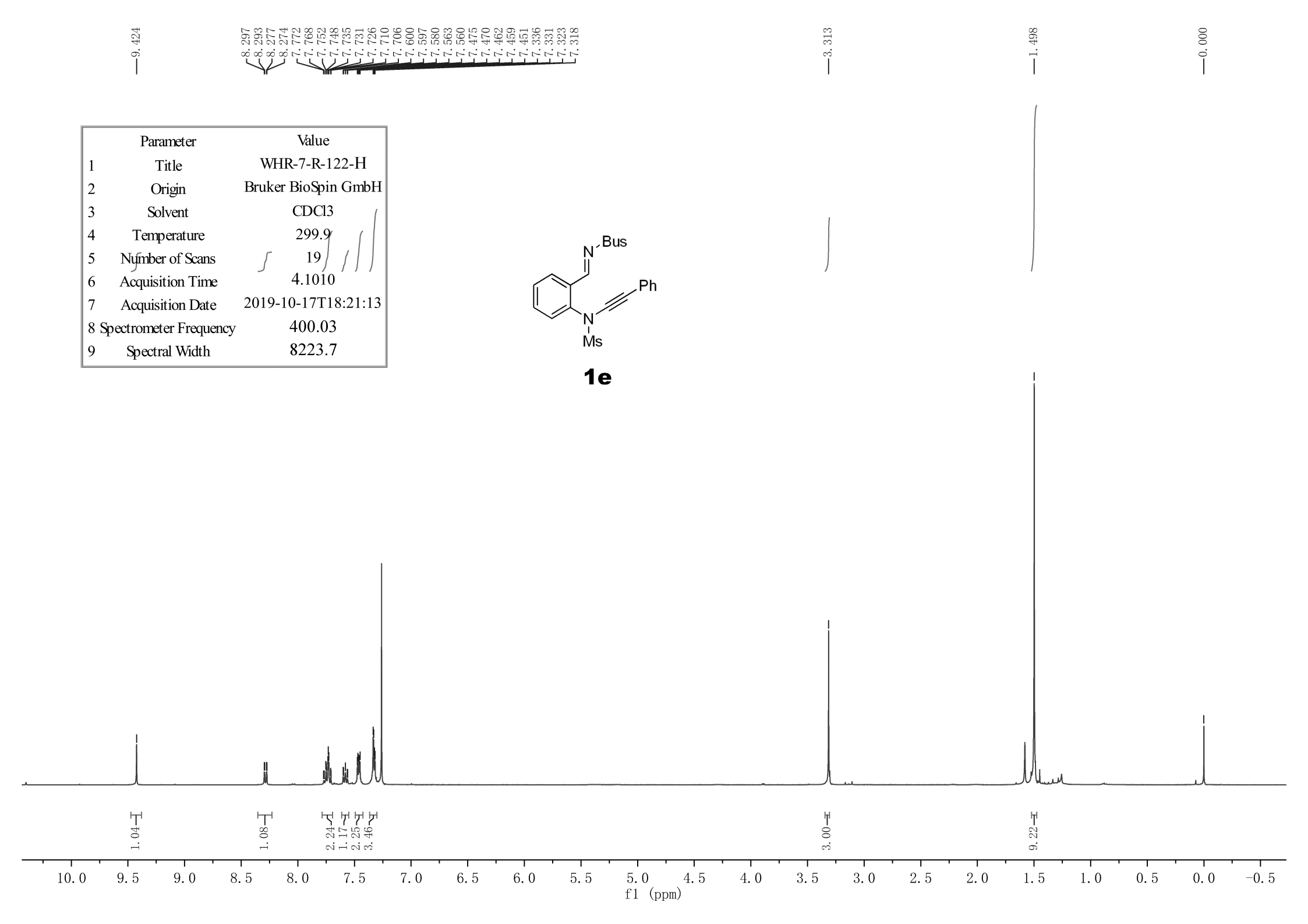
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



1d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7.752
7.748
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7.600
7.597
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7.560
7.475
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7.462
7.459
7.451
7.336
7.331
7.323
7.318
3.313
1.498
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Parameter Value
1 Title WHR-7-R-122-H
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 299.9
5 Number of Scans 19
6 Acquisition Time 4.1010
7 Acquisition Date 2019-10-17T18:21:13
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9 Spectral Width 8223.7
N
Bus
Ph
N
Ms
1e
1.04
1.08
2.24
1.17
2.25
3.46
3.00
9.22
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
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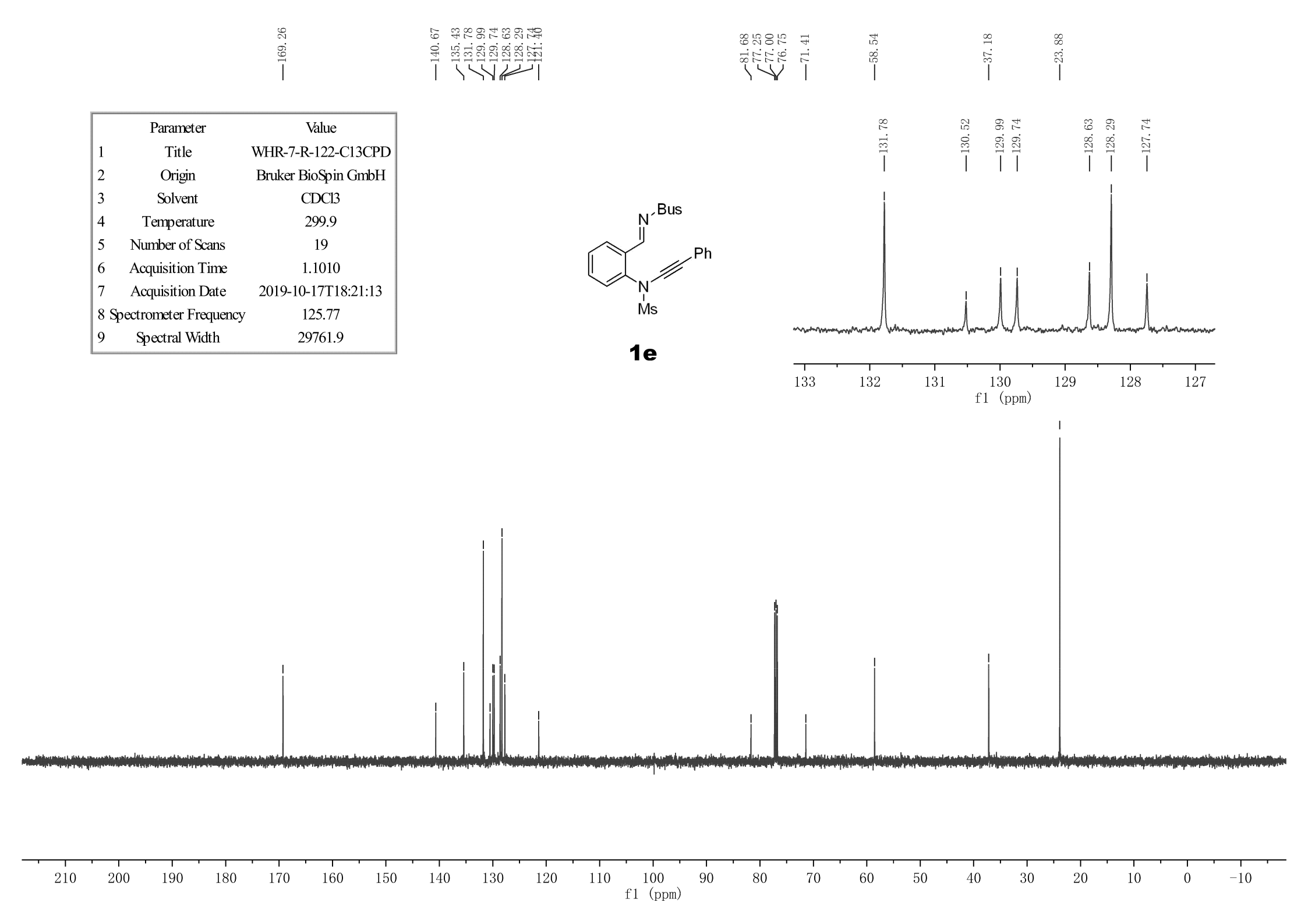
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)



	Parameter	Value
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3	Solvent	CDCl3
4	Temperature	299.9
5	Number of Scans	19
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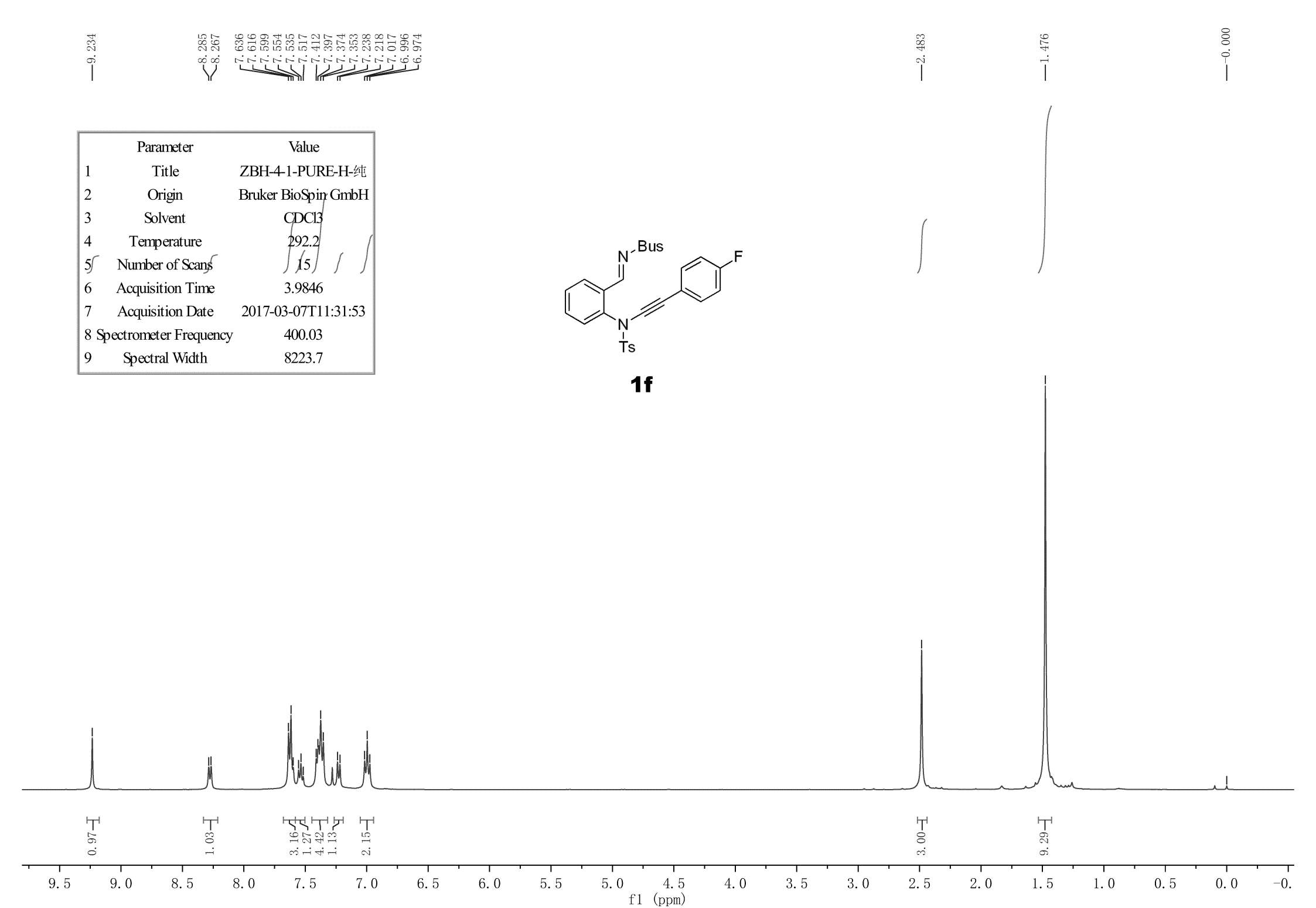
7	Acquisition Date	2019-10-17T18:21:13
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9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7.535
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7.412
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7.353
7.238
7.218
7.017
6.996
6.974
2.483
1.476
-0.000
Parameter Value
1 Title ZBH-4-1-PURE-H-纯
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 292.2
5 Number of Scans 15
6 Acquisition Time 3.9846
7 Acquisition Date 2017-03-07T11:31:53
8 Spectrometer Frequency 400.03
9 Spectral Width 8223.7
N
Bus
F
N
Ts
1f
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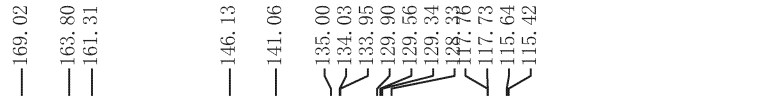
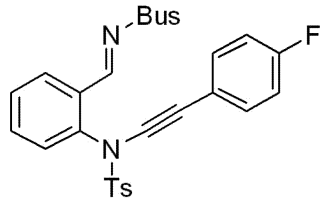
1.27
4.42
1.13
2.15
3.00
9.29
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.
f1 (ppm)



	Parameter	Value
1	Title	ZBH-4-1-PURE-C2-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	292.5
5	Number of Scans	72
6	Acquisition Time	1.3631
7	Acquisition Date	2017-03-07T11:38:03
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



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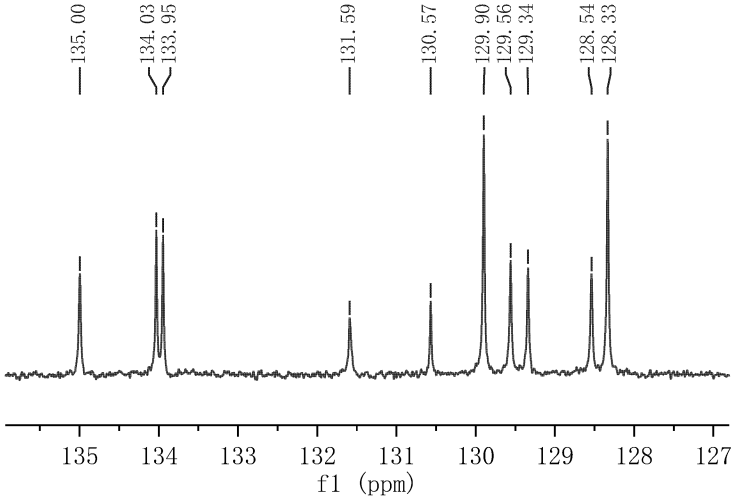
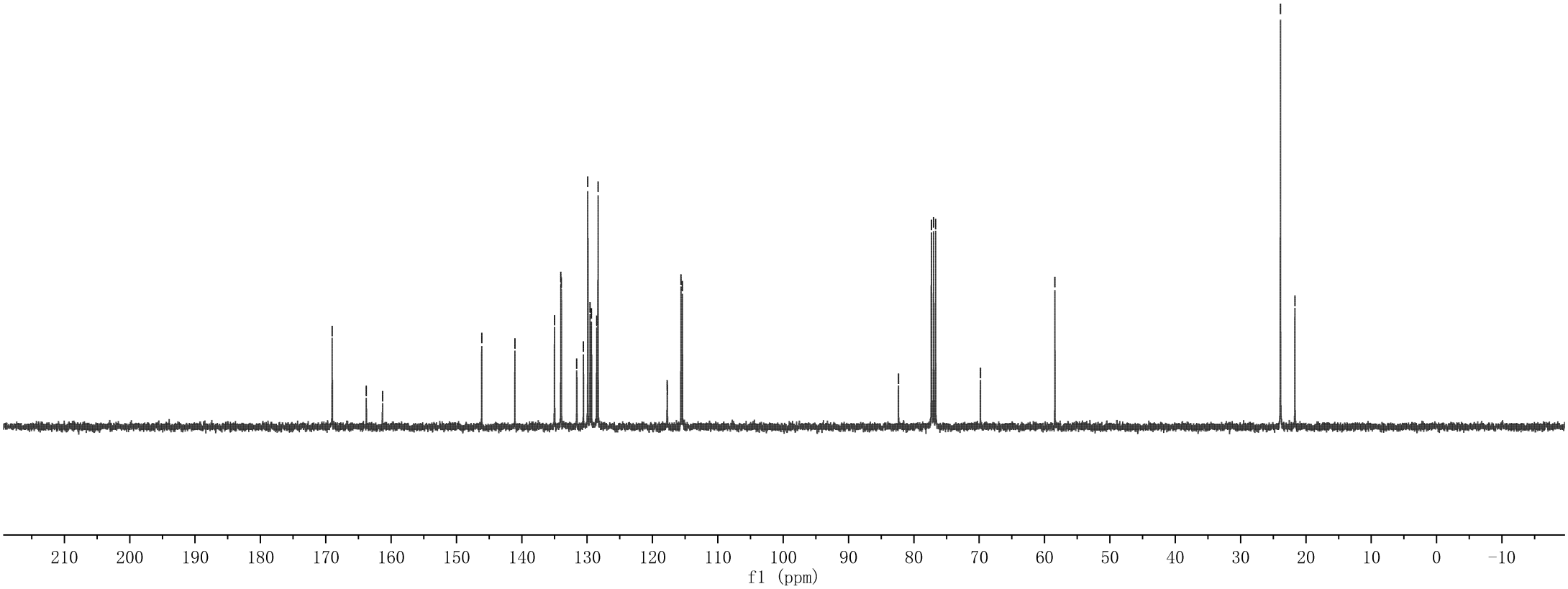
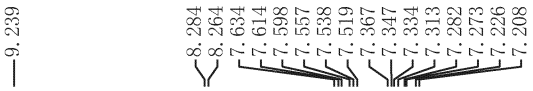
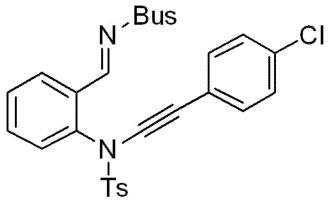






	Parameter	Value
1	Title	zbh-4-26-pure-H-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.0
5	Number of Scans	11
6	Acquisition Time	3.9846
7	Acquisition Date	2017-03-11T20:36:09
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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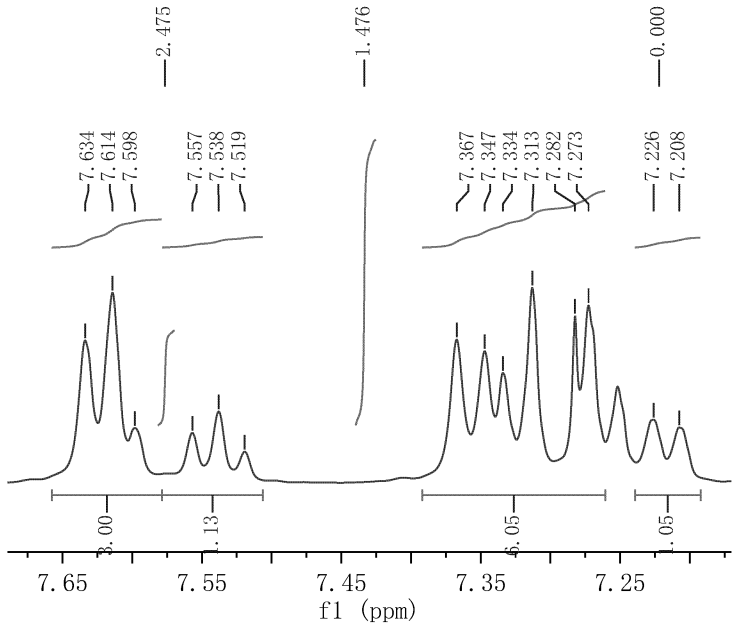
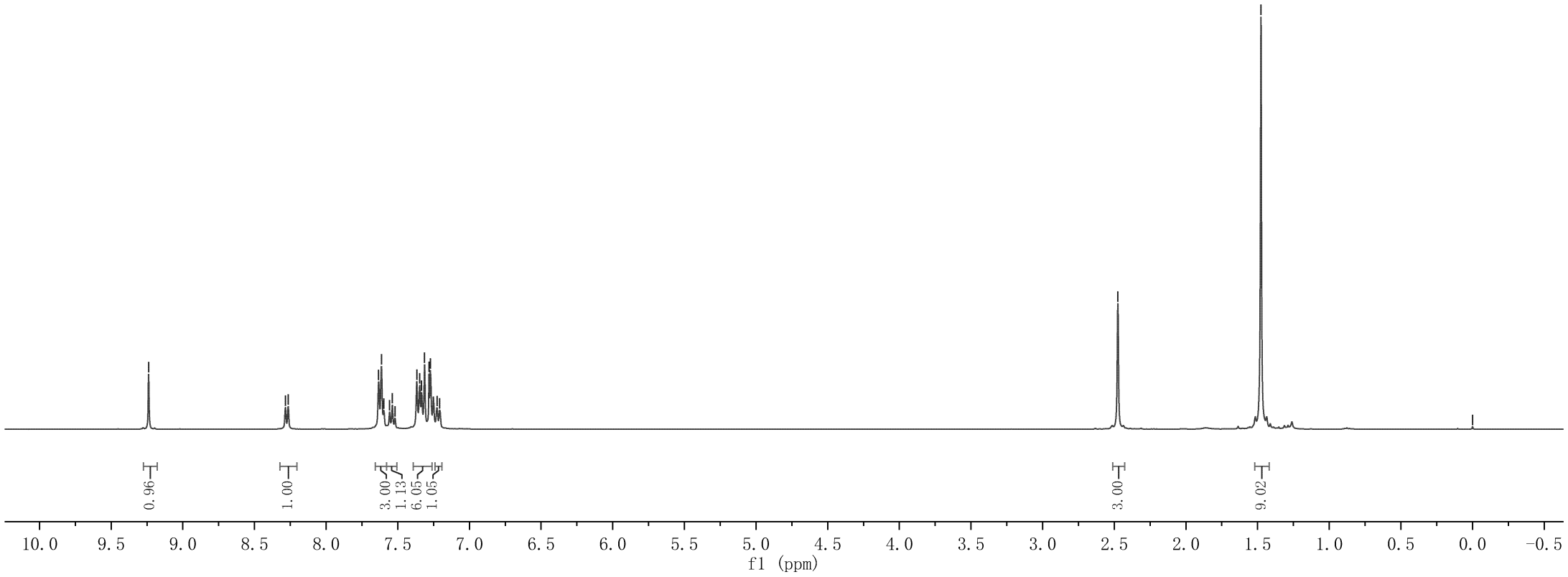
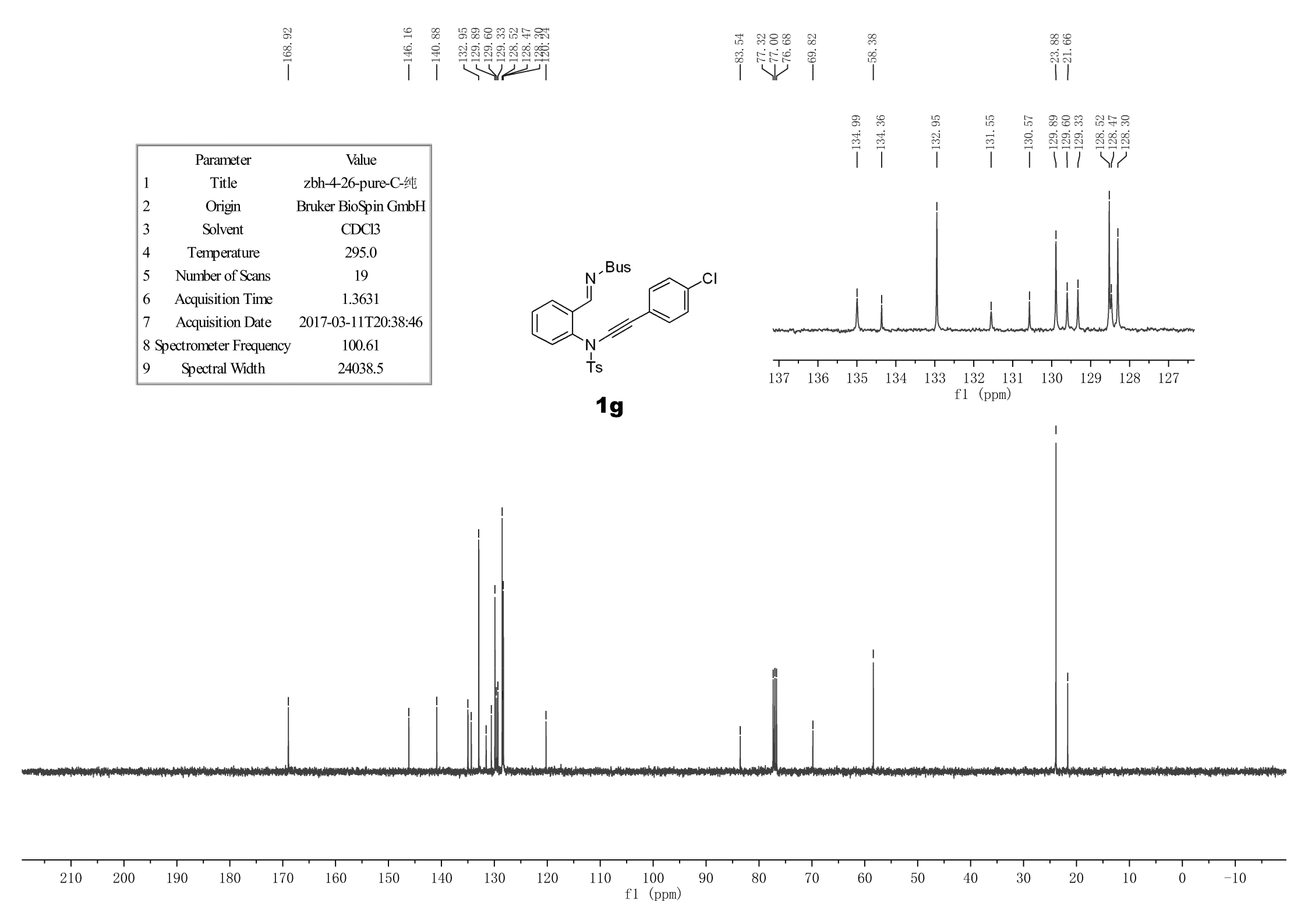
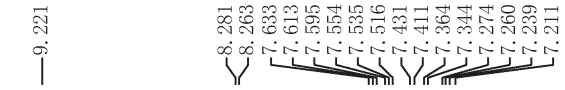
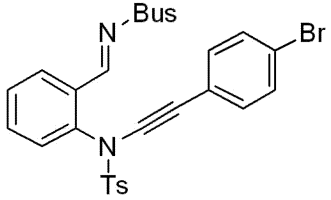




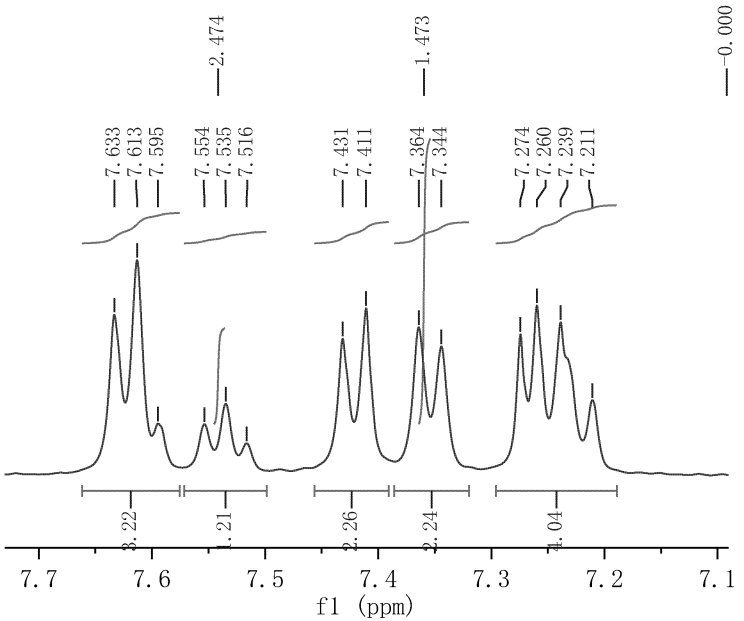

168.92
146.16
140.88
132.95
129.89
129.60
129.33
128.52
128.47
128.30
120.24
83.54
77.32
77.00
76.68
69.82
58.38
23.88
21.66
134.99
134.36
132.95
131.55
130.57
129.89
129.60
129.33
128.52
128.47
128.30
Parameter Value
1 Title zbh-4-26-pure-C-纯
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.0
5 Number of Scans 19
6 Acquisition Time 1.3631
7 Acquisition Date 2017-03-11T20:38:46
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
N
Bus
Cl
N
Ts
1g
137 136 135 134 133 132 131 130 129 128 127
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

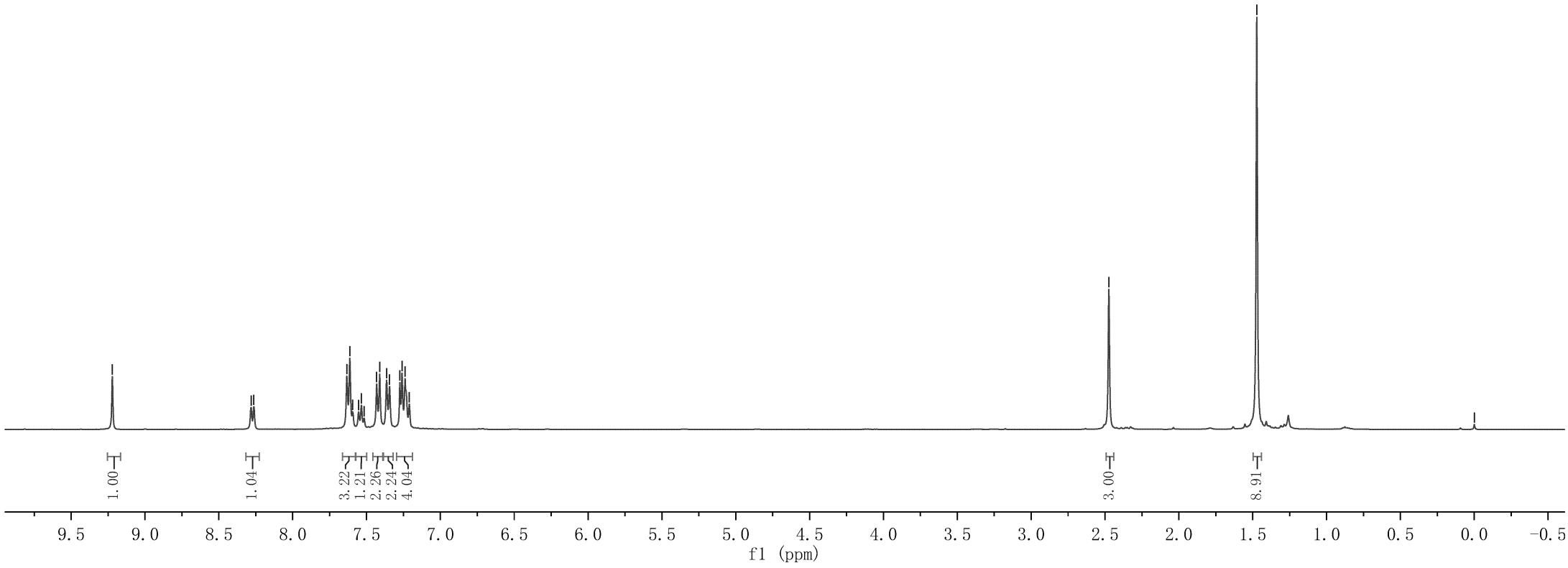


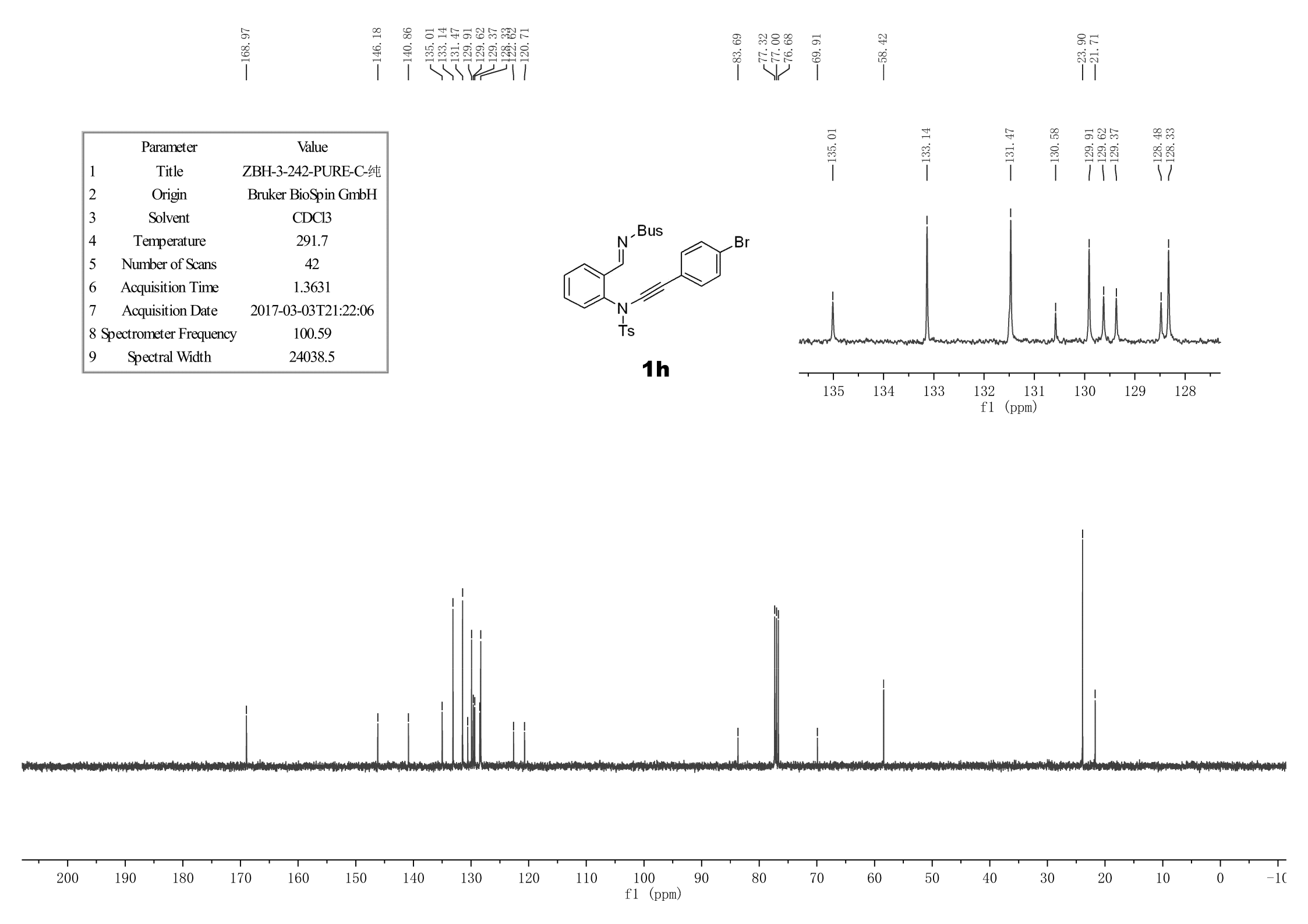
	Parameter	Value
1	Title	zbh-3-242-pure-2-H-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	294.9
5	Number of Scans	13
6	Acquisition Time	3.9846
7	Acquisition Date	2017-03-03T17:10:26
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



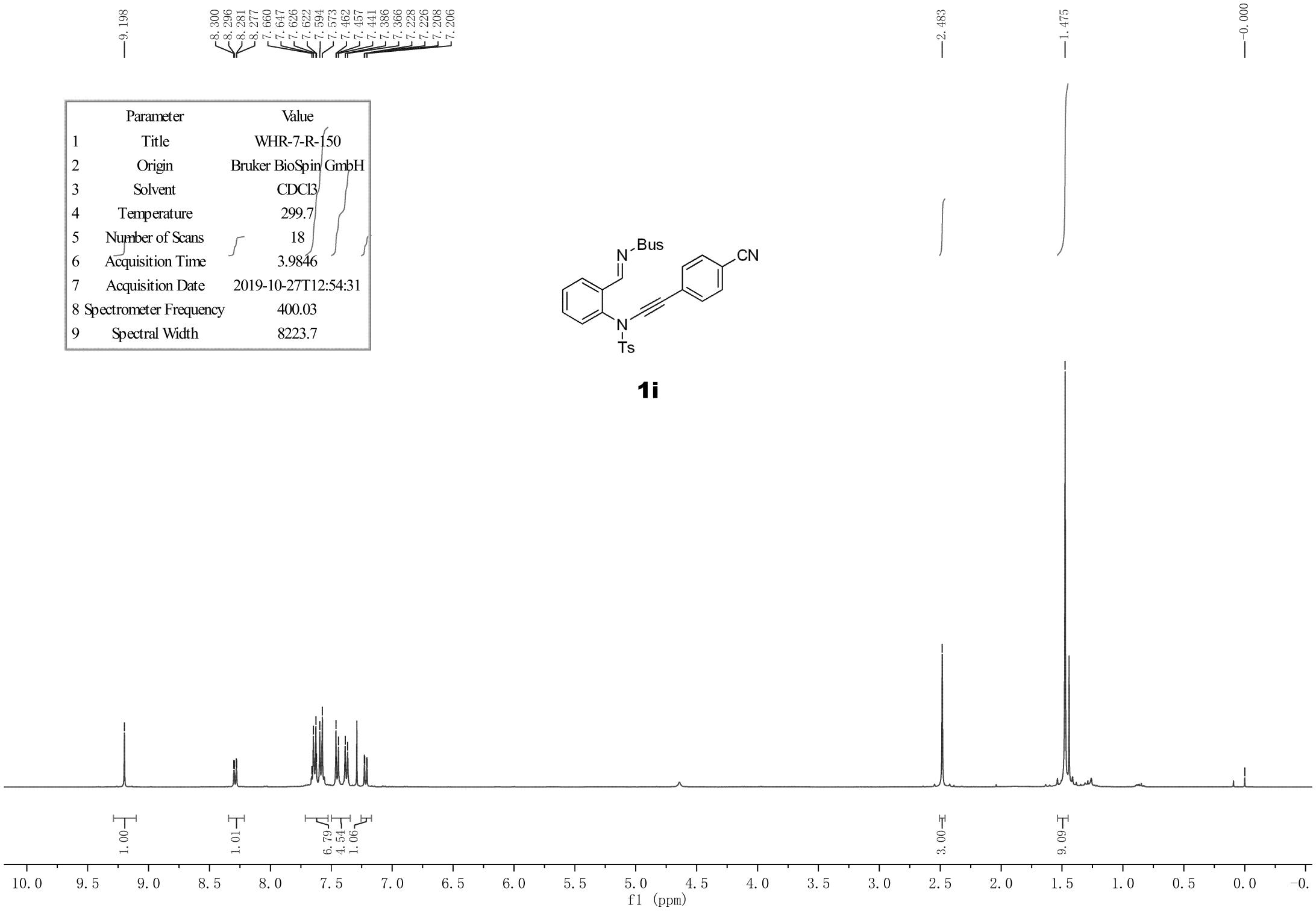
1h

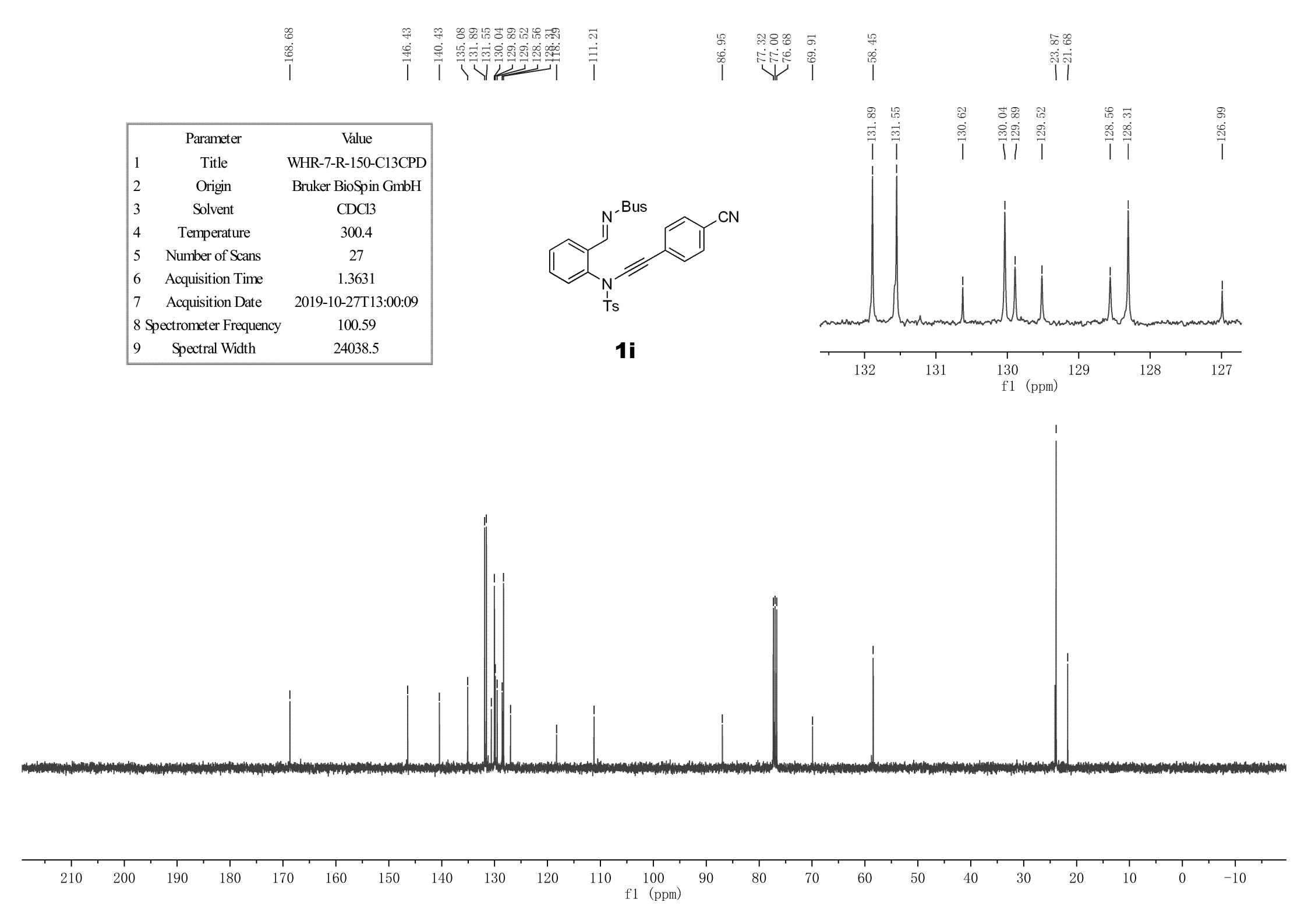


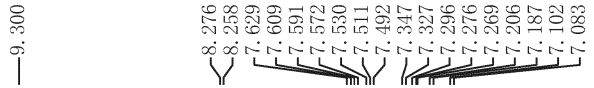




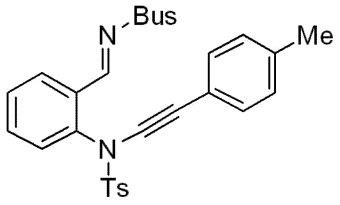
	Parameter	Value
1	Title	ZBH-3-242-PURE-C-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	291.7
5	Number of Scans	42
6	Acquisition Time	1.3631
7	Acquisition Date	2017-03-03T21:22:06
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5


9.198
8.300
8.296
8.281
8.277
7.660
7.647
7.626
7.622
7.594
7.573
7.462
7.457
7.441
7.386
7.366
7.228
7.226
7.208
7.206
2.483
1.475
0.000
Parameter Value
1 Title WHR-7-R-150
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 299.7
5 Number of Scans 18
6 Acquisition Time 3.9846
7 Acquisition Date 2019-10-27T12:54:31
8 Spectrometer Frequency 400.03
9 Spectral Width 8223.7
N
Bus
CN
N
Ts
1i
1.00
1.01
6.79
4.54
1.06
3.00
9.09
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.
f1 (ppm)


168.68
146.43
140.43
135.08
131.89
131.55
130.04
129.89
129.52
128.56
128.31
118.29
111.21
86.95
77.32
77.00
76.68
69.91
58.45
23.87
21.68
Parameter Value
1 Title WHR-7-R-150-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 300.4
5 Number of Scans 27
6 Acquisition Time 1.3631
7 Acquisition Date 2019-10-27T13:00:09
8 Spectrometer Frequency 100.59
9 Spectral Width 24038.5
N
Bus
CN
N
Ts
1i
131.89
131.55
130.62
130.04
129.89
129.52
128.56
128.31
126.99
132
131
130
129
128
127
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)



	Parameter	Value
1	Title	zbh-4-11-pure-H-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.3
5	Number of Scans	11
6	Acquisition Time	3.9846
7	Acquisition Date	2017-03-09T17:41:15
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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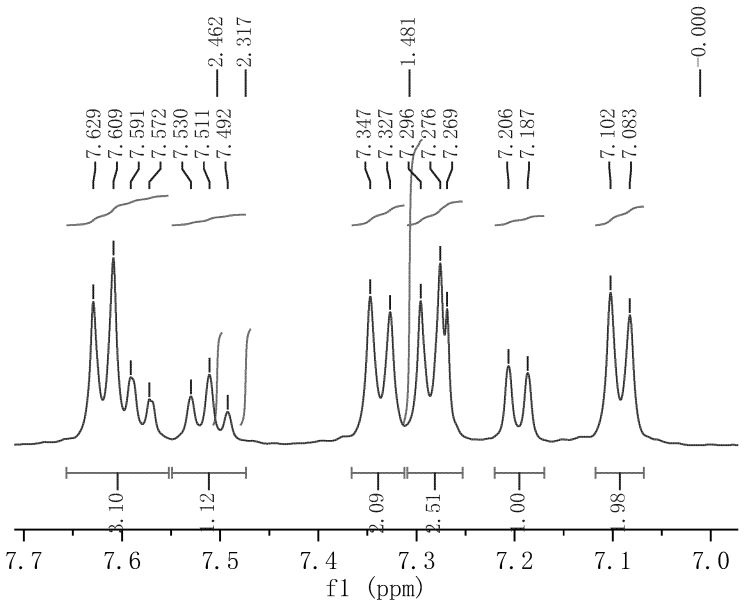

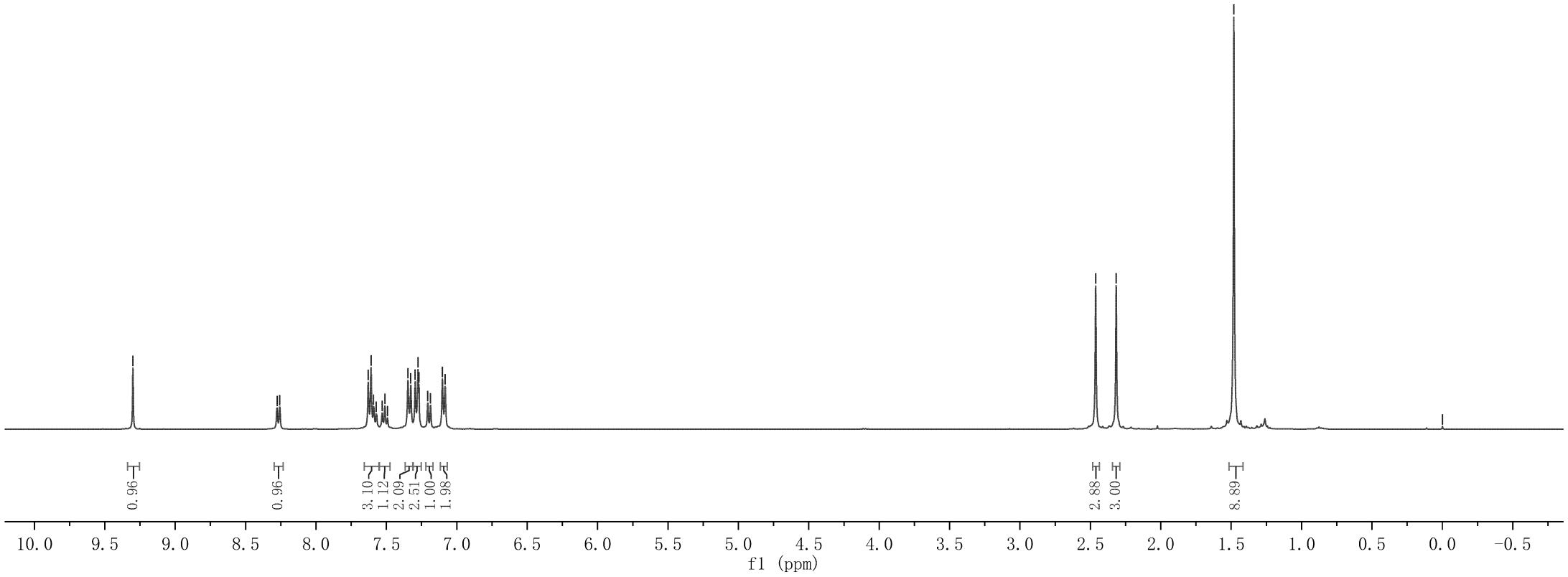

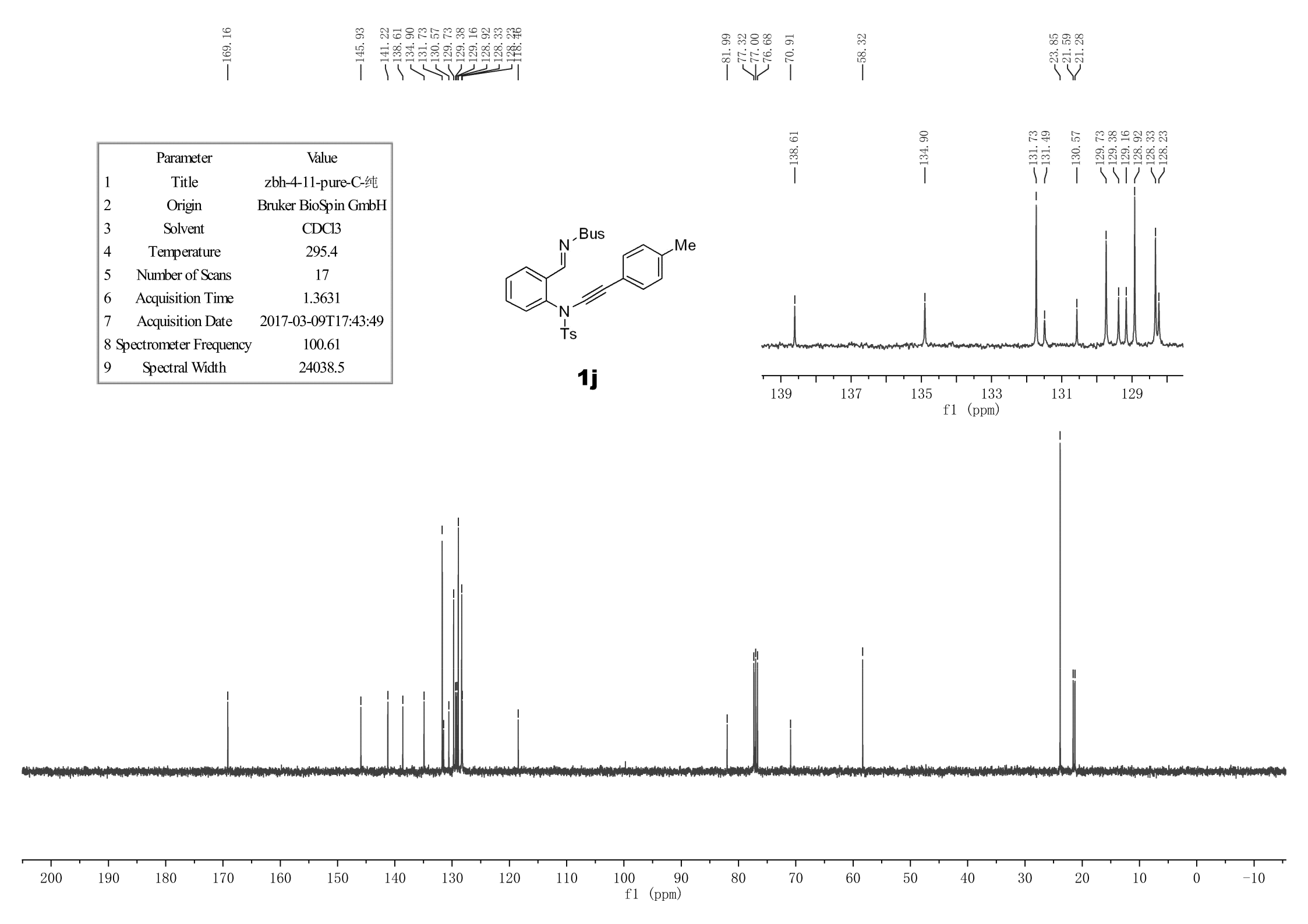
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145.93
141.22
138.61
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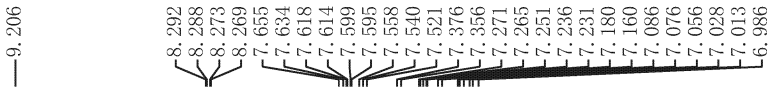
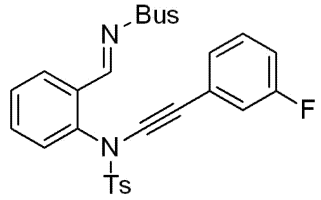
131.73
130.57
129.73
129.38
129.16
128.92
128.33
128.23
118.46
81.99
77.32
77.00
76.68
70.91
58.32
23.85
21.59
21.28
Parameter Value
1 Title zbh-4-11-pure-C-纯
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.4
5 Number of Scans 17
6 Acquisition Time 1.3631
7 Acquisition Date 2017-03-09T17:43:49
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
N
Bus
Me
N
Ts
1j
138.61
134.90
131.73
131.49
130.57
129.73
129.38
129.16
128.92
128.33
128.23
139
137
135
133
131
129
f1 (ppm)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)



	Parameter	Value
1	Title	WHR-4-R-165-mF
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	299.9
5	Number of Scans	19
6	Acquisition Time	3.9846
7	Acquisition Date	2019-09-25T14:50:14
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



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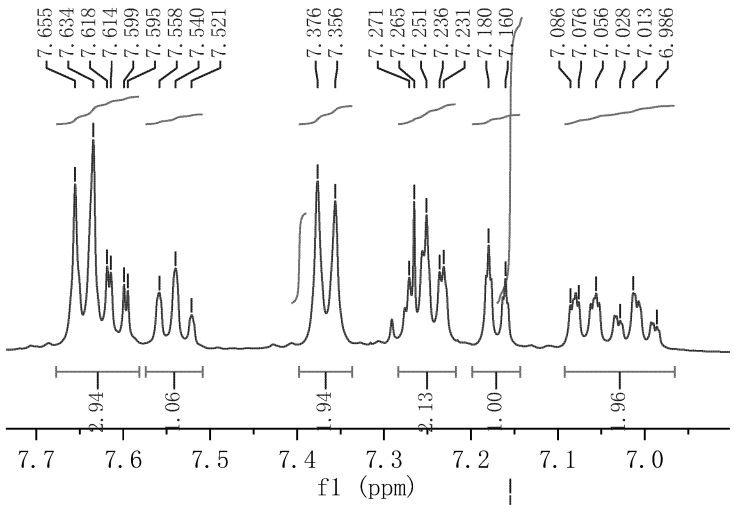
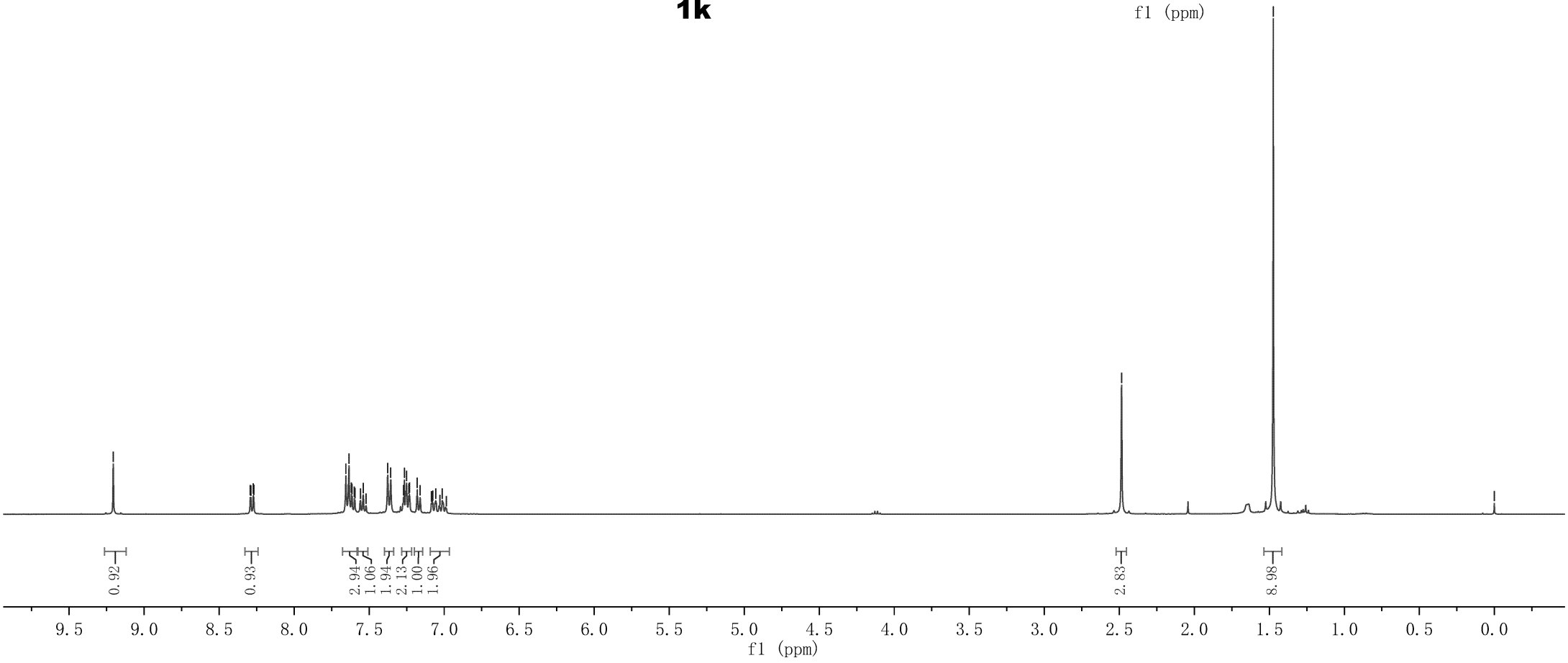
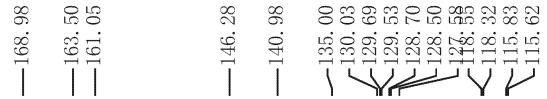
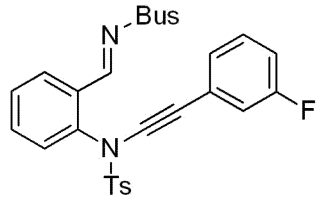






	Parameter	Value
1	Title	WHR-4-R-165-mF-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.5
5	Number of Scans	135
6	Acquisition Time	1.3631
7	Acquisition Date	2019-09-25T14:52:00
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



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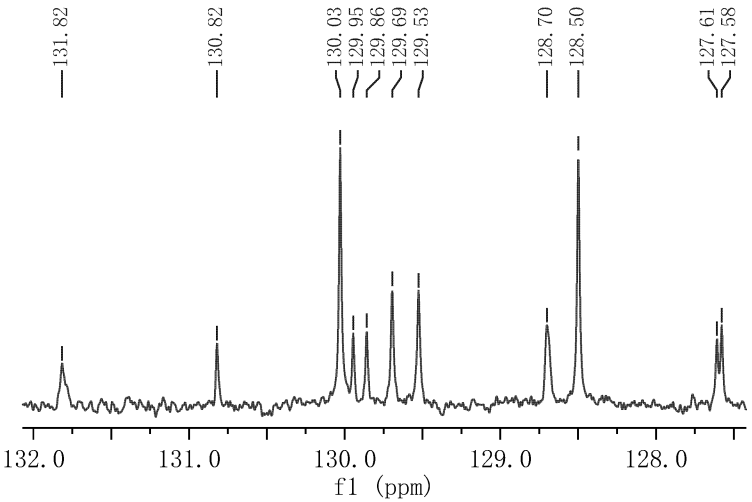
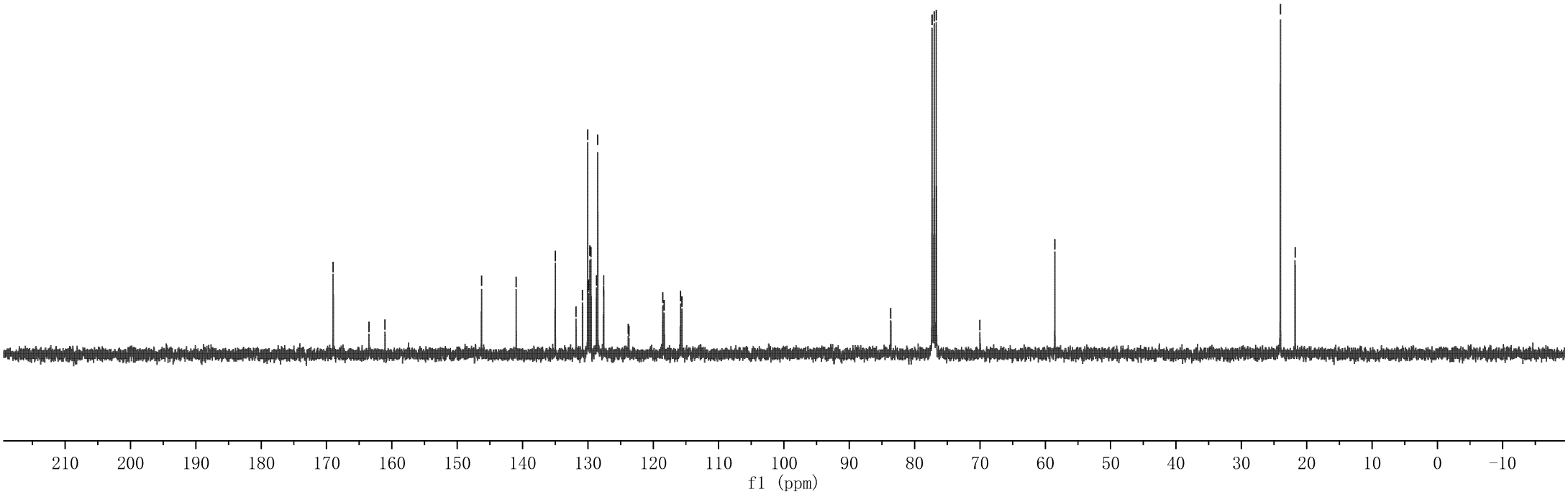
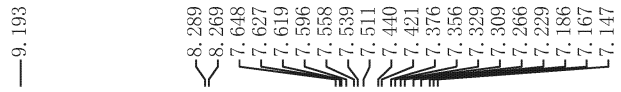
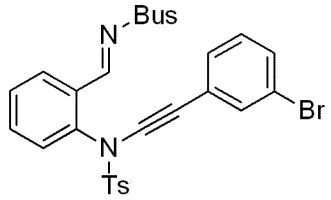






	Parameter	Value
1	Title	WHR-4-R-141-m-Br
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.4
5	Number of Scans	17
6	Acquisition Time	3.9846
7	Acquisition Date	2019-09-25T15:22:29
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



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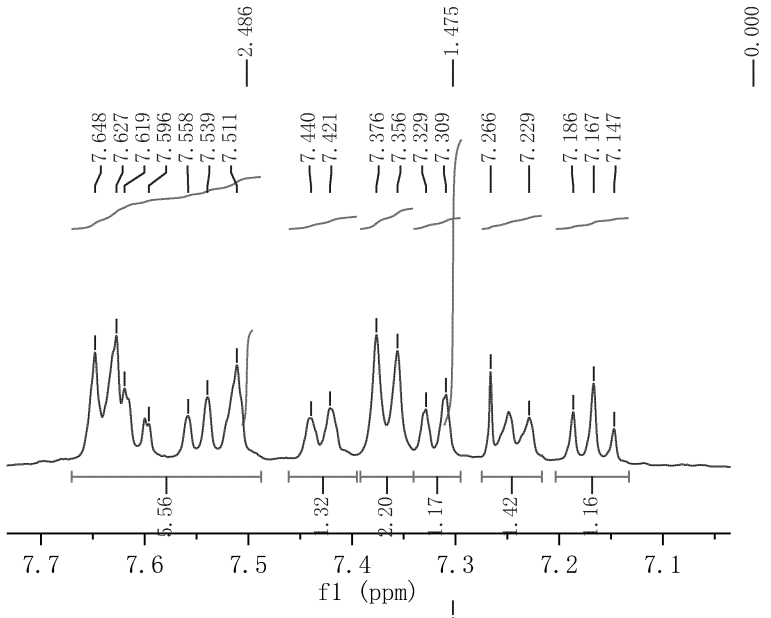
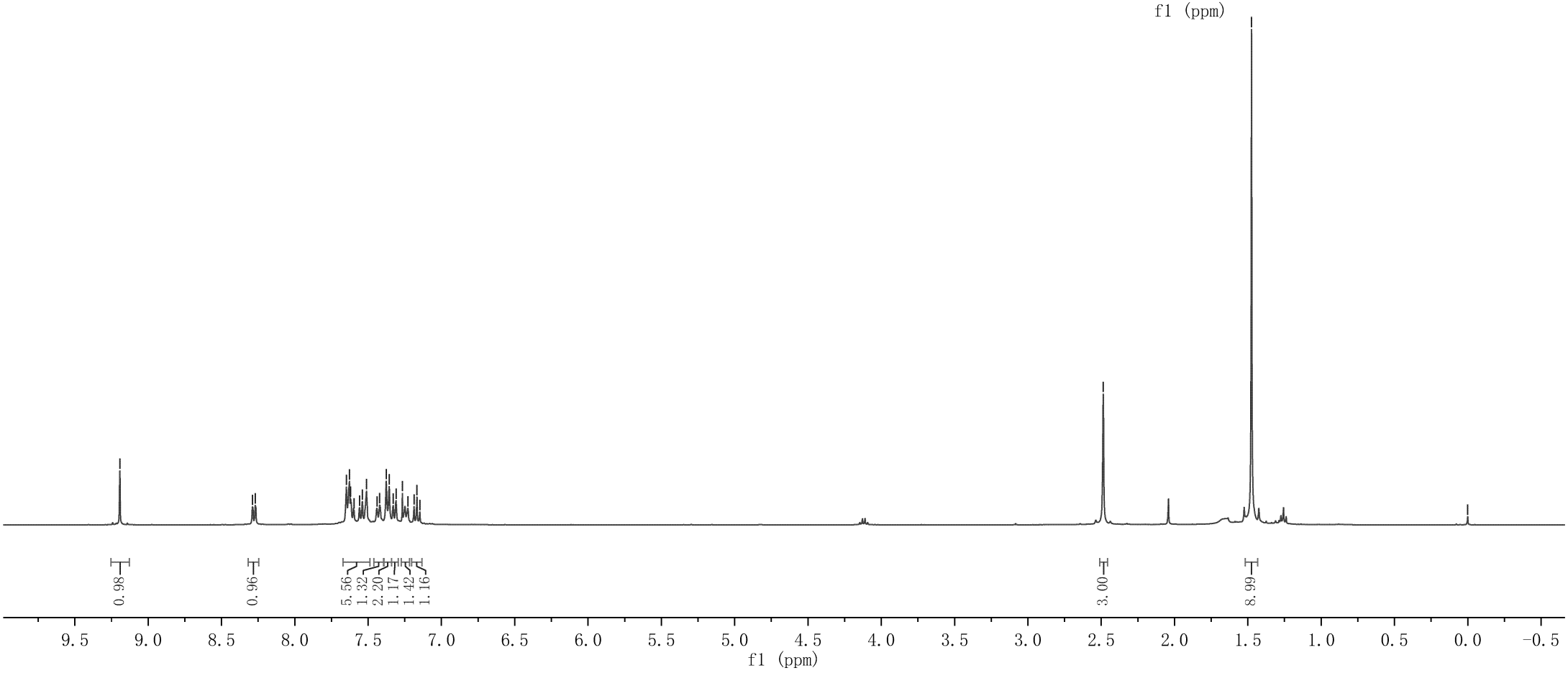
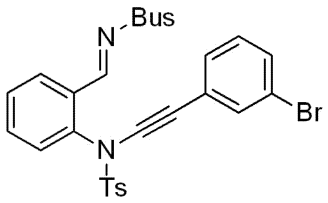
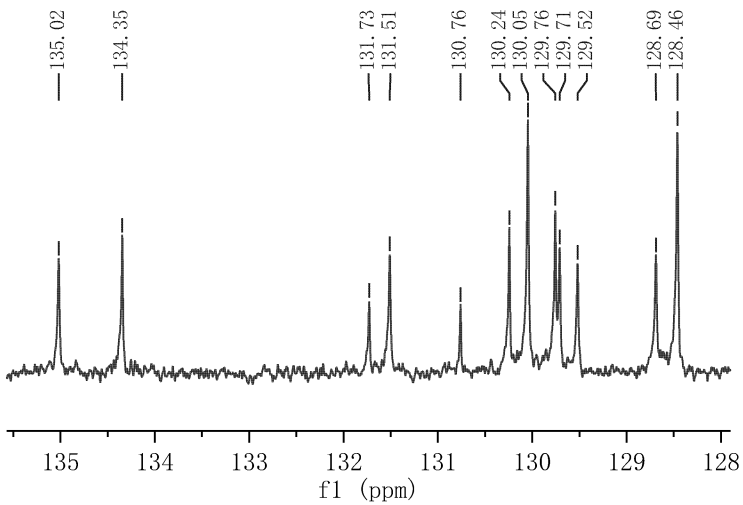


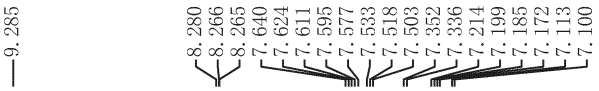


	Parameter	Value
1	Title	WHR-4-R-m-Br-sub
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.9
5	Number of Scans	230
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-02T14:56:24
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5

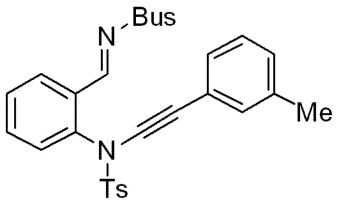


1l

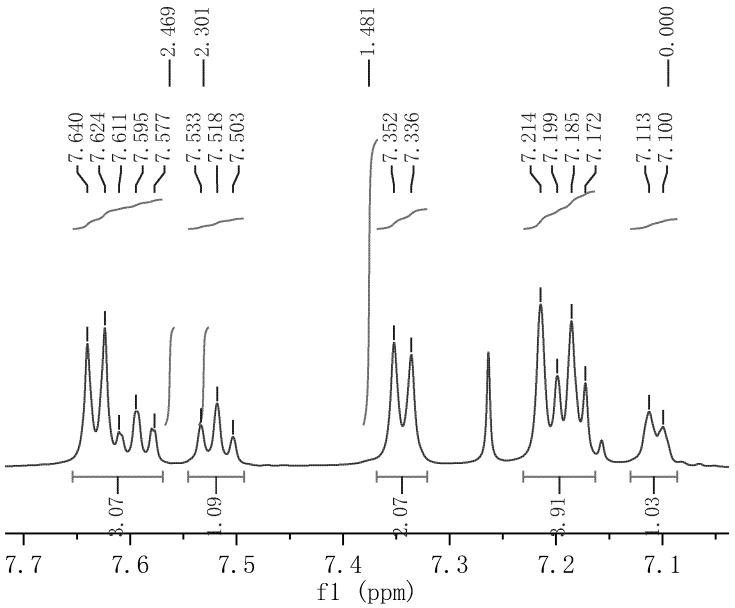


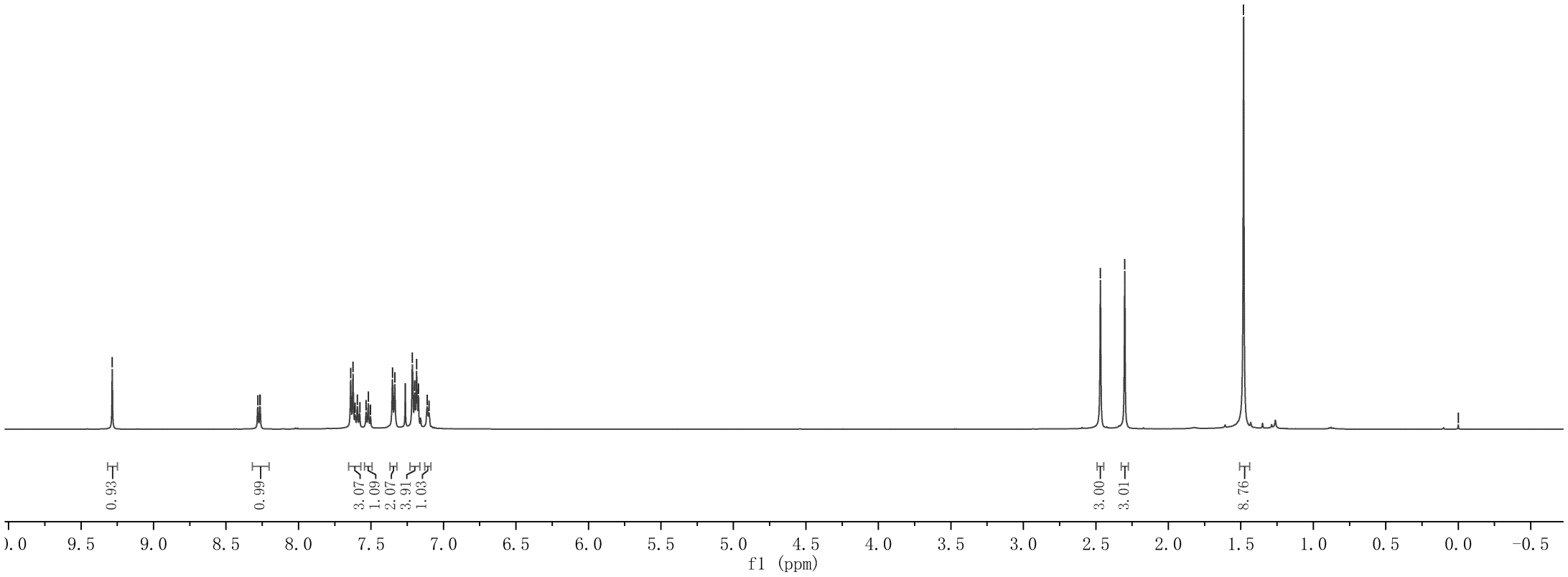


	Parameter	Value
1	Title	zbh-3-4-444444-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	16
6	Acquisition Time	3.2768
7	Acquisition Date	2017-03-19T16:29:00
8	Spectrometer Frequency	500.17
9	Spectral Width	10000.0

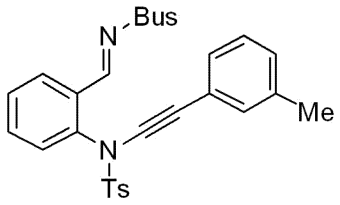


1m

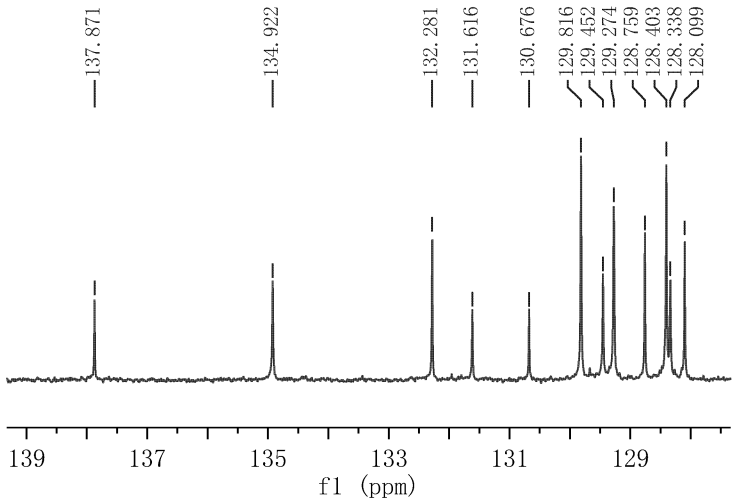


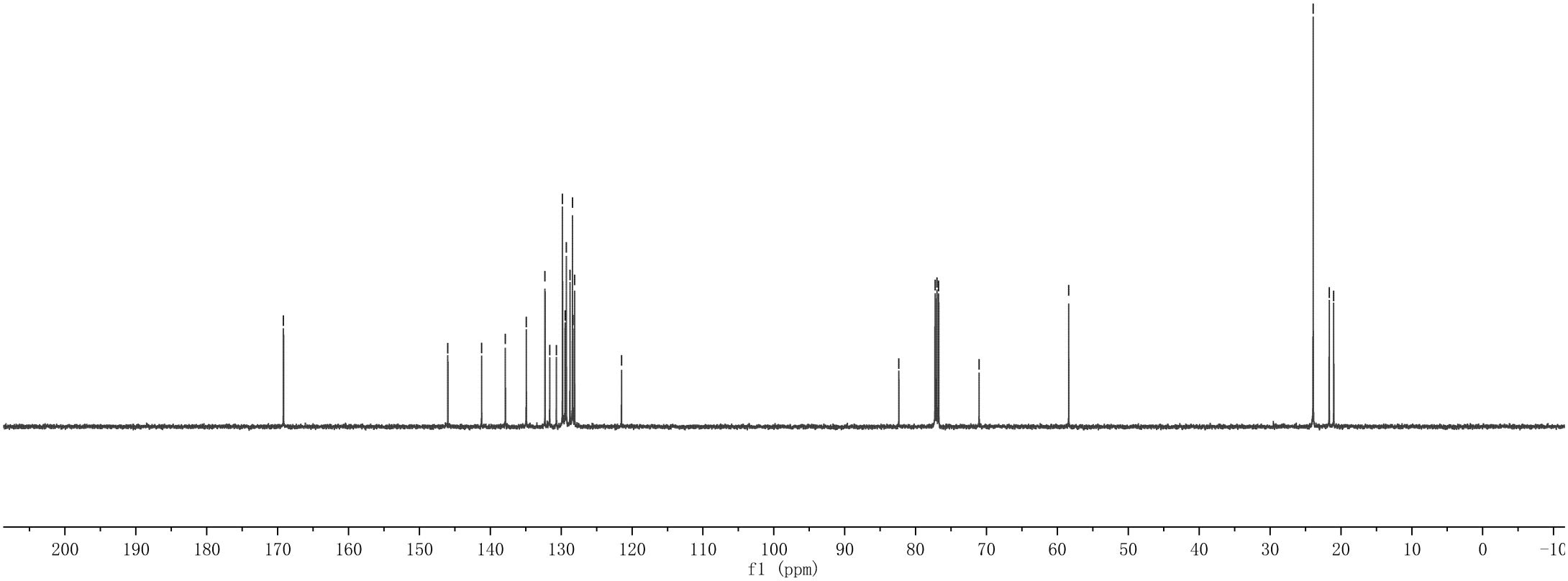


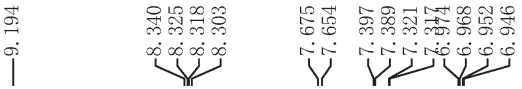
	Parameter	Value
1	Title	zbh-3-4-444444-C-500M
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	45
6	Acquisition Time	1.1010
7	Acquisition Date	2017-03-19T16:33:00
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9



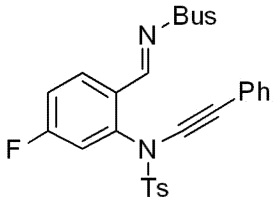
1m







	Parameter	Value
1	Title	ZBH-4-3-PURE-H-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	292.5
5	Number of Scans	18
6	Acquisition Time	3.9846
7	Acquisition Date	2017-03-07T11:45:59
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



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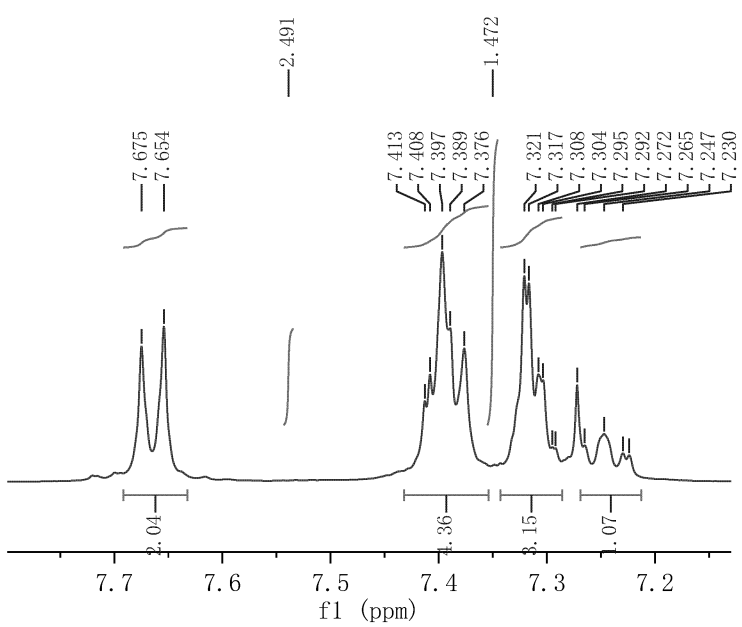
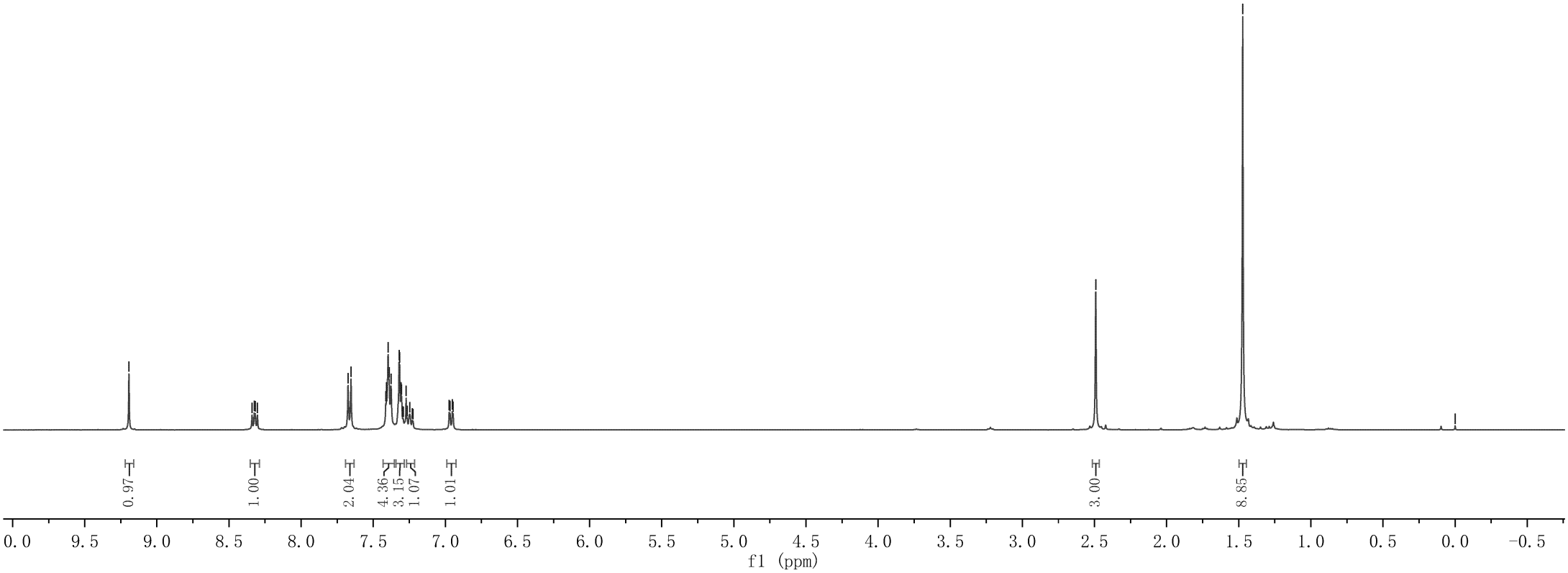
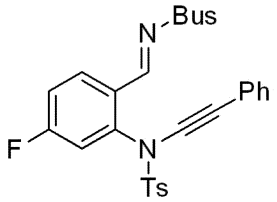




	Parameter	Value
1	Title	ZBH-4-3-PURE-C-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	292.6
5	Number of Scans	36
6	Acquisition Time	1.3631
7	Acquisition Date	2017-03-07T11:49:54
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



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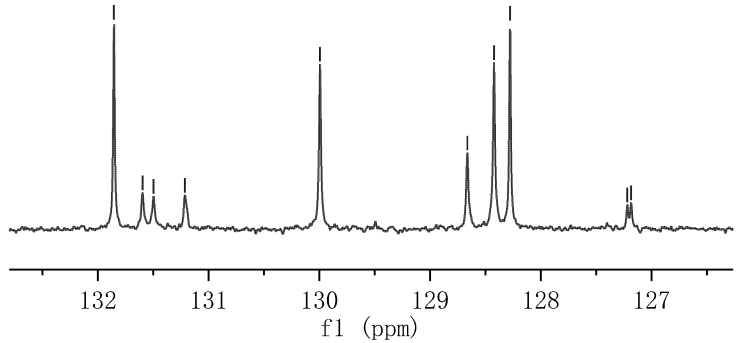
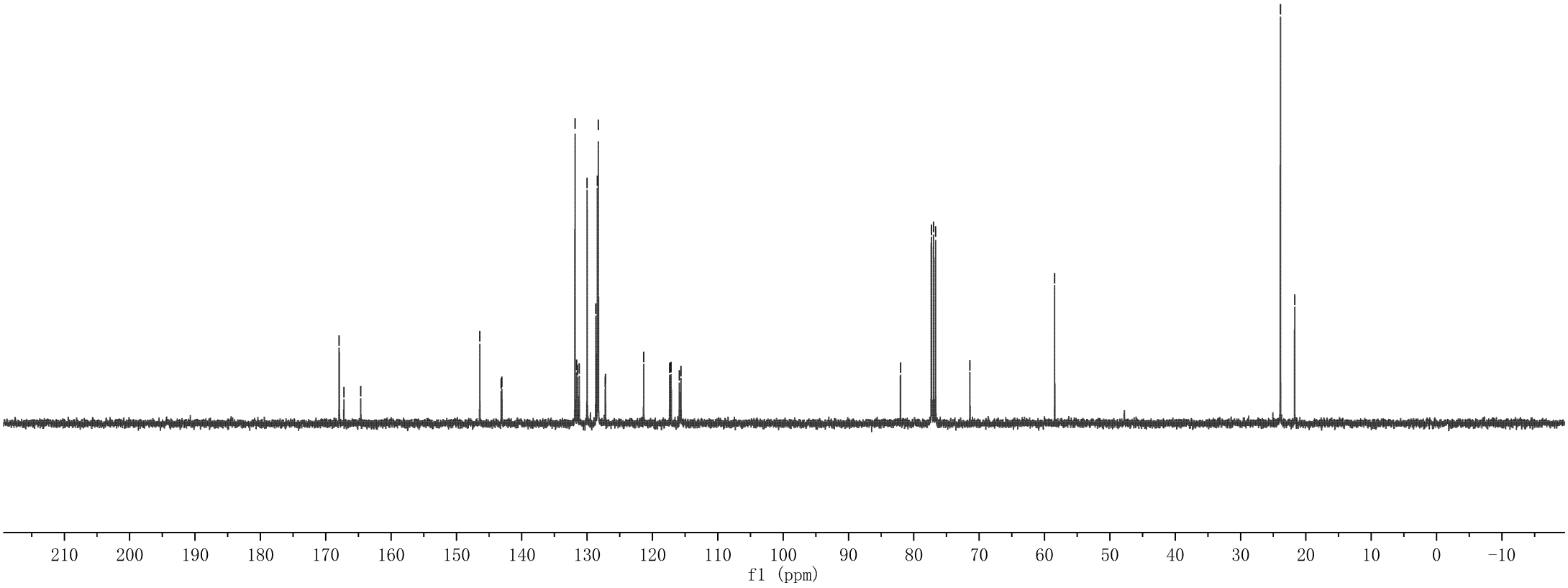
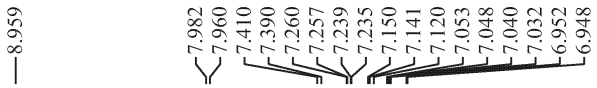
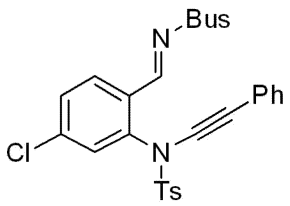






	Parameter	Value
1	Title	zbh-4-70-pure-H-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	294.6
5	Number of Scans	12
6	Acquisition Time	3.9846
7	Acquisition Date	2017-03-27T15:25:29
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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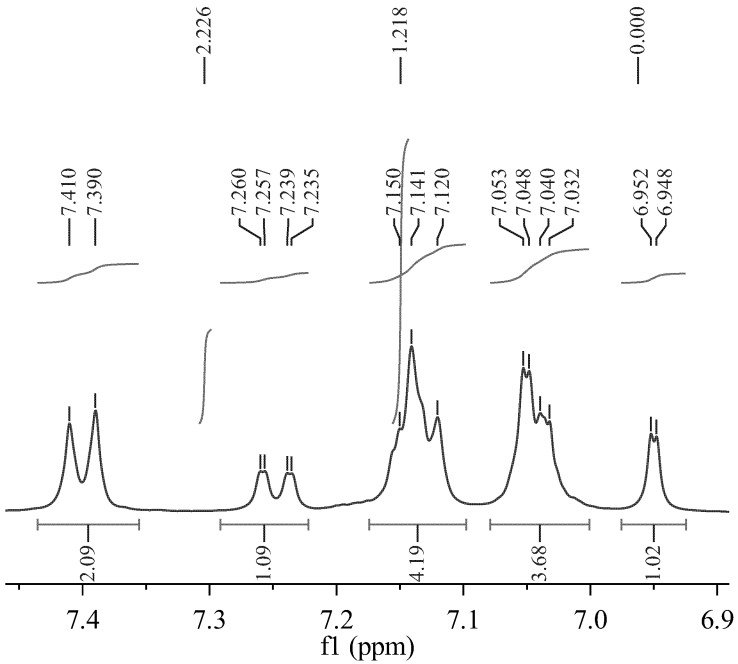
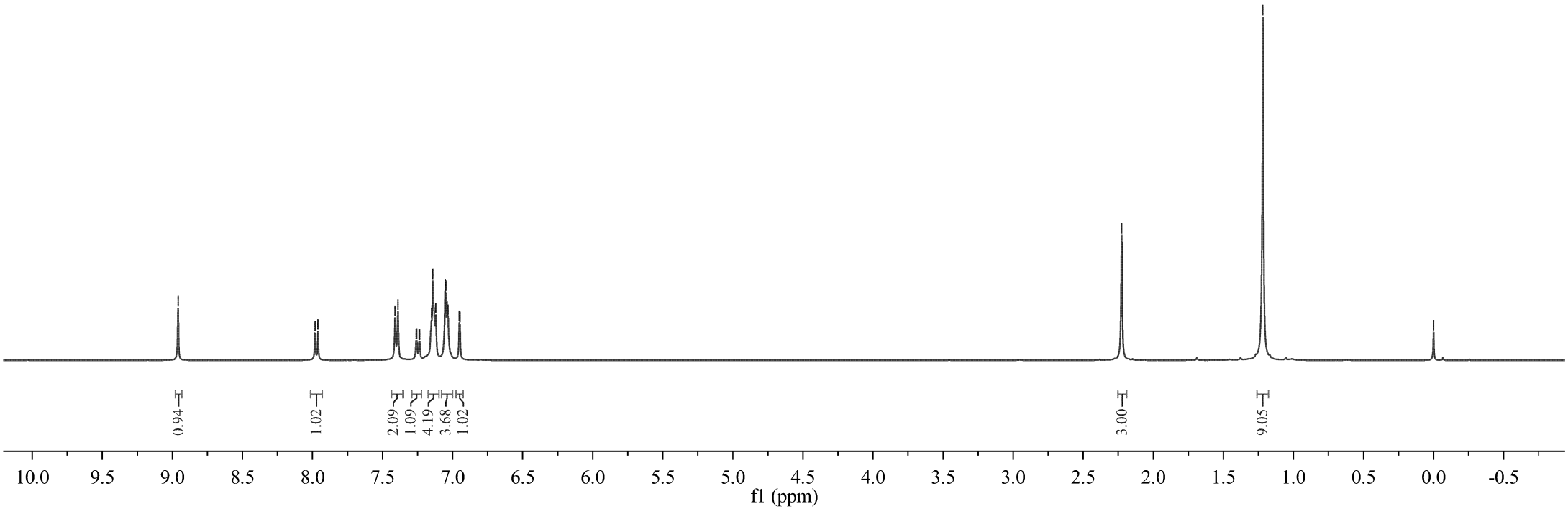
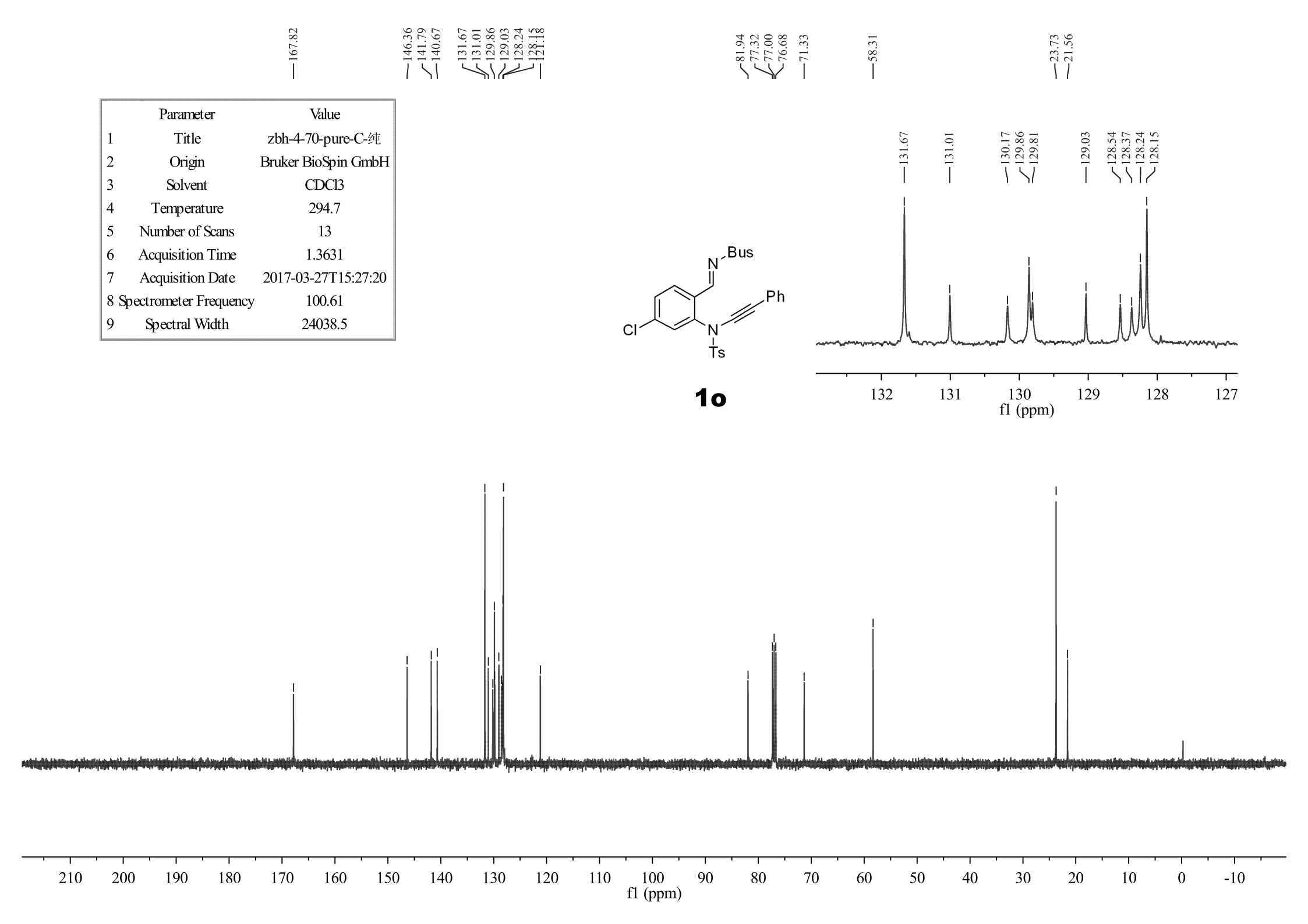
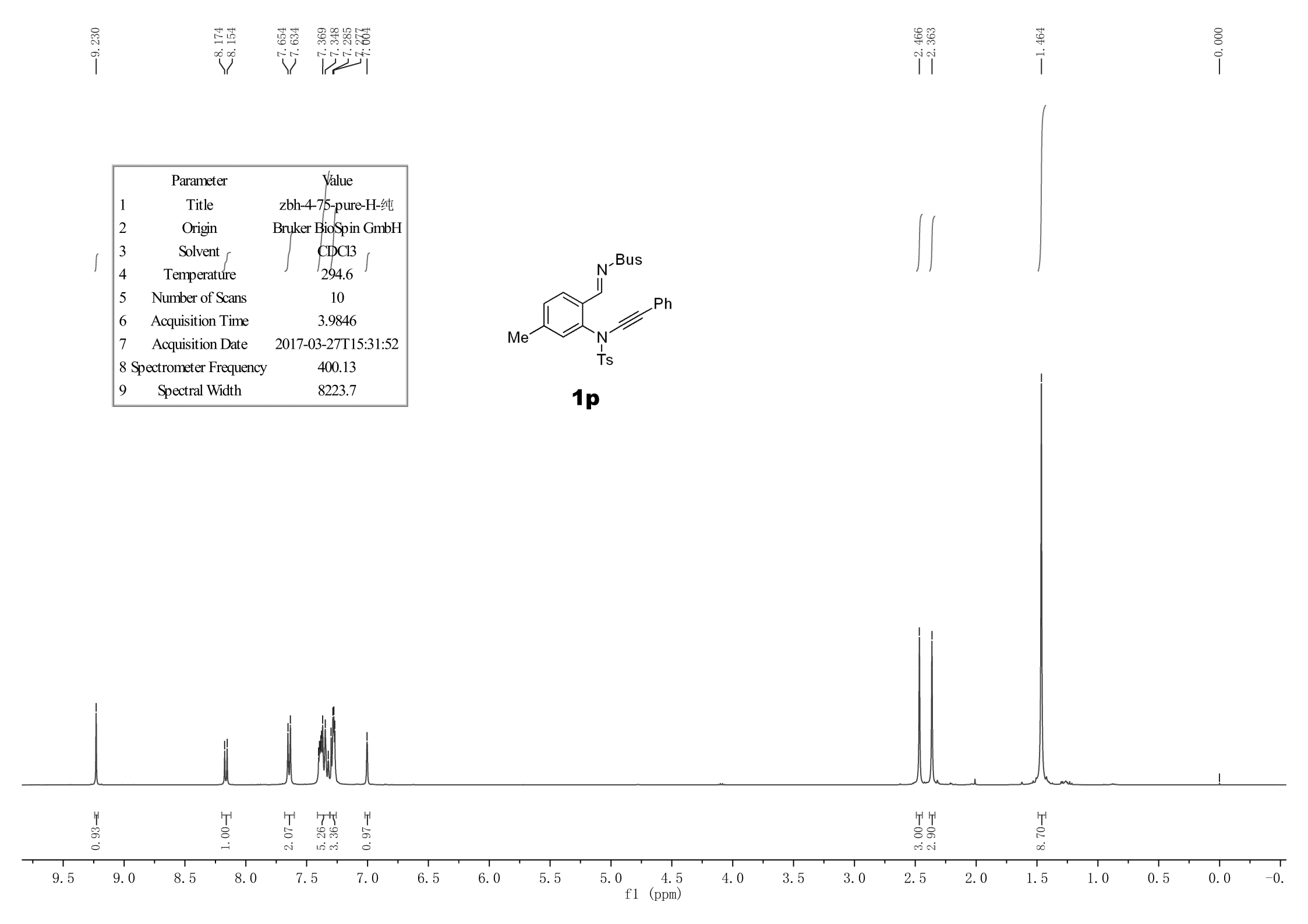
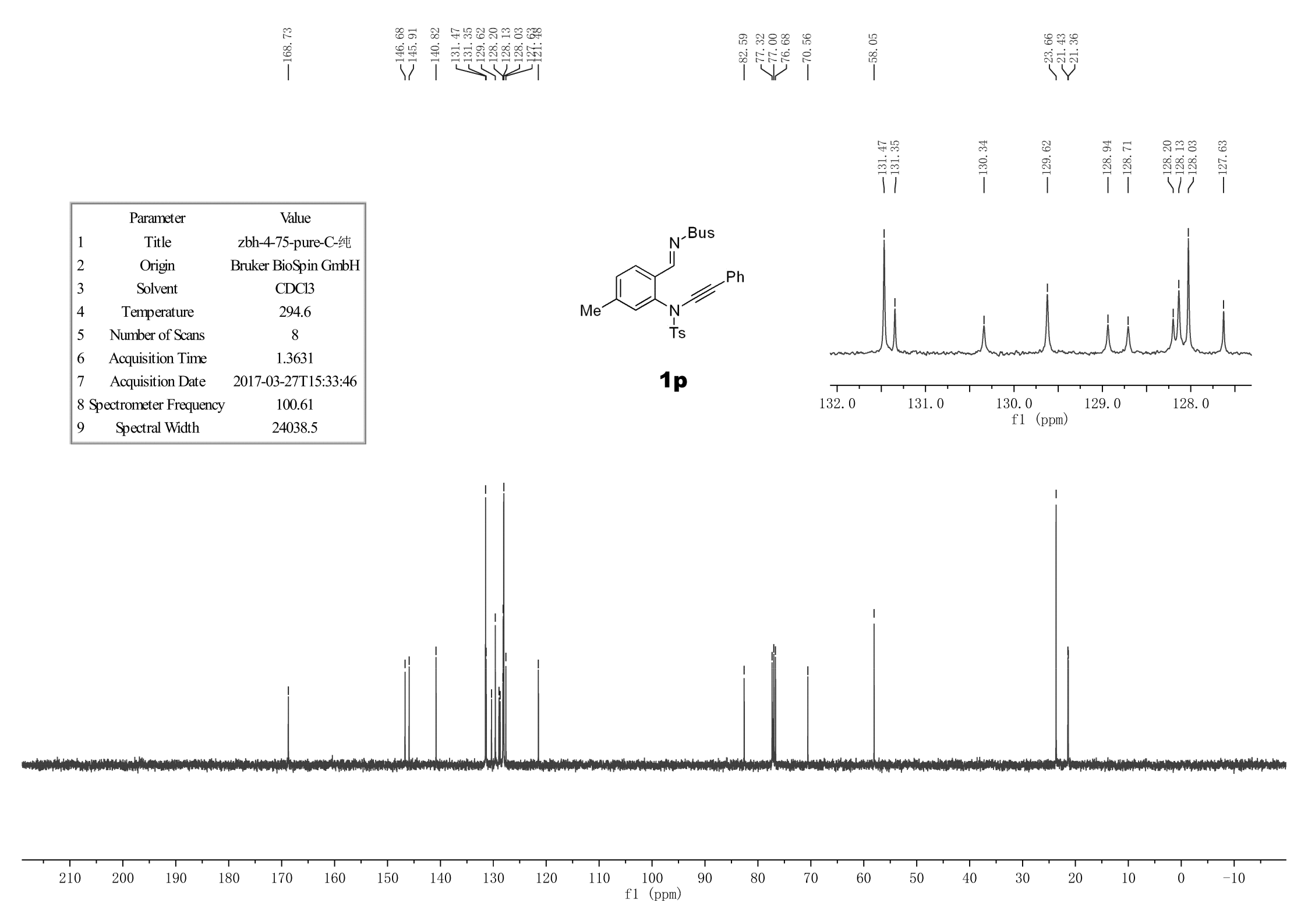


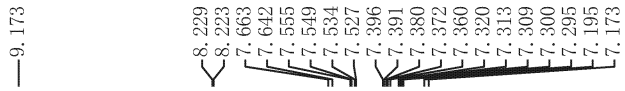



167.82
146.36
141.79
140.67
131.67
131.01
129.86
129.03
128.24
128.15
121.18
81.94
77.32
77.00
76.68
71.33
58.31
23.73
21.56
Parameter Value
1 Title zbh-4-70-pure-C-纯
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 294.7
5 Number of Scans 13
6 Acquisition Time 1.3631
7 Acquisition Date 2017-03-27T15:27:20
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
N
Bus
Ph
Cl
N
Ts
1o
131.67
131.01
130.17
129.86
129.81
129.03
128.54
128.37
128.24
128.15
132
131
130
129
128
127
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

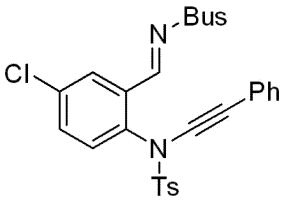

9.230
8.174
8.154
7.654
7.634
7.369
7.348
7.285
7.277
7.004
2.466
2.363
1.464
0.000
Parameter Value
1 Title zbh-4-75-pure-H-纯
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 294.6
5 Number of Scans 10
6 Acquisition Time 3.9846
7 Acquisition Date 2017-03-27T15:31:52
8 Spectrometer Frequency 400.13
9 Spectral Width 8223.7
N
Bus
Ph
Me
N
Ts
1p
0.93
1.00
2.07
5.26
3.36
0.97
3.00
2.90
8.70
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.
f1 (ppm)



	Parameter	Value
1	Title	zbh-4-75-pure-C-纯
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	294.6
5	Number of Scans	8
6	Acquisition Time	1.3631
7	Acquisition Date	2017-03-27T15:33:46
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



	Parameter	Value
1	Title	WHR-7-R-73
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.6
5	Number of Scans	13
6	Acquisition Time	3.9846
7	Acquisition Date	2019-10-05T16:10:47
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



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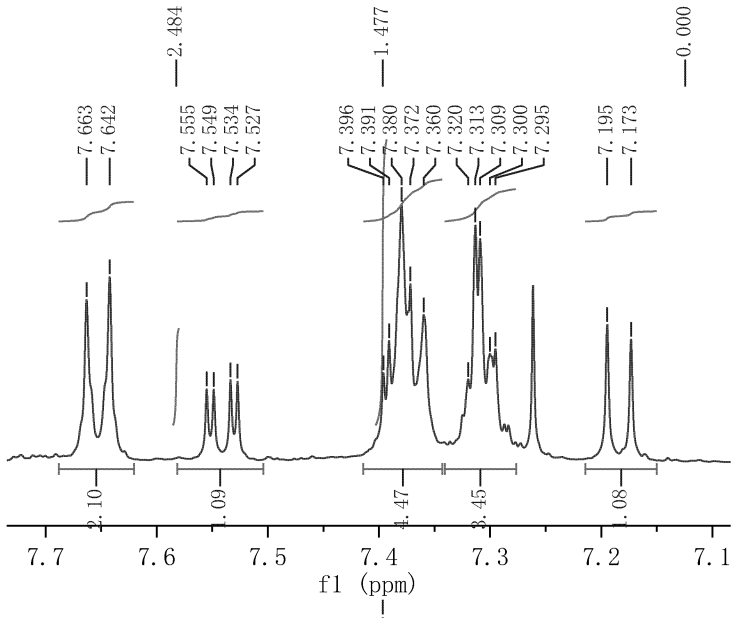
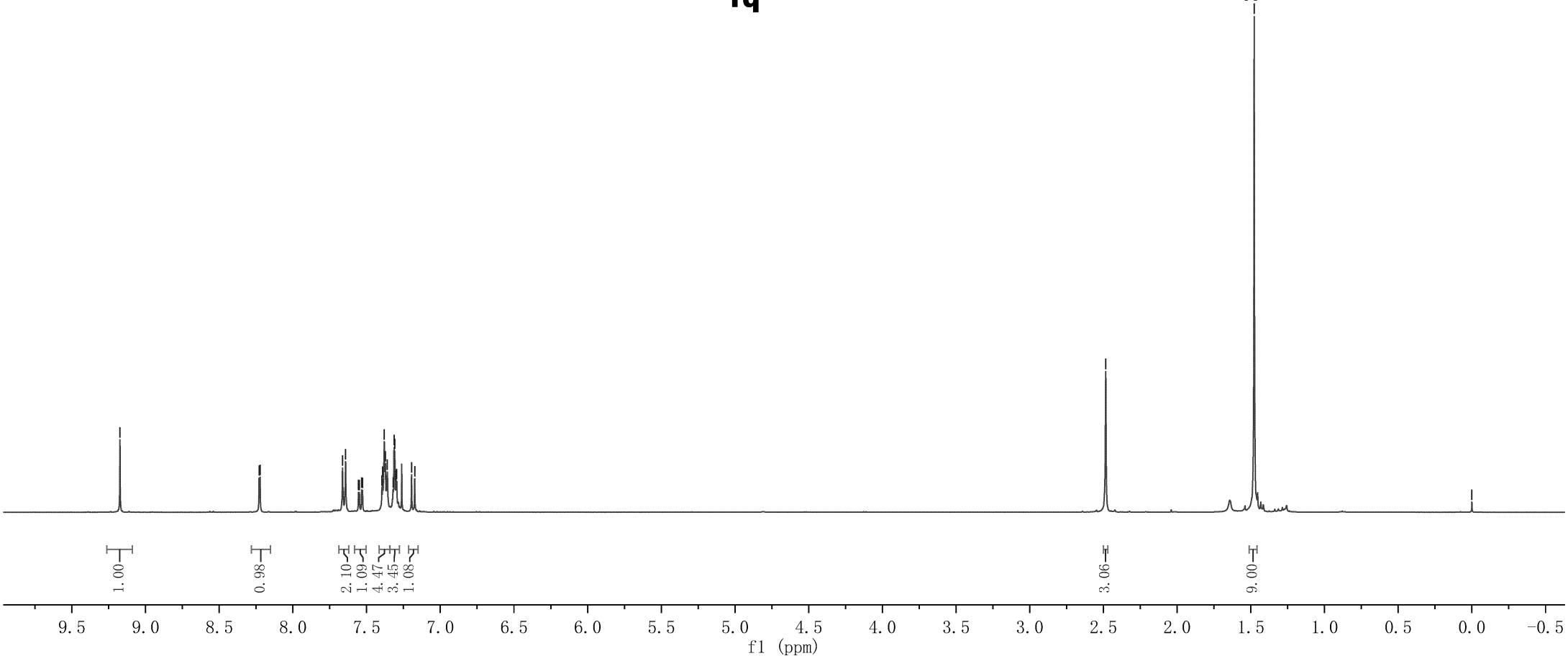
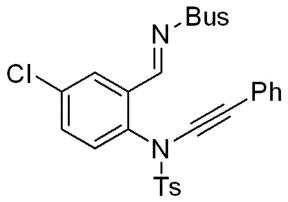




	Parameter	Value
1	Title	WHR-7-R-73
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.6
5	Number of Scans	8
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-05T16:11:56
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



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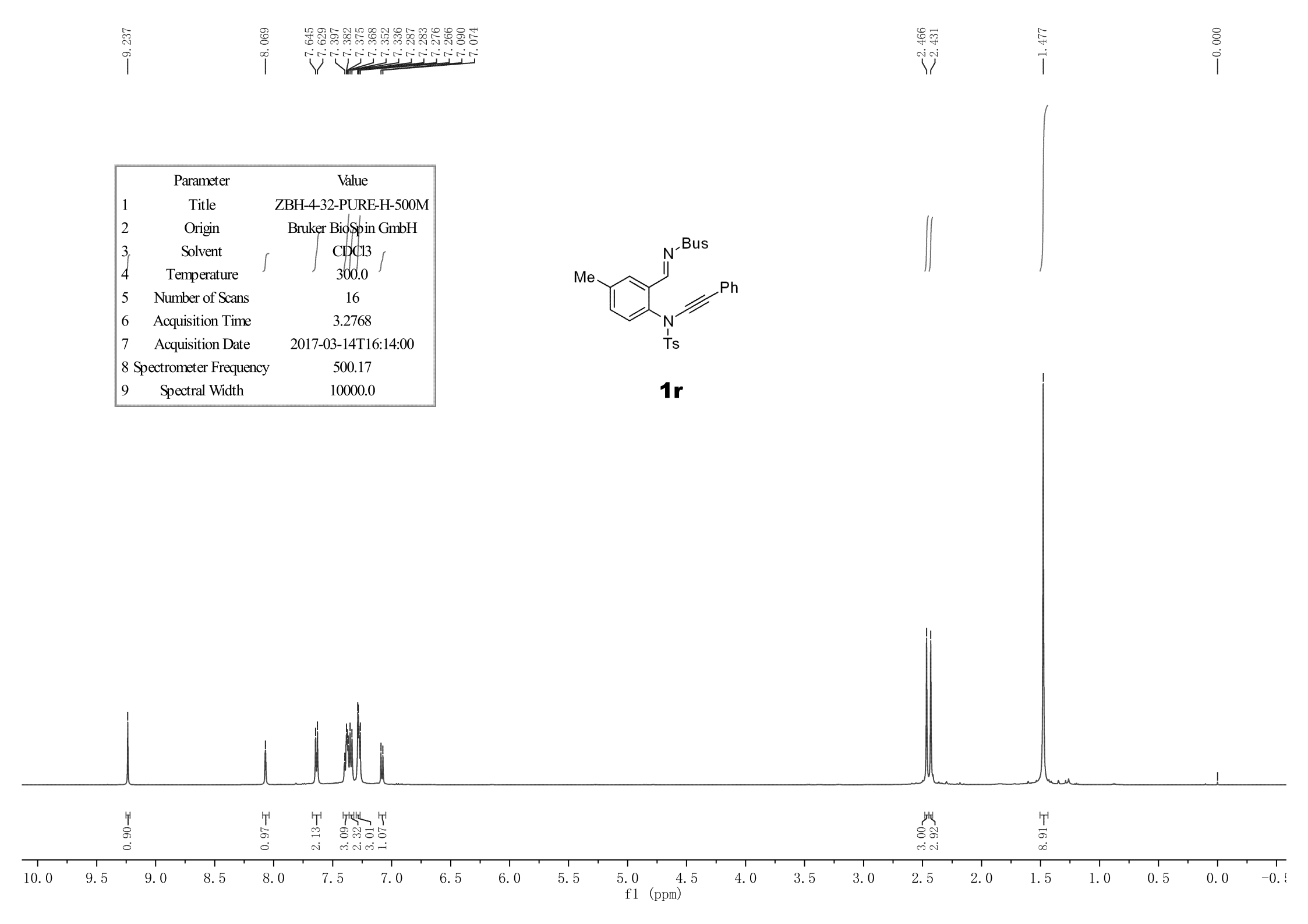
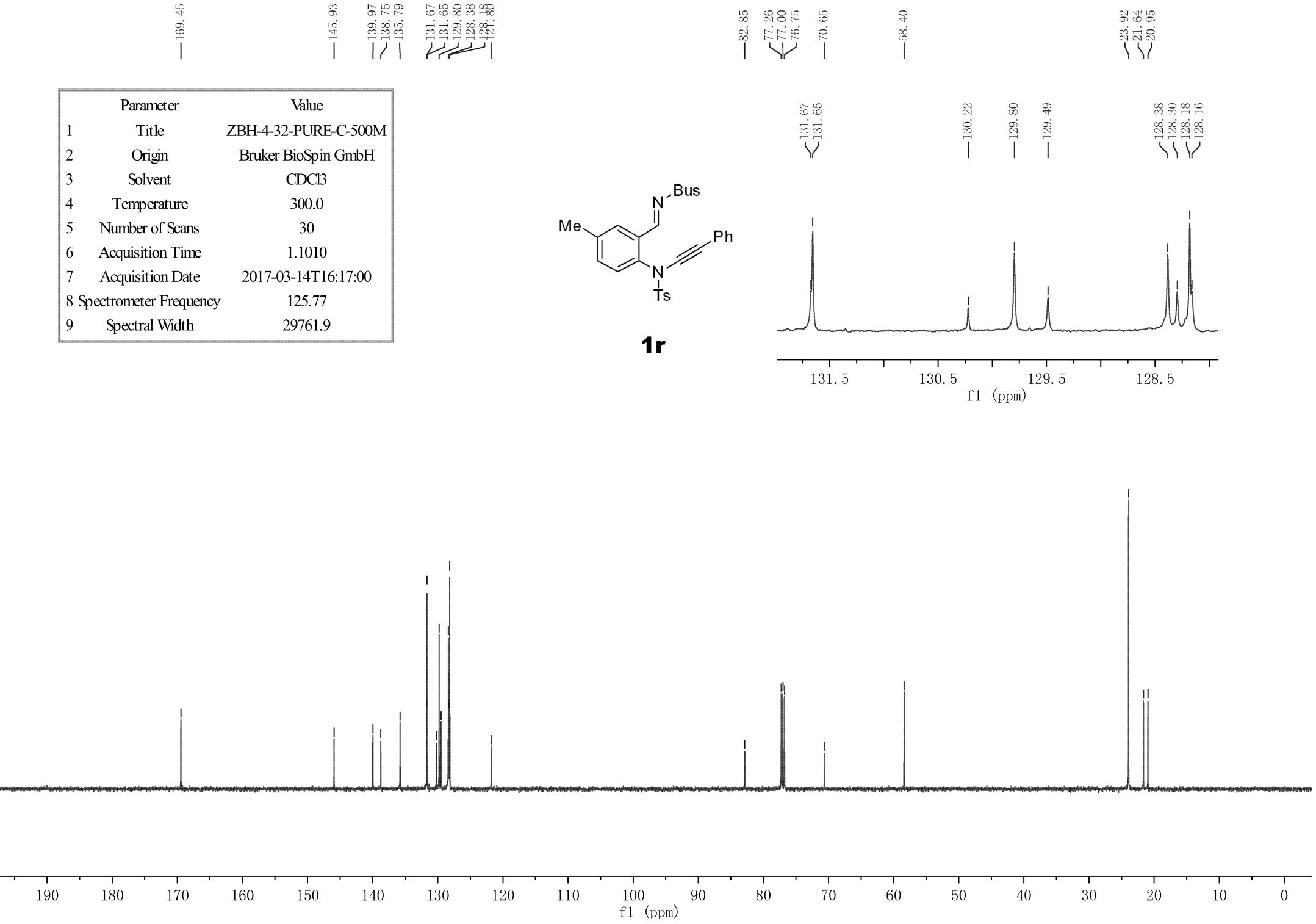
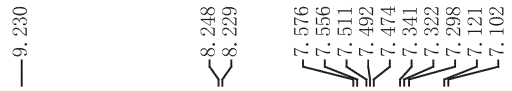
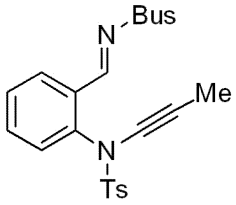

9.237
8.069
7.645
7.629
7.397
7.382
7.375
7.368
7.352
7.336
7.287
7.283
7.276
7.266
7.090
7.074
2.466
2.431
1.477
0.000
Parameter Value
1 Title ZBH-4-32-PURE-H-500M
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 300.0
5 Number of Scans 16
6 Acquisition Time 3.2768
7 Acquisition Date 2017-03-14T16:14:00
8 Spectrometer Frequency 500.17
9 Spectral Width 10000.0
N
Bus
Me
Ph
N
Ts
1r
0.90
0.97
2.13
3.09
2.32
3.01
1.07
3.00
2.92
8.91
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
f1 (ppm)



	Parameter	Value
1	Title	ZBH-4-32-PURE-C-500M
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	30
6	Acquisition Time	1.1010
7	Acquisition Date	2017-03-14T16:17:00
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9



	Parameter	Value
1	Title	zbh-4-119-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.5
5	Number of Scans	10
6	Acquisition Time	3.9846
7	Acquisition Date	2017-04-12T08:26:55
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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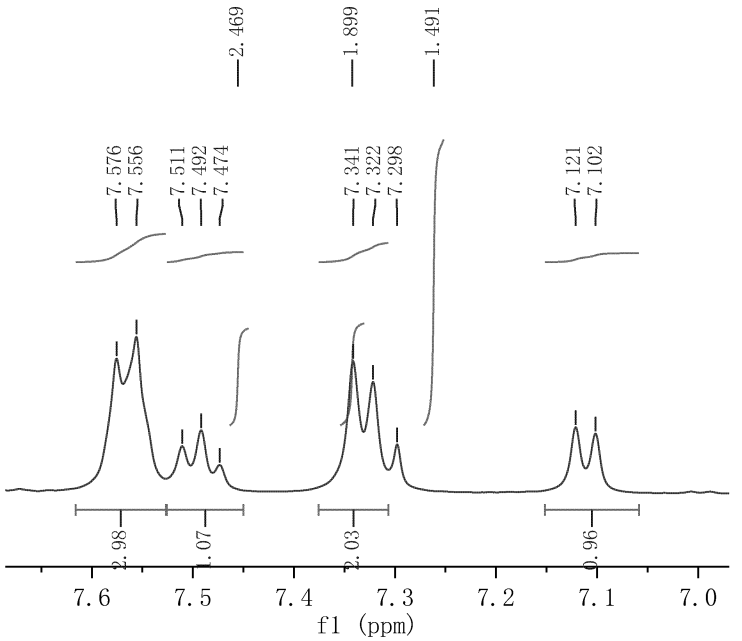
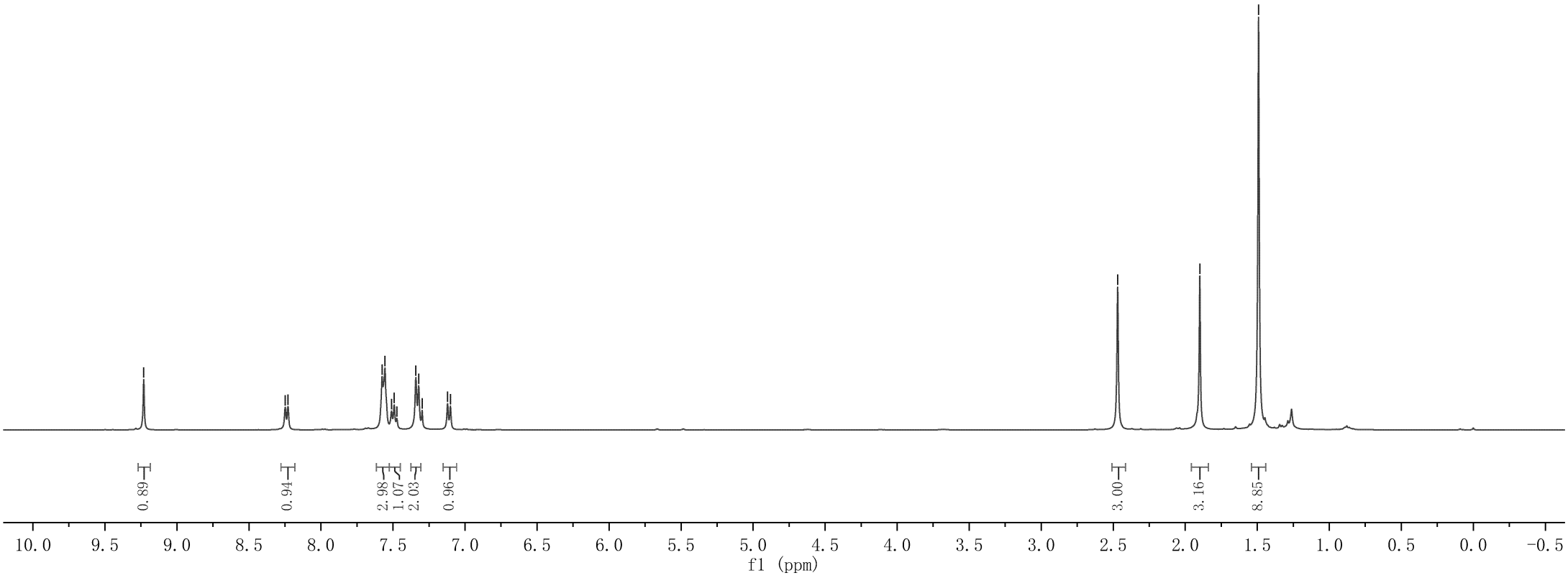
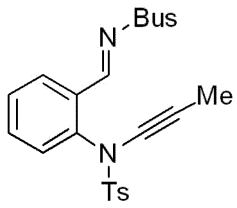


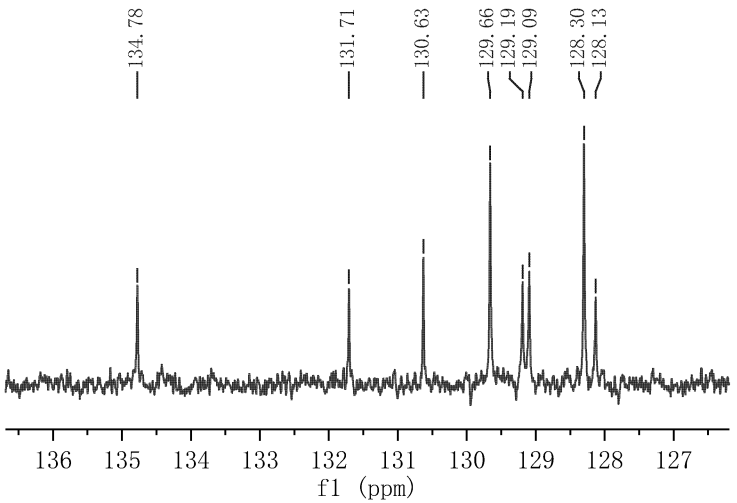


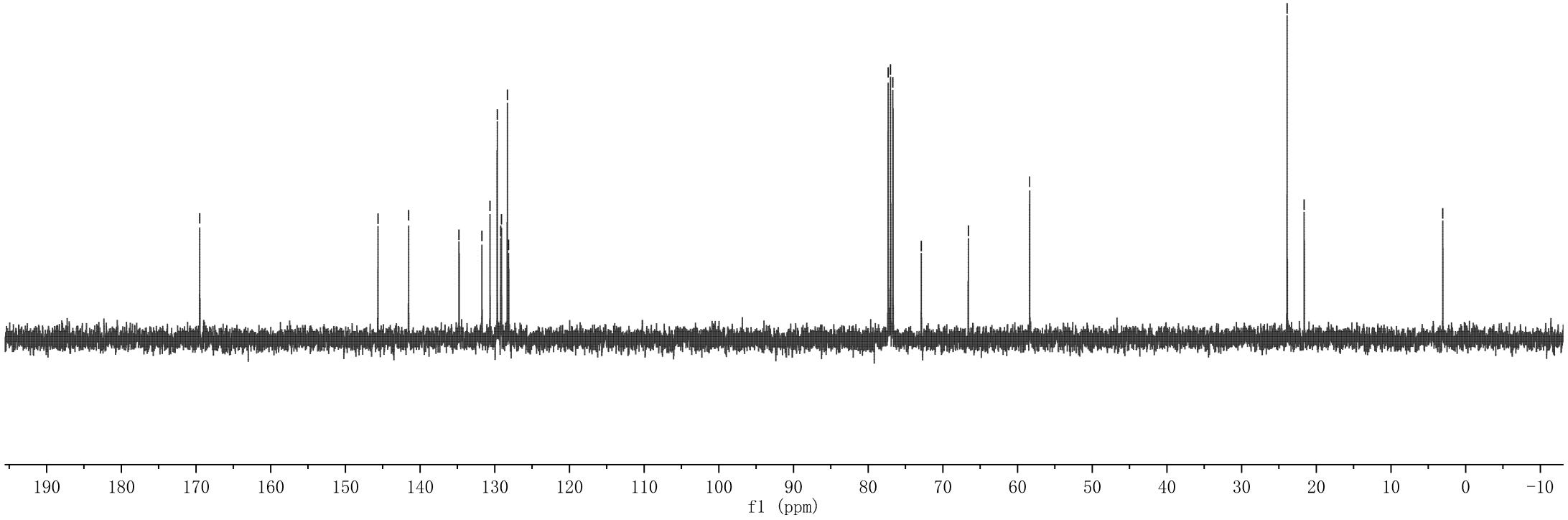
169.49
145.63
141.53
134.78
131.71
130.63
129.66
129.19
129.09
128.30
128.13
77.32
77.00
76.68
72.88
66.58
58.37
23.90
21.61
3.05

	Parameter	Value
1	Title	zbh-4-119-pure-C
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.2
5	Number of Scans	12
6	Acquisition Time	1.3631
7	Acquisition Date	2017-04-12T08:46:40
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



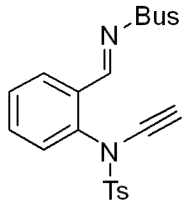
1s



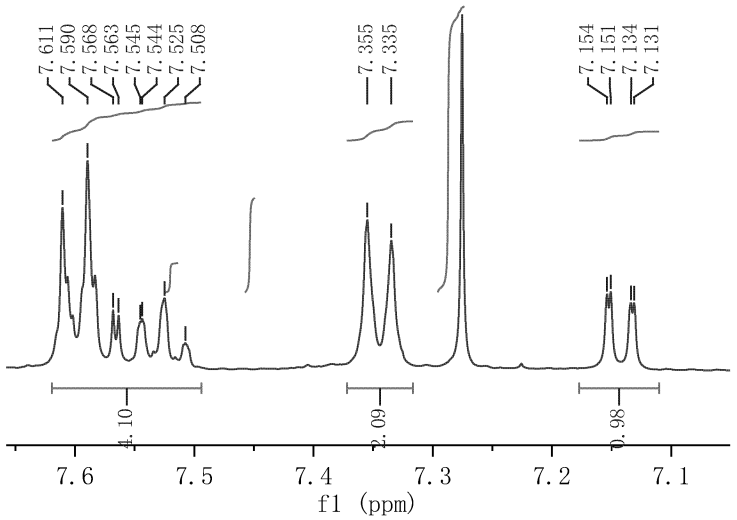


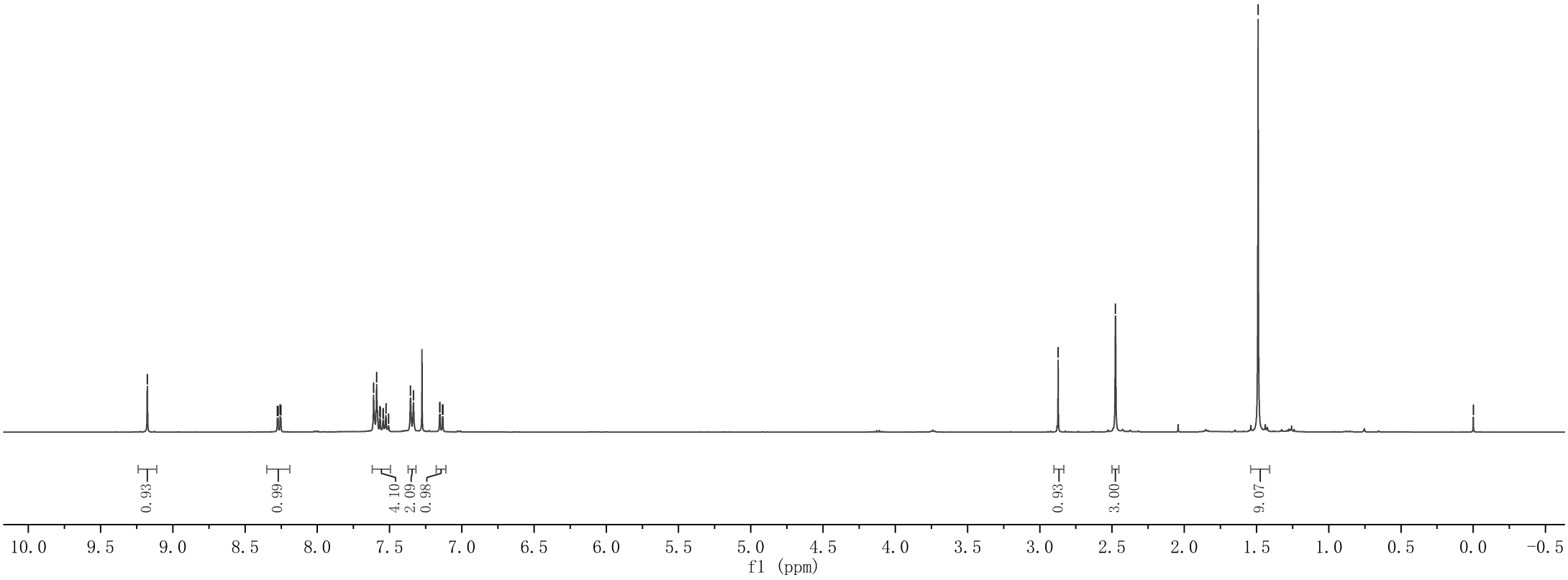
9.176
8.276
8.272
8.257
8.253
7.611
7.590
7.568
7.563
7.545
7.544
7.525
7.508
7.355
7.335
7.154
7.151
7.134
7.131
2.873
2.476
1.489
0.000

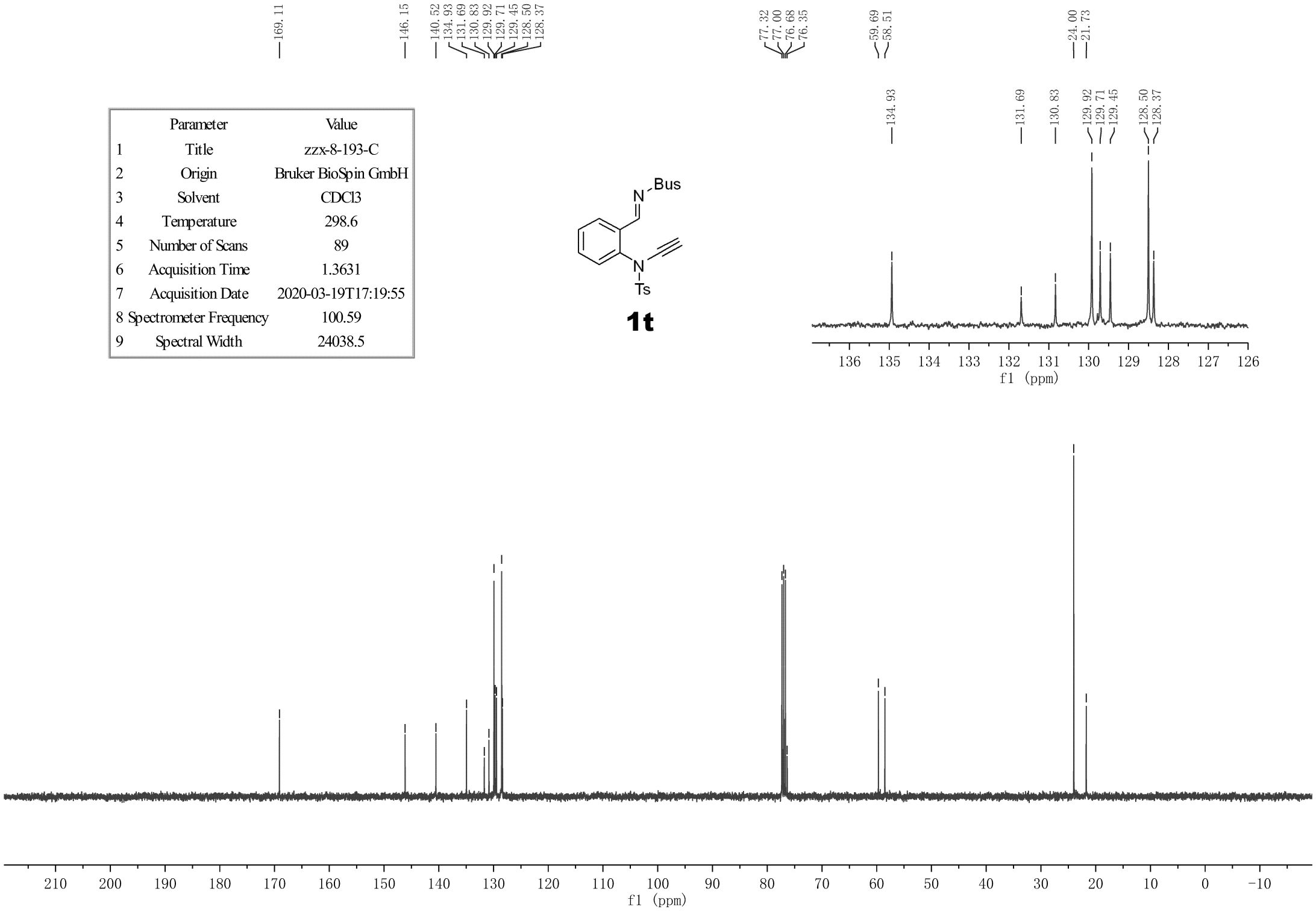
	Parameter	Value
1	Title	zzx-8-193-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	297.9
5	Number of Scans	9
6	Acquisition Time	3.9846
7	Acquisition Date	2020-03-19T17:16:20
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



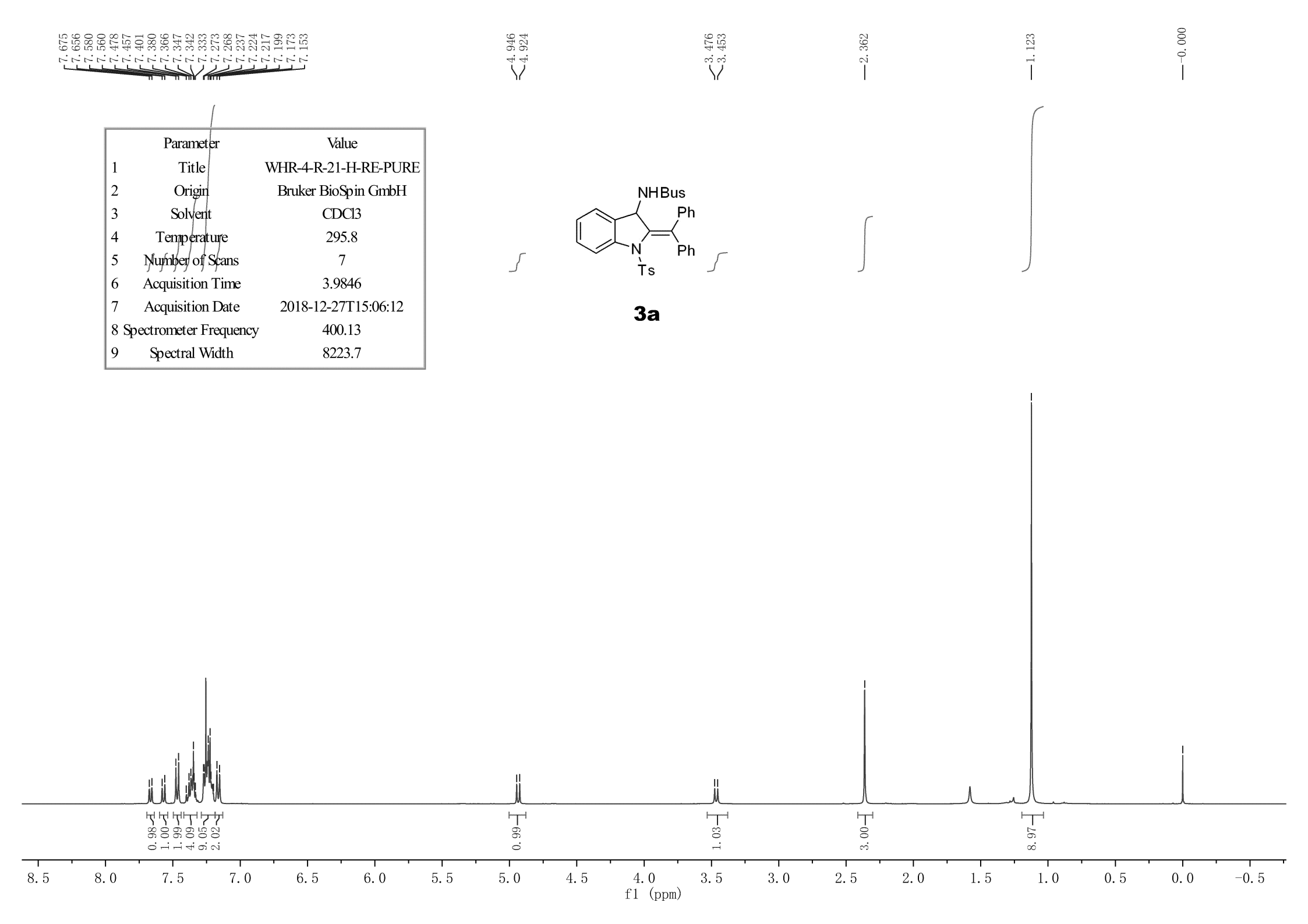
1t



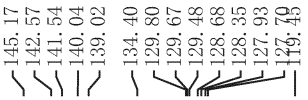




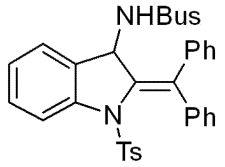
	Parameter	Value
1	Title	zzx-8-193-C
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.6
5	Number of Scans	89
6	Acquisition Time	1.3631
7	Acquisition Date	2020-03-19T17:19:55
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



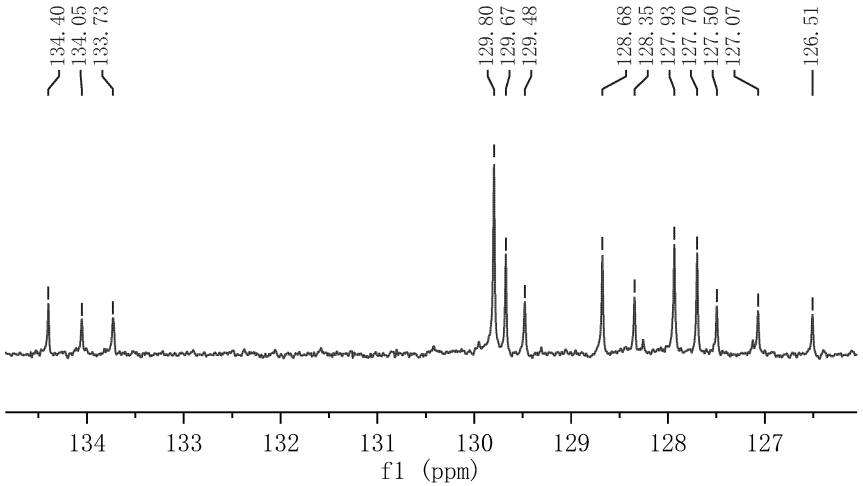
	Parameter	Value
1	Title	WHR-4-R-21-H-RE-PURE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.8
5	Number of Scans	7
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-27T15:06:12
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

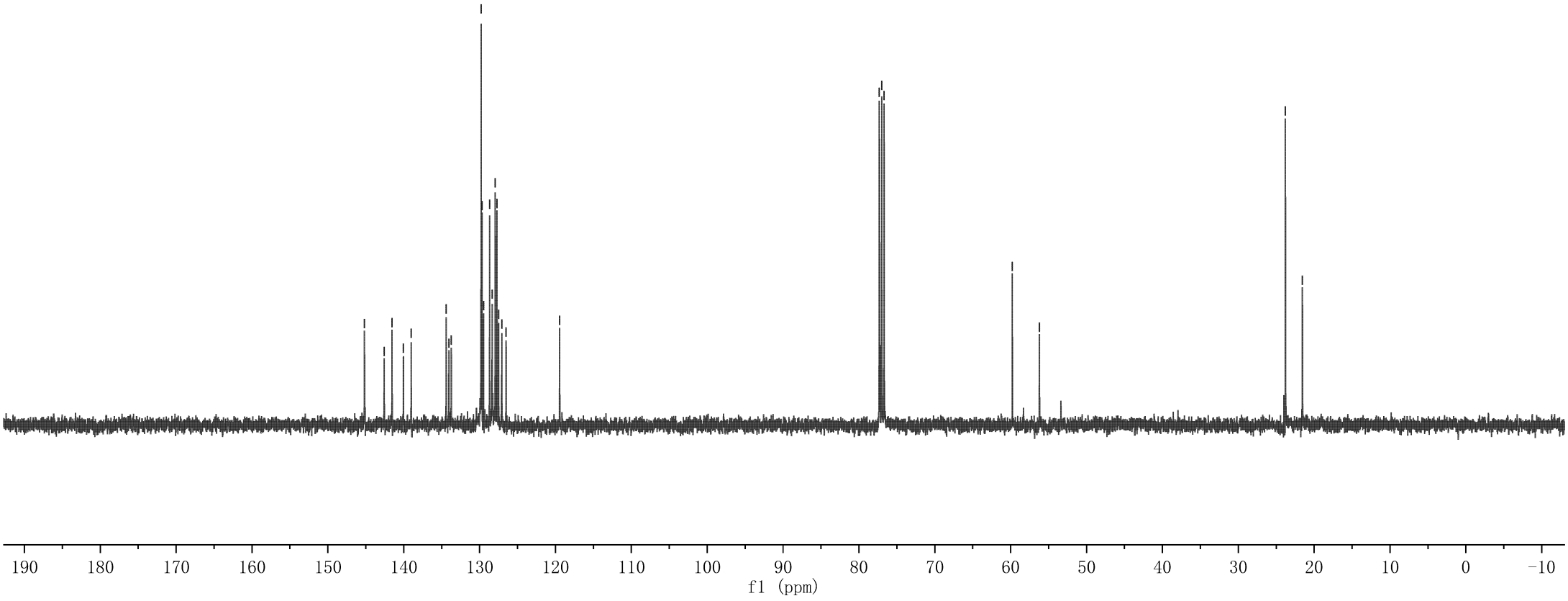


	Parameter	Value
1	Title	WHR-4-R-21-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	296.6
5	Number of Scans	38
6	Acquisition Time	1.3631
7	Acquisition Date	2018-12-01T15:24:47
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5

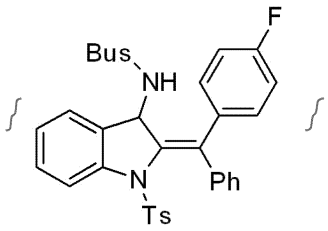


3a

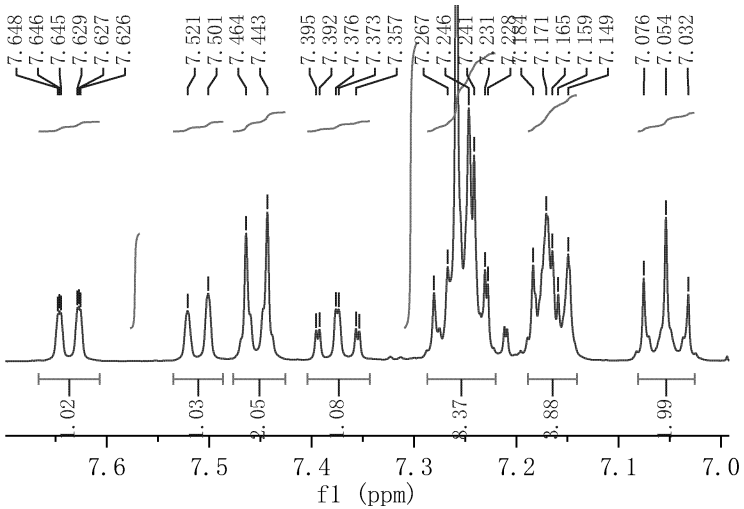


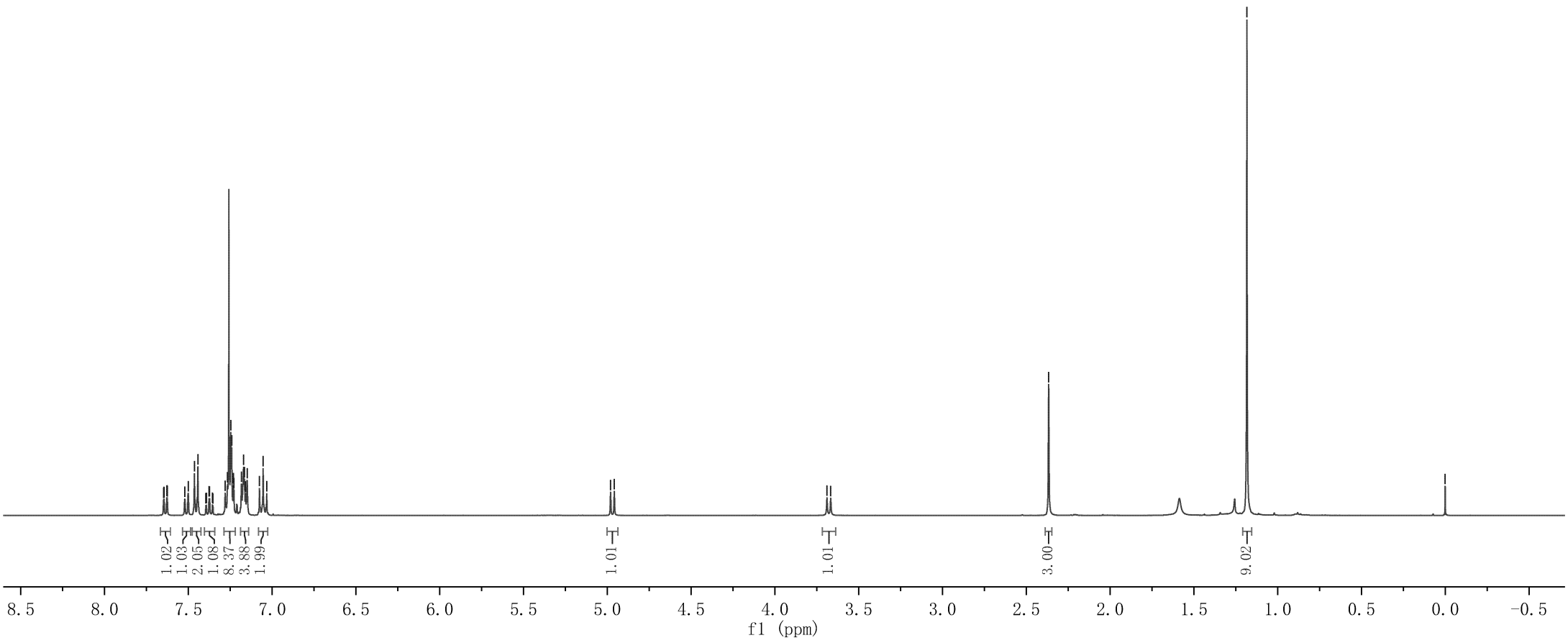


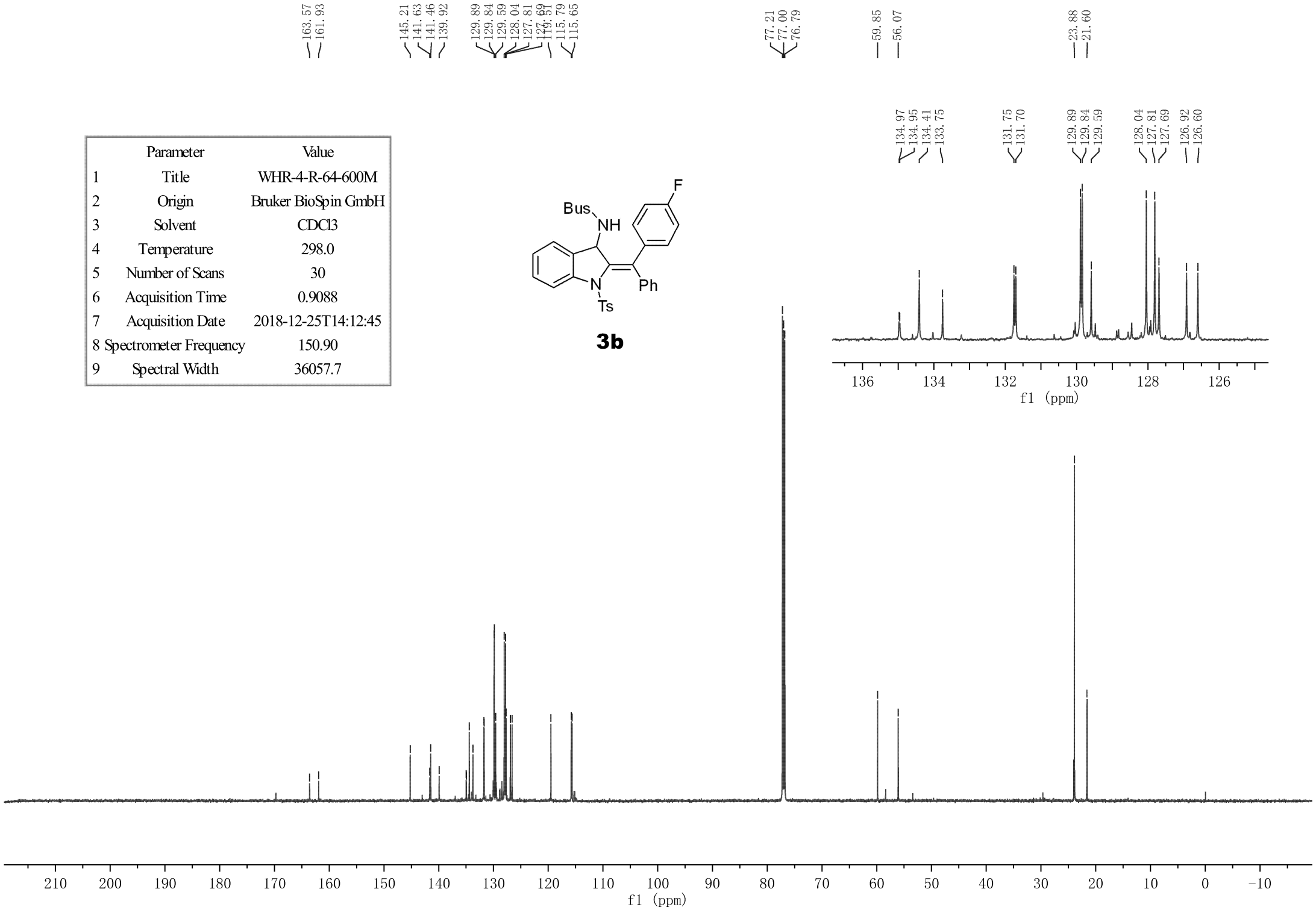
	Parameter	Value
1	Title	WHR-4-R-64-PURE-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	296.1
5	Number of Scans	6
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-29T15:29:46
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



3b

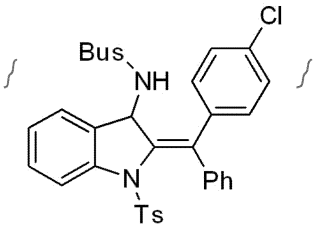






	Parameter	Value
1	Title	WHR-4-R-64-600M
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	30
6	Acquisition Time	0.9088
7	Acquisition Date	2018-12-25T14:12:45
8	Spectrometer Frequency	150.90
9	Spectral Width	36057.7

	Parameter	Value
1	Title	WHR-4-R-63
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.1
5	Number of Scans	9
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-24T15:54:11
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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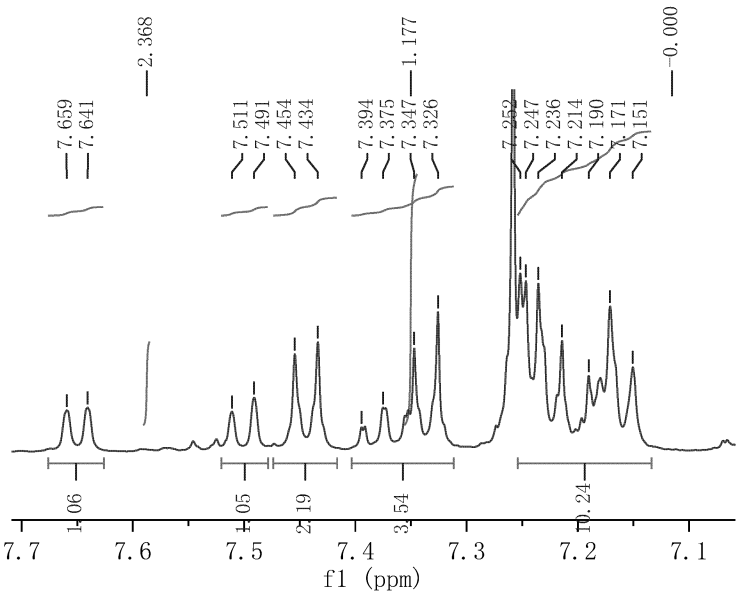
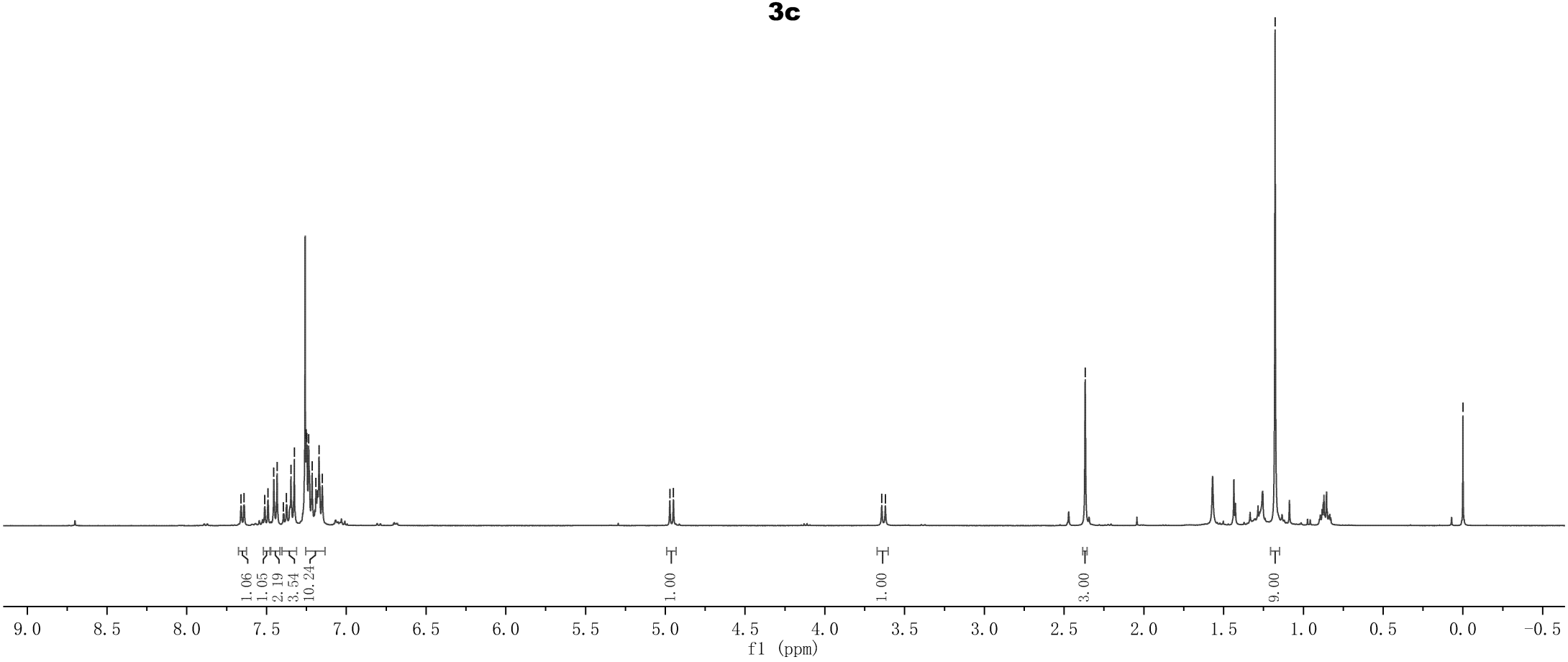
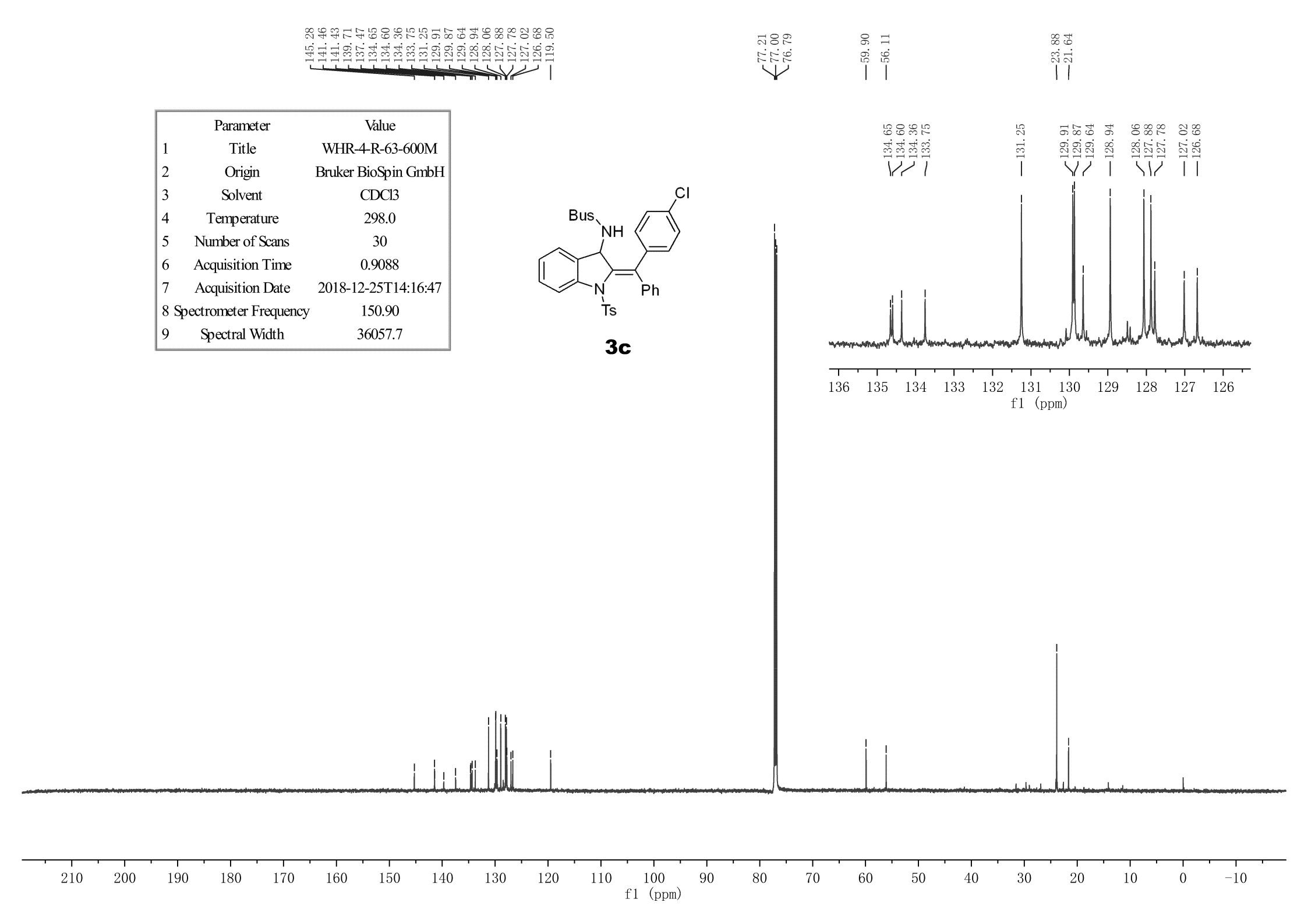
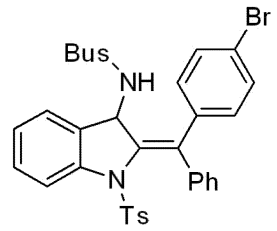






	Parameter	Value
1	Title	WHR-4-R-63-600M
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	30
6	Acquisition Time	0.9088
7	Acquisition Date	2018-12-25T14:16:47
8	Spectrometer Frequency	150.90
9	Spectral Width	36057.7

	Parameter	Value
1	Title	WHR-4-R-160-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.2
5	Number of Scans	10
6	Acquisition Time	3.9846
7	Acquisition Date	2019-02-14T15:15:10
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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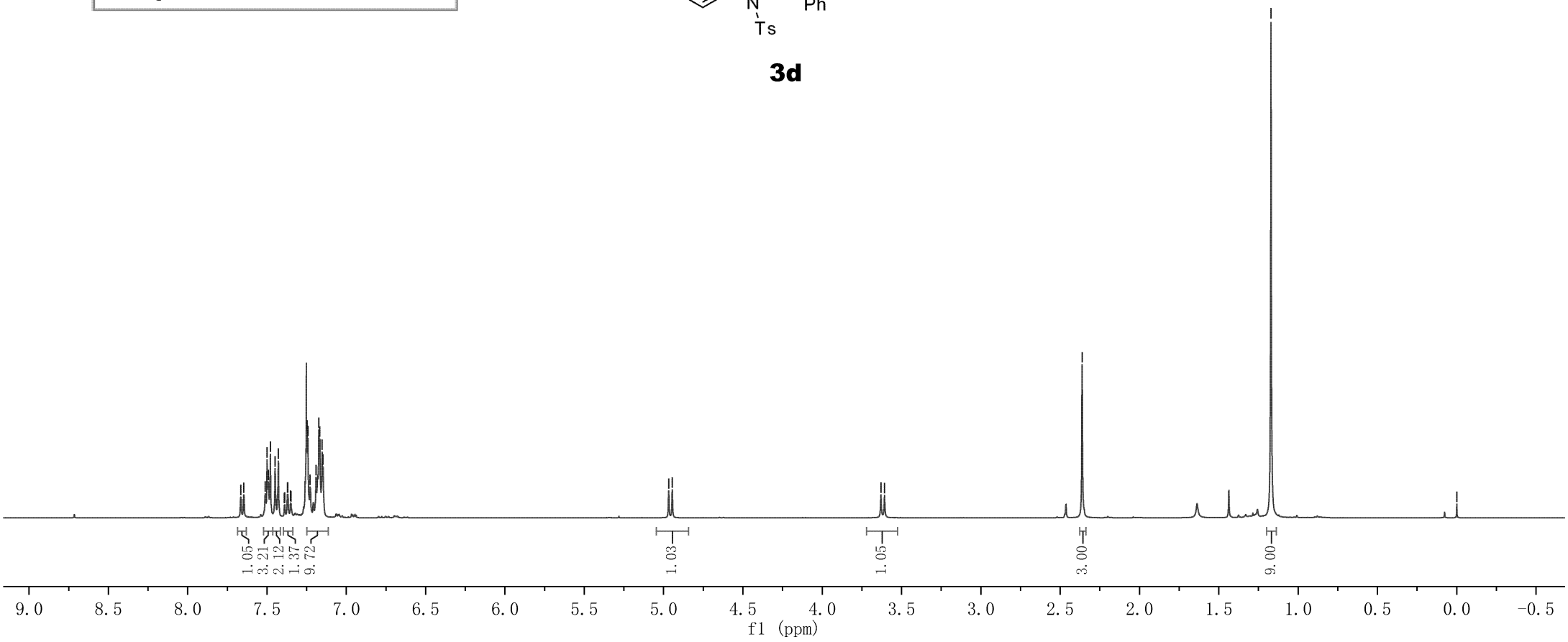

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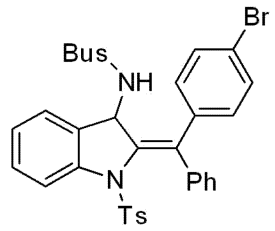
141.43
141.37
139.61
137.92
134.62
134.30
133.71
131.86
131.48
129.87
129.84
129.62
128.01
127.85
127.75
127.01
126.65
122.79
119.45

77.32
77.00
76.68

59.87
56.09

23.83
21.60

	Parameter	Value
1	Title	WHR-4-R-160-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.2
5	Number of Scans	8
6	Acquisition Time	1.3631
7	Acquisition Date	2019-02-14T15:19:00
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



3d

134.62
134.30
133.71
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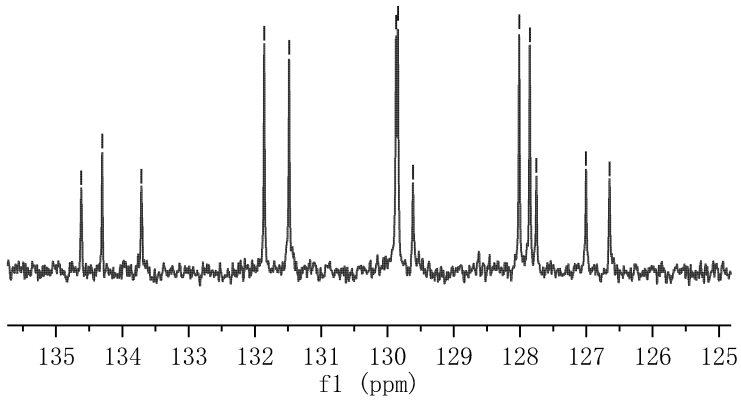
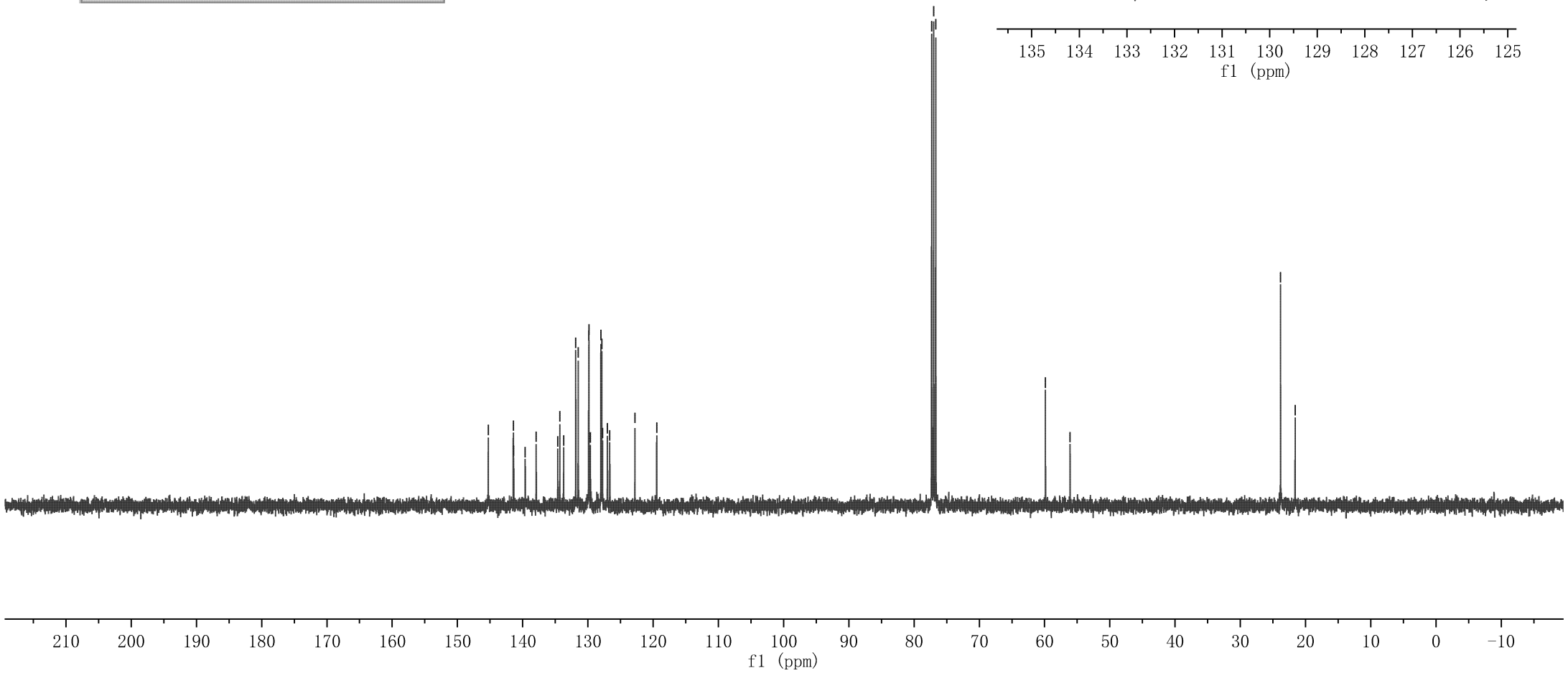
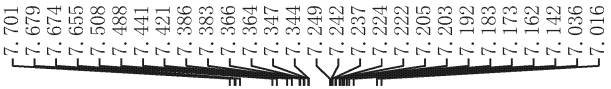
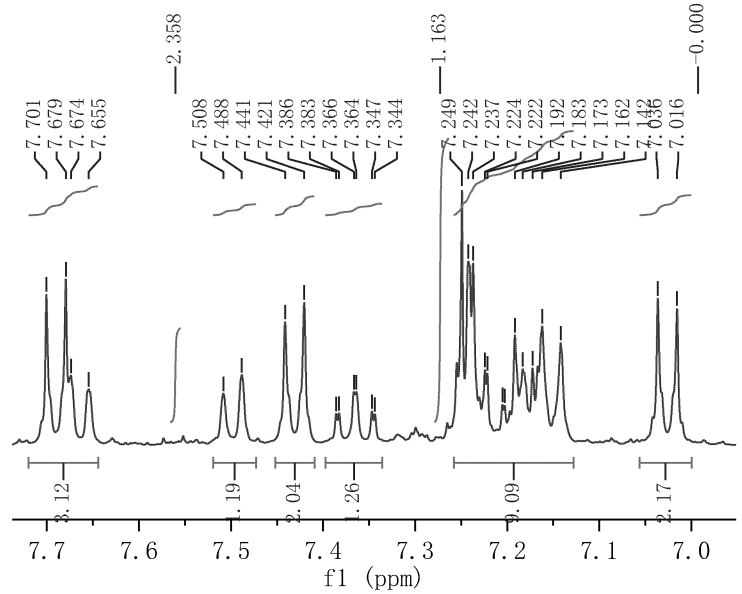
129.87
129.84
129.62
128.01
127.85
127.75
127.01
126.65

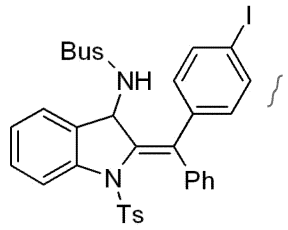








	Parameter	Value
1	Title	WHR-7-R-58-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.2
5	Number of Scans	8
6	Acquisition Time	3.9846
7	Acquisition Date	2019-10-04T16:30:11
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



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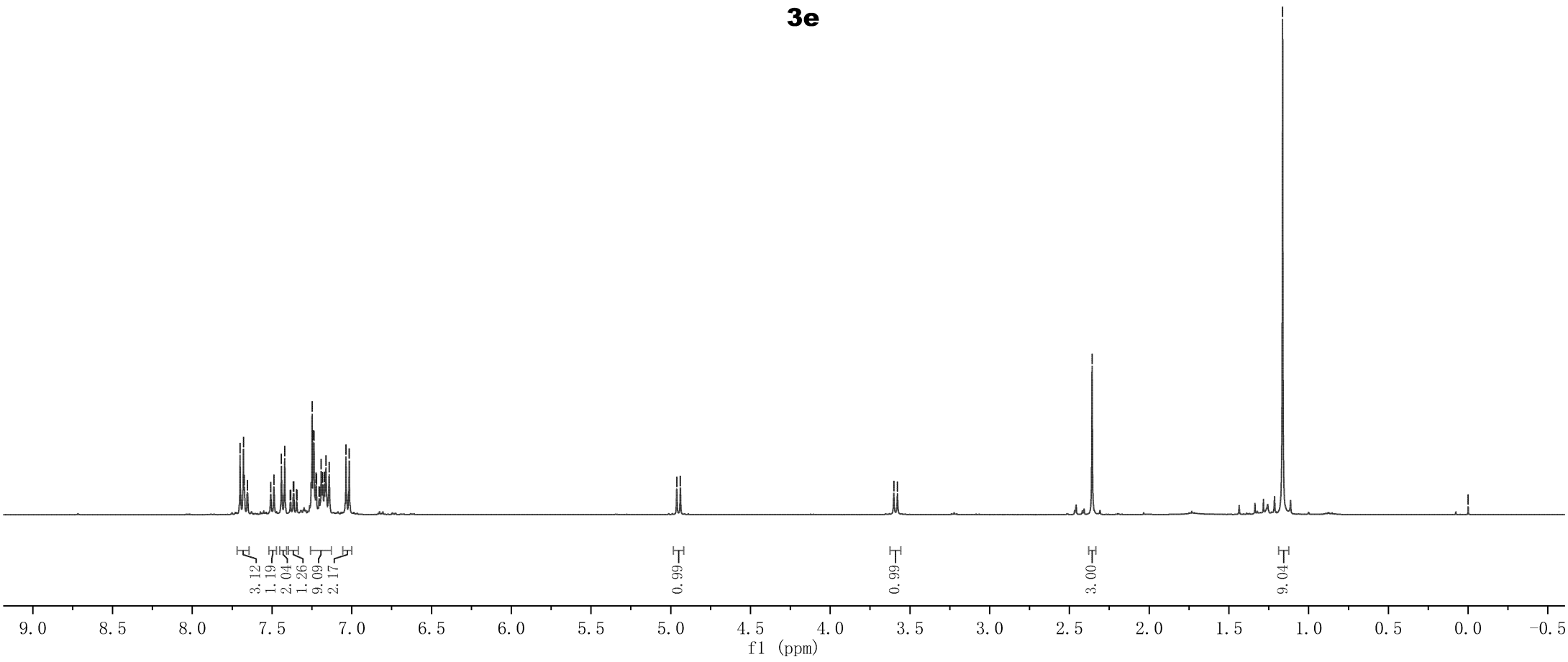
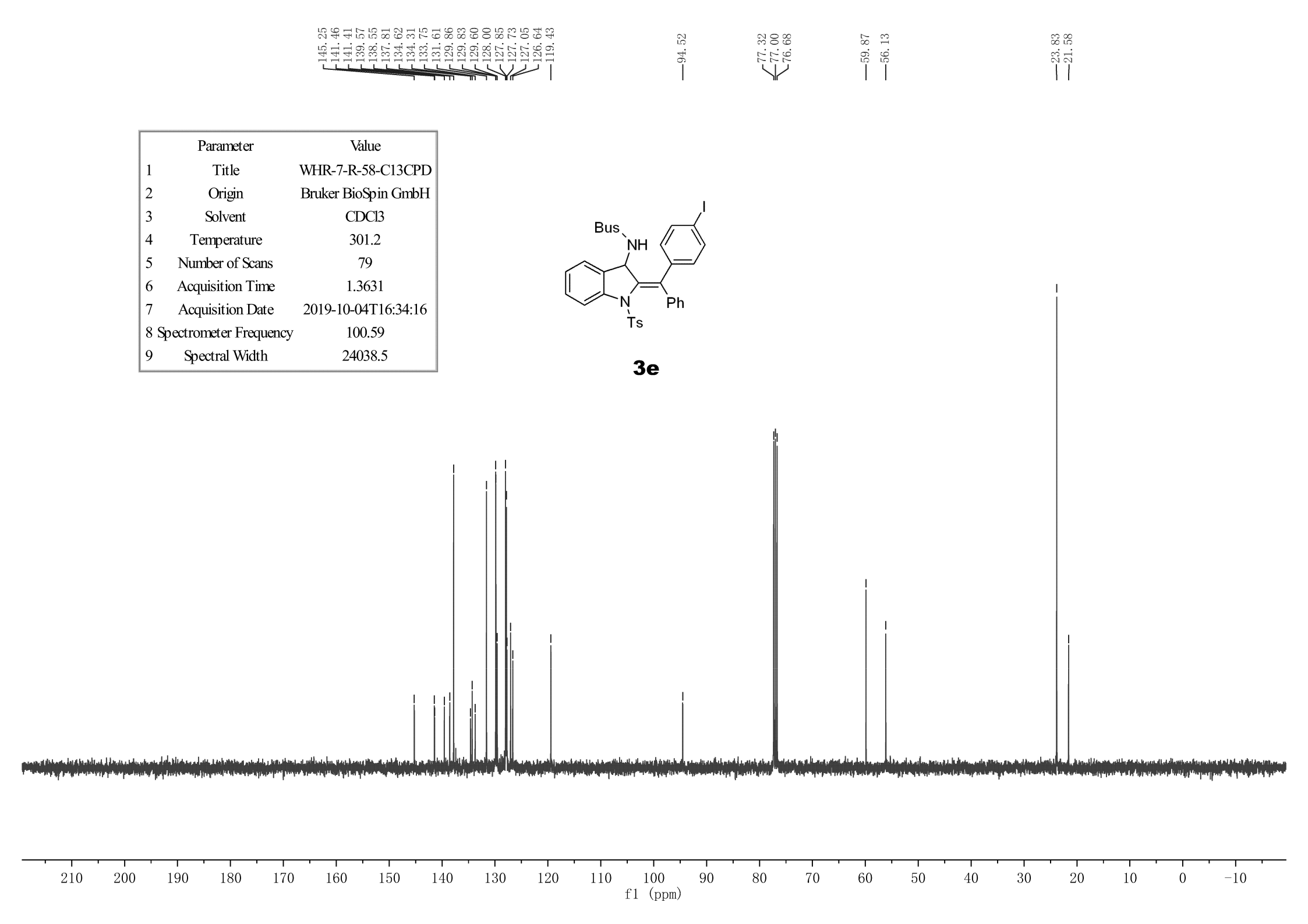
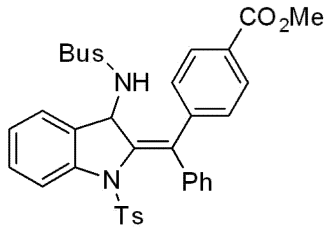




	Parameter	Value
1	Title	WHR-7-R-58-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	301.2
5	Number of Scans	79
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-04T16:34:16
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5

	Parameter	Value
1	Title	WHR-4-R-76-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.6
5	Number of Scans	12
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-27T14:59:23
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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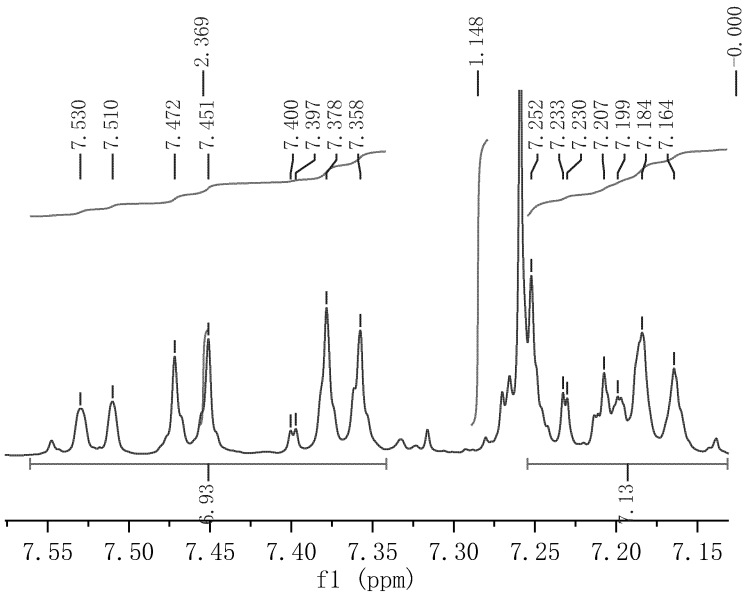
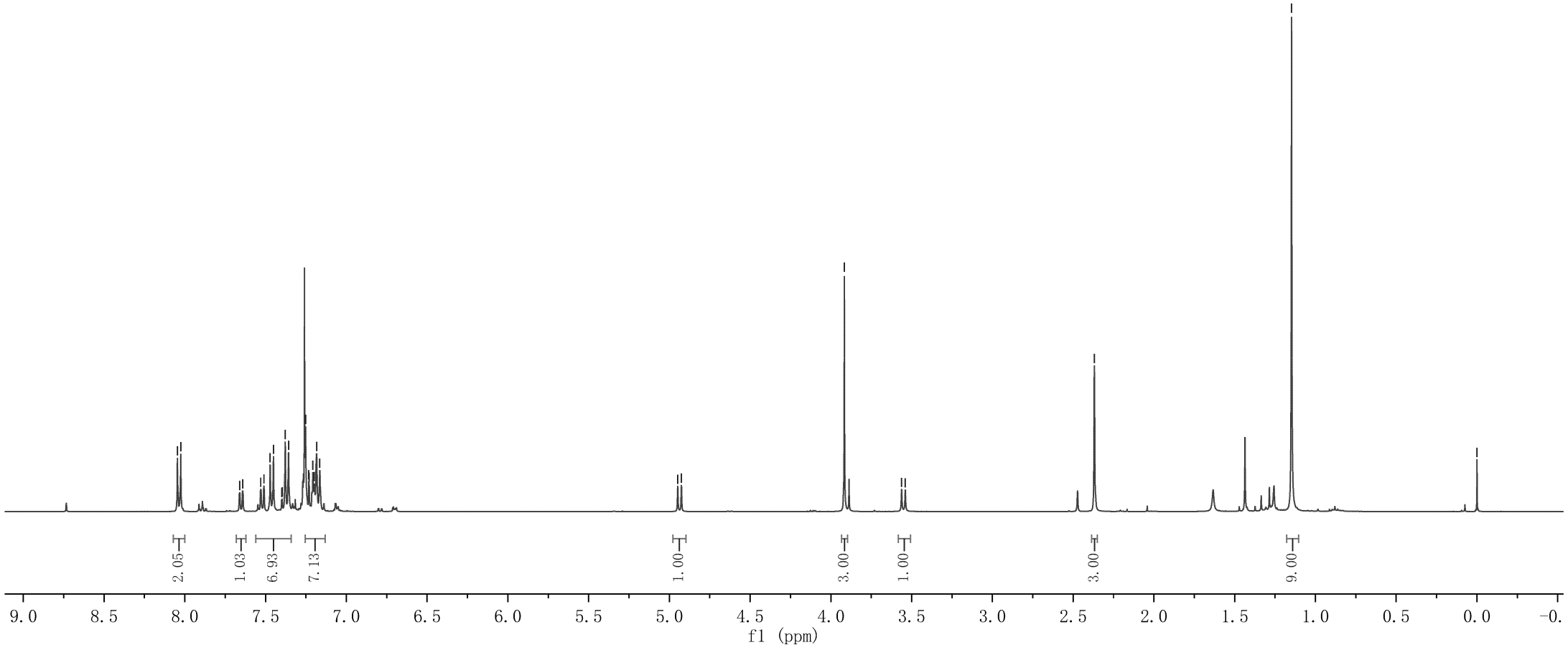
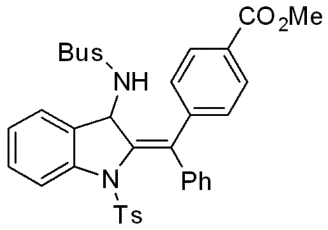


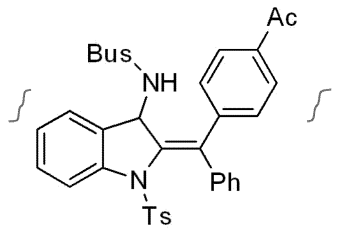


	Parameter	Value
1	Title	WHR-4-R-76-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	296.0
5	Number of Scans	124
6	Acquisition Time	1.3631
7	Acquisition Date	2018-12-27T20:14:52
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5

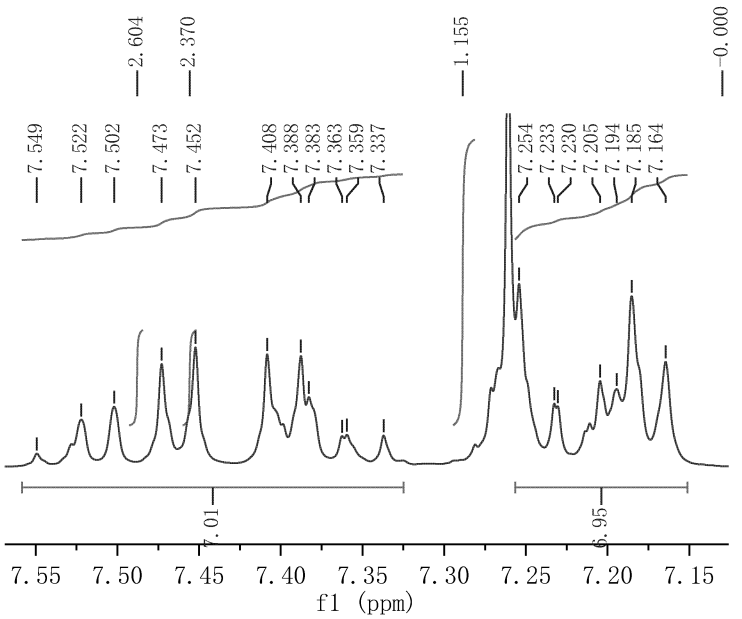


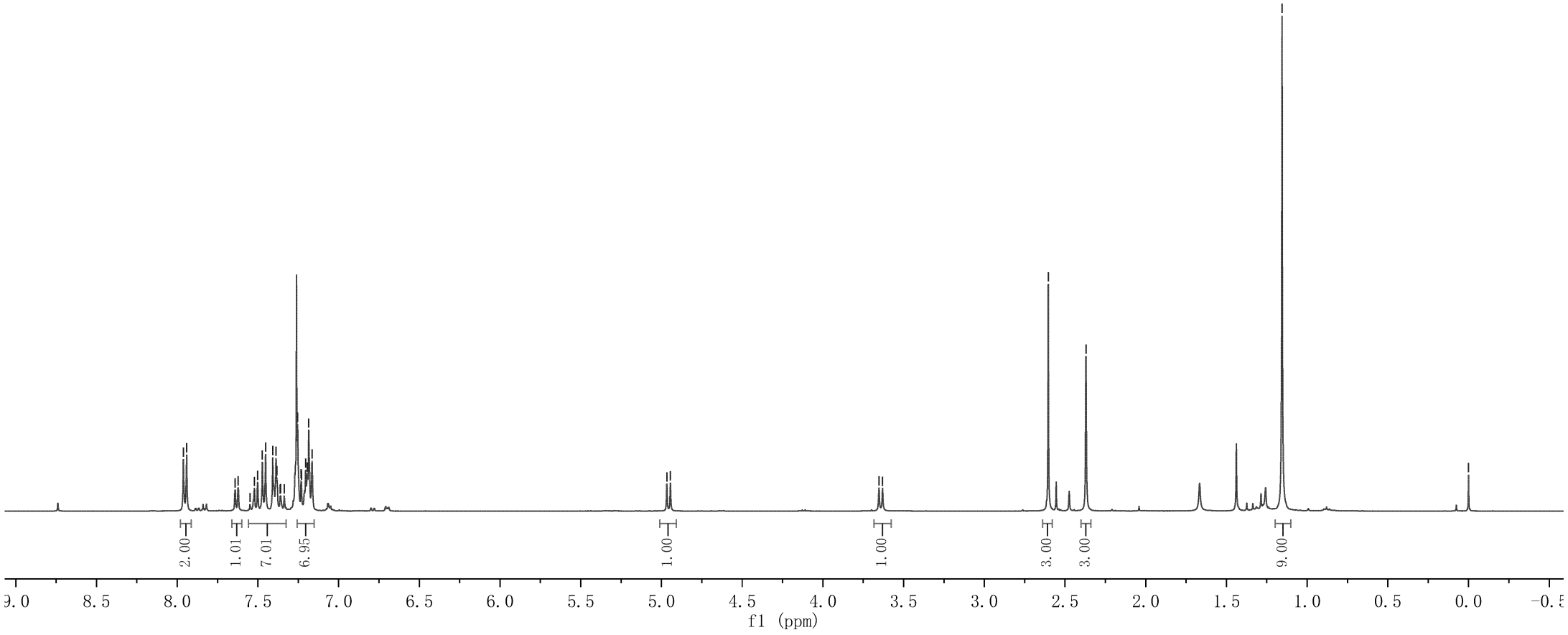
3f

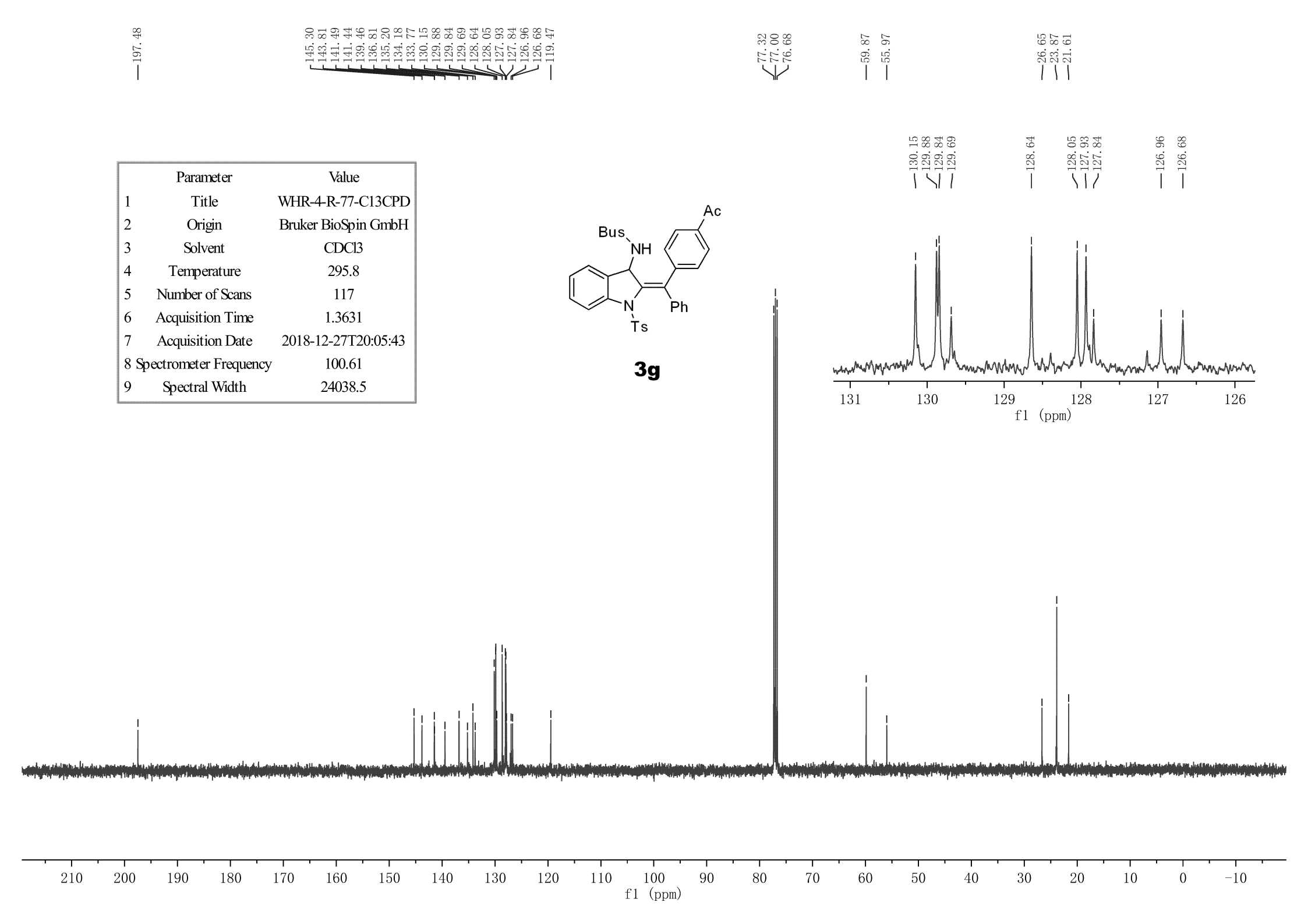
	Parameter	Value
1	Title	WHR-4-R-77-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.6
5	Number of Scans	7
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-27T15:03:00
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



3g



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141.49
141.44
139.46
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135.20
134.18
133.77
130.15
129.88
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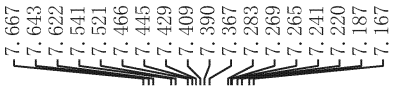
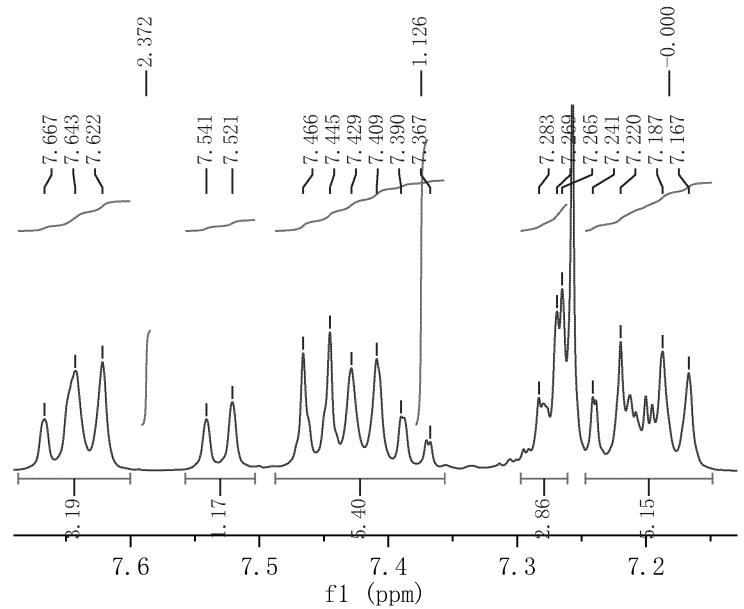
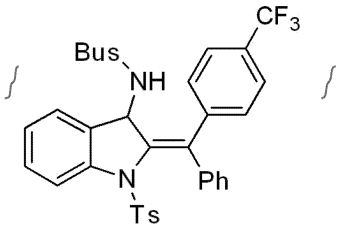
129.69
128.64
128.05
127.93
127.84
126.96
126.68
119.47
77.32
77.00
76.68
59.87
55.97
26.65
23.87
21.61
130.15
129.88
129.84
129.69
128.64
128.05
127.93
127.84
126.96
126.68
Parameter Value
1 Title WHR-4-R-77-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.8
5 Number of Scans 117
6 Acquisition Time 1.3631
7 Acquisition Date 2018-12-27T20:05:43
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
Bus
NH
Ac
Ph
N
Ts
3g
131
130
129
128
127
126
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)





	Parameter	Value
1	Title	WHR-4-R-74-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.9
5	Number of Scans	8
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-27T15:12:52
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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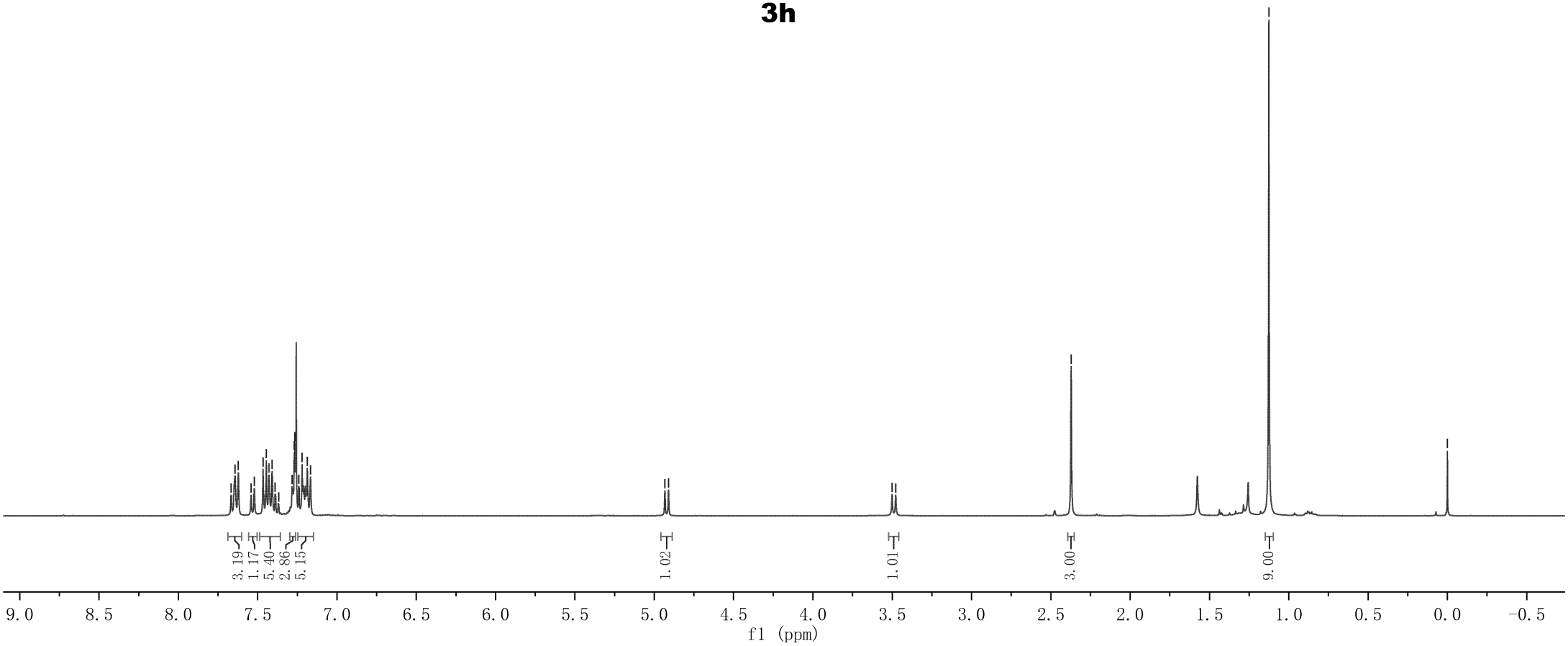
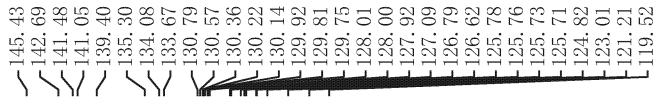
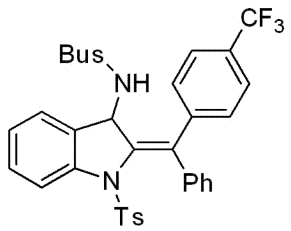
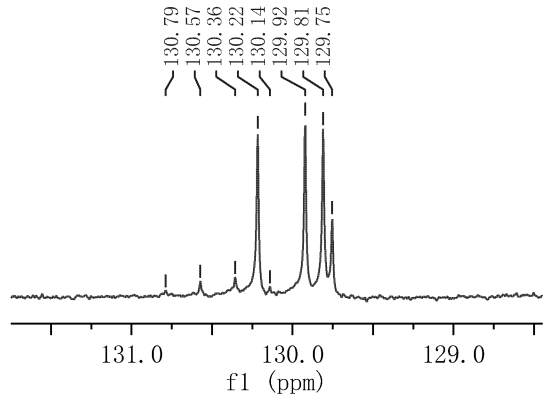


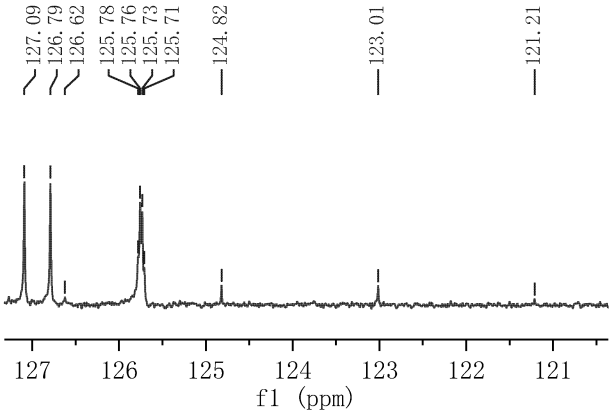


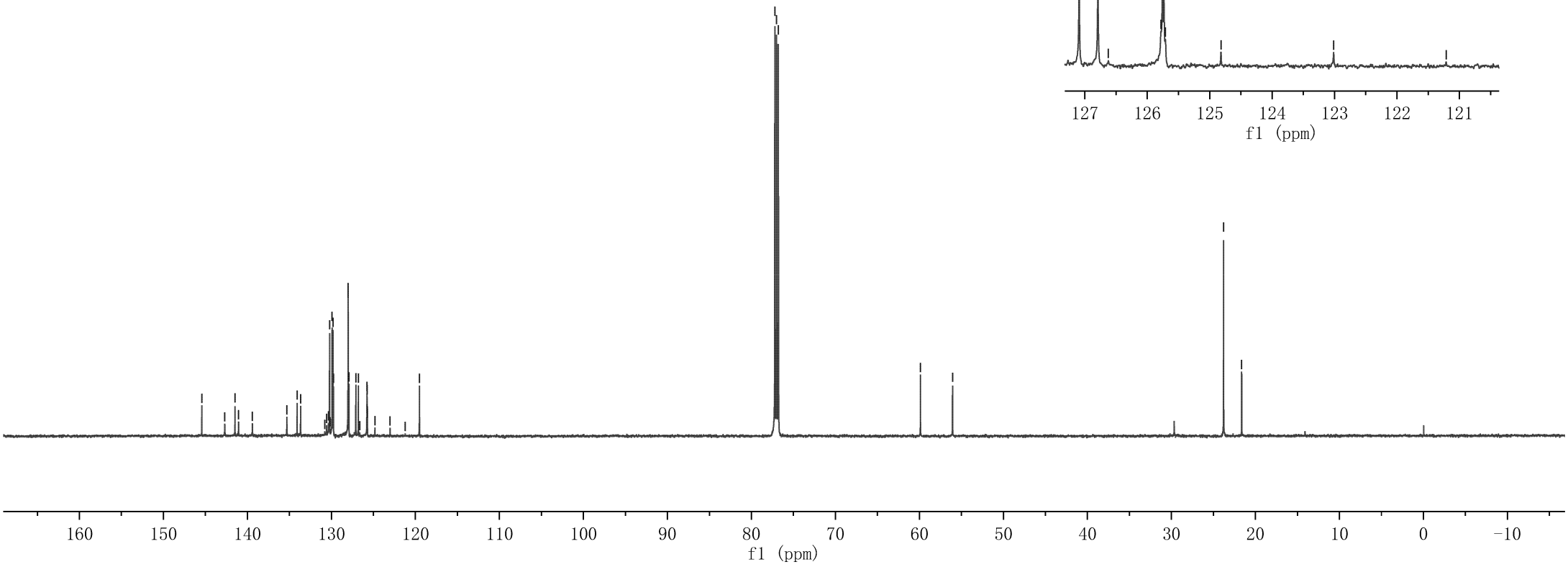
	Parameter	Value
1	Title	4-74
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	32
6	Acquisition Time	0.9088
7	Acquisition Date	2019-01-09T17:18:32
8	Spectrometer Frequency	150.90
9	Spectral Width	36057.7

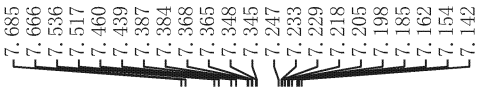


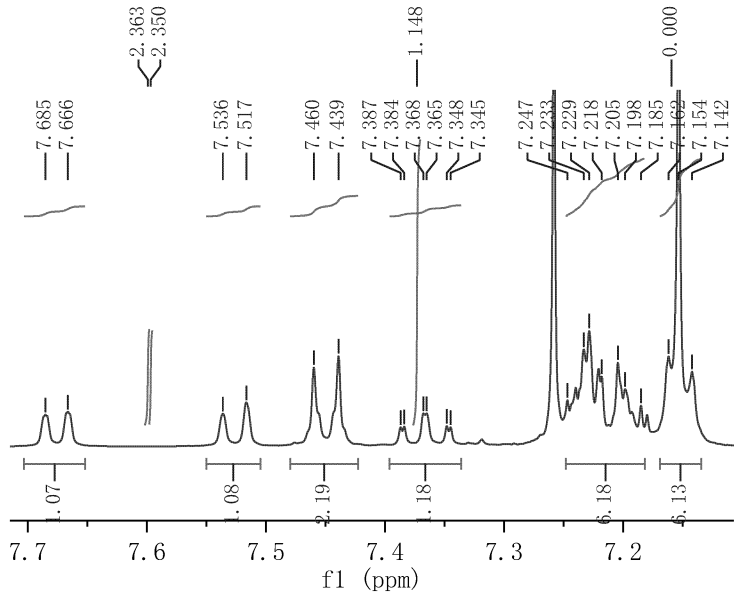
3h



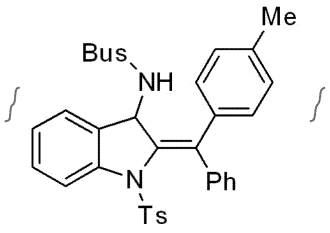




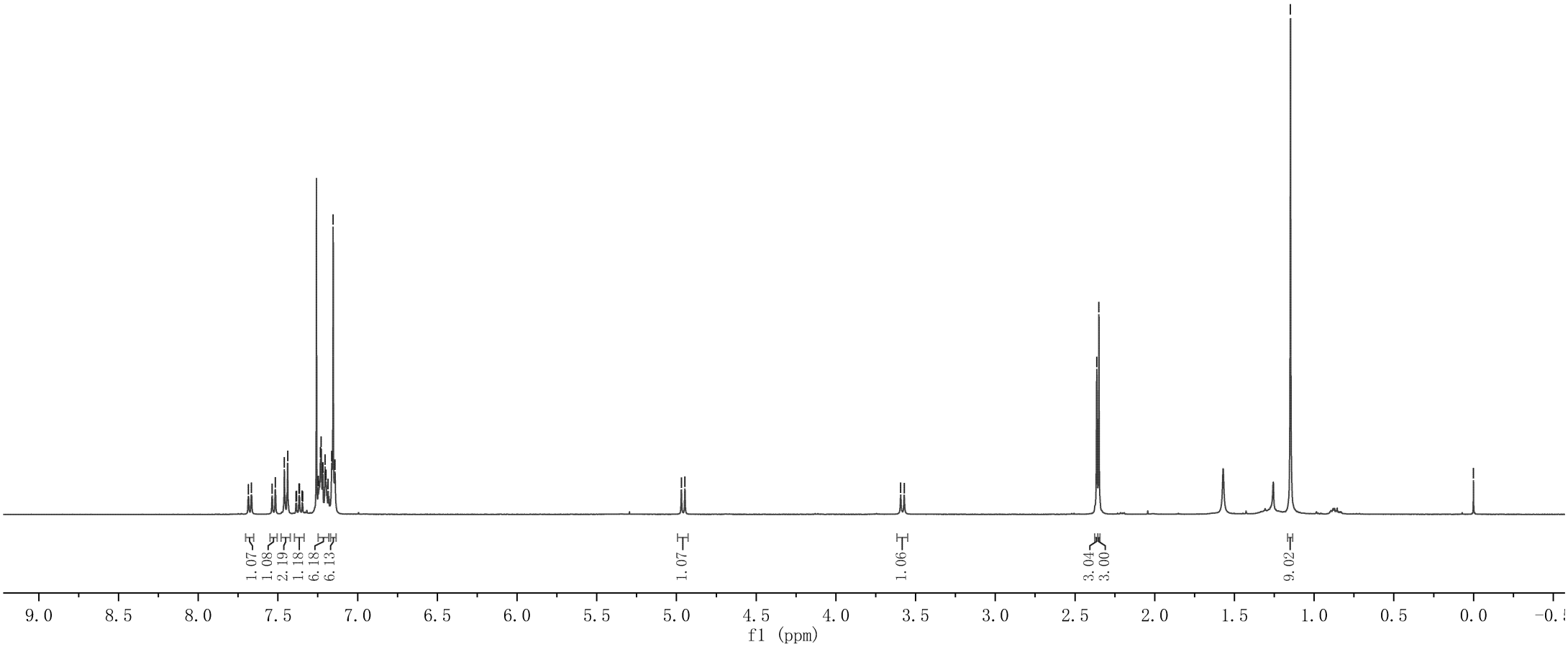


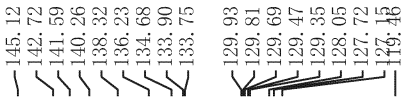


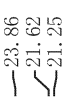
	Parameter	Value
1	Title	WHR-4-R-33-PURE-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	296.0
5	Number of Scans	8
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-29T15:35:18
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



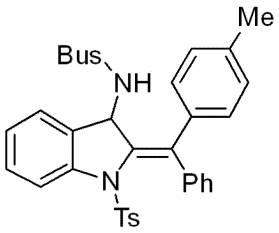
3i







	Parameter	Value
1	Title	WHR-4-R-33-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.3
5	Number of Scans	164
6	Acquisition Time	1.3631
7	Acquisition Date	2018-12-19T09:11:54
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



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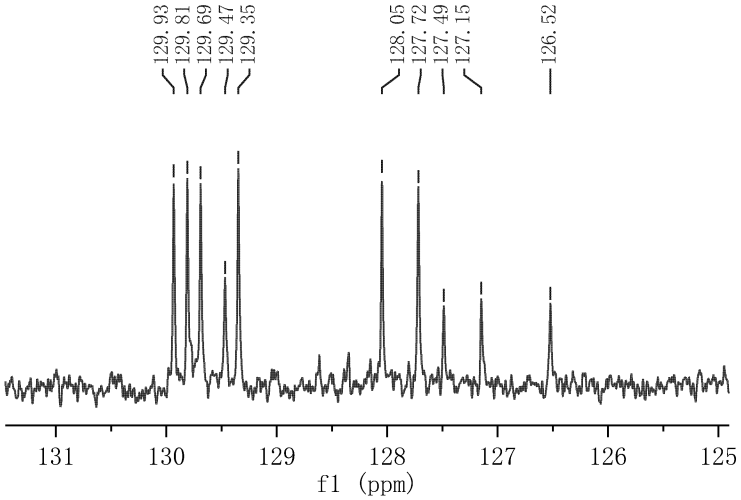
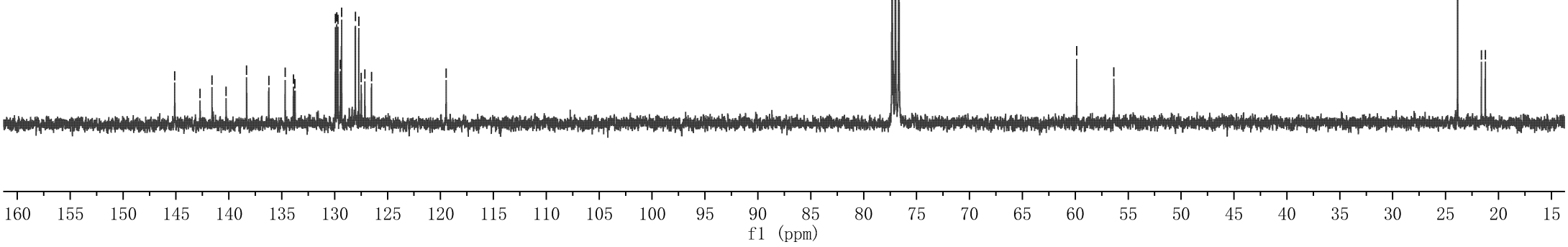
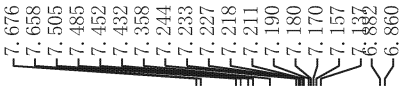
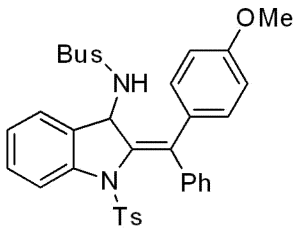


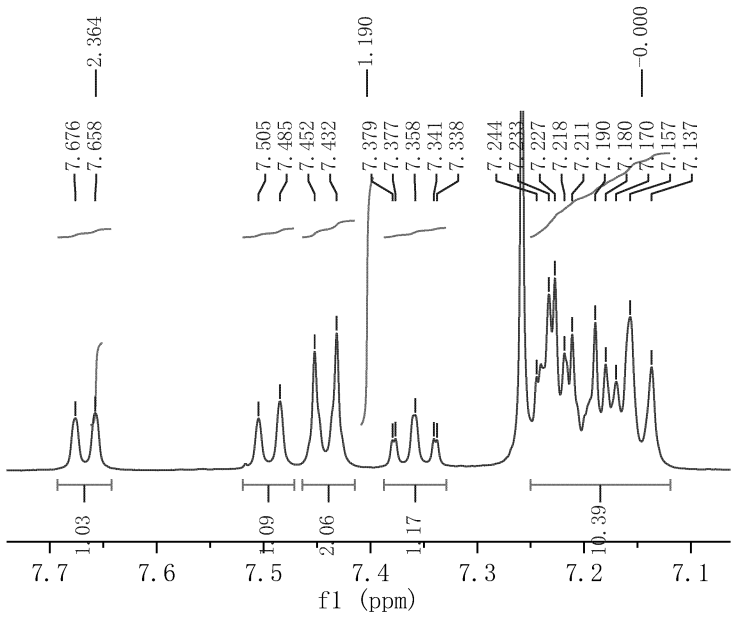


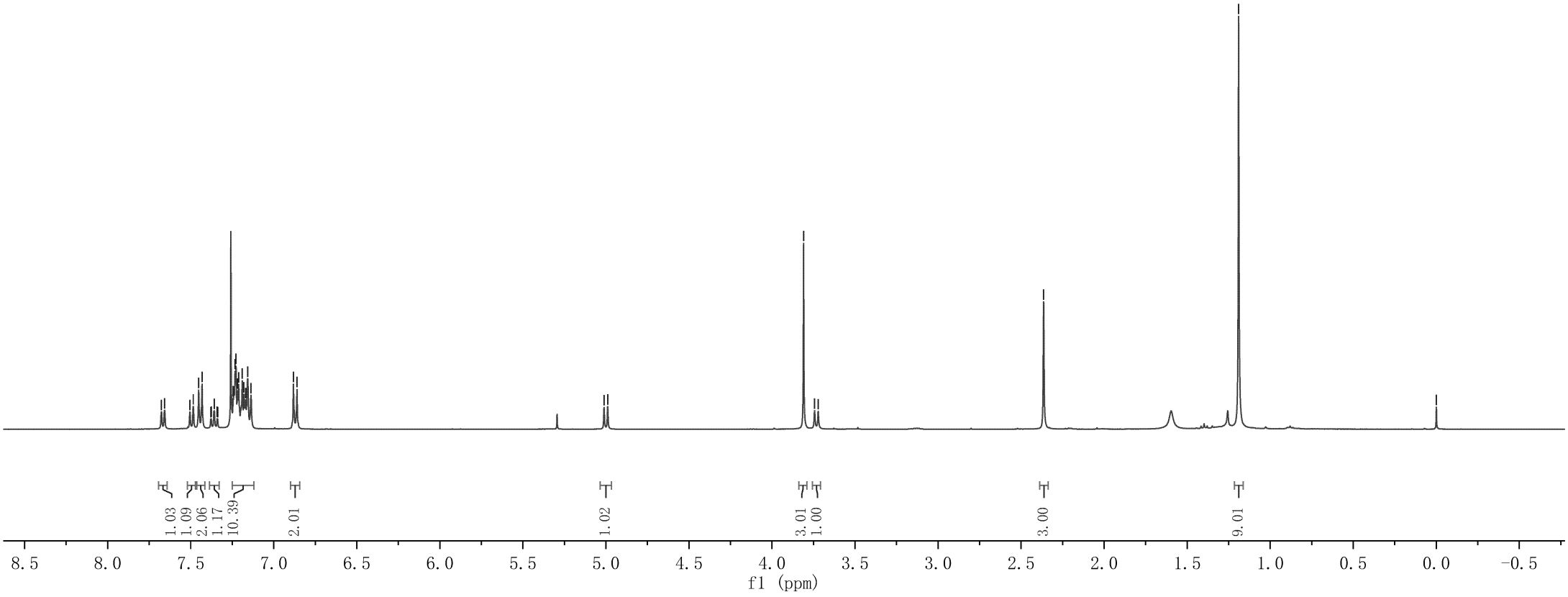


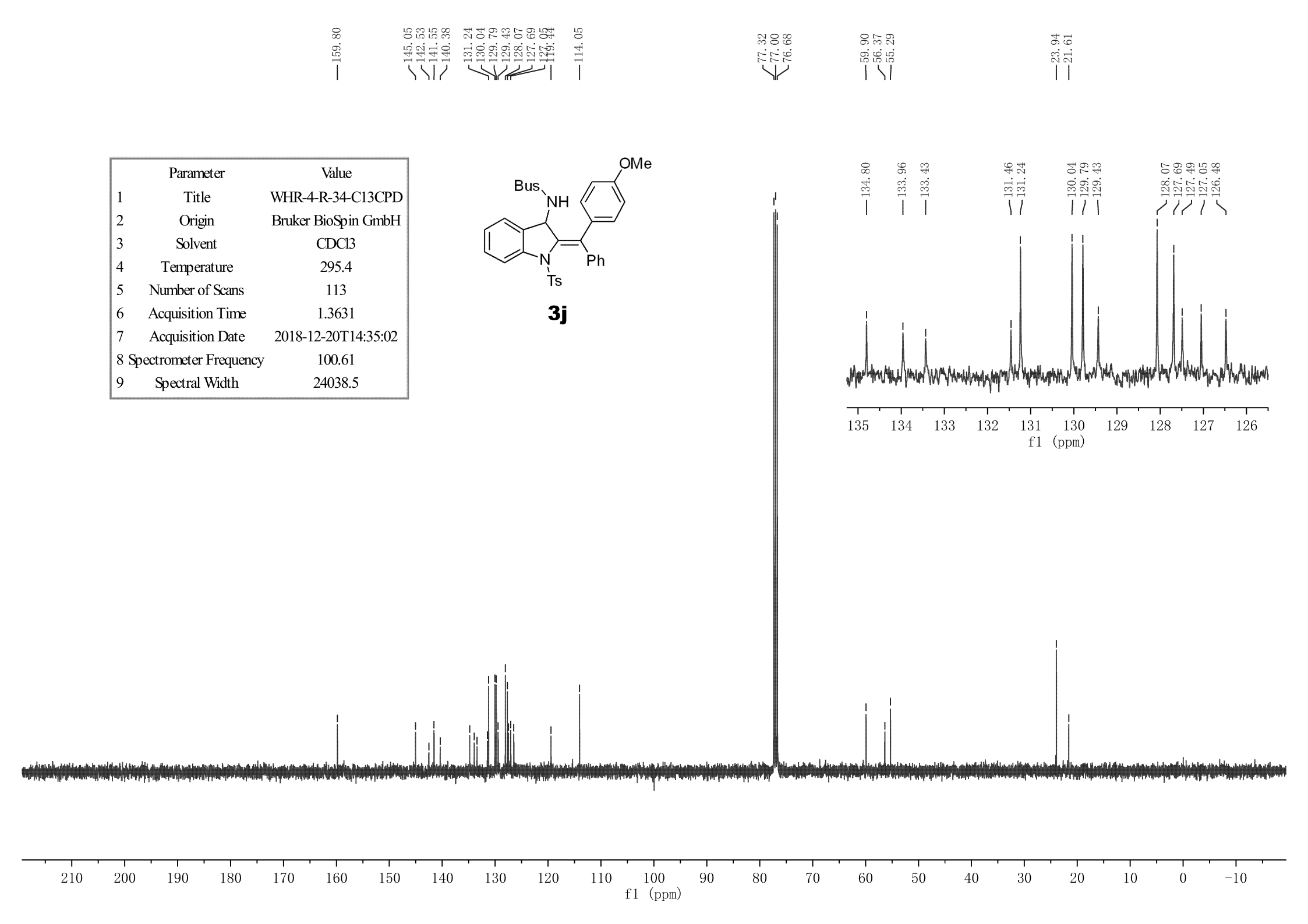
	Parameter	Value
1	Title	WHR-4-R-34-PURE-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.8
5	Number of Scans	8
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-29T15:39:18
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



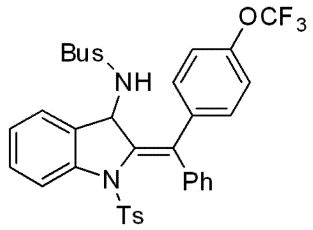
3j






159.80
145.05
142.53
141.55
140.38
131.24
130.04
129.79
129.43
128.07
127.69
114.05
77.32
77.00
76.68
59.90
56.37
55.29
23.94
21.61
Parameter Value
1 Title WHR-4-R-34-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.4
5 Number of Scans 113
6 Acquisition Time 1.3631
7 Acquisition Date 2018-12-20T14:35:02
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
Bus
NH
OMe
N
Ts
Ph
3j
134.80
133.96
133.43
131.46
131.24
130.04
129.79
129.43
128.07
127.69
127.49
127.05
126.48
135 134 133 132 131 130 129 128 127 126
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

	Parameter	Value
1	Title	WHR-7-R-162
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	7
6	Acquisition Time	4.0894
7	Acquisition Date	2019-11-05T10:21:05
8	Spectrometer Frequency	400.13
9	Spectral Width	8012.8



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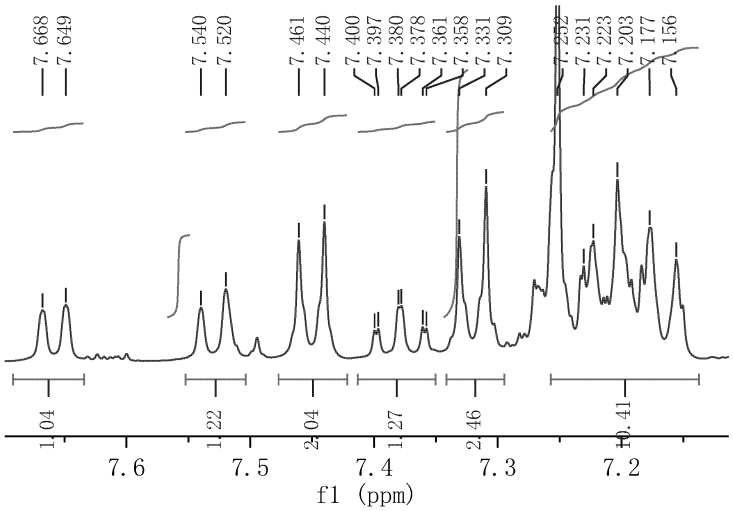
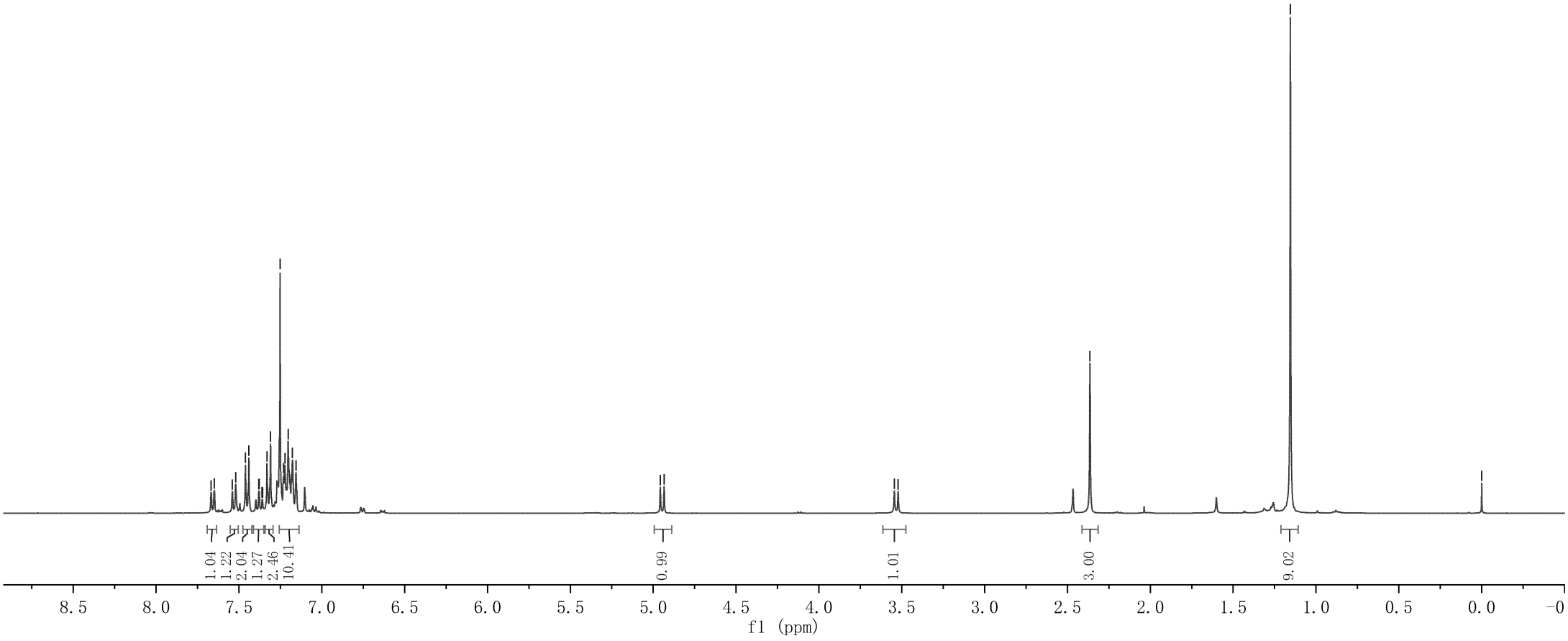




149.17
145.33
141.45
141.20
139.69
137.60
134.83
134.21
133.69
133.38
131.40
129.89
129.83
129.66
128.58
128.40
128.28
128.08
127.99
127.90
127.79
127.04
126.70
122.17
121.10
120.76
119.76
119.50
118.56

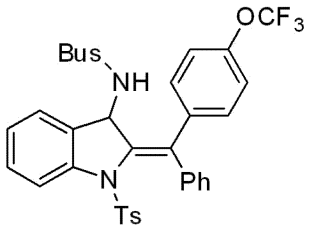
77.15
77.00
76.85

59.83

56.10

23.81
21.60

	Parameter	Value
1	Title	162
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	48
6	Acquisition Time	0.6423
7	Acquisition Date	2019-11-06T08:44:57
8	Spectrometer Frequency	213.81
9	Spectral Width	51020.4



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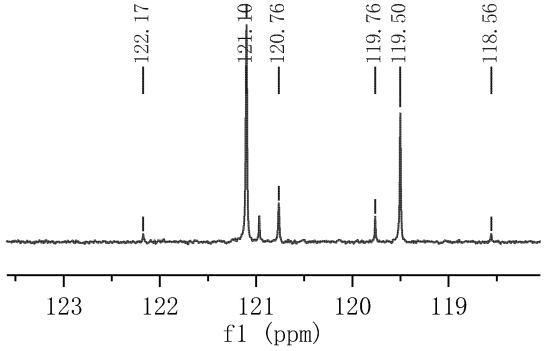
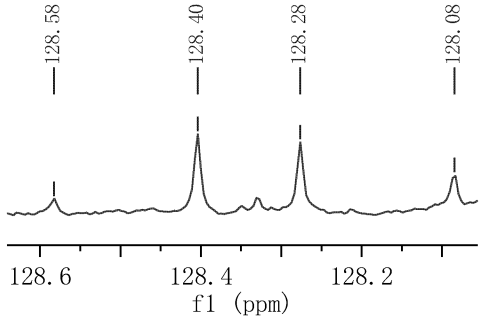
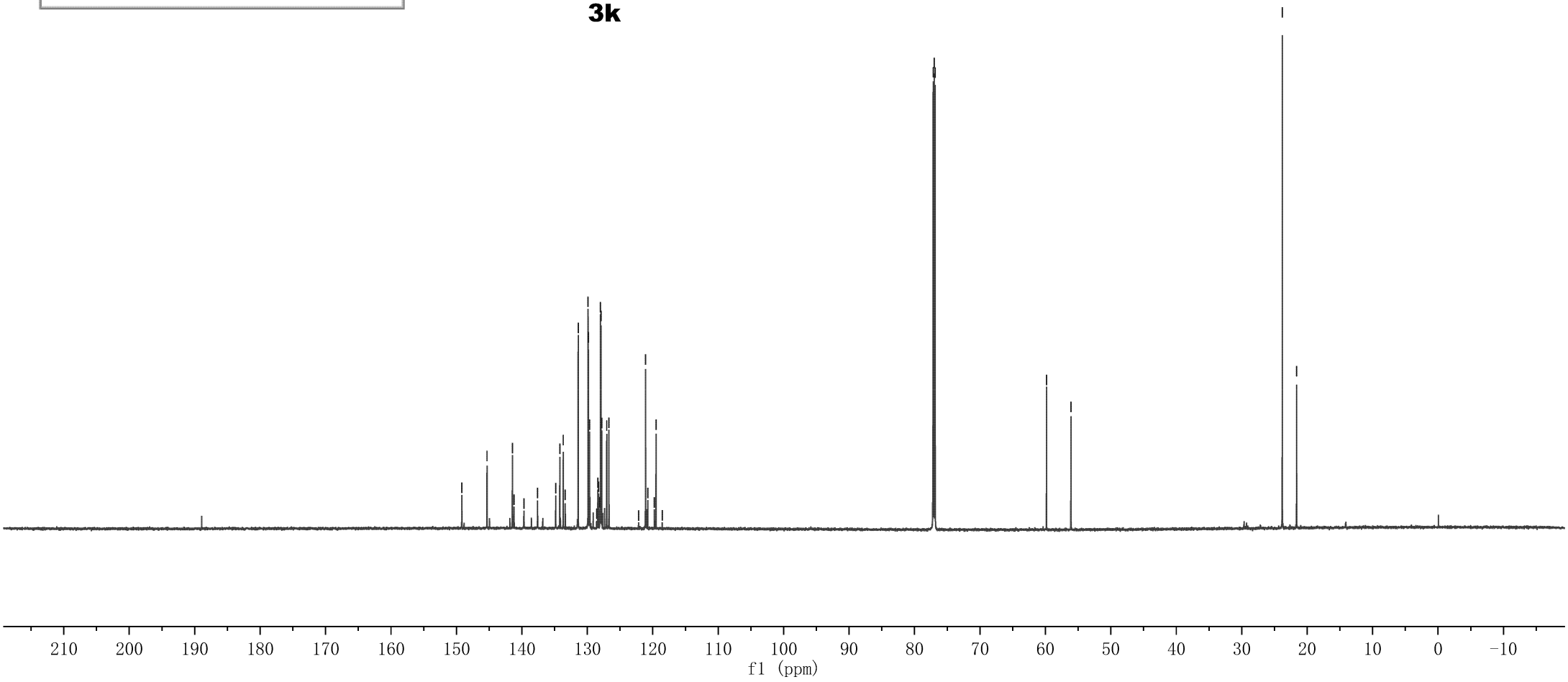
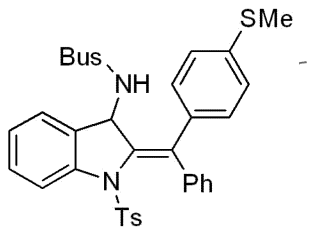


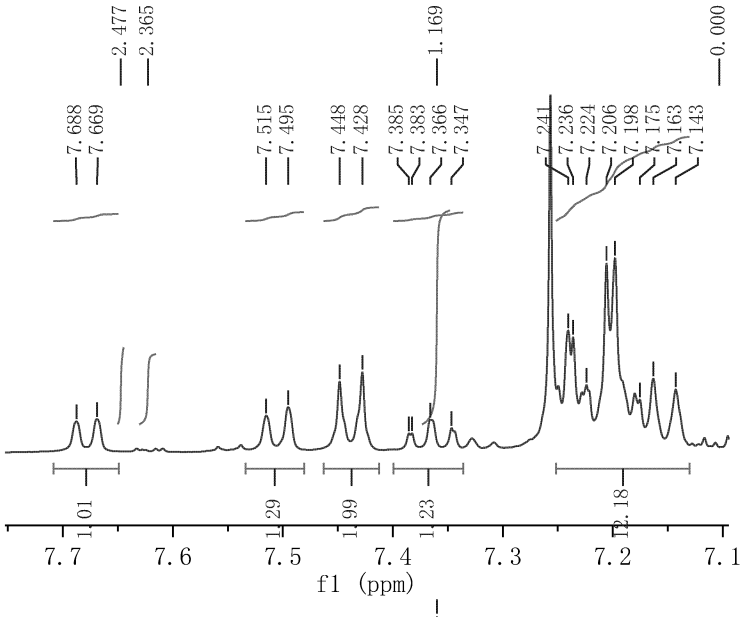


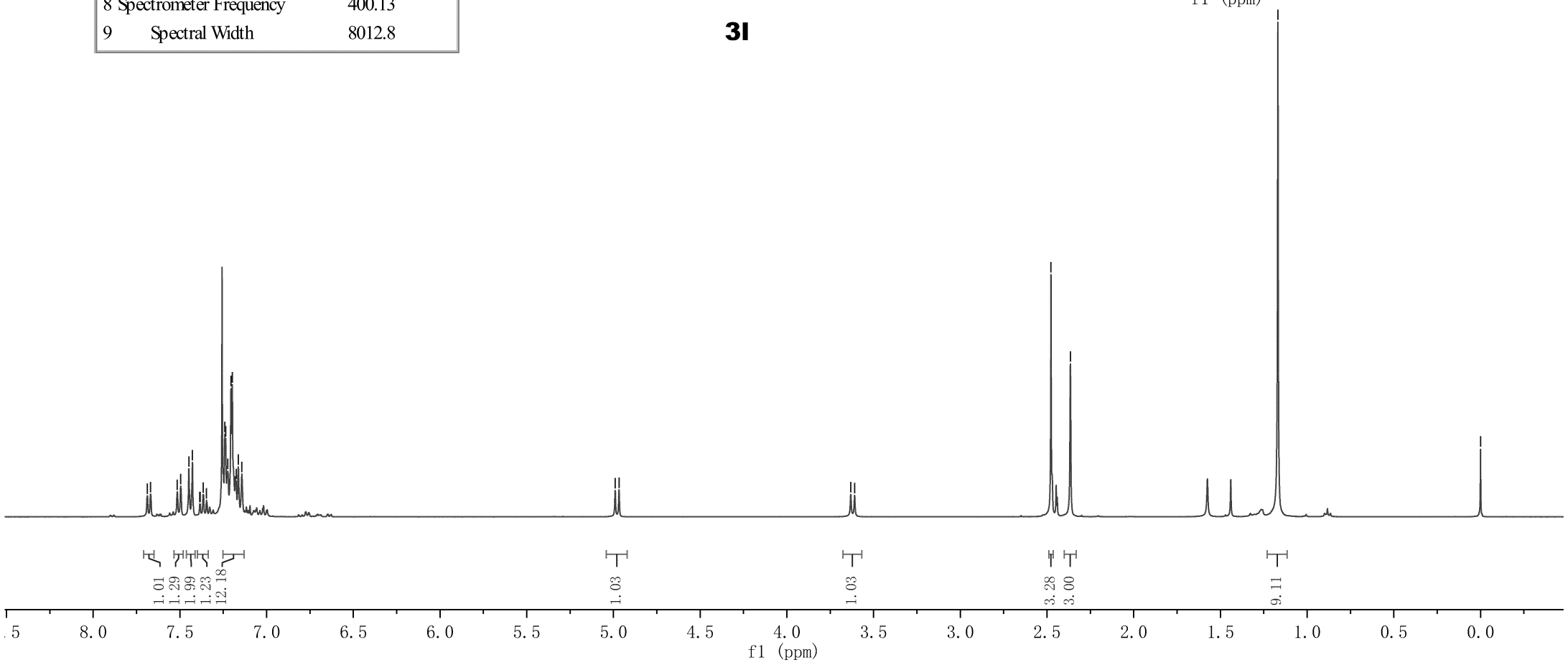


	Parameter	Value
1	Title	WHR-7-R-127
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	5
6	Acquisition Time	4.0894
7	Acquisition Date	2019-10-22T21:23:36
8	Spectrometer Frequency	400.13
9	Spectral Width	8012.8



3l





145.17
142.15
141.49
140.01
139.34
135.63
134.55
133.96
133.81
130.23
129.97
129.82
129.52
128.01
127.76
127.60
127.10
126.57
126.27
119.43

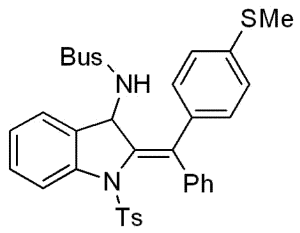
77.15
77.00
76.85

59.89
56.31

23.86
21.62

15.45

	Parameter	Value
1	Title	127
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	61
6	Acquisition Time	0.6423
7	Acquisition Date	2019-10-29T08:18:23
8	Spectrometer Frequency	213.81
9	Spectral Width	51020.4



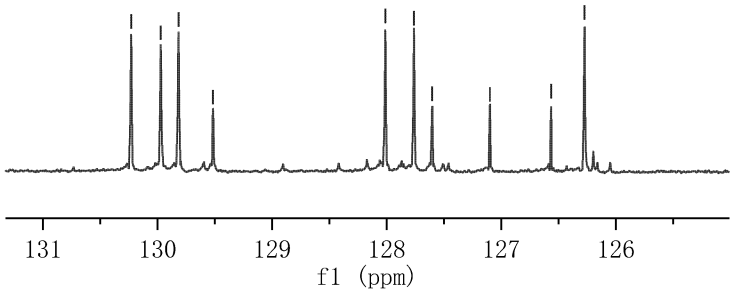
3l

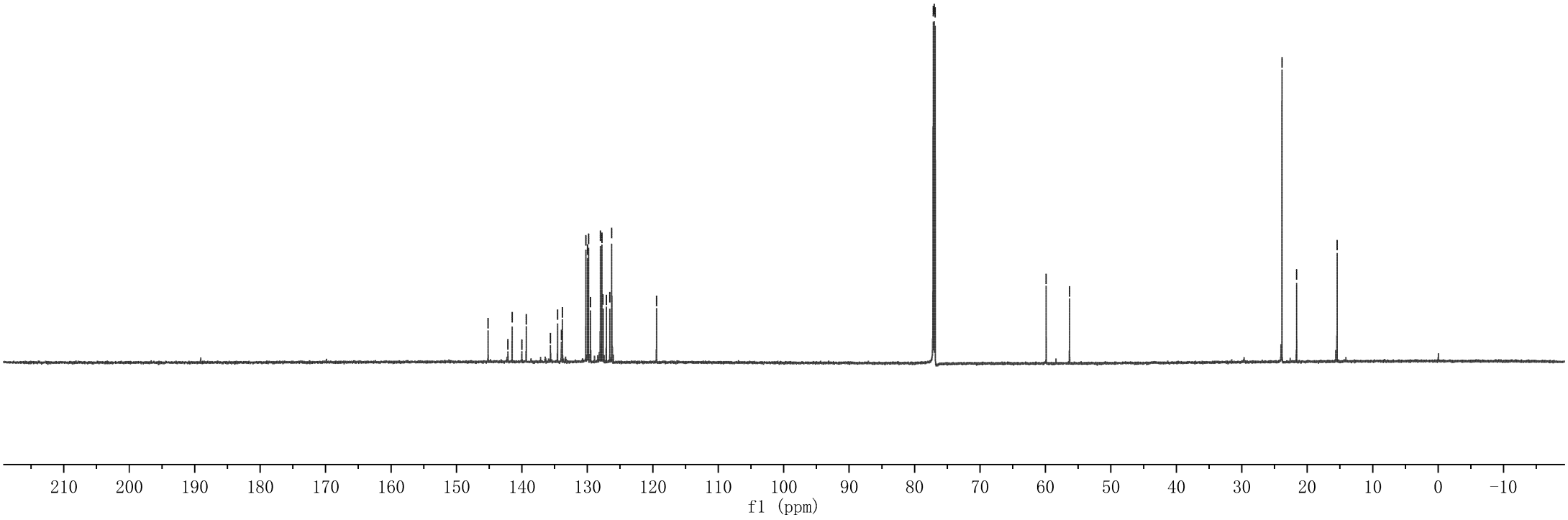
130.23
129.97
129.82
129.52

128.01
127.76
127.60

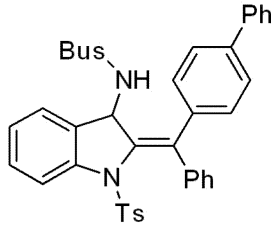
127.10

126.57
126.27

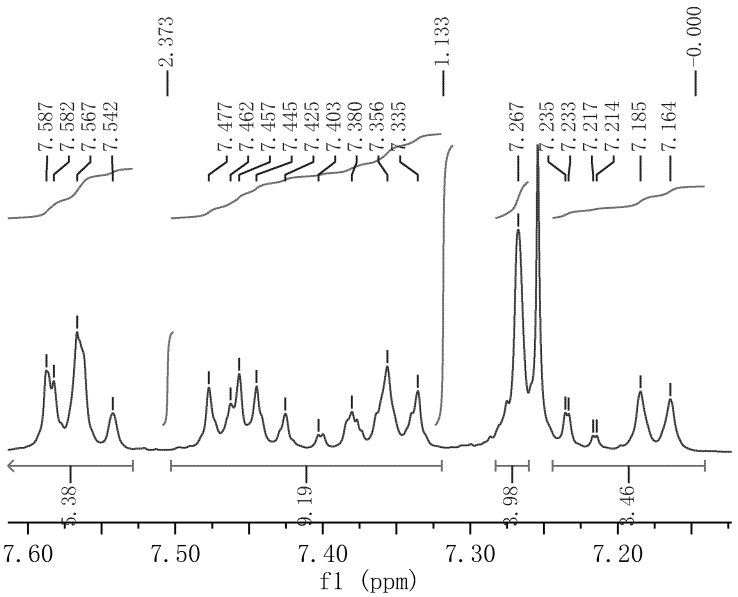


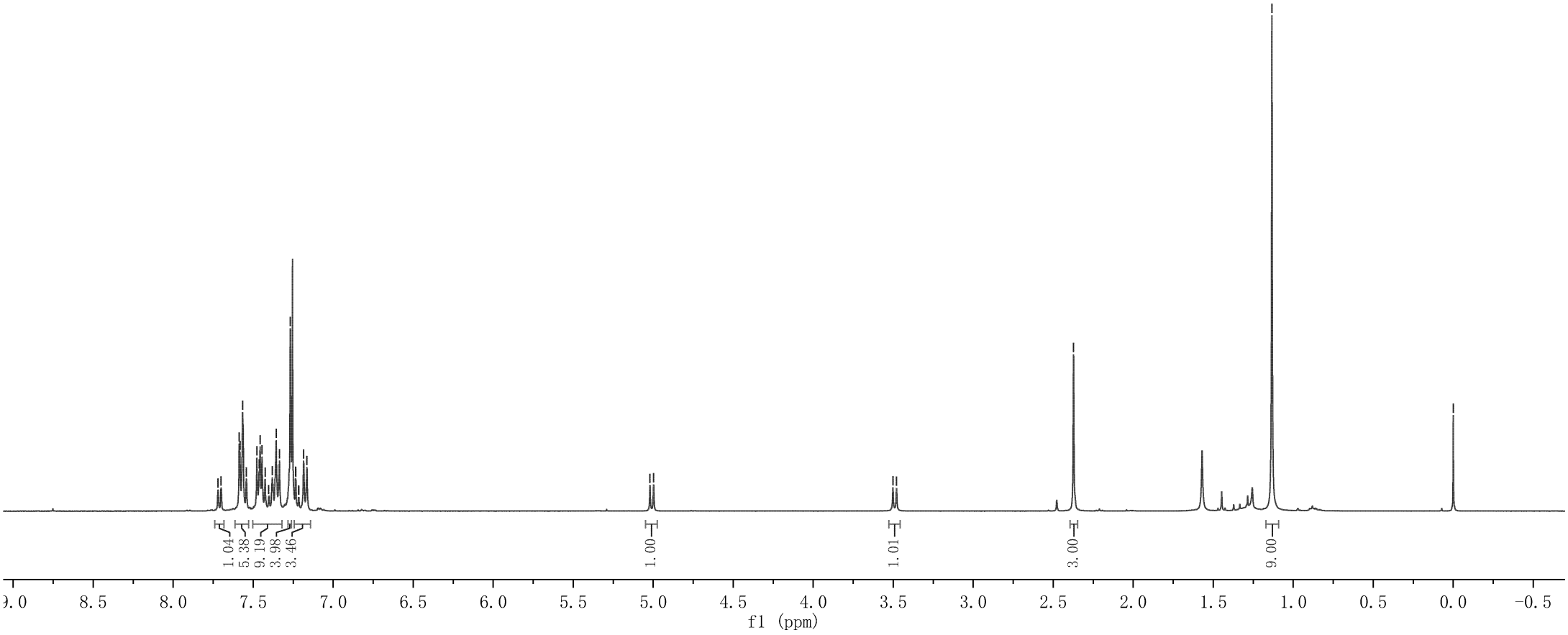


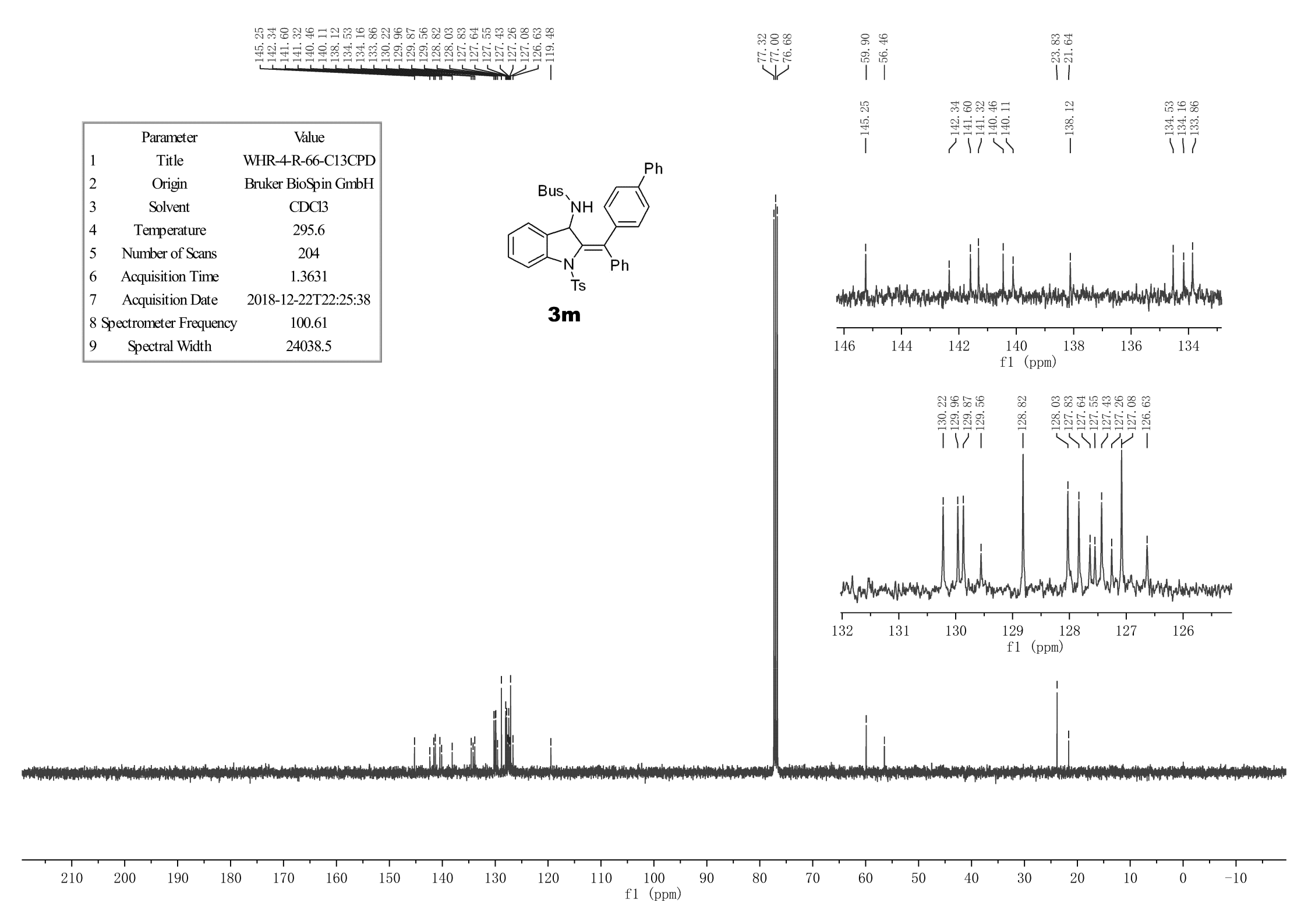
	Parameter	Value
1	Title	WHR-4-R-66
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.7
5	Number of Scans	12
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-22T22:22:11
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

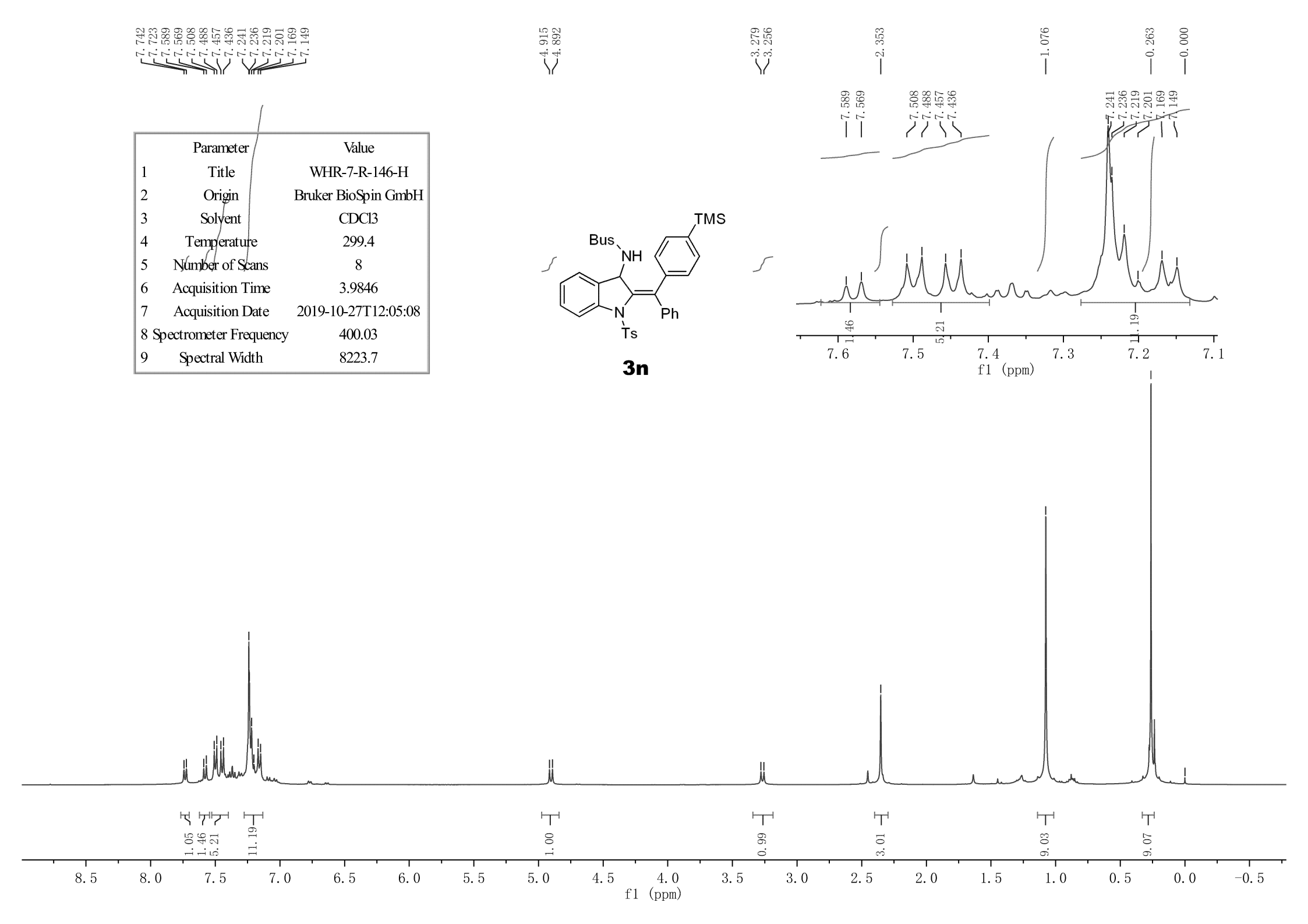


3m

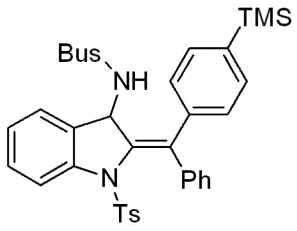




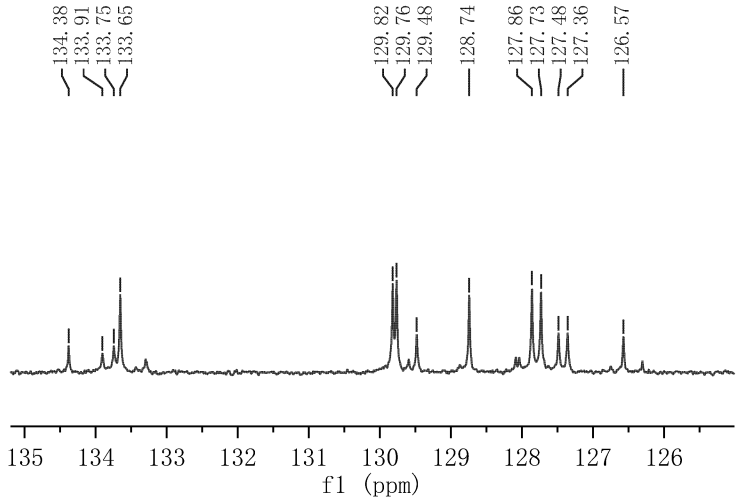

145.25
142.34
141.60
141.32
140.46
140.11
138.12
134.53
134.16
133.86
130.22
129.96
129.87
129.56
128.82
128.03
127.83
127.64
127.55
127.43
127.26
127.08
126.63
119.48
77.32
77.00
76.68
59.90
56.46
23.83
21.64
Parameter Value
1 Title WHR-4-R-66-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.6
5 Number of Scans 204
6 Acquisition Time 1.3631
7 Acquisition Date 2018-12-22T22:25:38
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
Bus
NH
Ph
N
Ts
Ph
3m
f1 (ppm)
f1 (ppm)
f1 (ppm)


7.742
7.723
7.589
7.569
7.508
7.488
7.457
7.436
7.241
7.236
7.219
7.201
7.169
7.149
4.915
4.892
3.279
3.256
2.353
1.076
0.263
0.000
Parameter Value
1 Title WHR-7-R-146-H
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 299.4
5 Number of Scans 8
6 Acquisition Time 3.9846
7 Acquisition Date 2019-10-27T12:05:08
8 Spectrometer Frequency 400.03
9 Spectral Width 8223.7
Bus
NH
TMS
Ph
N
Ts
3n
1.46
5.21
1.19
f1 (ppm)
1.05
1.46
5.21
11.19
1.00
0.99
3.01
9.03
9.07
f1 (ppm)

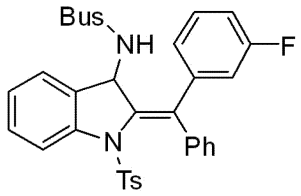
	Parameter	Value
1	Title	WHR-7-R-146-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	299.4
5	Number of Scans	8
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-27T12:09:07
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



3n



	Parameter	Value
1	Title	WHR-4-R-60
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.8
5	Number of Scans	11
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-20T14:53:15
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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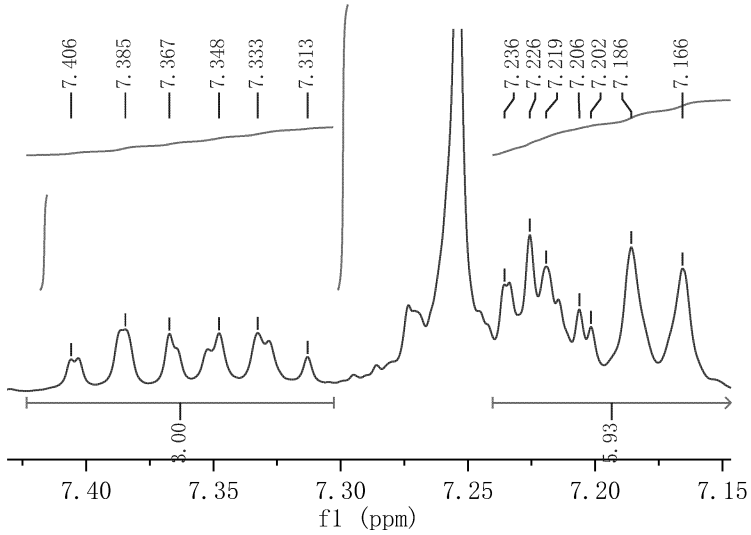
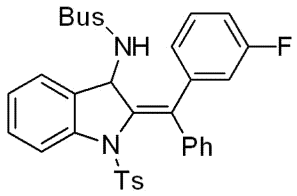
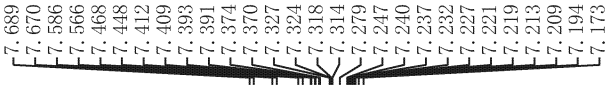


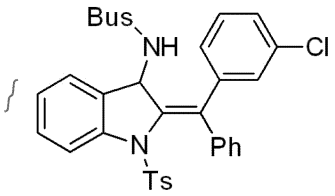
	Parameter	Value
1	Title	WHR-4-R-60-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.6
5	Number of Scans	108
6	Acquisition Time	1.3631
7	Acquisition Date	2018-12-21T14:50:34
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



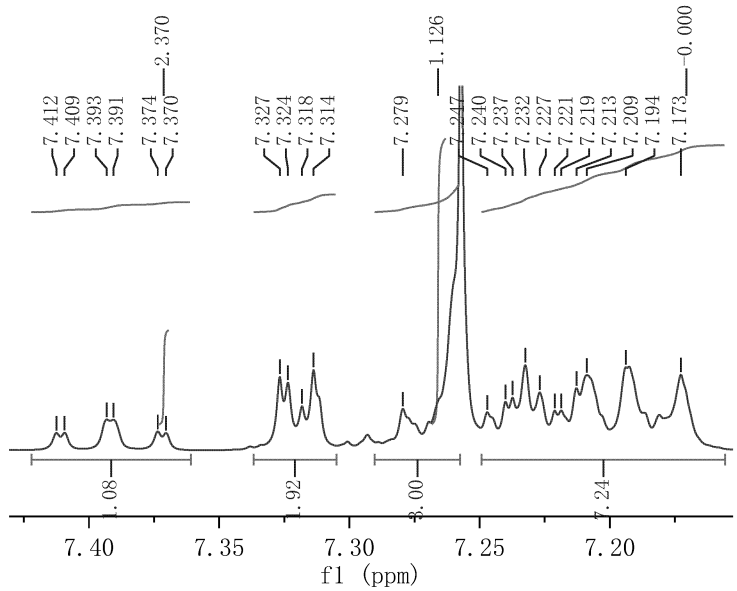
3o

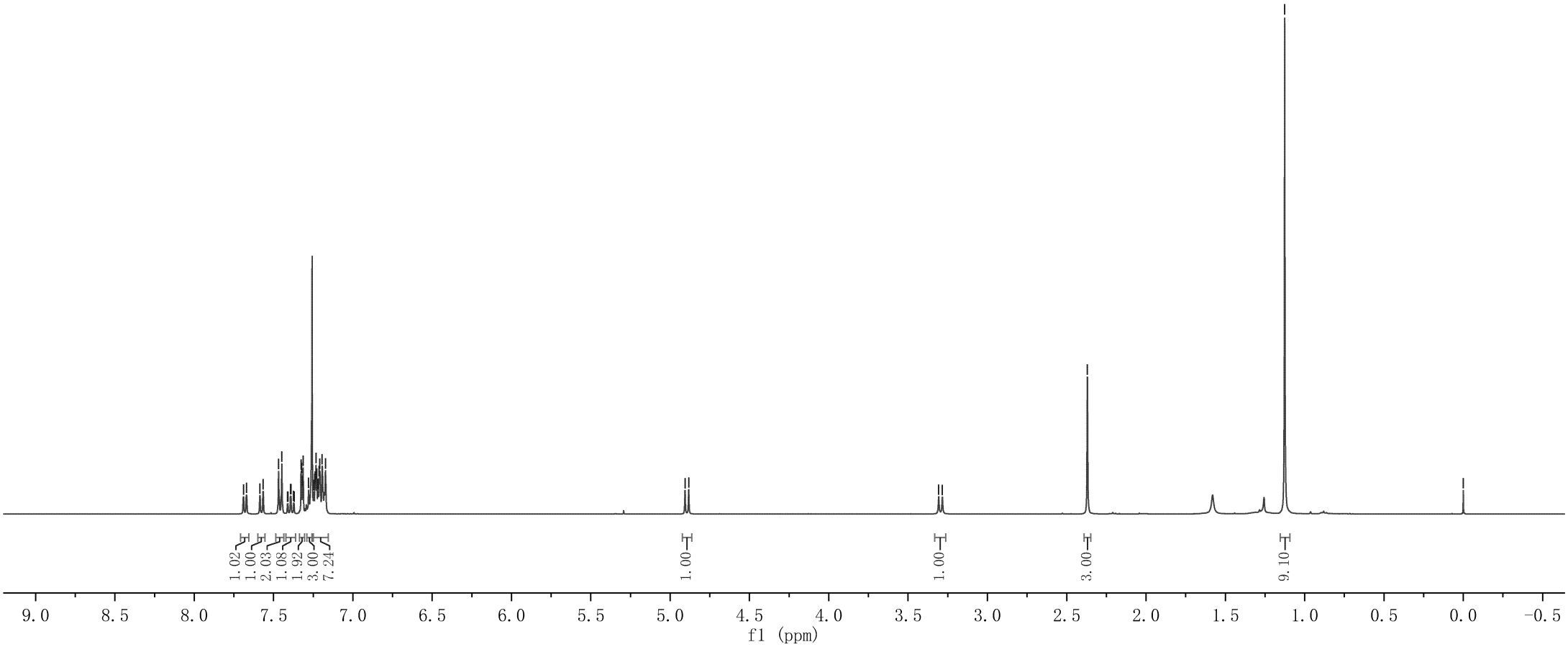


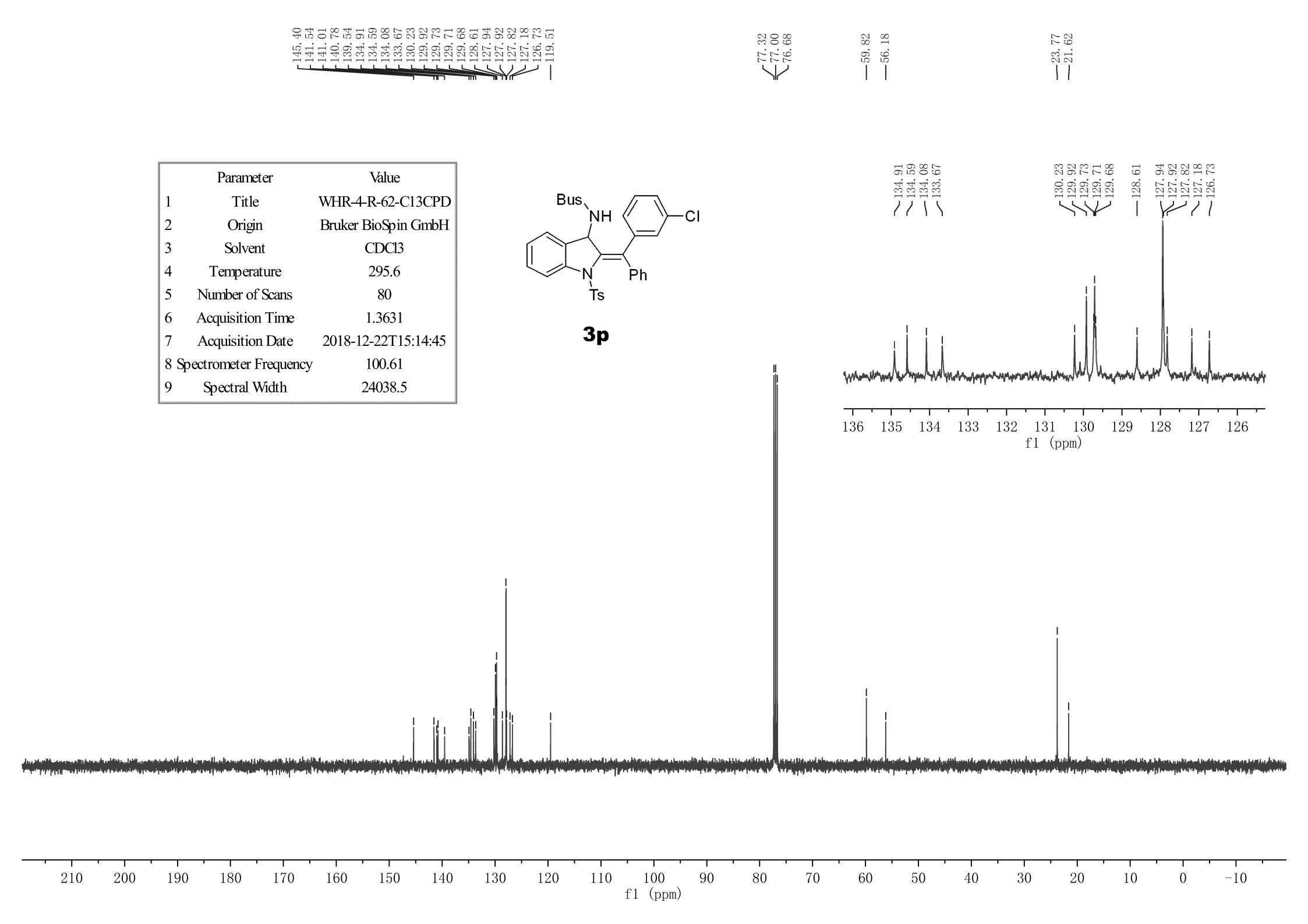
	Parameter	Value
1	Title	WHR-4-R-62
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	296.0
5	Number of Scans	15
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-29T15:25:37
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

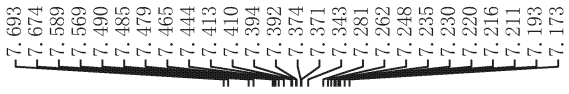


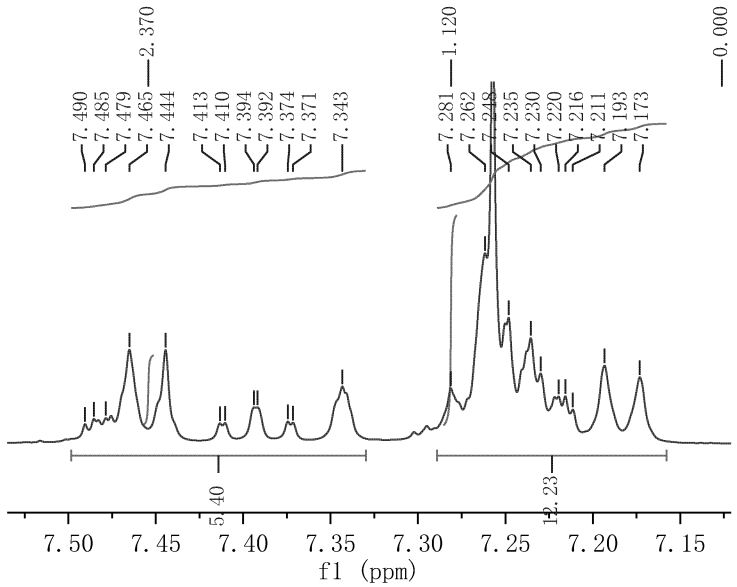
3p



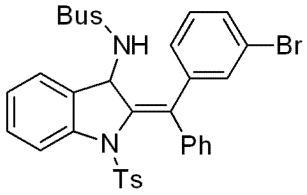



145.40
141.54
141.01
140.78
139.54
134.91
134.59
134.08
133.67
130.23
129.92
129.73
129.71
129.68
128.61
127.94
127.92
127.82
127.18
126.73
119.51
77.32
77.00
76.68
59.82
56.18
23.77
21.62
Parameter Value
1 Title WHR-4-R-62-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.6
5 Number of Scans 80
6 Acquisition Time 1.3631
7 Acquisition Date 2018-12-22T15:14:45
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
Bus
NH
Cl
Ph
N
Ts
3p
f1 (ppm)

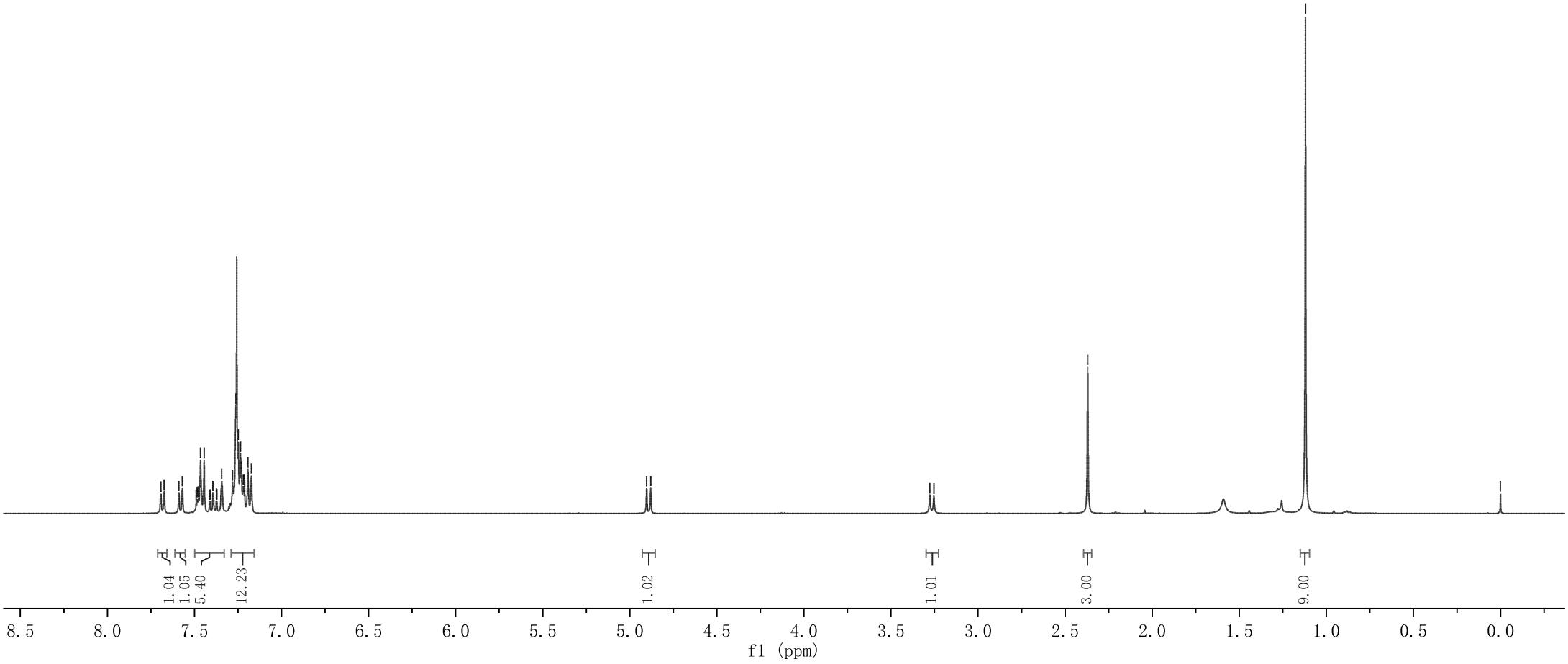


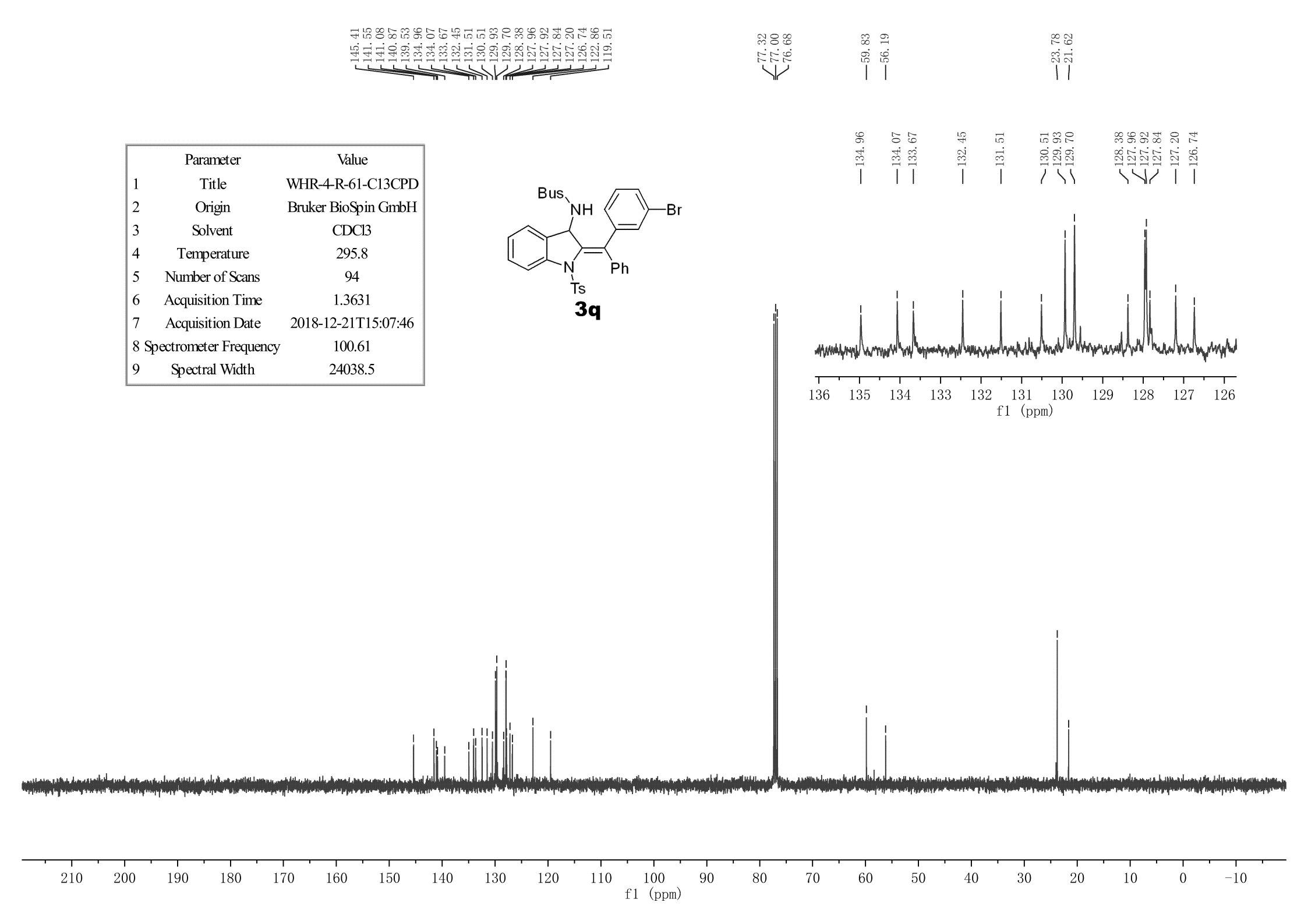


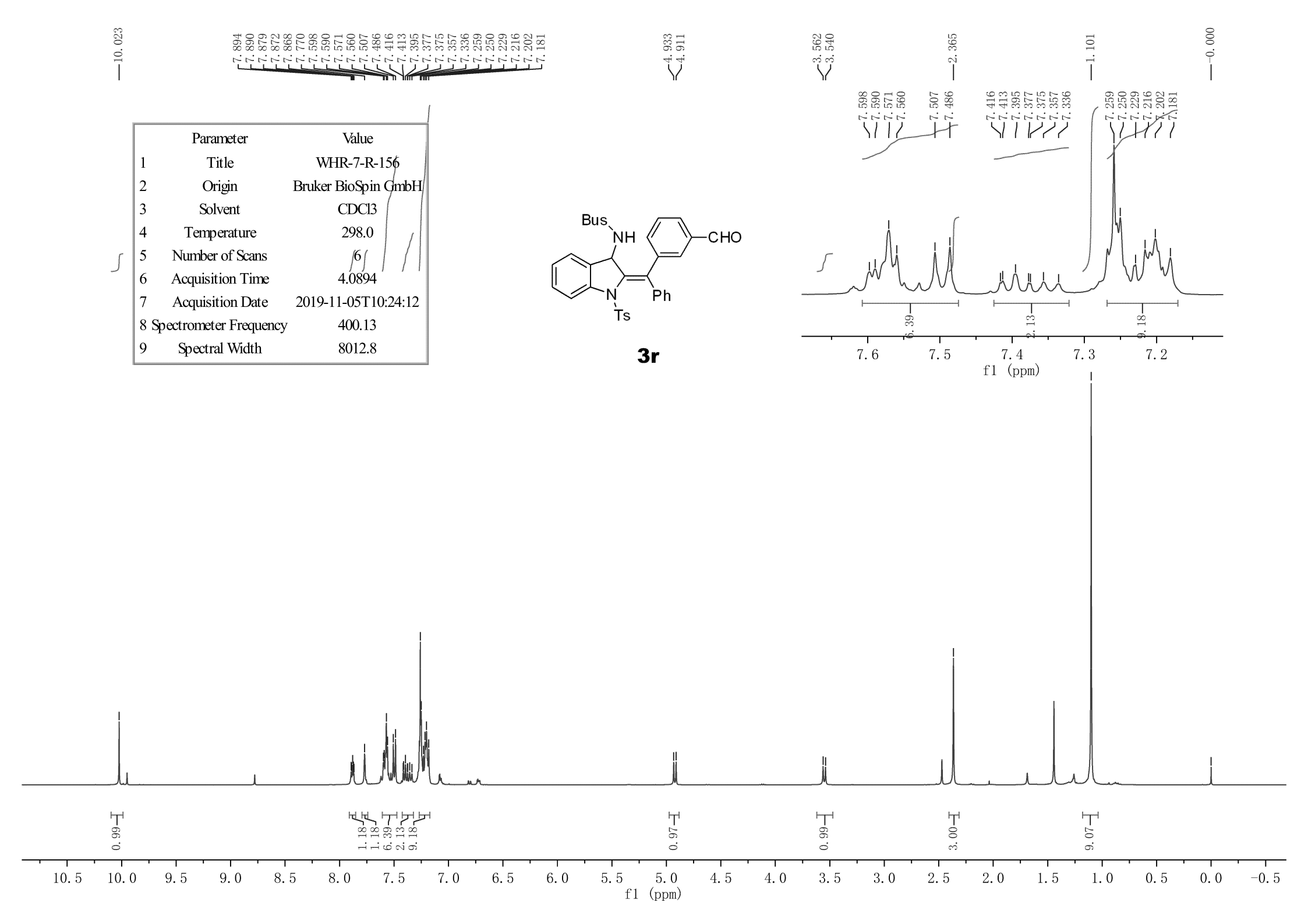
	Parameter	Value
1	Title	WHR-4-R-61-PURE-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.9
5	Number of Scans	9
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-29T15:43:08
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



3q

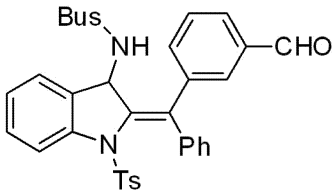



145.41
141.55
141.08
140.87
139.53
134.96
134.07
133.67
132.45
131.51
130.51
129.93
129.70
128.38
127.96
127.92
127.84
127.20
126.74
122.86
119.51
77.32
77.00
76.68
59.83
56.19
23.78
21.62
Parameter Value
1 Title WHR-4-R-61-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.8
5 Number of Scans 94
6 Acquisition Time 1.3631
7 Acquisition Date 2018-12-21T15:07:46
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
Bus
NH
Br
Ph
N
Ts
3q
134.96
134.07
133.67
132.45
131.51
130.51
129.93
129.70
128.38
127.96
127.92
127.84
127.20
126.74
136 135 134 133 132 131 130 129 128 127 126
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

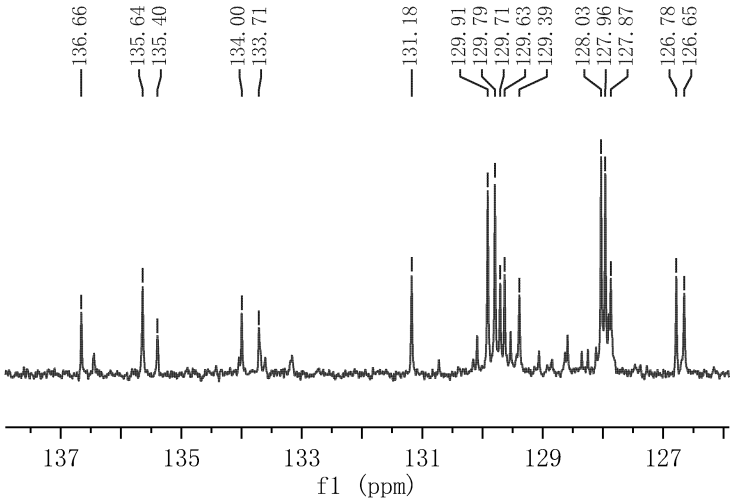

10.023
7.894
7.890
7.879
7.872
7.868
7.770
7.598
7.590
7.571
7.560
7.507
7.486
7.416
7.413
7.395
7.377
7.375
7.357
7.336
7.259
7.250
7.229
7.216
7.202
7.181
4.933
4.911
3.562
3.540
2.365
1.101
0.000
Parameter Value
1 Title WHR-7-R-156
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 6
6 Acquisition Time 4.0894
7 Acquisition Date 2019-11-05T10:24:12
8 Spectrometer Frequency 400.13
9 Spectral Width 8012.8
Bus
NH
CHO
Ph
N
Ts
3r
6.39
2.13
9.18
f1 (ppm)
0.99
1.18
1.18
6.39
2.13
9.18
0.97
0.99
3.00
9.07
f1 (ppm)

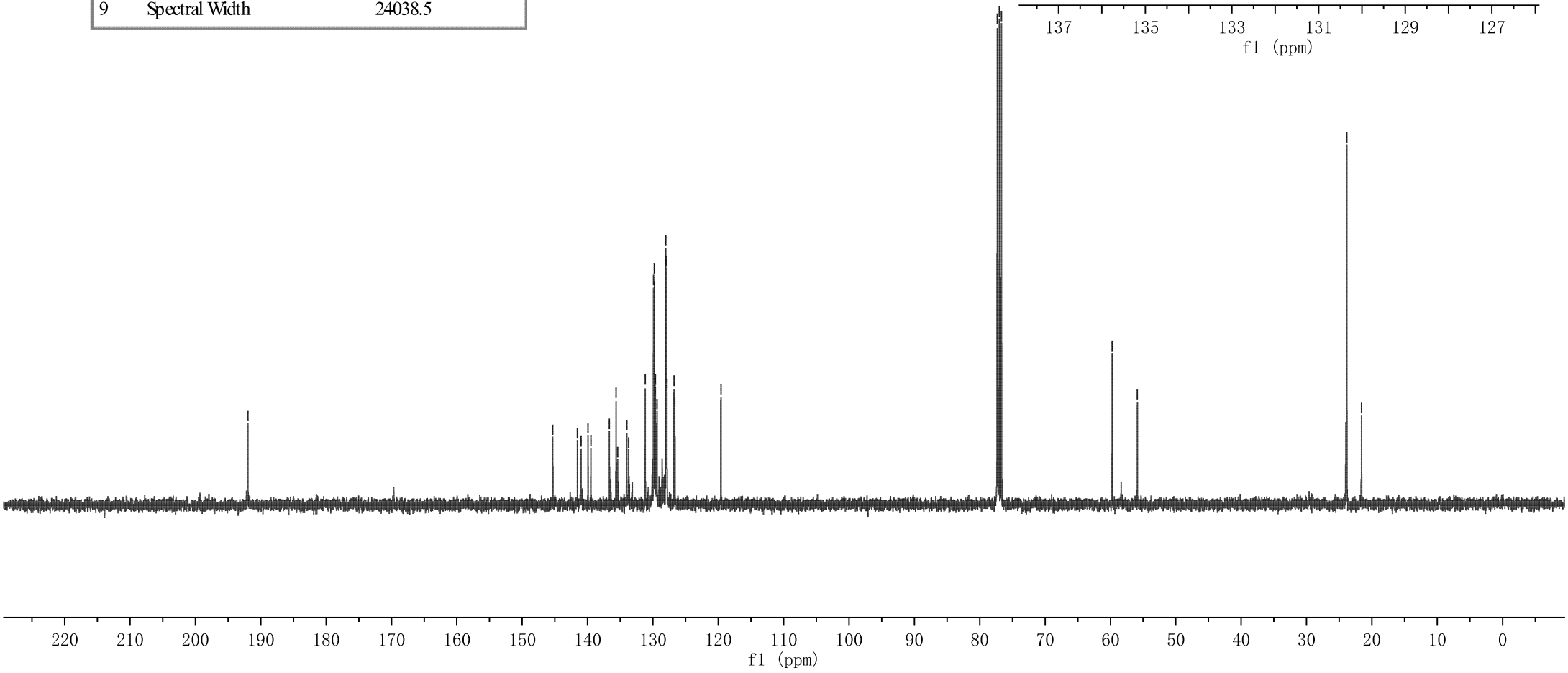
191.98
145.32
141.55
141.00
139.93
139.49
136.66
135.64
135.40
134.00
133.71
131.18
129.91
129.79
129.71
129.63
129.39
128.03
127.96
127.87
126.78
126.65
119.60
77.32
77.00
76.68
59.74
55.88
23.84
21.59

	Parameter	Value
1	Title	WHR-7-R-150-3-CHO-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	106
6	Acquisition Time	1.3631
7	Acquisition Date	2020-01-04T20:28:19
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5

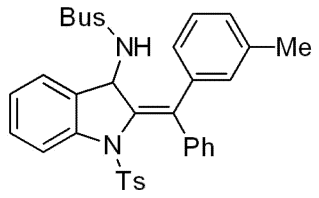


3r

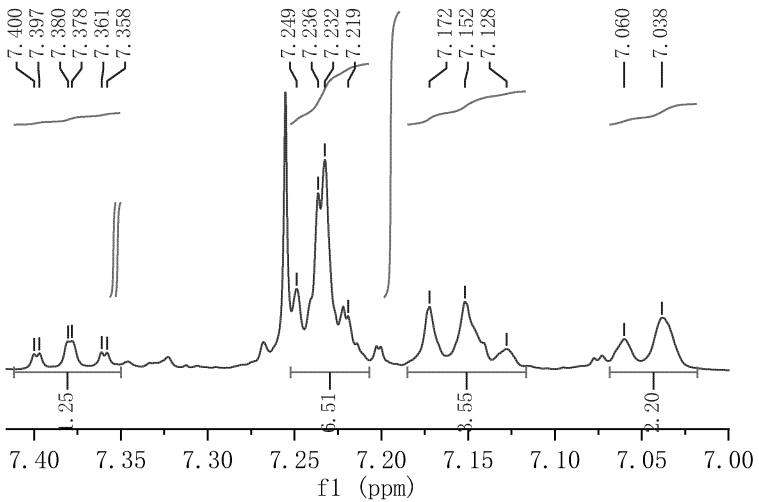


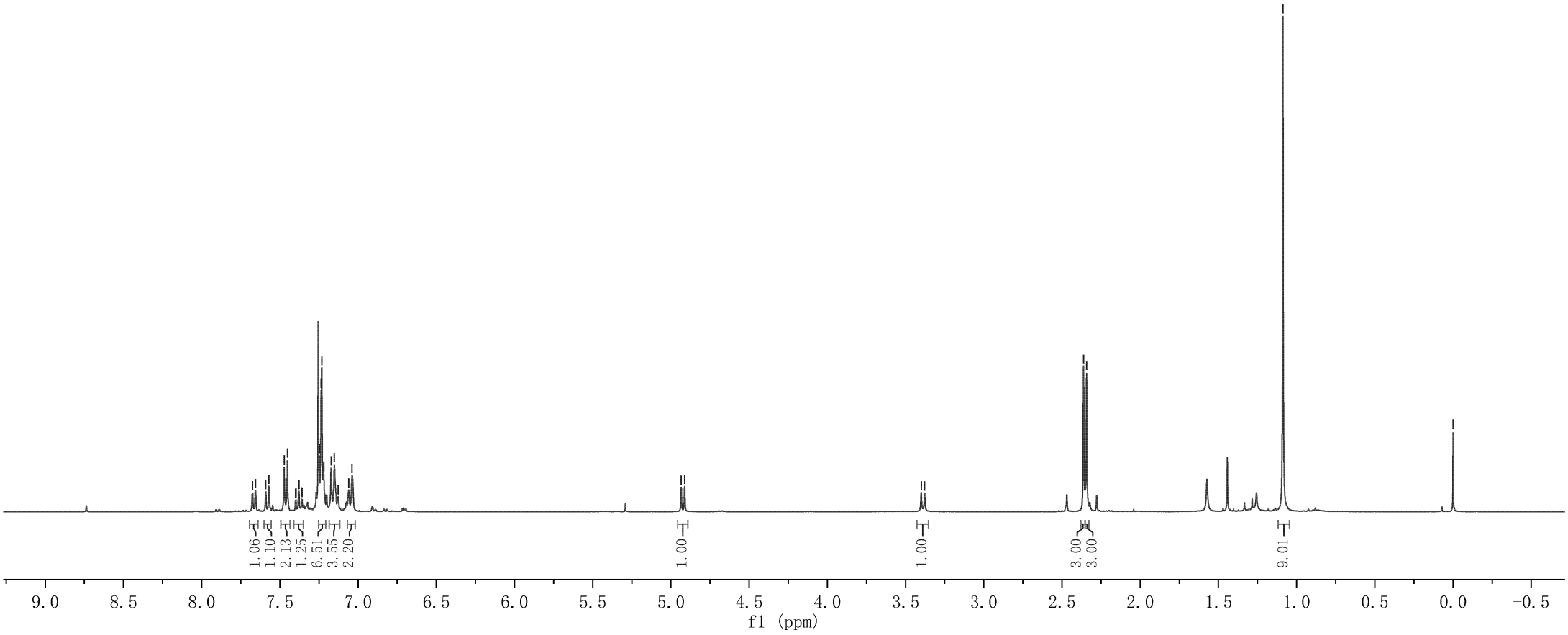


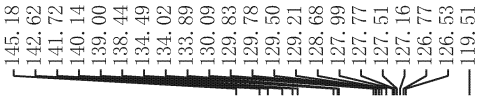
	Parameter	Value
1	Title	WHR-4-R-65
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.9
5	Number of Scans	12
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-22T15:27:00
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



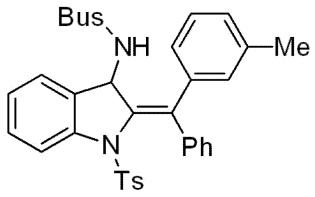
3s



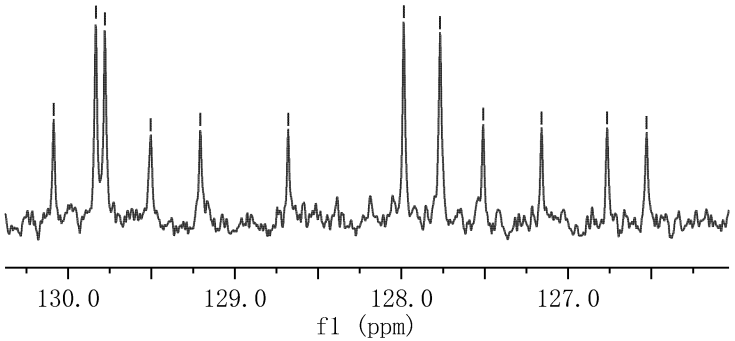


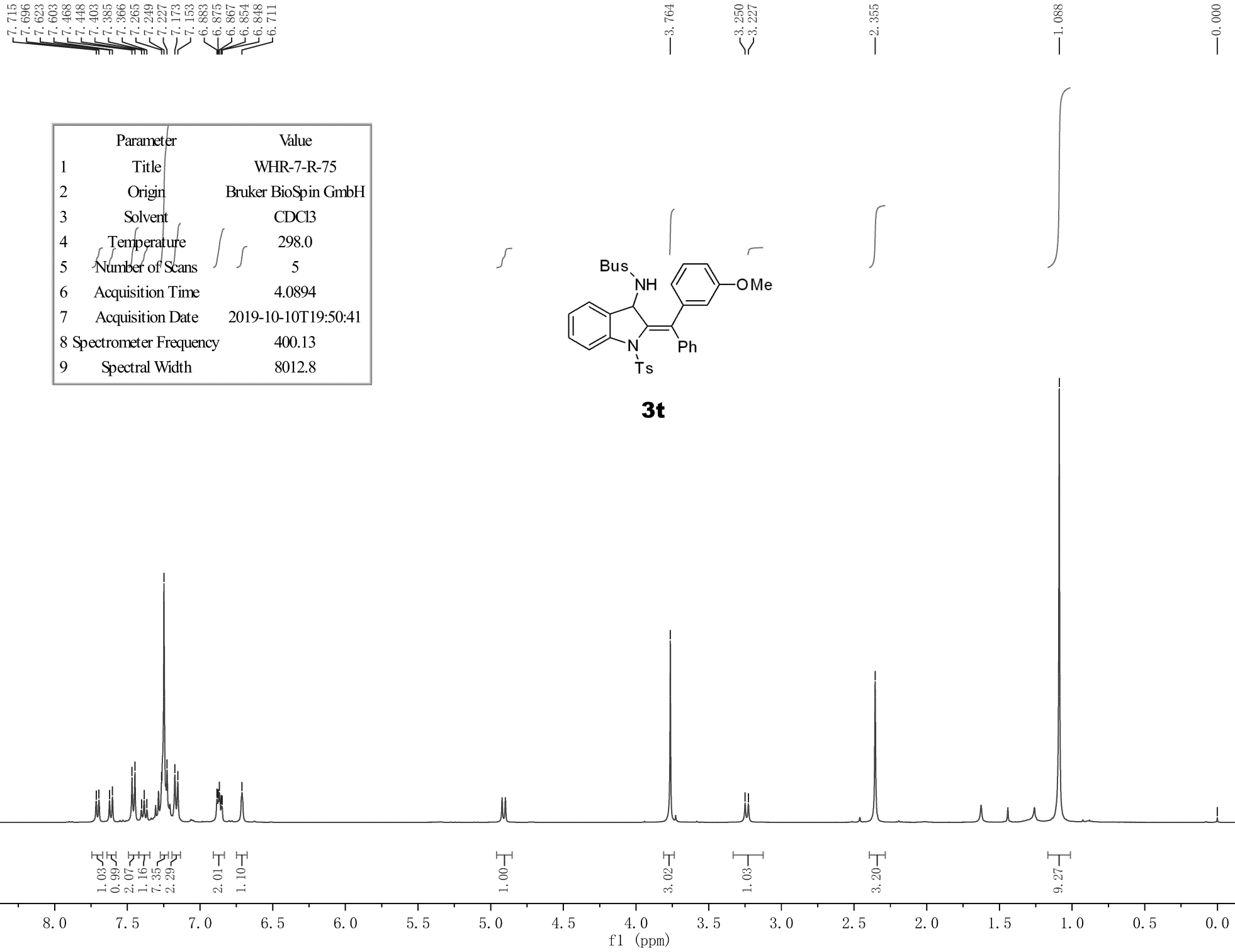


	Parameter	Value
1	Title	WHR-4-R-65-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	296.1
5	Number of Scans	190
6	Acquisition Time	1.3631
7	Acquisition Date	2018-12-22T15:30:07
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



3s

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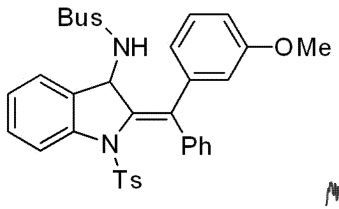
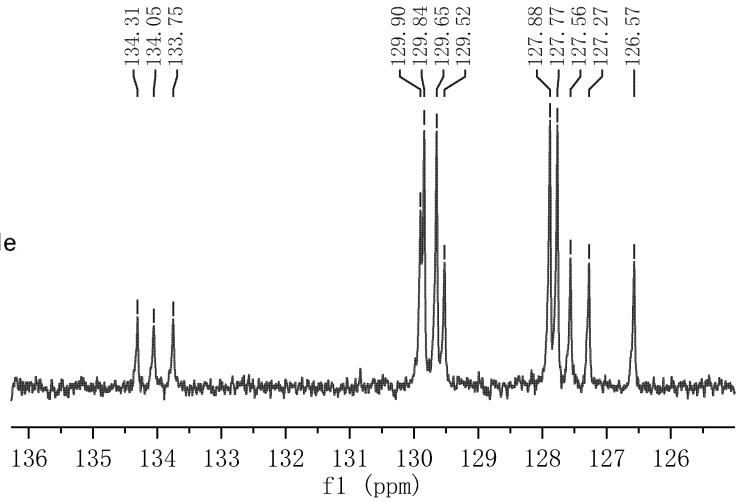
7.696
7.623
7.603
7.468
7.448
7.403
7.385
7.366
7.265
7.249
7.227
7.173
7.153
6.883
6.875
6.867
6.854
6.848
6.711
3.764
3.250
3.227
2.355
1.088
0.000
Parameter Value
1 Title WHR-7-R-75
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 5
6 Acquisition Time 4.0894
7 Acquisition Date 2019-10-10T19:50:41
8 Spectrometer Frequency 400.13
9 Spectral Width 8012.8
Bus
NH
OMe
Ph
N
Ts
3t
1.03
0.99
2.07
1.16
7.35
2.29
2.01
1.10
1.00
3.02
1.03
3.20
9.27
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)

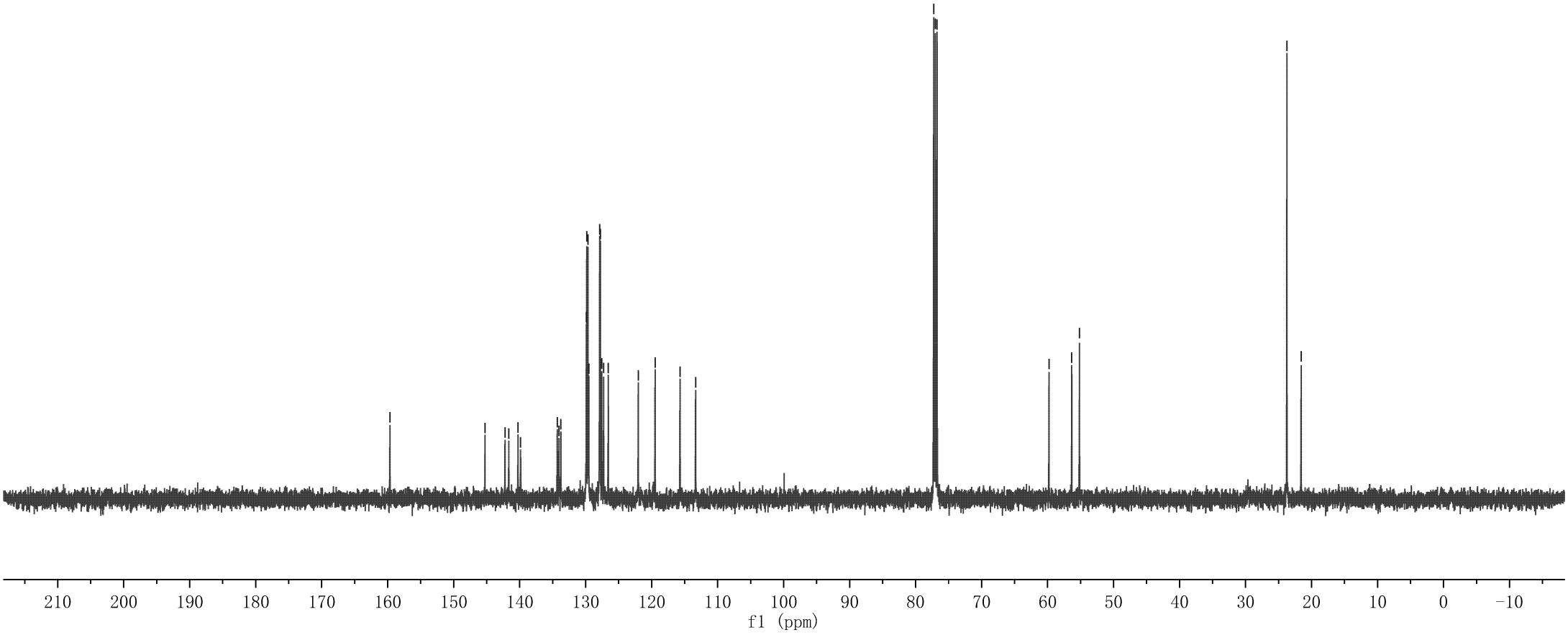
159.66
145.25
142.22
141.65
140.26
139.86
134.31
134.05
133.75
129.90
129.84
129.65
129.52
127.88
127.77
127.56
127.27
126.57
122.02
119.48
115.70
113.34
77.25
77.00
76.75
59.79
56.34
55.17
23.74
21.58

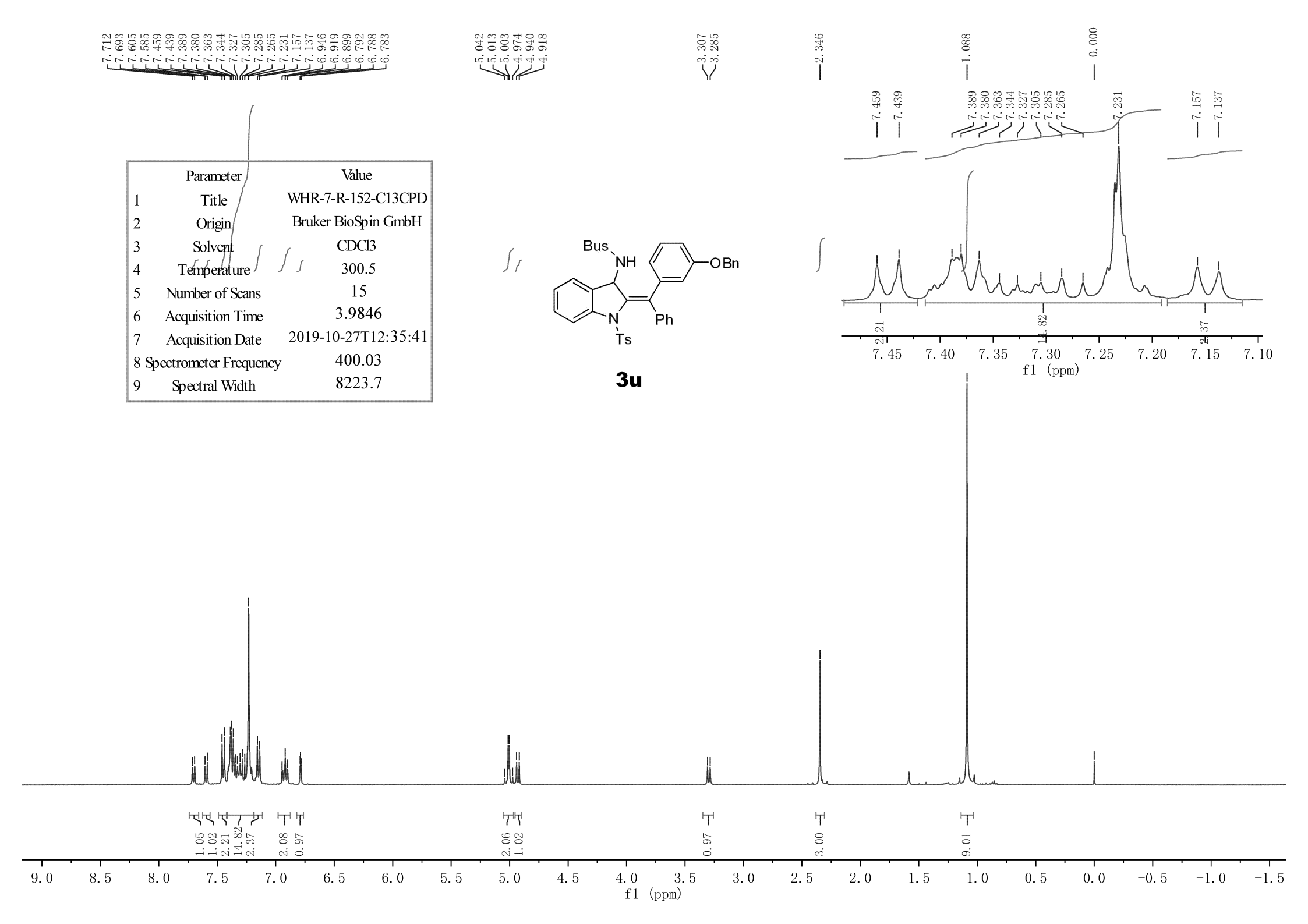
	Parameter	Value
1	Title	WHR-7-R-75-OMe
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.1
5	Number of Scans	130
6	Acquisition Time	1.1010
7	Acquisition Date	2019-10-11T18:04:52
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9



3t






7.712
7.693
7.605
7.585
7.459
7.439
7.389
7.380
7.363
7.344
7.327
7.305
7.285
7.265
7.231
7.157
7.137
6.946
6.919
6.899
6.792
6.788
6.783
5.042
5.013
5.003
4.974
4.940
4.918
3.307
3.285
2.346
1.088
0.000
Parameter Value
1 Title WHR-7-R-152-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 300.5
5 Number of Scans 15
6 Acquisition Time 3.9846
7 Acquisition Date 2019-10-27T12:35:41
8 Spectrometer Frequency 400.03
9 Spectral Width 8223.7
Bus
NH
OBn
Ph
N
Ts
3u
f1 (ppm)
1.05
1.02
2.21
14.82
2.37
2.08
0.97
2.06
1.02
0.97
3.00
9.01

158.87
145.23
142.16
141.63
140.32
139.83
136.66
134.35
134.13
133.74
129.90
129.83
129.66
129.52
128.52
127.97
127.91
127.77
127.56
127.25
126.58
122.35
119.48
116.49
114.32

77.32
77.00
76.68

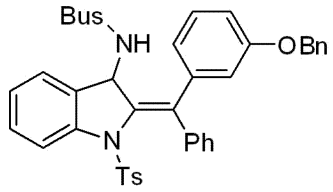
69.98

59.77

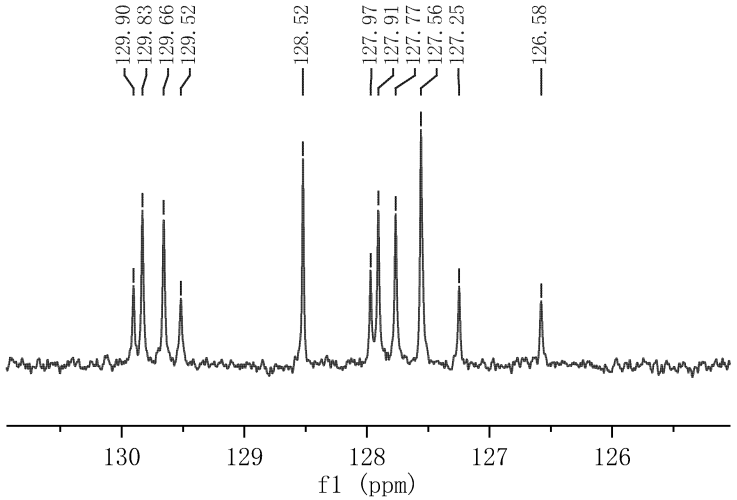
56.29

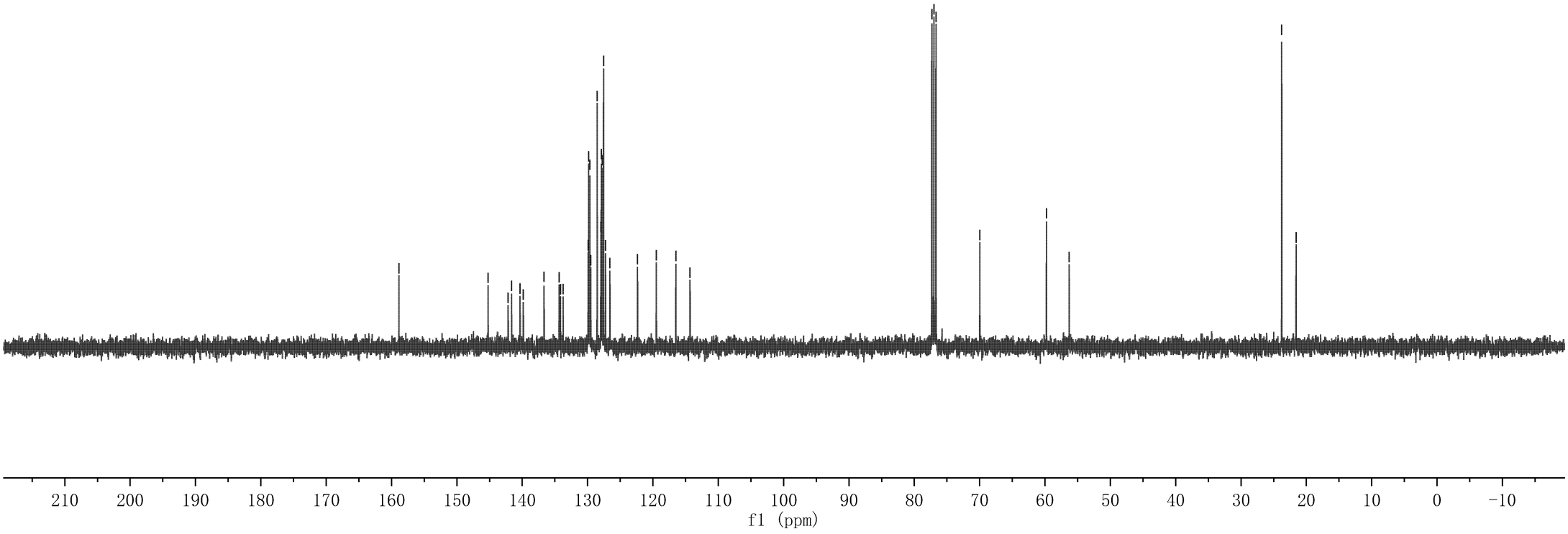
23.77
21.58

	Parameter	Value
1	Title	WHR-7-R-152-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.5
5	Number of Scans	32
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-27T12:37:21
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5

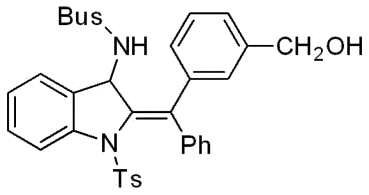


3u

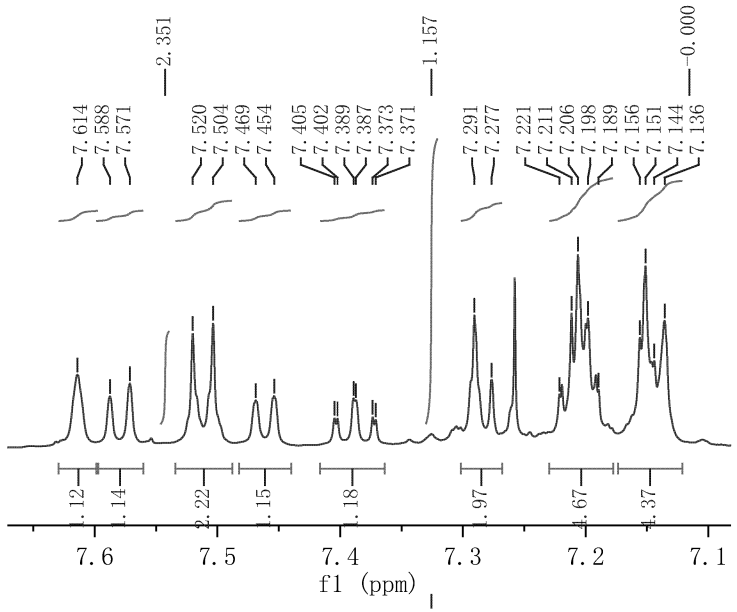


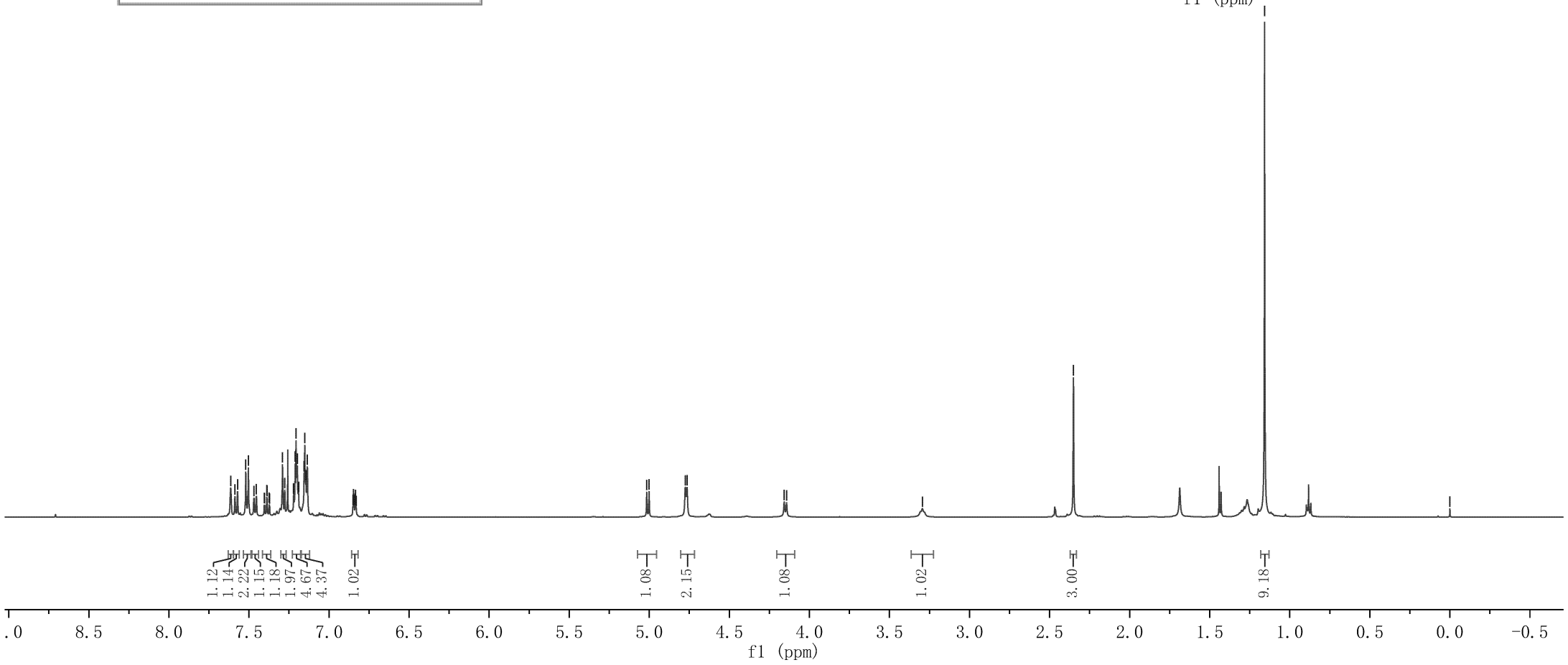


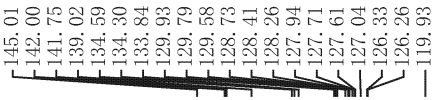
	Parameter	Value
1	Title	WHR-7-R-95-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	299.2
5	Number of Scans	13
6	Acquisition Time	3.1719
7	Acquisition Date	2019-10-12T22:19:41
8	Spectrometer Frequency	500.17
9	Spectral Width	10330.6

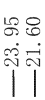


3v

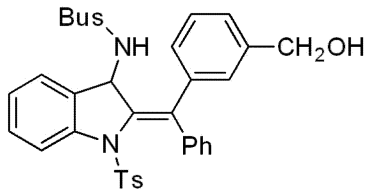




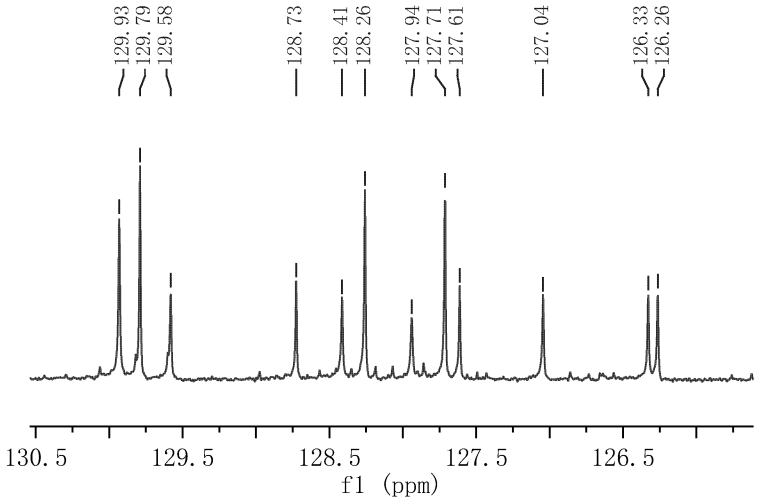


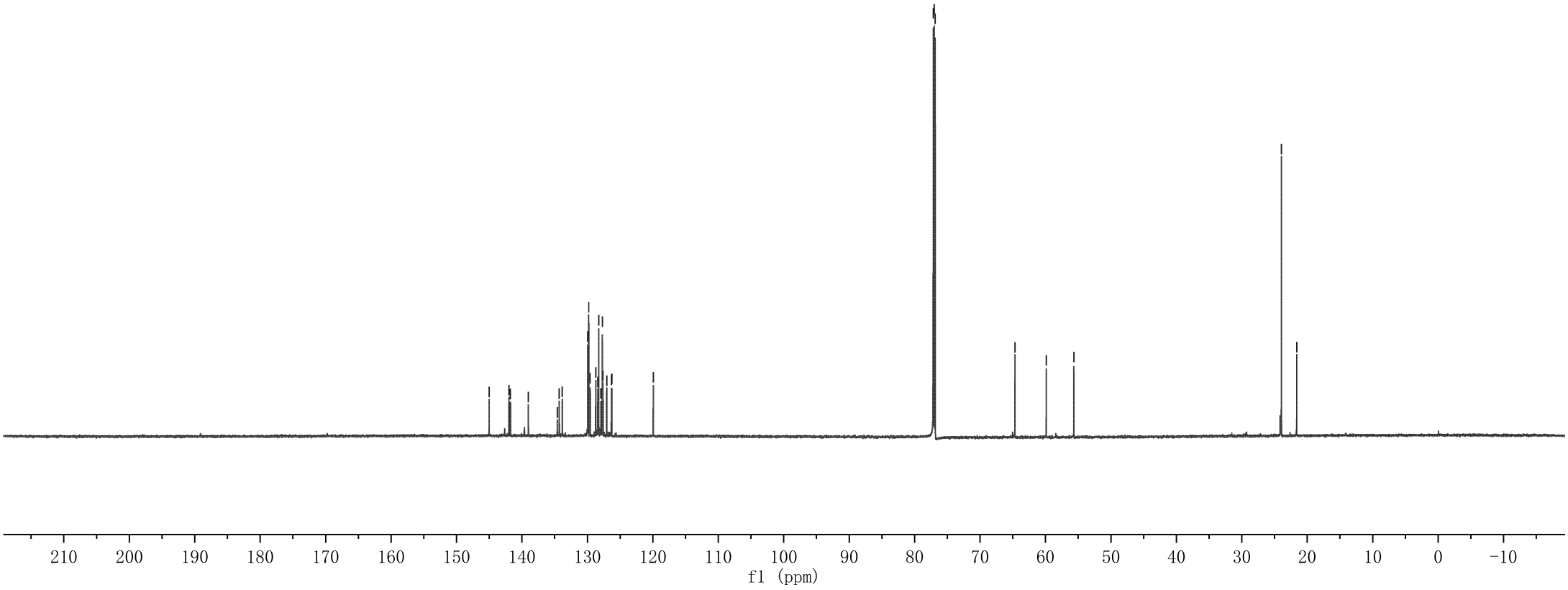


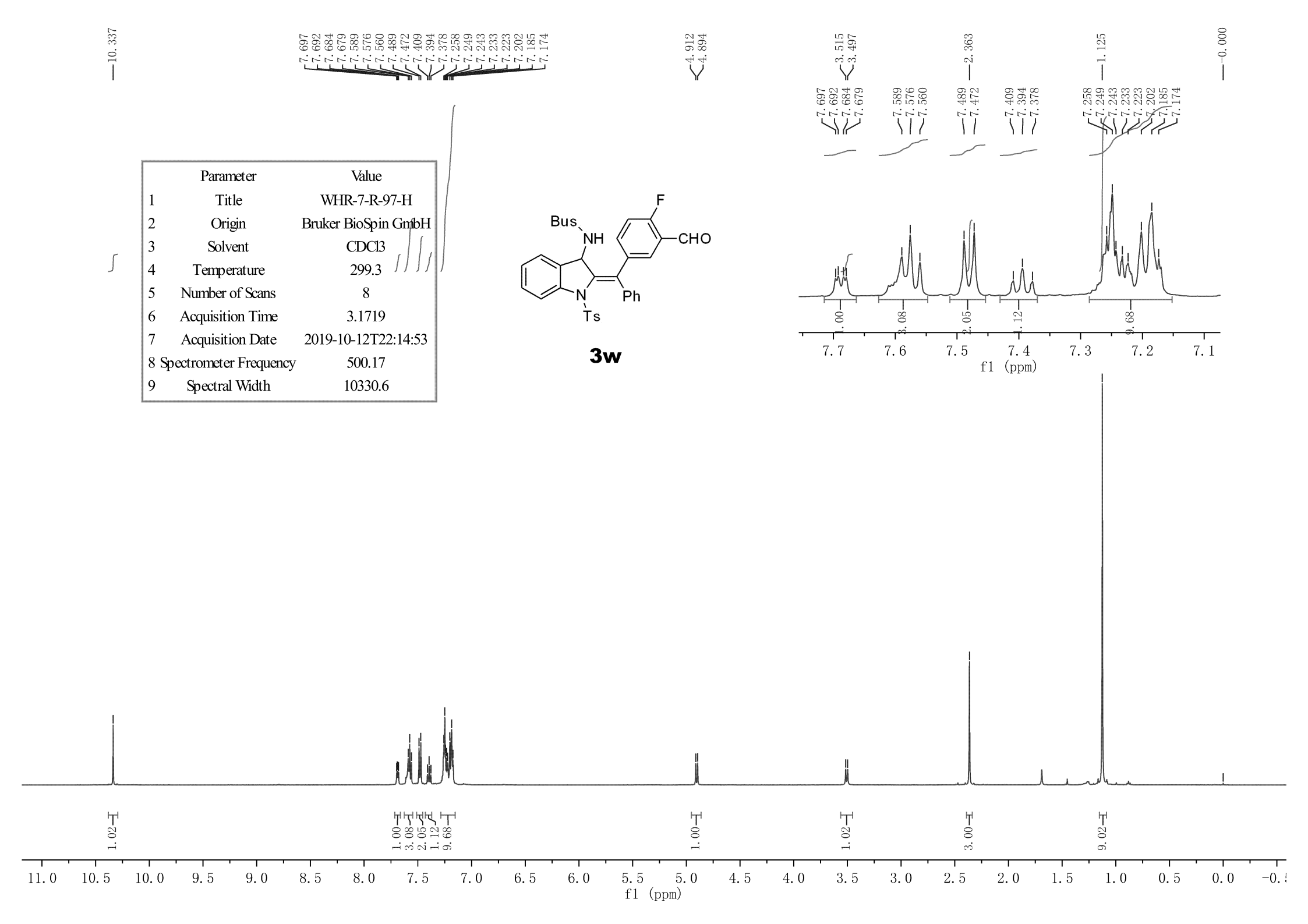
	Parameter	Value
1	Title	95
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	48
6	Acquisition Time	0.6423
7	Acquisition Date	2019-10-29T08:14:07
8	Spectrometer Frequency	213.81
9	Spectral Width	51020.4

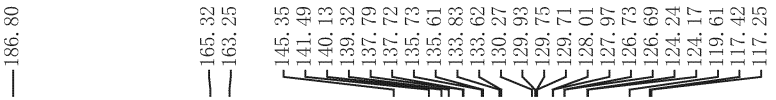


3v

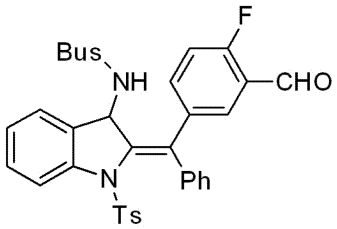




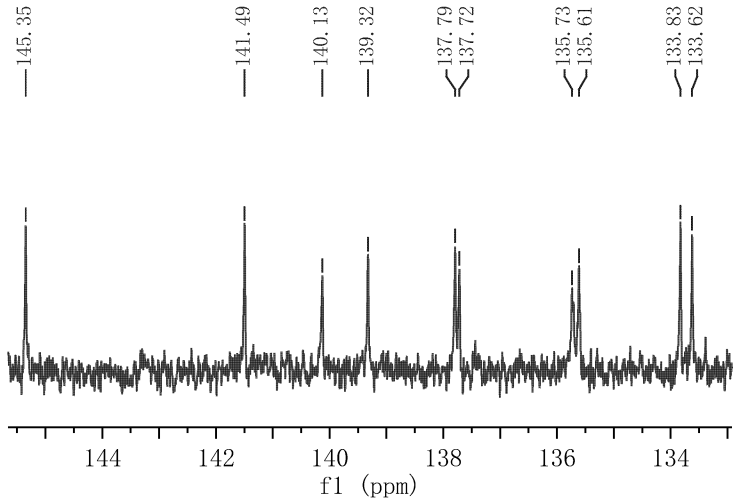

10.337
7.697
7.692
7.684
7.679
7.589
7.576
7.560
7.489
7.472
7.409
7.394
7.378
7.258
7.249
7.243
7.233
7.223
7.202
7.185
7.174
4.912
4.894
3.515
3.497
2.363
1.125
-0.000
Parameter Value
1 Title WHR-7-R-97-H
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 299.3
5 Number of Scans 8
6 Acquisition Time 3.1719
7 Acquisition Date 2019-10-12T22:14:53
8 Spectrometer Frequency 500.17
9 Spectral Width 10330.6
Bus
NH
F
CHO
Ph
N
Ts
3w
1.00
3.08
2.05
1.12
9.68
f1 (ppm)
1.02
1.00
3.08
2.05
1.12
9.68
1.00
1.02
3.00
9.02
f1 (ppm)

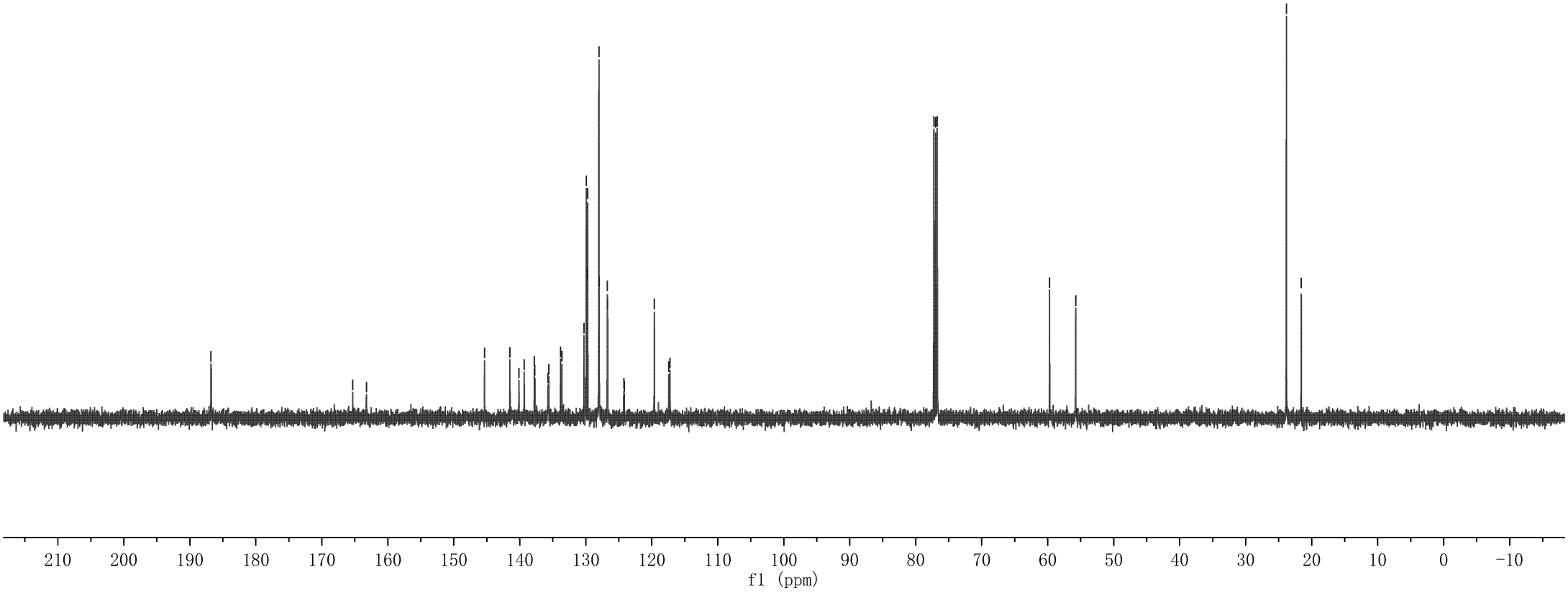


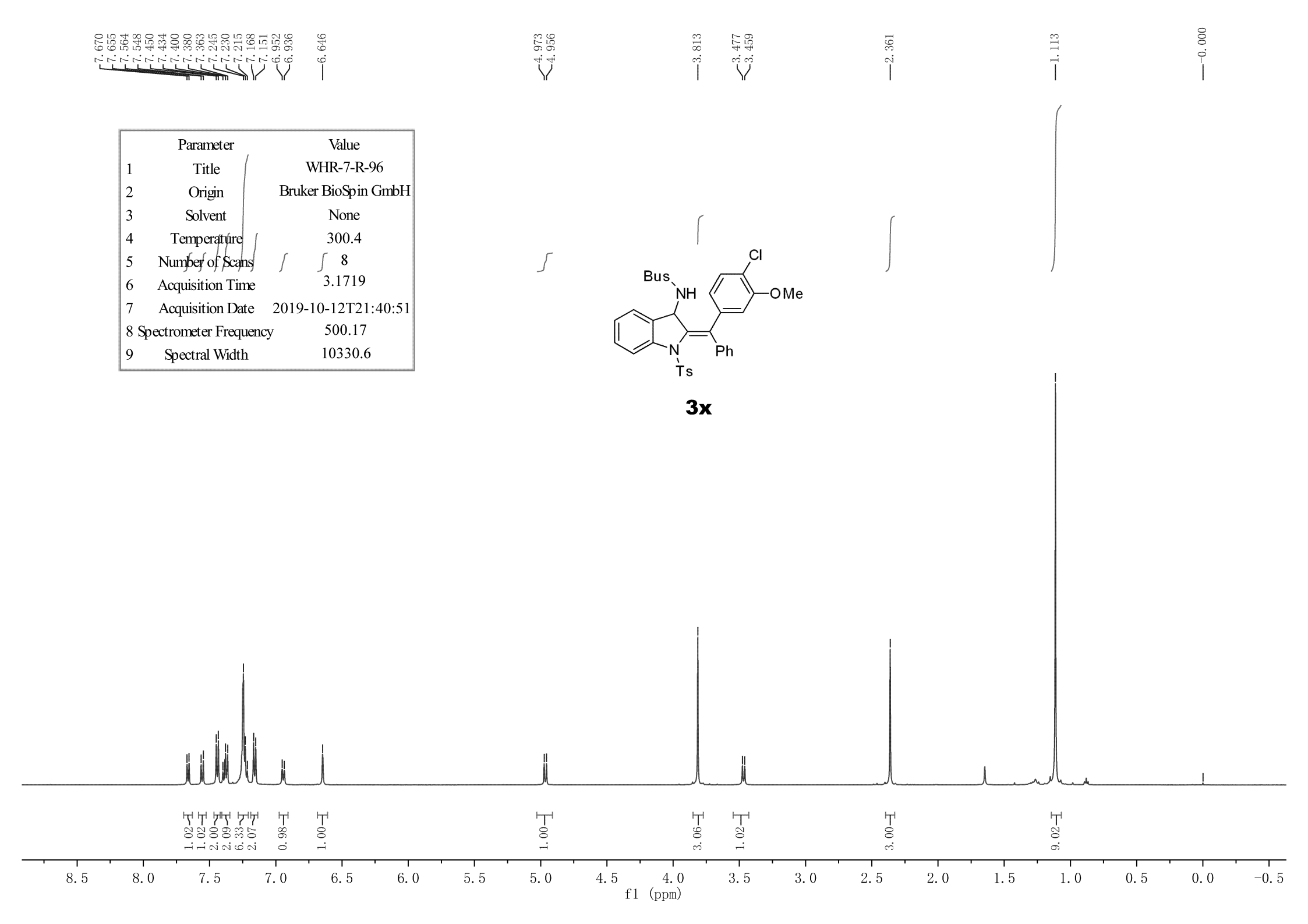
	Parameter	Value
1	Title	WHR-7-R-97
2	Origin	Bruker BioSpin GmbH
3	Solvent	None
4	Temperature	300.3
5	Number of Scans	58
6	Acquisition Time	1.1010
7	Acquisition Date	2019-10-12T21:50:03
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9



3w



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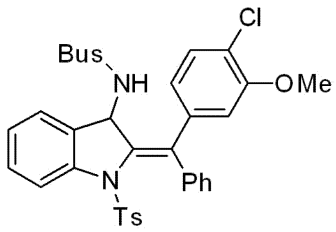
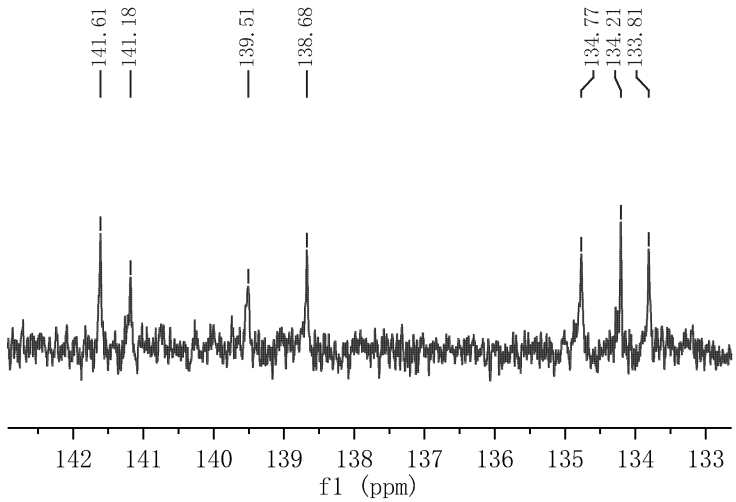
7.434
7.400
7.380
7.363
7.245
7.230
7.215
7.168
7.151
6.952
6.936
6.646
4.973
4.956
3.813
3.477
3.459
2.361
1.113
-0.000
Parameter Value
1 Title WHR-7-R-96
2 Origin Bruker BioSpin GmbH
3 Solvent None
4 Temperature 300.4
5 Number of Scans 8
6 Acquisition Time 3.1719
7 Acquisition Date 2019-10-12T21:40:51
8 Spectrometer Frequency 500.17
9 Spectral Width 10330.6
Bus
NH
Cl
OMe
Ph
N
Ts
3x
1.02
1.02
2.00
2.09
6.33
2.07
0.98
1.00
1.00
3.06
1.02
3.00
9.02
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)

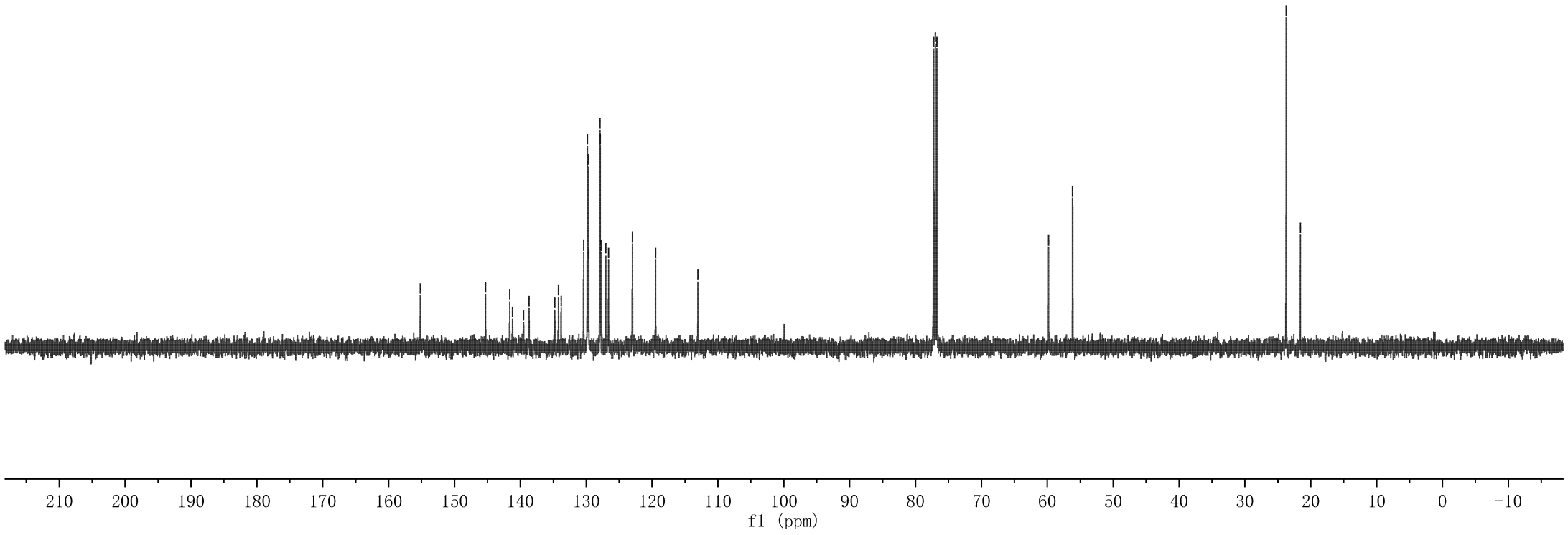
155.19
145.27
141.61
138.68
134.21
133.81
130.39
129.82
129.69
129.62
127.92
127.88
127.78
127.05
126.61
122.98
77.25
77.00
76.75
59.80
56.16
23.73
21.58

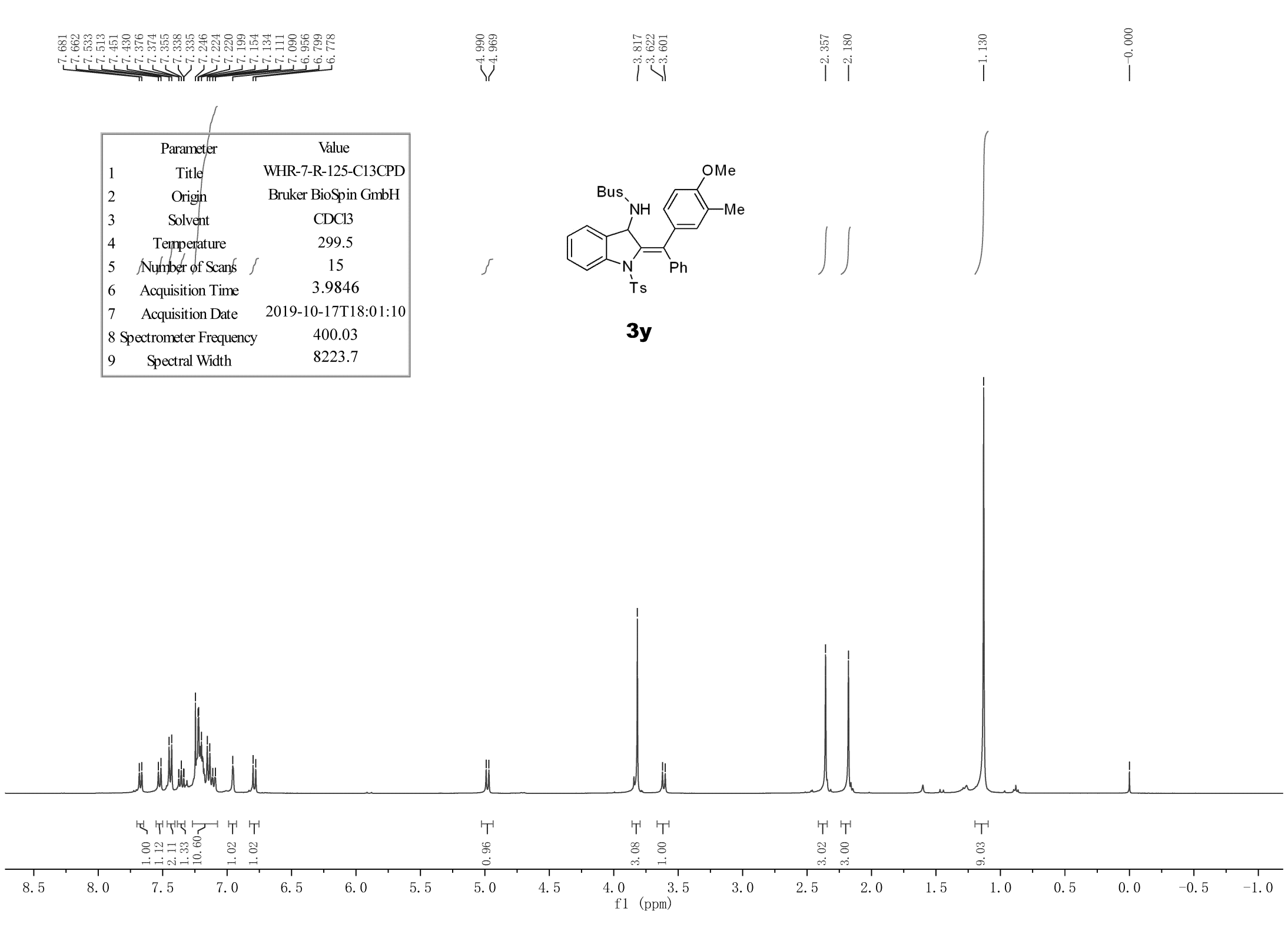
	Parameter	Value
1	Title	WHR-7-R-96
2	Origin	Bruker BioSpin GmbH
3	Solvent	None
4	Temperature	300.4
5	Number of Scans	39
6	Acquisition Time	1.1010
7	Acquisition Date	2019-10-12T21:47:41
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9

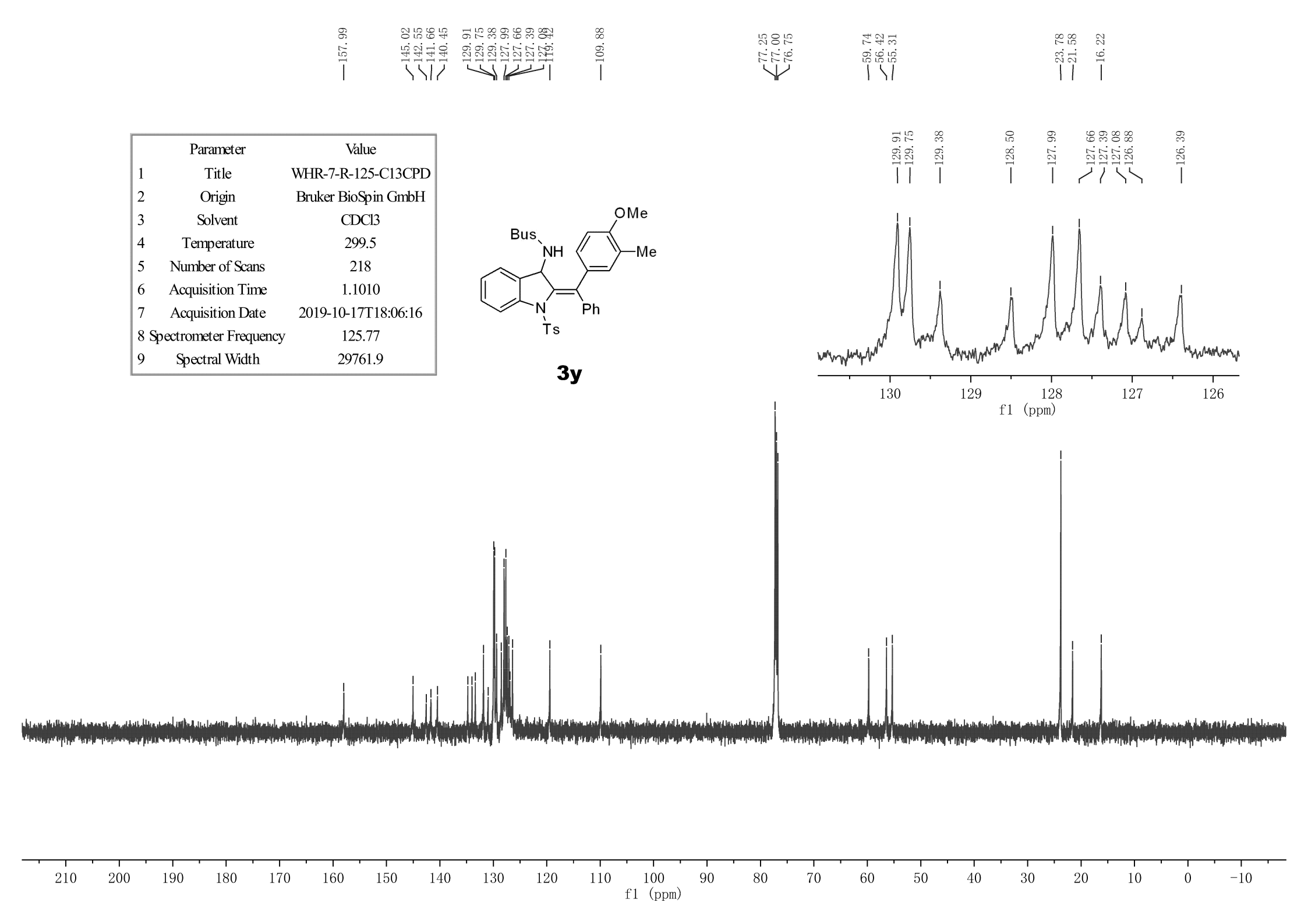


3x

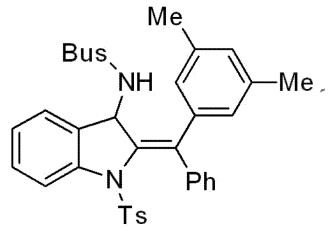




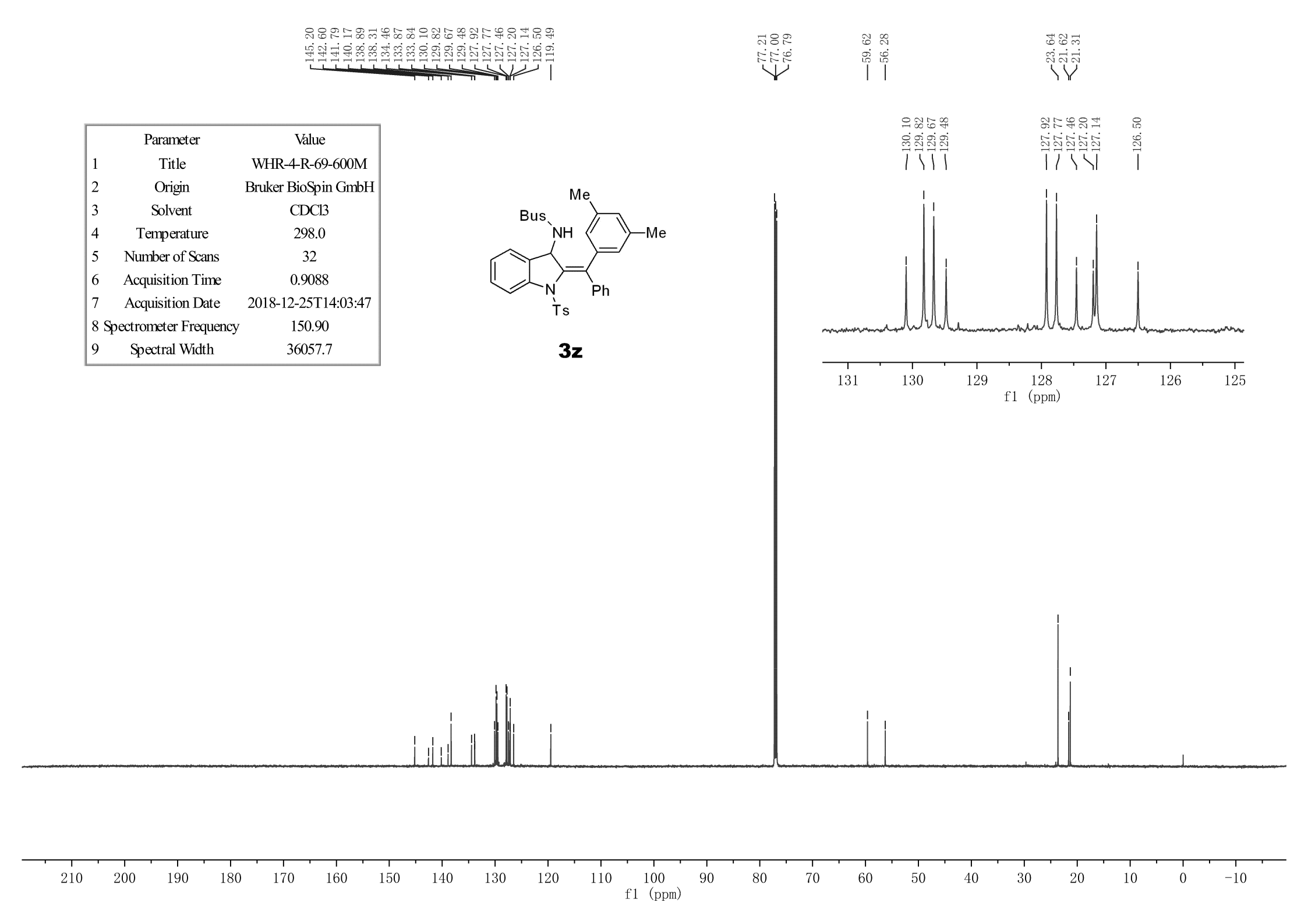

7.681
7.662
7.533
7.513
7.451
7.430
7.376
7.374
7.355
7.338
7.335
7.246
7.224
7.220
7.199
7.154
7.134
7.111
7.090
6.956
6.799
6.778
4.990
4.969
3.817
3.622
3.601
2.357
2.180
1.130
0.000
Parameter Value
1 Title WHR-7-R-125-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 299.5
5 Number of Scans 15
6 Acquisition Time 3.9846
7 Acquisition Date 2019-10-17T18:01:10
8 Spectrometer Frequency 400.03
9 Spectral Width 8223.7
Bus
NH
OMe
Me
Ph
N
Ts
3y
1.00
1.12
2.11
1.33
10.60
1.02
1.02
0.96
3.08
1.00
3.02
3.00
9.03
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)

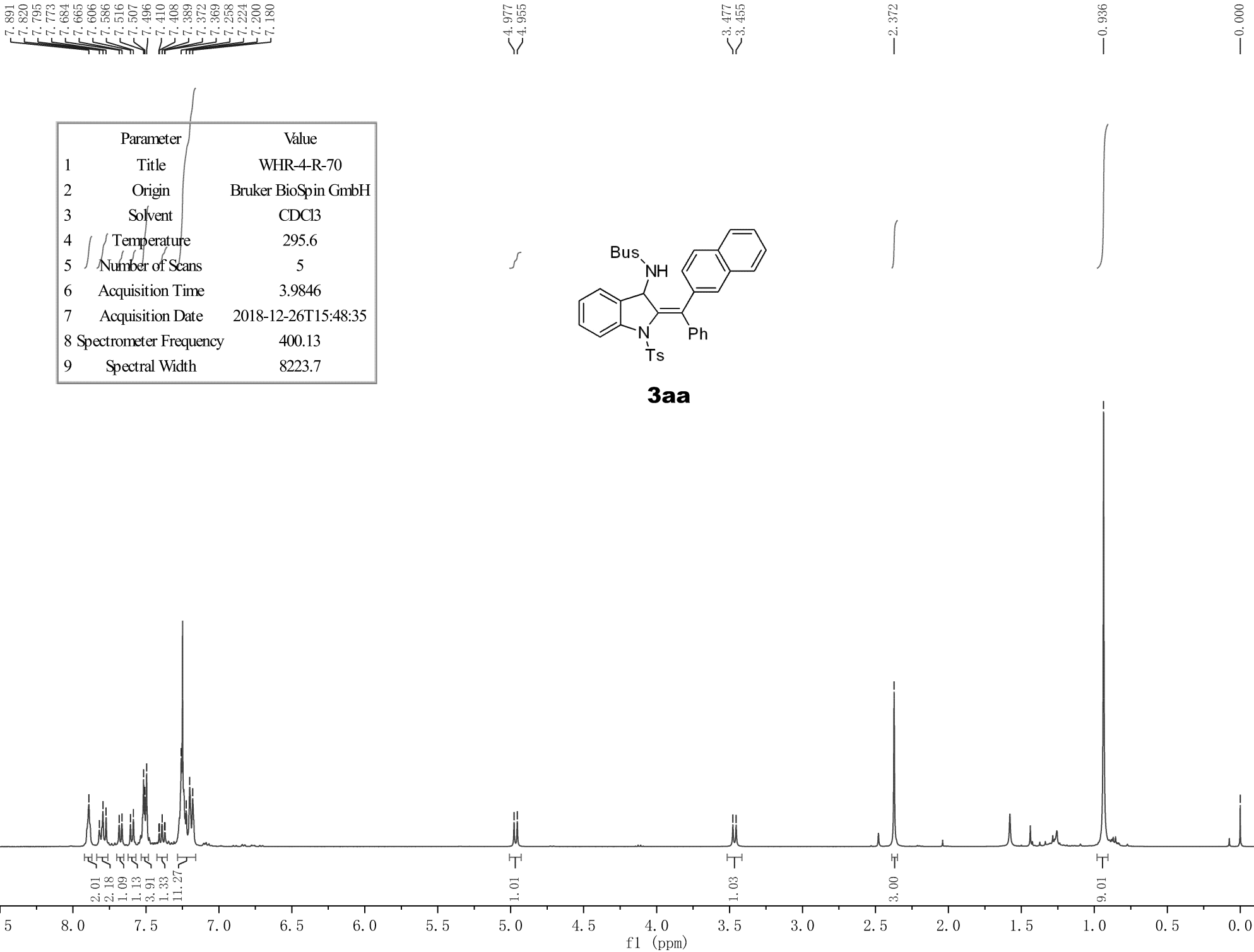

157.99
145.02
142.55
141.66
140.45
129.91
129.75
129.38
127.99
127.66
127.39
127.08
126.88
126.39
109.88
77.25
77.00
76.75
59.74
56.42
55.31
23.78
21.58
16.22
Parameter Value
1 Title WHR-7-R-125-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 299.5
5 Number of Scans 218
6 Acquisition Time 1.1010
7 Acquisition Date 2019-10-17T18:06:16
8 Spectrometer Frequency 125.77
9 Spectral Width 29761.9
Bus
NH
OMe
Me
Ph
N
Ts
3y
f1 (ppm)
f1 (ppm)

	Parameter	Value
1	Title	WHR-4-R-69-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.3
5	Number of Scans	5
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-25T15:34:57
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



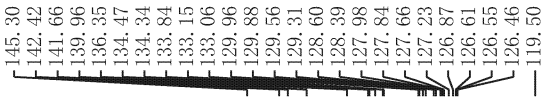
3z


145.20
142.60
141.79
140.17
138.89
138.31
134.46
133.87
133.84
130.10
129.82
129.67
129.48
127.92
127.77
127.46
127.20
127.14
126.50
119.49
77.21
77.00
76.79
59.62
56.28
23.64
21.62
21.31
Parameter Value
1 Title WHR-4-R-69-600M
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 32
6 Acquisition Time 0.9088
7 Acquisition Date 2018-12-25T14:03:47
8 Spectrometer Frequency 150.90
9 Spectral Width 36057.7
Me
Bus
NH
Me
N
Ph
Ts
3z
f1 (ppm)
f1 (ppm)

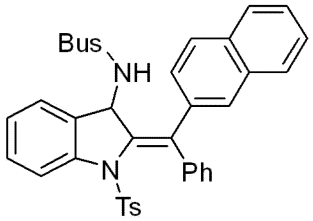


	Parameter	Value
1	Title	WHR-4-R-70
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.6
5	Number of Scans	5
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-26T15:48:35
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

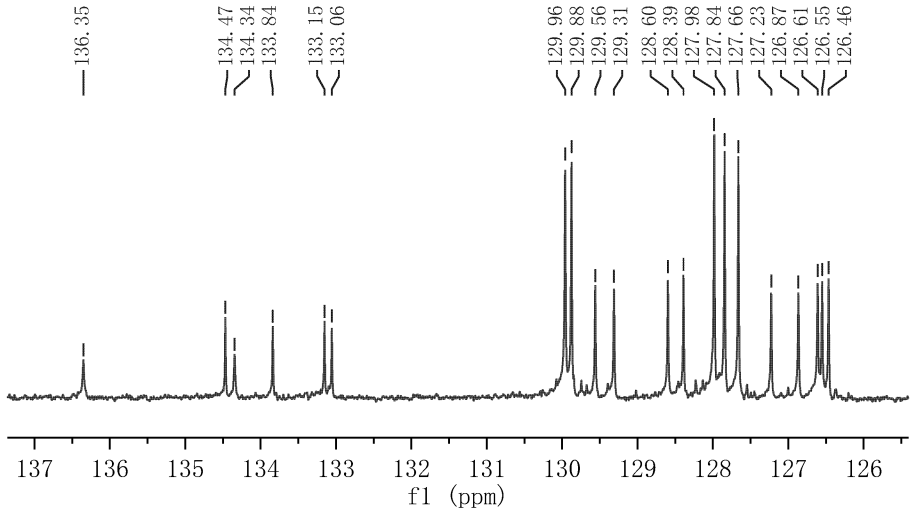
3aa

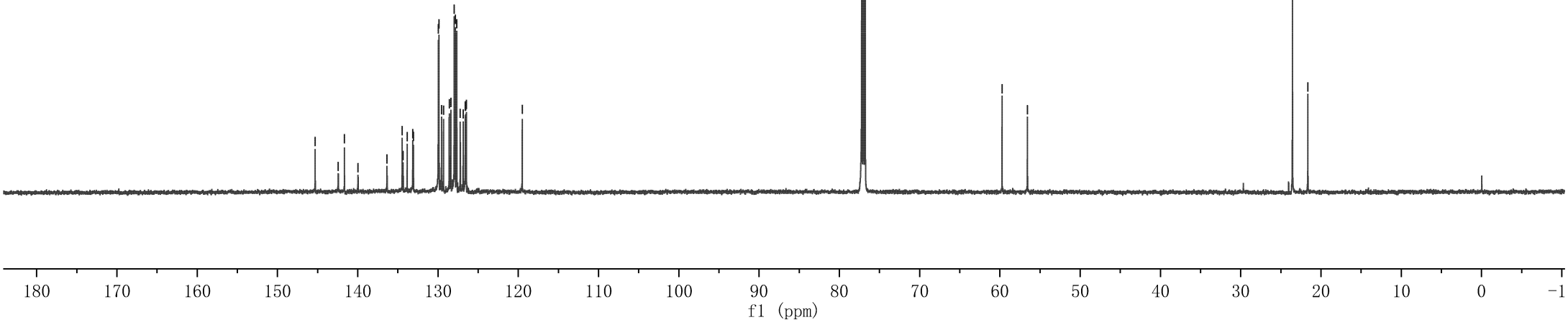


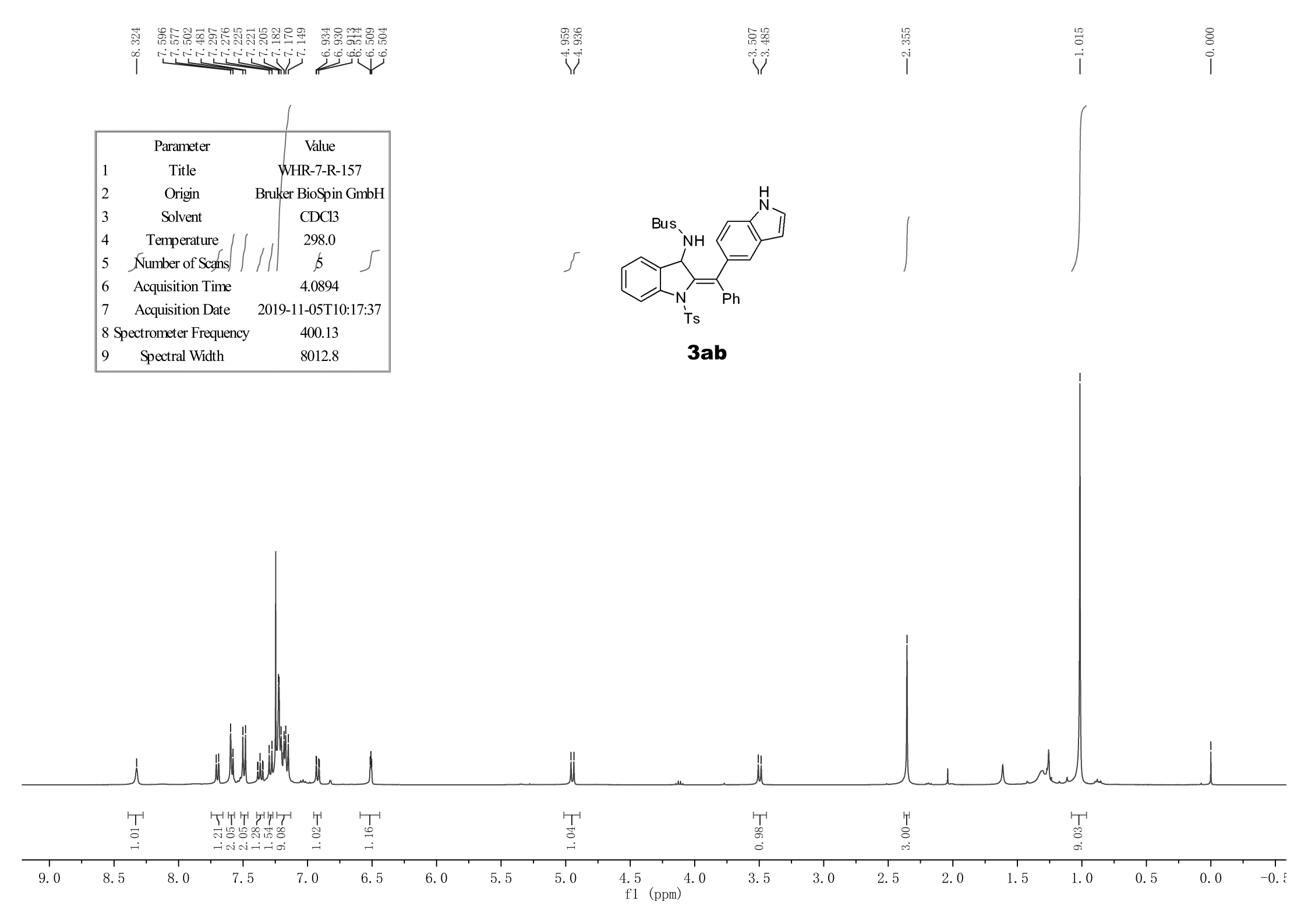
	Parameter	Value
1	Title	4-70
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	32
6	Acquisition Time	0.9088
7	Acquisition Date	2019-01-09T17:13:21
8	Spectrometer Frequency	150.90
9	Spectral Width	36057.7



3aa



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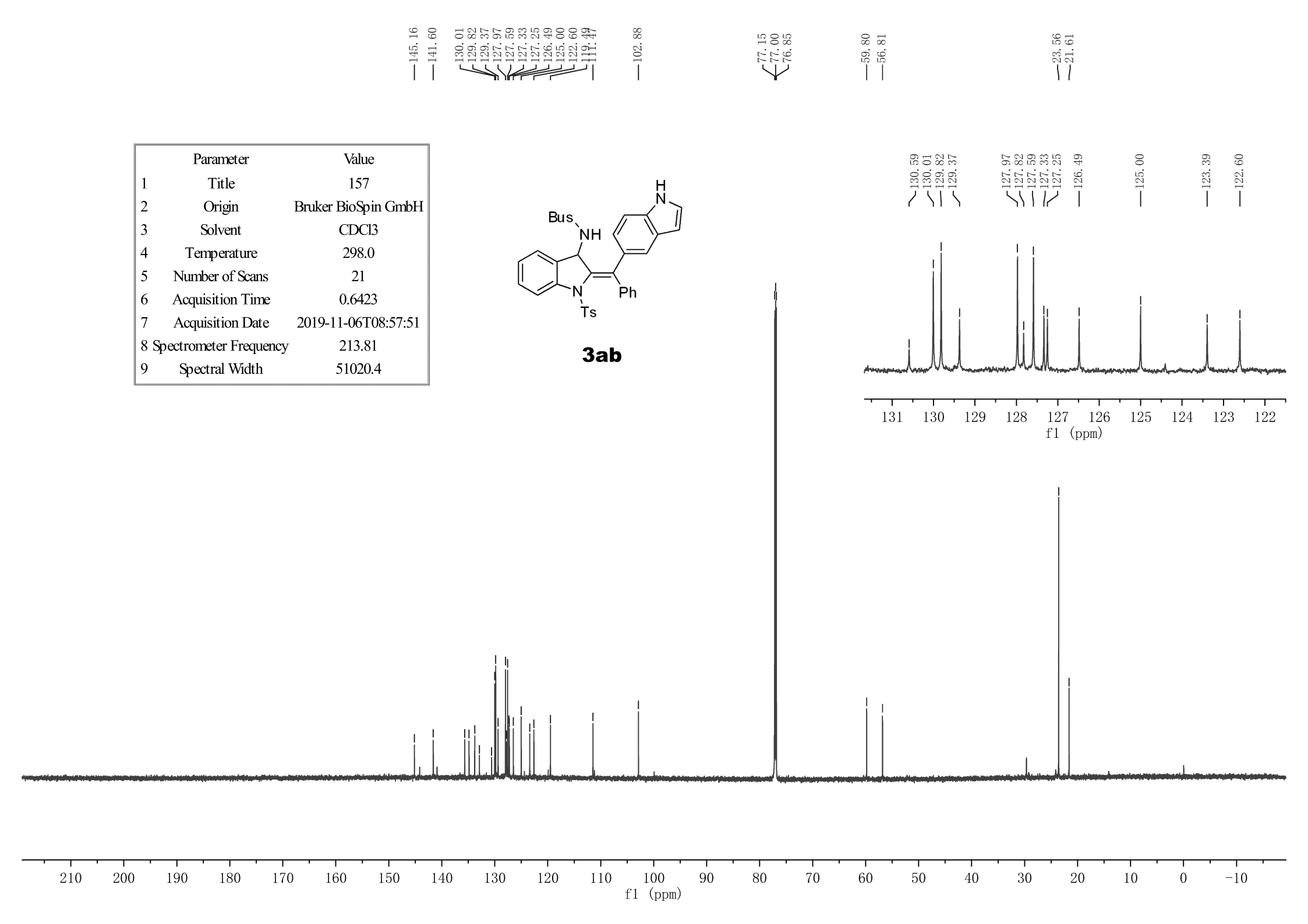
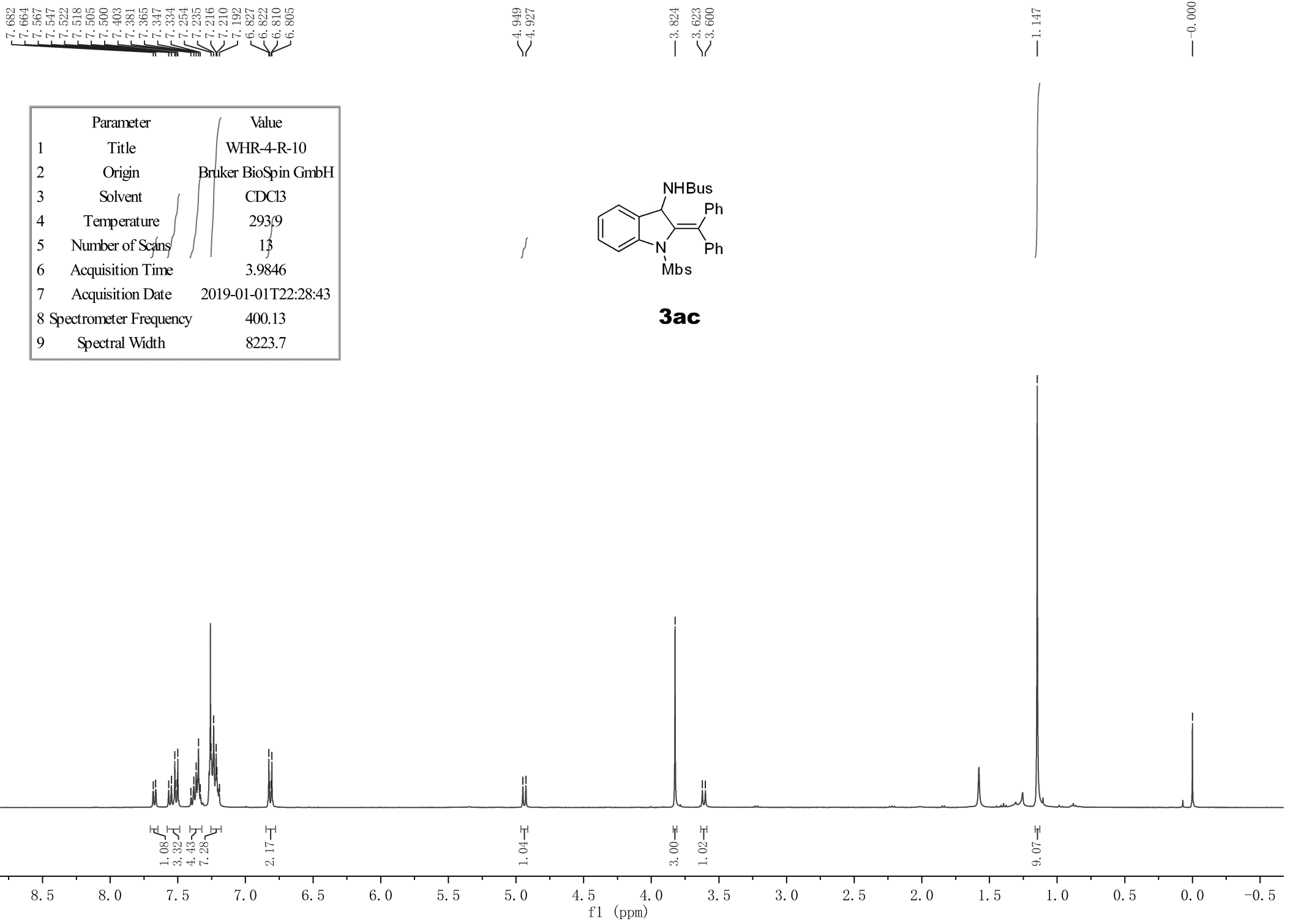
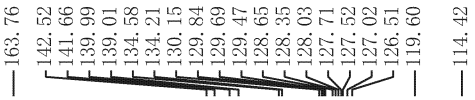
7.596
7.577
7.502
7.481
7.297
7.276
7.225
7.221
7.205
7.182
7.170
7.149
6.934
6.930
6.513
6.509
6.504
4.959
4.936
3.507
3.485
2.355
1.015
0.000
Parameter Value
1 Title WHR-7-R-157
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 5
6 Acquisition Time 4.0894
7 Acquisition Date 2019-11-05T10:17:37
8 Spectrometer Frequency 400.13
9 Spectral Width 8012.8
Bus
NH
H
N
N
Ts
Ph
3ab
1.01
1.21
2.05
2.05
1.28
1.54
9.08
1.02
1.16
1.04
0.98
3.00
9.03
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)


145.16
141.60
130.01
129.82
129.37
127.97
127.59
127.33
127.25
126.49
125.00
122.60
119.49
111.47
102.88
77.15
77.00
76.85
59.80
56.81
23.56
21.61
Parameter Value
1 Title 157
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 21
6 Acquisition Time 0.6423
7 Acquisition Date 2019-11-06T08:57:51
8 Spectrometer Frequency 213.81
9 Spectral Width 51020.4
Bus
NH
H
N
N
Ts
Ph
3ab
130.59
130.01
129.82
129.37
127.97
127.82
127.59
127.33
127.25
126.49
125.00
123.39
122.60
131 130 129 128 127 126 125 124 123 122
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

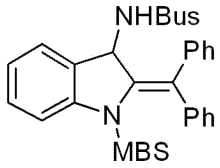


	Parameter	Value
1	Title	WHR-4-R-10
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	293.9
5	Number of Scans	13
6	Acquisition Time	3.9846
7	Acquisition Date	2019-01-01T22:28:43
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

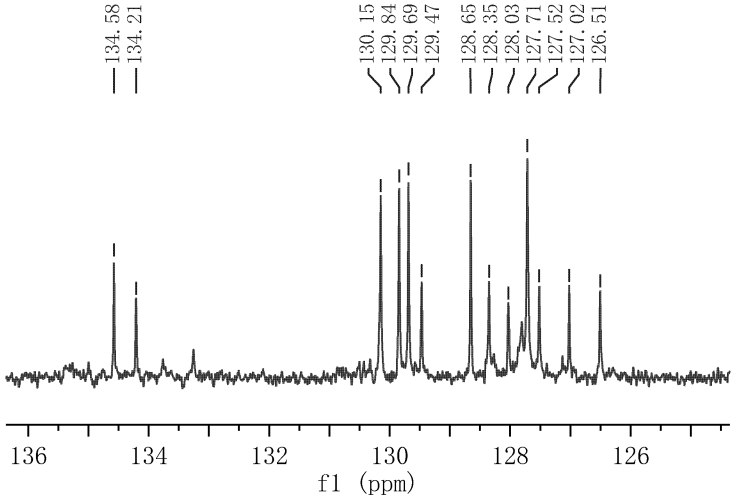
3ac

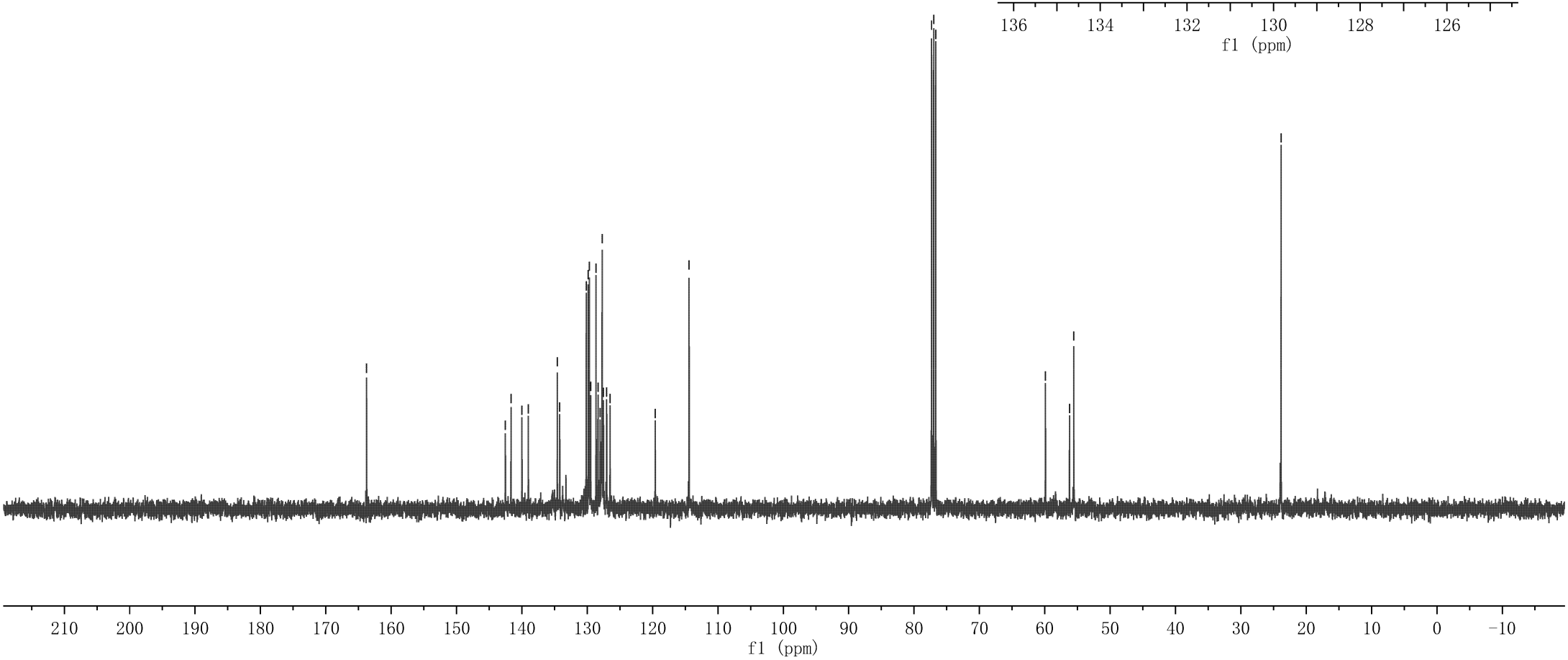


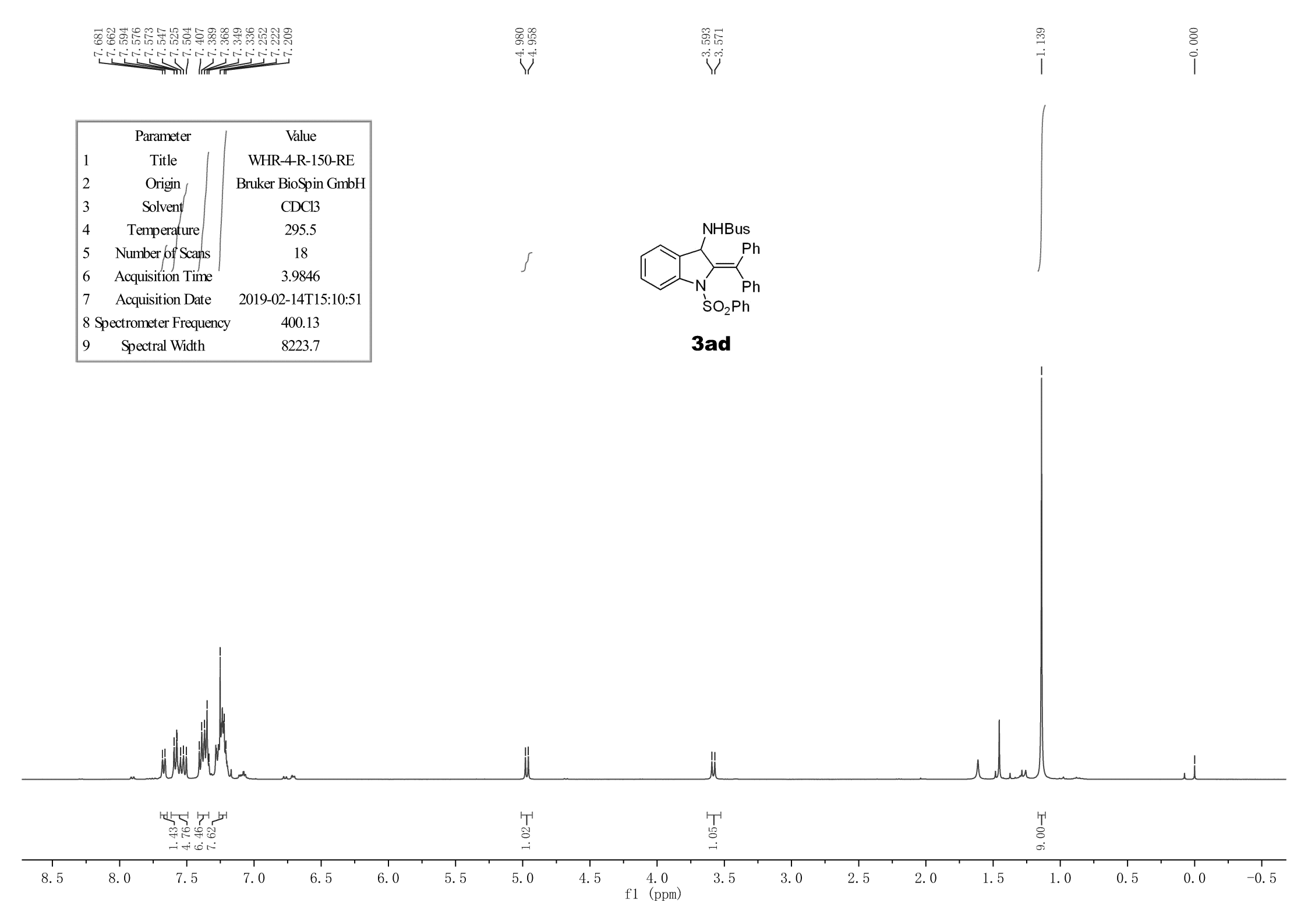
	Parameter	Value
1	Title	WHR-4-R-10-C
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	297.1
5	Number of Scans	57
6	Acquisition Time	1.3631
7	Acquisition Date	2018-11-28T10:49:13
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



3ac







	Parameter	Value
1	Title	WHR-4-R-150-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.5
5	Number of Scans	18
6	Acquisition Time	3.9846
7	Acquisition Date	2019-02-14T15:10:51
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

3ad

142.65
141.50
140.02
138.98
136.98
134.51
134.09
133.97
129.85
129.70
129.54
129.17
128.70
128.45
128.00
127.87
127.61
127.15
126.60
119.33

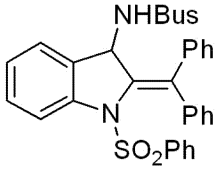
77.32
77.00
76.68

59.97

56.15

23.96

	Parameter	Value
1	Title	WHR-4-R-8-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	297.0
5	Number of Scans	42
6	Acquisition Time	1.3631
7	Acquisition Date	2018-11-28T11:03:52
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



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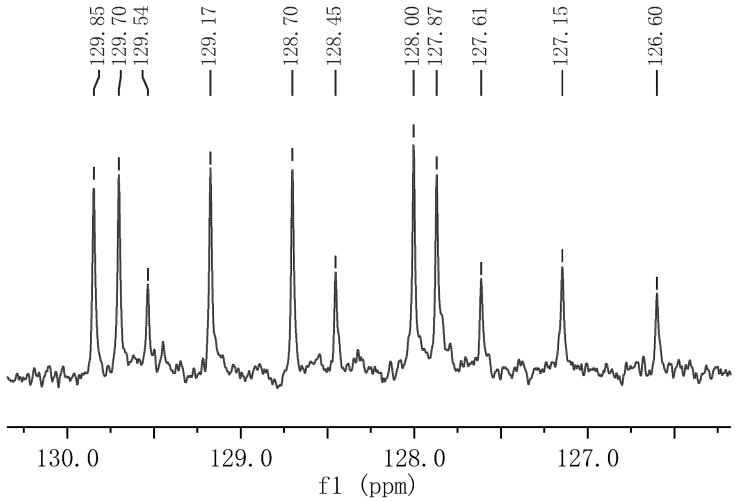
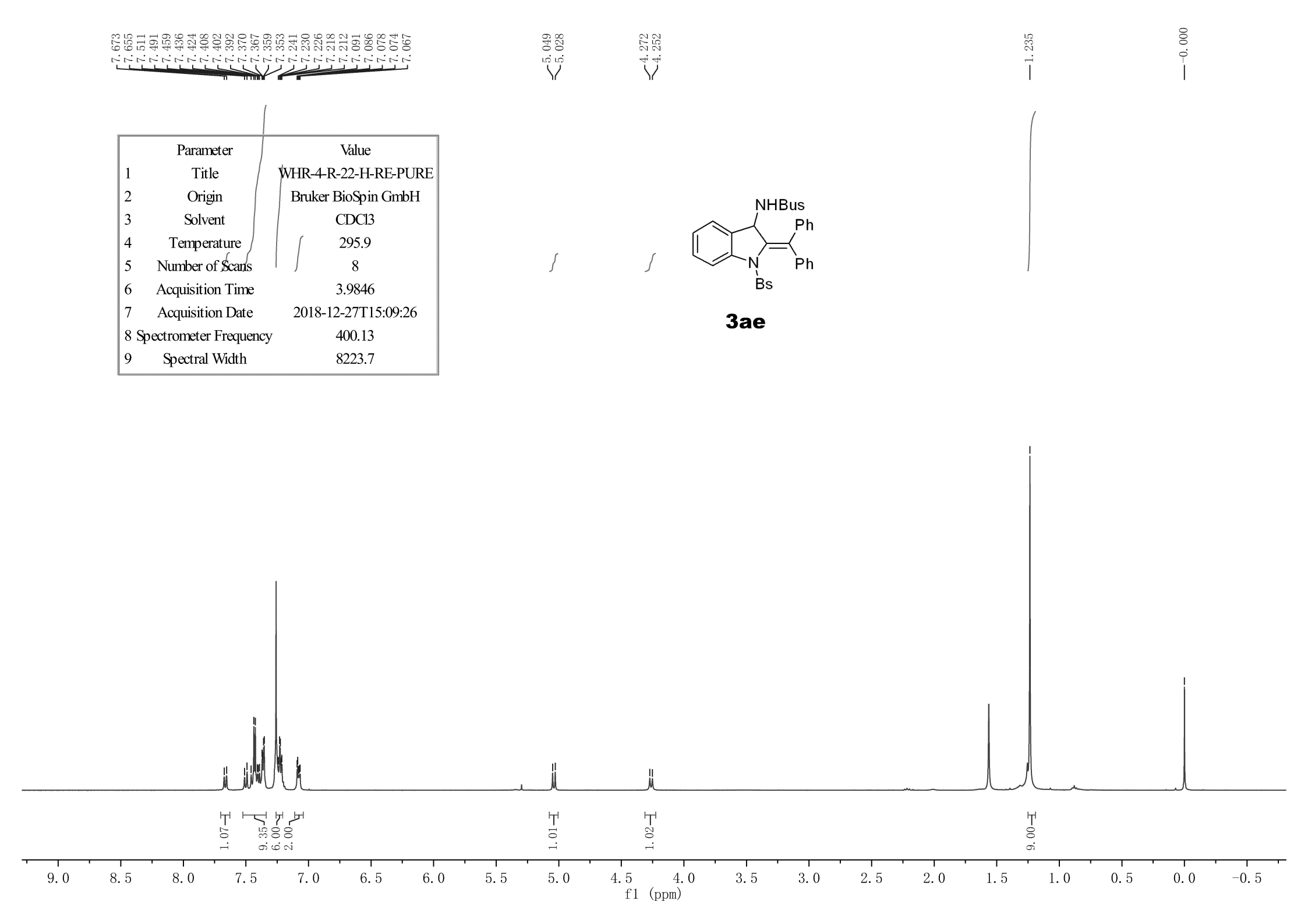




	Parameter	Value
1	Title	WHR-4-R-22-H-RE-PURE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.9
5	Number of Scans	8
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-27T15:09:26
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

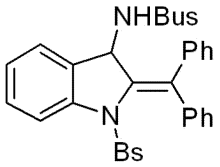
142.68
141.14
139.55
138.75
135.87
135.06
134.36
132.33
129.94
129.76
129.65
129.59
129.40
128.68
127.86
127.71
127.13
126.83
119.71

77.32
77.00
76.68

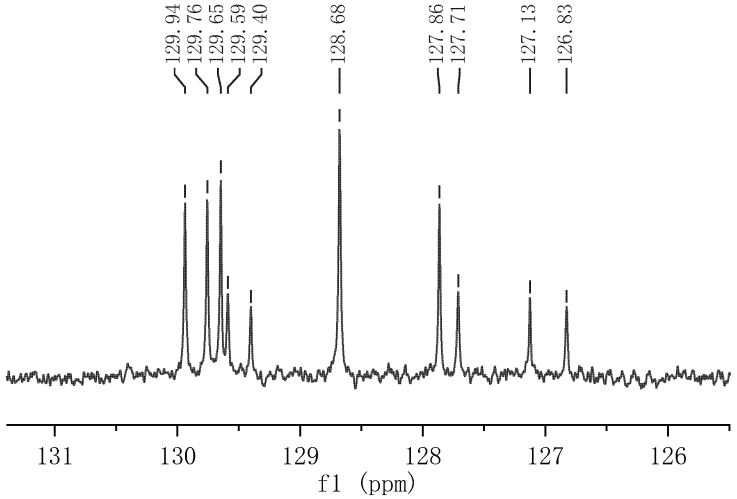
59.93
56.01

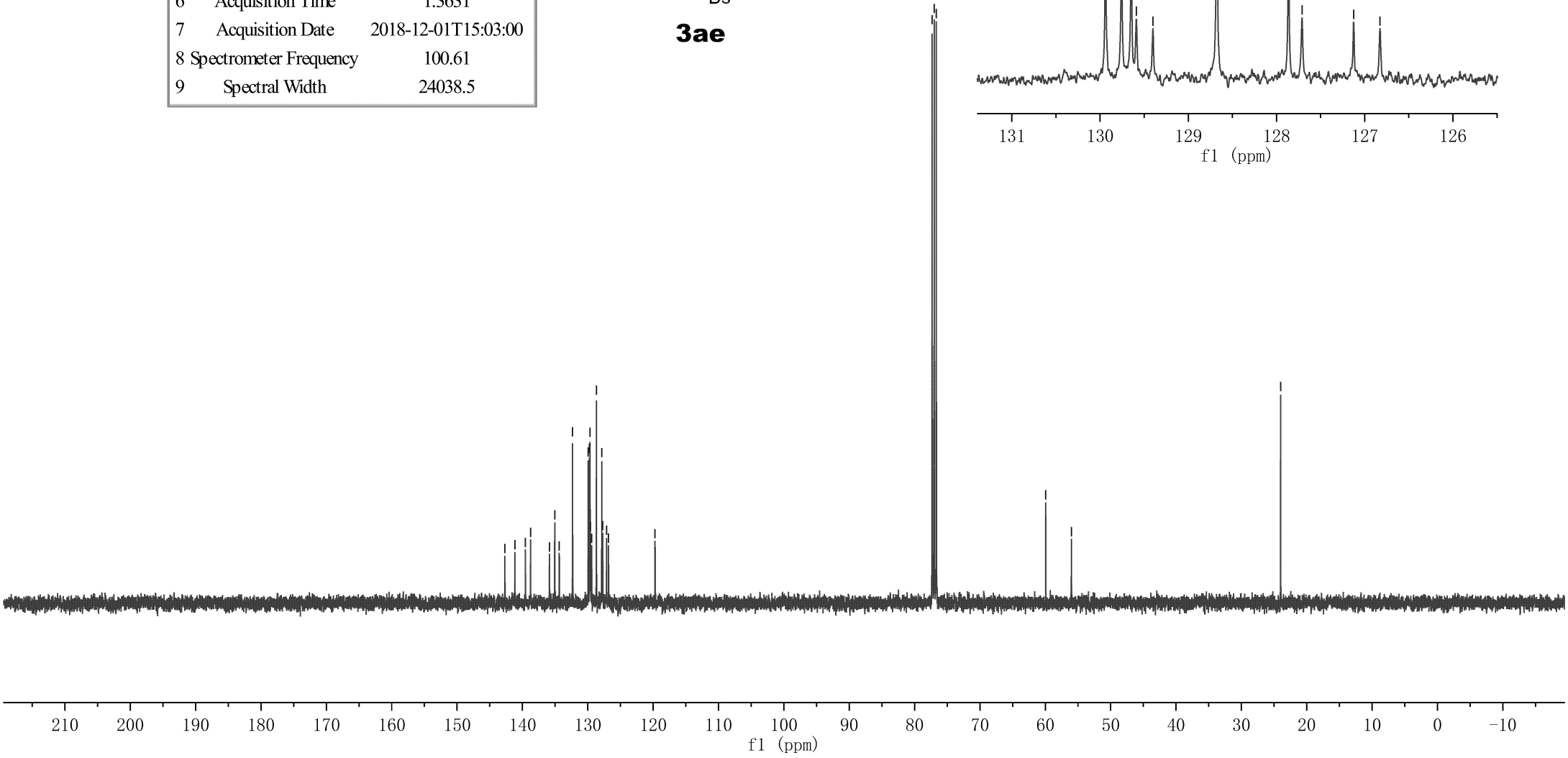
24.00

	Parameter	Value
1	Title	WHR-4-R-22-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	296.5
5	Number of Scans	120
6	Acquisition Time	1.3631
7	Acquisition Date	2018-12-01T15:03:00
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5

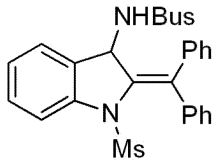


3ae

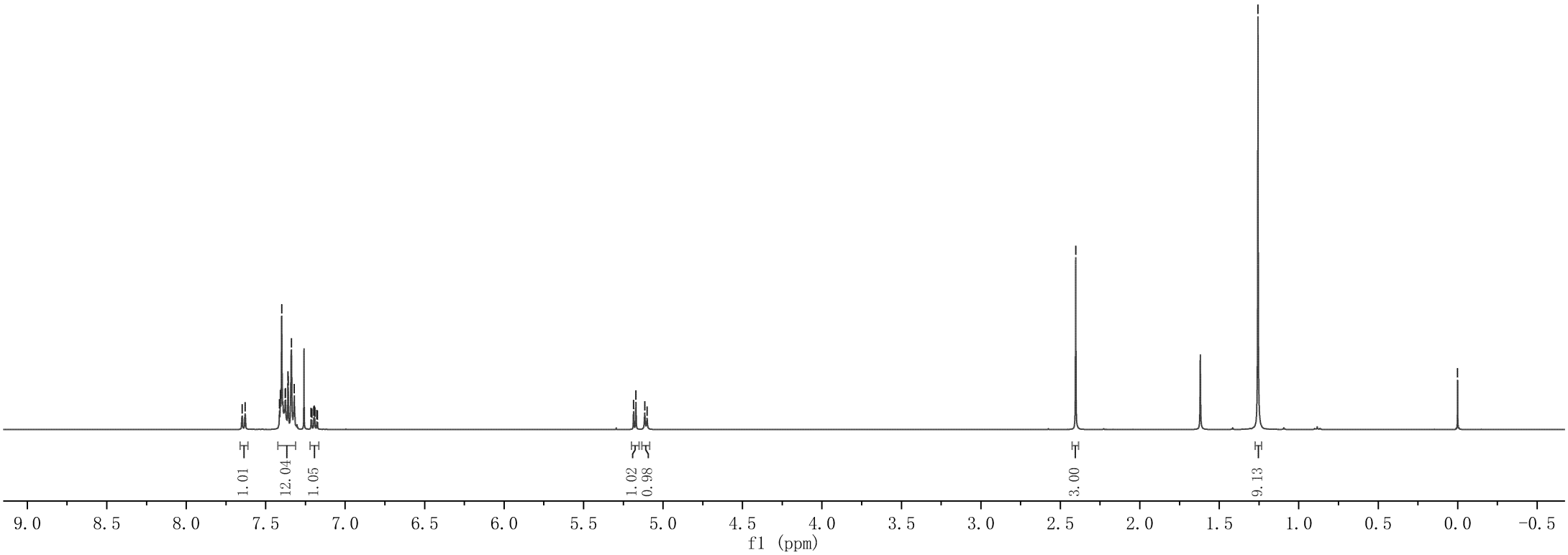


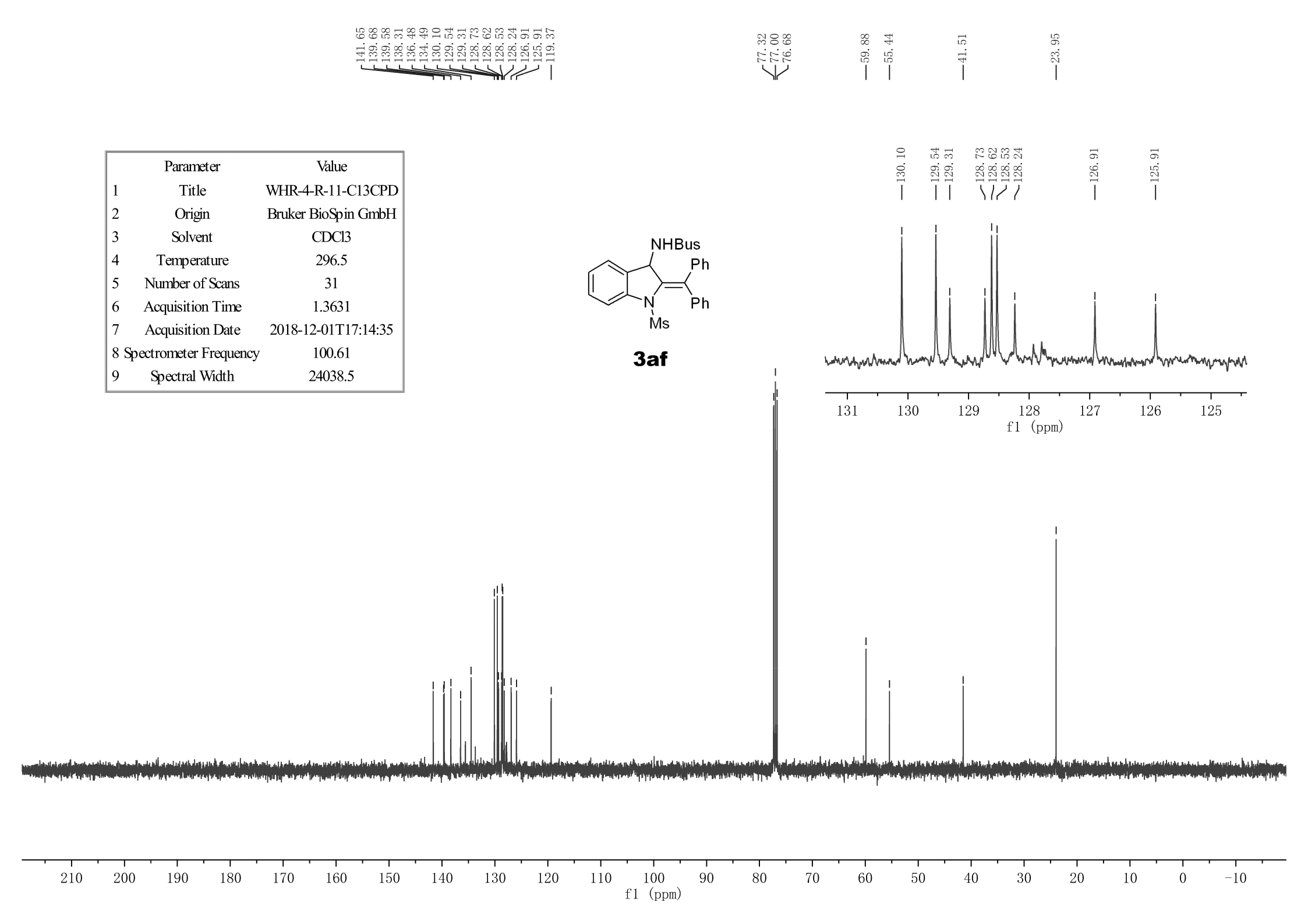


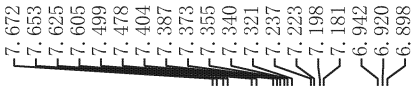
	Parameter	Value
1	Title	WHR-4-R-11-H-PURE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.3
5	Number of Scans	16
6	Acquisition Time	3.9846
7	Acquisition Date	2018-12-26T15:15:47
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



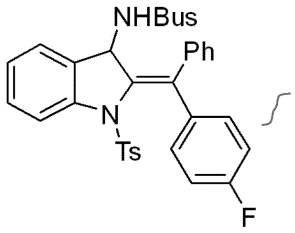
3af




141.65
139.68
139.58
138.31
136.48
134.49
130.10
129.54
129.31
128.73
128.62
128.53
128.24
126.91
125.91
119.37
77.32
77.00
76.68
59.88
55.44
41.51
23.95
Parameter Value
1 Title WHR-4-R-11-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 296.5
5 Number of Scans 31
6 Acquisition Time 1.3631
7 Acquisition Date 2018-12-01T17:14:35
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
NHBus
Ph
Ph
N
Ms
3af
130.10
129.54
129.31
128.73
128.62
128.53
128.24
126.91
125.91
131
130
129
128
127
126
125
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)



	Parameter	Value
1	Title	WHR-4-R-148
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	294.4
5	Number of Scans	11
6	Acquisition Time	3.9846
7	Acquisition Date	2019-02-14T09:22:09
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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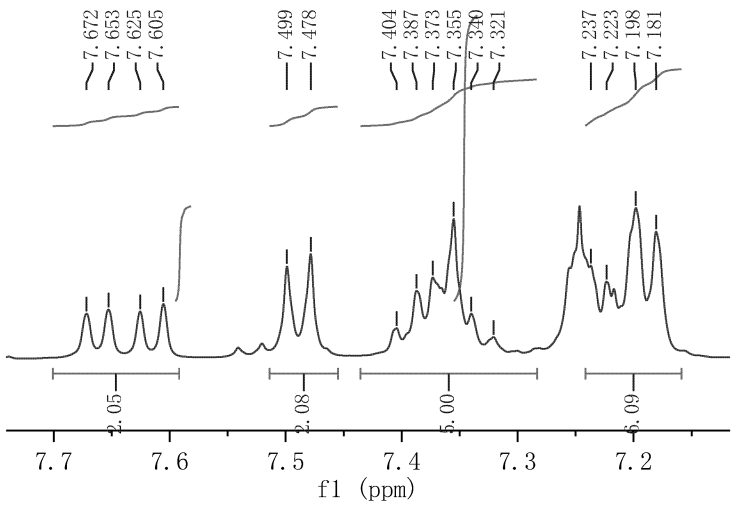
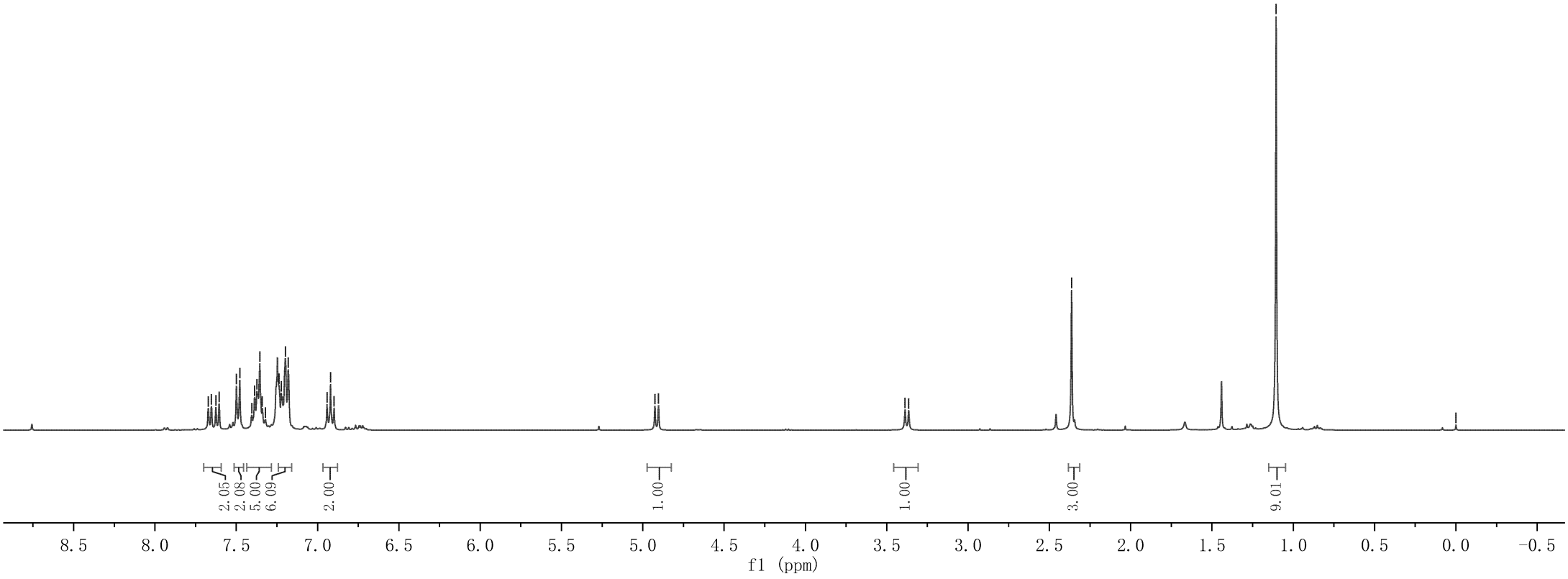
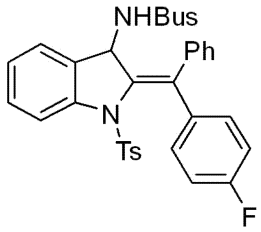


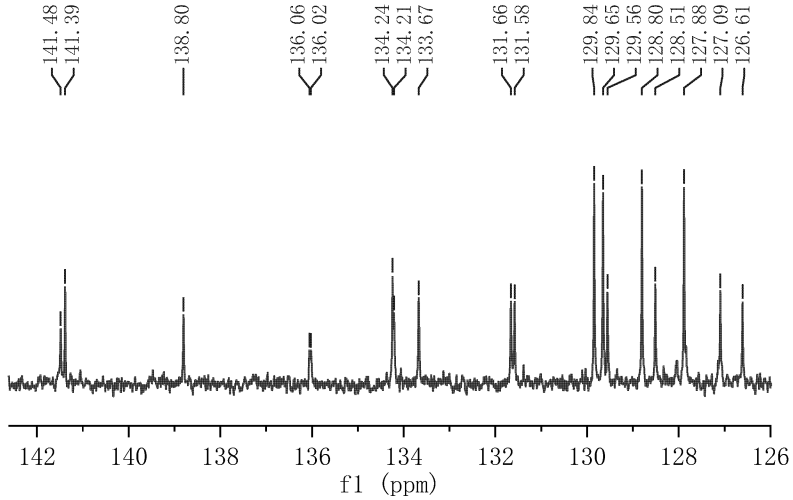


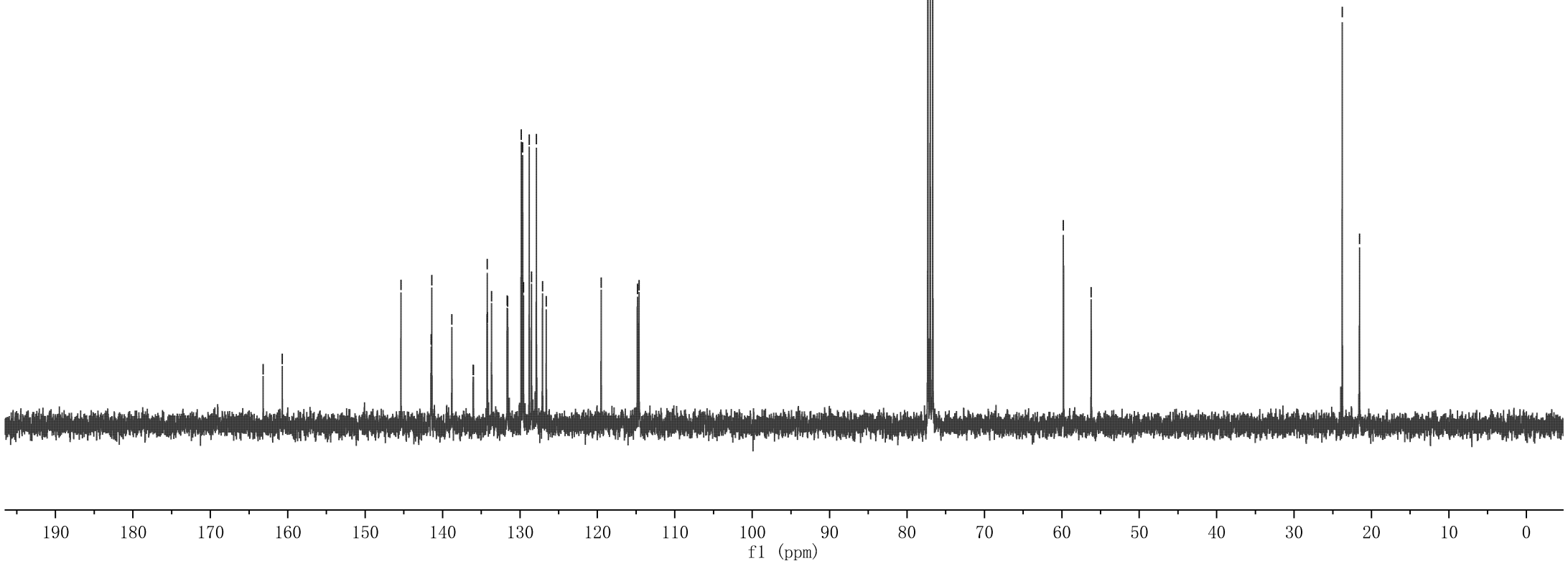
163.18
160.71
145.37
141.48
141.39
138.80
136.06
136.02
134.24
134.21
133.67
131.66
131.58
129.84
129.65
129.56
128.80
128.51
127.88
127.09
126.61
119.51
114.83
114.62
77.32
77.00
76.68
59.80
56.21
23.78
21.55

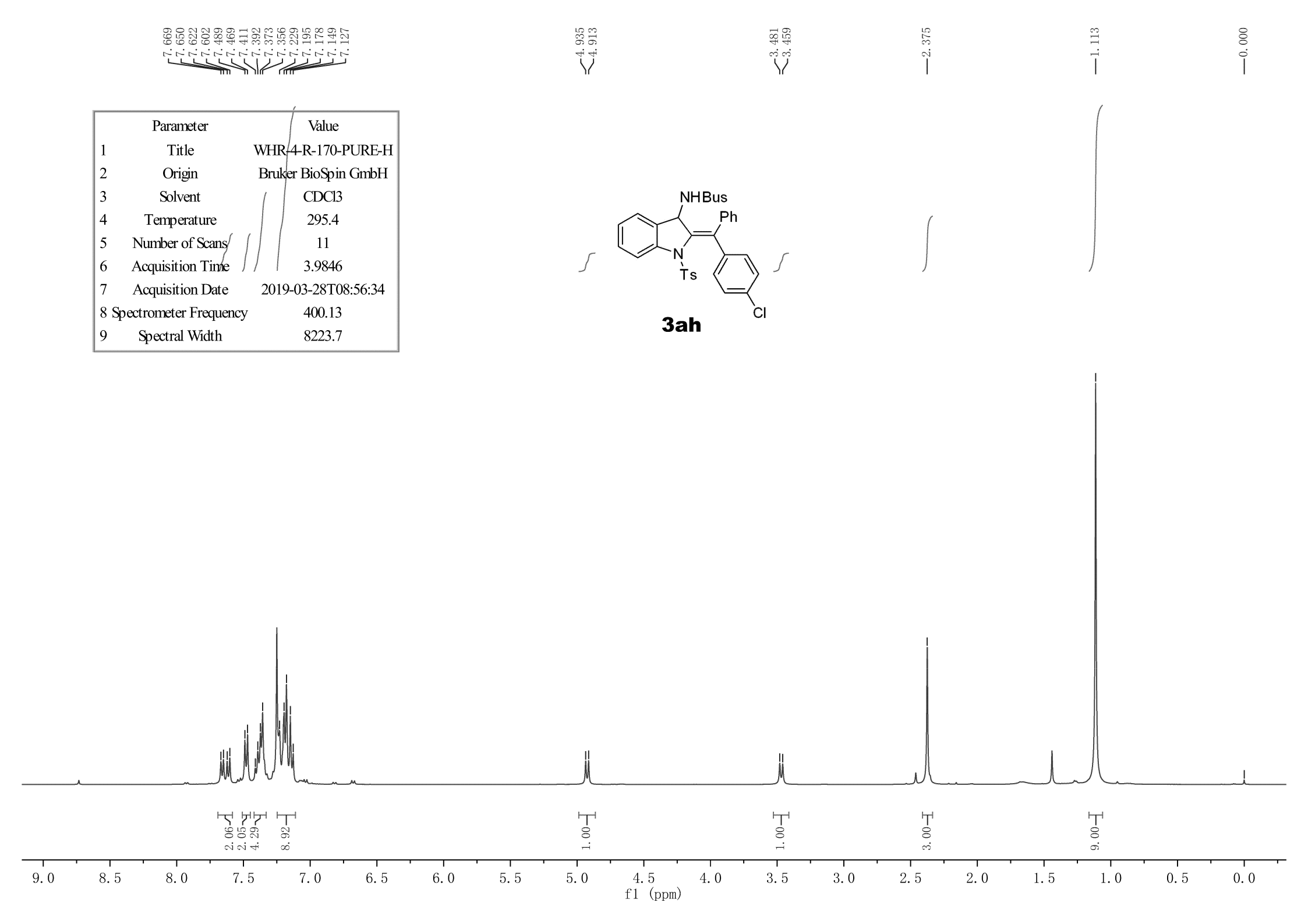
	Parameter	Value
1	Title	WHR-4-R-148-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	294.5
5	Number of Scans	32
6	Acquisition Time	1.3631
7	Acquisition Date	2019-02-14T09:25:37
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



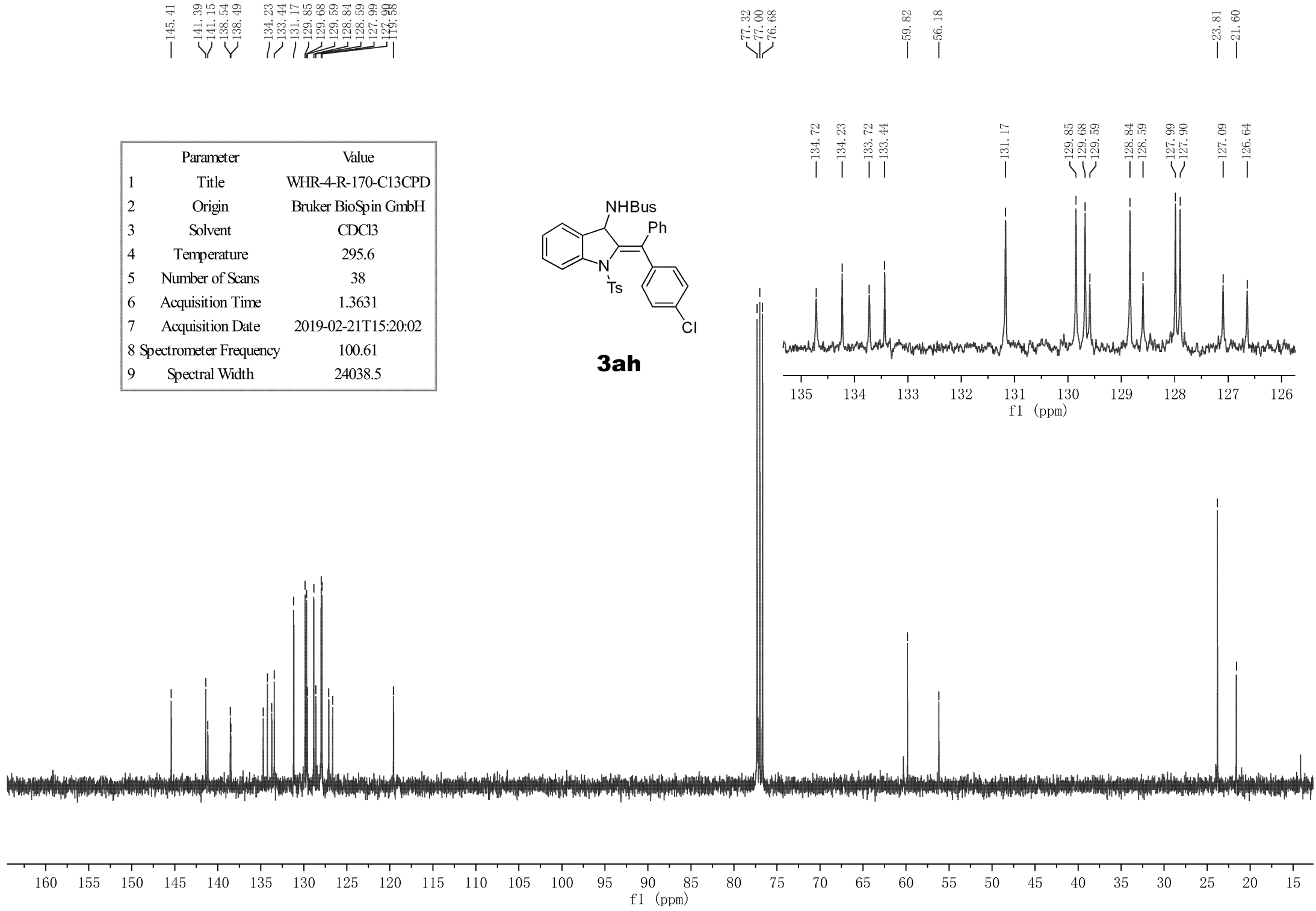
3ag







	Parameter	Value
1	Title	WHR-4-R-170-PURE-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.4
5	Number of Scans	11
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-28T08:56:34
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7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133.44
131.17
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129.68
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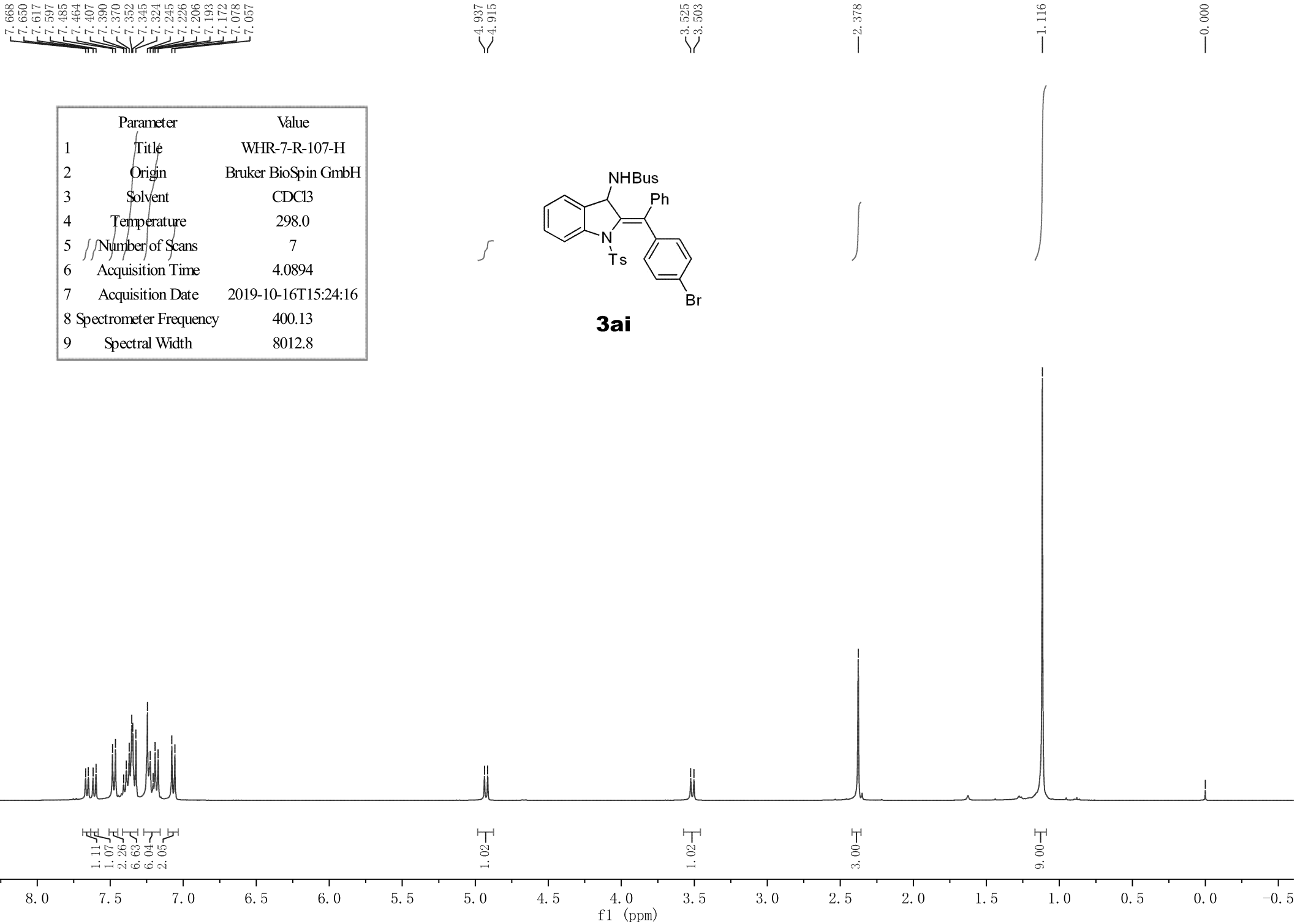
128.84
128.59
127.99
127.90
126.58
77.32
77.00
76.68
59.82
56.18
23.81
21.60
134.72
134.23
133.72
133.44
131.17
129.85
129.68
129.59
128.84
128.59
127.99
127.90
127.09
126.64
NHBus
Ph
N
Ts
Cl
3ah
Parameter Value
1 Title WHR-4-R-170-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.6
5 Number of Scans 38
6 Acquisition Time 1.3631
7 Acquisition Date 2019-02-21T15:20:02
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
f1 (ppm)
f1 (ppm)


7.668
7.650
7.617
7.597
7.485
7.464
7.407
7.390
7.370
7.352
7.345
7.324
7.245
7.226
7.206
7.193
7.172
7.078
7.057
4.937
4.915
3.525
3.503
2.378
1.116
0.000
Parameter Value
1 Title WHR-7-R-107-H
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 7
6 Acquisition Time 4.0894
7 Acquisition Date 2019-10-16T15:24:16
8 Spectrometer Frequency 400.13
9 Spectral Width 8012.8
NHBus
Ph
N
Ts
Br
3ai
1.11
1.07
2.26
6.63
6.04
2.05
1.02
1.02
3.00
9.00
f1 (ppm)

145.40
141.39
141.14
138.94
138.46
134.77
134.25
133.74
131.47
130.93
129.85
129.68
129.59
128.84
128.61
127.90
127.09
126.64
121.77
119.59

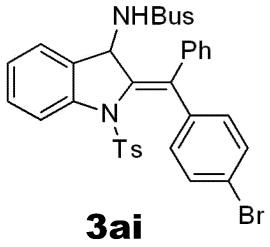
77.25
77.00
76.74

59.82

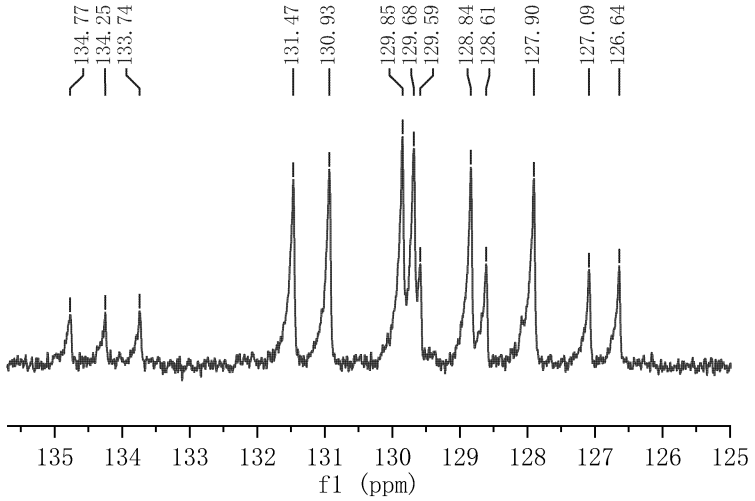
56.17

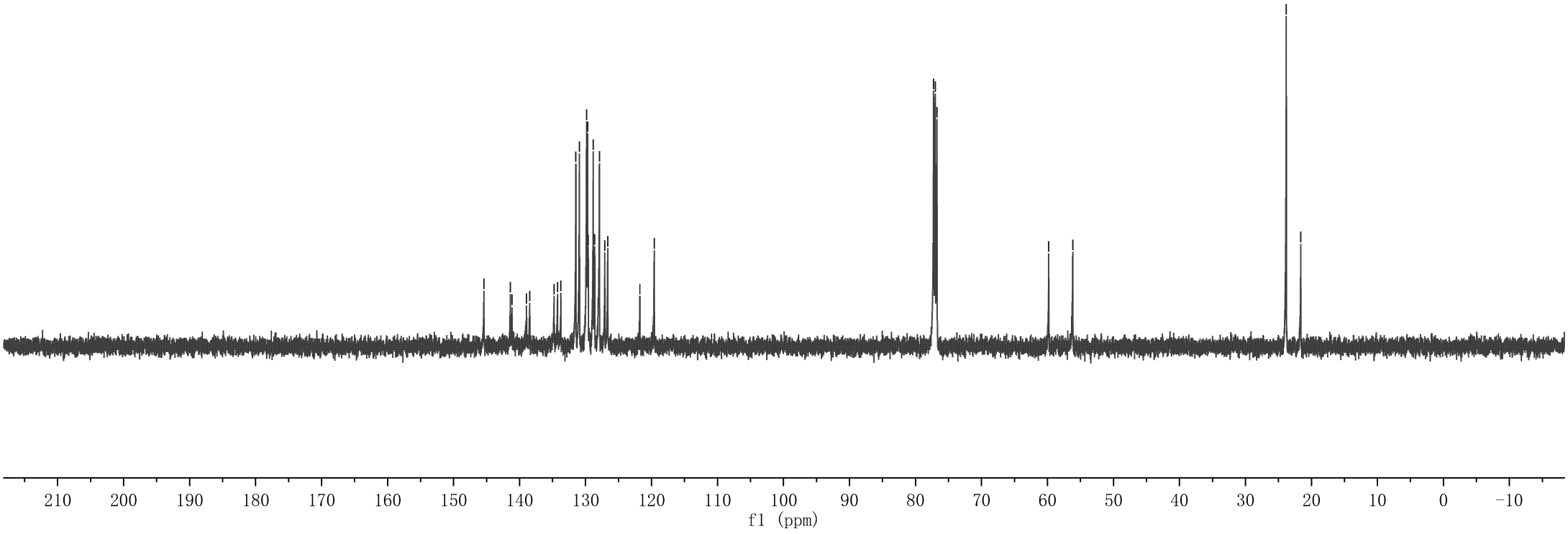
23.82
21.62

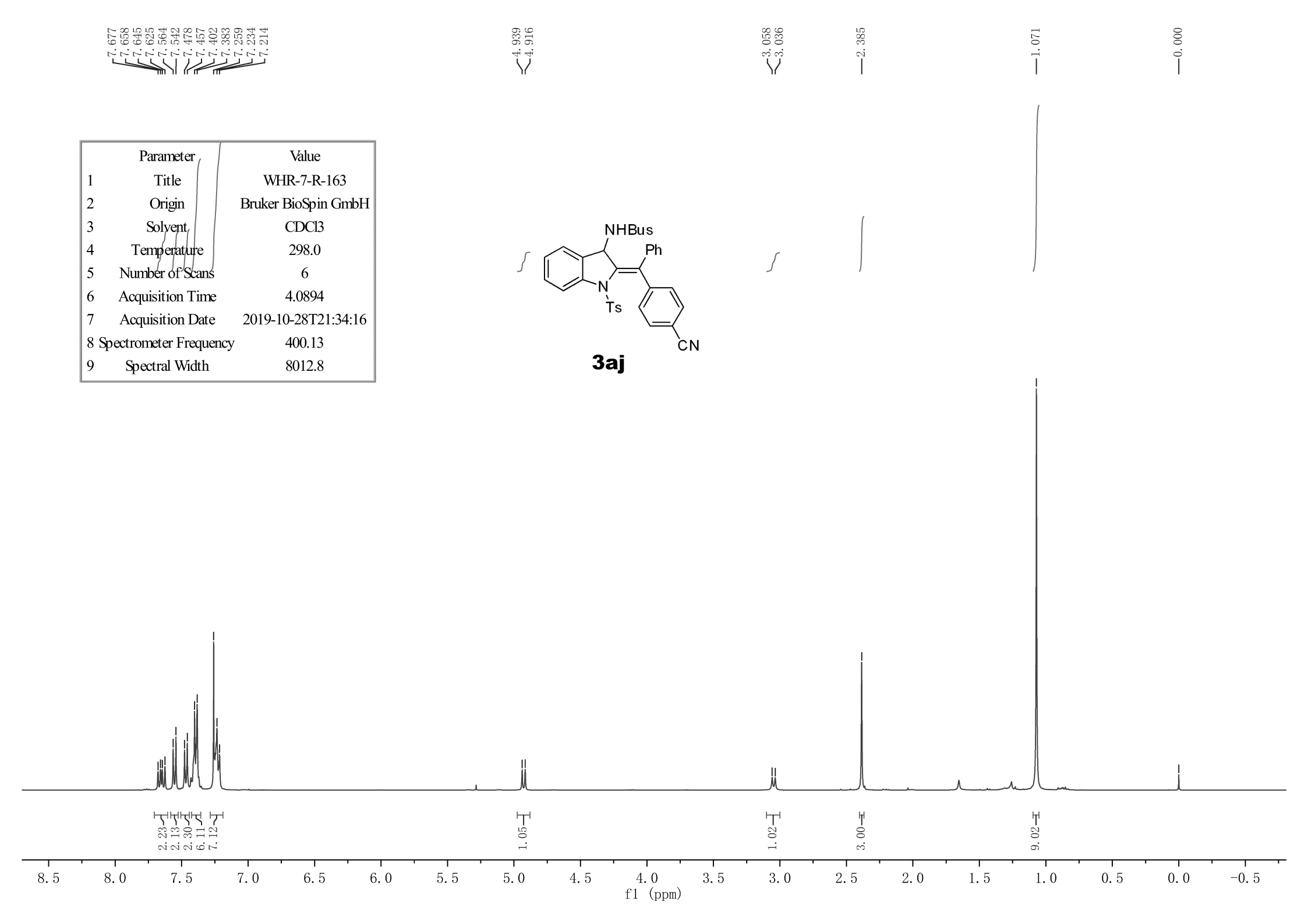
	Parameter	Value
1	Title	WHR-7-R-107-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	87
6	Acquisition Time	1.1010
7	Acquisition Date	2019-10-16T15:27:06
8	Spectrometer Frequency	125.77
9	Spectral Width	29761.9



3ai



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7.542
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7.457
7.402
7.383
7.259
7.234
7.214
4.939
4.916
3.058
3.036
2.385
1.071
0.000
Parameter Value
1 Title WHR-7-R-163
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 6
6 Acquisition Time 4.0894
7 Acquisition Date 2019-10-28T21:34:16
8 Spectrometer Frequency 400.13
9 Spectral Width 8012.8
NHBus
Ph
N
Ts
CN
3aj
2.23
2.13
2.30
6.11
7.12
1.05
1.02
3.00
9.02
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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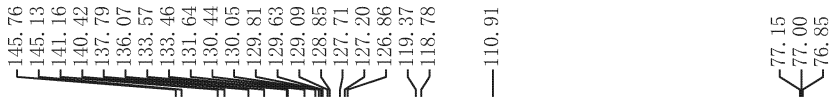
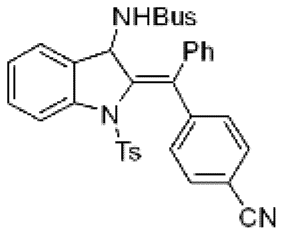
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)



	Parameter	Value
1	Title	163
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	48
6	Acquisition Time	0.6423
7	Acquisition Date	2019-10-29T08:03:50
8	Spectrometer Frequency	213.81
9	Spectral Width	51020.4



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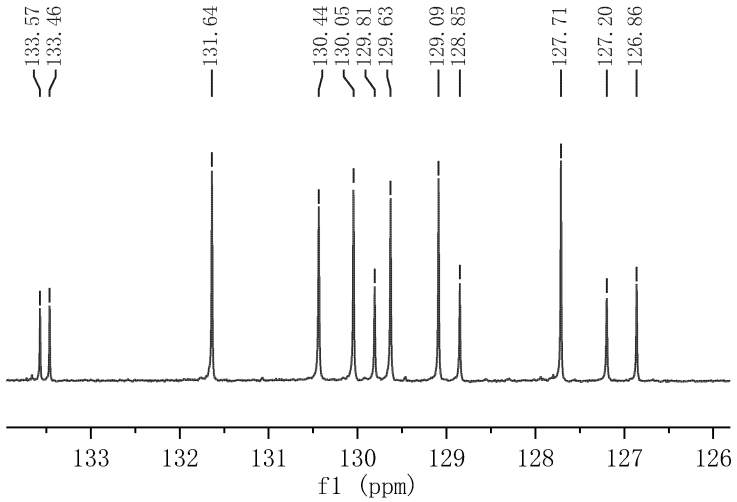
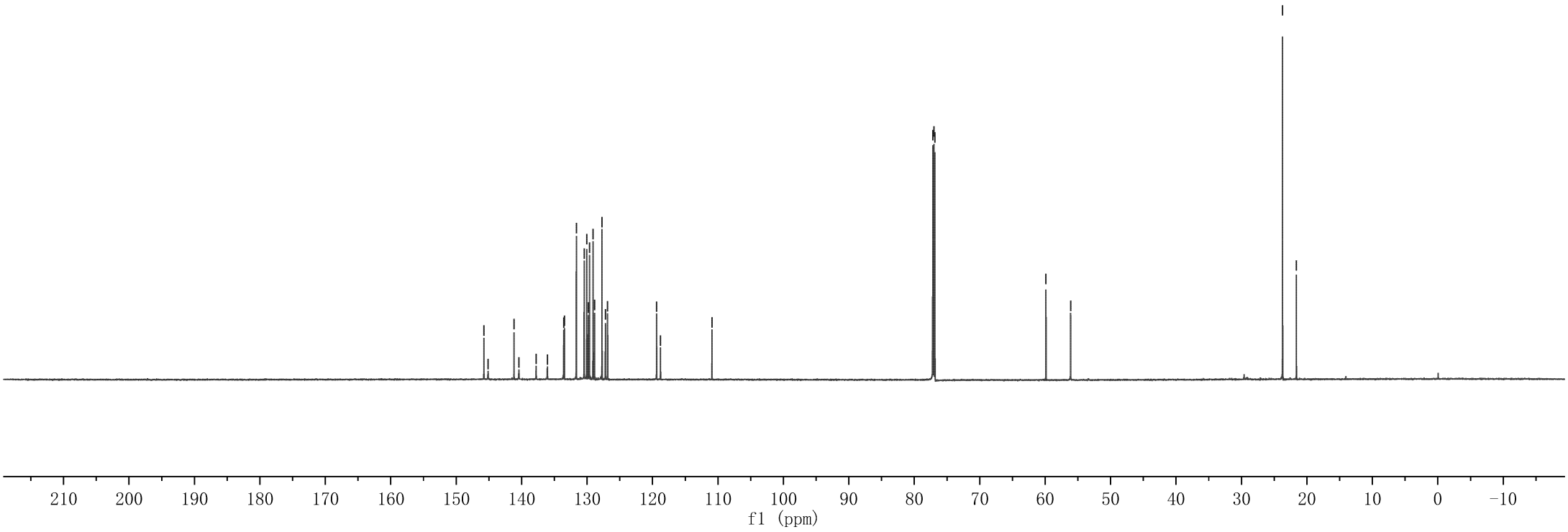
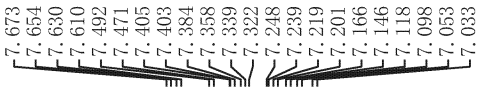
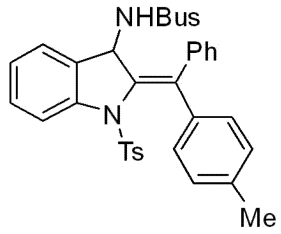






	Parameter	Value
1	Title	WHR-4-R-144-PURE-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	16
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-28T14:53:21
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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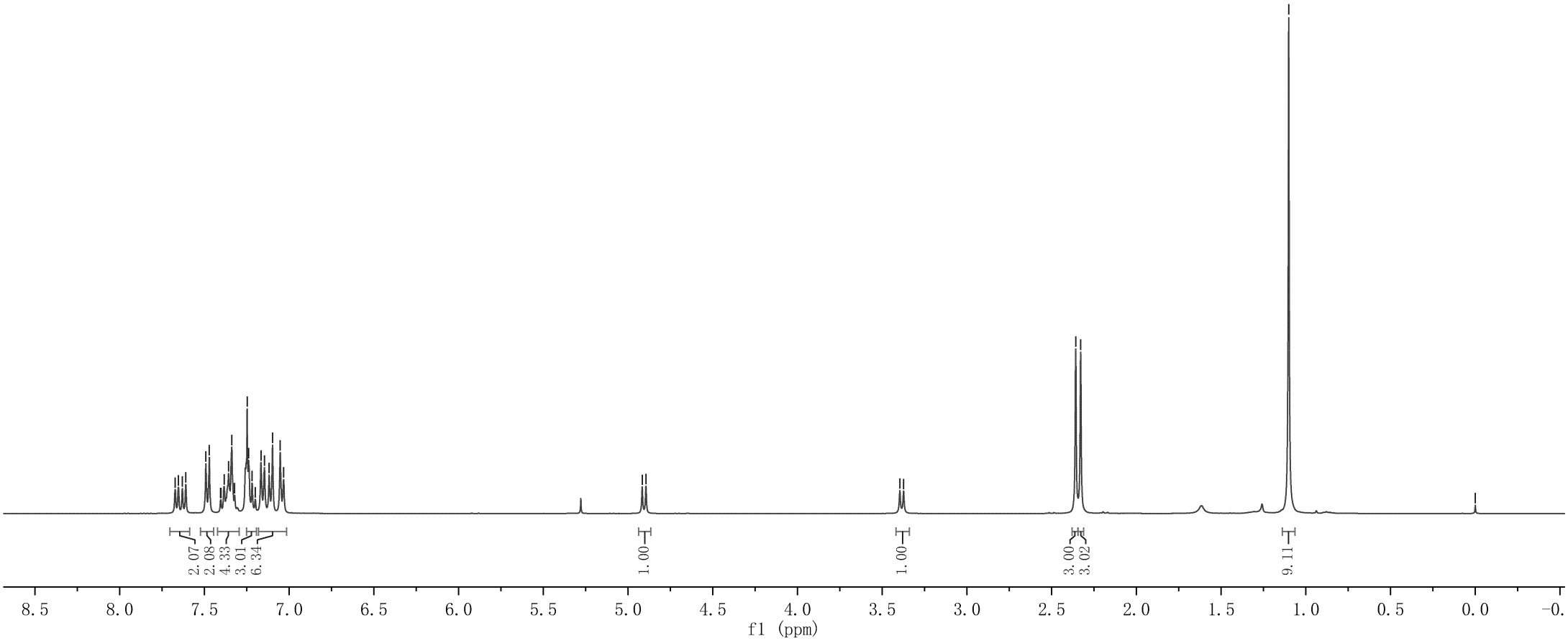

145.12
142.55
141.59
139.19
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137.16
134.39
133.82
133.55
129.74
129.69
129.68
129.46
128.67
128.45
128.28
127.90
127.08
126.46
119.50

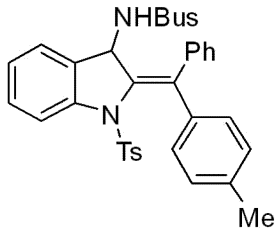
77.32
77.00
76.68

59.77

56.30

23.79
21.58
21.28

	Parameter	Value
1	Title	WHR-4-R-144-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.1
5	Number of Scans	35
6	Acquisition Time	1.3631
7	Acquisition Date	2019-02-14T16:46:00
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



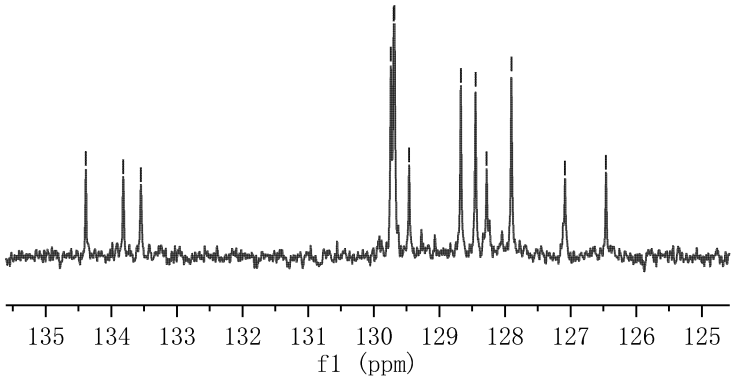
3ak

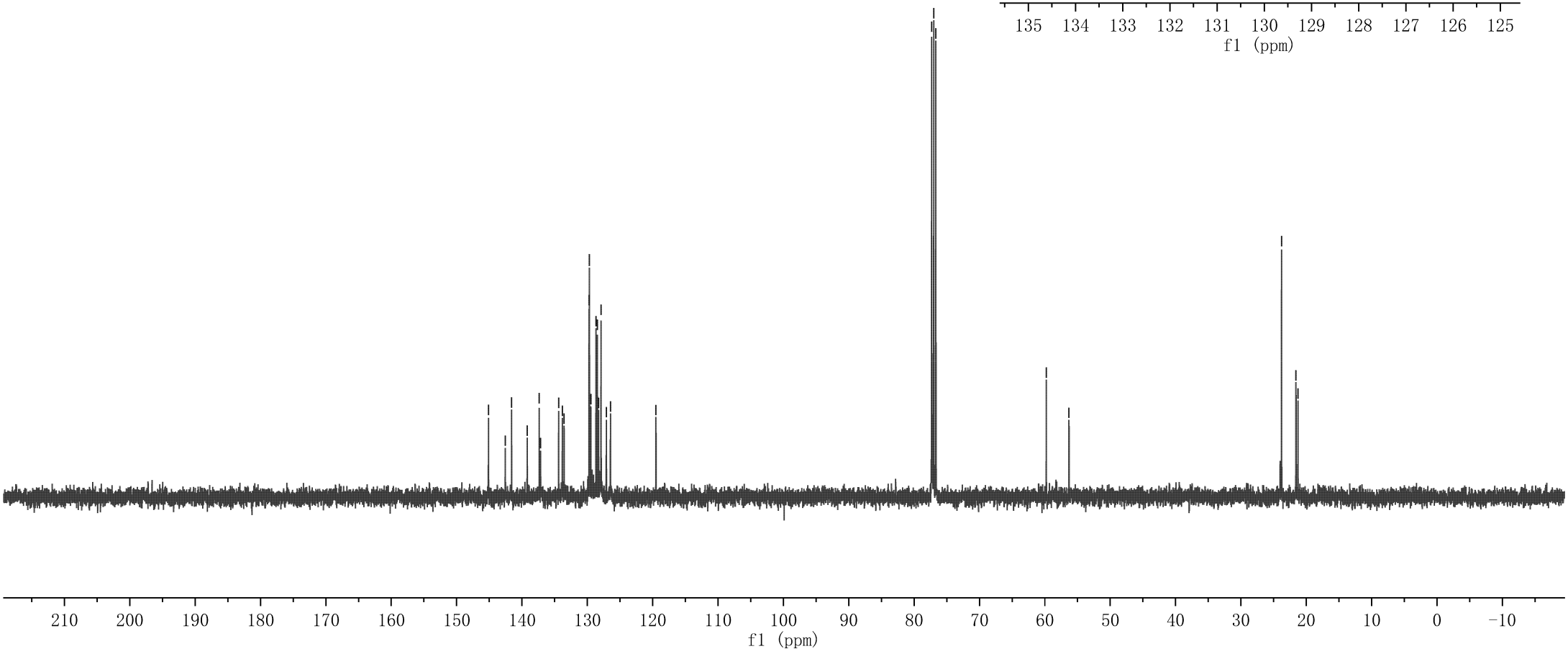
134.39
133.82
133.55

129.74
129.69
129.68
129.46
128.67
128.45
128.28
127.90

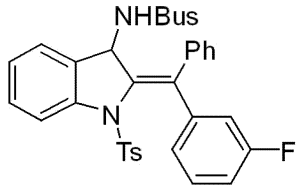
127.08

126.46

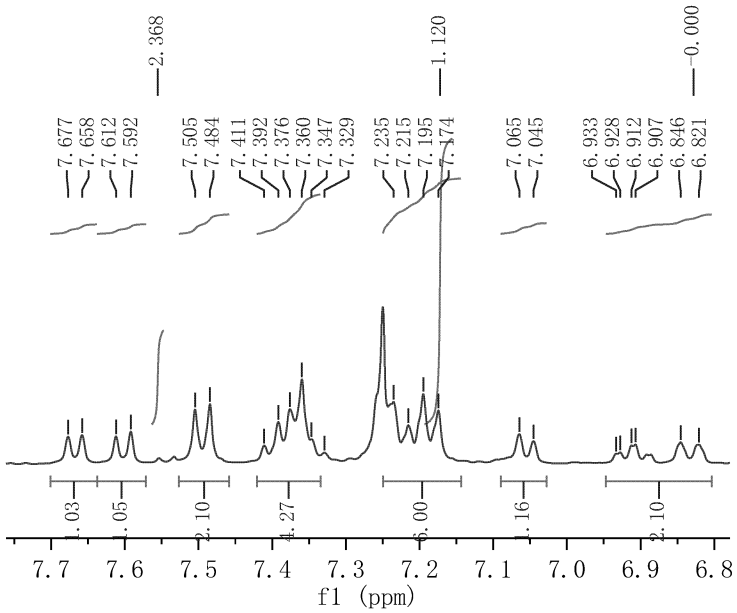


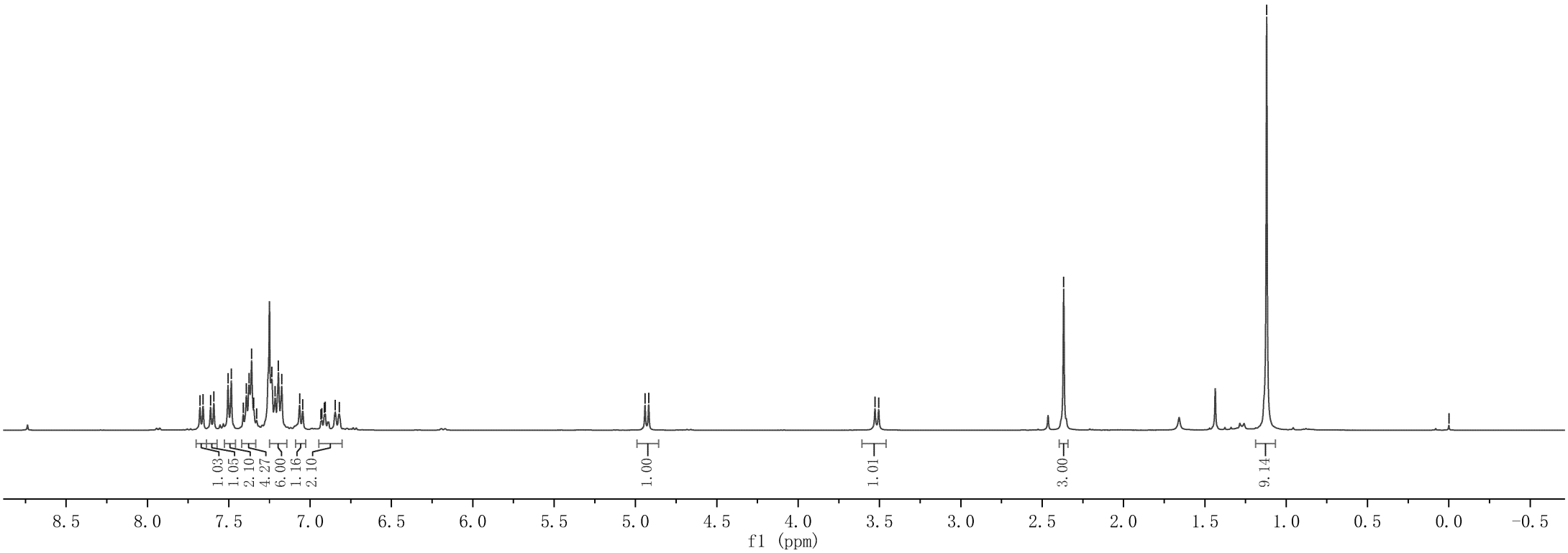


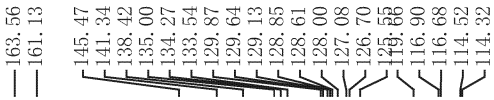
	Parameter	Value
1	Title	WHR-4-R-169
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.1
5	Number of Scans	10
6	Acquisition Time	3.9846
7	Acquisition Date	2019-02-16T21:21:53
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



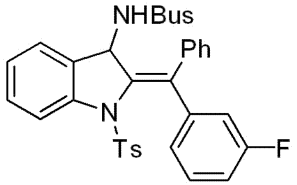
3al







	Parameter	Value
1	Title	WHR-4-R-169-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.3
5	Number of Scans	50
6	Acquisition Time	1.3631
7	Acquisition Date	2019-02-16T21:27:33
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



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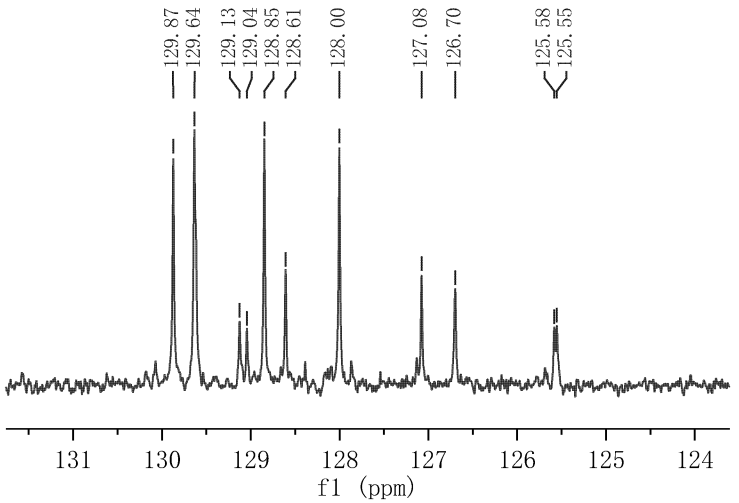
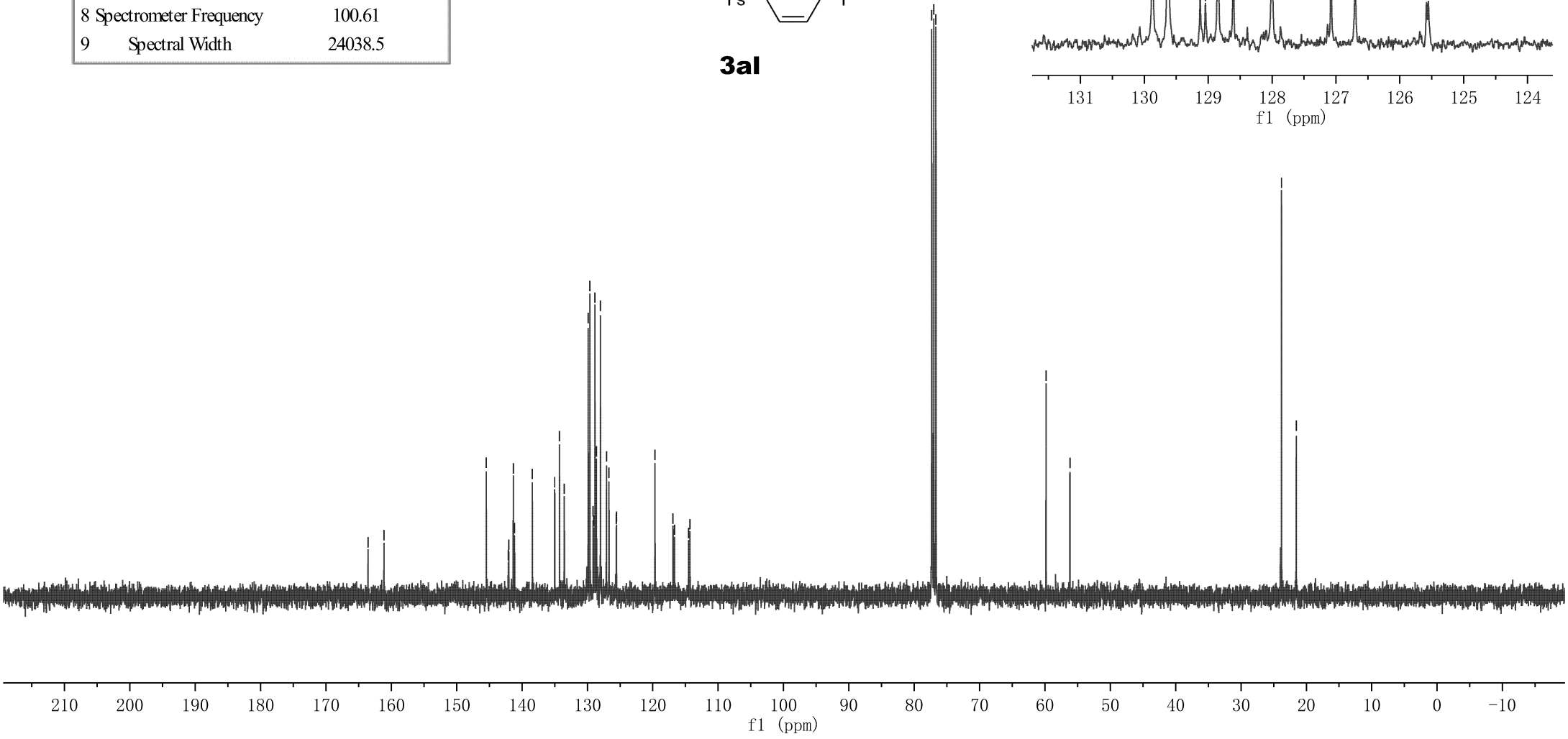
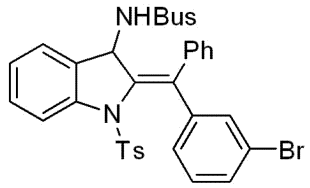




	Parameter	Value
1	Title	WHR-4-R-153
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.1
5	Number of Scans	11
6	Acquisition Time	3.9846
7	Acquisition Date	2019-02-14T16:19:54
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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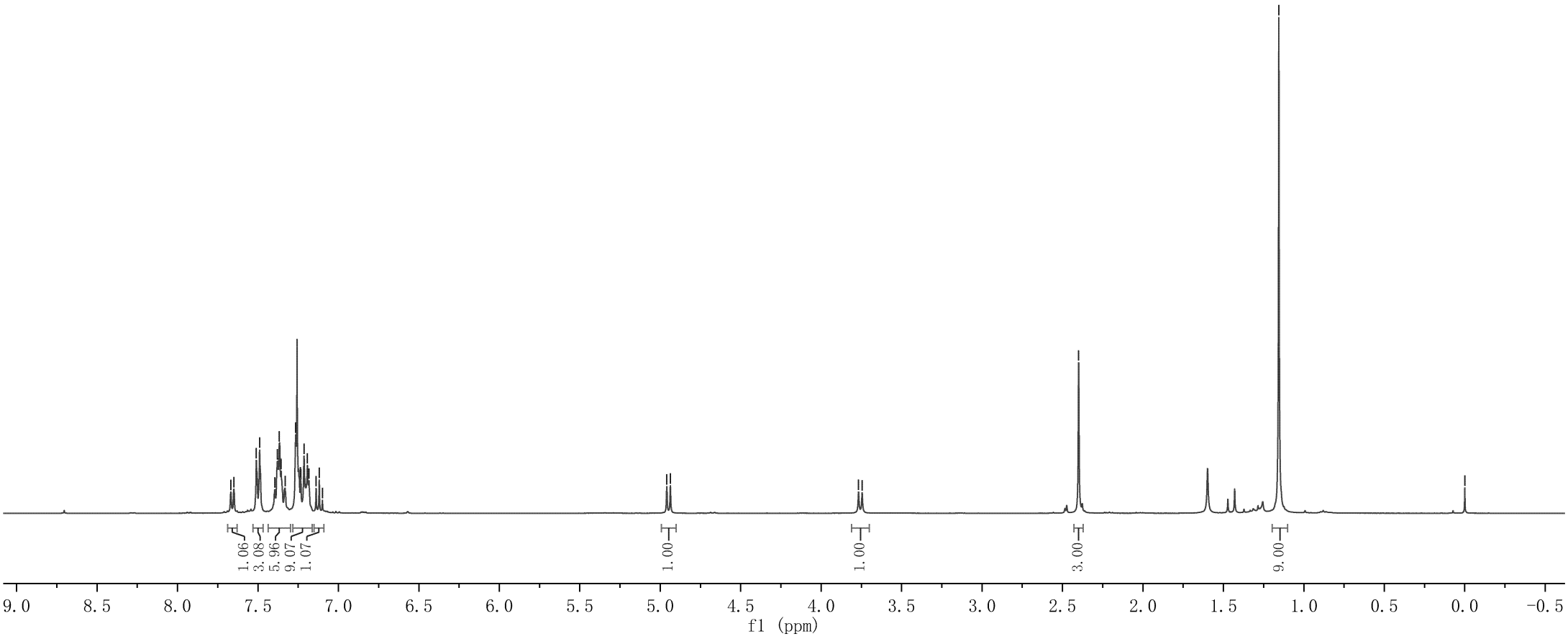

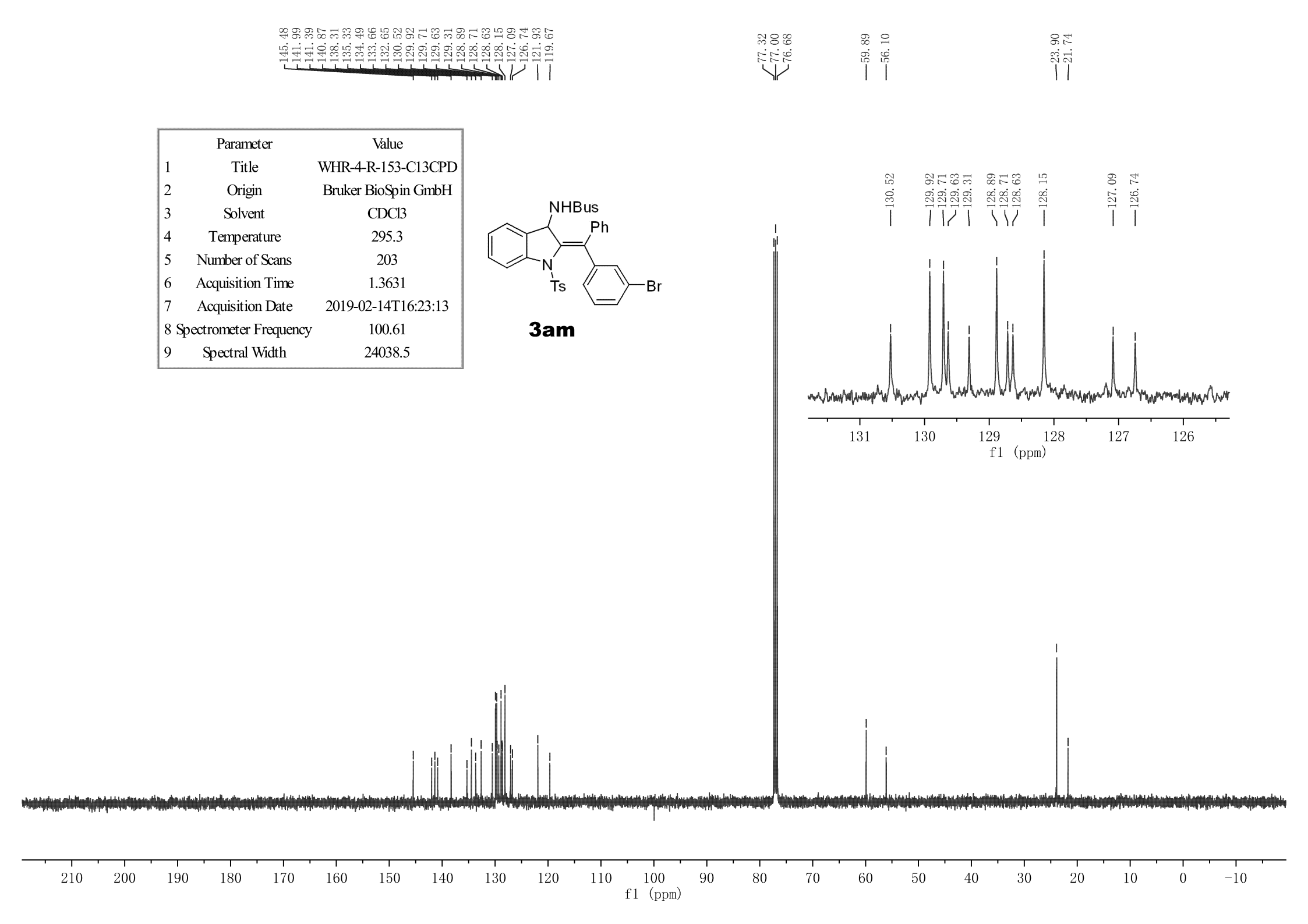
145.48
141.99
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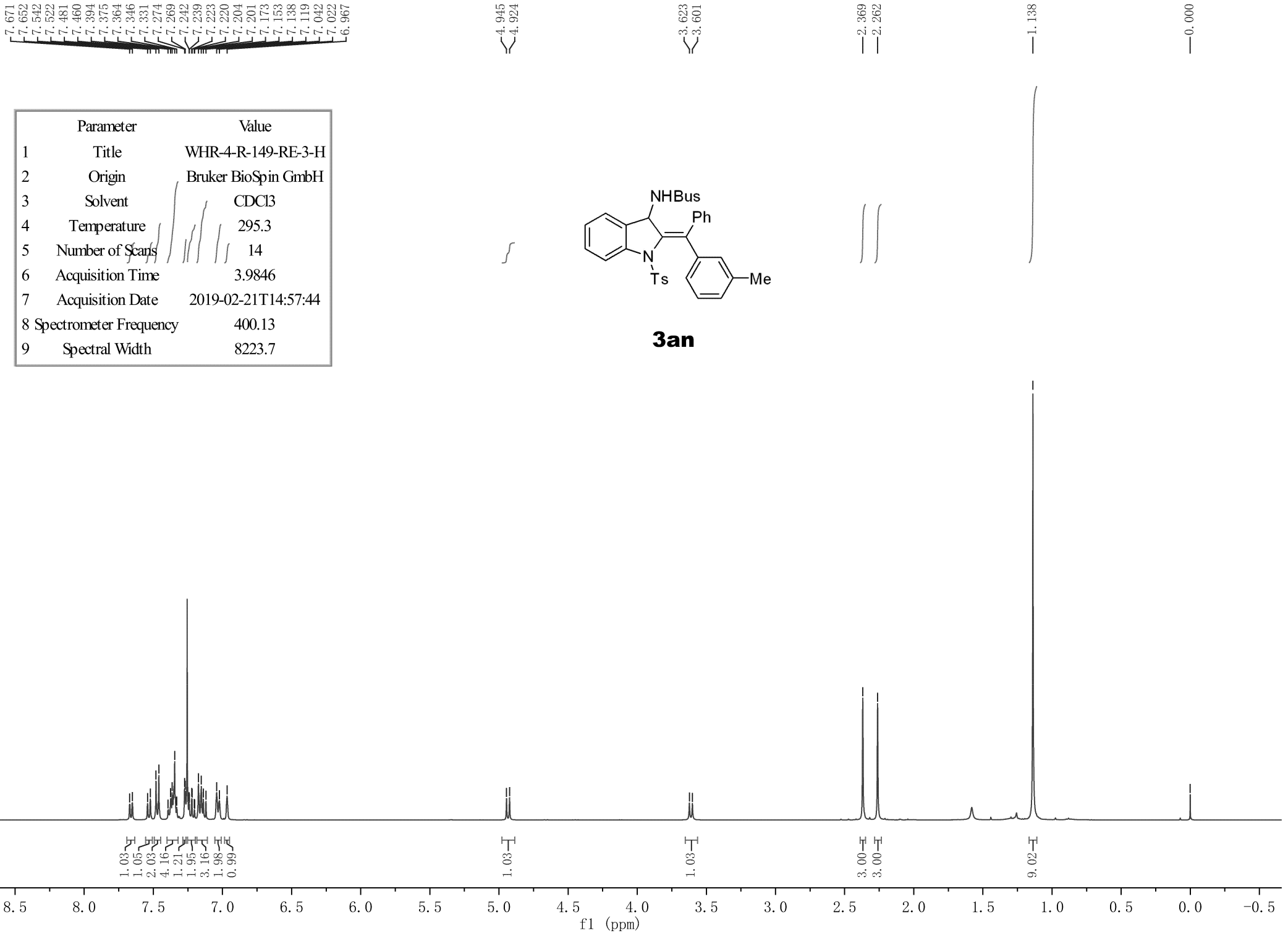
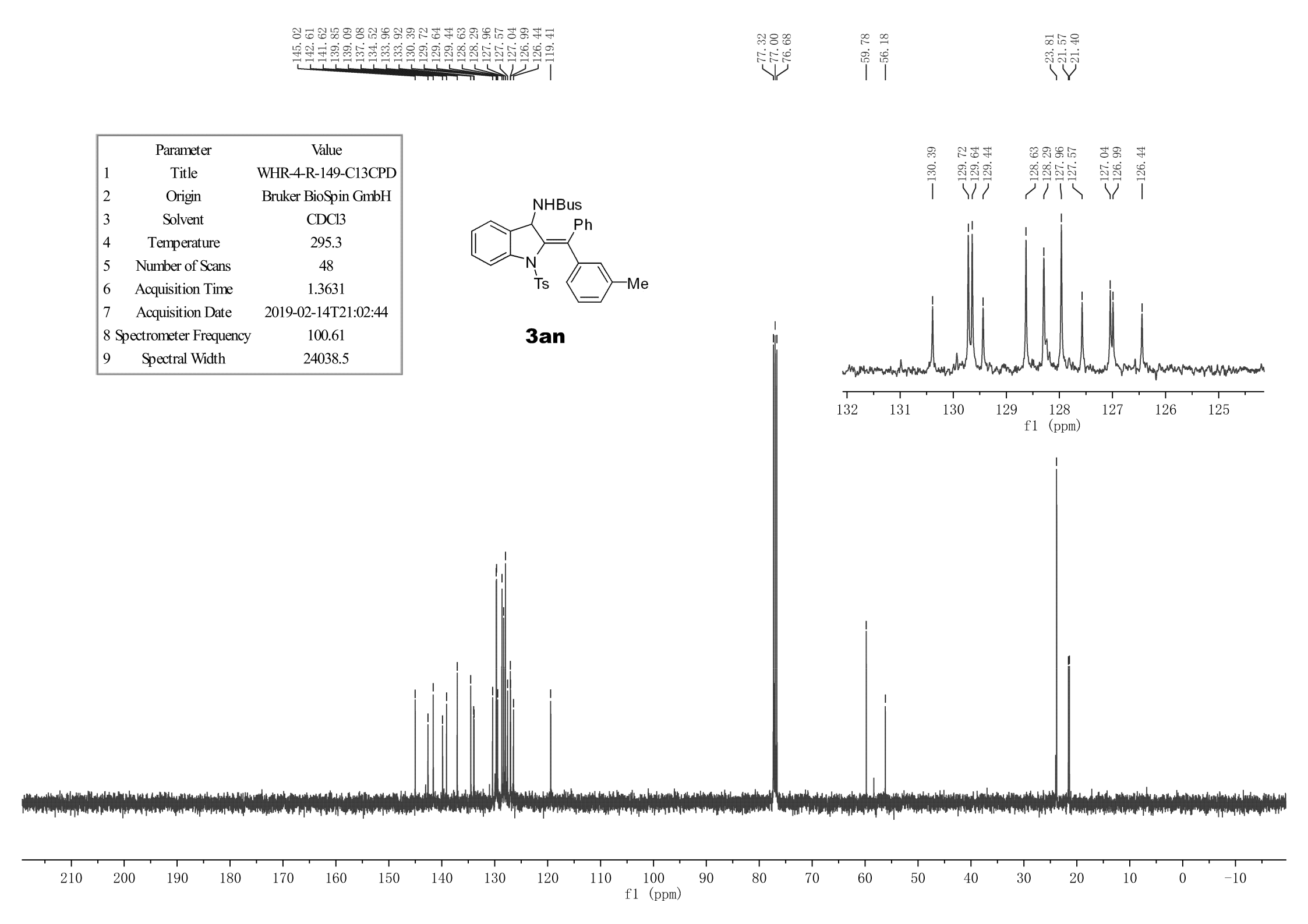
135.33
134.49
133.66
132.65
130.52
129.92
129.71
129.63
129.31
128.89
128.71
128.63
128.15
127.09
126.74
121.93
119.67
77.32
77.00
76.68
59.89
56.10
23.90
21.74
Parameter Value
1 Title WHR-4-R-153-C13CPD
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 295.3
5 Number of Scans 203
6 Acquisition Time 1.3631
7 Acquisition Date 2019-02-14T16:23:13
8 Spectrometer Frequency 100.61
9 Spectral Width 24038.5
NHBus
Ph
N
Ts
Br
3am
130.52
129.92
129.71
129.63
129.31
128.89
128.71
128.63
128.15
127.09
126.74
131
130
129
128
127
126
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

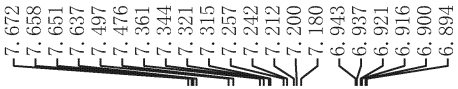


	Parameter	Value
1	Title	WHR-4-R-149-RE-3-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.3
5	Number of Scans	14
6	Acquisition Time	3.9846
7	Acquisition Date	2019-02-21T14:57:44
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7

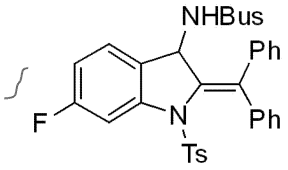
3an



	Parameter	Value
1	Title	WHR-4-R-149-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.3
5	Number of Scans	48
6	Acquisition Time	1.3631
7	Acquisition Date	2019-02-14T21:02:44
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



	Parameter	Value
1	Title	WHR-4-R-209-PURE-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	295.8
5	Number of Scans	9
6	Acquisition Time	3.9846
7	Acquisition Date	2019-03-28T14:36:58
8	Spectrometer Frequency	400.13
9	Spectral Width	8223.7



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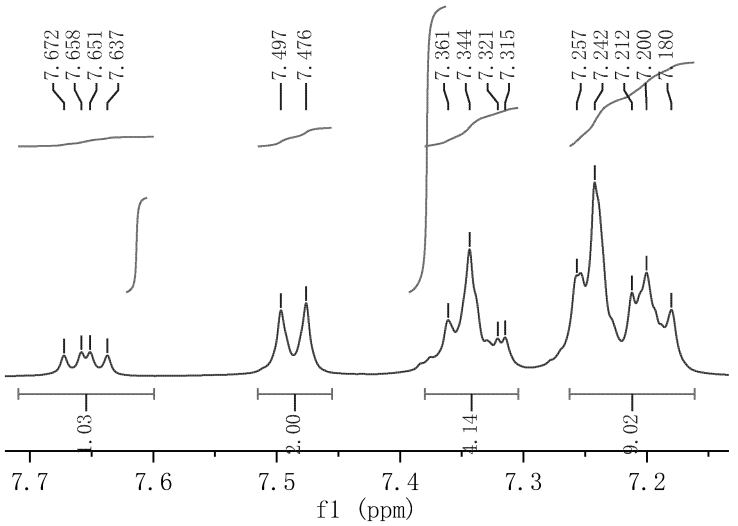

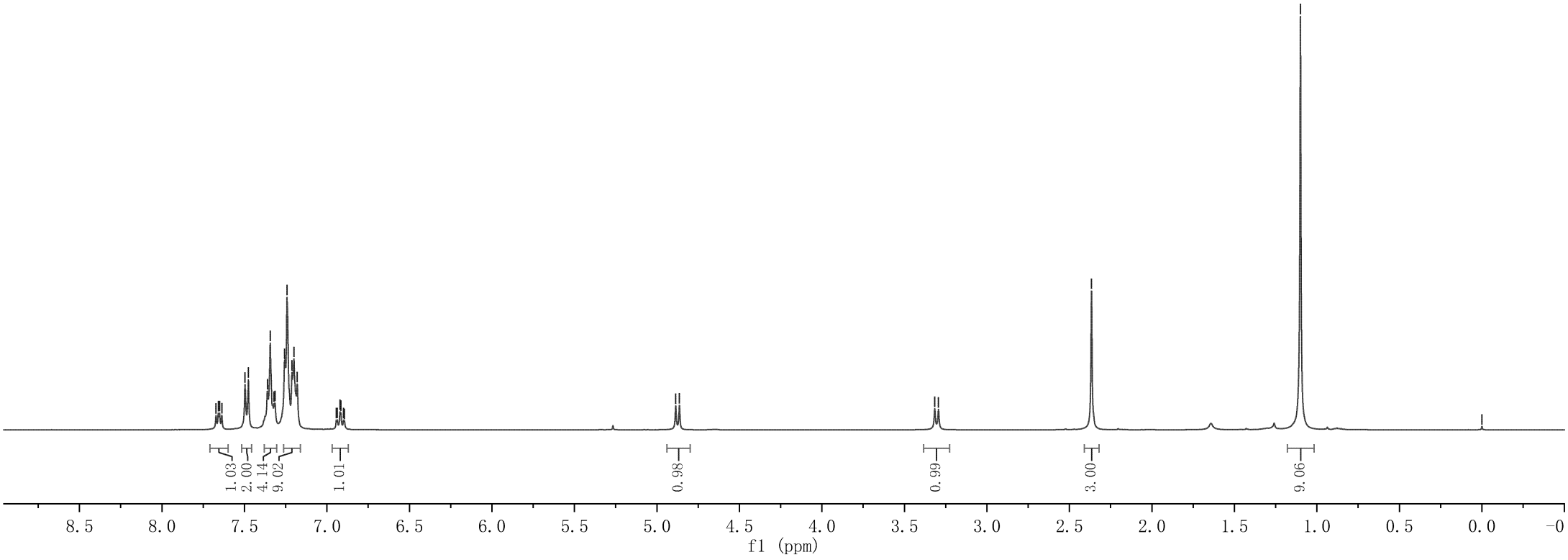

164.37
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127.67
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55.90
23.73
21.59

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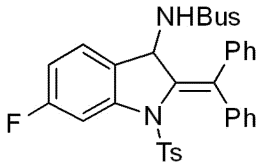
130.11
129.96
129.74
129.63
128.74
128.52
128.47
128.43
127.90
127.79
127.67

	Parameter	Value
1	Title	WHR-4-R-209-C-PURE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	114
6	Acquisition Time	1.3631
7	Acquisition Date	2019-03-28T15:32:08
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



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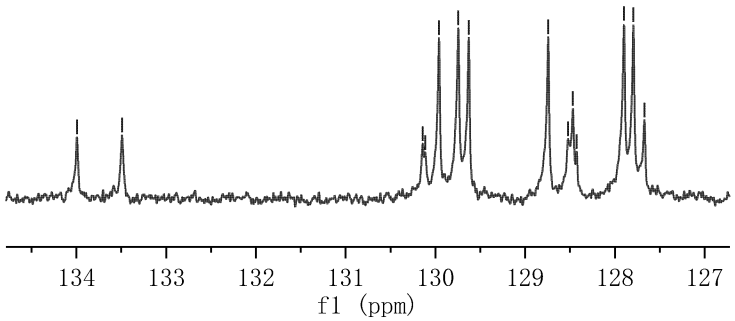
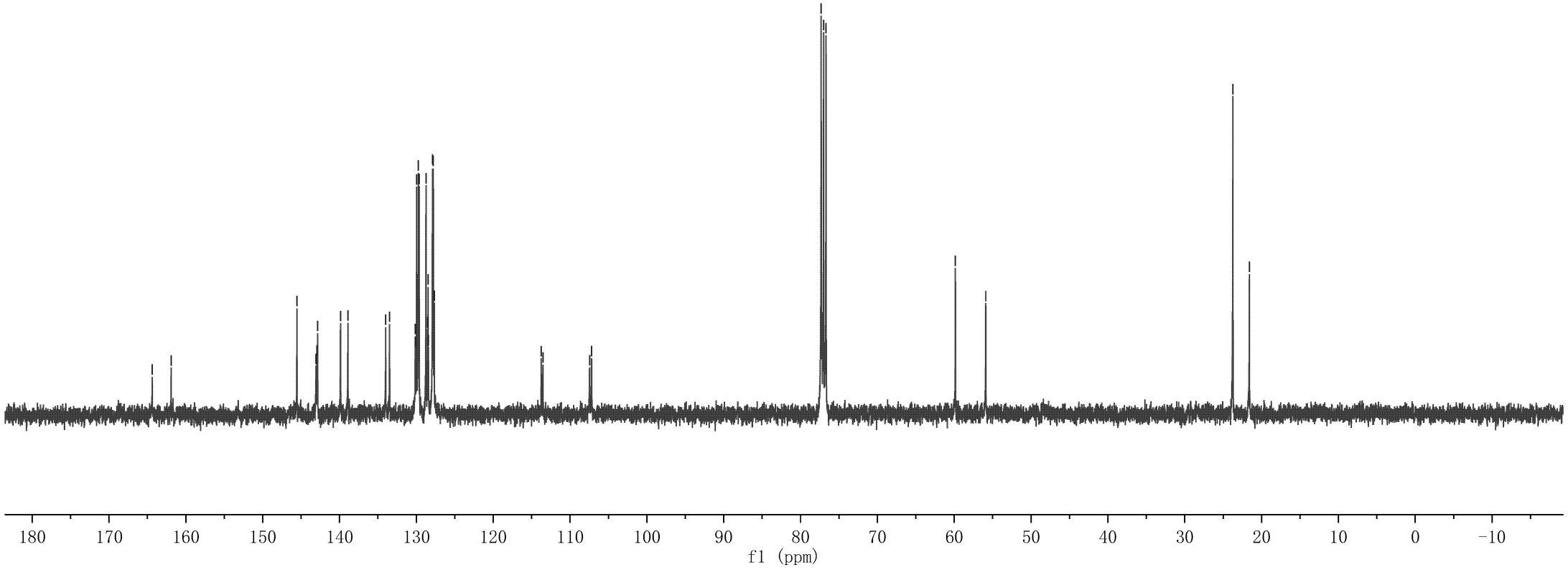
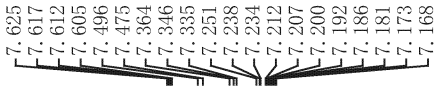
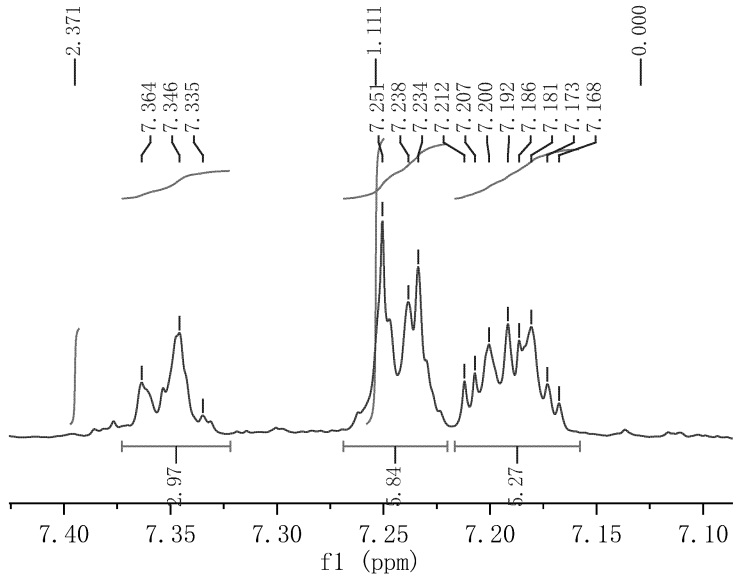
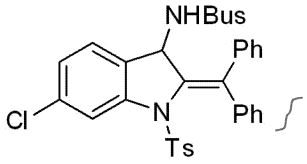








	Parameter	Value
1	Title	WHR-7-R-63-H-2
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.7
5	Number of Scans	5
6	Acquisition Time	3.9846
7	Acquisition Date	2019-10-03T16:18:47
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7



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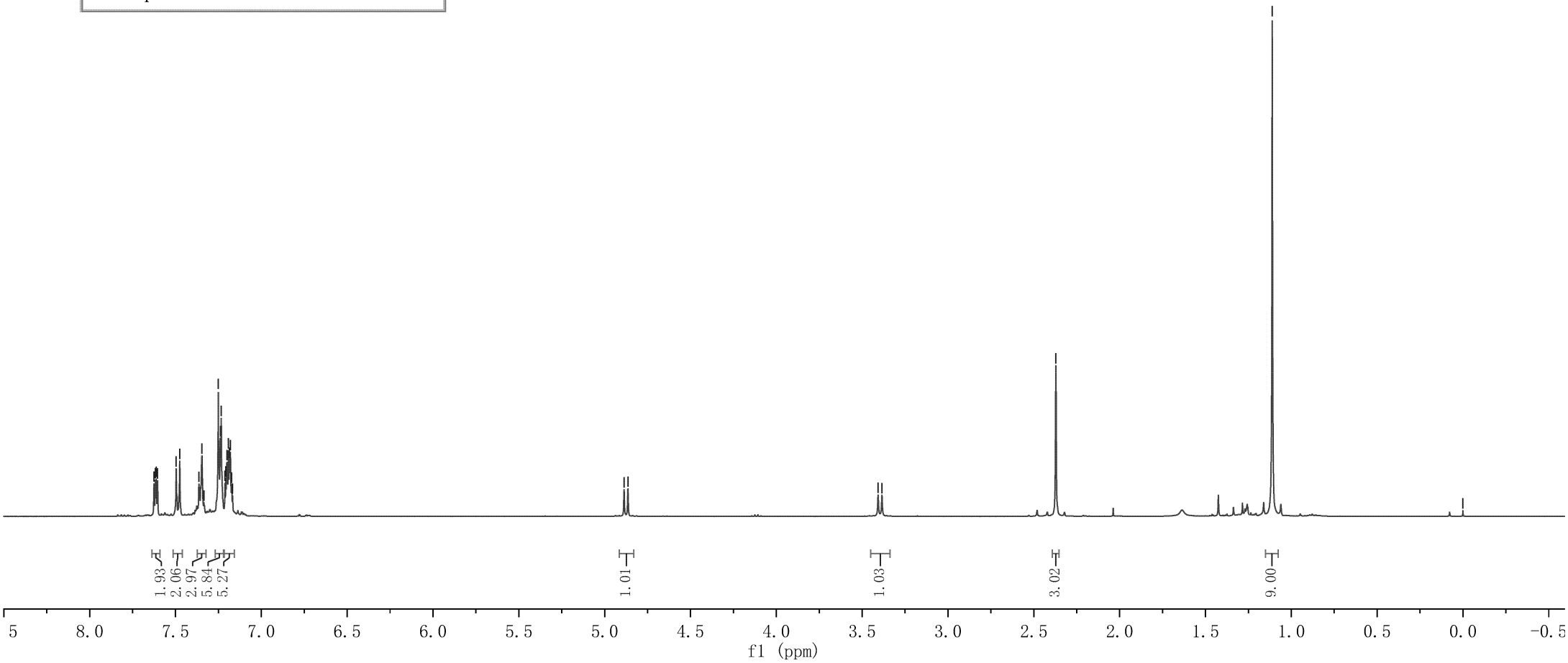
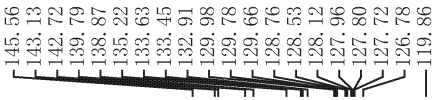
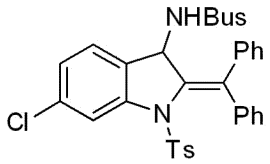




	Parameter	Value
1	Title	WHR-7-R-63-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	299.1
5	Number of Scans	39
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-03T16:12:59
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



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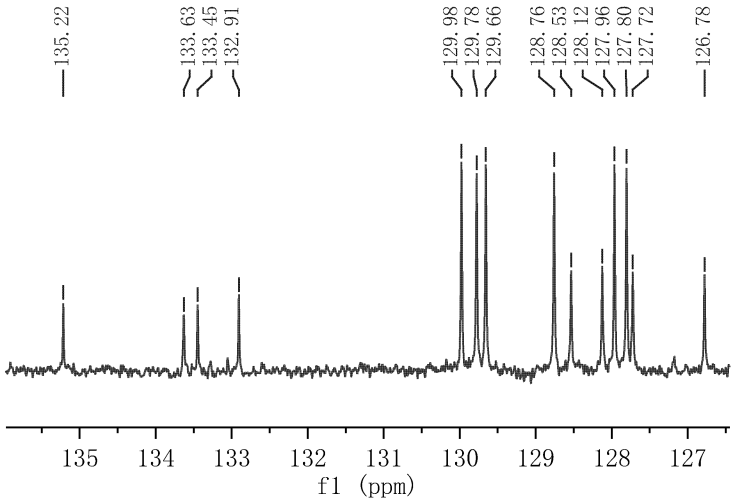
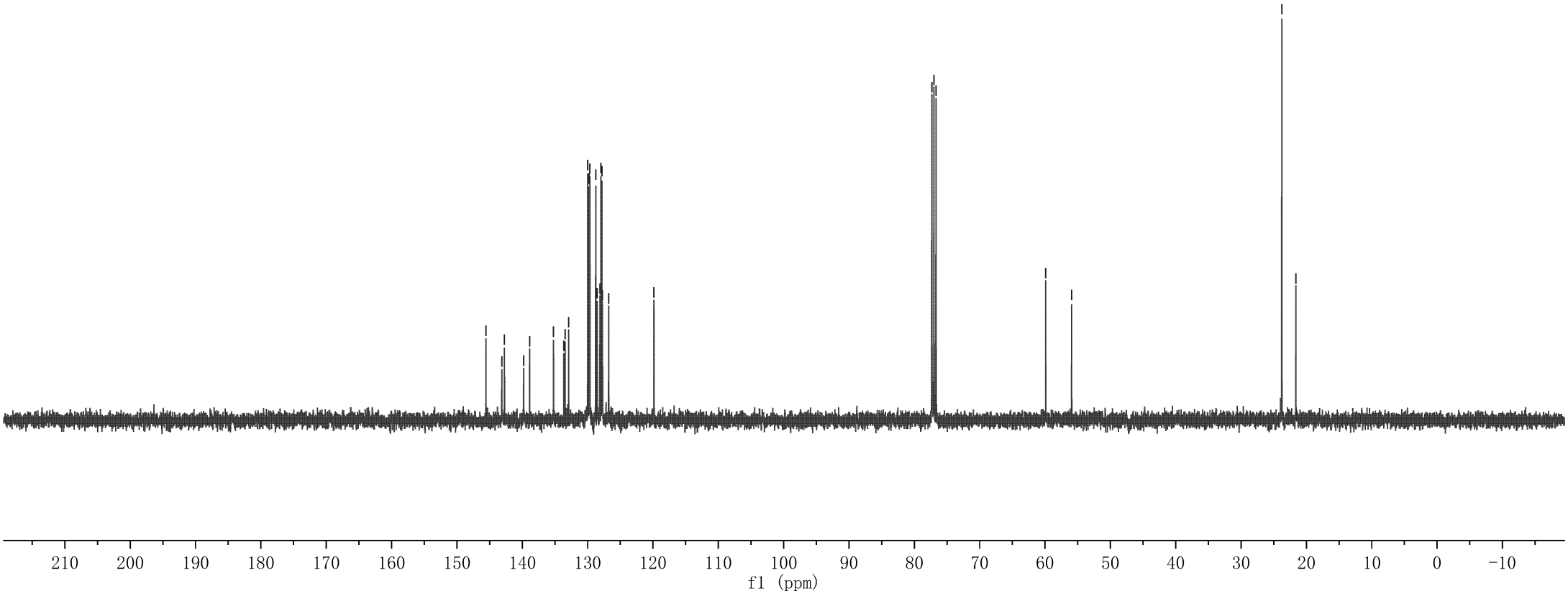
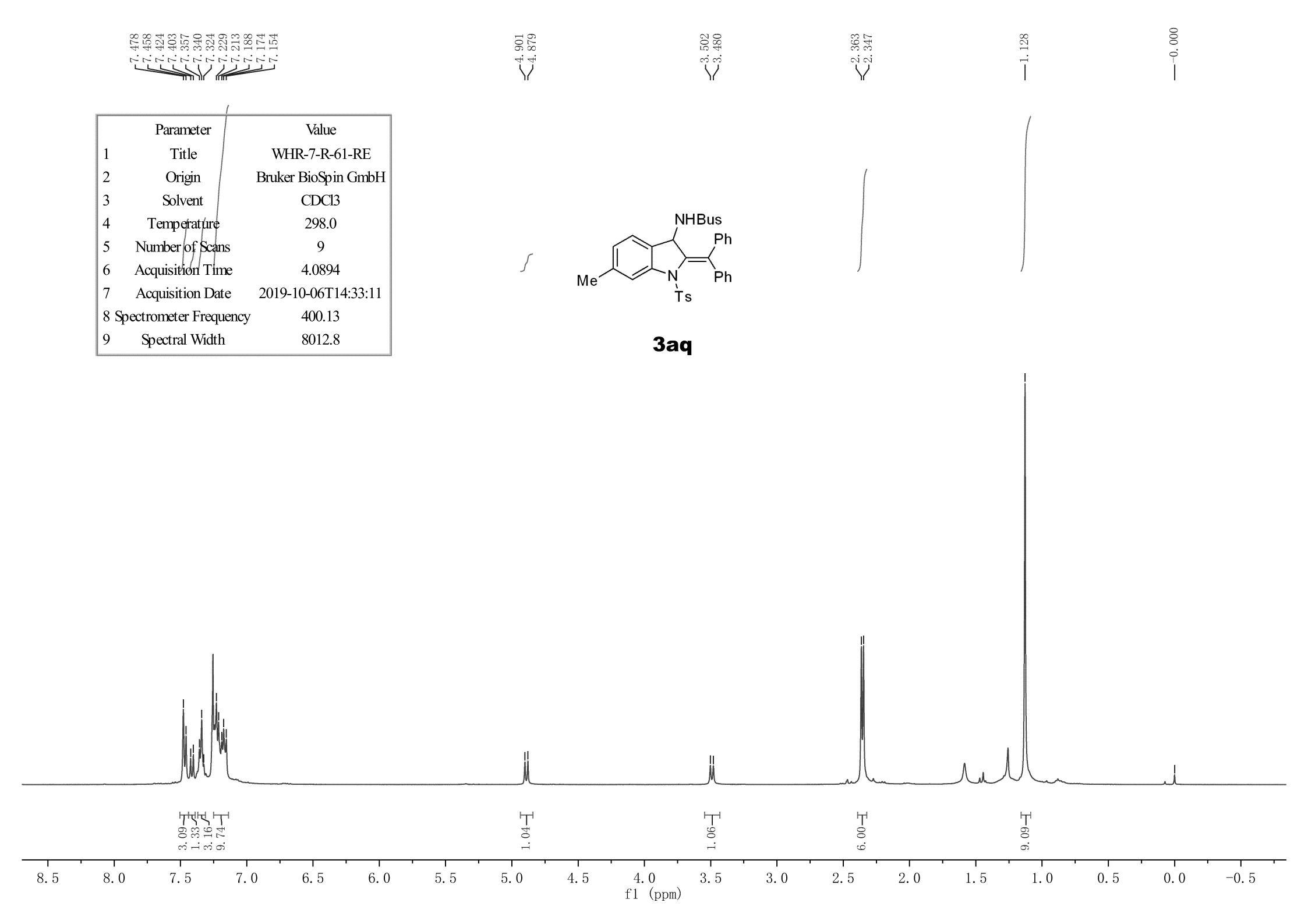
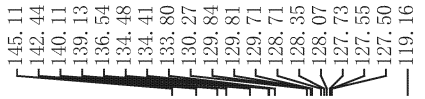


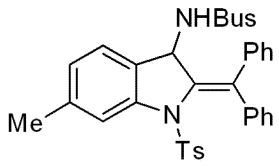




	Parameter	Value
1	Title	WHR-7-R-61-RE
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	9
6	Acquisition Time	4.0894
7	Acquisition Date	2019-10-06T14:33:11
8	Spectrometer Frequency	400.13
9	Spectral Width	8012.8



	Parameter	Value
1	Title	WHR-7-R-61-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.4
5	Number of Scans	168
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-03T15:13:38
8	Spectrometer Frequency	100.59
9	Spectral Width	24038.5



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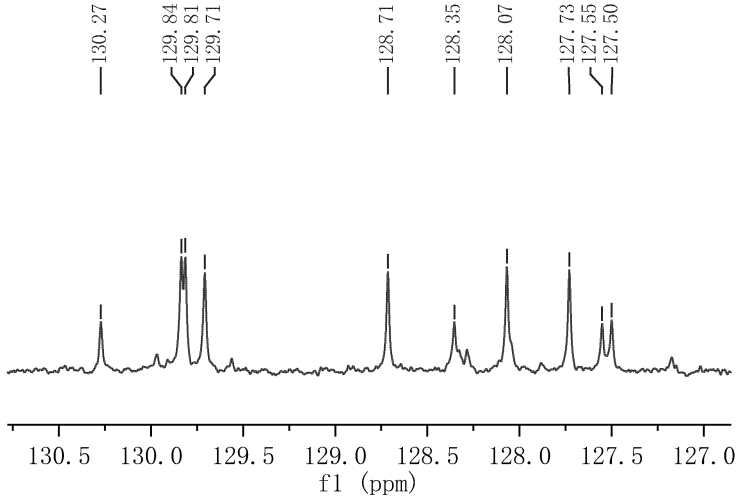

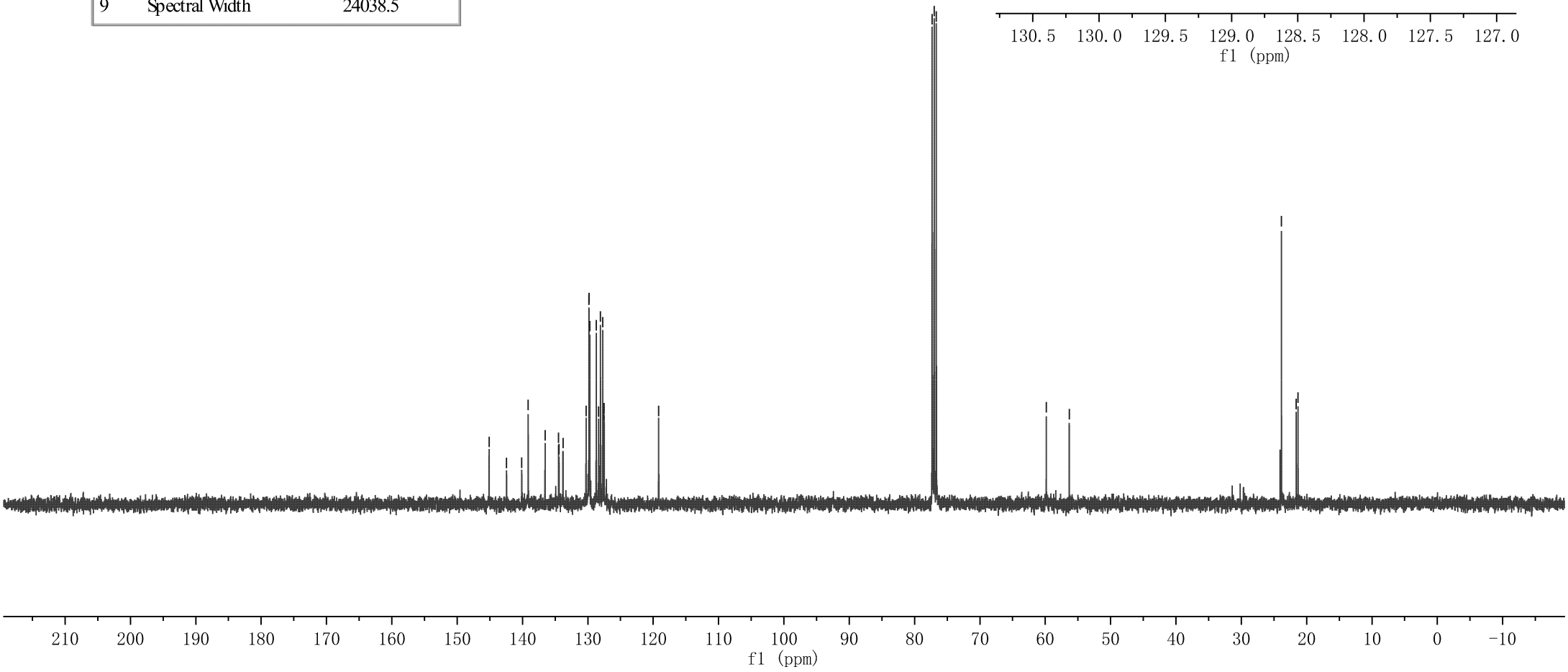

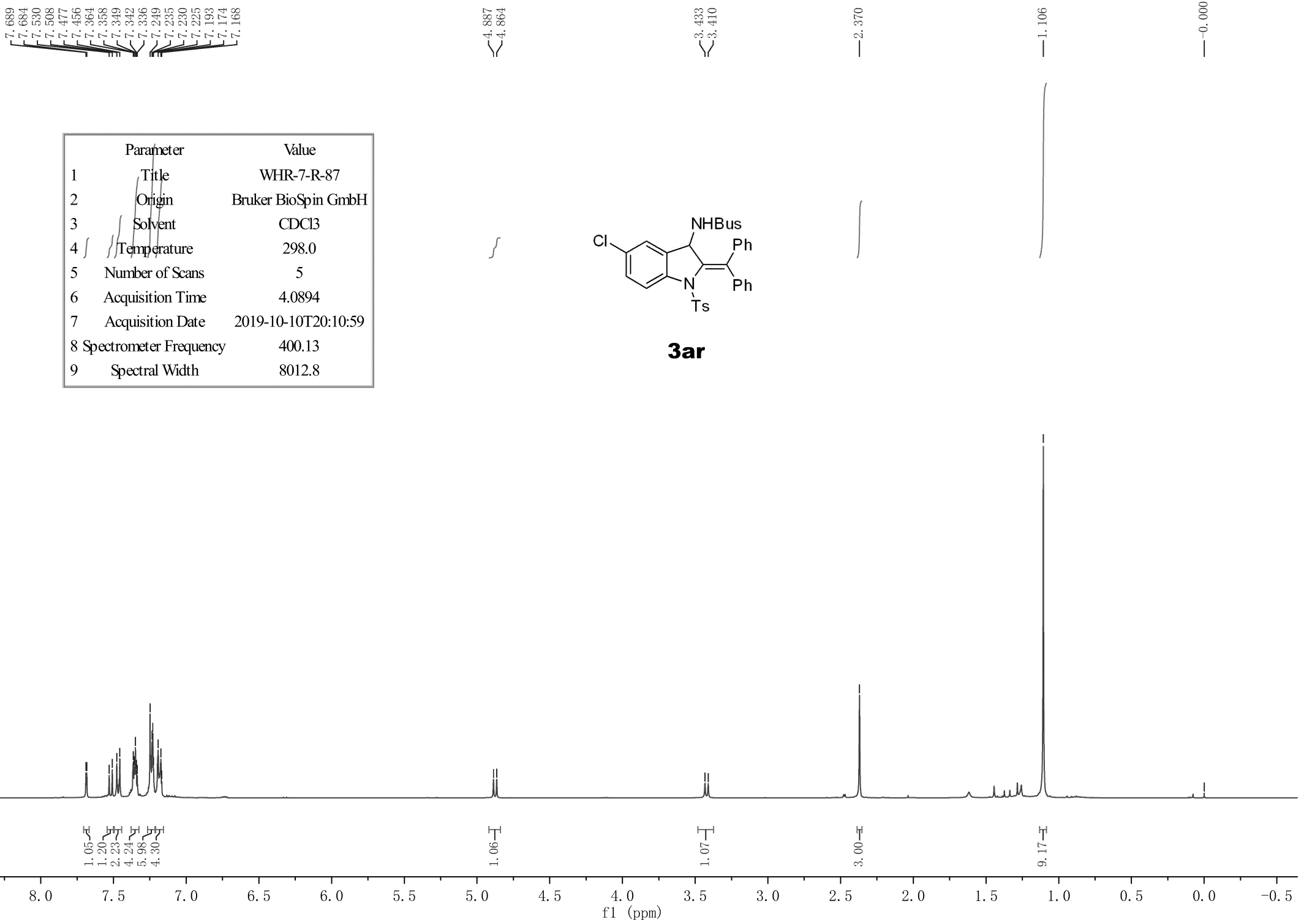
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7.456
7.364
7.358
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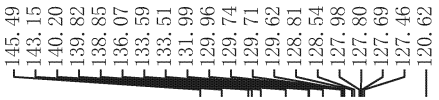
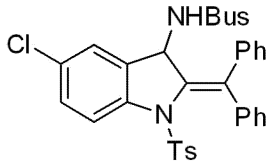
7.342
7.336
7.249
7.235
7.230
7.225
7.193
7.174
7.168
4.887
4.864
3.433
3.410
2.370
1.106
0.000
Parameter Value
1 Title WHR-7-R-87
2 Origin Bruker BioSpin GmbH
3 Solvent CDCl3
4 Temperature 298.0
5 Number of Scans 5
6 Acquisition Time 4.0894
7 Acquisition Date 2019-10-10T20:10:59
8 Spectrometer Frequency 400.13
9 Spectral Width 8012.8
NHBus
Cl
Ph
Ph
N
Ts
3ar
1.05
1.20
2.23
4.24
5.98
4.30
1.06
1.07
3.00
9.17
f1 (ppm)



	Parameter	Value
1	Title	WHR-7-R-87
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	8
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-10T20:15:09
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



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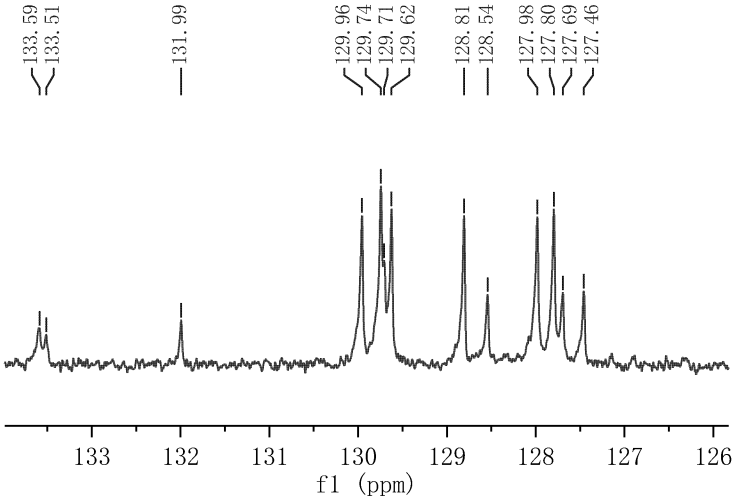
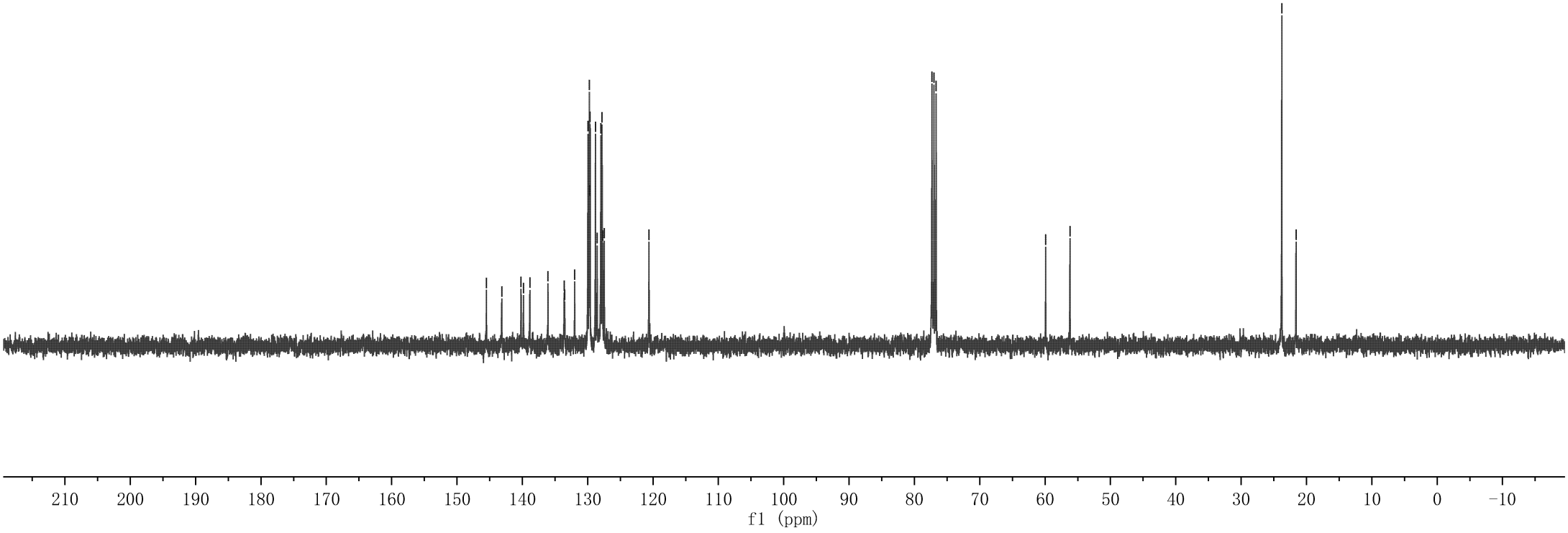
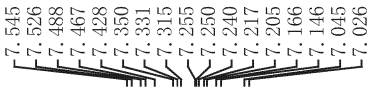
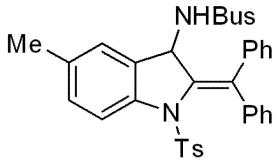


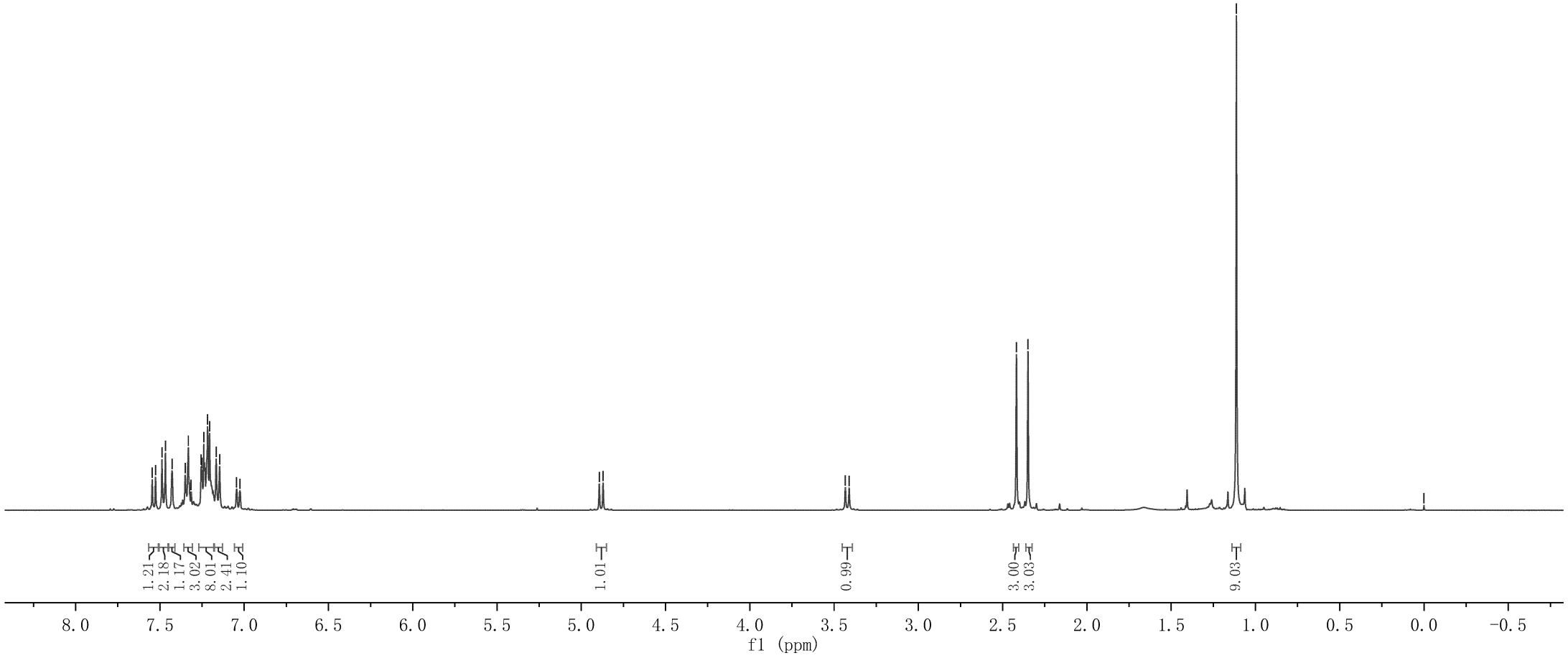


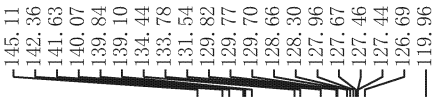


	Parameter	Value
1	Title	WHR-7-R-62-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.8
5	Number of Scans	6
6	Acquisition Time	3.9846
7	Acquisition Date	2019-10-11T14:33:27
8	Spectrometer Frequency	400.03
9	Spectral Width	8223.7

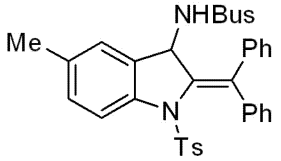


3as





	Parameter	Value
1	Title	WHR-7-R-62-H
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.8
5	Number of Scans	8
6	Acquisition Time	1.3631
7	Acquisition Date	2019-10-11T14:33:27
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



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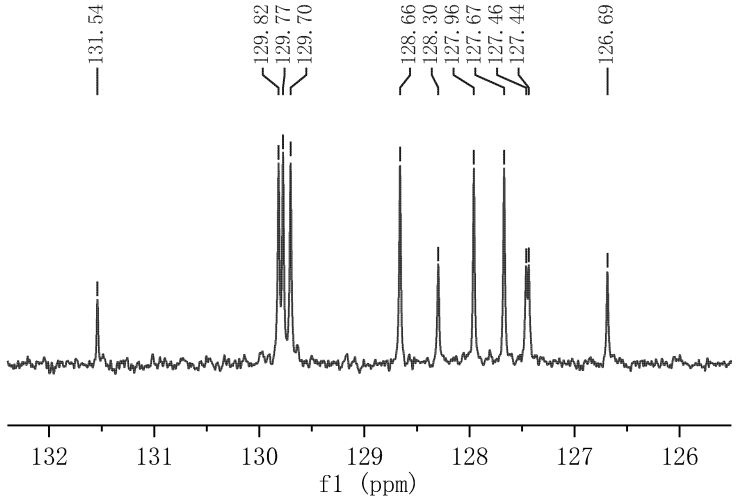
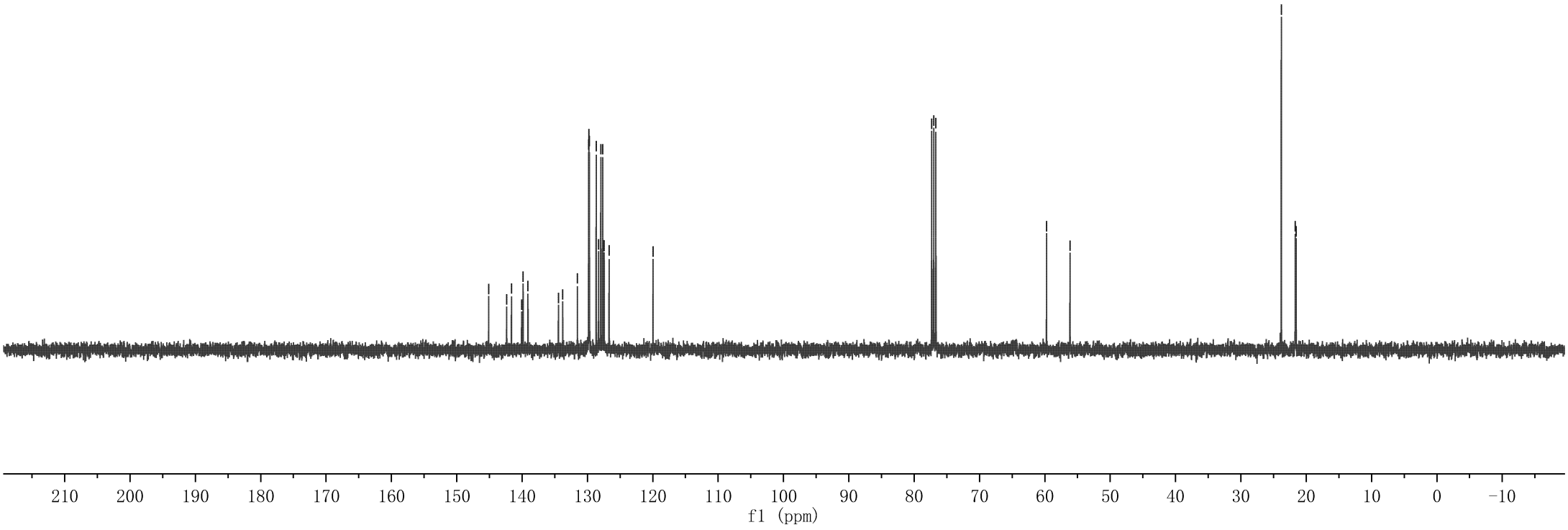
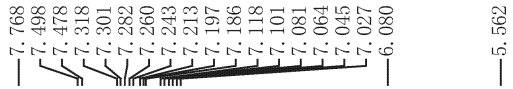
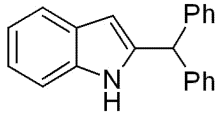


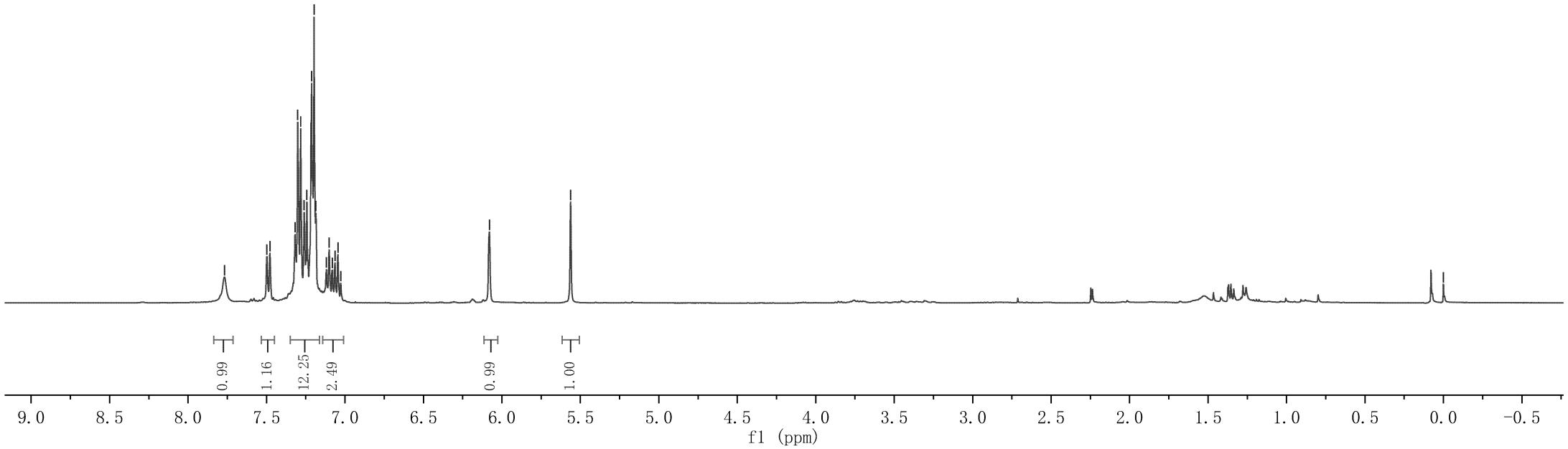


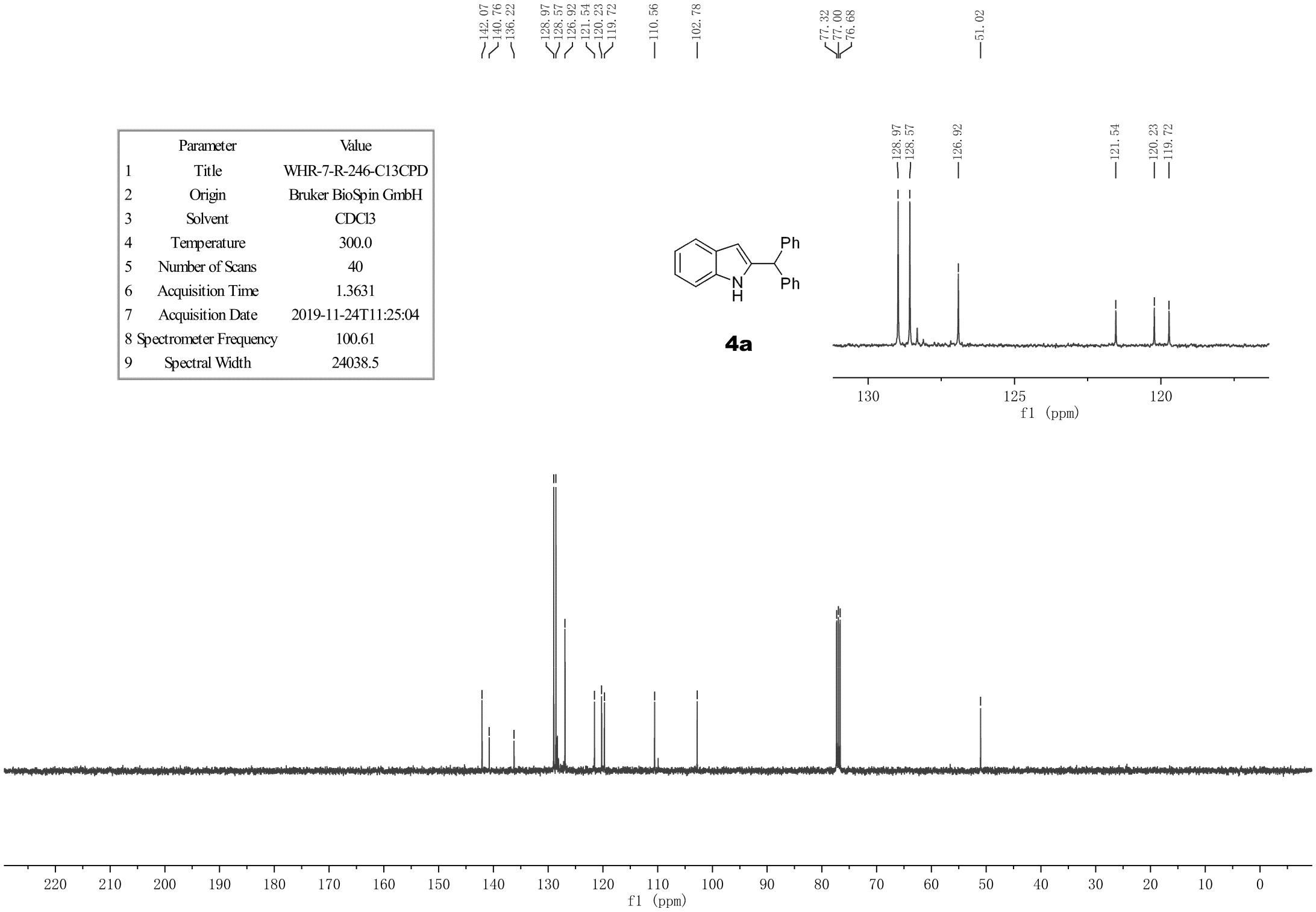


	Parameter	Value
1	Title	WHR-7-R-246
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	12
6	Acquisition Time	4.0894
7	Acquisition Date	2019-11-24T11:21:06
8	Spectrometer Frequency	400.13
9	Spectral Width	8012.8



4a





	Parameter	Value
1	Title	WHR-7-R-246-C13CPD
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	300.0
5	Number of Scans	40
6	Acquisition Time	1.3631
7	Acquisition Date	2019-11-24T11:25:04
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5

7.968
7.967
7.947
7.946
7.577
7.556
7.350
7.338
7.323
7.315
7.304
7.297
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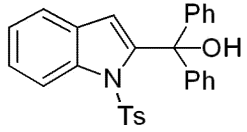
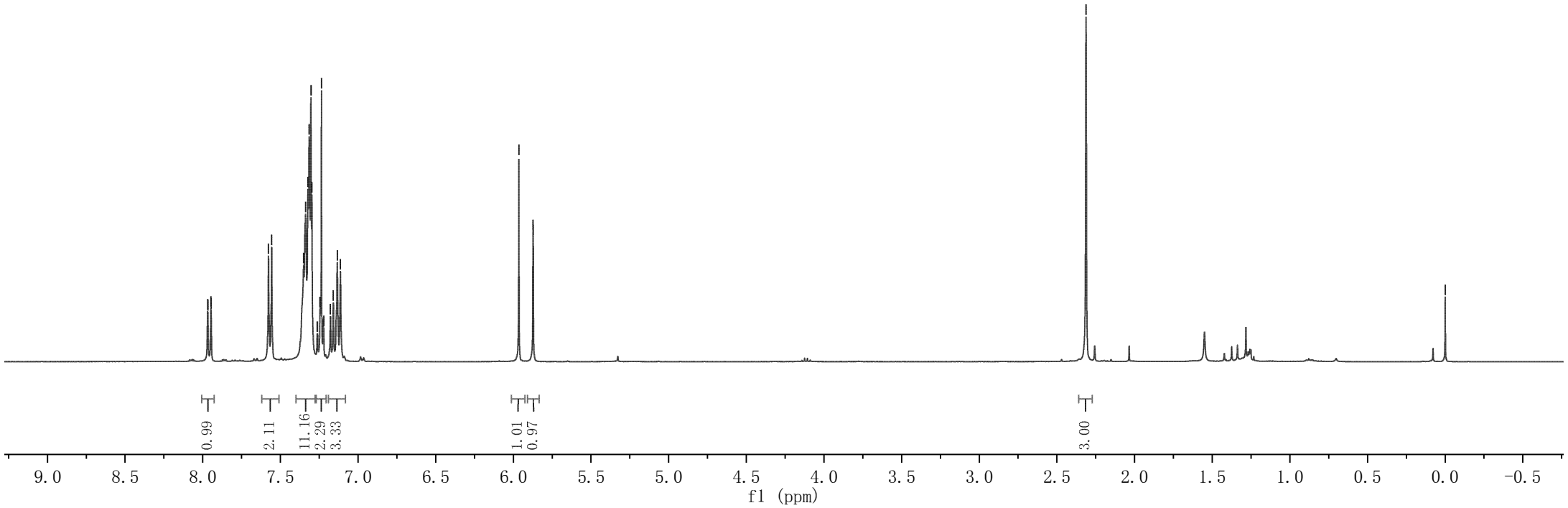
7.236
7.221
7.179
7.159
7.134
7.113
5.965
5.873
5.872
2.313
0.000

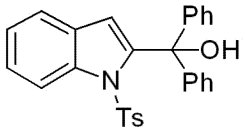
	Parameter	Value
1	Title	WHR-7-R-237
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	9
6	Acquisition Time	4.0894
7	Acquisition Date	2019-11-22T08:53:21
8	Spectrometer Frequency	400.13
9	Spectral Width	8012.8



5a



	Parameter	Value
1	Title	WHR-7-R-237
2	Origin	Bruker BioSpin GmbH
3	Solvent	CDCl3
4	Temperature	298.0
5	Number of Scans	8
6	Acquisition Time	1.3631
7	Acquisition Date	2019-11-22T09:01:23
8	Spectrometer Frequency	100.61
9	Spectral Width	24038.5



5a