

Supporting Information

**Copper-catalyzed B–H bond insertion reaction of azide-ynamide with borane
adducts via α -imino copper carbenes**

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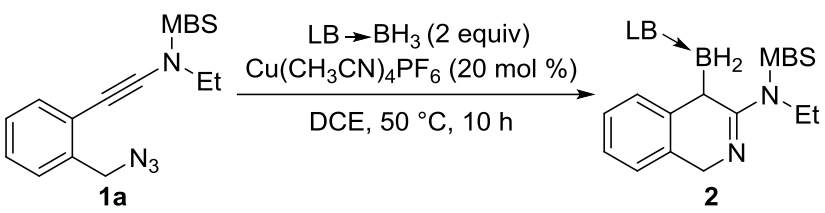
General Information

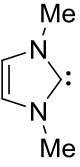
All reactions were carried out with a Titan HMS-14 digital magnetic stirrer with hot plate. Ethyl acetate (ACS grade), hexanes (ACS grade), anhydrous 1,2-dichloroethane (ACS grade) and toluene (ACS grade) were obtained commercially and used without further purification. Methylene chloride, tetrahydrofuran 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 (200-300 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 Agilent 1290-6545XT Ultra-High performance liquid chromatography-quadrupole time-of-flight mass spectrometer using electron spray ionization.

^1H NMR spectra and ^{13}C NMR spectra, were recorded on a Bruker AV-400 spectrometer in chloroform- d , acetone- d_6 and methanol- d_4 . For ^1H NMR spectra, chemical shifts are reported in ppm with the internal TMS signal at 0.0 ppm as the standard. For ^{13}C NMR spectra, chemical shifts are reported in ppm with the internal chloroform signal at 77.0 ppm as the standard, acetone at 30.0 ppm as a standard and methanol at 49.7 ppm as a standard.

More Reaction Condition Study

Table S1. Screening of Other Lewis Base–Borane Adducts ^a

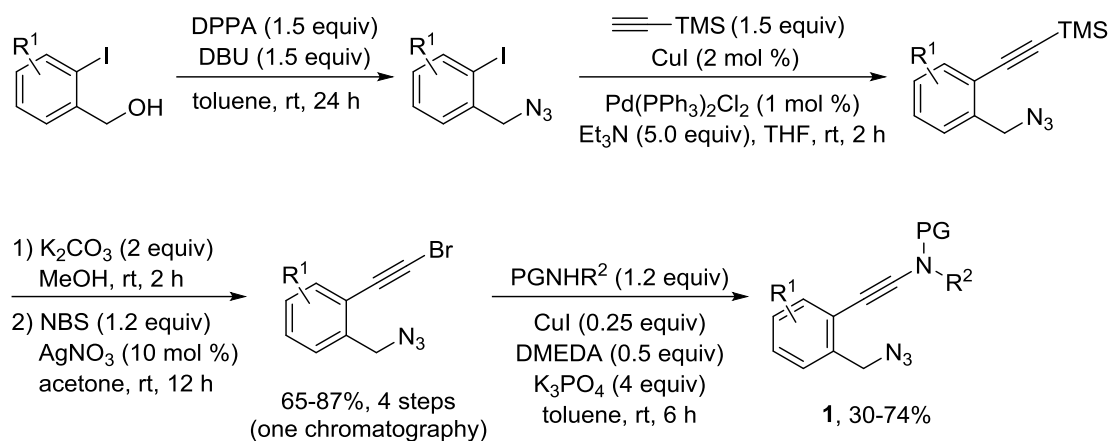


Entry	LB	Yield (%) ^b
1	<i>n</i> Bu ₃ P	n.r.
2	Ph ₃ P	n.r.
3	<i>n</i> Bu ₃ N	n.r.
4	Et ₃ N	trace
5	Et ₂ MeN	trace
6	EtMe ₂ N	trace
7	DMAP	n.r.
8	pyridine	n.r.
9		n.r.

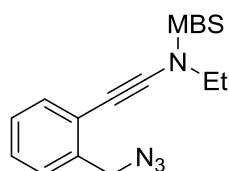
^aReaction conditions: **1a** (0.05 mmol), Cu(CH₃CN)₄PF₆ (0.01 mmol), borane (0.1 mmol), DCE (1 mL), 50 °C, 10 h, in vials. ^bMeasured by ¹H NMR using 1,3,5-trimethoxybenzene as internal reference.

Our attempts to extend the reaction to other Lewis base-borane adducts only led to the formation of complicated mixtures or no reaction.

Representative synthetic procedure for the preparation of ynamides **1**^{1,2}



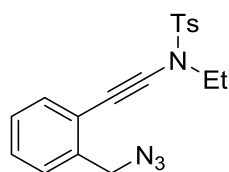
N-((2-(azidomethyl)phenyl)ethynyl)-*N*-ethyl-4-methoxybenzenesulfonamide (**1a**)



1a

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1a** was afforded as a pale yellow oil (55%, 203.5 mg). ¹H NMR (400 MHz, CDCl₃) δ 7.90 (d, *J* = 8.4 Hz, 2H), 7.41 – 7.27 (m, 4H), 7.02 (d, *J* = 8.8 Hz, 2H), 4.45 (s, 2H), 3.87 (s, 3H), 3.51 (q, *J* = 7.2 Hz, 2H), 1.29 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 163.7, 136.3, 131.8, 129.7, 129.1, 128.5, 128.1, 127.9, 122.6, 114.4, 87.1, 68.5, 55.6, 53.1, 46.6, 13.3; IR (neat): 2936, 2203, 2083, 1589, 1362, 1262, 1158, 1092, 996, 804, 756 cm⁻¹; HRESIMS Calcd for [C₁₈H₁₈N₄NaO₃S]⁺ (M + Na⁺) 393.0992, found 393.0997.

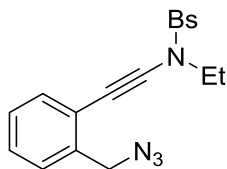
N-((2-(azidomethyl)phenyl)ethynyl)-*N*-ethyl-4-methylbenzenesulfonamide (**1b**)



1b

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1b** was afforded as a pale yellow oil (48%, 170.1 mg). ¹H NMR (400 MHz, CDCl₃) δ 7.85 (d, *J* = 8.0 Hz, 2H), 7.41 – 7.25 (m, 6H), 4.40 (s, 2H), 3.51 (q, *J* = 7.2 Hz, 2H), 2.41 (s, 3H), 1.28 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 144.7, 136.1, 134.5, 131.6, 129.7, 128.4, 127.9, 127.8, 127.3, 122.4, 86.8, 68.3, 52.9, 46.5, 21.3, 13.1; IR (neat): 2980, 2287, 2096, 1627, 1452, 1342, 1260, 1178, 1090, 997 cm⁻¹; HRESIMS Calcd for [C₁₈H₁₈N₄NaO₂S]⁺ (*M* + Na⁺) 377.1043, found 377.1048.

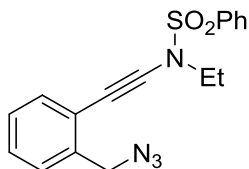
***N*-((2-(azidomethyl)phenyl)ethynyl)-4-bromo-*N*-ethylbenzenesulfonamide (1c)**



1c

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1c** was afforded as a pale yellow oil (34%, 142.6 mg). ¹H NMR (400 MHz, CDCl₃) δ 7.84 (d, *J* = 8.8 Hz, 2H), 7.70 (d, *J* = 8.8 Hz, 2H), 7.42 – 7.27 (m, 4H), 4.45 (s, 2H), 3.53 (q, *J* = 7.2 Hz, 2H), 1.30 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 136.5, 136.3, 132.5, 131.9, 128.9, 128.8, 128.7, 128.2, 122.3, 86.2, 68.7, 53.0, 46.8, 13.3; IR (neat): 2939, 2787, 2256, 2102, 1587, 1448, 1397, 1019, 862 cm⁻¹; HRESIMS Calcd for [C₁₇H₁₅N₄BrNaO₂S]⁺ (*M* + Na⁺) 440.9991, found: 440.9997.

***N*-((2-(azidomethyl)phenyl)ethynyl)-*N*-ethylbenzenesulfonamide (1d)**



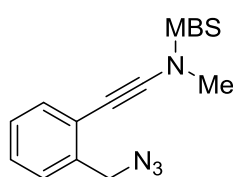
1d

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1d** was afforded as a pale yellow oil (52%, 176.8 mg). ¹H NMR (400 MHz, CDCl₃) δ 7.97 (d, *J* = 7.6 Hz, 2H), 7.63 (t, *J* = 7.2 Hz, 1H), 7.54 (t, *J* = 7.6

Hz, 2H), 7.41 – 7.39 (m, 1H), 7.33 – 7.24 (m, 3H), 4.43 (s, 2H), 3.52 (q, $J = 7.2$ Hz, 2H), 1.27 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 137.3, 136.2, 133.6, 131.7, 129.1, 128.5, 128.0, 127.9, 127.2, 122.3, 86.5, 68.3, 52.8, 46.6, 13.1; IR (neat): 3057, 2829, 2787, 2153, 2122, 1379, 1097, 1019, 950, 730 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{17}\text{H}_{16}\text{N}_4\text{NaO}_2\text{S}]^+$ ($\text{M} + \text{Na}^+$) 363.0886, found: 363.0894.

***N*-((2-(azidomethyl)phenyl)ethynyl)-4-methoxy-*N*-methylbenzenesulfonamide**

(1e)

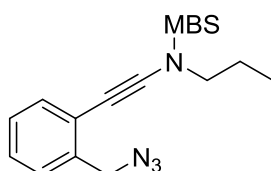


1e

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1e** was afforded as a pale yellow oil (74%, 263.7 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.90 (d, $J = 9.2$ Hz, 2H), 7.40 – 7.26 (m, 4H), 7.03 (d, $J = 8.8$ Hz, 2H), 4.45 (s, 2H), 3.87 (s, 3H), 3.17 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.8, 136.4, 131.8, 129.9, 128.5, 128.1, 128.0, 127.6, 122.4, 114.4, 88.9, 66.6, 55.6, 53.0, 39.0; IR (neat): 2968, 2233, 2097, 1595, 1498, 1363, 1311, 1261, 1159, 805 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{17}\text{H}_{16}\text{N}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 379.0835, found: 379.0845.

***N*-((2-(azidomethyl)phenyl)ethynyl)-4-methoxy-*N*-propylbenzenesulfonamide**

(1f)

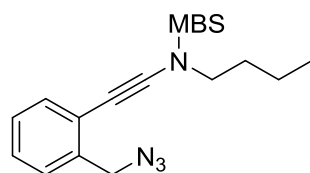


1f

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1f** was afforded as a pale yellow oil (36%, 138.4 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.90 (d, $J = 8.8$ Hz, 2H), 7.40 – 7.26 (m, 4H), 7.01 (d, $J = 8.8$ Hz, 2H), 4.44 (s, 2H), 3.86 (s, 3H), 3.39 (t, $J = 7.2$ Hz, 2H), 1.79 – 1.70 (m, 2H), 0.96 (t, J

= 7.2 Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.7, 136.3, 131.7, 129.7, 129.0, 128.5, 128.1, 127.9, 122.6, 114.3, 87.4, 68.2, 55.6, 53.0(2), 52.9(8), 21.3, 10.8; IR (neat): 2968, 2306, 2057, 1598, 1498, 1324, 1260, 1096, 1027, 835 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{19}\text{H}_{20}\text{N}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 407.1148, found: 407.1155.

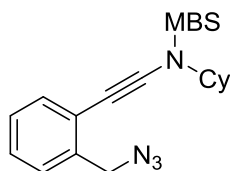
***N*-((2-(azidomethyl)phenyl)ethynyl)-*N*-butyl-4-methoxybenzenesulfonamide (**1g**)**



1g

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1g** was afforded as a pale yellow oil (30%, 119.4 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.90 (d, $J = 9.2$ Hz, 2H), 7.41 – 7.27 (m, 4H), 7.02 (d, $J = 8.8$ Hz, 2H), 4.45 (s, 2H), 3.87 (s, 3H), 3.43 (t, $J = 7.2$ Hz, 2H), 1.74 – 1.67 (m, 2H), 1.42 – 1.37 (m, 2H), 0.93 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.7, 136.2, 131.7, 129.7, 129.0, 128.5, 128.1, 127.9, 122.6, 114.3, 87.4, 68.3, 55.6, 53.0, 51.1, 29.9, 19.4, 13.5; IR (neat): 3040, 2306, 2057, 1597, 1462, 1231, 1027, 918, 802, 741 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{20}\text{H}_{22}\text{N}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 421.1305, found: 421.1314.

***N*-((2-(azidomethyl)phenyl)ethynyl)-*N*-cyclohexyl-4-methoxybenzenesulfonamide (**1h**)**

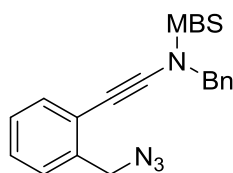


1h

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1h** was afforded as a pale yellow oil (35%, 148.6 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.91 (d, $J = 8.8$ Hz, 2H), 7.43 – 7.41 (m, 1H), 7.37 – 7.32 (m, 1H), 7.29 – 7.26 (m, 2H), 6.99 (d, $J = 8.8$ Hz, 2H), 4.45 (s, 2H), 3.88 – 3.81 (m, 4H), 1.79 – 1.72 (m, 4H), 1.61 – 1.51 (m, 3H), 1.36 – 1.26 (m, 2H), 1.12 – 1.03 (m, 1H); ^{13}C NMR

(100 MHz, CDCl₃) δ 163.4, 135.9, 131.6, 130.4, 129.3, 128.5, 128.0, 127.6, 122.8, 114.2, 85.3, 69.9, 59.4, 55.5, 52.9, 31.1, 25.2, 24.7; IR (neat): 3025, 2229, 2102, 1593, 1447, 1361, 1025, 986, 810 cm⁻¹; HRESIMS Calcd for [C₂₂H₂₄N₄NaO₃S]⁺ (M + Na⁺) 447.1461, found: 447.1469.

***N*-((2-(azidomethyl)phenyl)ethynyl)-*N*-benzyl-4-methoxybenzenesulfonamide (**1i**)**

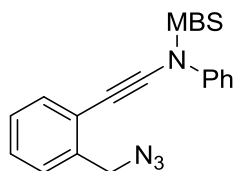


1i

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1i** was afforded as a pale yellow oil (37%, 168.5 mg). ¹H NMR (400 MHz, CDCl₃) δ 7.87 (d, *J* = 8.8 Hz, 2H), 7.33 (s, 5H), 7.26 – 7.19 (m, 4H), 6.99 (d, *J* = 8.8 Hz, 2H), 4.60 (s, 2H), 4.13 (s, 2H), 3.86 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 163.8, 136.2, 134.2, 131.5, 129.9, 129.0, 128.8, 128.6, 128.4, 128.1, 127.9, 122.2, 114.4, 87.5, 69.1, 55.7, 55.4, 52.6; IR (neat): 2980, 2230, 2094, 1635, 1454, 1339, 1188, 1339, 996, 752 cm⁻¹; HRESIMS Calcd for [C₂₃H₂₀N₄NaO₃S]⁺ (M + Na⁺) 455.1148, found: 455.1139.

***N*-((2-(azidomethyl)phenyl)ethynyl)-4-methoxy-*N*-phenylbenzenesulfonamide**

(1j)

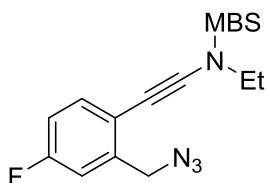


1j

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1j** was afforded as a pale yellow oil (52%, 217.4 mg). ¹H NMR (400 MHz, CDCl₃) δ 7.54 (d, *J* = 9.2 Hz, 2H), 7.28 – 7.11 (m, 9H), 6.79 (d, *J* = 9.2 Hz, 2H), 4.33 (s, 2H), 3.67 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 163.9, 138.6, 136.4, 131.8, 130.2, 129.1, 128.5, 128.2, 128.1(1), 128.0(5), 127.2, 126.1, 122.2, 114.0, 87.8,

68.0, 55.5, 52.9; IR (neat): 3066, 2237, 2091, 1576, 1456, 1263, 1113, 1090, 888, 692 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{22}\text{H}_{18}\text{N}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 441.0992, found: 441.0994.

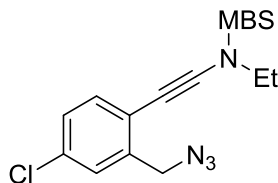
***N*-((2-(azidomethyl)-4-fluorophenyl)ethynyl)-*N*-ethyl-4-methoxybenzenesulfonamide (1k)**



1k

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1k** was afforded as a pale yellow oil (39%, 151.3 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.90 (d, $J = 8.8$ Hz, 2H), 7.31 (dd, $J = 8.4, 5.6$ Hz, 1H), 7.08 (dd, $J = 8.8, 2.8$ Hz, 1H), 7.03 (d, $J = 8.8$ Hz, 2H), 6.98 (td, $J = 8.4, 2.8$ Hz, 1H), 4.43 (s, 2H), 3.87 (s, 3H), 3.51 (q, $J = 7.2$ Hz, 2H), 1.29 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.8, 161.9 (d, $J = 246.0$ Hz), 132.1 (d, $J = 3.0$ Hz), 130.4 (d, $J = 9.0$ Hz), 129.7, 129.0, 124.7 (d, $J = 10.0$ Hz), 118.0 (d, $J = 23.0$ Hz), 115.0, 114.6 (d, $J = 21.0$ Hz), 114.4, 88.1, 67.9 (d, $J = 3.0$ Hz), 55.6, 52.3, 46.5, 13.2; ^{19}F NMR (376 MHz, CDCl_3) δ -110.6; IR (neat): 3066, 2235, 2093, 1609, 1497, 1261, 1092, 916, 730, 556 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{18}\text{H}_{17}\text{FN}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 411.0898, found: 411.0905.

***N*-((2-(azidomethyl)-4-chlorophenyl)ethynyl)-*N*-ethyl-4-methoxybenzenesulfonamide (1l)**

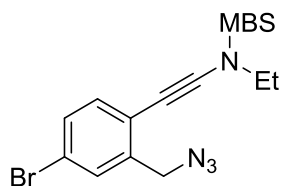


1l

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1l** was afforded as a pale yellow oil (51%, 206.0 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.88 (d, $J = 8.8$ Hz, 2H), 7.35 – 7.30 (m, 2H), 7.22 (dd, $J = 8.4, 2.0$ Hz, 1H), 7.02 (d, $J = 8.8$ Hz, 2H), 4.44 (s, 2H), 3.87 (s, 3H), 3.51 (q, $J = 7.2$ Hz,

2H), 1.28 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.7, 138.1, 133.5, 132.7, 129.6, 128.9, 128.2, 128.1, 120.8, 114.3, 88.0, 67.5, 55.5, 52.4, 46.4, 13.2; IR (neat): 3035, 2212, 2105, 1595, 1497, 1332, 1263, 1159, 995, 834 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{18}\text{H}_{17}\text{ClN}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 427.0602, found: 427.0599.

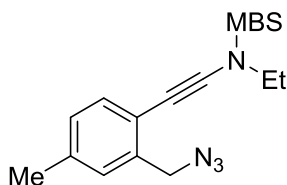
***N*-((2-(azidomethyl)-4-bromophenyl)ethynyl)-*N*-ethyl-4-methoxybenzenesulfonamide (1m)**



1m

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1m** was afforded as a pale yellow oil (49%, 219.5 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.89 (d, $J = 8.8$ Hz, 2H), 7.51 (d, $J = 1.6$ Hz, 1H), 7.40 (dd, $J = 8.4, 1.6$ Hz, 1H), 7.21 (d, $J = 8.4$ Hz, 1H), 7.03 (d, $J = 8.8$ Hz, 2H), 4.41 (s, 2H), 3.88 (s, 3H), 3.51 (q, $J = 7.2$ Hz, 2H), 1.29 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.8, 135.1, 133.9, 130.8, 129.9, 129.7, 129.0, 124.6, 121.7, 114.4, 88.5, 67.6, 55.6, 52.5, 46.5, 13.3; IR (neat): 2937, 2231, 2097, 1597, 1497, 1363, 1259, 1158, 835, 764 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{18}\text{H}_{17}\text{BrN}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 471.0097, found: 471.0089.

***N*-((2-(azidomethyl)-4-methylphenyl)ethynyl)-*N*-ethyl-4-methoxybenzenesulfonamide (1n)**

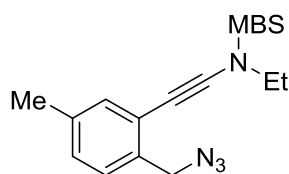


1n

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1n** was afforded as a pale yellow oil (53%, 203.5 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.89 (d, $J = 8.8$ Hz, 2H), 7.30 (d, $J = 8.0$ Hz, 1H), 7.15 (s, 1H), 7.07 (d, $J = 7.6$ Hz, 1H), 7.01 (d, $J = 8.8$ Hz, 2H), 4.41 (s, 2H), 3.85 (s, 3H), 3.49 (q, J

= 7.2 Hz, 2H), 2.34 (s, 3H), 1.28 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.6, 138.2, 136.3, 131.8, 129.6, 129.2, 129.0, 128.8, 119.4, 114.3, 86.1, 68.3, 55.5, 53.0, 46.5, 21.2, 13.2; IR (neat): 2978, 2232, 2093, 1594, 1362, 1260, 1089, 926, 834, 671 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{19}\text{H}_{20}\text{N}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 407.1148, found: 407.1152.

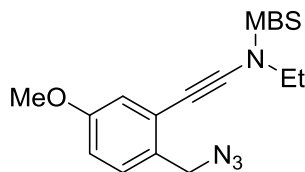
***N*-((2-(azidomethyl)-5-methylphenyl)ethynyl)-*N*-ethyl-4-methoxybenzenesulfonamide (1o)**



1o

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1o** was afforded as a pale yellow oil (49%, 188.5 mg). ^1H NMR (400 MHz, CDCl_3) δ 7.89 (d, $J = 8.8$ Hz, 2H), 7.30 (d, $J = 8.0$ Hz, 1H), 7.15 (s, 1H), 7.07 (d, $J = 7.6$ Hz, 1H), 7.01 (d, $J = 8.8$ Hz, 2H), 4.41 (s, 2H), 3.86 (s, 3H), 3.50 (q, $J = 7.2$ Hz, 2H), 2.34 (s, 3H), 1.28 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 163.7, 138.3, 136.3, 131.9, 129.7, 129.3, 129.1, 128.9, 119.5, 114.3, 86.2, 68.3, 55.6, 53.0, 46.5, 21.3, 13.2; IR (neat): 3066, 2273, 2023, 1608, 1491, 1361, 1089, 883, 651, 542 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{19}\text{H}_{20}\text{N}_4\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 407.1148, found: 407.1152.

***N*-((2-(azidomethyl)-5-methoxyphenyl)ethynyl)-*N*-ethyl-4-methoxybenzenesulfonamide (1p)**

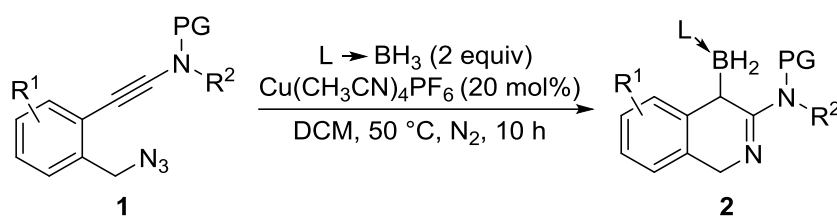


1p

Prepared according to typical procedure, after a flash column chromatography (PE:EA = 10:1) the product **1p** was afforded as a pale yellow oil (42%, 168.2 mg). ^1H NMR

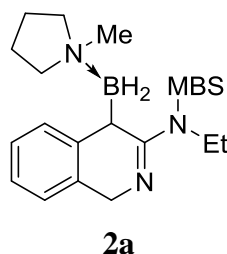
(400 MHz, CDCl₃) δ 7.90 (d, J = 8.8 Hz, 2H), 7.23 (d, J = 8.4 Hz, 1H), 7.01 (d, J = 8.8 Hz, 2H), 6.92 (d, J = 2.4 Hz, 1H), 6.83 (dd, J = 8.4, 2.8 Hz, 1H), 4.38 (s, 2H), 3.86 (s, 3H), 3.78 (s, 3H), 3.51 (q, J = 7.2 Hz, 2H), 1.29 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 163.7, 159.1, 130.2, 129.6, 129.0, 128.4, 123.9, 116.5, 114.3, 114.0, 86.7, 68.6, 55.5, 55.2, 52.5, 46.5, 13.2; IR (neat): 3100, 2242, 2087, 1593, 1193, 1089, 987, 834, 671 cm⁻¹; HRESIMS Calcd for [C₁₉H₂₀N₄NaO₄S]⁺ (M + Na⁺) 423.1097, found: 423.1099.

General procedure for the synthesis of organoboron compound 2:



Cu(CH₃CN)₄PF₆ (0.06 mmol, 20 mol %) was added to a solution of the azide-ynamide **1** (0.3 mmol, 1 equiv) and borane adduct (0.6 mmol, 2 equiv) in DCM (0.05 M) at room temperature. The reaction mixture was stirred at 50 °C in sealed tubes under N₂ atmosphere, and the progress of the reaction was monitored by TLC. Upon completion, the mixture was then concentrated and the residue was purified by chromatography on silica gel (PE:EA = 3:1) to afford the desired organoboron compound **2**.

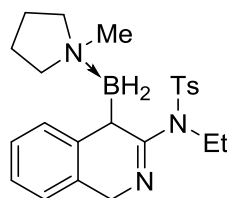
N-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (**2a**)



Compound **2a** was prepared in 78% yield (103.2 mg) according to the general procedure (Table 2, entry 1). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a brown solid (mp 81–83 °C). ¹H NMR (400 MHz,

CDCl₃) δ 7.49 (d, $J = 8.8$ Hz, 2H), 7.15 – 7.05 (m, 4H), 6.72 (d, $J = 8.8$ Hz, 2H), 4.56 (s, 2H), 4.13 (s, 1H), 3.75 (s, 3H), 3.71 – 3.61 (m, 2H), 3.30 – 3.24 (m, 1H), 3.08 – 3.02 (m, 1H), 2.97 – 2.91 (m, 1H), 2.82 – 2.76 (m, 1H), 2.69 (s, 3H), 2.02 – 1.92 (m, 4H), 1.23 (t, $J = 7.2$ Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 169.0, 162.6, 143.8, 133.4, 130.0, 129.6, 126.1, 125.1, 124.8, 123.9, 113.6, 62.0, 61.6, 55.4, 53.0, 48.3, 43.6, 22.6, 22.3, 14.4; ¹¹B NMR (128 MHz, CDCl₃) δ -5.40; IR (neat): 3447, 2382, 1628, 1596, 1340, 1150, 1088, 1025, 833, 750 cm⁻¹; HRESIMS Calcd for [C₂₃H₃₂BN₃NaO₃S]⁺ (M + Na⁺) 464.2150, found 464.2144.

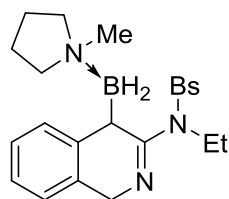
***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methylbenzenesulfonamide (2b)**



2b

Compound **2b** was prepared in 65% yield (82.9 mg) according to the general procedure (Table 2, entry 2). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a pale yellow oil. ¹H NMR (400 MHz, CDCl₃) δ 7.44 (d, $J = 8.4$ Hz, 2H), 7.14 – 7.04 (m, 6H), 4.56 (s, 2H), 4.13 (s, 1H), 3.74 – 3.63 (m, 2H), 3.27 – 3.20 (m, 1H), 3.04 – 2.97 (m, 1H), 2.92 – 2.88 (m, 1H), 2.79 – 2.72 (m, 1H), 2.65 (s, 3H), 2.27 (s, 3H), 1.99 – 1.88 (m, 4H), 1.24 (t, $J = 7.2$ Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 168.7, 143.7, 143.0, 135.2, 133.4, 129.0, 127.4, 126.0, 125.0, 124.8, 123.8, 61.9, 61.5, 52.9, 48.2, 43.5, 42.7, 22.5, 22.2, 21.3, 14.4; ¹¹B NMR (128 MHz, CDCl₃) δ -5.78; IR (neat): 3340, 2381, 1633, 1340, 1260, 1150, 1090, 1024, 750 cm⁻¹; HRESIMS Calcd for [C₂₃H₃₃BN₃O₂S]⁺ (M + H⁺) 426.2381, found 426.2390.

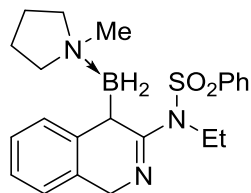
***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-4-bromo-*N*-ethylbenzenesulfonamide (2c)**



2c

Compound **2c** was prepared in 78% yield (114.4 mg) according to the general procedure (Table 2, entry 3). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a brown oil. ^1H NMR (400 MHz, CDCl_3) δ 7.42 (dd, $J = 15.6, 8.8$ Hz, 4H), 7.14 – 7.04 (m, 4H), 4.57 (s, 2H), 4.04 (s, 1H), 3.74 – 3.63 (m, 2H), 3.27 – 3.20 (m, 1H), 3.03 – 2.97 (m, 1H), 2.96 – 2.88 (m, 1H), 2.78 – 2.74 (m, 1H), 2.65 (s, 3H), 2.01 – 1.90 (m, 4H), 1.23 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 168.5, 143.4, 137.3, 133.3, 131.6, 129.2, 127.3, 126.2, 125.3, 124.9, 124.1, 62.1, 61.6, 53.0, 48.3, 43.8, 22.6, 22.3, 14.5; ^{11}B NMR (128 MHz, CDCl_3) δ -5.78; IR (neat): 3340, 2987, 2073, 1636, 1334, 1096, 991, 789, 595 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{22}\text{H}_{29}\text{BBrN}_3\text{NaO}_2\text{S}]^+$ ($\text{M} + \text{Na}^+$) 512.1149, found 512.1152.

***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-*N*-ethylbenzenesulfonamide (2d)**

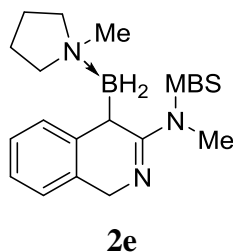


2d

Compound **2d** was prepared in 51% yield (62.9 mg) according to the general procedure (Table 2, entry 4). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a brown oil. ^1H NMR (400 MHz, CDCl_3) δ 7.58 (d, $J = 7.2$ Hz, 1H), 7.40 (t, $J = 7.2$ Hz, 1H), 7.29 – 7.27 (m, 2H), 7.13 – 7.04 (m, 4H), 4.56 (s, 2H), 4.13 (s, 1H), 3.80 – 3.64 (m, 2H), 3.29 – 3.22 (m, 1H), 3.05 – 2.98 (m, 1H), 2.94 – 2.89 (m, 1H), 2.79 – 2.73 (m, 1H), 2.66 (s, 3H), 1.99 – 1.90 (m, 4H), 1.25 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 168.7, 143.6, 138.4, 133.4, 132.3, 128.4, 127.5, 126.1, 125.2, 124.9, 124.0, 62.1, 61.6, 53.0, 48.3, 43.7, 22.6, 22.3, 14.5; ^{11}B NMR (128 MHz,

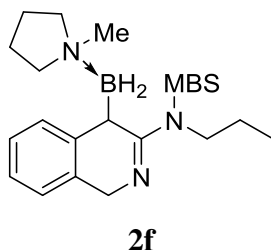
CDCl₃) δ -5.57; IR (neat): 3340, 3447, 1632, 1597, 1341, 1300, 1150, 1025, 833, 751 cm⁻¹; HRESIMS Calcd for [C₂₂H₃₀BN₃NaO₂S]⁺ (M + Na⁺) 434.2044, found 434.2039.

***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-4-methoxy-*N*-methylbenzenesulfonamide (2e)**



Compound **2e** was prepared in 63% yield (80.7 mg) according to the general procedure (Table 2, entry 5). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a black solid (mp 101-102 °C). ¹H NMR (400 MHz, CDCl₃) δ 7.51 (d, *J* = 9.2 Hz, 2H), 7.19 – 7.04 (m, 4H), 6.76 (d, *J* = 9.2 Hz, 2H), 4.66 – 4.52 (m, 2H), 4.30 (s, 1H), 3.76 (s, 3H), 3.21 – 3.17 (m, 1H), 3.13 (s, 3H), 3.04 – 2.93 (m, 2H), 2.85 – 2.78 (m, 1H), 2.72 (s, 3H), 2.01 – 1.94 (m, 4H); ¹³C NMR (100 MHz, CDCl₃) δ 171.2, 163.2, 141.9, 132.2, 129.8, 127.7, 126.6, 125.4, 125.1, 124.3, 113.9, 61.9, 61.8, 55.5, 52.1, 48.1, 42.0, 36.7, 22.4(2), 22.3(9); ¹¹B NMR (128 MHz, CDCl₃) δ -5.97; IR (neat): 3340, 3374, 1635, 1558, 1260, 1151, 822, 734, 555 cm⁻¹; HRESIMS Calcd for [C₂₂H₃₀BN₃NaO₃S]⁺ (M + Na⁺) 450.1993, found 450.1995.

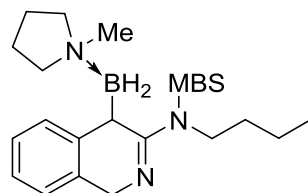
***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-4-methoxy-*N*-propylbenzenesulfonamide (2f)**



Compound **2f** was prepared in 62% yield (84.7 mg) according to the general procedure (Table 2, entry 6). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a yellow oil. ¹H NMR (400 MHz, CDCl₃) δ 7.56 (d, *J* = 8.4 Hz, 2H),

7.17 – 7.07 (m, 4H), 6.80 (d, $J = 8.8$ Hz, 2H), 4.60 (s, 2H), 4.11 (s, 1H), 3.78 (s, 3H), 3.72 – 3.65 (m, 1H), 3.61 – 3.56 (m, 1H), 3.23 – 3.16 (m, 1H), 2.93 – 2.86 (m, 2H), 2.74 – 2.69 (m, 1H), 2.62 (s, 3H), 1.99 – 1.87 (m, 4H), 1.74 – 1.66 (m, 2H), 0.93 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 170.7, 163.3, 144.3, 142.0, 129.8, 129.3, 126.6, 125.4, 125.1, 124.6, 114.0, 62.3, 61.6, 55.6, 51.6, 50.3, 48.2, 42.7, 22.6, 22.4, 22.1, 11.4; ^{11}B NMR (128 MHz, CDCl_3) δ -5.54; IR (neat): 3340, 2383, 1704, 1635, 1558, 1455, 1380, 1264, 1151, 1086 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{24}\text{H}_{34}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 478.2306, found 478.2311.

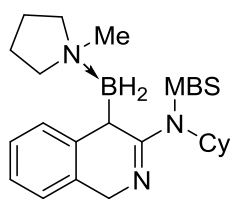
***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-*N*-butyl-4-methoxybenzenesulfonamide (2g)**



2g

Compound **2g** was prepared in 66% yield (92.9 mg) according to the general procedure (Table 2, entry 7). The product was isolated through silica gel column chromatography (PE:EA = 5:1) as a yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 7.46 (d, $J = 9.2$ Hz, 2H), 7.12 – 7.04 (m, 4H), 6.71 (d, $J = 8.8$ Hz, 2H), 4.54 (s, 2H), 4.15 (s, 1H), 3.74 (s, 3H), 3.70 – 3.65 (m, 1H), 3.55 – 3.48 (m, 1H), 3.31 – 3.24 (m, 1H), 3.08 – 3.01 (m, 1H), 2.95 – 2.90 (m, 1H), 2.81 – 2.75 (m, 1H), 2.68 (s, 3H), 2.00 – 1.91 (m, 4H), 1.67 – 1.60 (m, 2H), 1.39 – 1.33 (m, 2H), 0.91 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 162.6, 144.0, 133.7, 130.0, 129.6, 126.0, 125.2, 124.8, 123.9, 113.6, 62.0, 61.6, 55.4, 53.0, 48.4(2), 48.3(8), 42.9, 30.8, 22.7, 22.4, 20.3, 13.8; ^{11}B NMR (128 MHz, CDCl_3) δ -5.62; IR (neat): 3340, 2105 1704, 1635, 1518, 1339, 1259, 1149, 871, 561 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{25}\text{H}_{36}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 492.2463, found 492.2467.

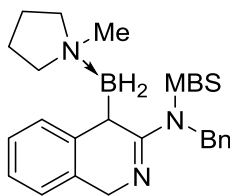
***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-*N*-cyclohexyl-4-methoxybenzenesulfonamide (2h)**



2h

Compound **2h** was prepared in 54% yield (80.3 mg) according to the general procedure (Table 2, entry 8). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a pale yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 7.84 (d, $J = 8.8$ Hz, 2H), 7.09 – 7.01 (m, 3H), 6.95 (d, $J = 7.2$ Hz, 1H), 6.78 (d, $J = 9.2$ Hz, 2H), 4.68 – 4.57 (m, 2H), 3.81 – 3.73 (m, 5H), 3.25 – 3.19 (m, 1H), 3.02 – 2.95 (m, 1H), 2.90 – 2.84 (m, 1H), 2.73 – 2.68 (m, 1H), 2.61 (s, 3H), 2.15 – 2.09 (m, 2H), 1.97 – 1.88 (m, 4H), 1.68 – 1.55 (m, 6H), 1.19 – 1.06 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ 169.4, 162.2, 143.3, 133.5, 133.1, 130.2, 125.9, 125.4, 124.9, 124.0, 113.4, 62.4, 62.2, 61.7, 55.4, 53.1, 48.3, 42.3, 34.2, 31.0, 26.9, 26.7, 25.5, 22.7, 22.3; ^{11}B NMR (128 MHz, CDCl_3) δ -4.23; IR (neat): 3340, 2388, 1682, 1622, 1397, 1260, 1076, 749 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{27}\text{H}_{38}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 518.2619, found 518.2614.

***N*-benzyl-*N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-4-methoxybenzenesulfonamide (2i)**

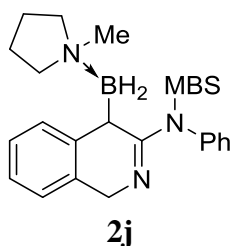


2i

Compound **2i** was prepared in 66% yield (99.9 mg) according to the general procedure (Table 2, entry 9). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 7.51 – 7.46 (m, 4H), 7.28 – 7.20 (m, 3H), 7.08 – 6.96 (m, 4H), 6.69 (d, $J = 9.2$ Hz, 2H), 5.11 (d, $J = 14.4$ Hz, 1H), 4.75 (d, $J = 14.4$ Hz, 1H), 4.59 – 4.50 (m, 2H), 4.06 (s, 1H), 3.72 (s, 3H), 2.90 – 2.83 (m, 2H), 2.67 – 2.58 (m, 2H), 2.42 (s, 3H), 1.80 – 1.75 (m, 4H); ^{13}C NMR (100 MHz, CDCl_3) δ 168.6, 162.6, 143.7, 137.9, 133.5, 130.3, 129.7, 129.4, 127.9, 127.0, 126.0,

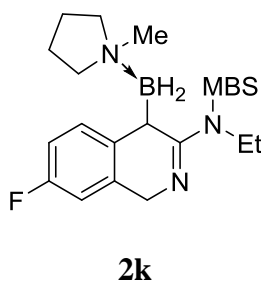
125.0, 124.8, 123.7, 113.5, 61.5(1), 61.4(9), 55.4, 52.7, 51.1, 47.9, 22.4, 22.3; ^{11}B NMR (128 MHz, CDCl_3) δ -3.88; IR (neat): 3340, 2970, 2381, 1704, 1632, 1558, 1340, 1153, 1091, 1024, 750 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{28}\text{H}_{34}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 526.2306, found 526.2302.

***N*-(4-(1-methylpyrrolidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-4-methoxy-*N*-phenylbenzenesulfonamide (2j)**



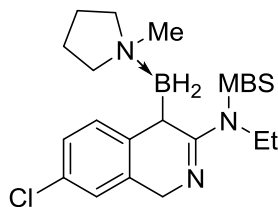
Compound **2j** was prepared in 61% yield (89.5 mg) according to the general procedure (Table 2, entry 10). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a colorless oil. ^1H NMR (400 MHz, CDCl_3) δ 7.72 (d, J = 8.8 Hz, 2H), 7.43 – 7.34 (m, 3H), 7.15 – 7.12 (m, 3H), 7.07 (dd, J = 5.6, 3.2 Hz, 2H), 6.88 (d, J = 8.8 Hz, 2H), 6.74 (dd, J = 5.2, 3.2 Hz, 1H), 4.82 (s, 2H), 3.83 (s, 3H), 3.03 – 2.98 (m, 2H), 2.87 – 2.82 (m, 1H), 2.78 – 2.71 (m, 1H), 2.63 – 2.57 (m, 1H), 2.38 (s, 3H), 1.91 – 1.83 (m, 4H); ^{13}C NMR (100 MHz, CDCl_3) δ 169.8, 163.9, 139.5, 136.8, 131.6, 131.0, 129.9, 129.5, 129.2, 128.8, 126.9, 125.4(1), 125.3(7), 124.9, 113.7, 62.3, 61.8, 55.7, 50.4, 47.7, 41.6, 22.4, 22.0; ^{11}B NMR (128 MHz, CDCl_3) δ -6.13; IR (neat): 3340, 2380, 1646, 1595, 1349, 1260, 1161, 1089, 750, 698 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{27}\text{H}_{32}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 512.2150, found 512.2158.

***N*-(4-(1-methylpyrrolidine-boranyl)-7-fluoro-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (2k)**



Compound **2k** was prepared in 36% yield (49.6 mg) according to the general procedure (Table 2, entry 11). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a pale red oil. ¹H NMR (400 MHz, CDCl₃) δ 7.49 (d, *J* = 8.8 Hz, 2H), 7.00 (t, *J* = 6.4 Hz, 1H), 6.76 – 6.72 (m, 4H), 4.56 – 4.46 (m, 2H), 4.09 (s, 1H), 3.75 (s, 3H), 3.72 – 3.62 (m, 2H), 3.28 – 3.22 (m, 1H), 3.08 – 3.05 (m, 1H), 2.96 – 2.93 (m, 1H), 2.84 – 2.81 (m, 1H), 2.70 (s, 3H), 2.01 – 1.94 (m, 4H), 1.23 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 168.5, 162.7, 161.7 (d, *J* = 241.0 Hz), 146.5 (d, *J* = 8.0 Hz), 129.8, 129.6, 129.1 (d, *J* = 2.0 Hz), 126.2 (d, *J* = 8.0 Hz), 113.6, 111.4 (d, *J* = 21.0 Hz), 110.4 (d, *J* = 21.0 Hz), 62.0, 61.6, 55.4, 52.3, 48.4, 43.6, 22.6, 22.3, 14.4; ¹¹B NMR (128 MHz, CDCl₃) δ -6.67; ¹⁹F NMR (376 MHz, CDCl₃) δ -110.8; IR (neat): 3340, 2373, 1633, 1577, 1496 1341, 1152, 1089, 962, 804, 733 cm⁻¹; HRESIMS Calcd for [C₂₃H₃₁BFN₃NaO₃S]⁺ (M + Na⁺) 482.2055, found 482.2058.

***N*-(4-(1-methylpyrrolidine-boranyl)-7-chloro-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (2l)**

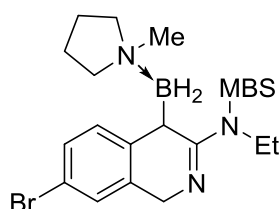


2l

Compound **2l** was prepared in 72% yield (102.9 mg) according to the general procedure (Table 2, entry 12). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a pale yellow oil. ¹H NMR (400 MHz, CDCl₃) δ 7.54 (d, *J* = 8.8 Hz, 2H), 7.11 – 7.06 (m, 2H), 6.97 (d, *J* = 8.0 Hz, 1H), 6.75 (d, *J* = 9.2 Hz, 2H), 4.52 (s, 2H), 4.12 (s, 1H), 3.76 (s, 3H), 3.71 – 3.61 (m, 2H), 3.28 – 3.21 (m, 1H), 3.06 – 3.00 (m, 1H), 2.96 – 2.90 (m, 1H), 2.82 – 2.76 (m, 1H), 2.68 (s, 3H), 2.02 – 1.90 (m, 4H), 1.22 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 169.1, 162.7, 142.6, 135.3, 129.7, 129.6, 129.3, 126.1, 125.9, 125.2, 113.7, 62.1, 61.6, 55.4, 52.6, 48.4, 43.6, 42.5, 22.6, 22.3, 14.4; ¹¹B NMR (128 MHz, CDCl₃) δ -4.58; IR (neat): 3340, 2382, 1635,

1590 1339, 1259, 1150, 803, 749 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{23}\text{H}_{31}\text{BClN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 498.1760, found 498.1766.

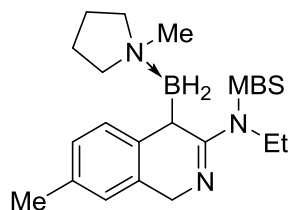
***N*-(4-(1-methylpyrrolidine-boranyl)-7-bromo-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (2m)**



2m

Compound **2m** was prepared in 65% yield (101.3 mg) according to the general procedure (Table 2, entry 13). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a dark oil. ^1H NMR (400 MHz, CDCl_3) δ 7.48 (d, $J = 8.8$ Hz, 2H), 7.25 – 7.21 (m, 2H), 6.93 (d, $J = 8.0$ Hz, 1H), 6.75 (d, $J = 8.8$ Hz, 2H), 4.52 (s, 2H), 4.10 (s, 1H), 3.76 (s, 3H), 3.72 – 3.61 (m, 2H), 3.25 – 3.20 (m, 1H), 3.03 – 2.98 (m, 1H), 2.94 – 2.89 (m, 1H), 2.82 – 2.77 (m, 1H), 2.67 (s, 3H), 2.03 – 1.91 (m, 4H), 1.22 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 168.8, 162.6, 143.1, 135.8, 129.7, 129.5, 128.9, 128.0, 126.3, 117.2, 113.6, 62.0, 61.6, 55.4, 52.4, 48.3, 43.5, 42.4, 22.5, 22.2, 14.3; ^{11}B NMR (128 MHz, CDCl_3) δ -6.41; IR (neat): 3340, 2377, 1622, 1558, 1507, 1417, 1260, 1077, 803, 750 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{23}\text{H}_{31}\text{BBrN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 542.1255, found 542.1259.

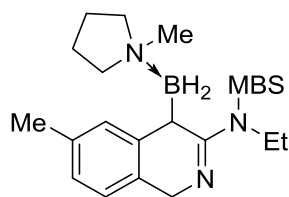
***N*-(4-(1-methylpyrrolidine-boranyl)-7-methyl-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (2n)**



2n

Compound **2n** was prepared in 69% yield (94.2 mg) according to the general procedure (Table 2, entry 14). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 7.76 (d, $J = 9.2$ Hz, 2H), 7.57 – 6.95 (m, 5H), 4.74 – 4.63 (m, 2H), 3.94 – 3.82 (m, 6H), 3.06 – 3.01 (m, 1H), 2.93 – 2.86 (m, 1H), 2.71 – 2.59 (m, 2H), 2.53 (s, 3H), 2.29 (s, 3H), 1.92 – 1.83 (m, 4H), 1.32 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 168.7, 162.6, 158.2, 145.5, 130.0, 129.7, 126.0, 125.9, 113.6, 111.0, 108.7, 62.0, 61.7, 55.4, 55.3, 52.4, 48.5, 43.6, 43.2, 22.7, 22.4, 14.4; ^{11}B NMR (128 MHz, CDCl_3) δ -5.35; IR (neat): 3340, 2377, 1704, 1635, 1558, 1339, 1260, 1150, 749, 567 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{24}\text{H}_{34}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 478.2306, found 478.2311.

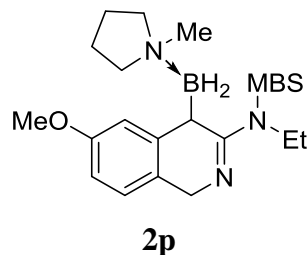
***N*-(4-(1-methylpyrrolidine-boranyl)-6-methyl-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamidee (**2o**)**



2o

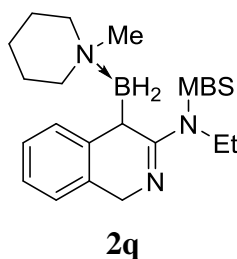
Compound **2o** was prepared in 64% yield (87.4 mg) according to the general procedure (Table 2, entry 15). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 7.69 (d, $J = 8.8$ Hz, 2H), 7.03 – 6.89 (m, 5H), 4.69 – 4.58 (m, 2H), 3.98 (s, 1H), 3.82 – 3.77 (m, 5H), 3.12 – 3.07 (m, 1H), 2.91 – 2.87 (m, 1H), 2.78 – 2.73 (m, 1H), 2.66 – 2.62 (m, 1H), 2.57 (s, 3H), 2.30 (s, 3H), 1.97 – 1.86 (m, 4H), 1.29 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 171.7, 163.8, 134.6, 130.7, 130.0, 128.6, 127.9, 126.2, 125.3, 114.3, 62.5, 61.6, 55.7, 50.3, 47.9, 44.0, 22.5, 21.9, 20.9, 15.0; ^{11}B NMR (128 MHz, CDCl_3) δ -5.15; IR (neat): 3340, 2381, 1703, 1625, 1554, 1342, 1260, 1150, 750, 551 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{24}\text{H}_{34}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 478.2306, found 478.2302.

***N*-(4-(1-methylpyrrolidine-boranyl)-6-methoxy-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (2p)**



Compound **2p** was prepared in 80% yield (113.1 mg) according to the general procedure (Table 2, entry 16). The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a yellow oil. ^1H NMR (400 MHz, CD_3OD) δ 7.52 (d, $J = 9.2$ Hz, 2H), 6.90 (d, $J = 8.0$ Hz, 1H), 6.82 (d, $J = 8.8$ Hz, 2H), 6.57 – 6.54 (m, 2H), 4.37 (dd, $J = 28.4, 16.0$ Hz, 2H), 3.89 (s, 1H), 3.73 – 3.61 (m, 8H), 3.25 (s, 1H), 3.04 – 2.93 (m, 1H), 2.85 – 2.75 (m, 1H), 2.75 – 2.65 (m, 1H), 2.65 – 2.56 (m, 1H), 2.46 (s, 3H), 1.88 – 1.73 (m, 4H), 1.15 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CD_3OD) δ 173.5, 165.7, 160.8, 145.5, 131.7, 127.8, 126.5, 115.9, 112.9, 111.6, 64.0, 63.4, 56.9, 56.0, 52.8, 45.6, 24.2, 23.7, 16.0; ^{11}B NMR (128 MHz, CD_3OD) δ -5.39; IR (neat): 2919, 2379, 1573, 1506, 1372, 1272, 1174, 1067, 744, 585 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{24}\text{H}_{34}\text{BN}_3\text{NaO}_4\text{S}]^+$ ($\text{M} + \text{Na}^+$) 494.2255, found 494.2247.

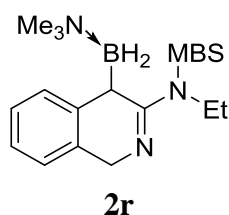
***N*-(4-(1-methylpiperidine-boranyl)-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (2q)**



Compound **2q** was prepared in 75% yield (102.4 mg) according to the general procedure. The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a pale yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 7.45 (d, $J = 8.8$ Hz, 2H), 7.15 – 7.05 (m, 4H), 6.70 (d, $J = 8.8$ Hz, 2H), 4.55 (s, 2H), 4.12 (s, 1H), 3.74 – 3.60 (m, 5H), 3.07 – 2.97 (m, 2H), 2.89 – 2.78 (m, 2H), 2.65 (s, 3H), 1.80 – 1.77 (m, 1H), 1.71 – 1.63

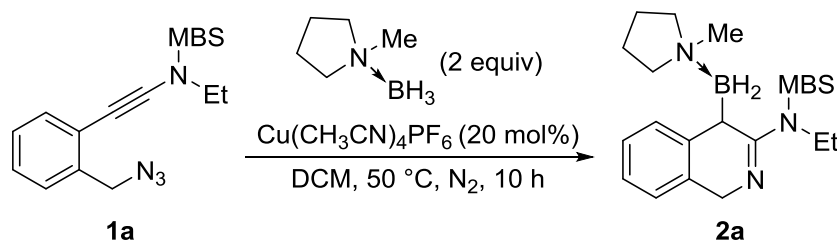
(m, 4H), 1.47 – 1.44 (m, 1H), 1.24 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, Acetone- d_6) δ 170.0, 164.0, 145.2, 134.8, 132.1, 130.7, 127.0, 126.3, 126.0, 124.8, 114.7, 59.4, 59.3, 56.2, 53.4, 46.7, 44.2, 42.5, 23.4, 21.0, 20.9, 15.3; ^{11}B NMR (128 MHz, CDCl_3) δ -4.30; IR (neat): 3447, 1704, 1635, 1581, 1497, 1339, 1260, 750, 671 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{24}\text{H}_{35}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{H}^+$) 456.2487, found 456.2493.

***N*-(4-(trimethylamine-boranyl)-1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (2r)**



Compound **2r** was prepared in 80% yield (99.6 mg) according to the general procedure. The product was isolated through silica gel column chromatography (PE:EA = 3:1) as a pale yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 7.48 (d, $J = 8.8$ Hz, 2H), 7.14 – 7.12 (m, 1H), 7.08 – 7.06 (m, 3H), 6.73 (d, $J = 8.8$ Hz, 2H), 4.56 (s, 2H), 4.11 (s, 1H), 3.75 (s, 3H), 3.72 – 3.64 (m, 2H), 2.65 (s, 9H), 1.24 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 169.2, 162.7, 143.5, 133.3, 129.6(9), 129.6(5), 126.3, 125.2, 124.9, 124.1, 113.7, 55.4, 52.9, 52.6, 43.6, 42.5, 14.4; ^{11}B NMR (128 MHz, CDCl_3) δ -6.27; IR (neat): 3340, 2381, 1704, 1635, 1558, 1339, 1260, 1087, 749 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{21}\text{H}_{30}\text{BN}_3\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 438.1993, found 438.1998.

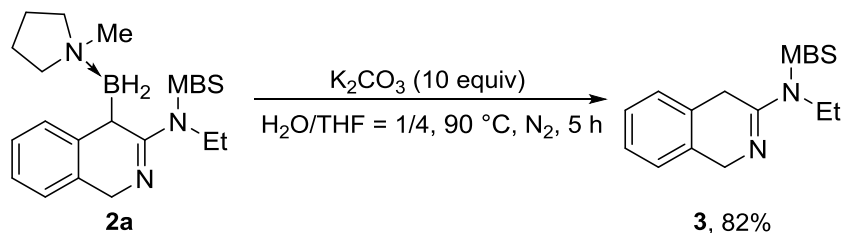
Gram-scale synthesis of 2a



$\text{Cu}(\text{CH}_3\text{CN})_4\text{PF}_6$ (0.24 g, 0.64 mmol) was added to a solution of the azide-ynamide **1a** (1.18 g, 3.2 mmol) and borane (0.63 g, 6.4 mmol) in DCM (10 mL) in a 50 mL sealed tube under N_2 atmosphere. The reaction mixture was stirred at 50 $^\circ\text{C}$ for 10 h. Upon

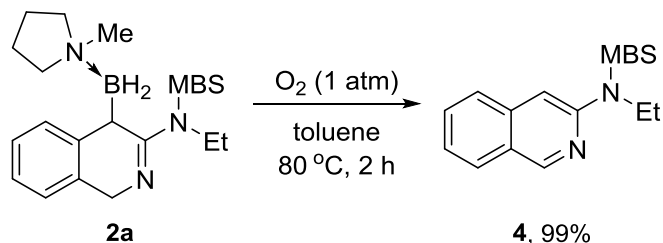
completion, the mixture was then concentrated and the residue was purified by chromatography on silica gel (PE:EA = 3:1) to afford the desired organoboron compound **2a** (0.96 g, 68% yield).

N-(1,4-dihydroisoquinolin-3-yl)-*N*-ethyl-4-methoxybenzenesulfonamide (**3**)



Compound **3** was prepared in 82% yield (56.5 mg) according to the following procedure. The powdered potassium carbonate (276 mg, 2.0 mmol) was introduced to a Schlenk tube under argon atmosphere, followed by a solution of **2a** (88.3 mg, 0.2 mmol) in THF (2 mL) and H₂O (0.5 mL) was injected into the Schlenk tube. The reaction mixture were stirred at 90 °C for 5 hours. After completion, the mixture was concentrated and purified by flash chromatography on silica gel (PE:EA = 5:1) to give **3** as a yellow oil. ¹H NMR (400 MHz, CDCl₃) δ 7.72 (d, *J* = 8.8 Hz, 2H), 7.24 – 7.21 (m, 2H), 7.17– 7.12 (m, 2H), 6.94 (d, *J* = 8.8 Hz, 2H), 4.73 (t, *J* = 3.2 Hz, 2H), 3.85 – 3.82 (m, 5H), 3.71 (q, *J* = 7.2 Hz, 2H), 1.16 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 163.0, 156.0, 133.1, 131.3, 131.0, 129.4, 127.2, 127.0, 126.8, 125.1, 114.2, 55.6, 52.6, 43.0, 34.7, 14.2; IR (neat): 2982, 1908, 1693, 1521, 1407, 1294, 1086, 842, 711, 540 cm⁻¹; HRESIMS Calcd for [C₁₈H₂₀N₂NaO₃S]⁺ (M + Na⁺) 367.1087, found 367.1085.

N-ethyl-*N*-(isoquinolin-3-yl)-4-methoxybenzenesulfonamide



Compound **4** was prepared in 99% yield (67.8 mg) according to the following procedures. **2a** (88.3 mg, 0.2 mmol) in toluene (5 mL) was introduced to an oven-dried eggplant-shaped bottle. Then the mixture was heated to 80 °C for 2 hours with an

oxygen ball. Upon completion, the mixture was then concentrated and the residue was purified by chromatography on silica gel (PE:EA = 3:1) to afford the desired **4** as a pale yellow oil. ^1H NMR (400 MHz, CDCl_3) δ 9.00 (s, 1H), 7.97 – 7.86 (m, 3H), 7.71 (t, J = 7.2 Hz, 1H), 7.60 (t, J = 7.2 Hz, 1H), 7.55 (d, J = 8.8 Hz, 2H), 6.88 (d, J = 8.8 Hz, 2H), 3.93 – 3.78 (m, 5H), 1.11 (t, J = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 162.8, 151.4, 146.6, 137.2, 130.7, 130.5, 129.7, 127.4(4), 127.3(9), 127.3, 127.0, 120.4, 113.9, 55.5, 43.3, 14.1; IR (neat): 3081, 1711, 1605, 1559, 1422, 1332, 1112, 957, 714, 517 cm^{-1} ; HRESIMS Calcd for $[\text{C}_{18}\text{H}_{18}\text{N}_2\text{NaO}_3\text{S}]^+$ ($\text{M} + \text{Na}^+$) 365.0930, found 365.0921.

Reference:

1. W.-B. Shen, B. Zhou, Z.-X. Zhang, H. Yuan, W. Fang and L.-W. Ye, *Org. Chem. Front.*, 2018, **5**, 2468–2472.
2. Y. Pan, G.-W. Chen, C.-H. Shen, W. He, L.-W. Ye, *Org. Chem. Front.*, 2016, **3**, 491–495.

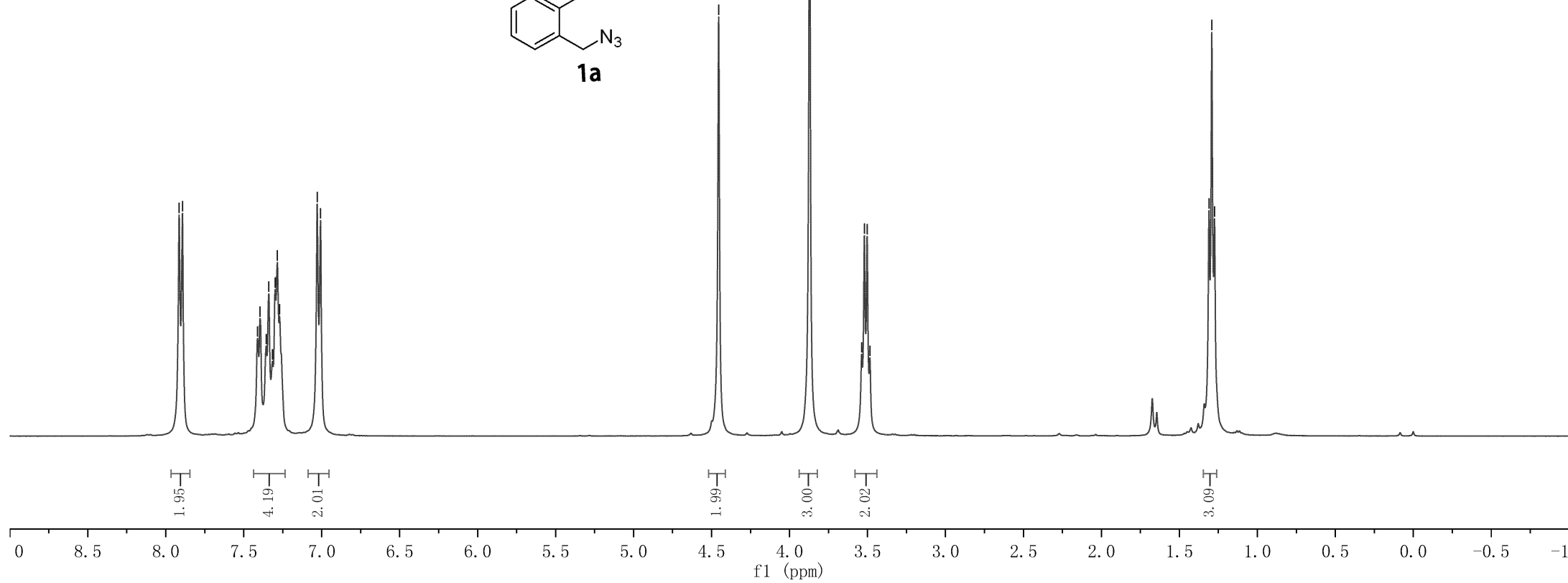
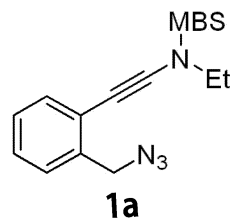
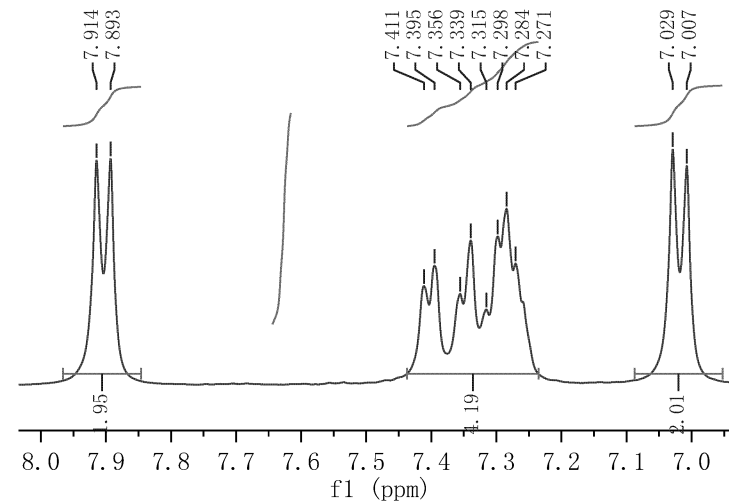
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4.454

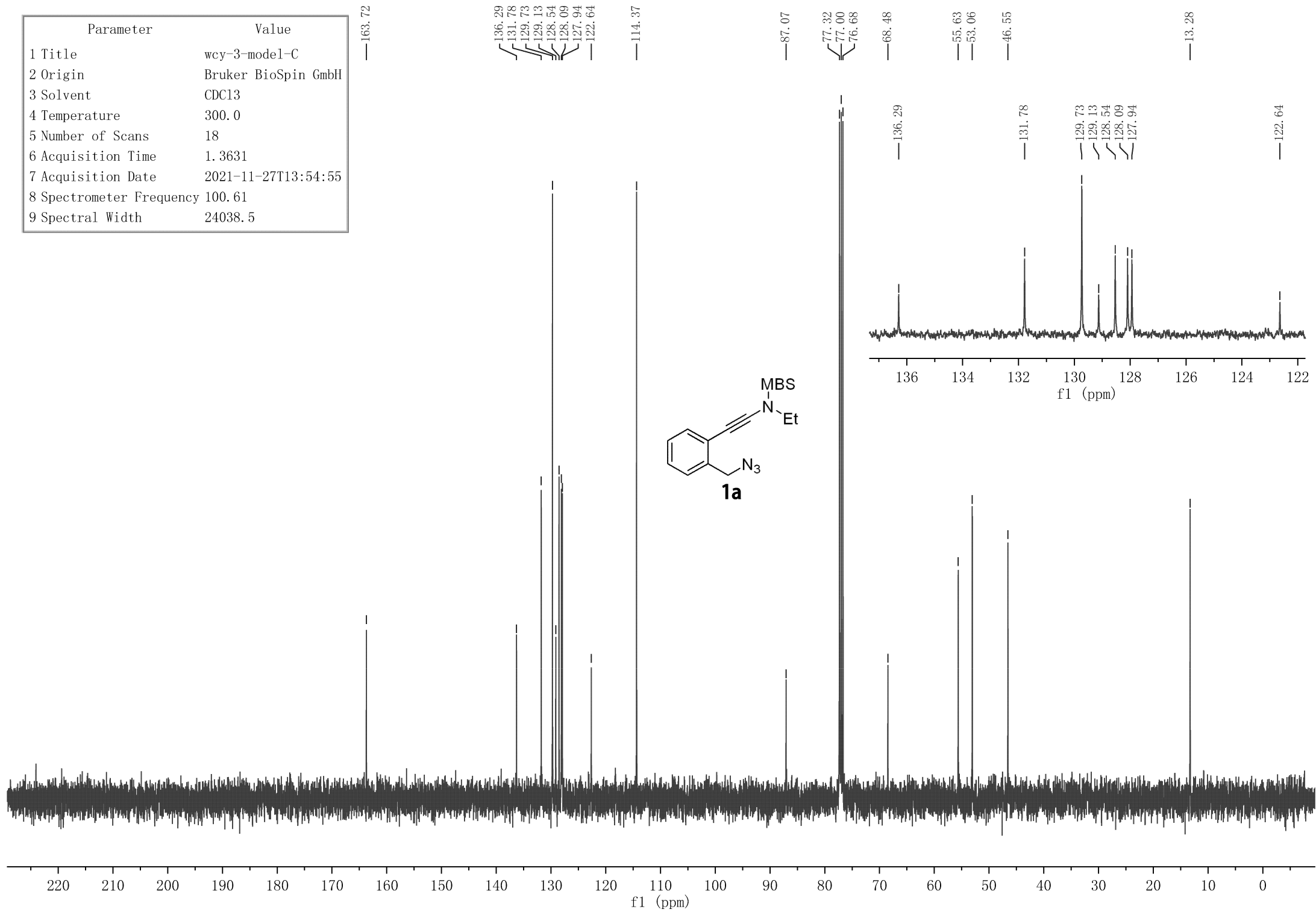
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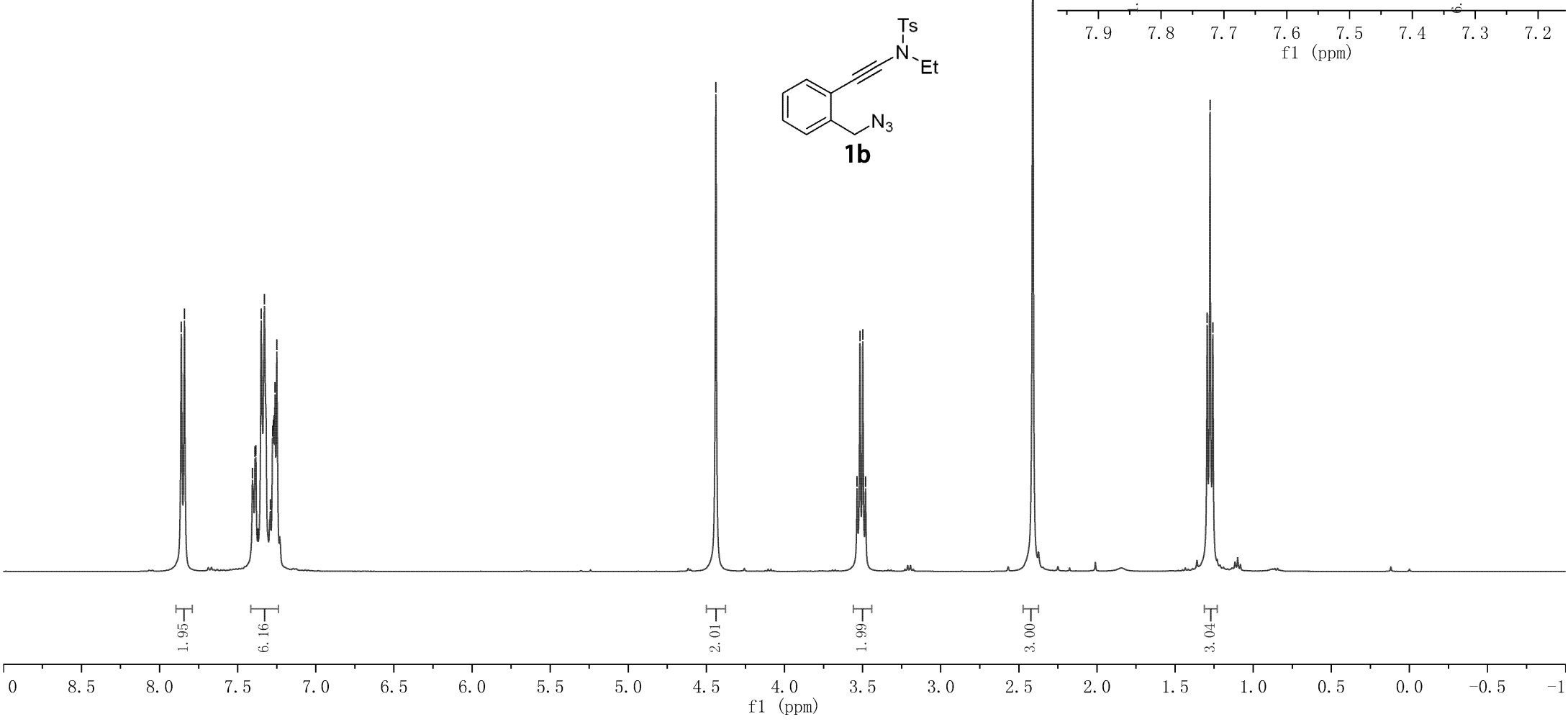
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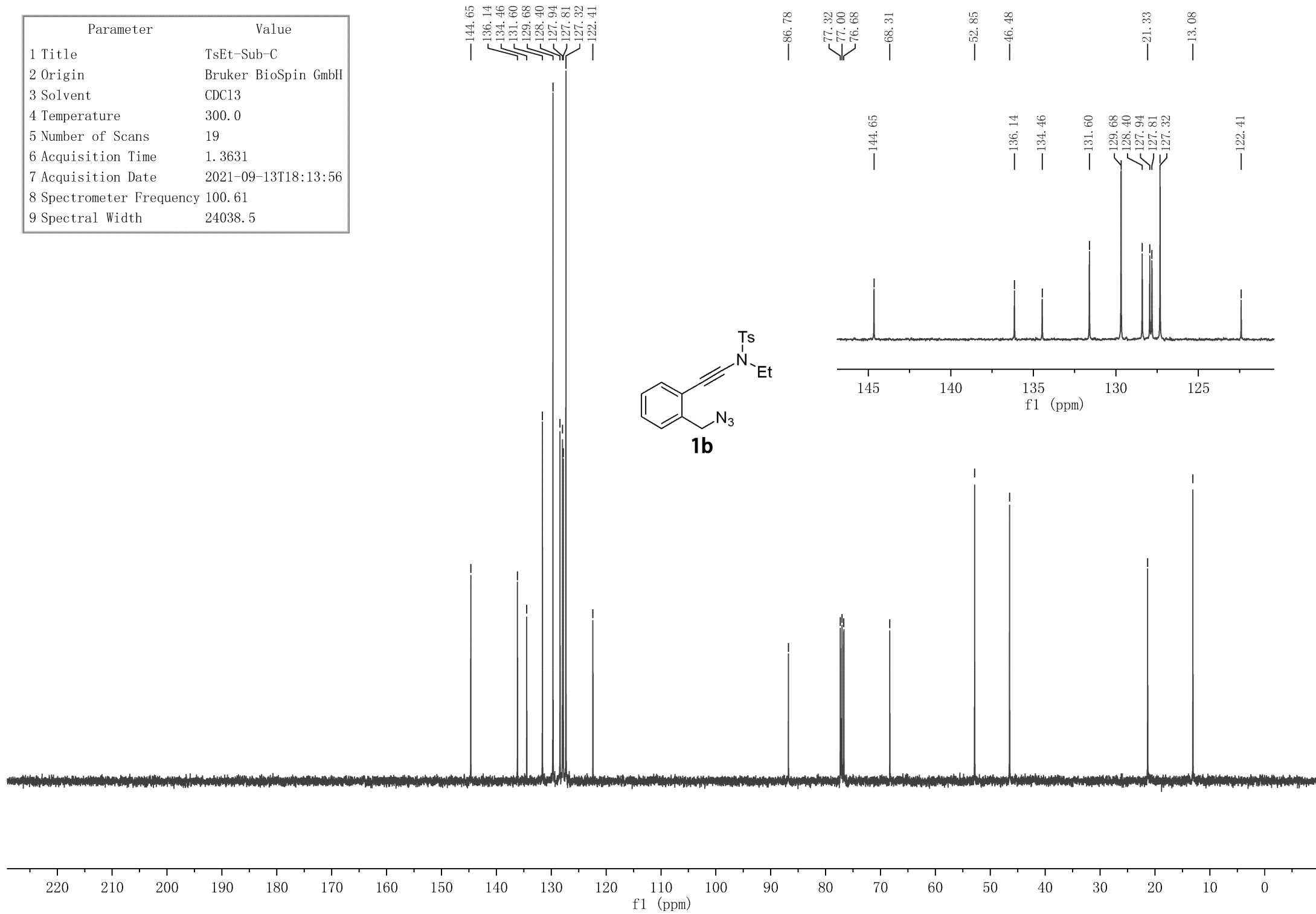
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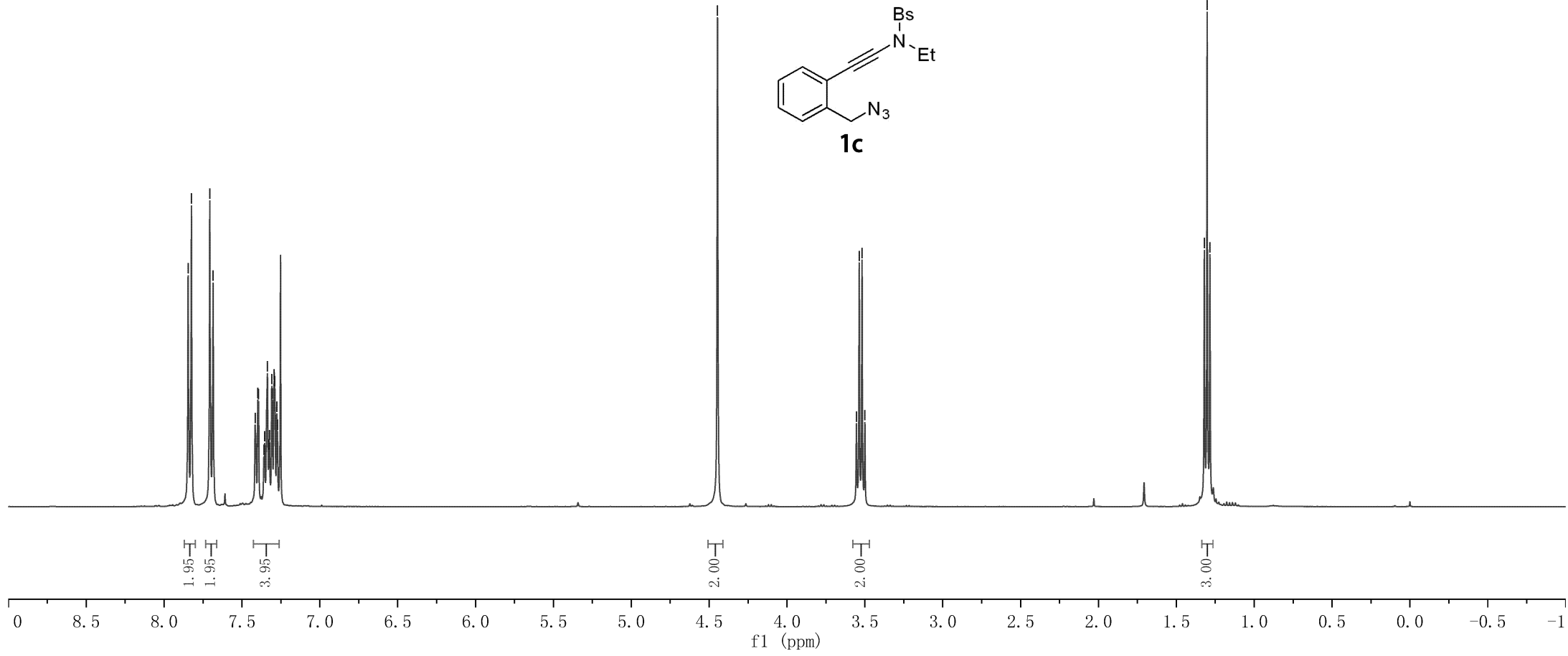
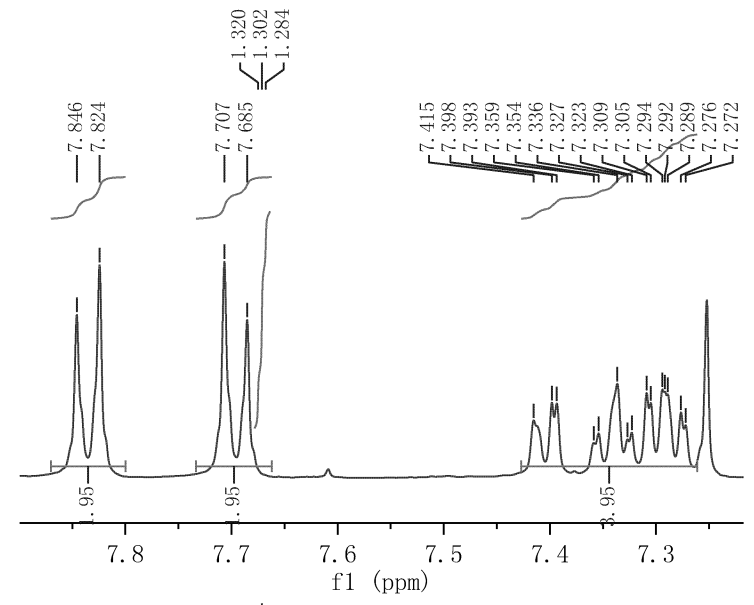
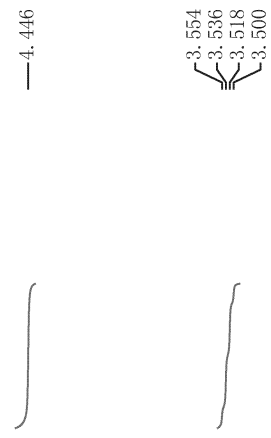
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9 Spectral Width	8012.8



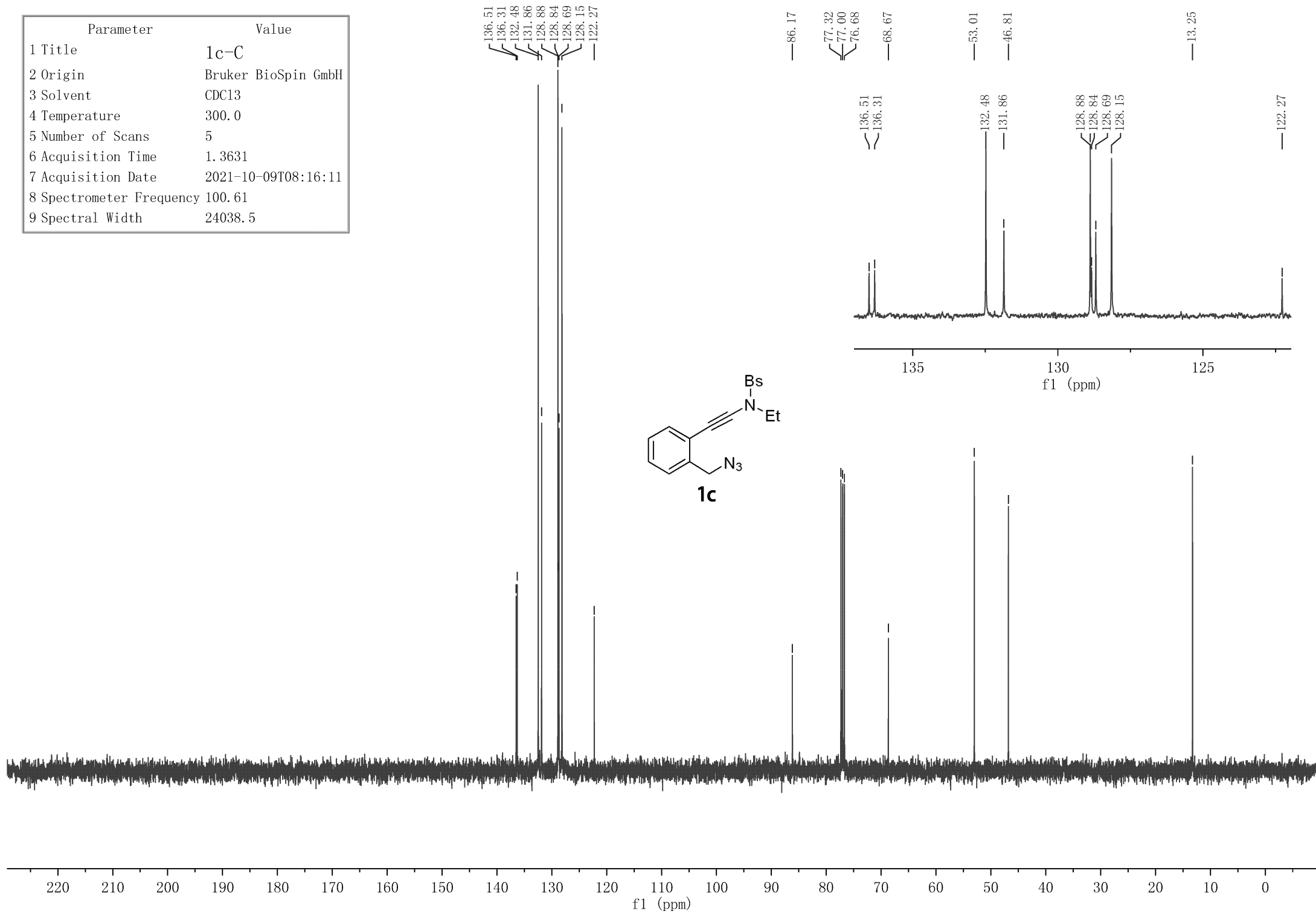
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Parameter	Value
1 Title	BsEt-Sub-III
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	298.0
5 Number of Scans	4
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-09T08:15:20
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	1c-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	5
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-09T08:16:11
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



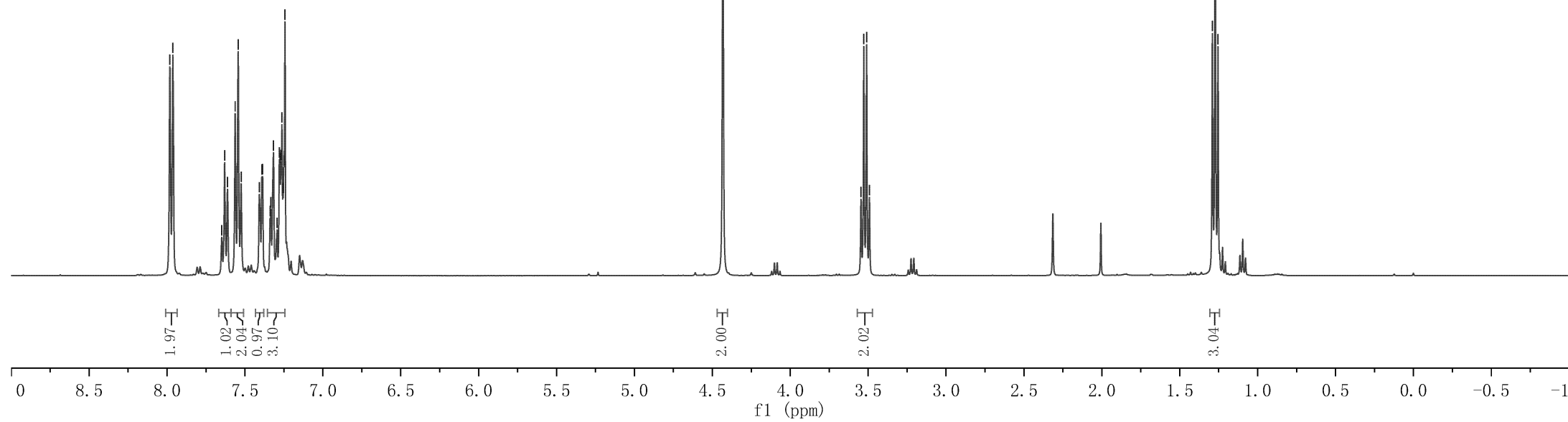
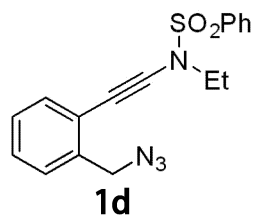
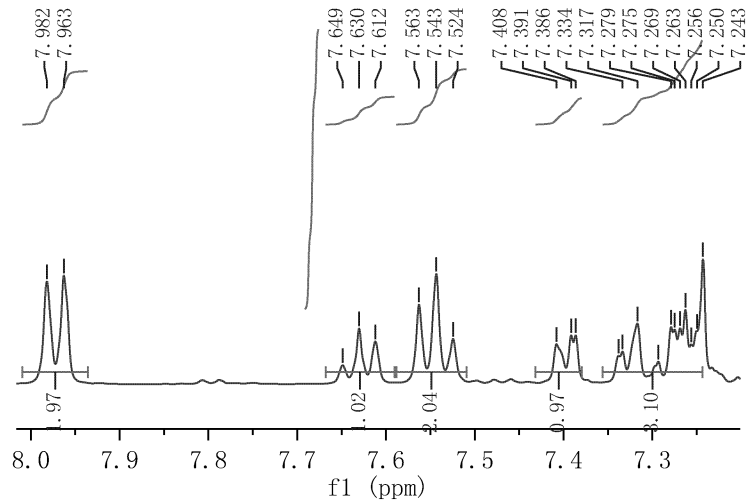
7.982
7.963
7.649
7.630
7.612
7.563
7.543
7.524
7.408
7.391
7.386
7.338
7.334
7.317
7.293
7.279
7.275
7.269
7.263
7.256
7.250
7.243

Parameter	Value
1 Title	wcy-4-13-H
2 Origin	
3 Solvent	CDCl3
4 Temperature	297.3
5 Number of Scans	16
6 Acquisition Time	4.0002
7 Acquisition Date	2022-01-18T10:32:12
8 Spectrometer Frequency	399.93
9 Spectral Width	8012.0

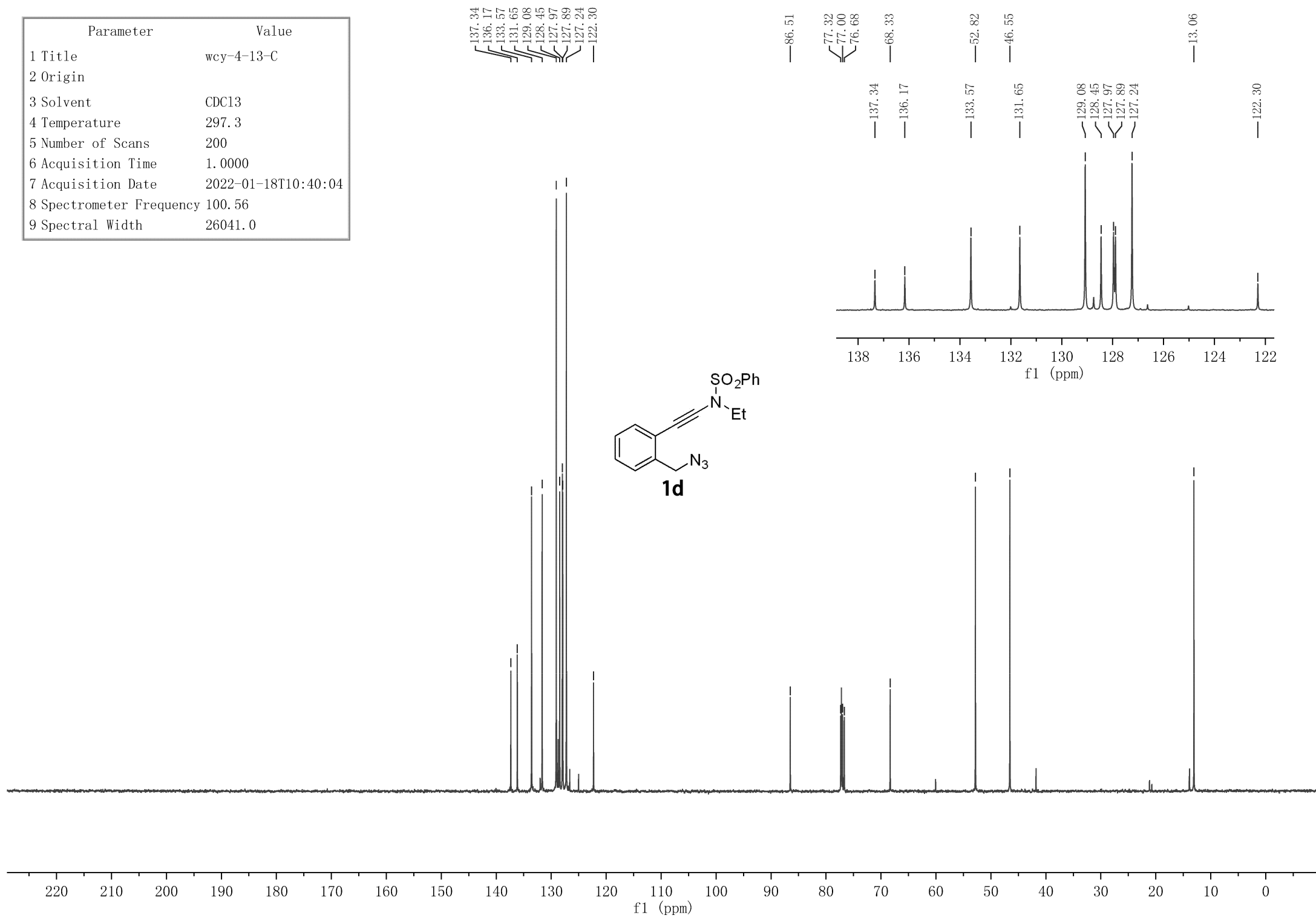
4.432

3.546
3.528
3.510
3.492

1.291
1.273
1.254



Parameter	Value
1 Title	wcy-4-13-C
2 Origin	
3 Solvent	CDC13
4 Temperature	297.3
5 Number of Scans	200
6 Acquisition Time	1.0000
7 Acquisition Date	2022-01-18T10:40:04
8 Spectrometer Frequency	100.56
9 Spectral Width	26041.0



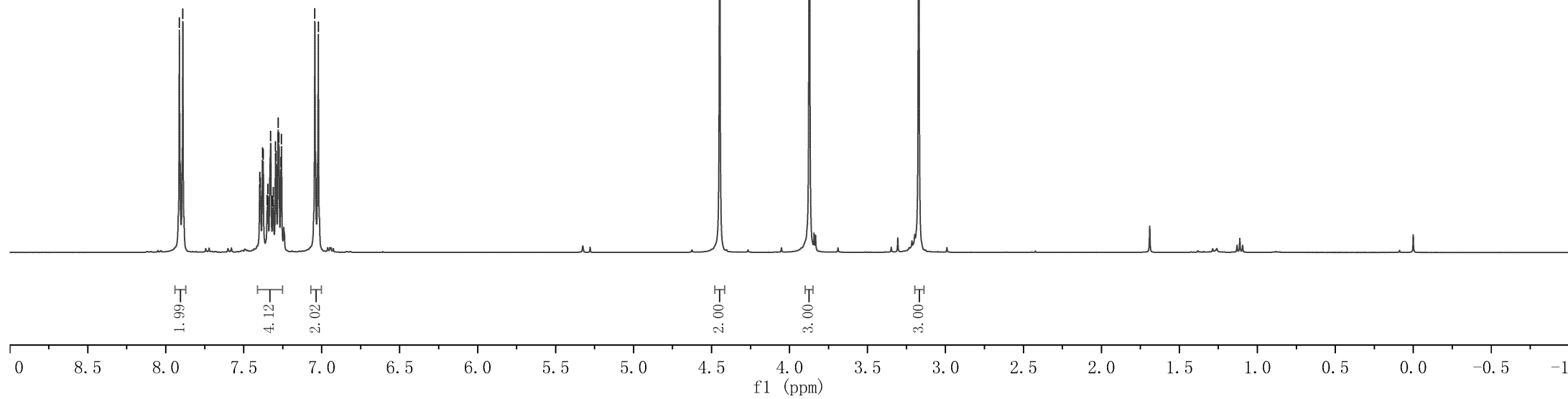
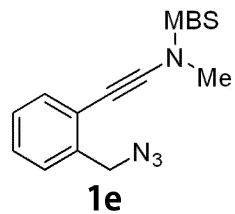
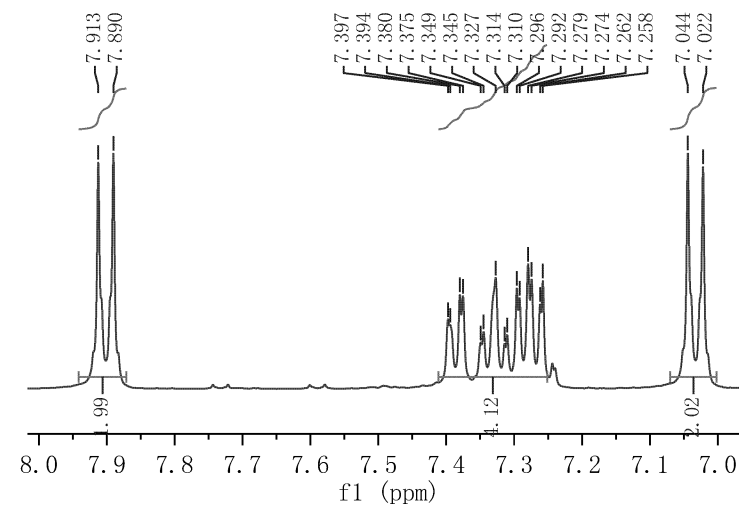
7.913
7.890
7.380
7.327
7.296
7.279
7.274
7.258
7.044
7.022

Parameter	Value
1 Title	zgy-9-MBSMe
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	9
6 Acquisition Time	4.0894
7 Acquisition Date	2022-01-20T16:59:41
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

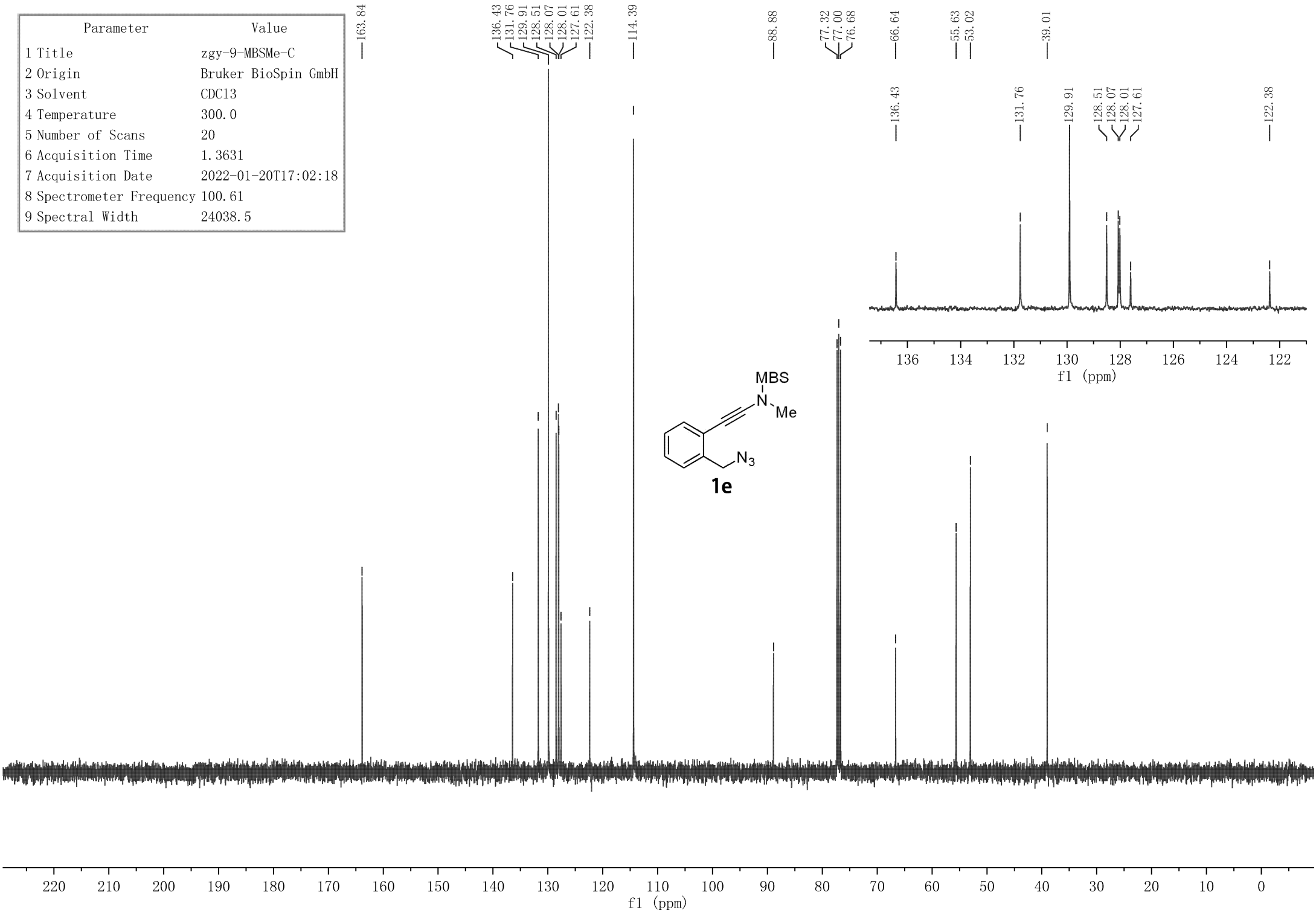
4.448

3.873

3.172



Parameter	Value
1 Title	zgy-9-MBSMe-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	20
6 Acquisition Time	1.3631
7 Acquisition Date	2022-01-20T17:02:18
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



7.911
7.889
7.380
7.329
7.291
7.287
7.280
7.274
7.026
7.004

4.444

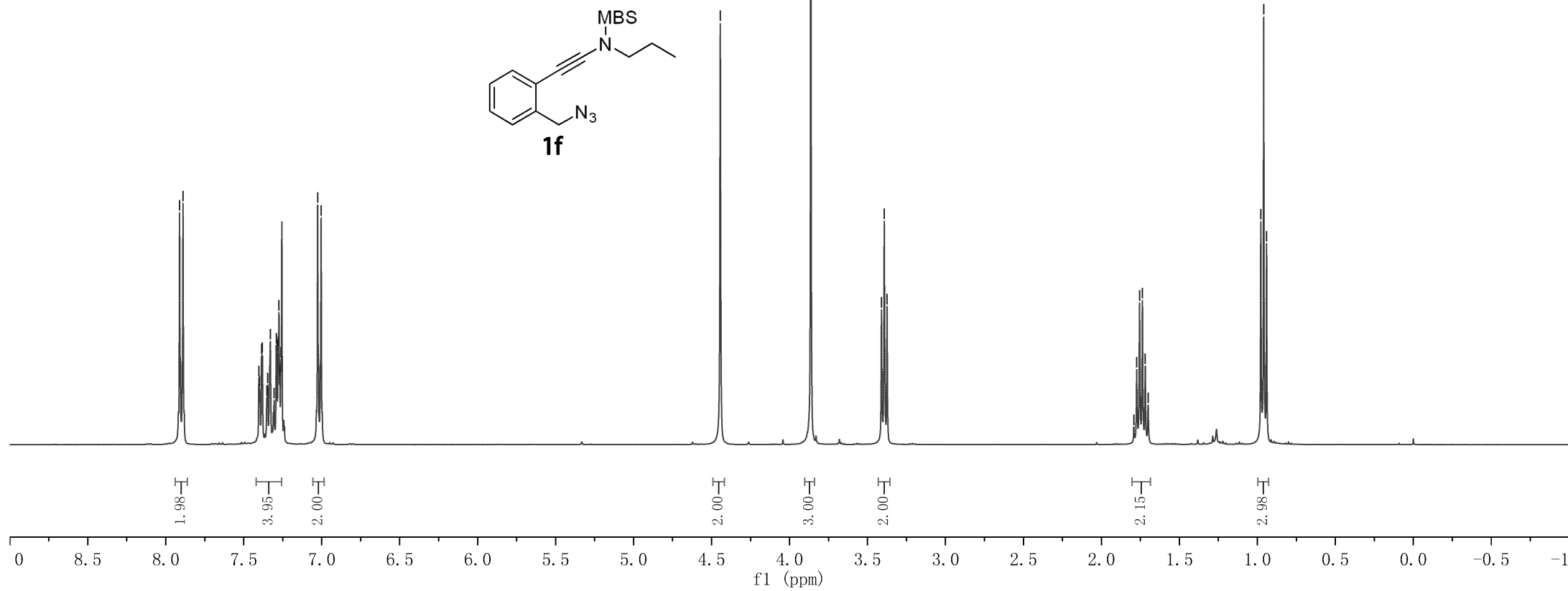
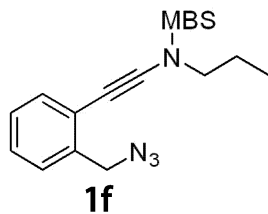
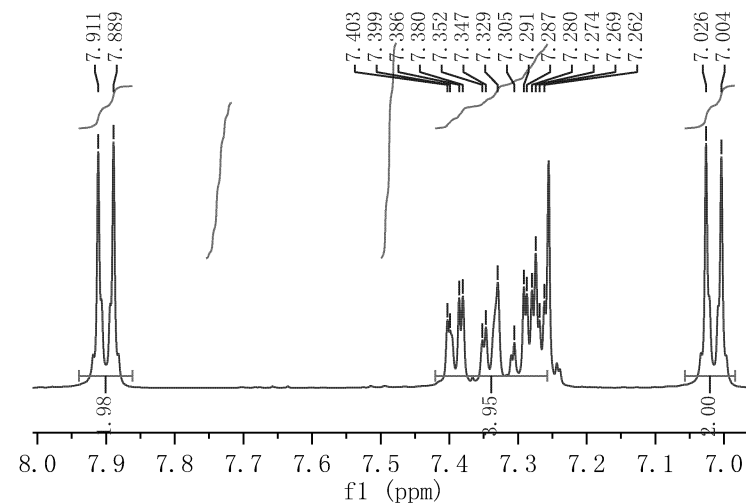
3.864

3.410
3.393
3.375

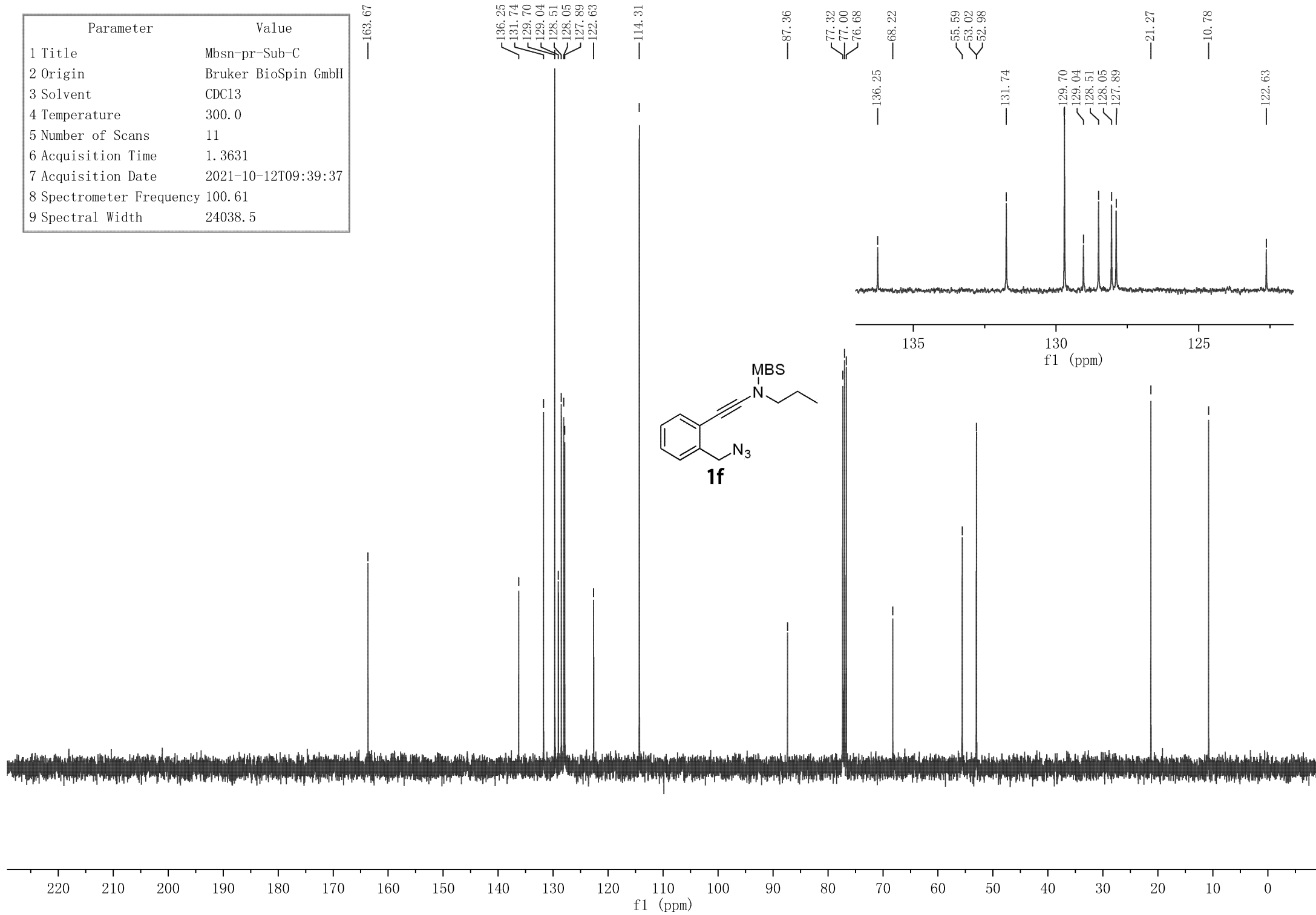
1.792
1.773
1.755
1.737
1.719
1.701

0.978
0.959
0.941

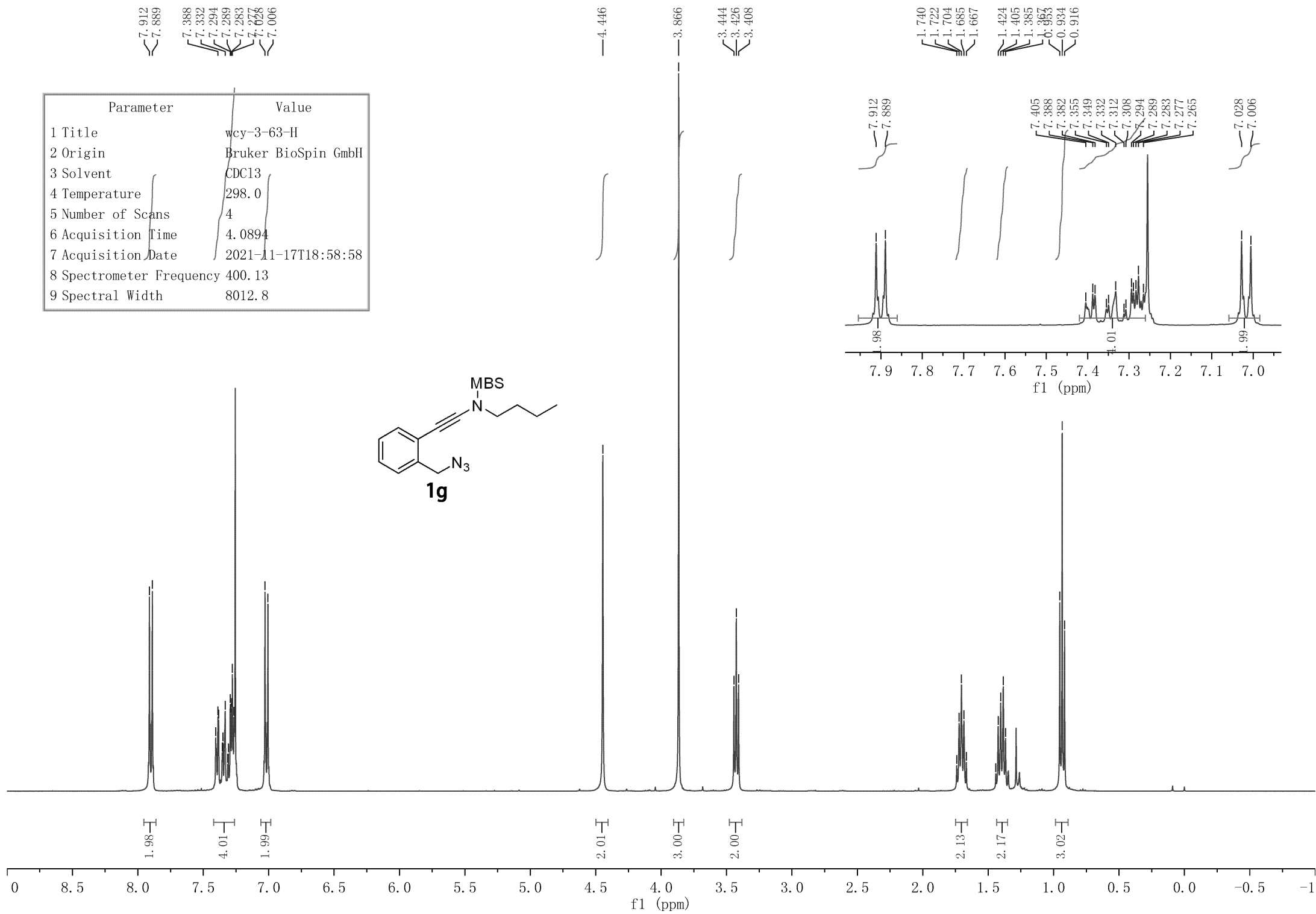
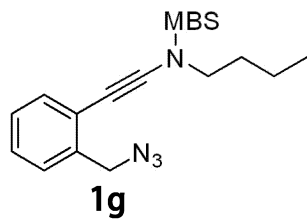
Parameter	Value
1 Title	Mbsn-pr-Sub-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	9
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-12T09:38:10
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



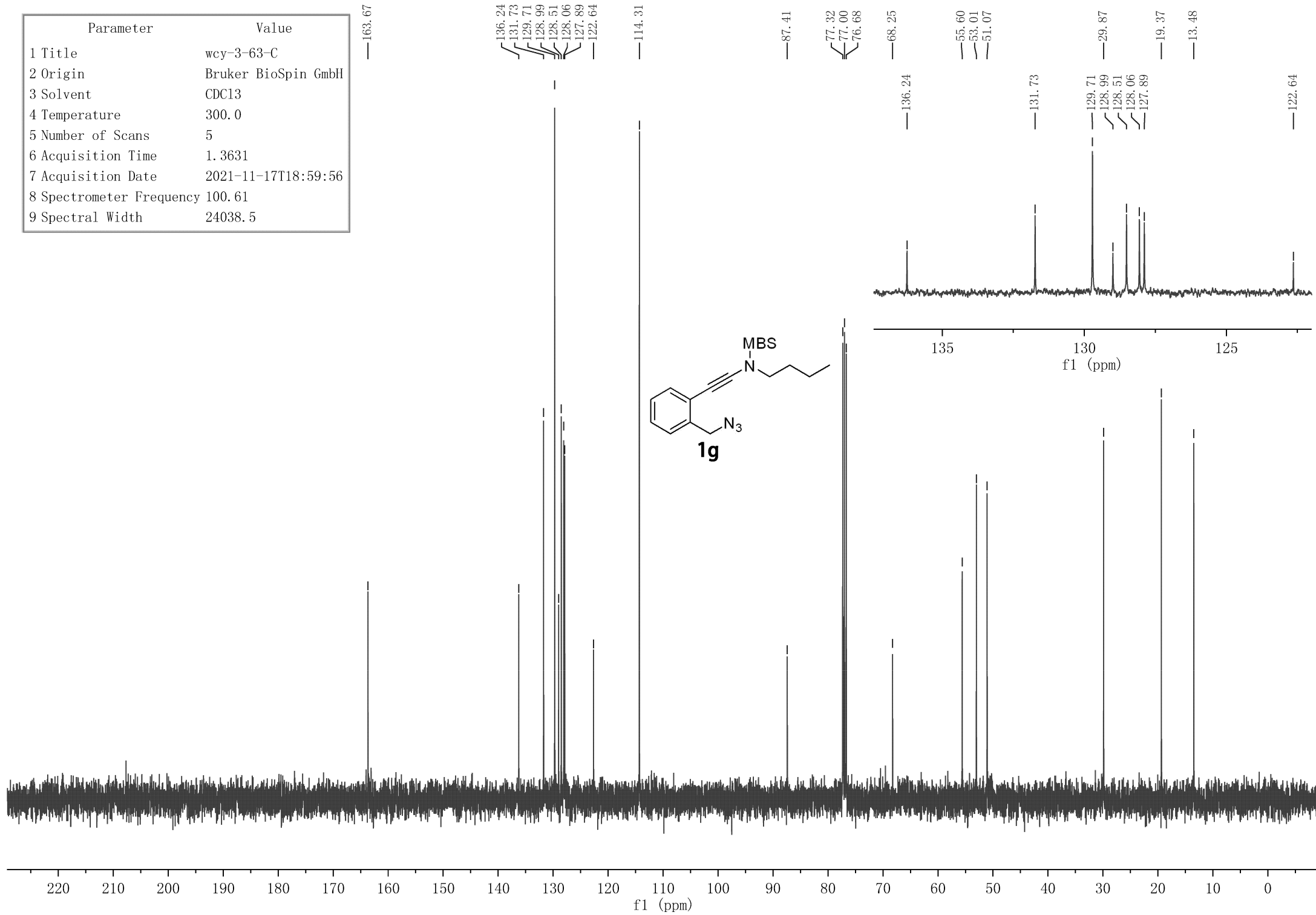
Parameter	Value
1 Title	Mbsn-pr-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	11
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-12T09:39:37
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



Parameter	Value
1 Title	wcy-3-63-H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	4
6 Acquisition Time	4.0894
7 Acquisition Date	2021-11-17T18:58:58
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	wcy-3-63-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	5
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-17T18:59:56
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



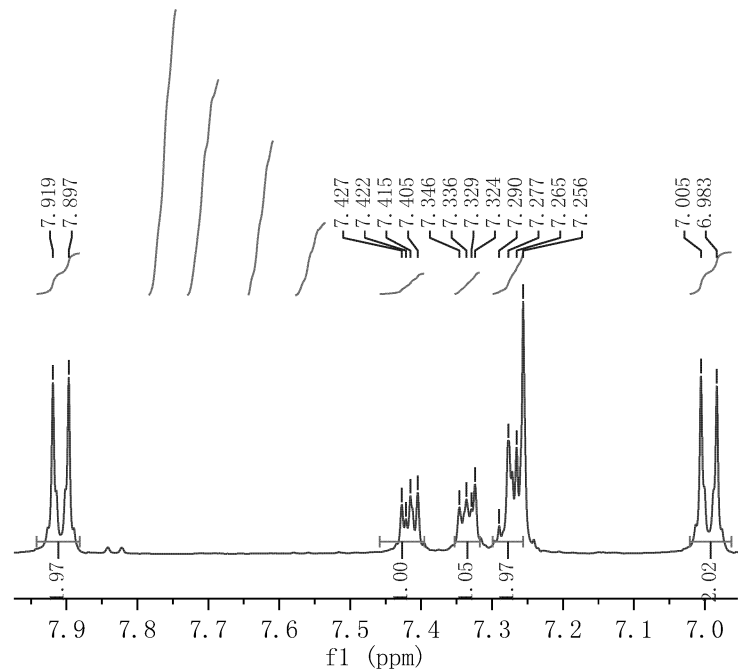
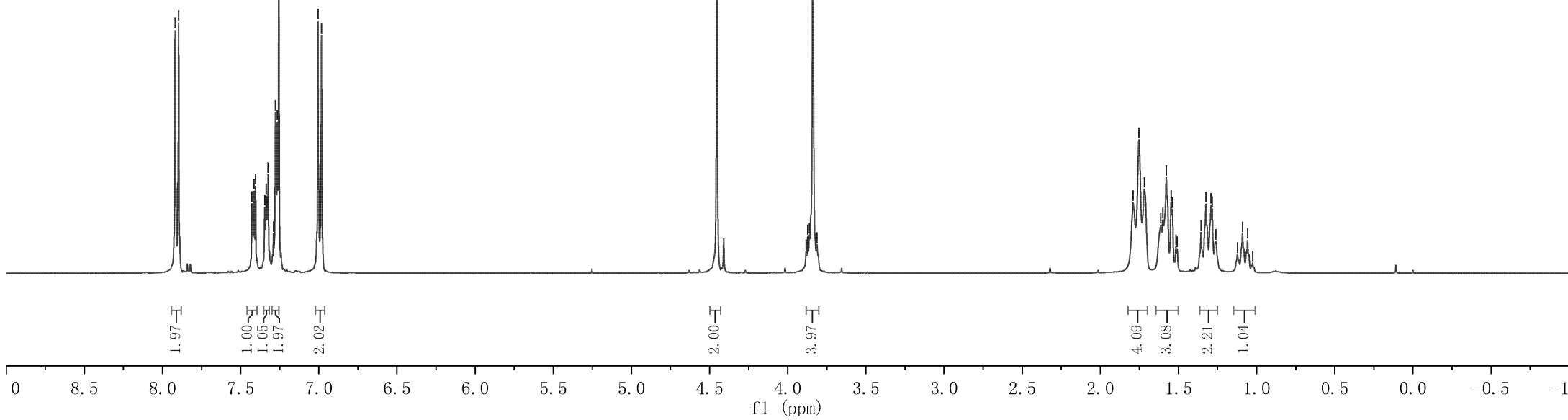
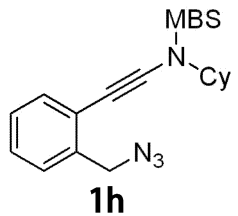
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7.415
7.405
7.336
7.324
7.277
7.265
7.005
6.983

4.453

3.882
3.872
3.862
3.839
3.814

1.791
1.753
1.718
1.613
1.601
1.578
1.548
1.539
1.517
1.508
1.355
1.324
1.292
1.284
1.261
1.123
1.091
1.058
1.026

Parameter	Value
1 Title	MbsCy-Sub-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	4
6 Acquisition Time	4.0894
7 Acquisition Date	2021-11-04T19:34:31
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	MbsCy-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	6
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-04T19:35:25
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

163.42

135.90
131.55
130.36
129.33
128.47
127.96
127.61
122.84

114.18

85.25

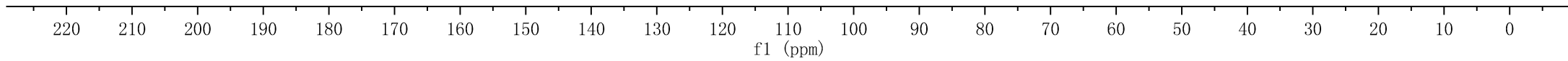
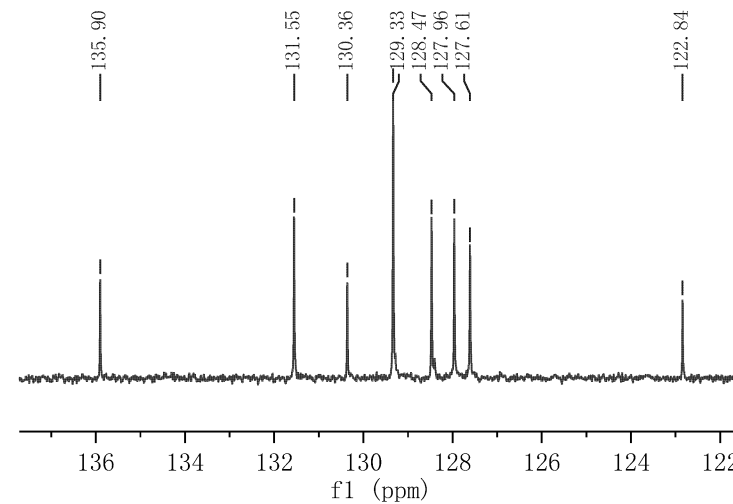
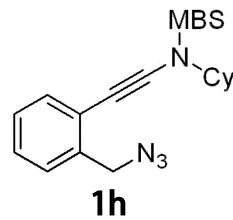
77.32
77.00
76.68

69.87

59.36
55.45
52.92

31.10

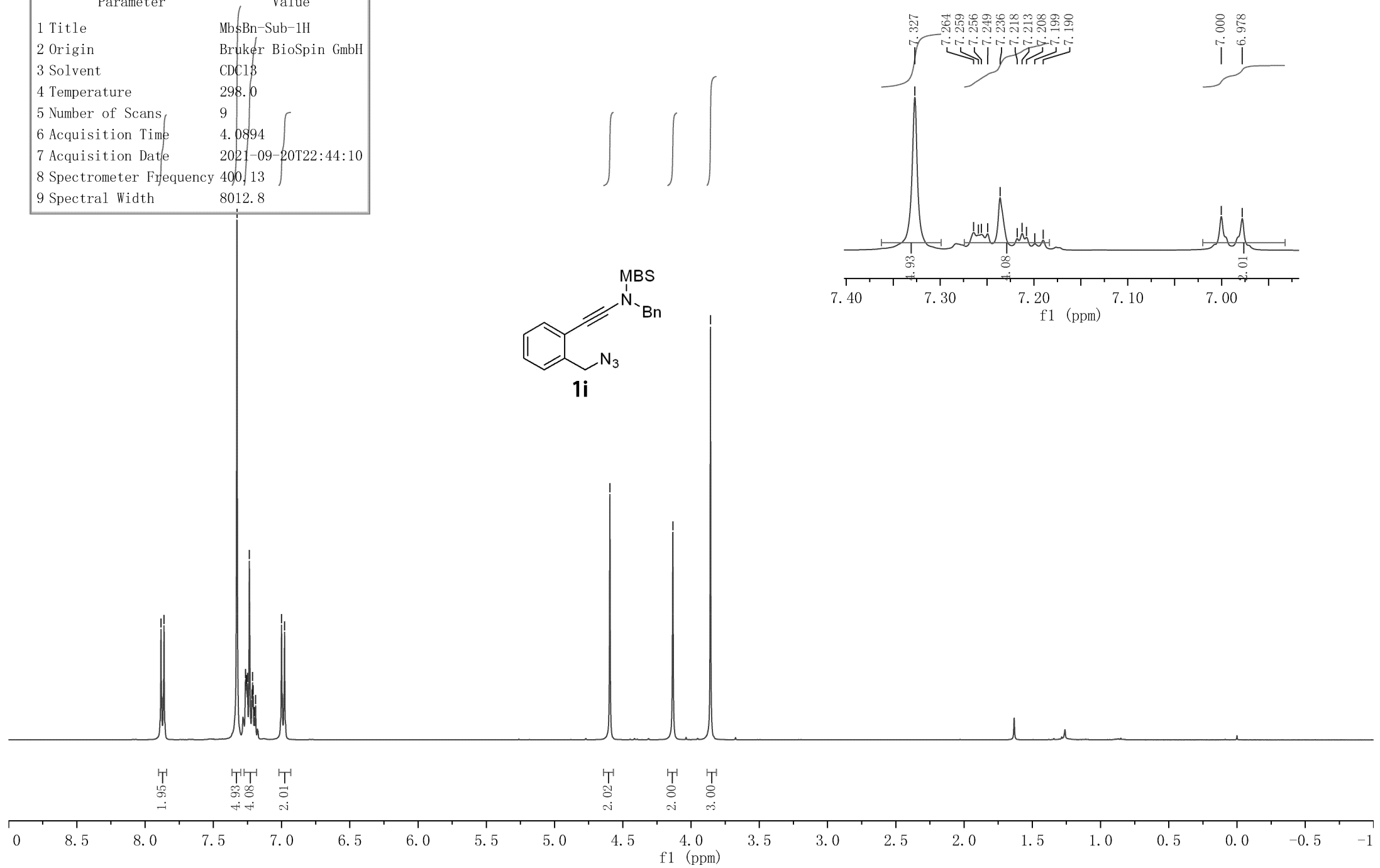
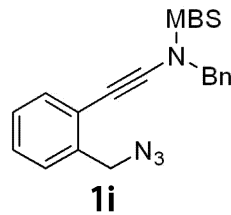
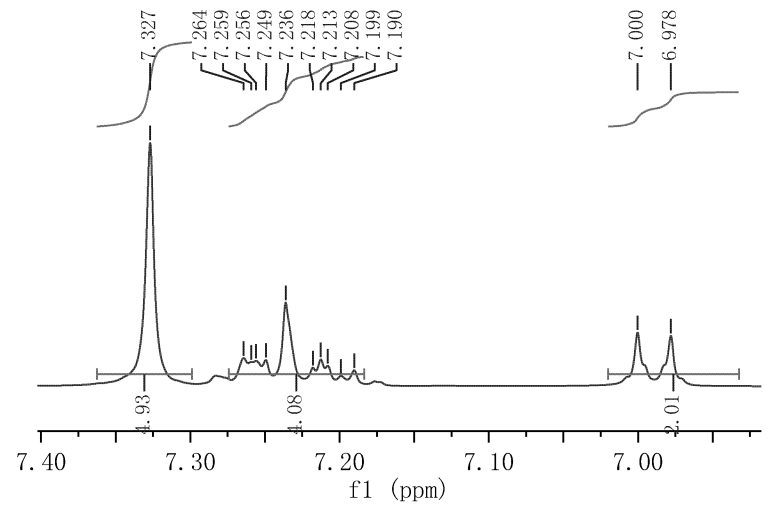
25.22
24.70



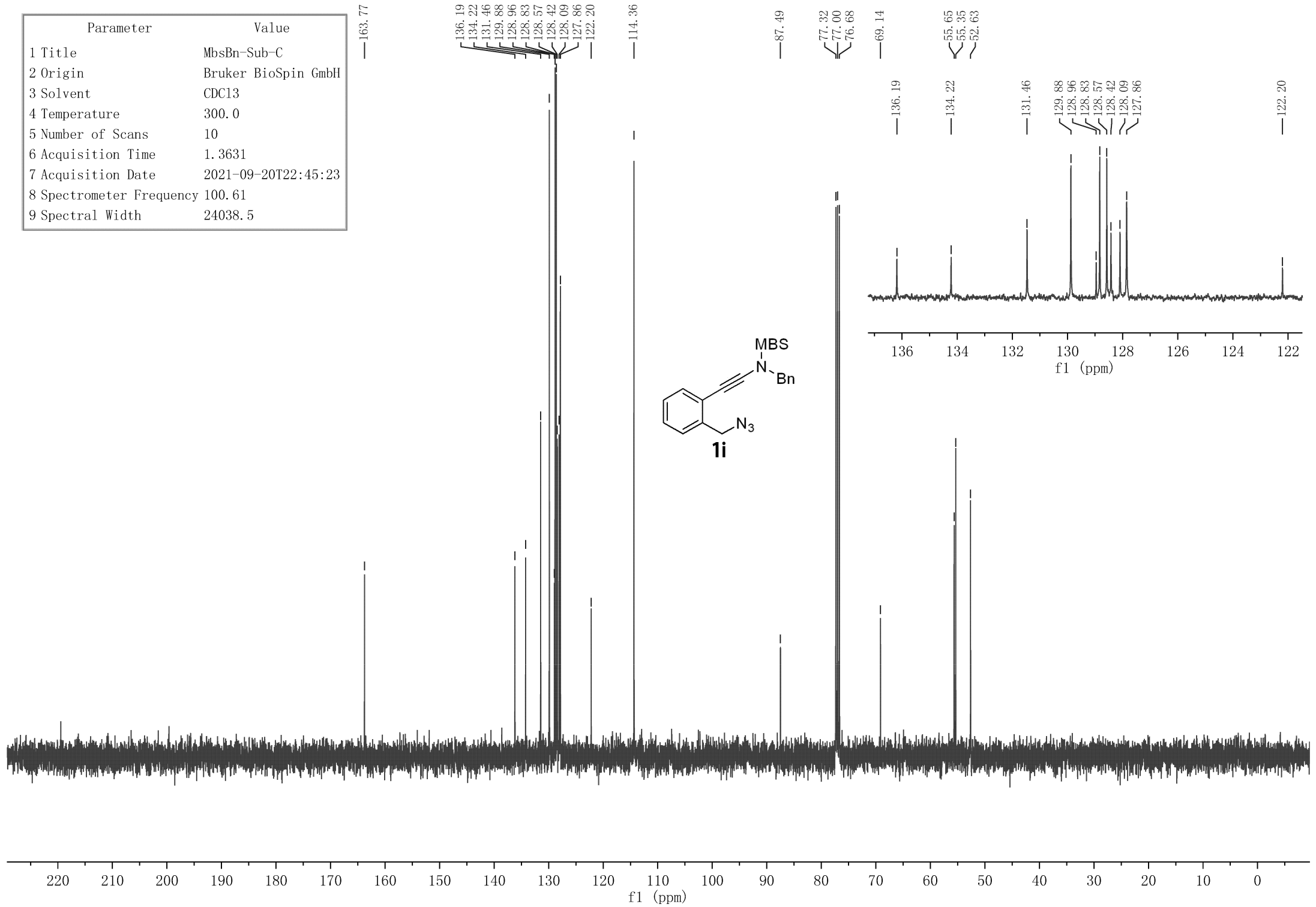
7.883
7.861
7.327
7.264
7.259
7.256
7.249
7.236
7.218
7.213
7.208
7.199
7.190
7.000
6.978

4.595
4.134
3.858

Parameter	Value
1 Title	Mb8Bn-Sub-1H
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	2021-09-20T22:44:10
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	MbsBn-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	10
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-20T22:45:23
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

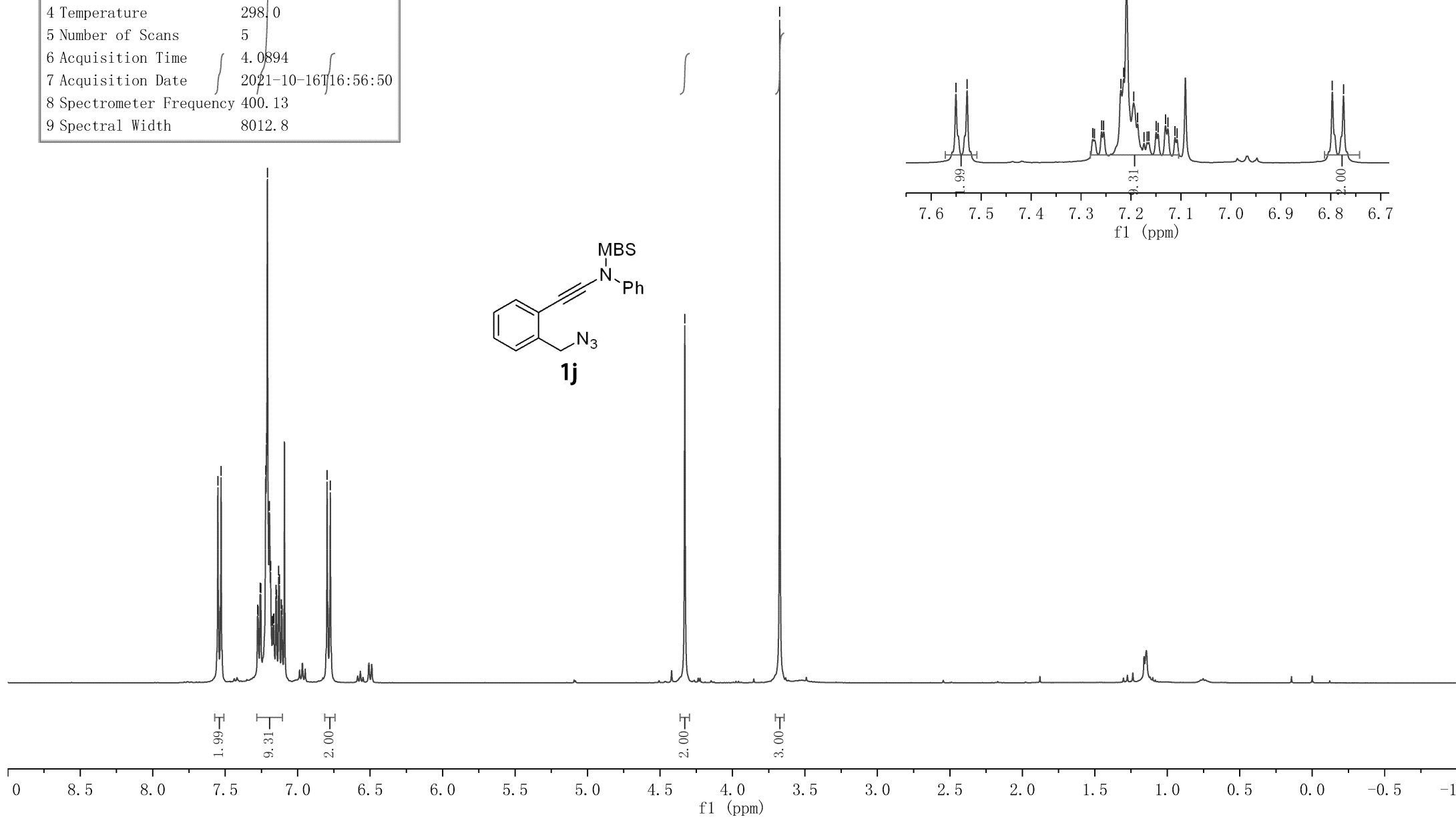
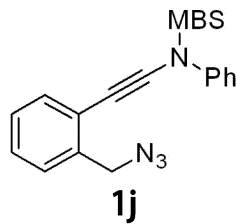
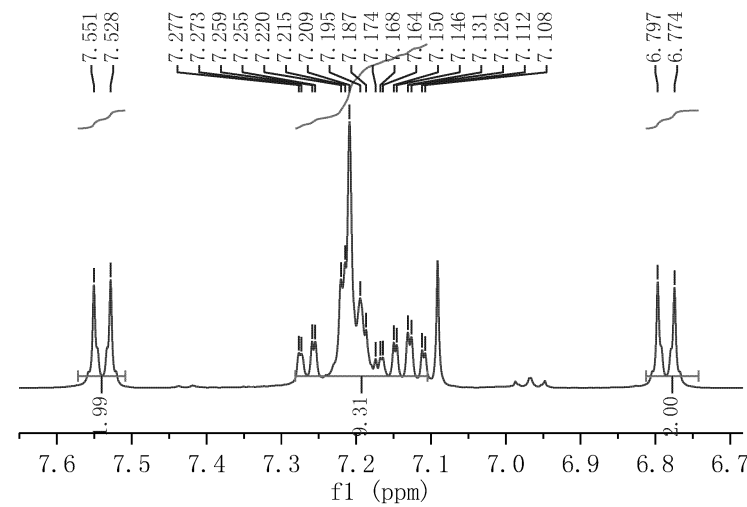


7.551
7.528
7.220
7.215
7.209
7.195
7.187
6.774

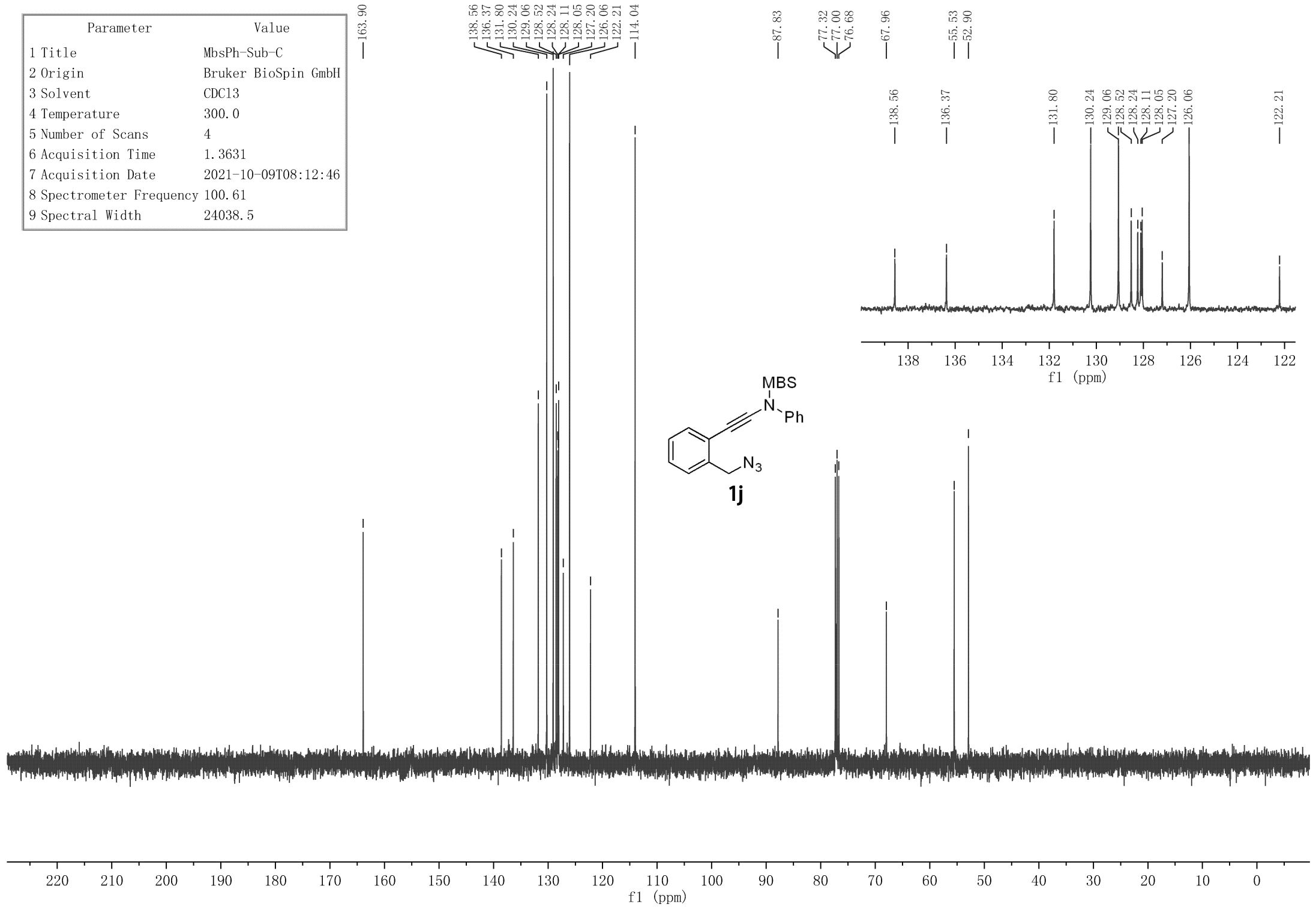
4.329

3.674

Parameter	Value
1 Title	MbsPh-Sub-1H
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	2021-10-16 16:56:50
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	MbsPh-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	4
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-09T08:12:46
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



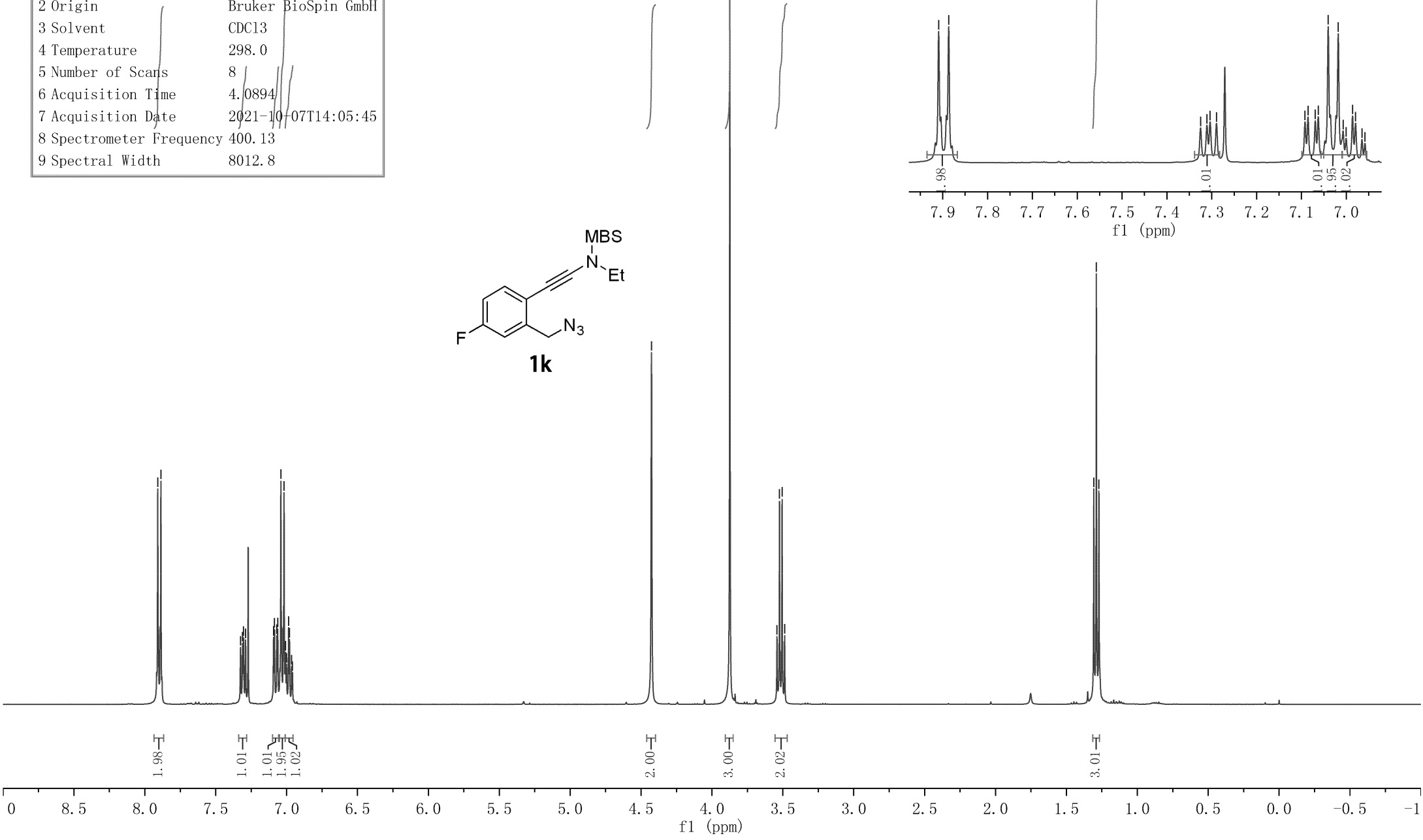
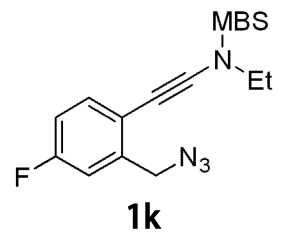
Parameter	Value
1 Title	4-F-Sub-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-07T14:05:45
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

7.909
7.887
7.325
7.311
7.304
7.290
7.092
7.085
7.069
7.063
7.040
7.018
7.007
7.000
6.986
6.979
6.965
6.958

4.426
3.874
3.541
3.523
3.505
3.487

1.307
1.289
1.271

7.325
7.311
7.304
7.290
7.092
7.085
7.069
7.063
7.040
7.018
7.007
7.000
6.986
6.979

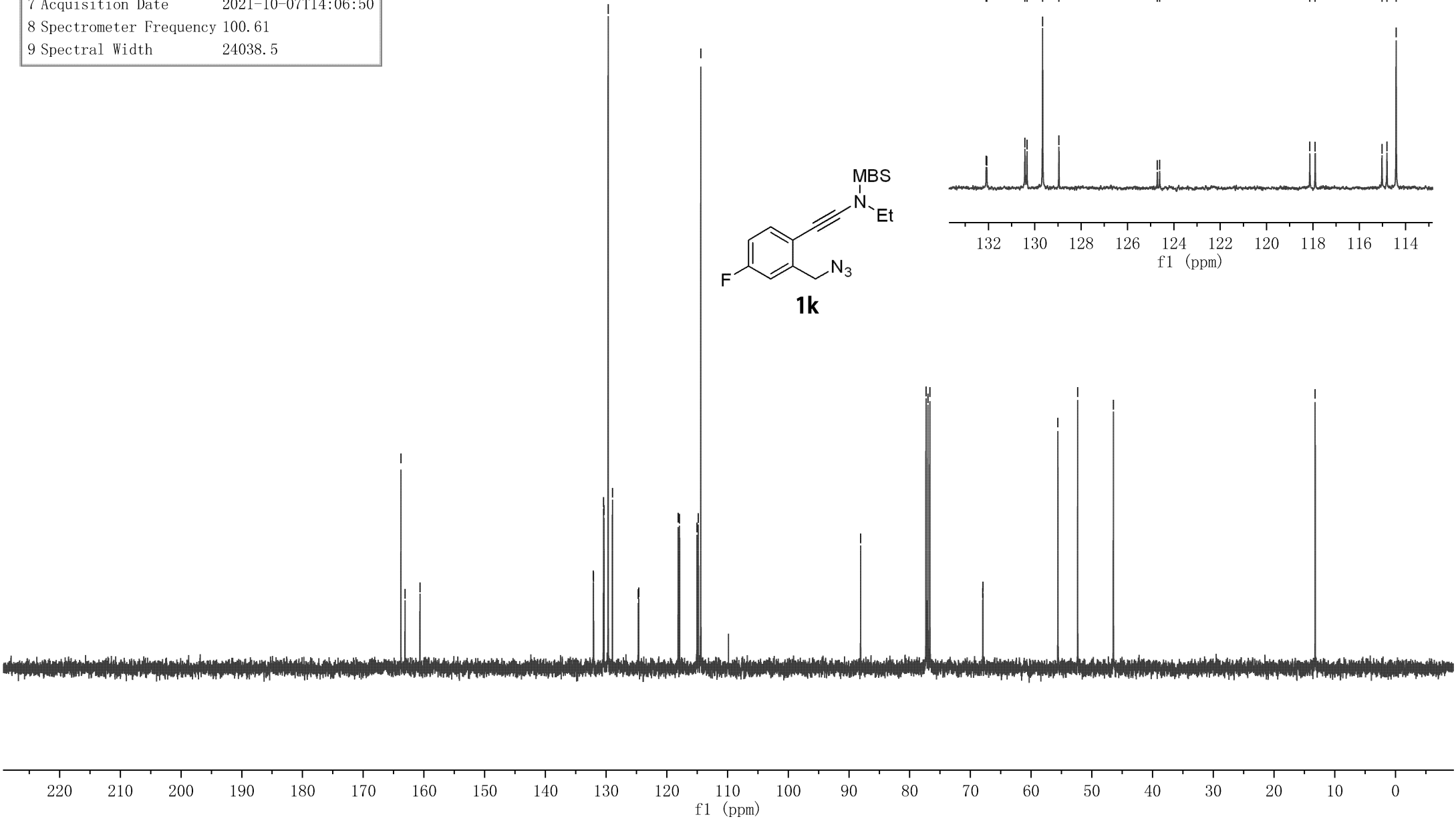
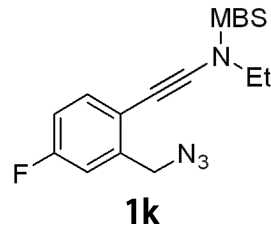


Parameter	Value
1 Title	4-F-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	11
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-07T14:06:50
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

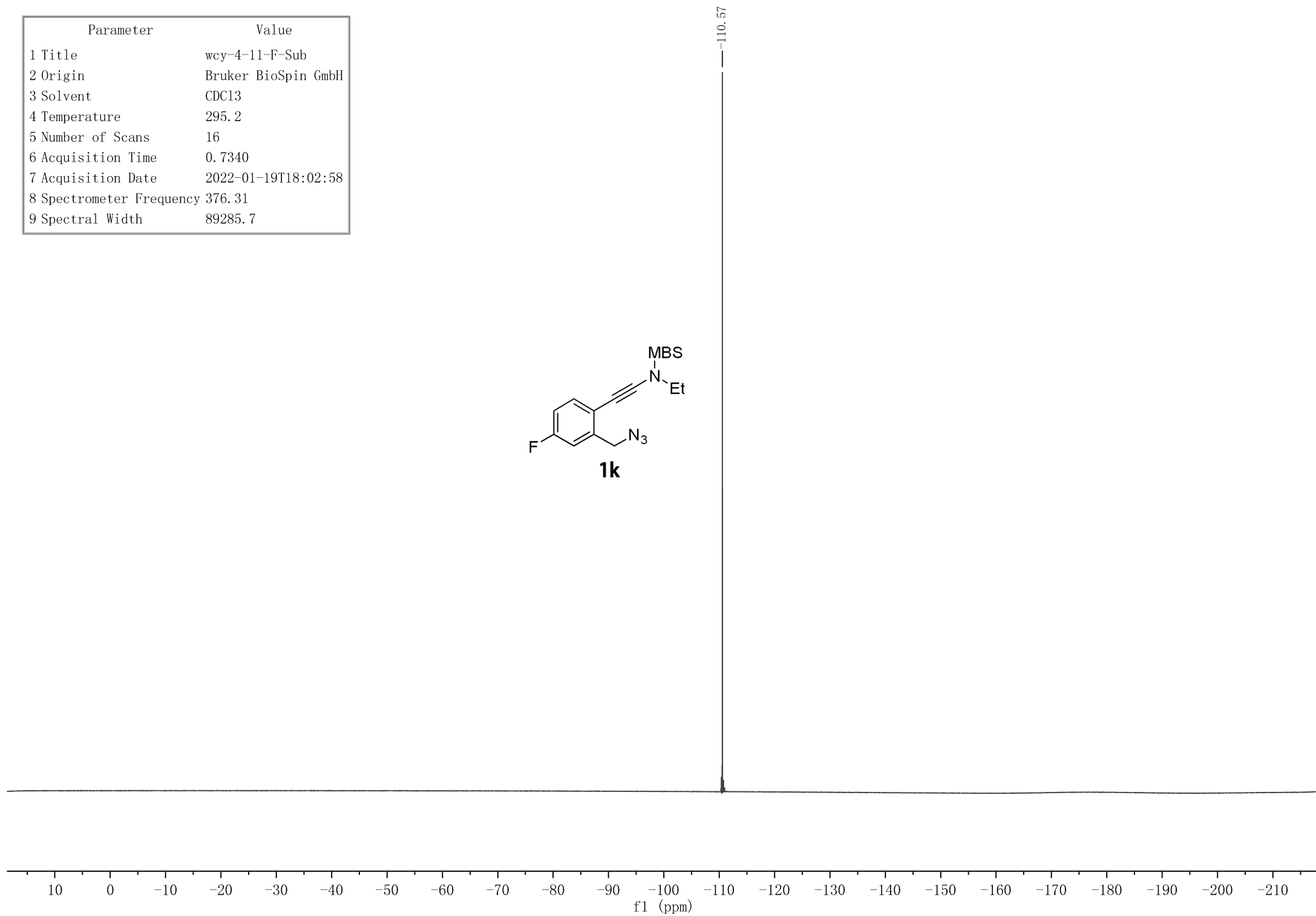
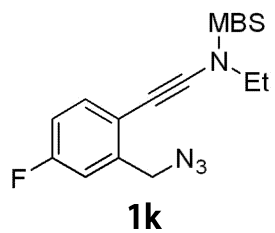
163.79
163.12
160.66
132.10
132.07
130.43
130.34
129.66
128.96
124.71
124.61
118.13
117.90
115.02
114.81
114.41

88.08
77.32
77.00
76.68
67.96
67.93
55.59
52.34
46.46

132.10
132.07
130.43
130.34
129.66
128.96
124.71
124.61
118.13
117.90
115.02
114.81
114.41

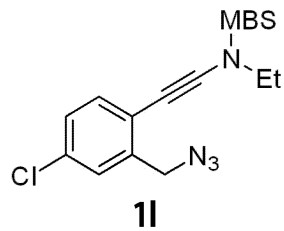


Parameter	Value
1 Title	wcy-4-11-F-Sub
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	295.2
5 Number of Scans	16
6 Acquisition Time	0.7340
7 Acquisition Date	2022-01-19T18:02:58
8 Spectrometer Frequency	376.31
9 Spectral Width	89285.7



7.895
7.873
7.346
7.342
7.322
7.302
7.237
7.233
7.217
7.212
7.035
7.013

Parameter	Value
1 Title	4-Cl-Sub-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-09-19T17:02:23
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

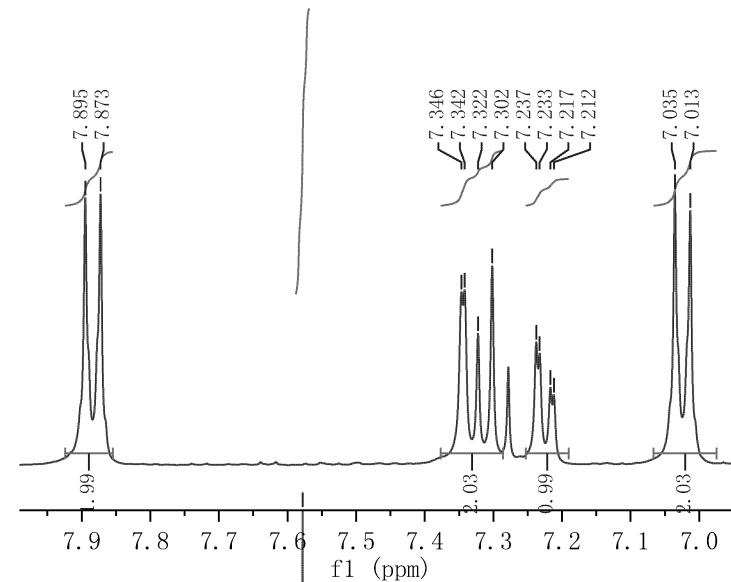


4.437

3.866

3.534
3.516
3.498
3.480

1.298
1.280
1.262



1.99

2.03
0.99

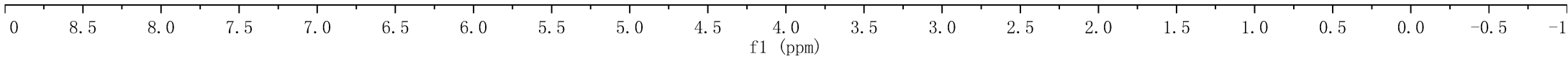
2.03

1.93

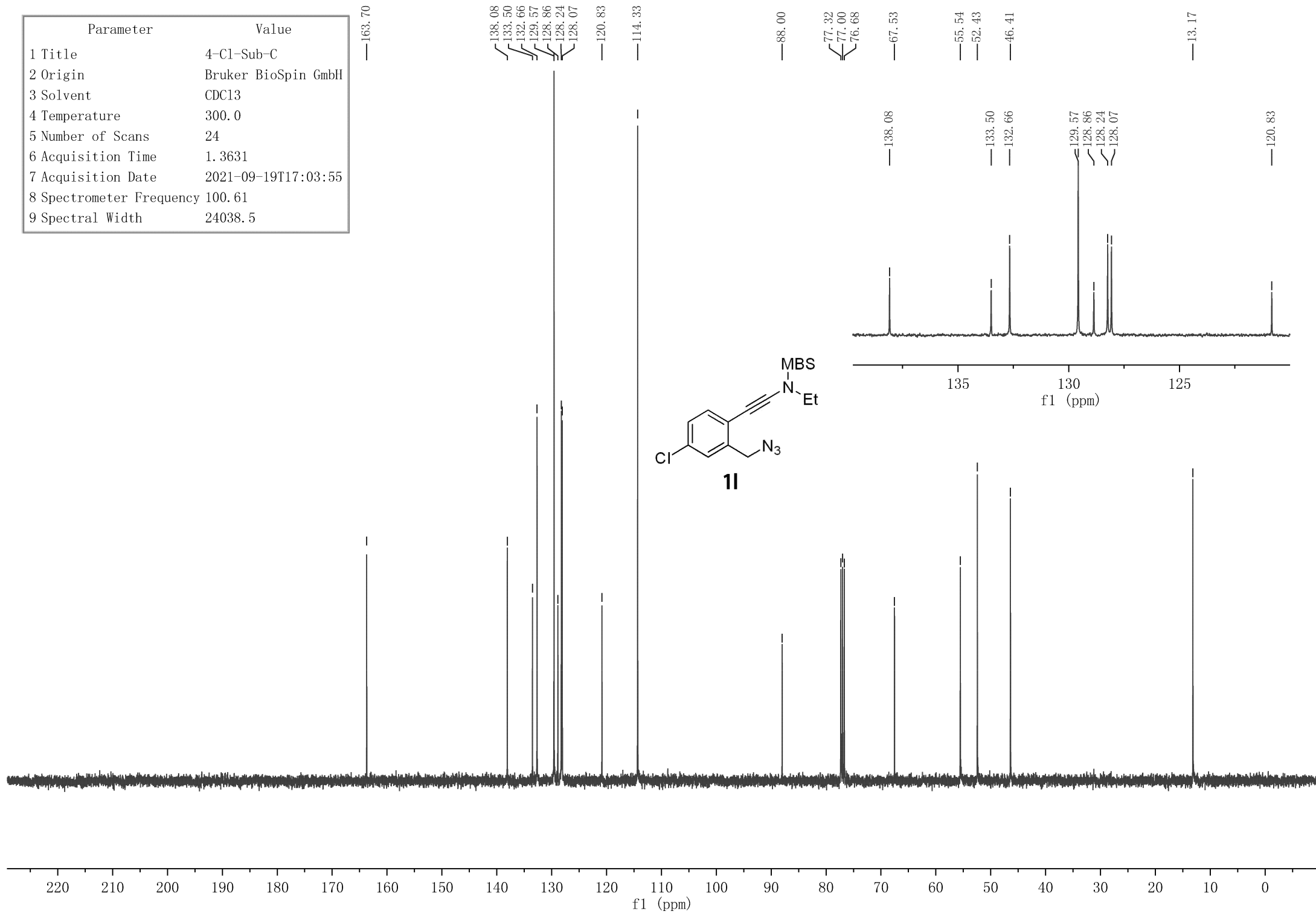
3.00

2.03

3.11



Parameter	Value
1 Title	4-Cl-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	24
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-19T17:03:55
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

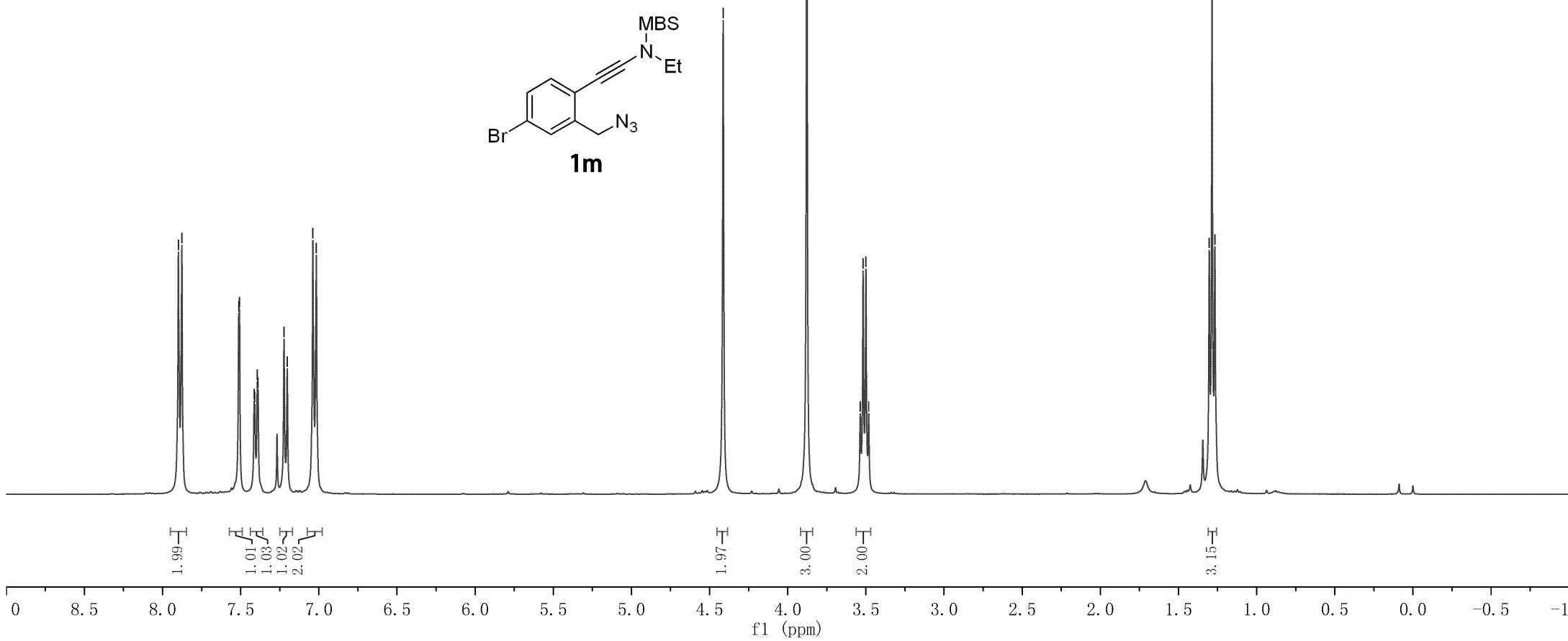
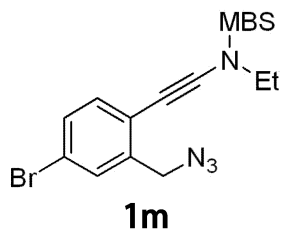
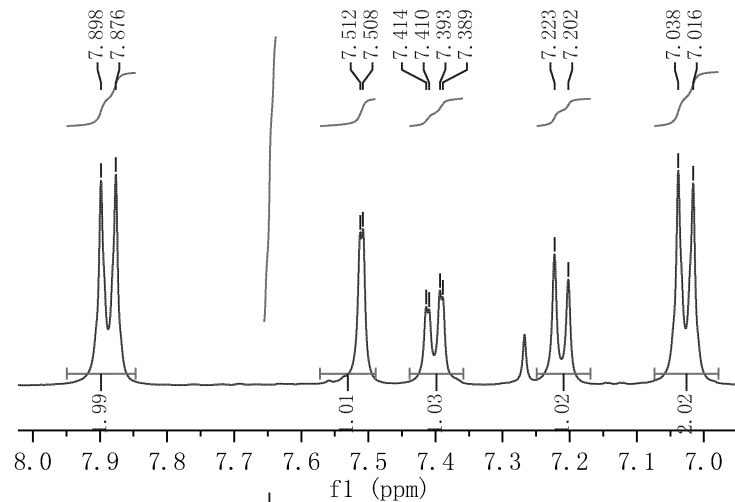


7.898
7.876
7.512
7.508
7.414
7.393
7.389
7.223
7.202
7.038
7.016

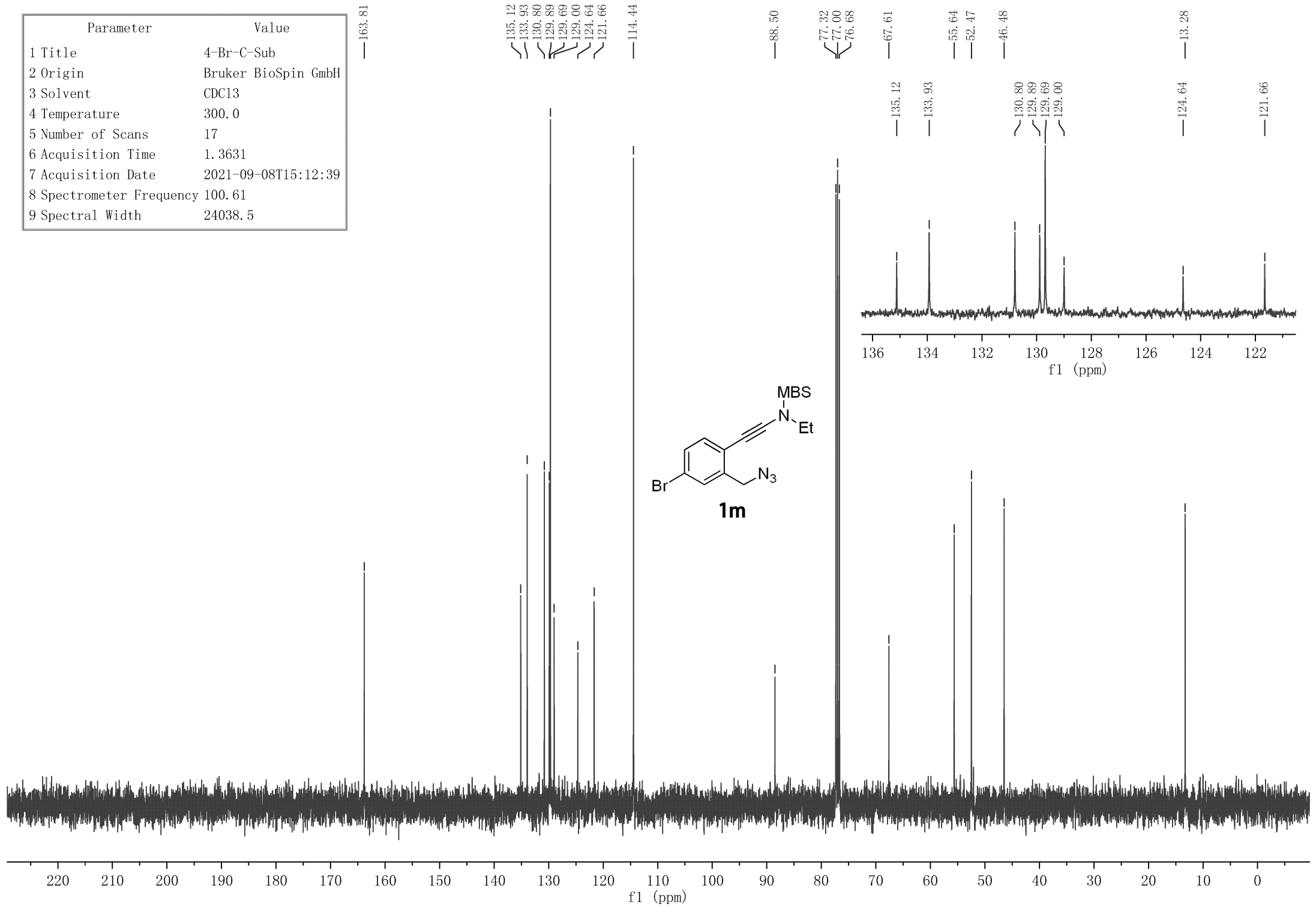
4.413
3.878
3.536
3.518
3.500
3.482

1.303
1.285
1.267

Parameter	Value
1 Title	4-Br-H-Sub
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	6
6 Acquisition Time	4.0894
7 Acquisition Date	2021-09-08T15:11:32
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	4-Br-C-Sub
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	17
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-08T15:12:39
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



7.902
7.880

7.306
7.286
7.149
7.081
7.062
7.018
6.996

4.408

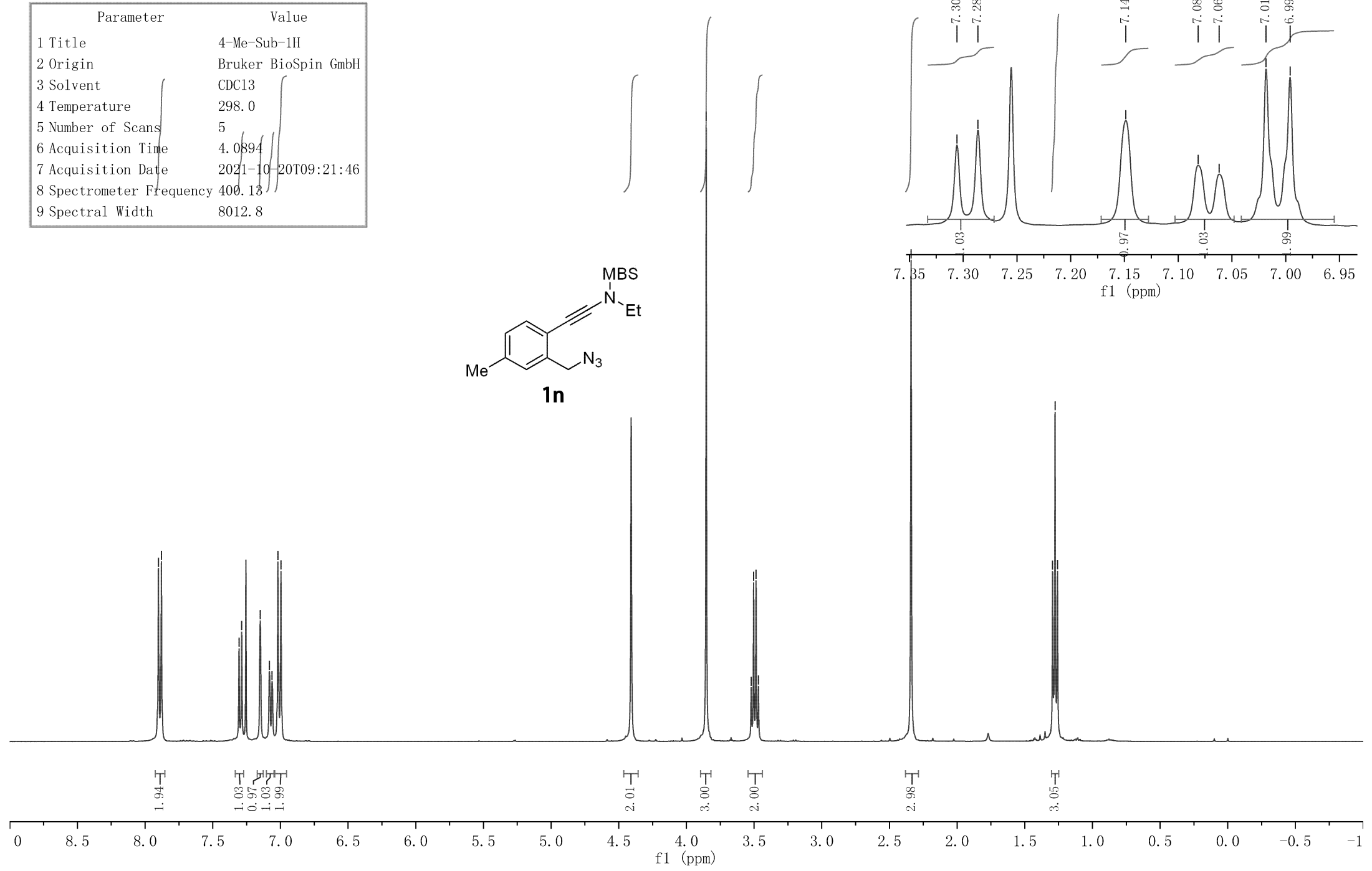
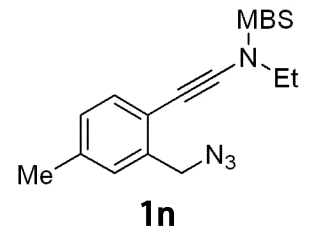
3.854

3.522
3.504
3.486
3.468

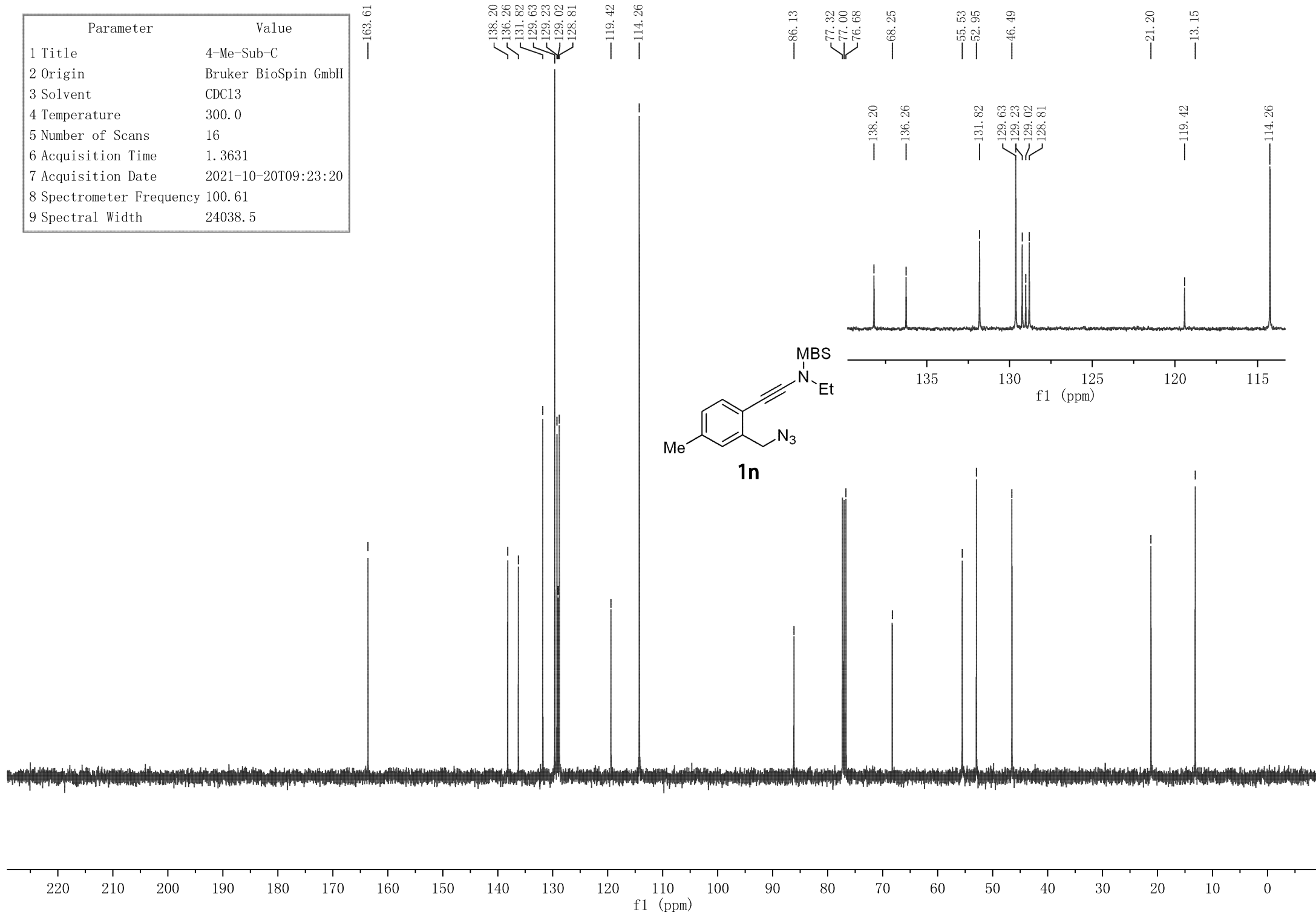
2.340

1.294
1.276
1.258

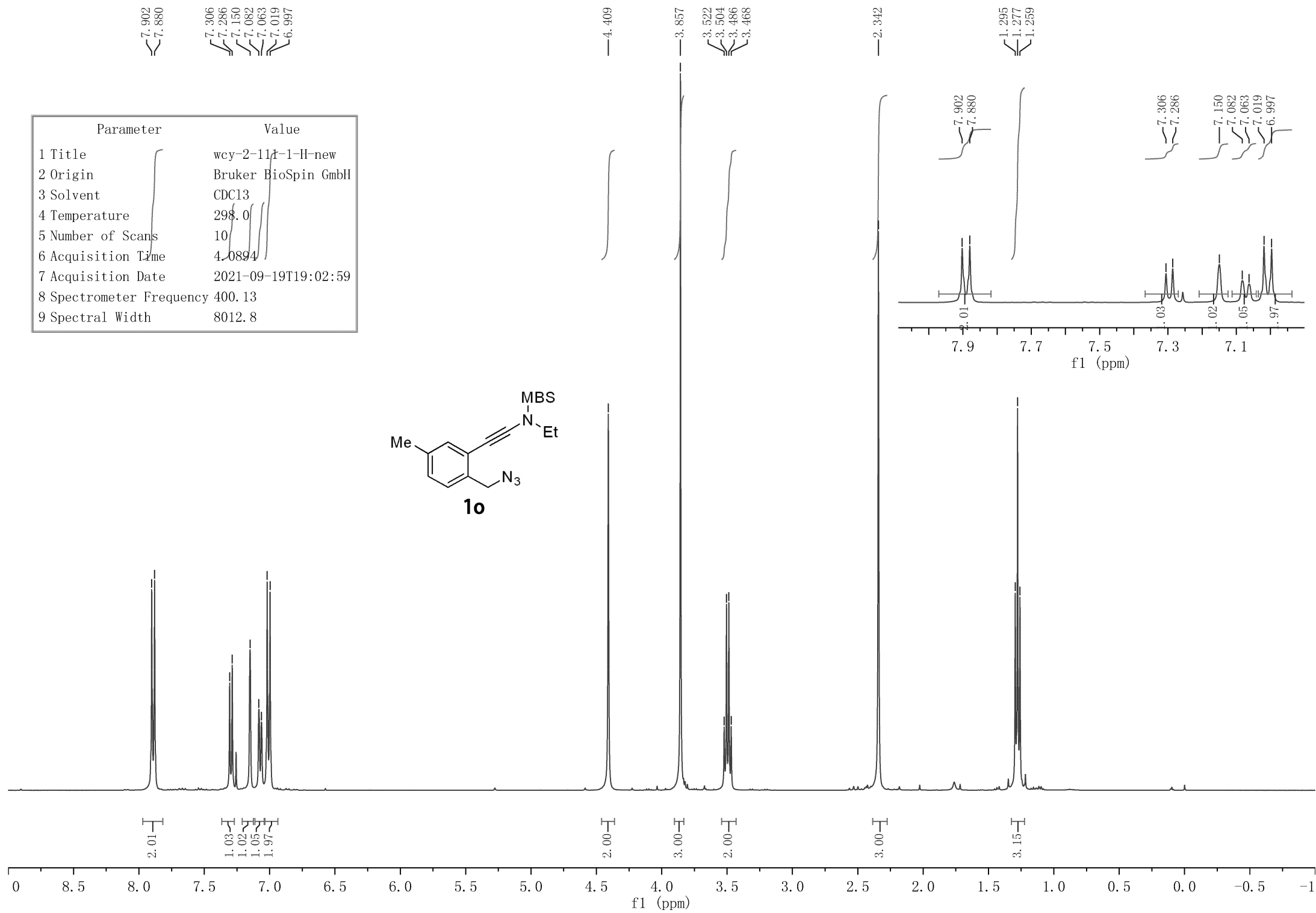
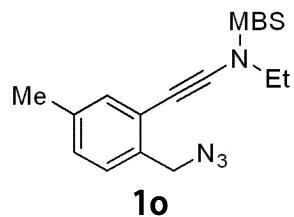
Parameter	Value
1 Title	4-Me-Sub-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	5
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-20T09:21:46
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



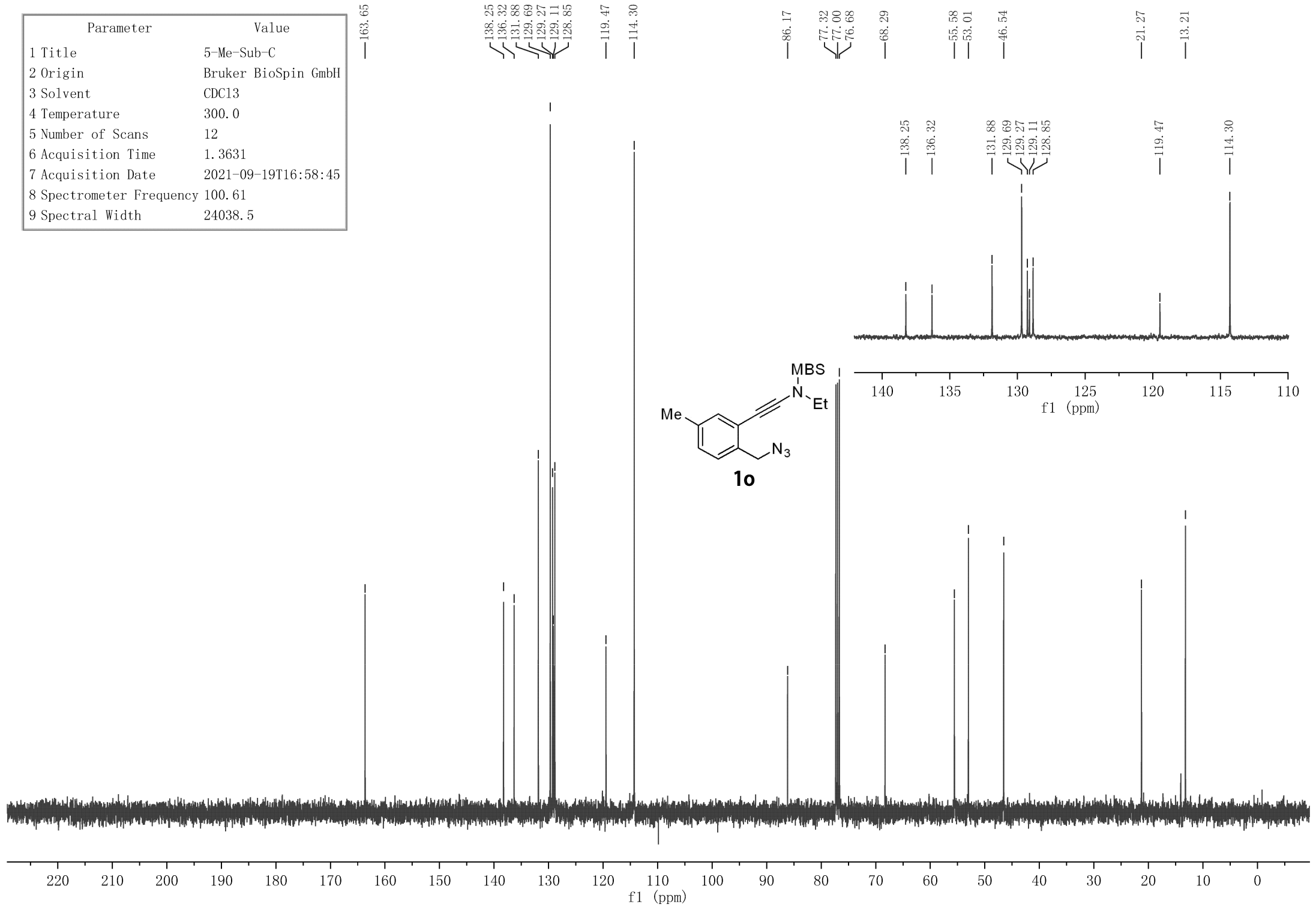
Parameter	Value
1 Title	4-Me-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	16
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-20T09:23:20
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



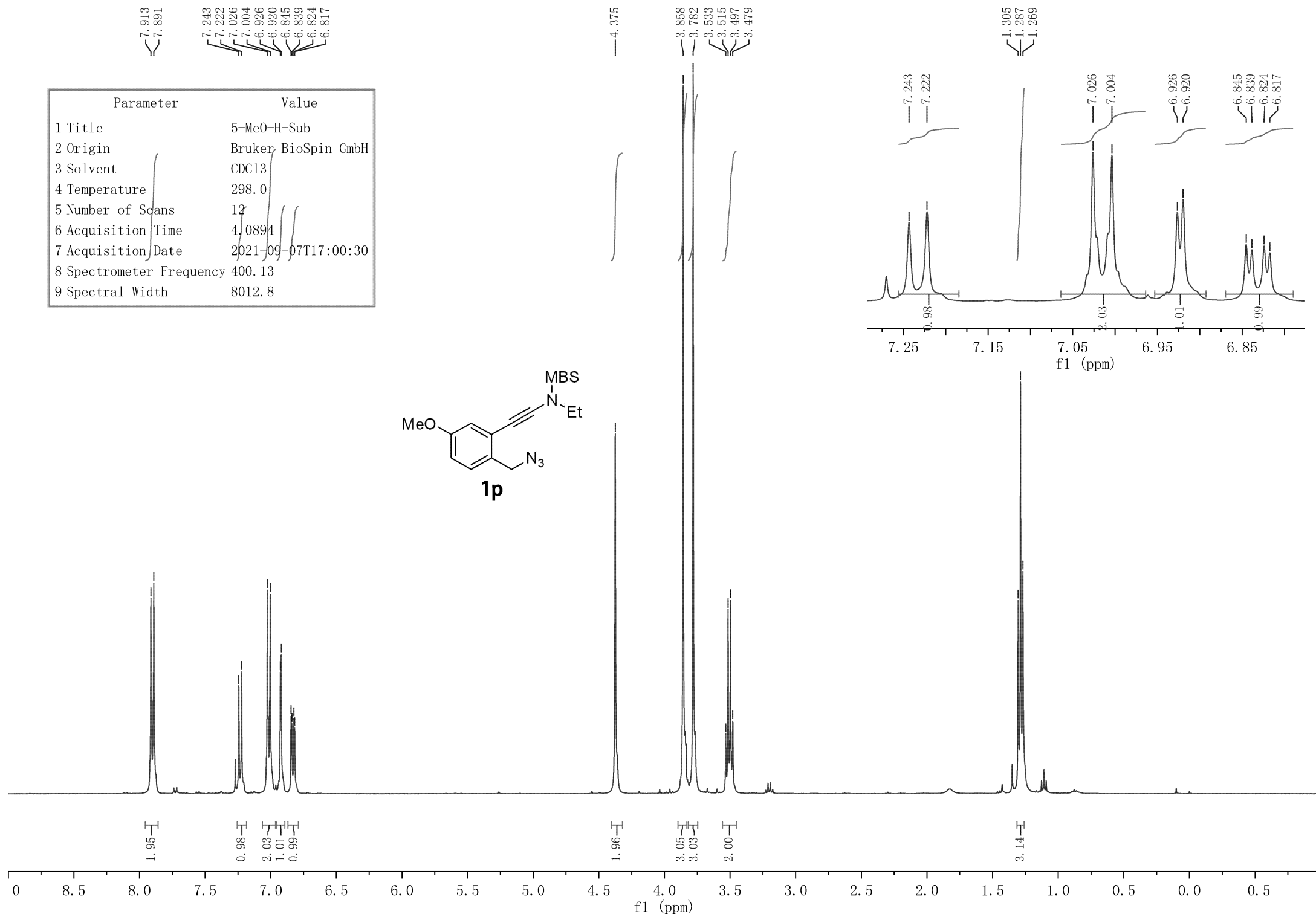
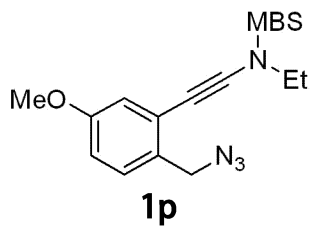
Parameter	Value
1 Title	wcy-2-11t-1-H-new
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	10
6 Acquisition Time	4.0894
7 Acquisition Date	2021-09-19T19:02:59
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



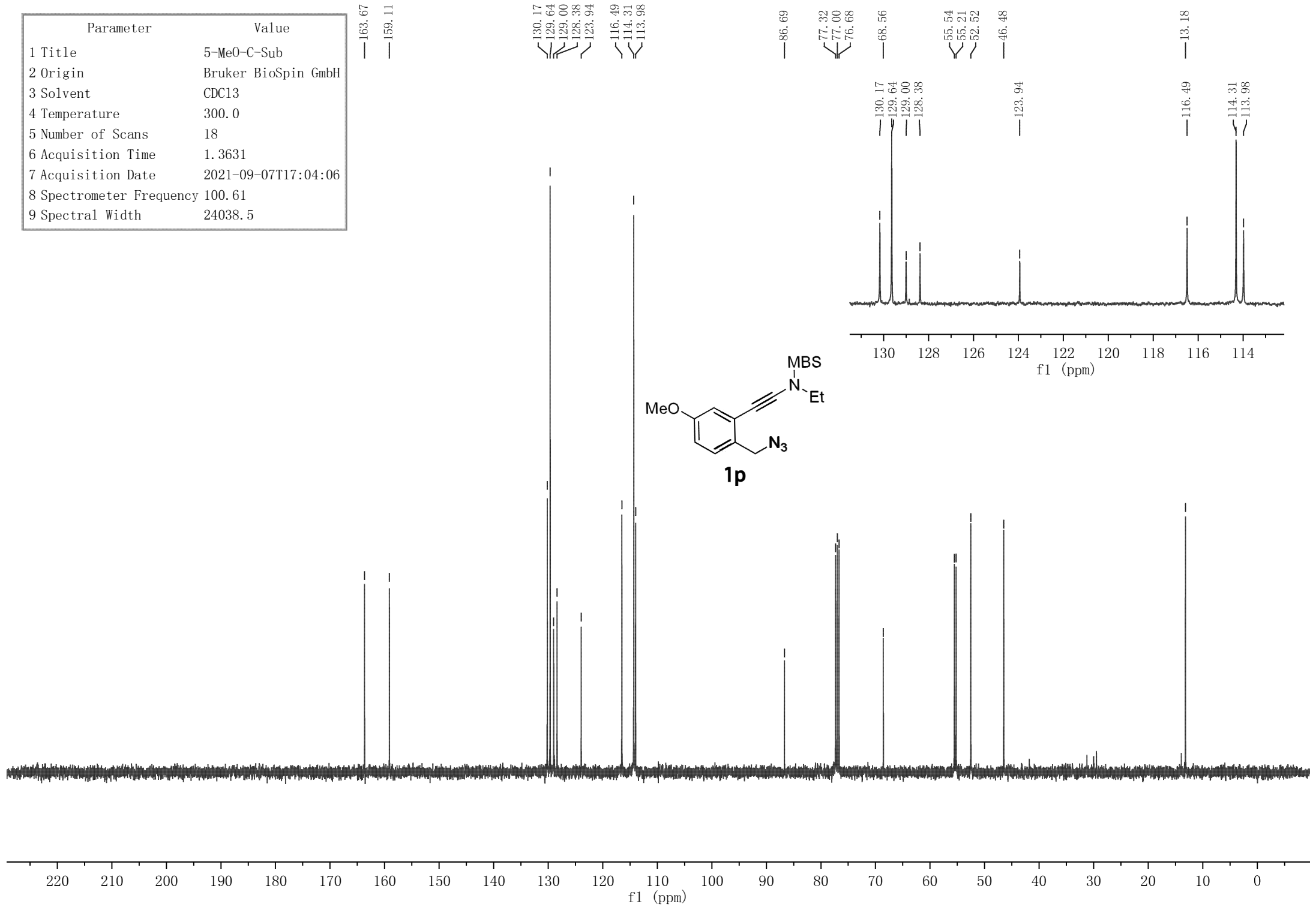
Parameter	Value
1 Title	5-Me-Sub-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	12
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-19T16:58:45
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



Parameter	Value
1 Title	5-MeO-H-Sub
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	12
6 Acquisition Time	4.0894
7 Acquisition Date	2021-09-07T17:00:30
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	5-MeO-C-Sub
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	18
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-07T17:04:06
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

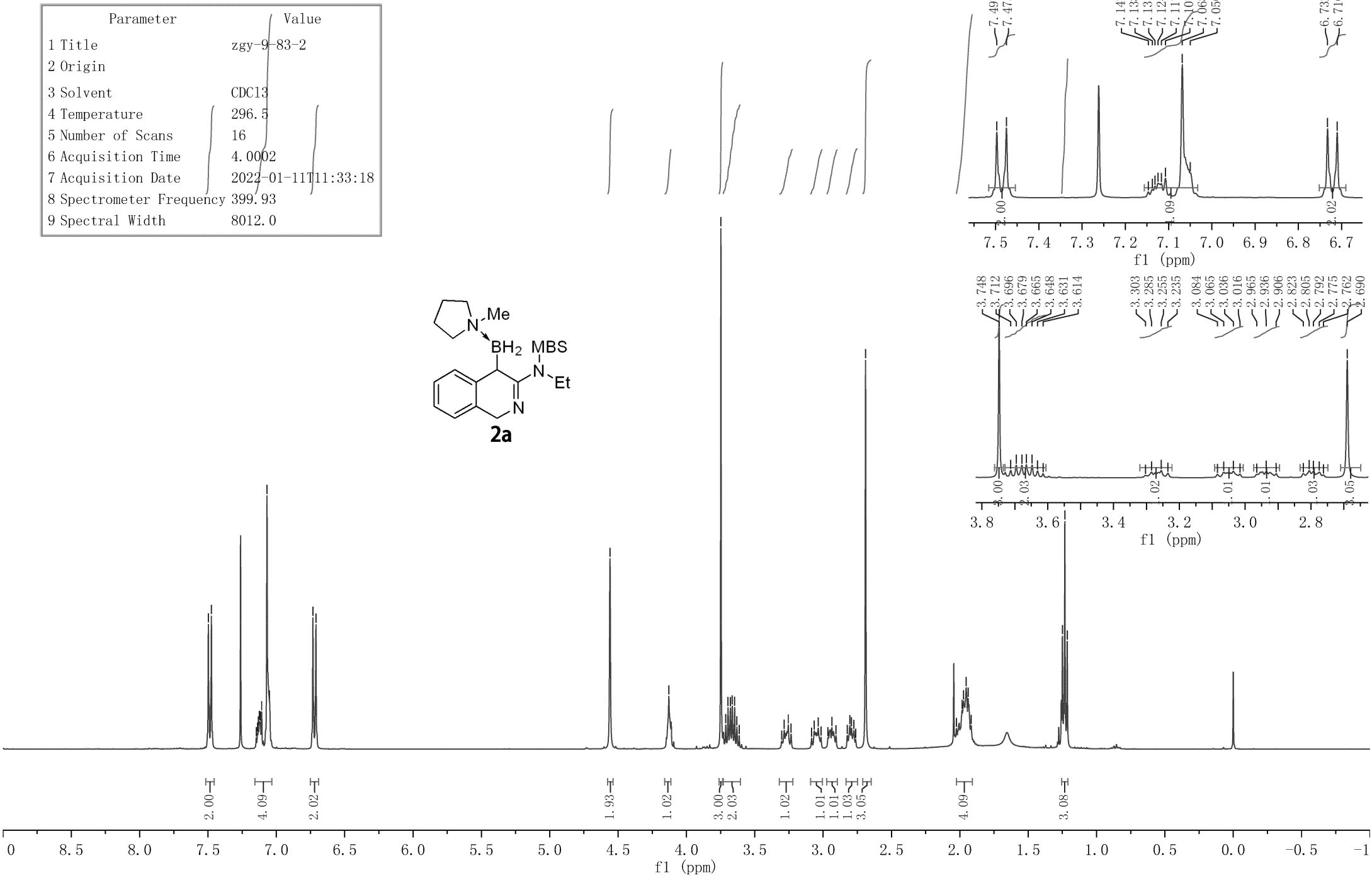


Parameter	Value
1 Title	zgy-9-83-2
2 Origin	
3 Solvent	CDC13
4 Temperature	296.5
5 Number of Scans	16
6 Acquisition Time	4.0002
7 Acquisition Date	2022-01-11T11:33:18
8 Spectrometer Frequency	399.93
9 Spectral Width	8012.0

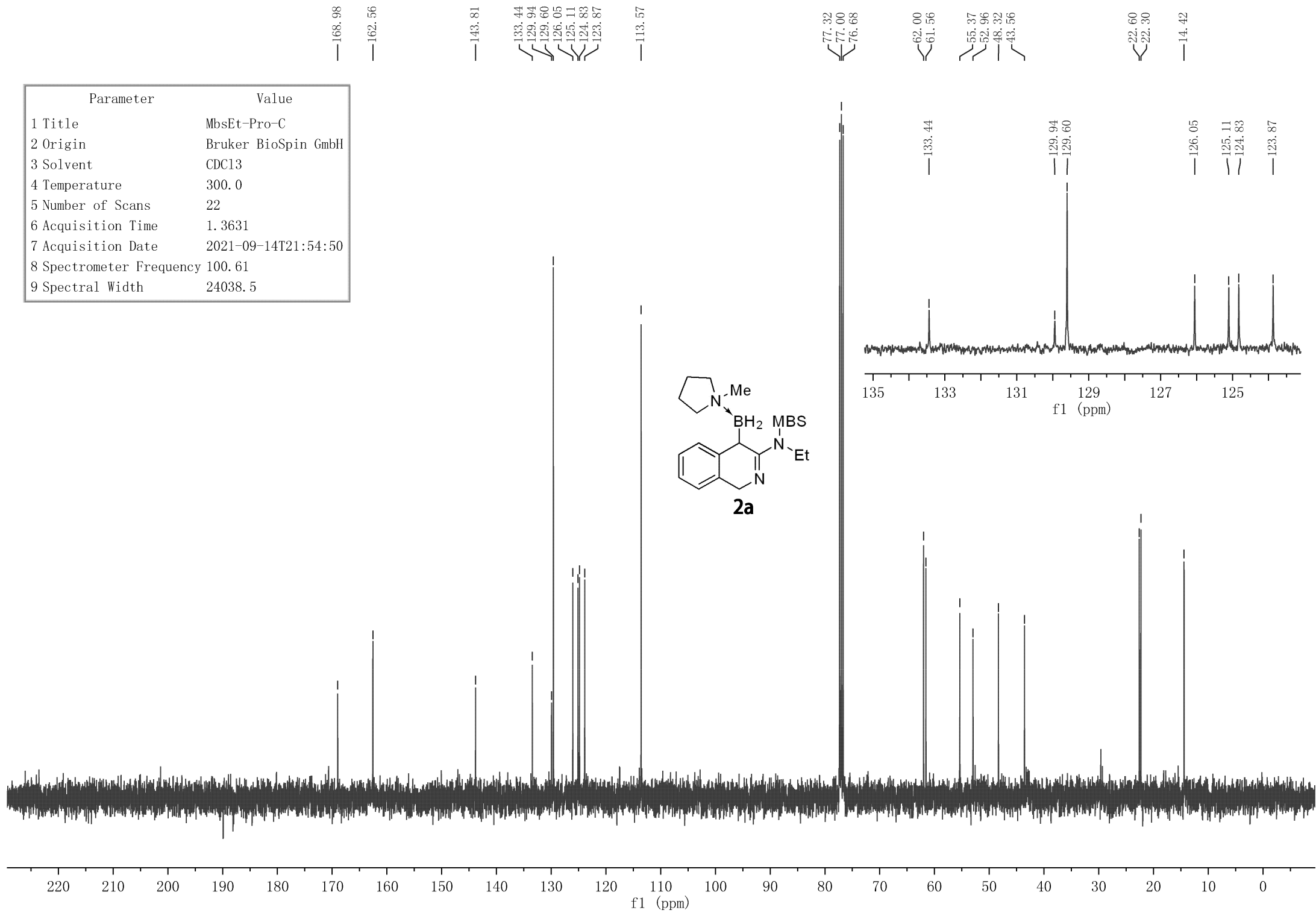
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7.475
7.124
7.117
7.107
7.068
7.059
6.732
6.710

4.559
4.129
3.748
3.712
3.696
3.679
3.665
3.648
3.285
3.255
3.235
3.065
3.036
2.936
2.823
2.805
2.792
2.775
2.699
2.624
1.984
1.974
1.954
1.940
1.917

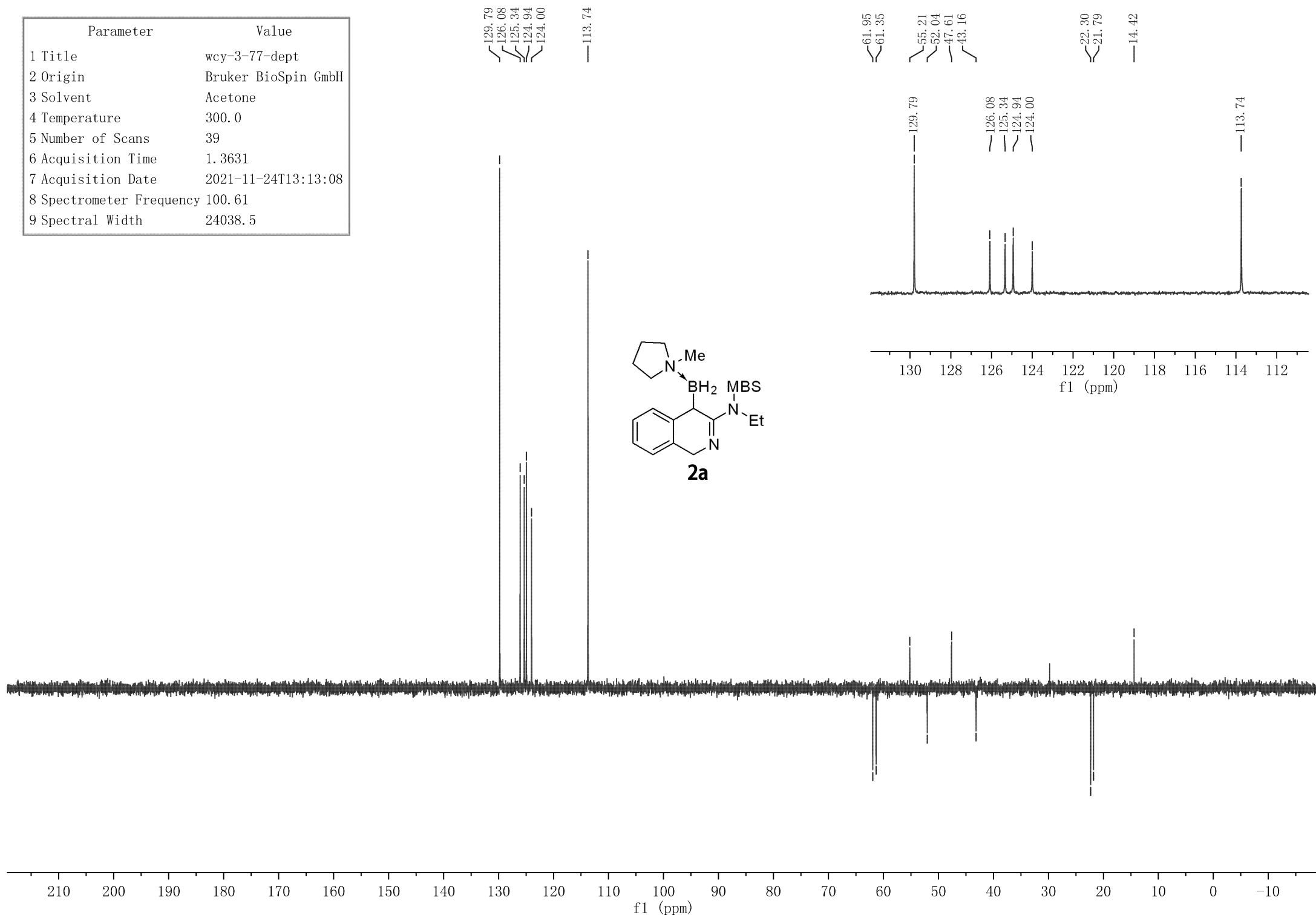
1.250
1.232
1.214



Parameter	Value
1 Title	MbsEt-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	22
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-14T21:54:50
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



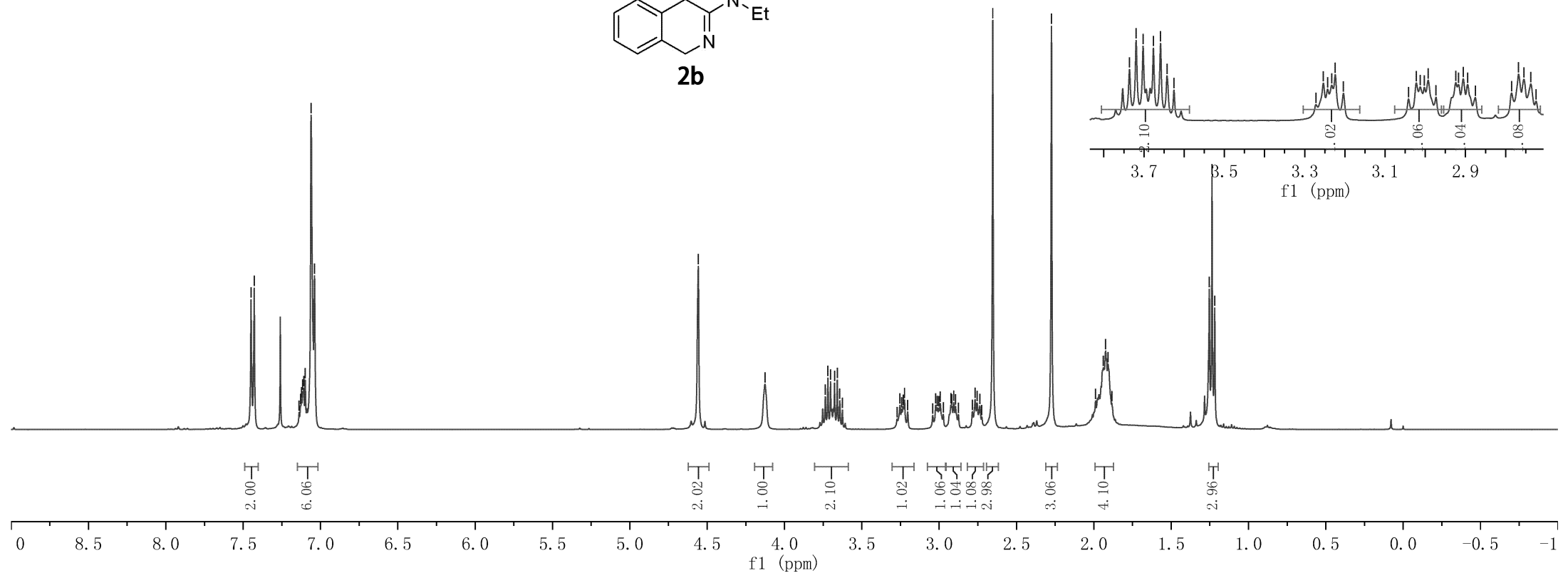
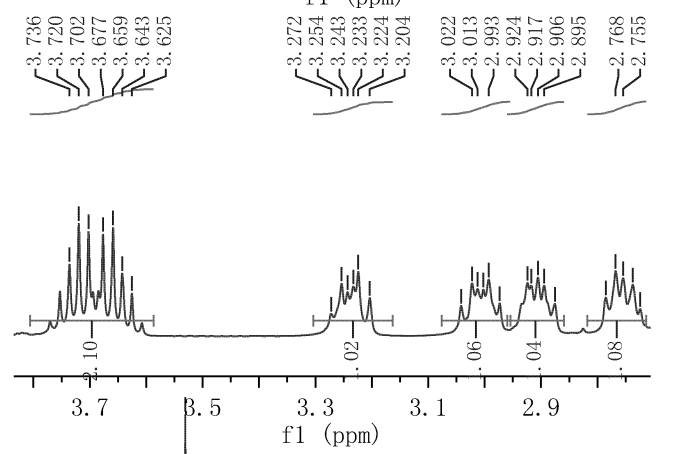
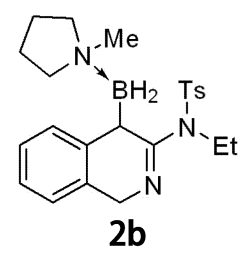
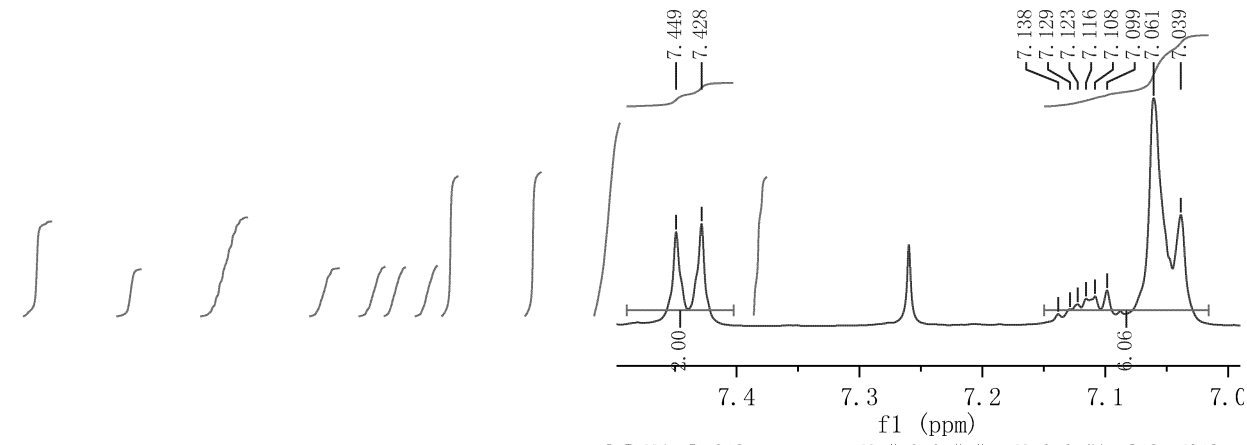
Parameter	Value
1 Title	wcy-3-77-dept
2 Origin	Bruker BioSpin GmbH
3 Solvent	Acetone
4 Temperature	300.0
5 Number of Scans	39
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-24T13:13:08
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



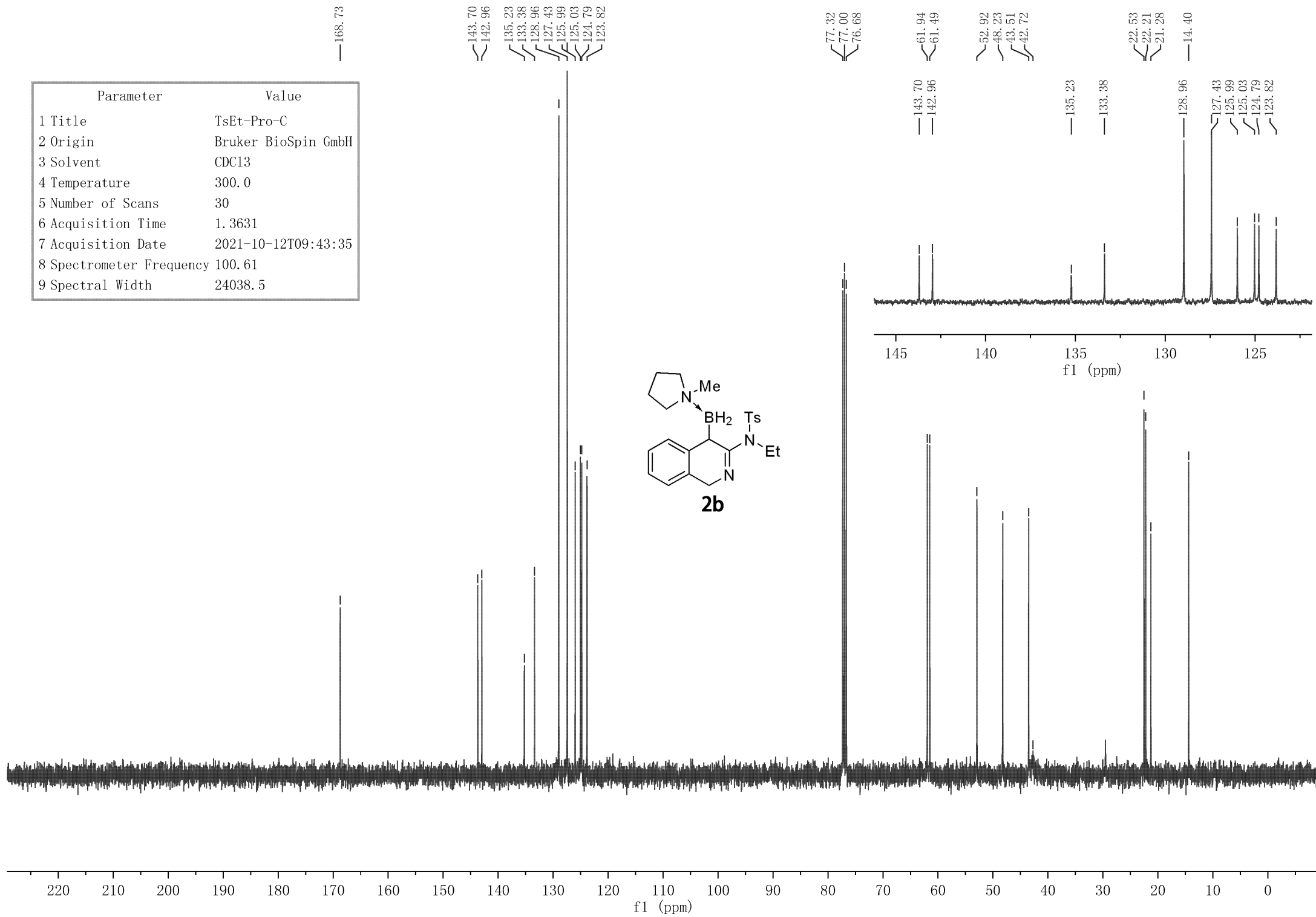
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7.428
7.138
7.129
7.123
7.116
7.108
7.099
7.061
7.039

4.557
4.126
3.736
3.720
3.702
3.677
3.659
3.643
3.254
3.224
3.022
2.993
2.924
2.917
2.906
2.768
2.755
2.737
2.653
2.274
1.989
1.939
1.924
1.908
1.884
1.254
1.236
1.218

Parameter	Value
1 Title	TsEt-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	5
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-12T09:42:27
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	TsEt-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	30
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-12T09:43:35
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

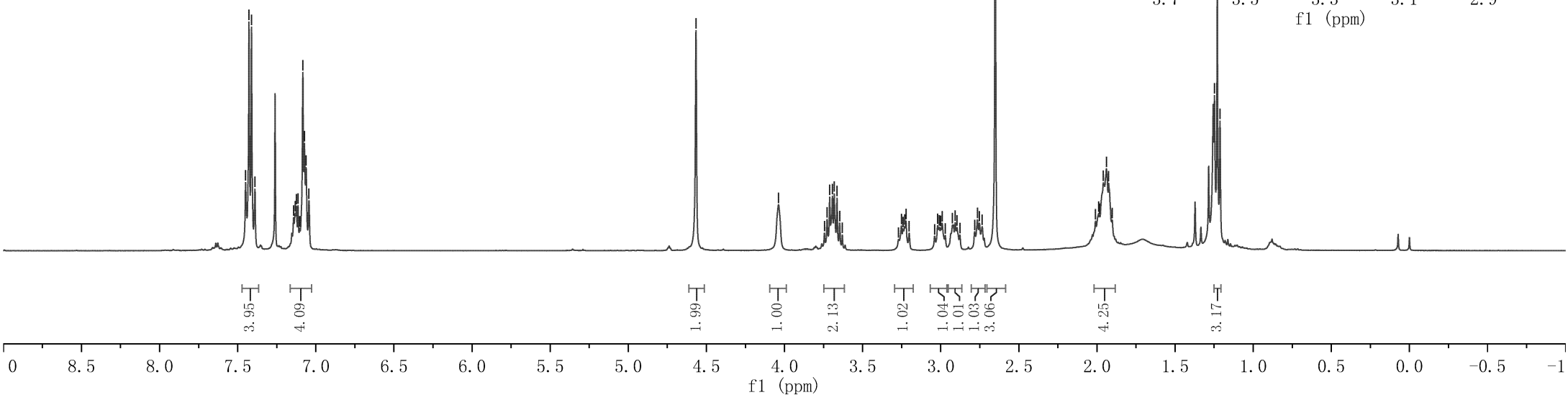
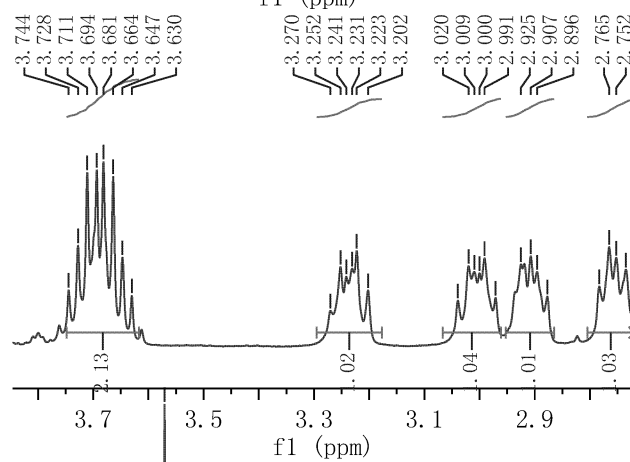
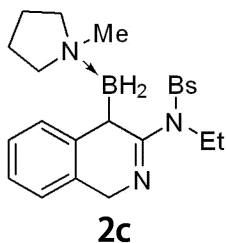
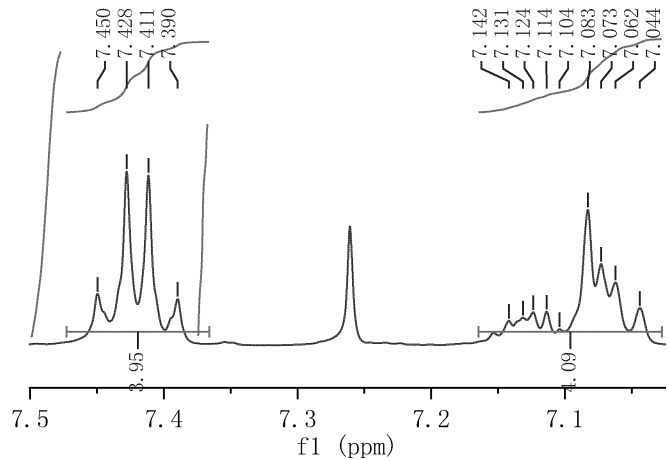


7.450
7.428
7.411
7.390
7.142
7.131
7.124
7.114
7.104
7.083
7.073
7.062
7.044

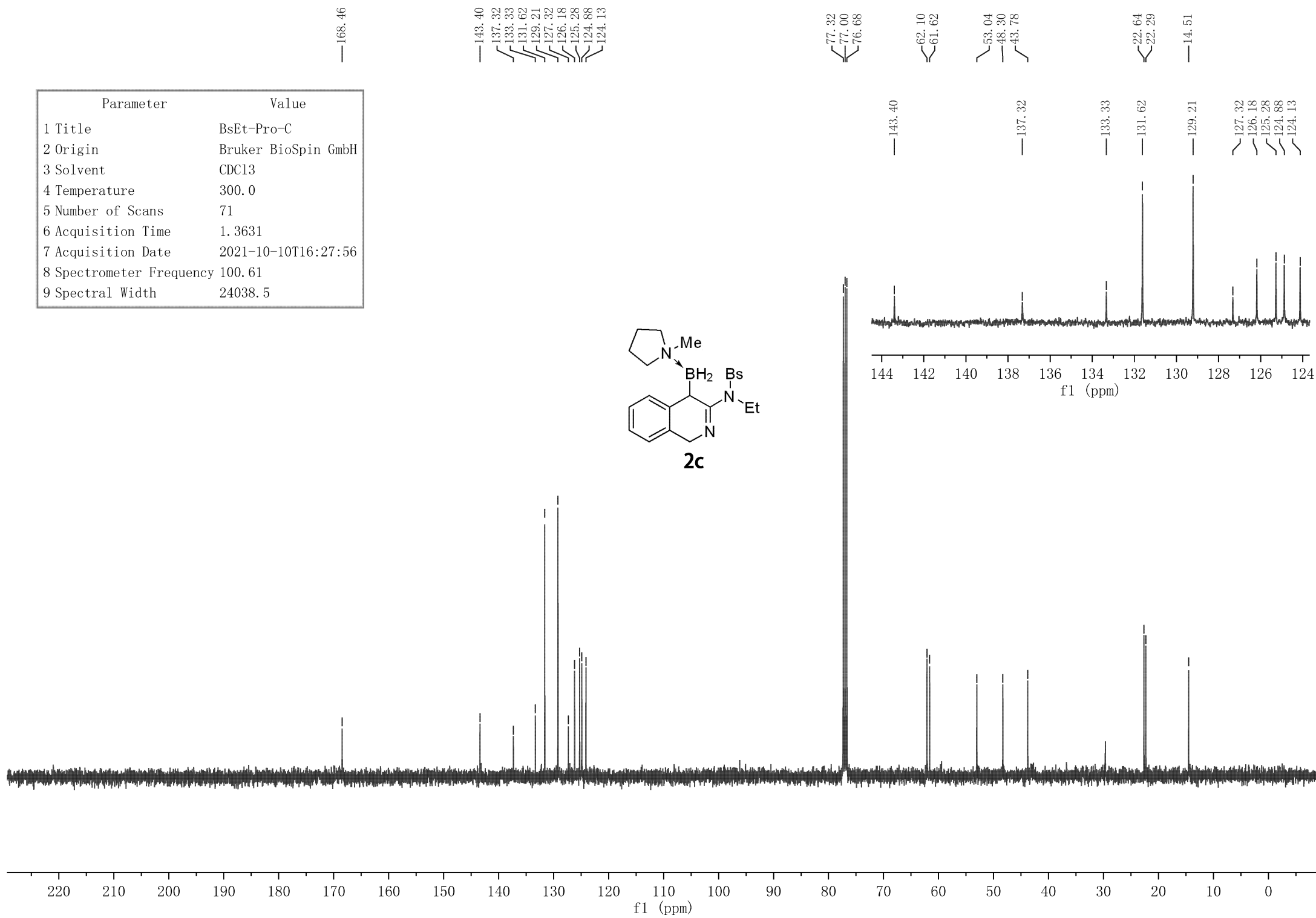
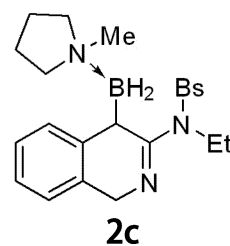
Parameter	Value
1 Title	BsEt-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	6
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-10T16:25:56
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

4.567

4.038
3.728
3.711
3.694
3.681
3.664
3.252
3.231
3.223
3.020
2.991
2.925
2.907
2.765
2.752
2.735
2.664
2.656
1.989
1.983
1.959
1.940
1.926
1.903
1.248
1.230
1.212



Parameter	Value
1 Title	BsEt-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	71
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-10T16:27:56
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



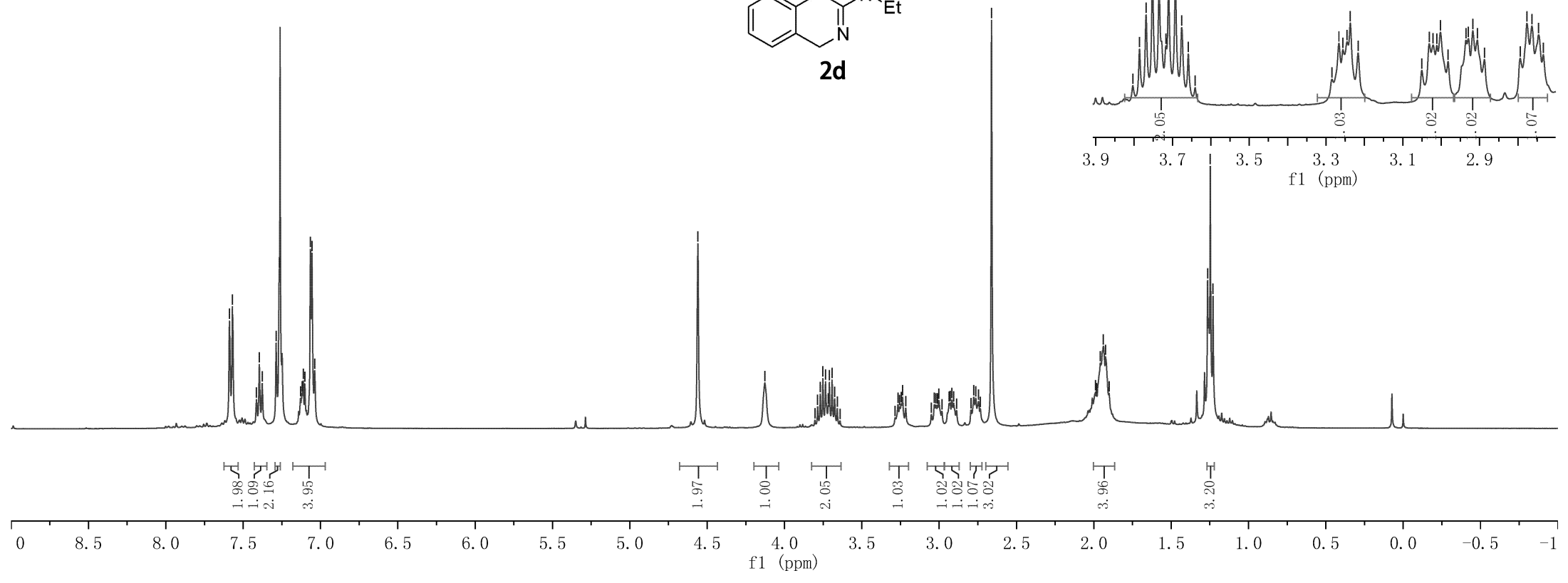
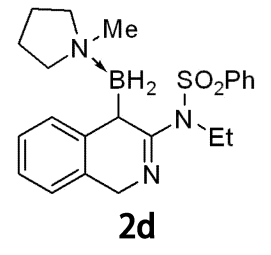
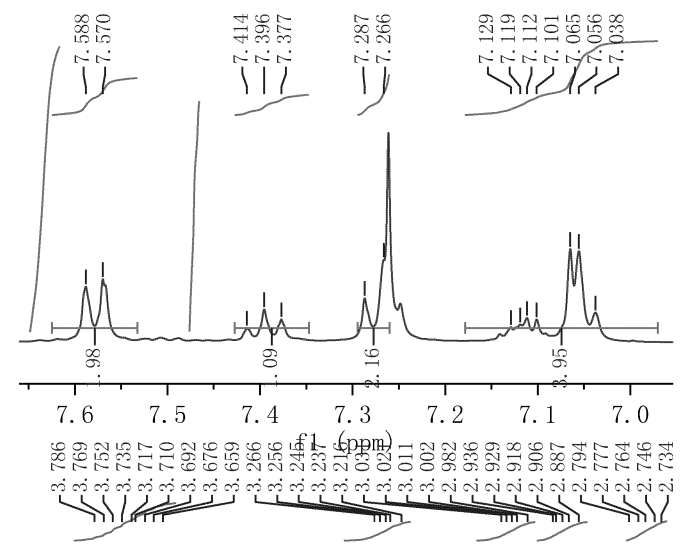
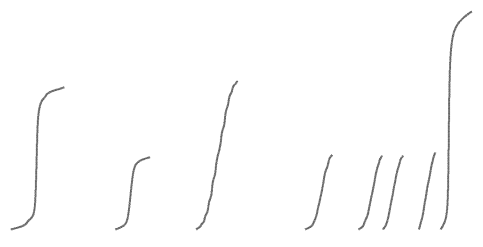
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7.570
7.414
7.396
7.377
7.287
7.266
7.129
7.119
7.112
7.101
7.065
7.056
7.038

4.560

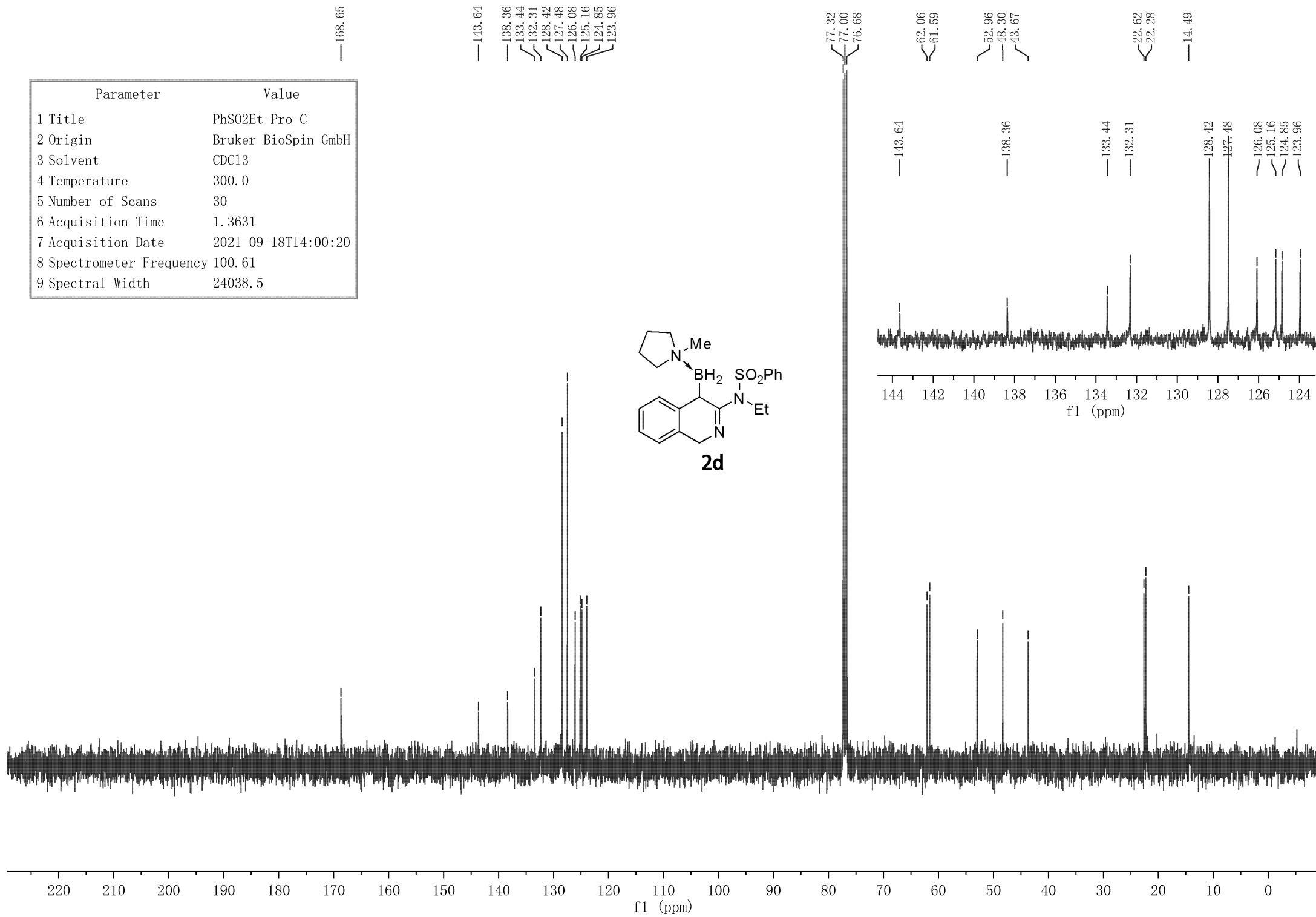
4.127
3.769
3.752
3.735
3.710
3.692
3.676
3.266
3.245
3.237
3.002
2.936
2.929
2.918
2.906
2.777
2.764
2.746
2.662
1.982
1.959
1.939
1.925
1.902

1.264
1.247
1.229

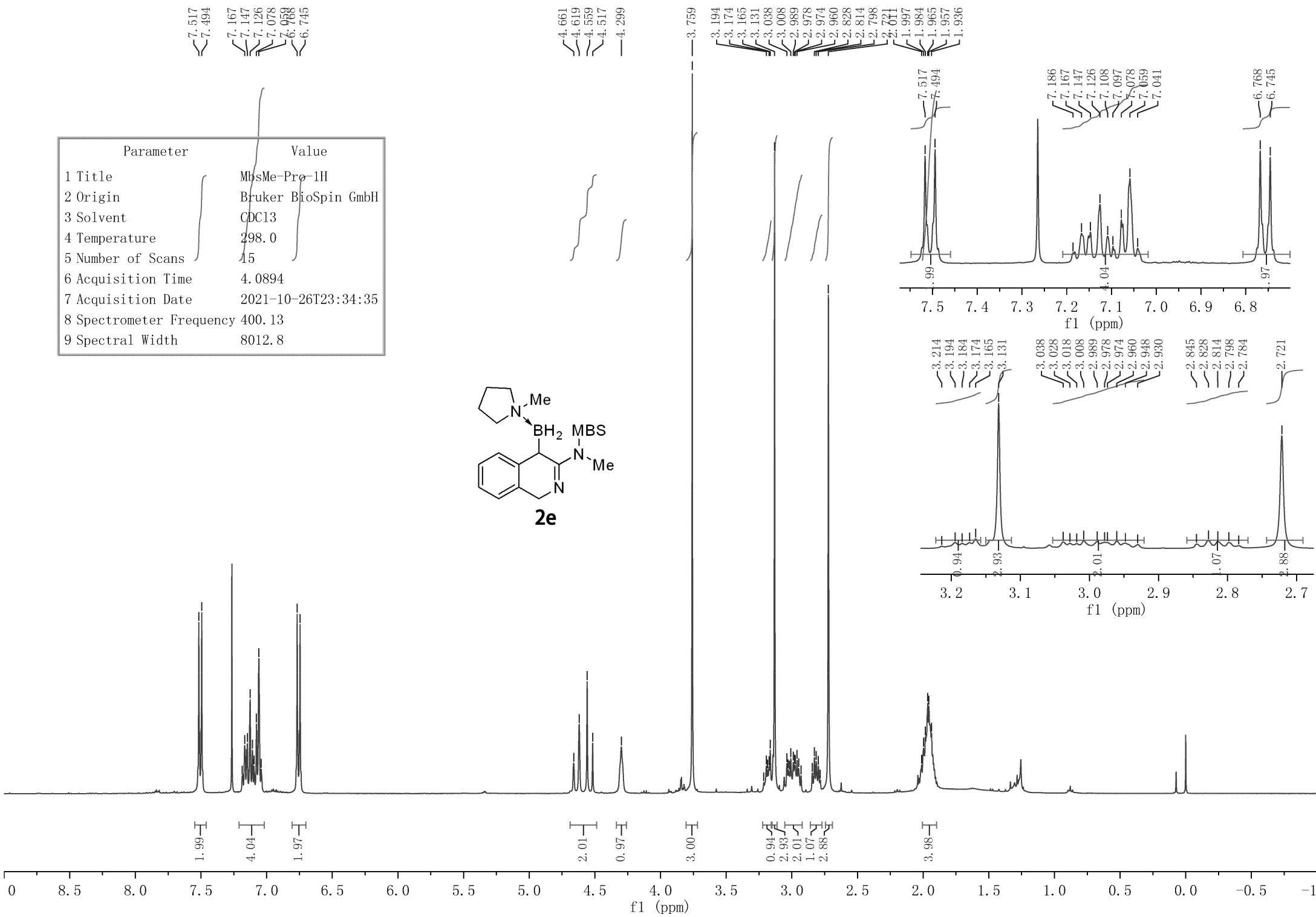
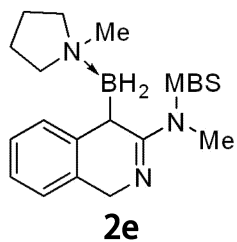
Parameter	Value
1 Title	PhSO2Et-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-09-18T13:58:55
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



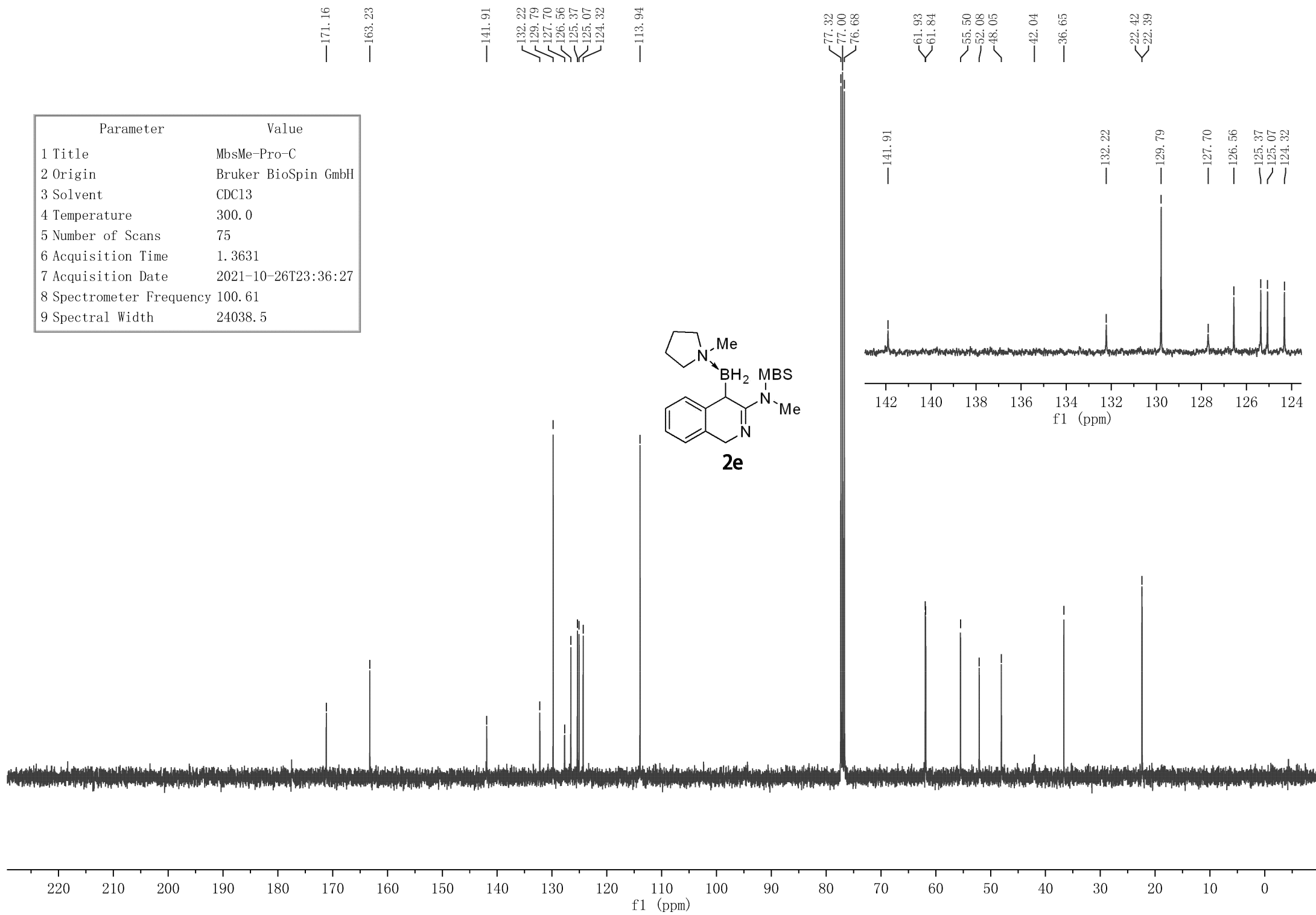
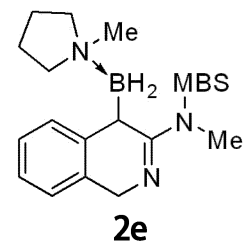
Parameter	Value
1 Title	PhSO2Et-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	30
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-18T14:00:20
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



Parameter	Value
1 Title	MbsMe-Pro-III
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	298.0
5 Number of Scans	15
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-26T23:34:35
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	MbsMe-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	75
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-26T23:36:27
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



7.573
7.552
7.147
7.137
7.103
7.091
7.068
6.812
6.790

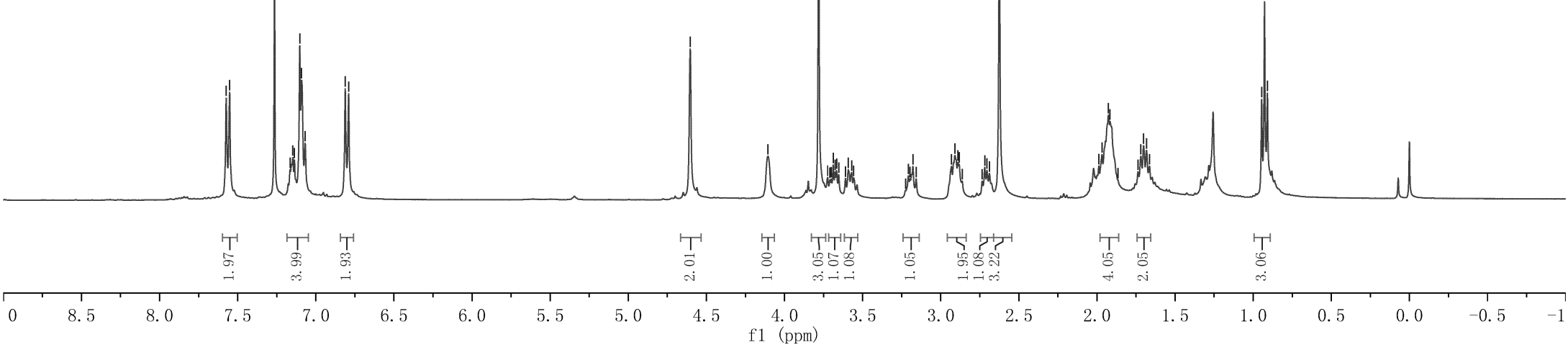
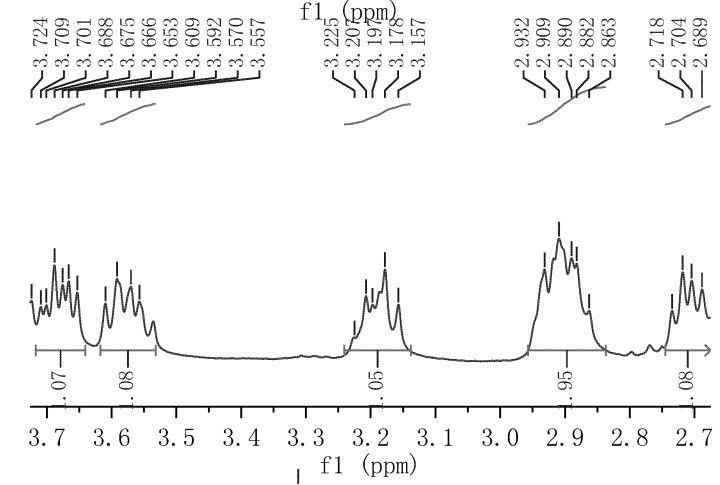
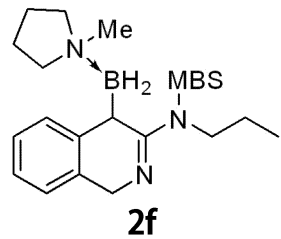
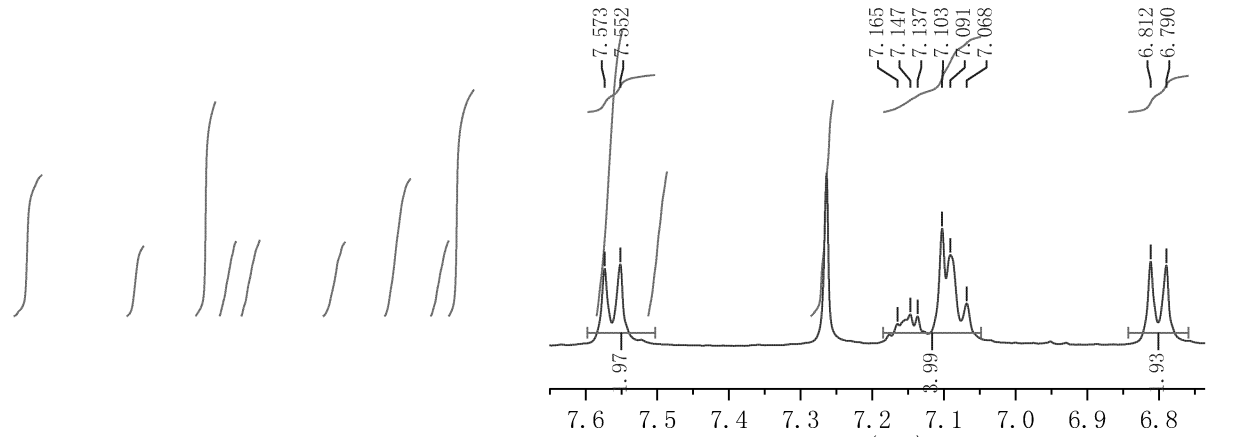
4.603

4.106

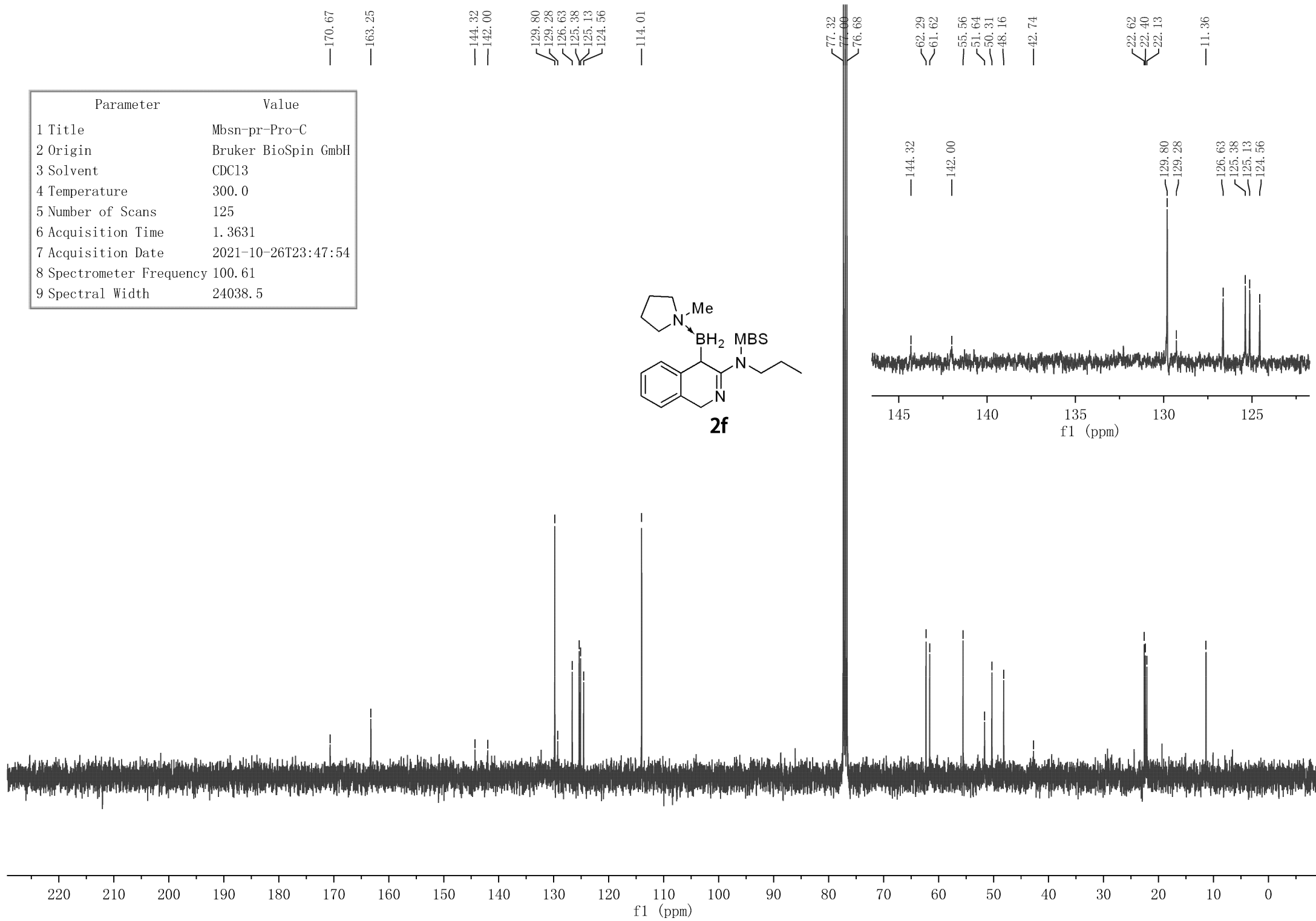
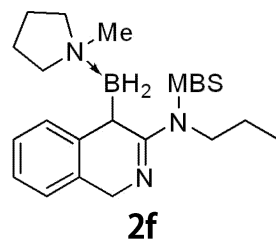
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3.688
3.675
3.666
3.592
3.570
3.207
3.178
3.157
2.932
2.909
2.890
2.882
2.718
2.704
2.625
2.688
1.968
1.927
1.916
1.866
1.737
1.719
1.702
1.683
1.664

0.946
0.927
0.909

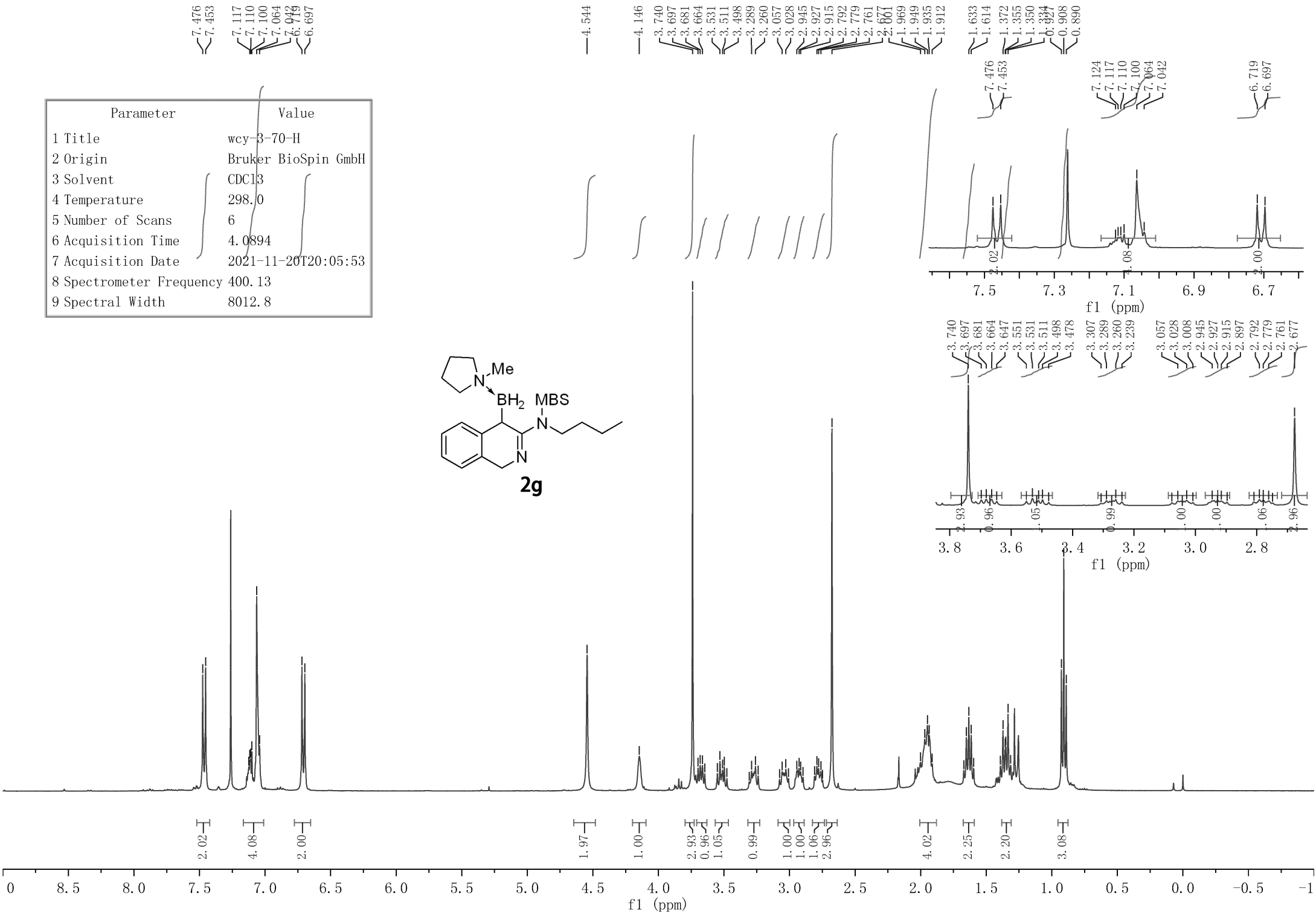
Parameter	Value
1 Title	Mbsn-pr-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	30
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-26T23:44:35
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	Mbsn-pr-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	125
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-26T23:47:54
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



Parameter	Value
1 Title	wcy-3-70-H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	6
6 Acquisition Time	4.0894
7 Acquisition Date	2021-11-20T20:05:53
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	wcy-3-70-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	200
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-20T20:07:08
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

162.57

143.98

133.65

129.99

129.60

126.03

125.16

124.84

123.88

113.60

77.32

77.00

76.68

62.04

61.60

55.39

53.04

48.42

48.38

42.91

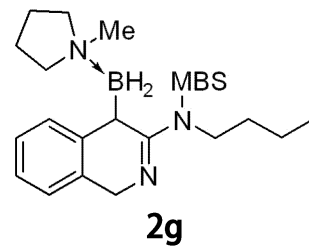
30.80

22.68

22.37

20.27

13.77



133.65

129.99

129.60

126.03

125.16

124.84

123.88

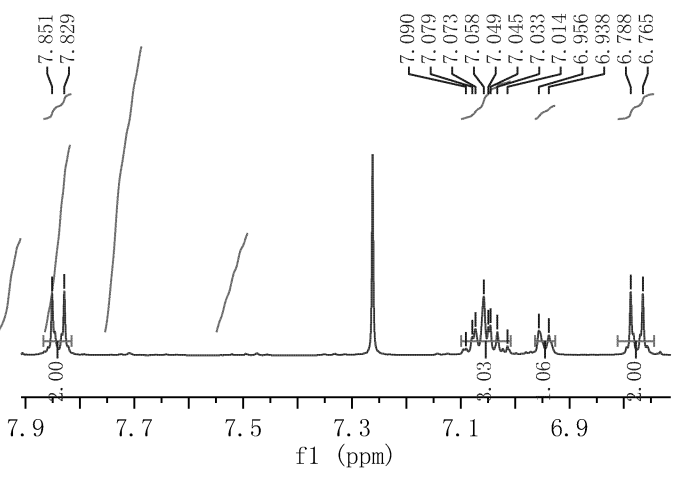
134 133 132 131 130 129 128 127 126 125 124
f1 (ppm)

220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

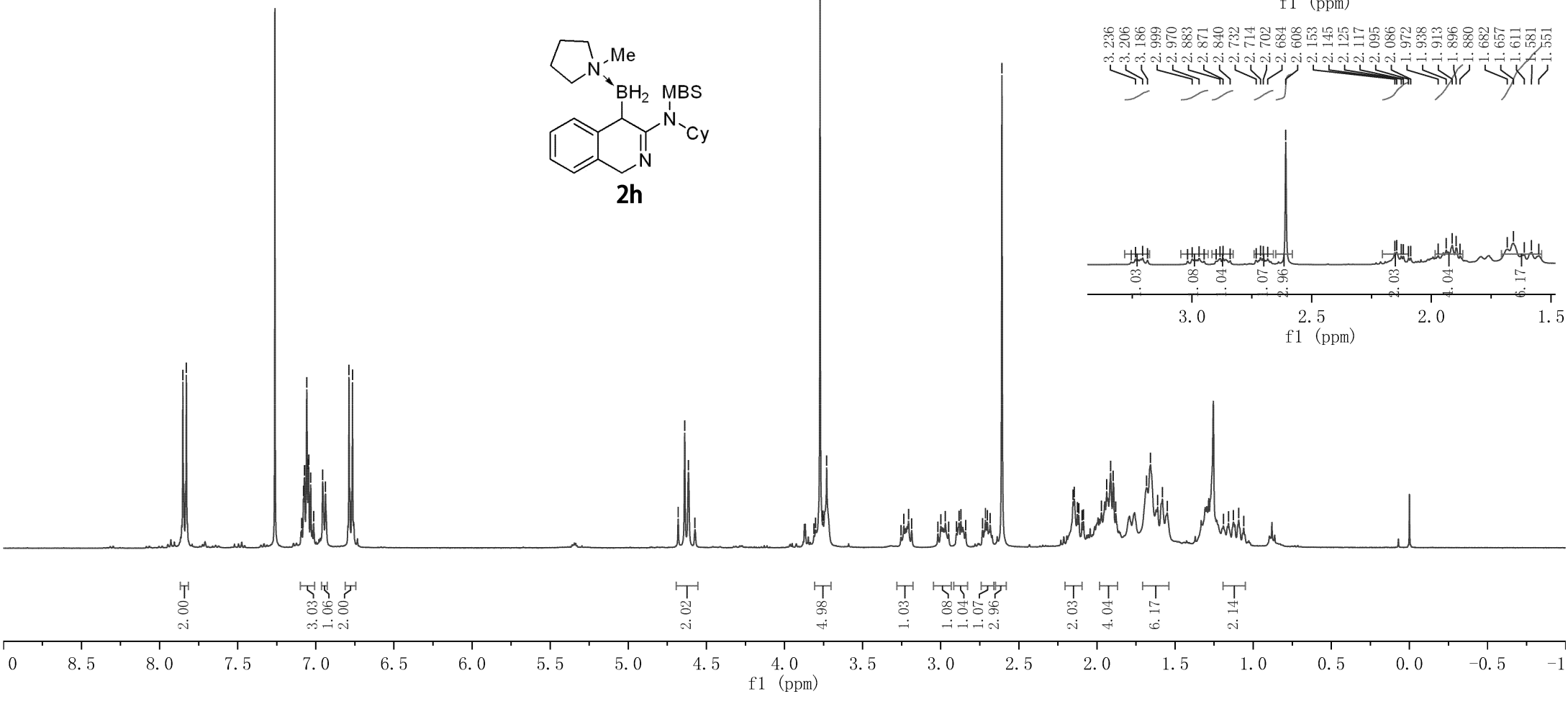
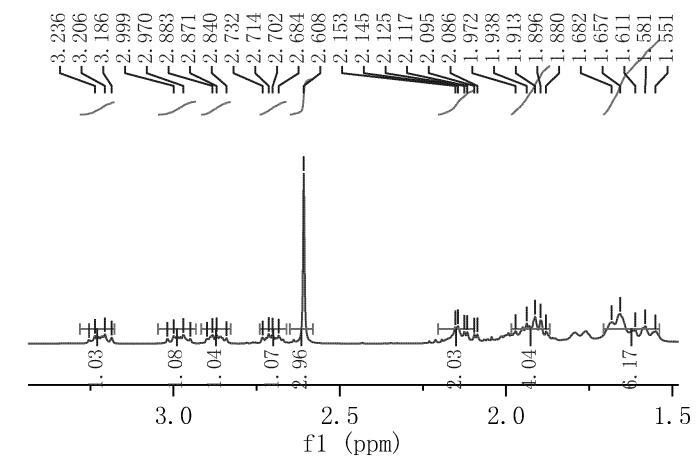
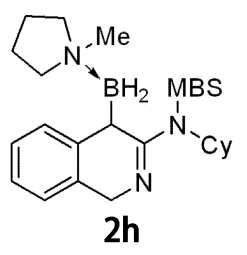
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7.829
7.090
7.079
7.073
7.058
7.049
7.045
7.033
7.014
6.956
6.938
6.788
6.765

4.681
4.639
4.615
4.573

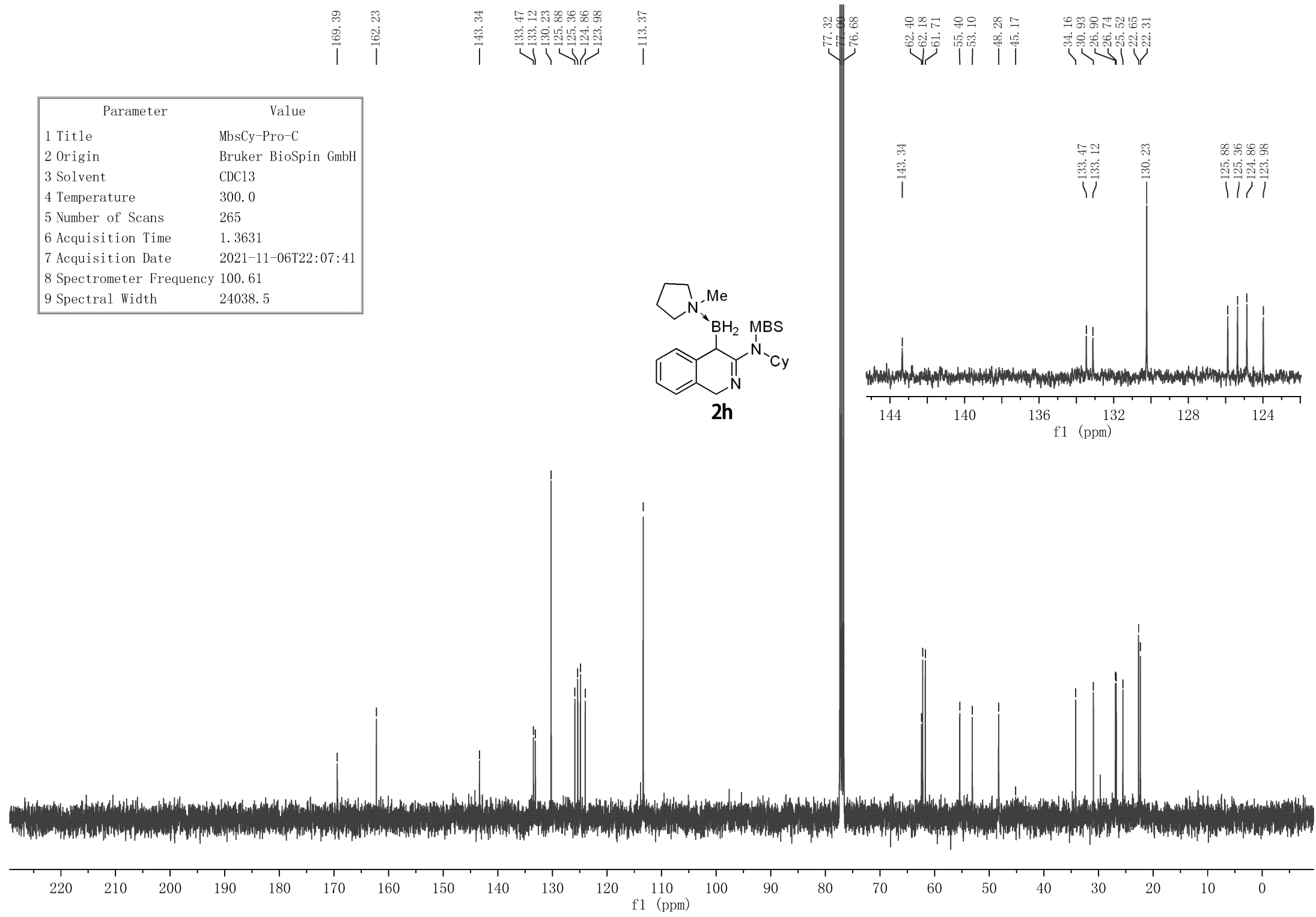
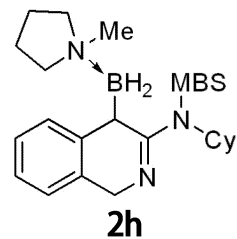
3.811
3.801
3.754
3.730
3.236
3.206
2.999
2.970
2.883
2.871
2.732
2.714
2.702
2.684
2.608
2.153
2.145
1.972
1.938
1.913
1.896
1.682
1.657
1.611
1.581
1.158
1.127
1.093
1.061



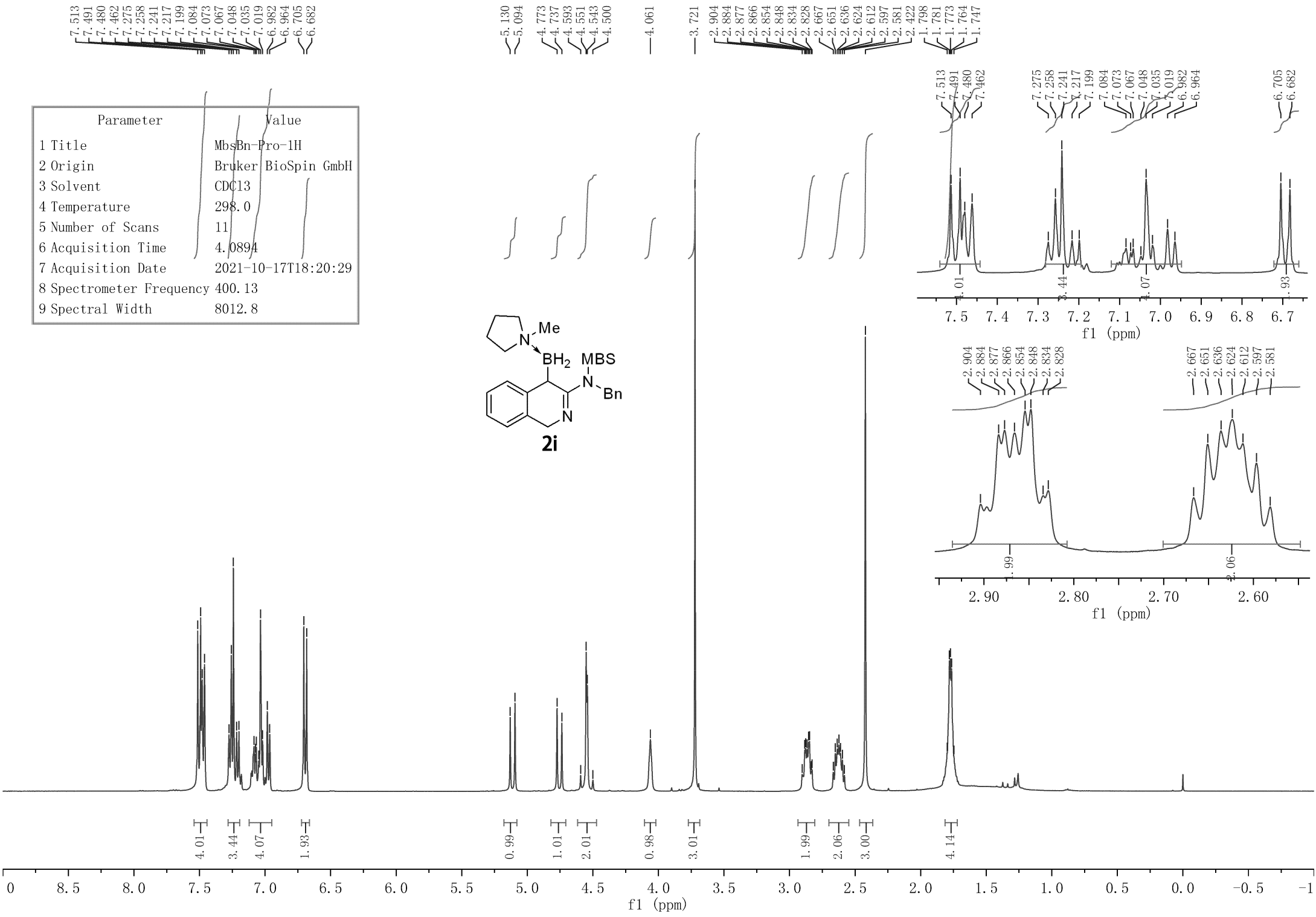
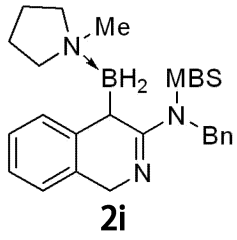
Parameter	Value
1 Title	MbsCy-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	13
6 Acquisition Time	4.0894
7 Acquisition Date	2021-11-05T20:13:34
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



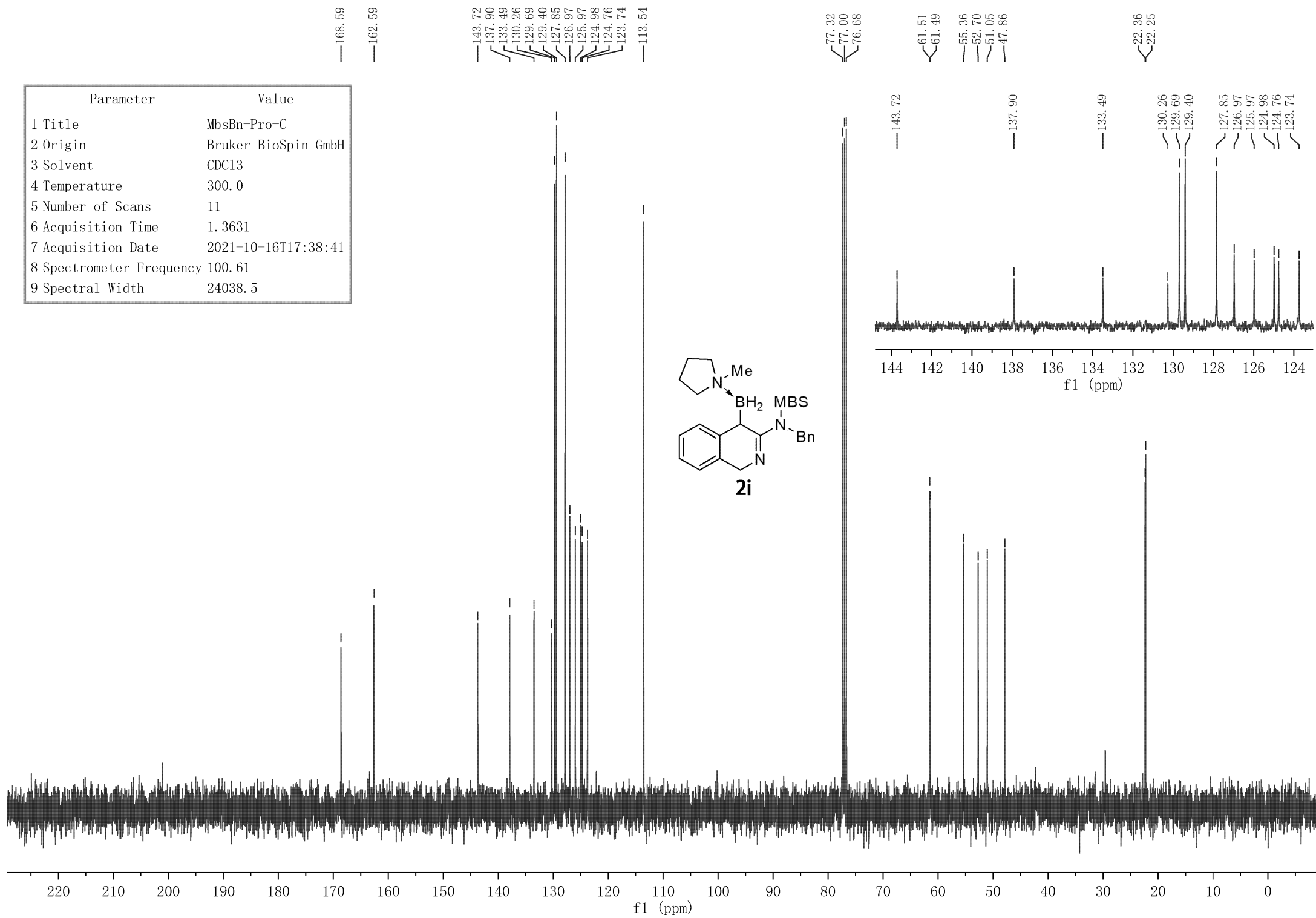
Parameter	Value
1 Title	MbsCy-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	265
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-06T22:07:41
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



Parameter	Value
1 Title	MbsBn-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	298.0
5 Number of Scans	11
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-17T18:20:29
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	MbsBn-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	11
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-16T17:38:41
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



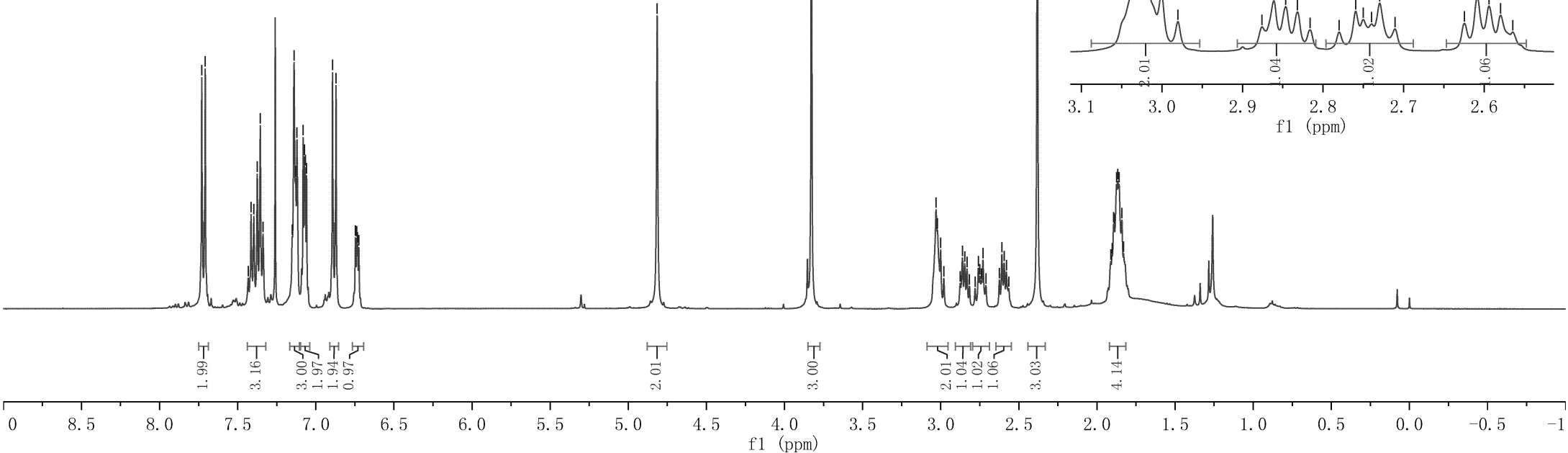
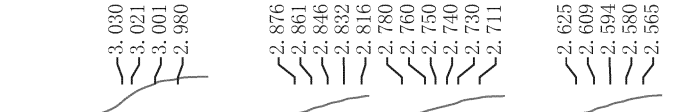
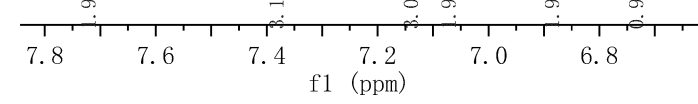
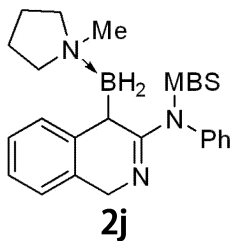
Parameter	Value
1 Title	MbsPh ₇ Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl ₃
4 Temperature	298.0
5 Number of Scans	7
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-16T17:24:44
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

7.730
7.708
7.433
7.415
7.397
7.375
7.355
7.338
7.151
7.139
7.130
7.121
7.081
7.073
7.067
7.059
6.871
6.746
6.738
6.733
6.725

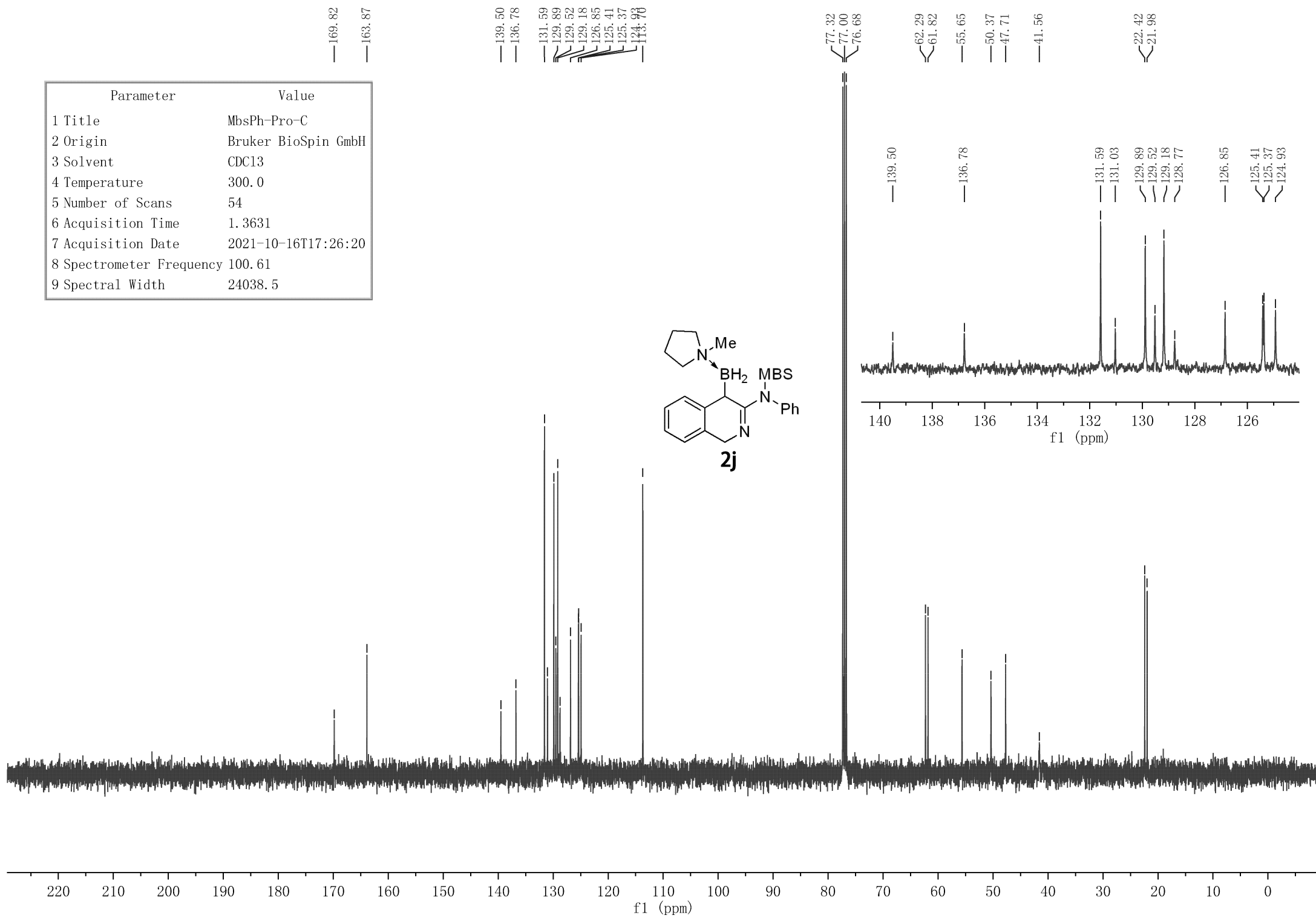
4.815

3.828
3.030
3.021
3.001
2.980
2.861
2.846
2.832
2.760
2.750
2.740
2.730
2.625
2.609
2.594
2.580
2.382
2.377
1.903
1.894
1.889
1.875
1.867
1.858
1.840
1.830

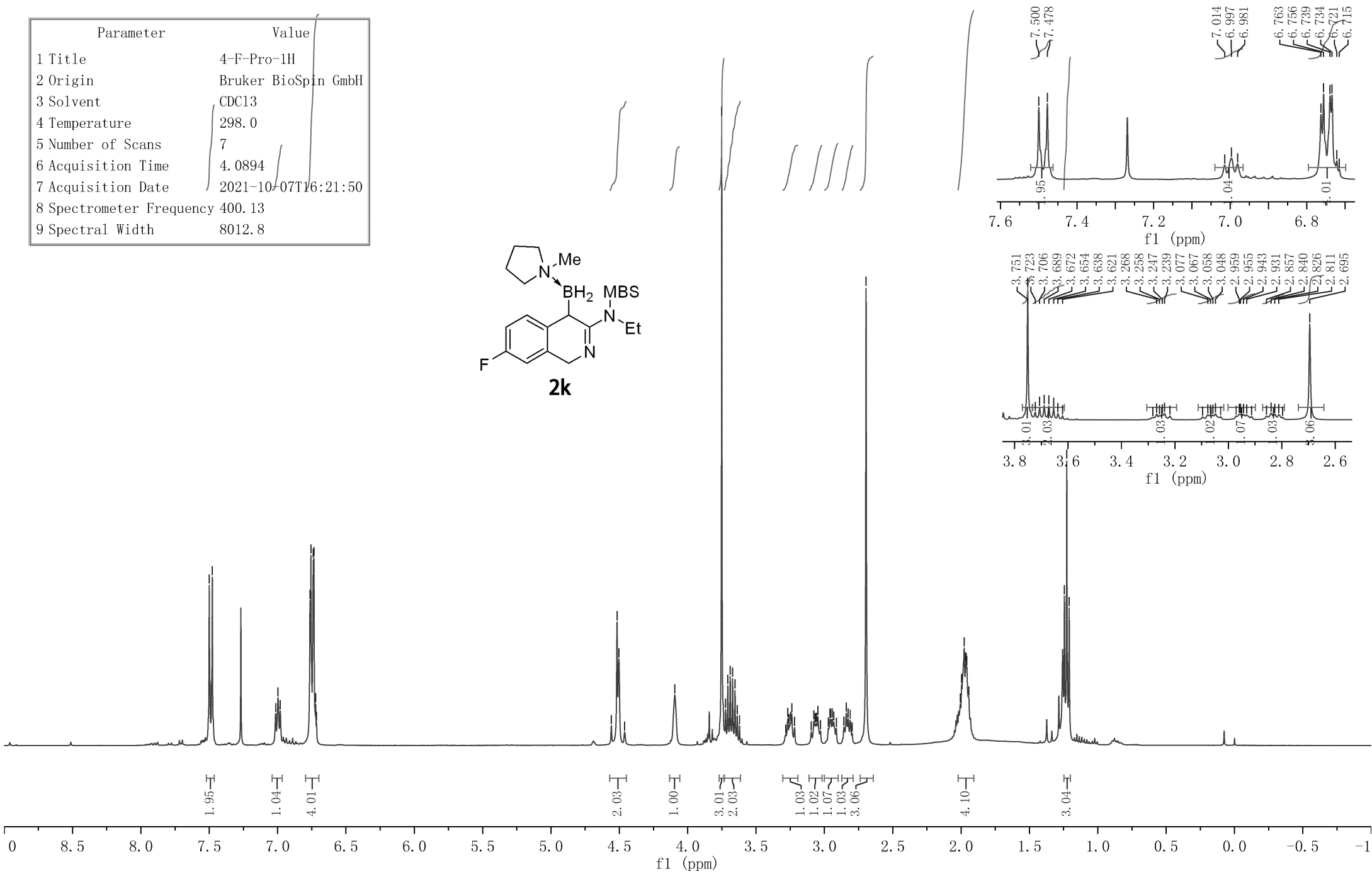
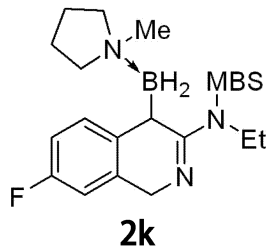
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7.708
7.433
7.415
7.397
7.375
7.355
7.338
7.151
7.139
7.130
7.121
7.081
7.073
7.067
7.059
6.893
6.871
6.746
6.738
6.733
6.725



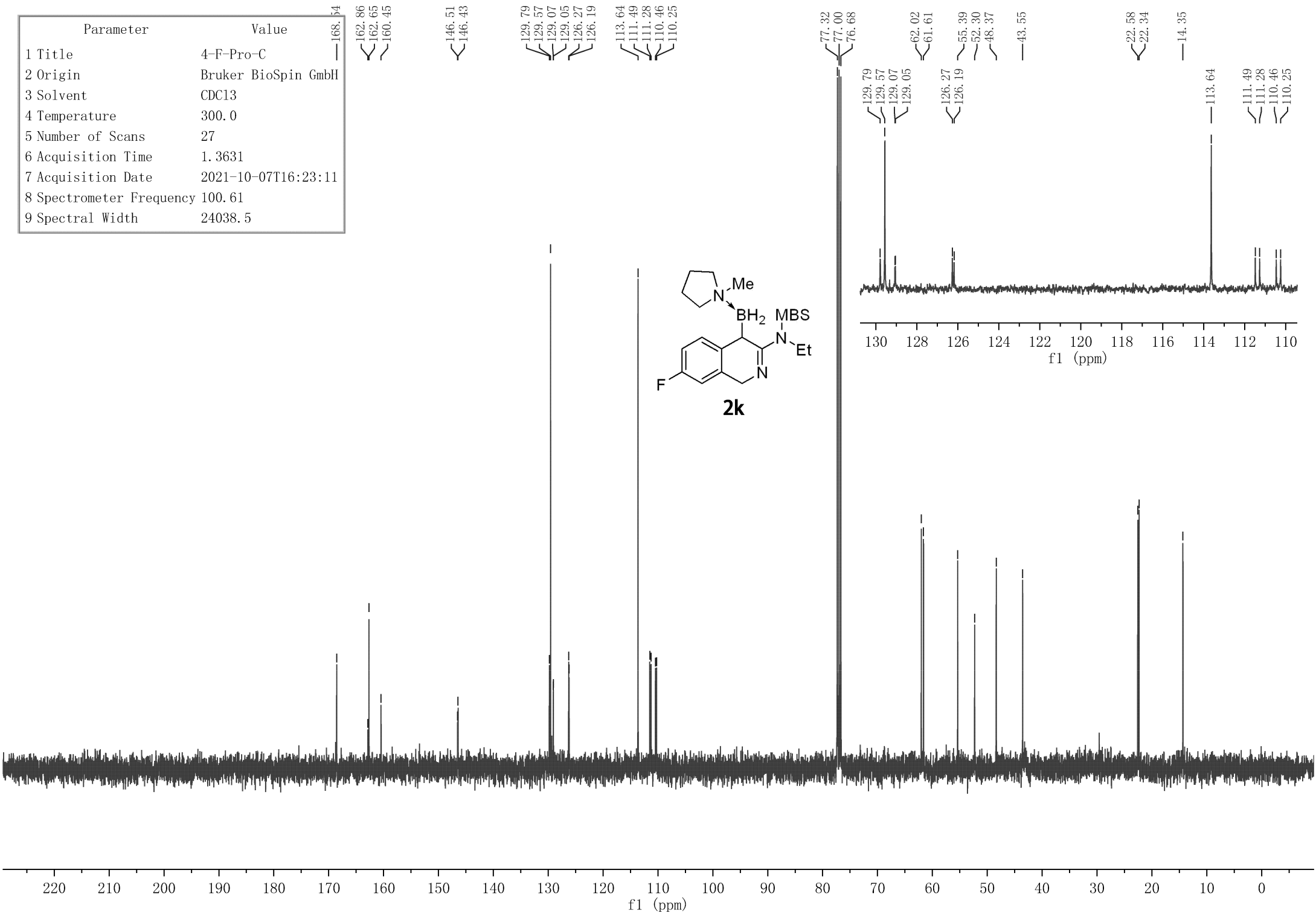
Parameter	Value
1 Title	MbsPh-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	54
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-16T17:26:20
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



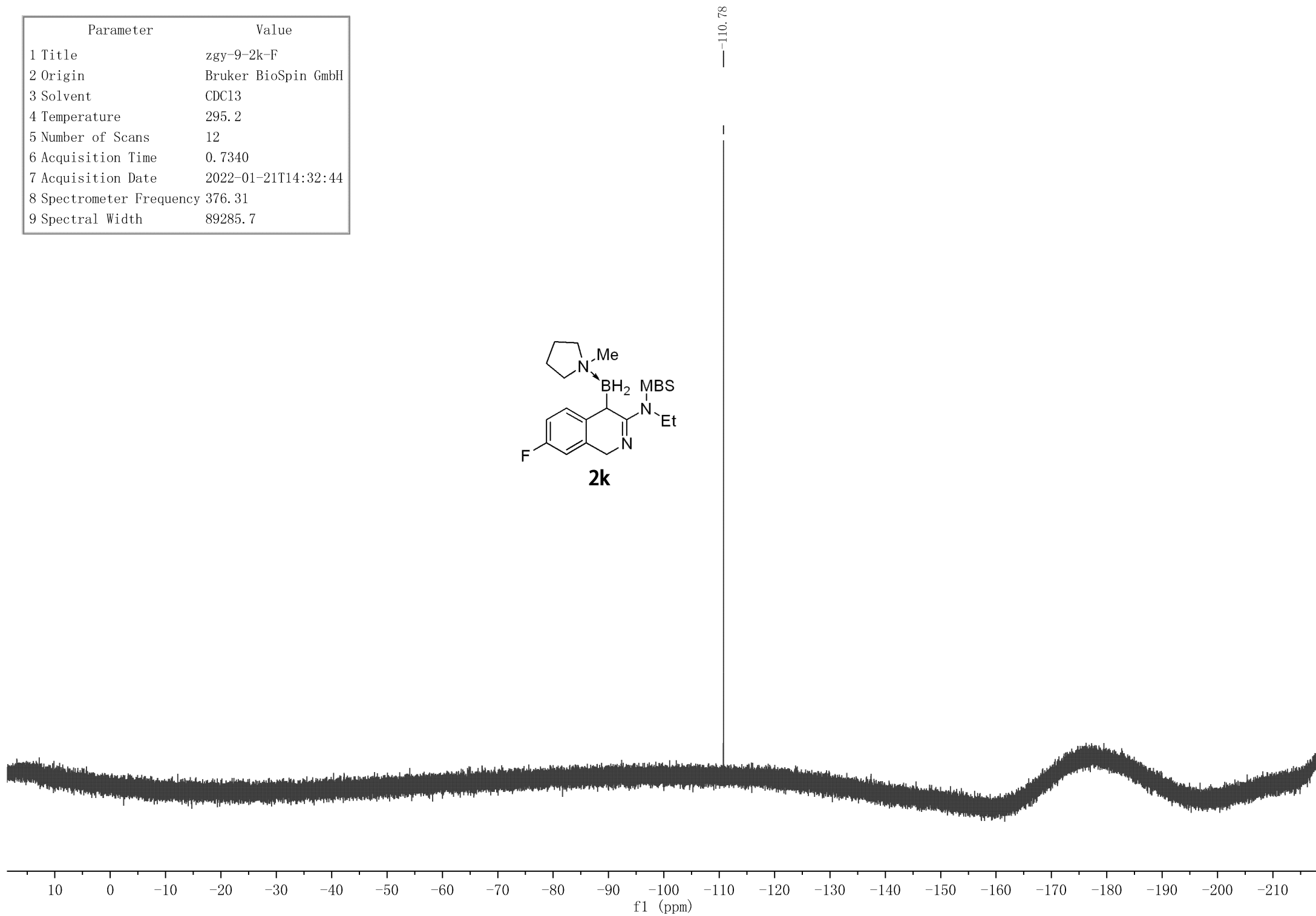
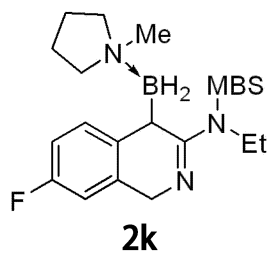
Parameter	Value
1 Title	4-F-Pro-IH
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	7
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-07T16:21:50
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	4-F-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	27
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-07T16:23:11
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



Parameter	Value
1 Title	zgy-9-2k-F
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	295.2
5 Number of Scans	12
6 Acquisition Time	0.7340
7 Acquisition Date	2022-01-21T14:32:44
8 Spectrometer Frequency	376.31
9 Spectral Width	89285.7

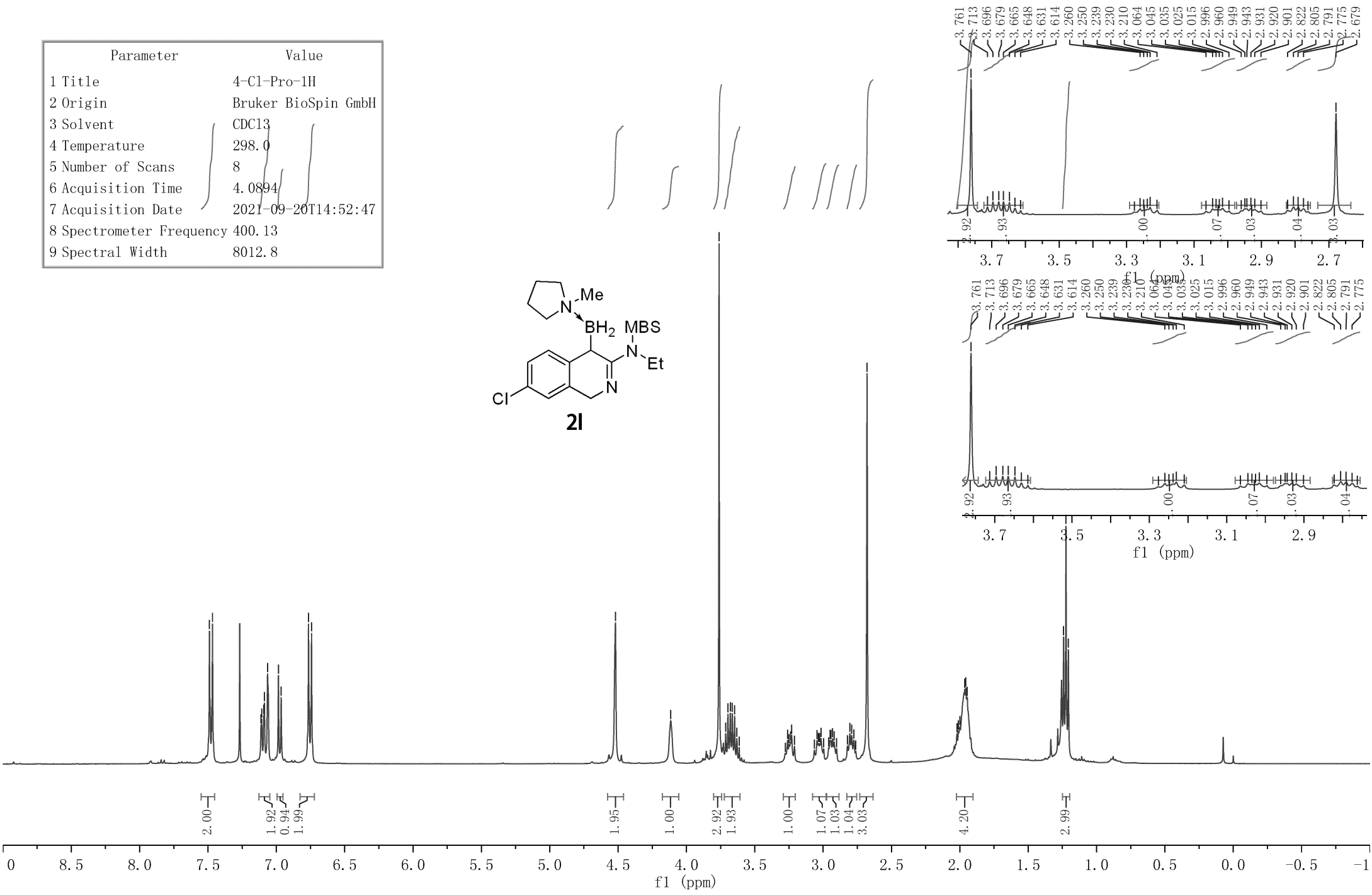
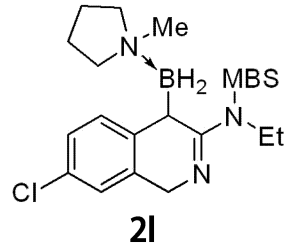


Parameter	Value
1 Title	4-Cl-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-09-20T14:52:47
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

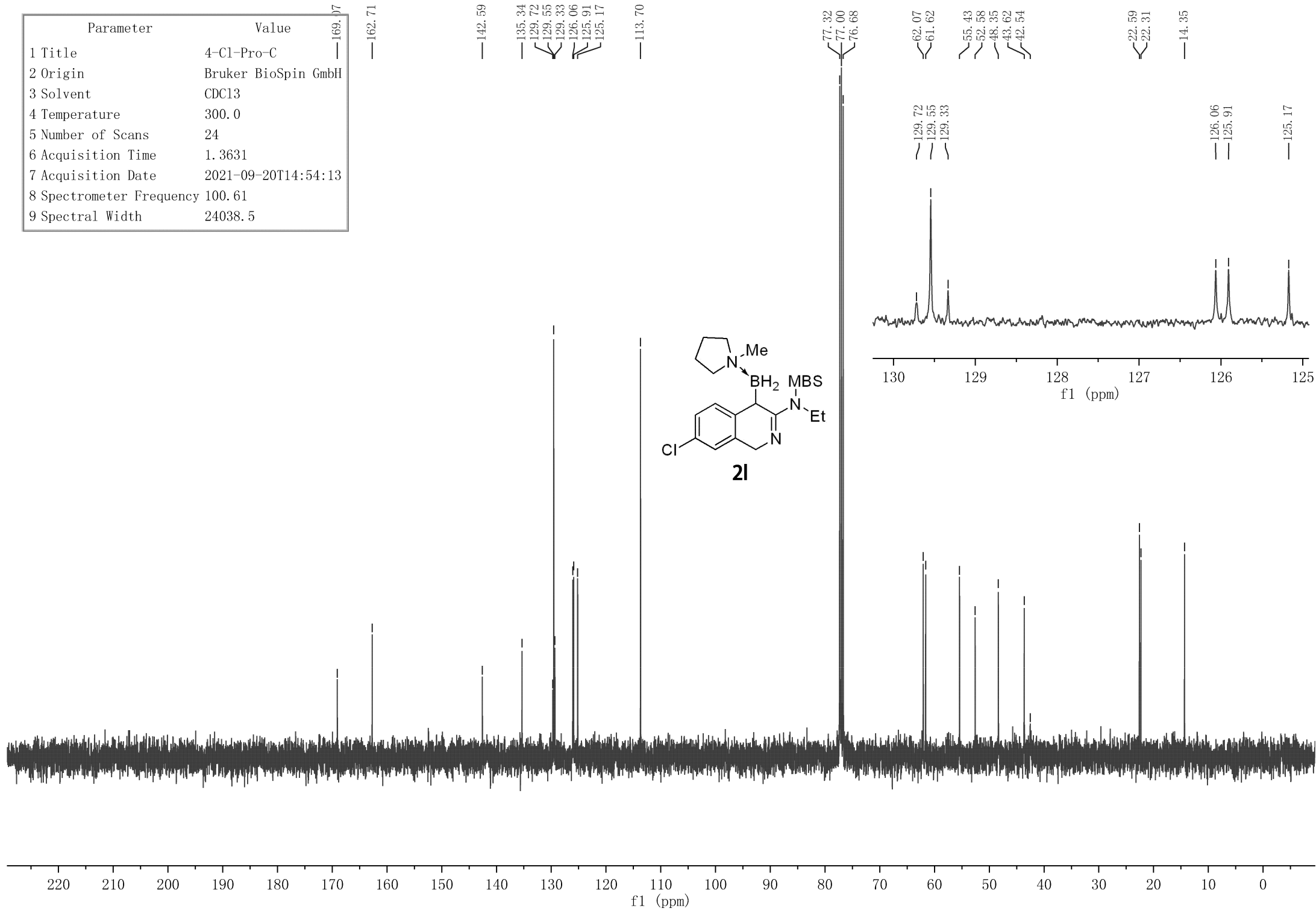
7.489
7.467
7.092
7.087
7.064
6.985
6.965
6.763
6.742

4.519
4.115
3.761
3.713
3.696
3.679
3.665
3.648
3.260
3.230
3.045
3.015
2.949
2.943
2.931
2.805
2.791
2.775
2.679
2.629
2.011
1.999
1.965
1.957
1.946

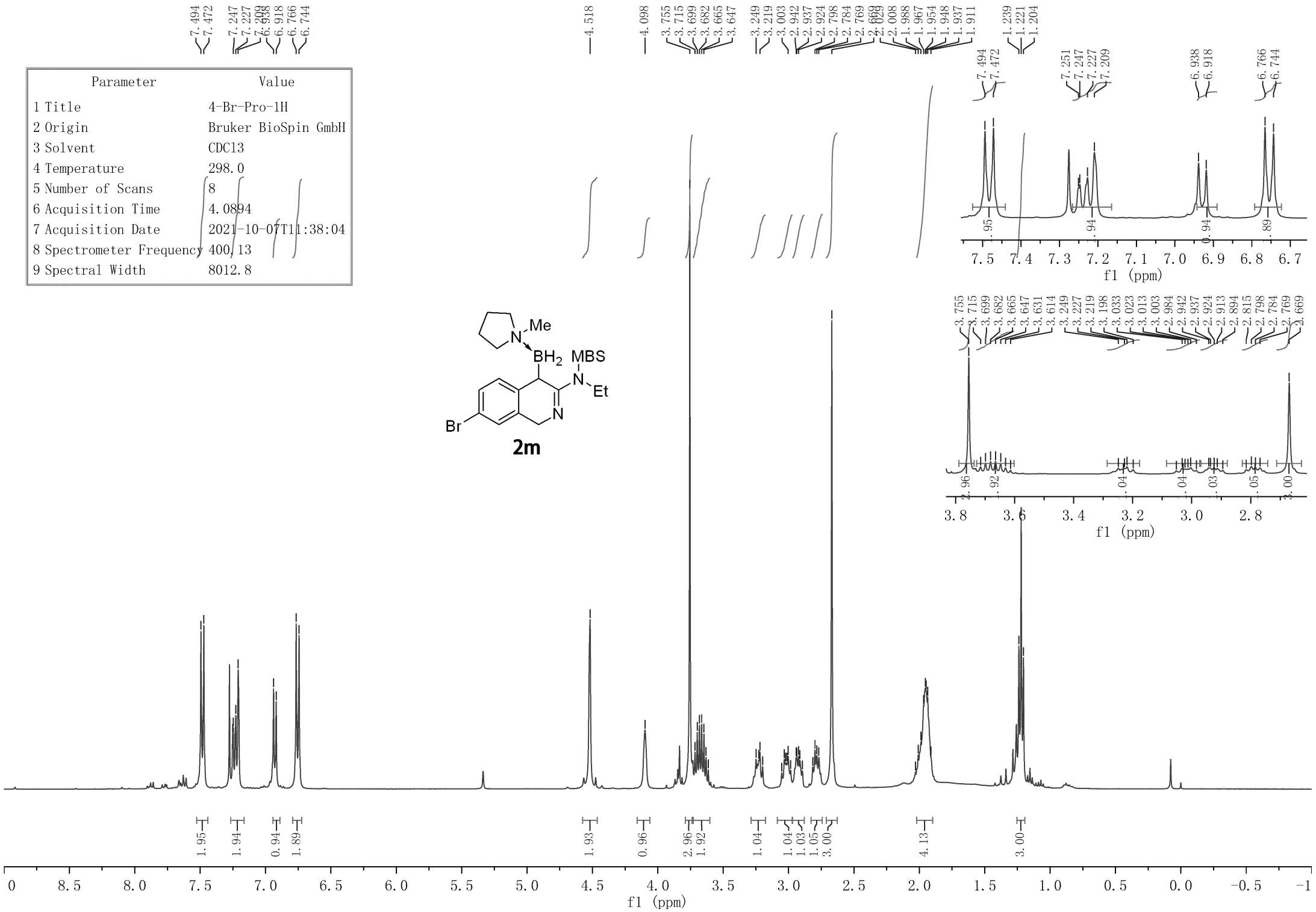
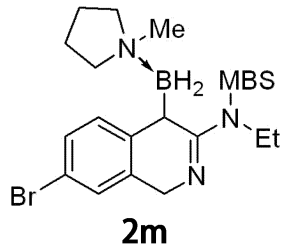
1.241
1.224
1.206



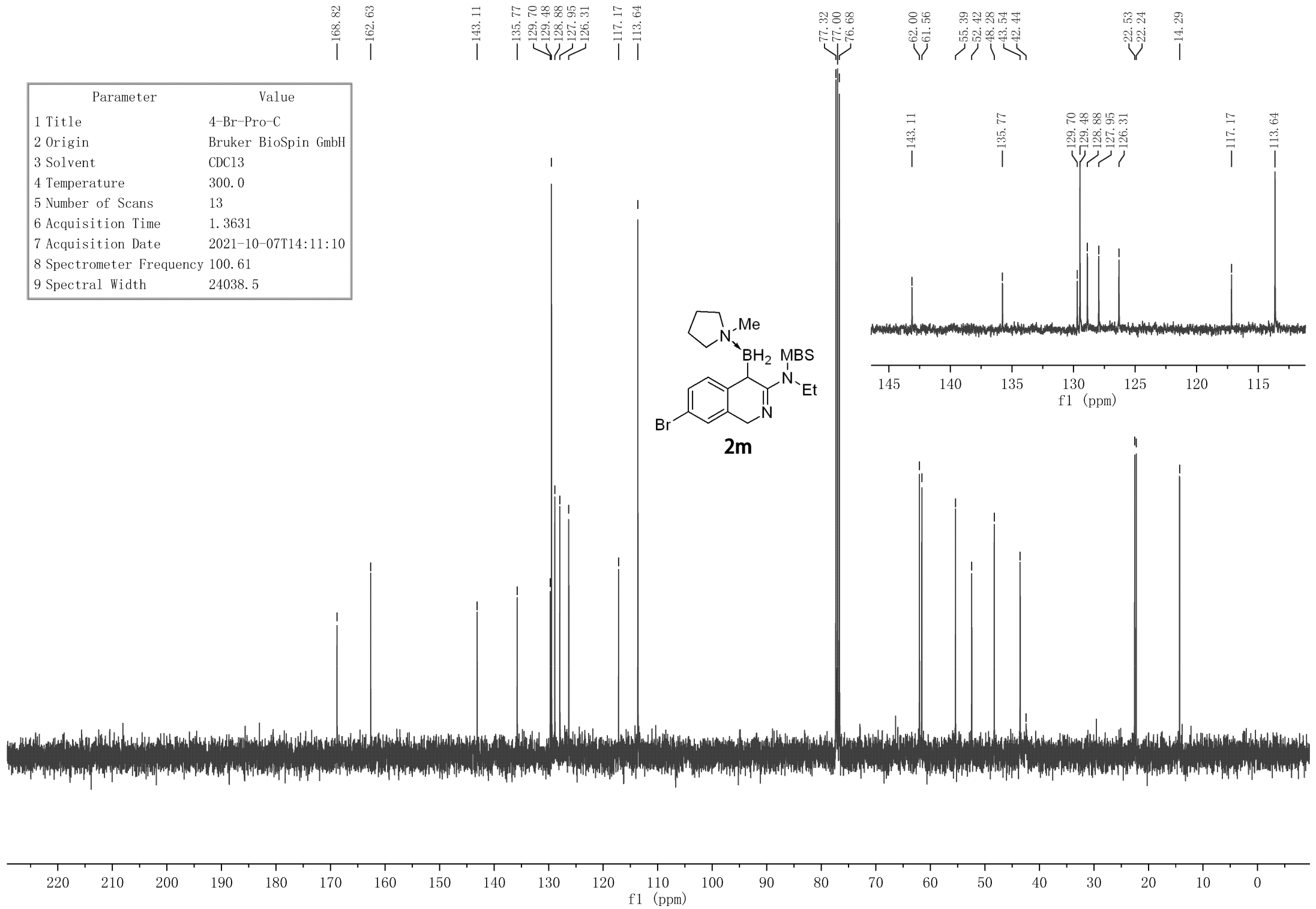
Parameter	Value
1 Title	4-Cl-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	24
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-20T14:54:13
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



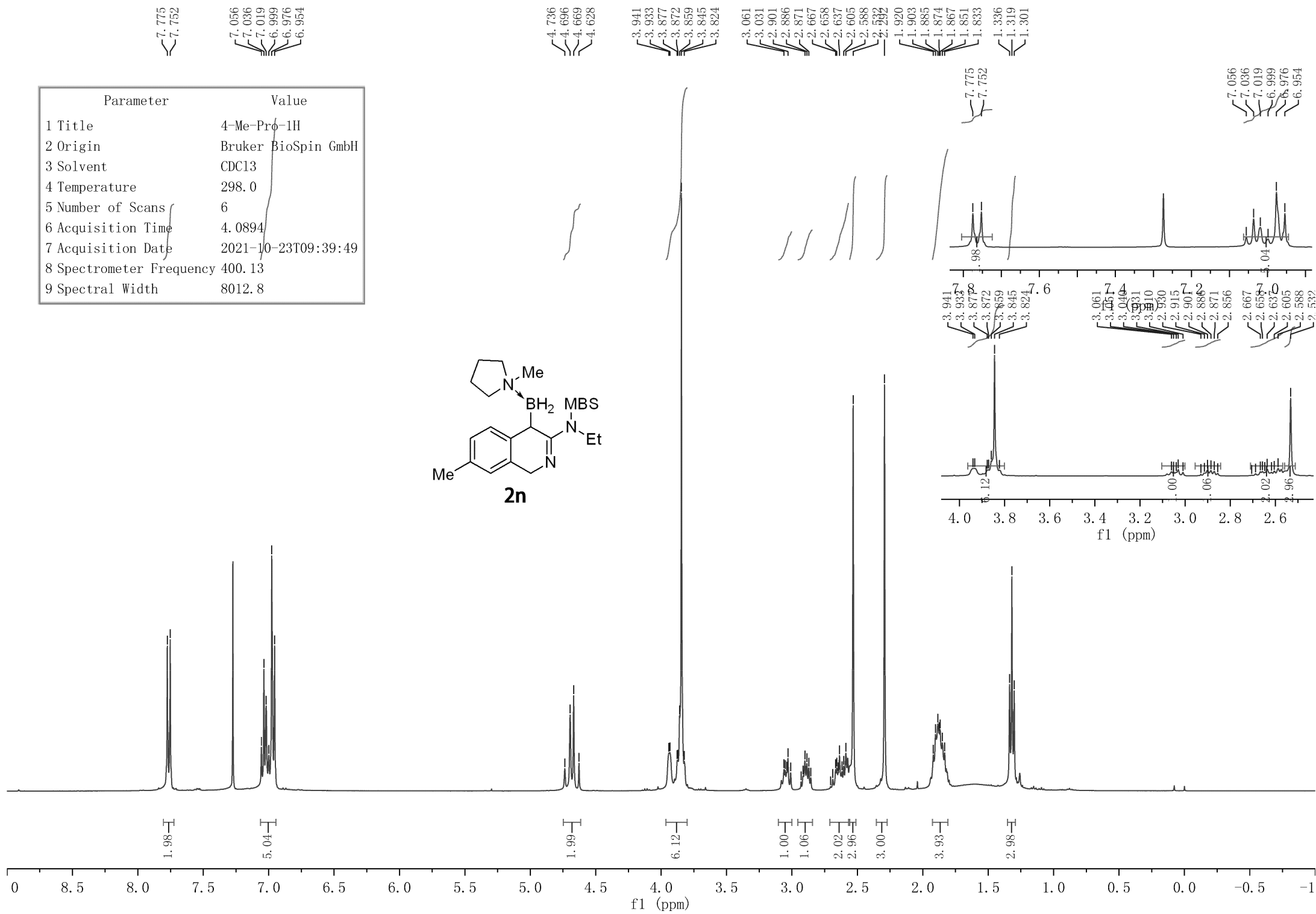
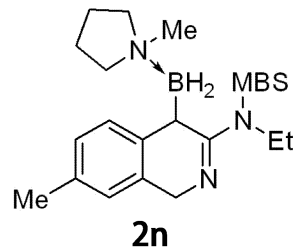
Parameter	Value
1 Title	4-Br-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-07T11:38:04
8 Spectrometer Frequency	400,13
9 Spectral Width	8012.8



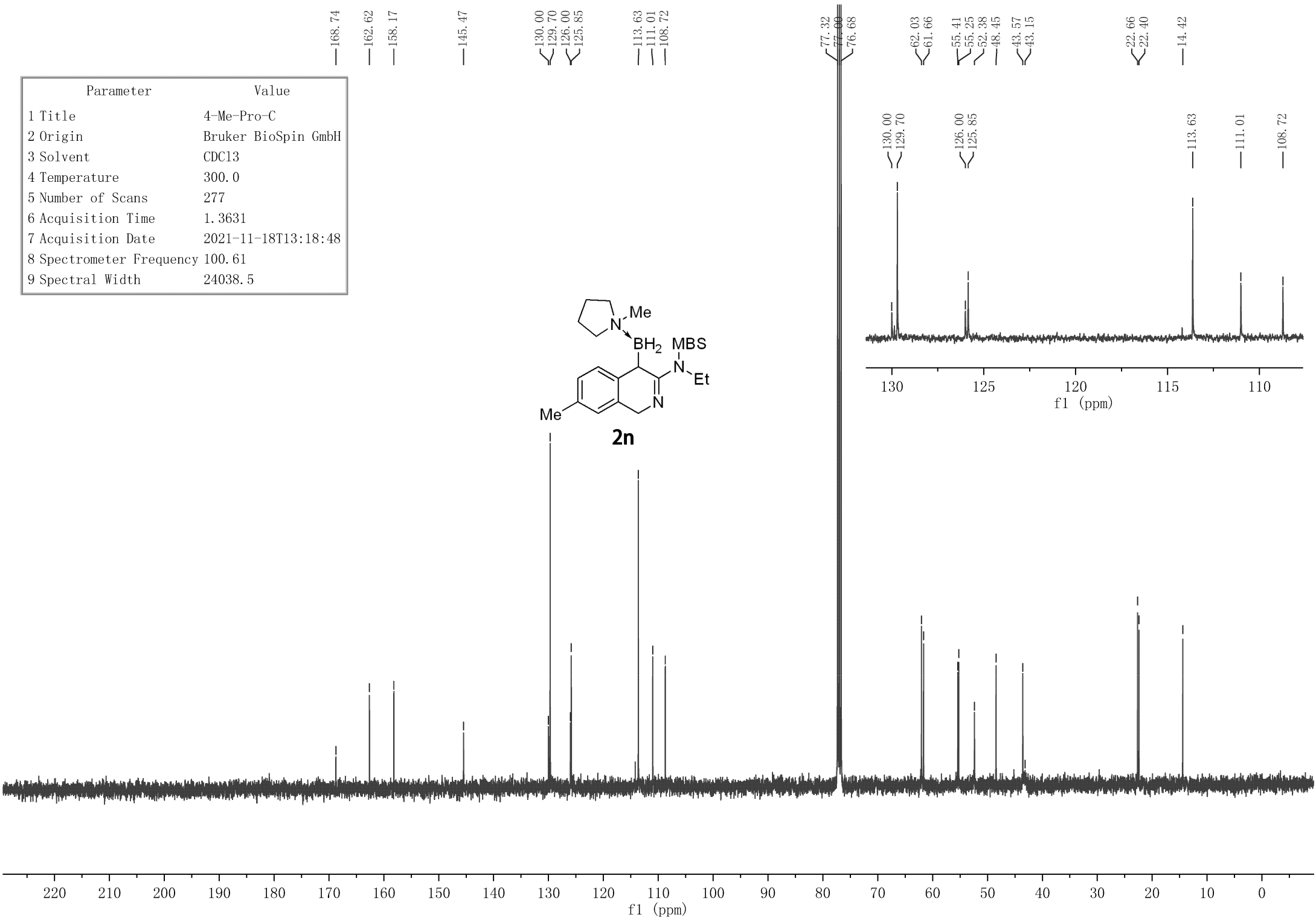
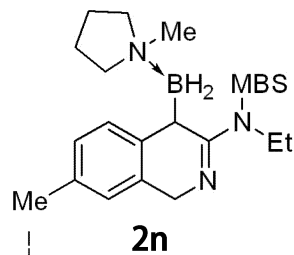
Parameter	Value
1 Title	4-Br-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	13
6 Acquisition Time	1.3631
7 Acquisition Date	2021-10-07T14:11:10
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



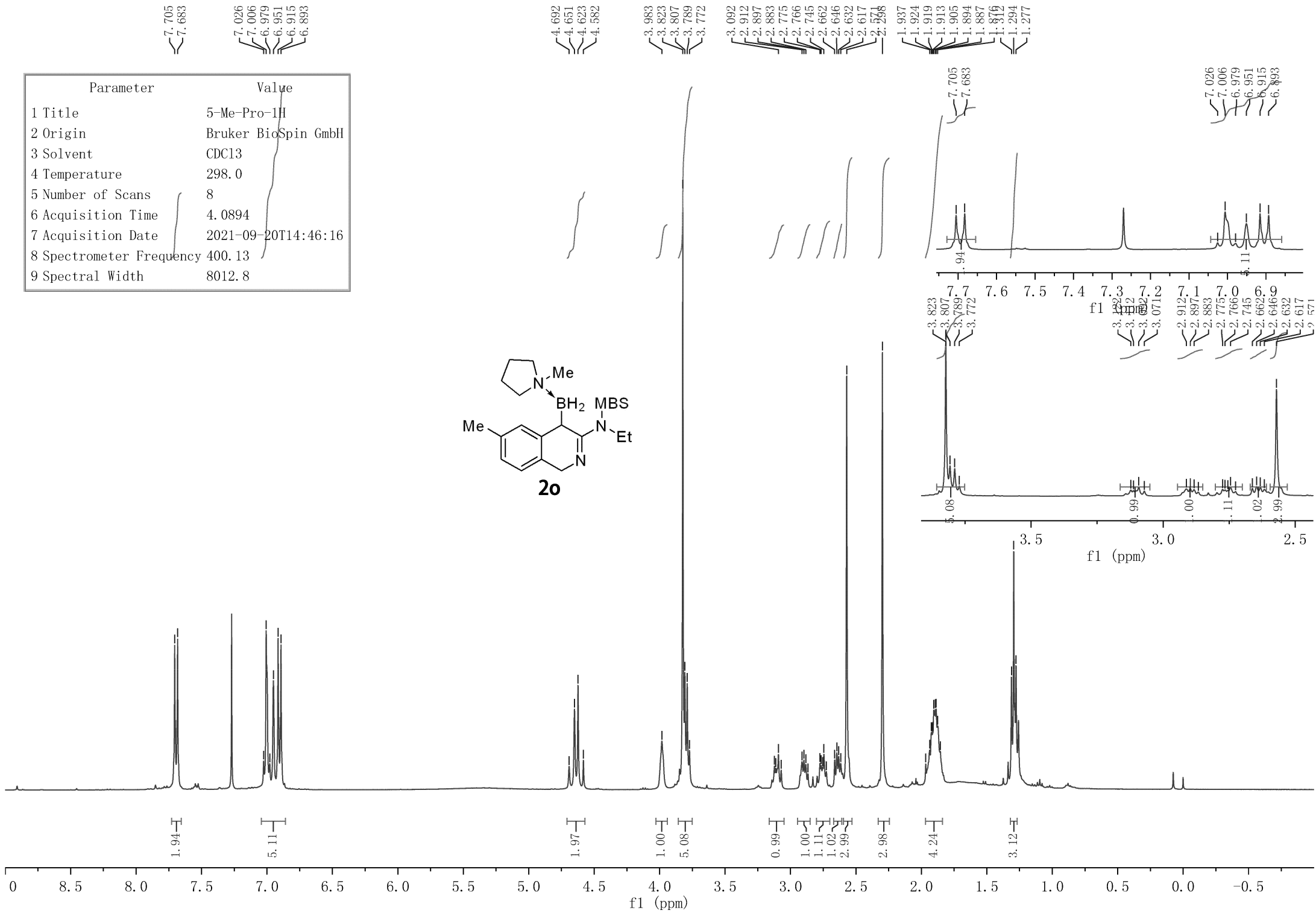
Parameter	Value
1 Title	4-Me-Prϕ-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	298.0
5 Number of Scans	6
6 Acquisition Time	4.0894
7 Acquisition Date	2021-10-23T09:39:49
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



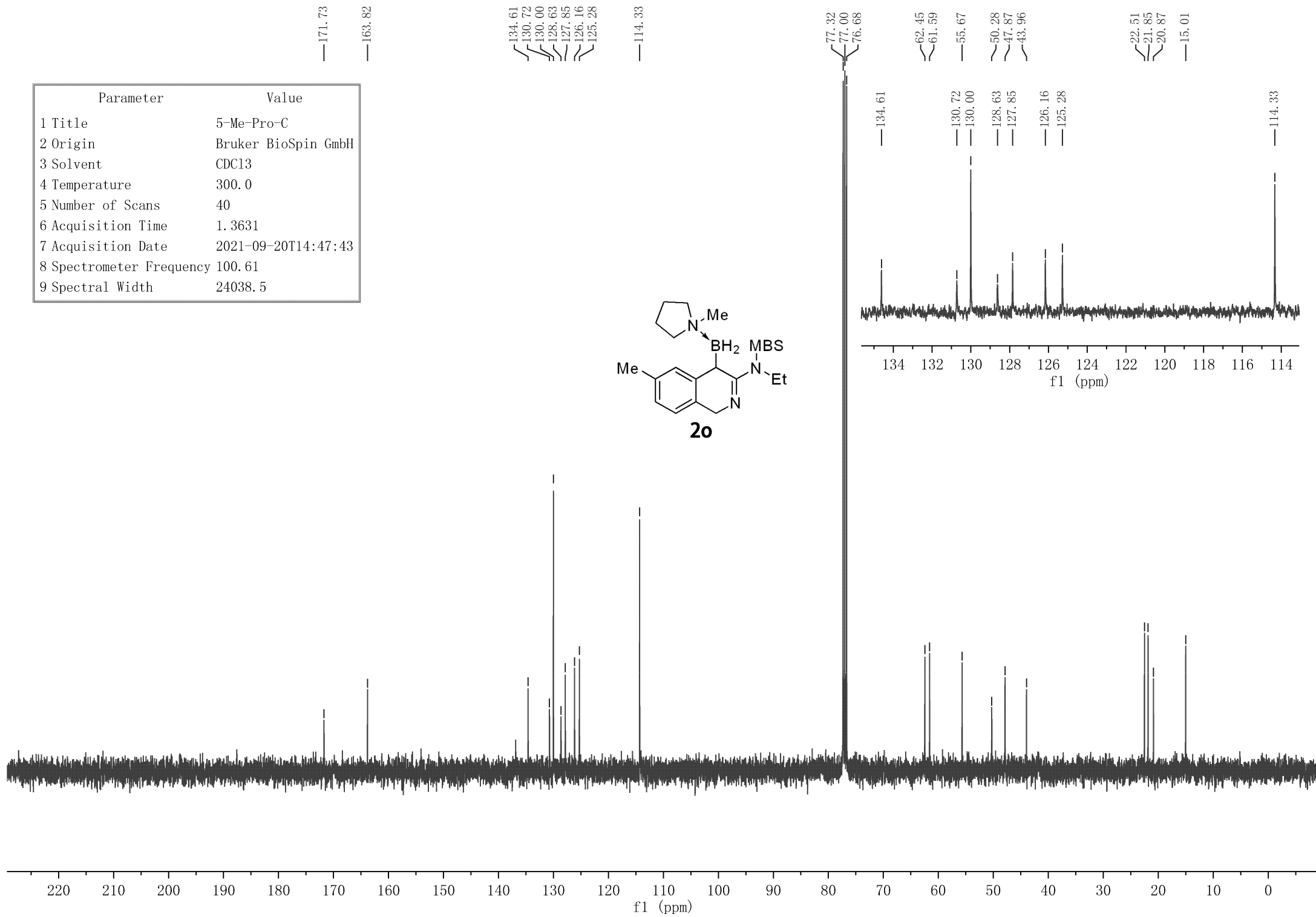
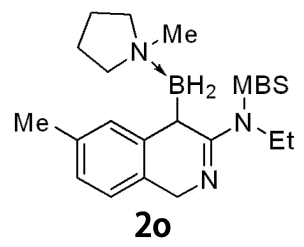
Parameter	Value
1 Title	4-Me-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	277
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-18T13:18:48
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



Parameter	Value
1 Title	5-Me-Pro-1H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-09-20T14:46:16
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	5-Me-Pro-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	40
6 Acquisition Time	1.3631
7 Acquisition Date	2021-09-20T14:47:43
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



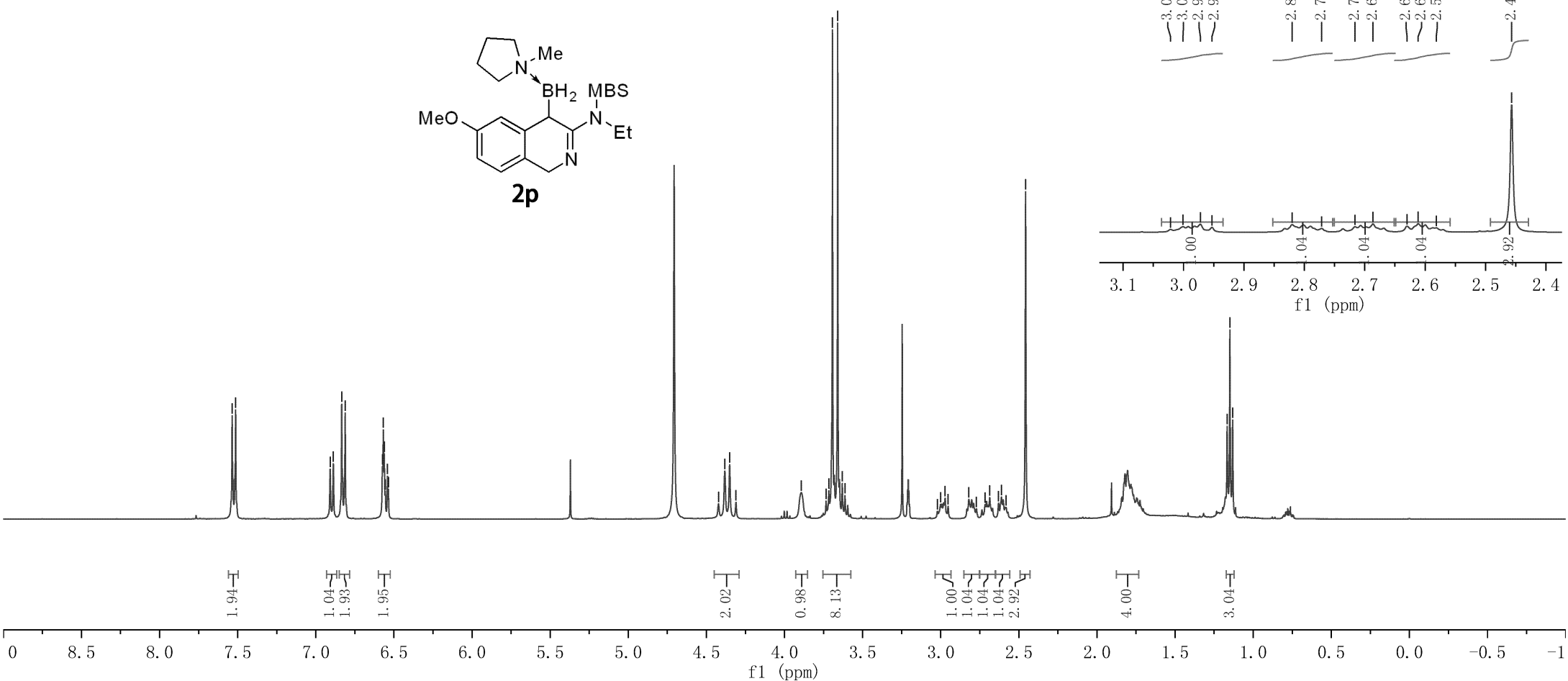
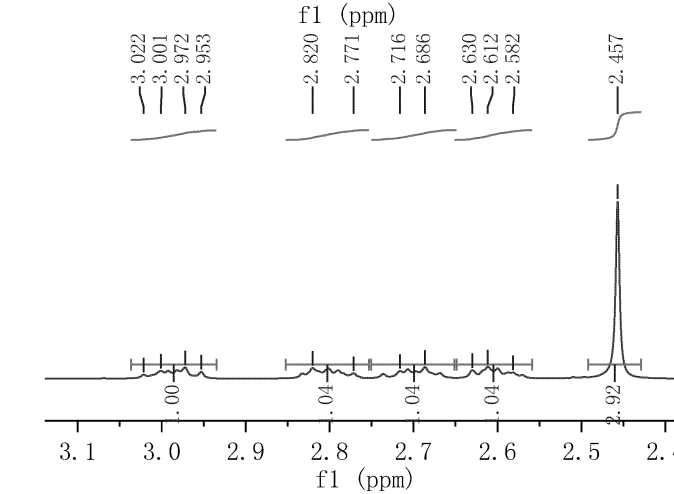
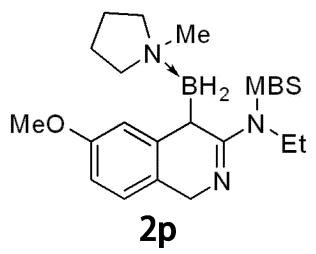
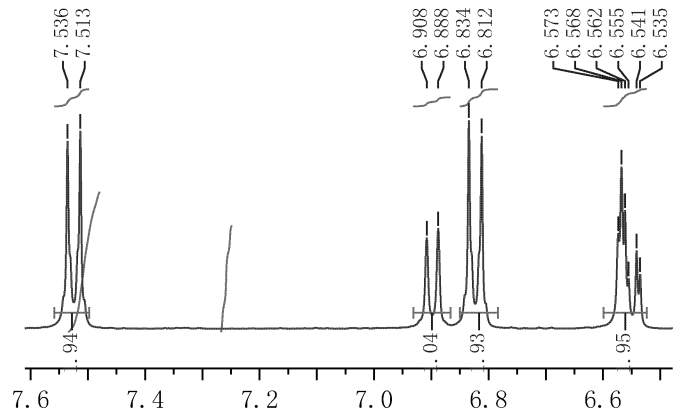
Parameter	Value
1 Title	5-MeO-P
2 Origin	Bruker BioSpin GmbH
3 Solvent	MeOD
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-11-19T00:01:29
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

7.536
7.513

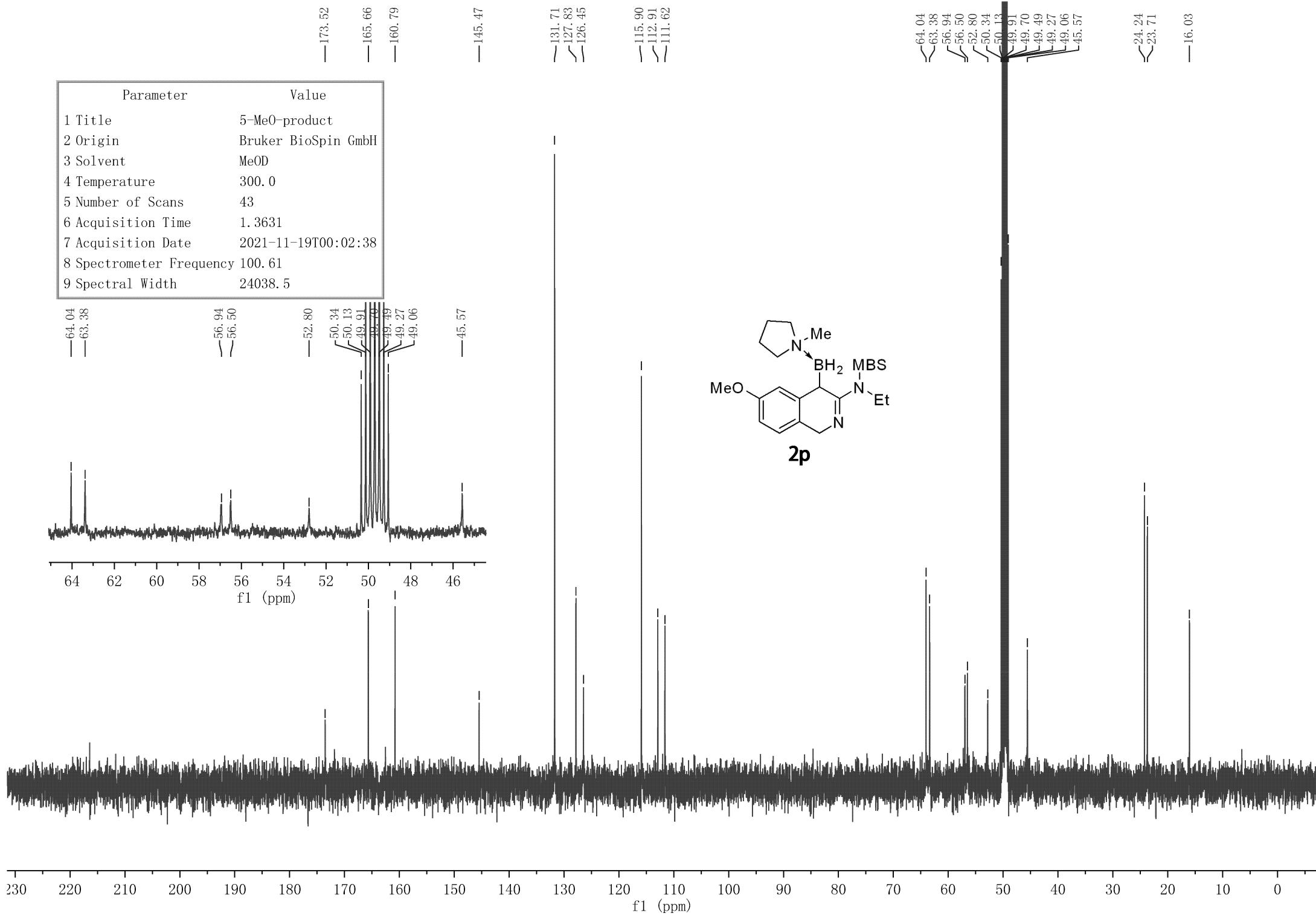
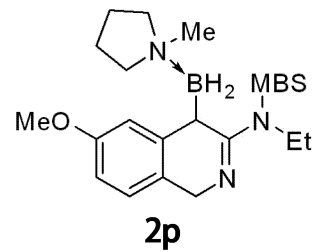
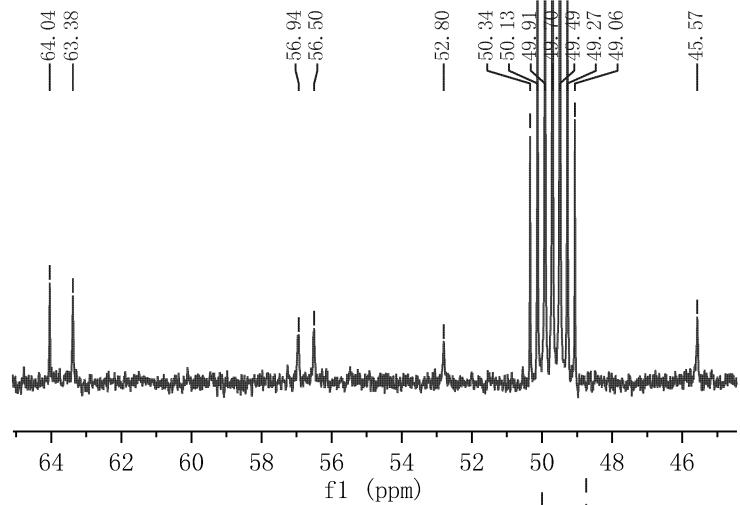
6.908
6.888
6.834
6.812
6.573
6.568
6.562
6.555
6.541
6.535

4.422
4.382
4.351
4.311
3.892
3.734
3.716
3.693
3.660
3.630
3.613
3.022
3.001
2.972
2.953
2.820
2.771
2.716
2.686
2.630
2.612
2.582
2.457

1.167
1.149
1.131



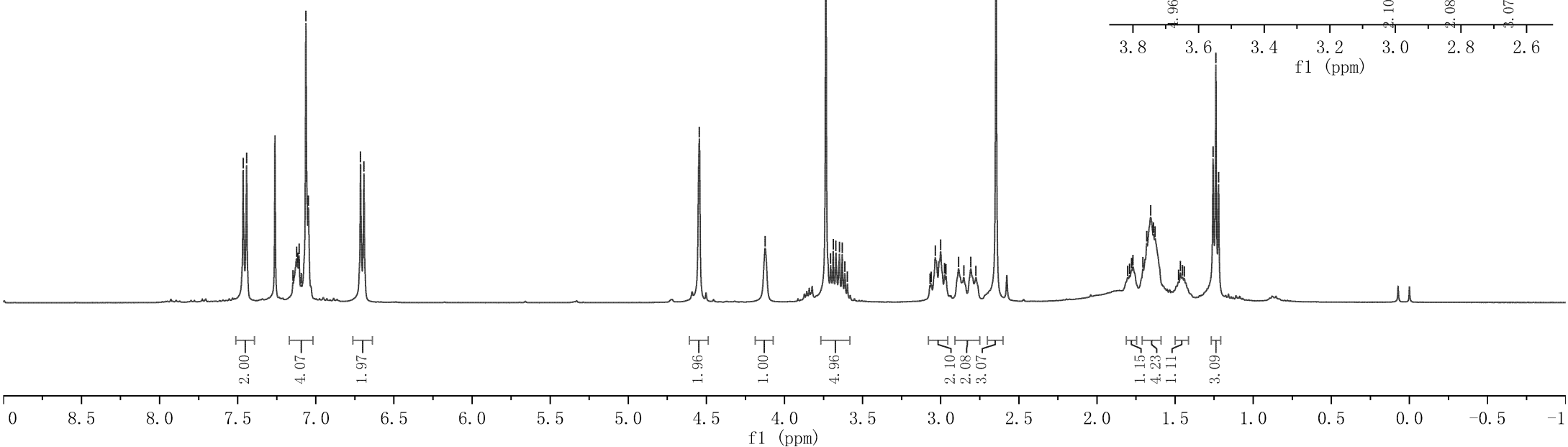
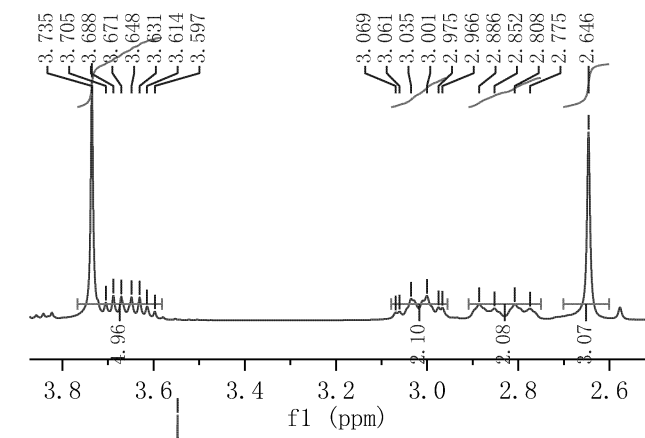
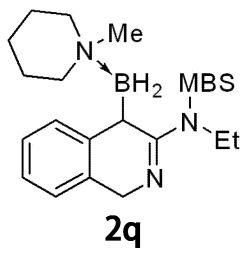
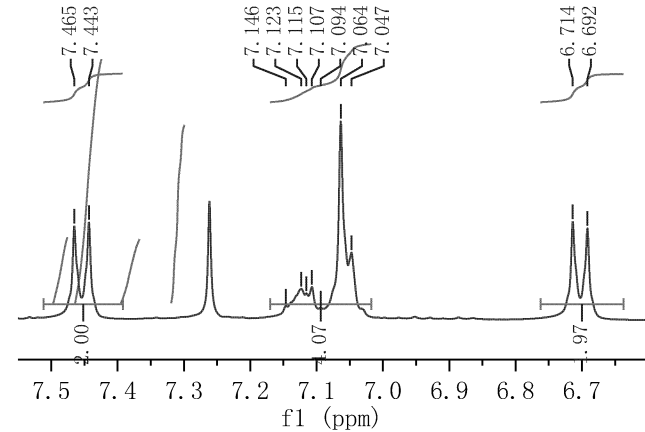
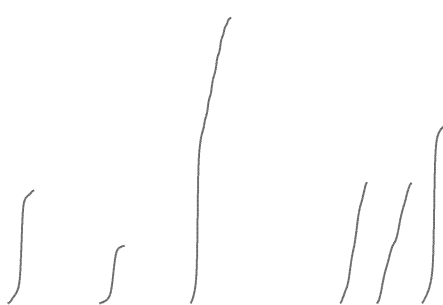
Parameter	Value
1 Title	5-MeO-product
2 Origin	Bruker BioSpin GmbH
3 Solvent	MeOD
4 Temperature	300.0
5 Number of Scans	43
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-19T00:02:38
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

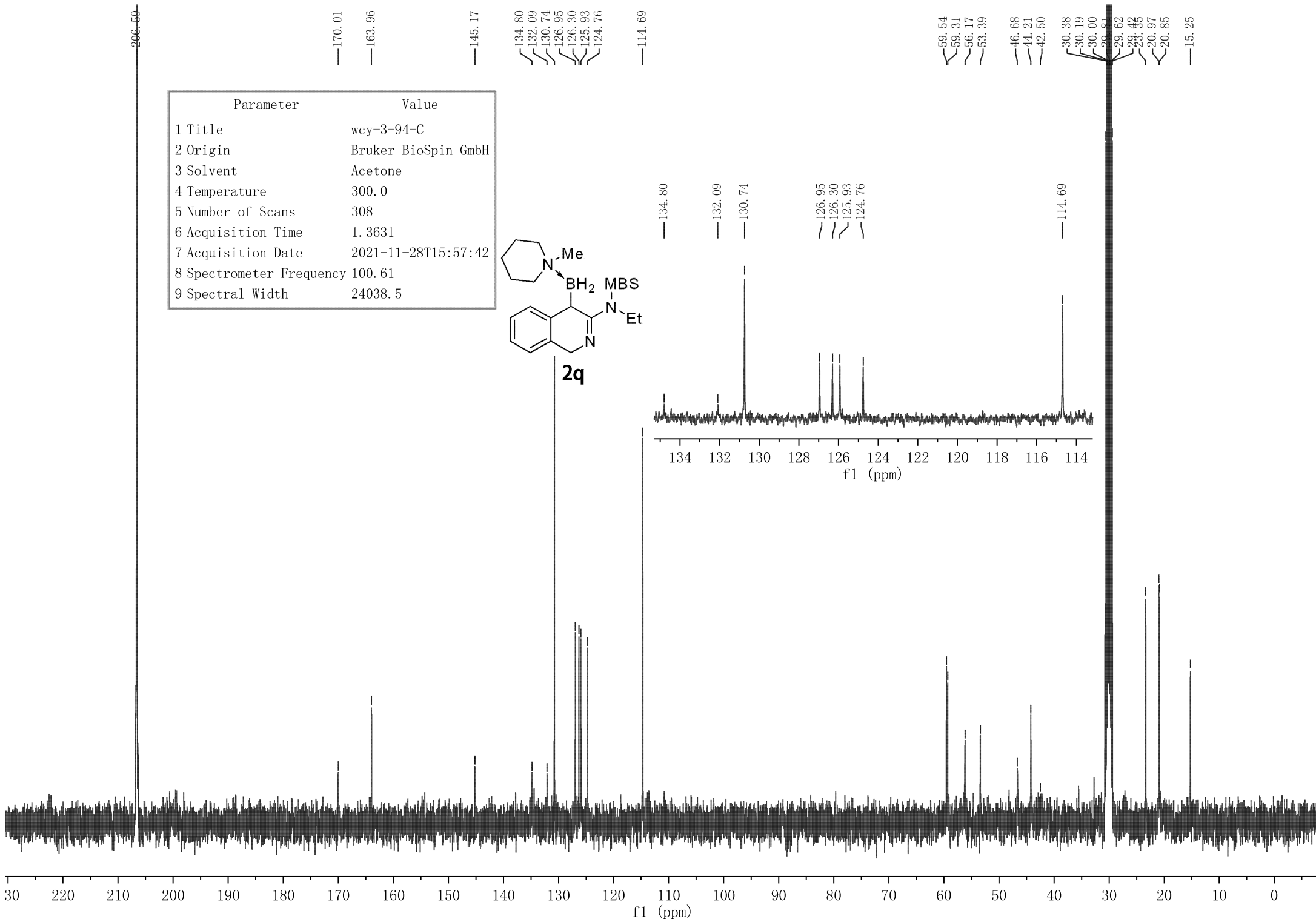


7.465
7.443
7.123
7.115
7.107
7.064
7.047
6.974
6.692

Parameter	Value
1 Title	zgy-9-2q-H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	9
6 Acquisition Time	4.0894
7 Acquisition Date	2022-01-21T16:40:17
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

4.545
4.123
3.735
3.705
3.688
3.671
3.648
3.631
3.614
3.601
3.035
2.975
2.966
2.886
2.852
2.808
2.775
2.646
1.804
1.792
1.779
1.769
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1.453
1.441
1.257
1.239
1.222



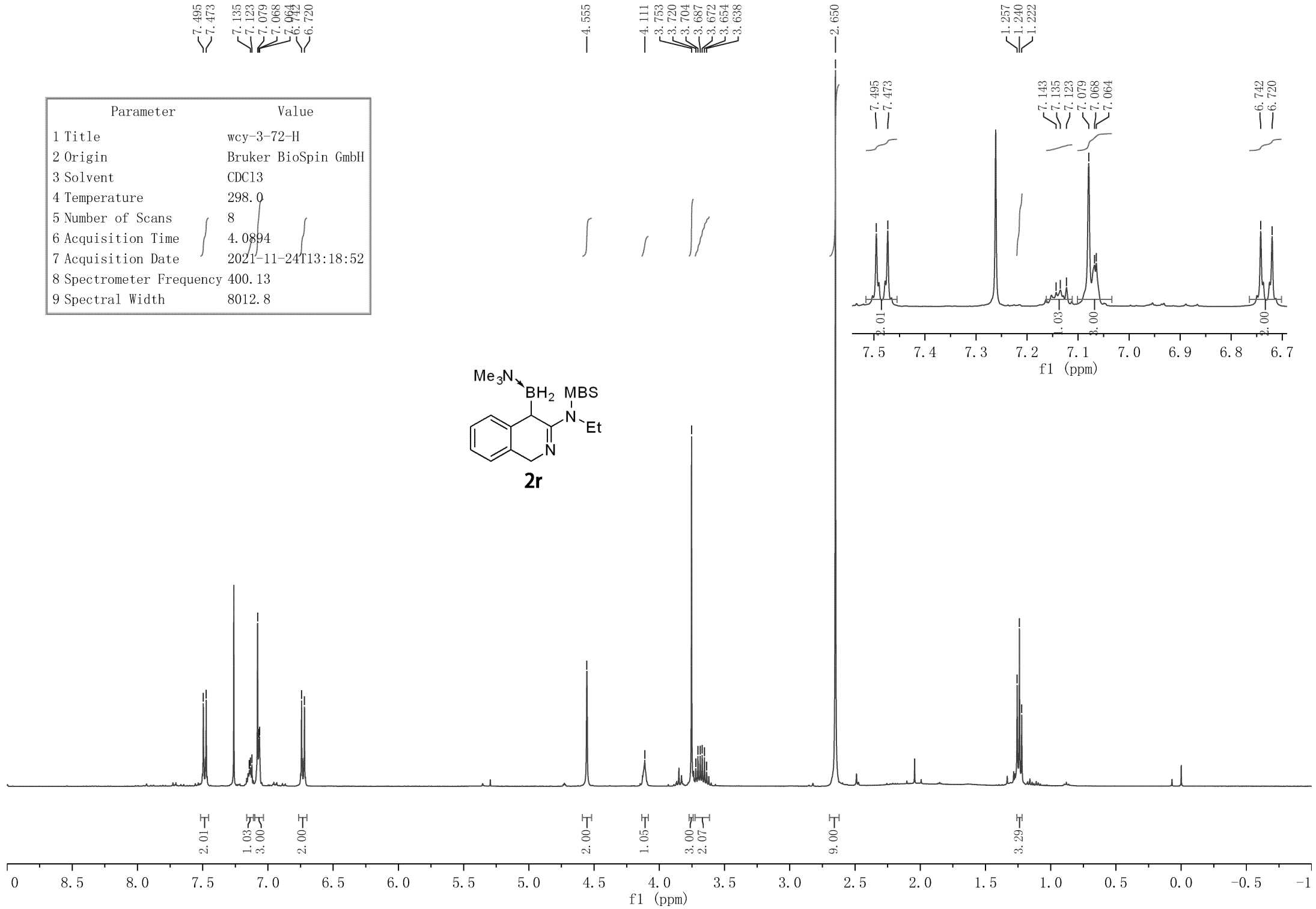


Parameter	Value
1 Title	wcy-3-72-H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	8
6 Acquisition Time	4.0894
7 Acquisition Date	2021-11-24T13:18:52
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

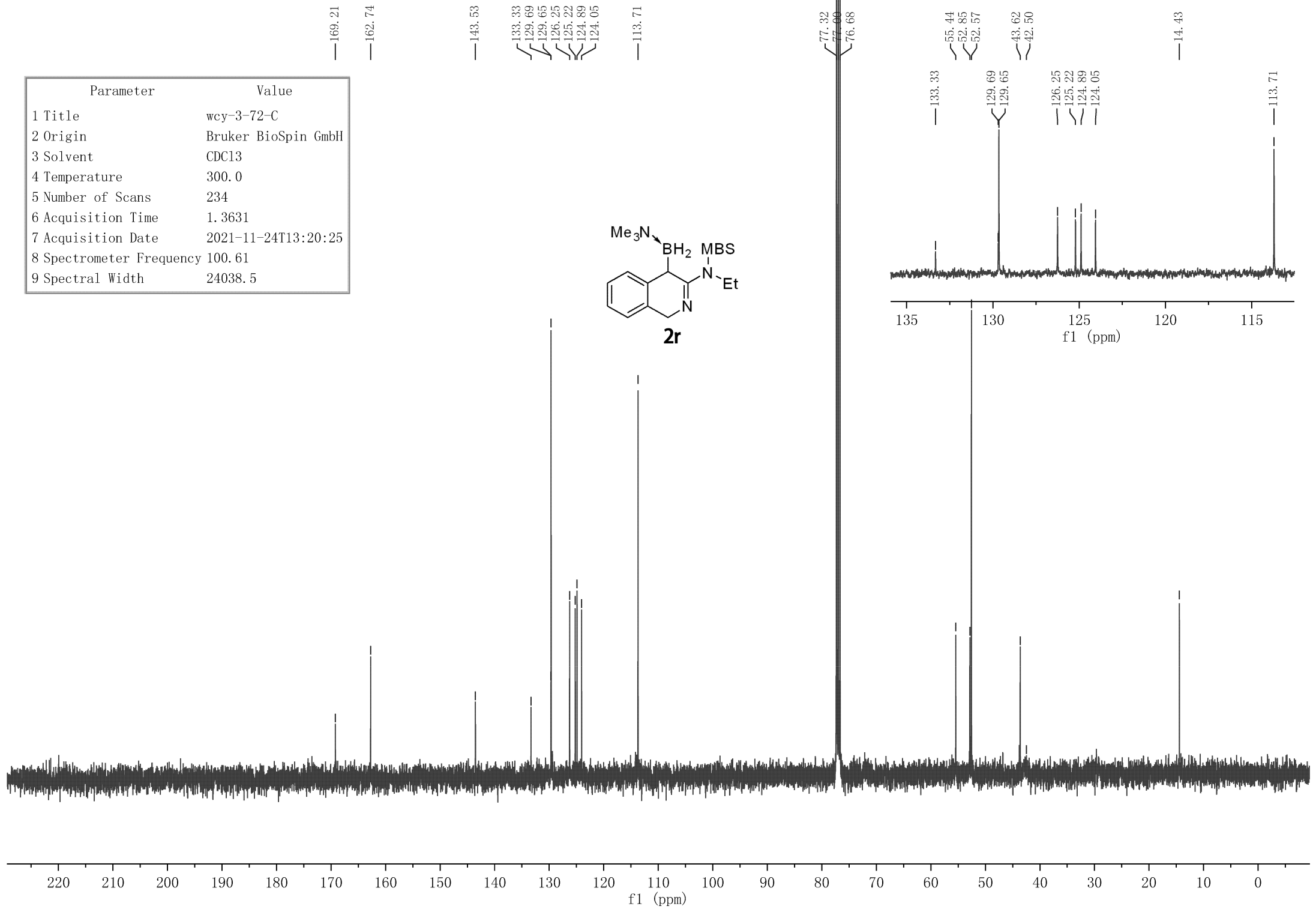
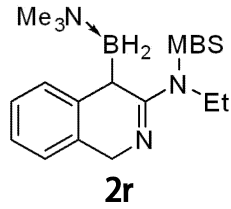
7.495
7.473
7.135
7.123
7.079
7.068
6.964
6.742
6.720

4.555
4.111
3.753
3.720
3.704
3.687
3.672
3.654
3.638

1.257
1.240
1.222



Parameter	Value
1 Title	wcy-3-72-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	234
6 Acquisition Time	1.3631
7 Acquisition Date	2021-11-24T13:20:25
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



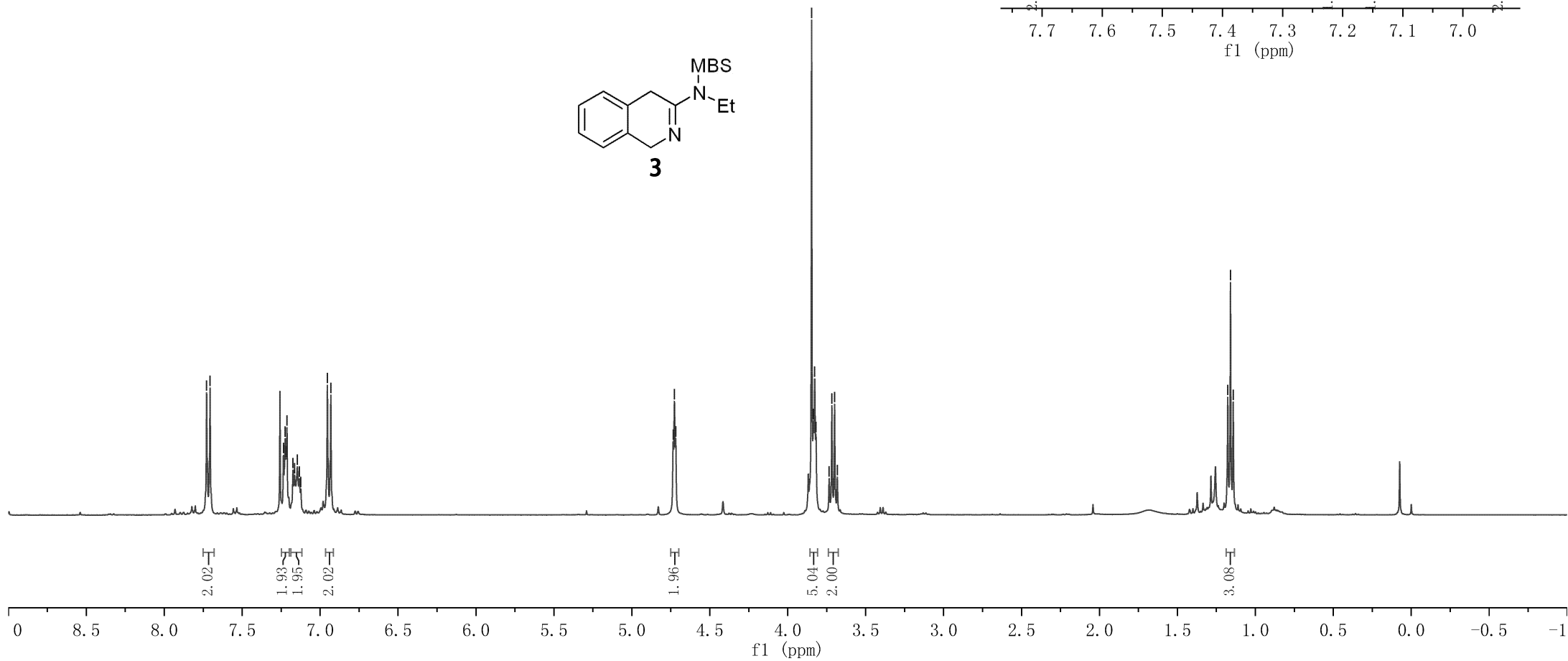
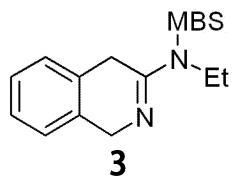
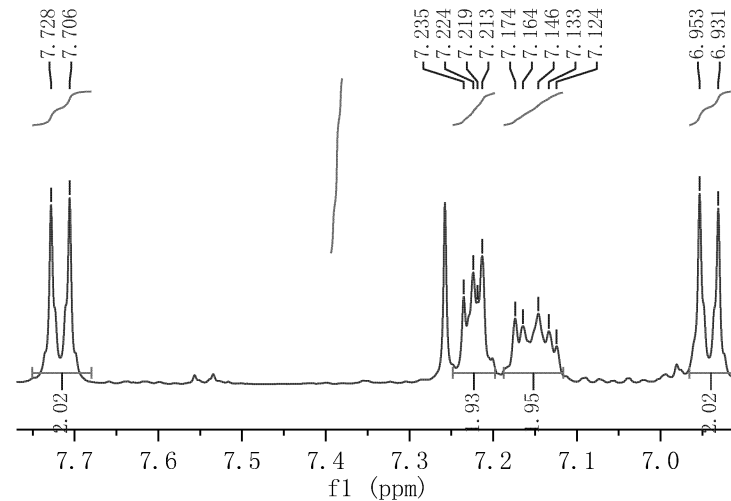
Parameter	Value
1 Title	transformation
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	9
6 Acquisition Time	4.0894
7 Acquisition Date	2021-12-10T16:00:47
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8

7.728
7.706
7.235
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7.219
7.213
7.174
7.164
7.146
7.133
7.124
6.953
6.931

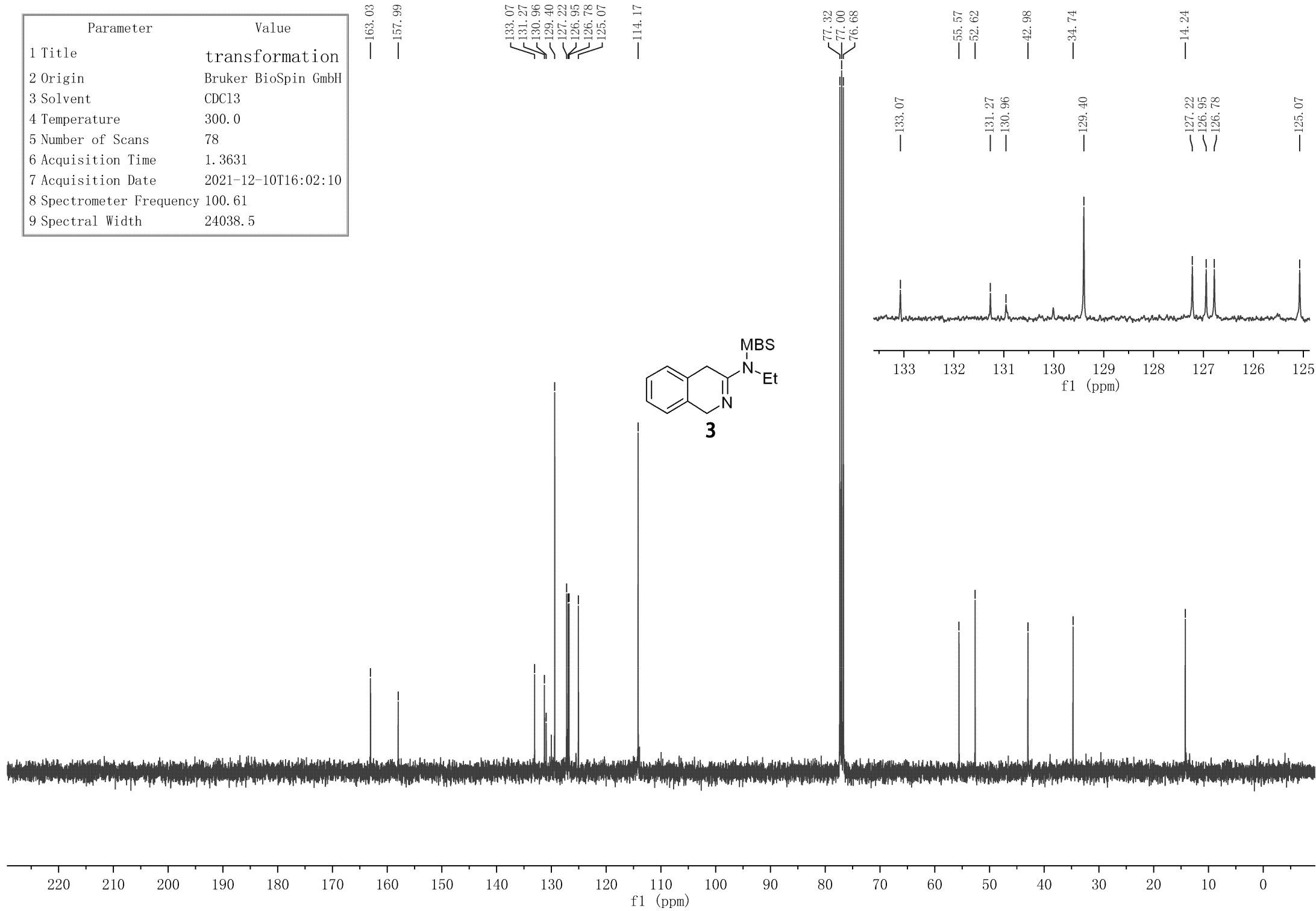
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4.727
4.719

3.847
3.836
3.827
3.819
3.734
3.717
3.699
3.682

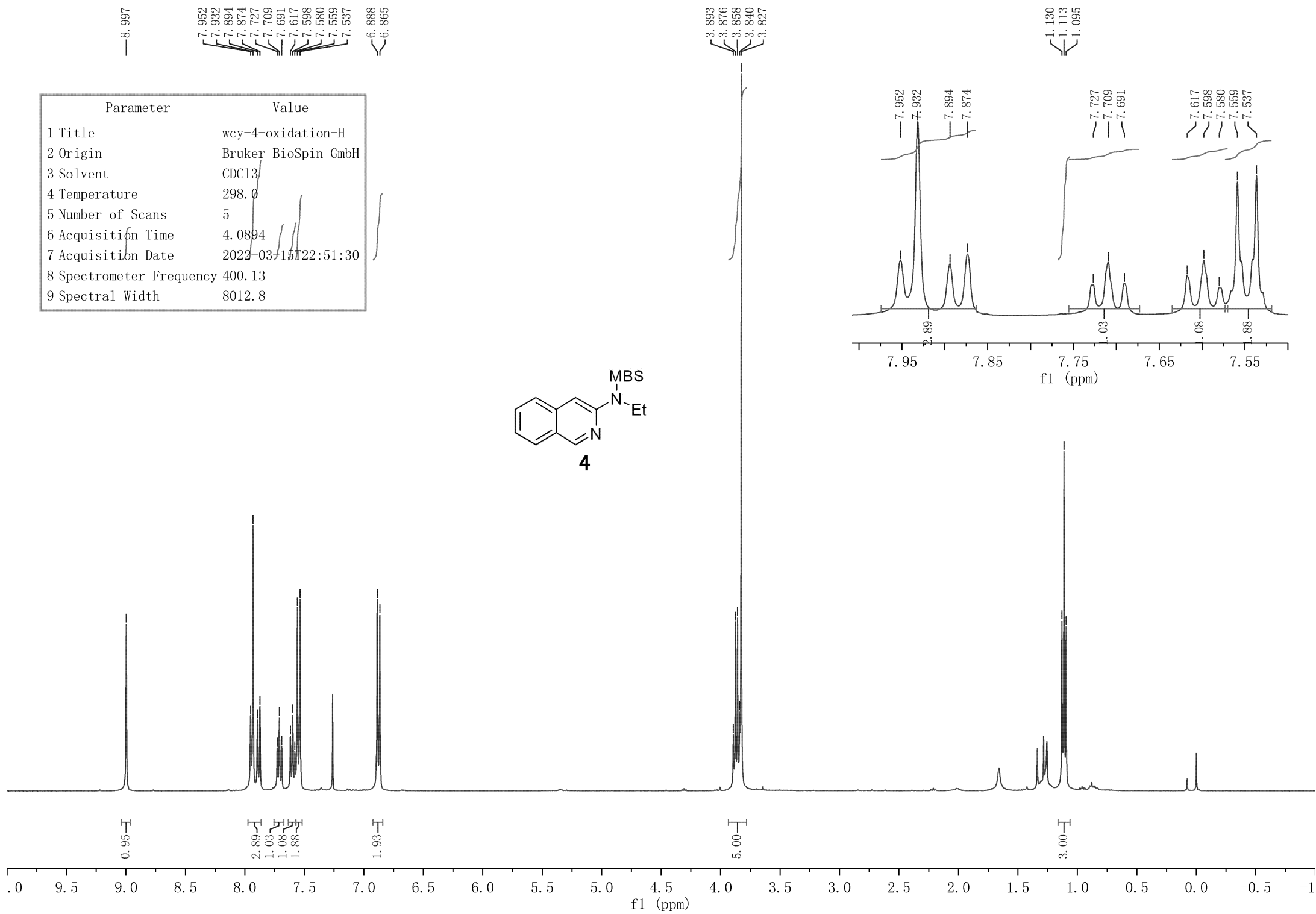
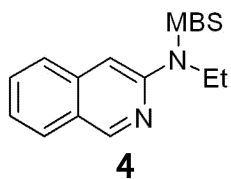
1.177
1.160
1.142



Parameter	Value
1 Title	transformation
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	78
6 Acquisition Time	1.3631
7 Acquisition Date	2021-12-10T16:02:10
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5



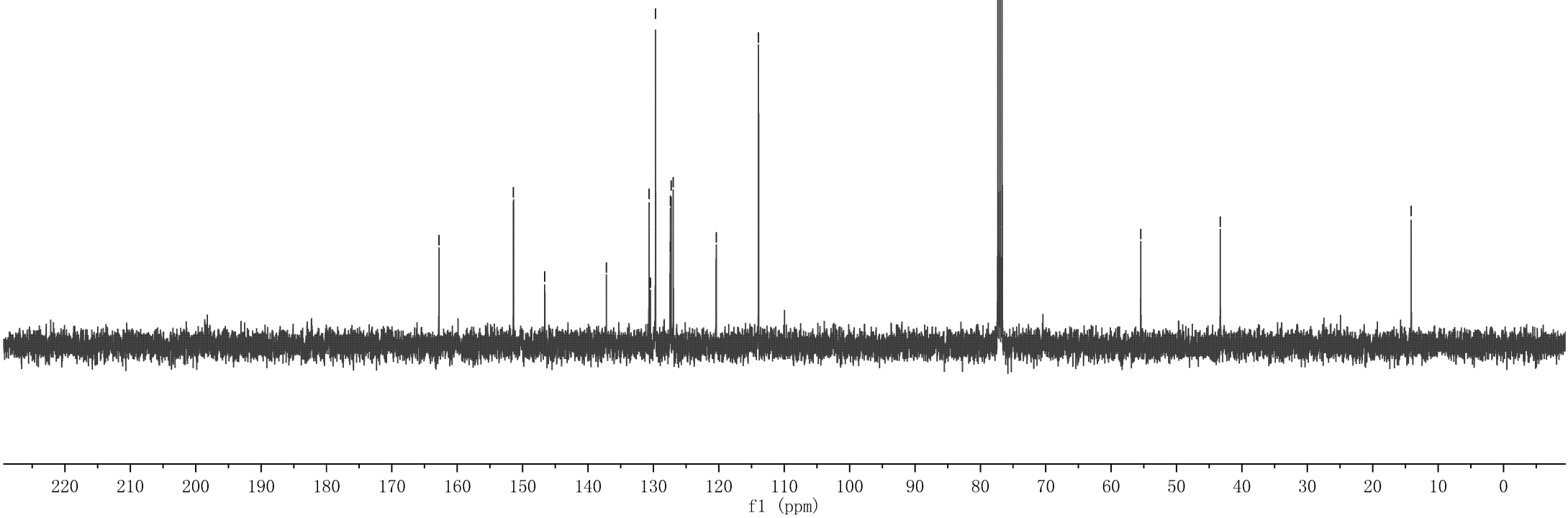
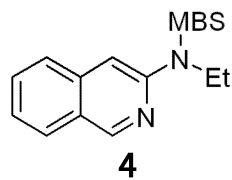
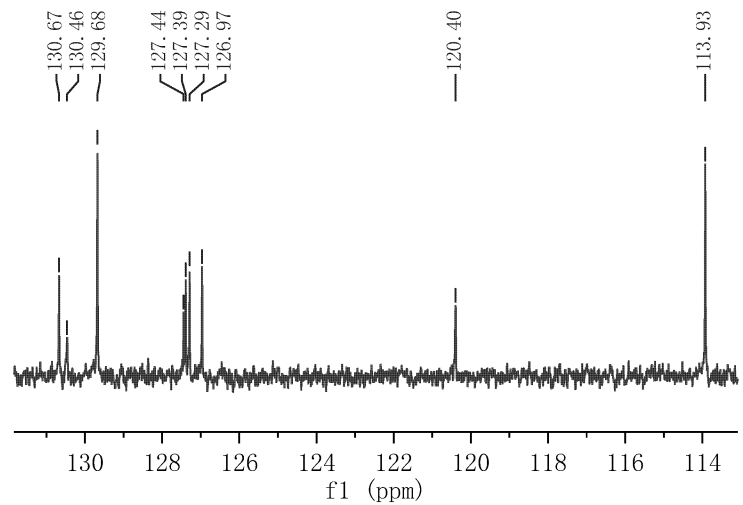
Parameter	Value
1 Title	wcy-4-oxidation-H
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	298.0
5 Number of Scans	5
6 Acquisition Time	4.0894
7 Acquisition Date	2022-03-15T22:51:30
8 Spectrometer Frequency	400.13
9 Spectral Width	8012.8



Parameter	Value
1 Title	wcy-4-oxidation-C
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	300.0
5 Number of Scans	26
6 Acquisition Time	1.3631
7 Acquisition Date	2022-03-15T22:52:43
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

162.80
151.40
146.61
137.18
130.67
129.68
127.44
127.39
127.29
126.97
113.93

77.32
77.00
76.68
55.47
43.31
14.12



Parameter	Value
1 Title	wcy-4-oxidation-dept
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDC13
4 Temperature	300.0
5 Number of Scans	11
6 Acquisition Time	1.3631
7 Acquisition Date	2022-03-19T17:54:57
8 Spectrometer Frequency	100.61
9 Spectral Width	24038.5

