Supporting Information

Copper-Catalyzed Azodicarboxylate-Alkyne (3+2) Cycloaddition

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I. General considerations

Reagents. Unless otherwise indicated, all reactions were carried out in Schlenk tube under an argon atmosphere with dry solvents. Anhydrous isopropanol and anhydrous acetonitrile were purchased from JK Chemical and used as received. Ether/THF was dried and purified by distillation from sodium/benzophenone. CH_2Cl_2 were distilled from CaH_2. Anhydrous $CuCl_2$ was purchased from Aladdin. Other copper catalysts were purchased from Alfa Aesar, Strem, Aladdin or JK Chemical and used as received. All other reagents were purchased from commercial sources and used as received. For reactions that require heating, oil bath was used as the heat source.

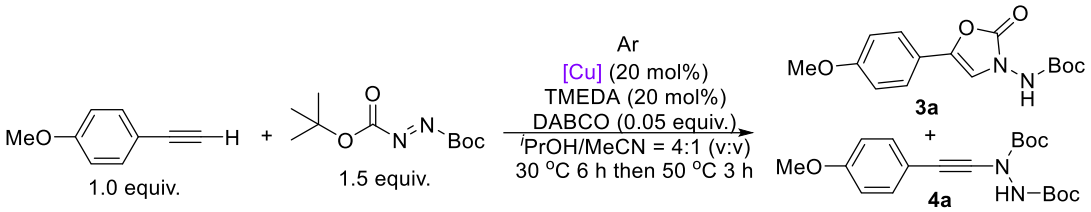
Analytical Methods. All new compounds were characterized by ^{1}H NMR, ^{13}C NMR, and HRMS. NMR spectra were recorded on a Bruker AV-400 instrument in DMSO-d_6 or $CDCl_3$. All ^{1}H NMR chemical shifts are reported in parts per million (ppm) and are referenced relative to the residual solvent signals of DMSO-d_6 (δ = 2.50 ppm) and $CDCl_3$ (δ = 7.26 ppm). All ^{13}C NMR spectra are reported in ppm relative to the residual solvent signals of DMSO-d_6 (δ = 39.50 ppm) and $CDCl_3$ (δ = 77.00 ppm). Coupling constants are reported in Hz with multiplicities denoted as s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet) and br (broad). Column chromatography was performed over silica gel (200-300 mesh) using petroleum ether and ethyl acetate as the eluent. Reactions were monitored by thin-layer chromatography (TLC) carried out on commercial silica gel plates (GF254) using UV light as a visualizing agent. High-resolution mass spectra (HRMS; (ESI)) were acquired with quadrupole and time-of-flight (TOF) mass spectrometers.

II. Optimization of reaction conditions

1 Catalyst:

The best result was obtained using $CuCl_2$ as the catalyst, which offers the advantages of bench stability and low cost. Substitution of the catalyst with $CuBr_2$, CuCl, $Cu(OAc)_2$, or commercially available *Cu-TMEDA* complexes, resulted in reduced yields or failure to produce target compound **3a**.

Table S1. Catalyst Screening



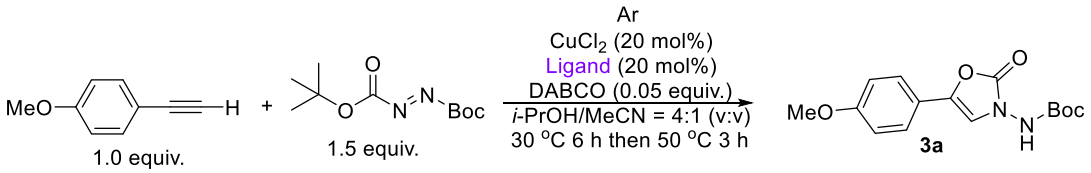
entry	catalyst	yield of **3a**(**4a**)[a]
1	-	0
2	**$CuCl_2$**	**86%**
3	$CuBr_2$	70%
4	$Cu(OAc)_2$	0(17%)
5	*Cu-TMEDA*[b]	74%
6	CuCl	75%

[a]0.4 mmol scale experiment, yields were determined by ^{1}H NMR using 4-nitroacetophenone as internal standard, the yield of **4a** in parentheses. [b]the reaction was performed without extra TMEDA and base.

2 Ligand:

Alternative ligands did not facilitate the formation of the desired product.

Table S2. Ligand Screening



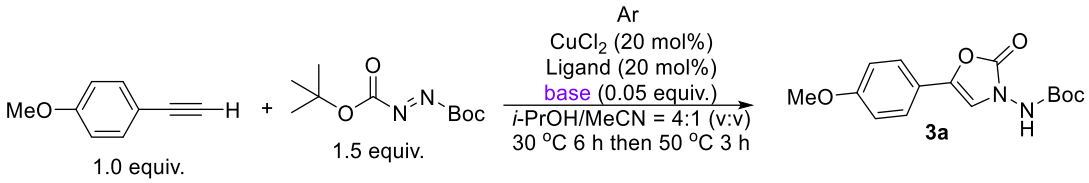
entry	ligand	yield of **3a**[a]
1	-	0
2	DMAP	trace
3	**TMEDA**	**86%**
4	DMEDA	0
5	1,10-phen	0

[a]0.4 mmol scale experiment, yields were determined by ^{1}H NMR using 4-nitroacetophenone as internal standard.

3 Base:

DABCO was identified as the optimal base, as its omission or substitution with other bases led to lower yields, while variations in its loading within a reasonable range had no significant impact.

Table S3. Base Screening

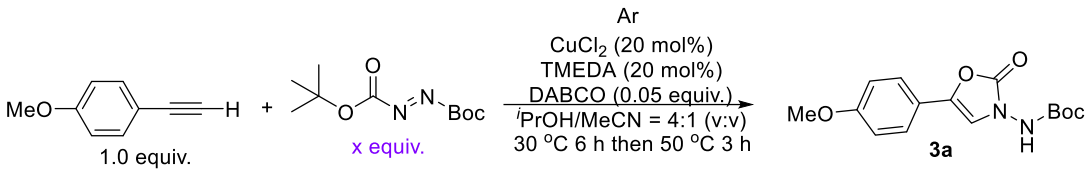


entry	base	yield of **3a**[a]
1	-	63%
2	**DABCO**	**86%**
3	K_2CO_3	72%
4	Et_3N	66%
5	DABCO (0.02 equiv.)	78%
6	DABCO (0.1 equiv.)	85%
7	DABCO (0.5 equiv.)	83%

[a]0.4 mmol scale experiment, yields were determined by ^{1}H NMR using 4-nitroacetophenone as internal standard.

4 Equivalents of DBAD:

Table S4. Screening of Equivalents of DBAD



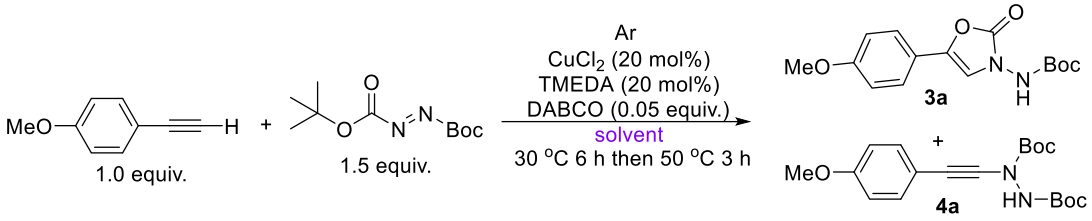
entry	x	yield of **3a**[a]
1	1.0	65%
2	1.2	72%
3	**1.5**	**86%**
4	2.0	82%

[a]0.4 mmol scale experiment, yields were determined by ^{1}H NMR using 4-nitroacetophenone as internal standard.

5 Solvent:

A range of solvents and solvent mixtures with different composition ratios were evaluated. The results with single solvents were generally unsatisfactory. It is worth noting that the choice of alcohol was found to be paramount. The reaction afforded low yields **3a** with methanol or ethanol and a 43% yield with *tert*-butanol (ca. 9% **4a**), while isopropanol achieved a 69% yield. Furthermore, adjusting the solvent composition ratio was also shown to provide improved reaction outcomes.

Table S5. Solvent Screening



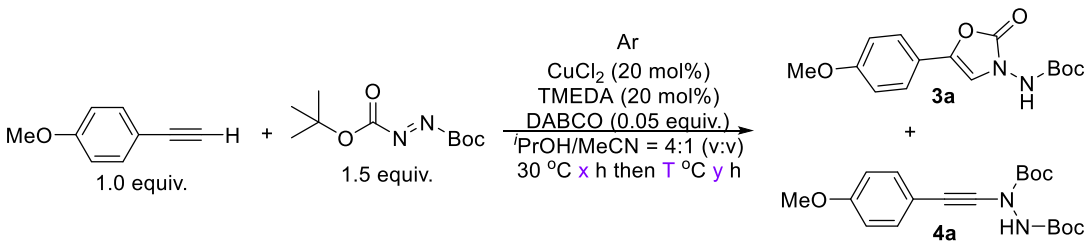
entry	solvent	yield of **3a**(**4a**)[a]
1	CH_2Cl_2	ca. 36%(27%)
2	toluene	0(7%)
3	EtOAc	0(33%)
4	MeCN	44%(ca. 17%)
5	MeOH	6%
6	EtOH	8%
7	^{i}PrOH	69%
8	^{t}BuOH	43%(ca. 10%)
9	^{i}PrOH/MeCN = 9:1 (v:v)	76%
10	**^{i}PrOH/MeCN = 4:1 (v:v)**	**86%**
11	^{i}PrOH/MeCN = 1:1 (v:v)	80%(<5%)
12	^{i}PrOH/MeCN = 2:3 (v:v)	74%(ca. 11%)

[a]0.4 mmol scale experiment, yields were determined by ^{1}H NMR using 4-nitroacetophenone as internal standard, the yield of **4a** in parentheses.

6 Reaction time:

The reaction mixture was stirred at 30 °C for x h, followed by further stirring at T °C for y h.

Table S6. Screening of Reaction Time

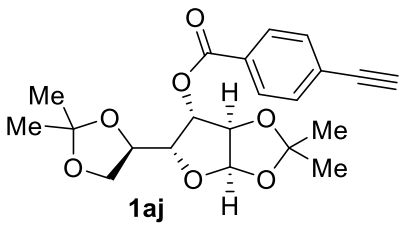


entry	x	T	y	yield of **3a**(**4a**)[a]
1	6	-	-	ca.42%(40%)
2	33	-	-	82%
3	**6**	**50**	**3**	**86%**
4	6	80	3	79%

[a]0.4 mmol scale experiment, yields were determined by ^{1}H NMR using 4-nitroacetophenone as internal standard, the yield of **4a** in parentheses.

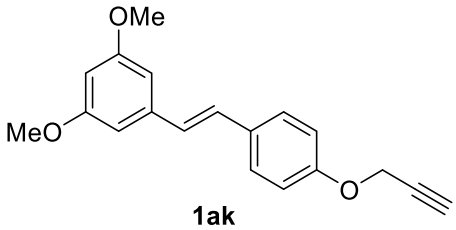
III. Synthesis and characterization of terminal alkynes

Alkyne **1aj**, **1ak**, **1am**, **1ao**, **1ap** were prepared according to the reported literatures. The ^{1}H NMR spectral data matched those of previously reported.



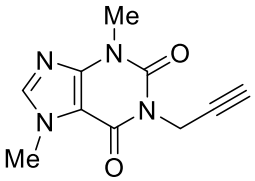
1aj

[1]



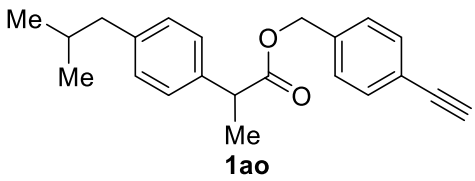
1ak

[2]



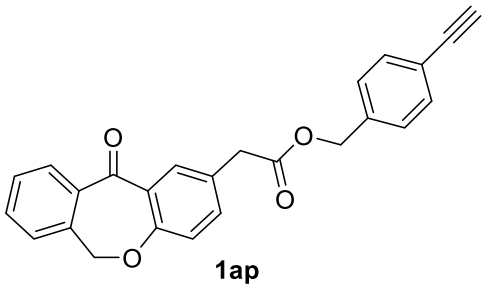
1am

[3]



1ao

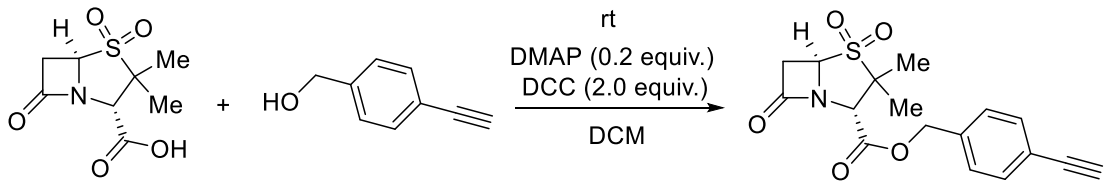
[4]



1ap

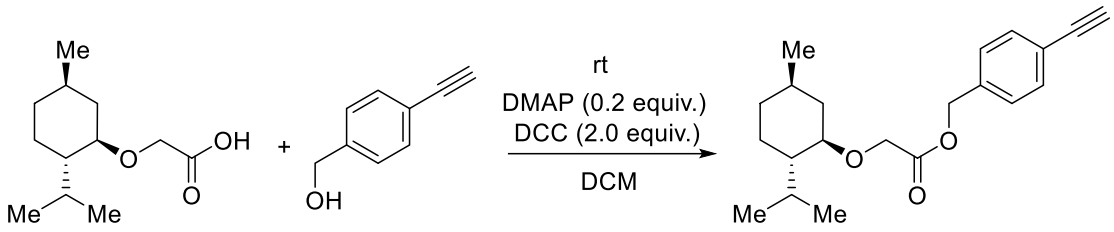
[5]

Compound **1al** and **1aq** were synthesized according to procedure literature[5].



Sulbactam-derivatived terminal alkyne (1al): In a 100 mL round-bottom flask equipped with a stir bar, sulbactam acid (1.75 g, 7.5 mmol, 1.5 equiv.), (4-ethynylphenyl)methanol (0.66 g, 5.0 mmol, 1.0 equiv.), and anhydrous DCM (30 mL) were combined. Dicyclohexylcarbodiimide (DCC, 2.06 g, 10.0 mmol, 2.0 equiv.) was added, followed by 4-dimethylaminopyridine (DMAP, 122.0 mg, 1.0 mmol, 0.2 equiv.). The resulting mixture was stirred at room temperature for 12 h. The solid byproduct was removed by filtration, and the filtrate was concentrated under reduced pressure. The crude residue was purified by flash column chromatography to afford the product **1al** (973 mg, 56%) as a white solid, m.p. 89.9~91.0 ºC. Considering that compound **3al** is dissolved in DMSO, the starting material **1al**

was also analyzed by NMR using DMSO-d_6 as the solvent to facilitate data comparison. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.51 (d, J = 8.4 Hz, 2H), 7.45 (d, J = 8.4 Hz, 2H), 5.28 (d, J = 12.4 Hz, 1H), 5.23 (d, J = 12.4 Hz, 1H), 5.20 (dd, J = 4.4, 1.6 Hz, 1H), 4.53 (s, 1H), 4.25 (s, 1H), 3.67 (dd, J = 16.4, 4.4 Hz, 1H), 3.26 (dd, J = 16.4, 1.6 Hz, 1H), 1.45 (s, 3H), 1.29 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 172.1, 166.7, 135.9, 131.9, 128.7, 121.8, 83.1, 81.4, 66.8, 62.25, 62.21, 60.4, 37.3, 19.5, 17.7; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{17}H_{17}NNaO_5S^+$ 370.0720, found 370.0715.

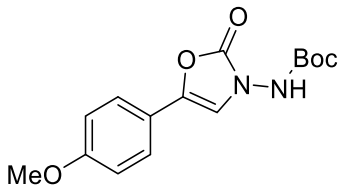


(-)-Menthol-derived terminal alkyne (1aq): In a 100 mL round-bottom flask equipped with a stir bar, (-)-menthoxyacetic acid (1.61 g, 7.5 mmol, 1.5 equiv.), (4-ethynylphenyl)methanol (0.66 g, 5.0 mmol, 1.0 equiv.), and anhydrous DCM (30 mL) were combined. Dicyclohexylcarbodiimide (DCC, 2.06 g, 10.0 mmol, 2.0 equiv.) was added, followed by 4-dimethylaminopyridine (DMAP, 122.0 mg, 1.0 mmol, 0.2 equiv.). The resulting mixture was stirred at room temperature for 12 h. The solid byproduct was removed by filtration, and the filtrate was concentrated under reduced pressure. The crude residue was purified by flash column chromatography to afford the product **1aq** (1.22 g, 74%) as a white solid, m.p. 67.0~68.0 ºC. Considering that the product **3aq** is dissolved in DMSO, the starting material **1ar** was also tested by NMR using DMSO-d_6 as the solvent to facilitate data comparison. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.48 (d, J = 8.0 Hz, 2H), 7.38 (d, J = 8.0 Hz, 2H), 5.14 (s, 2H), 4.21 (s, 1H), 4.19-4.06 (m, 2H), 3.18-3.08 (m, 1H), 2.27-2.17 (m, 1H), 2.09-2.01 (m, 1H), 1.63-1.52 (m, 2H), 1.34-1.24 (m, 1H), 1.19-1.09 (m, 1H), 0.99-0.65 (m, 12H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 170.4, 136.8, 131.7, 128.2, 121.4, 83.2, 81.1, 79.0, 65.2, 65.0, 47.8, 39.7, 34.0, 30.8, 25.0, 22.9, 22.2, 20.9, 16.3; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{21}H_{28}NaO_3^+$ 351.1931, found 351.1925.

IV. General procedure for the azodicarboxylate-alkyne (3+2) cycloaddition

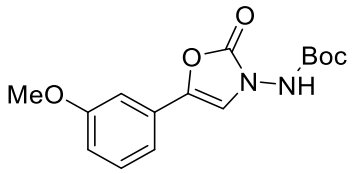
General Procedure: In a 15 mL resealable screw-cap test tube, solid reagents—including di-*tert*-butyl azodicarboxylate (DBAD, 138.4 mg, 0.6 mmol, 1.5 equiv.), 1,4-diazabicyclo[2.2.2]octane (DABCO, 2.2 mg, 0.02 mmol, 0.05 equiv.), anhydrous cupric chloride (10.8 mg, 0.08 mmol, 20 mol%) were added successively. (If the alkyne substrate was in solid form, it was also added at this stage.) The tube was evacuated and backfilled with argon (this process was repeated for 3 times). Anhydrous MeCN (0.2 mL), liquid alkyne **1** (0.4 mmol, 1.0 equiv.), *N*,*N*,*N*',*N*'-tetramethylethylenediamine (TMEDA, 9.3 mg, 0.08 mmol, 20 mol%), ^{i}PrOH (0.8 mL) were added successively under argon atmosphere. The reaction mixture was stirred vigorously at 30 ºC for 6 h, then oil path was elevated to 50 °C over approximately 10 minutes and stirred for an additional 3 h. After that, the reaction was diluted with ethyl acetate (4 mL), then saturated aq. sodium bicarbonate (4 mL) was added. The aqueous layer was extracted with EtOAc (3 × 8 mL). The combined organic layer was washed with brine (5 mL), dried over Na_2SO_4, filtered, and concentrated under reduced pressure. The crude product was purified by flash chromatography (silica gel， 200~300 mesh) to afford the related N-aminooxazol-2-one product.

V. Characterization data for the products

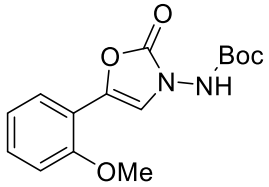


***tert*-Butyl (5-(4-methoxyphenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3a):** The representative procedure was followed using 4-ethynylanisole **1a** (52.8 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 3:1 (v/v)) to afford **3a** (94.3 mg, 77% yield) as a white solid, m.p. 156.8~158.9 ºC. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.32-9.72 (m, 1H, -N*H*CO), 7.65 (s, 1H), 7.46 (d, J = 8.4 Hz, 2H), 7.00 (d, J = 8.4 Hz, 2H), 3.77 (s, 3H), 1.53-1.32 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 159.2, 154.2, 152.8, 136.3, 124.2, 119.7, 114.5, 112.3, 81.3, 55.2, 27.9; HRMS (ESI) m/z: [M

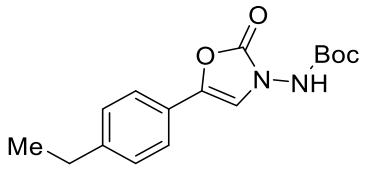
+ Na]$^+$ Calcd for $C_{15}H_{18}N_2NaO_5^+$ 329.1108, found 329.1107.



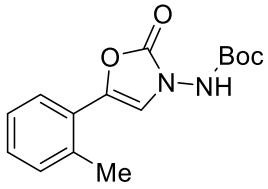
***tert*-Butyl (5-(3-methoxyphenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3b):** The representative procedure was followed using 3-ethynylanisole **1b** (52.8 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 6:1 to 4:1 petroleum ether/EtOAc (v/v)) to afford **3b** (85.3 mg, 70% yield) as a white solid, m.p. 152.1~153.9 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.37-9.73 (m, 1H, -N*H*CO), 7.86 (s, 1H), 7.35 (dd, J = 8.0, 8.0 Hz, 1H), 7.15-7.04 (m, 2H), 6.90 (dd, J = 8.0, 2.8 Hz, 1H), 3.78 (s, 3H), 1.55-1.31 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 159.6, 154.2, 152.7, 135.9, 130.2, 128.3, 114.8, 114.6, 114.1, 107.6, 81.4, 55.2, 27.9; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{15}H_{18}N_2NaO_5^+$ 329.1108, found 329.1107.



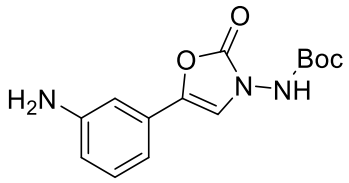
***tert*-Butyl (5-(2-methoxyphenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3c):** The representative procedure was followed using 2-ethynylanisole **1c** (52.8 mg, 0.4 mmol), The reaction mixture was stirred vigorously at 30 °C for 6 h, then oil path was elevated to 60 °C over approximately 10 minutes and stirred for an additional 12 h. The crude product was purified by flash chromatography (eluted with a gradient from 5:1 to 3:1 petroleum ether/EtOAc (v/v)) to afford **3c** (100.1 mg, 82% yield) as a white solid, m.p. 171.9~173.8 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.30-9.70 (m, 1H, -N*H*CO), 7.54-7.44 (m, 2H), 7.31 (dd, J = 8.0, 8.0 Hz, 1H), 7.10 (d, J = 8.0 Hz, 1H), 7.03 (dd, J = 8.0, 8.0 Hz, 1H), 3.90 (s, 3H), 1.55-1.31 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.9, 154.1, 152.2, 132.7, 128.9, 123.7, 120.6, 117.4, 115.4, 111.1, 81.2, 55.4, 27.9; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{15}H_{18}N_2NaO_5^+$ 329.1108, found 329.1106.



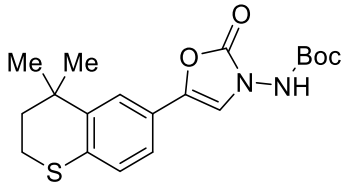
***tert*-Butyl (5-(4-ethylphenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3d):** The representative procedure was followed using 1-ethyl-4-ethynylbenzene **1d** (52.0 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 8:1 (v/v)) to afford **3d** (86.4 mg, 71% yield) as a white solid, m.p. 172.8~174.1 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.33-9.71 (m, 1H, -N*H*CO), 7.78 (s, 1H), 7.44 (d, J = 8.0 Hz, 2H), 7.27 (d, J = 8.0 Hz, 2H), 2.61 (q, J = 7.6 Hz, 2H), 1.55-1.31 (m, 9H), 1.17 (t, J = 7.6 Hz, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.2, 152.7, 144.0, 136.3, 128.4, 124.6, 122.6, 113.4, 81.3, 27.94, 27.86, 15.4; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{16}H_{20}N_2NaO_4^+$ 327.1315, found 327.1313.



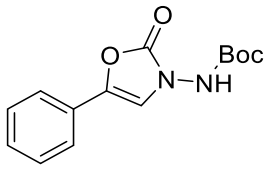
***tert*-Butyl (2-oxo-5-(o-tolyl)oxazol-3(2H)-yl)carbamate (3e):** The representative procedure was followed using 1-ethynyl-2-methylbenzene **1e** (46.5 mg, 0.4 mmol), anhydrous cupric chloride (16.1 mg, 0.12 mmol, 30 mol%), TMEDA (13.9 mg, 0.12 mmol, 30 mol%) and DABCO (2.2 mg, 0.02 mol, 0.05 equiv.). The reaction mixture was stirred vigorously at 30 °C for 6 h, then oil path was heated to 60 °C (this process takes about 10 mins) and stirred for another 12 h. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 4:1 (v/v)) to afford **3e** (82.4 mg, 71% yield) as a white solid, m.p. 164.8~165.8 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.36-9.78 (m, 1H, -N*H*CO), 7.55 (s, 1H), 7.51 (d, J = 6.8 Hz, 1H), 7.34-7.22 (m, 3H), 2.35 (s, 3H), 1.55-1.32 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.5, 135.1, 134.0, 131.1, 128.1, 126.3, 126.0, 125.0, 116.8, 81.2, 27.9, 21.2; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{15}H_{18}N_2NaO_4^+$ 313.1159, found 313.1154.



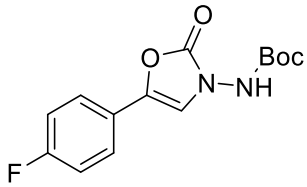
***tert*-Butyl (5-(3-aminophenyl)-2-oxooxazol-3(2H)-yl)carbamate (3f):** The representative procedure was followed using 3-ethynylaniline **1f** (46.9 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 2:1 (v/v)) to afford **3f** (63.1 mg, 54% yield) as a white solid, m.p. 181.8~182.9 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.35-9.89 (m, 1H, -N*H*CO), 7.65 (s, 1H), 7.05 (dd, J = 7.6, 7.6 Hz, 1H), 6.77-6.63 (m, 2H), 6.51 (dd, J = 7.6, 2.0 Hz, 1H), 5.26 (s, 2H, -NH_2), 1.56-1.31 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.8, 149.0, 136.7, 129.5, 127.5, 113.8, 113.4, 110.3, 107.7, 81.2, 27.9; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{14}H_{17}N_3NaO_4^+$ 314.1111, found 314.1107.



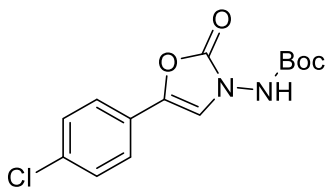
***tert*-Butyl (5-(4,4-dimethylthiochroman-6-yl)-2-oxooxazol-3(2*H*)-yl)carbamate (3g):** The representative procedure was followed using 6-ethynyl-4,4-dimethylthiochromane **1g** (80.8 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 8:1 (v/v)) to afford **3g** (109.9 mg, 73% yield) as a yellow foam. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.37-9.73 (m, 1H, -N*H*CO), 7.78 (s, 1H), 7.53 (d, J = 2.0 Hz, 1H), 7.18 (dd, J = 8.4, 2.0 Hz, 1H), 7.09 (d, J = 8.4 Hz, 1H), 3.12-2.97 (m, 2H), 1.95-1.84 (m, 2H), 1.57-1.33 (m, 9H), 1.29 (s, 6H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.2, 152.7, 142.5, 136.2, 132.0, 126.7, 122.9, 120.7, 120.3, 113.2, 81.3, 36.9, 32.8, 29.8, 27.9, 22.3; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{19}H_{24}N_2NaO_4S^+$ 399.1349, found 399.1344.



***tert*-Butyl (2-oxo-5-phenyloxazol-3(2*H*)-yl)carbamate (3h):** The representative procedure was followed using phenylacetylene **1h** (40.8 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 8:1 to 4:1 petroleum ether/EtOAc (v/v)) to afford **3h** (73.8 mg, 67% yield) as a white solid, m.p. 188.0~188.4 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.50-10.00 (m, 1H, -N*H*CO), 7.84 (s, 1H), 7.53 (d, J = 7.2 Hz, 2H), 7.44 (dd, J = 7.2, 7.2 Hz, 2H), 7.33 (dd, J = 7.2, 7.2 Hz, 1H), 1.57-1.30 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.2, 152.7, 136.0, 129.0, 128.2, 127.0, 122.5, 114.2, 81.3, 27.9; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{14}H_{16}N_2NaO_4$ 299.1002, found 299.1002.

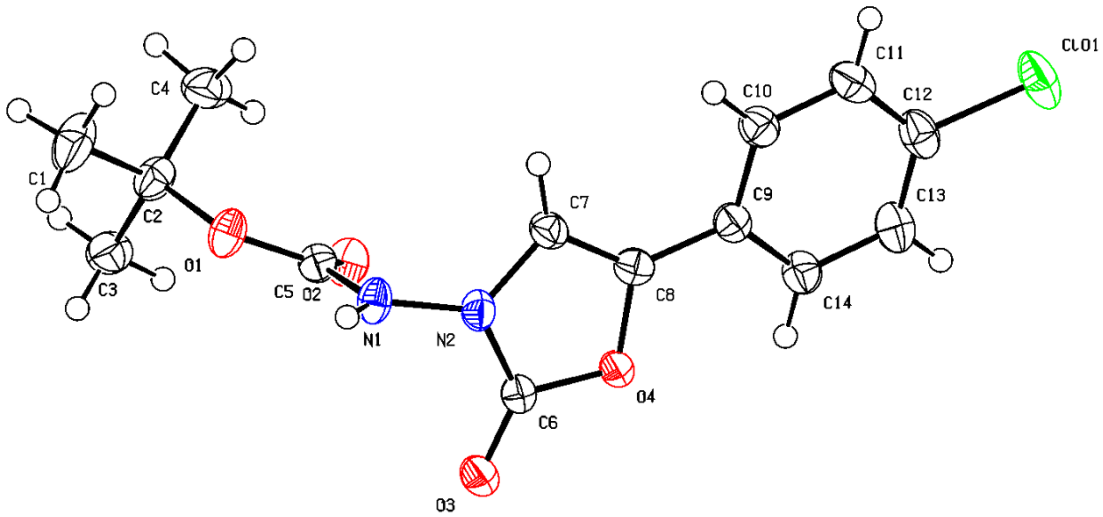


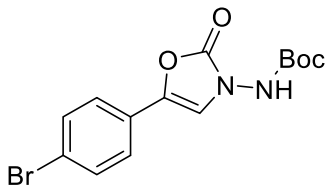
***tert*-Butyl (5-(4-fluorophenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3i):** The representative procedure was followed using 4-fluorophenylacetylene **1i** (48.0 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 6:1 (v/v)) to afford **3i** (84.6 mg, 72% yield) as a white solid, m.p. 162.7~164.3 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.35-9.76 (m, 1H, -N*H*CO), 7.81 (s, 1H), 7.62-7.52 (m, 2H), 7.29 (t, J = 8.8 Hz, 2H), 1.54-1.30 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 161.7 (d, J = 246.6 Hz), 154.2, 152.7, 135.3, 124.8 (d, J = 8.3 Hz), 123.7 (d, J = 3.0 Hz), 116.1 (d, J = 22.0 Hz), 114.0, 81.4, 27.9; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{14}H_{15}FN_2NaO_4^{+}$ 317.0908, found 317.0908.



***tert*-Butyl (5-(4-chlorophenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3j):** The representative procedure was followed using 4-chlorophenylacetylene **1j** (54.6 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 8:1 to 4:1 petroleum ether/EtOAc (v/v)) to afford **3j** (78.2 mg, 63% yield) as a white solid. m.p. 149.1~150.1 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.38-9.75 (m, 1H, -N*H*CO), 7.89 (s, 1H), 7.54 (d, J = 8.4 Hz, 2H), 7.49 (d, J = 8.4 Hz, 2H), 1.56-1.26 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.5, 135.1, 132.5, 129.0, 125.9, 124.2, 114.9, 81.4, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{14}H_{15}ClN_2NaO_4^+$ 333.0613, found 333.0613.

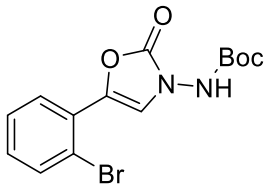
X-Ray structure of 3j (CCDC 2488345)



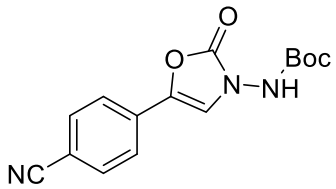


***tert*-Butyl (5-(4-bromophenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3k):** The representative procedure was followed using 4-bromophenylacetylene **1k** (72.4 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 4:1 (v/v)) to afford **3k** (77.5 mg, 55% yield) as a white solid, m.p. 192.6~193.0 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.40-9.74 (m, 1H, -N*H*CO), 7.92 (s, 1H), 7.63 (d, J =

8.4 Hz, 2H), 7.47 (d, J = 8.4 Hz, 2H), 1.56-1.30 (m, 9H); $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6) δ 154.1, 152.5, 135.1, 131.9, 126.2, 124.4, 121.0, 115.0, 81.4, 27.8; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{14}H_{15}BrN_2NaO_4^+$ 377.0107, found 377.0102.

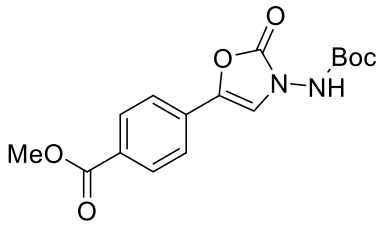


***tert*-Butyl (5-(2-bromophenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3l):** The representative procedure was followed using 2-bromophenylacetylene **1l** (72.4 mg, 0.4 mmol), anhydrous cupric chloride (16.1 mg, 0.12 mmol, 30 mol%), TMEDA (13.9 mg, 0.12 mmol, 30 mol%) and DABCO (2.2 mg, 0.02 mol, 0.05 equiv.). The reaction mixture was stirred vigorously at 30 °C for 6 h, then oil path was heated to 60 °C (this process takes about 10 mins) and stirred for another 12 h. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 6:1 (v/v)) to afford **3l** (89.8 mg, 63% yield) as a white solid, m.p. 149.1~150.1 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.41-9.81 (m, 1H, -N*H*CO), 7.89 (s, 1H), 7.73 (d, J = 8.0 Hz, 1H), 7.62 (d, J = 8.0 Hz, 1H), 7.49 (dd, J = 8.0, 8.0 Hz, 1H), 7.30 (dd, J = 8.0, 8.0 Hz, 1H), 1.57-1.33 (m, 9H); $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6) δ 154.1, 152.1, 134.0, 133.7, 129.9, 128.1, 127.6, 127.0, 118.2, 81.3, 27.9; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{14}H_{15}BrN_2NaO_4^+$ 377.0107, found 377.0105.

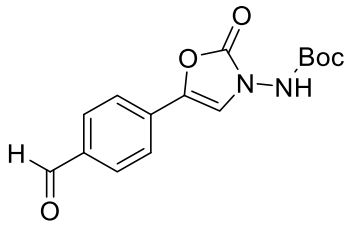


***tert*-Butyl (5-(4-cyanophenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3m):** The representative procedure was followed using 4-ethynylbenzonitrile **1m** (50.9 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 3:1 (v/v)) to afford **3m** (72.3 mg, 60% yield) as a white solid, m.p. 170.5~171.1 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.46-9.87 (m, 1H, -N*H*CO), 8.14 (s, 1H), 7.89 (d, J =

8.4 Hz, 2H), 7.68 (d, *J* = 8.4 Hz, 2H), 1.54-1.29 (m, 9H); $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6) δ 154.1, 152.4, 134.5, 133.0, 131.2, 122.9, 118.6, 117.6, 110.0, 81.6, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{15}H_{15}N_3NaO_4^+$ 324.0955, found 324.0951.

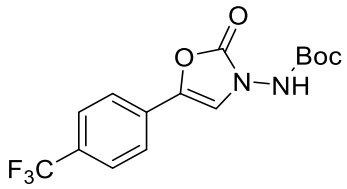


Methyl 4-(3-((*tert*-butoxycarbonyl)amino)-2-oxo-2,3-dihydrooxazol-5-yl)benzoate (3n): The representative procedure was followed using 4-ethynylbenzoate **1n** (64.1 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 1:1 (v/v)) to afford **3n** (85.9 mg, 64% yield) as a white solid, m.p. 258.2~260.2 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.44-9.81 (m, 1H, -N*H*CO), 8.08 (s, 1H), 8.00 (d, *J* = 8.4 Hz, 2H), 7.65 (d, *J* = 8.4 Hz, 2H), 3.85 (s, 3H), 1.57-1.32 (m, 9H); $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6) δ 165.7, 154.1, 152.5, 135.1, 131.2, 129.9, 128.6, 122.5, 116.8, 81.5, 52.2, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{16}H_{18}N_2NaO_6^+$ 357.1057, found 357.1054.

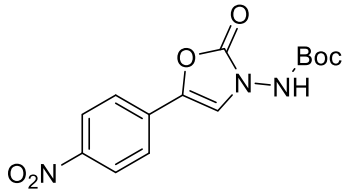


***tert*-Butyl (5-(4-formylphenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3o):** The representative procedure was followed using 4-ethynylbenzaldehyde **1o** (52.1 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 3:1 to 2.5:1 petroleum ether/EtOAc (v/v)) to afford **3o** (59.6 mg, 49% yield) as an orange solid, m.p. 187.5~188.0 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.45-9.88 (m, 1H, -N*H*CO), 9.98 (s, 1H), 8.13 (s, 1H), 7.96 (d, *J* = 8.4 Hz, 2H), 7.73 (d, *J* = 8.4 Hz, 2H), 1.55-1.30 (m, 9H); $^{13}C\{^{1}H\}$

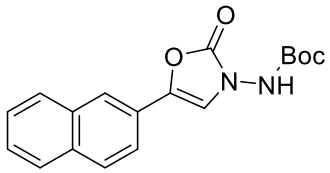
NMR (101 MHz, DMSO-d_6) δ 192.2, 154.1, 152.4, 135.2, 135.0, 132.2, 130.3, 122.8, 117.3, 81.5, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{15}H_{16}N_2NaO_5^+$ 327.0951, found 327.0948.



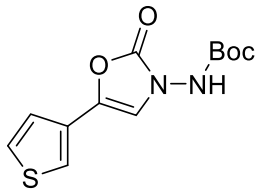
***tert*-Butyl (2-oxo-5-(4-(trifluoromethyl)phenyl)oxazol-3(2*H*)-yl)carbamate (3p):** The representative procedure was followed using 4-(trifluoromethyl)phenylacetylene **1p** (68.0 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 8:1 to 4:1 petroleum ether/EtOAc (v/v)) to afford **3p** (89.4 mg, 65% yield) as a white solid, m.p. 183.0~183.6 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.54-9.85 (m, 1H, -N*H*CO), 8.10 (s, 1H), 7.79 (d, J = 8.4 Hz, 2H), 7.72 (d, J = 8.4 Hz, 2H), 1.56-1.31 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.5, 134.7, 130.8, 128.0 (q, J = 32.0 Hz), 126.0 (q, J = 3.8 Hz), 124.1 (q, J = 273.4 Hz), 123.0, 116.7, 81.5, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{15}H_{15}F_3N_2NaO_4^+$ 367.0876, found 367.0876.



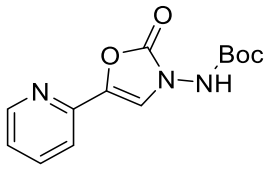
***tert*-Butyl (5-(4-nitrophenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3q):** The representative procedure was followed using 4-nitrophenylacetylene **1q** (58.8 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 3:1 (v/v)) to afford **3q** (65.7 mg, 51% yield) as a yellow solid, m.p. 267.8~268.9 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.53-9.92 (m, 1H, -N*H*CO), 8.28 (d, J = 8.8 Hz, 2H), 8.23 (s, 1H), 7.75 (d, J = 8.8 Hz, 2H), 1.57-1.31 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.3, 146.3, 134.3, 133.0, 124.5, 123.2, 118.4, 81.6, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{14}H_{15}N_3NaO_6^+$ 344.0853, found 344.0853.



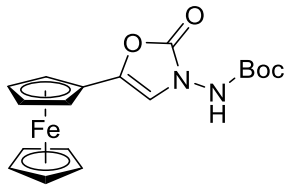
***tert*-Butyl (5-(naphthalen-2-yl)-2-oxooxazol-3(2*H*)-yl)carbamate (3r):** The representative procedure was followed using 2-ethynylnaphthalene **1r** (60.9 mg, 0.4 mmol) as a starting material. Upon completion, the reaction mixture was filtered through a short silica gel pad, and eluted with EtOAc. The combined filtrates were concentrated under reduced pressure. The crude product was then triturated with petroleum ether/EtOAc = 80:5 (v/v) to afford **3r** (77.9 mg, 60% yield) as a white solid, m.p. 204.7~205.4 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.39-9.84 (m, 1H, -N*H*CO), 8.02 (s, 1H), 8.00-7.94 (m, 3H), 7.93-7.88 (m, 1H), 7.68 (dd, J = 8.4, 1.6 Hz, 1H), 7.58-7.48 (m, 2H), 1.57-1.33 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.2, 152.7, 136.2, 132.9, 132.4, 128.7, 128.1, 127.7, 126.9, 126.5, 124.4, 120.9, 120.6, 114.9, 81.4, 27.9; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{18}H_{18}N_2NaO_4^+$ 349.1159, found 349.1154.



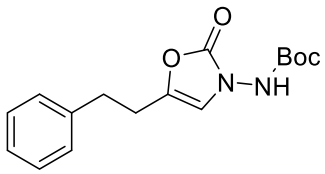
***tert*-Butyl (2-oxo-5-(thiophen-3-yl)oxazol-3(2*H*)-yl)carbamate (3s):** The representative procedure was followed using 3-ethynylthiophene **1s** (43.3 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 5:1 (v/v)) to afford **3s** (87.1 mg, 78% yield) as a white solid, m.p. 170.4~171.7 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.30-9.73 (m, 1H, -N*H*CO), 7.71-7.60 (m, 3H), 7.31 (dd, J = 4.8, 1.2 Hz, 1H), 1.54-1.31 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.2, 152.6, 133.9, 128.14, 128.10, 123.4, 120.1, 113.3, 81.3, 27.9; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{12}H_{14}N_2NaO_4S^+$ 305.0566 found 305.0566.



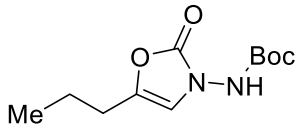
***tert*-Butyl (2-oxo-5-(pyridin-2-yl)oxazol-3(2*H*)-yl)carbamate (3t):** The representative procedure was followed using 2-ethynylpyridine **1t** (41.2 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 2:1 (v/v)) to afford **3t** (51.8 mg, 50% yield) as a slightly yellow solid, m.p. 195.8~196.9 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.36-9.81 (m, 1H, -N*H*CO), 8.57 (d, J = 4.8 Hz, 1H), 7.93 (s, 1H), 7.87 (ddd, J = 7.6, 7.6, 1.6 Hz, 1H), 7.52 (d, J = 7.6 Hz, 1H), 7.32 (ddd, J = 7.6, 4.8, 1.6 Hz, 1H), 1.54-1.27 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.6, 149.8, 145.9, 137.2, 135.8, 123.0, 117.8, 117.2, 81.4, 27.9; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{13}H_{15}N_3NaO_4^+$ 300.0955, found 300.0956.



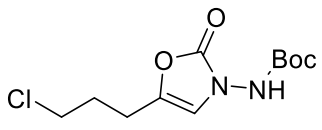
***tert*-Butyl (2-oxo-5-ferrocenyloxazol-3(2*H*)-yl)carbamate (3u):** The representative procedure was followed using ethylnylferrocene **1u** (84.0 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 6:1 to 4:1 petroleum ether/EtOAc (v/v)) to afford **3u** (89.9 mg, 59% yield) as an orange solid, m.p. 201.3~202.0 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.18-9.61 (m, 1H, -N*H*CO), 7.23 (s, 1H), 4.56 (br s, 2H), 4.34 (br s, 2H), 4.16 (br s, 5H), 3.77 (s, 3H), 1.55-1.33 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 153.0, 136.2, 111.6, 81.1, 72.5, 69.3, 68.7, 64.7, 27.8; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{18}H_{20}FeN_2NaO_4^+$ 407.0665, found 407.0669.



***tert*-Butyl (2-oxo-5-phenethyloxazol-3(2*H*)-yl)carbamate (3v):** The representative procedure was followed using but-3-yn-1-ylbenzene **1v** (52.1 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 6:1 to 5:1 petroleum ether/EtOAc (v/v)) to afford **3v** (67.1 mg, 55% yield) as a white solid, m.p. 136.0~137.0 °C. ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 10.04-9.51 (m, 1H, -N*H*CO), 7.34-7.15 (m, 5H), 6.85 (s, 1H), 2.81 (t, *J* = 7.2 Hz, 2H), 2.67 (t, *J* = 7.2 Hz, 2H), 1.51-1.28 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-*d*$_6$) δ 154.1, 153.4, 140.3, 137.5, 128.4, 128.3, 126.2, 113.9, 81.0, 31.8, 27.9, 27.1; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{16}H_{20}N_2NaO_4^+$ 327.1315, found 327.1312.

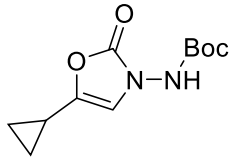


***tert*-Butyl (2-oxo-5-propyloxazol-3(2*H*)-yl)carbamate (3w):** The representative procedure was followed using pent-1-yne **1w** (68.1 mg, 1.0 mmol), DBAD (345.4 mg, 1.5 mmol, 1.5 equiv.), DABCO (5.8 mg, 0.05 mmol, 0.05 equiv.), anhydrous cupric chloride (26.9 mg, 0.2 mmol, 20 mol%), TMEDA (23.2 mg, 0.2 mmol, 20 mol%) in anhydrous MeCN (0.4 mL) and ^{i}PrOH (1.6 mL). The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 6:1 (v/v)) to afford **3w** (116.2 mg, 48% yield) as a white solid, m.p. 95.8~96.7 °C. ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 10.03-9.50 (m, 1H, -N*H*CO), 6.87 (s, 1H), 2.32 (dt, *J* = 7.6, 1.2 Hz, 2H), 1.50 (dq, *J* = 7.6, 7.6 Hz, 2H), 1.46-1.32 (m, 9H), 0.90 (t, *J* = 7.6 Hz, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-*d*$_6$) δ 154.1, 153.5, 138.0, 113.7, 80.9, 27.9, 27.1, 19.3, 13.2; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{11}H_{18}N_2NaO_4^+$ 265.1159, found 265.1155.

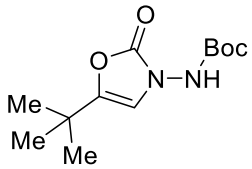


***tert*-Butyl (5-(3-chloropropyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3x):** The representative procedure was followed using 5-chloropent-1-yne **1x** (41.0 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 6:1 (v/v)) to afford **3x** (54.3 mg, 49% yield) as a white solid, m.p. 119.0~120.3 °C. ^{1}H NMR

(400 MHz, DMSO-d_6) δ 10.12-9.55 (m, 1H, -N*H*CO), 6.96 (s, 1H), 3.67 (t, J = 6.4 Hz, 2H), 2.56-2.47 (m, 2H), 1.94 (tt, J = 6.4, 6.4 Hz, 2H), 1.50-1.31 (m, 9H); $^{13}C\{^1H\}$ NMR (101 MHz, DMSO-d_6) δ 154.2, 153.4, 136.9, 114.1, 81.0, 44.3, 29.0, 27.9, 22.7; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{11}H_{17}ClN_2NaO_4^+$ 299.0769, found 299.0770.

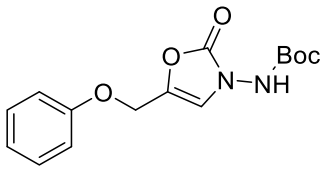


***tert*-Butyl (5-cyclopropyl-2-oxooxazol-3(2*H*)-yl)carbamate (3y):** The representative procedure was followed using cyclopropyl acetylene **1y** (26.4 mg, 0.4 mmol), The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 6:1 (v/v)) to afford **3y** (59.8 mg, 62% yield) as a white solid, m.p. 135.0~136.3 °C. ^1H NMR (400 MHz, DMSO-d_6) δ 10.09-9.50 (m, 1H, -N*H*CO), 6.89 (d, J = 1.2 Hz, 1H), 1.74-1.63 (m, 1H), 1.48-1.31 (m, 9H), 0.86-0.76 (m, 2H), 0.67-0.56 (m, 2H); $^{13}C\{^1H\}$ NMR (101 MHz, DMSO-d_6) δ 154.1, 153.3, 139.7, 112.9, 81.0, 27.9, 6.2, 5.0; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{11}H_{16}N_2NaO_4^+$ 263.1002, found 263.0999.

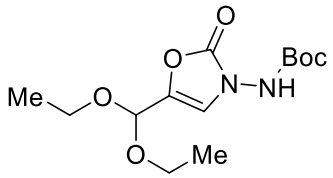


***tert*-Butyl (5-(*tert*-butyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3z):** The representative procedure was followed using 3,3-dimethylbut-1-yne **1z** (82.1 mg, 1.0 mmol), DBAD (345.4 mg, 1.5 mmol, 1.5 equiv.), DABCO (5.8 mg, 0.05 mmol, 0.05 equiv.), anhydrous cupric chloride (26.9 mg, 0.2 mmol, 20 mol%), TMEDA (23.2 mg, 0.2 mmol, 20 mol%) in anhydrous MeCN (0.4 mL) and ^{i}PrOH (1.6 mL). The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 4:1 (v/v)) to afford **3z** (129.6 mg, 51% yield) as a white solid, m.p. 169.7~170.8 °C. ^1H NMR (400 MHz, DMSO-d_6) δ 10.05-9.52 (m, 1H, -N*H*CO), 6.84 (s, 1H), 1.50-1.30 (m, 9H), 1.14 (s, 9H); $^{13}C\{^1H\}$ NMR (101 MHz, DMSO-d_6) δ 154.1,

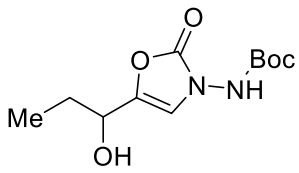
153.4, 145.5, 111.2, 80.9, 30.8, 27.9, 27.2; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{12}H_{20}N_2NaO_4^+$ 279.1315, found 279.1318.



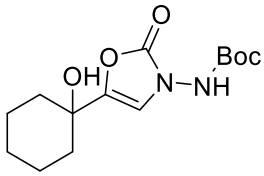
***tert*-Butyl (2-oxo-5-(phenoxymethyl)oxazol-3(2*H*)-yl)carbamate (3aa):** The representative procedure was followed using (prop-2-yn-1-yloxy)benzene **1aa** (52.8 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 3:1 (v/v)) to afford **3aa** (64.9mg, 53% yield) as a white solid, m.p. 120.1~122.6 ºC. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.24-9.65 (m, 1H, -N*H*CO), 7.42 (s, 1H), 7.31 (dd, J = 7.6, 7.6 Hz, 2H), 7.01 (d, J = 7.6 Hz, 2H), 6.97 (dd, J = 7.6, 7.6 Hz, 1H), 4.86 (s, 2H), 1.56-1.24 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 157.6, 154.1, 153.1, 133.2, 129.6, 121.2, 118.9, 114.8, 81.3, 59.9, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{15}H_{18}N_2NaO_5^+$ 329.1108, found 329.1112.



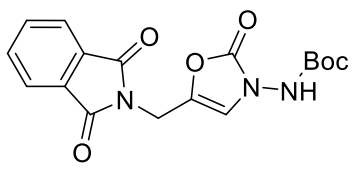
***tert*-Butyl (5-(diethoxymethyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3ab):** The representative procedure was followed using 3,3-diethoxyprop-1-yne **1ab** (51.3 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 6:1 to 4:1 petroleum ether/EtOAc (v/v)) to afford **3ab** (46.4 mg, 38% yield) as a colorless sticky. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.17-9.62 (m, 1H, -N*H*CO), 7.20 (s, 1H), 5.34 (s, 1H), 3.63-3.46 (m, 4H), 1.51-1.31 (m, 9H), 1.14 (t, J = 6.8 Hz, 6H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 153.0, 134.1, 116.8, 94.2, 81.1, 61.3, 27.9, 15.0; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{13}H_{22}N_2NaO_6^+$ 325.1370, found 325.1368.



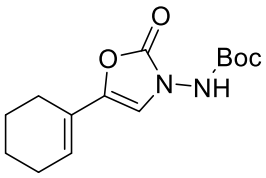
***tert*-Butyl (5-(1-hydroxypropyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3ac):** The representative procedure was followed using pent-1-yn-3-ol **1ac** (33.6 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 1.5:1 (v/v)) to afford (±)-**3ac** (46.3 mg, 45% yield) as a white solid, m.p. 131.7~133.0 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.12-9.53 (m, 1H, -N*H*CO), 7.00 (s, 1H), 5.39 (d, J = 6.0 Hz, 1H, -O*H*), 4.15 (dt, J = 6.0, 6.0 Hz, 1H), 1.69-1.52 (m, 2H), 1.51-1.30 (m, 9H), 0.85 (t, J = 6.0 Hz, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.2, 153.4, 140.0, 114.2, 81.0, 65.6, 27.9, 26.9, 9.8; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{11}H_{18}N_2NaO_5^{+}$ 281.1108, found 281.1107.



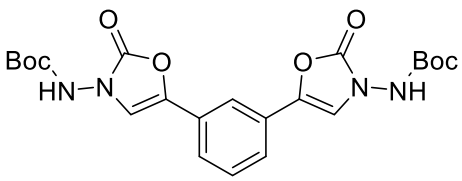
***tert*-Butyl (5-(1-hydroxycyclohexyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3ad):** The representative procedure was followed using 1-ethynylcyclohexan-1-ol **1ad** (49.7 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 2:1 (v/v)) to afford **3ad** (71.8 mg, 61% yield) as a white solid, m.p. 160.6~162.1 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.09-9.57 (m, 1H, -N*H*CO), 6.96 (s, 1H), 5.08 (s, 1H, -O*H*), 1.76-1.19 (m, 19H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 153.3, 143.3, 112.8, 81.0, 67.0, 34.8, 27.9, 25.1, 21.3; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{14}H_{22}N_2NaO_5^{+}$ 321.1421, found 321.1420.



***tert*-Butyl (5-((1,3-dioxoisoindolin-2-yl)methyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3ae):** The representative procedure was followed using N-propargylphthalimide **1ae** (74.1 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 2:1 (v/v)) to afford **3ae** (71.9 mg, 50% yield) as a white solid, m.p. 192.1~193.0 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.20-9.58 (m, 1H, -N*H*CO), 7.98-7.78 (m, 4H), 7.29 (s, 1H), 4.56 (s, 2H), 1.54-1.16 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 167.1, 154.0, 153.0, 134.6, 132.4, 131.5, 123.3, 116.6, 81.1, 32.6, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{17}H_{17}N_3NaO_6^+$ 382.1010, found 382.1008.

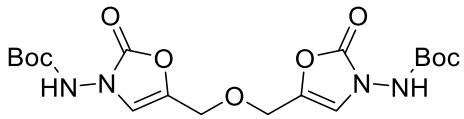


***tert*-Butyl (5-(cyclohex-1-en-1-yl)-2-oxooxazol-3(2*H*)-yl)carbamate (3af):** The representative procedure was followed using 1-ethynylcyclohexene **1af** (106.2 mg, 1.0 mmol), DBAD (345.4 mg, 1.5 mmol, 1.5 equiv.), DABCO (5.8 mg, 0.05 mmol, 0.05 equiv.), anhydrous cupric chloride (26.9 mg, 0.2 mmol, 20mol%), TMEDA (23.2 mg, 0.2 mmol, 20mol%) in anhydrous MeCN (0.4 mL) and ^{i}PrOH (1.6 mL). The crude product was purified by flash chromatography (eluted with a gradient from 8:1 to 6:1 petroleum ether/EtOAc (v/v)) to afford **3af** (167.4 mg, 60% yield) as a white solid, m.p. 146.2~147.1 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.22-9.61 (m, 1H, -N*H*CO), 7.16 (s, 1H), 6.03-5.92 (m, 1H), 2.21-2.08 (m, 2H), 2.08-1.97 (m, 2H), 1.69-1.52 (m, 4H), 1.50-1.30 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.7, 137.3, 123.8, 122.5, 112.5, 81.1, 27.9, 24.4, 22.7, 21.6, 21.4; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{14}H_{20}N_2NaO_4^+$ 303.1315, found 303.1314.

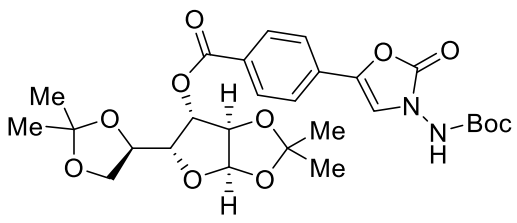


Di-*tert*-butyl (1,3-phenylenebis(2-oxooxazole-5,3(2*H*)-diyl))dicarbamate (3ag): The representative procedure was followed using 1,3-diethynylbenzene **1ag** (50.5 mg, 0.4 mmol),

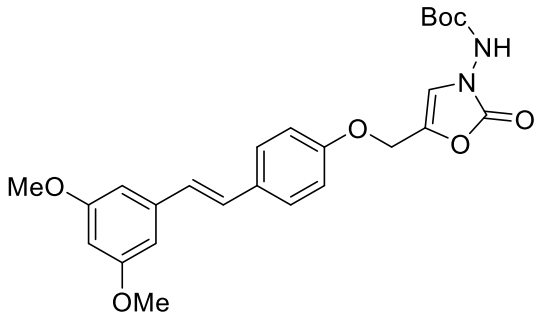
DBAD (276.3 mg, 1.2 mmol, 3.0 equiv.), DABCO (2.2 mg, 0.02 mmol, 0.05 equiv.), anhydrous cupric chloride (10.8 mg, 0.08 mmol, 20 mol%), TMEDA (9.3 mg, 0.08 mmol, 20 mol%) in anhydrous MeCN (0.2 mL) and ^{i}PrOH (0.8 mL). The reaction mixture was stirred vigorously at 30 °C overnight (ca. 15 h), then oil path was heated to 50 °C and stirred for another 6 h. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 1:1 (v/v)) to afford **3ag** (79.7 mg, 42% yield) as a white solid, m.p. >300 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.41-9.78 (m, 2H, -N*H*CO), 7.93 (s, 2H), 7.67 (s, 1H), 7.55-7.44 (m, 3H), 1.57-1.31 (m, 18H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 152.6, 135.4, 129.7, 127.8, 122.0, 116.3, 115.1, 81.4, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{22}H_{26}N_4NaO_8^+$ 497.1643, found 497.1640.



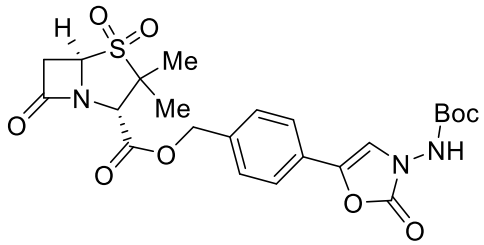
Di-*tert*-butyl ((oxybis(methylene))bis(2-oxooxazole-5,3(2*H*)-diyl))dicarbamate (3ah): The representative procedure was followed using dipropargyl ether **1ah** (37.6 mg, 0.4 mmol), DBAD (276.3 mg, 1.2 mmol, 3.0 equiv.), DABCO (2.2 mg, 0.02 mmol, 0.05 equiv.), anhydrous cupric chloride (10.8 mg, 0.08 mmol, 20 mol%), TMEDA (9.3 mg, 0.08 mmol, 20 mol%) in anhydrous MeCN (0.2 mL) and ^{i}PrOH (0.8 mL). The reaction mixture was stirred vigorously at 30 °C overnight (ca. 15 h), then oil path was heated to 50 °C and stirred for another 6 h. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 1:1 (v/v)) to afford **3ah** (68.5 mg, 39% yield) as a white solid, m.p. 156.0-156.9 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.23-9.59 (m, 2H, -N*H*CO), 7.32 (s, 2H), 4.22 (s, 4H), 1.57-1.28 (m, 18H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.1, 153.2, 133.7, 118.4, 81.2, 61.2, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{18}H_{26}N_4NaO_9^+$ 465.1592, found 465.1591.



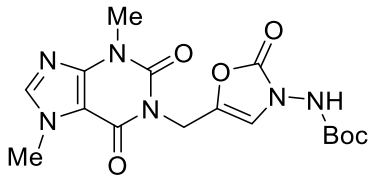
Glucofuranose-derivatived oxazol-2-one (**3aj**): The representative procedure was followed using glucofuranose-derivatived terminal alkyne **1aj** (155.4 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with a gradient from 3:1 to 2:1 petroleum ether/EtOAc (v/v)) to afford **3aj** (145.7 mg, 65% yield) as a white foam. ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 10.47-9.84 (m, 1H, -N*H*CO), 8.11 (s, 1H), 8.01 (d, *J* = 8.4 Hz, 2H), 7.68 (d, *J* = 8.4 Hz, 2H), 5.99 (d, *J* = 4.0 Hz, 1H), 5.26 (d, *J* = 2.8 Hz, 1H), 4.71 (d, *J* = 4.0 Hz, 1H), 4.38 (ddd, *J* = 7.2, 6.0, 5.2 Hz, 1H), 4.24 (dd, *J* = 7.2, 2.8 Hz, 1H), 4.06 (dd, *J* = 8.4, 6.0 Hz, 1H), 3.95 (dd, *J* = 8.4, 5.2 Hz, 1H), 1.56-1.36 (m, 12H), 1.33 (s, 3H), 1.26 (s, 3H), 1.20 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-*d*$_6$) δ 164.2, 154.1, 152.4, 134.9, 131.7, 130.1, 128.0, 122.6, 117.0, 111.4, 108.5, 104.7, 82.6, 81.5, 79.1, 76.4, 72.1, 66.3, 27.8, 26.6, 26.4, 25.9, 25.0; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{27}H_{34}N_2NaO_{11}^{+}$ 585.2055, found 585.2056.



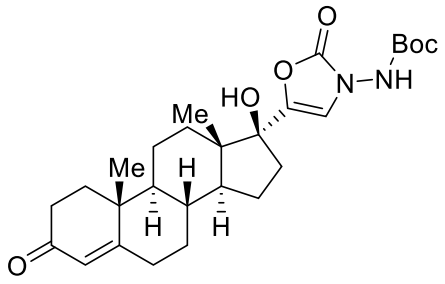
Pterostilbene-derivatived N-aminooxazol-2-one (3ak): The representative procedure was followed using pterostilbene-derivatived alkyne **1ak** (117.8 mg, 0.4 mmol) as a starting material. The reaction mixture was stirred vigorously at 30 °C overnight (ca. 15 h), then oil path was heated to 50 °C (this process takes about 10 mins) and stirred for another 6 h. The crude product was purified by flash chromatography (eluted with a gradient from 3:1 to 2:1 petroleum ether/EtOAc (v/v)) to afford **3ak** (104.8 mg, 56% yield) as a white solid, m.p. 135.4~137.5 °C. ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 10.23-9.60 (m, 1H, -N*H*CO), 7.55 (d, *J* = 8.0 Hz, 2H), 7.44 (s, 1H), 7.23 (d, *J* = 16.4 Hz, 1H), 7.05 (d, *J* = 16.4 Hz, 1H), 7.03 (d, *J* = 8.0 Hz, 2H), 6.75 (d, *J* = 2.4 Hz, 2H), 6.40 (dd, *J* = 2.4, 2.4 Hz, 1H), 4.89 (s, 2H), 3.77 (s, 6H), 1.52-1.28 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-*d*$_6$) δ 160.6, 157.3, 154.1, 153.1, 139.4, 133.1, 130.3, 128.4, 127.8, 126.6, 119.0, 115.1, 104.2, 99.5, 81.3, 60.0, 55.2, 27.8; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{25}H_{28}N_2NaO_7^{+}$ 491.1789, found 491.1787.



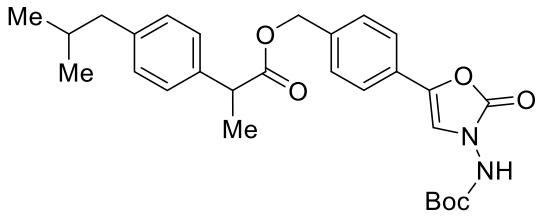
Sulbactam-derivatived *N*-aminooxazol-2-one (3al): The representative procedure was followed using sulbactam-derivatived terminal alkyne **1al** (139.0 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 1.5:1 (v/v)) to afford **3al** (104.4 mg, 50% yield) as a white solid. m.p 191.9~193.5 ºC. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.37-9.78 (m, 1H, -N*H*CO), 7.88 (s, 1H), 7.56 (d, J = 8.0 Hz, 2H), 7.50 (d, J = 8.0 Hz, 2H), 5.28 (d, J = 12.4 Hz, 1H), 5.22 (d, J = 12.4 Hz, 1H), 5.19 (d, J = 4.8 Hz, 1H), 4.53 (s, 1H), 3.68 (dd, J = 16.4, 4.8 Hz, 1H), 3.26 (d, J = 16.4 Hz, 1H), 1.56-1.24 (m, 15H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 172.1, 166.7, 154.1, 152.6, 135.7, 134.9, 129.3, 127.1, 122.6, 114.7, 81.4, 67.0, 62.3, 62.2, 60.4, 37.3, 27.8, 19.5, 17.7; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{23}H_{27}N_3NaO_9S^{+}$ 544.1360, found 544.1357.



Theobromine-derivatived N-aminooxazol-2-one (3am): The representative procedure was followed using theobromine-derivatived alkyne **1am** (87.3 mg, 0.4 mmol) as a starting material. The reaction mixture was stirred vigorously at 30 ºC overnight (ca. 15 h), then oil path was heated to 50 ºC and stirred for another 3 h. The crude product was purified by flash chromatography (eluted with EtOAc) to afford **3am** (44.5 mg, 31% yield) as a white foam. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.17-9.53 (m, 1H, -N*H*CO), 8.05 (s, 1H), 7.13 (s, 1H), 4.82 (s, 2H), 3.89 (s, 3H), 3.42 (s, 3H), 1.62-1.27 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 154.0, 153.8, 152.9, 150.5, 148.6, 143.2, 133.3, 116.6, 106.5, 81.1, 35.3, 33.2, 29.5, 27.8; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{16}H_{20}N_6NaO_6^{+}$ 415.1337, found 415.1335.

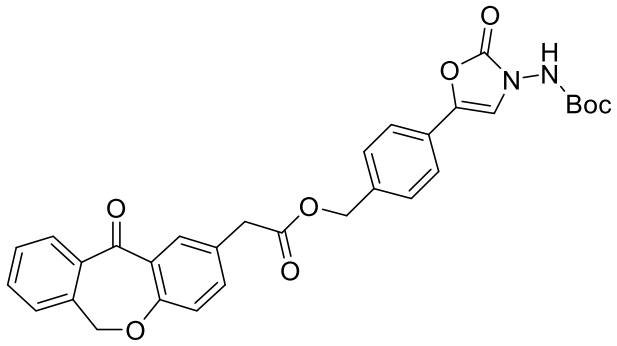


Ethisterone-derivatived N-aminooxazol-2-one (3an): The representative procedure was followed using ethisterone-derivatived terminal alkyne **1an** (125.0 mg, 0.4 mmol) as a starting material in anhydrous MeCN (0.4 mL) and ^{i}PrOH (1.6 mL). The reaction mixture was stirred vigorously at 30 ºC for 6 h, then oil path was heated to 60 ºC and stirred for another 16 h. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 1:1 (v/v)) to afford **3an** (27.4 mg, 14% yield) as a white foam, along with recovery of the starting material (83.9 mg, 43% brsm). ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 10.05-9.56 (m, 1H, -N*H*CO), 7.00 (s, 1H), 5.61 (s, 1H), 5.39-5.26 (m, 1H, -O*H*), 2.46-2.30 (m, 2H), 2.29-2.19 (m, 1H), 2.18-2.06 (m, 1H), 2.02-1.88 (m, 2H), 1.88-1.73 (m, 2H), 1.72-1.08 (m, 21H), 0.95-0.68 (m, 5H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-*d*$_6$) δ 198.0, 170.8, 154.1, 153.4, 141.9, 123.1, 114.9, 80.9, 80.2, 53.0, 48.9, 46.7, 38.2, 35.5, 35.4, 35.0, 33.6, 33.1, 32.0, 31.5, 27.9, 23.1, 20.3, 16.9, 13.8; HRMS (ESI) m/z: [M + Na]$^{+}$ Calcd for $C_{27}H_{38}N_2NaO_6^{+}$ 509.2622, found 509.2617.

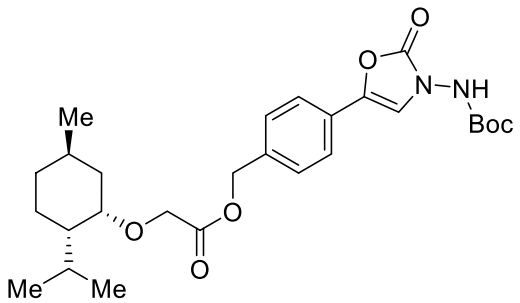


Ibuprofen-derivatived N-aminooxazol-2-one (3ao): The representative procedure was followed using (±)-ibuprofen derivatived alkyne **1ao** (128.2 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 4:1 (v/v)) to afford (±)-**3ao** (153.2 mg, 78% yield) as a white solid, m.p. 139.7~141.8 ºC. ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 10.37-9.78 (m, 1H, -N*H*CO), 7.83 (s, 1H), 7.45 (d, *J* = 8.4 Hz, 2H), 7.27 (d, *J* = 8.4 Hz, 2H), 7.18 (d, *J* = 8.4 Hz, 2H), 7.09 (d, *J* = 8.4 Hz, 2H), 5.11 (d, *J* = 13.2 Hz, 1H), 5.07 (d, *J* = 13.2 Hz, 1H), 3.82 (q, *J* = 7.2 Hz, 1H), 2.40 (d, *J* = 6.8 Hz, 2H), 1.87-1.70 (m, 1H), 1.53-1.32 (m, 12H), 0.84 (d, *J* = 6.8 Hz, 6H); ^{13}C{^{1}H} NMR

(101 MHz, DMSO-d_6) δ 173.7, 154.1, 152.6, 139.9, 137.7, 136.1, 135.8, 129.1, 128.1, 127.1, 126.6, 122.4, 114.4, 81.3, 65.1, 44.2, 44.1, 29.6, 27.8, 22.1, 18.3; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{28}H_{34}N_2NaO_6^+$ 517.2309, found 517.2306.



Isoxepac-derivatived N-aminooxazol-2-one (3ap): The representative procedure was followed using isoxepac-derivatived terminal alkyne **1ap** (153.0 mg, 0.4 mmol) as a starting material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 3:1 (v/v)) to afford **3ap** (140.8 mg, 63% yield) as a white foam. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.34-9.72 (m, 1H, -N*H*CO), 8.02 (d, *J* = 2.4 Hz, 1H), 7.85 (s, 1H), 7.77 (dd, *J* = 7.6, 1.6 Hz, 2H), 7.65 (ddd, *J* = 7.6, 7.6, 1.6 Hz, 2H), 7.59-7.47 (m, 5H), 7.41 (d, *J* = 7.6 Hz, 2H), 7.07 (d, *J* = 7.6 Hz, 1H), 5.29 (s, 2H), 5.13 (s, 2H), 3.82 (s, 2H), 1.54-1.32 (m, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 190.1, 171.0, 159.8, 154.1, 152.6, 139.9, 136.9, 136.0, 135.81, 135.77, 133.0, 131.9, 129.2, 128.7, 128.5, 128.3, 128.0, 126.7, 124.5, 122.5, 120.7, 114.4, 81.3, 72.7, 65.4, 39.0, 27.8; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{31}H_{28}N_2NaO_8^+$ 579.1738, found 579.1737.

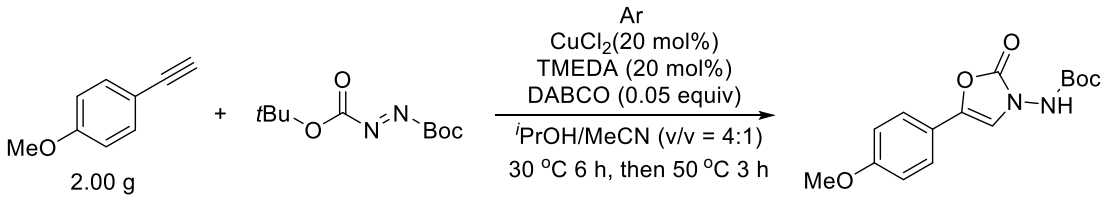


(-)-Menthol-derivatived N-aminooxazol-2-one (3aq): The representative procedure was followed using (-)-menthol-derivatived terminal alkyne **1aq** (131.4 mg, 0.4 mmol) as a starting

material. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 4:1 (v/v)) to afford **3aq** (146.5 mg, 73% yield) as a white solid, m.p. 141.4~143.2 ºC. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.33-9.76 (m, 1H, -N*H*CO), 7.86 (s, 1H), 7.53 (d, *J* = 8.0 Hz, 2H), 7.43 (d, *J* = 8.0 Hz, 2H), 5.14 (s, 2H), 4.20 (d, *J* = 16.4 Hz, 1H), 4.15 (d, *J* = 16.4 Hz, 1H), 3.19-3.09 (m, 1H), 2.29-2.16 (m, 1H), 2.12-2.00 (m, 1H), 1.64-1.21 (m, 12H), 1.20-1.09 (m, 1H), 0.98-0.65 (m, 12H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 170.4, 154.1, 152.6, 135.8, 135.7, 128.7, 126.8, 122.5, 114.5, 81.3, 79.0, 65.3, 65.1, 47.8, 34.0, 30.8, 27.8, 25.0, 22.9, 22.2, 20.8, 16.3; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{27}H_{38}N_2NaO_7^+$ 525.2571, found 525.2569.

VI. Synthetic applications

a. Gram-scale azodicarboxylate-alkyne (3+2) cycloaddition procedure:



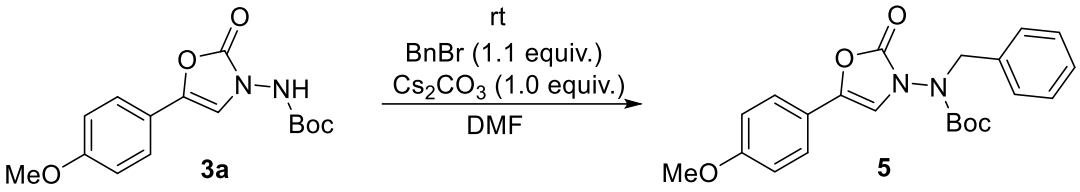
In a 100 mL three-necked flask, DBAD (5.23 g, 22.7 mmol, 1.5 equiv.), DABCO (84.6 mg, 0.76 mmol, 0.05 equiv.), anhydrous cupric chloride (406.0 mg, 3.0 mmol, 20 mol%), were added successively. A reflux condenser was attached, then the flask was evacuated and backfilled with argon (this process was repeated for 3 times). Anhydrous MeCN (8.0 mL), 4-ethynylanisole (**1a**, 2.00 g, 15.1 mmol, 1.0 equiv.), TMEDA (350.3 mg, 3.0 mmol, 20 mol%), and anhydrous ^{i}PrOH (32.0 mL) were added under argon atmosphere. The reaction mixture was stirred at ambient temperature for 1 minute, then submerged to pre-heated oil bath at 30°C and stirred for 6 hours. Subsequently, the temperature of the oil bath was raised to 50°C (this process takes about 10 mins) and the reaction was continued for an additional 3 hours, then:

(a) Purification procedures utilizing column chromatography: Once the reaction mixture was cooled to ambient temperature, 30 mL of ethyl acetate was introduced, followed by the addition of 40 mL of $NaHCO_3$ saturated aqueous solution. The organic phase was subsequently extracted with ethyl acetate (3 × 30 mL). The combined organic layer was washed with brine (30 mL), dried over Na_2SO_4, filtered, and concentrated. The crude product was purified by flash chromatography (eluted with a gradient from 5:1 to 2:1 petroleum ether/EtOAc (v/v)) to afford the **3a** (3.26 g, 70%) as a white solid.

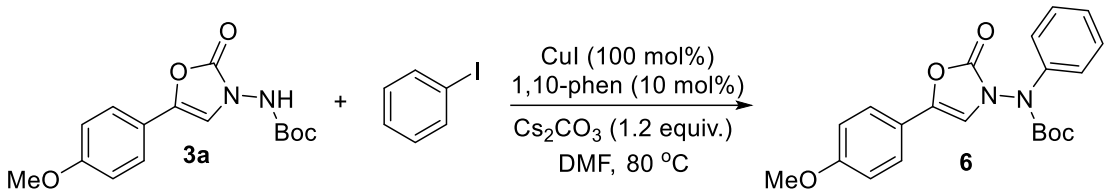
(b) Purification procedures employing trituration: Upon cooling the reaction mixture to ambient temperature, the majority of the solvent was removed under reduced pressure using a rotary evaporator. The resulting residue was subsequently diluted with ethyl acetate (20 mL). Silica gel (200-300 mesh) was carefully packed into a sintered glass funnel, which was connected to a vacuum filtration apparatus. The reaction mixture was carefully filtered through the silica gel under vacuum conditions. The combined filtrates were concentrated under reduced

pressure to obtain a crude product. This crude material was suspended in 20 mL of ethyl acetate and transferred into a 500 mL conical flask equipped with a magnetic stir bar. During stirring, 250 mL of petroleum ether was added dropwise over 2–3 minutes. After addition, the mixture was allowed to stand undisturbed for 5 minutes to facilitate complete precipitation. The resulting solid was collected *via* vacuum filtration and dried under vacuum to yield a white solid of **3a** (3.20 g, 69%).

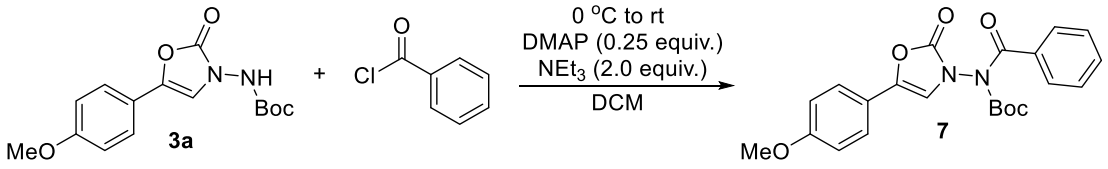
b. N-functionalizations:



***tert*-Butyl benzyl(5-(4-methoxyphenyl)-2-oxooxazol-3(2*H*)-yl)carbamate** (**5**): In a 15 mL oven-dried resealable screw-cap test tube, a mixture of **3a** (91.9 mg, 0.3 mmol, 1.0 equiv.) and cesium carbonate (97.5 mg, 0.3 mmol, 1.0 equiv.) in anhydrous MeCN (1.0 mL) was prepared. To this mixture, benzyl bromide (56.4 mg, 0.33 mmol, 1.1 equiv.) was added dropwise. The reaction mixture was stirred for 12 h at room temperature. The reaction was diluted with water (10 mL) and extracted with ethyl acetate (3 ×10 mL). The combined organic phases were washed with brine (3×10 mL), dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude material was purified by flash chromatography (eluted with petroleum ether/EtOAc = 8:1 (v/v)) to afford **5** (112.4 mg, 95% yield) as a white solid, m.p. 107.0~108.0 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.50 (s, 1H), 7.45-7.26 (m, 7H), 6.98 (d, J = 8.8 Hz, 2H), 4.90 (d, J = 14.8 Hz, 1H), 4.62 (d, J = 14.8 Hz, 1H), 3.76 (s, 3H), 1.40 (s, 9H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 159.2, 153.2, 152.0, 136.5, 135.7, 128.5, 128.3, 127.8, 124.2, 119.4, 114.4, 111.2, 82.4, 55.2, 52.6, 27.6; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{22}H_{24}N_2NaO_5^+$ 419.1577, found 419.1577.

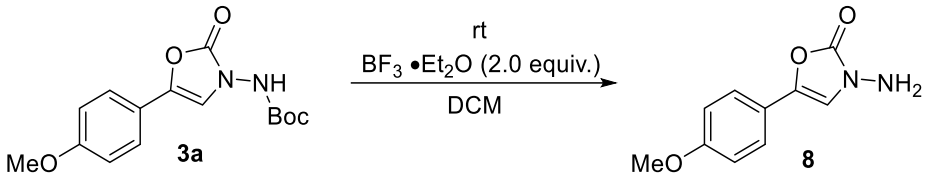


***tert*-Butyl (5-(4-methoxyphenyl)-2-oxooxazol-3(2*H*)-yl)(phenyl)carbamate (6):** Compound **6** was synthesized in accordance with a documented protocol, with some modifications.[6] In a 15 mL oven-dried resealable screw-cap test tube, CuI (57.0 mg, 0.3 mmol, 100 mol%), 1,10-phenanthroline (5.4 mg, 0.03 mmol, 10 mol%), **3a** (91.8 mg, 0.3 mmol, 1.0 equiv.) and Cs_2CO_3 (117.4 mg, 0.36 mmol, 1.2 equiv.) were added. The tube was evacuated and backfilled with argon. Anhydrous DMF (3.0 mL) and iodobenzene (61.2 mg, 0.33 mmol, 1.1 equiv.) were added via syringe. The tube was sealed and stirred at 80 ºC for 30 h. The reaction mixture was cooled to room temperature, diluted with water (6 mL) and extracted with ethyl acetate (3 × 10 mL). The combined organic phases were washed with brine (3 × 10 mL), dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude material was purified by flash chromatography (eluted with petroleum ether/EtOAc = 6:1 (v/v)) to afford **6** (59.1 mg, 52% yield) as a slightly orange solid. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.96 (s, 1H), 7.53-7.40 (m, 6H), 7.36-7.27 (m, 1H), 7.02 (d, J = 9.2 Hz, 2H), 3.78 (s, 3H), 1.42 (s, 9H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 159.4, 152.4, 151.4, 139.8, 137.2, 129.1, 127.1, 124.4, 124.1, 119.3, 114.5, 111.0, 83.3, 55.2, 27.5; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{21}H_{22}N_2NaO_5^+$ 405.1421, found 405.1422.



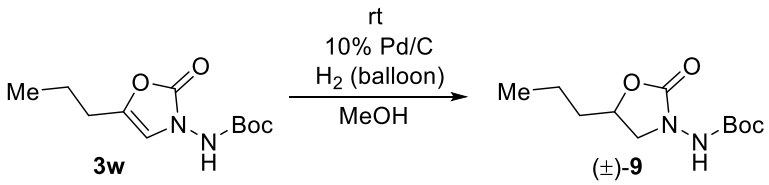
***tert*-Butyl benzoyl(5-(4-methoxyphenyl)-2-oxooxazol-3(2*H*)-yl)carbamate (7):** In an 15 mL oven-dried resealable screw-cap test tube, **3a** (91.9 mg, 0.3 mmol) and DMAP (9.2 mg, 0.075 mmol, 0.25 equiv.) were dissolved DCM (1.5 mL). Et_3N (60.7 mg, 0.6 mmol, 2.0 equiv.) was added, and the mixture cooled to 0 °C. Benzoyl chloride (46.4 mg, 0.33 mmol, 1.1 equiv.) was added dropwise at 0 °C, then stirred at room temperature for 1 h. The reaction was quenched with saturated NH_4Cl (4 mL), extracted with DCM (3 × 10 mL), dried over Na_2SO_4, filtered,

and concentrated. The crude product was purified by flash chromatography (eluted with petroleum ether/EtOAc = 6:1 (v/v)) to yield compound **7** (78.8 mg, 64% yield) as a white solid, m.p. 167.6~169.0 °C ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.97 (s, 1H), 7.73 (d, J = 7.2 Hz, 2H), 7.68 (dd, J = 7.2, 7.2 Hz, 1H), 7.58 (dd, J = 7.2, 7.2 Hz, 2H), 7.49 (d, J = 8.8 Hz, 2H), 7.05 (d, J = 8.8 Hz, 1H), 3.80 (s, 3H), 1.19 (s, 9H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 168.9, 159.5, 151.9, 149.2, 137.5, 134.0, 132.7, 128.6, 128.0, 124.4, 119.1, 114.6, 110.9, 85.9, 55.3, 26.8; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{22}H_{22}N_2NaO_6^+$ 433.1370, found 433.1368.



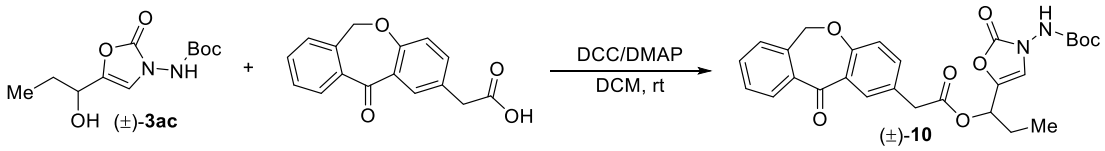
3-Amino-5-(4-methoxyphenyl)oxazol-2(3*H*)-one (8): In a 15 mL oven-dried resealable screw-cap test tube were added **3a** (91.8 mg, 0.3 mmol) and DCM (1.5 mL). $BF_3 \cdot Et_2O$ (85.2 mg, 0.6 mmol, 2.0 equiv.) was added to the tube *via* syringe. The mixture was stirred at room temperature for 10 min. The reaction was quenched by addition of saturated aq. $NaHCO_3$ (4 mL) at 0 °C. After quenching the reaction, the mixture was allowed to warm to room temperature and was extracted with DCM (10 mL × 4). The organic layer was dried over anhydrous Na_2SO_4, filtered, and concentrated. The crude material was purified by trituration with petroleum ether/EtOAc = 40:1 (v/v) to afford the desired compound **8** (44.9 mg, 73% yield) as a slightly yellow solid, m.p. 198.2~199.6 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.46 (s, 1H), 7.44 (d, J = 8.8 Hz, 2H), 6.97 (d, J = 8.8 Hz, 2H), 5.48 (s, 2H, -NH_2), 3.76 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 158.7, 154.2, 134.8, 123.8, 120.3, 114.4, 113.4, 55.2; HRMS (ESI) m/z: [M + Na]$^+$ Calcd for $C_{10}H_{10}N_2NaO_3^+$ 229.0584, found 229.0582.

c. Hydrogenation of N-aminooxazol-2-one



***tert*-Butyl (2-oxo-5-propyloxazolidin-3-yl)carbamate (9):** In a 10 mL round bottom flask were added **3w** (60.0 mg, 0.2 mmol) and 10% Pd/C (6.0 mg, 10wt%) were combined. The flask was evacuated and backfilled with hydrogen (this sequence was repeated a total of three times). CH_3OH (1.0 mL) was added to the tube *via* syringe. The reaction mixture was stirred at room temerature for 24 h. After completion, the reaction mixture was filtered through a pad of Celite to remove the catalyst. The filtrate was concentrated under reduced pressure, and the crude residue was purified by flash chromatography (eluted with petroleum ether/EtOAc = 5:1 (v/v)) to afford the corresponding product (±)-**9** (51.6 mg, 86% yield) as a white solid, m.p. 130.1~131.4 ºC. ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.44-8.81 (m, 1H, -N*H*CO), 4.61-4.47 (m, 1H), 3.70 (dd, J = 8.0, 8.0 Hz, 1H), 3.29 (dd, J = 8.0, 8.0 Hz, 1H), 1.72-1.53 (m, 2H), 1.52-1.21 (m, 11H), 0.91 (t, J = 7.2 Hz, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 156.8, 154.1, 80.2, 72.7, 50.8, 36.1, 28.0, 17.3, 13.6; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{11}H_{20}N_2NaO_4^+$ 267.1315, found 267.1316.

d. Esterification reaction of 3ac with Isoxepac

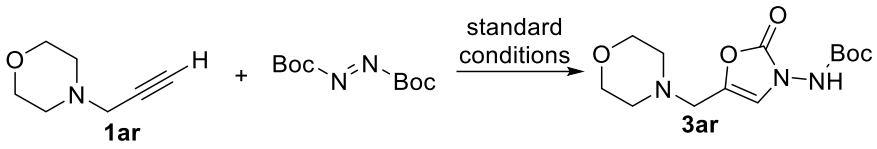


1-(3-((*tert*-butoxycarbonyl)amino)-2-oxo-2,3-dihydrooxazol-5-yl)propyl 2-(11-oxo-6,11-dihydrodibenzo[b,e]oxepin-2-yl)acetate (10): In a 10 mL round-bottom flask were combined (±)-**3ac** (155.0 mg, 0.6 mmol, 1.0 equiv.), isoxepac (161.0 mg, 0.6 mmol, 1.0 equiv.), DCC (185.7 mg, 0.9 mmol, 1.5 equiv.), and DMAP (7.3 mg, 0.06 mmol, 0.1 equiv.). The flask was evacuated and backfilled with argon (three cycles). Anhydrous DCM (3.0 mL) was then added *via* syringe. The reaction mixture was stirred at room temperature for 16 h. The resulting byproduct DCU was removed by filtration through a short pad of Celite. The filtrate was concentrated under reduced pressure. The crude material was purified by flash column chromatography (eluting with petroleum ether/EtOAc = 2:1 (v/v)) to afford compound (±)-**10** (126.0 mg, 42% yield) as a white foam. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.21-9.66 (m, 1H, -N*H*CO), 8.08-7.96 (m, 1H), 7.77 (d, J = 8.0 Hz, 1H), 7.66 (dd, J = 8.0, 8.0 Hz, 1H), 7.61-

7.44 (m, 3H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.37 (s, 1H), 7.07 (d, *J* = 8.0 Hz, 1H), 5.50 (t, *J* = 7.2 Hz, 1H), 5.29 (s, 2H), 3.80 (s, 2H), 1.90-1.69 (m, 2H), 1.52-1.26 (m, 9H), 0.83 (t, *J* = 7.2 Hz, 3H); $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6) δ 190.1, 170.5, 159.9, 154.1, 152.9, 139.9, 136.8, 135.9, 134.6, 133.1, 131.9, 129.2, 128.8, 128.3, 127.9, 124.5, 120.7, 117.6, 81.2, 72.7, 68.1, 38.8, 27.8, 23.9, 9.4; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{27}H_{28}N_2NaO_8^+$ 531.1738, found 531.1734.

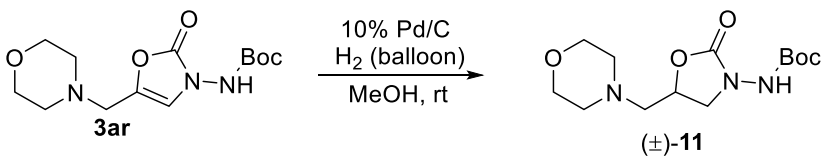
e. Consise synthesis of Furaltadone

Step 1:



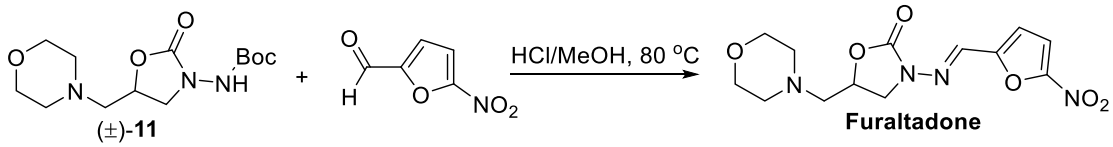
***tert*-Butyl (5-(morpholinomethyl)-2-oxooxazol-3(2*H*)-yl)carbamate (3ar):** The general procedure for preparing N-aminooxazol-2-one was followed using N-propargyl morpholine **1ar** (125.2 mg, 1.0 mmol), DBAD (345.4 mg, 1.5 mmol, 1.5 equiv.), DABCO (5.8 mg, 0.05 mmol, 0.05 equiv.), anhydrous cupric chloride (26.9 mg, 0.2 mmol, 20 mol%), TMEDA (23.2 mg, 0.2 mmol, 20 mol%) in anhydrous MeCN (0.4 mL) and ^{i}PrOH (1.6 mL). The crude product was purified by flash chromatography (eluted with EtOAc) to afford **3ar** (161.6 mg, 44% yield) as a white solid, m.p. 146.8~147.9 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.11-9.57 (m, 1H, -N*H*CO), 7.12 (s, 1H), 3.65-3.50 (m, 4H), 3.26 (s, 2H), 2.44-2.29 (m, 4H), 1.51-1.29 (m, 9H); $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6) δ 154.1, 153.4, 133.9, 117.2, 81.1, 66.1, 52.5, 52.3, 27.9; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{13}H_{21}N_3NaO_5^+$ 322.1373, found 322.1375.

Step 2:



***tert*-butyl (5-(morpholinomethyl)-2-oxooxazolidin-3-yl)carbamate (11):** In a 10 mL round-bottom flask, **3ar** (90.0 mg, 0.3 mmol) and 10% Pd/C (9.0 mg, 10wt%) were combined. The flask was evacuated and backfilled with hydrogen (this process was repeated three times). CH_3OH (1.5 mL) was then added via syringe. The reaction mixture was stirred under a H_2 atmosphere at room temperature for 16 h. After completion, the reaction mixture was filtered through a pad of Celite to remove the catalyst. The filtrate was concentrated under reduced pressure, and the crude residue was purified by flash column chromatography (eluting with ethyl acetate) to afford product (±)-**11** (33.0 mg, 36% yield) as a white solid. m.p. 143.7~145.3 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.86 (br s, 1H, -N*H*CO), 4.73-4.55 (m, 1H), 3.81-3.70 (m, 1H), 3.69-3.58 (m, 4H), 3.58-3.37 (m, 1H), 2.77-2.63 (m, 1H), 2.63-2.37 (m, 5H), 1.42 (s, 9H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 154.2, 152.7, 136.0, 129.0, 128.2, 127.0, 122.5, 114.2, 81.3, 27.9; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{13}H_{23}N_3NaO_5^+$ 324.1530, found 324.1534.

Step 3:

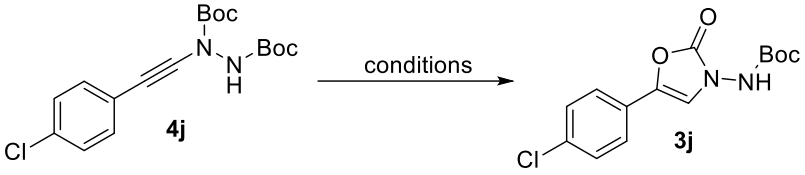


Fulratadone: In an oven-dried resealable screw-cap test tube, (±)-**11** (20.7 mg, 0.07 mmol, 1 equiv.) and 5-nitrofurfural (14.1 mg, 0.1 mmol, 1.5 equiv.) were added. The tube was evacuated and backfilled with argon (this sequence was repeated a total of three times). Under an argon atmosphere, anhydrous CH_3OH (0.5 mL) and a 4.0 M solution of HCl in dioxane (35 μL, 0.14 mmol, 2.0 equiv.) were added *via* syringe. The reaction mixutre was stirred at 80 °C for 30 min. The reaction mixture was cooled to room temperature, then quenched with saturated aq. $NaHCO_3$ (3 mL) and washed with EtOAc (3 × 10 mL). The combined organic phases were washed with brine (3 × 10 mL), dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude material was purified by flash chromatography (eluted with a gradient from 80:1 to 40:1 DCM/MeOH (v/v)) to afford Fulratadone (19.0 mg, 85% yield) as a yellow solid, m.p. 206.2~208.7 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.85 (s, 1H), 7.80 (d, J = 4.0 Hz, 1H), 7.15 (d, J = 4.0 Hz, 1H), 5.02-4.88 (m, 1H), 4.04 (t, J = 8.8 Hz, 1H), 3.71-3.62 (m, 1H), 3.62-3.48

(m, 4H), 2.74-2.60 (m, 2H), 2.55-2.40 (m, 4H); $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6) δ 152.8, 151.8, 132.0, 114.9, 114.7, 71.3, 66.2, 60.7, 53.7, 45.9; HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{13}H_{16}N_4NaO_6^+$ 347.0962, found 347.0958. As shown in the spectra section, the NMR data are consistent with those of the commercial reference material (Adamas, ≥98% HPLC), m.p. 208.1~210.7 ºC.

VII. Mechanistic studies

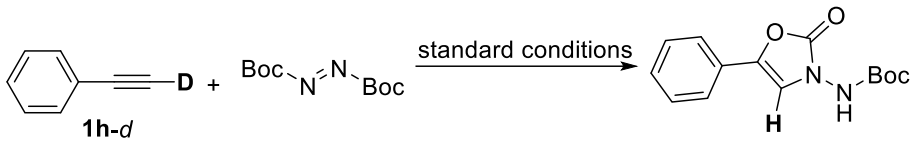
a. Control experiments on ynehydrazide annulation reaction



conditions	NMR yield
cat. $CuCl_2$/TMEDA/DABCO, 50 °C 6 h	91%
$CuCl_2$(5 mol%), ^{i}PrOH, 30 °C 6 h	94%
w/o $CuCl_2$, ^{i}PrOH, 30 °C 6 h	0%

In a resealable screw-cap test tube, DABCO (2.2 mg, 0.08 mmol, 0.05 equiv.), anhydrous cupric chloride (10.8 mg, 0.08 mmol, 20 mol%) and **4j** (146.7 mg, 0.4 mmol, 1.0 equiv.) were added. The tube was evacuated and backfilled with argon (this process was repeated for 3 times). Anhydrous MeCN (0.2 mL), TMEDA (9.3 mg, 0.08 mmol, 20 mol%) and isopropanol (0.8 mL) were added sequentially *via* syringe under argon atmosphere. The reaction mixture was stirred vigorously at 50 ºC for 6 h. Once the reaction mixture was cooled to ambient temperature, saturated aq. sodium bicarbonate (4 mL) was added. The aqueous layer was extracted with EtOAc (3 × 6 mL). After extraction, 4-nitroacetophenone (66.0 mg, 0.4 mmol) was added as internal standard, the organic layer was studied by NMR spectroscopy. Control experiments indicated that copper plays a pivotal role in the 5-*endo*-dig annulation, and simple cupric chloride showing catalytic efficacy comparable to that of complex copper catalysts.

b. Deuterium-labeling experiment



The representative procedure was followed using commercially available **1h**-*d* (41.2 mg, 0.4 mmol, 1.0 equiv.) as a starting material. After that, the reaction was diluted with ethyl acetate (4 mL), then saturated aq. sodium bicarbonate (4 mL) was added. The aqueous layer was extracted with EtOAc (3 × 8 mL). The combined organic layer was washed with brine (5 mL), dried over Na_2SO_4, filtered, and concentrated under reduced pressure. The crude product was purified by eluted with a gradient from 8:1 to 4:1 petroleum ether/EtOAc (v/v)) to afford **3h** (70.0 mg, 63% yield). Both crude product and isolated **3h** NMR spectroscopy indicated no deuterium incorporation in the product.

VIII. References

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[2] Tang, K.-W.; Yang, S.-C.; Tseng, C.-H. *Int. J. Mol. Sci.* **2019**, *20*, 4564.

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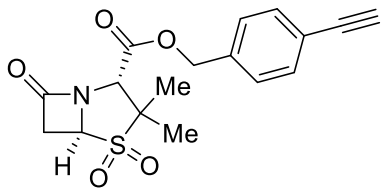
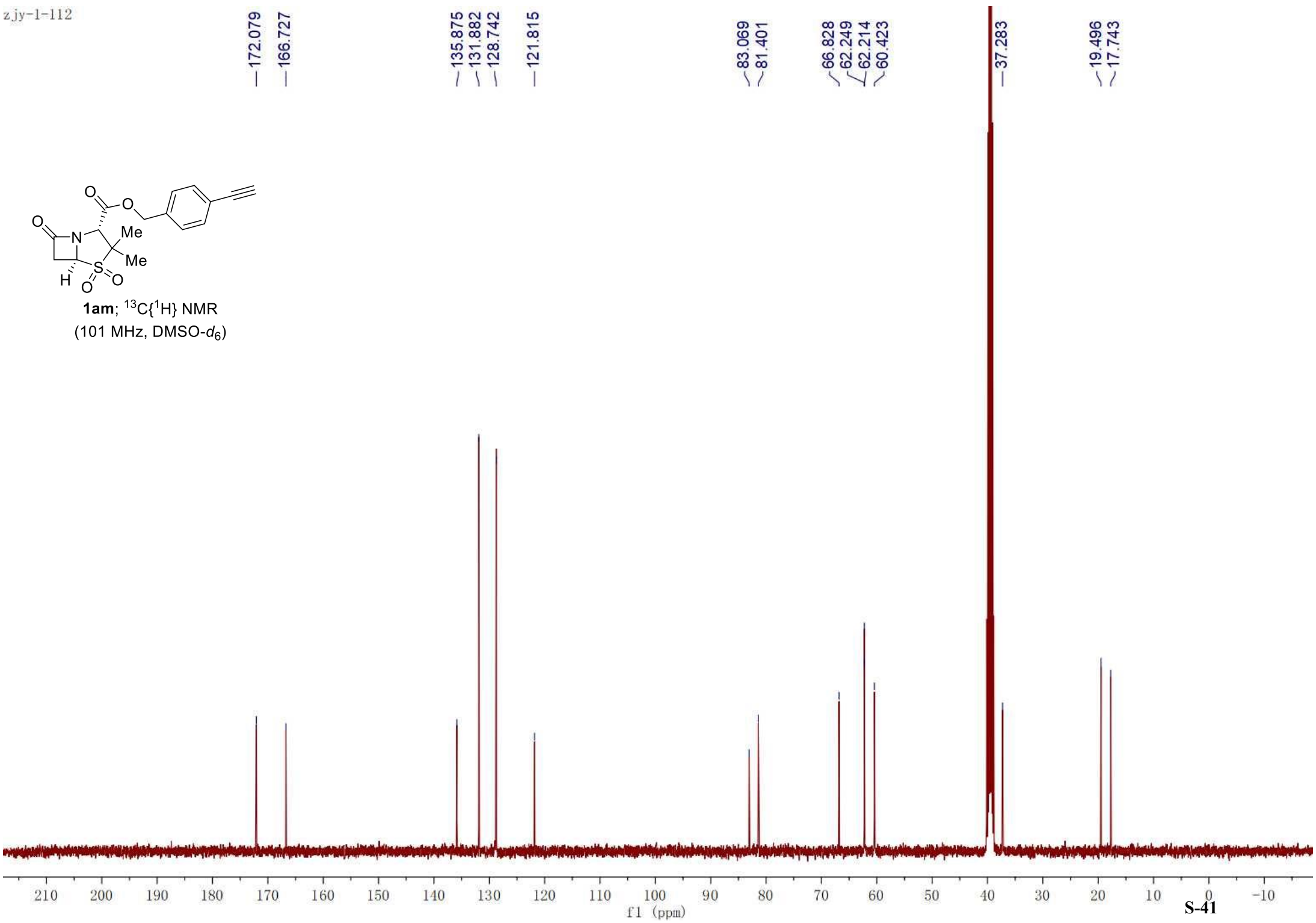
[6] Kim, K.-Y.; Shin, J.-T.; Lee, K.-S.; Cho, C.-G. *Tetrahedron Lett.* **2004**, *45*, 117.

IX. Copies of NMR spectra

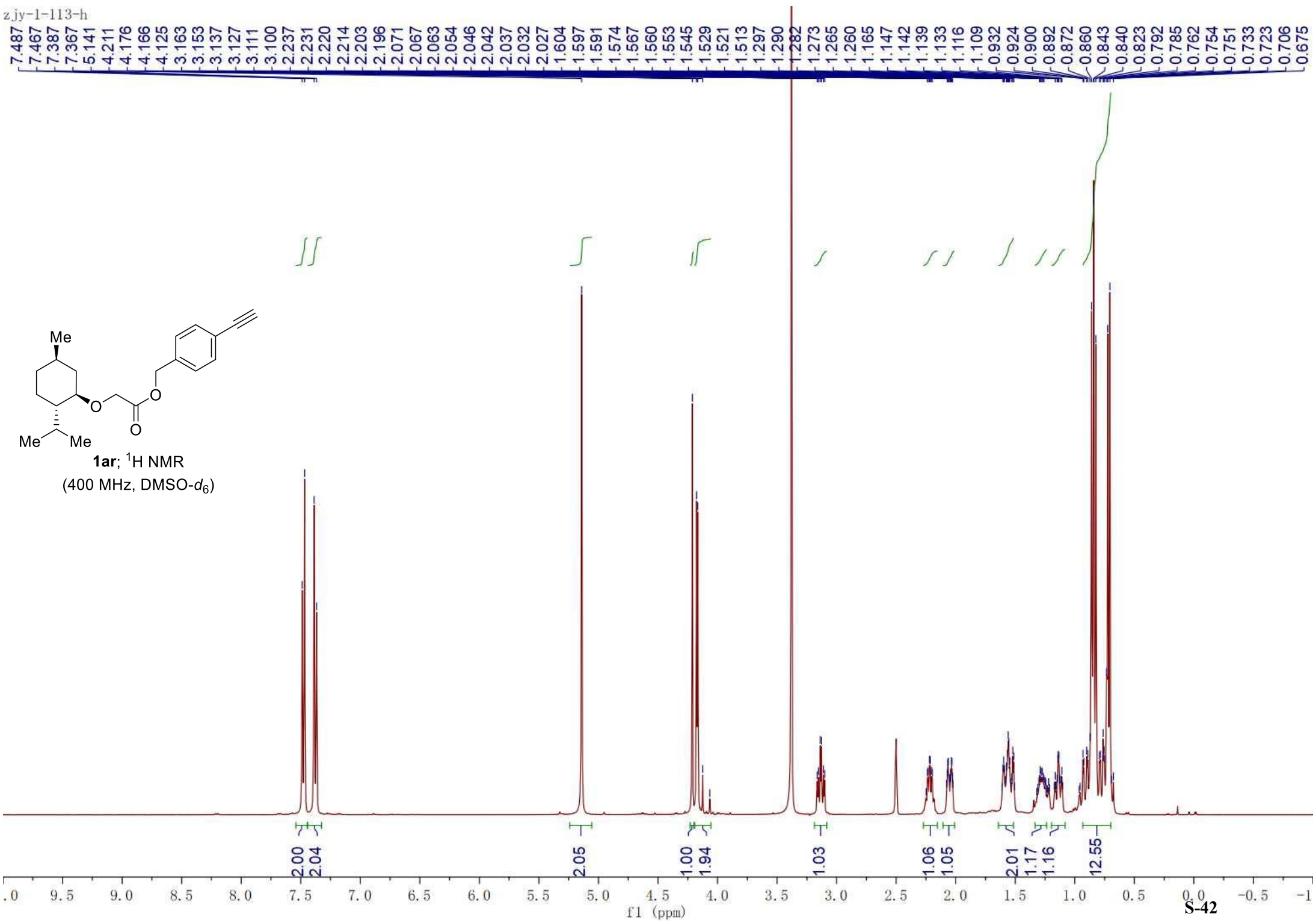
zjy-1-112-h

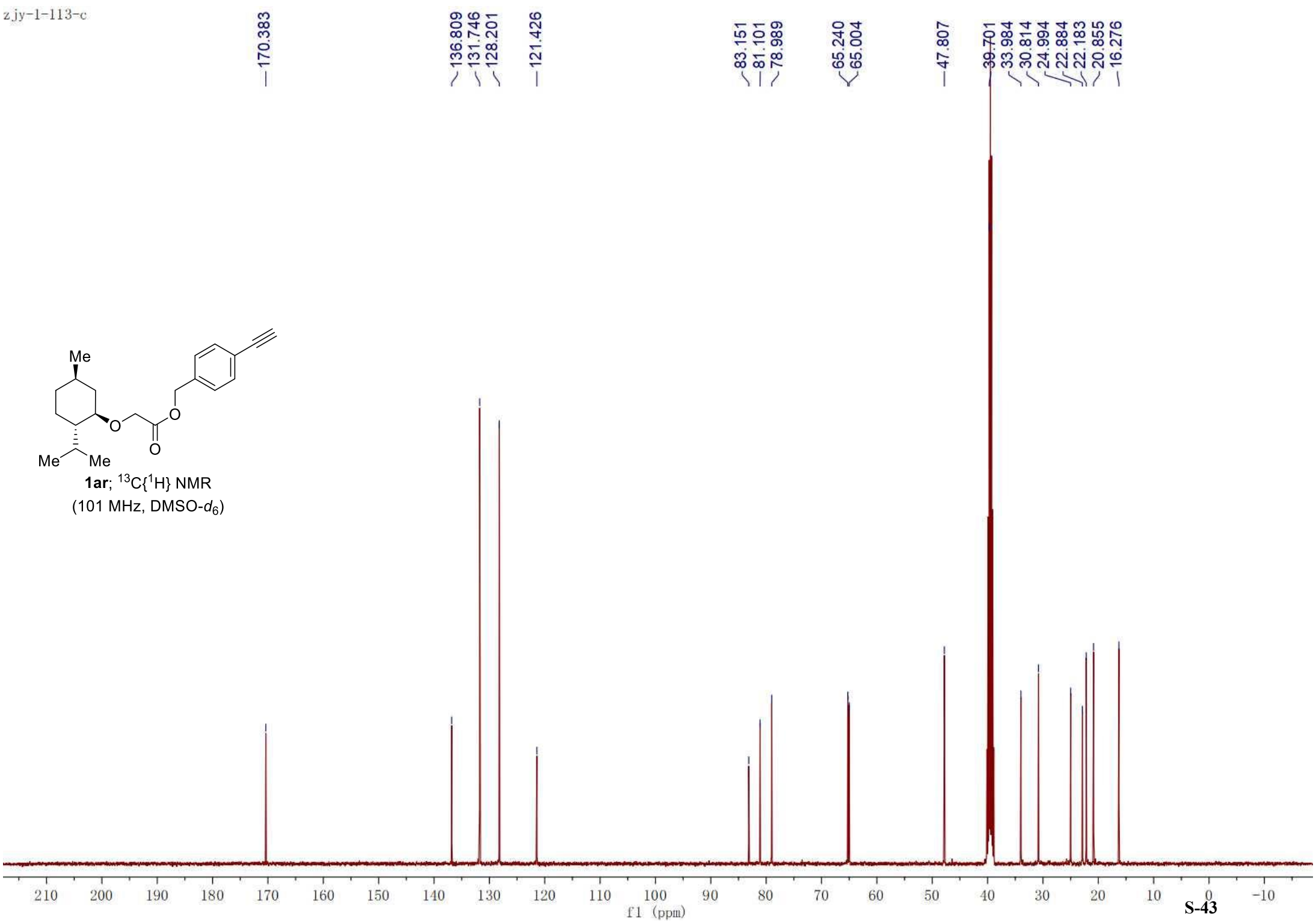


1am; ^{1}H NMR
(400 MHz, DMSO-d_6)

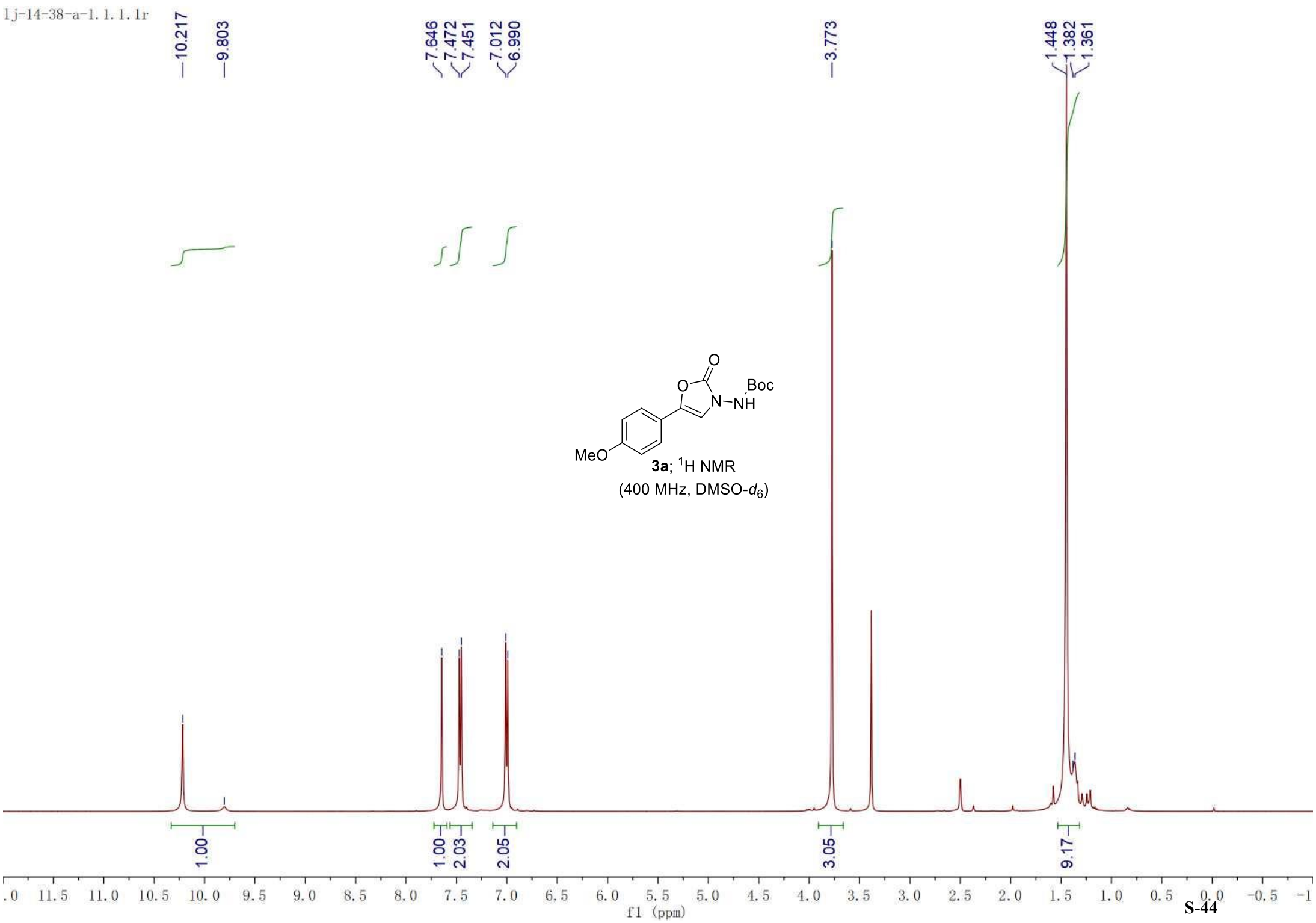


1am; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)


zjy-1-113-h
Me
Me
Me
O
O
O
1ar; 1H NMR
(400 MHz, DMSO-d6)
f1 (ppm)

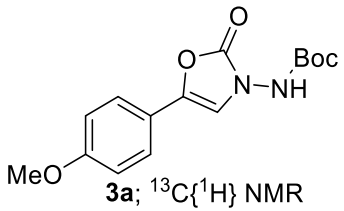


1ar; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



3a; ^{1}H NMR
(400 MHz, DMSO-d_6)

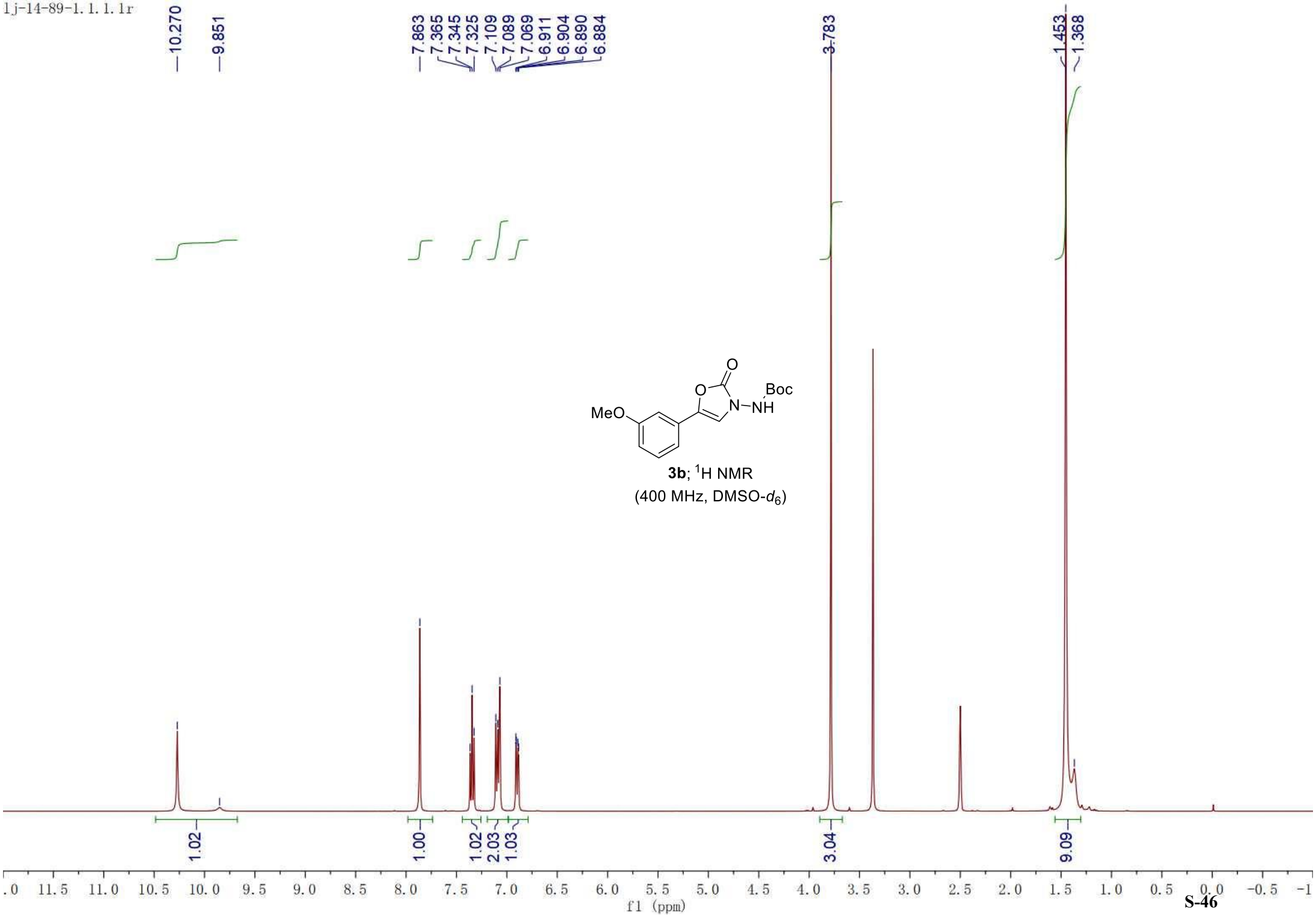
1j-14-38-a-1.2.1.1r



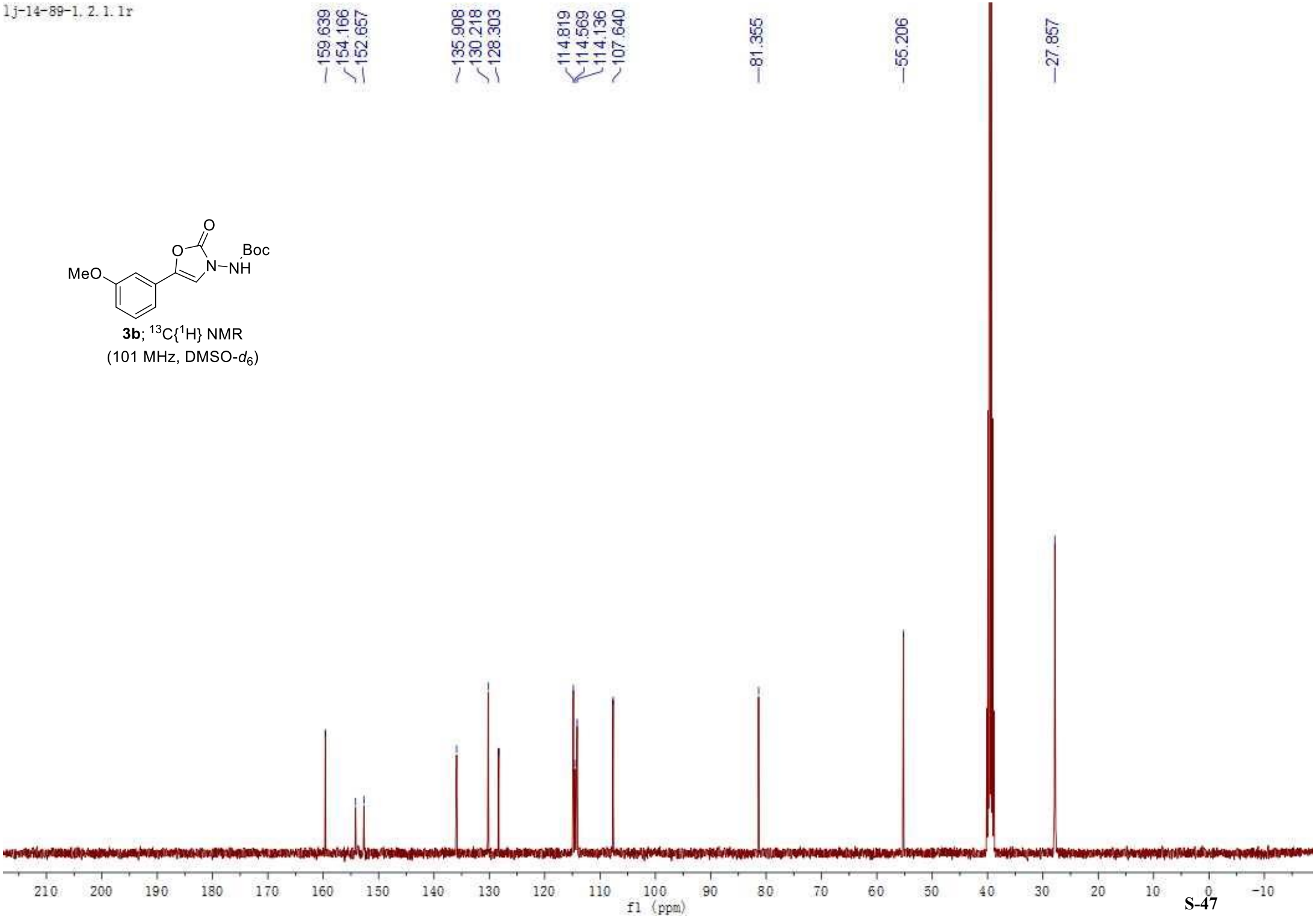
3a; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

159.212
154.191
152.811
136.266
124.193
119.650
114.491
112.265
81.264
55.224
27.870

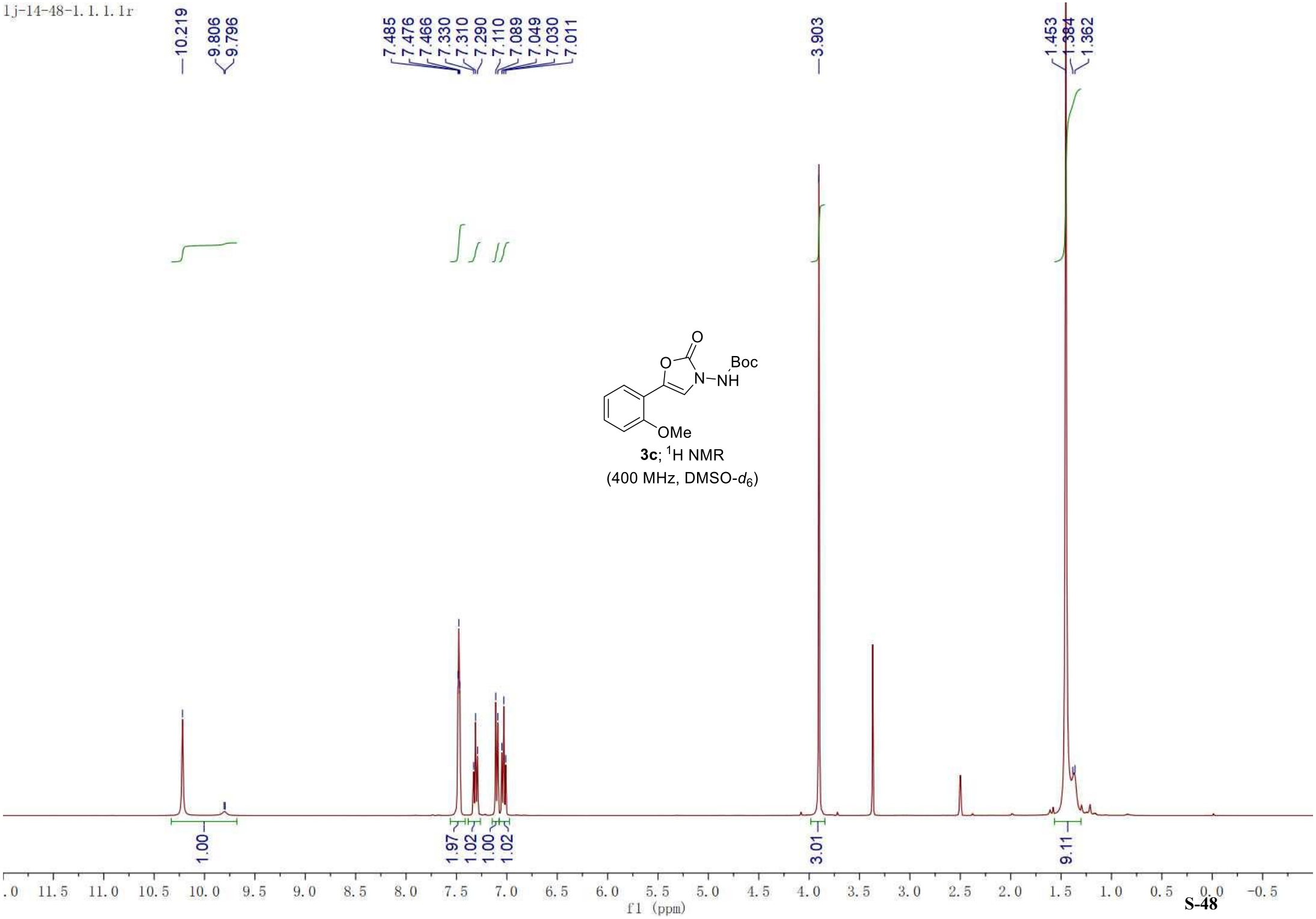
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)



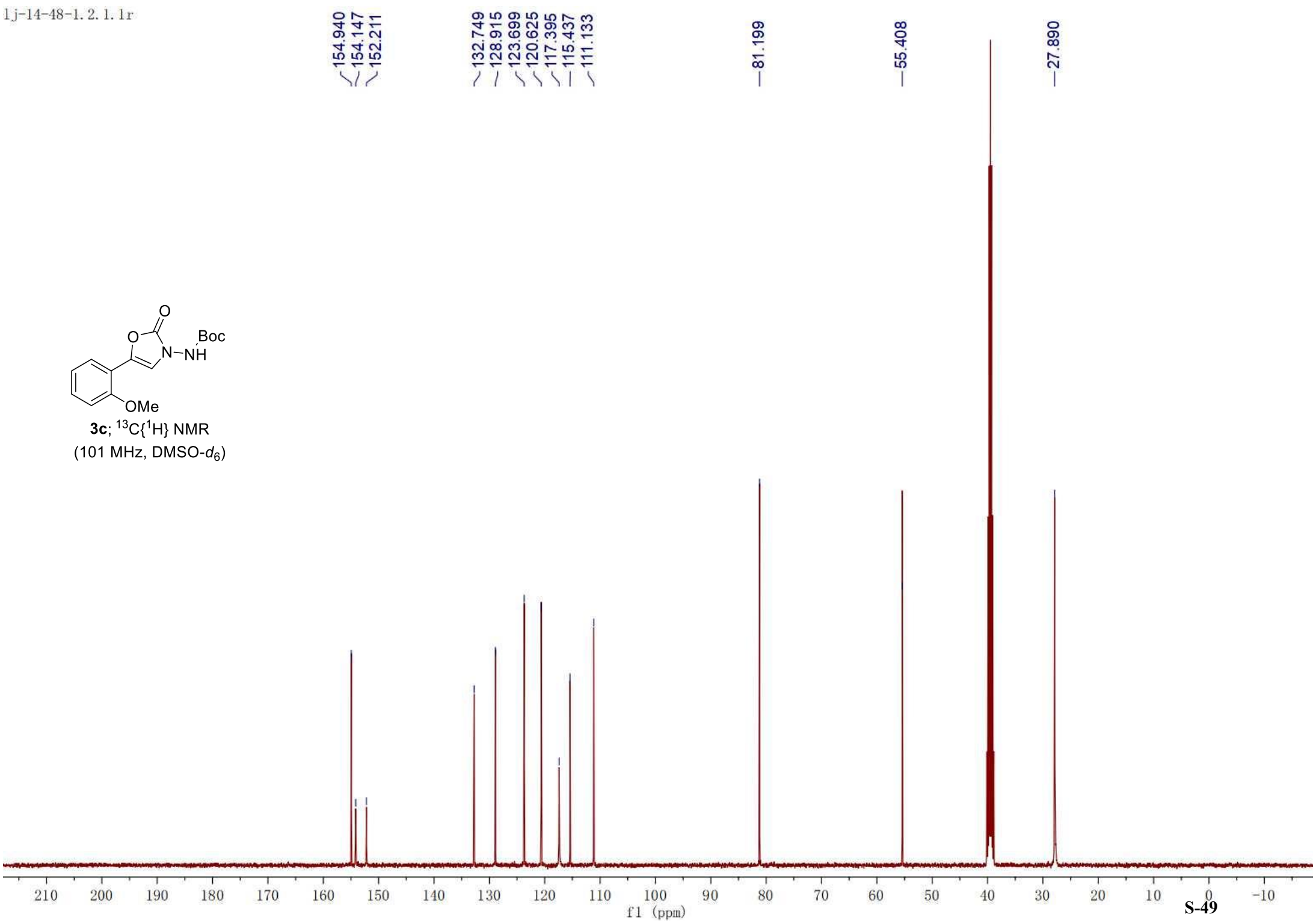
3b; ^{1}H NMR
(400 MHz, DMSO-d_6)



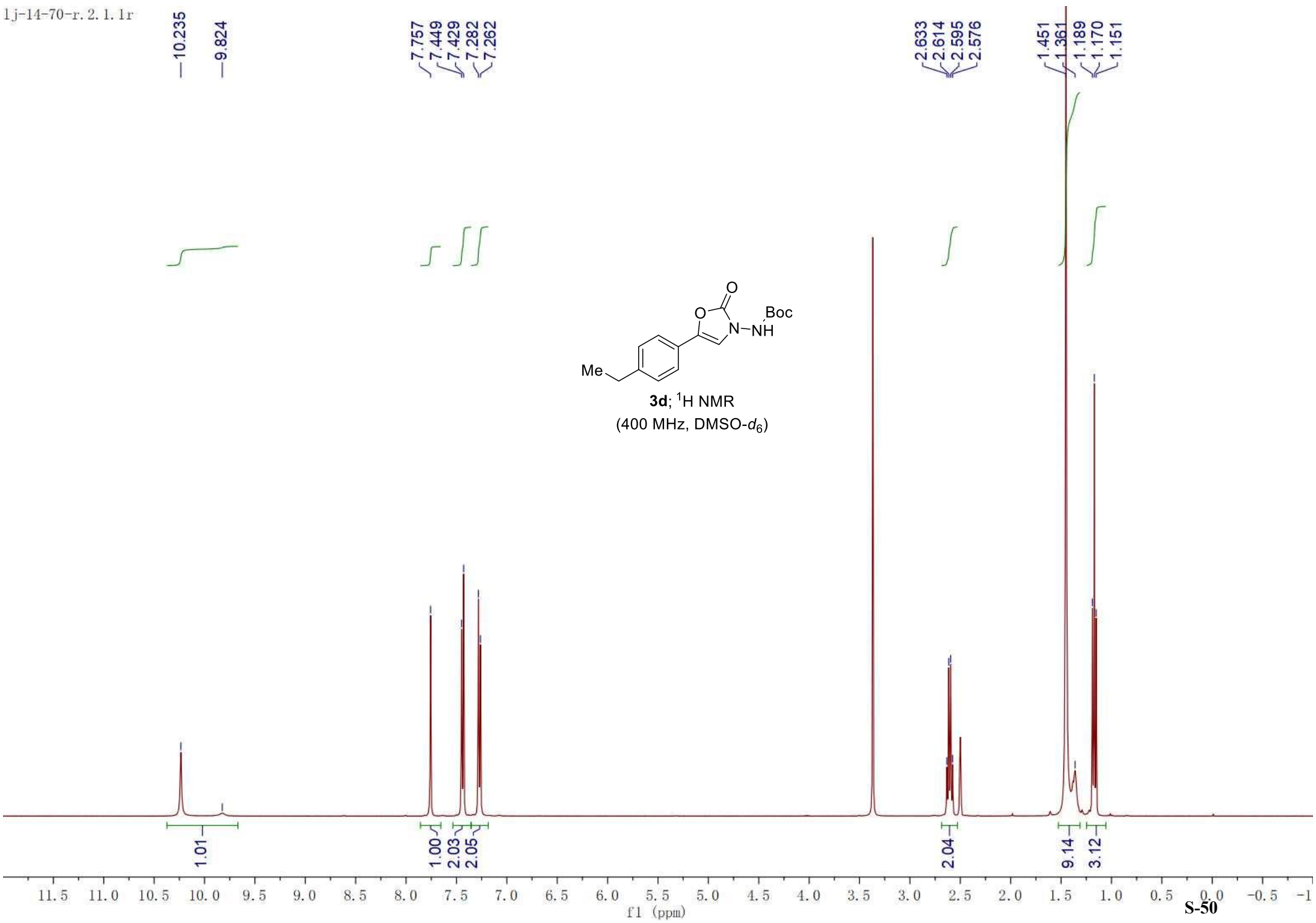
3b; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



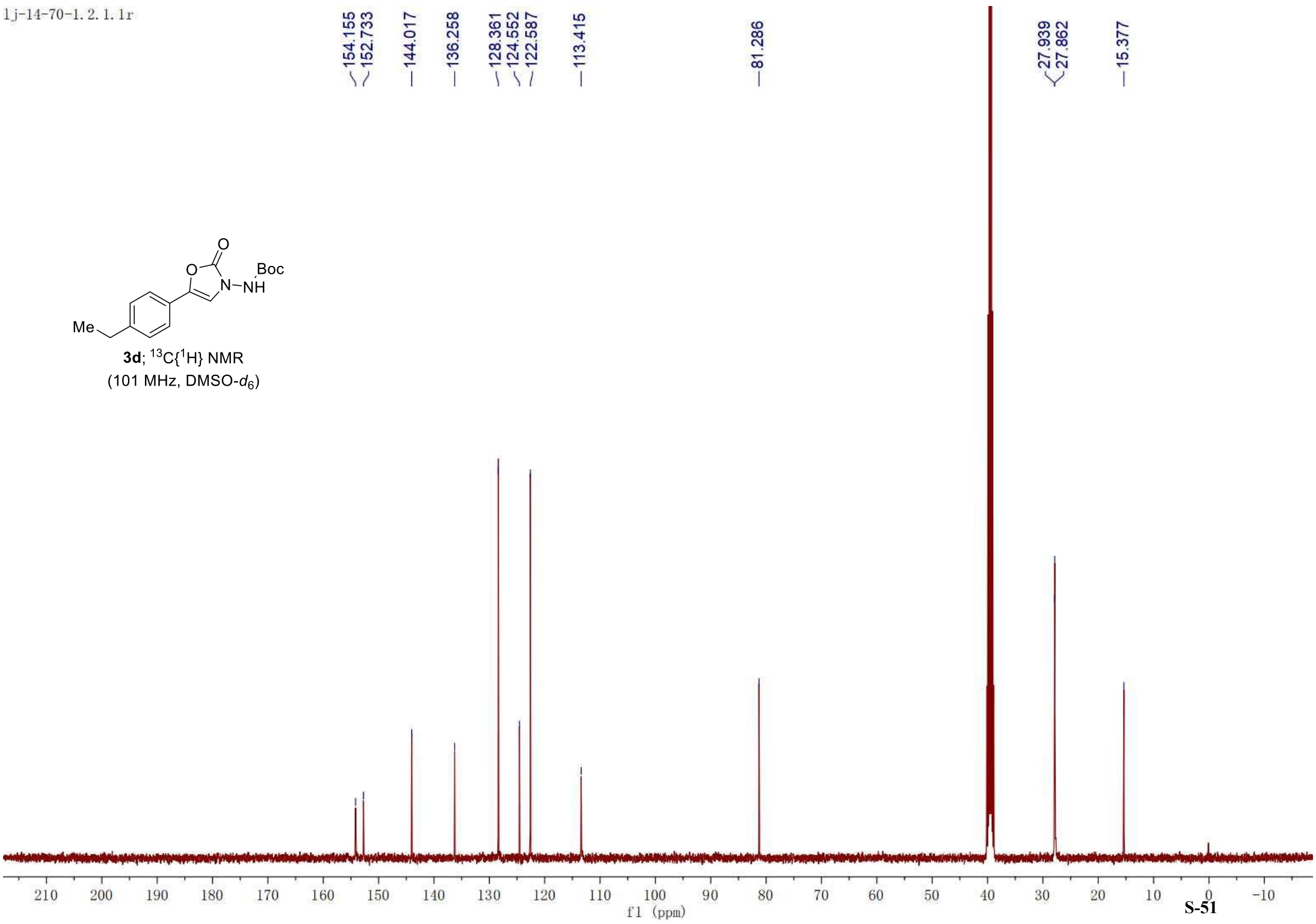
3c; ^{1}H NMR
(400 MHz, DMSO-d_6)



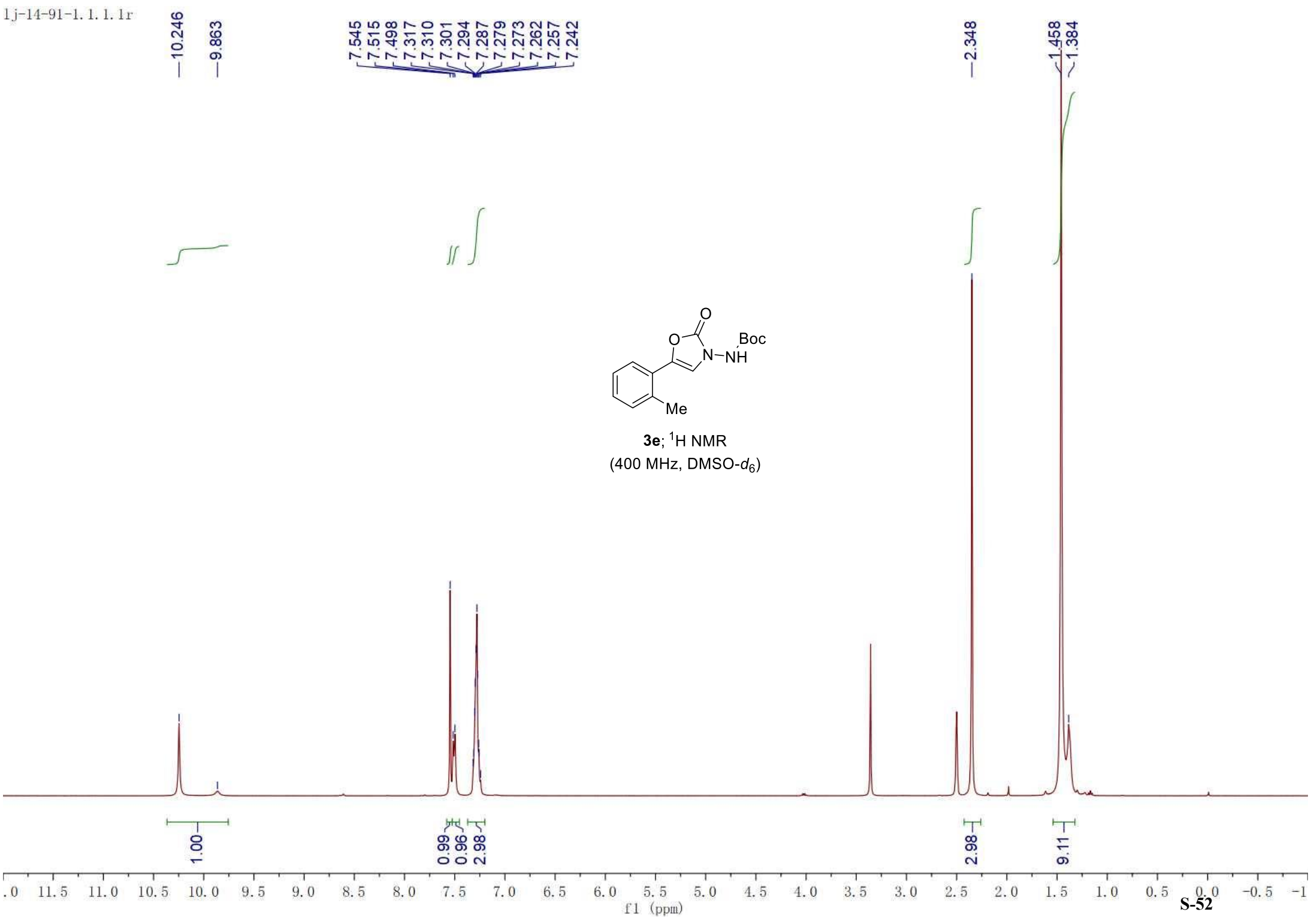
3c; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



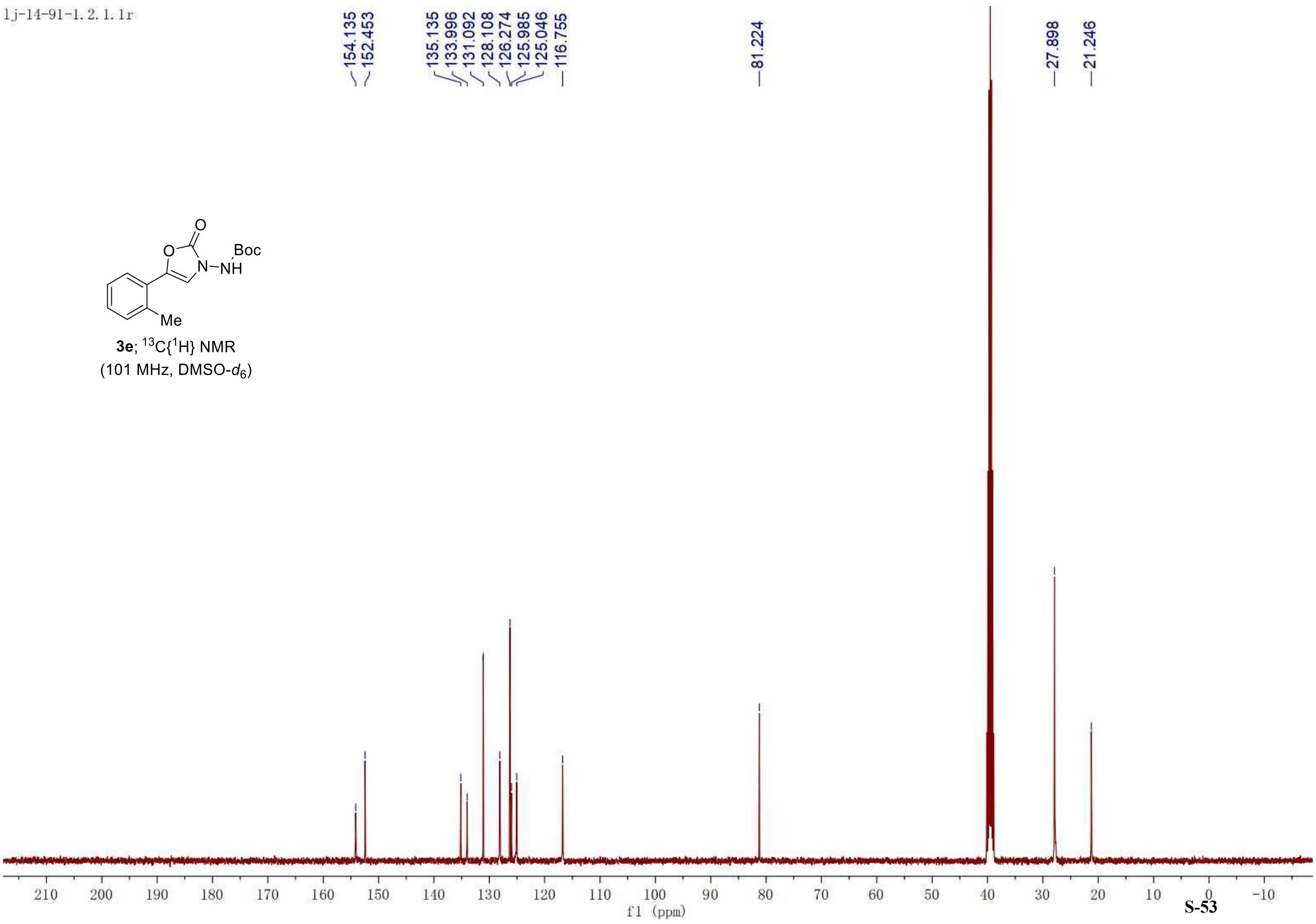
3d; ^{1}H NMR
(400 MHz, DMSO-d_6)



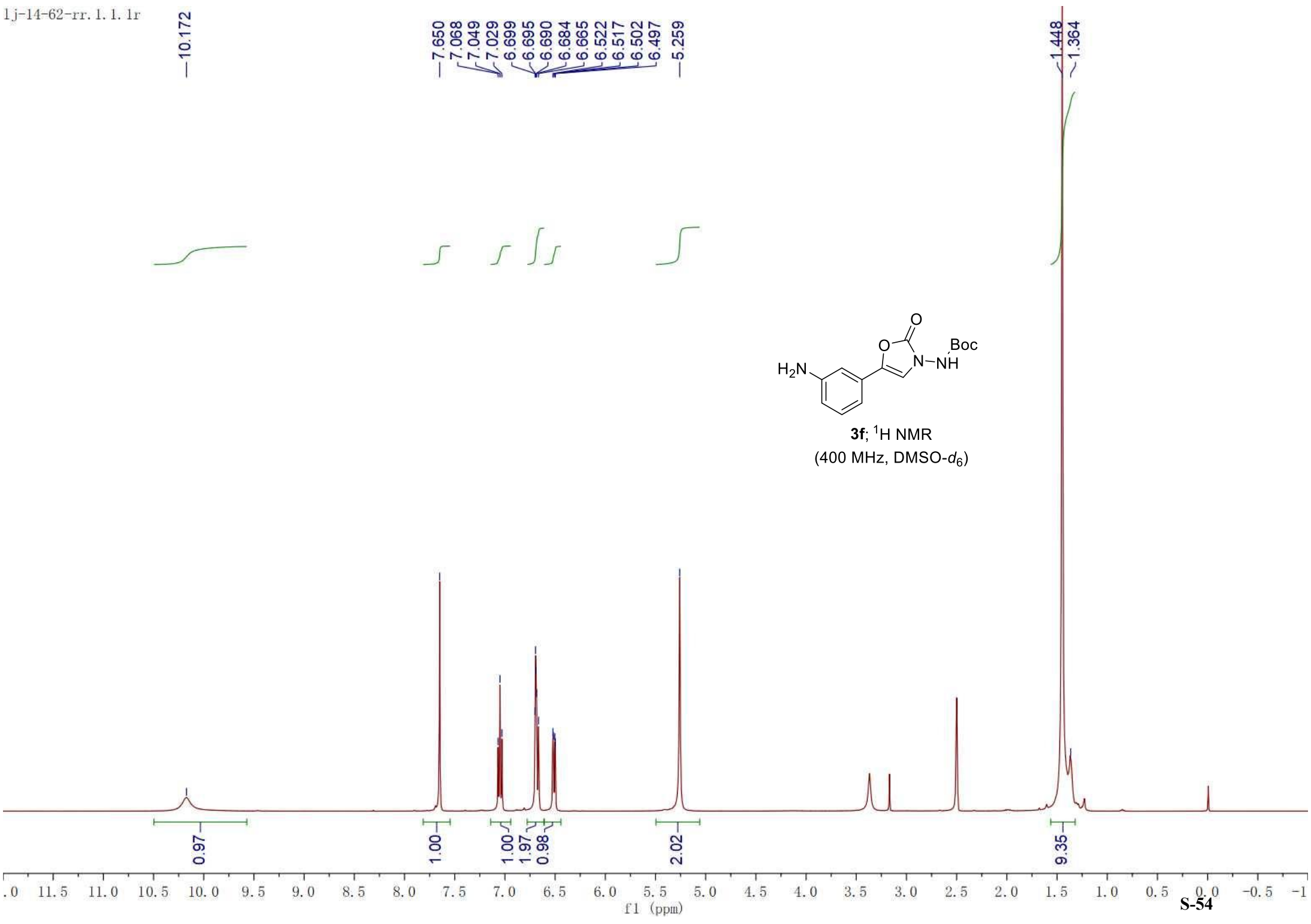
3d; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



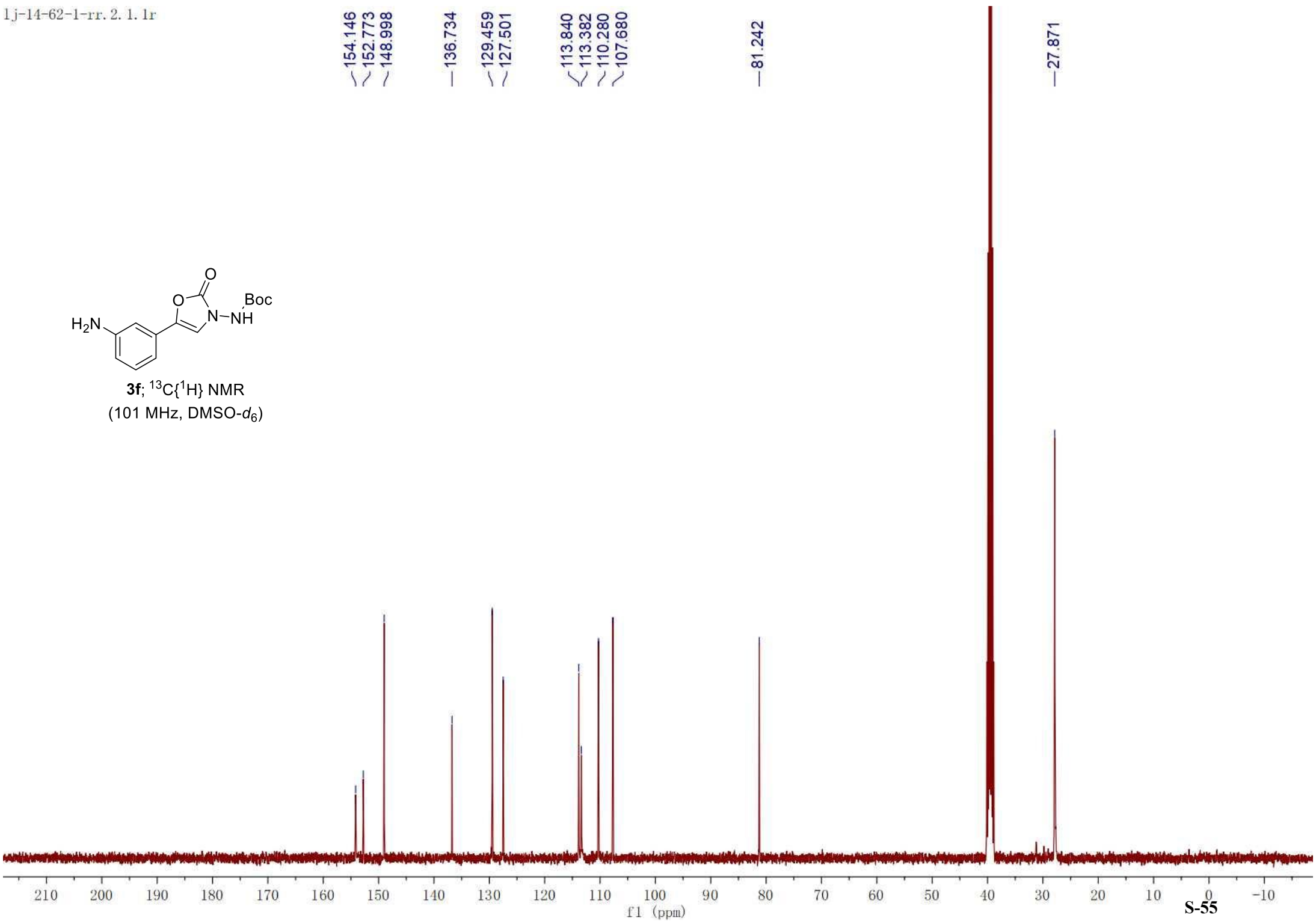
3e; ^{1}H NMR
(400 MHz, DMSO-d_6)



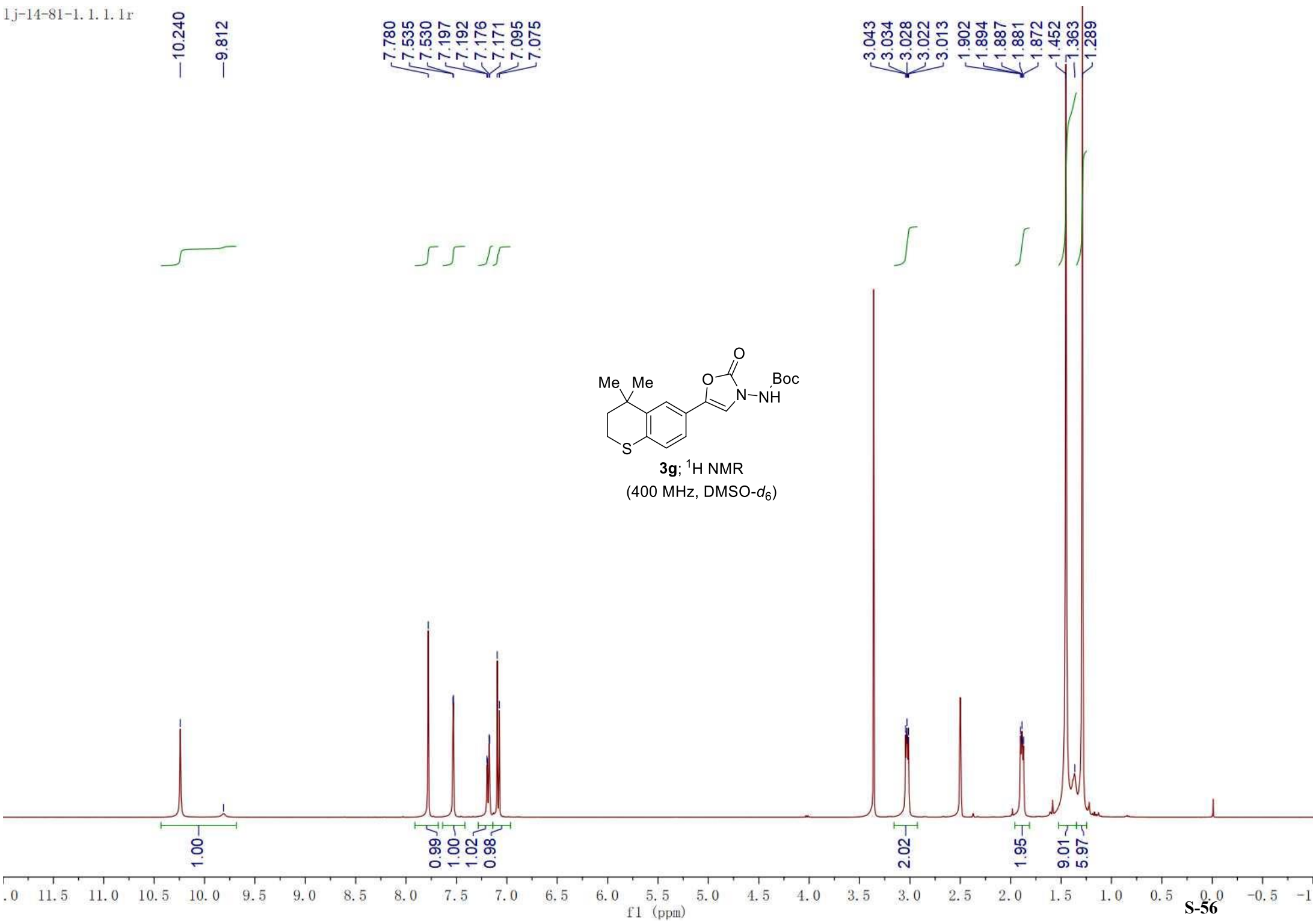
3e; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



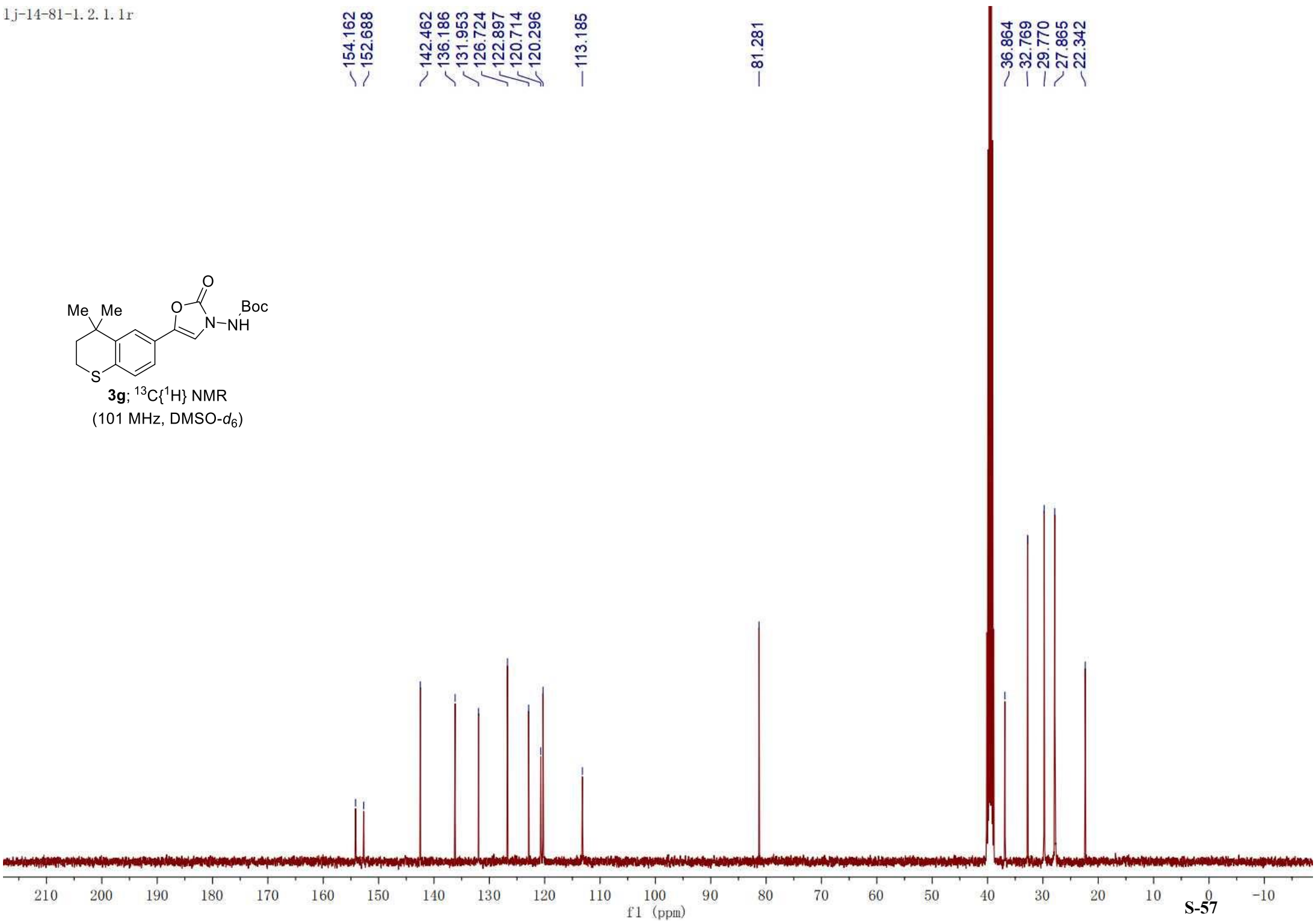
3f; ^{1}H NMR
(400 MHz, DMSO-d_6)



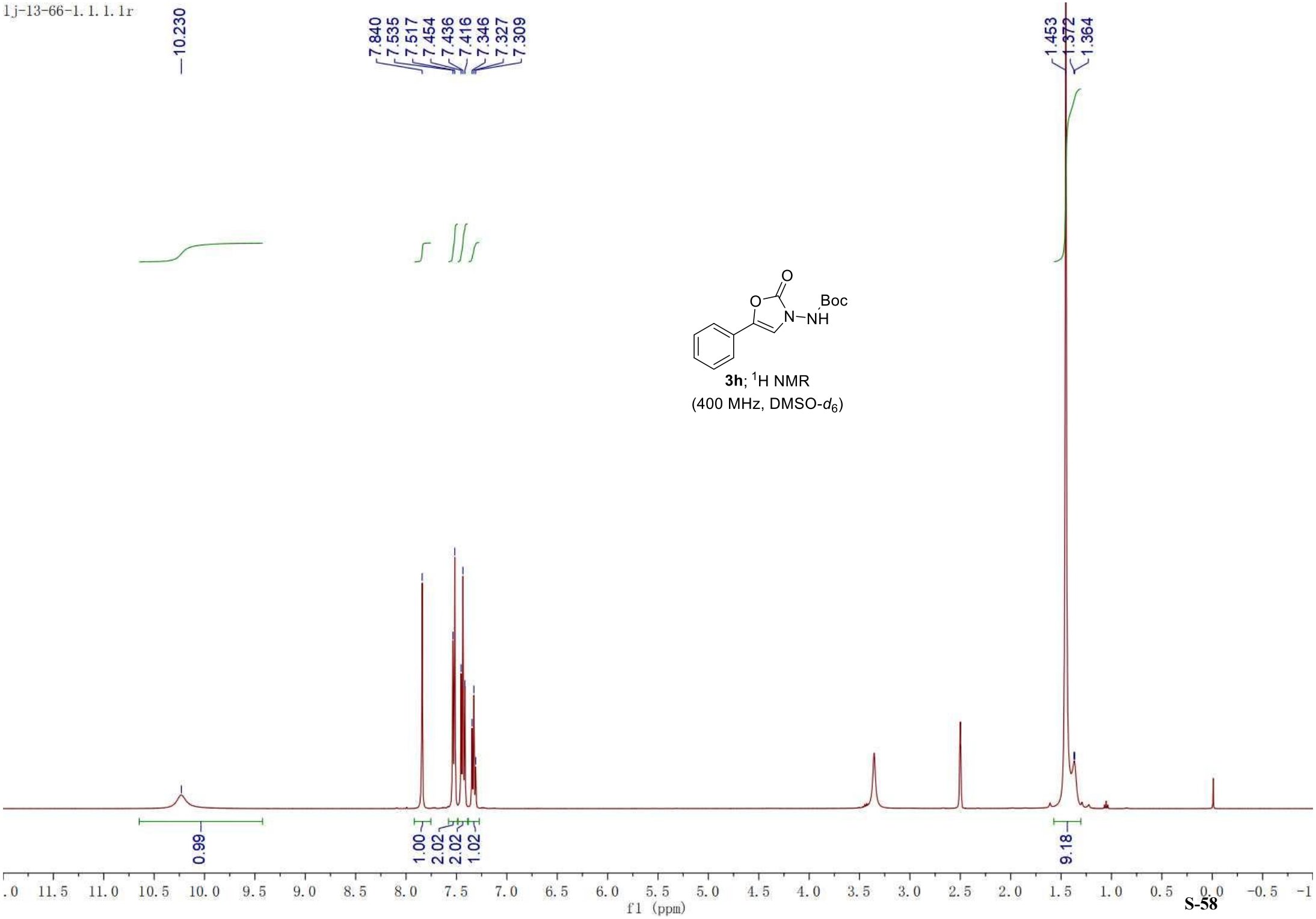
3f; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



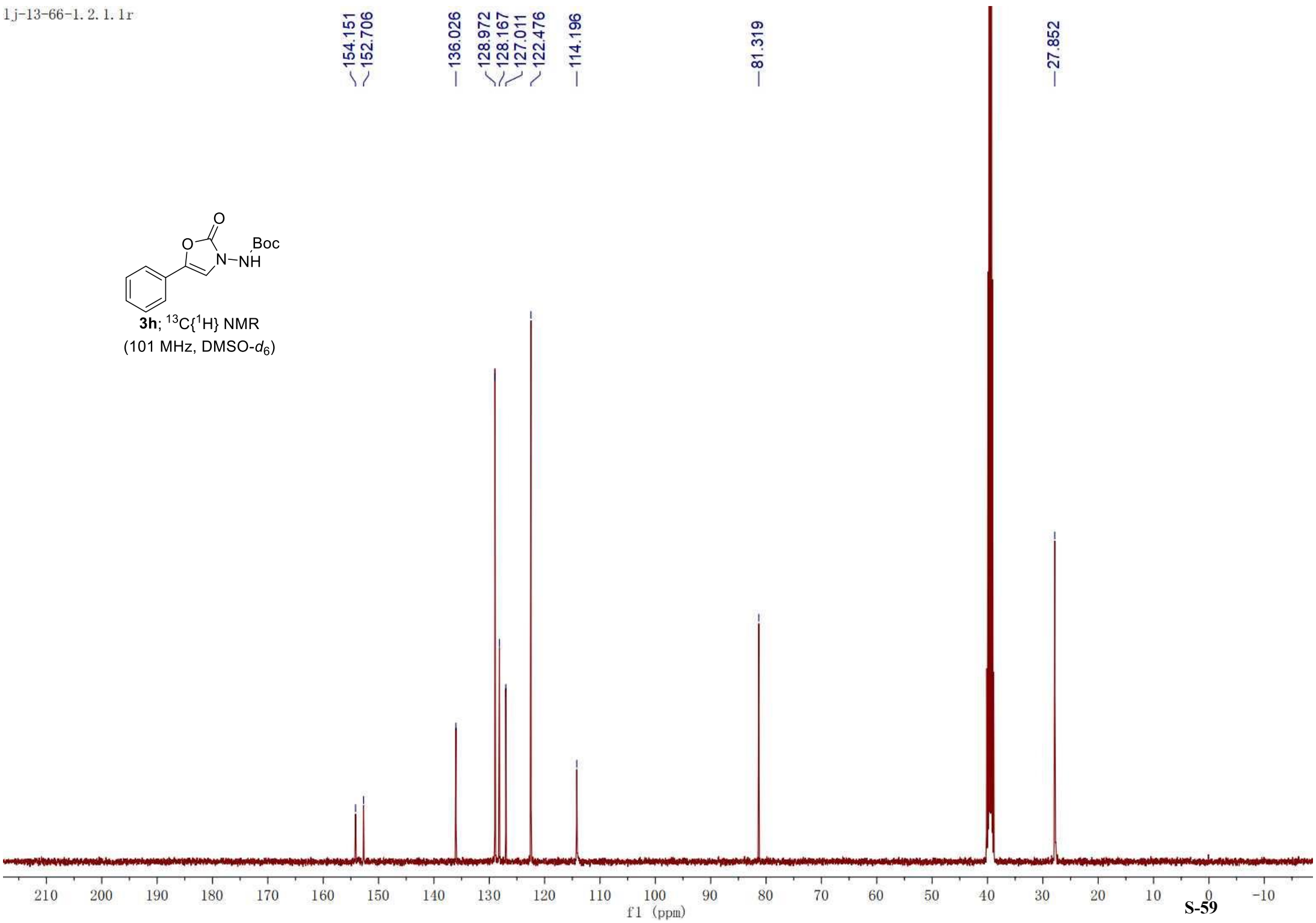
3g; ^{1}H NMR
(400 MHz, DMSO-d_6)



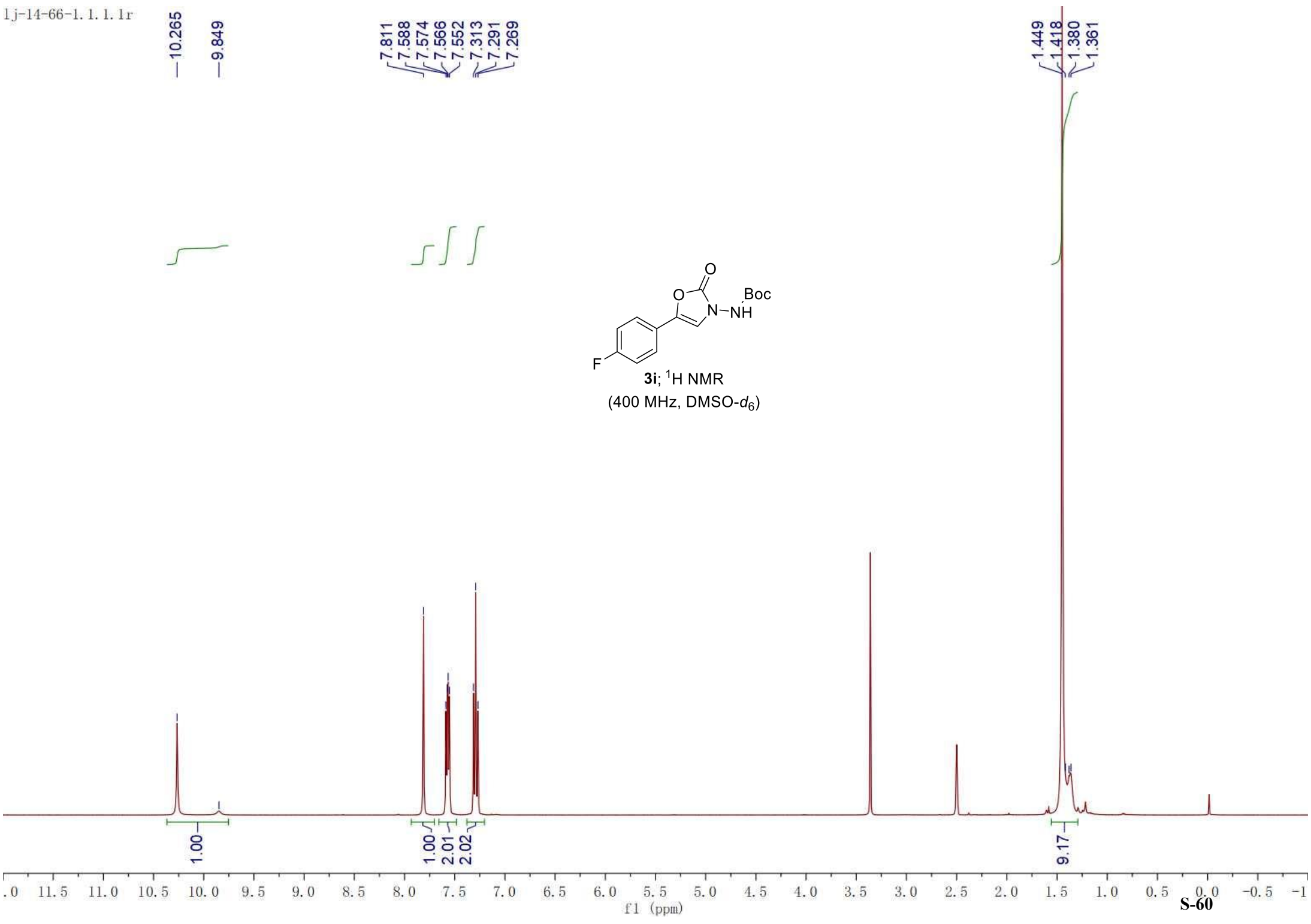
3g; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



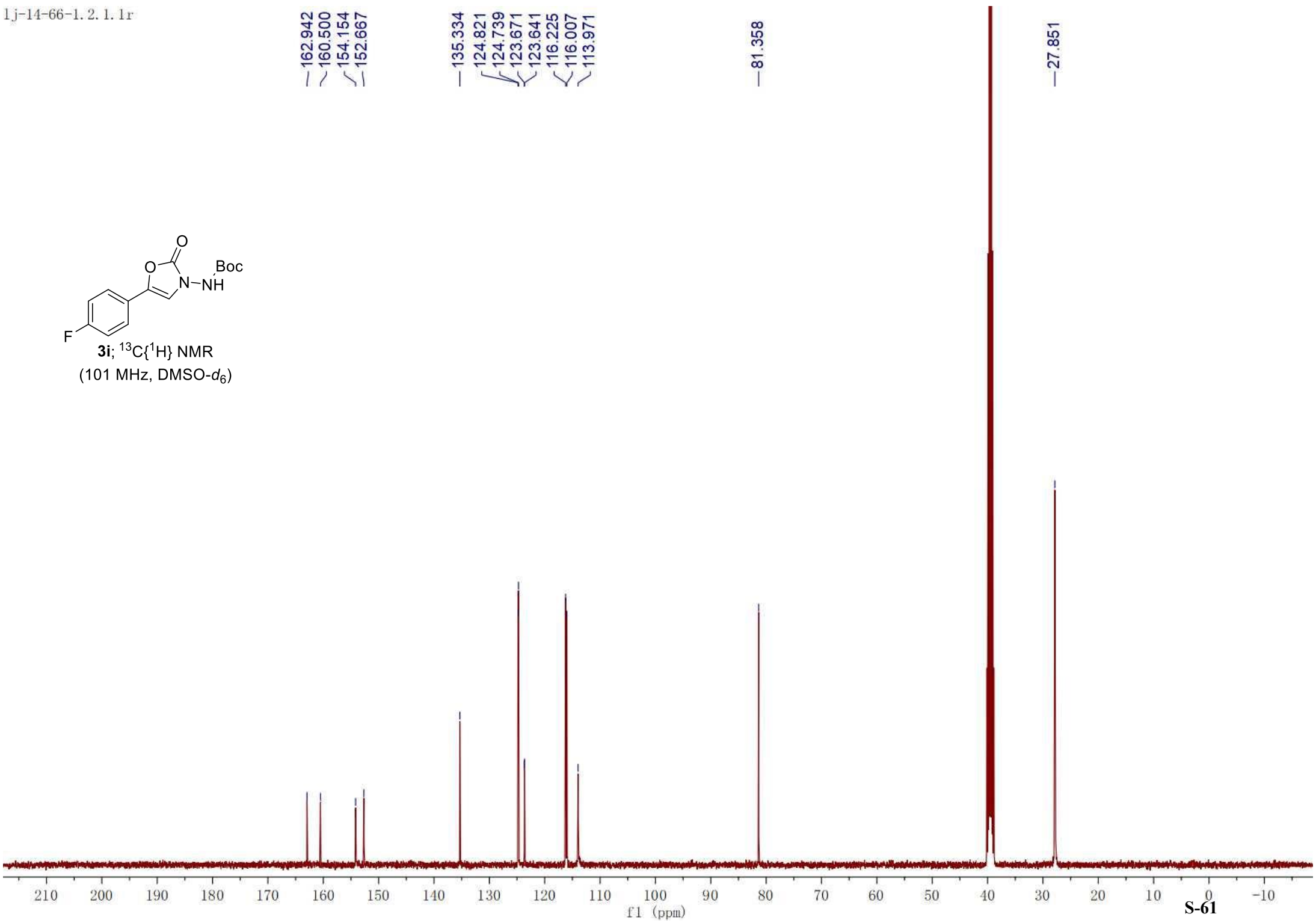
3h; ^{1}H NMR
(400 MHz, DMSO-d_6)



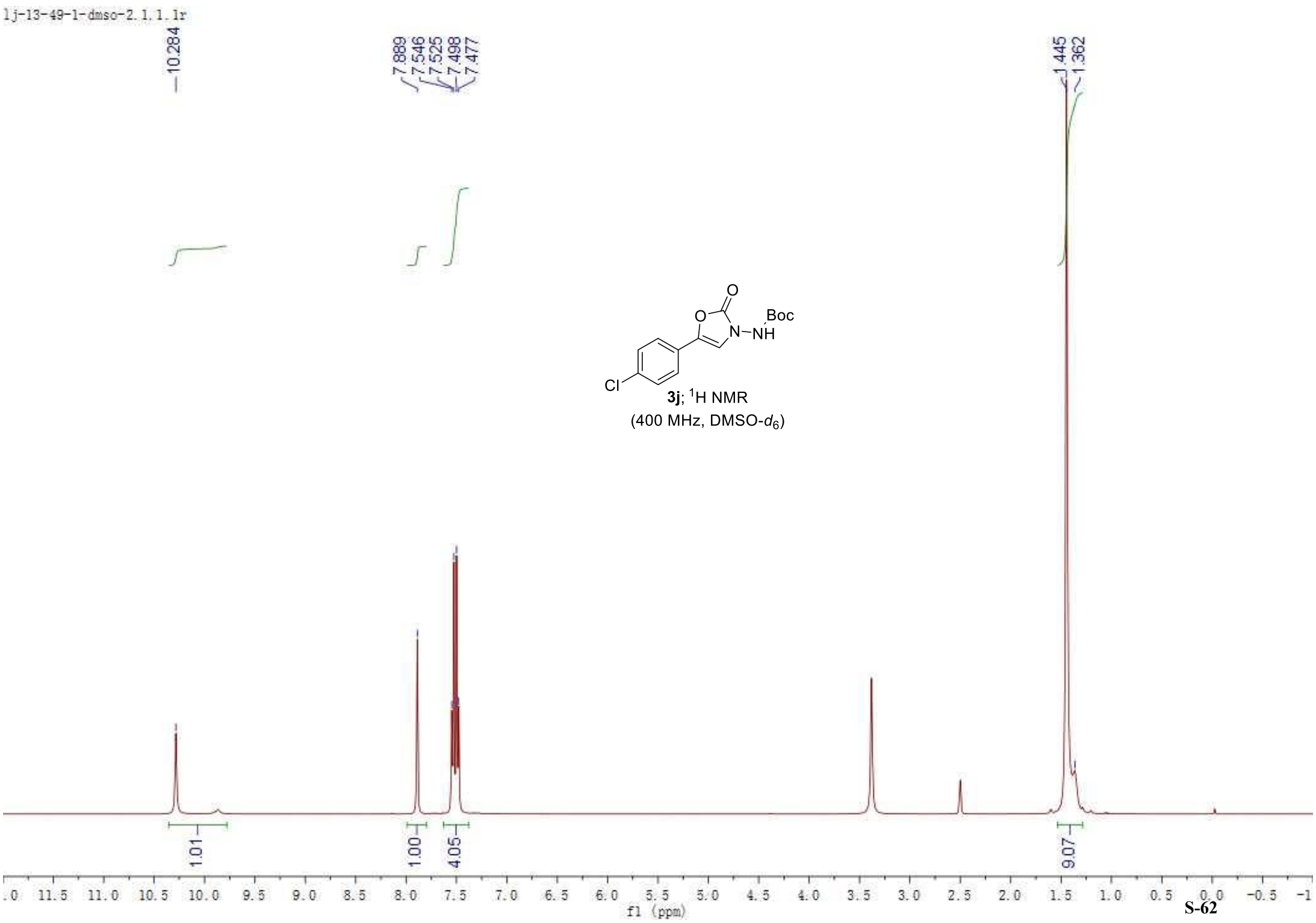
3h; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



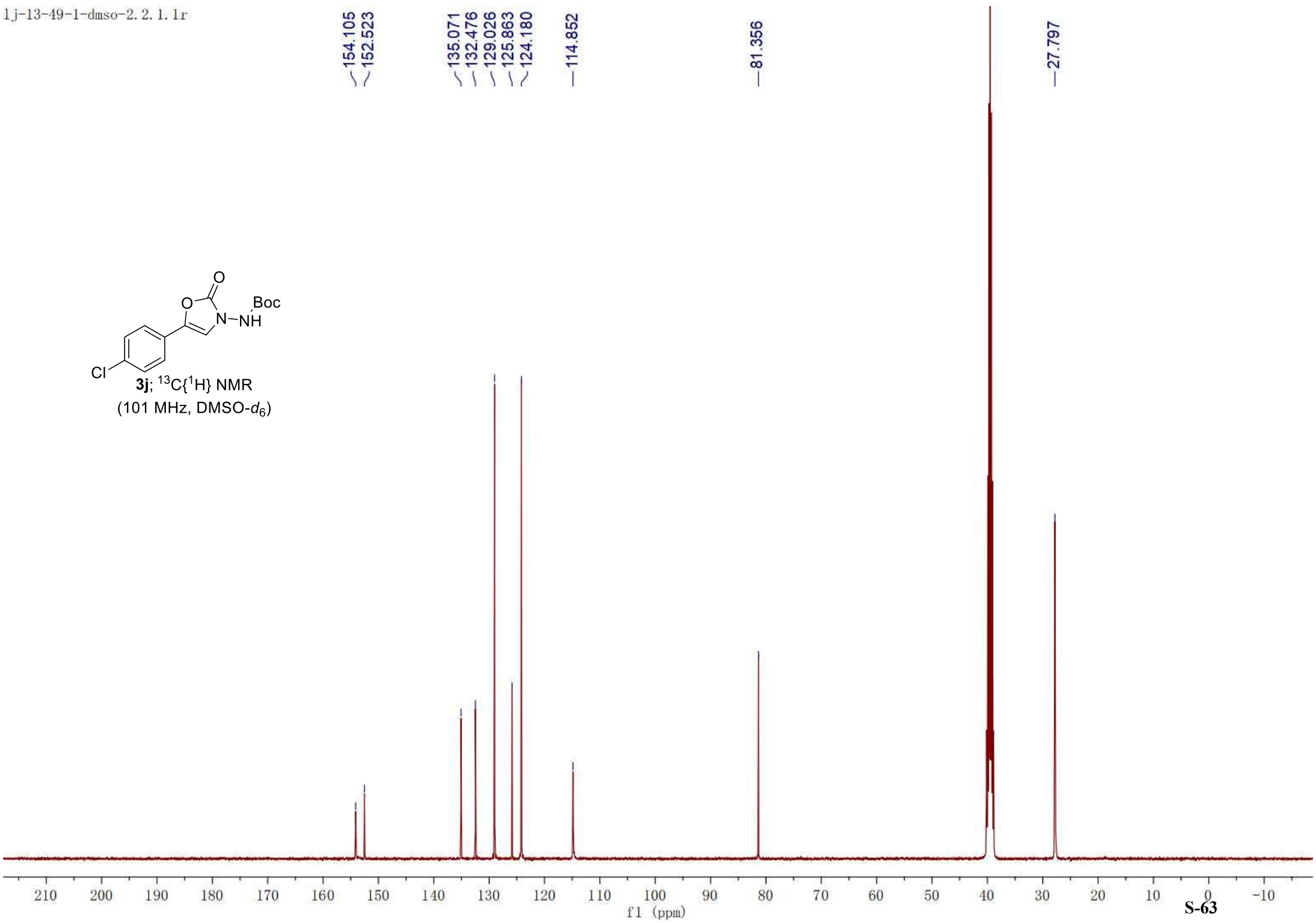
3i; ^{1}H NMR
(400 MHz, DMSO-d_6)



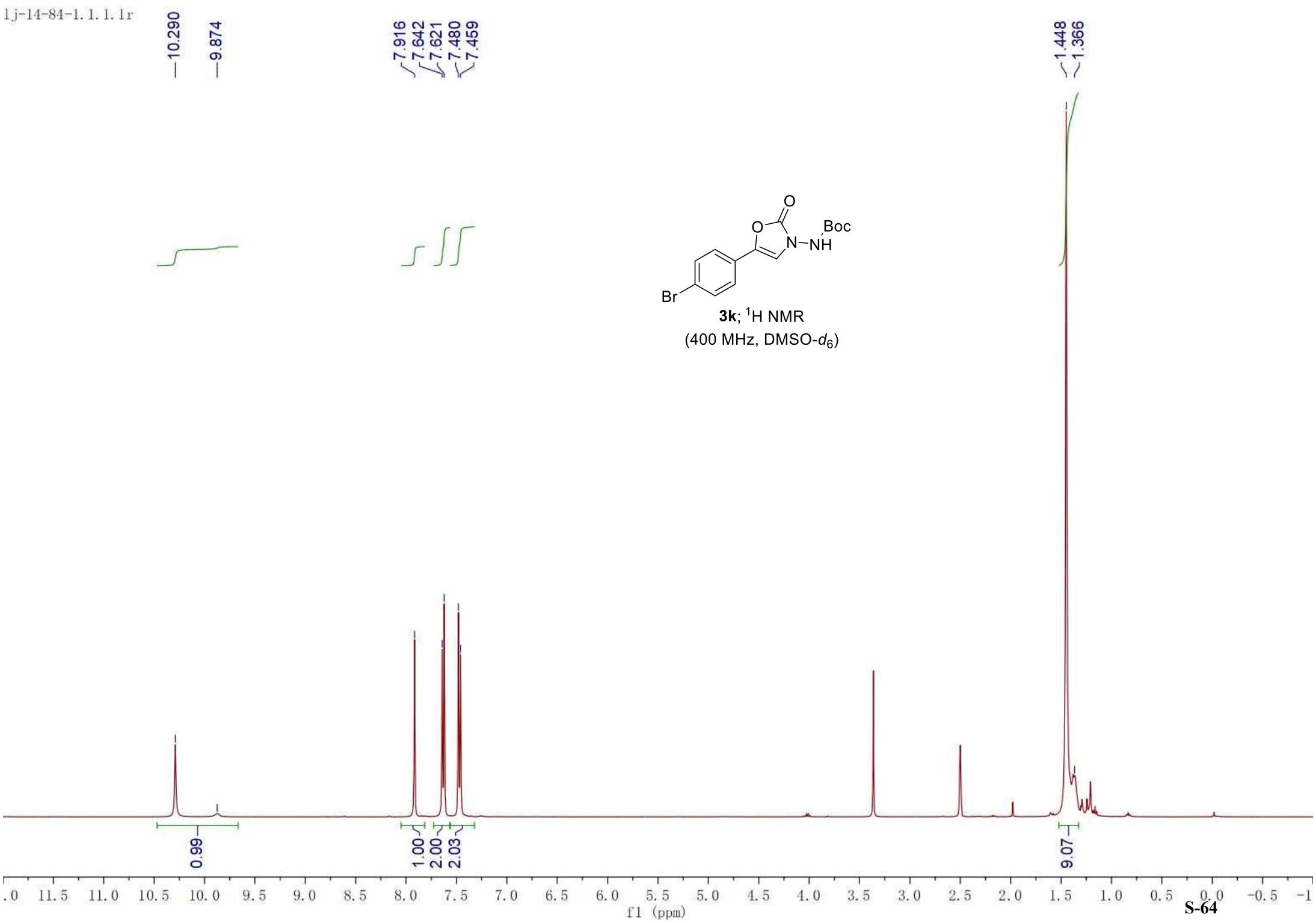
3i; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



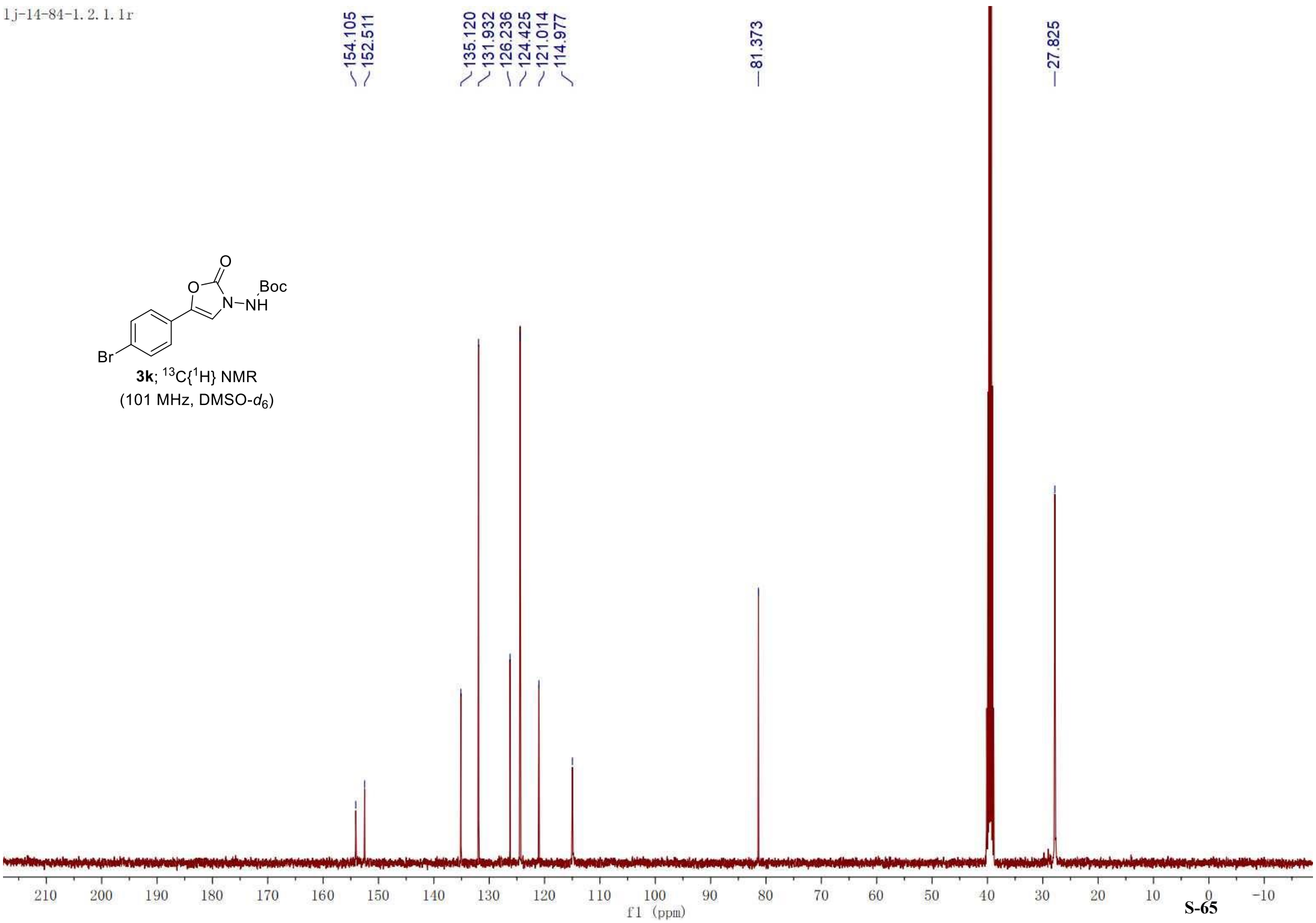
3j; ^{1}H NMR
(400 MHz, DMSO-d_6)

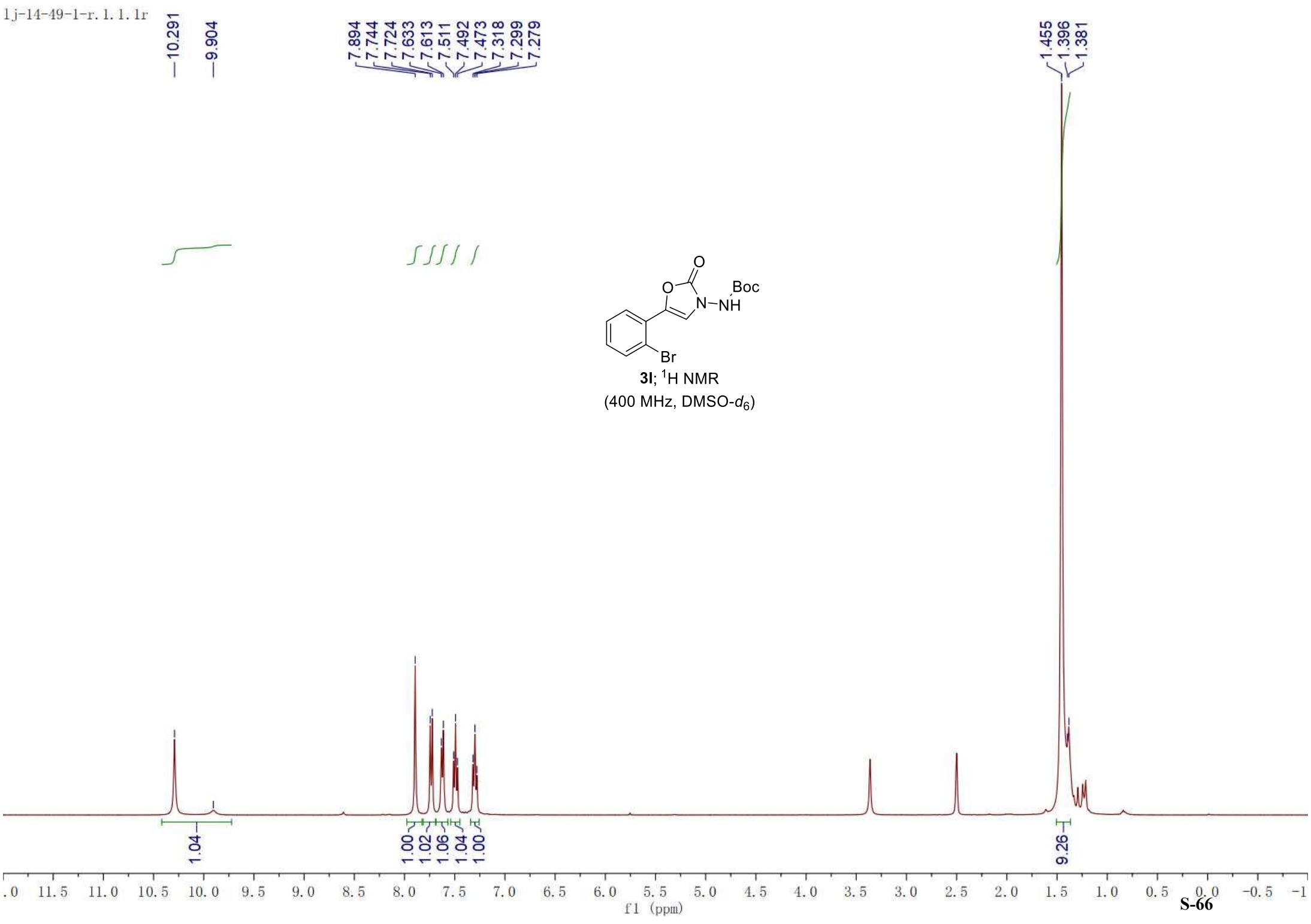


3j; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

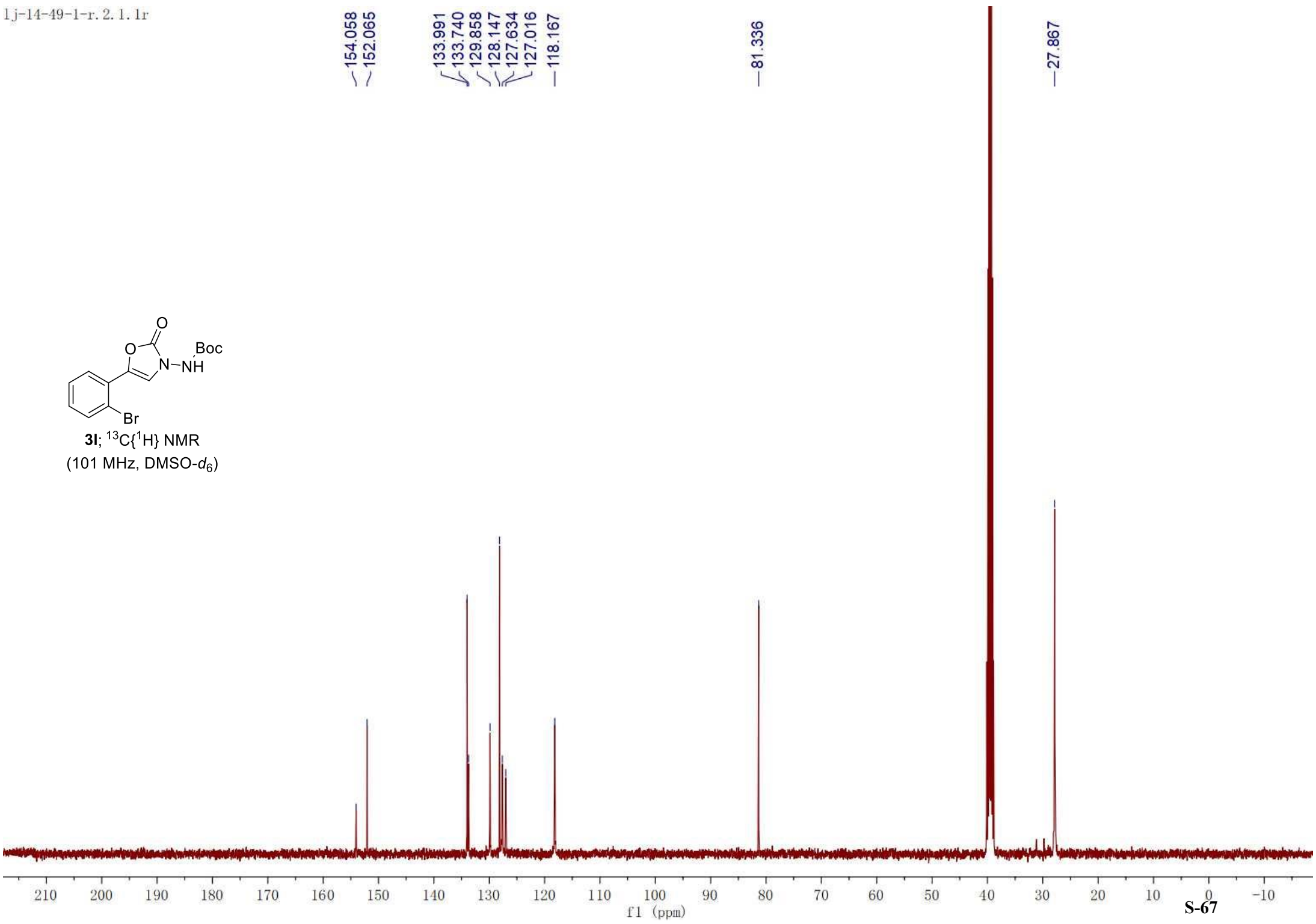


3k; ^{1}H NMR
(400 MHz, DMSO-d_6)

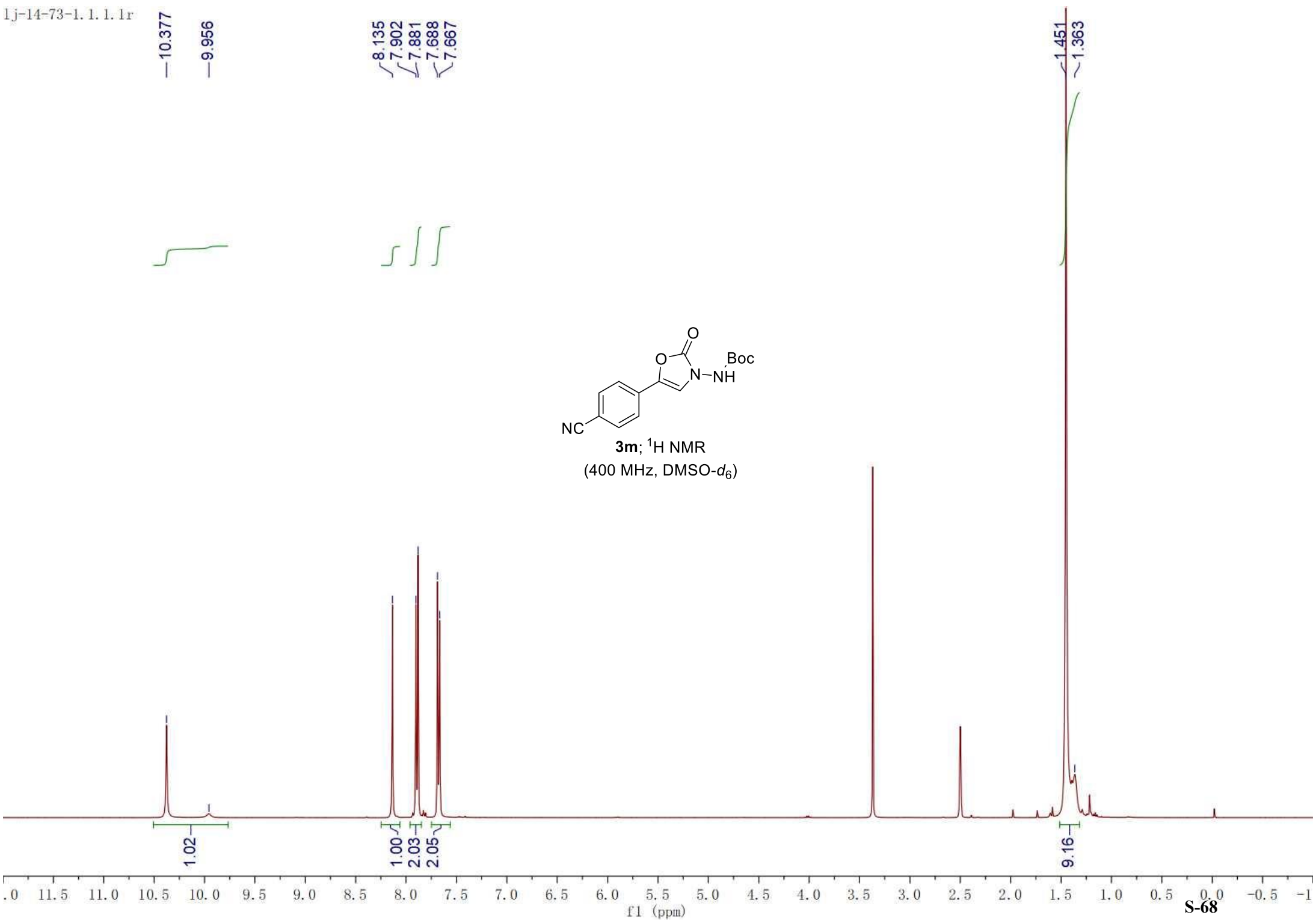

1j-14-84-1.2.1.1r
154.105
152.511
135.120
131.932
126.236
124.425
121.014
114.977
81.373
27.825
O
O
N
NH
Boc
Br
3k; 13C{1H} NMR
(101 MHz, DMSO-d6)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)



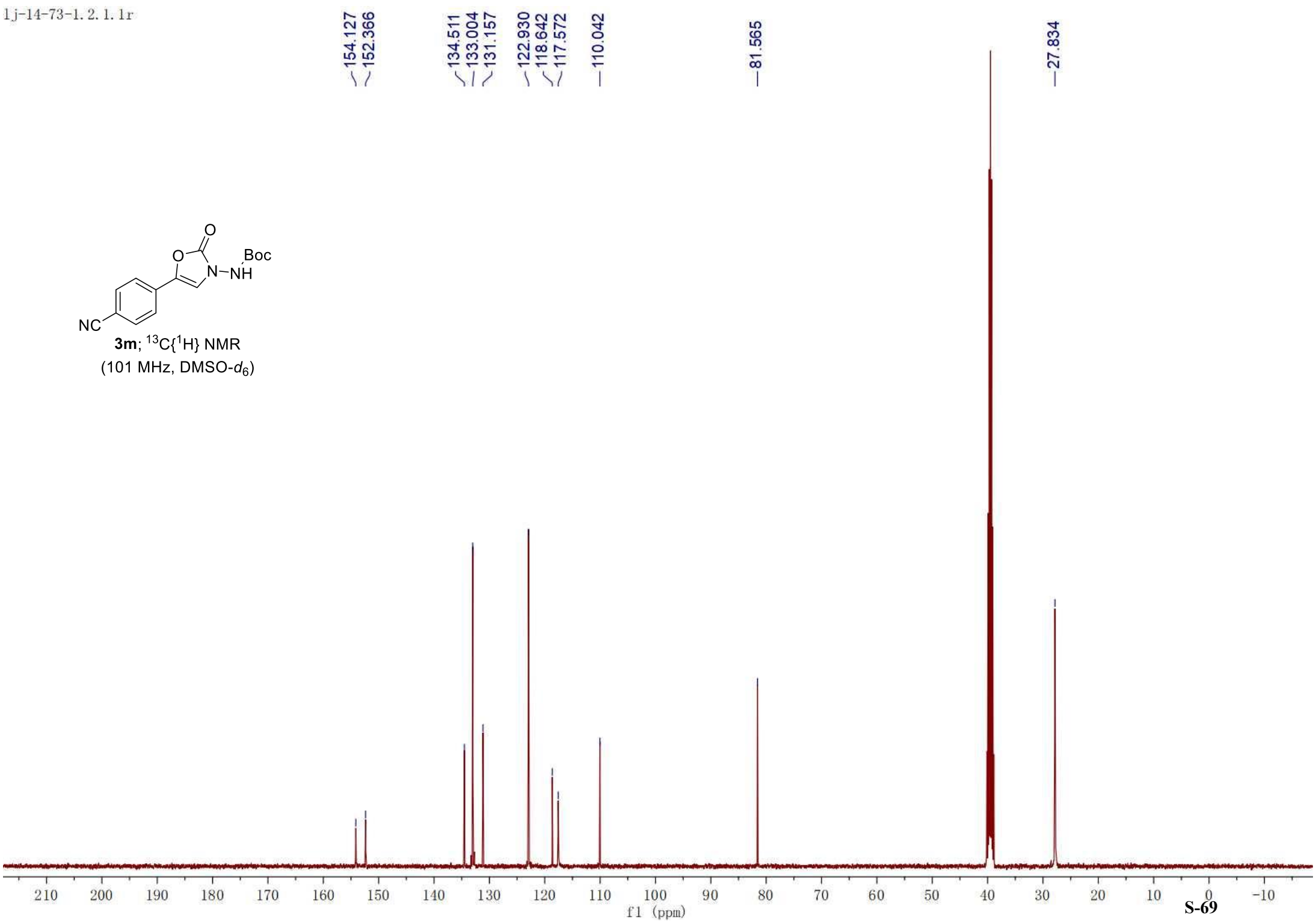
3l; ^{1}H NMR
(400 MHz, DMSO-d_6)



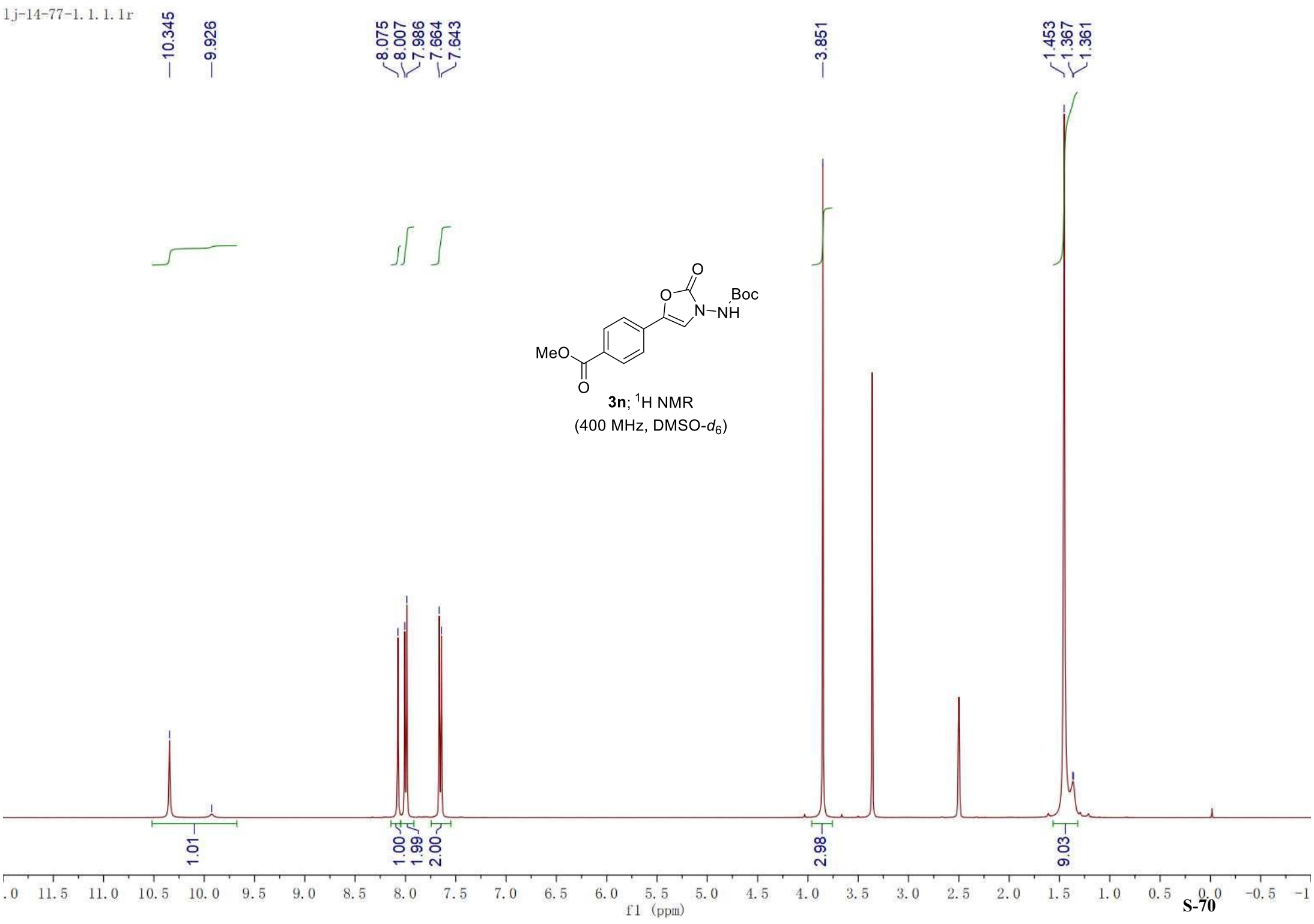
3l; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



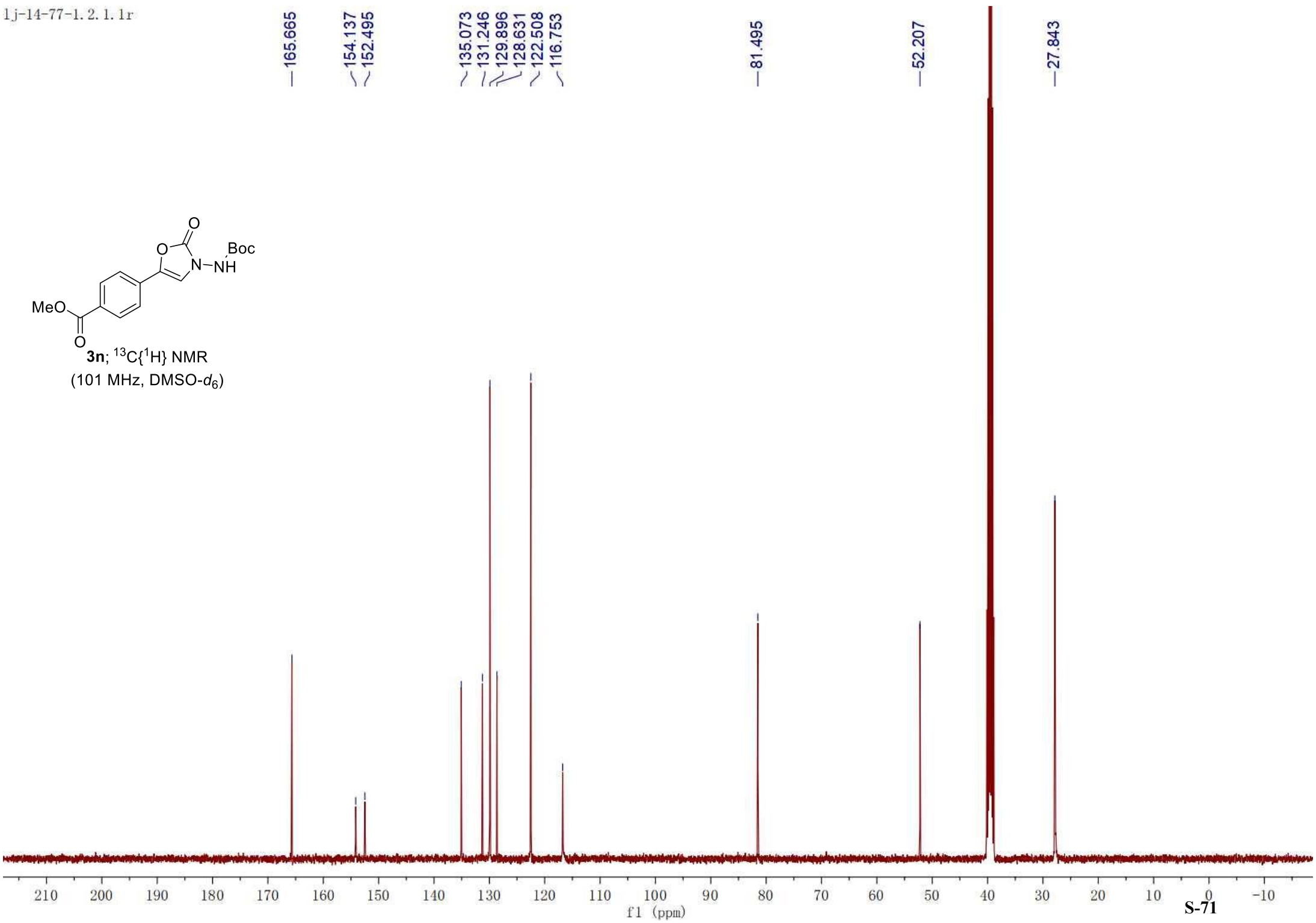
3m; ^{1}H NMR
(400 MHz, DMSO-d_6)



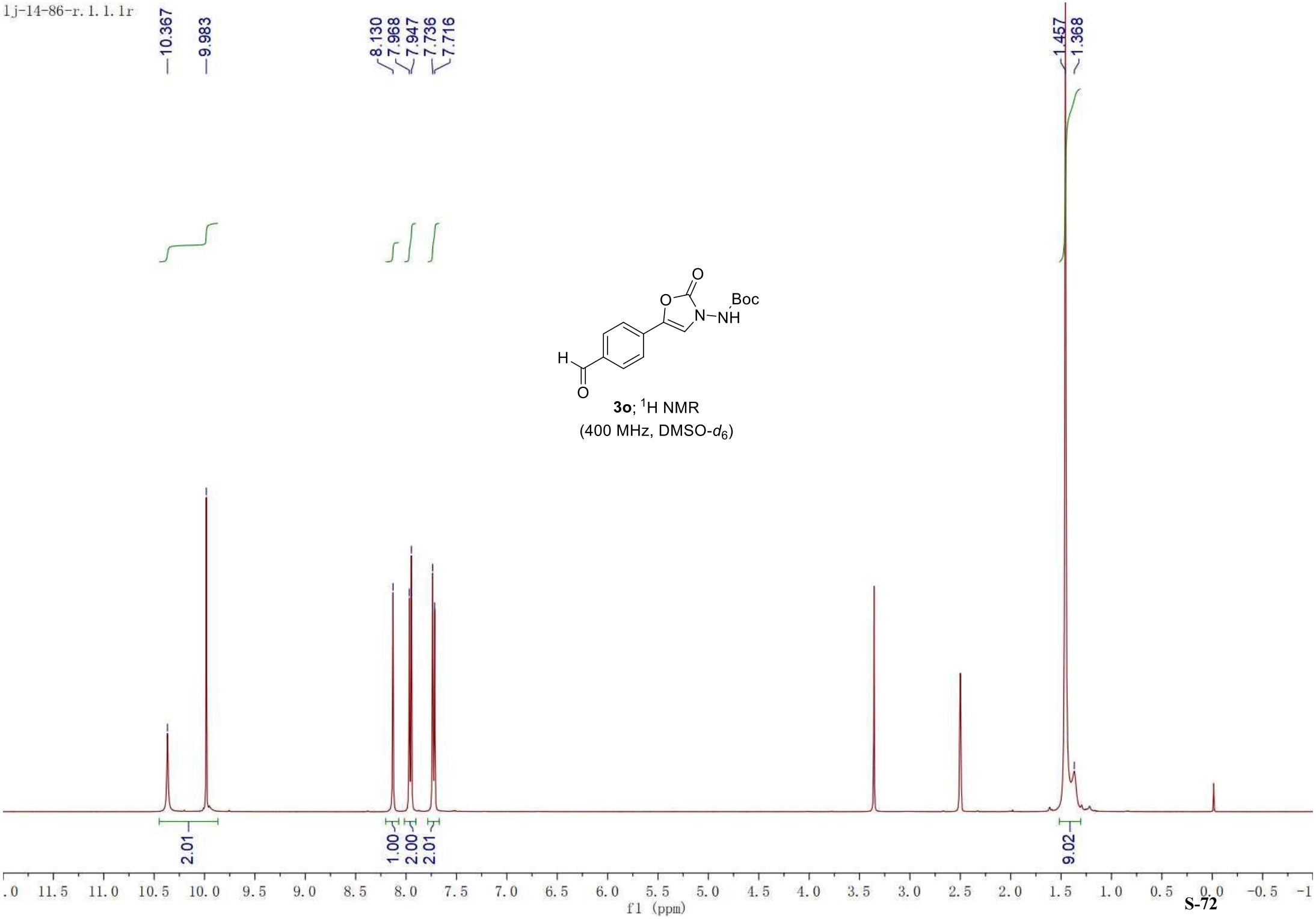
3m; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



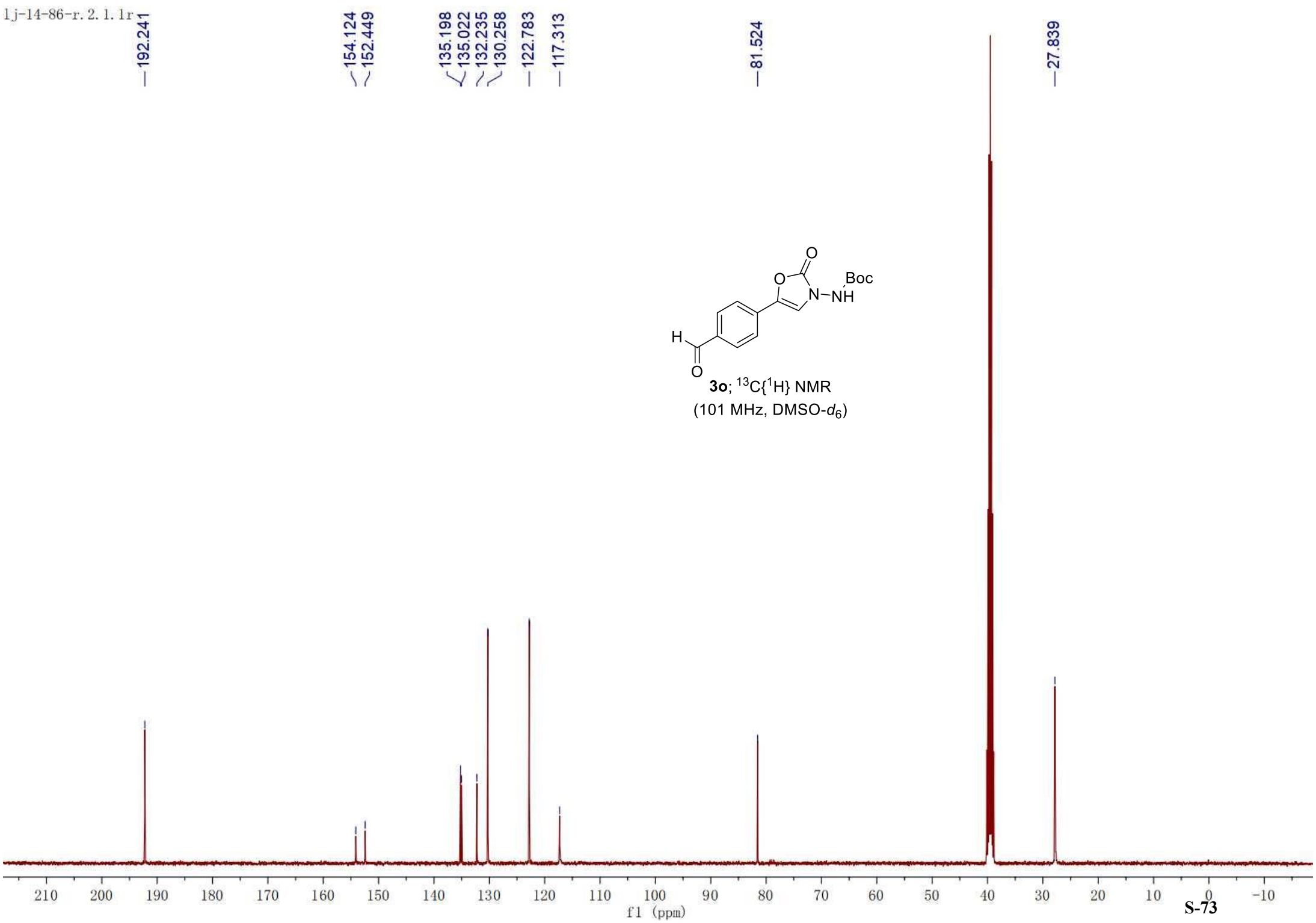
3n; ^{1}H NMR
(400 MHz, DMSO-d_6)



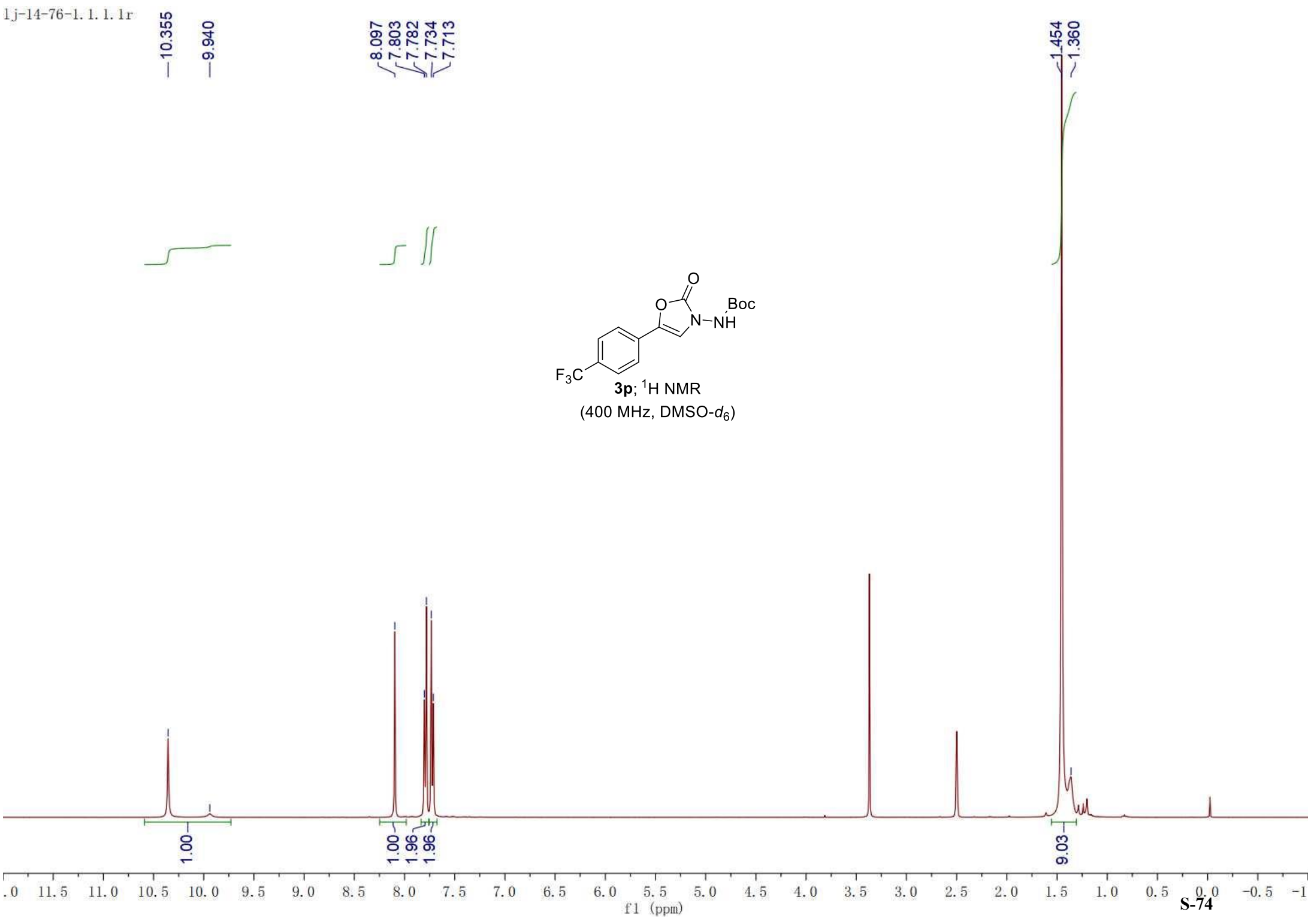
3n; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



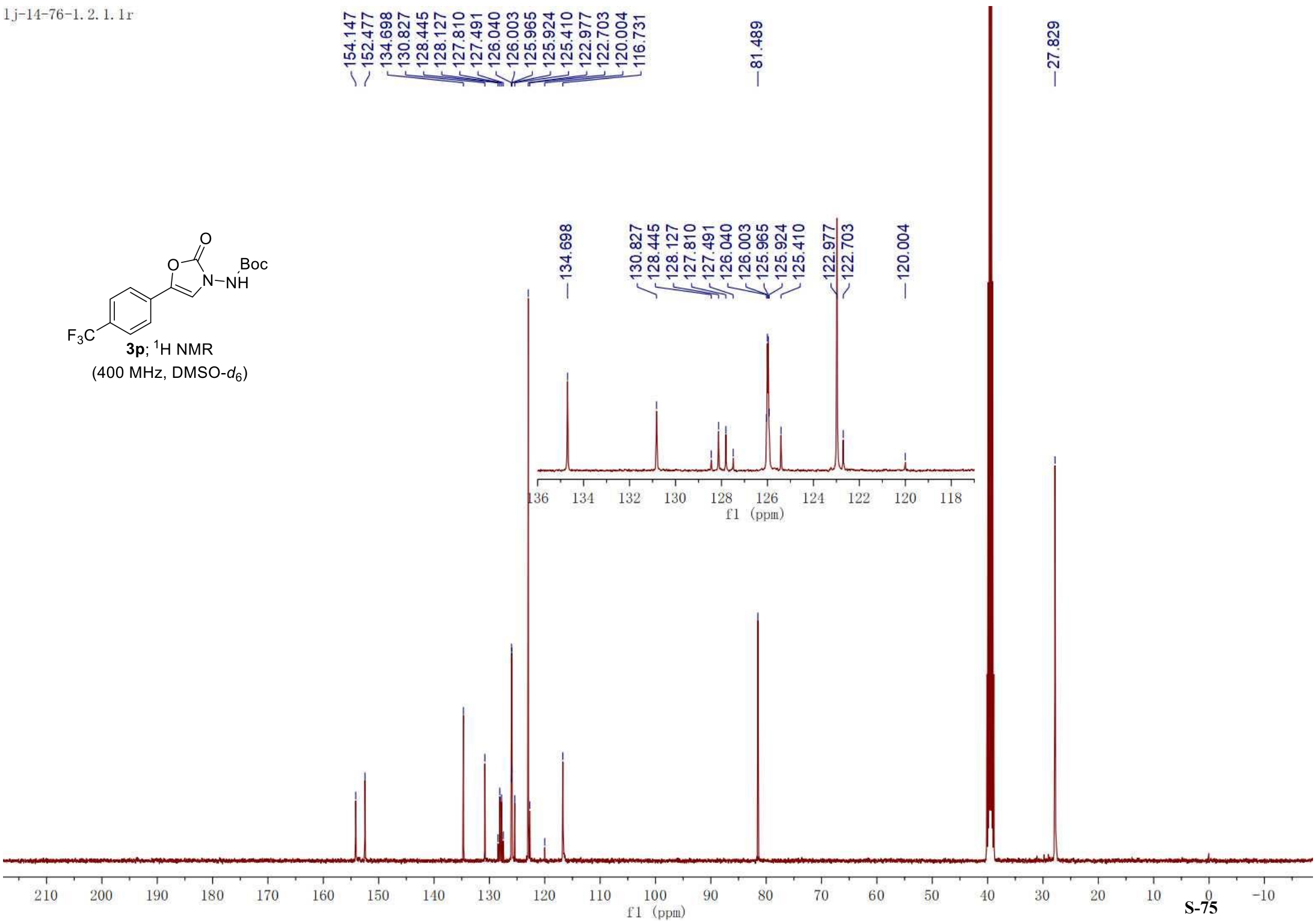
3o; ^{1}H NMR
(400 MHz, DMSO-d_6)

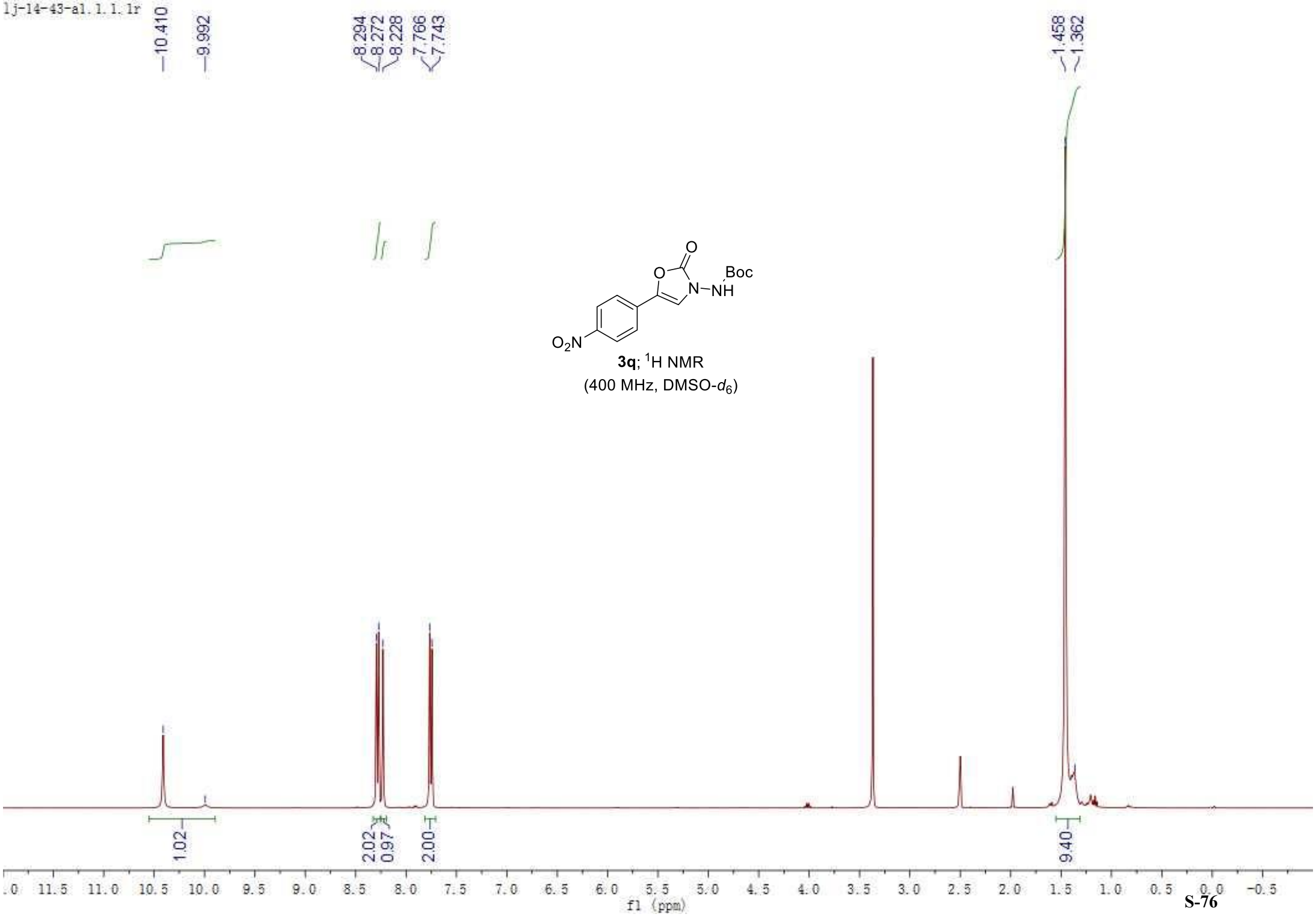


3o; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

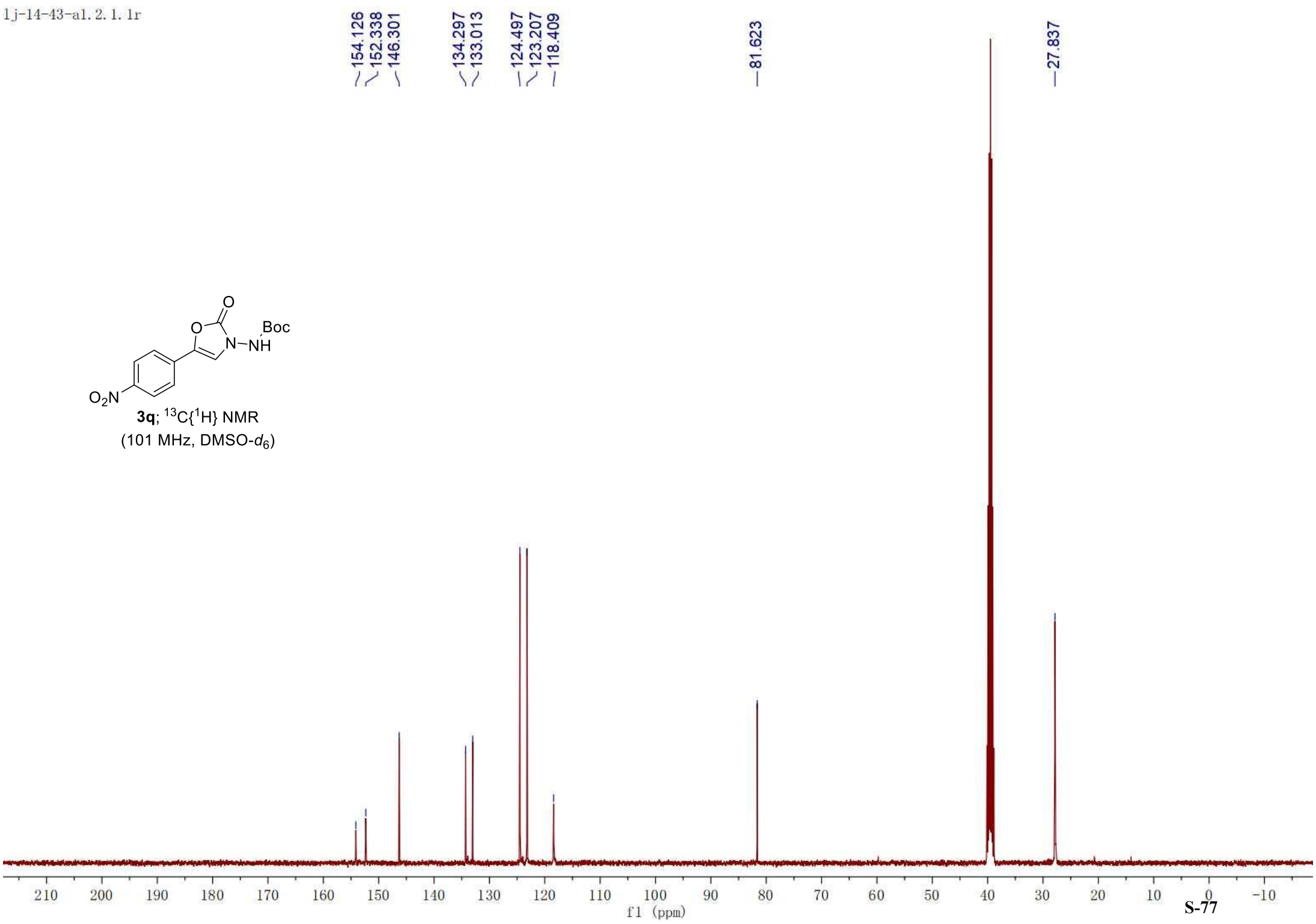


3p; ^{1}H NMR
(400 MHz, DMSO-d_6)

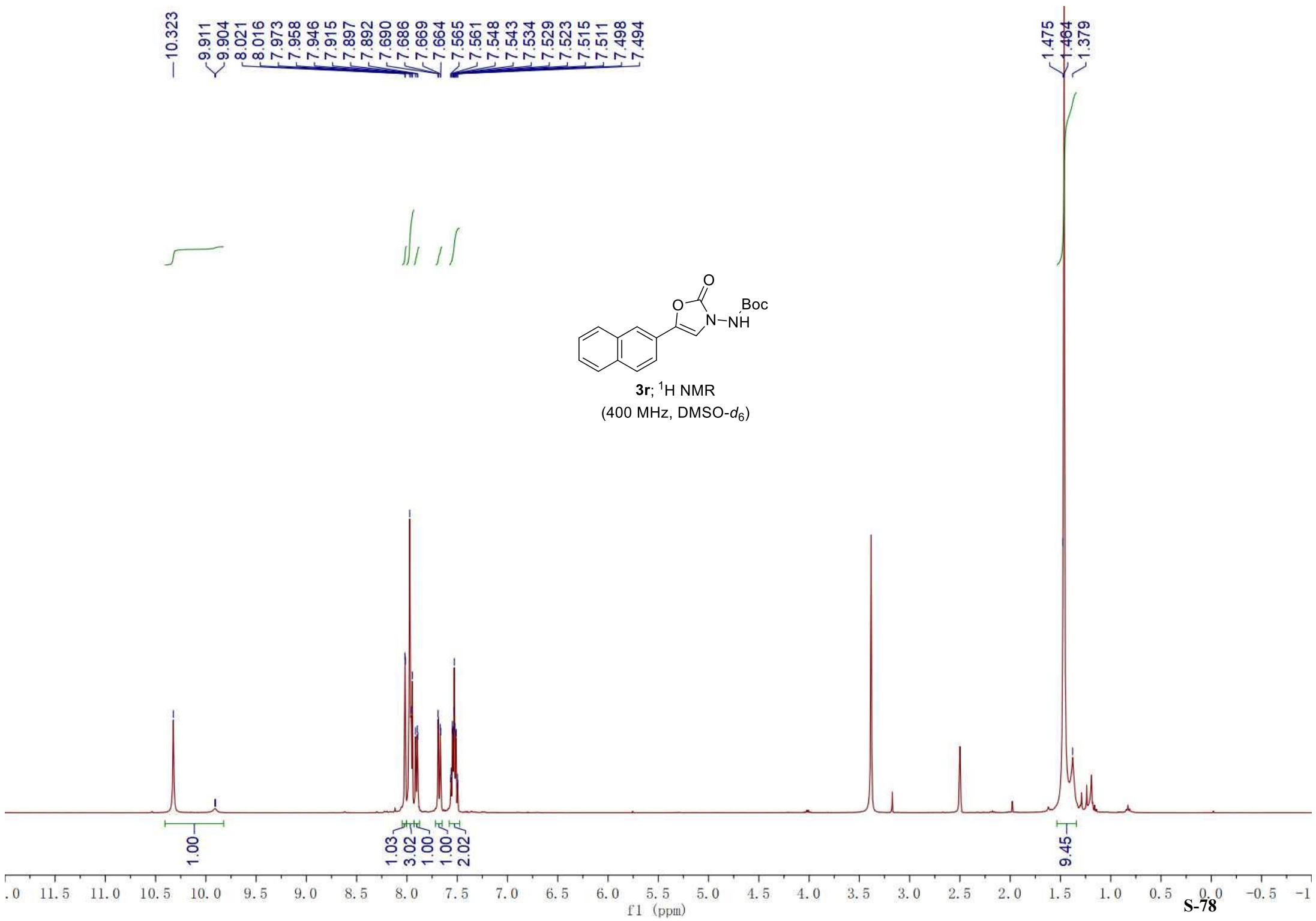

1j-14-76-1.2.1.1r
154.147
152.477
134.698
130.827
128.445
128.127
127.810
127.491
126.040
126.003
125.965
125.924
125.410
122.977
122.703
120.004
116.731
81.489
27.829
Boc
N
NH
O
O
F3C
3p; 1H NMR
(400 MHz, DMSO-d6)
f1 (ppm)
f1 (ppm)



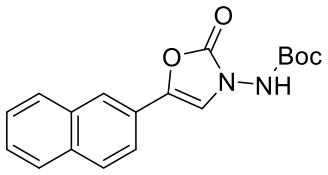
3q; ^{1}H NMR
(400 MHz, DMSO-d_6)



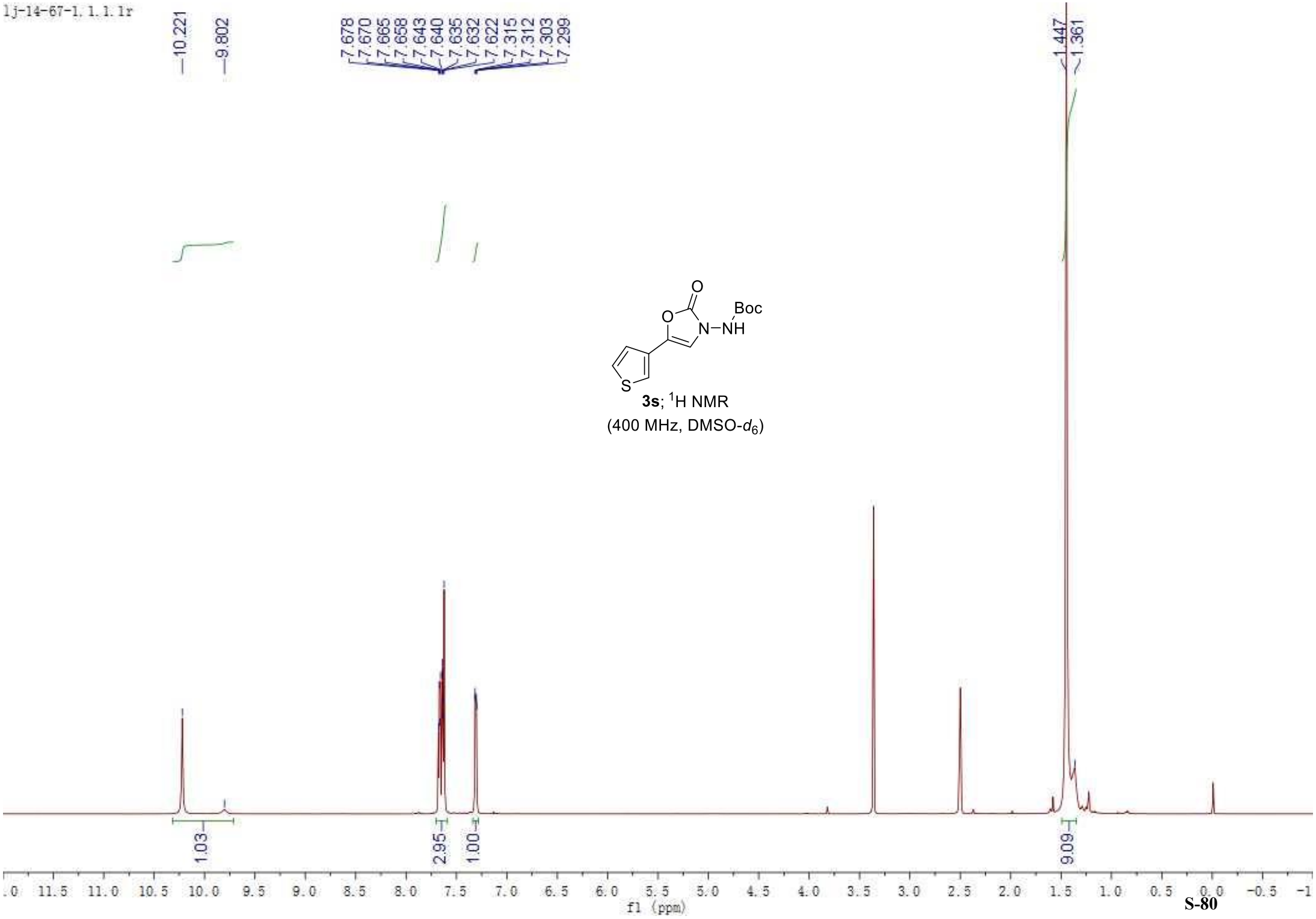
3q; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



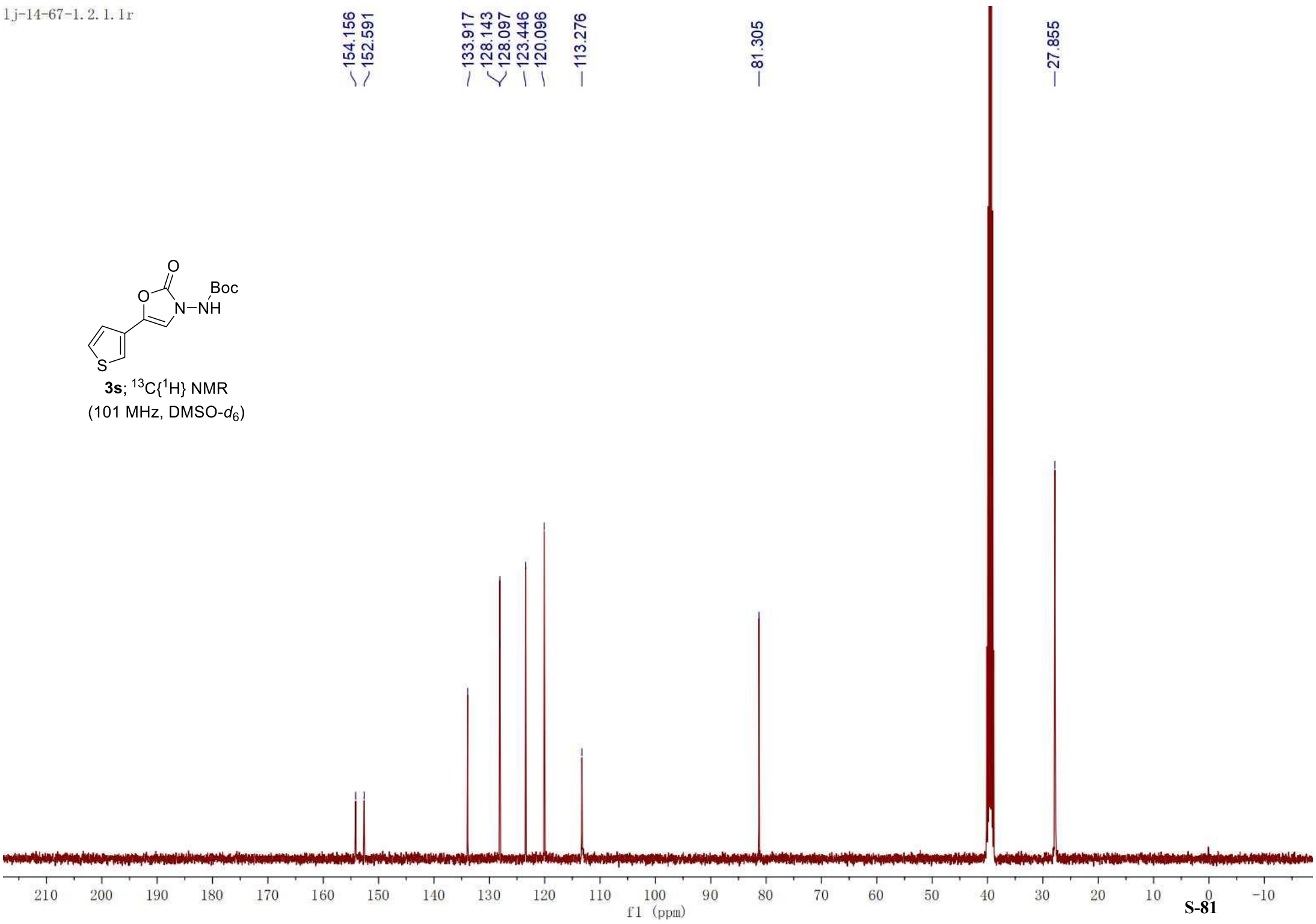
3r; ^{1}H NMR
(400 MHz, DMSO-d_6)



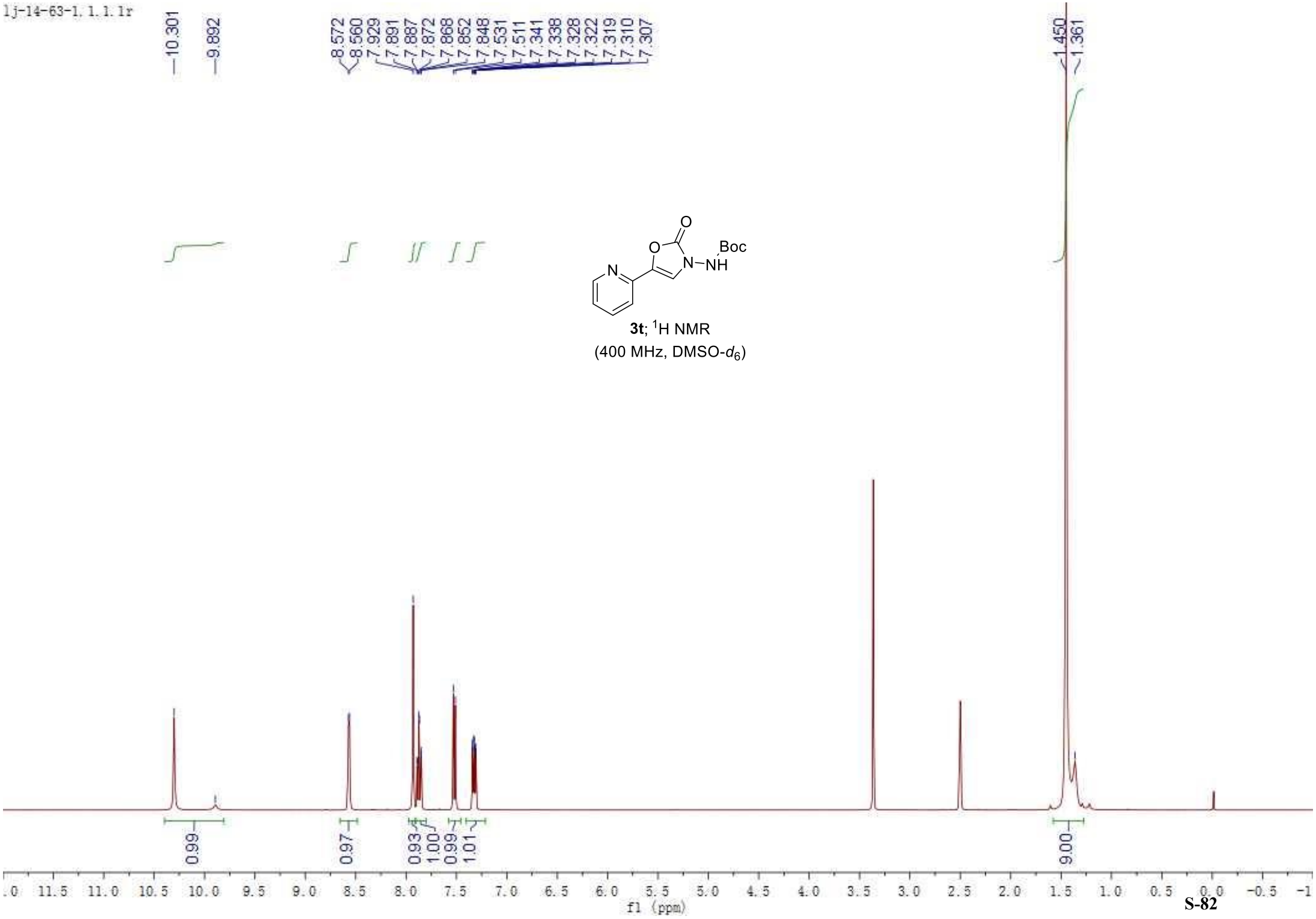
3r; ^{1}H NMR
(400 MHz, DMSO-d_6)



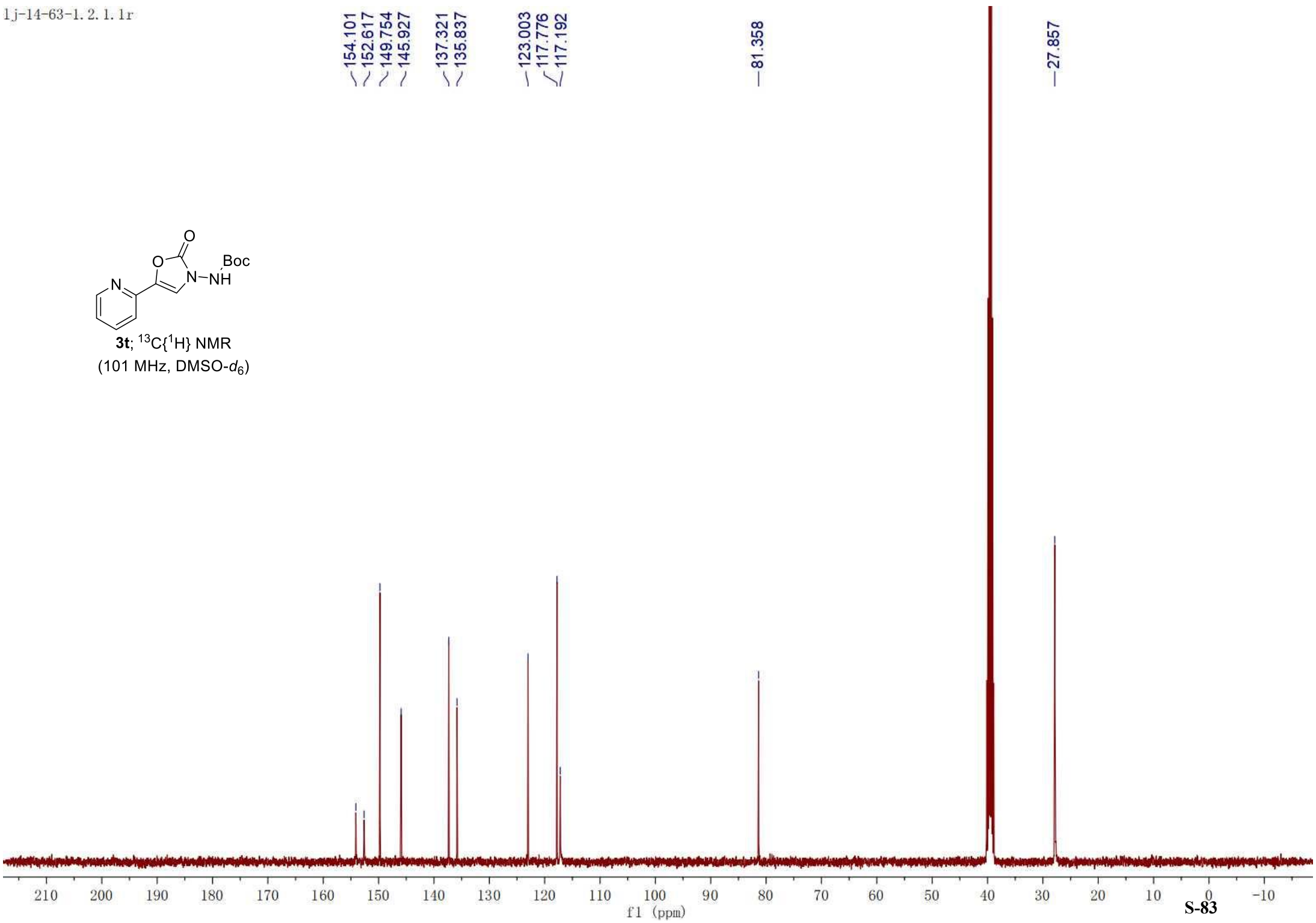
3s; ^{1}H NMR
(400 MHz, DMSO-d_6)



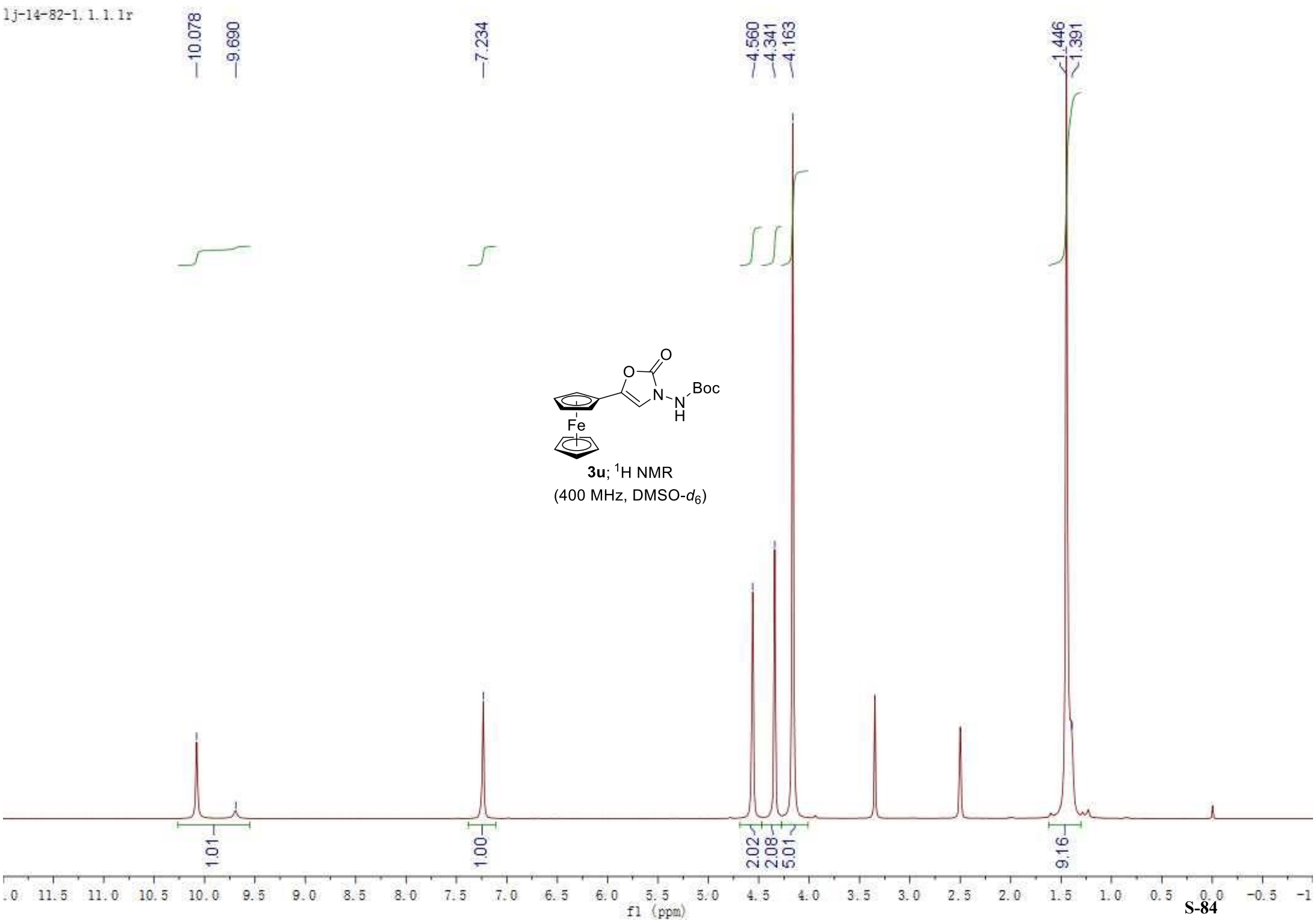
3s; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



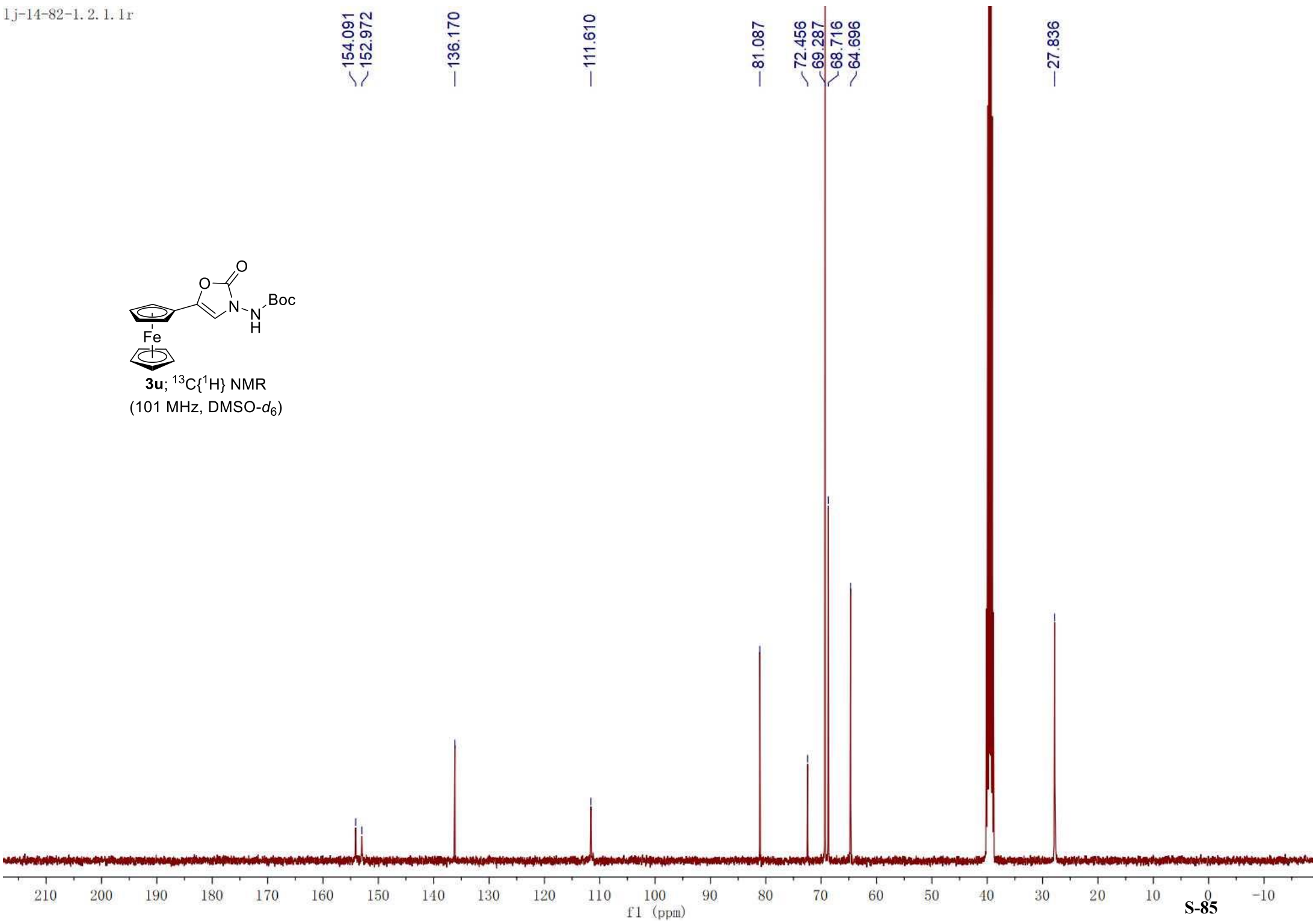
3t; ^{1}H NMR
(400 MHz, DMSO-d_6)



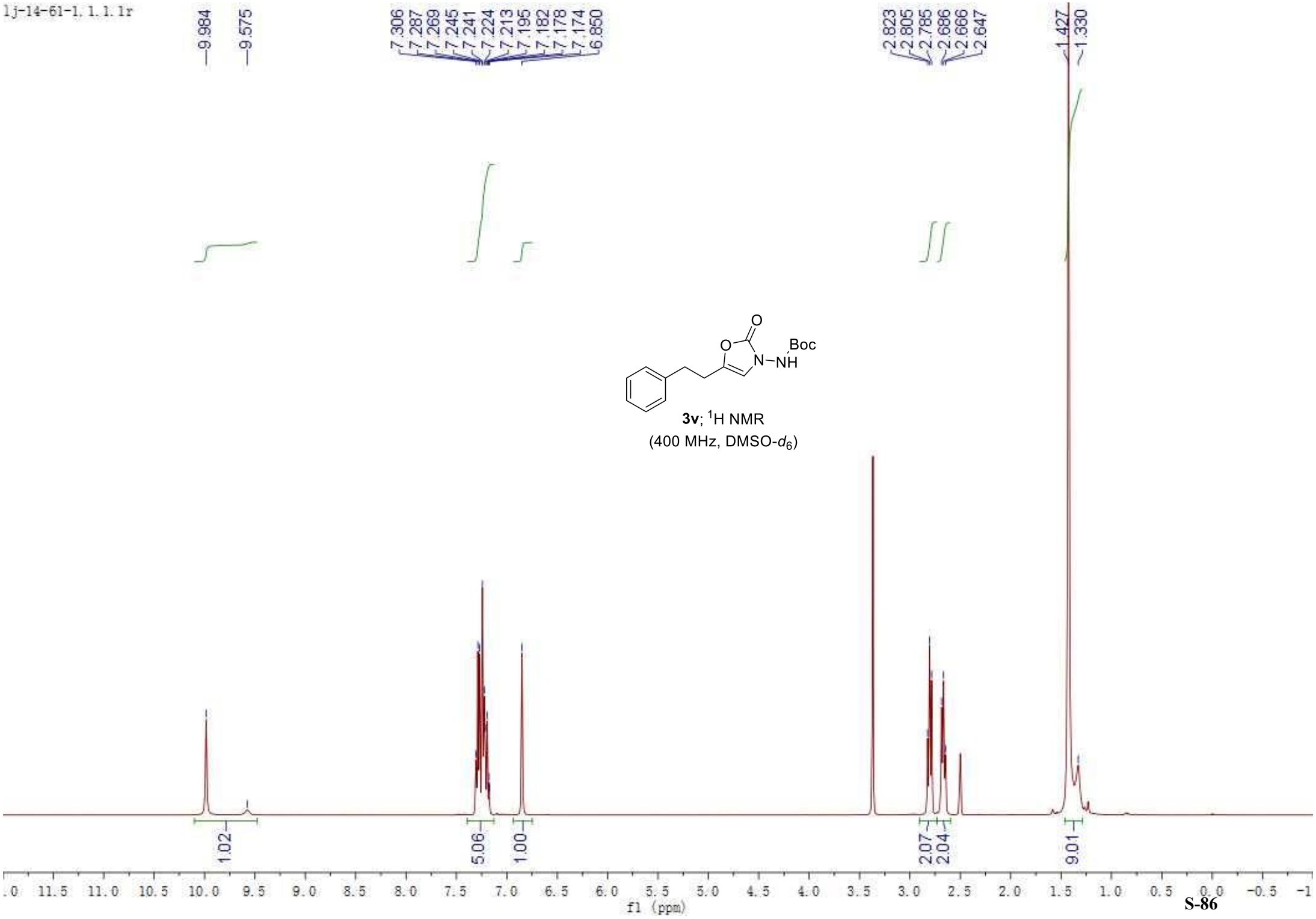
3t; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



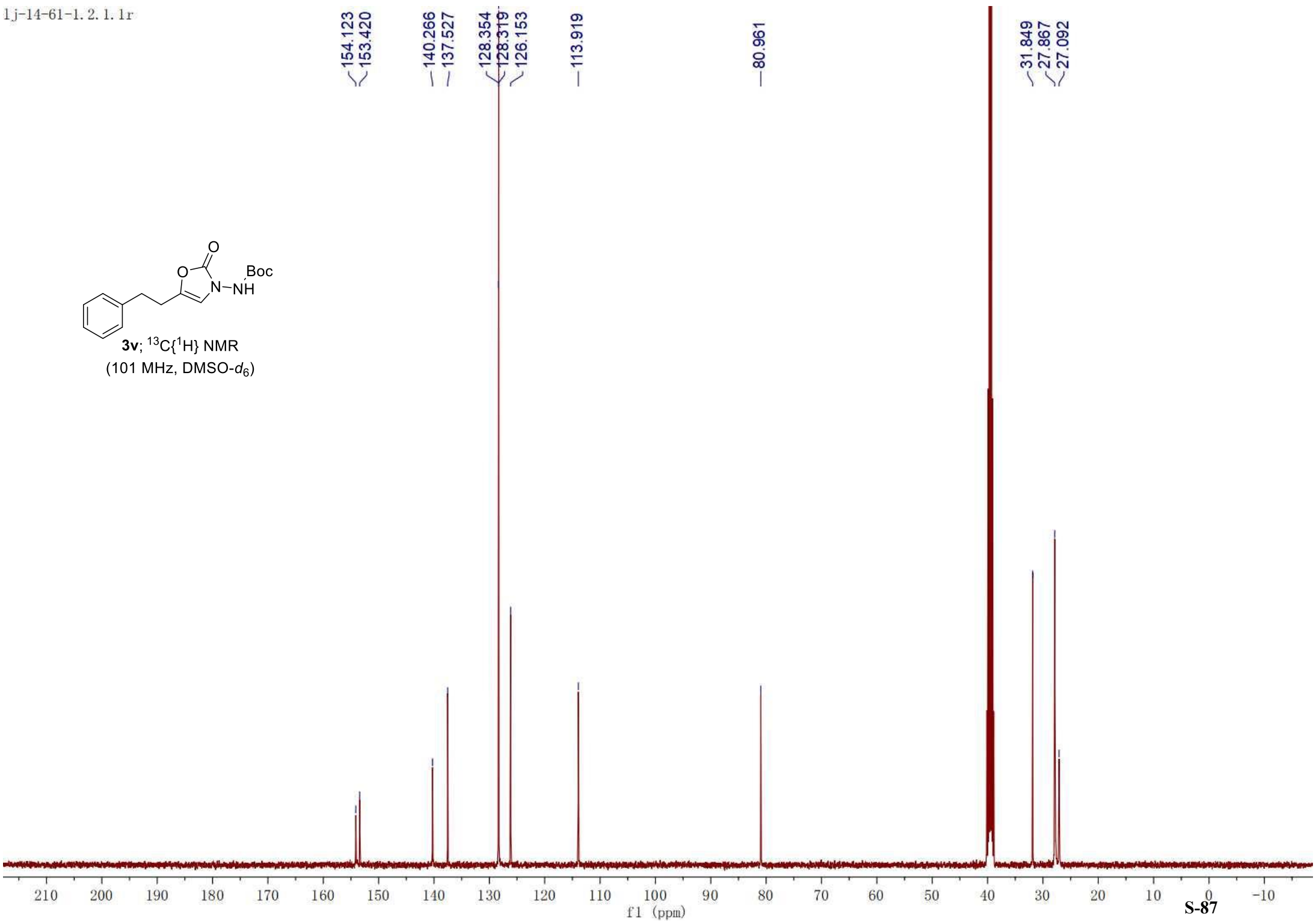
3u; ^{1}H NMR
(400 MHz, DMSO-d_6)



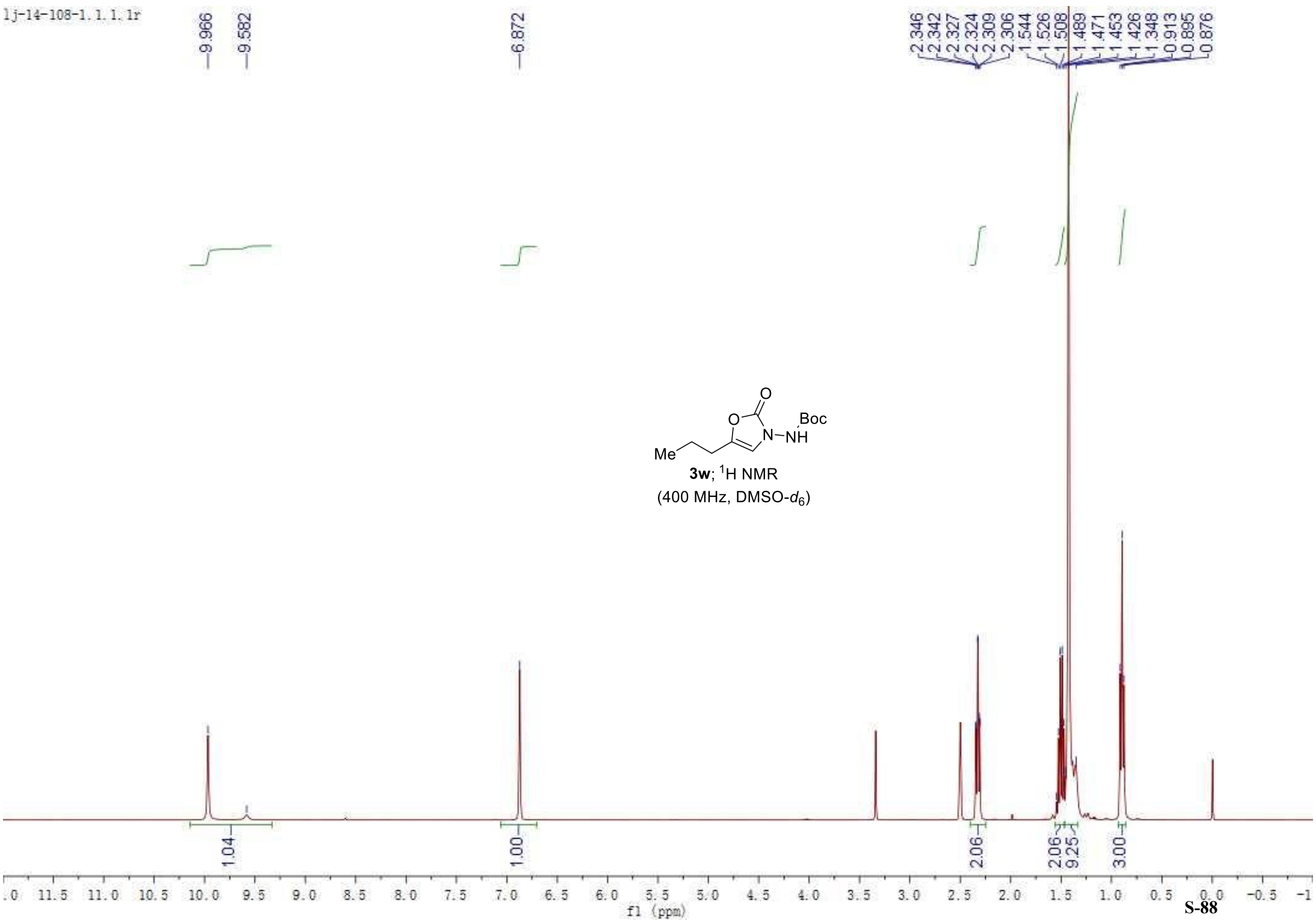
3u; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



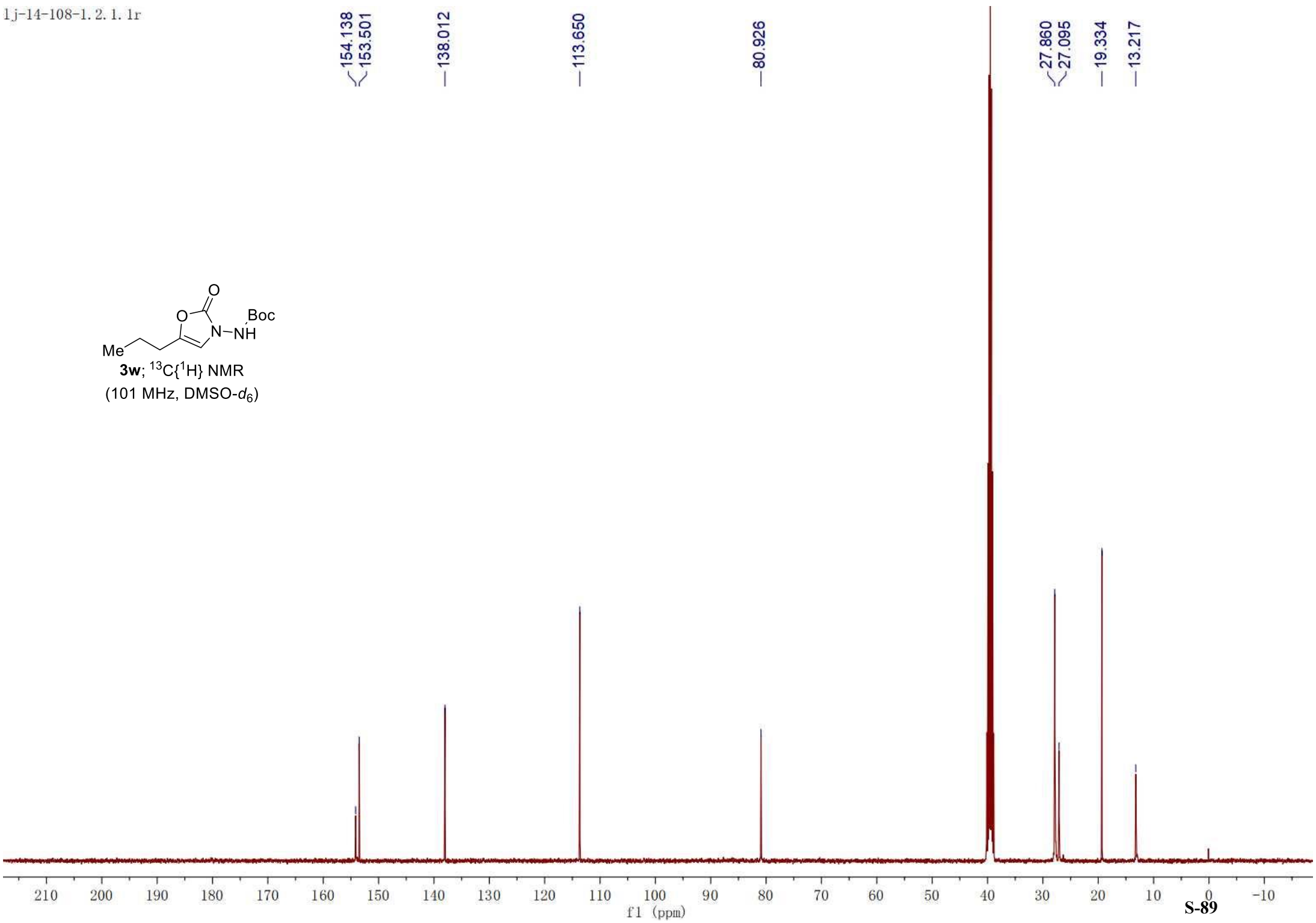
3v; ^{1}H NMR
(400 MHz, DMSO-d_6)



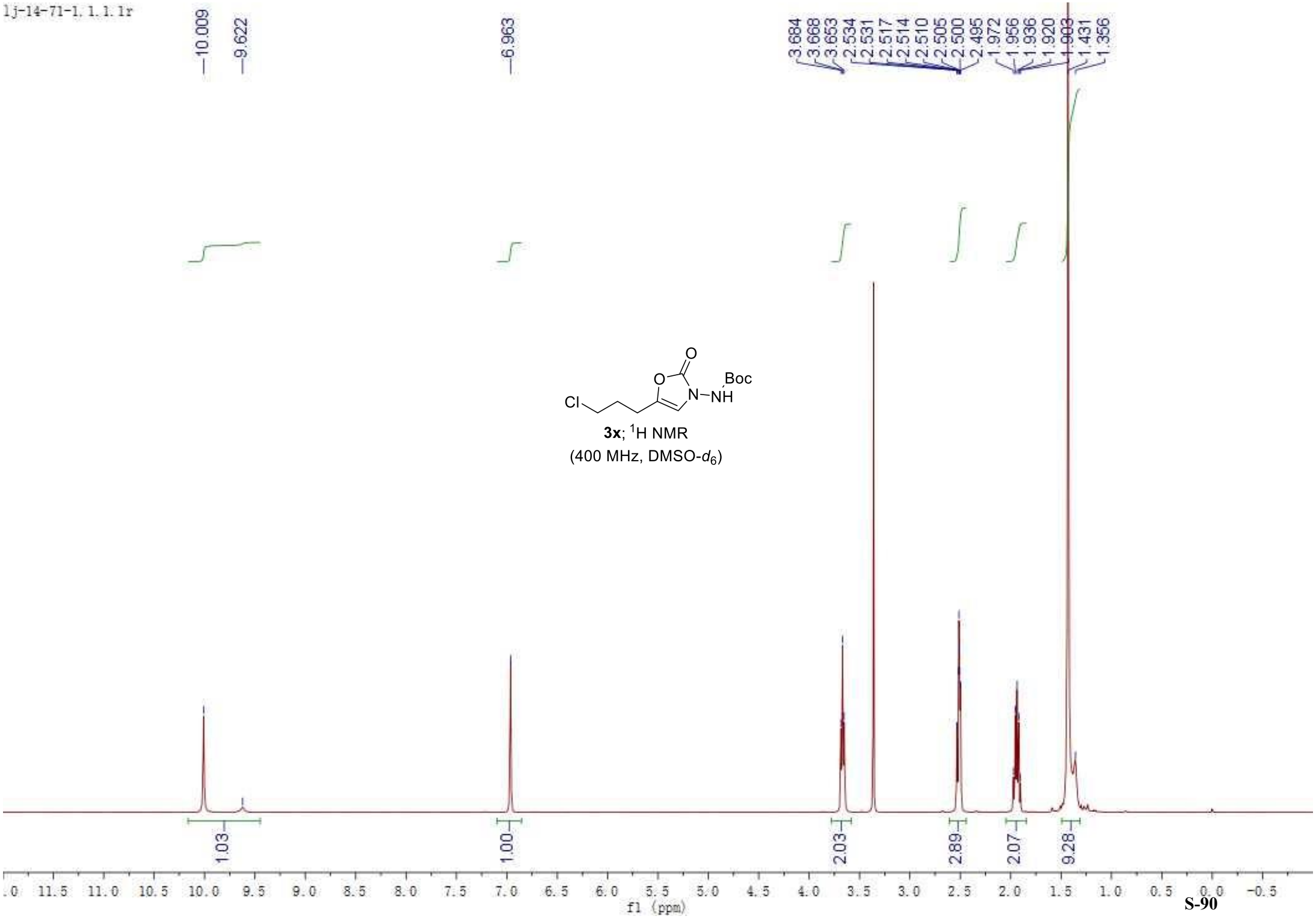
3v; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



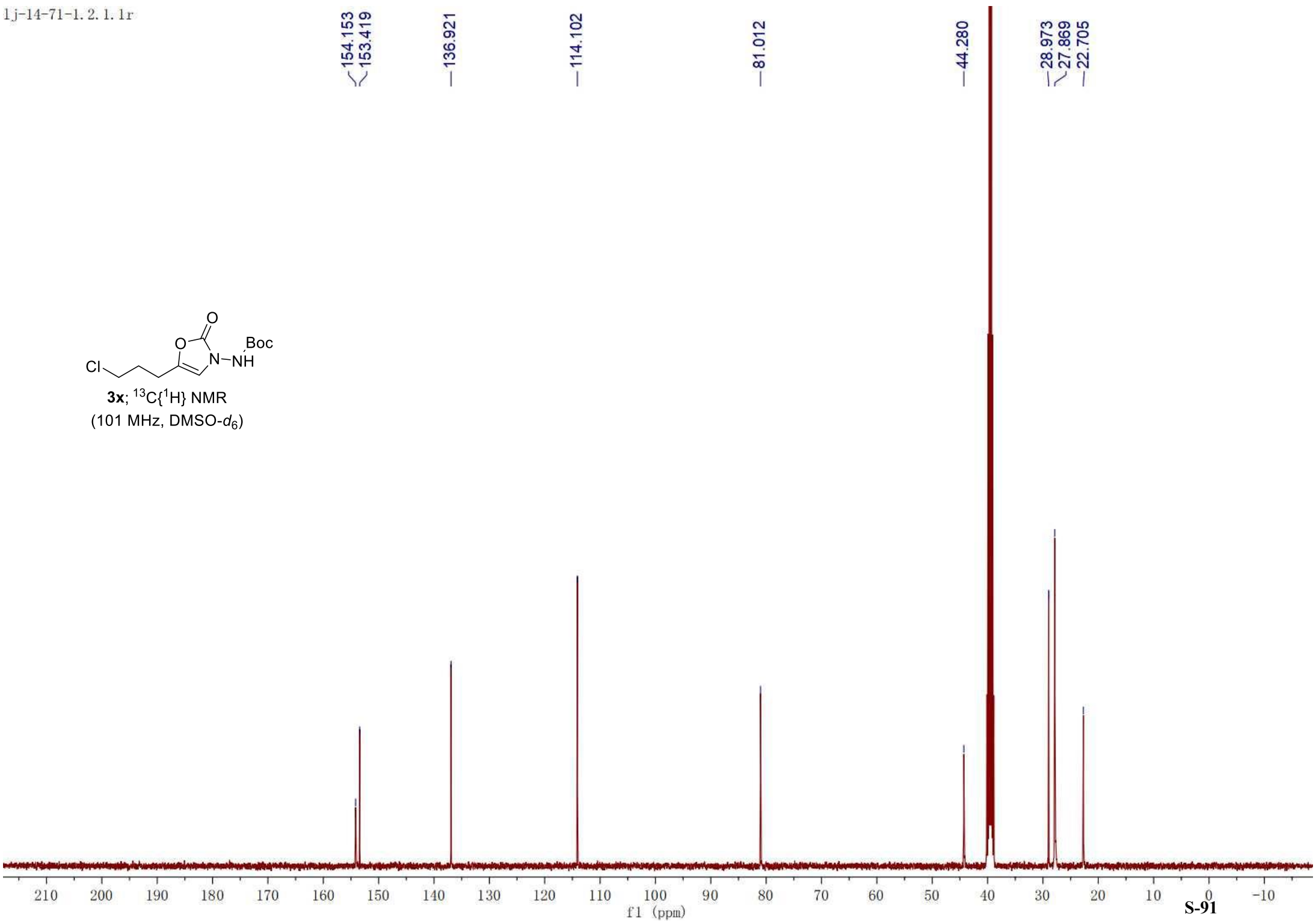
3w; ^{1}H NMR
(400 MHz, DMSO-d_6)



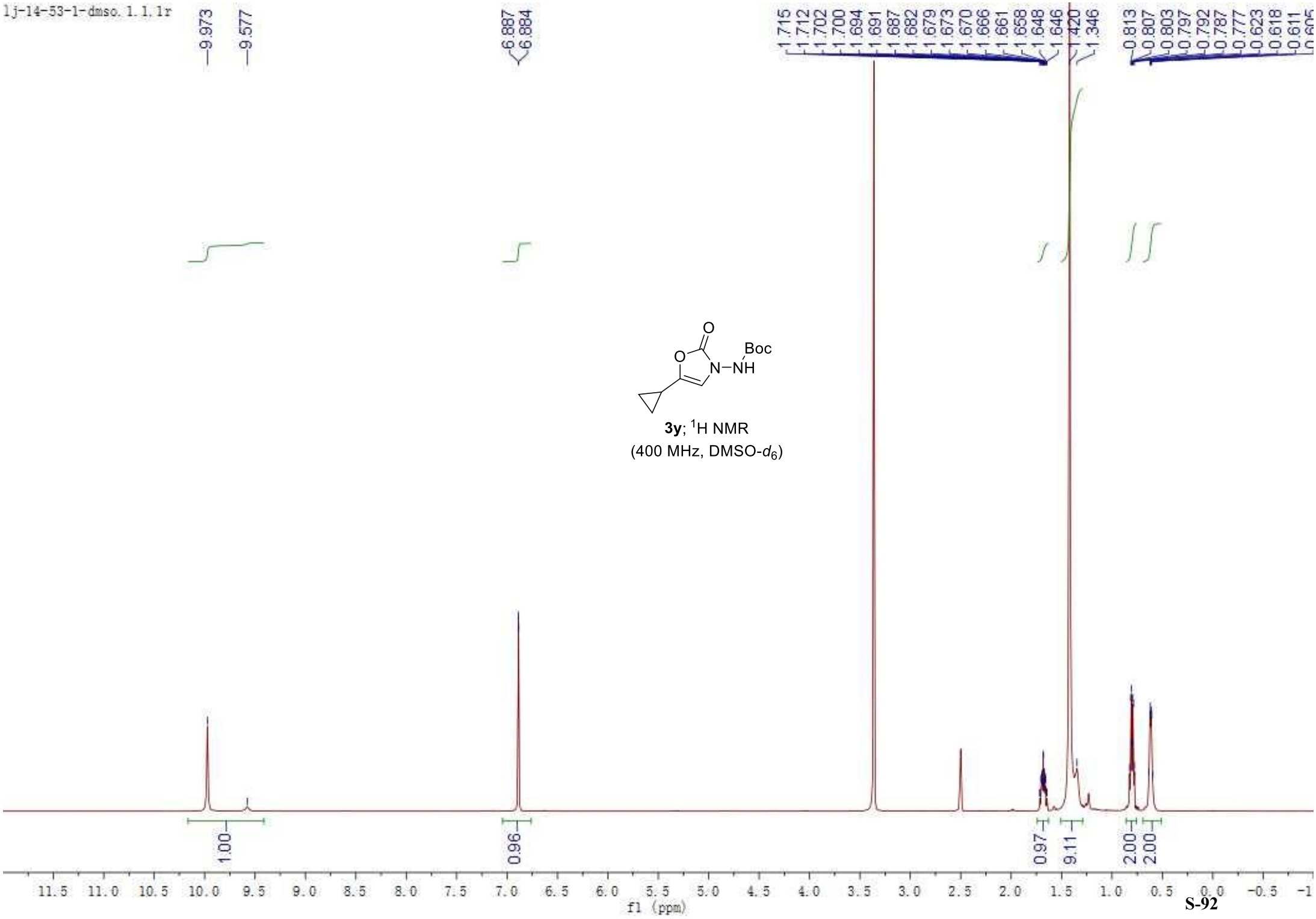
3w; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



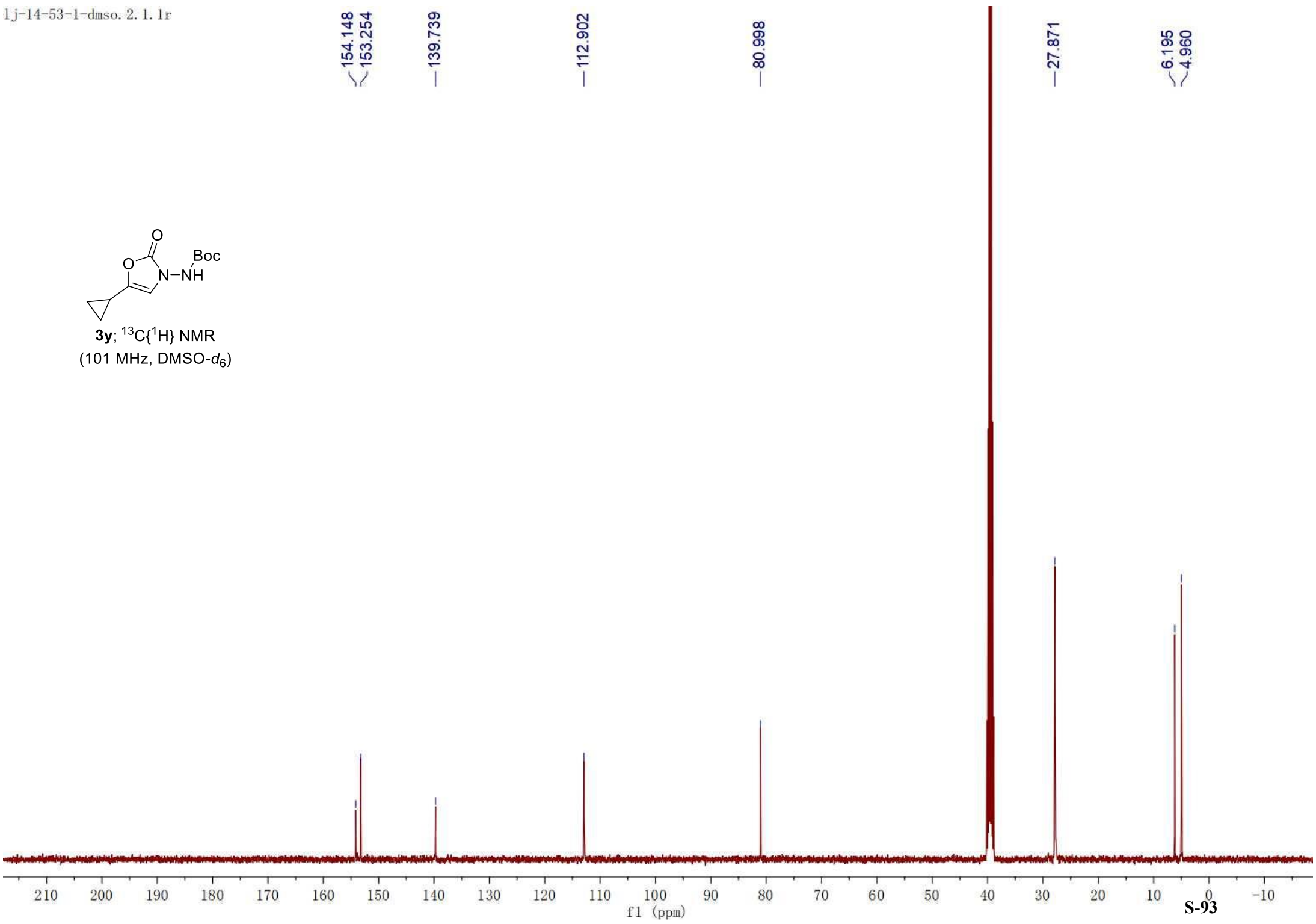
3x; ^{1}H NMR
(400 MHz, DMSO-d_6)



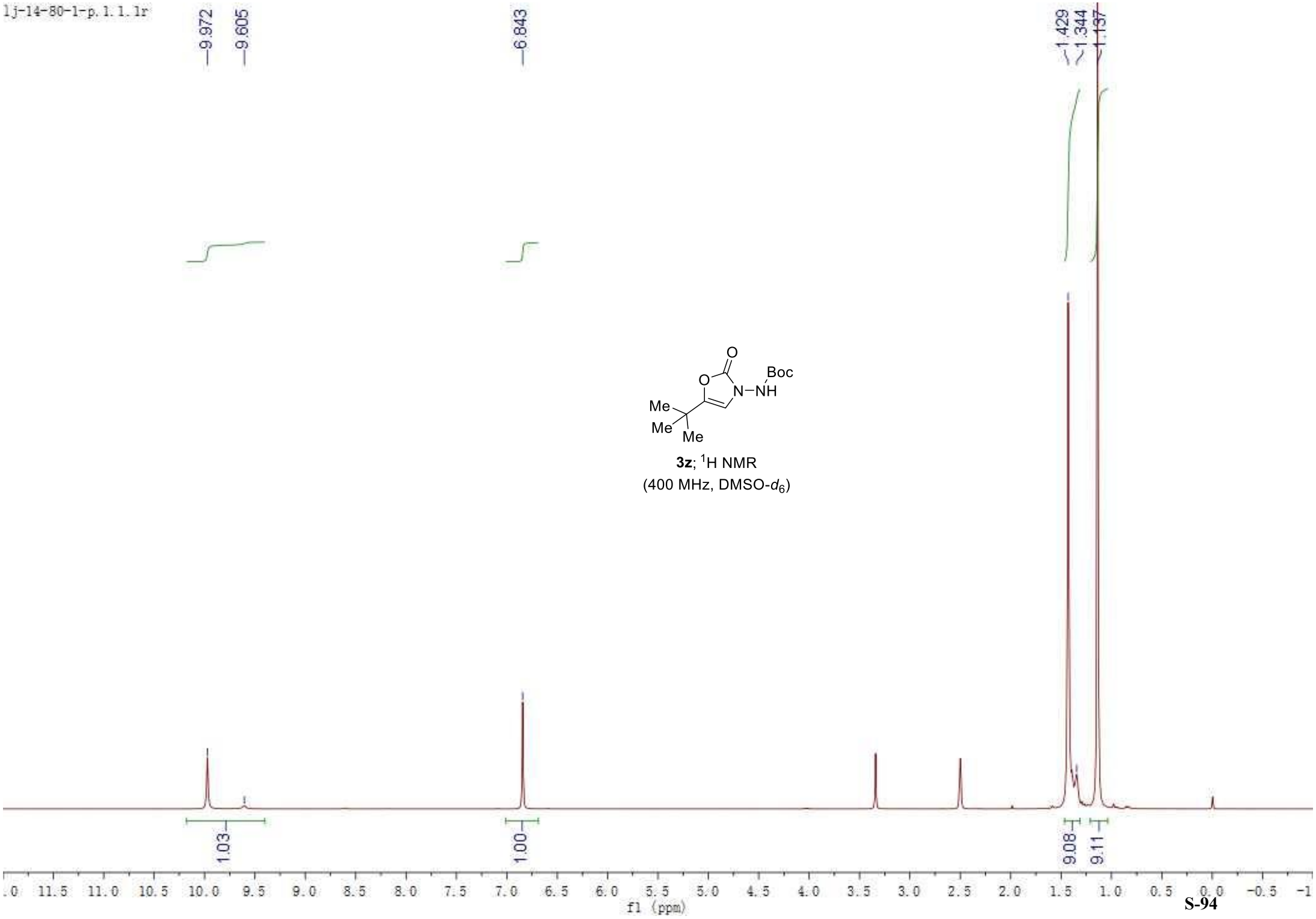
3x; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



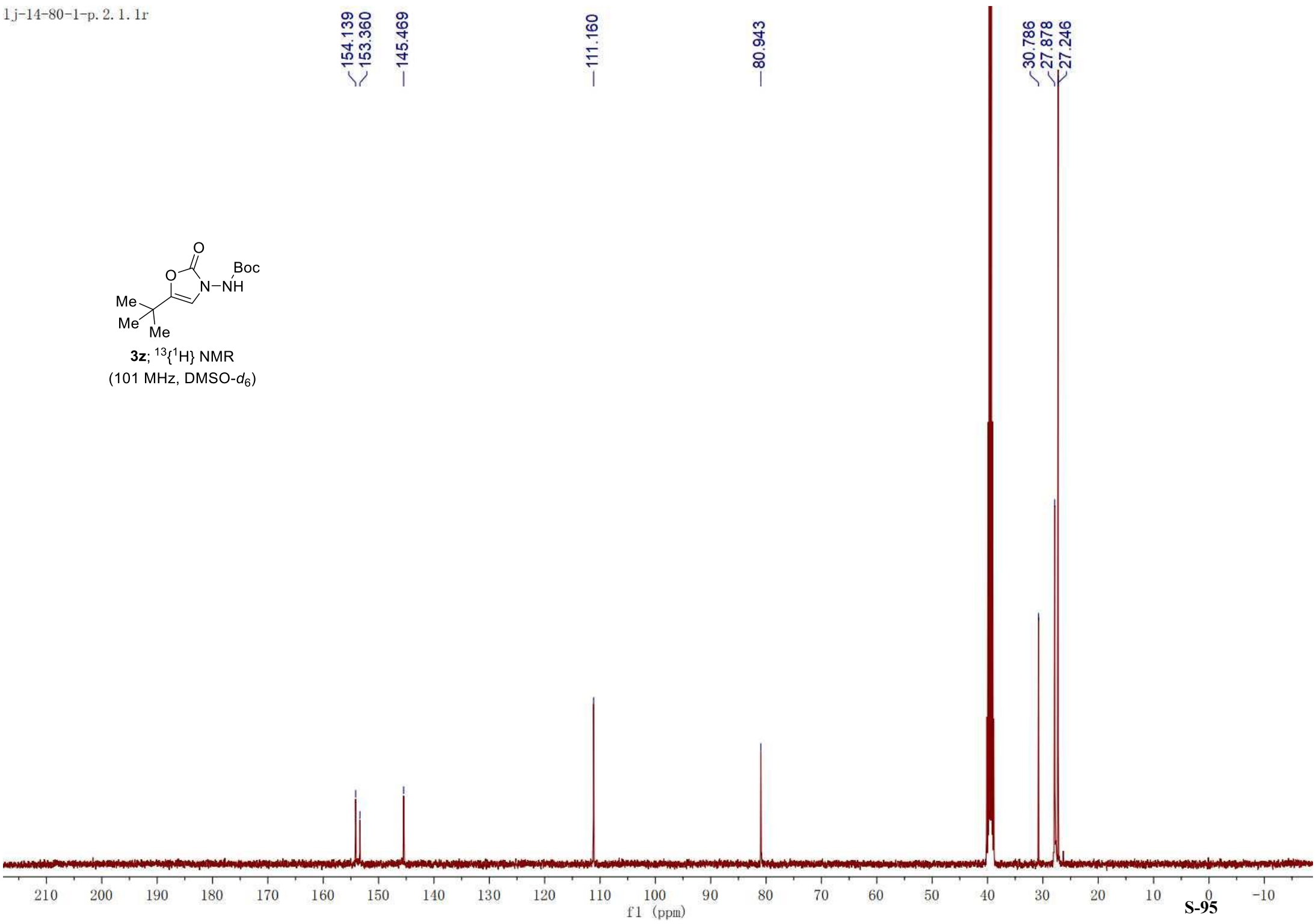
3y; ^{1}H NMR
(400 MHz, DMSO-d_6)



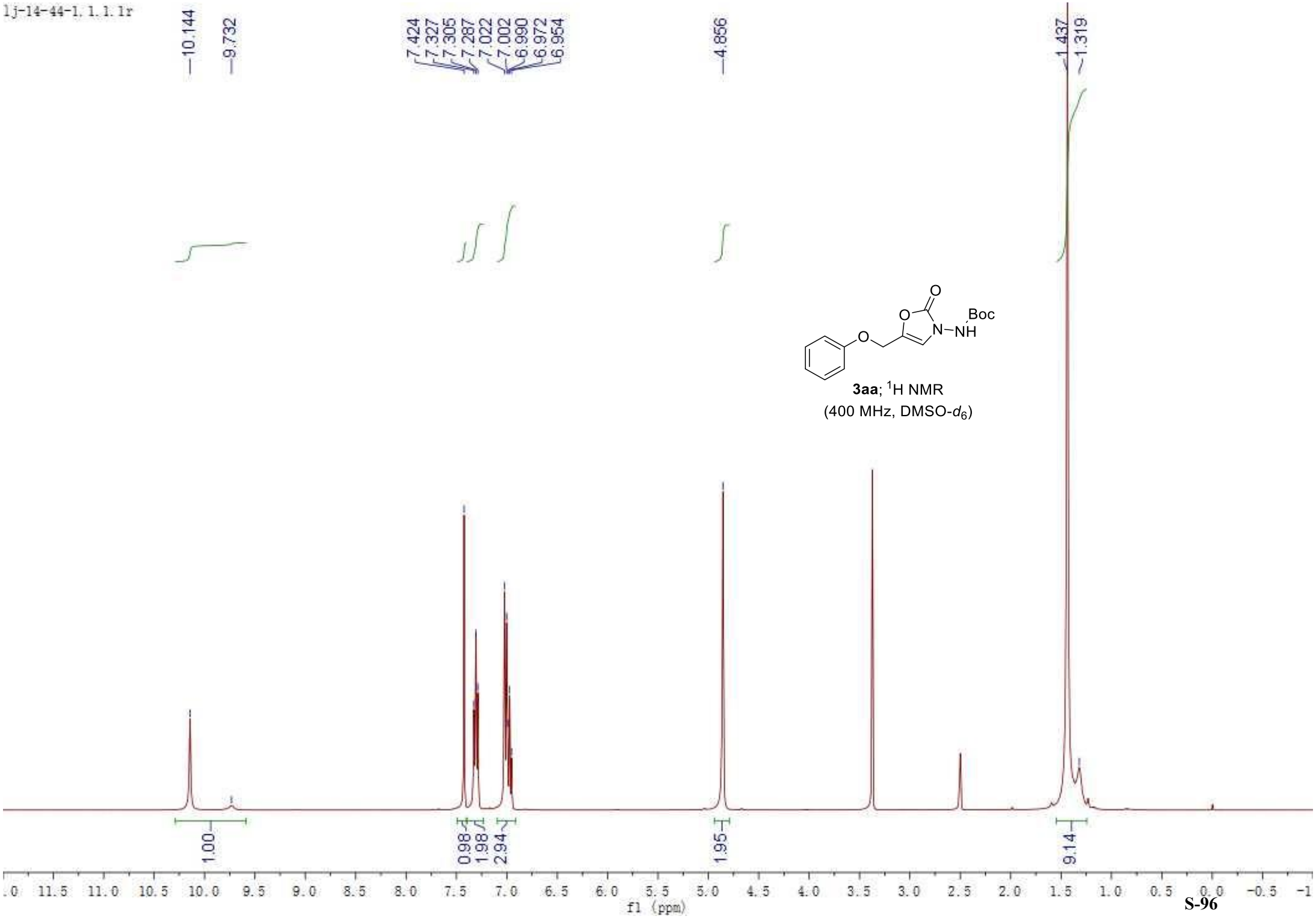
3y; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



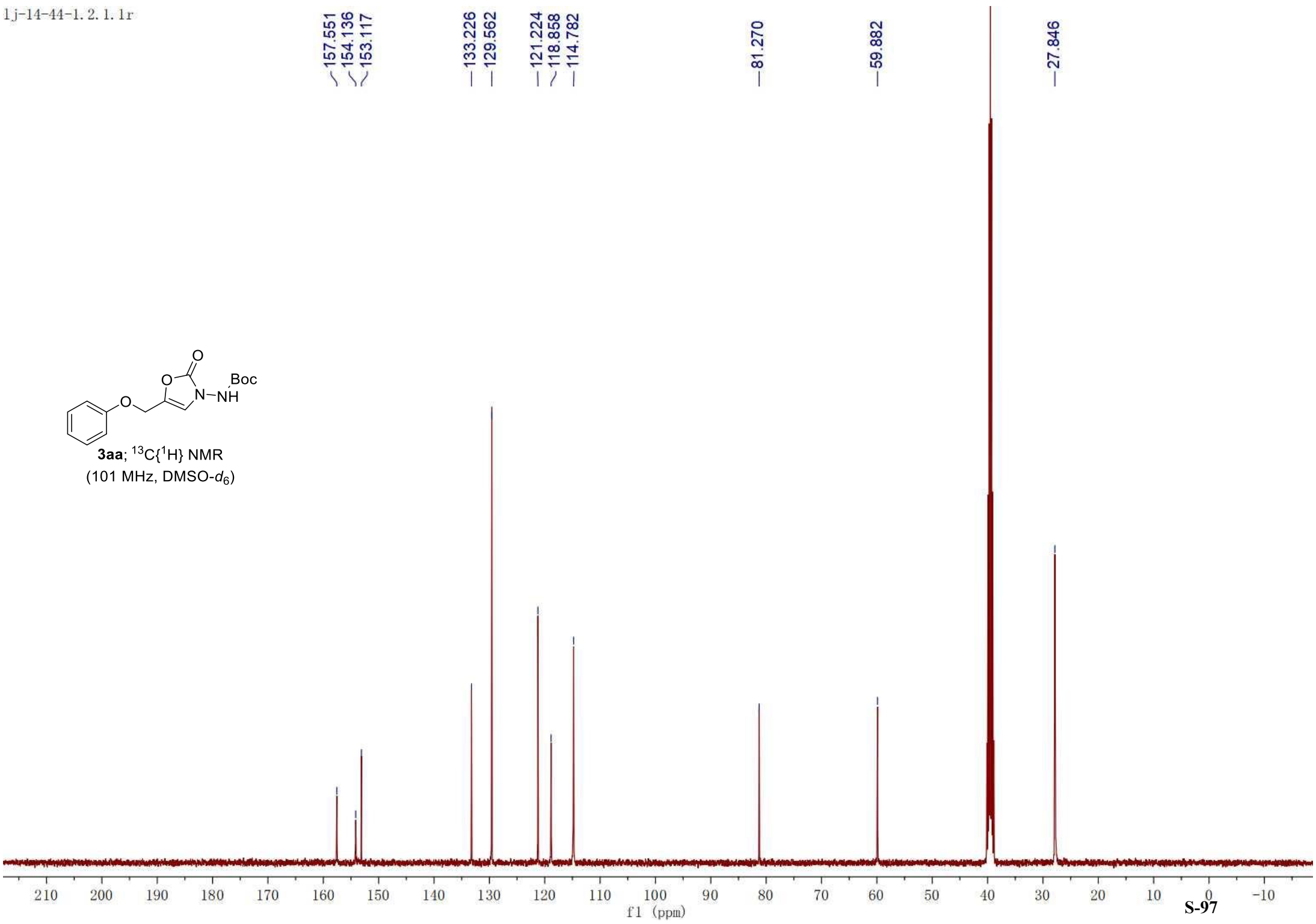
3z; ^{1}H NMR
(400 MHz, DMSO-d_6)



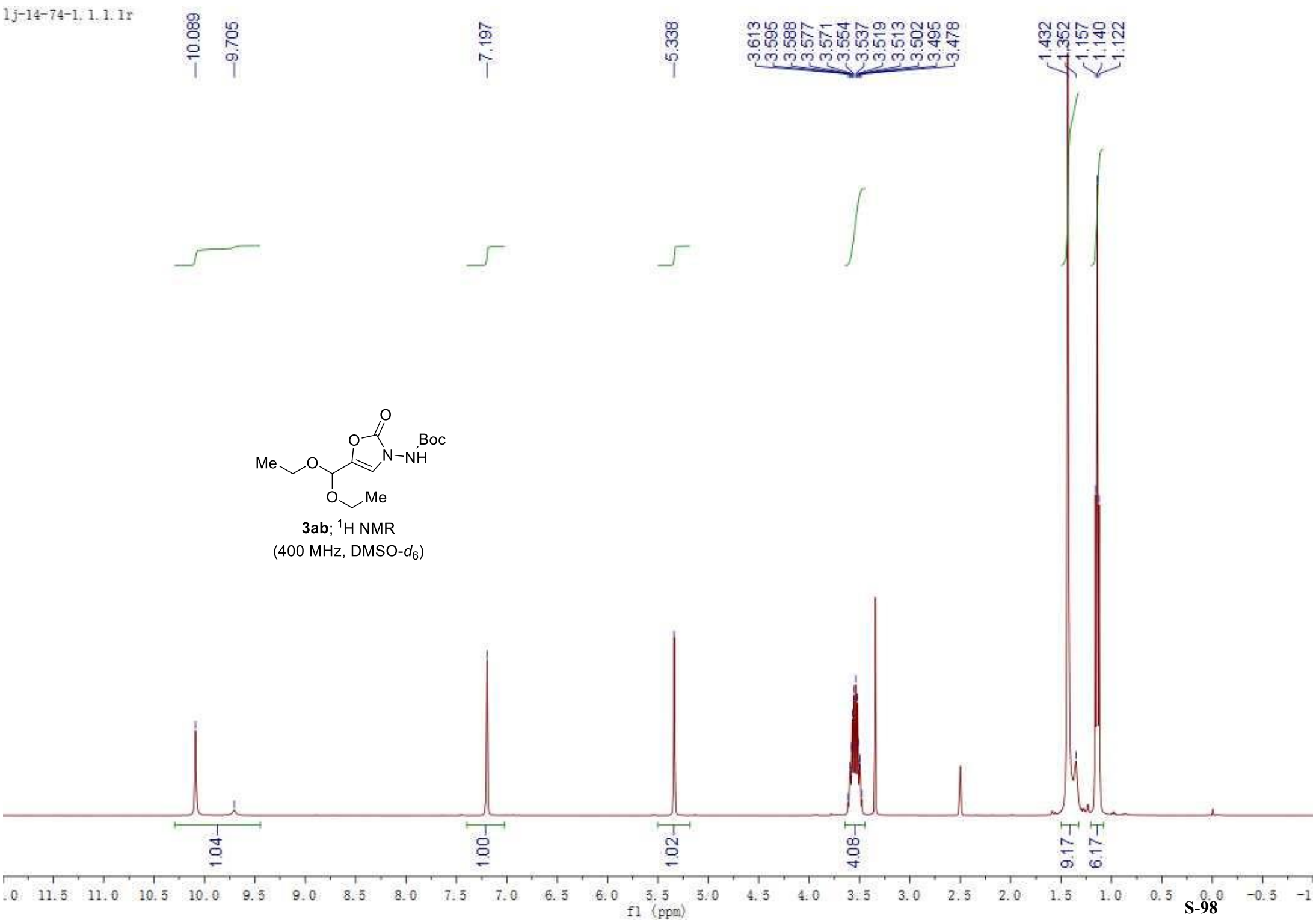
3z; $^{13}\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



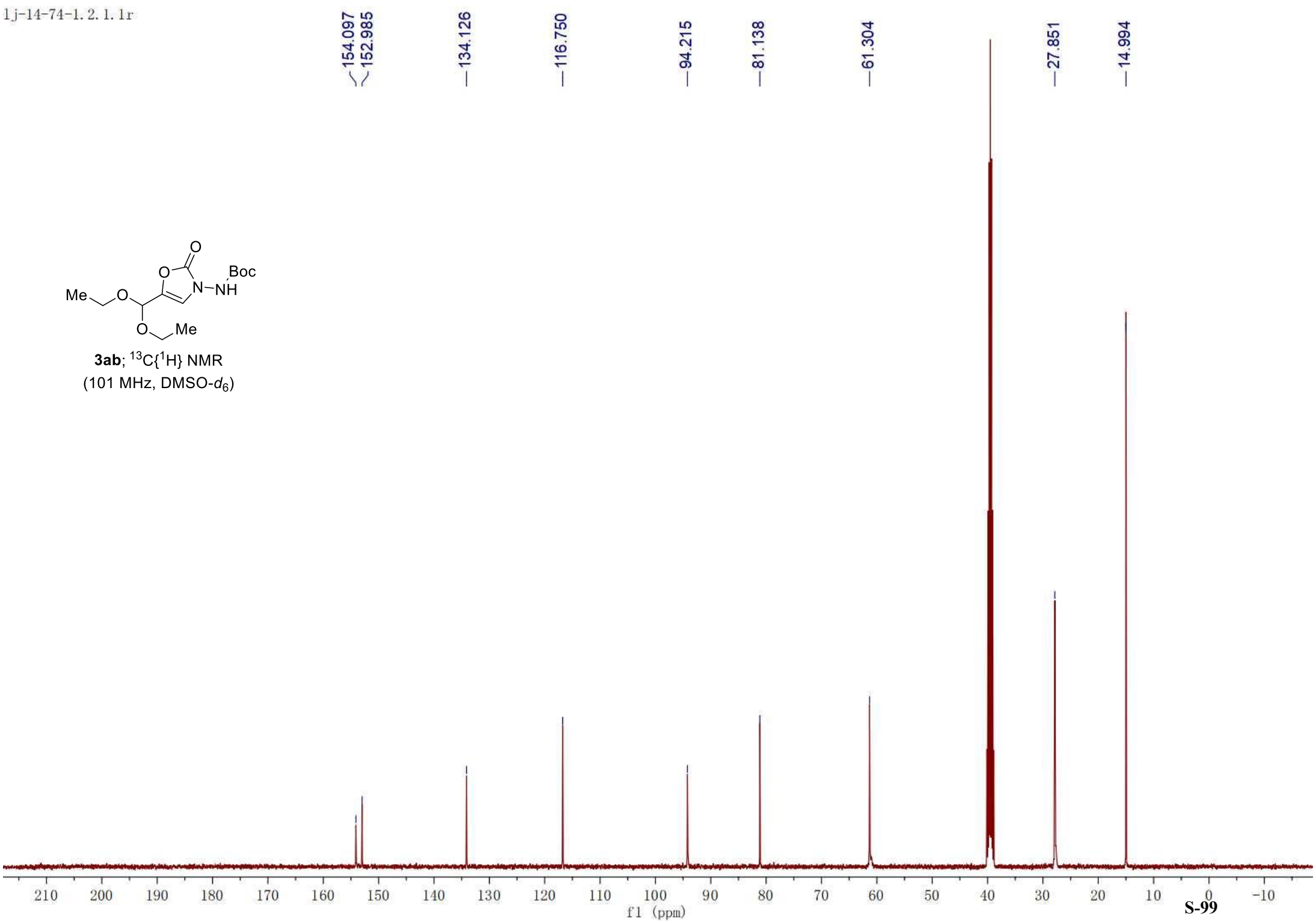
3aa; ^{1}H NMR
(400 MHz, DMSO-d_6)



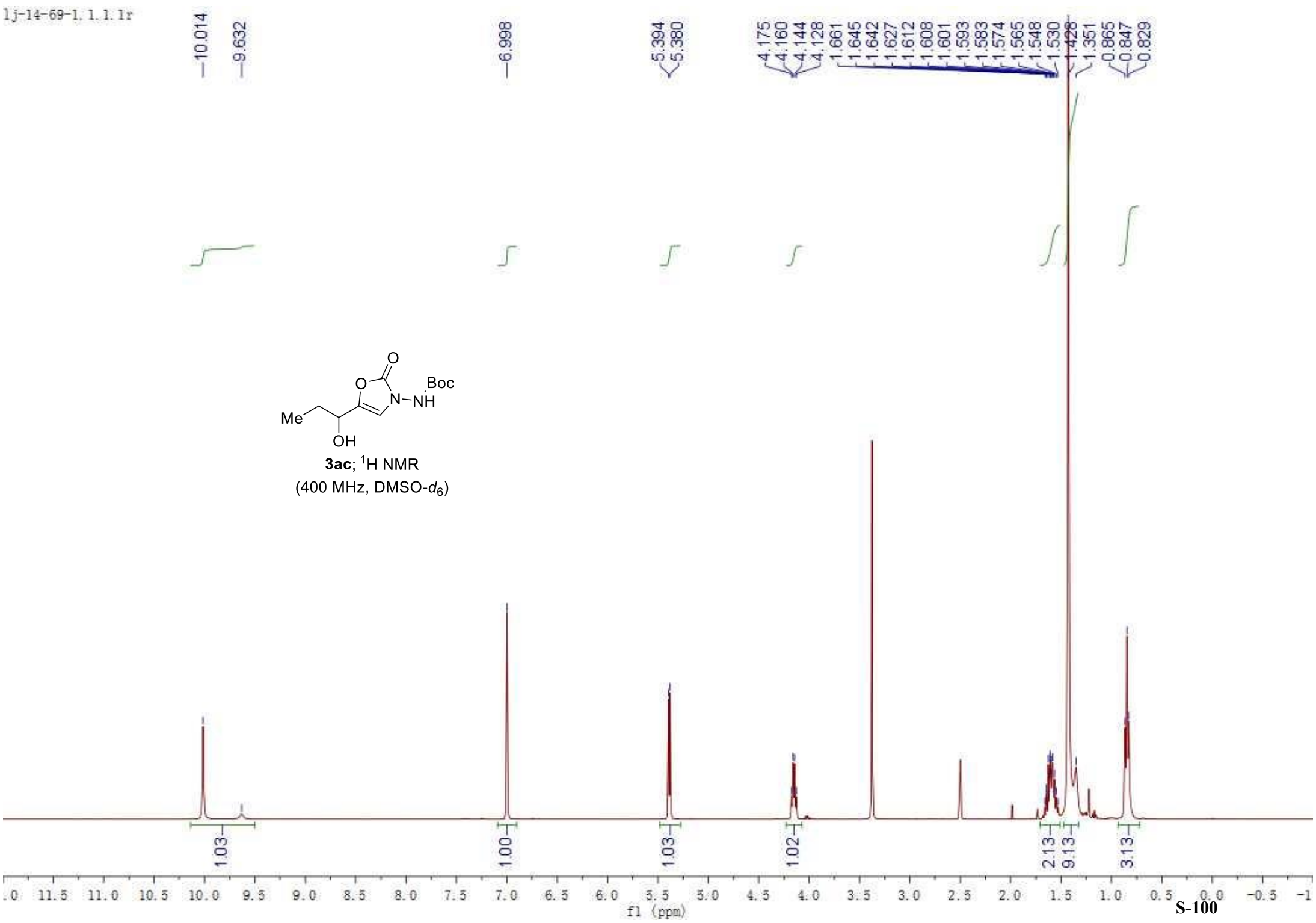
3aa; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



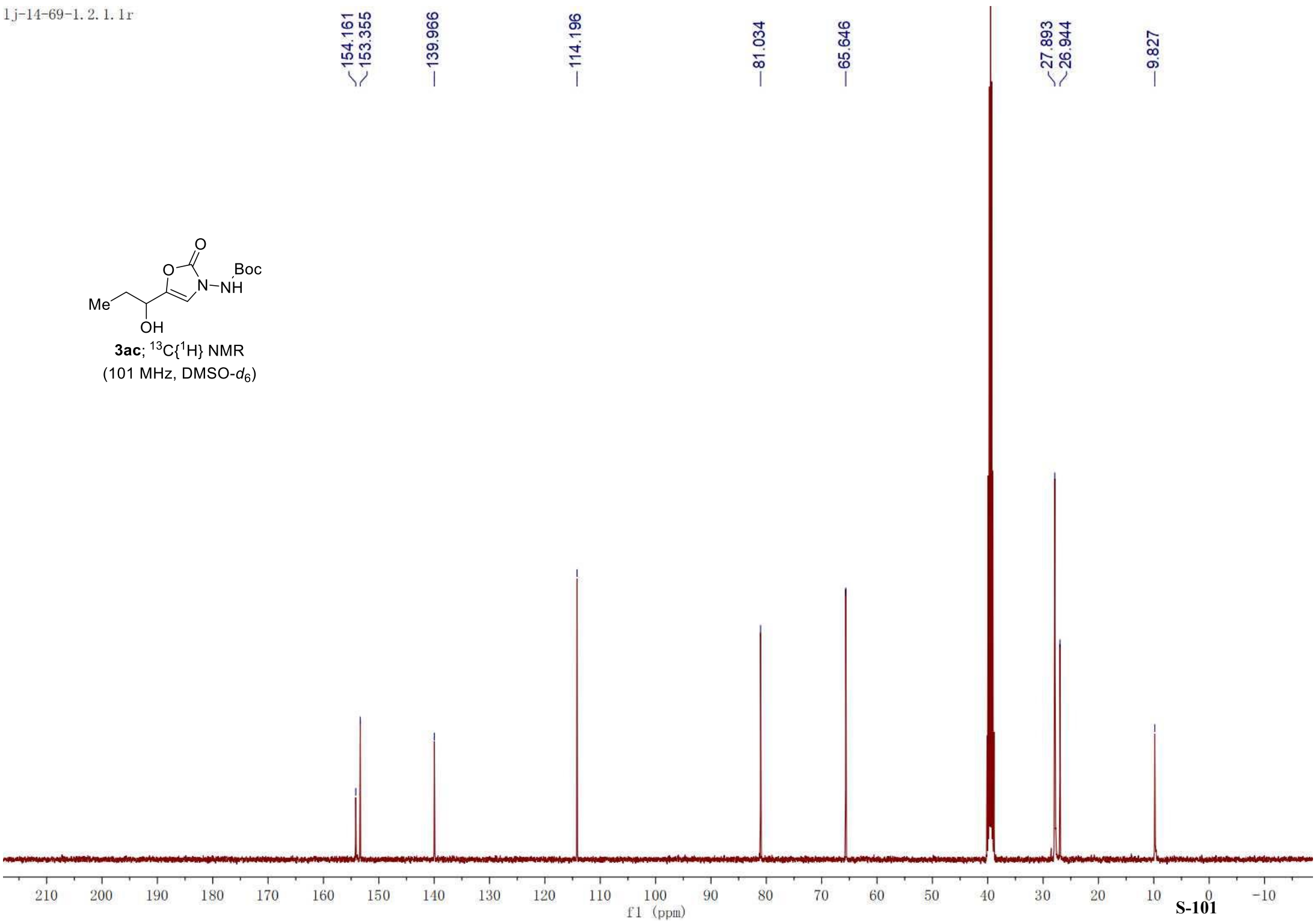
3ab; ^{1}H NMR
(400 MHz, DMSO-d_6)



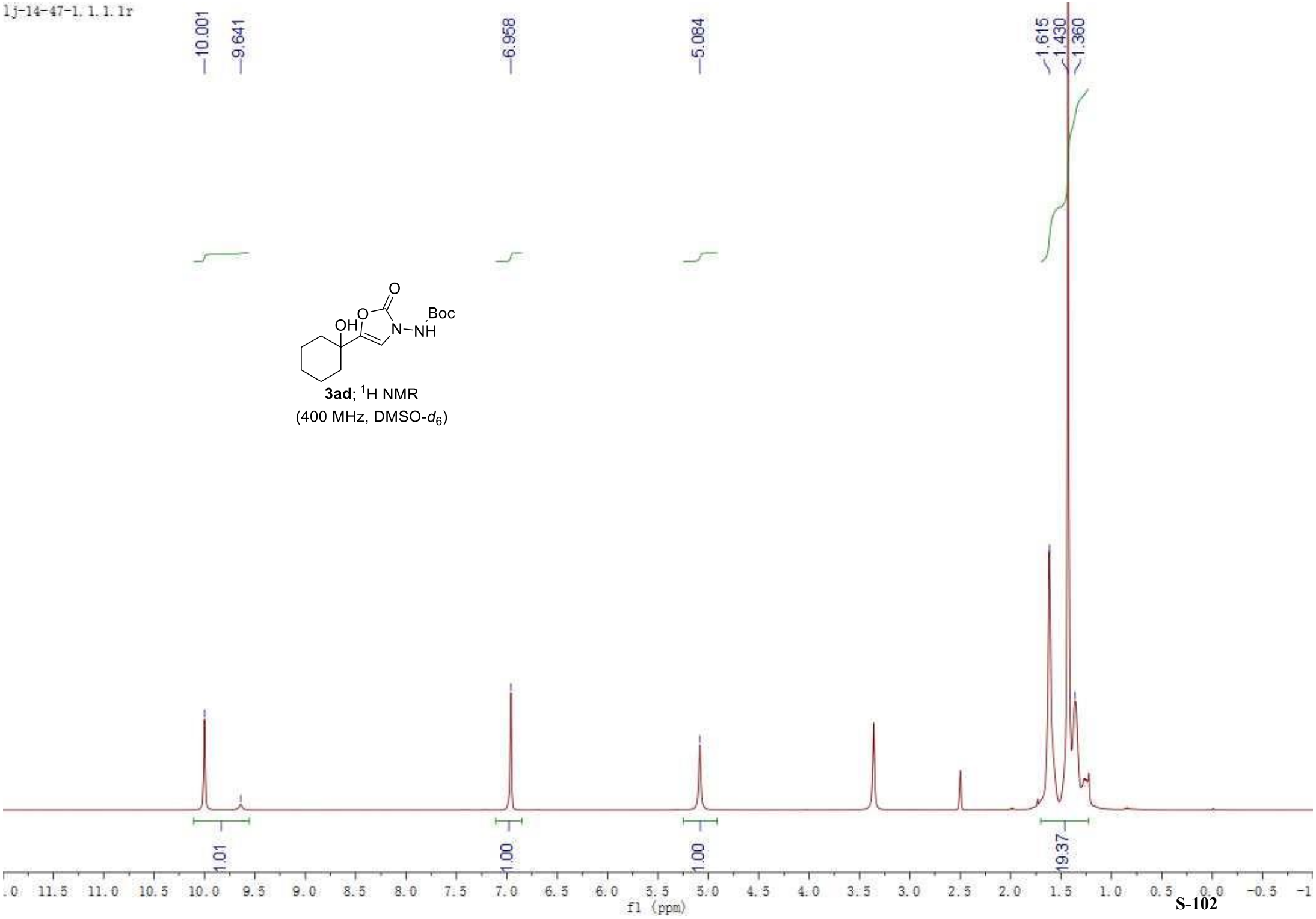
3ab; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



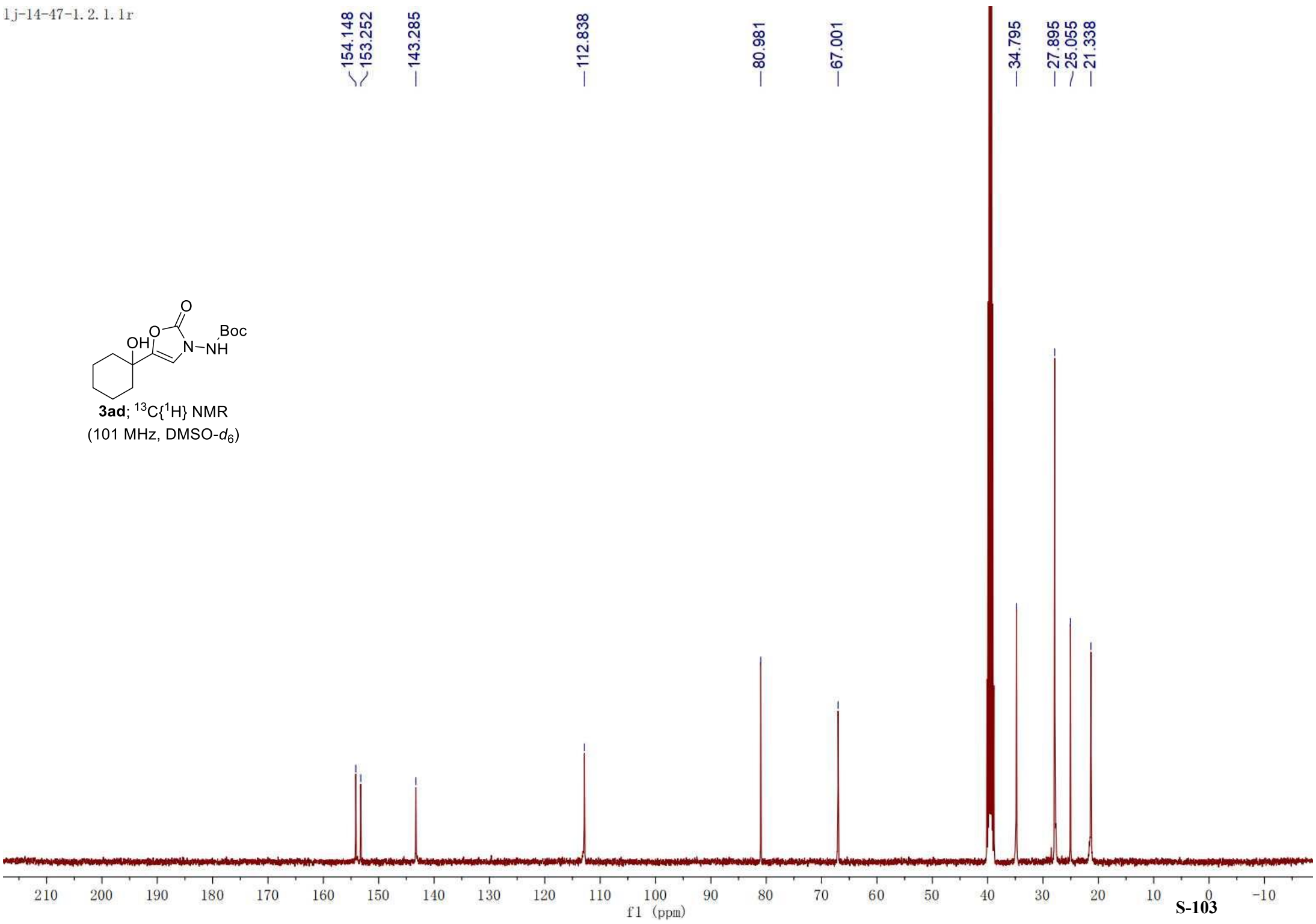
3ac; ^{1}H NMR
(400 MHz, DMSO-d_6)



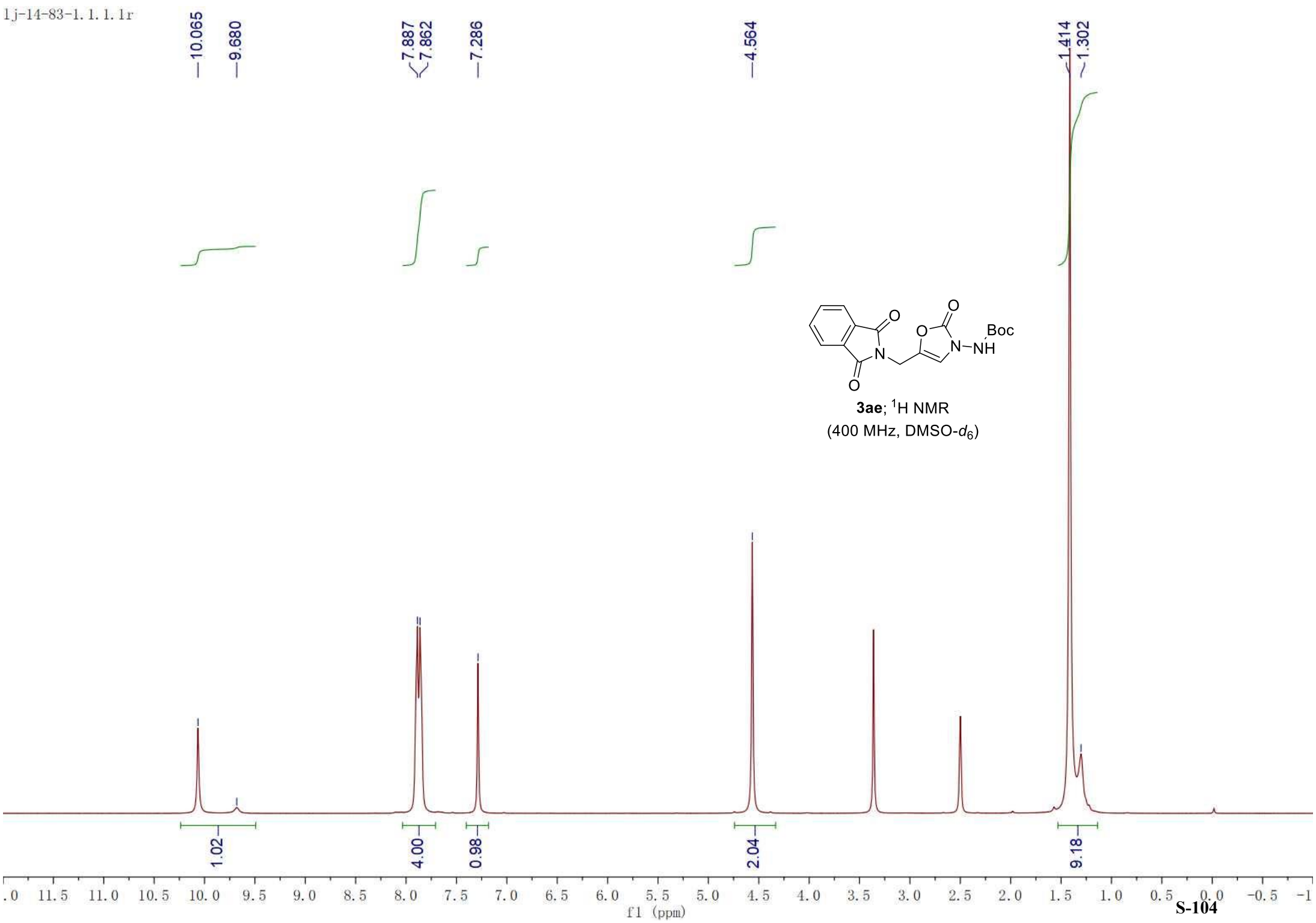
3ac; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



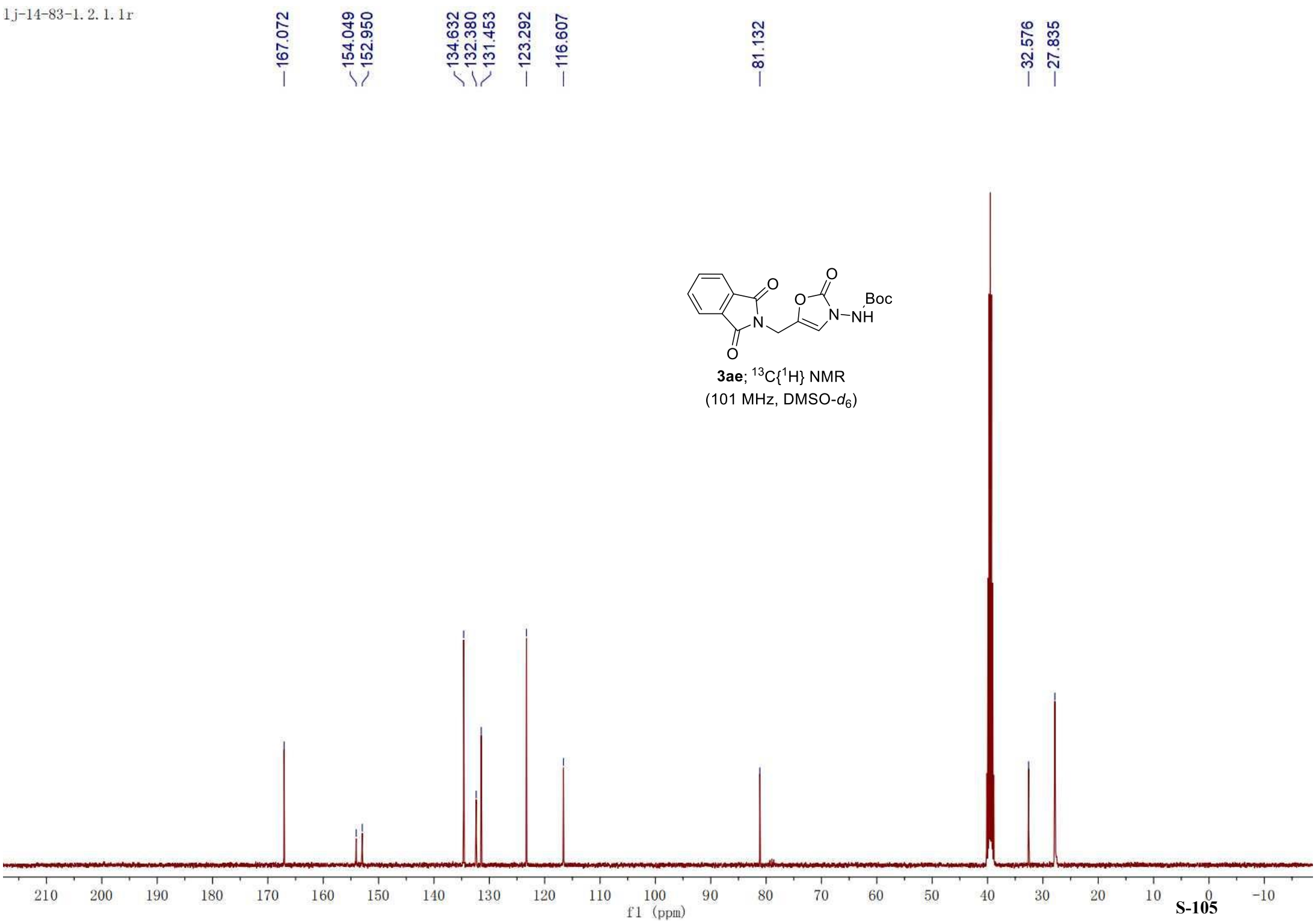
3ad; ^{1}H NMR
(400 MHz, DMSO-d_6)



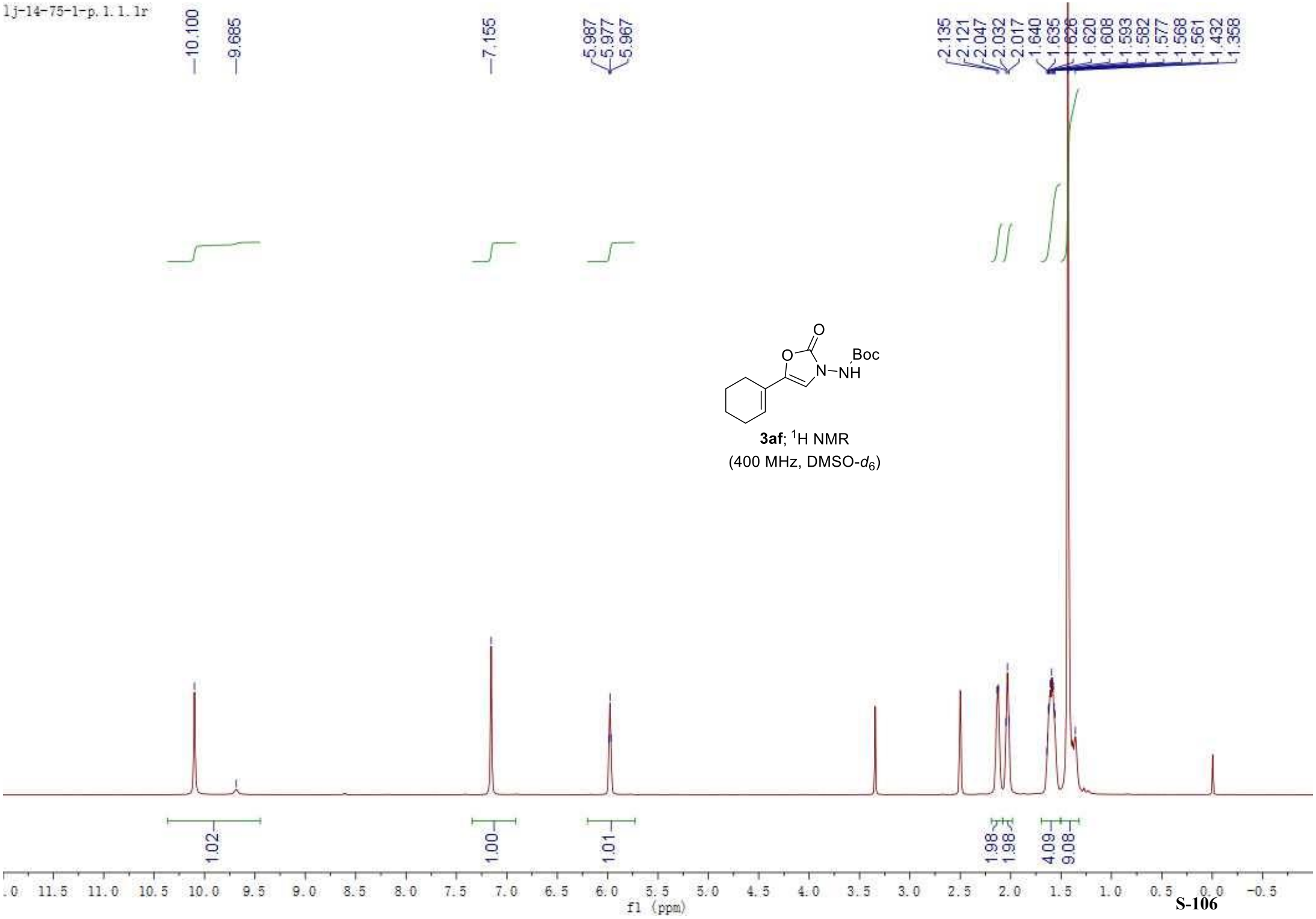
3ad; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



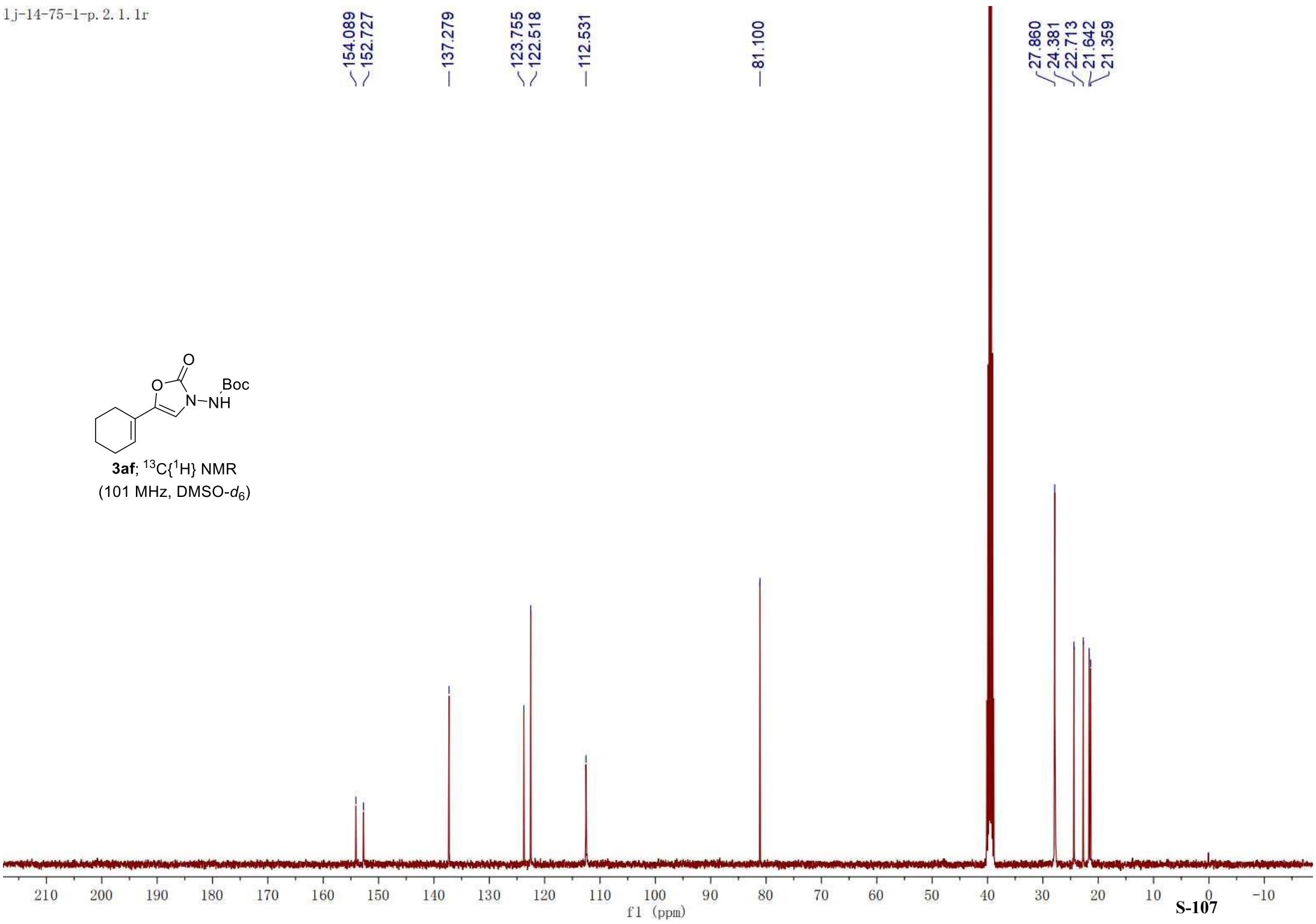
3ae; ^{1}H NMR
(400 MHz, DMSO-d_6)



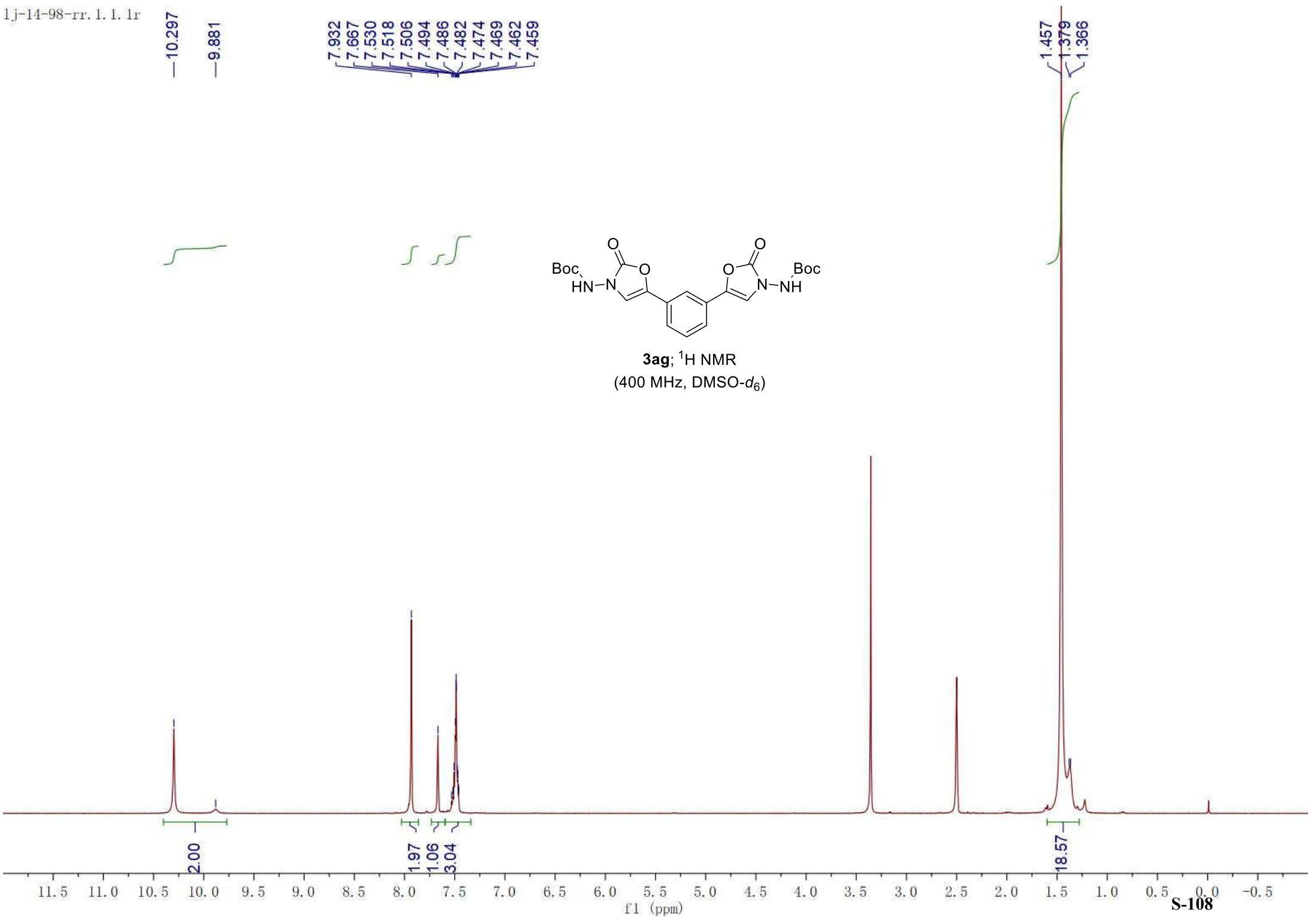
3ae; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



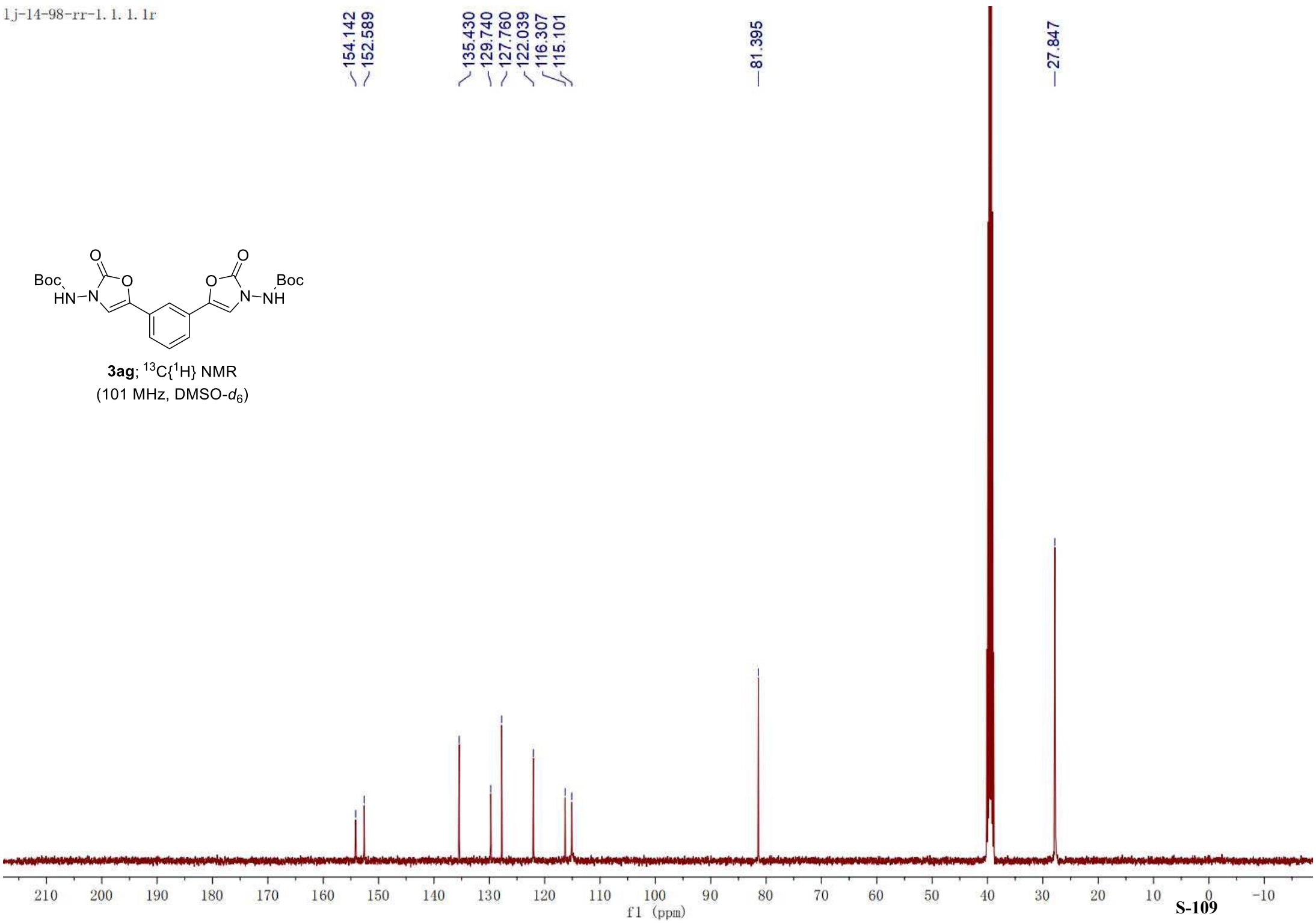
3af; ^{1}H NMR
(400 MHz, DMSO-d_6)



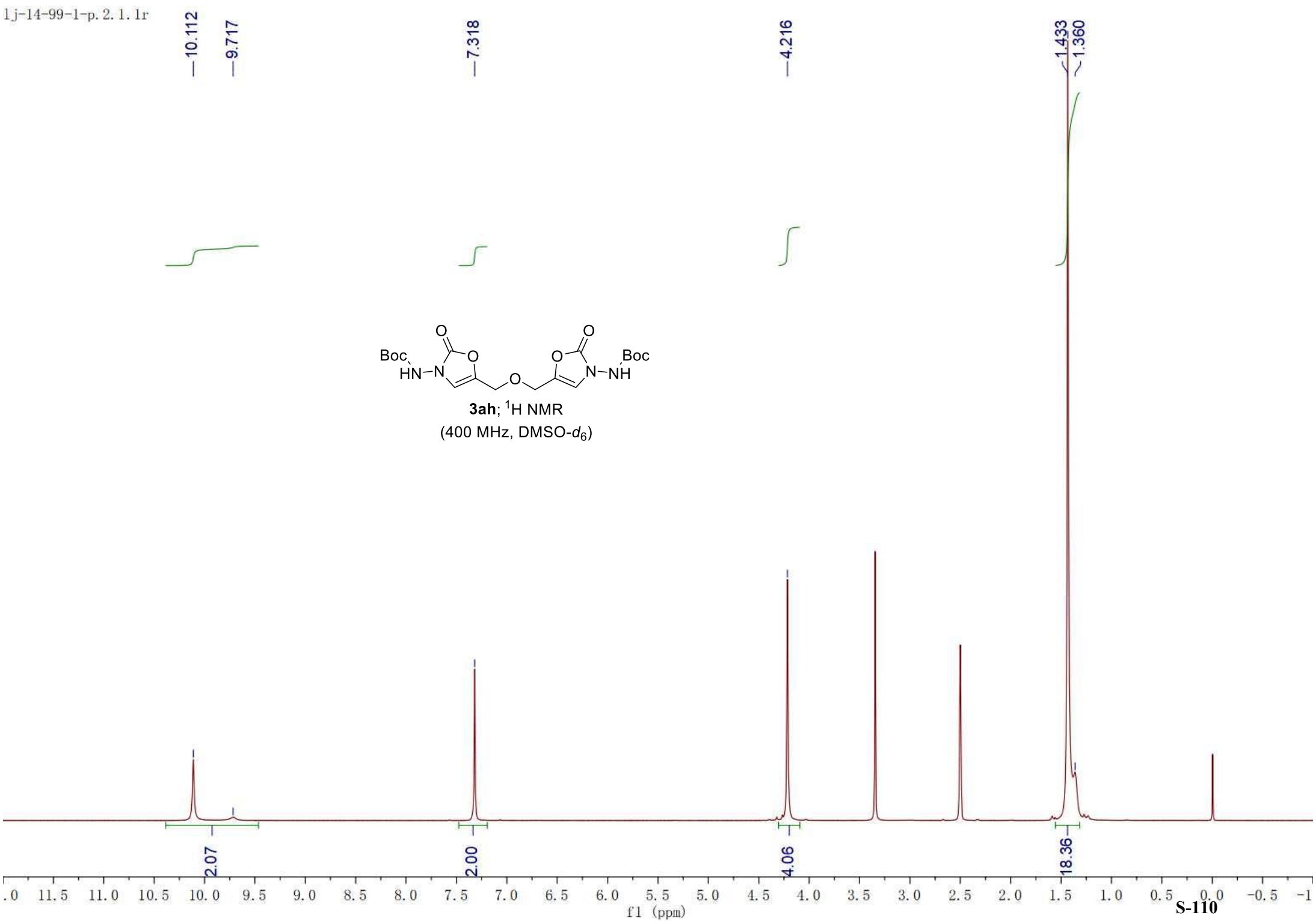
3af; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

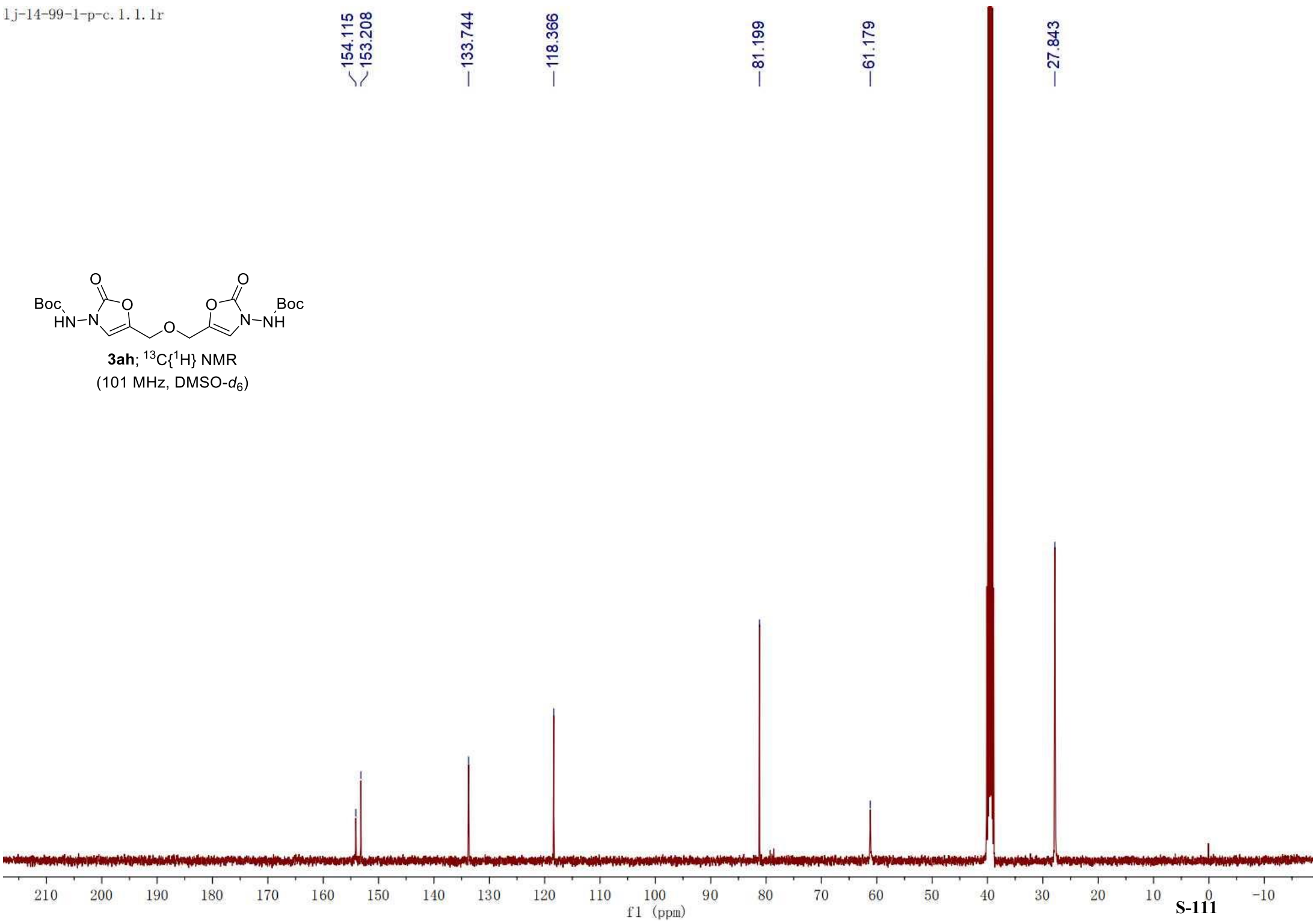


3ag; ^{1}H NMR
(400 MHz, DMSO-d_6)

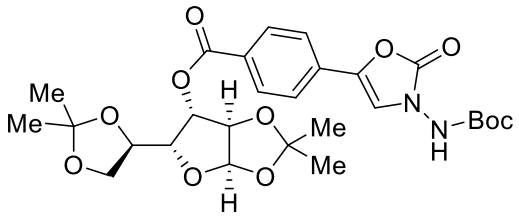


3ag; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)


1j-14-99-1-p.2.1.1r
10.112
9.717
7.318
4.216
1.433
1.360
Boc
HN–N
O
O
O
O
N–NH
Boc
3ah; 1H NMR
(400 MHz, DMSO-d6)
2.07
2.00
4.06
18.36
f1 (ppm)

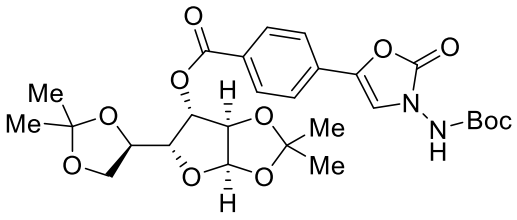

1j-14-99-1-p-c. 1. 1. 1r
154.115
153.208
133.744
118.366
81.199
61.179
27.843
Boc
HN
N
O
O
O
O
N
NH
Boc
3ah; 13C{1H} NMR
(101 MHz, DMSO-d6)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

gjb-1-14-h



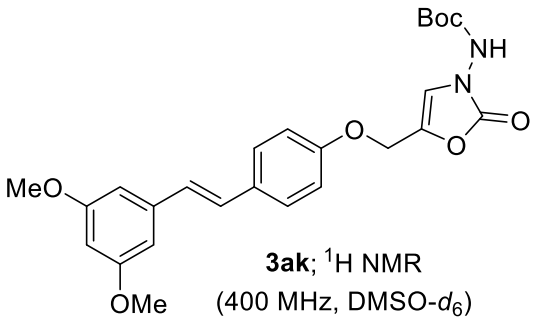
3aj; ^{1}H NMR
(400 MHz, DMSO-d_6)

gjb-1-14-c

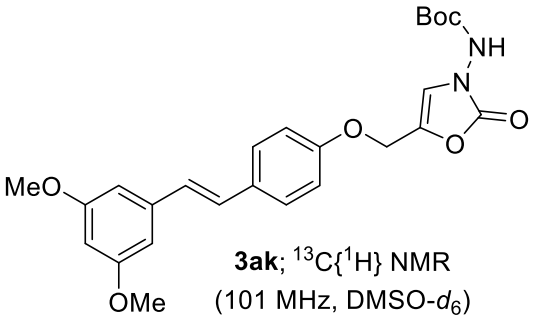


3aj; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

gjb-1-15-h

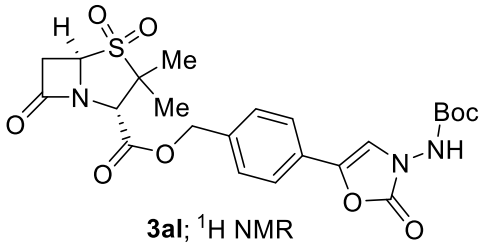


3ak; ^{1}H NMR
(400 MHz, DMSO-d_6)



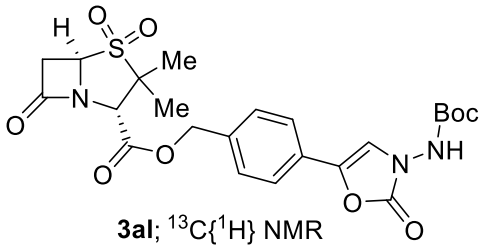
3ak; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

gjb-1-16-h

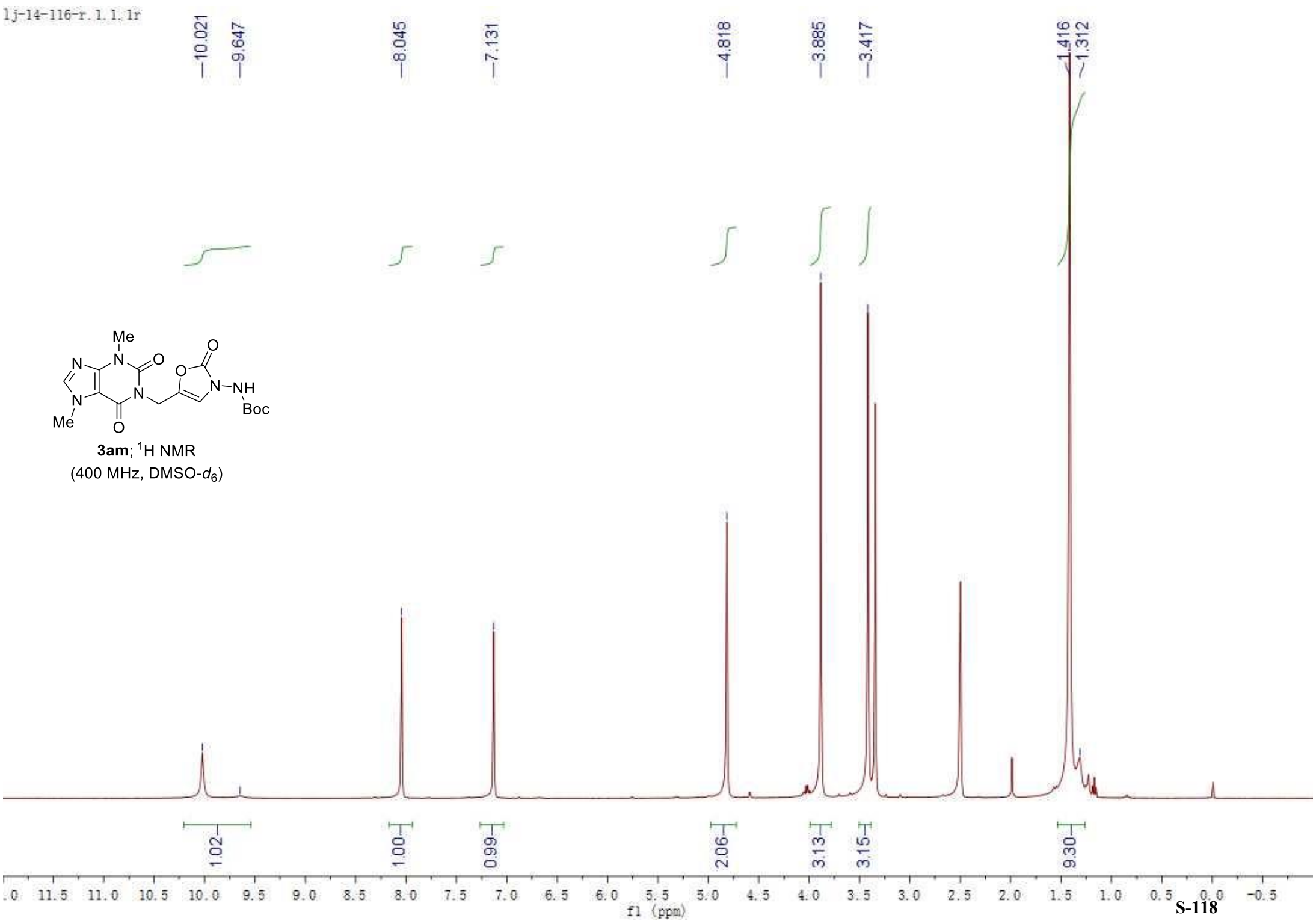


3al; ^{1}H NMR
(400 MHz, DMSO-d_6)

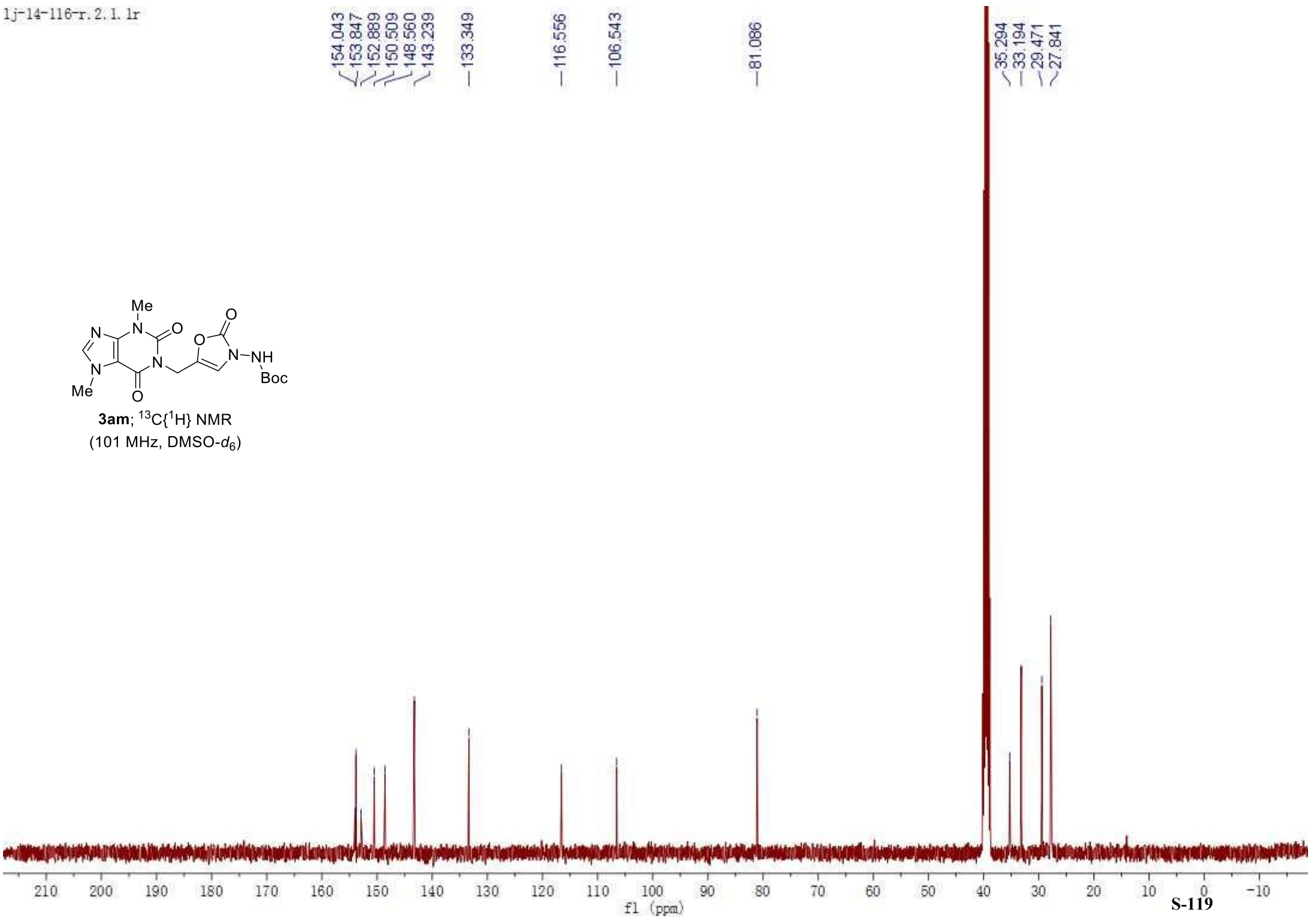
gjb-1-16-c



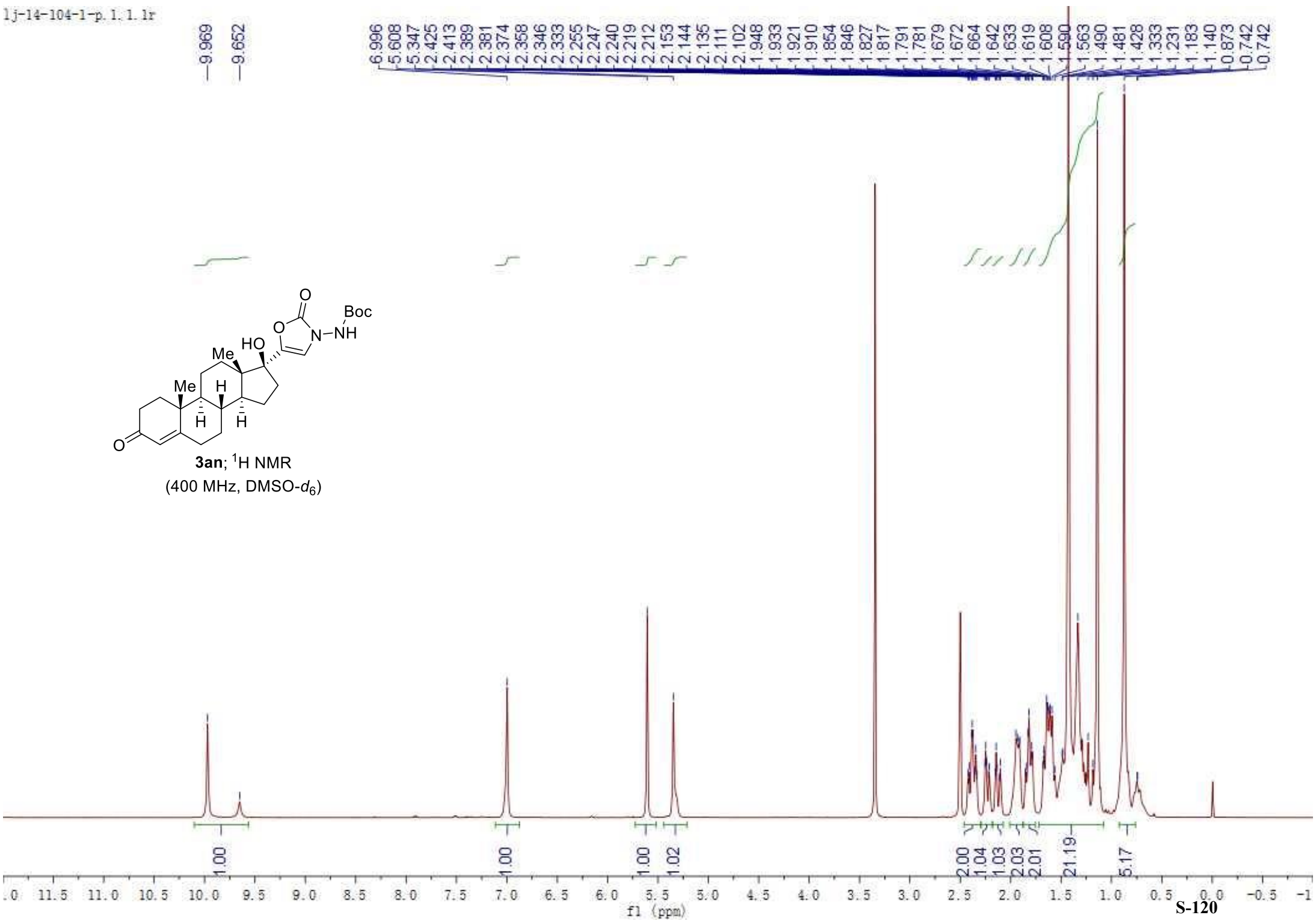
3al; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



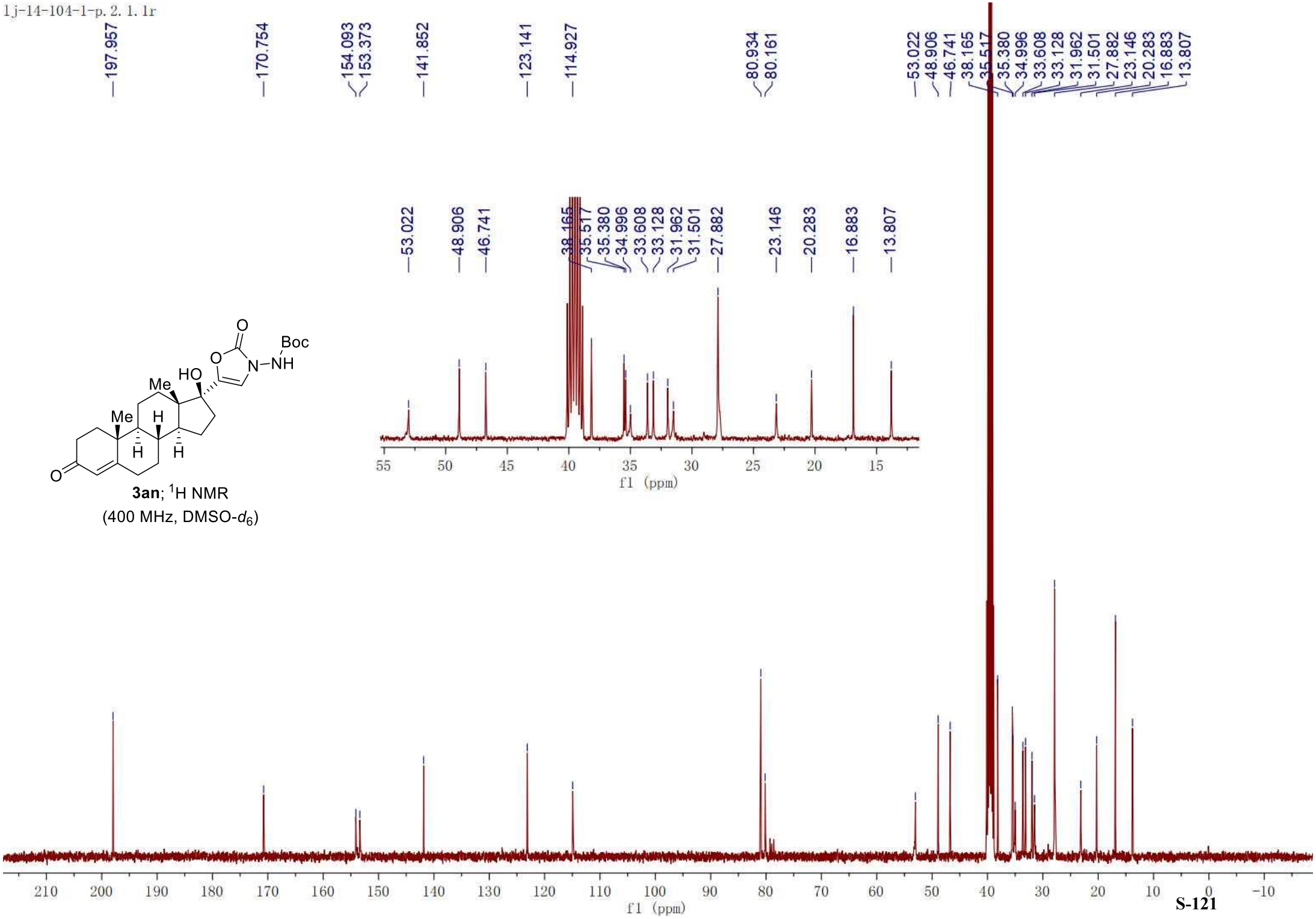
3am; ^{1}H NMR
(400 MHz, DMSO-d_6)



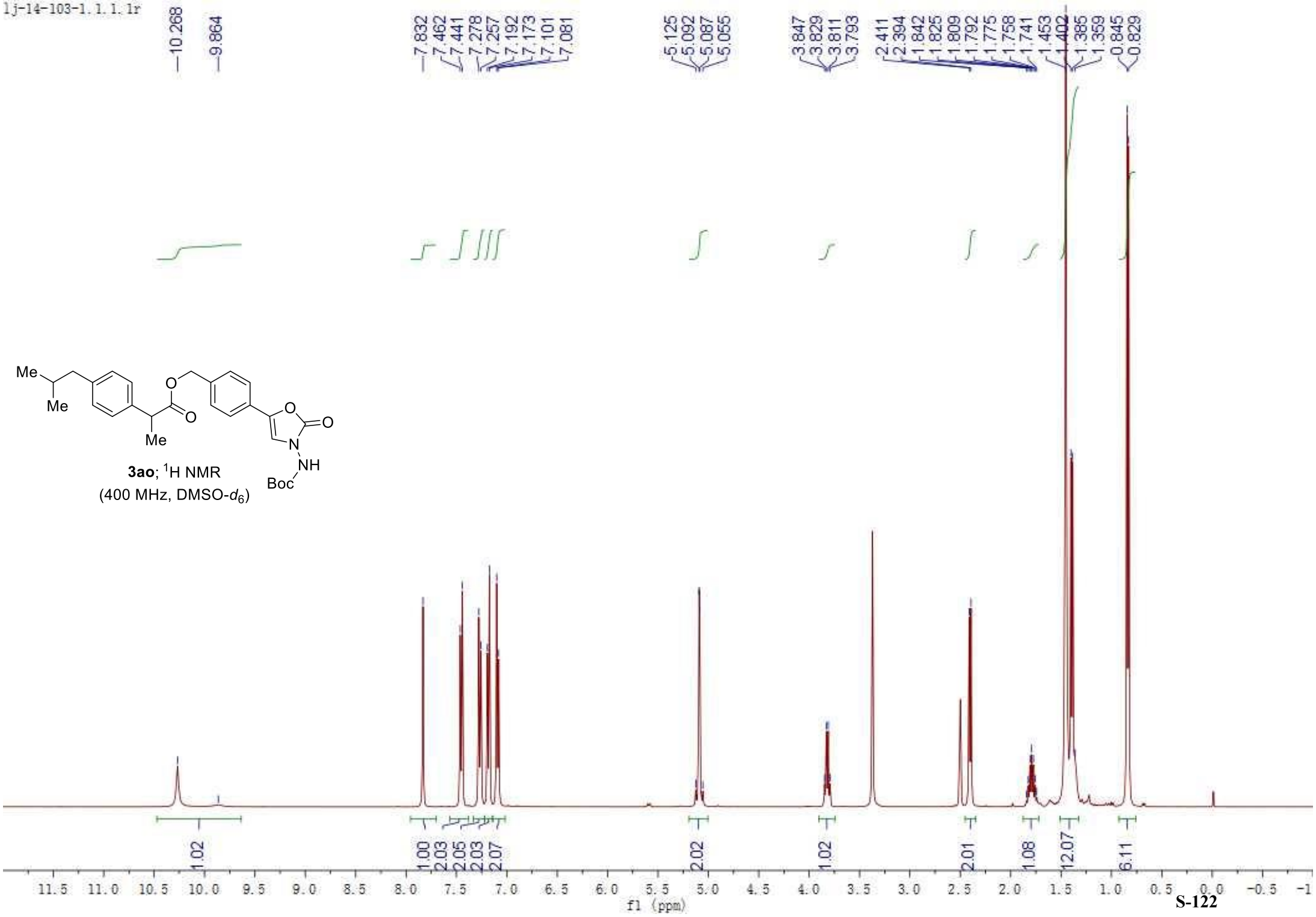
3am; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

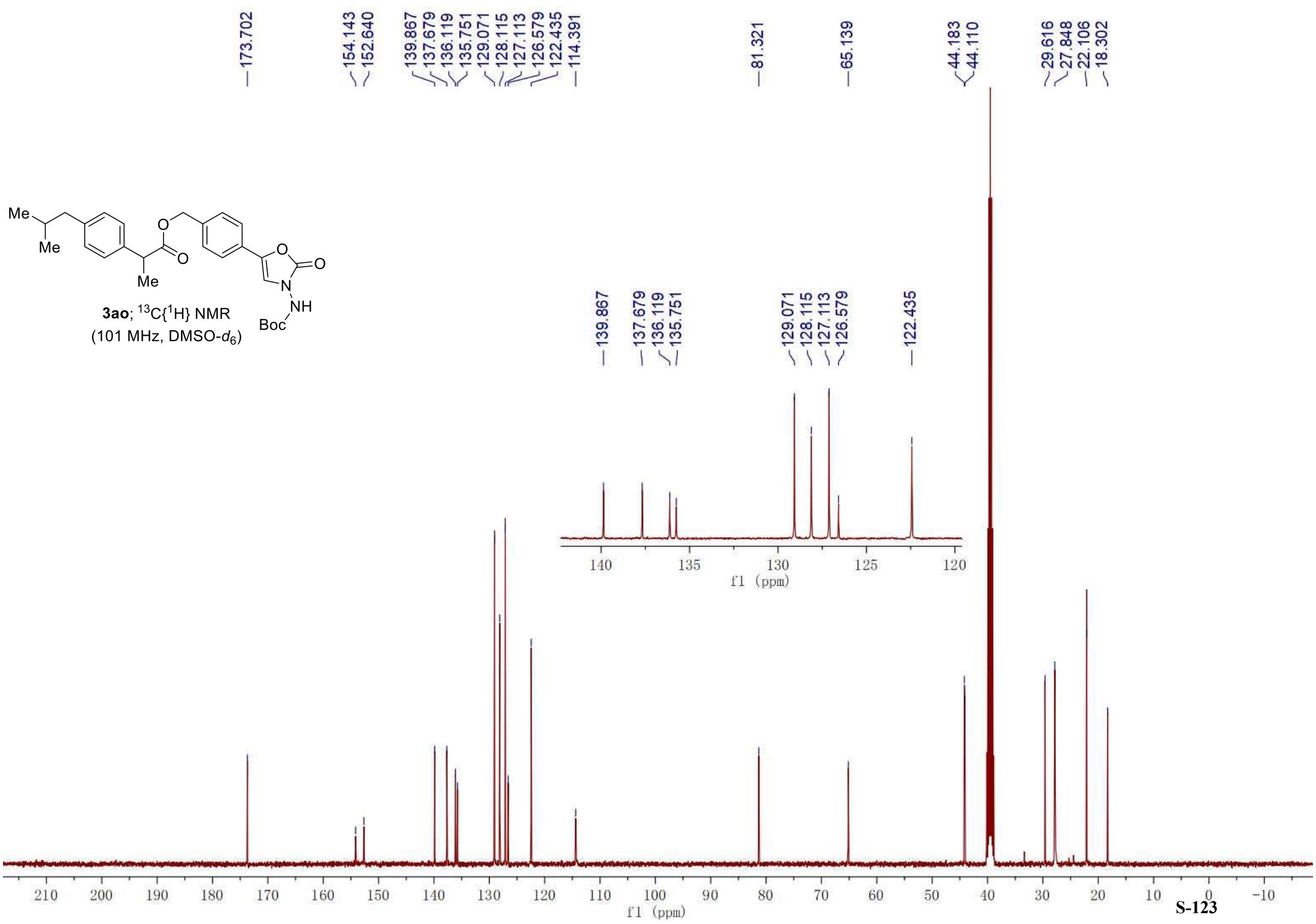


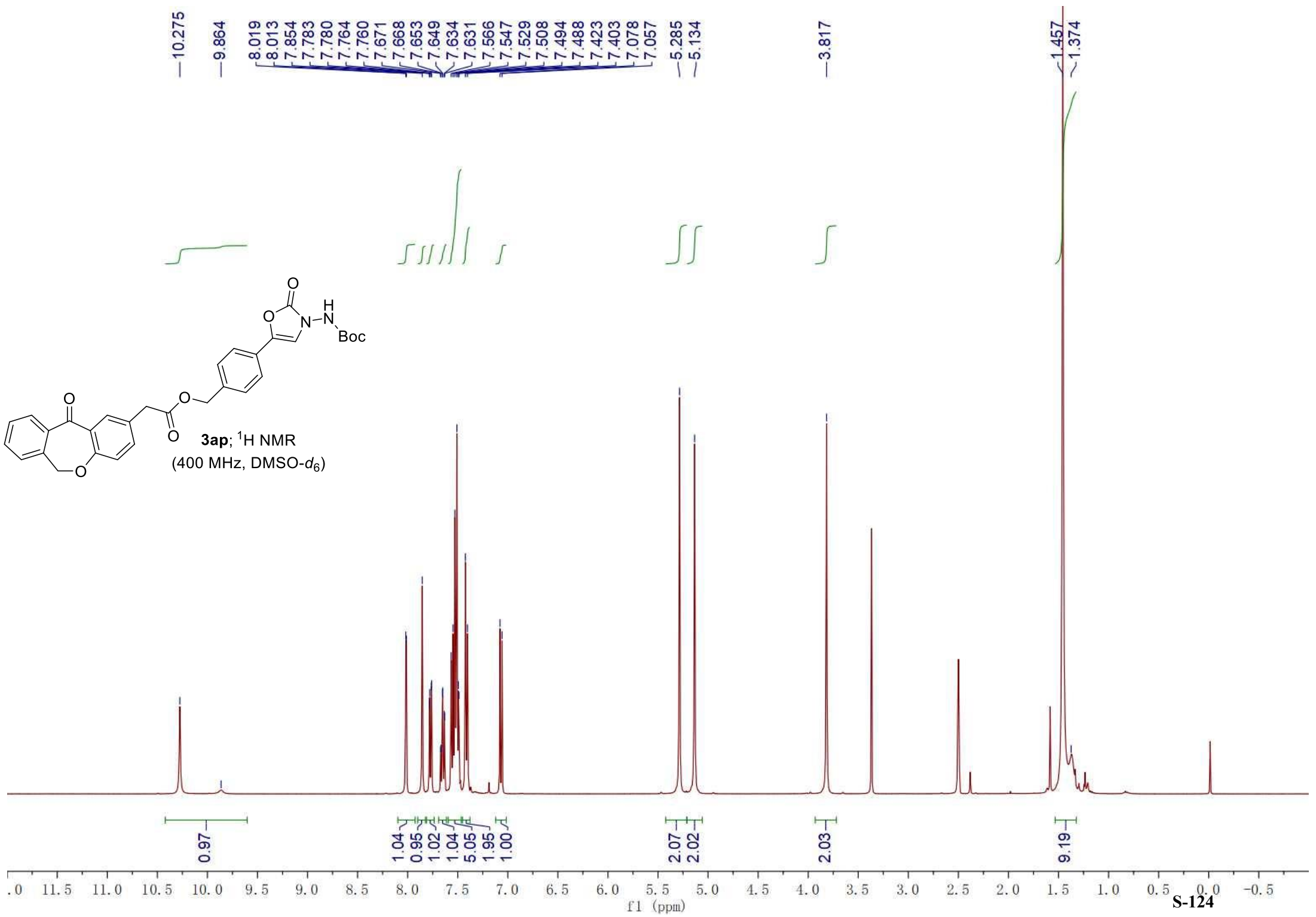
3an; ^{1}H NMR
(400 MHz, DMSO-d_6)

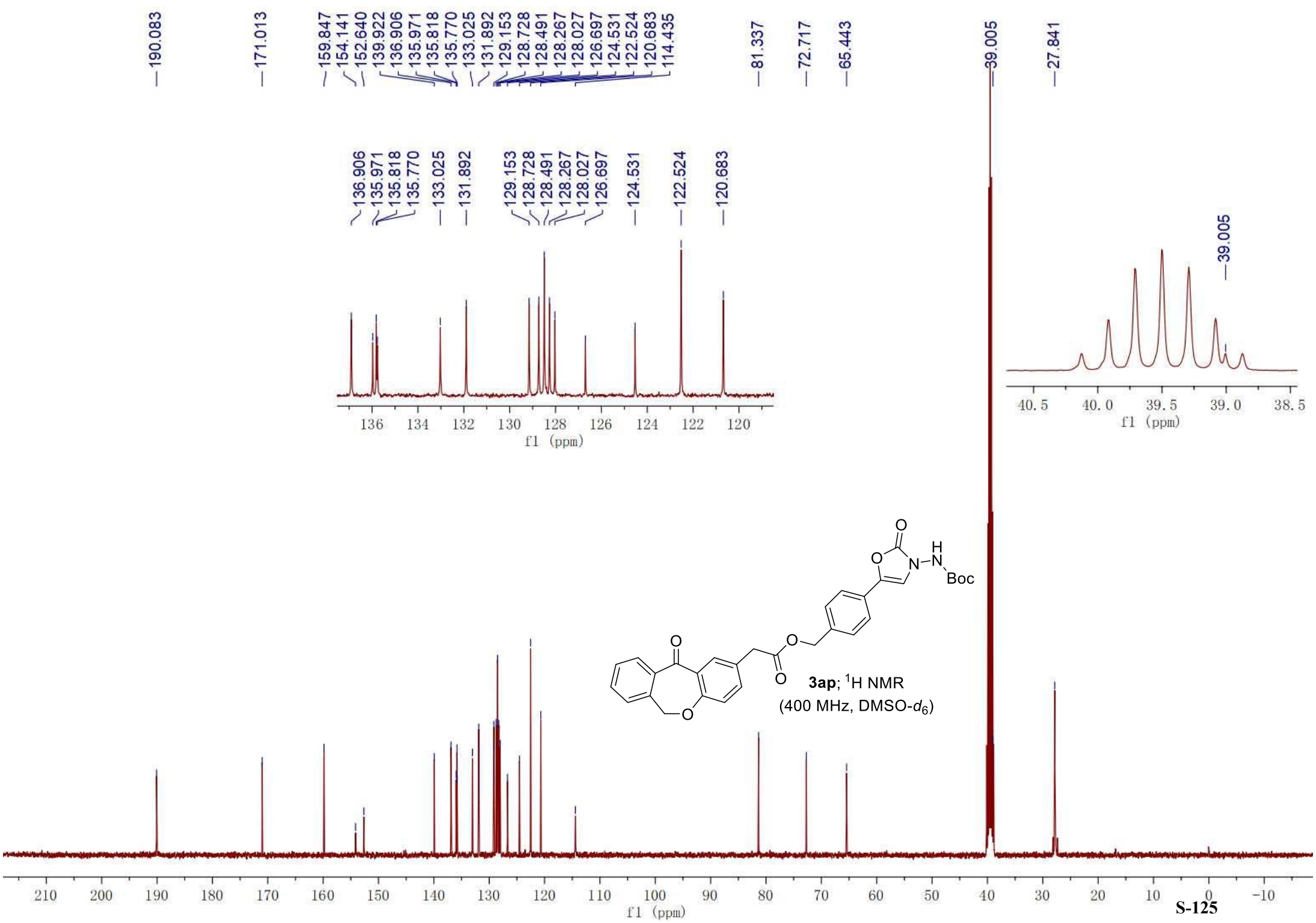


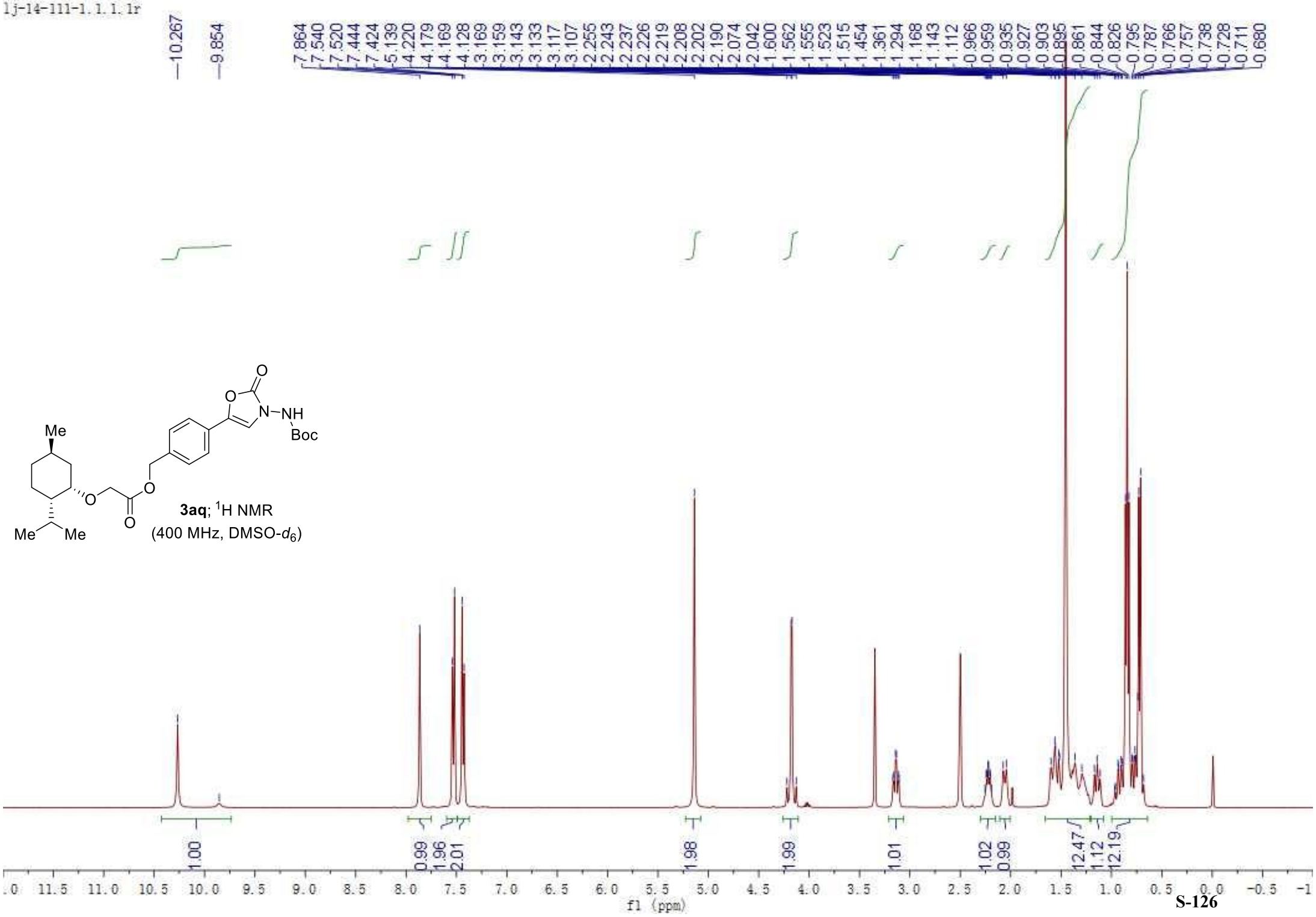
3an; ^{1}H NMR
(400 MHz, DMSO-d_6)


lj-14-103-1.1.1.1r
10.268
9.864
7.832
7.462
7.441
7.278
7.257
7.192
7.173
7.101
7.081
5.125
5.092
5.087
5.055
3.847
3.829
3.811
3.793
2.411
2.394
1.842
1.825
1.809
1.792
1.775
1.758
1.741
1.453
1.402
1.385
1.359
0.845
0.829
Me
Me
Me
O
O
O
O
N
NH
Boc
3ao; 1H NMR
(400 MHz, DMSO-d6)
1.02
1.00
2.03
2.05
2.03
2.07
2.02
1.02
2.01
1.08
12.07
6.11
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1
f1 (ppm)

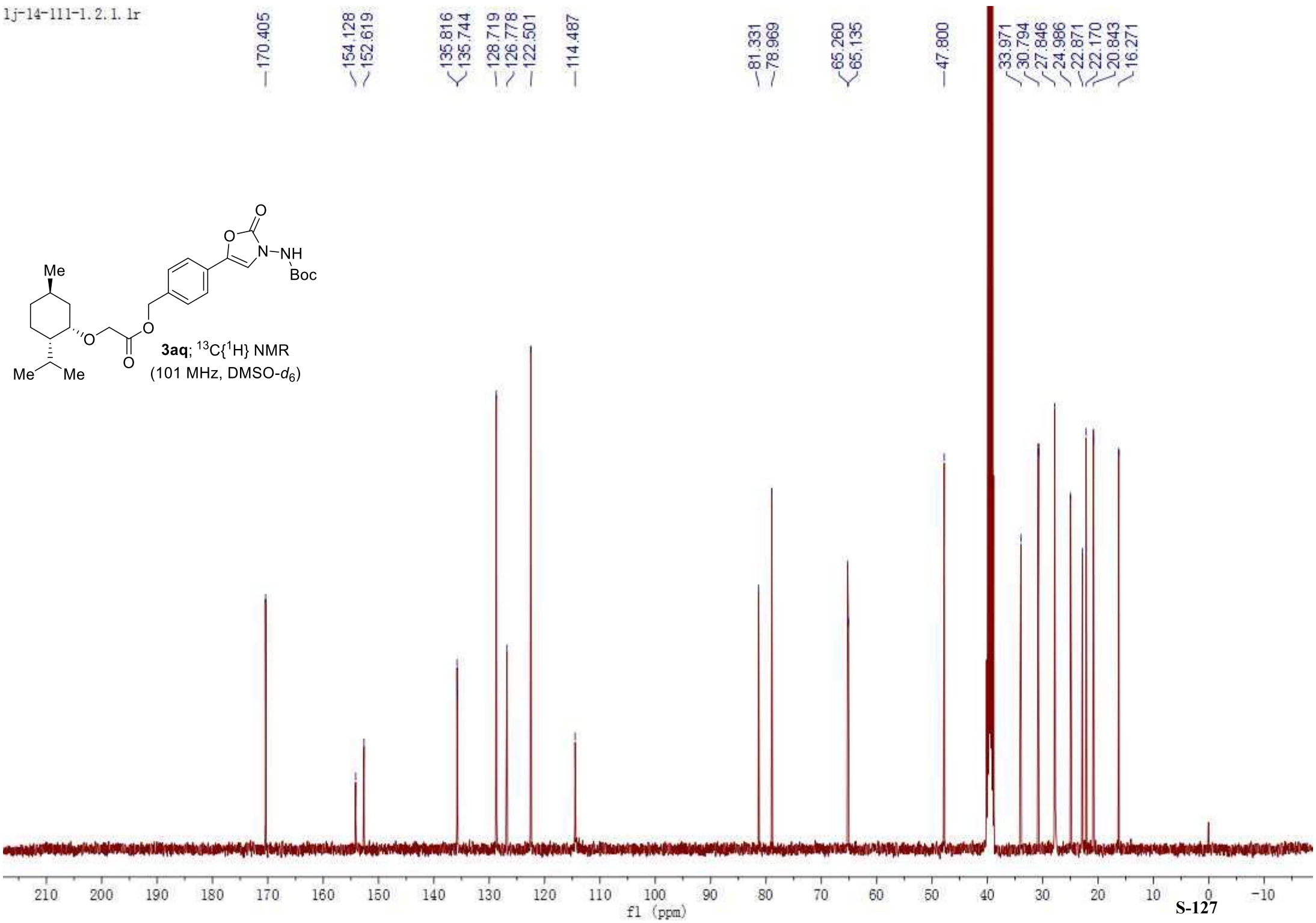

173.702
154.143
152.640
139.867
137.679
136.119
135.751
129.071
128.115
127.113
126.579
122.435
114.391
81.321
65.139
44.183
44.110
29.616
27.848
22.106
18.302
Me
Me
Me
O
O
O
O
N
NH
Boc
3ao; 13C{1H} NMR
(101 MHz, DMSO-d6)
f1 (ppm)


10.275
9.864
8.019
8.013
7.854
7.783
7.780
7.764
7.760
7.671
7.668
7.653
7.649
7.634
7.631
7.566
7.547
7.529
7.508
7.494
7.488
7.423
7.403
7.078
7.057
5.285
5.134
3.817
1.457
1.374
O
O
N
H
N
Boc
O
O
O
O
3ap; 1H NMR
(400 MHz, DMSO-d6)
0.97
1.04
0.95
1.02
1.04
5.05
1.95
1.00
2.07
2.02
2.03
9.19
f1 (ppm)

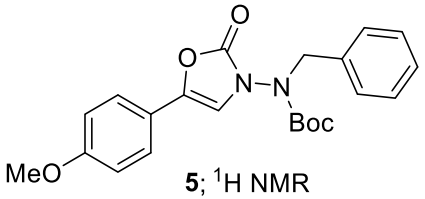

190.083
171.013
159.847
154.141
152.640
139.922
136.906
135.971
135.818
135.770
133.025
131.892
129.153
128.728
128.491
128.267
128.027
126.697
124.531
122.524
120.683
114.435
81.337
72.717
65.443
39.005
27.841
f1 (ppm)
3ap; 1H NMR
(400 MHz, DMSO-d6)
Boc



3aq; ^{1}H NMR
(400 MHz, DMSO-d_6)

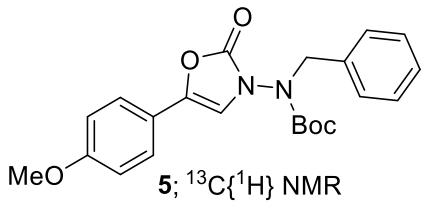

1j-14-111-1.2.1.1r
170.405
154.128
152.619
135.816
135.744
128.719
126.778
122.501
114.487
81.331
78.969
65.260
65.135
47.800
33.971
30.794
27.846
24.986
22.871
22.170
20.843
16.271
Me
Me
Me
O
O
N
NH
Boc
O
O
O
O
3aq; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

gjb-1-56-h



5; ^{1}H NMR
(400 MHz, DMSO-d_6)

gjb-1-56-c

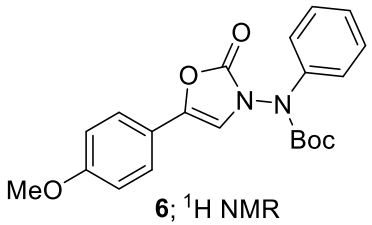


5; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

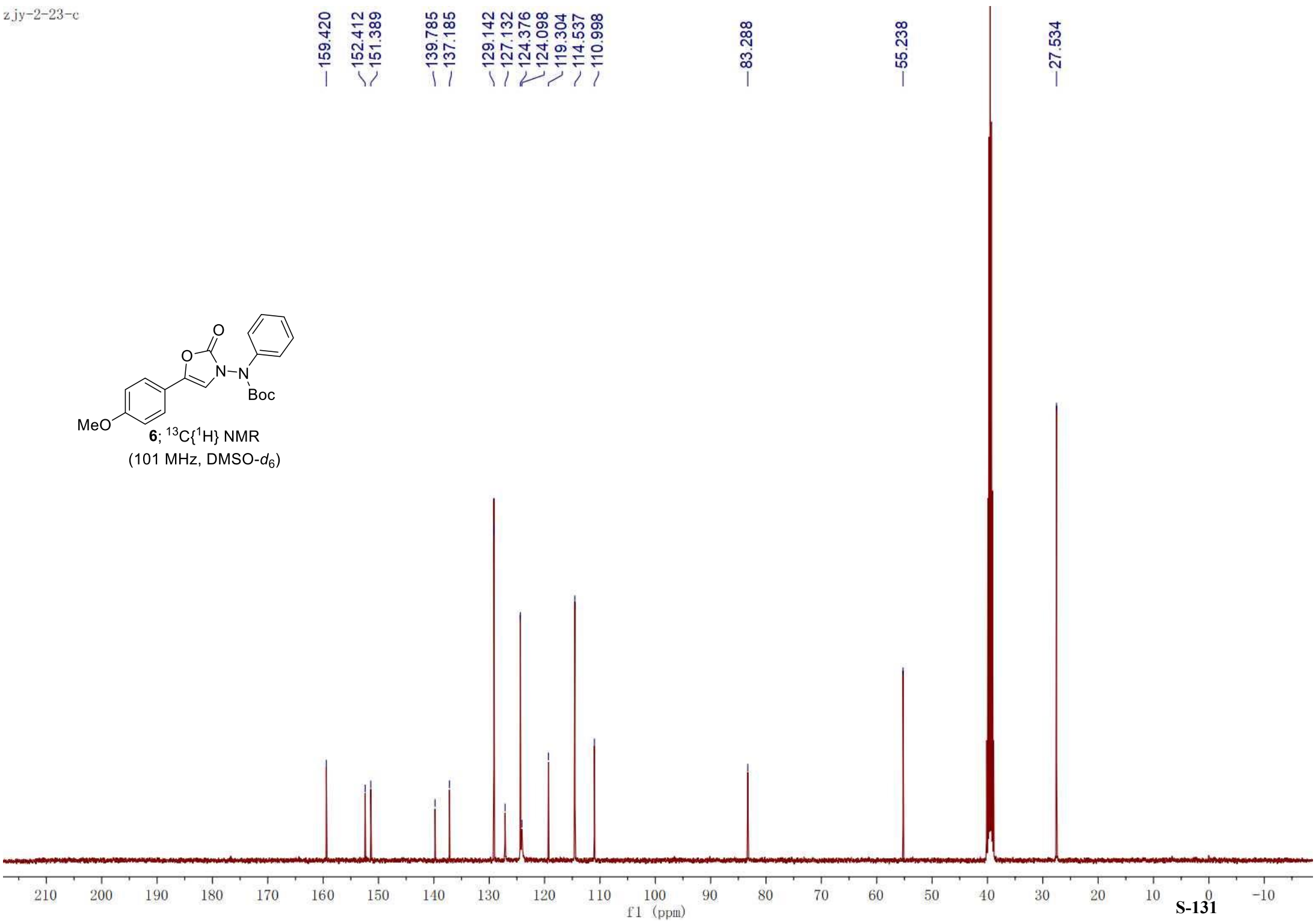
159.241
153.177
151.974
136.527
135.680
128.506
128.331
127.803
124.236
119.425
114.444
111.188
82.443
55.216
52.627
27.600

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

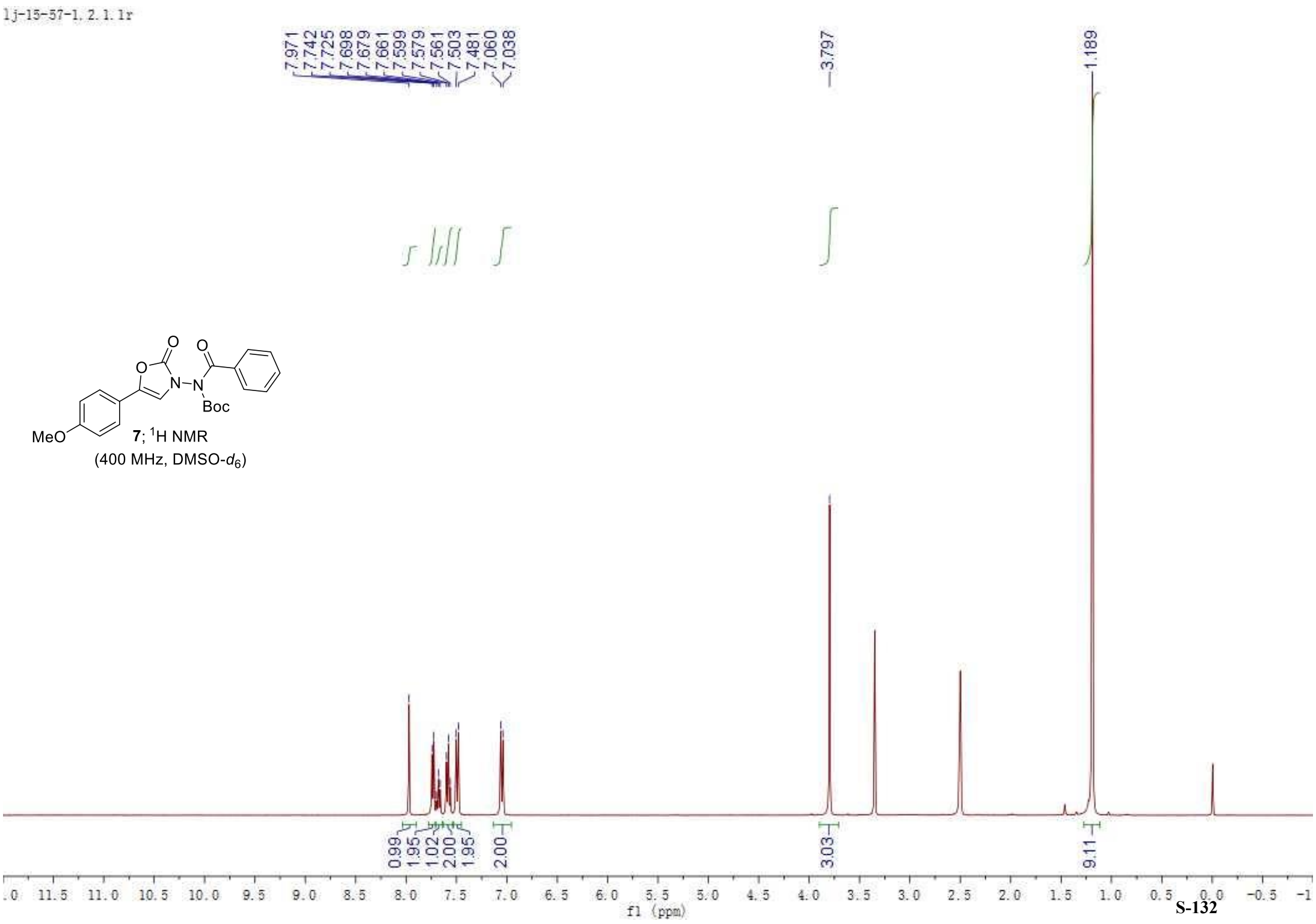
zjy-2-23-h



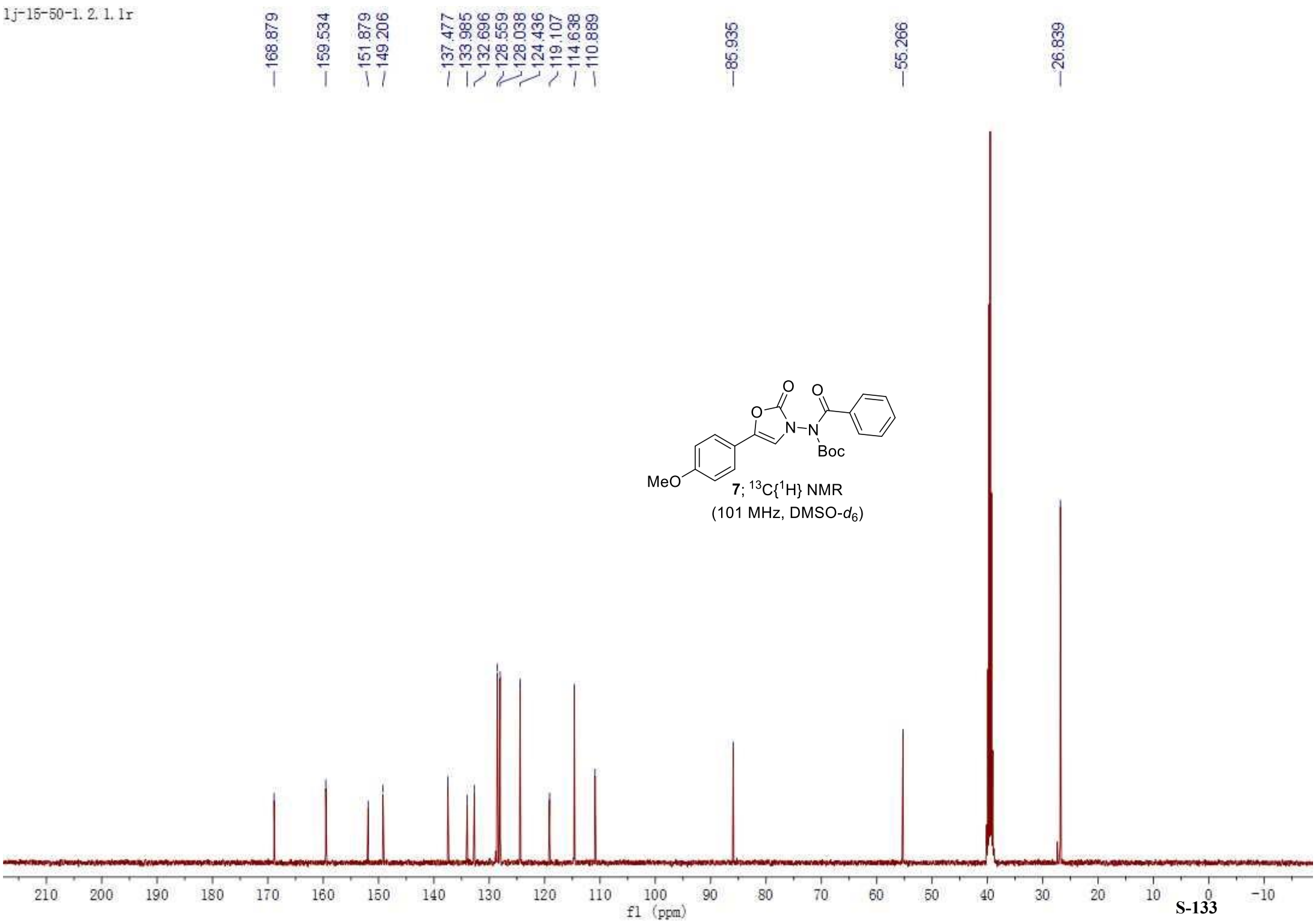
6; ^{1}H NMR
(400 MHz, DMSO-d_6)



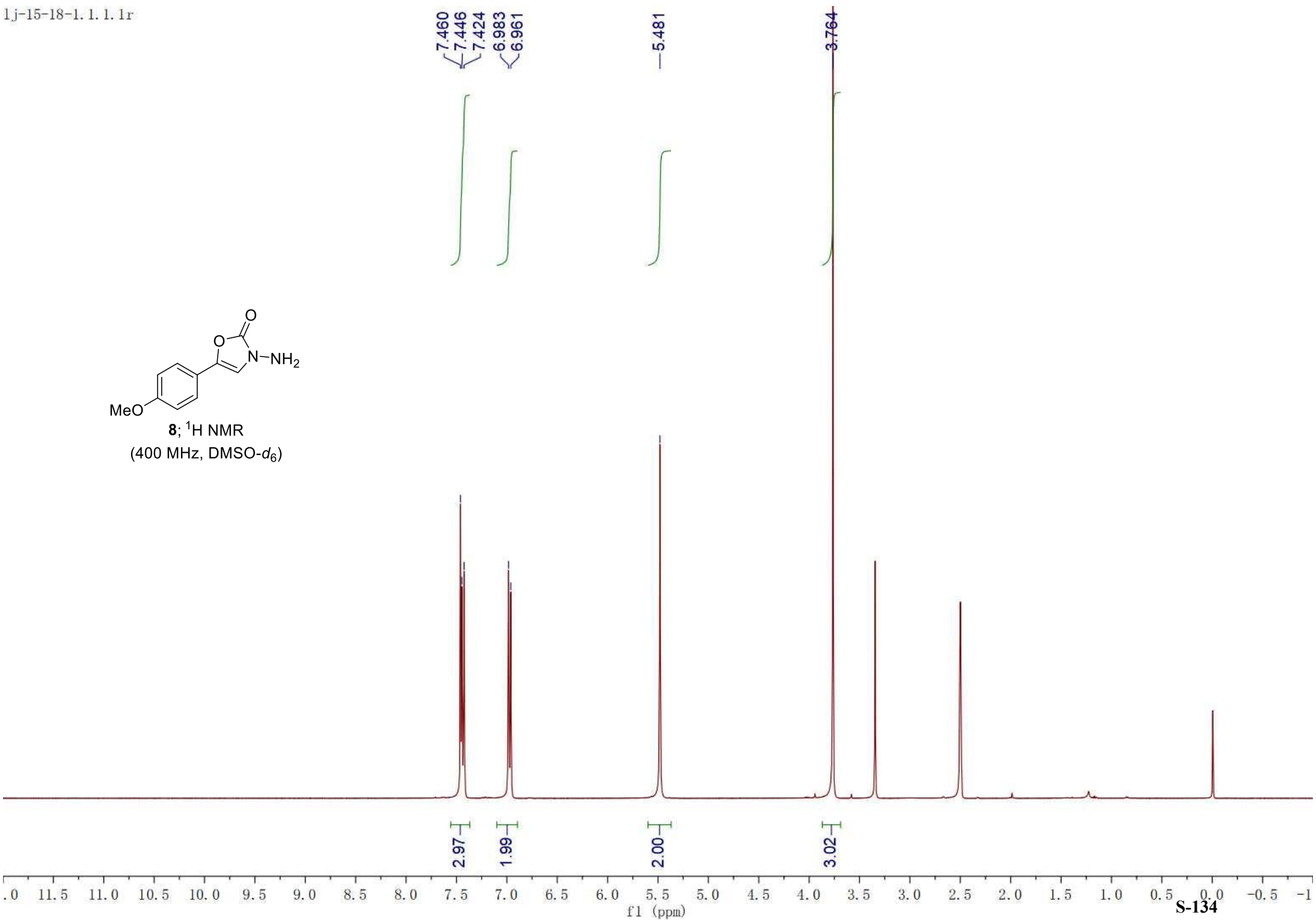
6; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



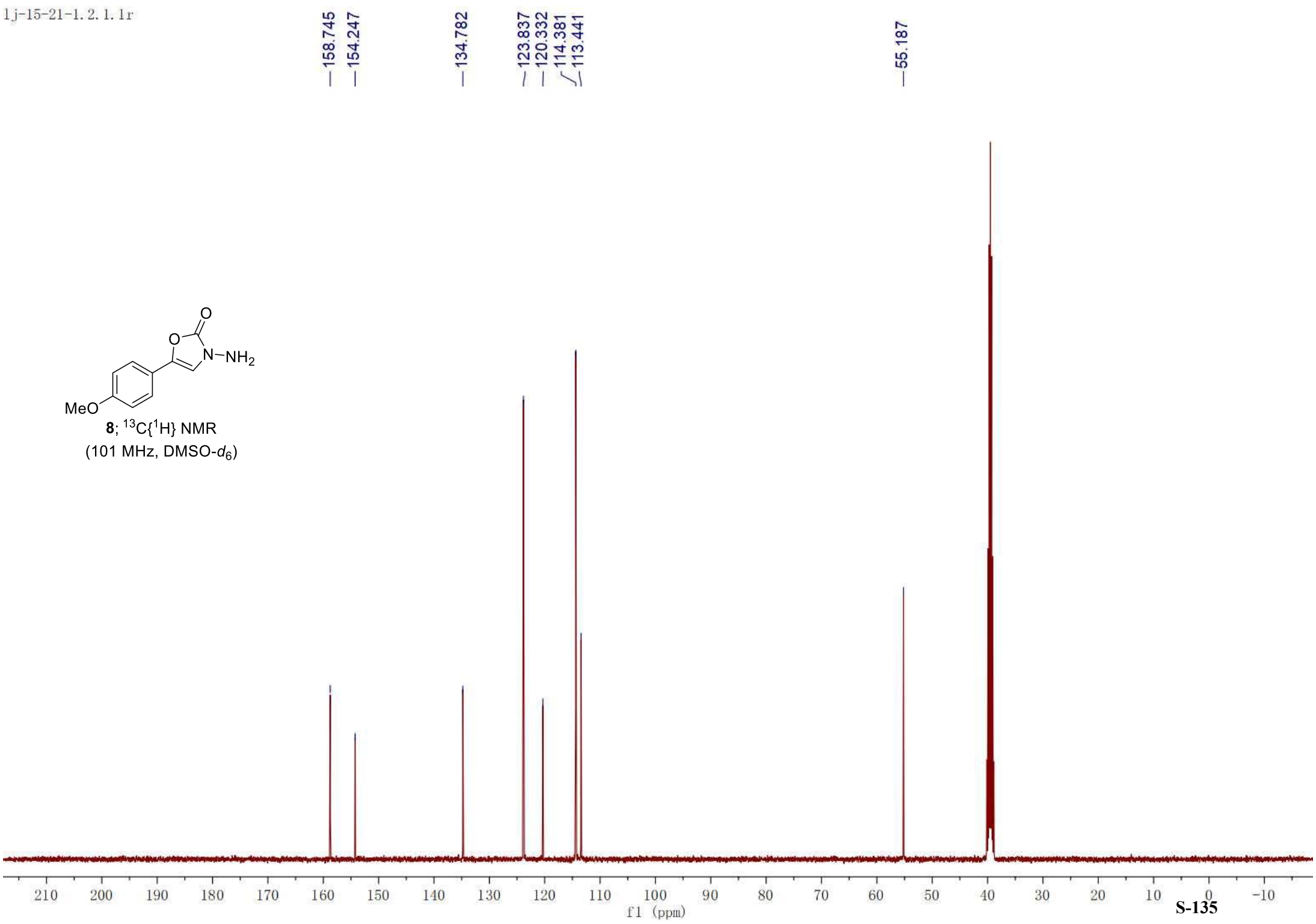
7; ^{1}H NMR
(400 MHz, DMSO-d_6)



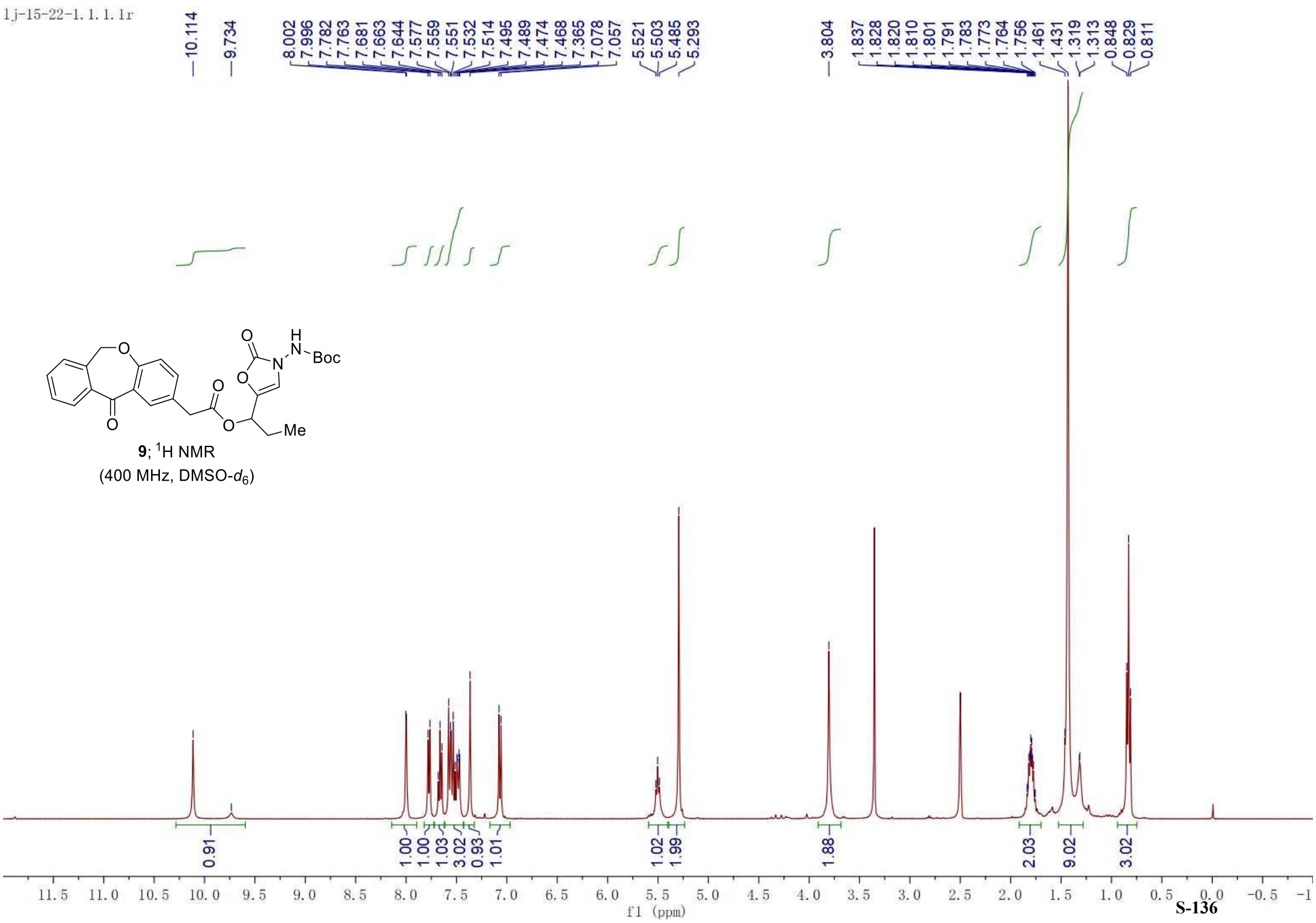
7; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



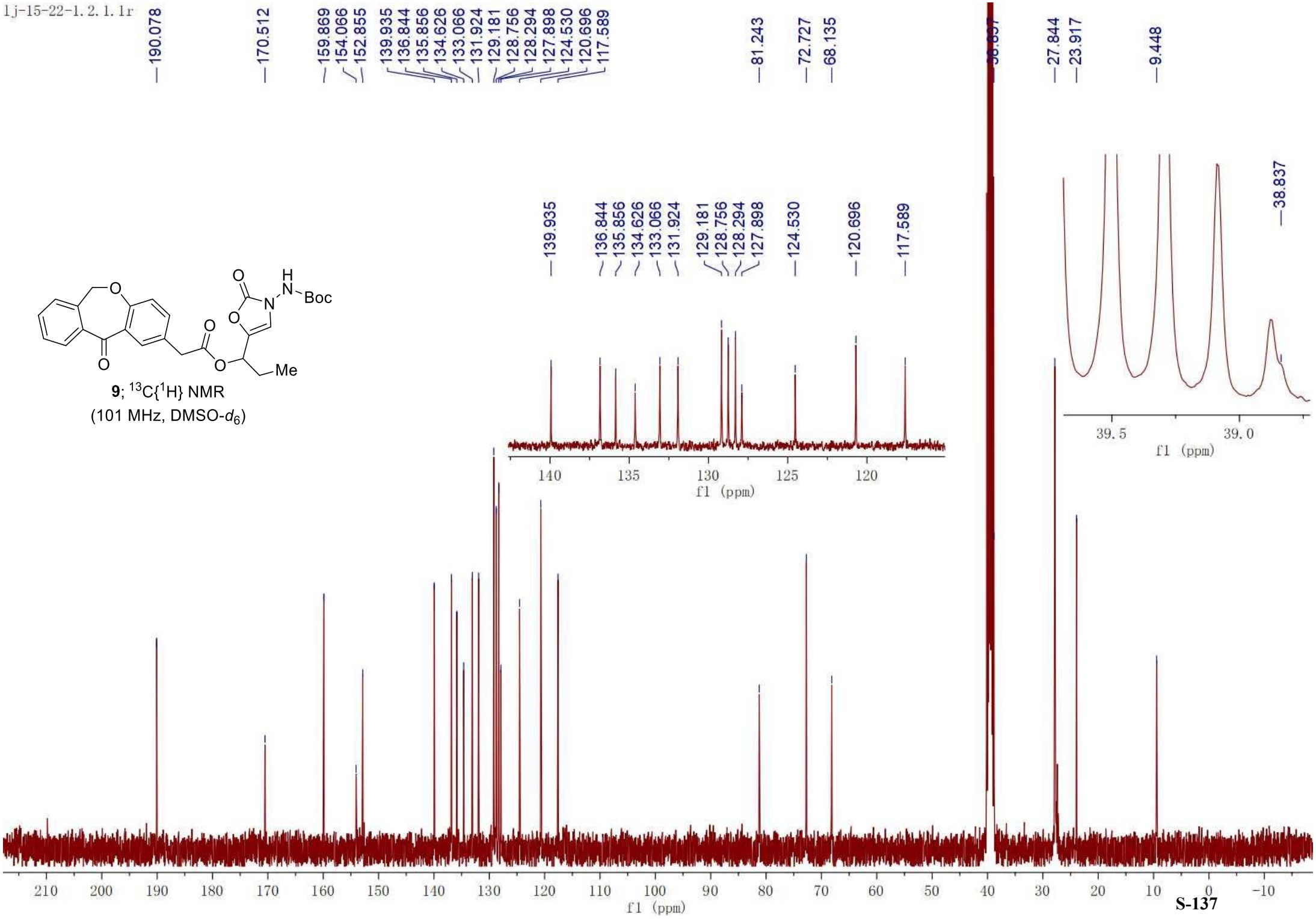
8; ^{1}H NMR
(400 MHz, DMSO-d_6)

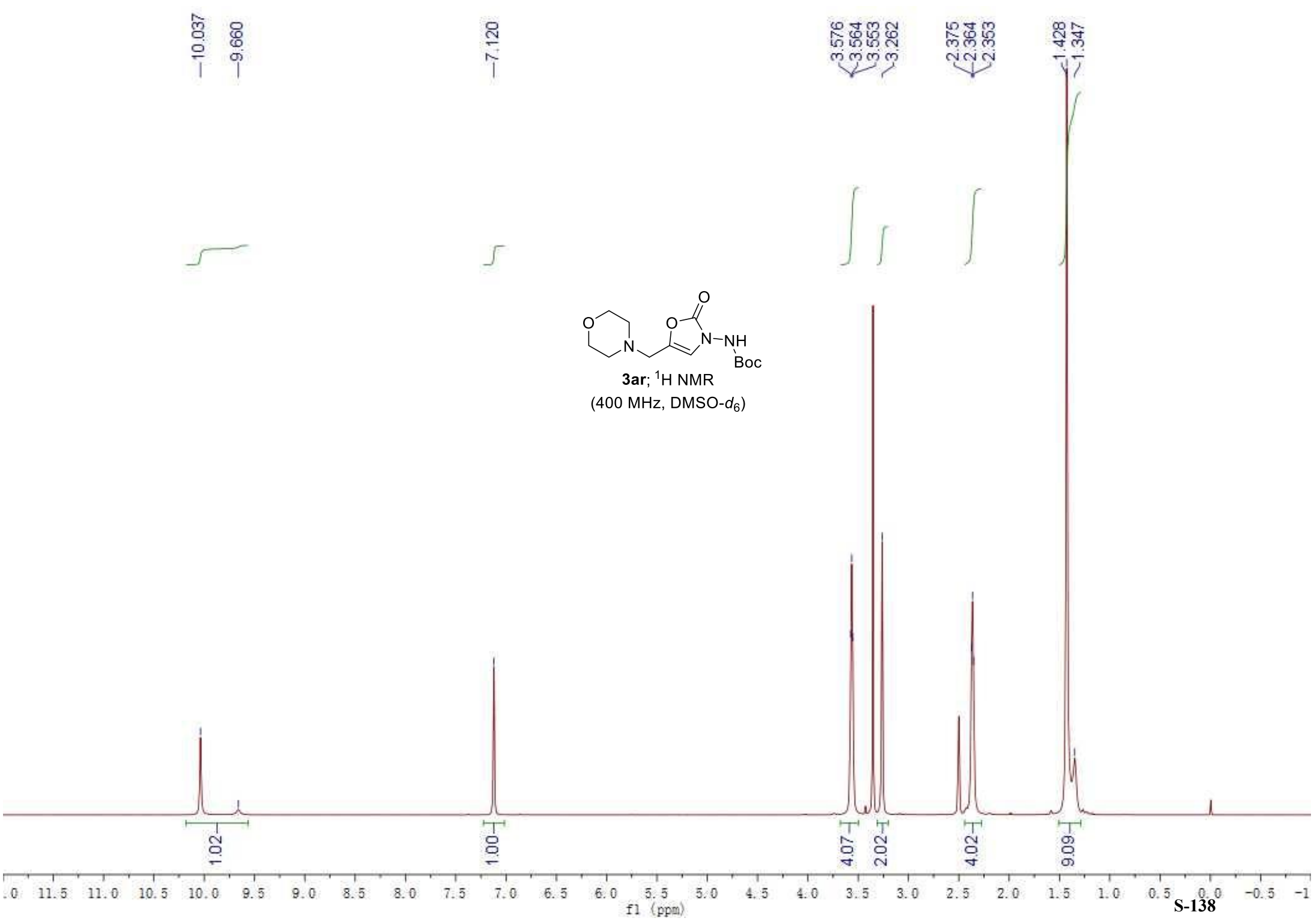


8; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)

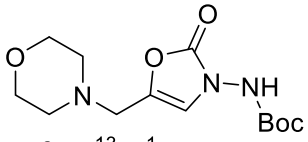


9; ^{1}H NMR
(400 MHz, DMSO-d_6)

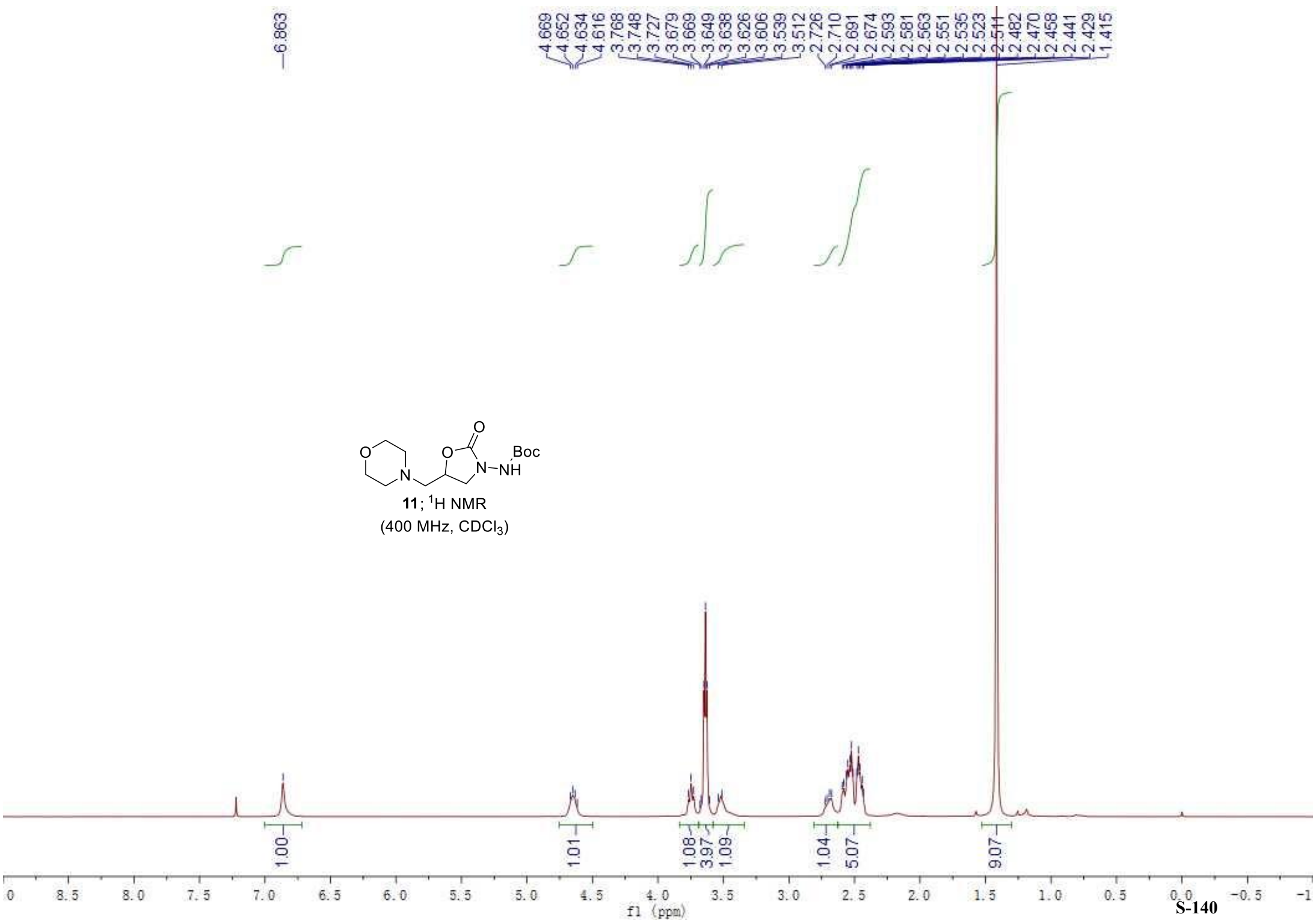

1j-15-22-1.2.1.1r
190.078
170.512
159.869
154.066
152.855
139.935
136.844
135.856
134.626
133.066
131.924
129.181
128.756
128.294
127.898
124.530
120.696
117.589
81.243
72.727
68.135
38.837
27.844
23.917
9.448
Boc
Me
9; 13C{1H} NMR
(101 MHz, DMSO-d6)
f1 (ppm)



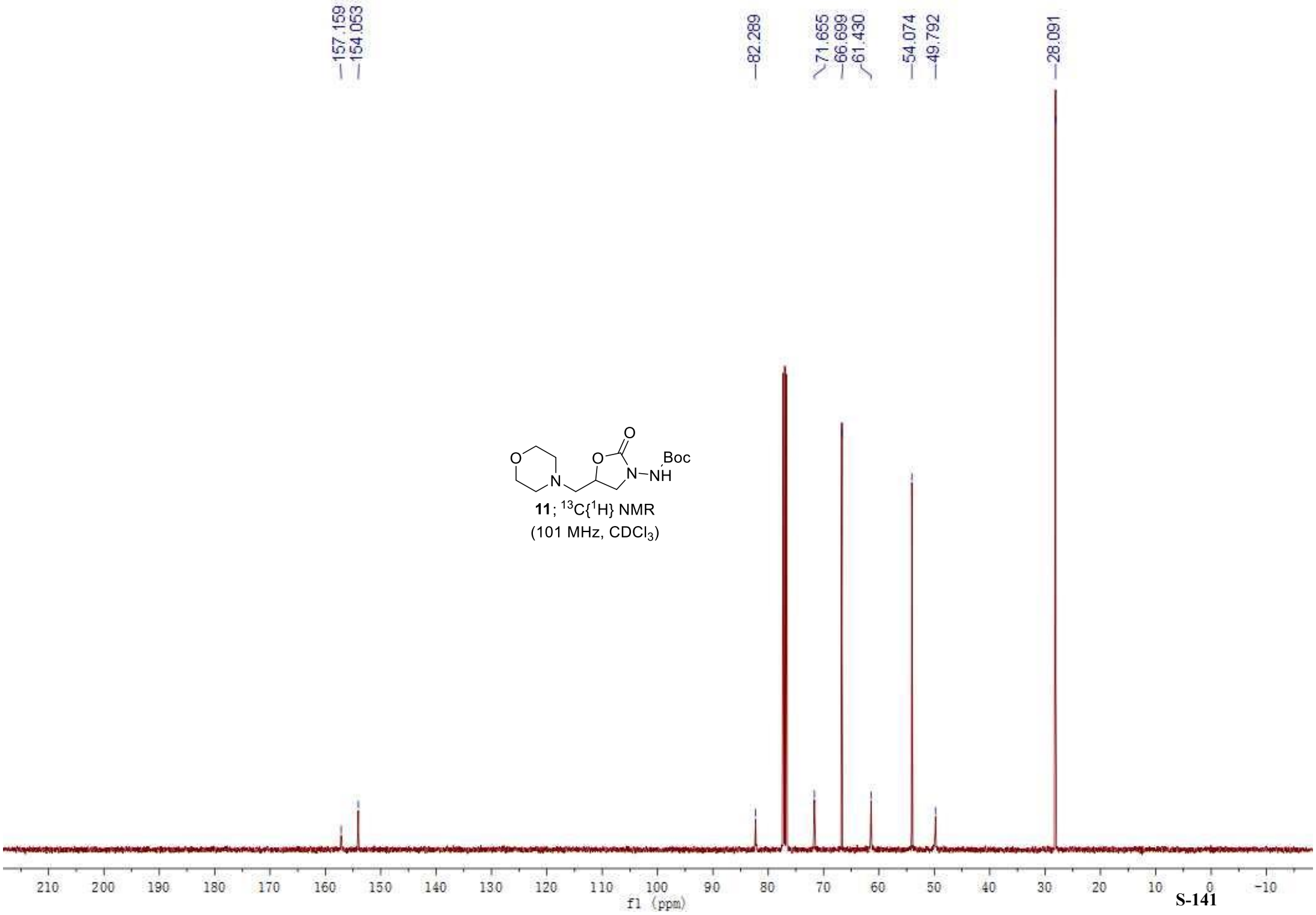
3ar; ^{1}H NMR
(400 MHz, DMSO-d_6)



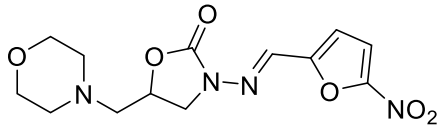
3ar; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



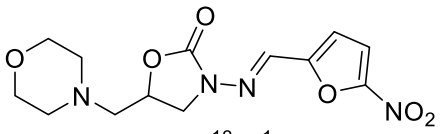
11; ^{1}H NMR
(400 MHz, $CDCl_3$)



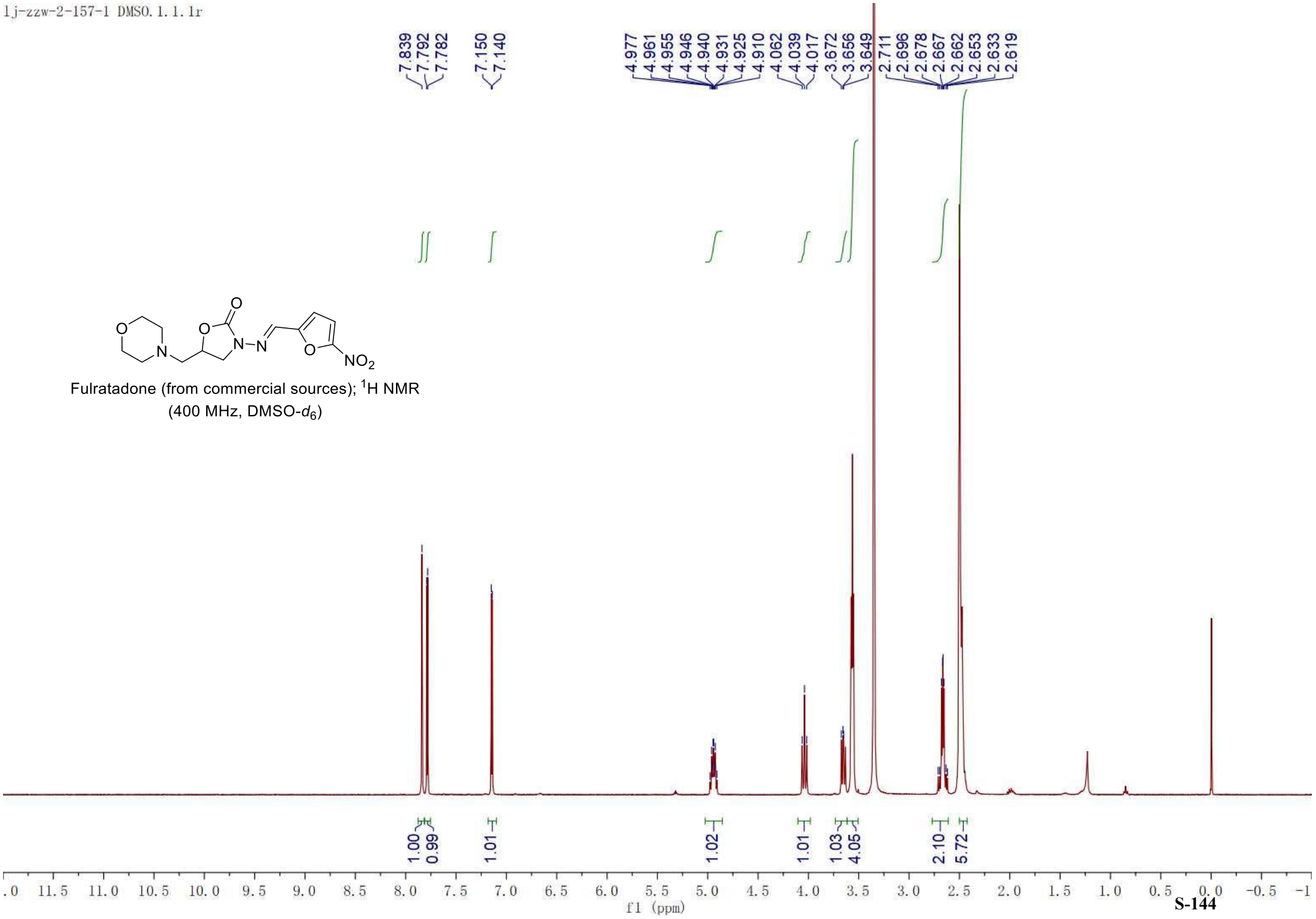
11; $^{13}C\{^{1}H\}$ NMR
(101 MHz, $CDCl_3$)



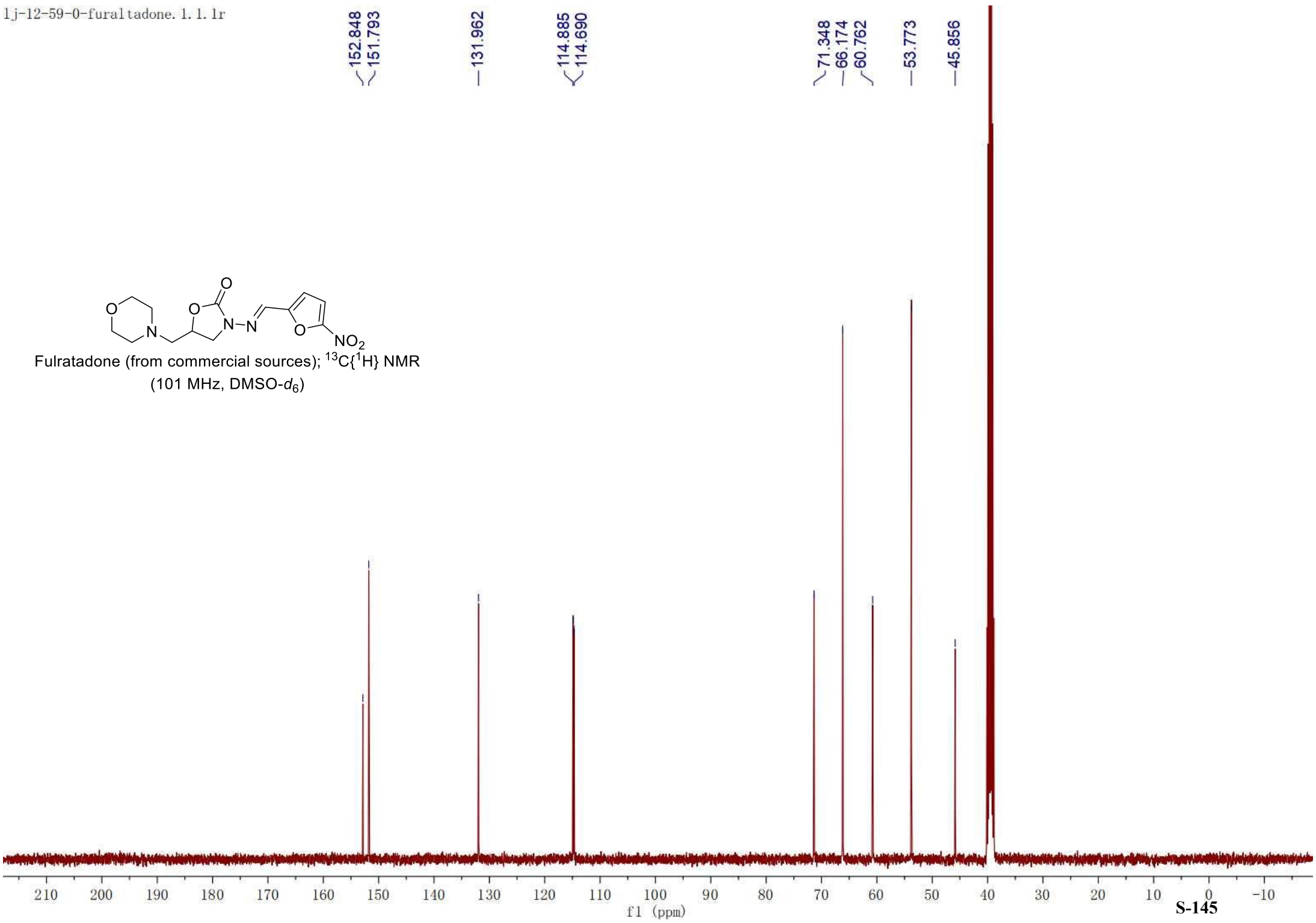
Fulratadone; ^{1}H NMR
(400 MHz, DMSO-d_6)



Fulratadone; $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)



Fulratadone (from commercial sources); ^{1}H NMR (400 MHz, DMSO-d_6)



Fulratadone (from commercial sources); $^{13}C\{^{1}H\}$ NMR
(101 MHz, DMSO-d_6)