Electronic Supplementary Material (ESI) for ChemComm.

Simple Magnesium Catalyst Mediated γ-Butyrolactams in Desymmetrization of *meso*-Aziridines

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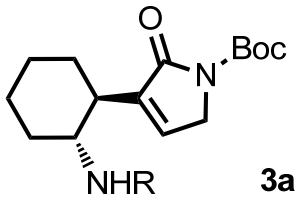
General Remarks

All reactions were performed under an argon atmosphere and solvents were dried according to established procedures. ^{1}H NMR (300 M), and ^{13}C NMR (75 M) spectra were obtained in $CDCl_3$ or DMSO. The chemical shifts are reported in ppm relative to internal standard TMS (^{1}H NMR), to residual signals of the solvents ($CHCl_3$, 7.26 ppm for ^{1}H NMR and 77.0 ppm for ^{13}C NMR). The enantiomeric excess was determined by HPLC analysis. *Bu_2Mg* (1.0M in heptane) is commercially available.

Representative Procedure for Catalytic Asymmetric Ring-Opening Reactions of Aziridines with γ-Butyrolactams to Generate 3a and It's Isomer

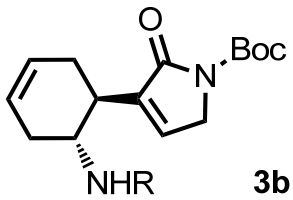
To a stirred solution of (S)- or (R)- **L7** (0.01 mmol) in toluene (0.5 mL) was added $MgBu_2$ (10 μ L, 1.0 M in heptane, 0.01 mmol) under an argon atmosphere, the mixture was stirred at room temperature for 30 min to generate the catalyst in-situ. Then γ-Butyrolactams **2** (0.15 mmol) and *N*-(2-picolinoyl) aziridines **1a** (0.10 mmol) in toluene (0.5 mL) was transferred into the flask containing the catalyst in one portion. After the addition, the mixture was stirred at 30 ˚C for 20 h. Then the reaction was quenched with saturated NH_4Cl and extracted with CH_2Cl_2. The combined organic layer was dried over Na_2SO_4 and concentrated under vacuum, the residue was purified by silica gel column chromatography (PE: EA = 4: 1 to 2: 1)to afford products **3a**.



3a

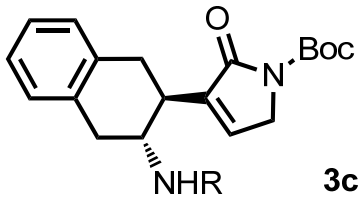
White solid, from [*S*-**L7**], m.p. 144-146 ^{o}C; 27.5mg, 74% yield; 96% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 18.0 min, t_{major} =

19.8 min); $[\alpha]^{rt}_{D}$ = -15.0 (*c* = 1.00, $CHCl_3$); from [*R*-**L7**], m.p. 147-150 °C; 33.0mg, 89% yield; 94% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 17.5 min, t_{major} = 15.8 min); $[\alpha]^{rt}_{D}$ = 20.2 (*c* = 0.99, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.53 (d, *J* = 4.2 Hz, 1H), 8.12 (d, *J* = 7.8 Hz, 1H), 7.98 (d, *J* = 9.8 Hz, 1H), 7.82 (td, *J* = 7.7, 1.7 Hz, 1H), 7.41 (ddd, *J* = 7.5, 4.8, 1.1 Hz, 1H), 7.01 (s, 1H), 4.19 (dd, *J* = 10.3, 3.6 Hz, 1H), 4.14 (s, 2H), 2.61 (td, *J* = 11.4, 2.7 Hz, 1H), 2.09 (dd, *J* = 17.8, 7.6 Hz, 3H), 1.97 – 1.64 (m, 2H), 1.50 (s, 9H), 1.47 – 1.38 (m, 2H), 1.27 (m, *J* = 9.9 Hz, 2H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.5, 163.6, 149.7, 149.6, 148.1, 141.2, 137.3, 137.2, 126.1, 122.0, 82.7, 50.5, 49.7, 40.3, 33.9, 32.6, 28.0, 25.5, 25.2. **IR** (neat): 3362, 2930, 2732, 1715, 1666, 1523, 1322, 1159, 736, 621 cm^{-1}; **HRMS** (ESI): $C_{21}H_{28}N_3O_4$ $[M+H]^+$ calcd: 386.2074, found: 386.2077.



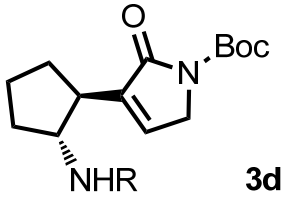
3b

Colorless oil, from [*S*-**L7**], 31.8mg, 83% yield; 86% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 37.0 min, t_{major} = 24.7 min); $[\alpha]^{rt}_{D}$ = -30.4 (*c* = 1.02, $CHCl_3$); from [*R*-**L7**], 32.2mg, 84% yield; 84% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 25.4 min, t_{major} = 37.5 min); $[\alpha]^{rt}_{D}$ = 40.8 (*c* = 1.03, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.54 (d, *J* = 4.3 Hz, 1H), 8.10 (dd, *J* = 14.7, 8.8 Hz, 2H), 7.83 (td, *J* = 7.7, 1.7 Hz, 1H), 7.41 (ddd, *J* = 7.5, 4.8, 1.1 Hz, 1H), 7.03 (s, 1H), 5.92 – 5.57 (m, 2H), 4.49 (qd, *J* = 9.8, 5.5 Hz, 1H), 4.15 (s, 2H), 3.00 (td, *J* = 10.7, 5.2 Hz, 1H), 2.70 – 2.39 (m, 2H), 2.31 – 2.06 (m, 2H), 1.51 (s, 9H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.4, 163.8, 149.7, 149.5, 148.1, 140.8, 137.9, 137.2, 126.1, 125.7, 124.9, 122.0, 82.8, 49.8, 47.6, 36.0, 32.8, 31.9, 28.0. **IR** (neat): 3333, 2927, 2677, 1718, 1523, 1324, 1159, 999, 779, 621 cm^{-1}; **HRMS** (ESI): $C_{21}H_{26}N_3O_4$ $[M+H]^+$ calcd: 384.1918, found: 384.1917.



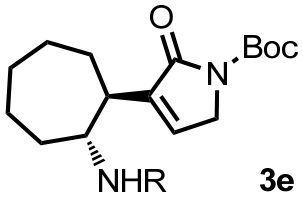
3c

White solid, from [*S*-**L7**], m.p. 187-188 ^{o}C; 32.5mg, 75% yield; 91% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 45.9 min, t_{major} = 30.5 min); $[\alpha]^{rt}_{D}$ = -51.7 (*c* = 1.03, $CHCl_3$); from [*R*-**L7**], m.p. 186-188 ^{o}C; 31.6mg, 73% yield; 89% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 34.1 min, t_{major} = 45.6 min); $[\alpha]^{rt}_{D}$ = 56.1 (*c* = 0.98, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.55 (d, *J* = 4.1 Hz, 1H), 8.16 (t, *J* = 9.5 Hz, 2H), 7.84 (td, *J* = 7.7, 1.7 Hz, 1H), 7.42 (ddd, *J* = 7.6, 4.8, 1.1 Hz, 1H), 7.21 – 6.92 (m, 5H), 4.67 (qd, *J* = 10.5, 5.5 Hz, 1H), 4.19 (s, 2H), 3.23 (tdd, *J* = 15.2, 13.8, 5.1 Hz, 3H), 3.08 – 2.78 (m, 2H), 1.52 (s, 9H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.3, 164.0, 149.7, 149.5, 148.2, 140.5, 138.2, 137.3, 134.4, 134.1, 128.8, 128.4, 126.3, 126.2, 122.1, 82.9, 49.8, 48.2, 36.8, 36.5, 35.4, 28.1. **IR** (neat): 3336, 2927, 2854, 2374, 1717, 1523, 1323, 1159, 745, 621 cm^{-1}; **HRMS** (ESI): $C_{25}H_{28}N_3O_4$ $[M+H]^+$ calcd: 434.2074, found: 434.2078.



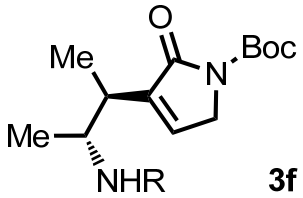
3d

Colorless oil, from [*S*-**L7**], 19.3mg, 52% yield; 93% *ee* determined by HPLC on a Chiralpak IA-H column (hexane/2-propanol = 60/40, flow rate = 1.0 mL/min, t_{minor} = 14.9 min, t_{major} = 10.5 min); $[\alpha]^{rt}_{D}$ = -51.7 (*c* = 0.97, $CHCl_3$); from [*R*-**L7**], 18.9mg, 51% yield; 93% *ee* determined by HPLC on a Chiralpak IA-H column (hexane/2-propanol = 60/40, flow rate = 1.0 mL/min, t_{minor} = 10.0 min, t_{major} = 13.7 min); $[\alpha]^{rt}_{D}$ = 36.2 (*c* = 1.02, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.54 (d, *J* = 4.2 Hz, 1H), 8.12 (dd, *J* = 15.9, 8.5 Hz, 2H), 7.83 (t, *J* = 7.7 Hz, 1H), 7.42 (dd, *J* = 6.8, 5.2 Hz, 1H), 7.06 (s, 1H), 4.73 – 4.50 (m, 1H), 4.20 (s, 2H), 2.86 (dd, *J* = 18.5, 9.3 Hz, 1H), 2.39 – 2.20 (m, 2H), 1.91 – 1.78 (m, 2H), 1.75 – 1.58 (m, 2H), 1.53 (s, 9H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.5, 164.1, 149.7, 149.6, 148.1, 140.6, 137.3, 137.0, 126.2, 122.1, 82.8, 53.7, 49.7, 43.3, 32.5, 30.8, 28.1, 22.1. **IR** (neat): 3366, 2929, 2372, 1720, 1323, 1294, 1159, 998, 750, 621 cm^{-1}; **HRMS** (ESI): $C_{20}H_{26}N_3O_4$ $[M+H]^+$ calcd: 372.1918, found: 372.1920.



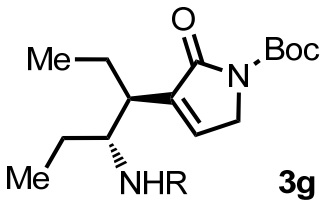
3e

Colorless oil, from [*S*-**L7**], 12.0mg, 30% yield; 83% *ee* determined by HPLC on a Chiralpak IA-H column (hexane/2-propanol = 60/40, flow rate = 1.0 mL/min, t_{minor} = 17.7 min, t_{major} = 20.7 min); $[\alpha]^{rt}_{D}$ = -6.1 (*c* = 0.98, $CHCl_3$); from [*R*-**L7**], 12.0mg, 30% yield; 81% *ee* determined by HPLC on a Chiralpak IA-H column (hexane/2-propanol = 60/40, flow rate = 1.0 mL/min, t_{minor} = 21.2 min, t_{major} = 17.8 min); $[\alpha]^{rt}_{D}$ = 7.3 (*c* = 1.10, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.52 (d, *J* = 4.2 Hz, 1H), 8.09 (t, *J* = 10.3 Hz, 2H), 7.81 (dd, *J* = 7.7, 6.3 Hz, 1H), 7.40 (dd, *J* = 6.6, 5.0 Hz, 1H), 6.98 (s, 1H), 4.37 (dd, *J* = 17.4, 7.6 Hz, 1H), 4.13 (s, 2H), 2.78 (s, 1H), 1.96 (d, *J* = 8.7 Hz, 1H), 1.79 (dd, *J* = 15.7, 9.8 Hz, 4H), 1.68 – 1.59 (m, 5H), 1.51 (s, 9H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.4, 163.2, 149.8, 148.1, 142.5, 137.2, 136.6, 126.1, 122.0, 82.8, 52.8, 49.6, 42.5, 34.5, 30.8, 28.2, 28.1, 26.2, 24.2. **IR** (neat): 3369, 2927, 2373, 1724, 1522, 1267, 1157, 1074, 739, 621 cm^{-1}; **HRMS** (ESI): $C_{22}H_{30}N_3O_4$ $[M+H]^+$ calcd: 400.2231, found: 400.2233.



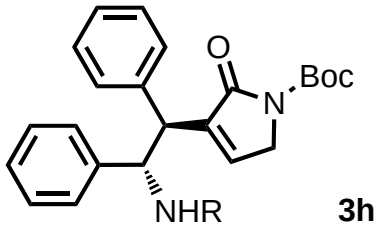
3f

Colorless oil, from [*S*-**L7**], 25.1mg, 70% yield; 93% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 33.8 min, t_{major} = 22.7 min); $[\alpha]^{rt}_{D}$ = 3.8 (*c* = 1.05, $CHCl_3$); from [*R*-**L7**], 22.3 mg, 62% yield; 90% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 22.6 min, t_{major} = 31.0 min); $[\alpha]^{rt}_{D}$ = -3.9 (*c* = 1.03, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.55 (d, *J* = 4.3 Hz, 1H), 8.15 (d, *J* = 7.6 Hz, 2H), 7.84 (t, *J* = 7.1 Hz, 1H), 7.54 – 7.34 (m, 1H), 6.98 (s, 1H), 4.50 – 4.29 (m, 1H), 4.21 (s, 2H), 2.91 (p, *J* = 6.9 Hz, 1H), 1.53 (s, 9H), 1.28 (d, *J* = 6.7 Hz, 3H), 1.21 (d, *J* = 7.0 Hz, 3H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.4, 163.7, 149.7, 148.1, 141.8, 138.2, 137.3, 126.1, 122.1, 82.9, 49.7, 48.2, 36.1, 28.1, 19.6, 17.4. **IR** (neat): 3369, 2974, 2293, 1717, 1521, 1298, 1158, 1043, 799, 621 cm^{-1}; **HRMS** (ESI): $C_{19}H_{26}N_3O_4$ $[M+H]^+$ calcd: 360.1918, found: 360.1920.



3g

Colorless oil, from [*S*-**L7**], 21.7mg, 56% yield; 80% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 80/20, flow rate = 1.0 mL/min, t_{minor} = 35.9 min, t_{major} = 39.5 min); $[\alpha]^{rt}_{D}$ = 36.6 (*c* = 1.01, $CHCl_3$); from [*R*-**L7**], 23.2mg, 60% yield; 77% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 80/20, flow rate = 1.0 mL/min, t_{minor} = 41.0 min, t_{major} = 36.2 min); $[\alpha]^{rt}_{D}$ = -24.3 (*c* = 1.03, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.56 (d, *J* = 4.4 Hz, 1H), 8.16 (t, *J* = 9.0 Hz, 2H), 7.85 (td, *J* = 7.7, 1.5 Hz, 1H), 7.42 (dd, *J* = 6.7, 4.9 Hz, 1H), 6.97 (s, 1H), 4.42 – 4.20 (m, 3H), 2.86 (dt, *J* = 8.5, 5.6 Hz, 1H), 1.80 – 1.66 (m, 2H), 1.56 (s, 9H), 1.38 (ddt, *J* = 23.5, 14.2, 7.1 Hz, 2H), 0.94 (t, *J* = 7.4 Hz, 3H), 0.86 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.7, 164.3, 149.9, 149.7, 148.2, 140.2, 139.5, 137.3, 126.1, 122.3, 82.9, 52.3, 49.9, 41.7, 28.1, 27.1, 24.6, 11.4, 10.7. **IR** (neat): 3368, 2929, 2297, 1719, 1521, 1292, 1157, 800, 736, 621 cm^{-1}; **HRMS** (ESI): $C_{21}H_{30}N_3O_4$ $[M+H]^+$ calcd: 388.2231, found: 388.2234.

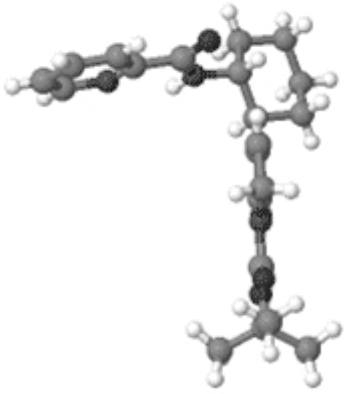


3h

White solid, from [*S*-**L7**], m.p. 205-208 ^{o}C; 27.0mg, 56% yield; 82% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 16.5 min, t_{major} = 34.2 min); $[\alpha]^{rt}_{D}$ = 67.4 (*c* = 0.99, $CHCl_3$); from [*R*-**L7**], m.p. 213-215 ^{o}C; 29.0mg, 60% yield; 81% *ee* determined by HPLC on a Chiralpak IC-H column (hexane/2-propanol = 40/60, flow rate = 1.0 mL/min, t_{minor} = 35.1 min, t_{major} = 15.5 min); $[\alpha]^{rt}_{D}$ = -56.0 (*c* = 0.97, $CHCl_3$); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 8.70 (d, *J* = 9.9 Hz, 1H), 8.55 (d, *J* = 4.3 Hz, 1H), 8.10 (d, *J* = 7.8 Hz, 1H), 7.80 (td, *J* = 7.7, 1.6 Hz, 1H), 7.40 (ddd, *J* = 7.5, 4.8, 1.1 Hz, 1H), 7.32 (s, 1H), 7.26 – 7.20 (m, 2H), 7.20 – 7.03 (m, 9H), 5.80 (dd, *J* = 11.4, 10.1 Hz, 1H), 4.42 (d, *J* = 11.6 Hz, 1H), 4.19 (s, 2H), 1.49 (s, 9H). **^{13}C NMR** (75 MHz, $CDCl_3$) δ 169.0, 163.5, 149.7, 149.3, 148.2, 140.1, 139.8, 138.3, 138.1, 137.3, 128.7, 128.4, 127.4, 127.3, 127.0, 126.3, 122.2, 82.9,

56.2, 49.8, 48.3, 28.0. **IR** (neat): 3357, 2926, 2370, 1718, 1516, 1299, 1153, 1043, 703, 620 cm^{-1}; **HRMS** (ESI): $C_{29}H_{30}N_3O_4$ $[M+H]^+$ calcd: 484.2231, found: 484.2236.

X-Ray Analysis of 3a



CCDC 1472290

Bond precision: C-C = 0.0063 A Wavelength=1.54184

Cell: a=16.8244(6) b=6.0896(2) c=41.9414(16)
alpha=90 beta=101.245(4) gamma=90

Temperature: 294 K

	Calculated	Reported
Volume	4214.6(3)	4214.6(3)
Space group	I 2	I 1 2 1
Hall group	I 2y	I 2y
Moiety formula	C21 H27 N3 O4	C21 H27 N3 O4
Sum formula	C21 H27 N3 O4	C21 H27 N3 O4
Mr	385.46	385.45
Dx,g cm-3	1.215	1.215
Z	8	8
Mu (mm-1)	0.691	0.691
F000	1648.0	1648.0
F000'	1653.07	
h,k,lmax	20,7,51	20,7,50
Nref	8005[4407]	5306
Tmin,Tmax	0.869,0.908	0.804,1.000

Tmin' 0.853

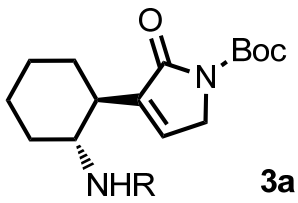
Correction method= # Reported T Limits: Tmin=0.804 Tmax=1.000 AbsCorr = MULTI-SCAN

Data completeness= 1.20/0.66 Theta(max)= 69.863

R(reflections)= 0.0496(3879) wR2(reflections)= 0.1189(5306)

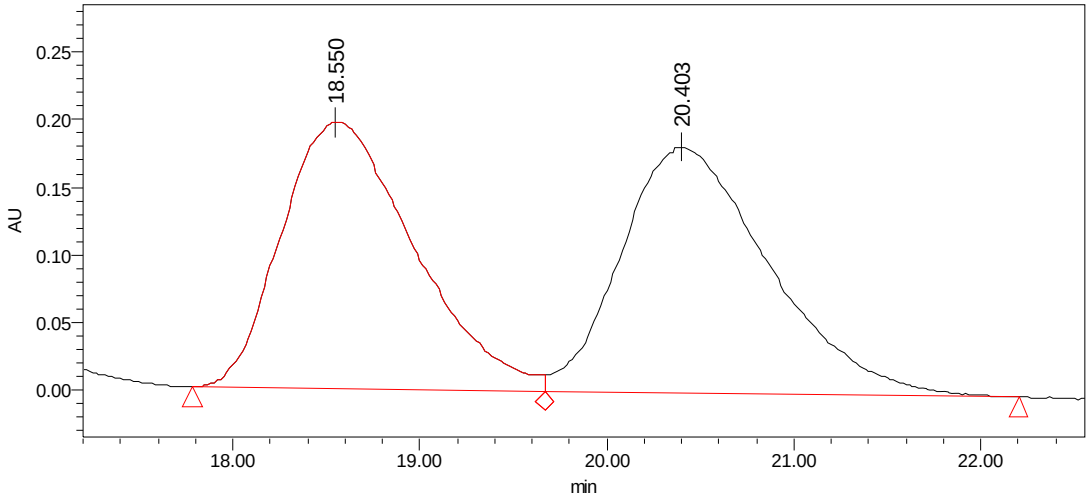
S = 1.042 Npar= 529

HPLC Results



3a

HPLC using an IC-H (*n*-Hexane/*i*-PrOH=40/60, flow rate 1.0 mL/min)



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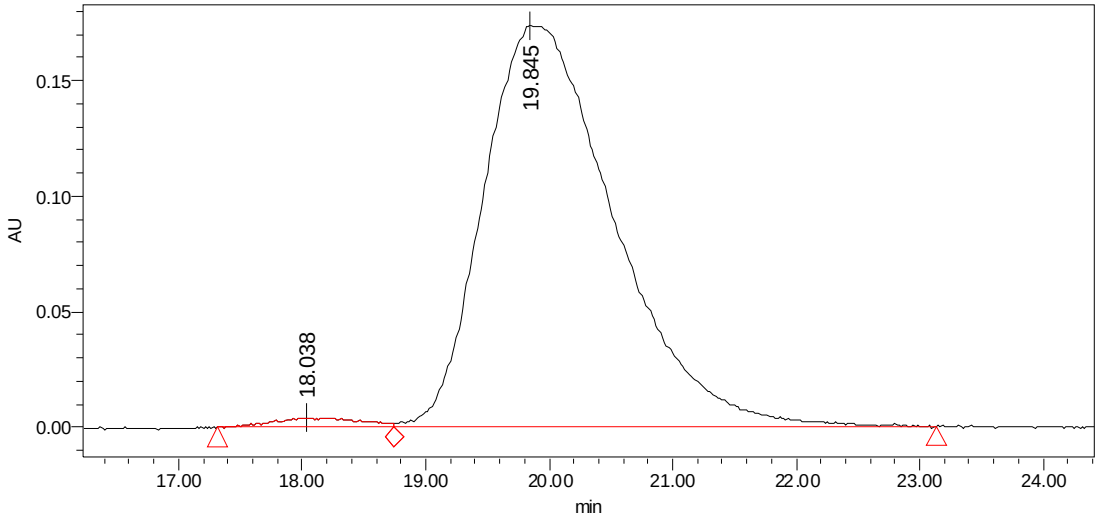

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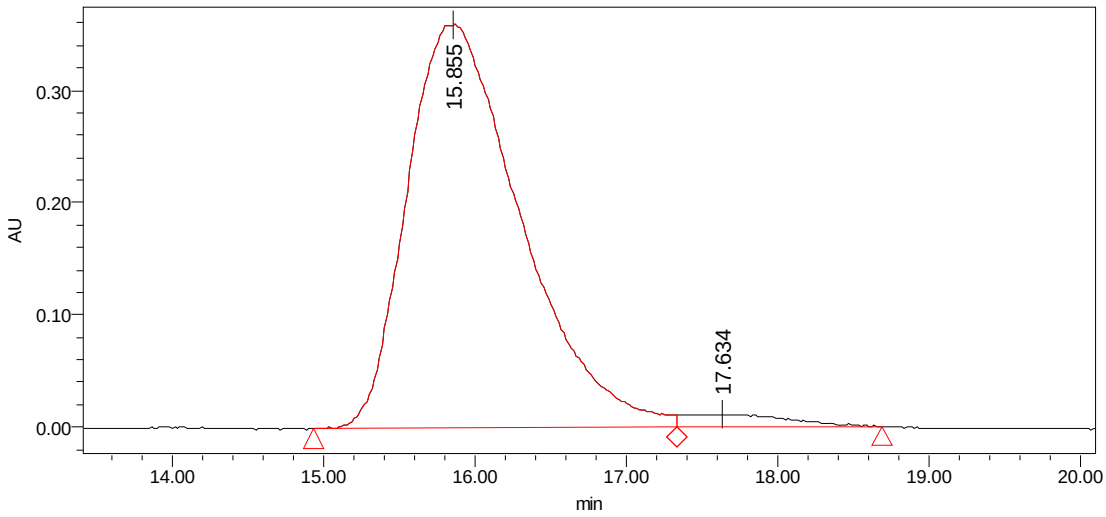

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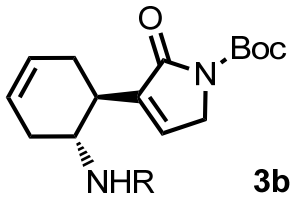
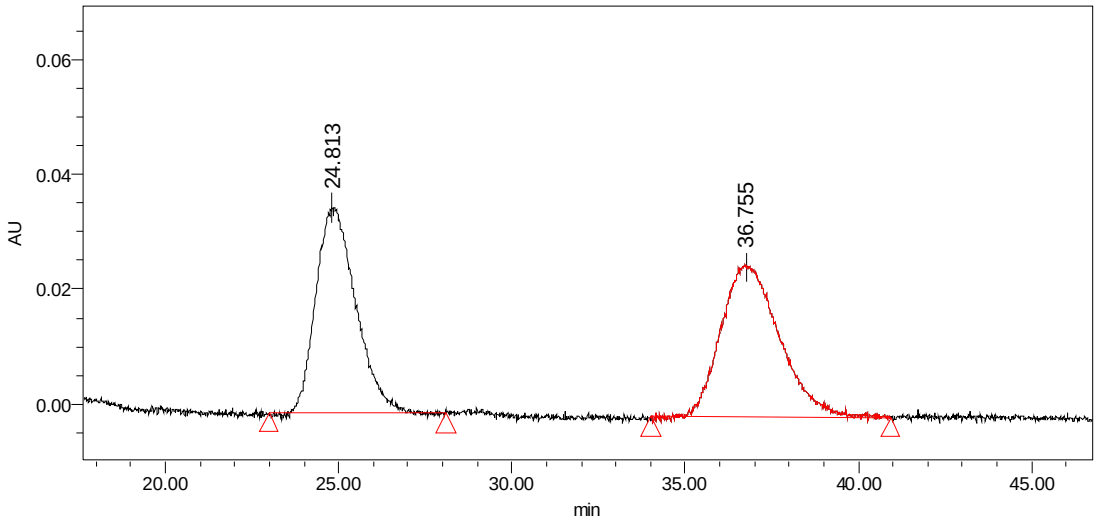
2	17.634	555672	2.87	11189

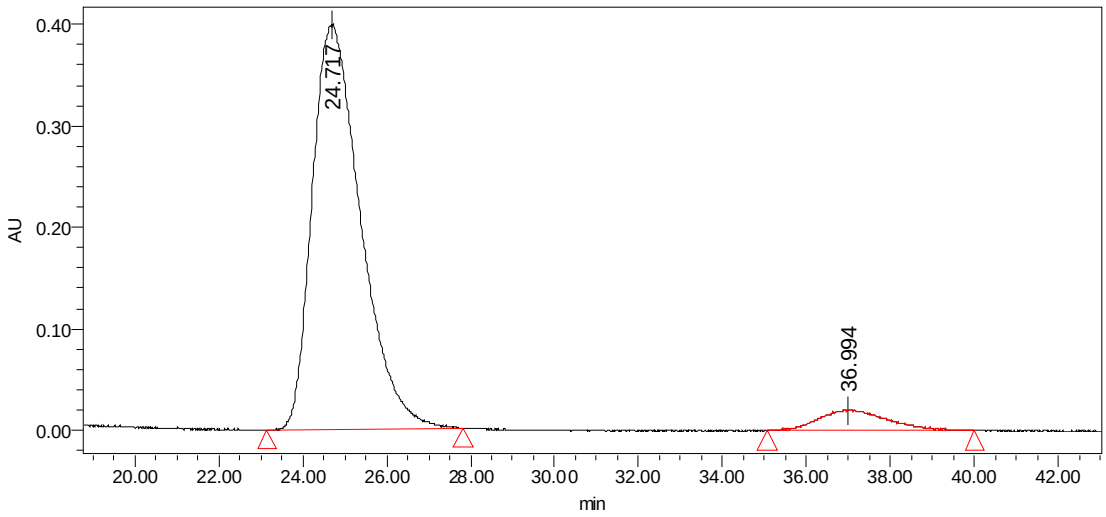


3b

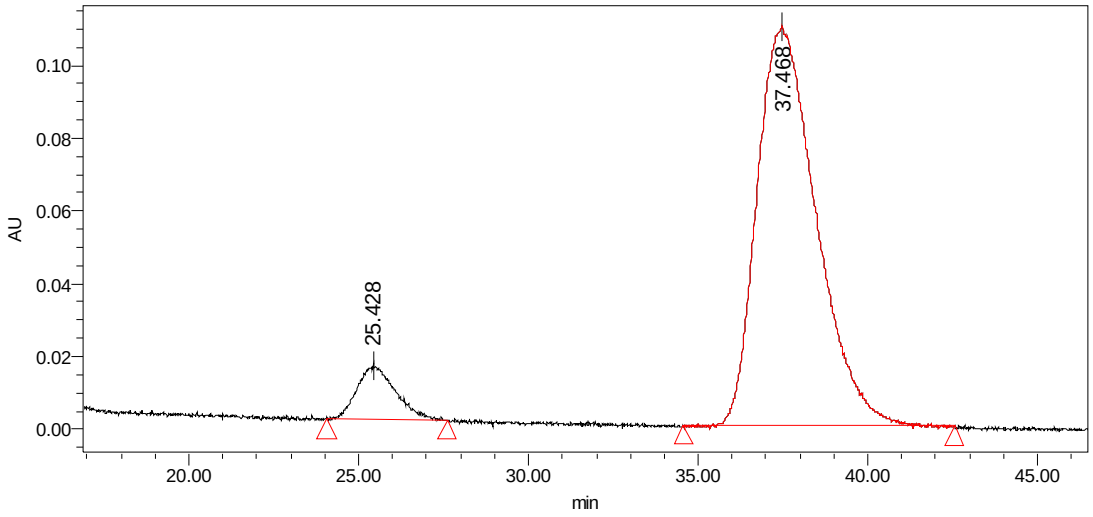
HPLC using an IC-H (*n*-Hexane/*i*-PrOH=40/60, flow rate 1.0 mL/min)



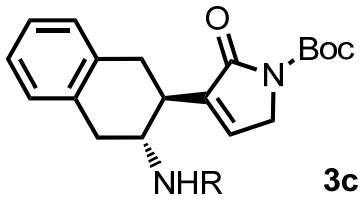
	Retention Time	Area	% Area	Height
1	24.813	2893972	48.20	35834
2	36.755	3110063	51.80	26271



	Retention Time	Area	% Area	Height
1	24.717	32049982	93.15	399502
2	36.994	2357991	6.85	20032

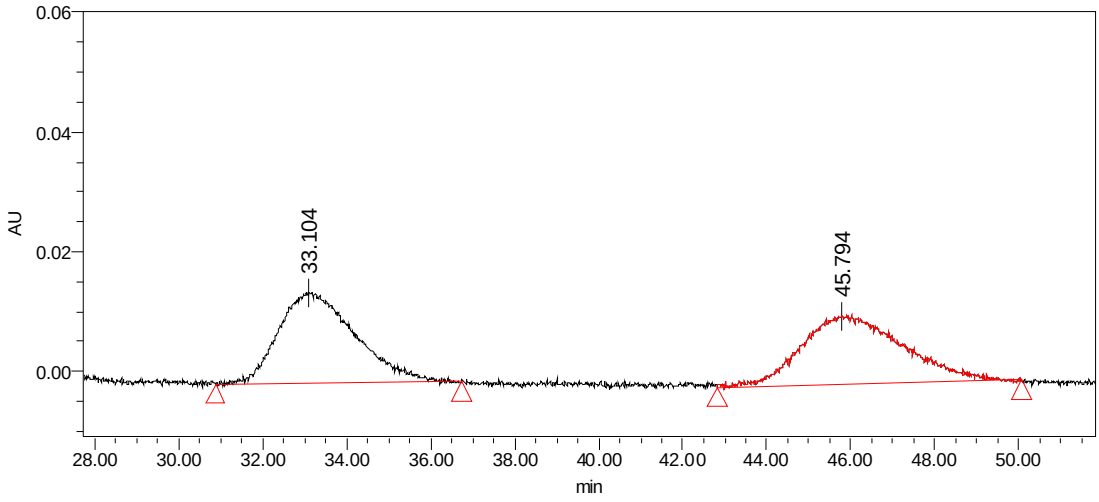


	Retention Time	Area	% Area	Height
1	25.428	1149937	7.97	14612
2	37.468	13270436	92.03	109502

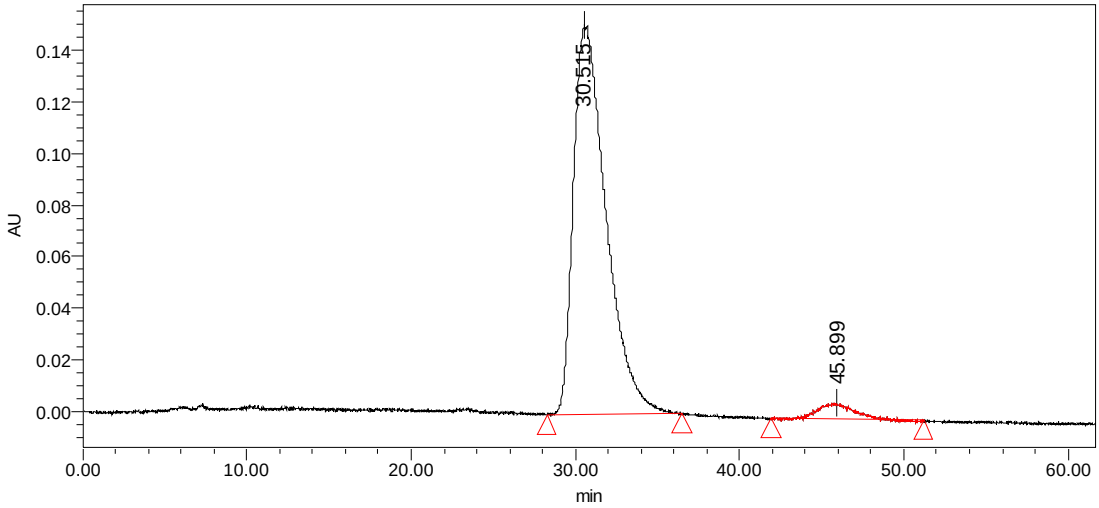


3c

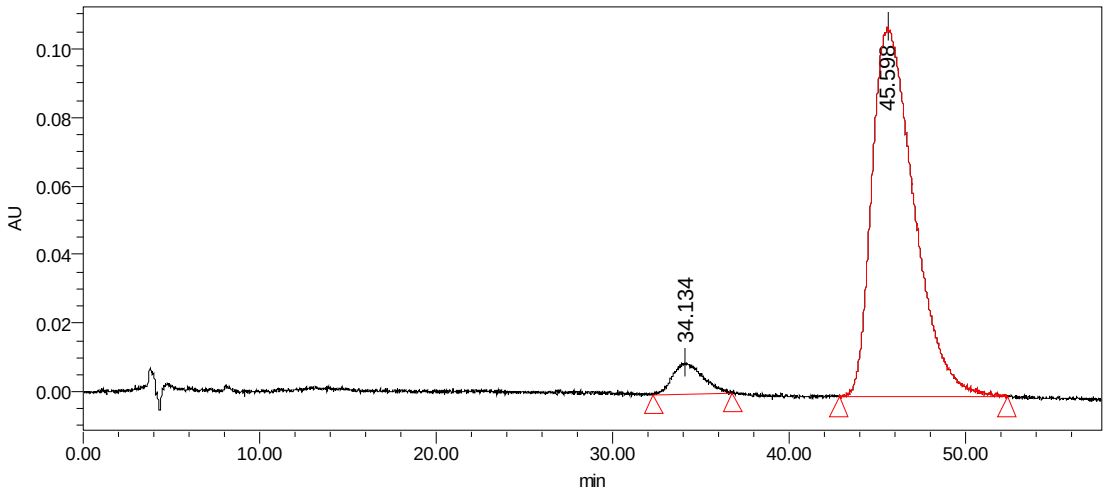
HPLC using an IC-H (*n*-Hexane/*i*-PrOH=40/60, flow rate 1.0 mL/min)



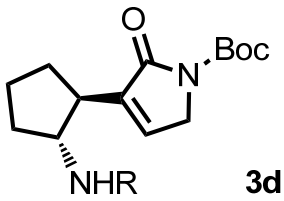
	Retention Time	Area	% Area	Height
1	33.104	1912881	50.28	14951
2	45.794	1891324	49.72	11305



	Retention Time	Area	% Area	Height
1	30.515	20931871	95.52	150812
2	45.899	981334	4.48	6147

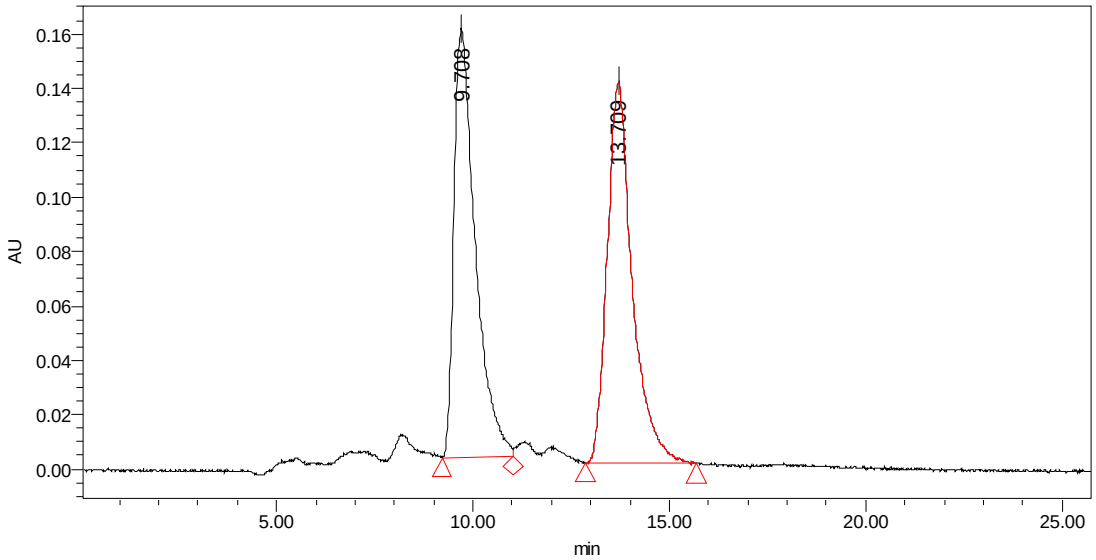


	Retention Time	Area	% Area	Height
1	34.134	1037665	5.47	8891
2	45.598	17922014	94.53	107732

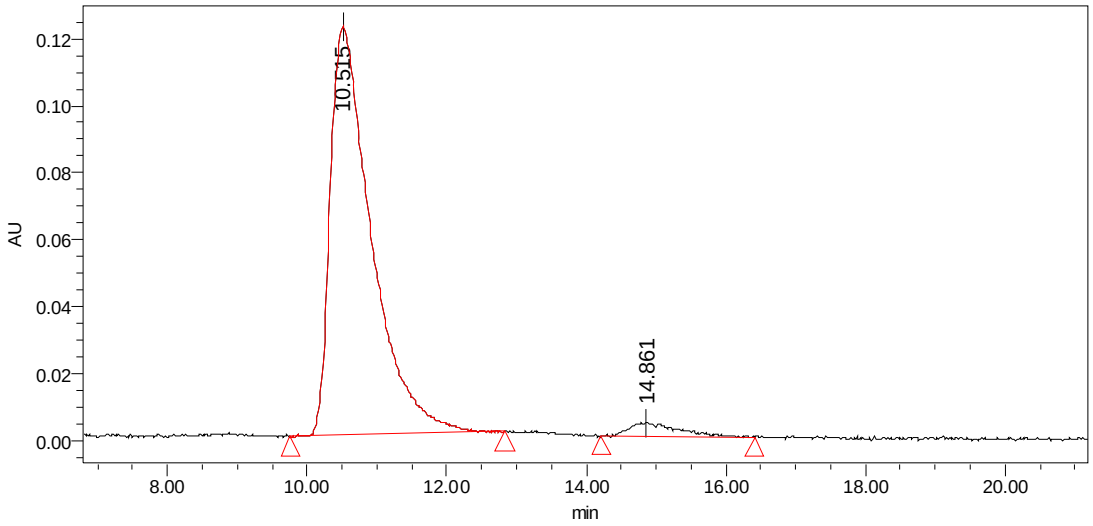


3d

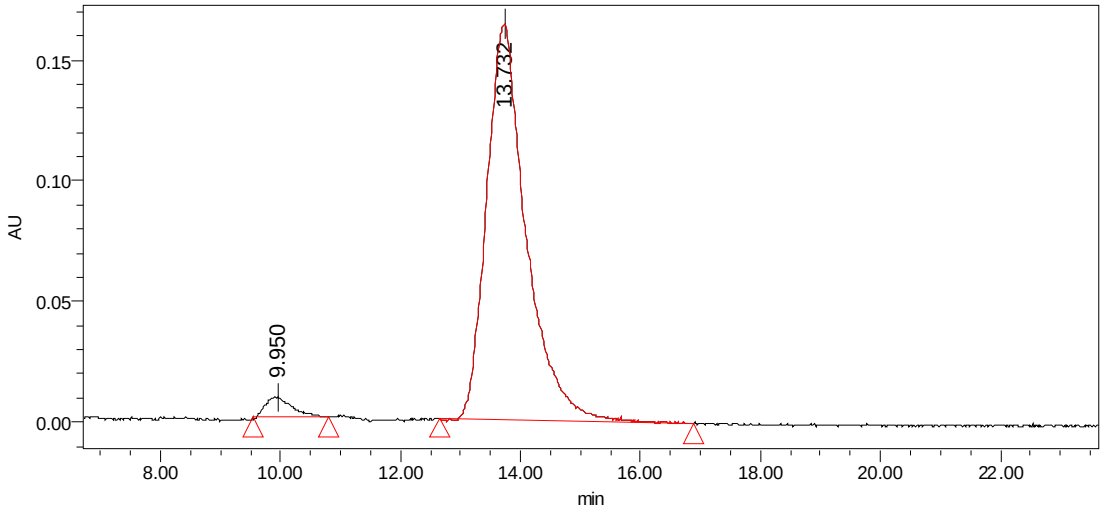
HPLC using an IA-H (*n*-Hexane/*i*-PrOH=60/40, flow rate 1.0 mL/min)



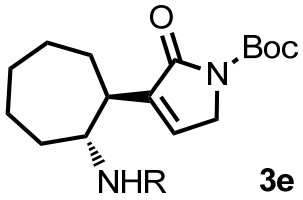
	Retention Time	Area	% Area	Height
1	9.708	5974493	48.90	157579
2	13.709	6243570	51.10	140615



	Retention Time	Area	% Area	Height
1	10.515	5012748	96.30	122051
2	14.861	192435	3.70	3876

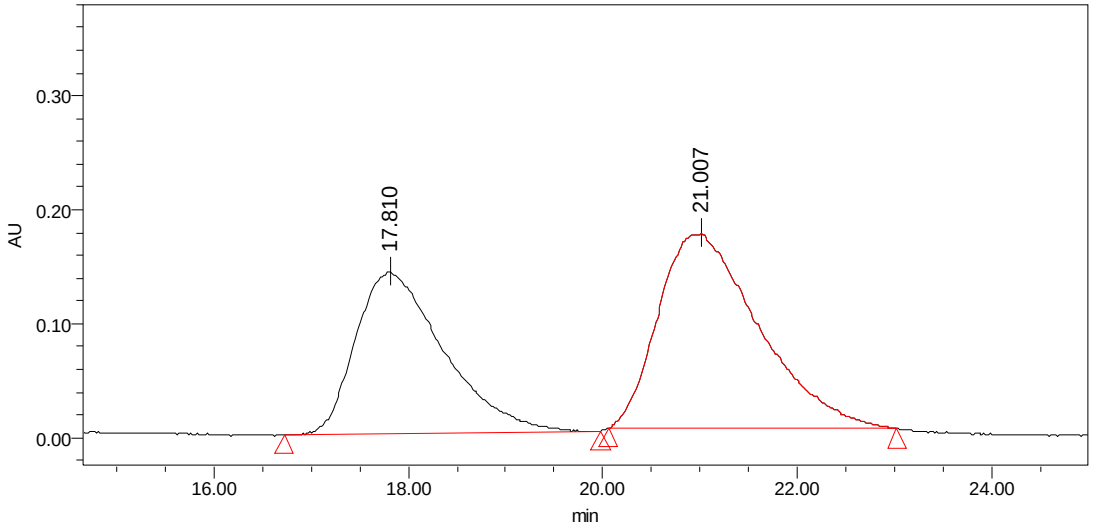


	Retention Time	Area	% Area	Height
1	9.950	266322	3.42	8333
2	13.732	7520174	96.58	164340

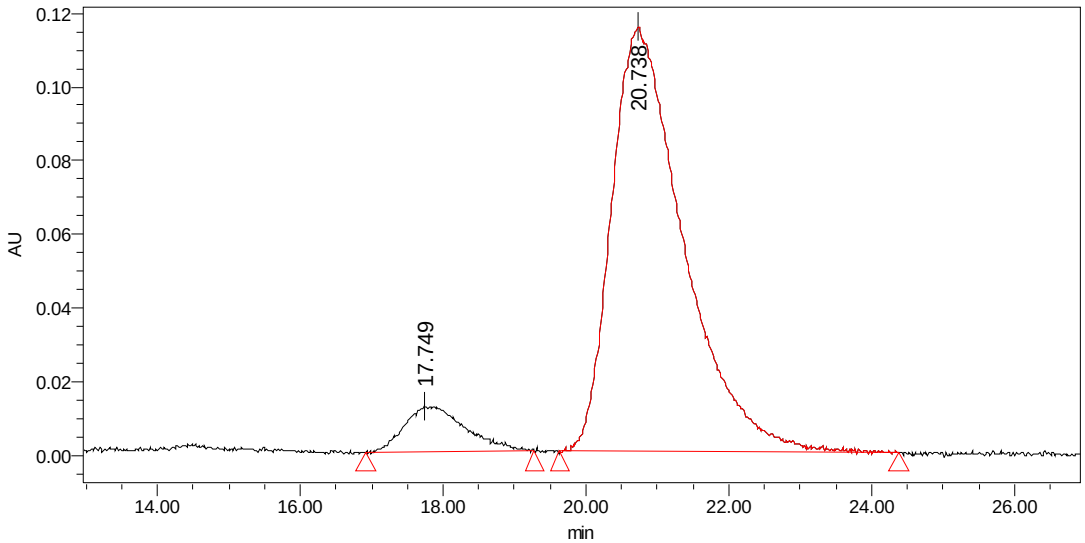


3e

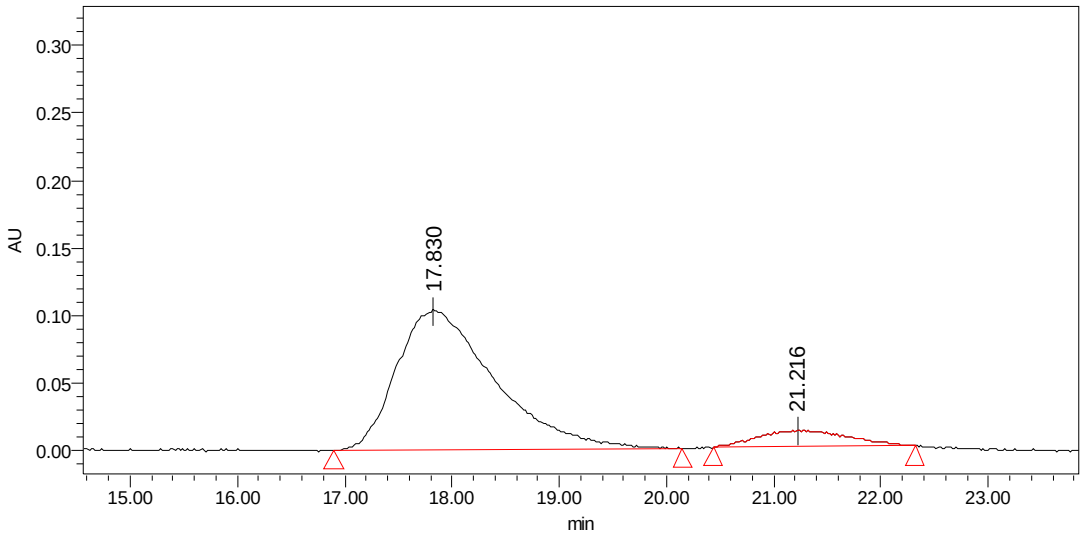
HPLC using an IC-H (*n*-Hexane/*i*-PrOH=40/60, flow rate 1.0 mL/min)



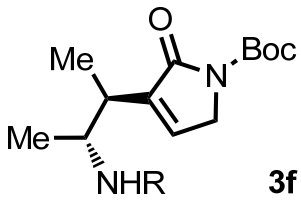
	Retention Time	Area	% Area	Height
1	17.810	8872447	42.00	142029
2	21.007	12250866	58.00	171047



	Retention Time	Area	% Area	Height
1	17.749	732527	8.33	12302
2	20.738	8058708	91.67	115171

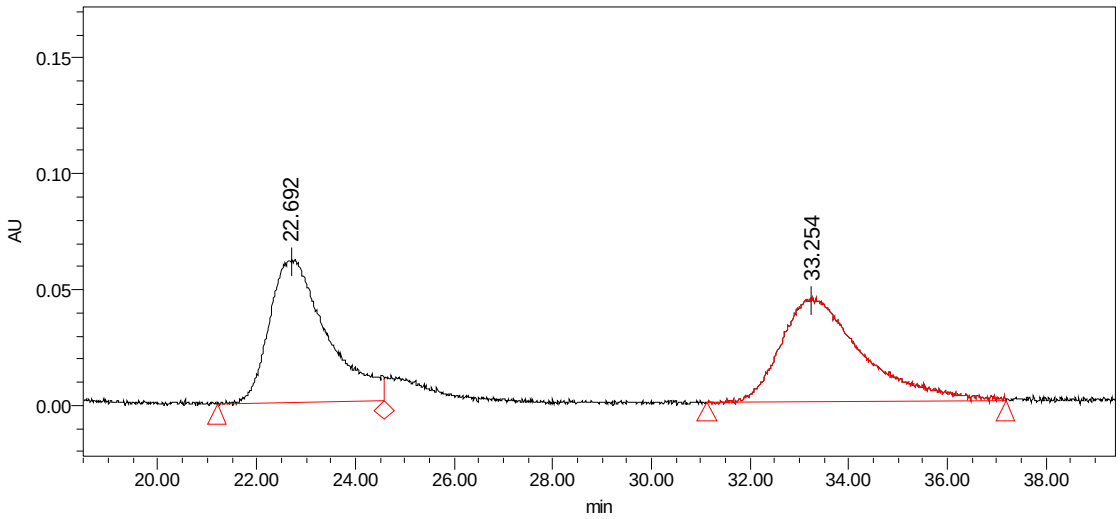


	Retention Time	Area	% Area	Height
1	17.830	6526835	90.50	102776
2	21.216	685535	9.50	11534

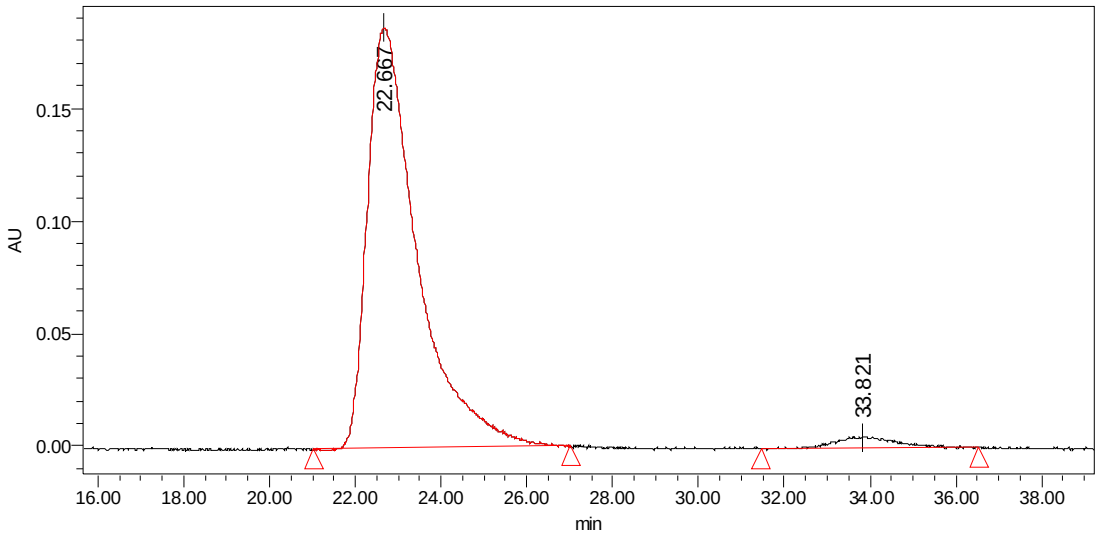


3f

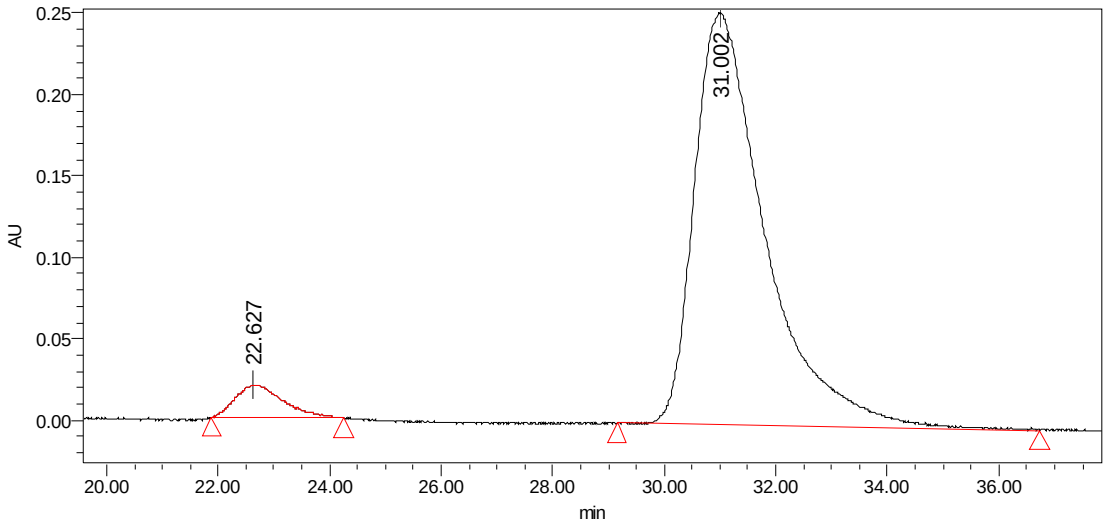
HPLC using an IC-H (*n*-Hexane/*i*-PrOH=40/60, flow rate 1.0 mL/min)



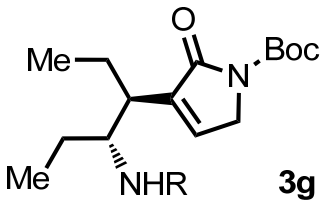
	Retention Time	Area	% Area	Height
1	22.692	5019582	49.63	60977
2	33.254	5094961	50.37	44042



	Retention Time	Area	% Area	Height
1	22.667	15118625	96.62	186844
2	33.821	529137	3.38	5022

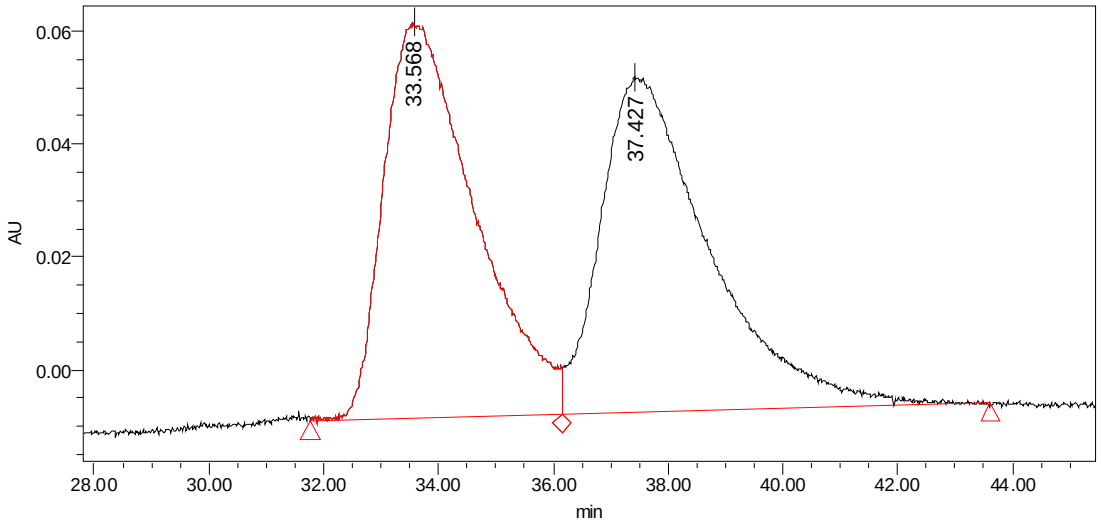


	Retention Time	Area	% Area	Height
1	22.627	1177527	5.01	19900
2	31.002	22317032	94.99	252826

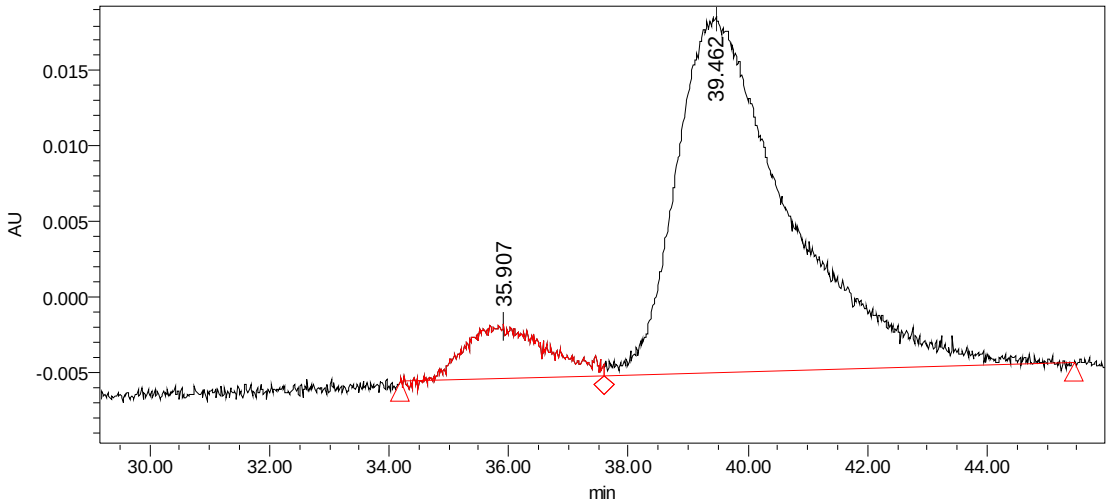


3g

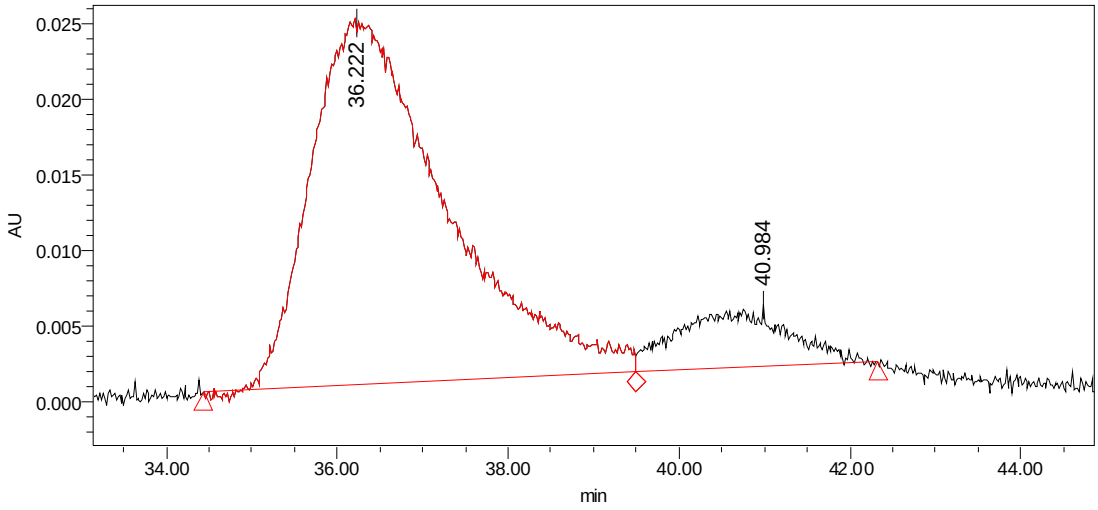
HPLC using an IC-H (*n*-Hexane/*i*-PrOH=80/20, flow rate 1.0 mL/min)



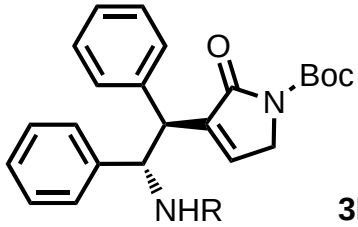
	Retention Time	Area	% Area	Height
1	33.568	7698823	49.73	69683
2	37.427	7782101	50.27	59241



	Retention Time	Area	% Area	Height
1	35.907	336024	9.86	3379
2	39.462	3071945	90.14	23519

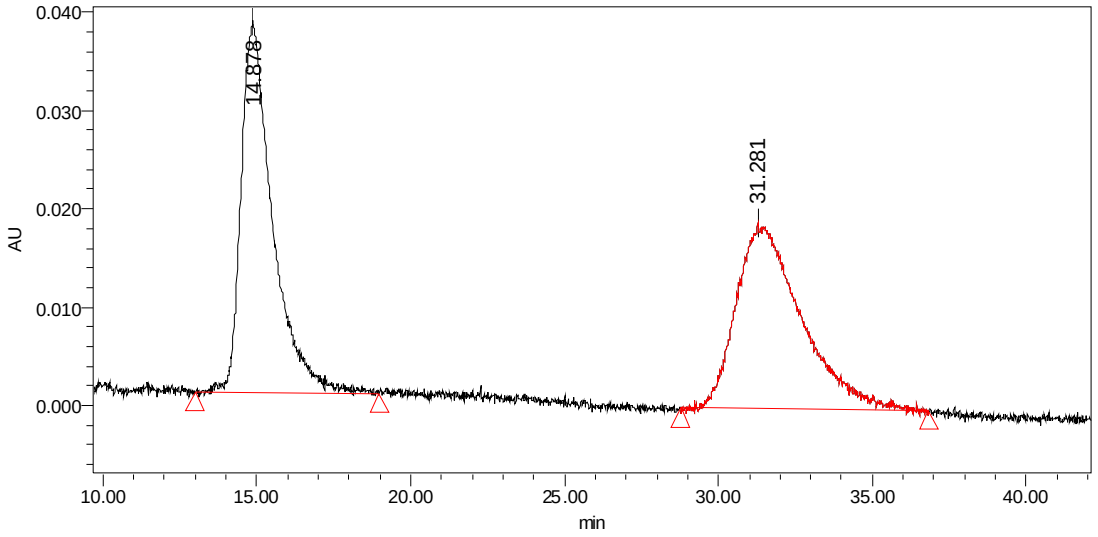


	Retention Time	Area	% Area	Height
1	36.222	2659249	88.43	23829
2	40.984	347807	11.57	3450

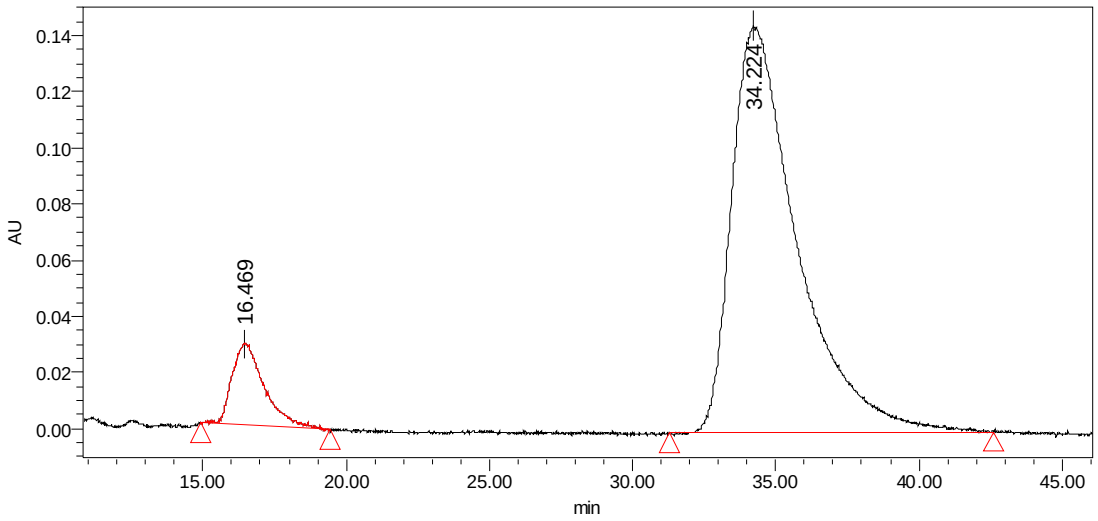


3h

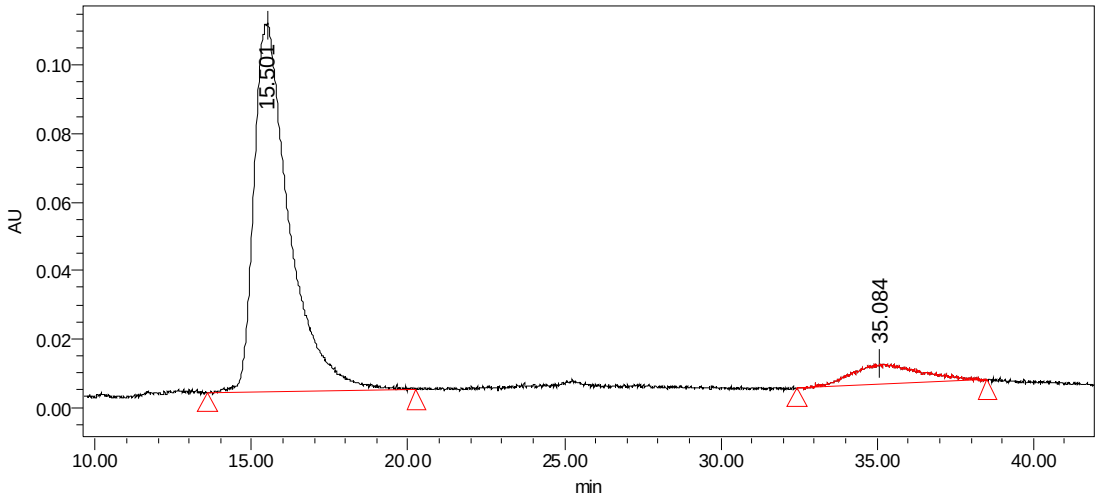
HPLC using an IC-H (*n*-Hexane/*i*-PrOH=40/60, flow rate 1.0 mL/min)



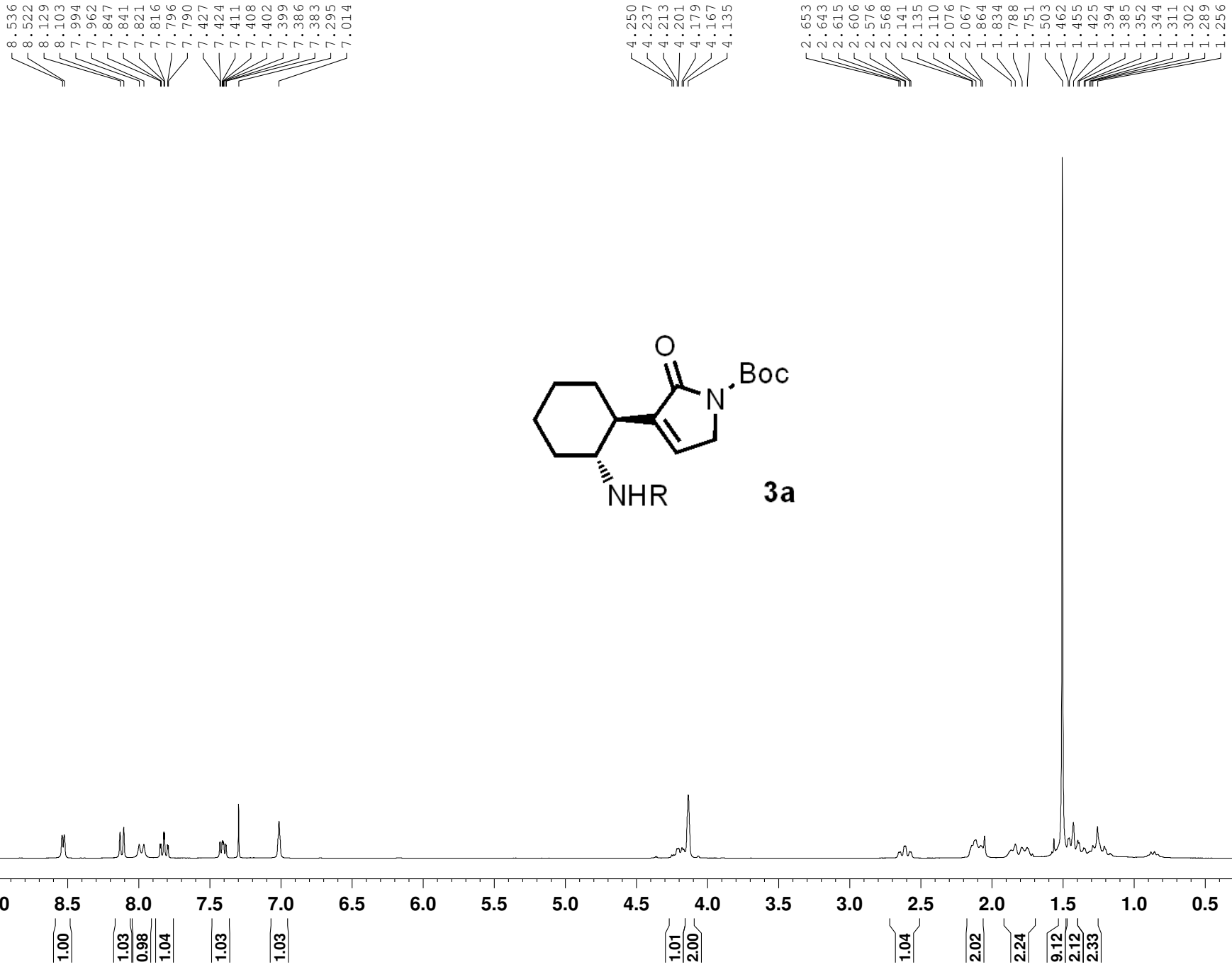
	Retention Time	Area	% Area	Height
1	14.878	2693376	49.55	37509
2	31.281	2741859	50.45	18704



	Retention Time	Area	% Area	Height
1	16.469	2261933	8.92	28899
2	34.224	23104640	91.08	144904



	Retention Time	Area	% Area	Height
1	15.501	8462843	90.54	107420
2	35.084	884576	9.46	5713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7.411
7.408
7.402
7.399
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7.383
7.295
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4.167
4.135
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2.615
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2.135
2.110
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2.067
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1.834
1.788
1.751
1.503
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1.425
1.394
1.385
1.352
1.344
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1.302
1.289
1.256
O
N
Boc
NHR
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8.0
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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
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2.02
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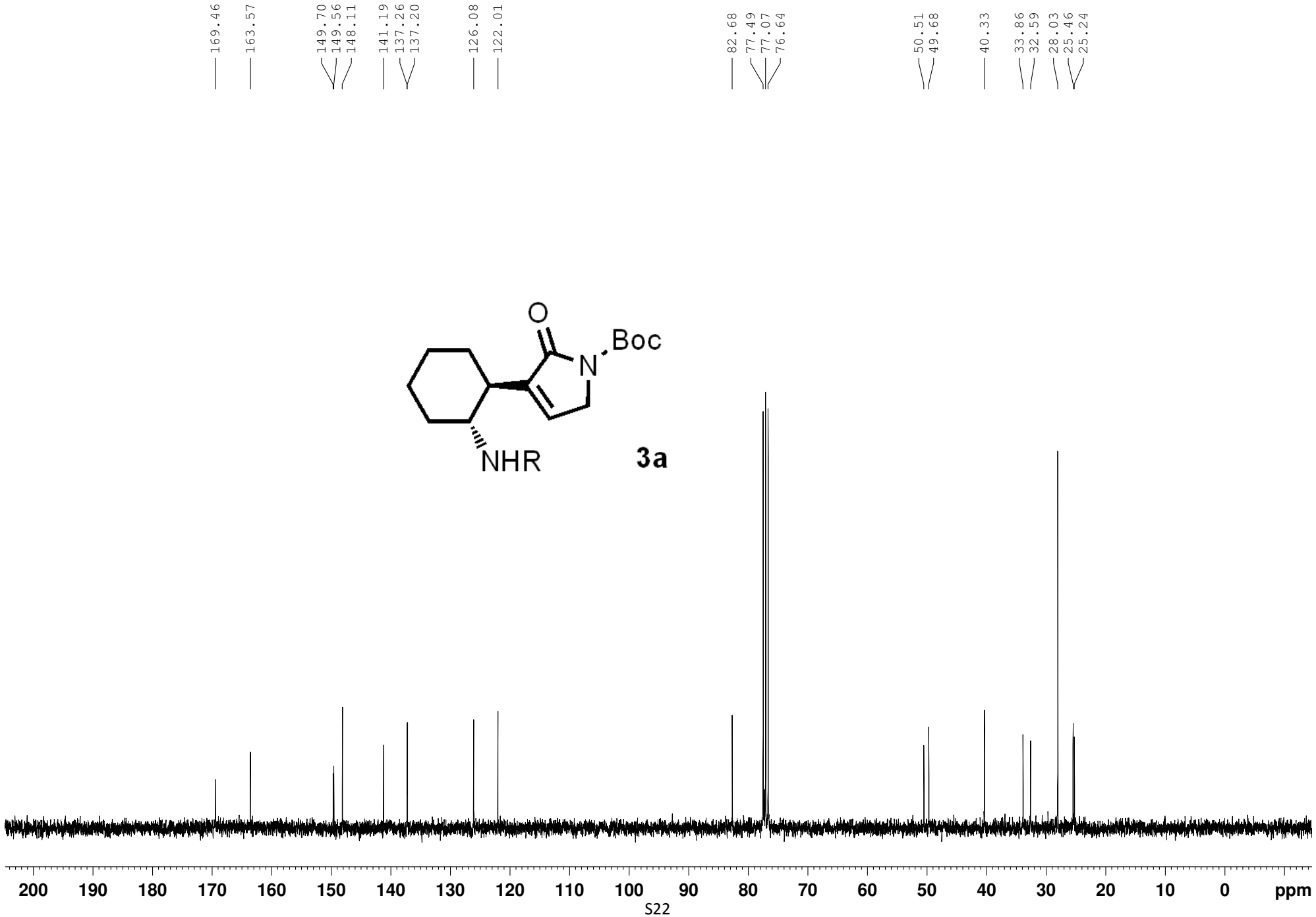
2.33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137.20
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77.07
76.64
50.51
49.68
40.33
33.86
32.59
28.03
25.46
25.24
O
N
Boc
NHR
3a
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140
130
120
110
100
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60
50
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20
10
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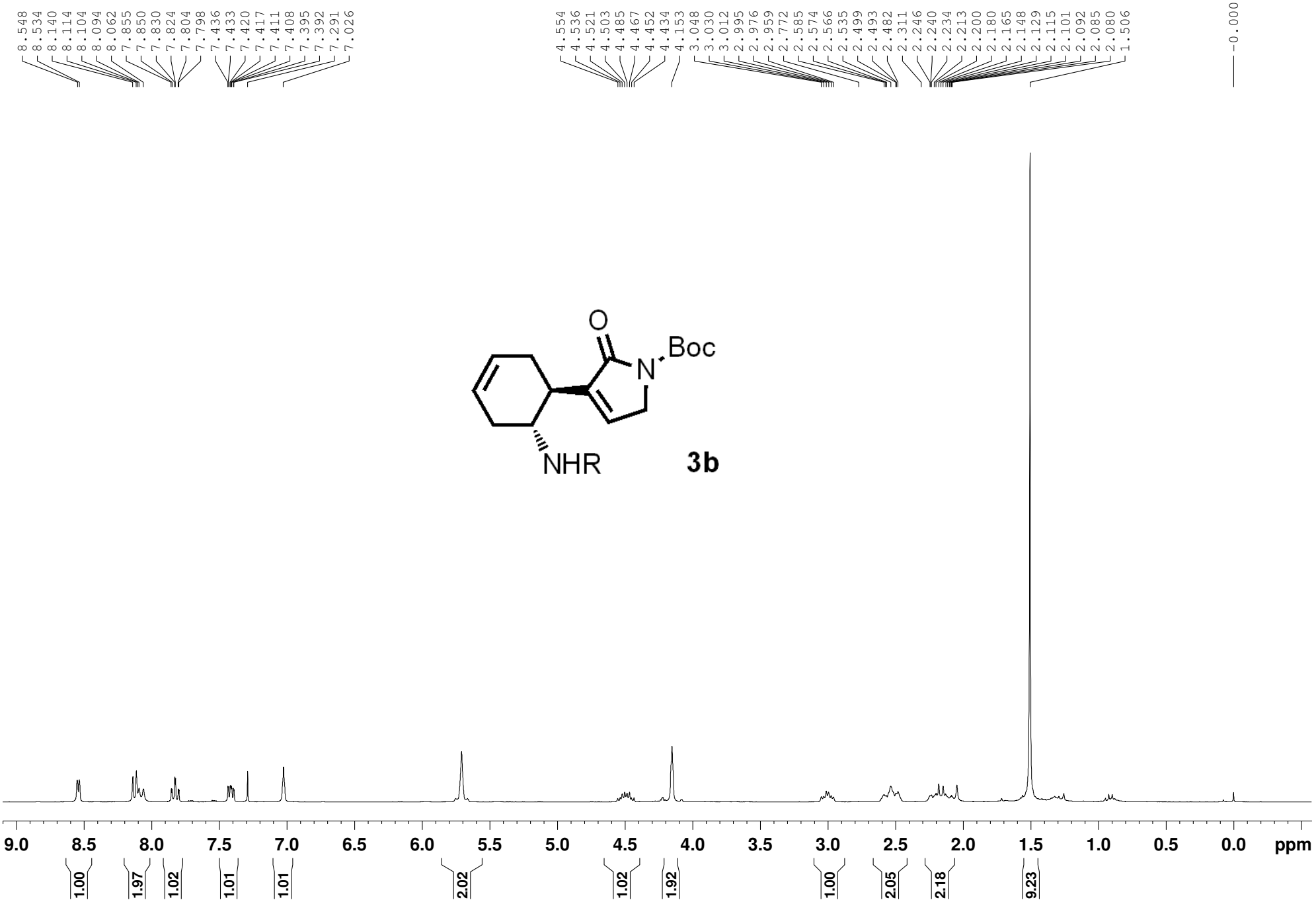
ppm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7.436
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7.420
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7.411
7.408
7.395
7.392
7.291
7.026
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4.536
4.521
4.503
4.485
4.467
4.452
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4.153
3.048
3.030
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2.585
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O
Boc
N
NHR
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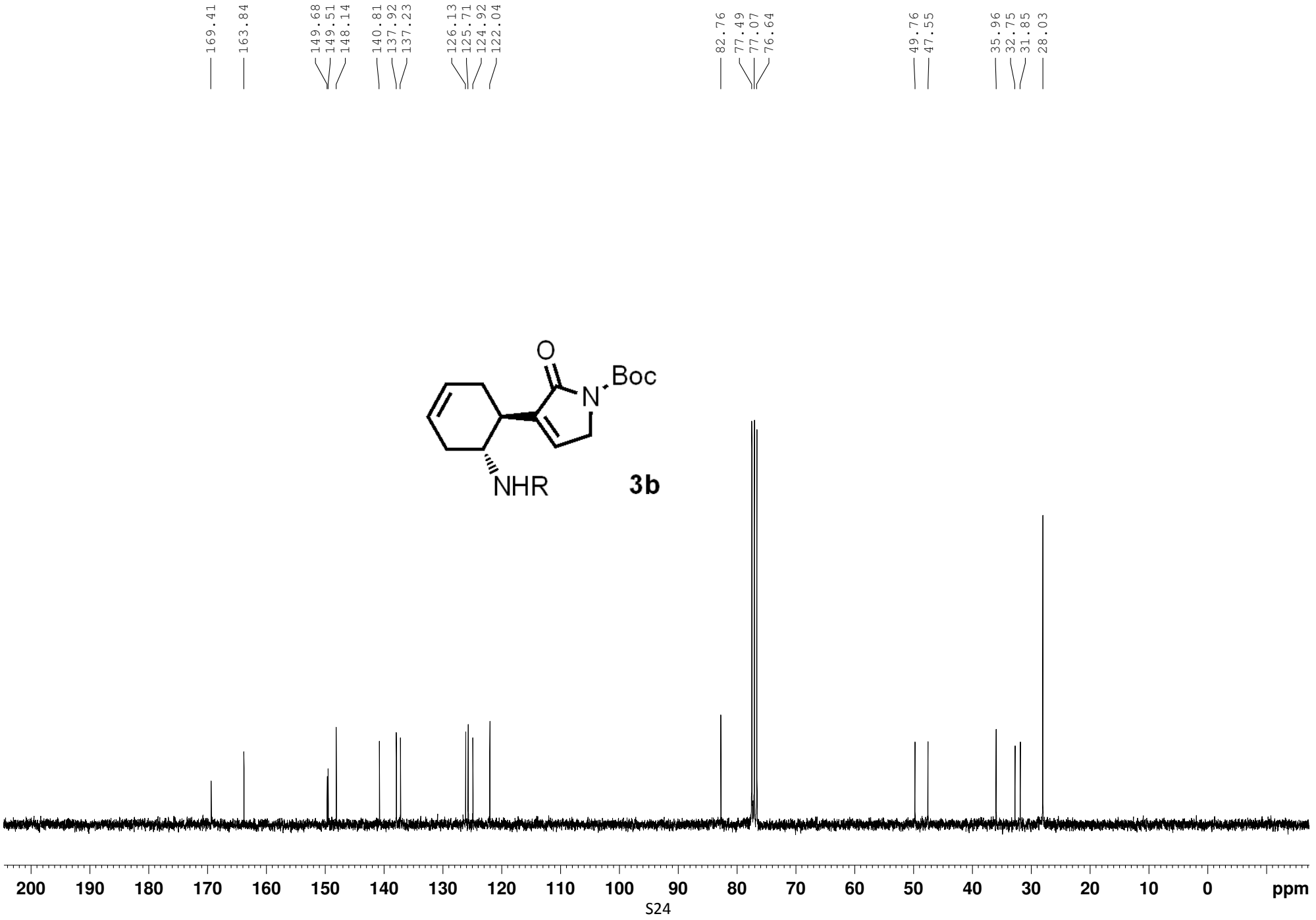
9.23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124.92
122.04
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77.49
77.07
76.64
49.76
47.55
35.96
32.75
31.85
28.03
O
N
Boc
NHR
3b
200
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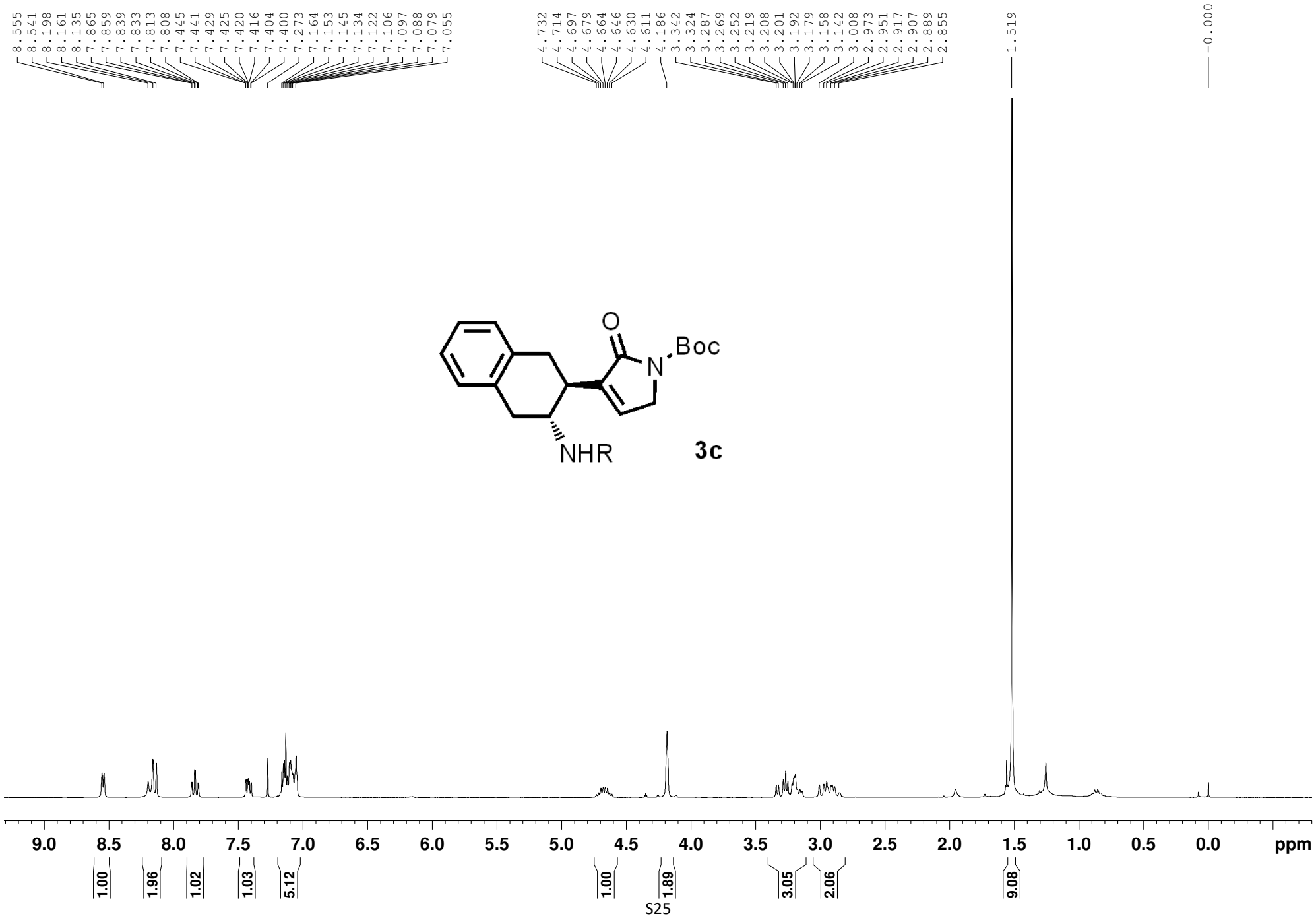
20
10
0
ppm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7.145
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4.664
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N
Boc
NHR
3c
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6.5
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5.0
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4.0
3.5
3.0
2.5
2.0
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0.0
ppm
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1.03
5.12
1.00
1.89
3.05
2.06
9.08


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140.47
138.19
137.29
134.42
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128.36
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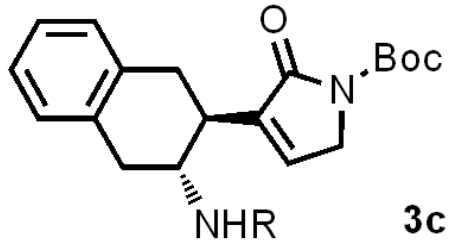
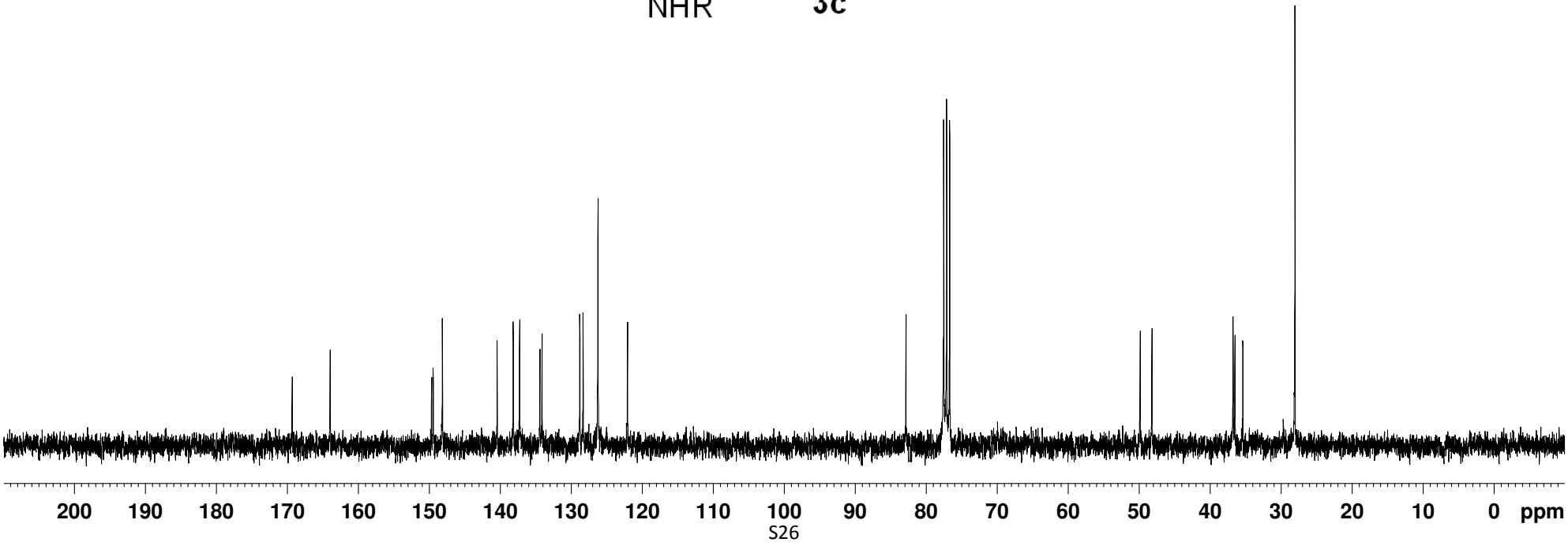

O
N
Boc
NHR

3c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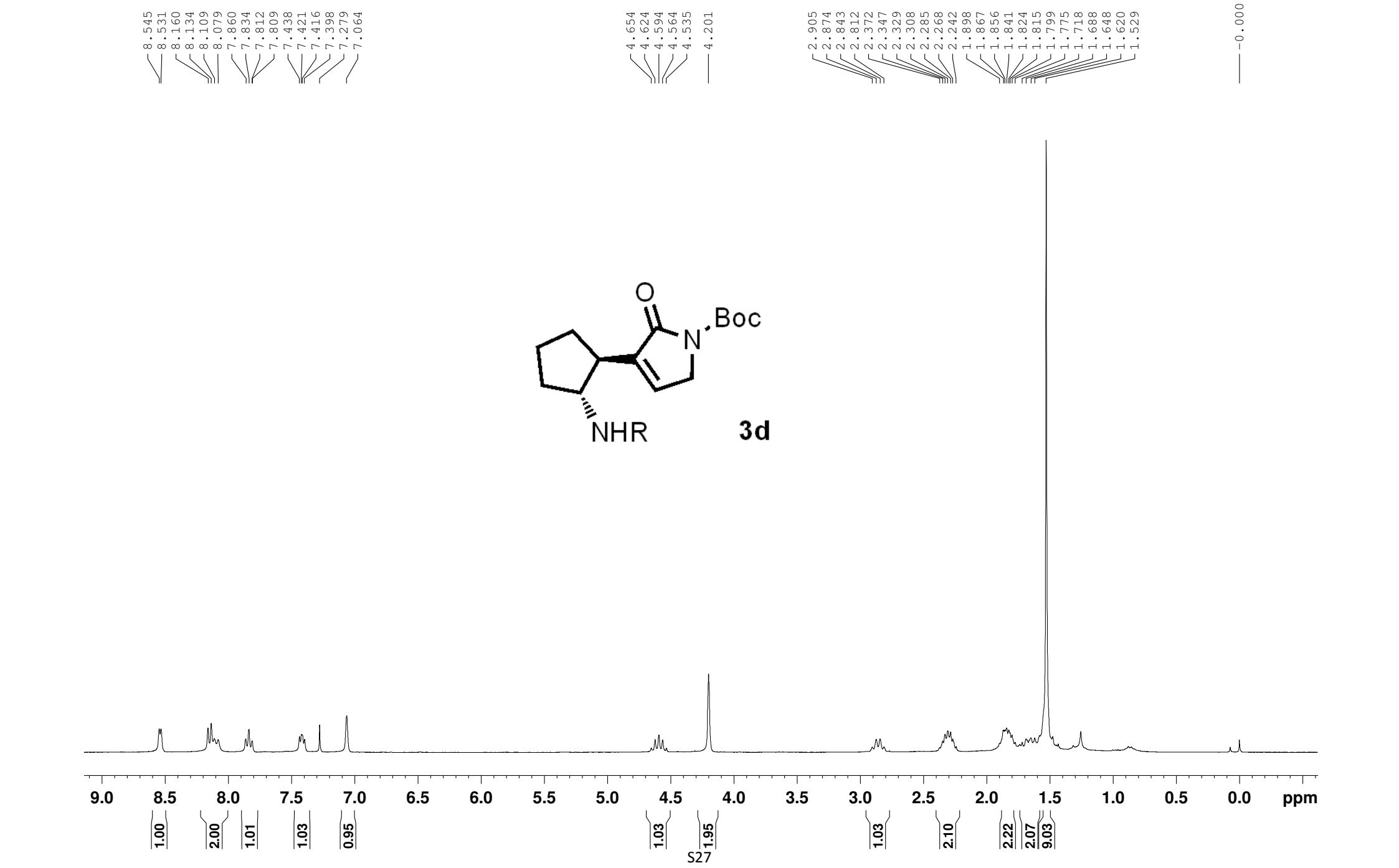
0
ppm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O
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Boc
NHR
3d
9.0
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8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
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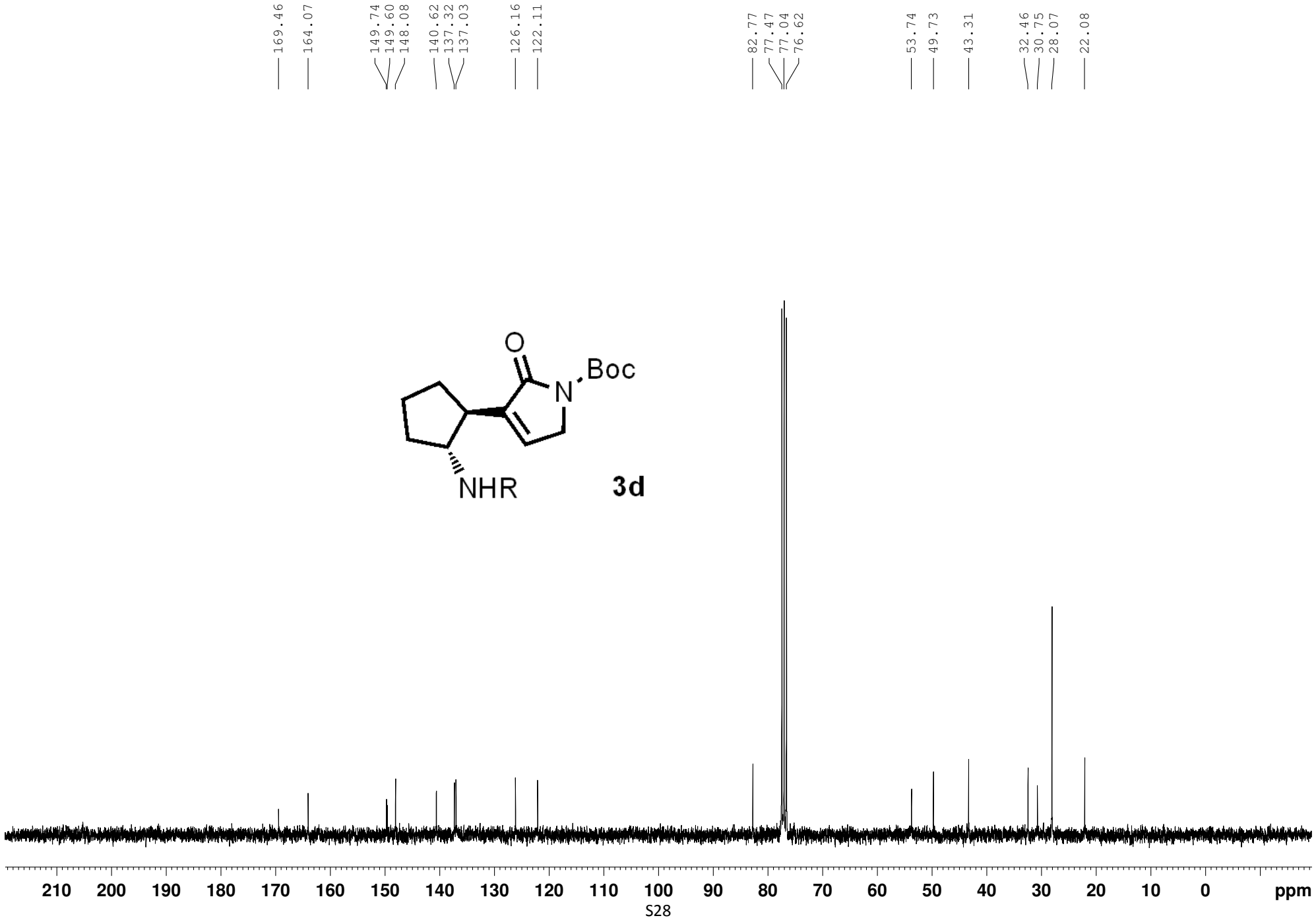
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32.46
30.75
28.07
22.08
O
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Boc
NHR
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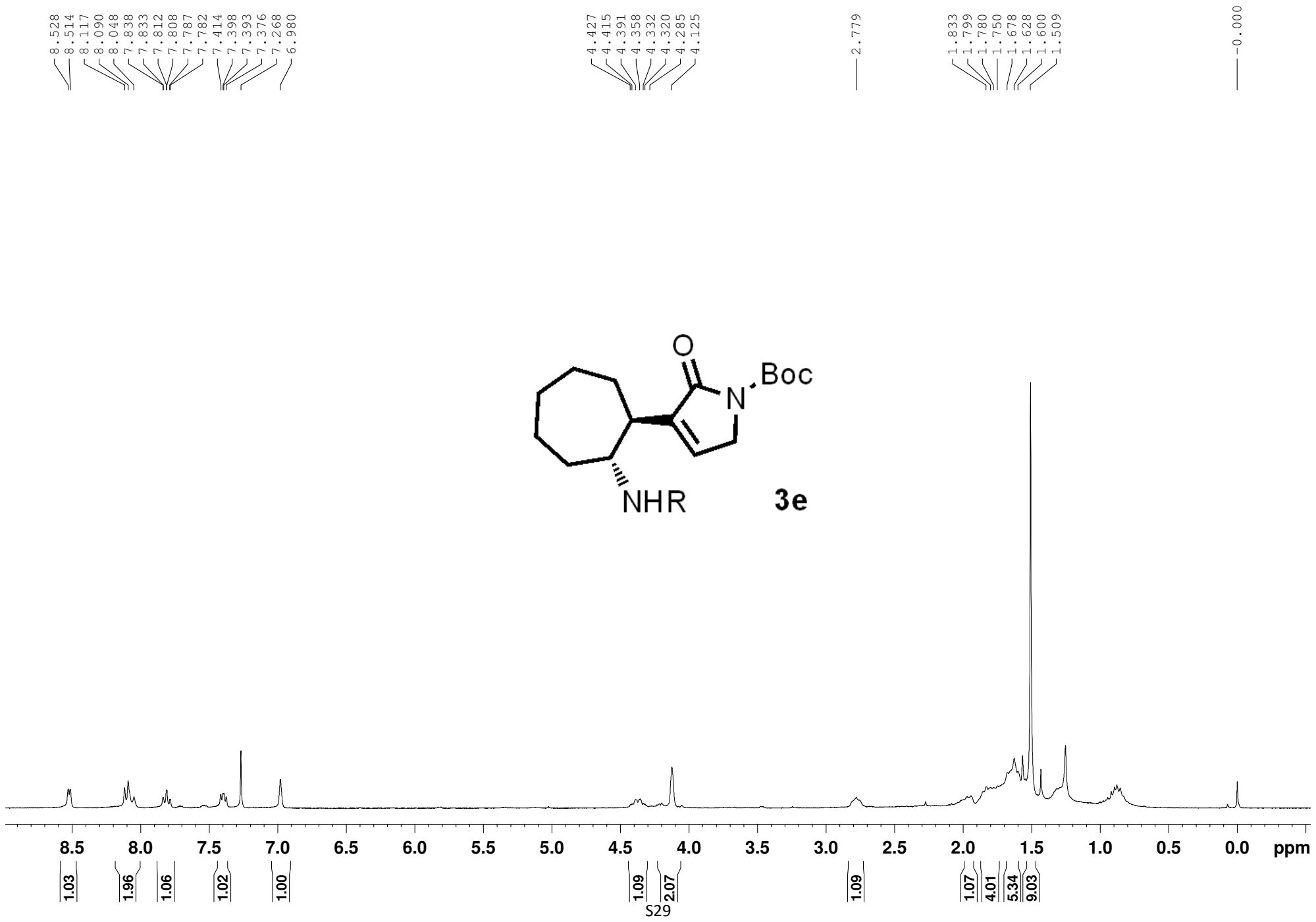
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7.268
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4.415
4.391
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1.628
1.600
1.509
0.000
O
N
Boc
NHR
3e
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7.5
7.0
6.5
6.0
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5.0
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4.0
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3.0
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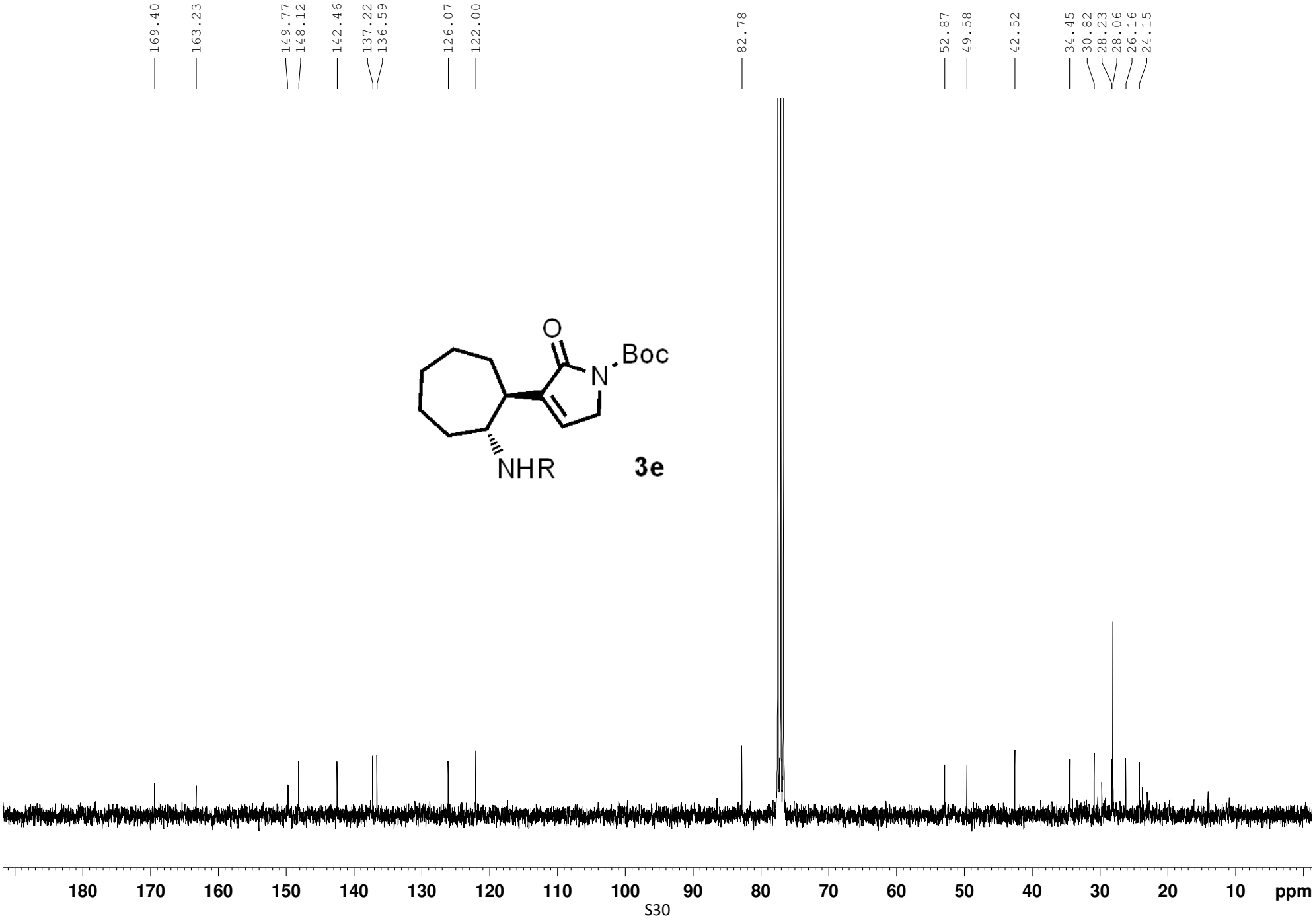
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N
Boc
NHR
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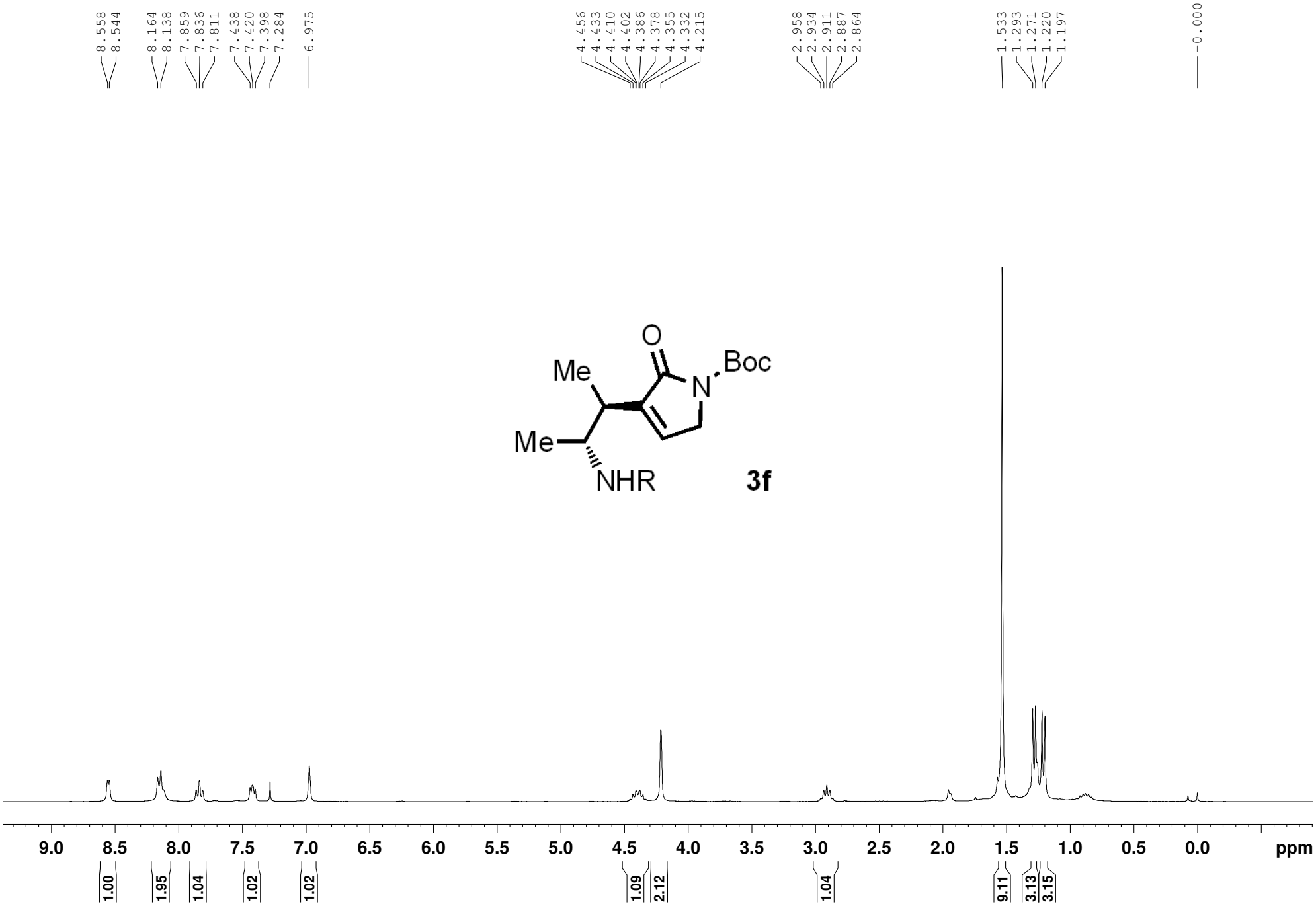
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Me
N
Boc
Me
NHR
3f
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7.0
6.5
6.0
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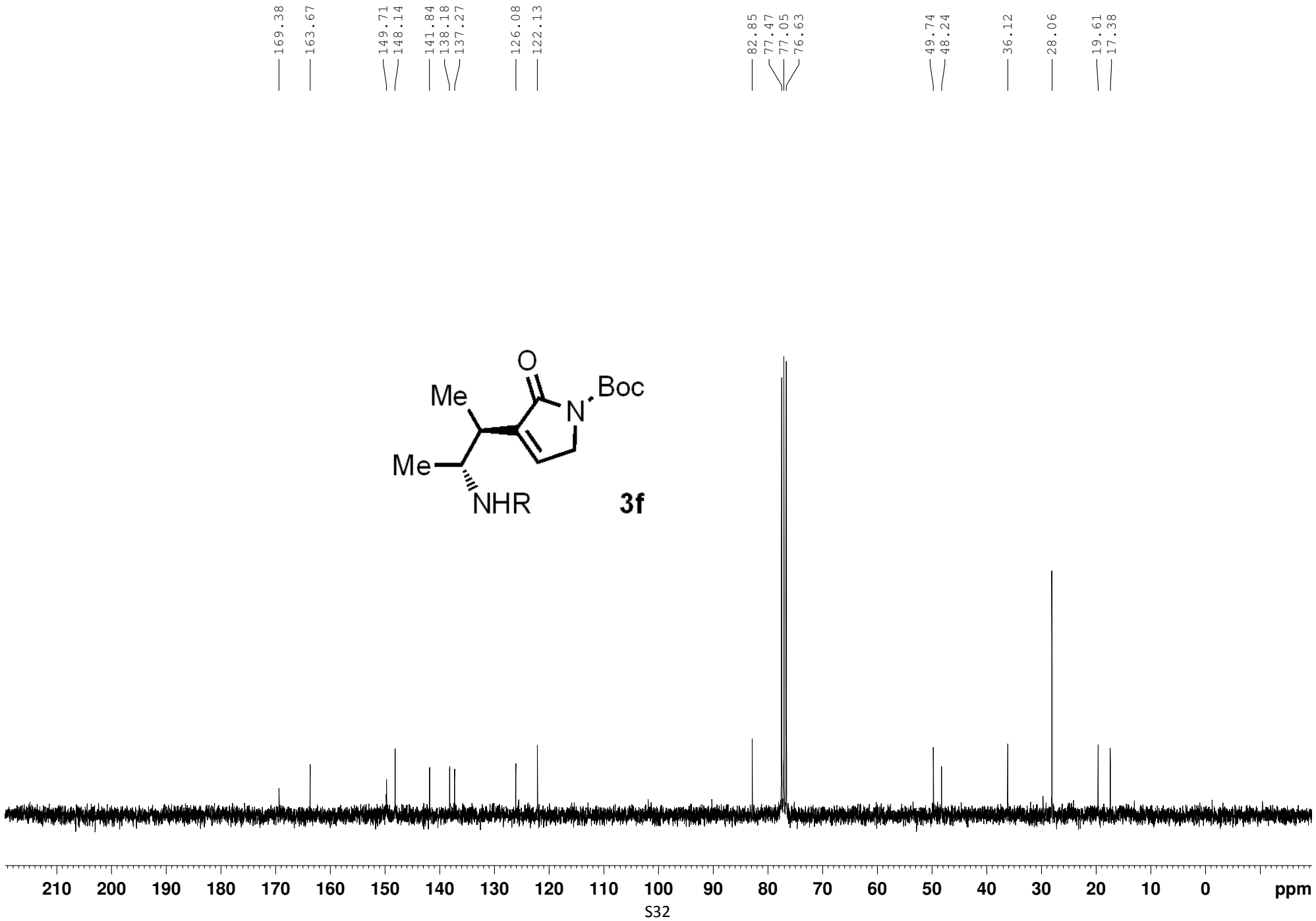
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48.24
36.12
28.06
19.61
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O
Me
N
Boc
Me
NHR
3f
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200
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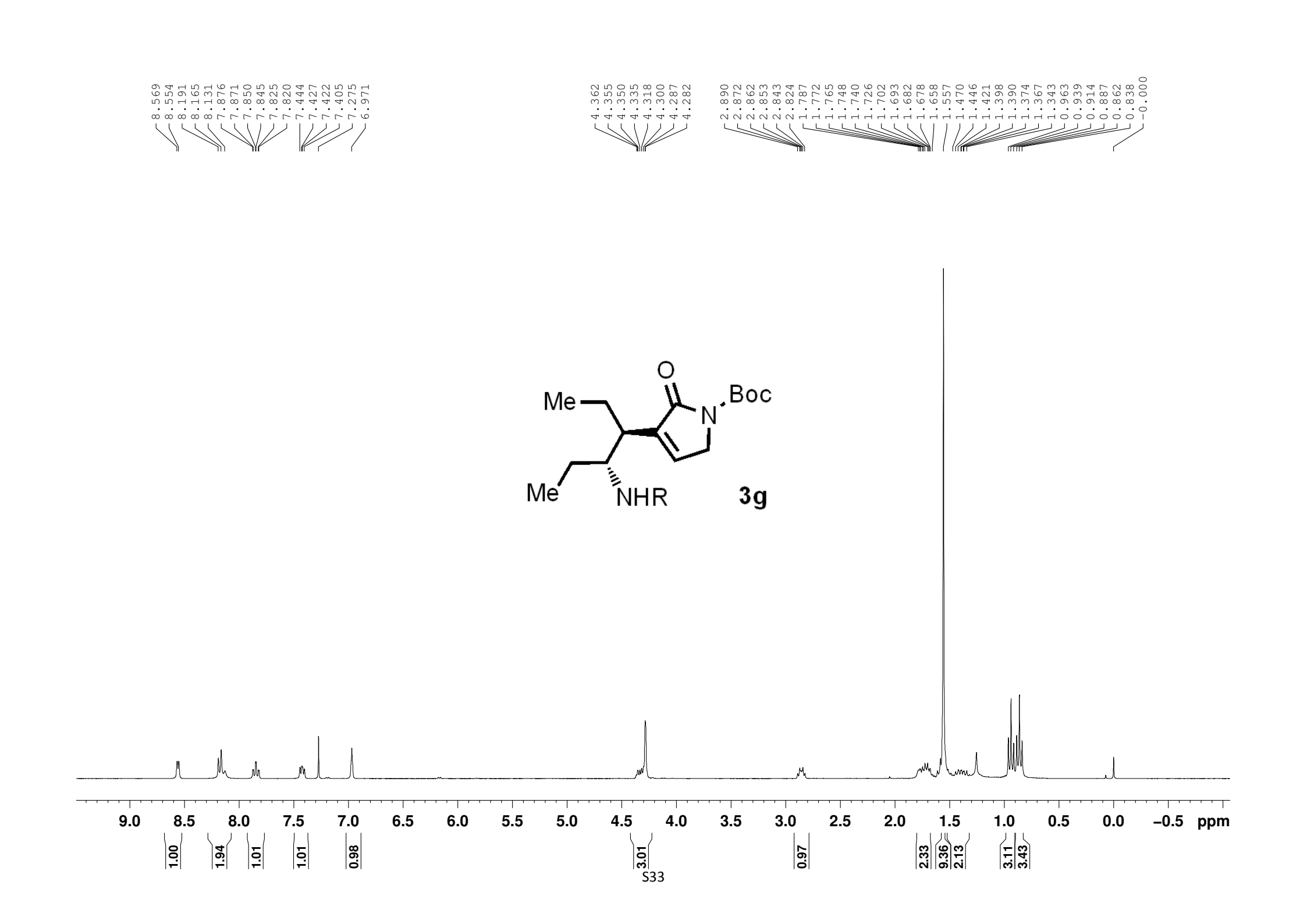
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7.422
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4.318
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4.287
4.282
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2.853
2.843
2.824
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1.772
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1.748
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1.726
1.702
1.693
1.682
1.678
1.658
1.557
1.470
1.446
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1.398
1.390
1.374
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1.343
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0.939
0.914
0.887
0.862
0.838
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Me
N
Boc
Me
NHR
3g
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8.0
7.5
7.0
6.5
6.0
5.5
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4.0
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3.0
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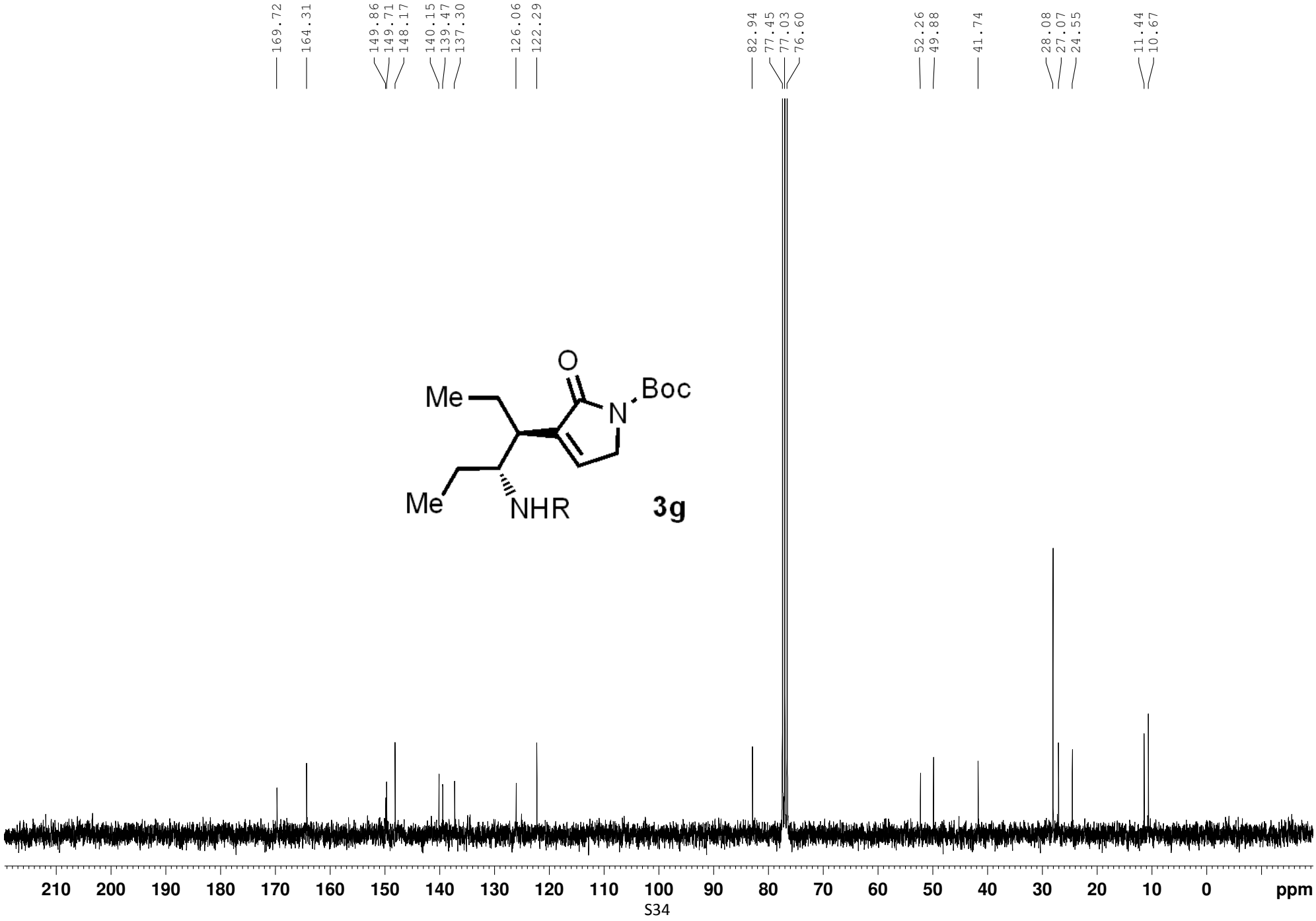
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77.03
76.60
52.26
49.88
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24.55
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O
Me
N
Boc
Me
NHR
3g
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200
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130
120
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100
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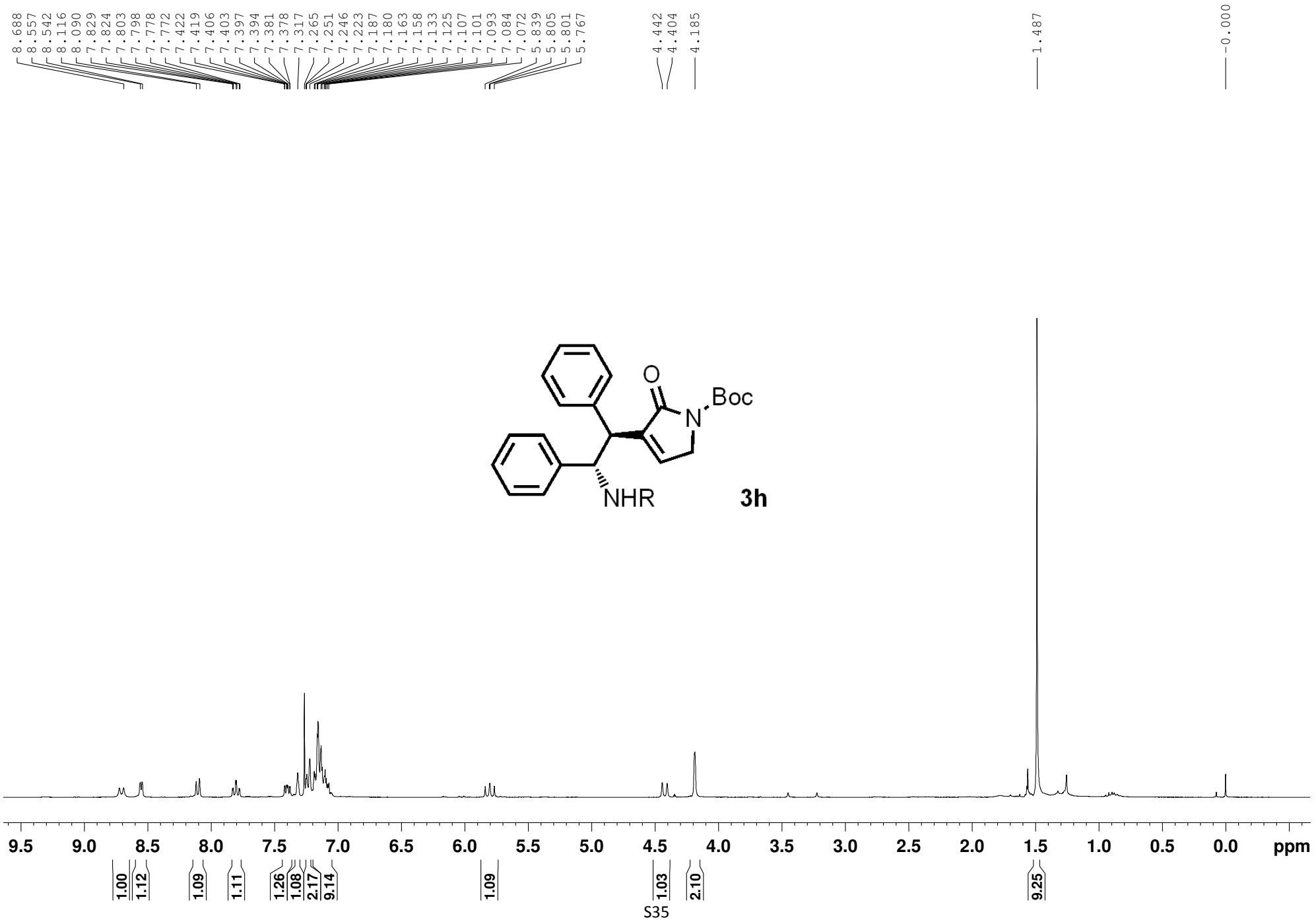
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7.403
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7.394
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7.378
7.317
7.265
7.251
7.246
7.223
7.187
7.180
7.163
7.158
7.133
7.125
7.107
7.101
7.093
7.084
7.072
5.839
5.805
5.801
5.767
4.442
4.404
4.185
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-0.000
O
Boc
N
NHR
3h
9.5
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8.0
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7.0
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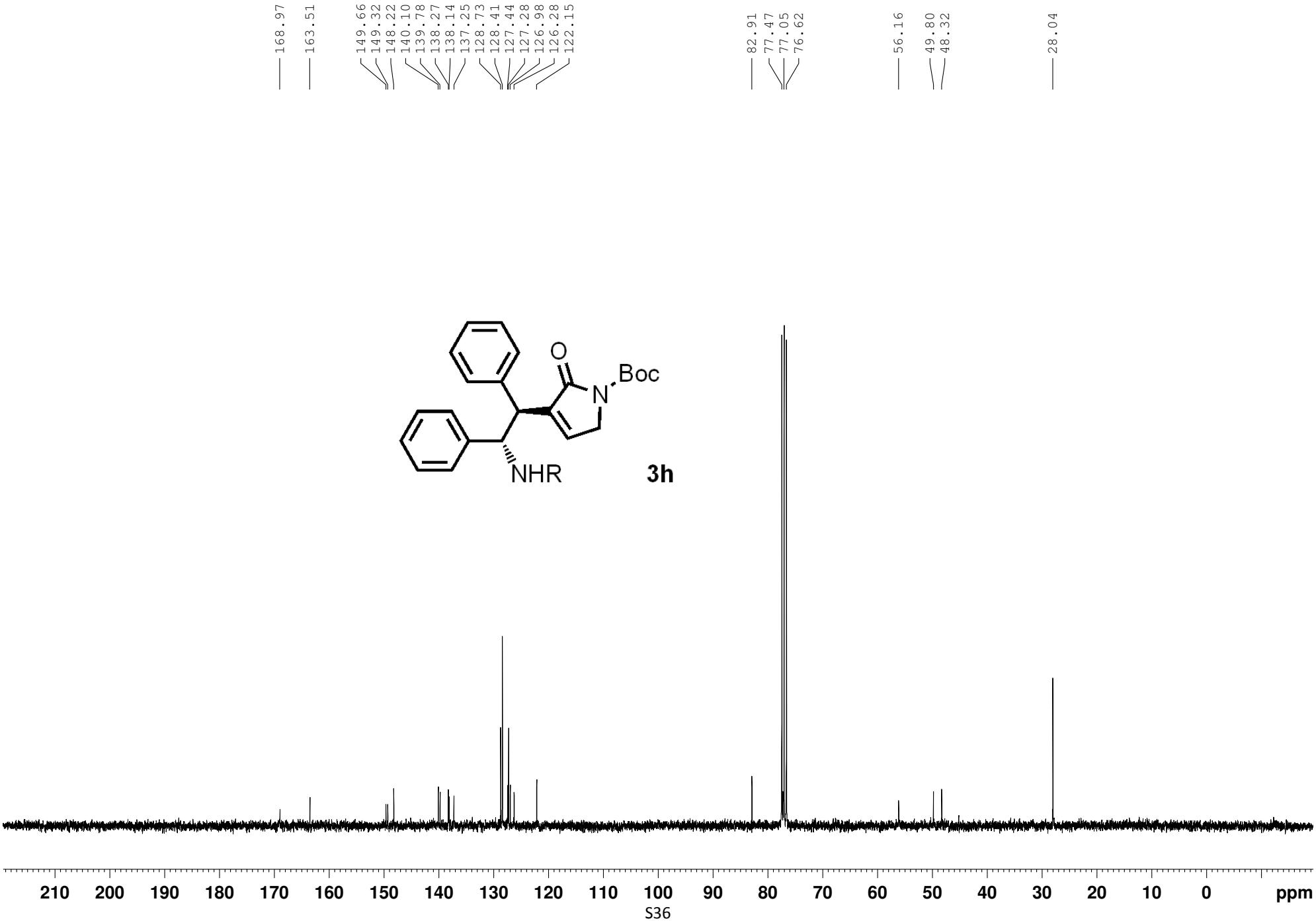
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77.47
77.05
76.62
56.16
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48.32
28.04
O
N
Boc
NHR
3h
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200
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160
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120
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100
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70
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10
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ppm