Supplementary Information

Rhodium-Catalysed Synthesis of Multi-Substituted Silylindenes from Aryl Alkynes and Hydrosilanes via C-H Bond Activation

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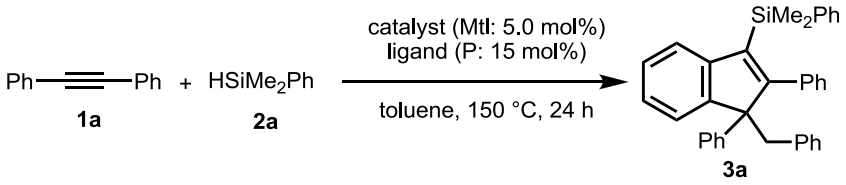
General. All reactions were carried out in a dry solvent under an argon atmosphere. Toluene was purchased from Wako Pure Chemical Industries and was dried and degassed before use. $[RhCl(cod)]_2$ was purchased from Tokyo Kasei Kogyo Co.. Diphenylacetylene (**1a**) and all organosilanes **2a-2e** and tributylgermane (**2f**) were purchased from Aldrich Co., Kanto Kagaku Reagent Division, Tokyo Kasei Kogyo Co., and Wako Pure Chemical Industries. Substituted diarylalkynes **1b-1j** were prepared according to the literature methods.[1]

NMR spectra were recorded on JEOL ECX500 (500 MHz for ^{1}H NMR and 125 MHz for ^{13}C NMR) and JEOL ECS400 (400 MHz for ^{1}H NMR, 100 MHz for ^{13}C NMR, 376 MHz for ^{19}F NMR, and 78 MHz for ^{29}Si NMR) spectrometers. Proton chemical shifts are reported relative to Me_4Si ($CDCl_3$) at δ 0.00 ppm or residual solvent peak ($CDCl_3$ at δ 7.26 ppm). Carbon chemical shifts are reported relative to $CDCl_3$ at δ 77.00 ppm. Fluorine chemical shifts are reported relative to TFA ($CDCl_3$) at δ -76.55 ppm as an external standard. Silicon chemical shifts are reported relative to Me_4Si ($CDCl_3$) at δ 0.00 ppm as an external standard. Infrared (IR) spectra were recorded on a JASCO FT/IR 410 Fourier transform infrared spectrophotometer. DART-mass spectra were measured on a JEOL JMS-T100LC AccuTOF spectrometer for HRMS. FAB-mass spectra were measured on a JEOL JMS-700T spectrometer for HRMS. Indene **5b** and **5c** were purified by recycling preparative HPLC (LC-9210NEXT; column, JAIGEL-1H and JAIGEL-2H; solvent, $CHCl_3$).

Table 1. Investigation of several transition metal complexes and ligands[a]

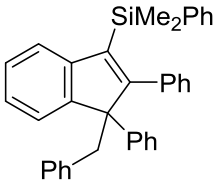


Entry	Catalyst	Ligand	Yield (%)[b]
1	$MnBr(CO)_5$	none	0
2	$Mn_2(CO)_{10}$	none	0
3	$ReBr(CO)_5$	none	0
4	$[ReBr(CO)_3(thf)]_2$	none	0
5	$Re_2(CO)_{10}$	none	0
6	$Fe(CO)_5$	none	0
7	$Fe_2(CO)_9$	none	0
8	$Fe_3(CO)_{12}$	none	0
9	$[CpFe(CO)_2]_2$	none	0
10	$Ru_3(CO)_{12}$	none	0
11	$[RuCl_2(p\text{-cymene})]_2$	none	0
12	$Co_2(CO)_8$	none	0
13	$CoCl(PPh_3)_3$	none	0
14	$Rh_4(CO)_{12}$	none	0
15	$RhCl(PPh_3)_3$	none	46
16	$[RhCl(cod)]_2$	PPh_3	50 (47)[c]
17	$[RhCl(cod)]_2$	PPh_3	40[d]
18	$[RhCl(cod)]_2$	PPh_3	39[e]
19	$[RhCl(cod)]_2$	PPh_3	44[f]
20	$[RhCl(cod)]_2$	PPh_3	42[g]
21	$[RhCl(cod)]_2$	PCy_3	21
22	$[RhCl(cod)]_2$	PMe_3	11
23	$[RhCl(cod)]_2$	$P(4\text{-}OMeC_6H_4)_3$	30
24	$[RhCl(cod)]_2$	$P(4\text{-}CF_3C_6H_4)_3$	49
25	$[RhCl(cod)]_2$	DPPE	0
26	$[RhCl(cod)]_2$	DPPF	0
27	$[RhCl(cod)]_2$	(*R*)-BINAP	0
28	$[RhCl(coe)_2]_2$	PPh_3	47
29	$[RhCl(ethylene)_2]_2$	PPh_3	48
30	$[RhCl(nbd)]_2$	PPh_3	44
31	$[Rh(OH)(cod)]_2$	PPh_3	47
32	$RhH(PPh_3)_4$	PPh_3	45
33	$[Rh(cod)_2]OTf$	PPh_3	37
34	$[Cp^*RhCl_2]_2$	none	0
35	$Ir_4(CO)_{12}$	none	0
36	$[IrCl(cod)]_2$	PPh_3	0
37	$[Ir(OMe)(cod)]_2$	DTBPY	0

[a] **1a** (2.0 equiv). [b] ^1H NMR yield using 1,1,2,2-tetrachloroethane as an internal standard. [c] Isolated yield. [d] With MS 3A (40 mg/mmol). [e] With MS 4A (40 mg/mmol). [f] With MS 5A (40 mg/mmol). [g] With MS 13X (40 mg/mmol).

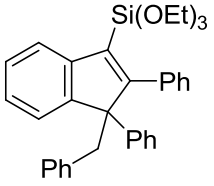
Typical procedure for Rhodium-Catalyzed Synthesis of Multi-Substituted Silylindenes by C-H Bond Activation. A mixture of dimethylphenylsilane (**1a**, 34.1 mg, 0.250 mmol), diphenylacetylene (**2a**, 89.1 mg, 0.500 mmol), $[RhCl(cod)]_2$ (3.1 mg, 6.3 μmol), triphenylphosphine (9.9 mg, 38 μmol), and toluene (1.0 mL) was stirred at 150 °C for 24 h in a sealed tube. Then the solvent was removed in vacuo. The product was isolated by column chromatography on silica gel (hexane) to give (1-benzyl-1,2-diphenyl-1*H*-inden-3-yl)trimethylsilane (**3a**, 57.6 mg, 47% yield).

(1-Benzyl-1,2-diphenyl-1*H*-inden-3-yl)dimethyl(phenyl)silane (3a).



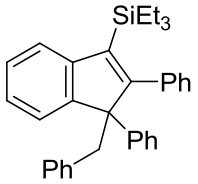
White solid (57.6 mg, 47%); mp 133-135 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ -0.12 (s, 3H), 0.28 (s, 3H), 3.39 (d, *J* = 12.9 Hz, 1H), 3.80 (d, *J* = 12.9 Hz, 1H), 6.54 (d, *J* = 7.4 Hz, 2H), 6.63 (d, *J* = 6.9 Hz, 2H), 6.98 (dd, *J* = 7.7, 7.7 Hz, 2H), 7.06 (dd, *J* = 7.7, 7.7 Hz, 2H), 7.08-7.13 (m, 4H), 7.14-7.34 (m, 12H); ^{13}C NMR (125 MHz, $CDCl_3$) δ -0.86, -0.29, 40.0, 65.7, 123.2, 124.0, 124.9, 126.1, 126.6, 127.0, 127.1, 127.2 (2C), 127.6, 127.7, 128.4, 128.7, 130.05, 130.08, 133.9, 136.8, 137.4, 137.9, 139.2, 141.9, 148.2, 152.5, 166.4; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -12.3; IR (neat, ν / cm^{-1}) 3063, 2959, 1456, 1261, 1109, 822, 699; HRMS (DART+) Calcd for $C_{36}H_{33}Si$ $[M+H]^+$ 493.2352, Found 493.2364.

(1-Benzyl-1,2-diphenyl-1*H*-inden-3-yl)triethoxysilane (3b).



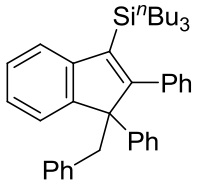
Yellow oil (62.0 mg, 48%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.98 (t, *J* = 7.2 Hz, 9H), 3.35 (d, *J* = 13.0 Hz, 1H), 3.45 (q, *J* = 7.2 Hz, 6H), 3.81 (d, *J* = 13.0 Hz, 1H), 6.35 (d, *J* = 6.7 Hz, 2H), 6.78-6.91 (m, 4H), 6.91-7.01 (m, 1H), 7.09-7.20 (m, 4H), 7.20-7.30 (m, 7H), 7.75 (d, *J* = 6.7 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 17.9, 40.0, 58.0, 65.4, 123.5, 123.6, 125.3, 126.1, 126.7, 126.8, 126.88, 126.94, 127.0, 127.9, 128.6, 129.6, 129.9, 132.7, 136.3, 136.7, 142.2, 147.3, 152.9, 167.7; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -58.1; IR (neat, ν / cm^{-1}) 3062, 2969, 2920, 2890, 1491, 1443, 1163, 1065, 963, 813, 795, 758, 700; HRMS (DART+) Calcd for $C_{34}H_{37}O_3Si$ $[M+H]^+$ 521.2512, Found 521.2524.

(1-Benzyl-1,2-diphenyl-1*H*-inden-3-yl)triethylsilane (3c).



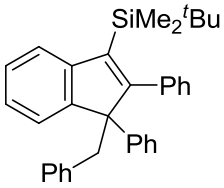
Yellow oil (47.8 mg, 40%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.35-0.56 (m, 6H), 0.69 (t, *J* = 8.1 Hz, 9H), 3.30 (d, *J* = 13.5 Hz, 1H), 3.75 (d, *J* = 13.5 Hz, 1H), 6.57 (dd, *J* = 6.7, 7.2 Hz, 4H), 6.94 (t, *J* = 7.2 Hz, 2H), 6.99-7.05 (m, 2H), 7.07-7.17 (m, 5H), 7.19-7.31 (m, 5H), 7.47 (d, *J* = 7.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 3.95, 7.42, 39.7, 65.7, 122.5, 124.2, 124.8, 126.1, 126.5, 126.7, 126.9, 127.2, 127.3, 127.5, 128.2, 129.9, 130.0, 137.1, 137.4, 137.8, 142.1, 149.0, 152.3, 166.5; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -0.06; IR (neat, ν / cm^{-1}) 2952, 1456, 1264, 1002, 699; HRMS (DART+) Calcd for $C_{34}H_{37}Si$ $[M+H]^+$ 473.2665, Found 473.2671.

(1-Benzyl-1,2-diphenyl-1*H*-inden-3-yl)tributylsilane (3d).



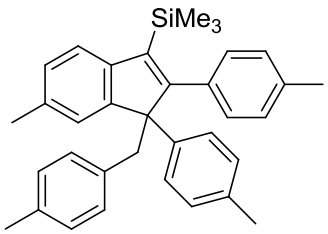
Yellow oil (63.6 mg, 46%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.35-0.53 (m, 6H), 0.74 (t, *J* = 7.2 Hz, 9H), 0.89-1.17 (m, 12H), 3.30 (d, *J* = 14.2 Hz, 1H), 3.75 (d, *J* = 14.2 Hz, 1H), 6.55 (d, *J* = 7.6 Hz, 4H), 6.94 (dd, *J* = 7.6, 7.6 Hz, 2H), 6.99-7.15 (m, 7H), 7.16-7.28 (m, 5H), 7.46 (d, *J* = 7.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 12.8, 13.6, 25.9, 26.5, 39.6, 65.6, 122.6, 124.1, 124.8, 126.1, 126.5, 126.7, 126.8, 127.1, 127.3, 127.4, 128.2, 129.9, 130.0, 137.1, 137.9, 138.1, 142.2, 149.1, 152.4, 165.9; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -4.40; IR (neat, ν / cm^{-1}) 2955, 2923, 1456, 757, 699; HRMS (DART+) Calcd for $C_{40}H_{49}Si$ $[M+H]^+$ 557.3604, Found 557.3593.

(1-Benzyl-1,2-diphenyl-1*H*-inden-3-yl)(*tert*-butyl)dimethylsilane (3e).



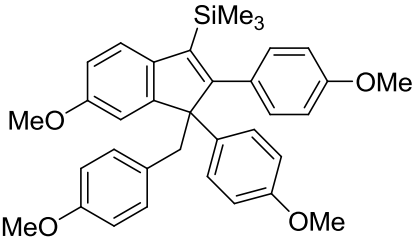
Yellow oil (39.1 mg, 33%); ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.43 (s, 3H), 0.00 (s, 3H), 0.81 (s, 9H), 3.31 (d, *J* = 14.2 Hz, 1H), 3.75 (d, *J* = 14.2 Hz, 1H), 6.60 (d, *J* = 7.2 Hz, 2H), 6.71 (d, *J* = 7.2 Hz, 2H), 6.93-7.04 (m, 5H), 7.05-7.15 (m, 4H), 7.15-7.25 (m, 5H), 7.51 (d, *J* = 7.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ -4.02, -2.99, 18.0, 27.8, 39.7, 68.2, 124.0, 124.5, 124.7, 126.2, 126.4, 126.5, 126.7, 127.2, 127.3, 127.6, 128.0, 129.9, 130.3, 137.4, 137.5, 137.7, 141.7, 149.1, 151.7, 166.8; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -0.38; IR (neat, ν / cm^{-1}) 2954, 2927, 2855, 1462, 824, 701; HRMS (DART+) Calcd for $C_{34}H_{37}Si$ $[M+H]^+$ 473.2665, Found 473.2677.

Trimethyl(6-methyl-1-(4-methylbenzyl)-1,2-di-*p*-tolyl-1*H*-inden-3-yl)silane (3f).



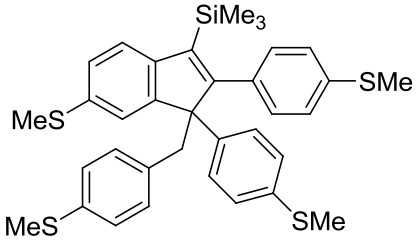
Yellow oil (36.4 mg, 30%); ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.05 (s, 9H), 2.21 (s, 3H), 2.29 (s, 3H), 2.32 (s, 3H), 2.33 (s, 3H), 3.24 (d, *J* = 13.5 Hz, 1H), 3.68 (d, *J* = 13.5 Hz, 1H), 6.49 (d, *J* = 8.1 Hz, 2H), 6.54 (d, *J* = 8.1 Hz, 2H), 6.75-6.81 (m, 3H), 6.94 (d, *J* = 8.1 Hz, 2H), 6.97-7.06 (m, 5H), 7.29 (d, *J* = 7.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 0.27, 20.9, 21.0, 21.2, 21.4, 39.6, 65.1, 121.9, 125.1, 127.1, 127.3, 127.63, 127.64, 128.8, 129.8, 130.0, 134.0, 134.4, 135.1, 135.2, 135.7, 136.8, 138.9, 139.1, 145.9, 152.6, 164.4; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -9.23; IR (neat, ν / cm^{-1}) 2921, 1507, 1249, 839; HRMS (DART+) Calcd for $C_{35}H_{39}Si$ $[M+H]^+$ 487.2821, Found 487.2814.

(6-Methoxy-1-(4-methoxybenzyl)-1,2-bis(4-methoxyphenyl)-1*H*-inden-3-yl)trimethylsilane (3g).



Yellow oil (60.1 mg, 44%); ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.03 (s, 9H), 3.16 (d, *J* = 13.7 Hz, 1H), 3.63 (d, *J* = 13.7 Hz, 1H), 3.70 (s, 3H), 3.71 (s, 3H), 3.79 (s, 3H), 3.80 (s, 3H), 6.49-6.58 (m, 7H), 6.69 (d, *J* = 9.0 Hz, 2H), 6.74-6.81 (m, 3H), 7.02 (d, *J* = 8.5 Hz, 2H), 7.30 (d, *J* = 8.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 0.32, 39.6, 55.07, 55.11, 55.14, 55.4, 65.0, 110.3, 112.2, 112.35, 112.44, 113.4, 122.7, 128.4, 129.5, 130.5, 130.9, 131.3, 133.9, 138.2, 141.5, 154.0, 157.3, 157.8, 158.0, 158.8, 163.3; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -9.30; IR (neat, ν / cm^{-1}) 2953, 2835, 1609, 1510, 1248, 1178, 1036, 836, 738; HRMS (DART+) Calcd for $C_{35}H_{39}O_4Si$ $[M+H]^+$ 551.2618, Found 551.2637.

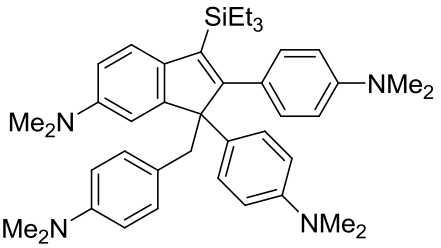
Trimethyl(6-(methylthio)-1-(4-(methylthio)benzyl)-1,2-bis(4-(methylthio)phenyl)-1*H*-inden-3-yl)silane (3h).



Gray solid (78.3 mg, 51%); mp 154-157 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.03 (s, 9H), 2.36 (s, 3H), 2.38 (s, 3H), 2.47 (s x 2, 6H), 3.14 (d, *J* = 13.3 Hz, 1H), 3.67 (d, *J* = 13.3 Hz, 1H), 6.52 (d, *J* = 6.5 Hz, 2H), 6.58 (d, *J* = 6.5 Hz, 2H), 6.80 (s, 1H), 6.90 (d, *J* = 5.8 Hz, 2H), 7.00 (d, *J* = 5.8

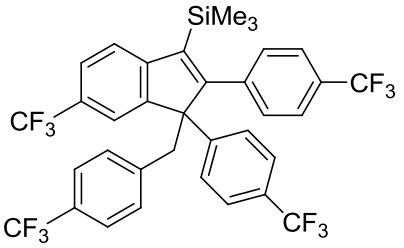
Hz, 2H), 7.04 (d, *J* = 5.8 Hz, 2H), 7.11 (d, *J* = 7.6 Hz, 2H), 7.16 (d, *J* = 7.6 Hz, 1H), 7.32 (d, *J* = 7.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 0.30, 15.5, 15.7, 16.2, 16.5, 39.7, 65.2, 122.8, 123.2, 124.9, 125.7, 125.8, 126.3, 127.9, 130.4 (2C), 134.1, 134.2, 134.3, 135.8, 136.5, 137.8, 137.9, 139.3, 145.9, 152.4, 163.5; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -8.96; IR (neat, ν / cm^{-1}) 2916, 1558, 1489, 1457, 830; HRMS (DART+) Calcd for $C_{35}H_{39}S_4Si$ $[M+H]^+$ 615.1704, Found 615.1709.

4,4'-(6-(Dimethylamino)-1-(4-(dimethylamino)benzyl)-3-(triethylsilyl)-1*H*-indene-1,2-diyl)bis(*N*,*N*-dimethylaniline) (3i).



Brownish yellow oil (20.3 mg, 25%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.36-0.55 (m, 6H), 0.70 (t, *J* = 8.1 Hz, 9H), 2.79 (s, 6H), 2.85 (s, 6H), 2.92 (s, 6H), 2.93 (s, 6H), 3.07 (d, *J* = 13.5 Hz, 1H), 3.57 (d, *J* = 13.5 Hz, 1H), 6.35-6.53 (m, 9H), 6.58-6.68 (m, 3H), 7.02 (d, *J* = 8.5 Hz, 2H), 7.29 (d, *J* = 8.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 4.20, 7.59, 39.7, 40.6, 40.8, 41.2, 41.4, 65.1, 110.08, 110.11, 110.9, 111.1, 112.4, 112.5, 122.1, 126.8, 127.05, 127.07, 128.2, 130.7, 131.1, 134.2, 148.1, 148.8, 149.1, 149.5, 154.4, 164.8; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -0.52; IR (neat, ν / cm^{-1}) 2950, 2871, 1611, 1519, 1349, 948, 821, 730; HRMS (DART+) Calcd for $C_{42}H_{57}N_4Si$ $[M+H]^+$ 645.4352, Found 645.4374.

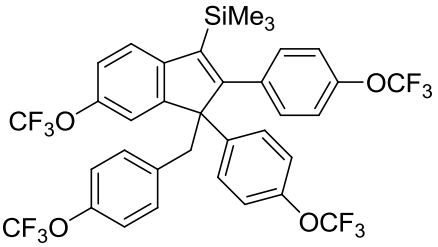
Trimethyl(6-(trifluoromethyl)-1-(4-(trifluoromethyl)benzyl)-1,2-bis(4-(trifluoromethyl)phenyl)-1*H*-inden-3-yl)silane (3j).



Yellow oil (63.5 mg, 36%); ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.01 (s, 9H), 3.39 (d, *J* = 13.7 Hz, 1H), 3.85 (d, *J* = 13.7 Hz, 1H), 6.67 (d, *J* = 7.6 Hz, 2H), 6.77 (d, *J* = 7.6 Hz, 2H), 7.15 (s, 1H), 7.19 (d, *J* = 8.1 Hz, 2H), 7.28 (d, *J* = 8.1 Hz, 2H), 7.49 (d, *J* = 8.1 Hz, 2H), 7.52-7.63 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 0.00, 39.7, 65.8, 121.20 (q, *J* = 3.8 Hz), 123.24, 123.4 (q, *J* = 272 Hz), 123.9 (q, *J* = 272 Hz), 124.0 (q, *J* = 272 Hz), 124.4 (q, *J* = 3.8 Hz), 124.6 (q, *J* = 3.8 Hz), 125.0 (q, *J* = 3.8 Hz), 121.2 (q, *J* = 3.8 Hz), 125.70 (q, *J* = 272 Hz), 125.74 (q, *J* = 3.8 Hz), 127.7 (q, *J* = 32 Hz), 129.2 (q, *J* = 32 Hz), 129.8 (q, *J* = 32 Hz), 129.98, 130.03, 130.5 (q, *J* = 32 Hz), 139.9 (q, *J* = 1.4 Hz), 140.4 (q, *J* = 1.4 Hz), 141.9, 143.9

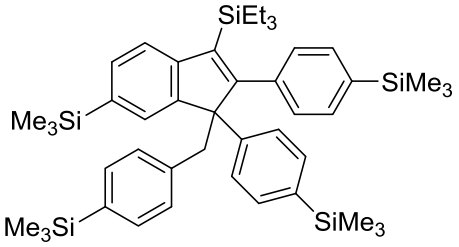
(q, *J* = 1.4 Hz), 151.20, 150.29 (q, *J* = 1.4 Hz), 164.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ -63.6 (2 x CF_3),-63.4, -62.7; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -8.14; IR (neat, ν / cm^{-1}) 2957, 1617, 1409, 1323, 1166, 1121, 1069, 1017, 841, 741; HRMS (DART+) Calcd for $C_{35}H_{27}F_{12}Si$ $[M+H]^+$ 703.1690, Found 703.1681.

Trimethyl(6-(trifluoromethoxy)-1-(4-(trifluoromethoxy)benzyl)-1,2-bis(4-(trifluoromethoxy)phenyl)-1*H*-inden-3-yl)silane (3k).



Pale yellow oil (99.3 mg, 52%); ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.02 (s, 9H), 3.33 (d, *J* = 13.7 Hz, 1H), 3.68 (d, *J* = 13.7 Hz, 1H), 6.64 (d, *J* = 8.5 Hz, 2H), 6.68 (d, *J* = 8.5 Hz, 2H), 6.81-6.94 (m, 3H), 7.03-7.20 (m, 7H), 7.40 (d, *J* = 8.5 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ -0.05, 39.4, 65.6, 117.7, 119.85, 119.92, 120.3, 120.40 (q, *J* = 257 Hz), 120.43 (q, *J* = 257 Hz), 120.5 (q, *J* = 257 Hz), 120.6 (q, *J* = 257 Hz), 120.9, 123.5, 128.6, 131.0, 131.2, 134.8, 135.6, 138.9, 140.6, 146.5, 147.0 (q, *J* = 1.9 Hz), 148.0 (q, *J* = 1.9 Hz), 148.4 (q, *J* = 1.9 Hz), 149.1 (q, *J* = 1.9 Hz), 152.7, 163.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -58.8, -58.9 (2 x CF_3), -59.0; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -8.46; IR (neat, ν / cm^{-1}) 2957, 1508, 1471, 1258, 1218, 1166, 1019, 842; HRMS (DART+) Calcd for $C_{35}H_{27}F_{12}O_4Si$ $[M+H]^+$ 767.1487, Found 767.1470.

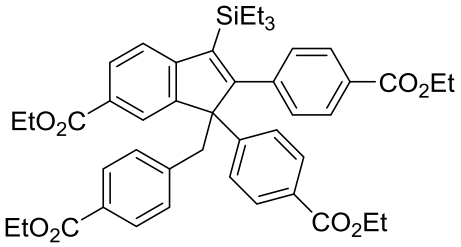
(4,4'-(3-(Triethylsilyl)-6-(trimethylsilyl)-1-(4-(trimethylsilyl)benzyl)-1*H*-indene-1,2-diyl)bis(4,1-phenylene))bis(trimethylsilane) (3l).



Yellow oil (36.7 mg, 39%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.16 (s, 9H), 0.19 (s, 9H), 0.25 (s, 9H), 0.26 (s, 9H), 0.35-0.52 (m, 6H), 0.65 (t, *J* = 7.9 Hz, 9H), 3.15 (d, *J* = 13.7 Hz, 1H), 3.79 (d, *J* = 13.7 Hz, 1H), 6.51 (d, *J* = 7.6 Hz, 2H), 6.53 (d, *J* = 7.6 Hz, 2H), 7.02-7.12 (m. 5H), 7.21-7.26 (m, 2H), 7.35 (d, *J* = 7.6 Hz, 2H), 7.40 (d, *J* = 7.2 Hz, 1H), 7.44 (d, *J* = 8.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.14, -1.07, -1.02, -0.87, 3.95, 7.44, 40.1, 66.0, 121.8, 126.9, 129.3, 129.4 129.5 (2C), 131.65, 131.73, 132.2, 133.1, 135.9, 136.8, 137.5, 138.1, 138.2, 139.3, 142.2, 149.8, 151.0, 167.1; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -4.14, -0.46, -0.11 (3 x *Si*); IR (neat, ν / cm^{-1})

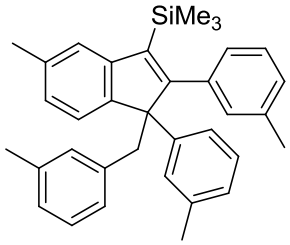
2954, 1596, 1457, 1248, 1111, 838, 735; HRMS (DART+) Calcd for $C_{46}H_{69}Si_5$ $[M+H]^+$ 761.4246, Found 761.4214.

Diethyl 4,4'-(6-(ethoxycarbonyl)-1-(4-(ethoxycarbonyl)benzyl)-3-(triethylsilyl)-1*H*-indene-1,2-diyl)dibenzoate (3m).



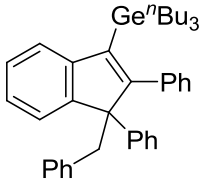
Yellow oil (33.6 mg, 36%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.34-0.56 (m, 6H), 0.67 (t, *J* = 8.1 Hz, 9H), 1.34 (t, *J* = 7.2 Hz, 3H), 1.35 (t, *J* = 7.2 Hz, 3H), 1.40 (t, *J* = 7.2 Hz, 3H), 1.41 (t, *J* = 7.2 Hz, 3H), 3.37 (d, *J* = 13.3 Hz, 1H), 3.89 (d, *J* = 13.3 Hz, 1H), 4.25-4.44 (m, 8H), 6.57 (d, *J* = 8.1 Hz, 2H), 6.65 (d, *J* = 7.6 Hz, 2H), 7.17 (d, *J* = 8.5 Hz, 2H), 7.55 (d, *J* = 7.6 Hz, 1H), 7.65 (d, *J* = 8.5 Hz, 2H), 7.70 (s, 1H), 7.84 (d, *J* = 8.5 Hz, 2H), 7.94 (d, *J* = 8.5 Hz, 2H), 8.03 (d, *J* = 8.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 3.93, 7.32, 14.26, 14.29, 14.30, 14.31, 39.4, 60.8, 60.9, 61.0, 61.1, 65.8, 122.7, 124.8, 127.0, 127.5, 128.5, 128.6, 128.8, 129.3, 129.4, 129.6, 129.7, 129.9, 130.1, 139.7, 141.3, 141.6, 145.9, 151.6, 153.3, 166.2, 166.3, 166.4, 166.6, 167.2; ^{29}Si NMR (78 MHz, $CDCl_3$) δ 0.57; IR (neat, ν / cm^{-1}) 2955, 1715, 1607, 1274, 1105, 1021, 733; HRMS (DART+) Calcd for $C_{46}H_{53}O_8Si$ $[M+H]^+$ 761.3510, Found 761.3509.

Trimethyl(5-methyl-1-(3-methylbenzyl)-1,2-di-*m*-tolyl-1*H*-inden-3-yl)silane (3n).



Yellow oil (72.3 mg, 59%); ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.01 (s, 9H), 2.13 (s, 3H), 2.23 (s, 3H), 2.29 (s, 3H), 2.43 (s, 3H), 3.24 (d, *J* = 13.0 Hz, 1H), 3.72 (d, *J* = 13.0 Hz, 1H), 6.39 (d, *J* = 8.1 Hz, 3H), 6.44 (d, *J* = 7.4 Hz, 1H), 6.85-6.90 (m, 2H), 6.90-6.98 (m, 4H), 6.99-7.08 (m, 3H), 7.12 (t, *J* = 7.4 Hz, 1H), 7.24 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 0.34, 21.2, 21.3, 21.7, 21.8, 40.2, 65.1, 123.1, 123.9, 124.5, 125.4, 126.5, 126.7, 126.8 (2C), 126.9, 127.0, 127.9 (2C), 128.0, 131.0, 131.5, 135.9, 136.0, 136.1, 137.28, 138.33, 137.9, 139.2, 142.0, 148.7, 149.5, 165.3; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -9.21; IR (neat, ν / cm^{-1}) 3032, 2921, 2860, 1604, 1488, 1472, 866, 837, 702; HRMS (DART+) Calcd for $C_{35}H_{39}Si$ $[M+H]^+$ 487.2821, Found 487.2828.

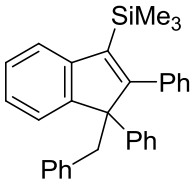
(1-Benzyl-1,2-diphenyl-1*H*-inden-3-yl)tributylgermane (3o).



Yellow oil (32.0 mg, 21%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.53-0.69 (m, 6H), 0.75 (t, *J* = 7.2 Hz, 9H), 0.97-1.19 (m, 12H), 3.32 (d, *J* = 13.3 Hz, 1H), 3.77 (d, *J* = 13.3 Hz, 1H), 6.50 (d, *J* = 6.7 Hz, 2H), 6.58 (d, *J* = 7.6 Hz, 2H), 6.92 (dd, *J* = 7.6, 7.6 Hz, 2H), 7.01 (t, *J* = 7.6 Hz, 1H), 7.05-7.13 (m, 4H), 7.13-7.18 (m, 2H), 7.19-7.27 (m, 5H), 7.37 (d, *J* = 8.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 13.6, 13.9, 28.3, 27.2, 39.7, 65.3, 122.3, 123.9, 124.8, 126.1, 126.4, 126.7, 127.0 (2C), 127.2, 127.4, 128.3, 129.86, 129.89, 137.0, 137.8, 140.2, 142.4, 149.1, 152.5, 163.4; IR (neat, ν / cm^{-1}) 3061, 3029, 2955, 2925, 1600, 1456, 1079, 1030, 757, 699; HRyMS (DART+) Calcd for $C_{40}H_{49}Ge$ $[M+H]^+$ 603.3046, Found 603.3034.

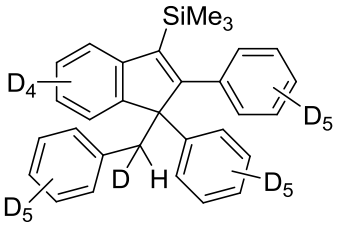
Procedure for trimethylsilylation of silyindene 3b. A mixture of diphenylacetylene (**1a**, 89.1 mg, 0.500 mmol), triethoxysilane (**2b**, 41.1 mg, 0.250 mmol), $[RhCl(cod)]_2$ (3.1 mg, 6.3 μmol), triphenylphosphine (9.9 mg, 38 μmol), and toluene (1.0 mL) was stirred at 150 °C for 24 h in a sealed tube. Then, the reaction mixture was cooled to ambient temperature, followed by addition of MeLi (1.13 M in Et_2O, 0.66 mL, 0.75 mmol) under argon atmosphere. The mixture was stirred at 25 °C for 24 h, was quenched with diluted aq. HCl, and was extracted with ethyl acetate (3 x 20 mL). The combined organic layer was dried over Na_2SO_4, was filtrated, and the solvent was removed in vacuo. The product was isolated by column chromatography on silica gel (hexane) to give (1-benzyl-1,2-diphenyl-1*H*-inden-3-yl)trimethylsilane (**3p**, 77.5 mg, 72% yield).

(1-Benzyl-1,2-diphenyl-1*H*-inden-3-yl)trimethylsilane (3p).



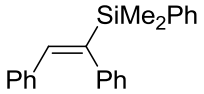
Yellow oil (77.5 mg, 72%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 0.05 (s, 9H), 3.33 (d, *J* = 13.2 Hz, 1H), 3.76 (d, *J* = 13.2 Hz, 1H), 6.55-6.69 (m, 4H), 6.90-7.05 (m, 4H), 7.06-7.16 (m, 5H), 7.17-7.29 (m, 5H), 7.40 (d, *J* = 7.4 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 0.20, 40.0, 65.7, 122.5, 124.4, 124.7, 126.1, 126.5, 126.6, 127.1 (2C), 127.39, 127.41, 128.1, 129.9, 130.1, 137.2, 137.9, 139.8, 141.8, 148.5, 152.0, 164.9; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -9.02; IR (neat, ν / cm^{-1}) 3060, 2952, 1496, 1455, 1250, 837, 698; HRMS (DART+) Calcd for $C_{31}H_{31}Si$ $[M+H]^+$ 431.2195, Found 431.2181.

3p-D_{20}. Yellow oil (79.4 mg, 70%); ^{1}H NMR (400 MHz, $CDCl_3$) δ -0.02 (s, 9H), 3.35 (s, 0.11H), 3.78 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 0.18, 39.5 (t, *J* = 19.1 Hz), 65.5, 122.0 (t, *J* = 23.5 Hz), 124.0 (t, *J* = 23.2 Hz), 124.2 (t, *J* = 23.0 Hz), 125.5 (t, *J* = 24.0 Hz), 125.74 (t, *J* = 22.3 Hz), 126.1 (t, *J* = 25.8 Hz), 126.5 (t, *J* = 24.2 Hz, 2C), 126.9 (t, *J* = 23.5 Hz), 127.2, 127.6 (t, *J* = 24.4 Hz), 129.4 (t, *J* = 23.5 Hz), 129.6 (t, *J* = 24.4 Hz), 137.0, 137.7, 139.6, 141.6, 148.3, 152.0, 164.8; ^{29}Si NMR (78 MHz, $CDCl_3$) δ -9.02; IR (neat, ν / cm^{-1}) 2953, 2898, 2277, 1377, 1250, 838; HRMS (DART+) Calcd for $C_{31}H_{11}D_{20}Si$ $[M+H]^+$ 451.3450, Found 451.3467.



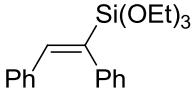
(*E*)-(1,2-Diphenylvinyl)dimethyl(phenyl)silane (4a).

Pale yellow oil (14.6 mg, 19%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.39 (s, 6H), 6.82 (s, 1H), 6.89 (d, *J* = 8.1 Hz, 2H), 6.91-6.96 (m, 2H), 7.02-7.10 (m, 3H), 7.14-7.27 (m, 3H), 7.29-7.39 (m, 3H), 7.51- 7.57 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ -3.11, 125.7, 127.1, 127.6, 127.7, 127.9, 128.5, 129.1, 129.5, 134.3, 137.2, 137.7, 139.1, 142.3, 145.0; IR (neat, ν / cm^{-1}) 3066, 2956, 1490, 1248, 1113, 954, 832, 700; HRMS (FAB+) Calcd for Formula: $C_{22}H_{22}Si$ $[M]^+$ 314.1491, Found 314.1489.



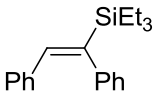
(*E*)-(1,2-Diphenylvinyl)triethoxysilane (4b).[2]

Yellow oil (6.6 mg, 8%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 1.21 (t, *J* = 7.2 Hz, 9H), 3.84 (q, *J* = 7.2 Hz, 6H), 7.01-7.08 (m, 2H), 7.08-7.13 (m, 3H), 7.15-7.24 (m, 4H), 7.26-7.32 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 18.1, 58.8, 126.1, 127.5, 127.8, 128.3, 128.5, 129.9, 136.9 (2C), 140.7, 142.4.

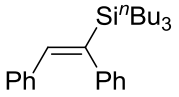


(*E*)-(1,2-Diphenylvinyl)triethylsilane (4c).[3]

Yellow oil (28.0 mg, 38%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.66 (q, *J* = 8.1 Hz, 6H), 3.84 (t, *J* = 8.1 Hz, 9H), 6.78 (s, 1H), 6.93-6.99 (m, 2H), 7.01 (d, *J* = 7.2 Hz, 2H), 7.06-7.13 (m, 3H), 7.20 (t, *J* = 7.2 Hz, 1H), 7.27-7.34 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 2.75, 7.30, 125.5, 126.9, 127.3, 127.9, 128.6, 129.5, 137.4, 138.7, 143.2, 144.1.

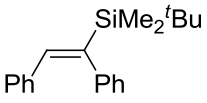


(*E*)-Tributyl(1,2-diphenylvinyl)silane (4d).



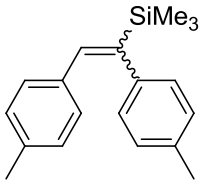
Transparent oil (47.8 mg, 50%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.50-0.77 (m, 6H), 0.90 (t, *J* = 7.2 Hz, 9H), 1.23-1.47 (m, 12H), 6.79 (s, 1H), 6.93-7.05 (m, 4H), 7.06-7.16 (m, 3H), 7.21 (t, *J* = 7.9 Hz, 1H), 7.31 (dd, *J* = 7.9, 7.9 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 11.4, 13.8, 25.9, 26.7, 125.5, 126.9, 127.3, 127.9, 128.6, 129.5, 137.5, 138.5, 143.2, 144.8; IR (neat, ν / cm^{-1}) 2955, 2922, 700; HRMS (FAB+) Calcd for Formula: $C_{26}H_{38}Si$ $[M]^+$ 378.2743, Found 378.2759.

(*E*)-*tert*-Butyl(1,2-diphenylvinyl)dimethylsilane (4e).



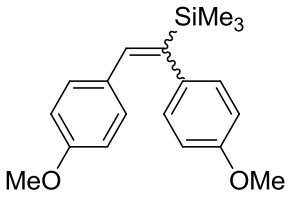
Transparent oil (21.9 mg, 30%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.16 (s, 6H), 0.87 (s, 9H), 6.85 (s, 1H), 6.88-6.96 (m, 2H), 7.02-7.11 (m, 5H), 7.18 (t, *J* = 7.2 Hz, 1H), 7.23-7.30 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ -5.24, 17.9, 27.1, 125.6, 126.9, 127.8, 127.9, 128.5, 129.5, 137.4, 139.8, 143.4, 145.0; IR (neat, ν / cm^{-1}) 2954, 2926, 2855, 1491, 1470, 1250, 824; HRMS (FAB+) Calcd for Formula: $C_{20}H_{27}Si$ $[M]^+$ 295.1882, Found 295.1887.

(1,2-Di-*p*-tolylvinyl)trimethylsilane (4f).



White solid (17.0 mg, 24%); mp 69-74 °C; (major-**4f**:minor-**4f** = 2.3:1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.08-0.14 (m, 9H, major&minor-**4f**), 2.24 (s, 3H, major-**4f**), 2.36 (s, 3H for major-**4f**, 3H for minor-**4f**), 2.37 (s, 3H, minor-**4f**), 6.75 (s, 1H, major-**4f**), 6.82-7.25 (m, 8H for major-**4f**, 9H for minor-**4f**); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.16, 0.83, 21.12, 21.18 (2 x C), 21.23, 127.1, 127.2, 128.49, 128.52, 128.59 (2 x C), 128.63, 129.30 (2 x C), 129.34 (2 x C), 134.7, 134.9, 136.7, 137.1 (2C), 139.7 (2C), 144.8, 145.9; IR (neat, ν / cm^{-1}) 2955, 2923, 1508, 1246, 840; HRMS (FAB+) Calcd for Formula: $C_{19}H_{25}Si$ $[M+H]^+$ 281.1726, Found 281.1713.

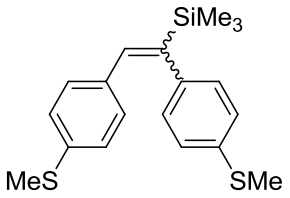
(1,2-Bis(4-methoxyphenyl)vinyl)trimethylsilane (4g).



Yellow oil (20.0 mg, 26%); (major-**4g**:minor-**4g** = 1.9:1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.12 (s, 9H, major&minor-**4g**), 3.73 (s, 3H, major-**4g**), 3.82 (s, 3H, minor-**4g**), 3.83 (s, 3H for major-**4g**, 3H for minor-**4g**), 6.64 (d, *J* = 8.5 Hz, 2H, major-**4g**), 6.72 (s, 1H, major-**4g**),

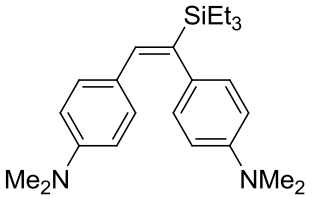
6.81-7.25 (m, 6H for major-**4g**, 9H for minor-**4g**); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.62, 0.87, 55.10, 55.14, 55.2 (2 x C), 113.21, 113.29 (2 x C), 113.34, 114.2, 128.2, 128.5 (2 x C), 129.8, 130.3, 130.7 (2 x C), 135.0, 136.9, 144.0, 144.3, 157.6, 157.7, 158.4, 158.8; IR (neat, ν / cm^{-1}) 2956, 1603, 1508, 1254, 1029, 833; HRMS (FAB+) Calcd for Formula: $C_{19}H_{24}O_2Si$ $[M]^+$ 312.1546, Found 312.1538.

(1,2-Bis(4-(methylthio)phenyl)vinyl)trimethylsilane (4h).



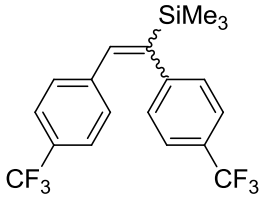
White solid (21.9 mg, 25%); mp 65-77 °C; (major-**4h**:minor-**4h** = 2.3:1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.12-0.21 (m, 9H, major&minor-**4h**), 2.44 (s, 3H, major-**4h**), 2.51-2.59 (m, 3H for major-**4h**, 6H for minor-**4h**), 6.76 (s, 1H, major-**4h**), 6.88-7.32 (m, 8H for major-**4g**, 9H for minor-**4g**); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.87, 0.85, 15.4, 15.8, 15.9, 16.1, 125.7, 125.9, 126.5, 126.9, 127.6, 127.9, 129.0, 129.8, 134.0, 135.2, 135.3, 136.6, 136.9, 137.3, 137.4, 139.6, 144.3, 144.4, 145.8, 146.4; IR (neat, ν / cm^{-1}) 2956, 2918, 1489, 1436, 1245, 1091, 839; HRMS (FAB+) Calcd for Formula: $C_{19}H_{24}S_2Si$ $[M]^+$ 344.1089, Found 344.1101.

(*E*)-4,4'-(1-(Triethylsilyl)ethene-1,2-diyl)bis(*N*,*N*-dimethylaniline) (4i).



Yellow oil (45.1 mg, 47%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.64 (q, *J* = 8.1 Hz, 6H), 0.97 (t, *J* = 8.1 Hz, 9H), 2.89 (s, 6H), 2.97 (s, 6H), 6.49 (d, *J* = 8.3 Hz, 2H), 6.64 (s, 1H), 6.76 (d, *J* = 8.3 Hz, 2H), 8.92 (d, *J* = 8.8 Hz, 2H), 8.93 (d, *J* = 8.8 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 2.87, 7.41, 40.3, 40.9, 111.8, 113.3, 126.5, 128.2 (2C), 130.6 (2C), 138.6, 138.7, 149.2; IR (neat, ν / cm^{-1}) 1521, 1507, 1222, 815.

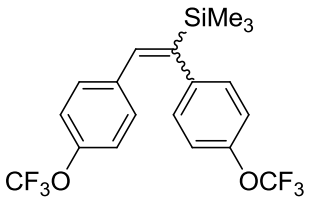
(1,2-Bis(4-(trifluoromethyl)phenyl)vinyl)trimethylsilane (4j).



Transparent oil (17.4 mg, 18%); (major-**4j**:minor-**4j** = 2.6:1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.21 (s, 9H, major&minor-**4j**), 6.87 (s, 1H, major-**4j**), 7.02 (d, *J* = 8.5 Hz, 2H, major-**4j**), 7.09 (d, *J* = 8.1 Hz, 2H, major-**4j**), 7.25 (s, 1H, minor-**4j**), 7.29 (d, *J* = 8.1 Hz, 2H, minor-**4j**), 7.36 (d, *J* = 8.5 Hz, 2H, major-**4j**), 7.43 (d, *J* = 8.1 Hz, 2H, minor-**4j**), 7.58 (d, *J* = 7.6 Hz, 2H, major-**4j**), 7.59 (d, *J* = 7.6 Hz, 2H, minor-**4j**), 7.59 (d, *J* = 7.6

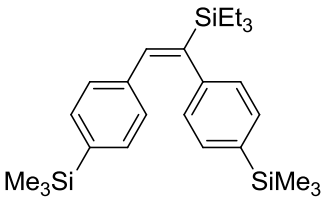
Hz, 2H, minor-**4j**); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.76, 0.60, 124.0 (q, *J* = 272 Hz), 124.1 (q, *J* = 272 Hz), 124.3 (q, *J* = 272 Hz), 125.0 (q, *J* = 3.6 Hz), 125.1 (q, *J* = 3.6 Hz), 125.8 (q, *J* = 3.6 Hz), 126.5 (q, *J* = 271 Hz), 127.3, 127.6 (2 x C), 128.30 (q, *J* = 32.4 Hz), 128.33 (q, *J* = 32.4 Hz), 128.8, 129.04 (q, *J* = 32.4 Hz), 129.07 (q, *J* = 32.4 Hz), 129.5 (2 x C), 136.7, 140.2, 143.1, 144.1, 146.3, 148.6, 149.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ -63.5, -63.3, -63.1 (2 x CF_3); IR (neat, ν / cm^{-1}) 2925, 2854, 1541, 1507, 1323, 1128, 1067, 842.

(1,2-Bis(4-(trifluoromethoxy)phenyl)vinyl)trimethylsilane (4k).



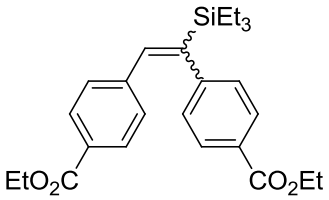
Transparent oil (27.9 mg, 27%); (major-**4k**:minor-**4k** = 2.3:1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.14 (s, 9H, major&minor-**4k**), 6.80 (s, 1H, major-**4k**), 6.90-6.95 (m, 4H, major&minor-**4k**), 6.99 (d, *J* = 8.5 Hz, 2H, major-**4k**), 7.13-7.22 (m, 2H for major-**4k**, 3H for minor-**4k**), 7.32 (d, *J* = 8.1 Hz, 2H, minor-**4k**); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.77, 0.59, 120.3, 120.39 (q, *J* = 257 Hz), 120.49 (q, *J* = 257 Hz), 120.50, 120.54 (q, *J* = 256 Hz), 120.6, 121.4 (2 x C), 128.4, 128.6 (2 x C), 129.9, 130.7, 135.6, 136.6, 138.3, 141.0, 143.9, 145.5, 146.9, 147.4, 147.6 (q, *J* = 1.9 Hz), 148.0 (q, *J* = 1.4 Hz), 148.6 (q, *J* = 1.4 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ -58.8 (2 x CF_3), -58.7 (2 x CF_3); IR (neat, ν / cm^{-1}) 2958, 1506, 1259, 1221, 1165, 840; HRMS (FAB+) Calcd for Formula: $C_{19}H_{18}F_6O_2Si$ $[M]^+$ 420.0980, Found 420.0981.

(*E*)-(1,2-Bis(4-(trimethylsilyl)phenyl)vinyl)triethylsilane (4l).



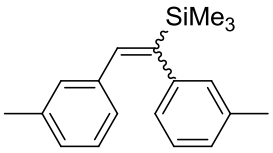
Transparent oil (25.2 mg, 23%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.18 (s, 9H), 0.28 (s, 9H), 0.63 (q, *J* = 7.9 Hz, 6H), 0.95 (t, *J* = 7.9 Hz, 9H), 6.72 (s, 1H), 6.93 (d, *J* = 7.6 Hz, 2H), 6.98 (d, *J* = 7.4 Hz, 2H), 7.25 (d, *J* = 7.6 Hz, 2H), 7.44 (d, *J* = 7.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.20, -0.96, 2.69, 7.29, 126.3, 128.8, 133.0, 133.6, 136.9, 137.7, 138.5, 139.3, 143.7, 144.5; IR (neat, ν / cm^{-1}) 2954, 1595, 1248, 1107, 839, 719; HRMS (FAB+) Calcd for Formula: $C_{26}H_{43}Si_3$ $[M]^+$ 439.2673, Found 439.2687.

Diethyl 4,4'-(1-(triethylsilyl)ethene-1,2-diyl)dibenzoate (4m).



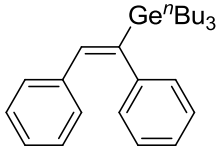
Transparent oil (41.4 mg, 38%); (major-**4m**:minor-**4m** = 2.9:1), major-**4m**: ^{1}H NMR (400 MHz, $CDCl_3$) δ major-**4m**: 0.65 (q, *J* = 8.1 Hz, 6H), 0.95 (t, *J* = 8.1 Hz, 9H), 1.34 (t, *J* = 7.2 Hz, 3H), 1.40 (t, *J* = 7.2 Hz, 3H), 4.30 (q, *J* = 7.2 Hz, 2H), 4.39 (q, *J* = 7.2 Hz, 2H), 6.84 (s, 1H), 6.98 (d, *J* = 8.5 Hz, 2H), 7.05 (d, *J* = 8.5 Hz, 2H), 7.76 (d, *J* = 8.3 Hz, 2H), 7.78 (d, *J* = 8.3 Hz, 2H); minor-**4m**: 0.41 (q, *J* = 8.1 Hz, 6H), 0.80 (t, *J* = 8.1 Hz, 9H), 1.34 (t, *J* = 7.2 Hz, 3H), 1.42 (t, *J* = 7.2 Hz, 3H), 4.39 (q, *J* = 7.2 Hz, 4H), 7.24 (d, *J* = 8.4 Hz, 2H), 7.30 (s, 1H), 7.39 (d, *J* = 8.4 Hz, 2H), 8.01 (d, *J* = 7.9 Hz, 2H), 8.03 (d, *J* = 7.9 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 2.70, 4.59, 7.23, 7.43, 14.25, 14.32 (3 x C), 60.8 (2 x C), 60.9, 61.0, 127.2 (2 x C), 128.0, 128.3, 128.8, 129.18 (2 x C), 129.22, 129.3, 130.0, 138.3, 141.3, 144.1, 145.5, 146.5, 146.6, 148.1, 12.2, 166.2. 166.6; IR (neat, ν / cm^{-1}) 2954, 1716, 1605, 1272, 1175, 1102, 1020, 734, 708; HRMS (FAB+) Calcd for Formula: $C_{26}H_{35}O_4Si$ $[M]^+$ 439.2305, Found 420.0981.

(1,2-Di-*m*-tolylvinyl)trimethylsilane (4n).



Transparent oil (16.5 mg, 24%); (major-**4n**:minor-**4n**=3.1:1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.14-0.25 (m, 9H, major&minor-**4n**), 2.22 (s, 3H, major-**4n**), 2.37 (s, 3H, major-**4n**), 2.43 (s, 6H, minor-**4n**), 6.74-7.34 (m, 9H, major&minor-**4n**); ^{13}C NMR (100 MHz, $CDCl_3$) δ -1.67, 0.80, 21.3, 21.4, 21.5 (2 x C), 124.3, 124.4, 125.6, 126.2 (2 x C), 126.3 (2 x C), 126.36, 126.49, 127.1 (2 x C), 127.73, 127.77, 127.79, 127.8, 127.9, 128.4, 129.4, 130.5, 137.1, 137.3, 137.5, 137.7, 137.9, 138.0, 142.7, 144.9, 147.0; IR (neat, ν / cm^{-1}) 2925, 1601, 1457, 1247, 837; HRMS (FAB+) Calcd for Formula: $C_{19}H_{24}Si$ $[M]^+$ 280.1647, Found 280.1641

(*E*)-Tributyl(1,2-diphenylvinyl)germane (4o).

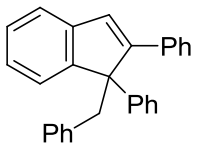


Transparent oil (43.0 mg, 41%); ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.73-0.97 (m, 15H), 1.21-1.40 (m, 12H), 6.64 (s, 1H), 6.92-7.01 (m, 4H), 7.03-7.12 (m, 3H), 7.15 (t, *J* = 7.2 Hz, 1H), 7.23-7.31 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 12.3, 13.7, 26.5, 27.2, 125.4, 126.7, 126.9, 127.9, 128.5, 129.3, 136.3, 137.4, 143.7, 147.0; IR (neat, ν / cm^{-1}) 3056, 3022, 2955, 2925,

1490,1457, 1376, 1079, 754, 695; HRMS (FAB+) Calcd for Formula: $C_{26}H_{39}Ge$ $[M+H]^+$ 425.2264, Found 425.2281.

Procedure for desilylation of silylindene 3b.[4] A mixture of diphenylacetylene (**1a**, 89.1 mg, 0.500 mmol), triethoxysilane (**2b**, 41.1 mg, 0.250 mmol), $[RhCl(cod)]_2$ (3.1 mg, 6.3 μmol), triphenylphosphine (9.9 mg, 38 μmol), and toluene (1.0 mL) was stirred at 150 °C for 24 h in a sealed tube. Then the solvent was removed in vacuo and the crude mixture was dissolved in dry DMF (1.0 mL). To the solution was added TBAF·$3H_2O$ (158 mg, 0.500 mmol) and the mixture was stirred at 100 °C for 17 h in a Schleck tube. The reaction mixture was cooled to ambient temperature, dissolved in CH_2Cl_2 (10 mL), and was washed with phosphate buffered saline solution (3 x 10 mL). The combined organic layer was dried over Na_2SO_4, was filtered, and was evaporated in vacuo. The product was isolated by column chromatography on silica gel (hexane/EtOAc= 10/1) to give 1-benzyl-1,2-diphenyl-1*H*-indene (**5a**, 61.5 mg, 69% yield).

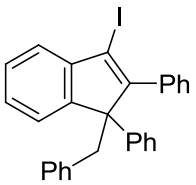
1-Benzyl-1,2-diphenyl-1*H*-indene (5a).



White solid (61.5 mg, 69%); mp 139-147 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.68 (d, *J* = 12.8 Hz, 1H), 3.96 (d, *J* = 12.8 Hz, 1H), 6.27 (d, *J* = 7.2 Hz, 2H), 6.80 (dd, *J* = 7.6, 7.6 Hz, 2H), 6.93 (d, *J* = 7.2 Hz, 1H), 7.04 (s, 1H), 7.11-7.17 (m, 3H), 7.20-7.31 (m, 9H), 7.36 (d, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 40.6, 62.1, 121.1, 123.1, 125.5, 125.9 (2C), 126.6, 126.7, 126.80, 126.81, 127.3, 128.4, 128.93, 128.97, 129.5, 135.1, 136.2, 142.7, 143.1, 151.4, 153.5; IR (neat, ν / cm^{-1}) 3061, 3030, 1600, 1495, 1456, 1443, 908, 757, 733, 697; HRMS (DART+) Calcd for $C_{28}H_{23}$ $[M+H]^+$ 359.1800, Found 359.1803.

Procedure for deprotection and iodination of silylindene 3p.[5] A mixture of silylindene (**3p**, 108 mg, 0.25 mmol) and MeOH (1.8 mL) was cooled to 0 °C, Then $AgBF_4$ (97.0 mg, 0.500 mmol) was added, and the resulting mixture was stirred at 0 °C for 5 min in a sealed tube. Then I_2 (127 mg, 0.500 mmol) was added and the mixture was stirred at 25 °C for 17 h. The reaction mixture was diluted with ether (10 mL) and was washed with aq. $Na_2S_2O_3$ (3 x 10 mL). The combined organic layer was dried over Na_2SO_4 was filtered, and was evaporated in vacuo. The product was isolated by column chromatography on silica gel (hexane/Et_2O= 99/1) and GPC purification to give 1-benzyl-3-iodo-1,2-diphenyl-1*H*-indene (**5b**, 62.3 mg, 51% yield).

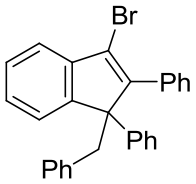
1-Benzyl-3-iodo-1,2-diphenyl-1*H*-indene (5b).



White solid (62.3 mg, 51%); mp 134-137 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.41 (d, *J* = 13.3 Hz, 1H), 3.86 (d, *J* = 13.3 Hz, 1H), 6.44 (d, *J* = 7.2 Hz, 2H), 6.84-7.09 (m, 6H), 7.15-7.37 (m, 11H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 40.0, 64.9, 96.5, 123.3, 123.4, 126.3, 126.77, 126.79, 127.0, 127.1, 127.3, 127.6, 128.1, 128.7, 129.5, 129.7, 135.7, 135.9, 141.3, 145.2, 150.4, 155.9; IR (neat, ν / cm^{-1}) 3649, 3061, 1716, 1698, 1684, 1558, 1541, 1507, 1489, 1457, 757, 697; HRMS (DART+) Calcd for $C_{28}H_{22}I$ $[M+H]^+$ 485.0766, Found 485.0758.

Procedure for deprotection and bromination of silylindene 3p.[6] A mixture of silylindene (**3p**, 54.0 mg, 0.125 mmol), NBS (28.9 mg, 0.163 mmol), and NaBr (16.7 mg, 0.163 mmol) in MeOH (1.0 mL) was stirred at 25 °C for 24 h. Then the reaction mixture was evaporated in vacuo. The product was isolated by column chromatography on silica gel (hexane/EtOAc= 30/1) and GPC purification to give 1-benzyl-3-bromo-1,2-diphenyl-1*H*-indene (**5c**, 26.3 mg, 48% yield).

1-Benzyl-3-bromo-1,2-diphenyl-1*H*-indene (5c).



Yellow solid (26.3 mg, 48%); mp 121-124 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.47 (d, *J* = 12.6 Hz, 1H), 3.90 (d, *J* = 12.6 Hz, 1H), 6.37 (d, *J* = 7.2 Hz, 2H), 6.89 (dd, *J* = 7.9, 7.9 Hz, 2H), 7.01 (t, *J* = 7.4 Hz, 1H), 7.04-7.17 (m, 3H), 7.21-7.35 (m, 11H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 39.9, 63.7, 119.7, 121.0, 123.2, 126.3, 126.5, 126.9, 127.0 (2C), 127.3, 127.8, 128.0, 128.9, 129.3, 129.7, 134.2, 135.7, 141.8, 142.7, 148.2, 150.4; IR (neat, ν / cm^{-1}) 3061, 3030, 1600, 1495, 1456, 1443, 908, 757, 733, 697; HRMS (DART+) Calcd for Formula: $C_{28}H_{22}Br$ $[M+H]^+$ 437.0905, Found 437.0890.

Preparation of single crystal of 3a. Single crystal of **3a** was obtained as a transparent block by recrystallization from ethyl acetate/hexane.

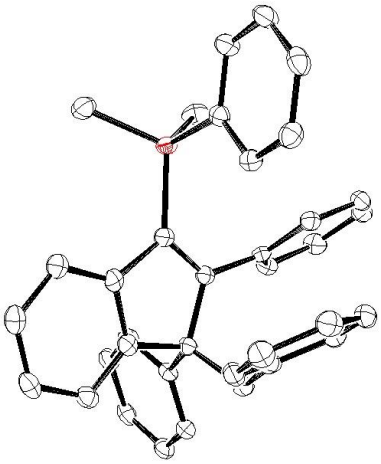
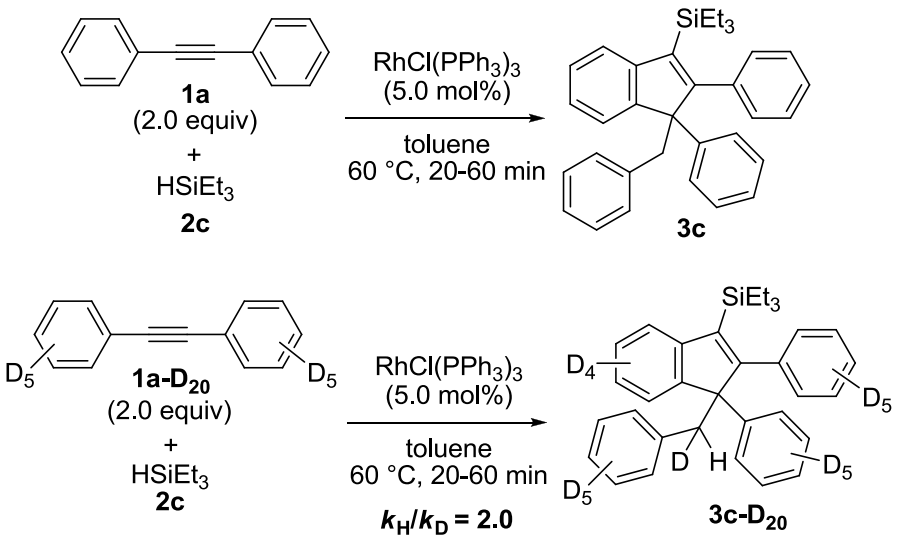


Fig. S1. X-ray crystal structure of **3a**. Thermal ellipsoids set at 50% probability. Hydrogen atoms are omitted for clarity.

KIE experiments.

Side-by-side reactions were performed (20, 30, 40, and 60 min) according to the typical procedure for a rhodium-catalysed synthesis of multi-substituted silylindene using **1a** or **1a-D$_{10}$** (vide infra). The resulting mixtures were evaporated in vacuo. The yields of **3c** and **3c-D$_{20}$** were calculated from ^{1}H NMR using 1,1,2,2-tetrachloroethane as an internal standard.



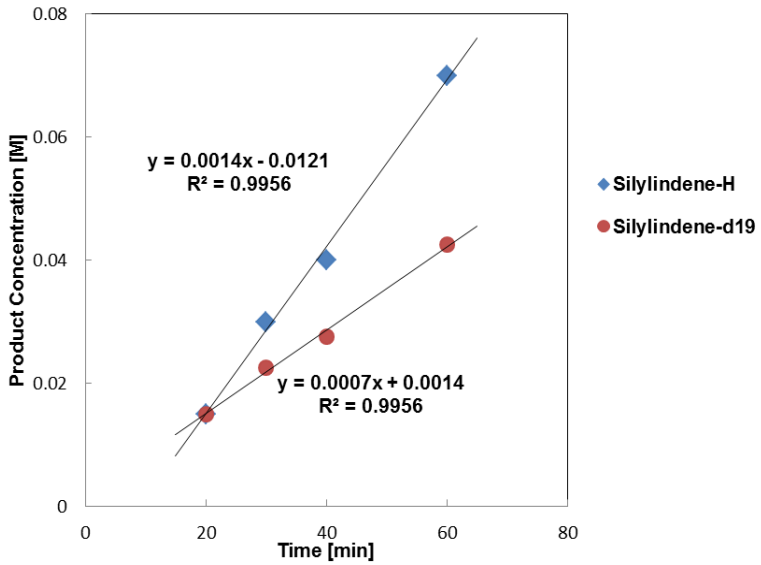


Fig. S2. Rate comparison for the rhodium-catalysed synthesis of silylindenes using **1a** (blue) and **1a-D$_{10}$** (red).

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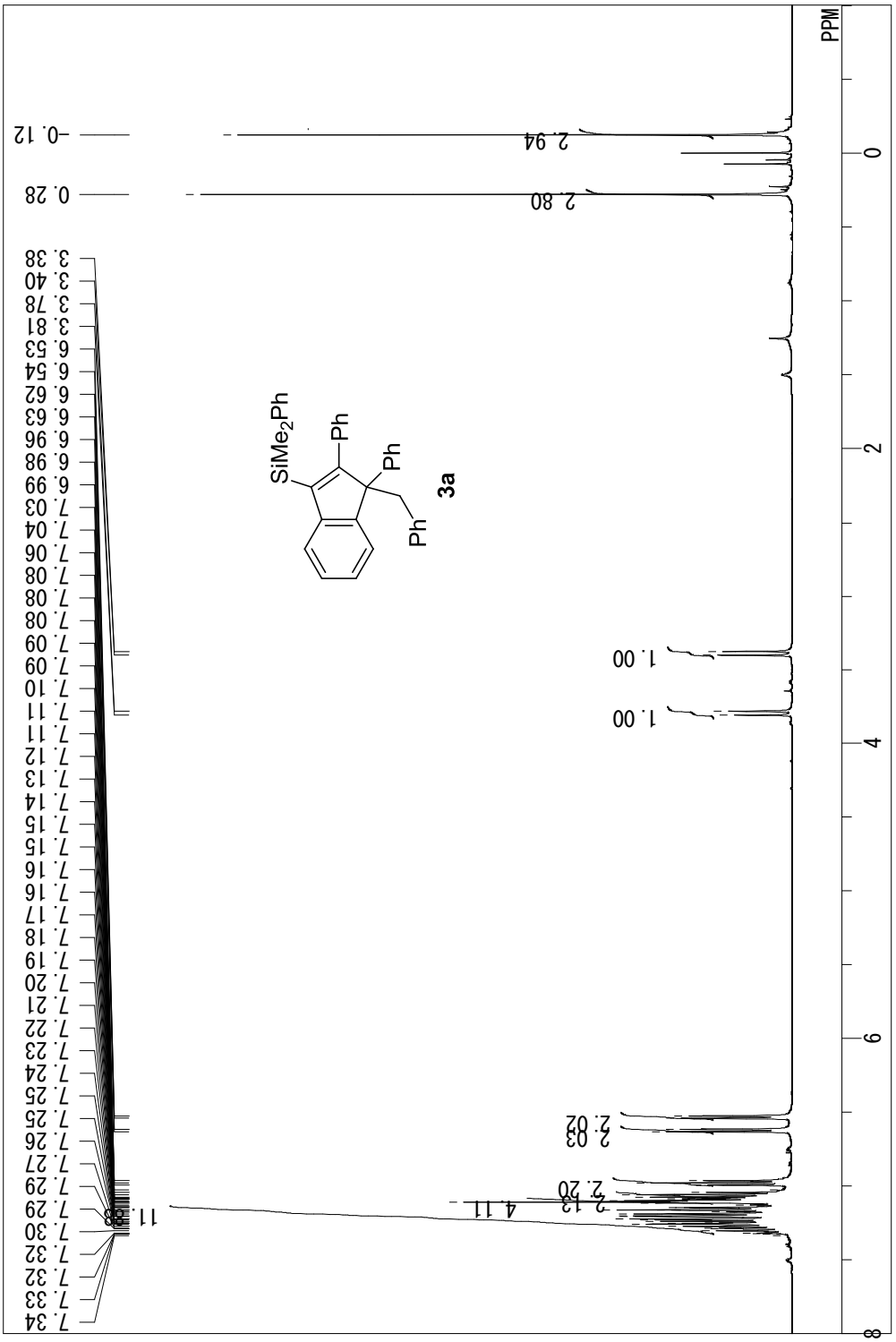
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2.13
4.11
11.88
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3.81
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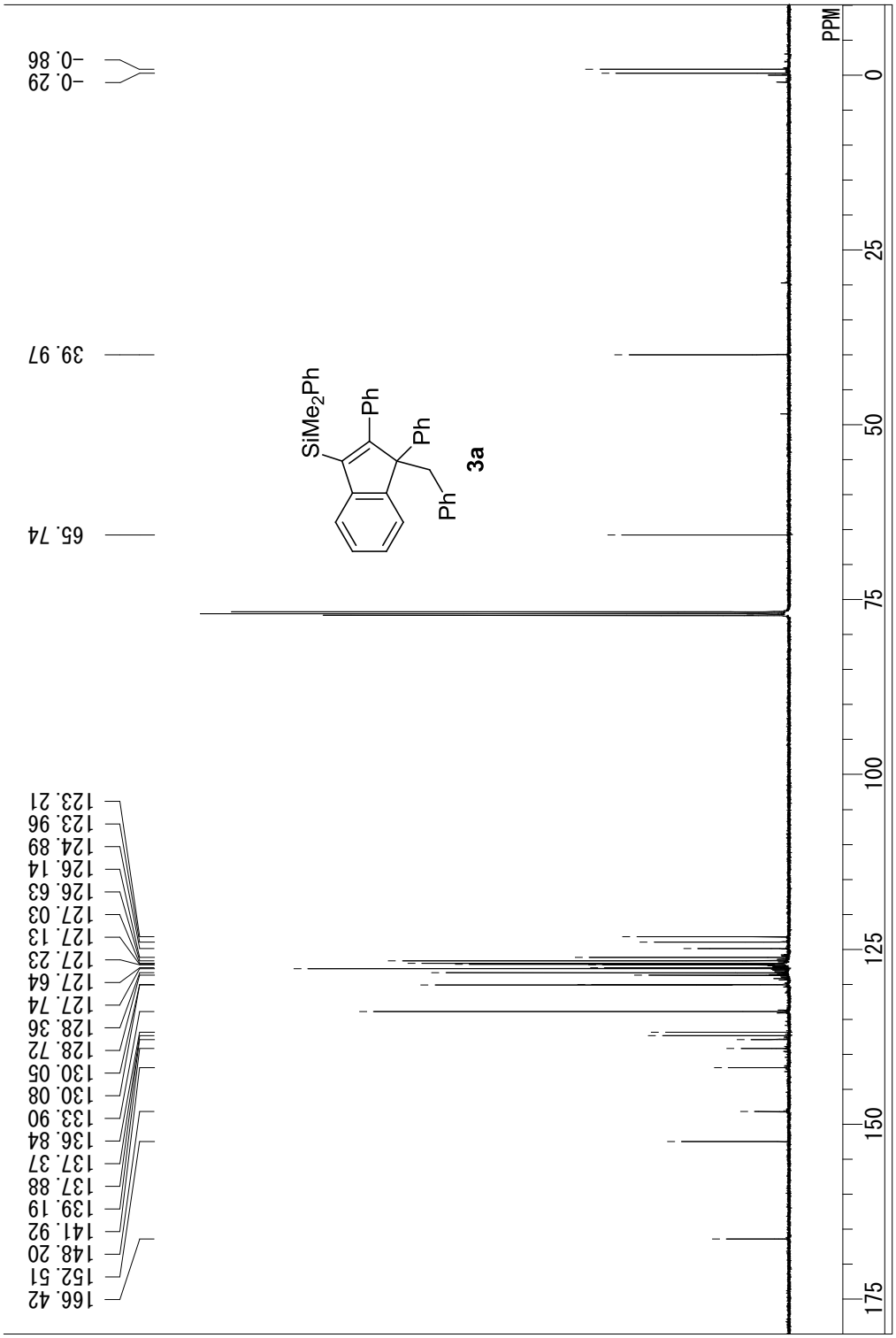
7.34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123.96
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126.63
127.03
127.13
127.23
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127.74
128.36
128.72
130.05
130.08
133.90
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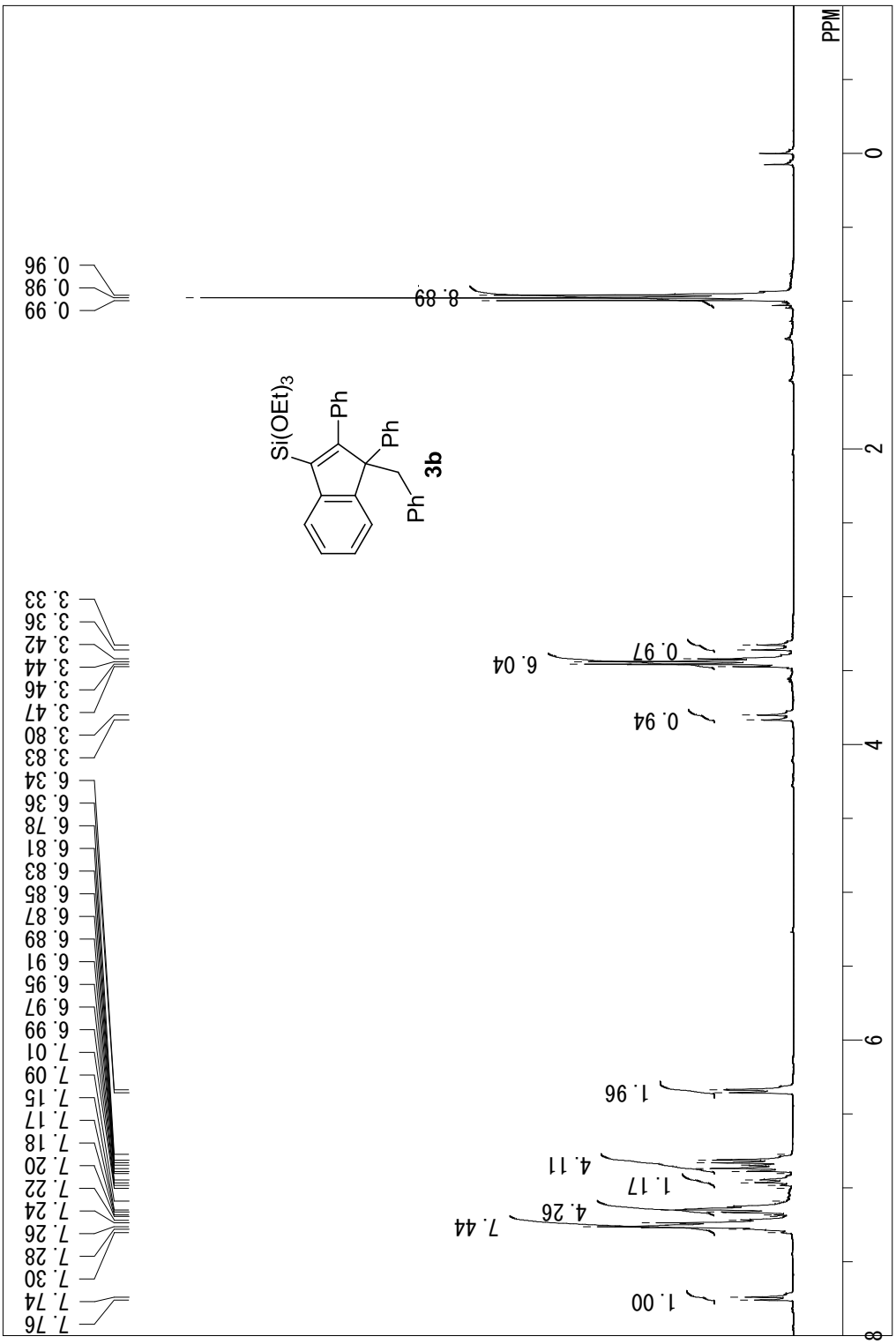
SiMe2Ph
Ph
Ph
Ph
3a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0.99
0.98
0.96
3.33
3.36
3.42
3.44
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3.47
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3.83
6.34
6.36
6.78
6.81
6.83
6.85
6.87
6.89
6.91
6.95
6.97
6.99
7.01
7.09
7.15
7.17
7.18
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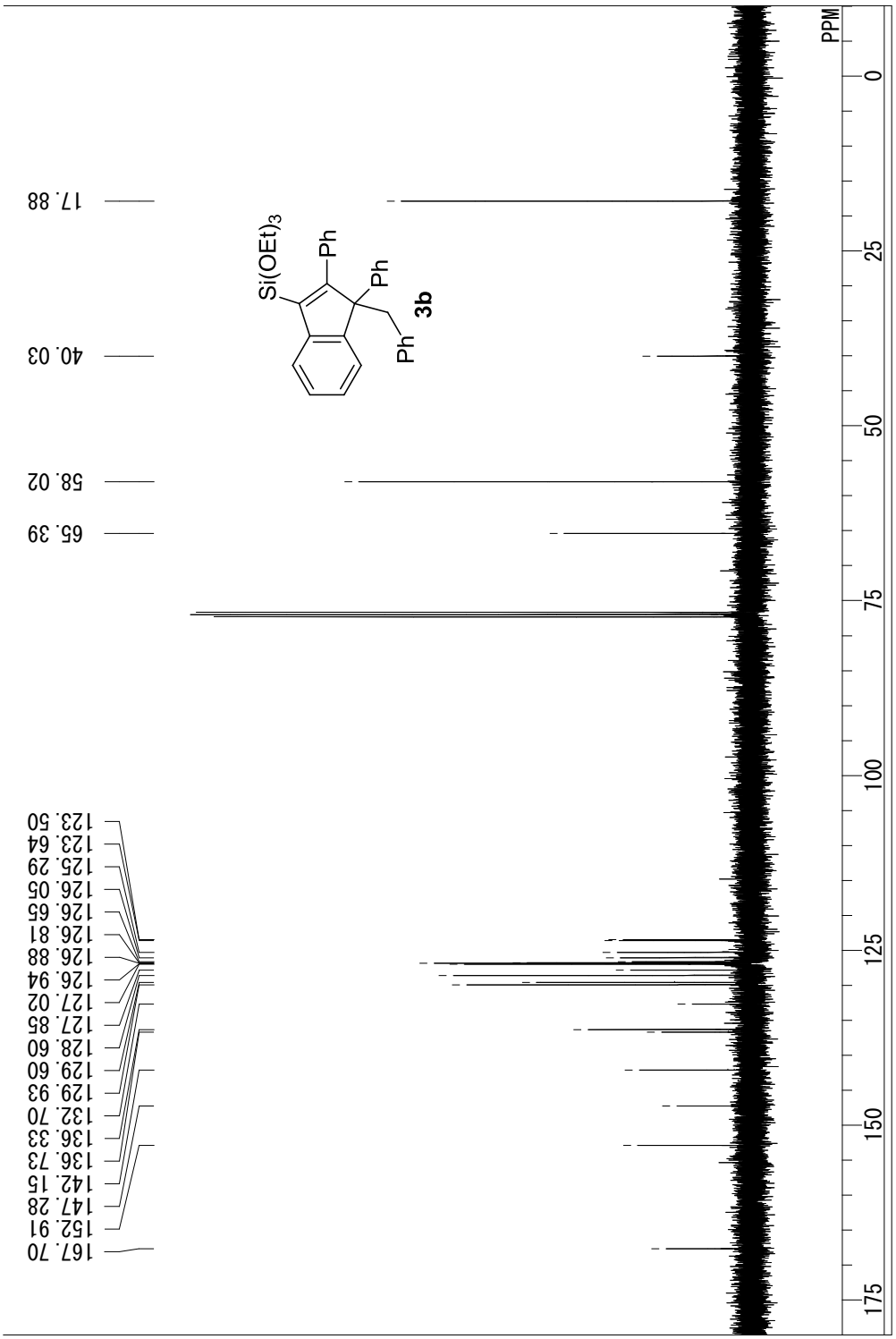
Ph
Ph
Ph
3b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132.70
136.33
136.73
142.15
147.28
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Si(OEt)3
Ph
Ph
Ph
3b
PPM
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100
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150
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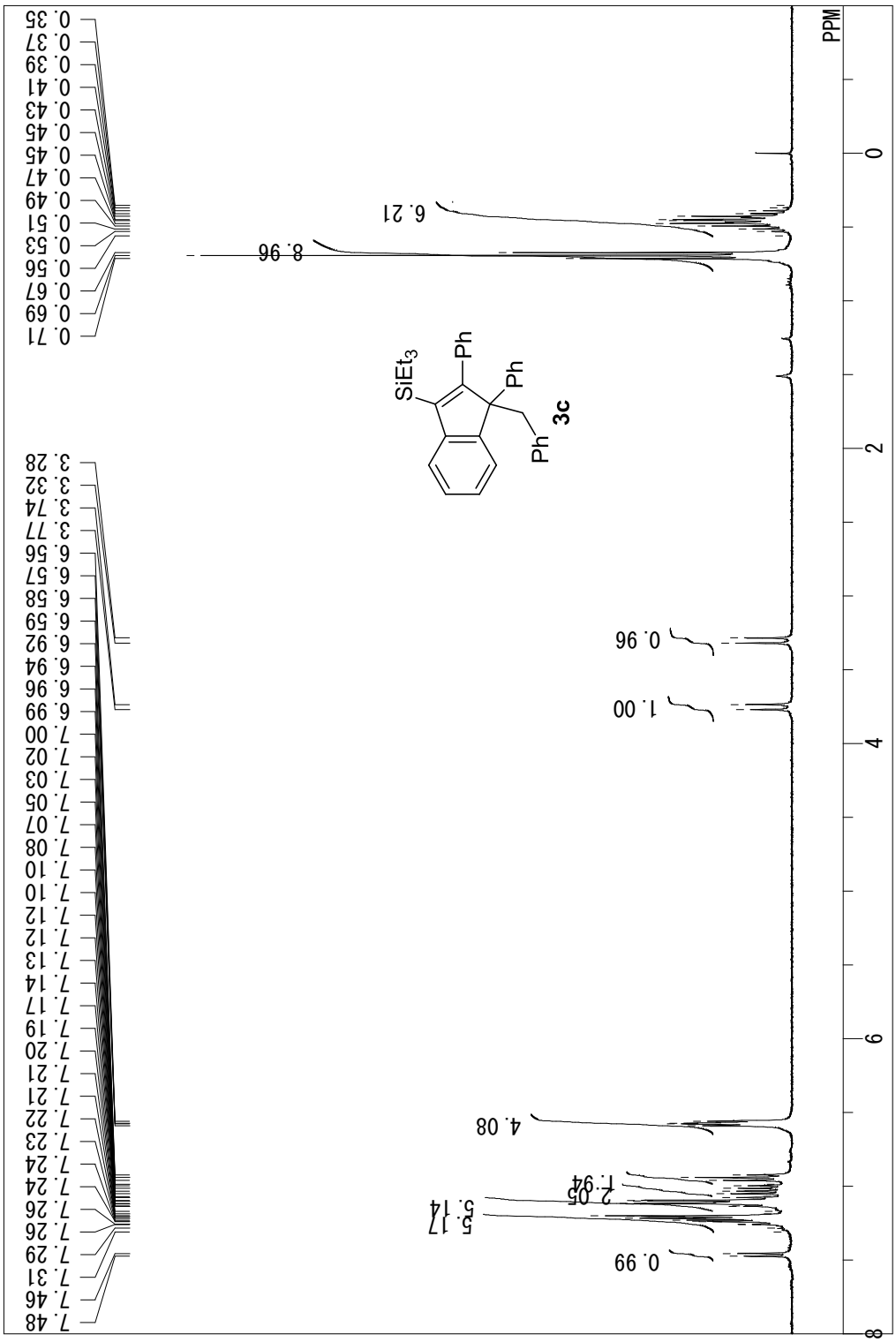
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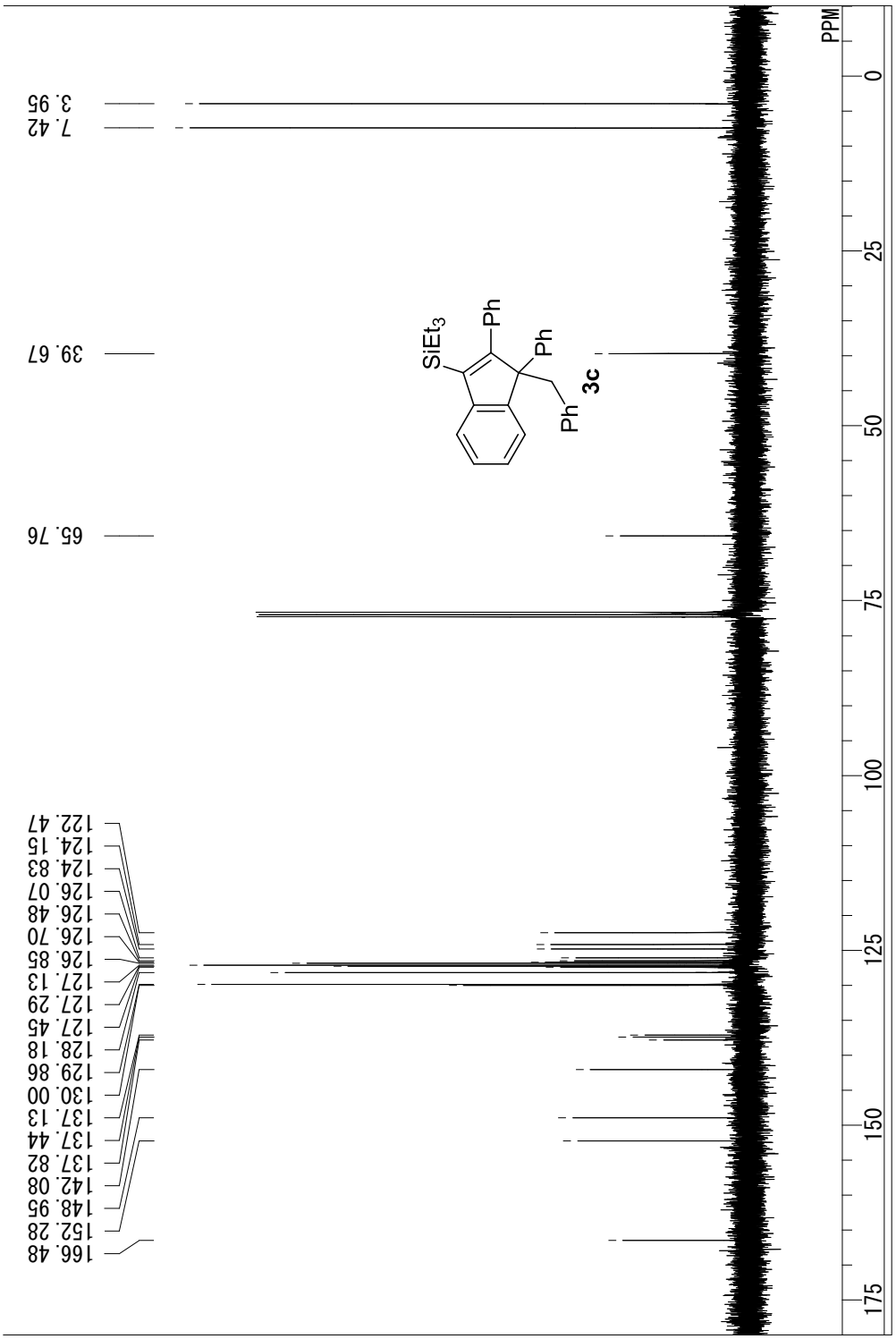
8.96
SiEt3
Ph
Ph
Ph
3c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127.45
128.18
129.86
130.00
137.13
137.44
137.82
142.08
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SiEt3
Ph
Ph
Ph
3c
PPM
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75
100
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150
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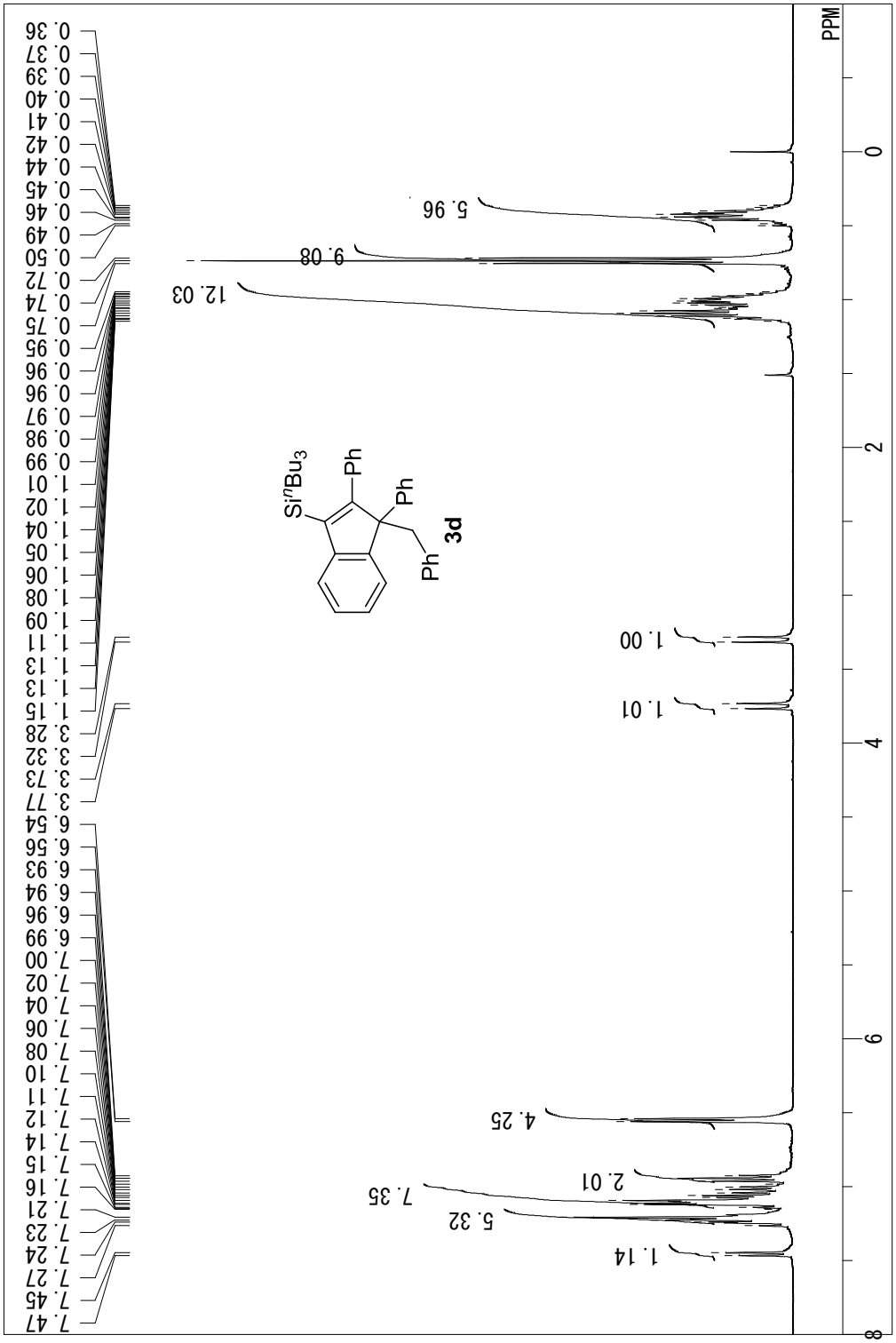
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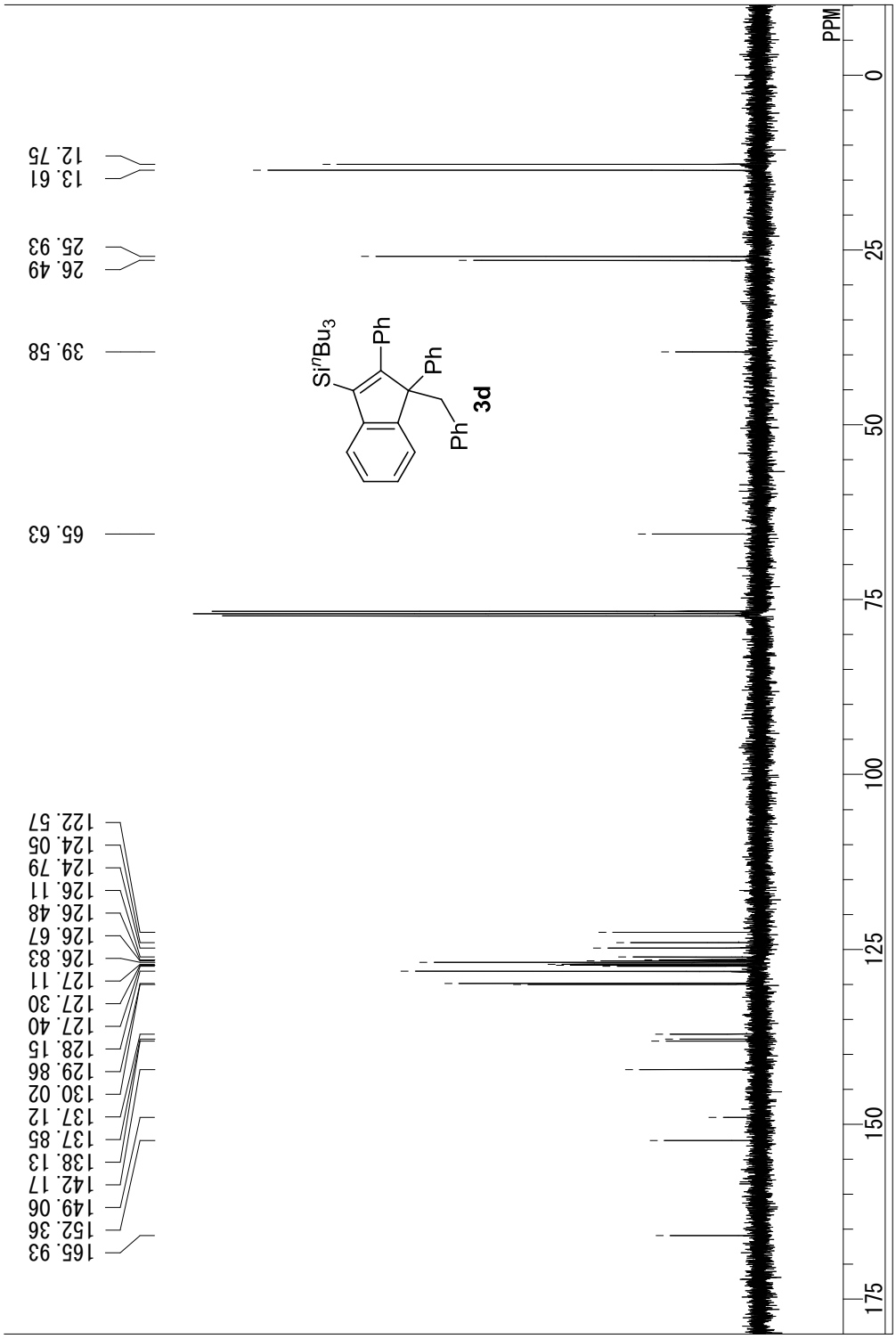
Si^{n}Bu$_3$
Ph
Ph
Ph
3d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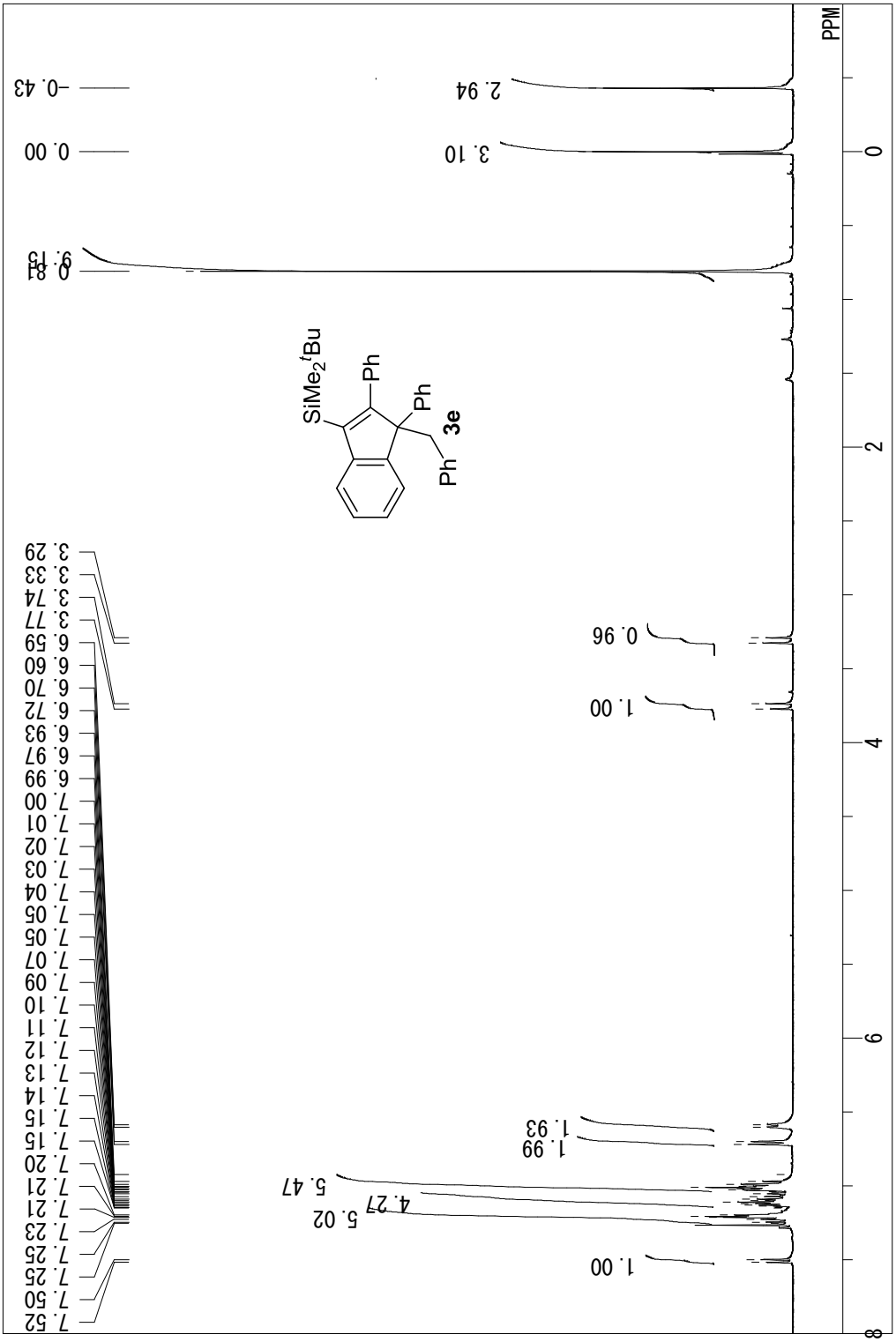
Si^{n}Bu$_3$
Ph
Ph
Ph
3d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6
8
SiMe2tBu
Ph
Ph
Ph
3e
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7.23
7.21
7.21
7.20
7.15
7.15
7.14
7.13
7.12
7.11
7.10
7.09
7.07
7.05
7.05
7.04
7.03
7.02
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6.93
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3.29
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0.96
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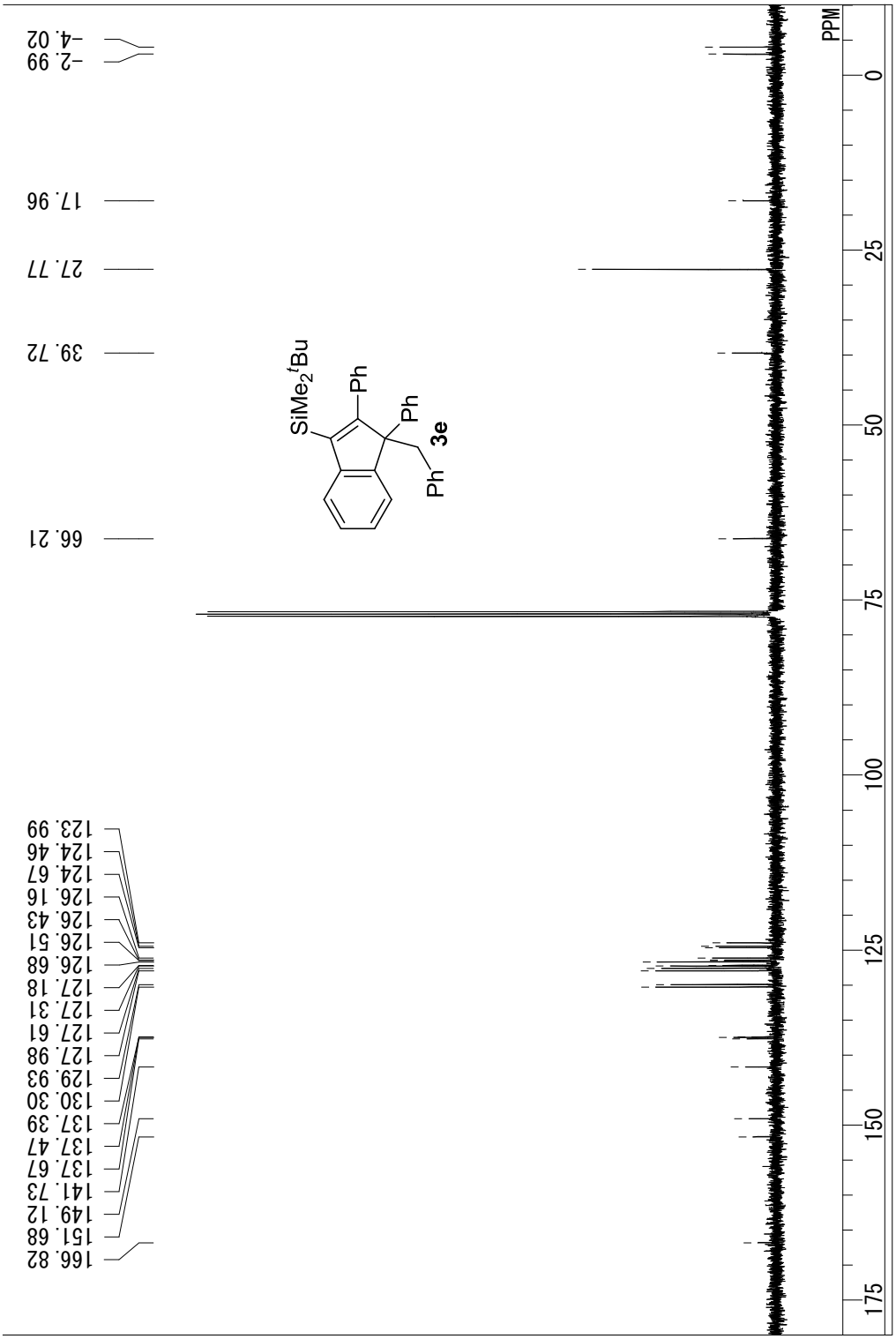
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39.72
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124.46
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127.18
127.31
127.61
127.98
129.93
130.30
137.39
137.47
137.67
141.73
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151.68
166.82
SiMe2tBu
Ph
Ph
Ph
3e
PPM
0
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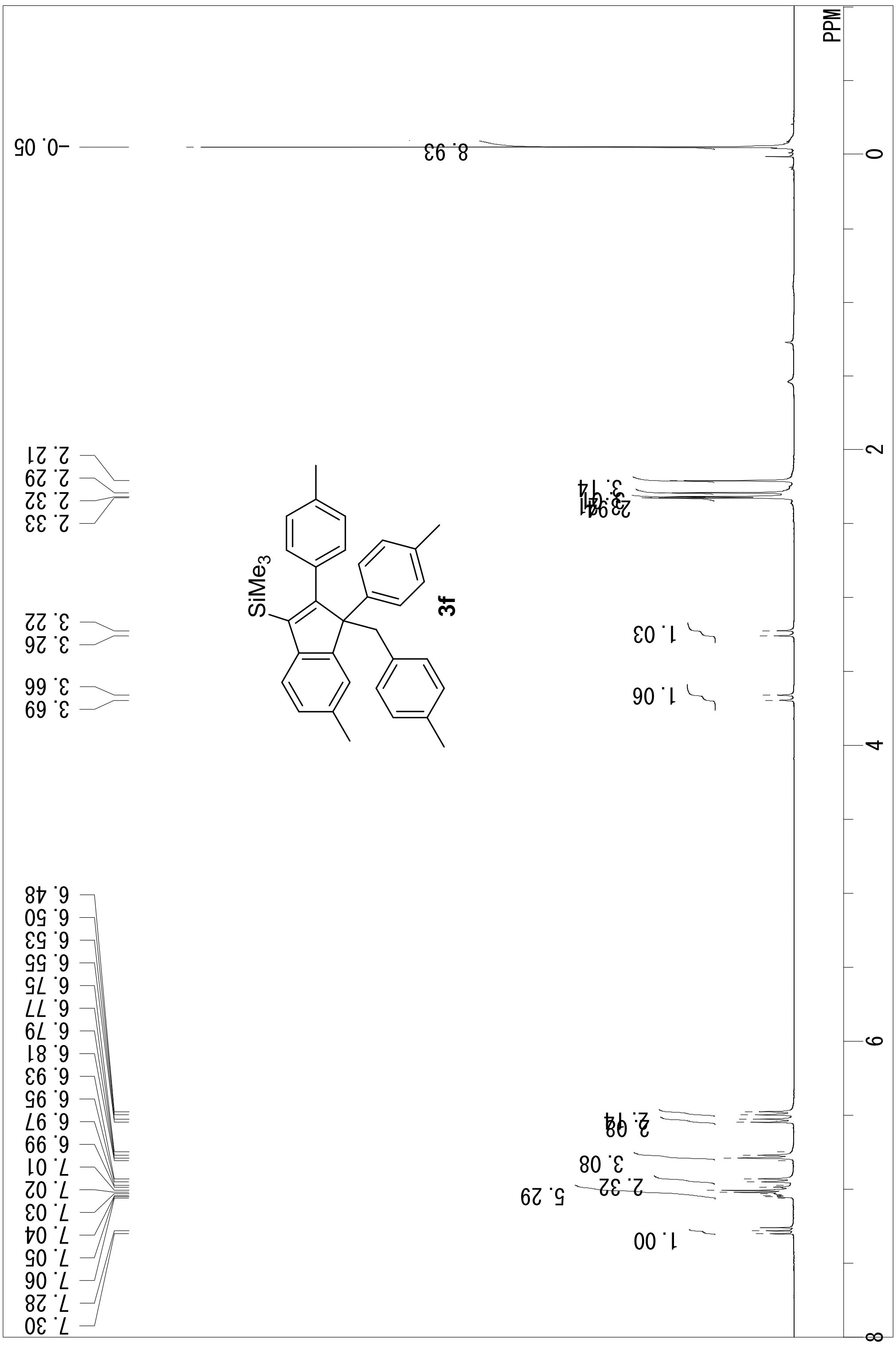
50
75
100
125
150
175


SiMe3
3f
PPM
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6.50
6.53
6.55
6.75
6.77
6.79
6.81
6.93
6.95
6.97
6.99
7.01
7.02
7.03
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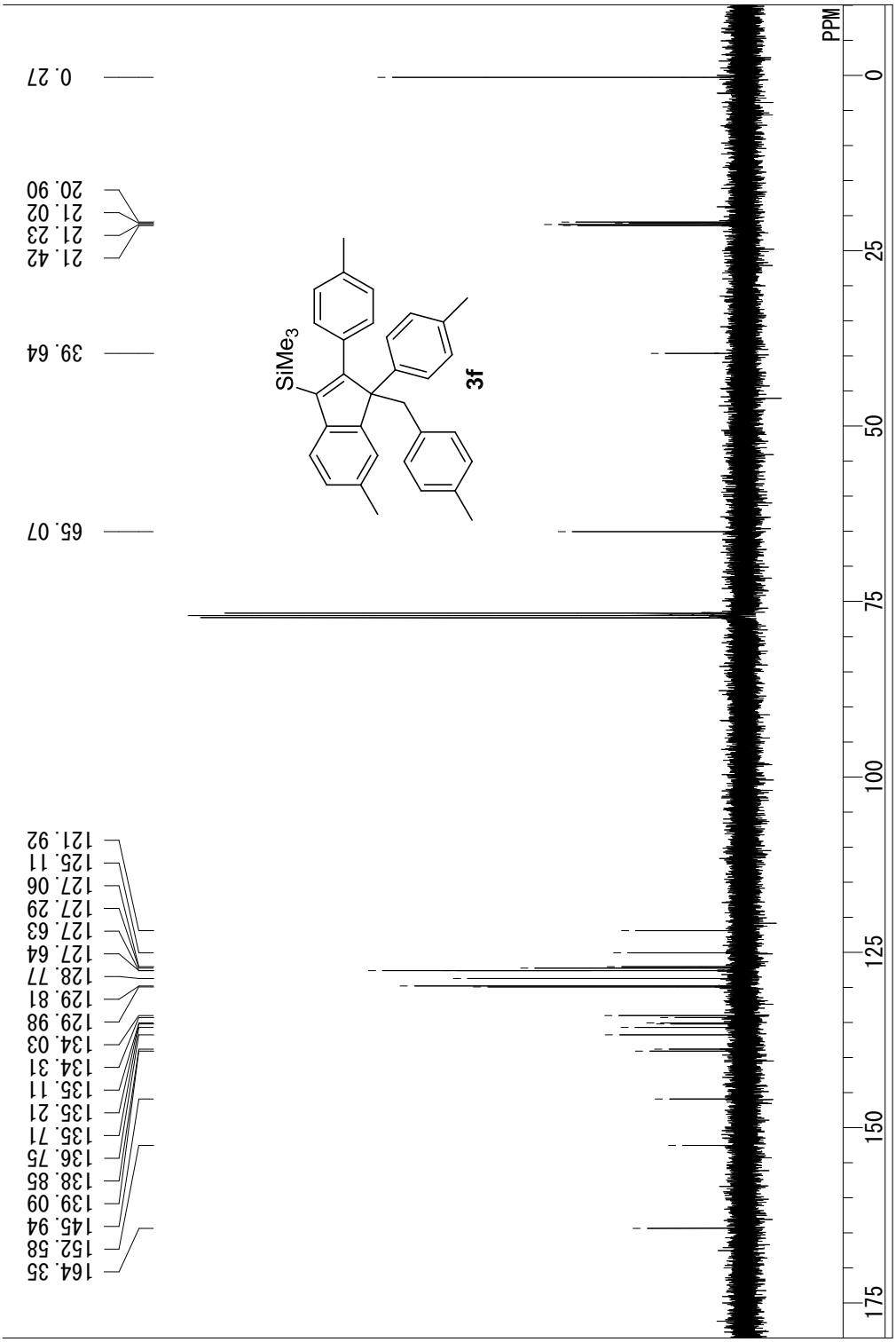
1.06
3.08
2.32
5.29
1.00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127.64
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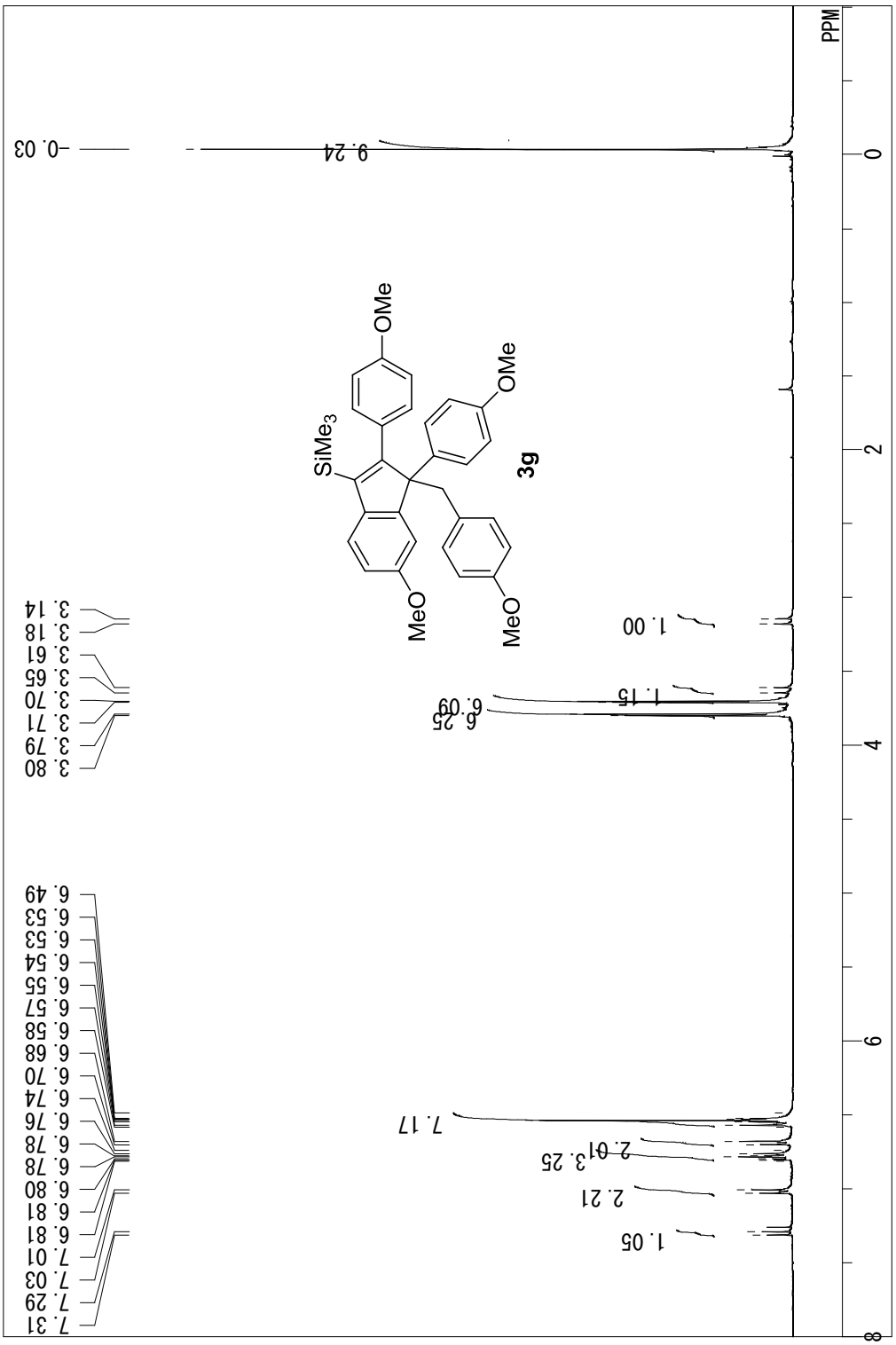
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OMe
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3g
MeO
MeO
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1.15
6.09
6.25
1.05
2.21
2.01
3.25
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3.14
3.18
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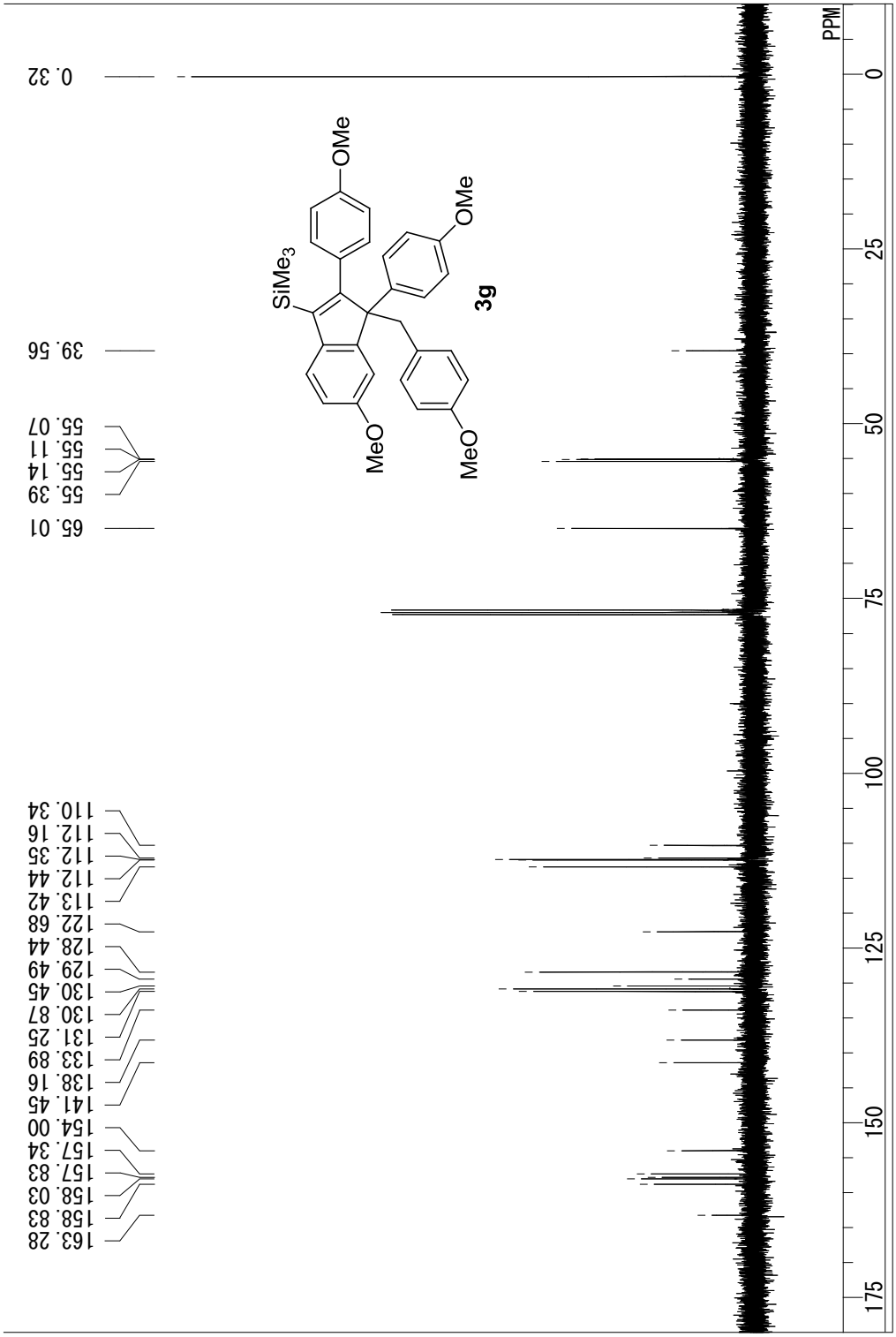
7.03
7.29
7.31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158.03
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OMe
OMe
MeO
MeO
3g
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100
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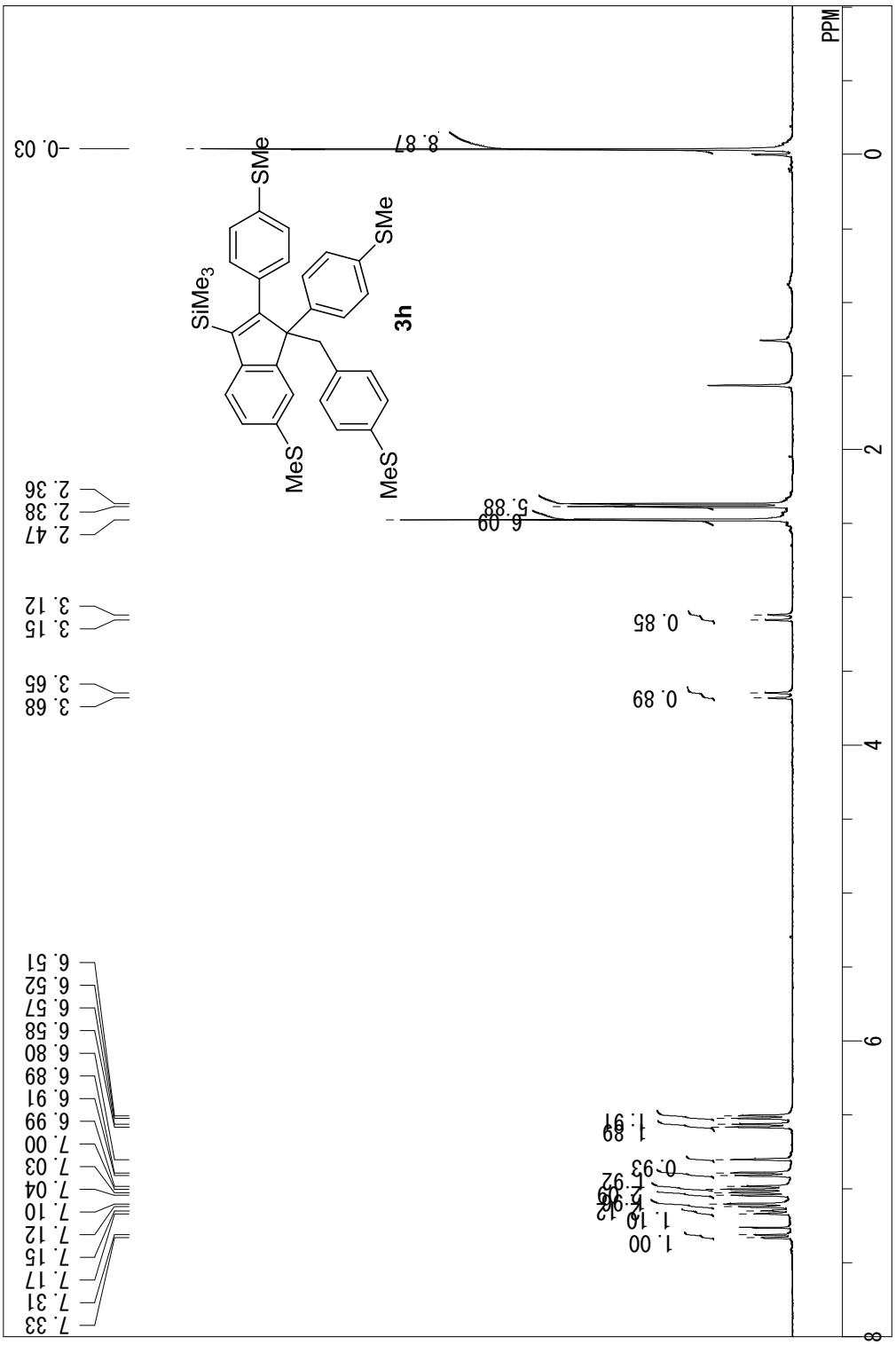
150
175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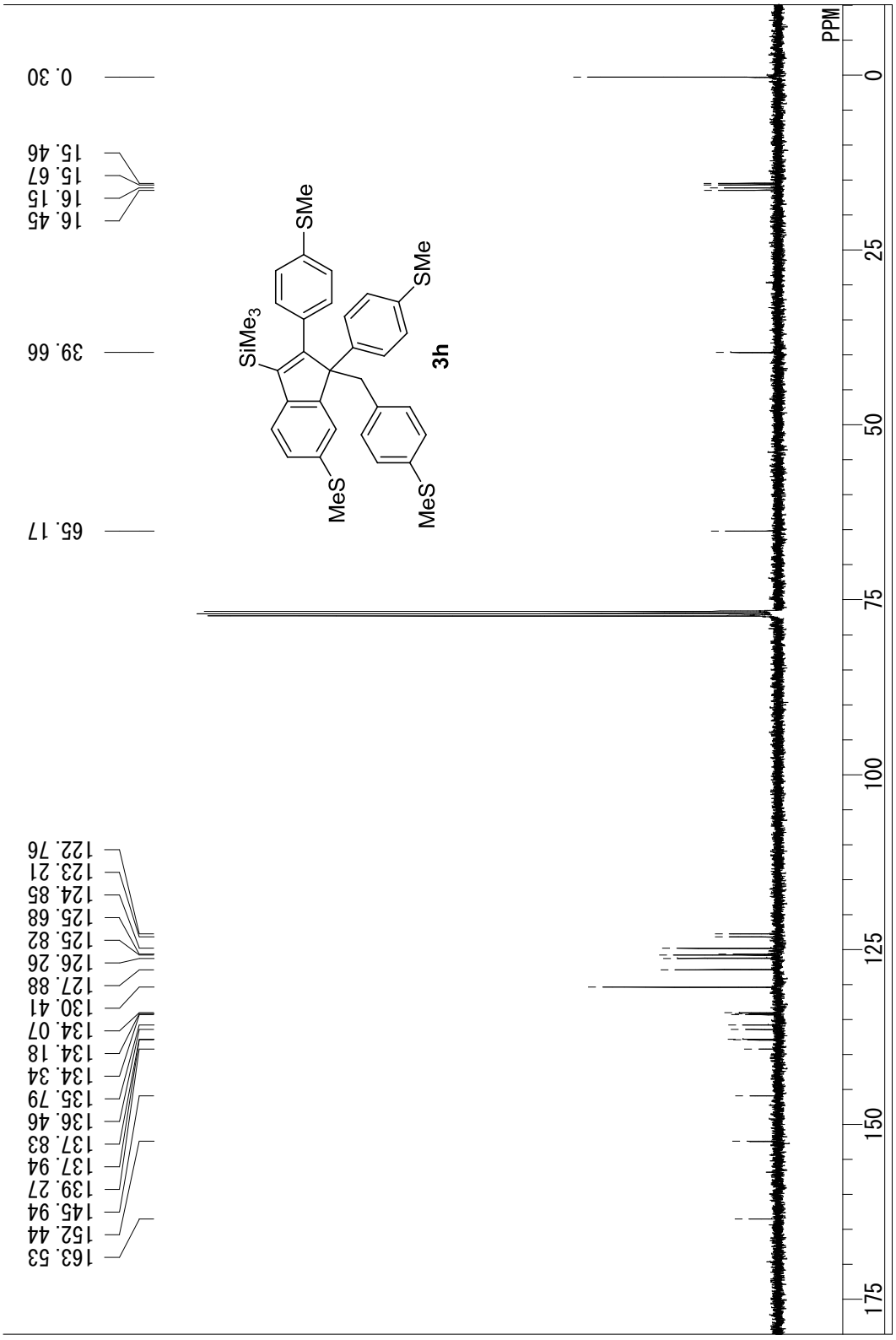
4
6
8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125.82
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134.34
135.79
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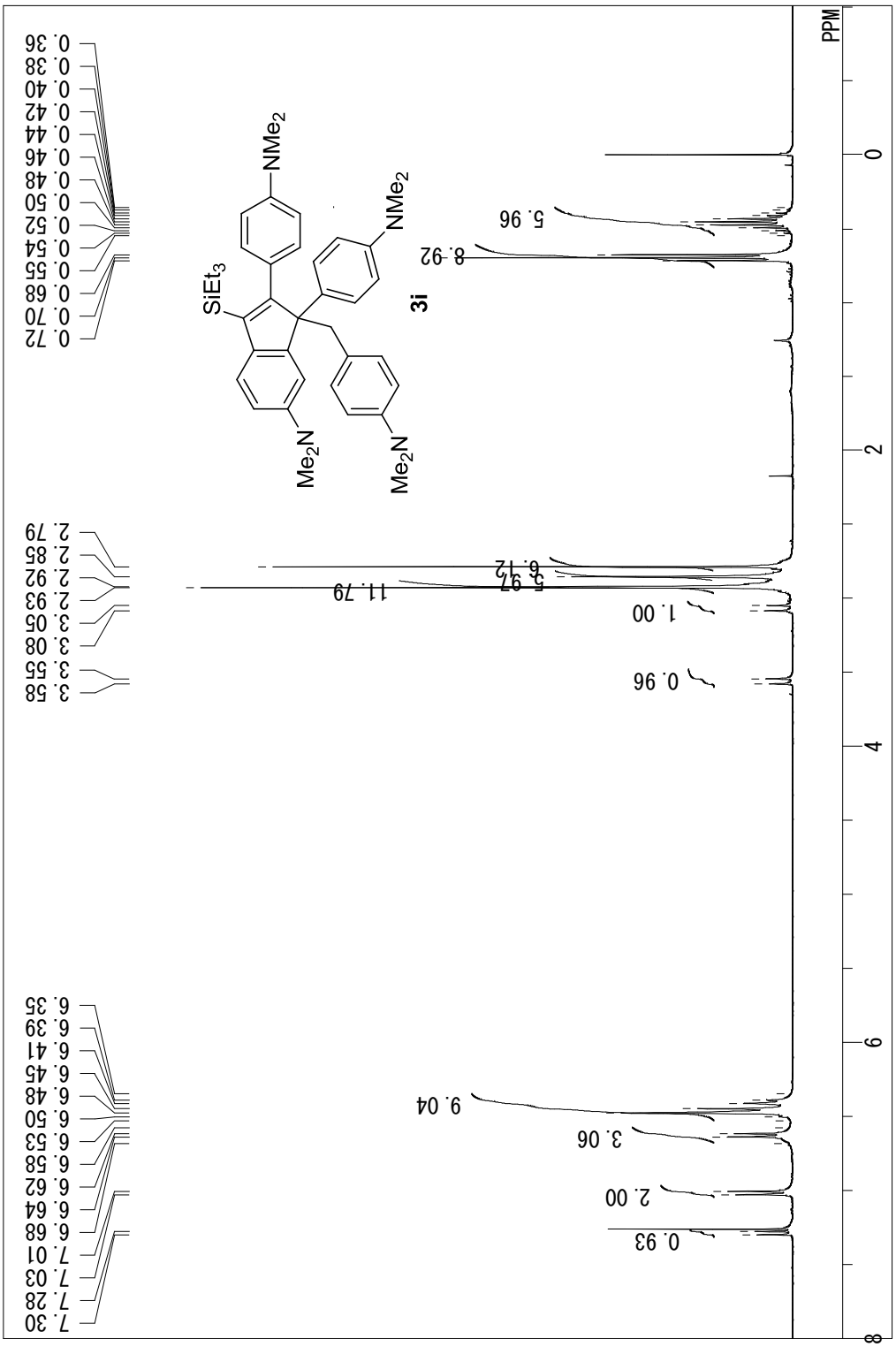
SMe
SMe
MeS
MeS
3h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2.79
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2.92
2.93
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NMe2
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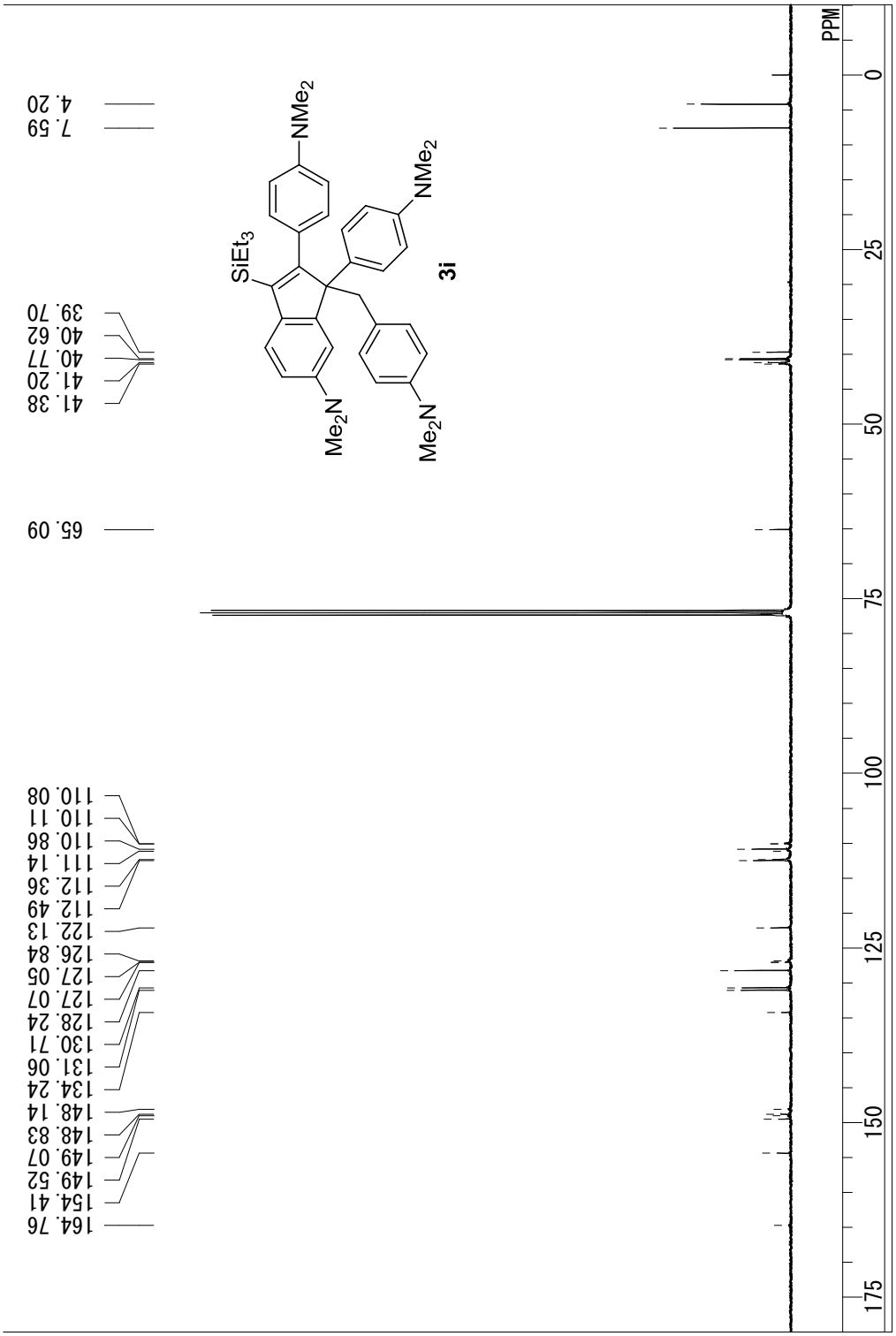
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150
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41.38
65.09
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110.11
110.86
111.14
112.36
112.49
122.13
126.84
127.05
127.07
128.24
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131.06
134.24
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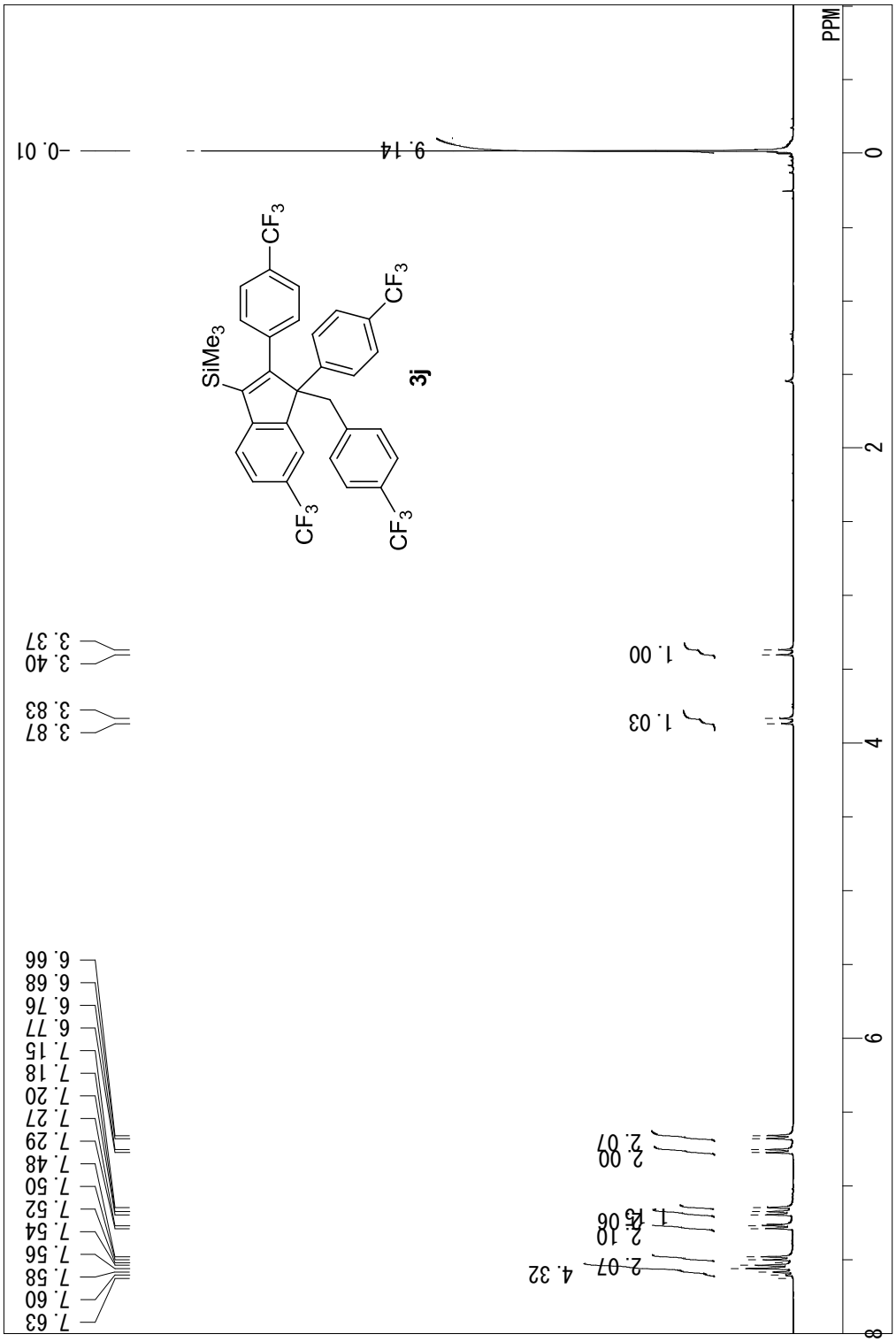
Me2N
3i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CF3
CF3
CF3
3j
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7.58
7.56
7.54
7.52
7.50
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7.29
7.27
7.20
7.18
7.15
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6.76
6.68
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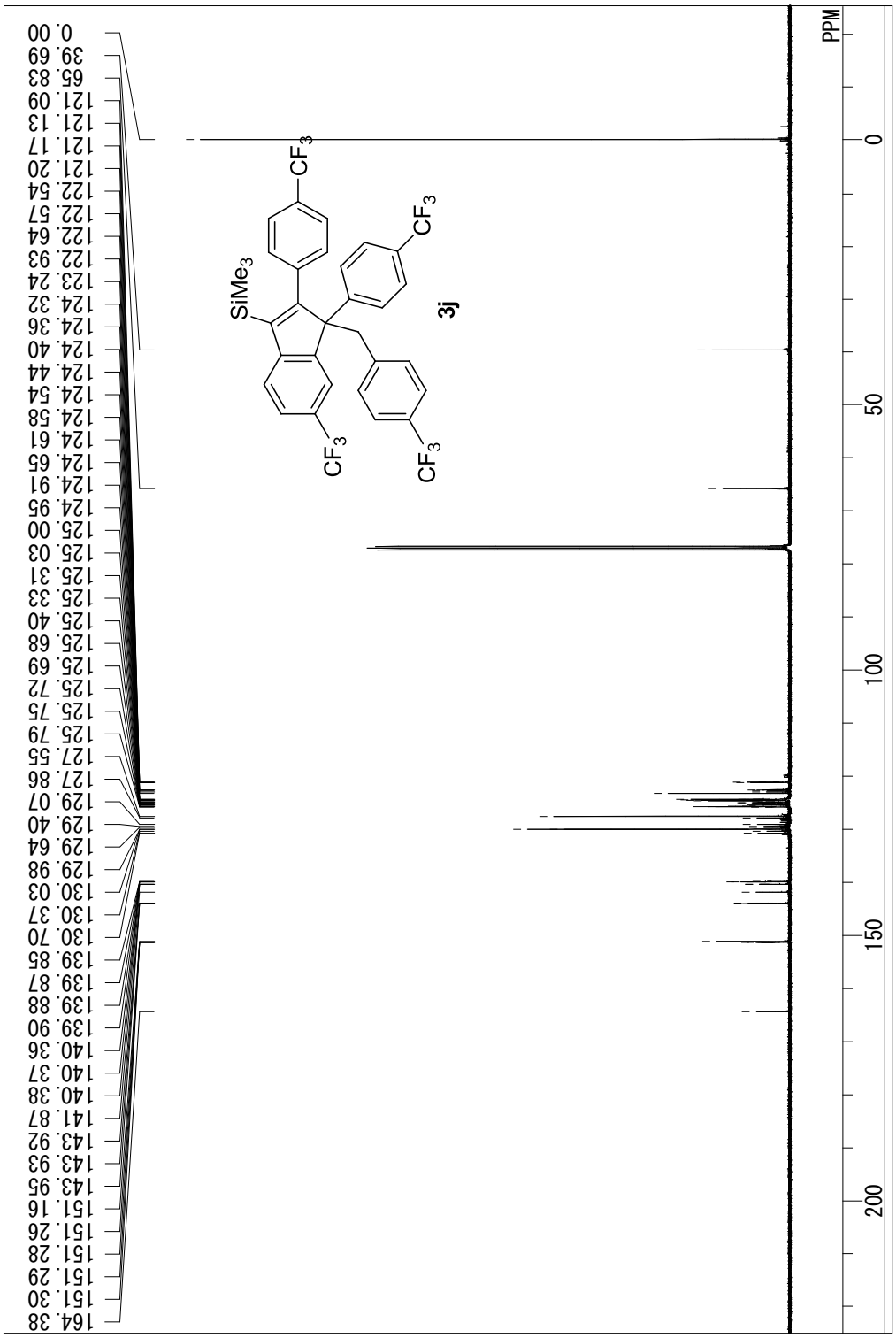
2.07
1.03
1.00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CF3
CF3
CF3
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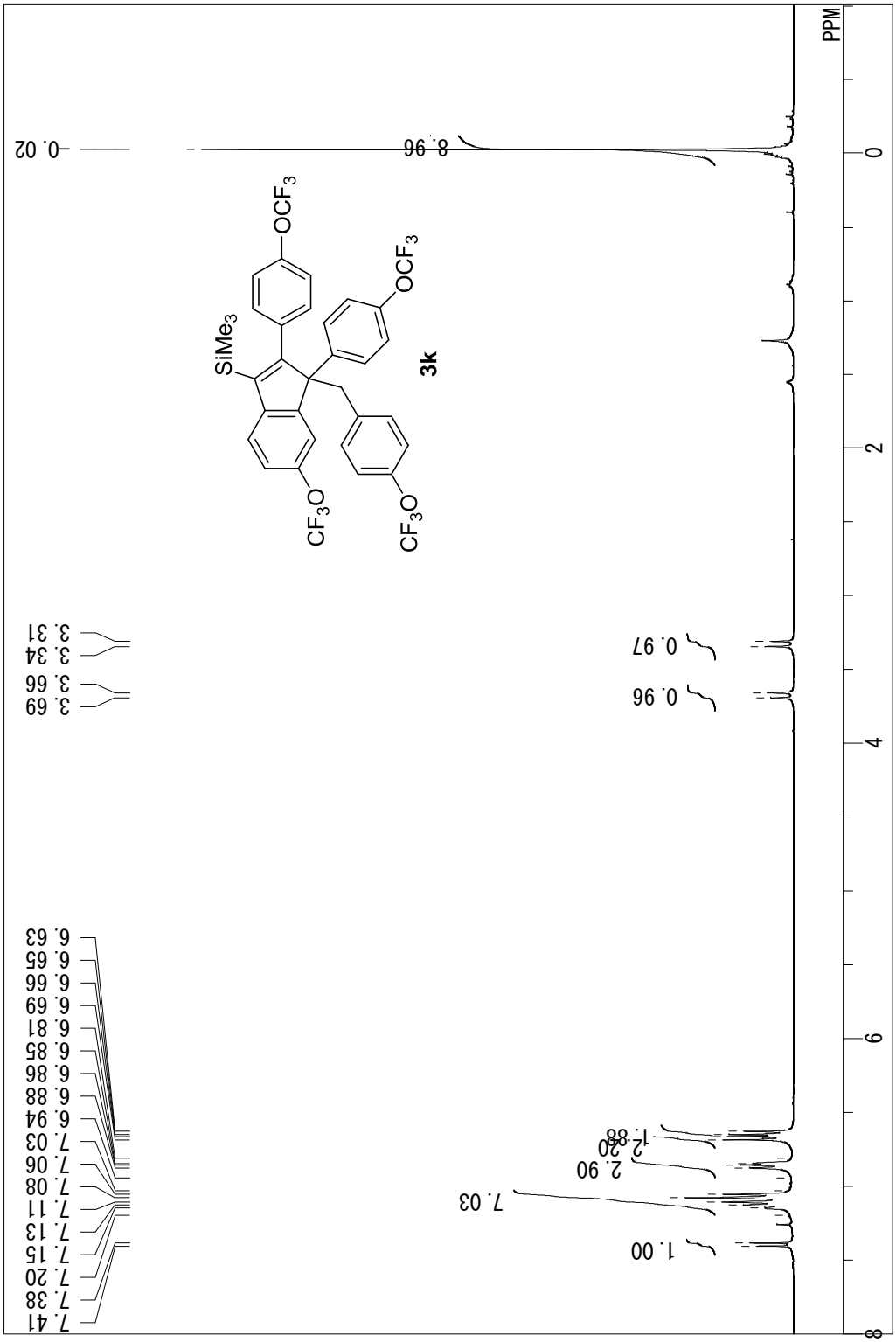
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OCF3
OCF3
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CF3O
CF3O
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0.97
0.96
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7.15
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7.11
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6.85
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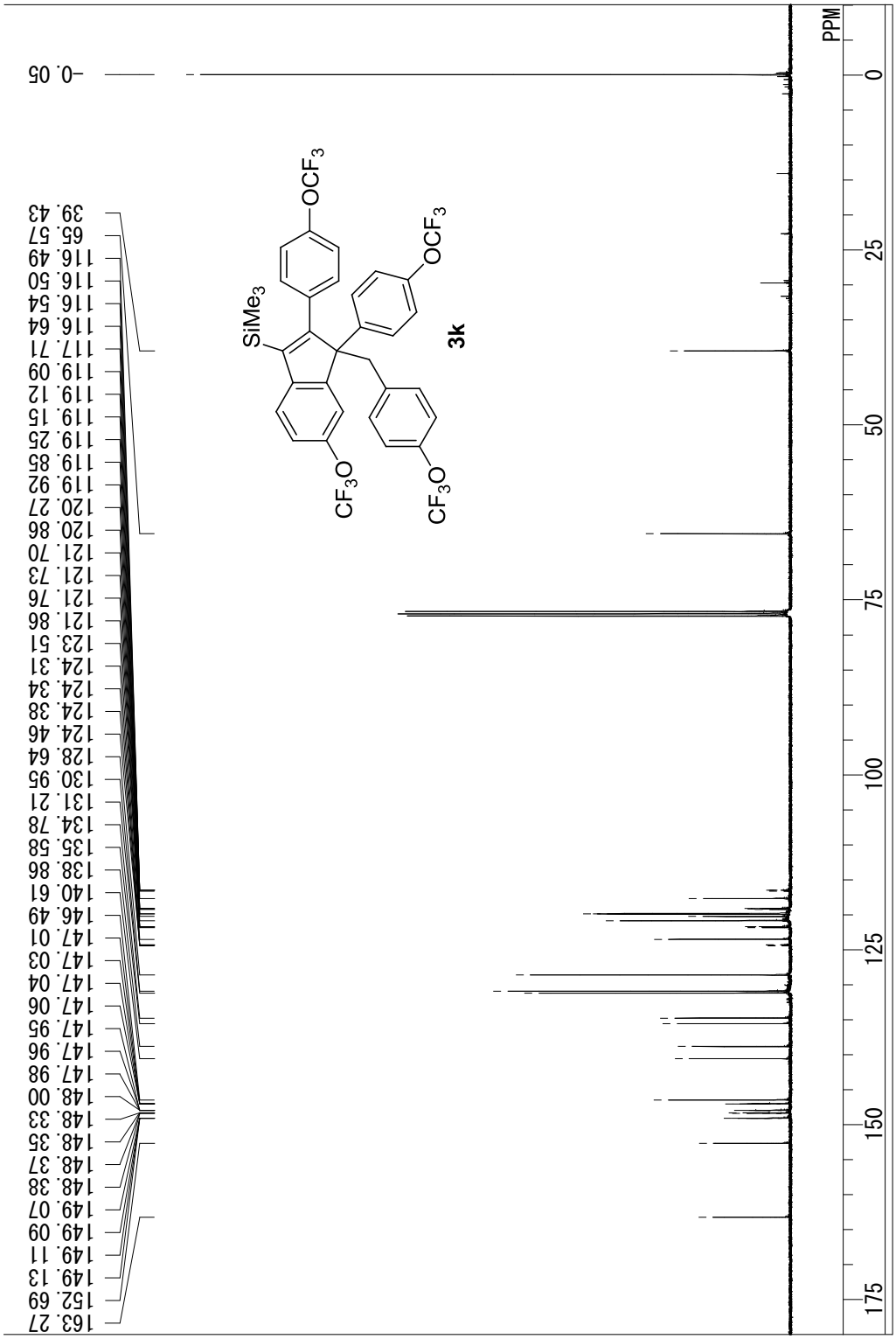
6.65
6.63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149.11
149.13
152.69
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OCF3
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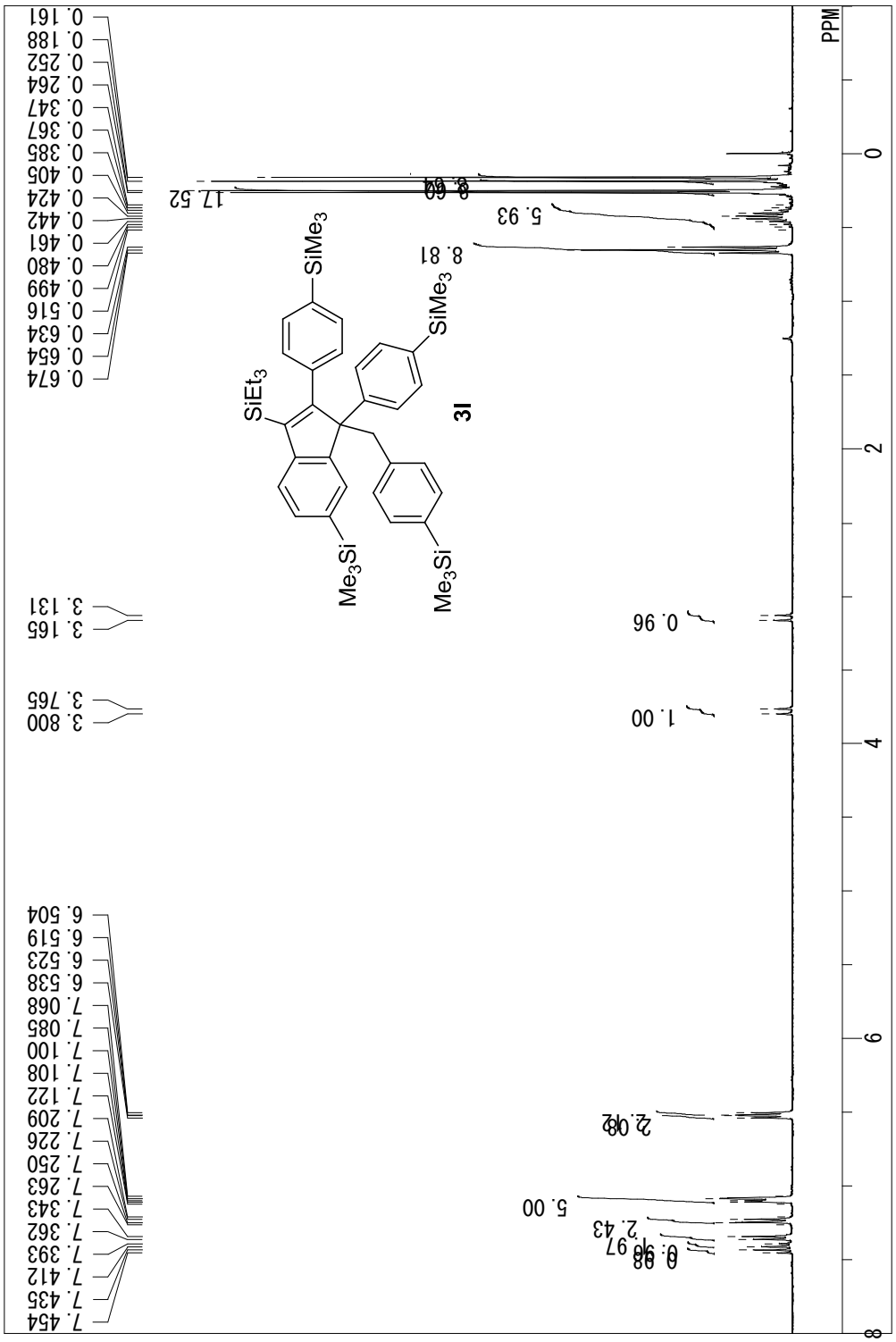
CF3O
CF3O
3k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7.343
7.263
7.250
7.226
7.209
7.122
7.108
7.100
7.085
7.068
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6.519
6.504
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3.765
3.165
3.131
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0.516
0.499
0.480
0.461
0.442
0.424
0.405
0.385
0.367
0.347
0.264
0.252
0.188
0.161
17.52
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2.08
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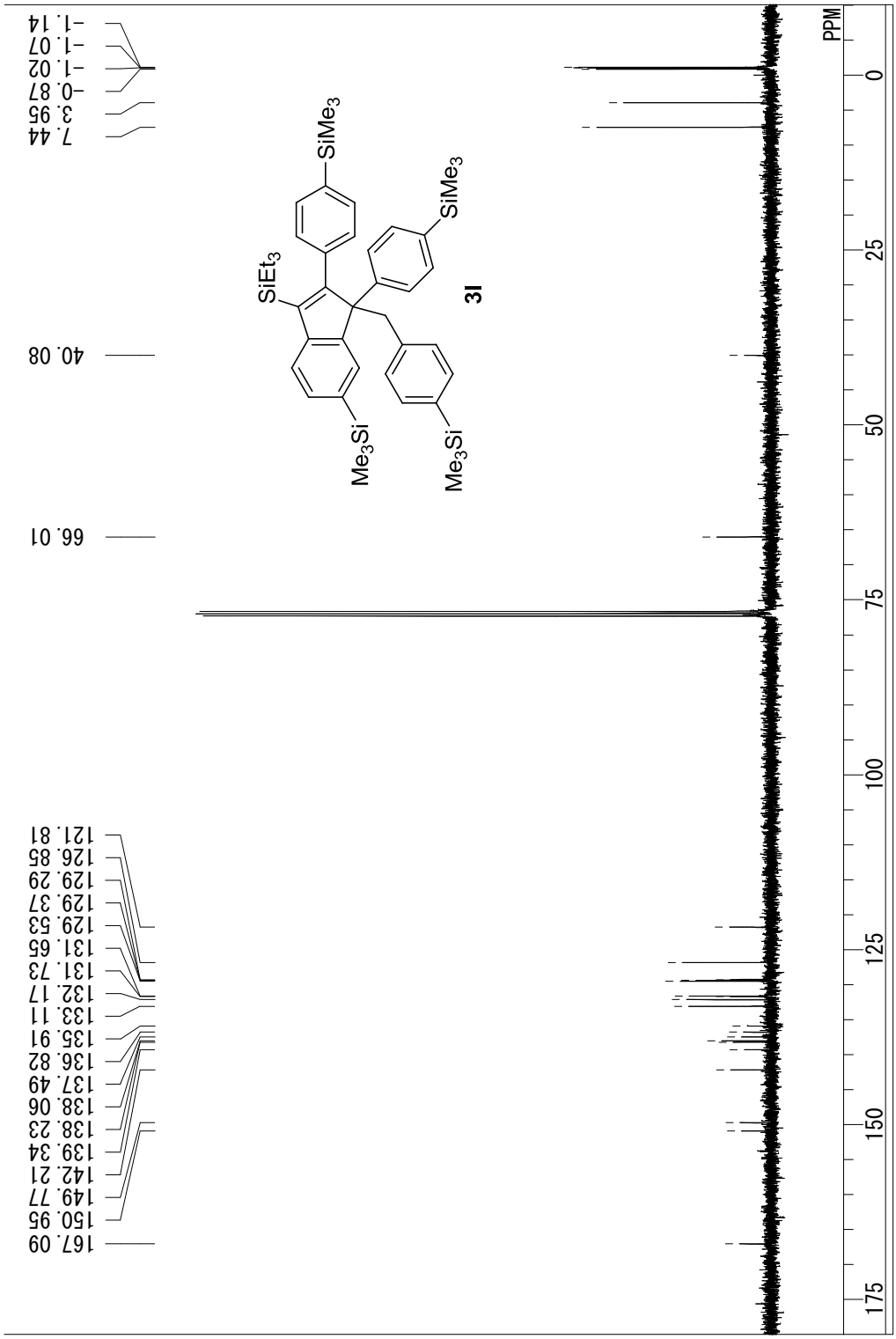
SiMe3
SiEt3
Me3Si
Me3Si
3l


SiMe3
SiMe3
SiEt3
Me3Si
Me3Si
3l
PPM
0
25
50
75
100
125
150
175
-1.14
-1.07
-1.02
-0.87
3.95
7.44
40.08
66.01
121.81
126.85
129.29
129.37
129.53
131.65
131.73
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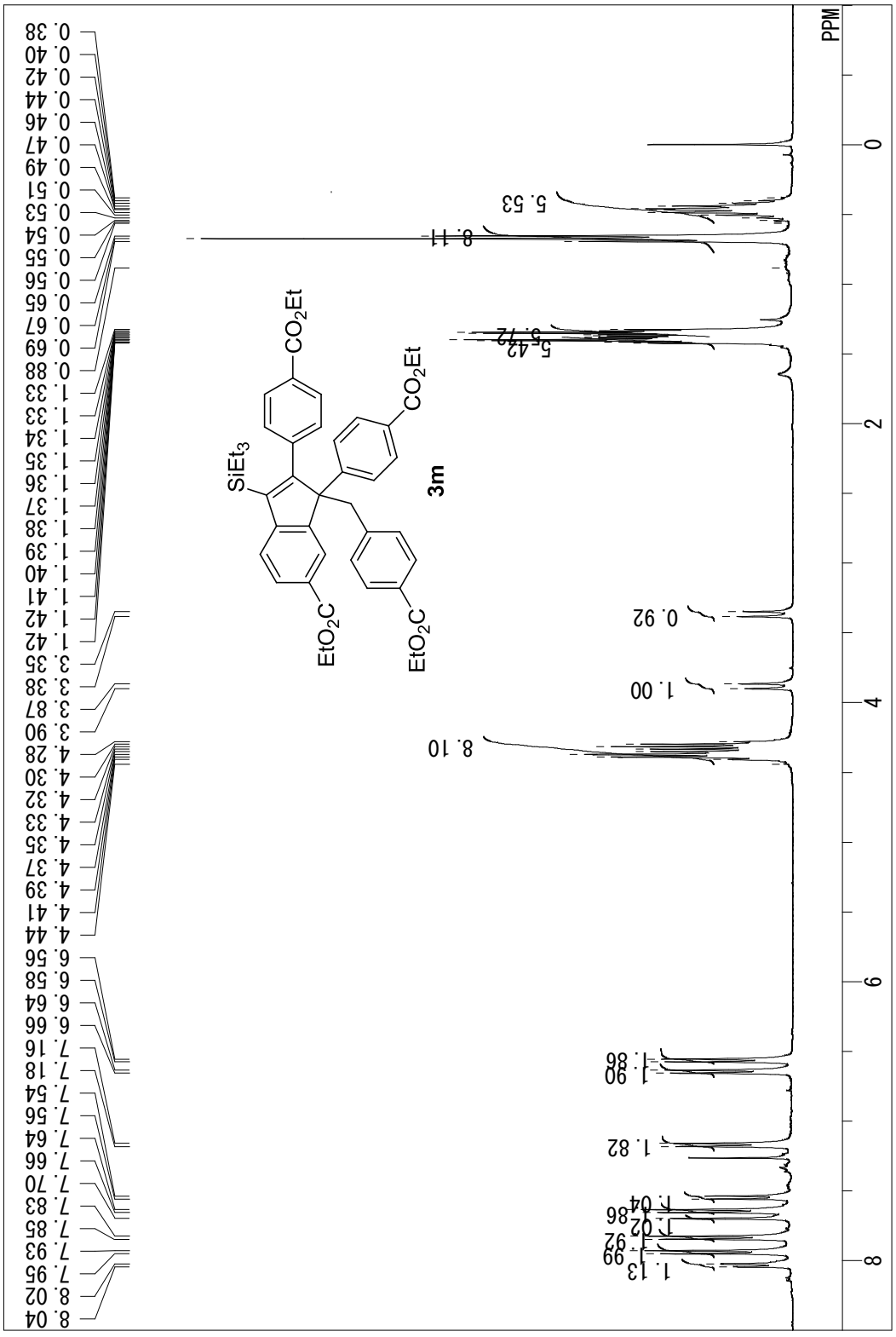
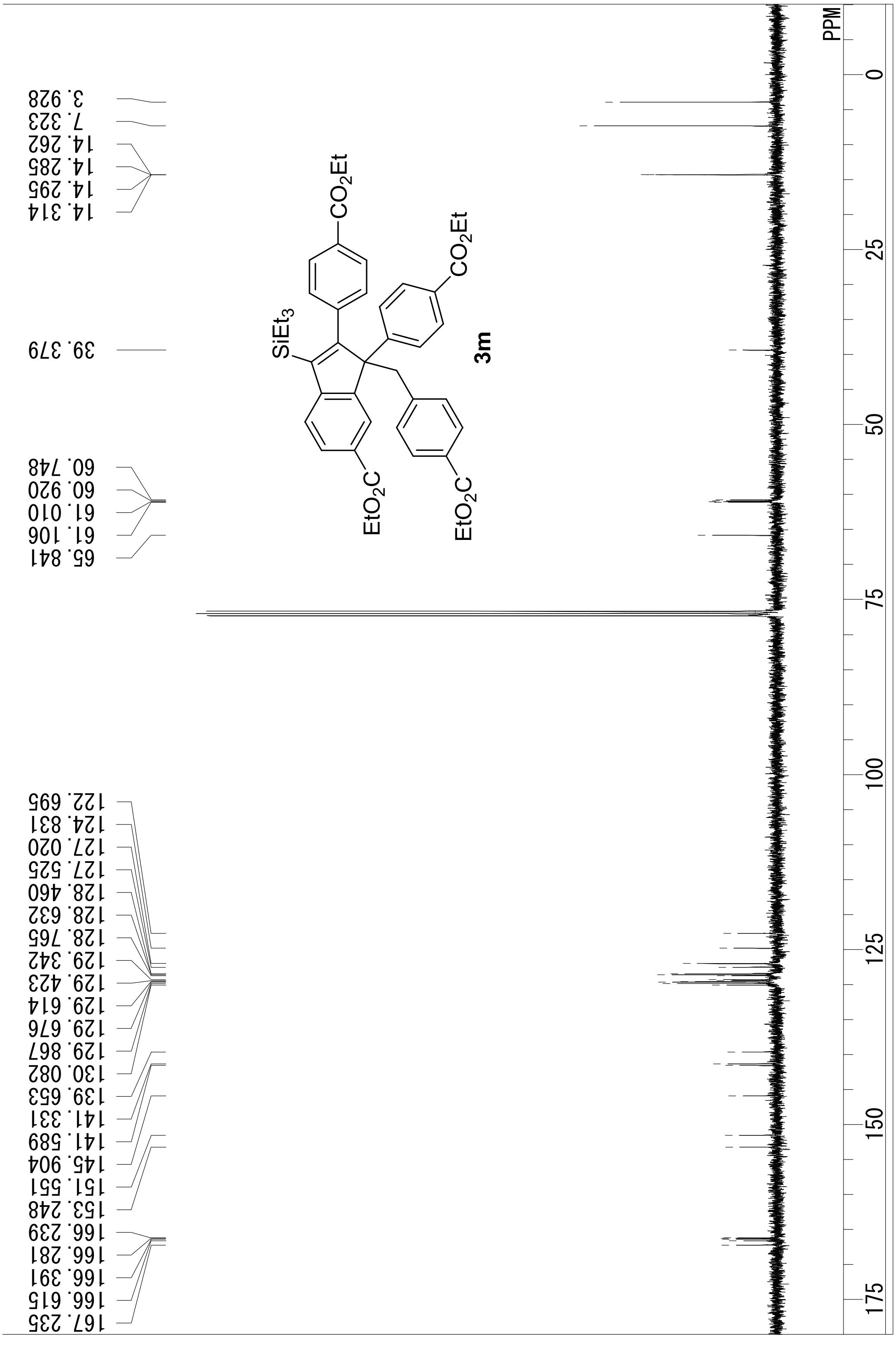

3m
SiEt3
CO2Et
CO2Et
EtO2C
EtO2C
8.10
5.53
5.42
5.12
8.11
1.00
0.92
1.82
1.90
1.86
1.13
1.99
1.92
1.02
1.04
PPM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61.106
65.841
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129.614
129.676
129.867
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139.653
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166.239
166.281
166.391
166.615
167.235
SiEt3
CO2Et
CO2Et
EtO2C
EtO2C
3m
PPM
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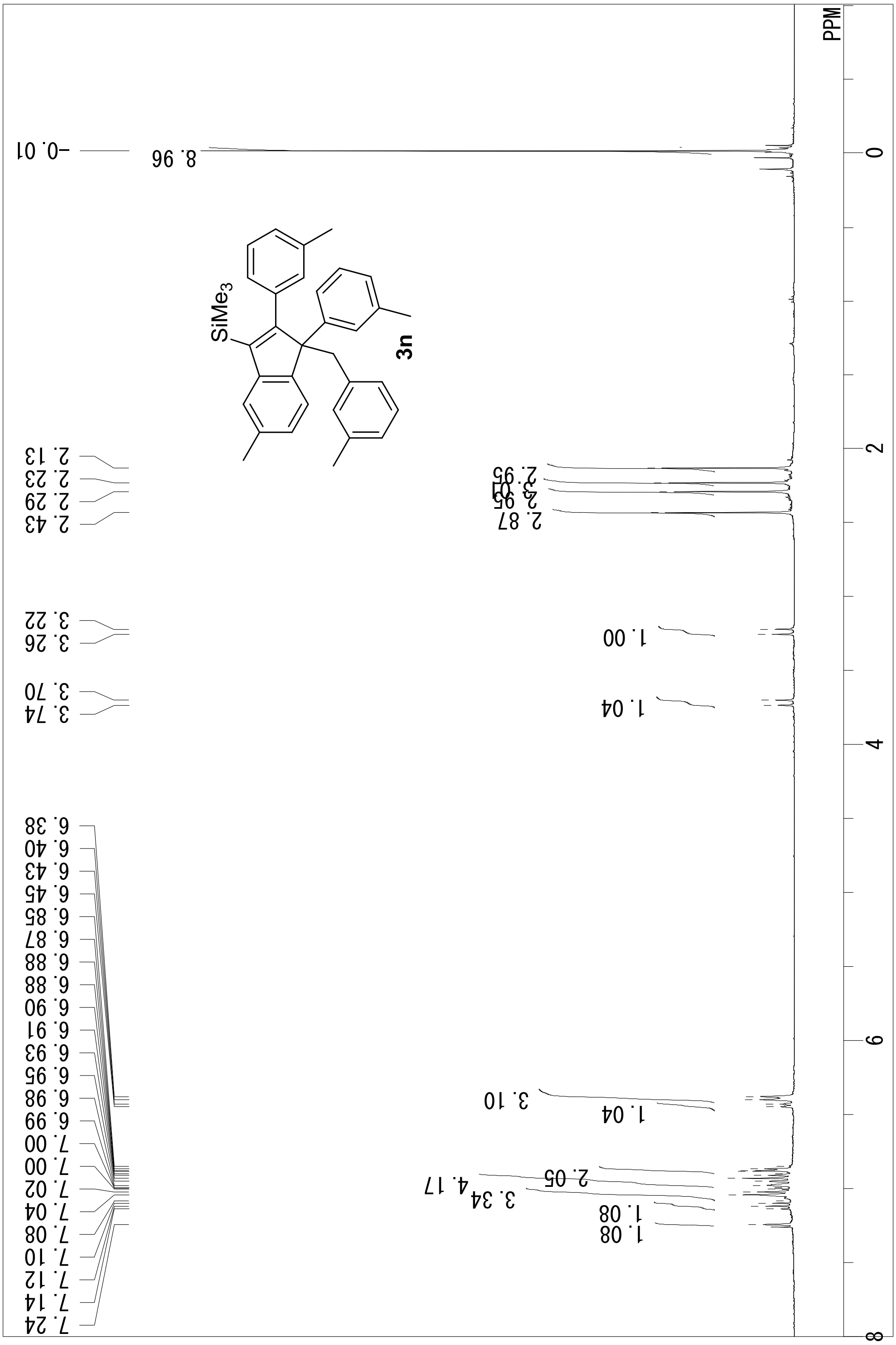
150
175


SiMe3
3n
PPM
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8.96
2.13
2.23
2.29
2.43
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2.95
2.87
3.22
3.26
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3.70
3.74
1.04
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6.40
6.43
6.45
6.85
6.87
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6.88
6.90
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6.95
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6.99
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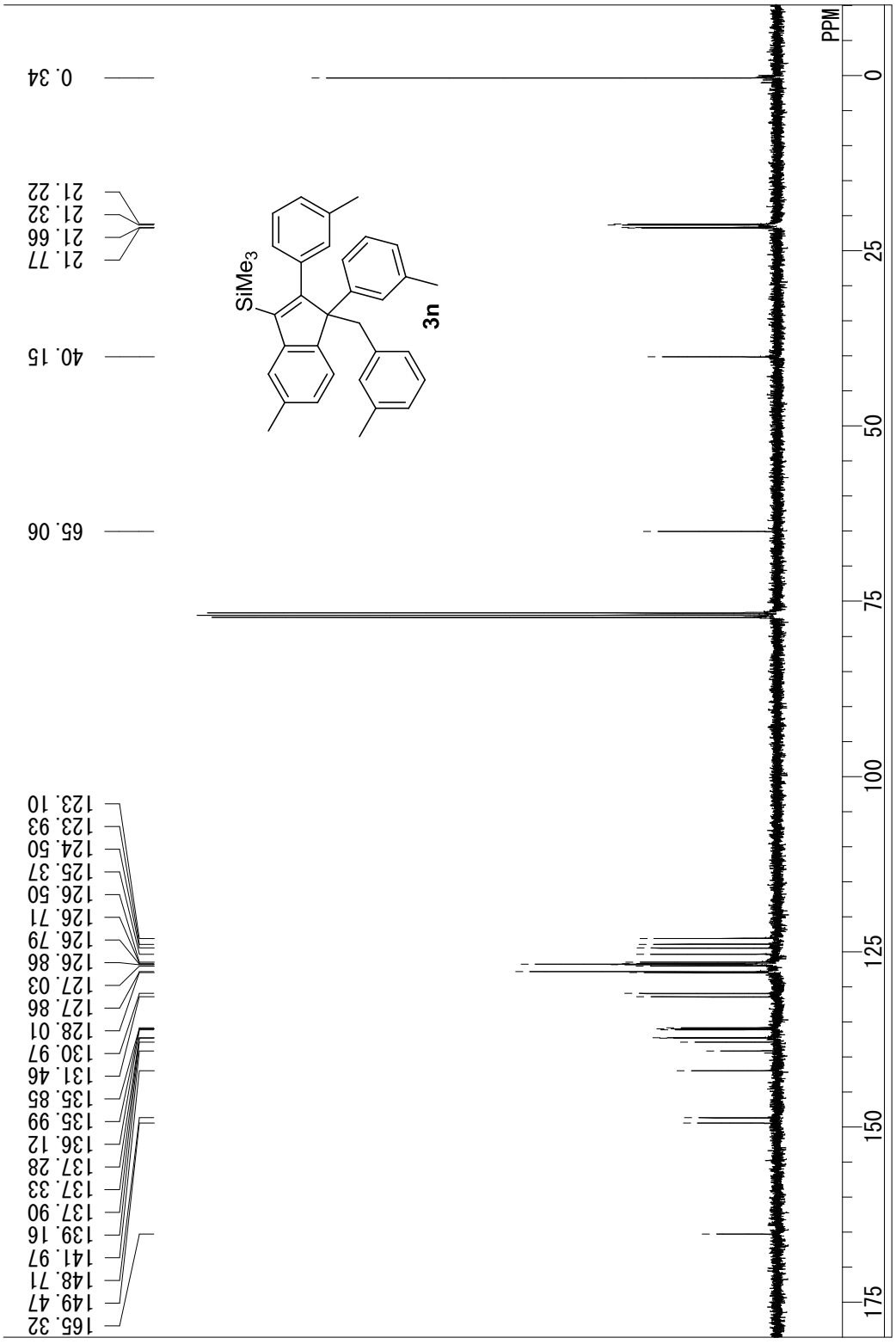
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165.32
SiMe3
3n
PPM
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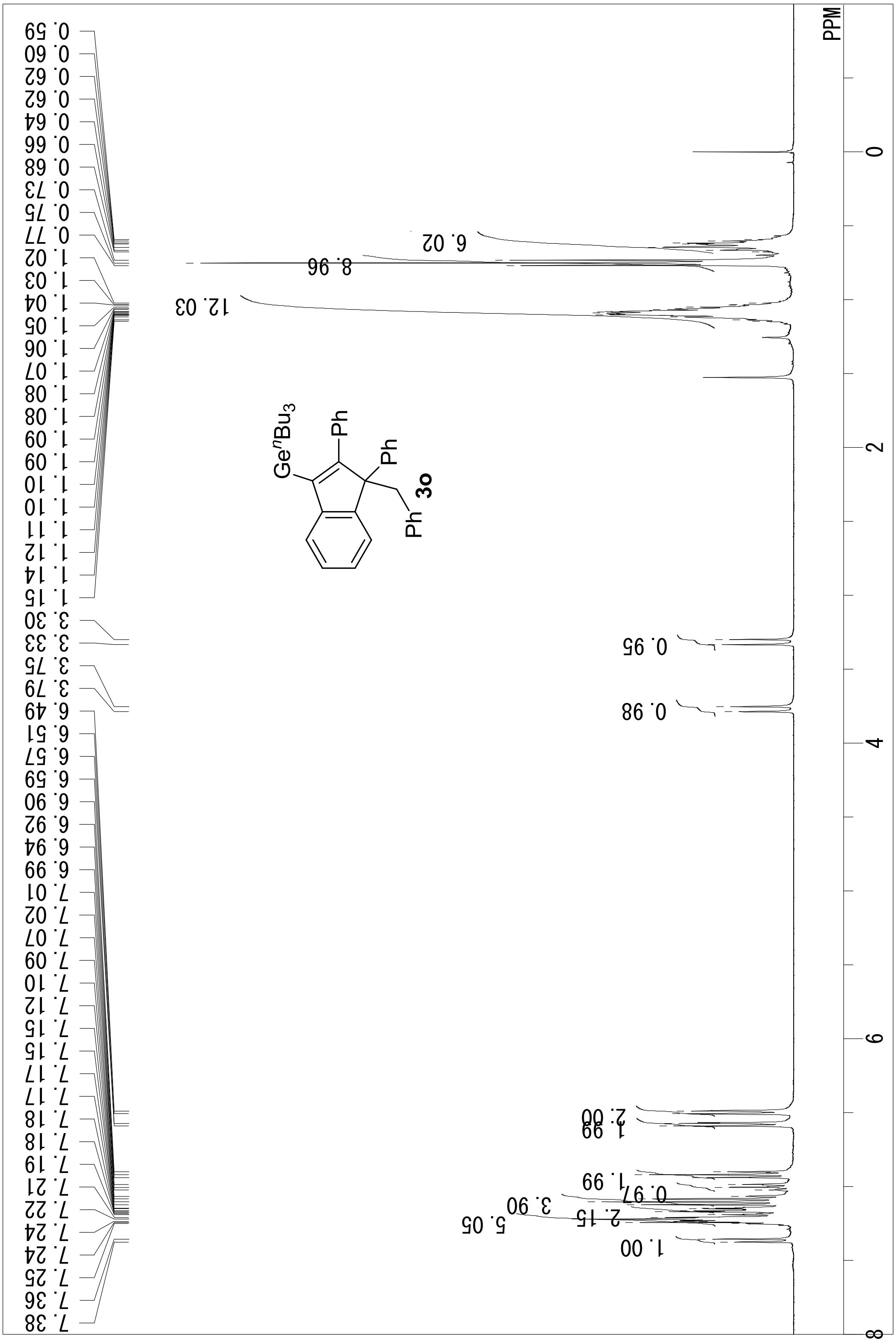
150
175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1.05
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1.08
1.08
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1.10
1.10
1.11
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1.15
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6.59
6.90
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6.94
6.99
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7.02
7.07
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7.15
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12.03
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0.98
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1.99
1.99
0.97
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Ge^{n}Bu$_3$
Ph
Ph
Ph
3o
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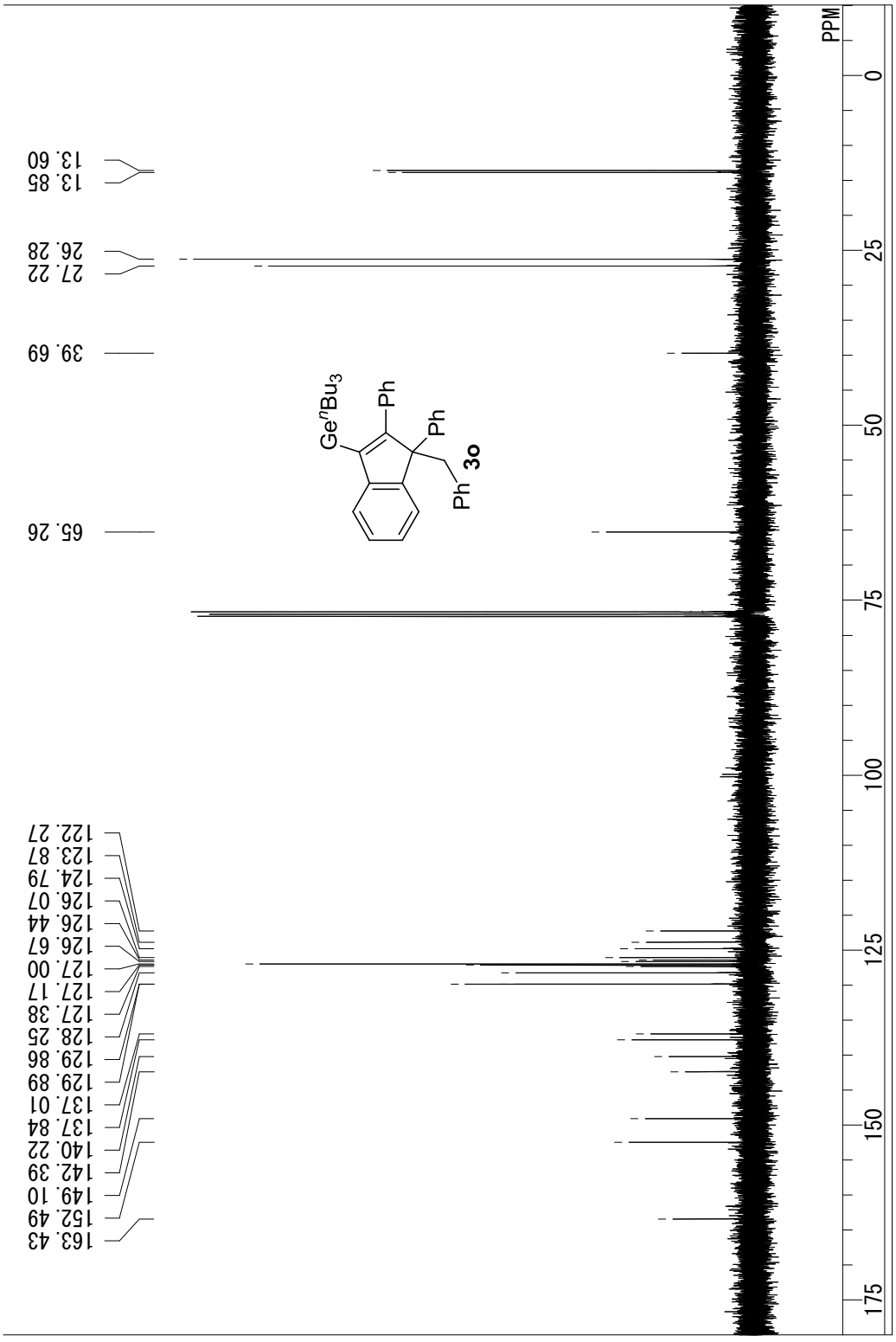
6
8
PPM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126.44
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128.25
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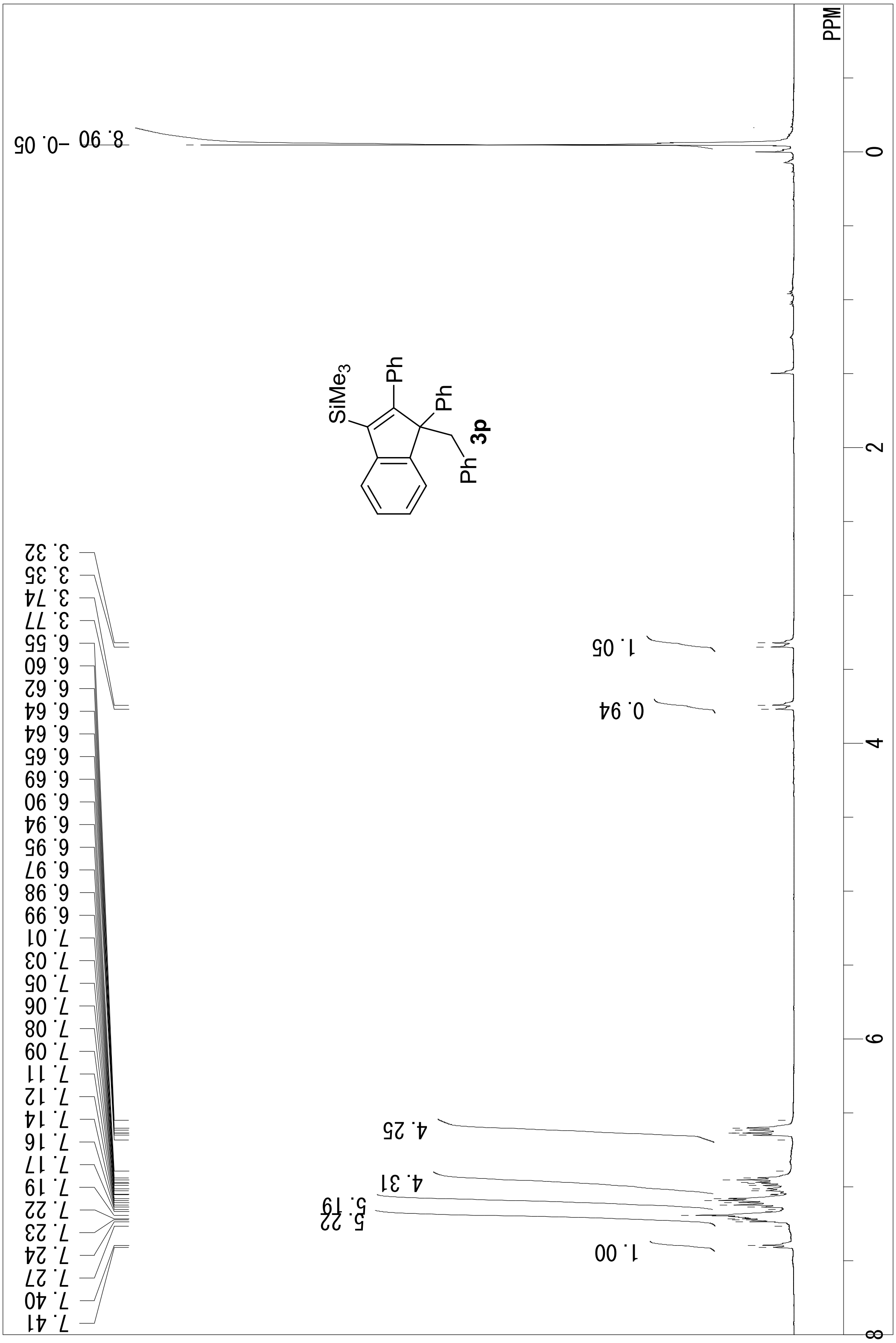
Ge^{n}Bu$_3$
Ph
Ph
Ph
3o



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6.69
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6.64
6.64
6.62
6.60
6.55
3.77
3.74
3.35
3.32
8.90
-0.05
1.00
5.22
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0.94
1.05
SiMe3
Ph
Ph
Ph
3p
PPM
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4
6
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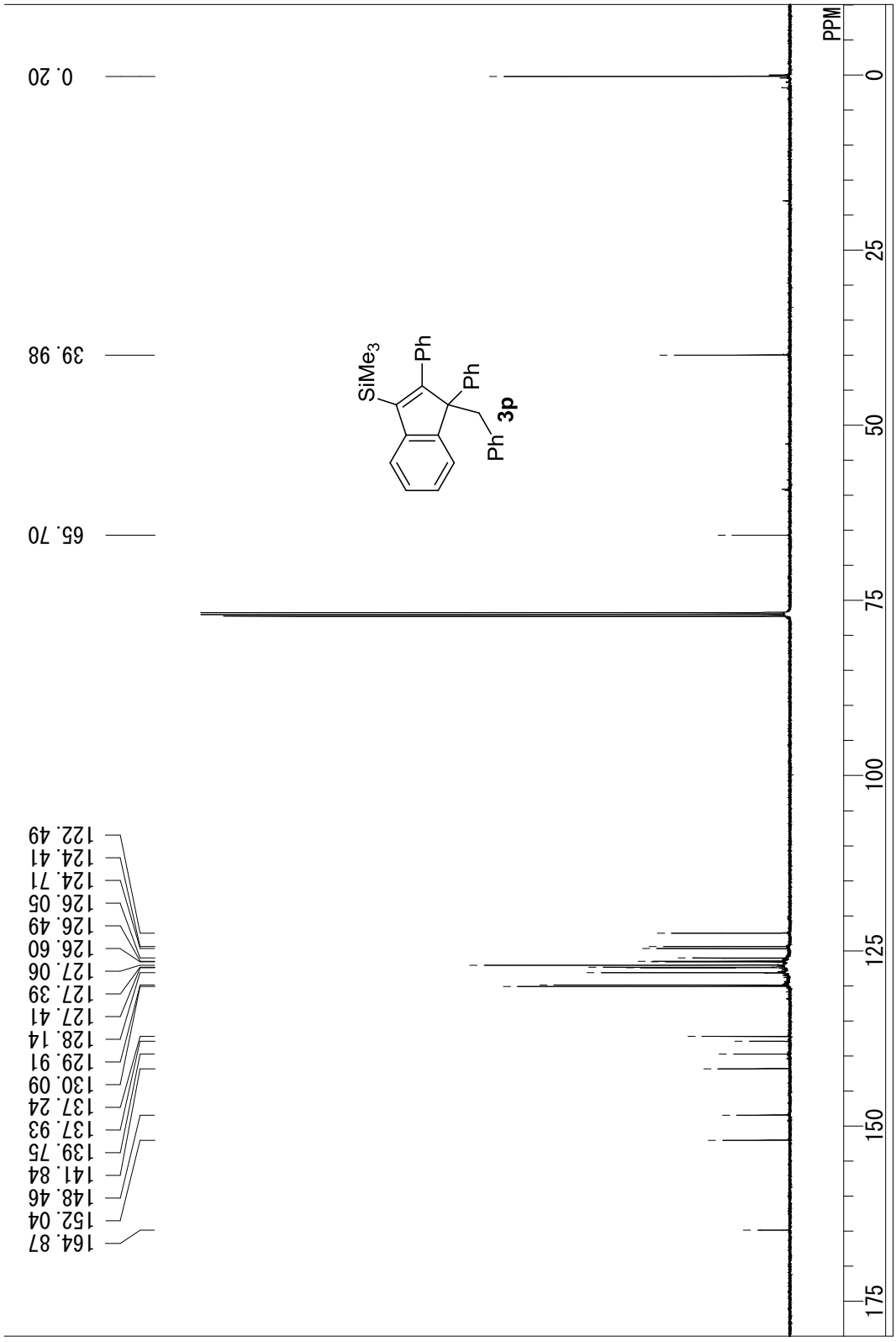
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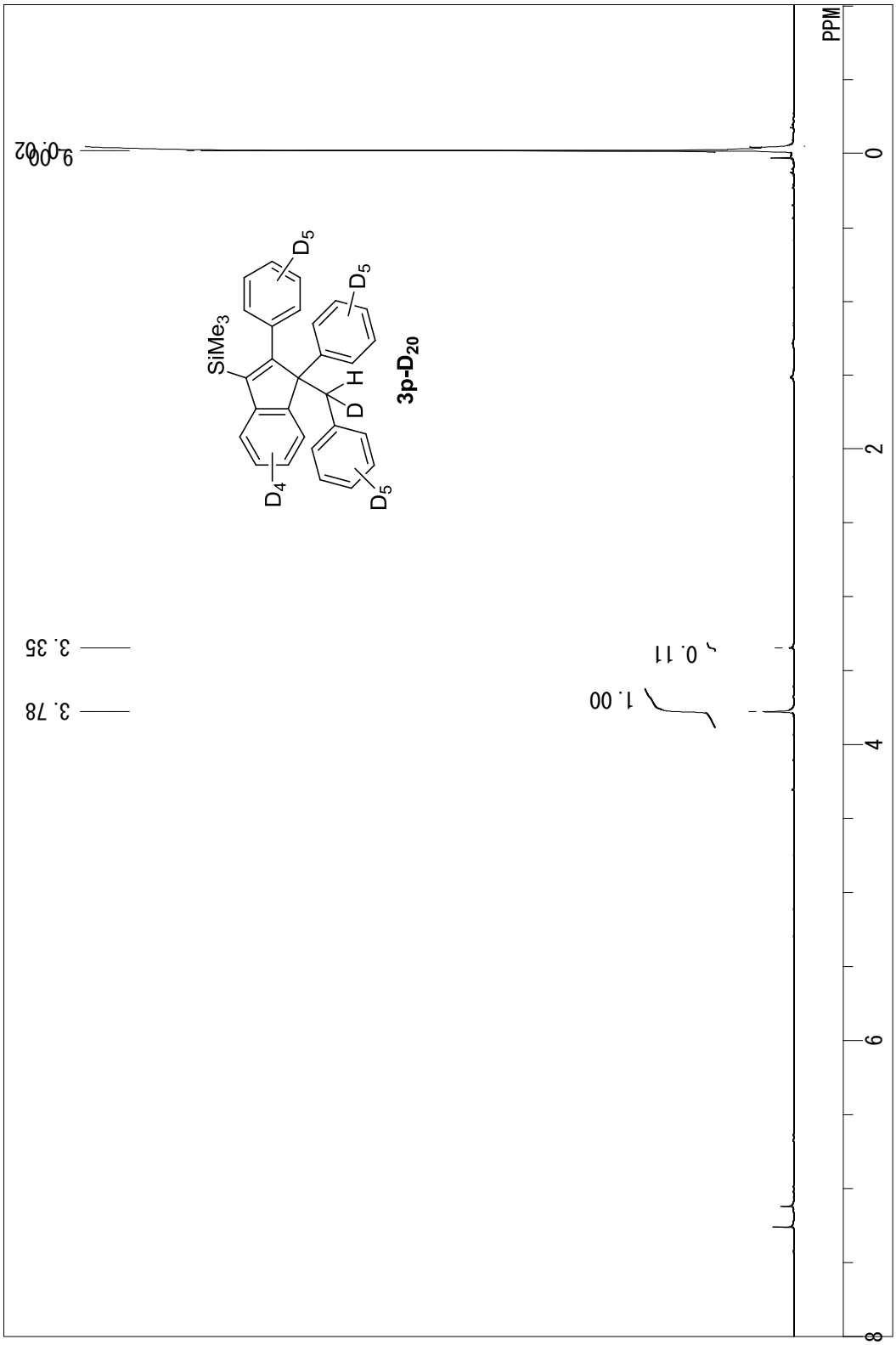
Ph
Ph
Ph
3p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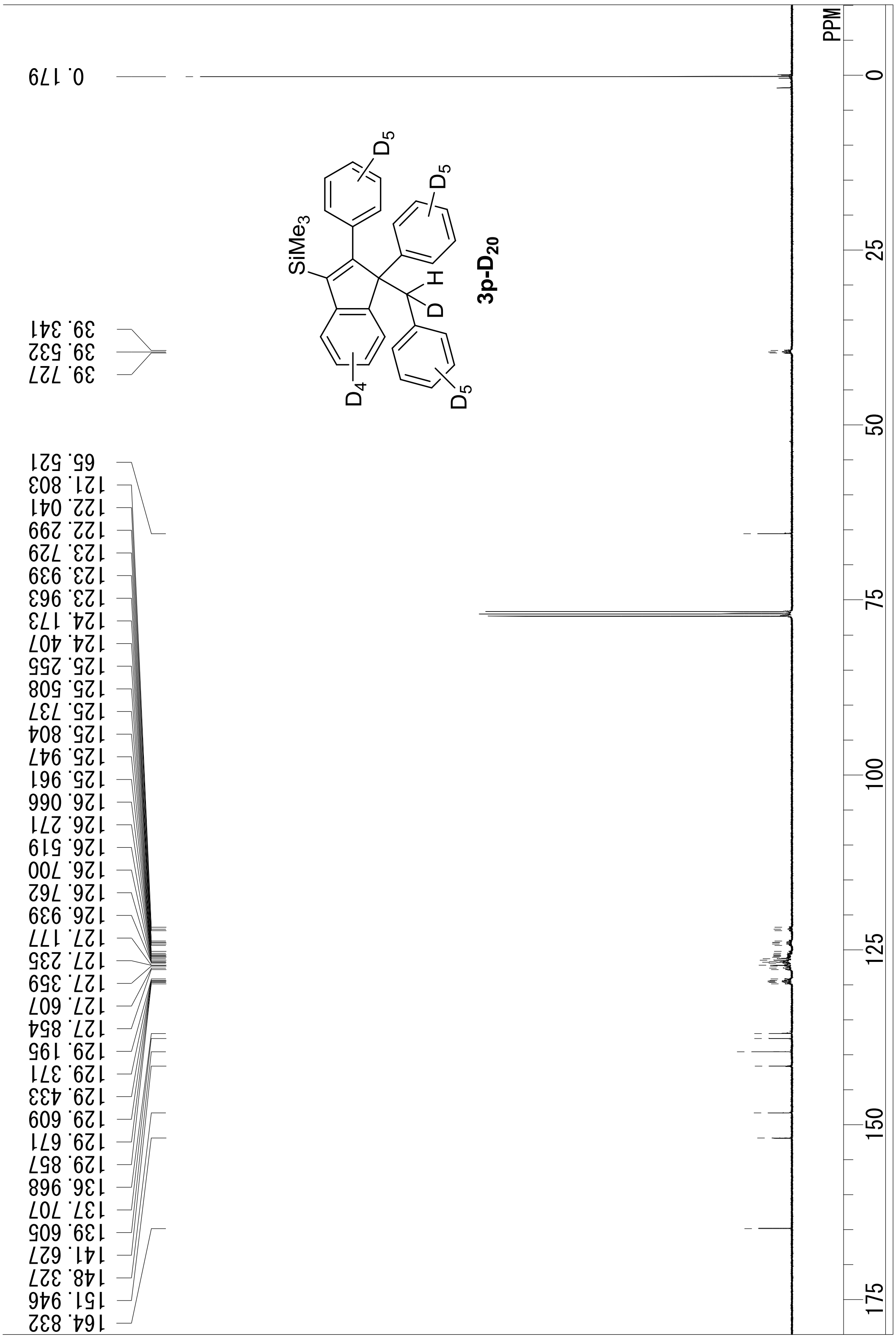
D5
D5
D
H
D4
D5
3p-D20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122.299
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123.939
123.963
124.173
124.407
125.255
125.508
125.737
125.804
125.947
125.961
126.066
126.271
126.519
126.700
126.762
126.939
127.177
127.235
127.359
127.607
127.854
129.195
129.371
129.433
129.609
129.671
129.857
136.968
137.707
139.605
141.627
148.327
151.946
164.832
SiMe$_3$
D$_5$
D$_5$
D$_4$
D
H
D$_5$
3p-D$_{20}$
PPM
0
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150
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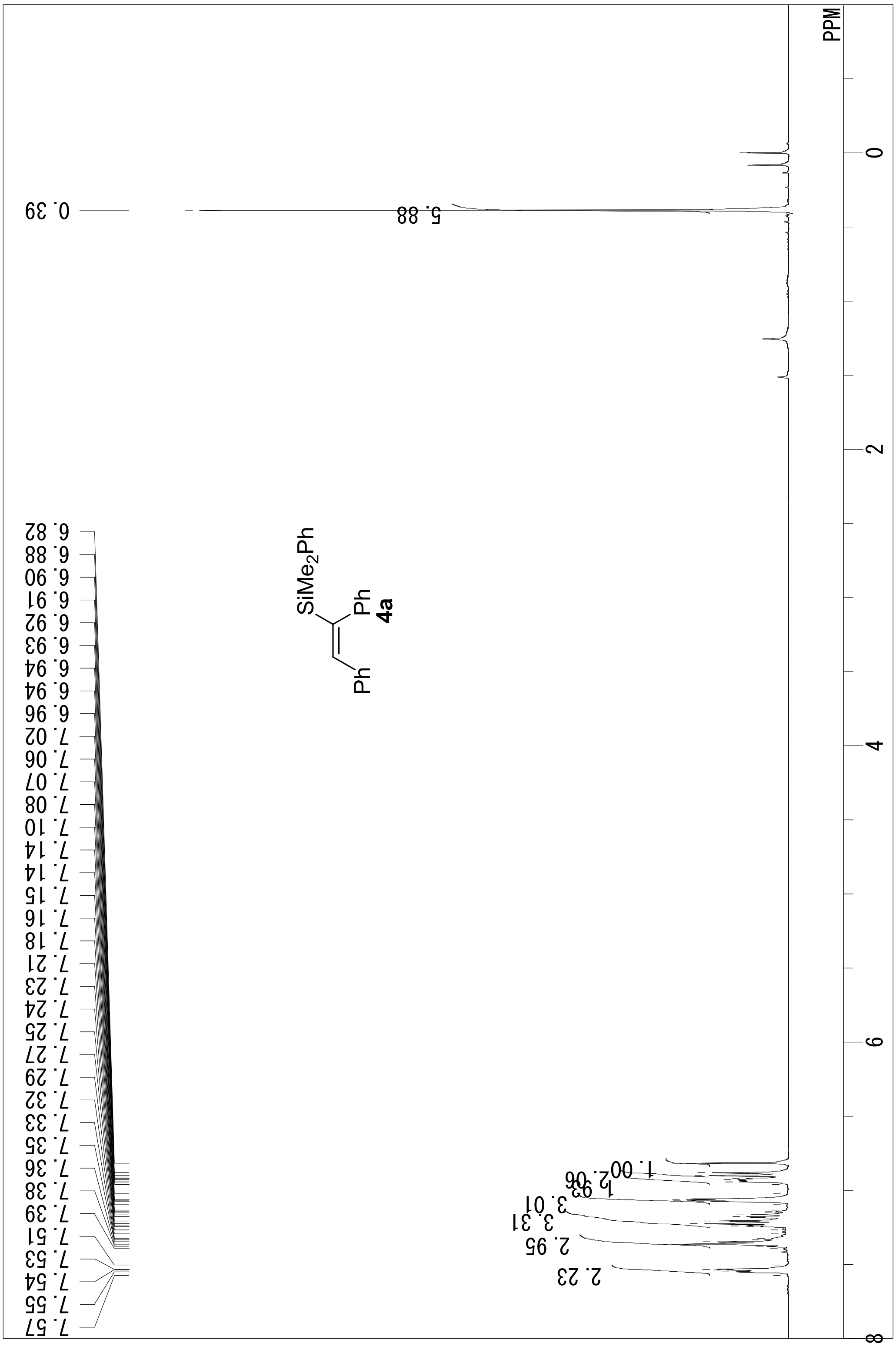
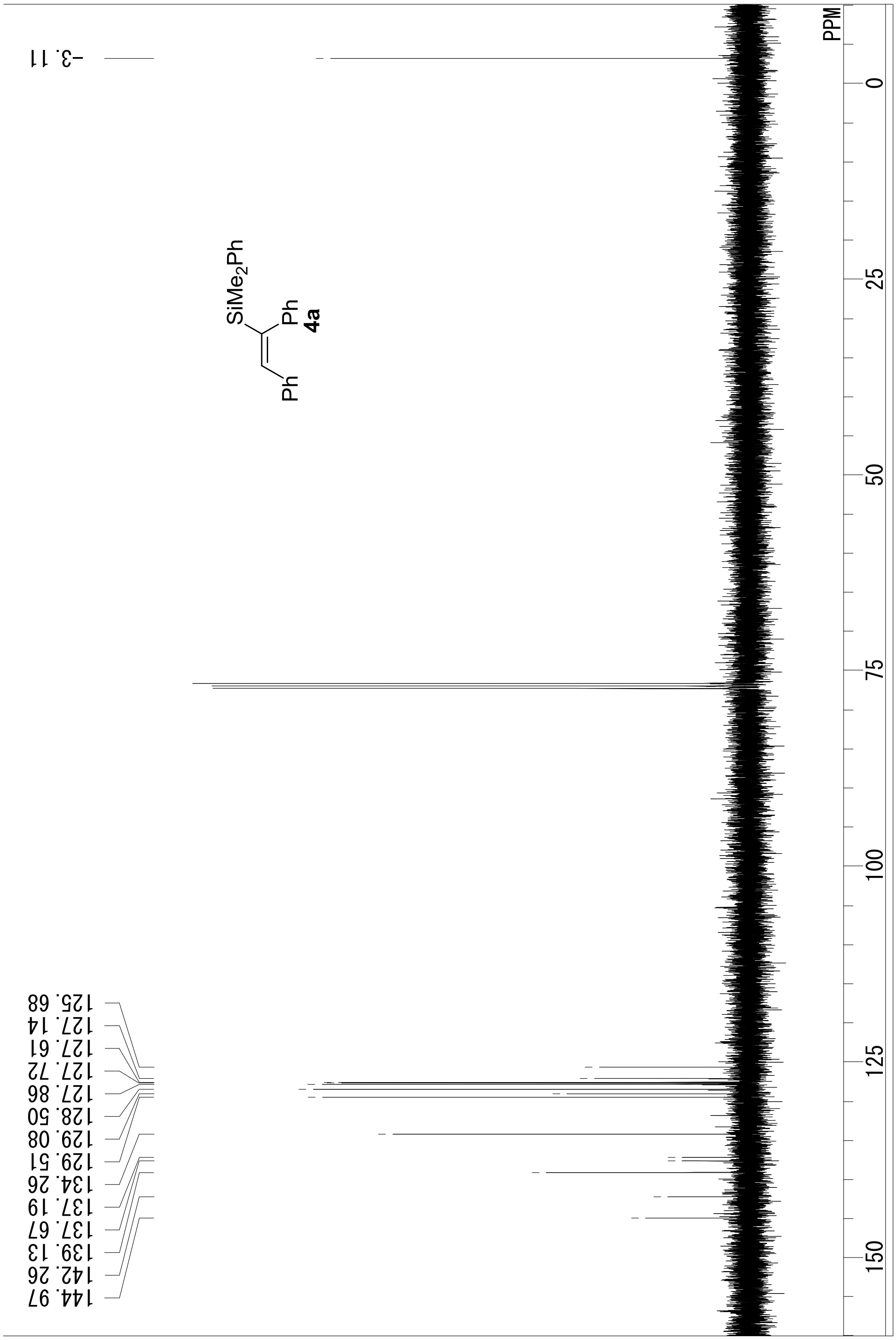

SiMe2Ph
Ph
Ph
4a
PPM



-3.11
SiMe2Ph
Ph
Ph
4a
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127.14
127.61
127.72
127.86
128.50
129.08
129.51
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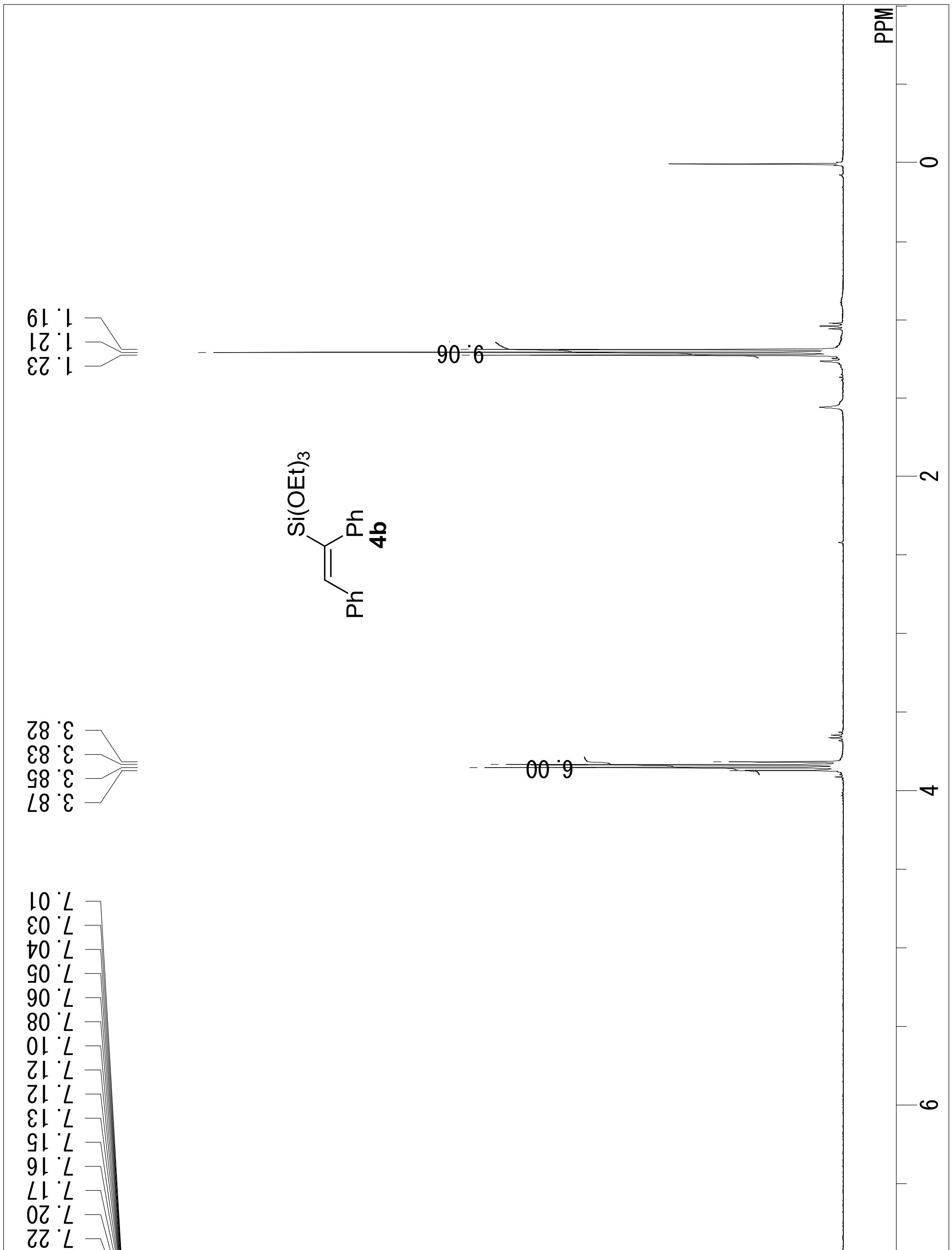
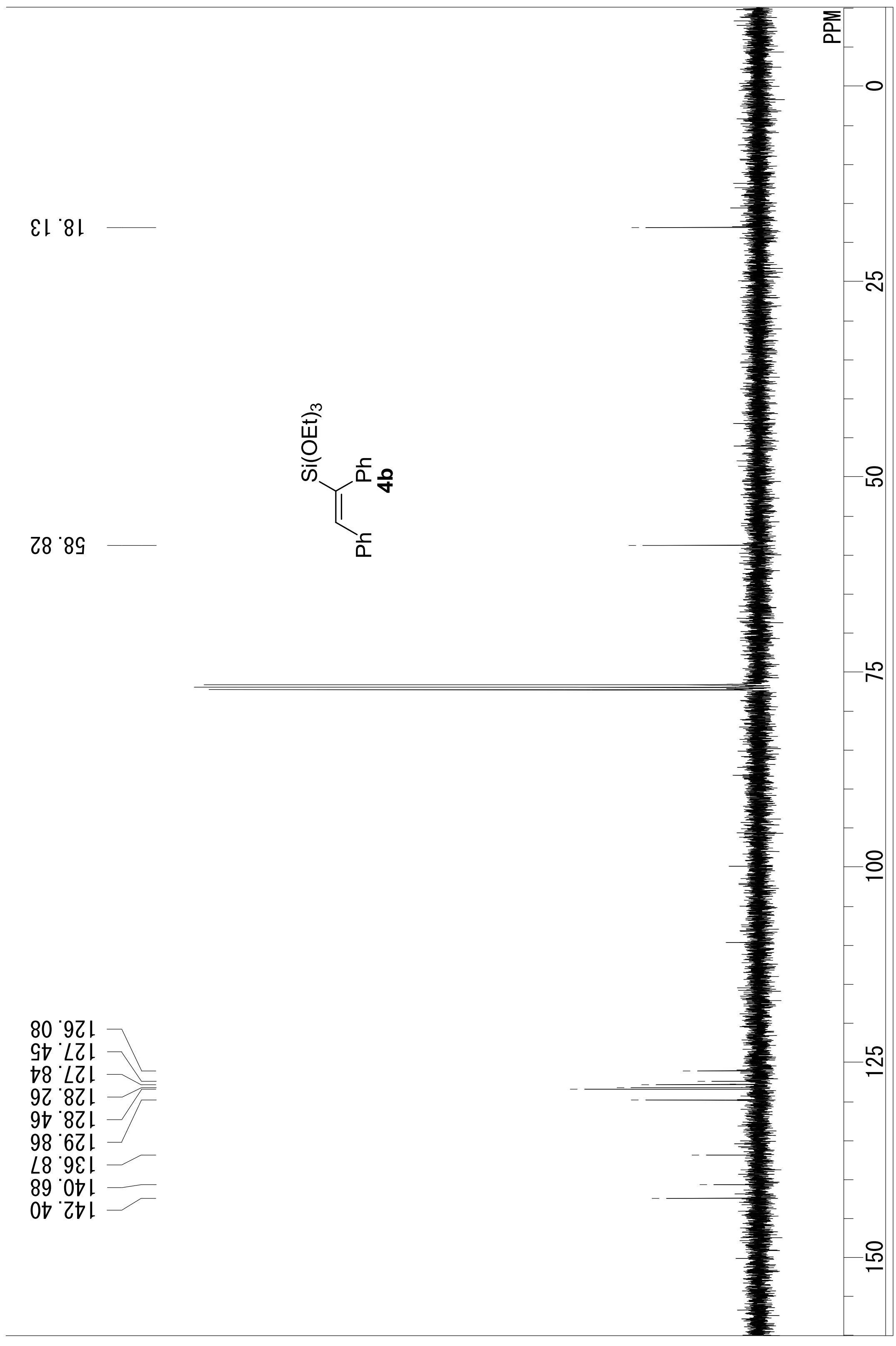
137.19
137.67
139.13
142.26
144.97
PPM
0
25
50
75
100
125
150



Si(OEt)3
Ph
Ph
4b
7.01
7.03
7.04
7.05
7.06
7.08
7.10
7.12
7.12
7.13
7.15
7.16
7.17
7.20
7.22
7.24
7.26
7.27
7.28
7.30
7.30
7.32
3.82
3.83
3.85
3.87
1.19
1.21
1.23
9.06
6.00
2.23
3.06
2.98
2.26
PPM
0
2
4
6
8



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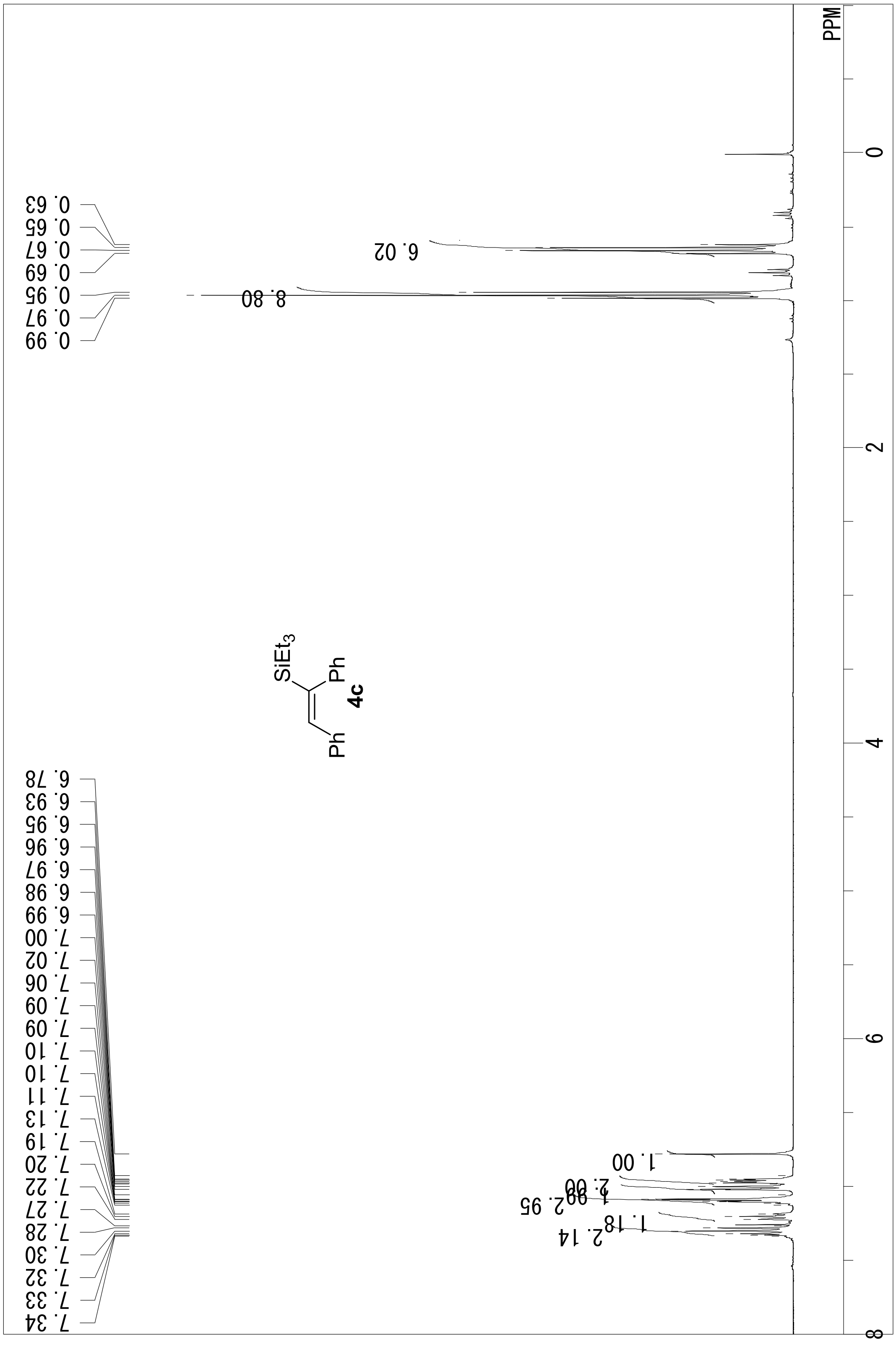
58.82
126.08
127.45
127.84
128.26
128.46
129.86
136.87
140.68
142.40
Si(OEt)3
Ph
Ph
4b
PPM
0
25
50
75
100
125
150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6.95
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6.98
6.99
7.00
7.02
7.06
7.09
7.09
7.10
7.10
7.11
7.13
7.19
7.20
7.22
7.27
7.28
7.30
7.32
7.33
7.34
6.02
8.80
1.00
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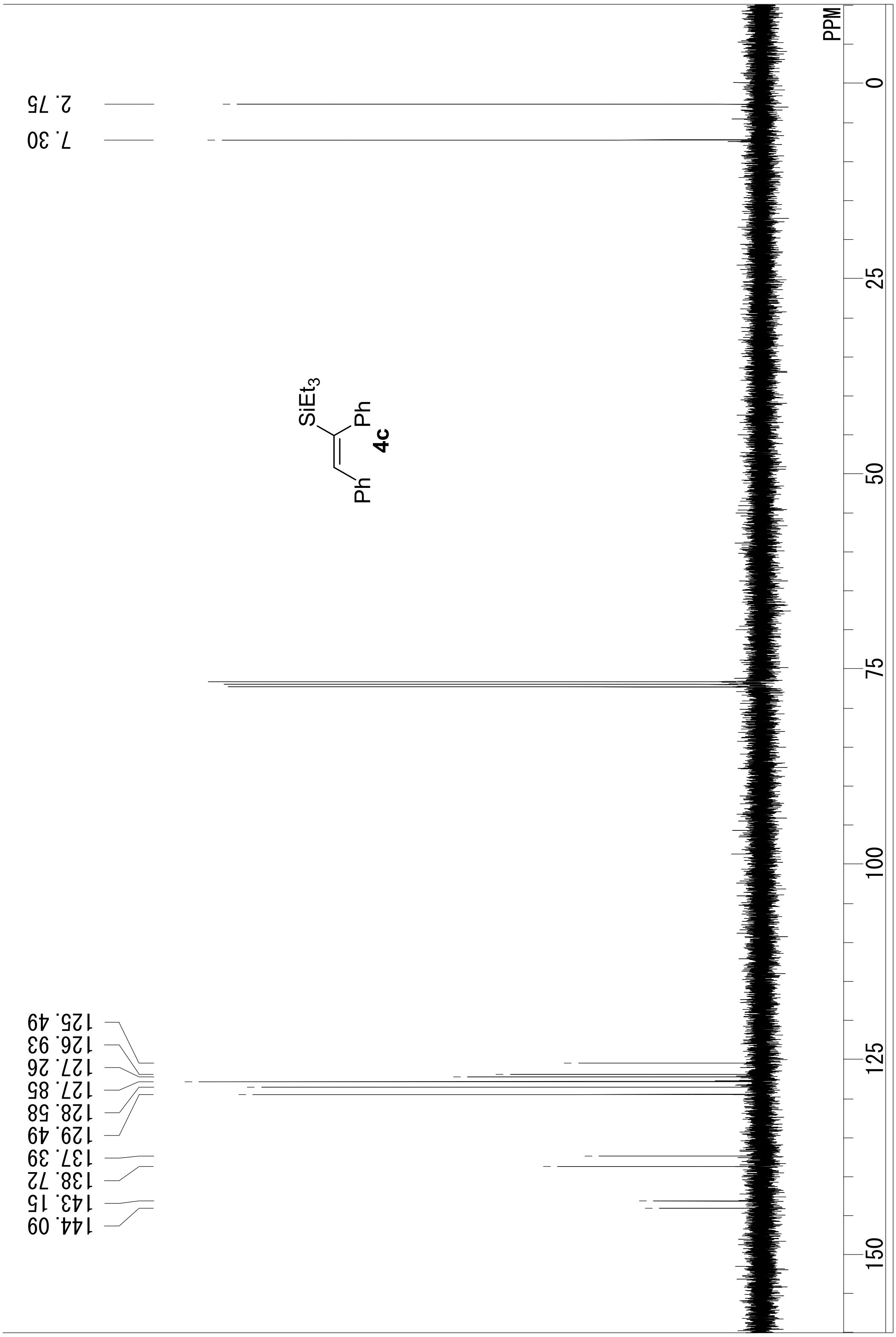
2.95
1.18
2.14
SiEt3
Ph
Ph
4c
PPM
0
2
4
6
8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129.49
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143.15
144.09
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Ph
Ph
4c
PPM
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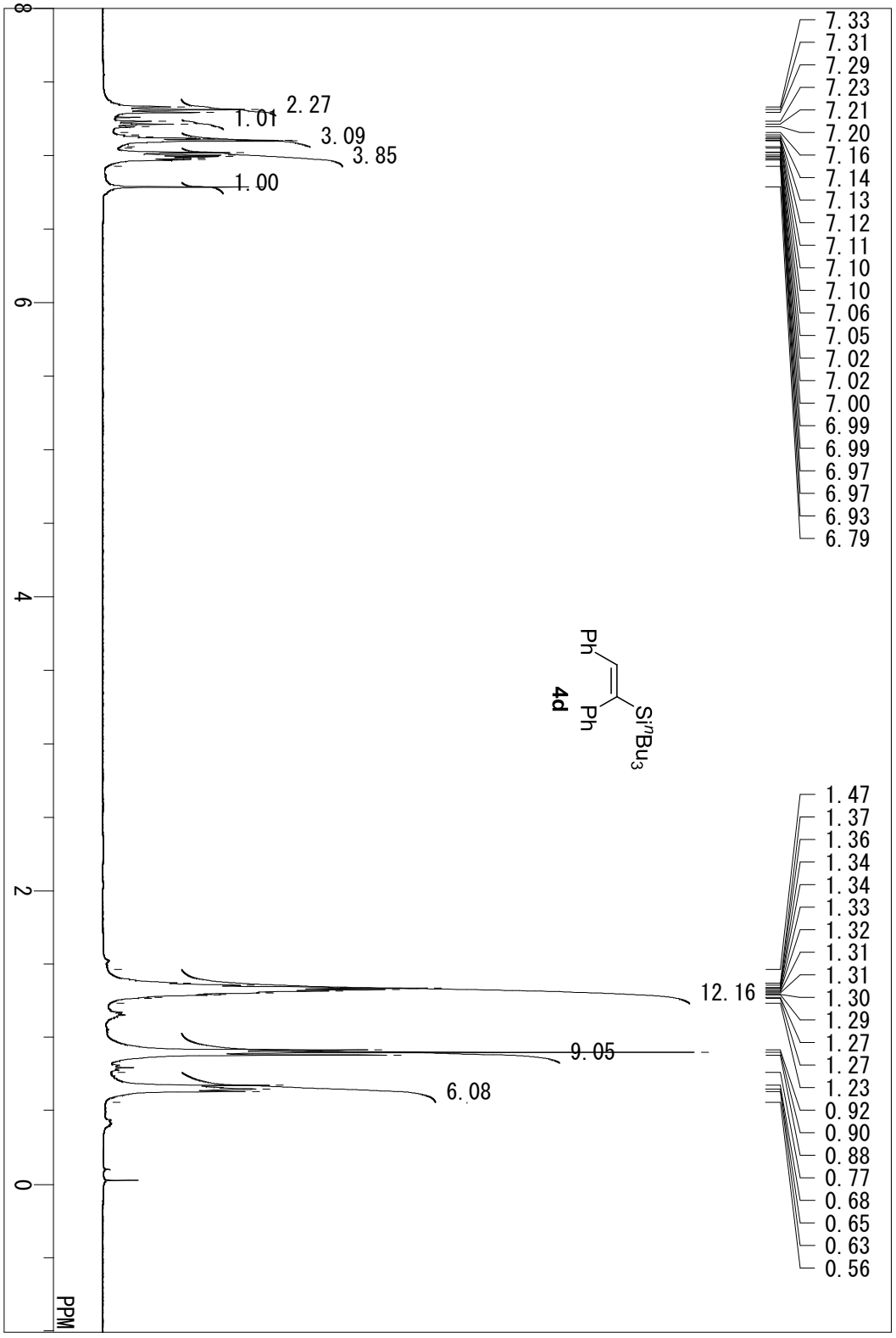
50
75
100
125
150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7.13
7.12
7.11
7.10
7.10
7.06
7.05
7.02
7.02
7.00
6.99
6.99
6.97
6.97
6.93
6.79
2.27
1.01
3.09
3.85
1.00
Ph
Ph
SiⁿBu3
4d
1.47
1.37
1.36
1.34
1.34
1.33
1.32
1.31
1.31
1.30
1.29
1.27
1.27
1.23
0.92
0.90
0.88
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0.65
0.63
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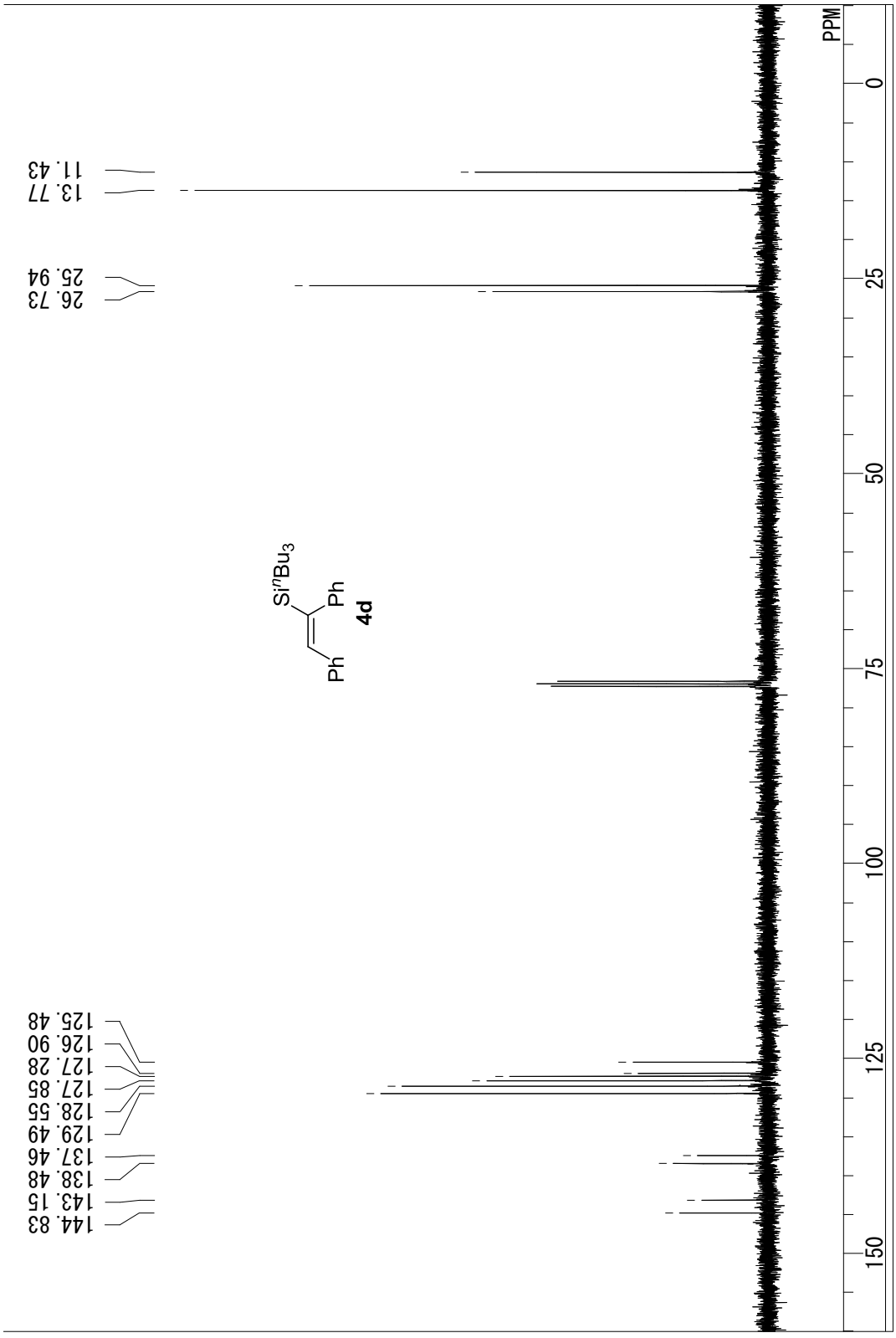
6.08
8
6
4
2
0
PPM


PPM
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75
100
125
150
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26.73
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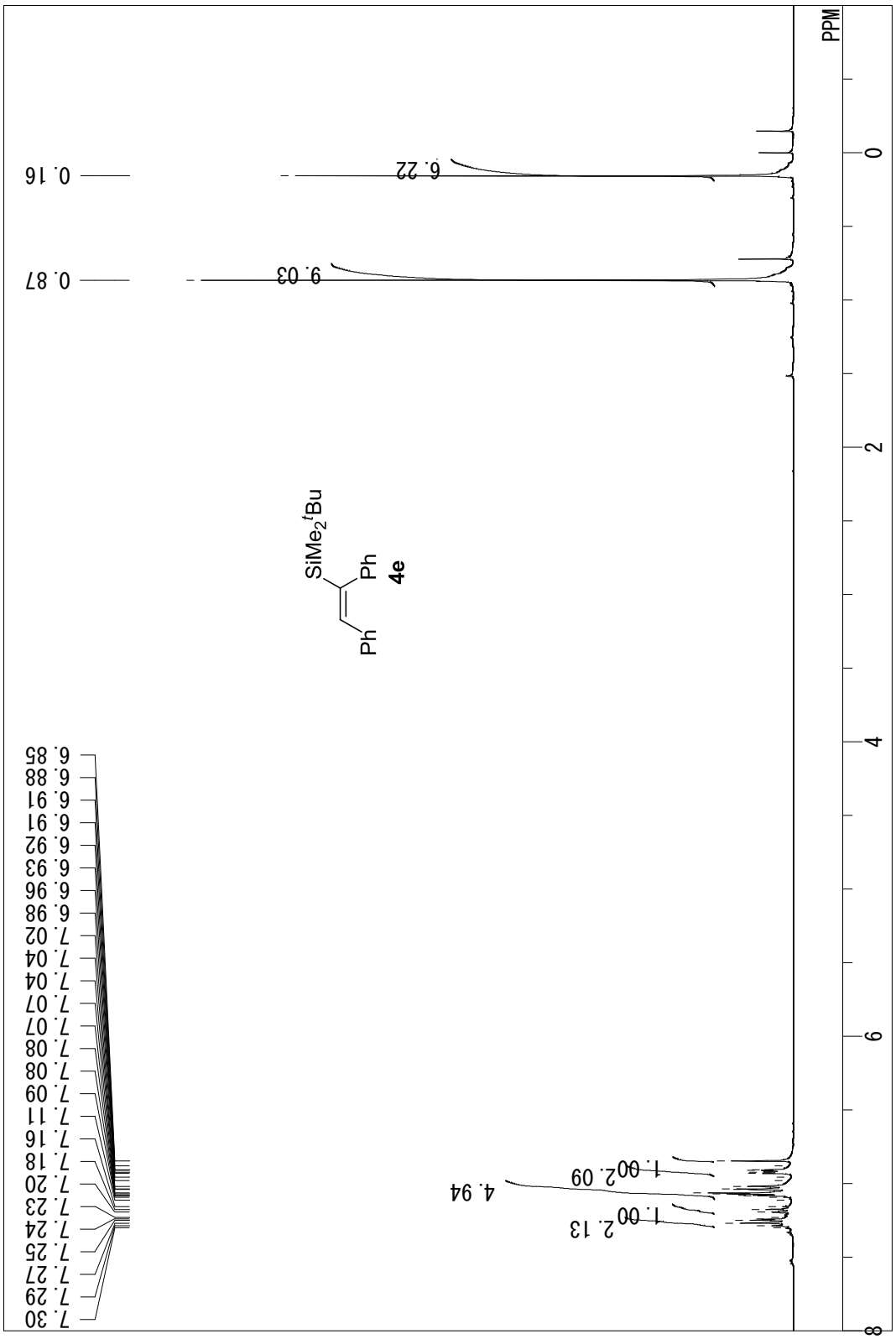
129.49
137.46
138.48
143.15
144.83
Si^{n}Bu$_3$
Ph
Ph
4d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0
2
4
6
8
0.16
6.22
0.87
9.03
SiMe2tBu
Ph
Ph
4e
6.85
6.88
6.91
6.91
6.92
6.93
6.96
6.98
7.02
7.04
7.04
7.07
7.07
7.08
7.08
7.09
7.11
7.16
7.18
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7.25
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7.29
7.30
4.94
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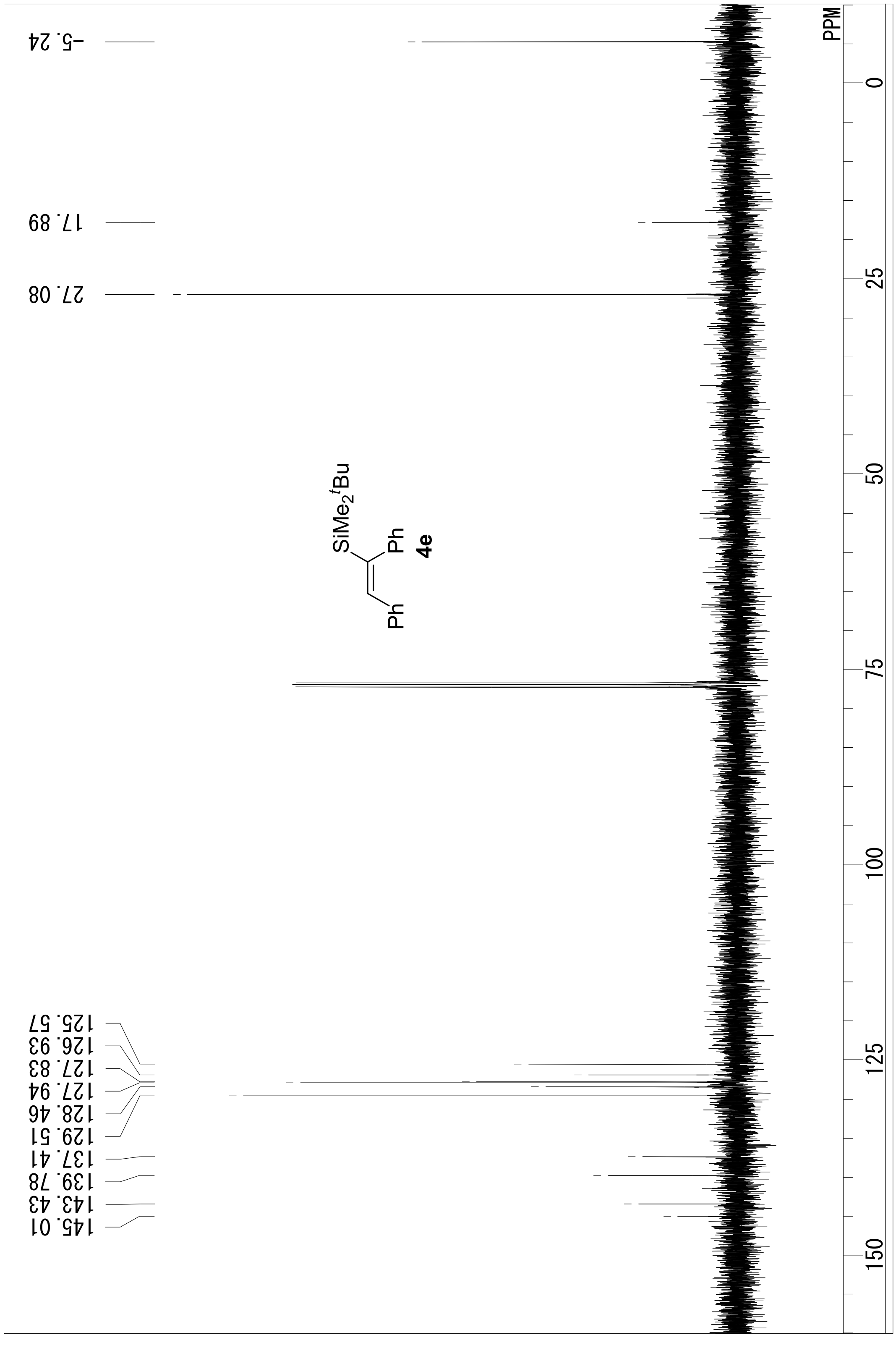
2.13
1.00
2.09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145.01
SiMe2tBu
Ph
Ph
4e
PPM
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75
100
125
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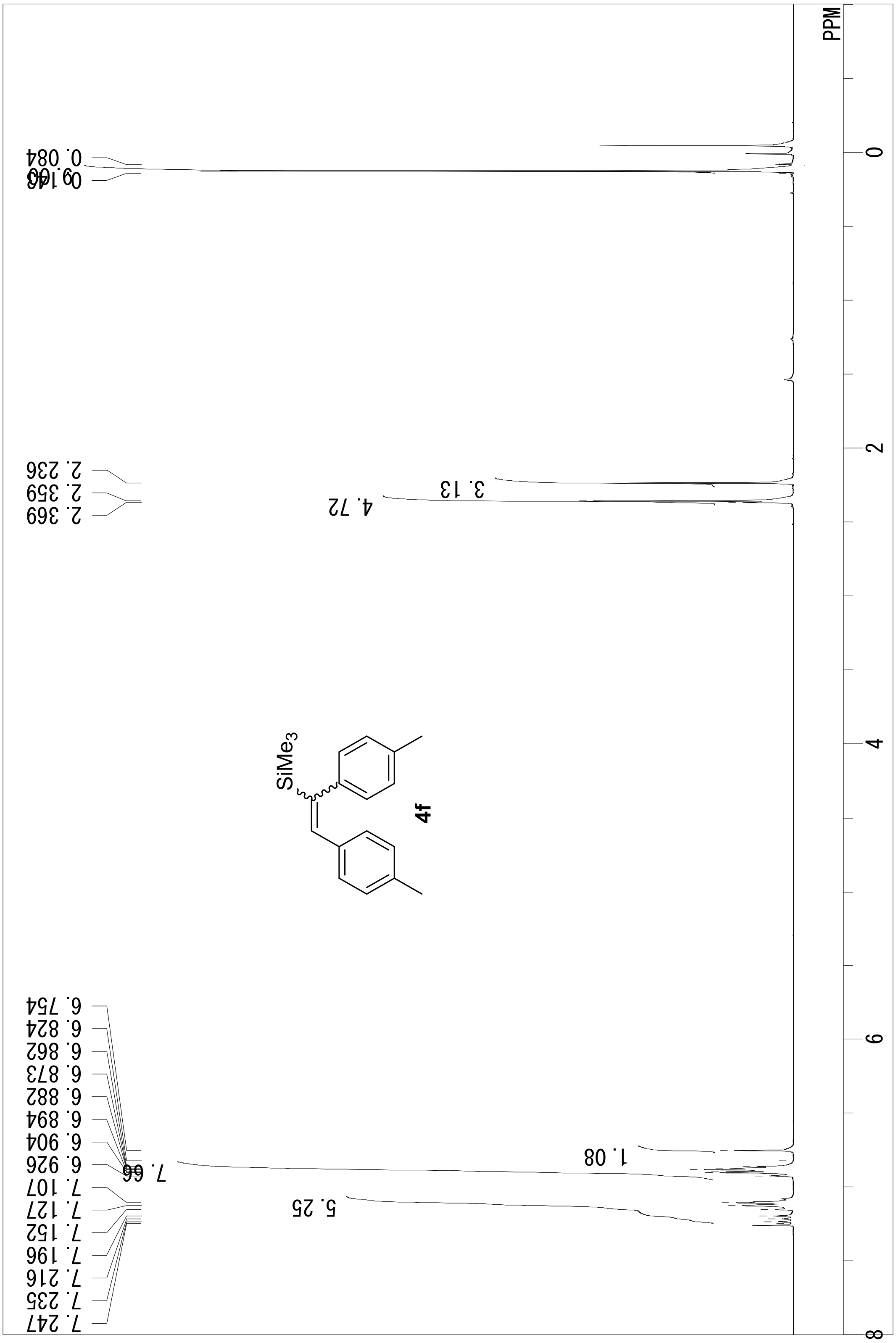
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2.369
3.13
4.72
SiMe$_3$
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6.824
6.862
6.873
6.882
6.894
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6.926
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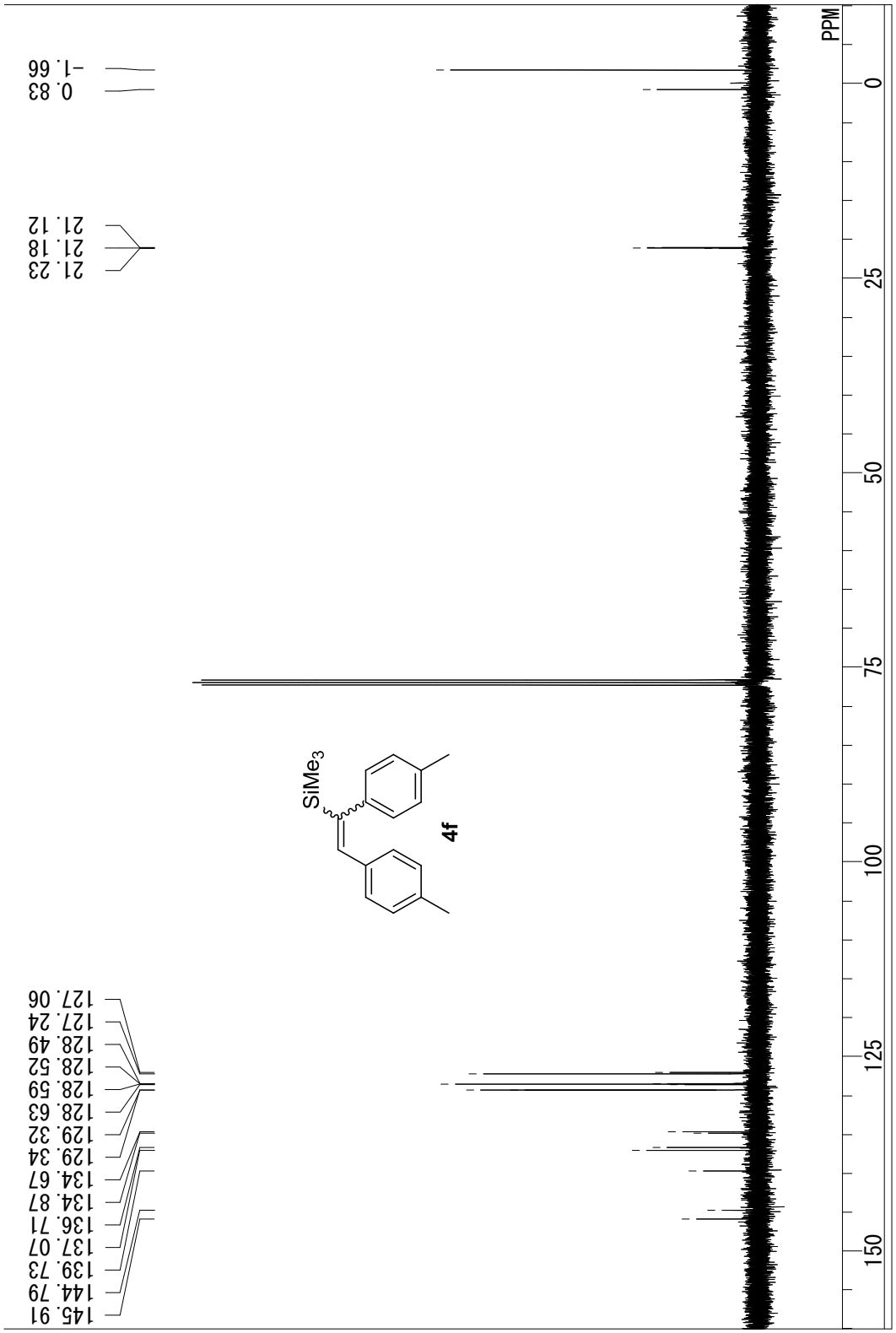
7.127
7.152
7.196
7.216
7.235
7.247
7.66
1.08
5.25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75
100
125
150
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4f
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21.18
21.23
127.06
127.24
128.49
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139.73
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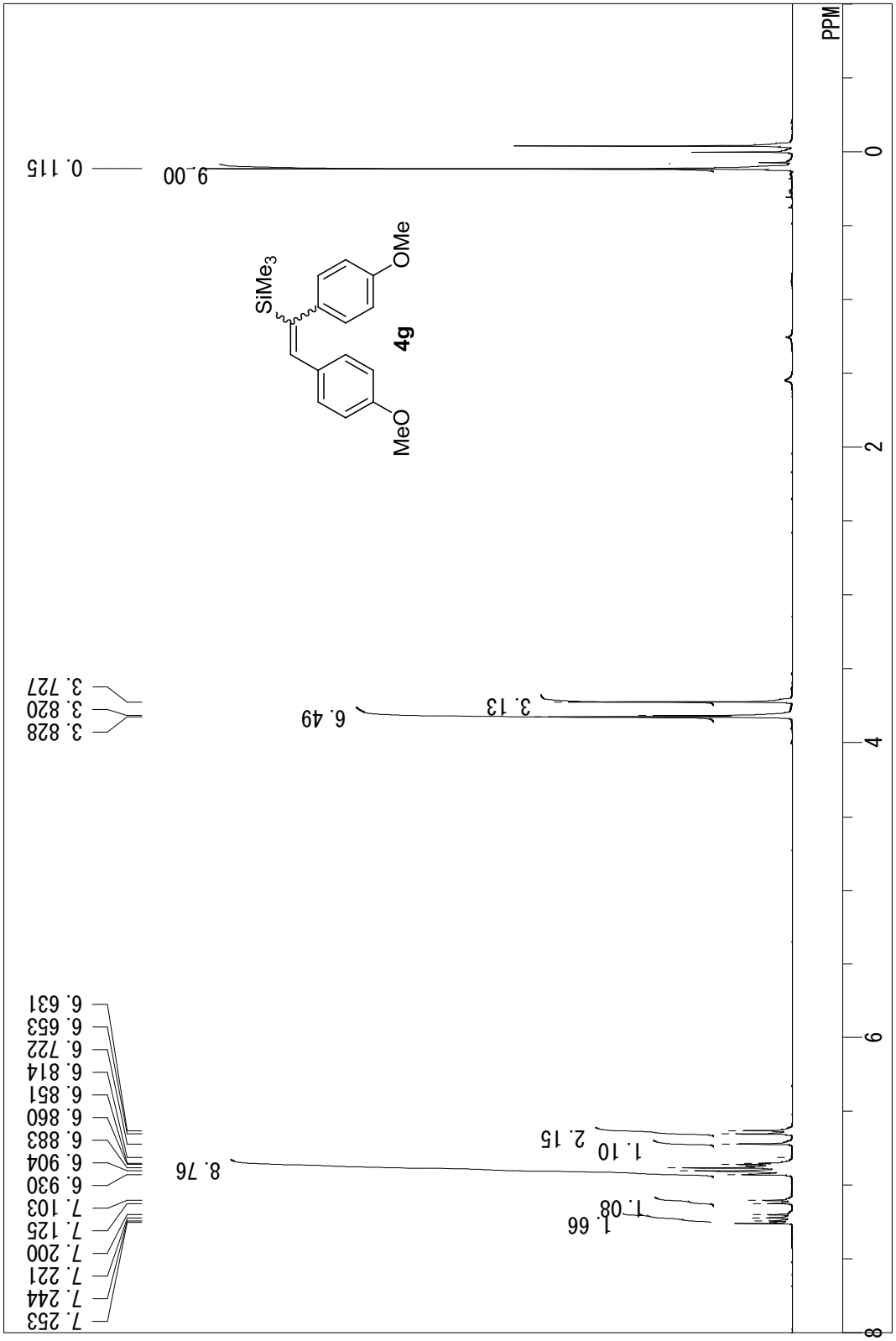
145.91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4
6
8
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9.00
3.828
3.820
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1.66
1.08
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2.15
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7.221
7.200
7.125
7.103
6.930
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6.814
6.722
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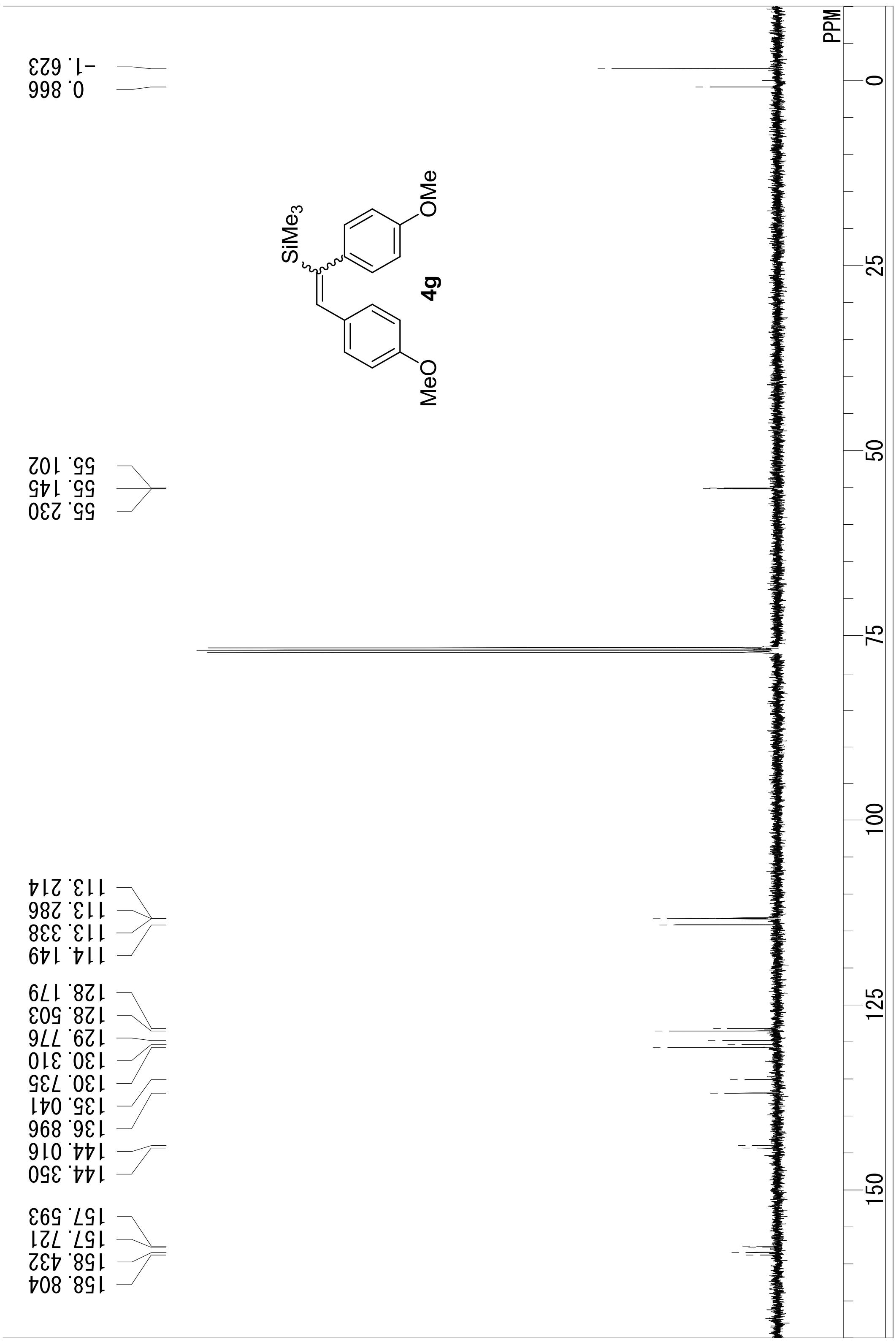
6.631
SiMe3
OMe
MeO
4g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130.310
130.735
135.041
136.896
144.016
144.350
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158.804
SiMe3
OMe
MeO
4g
PPM
0
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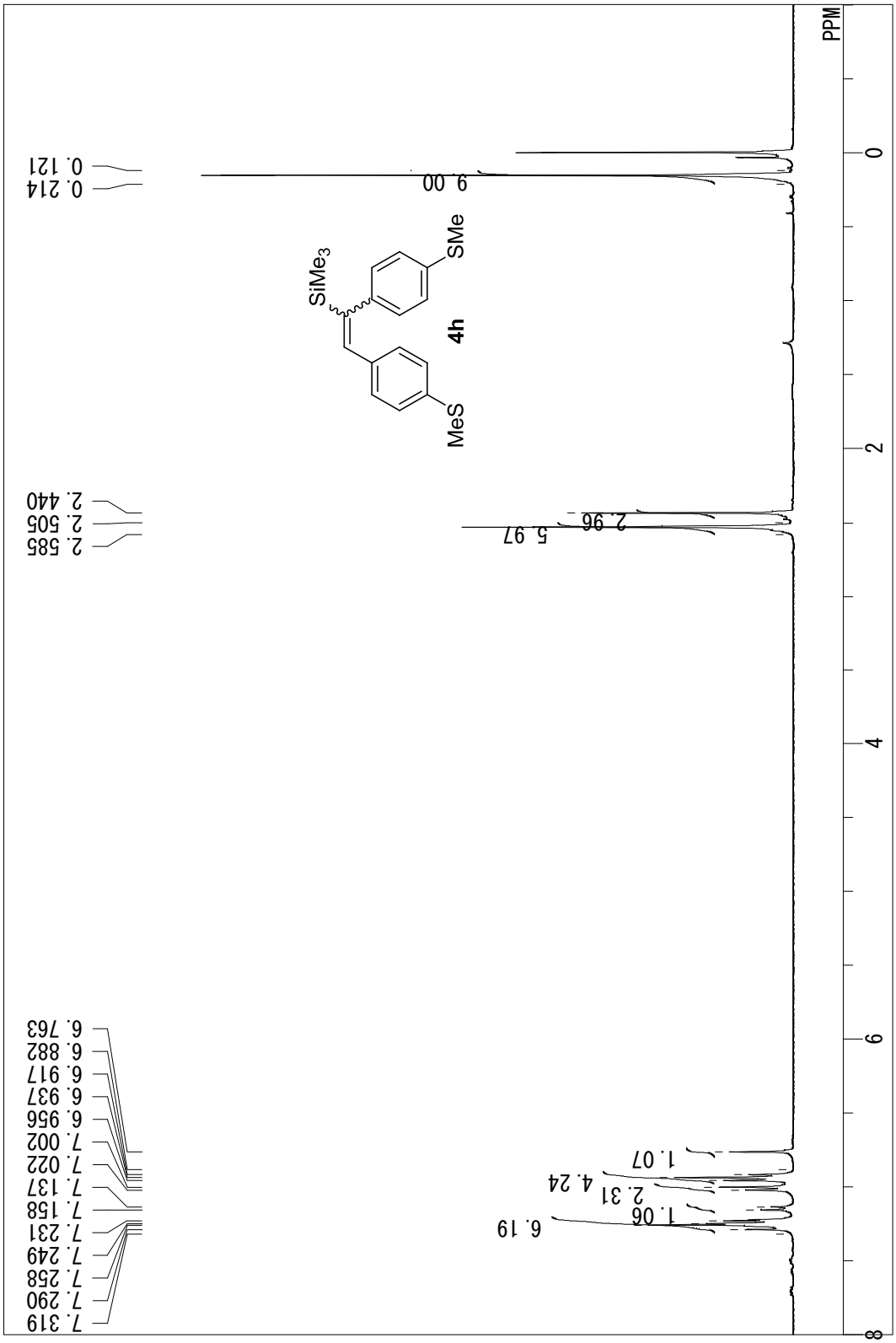
75
100
125
150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2
4
6
8
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SMe
MeS
4h
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5.97
2.96
2.585
2.505
2.440
0.214
0.121
6.19
1.06
2.31
4.24
1.07
7.319
7.290
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7.158
7.137
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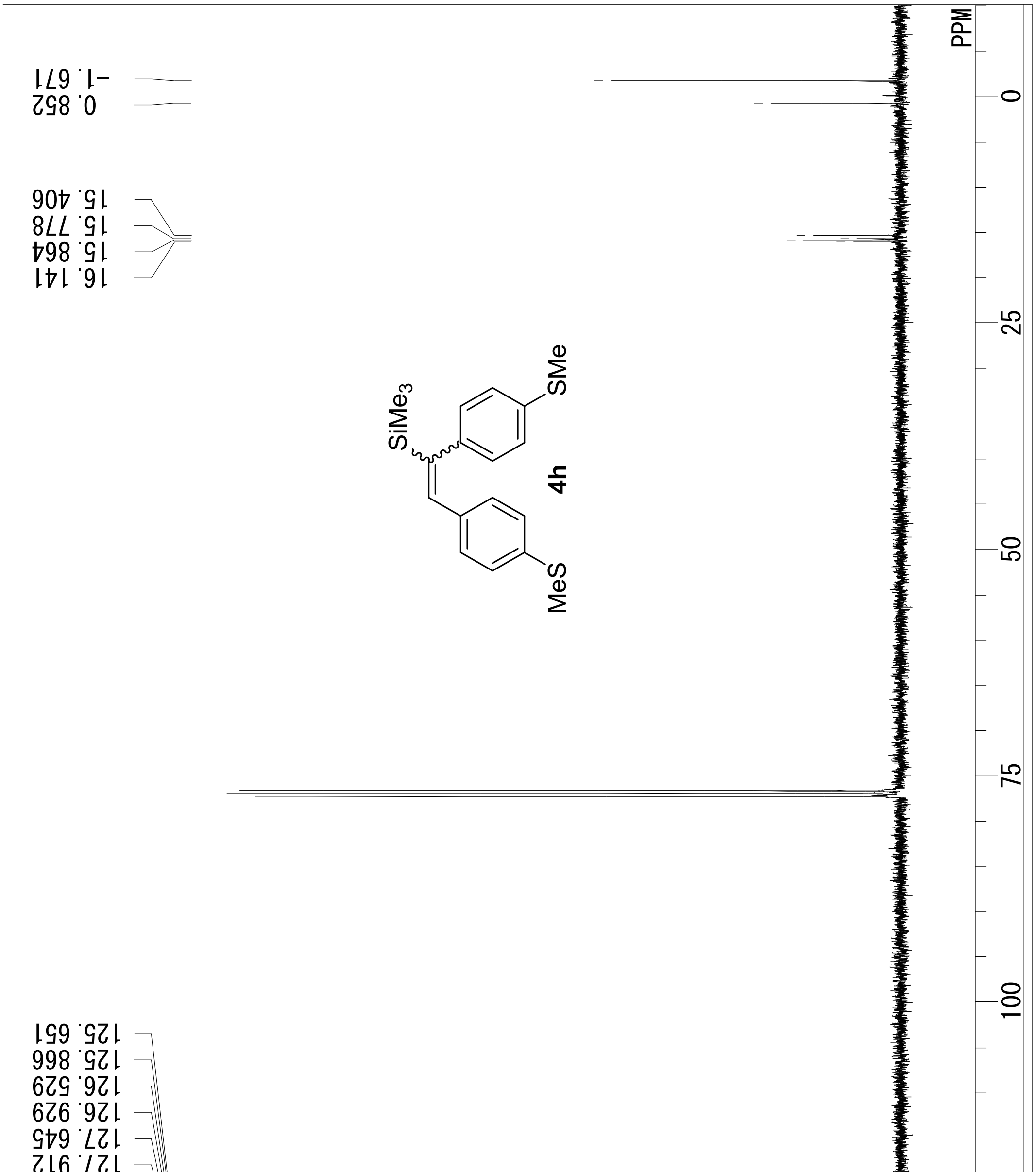
6.937
6.917
6.882
6.763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129.042
129.795
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135.165
135.322
136.600
136.882
137.316
137.435
139.619
144.312
144.393
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146.381
SiMe$_3$
SMe
MeS
4h
PPM
0
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50
75
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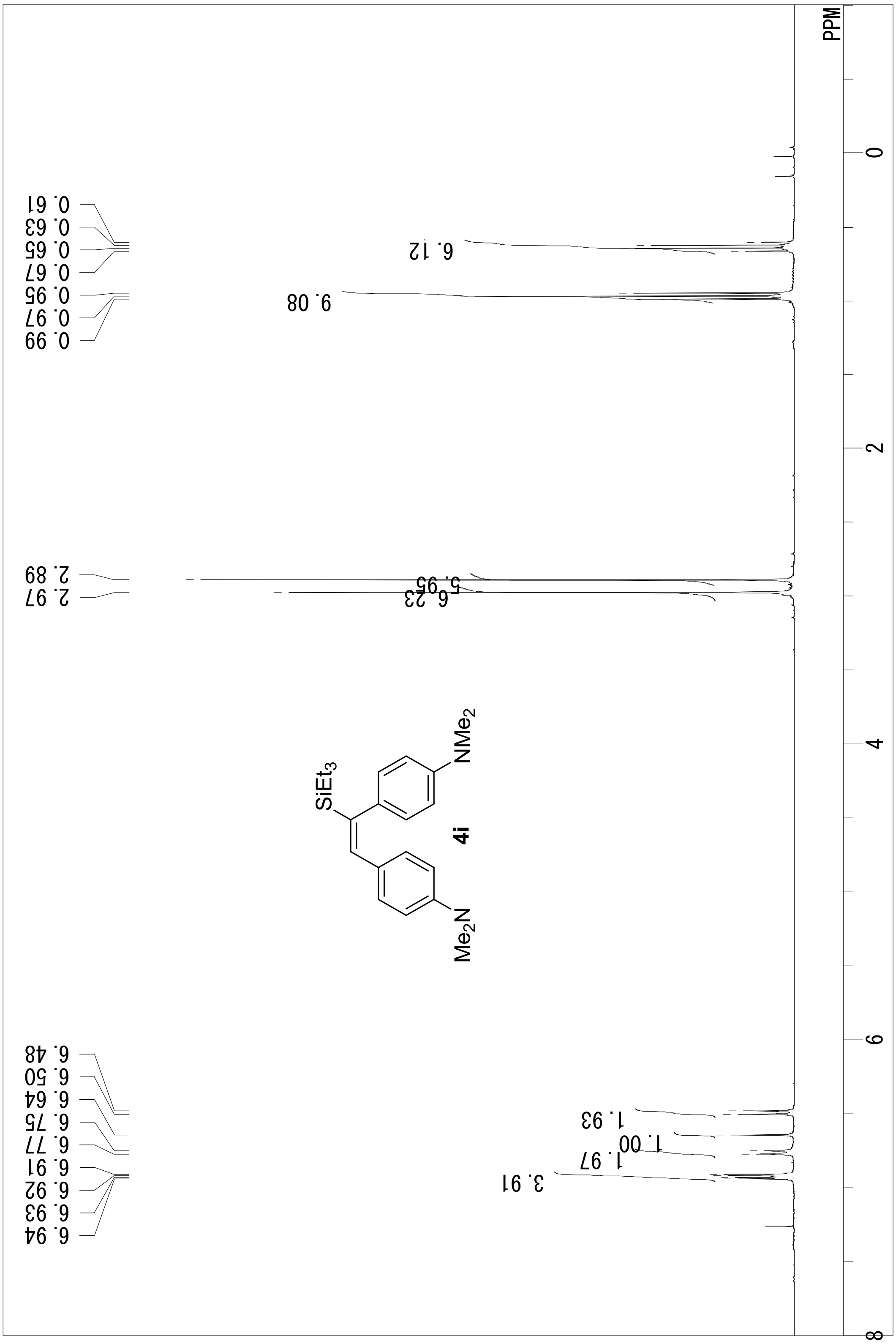
125
150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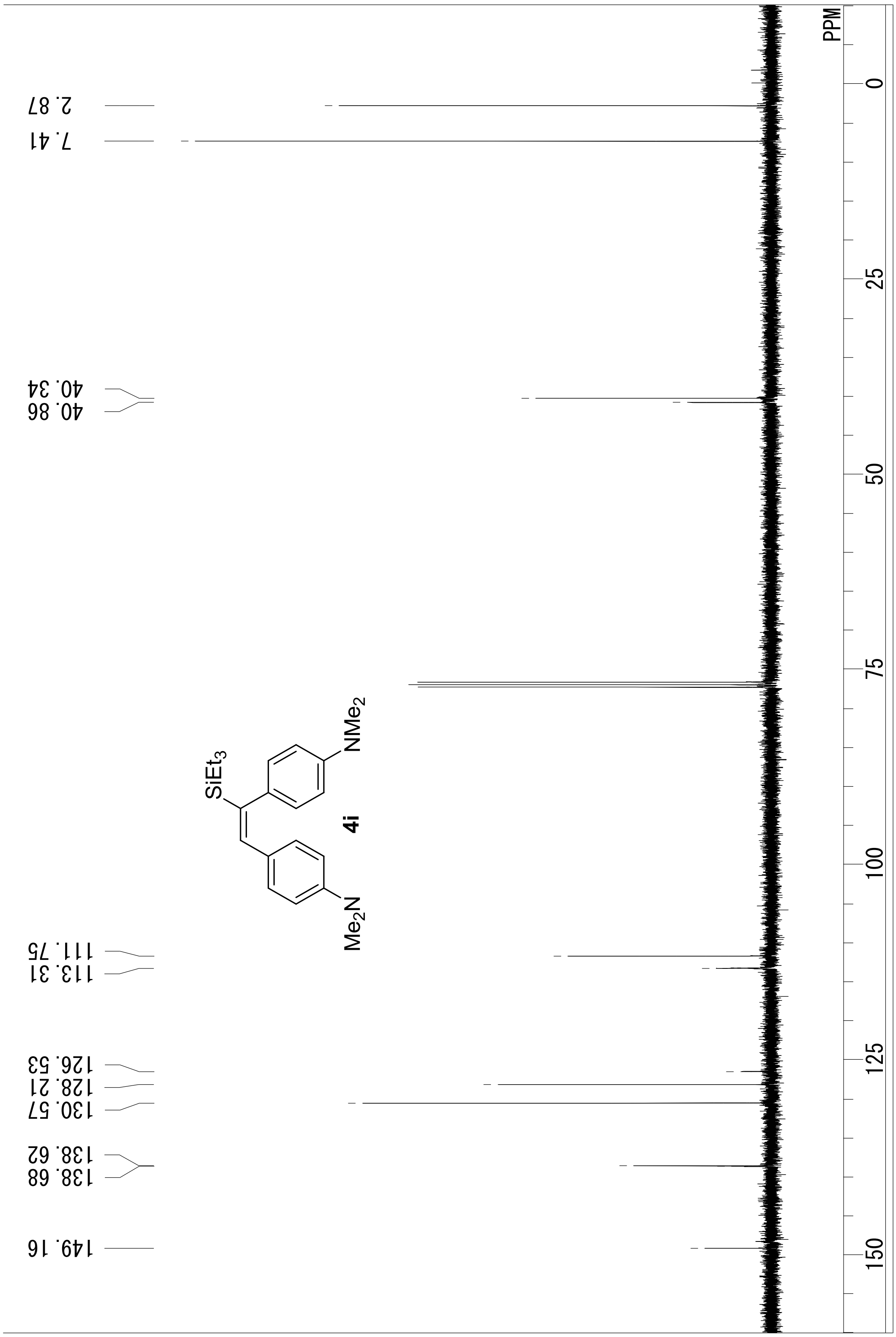
$SiEt_3$
NMe_2
Me_2N
4i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128.21
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138.62
138.68
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NMe$_2$
Me$_2$N
4i
PPM
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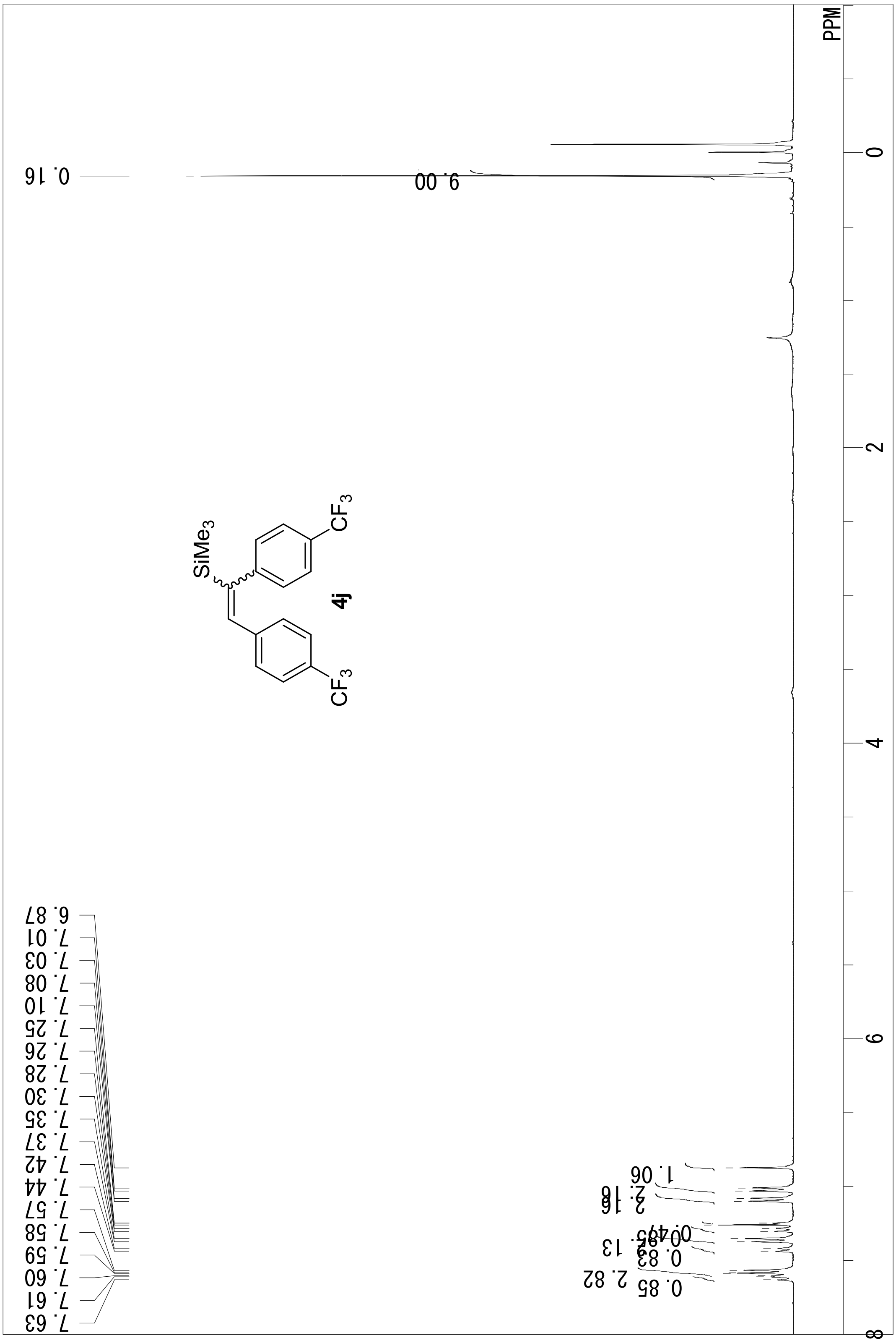
25
50
75
100
125
150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CF3
CF3
4j
PPM
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7.08
7.10
7.25
7.26
7.28
7.30
7.35
7.37
7.42
7.44
7.57
7.58
7.59
7.60
7.61
7.63
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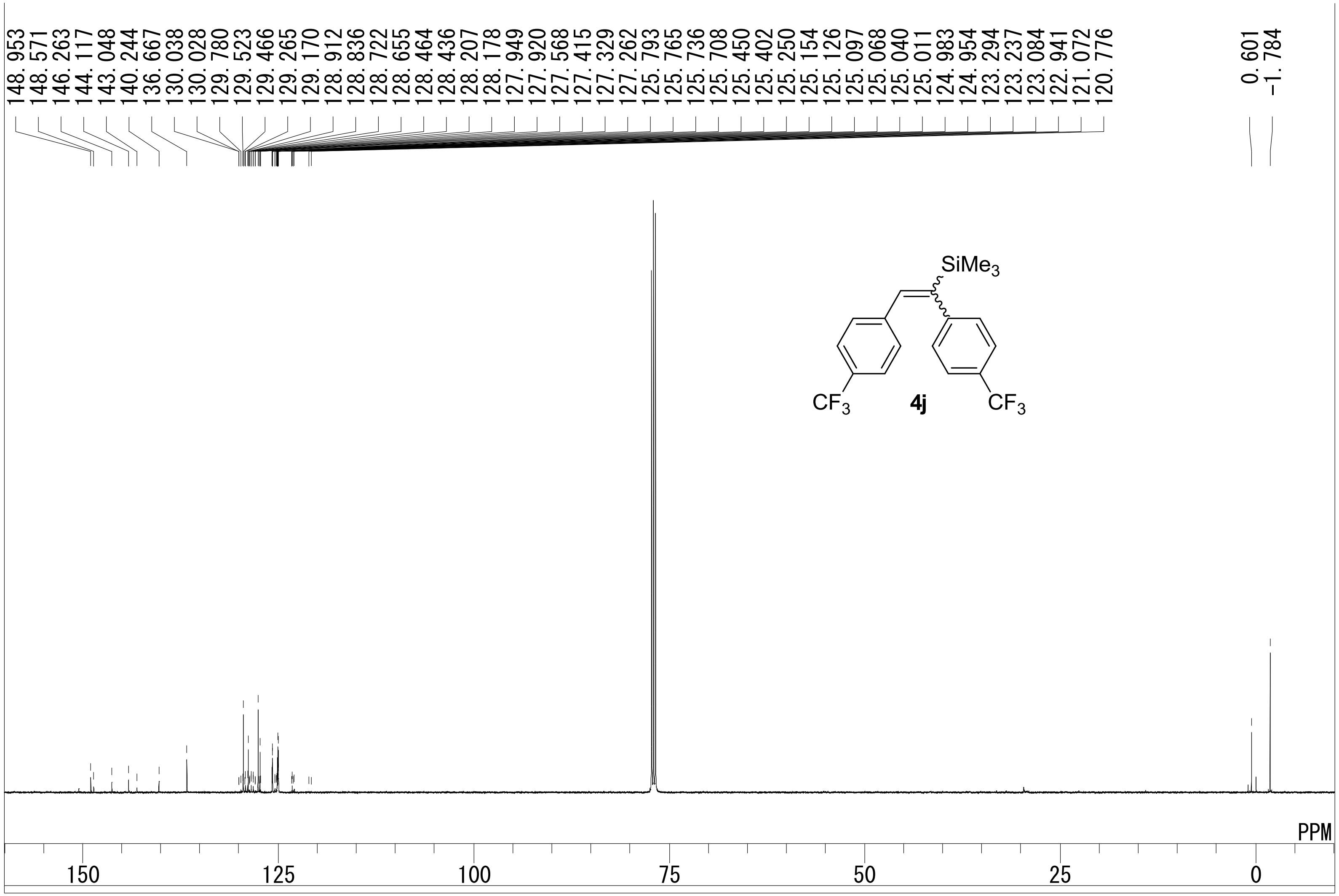
0.85
2.82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127. 262
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125. 011
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CF3
CF3
4j
PPM
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50
25
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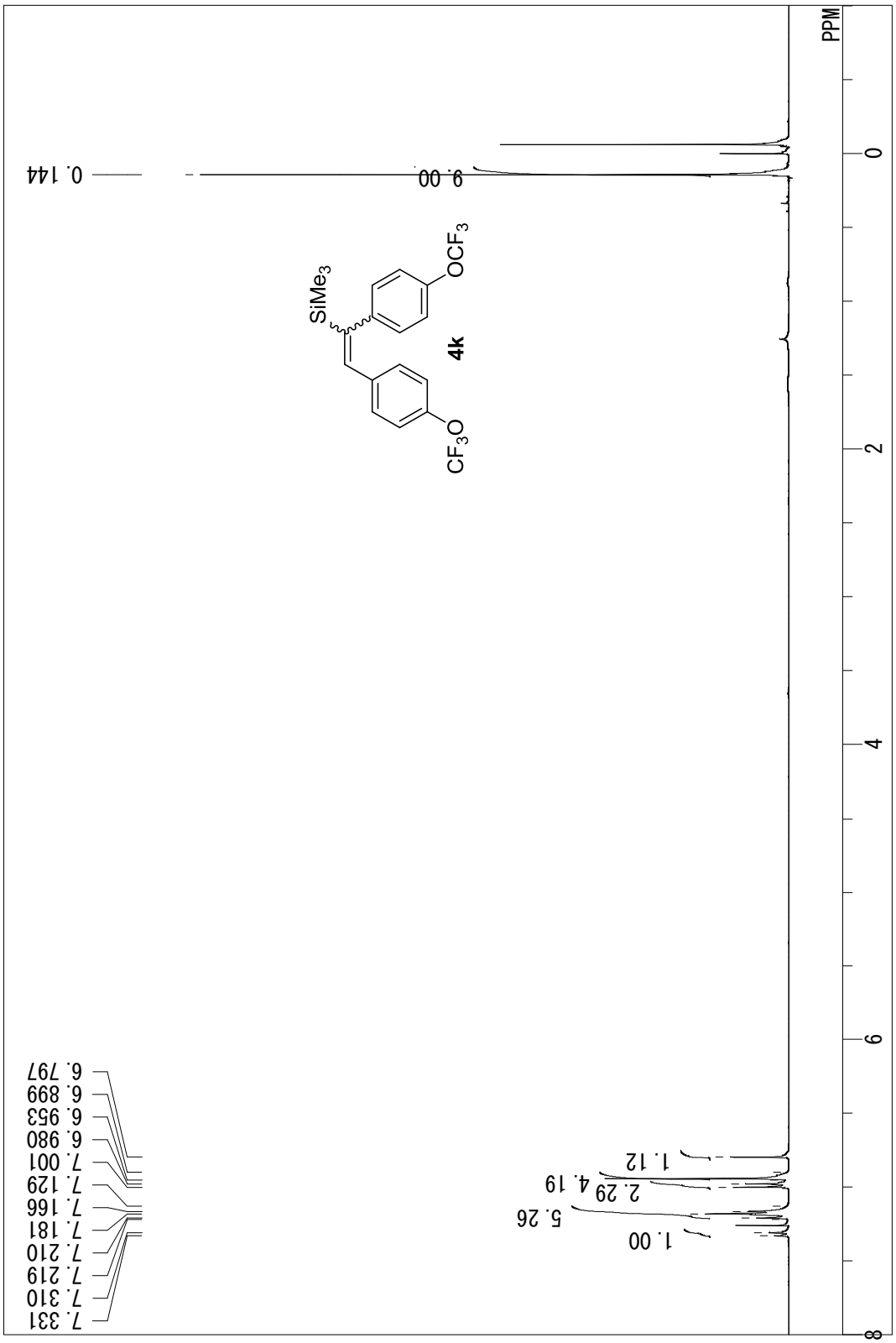
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OCF3
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1.12
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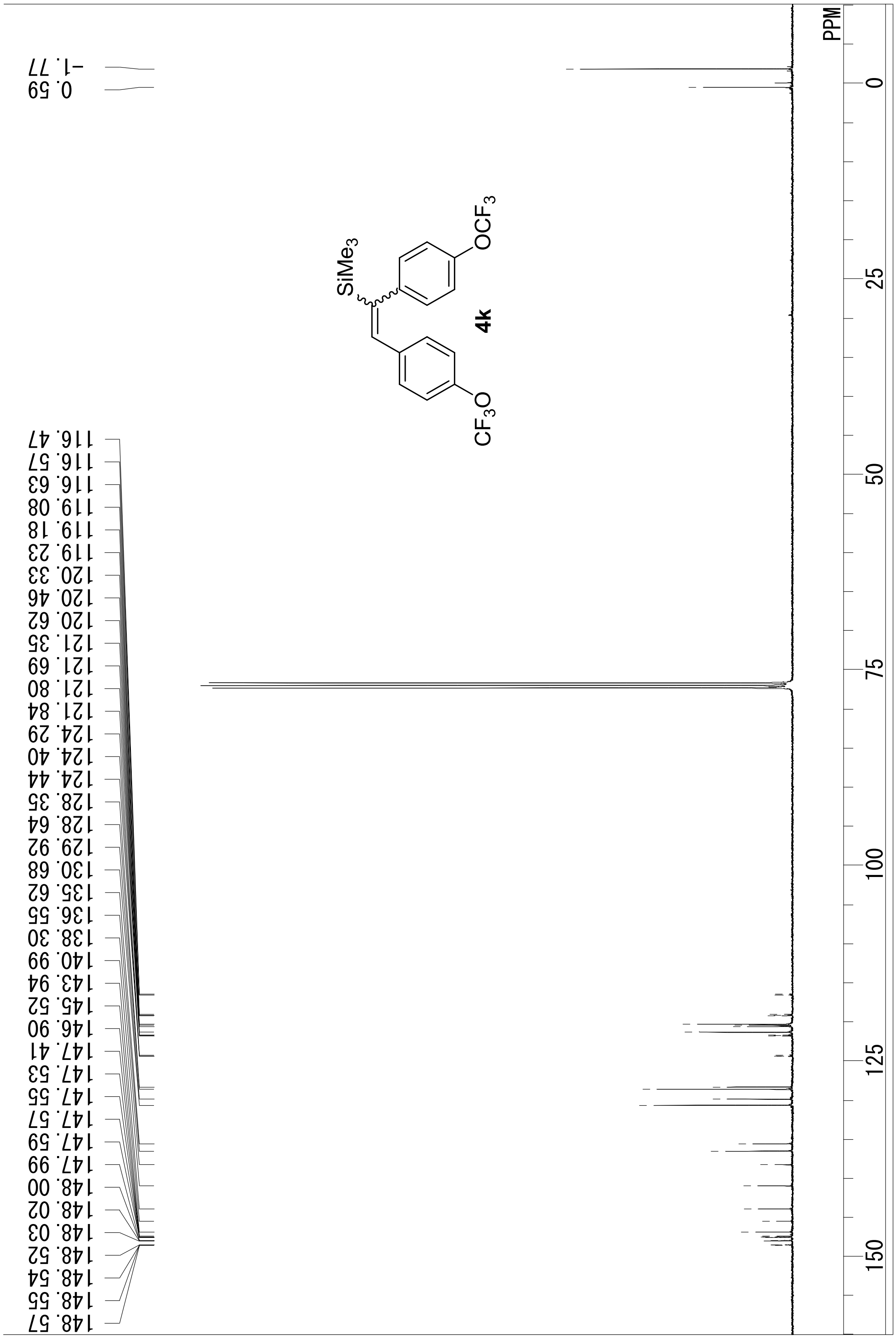
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145.52
146.90
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147.57
147.59
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148.00
148.02
148.03
148.52
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SiMe3
OCF3
CF3O
4k
PPM
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125
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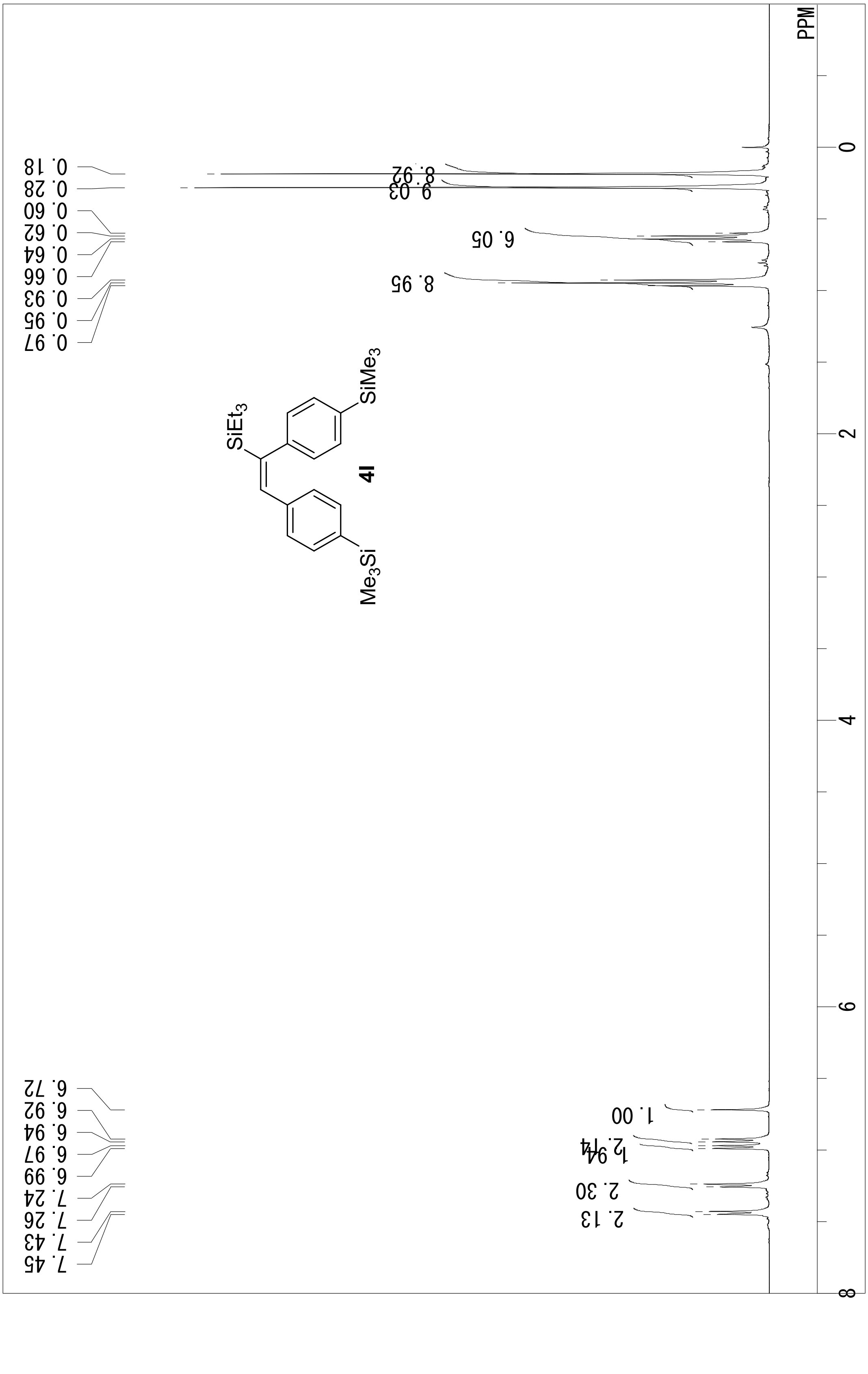
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6.99
7.24
7.26
7.43
7.45
8.92
9.03
6.05
8.95
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4l
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6
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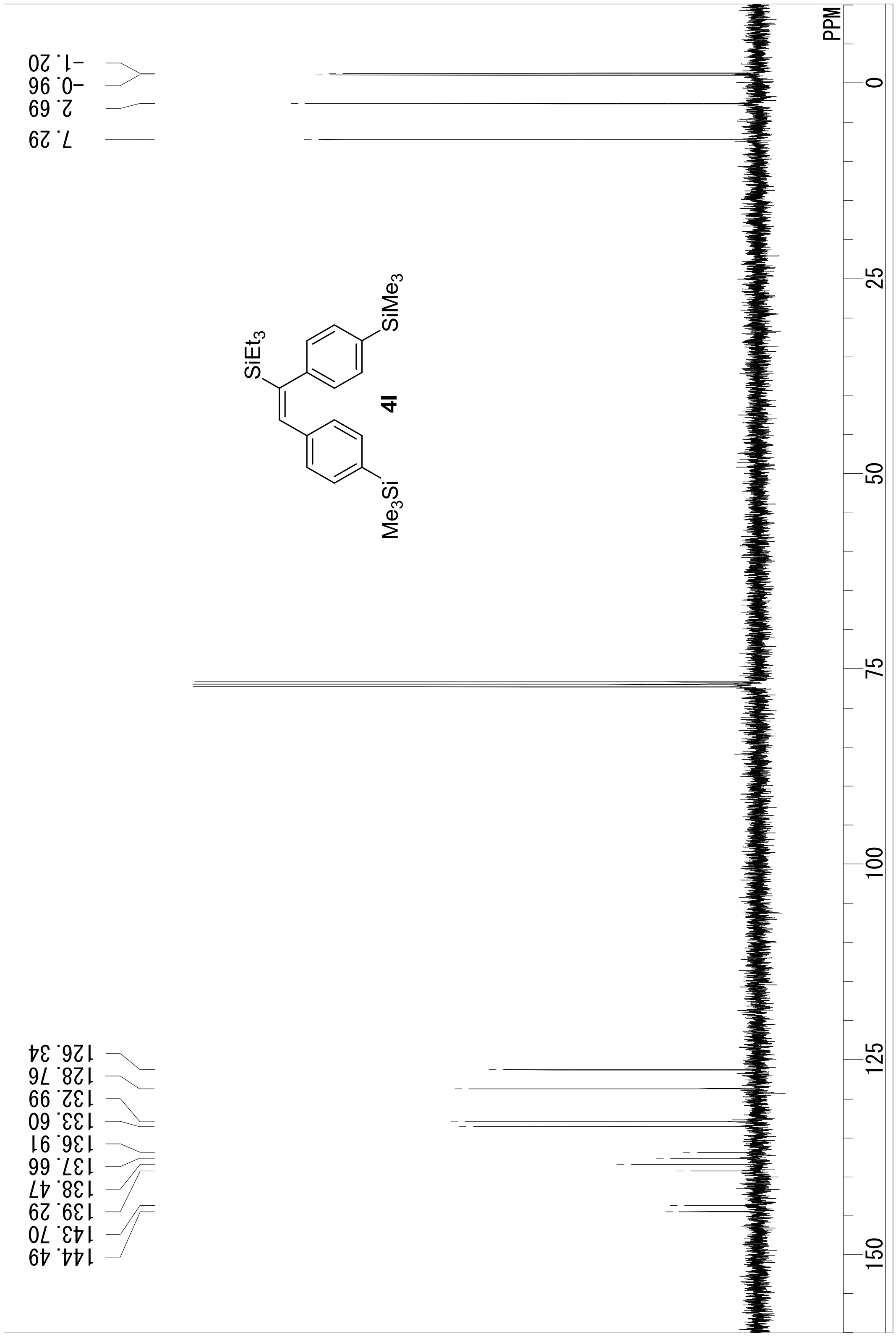
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PPM
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125
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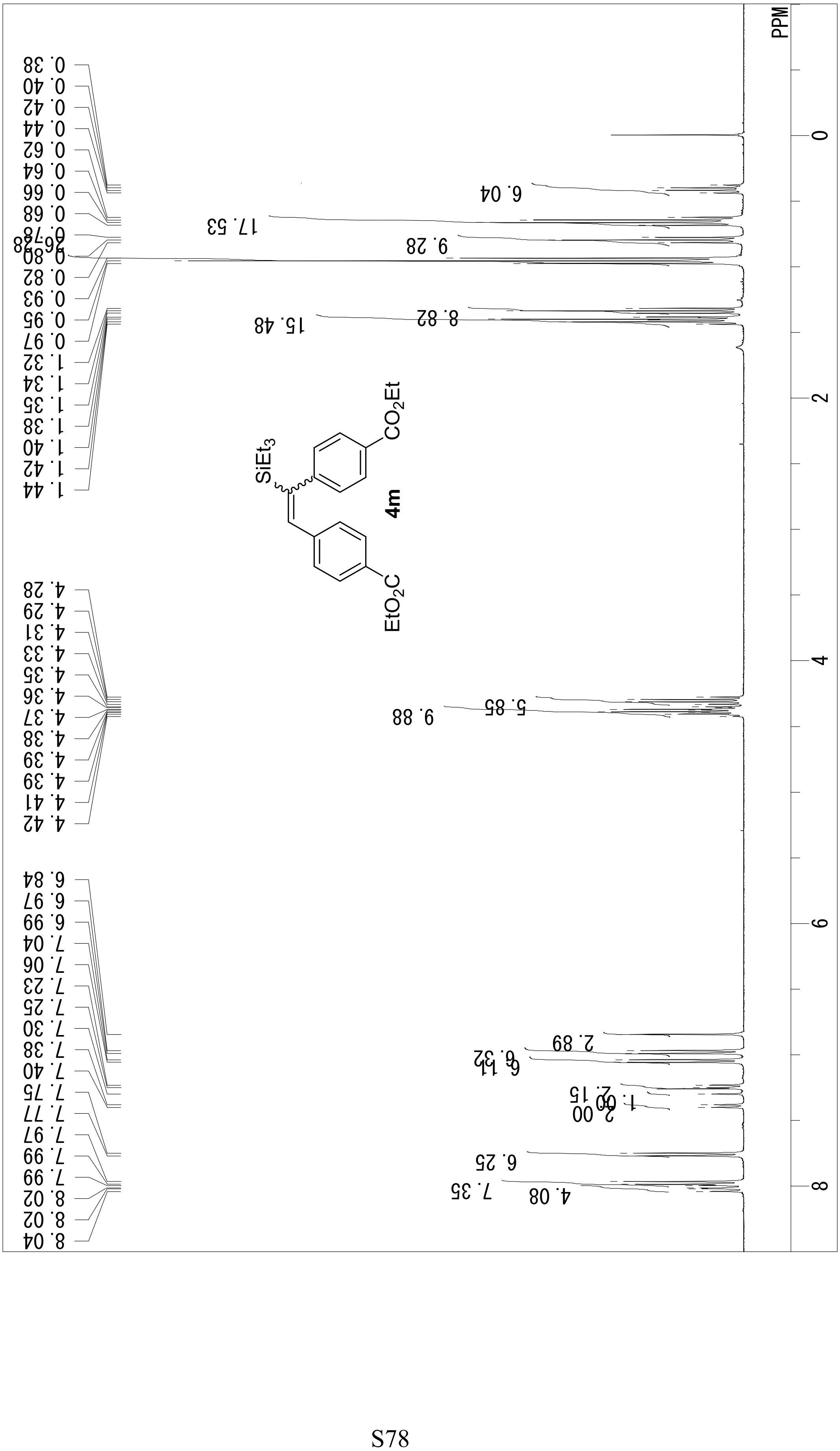
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8.82
5.85
9.88
2.89
6.32
6.11
2.15
1.00
2.00
6.25
7.35
4.08
0.38 0.40 0.42 0.44 0.62 0.64 0.66 0.68 0.78 0.80 0.82 0.93 0.95 0.97 1.32 1.34 1.35 1.38 1.40 1.42 1.44
4.28 4.29 4.31 4.33 4.35 4.36 4.37 4.38 4.39 4.39 4.41 4.42
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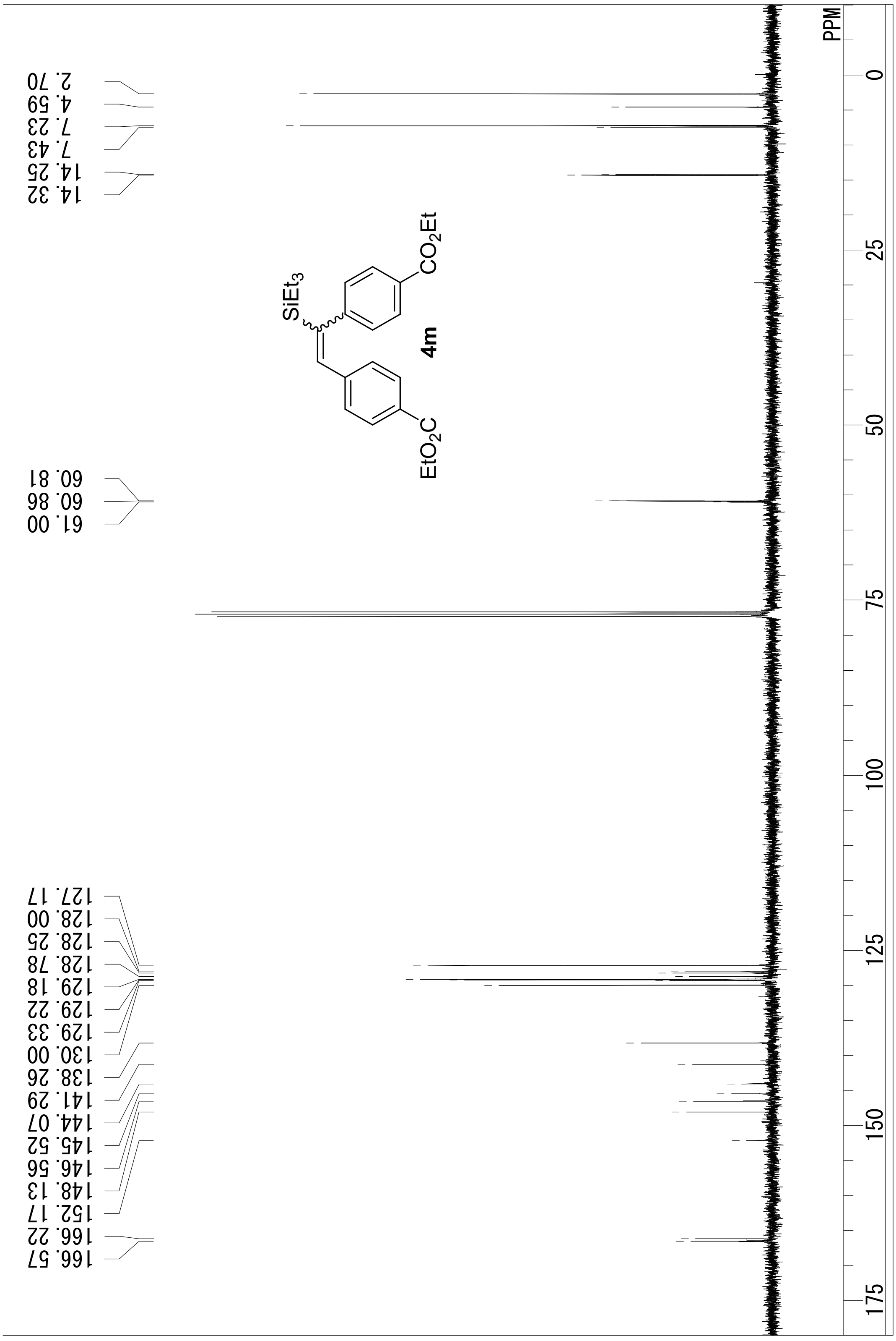
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129.18
129.22
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141.29
144.07
145.52
146.56
148.13
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CO2Et
EtO2C
4m
PPM
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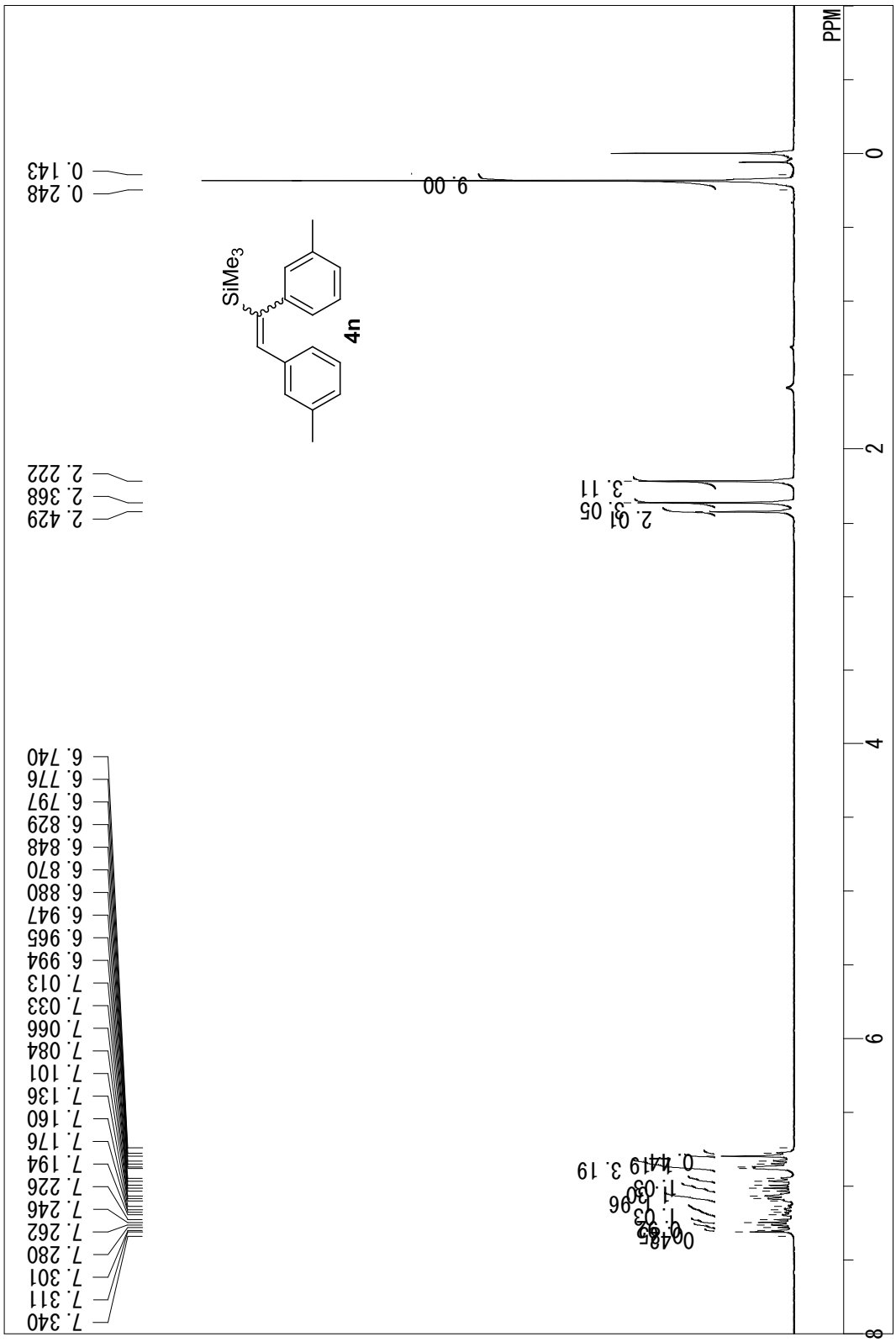
150
175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2.222
2.368
2.429
6.740
6.776
6.797
6.829
6.848
6.870
6.880
6.947
6.965
6.994
7.013
7.033
7.066
7.084
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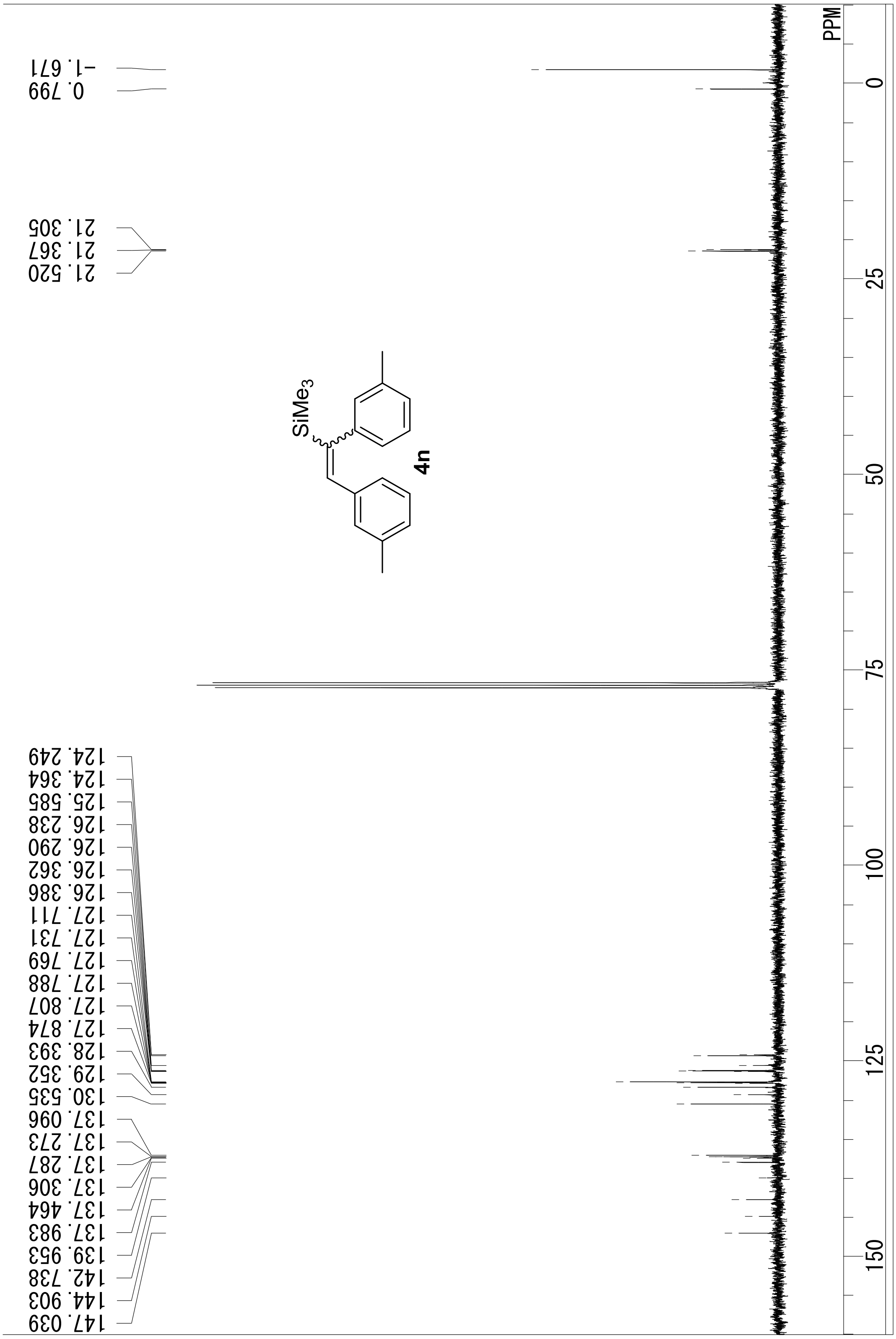
7.311
7.340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PPM
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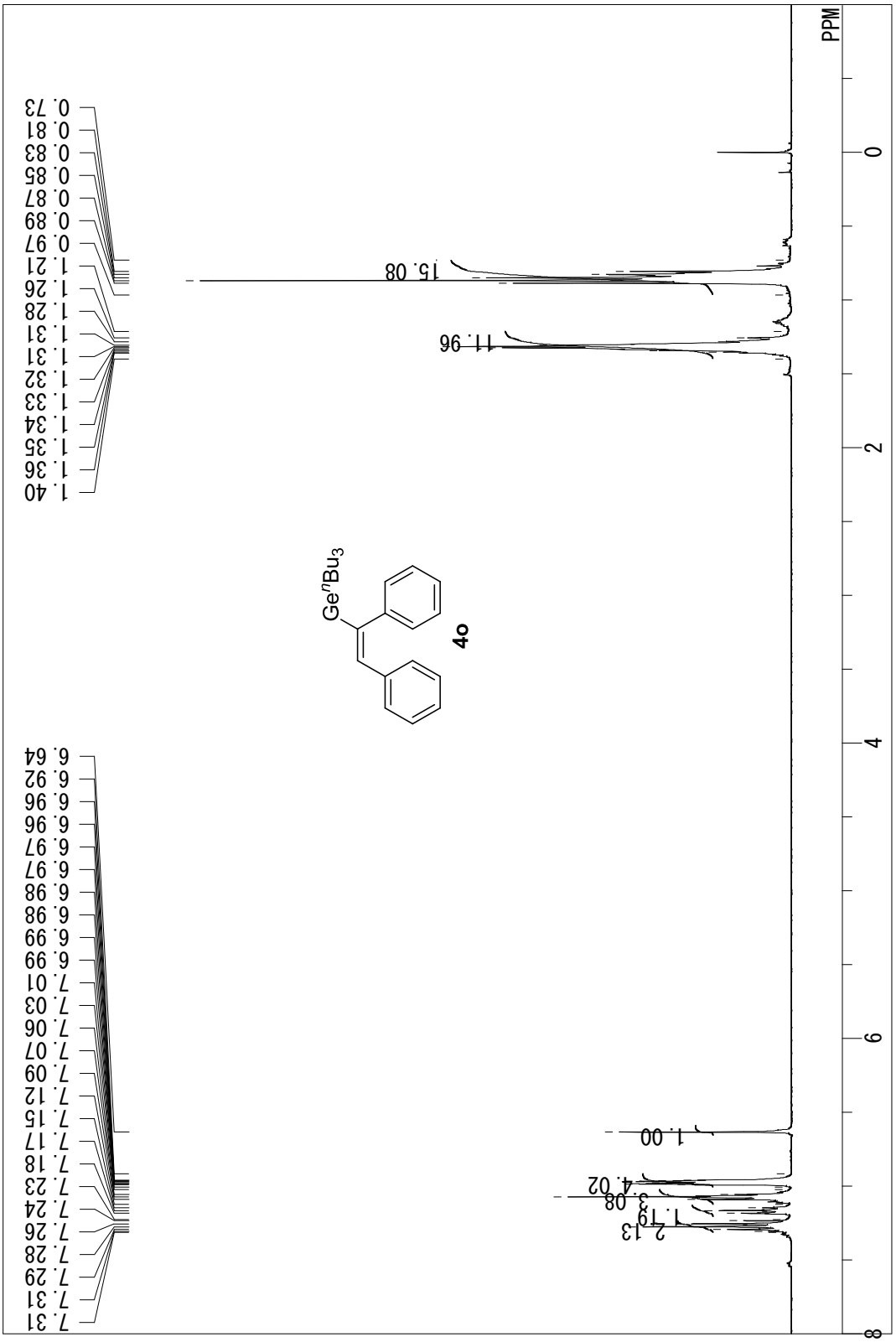
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4.02
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7.29
7.28
7.26
7.24
7.23
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7.17
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6.99
6.98
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6.97
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6.96
6.92
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1.40
1.36
1.35
1.34
1.33
1.32
1.31
1.31
1.28
1.26
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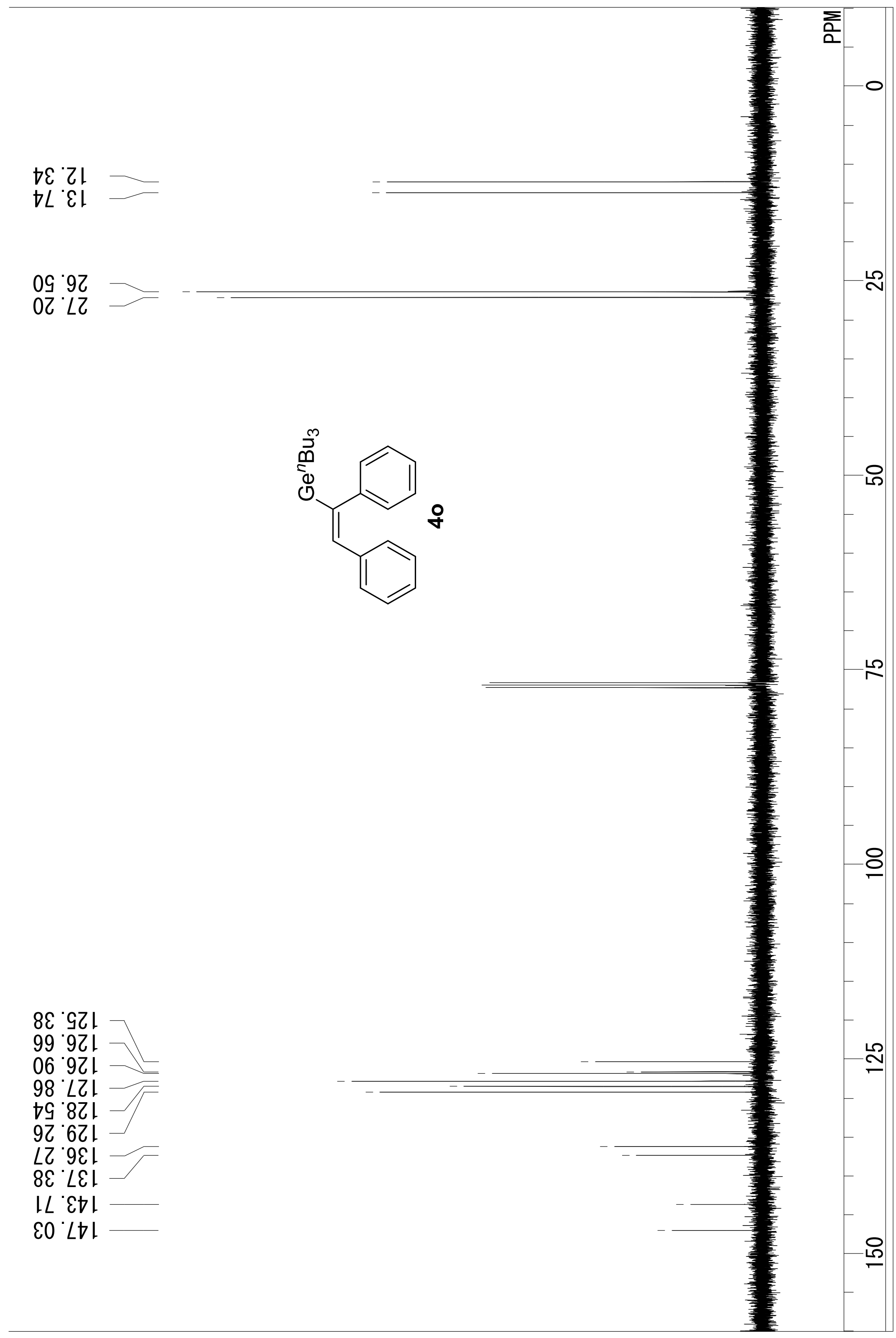
0.97
0.89
0.87
0.85
0.83
0.81
0.73
Ge^{n}Bu$_3$
4o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Ge^{n}Bu$_3$
4o
PPM
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75
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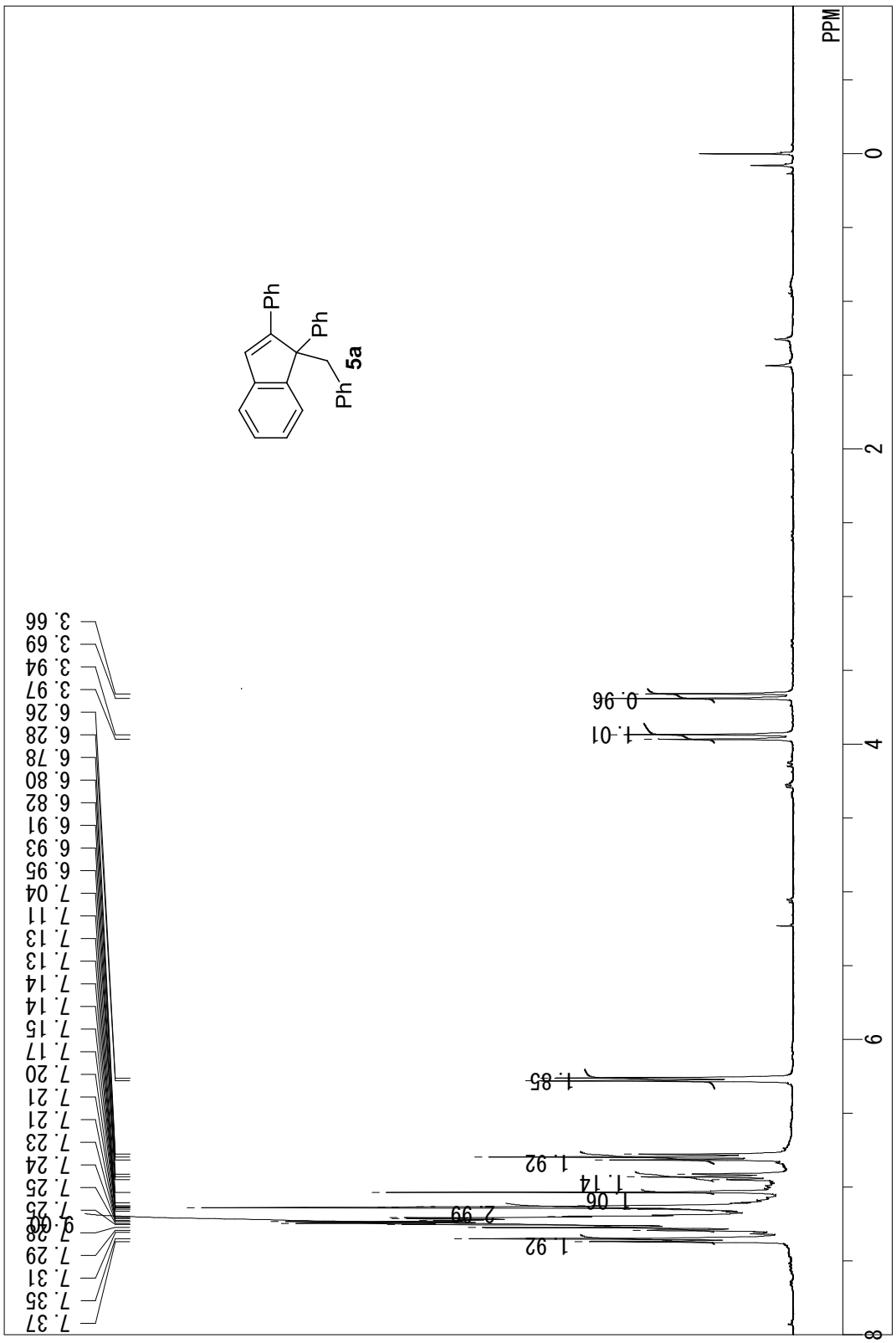
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Ph
Ph
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4
6
8
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1.92
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2.99
1.92
3.66
3.69
3.94
3.97
6.26
6.28
6.78
6.80
6.82
6.91
6.93
6.95
7.04
7.11
7.13
7.13
7.14
7.14
7.15
7.17
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7.23
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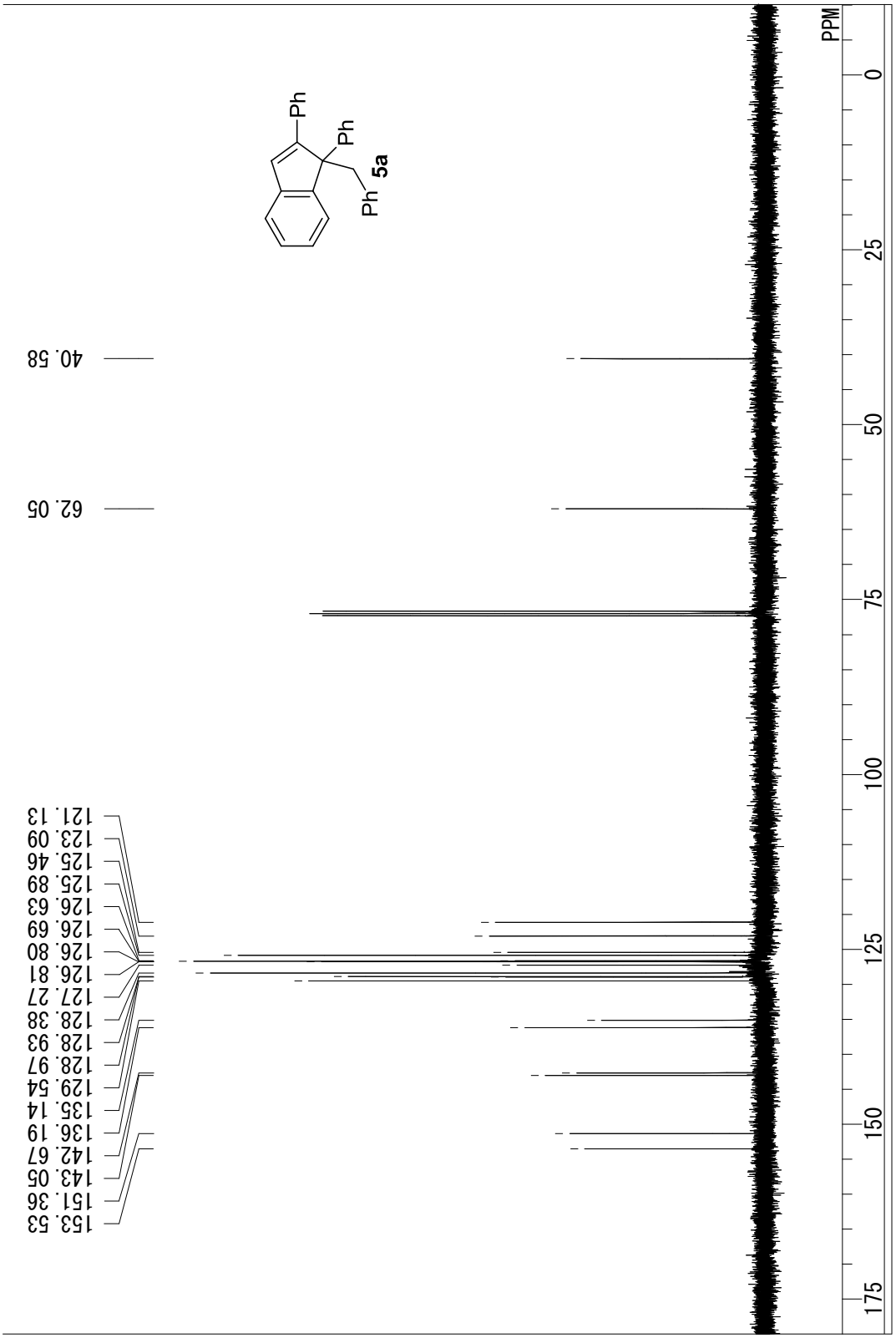
7.25
7.28
7.29
7.31
7.35
7.37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Ph
Ph
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127.27
128.38
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128.97
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0
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50
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100
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150
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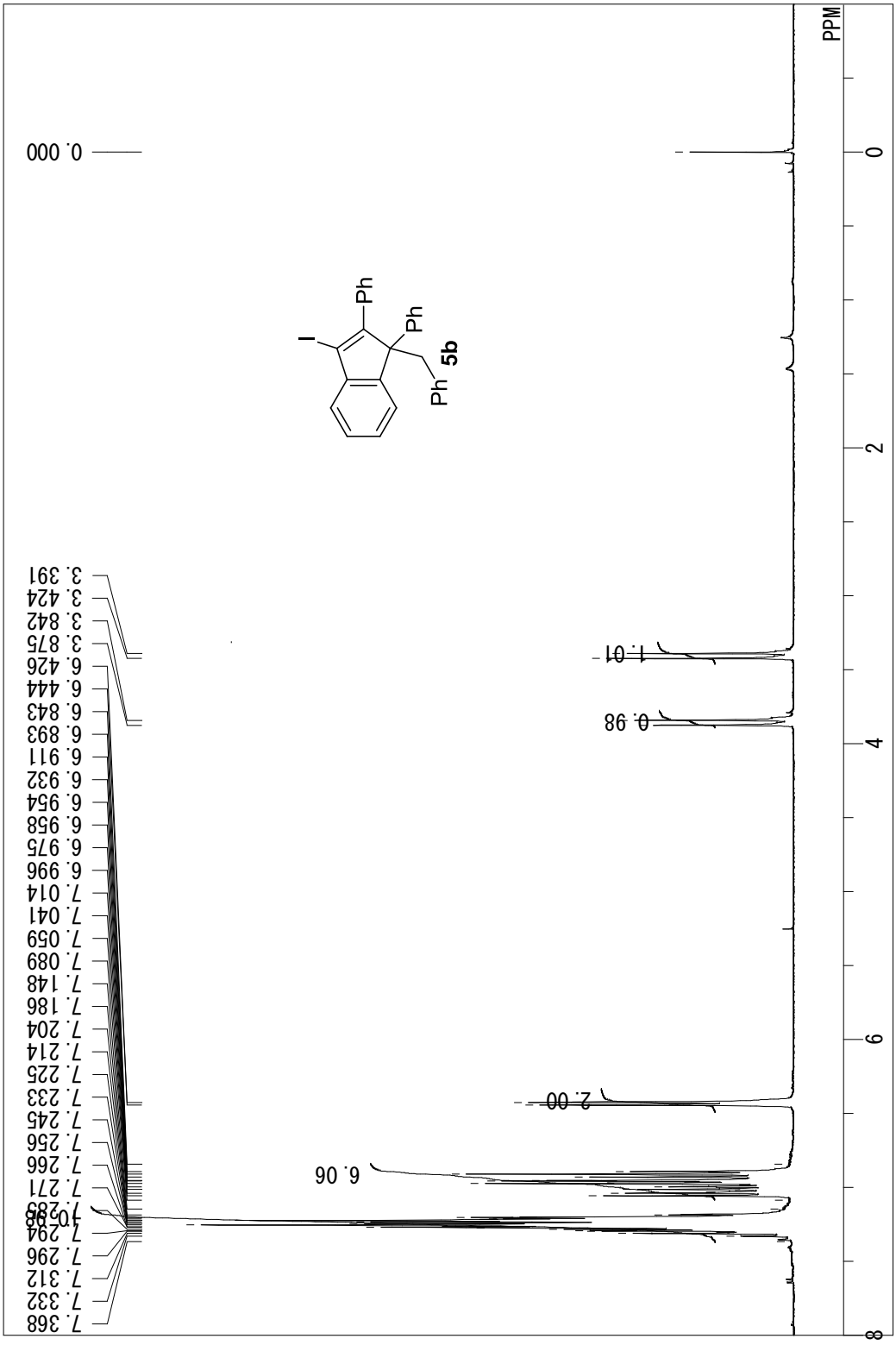
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6
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7.214
7.225
7.233
7.245
7.256
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7.296
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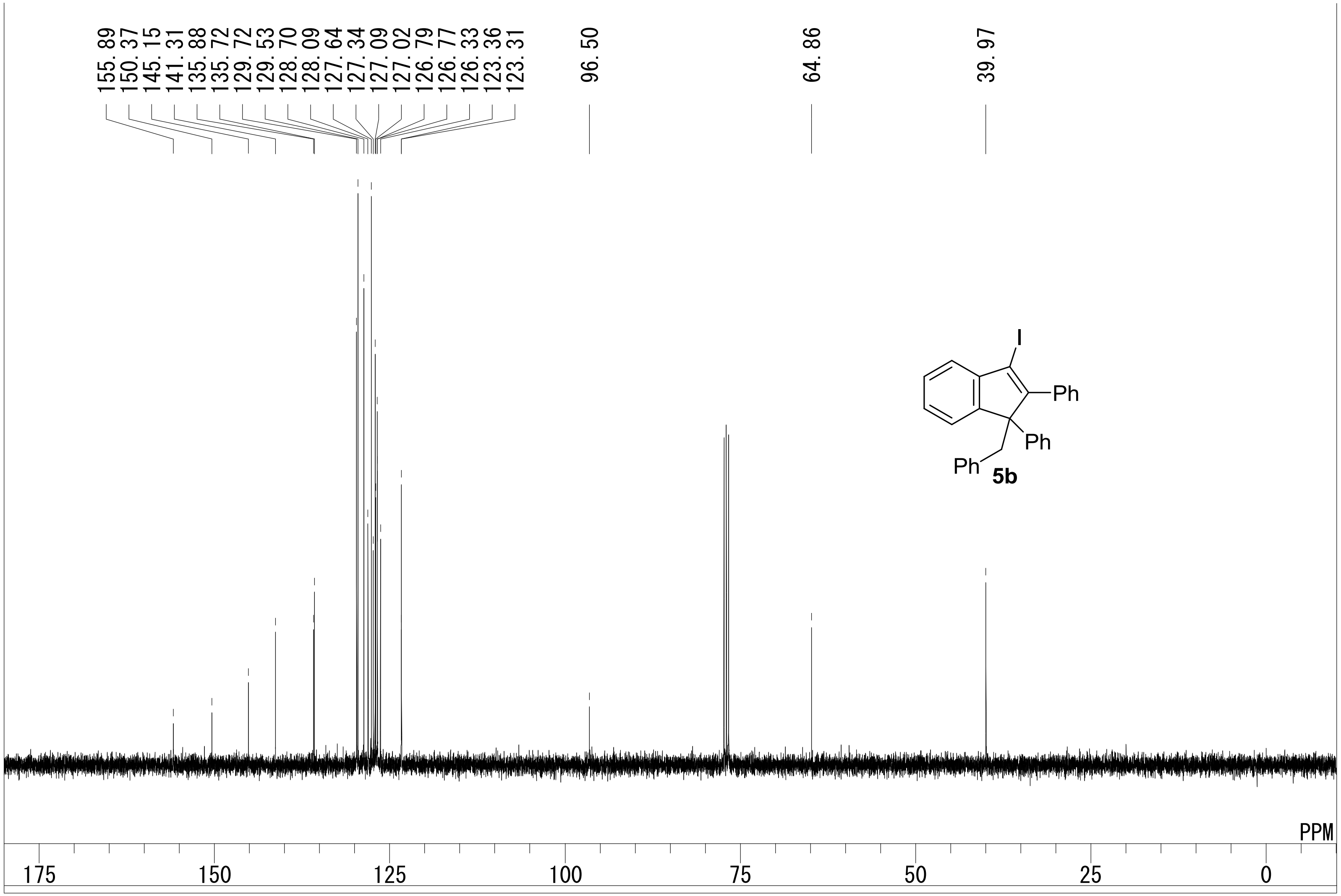
7.368
Ph
Ph
I
Ph
5b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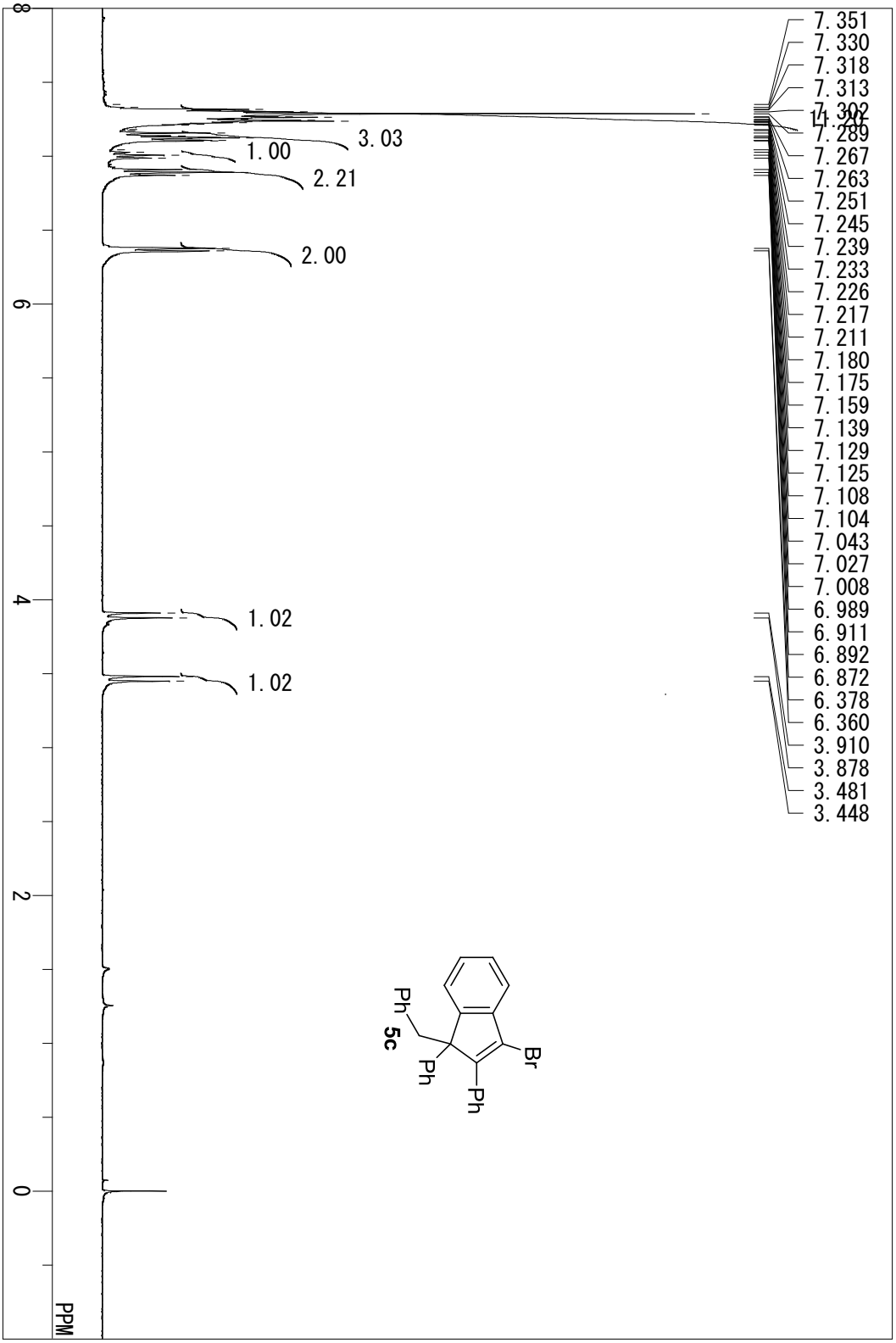
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1.02
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Ph
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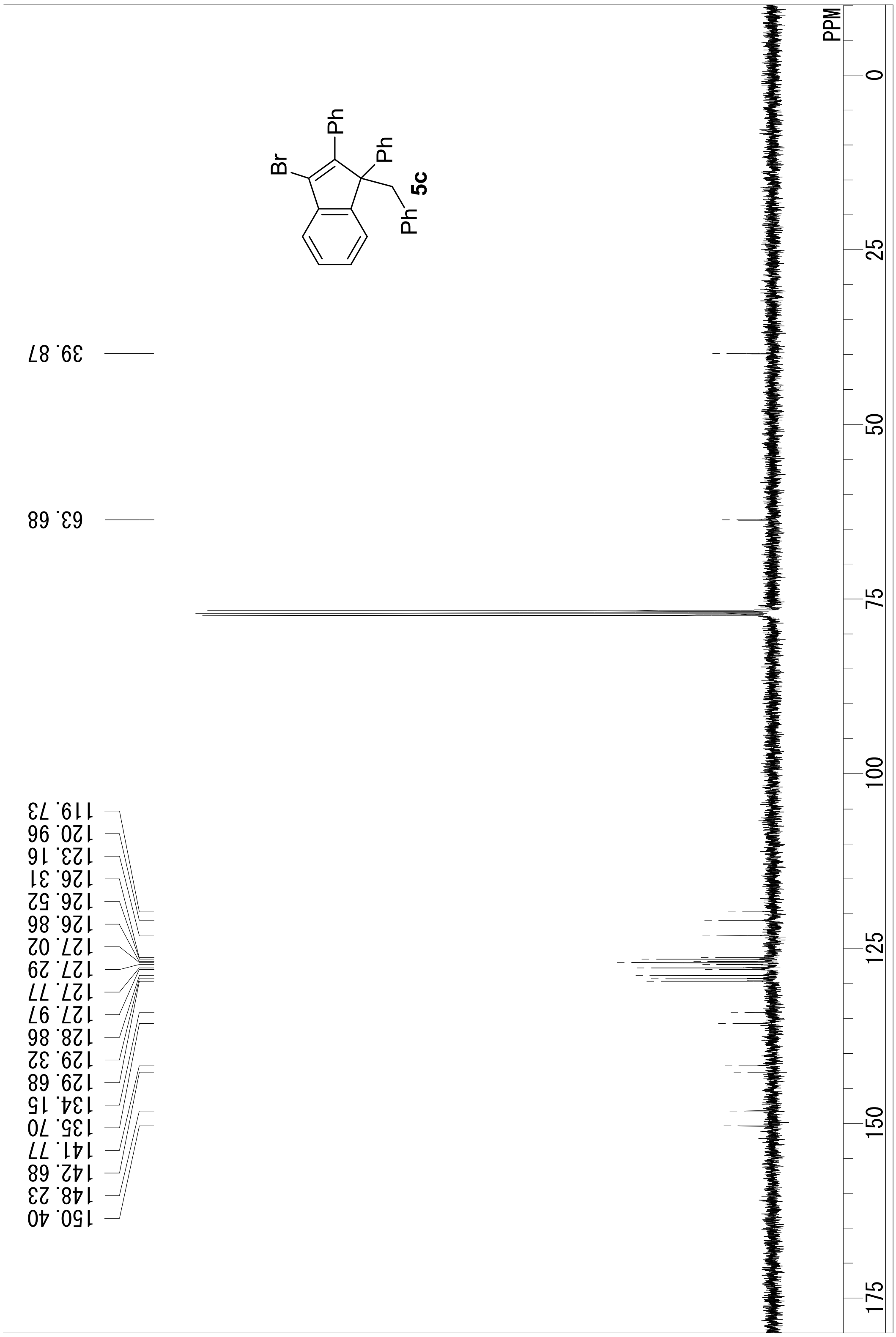
Br
5c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142.68
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150.40
PPM
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75
100
125
150
175