Supplementary data

Content

1. Experimental section

1.1. General

The NMR, IR and MALDI spectra were registered on the equipment of Assigned Spectral-Analytical Center of FRC Kazan Scientific Center of RAS. NMR experiments were performed with Bruker AVANCE-600, AVANCE-500 and AVANCE-400 (600, 500 and 400 MHz for ^{1}H NMR, 150, 125 and 100 MHz for ^{13}C NMR) spectrometers. Chemical shifts (δ in ppm) are referred to the solvents. The high resolution mass spectra (HRMS) were obtained on a Bruker Ultraflex III MALDI-TOF/TOF mass spectrometer in the reflectron mode. The device is equipped with a solid-state laser Nd:YAG laser (λ = 355 nm, repetition rate 100 Hz). Measurements were made in the range *m*/*z* 200-1000. A mixture of the sample (1 mg/mL, CH_2Cl_2) and calibrant PEG-400 (1 mg/mL, CH_3CN) was prepared to determine the exact mass values. *para*-Nitroaniline (10 mg/mL, CH_3CN) was used as a matrix. Portions (0.5 μl) of the matrix solution and the analyzed mixture were sequentially applied to the target and evaporated. The metal target MTP AnchorChip^{TM} was used. The specified composition allowed to provide the absolute error in determining the masses no more than 10 ppm. The *m*/*z* values of monoisotopic ions are given in the descriptions. The data was obtained using the FlexControl program (Bruker Daltonik GmbH, Germany) and processed using the FlexAnalysis 3.0 program (Bruker Daltonik GmbH, Germany). UV-Vis spectra were recorded at room temperature on a UV-6100 Ultraviolet/Visible Spectrophotometer using 10 mm quartz cells. Spectra were registered with a scan speed of 480 nm/min, using a spectral width of 1 nm. All samples were prepared in solution with the concentrations of ca ~3-10^{-5} mol/L. The melting points of chromophores were determined by Melting Point Meter MF-MP-4. The reaction progress and the purity of the obtained compounds were controlled by TLC on Sorbfil UV-254 plates with visualization under UV light. 6-Bromobenothiazole (**W**), iodohexane, iodobutane, 3-ethylaniline, 2-phenylaniline, 4-(diethylamino)-2-hydroxybenzaldehyde, tri(*o*-tolyl)phosphine and $Pd(OAc)_2$ were purchased from Aldrich or Acros. Bromoquinoxalines (**Z**, **Z'**),[3c] bromoquinoxaline-2-ones (**Y**, **Y'**) [3c], 6-bromoquinoline (**X**), [22] 4-vinylanilines **A**, **B**[20] and aldehydes – precursors of compounds **F**, **G**[21] were prepared according to literature. The range of bp for the petroleum ether is 65-70 ^{o}C.

1.2.1. Quinoxalines:

(*E*)-*N*,*N*-Dihexyl-4-(2-(3-methyl-2-phenylquinoxalin-6-yl)vinyl)aniline (AZ'-I)

Reaction condition: 4 h at 120 ^{o}C. Yield 51% (198 mg from 229 mg of **Z'**); yellow-orange powder; mp 59-60 ^{o}C; R_f = 0.25 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2953 (CH), 2925 (CH), 2854 (CH), 1597 (C=N, C=C), 1519, 1467, 1370, 1177, 955, 827, 800.

^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.02 (d, 1H, *J* = 8.7 Hz, 1H, H-8 quinoxaline), 7.99 (d, 1H, *J* = 1.5 Hz, 1H, H-5 quinoxaline), 7.92 (dd, 1H, *J* = 8.7, 1.5 Hz, 1H, H-7 quinoxaline), 7.69-7.63 (m, 2H, *o*-Ph), 7.56-7.46 (m, 3H, *m*,*p*-Ph), 7.45 (d, *J* = 8.8 Hz, 2H, H-3,5 aniline), 7.26 (d, *J* = 16.2 Hz, 1H, HC=CH), 7.07 (d, *J* = 16.2 Hz, 1H, HC=CH), 6.65 (d, *J* = 8.8 Hz, 2H, H-2,6 aniline), 3.31 (t, *J* = 7.6 Hz, 4H, NCH_2), 2.77 (s, 3H, CH_3), 1.66-1.55 (m, 4H, $NCH_2\underline{CH_2}$), 1.41-1.29 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.92 (t, *J* = 6.6 Hz, 6H, $N(CH_{2)5}\underline{CH_3}$).

^{13}C NMR (150 MHz, $CDCl_3$) δ: 153.6 (C), 152.6 (C), 148.3 (C), 141.9 (C), 140.5 (C), 140.1 (C), 139.3 (C), 131.7 (CH), 129.1 (CH), 129.0 (CH), 128.8 (CH), 128.5 (CH), 128.3 (CH), 127.4 (CH), 124.5 (CH), 124.0 (C), 122.4 (CH), 111.7 (CH), 51.1 (CH), 31.7 (CH), 27.3 (CH), 26.8 (CH), 24.3 (CH), 22.7 (CH), 14.0 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{35}H_{43}N_3$: 505.3451; found: 505.3485.

_N,N_-Dihexyl-4-(1-(3-methyl-2-phenylquinoxalin-6-yl)vinyl)aniline (AZ'-II)

Reaction condition: 4 h at 120 °C. Yield 2.5% (10 mg from 229 mg of **Z'**); yellow-orange oil; R_f = 0.45 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2955 (CH), 2928 (CH), 2856 (CH), 1608 (C=N, C=C), 1520, 1464, 1371, 1195, 1170, 996, 817.

^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 1.7 Hz, 1H, H-5 quinoxaline), 8.04 (d, *J* = 8.7 Hz, 1H, H-8 quinoxaline), 7.56 (dd, *J* = 8.7, 1.7 Hz, 1H, H-7 quinoxaline), 7.68-7.64 (m, 2H, *o*-Ph), 7.56-7.48 (m, 3H, *m,p*-Ph), 7.22 (d, *J* = 8.8 Hz, 1H, H-3,5 aniline), 6.60 (d, *J* = 8.8 Hz, 1H, H-2,6 aniline), 5.52 (br, 1H, ethene), 5.44 (br, 1H, ethene), 3.28 (t, *J* = 7.7 Hz, 4H, NCH_2), 2.77 (s, 3H, CH_3), 1.65-1.56 (m, 4H, $NCH_2\underline{CH_2}$), 1.38-1.30 (m, 4H, $N(CH_2)_2(\underline{CH_2})_3$), 0.90 (t, *J* = 6.4 Hz, 6H, $N(CH_2)_5\underline{CH_3}$).

^{13}C NMR (125 MHz, $CDCl_3$) δ: 154.5 (C), 152.6 (C), 149.1 (C), 148.0 (C), 144.1 (C), 141.3 (C), 140.7 (C), 139.2 (C), 130.3 (CH), 129.2 (CH), 129.0 (CH), 128.9 (CH), 128.6 (CH), 128.5 (CH), 127.4 (C), 127.3 (CH), 112.7 (CH), 111.2 (CH), 51.1 (CH), 31.7 (CH), 27.3 (CH), 26.9 (CH), 24.4 (CH), 22.7 (CH), 14.0 (CH).

HRMS: *m/z* $[M - H]^+$ calcd for $C_{35}H_{42}N_3$: 504.3373; found: 504.3379

_E_)-2-(ethyl(4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)phenyl)amino)ethyl acetate (BZ-I)

Yield 91% (220 mg from 160 mg of **Z**); mp 89-90 °C[20b]

HRMS: *m/z* $[M]^+$ calcd for $C_{29}H_{29}N_3O$: 451.2305; found: 451.2335

(_E_)-_N,N_-Dibutyl-3-ethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (DZ-I)

Reaction condition: 15 h at 100 °C. Yield 67% (446 mg from 420 mg of **Z**); orange powder; mp 107-108 °C; R_f = 0.35 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2957 (CH), 2929 (CH), 2871 (CH), 1598 (C=N, C=C), 1509, 1370, 1349, 1220, 1096, 1005, 955, 824, 713.

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.14 (d, *J* = 1.8 Hz, 1H, H-5 quinoxaline), 8.00 (d, *J* = 8.8 Hz, 1H, H-8 quinoxaline), 7.92 (dd, *J* = 8.8, 1.8 Hz, 1H, H-7 quinoxaline), 7.70-7.65 (m, 2H, *o*-Ph), 7.61 (d, *J* = 8.8 Hz, 1H, H-5 aniline), 7.59-7.46 (m, 4H, *m,p*-Ph, ethene), 7.03 (d, *J* = 16.0 Hz, 1H, ethene), 6.58 (dd, *J*

= 8.8, 2.5 Hz, 1H, H-6 aniline), 6.50 (d, *J* = 2.5 Hz, 1H, H-2 aniline), 3.32 (t, *J* = 7.5 Hz, 4H, NCH_2), 2.81 (q, *J* = 7.6 Hz, 2H, NCH_2), 2.77 (s, 3H, CH_3), 1.66-1.57 (m, 4H, $N(CH_2\underline{CH_2})$), 1.45-1.34 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.30 (t, *J* = 7.5 Hz, 3H, $NCH_2\underline{CH_3}$), 0.99 (t, *J* = 7.4 Hz, 6H, $N(CH_2)_3\underline{CH_3}$).

^{13}C NMR (150 MHz, $CDCl_3$): δ = 155.0 (C), 151.1 (C), 148.2 (C), 143.6 (C), 141.5 (C), 140.6 (C), 139.9 (C), 139.2 (C), 128.9 (CH), 128.8 (CH), 128.5 (CH), 128.4 (CH), 128.3 (CH), 128.2 (CH), 126.7 (CH), 124.9 (CH), 123.7 (CH), 122.0 (C), 111.6 (CH), 109.9 (CH), 50.6 (CH), 29.5 (CH), 27.1 (CH), 24.1 (CH), 20.3 (CH), 15.9 (CH), 13.9 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{33}H_{39}N_3$: 477.3138; found: 477.3166.

_N,N_-Dibutyl-3-ethyl-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (DZ-II)

Reaction condition: 15 h at 100 °C. Yield 11% (76 mg from 420 mg of **Z**); orange-yellow oil; R_f = 0.41 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2957 (CH), 2925 (CH), 2855 (CH), 1606 (C=N, C=C), 1509, 1462, 1370, 1344, 1222, 1182, 1005, 897, 843, 699.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.99 (d, *J* = 8.8 Hz, 1H, H-8 quinoxaline), 7.97 (d, *J* = 1.9 Hz, 1H, H-5 quinoxaline), 7.87 (dd, *J* = 8.8, 1.9 Hz, 1H, H-7 quinoxaline), 7.66-7.60 (m, 2H, *o*-Ph), 7.53-7.44 (m, 3H, *m*,*p*-Ph), 7.09 (d, *J* = 9.1 Hz, 1H, H-5 aniline), 6.55-6.49 (m, 2H, H-2,6 aniline), 5.91 (d, *J* = 1.3 Hz, 1H, ethene), 5.38 (d, *J* = 1.3 Hz, 1H, ethene), 3.31 (t, *J* = 7.5 Hz, 4H, NCH_2), 2.77 (s, 3H, CH_3), 2.38 (q, *J* = 7.5 Hz, 2H, NCH_2), 1.68-1.58 (m, 4H, $NCH_2\underline{CH_2}$), 1.45-1.35 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.05 (t, *J* = 7.5 Hz, 3H, $NCH_2\underline{CH_3}$), 0.99 (t, *J* = 7.4 Hz, 6H, $N(CH_2)_3\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 155.0 (C), 151.9 (C), 148.8 (C), 148.1 (C), 143.1 (C), 142.7 (C), 141.0 (C), 140.8 (C), 139.2 (C), 131.3 (CH), 128.8 (2 CH), 128.7 (CH), 128.5 (CH), 127.8 (CH), 127.5 (C), 126.9 (CH), 116.4 (CH), 111.7 (CH), 109.1 (CH), 50.8 (CH), 29.6 (CH), 27.0 (CH), 24.2 (CH), 20.4 (CH), 15.3 (CH), 14.0 (CH).

HRMS: *m/z* $[M - H]^+$ calcd for $C_{33}H_{38}N_3$: 476.3060; found: 476.3085.

(*E*)-3-Butoxy-*N*,*N*-diethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (E1Z-I)

Reaction condition: 8 h at 100 °C. Yield 65% (370 mg from 366 mg of **Z**); yellow-orange powder; R_f = 0.54 (hexane : ethyl acetate = 3:1); mp 118-120 °C.

IR (ν_{max}, cm^{-1}, KBr): 3034 (CH), 2961 (CH), 2922 (CH), 2868 (CH), 1593, 1553, 1517, 1467, 1446, 1405, 1379, 1342, 1304, 1276, 1229, 1215, 1177, 1154, 1128, 1109, 1068, 1024, 1003, 995, 965.

^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.06 (s, 1H, H-5 quinoxaline), 7.97-7.95 (m, 2H, H-7,8 quinoxaline), 7.68-7.64 (m, 2H, *o*-Ph), 7.60 (d, *J* = 16.4 Hz, 1H, ethene), 7.56-7.46 (m, 4H, *m*,*p*-Ph, H-5 aniline), 7.16 (d, *J* = 16.4 Hz, 1H, ethene), 6.32 (dd, *J* = 8.8, 2.3 Hz, 1H, H-6 aniline), 6.20 (d, *J* = 2.3 Hz, 1H, H-2 aniline), 4.05 (t, *J* = 6.5 Hz, 2H, OCH_2), 3.39 (q, *J* = 7.1 Hz, 4H, NCH_2), 2.75 (s, 3H, CH_3), 1.93-1.84 (m, 2H, $OCH_2\underline{CH_2}$), 1.64-1.53 (m, 4H, $O(CH_2)_2\underline{CH_2}$), 1.20 (t, *J* = 7.1 Hz, 6H, $NCH_2\underline{CH_3}$), 1.03 (t, *J* = 7.4 Hz, 6H, $O(CH_2)_3\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 158.4, 155.0, 151.0, 149.2, 141.7, 140.6, 140.5, 139.4, 129.0, 128.8, 128.5, 128.3, 128.2, 128.1, 126.8, 125.1, 122.9, 114.0, 104.7, 95.9, 68.1, 44.6, 31.5, 24.2, 19.5, 13.9, 12.8.

HRMS: *m/z* $[M]^+$ calcd for $C_{31}H_{35}N_3O$: 465.2774; found: 465.2780.

3-Butoxy-*N,N*-diethyl-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (E1Z-II)

Reaction condition: 8 h at 100 ^oC. Yield 9% (50 mg from 366 mg of **Z**); yellow oil; R_f = 0.41 (hexane : ethyl acetate = 5:1).

IR (ν_{max}, cm^{-1}, KBr): 3084 (CH), 3058 (CH), 2964 (CH), 2930 (CH), 2870 (CH), 1610 (C=N, C=C), 1555 (C=N, C=C), 1514, 1487, 1467, 1448, 1431, 1399, 1376, 1344, 1311, 1273, 1218, 1182, 1155, 1127, 1105, 1075, 1005, 996, 893, 841, 794, 767.

^{1}H NMR (600 MHz, $CDCl_3$) δ: 8.03 (d, *J* = 1.9 Hz, 1H, H-5 quinoxaline), 7.94 (d, *J* = 8.7 Hz, 1H, H-8 quinoxaline), 7.80 (dd, *J* = 8.7, 1.9 Hz, 1H, H-7 quinoxaline), 7.66-7.60 (m, 2H, *o*-Ph), 7.53-7.44 (m, 3H, *m,p*-Ph), 7.16 (d, *J* = 8.4 Hz, 1H, H-5 aniline), 6.30 (d, *J* = 8.4, 2.1 Hz, 1H, H-6 aniline), 6.17 (d, *J* = 2.1 Hz, 1H, H-2 aniline), 5.67 (d, *J* = 1.3 Hz, 1H, ethene), 5.44 (d, *J* = 1.3 Hz, 1H, ethene), 3.73 (t, *J* = 6.1 Hz, 2H, OCH_2), 3.37 (q, *J* = 7.0 Hz, 4H, NCH_2), 2.76 (s, 3H, CH_3), 1.24-1.20 (m, 2H, $OCH_2\underline{CH_2}$), 0.90-0.83 (m, 2H, $O(CH_2)_2\underline{CH_2}$), 1.20 (t, *J* = 7.5 Hz, 6H, $NCH_2\underline{CH_3}$), 0.54 (t, *J* = 7.4 Hz, 3H, $O(CH_2)_3\underline{CH_3}$).

^{13}C NMR (150 MHz, $CDCl_3$) δ: 157.8 (C), 154.7 (C), 151.5 (C), 149.3 (C), 147.2 (C), 144.3 (C), 141.1 (C), 140.7 (C), 139.4 (C), 131.9 (CH), 129.5 (CH), 128.9 (CH), 128.8 (CH), 128.5 (CH), 127.2 (CH), 126.4 (CH), 118.0 (C), 115.7 (CH), 104.0 (CH), 96.6 (CH), 67.5 (CH), 44.5 (CH), 31.1 (CH), 24.2 (CH), 18.8 (CH), 13.5 (CH), 12.7 (CH).

HRMS: *m/z* $[M-H]^+$ calcd for $C_{31}H_{34}N_3O$: 464.2696; found: 464.2695.

(*E*)-3-Hexyloxy-*N,N*-diethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (E2Z-I)

Reaction condition: 3.5 h at 100 ^oC. Yield 76% (505 mg from 402 mg of **Z**); yellow-orange crystals; mp 92-93 ^oC; R_f = 0.26 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2955 (CH), 2923 (CH), 2864 (CH), 1598 (C=N, C=C), 1550, 1513, 1469, 1453, 1402, 1375, 1348, 1277, 1230, 1215, 1196, 1135, 1110, 1004, 968, 807, 766, 709.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.06 (s, 1H, H-5 quinoxaline), 7.97-7.95 (m, 2H, H-7,8 quinoxaline), 7.68-7.64 (m, 2H, *o*-Ph), 7.62 (d, *J* = 16.4 Hz, 1H, ethene), 7.56-7.46 (m, 4H, *m,p*-Ph, H-5 aniline), 7.16 (d, *J* = 16.4 Hz, 1H, ethene), 6.32 (dd, *J* = 8.7, 2.1 Hz, 1H, H-6 aniline), 6.19 (d, *J* = 2.1 Hz, 1H, H-2 aniline), 4.04 (t, *J* = 6.5 Hz, 2H, OCH_2), 3.39 (q, *J* = 7.0 Hz, 4H, NCH_2), 2.76 (s, 3H, CH_3), 1.95-1.86 (m, 2H, $OCH_2\underline{CH_2}$), 1.60-1.51 (m, 2H, $O(CH_2)_2\underline{CH_2}$), 1.45-1.34 (m, 4H, $O(CH_2)_3(\underline{CH_2})_2$), 1.20 (t, *J* = 7.0 Hz, 6H, $NCH_2\underline{CH_3}$), 0.93 (t, *J* = 7.0 Hz, 6H, $O(CH_2)_5\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 158.4 (C), 154.9 (C), 150.9 (C), 149.1 (C), 141.7 (C), 140.6 (C), 140.5 (C), 139.4 (C), 128.9 (CH), 128.8 (CH), 128.4 (CH), 128.1 (CH), 128.0 (2CH), 126.7 (CH), 125.1 (CH), 122.8 (CH), 113.9 (C), 104.7 (CH), 95.9 (CH), 68.5 (CH), 44.5 (CH), 31.6 (CH), 29.4 (CH), 25.9 (CH), 24.2 (CH), 22.6 (CH), 14.0 (CH), 12.7 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{33}H_{39}N_3O$: 493.3087; found: 493.3115.

***N,N*-Diethyl-3-(hexyloxy)-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (E2Z-II)**

Reaction condition: 3.5 h at 100 ^oC. Yield 12% (80 mg from from 402 mg of **Z**); yellow powder; mp. 84-85 ^oC; R_f = 0.36 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2958 (CH), 2926 (CH), 2869 (CH), 1609 (C=N, C=C), 1554, 1514, 1467, 1445, 1400, 1375, 1353, 1280, 1222, 1155, 1107, 1006, 887, 839, 809, 773, 702.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.04 (d, *J* = 1.9 Hz, 1H, H-5 quinoxaline), 7.93 (d, *J* = 8.7 Hz, 1H, H-8 quinoxaline), 7.79 (dd, *J* = 8.7, 1.9 Hz, 1H, H-7 quinoxaline), 7.66-7.60 (m, 2H, *o*-Ph), 7.54-7.44 (m, 3H, *m,p*-Ph), 7.17 (d, *J* = 8.4 Hz, 1H, H-5 aniline), 6.30 (d, *J* = 8.4, 2.3 Hz, 1H, H-6 aniline), 6.17 (d, *J* = 2.3 Hz, 1H, H-2 aniline), 5.68 (d, *J* = 1.4 Hz, 1H, ethene), 5.44 (d, *J* = 1.4 Hz, 1H, ethene), 3.72 (t, *J* = 6.2 Hz, 2H, OCH_2), 3.37 (q, *J* = 7.1 Hz, 4H, NCH_2), 2.76 (s, 3H, CH_3), 1.26-1.21 (m, 2H, $OCH_2\underline{CH_2}$), 0.93-0.84 (m, 4H, $O(CH_2)_2(\underline{CH_2})_2$), 0.83-0.75 (m, 2H, $O(CH_2)_4\underline{CH_2}$), 1.20 (t, *J* = 7.1 Hz, 6H, $NCH_2\underline{CH_3}$), 0.68 (t, *J* = 7.1 Hz, 3H, $O(CH_2)_5\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 157.8 (C), 154.7 (C), 151.5 (C), 149.4 (C), 147.3 (C), 144.2 (C), 141.1 (C), 140.7 (C), 139.4 (C), 131.9 (CH), 129.5 (CH), 128.9 (CH), 128.8 (CH), 128.5 (CH), 127.3 (CH), 126.3 (CH), 118.0 (C), 115.7 (CH), 104.0 (CH), 96.5 (CH), 67.9 (CH), 44.5 (CH), 31.1 (CH), 29.1 (CH), 25.4 (CH), 24.2 (CH), 22.3 (CH), 13.9 (CH), 12.8 (CH).

HRMS: *m/z* $[M - H]^+$ calcd for $C_{33}H_{38}N_3O$: 492.3009 ; found: 492.3030.

1.2.2. Quinoxalin-2-ones:

(*E*)-7-(4-(Dihexylamino)styryl)-3-methyl-1-propylquinoxalin-2(1H)-one (AY-I)

Reaction condition: 5 h at 120 ^oC. Yield 60% (270 mg from 260 mg of **Y**); yellow powder; mp 103-104 ^oC; R_f = 0.35 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2955 (CH), 2927 (CH), 2855 (CH), 1656 (C=O), 1608 (C=N, C=C), 1599, 1446, 1372, 1185, 1113, 957, 822.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.72 (d, 1H, *J* = 8.3 Hz, 1H, H-5 quinoxaline), 7.48 (dd, 1H, *J* = 8.3, 1.0 Hz, 1H, H-6 quinoxaline), 7.41 (d, *J* = 8.7 Hz, 2H, H-3,5 aniline), 7.22 (s, 1H, H-8 quinoxaline), 7.12 (d, *J* = 16.1 Hz, 1H, ethene), 6.94 (d, *J* = 16.1 Hz, 1H, ethene), 6.64 (d, *J* = 8.7 Hz, 2H, H-2,6 aniline), 4.24 (t, *J* = 7.7 Hz, 2H, NCH_2), 3.30 (t, *J* = 7.4 Hz, 4H, NCH_2), 2.58 (s, 3H, CH_3), 1.89-1.78 (m, 2H, $NCH_2\underline{CH_2}$), 1.66-1.53 (m, 4H, $NCH_2\underline{CH_2}$), 1.41-1.24 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 1.09 (t, *J* = 7.4 Hz, 3H, $NCH_2\underline{CH_3}$), 0.91 (t, *J* = 7.5 Hz, 3H, $N(CH_{2)2}\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 156.8 (C), 152.2 (C), 148.4 (C), 140.0 (C), 132.9 (C), 131.9 (C), 131.5 (CH), 129.7 (CH), 128.2 (CH), 123.8 (C), 122.4, (CH), 120.7 (CH), 111.7 (CH), 110.9 (CH), 51.1 (CH), 43.6 (CH), 31.7 (CH), 27.3 (CH), 26.8 (CH), 22.7 (CH), 21.4 (CH), 20.7 (CH), 14.0 (CH), 11.4 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{32}H_{45}N_3O$: 487.3557; found: 487.3578.

7-(1-(4-(Dihexylamino)phenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1H)-one (AY-II)

Reaction condition: 5 h at 120 ^oC. Yield 4% (18 mg from 260 mg of **Y**); orange oil; R_f = 0.55 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2956 (CH), 2929 (CH), 2856 (CH), 1656, 1608 (C=N, C=C), 1520, 1443, 1371, 1196, 1181, 1002, 818.

^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.74 (d, *J* = 8.2 Hz, 1H, H-5 quinoxaline), 7.34 (d, *J* = 8.2 Hz, 1H, H-6 quinoxaline), 7.26 (s, 1H, H-8 quinoxaline), 7.18 (d, *J* = 8.6 Hz, 2H, H-3,5 aniline), 6.59 (d, *J* = 8.6 Hz, 2H, H-2,6 aniline), 5.48 (s, 1H, ethene), 5.29 (s, 1H, ethene), 4.16 (t, *J* = 7.5 Hz, 2H, NCH_2), 3.27 (t, *J* = 7.5 Hz, 4H, NCH_2), 2.59 (s, 3H, CH_3), 1.79-1.71 (m, 2H, N1(quinoxaline)-$CH_2\underline{CH_2}$), 1.64-1.53 (m, 4H, $NCH_2\underline{CH_2}$), 1.43-1.25 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.97 (t, *J* = 7.4 Hz, 3H, CH_3), 0.89 (t, *J* = 6.8 Hz, 6H, CH_3).

^{13}C NMR (150 MHz, $CDCl_3$): δ = 157.9 (C), 155.1 (C), 149.1 (C), 148.1 (C), 144.0 (C), 132.4 (C), 132.1 (C), 129.0 (2 CH), 127.0 (C), 124.0 (CH), 113.7 (CH), 111.9 (CH), 111.1 (CH), 51.0 (CH), 43.6 (CH), 31.7 (CH), 27.2 (CH), 26.8 (CH), 22.6 (CH), 21.5 (CH), 20.7 (CH), 14.0 (CH), 11.3 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{32}H_{45}N_3O$: 487.3557; found: 487.3585.

(*E*)-2-(Ethyl(4-(2-(2-methyl-3-oxo-4-propyl-3,4-dihydroquinoxalin-6-yl)vinyl)phenyl)amino)ethyl acetate (BY-I)

Reaction condition: 4 h at 120 ^oC. Yield 29% (90 mg from 200 mg of **Y**); orange oil; R_f = 0.25 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 2959 (CH), 2927 (CH), 1739 (C=O), 1654 (C=N, C=C), 1598, 1521, 1356, 1232, 1183, 956, 824 cm^{-1}.

^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.70 (d, 1H, *J* = 8.4 Hz, 1H, H-5 quinoxaline), 7.46 (dd, 1H, *J* = 8.4, 1.5 Hz, 1H, H-6 quinoxaline), 7.40 (d, *J* = 8.8 Hz, 2H, H-3,5 aniline), 7.20 (d, 1H, *J* = 1.5 Hz, 1H, H-8 quinoxaline), 7.10 (d, *J* = 16.1 Hz, 1H, ethene), 6.94 (d, *J* = 16.1 Hz, 1H, H ethene), 6.70 (d, *J* = 8.8 Hz, 2H, H-2,6 aniline), 4.24 (t, *J* = 6.3 Hz, 2H, OCH_2), 4.22 (t, *J* = 7.7 Hz, 2H, NCH_2), 3.58 (t, *J* = 6.3 Hz, 2H, NCH_2), 3.43 (q, *J* = 7.0 Hz, 2H, NCH_2), 2.56 (s, 3H, CH_3), 2.04 (s, 3H, CH_3), 1.86-1.77 (m, 2H, $NCH_2\underline{CH_2}CH_3$), 1.19 (t, *J* = 7.1 Hz, 3H, $NCH_2\underline{CH_3}$), 1.07 (t, *J* = 7.5 Hz, 3H, $N(CH_{2)2}\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 170.8 (C), 156.8 (C), 155.1 (C), 147.7 (C), 139.7 (C), 132.8 (C), 131.9 (C), 131.1 (CH), 129.6 (CH), 128.2 (CH), 124.8 (C), 123.0, (CH), 120.7 (CH), 111.9 (CH), 111.0 (CH), 61.5 (CH), 48.7 (CH), 45.2 (CH), 43.6 (CH), 21.3 (CH), 20.8 (CH), 20.6 (CH), 12.3 (CH), 11.4 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{26}H_{31}N_3O_3$: 433.2359; found: 433.2378.

(*E*)-7-(2-(6-(Dihexylamino)-[1,1'-biphenyl]-3-yl)vinyl)-3-methyl-1-propylquinoxalin-2(1H)-one (CY-I)

Reaction condition: 8 h at 120 ^{o}C. Yield 28% (80 mg from 144 mg of **Y**); yellow powder; mp 71-72 ^{o}C; R_f = 0.24 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2956 (CH), 2928 (CH), 2856 (CH), 1657 (C=O), 1605 (C=N, C=C), 1555, 1487, 1375, 1109, 963, 868, 821.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.74 (d, *J* = 8.4 Hz, 1H, H-5 quinoxaline), 7.57-7.52 (m, 2H, *o*-Ph), 7.49 (dd, *J* = 8.4, 1.7 Hz, 1H, H-6 quinoxaline), 7.45-7.38 (m, 4H, m-Ph, H-3,5 aniline), 7.31 (ddd, 7.4, 7.4, 1.8 Hz, 1H, *p*-Ph), 7.23 (d, *J* = 1.7 Hz, 1H, H-8 quinoxaline), 7.18 (d, *J* = 16.2 Hz, 1H, ethene), 7.07 (d, *J* = 16.2 Hz, 1H, ethene), 7.06 (d, *J* = 8.9 Hz, 1H, H-6 aniline), 4.23 (t, *J* = 7.6 Hz, 2H, NCH_2), 2.85 (t, *J* = 7.5 Hz, 4H, NCH_2), 2.58 (s, 3H, CH_3), 1.88-1.77 (m, 2H, N1(quinoxaline)-$CH_2\underline{CH_2}$), 1.41-1.31 (m, 4H, $NCH_2\underline{CH_2}$), 1.29-1.20 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.20-1.10 (m, 8H, $N(CH_2)_3(\underline{CH_2})_2$), 1.08 (t, *J* = 7.1 Hz, 3H, CH_3), 0.86 (t, *J* = 7.1 Hz, 6H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 157.2 (C), 155.1 (C), 149.9 (C), 141.9 (C), 139.3 (C), 136.0 (C), 132.9(C), 132.2 (C), 130.8 (CH), 130.1 (CH), 129.8 (CH), 129.6 (C), 128.8 (CH), 128.2 (CH), 126.6 (CH), 126.4 (CH), 125.2 (CH), 120.8 (CH), 120.3 (CH), 111.4 (CH), 52.2 (CH), 43.6 (CH), 31.6 (CH), 26.9 (CH), 26.8 (CH), 22.6 (CH), 21.4 (CH), 20.6 (CH), 13.9 (CH), 11.4 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{38}H_{49}N_3O$: 563.3870; found: 563.3867.

(*E*)-7-(4-(*N*,*N*-Dibutylamino)-2-ethylstyryl)-3-methyl-1-propylquinoxalin-2(1H)-one (DY-I)

Reaction condition: 8 h at 100 ^{o}C. Yield 36% (183 mg from 312 mg of **Y**); yellow powder; mp 76-77 ^{o}C. R_f = 0.14 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 3061 (CH), 3035 (CH), 2958 (CH), 2929 (CH), 2871 (CH), 1652 (C=O), 1600 (C=N, C=C), 1553, 1509, 1444, 1398, 1370, 1285, 1229, 1214, 1194, 1153, 1107, 1054, 1020, 1001, 956, 928, 863, 821.

^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.74 (d, *J* = 8.3, 1H, H-5 quinoxaline), 7.56 (d, *J* = 8.8 Hz, 1H, H-5 aniline), 7.51 (dd, *J* = 8.3, 1.4 Hz, 1H, H-6 quinoxaline), 7.43 (d, *J* = 16.4 Hz, 1H, ethene), 7.22 (d, *J* = 1.4 Hz, 1H, H-8 quinoxaline), 6.93 (d, *J* = 16.4 Hz, 1H, ethene), 6.54 (dd, *J* = 8.8, 2.6 Hz, 1H, H-6 aniline), 6.47 (d, *J* = 2.6 Hz, 1H, H-2 aniline), 4.24 (t, *J* = 7.7 Hz, 2H, NCH_2), 3.31 (t, *J* = 7.6 Hz, 4H, NCH_2), 2.78 (q, *J* = 7.6 Hz, 2H, C3(aniline)-CH_2), 2.59 (s, 3H, CH_3), 1.89-1.78 (m, 2H, N1(quinoxaline)-$CH_2\underline{CH_2}$), 1.65-1.55 (m, 4H, $NCH_2\underline{CH_2}$), 1.43-1.33 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.28 (t, *J* = 7.6 Hz, 3H, CH_3), 1.08 (t, *J* = 7.5 Hz, 3H, CH_3), 0.98 (t, *J* = 7.4 Hz, 6H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 156.8 (C), 155.2 (C), 148.4 (C), 143.6 (C), 140.4 (C), 132.9 (C), 131.9 (C), 129.7 (CH), 128.7 (CH), 126.8 (CH), 123.7 (CH), 121.8 (C), 120.6 (CH), 111.6 (CH), 111.2 (CH), 109.9 (CH), 50.7 (CH), 43.7 (CH), 29.6 (CH), 27.2 (CH), 21.4 (CH), 20.6 (CH), 20.4 (CH), 15.8 (CH), 14.0 (CH), 11.4 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{30}H_{41}N_3O$: 459.3244; found: 459.3261.

7-(1-(4-(*N*,*N*-Dibutylamino)-2-ethylphenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1H)-one (DY-II)

Reaction condition: 8 h at 100 ^{o}C. Yield 17% (86 mg from 312 mg of **Y**); yellow oil. R_f = 0.26 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2958 (CH), 2930 (CH), 2872 (CH), 1656 (C=O), 1606 (C=N, C=C), 1553, 1509, 1459, 1370, 1287, 1224, 1197, 1106, 1063, 1002, 930, 899, 874, 837.

^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.71 (d, *J* = 8.4, 1H, H-5 quinoxaline), 7.03 (d, *J* = 9.1 Hz, 1H, H-5 aniline), 7.39 (dd, *J* = 8.3, 1.5 Hz, 1H, H-6 quinoxaline), 7.06 (d, *J* = 1.5 Hz, 1H, H-8 quinoxaline), 6.54-6.48 (m, 2H, H-2,6 aniline), 5.80 (s, 1H, ethene), 5.34 (s, 1H, ethene), 4.06 (t, *J* = 7.8 Hz, 2H, NCH_2), 3.31 (t, *J* = 7.6 Hz, 4H, NCH_2), 2.57 (s, 3H, CH_3), 2.32 (q, *J* = 7.6 Hz, 2H, C3(aniline)-CH_2), 1.89-1.78 (m, 2H, N1(quinoxaline)-$CH_2\underline{CH_2}$), 1.65-1.55 (m, 4H, $NCH_2\underline{CH_2}$), 1.43-1.33 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.03 (t, *J* = 7.6 Hz, 3H, CH_3), 1.08 (t, *J* = 7.4 Hz, 3H, CH_3), 0.97 (t, *J* = 7.4 Hz, 6H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.9 (C), 155.1 (C), 148.2 (C), 148.7 (C), 143.5 (C), 142.8 (C), 132.3 (C), 132.2 (C), 131.2 (CH), 129.2 (CH), 127.3 (C), 121.7 (CH), 116.0 (CH), 112.3 (CH), 111.7 (CH), 109.1 (CH), 50.8 (CH), 43.6 (CH), 29.6 (CH), 27.0 (CH), 21.5 (CH), 20.5 (CH), 20.4 (CH), 15.4 (CH), 14.0 (CH), 11.2 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{30}H_{41}N_3O$: 459.3244; found: 459.3274.

(*E*)-6-(4-(Dibutylamino)-2-ethylstyryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one (DY'-I)

Reaction condition: 8 h at 100 ^{o}C. Yield 41% (131 mg from 194 mg of **Y'**); yellow powder; mp 60-61 ^{o}C. R_f = 0.16 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 3039 (CH), 2957 (CH), 2929 (CH), 2871 (CH), 1648 (C=O), 1608 (C=N, C=C), 1560, 1548, 1510, 1469, 1443, 1401, 1370, 1316, 1228, 1248, 1234, 1212, 1195, 1149, 1104, 1050, 1017, 998, 953, 889.

^{1}H NMR (400 MHz, $CDCl_3$): 7.92 (d, *J*=1.9Hz, 1H, H-5 quinoxaline), 7.59 (dd, *J* = 8.7 Hz, *J* = 1.9 Hz, 1H, H-7 quinoxaline), 7.54 (d, *J* = 8.7 Hz, 1H, H-5 aniline), 7.37 (d, *J* =15.9 Hz, 1H, ethene), 7.24 (d, *J*= 8.7 Hz, 1H, H-8 quinoxaline), 6.87 (d, *J*=15.9 Hz, 1H, ethene), 6.54 (dd, *J*=8.7 Hz, *J* = 2.7 Hz, 1H, H-6 aniline), 6.47 (d, *J* =2.7 Hz, 1H, H-2 aniline), 4.20 (t, *J* =7.7 Hz, 2H, NCH_2), 3.30 (t, *J* = 7.5 Hz, 4H, NCH_2), 2.76 (q, *J* = 7.6 Hz 2H, C3(aniline)-CH_2), 2.60 (s, 3H, C3-CH_3), 1.86-1.74 (m, 2H, $NCH_2\underline{CH_2}$), 1.65-1.54 (m, 4H, $NCH_2\underline{CH_2}$), 1.43-1.33 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.26 (t, *J* =7.6 Hz, 3H, CH_3), 1.06 (t, *J* = 7.4 Hz, 3H, CH_3), 0.97 (t, *J*=7.3 Hz, 6H, CH_3).

^{13}C NMR (150 MHz, $CDCl_3$): δ 158.6 (C), 154.7 (C), 148.1 (C), 143.2 (C), 134.5 (C), 133.2 (C), 130.1 (C), 127.8 (CH), 126.7 (CH), 126.5 (CH), 125.8 (CH), 123.2 (CH), 122.3 (C), 113.7 (CH), 111.7 (CH), 110.0 (CH), 50.7 (CH), 43.8 (CH), 29.6 (CH), 27.1 (CH), 21.5 (CH), 20.7 (CH), 20.3 (CH), 15.8 (CH), 14.0 (CH), 11.3 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{30}H_{41}N_3O$: 459.3244; found: 459.3219.

6-(1-(4-(Dibutylamino)-2-ethylphenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one (DY'-II)

Reaction condition: 8 h at 100 ^{o}C. Yield 17% (55 mg from 194 mg of **Y'**); yellow oil. R_f = 0.29 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 3082 (CH), 2959 (CH), 2931 (CH), 2872 (CH), 1656 (C=O), 1607 (C=N, C=C), 1558, 1509, 1459, 1424, 1370, 1321, 1285, 1252, 1222, 1197, 1150, 1122, 1074, 1021, 928, 897, 847, 815.

^{1}H NMR (600 MHz, $CDCl_3$): δ 7.75 (d, *J*=1.7 Hz, 1H, H-5 quinoxaline), 7.53 (dd, *J* = 8.7, 1.7 Hz, 1H, H-7 quinoxaline), 7.19 (d, *J* =8.7 Hz, H-8 quinoxaline), 7.02 (d, *J*=8.9 Hz, 1H, H-5 aniline), 6.56-6.43 (m, 2H, H 2,6-aniline), 5.73 (d, *J* = 1.3 Hz, 1H, ethene), 5.23 (d, *J* =1.3 Hz, 1H, ethene), 4.19 (t, *J* = 7.7 Hz, 2H, NCH_2), 3.29 (t, *J* = 7.6 Hz, 4H, NCH_2), 2.56 (s, 3H, CH_3), 2.36 (q, *J* =7.4 Hz, 2H, C3(aniline)-CH_2), 1.82-1.75 (m, 2H, $NCH_2\underline{CH_2}$), 1.65-1.58 (m, 4H, $NCH_2\underline{CH_2}$), 1.42-1.35 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.04 (t, *J* = 7.2 Hz, 3H, CH_3), 1.03 (t, *J* =7.4 Hz, 3H, CH_3), 0.98 (t, *J* = 7.3 Hz, 6H, CH_3).

^{13}C NMR (150 MHz, $CDCl_3$): δ 158.5 (C), 154.9 (C), 148.1 (C), 148.0 (C), 142.8 (C), 137.7 (C), 132.7 (C), 131.6 (C), 131.2 (CH), 128.0 (CH), 127.6 (CH), 127.5 (C), 114.7 (CH), 113.3 (CH), 111.6 (CH), 109.0 (CH), 50.8 (CH), 43.8 (CH), 29.6 (CH), 27.0 (CH), 21.5 (CH), 20.7 (CH), 20.4 (CH), 15.4 (CH), 14.0 (CH), 11.4 (CH).

HRMS: *m/z* $[M-H]^+$ calcd for $C_{30}H_{40}N_3O$: 458.3165; found: 458.3165

***(E)*-7-(2-Butoxy-4-(diethylamino)styryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one (E1Y-I)**

Reaction condition: 8 h at 100 ^{o}C. Yield 34% (126 mg from 234 mg of **Y**); orange powder; mp 111-113 ^{o}C. R_f = 0.25 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 3043 (CH), 2955 (CH), 2925 (CH), 2868 (CH), 1649 (C=O), 1625, 1595, 1557, 1516, 1469, 1446, 1403, 1388, 1368, 1353, 1310, 1274, 1230, 1198, 1152, 1116, 1075, 1041, 1013, 968, 862, 820, 806, 770, 744.

^{1}H NMR (600 MHz, $CDCl_3$) δ: 7.71 (d, *J* = 8.3 Hz, 1H, H-5 quinoxaline), 7.52 (d, *J* = 16.3 Hz, 1H, ethene), 7.49-7.43 (m, 2H, H-5 aniline, H-6 quinoxaline), 7.25 (d, *J* = 1.4 Hz, 1H, H-8 quinoxaline), 7.03 (d, *J* = 16.4 Hz, 1H, ethene), 6.31 (dd, *J* = 8.5, 1.9 Hz, 1H, H-6 aniline), 6.19 (d, *J* = 1.9 Hz, 1H, H-2 aniline), 4.24 (t, *J* = 7.6 Hz, 2H, NCH_2), 4.05 (t, *J* = 6.3 Hz, 4H, OCH_2), 3.39 (q, *J* = 7.0 Hz, NCH_2), 2.58 (s, 3H, CH_3), 1.91-1.80 (m, 4H, $NCH_2\underline{CH_2}$, $OCH_2\underline{CH_2}$), 1.63-1.56 (m, 2H, $O(CH_2)_2\underline{CH_2}$), 1.21 (t, *J* = 7.0 Hz, 3H, CH_3), 1.09 (t, *J* = 7.3 Hz, 3H, CH_3), 1.03 (t, *J* = 7.4 Hz, 6H, CH_3).

^{13}C NMR (150 MHz, $CDCl_3$) δ: 158.4 (C), 156.5 (C), 155.3 (C), 149.3 (C), 140.8 (C), 132.9 (C), 131.8 (C), 129.6 (CH), 127.9 (CH), 126.6 (CH), 122.6 (CH), 121.1 (CH), 113.7 (C), 110.5 (CH), 104.7 (CH), 95.8 (CH), 68.0 (CH), 44.6 (CH), 43.7 (CH), 31.5 (CH), 21.4 (CH), 20.6 (CH), 19.5 (CH), 13.9 (CH), 12.8 (CH), 11.4 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{28}H_{37}N_3O_2$: 447.2880 ; found: 447.2870.

7-(1-(2-Butoxy-4-(diethylamino)phenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one (E1Y-II)

Reaction condition: 8 h at 100 ^{o}C. Yield 19% (70 mg from 234 mg of **Y**); yellow oil. R_f = 0.31 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 2960 (CH), 2926 (CH), 2854 (CH), 1656 (C=O), 1608 (C=N, C=C), 1556, 1514, 1466, 1398, 1376, 1356, 1284, 1219, 1169, 1109, 1077, 1021, 894, 873, 835.

^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.67 (d, *J* = 8.4 Hz, 1H, H-5 quinoxaline), 7.30 (dd, *J* = 8.3, 1.5 Hz, 1H, H-6 quinoxaline), 7.19 (d, *J* = 1.5 Hz, 1H, H-8 quinoxaline), 7.14 (d, *J* = 9.1 Hz, 1H, H-5 aniline), 6.30 (dd, *J* = 8.5, 1.9 Hz, 1H, H-6 aniline), 6.16 (d, *J* = 1.9 Hz, 1H, H-2 aniline), 5.55 (s, 1H, ethene), 5.41 (s, 1H, ethene), 4.14 (t, *J* = 7.6 Hz, 2H, NCH_2), 3.71 (t, *J* = 6.2 Hz, 2H, OCH_2), 3.37 (q, *J* = 7.0 Hz, 4H, NCH_2), 2.58 (s, 3H, CH_3), 1.76-1.67 (m, 2H, N1(quinoxaline)-$CH_2\underline{CH_2}$), 1.65-1.55 (m, 4H, $NCH_2\underline{CH_2}$), 1.30-1.23 (m, 2H, $OCH_2\underline{CH_2}$), 1.19 (t, *J* = 7.0 Hz, 3H, CH_3), 0.94 (t, *J* = 7.4 Hz, 6H, CH_3), 0.93-0.87 (m, 2H, $O(CH_2)_2\underline{CH_2}$), 0.61 (t, *J* = 7.4 Hz, 3H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.7 (C), 157.2 (C), 155.1 (C), 149.4 (C), 147.4 (C), 144.8 (C), 132.1 (C), 132.0 (C), 131.8 (CH), 128.8 (CH), 122.3 (CH), 117.7 (C), 115.3 (CH), 111.9 (CH), 103.9 (CH), 96.2 (CH), 67.4 (CH), 44.5 (CH), 43.5 (CH), 31.1 (CH), 21.4 (CH), 20.6 (CH), 18.8 (CH), 13.6 (CH), 12.7 (CH), 11.2 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{28}H_{37}N_3O_2$: 447.2880; found: 447.2910.

(*E*)-7-(2-(9-Dodecyl-9H-carbazol-3-yl)vinyl)-3-methyl-1-propylquinoxalin-2(1H)-one (FY-I)

Reaction condition: 6 h at 120 ^{o}C. Yield 50% (185 mg from 186 mg of **Y**); orange powder; mp 80-82°C. R_f = 0.21 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 3051 (CH), 2923 (CH), 2851 (CH), 1654 (C=O), 1605 (C=N, C=C), 1493, 1467, 1448, 1384, 1351, 1329, 1274, 1186, 1155, 1137, 1084, 1023, 1003, 956, 868, 820, 806, 747, 720.

^{1}H NMR (600 MHz, $CDCl_3$) δ: 8.27 (s, 1H, H-4 carbazole), 8.14 (d, 1H, *J* = 7.7 Hz, 1H, carbazole), 7.78 (d, 1H, *J* = 8.3 Hz, 1H, H-5 quinoxaline), 7.70 (d, 1H, *J* = 8.2 Hz, 1H, carbazole), 7.57 (d, 1H, *J* = 8.2 Hz, 1H, carbazole), 7.48 (dd, 1H, *J* = 7.5, 7.4 Hz, 1H, H-7 carbazole), 7.44-7.38 (m, 3H, H-6 quinoxaline, 1H of ethene, 1H of carbazole) 7.31 (s, 1H, H-8 quinoxaline), 7.26 (dd, 1H, *J* = 7.5, 7.4 Hz, 1H, H-6 carbazole), 7.29 (d, *J* = 16.2 Hz, 1H, ethene), 4.30 (t, *J* = 7.2 Hz, 2H, NCH_2), 4.27 (t, *J* = 7.9 Hz, 2H, NCH_2), 2.60 (s, 3H, CH_3), 1.93-1.82 (m, 4H, $2NCH_2\underline{CH_2}$), 1.43-1.18 (m, 18H, $N(CH_2)_2(\underline{CH_2})_9CH_3$), 1.12 (t, *J* = 7.3 Hz, 3H, $N(CH_2)_2\underline{CH_3}$), 0.88 (t, *J* = 7.0 Hz, 3H, $N(CH_{2)11}\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.2 (C), 155.2 (C), 140.9 (C), 140.7 (C), 139.5 (C), 133.0 (C), 132.2 (CH), 132.1 (CH), 129.8 (CH), 127.8 (C), 126.0 (CH), 124.9, (CH), 124.7 (CH), 123.3 (C), 122.8 (C), 120.9 (CH), 120.4 (CH), 119.2 (CH), 119.1 (CH), 111.4 (CH), 109.1 (CH), 109.0 (C), 43.7 (CH), 43.2 (CH), 31.9 (CH), 29.6 (2CH), 29.55 (CH), 29.5 (CH), 29.4 (CH), 29.3 (CH), 29.0 (CH), 27.3 (CH), 22.7 (CH), 21.5 (CH), 20.7 (CH), 14.1 (CH), 11.5 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{38}H_{47}N_3O$: 561.3713; found: 561.3730.

(*E*)-3-Methyl-7-(2-(1-methyl-2-phenylindolizin-3-yl)vinyl)-1-propylquinoxalin-2(1*H*)-one (GY-I)

Reaction condition: 3.5 h at 100 ^{o}C. Yield 65% (400 mg from 400 mg of **Y**); orange-red powder; mp 172-174 ^{o}C; R_f = 0.33 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 3067 (CH), 2960 (CH), 2929 (CH), 2875 (CH), 1651 (C=O), 1601 (C=N, C=C), 1554, 1454, 1397, 1371, 1288, 1237, 1194, 1116, 943, 823, 771, 708.

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.34 (d, 1H, *J* = 6.8 Hz, 1H, H-5 indolizine), 7.67 (d, 1H, *J* = 8.3 Hz, 1H, H-8 indolizine), 7.53-7.46 (m, 2H, m-Ph), 7.45-7.38 (m, 4H, *o*,*p*-Ph, H-5 quinoxaline), 7.33 (d, 1H, *J* = 8.4 Hz, 1H, H-6 quinoxaline), 7.30 (d, *J* = 16.5 Hz, 1H, ethene), 7.00 (s, 1H, H-8 quinoxaline), 6.79 (dd, *J* = 8.3, 6.8 Hz, 1H, H-7 indolizine), 6.74 (d, *J* = 16.5 Hz, 1H, ethene), 6.68 (dd, *J* = 6.8, 6.8 Hz, 1H, H-6 indolizine), 4.15 (t, *J* = 7.5 Hz, 2H, NCH_2), 2.57 (s, 3H, CH_3), 2.28 (s, 3H, CH_3), 1.81-1.71 (m, 2H, $NCH_2\underline{CH_2}$), 1.03 (t, *J* = 7.3 Hz, 3H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 156.7 (C), 155.1 (C), 140.1 (C), 135.5 (C), 132.9 (C), 132.8 (C), 131.9 (C), 131.6 (C), 130.7 (CH), 129.7 (CH), 128.3 (CH), 127.0, (CH), 123.4 (CH), 122.7 (CH), 120.4 (CH), 118.9 (CH), 118.8 (C), 117.8 (CH), 117.3 (CH), 111.7 (CH), 110.3 (CH), 109.4 (C), 43.6 (CH), 21.4 (CH), 20.5 (CH), 11.4 (CH), 9.0 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{29}H_{27}N_3O$: 433.2148; found: 433.2149.

3-Methyl-7-(1-(1-methyl-2-phenylindolizin-3-yl)vinyl)-1-propylquinoxalin-2(1*H*)-one (GY-II)

Reaction condition: 3.5 h at 100 ^{o}C. Yield 19% (120 mg from 400 mg of **Y**); brown powder; mp 68-70 ^{o}C; R_f = 0.43 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 3068 (CH), 2960 (CH), 2928 (CH), 2873 (CH), 1655 (C=O), 1605 (C=N, C=C), 1444, 1351, 1198, 1117, 1001, 909, 833, 732, 700.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.72 (d, 1H, *J* = 8.4 Hz, 1H, H-8 indolizine), 7.43-7.20 (m, 8H, Ph, H-5,6 quinoxaline, H-5 indolizine), 6.89 (d, *J* = 1.6 Hz, 1H, H-8 quinoxaline), 6.65 (ddd, *J* = 8.9, 6.5, 1.0 Hz, 1H, H-7 indolizine), 6.31 (ddd, *J* = 6.8, 6.5, 1.3 Hz, 1H, H-6 indolizine), 5.97 (d, *J* = 1.0 Hz, 1H, ethene), 5.43 (d, *J* = 1.0 Hz, 1H, ethene), 3.98 (t, *J* = 7.8 Hz, 2H, NCH_2), 2.57 (s, 3H, CH_3), 2.38 (s, 3H, CH_3), 1.53-1.43 (m, 2H, $NCH_2\underline{CH_2}$), 0.80 (t, *J* = 7.4 Hz, 3H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 158.3 (C), 155.0 (C), 140.6 (C), 138.1 (C), 135.5 (C), 132.7 (C), 132.6 (C), 130.7 (C), 130.1 (CH), 129.8 (CH+C), 128.0 (CH), 126.4, (CH), 123.2 (CH), 121.4 (CH), 121.3 (CH), 119.8 (C), 117.5 (CH), 116.1 (CH), 111.8 (CH), 110.3 (CH), 107.0 (C), 43.5 (CH), 21.5 (CH), 20.5 (CH), 11.1 (CH), 9.4 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{29}H_{27}N_3O$: 433.2148; found: 433.2168.

1.2.3. Quinolines:

(*E*)-*N*,*N*-Dihexyl-4-(2-(quinolin-6-yl)vinyl)aniline (AX-I)

Reaction condition: 4.5 h at 120 ^{o}C. Yield 86% (260 mg from 151 mg of **X**); yellow powder; mp 45-46 ^{o}C; R_f = 0.25 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 2956 (CH), 2927 (CH), 2857 (CH), 1601 (C=N, C=C), 1519, 1459, 1362, 1186, 1117, 962, 890, 833.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.82 (dd, *J* = 4.2, 1.4 Hz, 1H, 1H, H-2 quinoline), 8.09-8.00 (m, 2H, H-4,8 quinoline), 7.94 (dd, *J* = 8.8, 1.4 Hz, 1H, H-7 quinoline), 7.70 (s, 1H, H-5 quinoline), 7.43 (d, *J* = 8.7 Hz, 2H, H-3,5 aniline), 7.18 (d, *J* = 16.2 Hz, 1H, ethene), 7.31 (dd, 1H, *J* = 8.2, 4.2 Hz, 1H, H-3 quinoline), 7.03 (d, *J* = 16.2 Hz, 1H, ethene), 6.65 (d, *J* = 8.7 Hz, 2H, H-2,6 aniline), 3.29 (t, *J* = 7.5 Hz, 4H, NCH_2), 1.65-1.54 (m, 4H, $NCH_2\underline{CH_2}$), 1.42-1.30 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.94 (t, *J* = 6.7 Hz, 6H, $N(CH_2)_5\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 149.3 (CH), 148.1 (C), 147.7 (C), 136.6 (C), 135.5 (CH), 130.5 (CH), 129.5 (CH), 128.7 (C), 127.9 (CH), 127.2 (CH), 124.4 (CH), 124.1 (C), 122.6 (CH), 121.2 (CH), 111.6 (CH), 51.0 (CH), 31.7 (CH), 27.3 (CH), 26.8 (CH), 22.6 (CH), 14.0 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{29}H_{38}N_2$: 414.3029; found: 414.3048.

***N*,*N*-Dihexyl-4-(1-(quinolin-6-yl)vinyl)aniline (AX-II)**

Reaction condition: 4.5 h at 120 ^{o}C. Yield 7% (21 mg from 151 mg of **X**); yellow oil; R_f = 0.36 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 2955 (CH), 2927 (CH), 2856 (CH), 1608 (C=N, C=C), 1520, 1464, 1370, 1188, 888, 843, 818.

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.90 (d, 1H, *J* = 4.2 Hz, 1H, H-2 quinoline), 8.12 (d, 1H, *J* = 8.1 Hz, 1H, H-4 quinoline), 8.06 (d, 1H, *J* = 8.5 Hz, 1H, H-8 quinoline), 7.81 (s, 1H, H-5 quinoline), 7.77 (dd, *J* = 8.5, 1.2 Hz, 1H, H-7 quinoline), 7.38 (d, 1H, *J* = 8.1, 4.2 Hz, 1H, H-3 quinoline), 7.22 (d, *J* = 8.6 Hz, 2H, H-3,5 aniline), 6.61 (d, *J* = 8.6 Hz, 2H, H-2,6 aniline), 5.50 (s, 1H, ethene), 5.35 (s, 1H, ethene), 3.28 (t, *J* = 7.5 Hz, 4H, NCH_2), 1.66-1.55 (m, 4H, $NCH_2\underline{CH_2}$), 1.38-1.29 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.91 (t, *J* = 7.2 Hz, 6H, $N(CH_2)_5\underline{CH_3}$).

^{13}C NMR (150 MHz, $CDCl_3$): δ = 150.1 (CH), 149.3 (C), 148.1 (C), 148.0 (C), 140.7 (C), 136.2 (CH), 130.6 (CH), 129.1 (CH), 128.9 (CH), 128.1 (C), 127.5 (C), 127.0 (CH), 121.2 (CH), 111.9 (CH), 111.1 (CH), 51.1 (CH), 31.7 (CH), 27.3 (CH), 26.9 (CH), 22.7 (CH), 14.0 (CH).

HRMS: *m/z* $[M - H]^+$ calcd for $C_{29}H_{37}N_2$: 413.2951; found: 413.2976.

(*E*)-*N*,*N*-Dibutyl-3-ethyl-4-(2-(quinolin-6-yl)vinyl)aniline (DX-I)

Reaction condition: 14 h at 120 ^{o}C. Yield 72% (180 mg from 135 mg of **X**); yellow oil; R_f = 0.28 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 2958 (CH), 2930 (CH), 2871 (CH), 1600 (C=N, C=C), 1509, 1456, 1367, 1288, 1223, 1105, 955, 885, 827, 794.

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.84 (d, 1H, *J* = 4.0 Hz, 1H, H-2 quinoline), 8.12-8.06 (m, 2H, H-4,8 quinoline), 7.98 (dd, *J* = 8.6, Hz, 1H, H-7 quinoline), 7.73 (s, 1H, H-5 quinoline), 7.61 (d, *J* = 8.4 Hz, 1H, H-5 aniline), 7.50 (d, *J* = 16.0 Hz, 1H, ethene), 7.34 (d, 1H, *J* = 7.9, 4.0 Hz, 1H, H-3 quinoline), 7.03 (d, *J* = 16.0 Hz, 1H, ethene), 6.59 (dd, *J* = 8.4, 1.5 Hz, 1H, H-6 aniline), 6.52 (d, *J* = 1.5 Hz, 1H, H-2 aniline), 3.33 (t, *J* = 7.5 Hz, 4H, NCH_2), 2.83 (q, *J* = 7.5 Hz, 2H, NCH_2), 1.67-1.59 (m, 4H, $NCH_2\underline{CH_2}$), 1.45-1.37 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.30 (t, *J* = 7.4 Hz, 3H, $NCH_2\underline{CH_3}$), 0.99 (t, *J* = 7.3 Hz, 6H, $N(CH_2)_3\underline{CH_3}$).

^{13}C NMR (150 MHz, $CDCl_3$): δ = 149.4 (CH), 148.1 (C), 147.7 (C), 143.3 (C), 136.9 (C), 135.5 (CH), 129.5 (CH), 128.7 (C), 127.6 (CH), 127.3 (CH), 126.6 (CH), 124.5 (CH), 124.1 (CH), 122.3 (C), 121.2 (CH), 111.5 (CH), 109.9 (CH), 50.6 (CH), 29.5 (CH), 27.6 (CH), 20.3 (CH), 15.7 (CH), 13.9 (CH).

HRMS: *m/z* $[M + H]^+$ calcd for $C_{27}H_{35}N_2$: 387.2794; found: 387.2820.

***N,N*-Dibutyl-3-ethyl-4-(1-(quinolin-6-yl)vinyl)aniline (DX-II)**

Reaction condition: 14 h at 120 ^{o}C. Yield 16% (40 mg from 135 mg of **X**); yellow oil; R_f = 0.43 (hexane/EtOAc, 5:1).

IR (ν_{max}, cm^{-1}, KBr): 2958 (CH), 2931 (CH), 2871 (CH), 1606 (C=N, C=C), 1508, 1460, 1369, 1290, 1223, 1186, 1157, 1100, 893, 842, 806, 778.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.85 (dd, 1H, *J* = 4.2, 1.6 Hz, 1H, H-2 quinoline), 8.06 (dd, 1H, *J* = 8.3, 1.2 Hz, 1H, H-4 quinoline), 8.04 (d, 1H, *J* = 8.8 Hz, 1H, H-8 quinoline), 7.84 (dd, *J* = 8.8, 2.0 Hz, 1H, H-7 quinoline), 7.63 (d, *J* = 2.0 Hz, 1H, H-5 quinoline), 7.33 (dd, 1H, *J* = 8.3, 4.2 Hz, 1H, H-3 quinoline), 7.09 (d, *J* = 9.0 Hz, 1H, H-5 aniline), 6.57-6.53 (m, 2H, H-2,6 aniline), 5.82 (d, *J* = 1.4 Hz, 1H, ethene), 5.34 (d, *J* = 1.4 Hz, 1H, ethene), 3.31 (t, *J* = 7.6 Hz, 4H, NCH_2), 2.36 (q, *J* = 7.5 Hz, 2H, NCH_2), 1.67-1.60 (m, 4H, $NCH_2\underline{CH_2}$), 1.45-1.36 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.03 (t, *J* = 7.5 Hz, 3H, $NCH_2\underline{CH_3}$), 0.99 (t, *J* = 7.4 Hz, 6H, $N(CH_2)_3\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 150.1 (CH), 149.0 (C), 148.1 (C), 148.0 (C), 143.0 (C), 140.3 (C), 136.3 (CH), 131.3 (CH), 129.2 (CH), 128.5 (CH), 128.2 (C), 127.8 (C), 125.4 (CH), 121.1 (CH), 116.0 (CH), 111.6 (CH), 109.0 (CH), 50.8 (CH), 29.6 (CH), 27.0 (CH), 20.4 (CH), 15.3 (CH), 14.0 (CH).

HRMS: *m/z* $[M - H]^+$ calcd for $C_{27}H_{33}N_2$: 385.2638; found: 385.2666.

1.2.4. Benzothiazoles:

(*E*)-4-(2-(Benzo[d]thiazol-6-yl)vinyl)-*N,N*-dihexylaniline (AW-I)

Reaction condition: 5.5 h at 120 ^{o}C. Yield 61% (447 mg from 375 mg of **W**); yellow-brown oil; R_f = 0.52 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2954 (CH), 2926 (CH), 2855 (CH), 1606 (C=N, C=C), 1592, 1520 (C-S), 1469, 1403, 1369, 1293, 1254, 1183, 959, 830.

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.90 (s, 1H, H-2 bezothiazole), 8.08 (d, *J* = 8.6 Hz, 1H, H-4 bezothiazole), 7.98 (s, 1H, H-7 bezothiazole), 7.67 (d, *J* = 8.6, 1.5 Hz, 1H, H-5 bezothiazole), 7.42 (d, *J* = 8.7 Hz, 2H, H-3,5 aniline), 7.13 (d, *J* = 16.2 Hz, 1H, ethene), 6.99 (d, *J* = 16.2 Hz, 1H, ethene), 6.66 (dd, *J* = 8.7 Hz, 2H, H-2,6 aniline), 3.30 (t, *J* = 7.6 Hz, 4H, NCH_2), 1.68-1.56 (m, 4H, $NCH_2\underline{CH_2}$), 1.42-1.30 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.94 (t, *J* = 6.9 Hz, 6H, CH_3).

^{13}C NMR (150 MHz, $CDCl_3$): δ = 153.0 (CH), 152.1 (C), 148.0 (C), 146.4 (C), 134.5 (C), 130.0 (CH), 127.9 (CH), 124.4 (CH), 124.2 (C), 123.3 (CH), 122.6 (CH), 118.9 (CH), 111.6 (CH), 51.0 (CH), 31.7 (CH), 27.3 (CH), 26.8 (CH), 22.6 (CH), 14.0 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{27}H_{36}N_2S$: 420.2593; found: 420.2591.

4-(1-(Benzo[d]thiazol-6-yl)vinyl)-*N*,*N*-dihexylaniline (AW-II)

Reaction condition: 5.5 h at 120 °C. Yield 6% (43 mg from 375 mg of **W**); yellow-brown oil; R_f = 0.60 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2954 (CH), 2924 (CH), 2853 (CH), 1608 (C=N, C=C), 1519 (C-S), 1466, 1398, 1370, 1291, 1254, 1195, 879, 840, 818.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.97 (s, 1H, H-2 bezothiazole), 8.08 (d, *J* = 8.5 Hz, 1H, H-4 bezothiazole), 7.96 (d, *J* = 1.7 Hz, 1H, H-7 bezothiazole), 7.57 (dd, *J* = 8.5, 1.7 Hz, 1H, H-5 bezothiazole), 7.21 (d, *J* = 8.9 Hz, 2H, H-3,5 aniline), 6.60 (dd, *J* = 8.9 Hz, 2H, H-2,6 aniline), 5.45 (d, *J* = 1.0 Hz, 1H, ethene), 5.29 (d, *J* = 1.0 Hz, 1H, ethene), 3.28 (t, *J* = 7.6 Hz, 4H, NCH_2), 1.65-1.55 (m, 4H, $NCH_2\underline{CH_2}$), 1.39-1.30 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.94 (t, *J* = ~ 6.6 Hz, 6H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 153.8 (CH), 152.7 (C), 149.3 (C), 148.0 (C), 140.4 (C), 133.7 (C), 129.1 (CH), 127.7 (C), 127.2 (CH), 122.9 (CH), 121.6 (CH), 111.6 (CH), 111.1 (CH), 51.1 (CH), 31.7 (CH), 27.3 (CH), 26.9 (CH), 22.7 (CH), 14.0 (CH).

HRMS: *m/z* $[M-H]^+$ calcd for $C_{27}H_{36}N_2S$: 419.2515; found: 419.2494.

(*E*)-4-(2-(Benzo[d]thiazol-6-yl)vinyl)-*N*,*N*-dibutyl-3-ethylaniline (DW-I)

Reaction condition 5 h at 120 °C. Yield 54% (60 mg from 60 mg of **W**); orange-brown oil; R_f = 0.37 (hexane/EtOAc, 10:1).

IR (ν_{max}, cm^{-1}, KBr): 2958 (CH), 2930 (CH), 2871 (CH), 1604 (C=N, C=C), 1592, 1548, 1509 (C-S), 1469, 1401, 1368, 1285, 1219, 1106, 958, 828.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.92 (s, 1H, H-2 bezothiazole), 8.09 (d, *J* = 8.2, 1H, H-4 bezothiazole), 8.00 (d, *J* = 1.6, 1H, H-7 bezothiazole), 7.69 (dd, *J* = 8.2, 1.6, 1H, H-5 bezothiazole), 7.56 (d, *J* = 8.7 Hz, 1H, H-5 aniline), 7.41 (d, *J* = 16.0 Hz, 1H, ethene), 6.96 (d, *J* = 16.0 Hz, 1H, ethene), 6.56 (dd, *J* = 8.7, 2.6 Hz, 1H, H-6 aniline), 6.50 (d, *J* = 2.6 Hz, 1H, H-2 aniline), 3.32 (t, *J* = 7.5 Hz, 4H, NCH_2), 2.80 (q, *J* = 7.5 Hz, 2H, C3(aniline)-CH_2), 1.67-1.54 (m, 4H, $NCH_2\underline{CH_2}$), 1.47-1.34 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.30 (t, *J* = 7.5 Hz, 3H, CH_3), 0.99 (t, *J* = 7.4 Hz, 6H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$): δ = 153.1 (CH), 152.1 (C), 148.1 (C), 143.3 (C), 136.8 (C), 134.5 (C), 127.3 (CH), 126.7 (CH), 124.5 (CH), 124.2 (CH), 123.4 (CH), 122.4 (C), 118.8 (CH), 111.6 (CH), 109.9 (CH), 50.7 (CH), 29.6 (CH), 27.1 (CH), 20.3 (CH), 15.8 (CH), 14.0 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{25}H_{32}N_2S$: 392.2280; found: 392.2275.

4-(1-(Benzo[*d*]thiazol-6-yl)vinyl)-*N*,*N*-dibutyl-3-ethylaniline (DW-II)

Reaction condition 5 h at 120 ^{o}C. Yield 18% (20 mg from 60 mg of **W**); orange oil; R_f = 0.47 (hexane/EtOAc, 10:1).

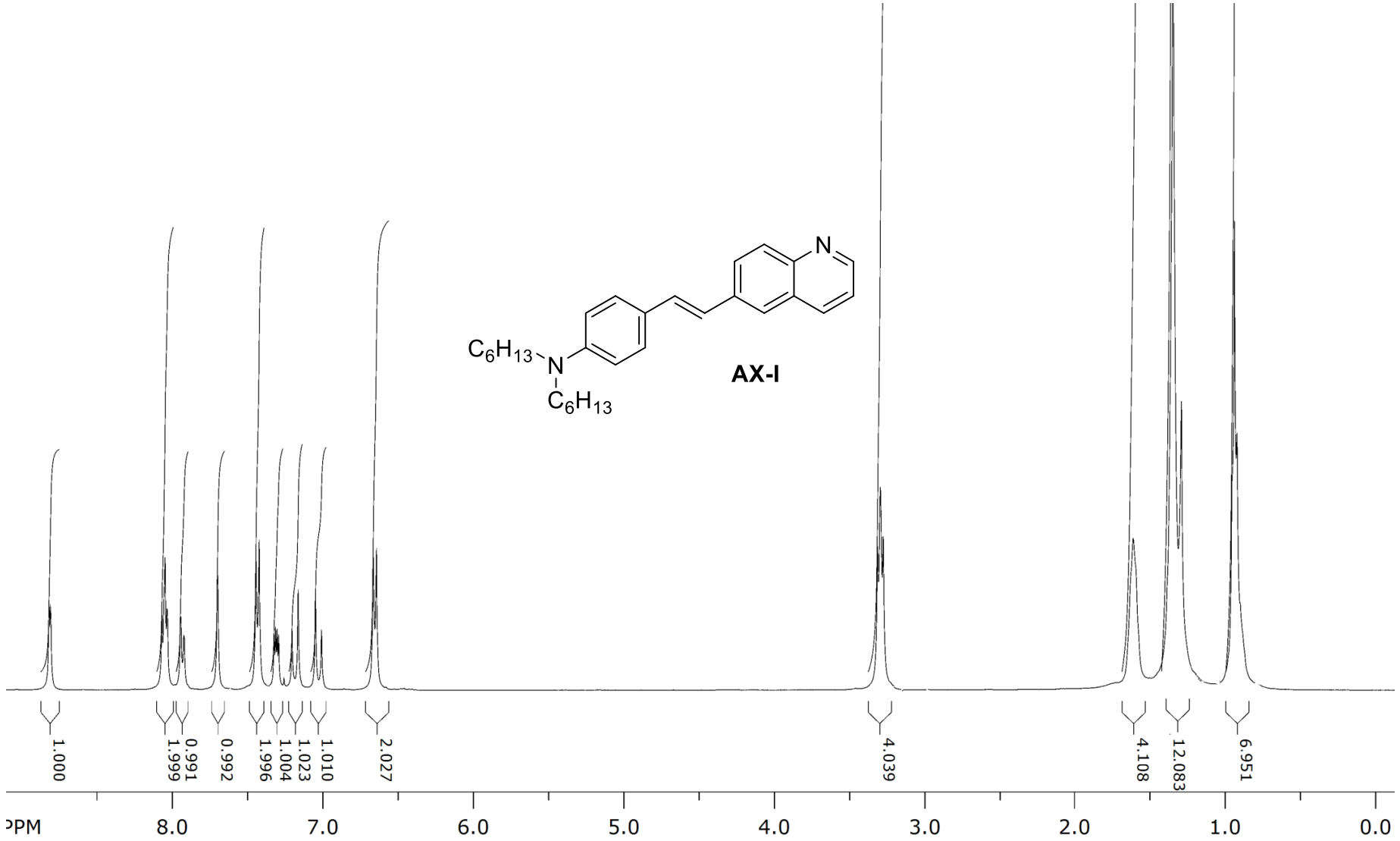
IR (ν_{max}, cm^{-1}, KBr): 2958 (CH), 2930 (CH), 2871 (CH), 1605 (C=N, C=C), 1549, 1509 (C-S), 1467, 1398, 1368, 1291, 1223, 1185, 1110, 899, 840, 806.

H NMR (500 MHz, $CDCl_3$): δ = 8.93 (s, 1H, H-2 bezothiazole), 8.04 (d, *J* = 8.5, 1H, H-4 bezothiazole), 7.81 (d, *J* = 1.5, 1H, H-7 bezothiazole), 7.60 (dd, *J* = 8.5, 1.5, 1H, H-5 bezothiazole), 7.07 (d, *J*=9.2 Hz, 1H, H-5 aniline), 6.55-6.50 (m, 2H, H 2,6-aniline), 5.75 (d, *J* = 1.0 Hz, 1H, ethene), 5.28 (d, *J* = 1.0 Hz, 1H, ethene), 3.30 (t, *J* = 7.7 Hz, 4H, NCH_2), 2.34 (q, *J* = 7.5 Hz, 2H, C2(aniline)-CH_2), 1.66-1.57 (m, 4H, $NCH_2\underline{CH_2}$), 1.45-1.35 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.03 (t, *J* = 7.5 Hz, 3H, CH_3), 0.99 (t, *J* = 7.3 Hz, 6H, CH_3).

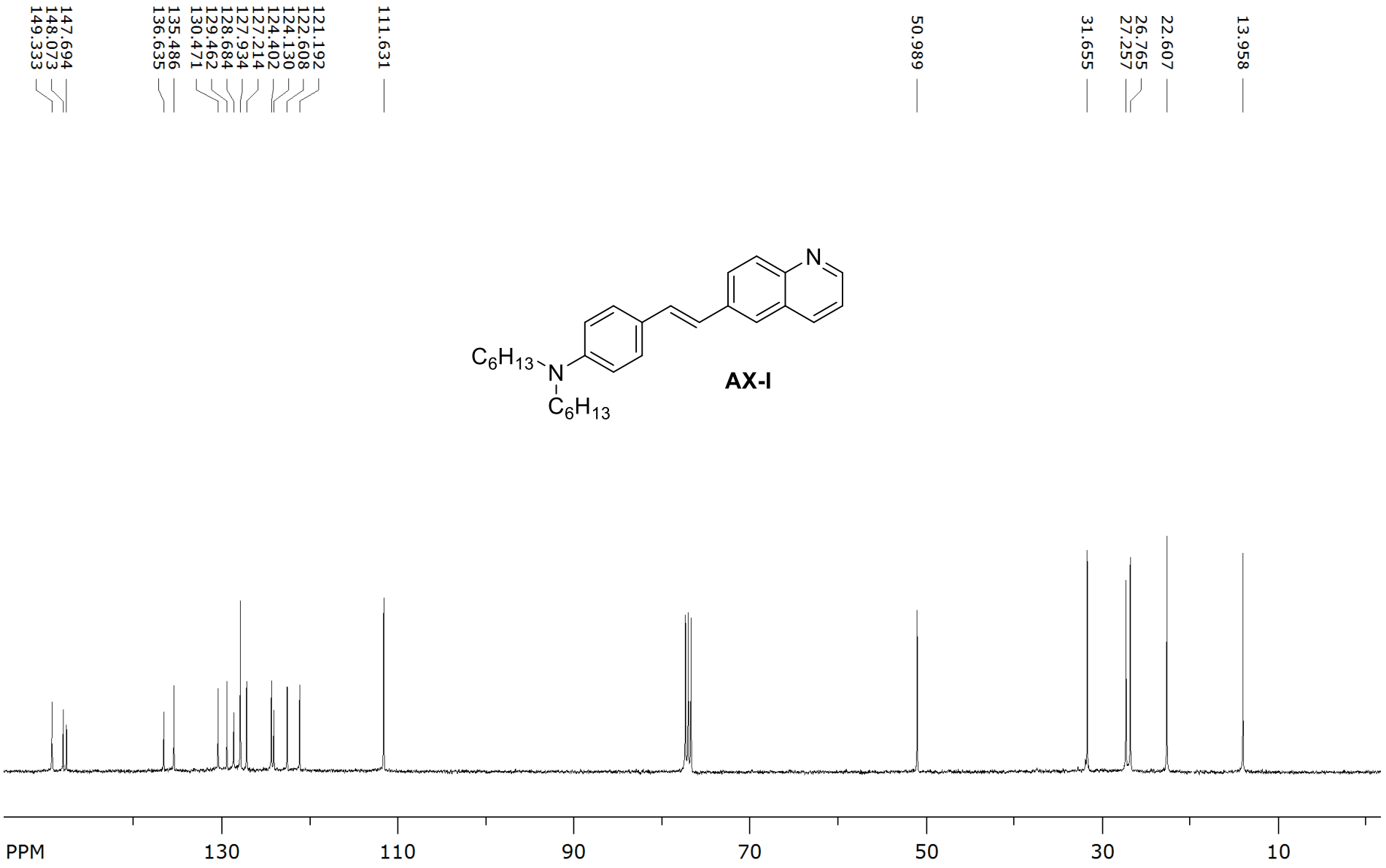
^{13}C NMR (125 MHz, $CDCl_3$): δ = 153.9 (CH), 152.6 (C), 149.0 (C), 148.1 (C), 143.0 (C), 140.1 (C), 134.0 (C), 131.4 (CH), 127.9 (C), 125.3 (CH), 123.0 (CH), 120.0 (CH), 115.5 (CH), 111.5 (CH), 108.9 (CH), 50.8 (CH), 29.6 (CH), 27.0 (CH), 20.4 (CH), 15.3 (CH), 14.0 (CH).

HRMS: *m/z* $[M]^+$ calcd for $C_{25}H_{32}N_2S$: 392.2280; found: 392.2295.

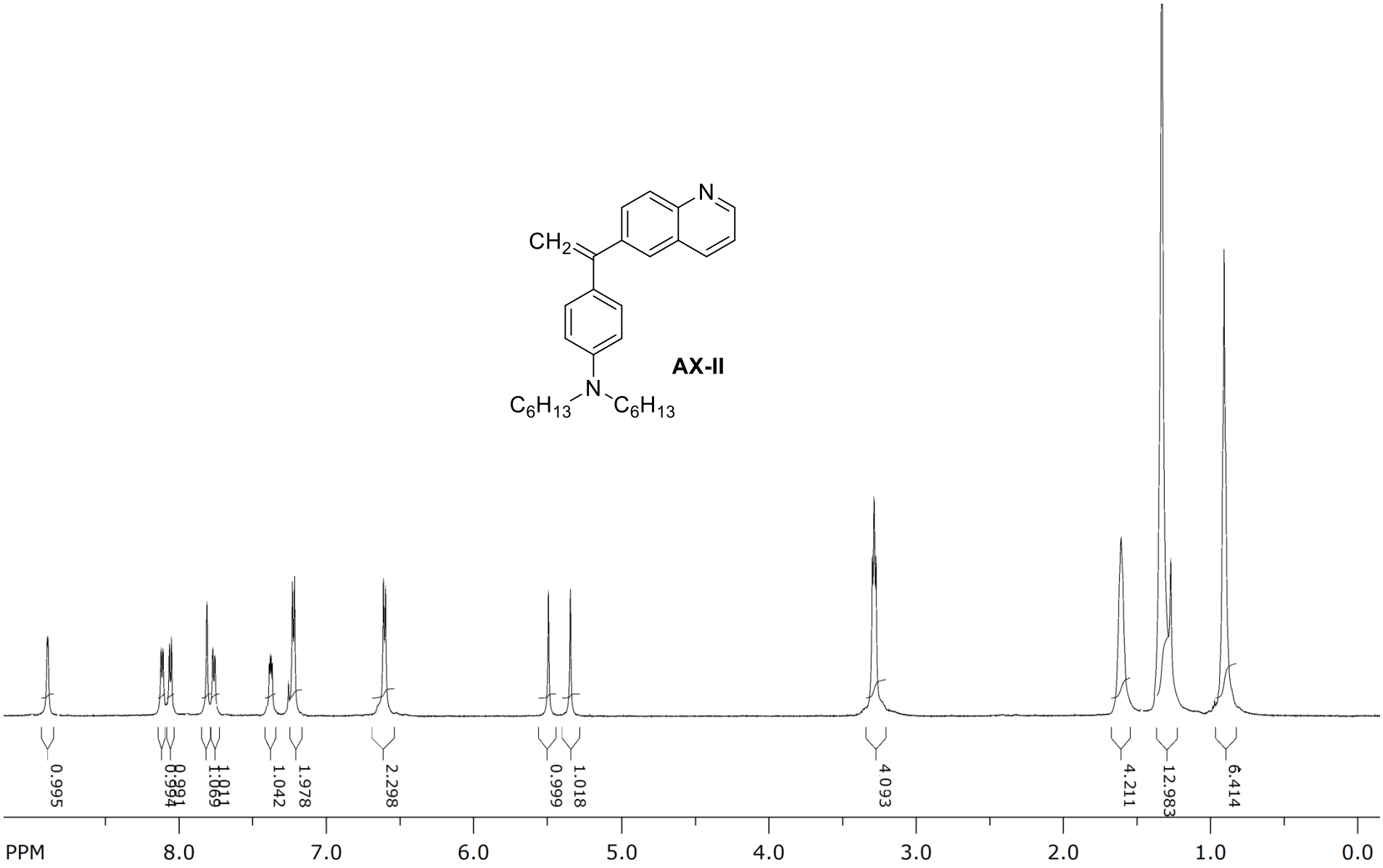
2. NMR of derivatives with quinoline acceptor moiety



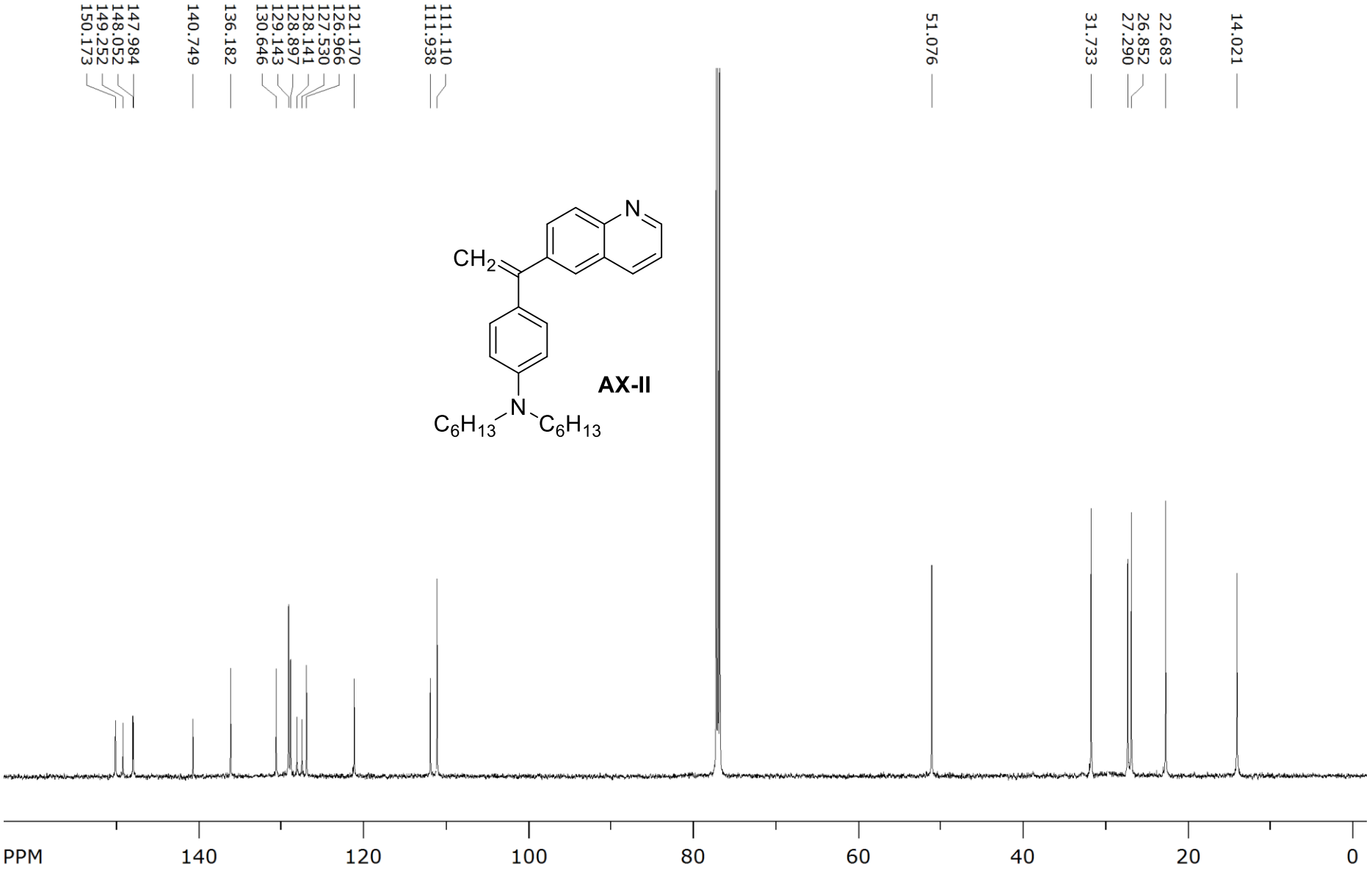
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dihexyl-4-(2-(quinolin-6-yl)vinyl)aniline



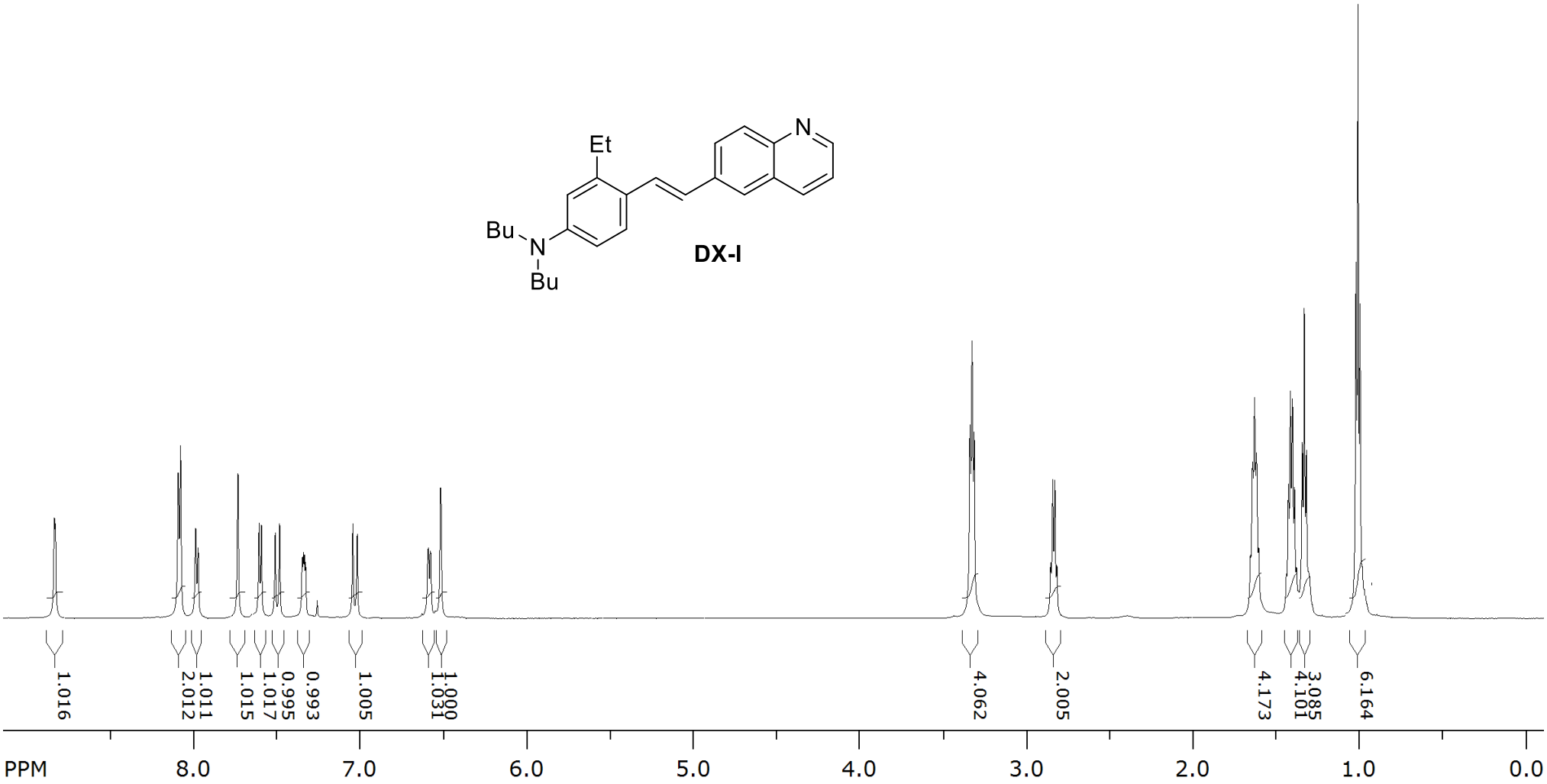
^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dihexyl-4-(2-(quinolin-6-yl)vinyl)aniline



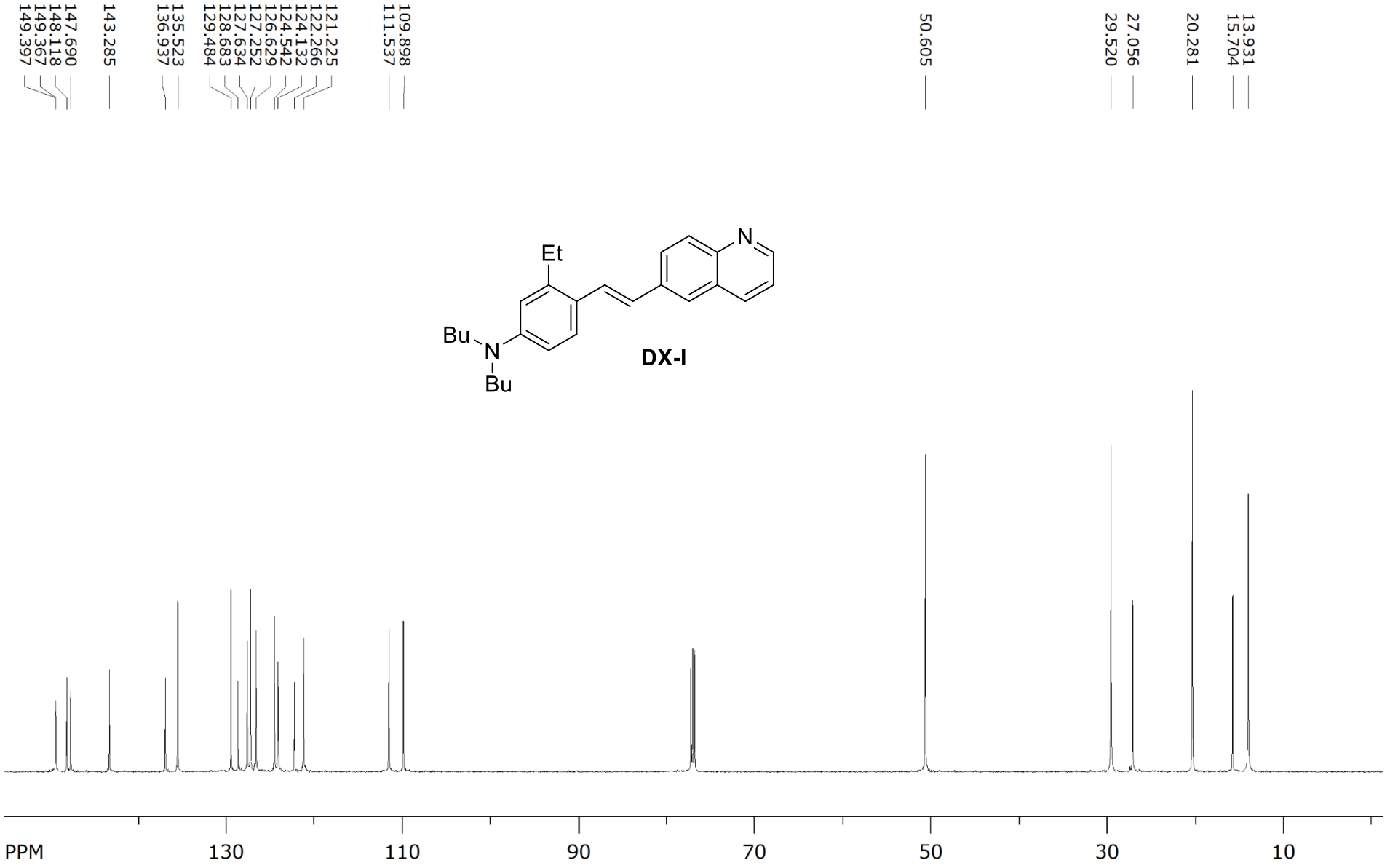
^{1}H NMR (600 MHz, $CDCl_3$) of *N*,*N*-dihexyl-4-(1-(quinolin-6-yl)vinyl)aniline



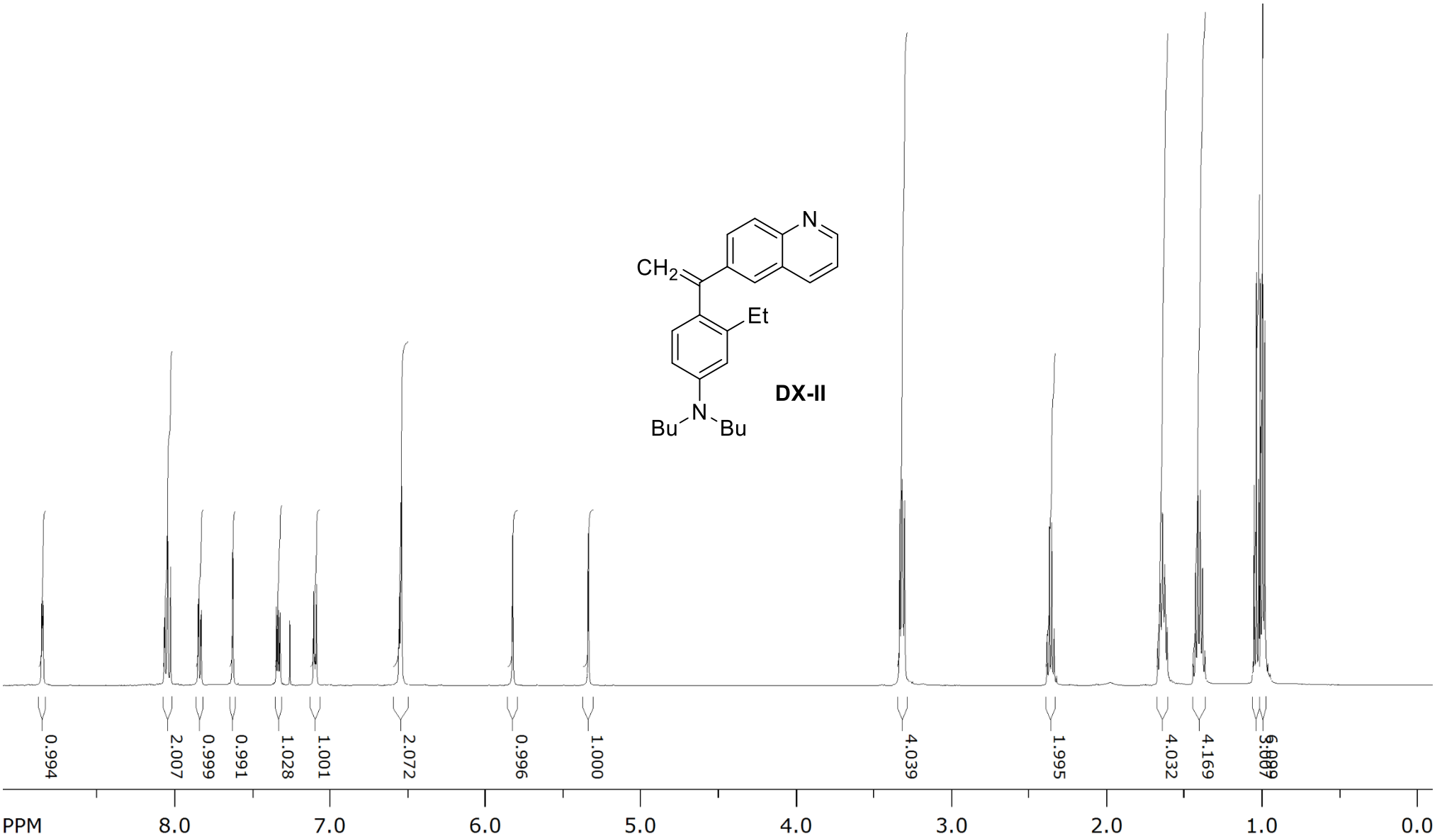
^{13}C NMR (150 MHz, $CDCl_3$) of *N*,*N*-dihexyl-4-(1-(quinolin-6-yl)vinyl)aniline



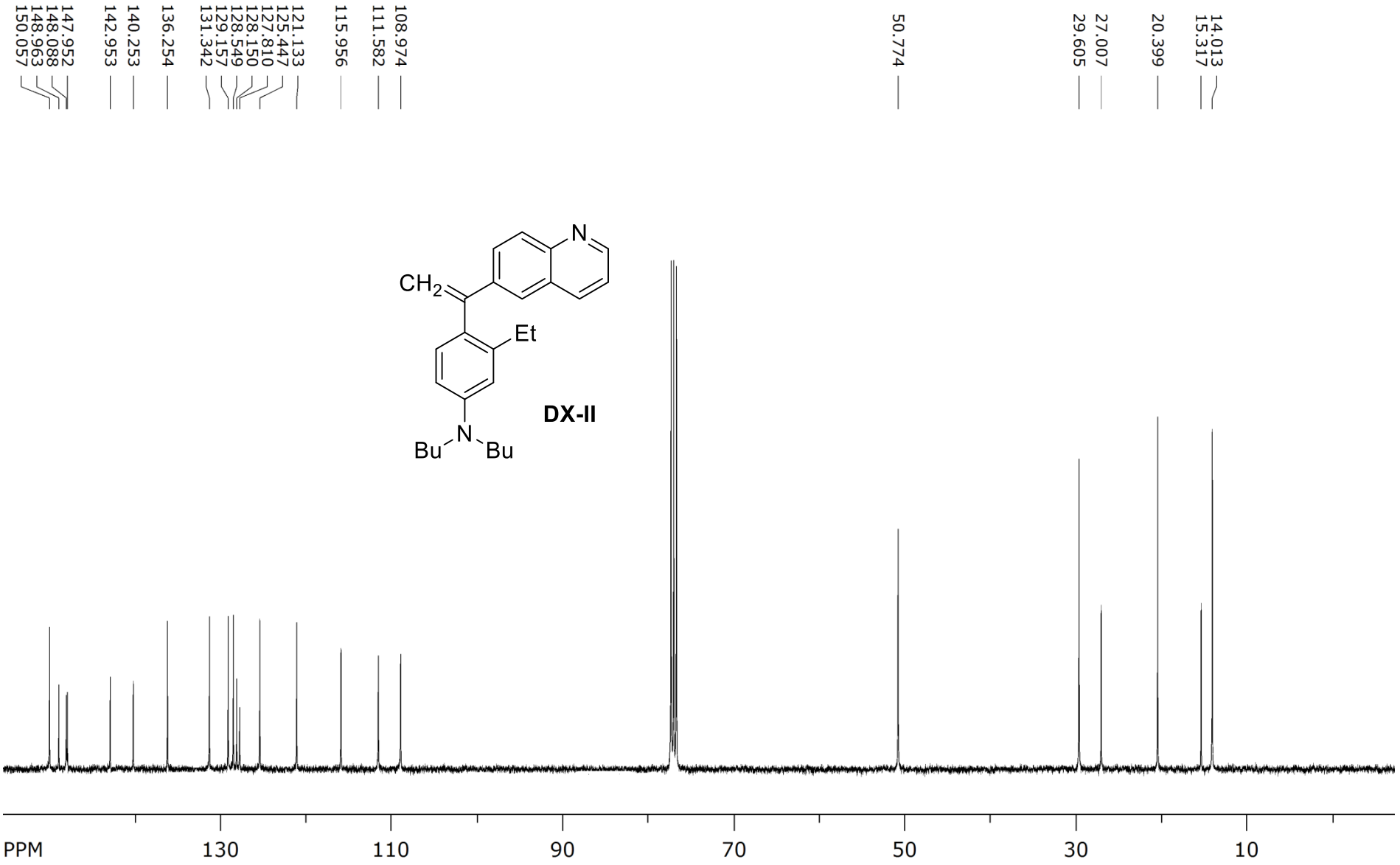
^{1}H NMR (600 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dibutyl-3-ethyl-4-(2-(quinolin-6-yl)vinyl)aniline



^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dibutyl-3-ethyl-4-(2-(quinolin-6-yl)vinyl)aniline

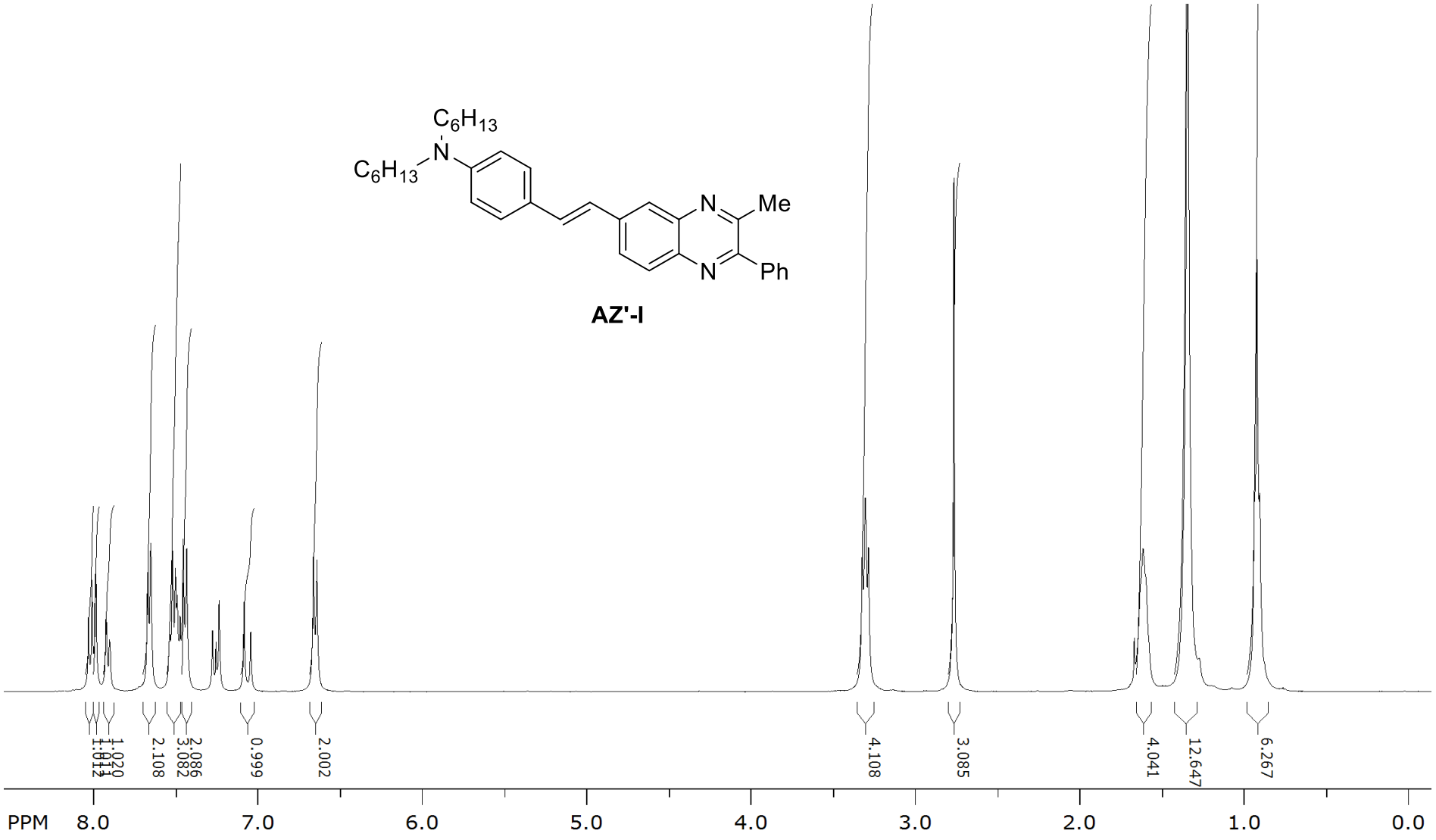


^{1}H NMR (500 MHz, $CDCl_3$) of *N*,*N*-dibutyl-3-ethyl-4-(1-(quinolin-6-yl)vinyl)aniline

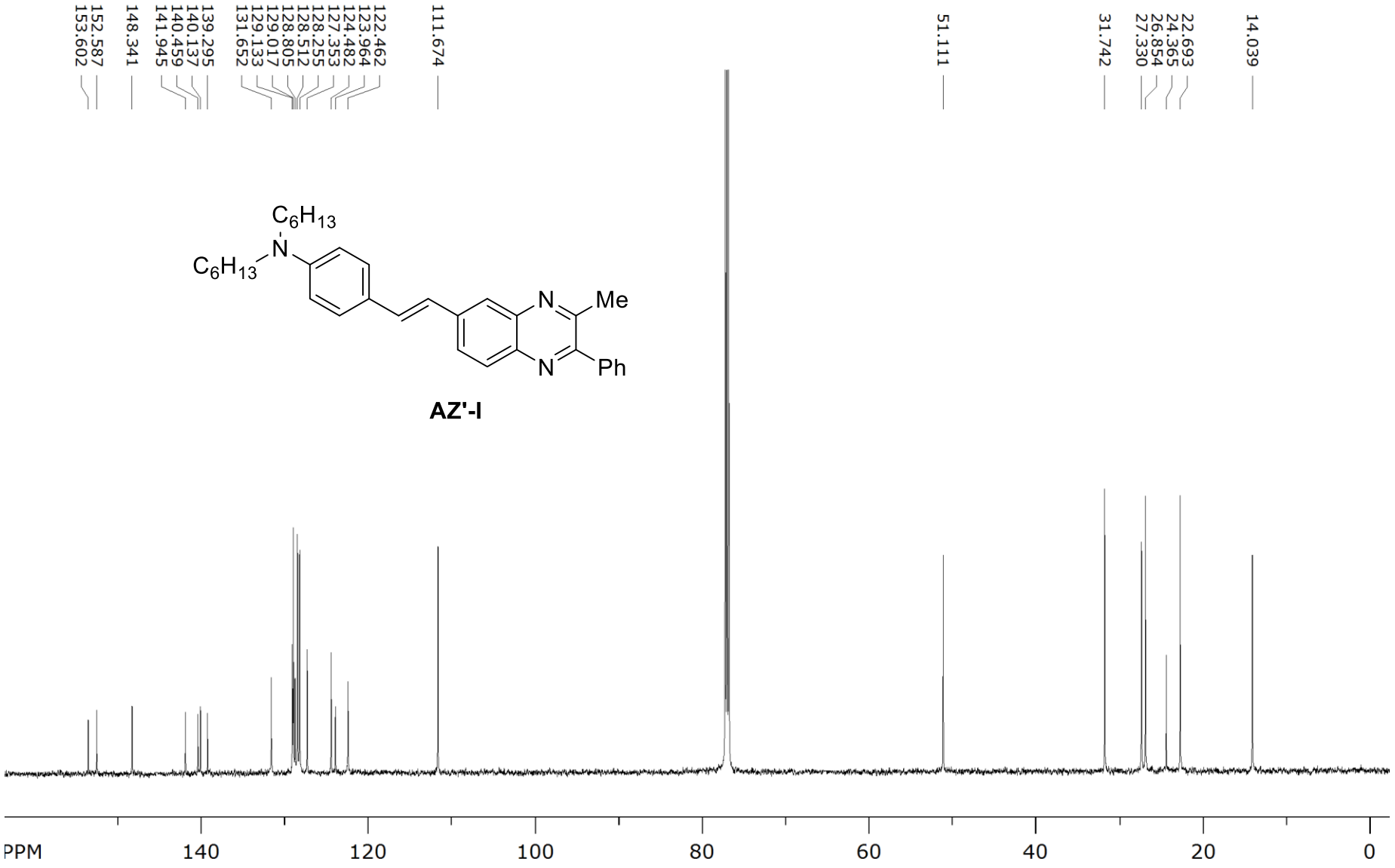


^{13}C NMR (100 MHz, $CDCl_3$) of *N*,*N*-dibutyl-3-ethyl-4-(1-(quinolin-6-yl)vinyl)aniline

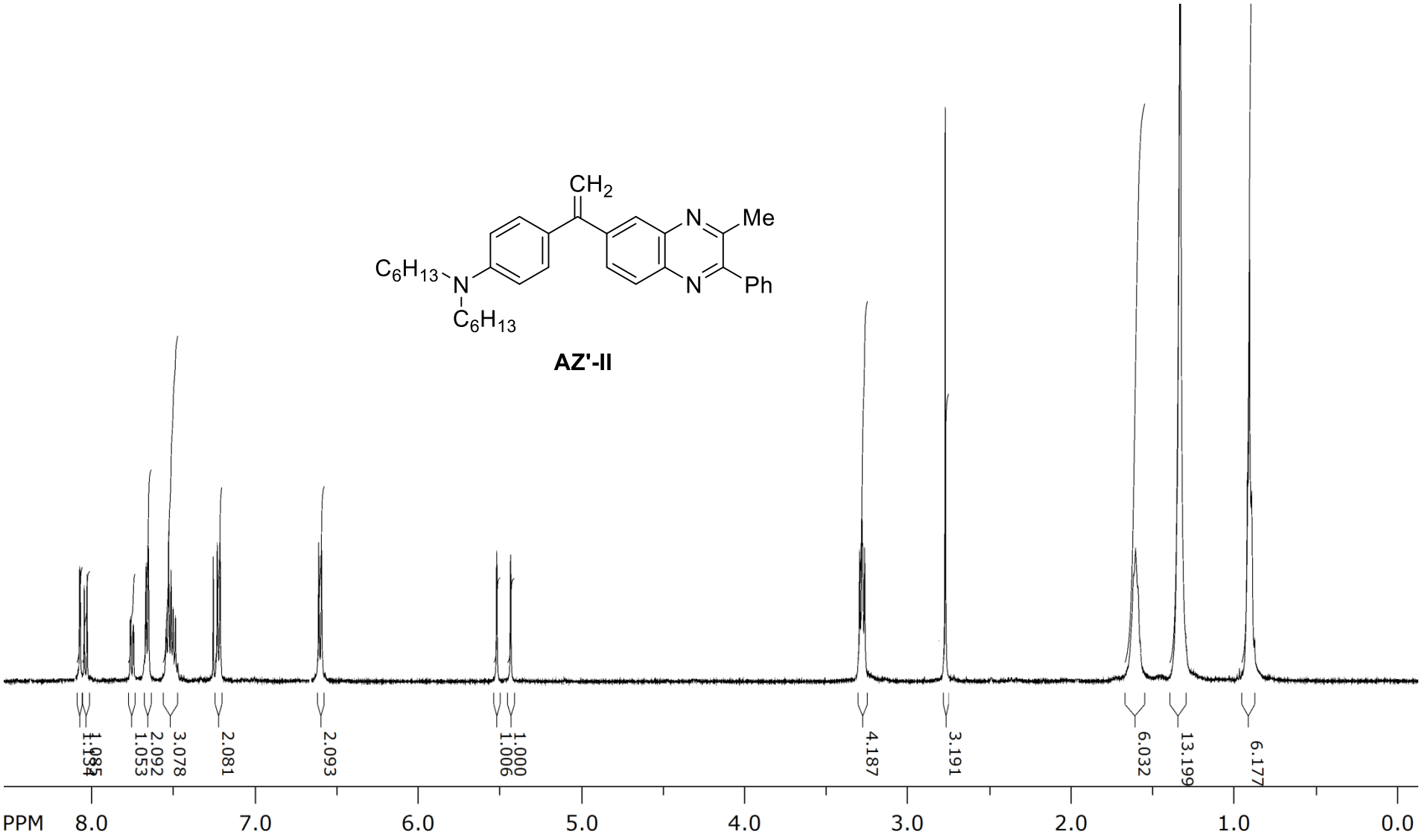
3. NMR of of derivatives with quinoxaline acceptor moiety



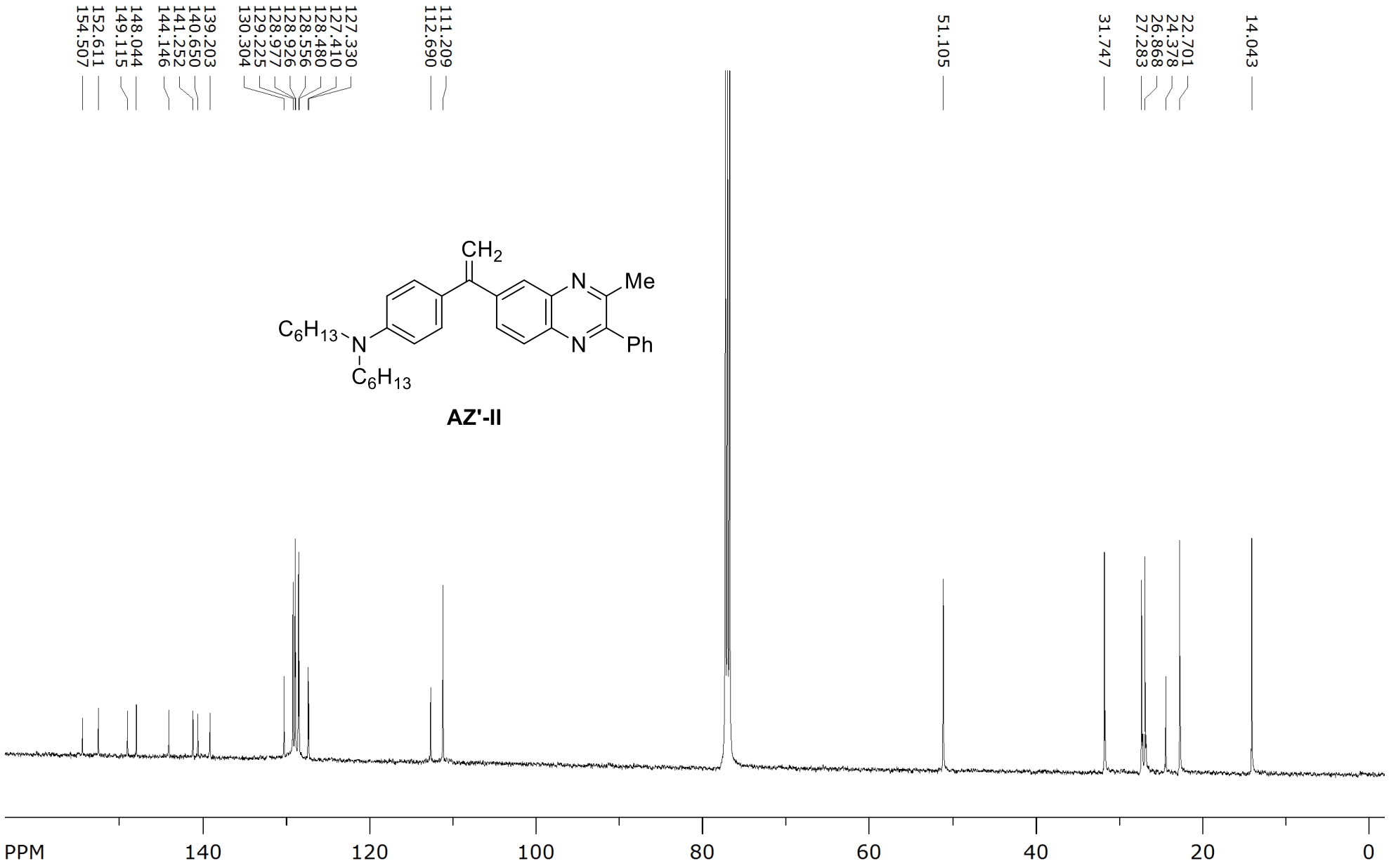
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dihexyl-4-(2-(3-methyl-2-phenylquinoxalin-6-yl)vinyl)aniline



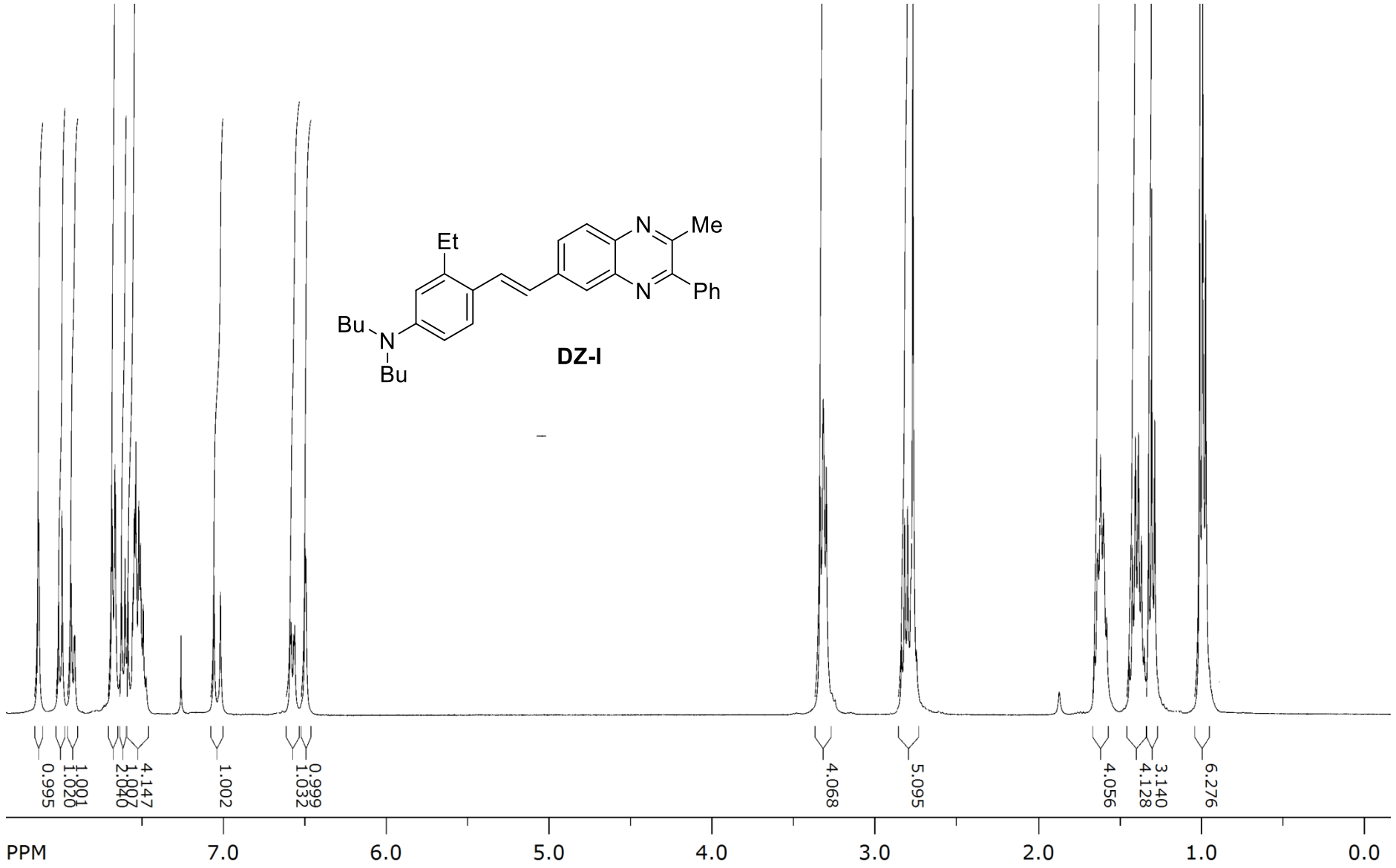
^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dihexyl-4-(2-(3-methyl-2-phenylquinoxalin-6-yl)vinyl)aniline



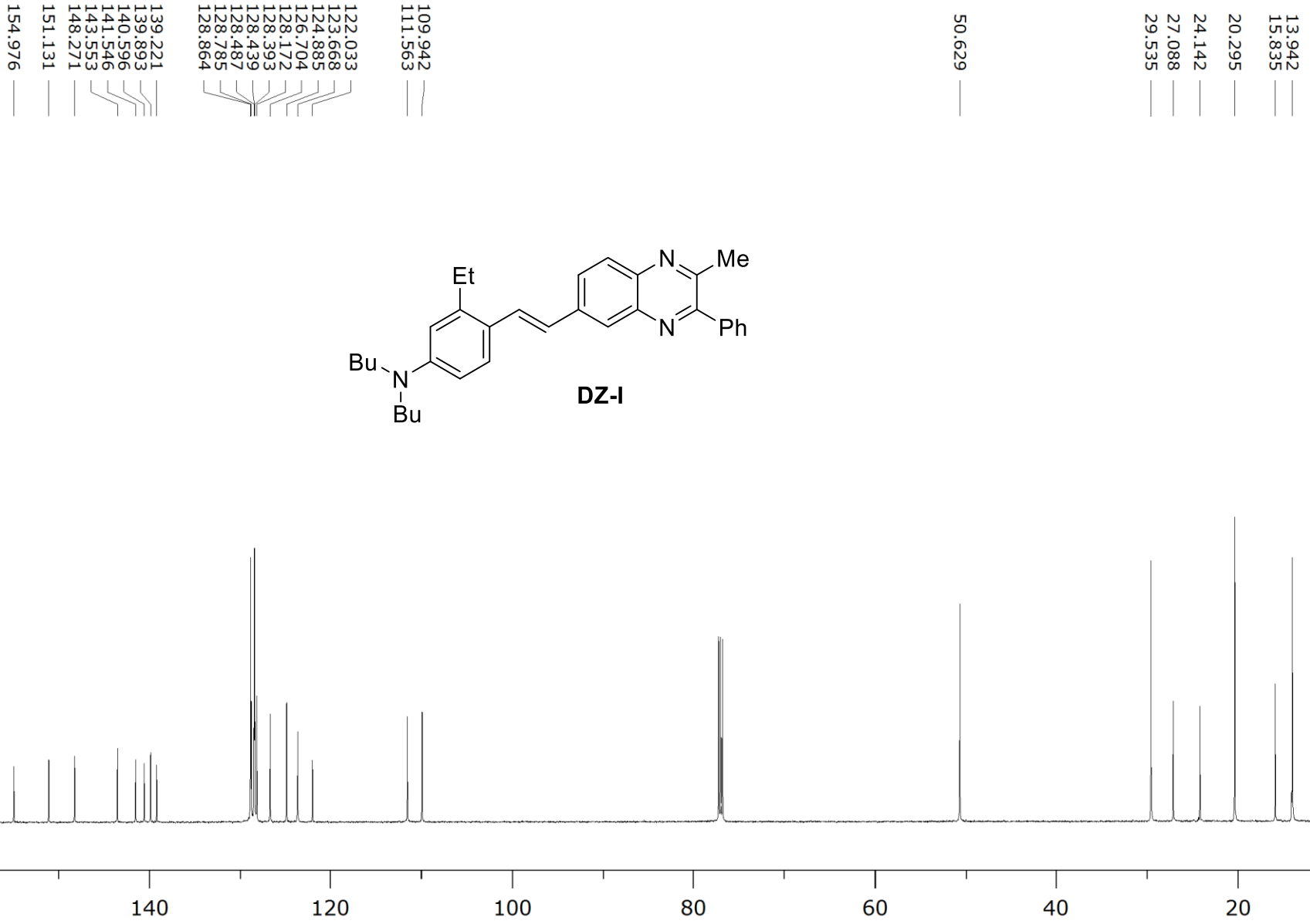
^{1}H NMR (125 MHz, $CDCl_3$) of *N*,*N*-dihexyl-4-(1-(3-methyl-2-phenylquinoxalin-6-yl)vinyl)aniline



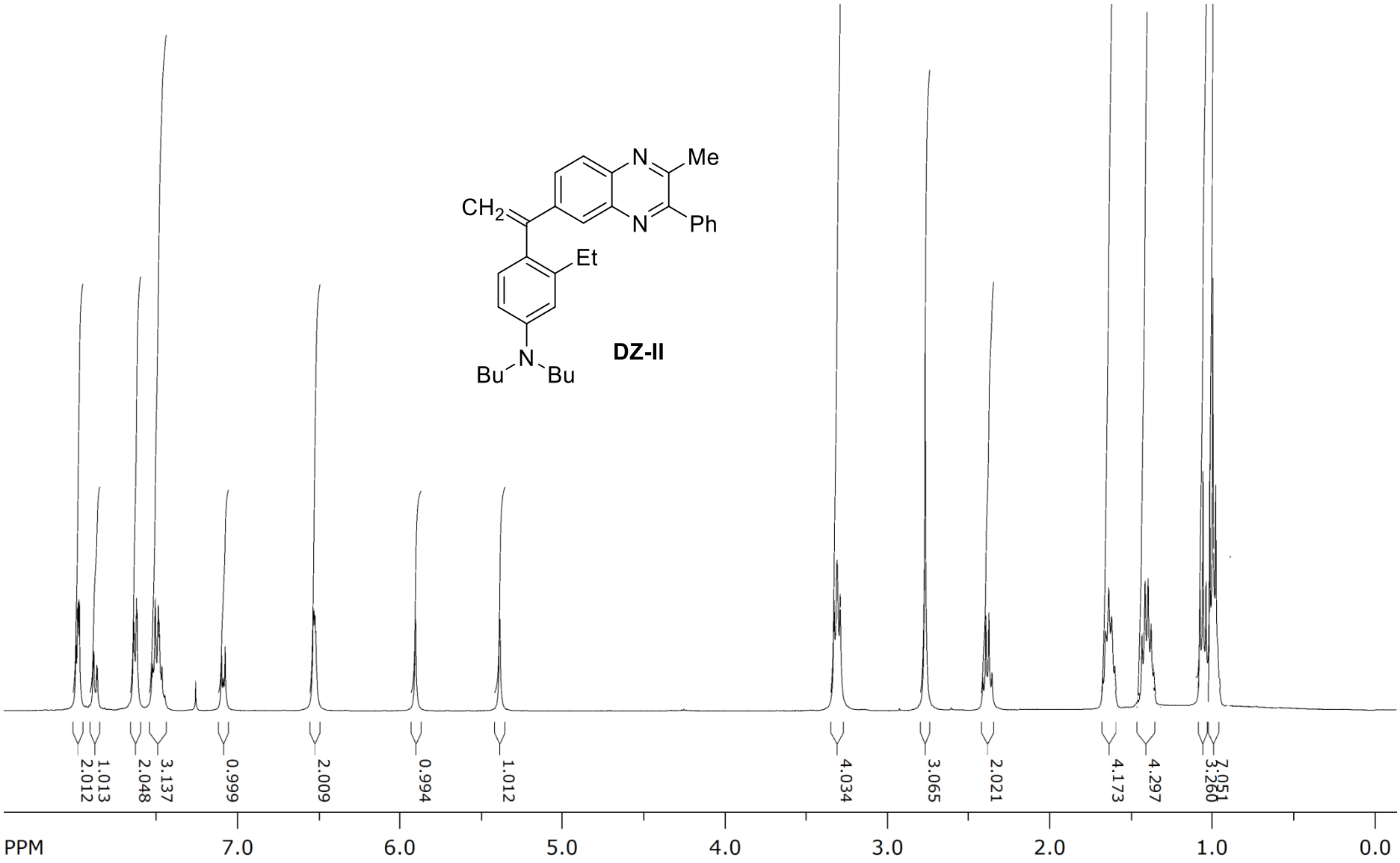
^{13}C NMR (125 MHz, $CDCl_3$) of *N*,*N*-dihexyl-4-(1-(3-methyl-2-phenylquinoxalin-6-yl)vinyl)aniline



^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dibutyl-3-ethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline

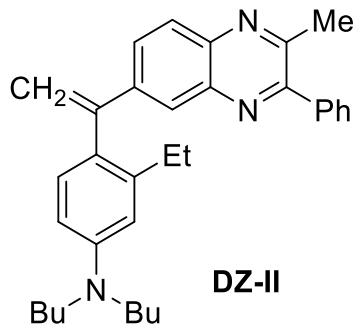


^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-*N*,*N*-dibutyl-3-ethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline

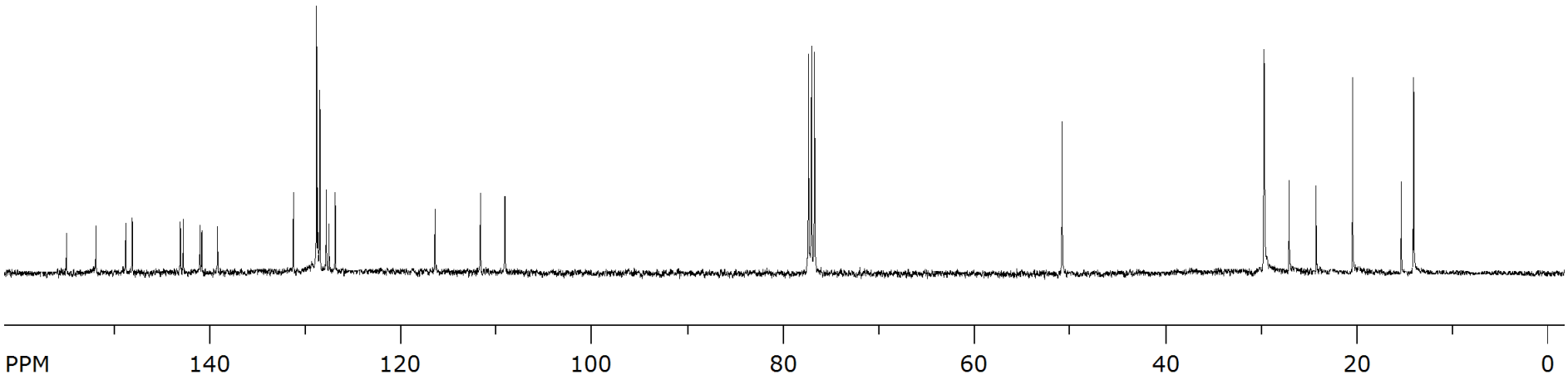


^{1}H NMR (400 MHz, $CDCl_3$) of *N*,*N*-dibutyl-3-ethyl-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline

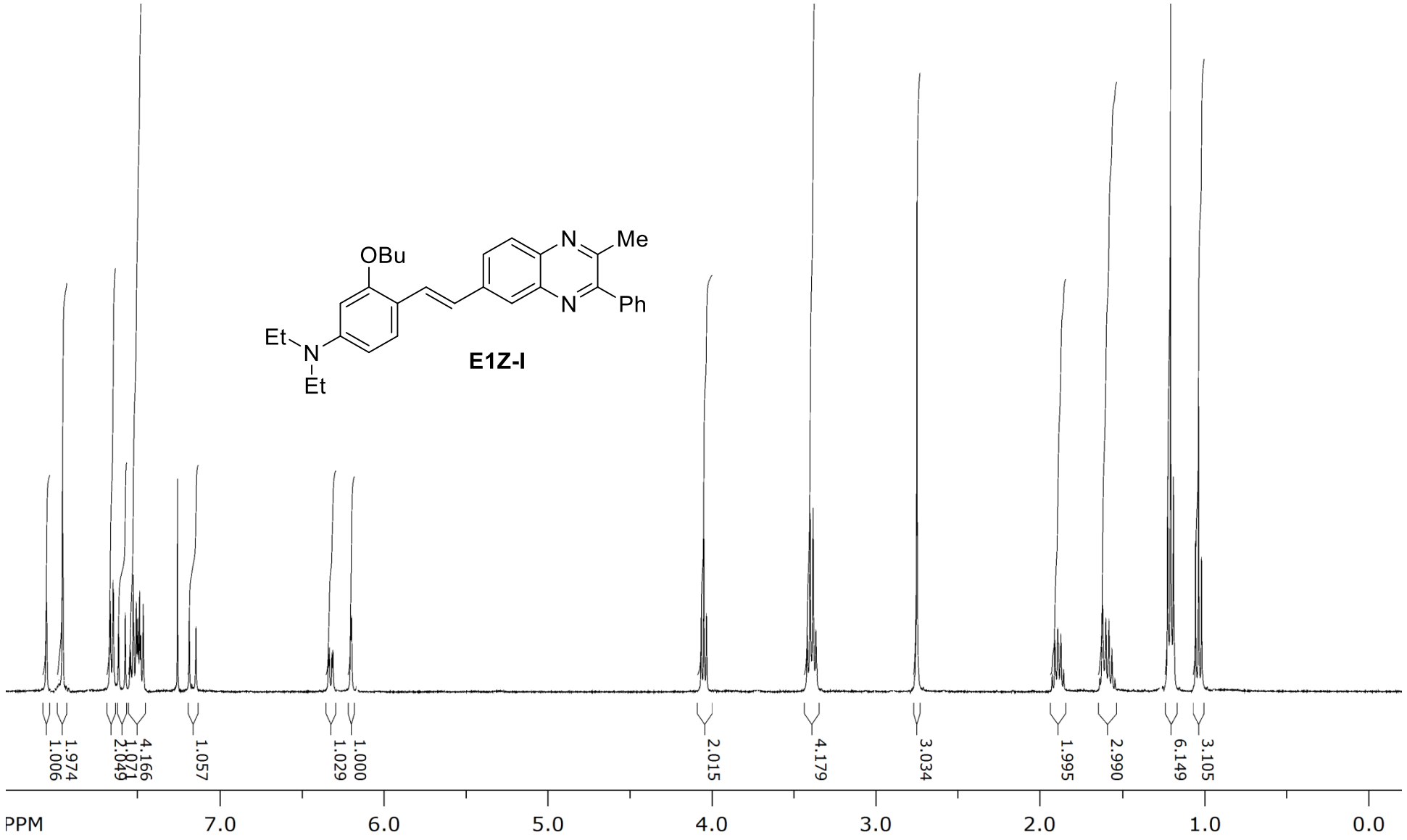
155.008
151.931
148.797
148.121
143.089
142.773
141.024
140.841
139.187
131.256
128.832
128.709
128.481
127.812
127.521
126.874
116.432
111.681
109.109
50.793
29.601
27.033
24.210
20.394
15.294
13.993



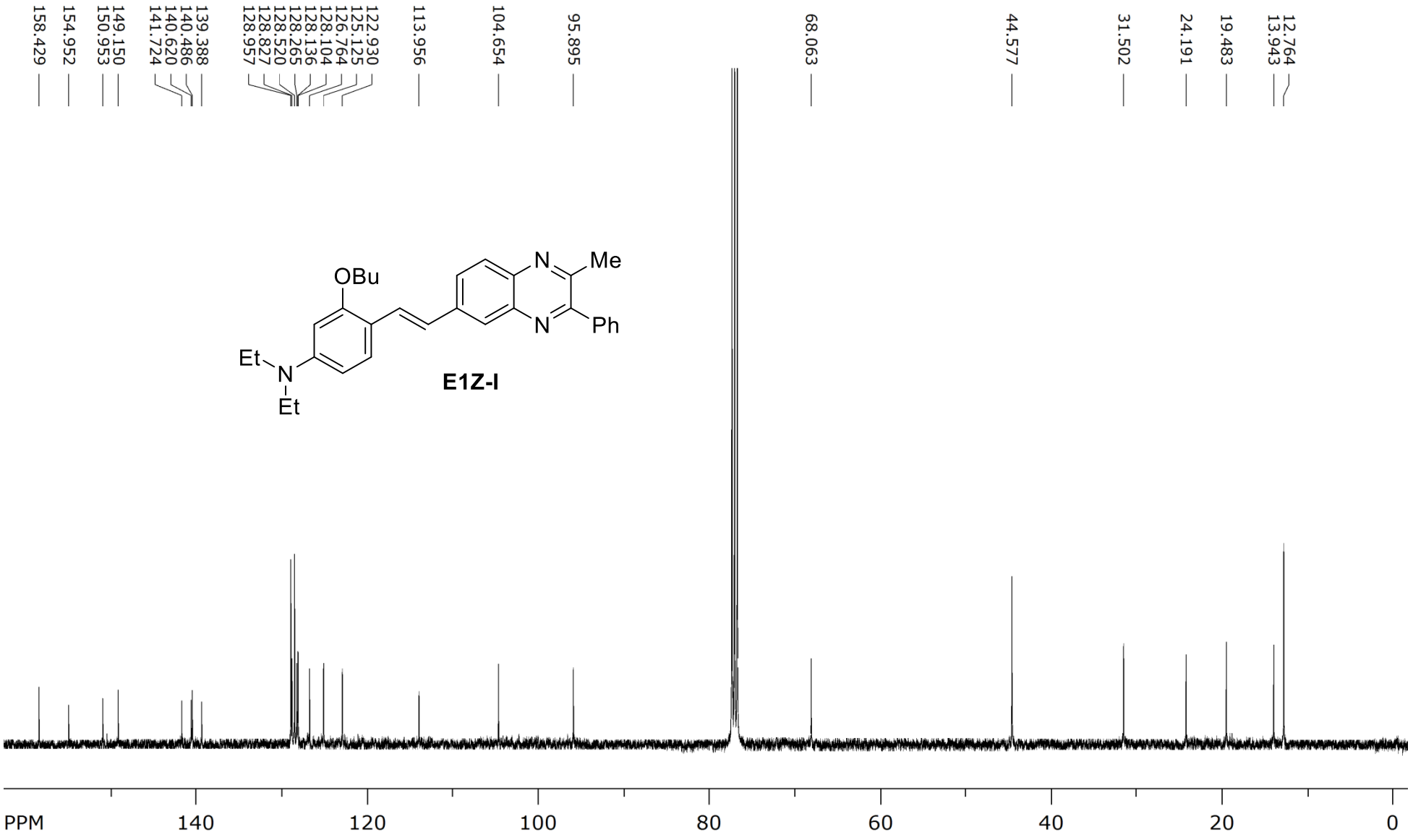
DZ-II



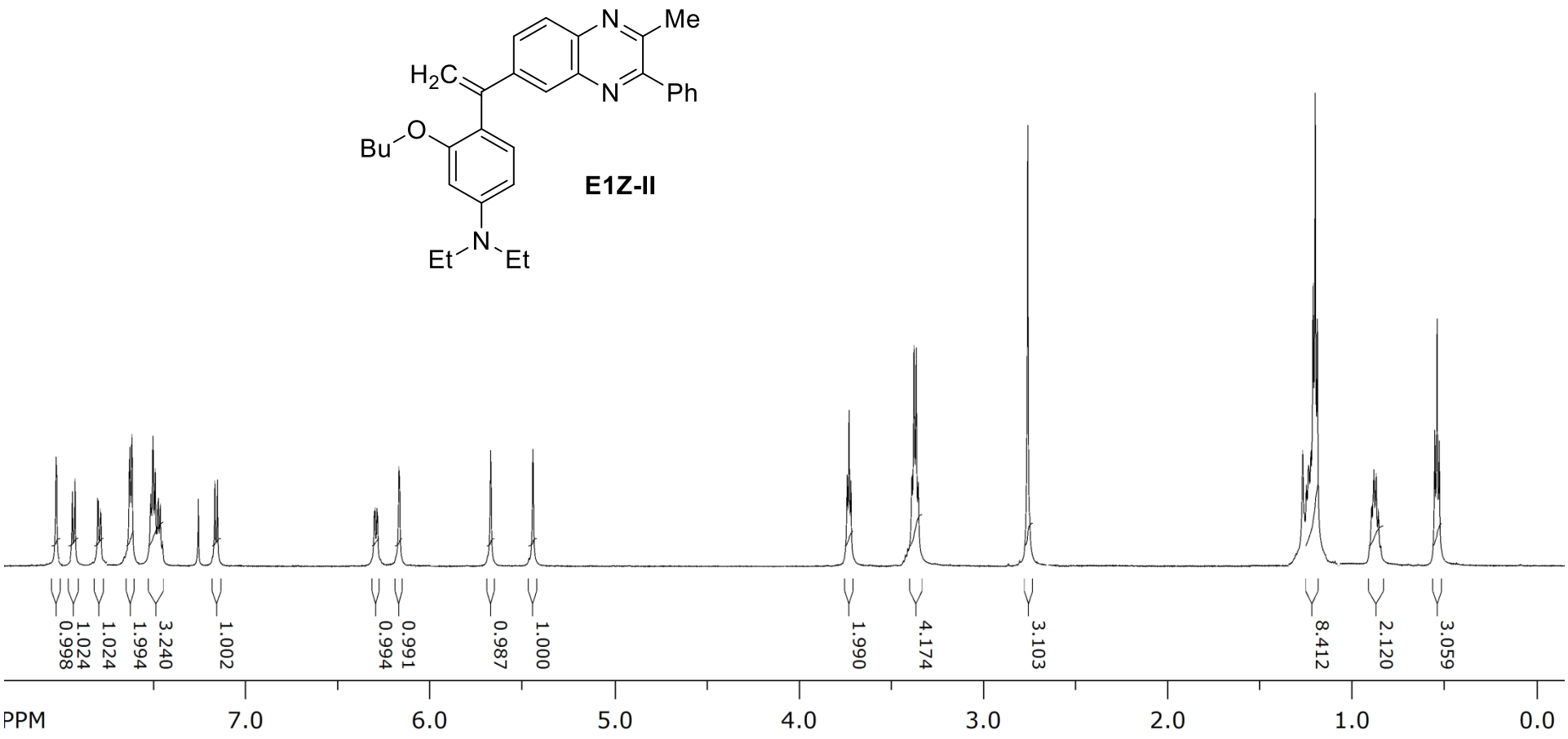
^{13}C NMR (100 MHz, $CDCl_3$) of *N*,*N*-dibutyl-3-ethyl-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline



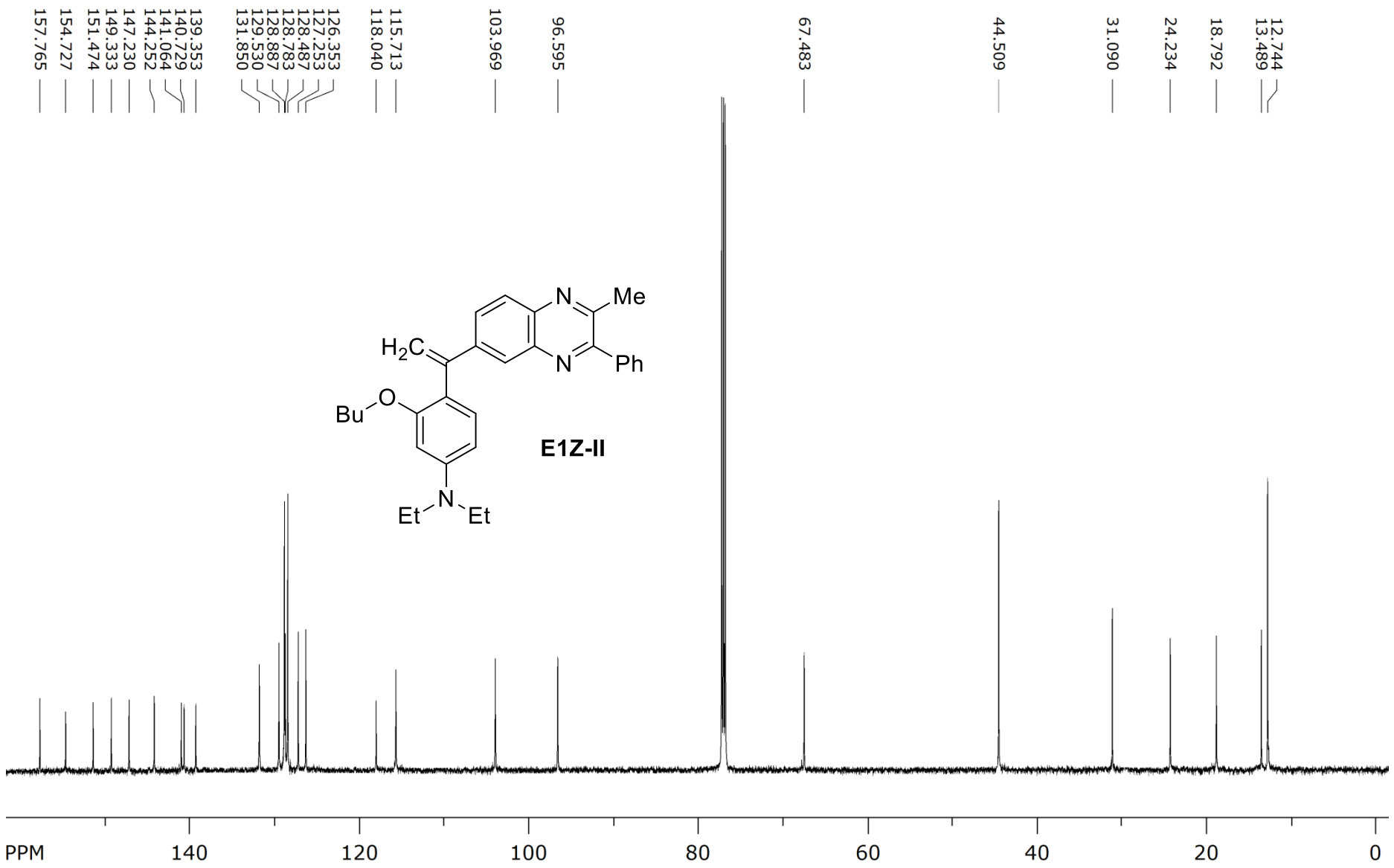
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-3-butoxy-*N*,*N*-diethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline



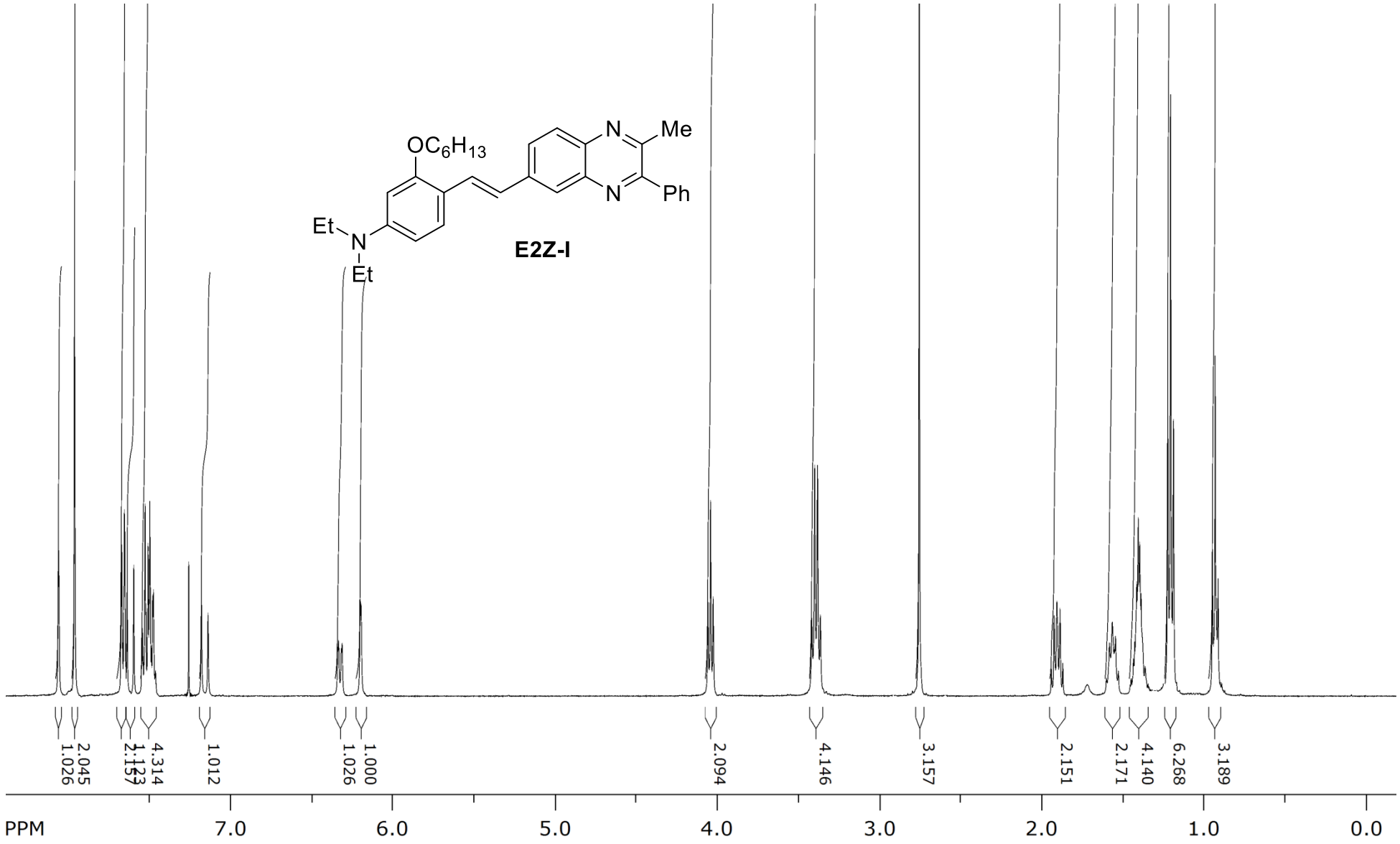
^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-3-butoxy-*N*,*N*-diethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline



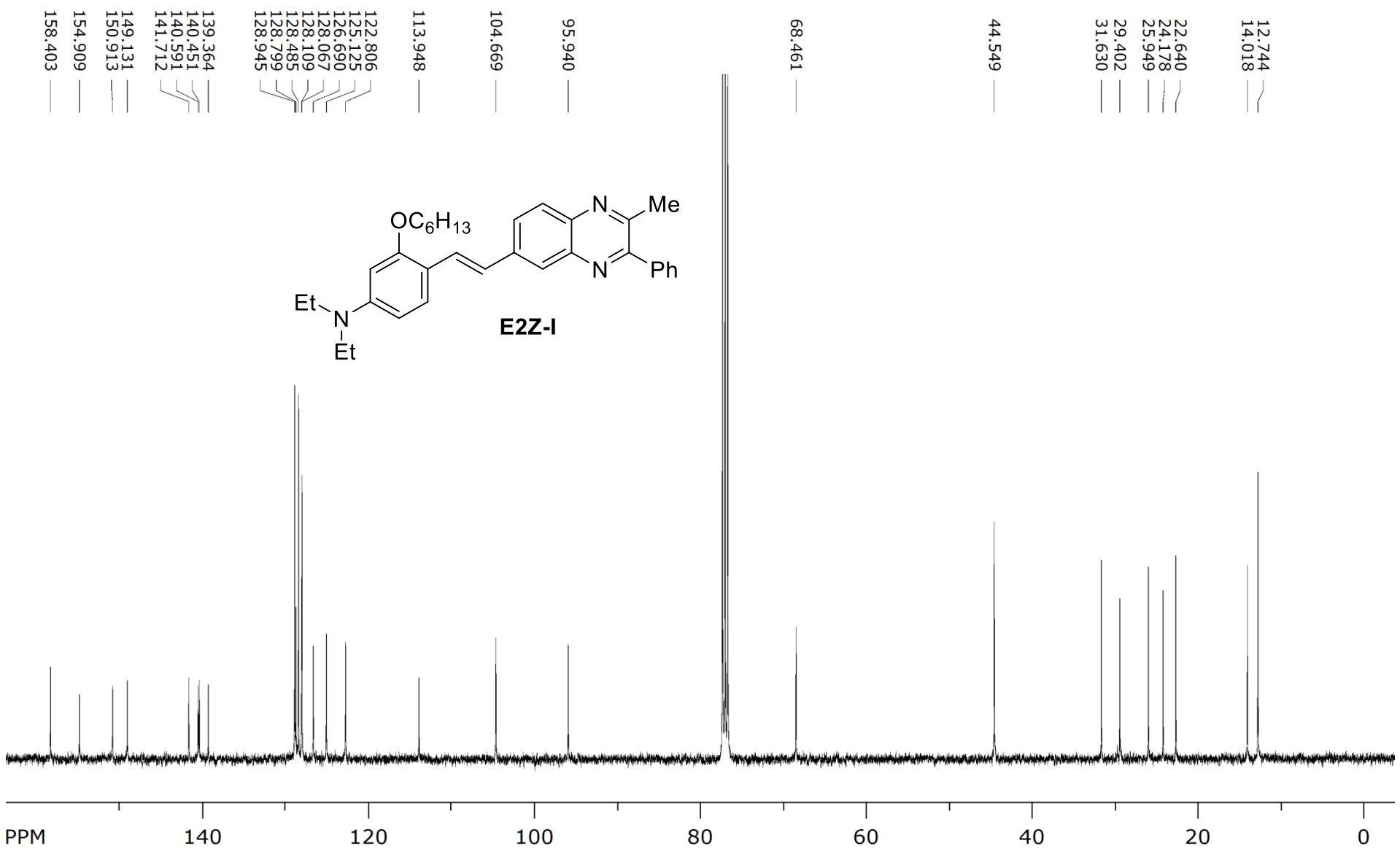
^{1}H NMR (600 MHz, $CDCl_3$) of 3-butoxy-N,N-diethyl-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline



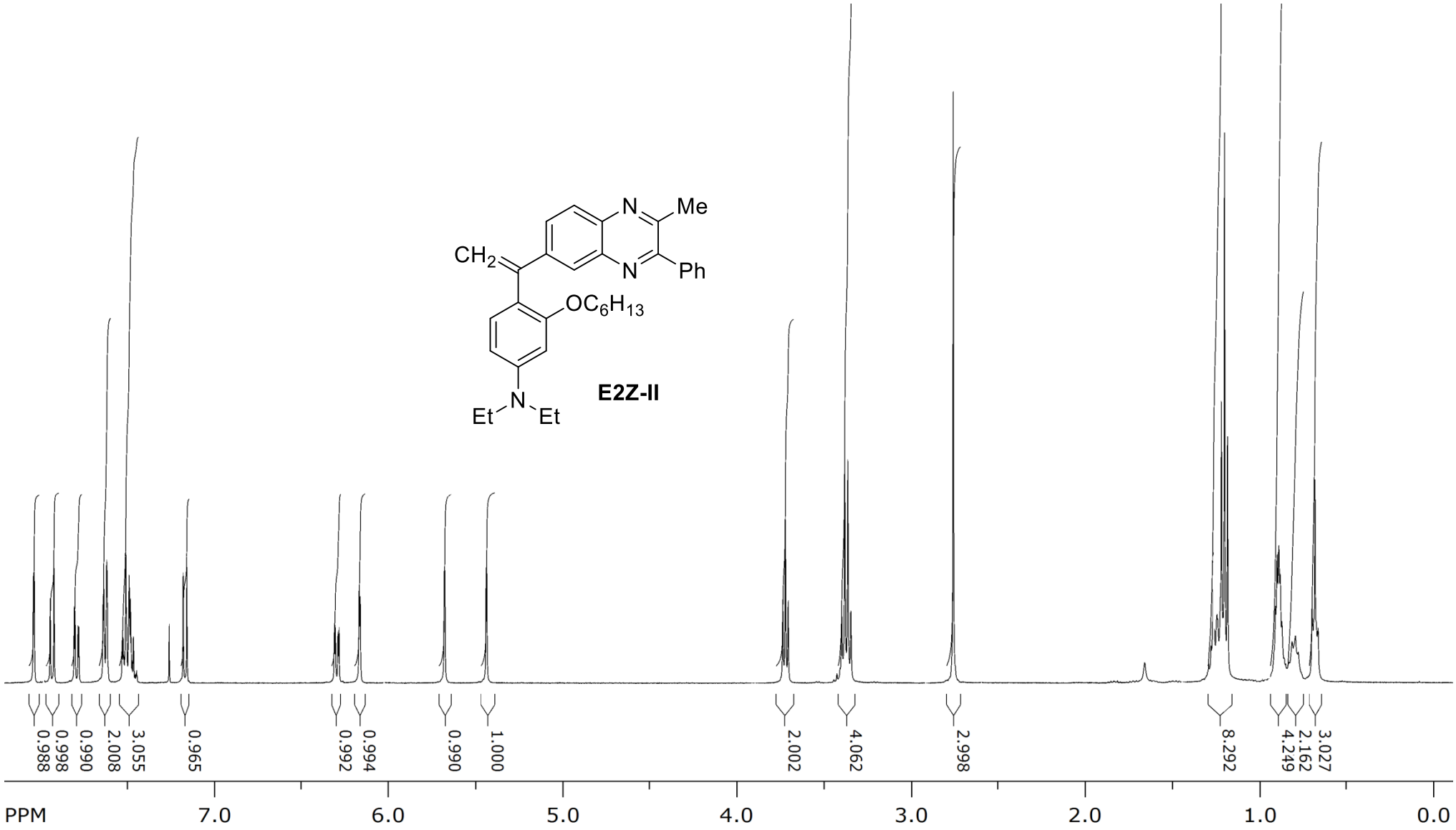
^{13}C NMR (150 MHz, $CDCl_3$) of 3-butoxy-N,N-diethyl-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline



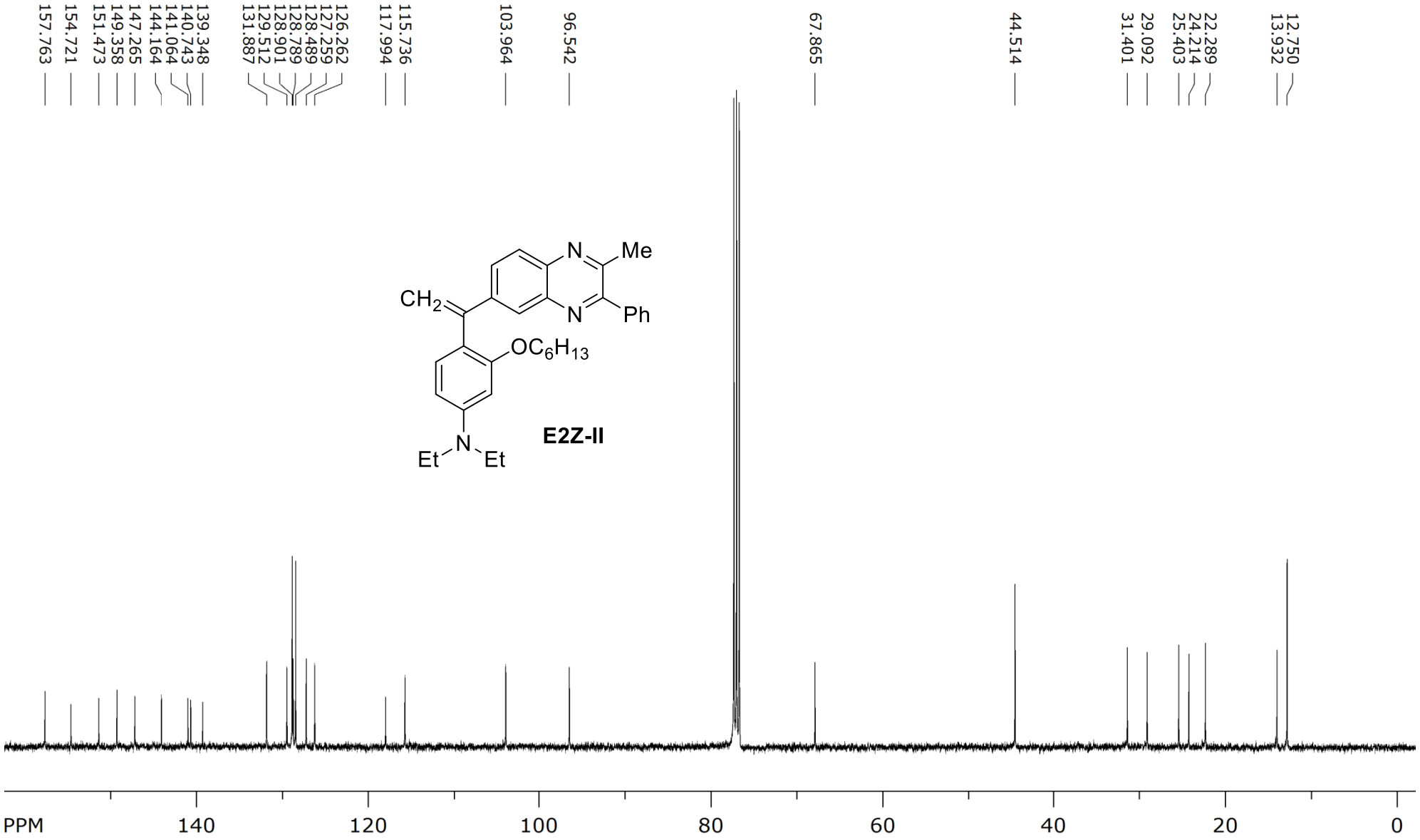
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-3-hexyloxy-*N*,*N*-diethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline



^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-3-hexyloxy-*N*,*N*-diethyl-4-(2-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline

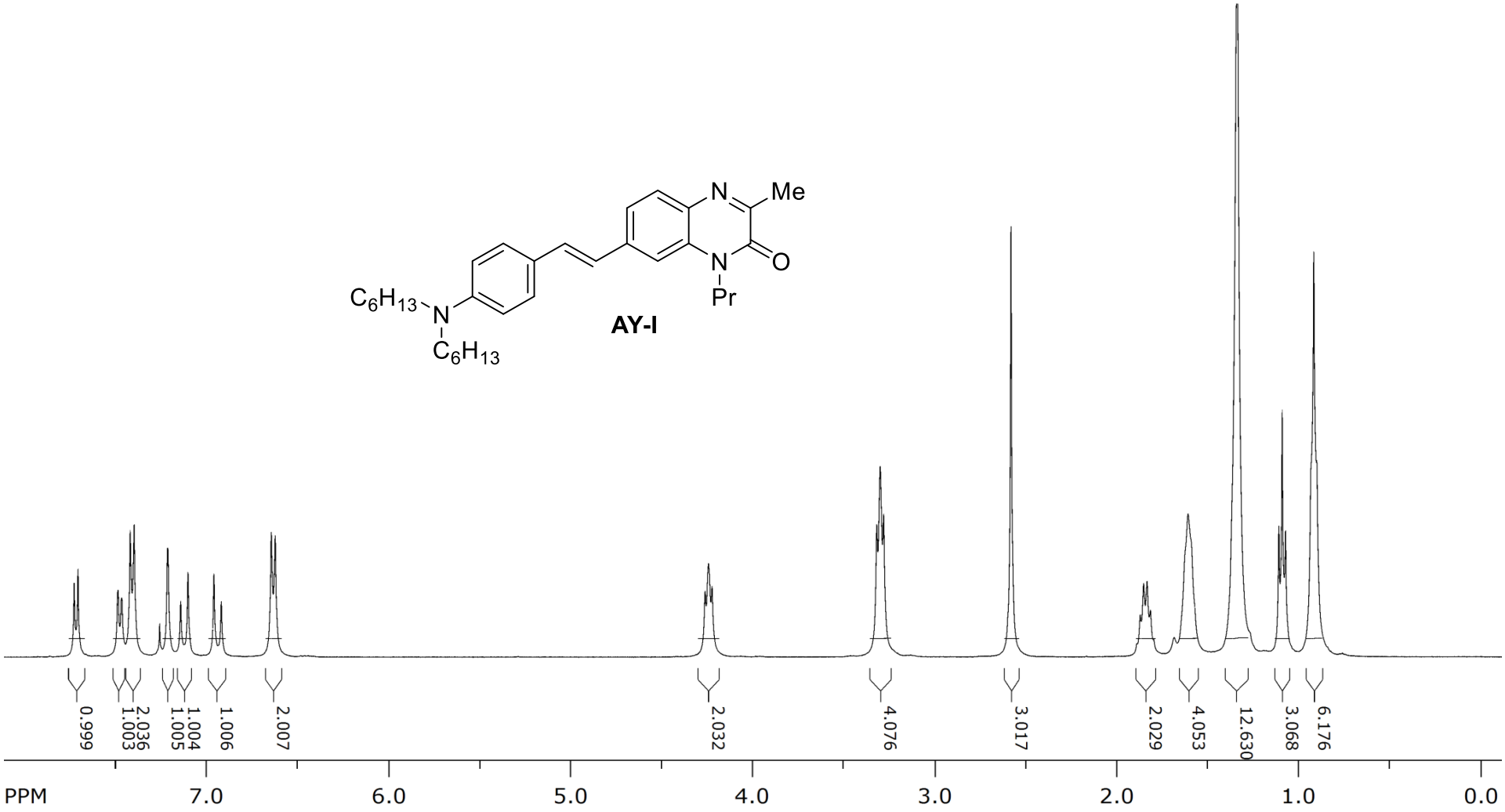


^{1}H NMR (400 MHz, $CDCl_3$) of *N*,*N*-diethyl-3-(hexyloxy)-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (**E2Z-II**)

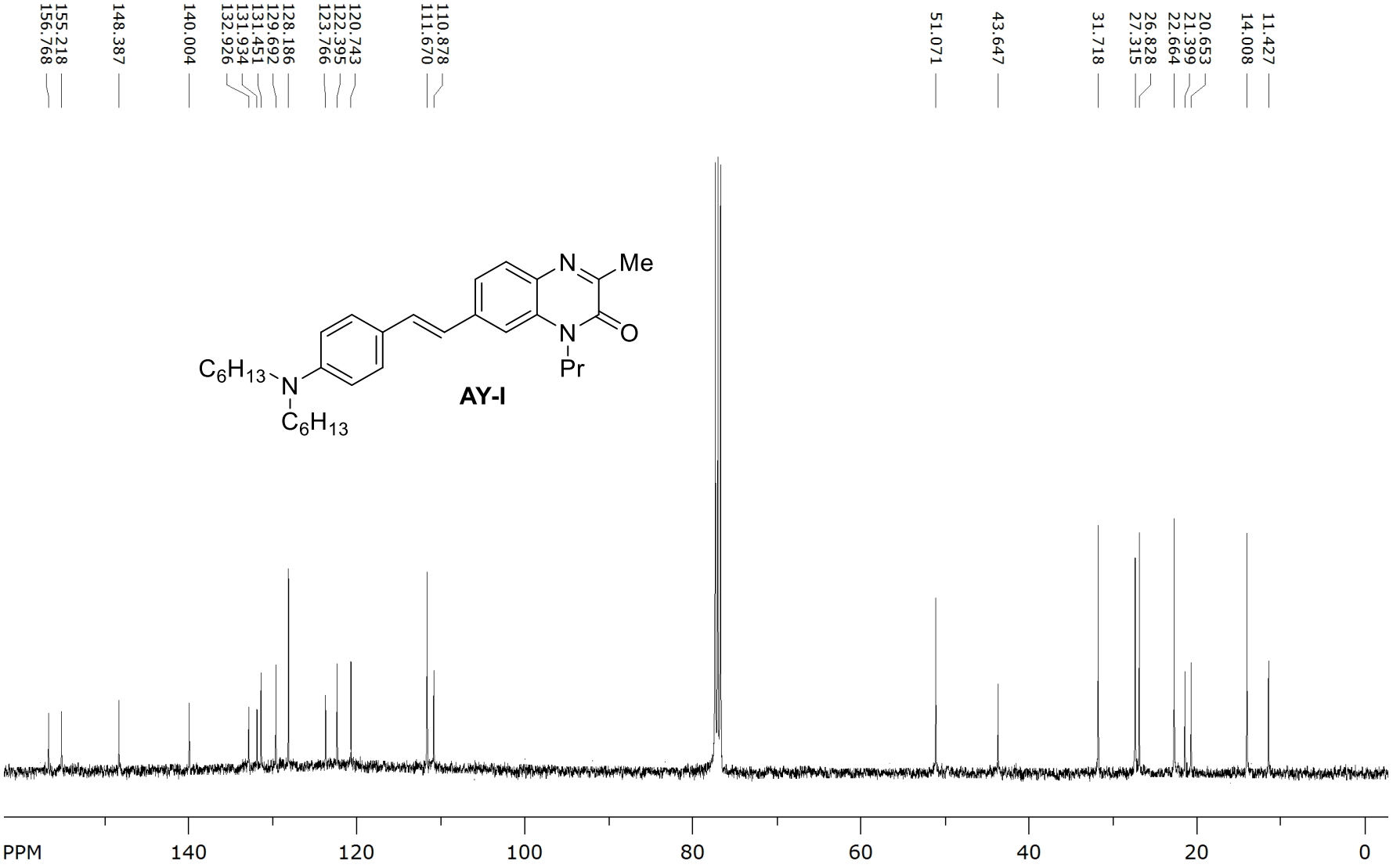


^{13}C NMR (100 MHz, $CDCl_3$) of *N*,*N*-diethyl-3-(hexyloxy)-4-(1-(2-methyl-3-phenylquinoxalin-6-yl)vinyl)aniline (**E2Z-II**)

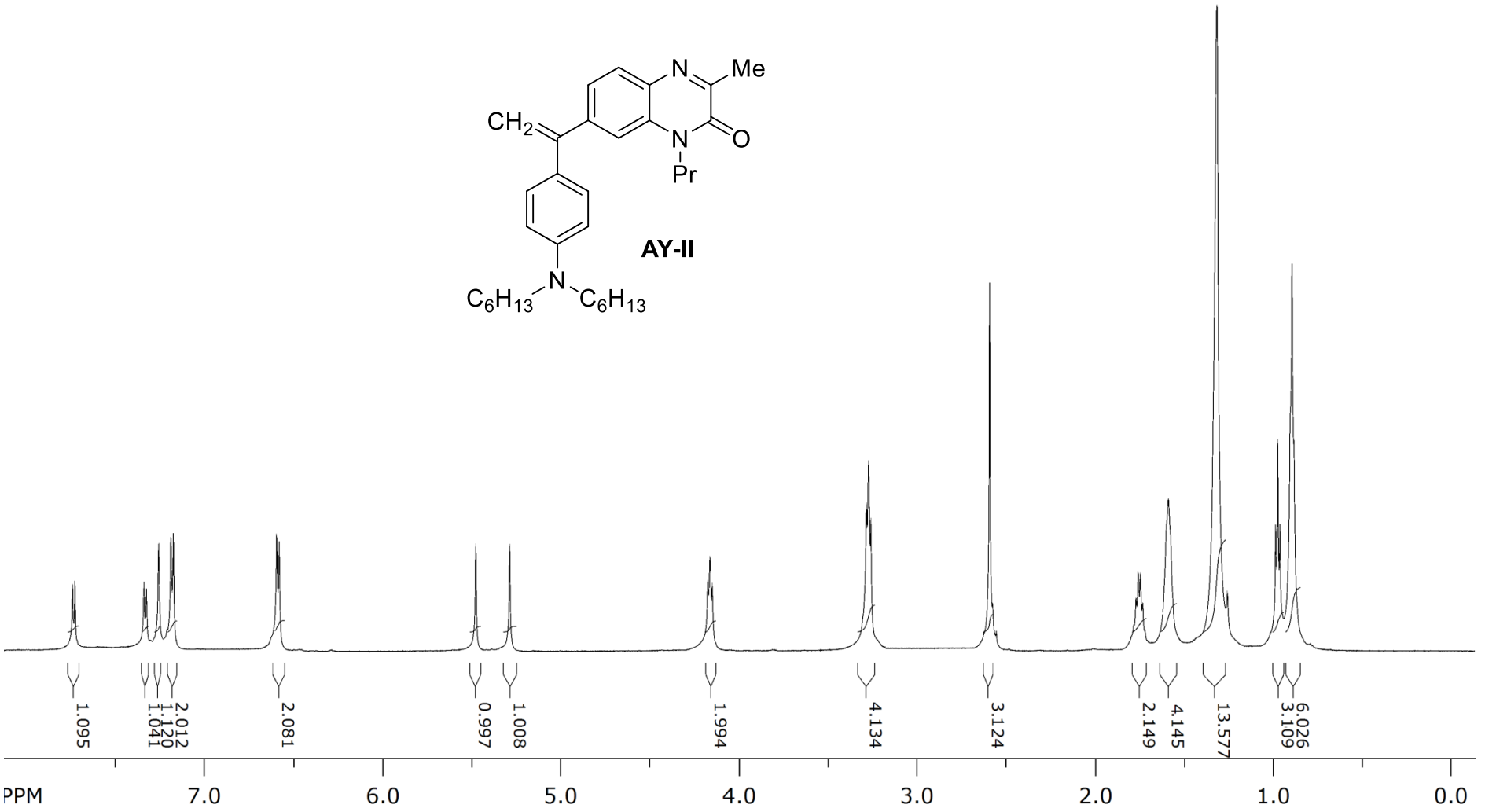
4. NMR of of derivatives with quinoxalinone acceptor moiety



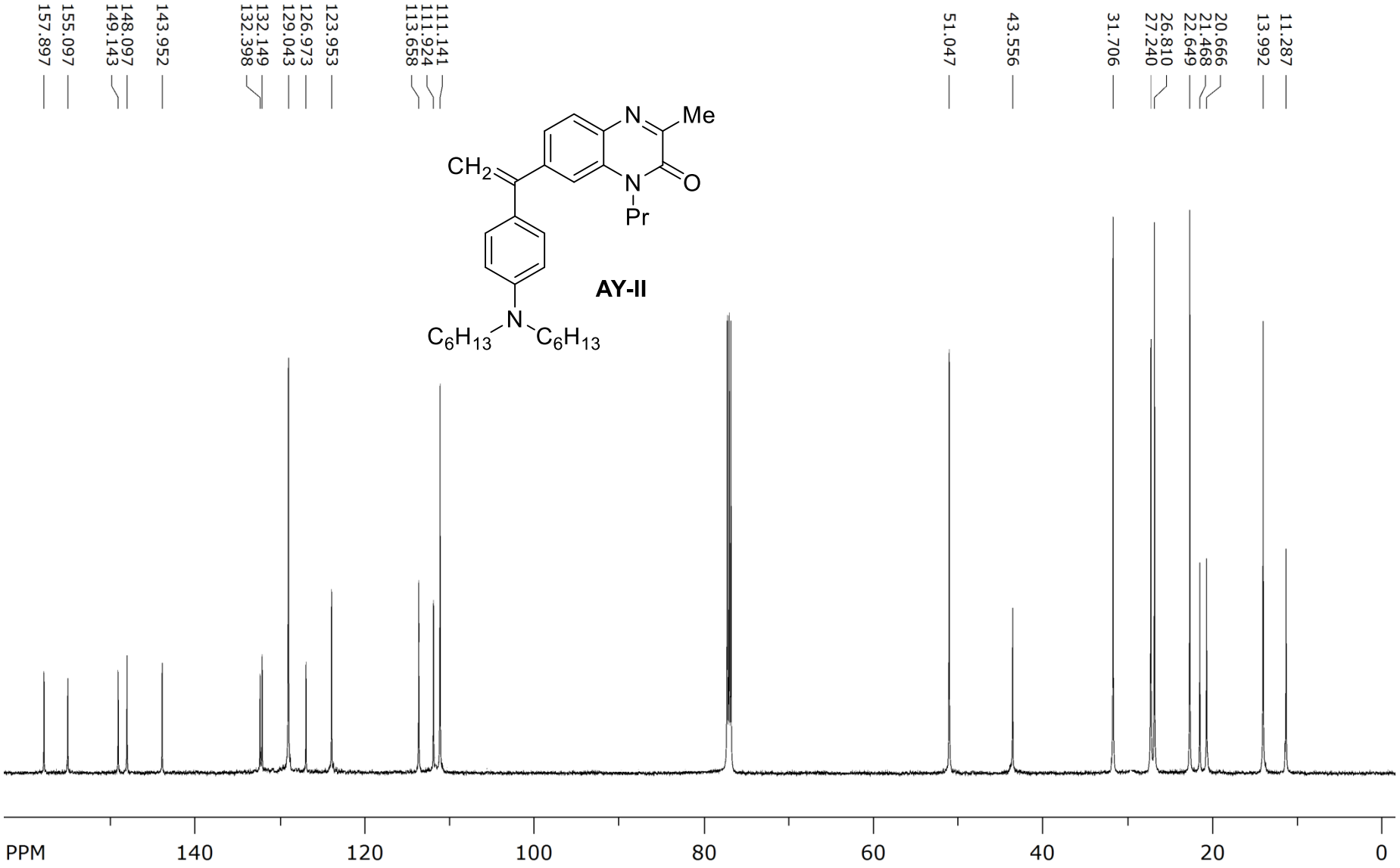
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-7-(4-(dihexylamino)styryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



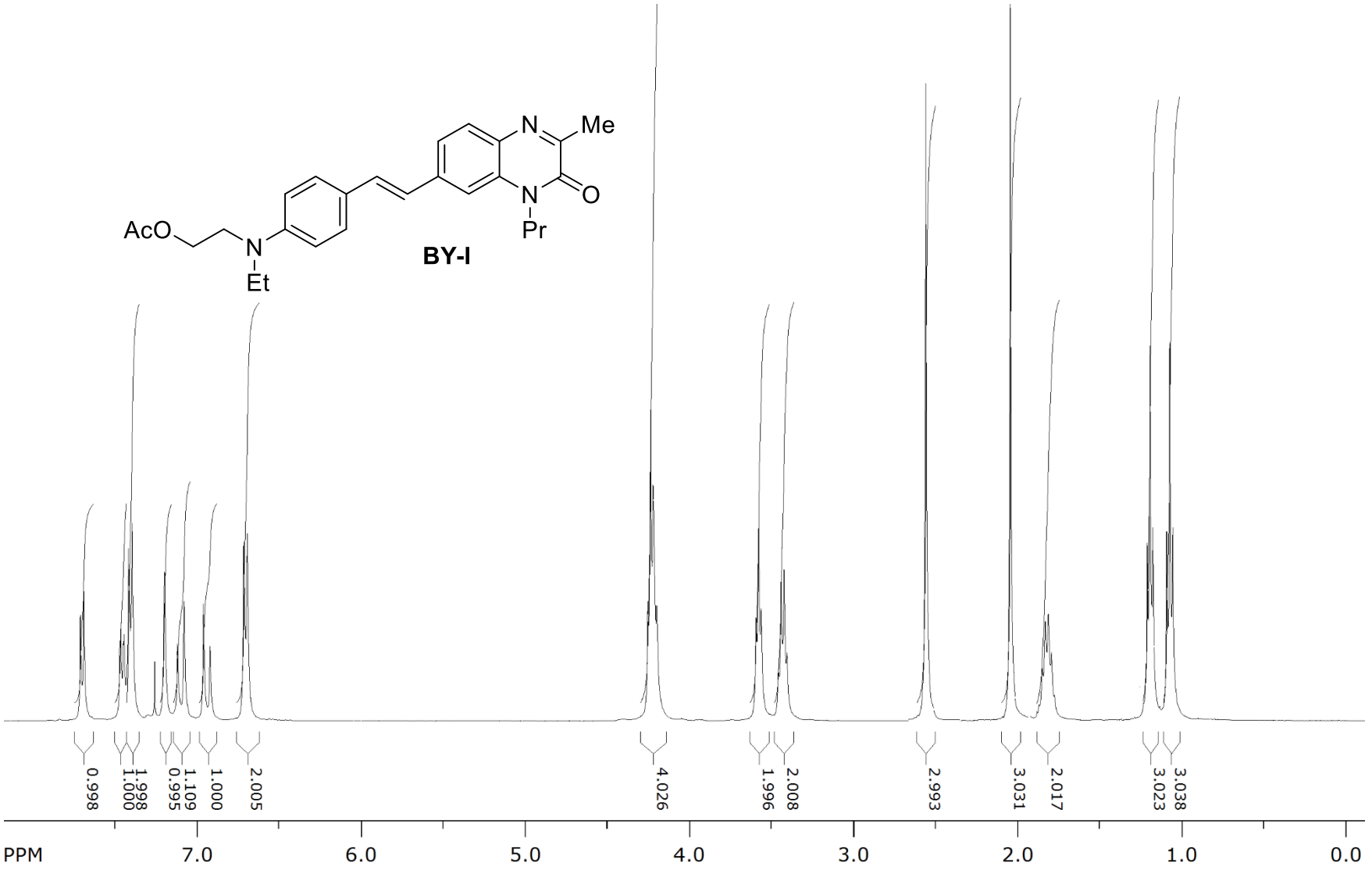
^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-7-(4-(dihexylamino)styryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



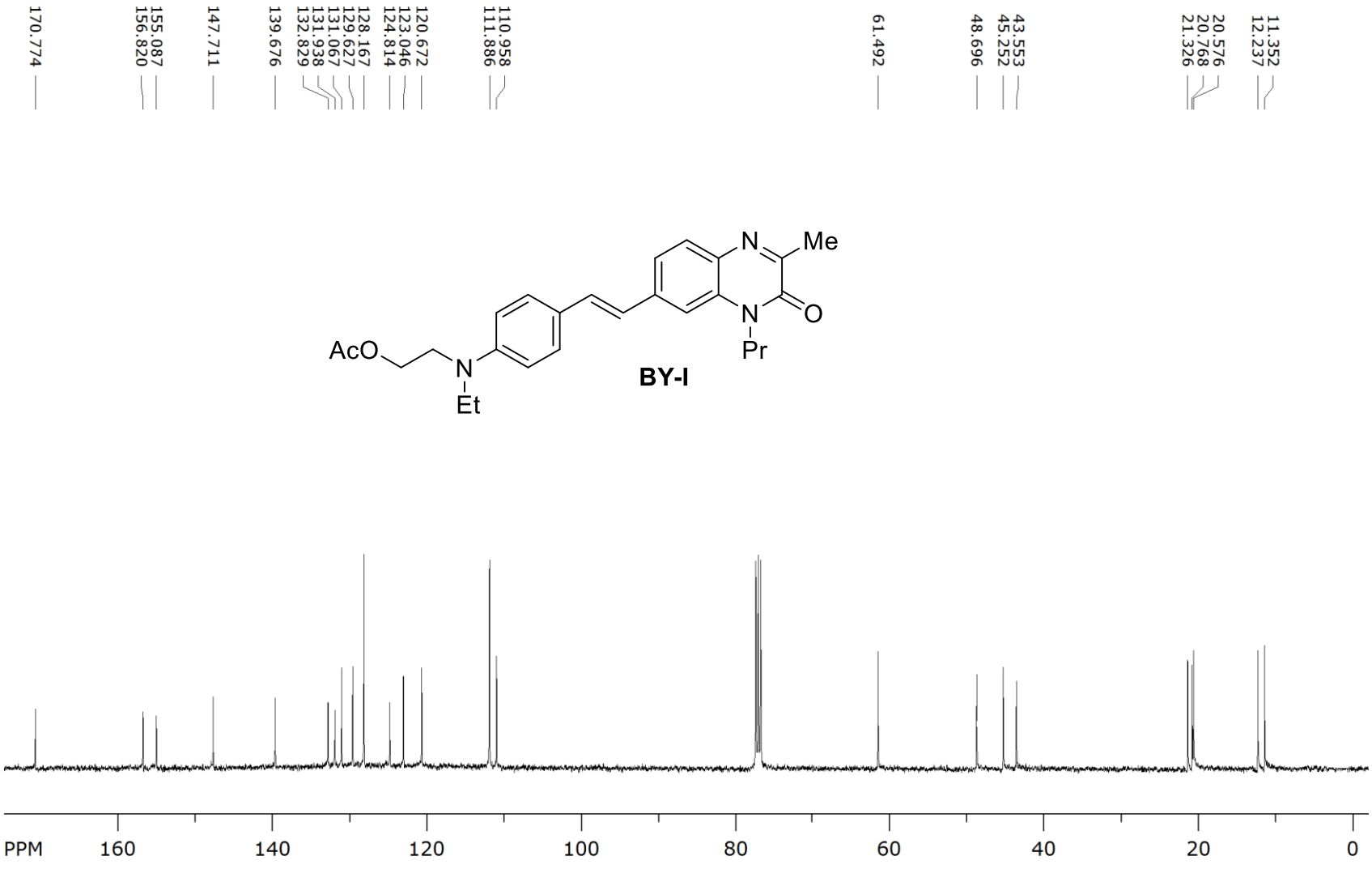
^{1}H NMR (600 MHz, $CDCl_3$) of 7-(1-(4-(dihexylamino)phenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



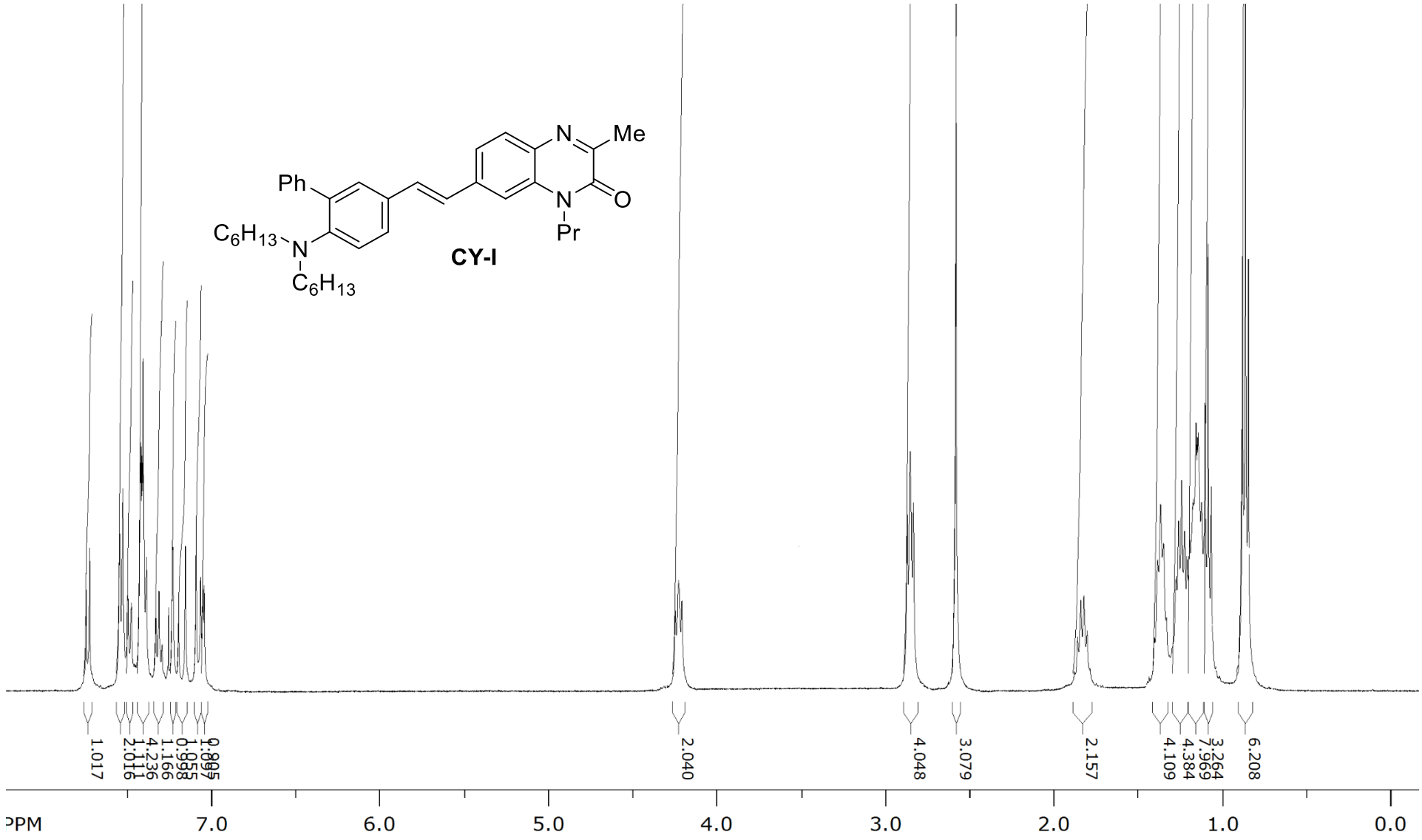
^{13}C NMR (150 MHz, $CDCl_3$) of 7-(1-(4-(dihexylamino)phenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



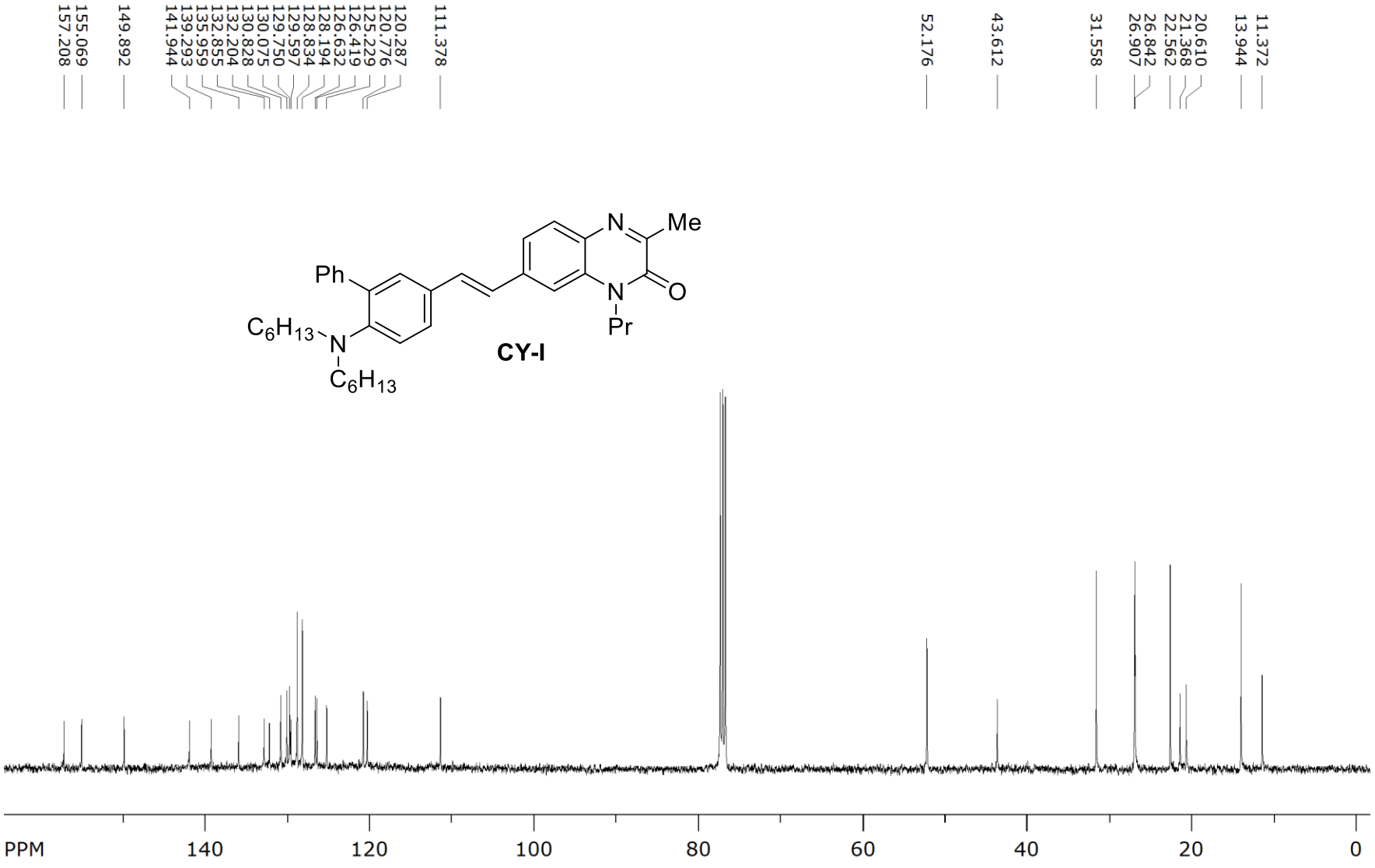
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-2-(ethyl(4-(2-(2-methyl-3-oxo-4-propyl-3,4-dihydroquinoxalin-6-yl)vinyl)phenyl)amino)ethyl acetate



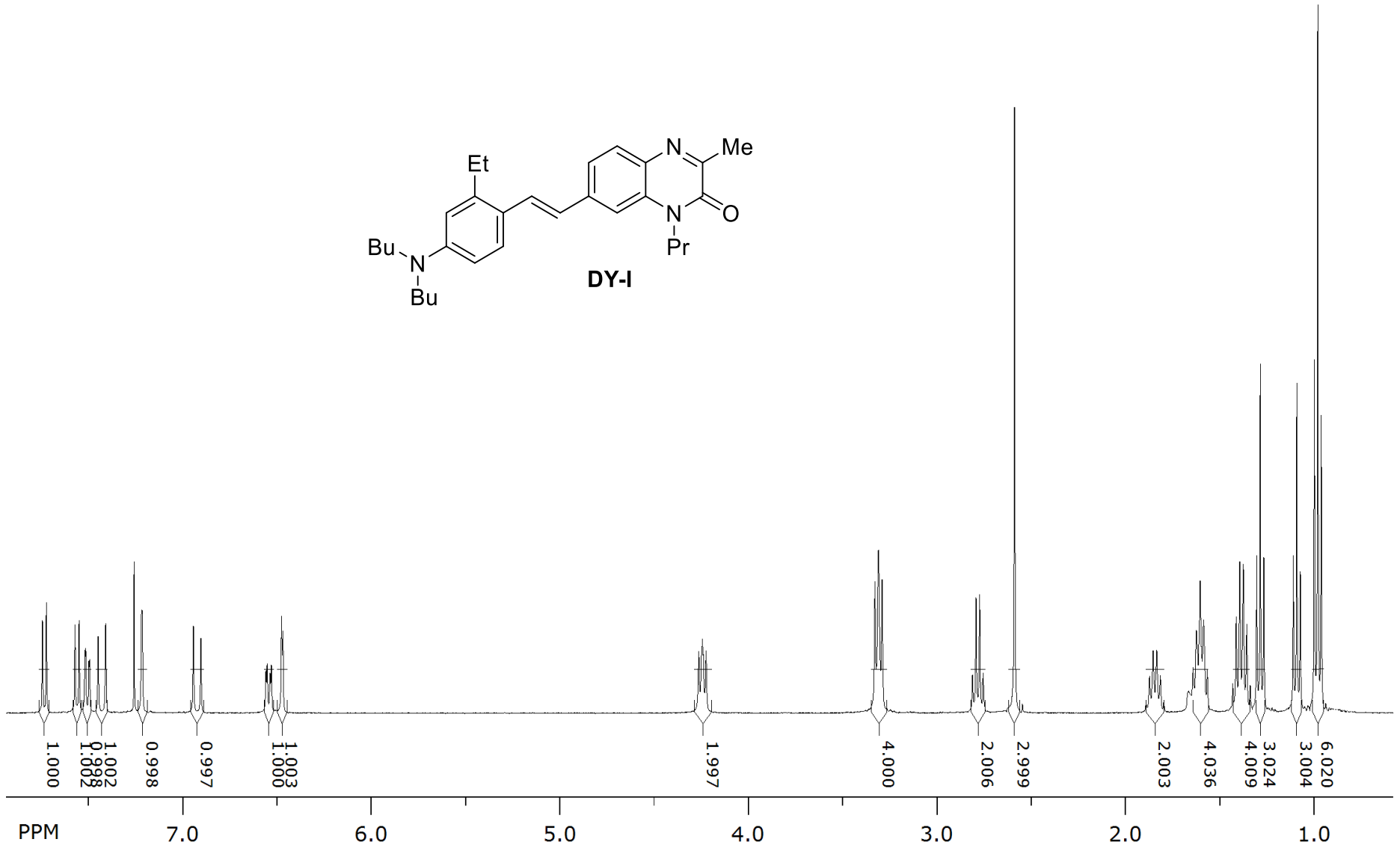
^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-2-(ethyl(4-(2-(2-methyl-3-oxo-4-propyl-3,4-dihydroquinoxalin-6-yl)vinyl)phenyl)amino)ethyl acetate



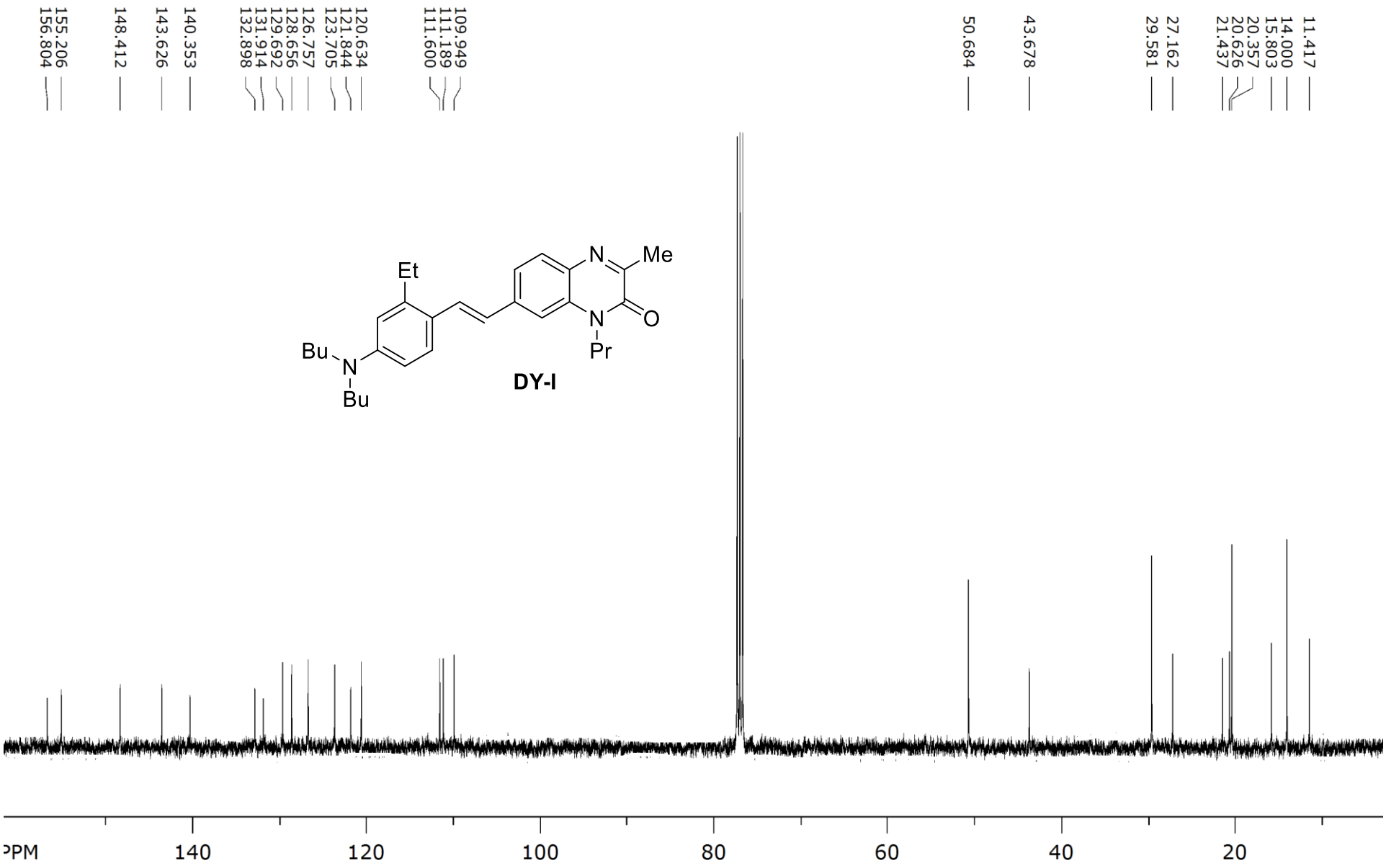
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-7-(2-(6-(dihexylamino)-[1,1'-biphenyl]-3-yl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



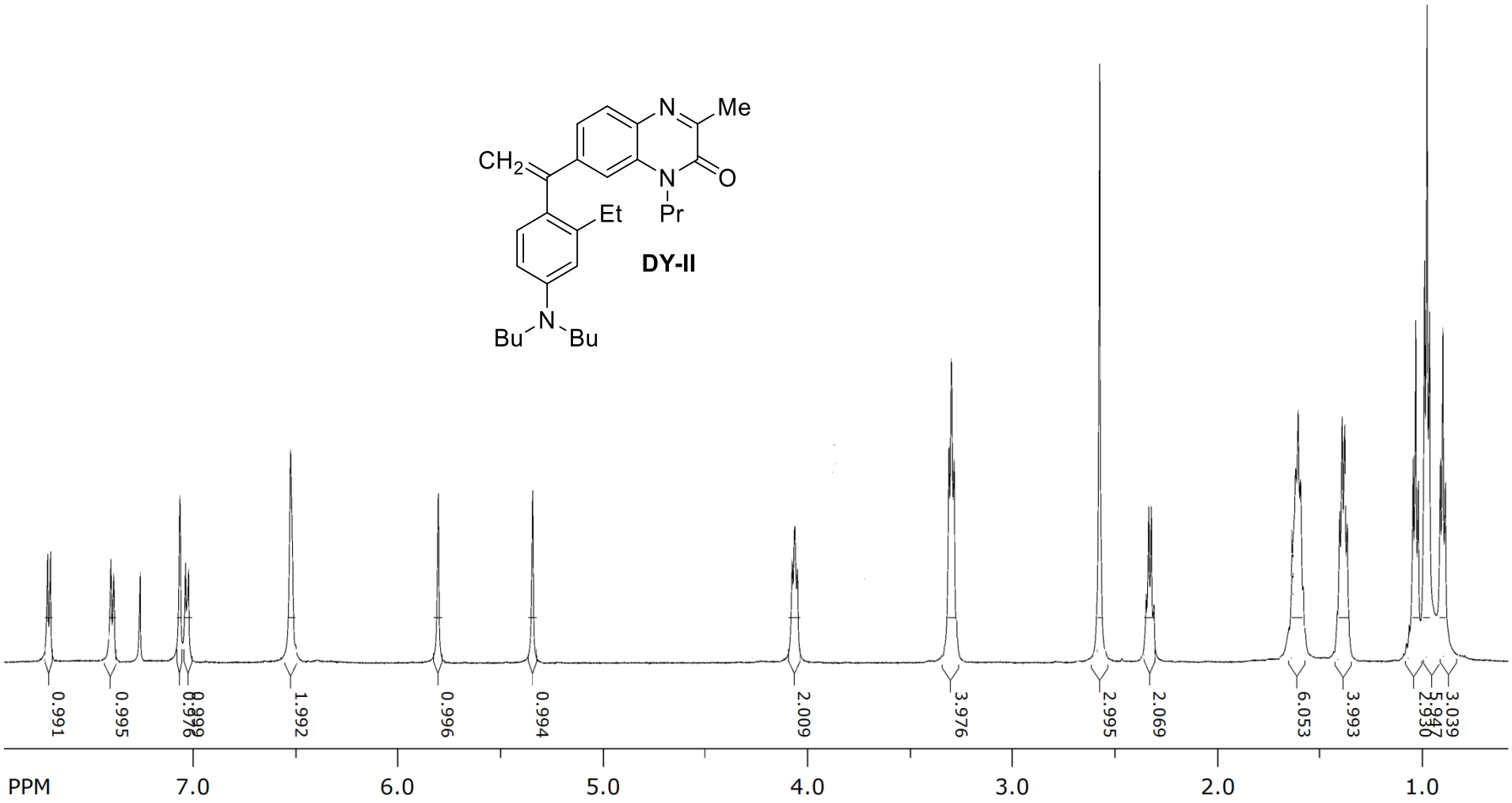
^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-7-(2-(6-(dihexylamino)-[1,1'-biphenyl]-3-yl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



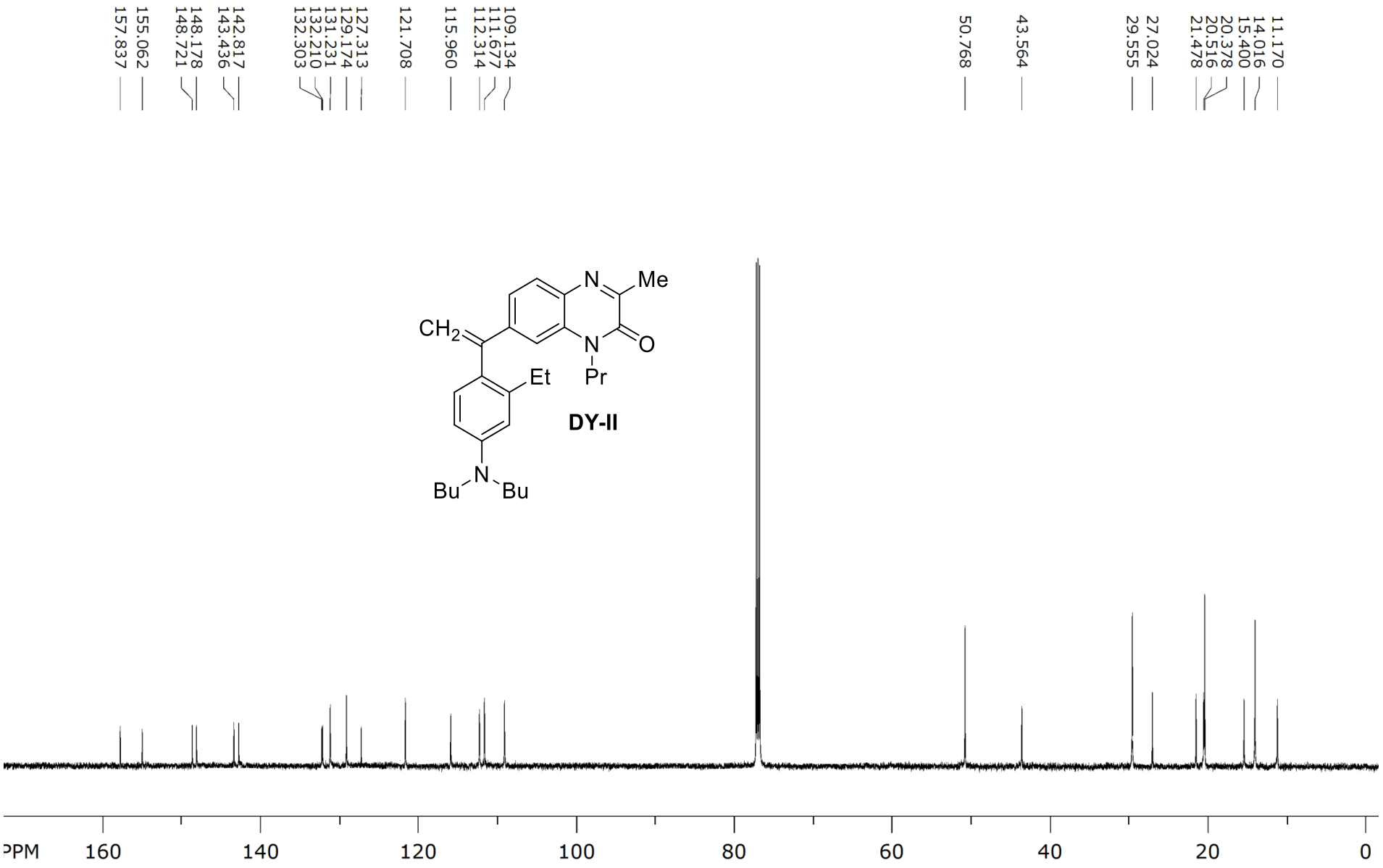
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-7-(4-(*N*,*N*-dibutylamino)-2-ethylstyryl)-3-methyl-1-propylquinoxalin-2(1H)-one



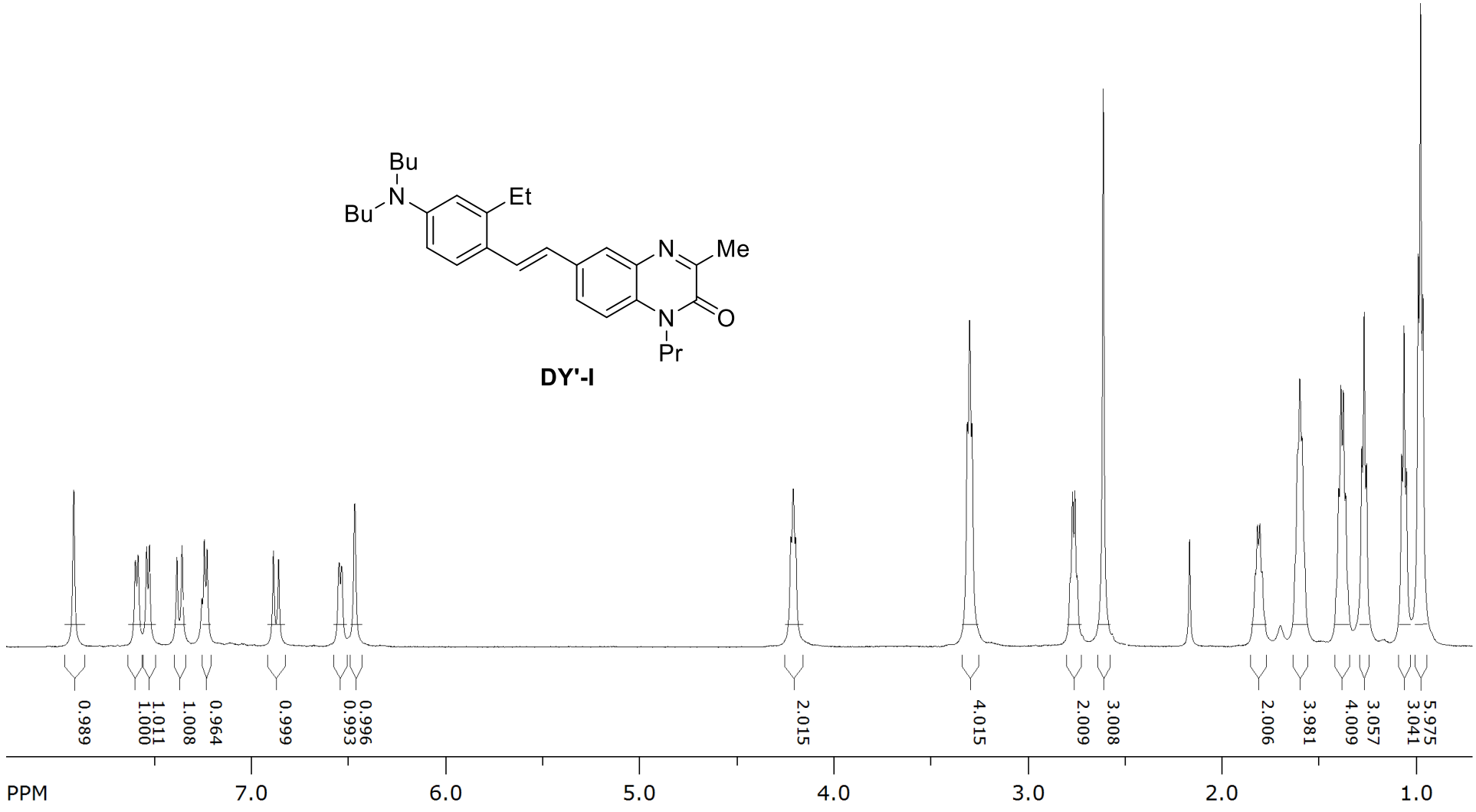
^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-7-(4-(*N*,*N*-dibutylamino)-2-ethylstyryl)-3-methyl-1-propylquinoxalin-2(1H)-one



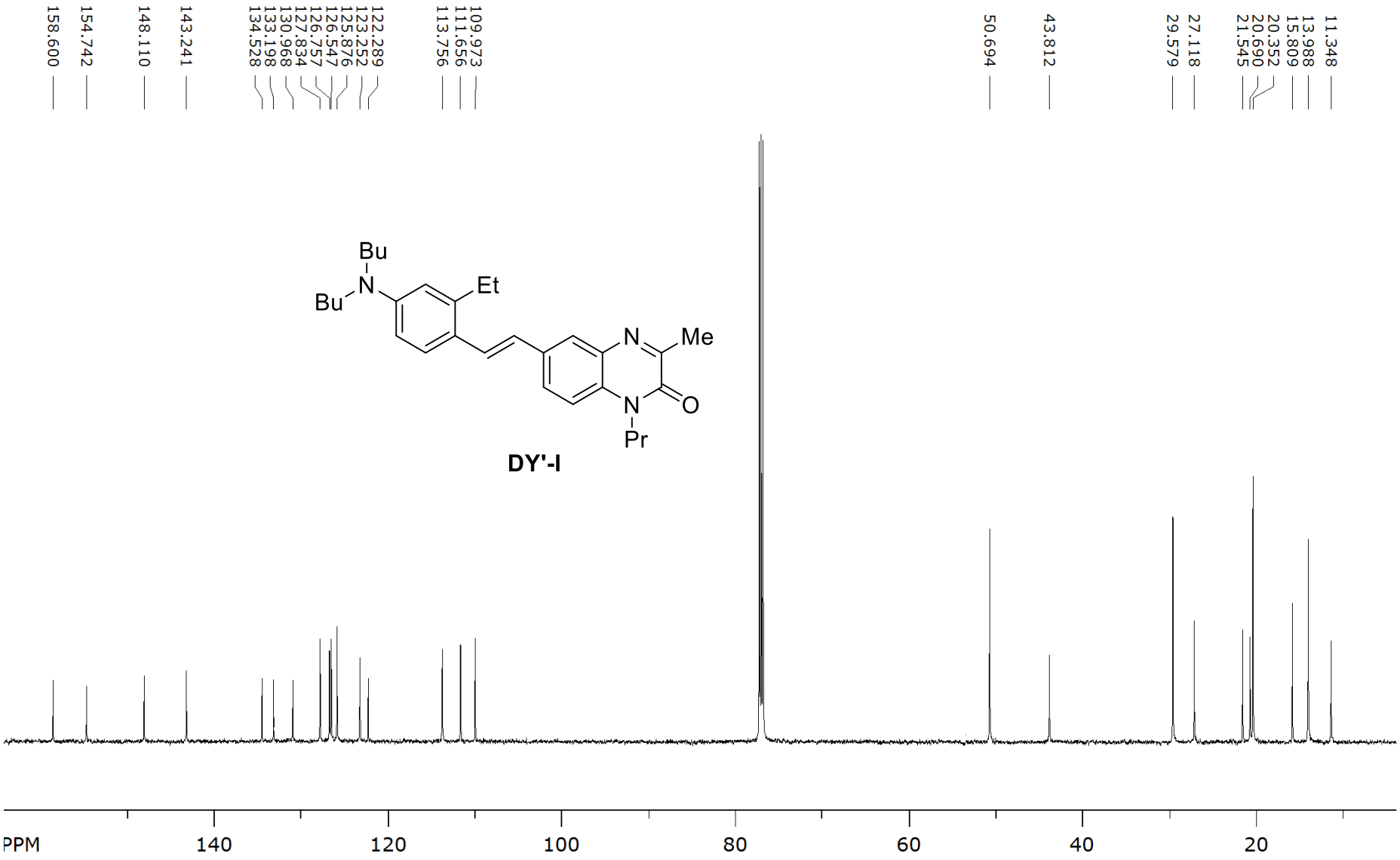
^{1}H NMR (100 MHz, $CDCl_3$) of 7-(1-(4-(dibutylamino)-2-ethylphenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1H)-one



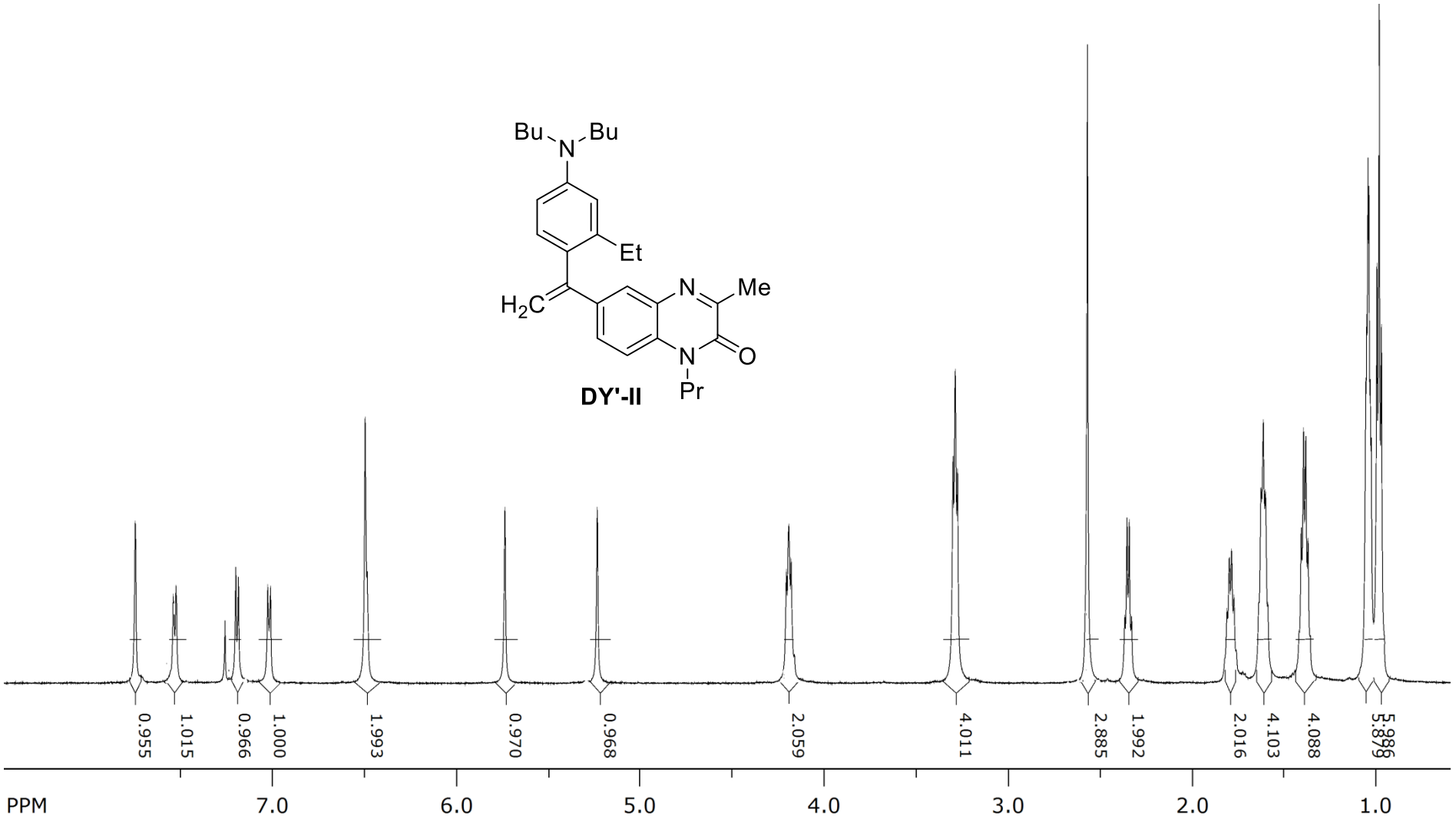
^{13}C NMR (100 MHz, $CDCl_3$) of 7-(1-(4-(dibutylamino)-2-ethylphenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



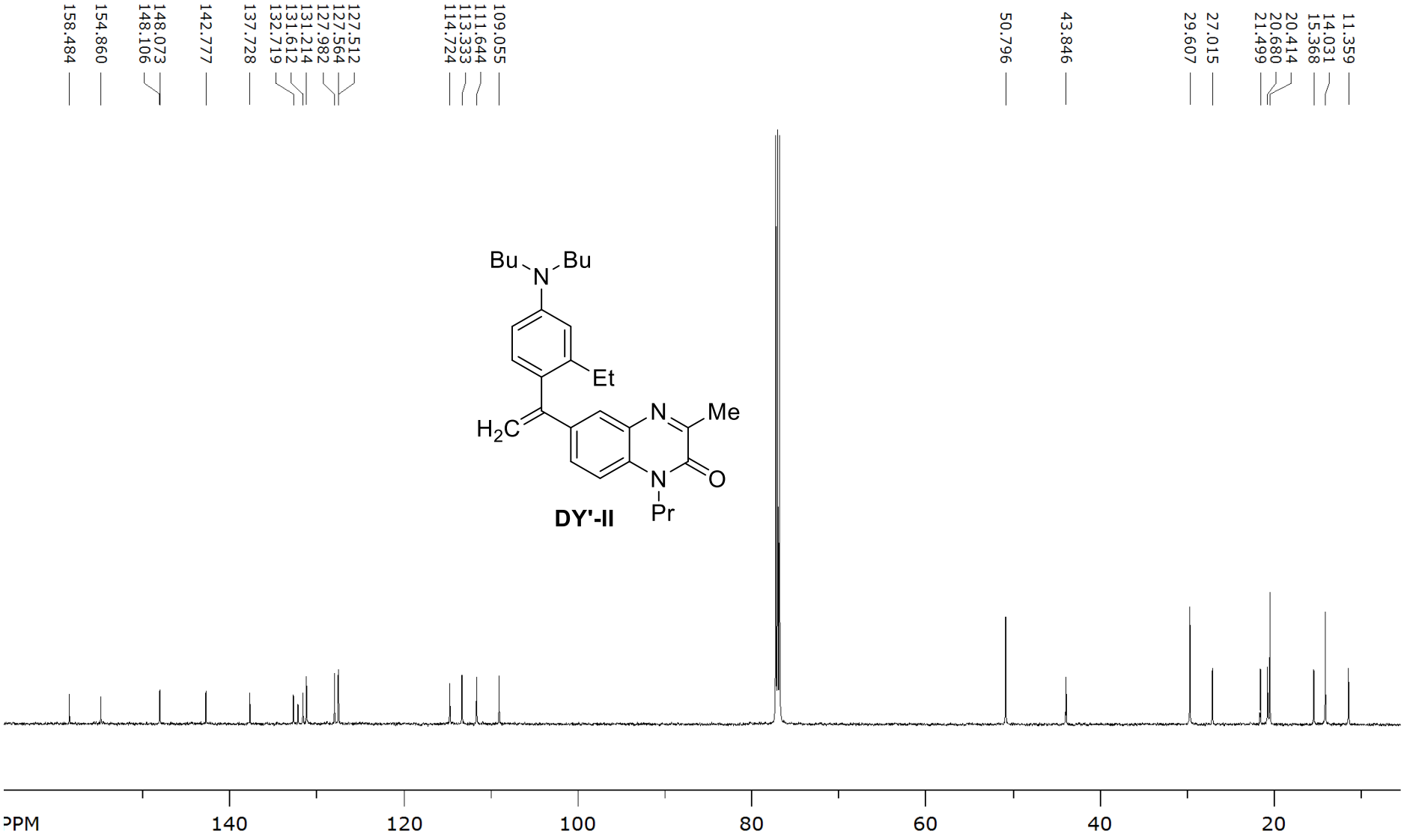
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-6-(4-(Dibutylamino)-2-ethylstyryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



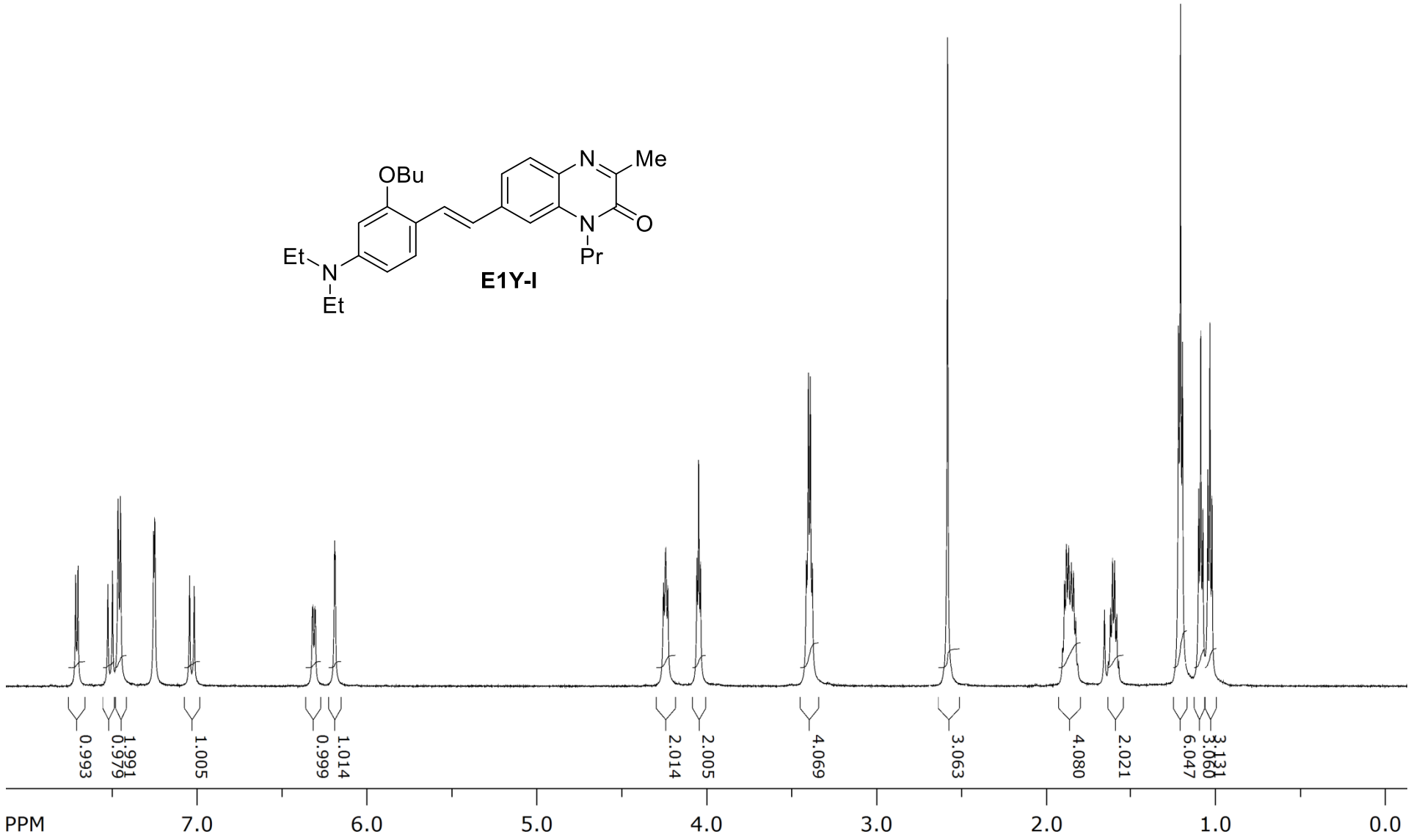
^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-6-(4-(Dibutylamino)-2-ethylstyryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



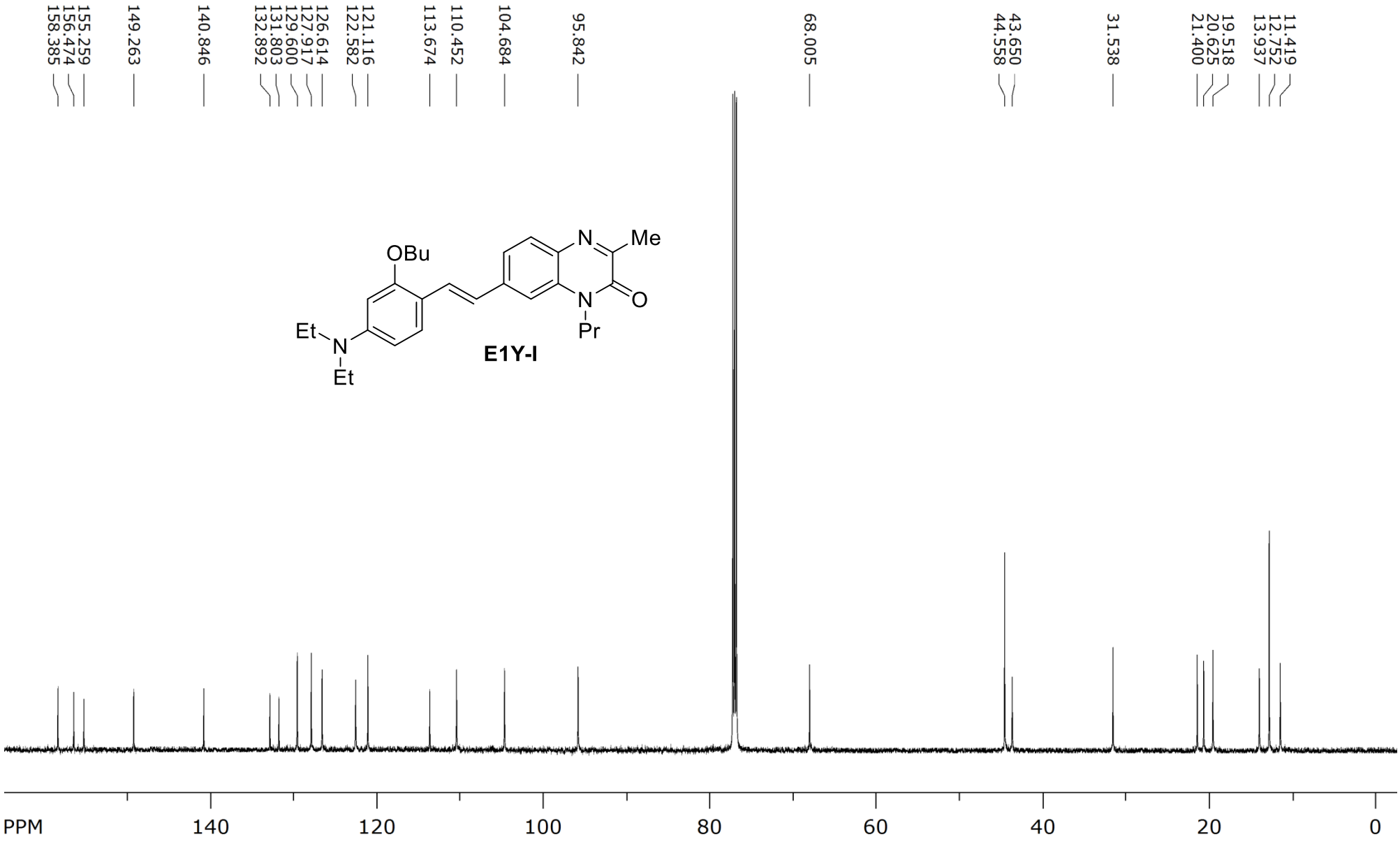
^{1}H NMR (150 MHz, $CDCl_3$) of 6-(1-(4-(dibutylamino)-2-ethylphenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



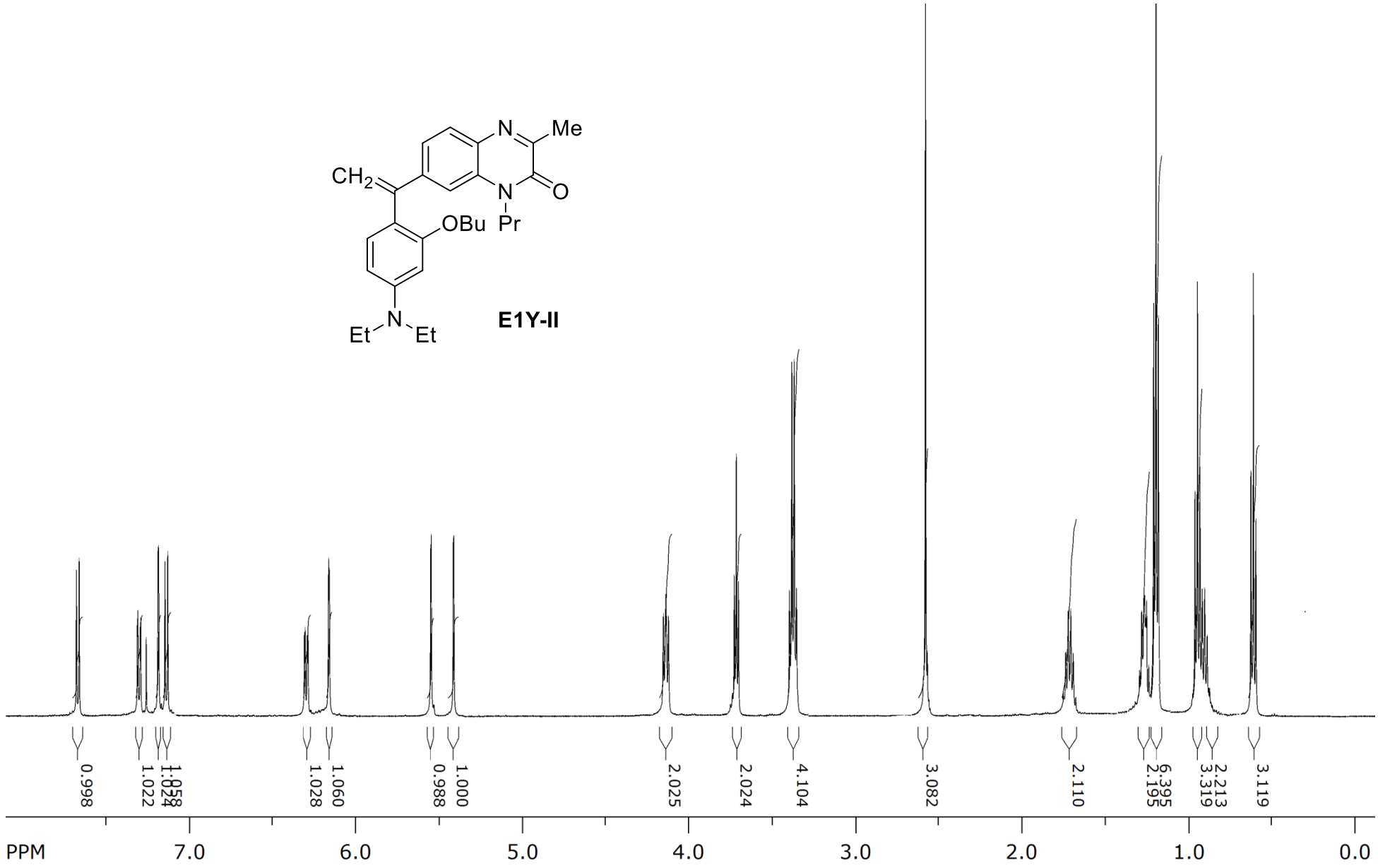
^{13}C NMR (150 MHz, $CDCl_3$) of 6-(1-(4-(dibutylamino)-2-ethylphenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1H)-one



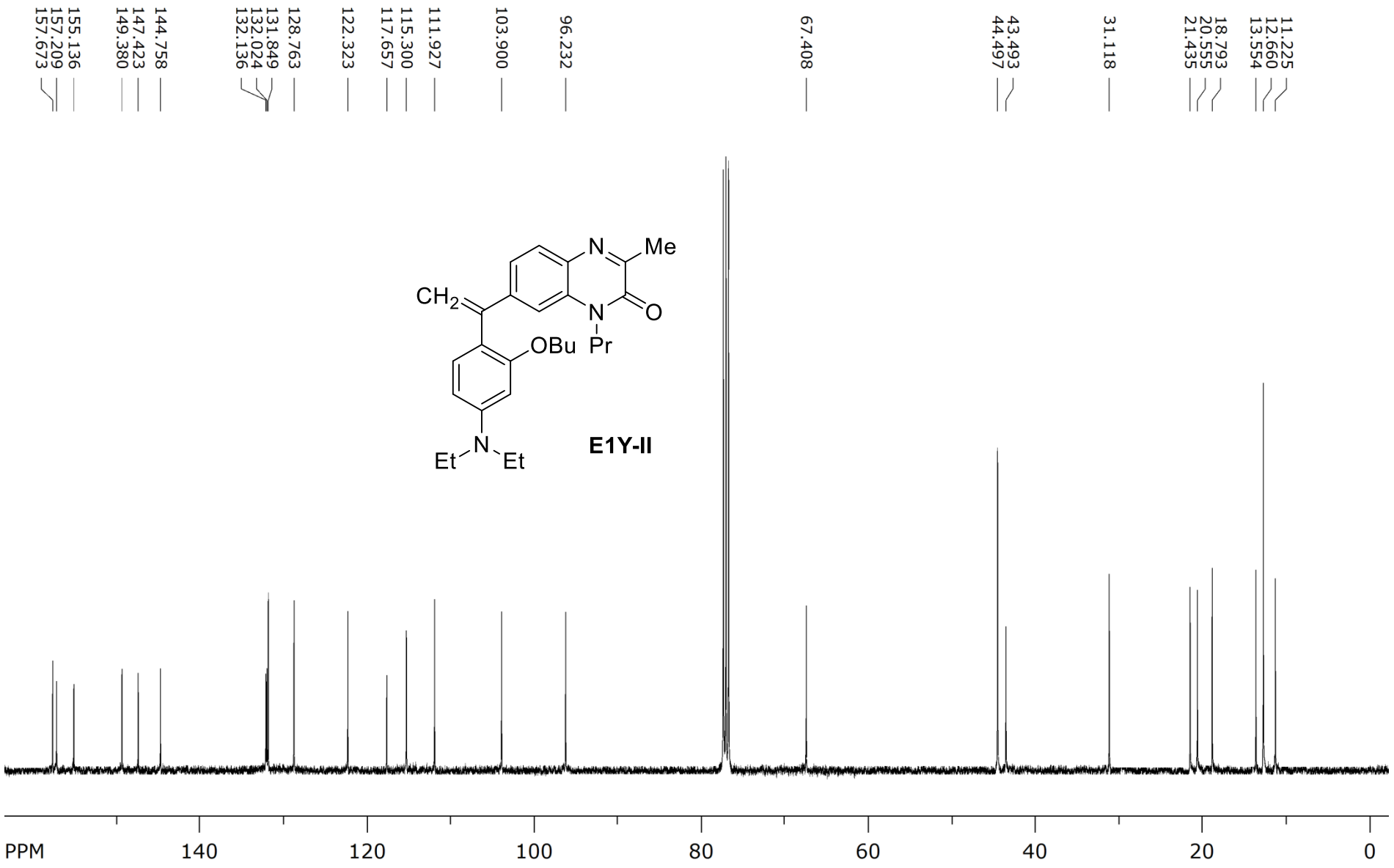
^{1}H NMR (600 MHz, $CDCl_3$) of (*E*)-7-(2-butoxy-4-(diethylamino)styryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



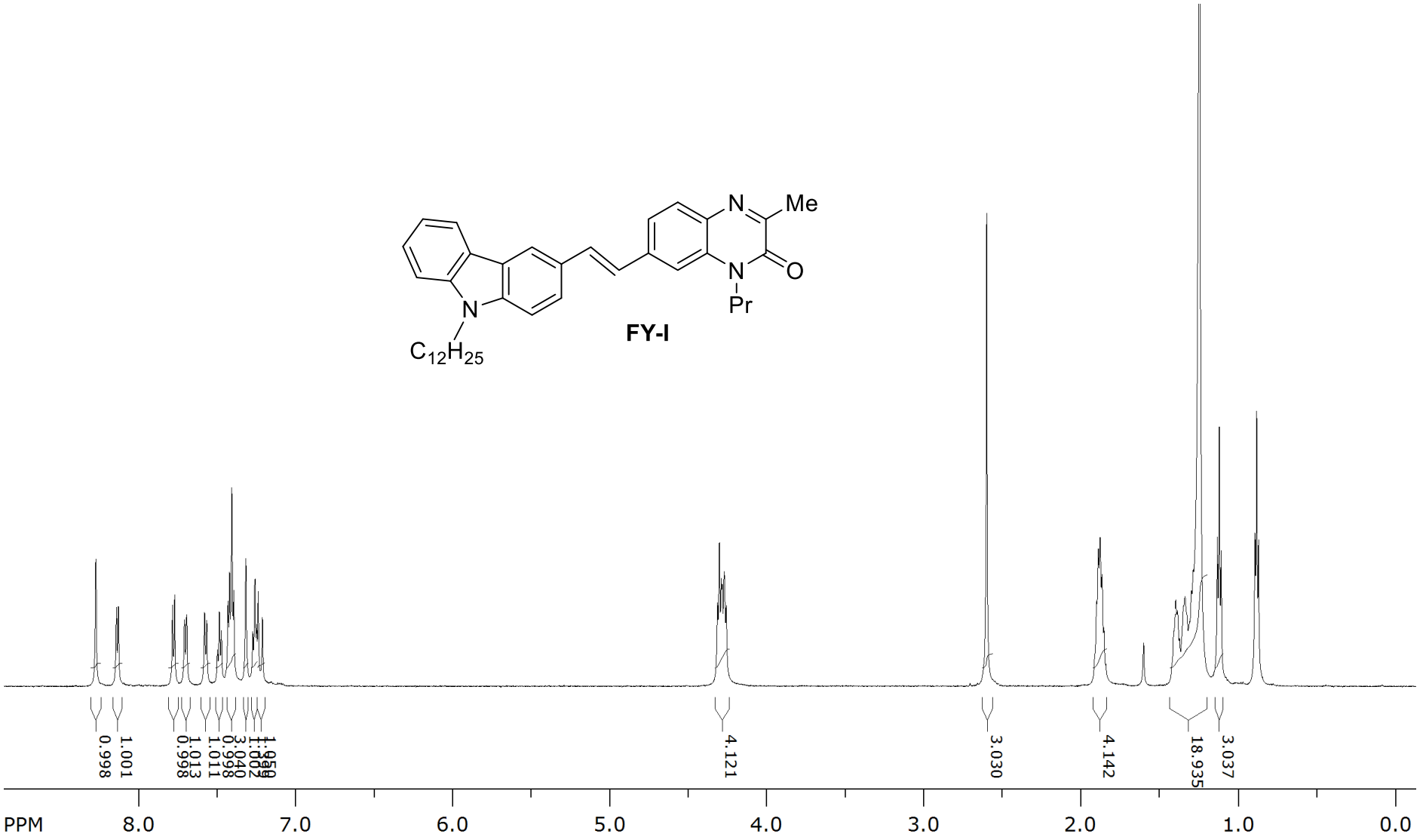
^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-7-(2-butoxy-4-(diethylamino)styryl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



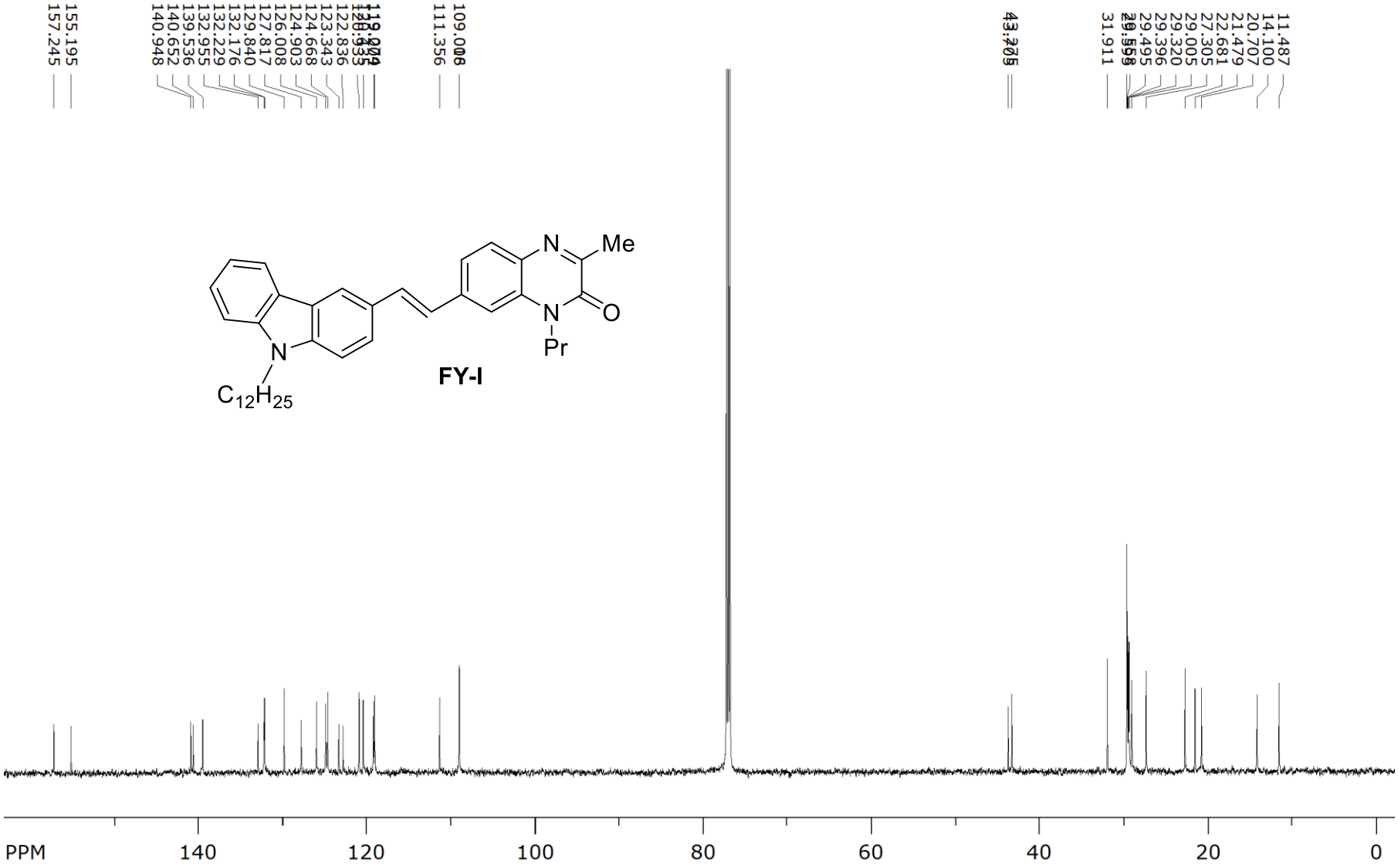
^{1}H NMR (500 MHz, $CDCl_3$) of 7-(1-(2-butoxy-4-(diethylamino)phenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



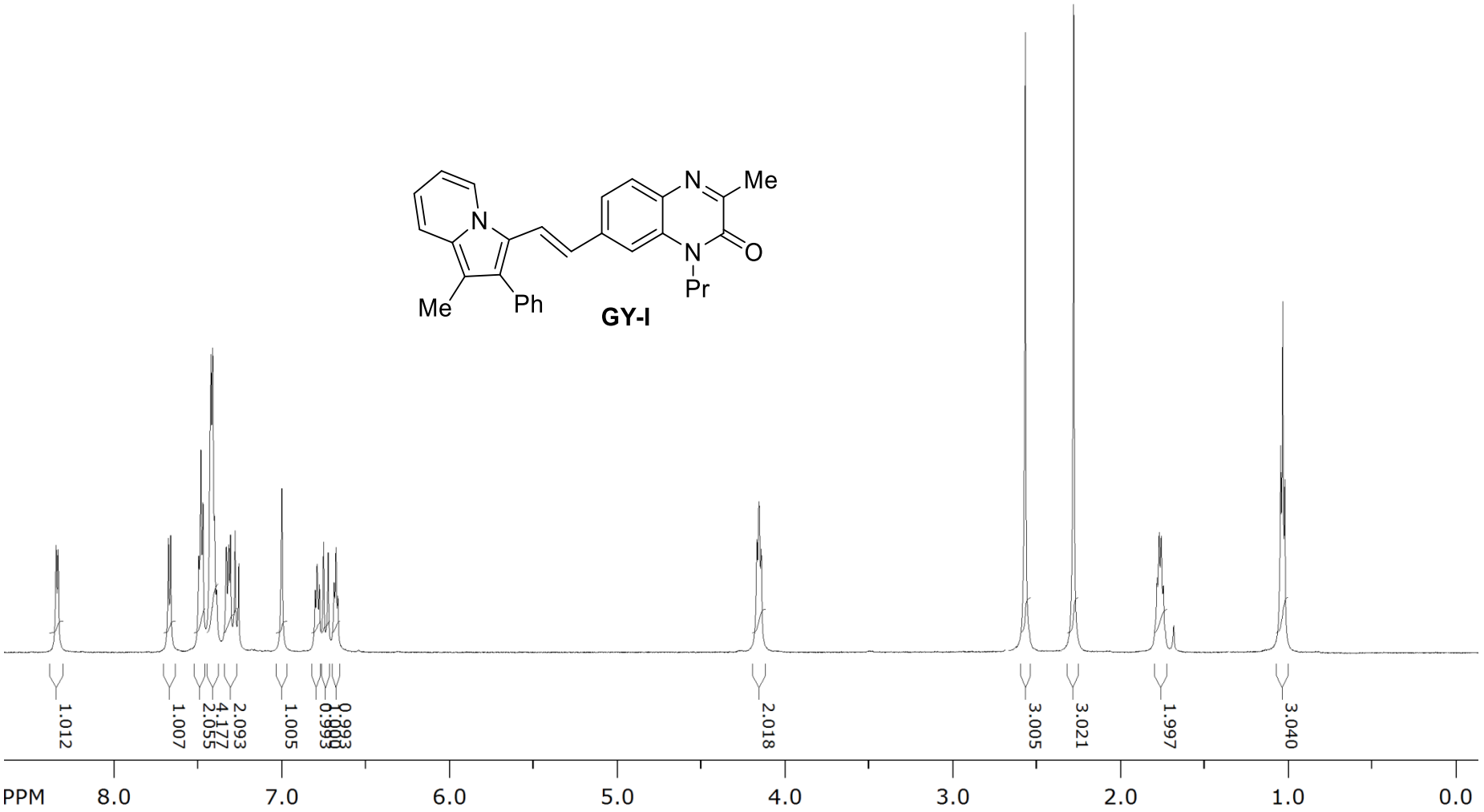
^{13}C NMR (100 MHz, $CDCl_3$) of 7-(1-(2-butoxy-4-(diethylamino)phenyl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



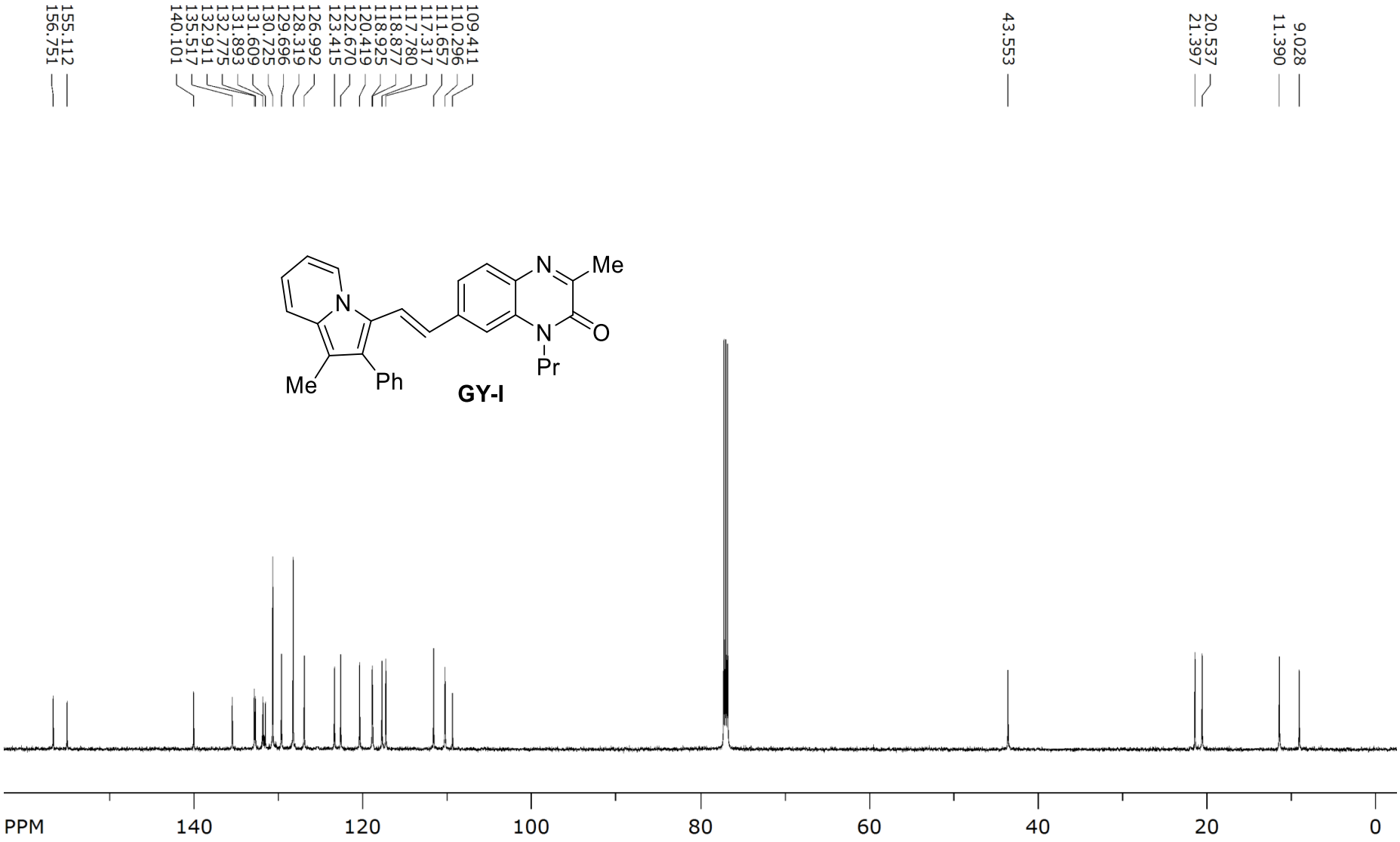
^{1}H NMR (600 MHz, $CDCl_3$) of (*E*)-7-(2-(9-dodecyl-9H-carbazol-3-yl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



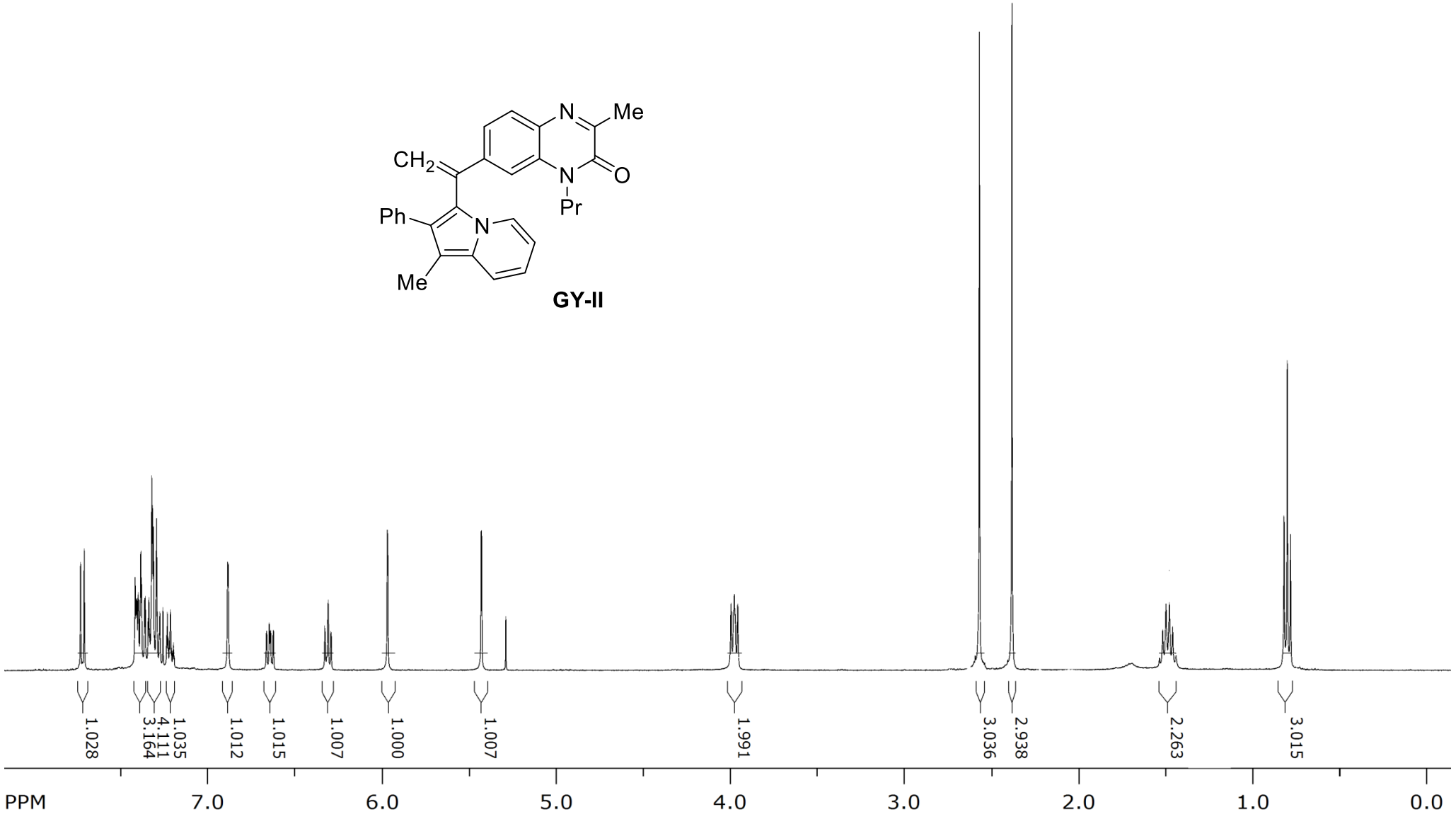
^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-7-(2-(9-dodecyl-9H-carbazol-3-yl)vinyl)-3-methyl-1-propylquinoxalin-2(1*H*)-one



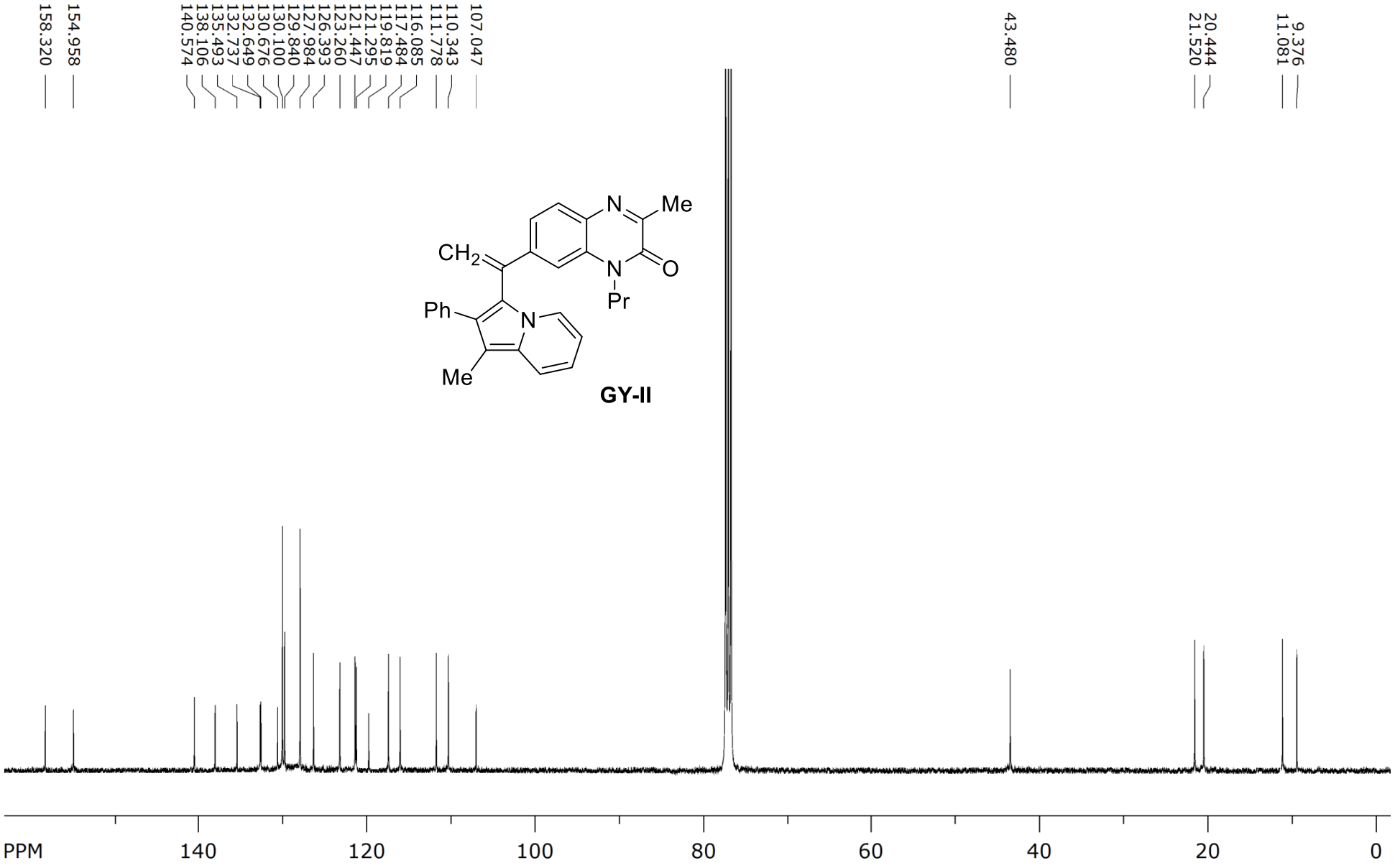
^{1}H NMR (600 MHz, $CDCl_3$) of (E)-3-methyl-7-(2-(1-methyl-2-phenylindolizin-3-yl)vinyl)-1-propylquinoxalin-2(1H)-one



^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-3-methyl-7-(2-(1-methyl-2-phenylindolizin-3-yl)vinyl)-1-propylquinoxalin-2(1*H*)-one

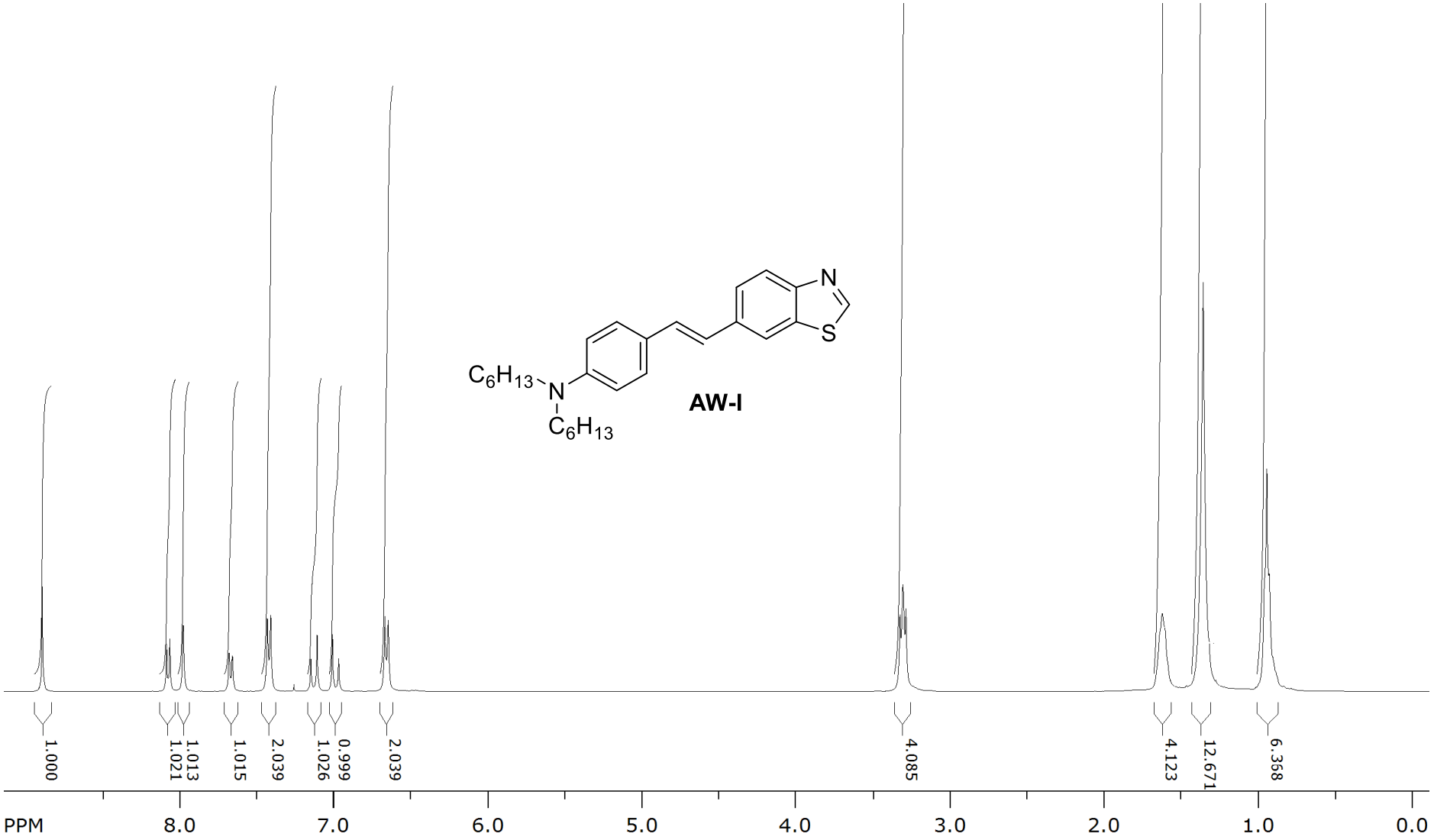


^{1}H NMR (400 MHz, $CDCl_3$) of 3-methyl-7-(1-(1-methyl-2-phenylindolizin-3-yl)vinyl)-1-propylquinoxalin-2(1*H*)-one (**GY-II**)

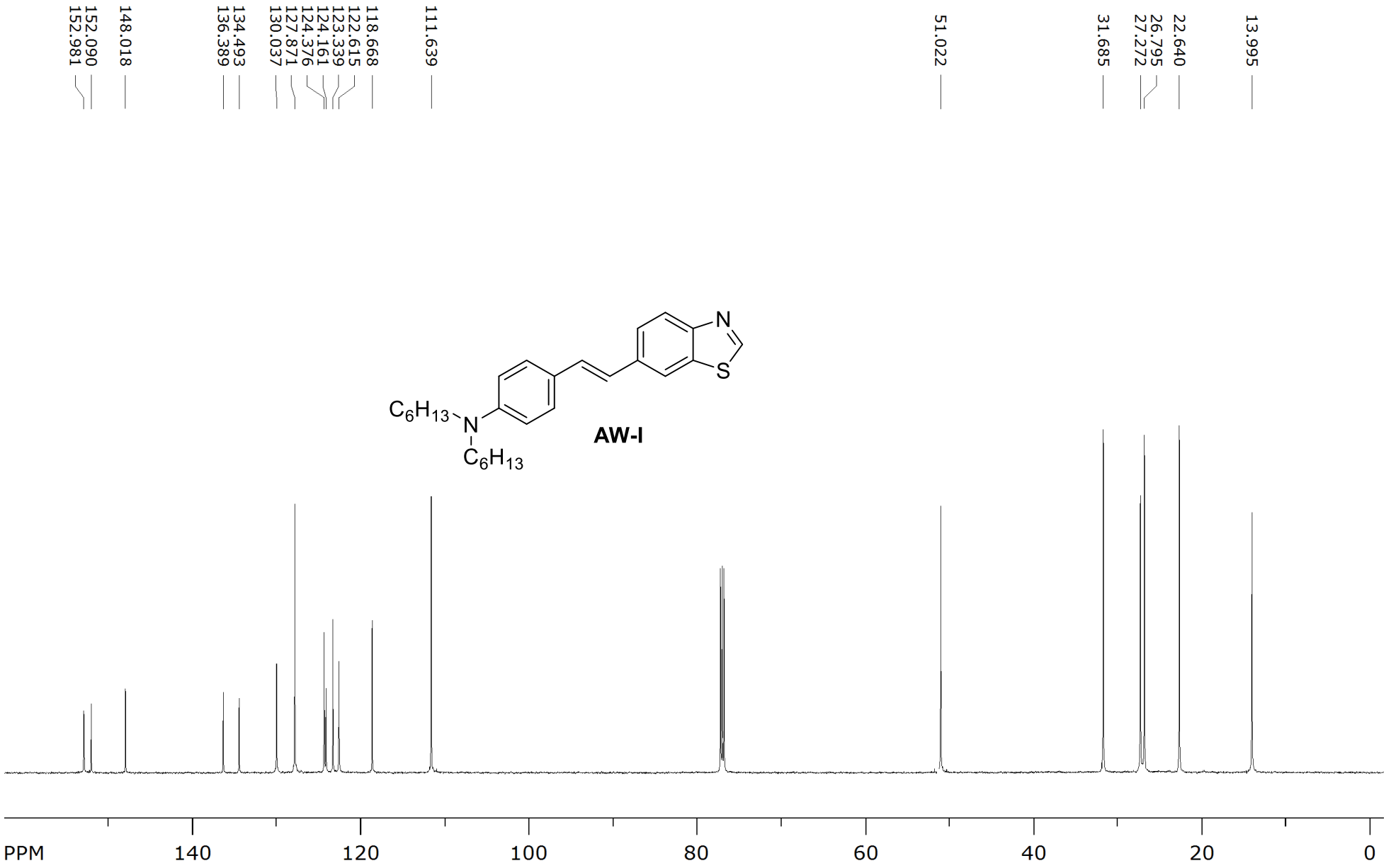


^{13}C NMR (400 MHz, $CDCl_3$) of 3-methyl-7-(1-(1-methyl-2-phenylindolizin-3-yl)vinyl)-1-propylquinoxalin-2(*1*H)-one (**GY-II**)

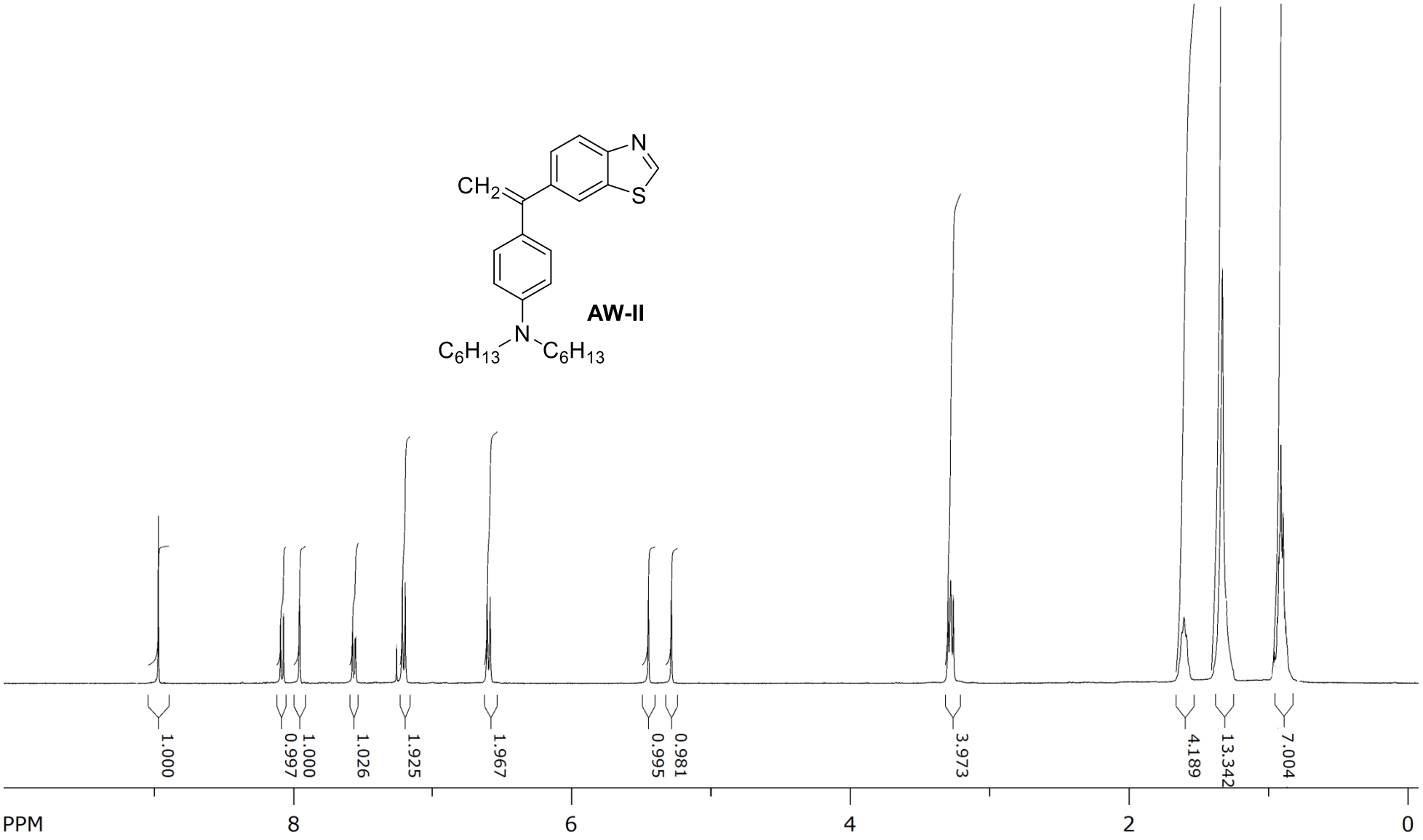
5. NMR of of derivatives with benzothiazole acceptor moiety



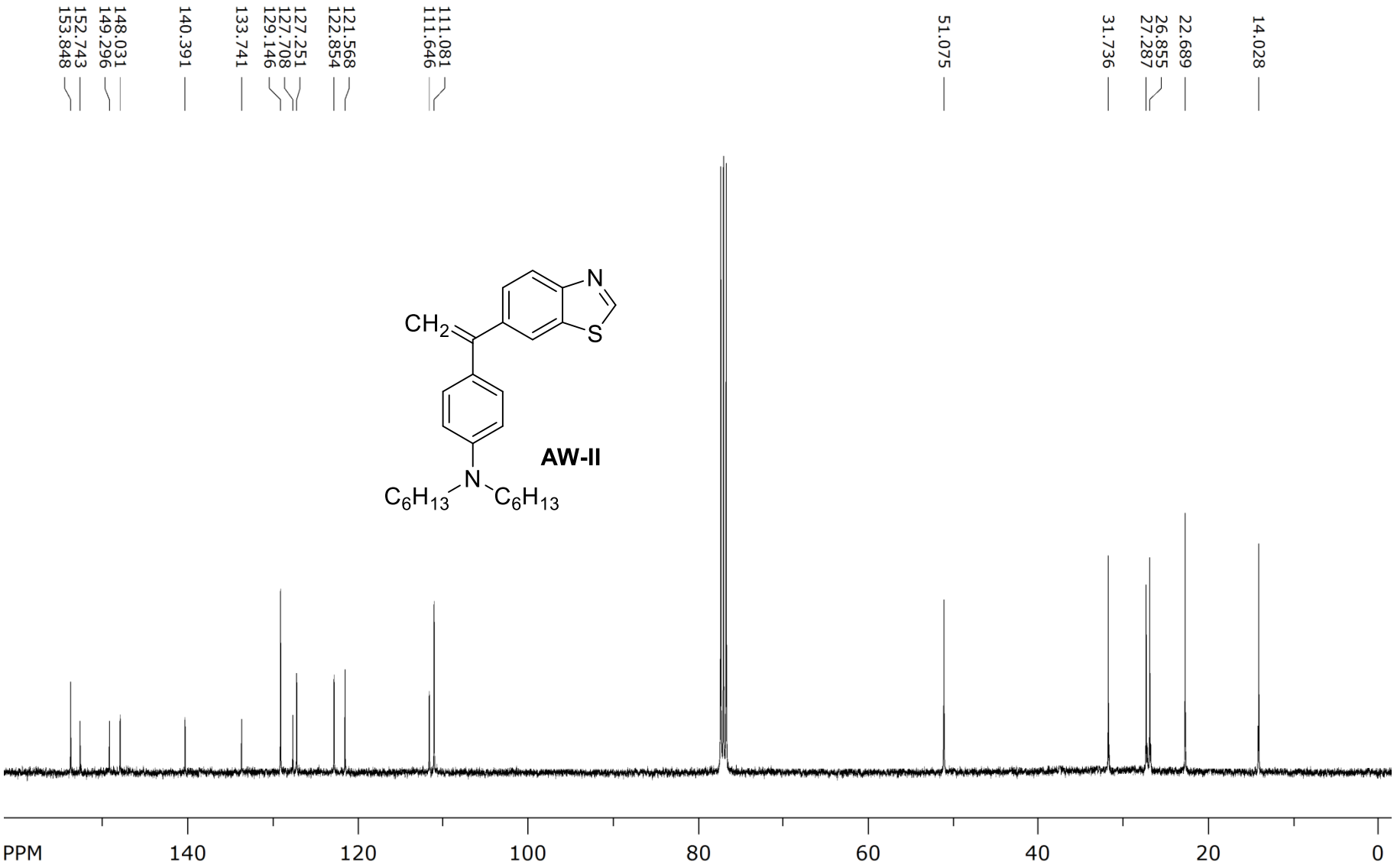
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-4-(2-(benzo[*d*]thiazol-6-yl)vinyl)-*N*,*N*-dihexylaniline



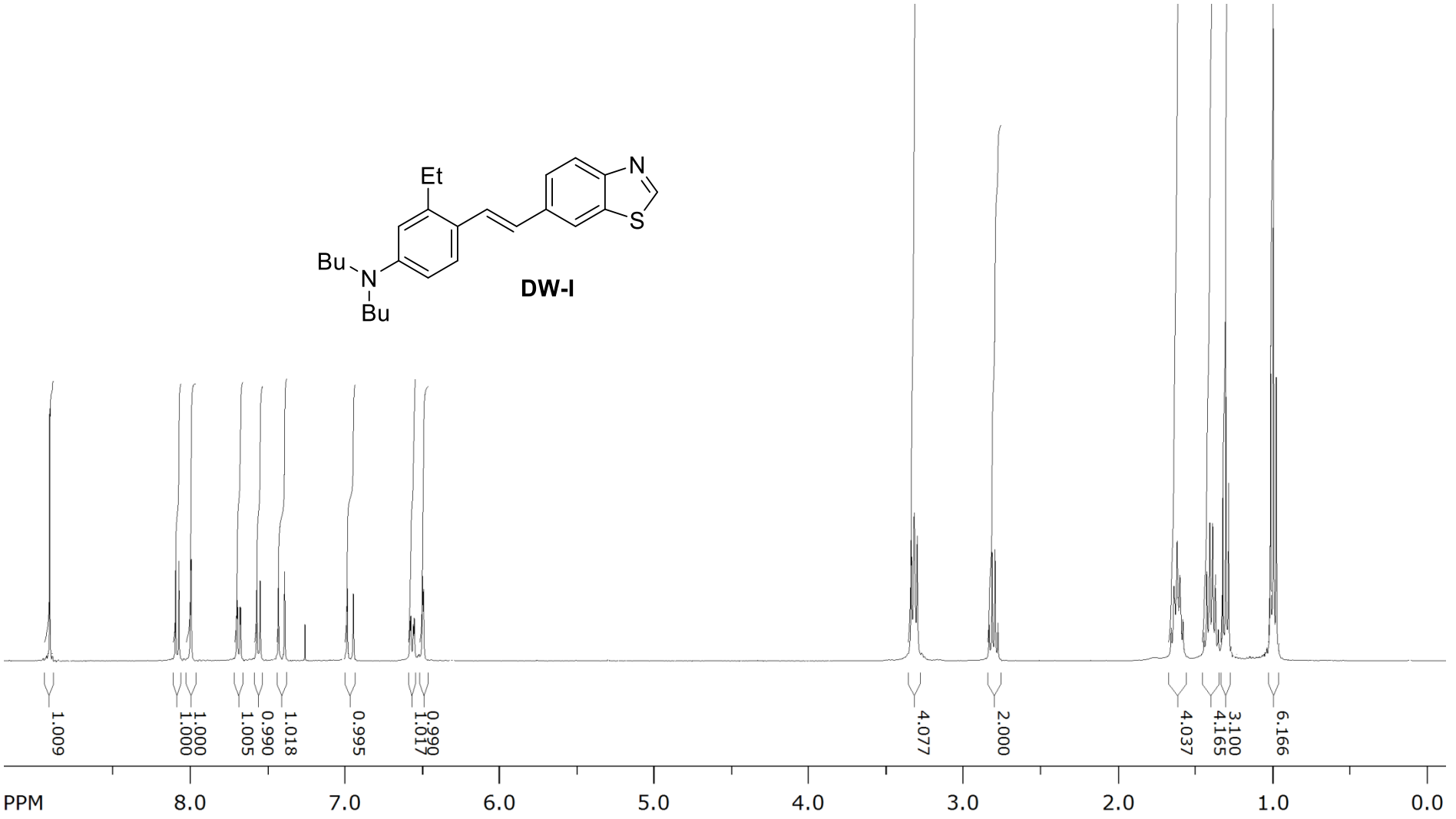
^{13}C NMR (150 MHz, $CDCl_3$) of (*E*)-4-(2-(benzo[*d*]thiazol-6-yl)vinyl)-*N*,*N*-dihexylaniline



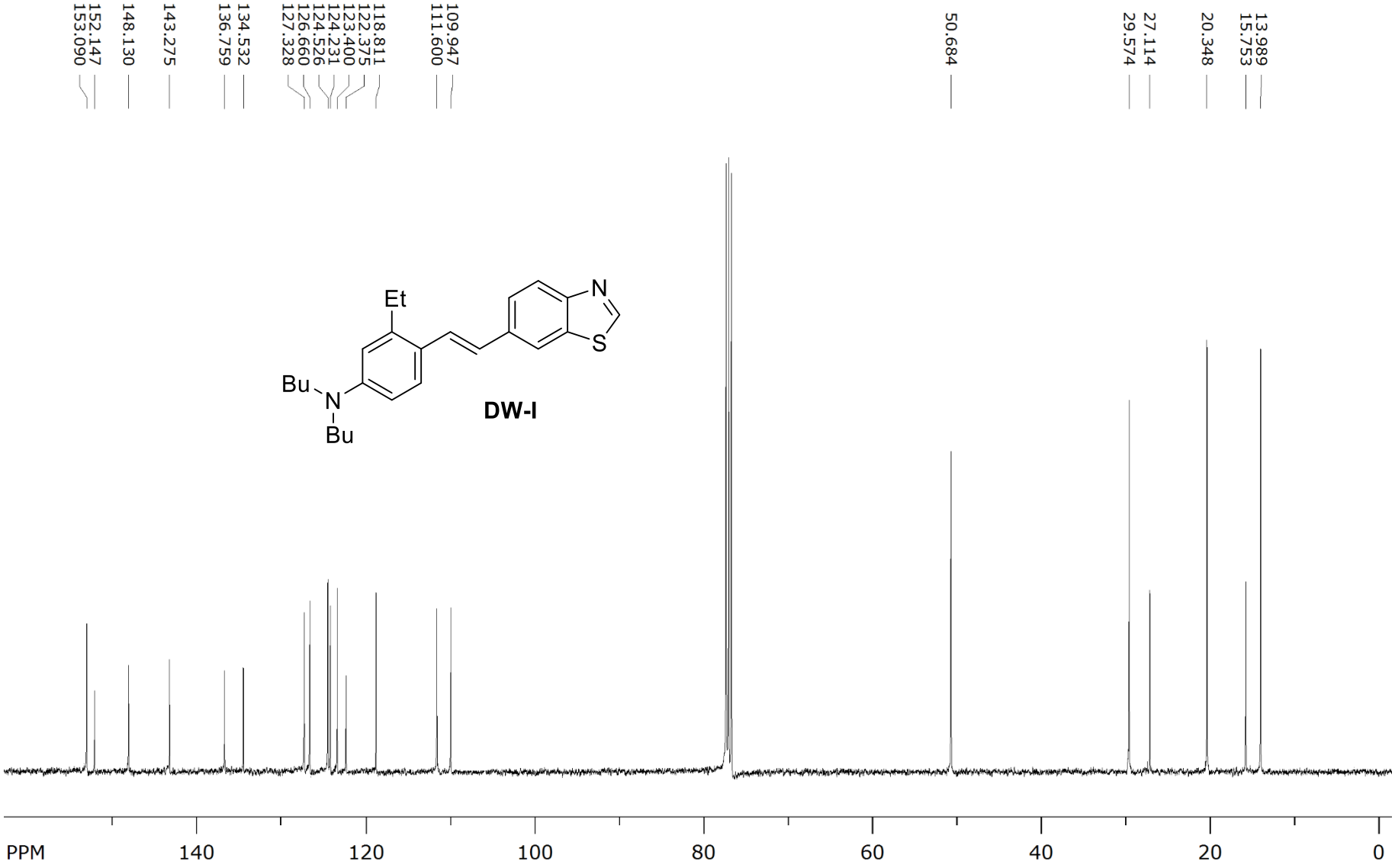
^{1}H NMR (400 MHz, $CDCl_3$) of 4-(1-(benzo[d]thiazol-6-yl)vinyl)-*N*,*N*-dihexylaniline



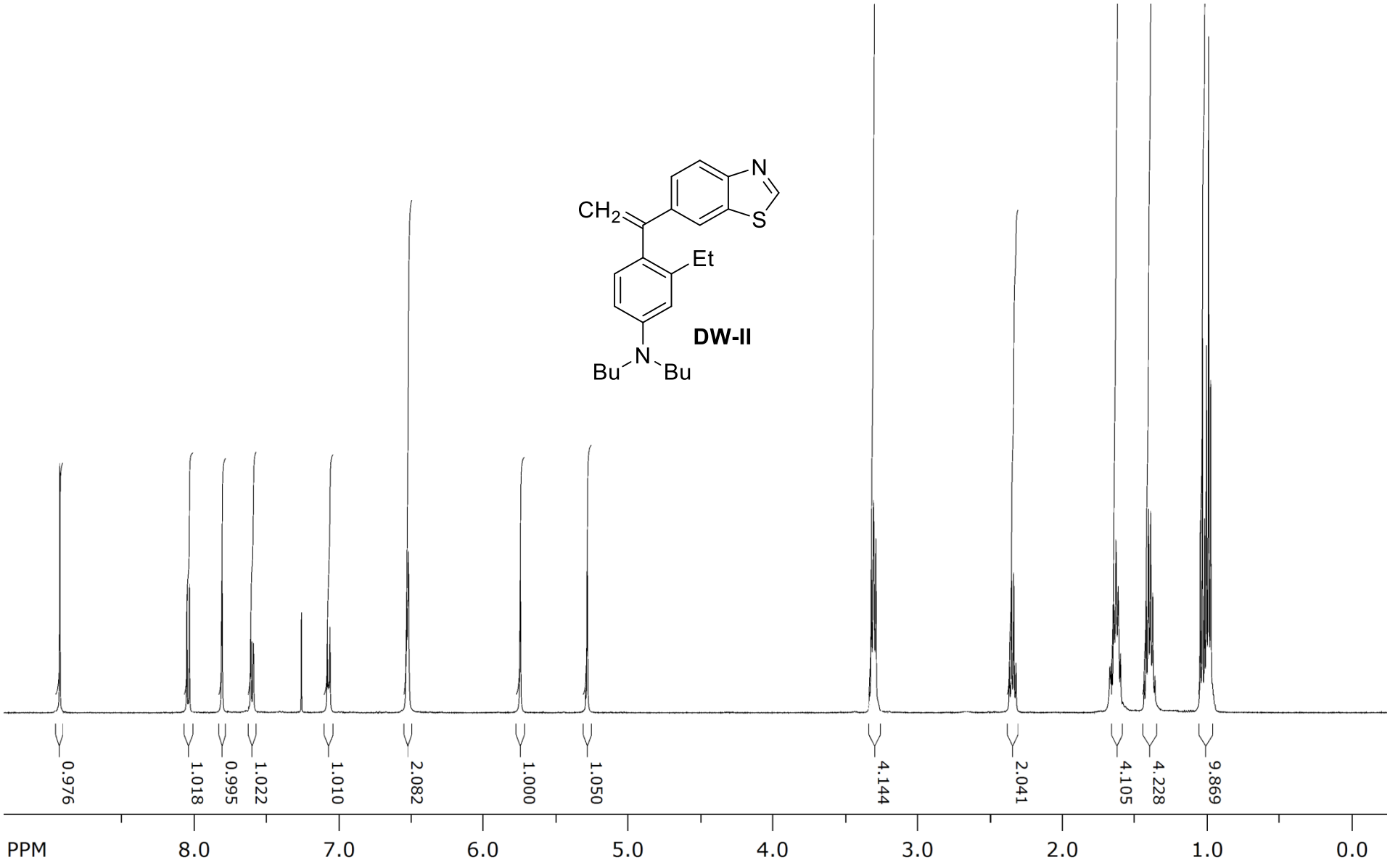
^{13}C NMR (100 MHz, $CDCl_3$) of 4-(1-(benzo[d]thiazol-6-yl)vinyl)-*N*,*N*-dihexylaniline



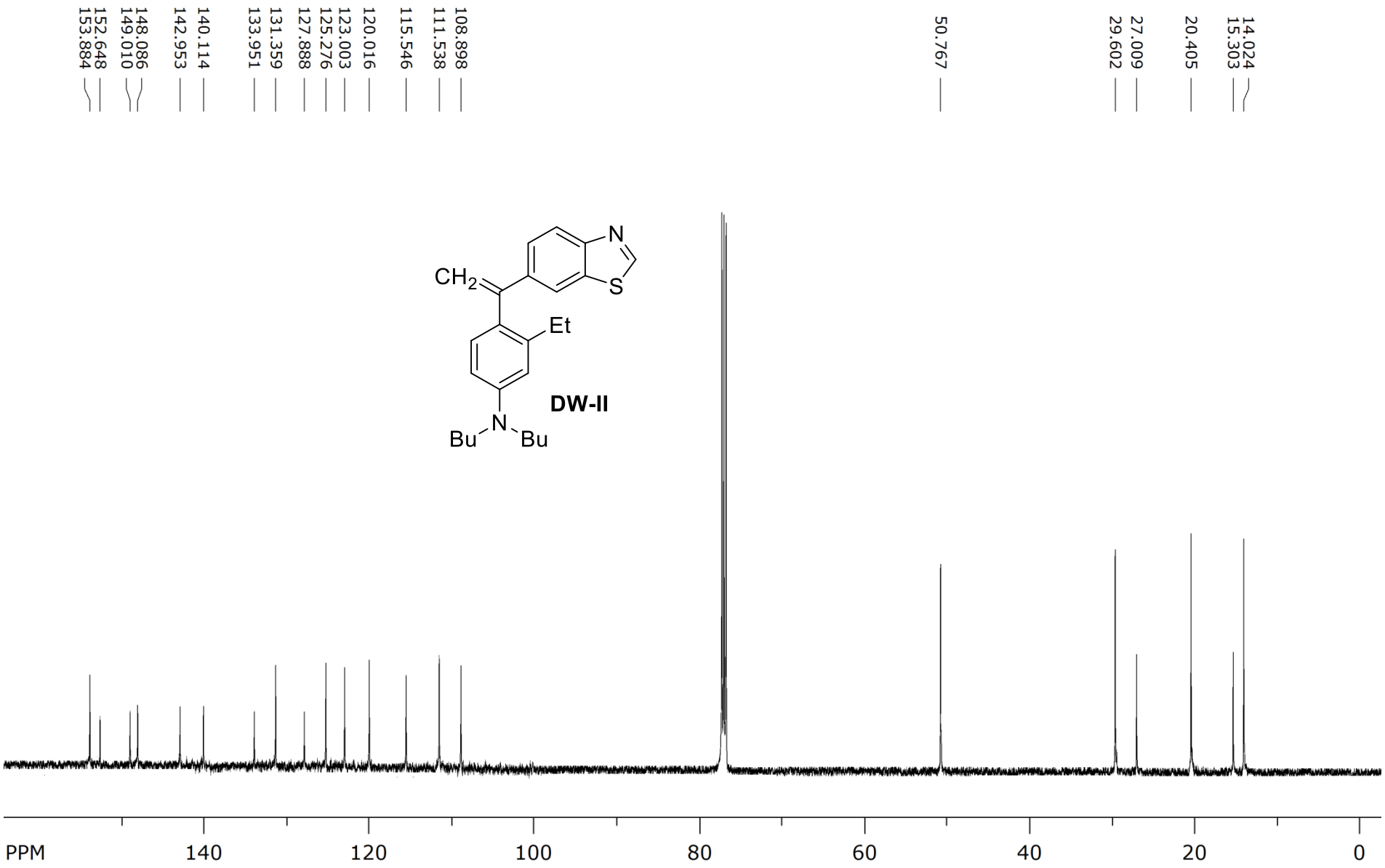
^{1}H NMR (400 MHz, $CDCl_3$) of (*E*)-4-(2-(benzo[d]thiazol-6-yl)vinyl)-*N*,*N*-dibutyl-3-ethylaniline



^{13}C NMR (100 MHz, $CDCl_3$) of (*E*)-4-(2-(benzo[*d*]thiazol-6-yl)vinyl)-*N*,*N*-dibutyl-3-ethylaniline

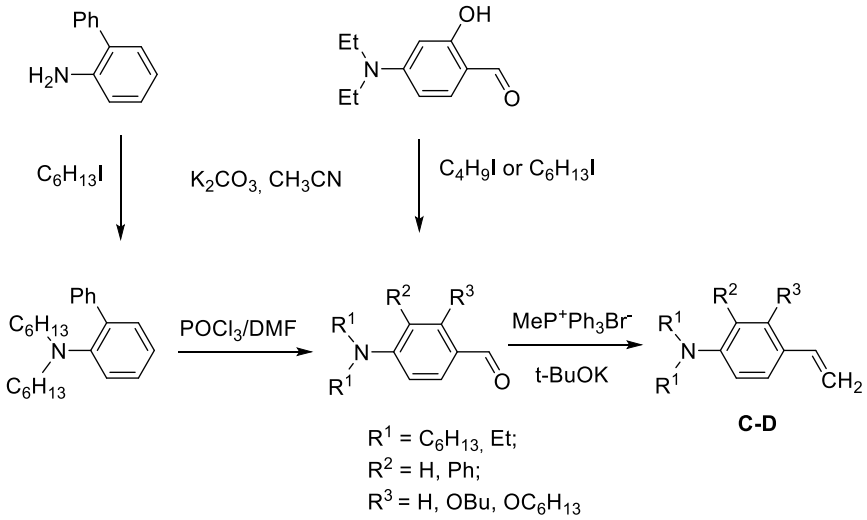


^{1}H NMR (500 MHz, $CDCl_3$) of 4-(1-(benzo[*d*]thiazol-6-yl)vinyl)-N,N-dibutyl-3-ethylaniline

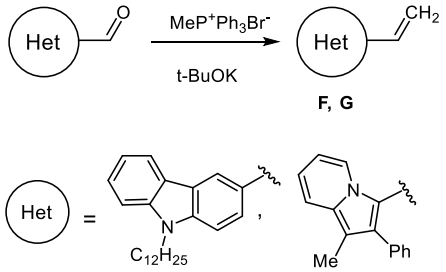


^{13}C NMR (125 MHz, $CDCl_3$) of 4-(1-(benzo[*d*]thiazol-6-yl)vinyl)-N,N-dibutyl-3-ethylaniline

6. Synthesis of chromophore precursors - vinylanilines C, D, E1, E2, vinylhetarenes F, G and some aldehydes



Scheme S1. Synthesis of 4-vinylanilines **C**, **D**, **E1**, **E2**.



Scheme S2. Synthesis of vinylhetarenes **F** and **G**.

4-Vinylanilines C, D, E1, E2 and vinylhetarenes F and G

To stirred mixture of methyl triphenylphosphonium bromide (1.31 g, 3.7 mmol) in THF (3 mL) under argon potassium *tert*-butylate (0.52 g, 4.5 mmol) was added. The mixture was stirred for 2 h at 0 °C and corresponding aldehyde (3.1 mmol) in THF (2 mL) was added (Schemes S1, S2). The mixture was stirred for 3 h at room temperature and solvent was evaporated under vacuum. The product was purified by column chromatography on silica gel (eluent hexane) when olefins **C**, **D** and **F** were synthesized. When olefins **E1**, **E2** and **G** were synthesized, the solvent was vacuum evaporated, the product was extracted by hexane from the residue. Solution was left on cold for several hours. The precipitate was filtered, the filtrate was evaporated under vacuum and the residue (**E1**, **E2** and **G**) was used without further purification (Compounds **E1**, **E2** and **G** were decomposed in the presence of silica gel).

N,N-Dihexyl-5-vinyl-[1,1'-biphenyl]-2-amine (C)

Yield 91% (0.22 g from 0.24 g of 6-(dihexylamino)-[1,1'-biphenyl]-3-carbaldehyde); light yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.53-7.47 (m, 2H, *o*-Ph), 7.41-7.34 (m, 2H, *m*-Ph), 7.32-7.22 (m, 3H, *p*-Ph, H-3,5 aniline), 7.02 (dd, 1H, *J* = 8.3 Hz, 1H, H-6 aniline), 6.68 (dd, 1H, *J* = 17.6, 10.9 Hz, 1H, ethene), 5.64 (dd, *J* = 17.6, 1.0 Hz, 1H, ethene), 5.12 (dd, *J* = 10.9, 1.0 Hz, 1H, ethene), 2.79 (t, *J* = 7.5 Hz, 4H, NCH_2), 1.39-1.28 (m, 4H, $NCH_2\underline{CH_2}$), 1.28-1.05 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.85 (t, *J* = 7.1 Hz, 6H, CH_3).

^{13}C NMR (150 MHz, $CDCl_3$) δ: 149.4 (C), 142.0 (C), 136.5 (CH), 136.1 (C), 130.9 (C), 129.6 (CH), 129.0 (CH), 128.1 (CH), 126.5 (CH), 125.5 (CH), 120.4 (CH), 111.5 (CH), 52.4 (CH), 31.6 (CH), 26.9 (CH), 26.8 (CH), 22.6 (CH), 14.0 (CH).

***N,N*-Dibutyl-3-ethyl-4-vinylaniline (D)**

Yield 67% (1.00 g from 1.50 g of 4-(dibutylamino)-2-ethylbenzaldehyde); light yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.42 (d, *J* = 8.7 Hz, 1H, H-5 aniline), 6.92 (dd, 1H, *J* = 17.3, 10.9 Hz, 1H, ethene), 6.52 (dd, 1H, *J* = 8.7, 2.6 Hz, 1H, H-6 aniline), 6.45 (d, *J* = 2.7 Hz, 1H, H-2 aniline), 5.48 (dd, *J* = 17.3, 1.5 Hz, 1H, ethene), 5.06 (dd, *J* = 10.9, 1.5 Hz, 1H, ethene), 3.29 (t, *J* = 7.6 Hz, 4H, NCH_2), 2.69 (q, *J* = 7.5 Hz, 2H, NCH_2), 1.63-1.55 (m, 4H, $NCH_2\underline{CH_2}$), 1.44-1.34 (m, 4H, $N(CH_2)_2\underline{CH_2}$), 1.24 (t, *J* = 7.6 Hz, 3H, $NCH_2\underline{CH_3}$), 0.98 (t, *J* = 7.3 Hz, 6H, $N(CH_2)_3\underline{CH3}$).

^{13}C NMR (150 MHz, $CDCl_3$) δ: 148.0 (C), 142.6 (C), 134.1 (CH), 126.5 (CH), 123.4 (C), 111.5 (CH), 110.3 (CH), 109.8 (CH), 50.7 (CH), 29.6 (CH), 26.9 (CH), 20.4 (CH), 15.6 (CH), 14.0 (CH).

3-Butoxy-*N,N*-diethyl-4-vinylaniline (E1)

Yield 61% (0.30 g from 0.50 g of 2-butoxy-4-(diethylamino)benzaldehyde); light yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.43 (d, *J* = 8.6 Hz, 1H, H-5 aniline), 7.08 (dd, 1H, *J* = 17.8, 11.2 Hz, 1H, ethene), 6.37 (dd, 1H, *J* = 8.6, 2.4 Hz, 1H, H-6 aniline), 6.28 (d, *J* = 2.4 Hz, 1H, H-2 aniline), 5.66 (dd, *J* = 17.8, 1.0 Hz, 1H, ethene), 5.10 (dd, *J* = 11.2, 1.0 Hz, 1H, ethene), 4.09 (t, *J* = 6.4 Hz, 2H, OCH_2), 3.45 (q, *J* = 7.1 Hz, 4H, NCH_2), 1.96-1.87 (m, 2H, $OCH_2\underline{CH_2}$), 1.70-1.59 (m, 2H, $O(CH_2)_2\underline{CH_2}$), 1.28 (t, *J* = 7.1 Hz, 6H, $NCH_2\underline{CH_3}$), 1.10 (t, *J* = 7.4 Hz, 3H, $O(CH_2)_3\underline{CH_3}$).

^{13}C NMR (150 MHz, $CDCl_3$) δ: 157.6 (C), 148.9 (C), 131.6 (CH), 127.2 (CH), 114.8 (C), 108.9 (CH), 104.4 (CH), 96.1 (CH), 67.8 (CH), 44.4 (CH), 31.4 (CH), 19.3 (CH), 13.8 (CH), 12.6 (CH).

***N,N*-Diethyl-3-(hexyloxy)-4-vinylaniline (E2)**

Yield 85% (0.34 g from 0.40 g of 4-(diethylamino)-2-(hexyloxy)benzaldehyde); light yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.40 (d, *J* = 8.6 Hz, 1H, H-5 aniline), 7.05 (dd, 1H, *J* = 17.7, 11.2 Hz, 1H, ethene), 6.34 (dd, 1H, *J* = 8.6, 2.3 Hz, 1H, H-6 aniline), 6.25 (d, *J* = 2.3 Hz, 1H, H-2 aniline), 5.63 (dd, *J* = 17.7, 1.7 Hz, 1H, ethene), 5.07 (dd, *J* = 11.2, 1.7 Hz, 1H, ethene), 4.05 (t, *J* = 6.4 Hz, 2H, OCH_2), 3.41 (q, *J* = 7.1 Hz, 4H, NCH_2), 1.95-1.84 (m, 2H, $OCH_2\underline{CH_2}$), 1.64-1.52 (m, 2H, $O(CH_2)_2\underline{CH_2}$), 1.49-1.38 (m, 4H, $O(CH_2)_3(\underline{CH_2})_2$), 1.24 (t, *J* = 7.1 Hz, 6H, $NCH_2\underline{CH_3}$), 1.00 (t, *J* = 7.0 Hz, 3H, $N(CH_2)_3\underline{CH_3}$).

^{13}C NMR (150 MHz, $CDCl_3$) δ: 157.7 (C), 148.8 (C), 131.7 (CH), 127.3 (CH), 114.9 (C), 109.1 (CH), 104.5 (CH), 96.3 (CH), 68.3 (CH), 44.5 (CH), 31.6 (CH), 29.4 (CH), 25.9 (CH), 22.6 (CH), 14.0 (CH), 12.7 (CH).

9-Dodecyl-3-vinyl-9H-carbazole (F)

Yield 67% (1.0 g from 1.5 g of 9-dodecyl-9H-carbazole-3-carbaldehyde); light yellow oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ: 8.13 (s, 1H, carbazol), 8.11 (d, 1H, *J* = 7.7 Hz, 1H, carbazole), 7.58 (d, 1H, *J* = 8.4 Hz, 1H, carbazole), 7.47 (dd, 1H, *J* = 7.9, 7.3 Hz, 1H, carbazole), 7.40 (d, 1H, *J* = 8.1 Hz, 1H, carbazole), 7.35 (d, 1H, *J* = 8.4 Hz, carbazole), 7.24 (dd, 1H, *J* = 7.5, 7.3 Hz, 1H, carbazole), 6.93 (dd, 1H, *J* = 18.0, 12.2 Hz, 1H, ethene), 5.79 (d, *J* = 17.5 Hz, 1H, ethene), 5.21 (d, *J* = 10.8, 1H, ethene), 4.29 (t, *J* = 7.2 Hz, 2H, NCH_2), 1.91-1.83 (m, 2H, $NCH_2\underline{CH_2}$), 1.43-1.21 (m, 18H, $N(CH_2)_2(\underline{CH_2})_9CH_3$), 0.90 (t, *J* = 7.0 Hz, 3H, $N(CH_{2)11}\underline{CH_3}$).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 140.9 (C), 148.3 (C), 137.6 (CH), 128.9 (C), 125.7 (CH), 124.0 (CH), 123.1 (C), 123.0 (C), 120.4 (CH), 118.9 (CH), 118.4 (CH), 110.8 (CH), 108.8 (CH), 108.6 (CH), 43.1 (CH), 32.0 (CH), 29.7 (2 CH), 29.6 (CH), 29.5 (CH), 29.4 (CH), 29.3 (CH), 29.0 (CH), 27.3 (CH), 22.7 (CH), 14.1 (CH).

1-Methyl-2-phenyl-3-vinylindolizine (G)

Yield 81% (0.33 g from 0.41 g of 1-methyl-2-phenylindolizine-3-carbaldehyde); light yellow oil.

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.31 (d, 1H, *J* = 7.0 Hz, 1H, H-5 indolizine), 7.59-7.55 (m, 2H, *m*-Ph), 7.54-7.51 (m, 2H, *o*-Ph), 7.50-7.45 (m, 2H, *p*-Ph, H-8 indolizine), 6.93 (dd, 1H, *J* = 18.0, 12.2 Hz, 1H, ethene), 6.79 (dd, *J* = 8.4, 6.6 Hz, 1H, H-7 indolizine), 6.64 (dd, *J* = 7.0, 6.6, 1.0 Hz, 1H, H-6 indolizine), 5.46 (dd, *J* = 18.0, 1.0 Hz, 1H, ethene), 5.26 (dd, *J* = 12.2, 1.0 Hz, 1H, ethene), 2.39 (s, 3H, CH_3).

6-(Dihexylamino)-[1,1'-biphenyl]-3-carbaldehyde and 4-(dibutylamino)-2-ethylbenzaldehyde

To stirred mixture of *N*,*N*-dibutyl-3-ethylaniline or *N*,*N*-dihexyl-[1,1'-biphenyl]-2-amine [anilines were synthesized from 3-ethylaniline/1,1'-biphenyl]-2-amine, 1-iodobutane/1-iodohexane, K_2CO_3 in acetonitrile under reflux] (0.022 mol), anhydrous DMF (2.75 g, 0.038 mol) and 1,2-dichloroethane (8 mL) $POCl_3$ (5.77 g, 0.038 mol) was added dropwise for 0.5 h. The reaction temperature has risen to 40-70 ^{o}C. The mixture was heated to 82 ^{o}C for 3-7 h, cooled to room temperature and neutralized to pH 8-9 with an aqueous solution of Na_2CO_3. The product was extracted by CH_2Cl_2 and washed with water. The organic layer was evaporated to give brown oil. The product was purified by column chromatography on silica-gel (eluent petroleum ether: ethyl acetate = 25:1).

6-(Dihexylamino)-[1,1'-biphenyl]-3-carbaldehyde

Yield 63% (1.50 g from 2.2 g of *N*,*N*-dihexyl-[1,1'-biphenyl]-2-amine); light yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 9.87 (s, 1H, CHO), 7.76 (dd, 1H, *J* = 8.5, 2.1 Hz, 1H, H-5 aniline), 7.68 (d, 1H, *J* = 2.1 Hz, 1H, H-3 aniline), 7.53-7.47 (m, 2H, *o*-Ph), 7.51-7.46 (m, 2H, *m*-Ph), 7.36-7.30 (m, 1H, *p*-Ph), 7.09 (d, 1H, *J* = 8.5 Hz, 1H, H-6 aniline), 2.98 (t, *J* = 7.5 Hz, 4H, NCH_2), 1.48-1.37 (m, 4H, $NCH_2\underline{CH_2}$), 1.32-1.09 (m, 12H, $N(CH_2)_2(\underline{CH_2})_3$), 0.88 (t, *J* = 7.1 Hz, 6H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 190.6 (CH), 154.9 (C), 141.5 (C), 134.3 (CH), 133.5 (C), 129.8 (CH), 128.8 (C), 128.5 (CH), 128.3 (CH), 126.9 (CH), 118.7 (CH), 51.7 (CH), 31.4 (CH), 27.0 (CH), 26.7 (CH), 22.5 (CH), 13.9 (CH).

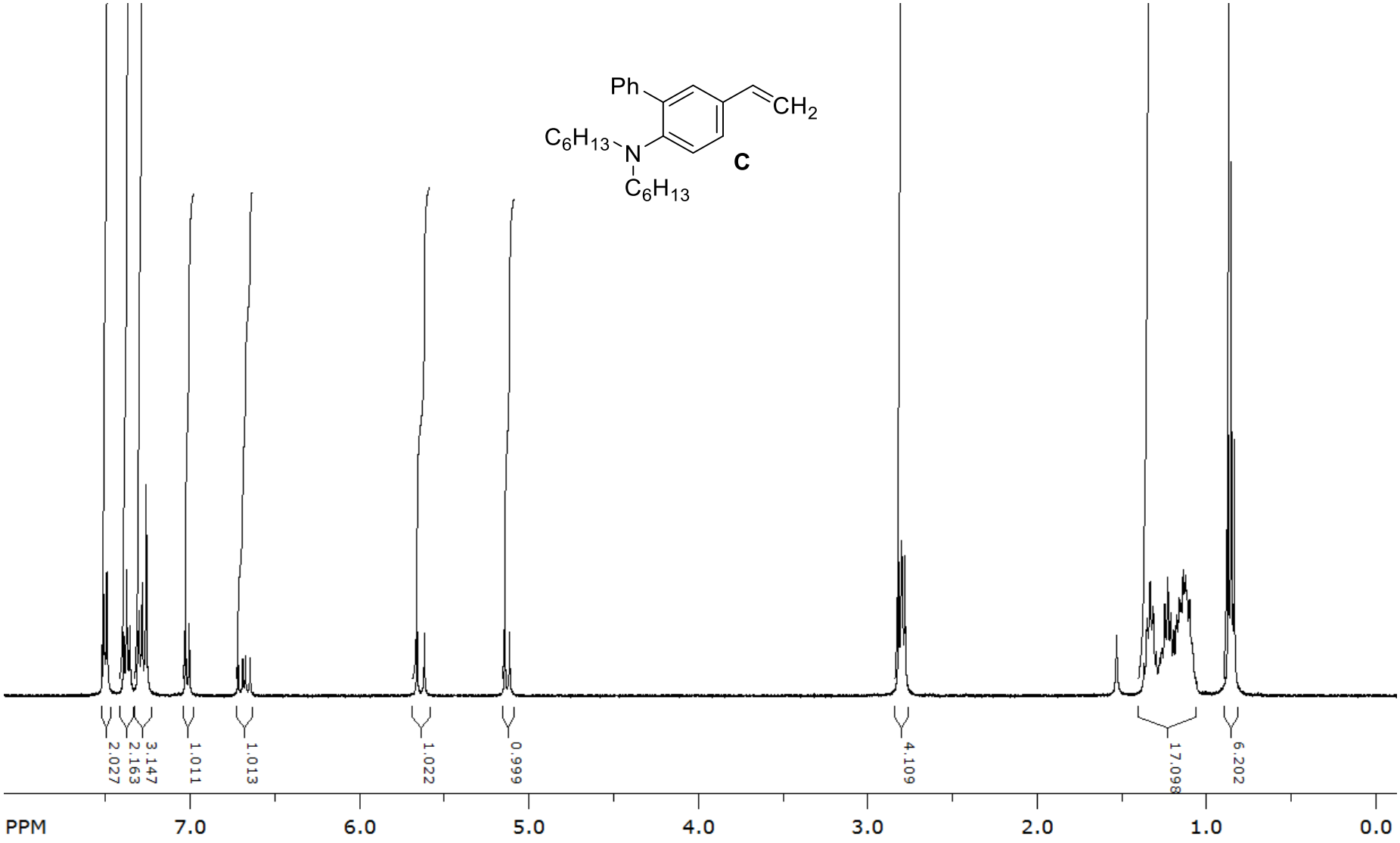
4-(Dibutylamino)-2-ethylbenzaldehyde

Yield 70% (3.96 g from 5.0 g of *N*,*N*-dibutyl-3-ethylaniline); yellow oil.

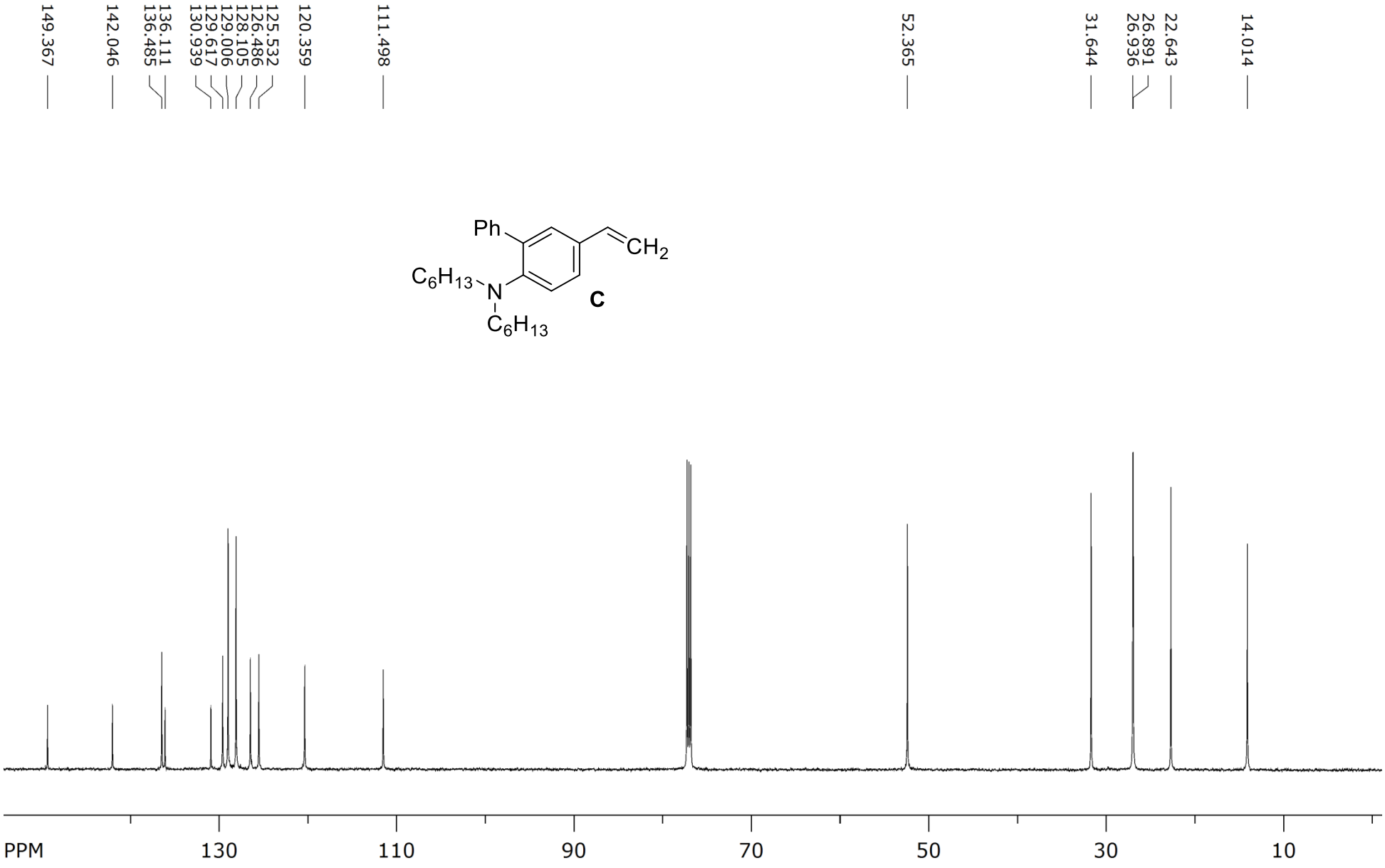
^{1}H NMR (600 MHz, $CDCl_3$): δ = 9.92 (s, 1H, -CH=O), 7.63 (d, *J* = 8.7 Hz, 1H, , H-5 aniline), 6.50 (d, *J* = 8.6 Hz, 1H, , H-6 aniline), 6.41 (s 1H, , H-3 aniline), 3.33 (t, *J* = 6.0 Hz, 4H, NCH_2), 3.00 (q, *J* = 7.3 Hz, 2H, CH_2), 1.63–1.55 (m, 4H, CH_2), 1.40–1.33 (m, 4H, CH_2), 1.26 (t, *J* = 7.4 Hz, 3H, CH_3), 0.96 (t, *J* = 7.3 Hz, 6H, CH_3).

^{13}C NMR (100 MHz, $CDCl_3$) δ: 189.3 (CH), 151.8 (C), 149.0 (C), 134.9 (CH), 121.8 (C), 111.3 (CH), 108.4 (CH), 50.5 (CH), 29.2 (CH), 26.4 (CH), 20.0 (CH), 15.9 (CH), 13.7 (CH).

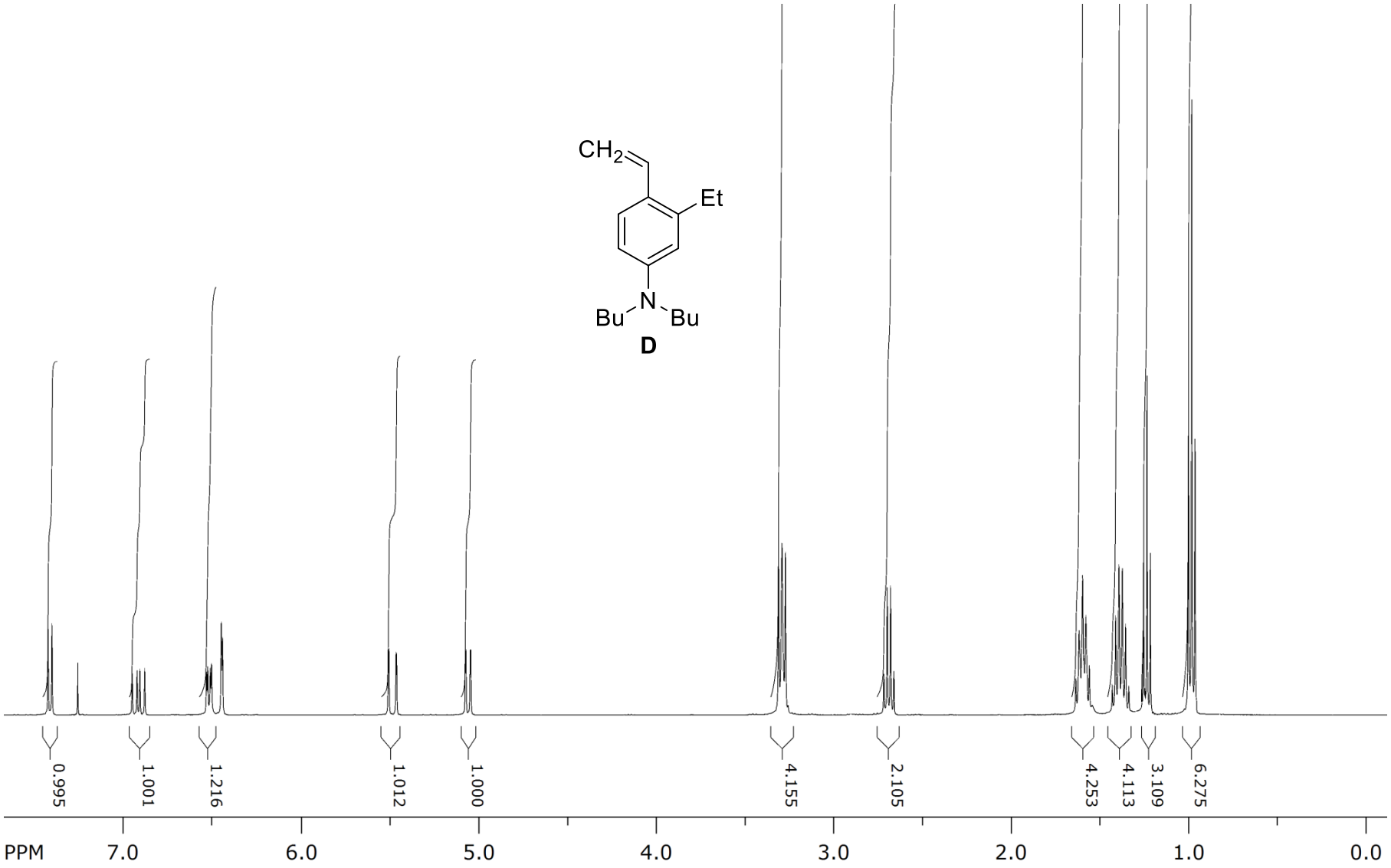
7. NMR of compounds (chromophore precursors) C-G and some aldehydes



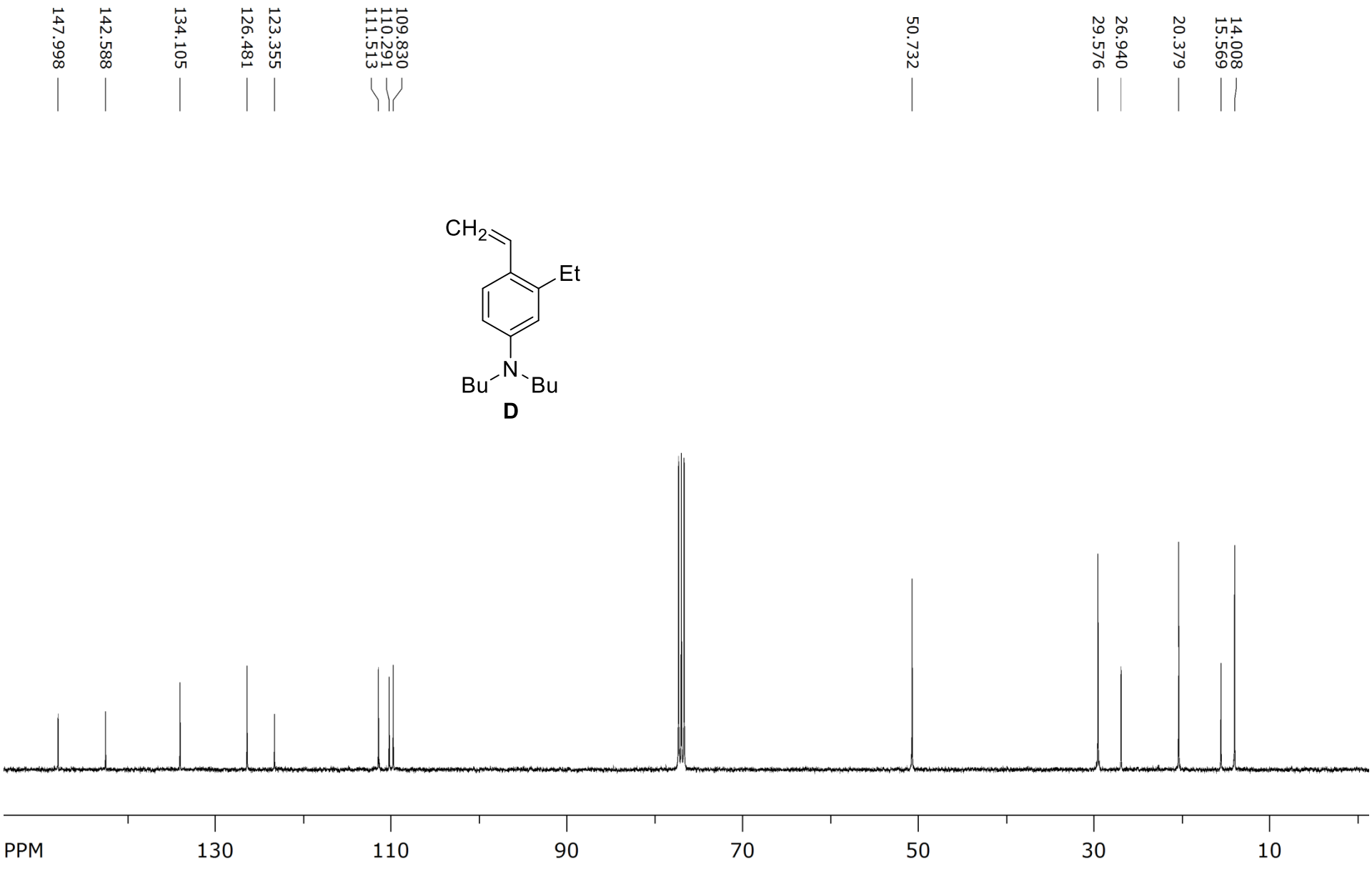
^{1}H NMR (400 MHz, $CDCl_3$) of of *N*,*N*-dihexyl-5-vinyl-[1,1'-biphenyl]-2-amine



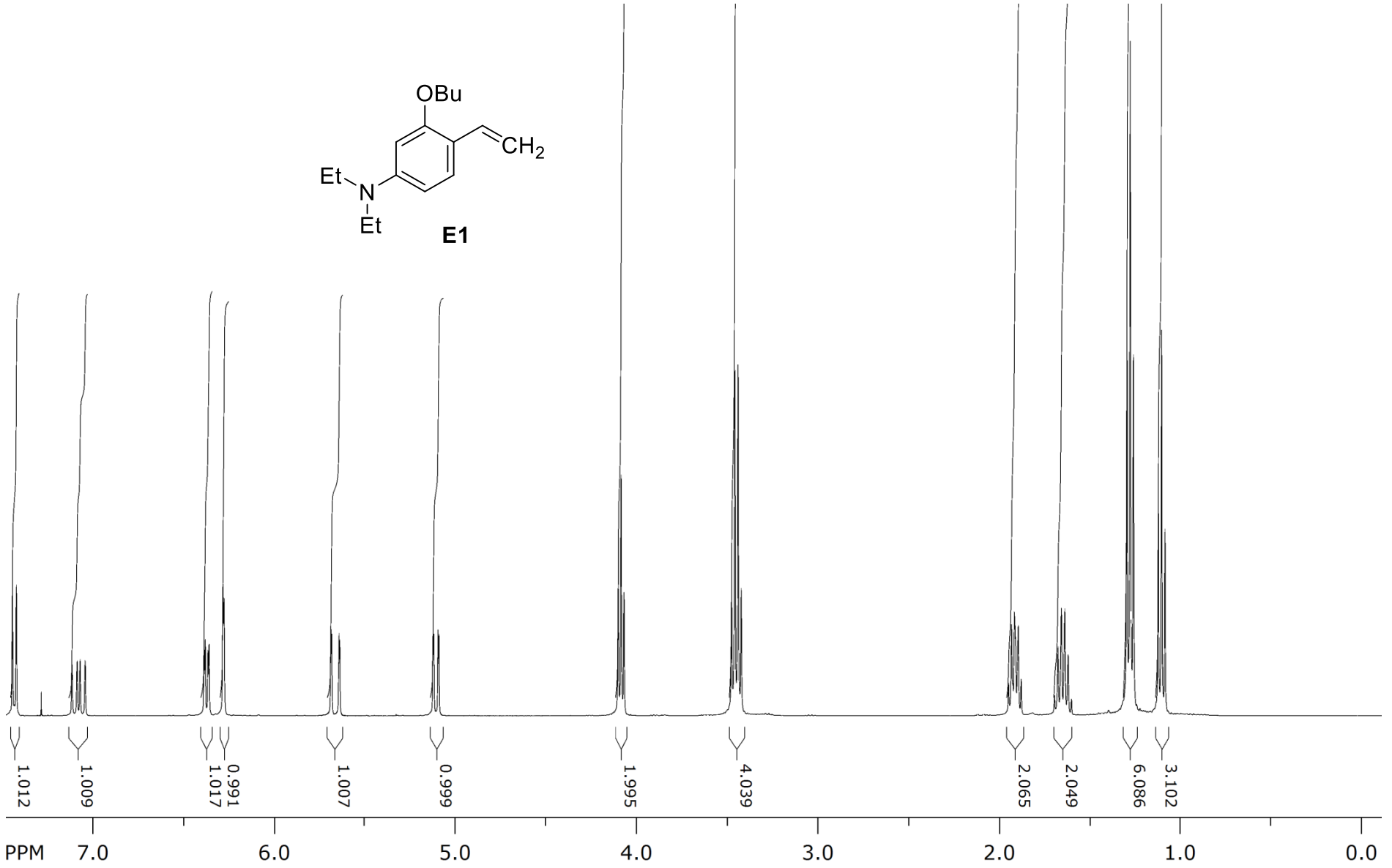
^{13}C NMR (150 MHz, $CDCl_3$) of *N*,*N*-dihexyl-5-vinyl-[1,1'-biphenyl]-2-amine



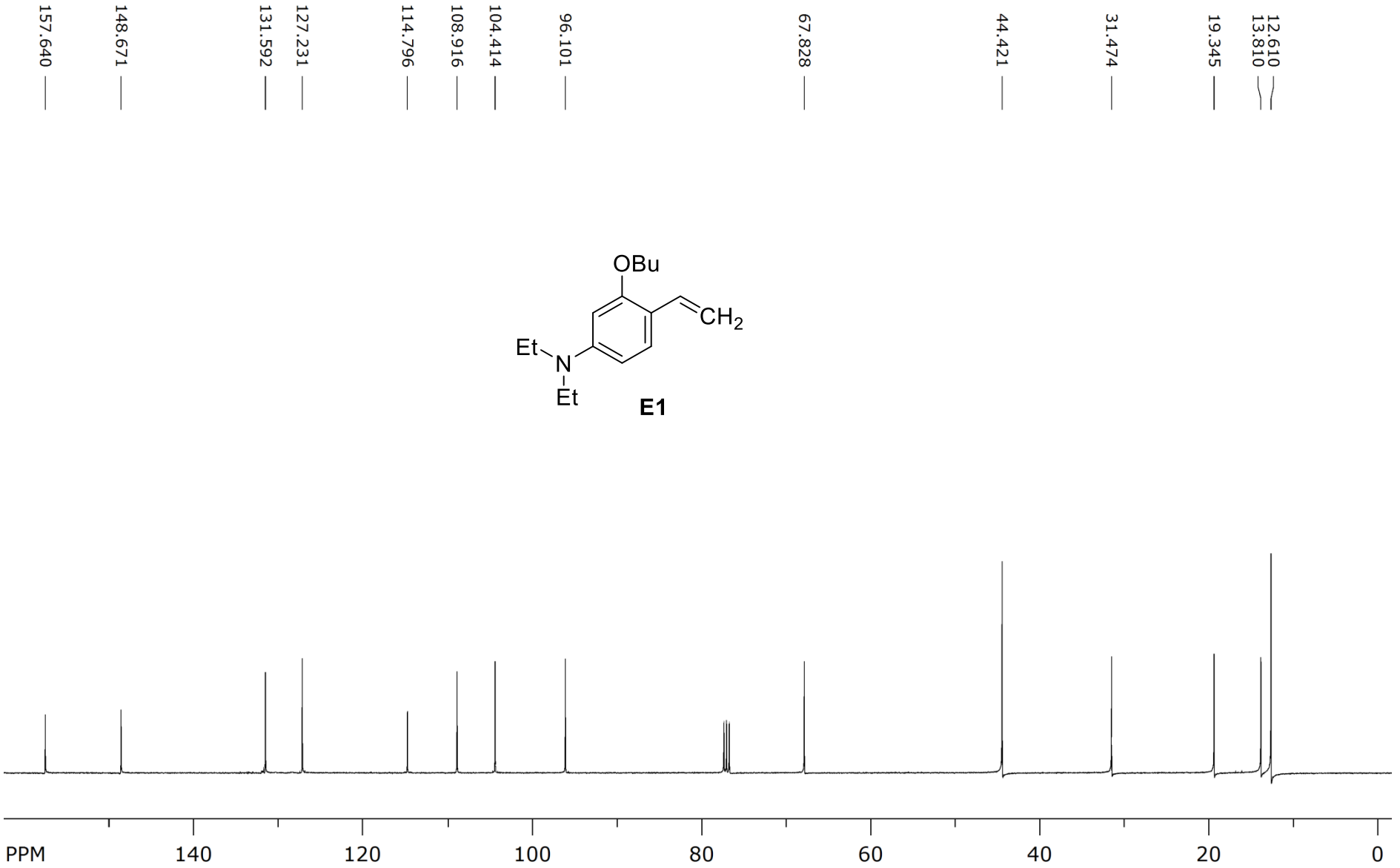
^{1}H NMR (400 MHz, $CDCl_3$) of N,N-dibutyl-3-ethyl-4-vinylaniline



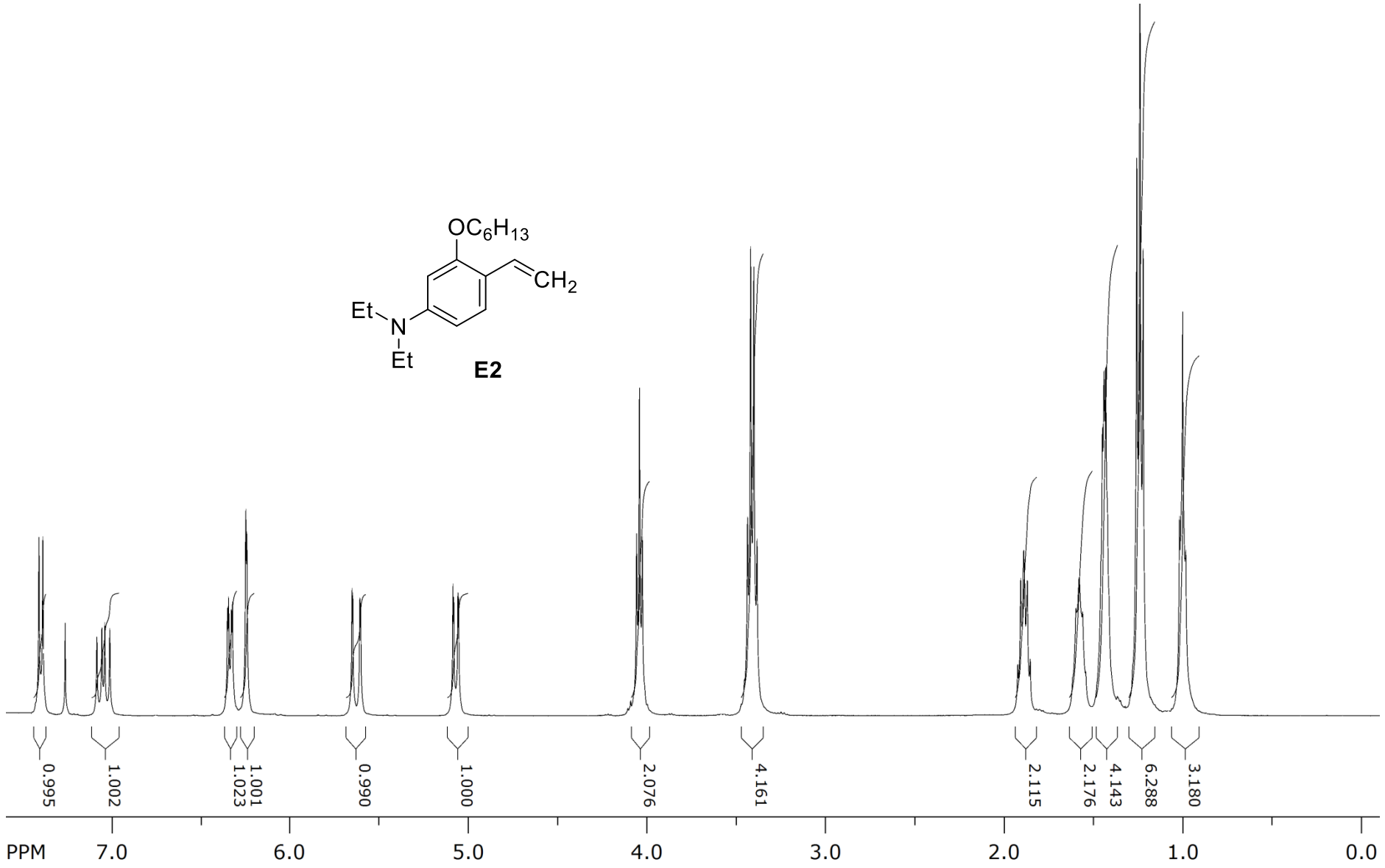
^{13}C NMR (100 MHz, $CDCl_3$) of *N*,*N*-dibutyl-3-ethyl-4-vinylaniline



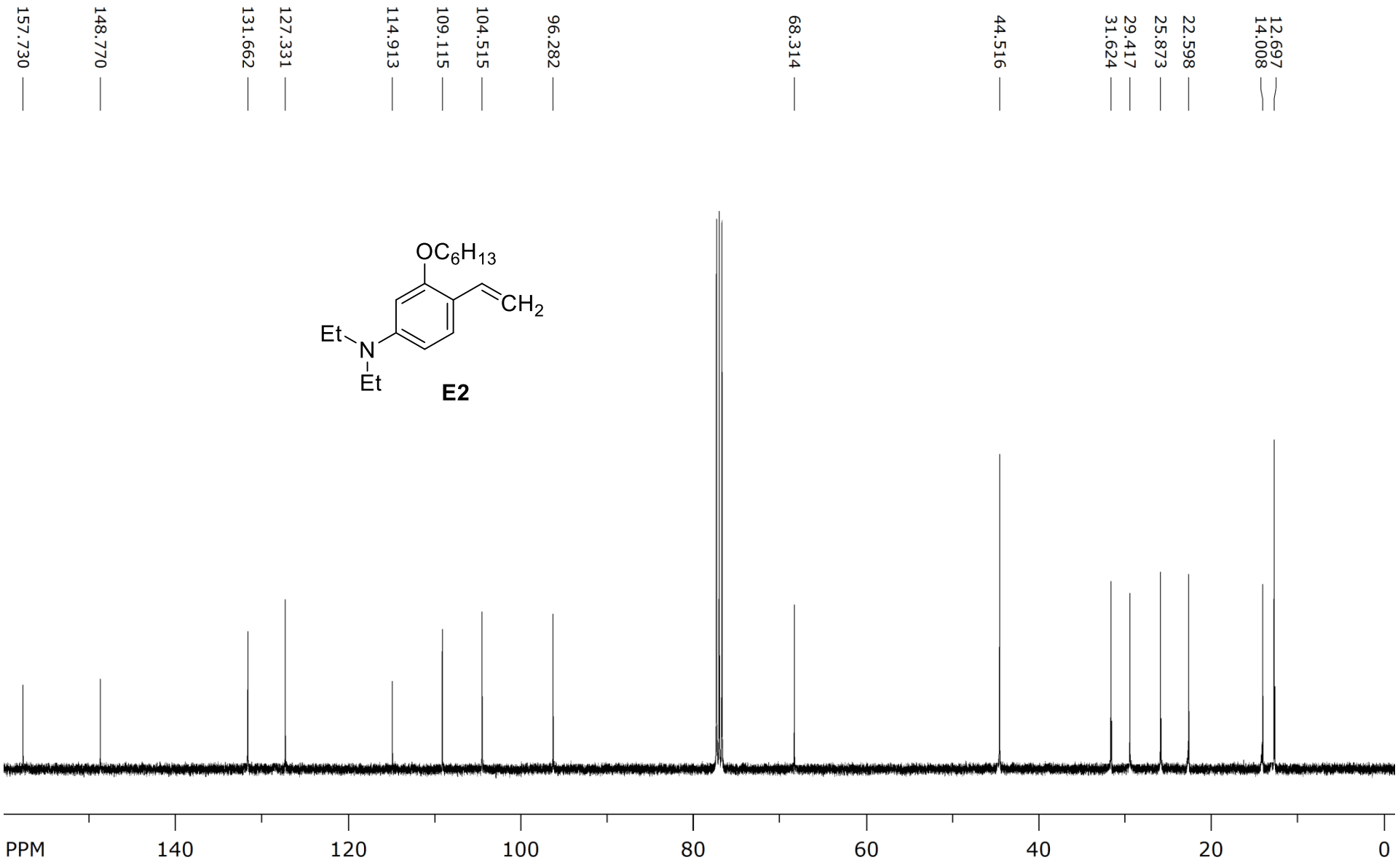
^{1}H NMR (400 MHz, $CDCl_3$) of 3-butoxy-*N*,*N*-diethyl-4-vinylaniline



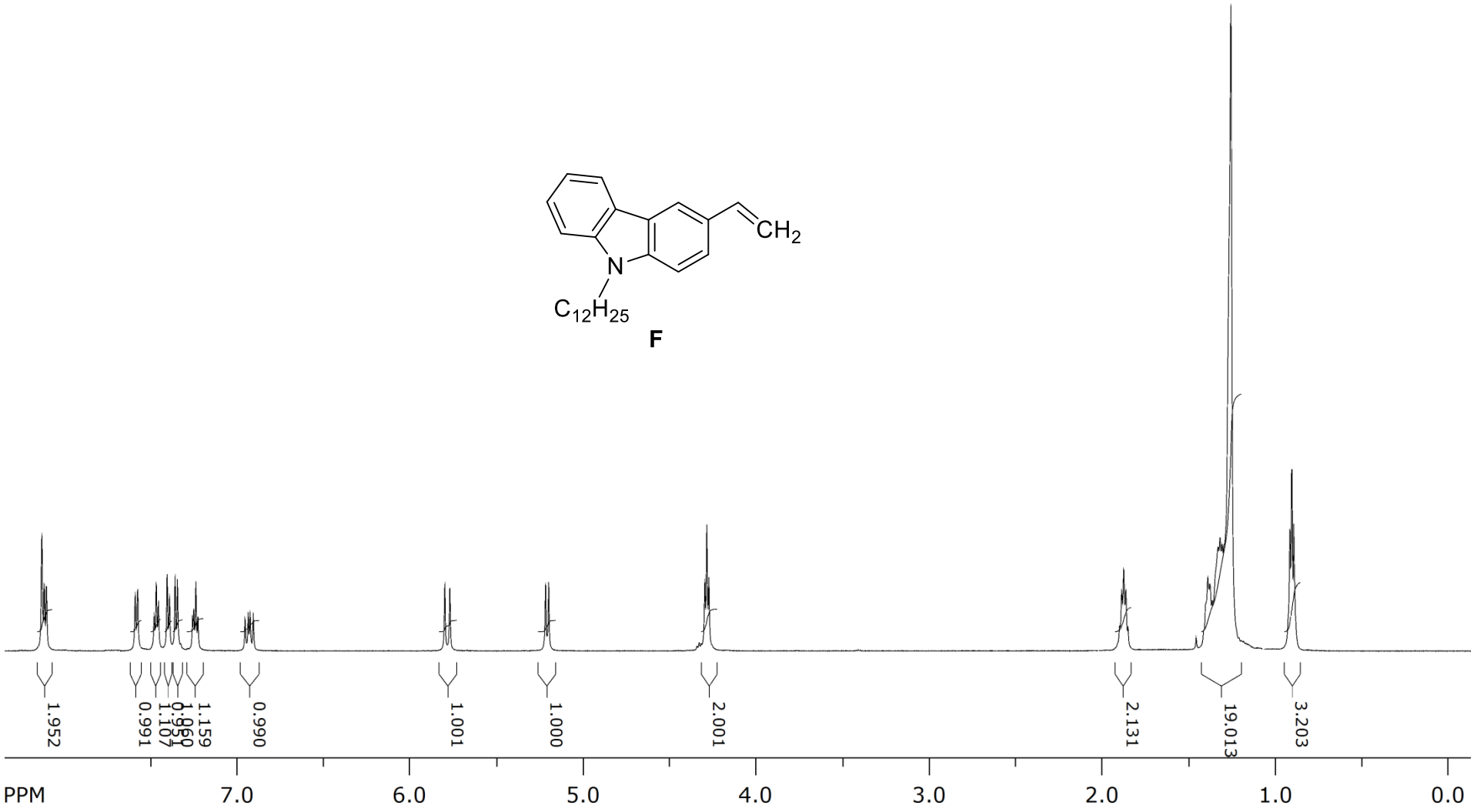
^{13}C NMR (100 MHz, $CDCl_3$) of 3-butoxy-*N*,*N*-diethyl-4-vinylaniline



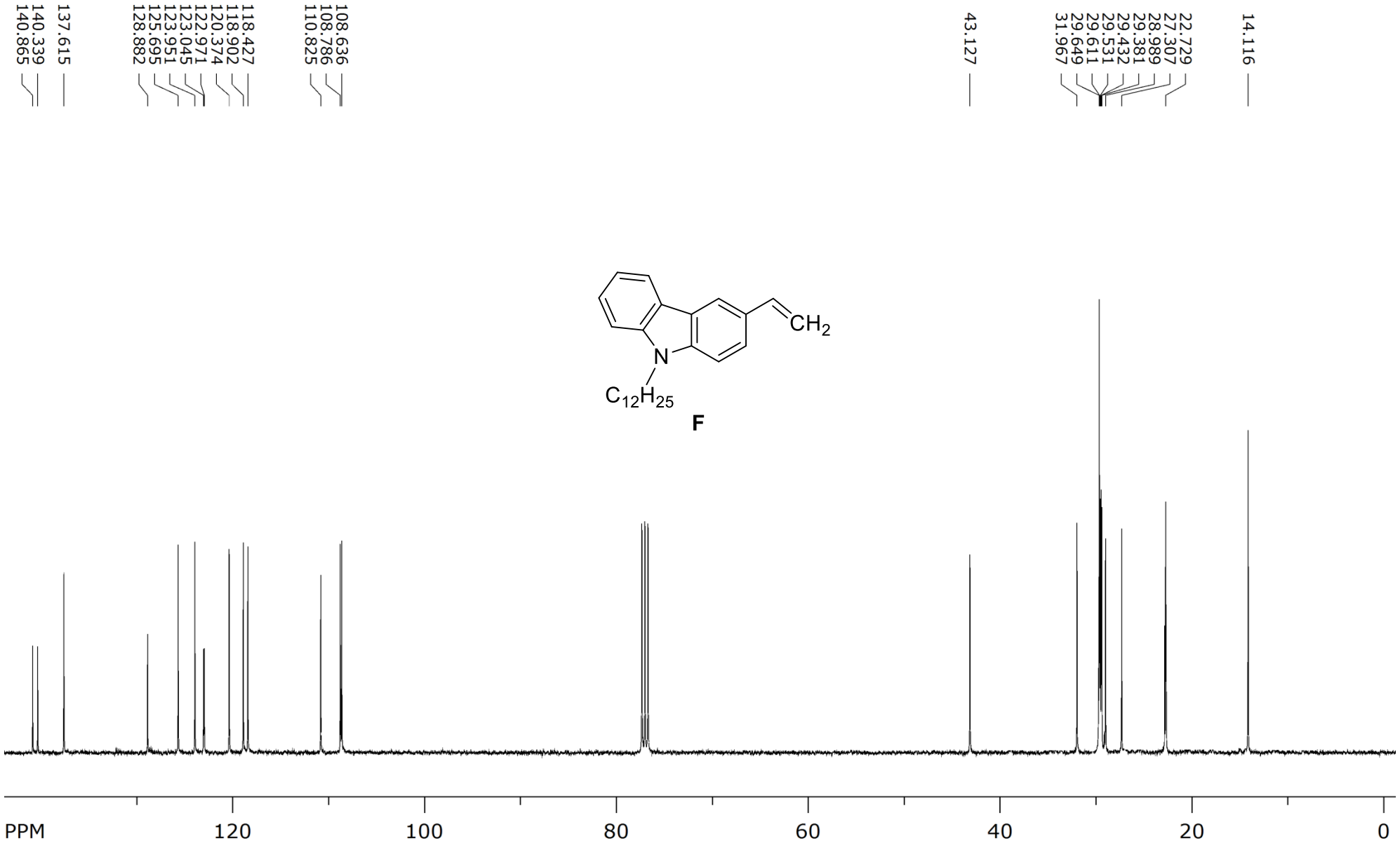
^{1}H NMR (400 MHz, $CDCl_3$) of *N*,*N*-diethyl-3-(hexyloxy)-4-vinylaniline



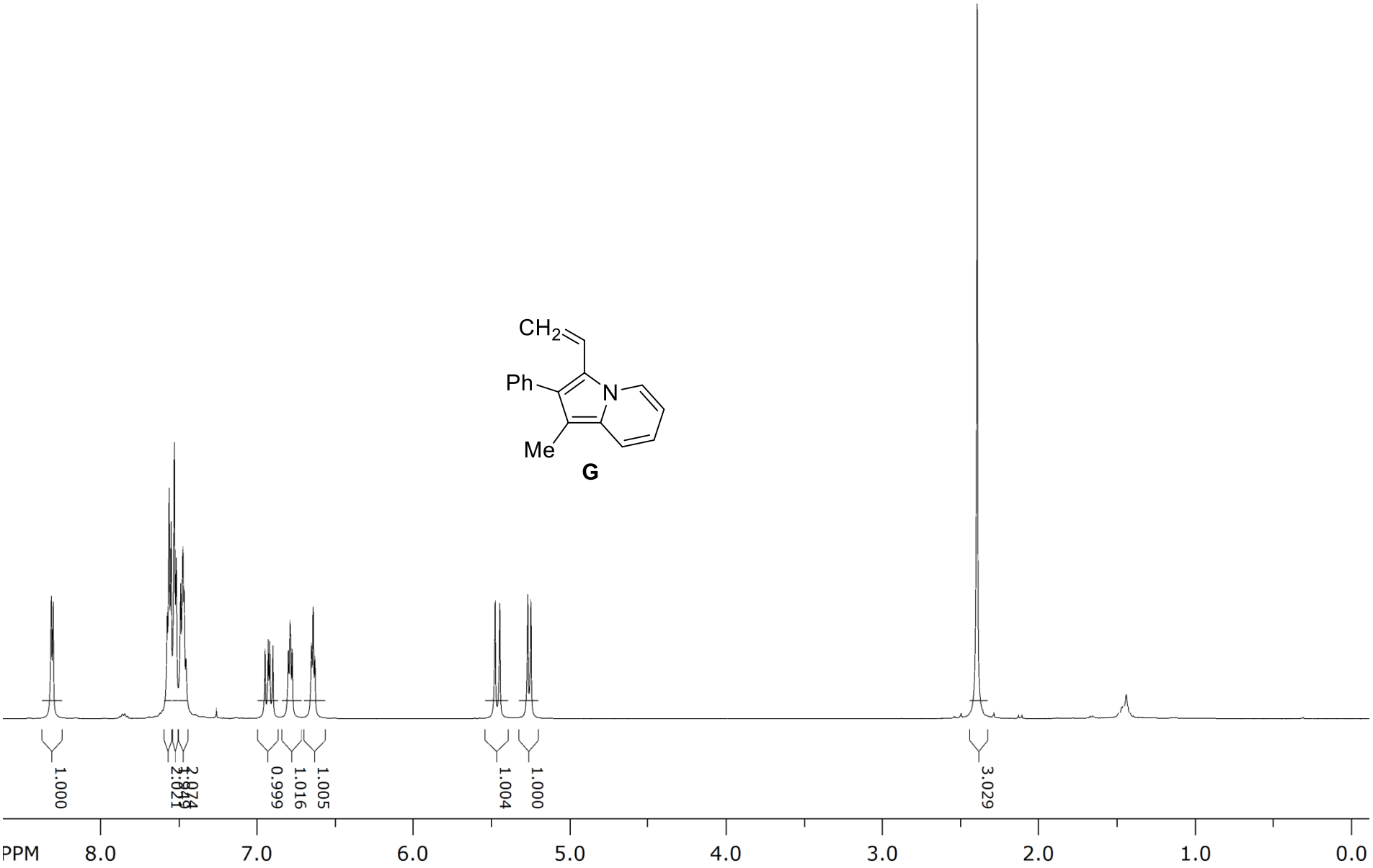
^{13}C NMR (100 MHz, $CDCl_3$) of 3 *N*,*N*-diethyl-3-(hexyloxy)-4-vinylaniline



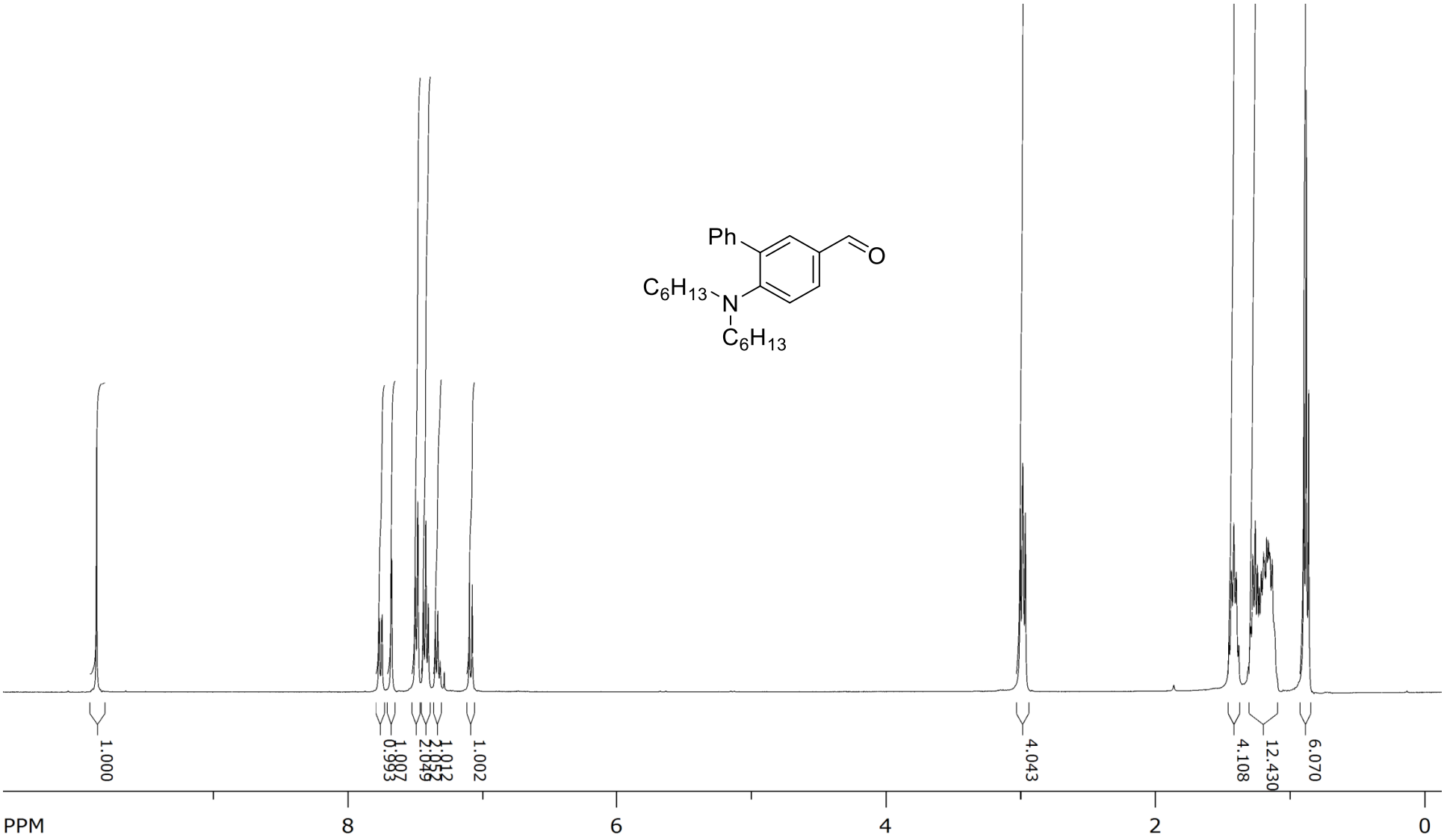
^{1}H NMR (600 MHz, $CDCl_3$) of 9-dodecyl-3-vinyl-9H-carbazole



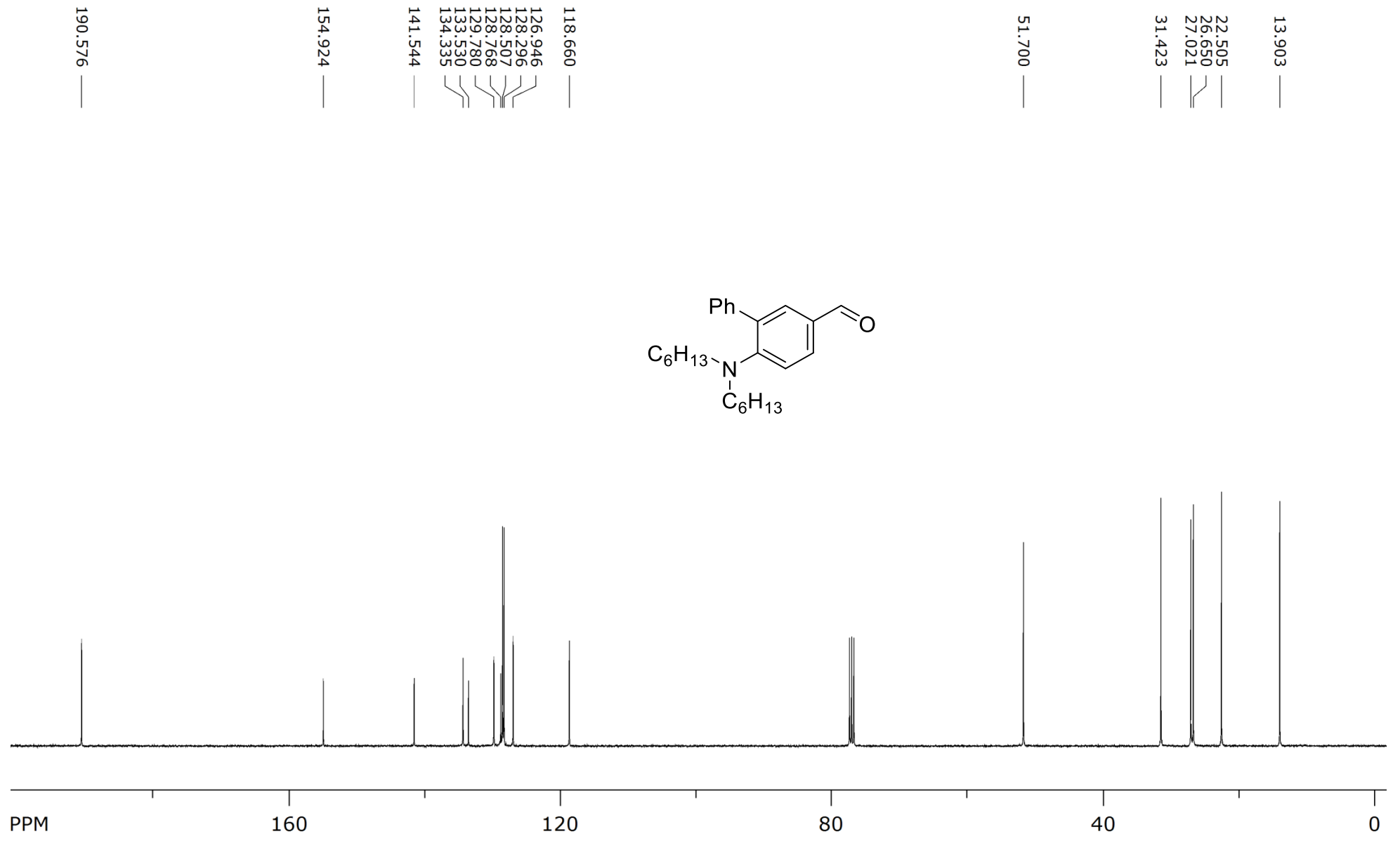
^{1}H NMR (600 MHz, $CDCl_3$) of 9-dodecyl-3-vinyl-9H-carbazole



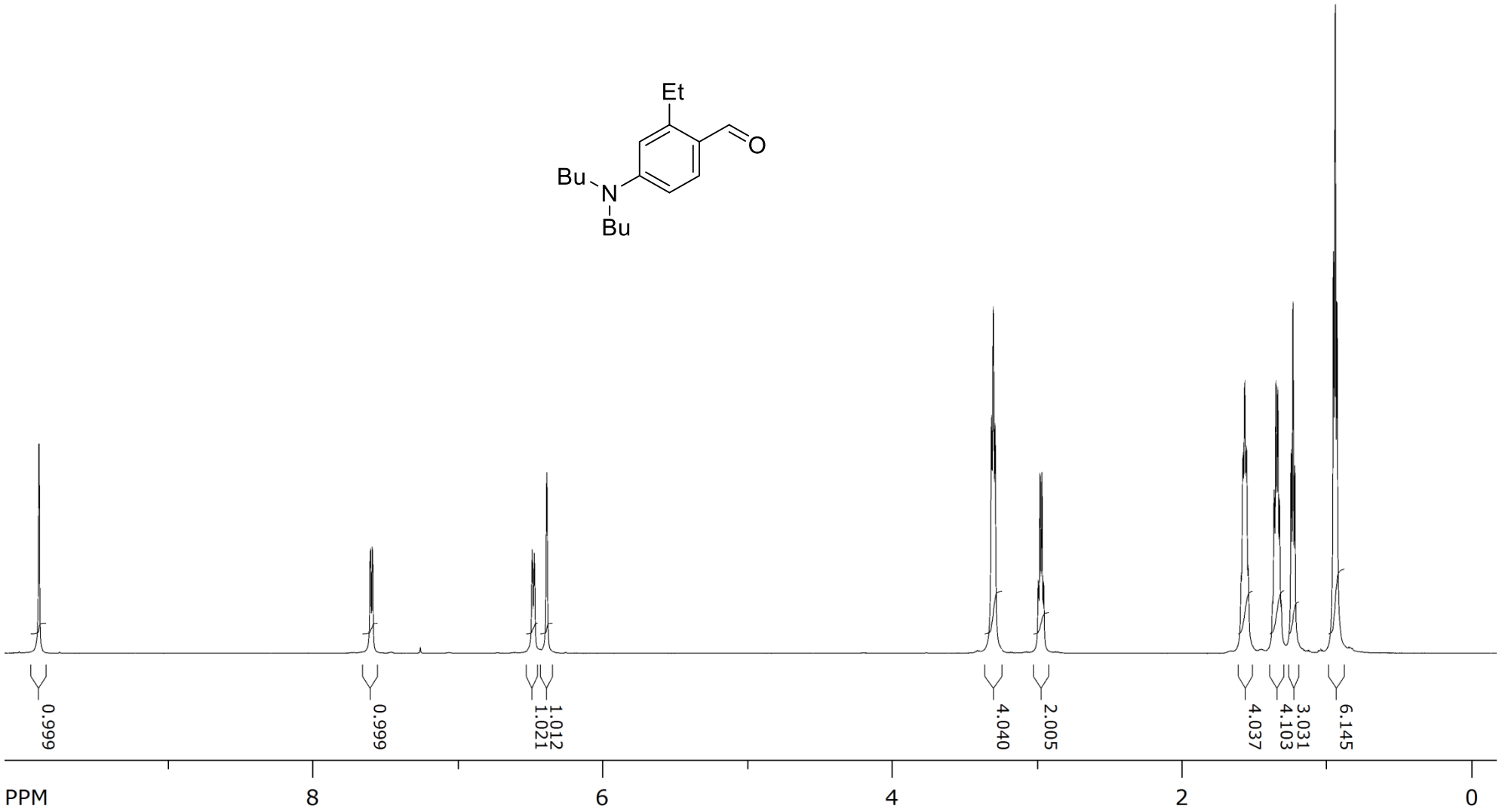
^{1}H NMR (600 MHz, $CDCl_3$) of 1-methyl-2-phenyl-3-vinylindolizine



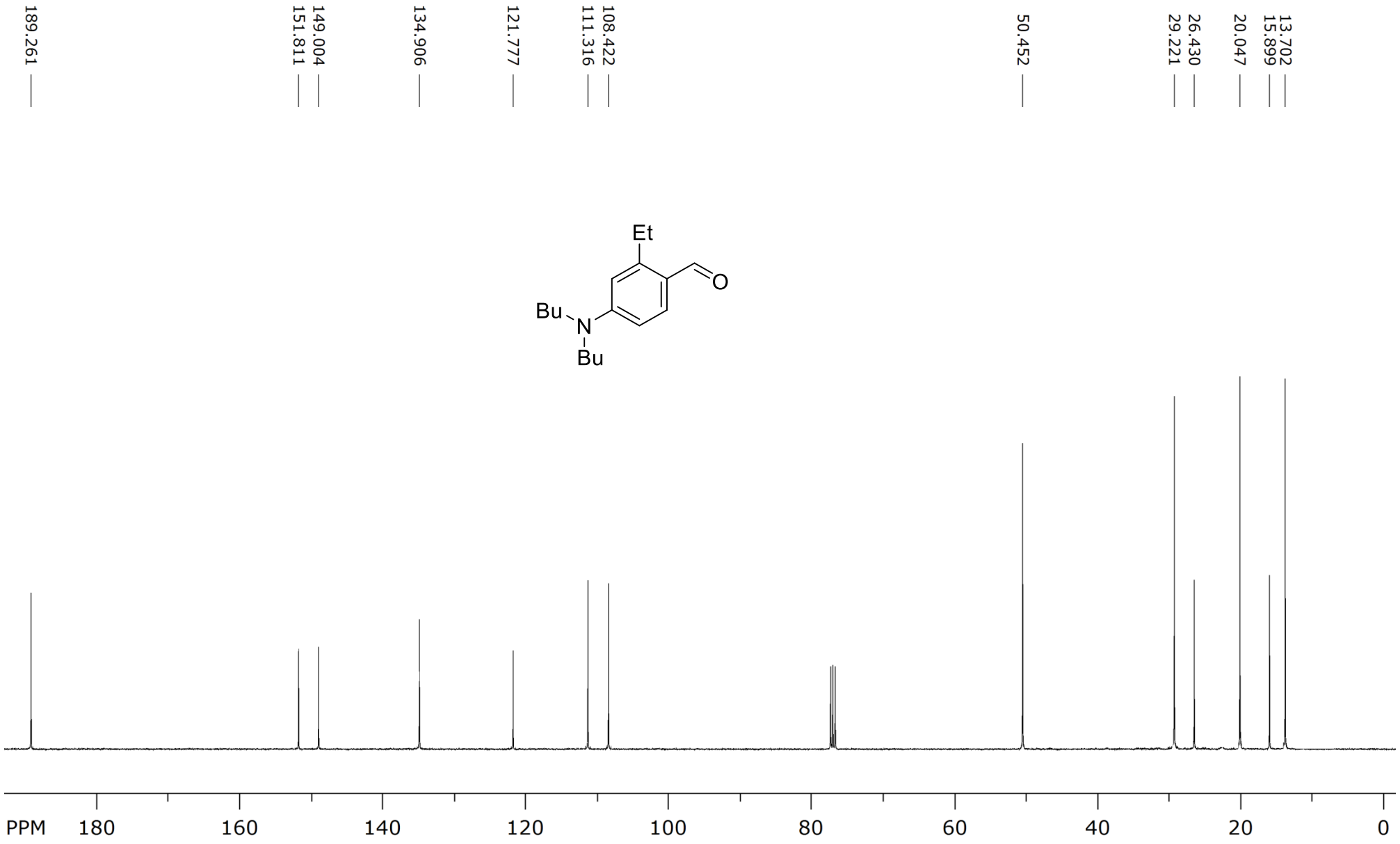
^{1}H NMR (400 MHz, $CDCl_3$) of 6-(dihexylamino)-[1,1'-biphenyl]-3-carbaldehyde



^{13}C NMR (100 MHz, $CDCl_3$) of 6-(dihexylamino)-[1,1'-biphenyl]-3-carbaldehyde



^{1}H NMR (600 MHz, $CDCl_3$) of 4-(dibutylamino)-2-ethylbenzaldehyde



^{13}C NMR (100 MHz, $CDCl_3$) of 4-(dibutylamino)-2-ethylbenzaldehyde

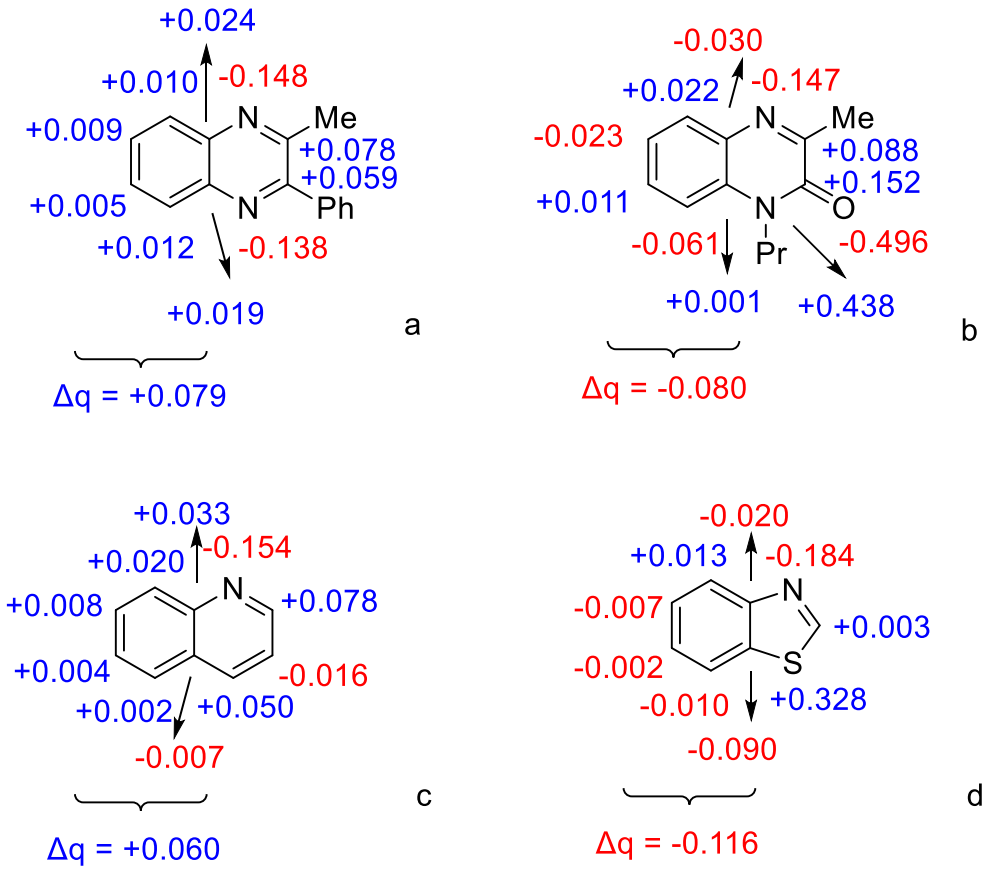
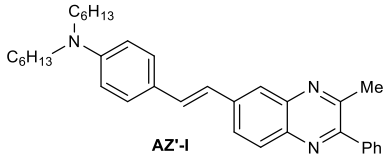
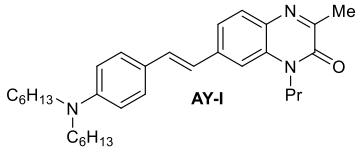
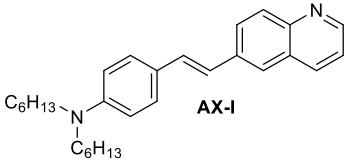
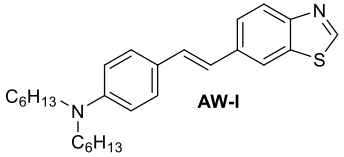
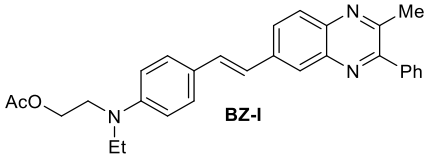
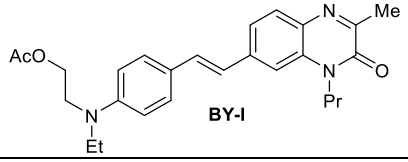
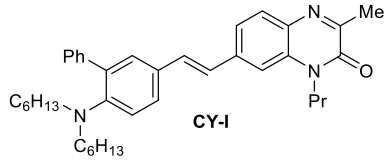
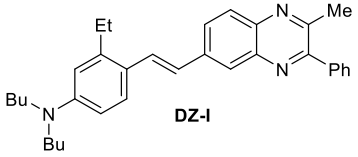
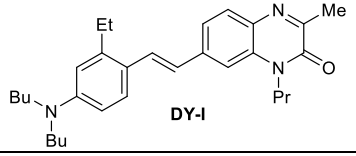
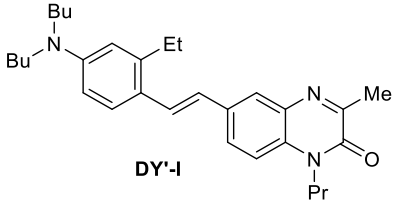
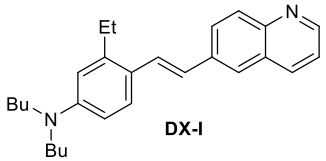
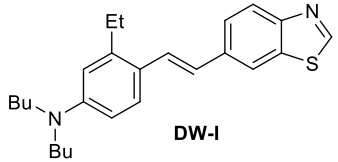
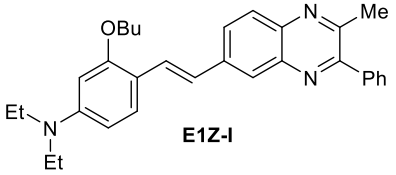
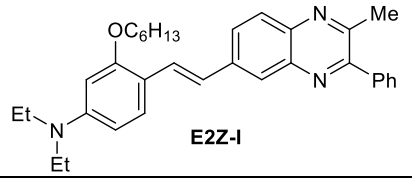
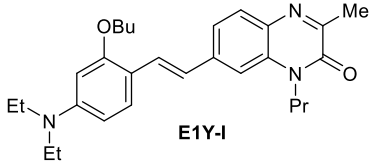
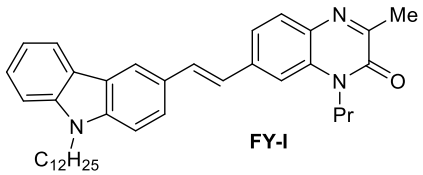
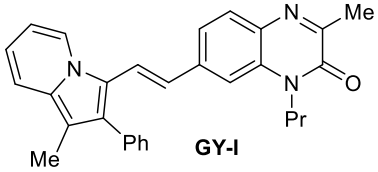


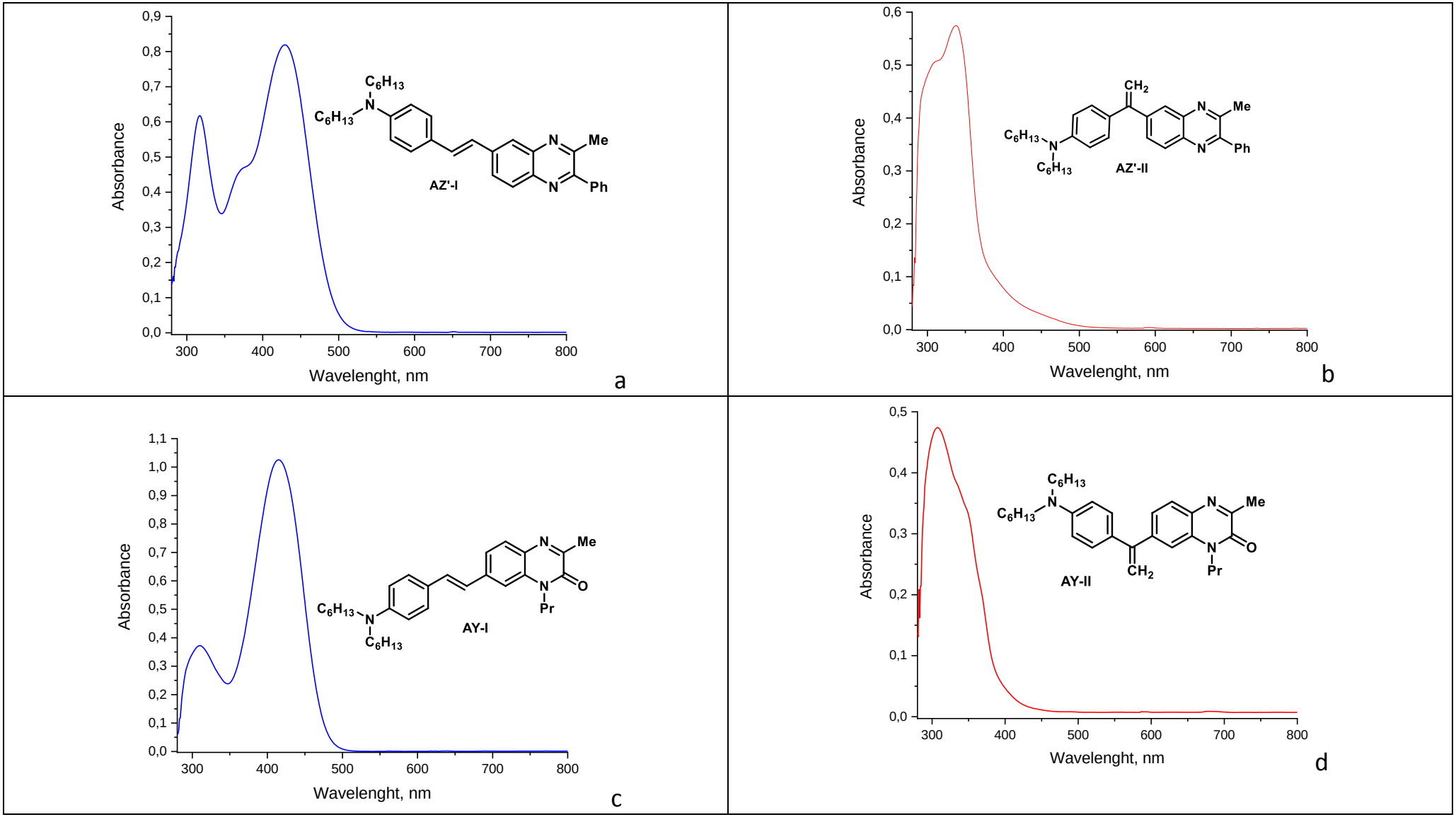
Figure S1. NBO charges on heterocyclic moiety calculated at B3LYP//5-31G** level (Δq - charges on benzene moiety)

Table S1. UV-vis spectra data and solvatochromic shifts

Структура продуктов	λ_{max}, нм (ε, $10^3 \cdot M^{-1} \cdot cm^{-1}$) CH_2Cl_2	solvatochromic CH_3CN/CH_2Cl_2 shift $\Delta\lambda_{max}$, nm
 **AZ'-I**	430 (32.9)	-7
 **AY-I**	415 (40.7)	-7
 **AX-I**	391 (34.1)	-3
 **AW-I**	381 (30.3)	-4
 **BZ-I**	410 (28.9)	-6
 **BY-I**	403 (32.0)	-4

 **CY-I**	393 (33.3)	-6
 **DZ-I**	425 (21.8)	-10
 **DY-I**	416 (32.7)	-8
 **DY'-I**	373 (34.6)	-4
 **DX-I**	387 (25.0)	-2
 **DW-I**	378 (30.2)	0
 **E1Z-I**	427 (27.0)	-9

 **E2Z-I**	426 (25.5)	-8
 **E1Y-I**	419 (32.4)	-6
 **FY-I**	387 (33.8)	-7
 **GY-I**	448 (25.6)	-8


Absorbance
Wavelenght, nm
AZ'-I
a
AZ'-II
b
AY-I
c
AY-II
d

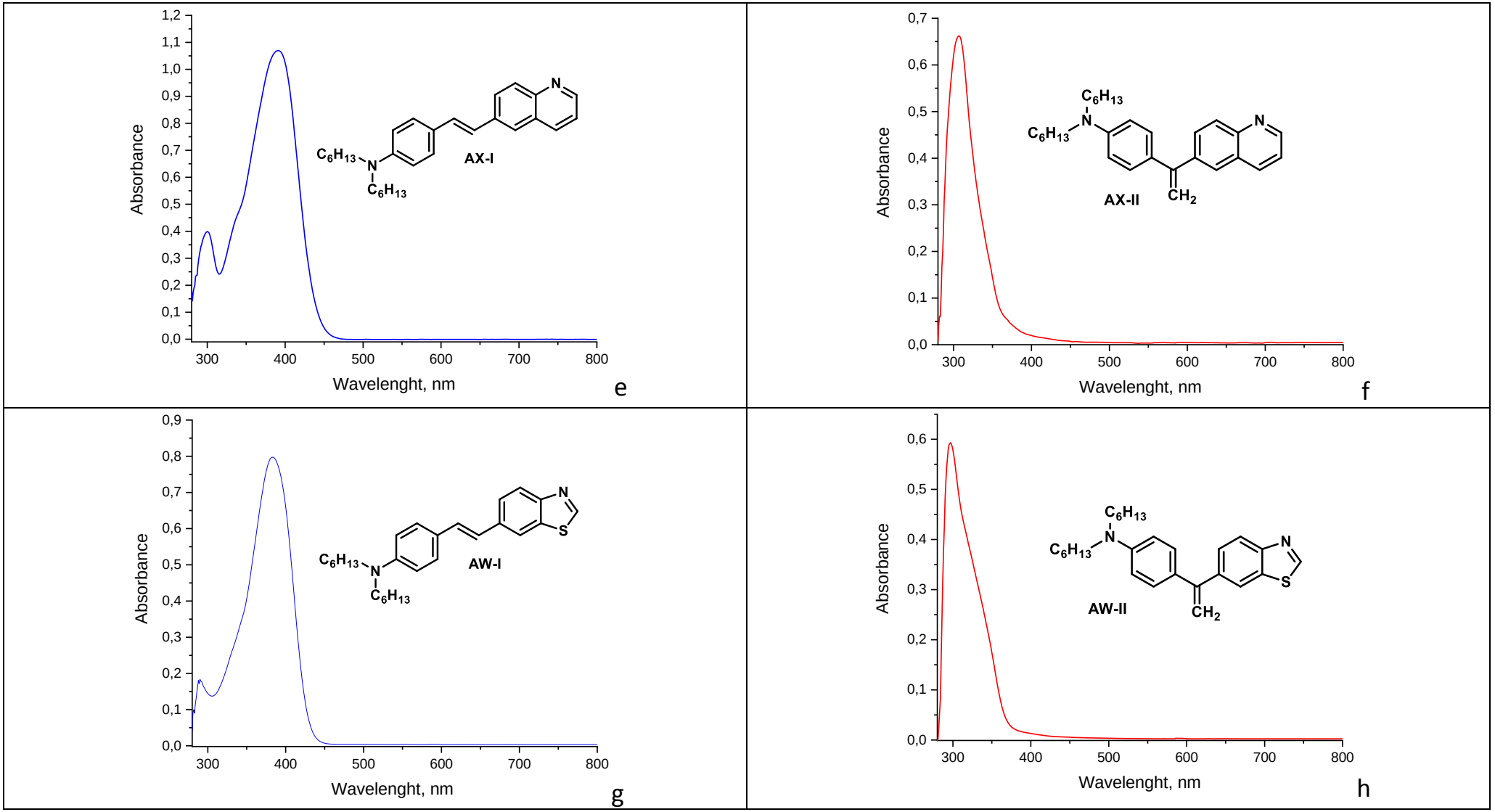


Figure S2. UV-vis spectra of 1,2-*trans*-(a,c,e,g) and 1,1-isomers (b,d,f,h) - *N*,*N*-dihexyl aniline derivatives (λ_{max} 337 nm, ε = 20.1 $10^3 M^{-1}\cdot cm^{-1}$ for **AZ'-II** ; λ_{max} 308 nm, ε = 18.6·$10^3 M^{-1}\cdot cm^{-1}$ for **AY-II** ; λ_{max} 307 nm, ε = 22.0 $10^3 M^{-1}\cdot cm^{-1}$ for **AX-II**; λ_{max} 292 nm, ε = 23.5 $10^3 M^{-1}\cdot cm^{-1}$ for **AW-II**)

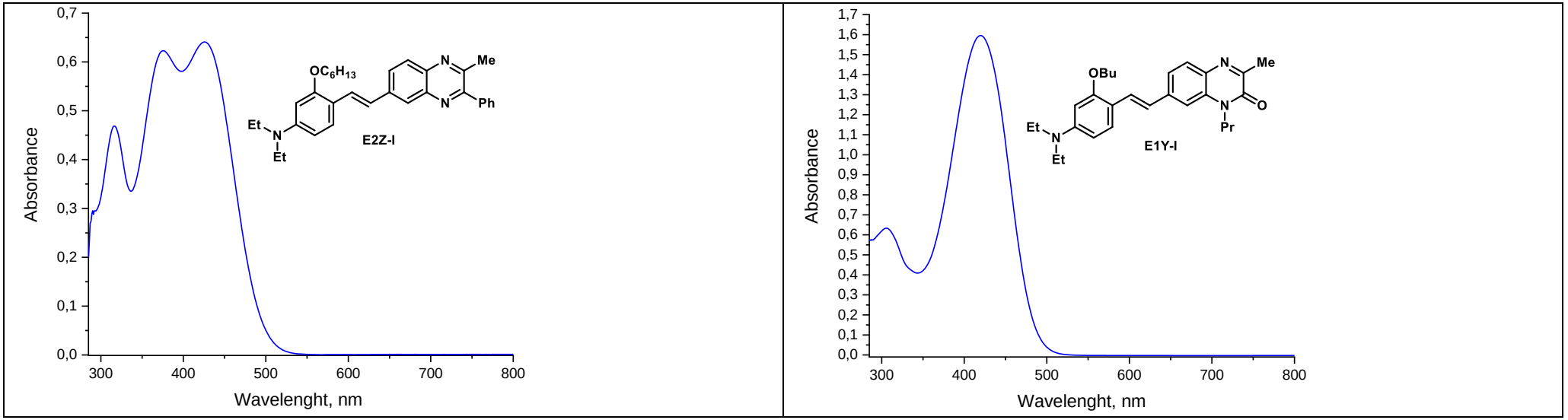


Figure S3. UV-vis spectra of some 1,2-*trans*-isomers with OAlk group

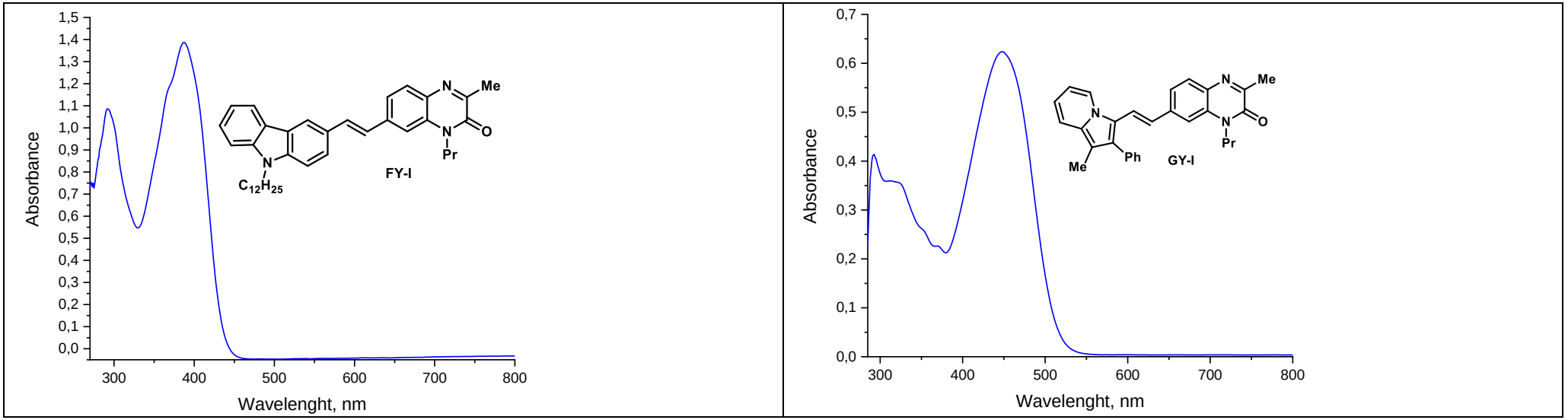


Figure S4. UV-vis spectra for 1,2-*trans*-isomers with fused heterocyclic donor moiety