Electronic Supplementary Material (ESI) for Chemical Science

Supporting Information II

Pd(II)-Catalyzed Alkylation of Unactivated C(sp^3)–H Bonds : Efficient Synthesis of Optically Active Unnatural α-Amino Acids

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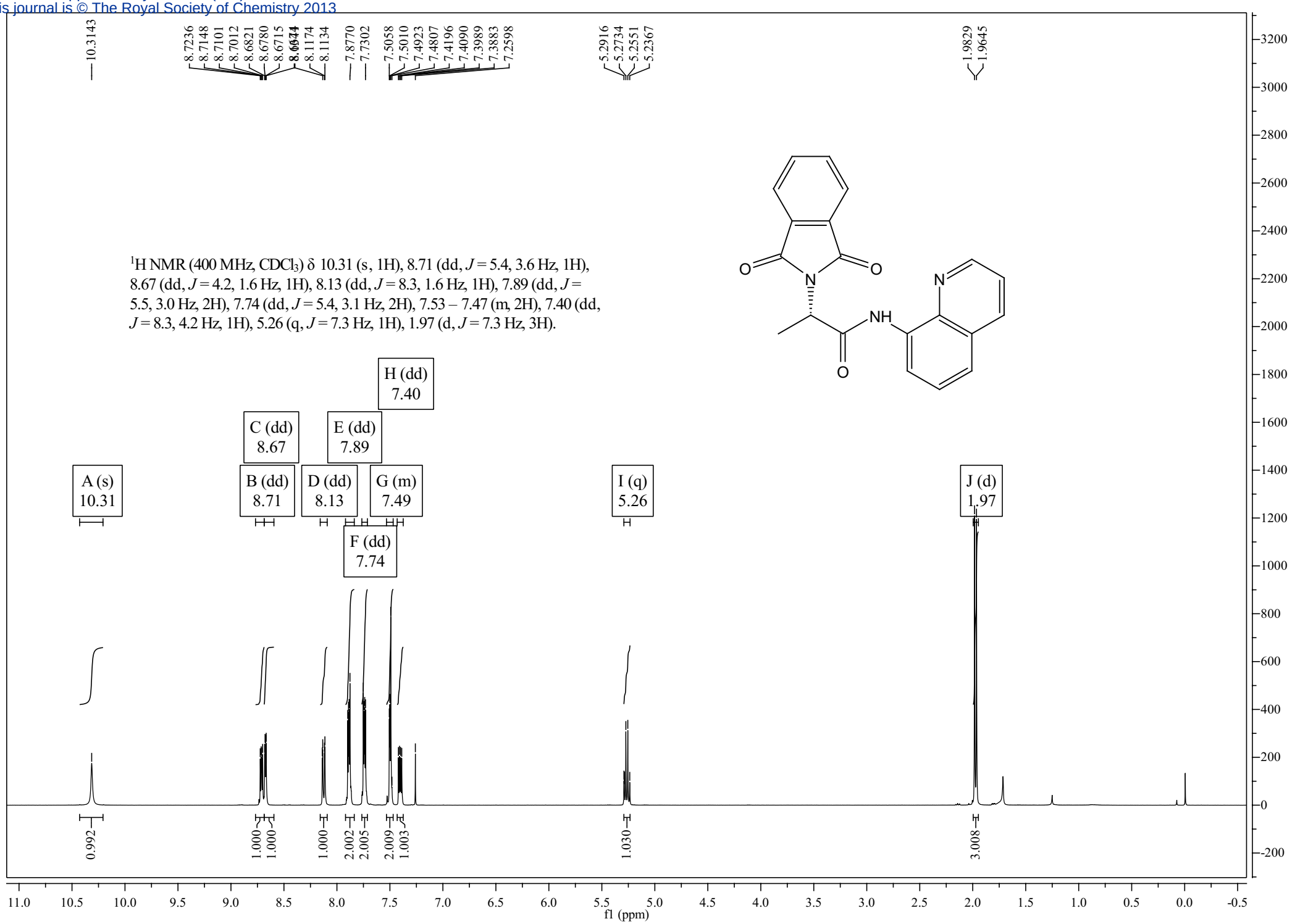
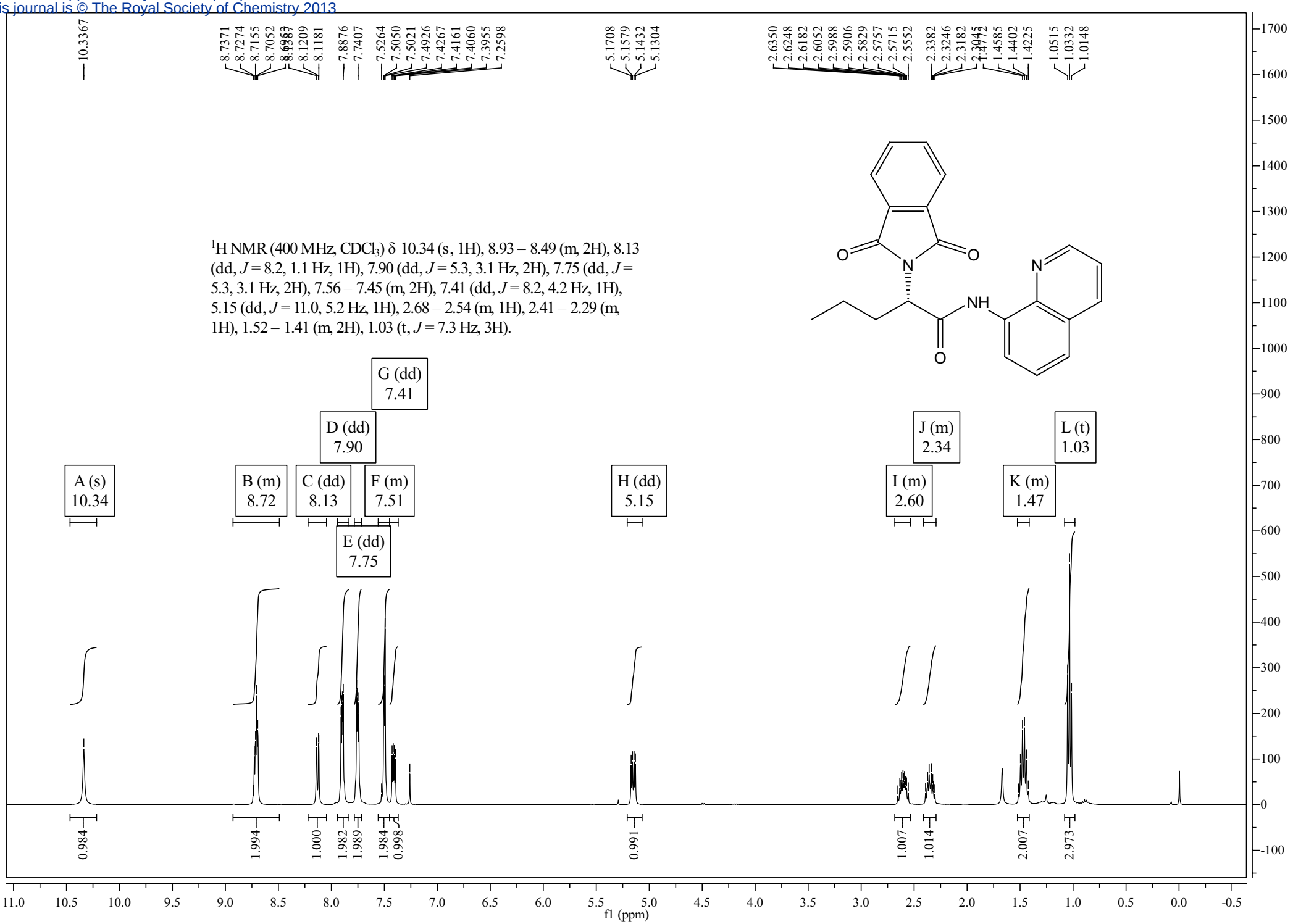
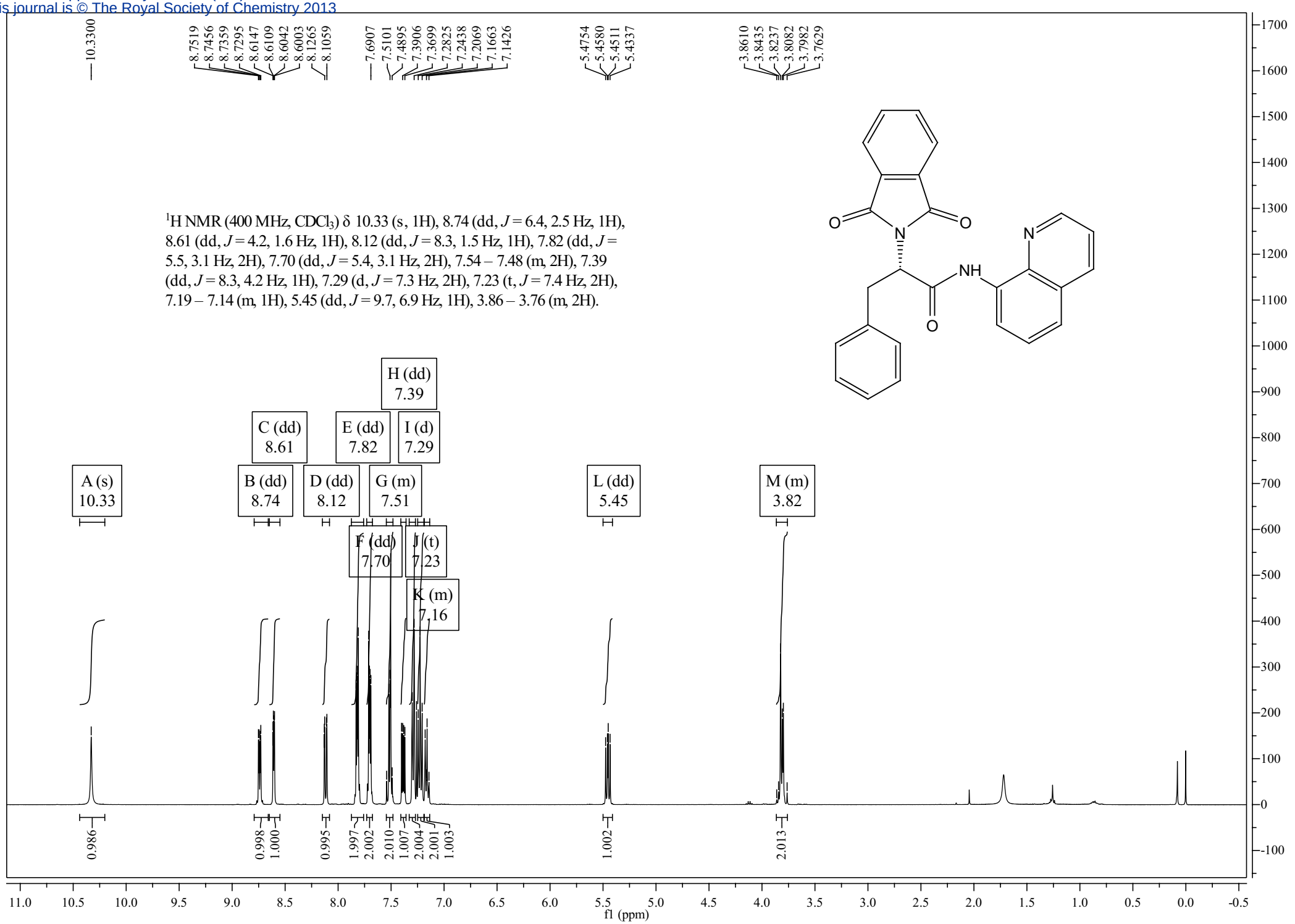
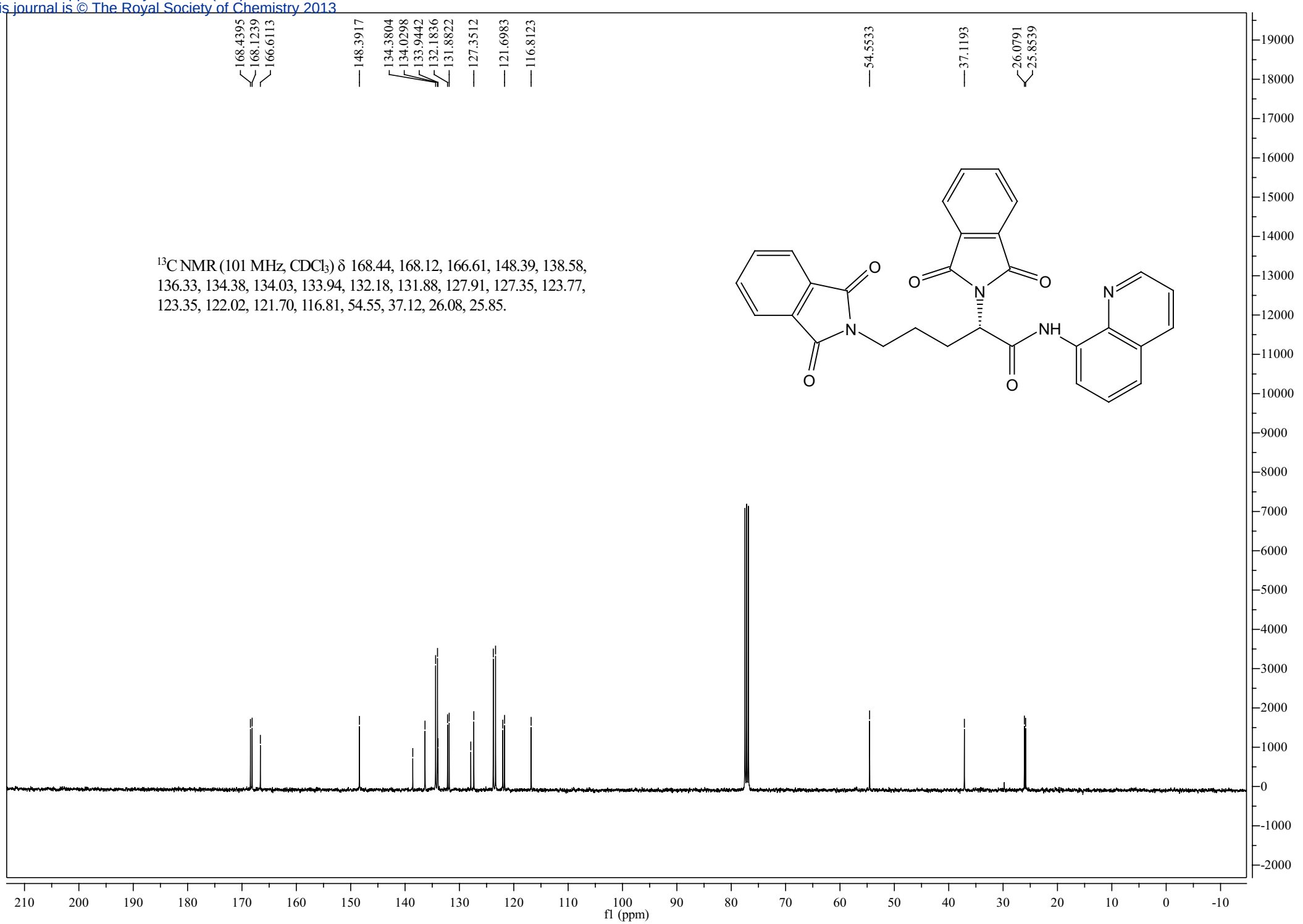
NMR Spectra

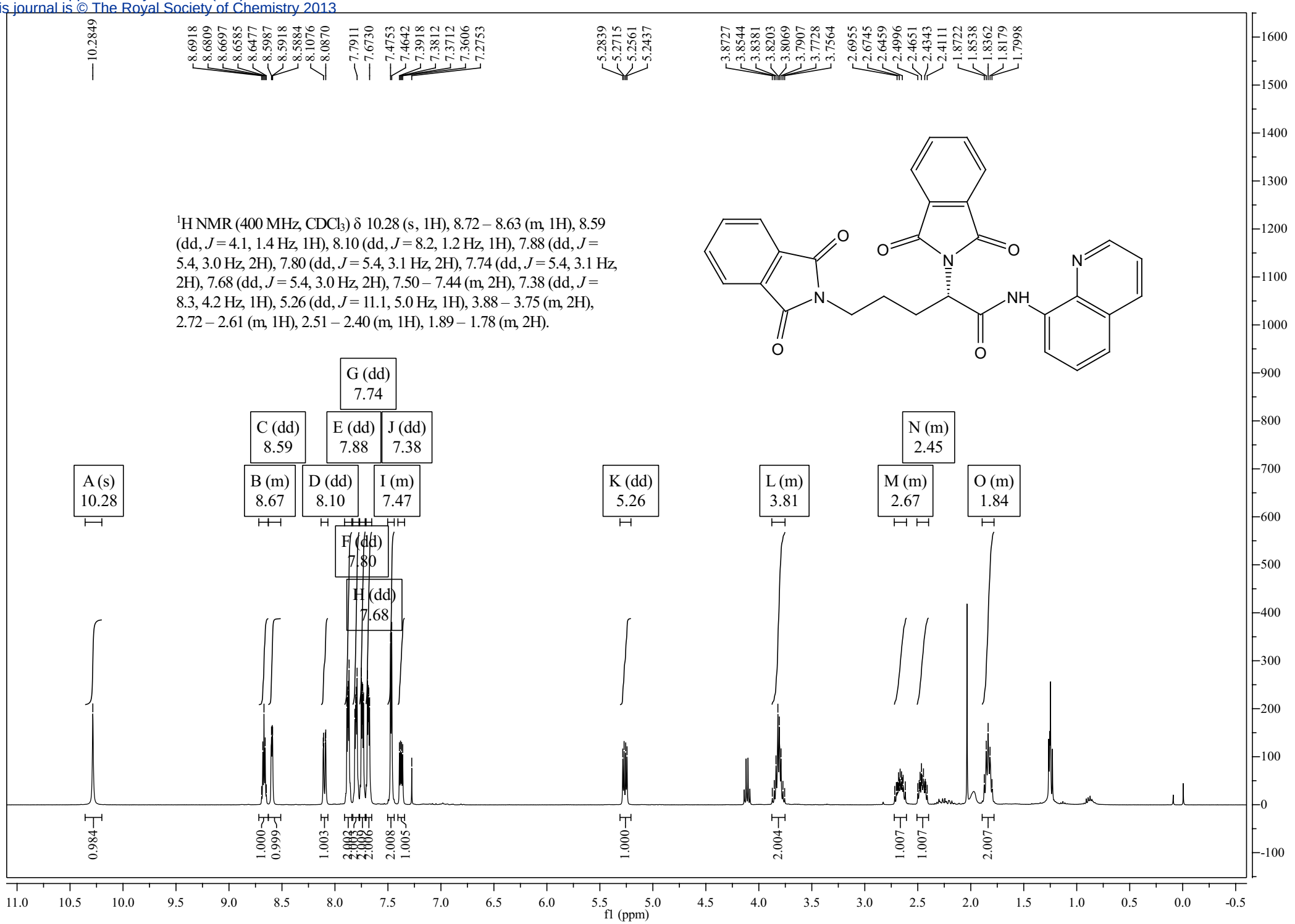


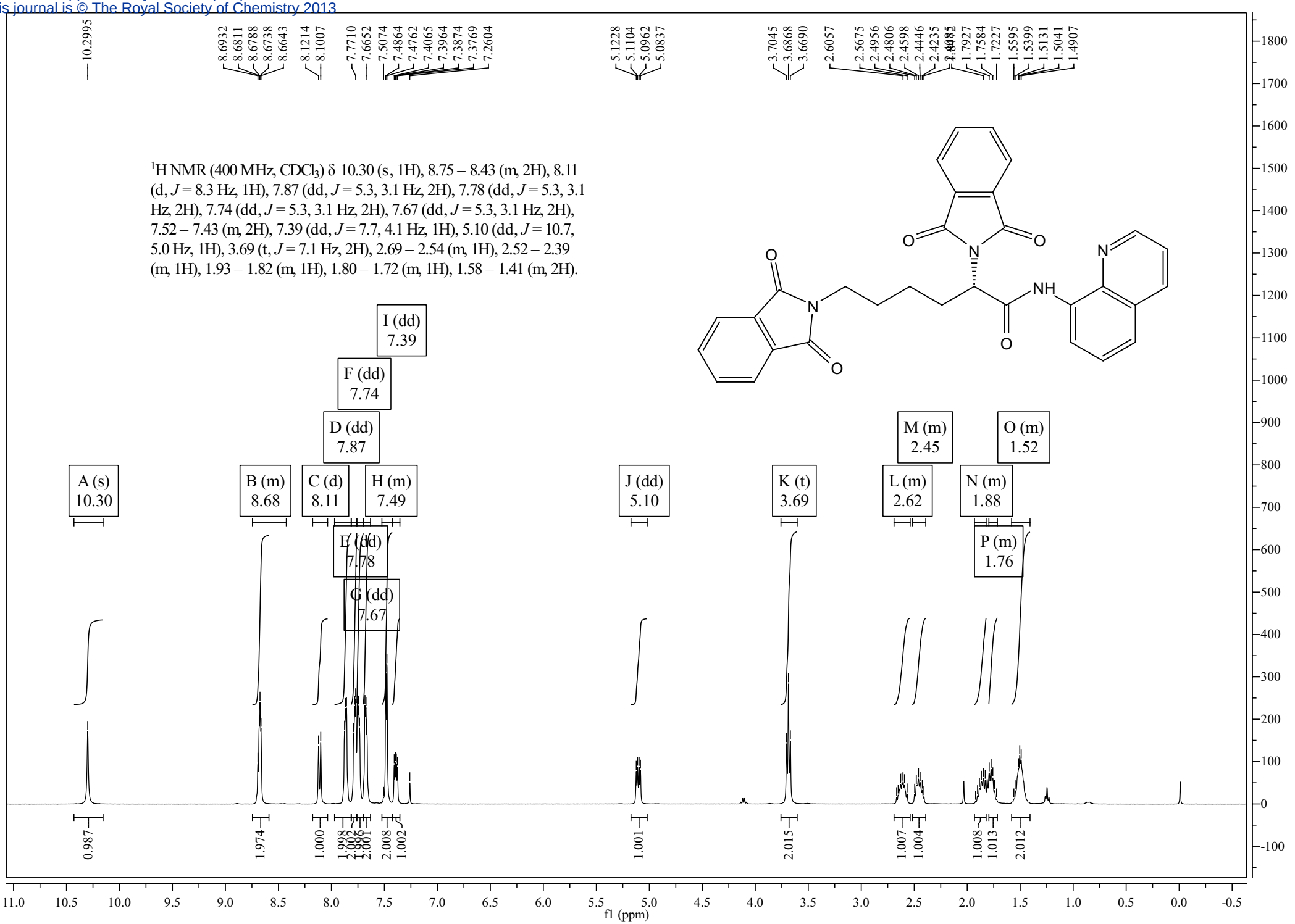


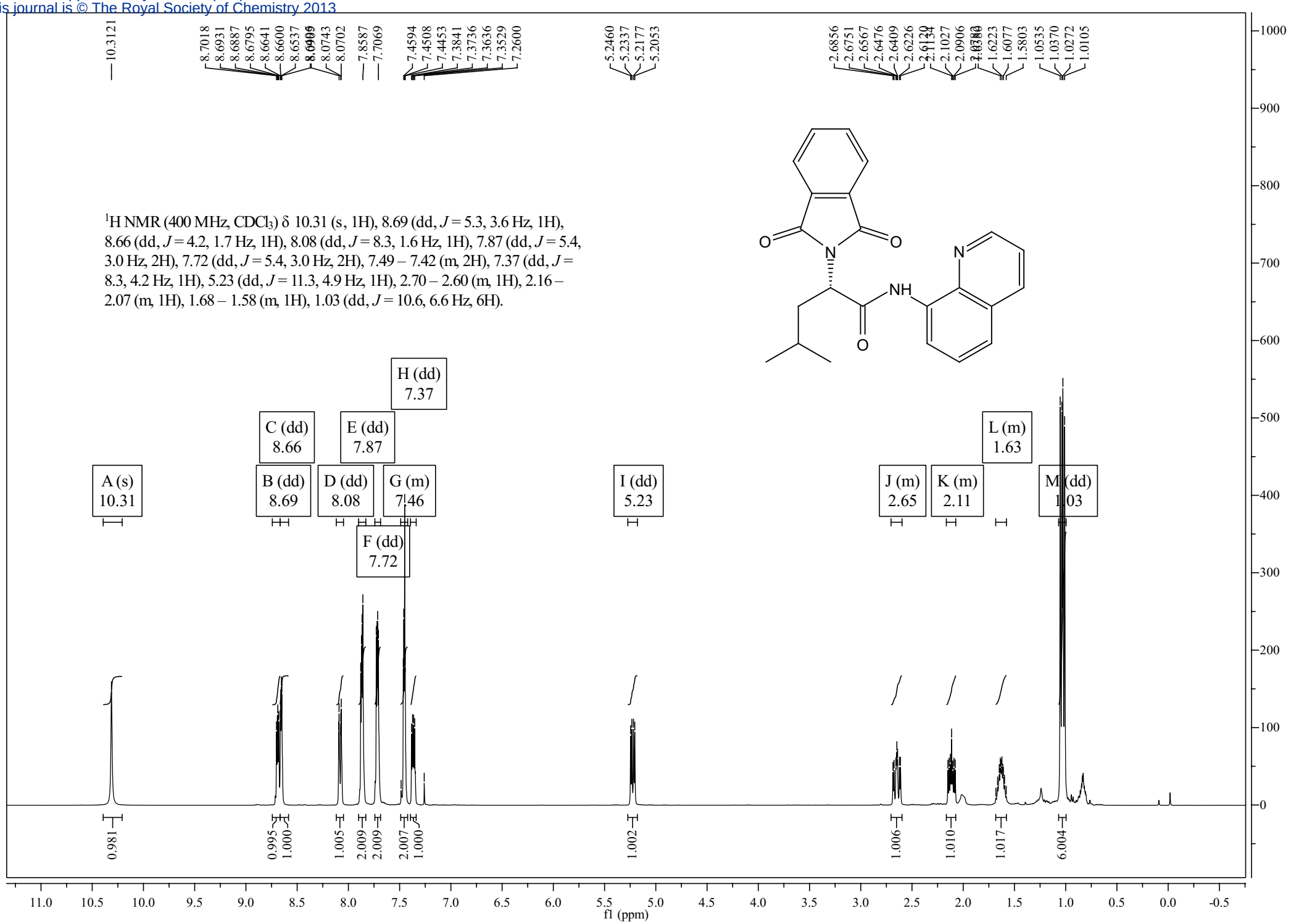


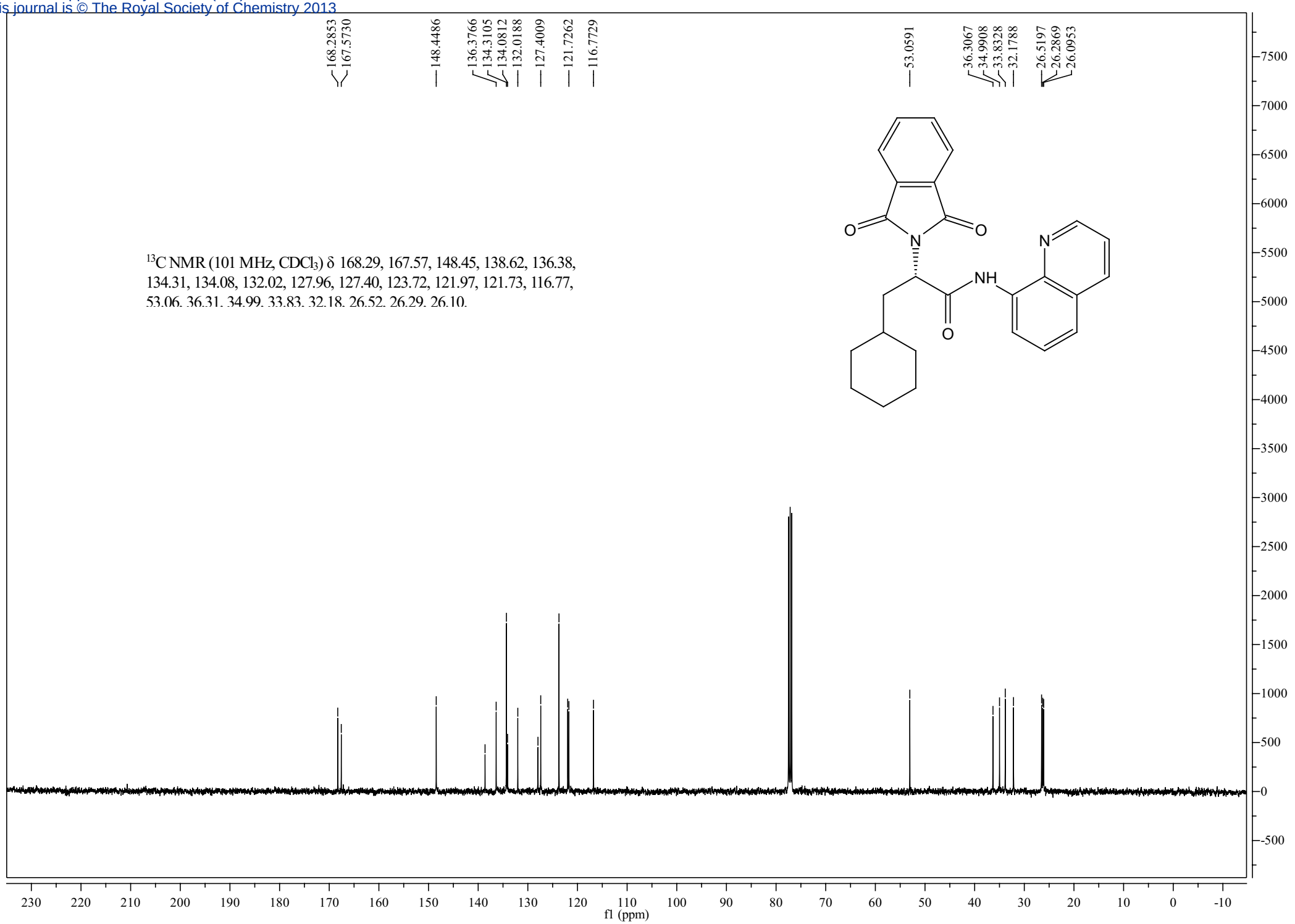


^{13}C NMR (101 MHz, $CDCl_3$) δ 168.44, 168.12, 166.61, 148.39, 138.58, 136.33, 134.38, 134.03, 133.94, 132.18, 131.88, 127.91, 127.35, 123.77, 123.35, 122.02, 121.70, 116.81, 54.55, 37.12, 26.08, 25.85.

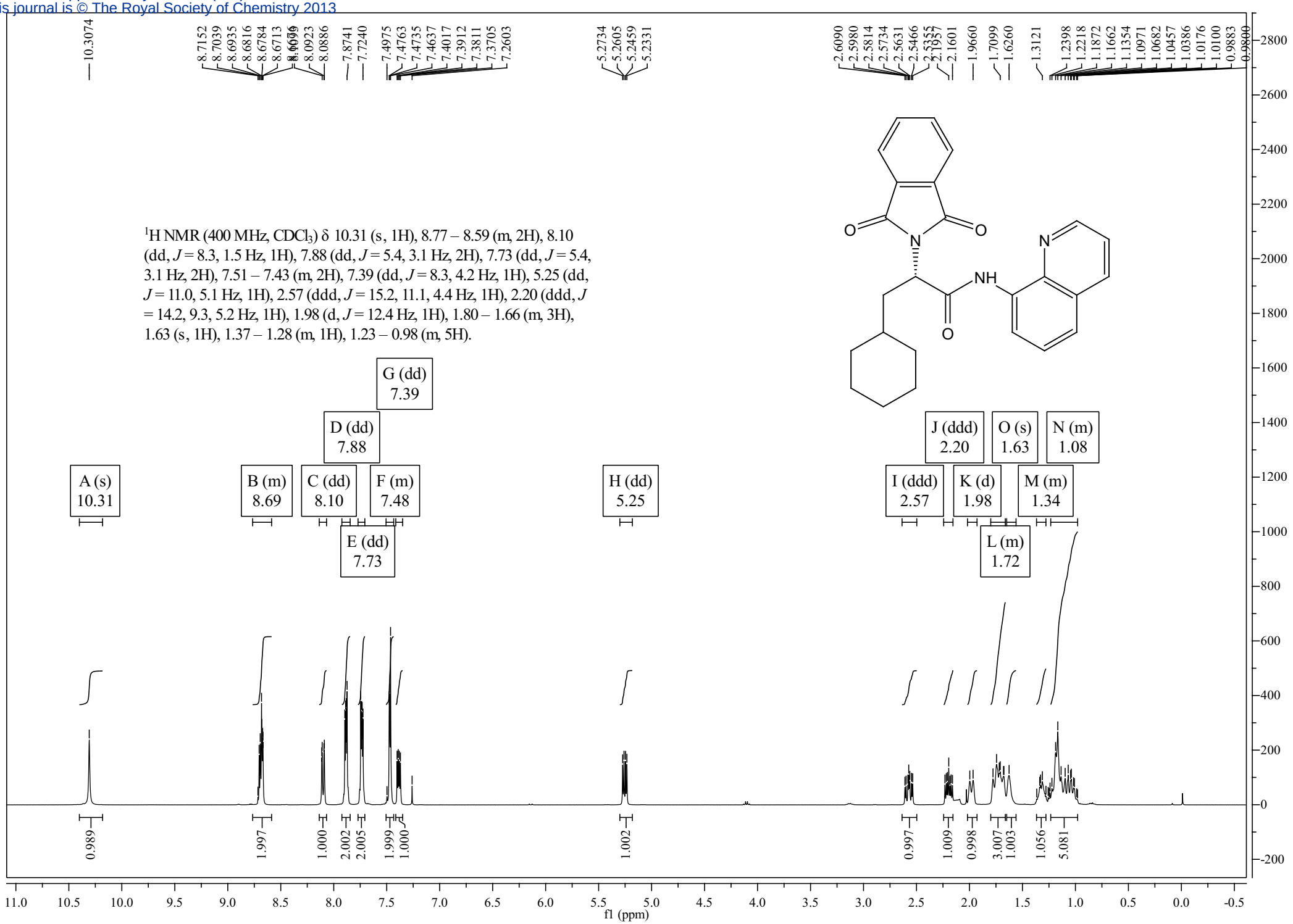


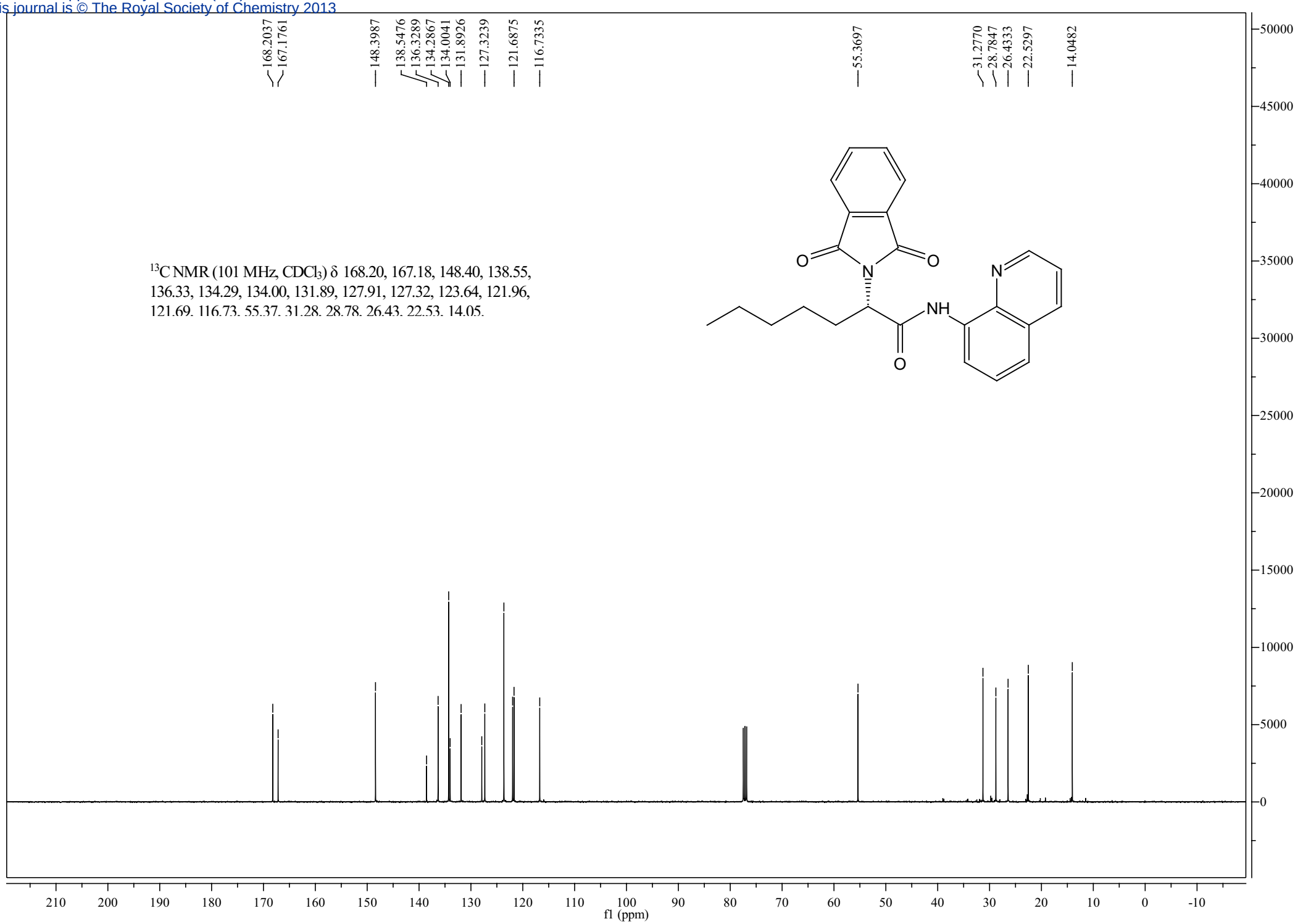




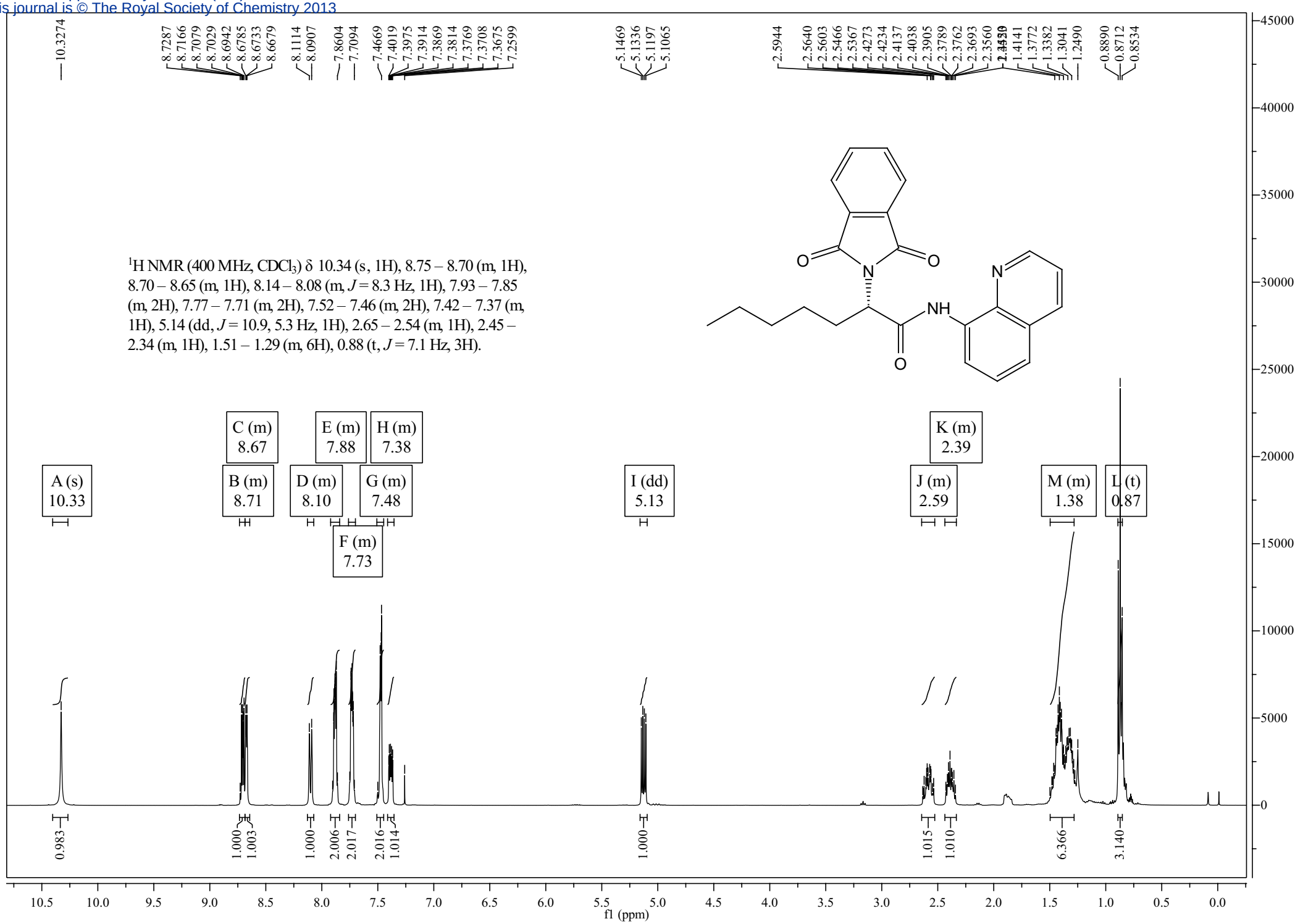


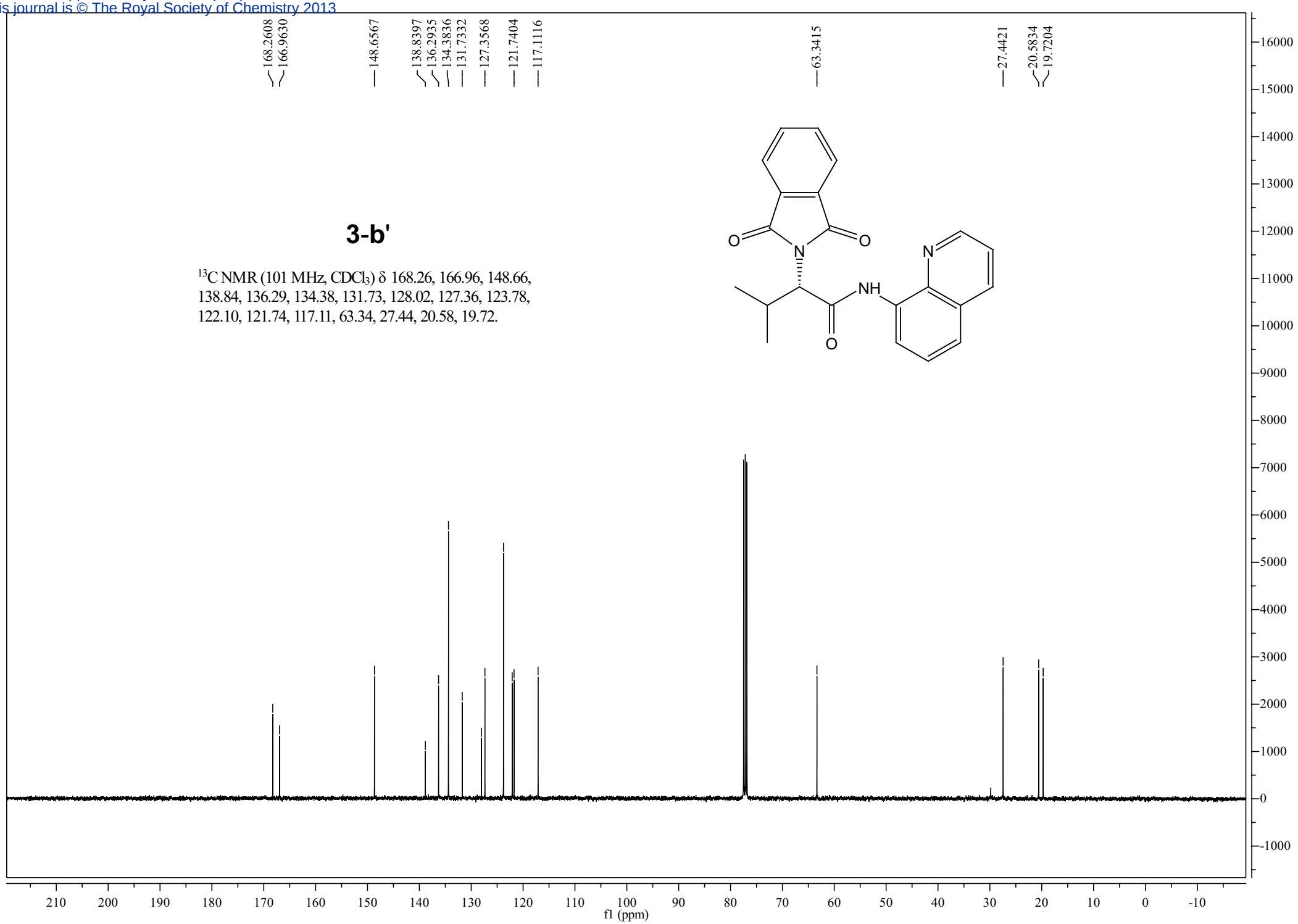
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.29, 167.57, 148.45, 138.62, 136.38, 134.31, 134.08, 132.02, 127.96, 127.40, 123.72, 121.97, 121.73, 116.77, 53.06, 36.31, 34.99, 33.83, 32.18, 26.52, 26.29, 26.10.





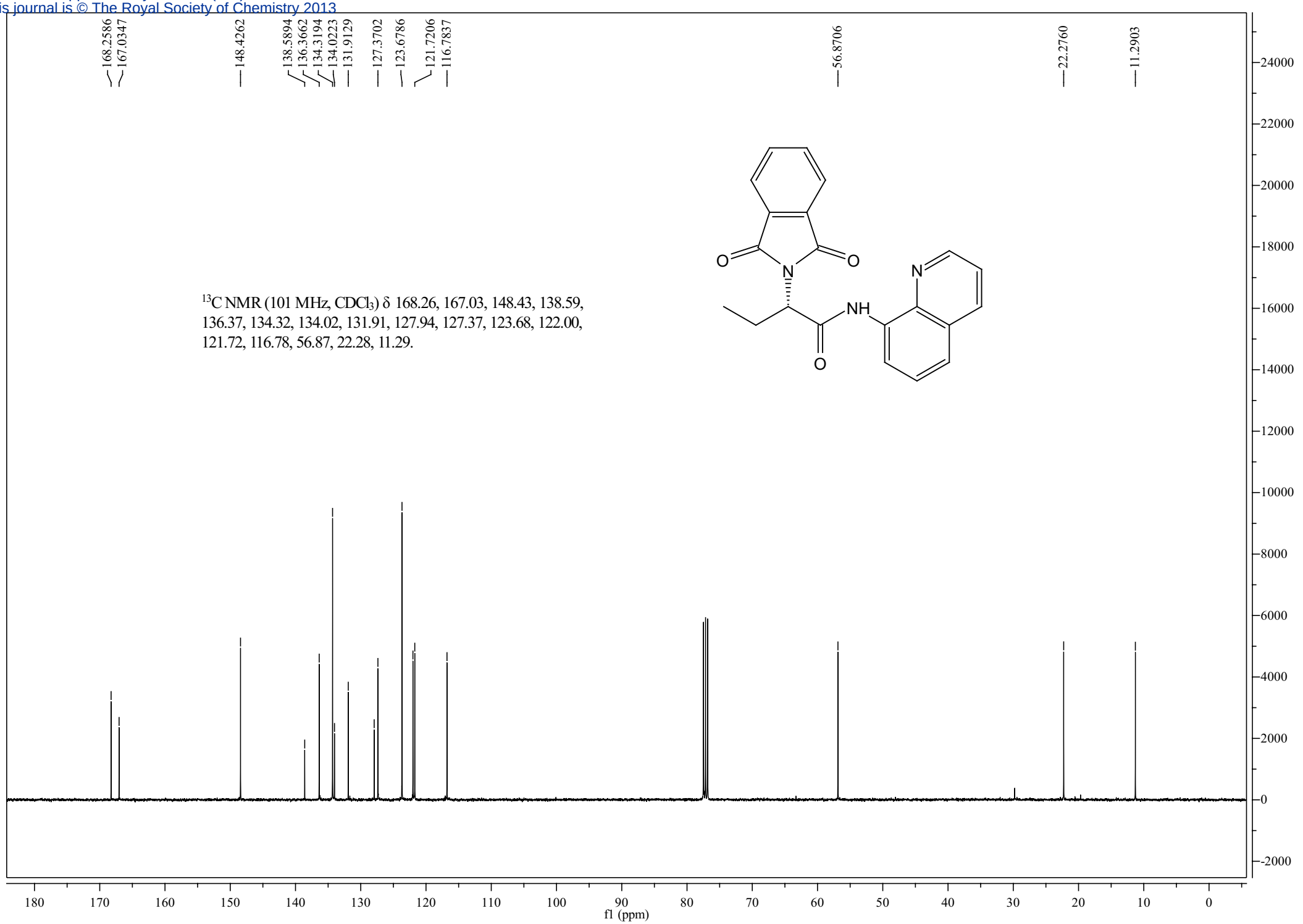
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.20, 167.18, 148.40, 138.55, 136.33, 134.29, 134.00, 131.89, 127.91, 127.32, 123.64, 121.96, 121.69, 116.73, 55.37, 31.28, 28.78, 26.43, 22.53, 14.05.



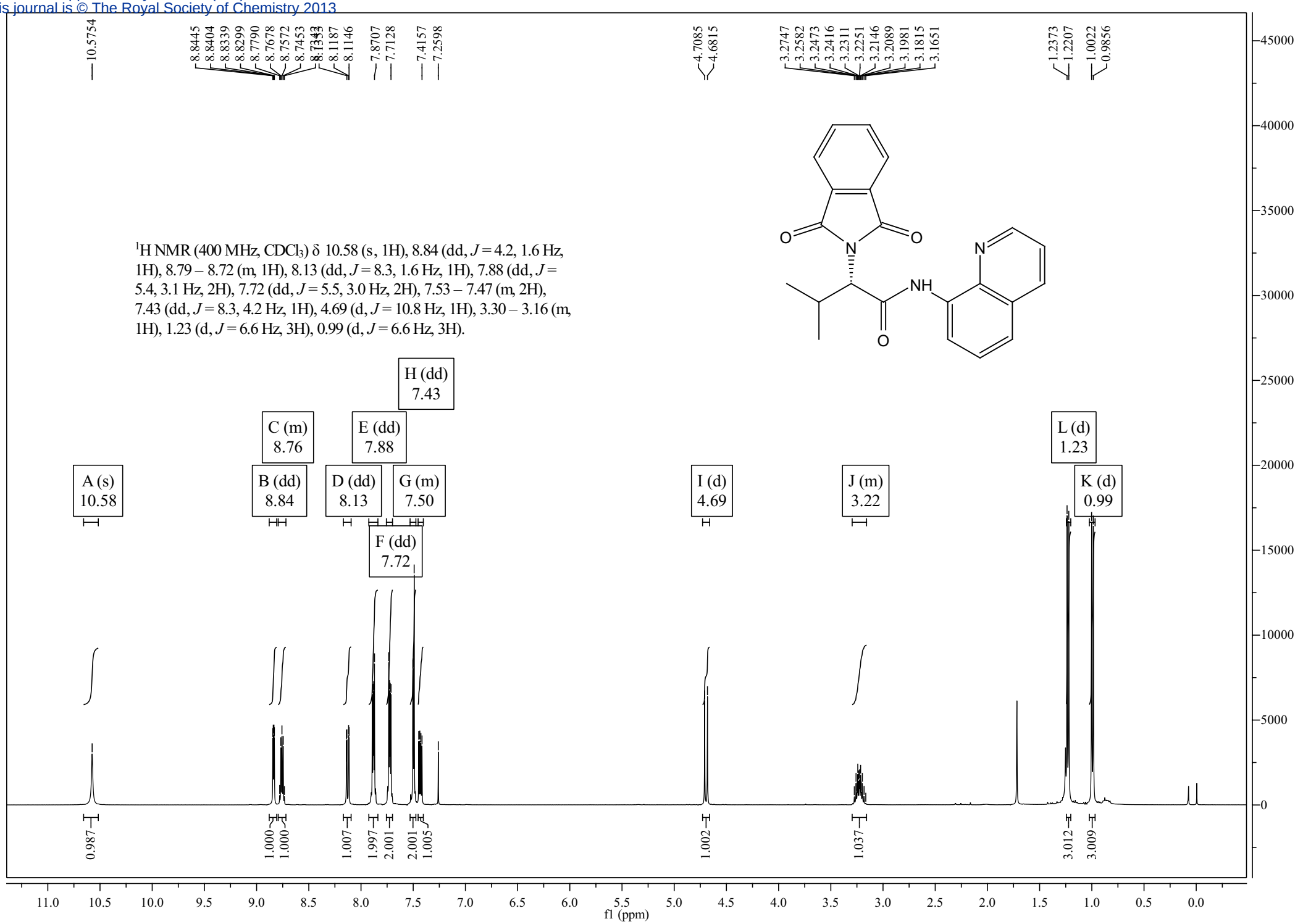


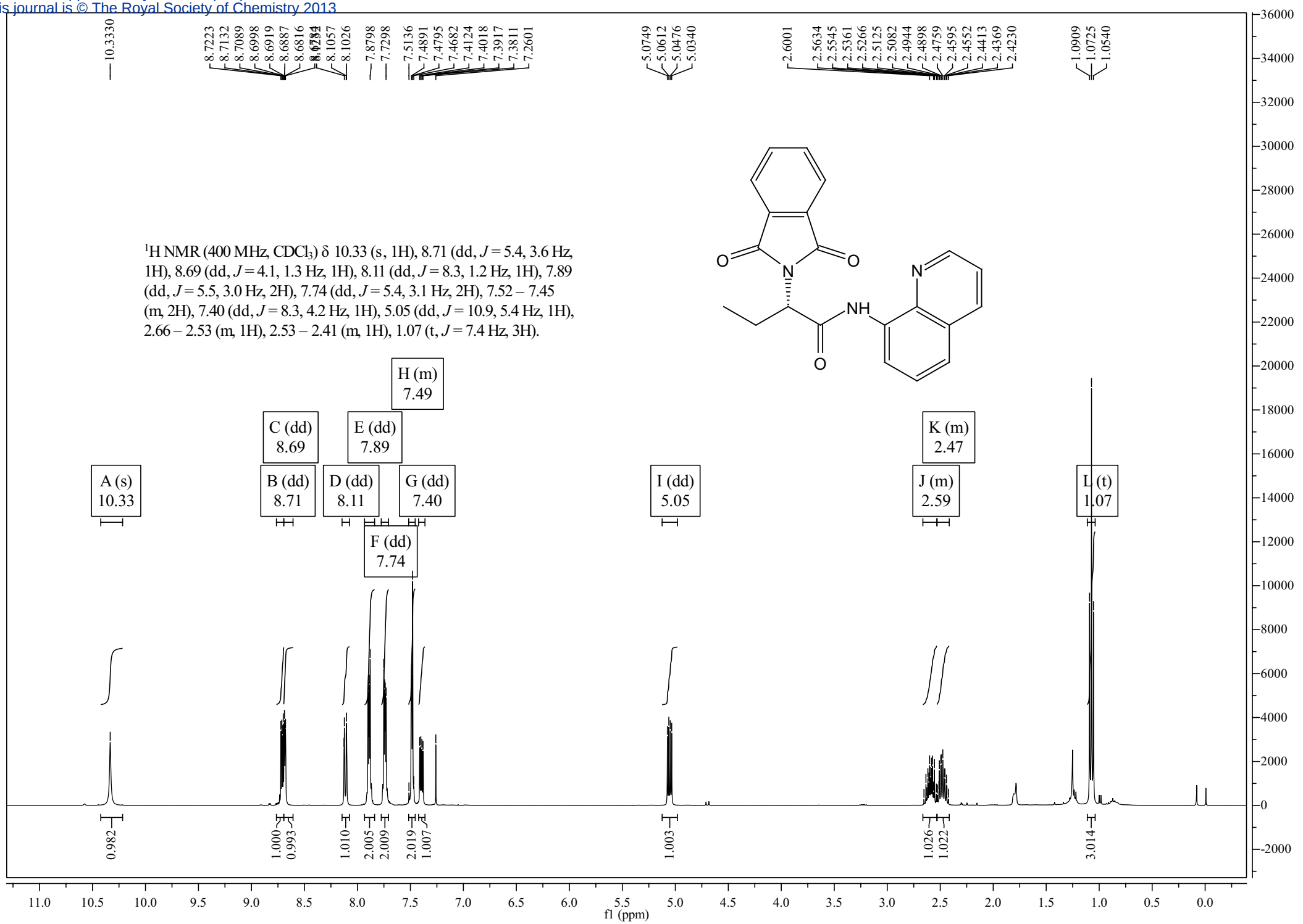
3-b'

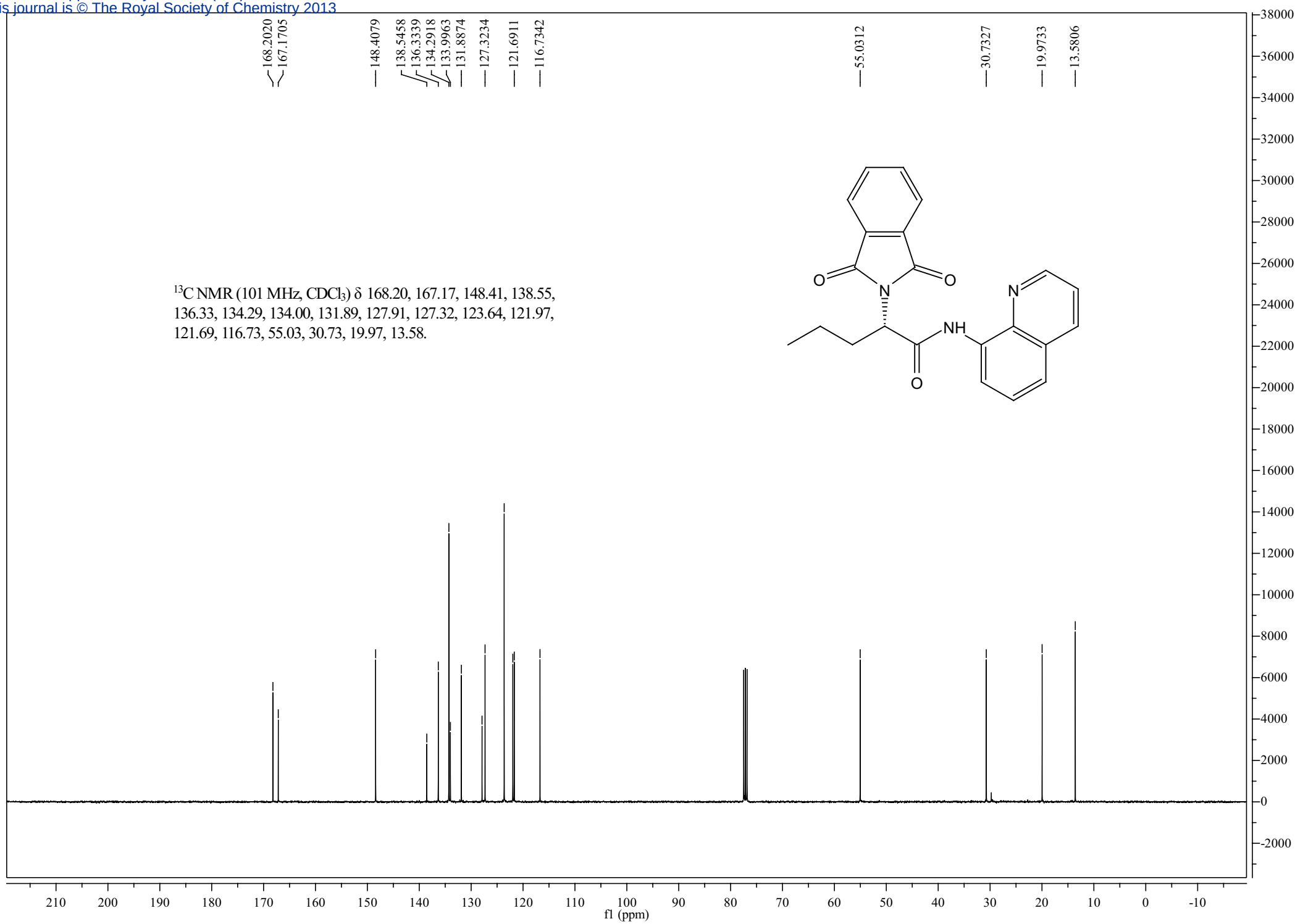
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.26, 166.96, 148.66, 138.84, 136.29, 134.38, 131.73, 128.02, 127.36, 123.78, 122.10, 121.74, 117.11, 63.34, 27.44, 20.58, 19.72.



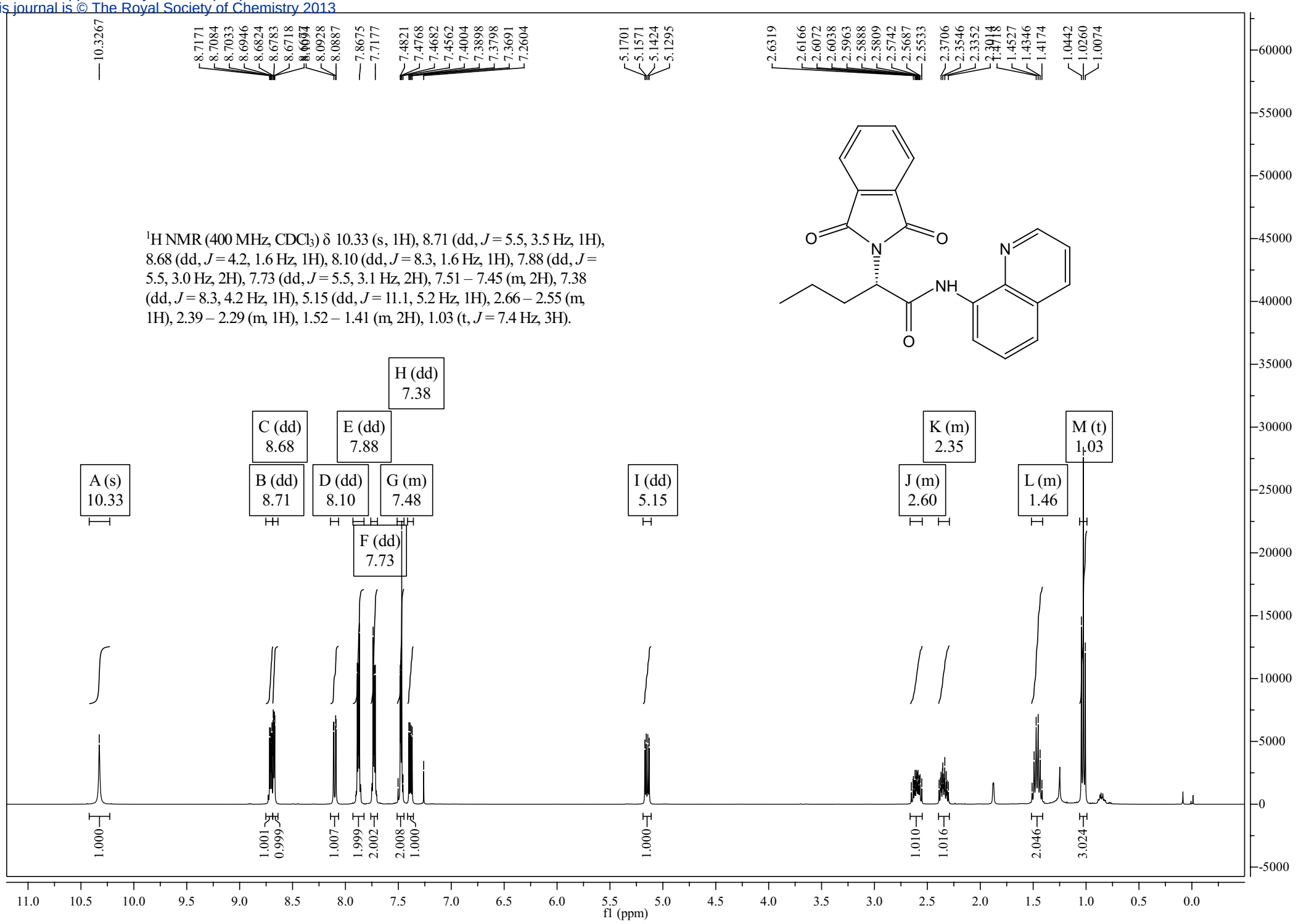
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.26, 167.03, 148.43, 138.59, 136.37, 134.32, 134.02, 131.91, 127.94, 127.37, 123.68, 122.00, 121.72, 116.78, 56.87, 22.28, 11.29.



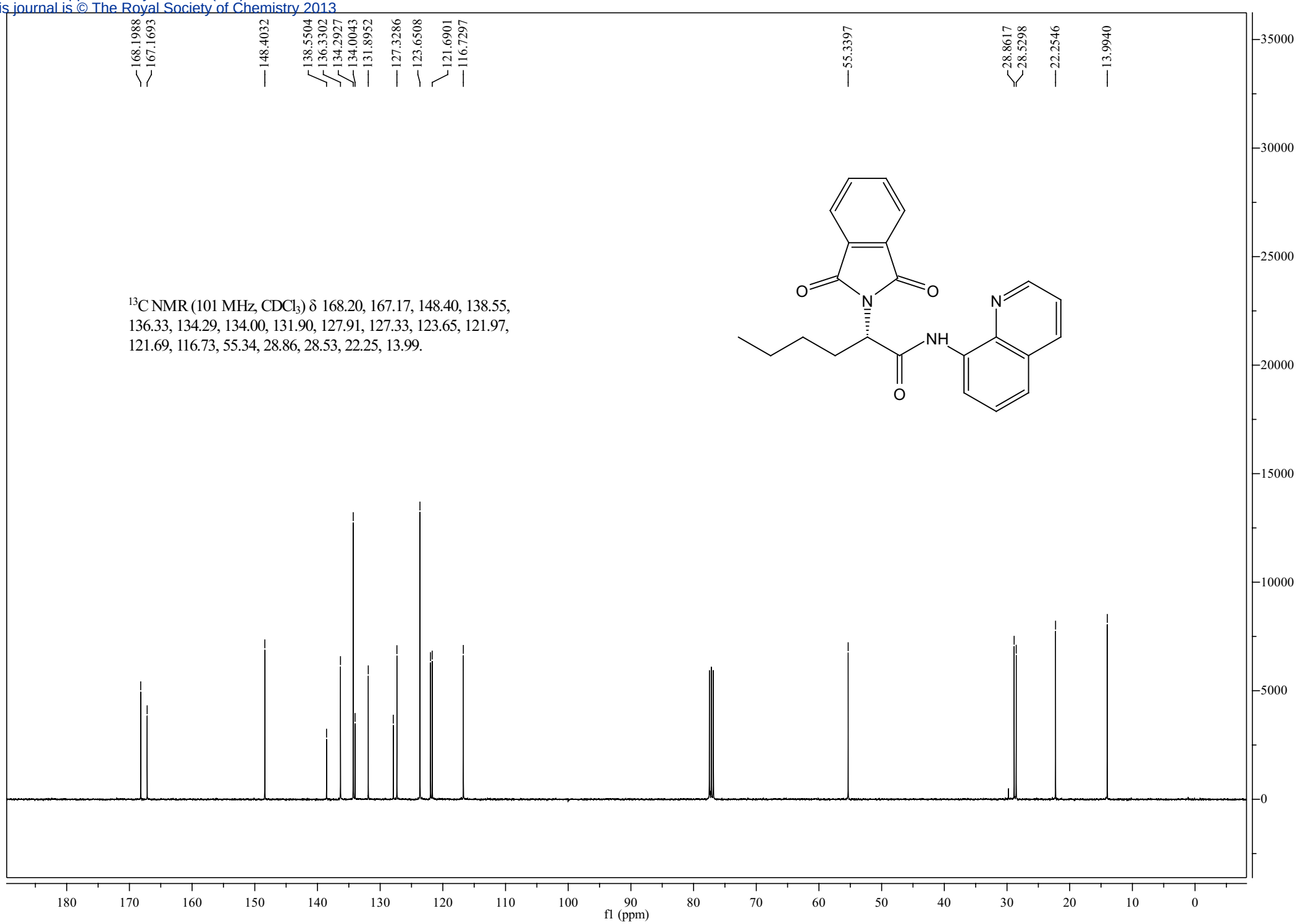




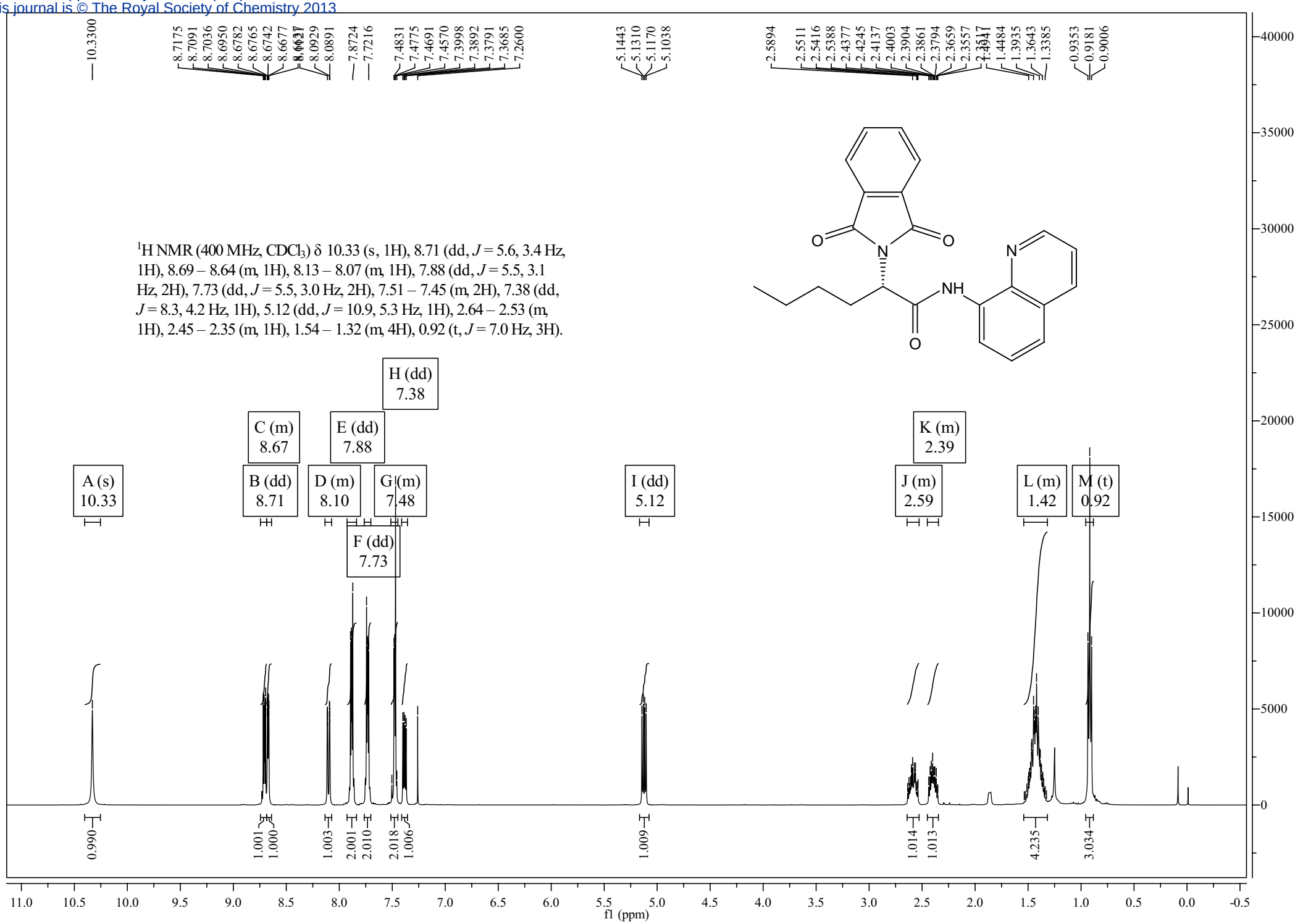
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.20, 167.17, 148.41, 138.55, 136.33, 134.29, 134.00, 131.89, 127.91, 127.32, 123.64, 121.97, 121.69, 116.73, 55.03, 30.73, 19.97, 13.58.

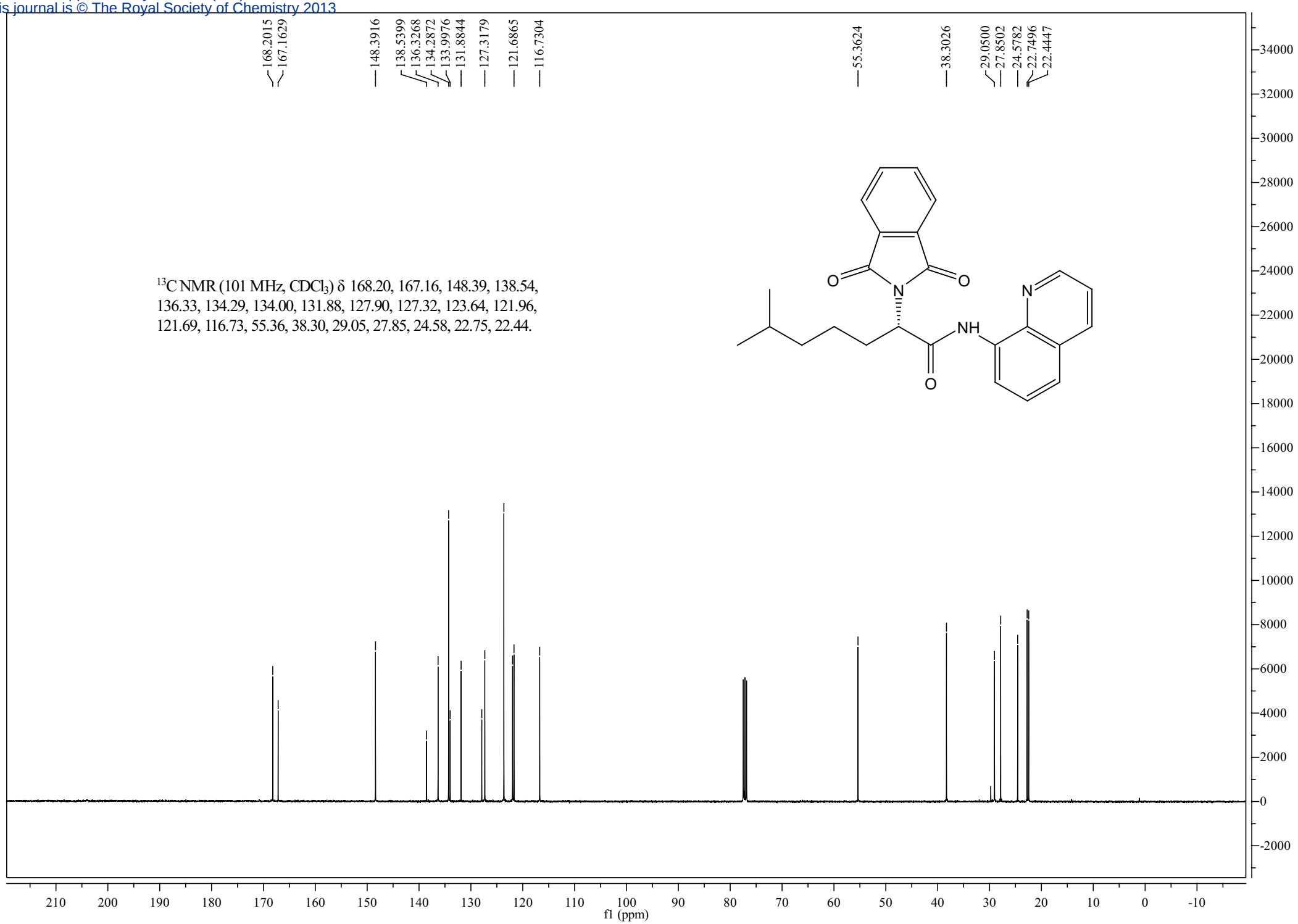


^{1}H NMR (400 MHz, $CDCl_3$) δ 10.33 (s, 1H), 8.71 (dd, J = 5.5, 3.5 Hz, 1H), 8.68 (dd, J = 4.2, 1.6 Hz, 1H), 8.10 (dd, J = 8.3, 1.6 Hz, 1H), 7.88 (dd, J = 5.5, 3.0 Hz, 2H), 7.73 (dd, J = 5.5, 3.1 Hz, 2H), 7.51 – 7.45 (m, 2H), 7.38 (dd, J = 8.3, 4.2 Hz, 1H), 5.15 (dd, J = 11.1, 5.2 Hz, 1H), 2.66 – 2.55 (m, 1H), 2.39 – 2.29 (m, 1H), 1.52 – 1.41 (m, 2H), 1.03 (t, J = 7.4 Hz, 3H).

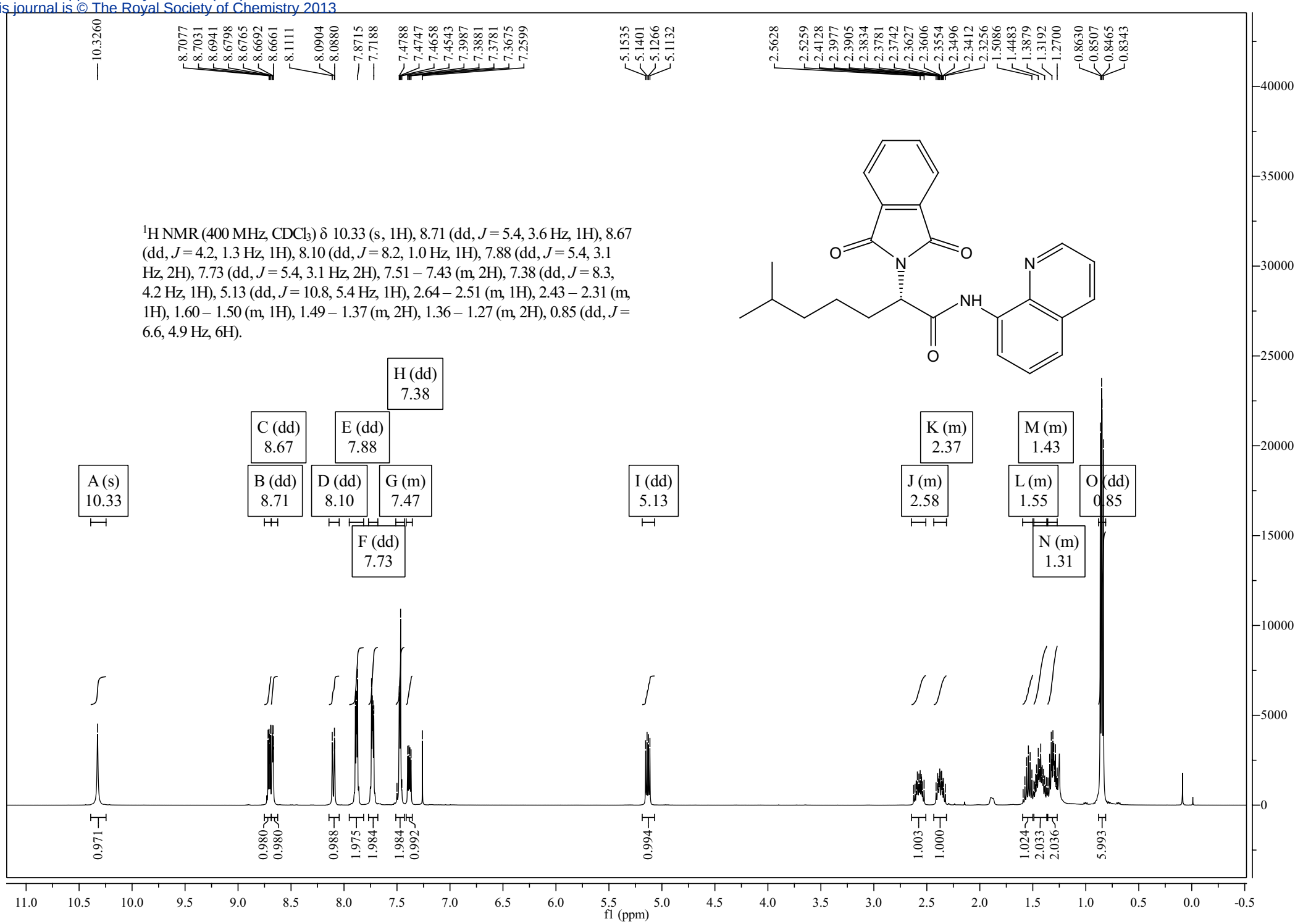


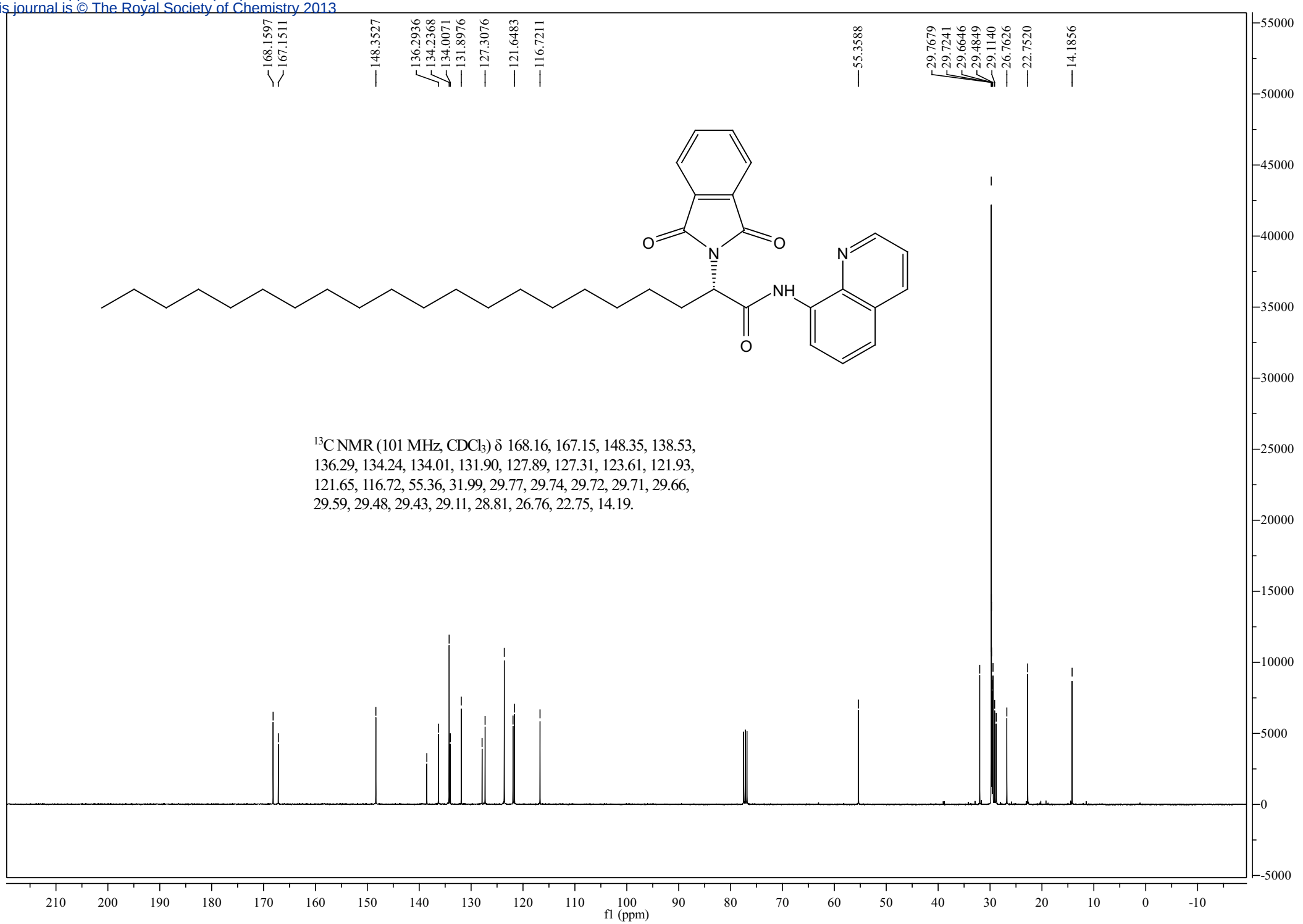
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.20, 167.17, 148.40, 138.55, 136.33, 134.29, 134.00, 131.90, 127.91, 127.33, 123.65, 121.97, 121.69, 116.73, 55.34, 28.86, 28.53, 22.25, 13.99.



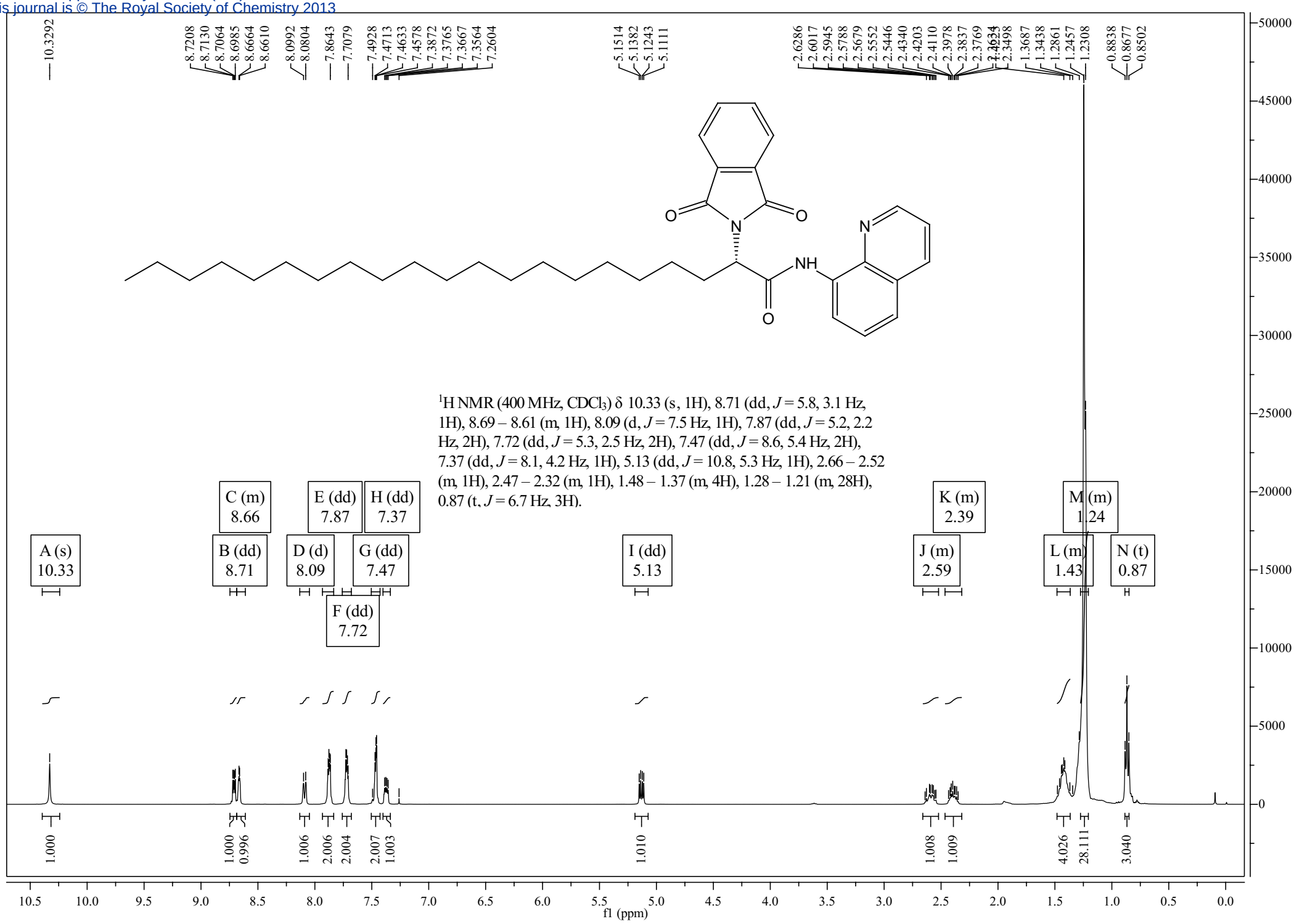


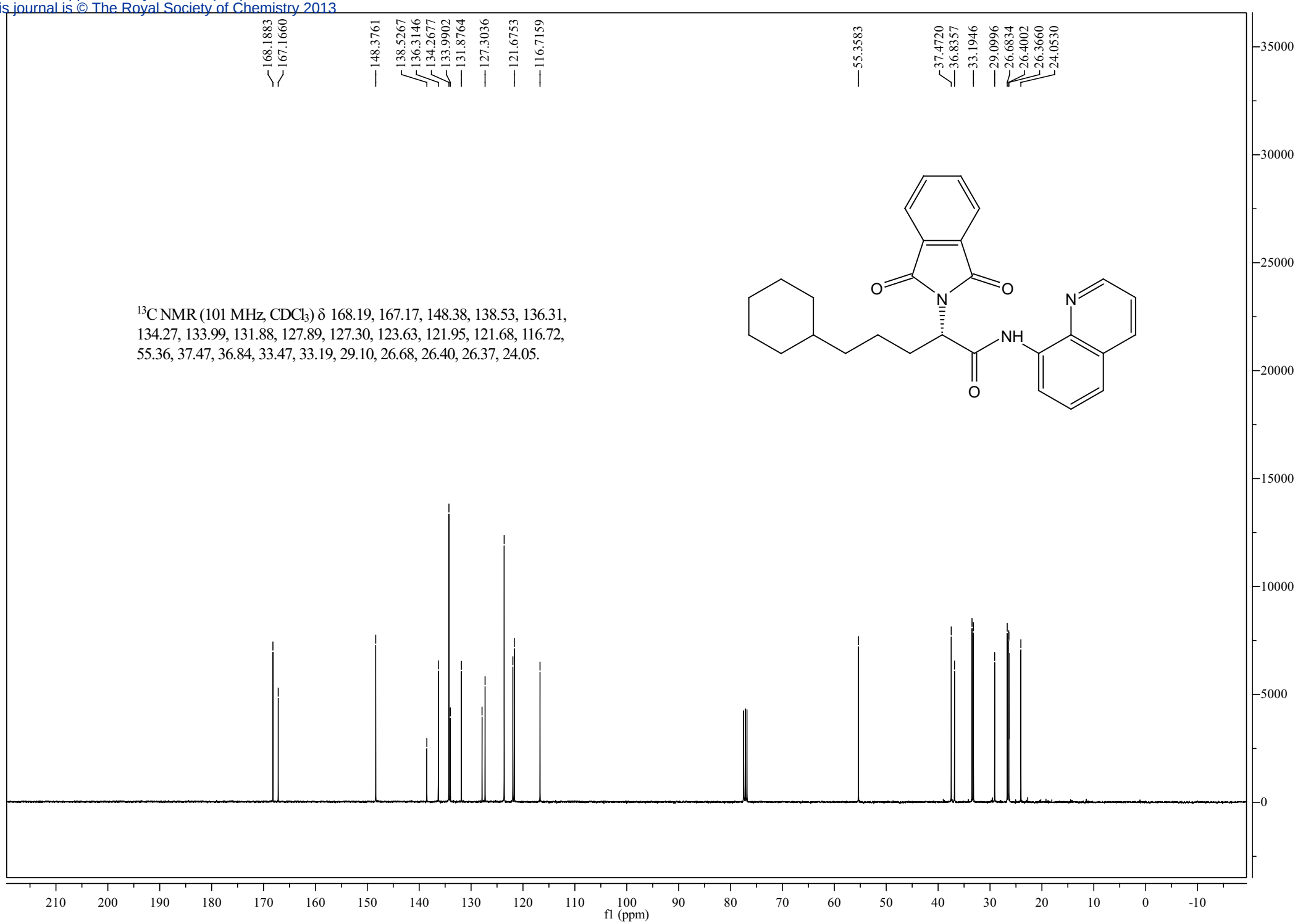
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.20, 167.16, 148.39, 138.54, 136.33, 134.29, 134.00, 131.88, 127.90, 127.32, 123.64, 121.96, 121.69, 116.73, 55.36, 38.30, 29.05, 27.85, 24.58, 22.75, 22.44.



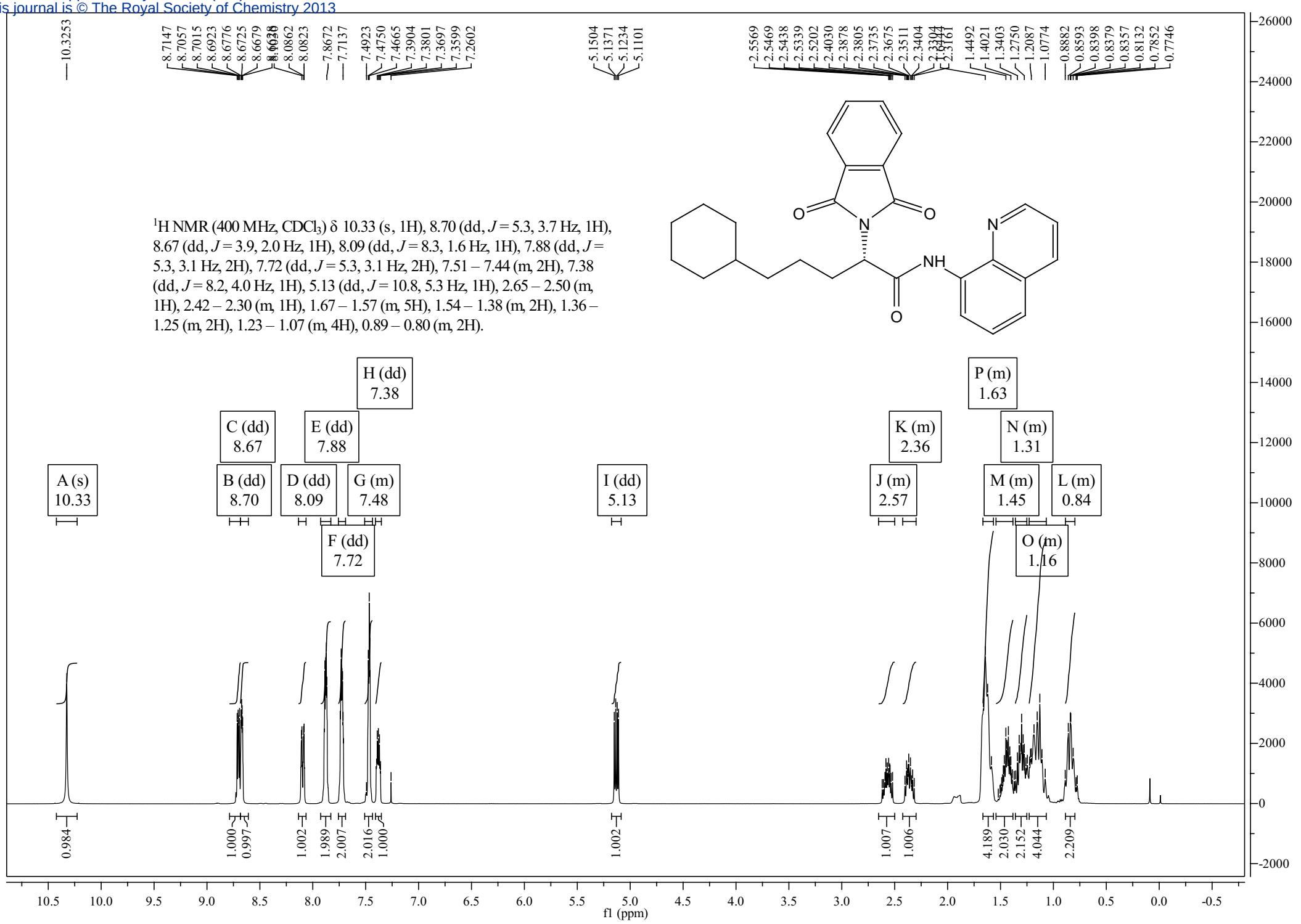


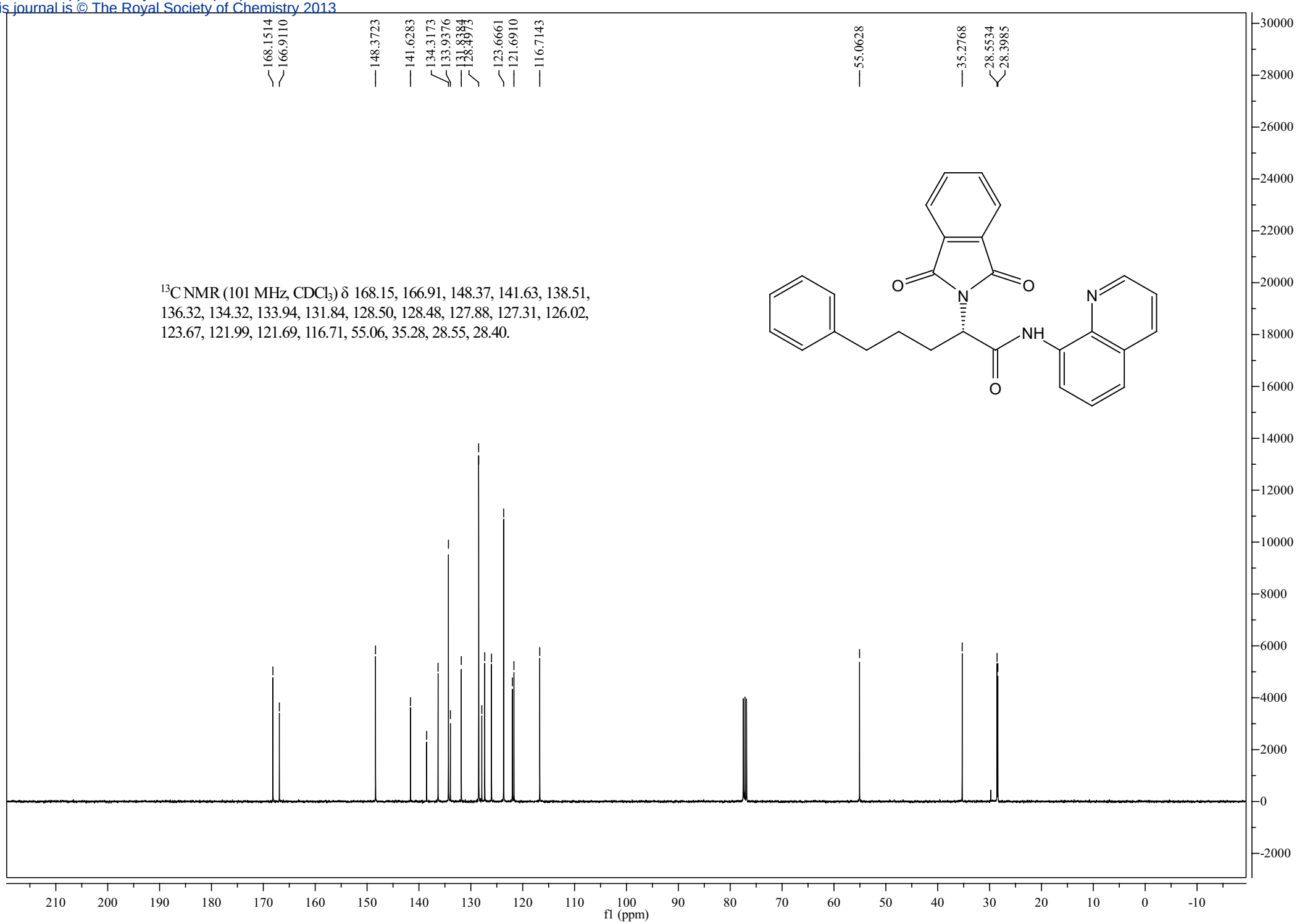
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.16, 167.15, 148.35, 138.53, 136.29, 134.24, 134.01, 131.90, 127.89, 127.31, 123.61, 121.93, 121.65, 116.72, 55.36, 31.99, 29.77, 29.74, 29.72, 29.71, 29.66, 29.59, 29.48, 29.43, 29.11, 28.81, 26.76, 22.75, 14.19.



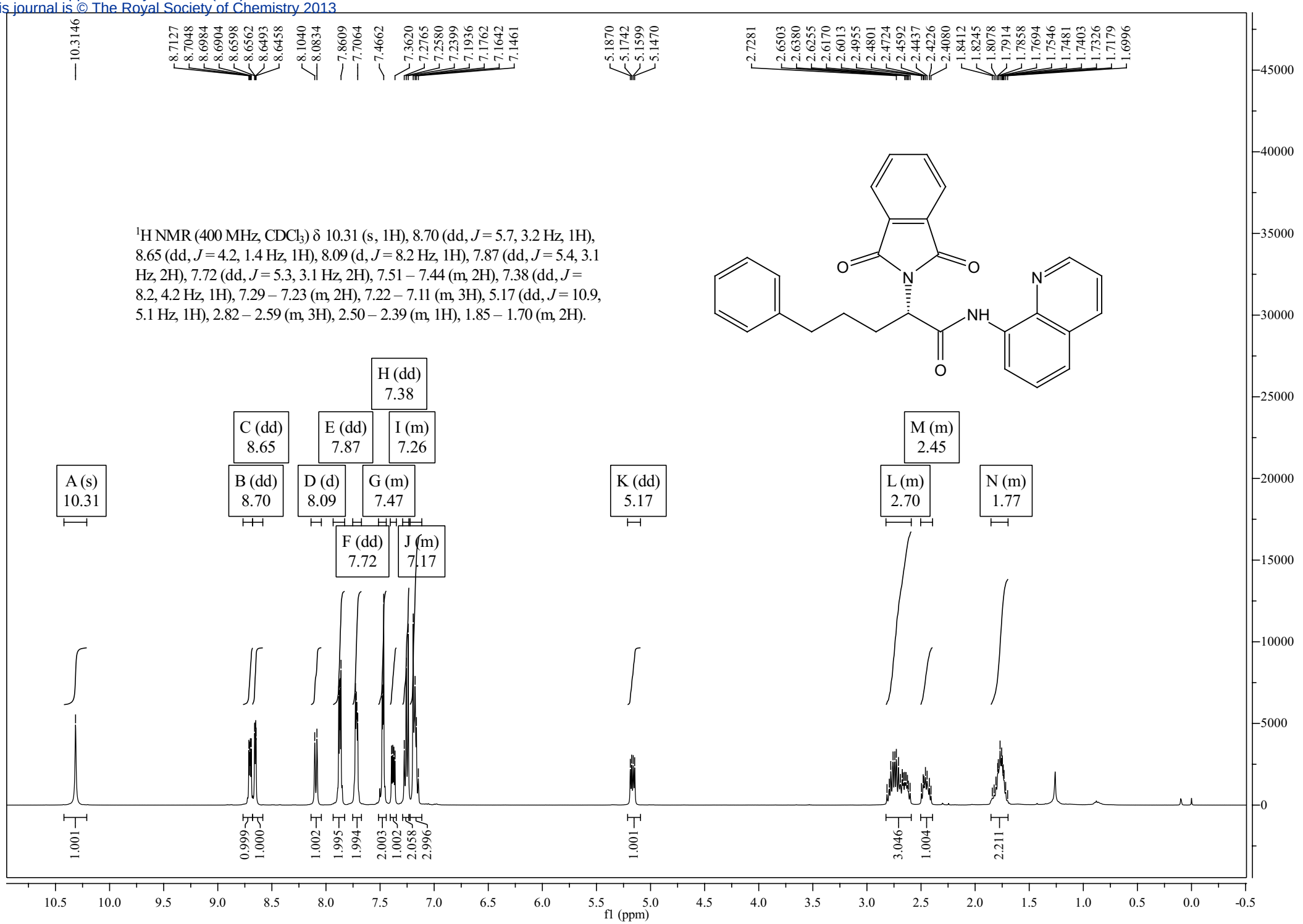


^{13}C NMR (101 MHz, $CDCl_3$) δ 168.19, 167.17, 148.38, 138.53, 136.31, 134.27, 133.99, 131.88, 127.89, 127.30, 123.63, 121.95, 121.68, 116.72, 55.36, 37.47, 36.84, 33.47, 33.19, 29.10, 26.68, 26.40, 26.37, 24.05.

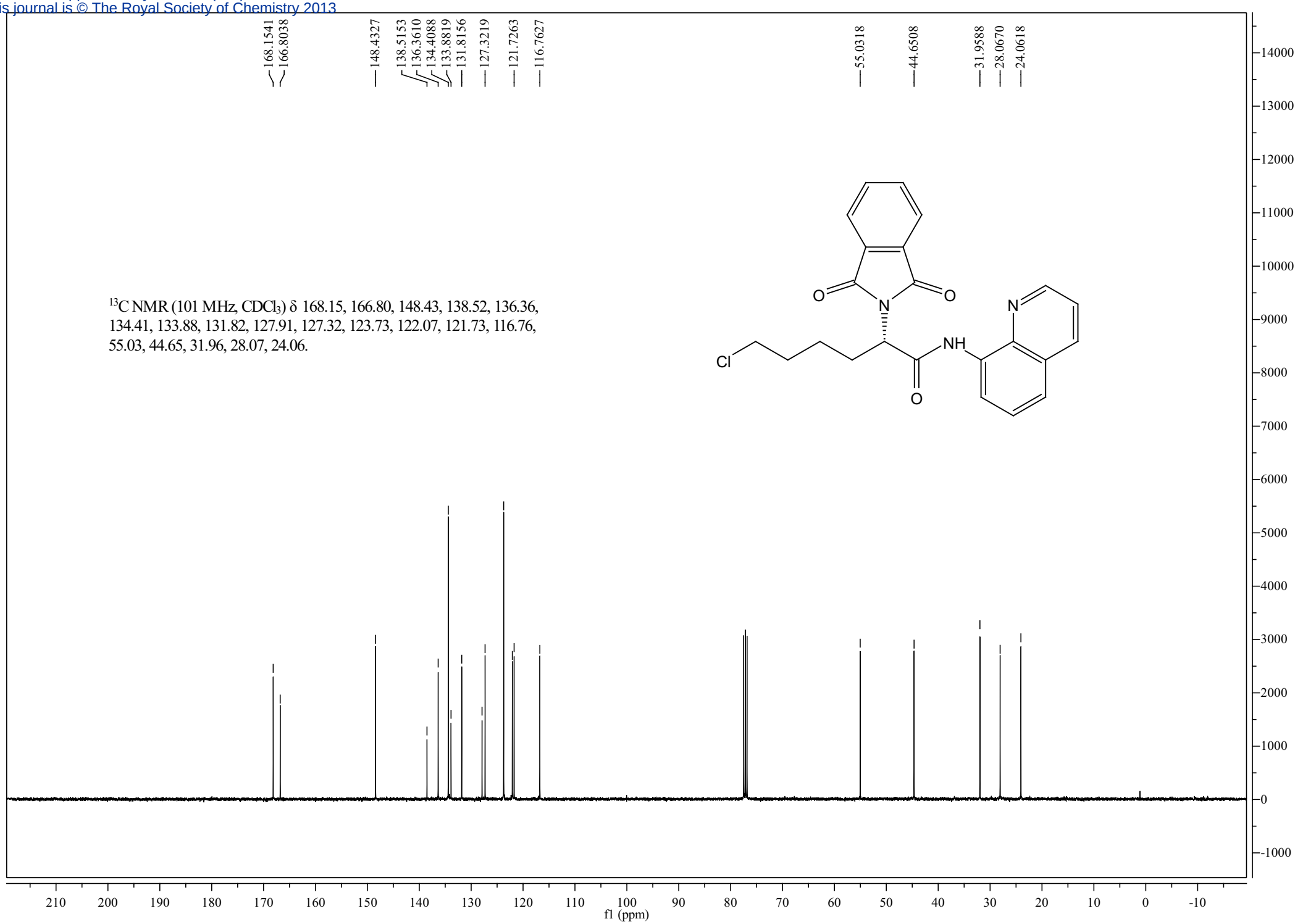




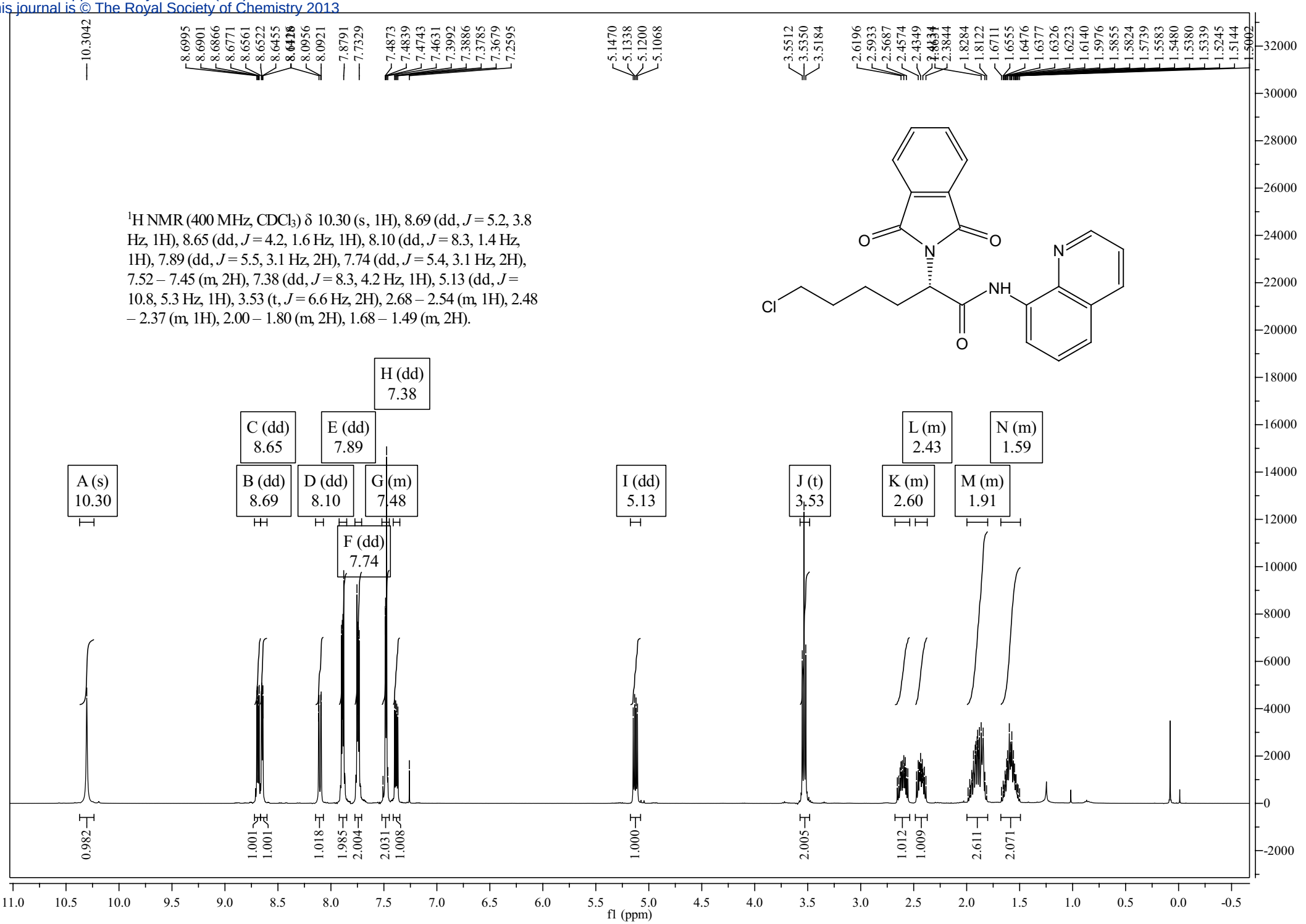
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.15, 166.91, 148.37, 141.63, 138.51, 136.32, 134.32, 133.94, 131.84, 128.50, 128.48, 127.88, 127.31, 126.02, 123.67, 121.99, 121.69, 116.71, 55.06, 35.28, 28.55, 28.40.



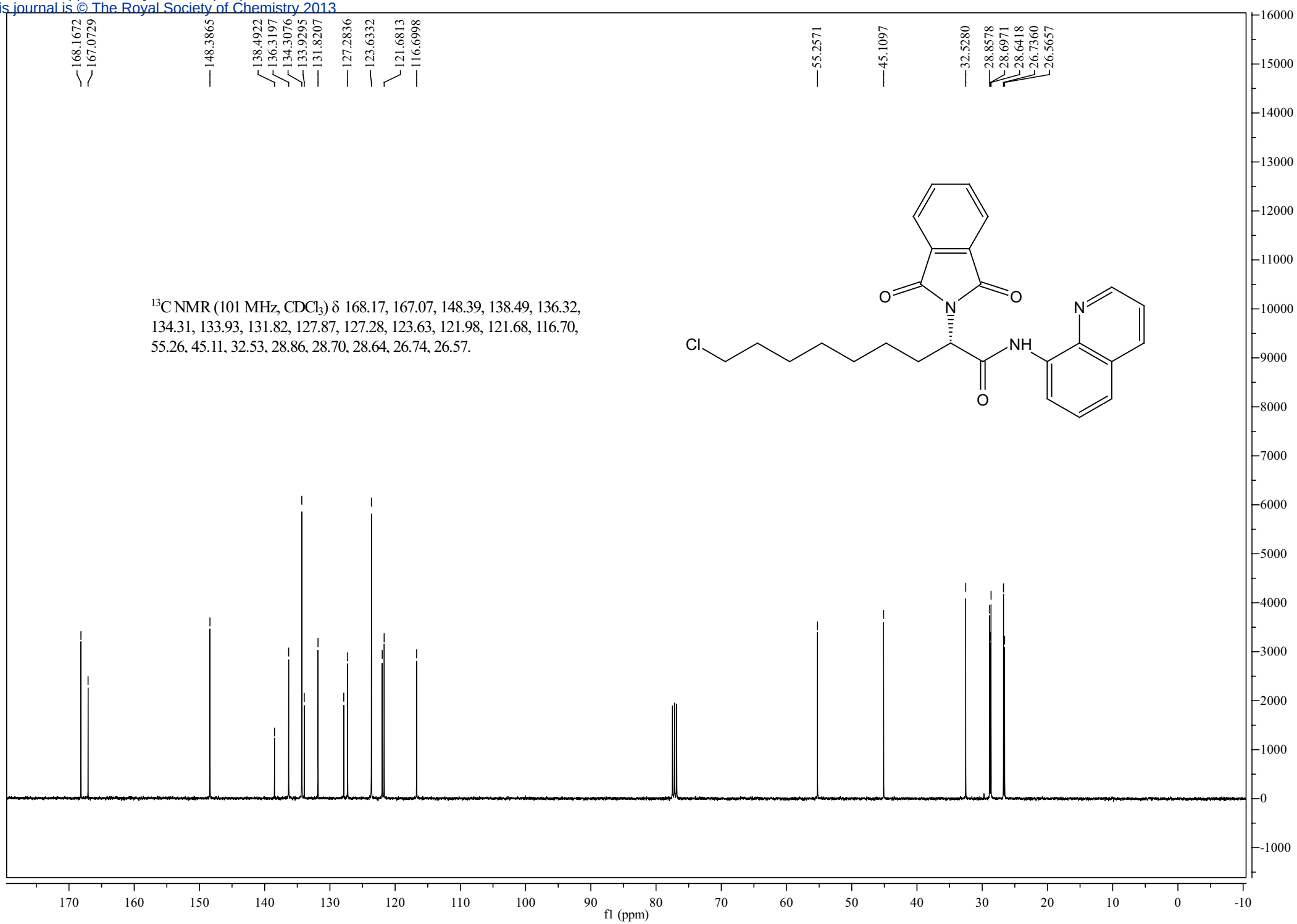
^{1}H NMR (400 MHz, $CDCl_3$) δ 10.31 (s, 1H), 8.70 (dd, *J* = 5.7, 3.2 Hz, 1H), 8.65 (dd, *J* = 4.2, 1.4 Hz, 1H), 8.09 (d, *J* = 8.2 Hz, 1H), 7.87 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.72 (dd, *J* = 5.3, 3.1 Hz, 2H), 7.51 – 7.44 (m, 2H), 7.38 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.29 – 7.23 (m, 2H), 7.22 – 7.11 (m, 3H), 5.17 (dd, *J* = 10.9, 5.1 Hz, 1H), 2.82 – 2.59 (m, 3H), 2.50 – 2.39 (m, 1H), 1.85 – 1.70 (m, 2H).



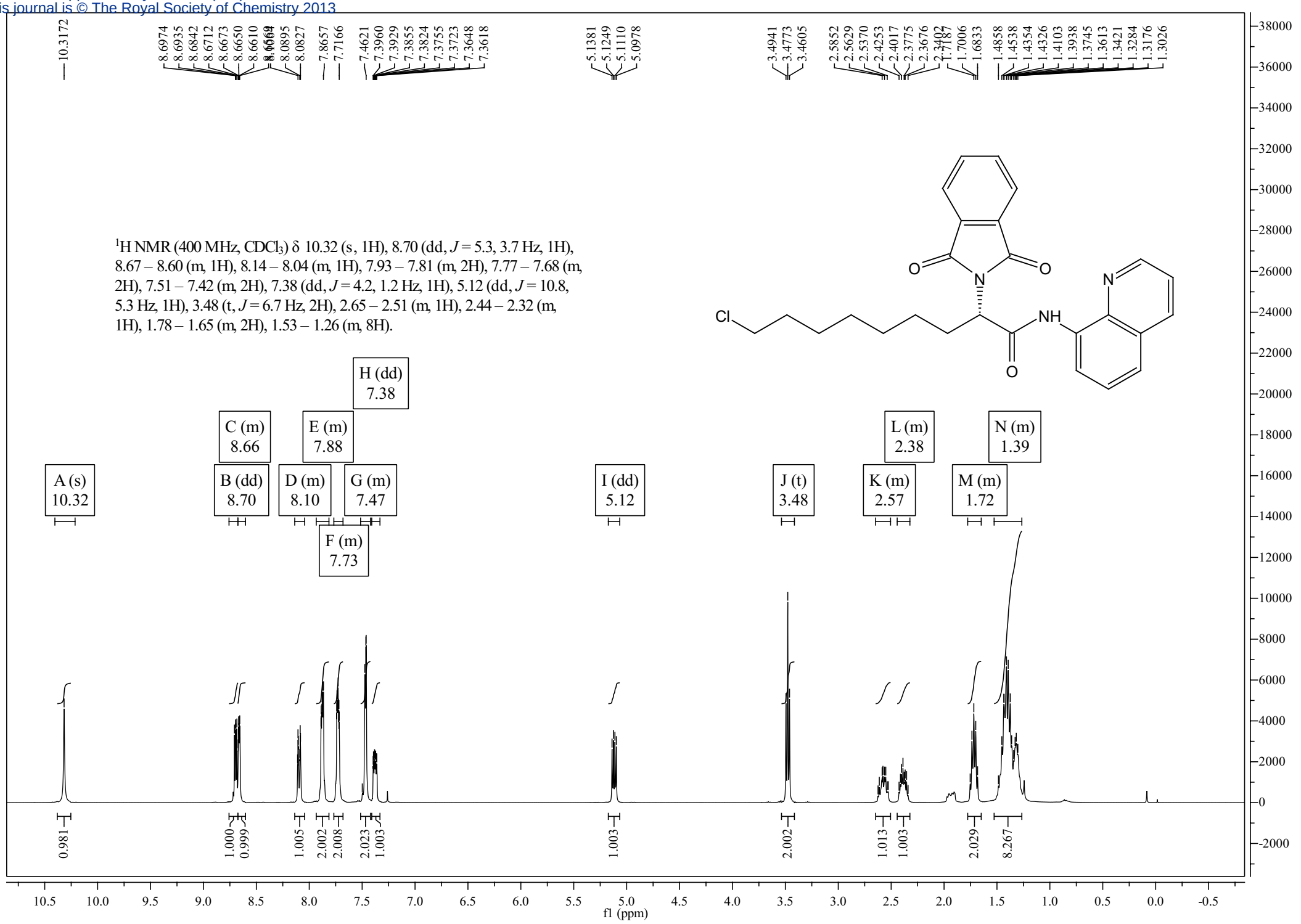
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.15, 166.80, 148.43, 138.52, 136.36, 134.41, 133.88, 131.82, 127.91, 127.32, 123.73, 122.07, 121.73, 116.76, 55.03, 44.65, 31.96, 28.07, 24.06.

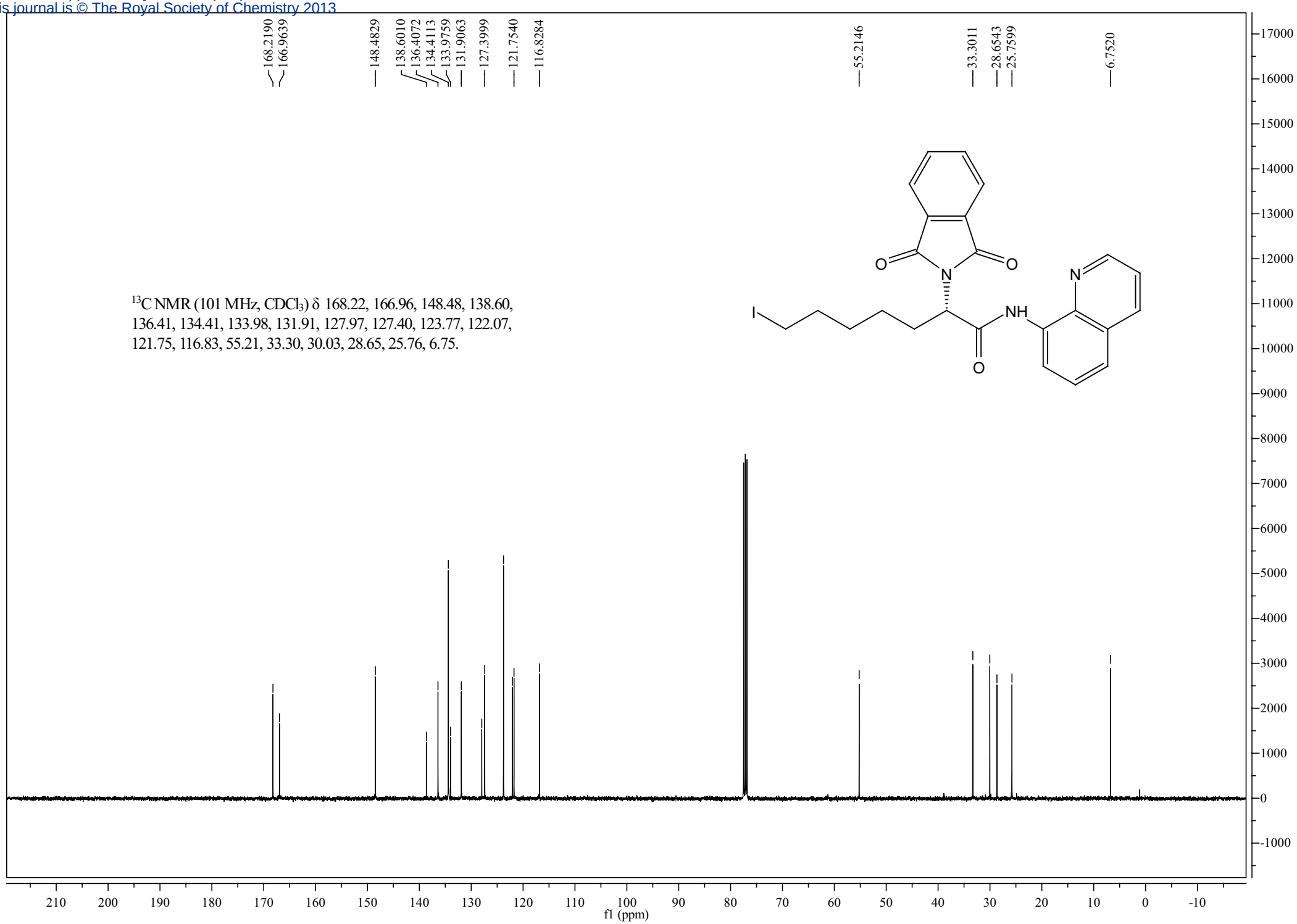


^{1}H NMR (400 MHz, $CDCl_3$) δ 10.30 (s, 1H), 8.69 (dd, *J* = 5.2, 3.8 Hz, 1H), 8.65 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.10 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.89 (dd, *J* = 5.5, 3.1 Hz, 2H), 7.74 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.52 – 7.45 (m, 2H), 7.38 (dd, *J* = 8.3, 4.2 Hz, 1H), 5.13 (dd, *J* = 10.8, 5.3 Hz, 1H), 3.53 (t, *J* = 6.6 Hz, 2H), 2.68 – 2.54 (m, 1H), 2.48 – 2.37 (m, 1H), 2.00 – 1.80 (m, 2H), 1.68 – 1.49 (m, 2H).

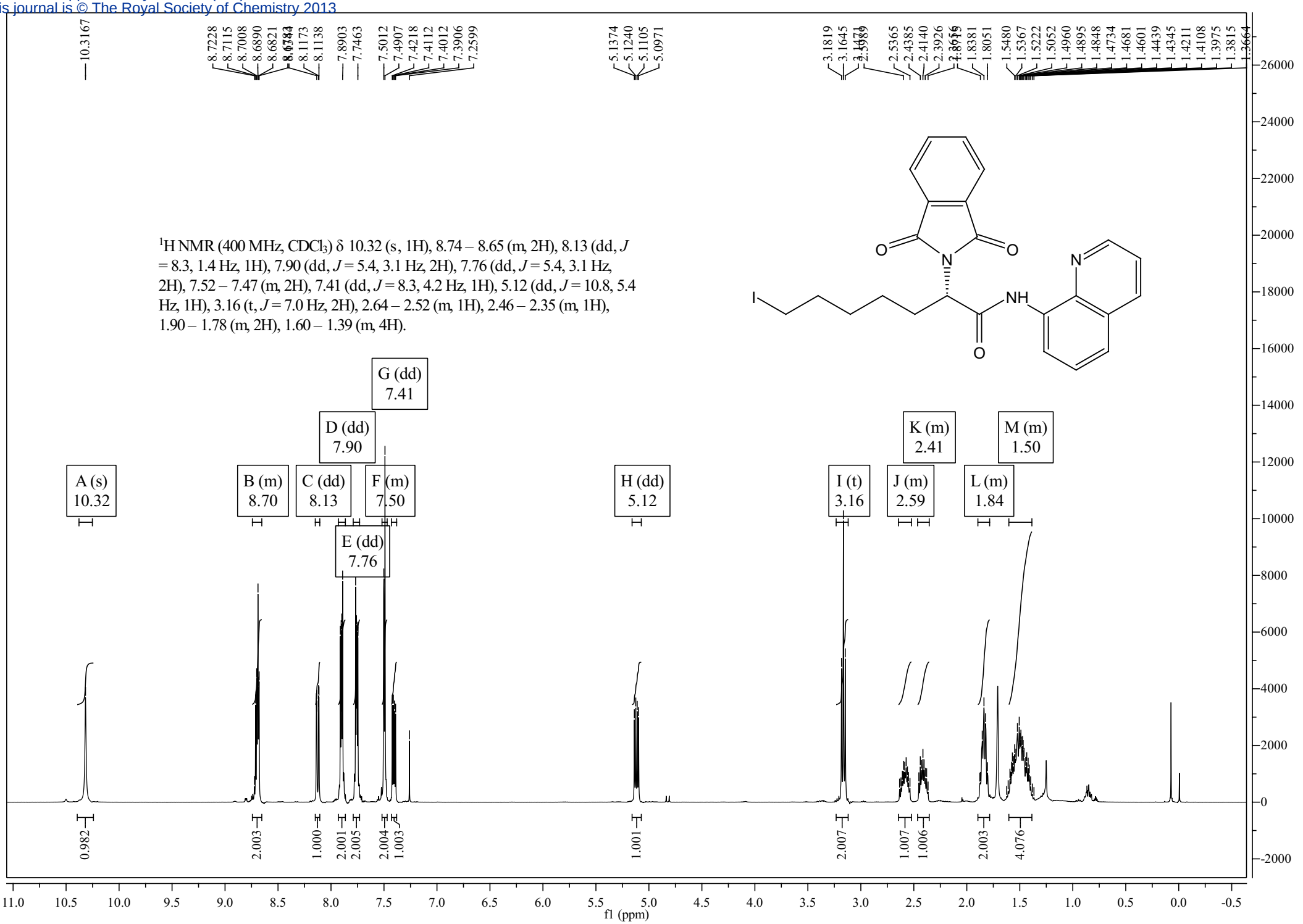


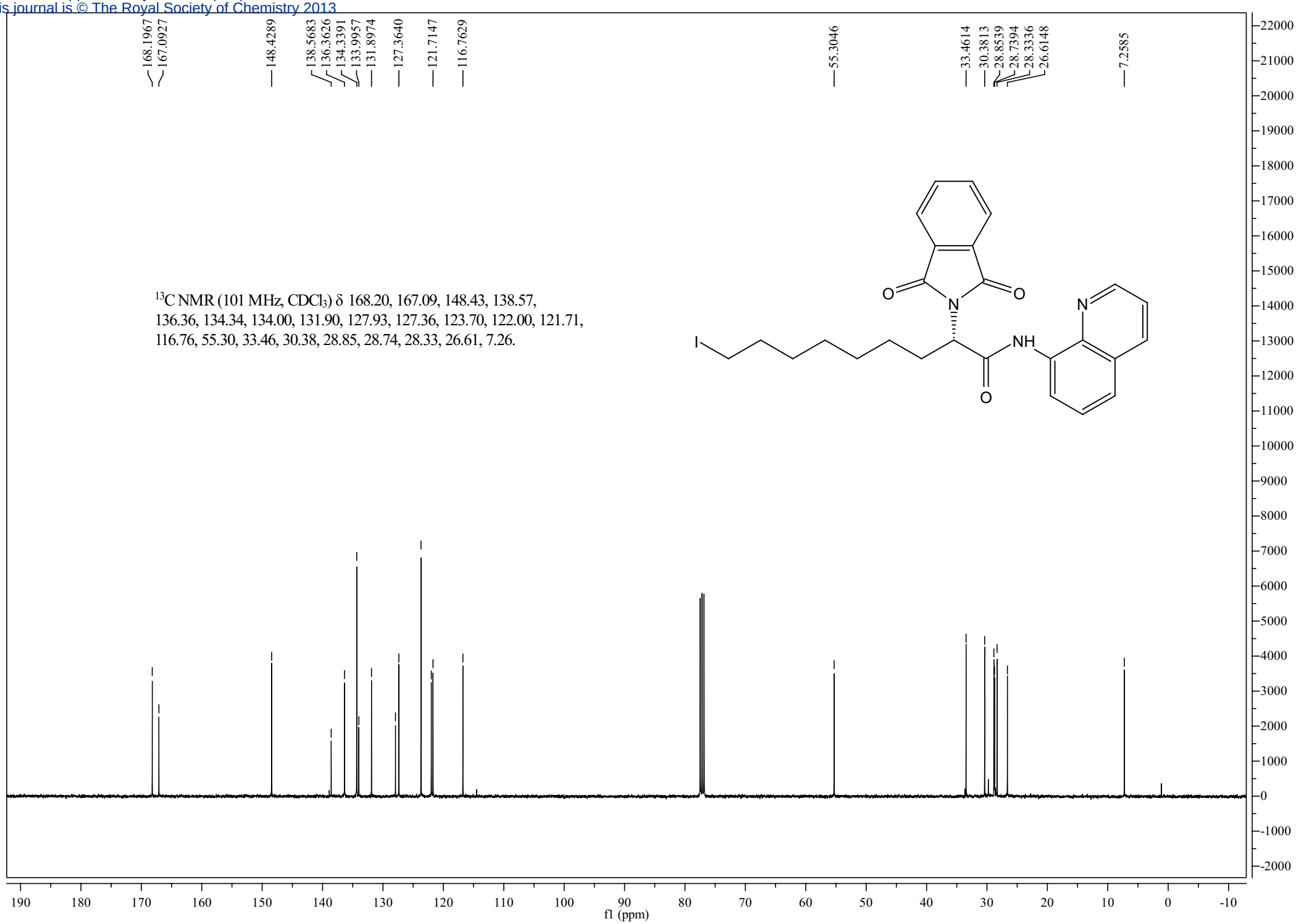
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.17, 167.07, 148.39, 138.49, 136.32, 134.31, 133.93, 131.82, 127.87, 127.28, 123.63, 121.98, 121.68, 116.70, 55.26, 45.11, 32.53, 28.86, 28.70, 28.64, 26.74, 26.57.



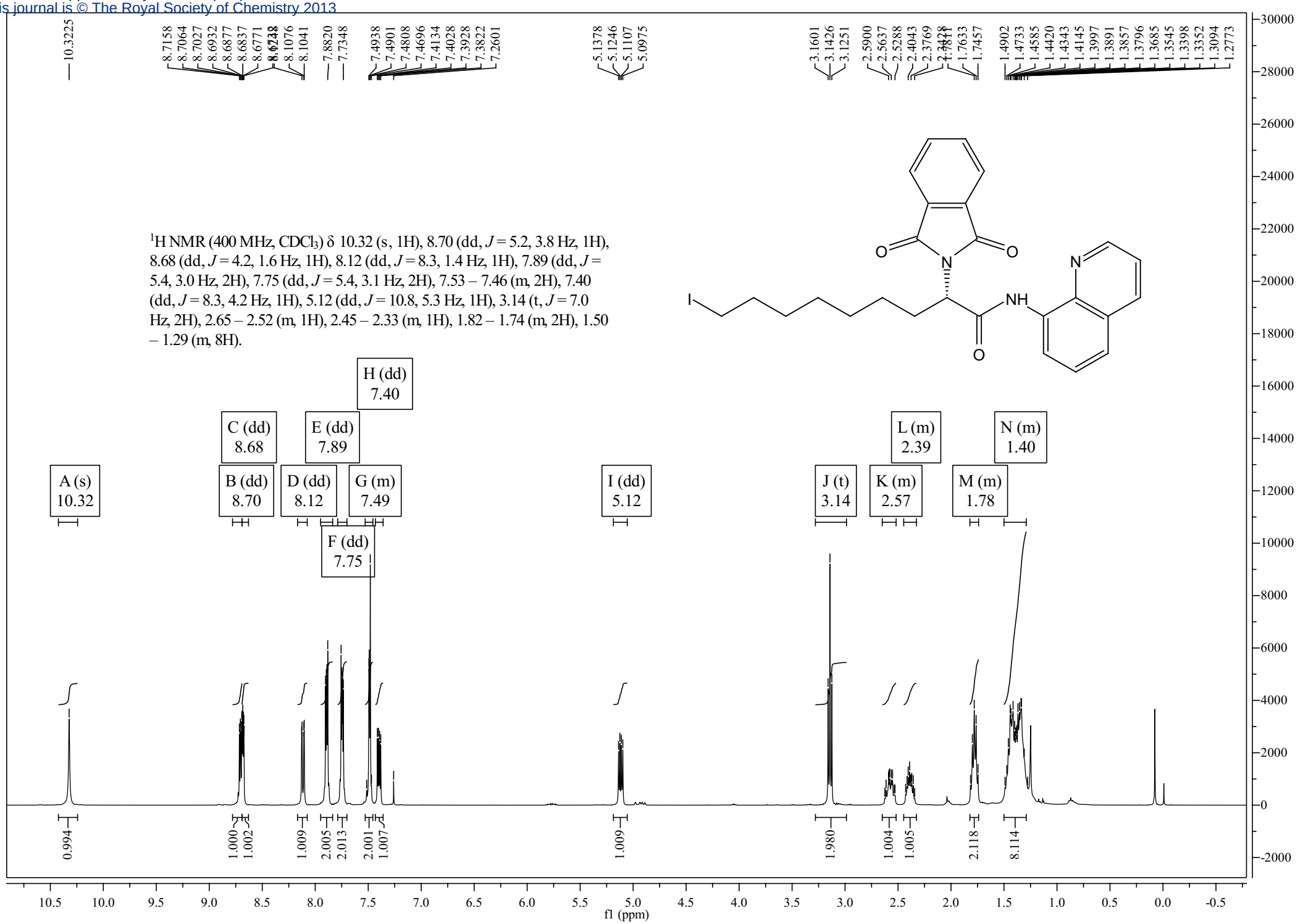


^{13}C NMR (101 MHz, $CDCl_3$) δ 168.22, 166.96, 148.48, 138.60, 136.41, 134.41, 133.98, 131.91, 127.97, 127.40, 123.77, 122.07, 121.75, 116.83, 55.21, 33.30, 30.03, 28.65, 25.76, 6.75.

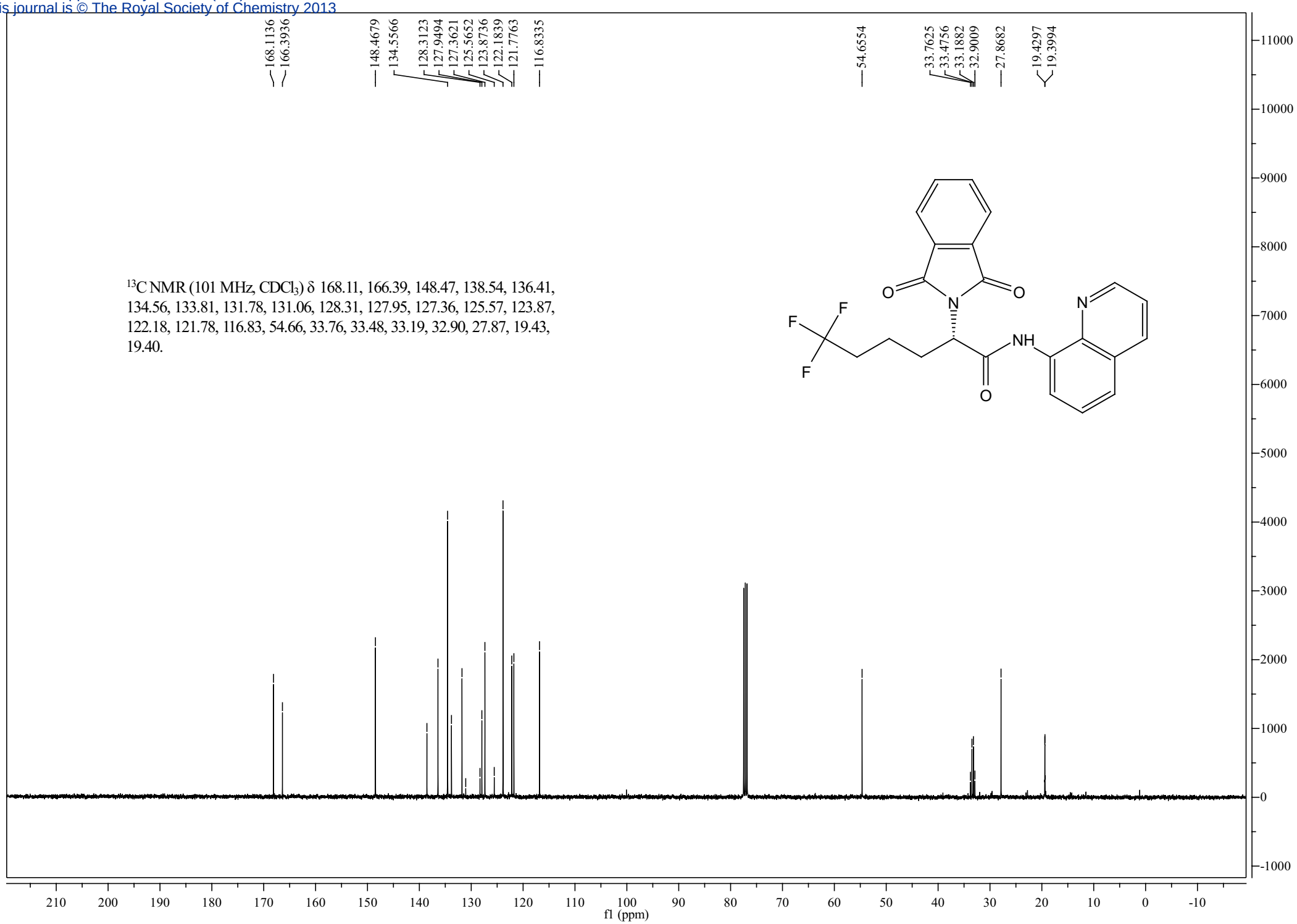




^{13}C NMR (101 MHz, $CDCl_3$) δ 168.20, 167.09, 148.43, 138.57, 136.36, 134.34, 134.00, 131.90, 127.93, 127.36, 123.70, 122.00, 121.71, 116.76, 55.30, 33.46, 30.38, 28.85, 28.74, 28.33, 26.61, 7.26.

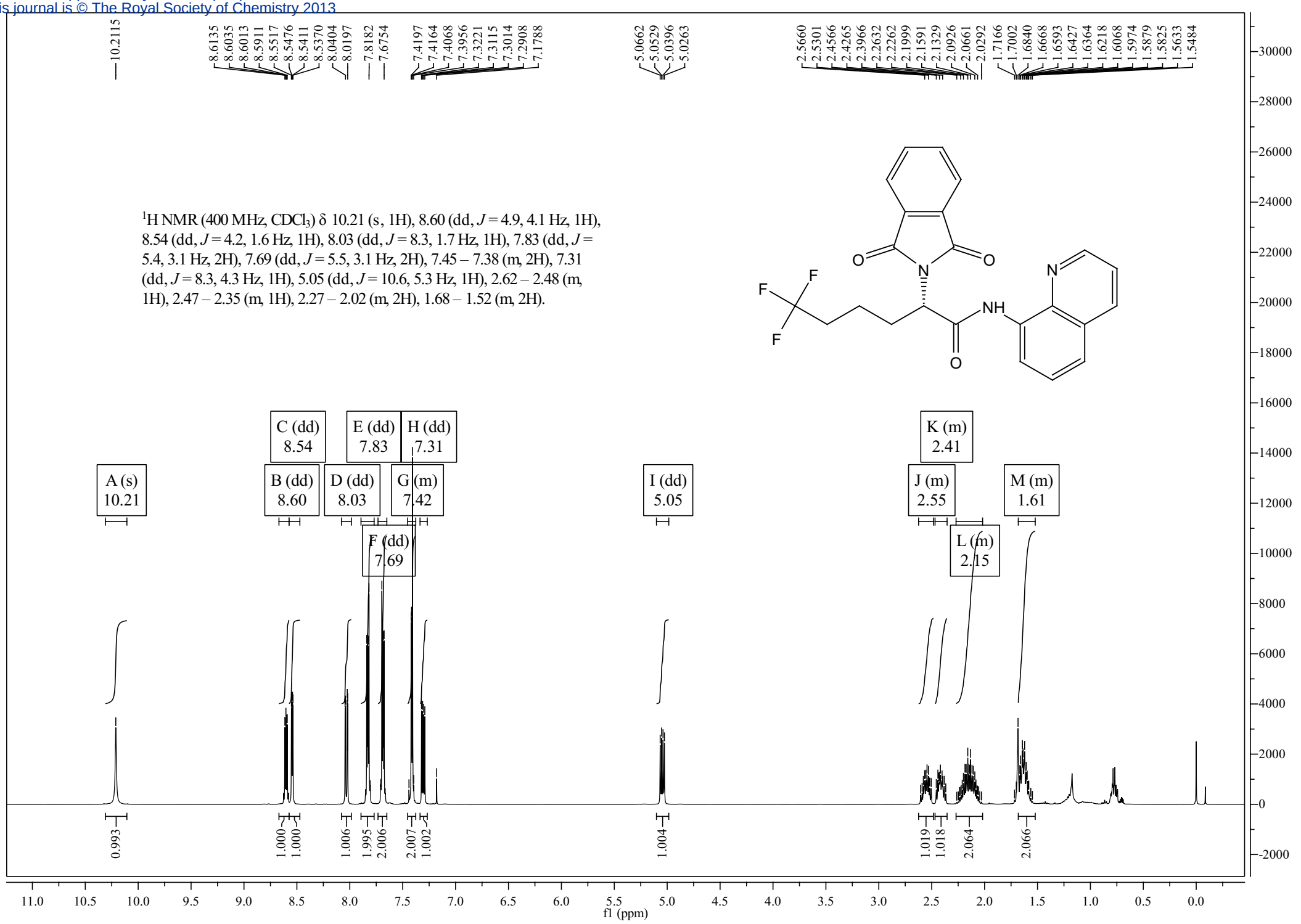


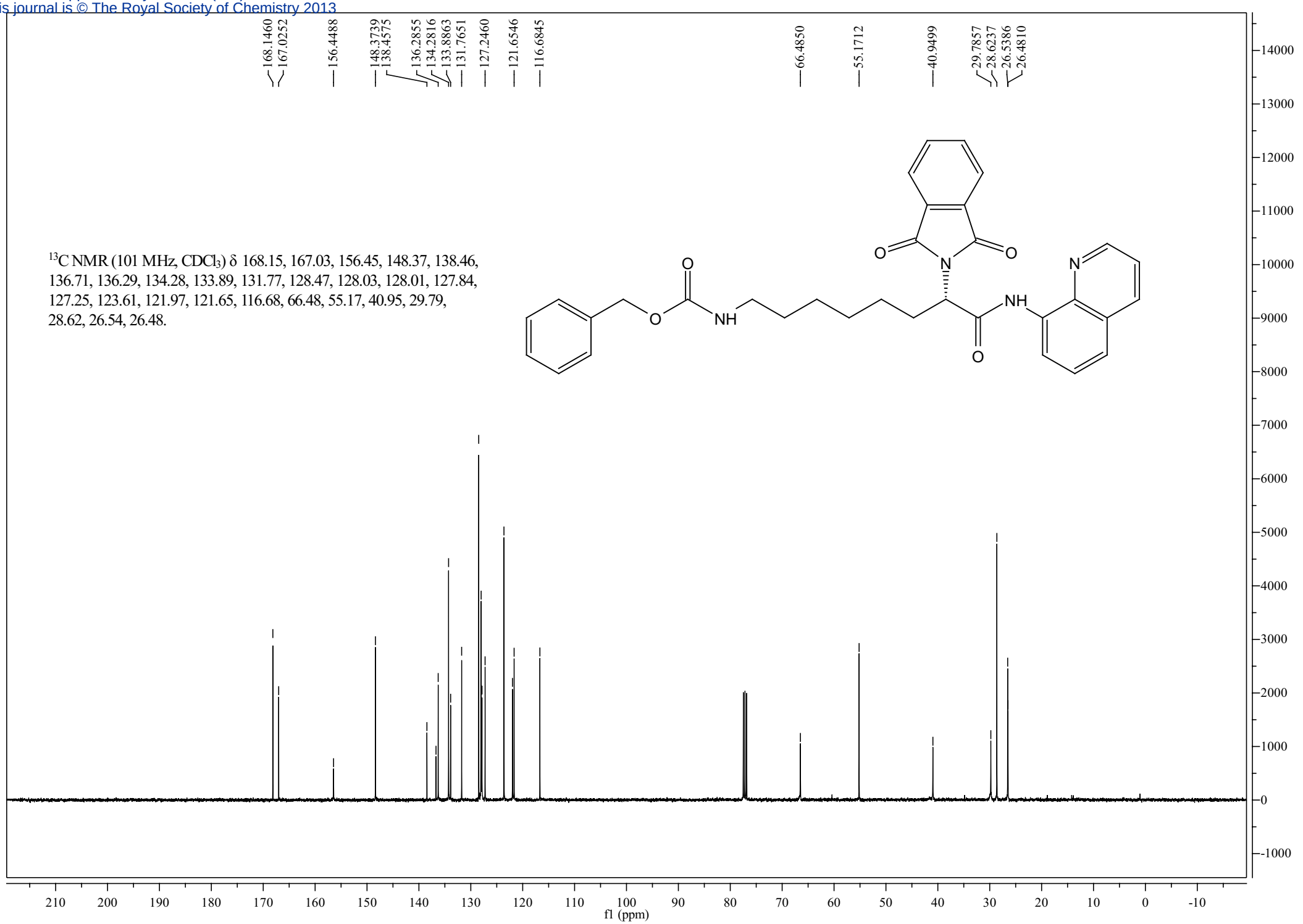
^{1}H NMR (400 MHz, $CDCl_3$) δ 10.32 (s, 1H), 8.70 (dd, *J* = 5.2, 3.8 Hz, 1H), 8.68 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.12 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.89 (dd, *J* = 5.4, 3.0 Hz, 2H), 7.75 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.53 – 7.46 (m, 2H), 7.40 (dd, *J* = 8.3, 4.2 Hz, 1H), 5.12 (dd, *J* = 10.8, 5.3 Hz, 1H), 3.14 (t, *J* = 7.0 Hz, 2H), 2.65 – 2.52 (m, 1H), 2.45 – 2.33 (m, 1H), 1.82 – 1.74 (m, 2H), 1.50 – 1.29 (m, 8H).



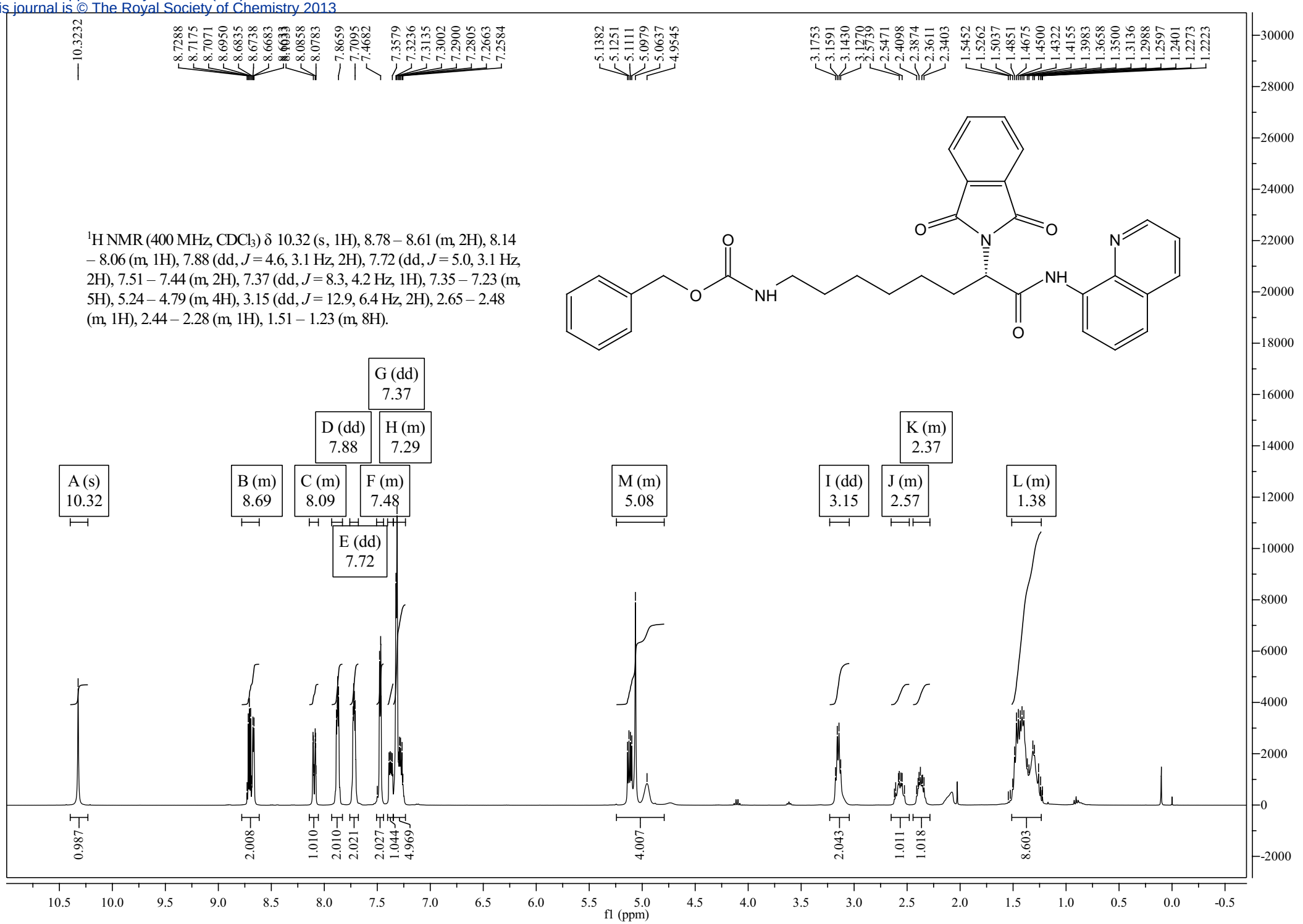
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.11, 166.39, 148.47, 138.54, 136.41, 134.56, 133.81, 131.78, 131.06, 128.31, 127.95, 127.36, 125.57, 123.87, 122.18, 121.78, 116.83, 54.66, 33.76, 33.48, 33.19, 32.90, 27.87, 19.43, 19.40.

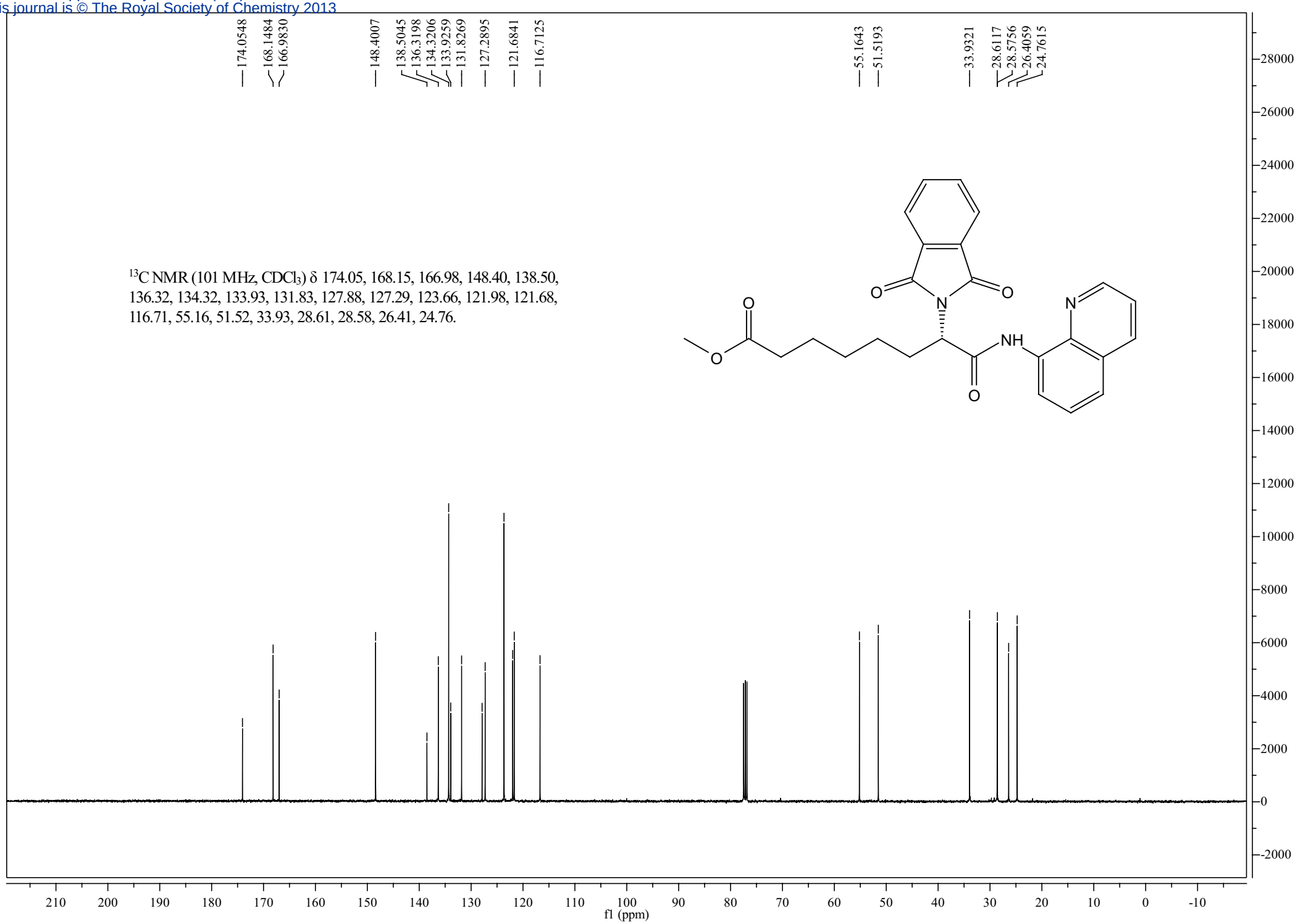
^{1}H NMR (400 MHz, $CDCl_3$) δ 10.21 (s, 1H), 8.60 (dd, *J* = 4.9, 4.1 Hz, 1H), 8.54 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.03 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.83 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.69 (dd, *J* = 5.5, 3.1 Hz, 2H), 7.45 – 7.38 (m, 2H), 7.31 (dd, *J* = 8.3, 4.3 Hz, 1H), 5.05 (dd, *J* = 10.6, 5.3 Hz, 1H), 2.62 – 2.48 (m, 1H), 2.47 – 2.35 (m, 1H), 2.27 – 2.02 (m, 2H), 1.68 – 1.52 (m, 2H).



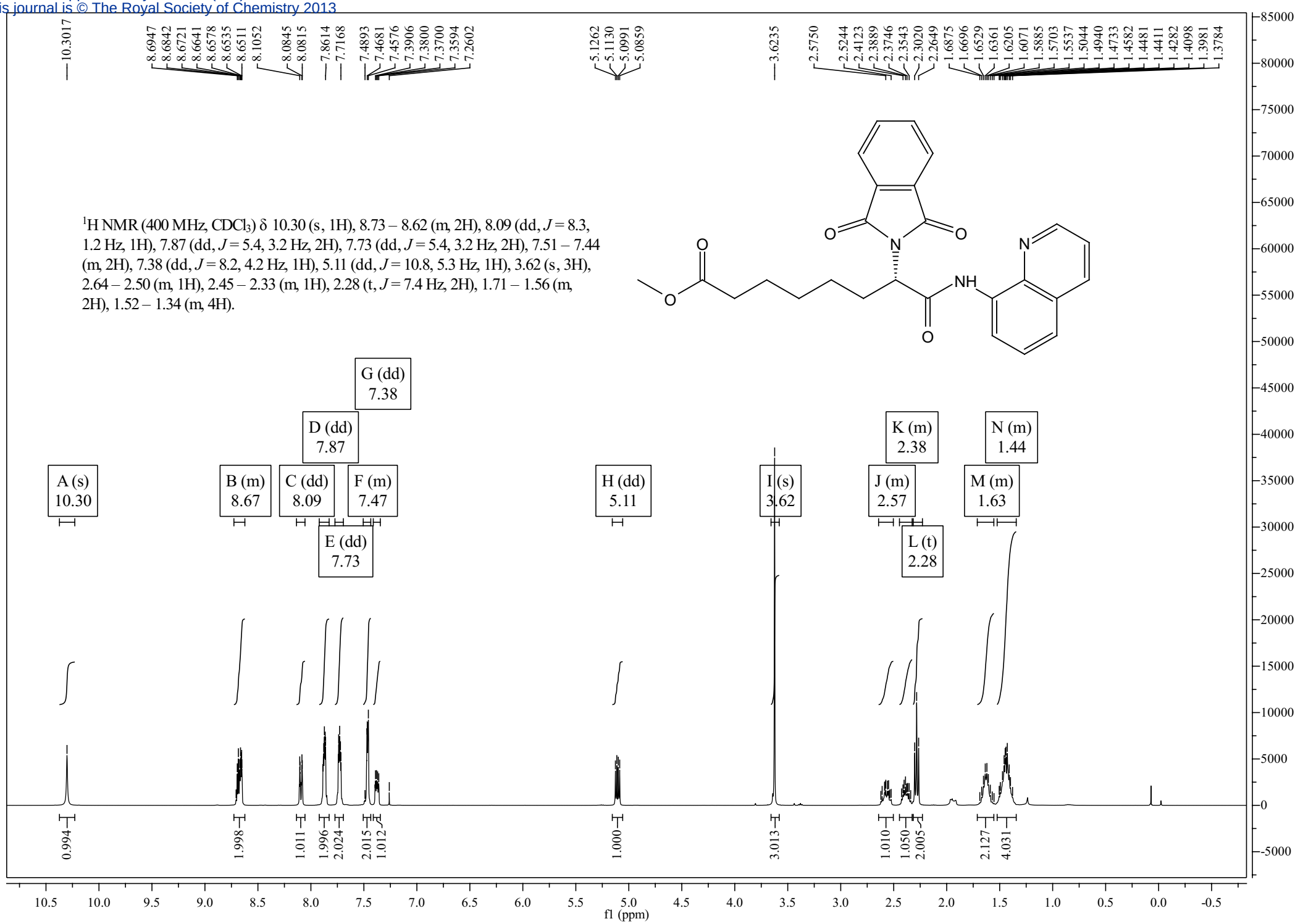


^{13}C NMR (101 MHz, $CDCl_3$) δ 168.15, 167.03, 156.45, 148.37, 138.46, 136.71, 136.29, 134.28, 133.89, 131.77, 128.47, 128.03, 128.01, 127.84, 127.25, 123.61, 121.97, 121.65, 116.68, 66.48, 55.17, 40.95, 29.79, 28.62, 26.54, 26.48.

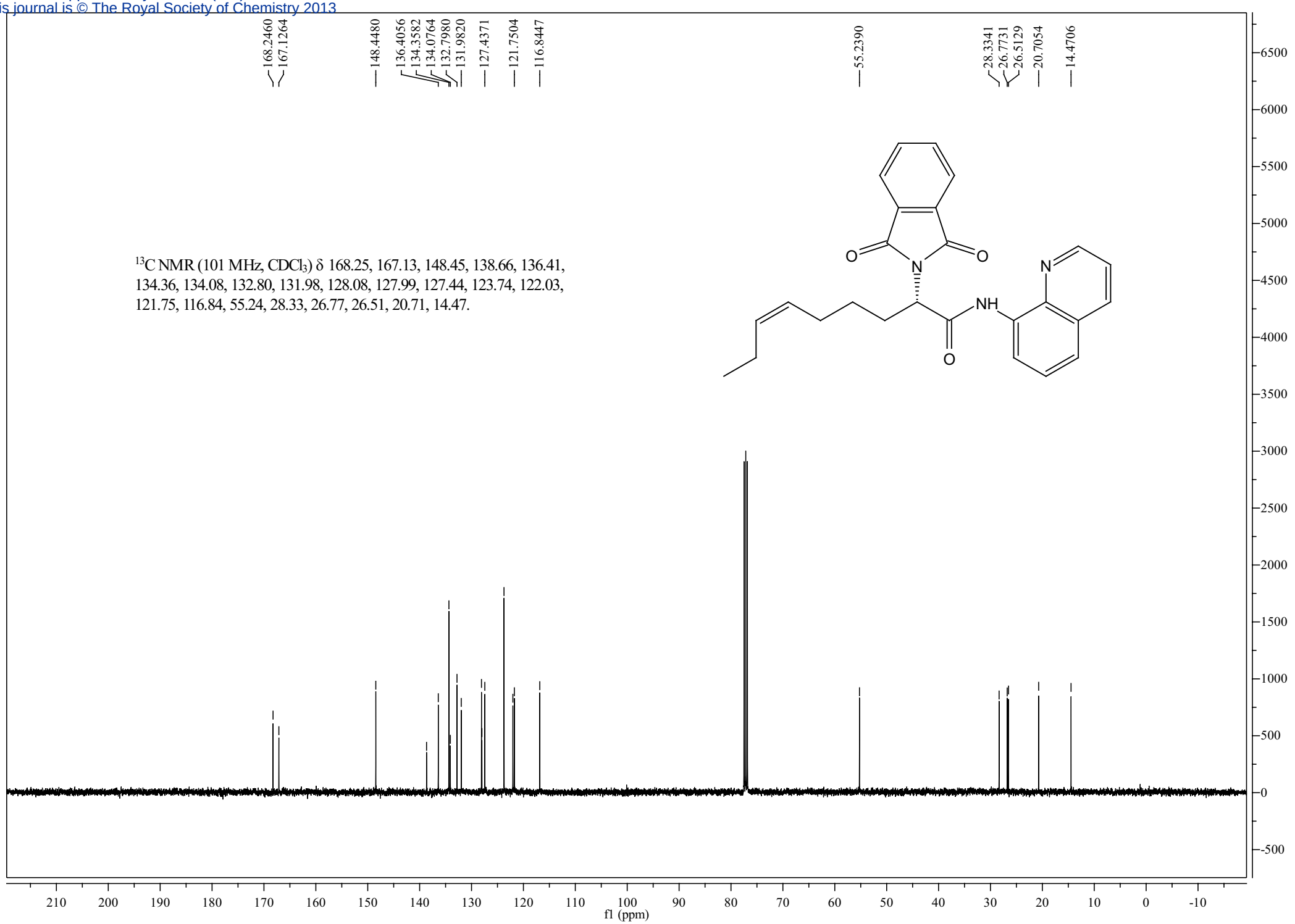




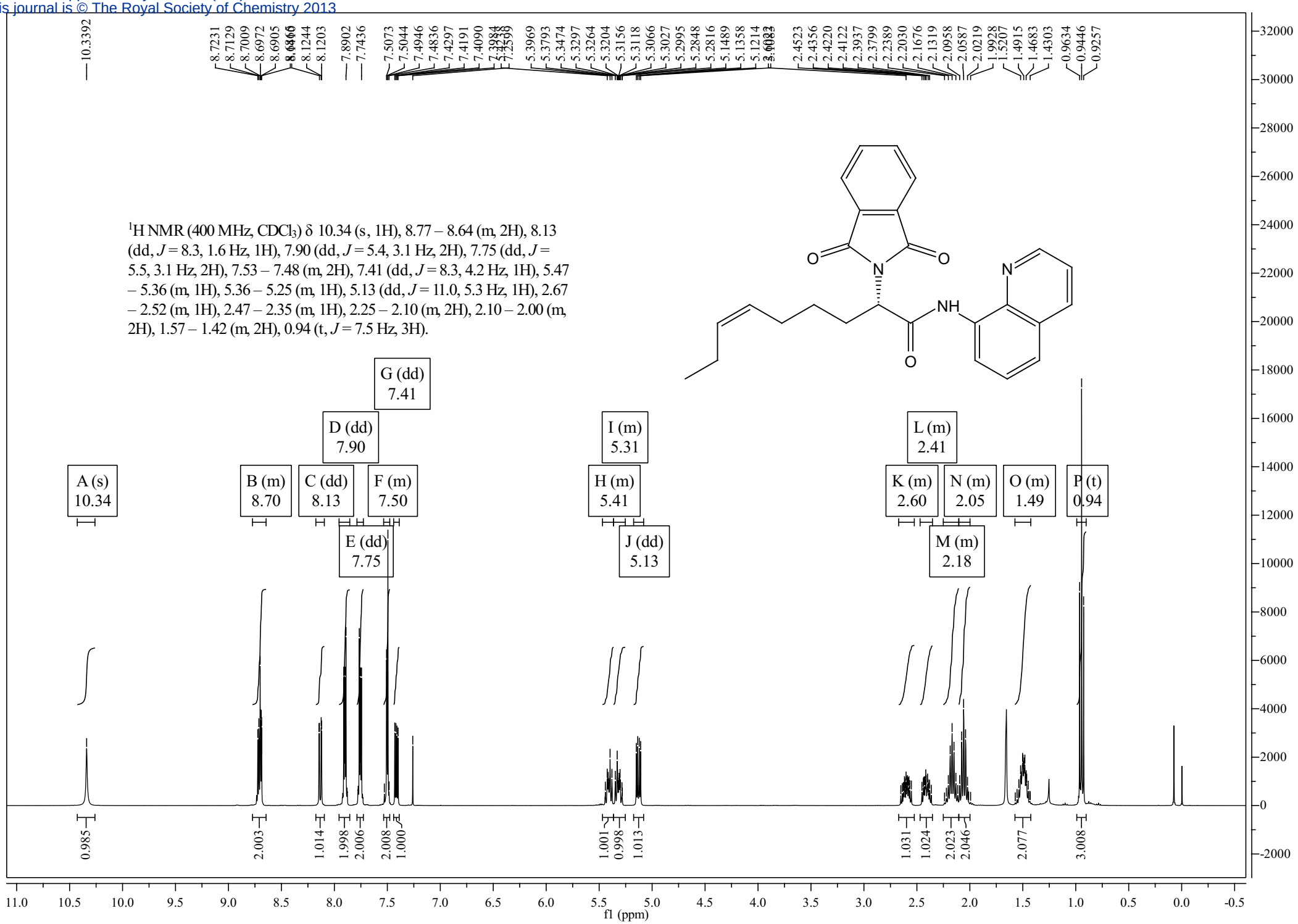
^{13}C NMR (101 MHz, $CDCl_3$) δ 174.05, 168.15, 166.98, 148.40, 138.50, 136.32, 134.32, 133.93, 131.83, 127.88, 127.29, 123.66, 121.98, 121.68, 116.71, 55.16, 51.52, 33.93, 28.61, 28.58, 26.41, 24.76.

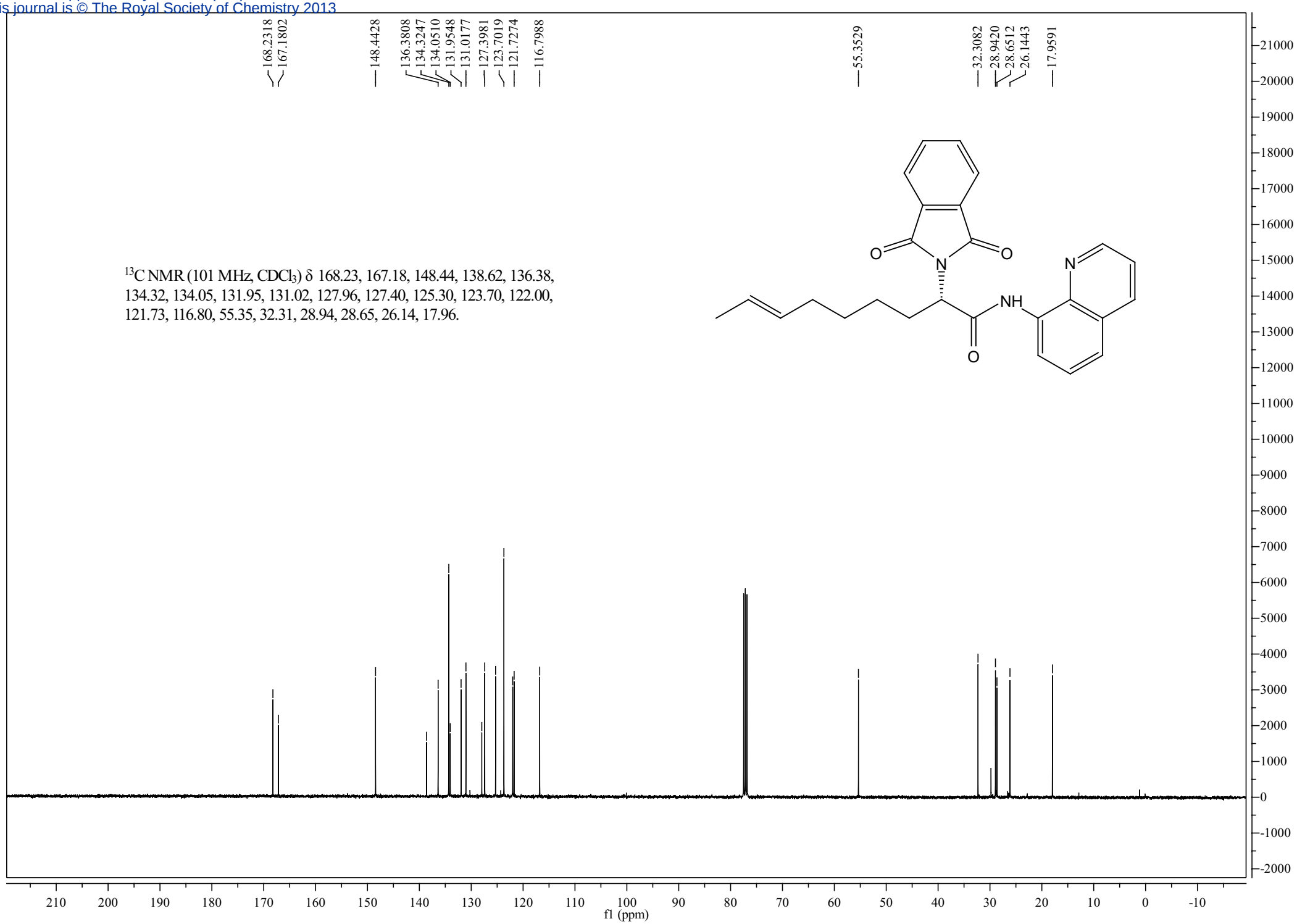


^{1}H NMR (400 MHz, $CDCl_3$) δ 10.30 (s, 1H), 8.73 – 8.62 (m, 2H), 8.09 (dd, *J* = 8.3, 1.2 Hz, 1H), 7.87 (dd, *J* = 5.4, 3.2 Hz, 2H), 7.73 (dd, *J* = 5.4, 3.2 Hz, 2H), 7.51 – 7.44 (m, 2H), 7.38 (dd, *J* = 8.2, 4.2 Hz, 1H), 5.11 (dd, *J* = 10.8, 5.3 Hz, 1H), 3.62 (s, 3H), 2.64 – 2.50 (m, 1H), 2.45 – 2.33 (m, 1H), 2.28 (t, *J* = 7.4 Hz, 2H), 1.71 – 1.56 (m, 2H), 1.52 – 1.34 (m, 4H).

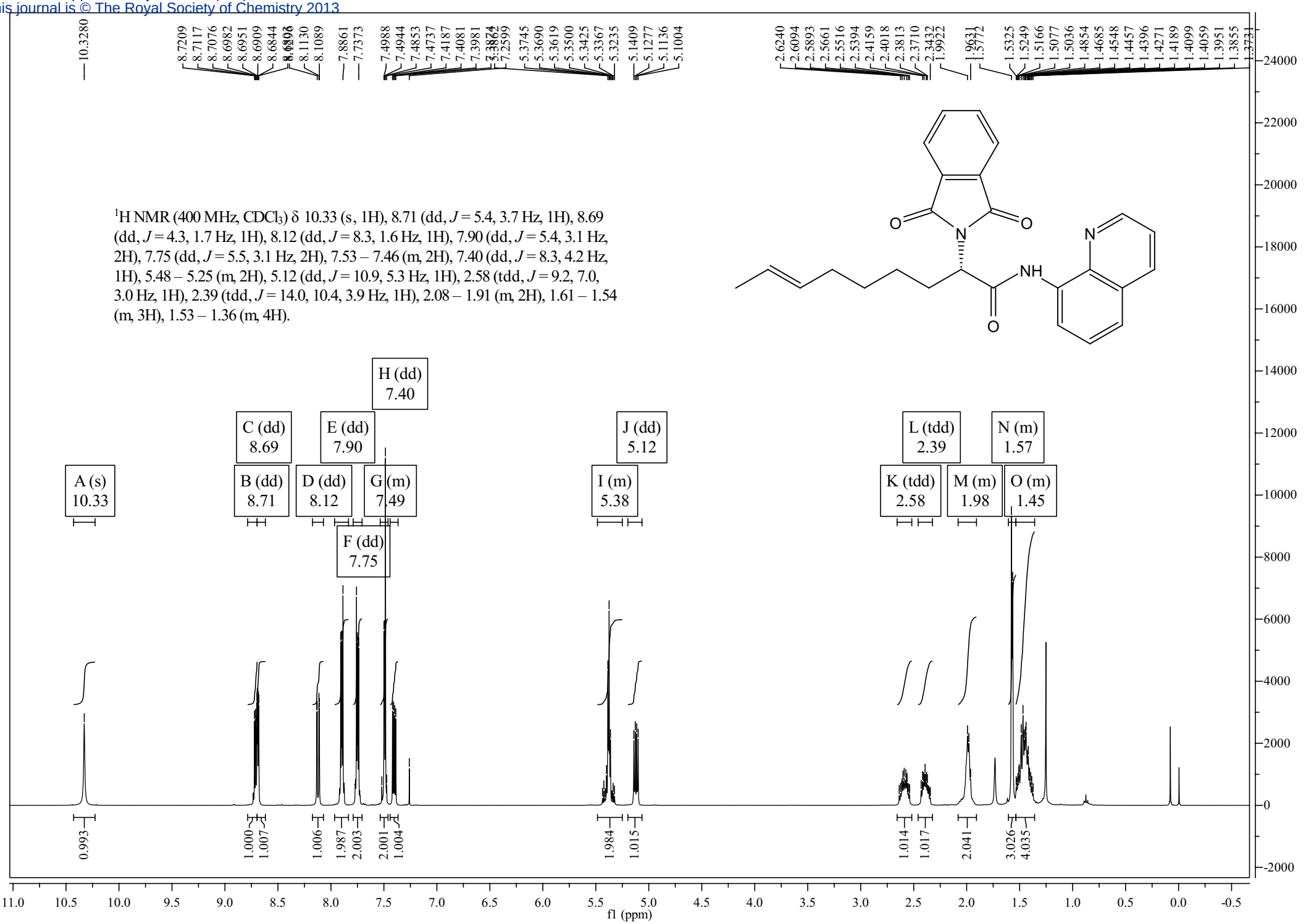


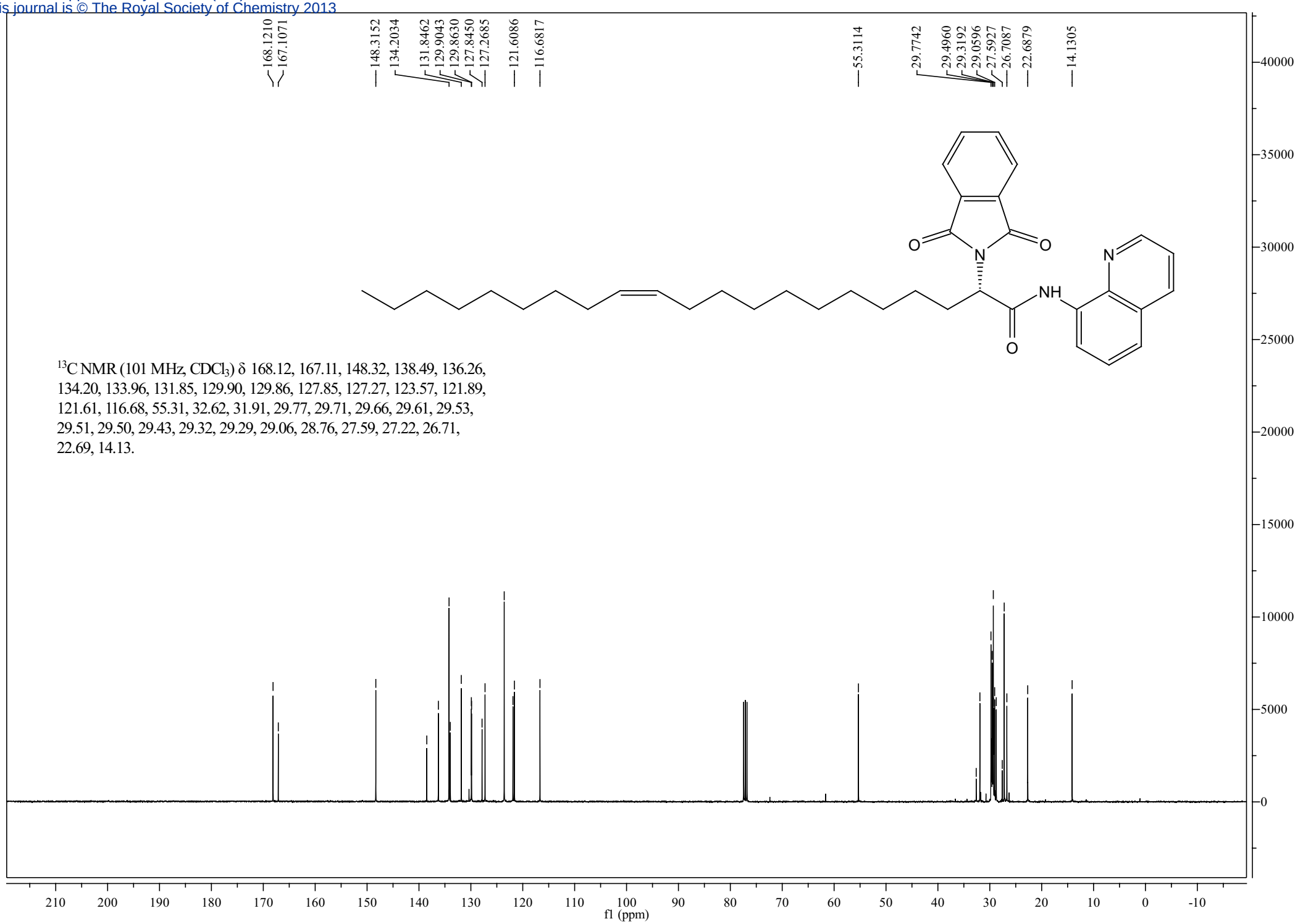
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.25, 167.13, 148.45, 138.66, 136.41, 134.36, 134.08, 132.80, 131.98, 128.08, 127.99, 127.44, 123.74, 122.03, 121.75, 116.84, 55.24, 28.33, 26.77, 26.51, 20.71, 14.47.



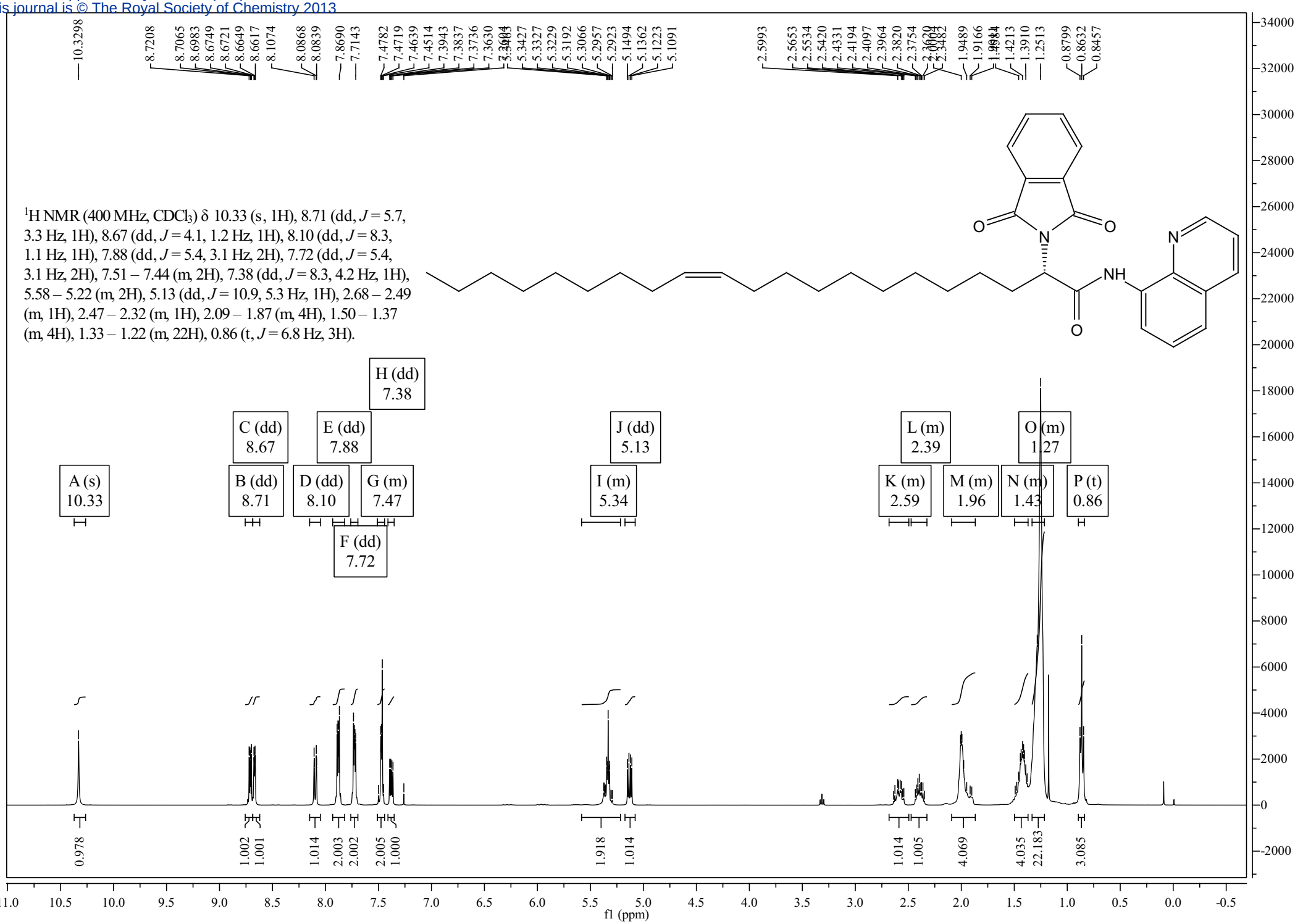


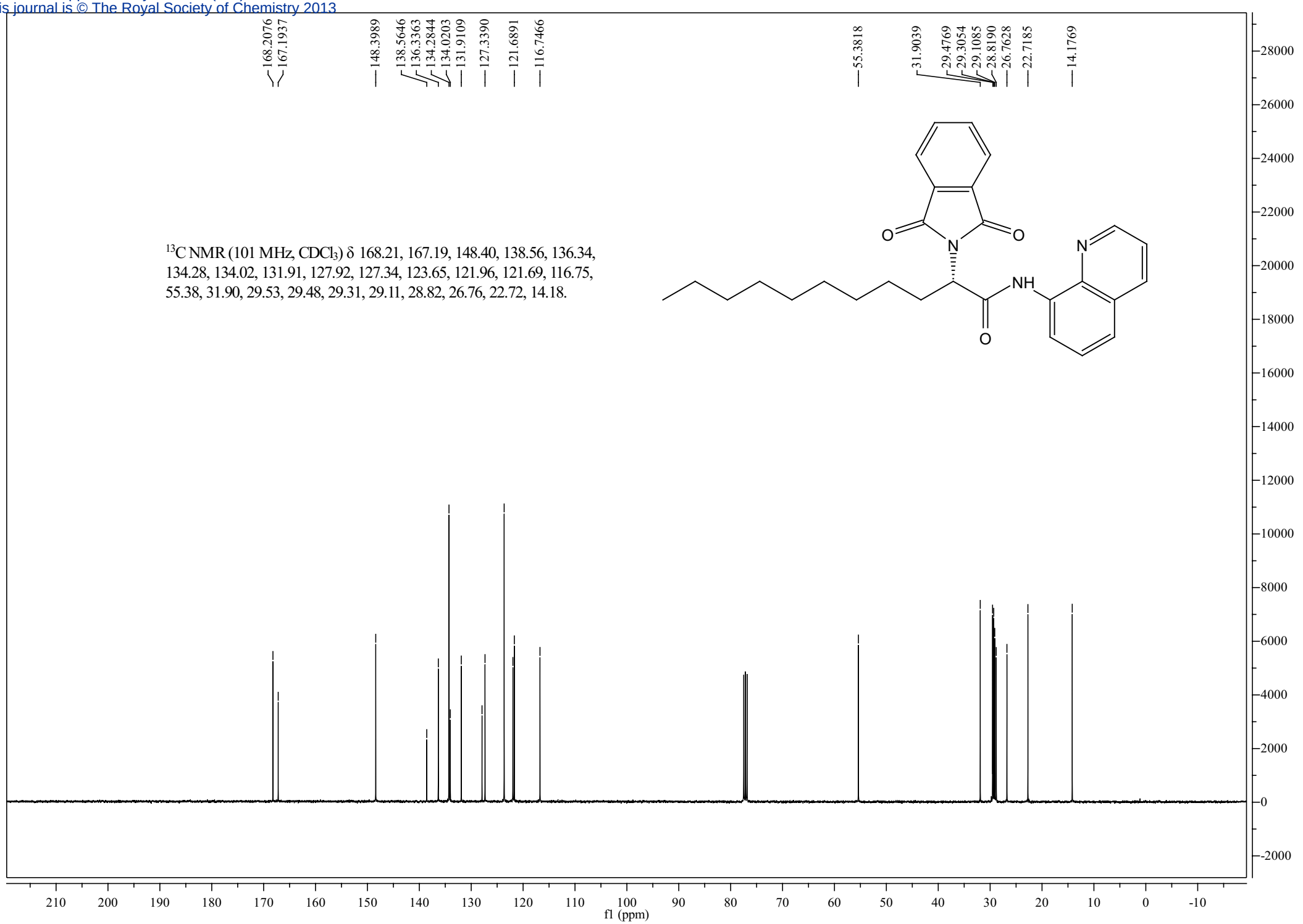
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.23, 167.18, 148.44, 138.62, 136.38, 134.32, 134.05, 131.95, 131.02, 127.96, 127.40, 125.30, 123.70, 122.00, 121.73, 116.80, 55.35, 32.31, 28.94, 28.65, 26.14, 17.96.



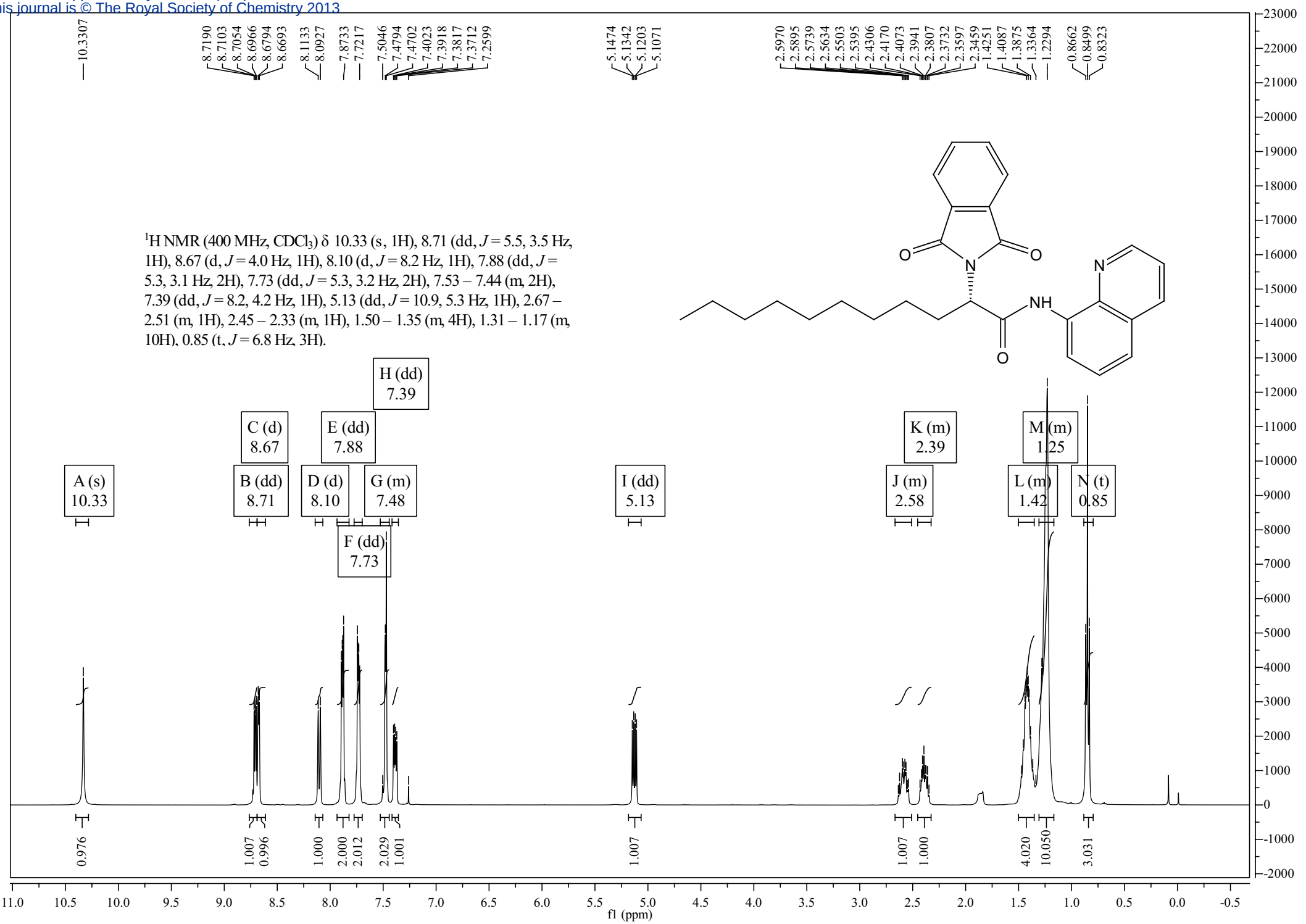


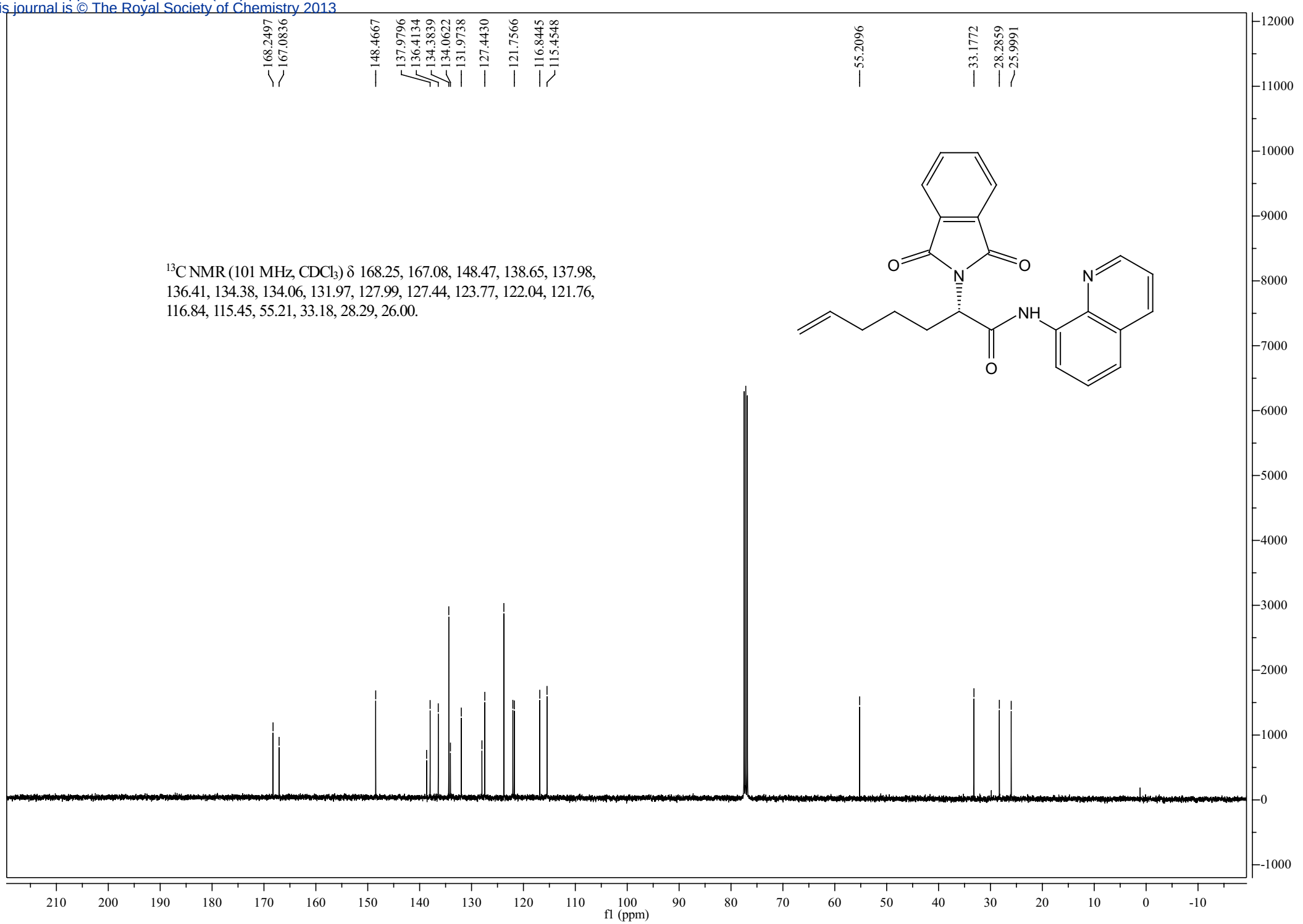
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.12, 167.11, 148.32, 138.49, 136.26, 134.20, 133.96, 131.85, 129.90, 129.86, 127.85, 127.27, 123.57, 121.89, 121.61, 116.68, 55.31, 32.62, 31.91, 29.77, 29.71, 29.66, 29.61, 29.53, 29.51, 29.50, 29.43, 29.32, 29.29, 29.06, 28.76, 27.59, 27.22, 26.71, 22.69, 14.13.



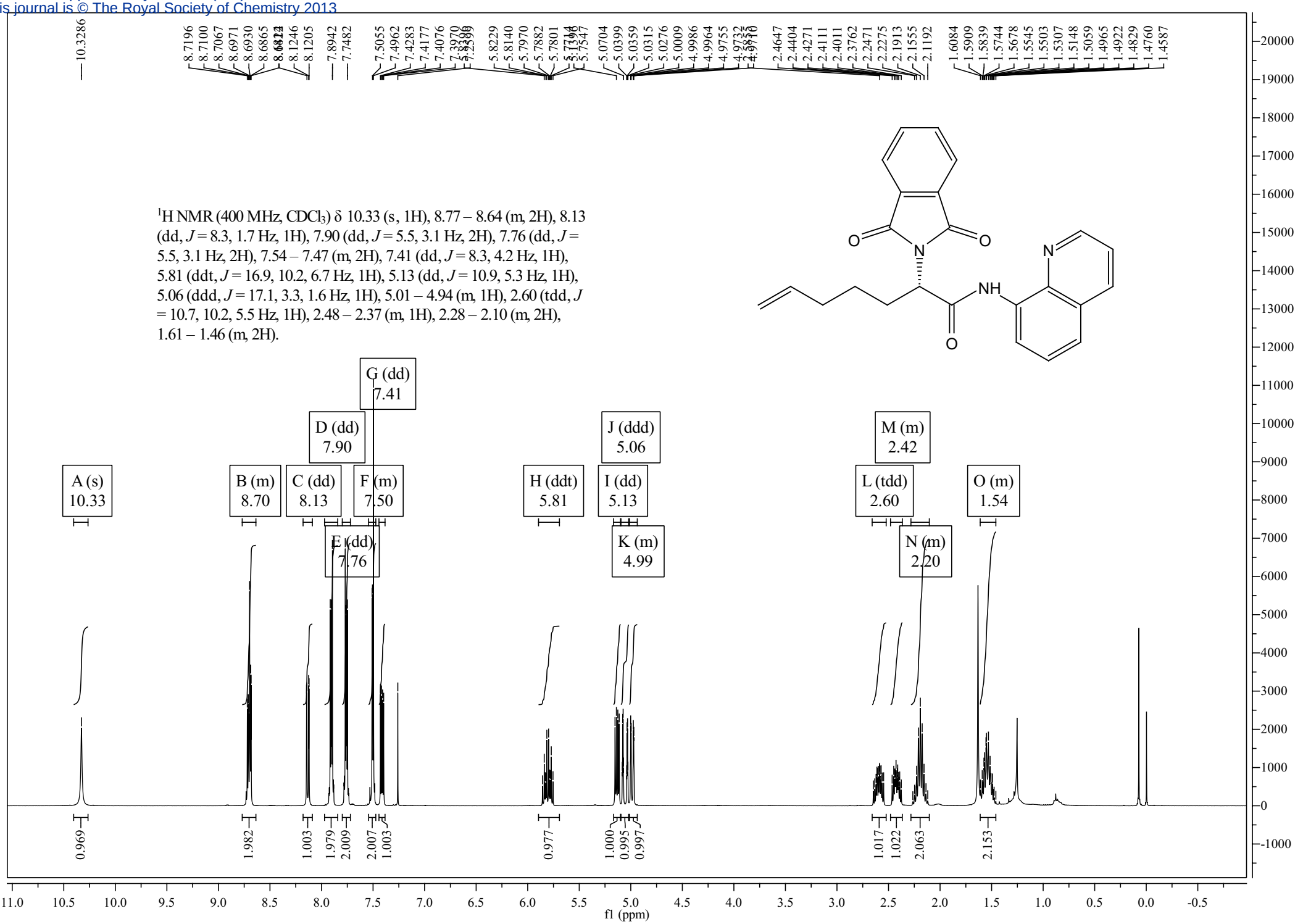


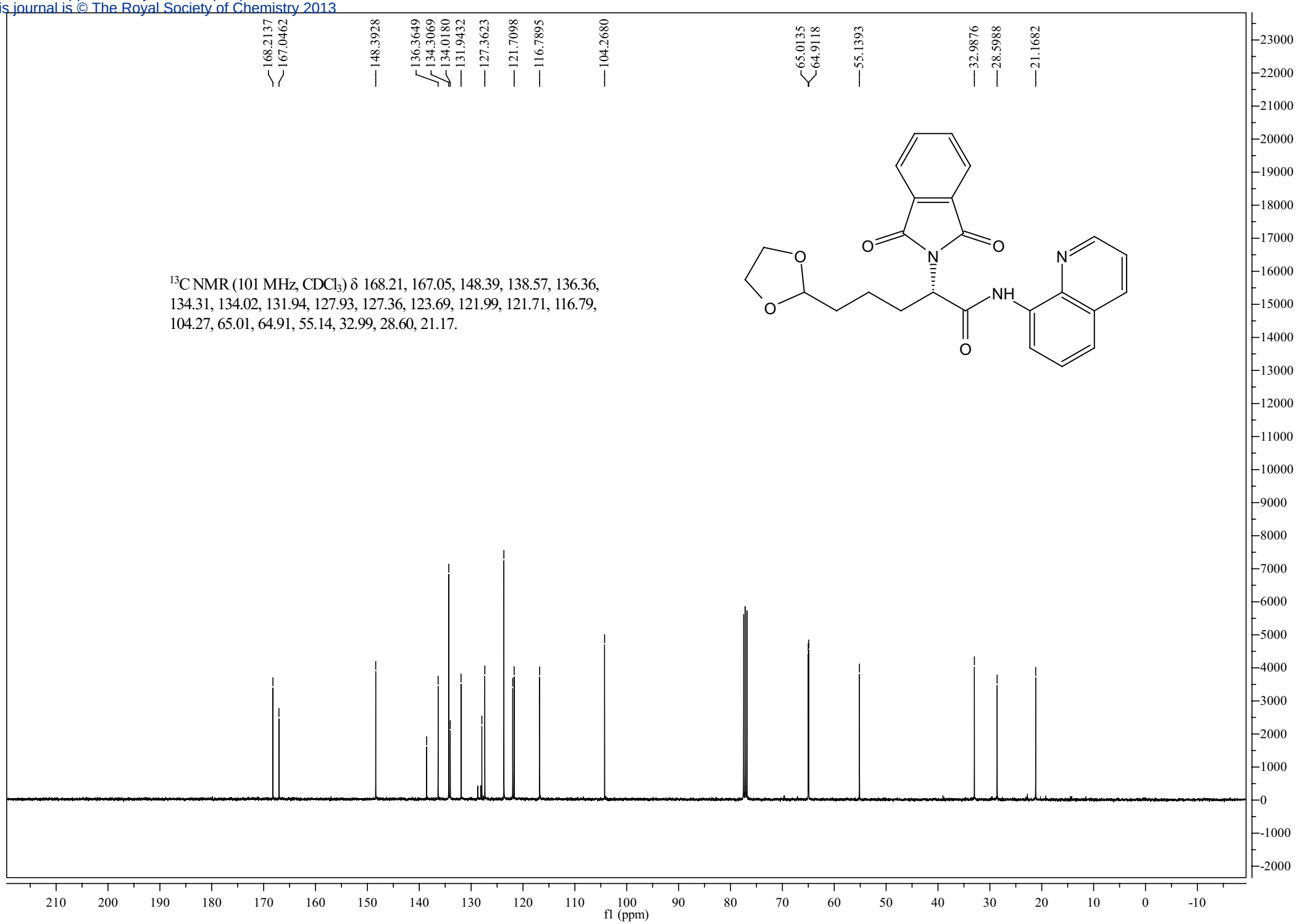
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.21, 167.19, 148.40, 138.56, 136.34, 134.28, 134.02, 131.91, 127.92, 127.34, 123.65, 121.96, 121.69, 116.75, 55.38, 31.90, 29.53, 29.48, 29.31, 29.11, 28.82, 26.76, 22.72, 14.18.





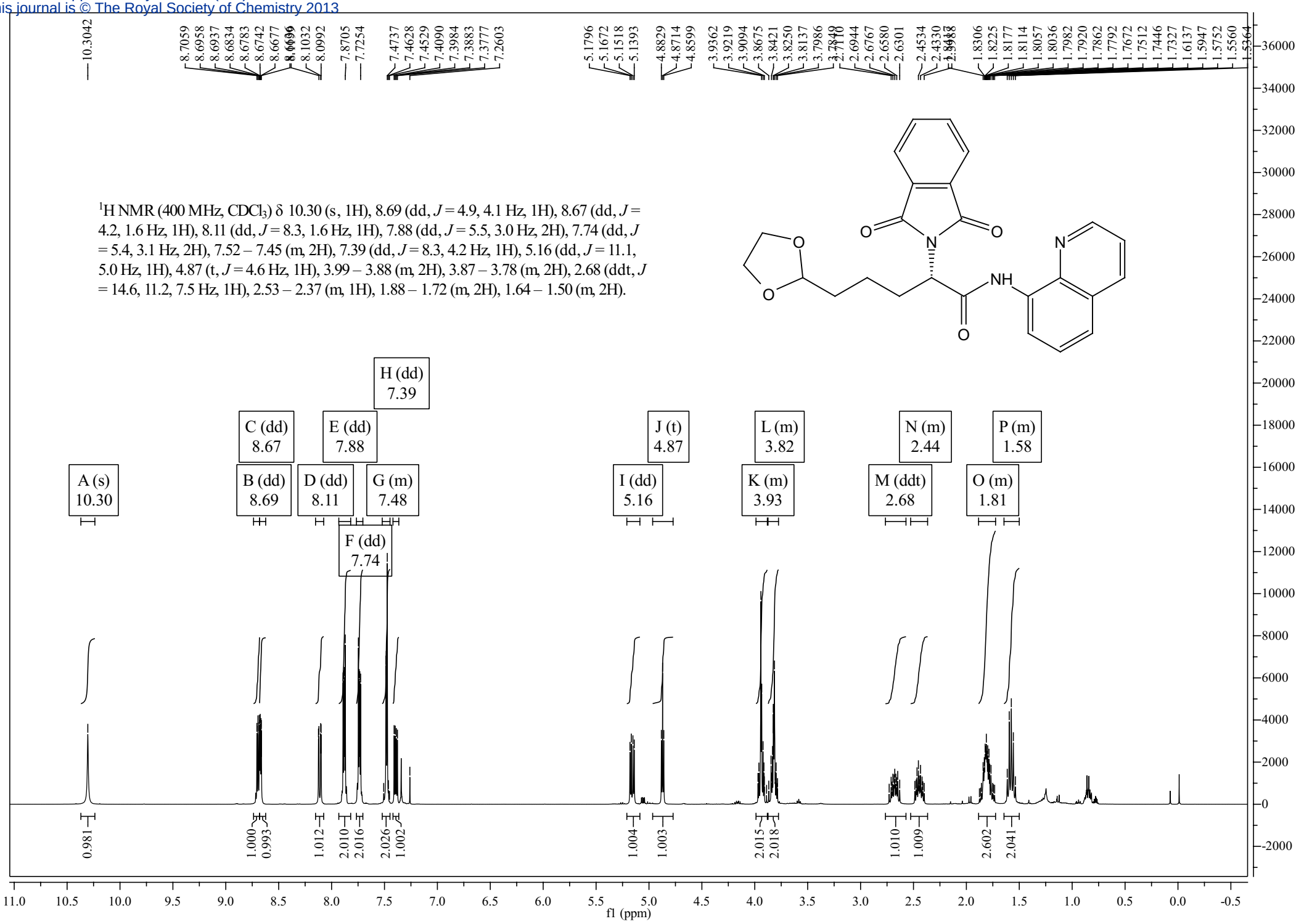
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.25, 167.08, 148.47, 138.65, 137.98, 136.41, 134.38, 134.06, 131.97, 127.99, 127.44, 123.77, 122.04, 121.76, 116.84, 115.45, 55.21, 33.18, 28.29, 26.00.

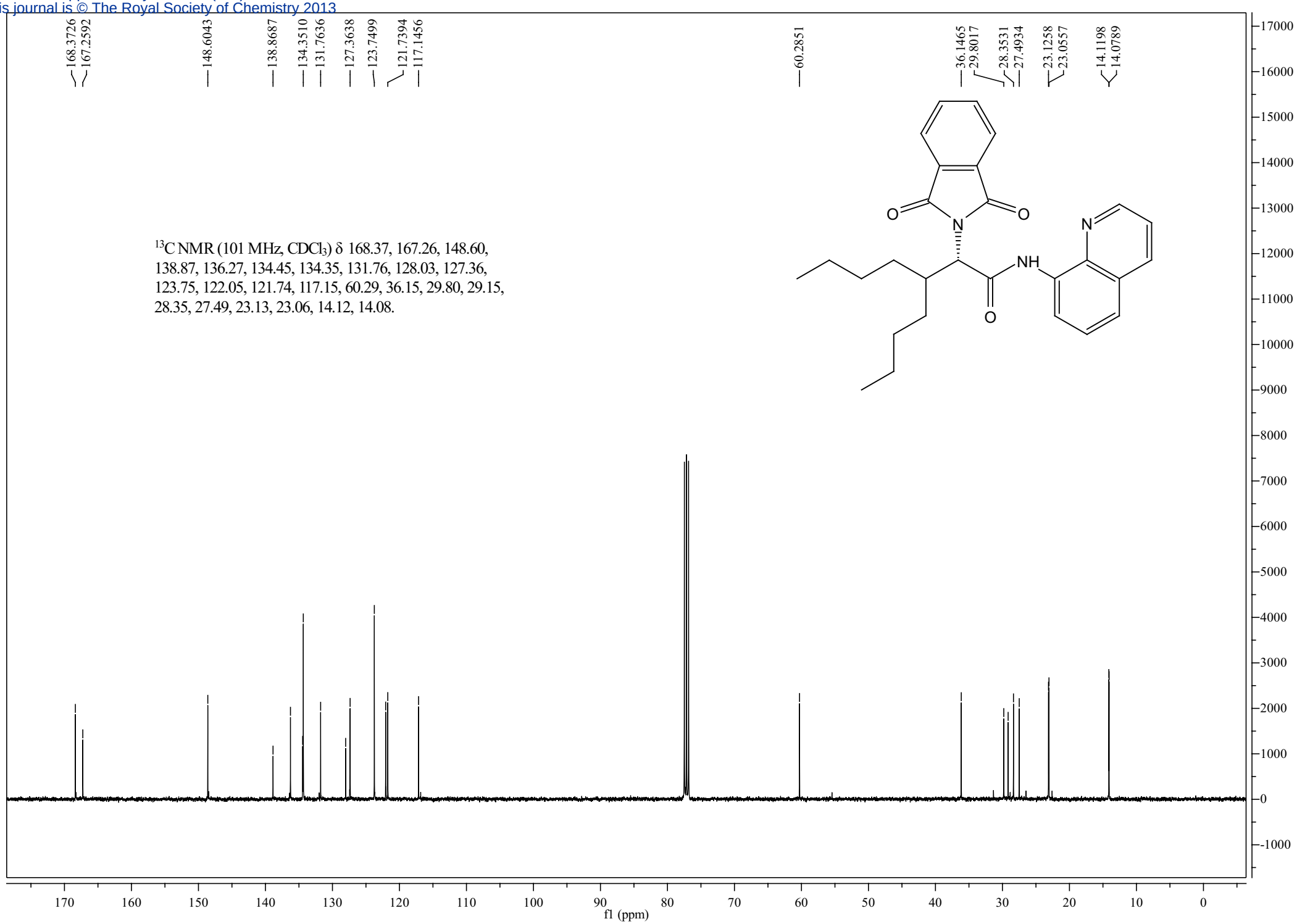




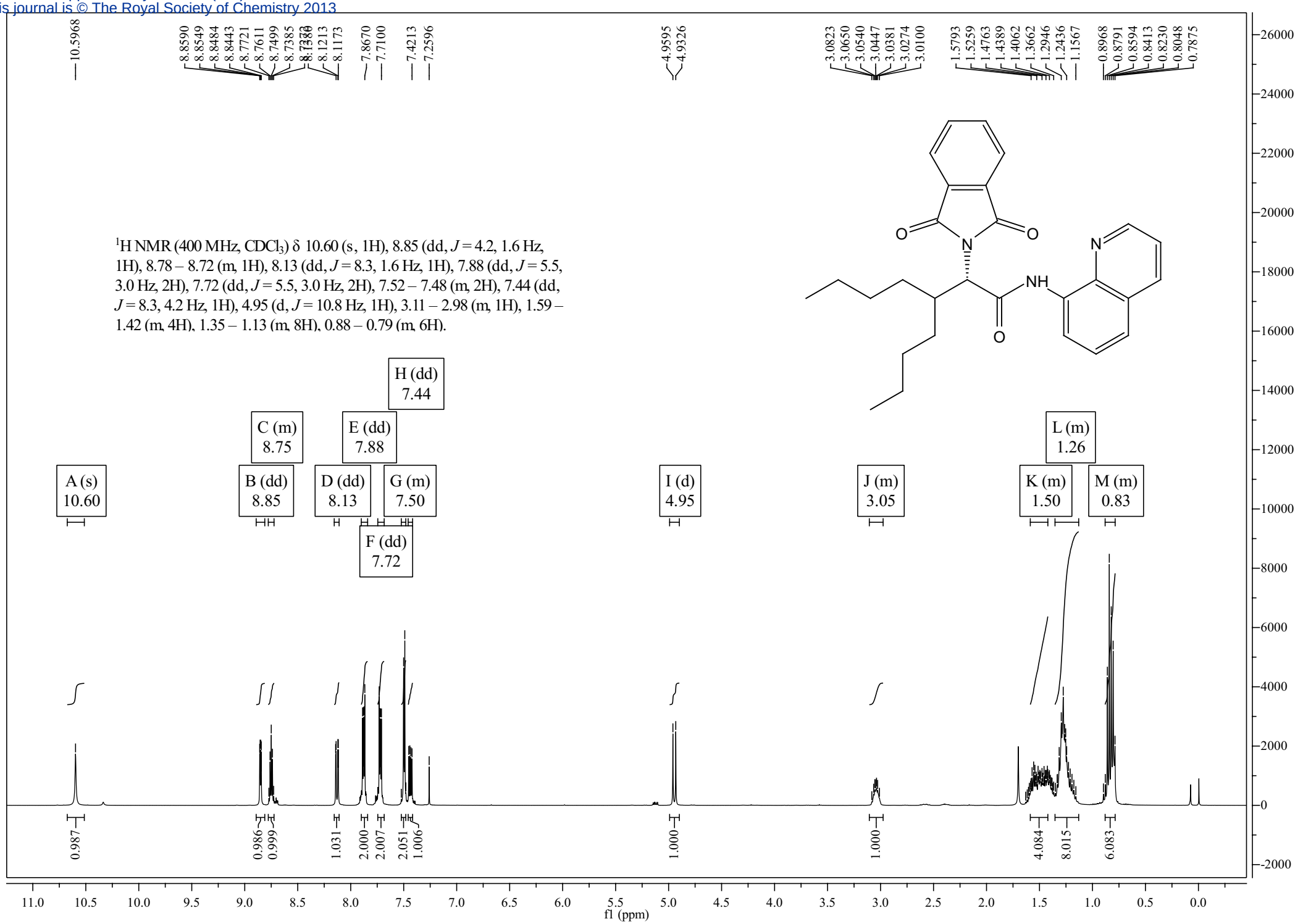
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.21, 167.05, 148.39, 138.57, 136.36, 134.31, 134.02, 131.94, 127.93, 127.36, 123.69, 121.99, 121.71, 116.79, 104.27, 65.01, 64.91, 55.14, 32.99, 28.60, 21.17.

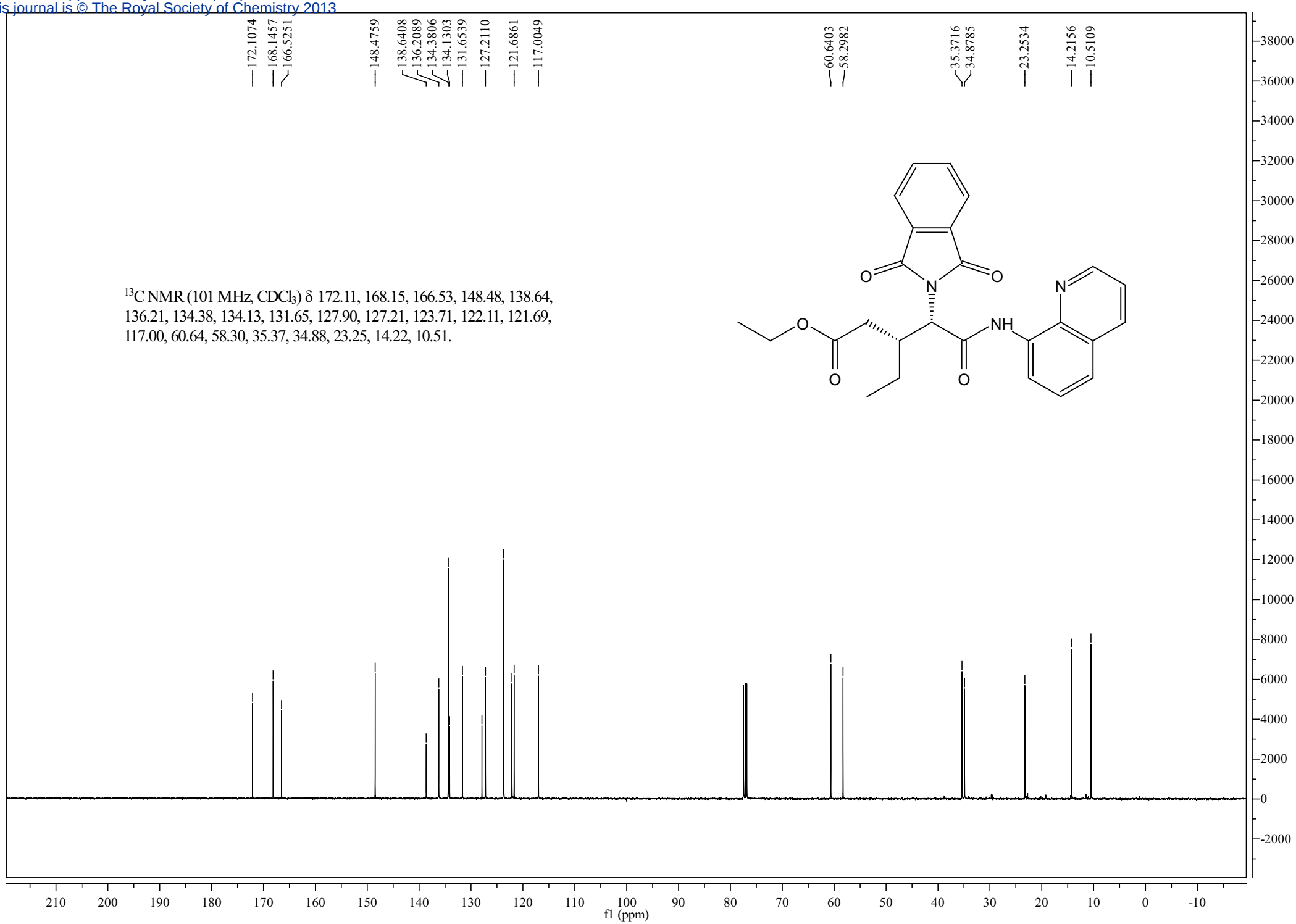
^{1}H NMR (400 MHz, $CDCl_3$) δ 10.30 (s, 1H), 8.69 (dd, *J* = 4.9, 4.1 Hz, 1H), 8.67 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.11 (dd, *J* = 8.3, 1.6 Hz, 1H), 7.88 (dd, *J* = 5.5, 3.0 Hz, 2H), 7.74 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.52 – 7.45 (m, 2H), 7.39 (dd, *J* = 8.3, 4.2 Hz, 1H), 5.16 (dd, *J* = 11.1, 5.0 Hz, 1H), 4.87 (t, *J* = 4.6 Hz, 1H), 3.99 – 3.88 (m, 2H), 3.87 – 3.78 (m, 2H), 2.68 (ddt, *J* = 14.6, 11.2, 7.5 Hz, 1H), 2.53 – 2.37 (m, 1H), 1.88 – 1.72 (m, 2H), 1.64 – 1.50 (m, 2H).



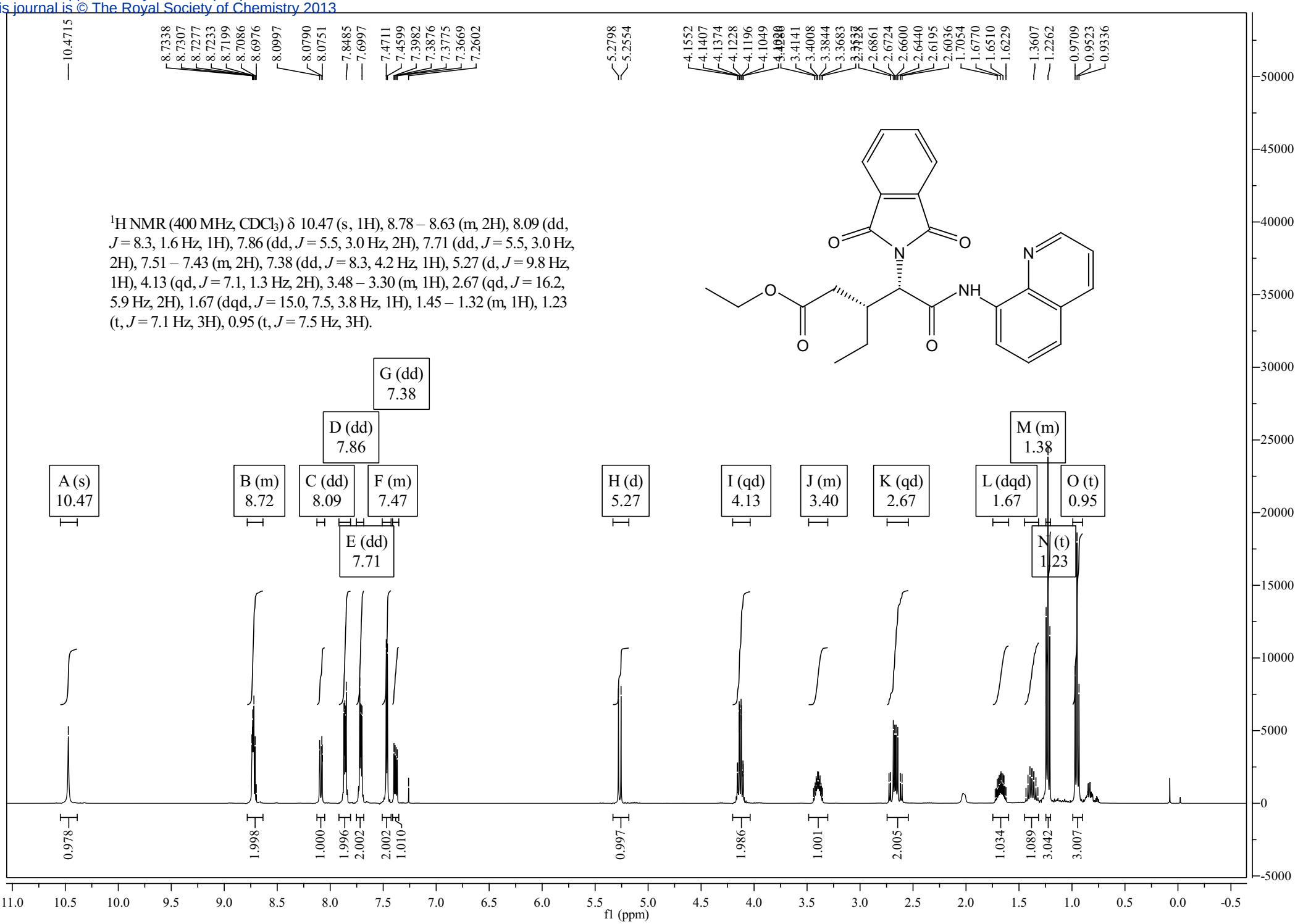


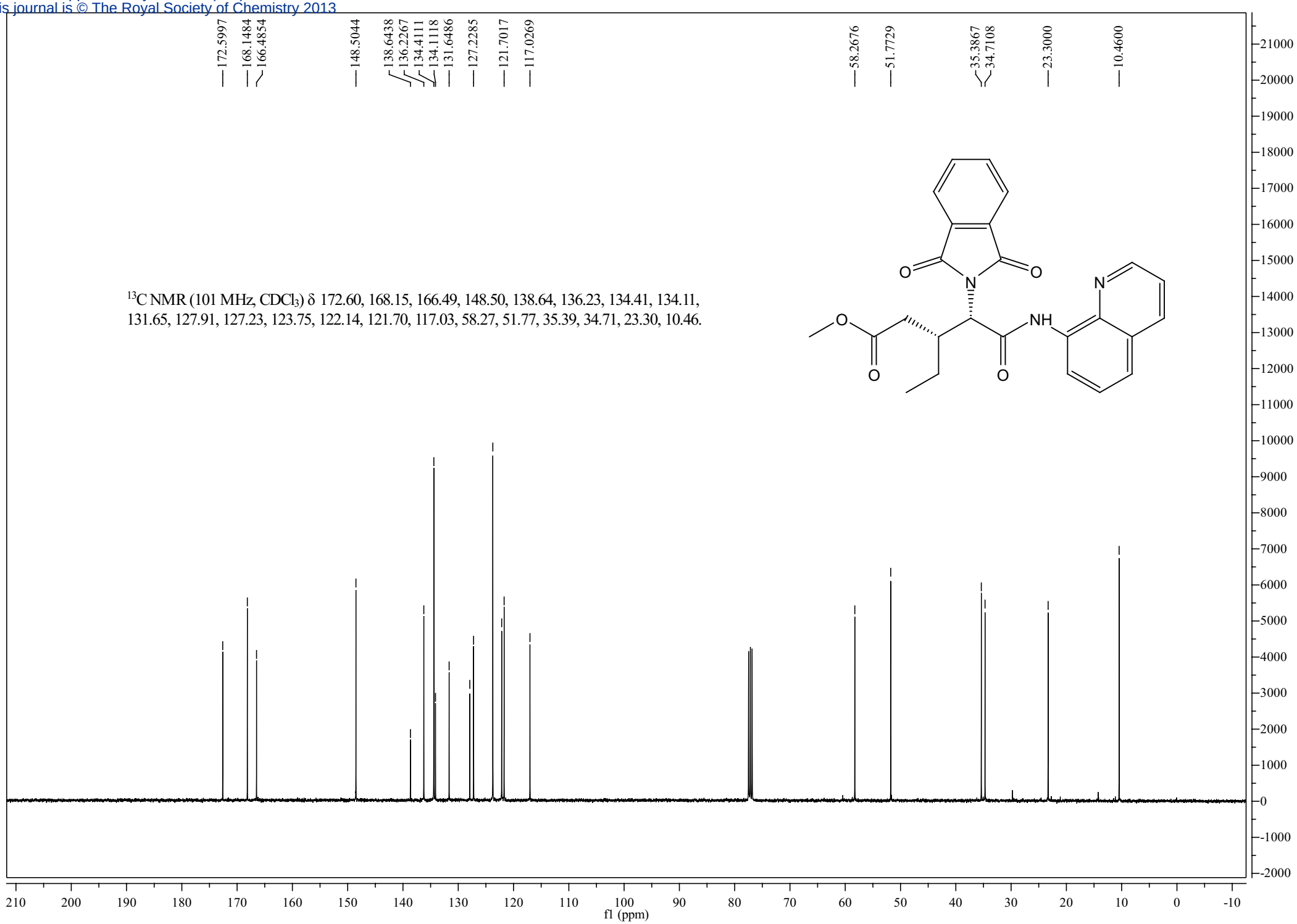
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.37, 167.26, 148.60, 138.87, 136.27, 134.45, 134.35, 131.76, 128.03, 127.36, 123.75, 122.05, 121.74, 117.15, 60.29, 36.15, 29.80, 29.15, 28.35, 27.49, 23.13, 23.06, 14.12, 14.08.



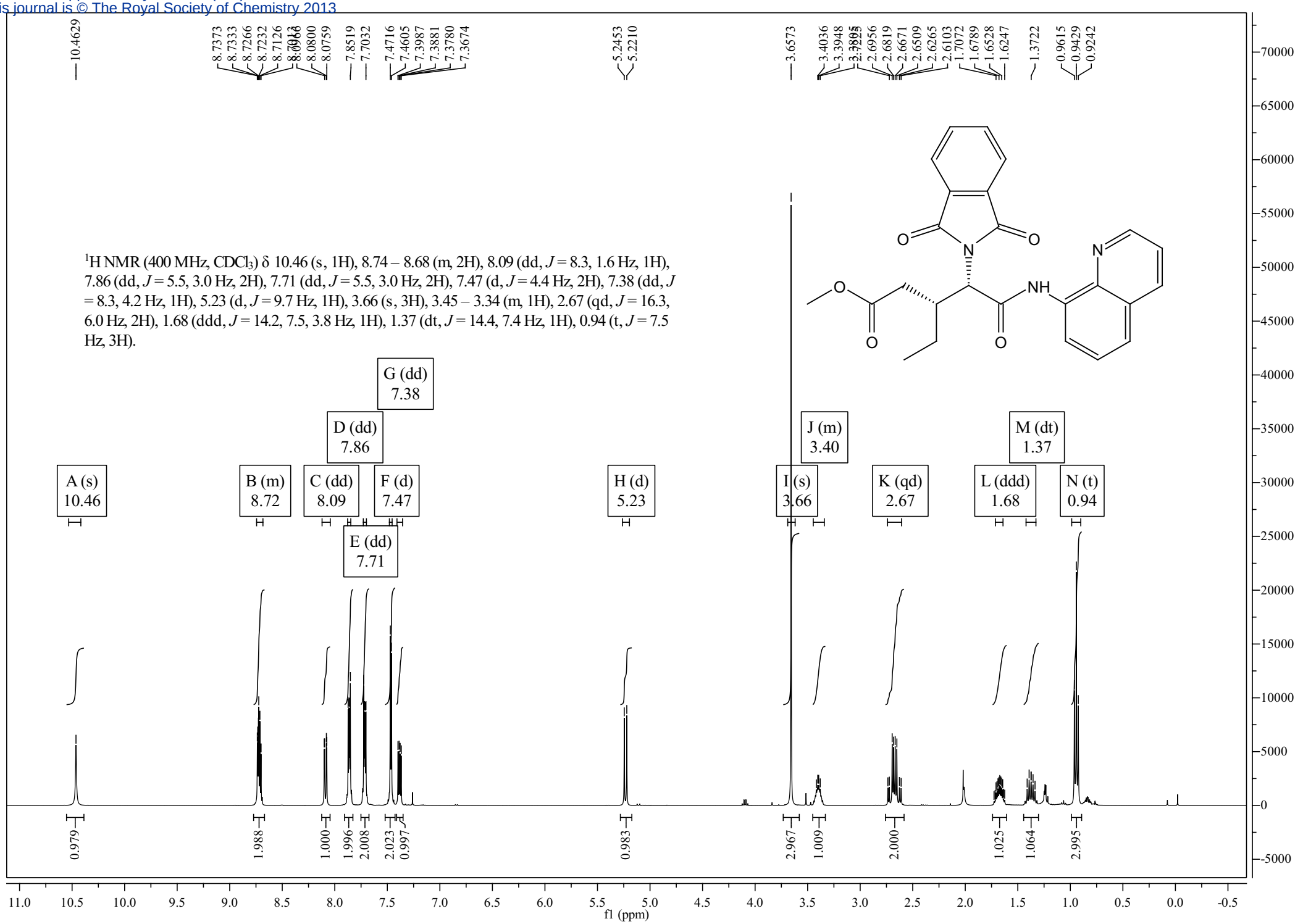


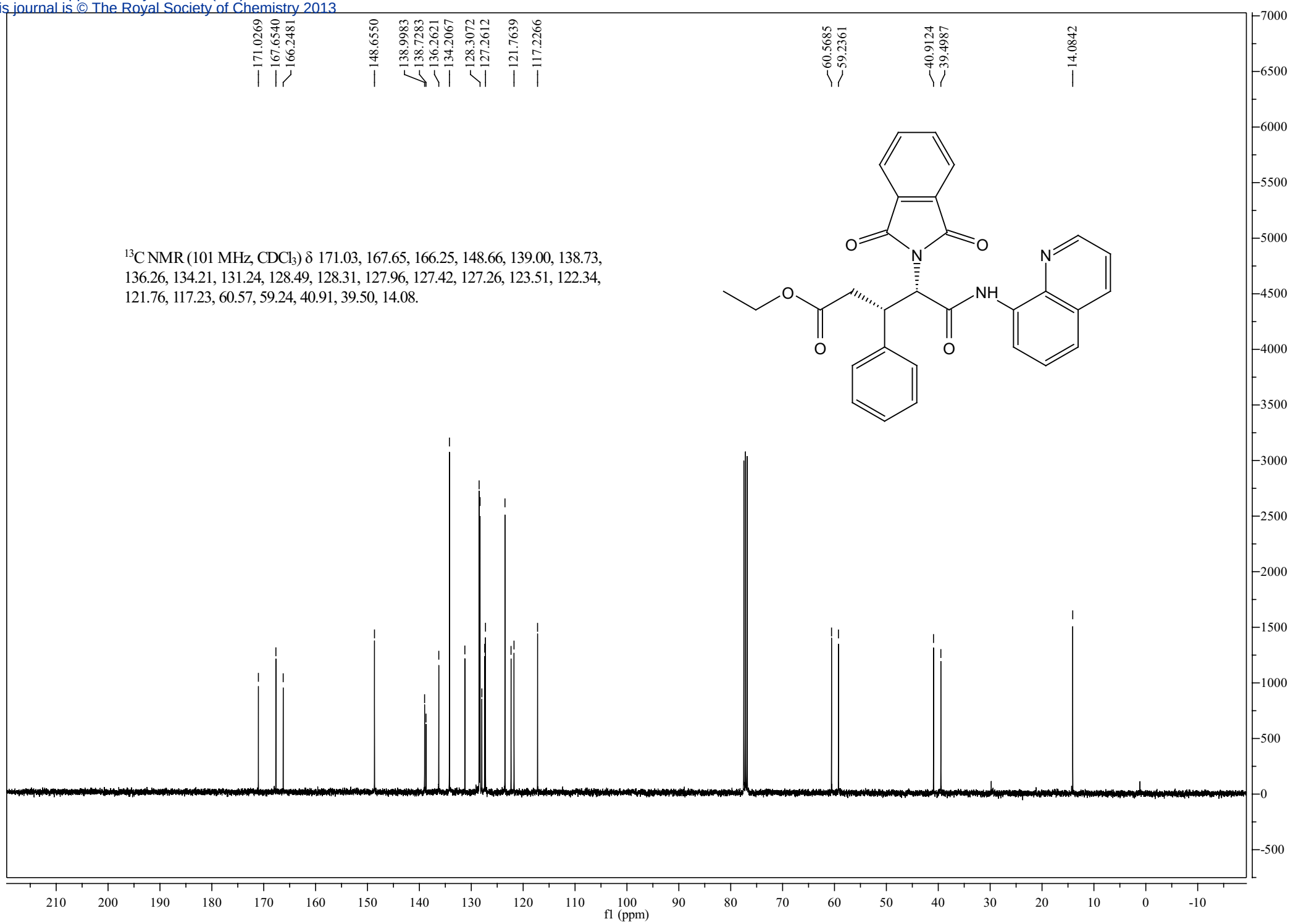
^{13}C NMR (101 MHz, $CDCl_3$) δ 172.11, 168.15, 166.53, 148.48, 138.64, 136.21, 134.38, 134.13, 131.65, 127.90, 127.21, 123.71, 122.11, 121.69, 117.00, 60.64, 58.30, 35.37, 34.88, 23.25, 14.22, 10.51.



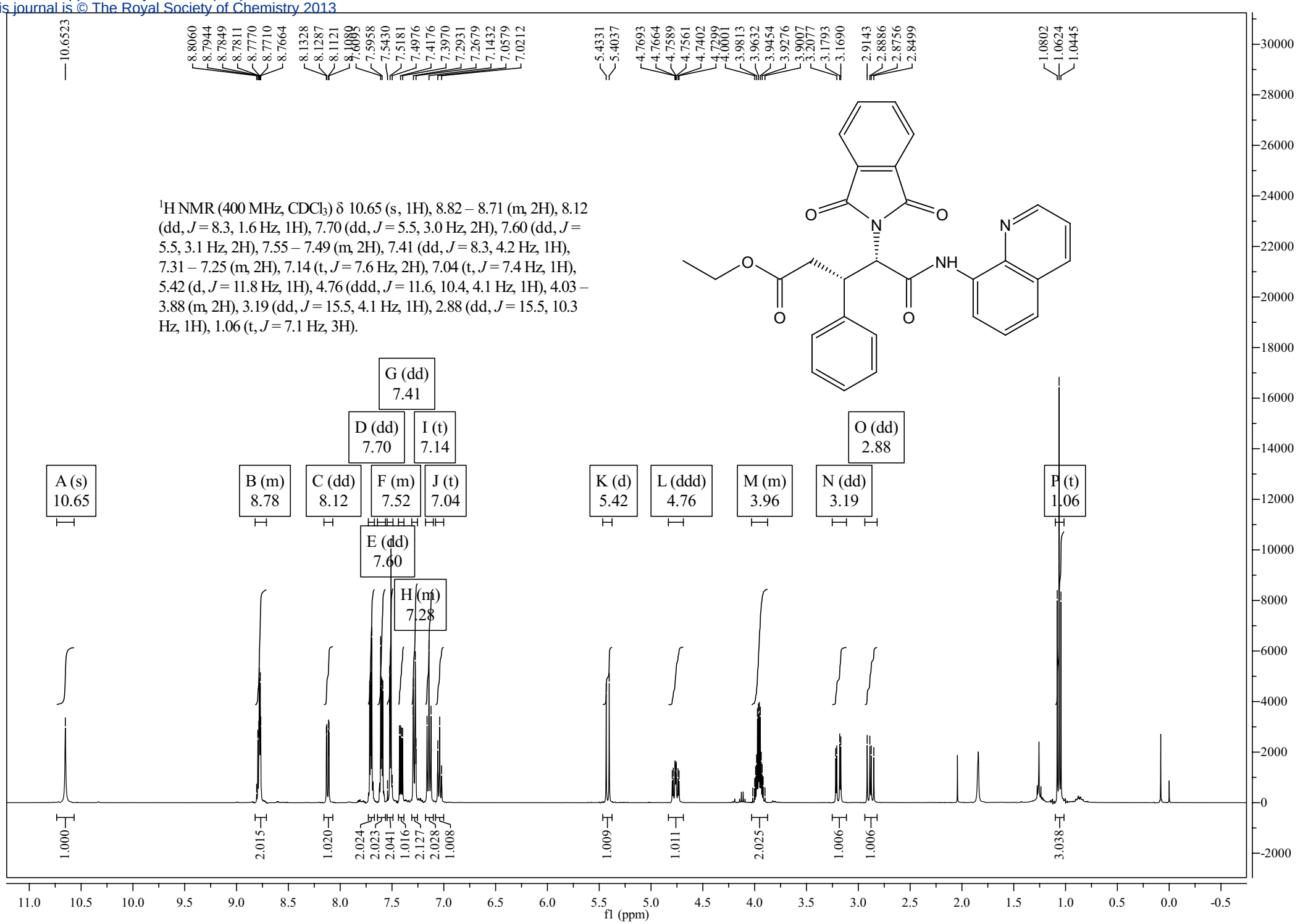


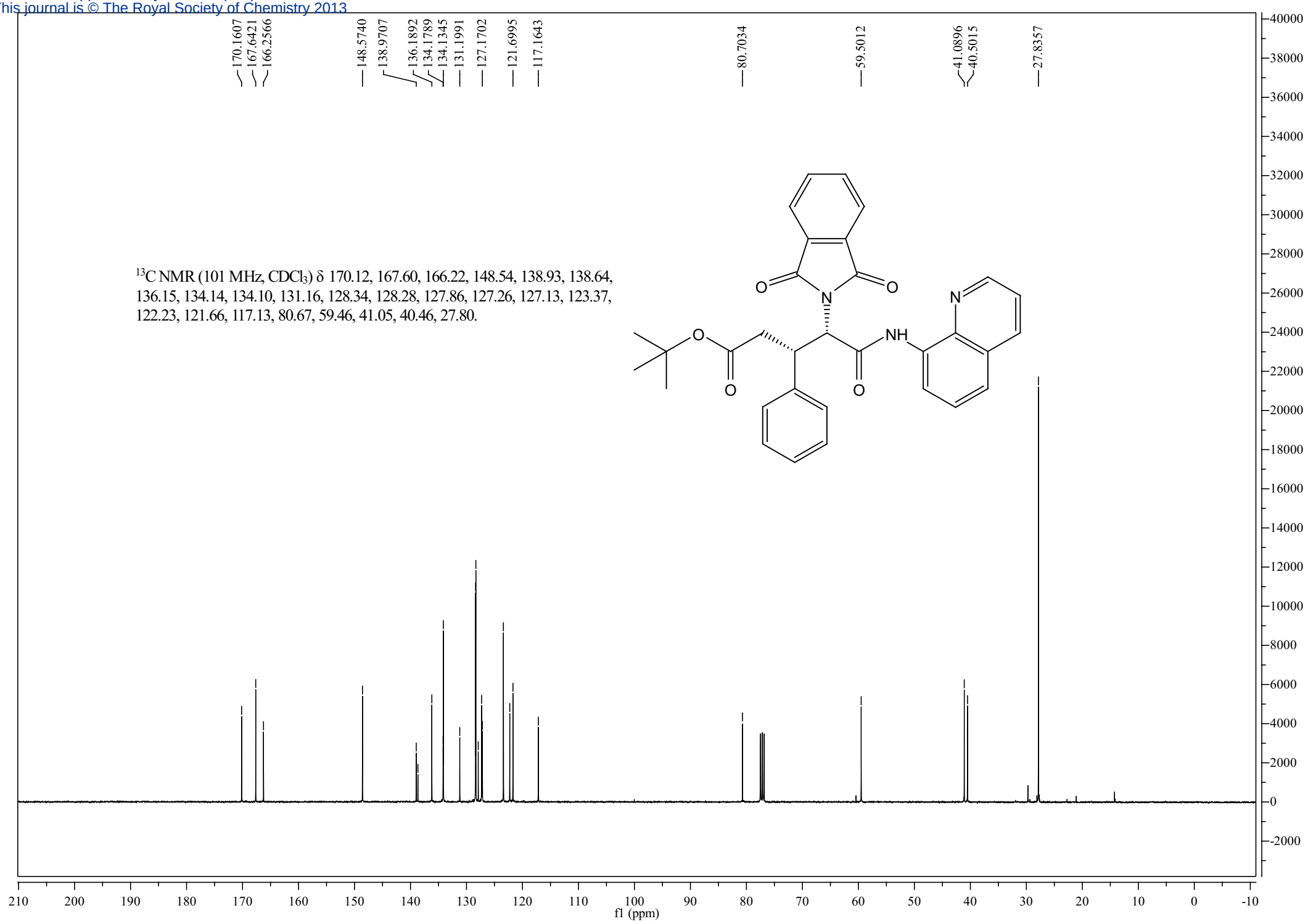
^{13}C NMR (101 MHz, $CDCl_3$) δ 172.60, 168.15, 166.49, 148.50, 138.64, 136.23, 134.41, 134.11, 131.65, 127.91, 127.23, 123.75, 122.14, 121.70, 117.03, 58.27, 51.77, 35.39, 34.71, 23.30, 10.46.



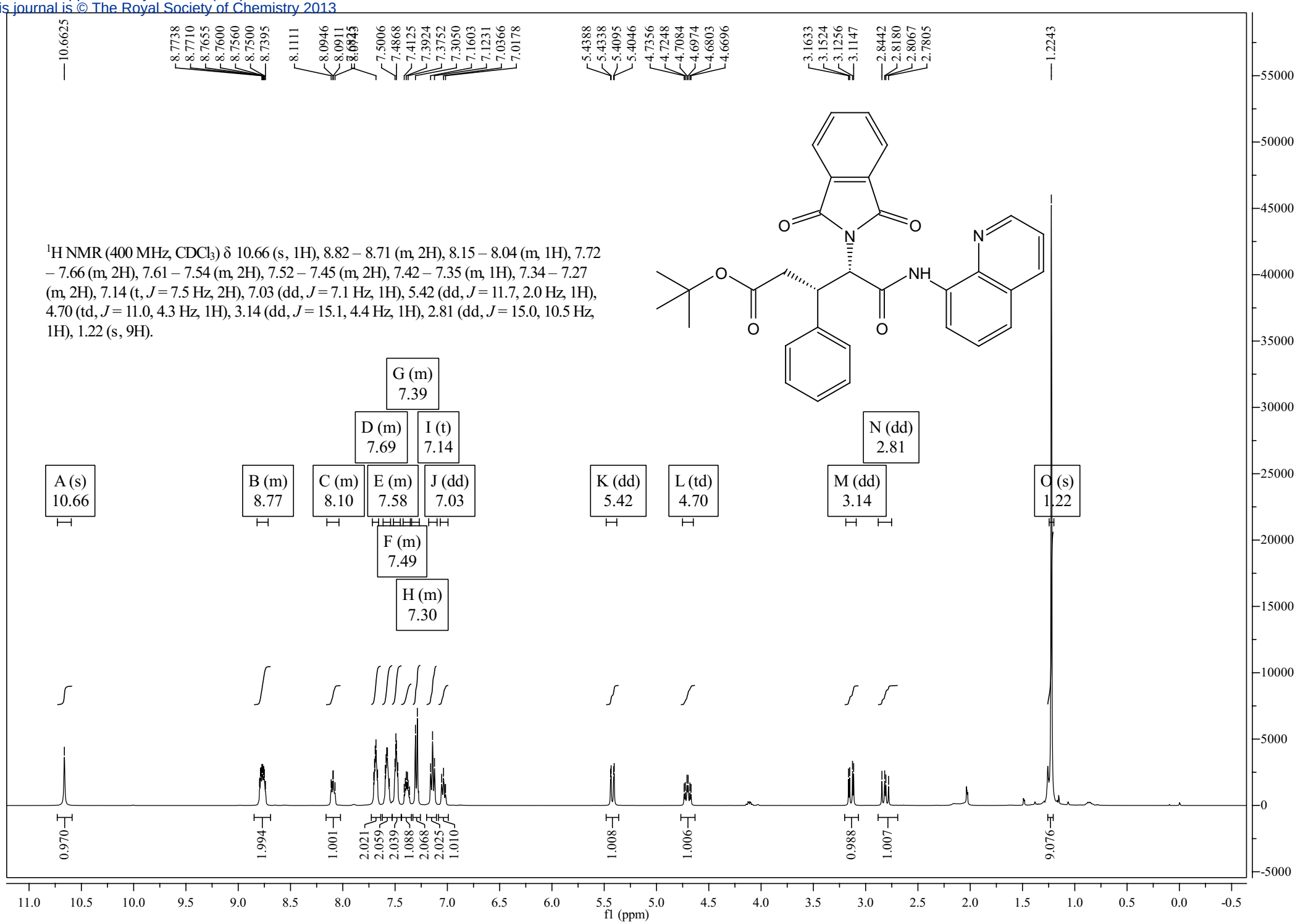


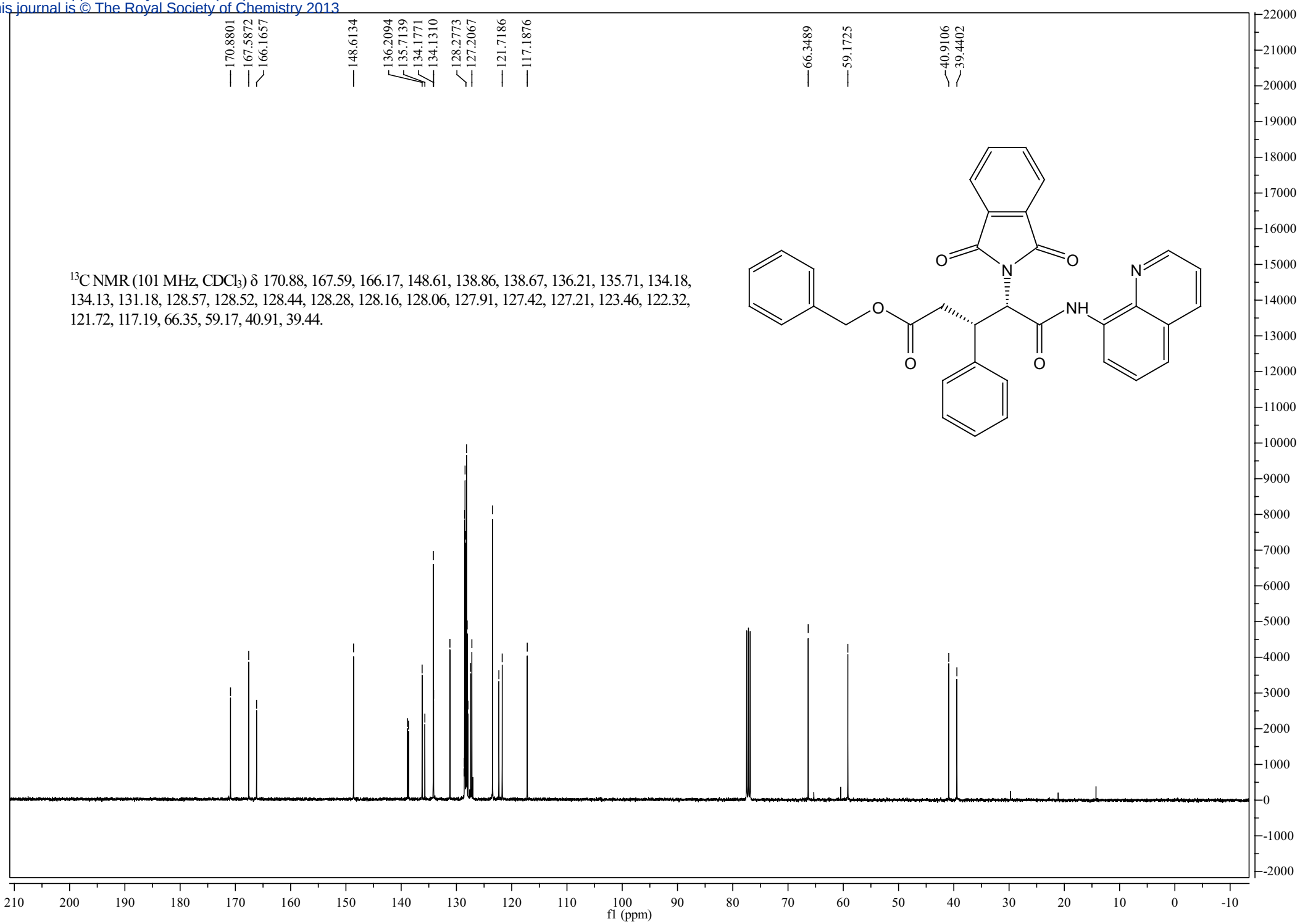
^{13}C NMR (101 MHz, $CDCl_3$) δ 171.03, 167.65, 166.25, 148.66, 139.00, 138.73, 136.26, 134.21, 131.24, 128.49, 128.31, 127.96, 127.42, 127.26, 123.51, 122.34, 121.76, 117.23, 60.57, 59.24, 40.91, 39.50, 14.08.



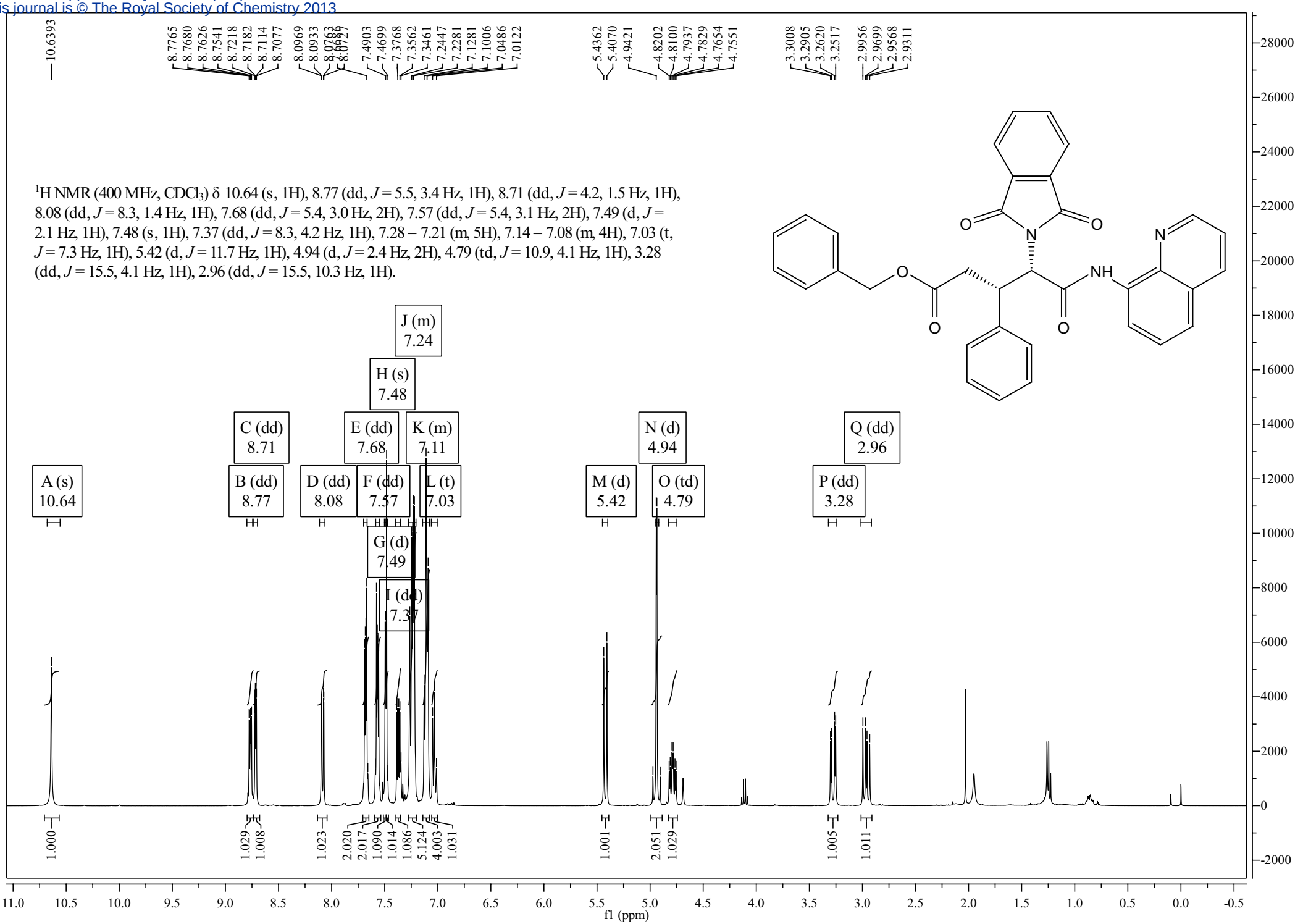


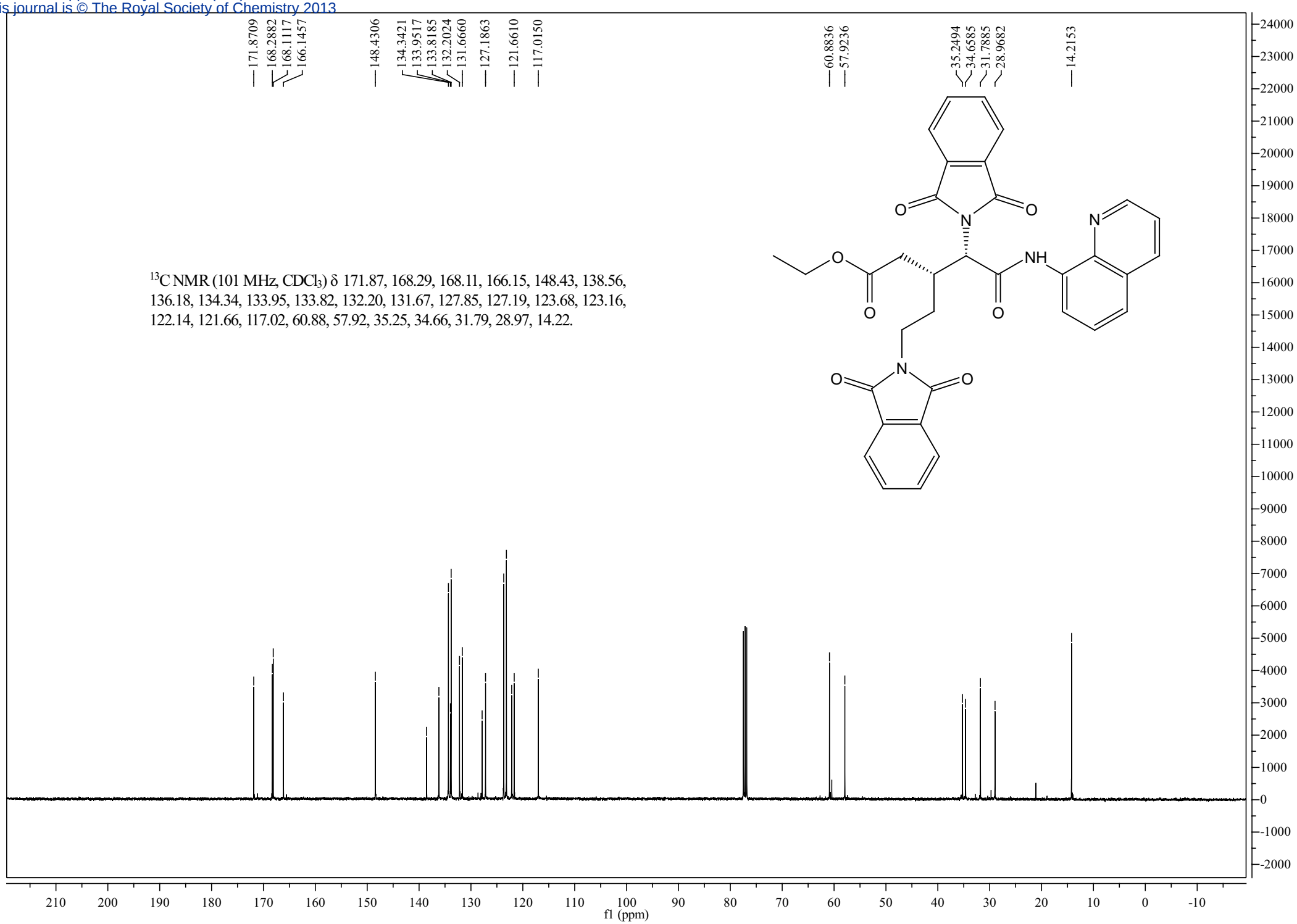
^{13}C NMR (101 MHz, $CDCl_3$) δ 170.12, 167.60, 166.22, 148.54, 138.93, 138.64, 136.15, 134.14, 134.10, 131.16, 128.34, 128.28, 127.86, 127.26, 127.13, 123.37, 122.23, 121.66, 117.13, 80.67, 59.46, 41.05, 40.46, 27.80.





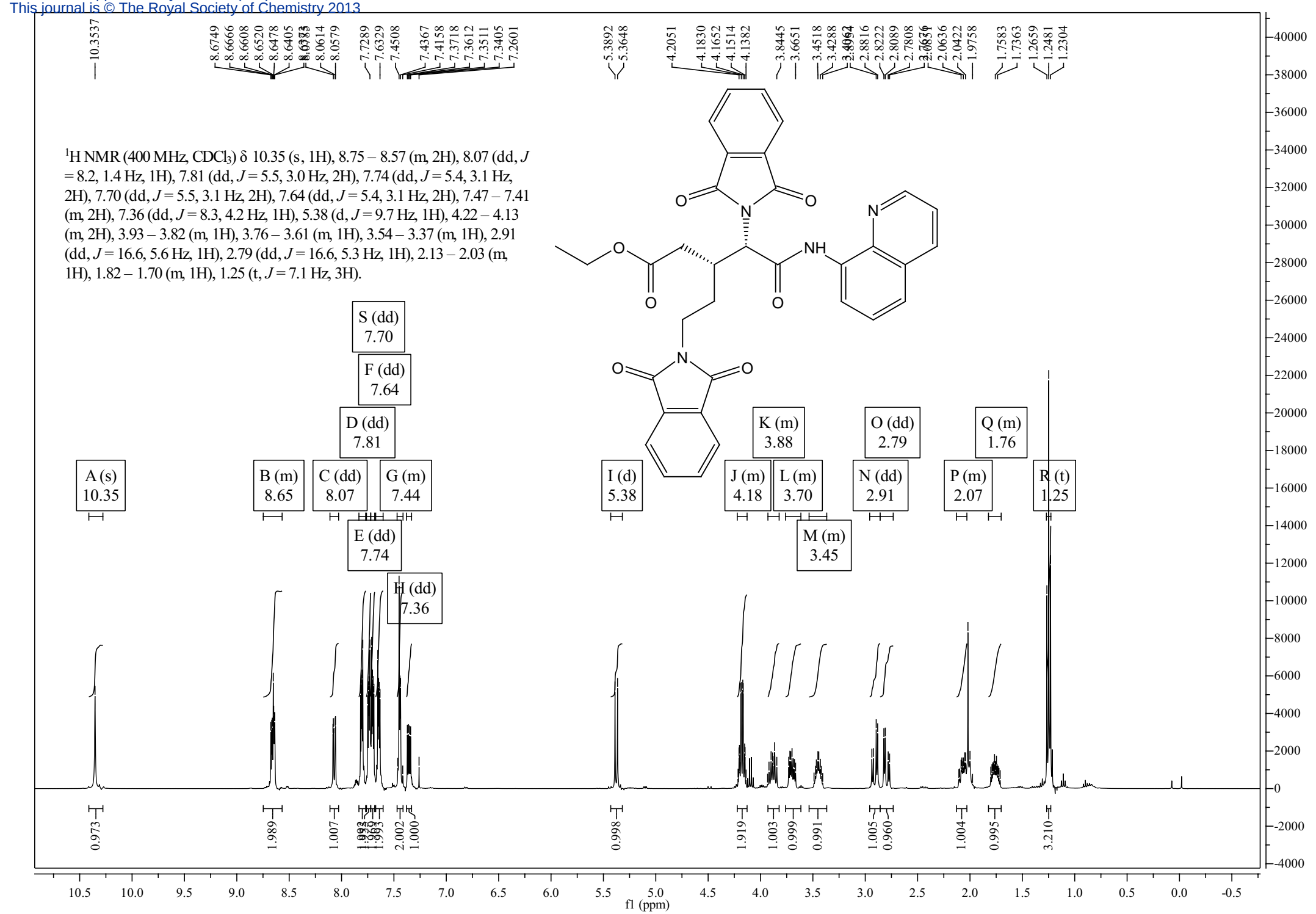
^{13}C NMR (101 MHz, $CDCl_3$) δ 170.88, 167.59, 166.17, 148.61, 138.86, 138.67, 136.21, 135.71, 134.18, 134.13, 131.18, 128.57, 128.52, 128.44, 128.28, 128.16, 128.06, 127.91, 127.42, 127.21, 123.46, 122.32, 121.72, 117.19, 66.35, 59.17, 40.91, 39.44.

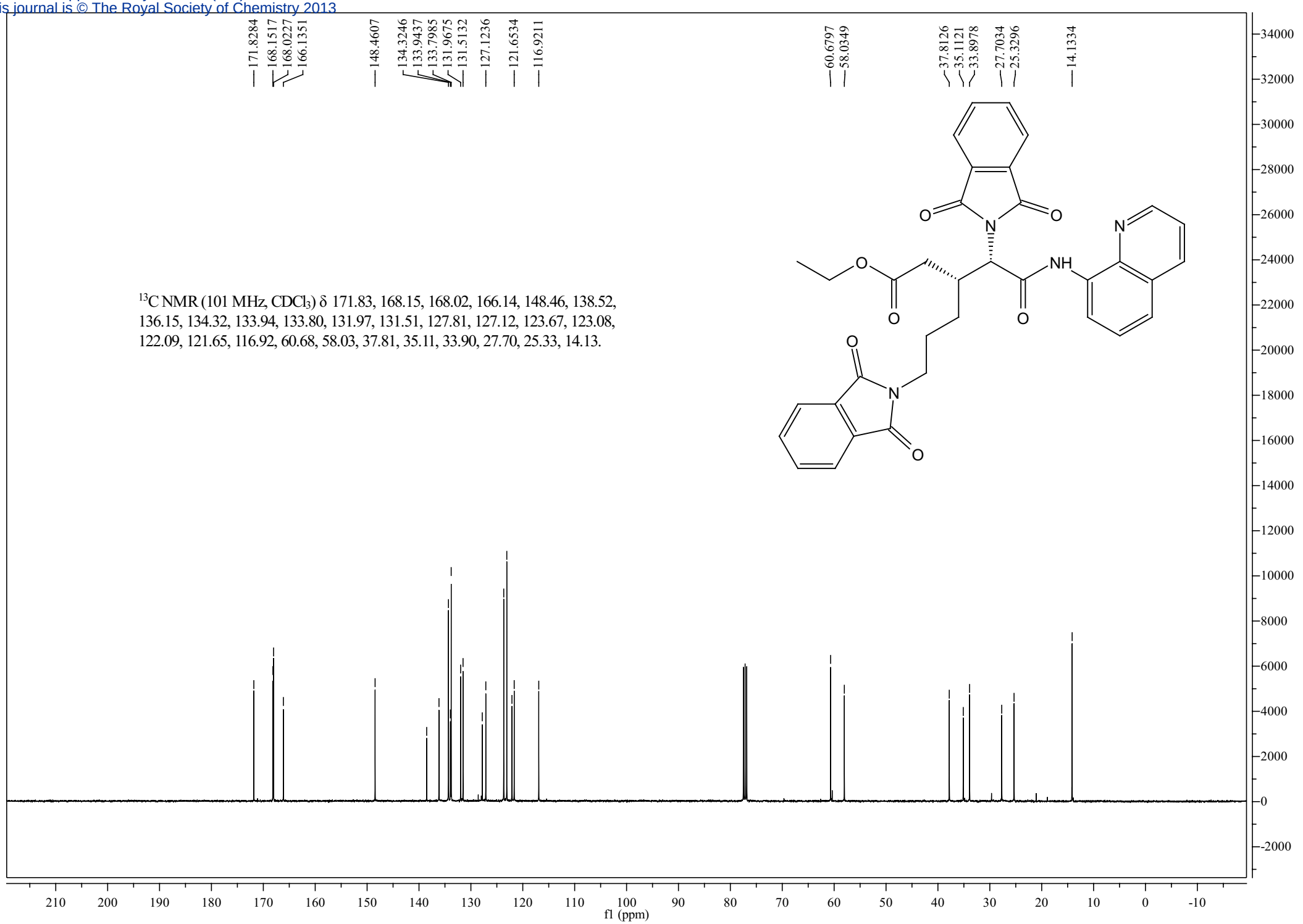




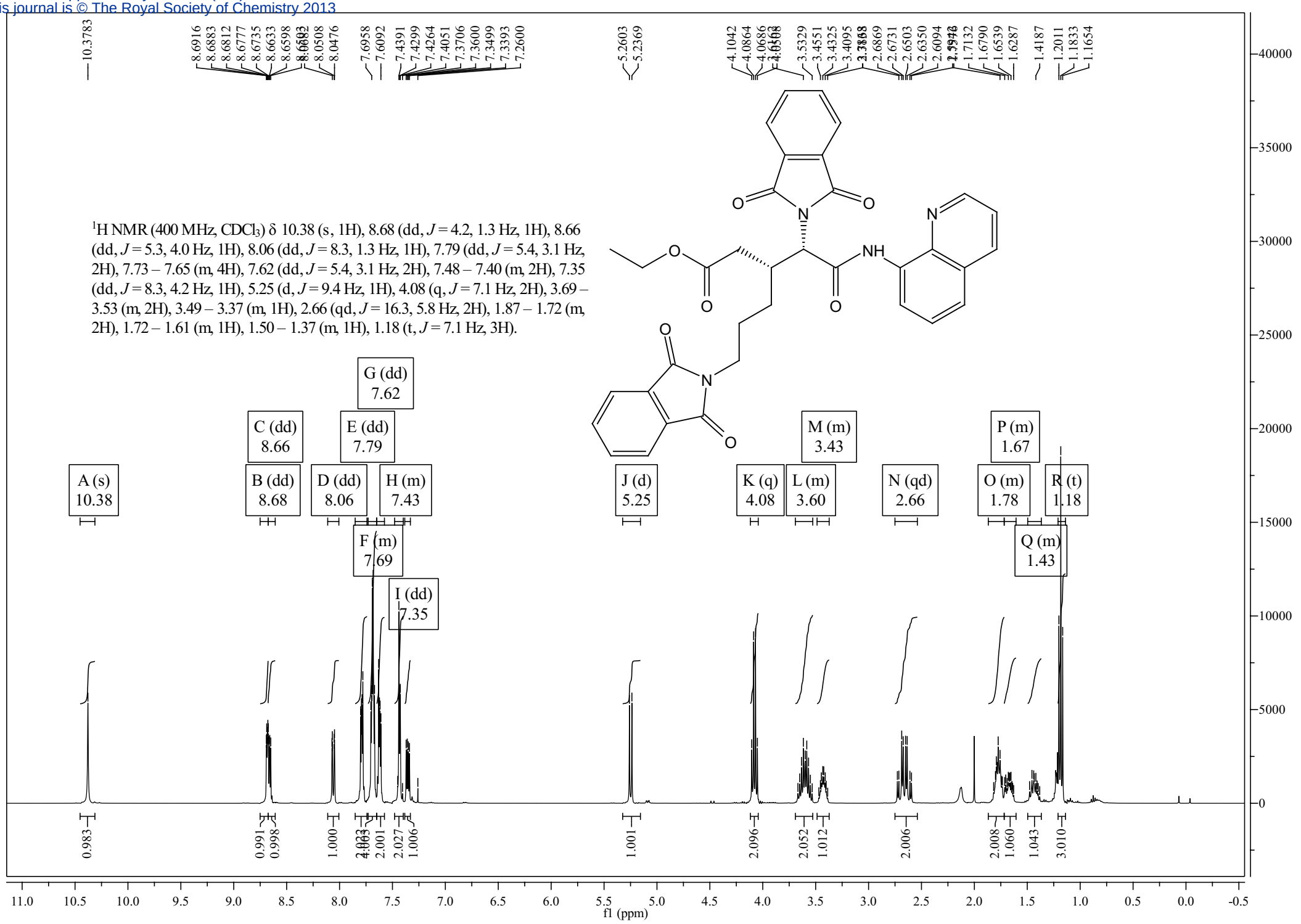
^{13}C NMR (101 MHz, $CDCl_3$) δ 171.87, 168.29, 168.11, 166.15, 148.43, 138.56, 136.18, 134.34, 133.95, 133.82, 132.20, 131.67, 127.85, 127.19, 123.68, 123.16, 122.14, 121.66, 117.02, 60.88, 57.92, 35.25, 34.66, 31.79, 28.97, 14.22.

^{1}H NMR (400 MHz, $CDCl_3$) δ 10.35 (s, 1H), 8.75 – 8.57 (m, 2H), 8.07 (dd, *J* = 8.2, 1.4 Hz, 1H), 7.81 (dd, *J* = 5.5, 3.0 Hz, 2H), 7.74 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.70 (dd, *J* = 5.5, 3.1 Hz, 2H), 7.64 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.47 – 7.41 (m, 2H), 7.36 (dd, *J* = 8.3, 4.2 Hz, 1H), 5.38 (d, *J* = 9.7 Hz, 1H), 4.22 – 4.13 (m, 2H), 3.93 – 3.82 (m, 1H), 3.76 – 3.61 (m, 1H), 3.54 – 3.37 (m, 1H), 2.91 (dd, *J* = 16.6, 5.6 Hz, 1H), 2.79 (dd, *J* = 16.6, 5.3 Hz, 1H), 2.13 – 2.03 (m, 1H), 1.82 – 1.70 (m, 1H), 1.25 (t, *J* = 7.1 Hz, 3H).

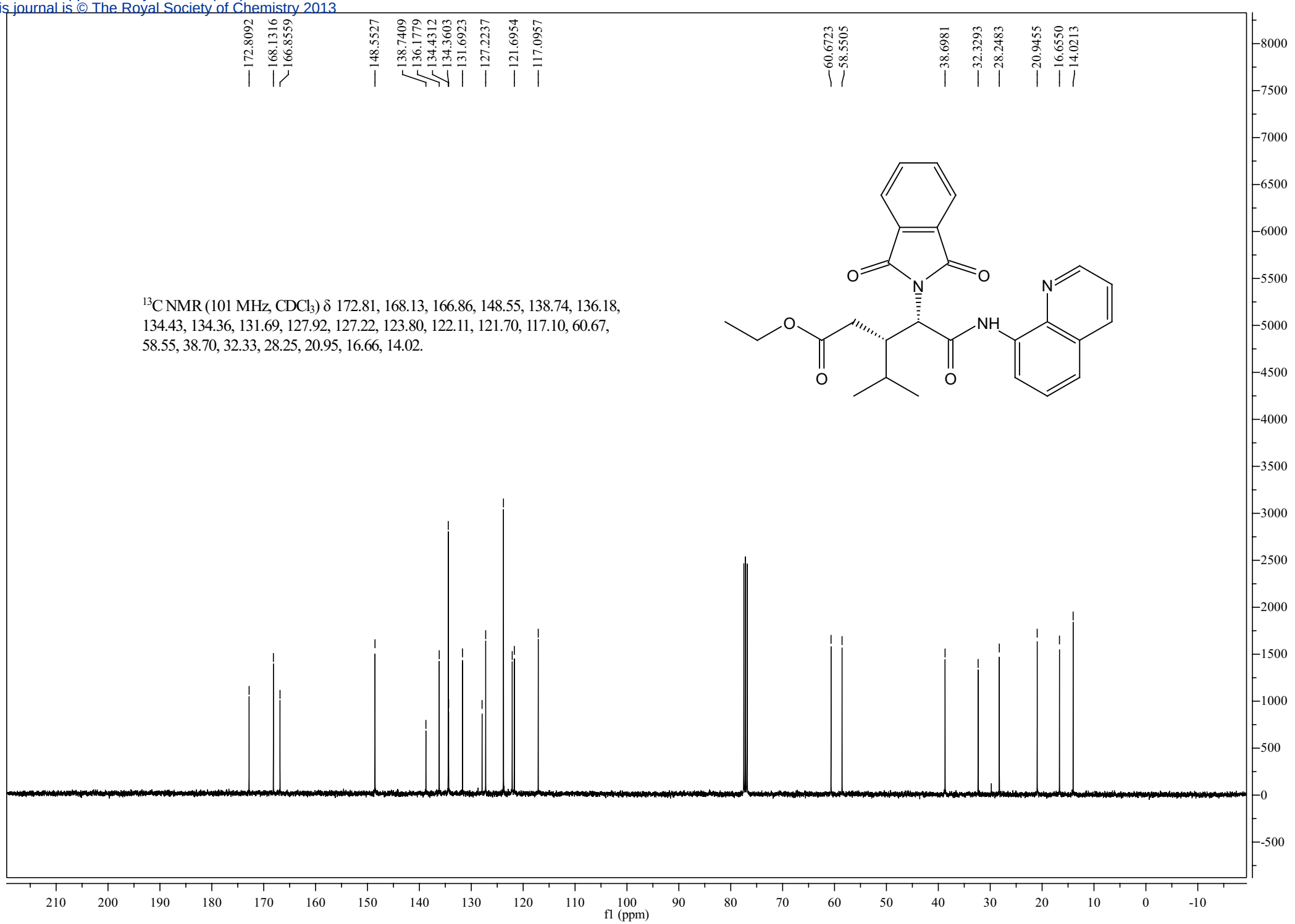




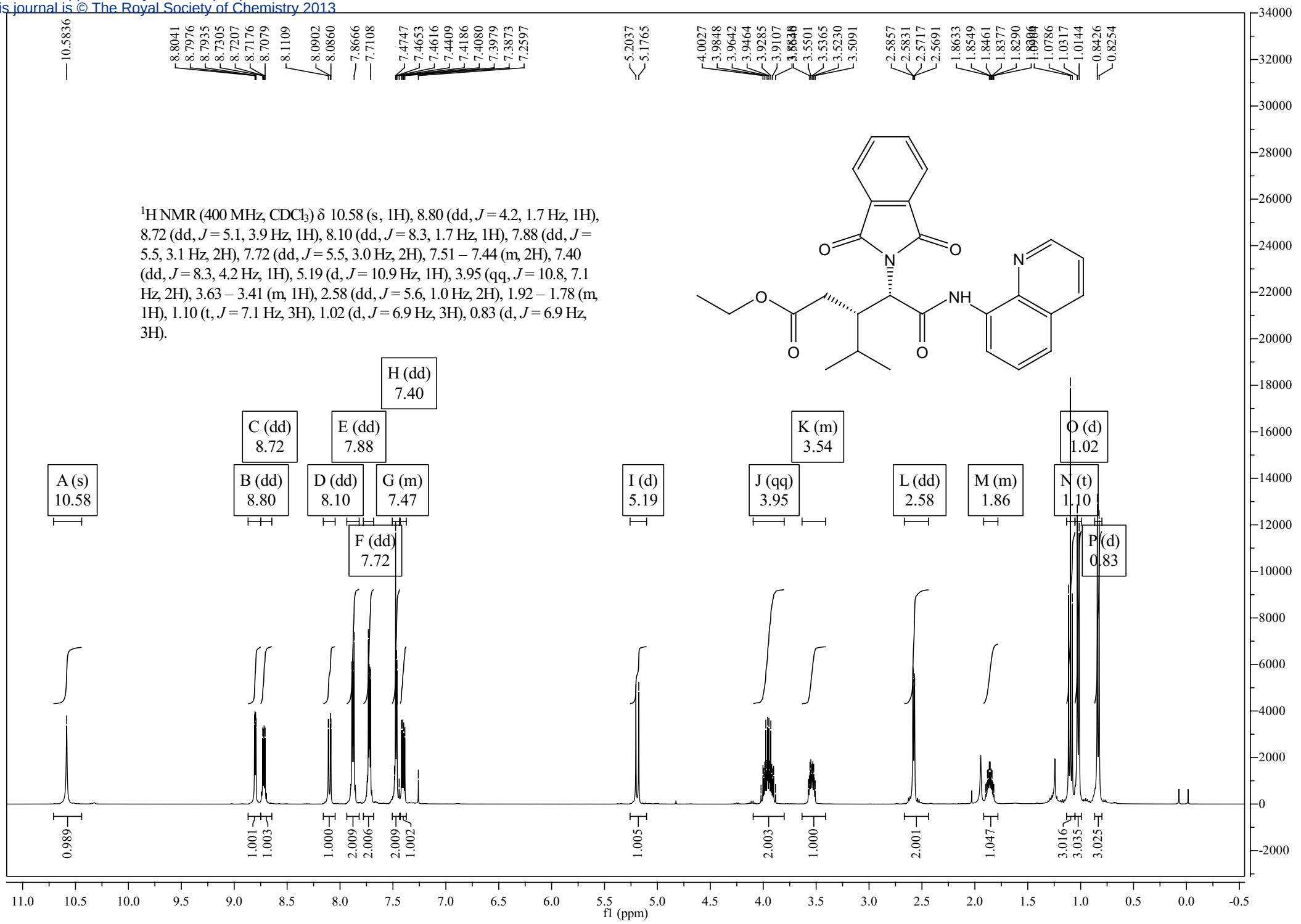
^{13}C NMR (101 MHz, $CDCl_3$) δ 171.83, 168.15, 168.02, 166.14, 148.46, 138.52, 136.15, 134.32, 133.94, 133.80, 131.97, 131.51, 127.81, 127.12, 123.67, 123.08, 122.09, 121.65, 116.92, 60.68, 58.03, 37.81, 35.11, 33.90, 27.70, 25.33, 14.13.

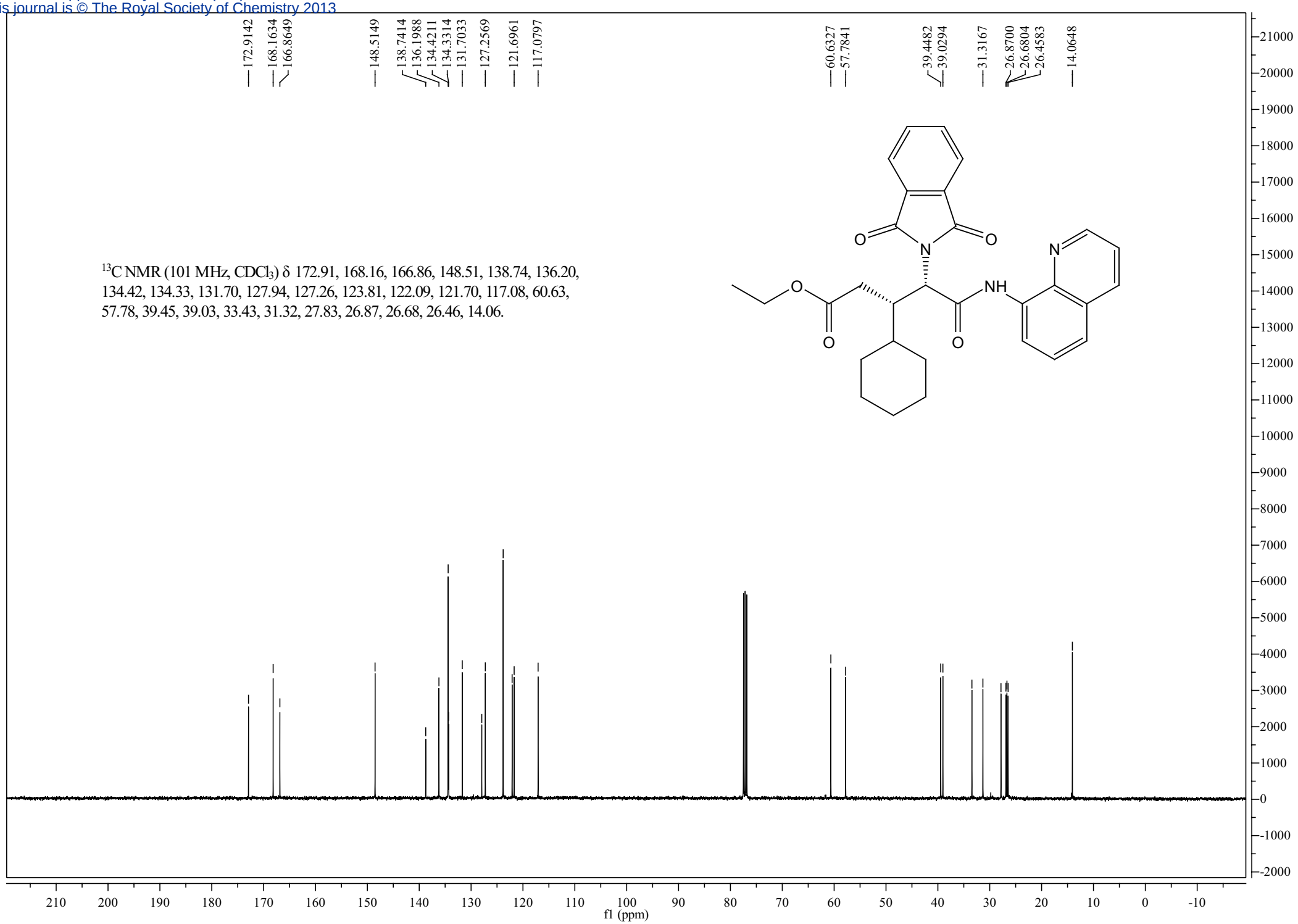


^{1}H NMR (400 MHz, $CDCl_3$) δ 10.38 (s, 1H), 8.68 (dd, *J* = 4.2, 1.3 Hz, 1H), 8.66 (dd, *J* = 5.3, 4.0 Hz, 1H), 8.06 (dd, *J* = 8.3, 1.3 Hz, 1H), 7.79 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.73 – 7.65 (m, 4H), 7.62 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.48 – 7.40 (m, 2H), 7.35 (dd, *J* = 8.3, 4.2 Hz, 1H), 5.25 (d, *J* = 9.4 Hz, 1H), 4.08 (q, *J* = 7.1 Hz, 2H), 3.69 – 3.53 (m, 2H), 3.49 – 3.37 (m, 1H), 2.66 (qd, *J* = 16.3, 5.8 Hz, 2H), 1.87 – 1.72 (m, 2H), 1.72 – 1.61 (m, 1H), 1.50 – 1.37 (m, 1H), 1.18 (t, *J* = 7.1 Hz, 3H).

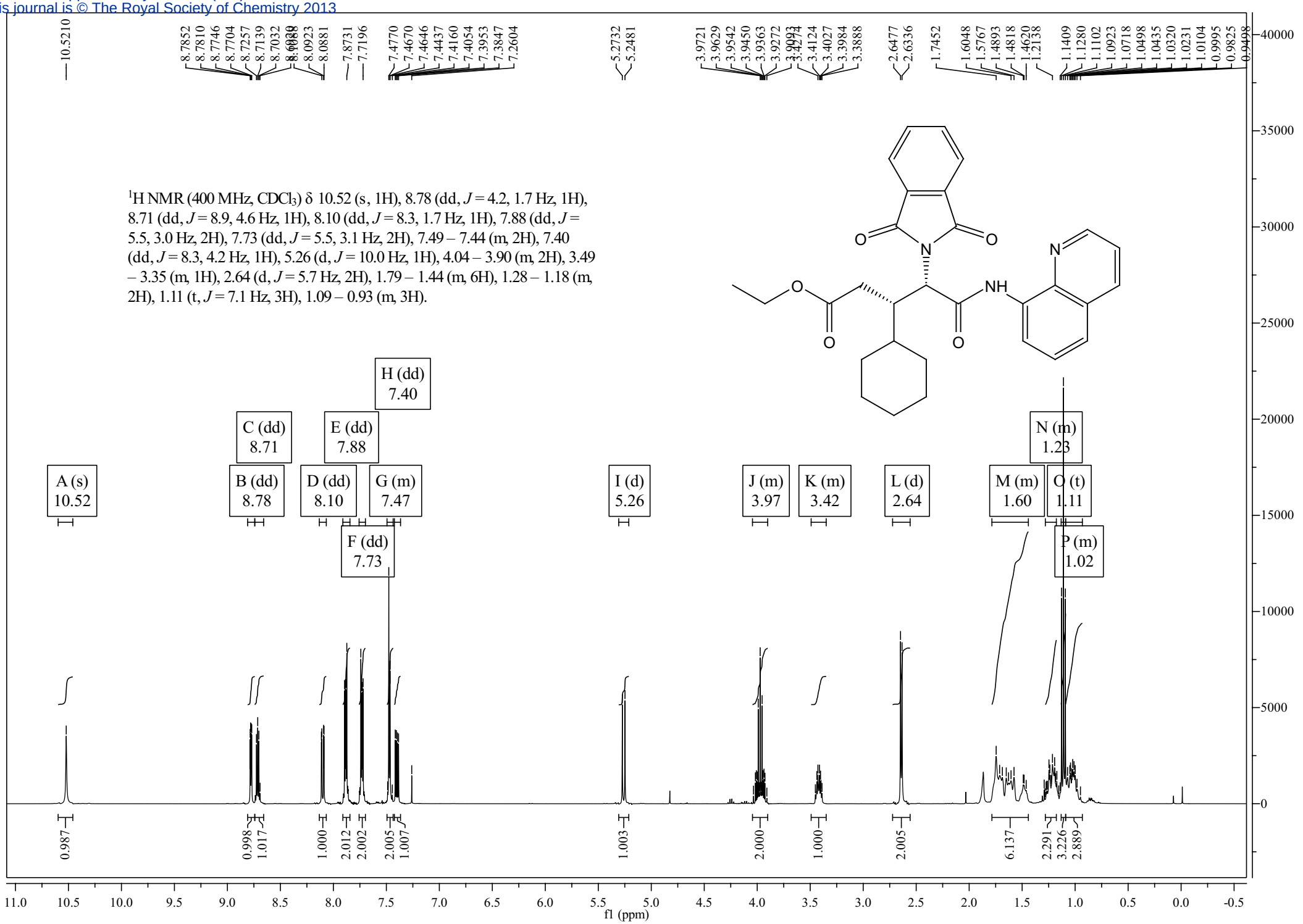


^{13}C NMR (101 MHz, $CDCl_3$) δ 172.81, 168.13, 166.86, 148.55, 138.74, 136.18, 134.43, 134.36, 131.69, 127.92, 127.22, 123.80, 122.11, 121.70, 117.10, 60.67, 58.55, 38.70, 32.33, 28.25, 20.95, 16.66, 14.02.



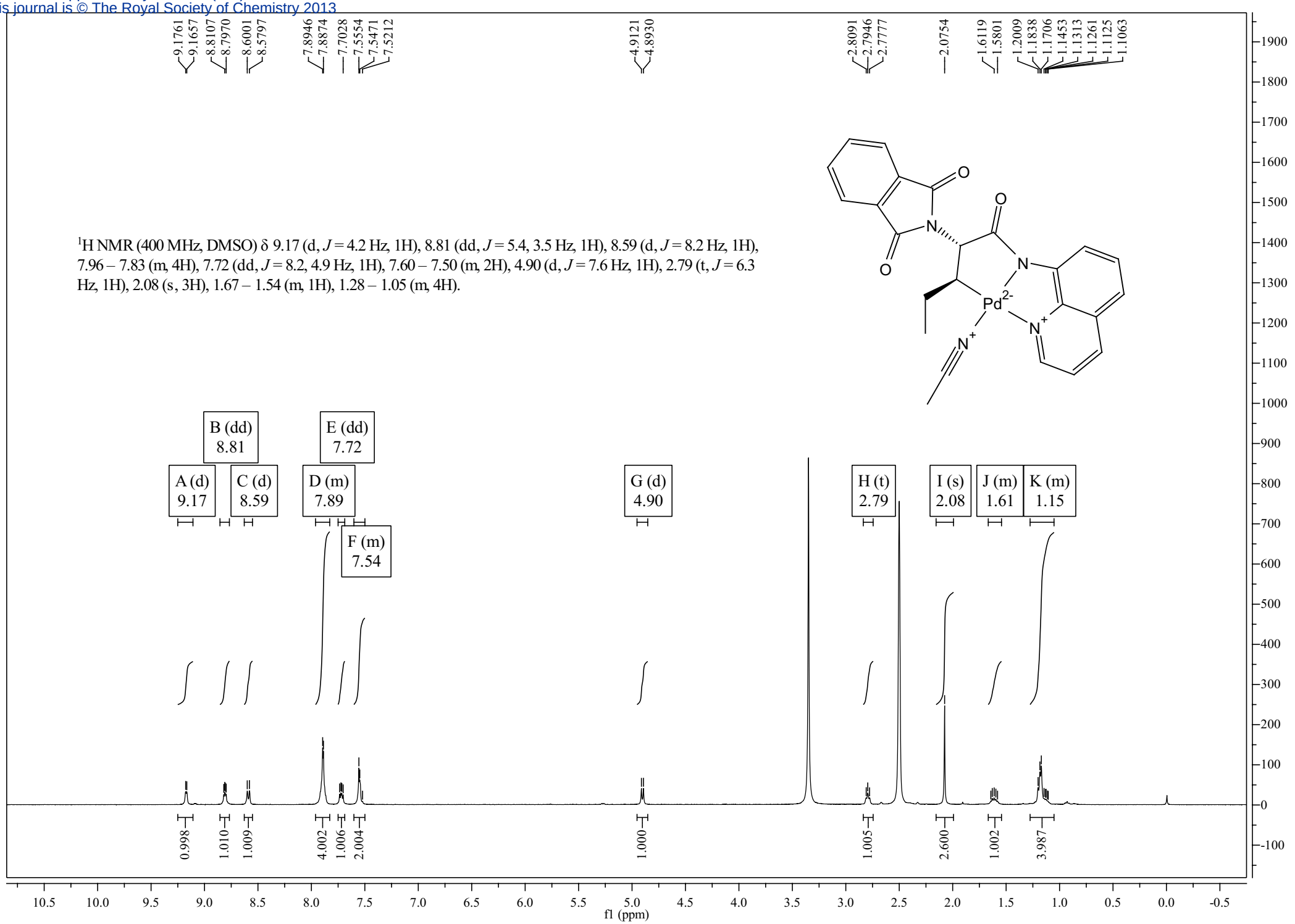


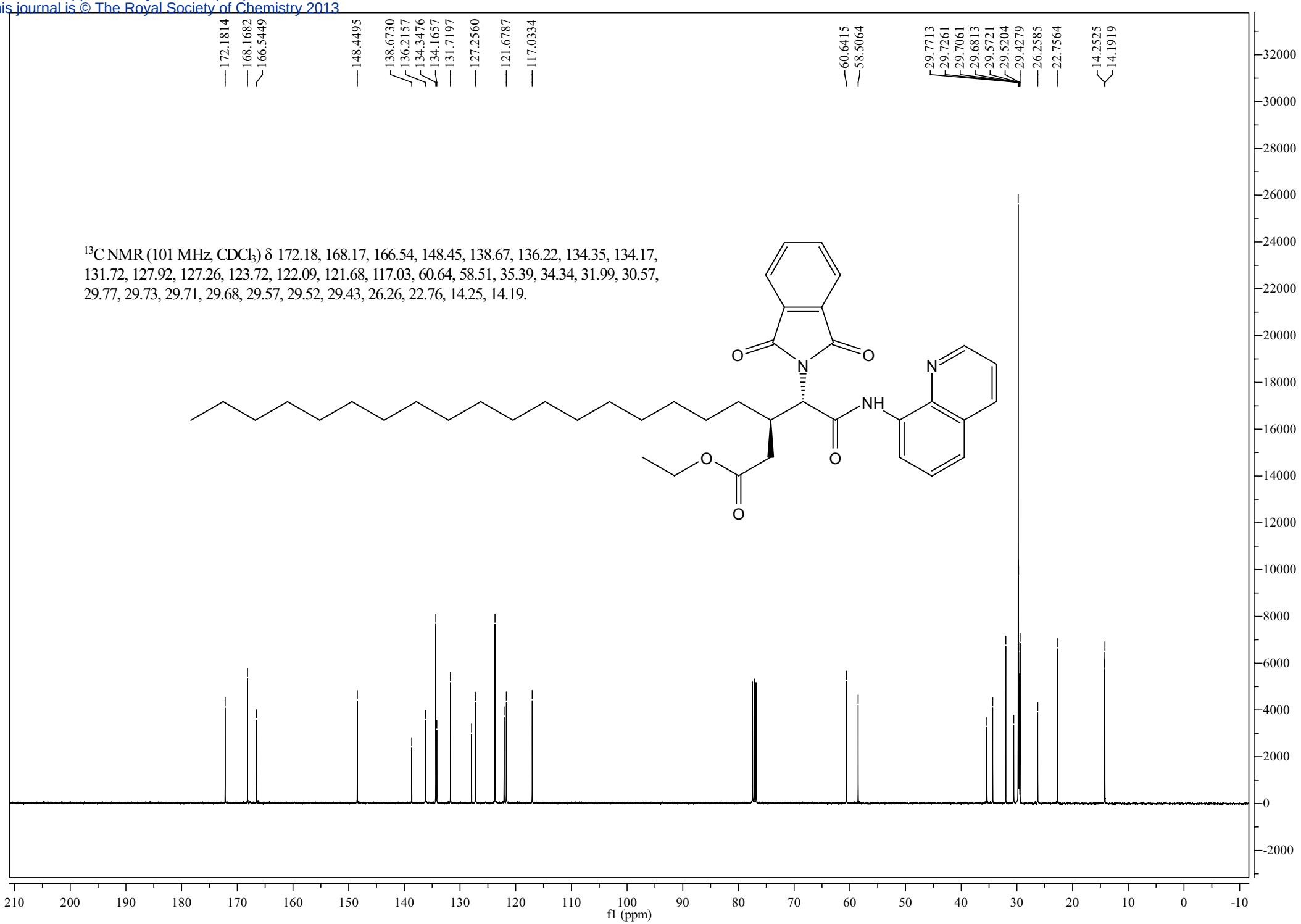
^{13}C NMR (101 MHz, $CDCl_3$) δ 172.91, 168.16, 166.86, 148.51, 138.74, 136.20, 134.42, 134.33, 131.70, 127.94, 127.26, 123.81, 122.09, 121.70, 117.08, 60.63, 57.78, 39.45, 39.03, 33.43, 31.32, 27.83, 26.87, 26.68, 26.46, 14.06.



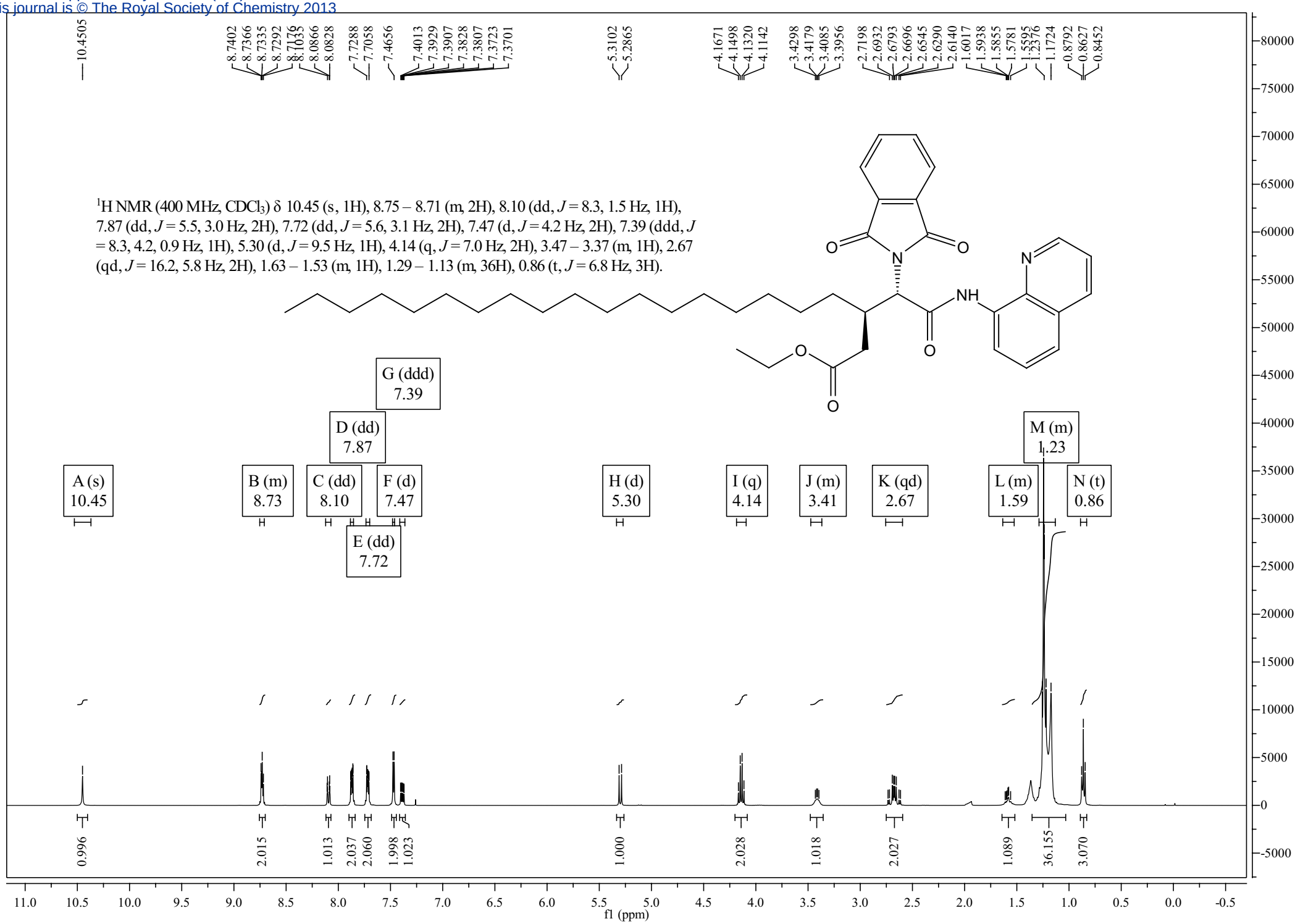
^{1}H NMR (400 MHz, $CDCl_3$) δ 10.52 (s, 1H), 8.78 (dd, J = 4.2, 1.7 Hz, 1H), 8.71 (dd, J = 8.9, 4.6 Hz, 1H), 8.10 (dd, J = 8.3, 1.7 Hz, 1H), 7.88 (dd, J = 5.5, 3.0 Hz, 2H), 7.73 (dd, J = 5.5, 3.1 Hz, 2H), 7.49 – 7.44 (m, 2H), 7.40 (dd, J = 8.3, 4.2 Hz, 1H), 5.26 (d, J = 10.0 Hz, 1H), 4.04 – 3.90 (m, 2H), 3.49 – 3.35 (m, 1H), 2.64 (d, J = 5.7 Hz, 2H), 1.79 – 1.44 (m, 6H), 1.28 – 1.18 (m, 2H), 1.11 (t, J = 7.1 Hz, 3H), 1.09 – 0.93 (m, 3H).

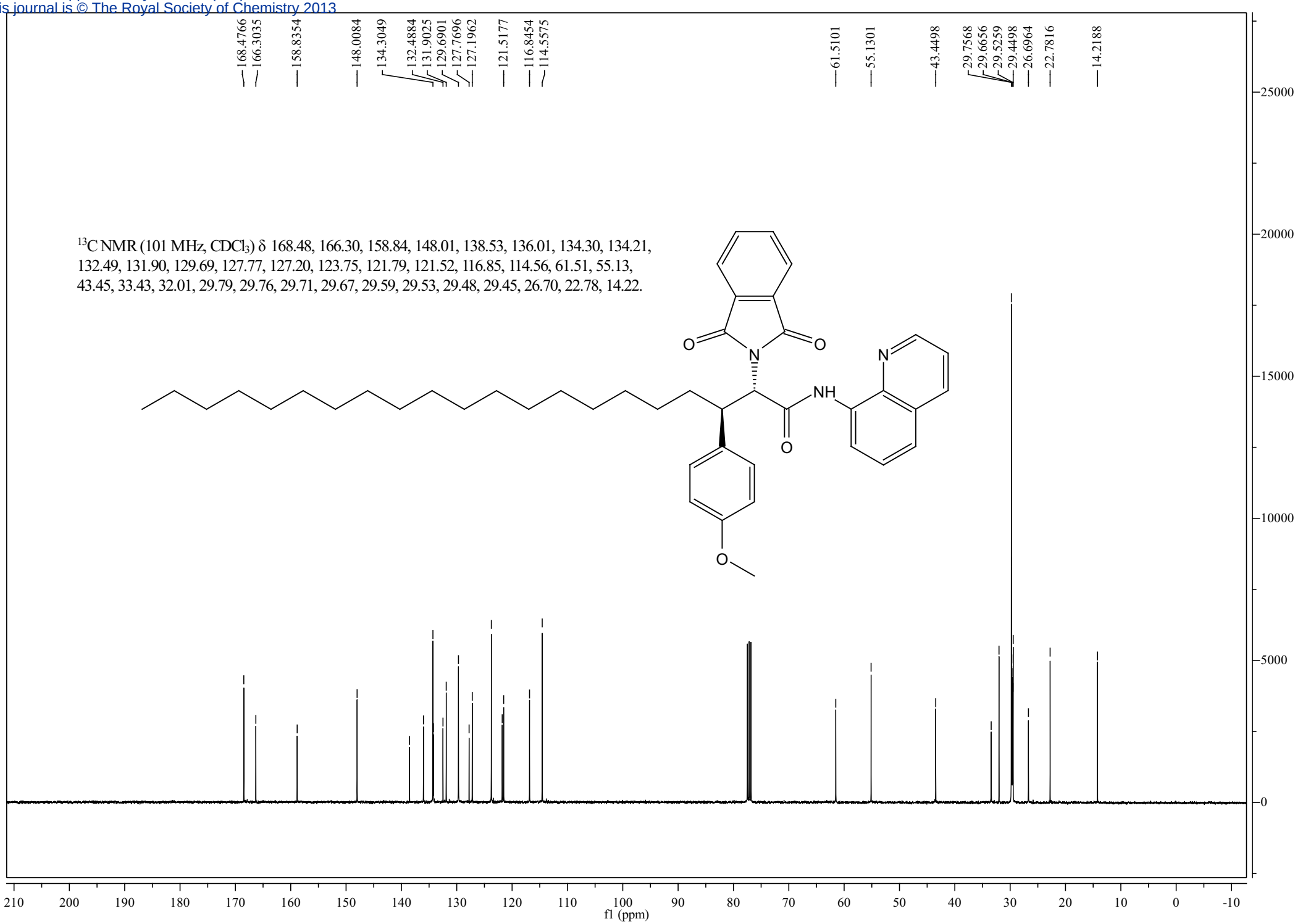
^{1}H NMR (400 MHz, DMSO) δ 9.17 (d, *J* = 4.2 Hz, 1H), 8.81 (dd, *J* = 5.4, 3.5 Hz, 1H), 8.59 (d, *J* = 8.2 Hz, 1H), 7.96 – 7.83 (m, 4H), 7.72 (dd, *J* = 8.2, 4.9 Hz, 1H), 7.60 – 7.50 (m, 2H), 4.90 (d, *J* = 7.6 Hz, 1H), 2.79 (t, *J* = 6.3 Hz, 1H), 2.08 (s, 3H), 1.67 – 1.54 (m, 1H), 1.28 – 1.05 (m, 4H).



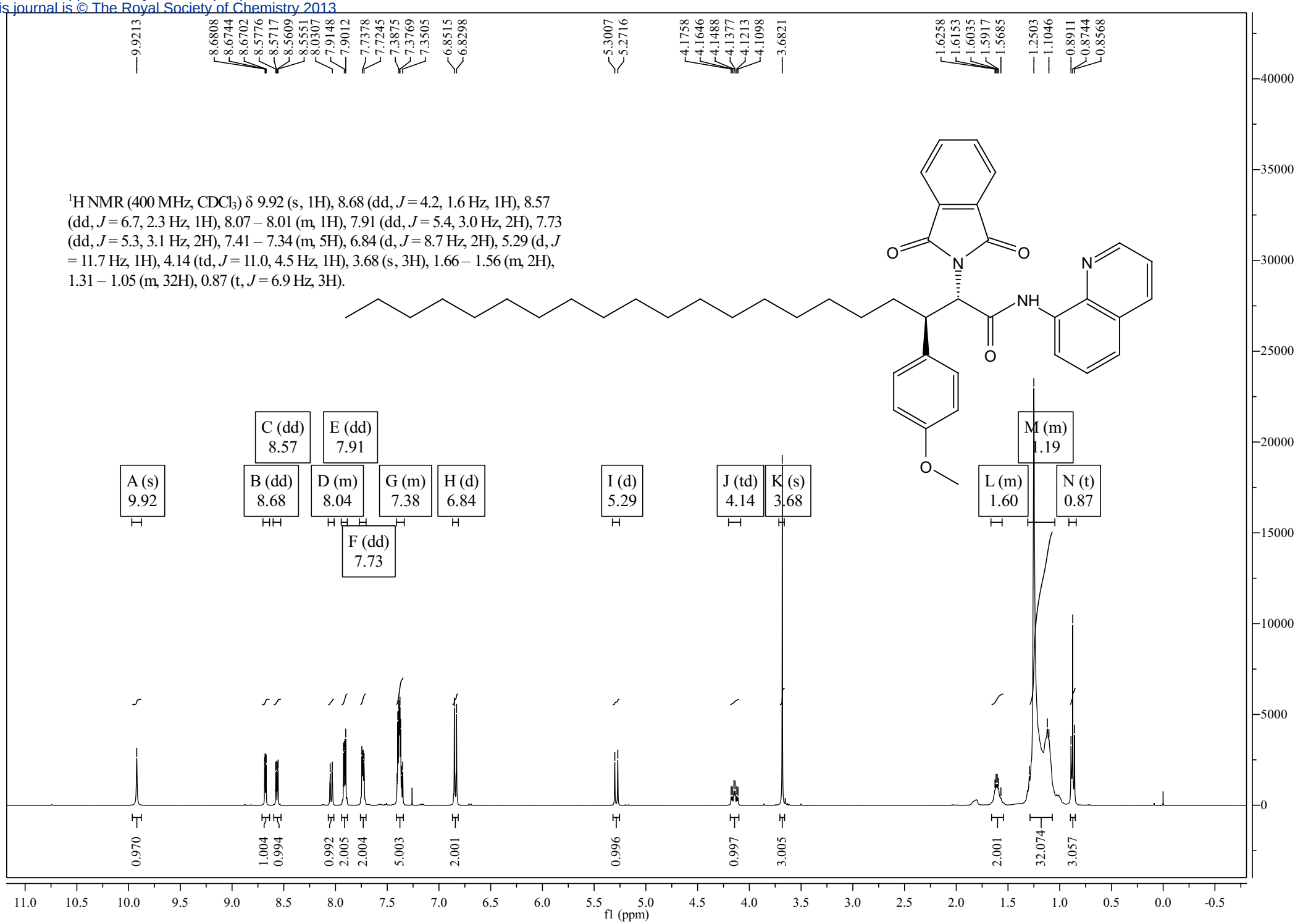


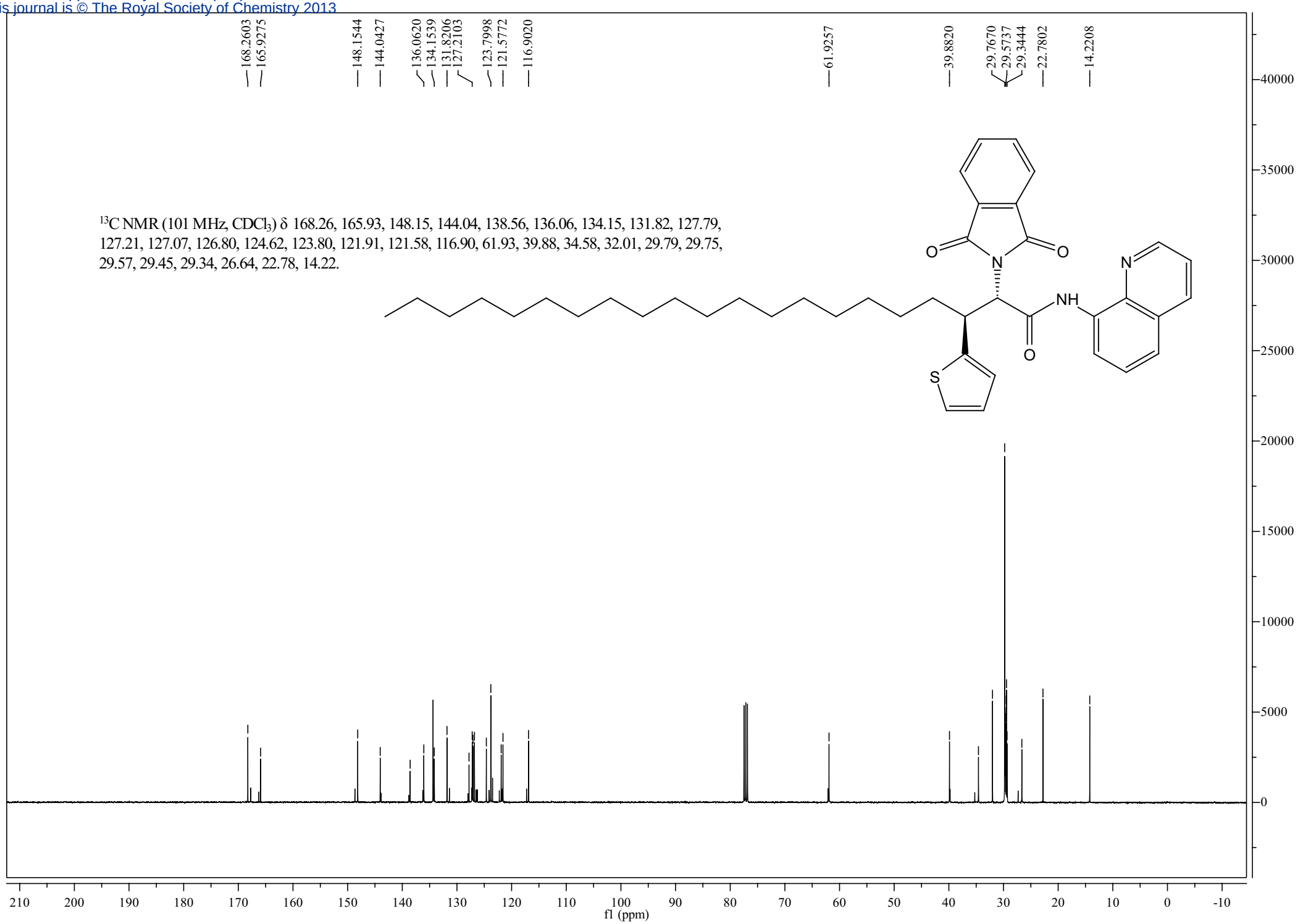
^{13}C NMR (101 MHz, $CDCl_3$) δ 172.18, 168.17, 166.54, 148.45, 138.67, 136.22, 134.35, 134.17, 131.72, 127.92, 127.26, 123.72, 122.09, 121.68, 117.03, 60.64, 58.51, 35.39, 34.34, 31.99, 30.57, 29.77, 29.73, 29.71, 29.68, 29.57, 29.52, 29.43, 26.26, 22.76, 14.25, 14.19.



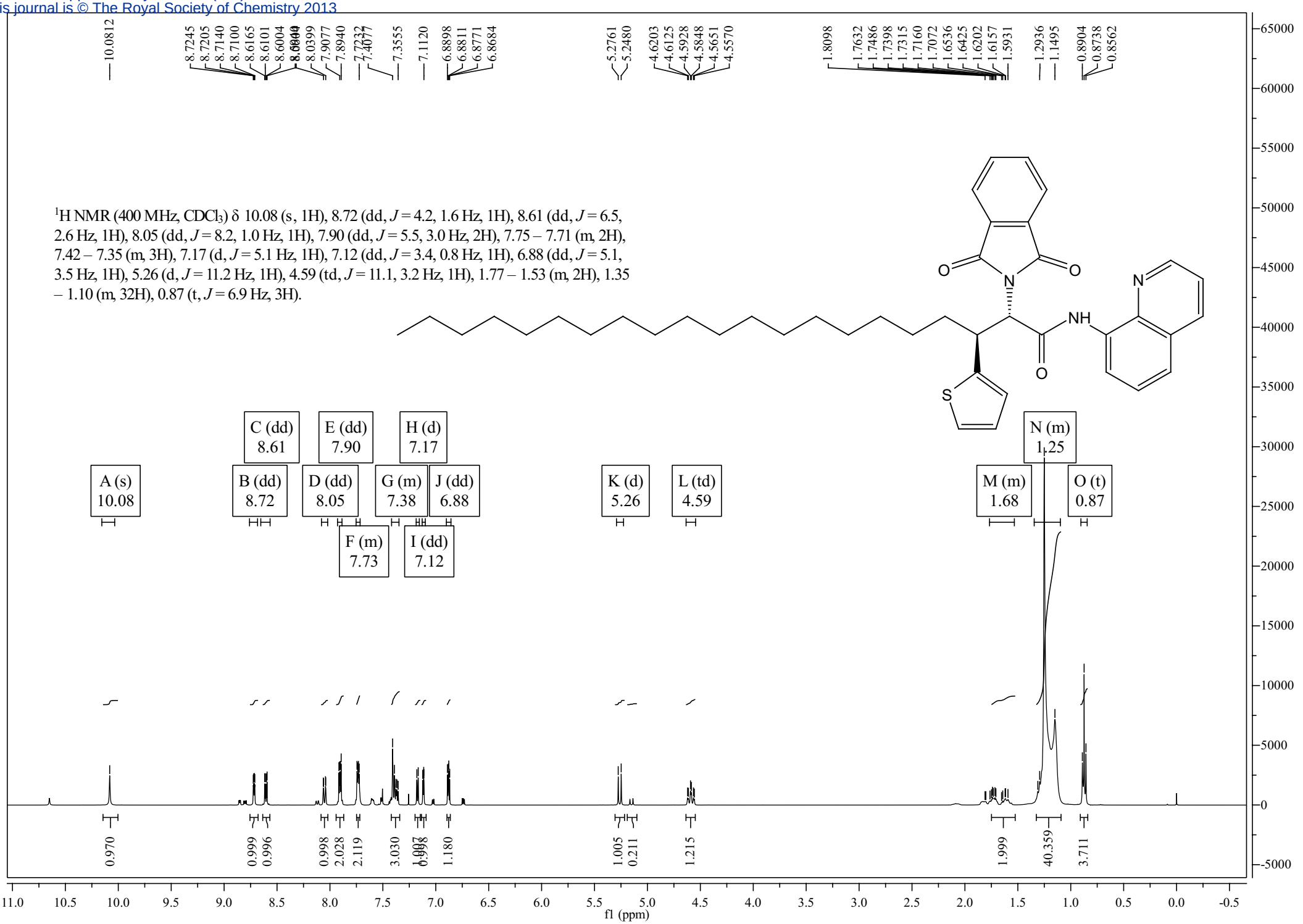


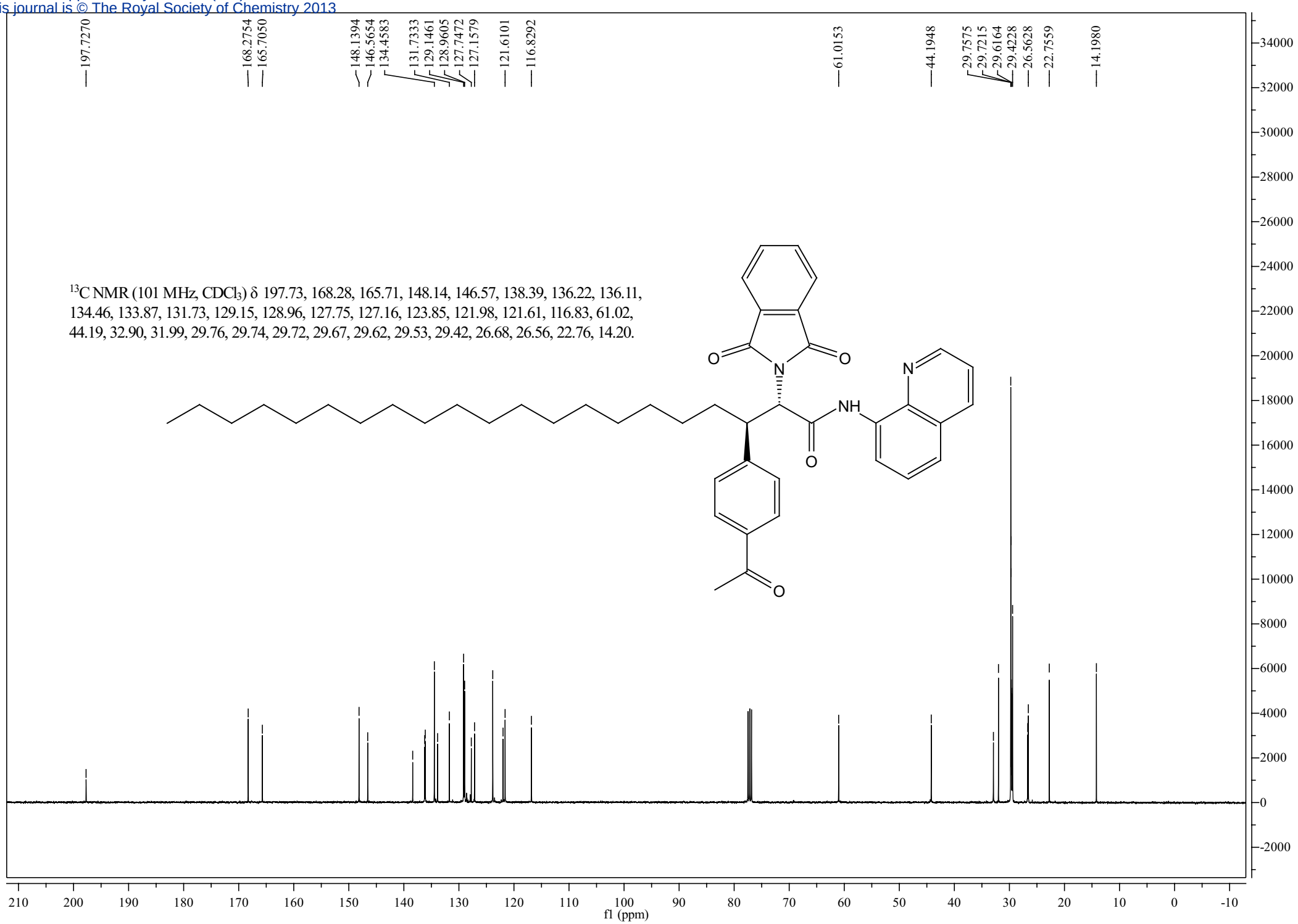
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.48, 166.30, 158.84, 148.01, 138.53, 136.01, 134.30, 134.21, 132.49, 131.90, 129.69, 127.77, 127.20, 123.75, 121.79, 121.52, 116.85, 114.56, 61.51, 55.13, 43.45, 33.43, 32.01, 29.79, 29.76, 29.71, 29.67, 29.59, 29.53, 29.48, 29.45, 26.70, 22.78, 14.22.



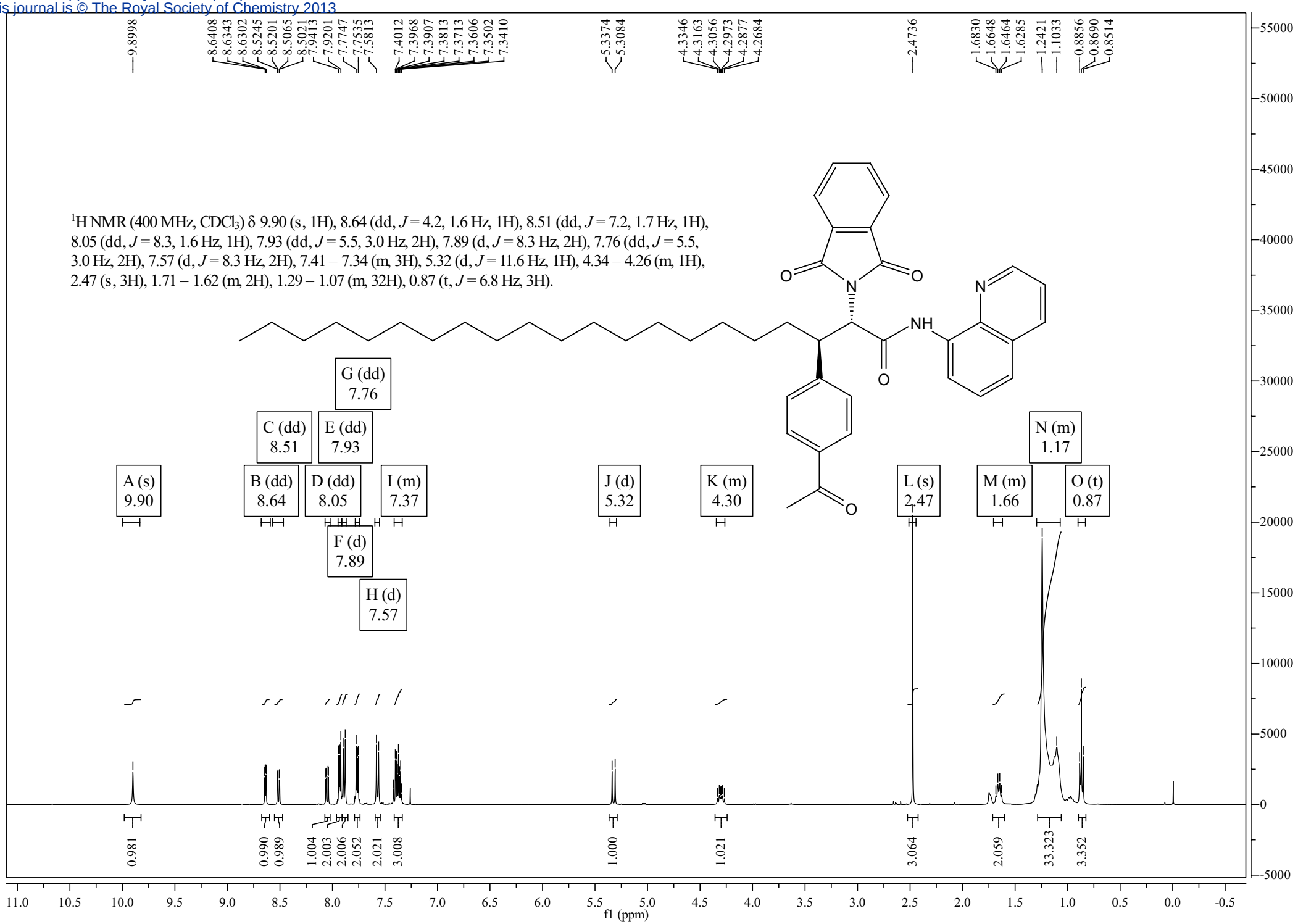


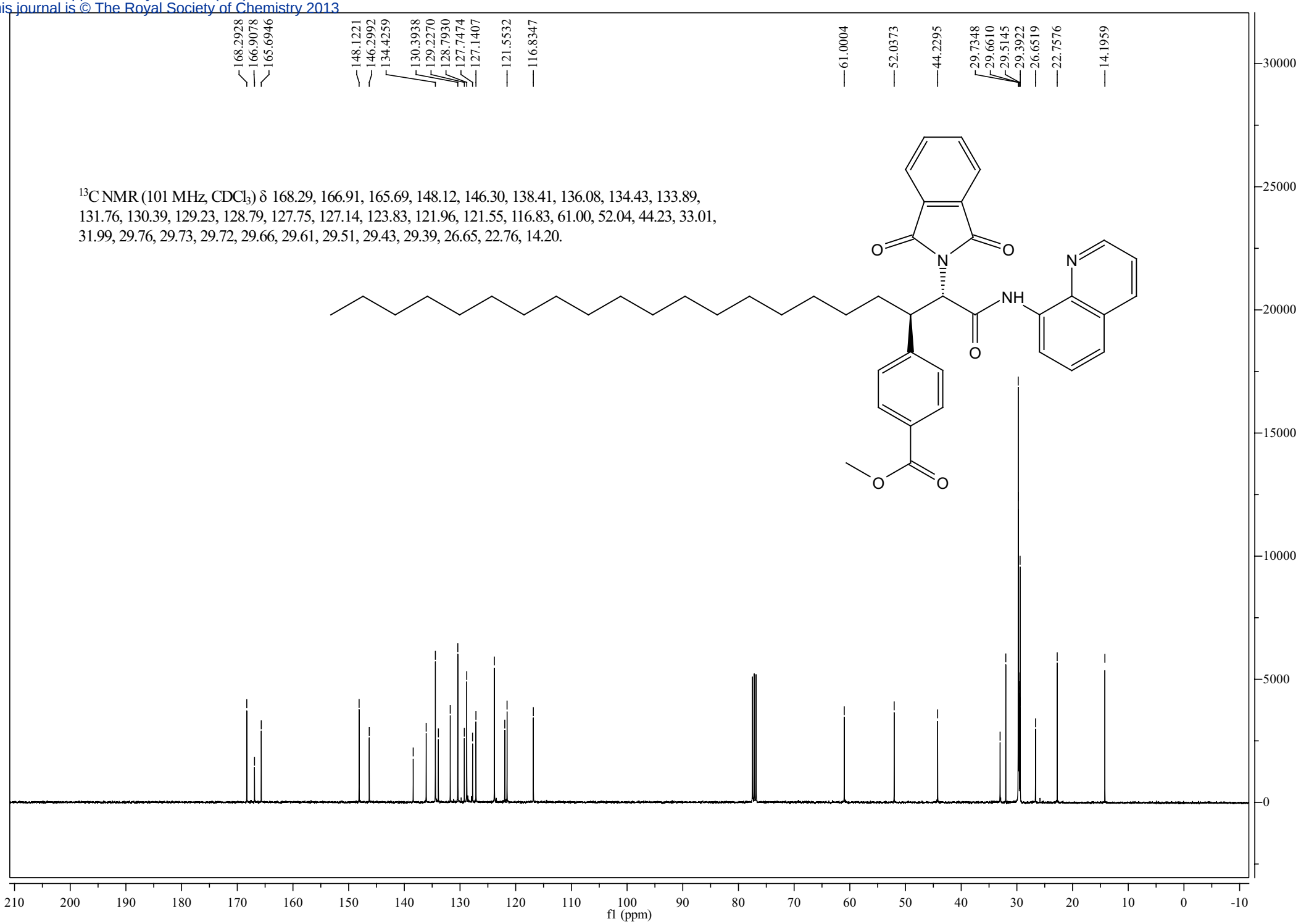
^{13}C NMR (101 MHz, $CDCl_3$) δ 168.26, 165.93, 148.15, 144.04, 138.56, 136.06, 134.15, 131.82, 127.79, 127.21, 127.07, 126.80, 124.62, 123.80, 121.91, 121.58, 116.90, 61.93, 39.88, 34.58, 32.01, 29.79, 29.75, 29.57, 29.45, 29.34, 26.64, 22.78, 14.22.





^{13}C NMR (101 MHz, $CDCl_3$) δ 197.73, 168.28, 165.71, 148.14, 146.57, 138.39, 136.22, 136.11, 134.46, 133.87, 131.73, 129.15, 128.96, 127.75, 127.16, 123.85, 121.98, 121.61, 116.83, 61.02, 44.19, 32.90, 31.99, 29.76, 29.74, 29.72, 29.67, 29.62, 29.53, 29.42, 26.68, 26.56, 22.76, 14.20.





^{13}C NMR (101 MHz, $CDCl_3$) δ 168.29, 166.91, 165.69, 148.12, 146.30, 138.41, 136.08, 134.43, 133.89, 131.76, 130.39, 129.23, 128.79, 127.75, 127.14, 123.83, 121.96, 121.55, 116.83, 61.00, 52.04, 44.23, 33.01, 31.99, 29.76, 29.73, 29.72, 29.66, 29.61, 29.51, 29.43, 29.39, 26.65, 22.76, 14.20.