APPENDIX 3

Spectra Relevant to Chapter 2: Formation of All-Carbon Quaternary Centers via Enantioselective Pd-catalyzed α-Vinylation of γ-Lactams

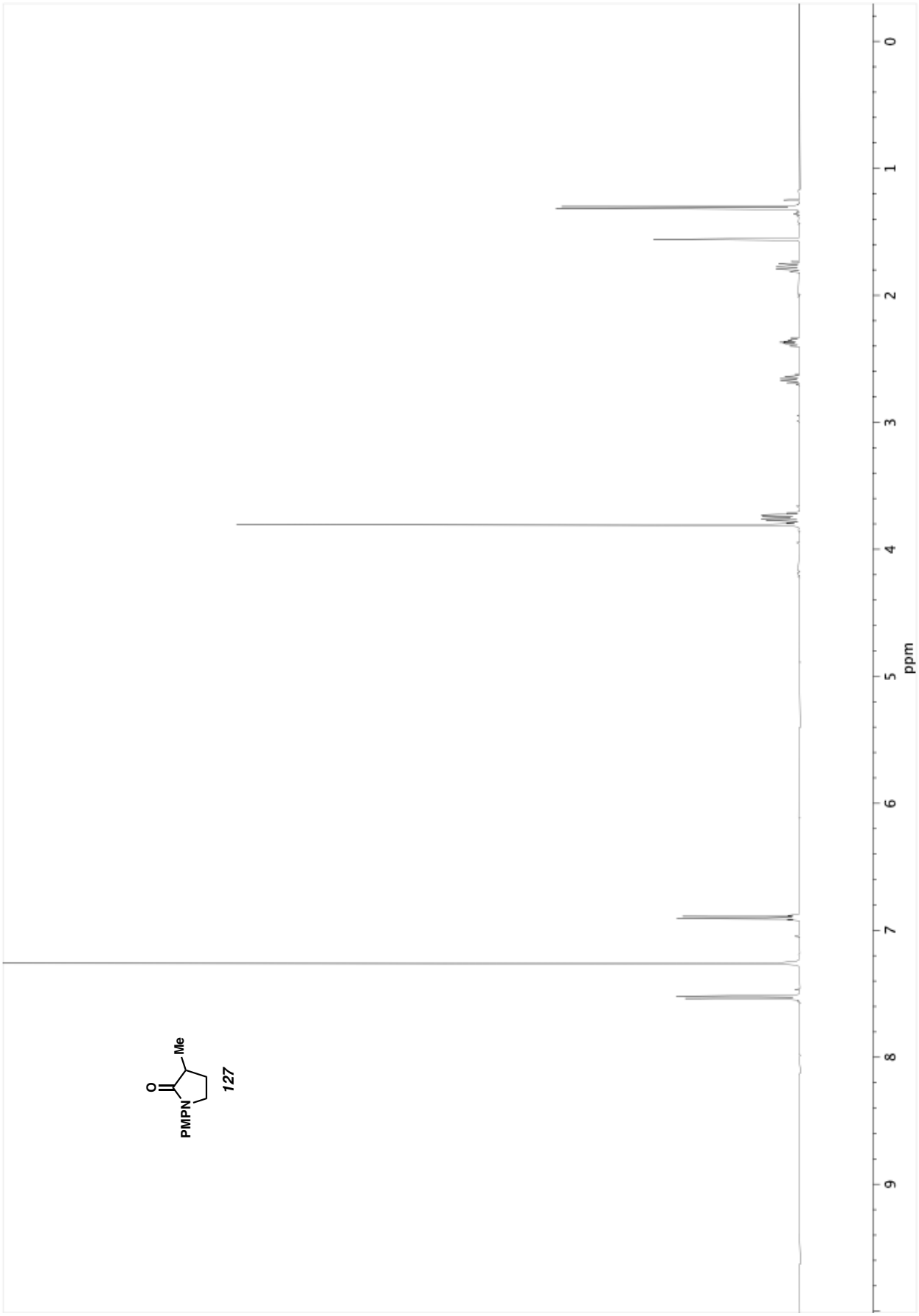

Figure A3.1 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***127.***

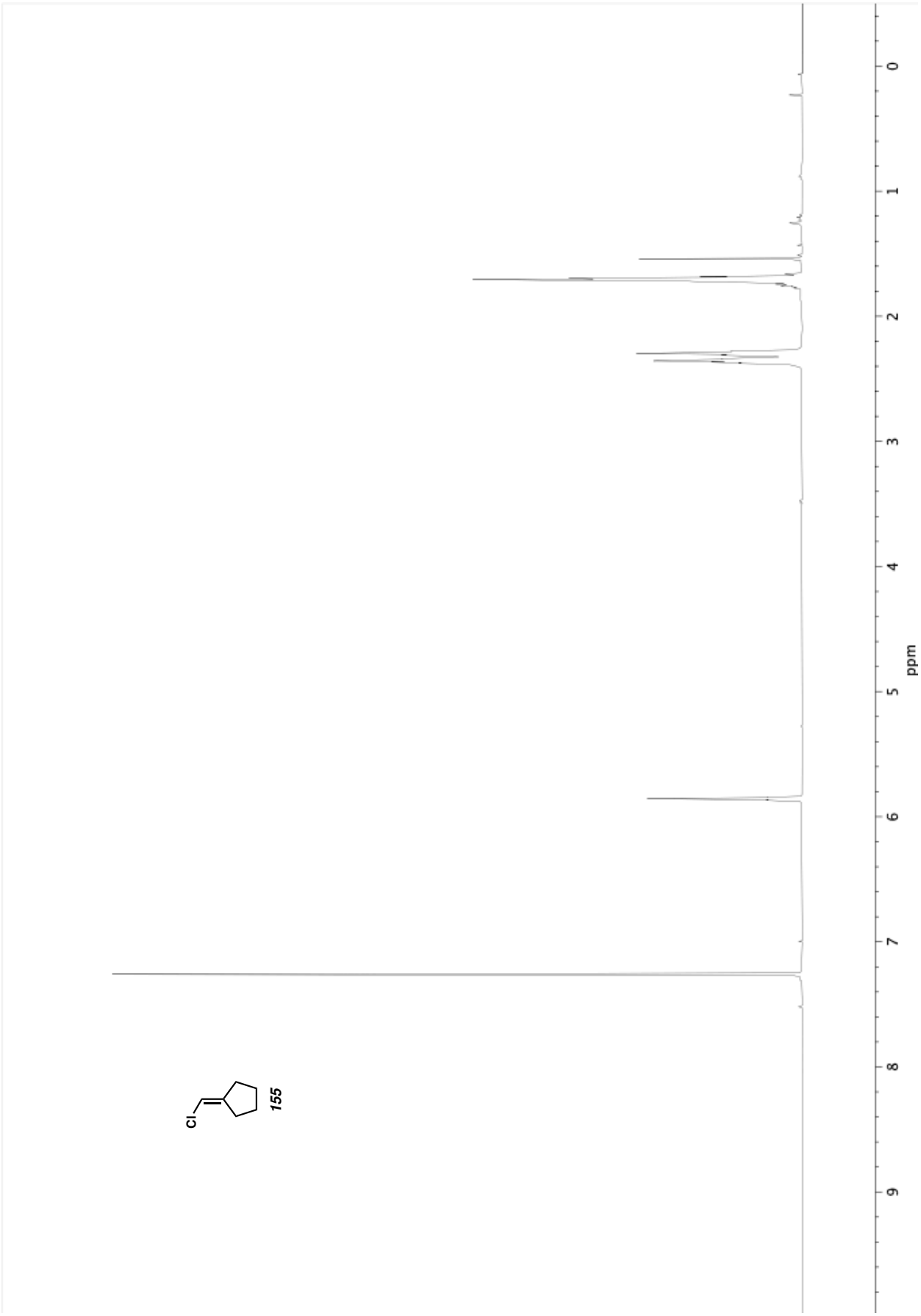

Figure A3.2 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***155****.*

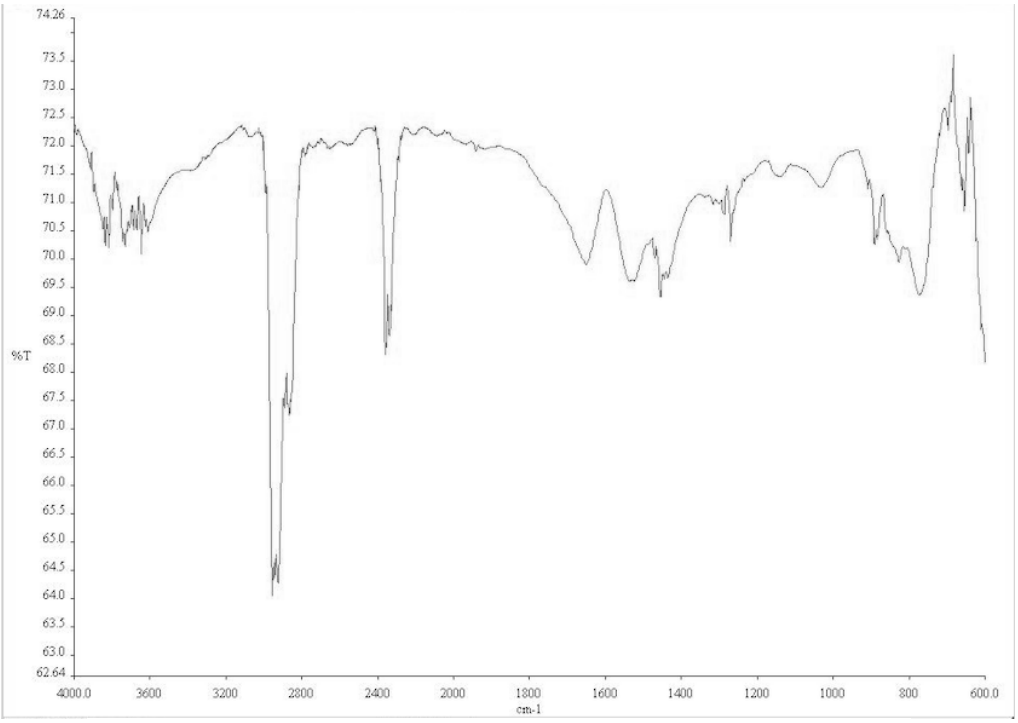

Figure A3.3 *Infrared spectrum (Thin Film, NaCl) of* ***155****.*

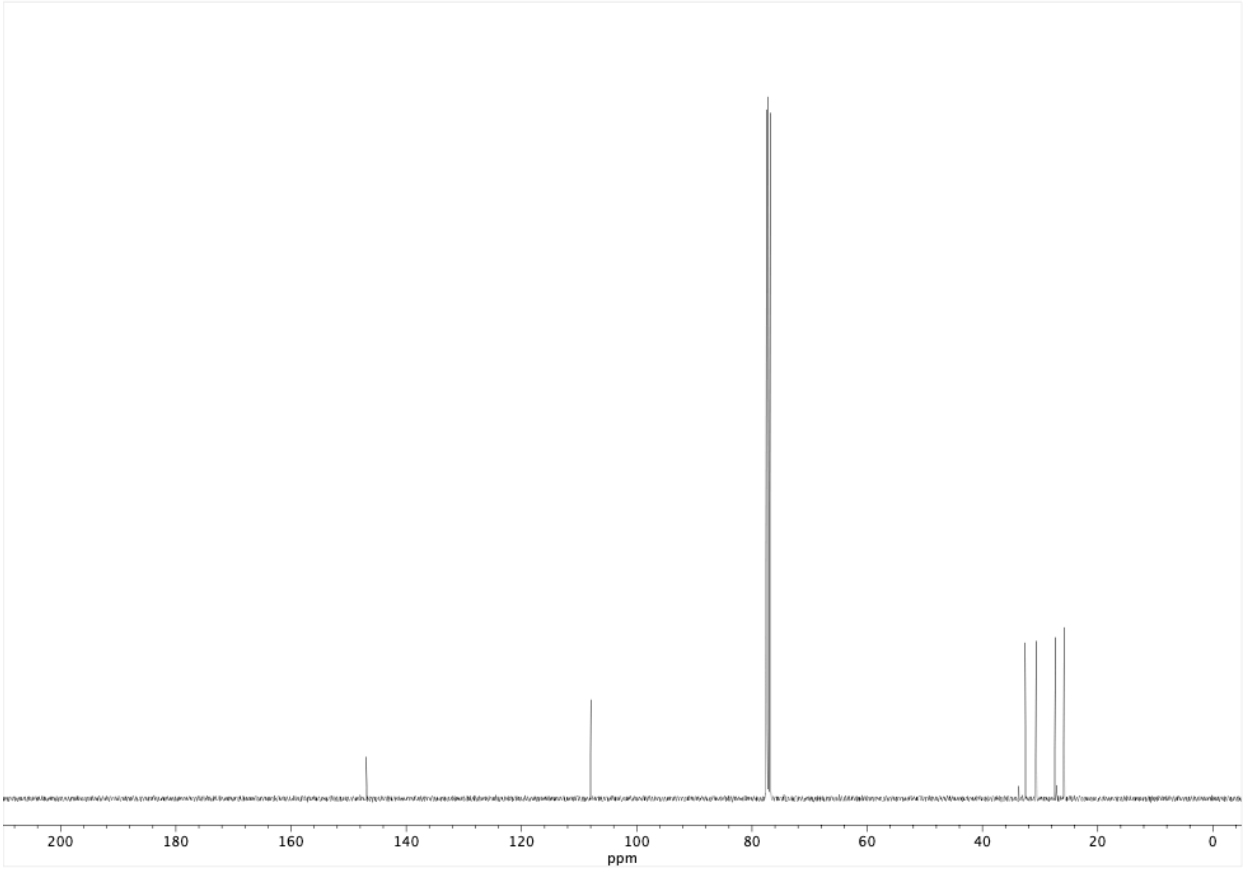

Figure A3.4 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***155.***

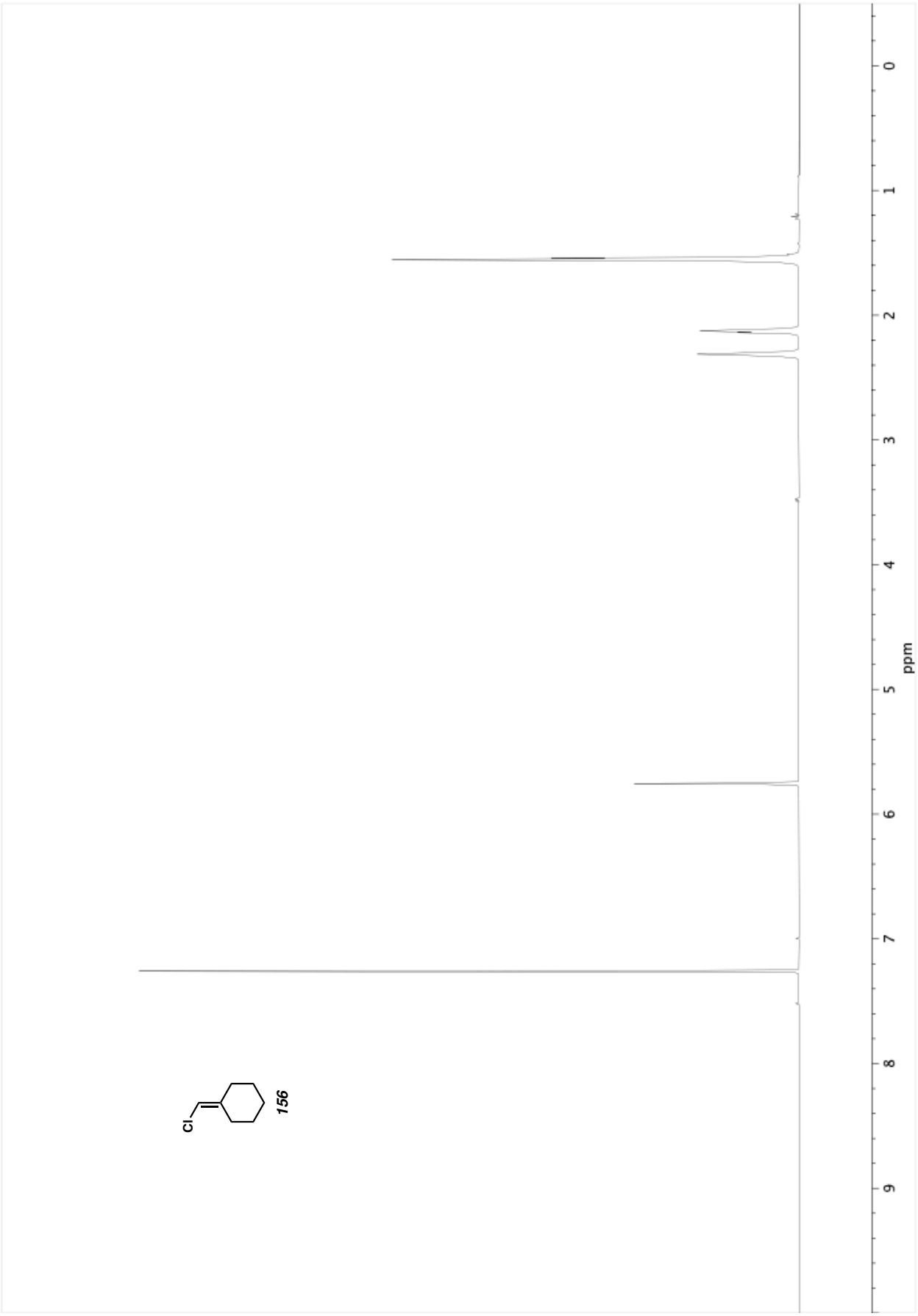

Figure A3.5 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***156****.*

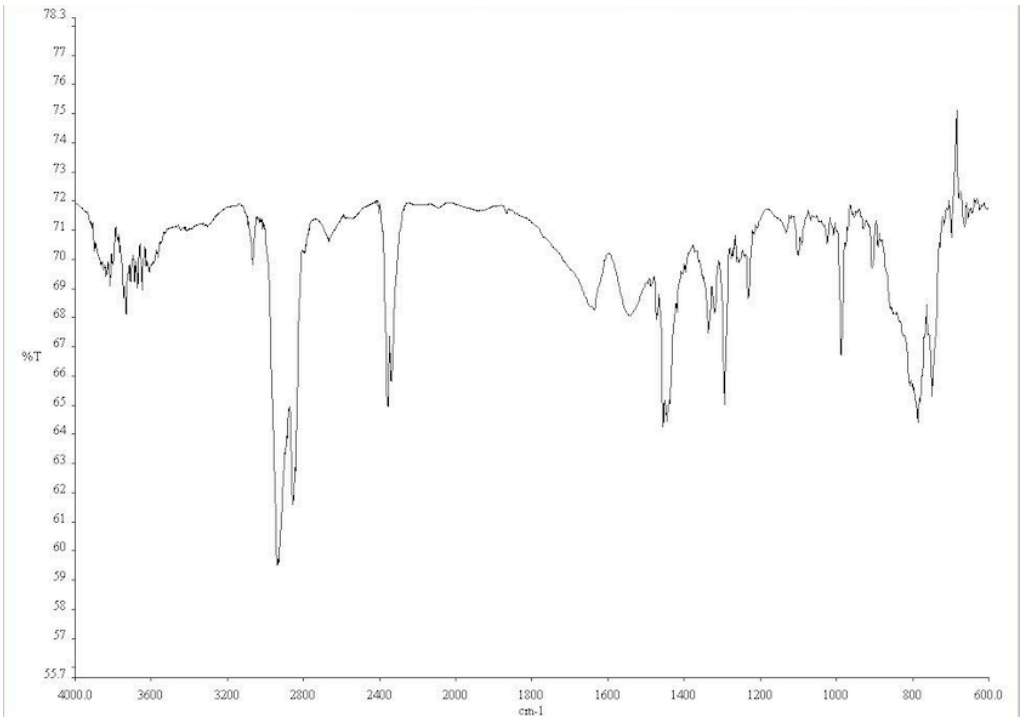

Figure A3.6 *Infrared spectrum (Thin Film, NaCl) of* ***156****.*

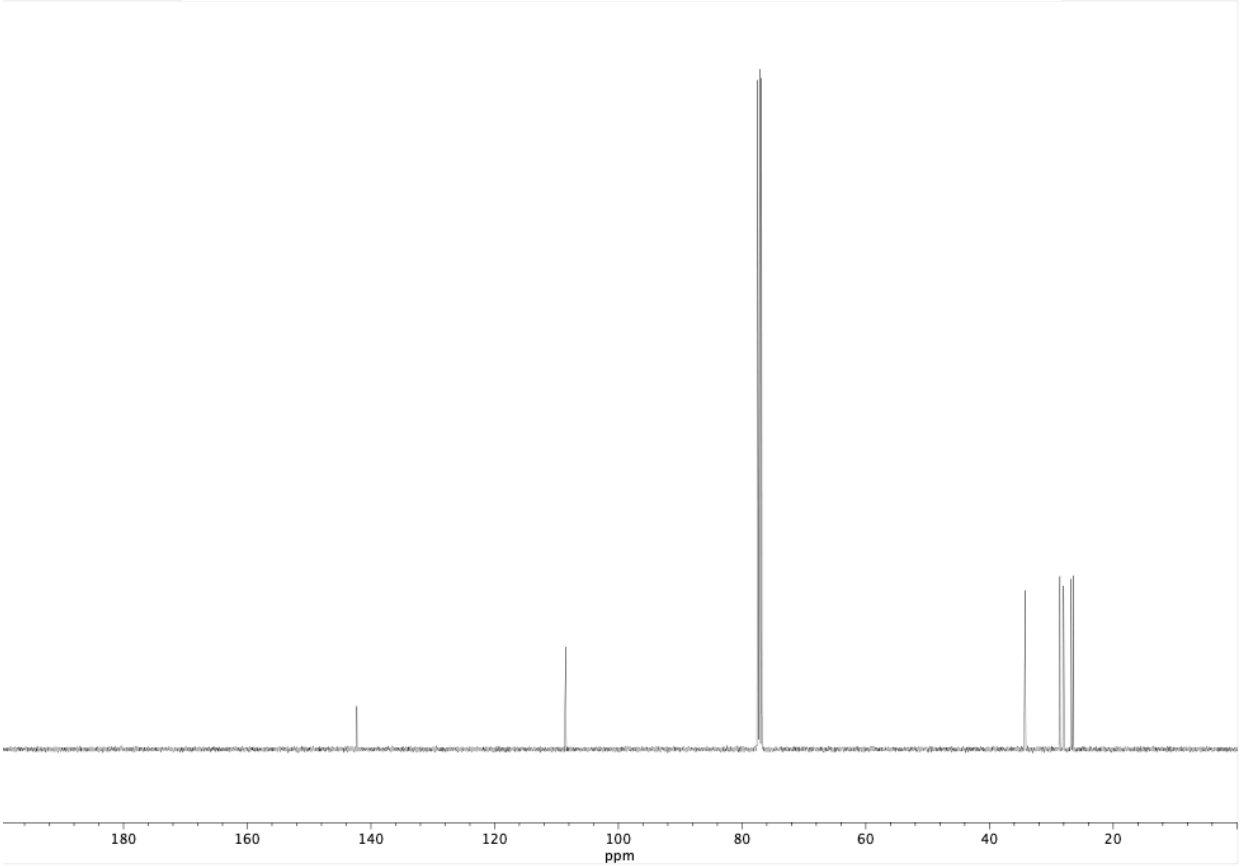

Figure A3.7 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***156.***

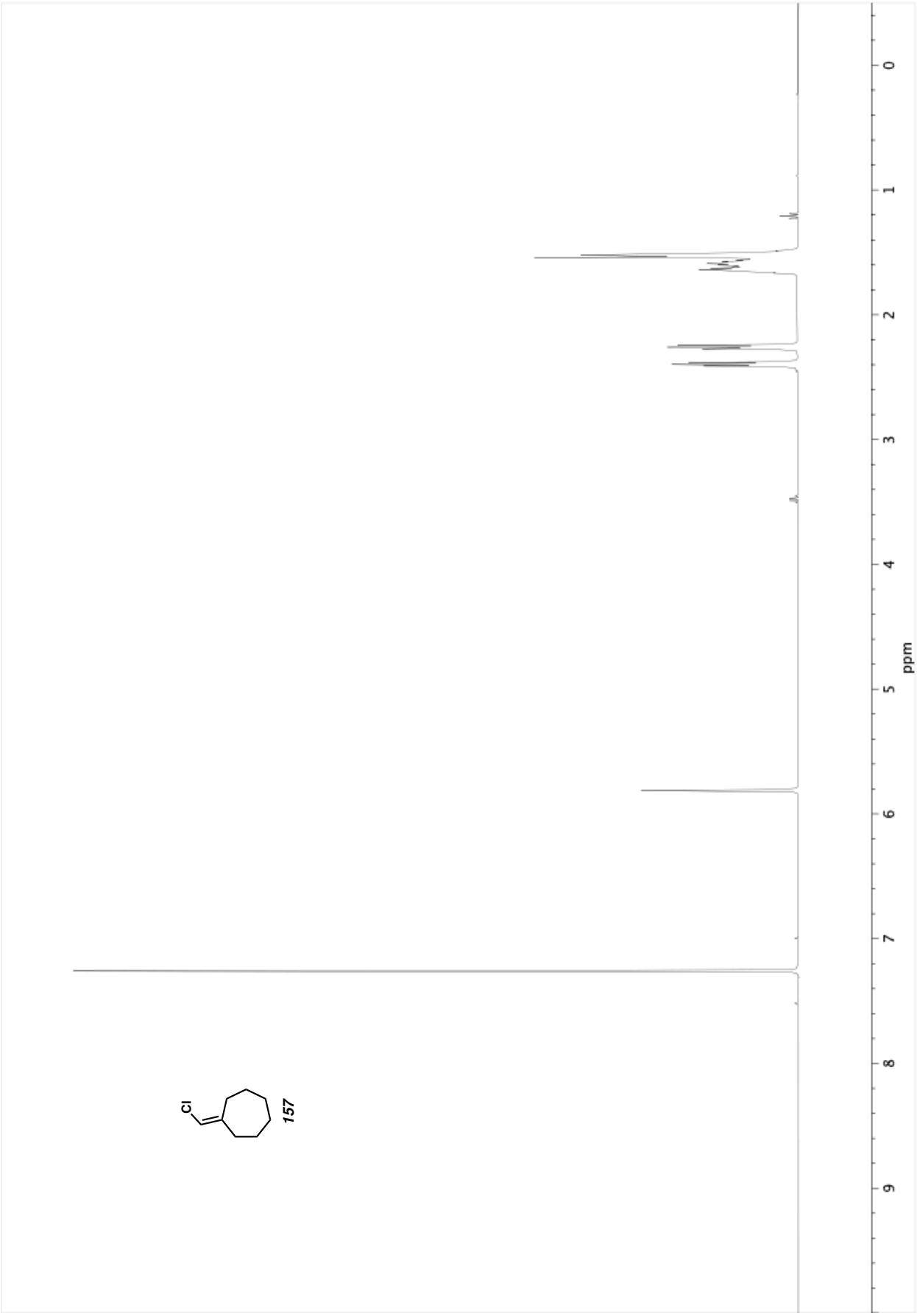

Figure A3.8 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***157.***

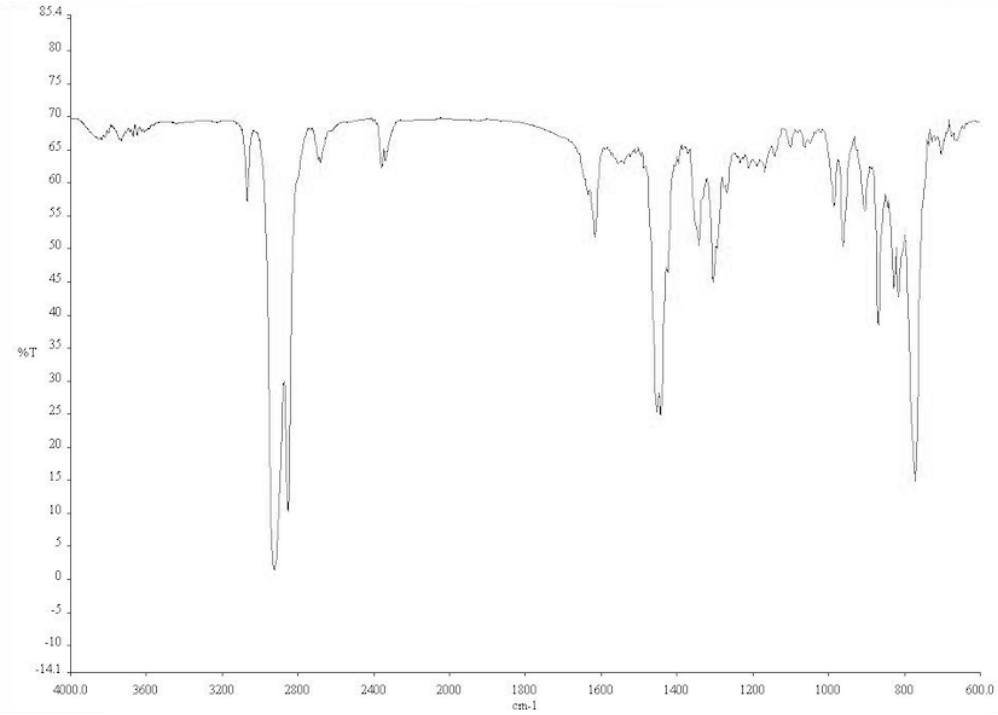

Figure A3.9 *Infrared spectrum (Thin Film, NaCl) of* ***157****.*

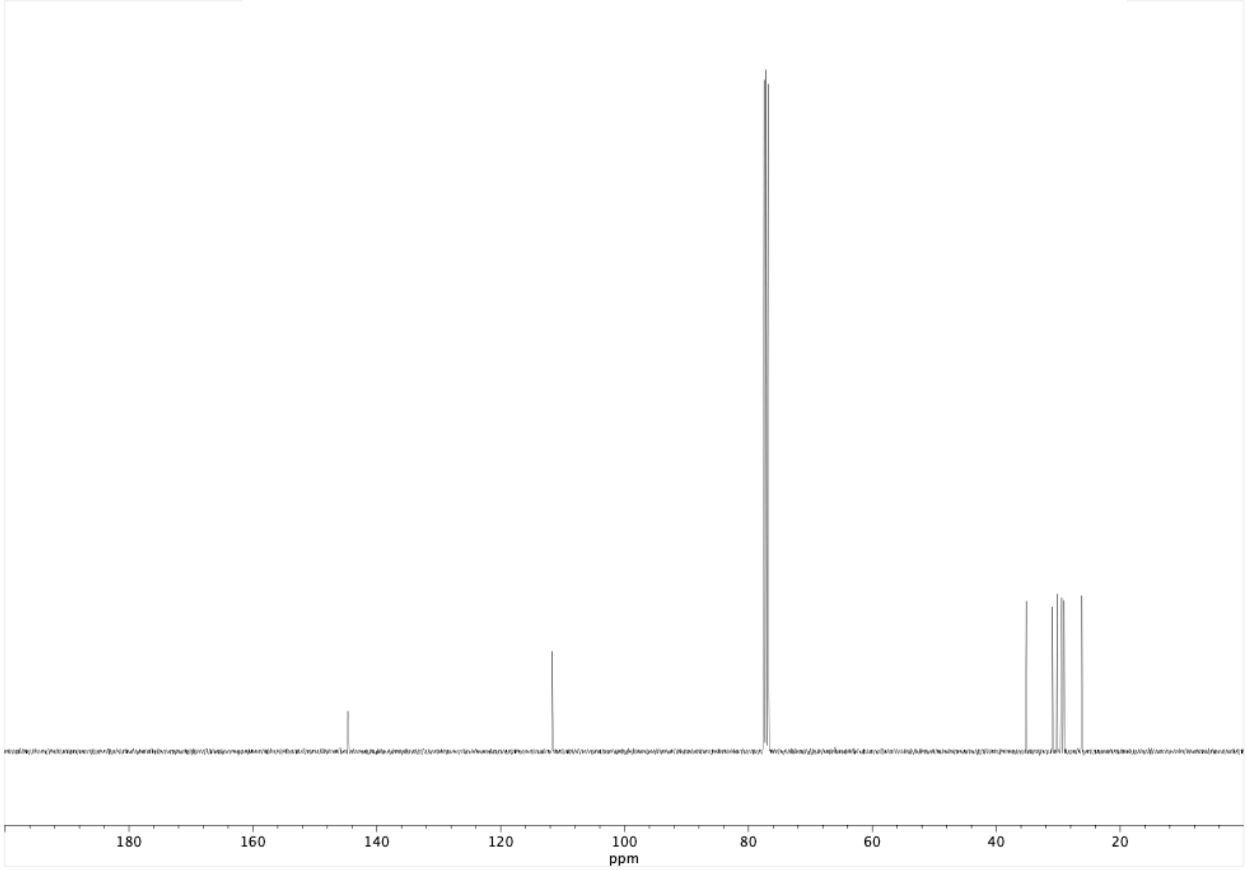

Figure A3.10 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***157****.*

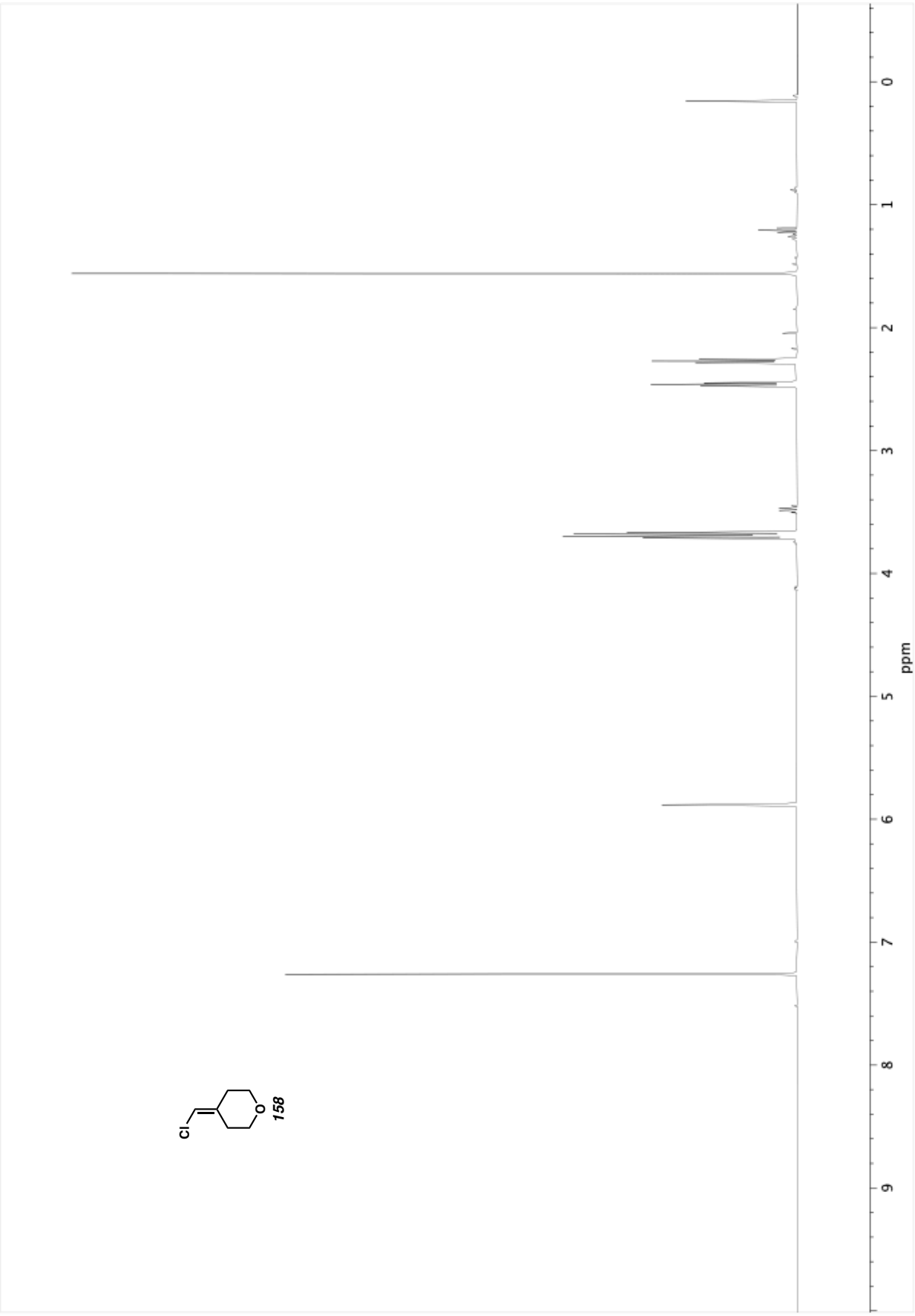

Figure A3.11 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***158.***

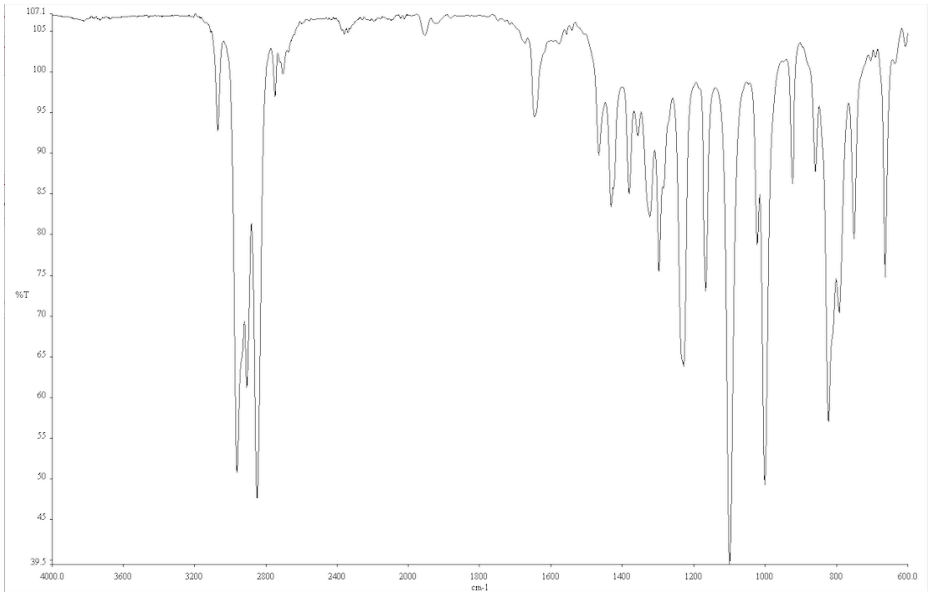

Figure A3.12 *Infrared spectrum (Thin Film, NaCl) of* ***158****.*

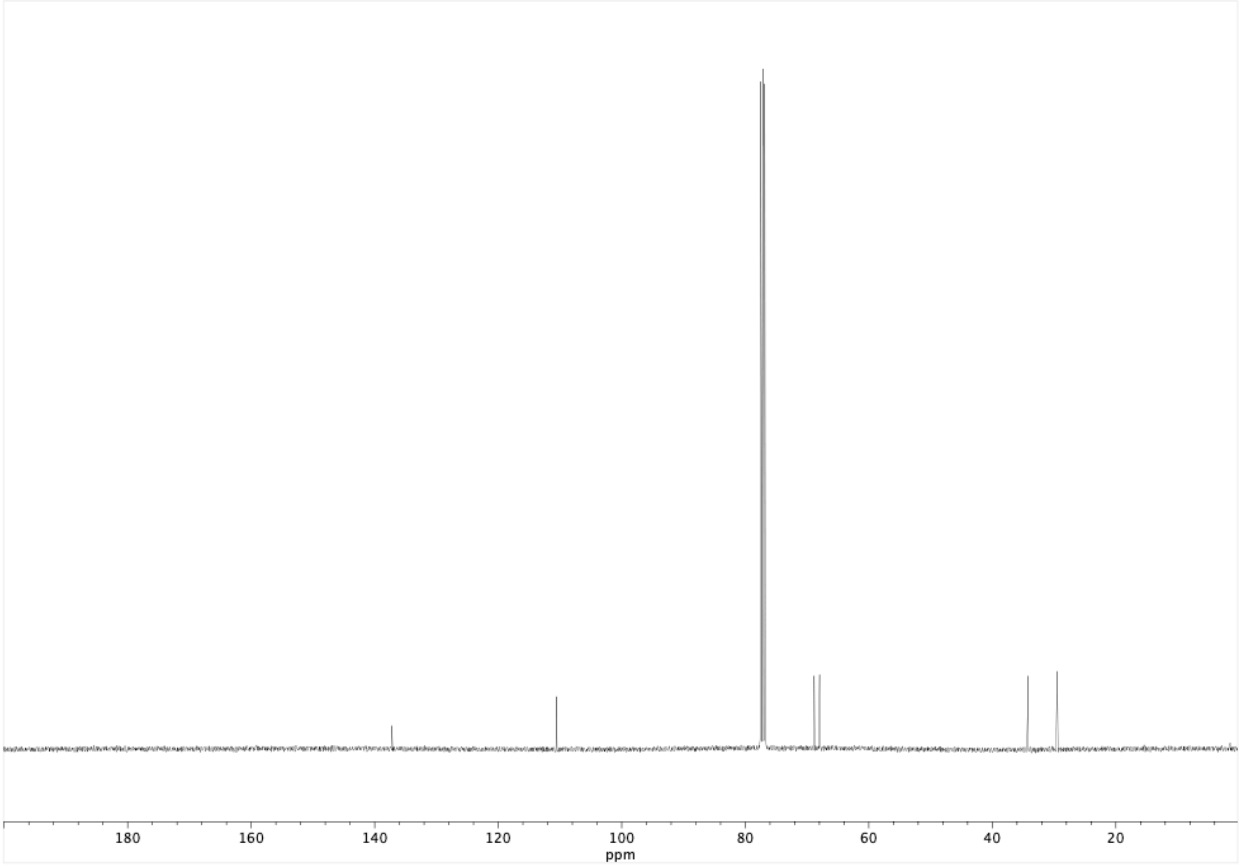

Figure A3.13 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***158****.*

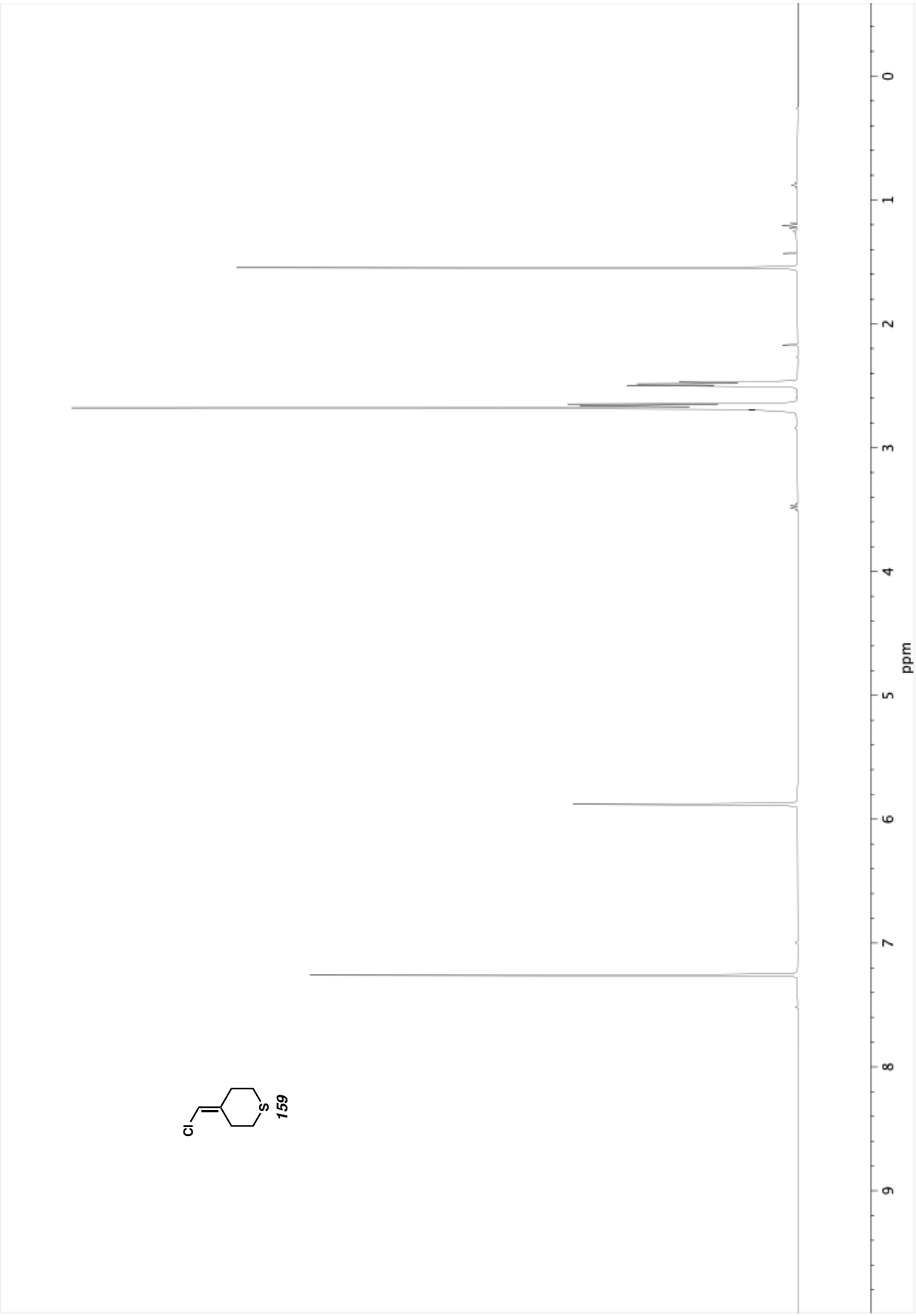

Figure A3.14 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***159.***

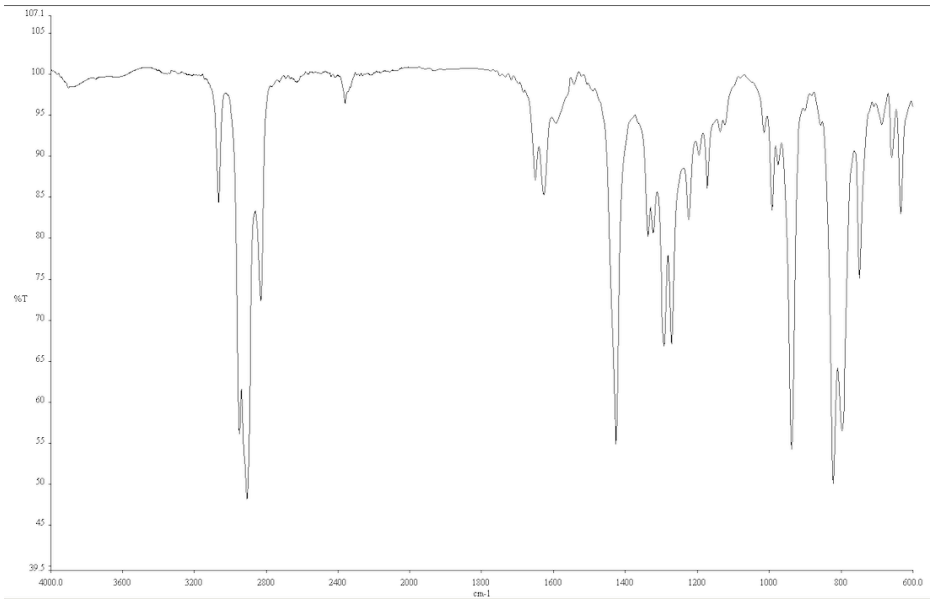

Figure A3.15 *Infrared spectrum (Thin Film, NaCl) of* ***159.***

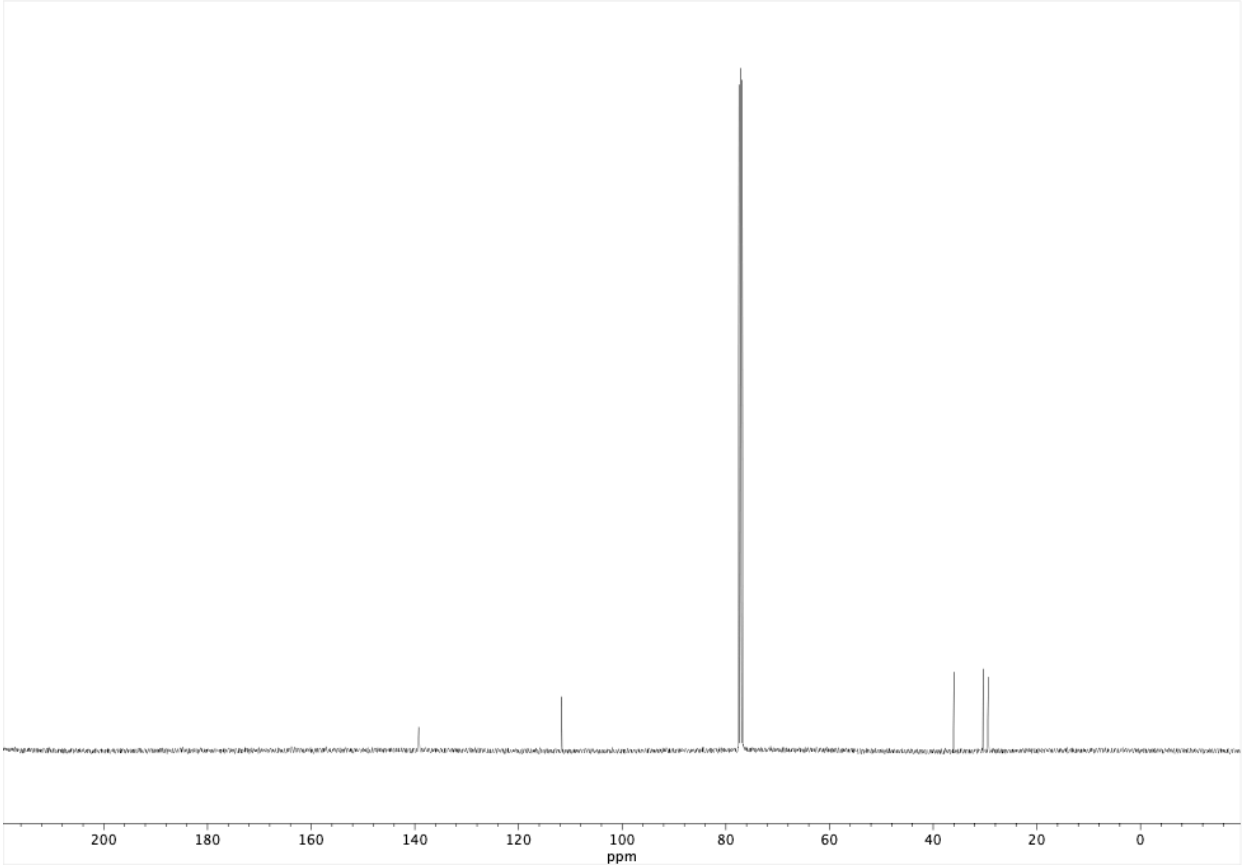

Figure A3.16 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***159.***

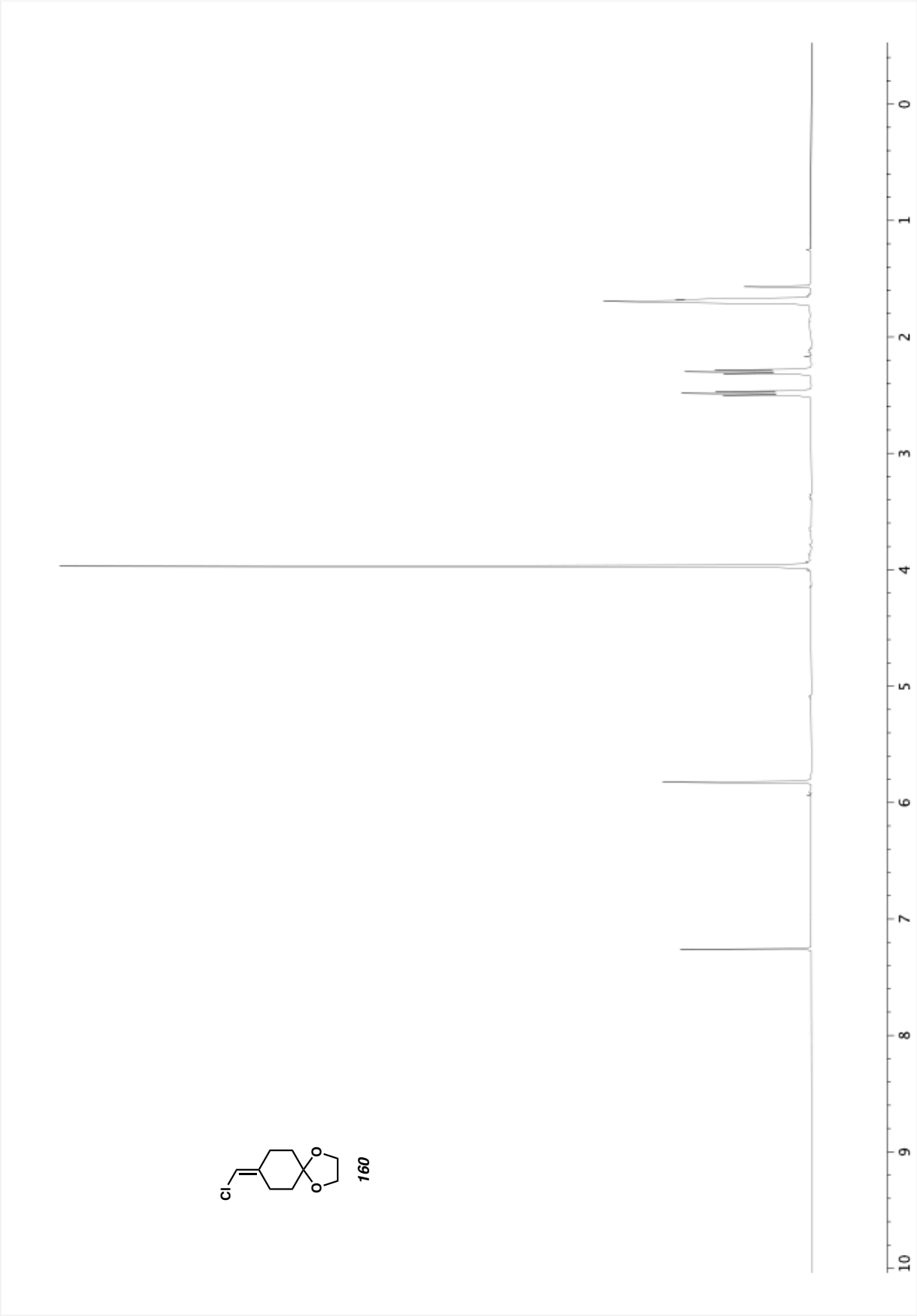

Figure A3.17 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***160****.*

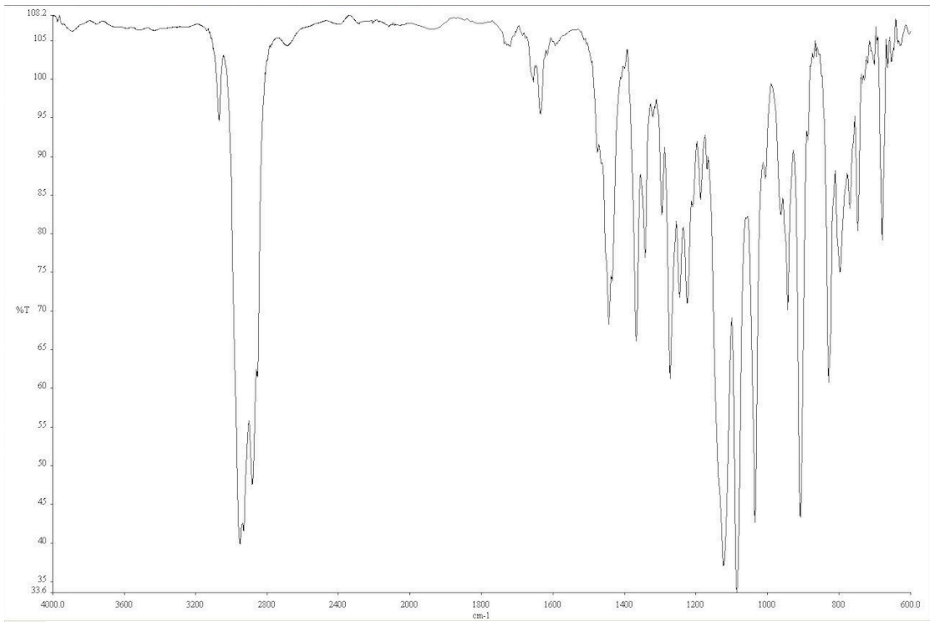

Figure A3.18 *Infrared spectrum (Thin Film, NaCl) of* ***160****.*

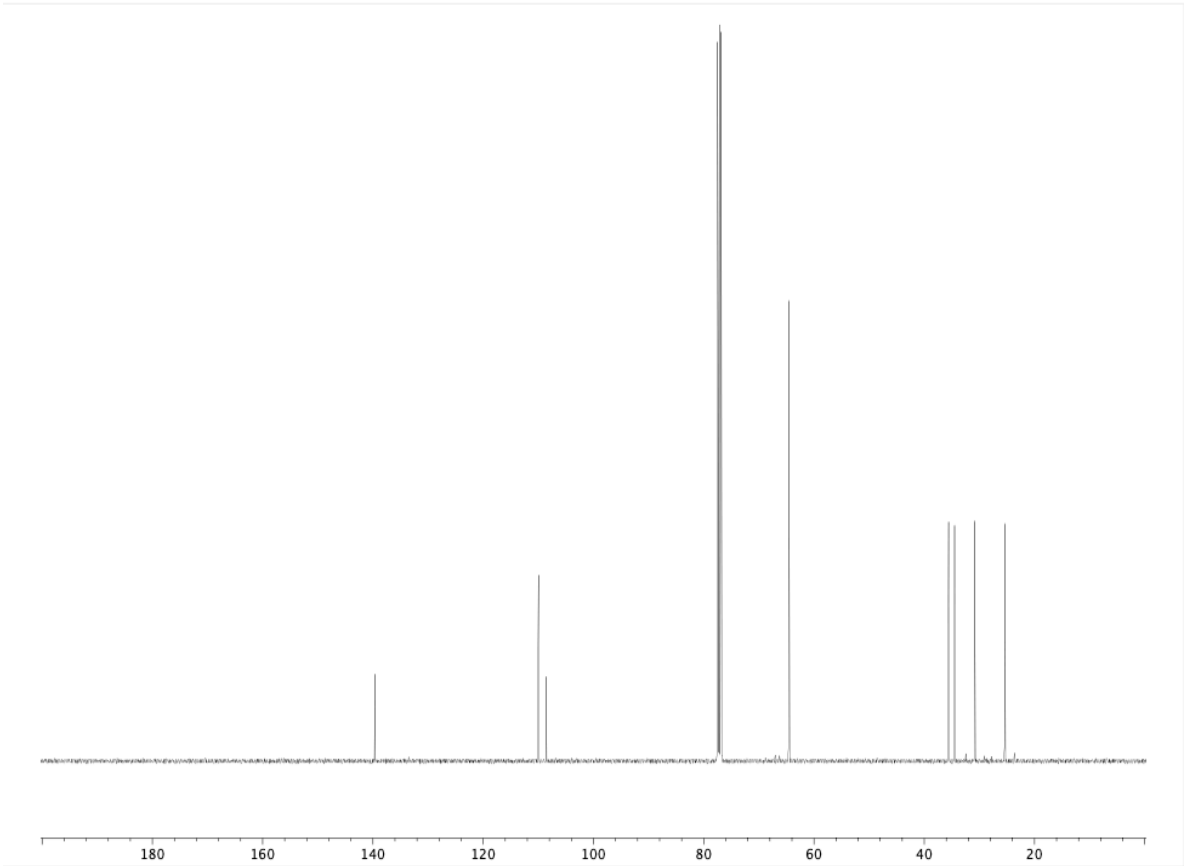

Figure A3.19 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***160****.*

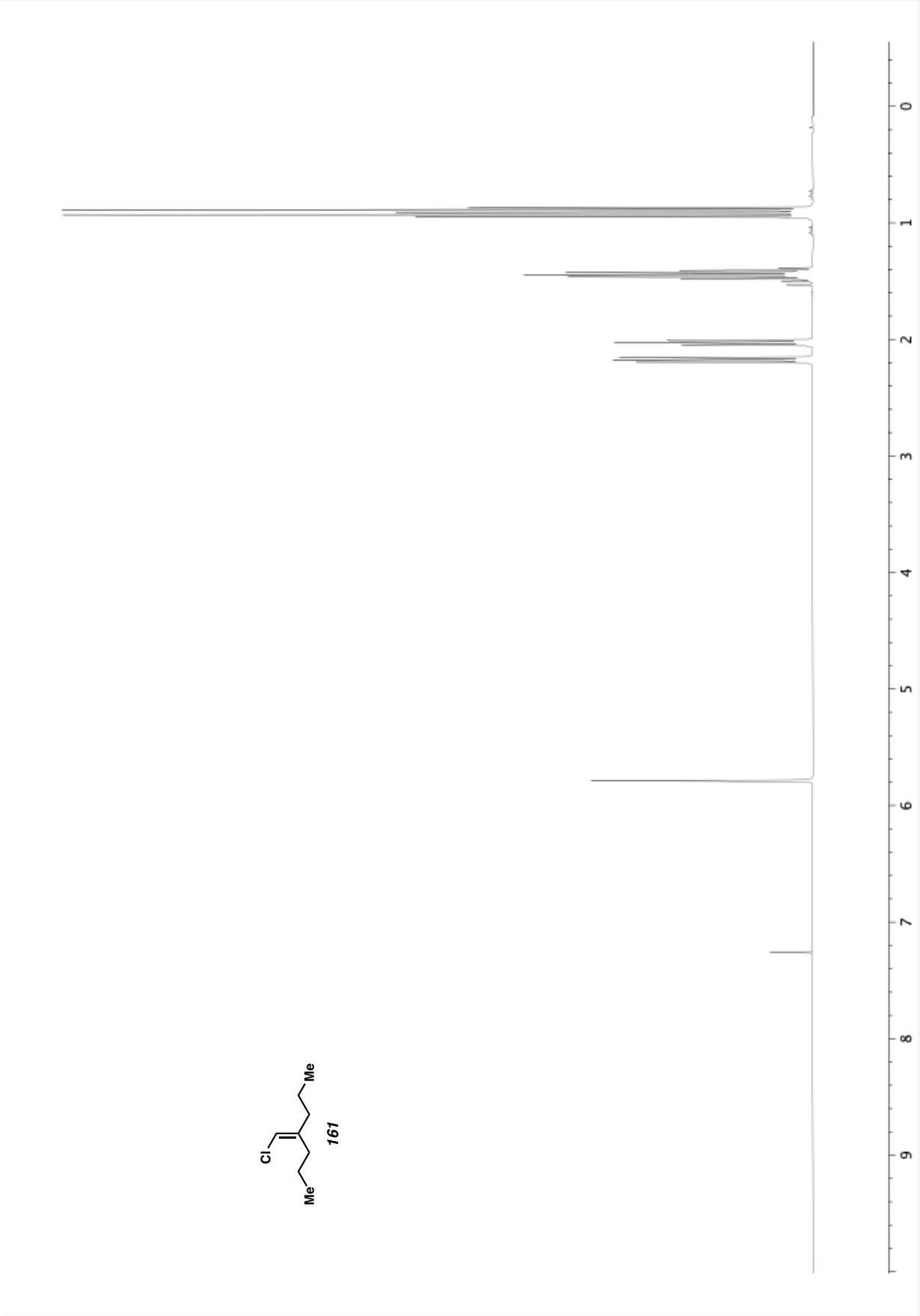

Figure A3.20 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***161****.*

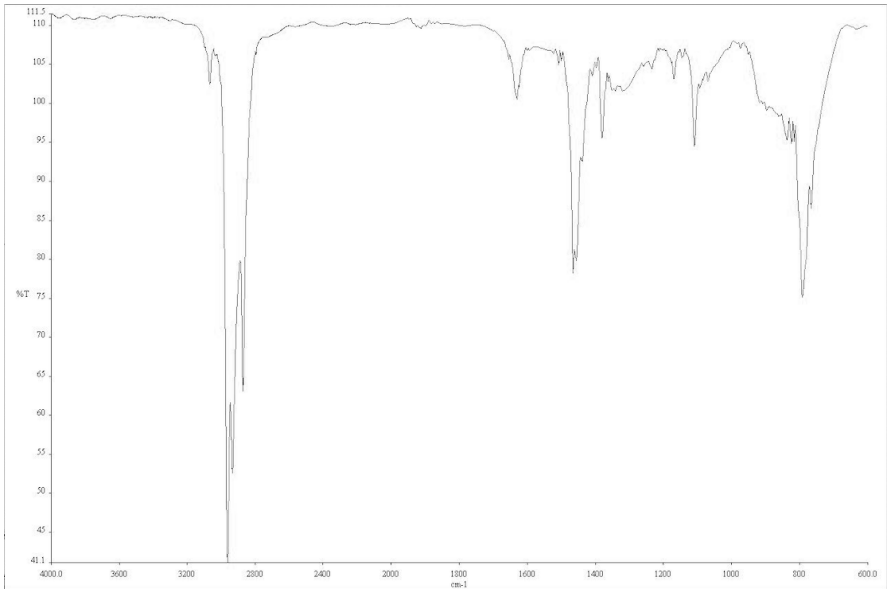

Figure A3.21 *Infrared spectrum (Thin Film, NaCl) of* ***161****.*

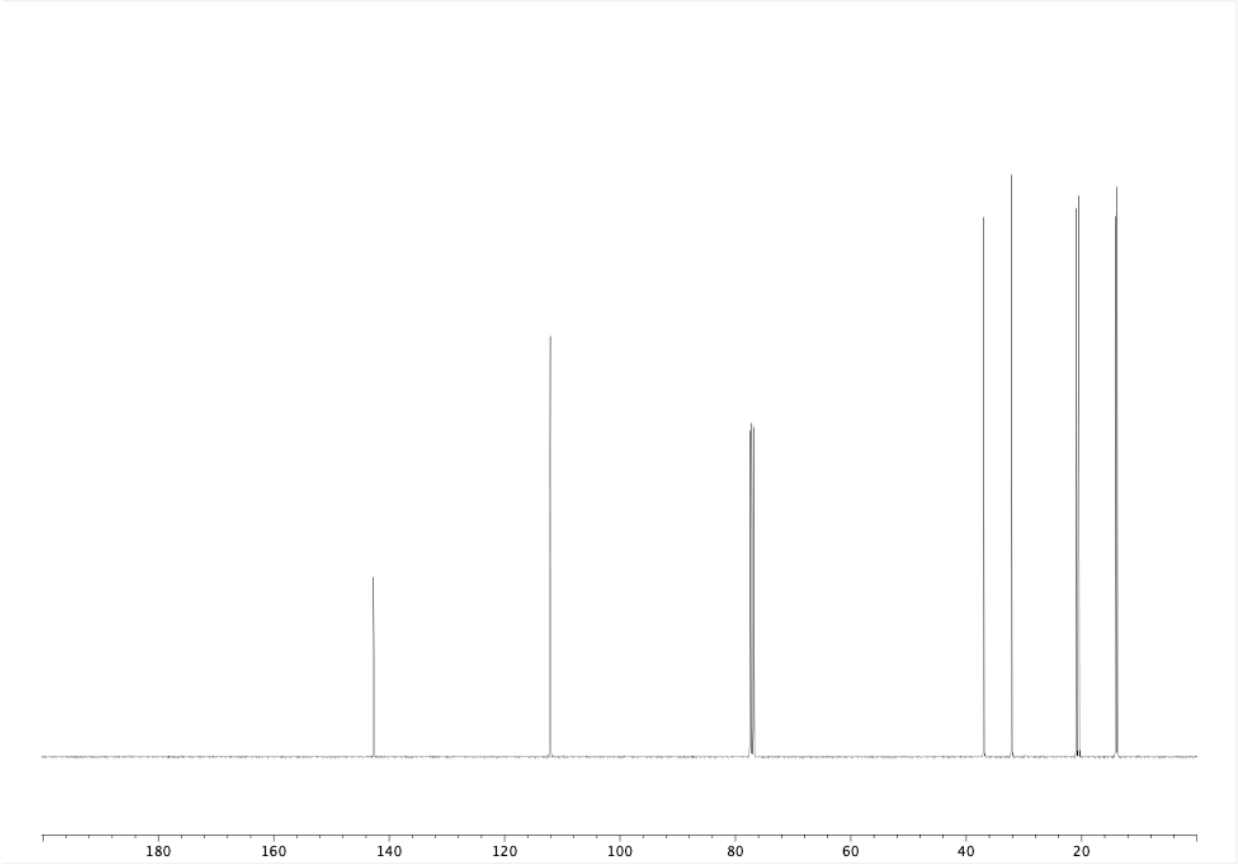

Figure A3.22 *^{13}C NMR (100 MHz, $CDCl_3$) of compound* ***161****.*

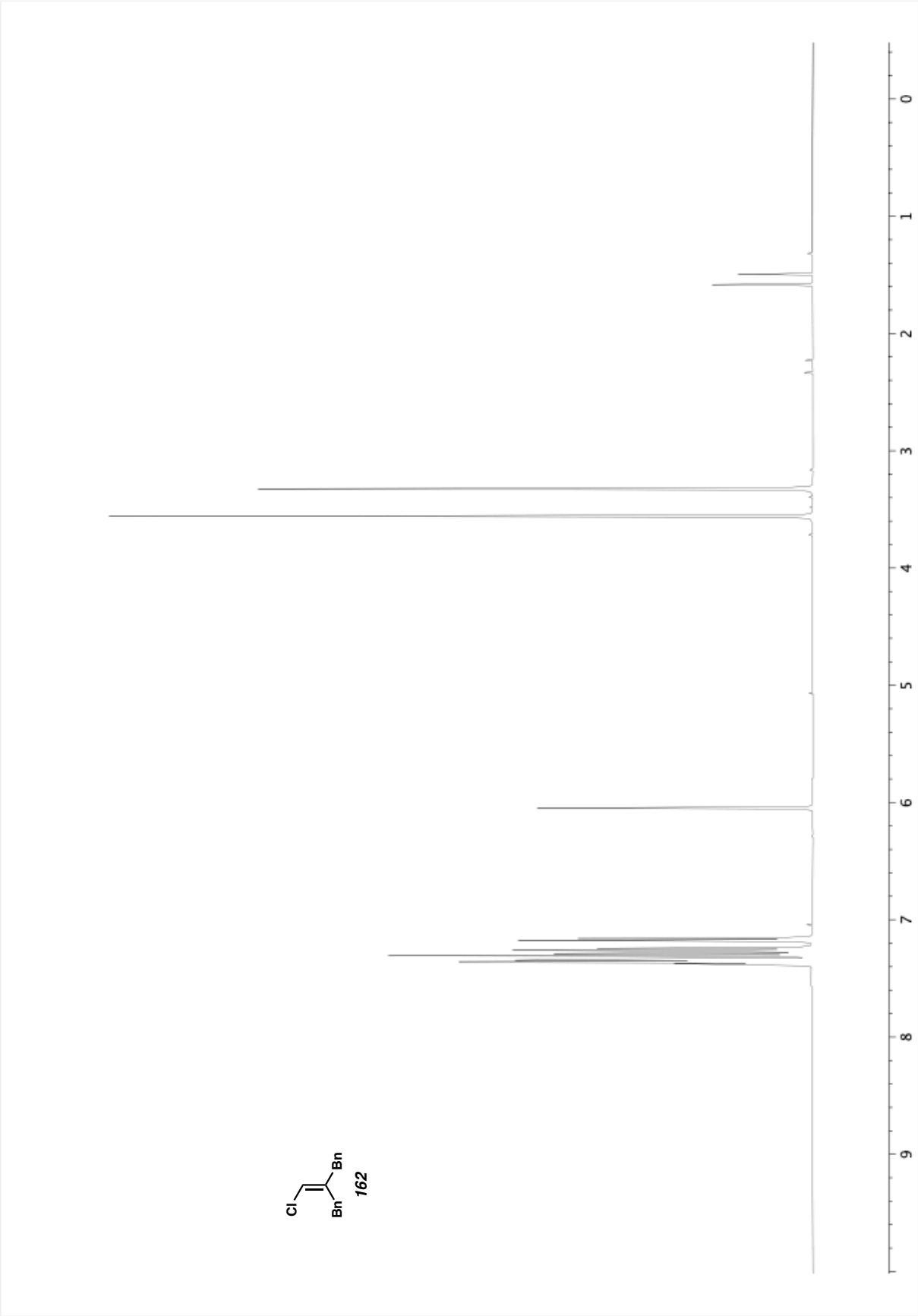

Figure A3.23 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***162****.*

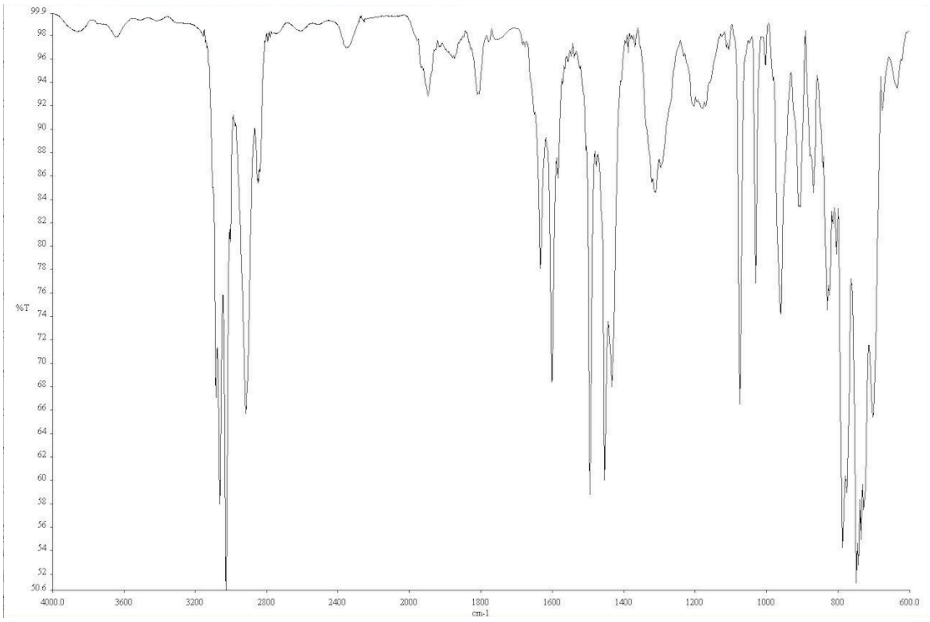

Figure A3.24 *Infrared spectrum (Thin Film, NaCl) of* ***162.***

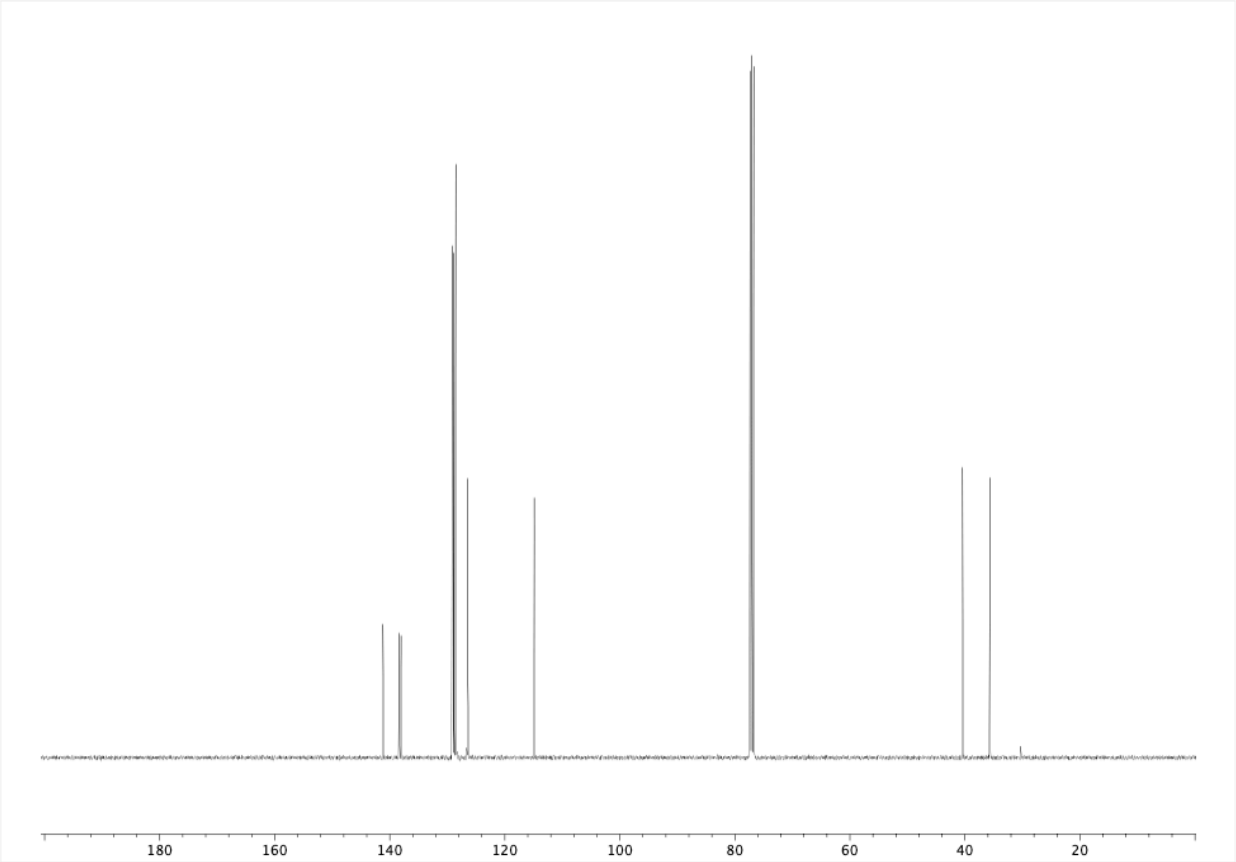

Figure A3.25 *^{13}C NMR (100 MHz, $CDCl_3$) of compound* ***162****.*

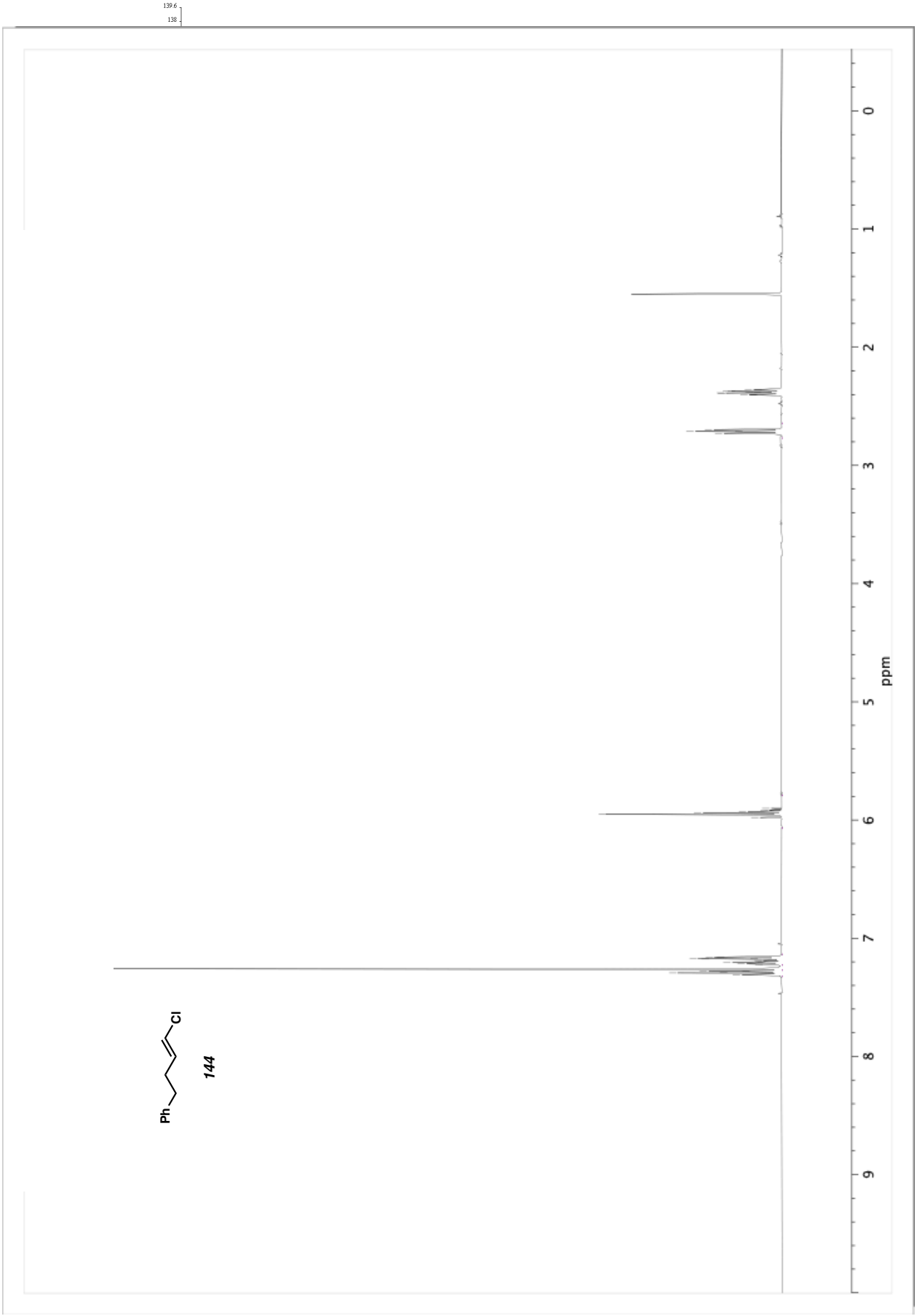

Figure A3.26 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***144****.*

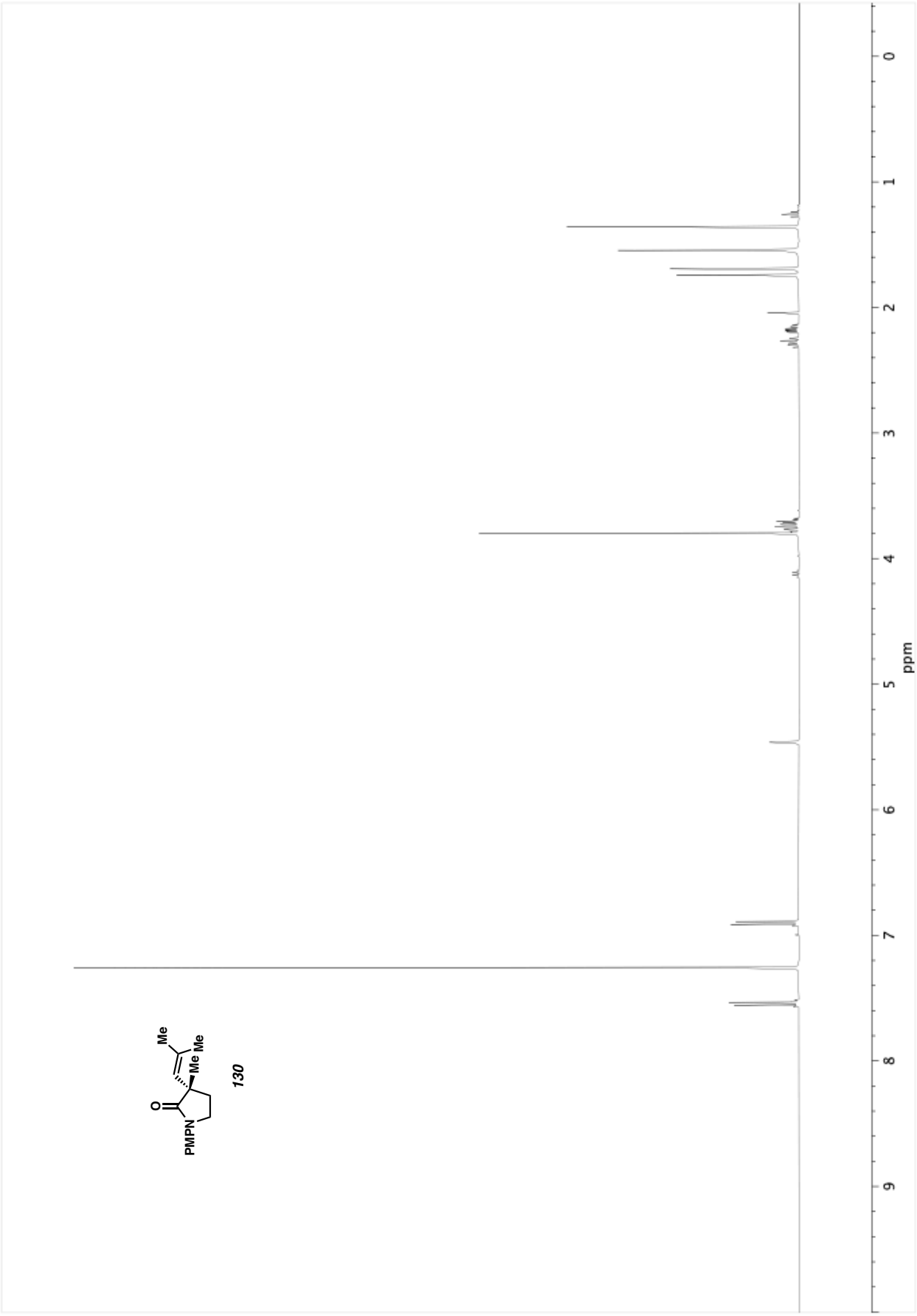

Figure A3.27 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***130***.

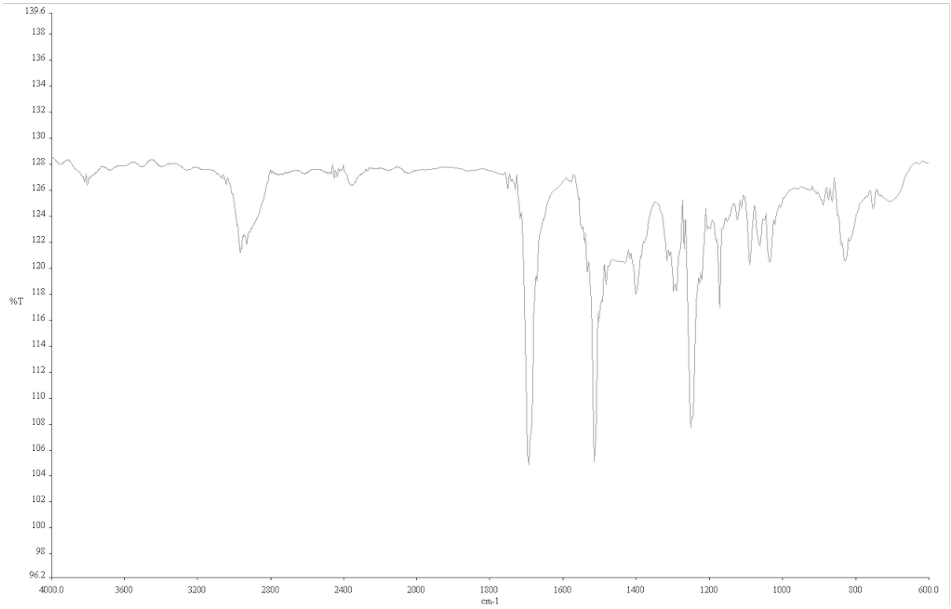

Figure A3.28 *Infrared spectrum (Thin Film, NaCl) of* ***130****.*

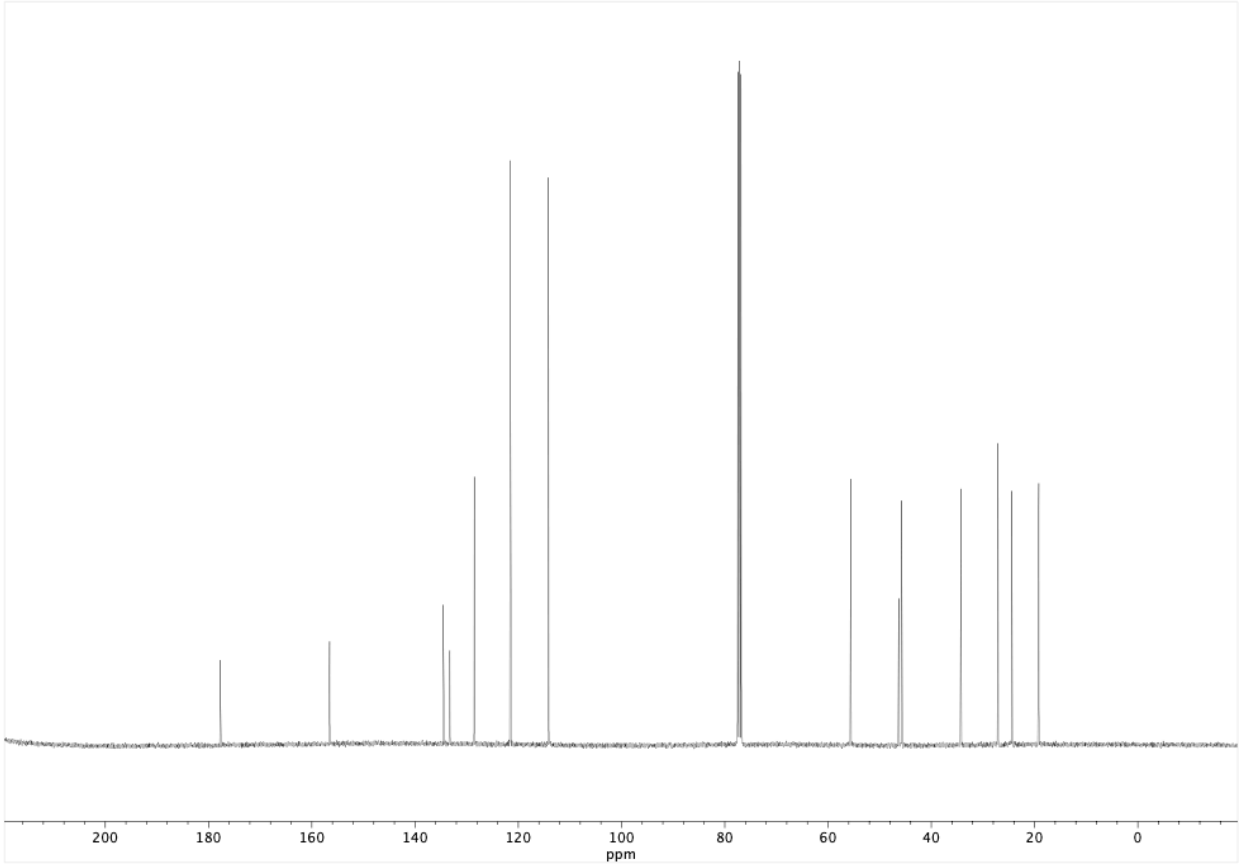

Figure A3.29 *^{13}C NMR (100 MHz, $CDCl_3$) of compound* ***130****.*

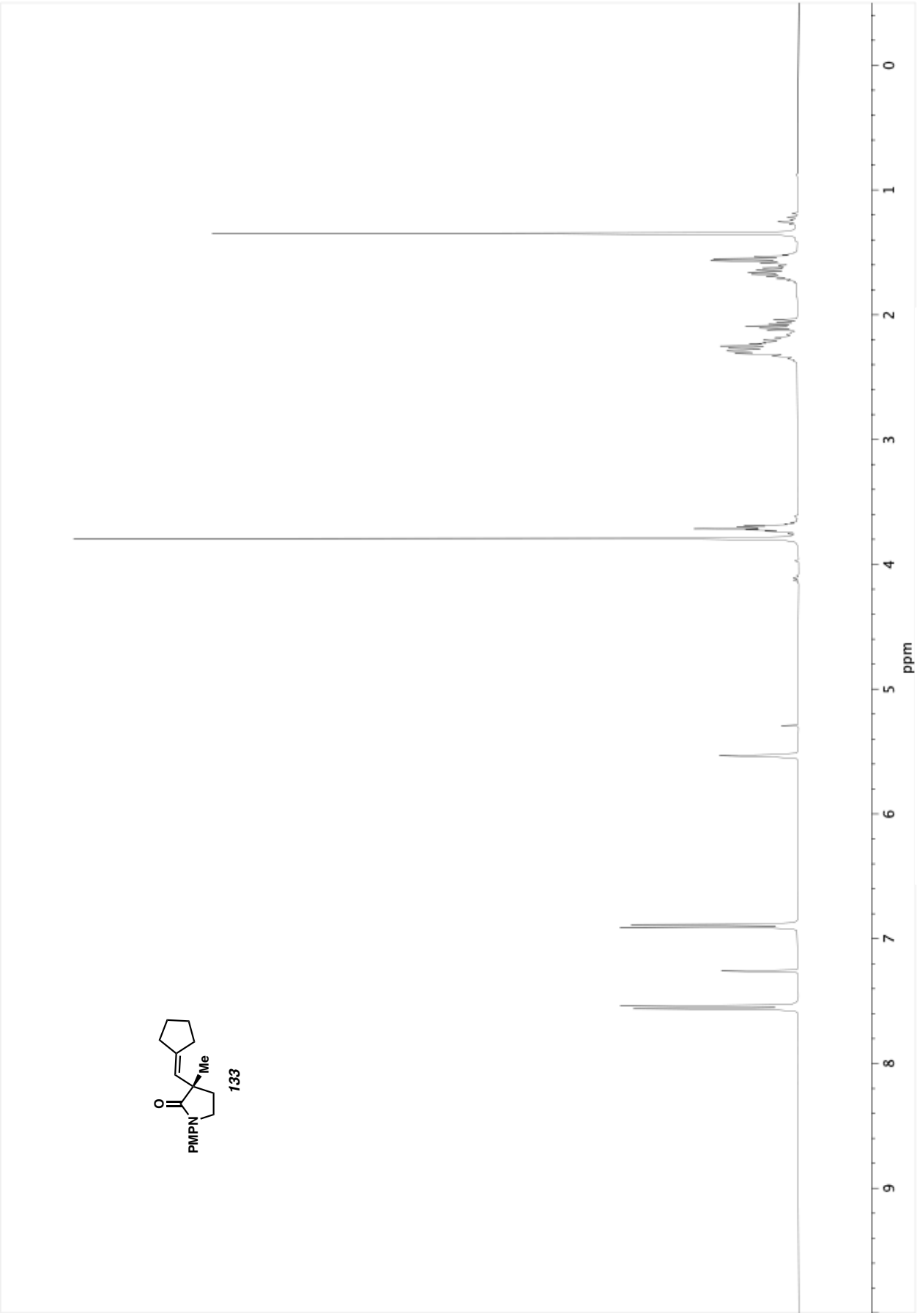

Figure A3.30 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***133***.

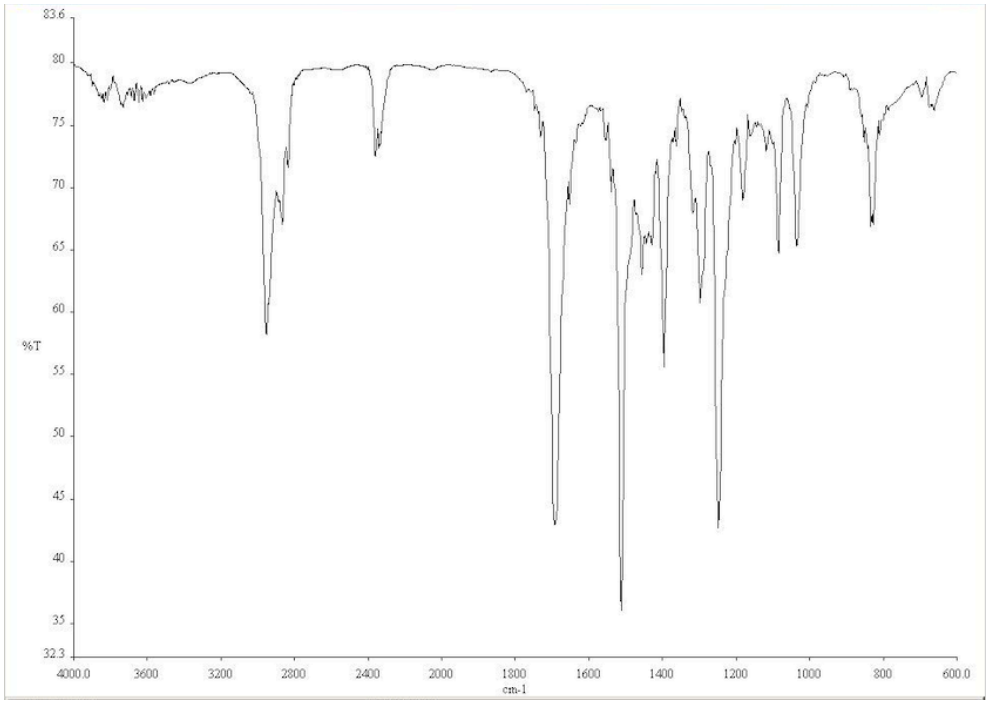

Figure A3.31 *Infrared spectrum (Thin Film, NaCl) of* ***133****.*

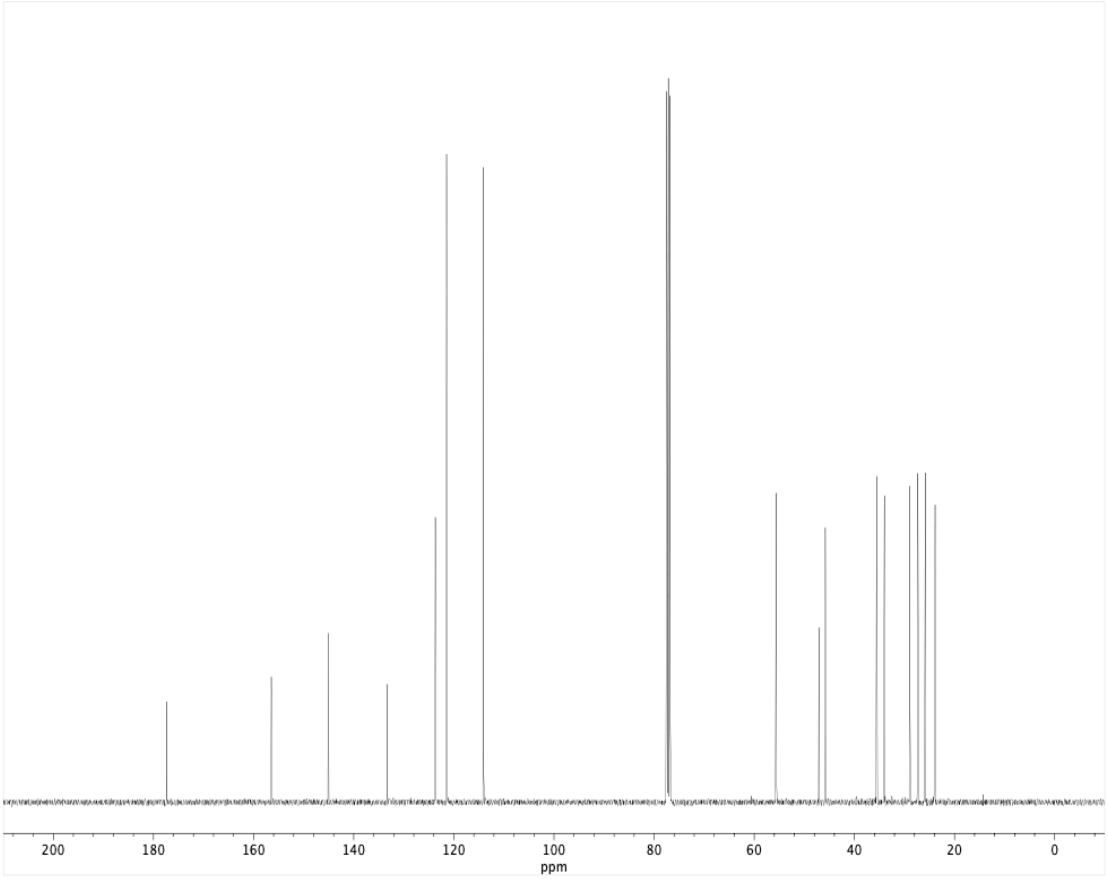

Figure A3.32 *^{13}C NMR (100 MHz, $CDCl_3$) of compound* ***133****.*

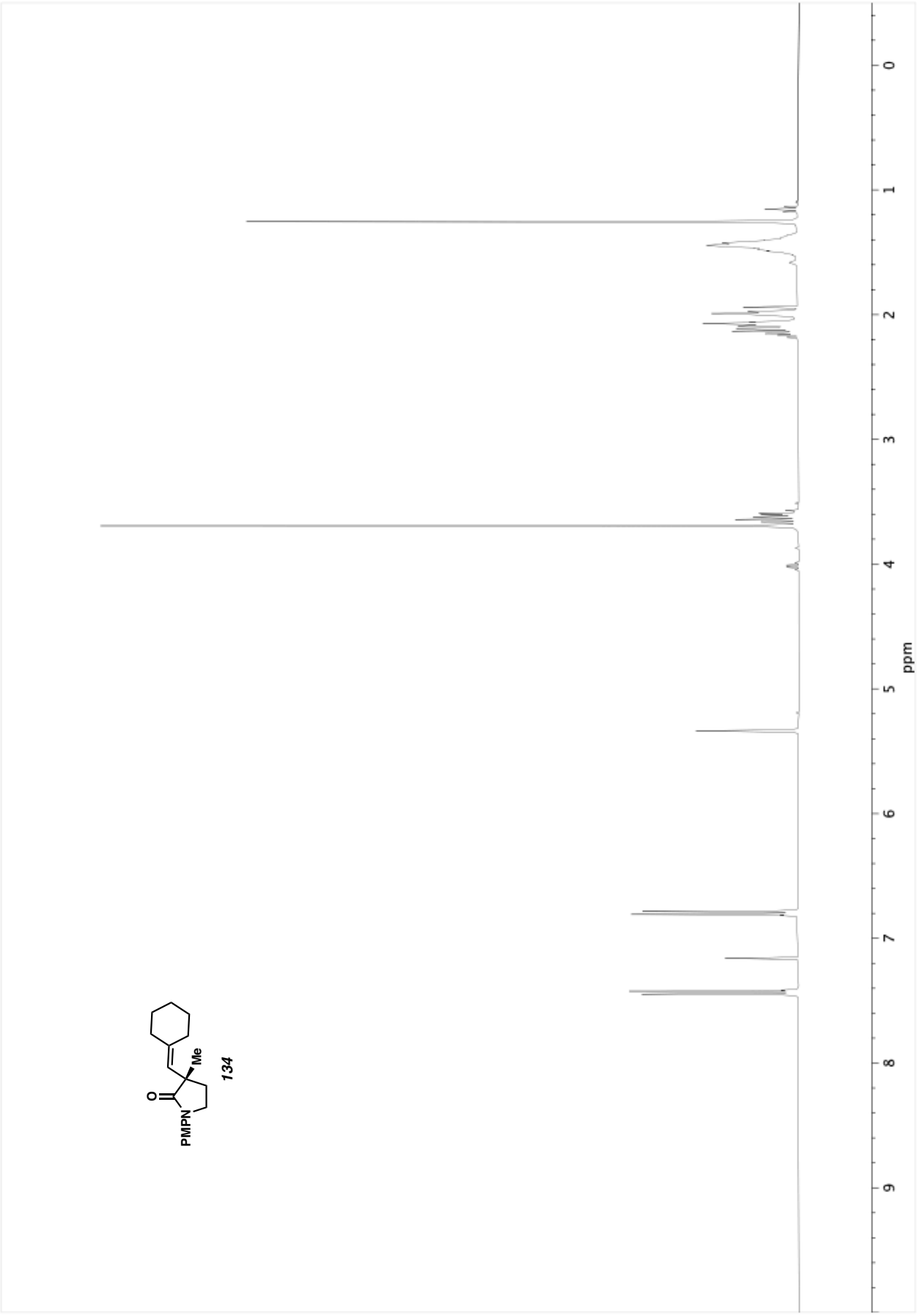

Figure A3.33 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***134****.*

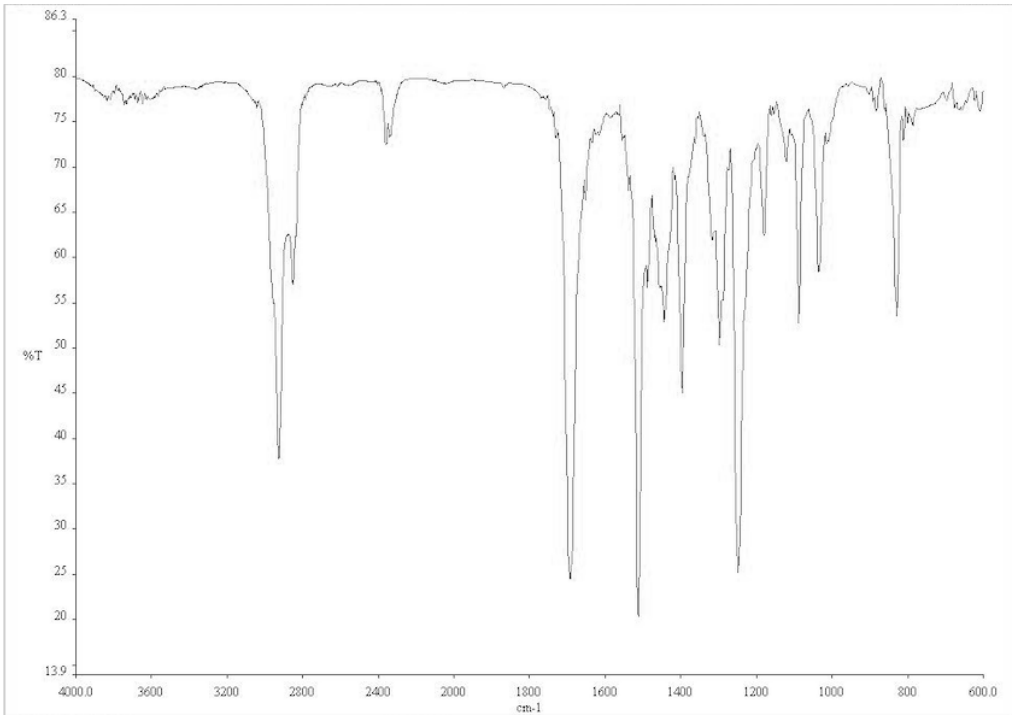

Figure A3.34 *Infrared spectrum (Thin Film, NaCl) of* ***134****.*

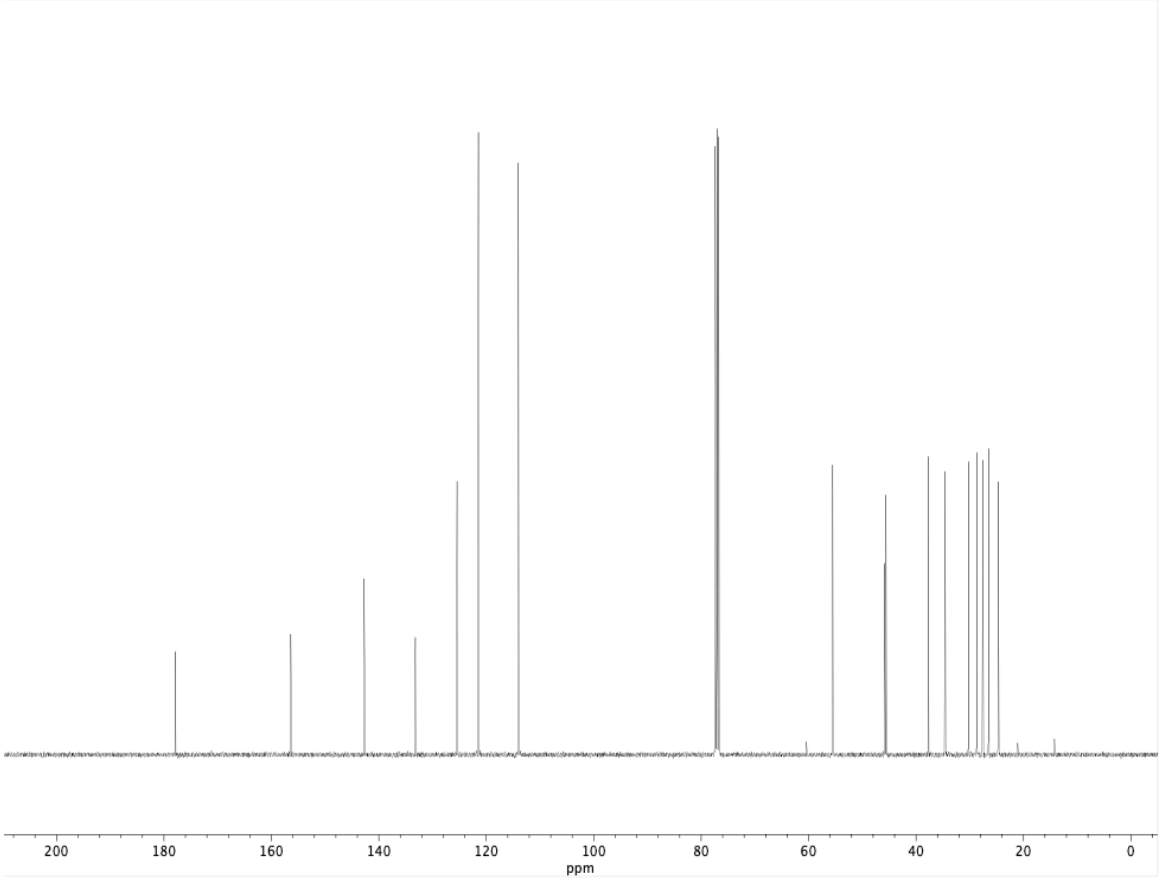

Figure A3.35 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***134.***

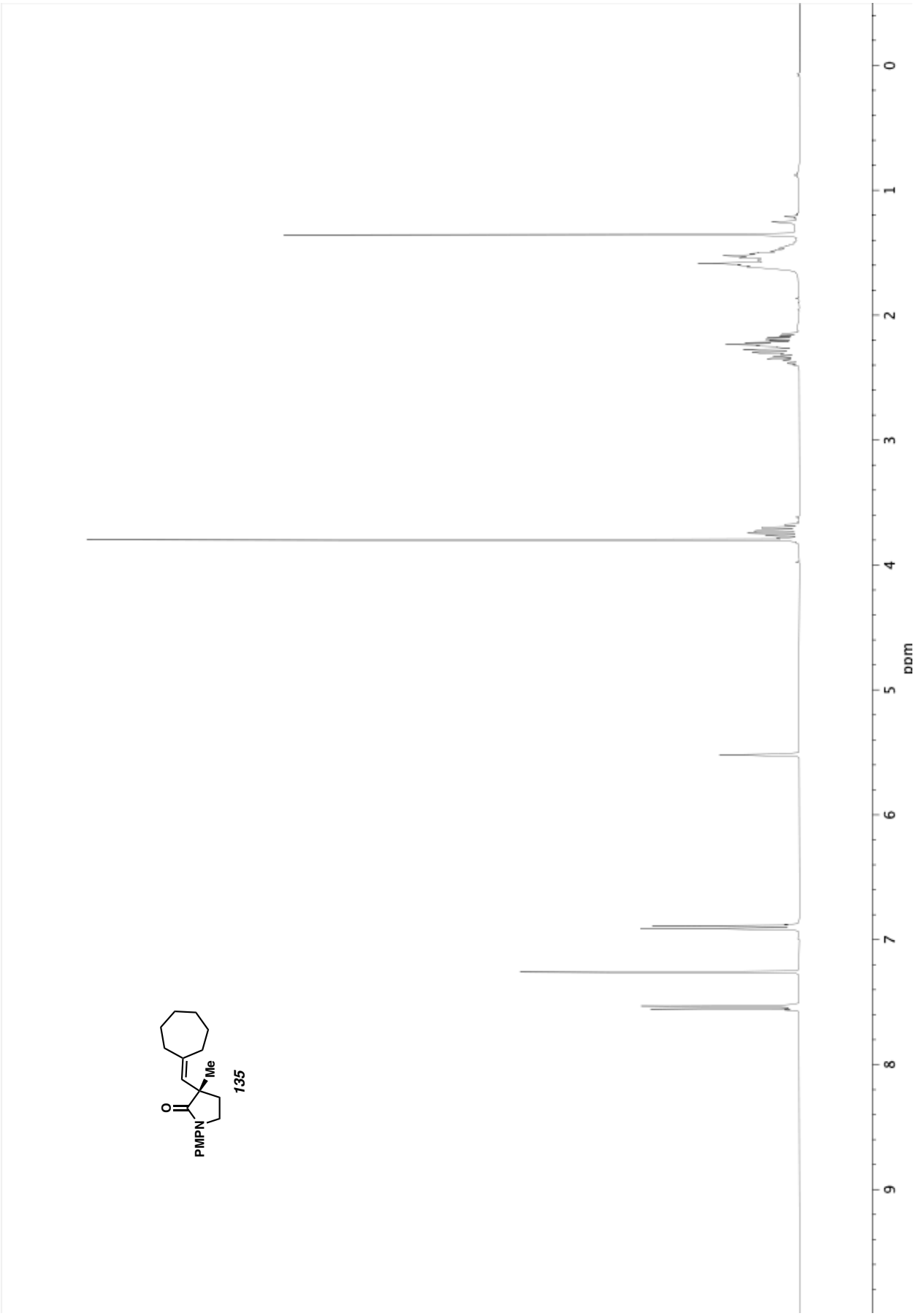

Figure A3.36 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***135***.

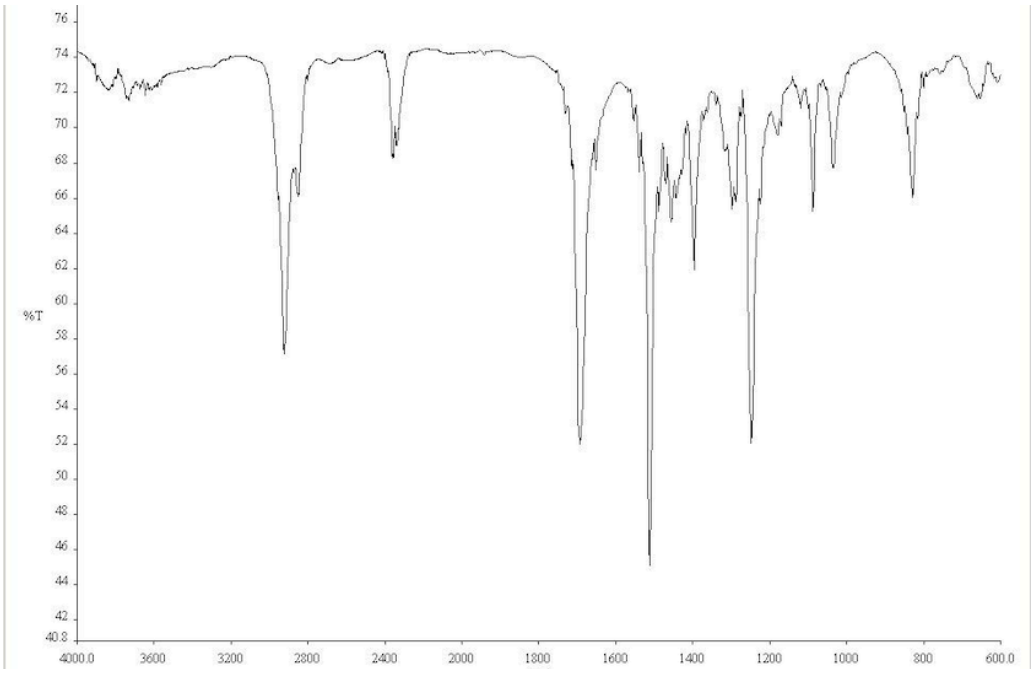

Figure A3.37 *Infrared spectrum (Thin Film, NaCl) of* ***135****.*

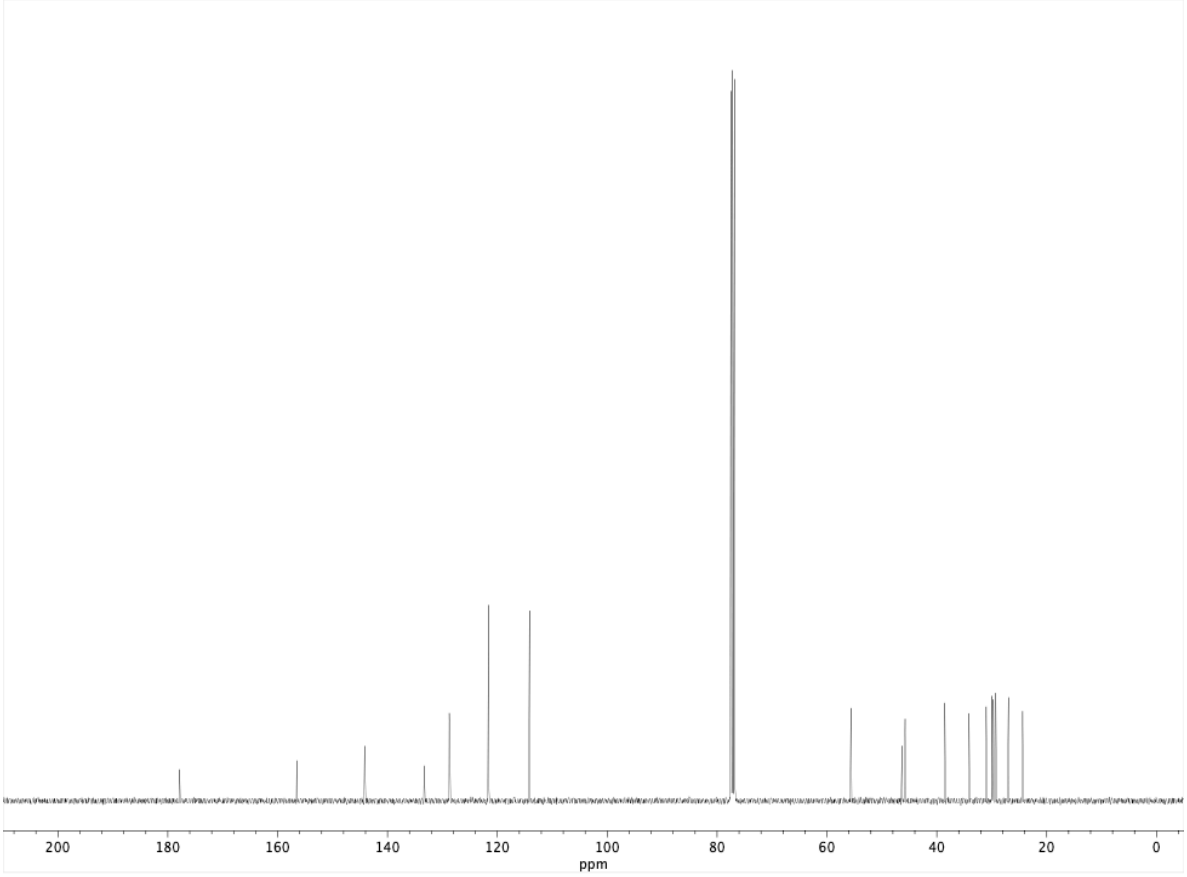

Figure A3.38 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***135****.*

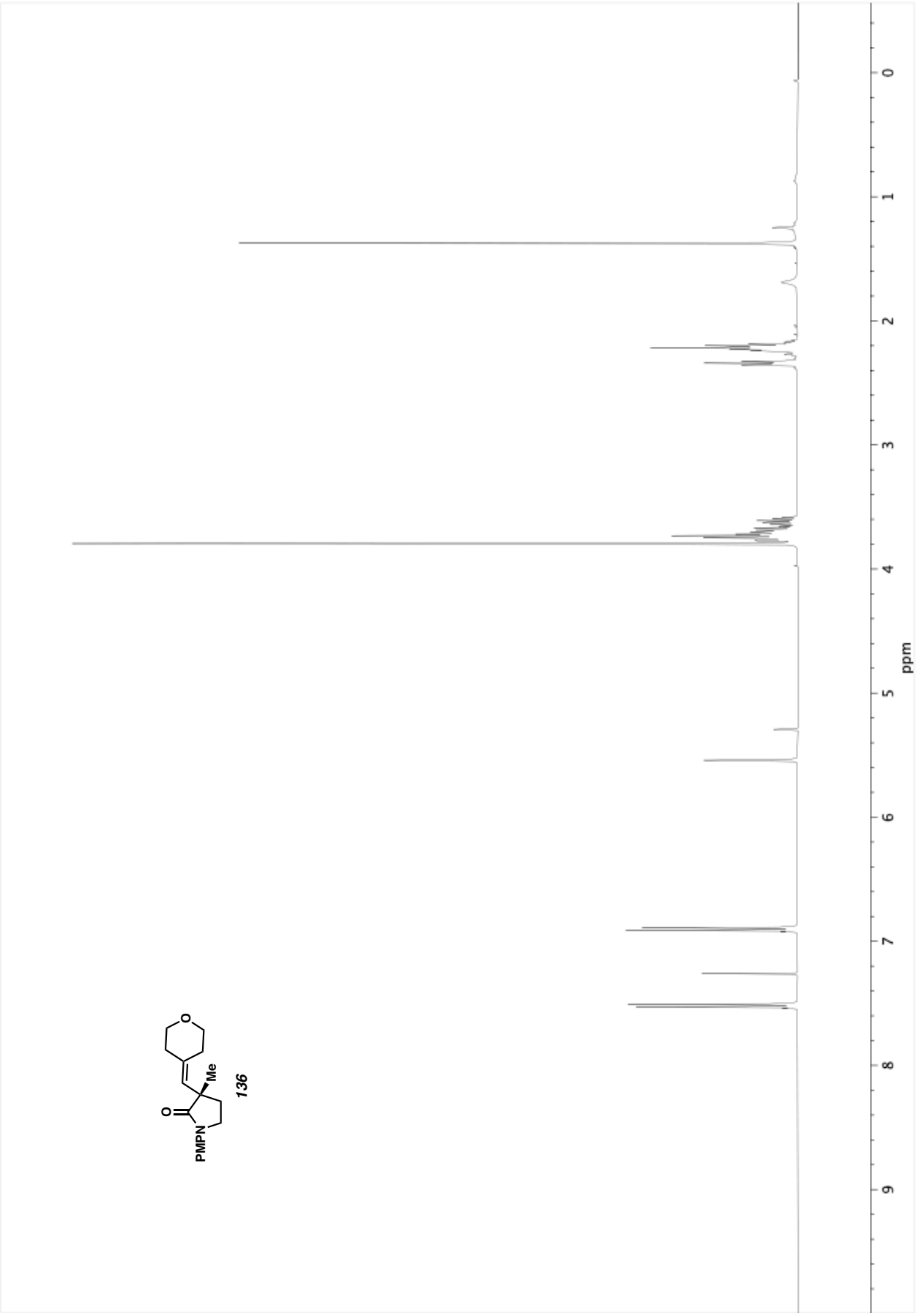

Figure A3.39 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***136****.*

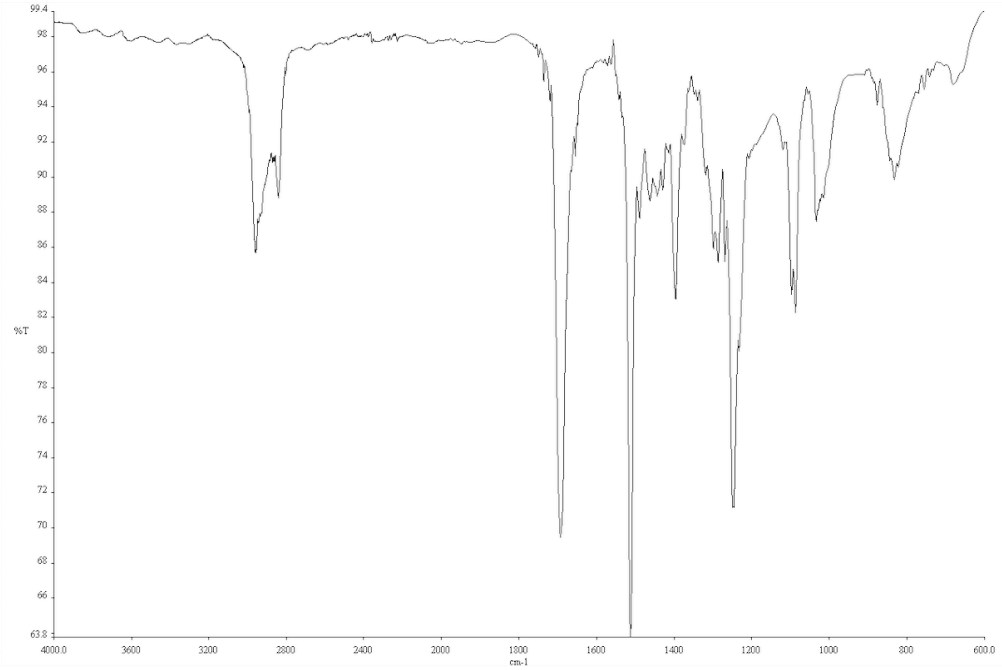

Figure A3.40 *Infrared spectrum (Thin Film, NaCl) of* ***136****.*

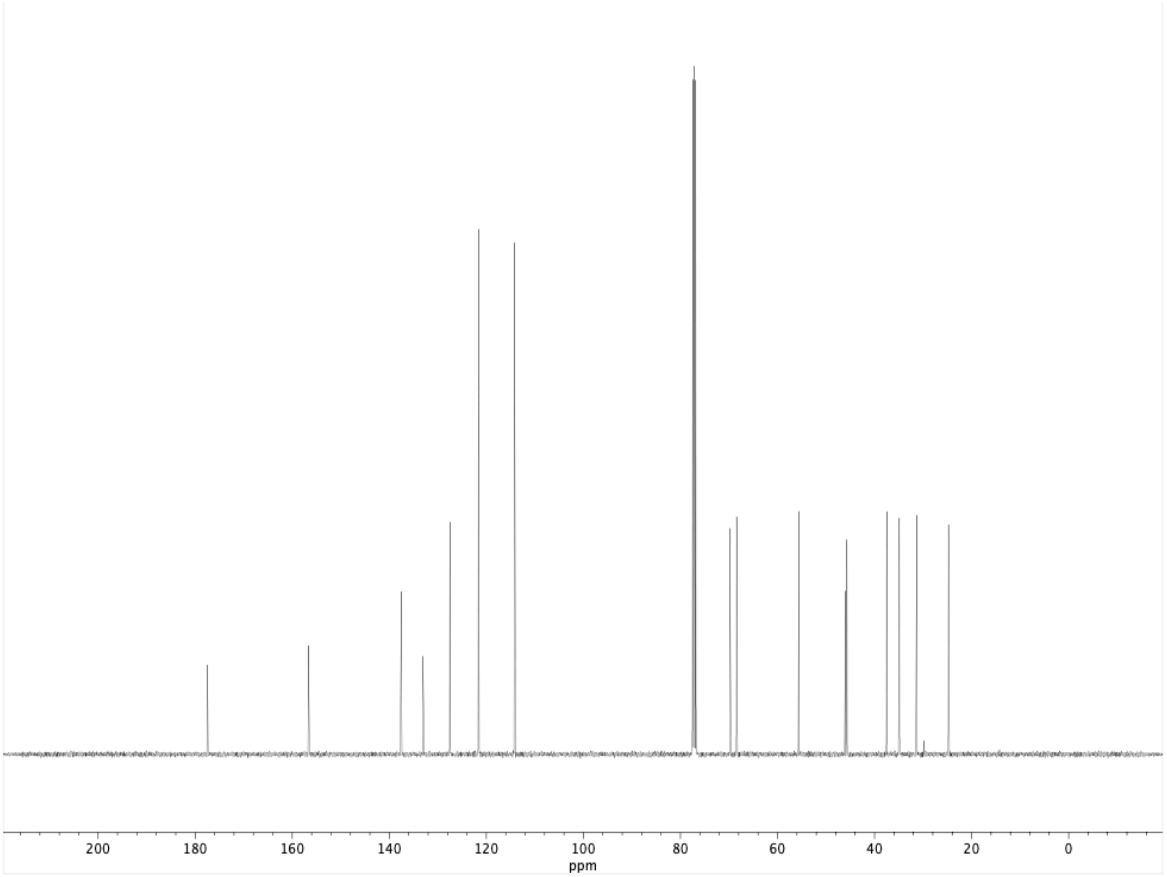

Figure A3.41 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***136****.*

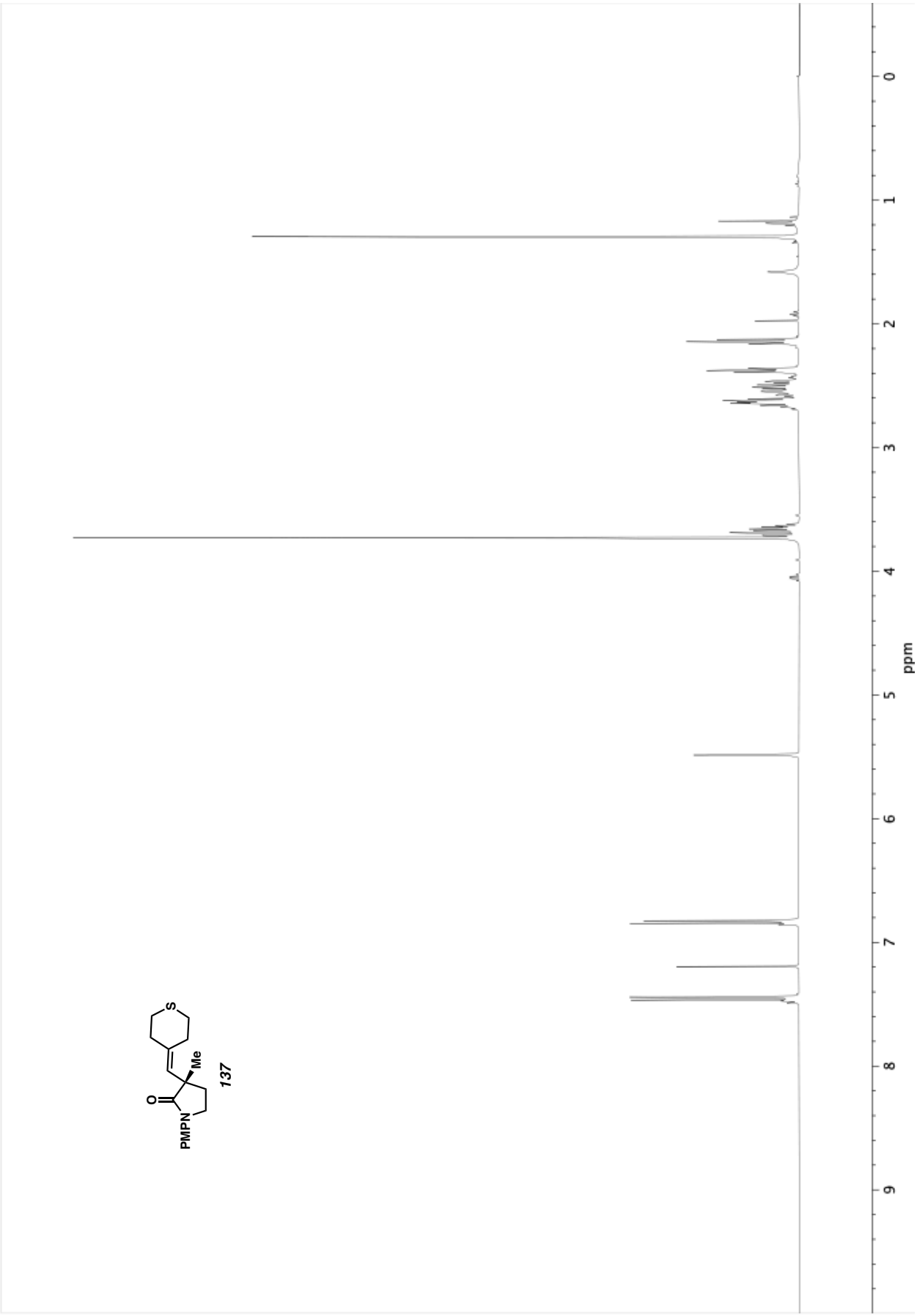

Figure A3.42. *^{1}H NMR (400 MHz, $CDCl_3$) of* ***137****.*

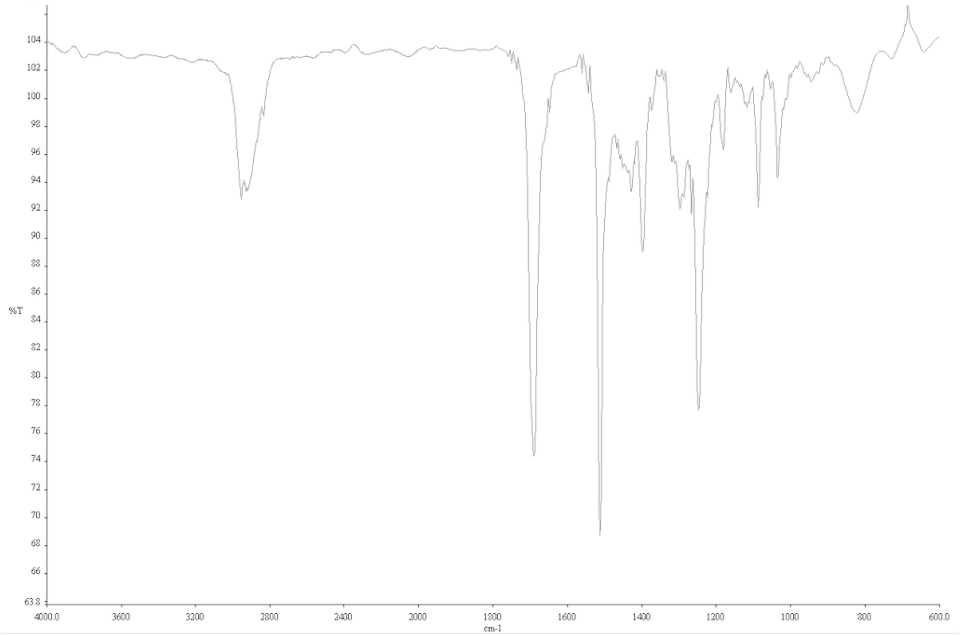

Figure A3.43 *Infrared spectrum (Thin Film, NaCl) of* ***137****.*

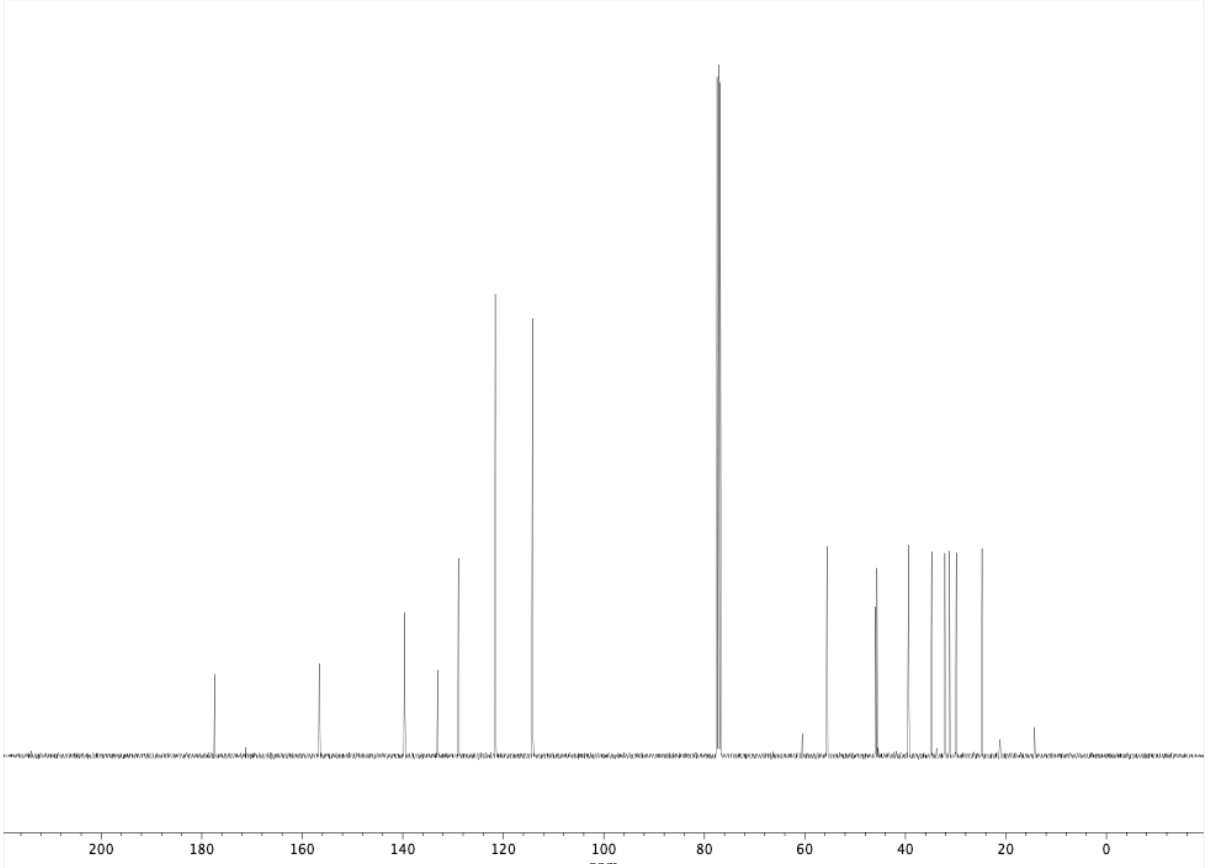

Figure A3.44 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***137****.*

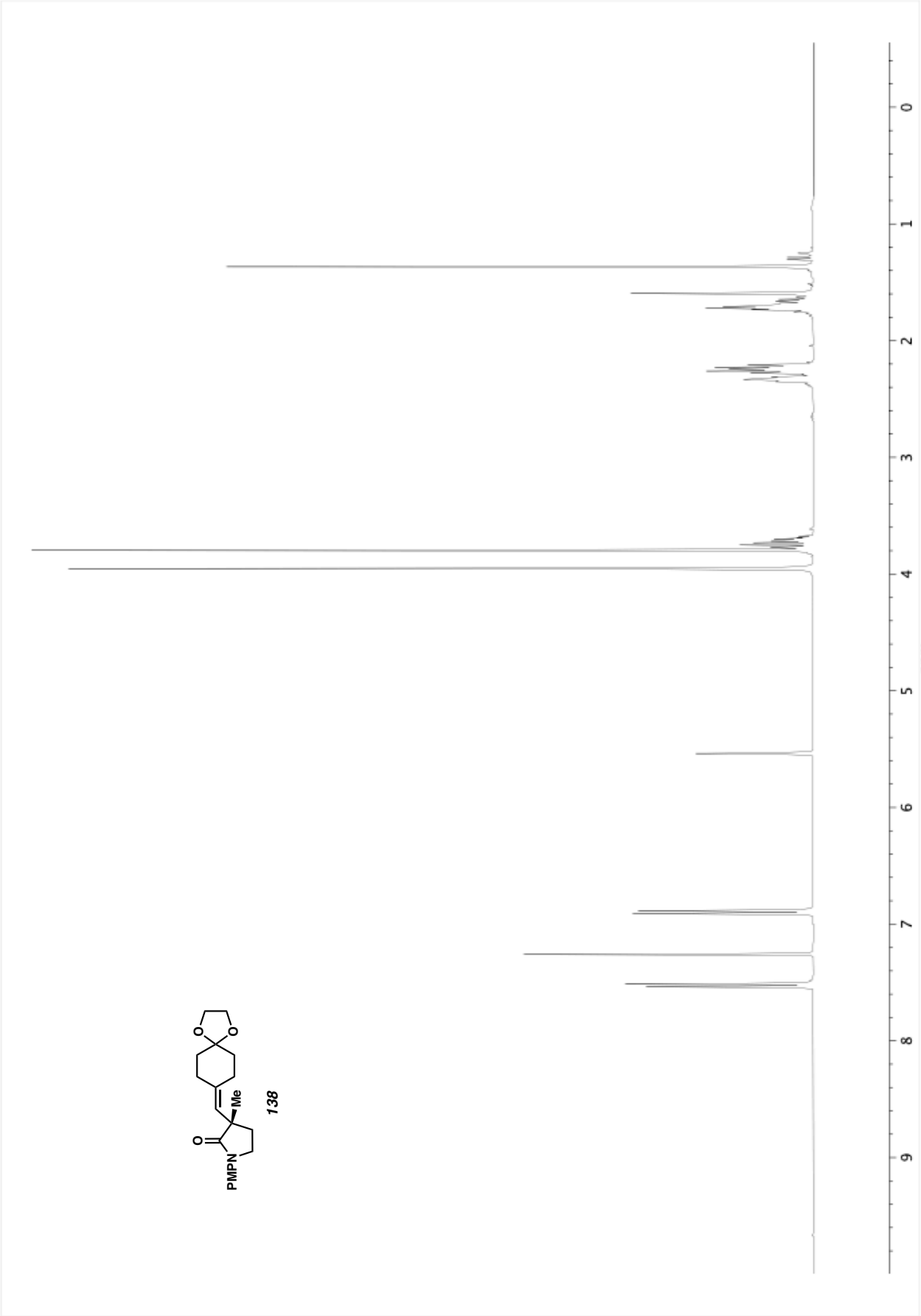

Figure A3.45 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***138****.*

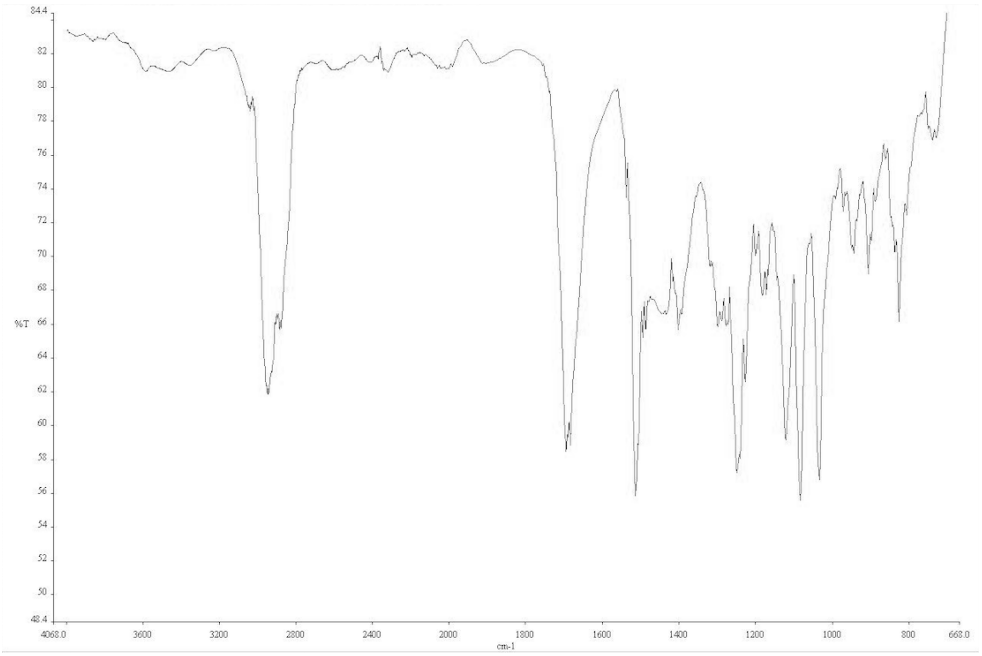

Figure A3.46 *Infrared spectrum (Thin Film, NaCl) of* ***138.***

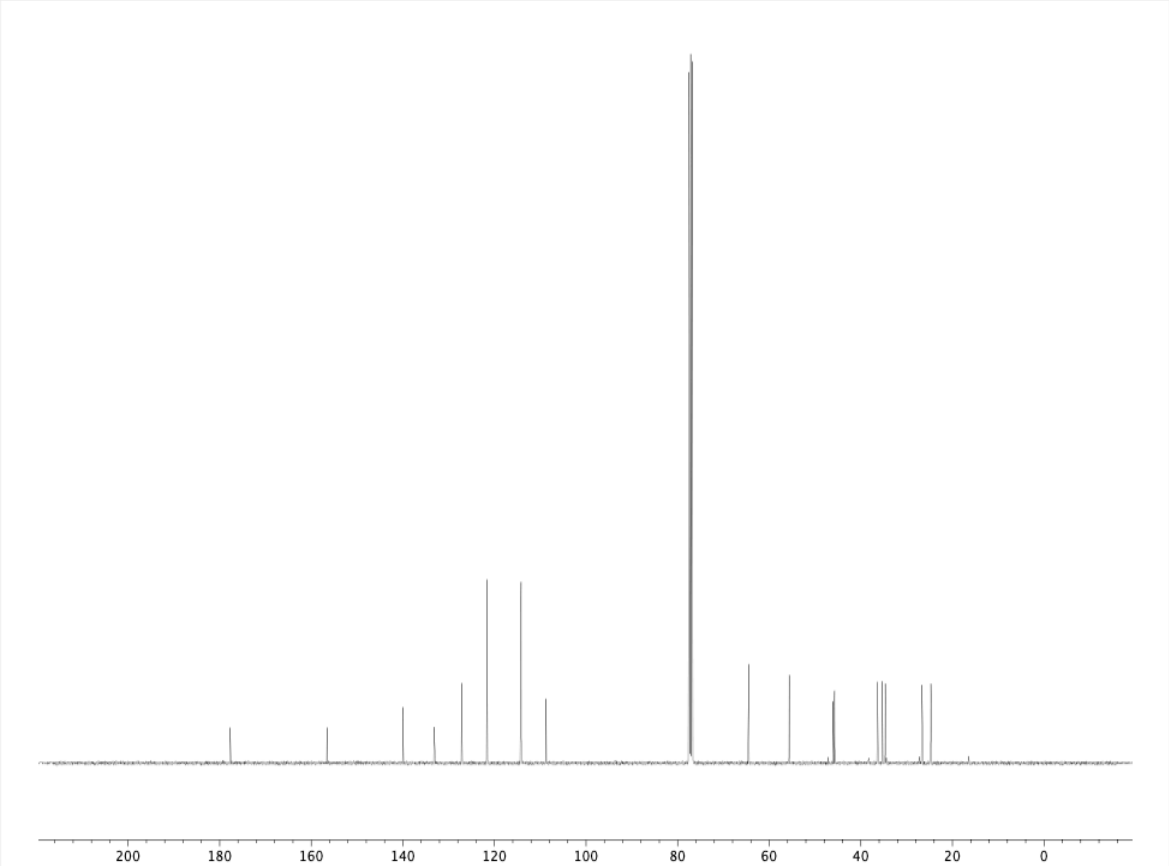

Figure A3.47 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***138****.*

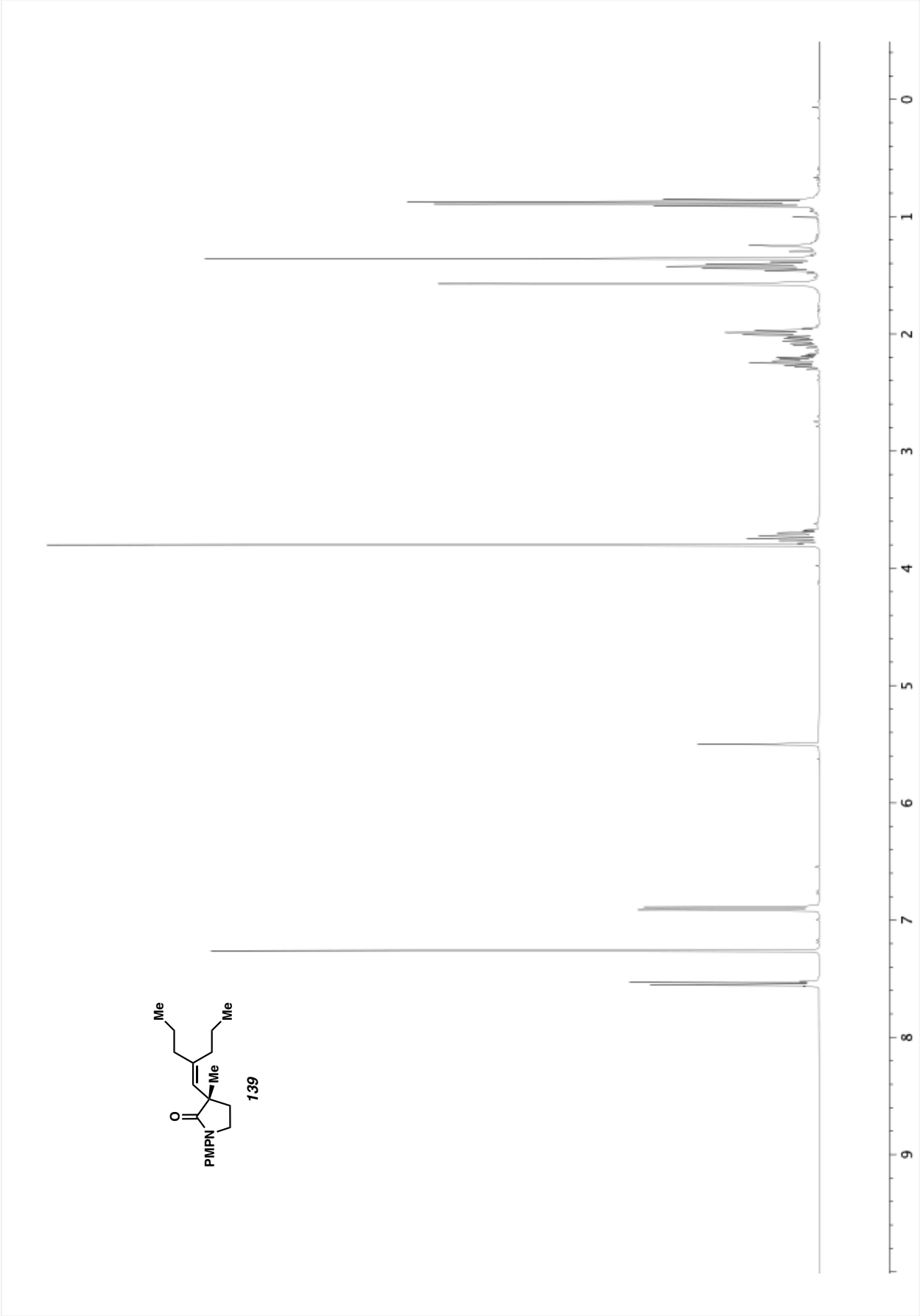

Figure A3.48 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***139.***

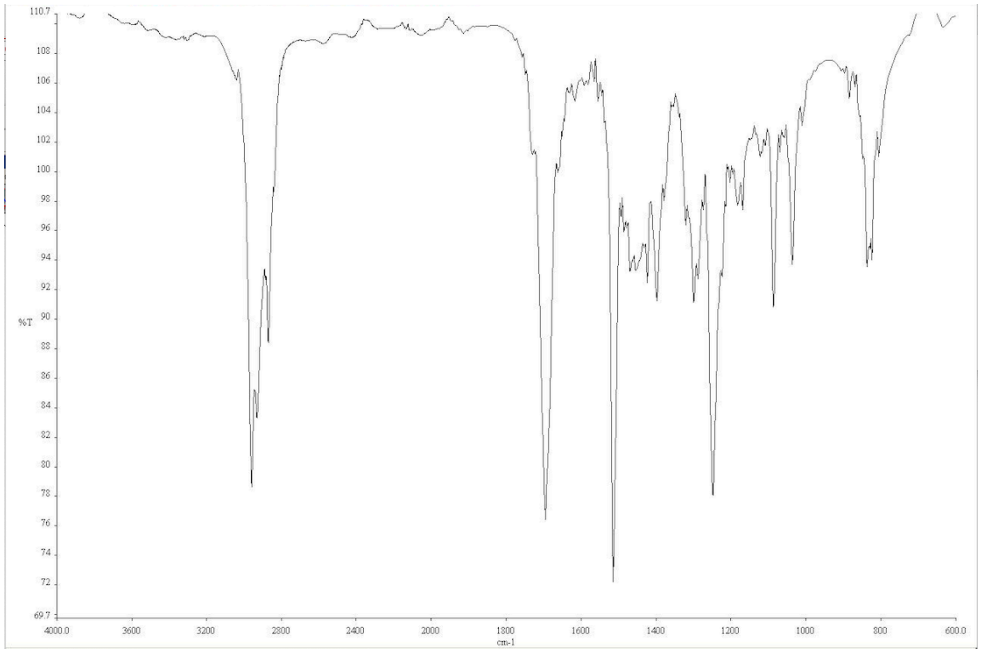

Figure A3.49 *Infrared spectrum (Thin Film, NaCl) of* ***139***.

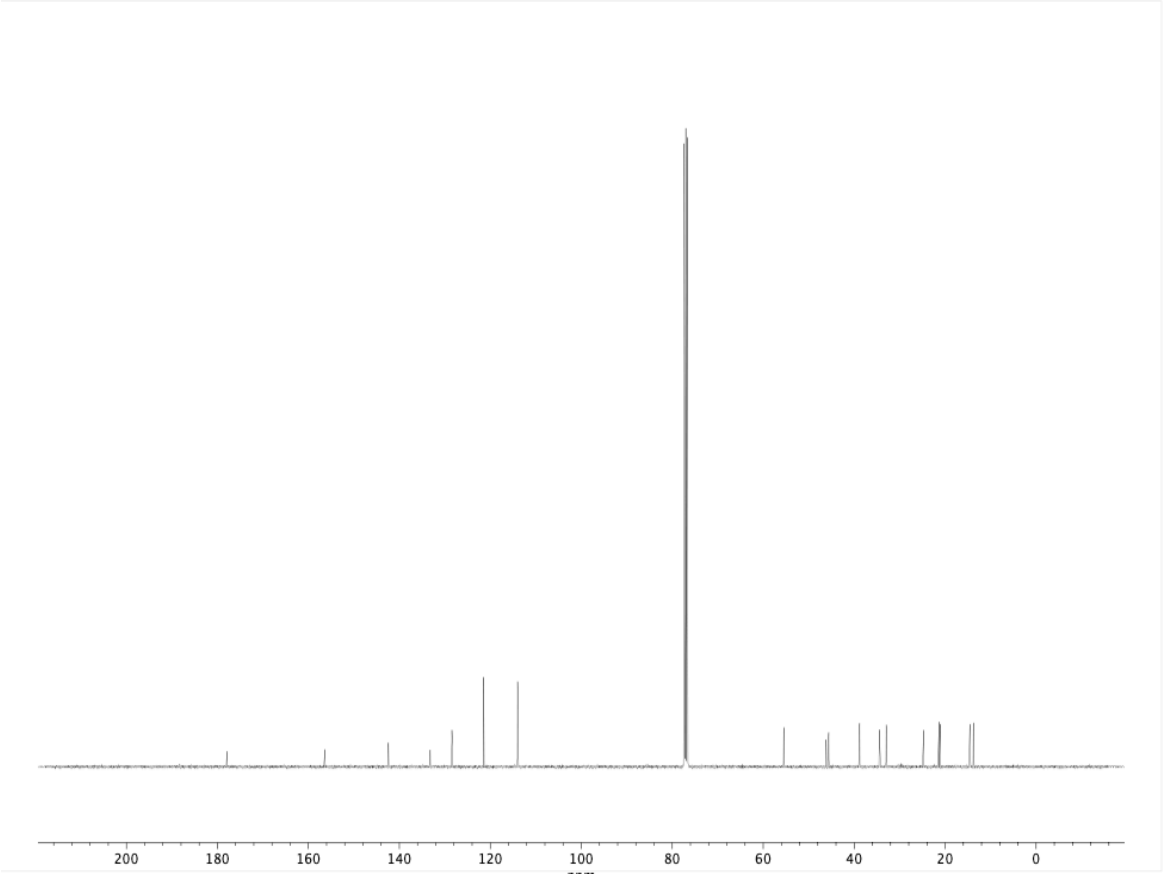

Figure A3.50 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***139***.

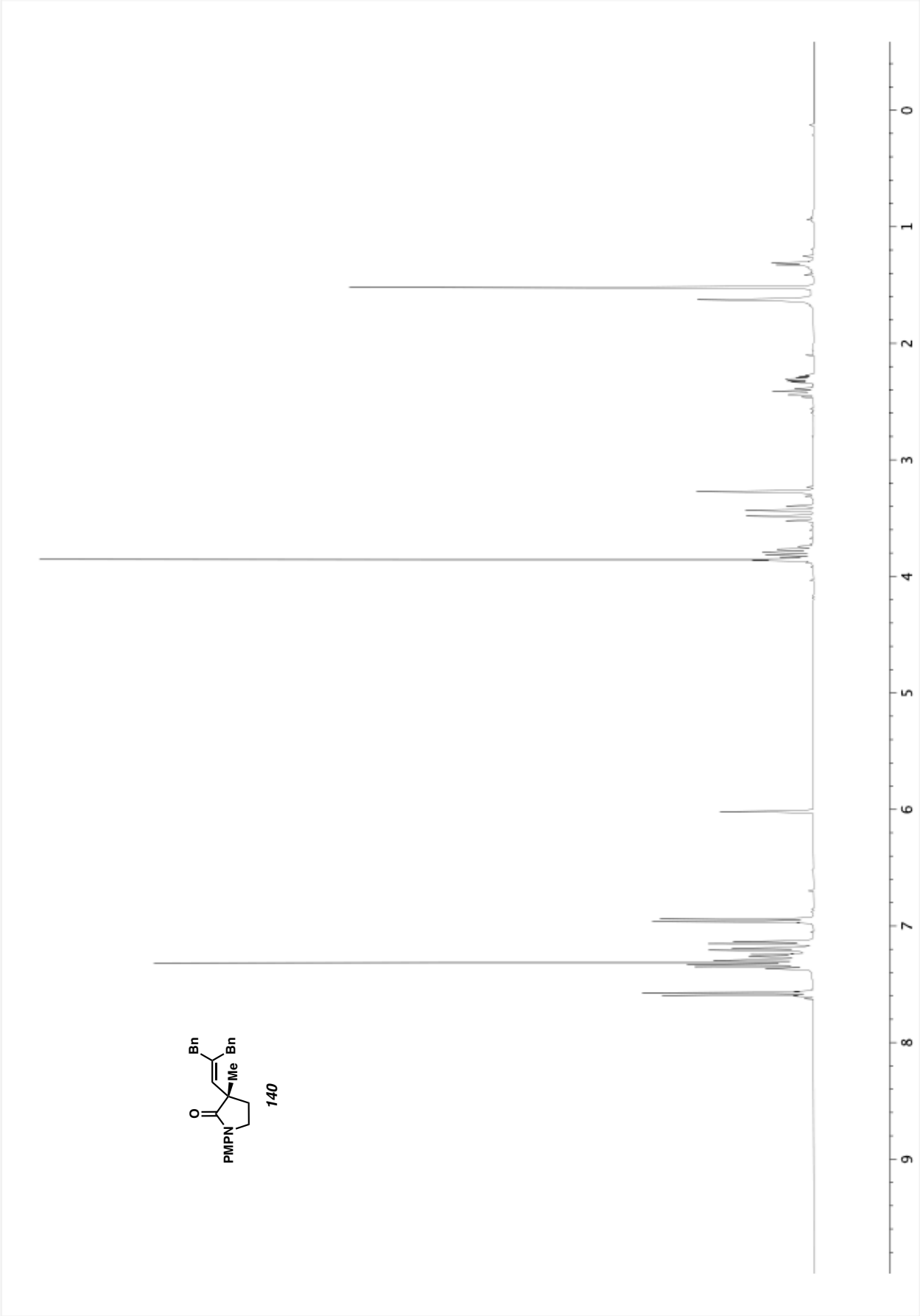

Figure A3.51 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***140****.*

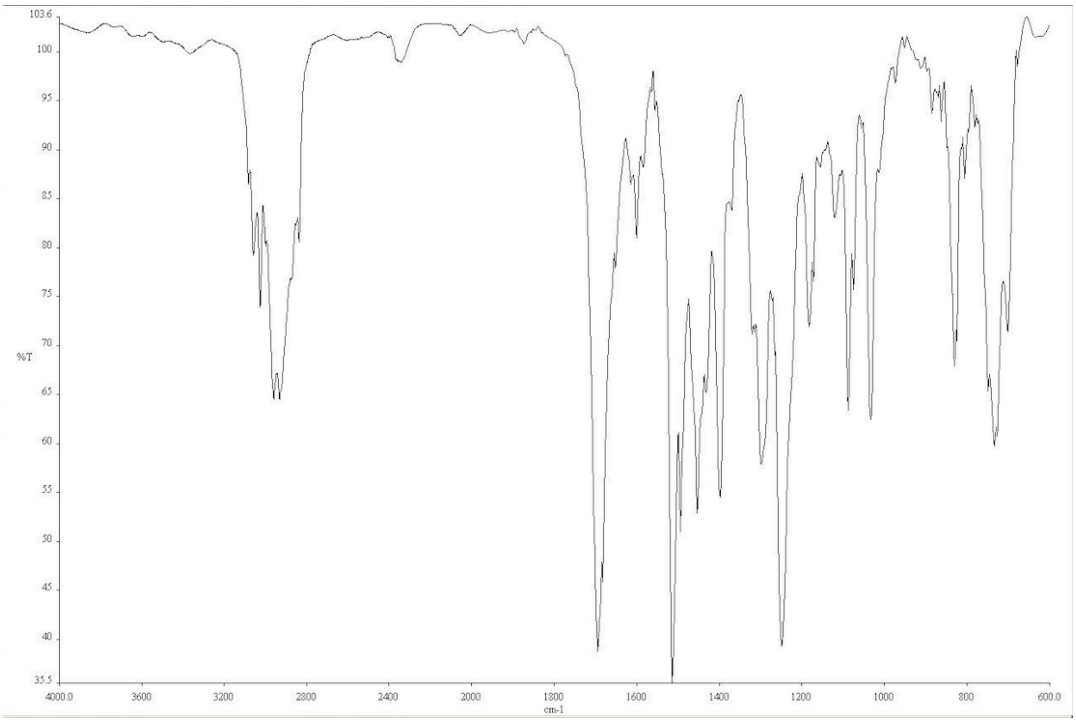

Figure A3.52 *Infrared spectrum (Thin Film, NaCl) of* ***140****.*

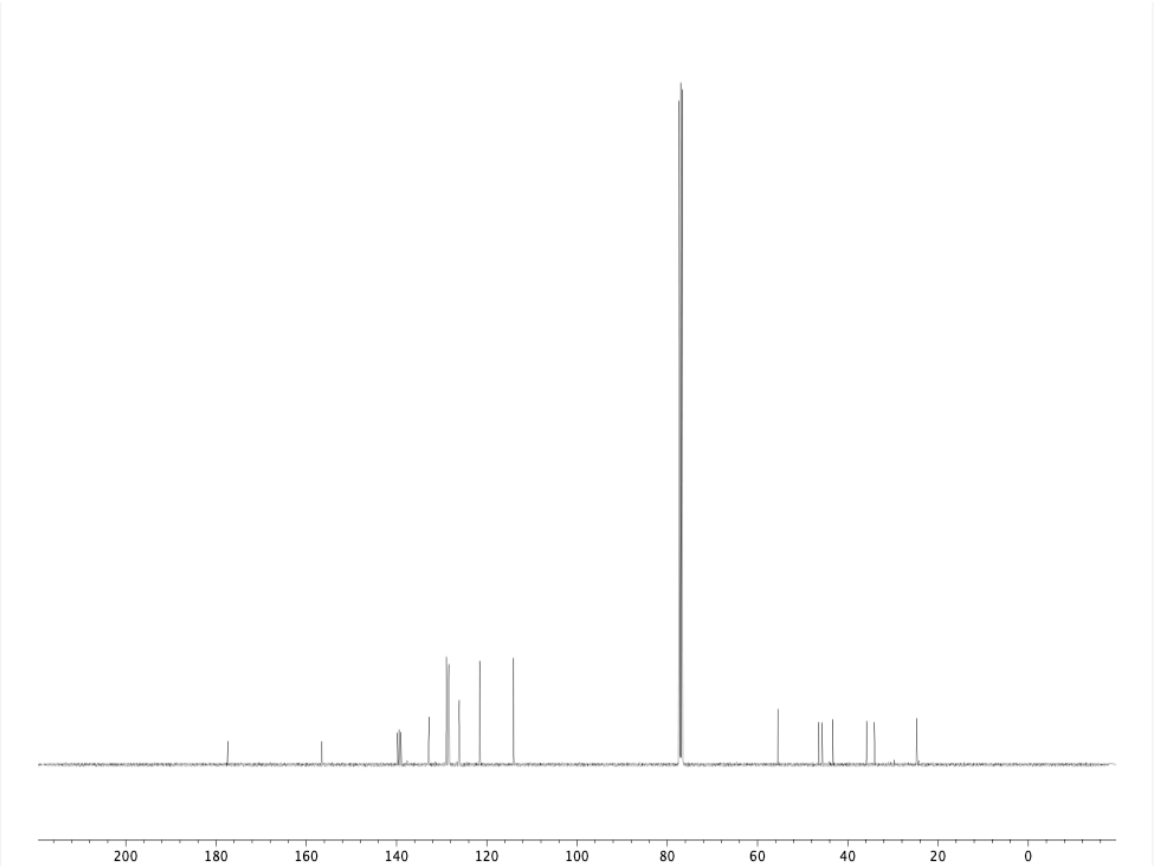

Figure A3.53 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***140****.*

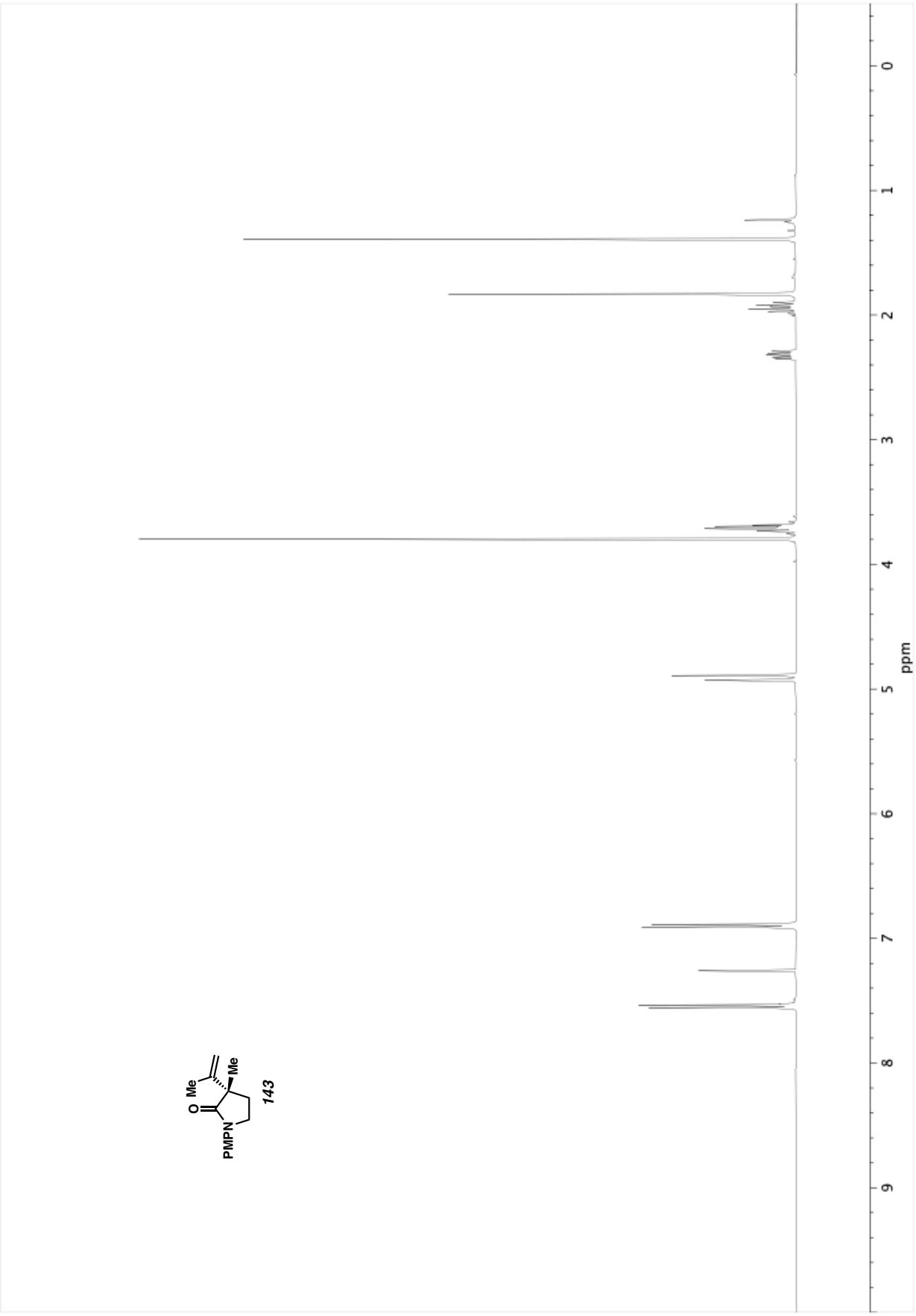

Figure A3.54 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***143****.*

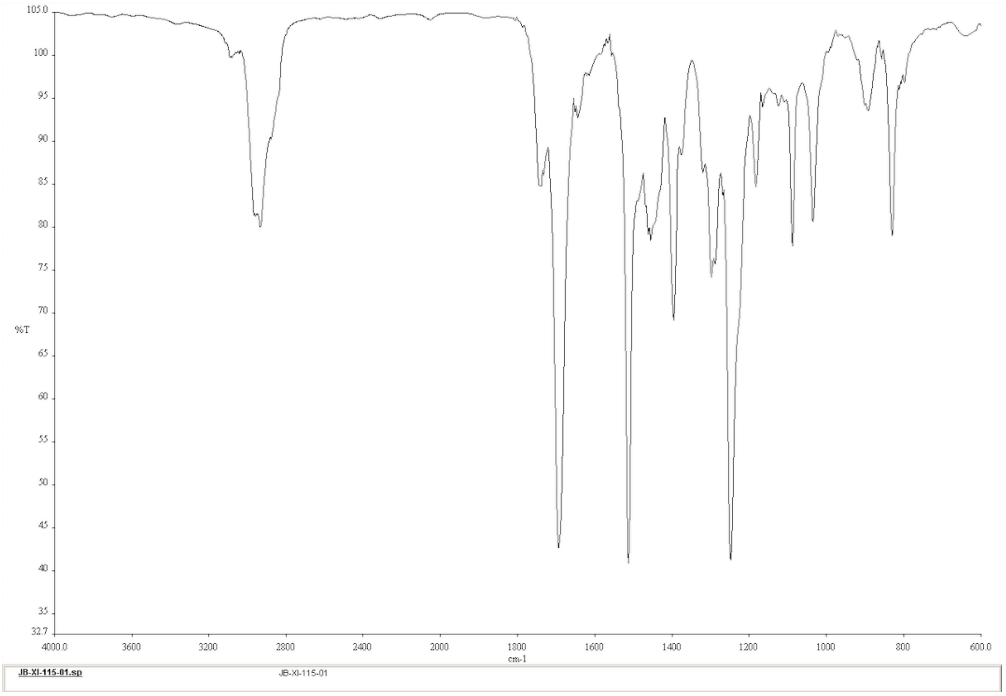

Figure A3.55 *Infrared spectrum (Thin Film, NaCl) of* ***143****.*

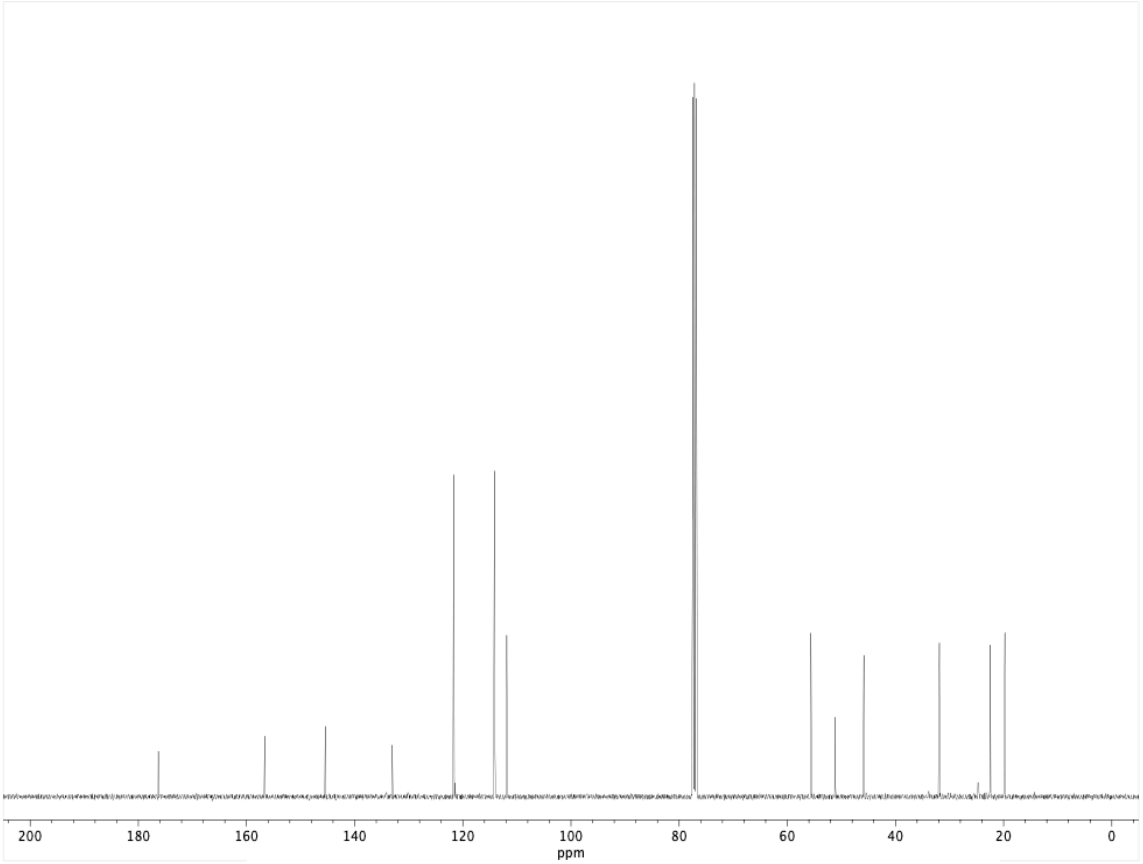

Figure A3.56 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***143****.*

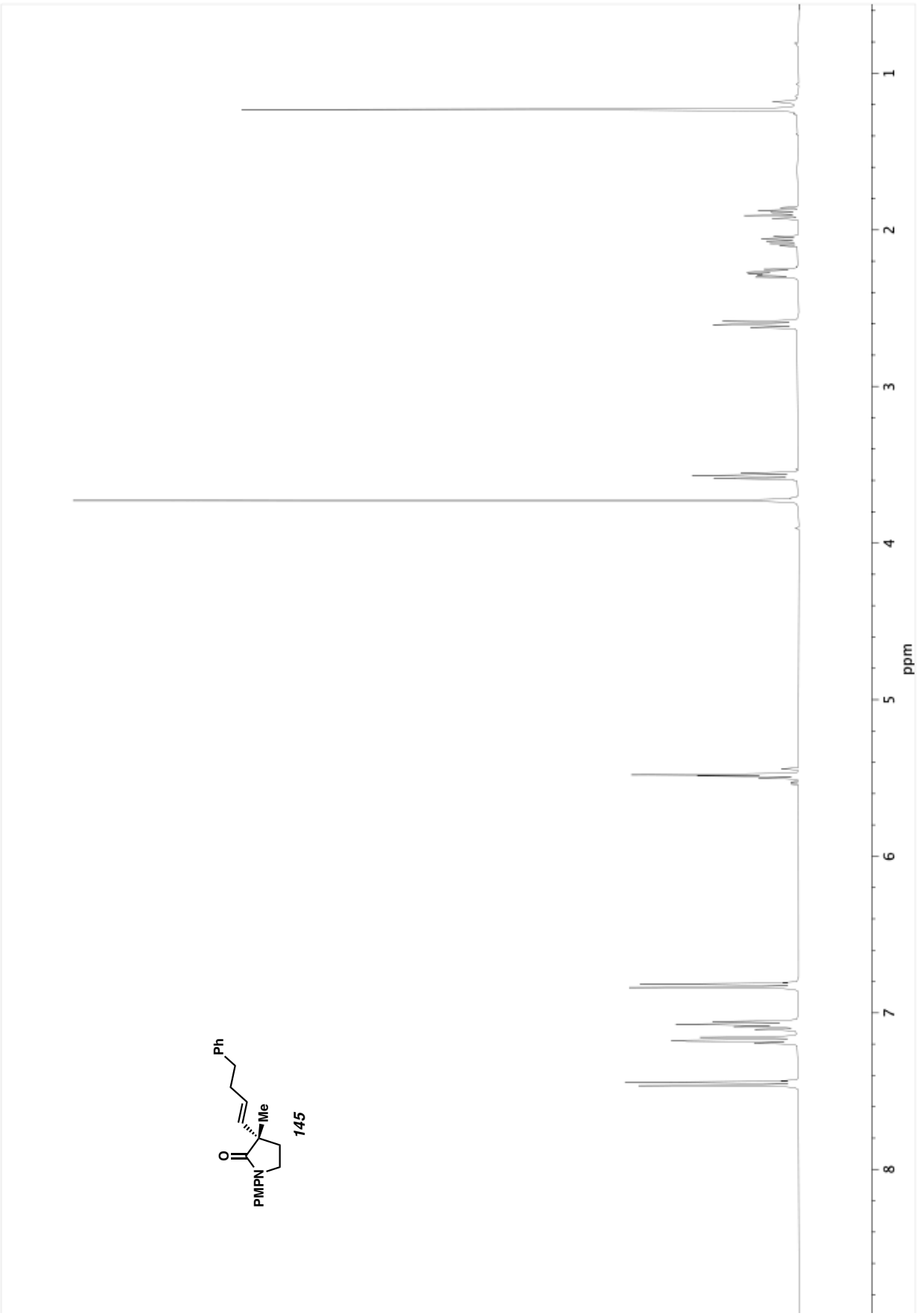

Figure A3.57 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***145****.*

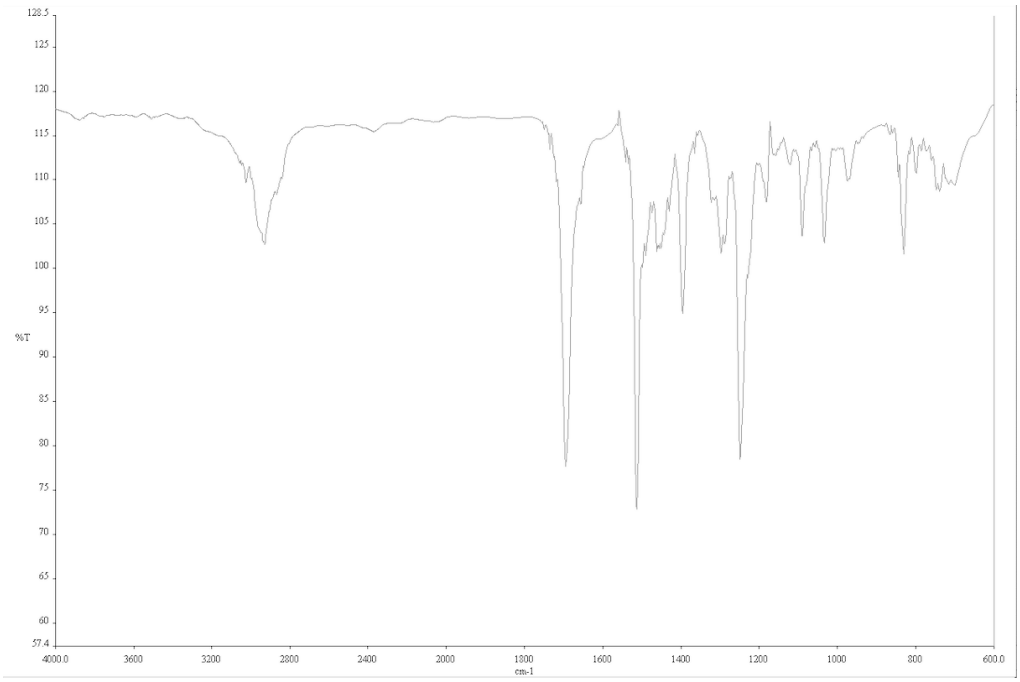

Figure A3.58 *Infrared spectrum (Thin Film, NaCl) of* ***145****.*

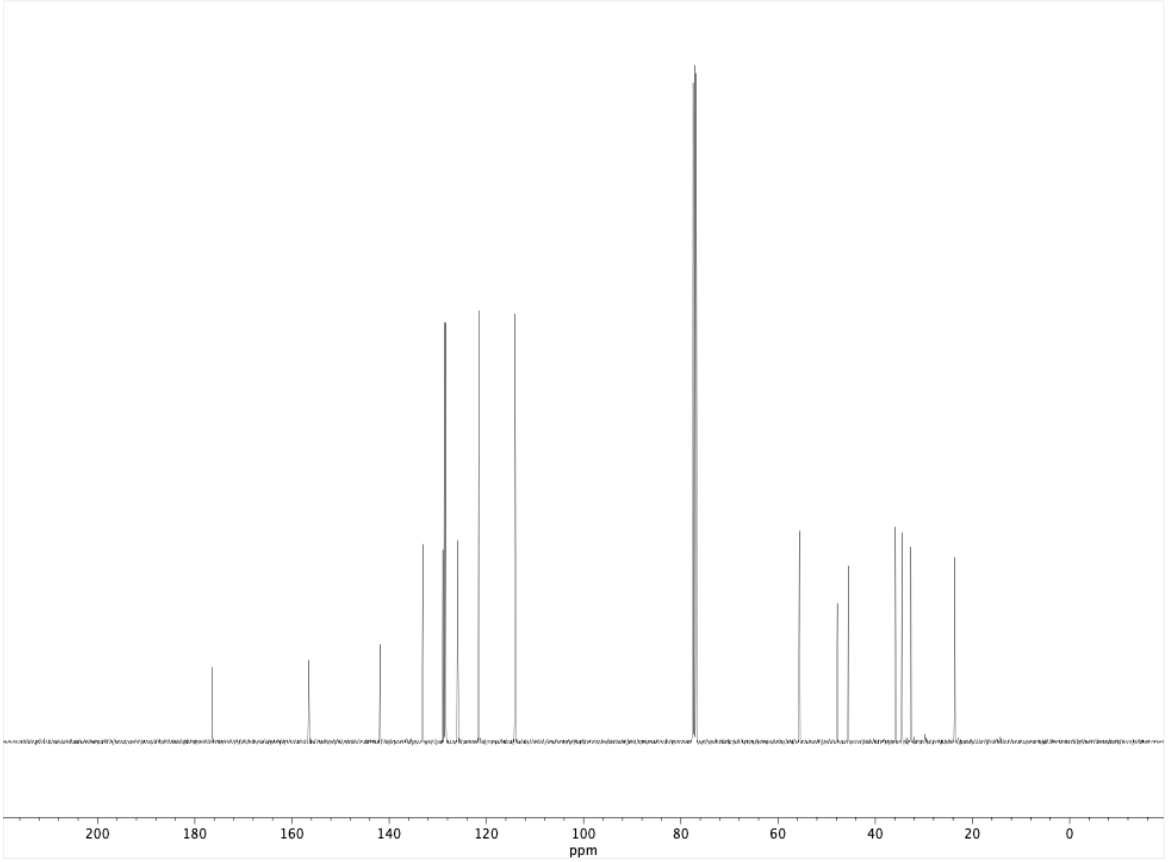

Figure A3.59 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***145****.*

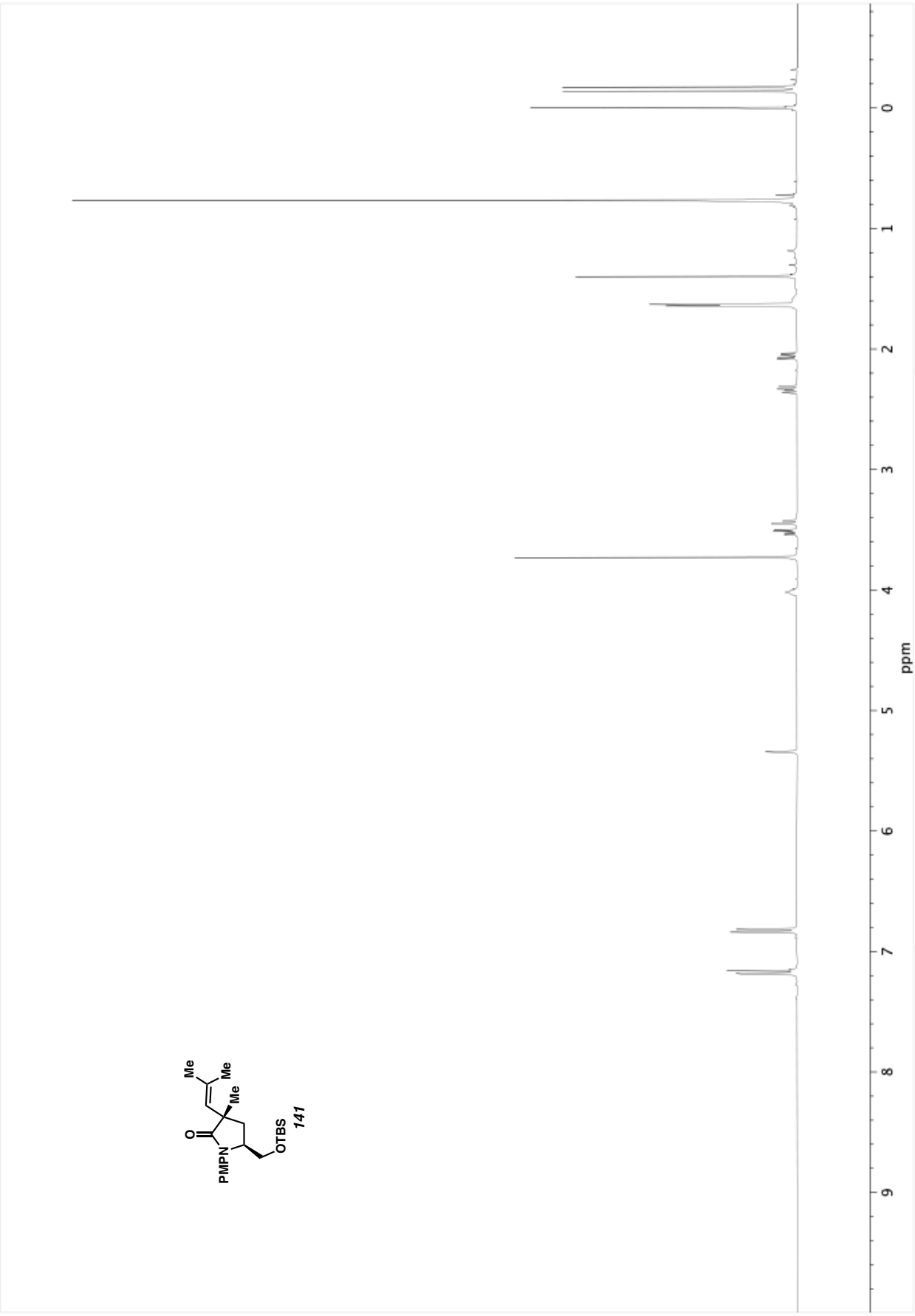

Figure A3.60 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***141****.*

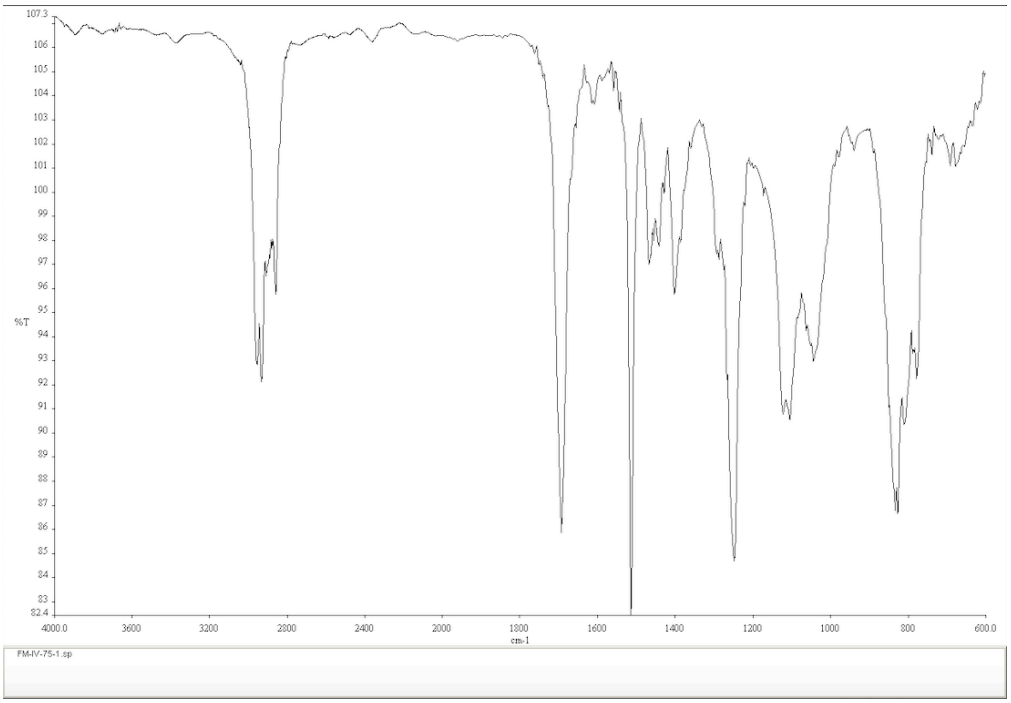

Figure A3.61 *Infrared spectrum (Thin Film, NaCl) of* ***141****.*

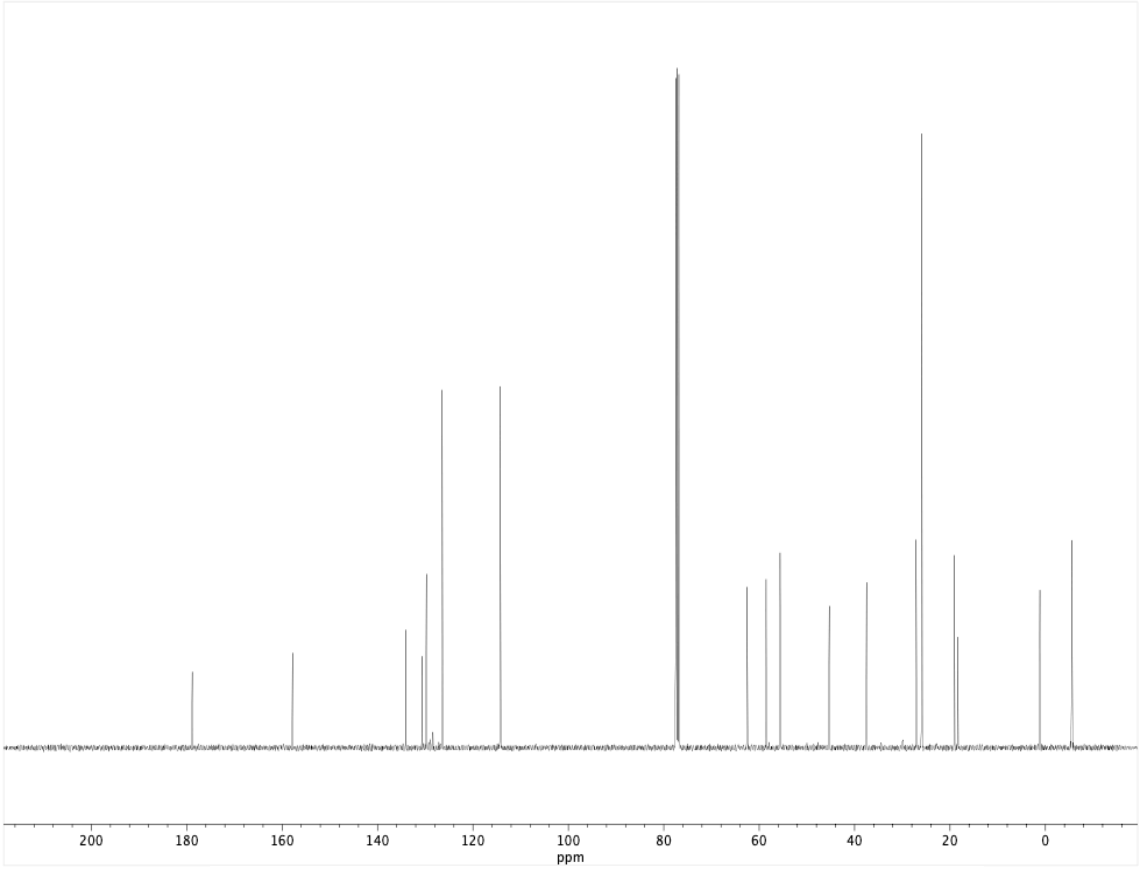

Figure A3.62 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***141****.*

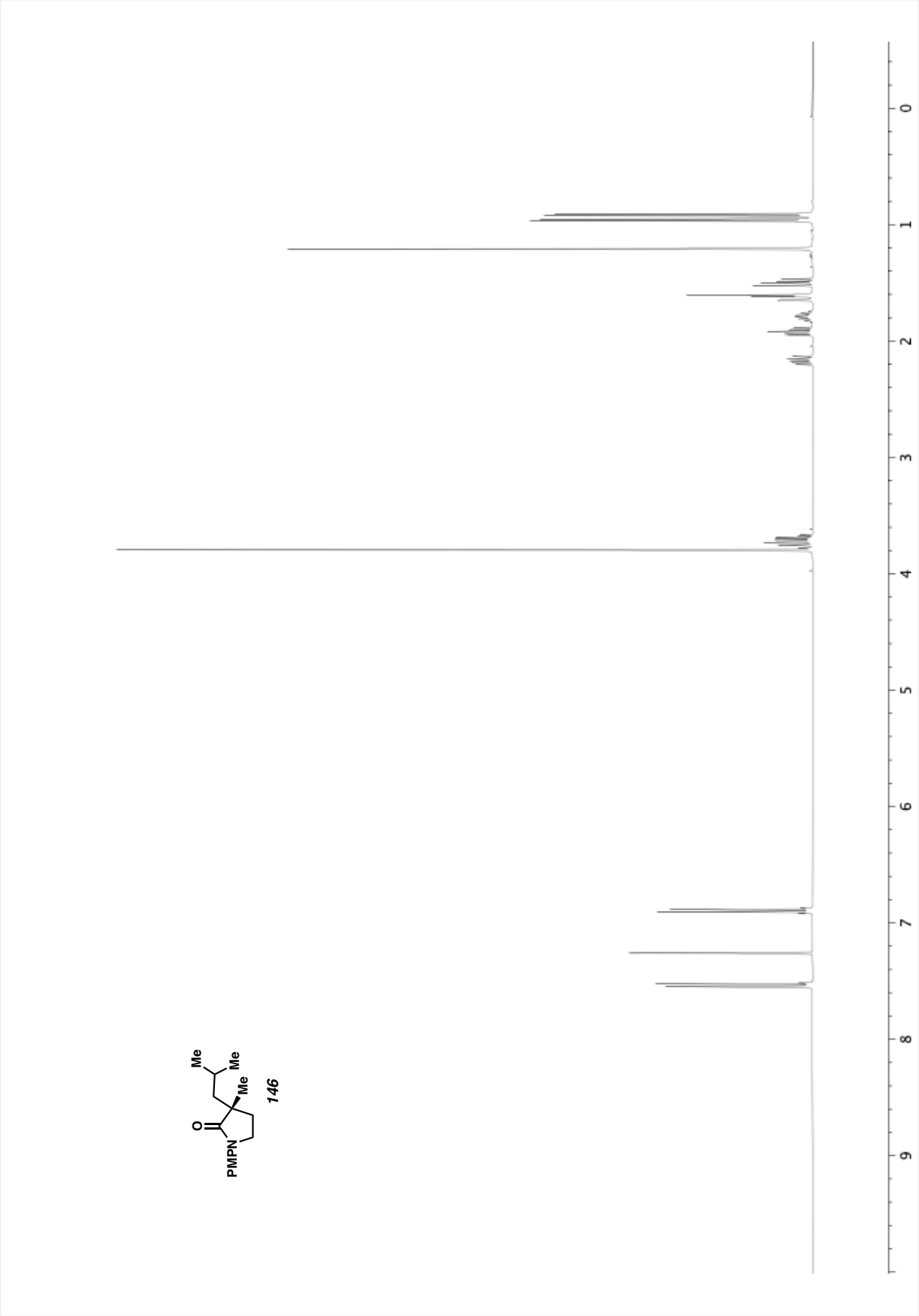

Figure A3.63 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***146****.*

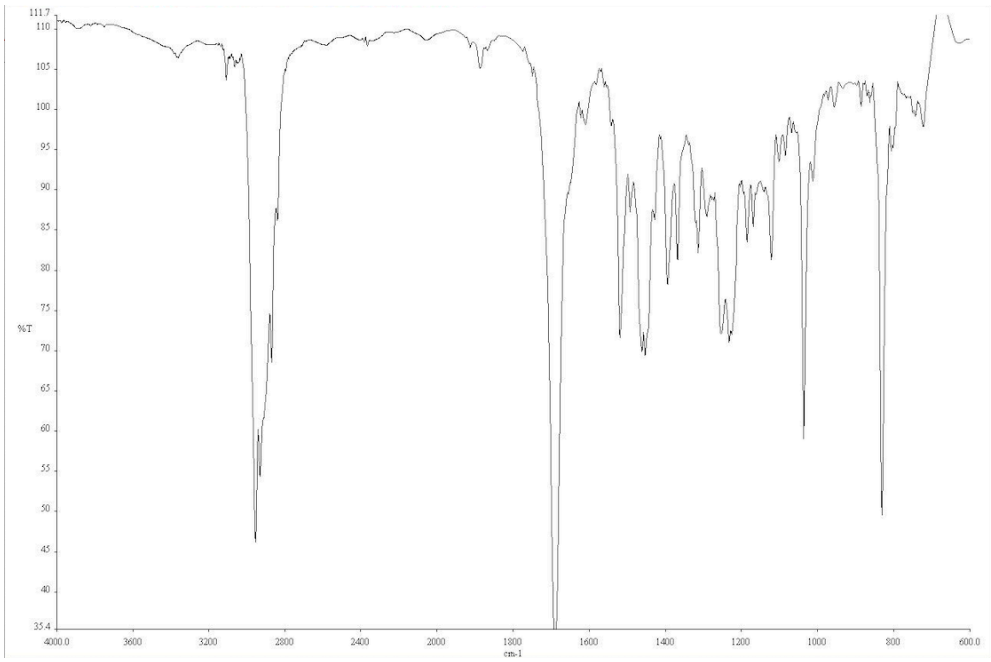

Figure A3.64 *Infrared spectrum (Thin Film, NaCl) of* ***146****.*

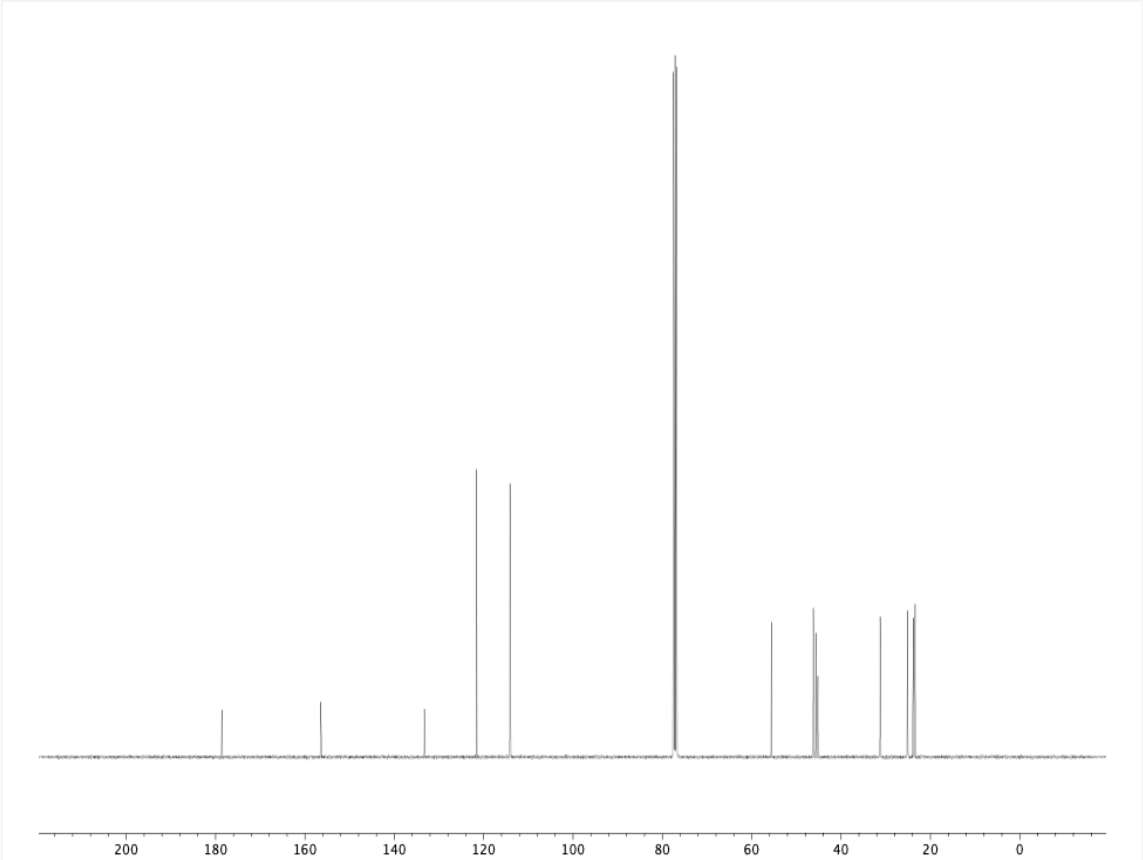

Figure A3.65 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***146****.*

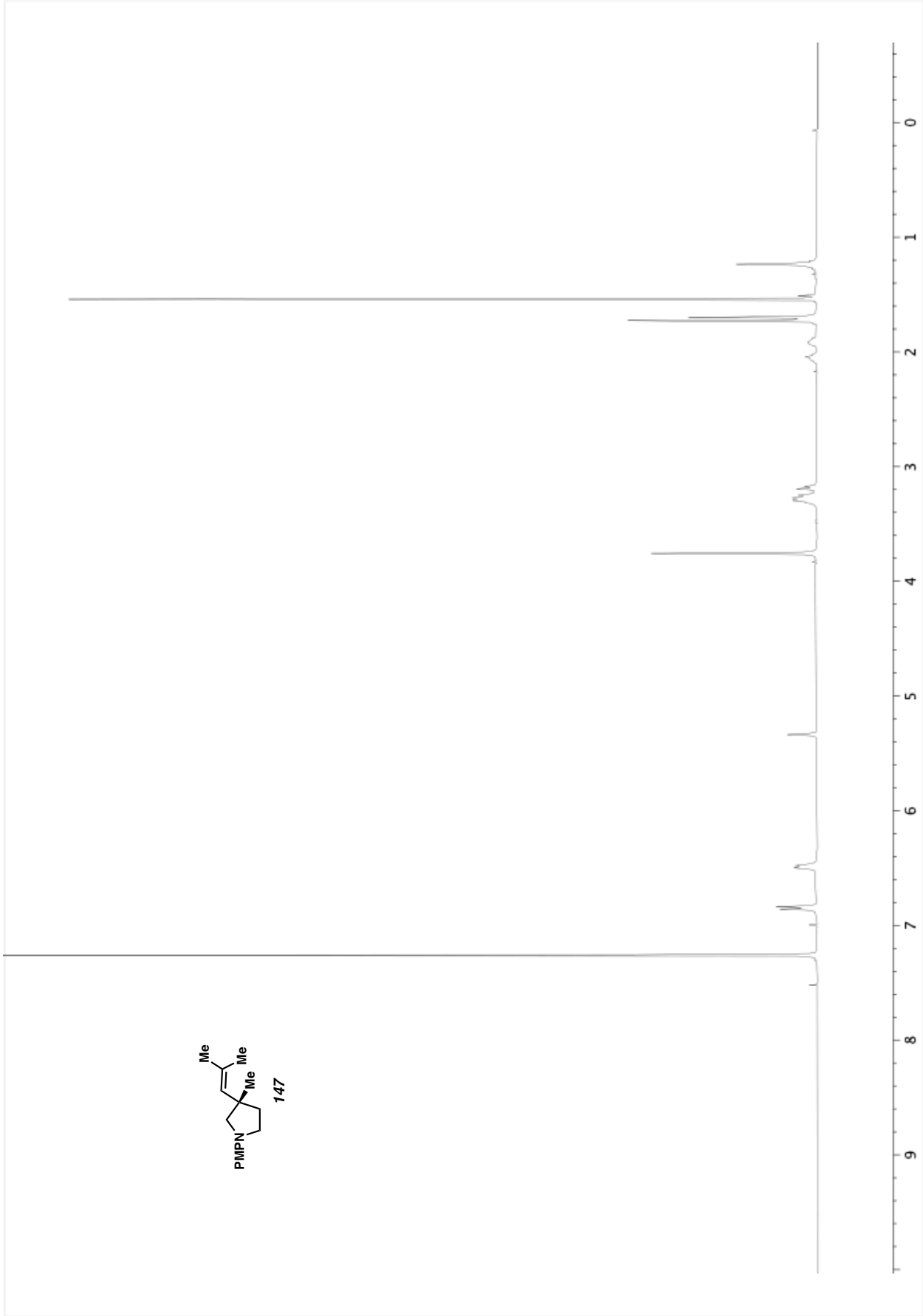

Figure A3.66 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***147.***

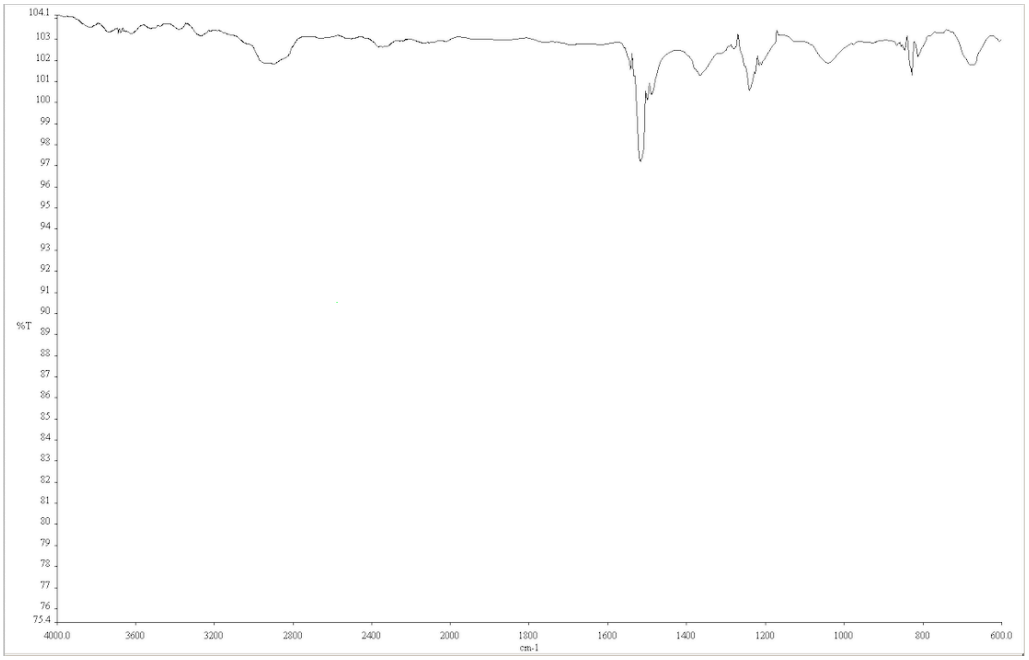

Figure A3.67 *Infrared spectrum (Thin Film, NaCl) of* ***147****.*

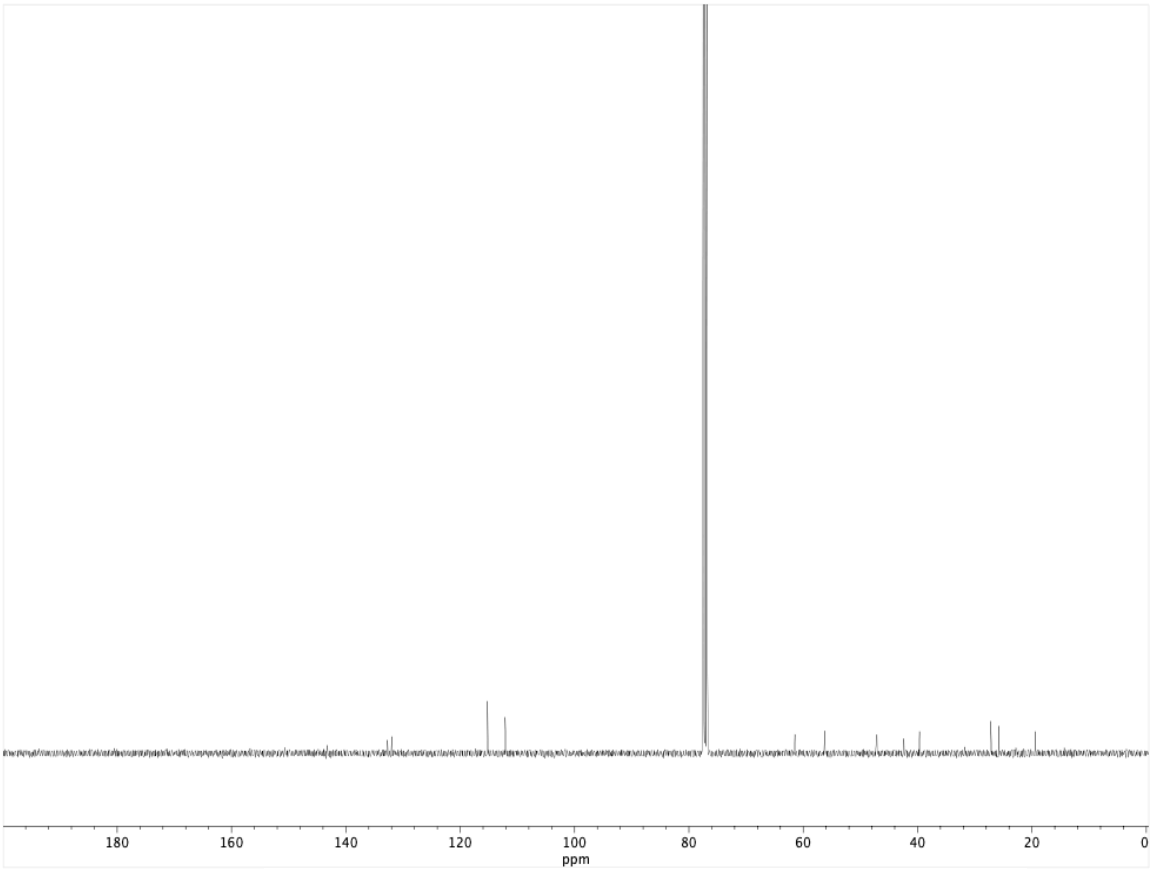

Figure A3.68 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***147****.*

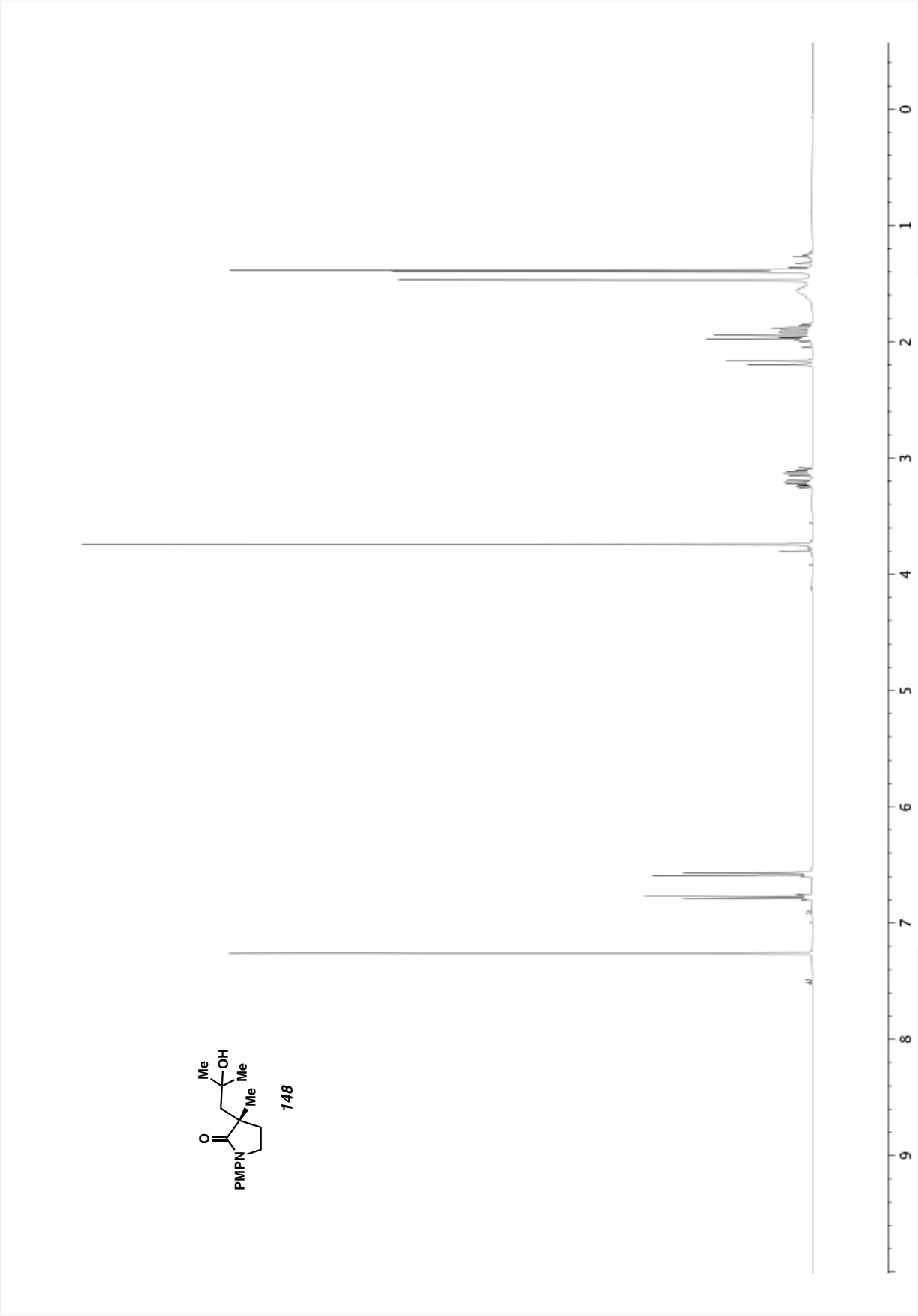

Figure A3.69 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***148****.*

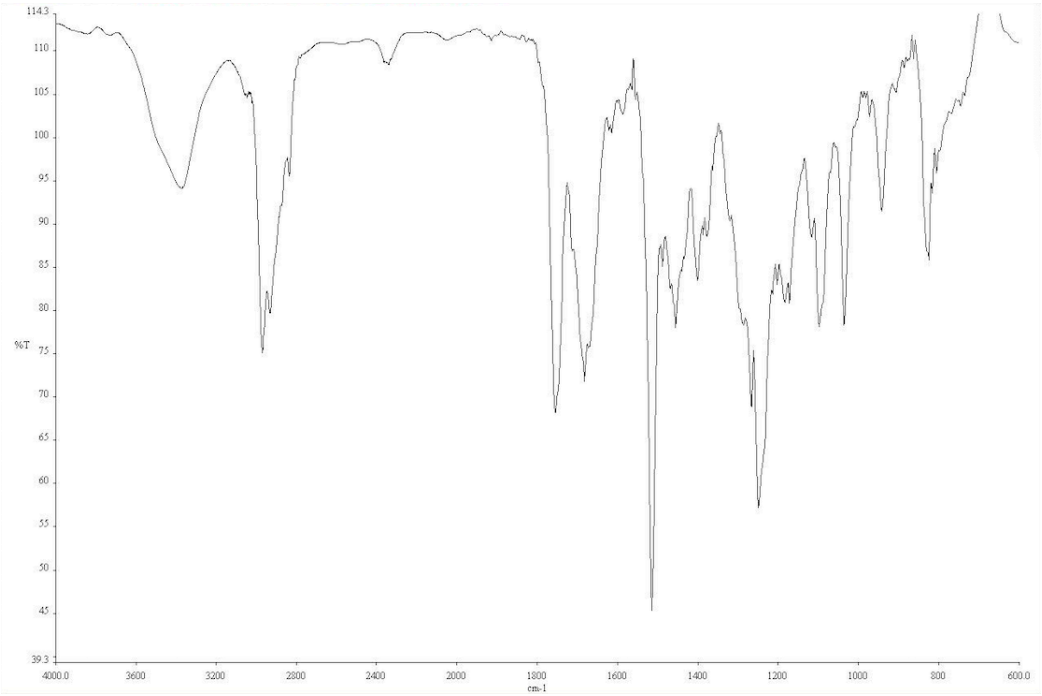

Figure A3.70 *Infrared spectrum (Thin Film, NaCl) of* ***148****.*

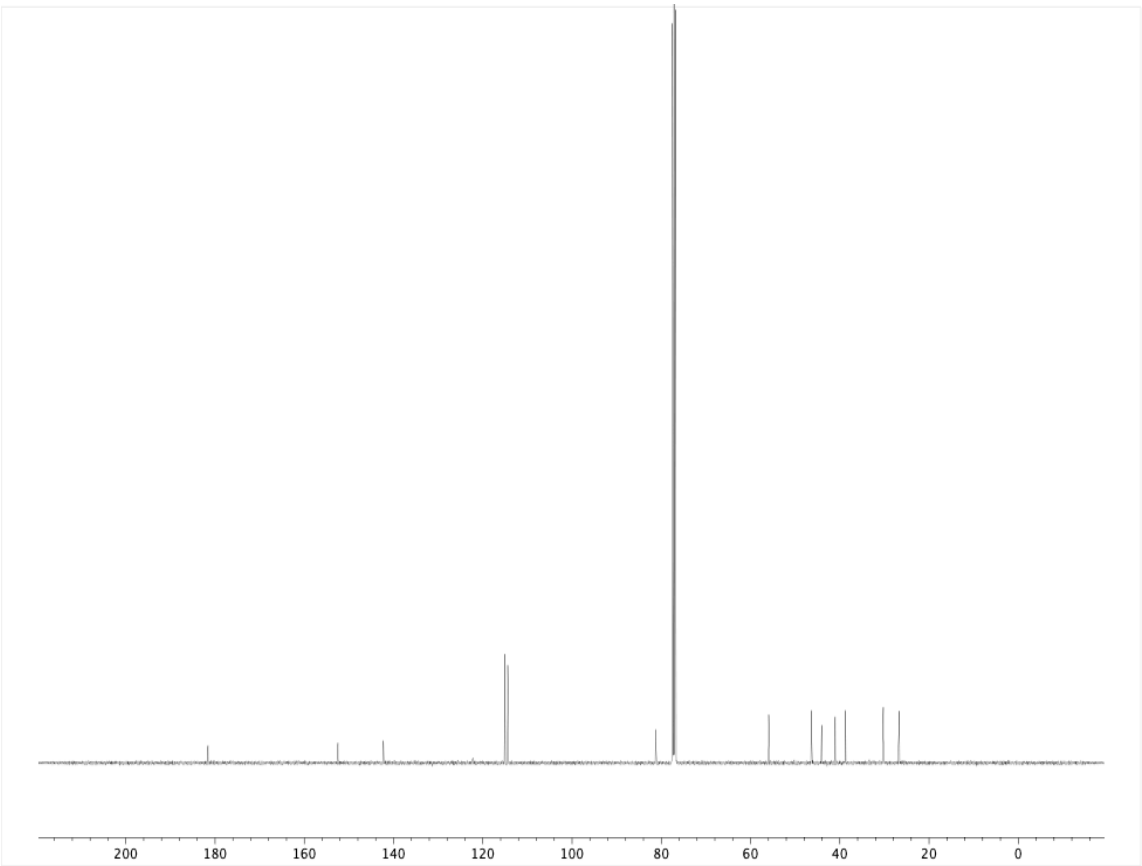

Figure A3.71 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***148****.*

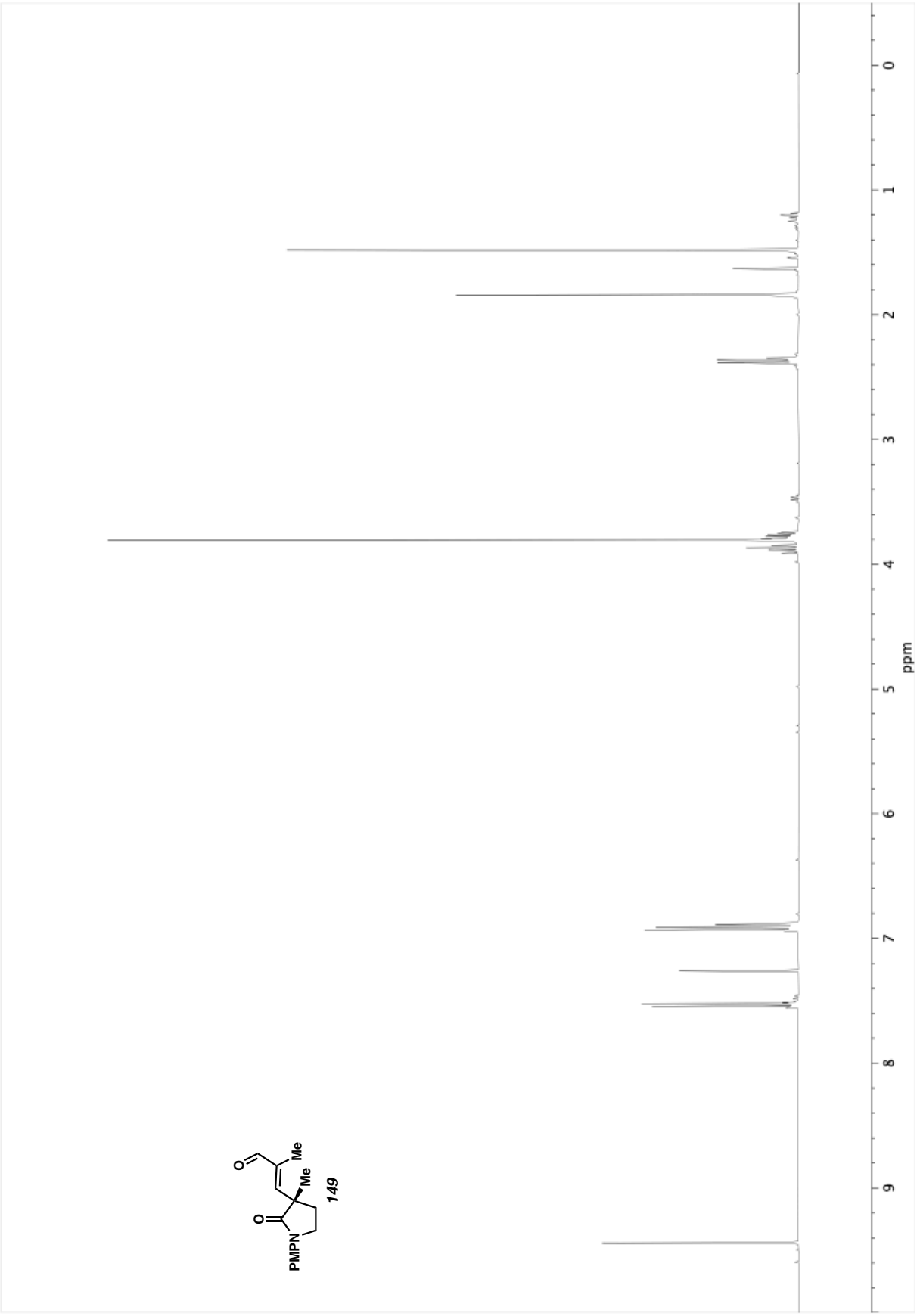

Figure A3.72 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***149***.

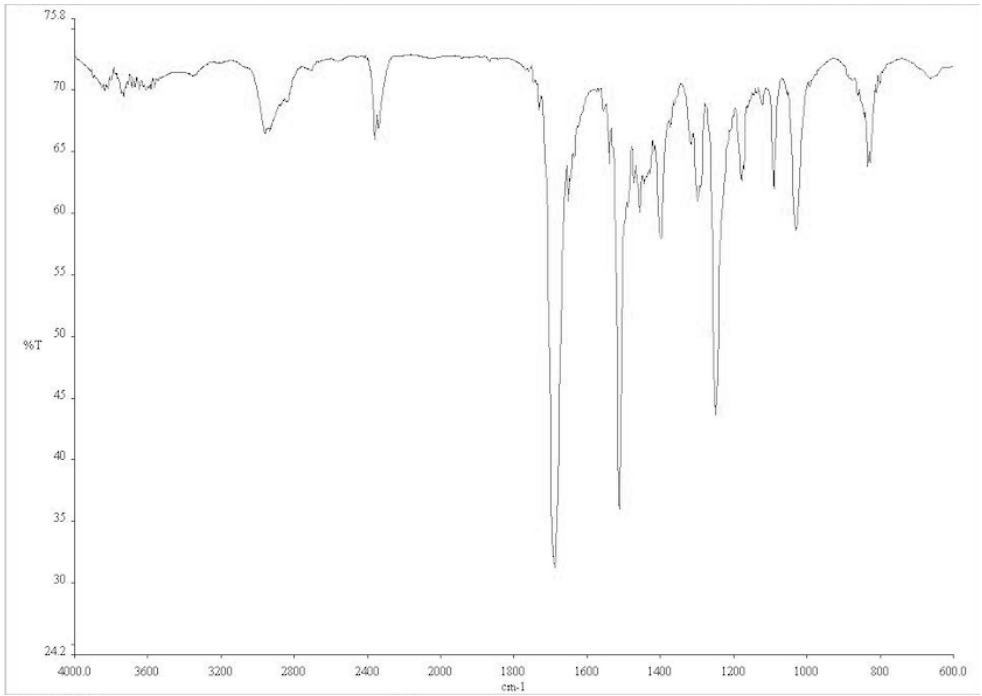

Figure A3.73 *Infrared spectrum (Thin Film, NaCl) of* ***149****.*

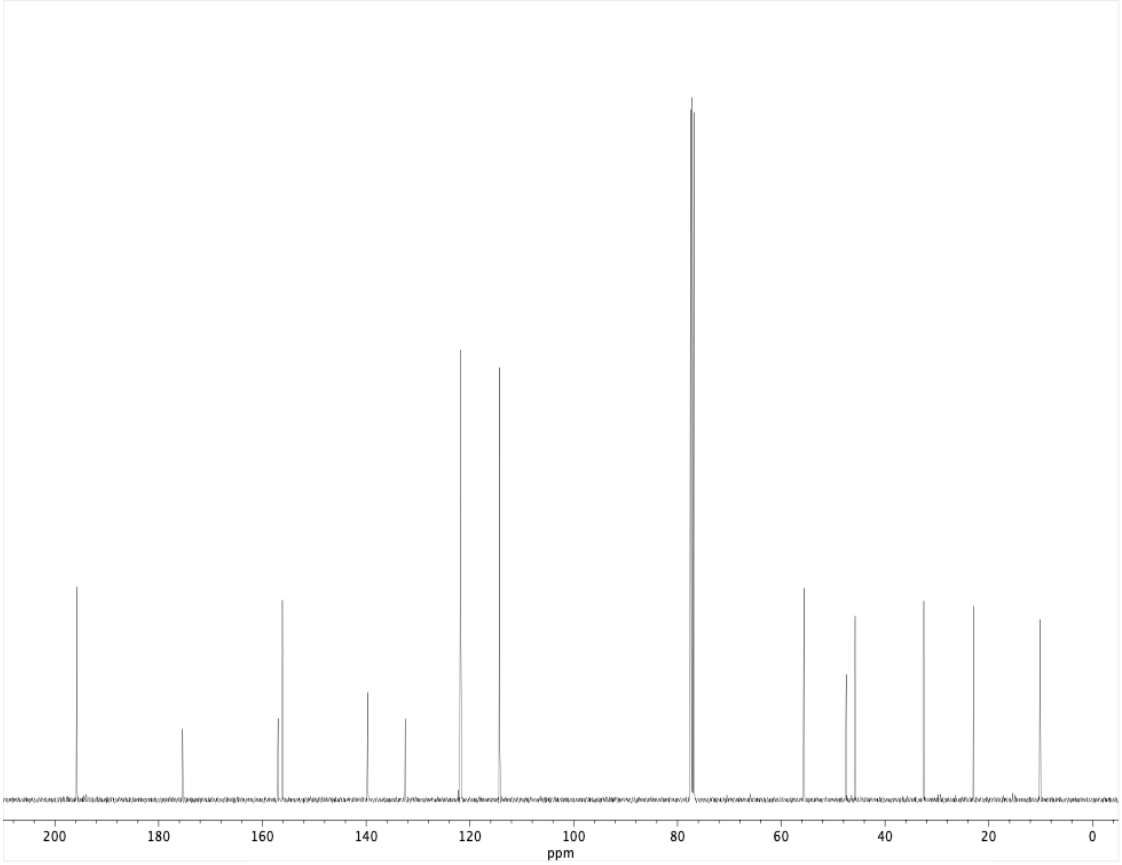

Figure A3.74 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***149****.*

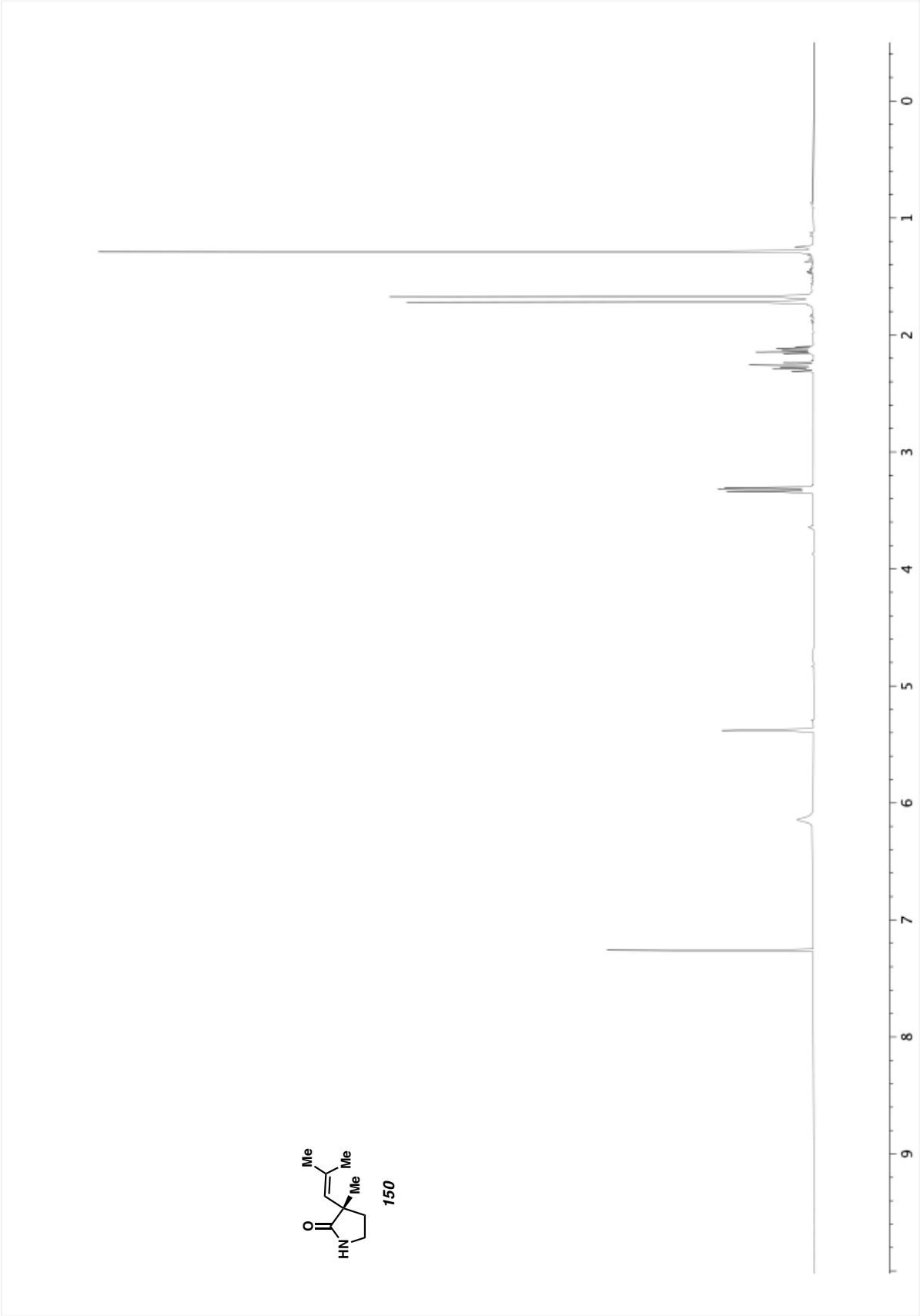

Figure A3.75 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***150.***

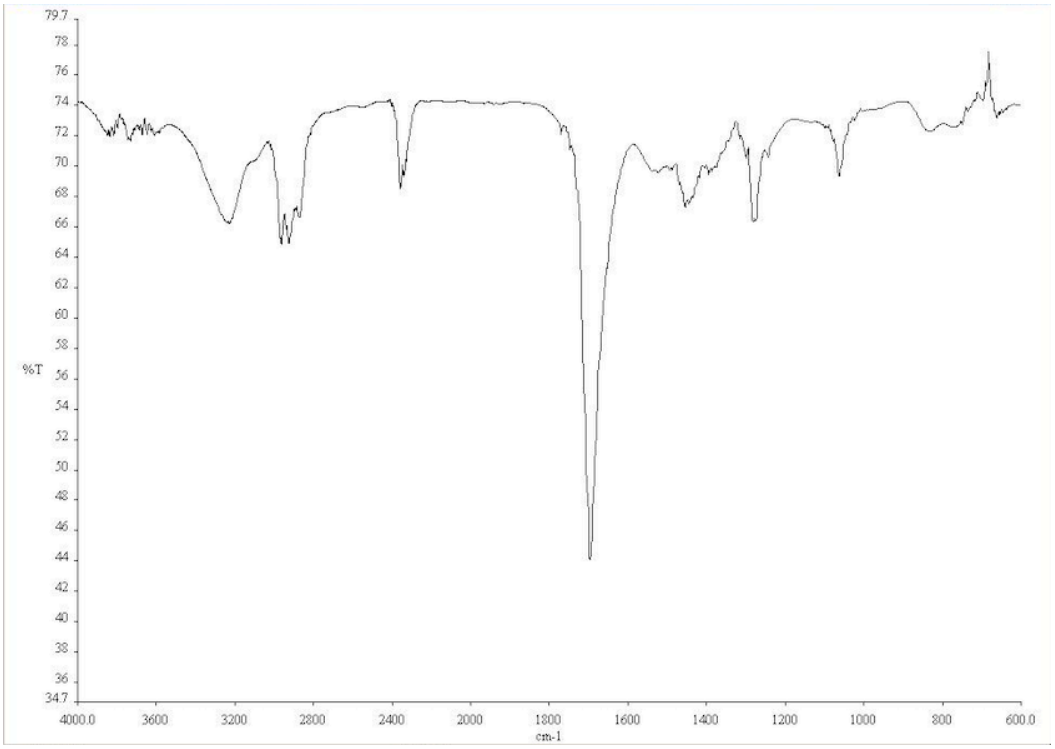

Figure A3.76 *Infrared spectrum (Thin Film, NaCl) of* ***150****.*

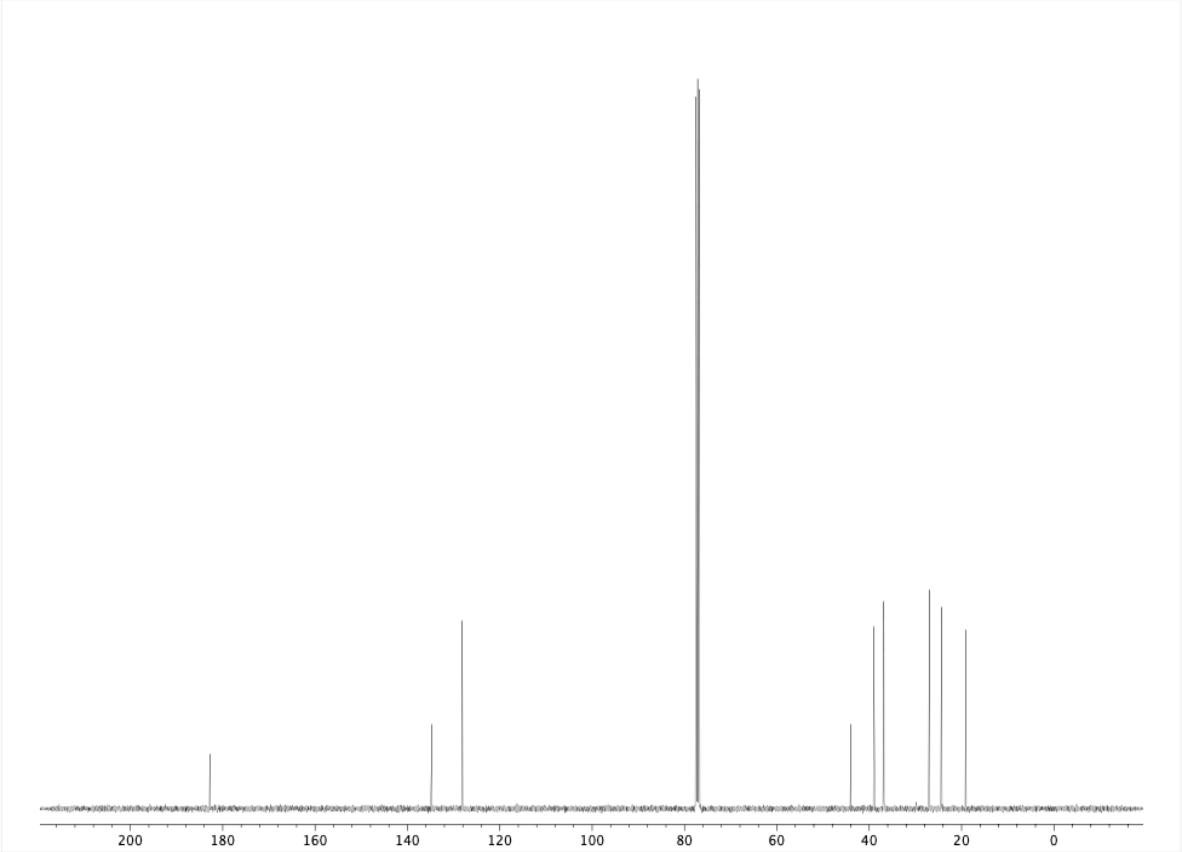

Figure A3.77 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***150****.*

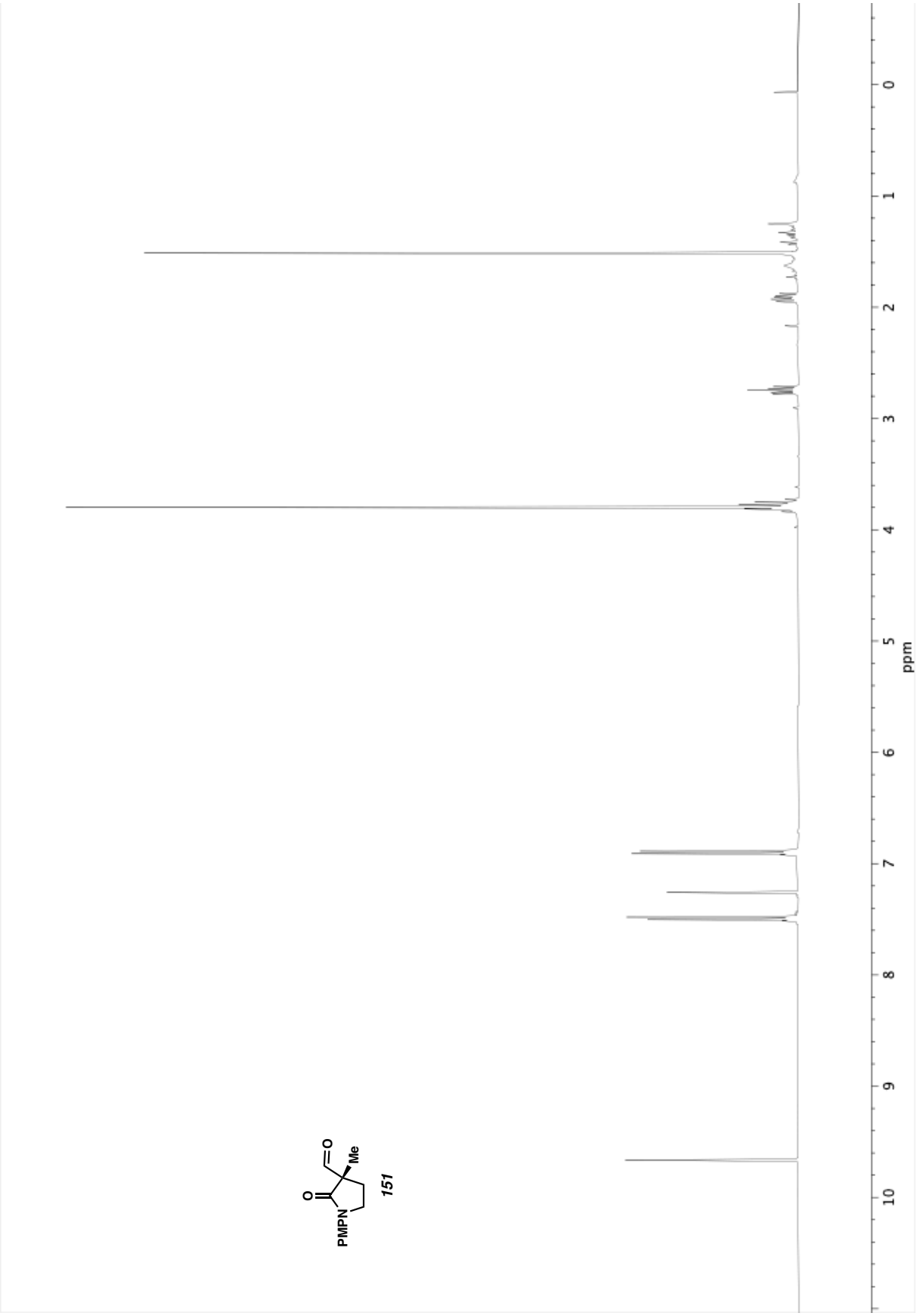

Figure A3.78 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***151****.*

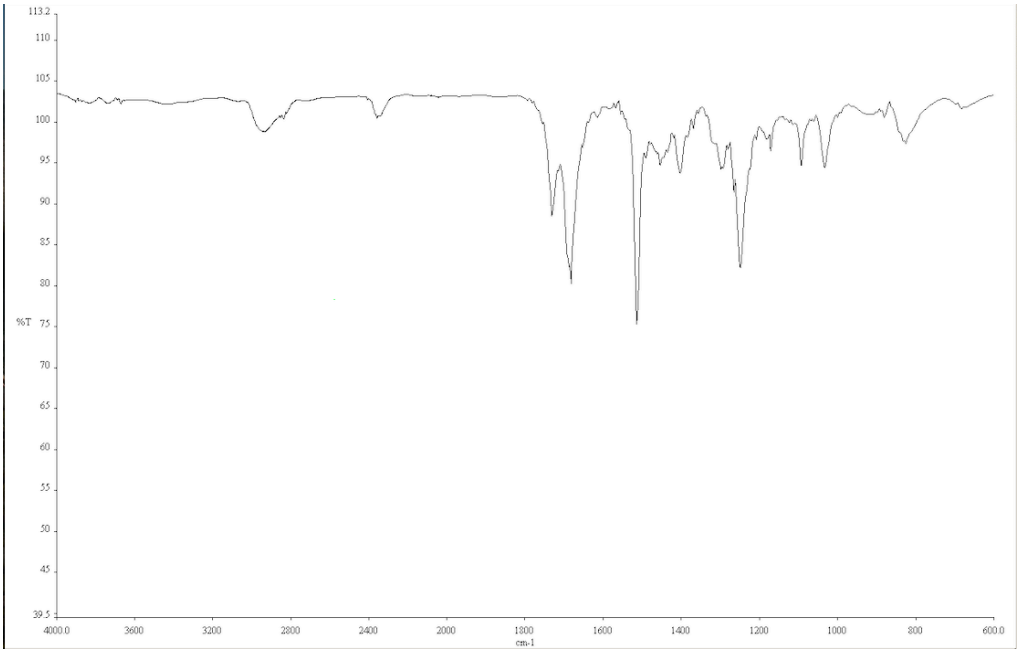

Figure A3.79 *Infrared spectrum (Thin Film, NaCl) of* ***151****.*

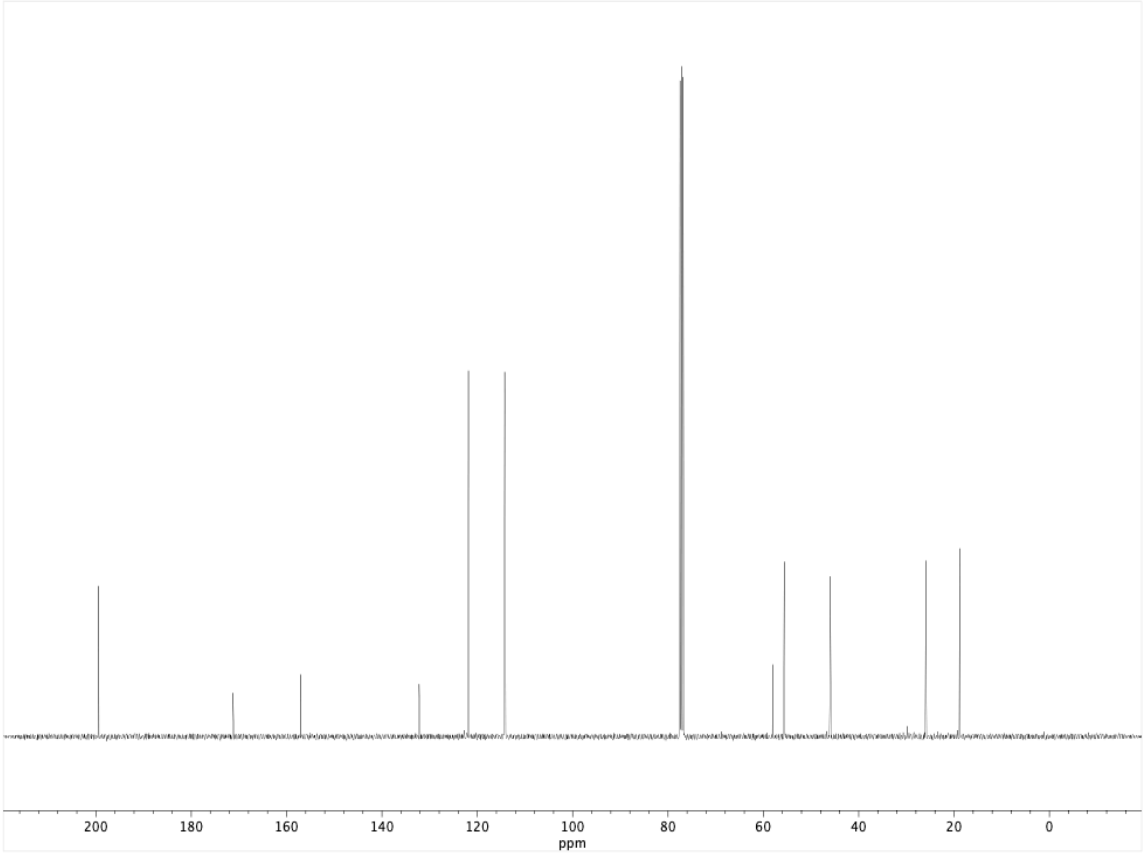

Figure A3.80 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***151****.*

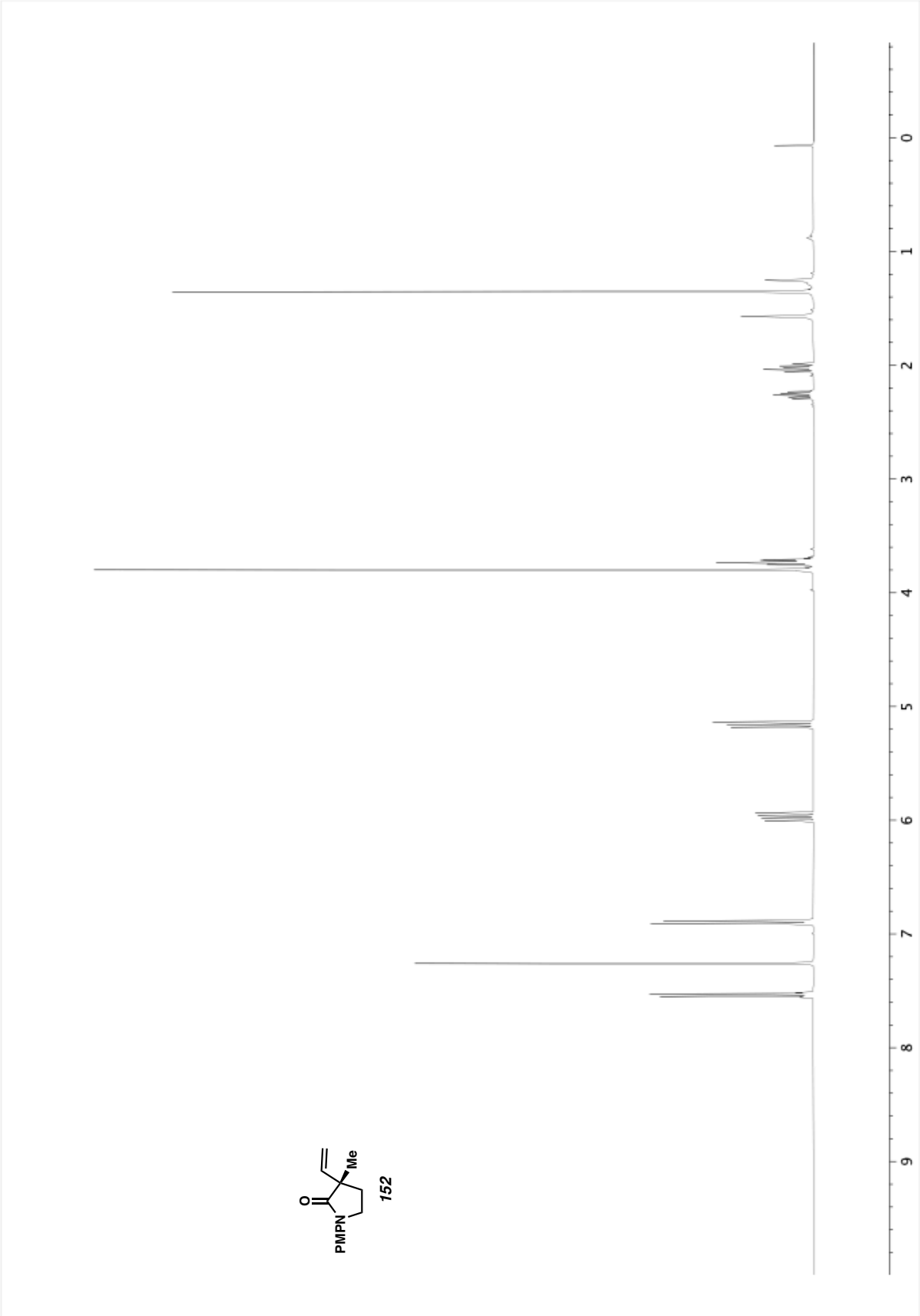

Figure A3.81 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***152.***

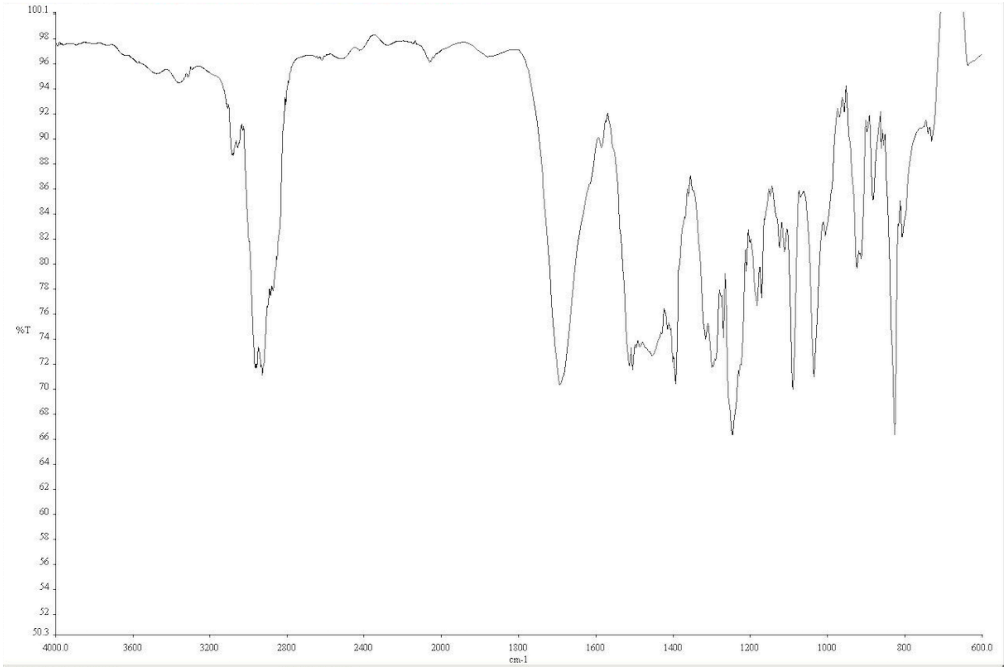

Figure A3.82 *Infrared spectrum (Thin Film, NaCl) of* ***152****.*

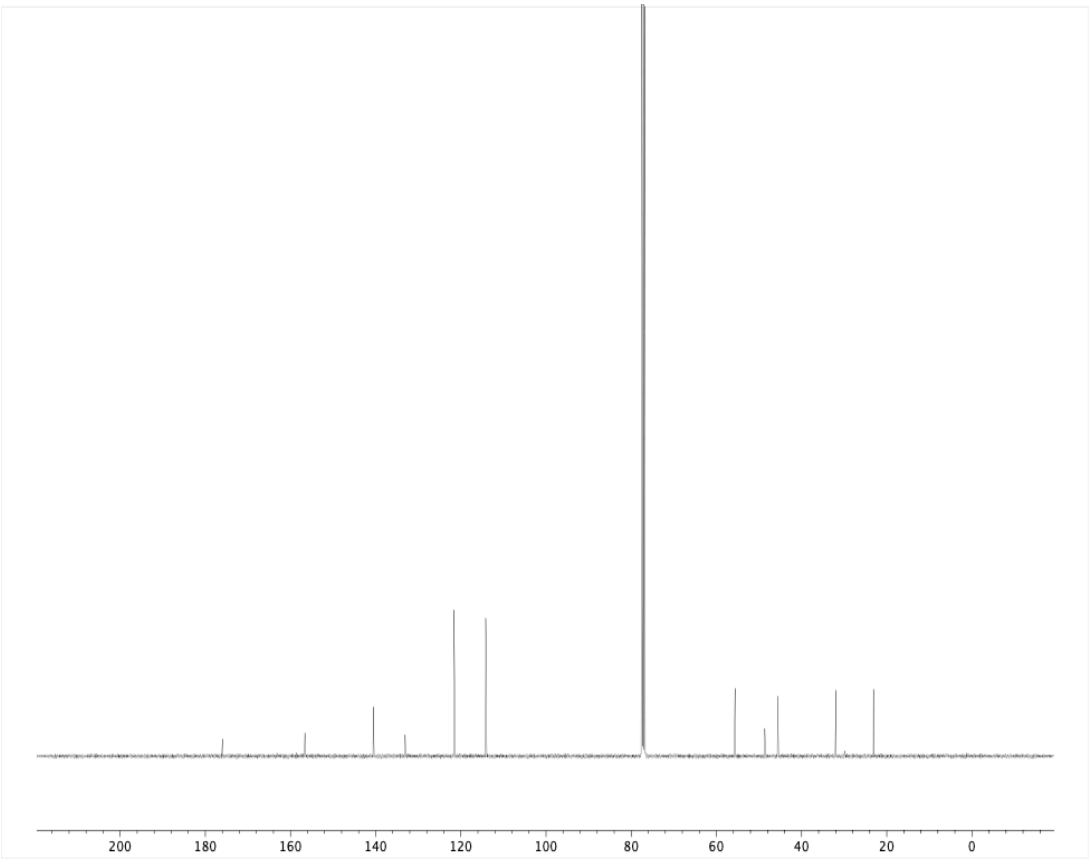

Figure A3.83 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***152****.*

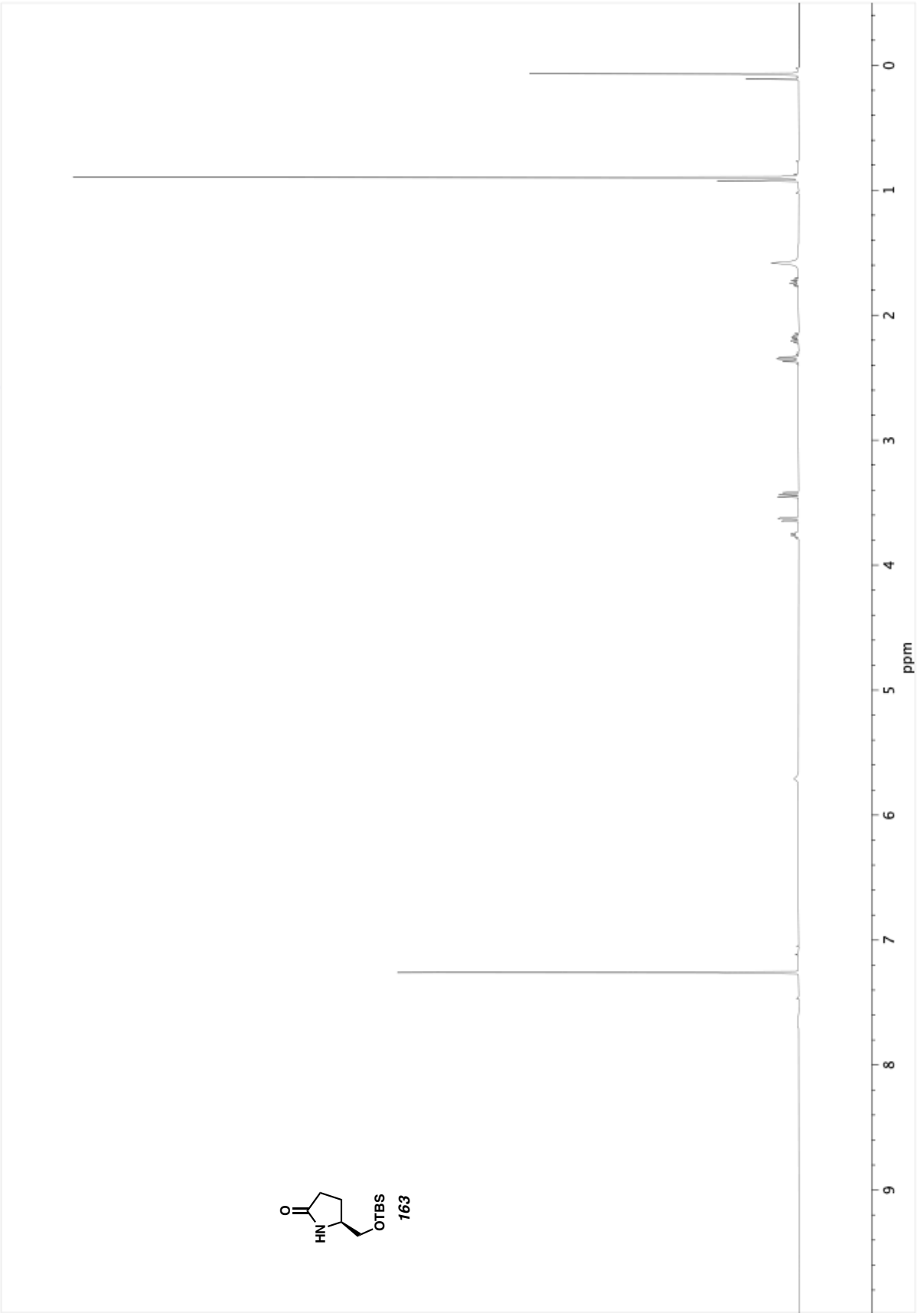

Figure A3.84 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***163.***

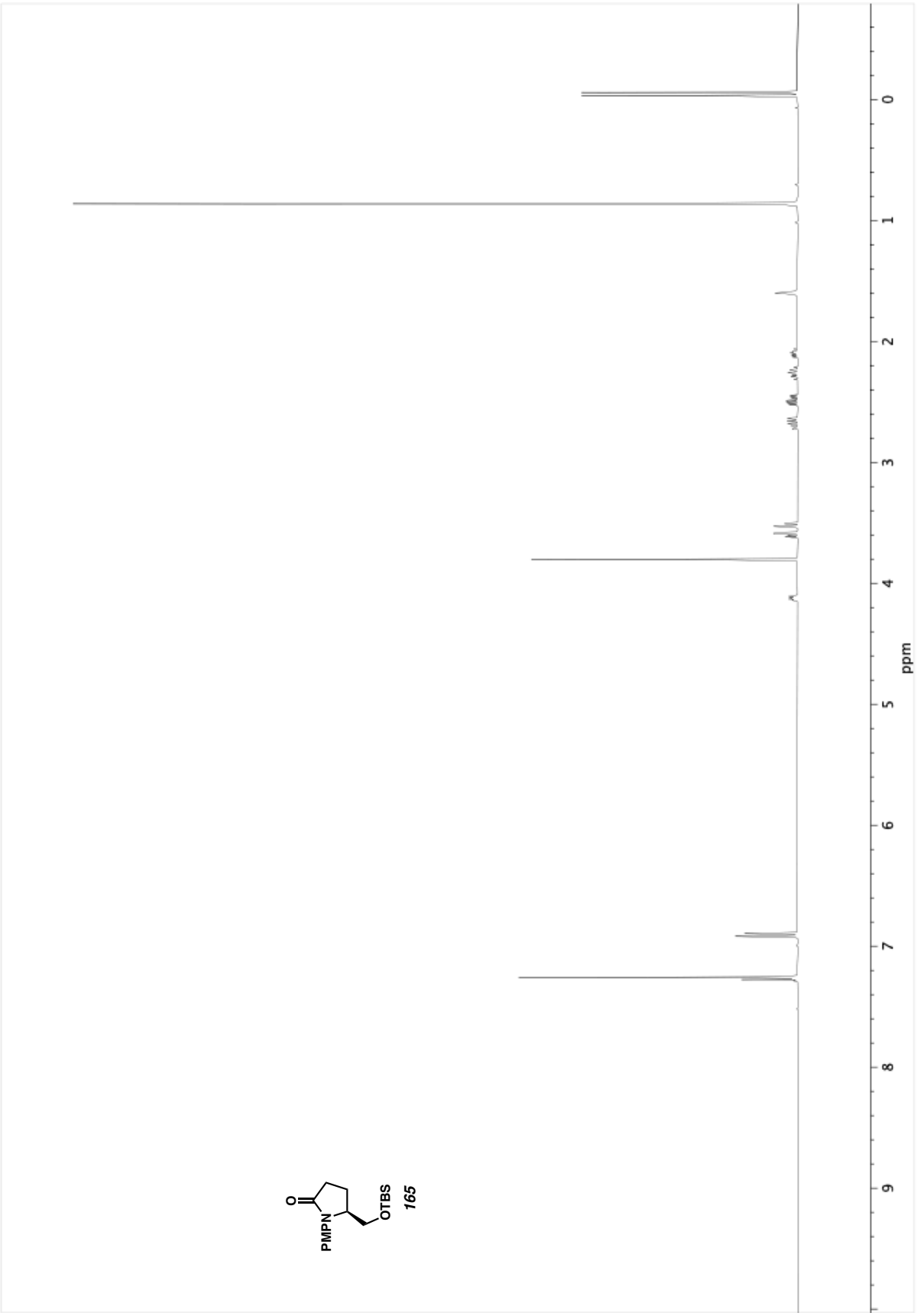

Figure A3.85 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***165.***

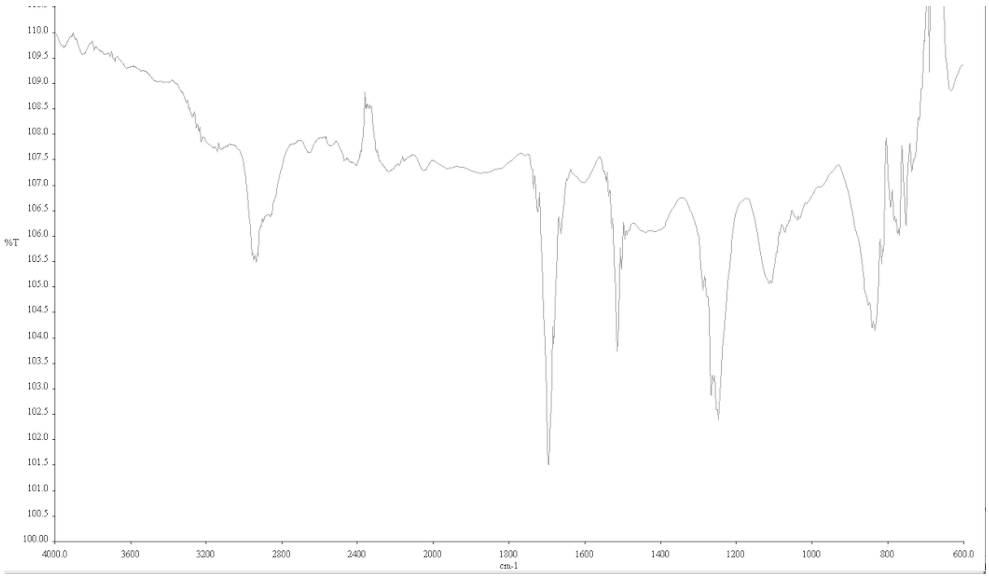

Figure A3.86 *Infrared spectrum (Thin Film, NaCl) of* ***165****.*

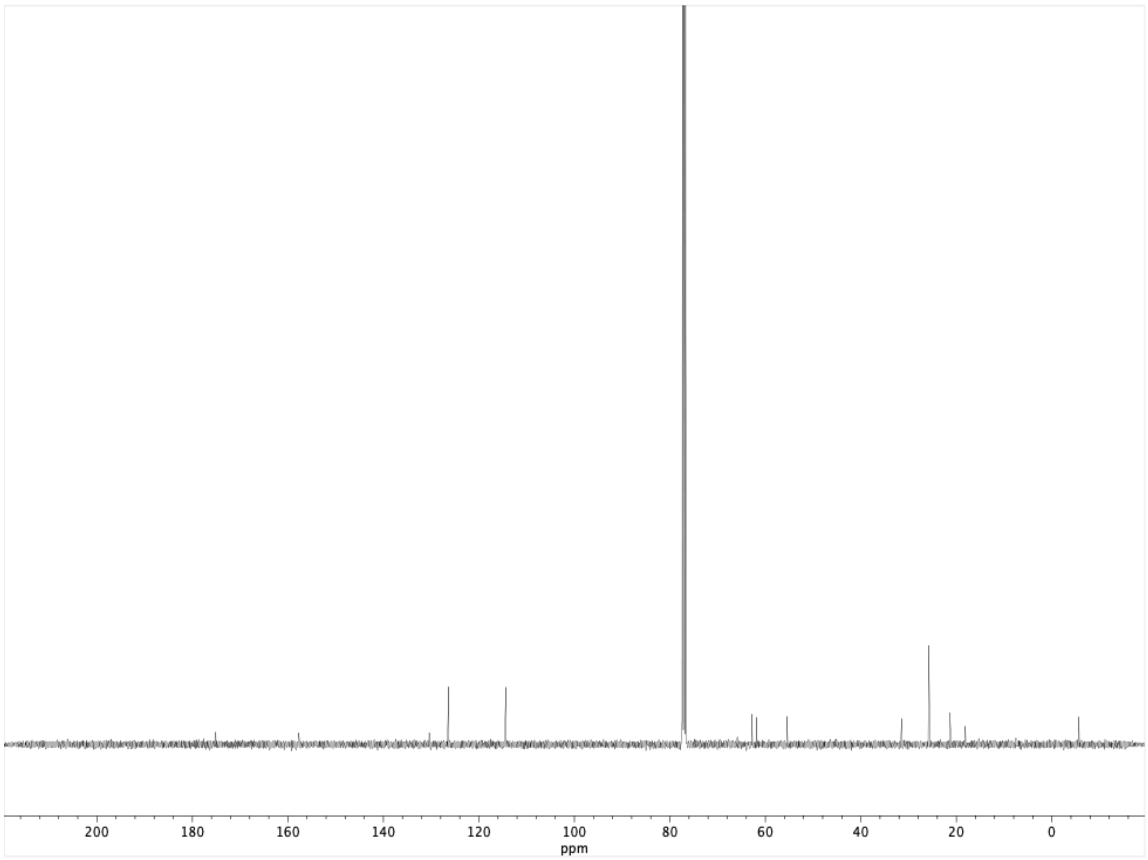

Figure A3.87 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***165****.*

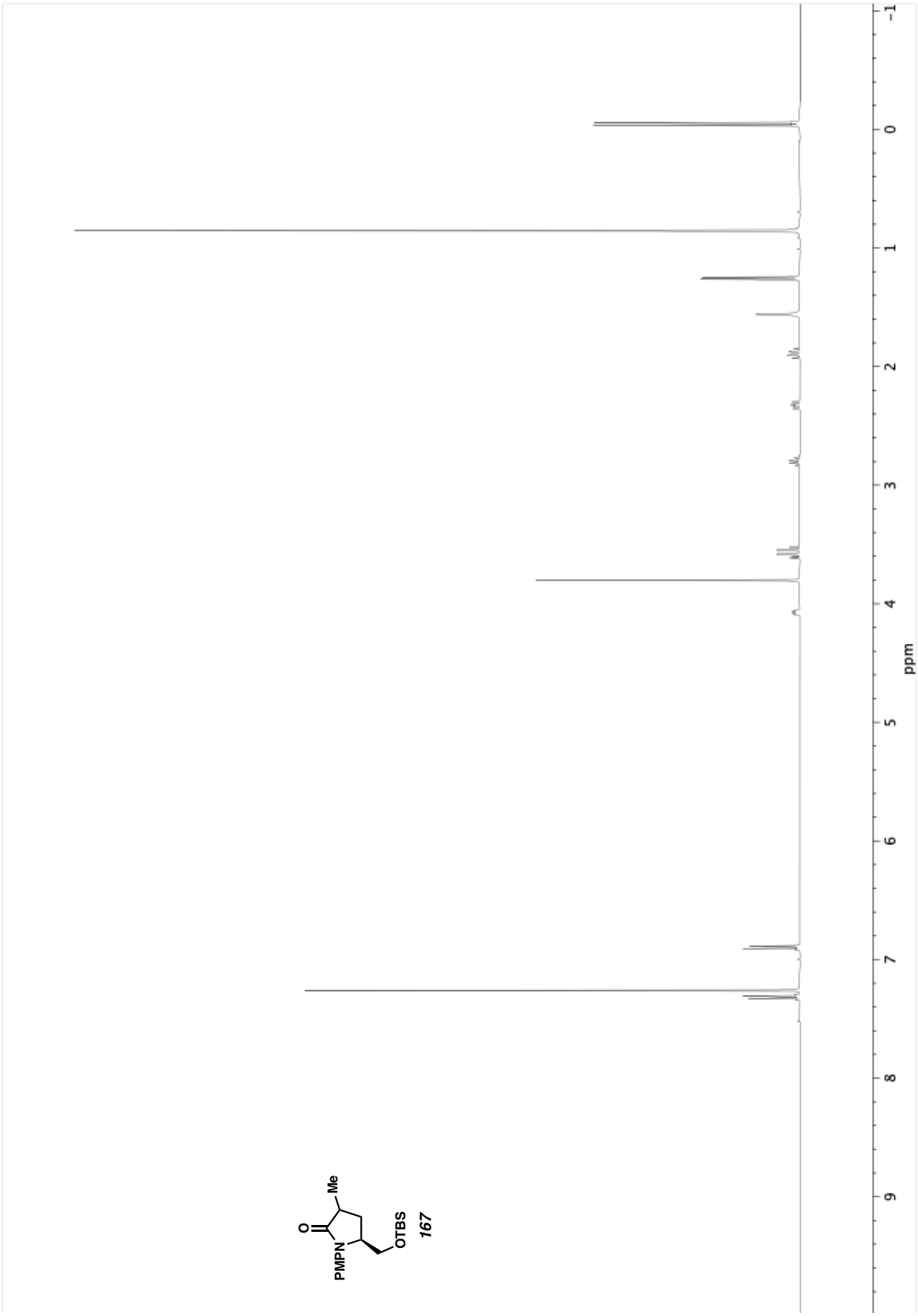

Figure A3.88 *^{1}H NMR (400 MHz, $CDCl_3$) of* ***167.***

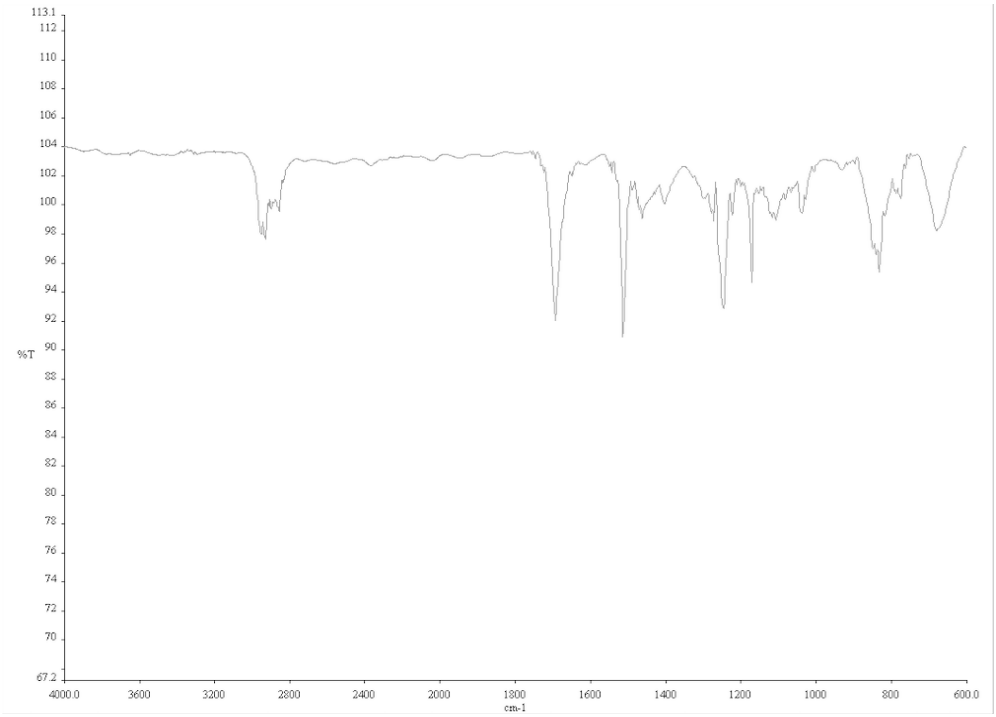

Figure A3.89 *Infrared spectrum (Thin Film, NaCl) of* ***167****.*

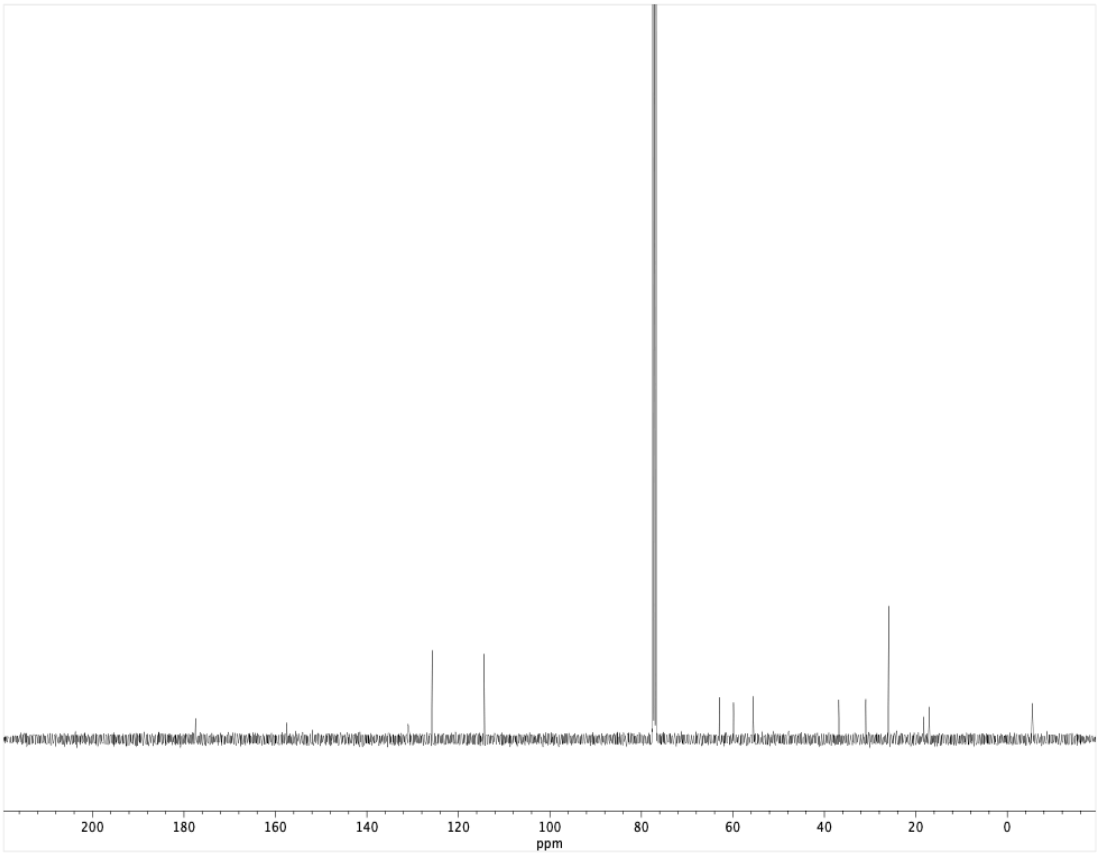

Figure A3.90 *^{13}C NMR (100 MHz, $CDCl_3$) of* ***167****.*