

APPENDIX 4

Spectra Relevant to Chapter 3:

Formation of All-Carbon Quaternary Centers via Enantioselective Pd-catalyzed α -Vinylolation of γ -Lactams

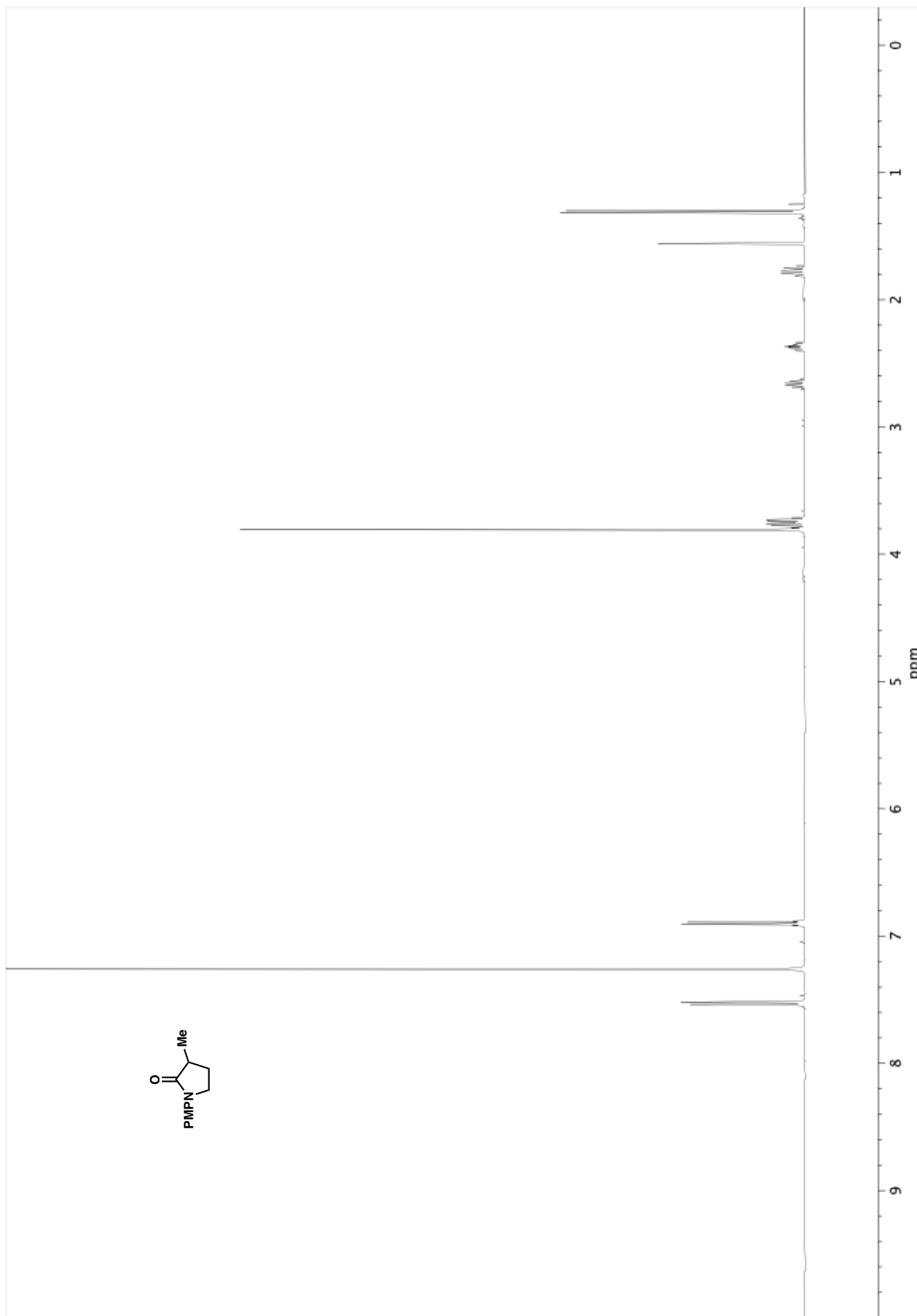


Figure A4.1. ^1H NMR (400 MHz, CDCl_3) of **85**.

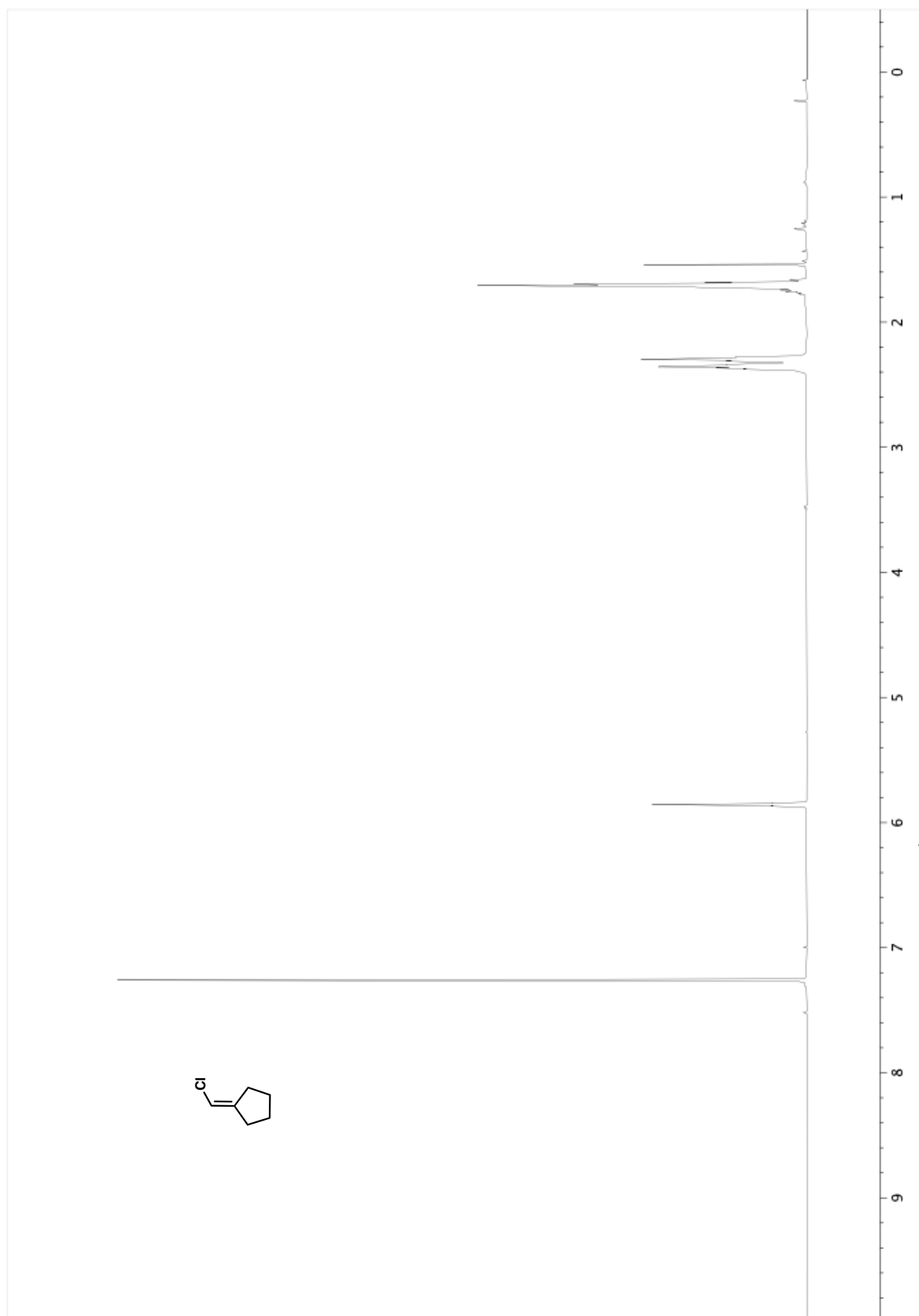


Figure A4.2. ^1H NMR (400 MHz, CDCl_3) of **108**.

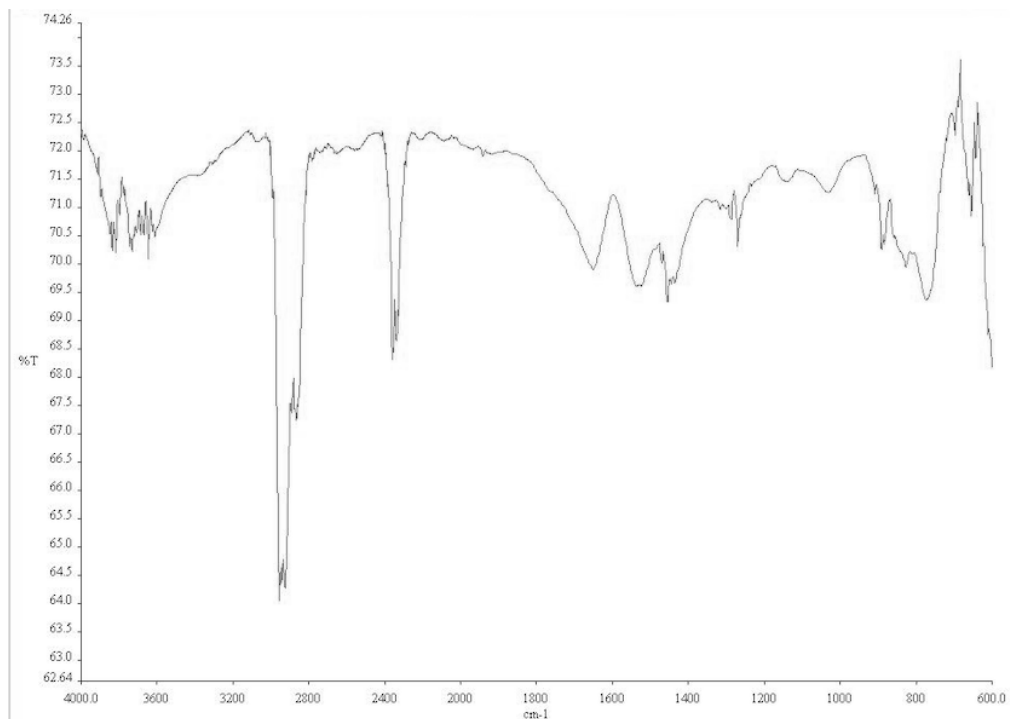


Figure A4.3. Infrared spectrum (Thin Film, NaCl) of **108**.

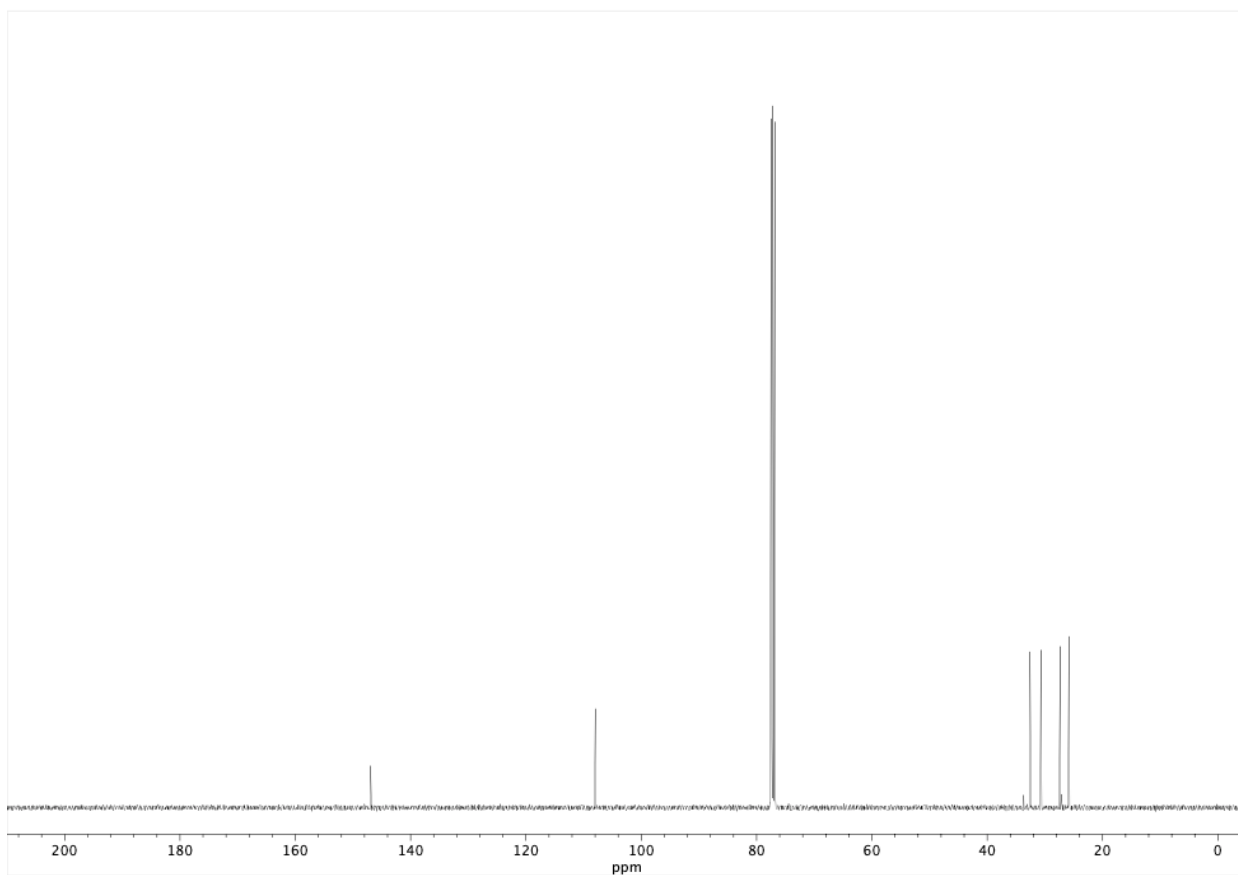


Figure A4.4. ¹³C NMR (100 MHz, CDCl₃) of **108**.

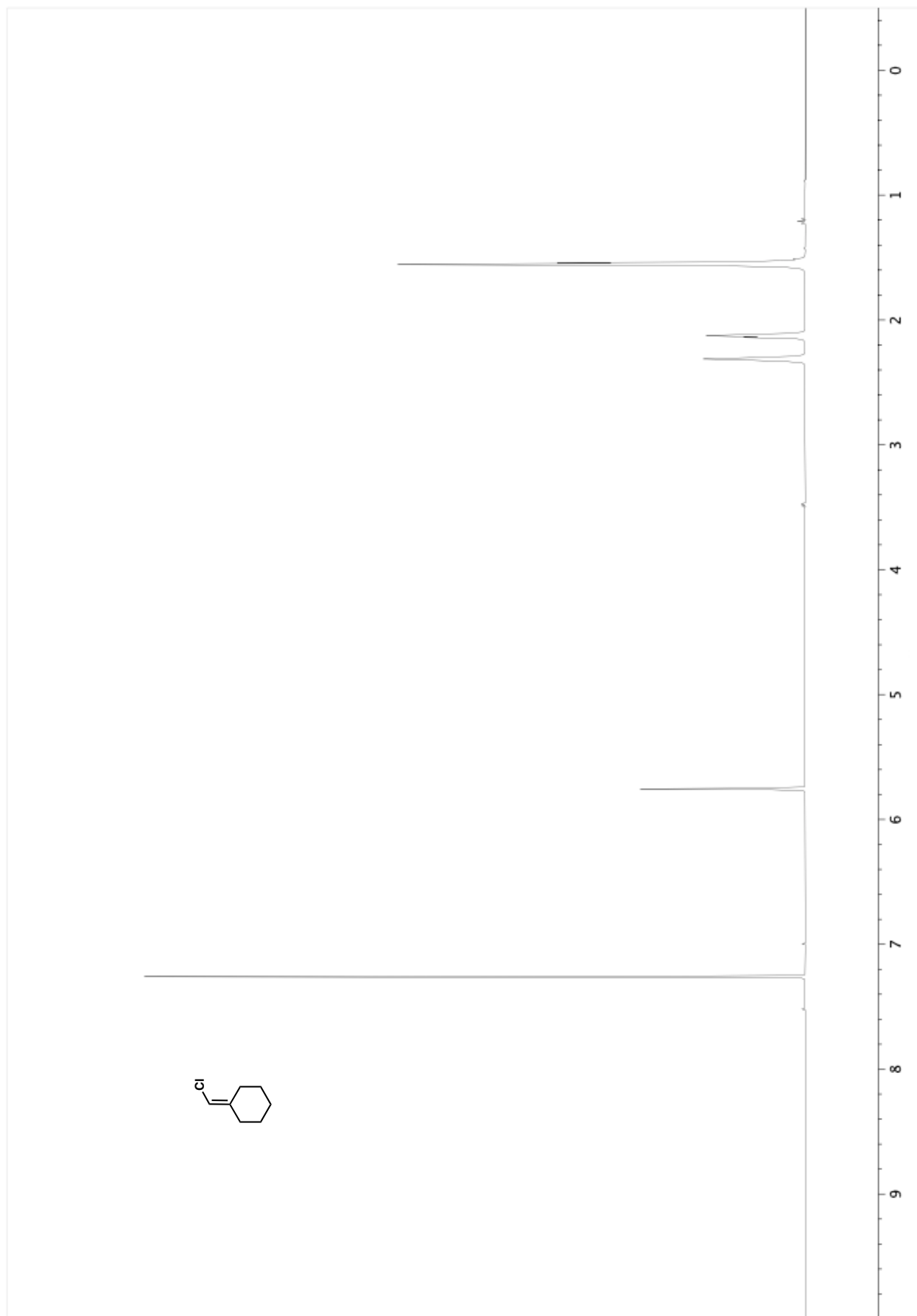


Figure A4.5. ^1H NMR (400 MHz, CDCl_3) of **109**.

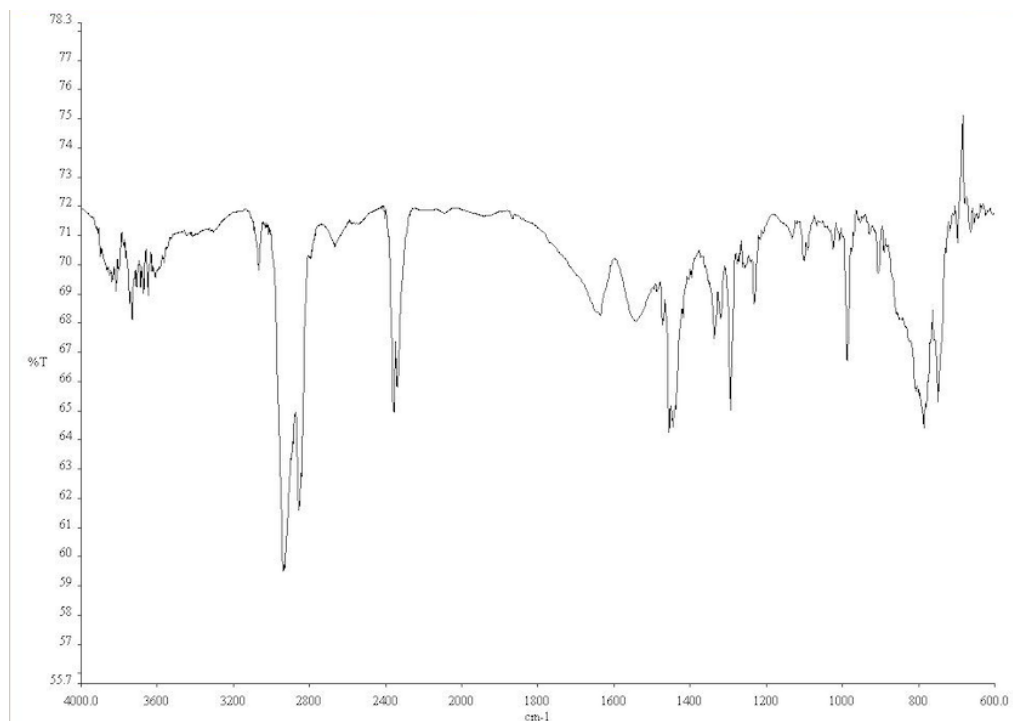


Figure A4.6. Infrared spectrum (Thin Film, NaCl) of **109**.

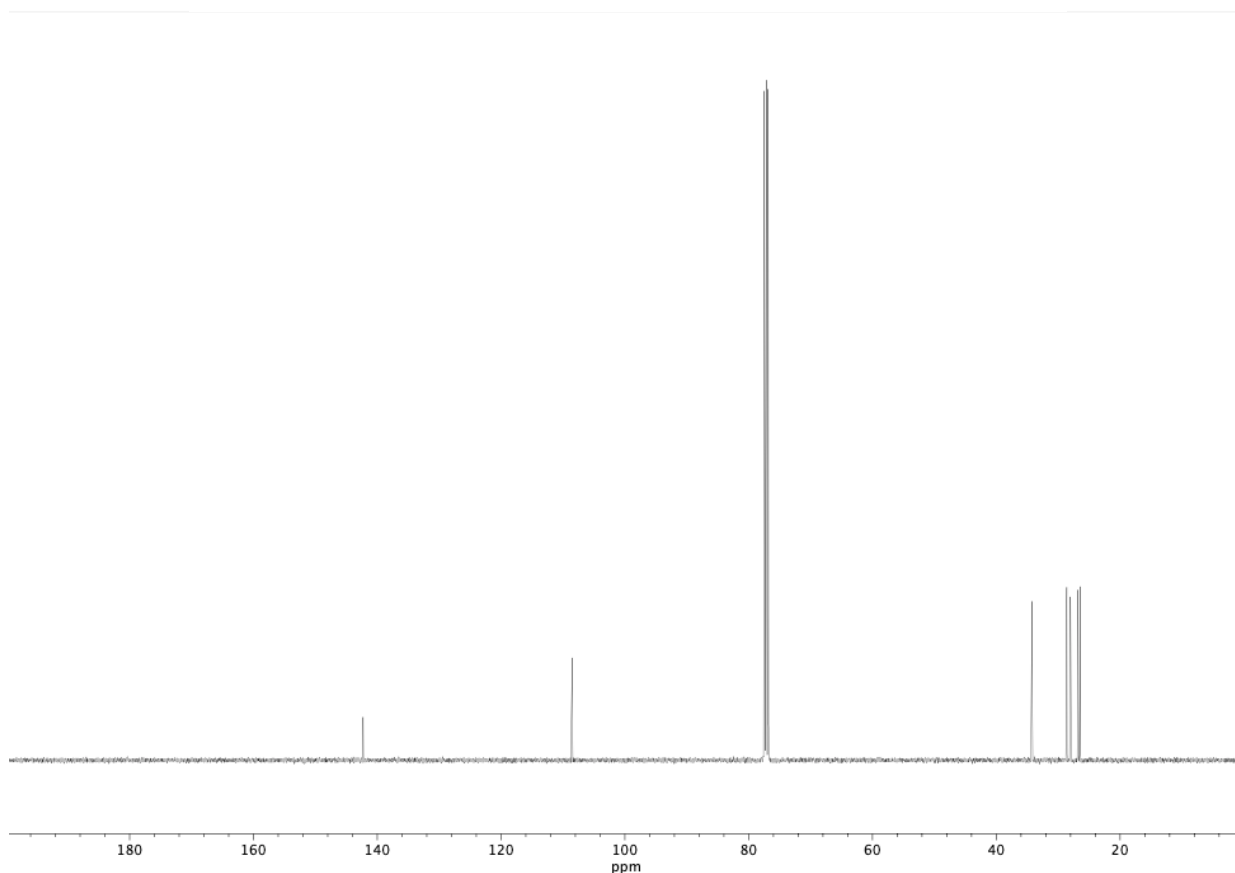


Figure A4.7. ¹³C NMR (100 MHz, CDCl₃) of **109**.

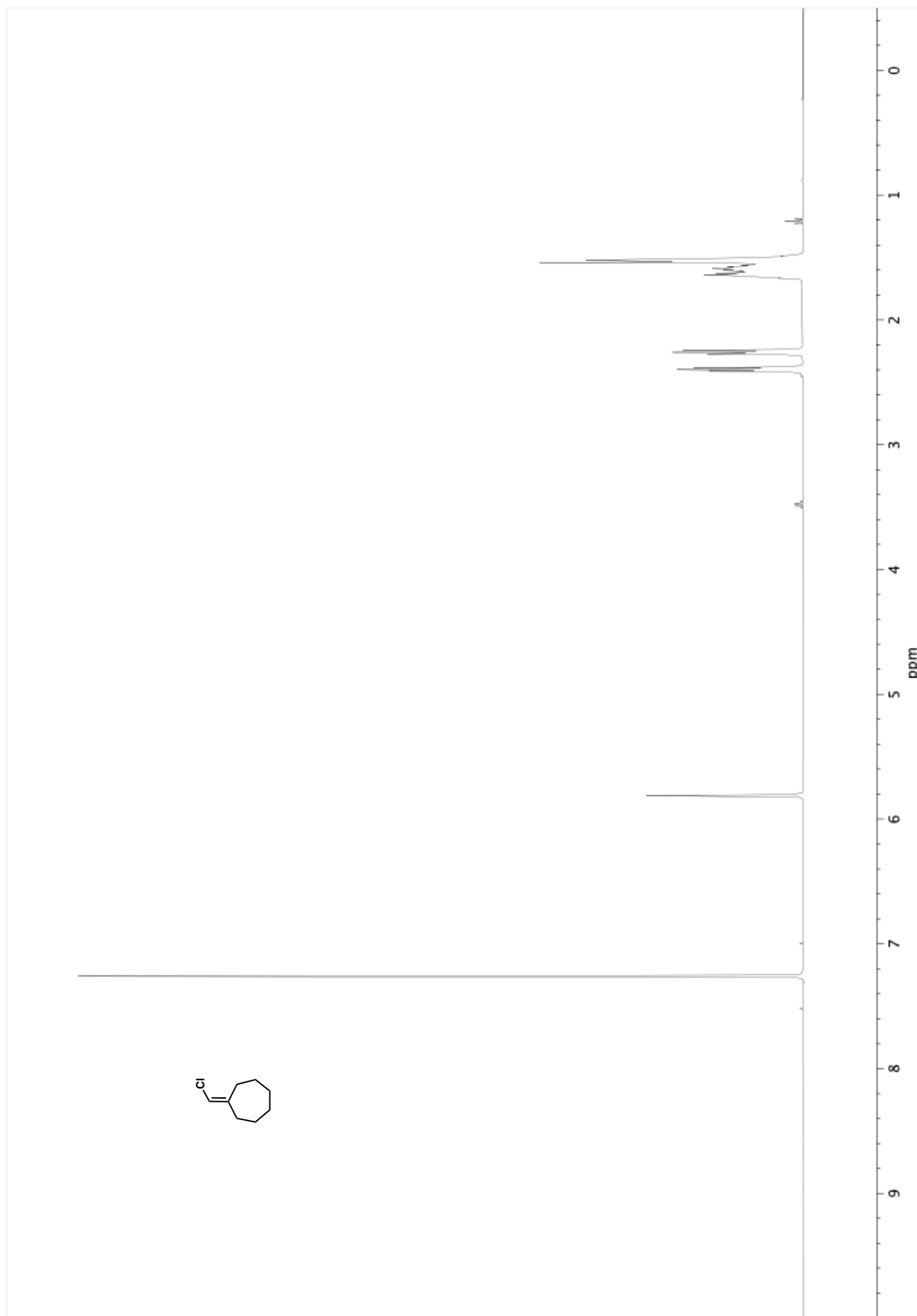


Figure A4.8. ^1H NMR (400 MHz, CDCl_3) of **110**.

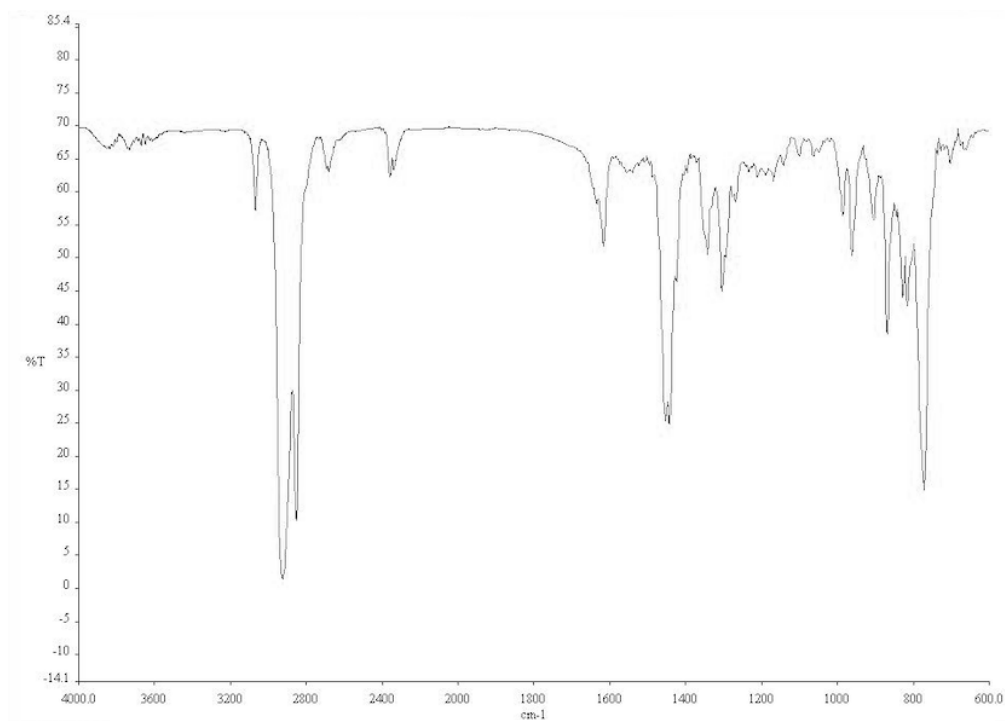


Figure A4.9. Infrared spectrum (Thin Film, NaCl) of **110**.

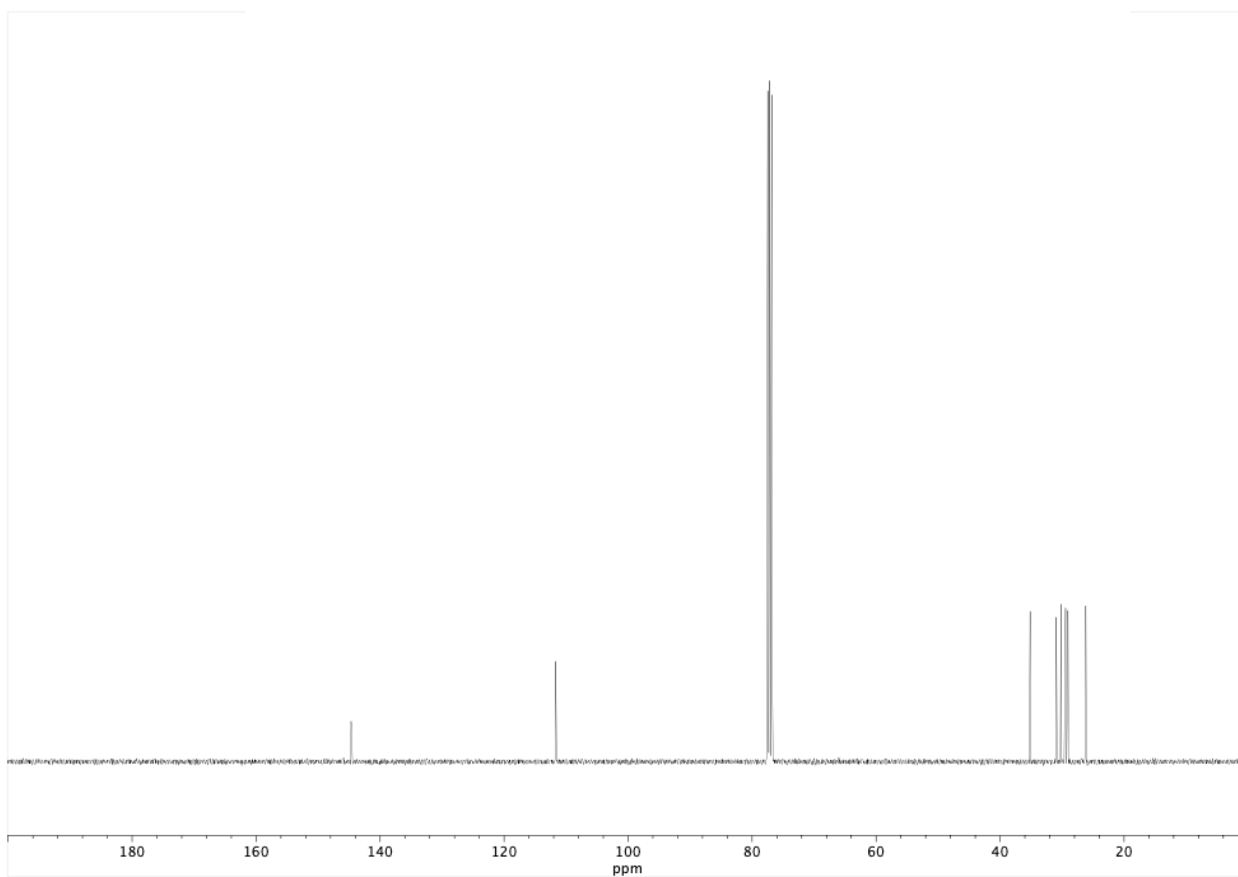


Figure A4.10. ¹³C NMR (100 MHz, CDCl₃) of **110**.

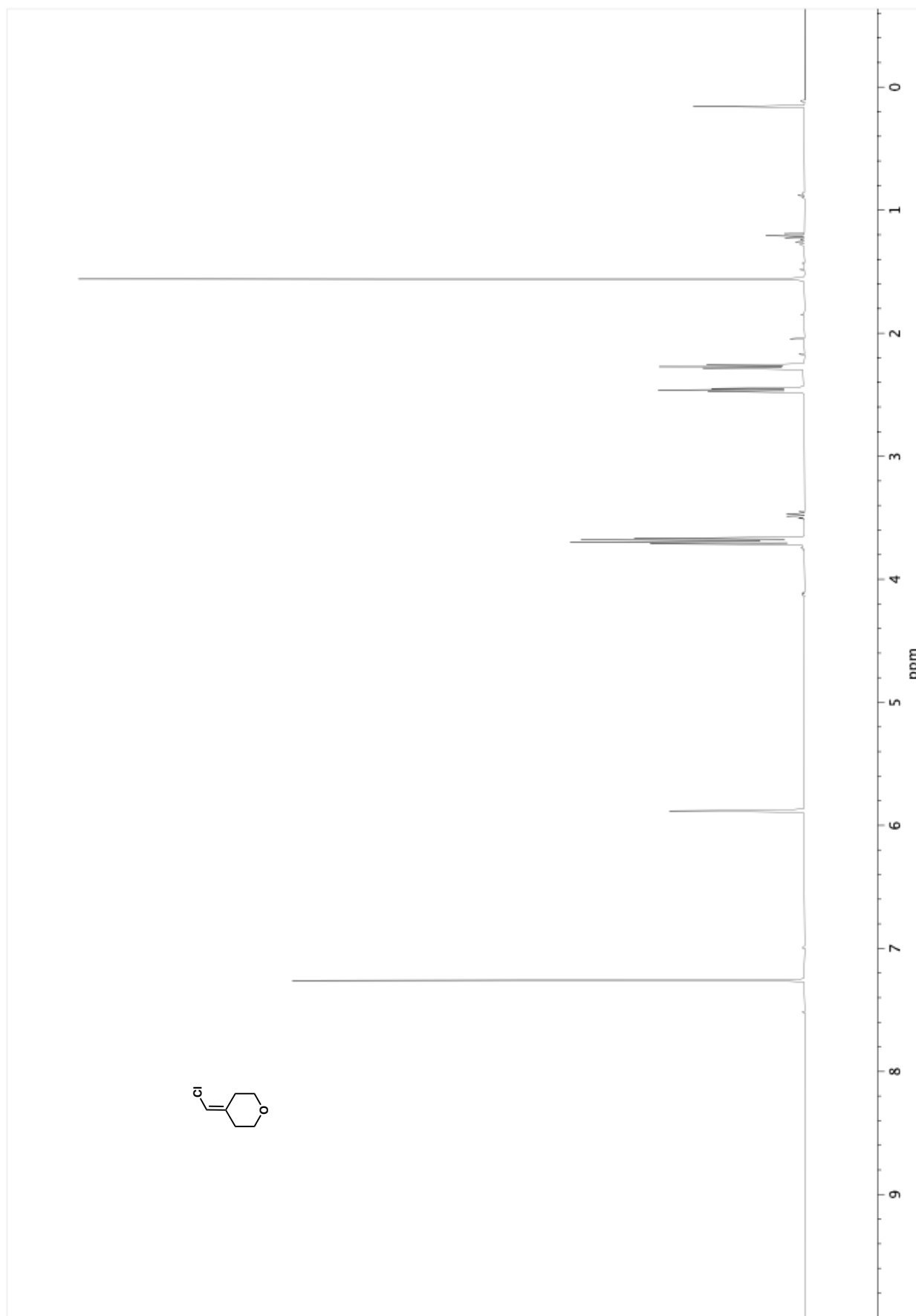


Figure A4.11. ^1H NMR (400 MHz, CDCl_3) of **111**.

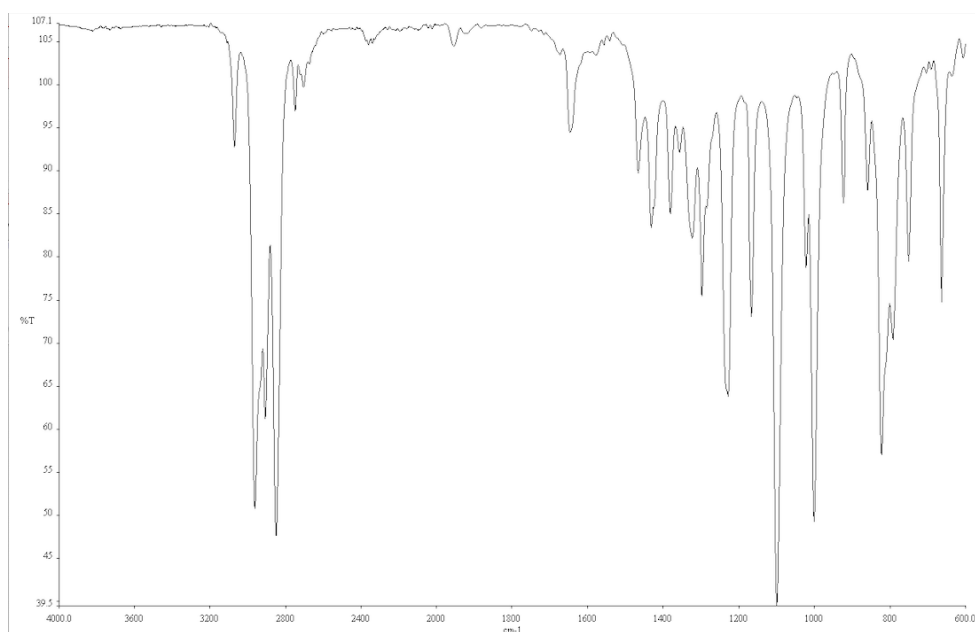


Figure A4.12. Infrared spectrum (Thin Film, NaCl) of **111**.

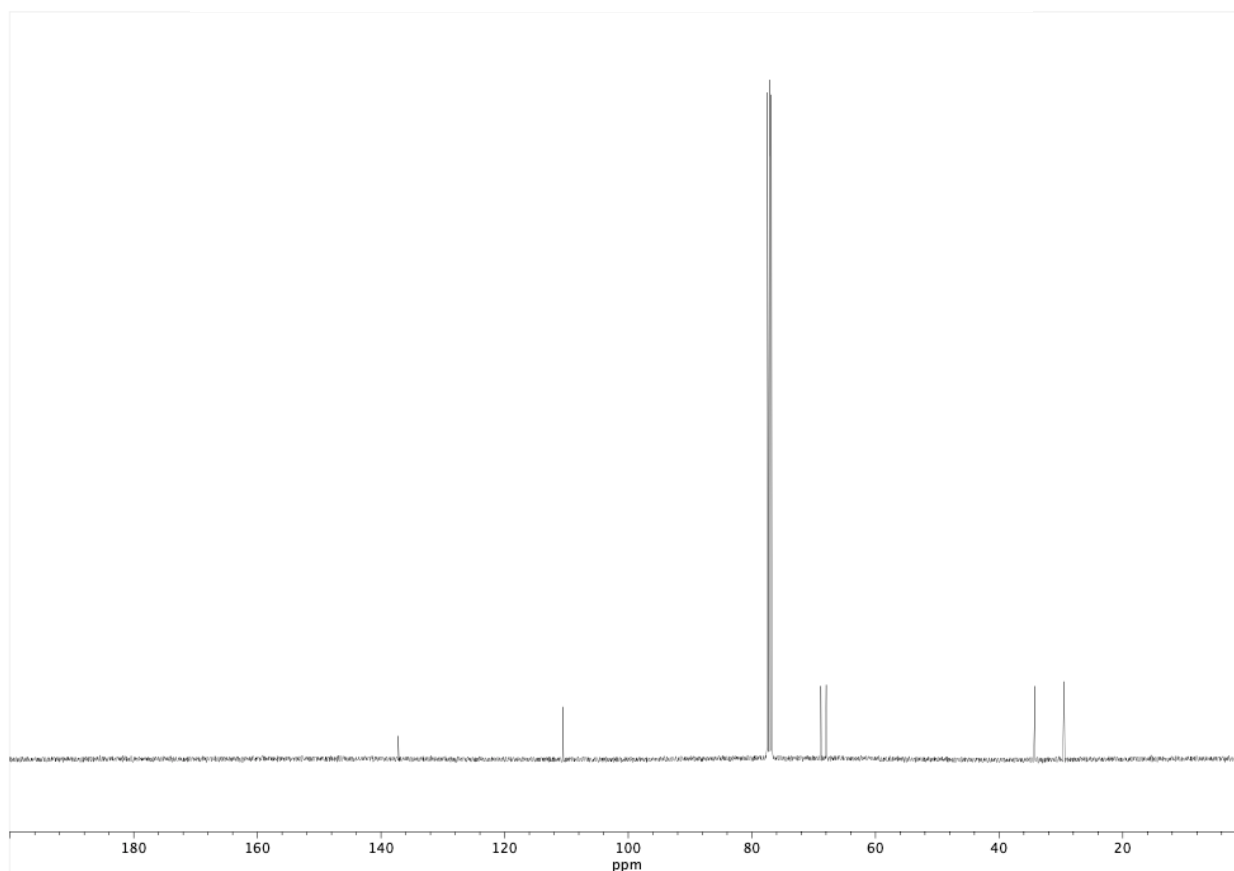


Figure A4.13. ¹³C NMR (100 MHz, CDCl₃) of **111**.

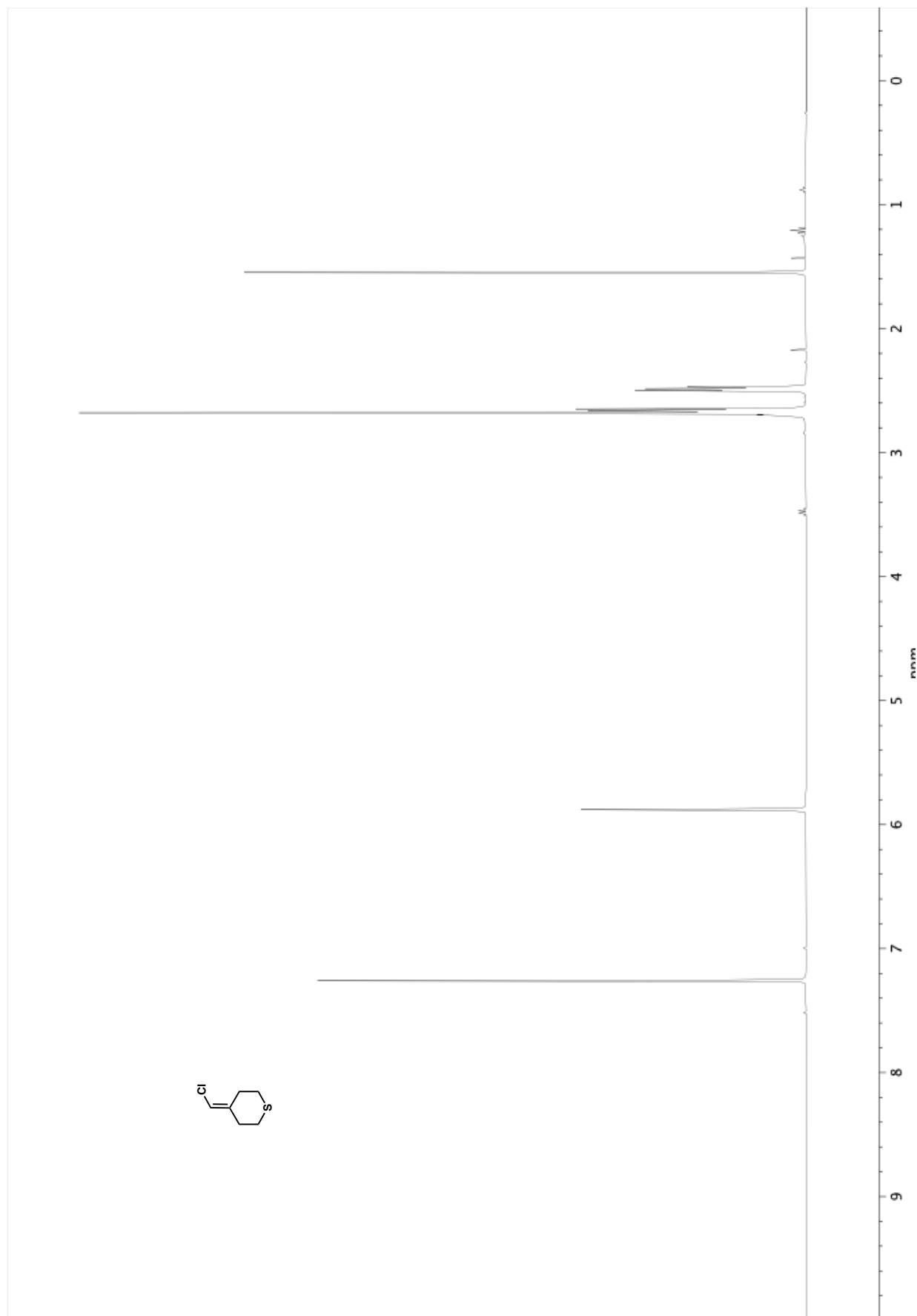


Figure A4.14. ^1H NMR (400 MHz, CDCl_3) of **112**.

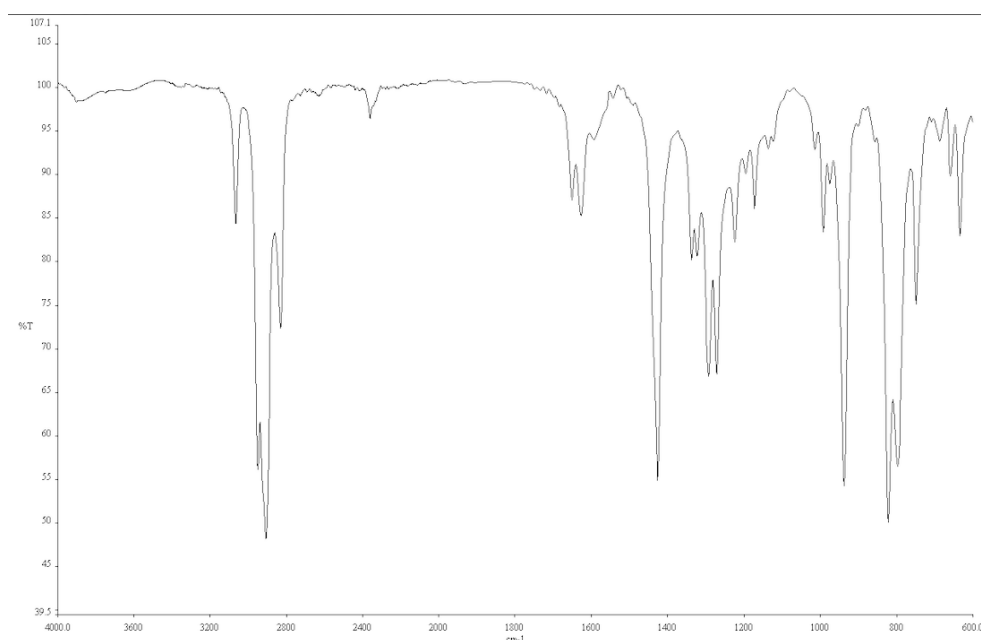


Figure A4.15. Infrared spectrum (Thin Film, NaCl) of **112**.

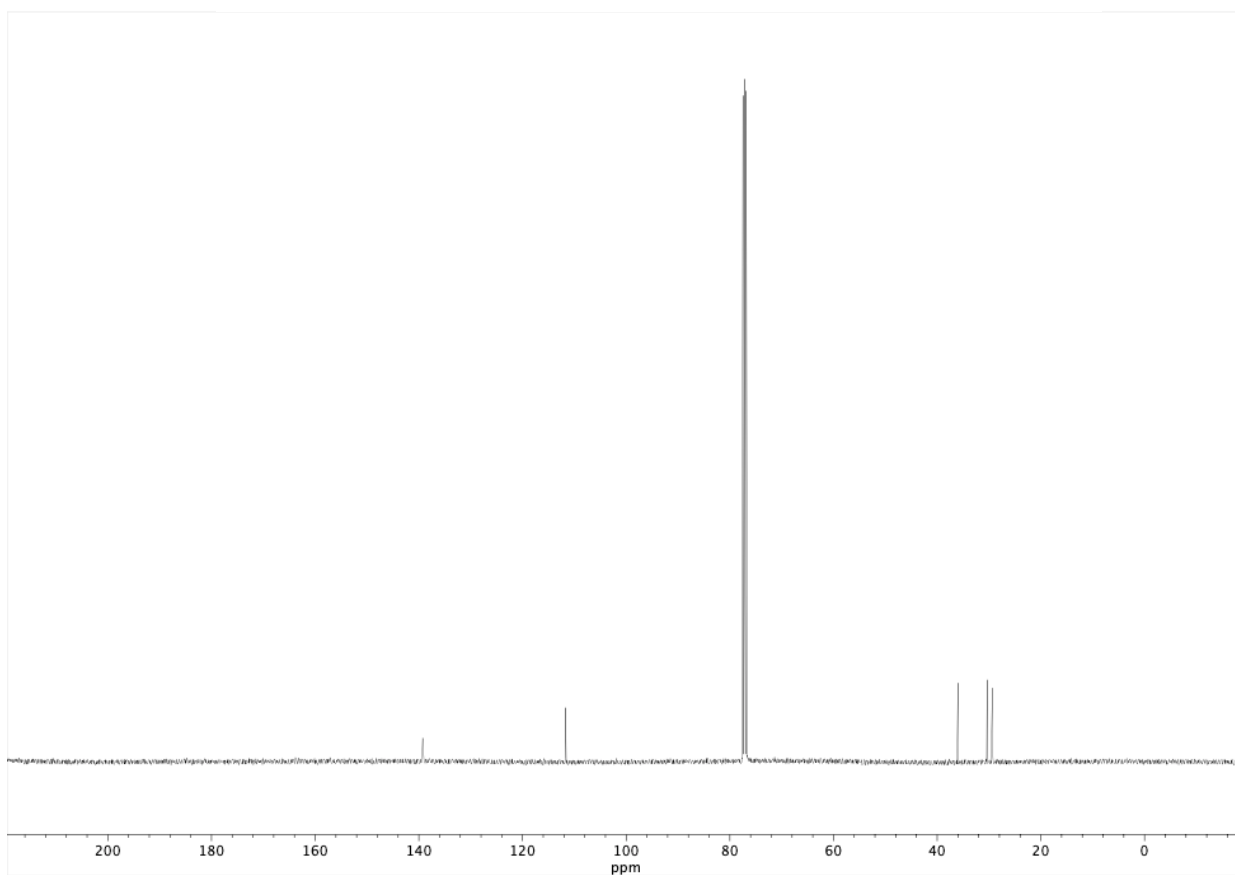


Figure A4.16. ^{13}C NMR (100 MHz, CDCl_3) of **112**.

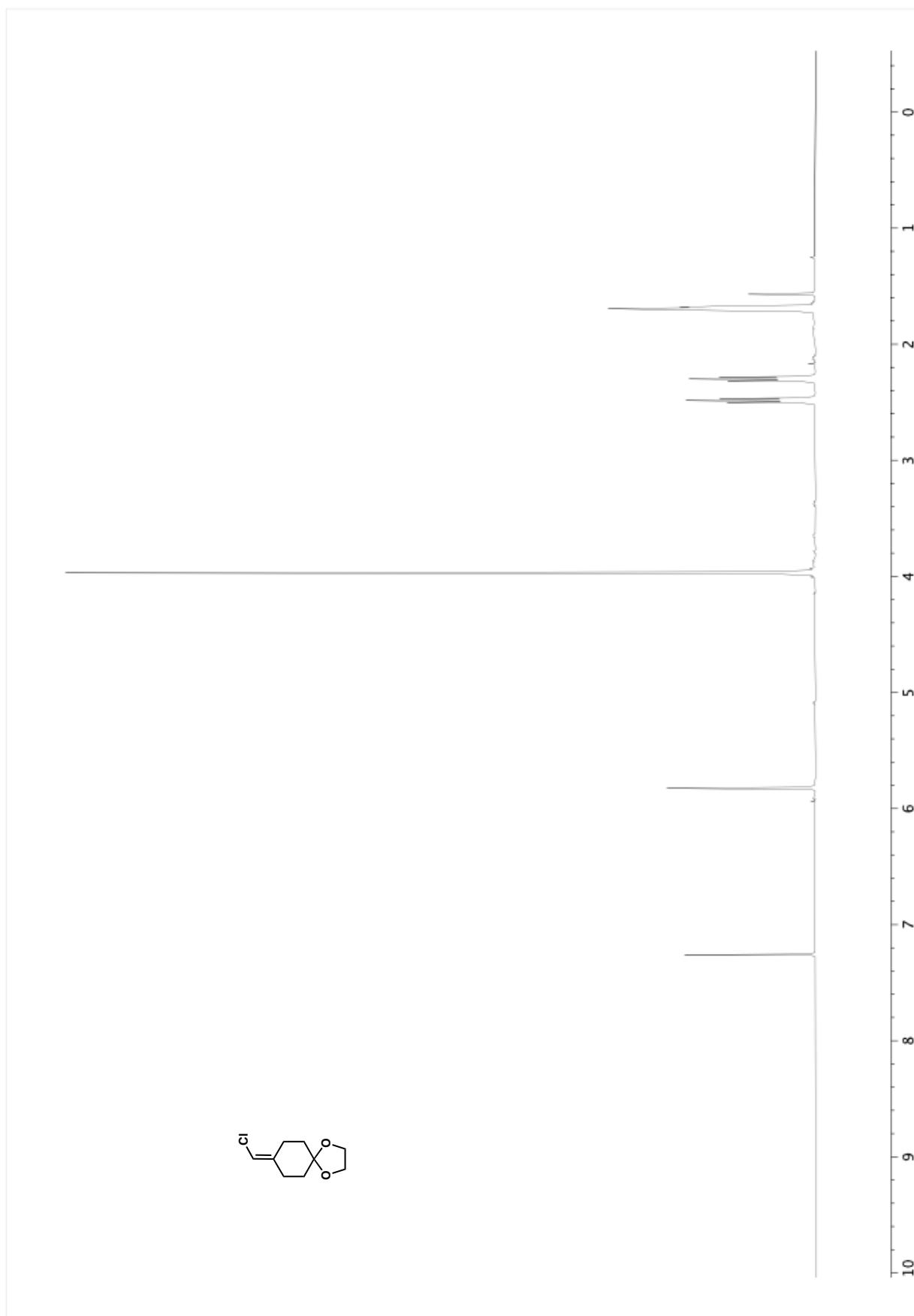


Figure A4.17. ^1H NMR (400 MHz, CDCl_3) of **113**.

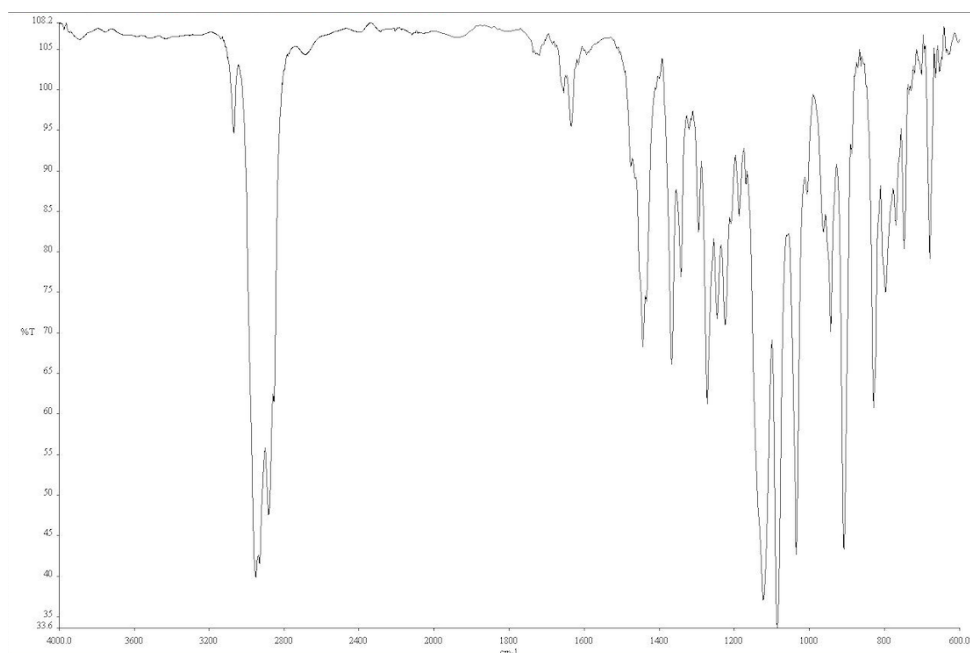


Figure A4.18. Infrared spectrum (Thin Film, NaCl) of **113**.

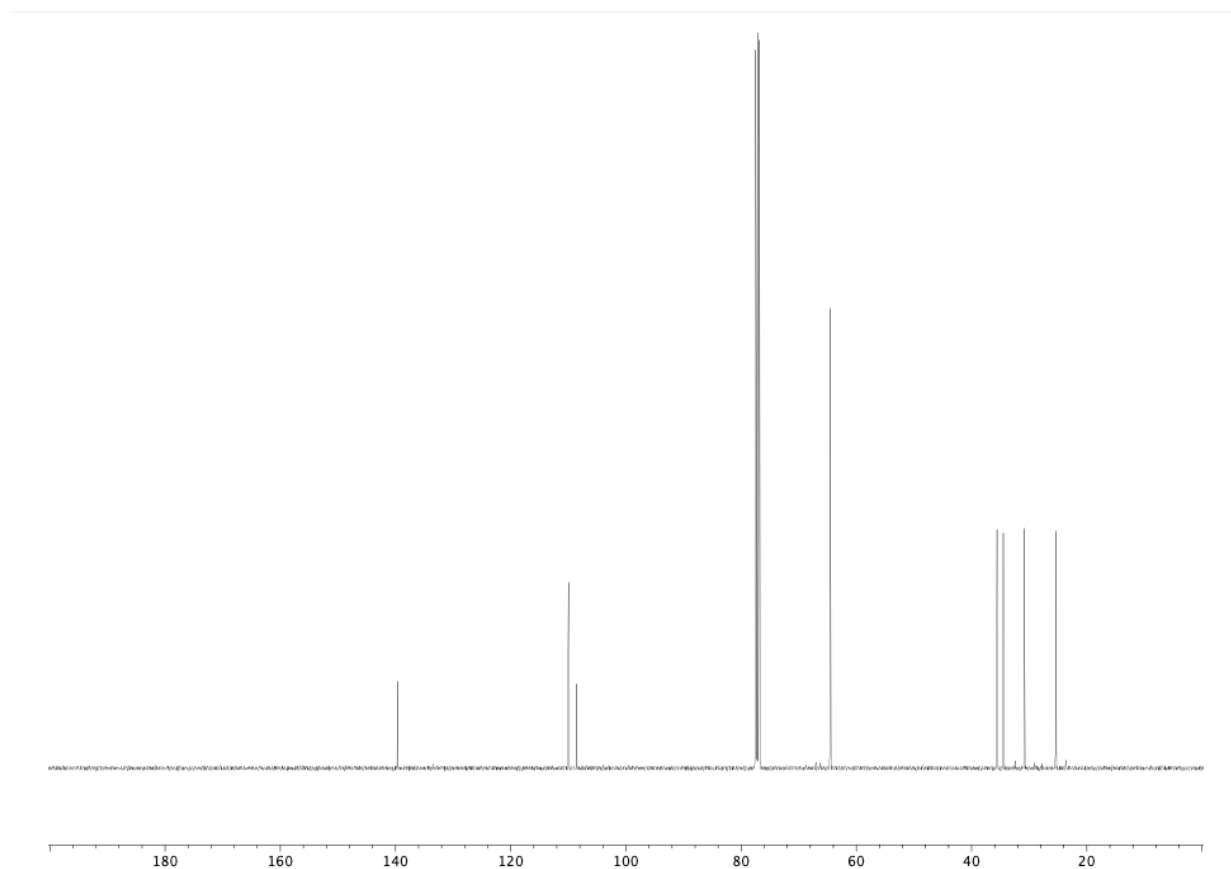


Figure A4.19. ¹³C NMR (100 MHz, CDCl₃) of **113**.

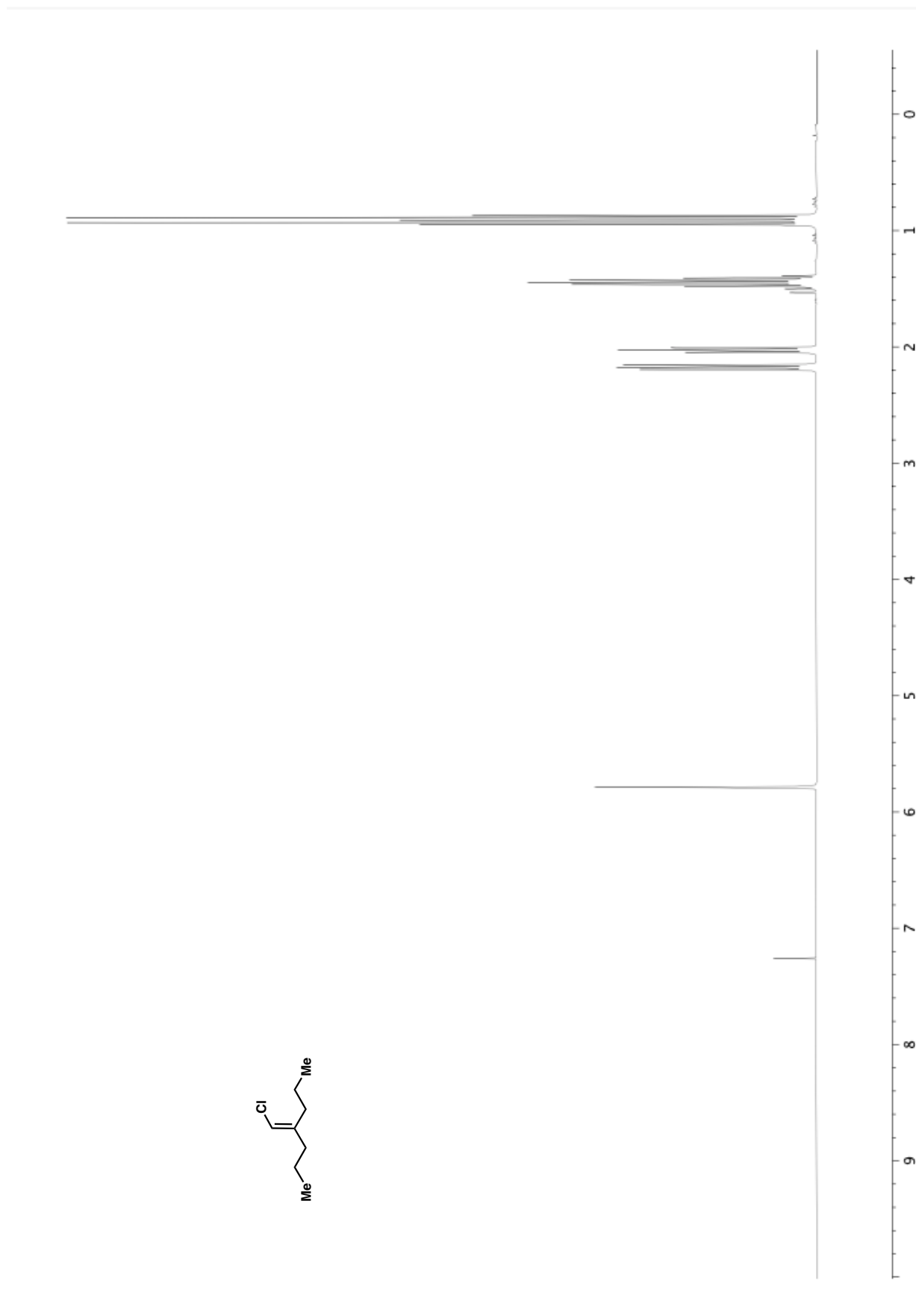


Figure A4.20. ¹H NMR (400 MHz, CDCl₃) of **114**.

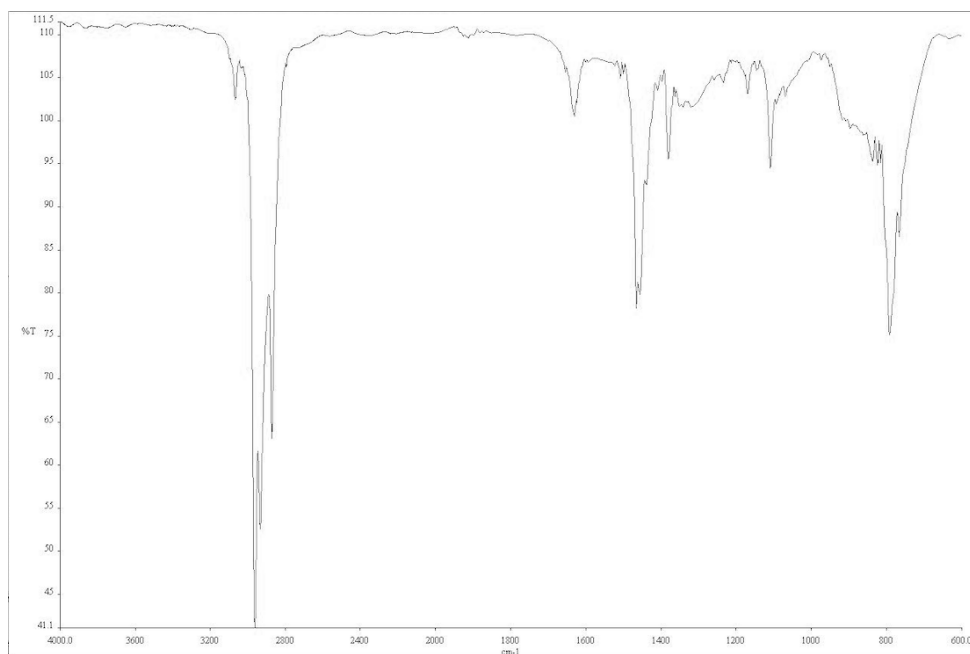


Figure A4.21. Infrared spectrum (Thin Film, NaCl) of **114**.

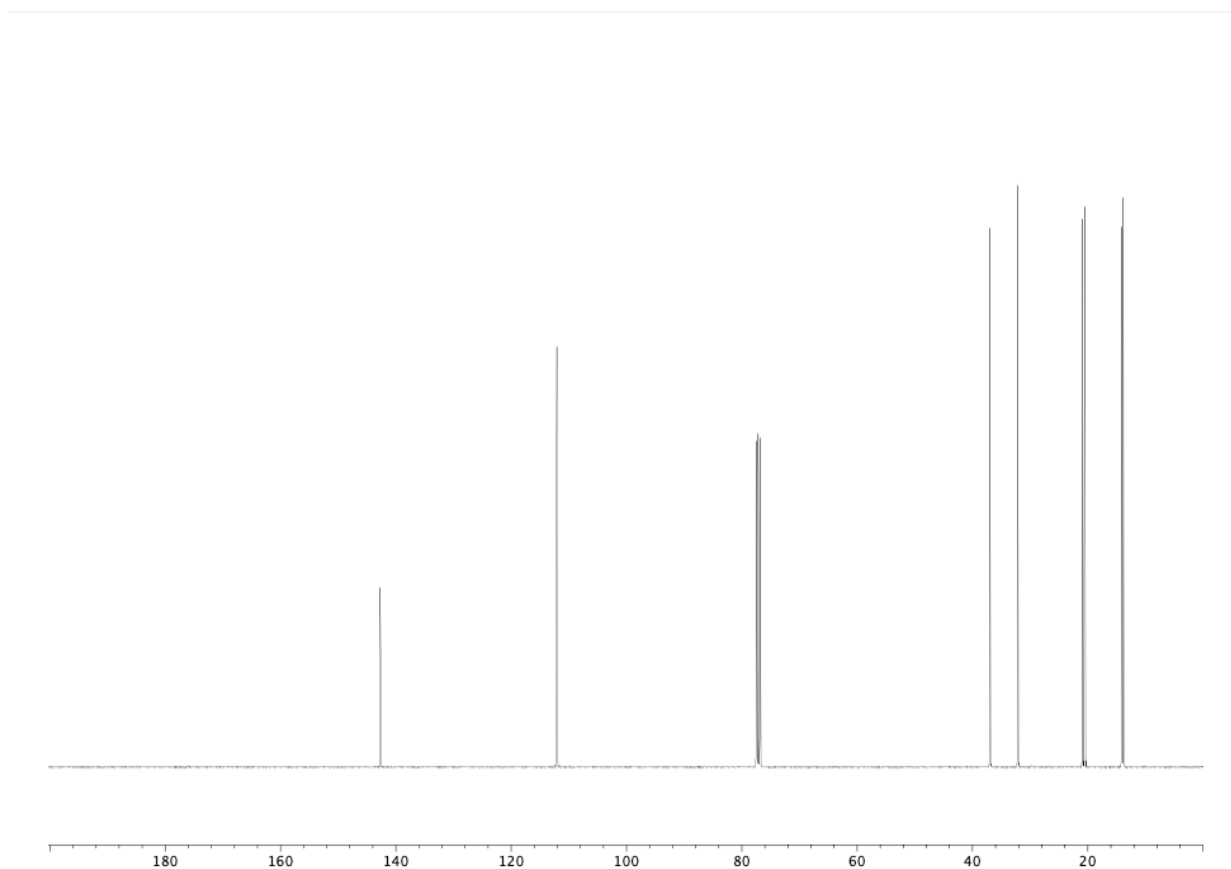


Figure A4.22. ¹³C NMR (100 MHz, CDCl₃) of compound **114**.

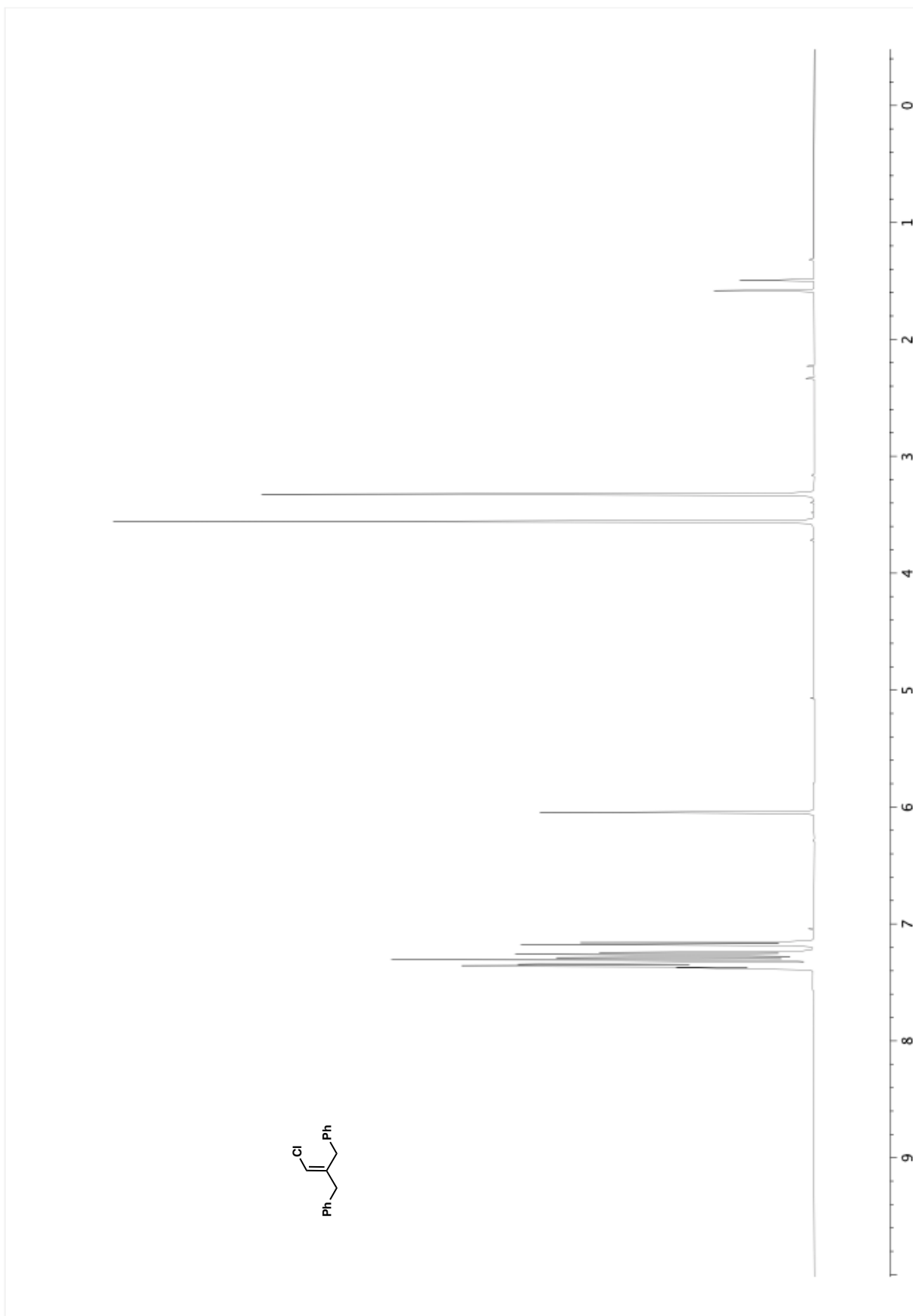


Figure A4.23. ^1H NMR (400 MHz, CDCl_3) of **115**.

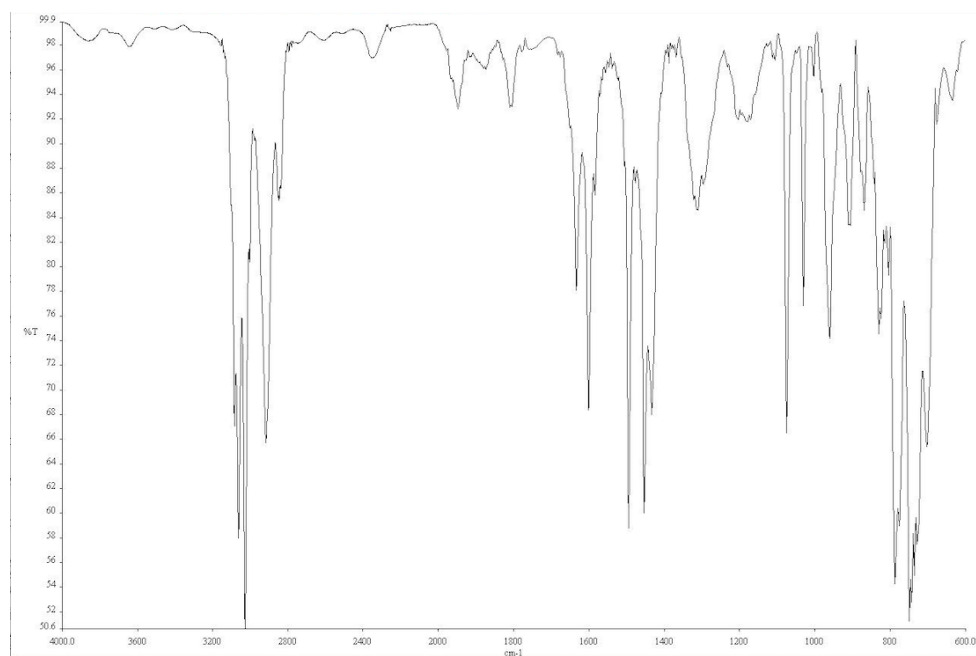


Figure A4.24. Infrared spectrum (Thin Film, NaCl) of **115**.

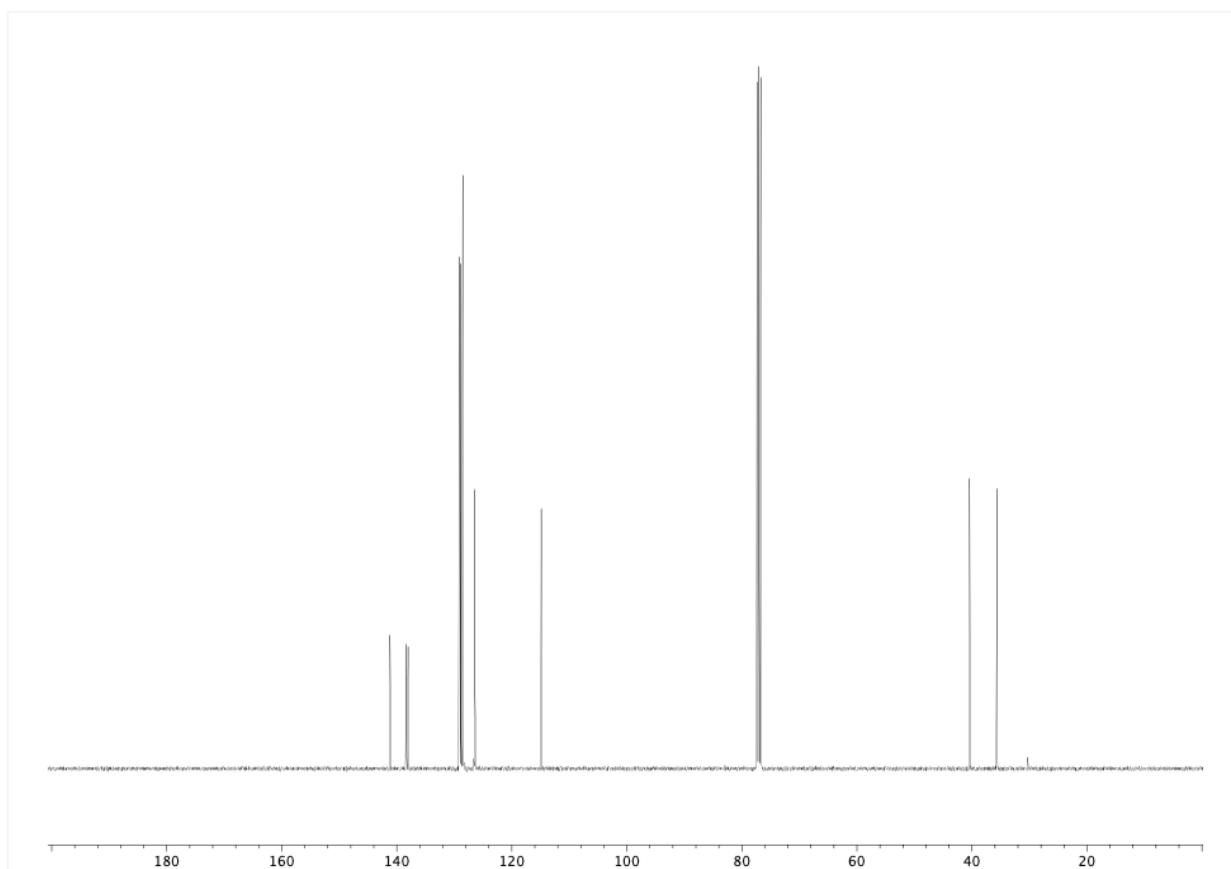


Figure A4.25. ¹³C NMR (100 MHz, CDCl₃) of compound **115**.

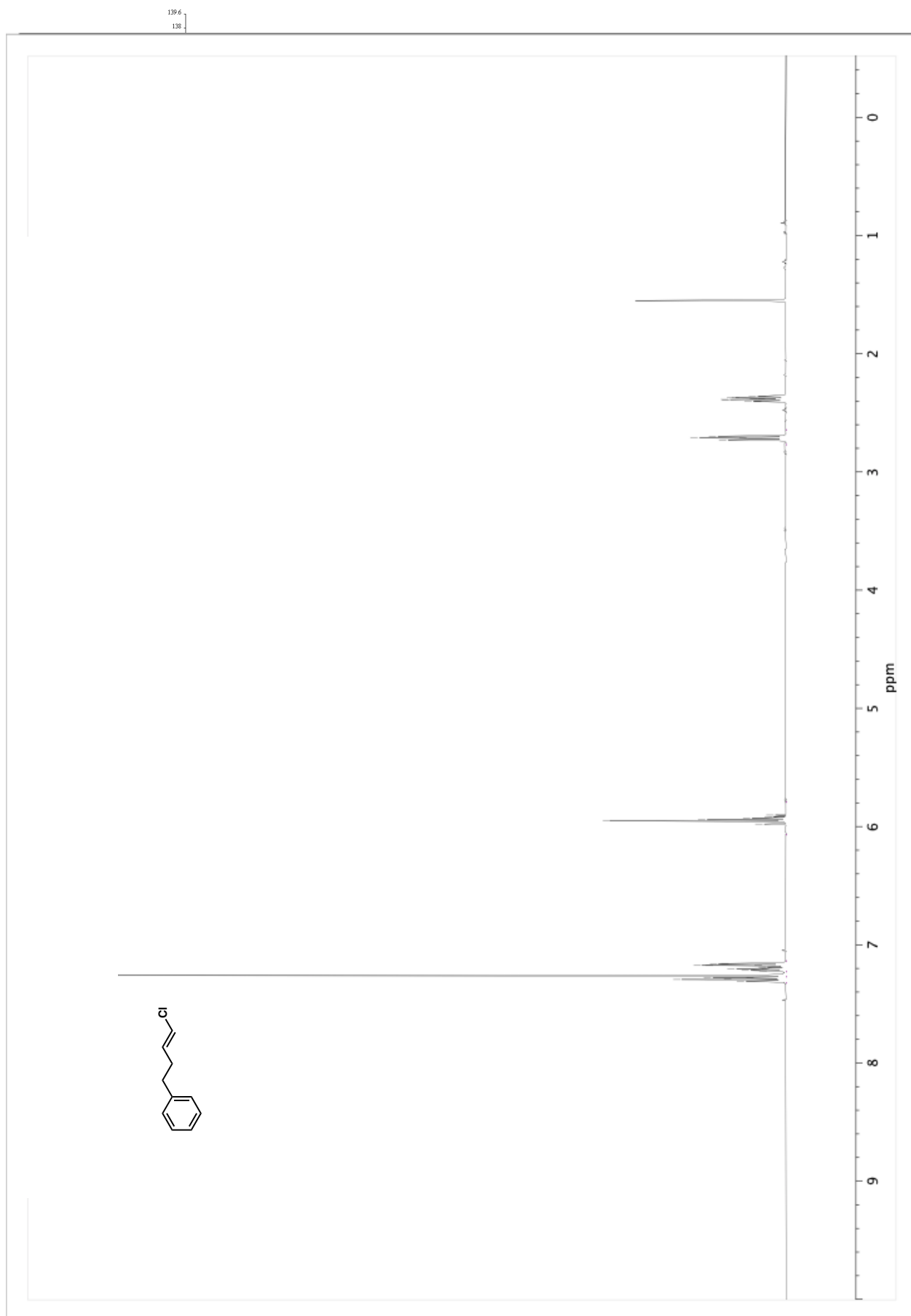


Figure A4.26. ^1H NMR (500 MHz, CDCl_3) of **99**.

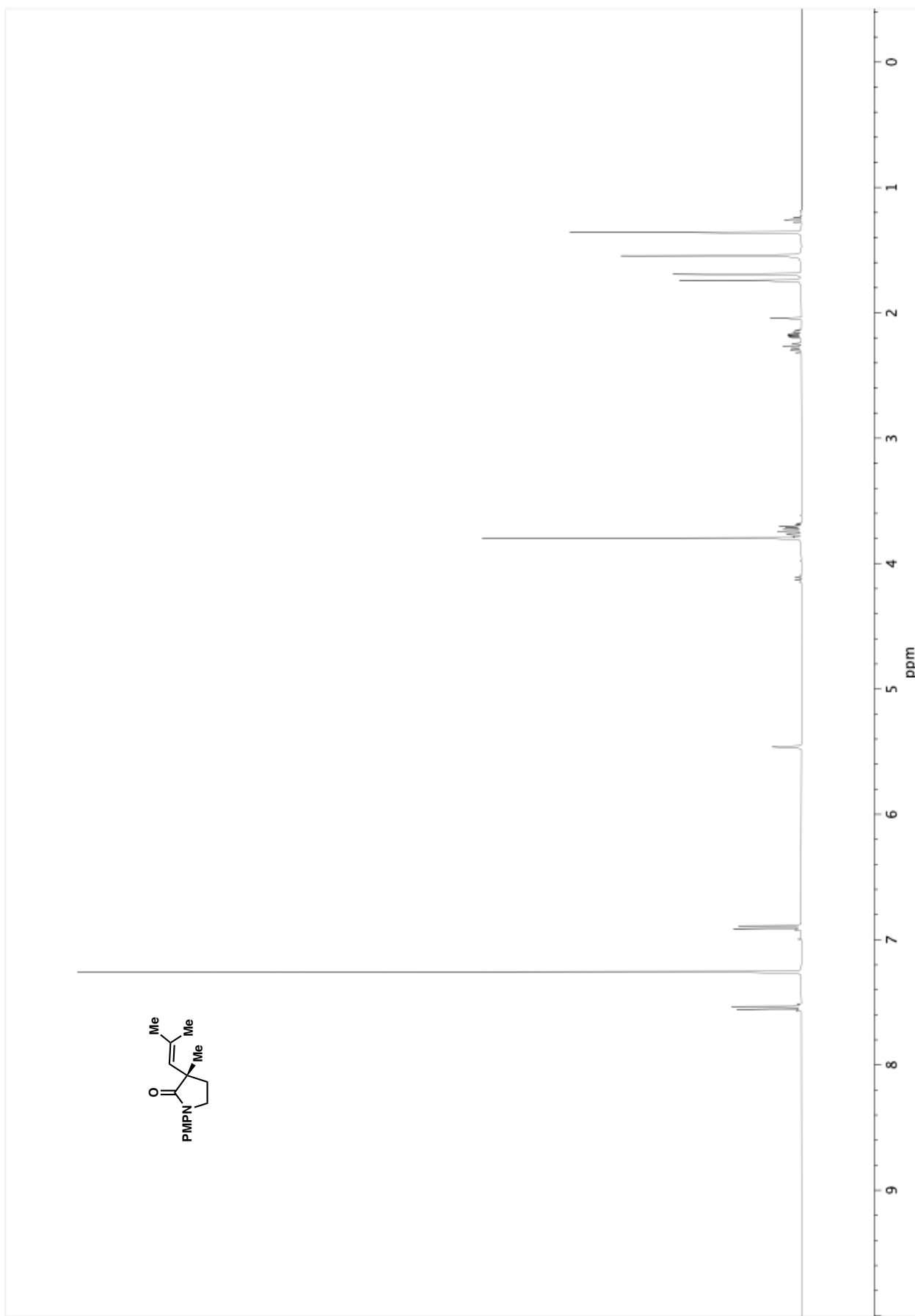


Figure A4.27. ^1H NMR (400 MHz, CDCl_3) of **87**.

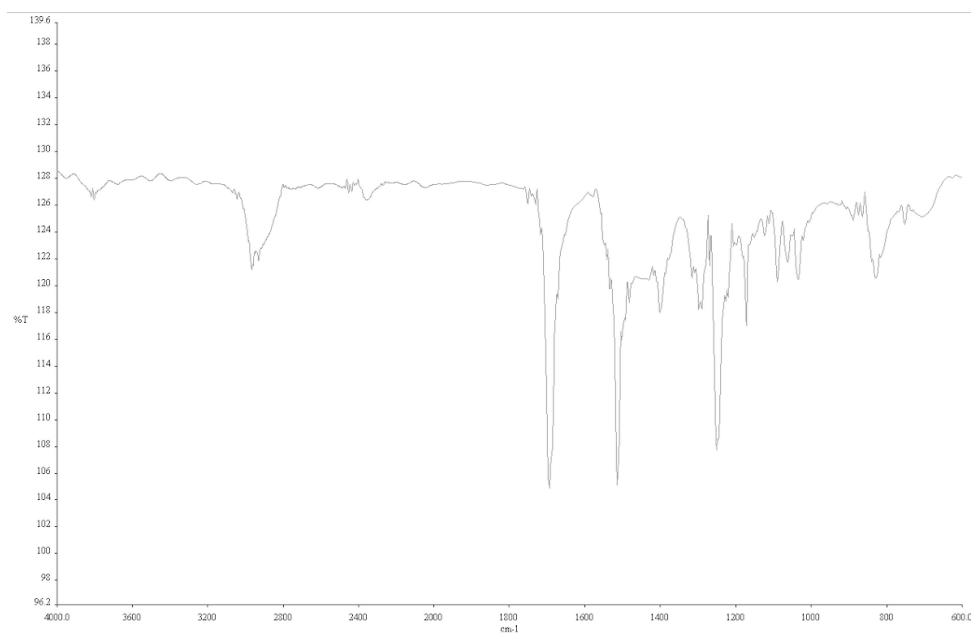


Figure A4.28. Infrared spectrum (Thin Film, NaCl) of **87**.

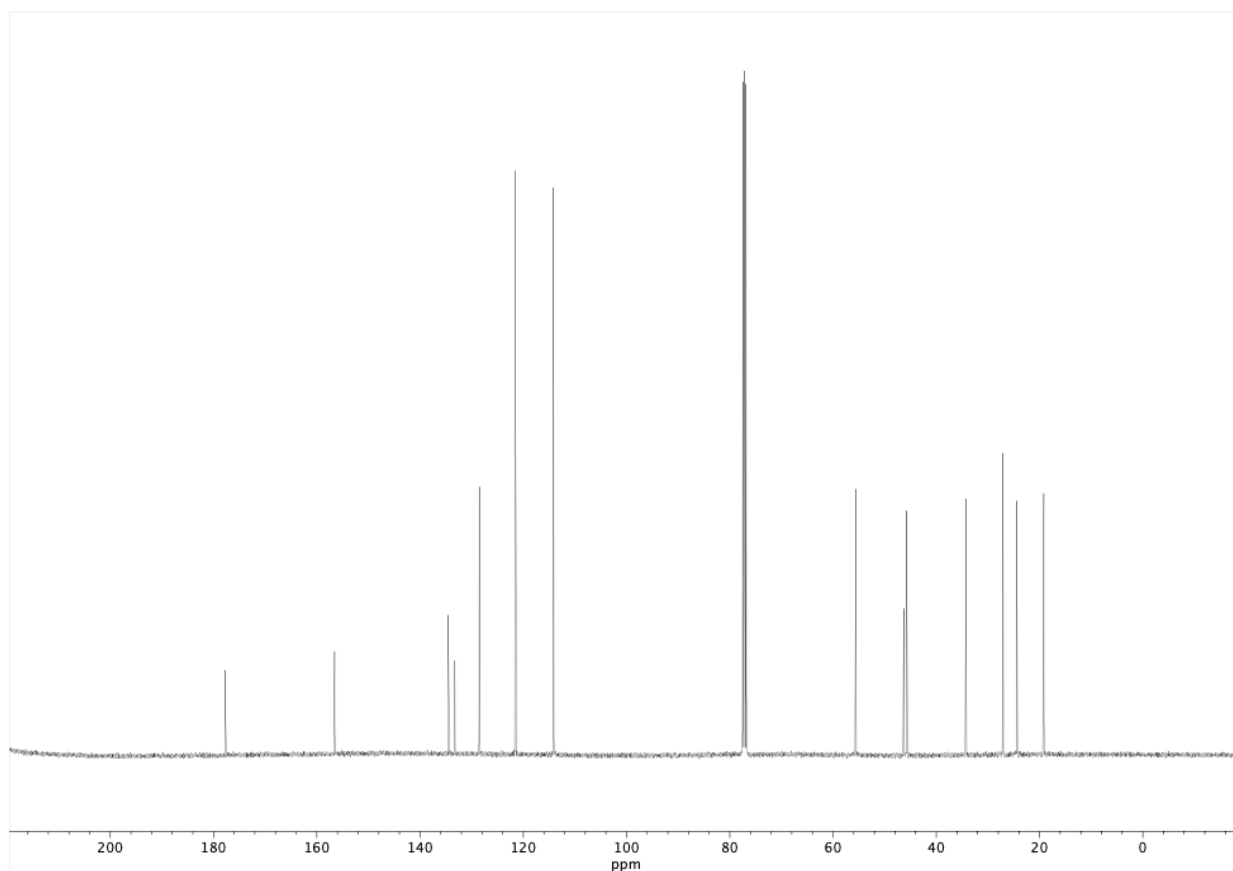


Figure A4.29. ^{13}C NMR (100 MHz, CDCl_3) of compound **87**.

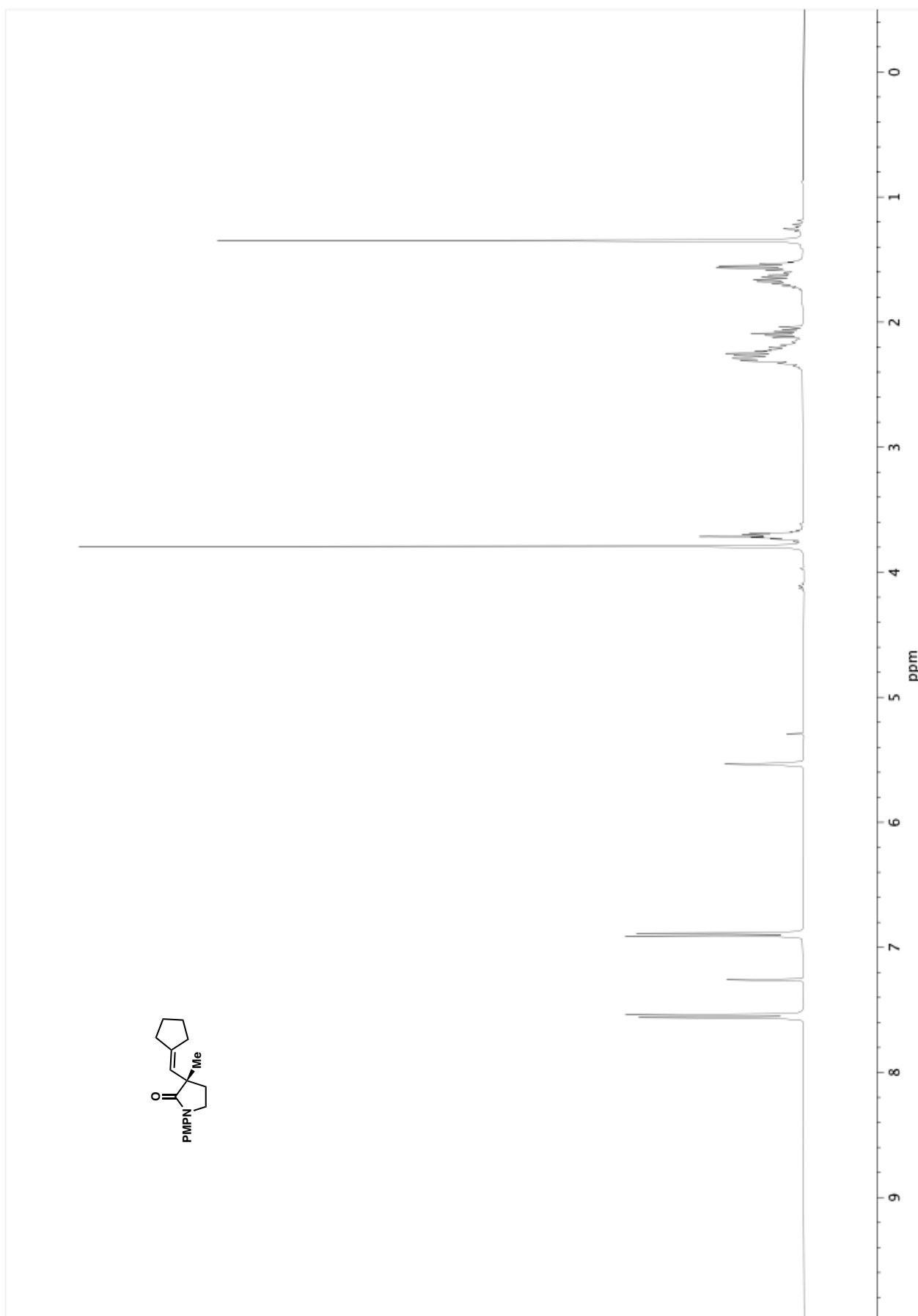


Figure A4.30. ^1H NMR (400 MHz, CDCl_3) of **88**.

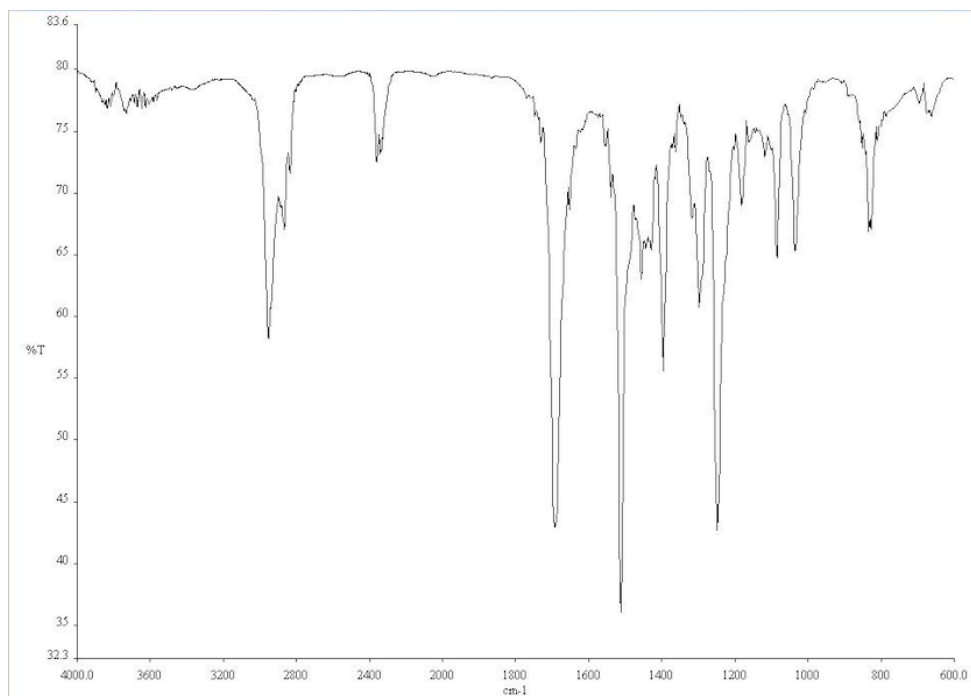


Figure A4.31. Infrared spectrum (Thin Film, NaCl) of **88**.

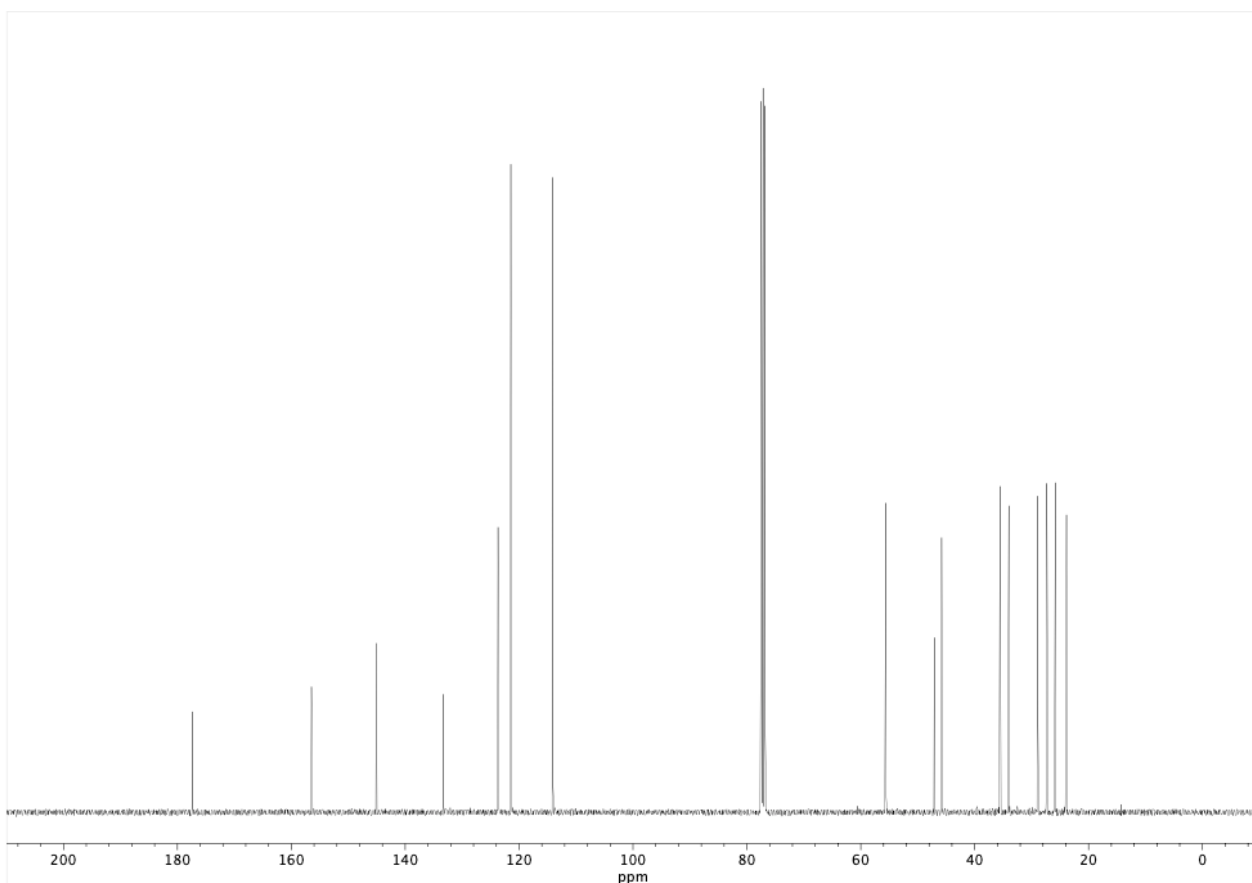


Figure A4.32. ¹³C NMR (100 MHz, CDCl₃) of compound **88**.

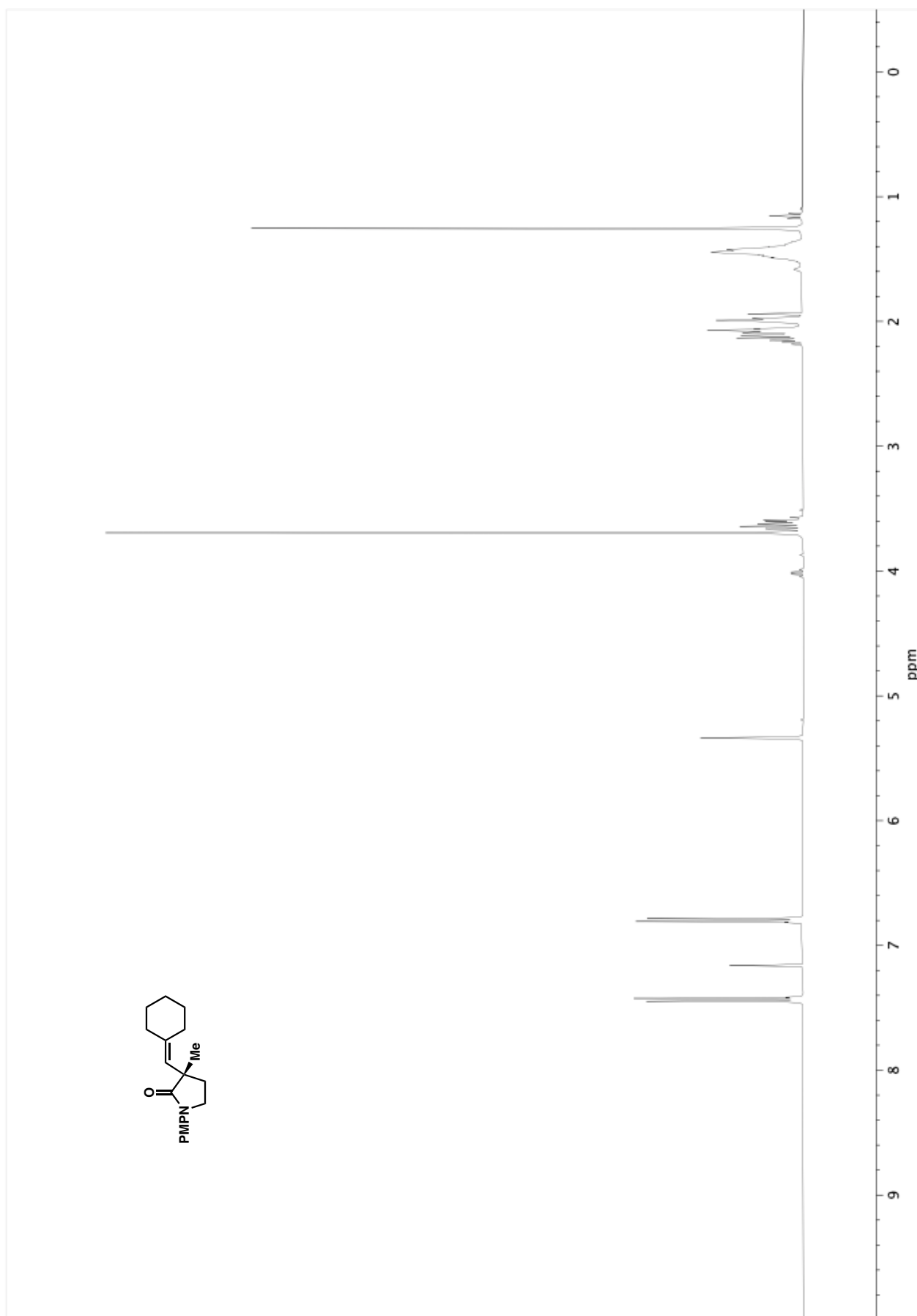


Figure A4.33. ^1H NMR (400 MHz, CDCl_3) of **89**.

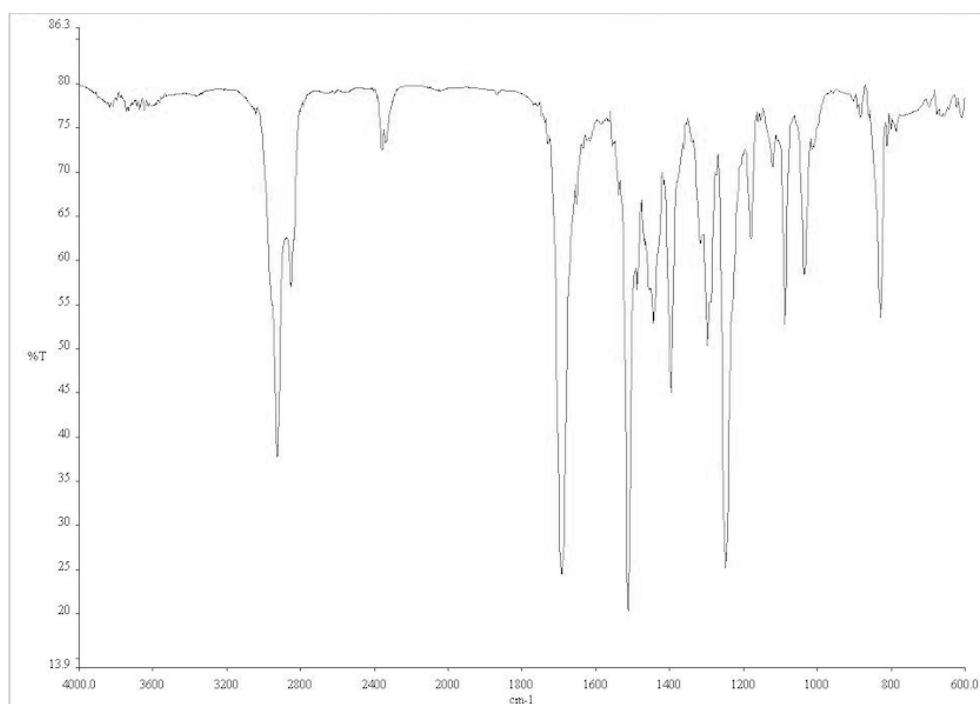


Figure A4.34. Infrared spectrum (Thin Film, NaCl) of **89**.

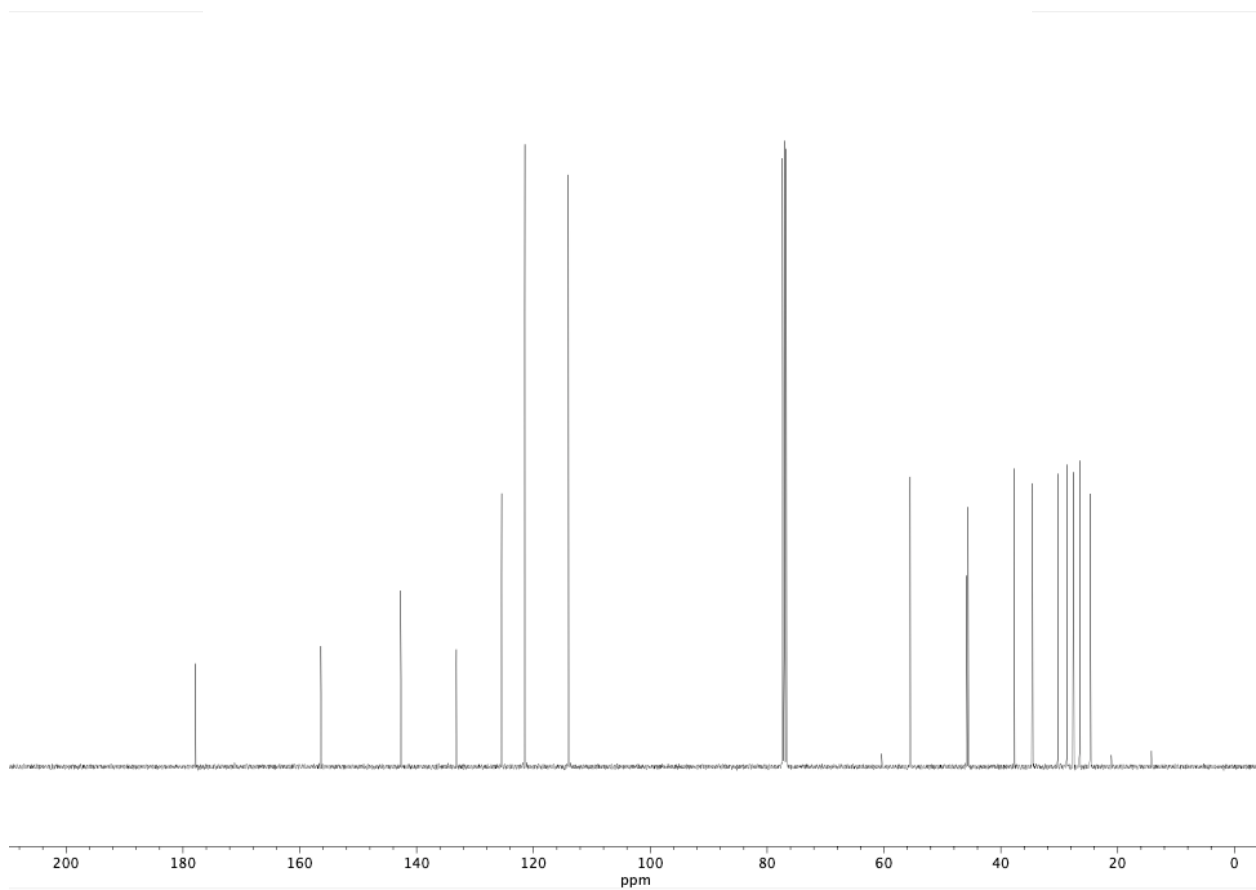


Figure A4.35. ¹³C NMR (100 MHz, CDCl₃) of **89**.

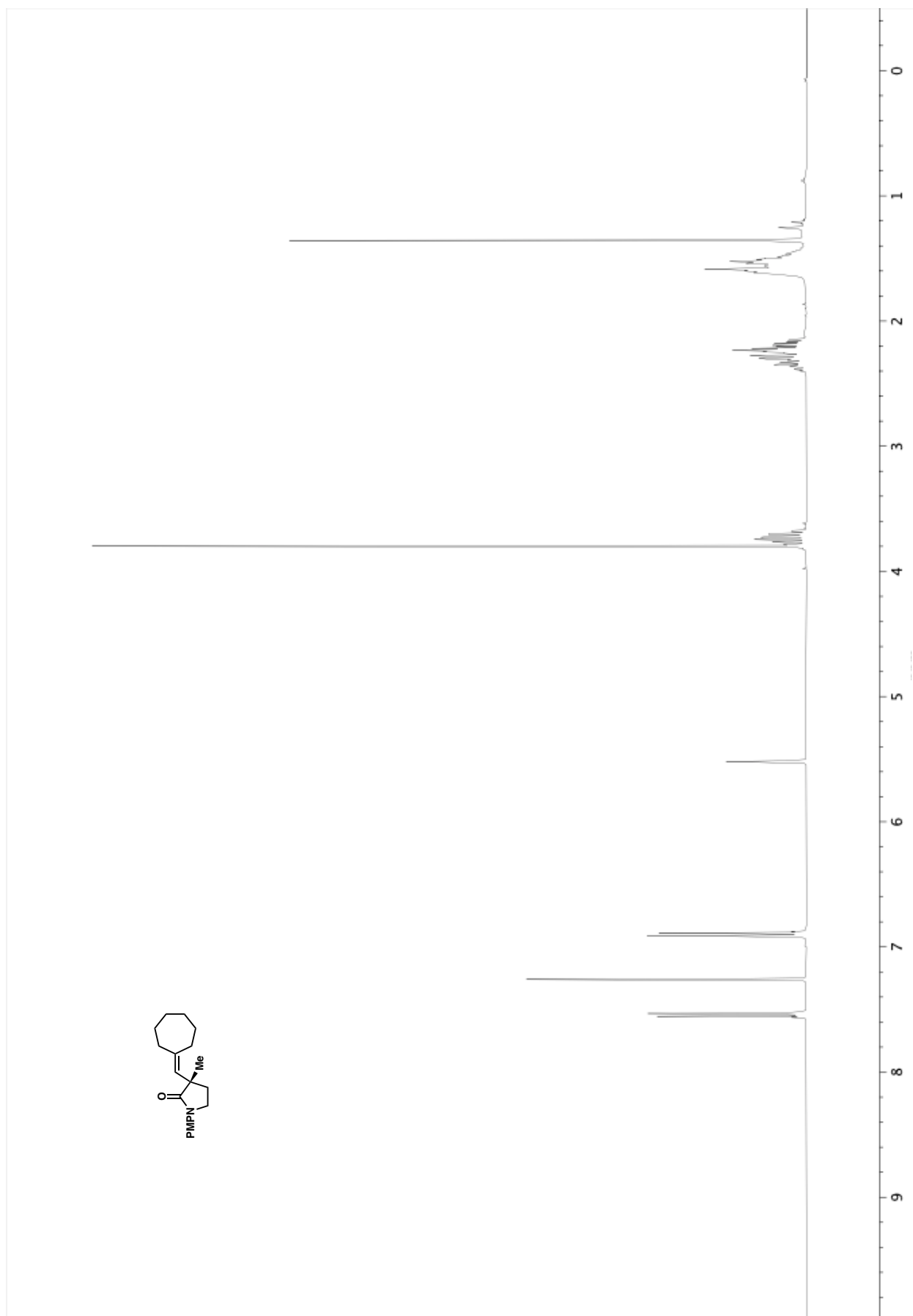


Figure A4.36. ^1H NMR (400 MHz, CDCl_3) of **90**.

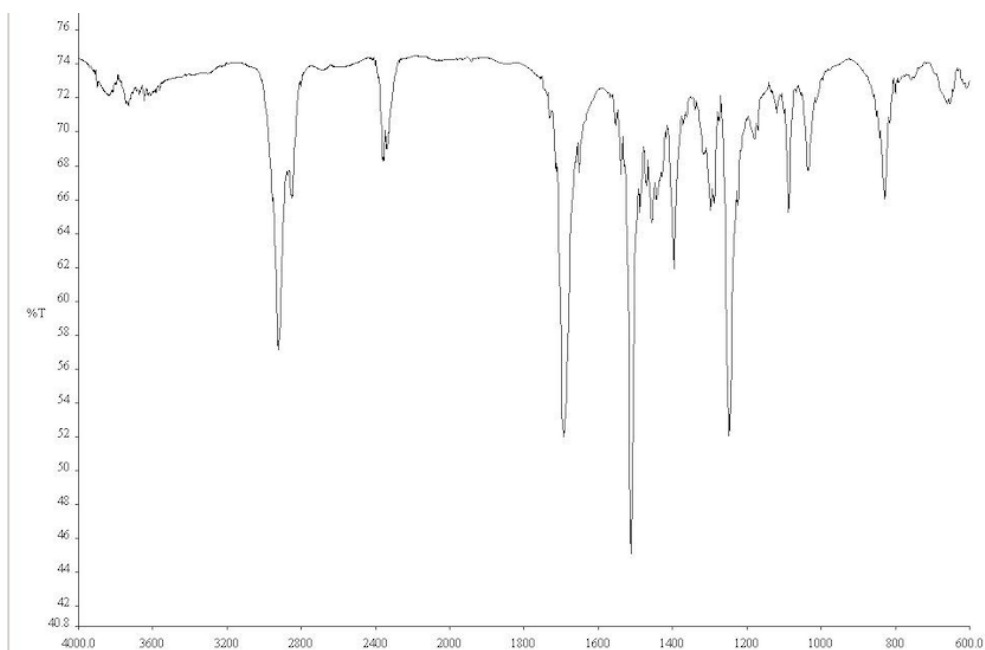


Figure A4.37. Infrared spectrum (Thin Film, NaCl) of **90**.

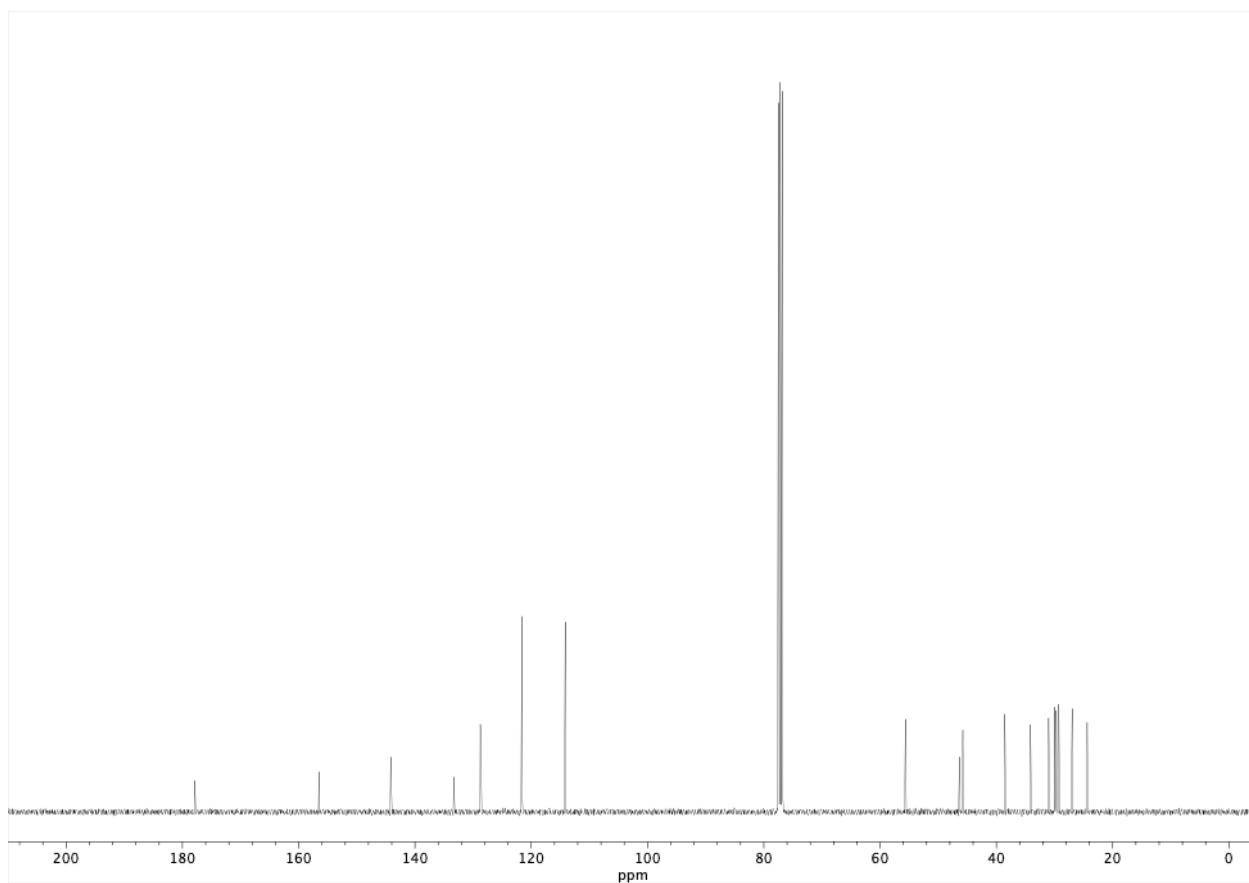


Figure A4.38. ¹³C NMR (100 MHz, CDCl₃) of **90**.

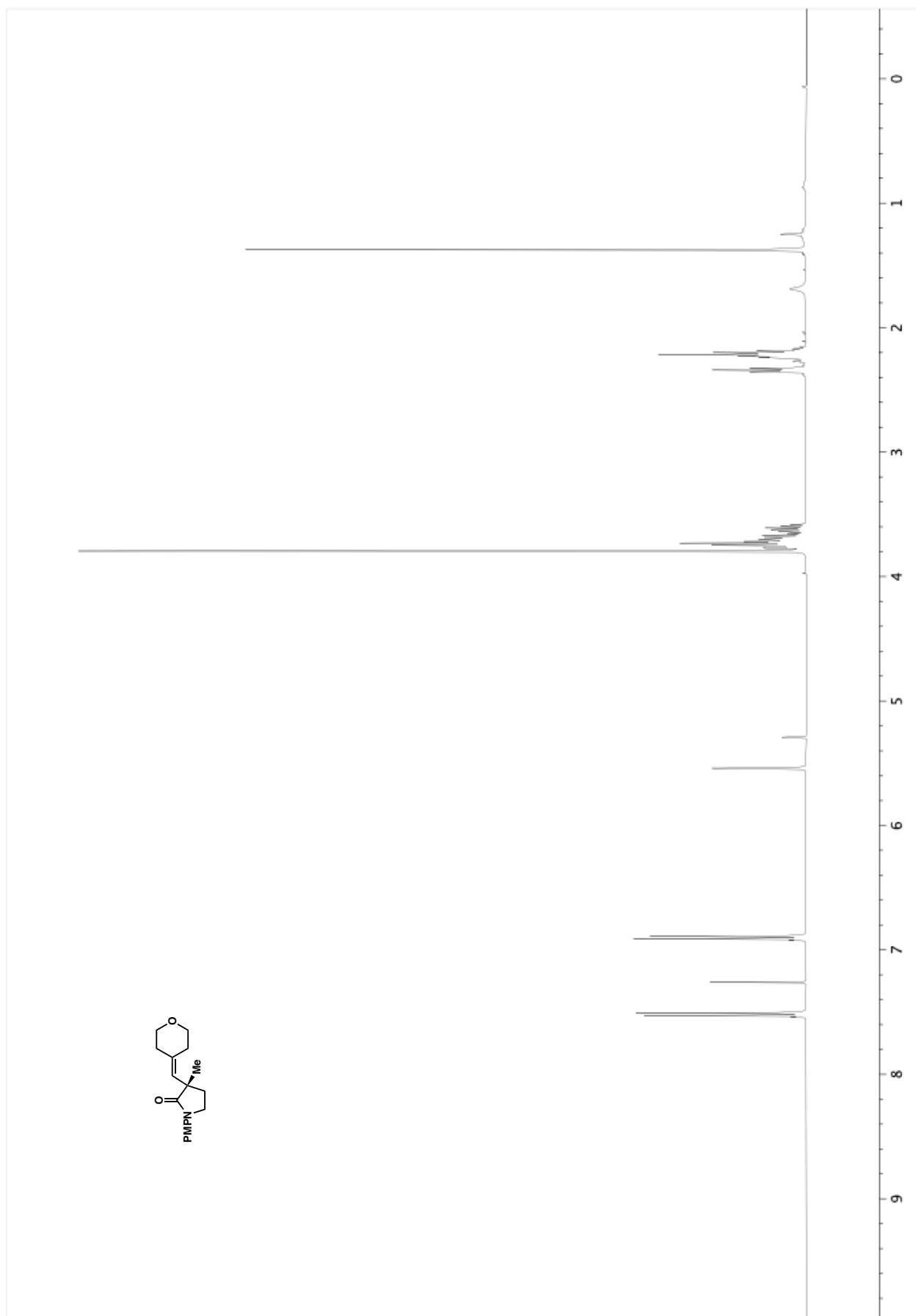


Figure A4.39. ^1H NMR (400 MHz, CDCl_3) of **91**.

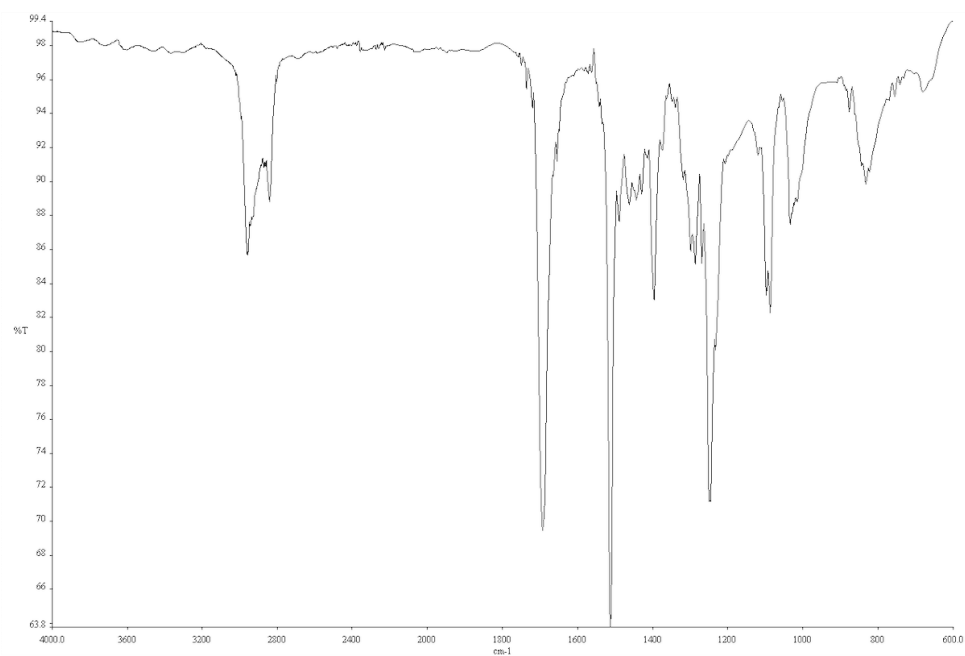


Figure A4.40. Infrared spectrum (Thin Film, NaCl) of **91**.

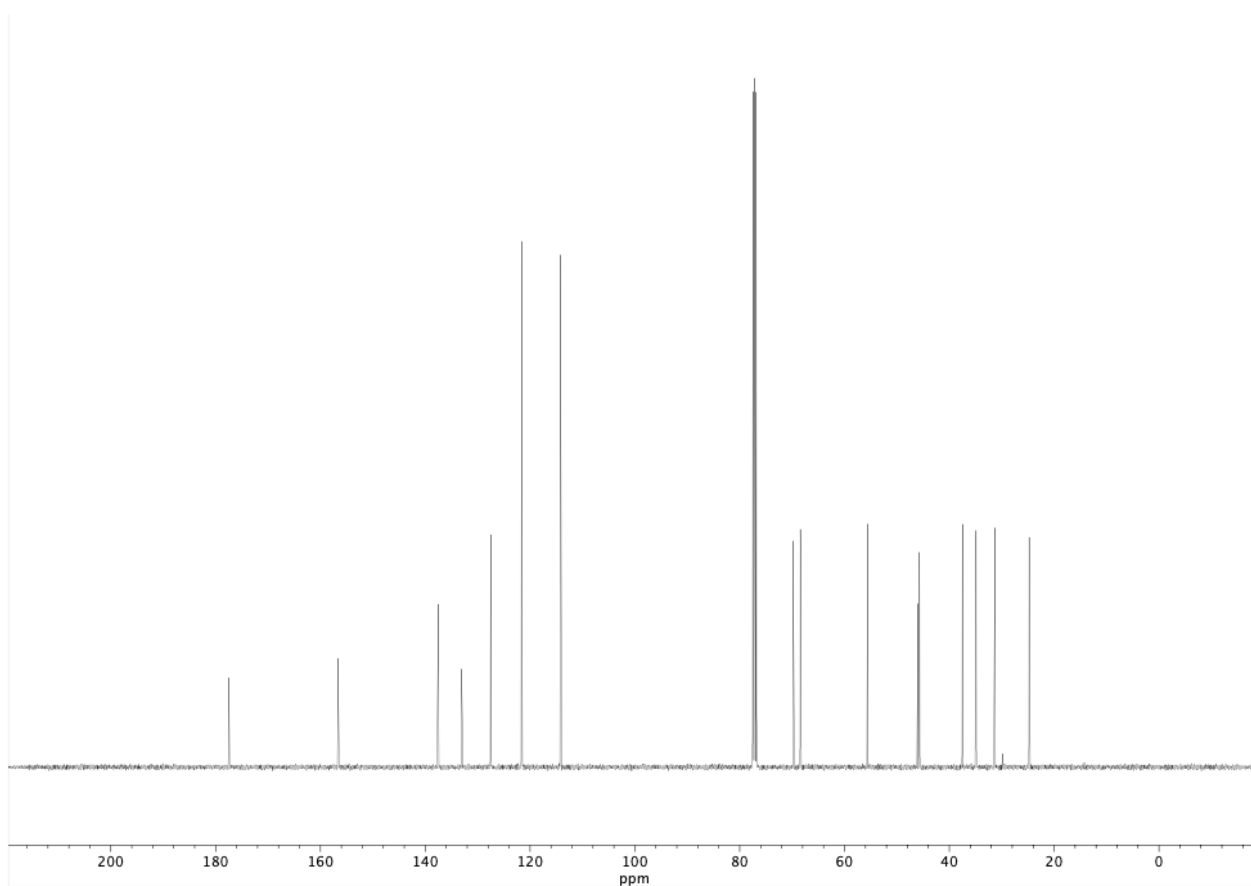
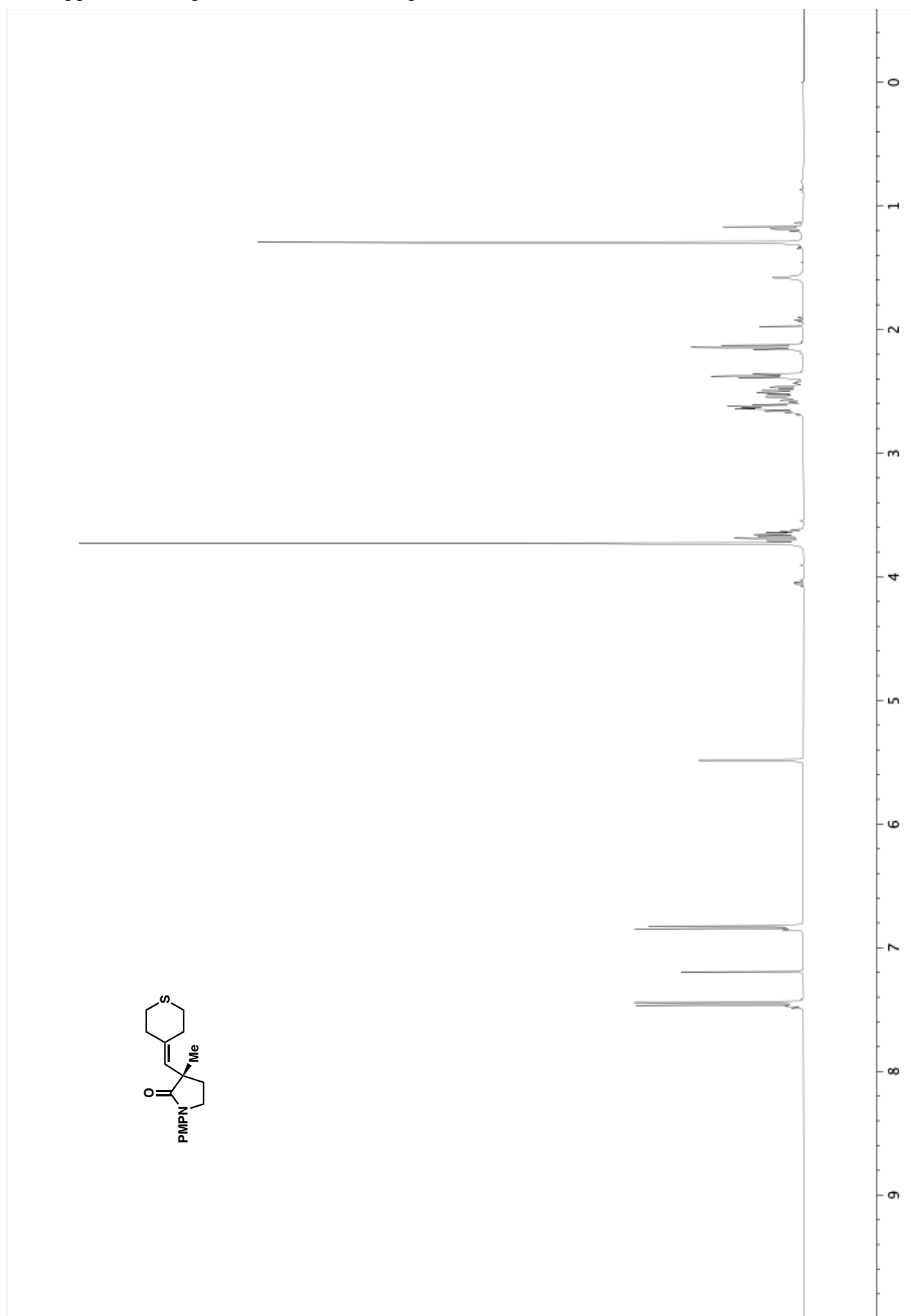


Figure A4.41. ¹³C NMR (100 MHz, CDCl₃) of **91**.



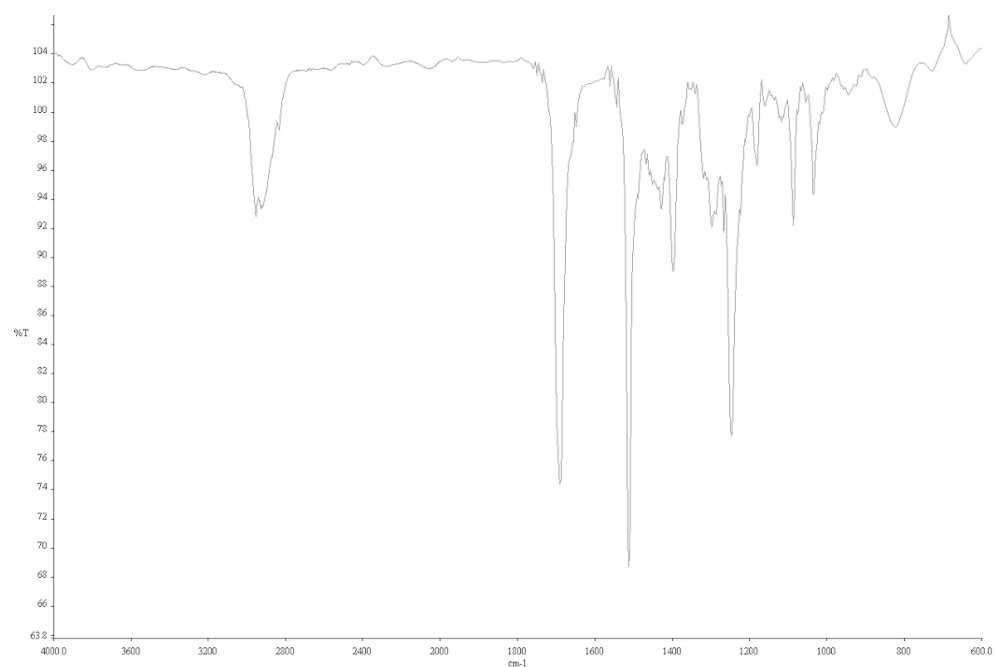


Figure A4.43. Infrared spectrum (Thin Film, NaCl) of **92**.

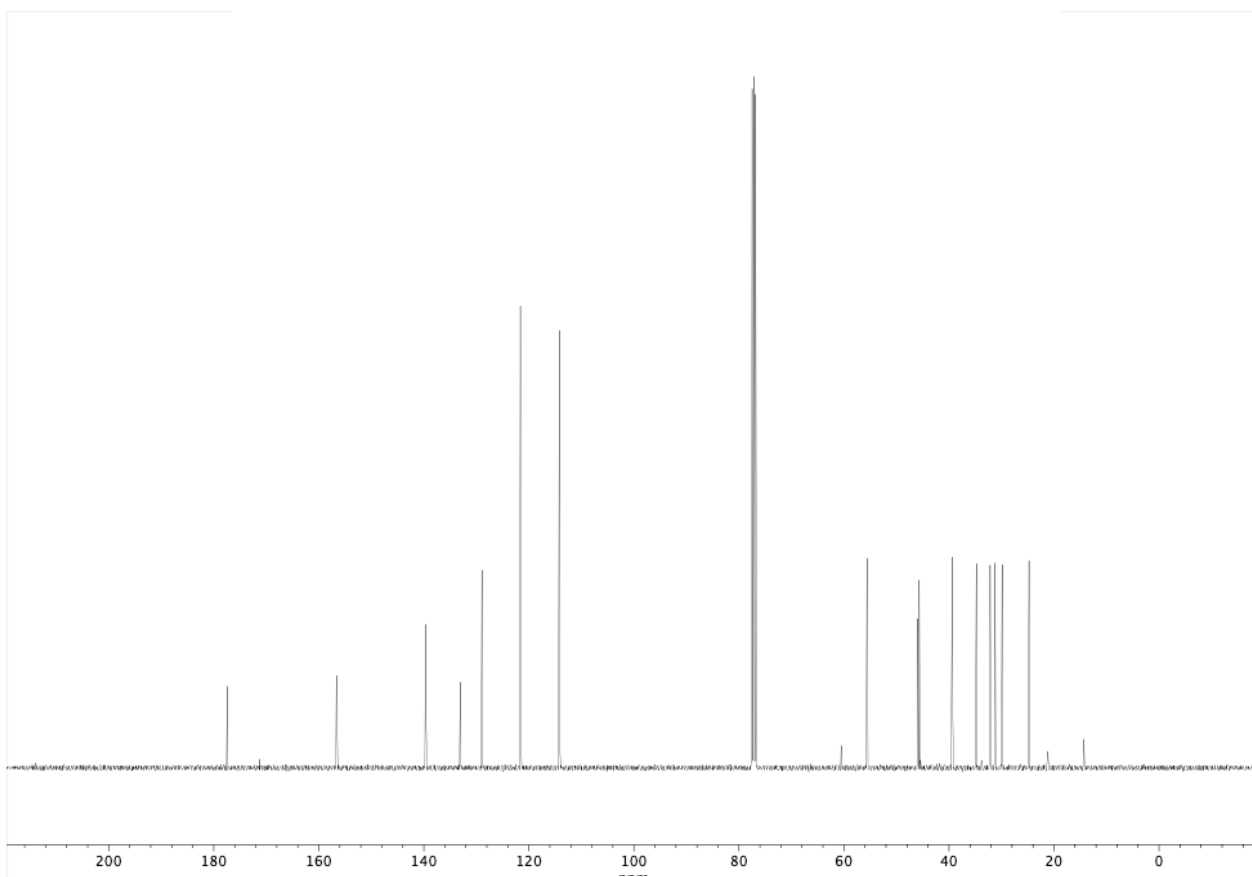


Figure A4.44. ¹³C NMR (100 MHz, CDCl₃) of **92**.

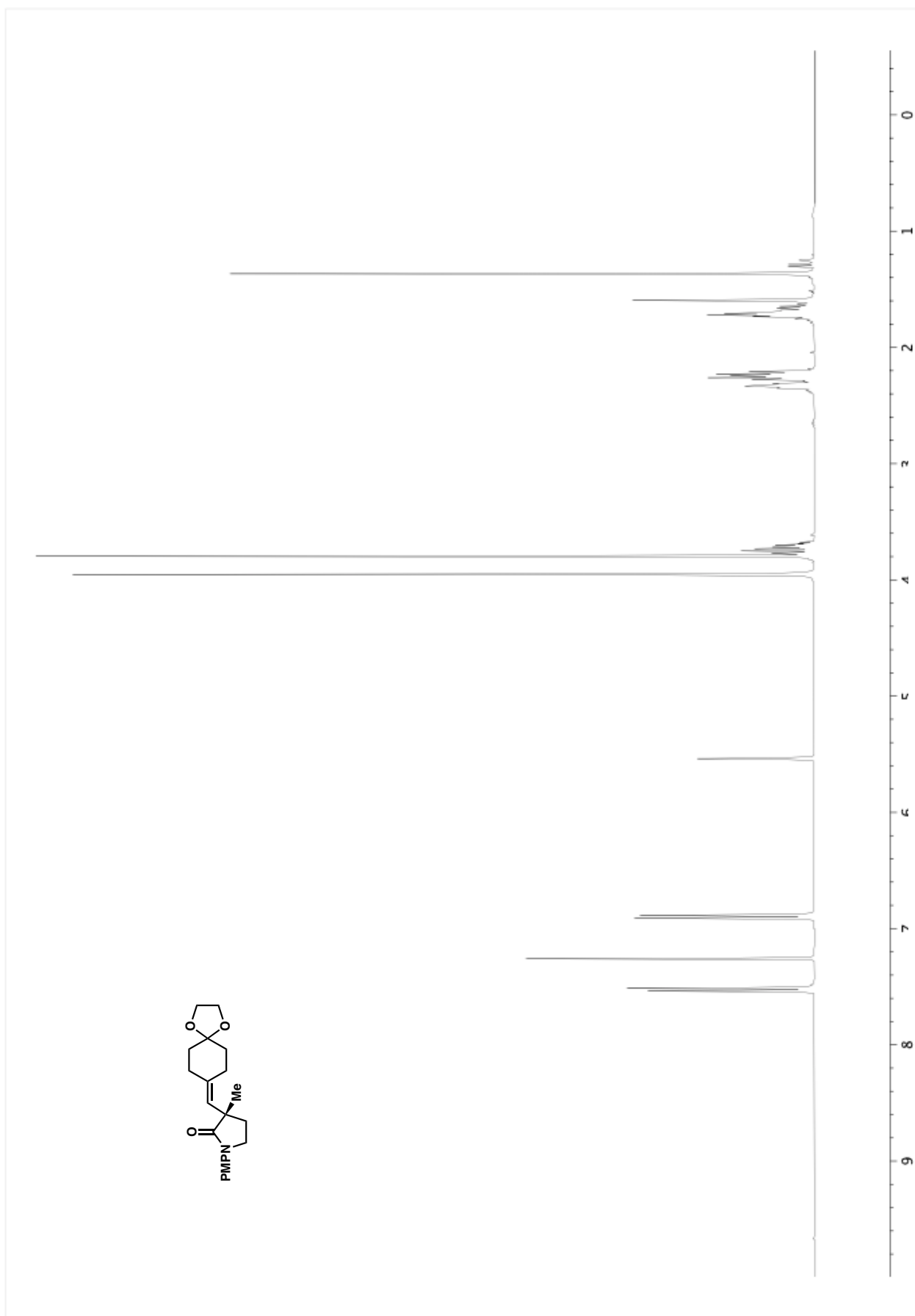


Figure A4.45. ^1H NMR (400 MHz, CDCl_3) of **93**.

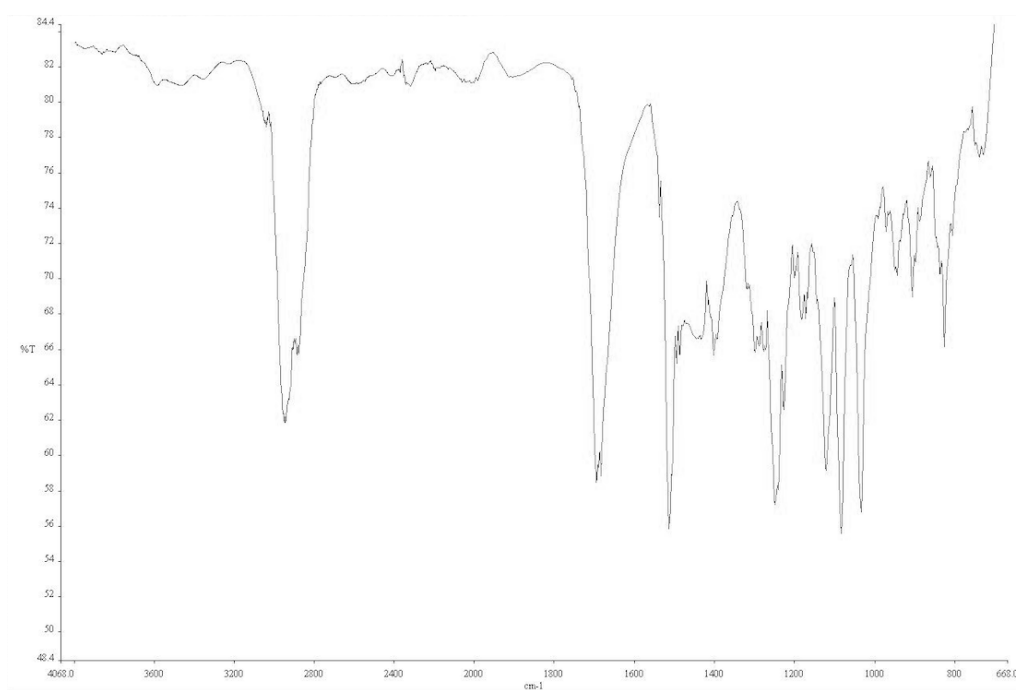


Figure A4.46. Infrared spectrum (Thin Film, NaCl) of **93**.

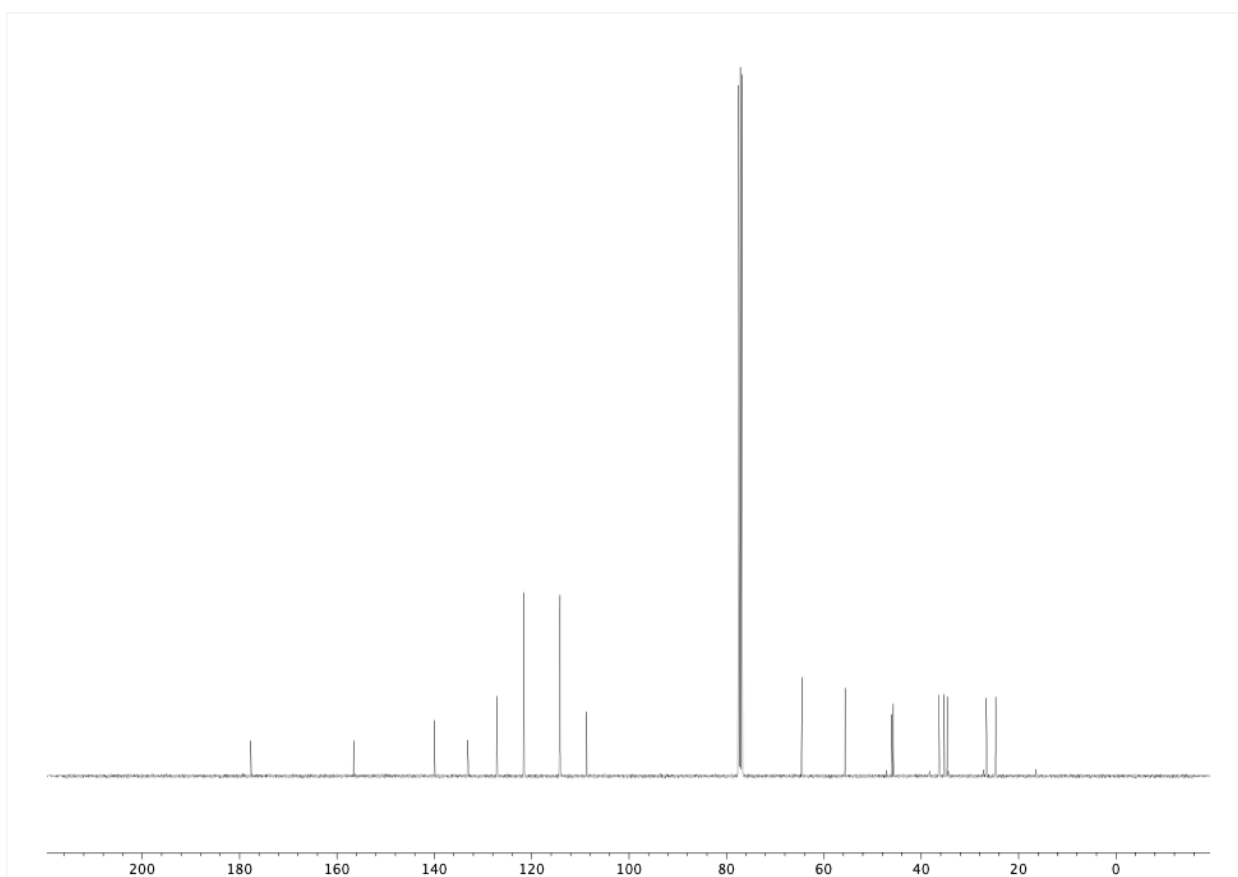


Figure A4.47. ¹³C NMR (100 MHz, CDCl₃) of **93**.

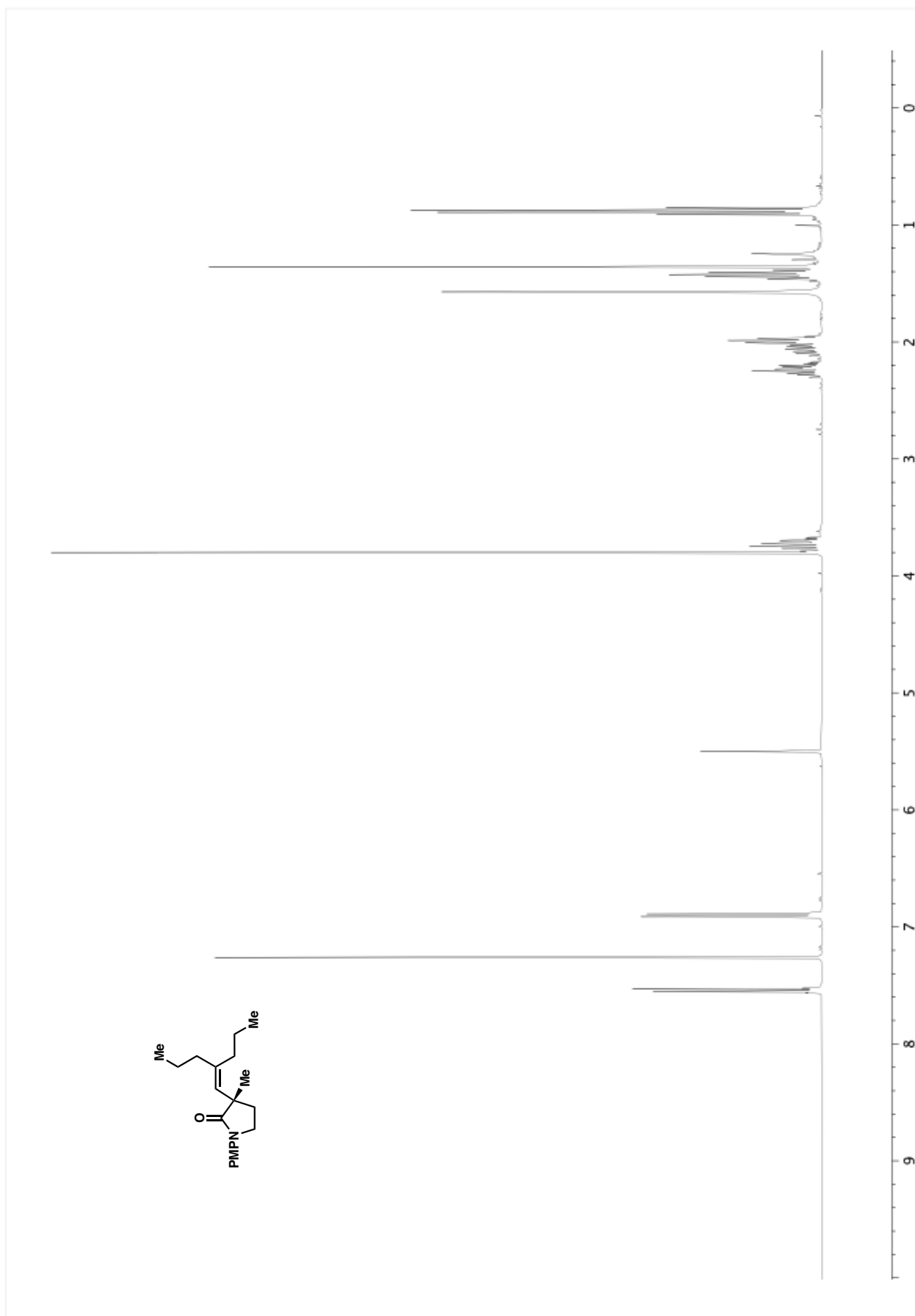


Figure A4.48. ^1H NMR (400 MHz, CDCl_3) of **94**.

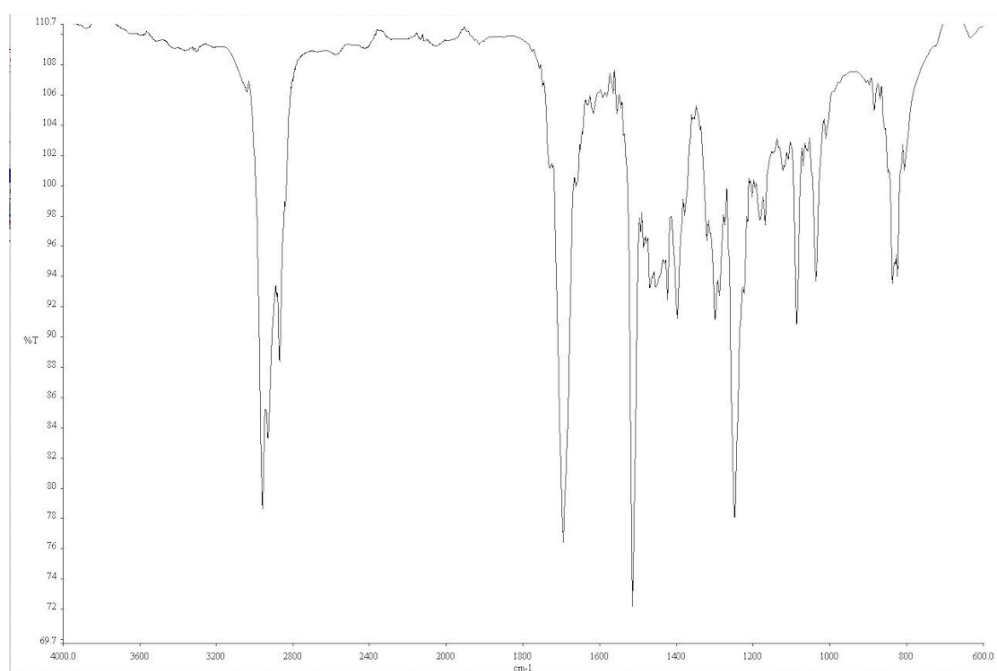


Figure A4.49. Infrared spectrum (Thin Film, NaCl) of **94**.

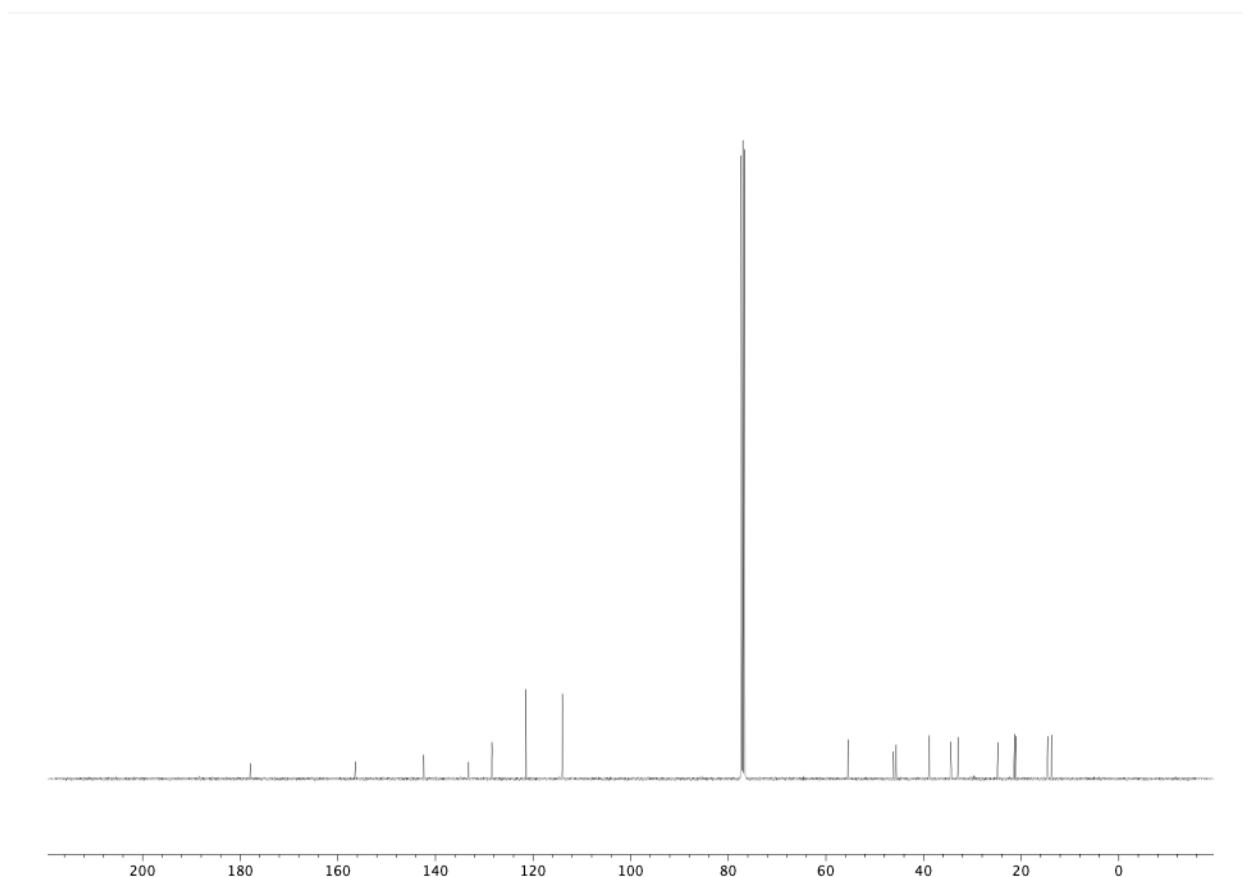


Figure A4.50. ¹³C NMR (100 MHz, CDCl₃) of **94**.

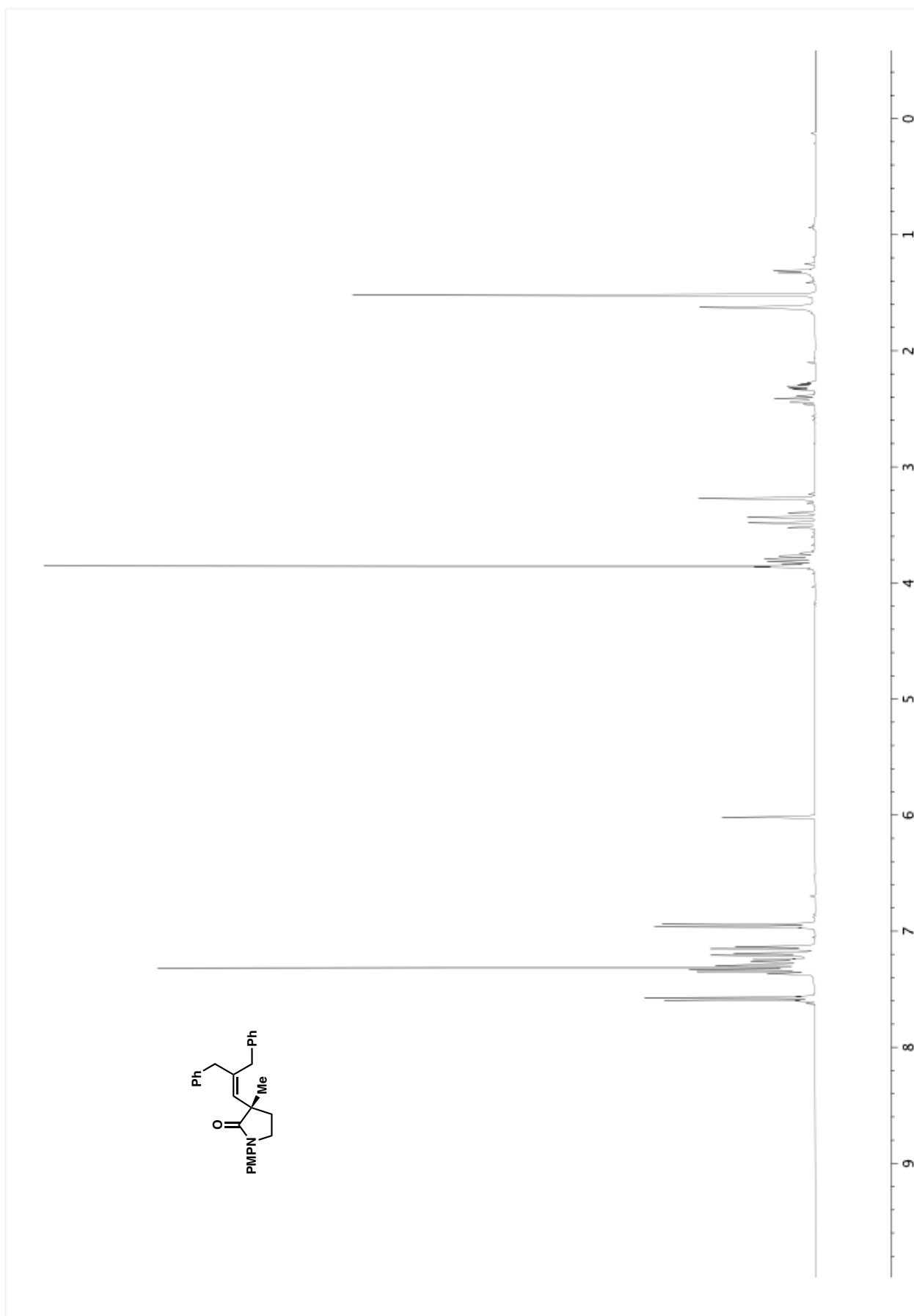


Figure A4.51. ^1H NMR (400 MHz, CDCl_3) of **95**.

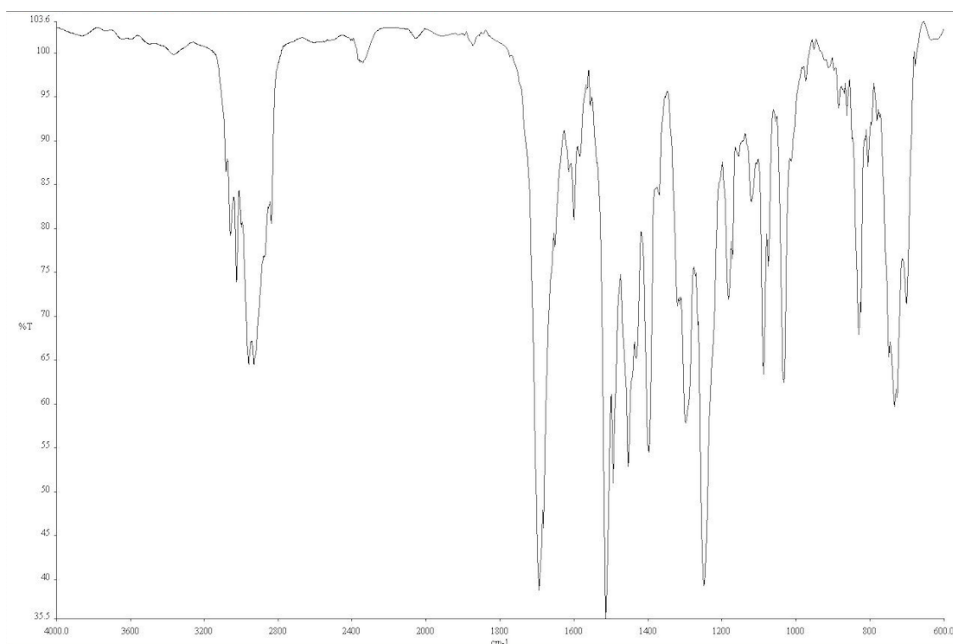


Figure A4.52. Infrared spectrum (Thin Film, NaCl) of **95**.

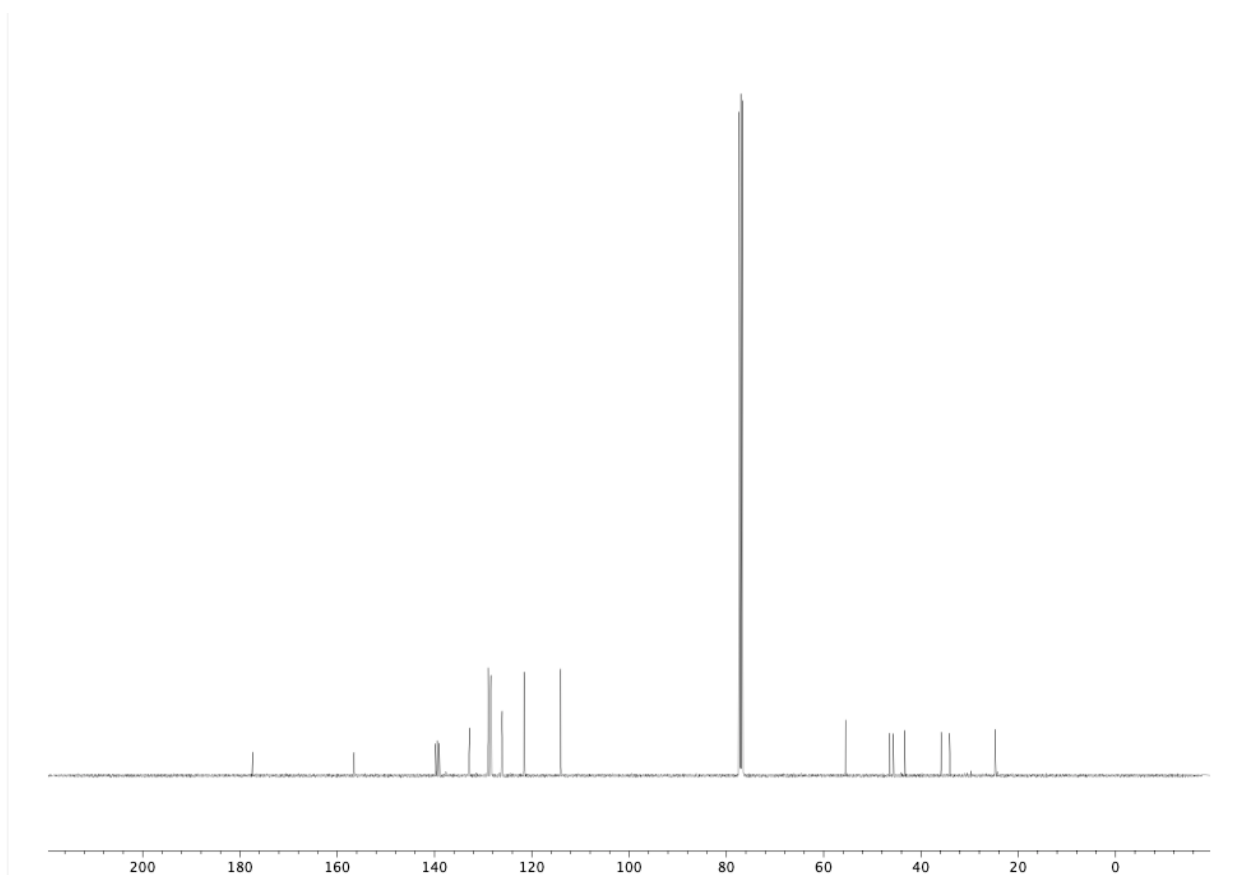


Figure A4.53. ¹³C NMR (100 MHz, CDCl₃) of **95**.

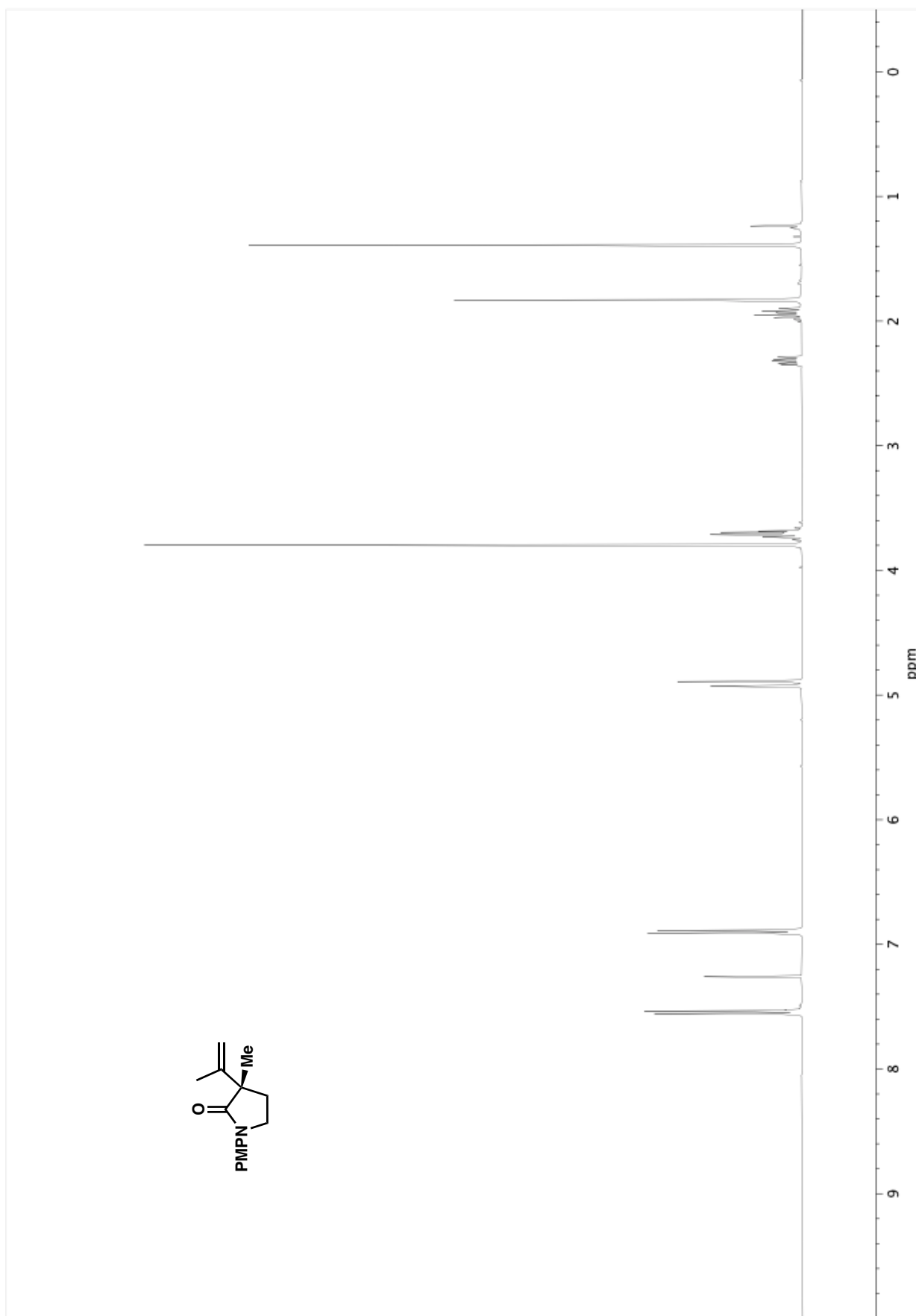


Figure A4.54. ^1H NMR (400 MHz, CDCl_3) of **98**.

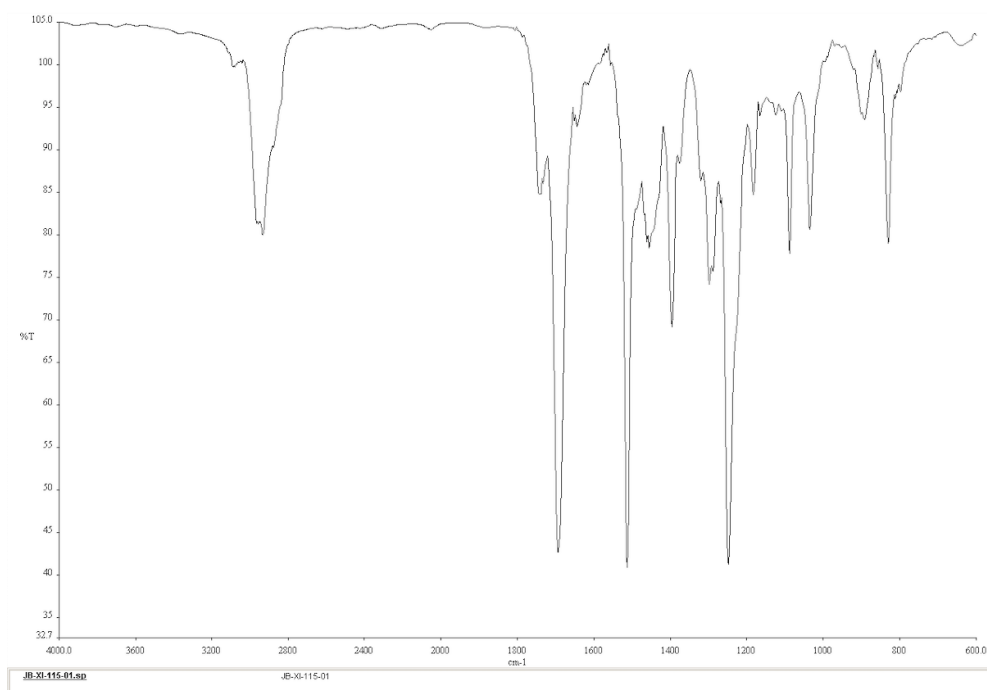


Figure A4.55. Infrared spectrum (Thin Film, NaCl) of **98**.

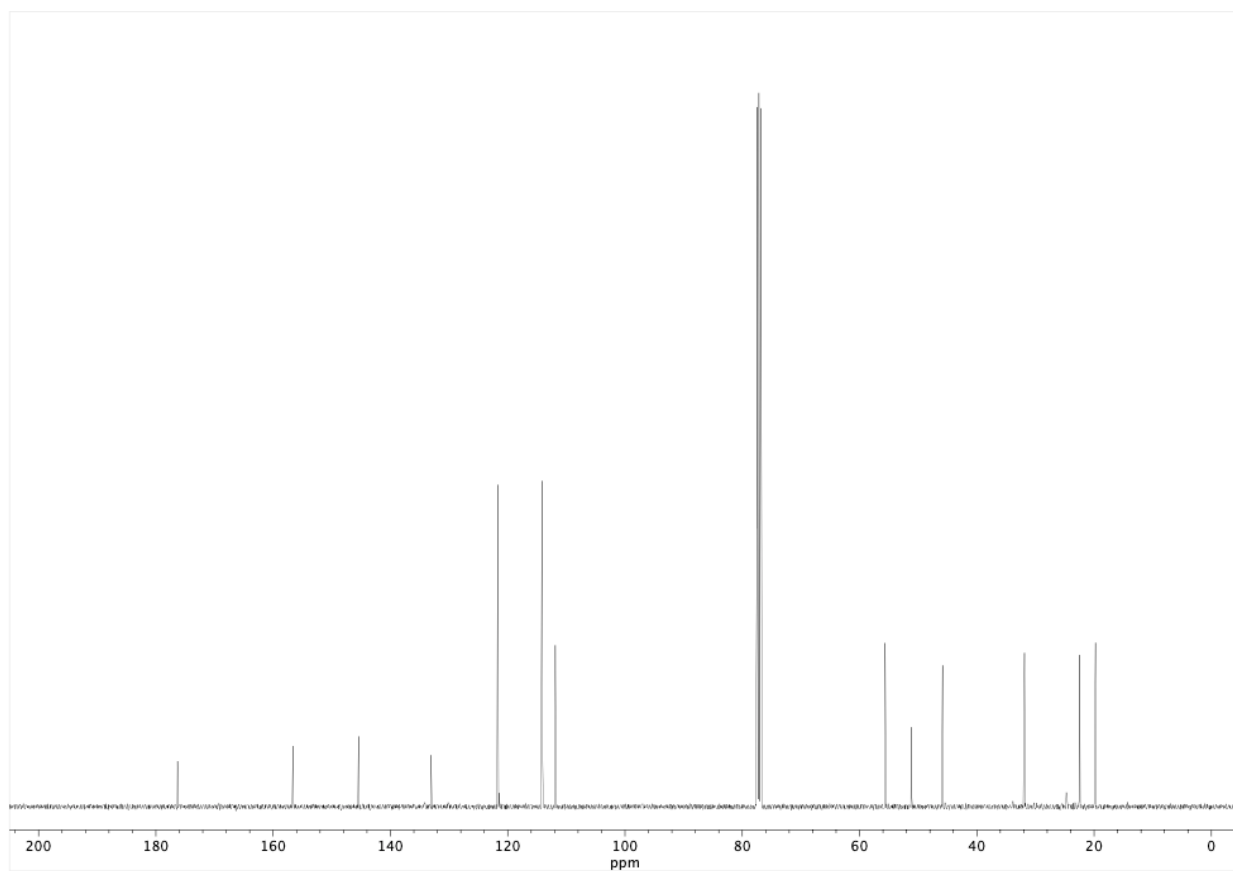


Figure A4.56. ¹³C NMR (100 MHz, CDCl₃) of **98**.

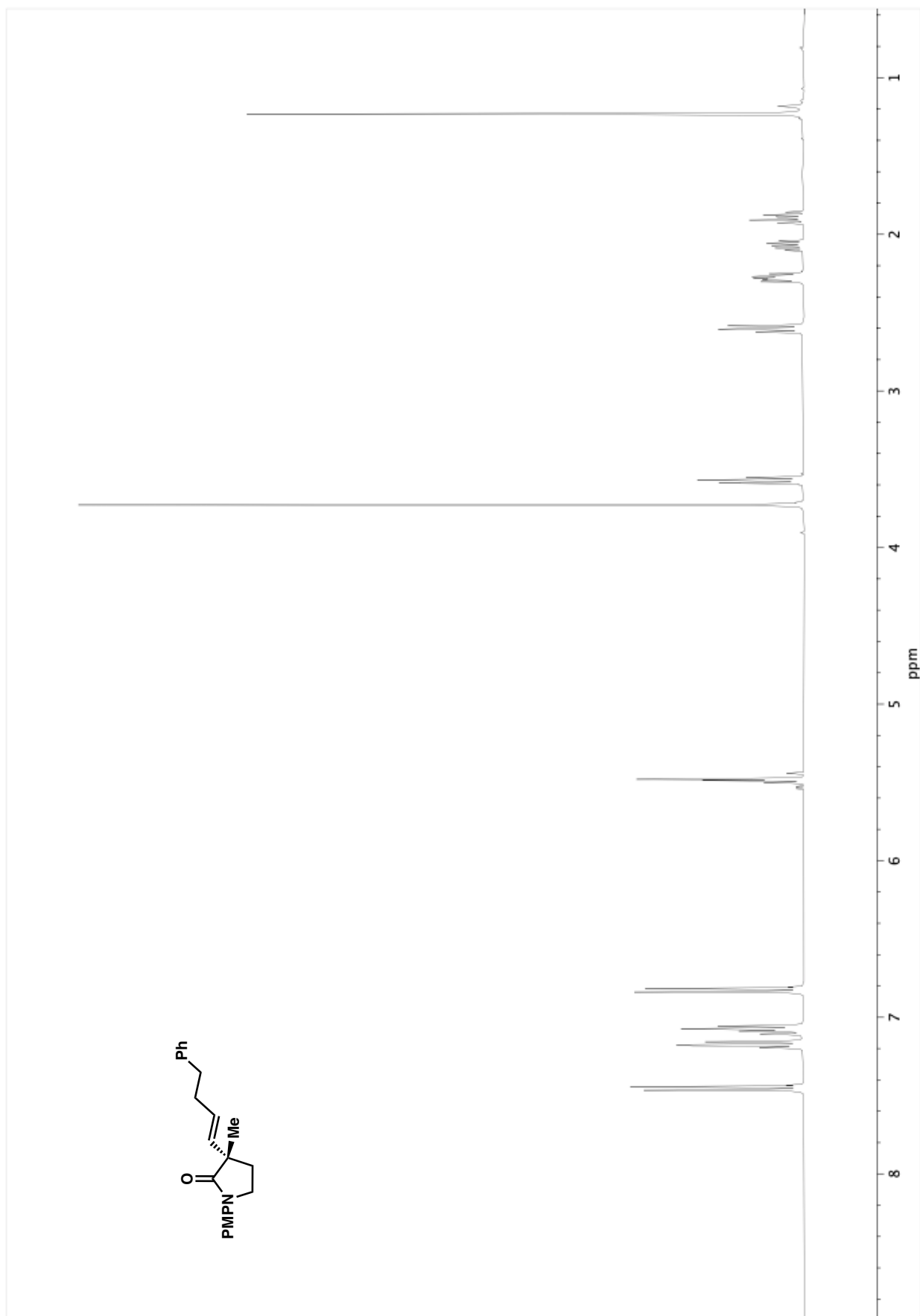


Figure A4.57. ¹H NMR (500 MHz, CDCl₃) of **100**.

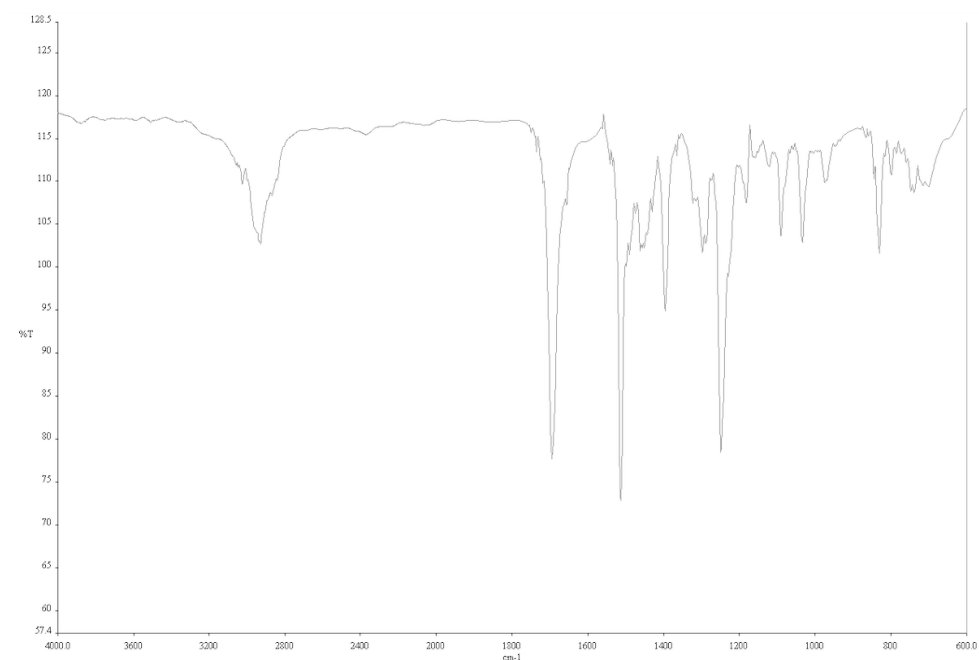


Figure A4.58. Infrared spectrum (Thin Film, NaCl) of

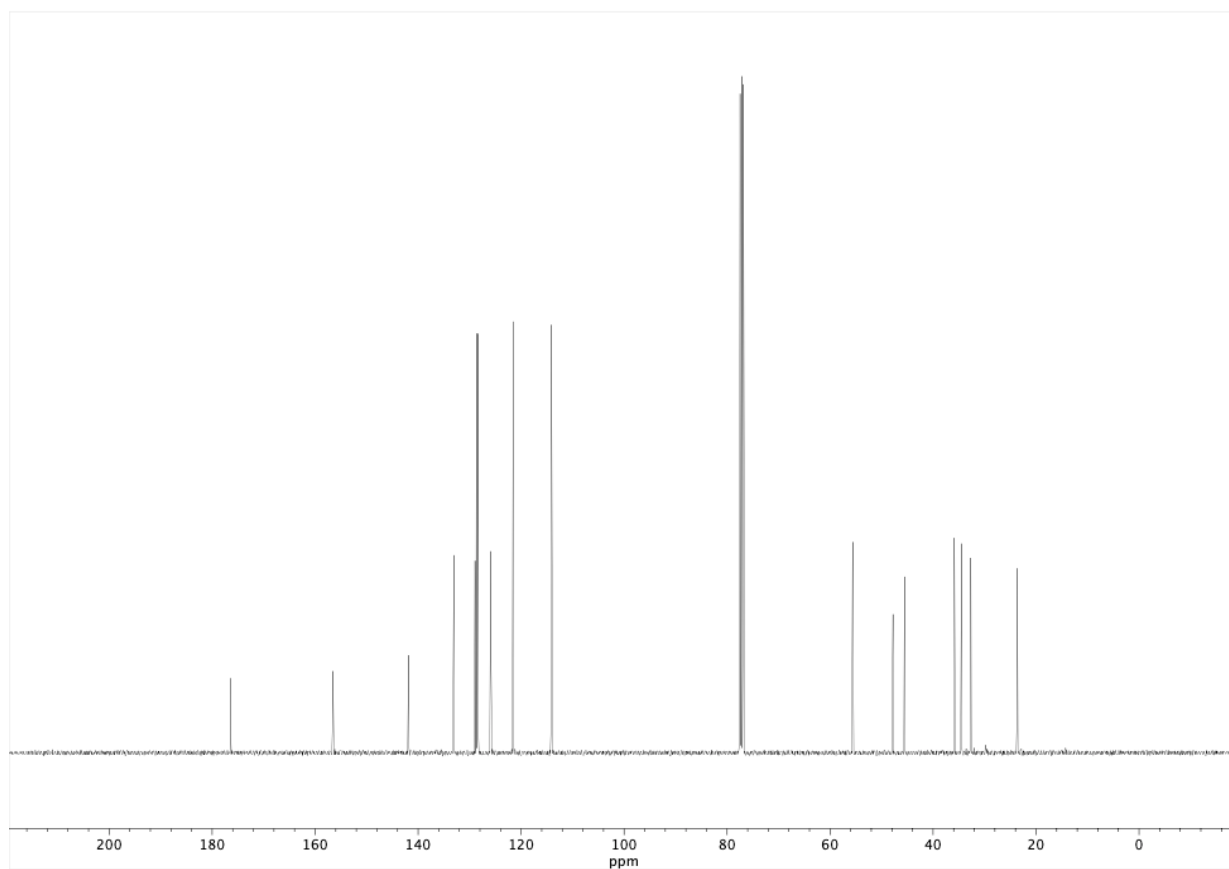


Figure A4.59. ¹³C NMR (100 MHz, CDCl₃) of **100**.



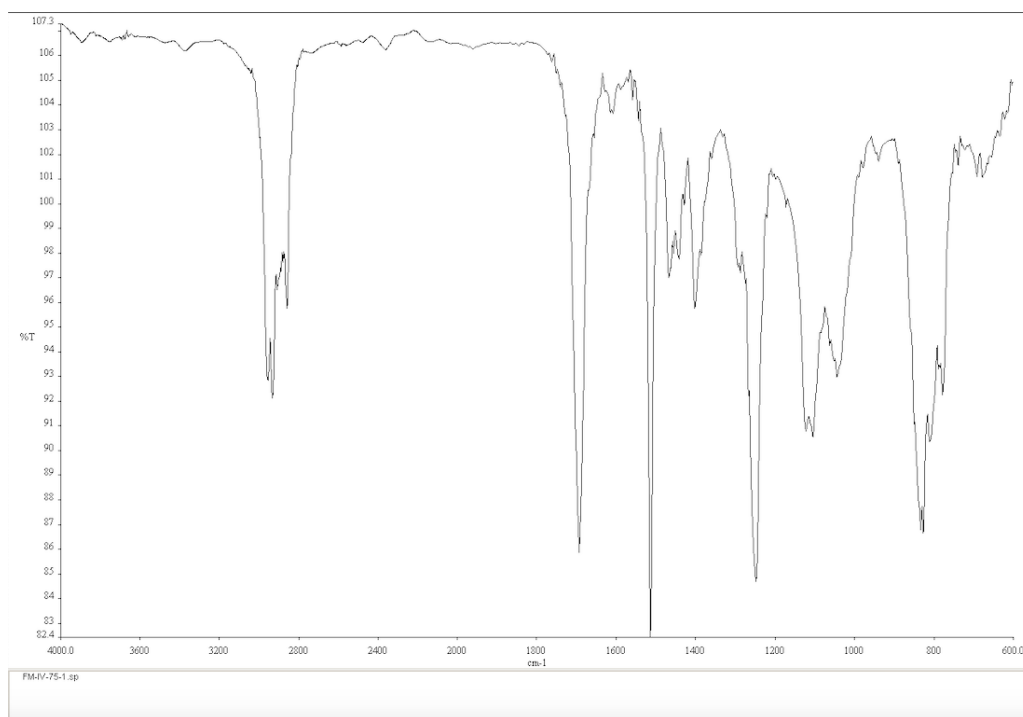


Figure A4.61. Infrared spectrum (Thin Film, NaCl) of **96**.

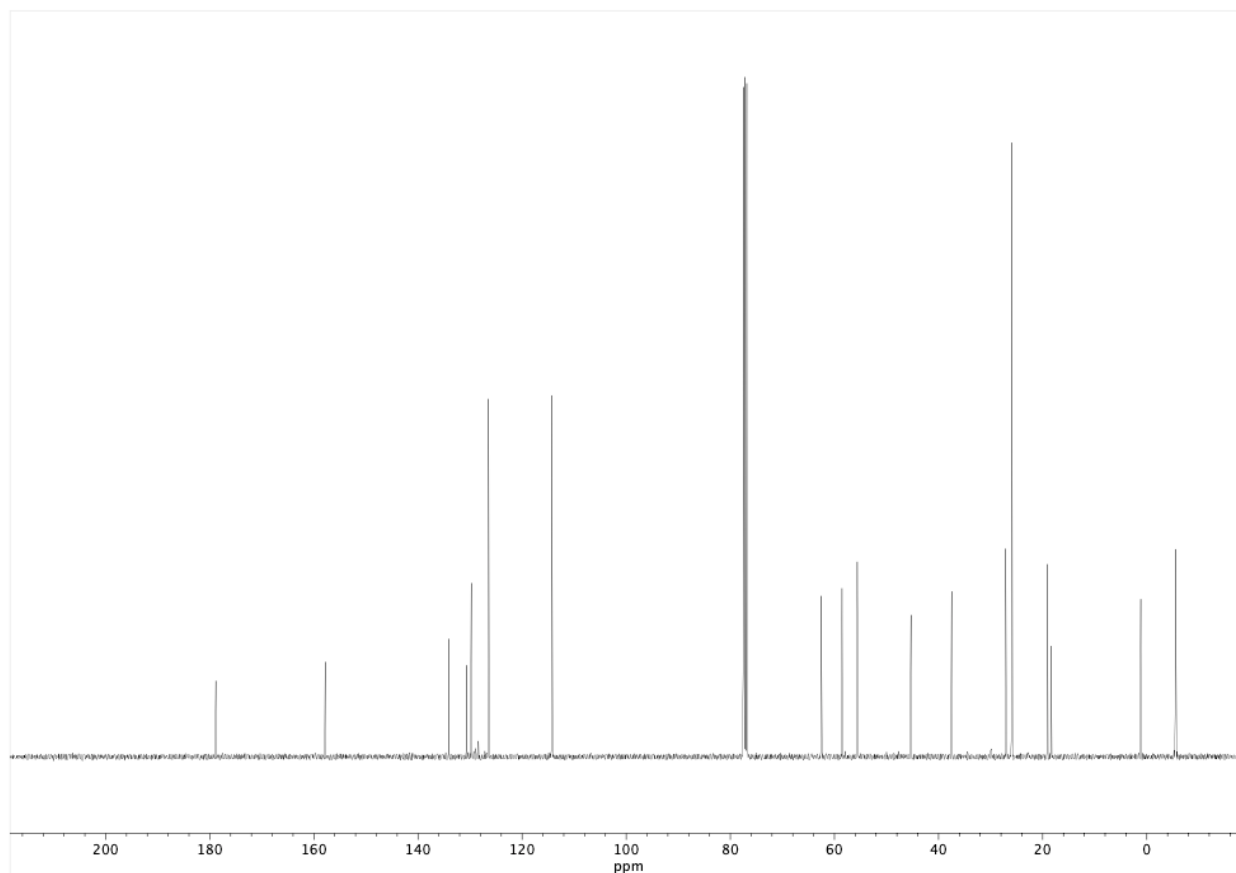


Figure A4.62. ^{13}C NMR (100 MHz, CDCl_3) of **96**.

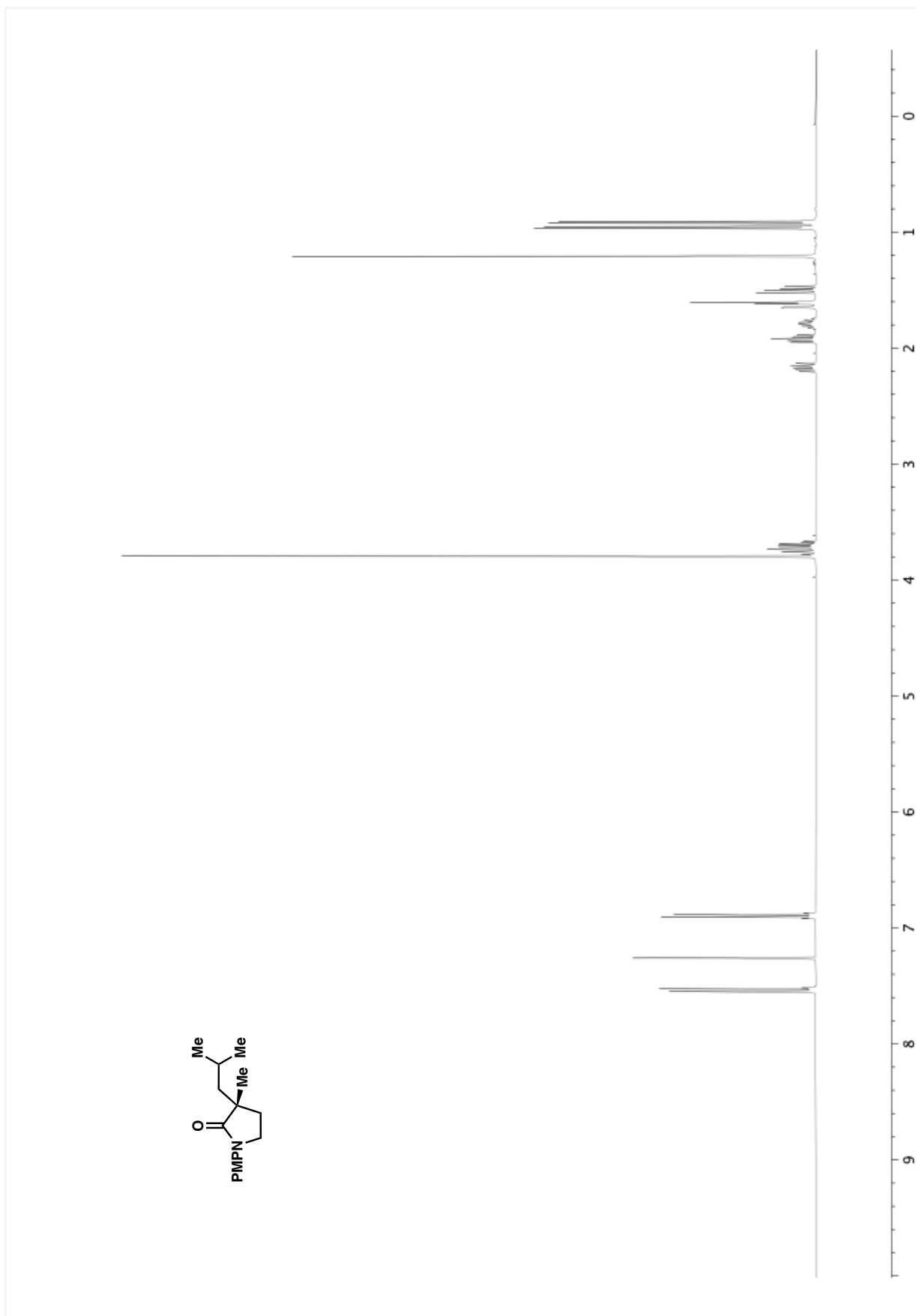


Figure A4.63. ^1H NMR (400 MHz, CDCl_3) of **101**.

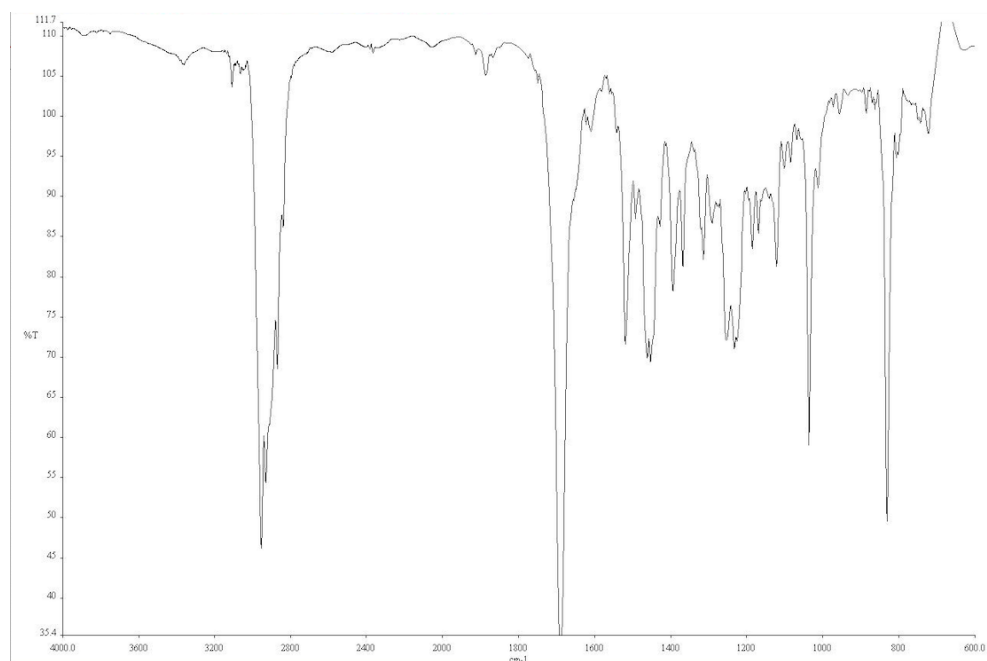


Figure A4.64. Infrared spectrum (Thin Film, NaCl) of **101**.

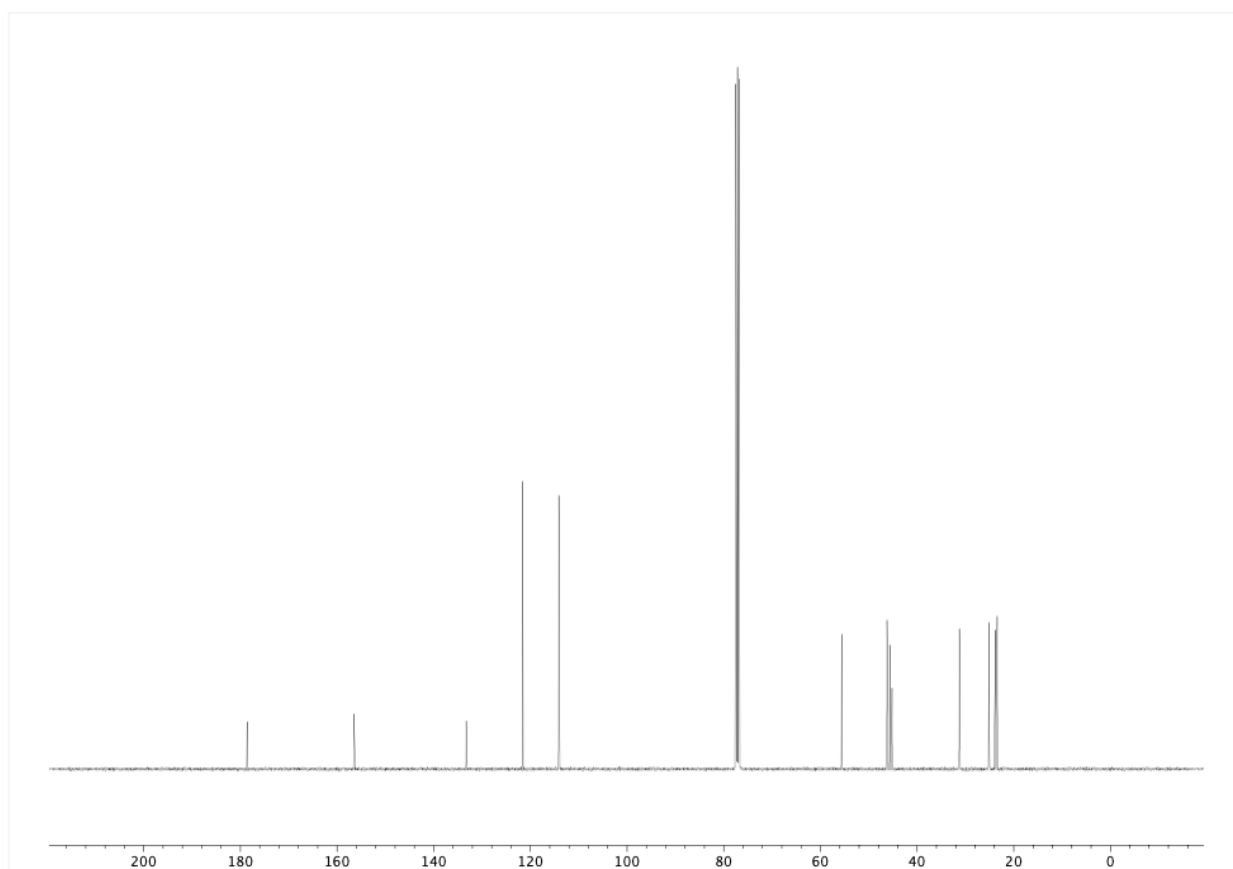


Figure A4.65. ^{13}C NMR (100 MHz, CDCl_3) of **101**.

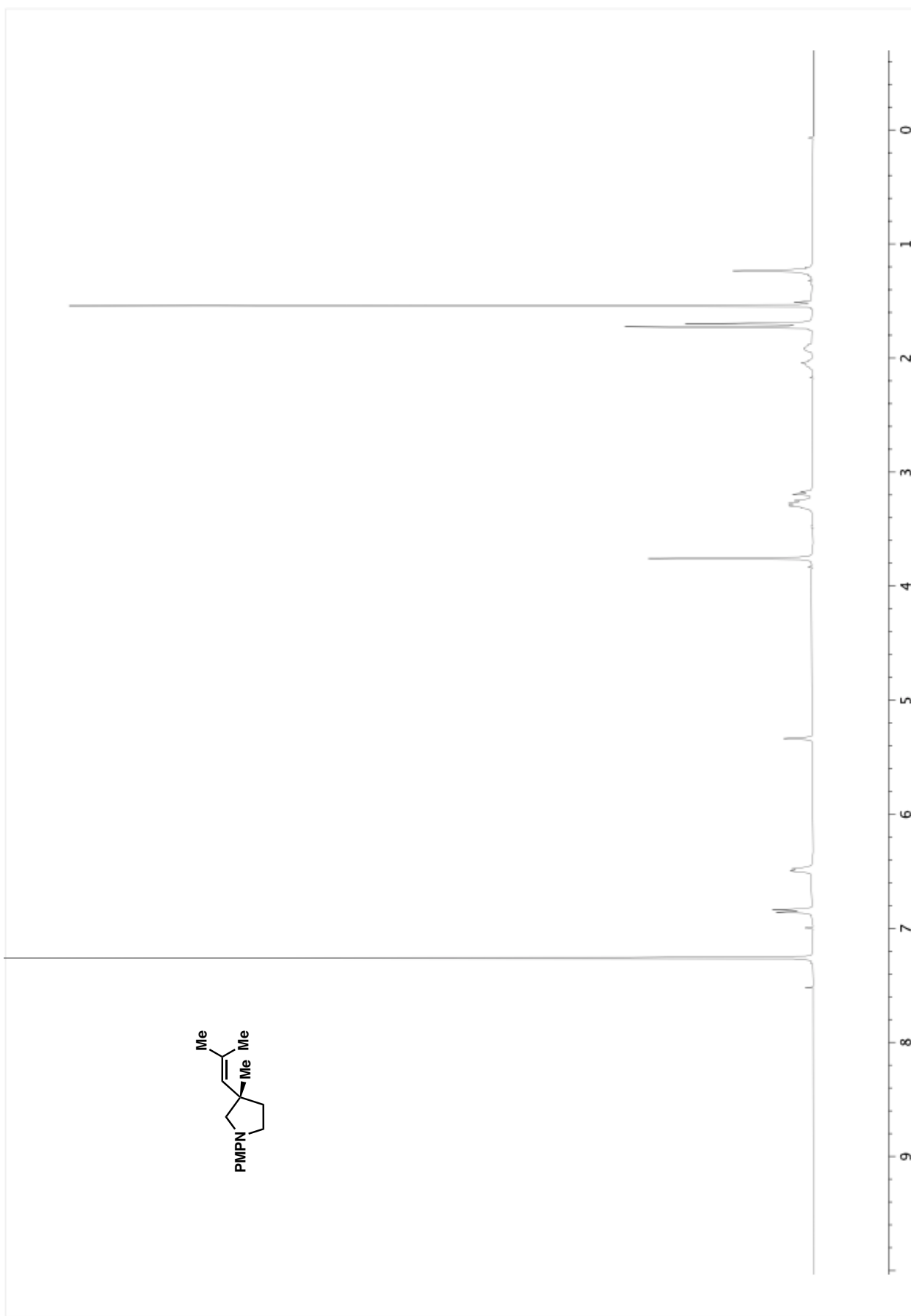


Figure A4.66. ^1H NMR (400 MHz, CDCl_3) of **102**.

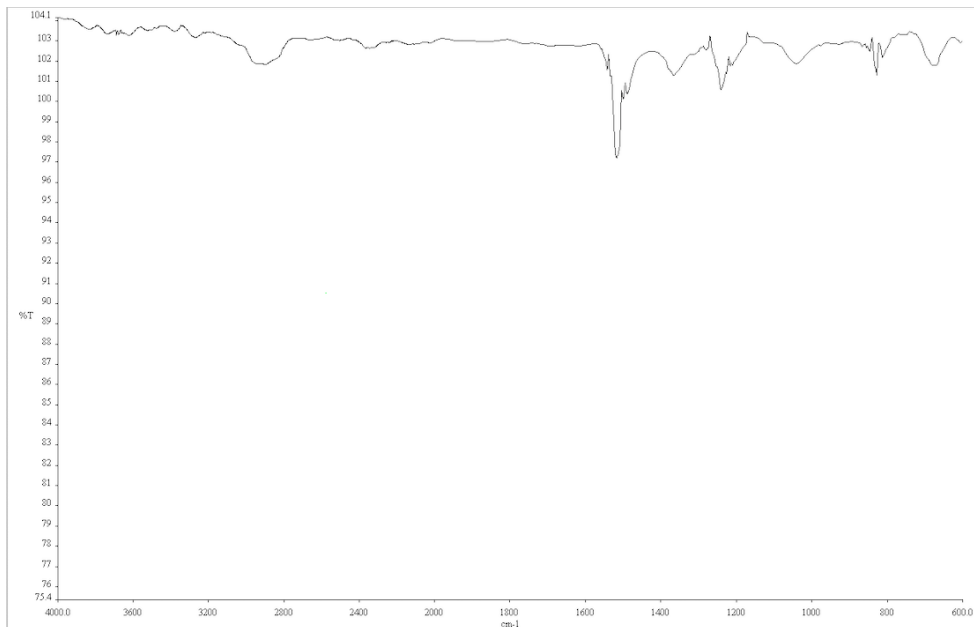


Figure A4.67. Infrared spectrum (Thin Film, NaCl) of **102**.

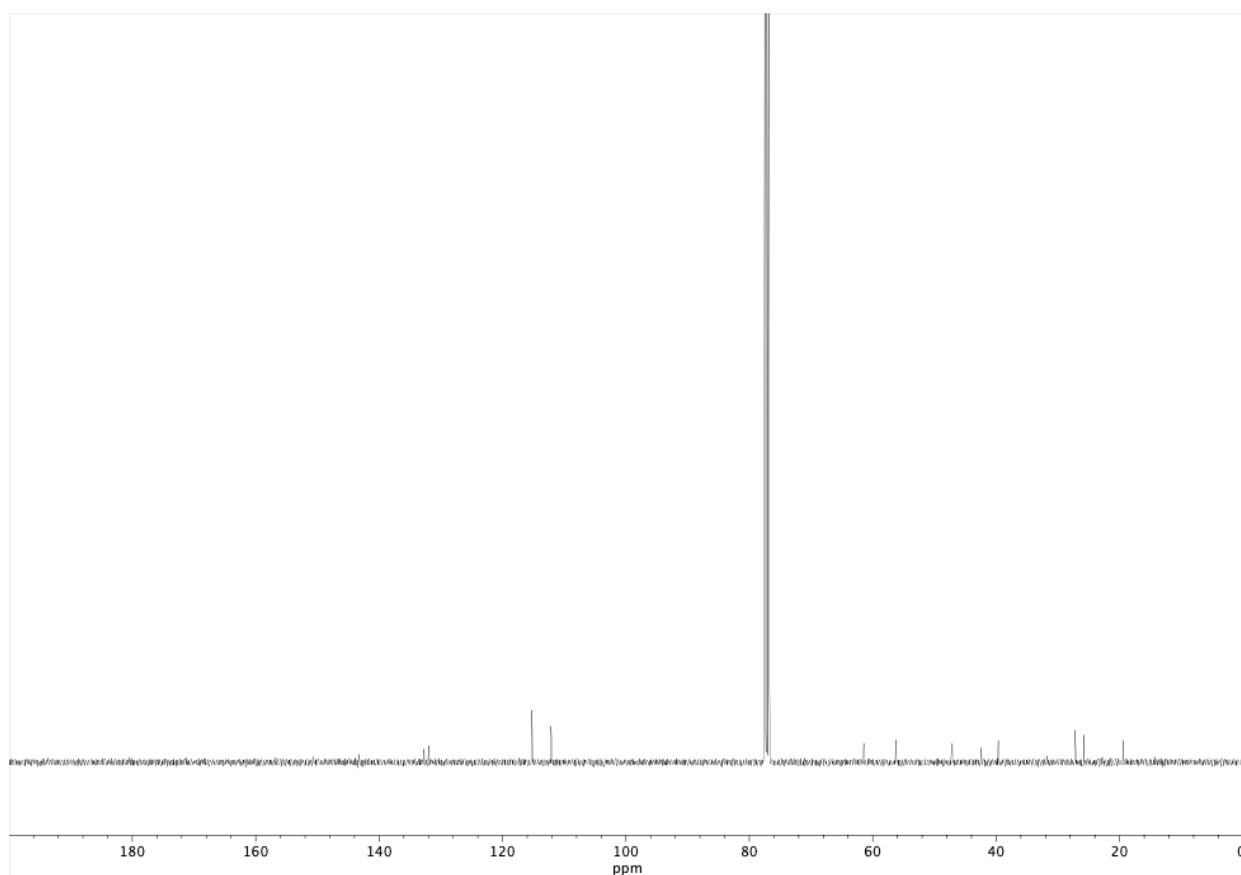


Figure A4.68. ¹³C NMR (100 MHz, CDCl₃) of **102**.

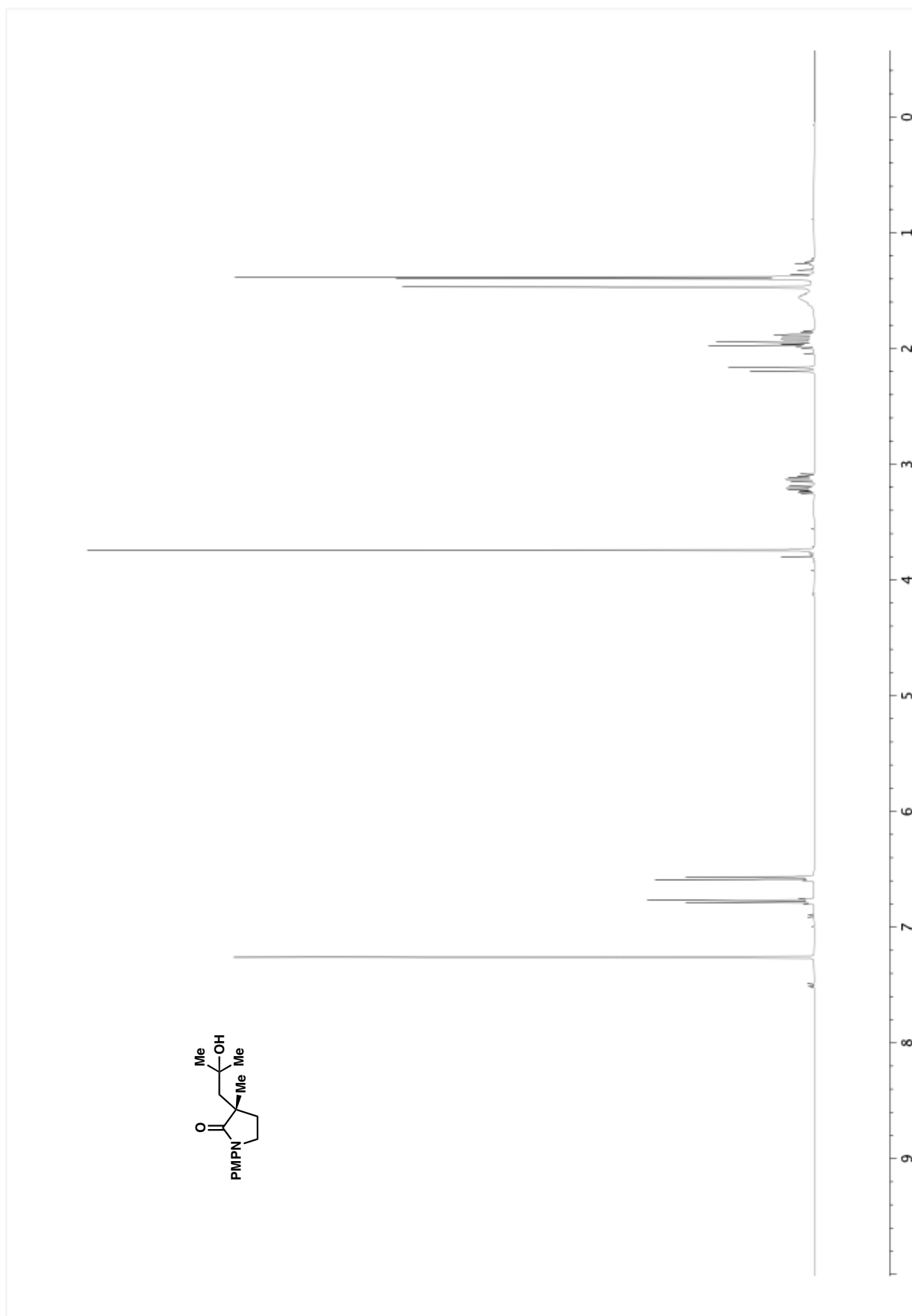


Figure A4.69. ^1H NMR (400 MHz, CDCl_3) of **103**.

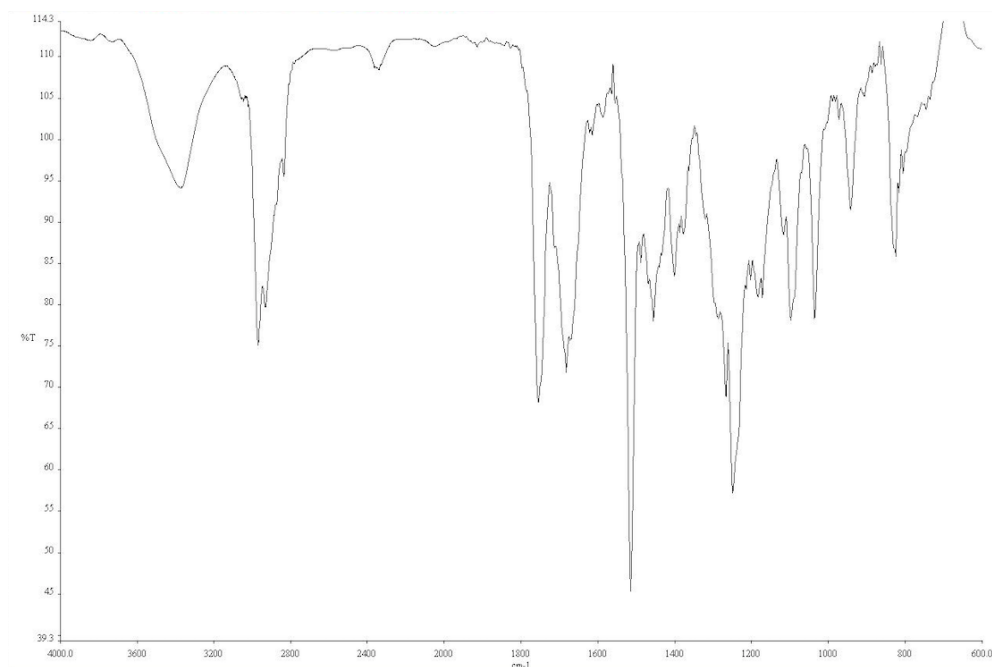


Figure A4.70. Infrared spectrum (Thin Film, NaCl) of **103**.

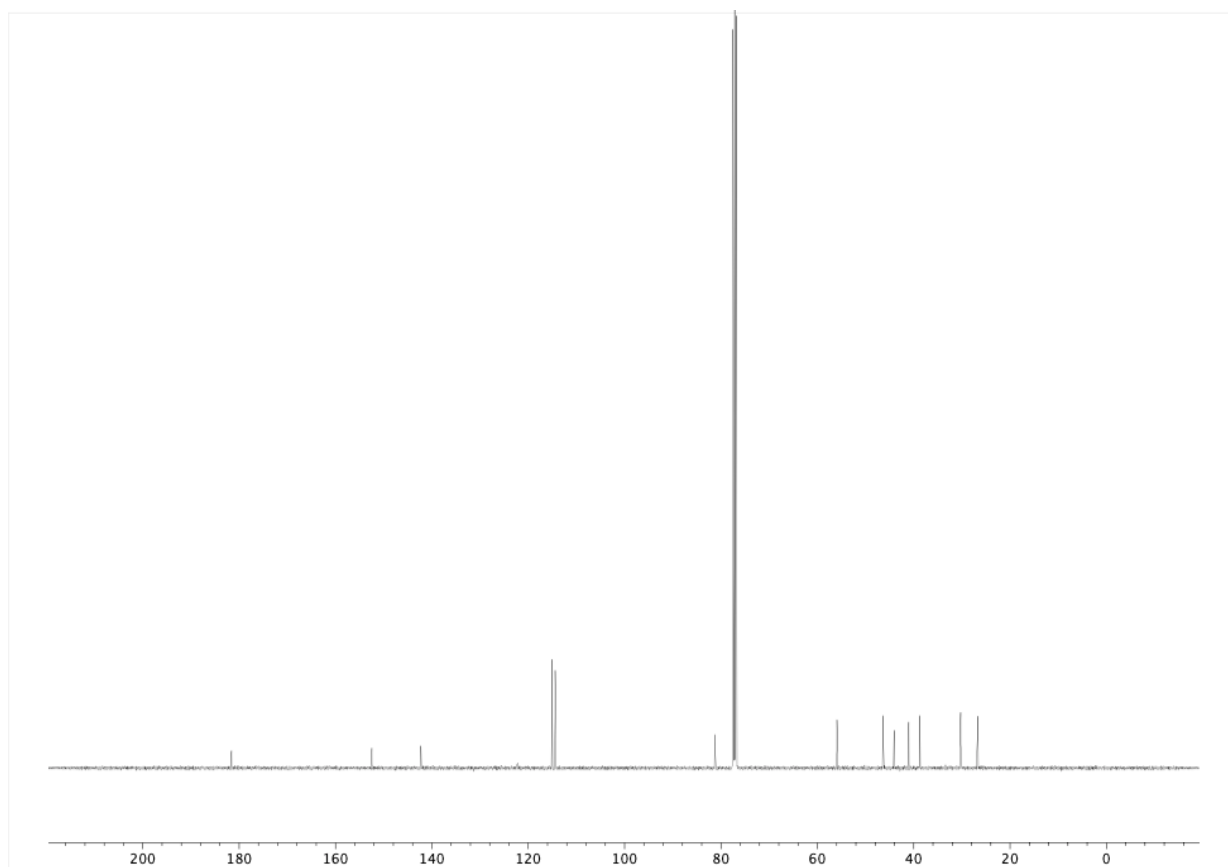


Figure A4.71. ¹³C NMR (100 MHz, CDCl₃) of **103**.

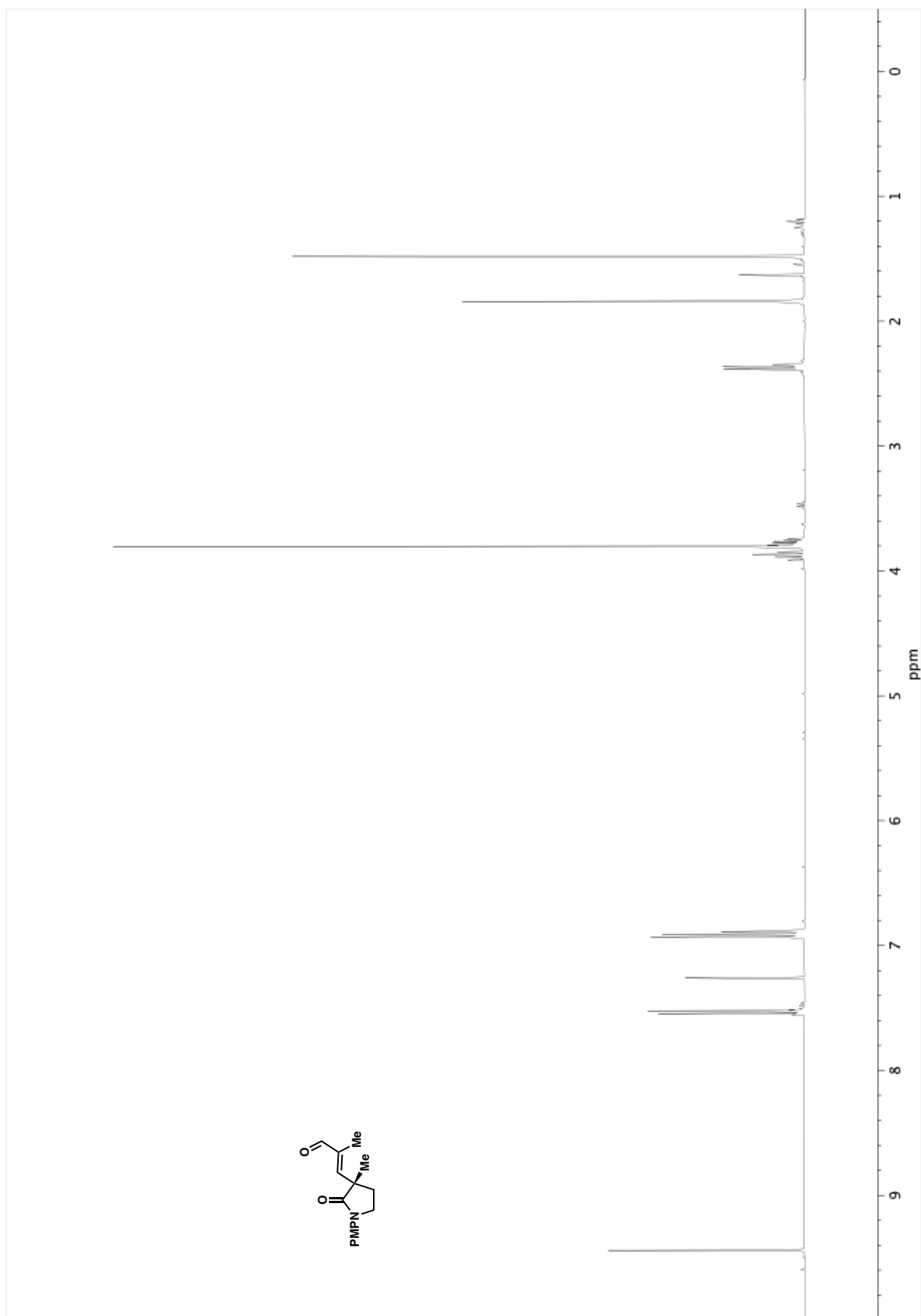


Figure A4.72. ^1H NMR (400 MHz, CDCl_3) of **104**.

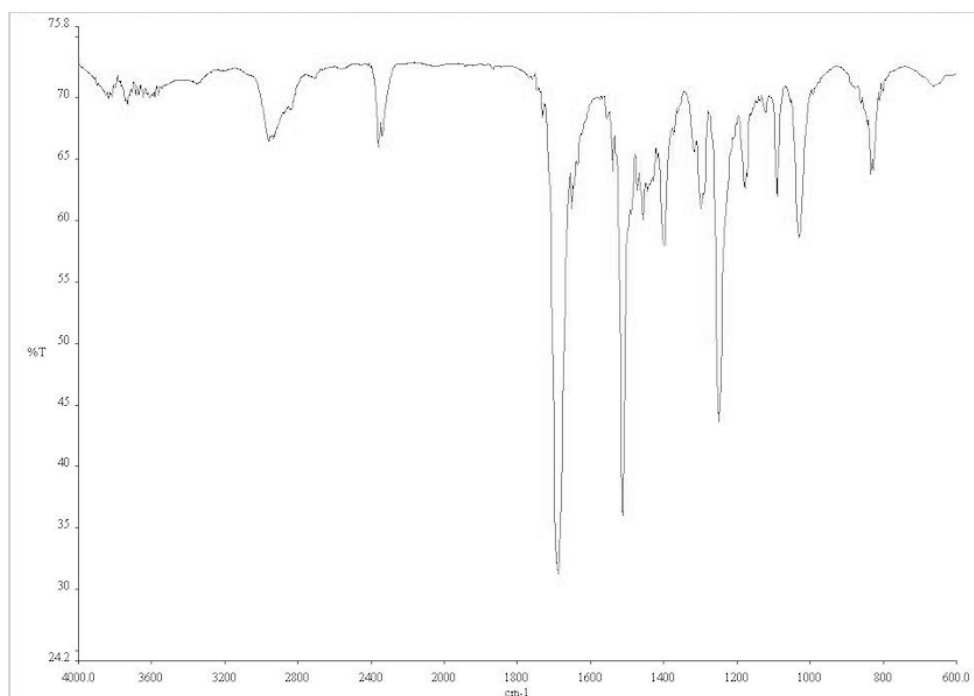


Figure A4.73. Infrared spectrum (Thin Film, NaCl) of **104**.

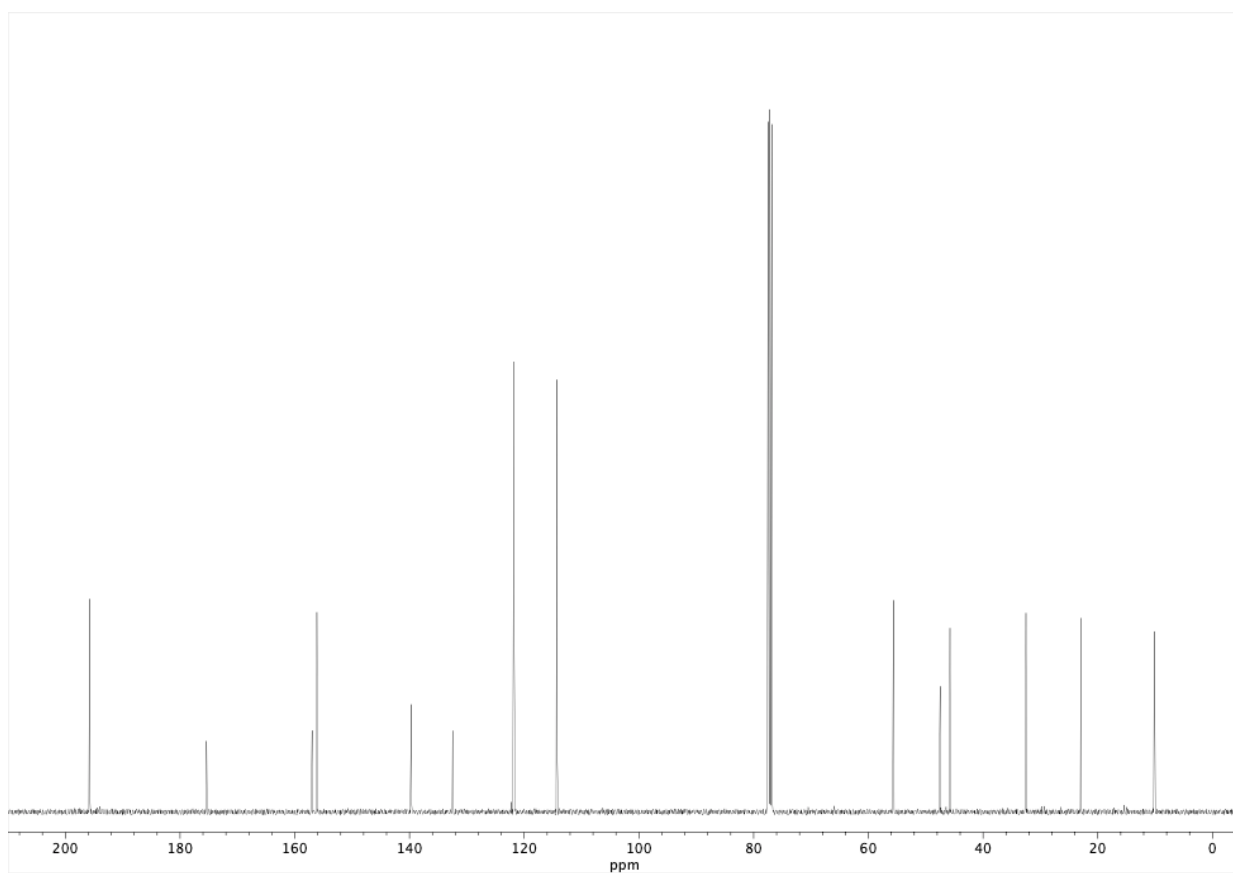


Figure A4.74. ¹³C NMR (100 MHz, CDCl₃) of **104**.

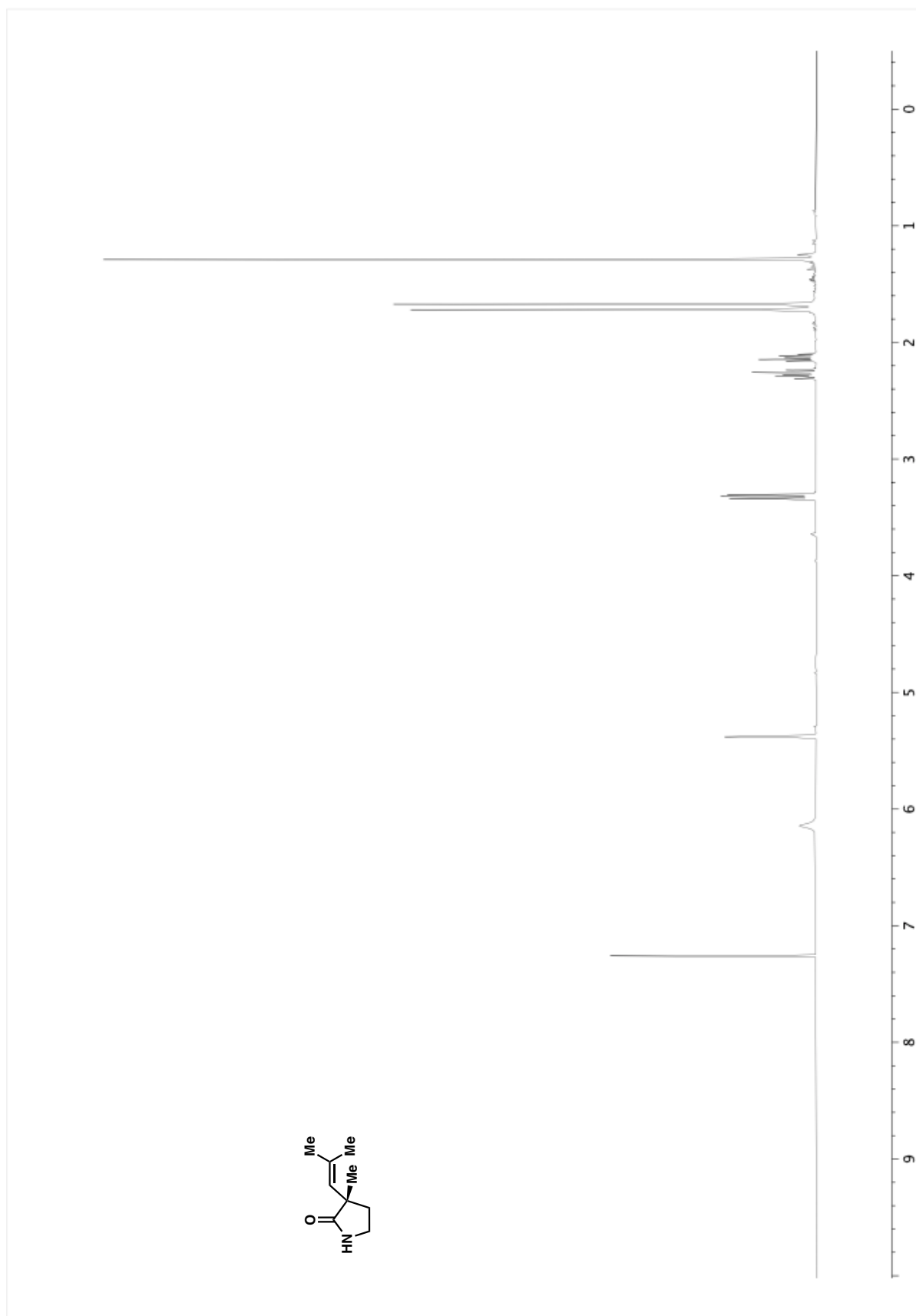


Figure A4.75. ¹H NMR (400 MHz, CDCl₃) of **105**.

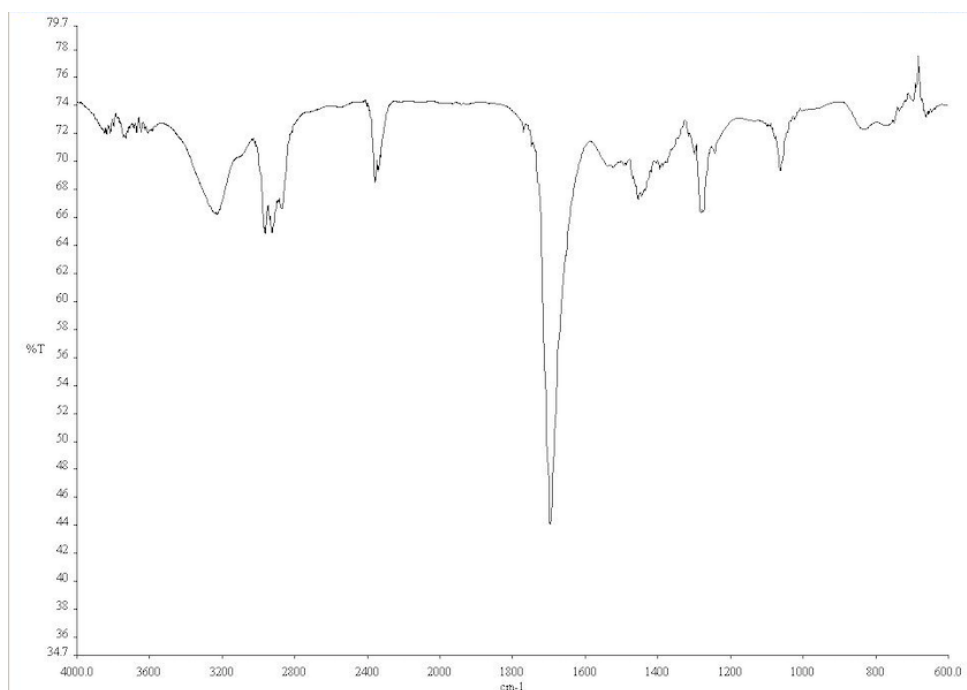


Figure A4.76. Infrared spectrum (Thin Film, NaCl) of **105**.

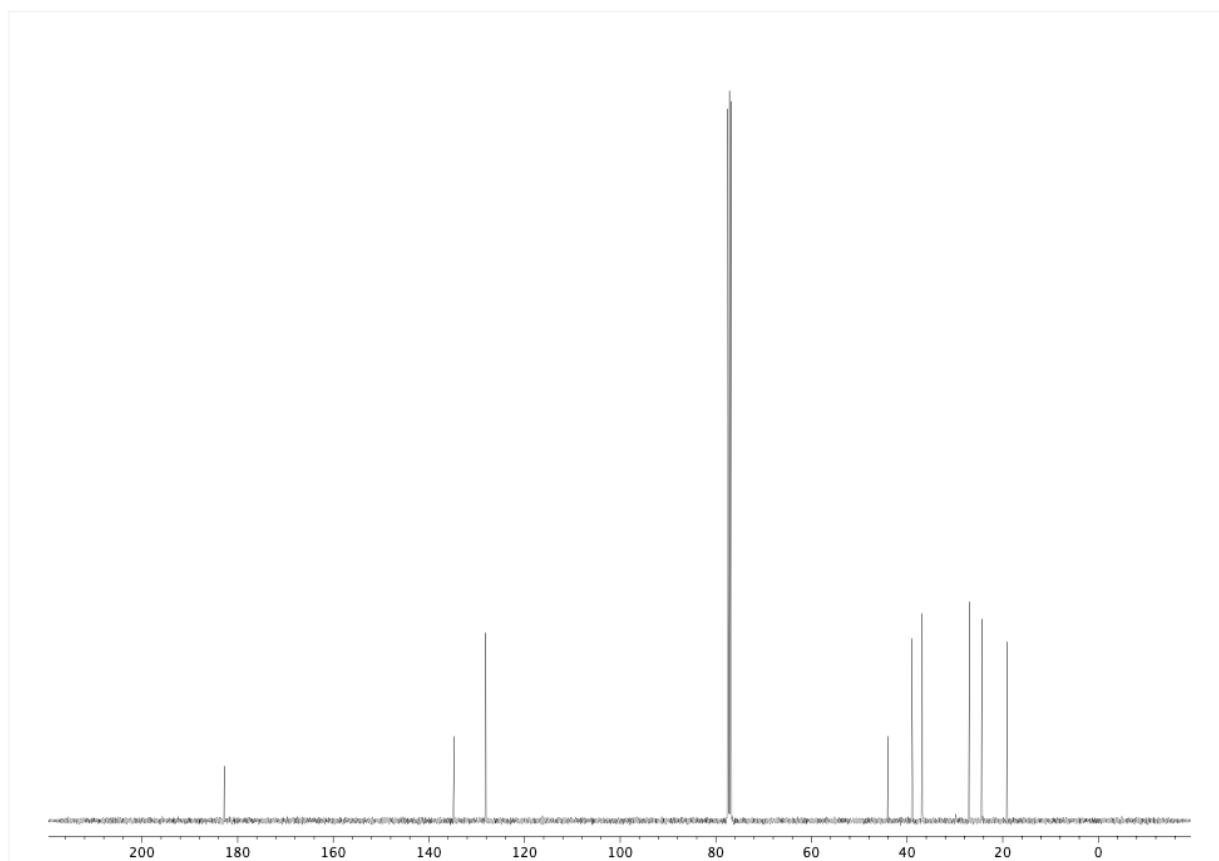


Figure A4.77. ¹³C NMR (100 MHz, CDCl₃) of **105**.

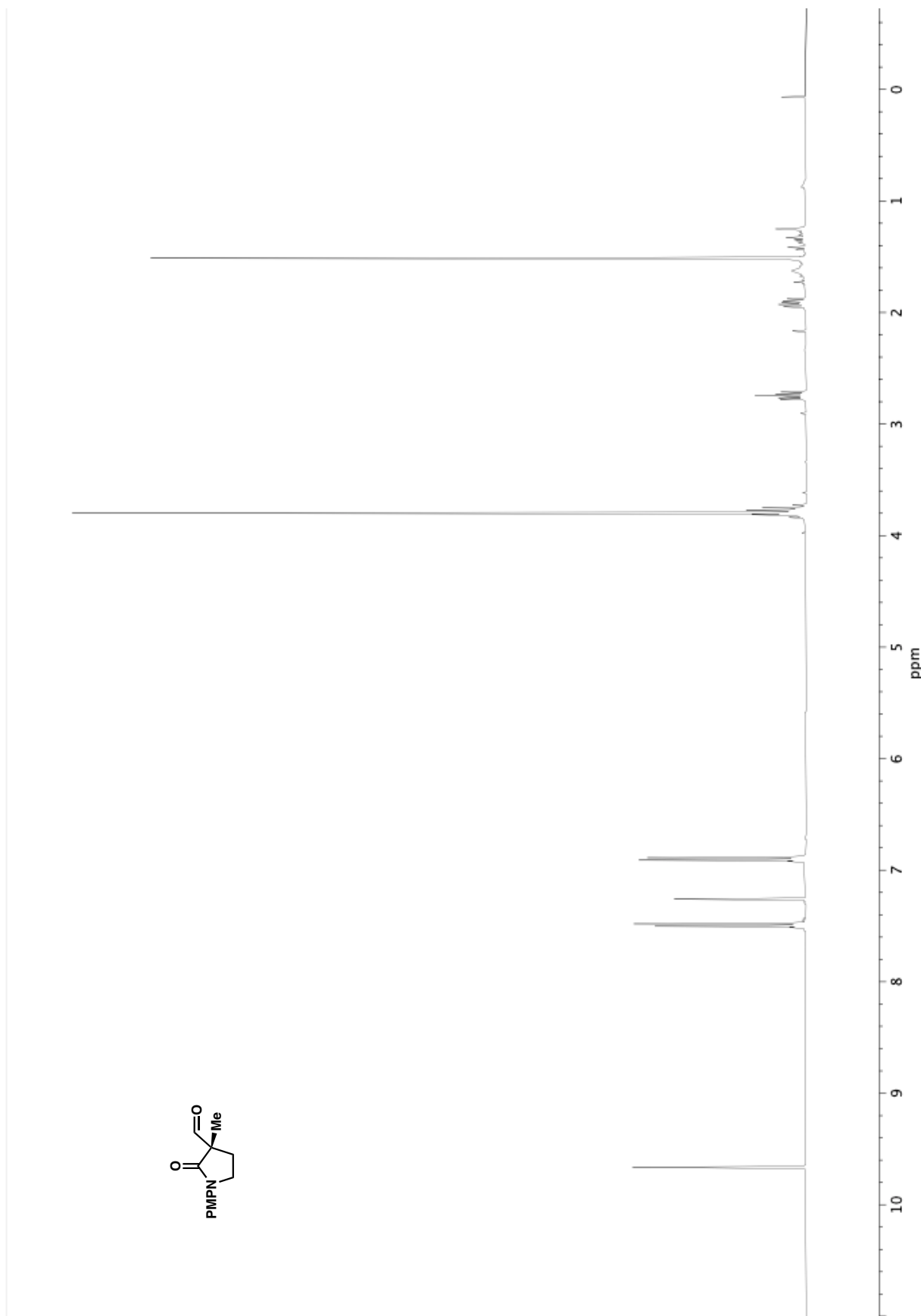


Figure A4.78. ^1H NMR (400 MHz, CDCl_3) of **106**.

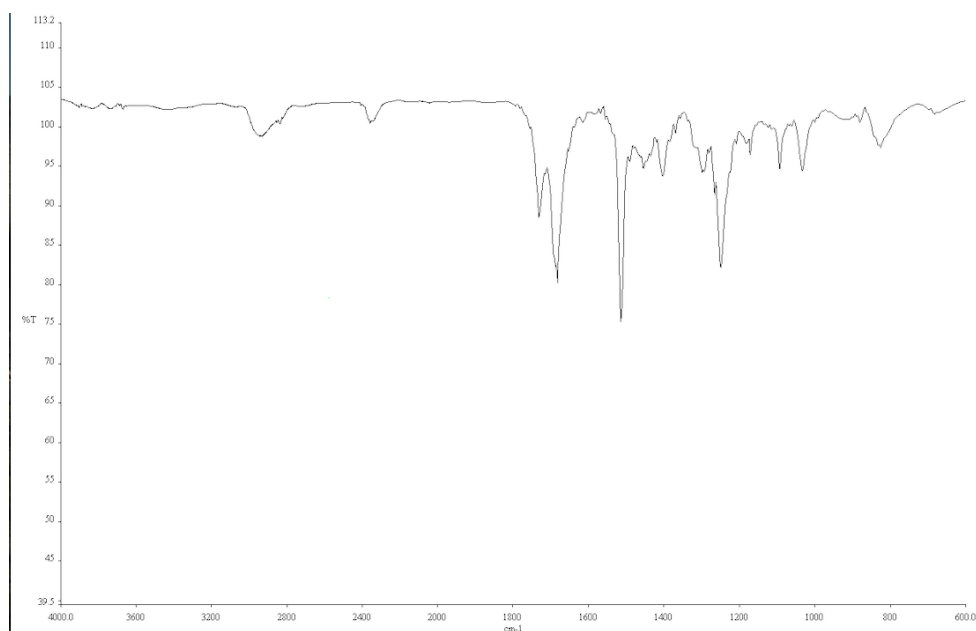


Figure A4.79. Infrared spectrum (Thin Film, NaCl) of **106**.

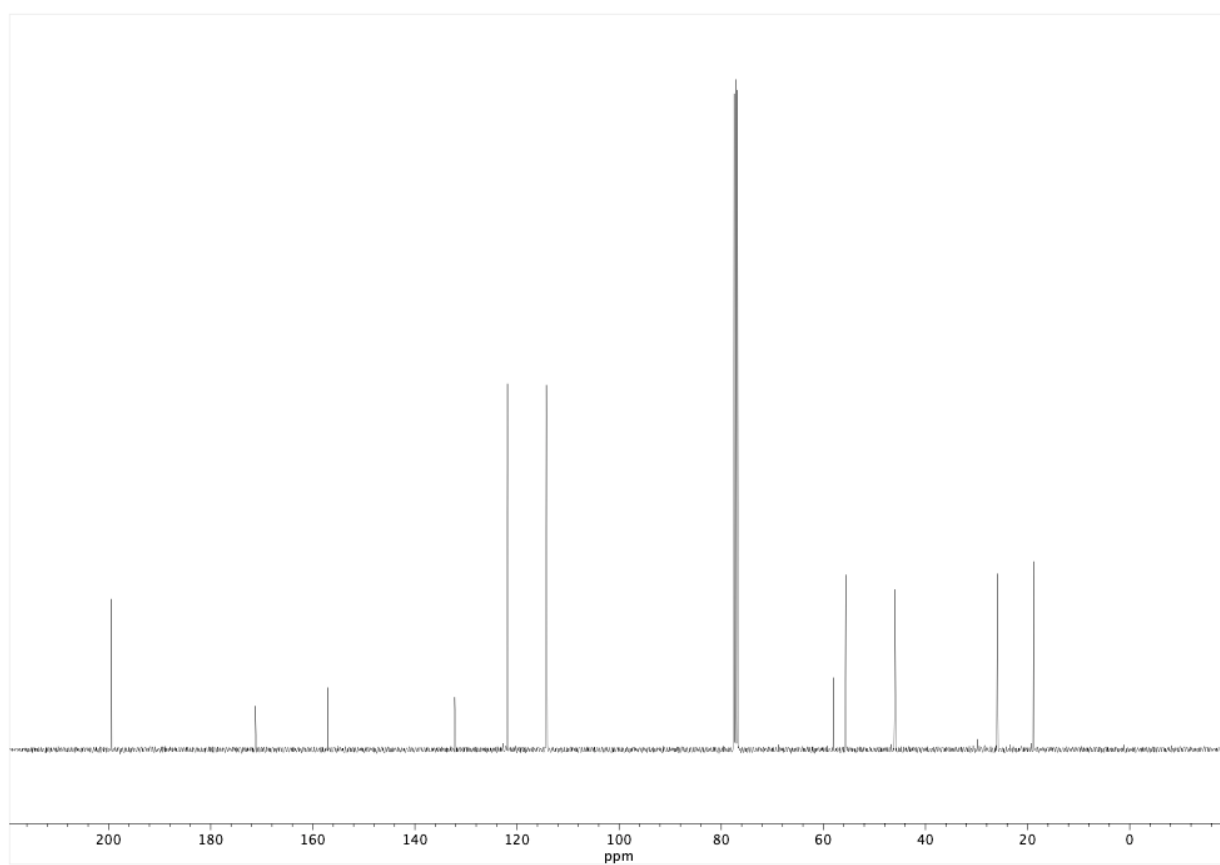


Figure A4.80. ¹³C NMR (100 MHz, CDCl₃) of **106**.

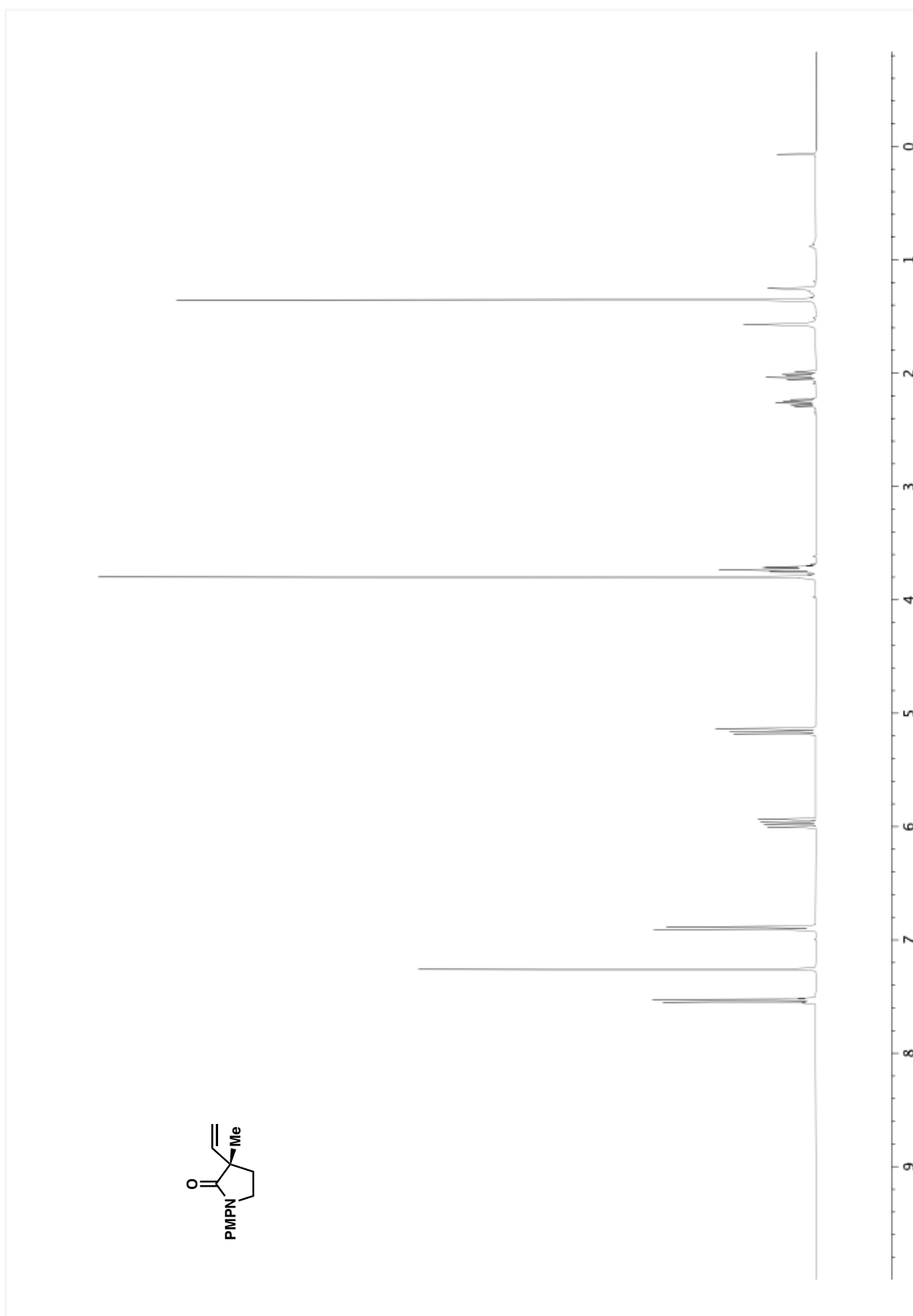


Figure A4.81. ^1H NMR (400 MHz, CDCl_3) of **107**.

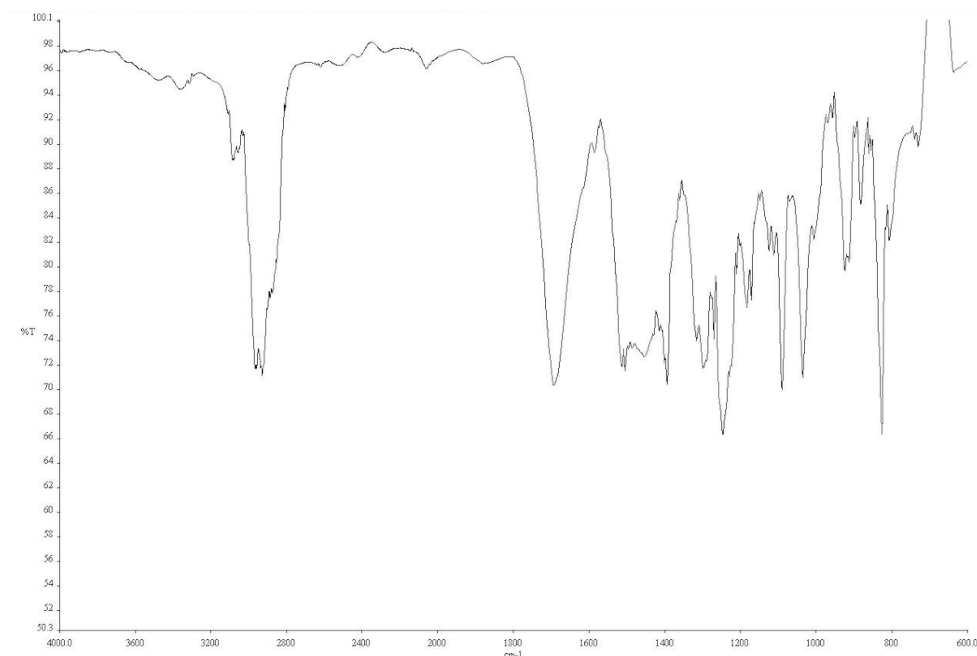


Figure A4.82. Infrared spectrum (Thin Film, NaCl) of **107**.

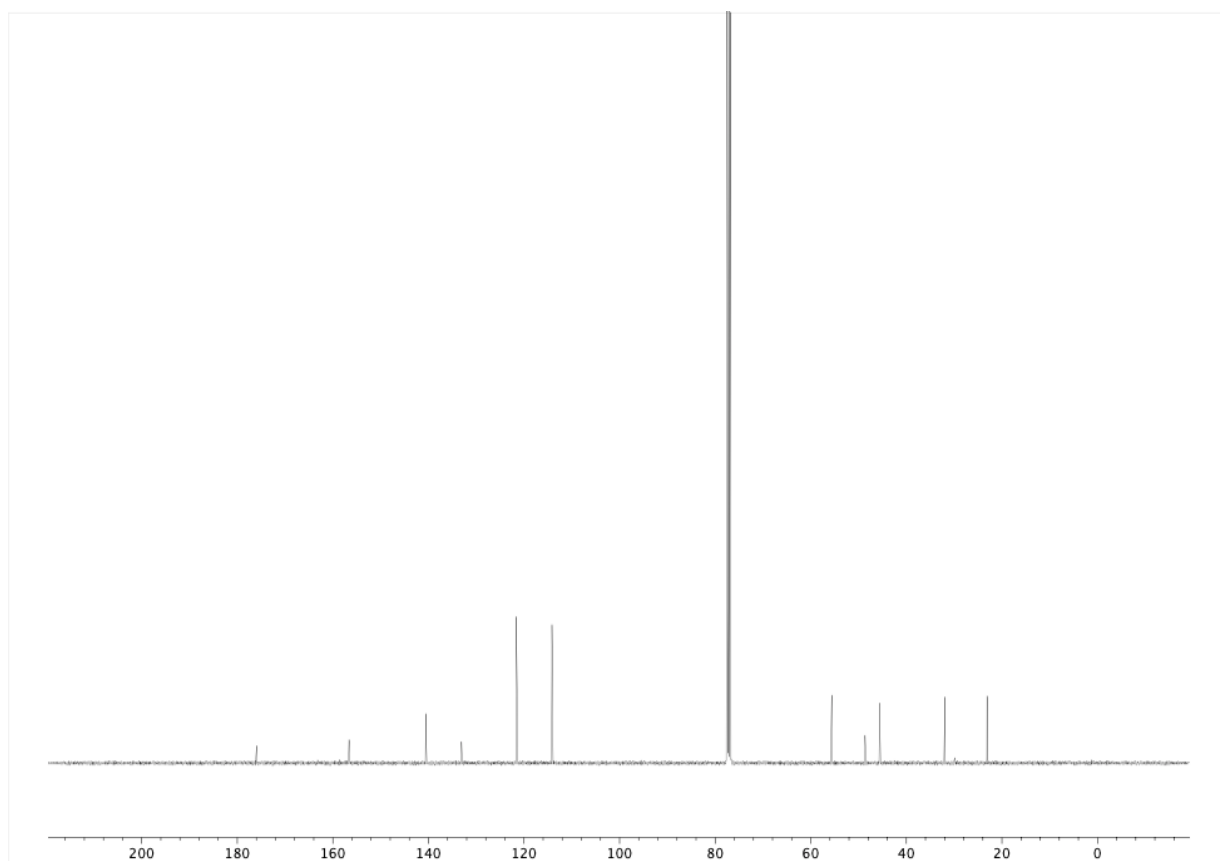


Figure A4.83. ¹³C NMR (100 MHz, CDCl₃) of **107**.

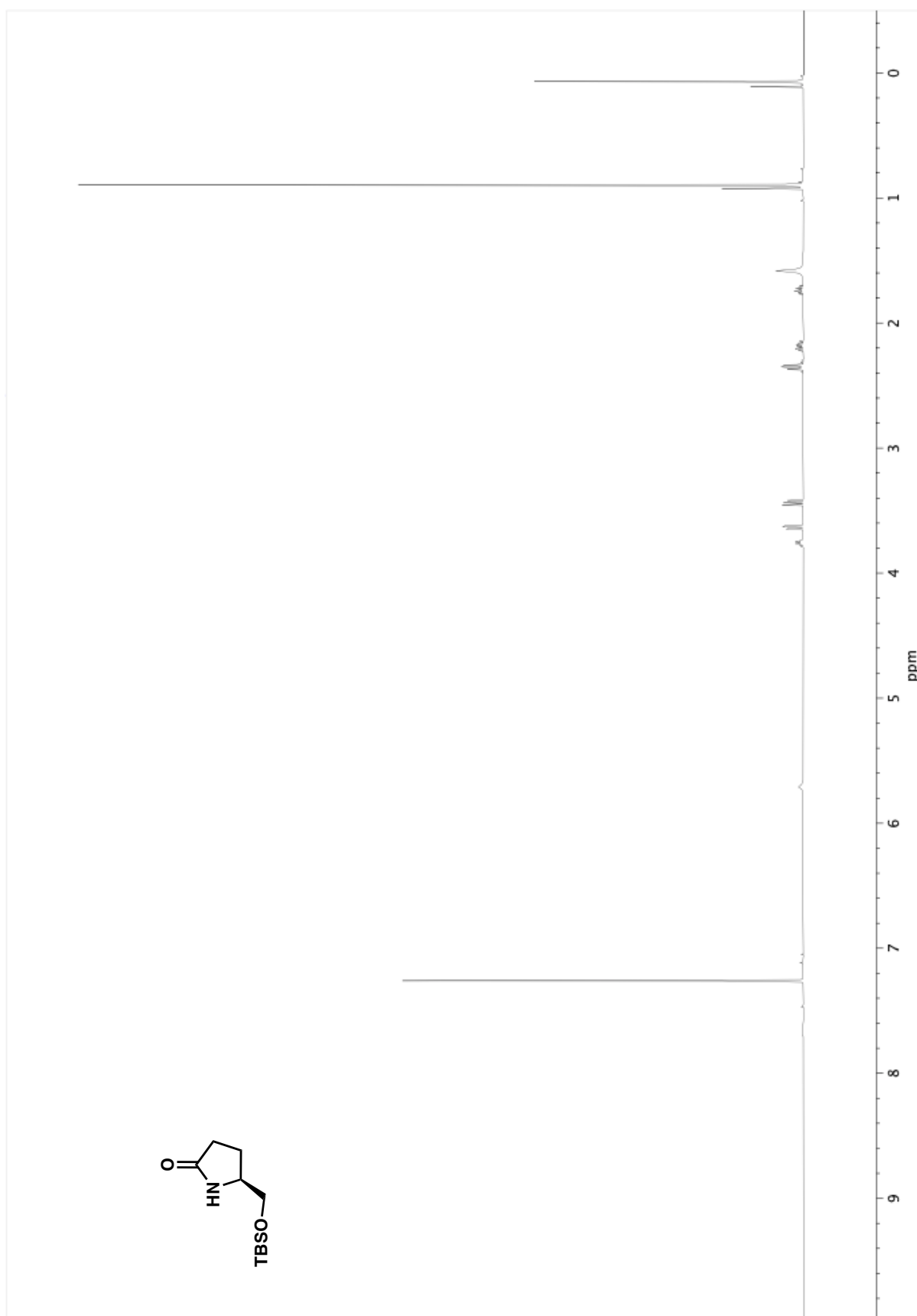


Figure A4.84. ¹H NMR (500 MHz, CDCl₃) of **116**.

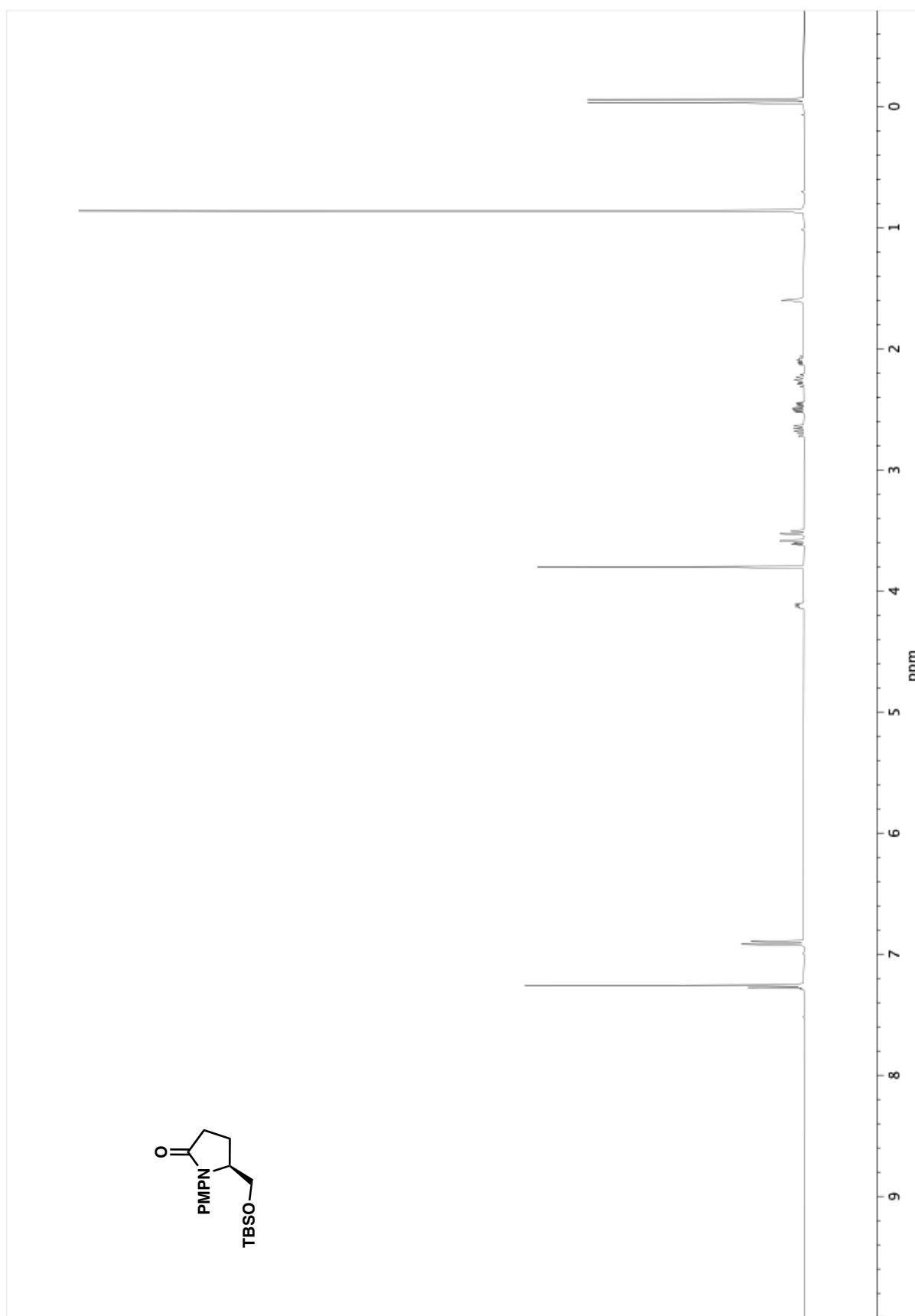


Figure A4.85. ^1H NMR (400 MHz, CDCl_3) of **117**.

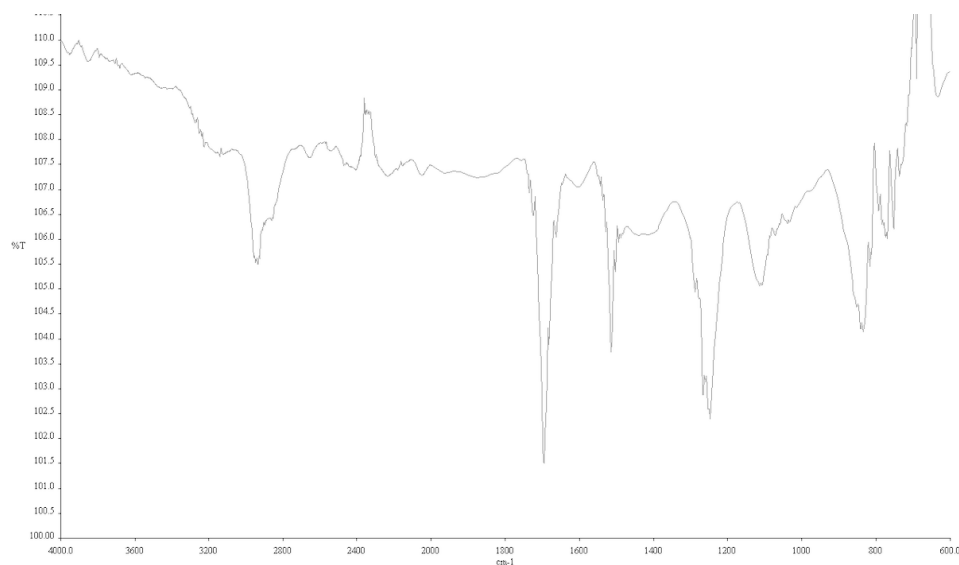


Figure A4.86. Infrared spectrum (Thin Film, NaCl) of **117**.

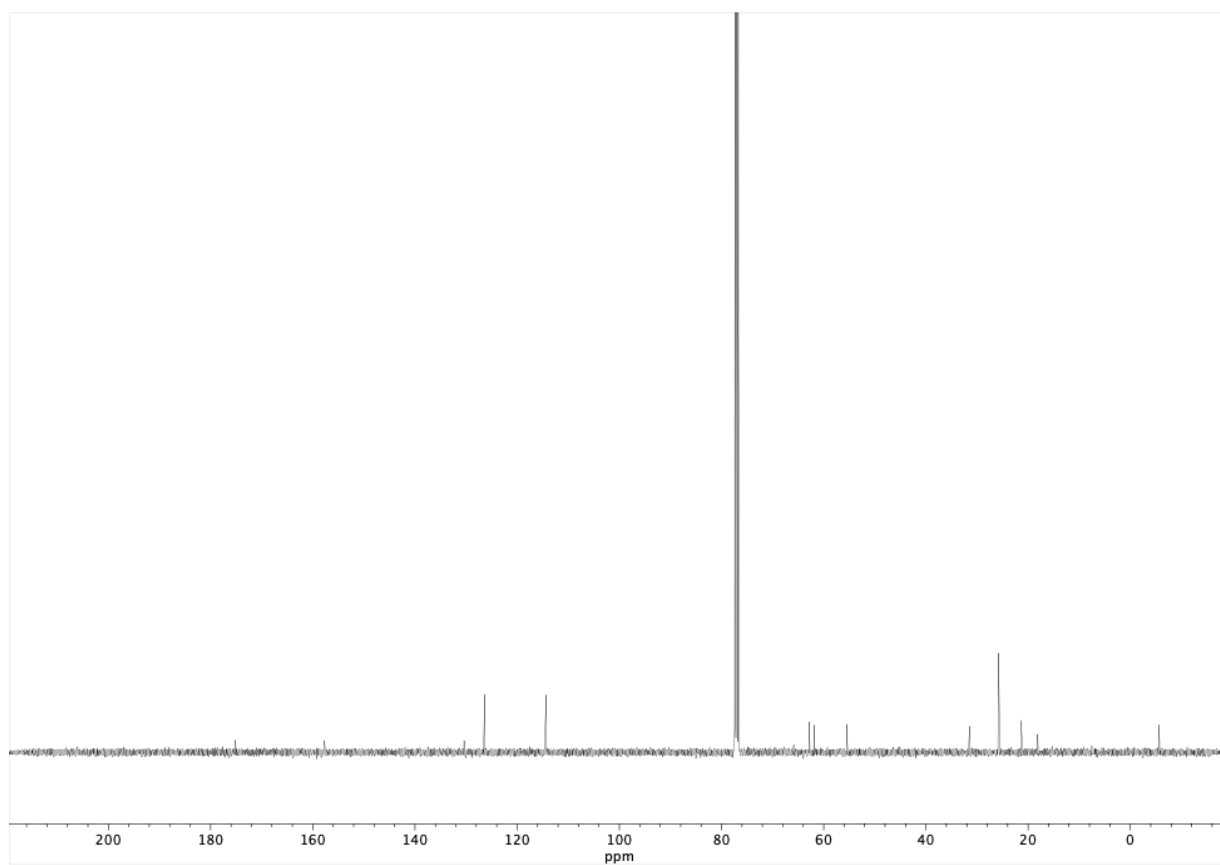


Figure A4.87. ¹³C NMR (100 MHz, CDCl₃) of **117**.

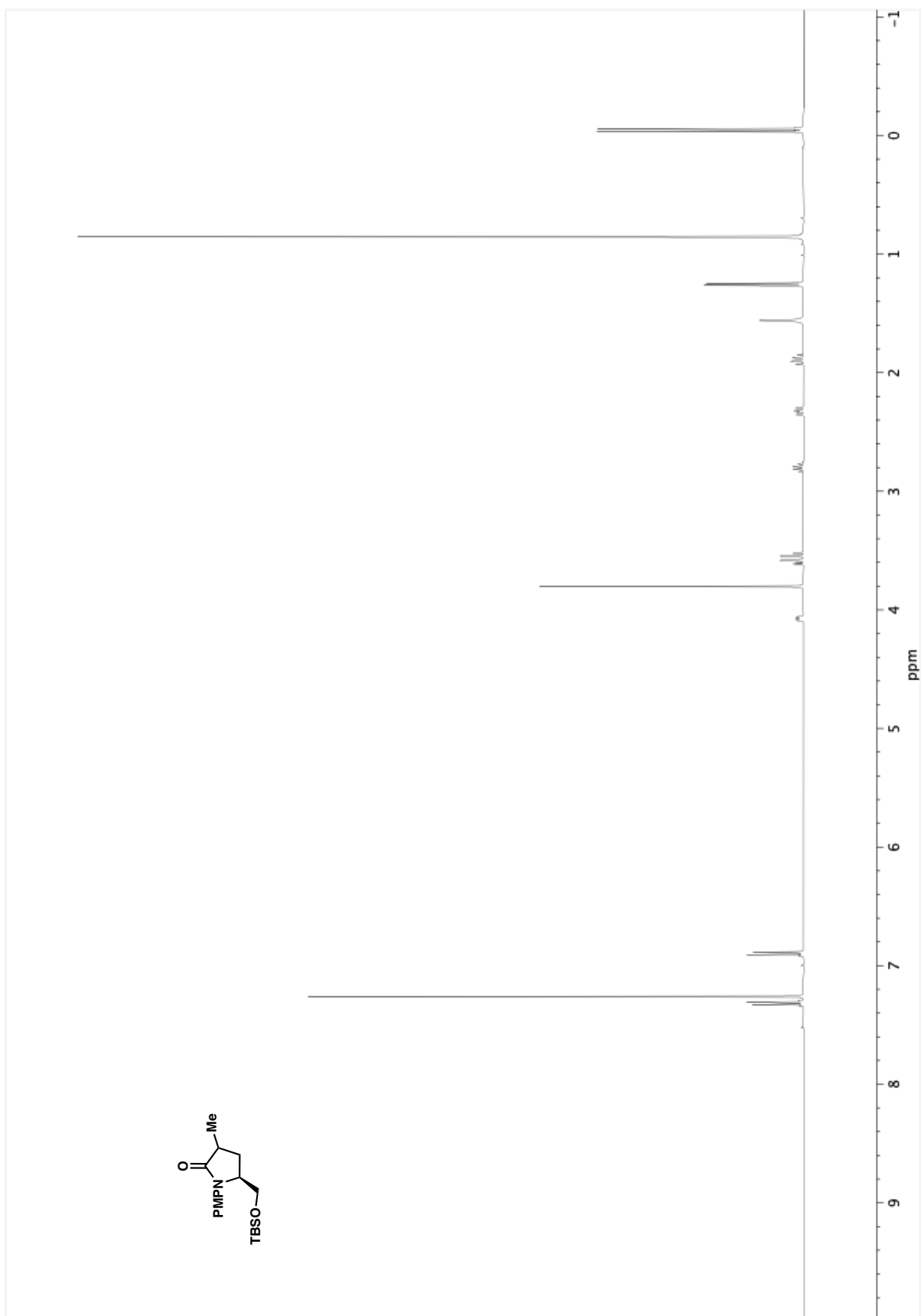


Figure A4.88. ¹H NMR (500 MHz, CDCl₃) of **118**.

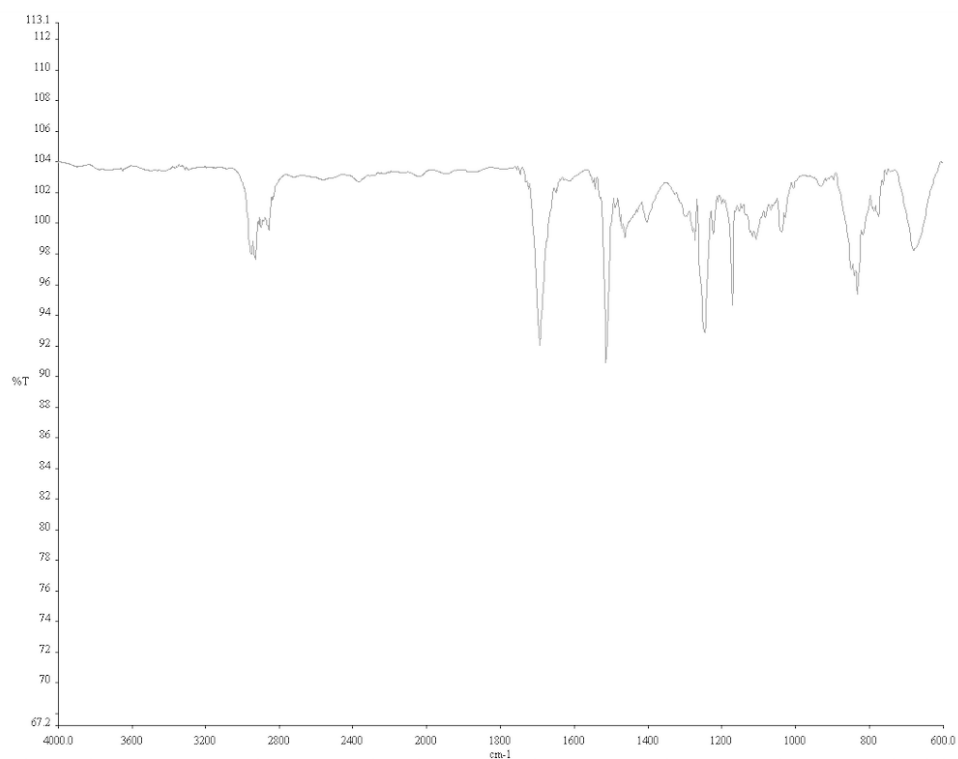


Figure A4.89. Infrared spectrum (Thin Film, NaCl) of **118**.

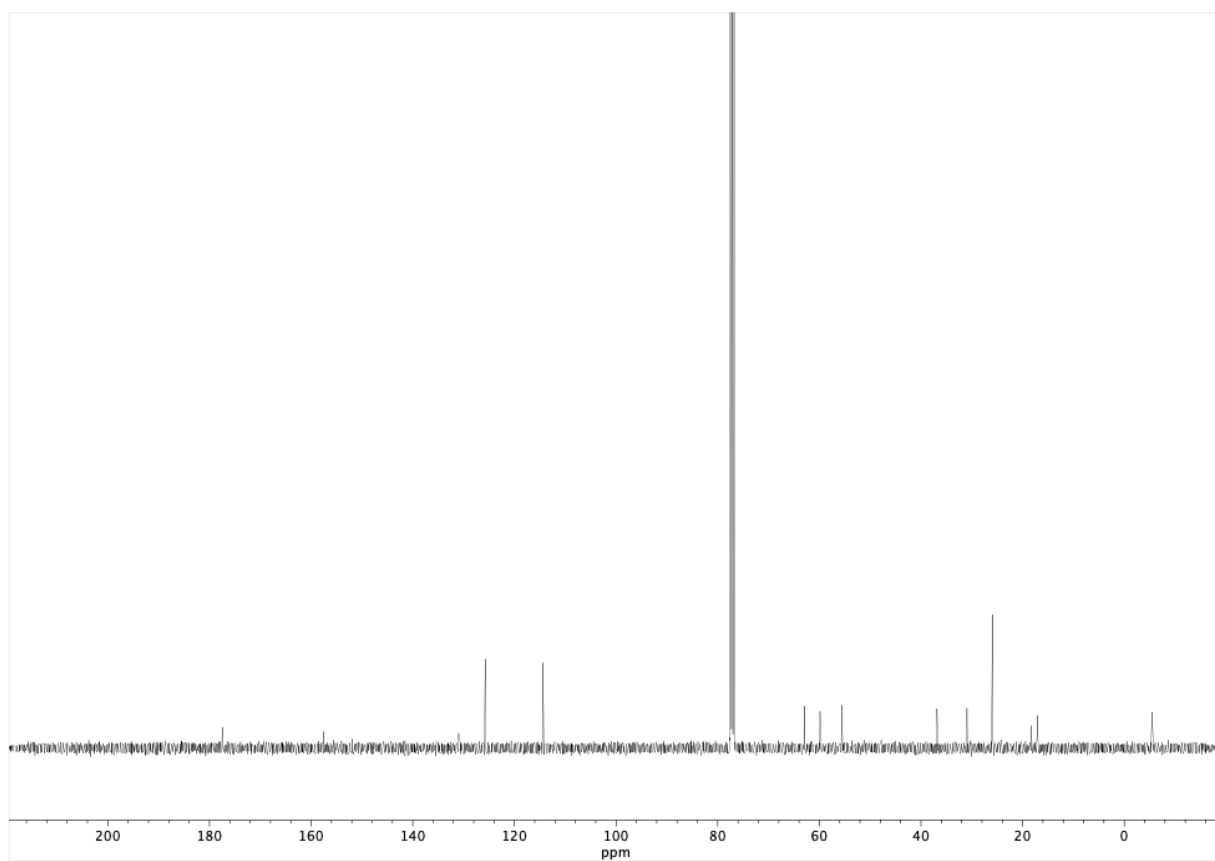


Figure A4.90. ^{13}C NMR (100 MHz, CDCl_3) of **118**.