

Supplemental materials

Concise synthesis and *in vitro* anticancer activity of benzo[*g*][1]benzopyrano[4,3-*b*]indol-6(13*H*)-ones (BBPIs), topoisomerase I inhibitors based on the marine alkaloid lamellarin

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Contents

Fig. 1. Concentration-response curves for cytotoxicity of 1a , 1c , 2a , and 2c against HeLa cells at 72 h. The bars indicate standard errors.	5
Fig. 2. Concentration-response curves for cytotoxicity of 1a , 1c , 2a , and 2c against MCF-7 cells at 72 h. The bars indicate standard errors.	6
Fig. 3. Concentration-response curves for cytotoxicity of 1a , 1c , 2a , and 2c against A549 cells at 72 h. The bars indicate standard errors.	7
Fig. 4. Concentration-response curves for cytotoxicity of 1a , 1c , 2a , and 2c against Vero cells at 72 h. The bars indicate standard errors.	8
Fig. 5. ¹ H NMR Spectrum of Compound 4 (400 MHz, CDCl ₃)	9
Fig. 6. ¹³ C NMR Spectrum of Compound 4 (100 MHz, CDCl ₃)	10
Fig. 7. DEPT Spectrum of Compound 4 (100 MHz, CDCl ₃)	11
Fig. 8. COSY Spectrum of Compound 4	12
Fig. 9. HSQC Spectrum of Compound 4	13
Fig. 10. HMBC Spectrum of Compound 4	14
Fig. 11. ¹ H NMR Spectrum of Compound 5a (400 MHz, CDCl ₃).....	15
Fig. 12. ¹³ C NMR Spectrum of Compound 5a (100 MHz, CDCl ₃)	16
Fig. 13. DEPT Spectrum of Compound 5a	17
Fig. 14. ¹ H NMR Spectrum of Compound 6a (300 MHz, CDCl ₃)	18
Fig. 15. ¹³ C NMR Spectrum of Compound 6a (100 MHz, CDCl ₃)	19
Fig. 16. DEPT Spectrum of Compound 6a	20
Fig. 17. COSY Spectrum of Compound 6a	21
Fig. 18. HSQC Spectrum of Compound 6a	22
Fig. 19. HMBC Spectrum of Compound 6a	23
Fig. 20. ¹ H NMR Spectrum of Compound 7 (400 MHz, CDCl ₃)	24
Fig. 21. ¹³ C NMR Spectrum of Compound 7 (100 MHz, CDCl ₃)	25
Fig. 22. DEPT Spectrum of Compound 7 (100 MHz, CDCl ₃)	26
Fig. 23. ¹ H NMR Spectrum of Compound 8 (500 MHz, DMSO- <i>d</i> ₆)	27
Fig. 24. ¹³ C NMR Spectrum of Compound 8 (125 MHz, DMSO- <i>d</i> ₆)	28
Fig. 25. HSQC Spectrum of Compound 8 (DMSO- <i>d</i> ₆)	29
Fig. 26. HMBC Spectrum of Compound 8 (DMSO- <i>d</i> ₆)	30
Fig. 27. ¹ H NMR Spectrum of Compound 12 (400 MHz, CDCl ₃)	31
Fig. 28. ¹³ C NMR Spectrum of Compound 12 (100 MHz, CDCl ₃)	32
Fig. 29. DEPT Spectrum of Compound 12	33
Fig. 30. ¹ H NMR Spectrum of Compound 13 (400 MHz, CDCl ₃)	34

Fig. 31. ¹³ C NMR Spectrum of Compound 13 (100 MHz, CDCl ₃)	35
Fig. 32. DEPT Spectrum of Compound 13	36
Fig. 33. ¹ H NMR Spectrum of Compound 14 (400 MHz, CDCl ₃)	37
Fig. 34. ¹³ C NMR Spectrum of Compound 14 (100 MHz, CDCl ₃)	38
Fig. 35. DEPT Spectrum of Compound 14	39
Fig. 36. ¹ H NMR Spectrum of Compound 15 (300 MHz, CDCl ₃)	40
Fig. 37. ¹³ C NMR Spectrum of Compound 15 (75 MHz, CDCl ₃)	41
Fig. 38. ¹ H NMR Spectrum of Compound 16 (300 MHz, CDCl ₃)	42
Fig. 39. ¹³ C NMR Spectrum of Compound 16 (75 MHz, CDCl ₃)	43
Fig. 40. ¹ H NMR Spectrum of Compound 17 (400 MHz, CDCl ₃)	44
Fig. 41. ¹³ C NMR Spectrum of Compound 17 (125 MHz, CDCl ₃)	45
Fig. 42. COSY Spectrum of Compound 17	46
Fig. 43. HSQC Spectrum of Compound 17	47
Fig. 44. HMBC Spectrum of Compound 17	48
Fig. 45. ¹ H NMR Spectrum of Compound 18 (300 MHz, CDCl ₃)	49
Fig. 46. ¹ H NMR Spectrum of Compound 19a (400 MHz, CDCl ₃).....	50
Fig. 47. ¹ H NMR Spectrum of Compound 19b (400 MHz, CDCl ₃)	51
Fig. 48. ¹³ C NMR Spectrum of Compound 19b (100 MHz, CDCl ₃)	52
Fig. 49. DEPT Spectrum of 19b	53
Fig. 50. ¹ H NMR Spectrum of Compound 20a (300 MHz, CDCl ₃).....	54
Fig. 51. ¹ H NMR Spectrum of Compound 20b (500 MHz, CDCl ₃)	55
Fig. 52. ¹³ C NMR Spectrum of Compound 20b (125 MHz, CDCl ₃)	56
Fig. 53. ¹ H NMR Spectrum of Compound 20d (400 MHz, CDCl ₃)	57
Fig. 54. ¹³ C NMR Spectrum of Compound 20d (100 MHz, CDCl ₃)	58
Fig. 55. DEPT Spectrum of Compound 20d (100 MHz, CDCl ₃)	59
Fig. 56. ¹ H NMR Spectrum of Compound 20e (500 MHz, CDCl ₃).....	60
Fig. 57. ¹³ C NMR Spectrum of Compound 20e (125 MHz, CDCl ₃).....	61
Fig. 58. ¹ H NMR Spectrum of Compound 2a (500 MHz, DMSO-d ₆)	62
Fig. 59. ¹³ C NMR Spectrum of Compound 2a (125 MHz, DMSO-d ₆)	63
Fig. 60. ¹ H NMR Spectrum of Compound 2b (400 MHz, DMSO-d ₆)	64
Fig. 61. ¹³ C NMR Spectrum of Compound 2b (100 MHz, DMSO-d ₆)	65
Fig. 62. ¹ H NMR Spectrum of Compound 2c (500 MHz, DMSO-d ₆).....	66
Fig. 63. ¹³ C NMR Spectrum of Compound 2c (125 MHz, DMSO-d ₆).....	67
Fig. 64. ¹ H NMR Spectrum of Compound 2d (500 MHz, DMSO-d ₆)	68
Fig. 65. ¹³ C NMR Spectrum of Compound 2d (125 MHz, DMSO-d ₆)	69
Fig. 66. ¹ H NMR Spectrum of Compound 2e (500 MHz, DMSO-d ₆).....	70

Fig. 67. ^{13}C NMR Spectrum of Compound **2e** (125 MHz, DMSO- d_6).....71

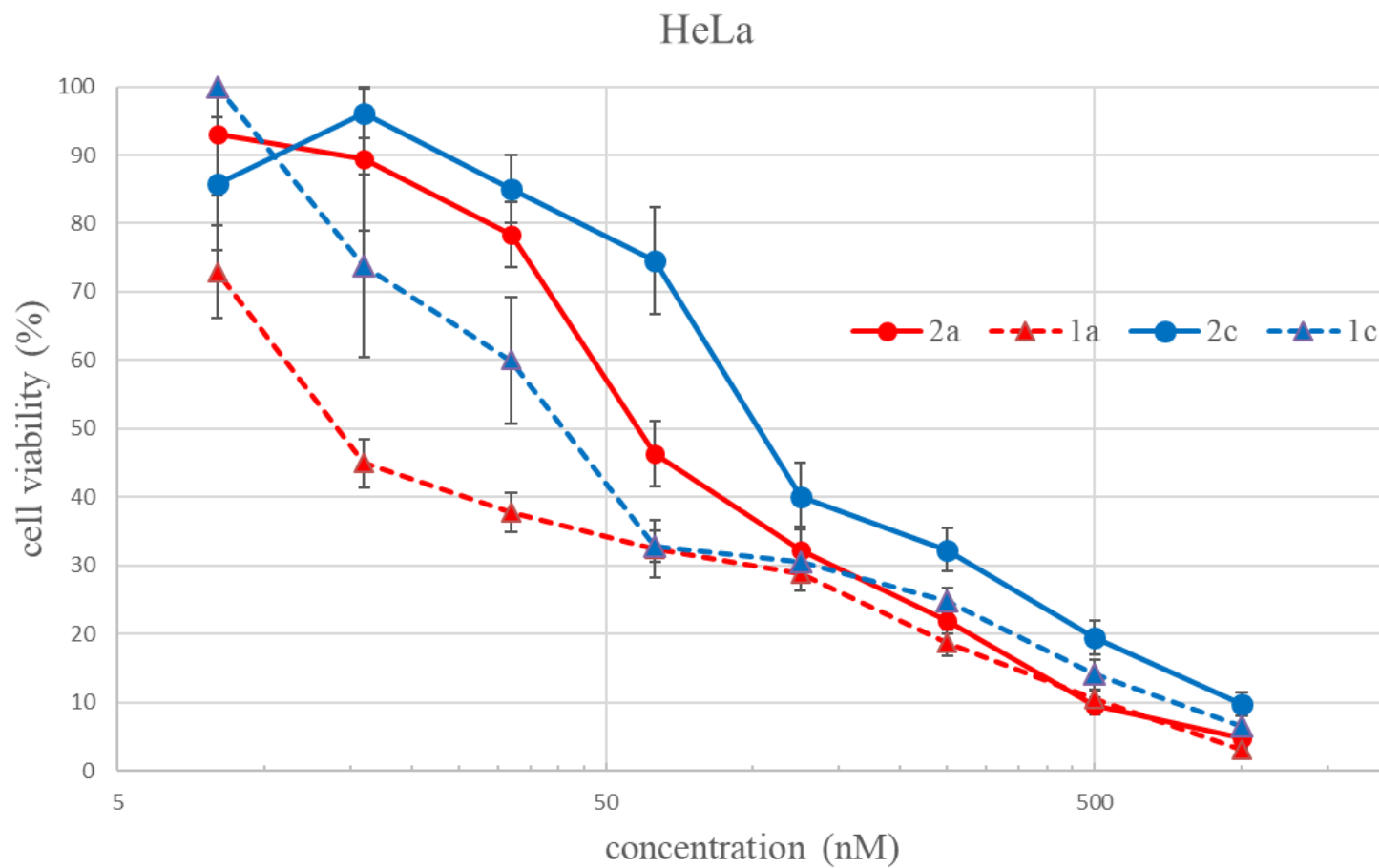


Fig. 1. Concentration-response curves for cytotoxicity of **1a**, **1c**, **2a**, and **2c** against HeLa cells at 72 h. The bars indicate standard errors.

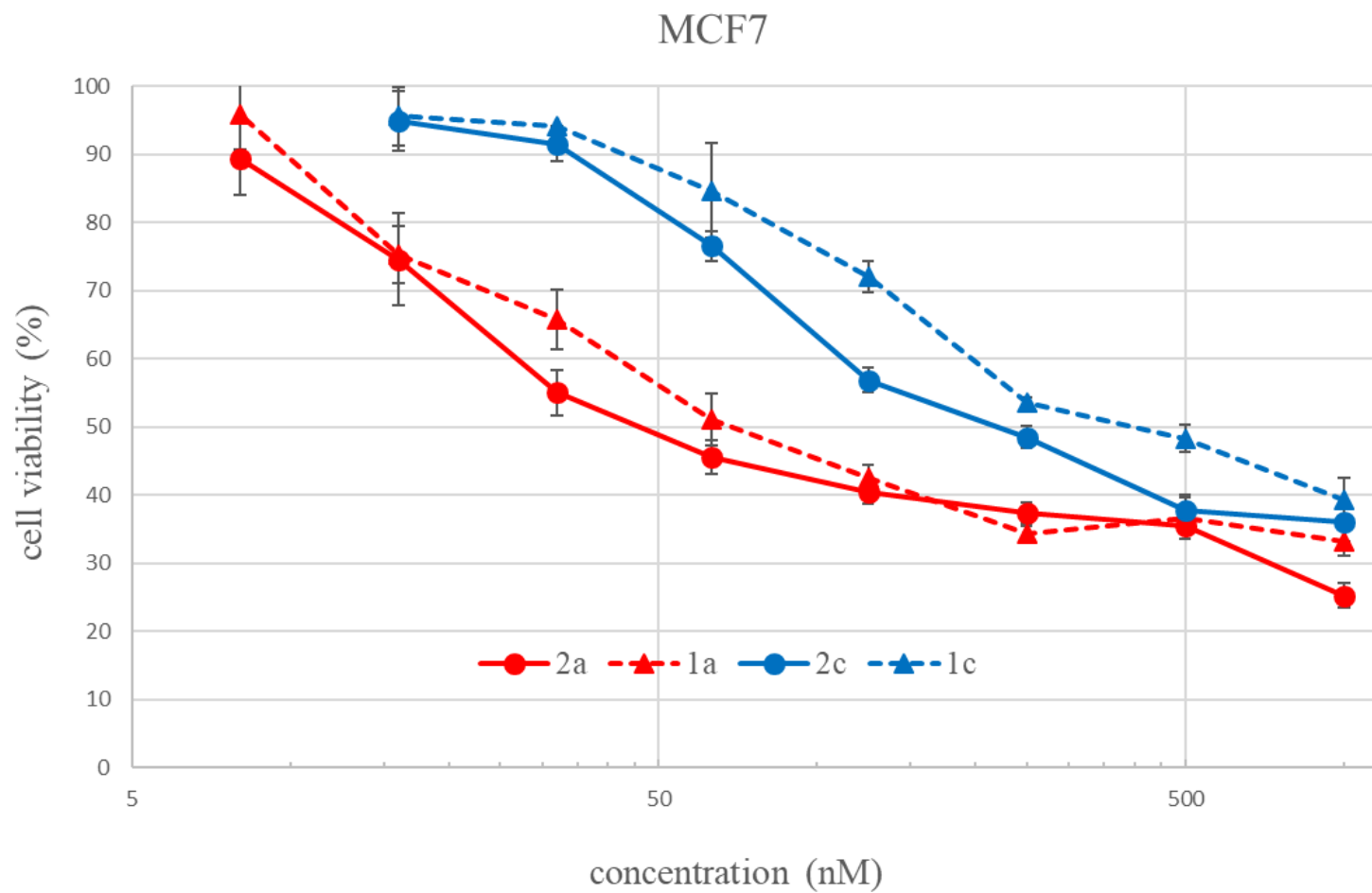


Fig. 2. Concentration-response curves for cytotoxicity of **1a**, **1c**, **2a**, and **2c** against MCF-7 cells at 72 h. The bars indicate standard errors.

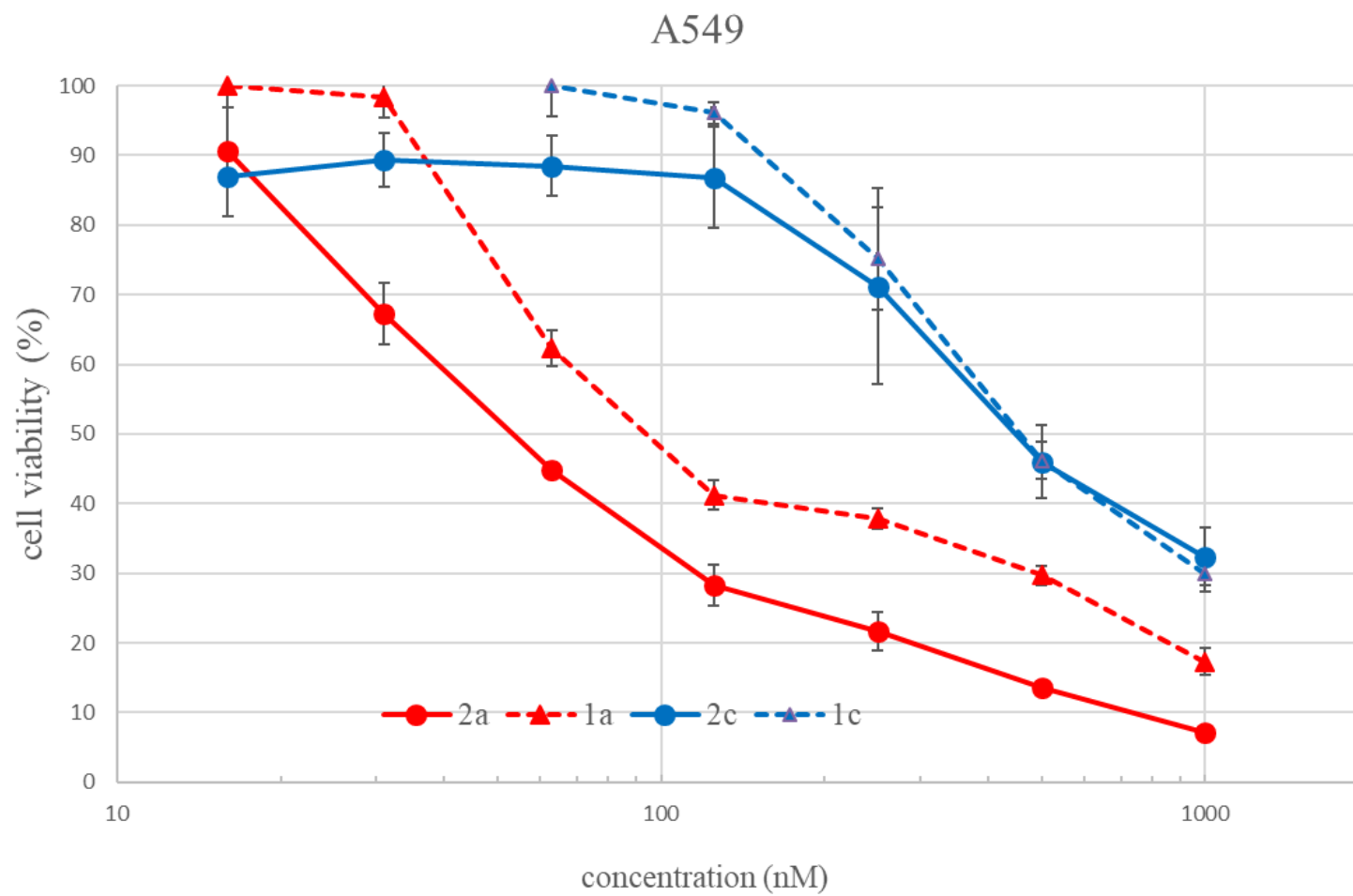


Fig. 3. Concentration-response curves for cytotoxicity of **1a**, **1c**, **2a**, and **2c** against A549 cells at 72 h. The bars indicate standard errors.

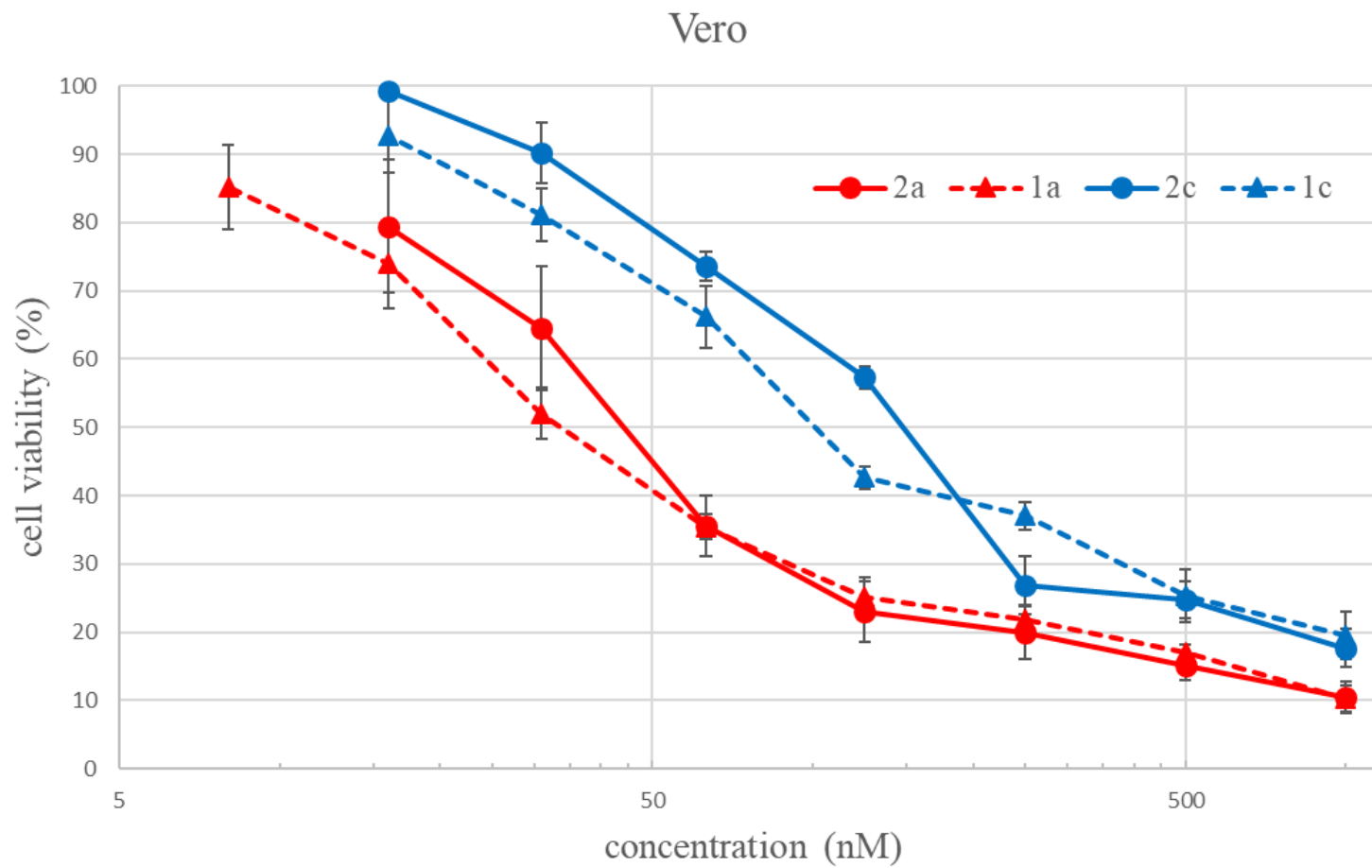


Fig. 4. Concentration-response curves for cytotoxicity of **1a**, **1c**, **2a**, and **2c** against Vero cells at 72 h. The bars indicate standard errors.

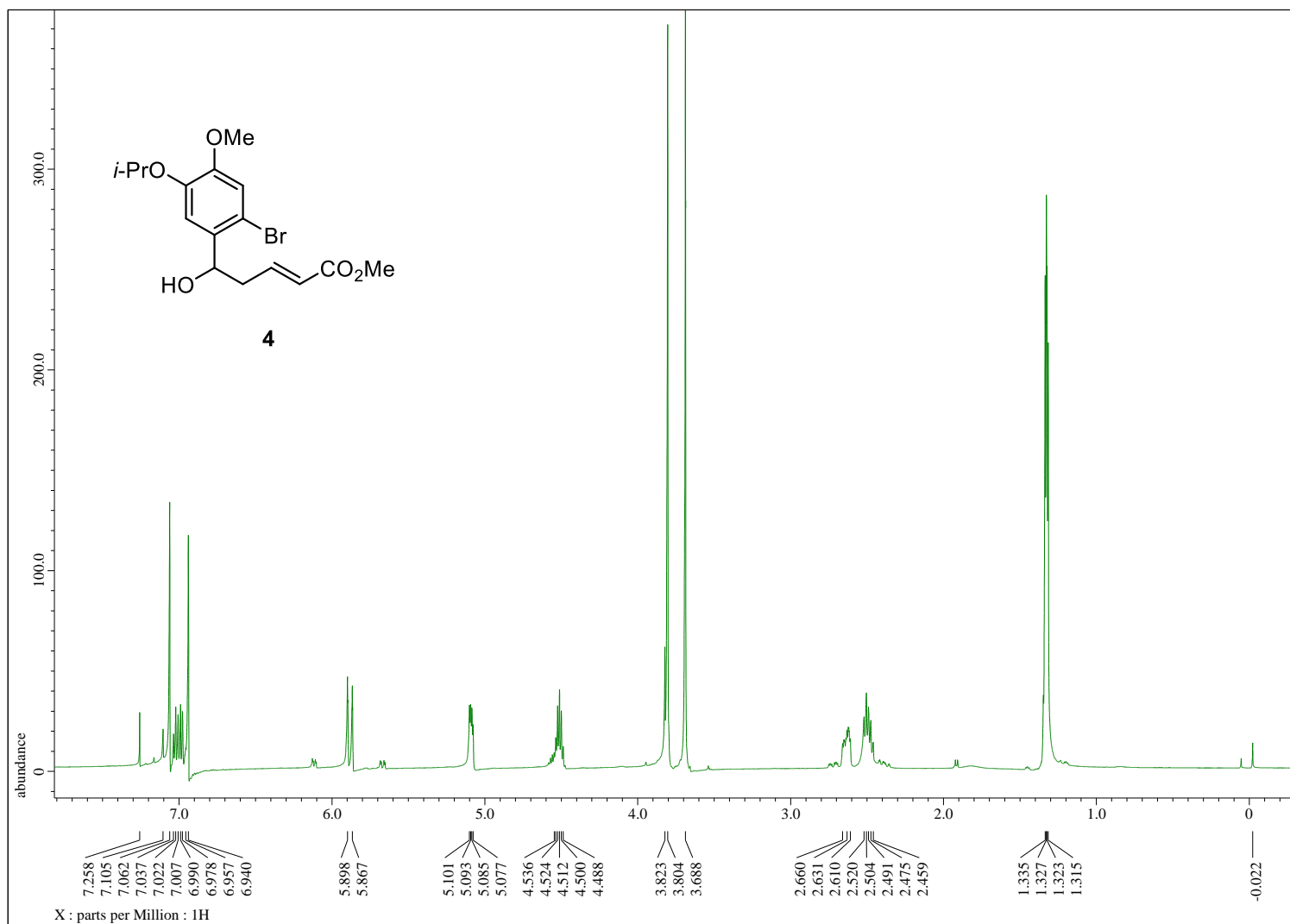


Fig. 5. ^1H NMR Spectrum of Compound 4 (400 MHz, CDCl_3)

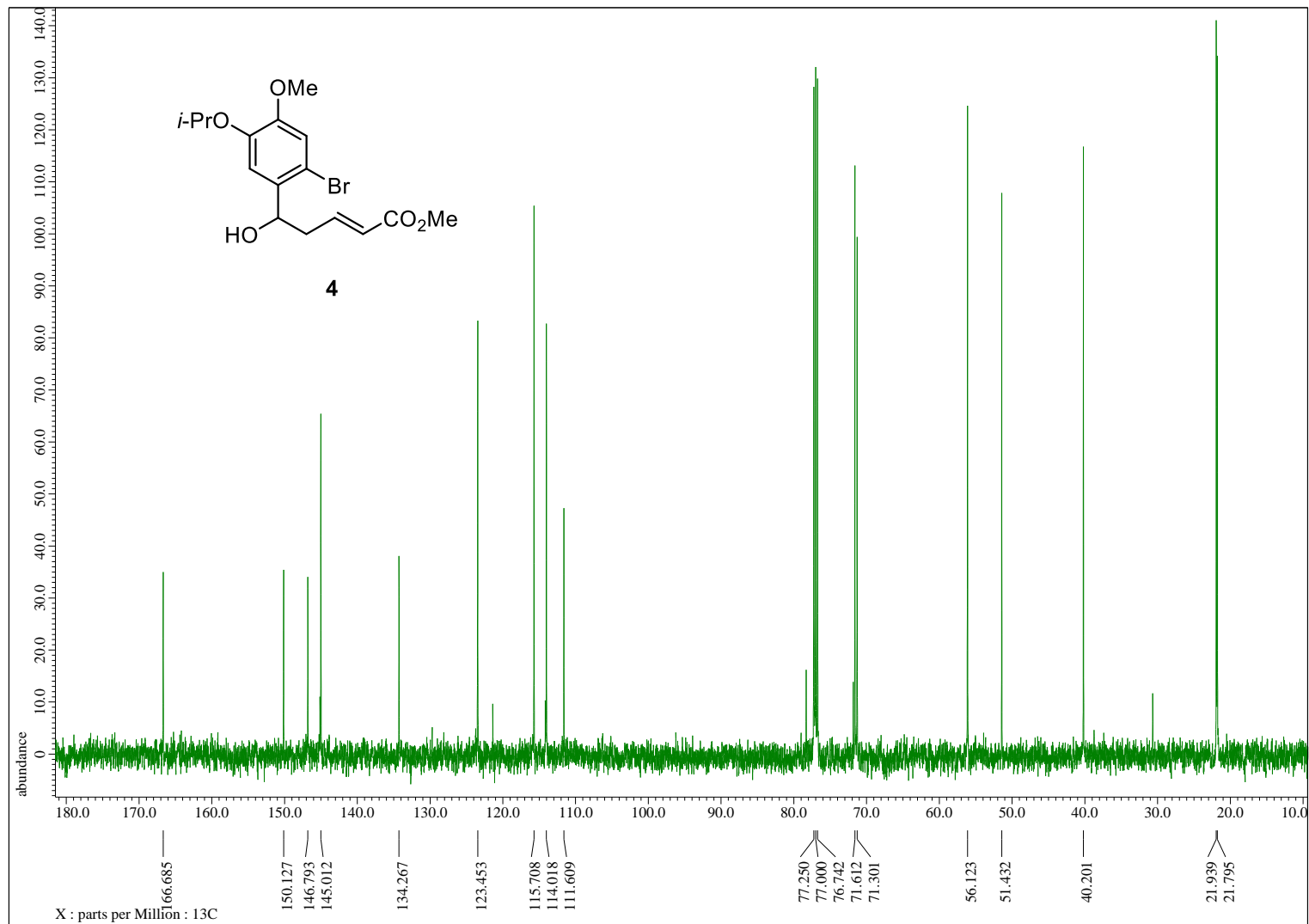


Fig. 6. ^{13}C NMR Spectrum of Compound **4** (100 MHz, CDCl_3)

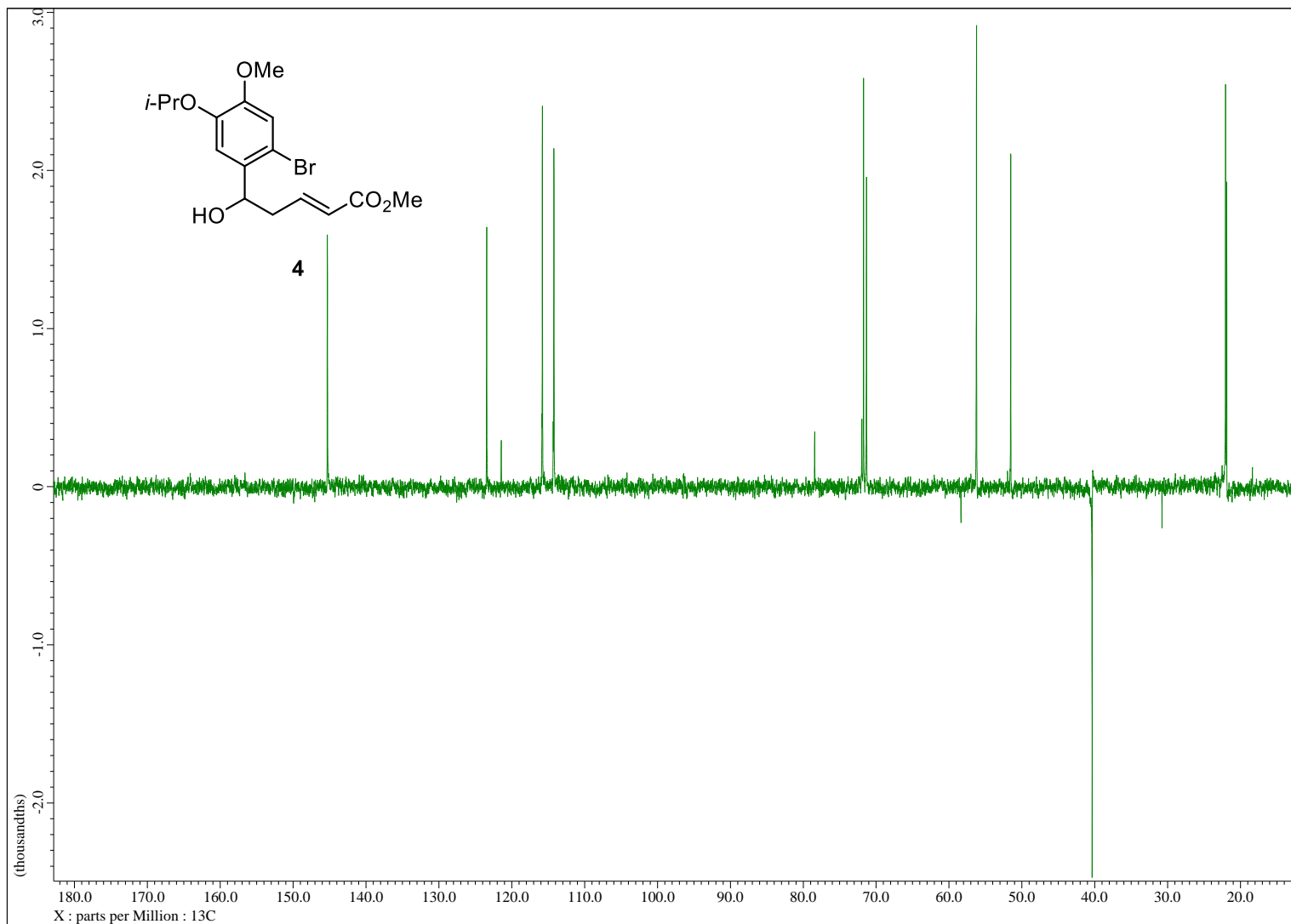


Fig. 7. DEPT Spectrum of Compound 4 (100 MHz, CDCl₃)

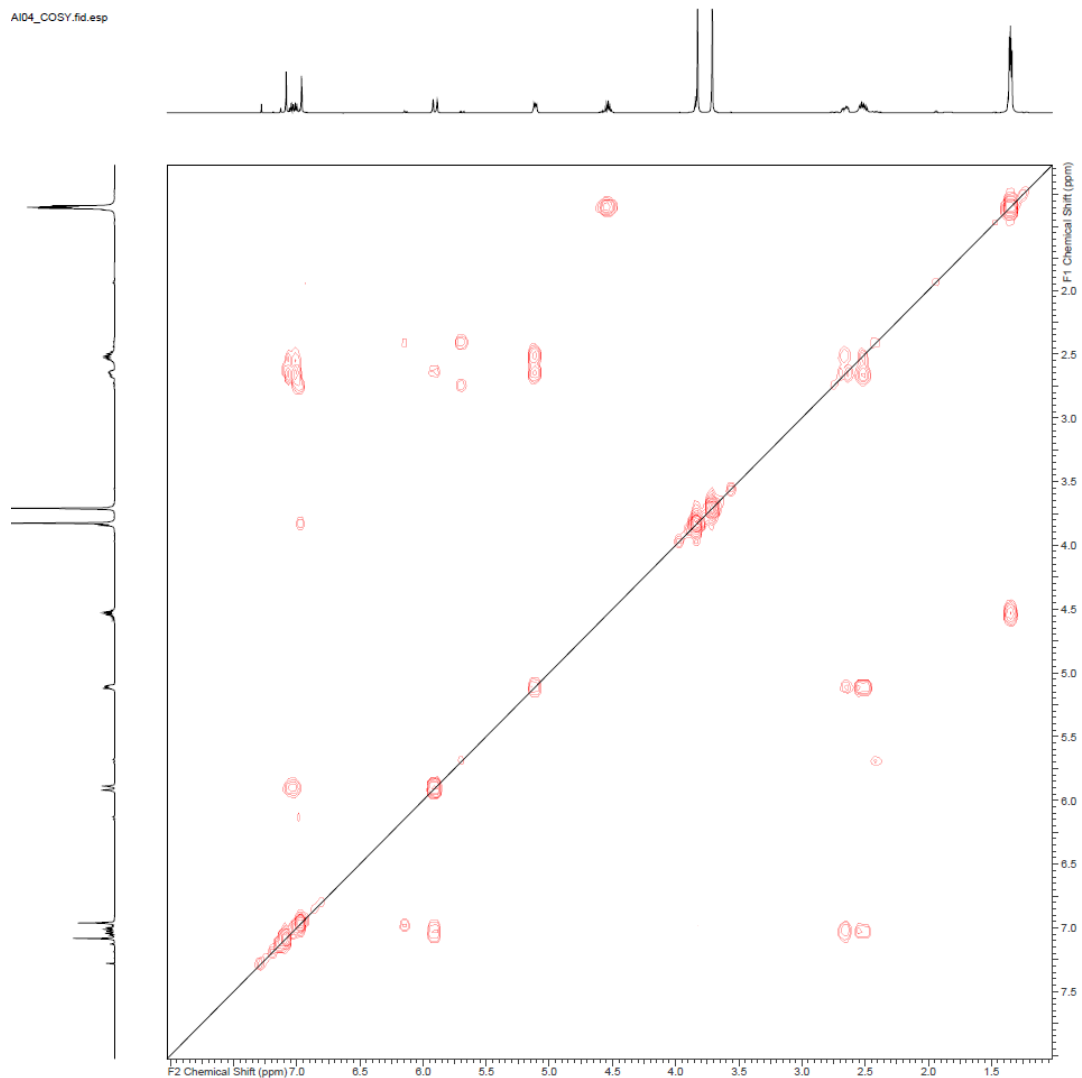
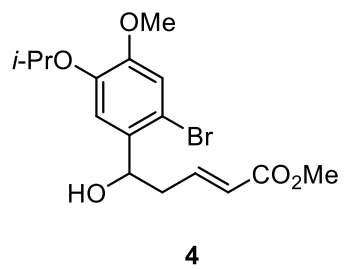


Fig. 8. COSY Spectrum of Compound **4**

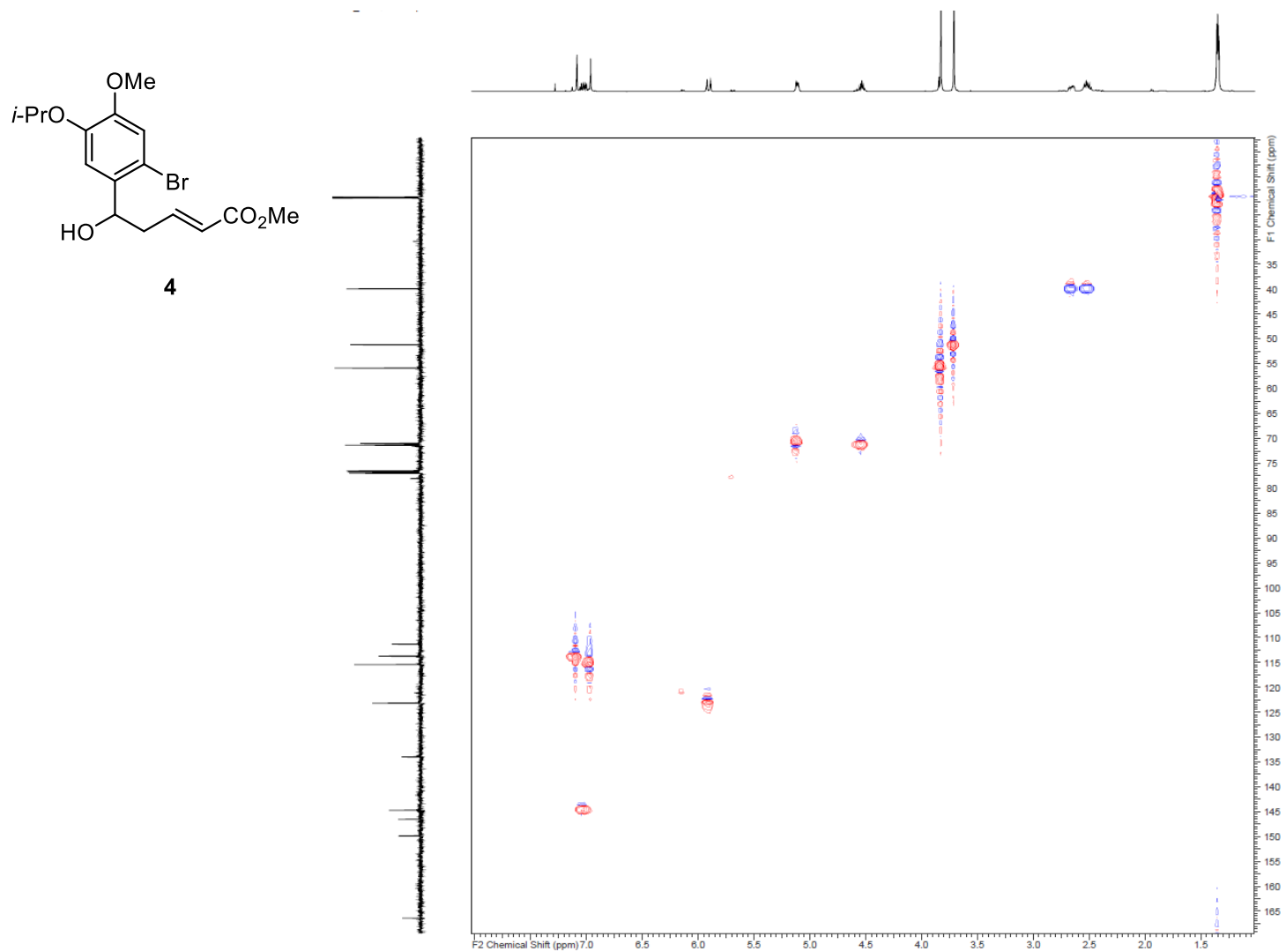


Fig. 9. HSQC Spectrum of Compound 4

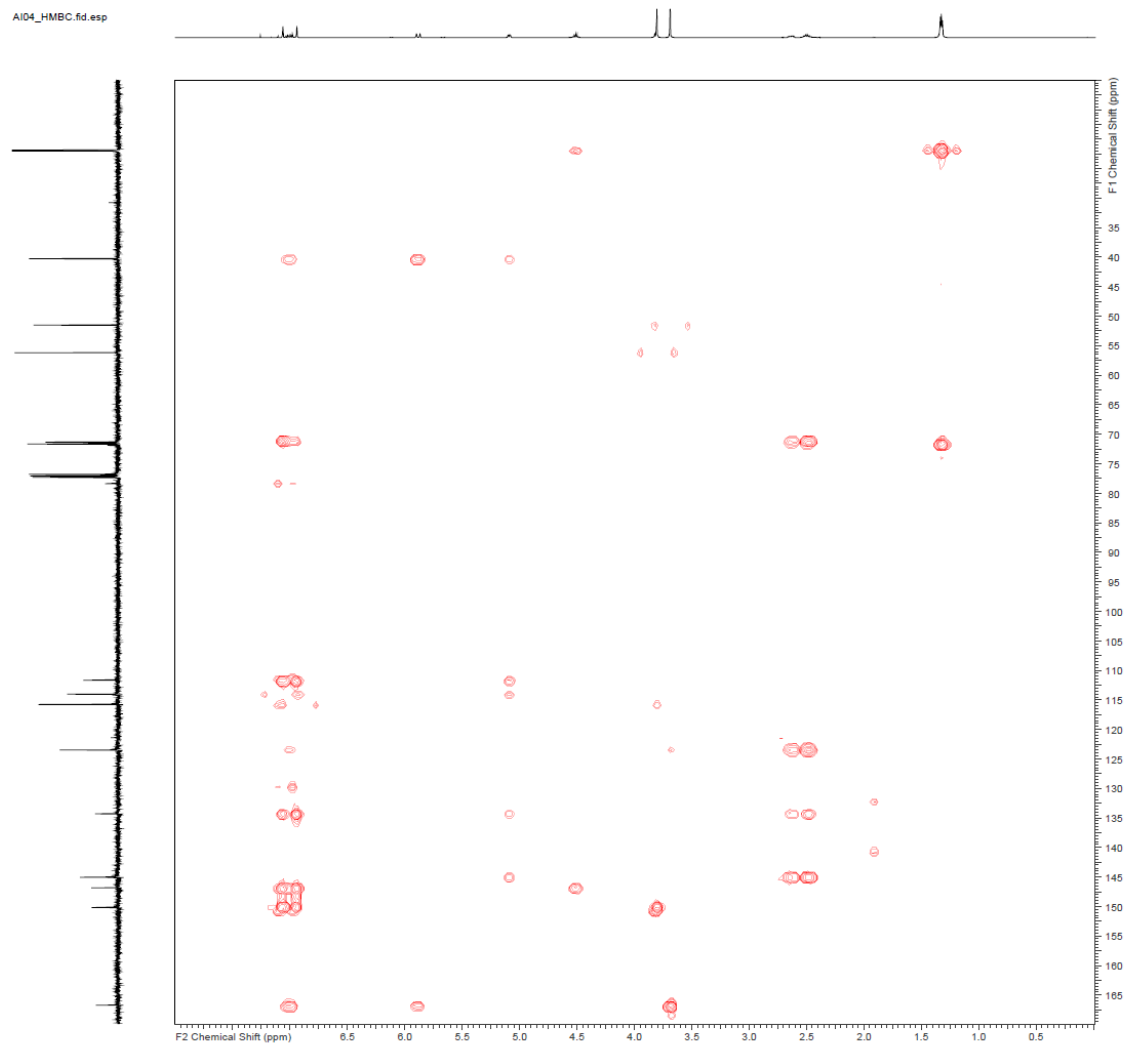


Fig. 10. HMBC Spectrum of Compound 4

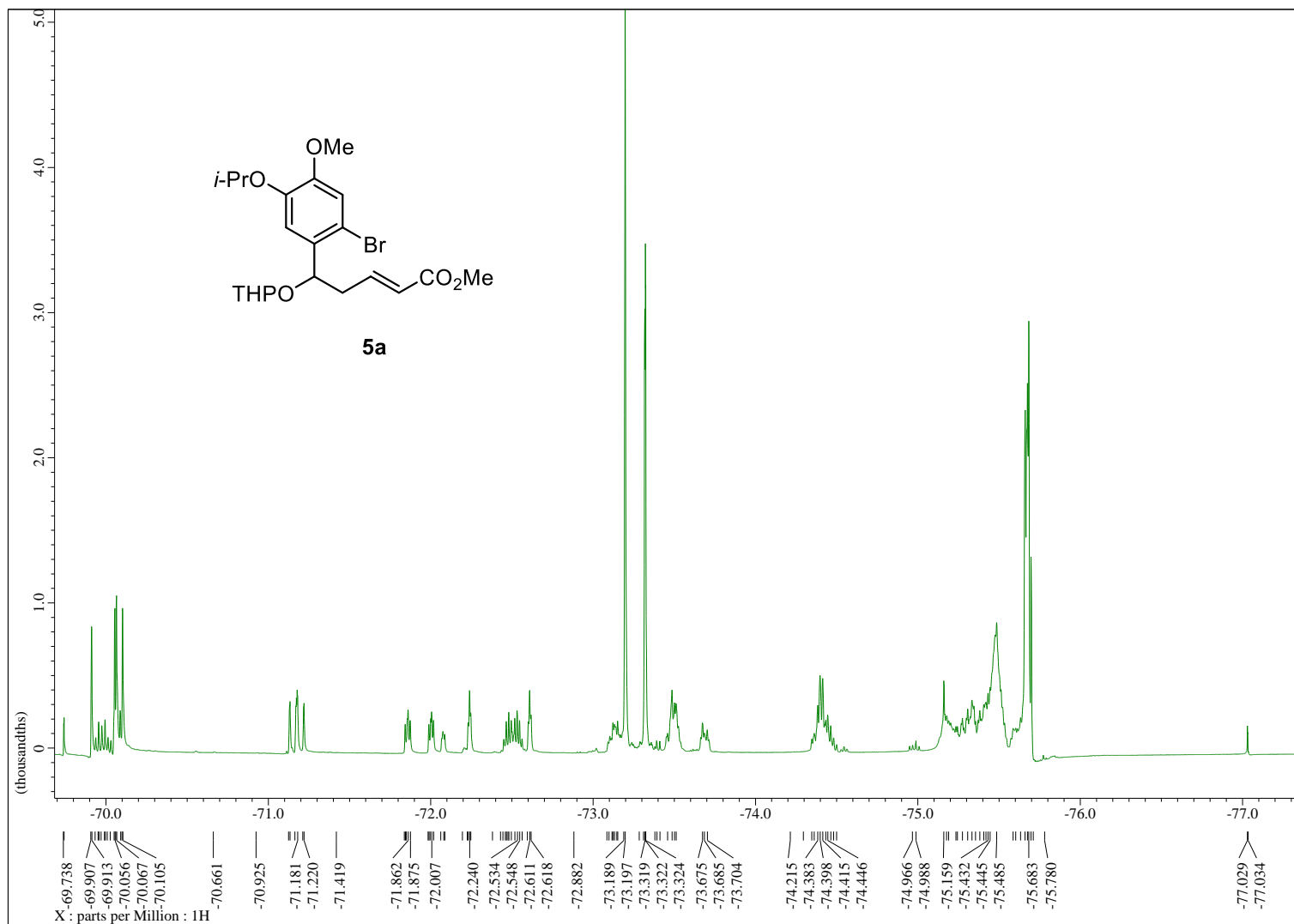


Fig. 11. ¹H NMR Spectrum of Compound **5a** (400 MHz, CDCl₃)

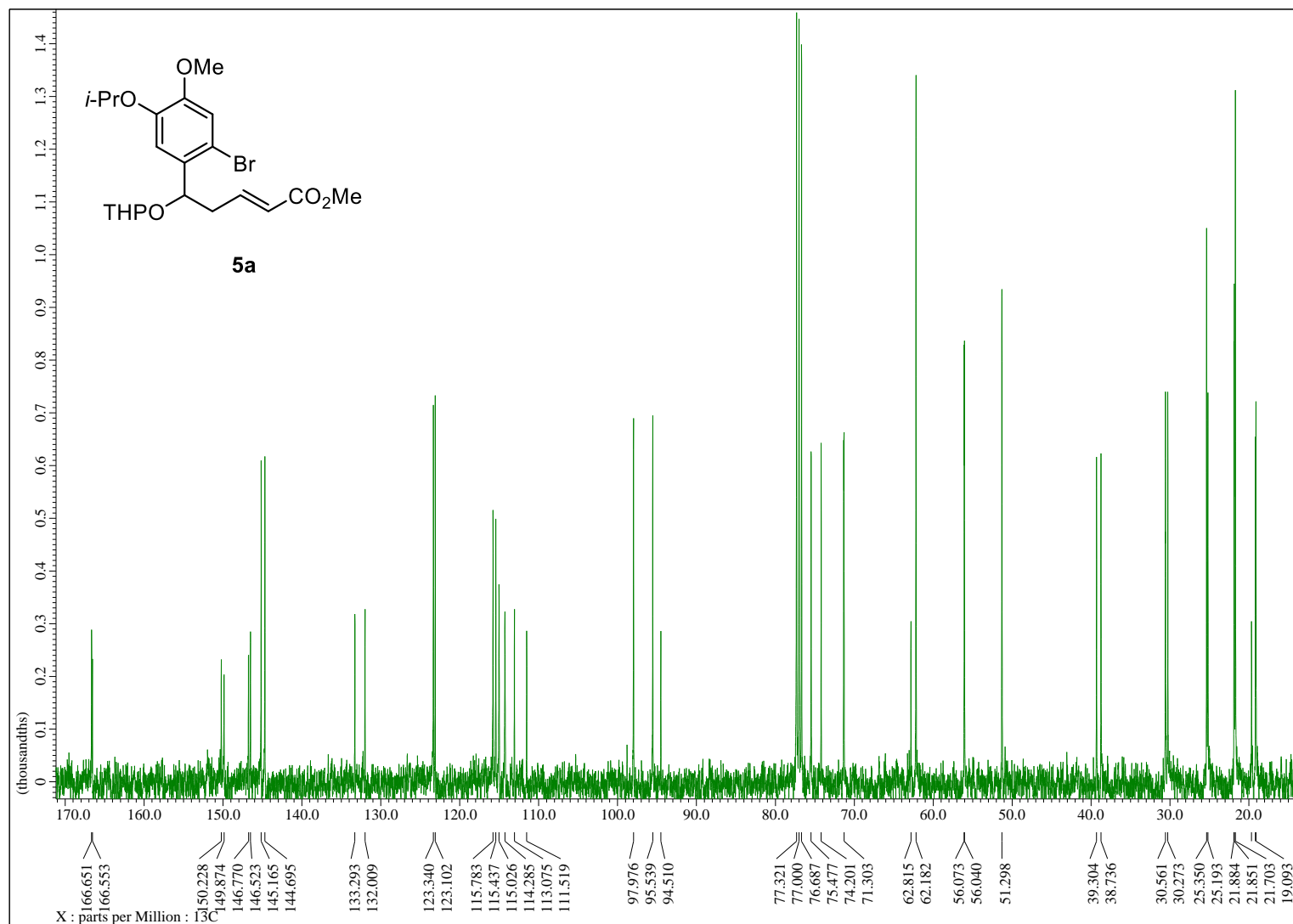


Fig. 12. ^{13}C NMR Spectrum of Compound **5a** (100 MHz, CDCl_3)

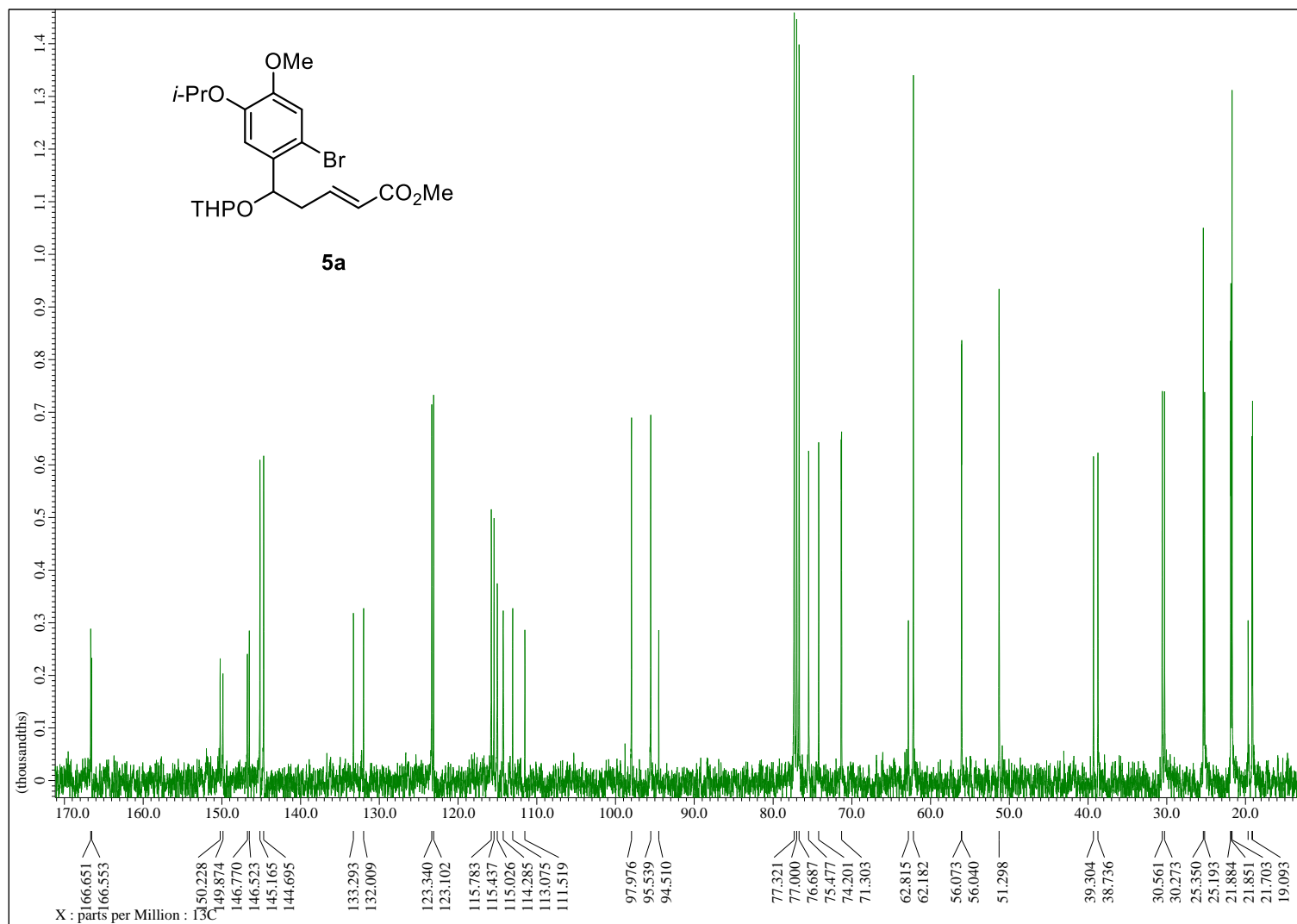


Fig. 13. DEPT Spectrum of Compound **5a**

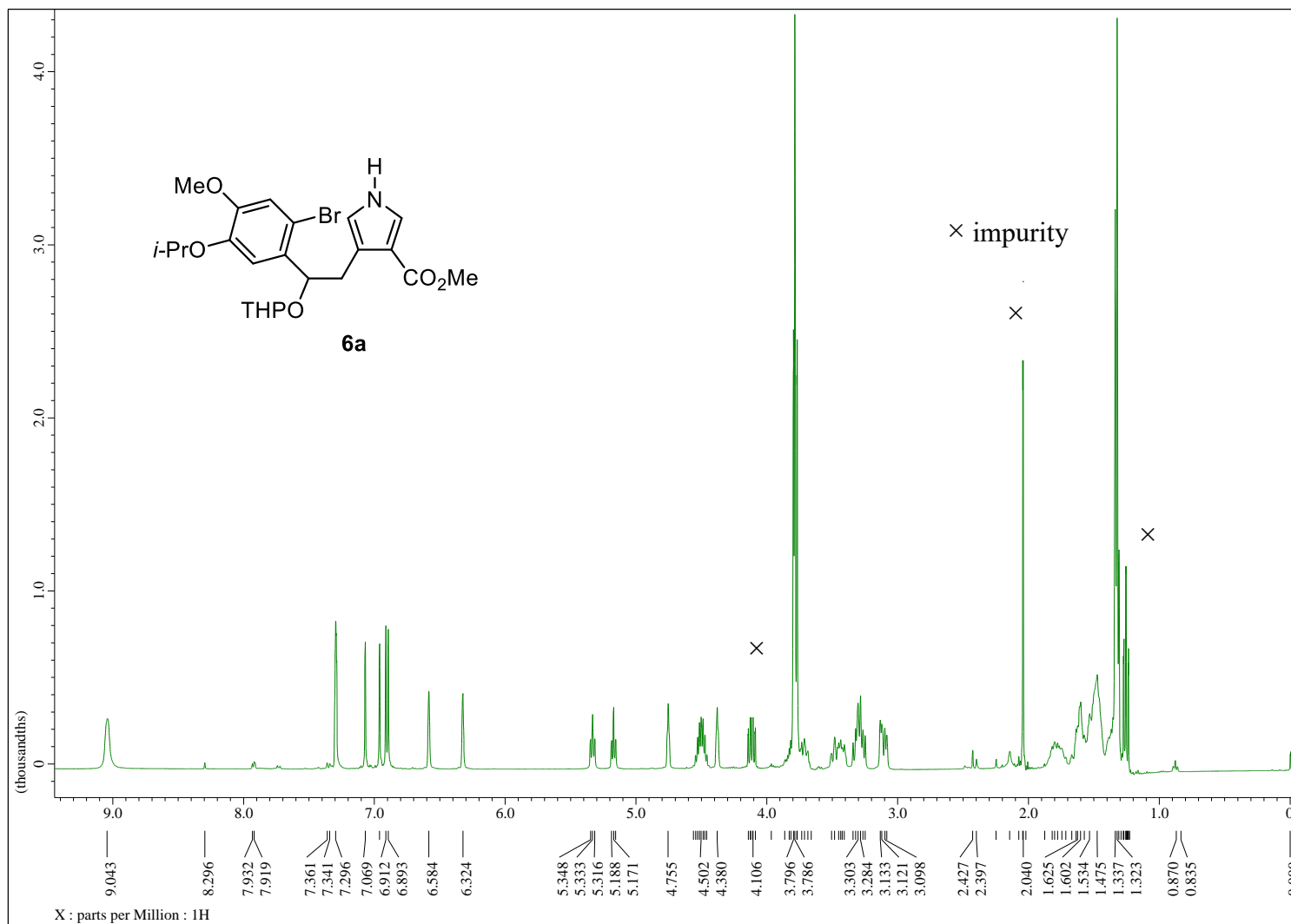


Fig. 14. ^1H NMR Spectrum of Compound **6a** (300 MHz, CDCl_3)

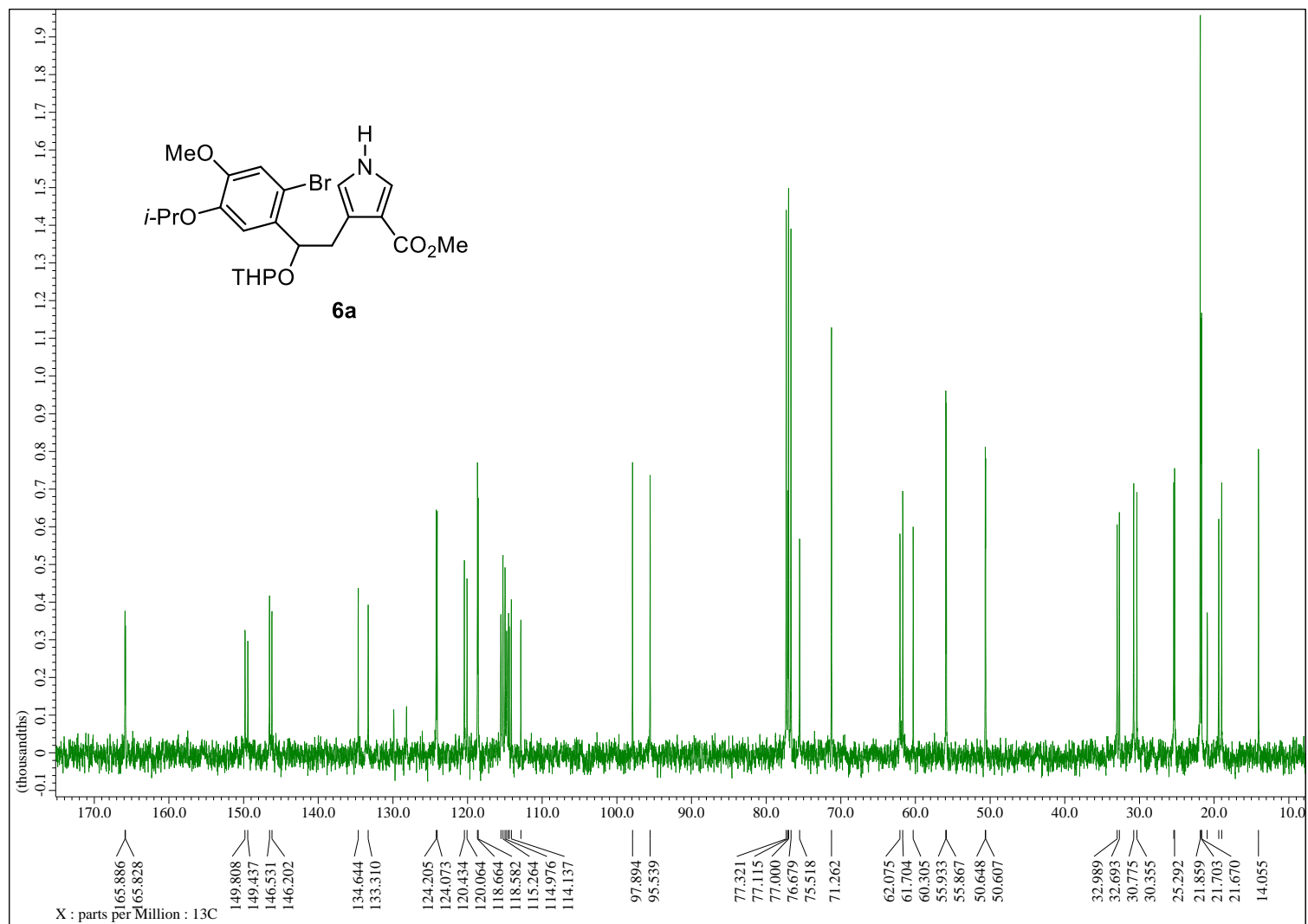


Fig. 15. ¹³C NMR Spectrum of Compound **6a** (100 MHz, CDCl₃)

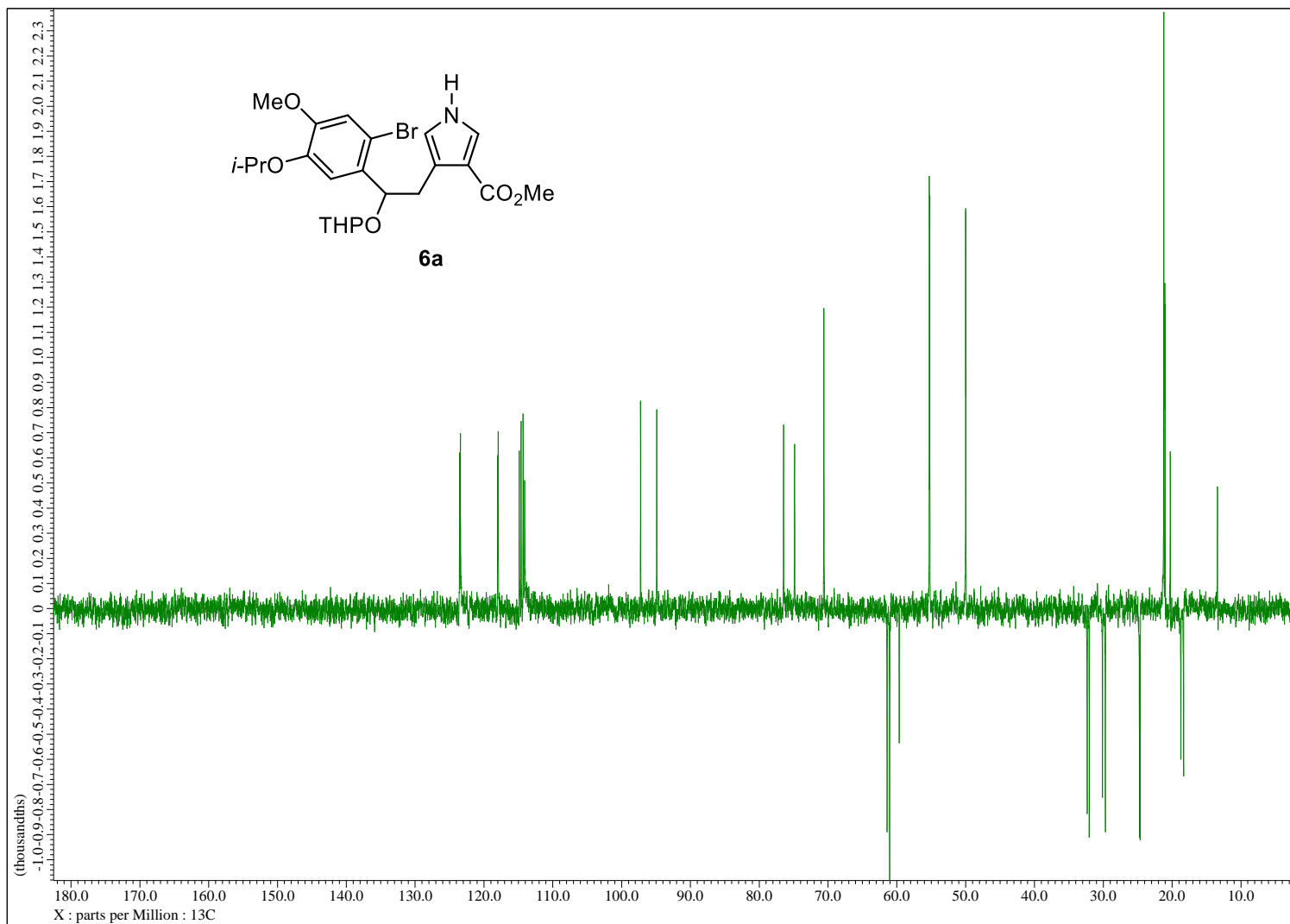


Fig. 16. DEPT Spectrum of Compound **6a**

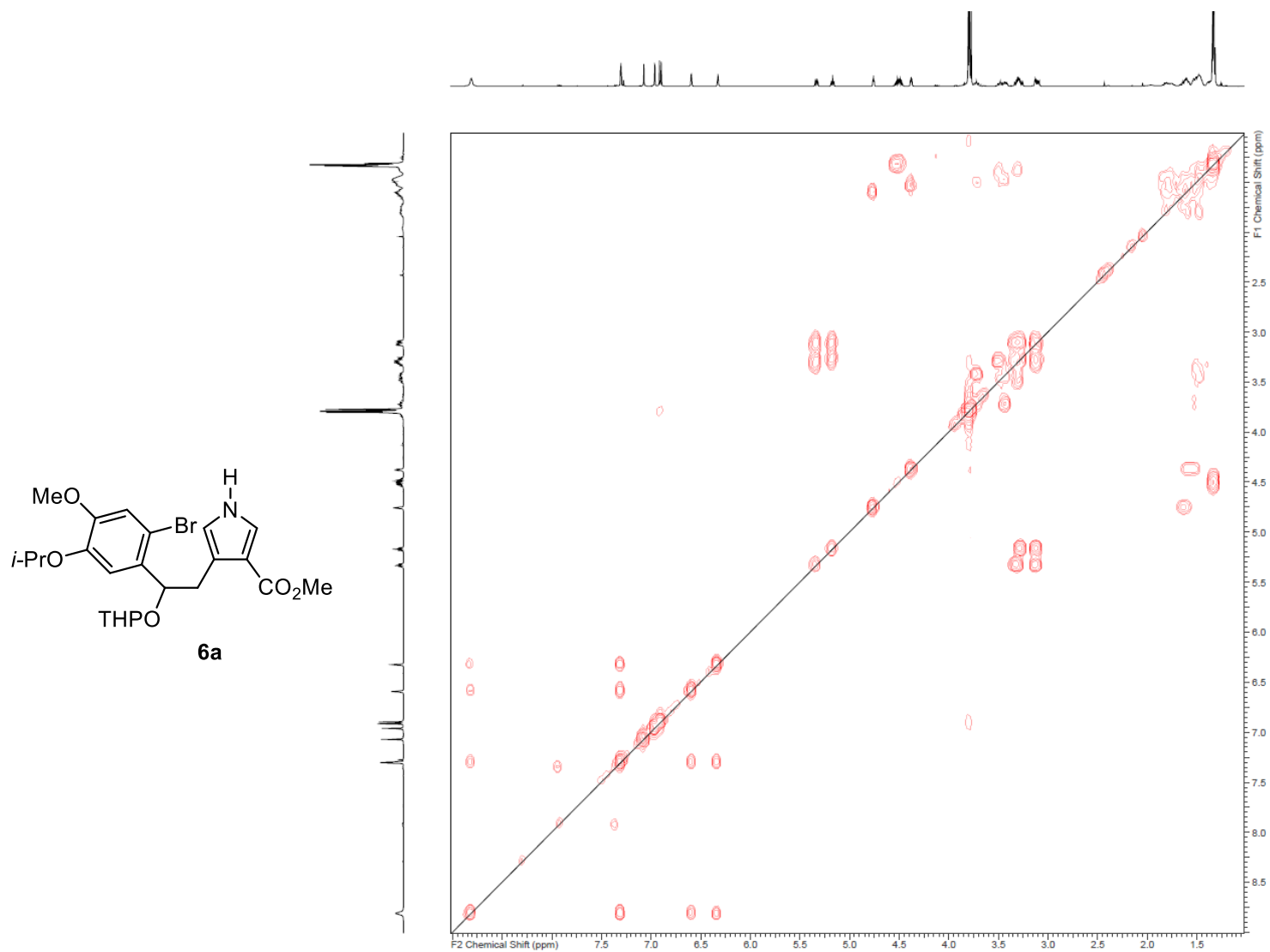


Fig. 17. COSY Spectrum of Compound **6a**

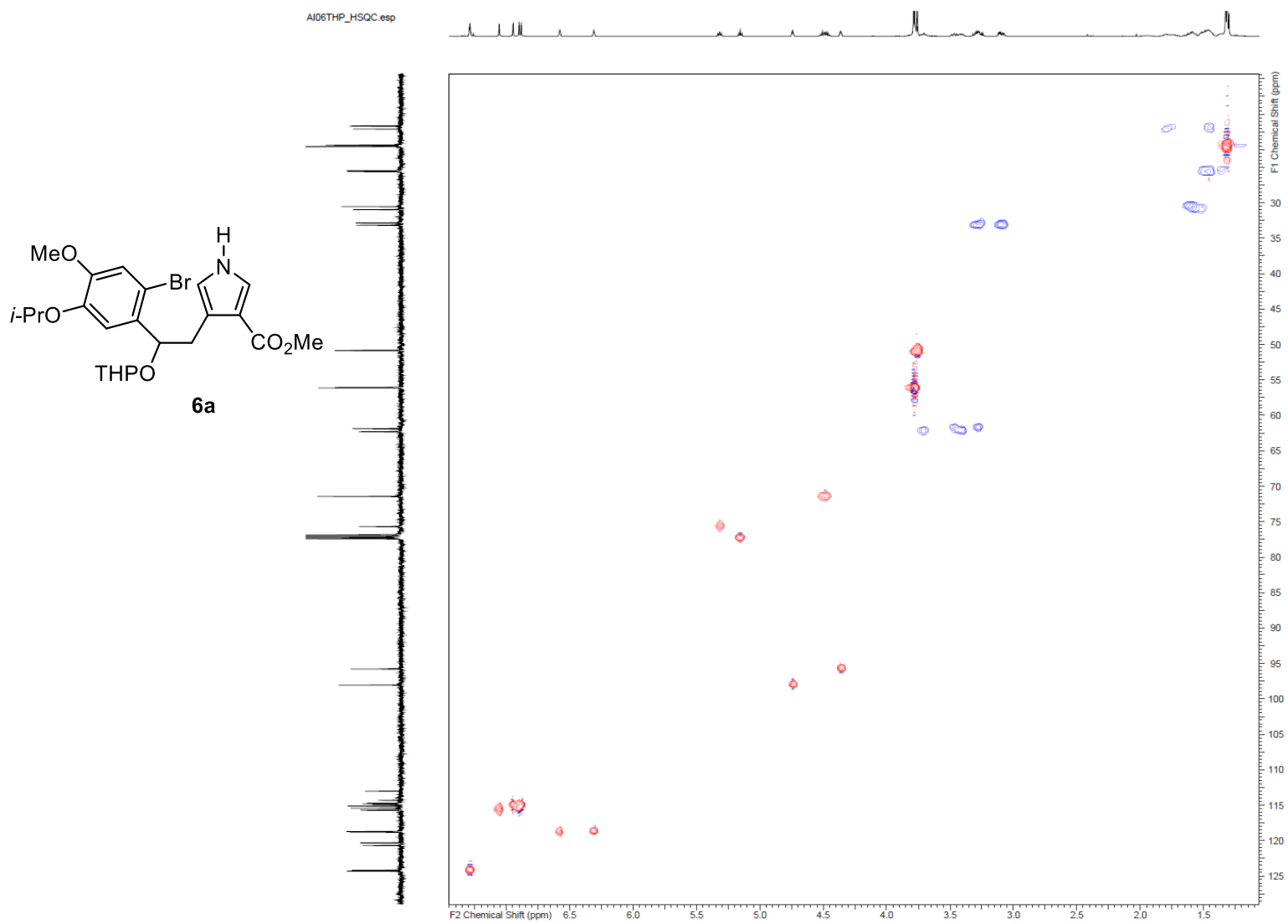
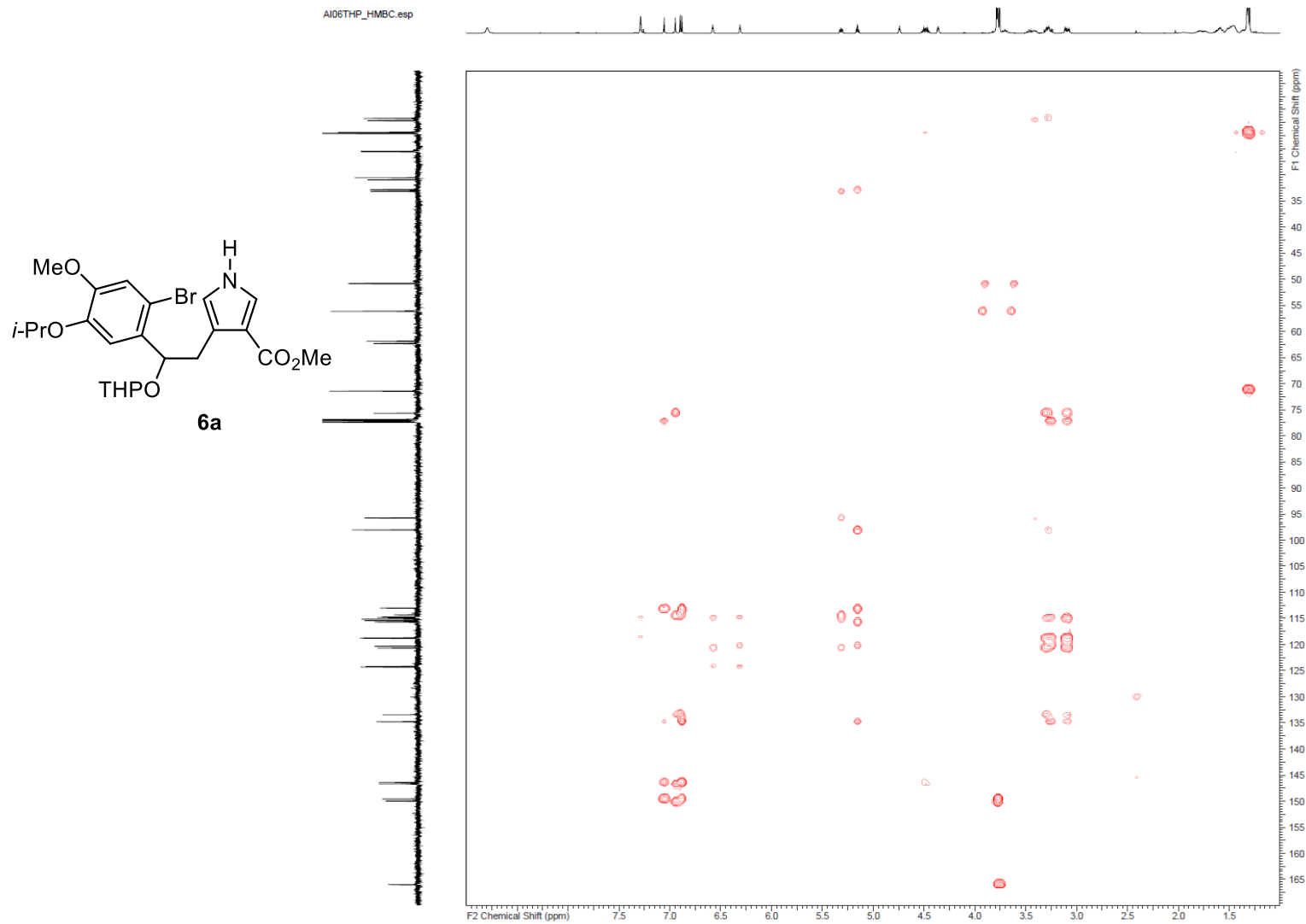


Fig. 18. HSQC Spectrum of Compound **6a**

Fig. 19. HMBC Spectrum of Compound **6a**

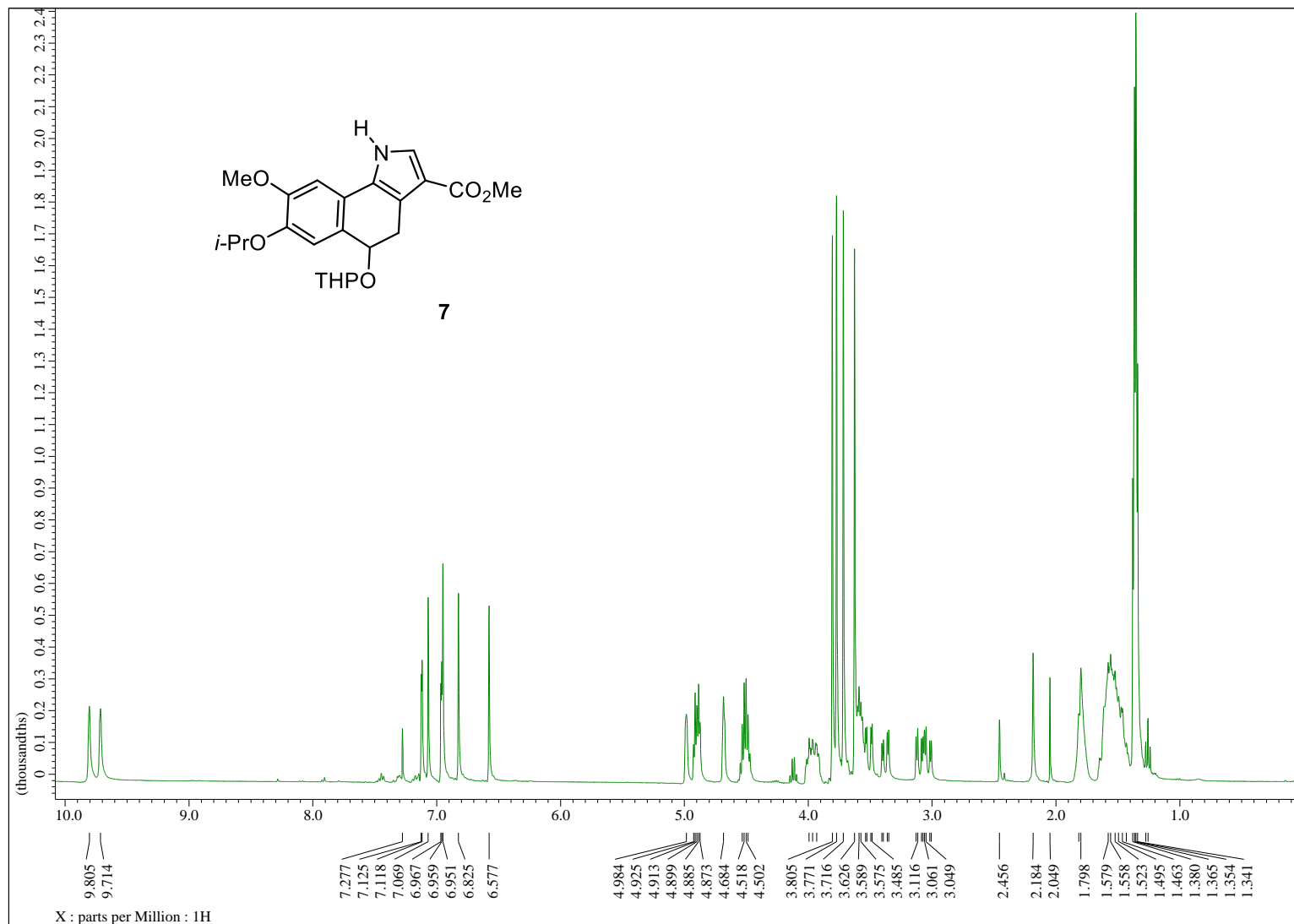


Fig. 20. ¹H NMR Spectrum of Compound **7** (400 MHz, CDCl₃)

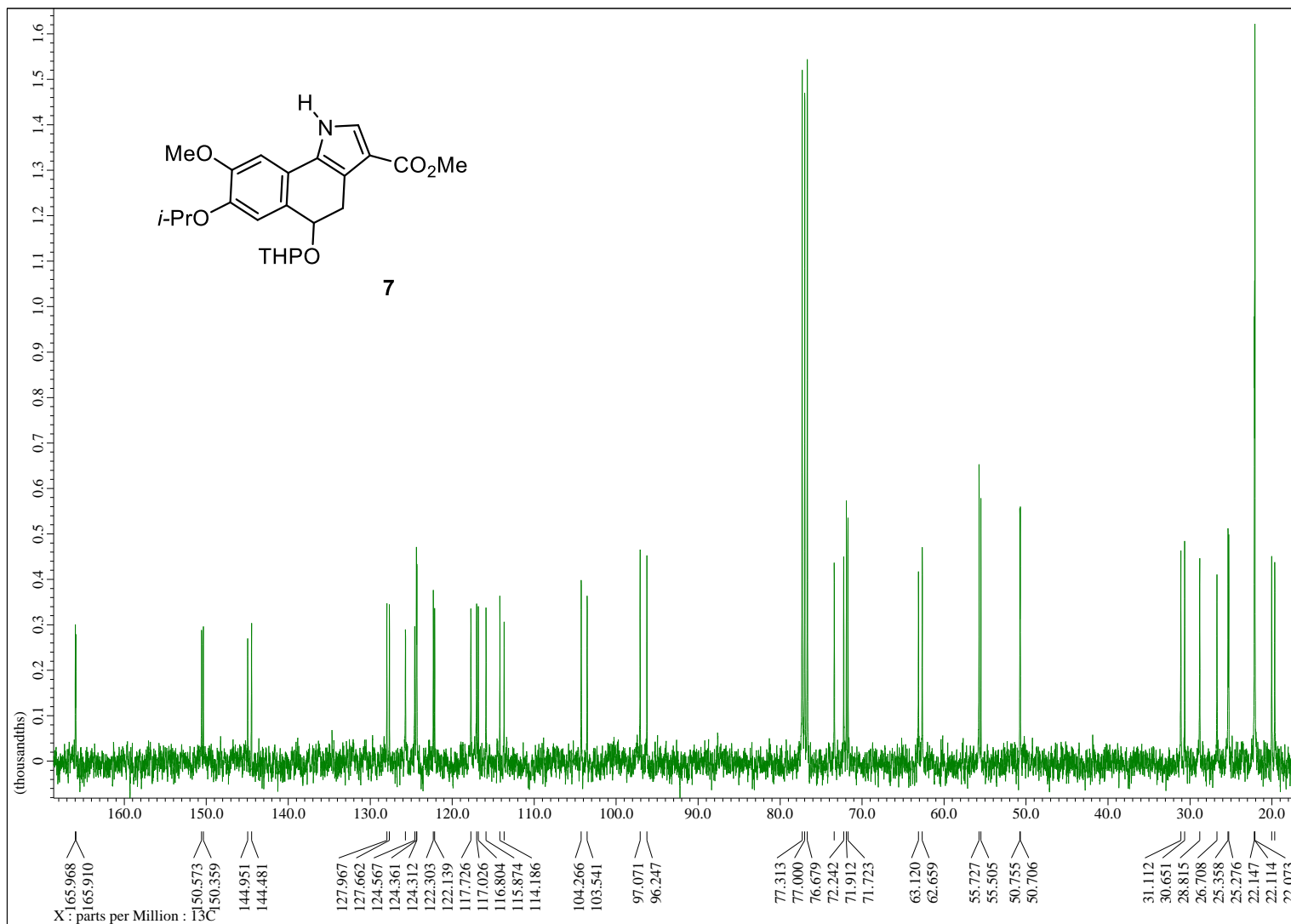


Fig. 21. ¹³C NMR Spectrum of Compound 7 (100 MHz, CDCl₃)

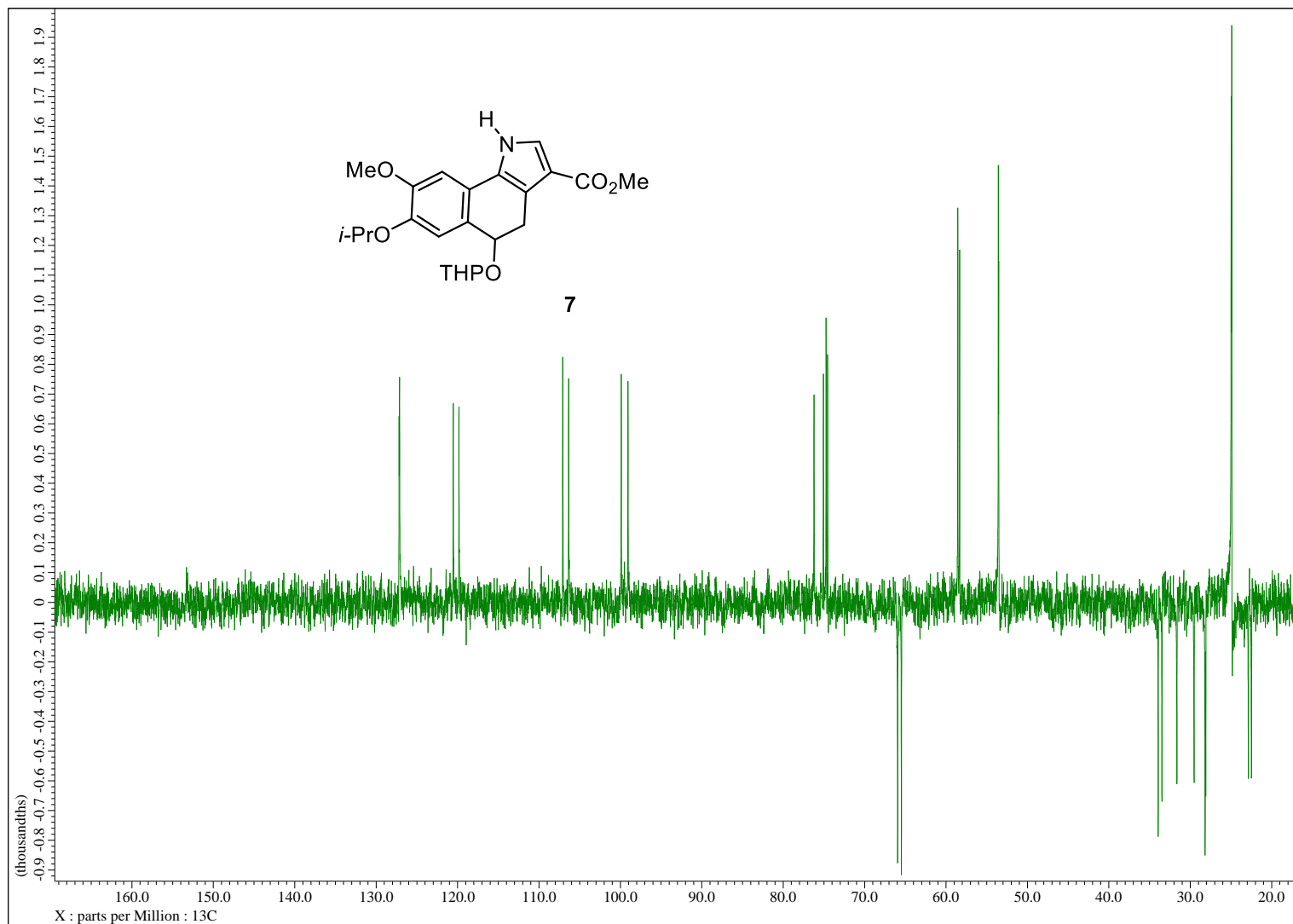


Fig. 22. DEPT Spectrum of Compound 7 (100 MHz, CDCl₃)

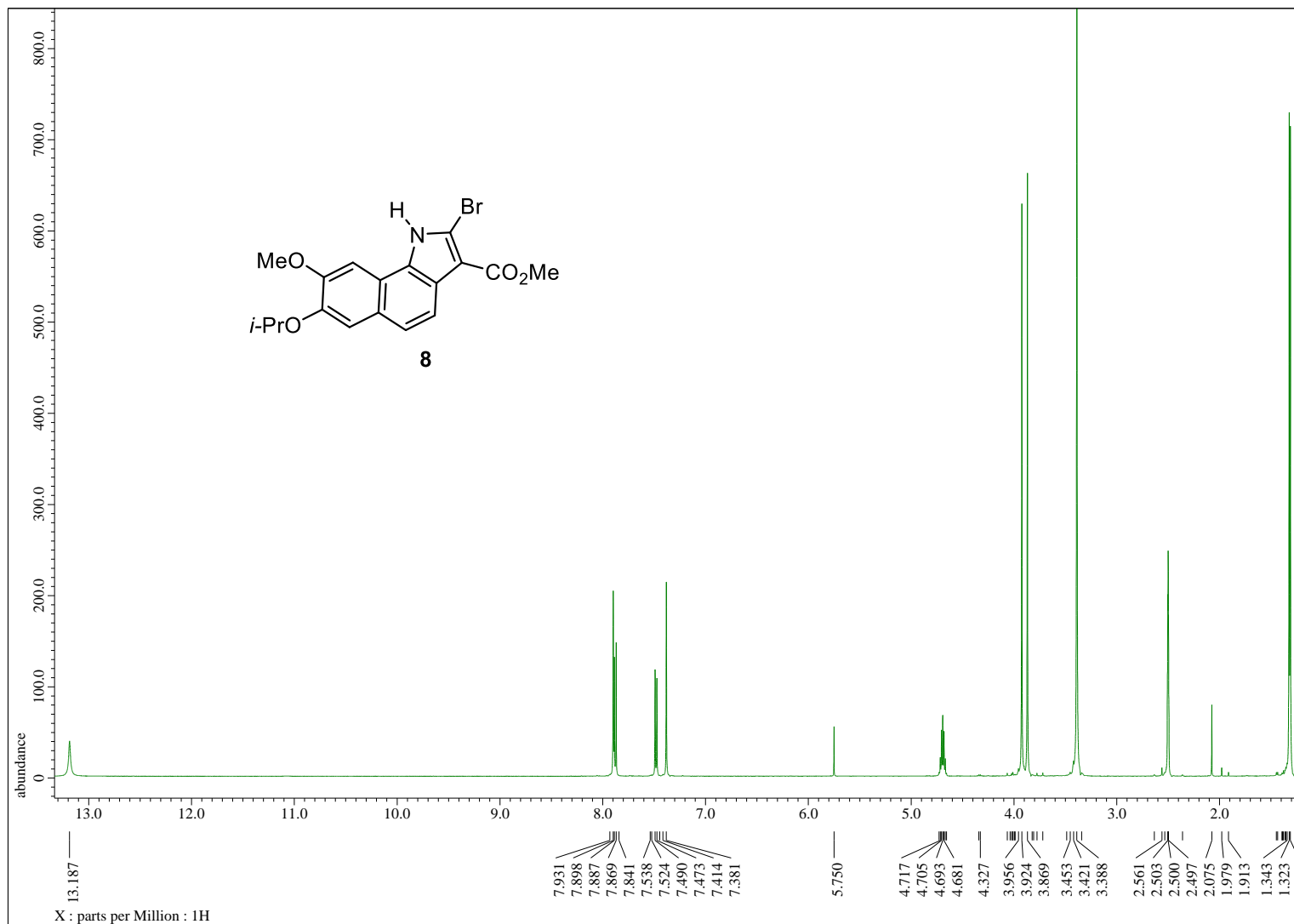
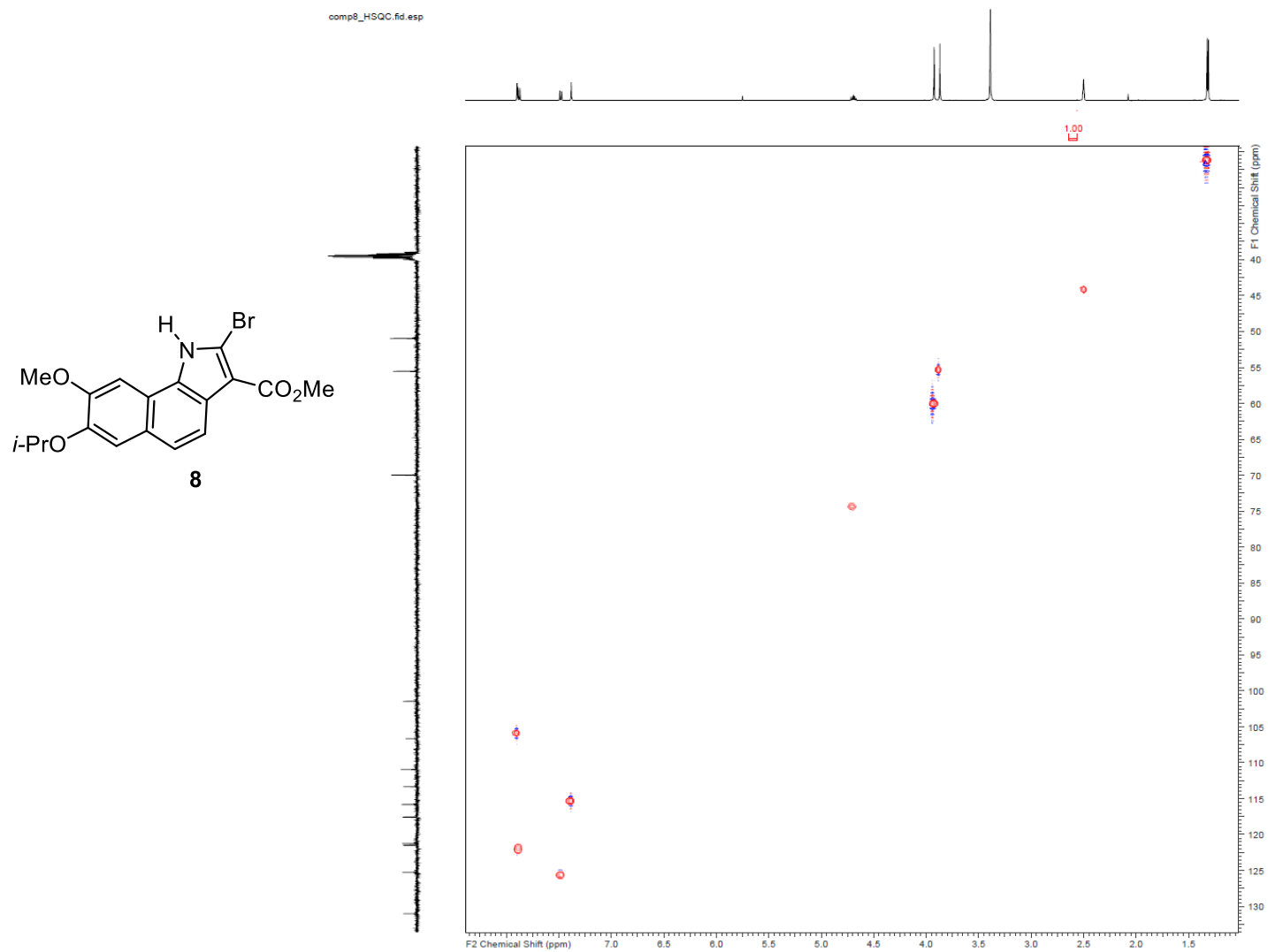


Fig. 23. ¹H NMR Spectrum of Compound **8** (500 MHz, DMSO-*d*₆)

Fig. 25. HSQC Spectrum of Compound **8** (DMSO- d_6)

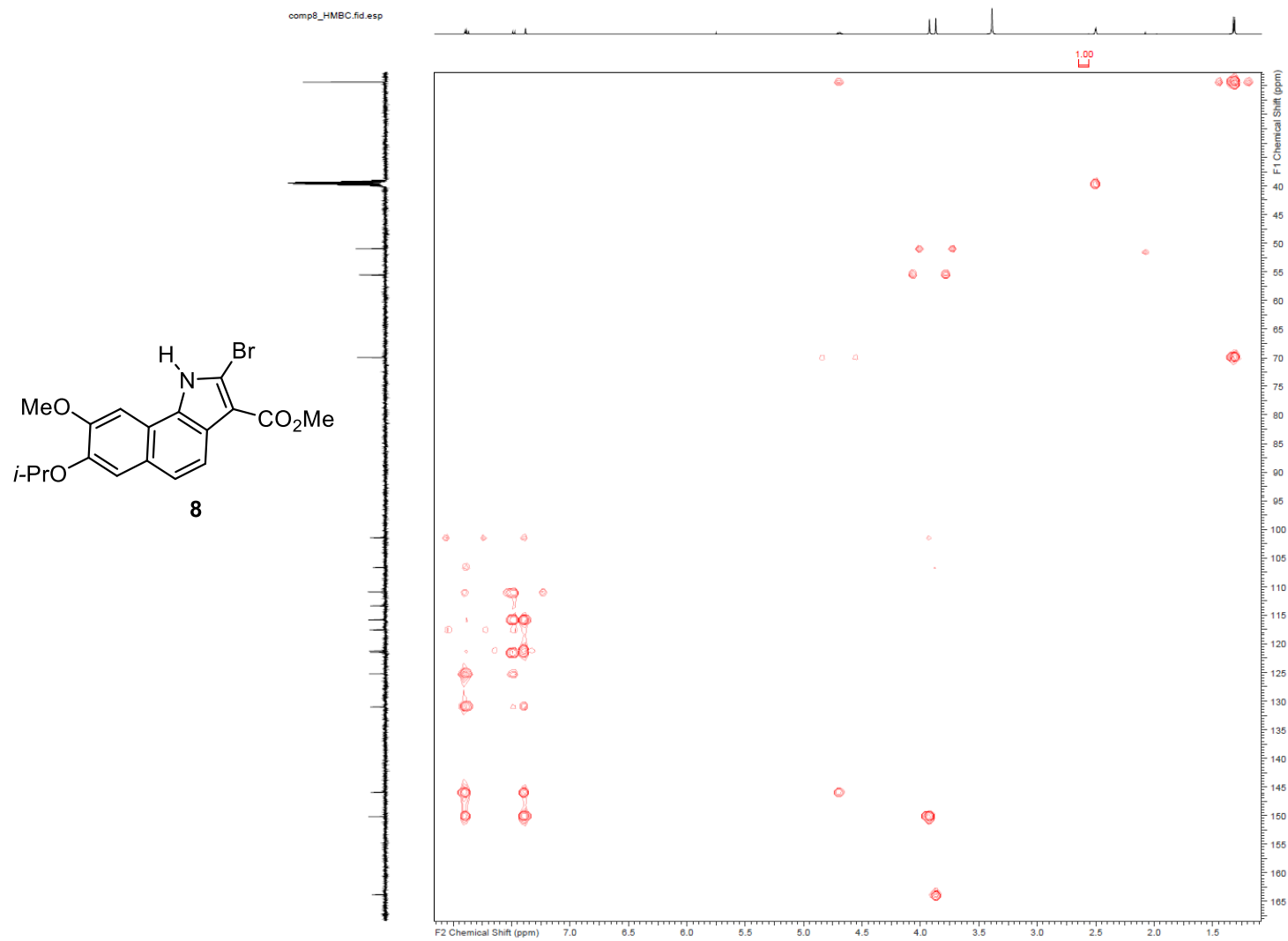


Fig. 26. HMBC Spectrum of Compound **8** (DMSO- d_6)

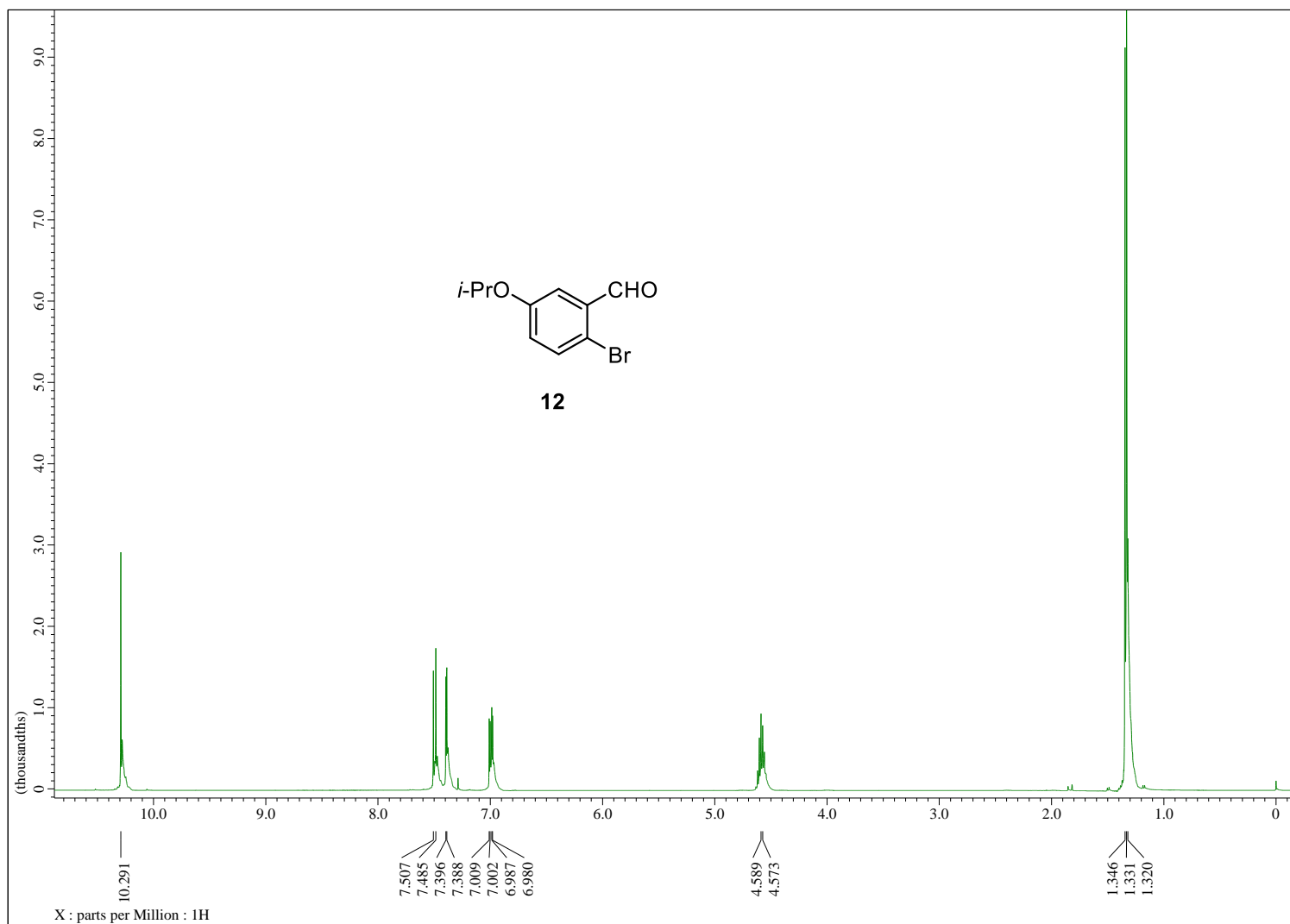


Fig. 27. ^1H NMR Spectrum of Compound **12** (400 MHz, CDCl_3)

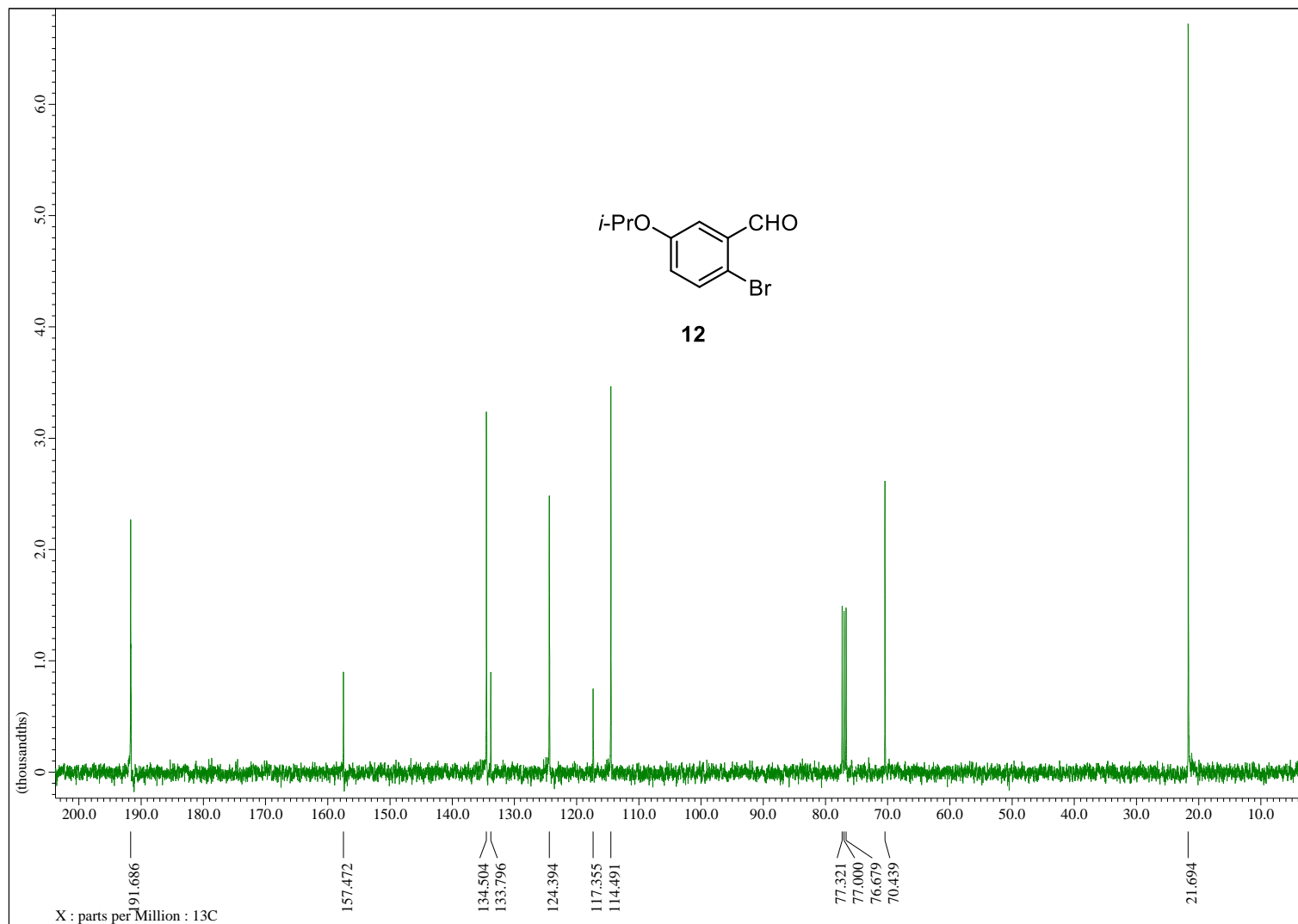


Fig. 28. ^{13}C NMR Spectrum of Compound **12** (100 MHz, CDCl_3)

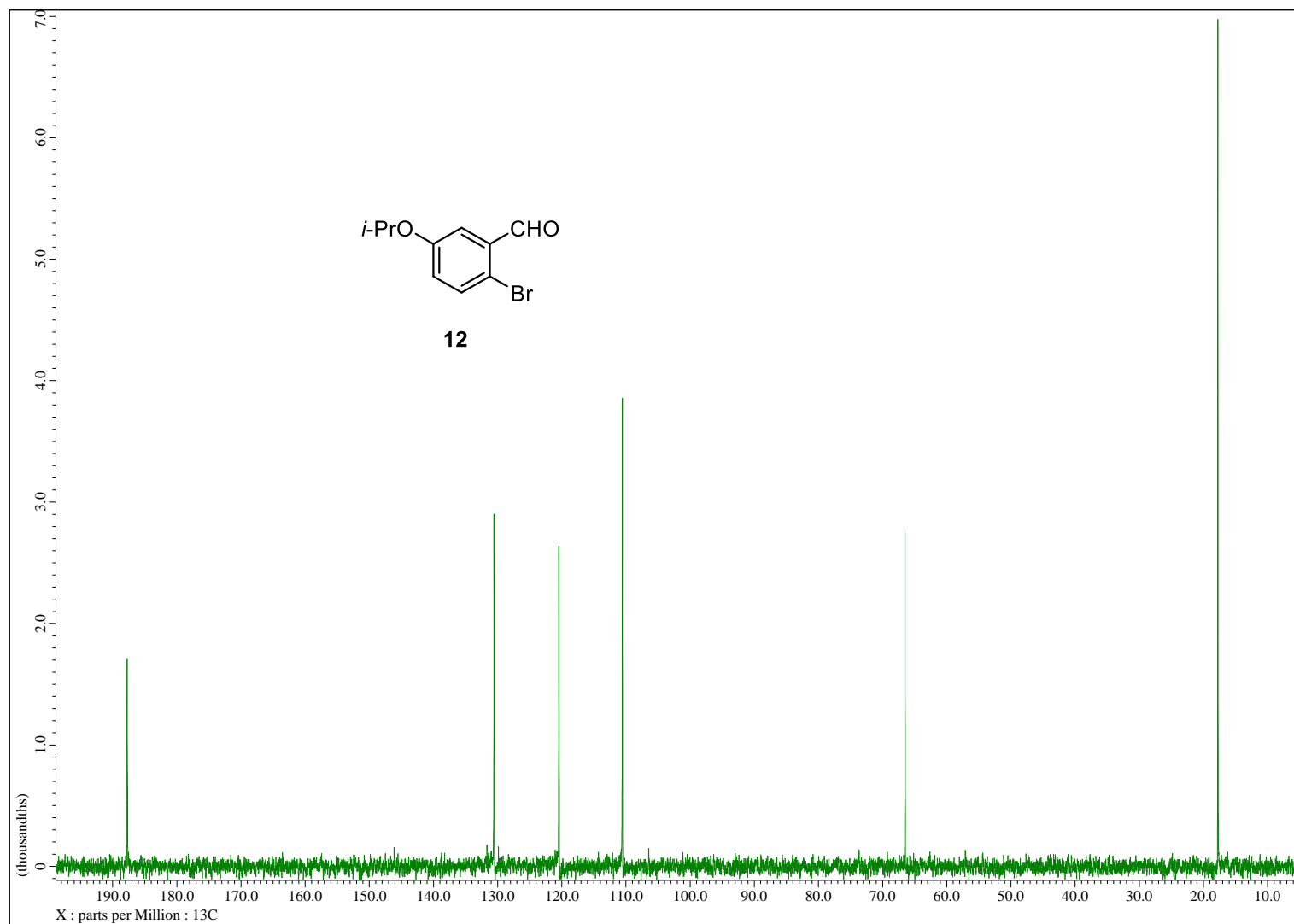


Fig. 29. DEPT Spectrum of Compound **12**

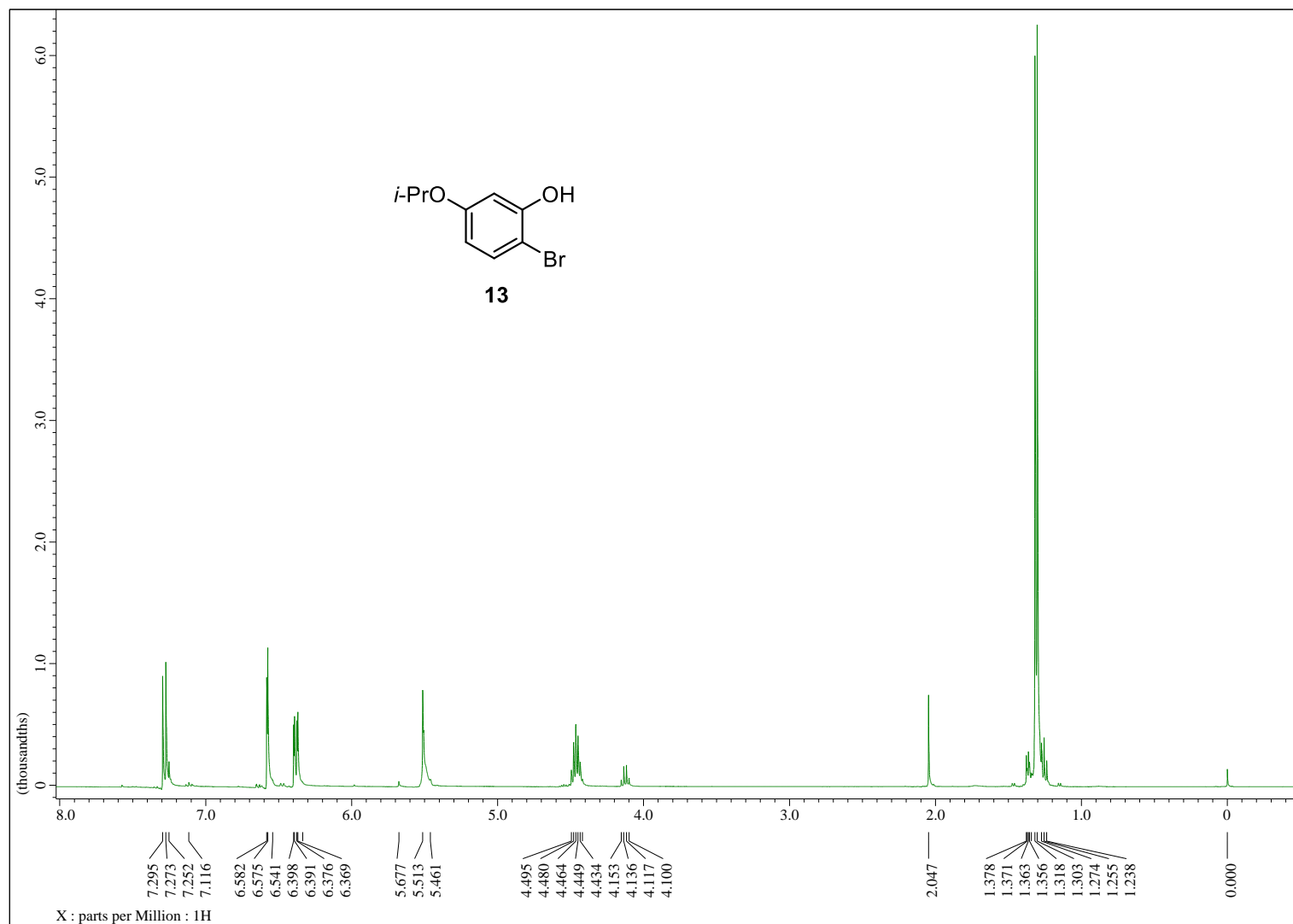


Fig. 30. ¹H NMR Spectrum of Compound **13** (400 MHz, CDCl₃)

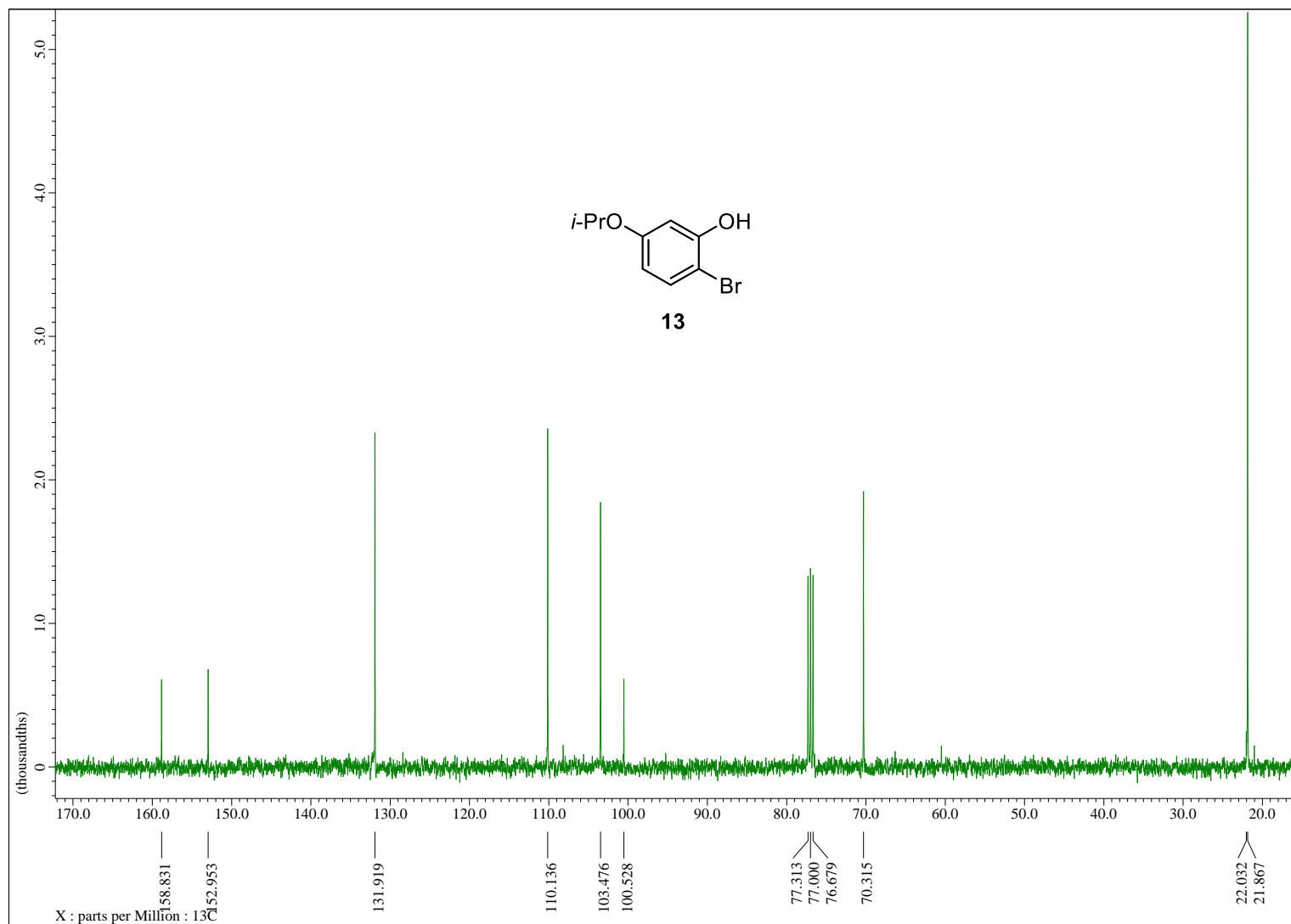


Fig. 31. ^{13}C NMR Spectrum of Compound **13** (100 MHz, CDCl_3)

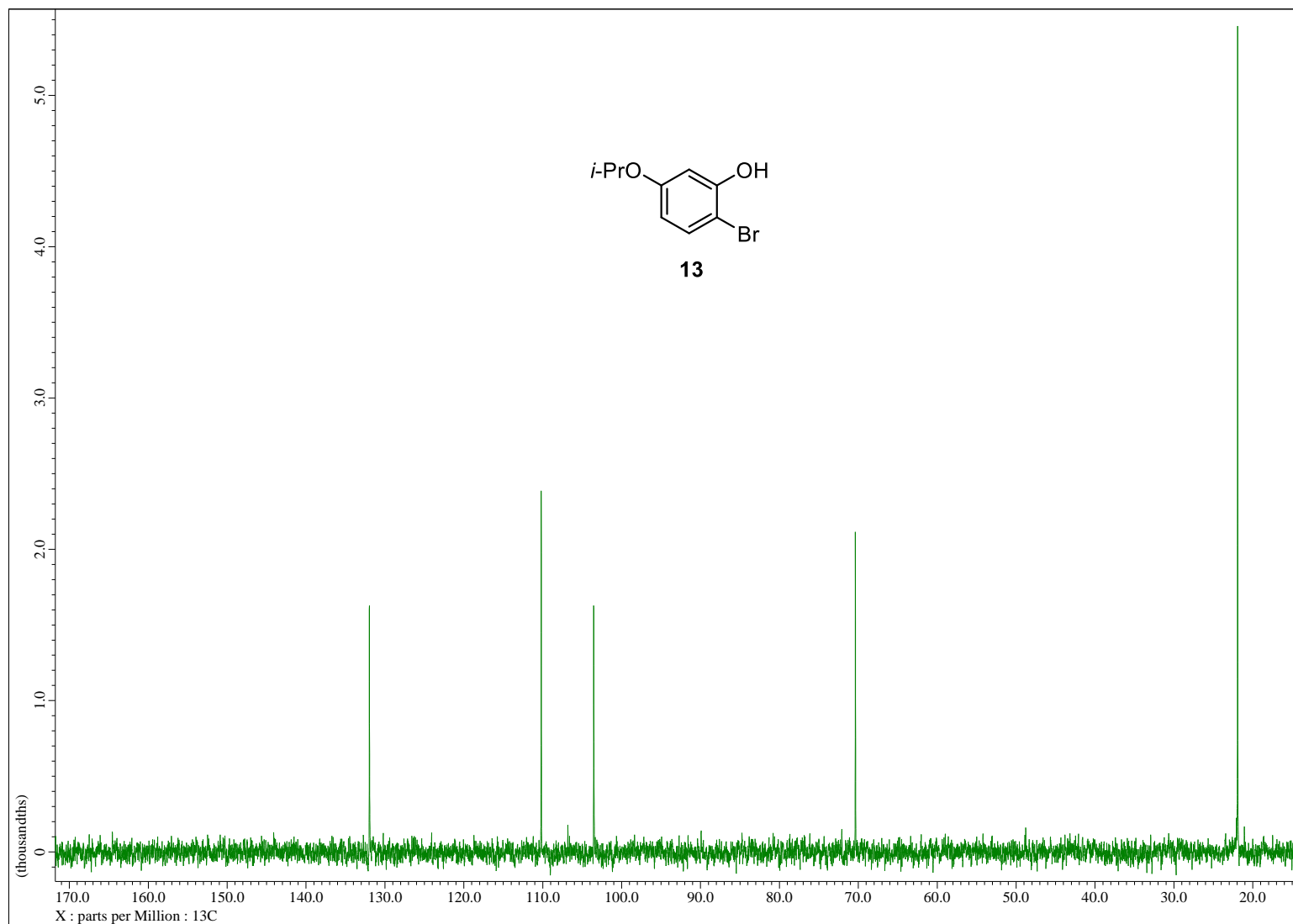


Fig. 32. DEPT Spectrum of Compound 13

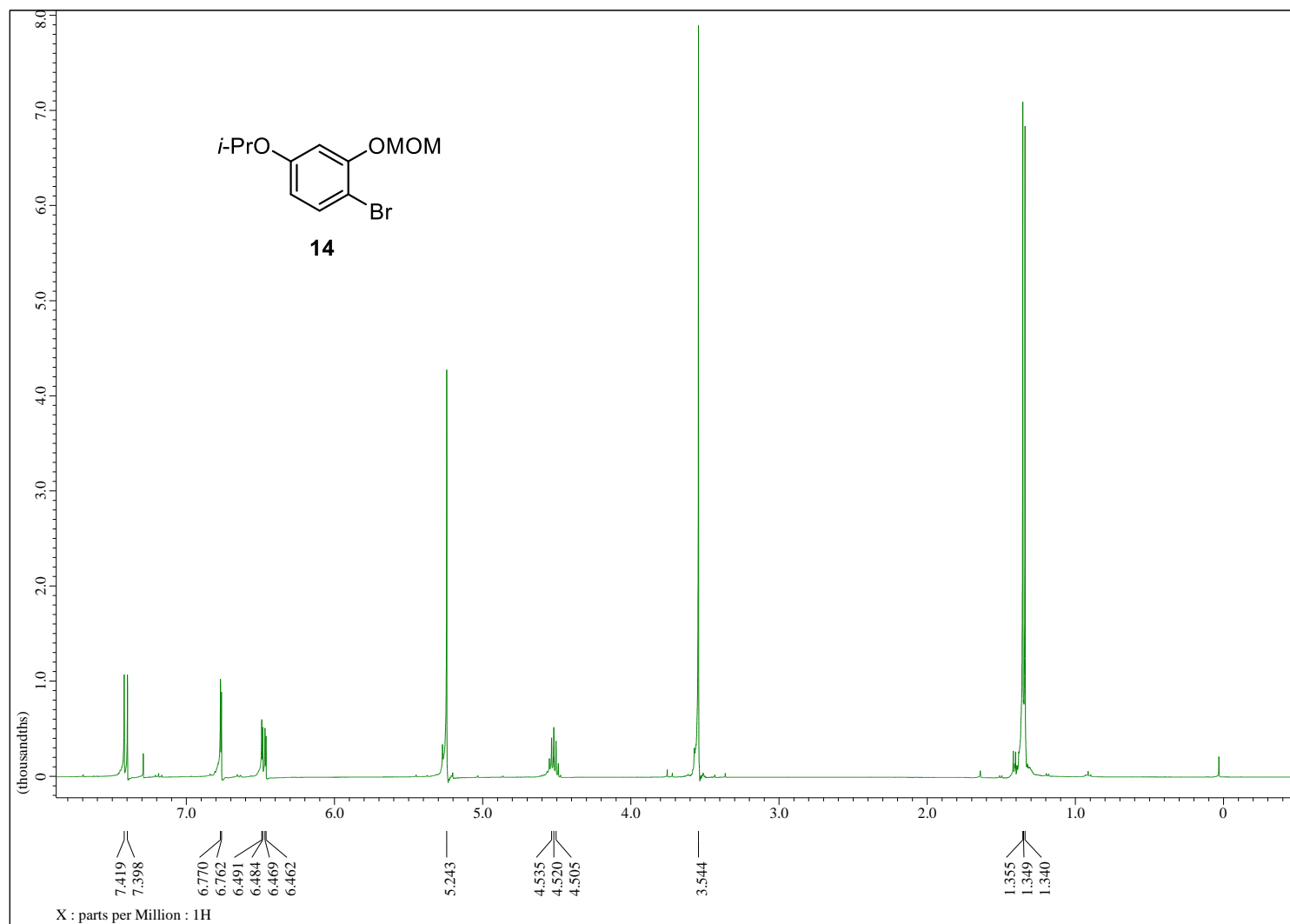


Fig. 33. ^1H NMR Spectrum of Compound **14** (400 MHz, CDCl_3)

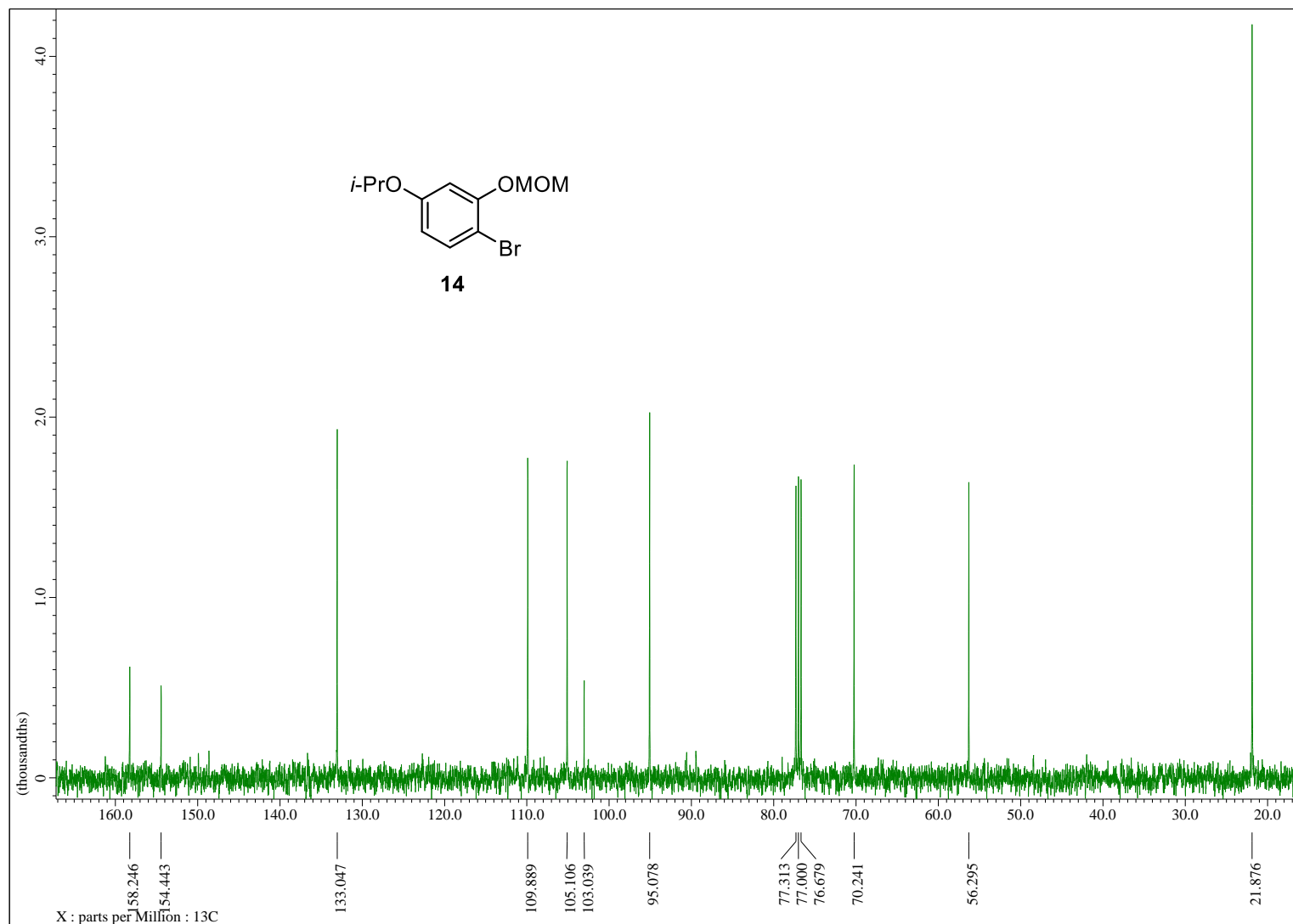


Fig. 34. ^{13}C NMR Spectrum of Compound **14** (100 MHz, CDCl_3)

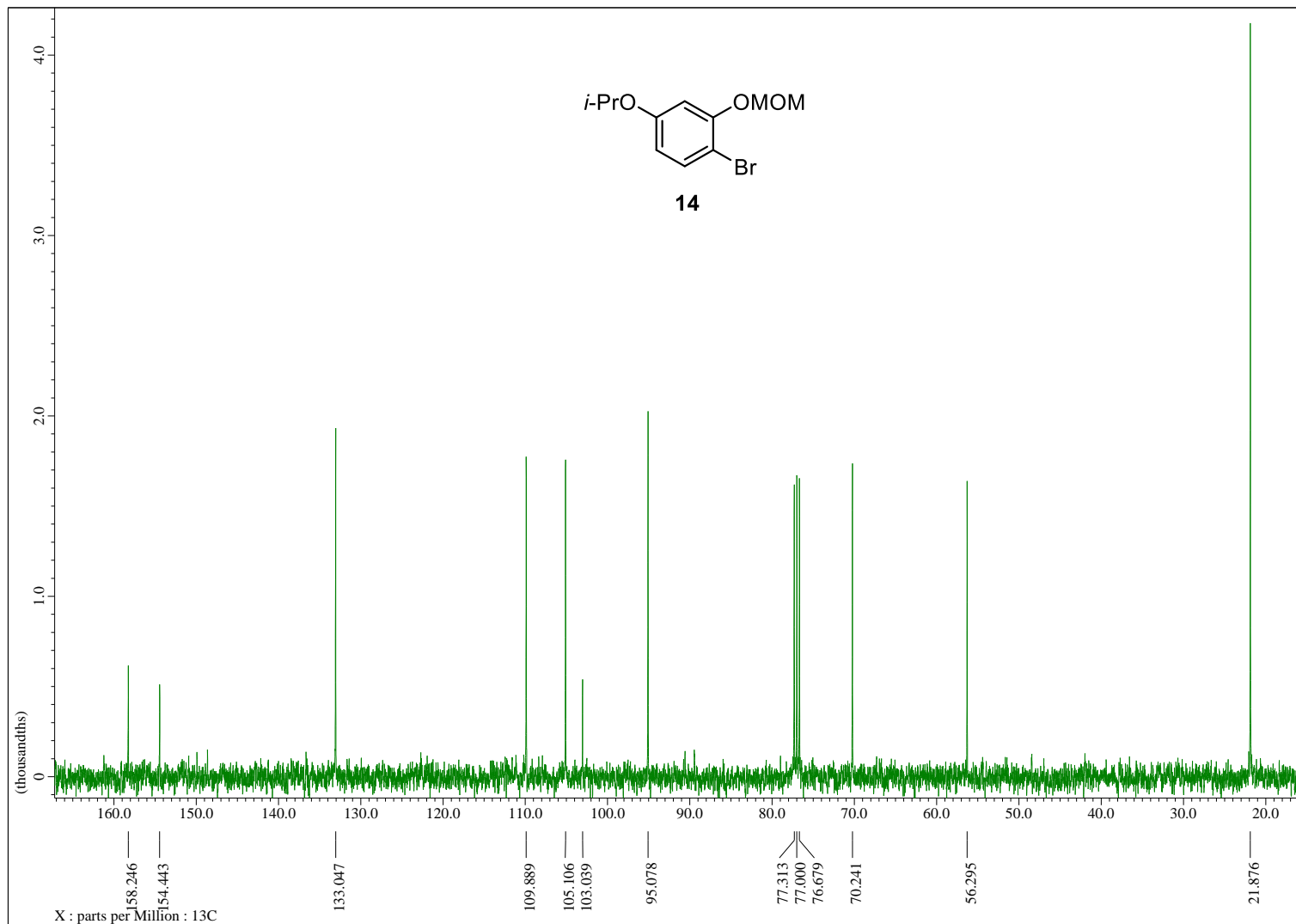


Fig. 35. DEPT Spectrum of Compound 14

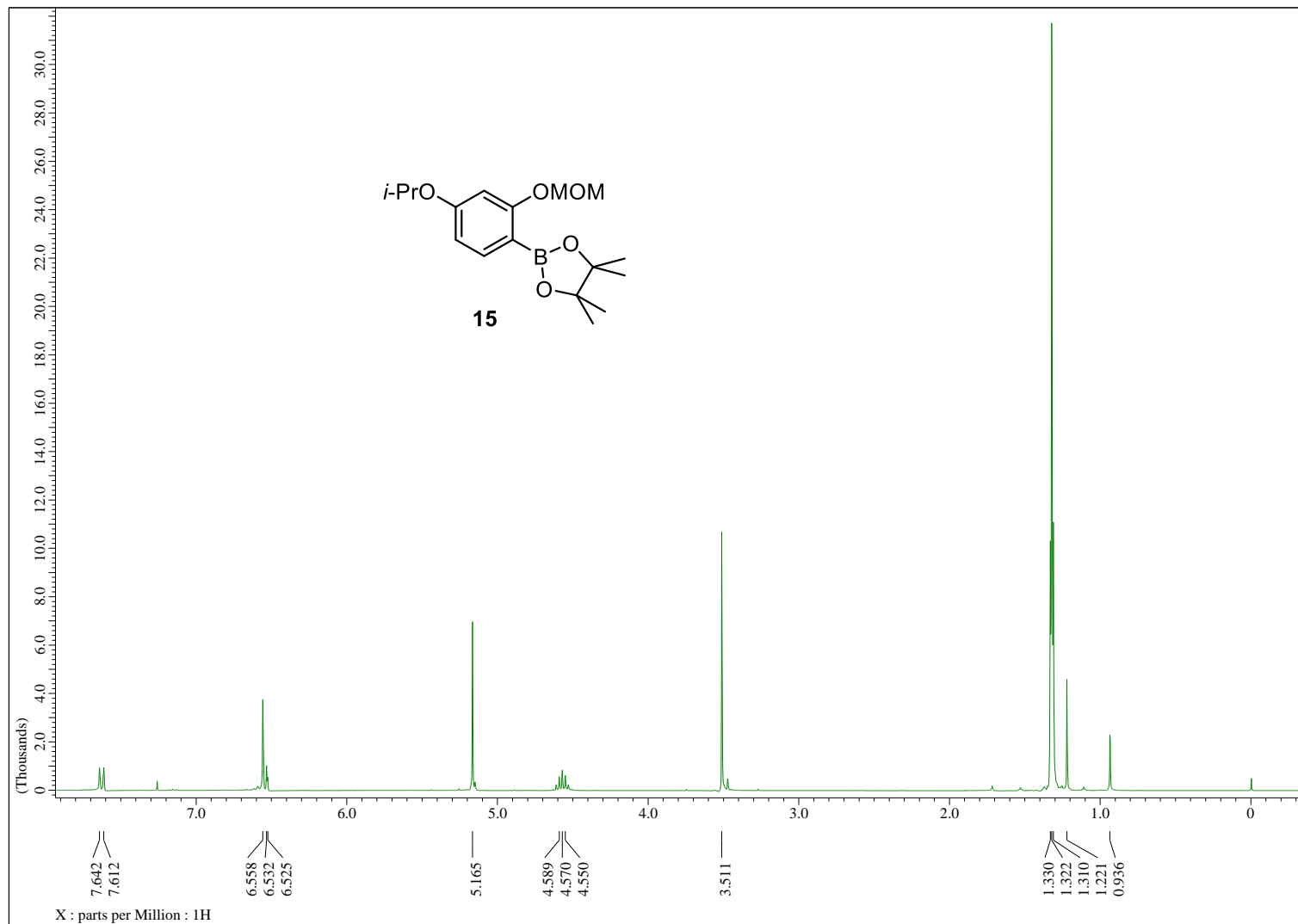


Fig. 36. ¹H NMR Spectrum of Compound **15** (300 MHz, CDCl₃)

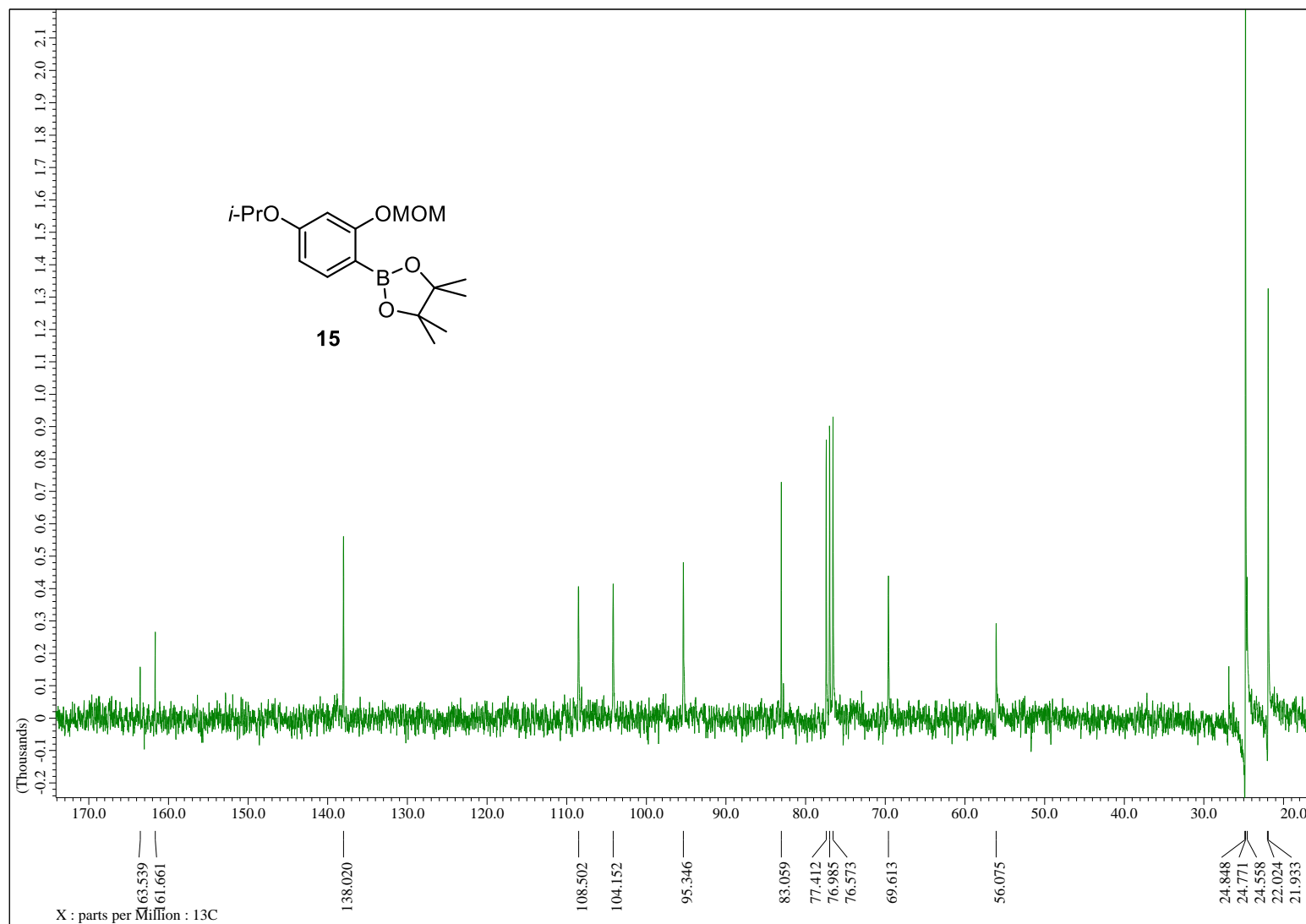


Fig. 37. ^{13}C NMR Spectrum of Compound **15** (75 MHz, CDCl_3)

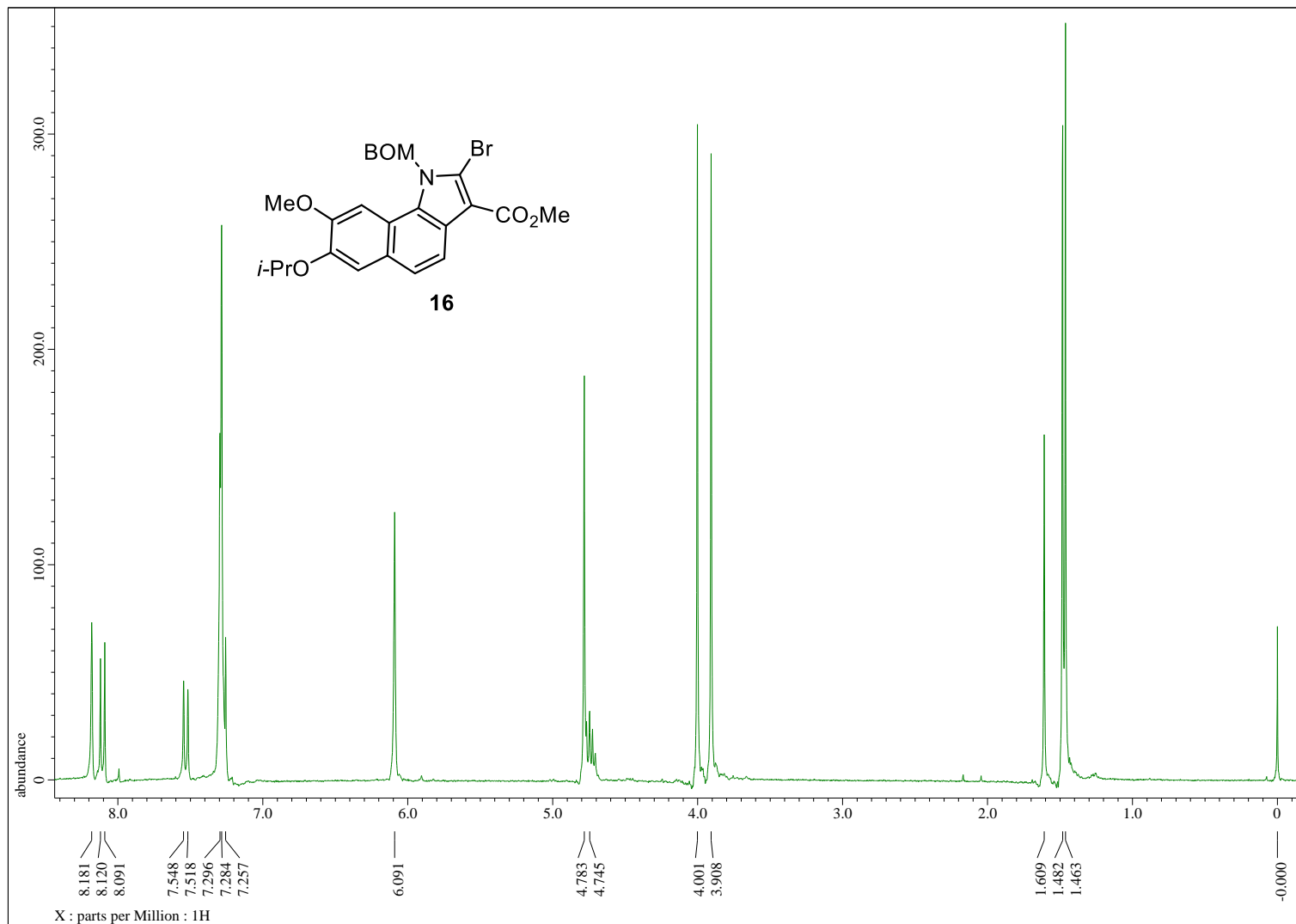


Fig. 38. ¹H NMR Spectrum of Compound **16** (300 MHz, CDCl₃)

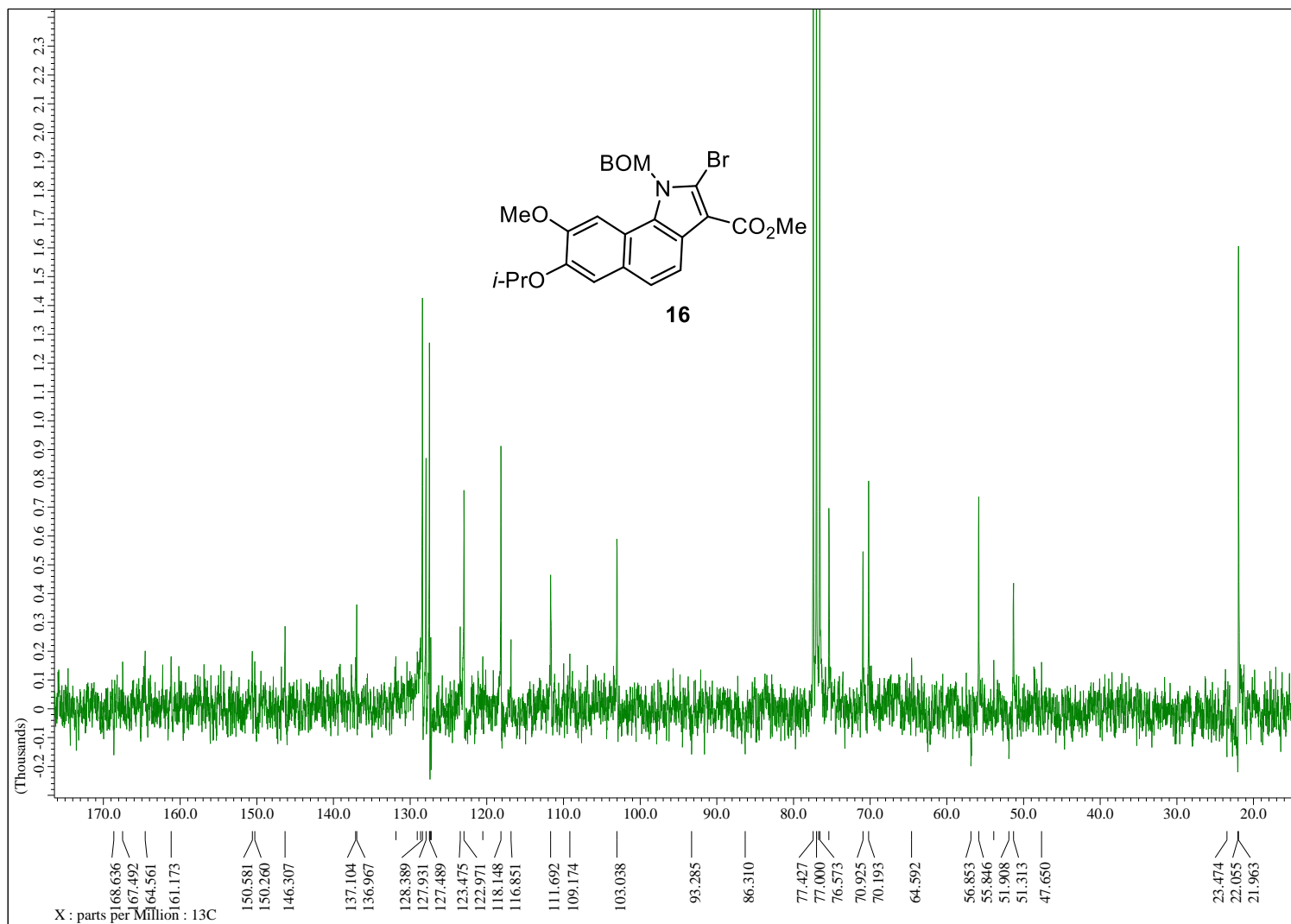


Fig. 39. ¹³C NMR Spectrum of Compound **16** (75 MHz, CDCl₃)

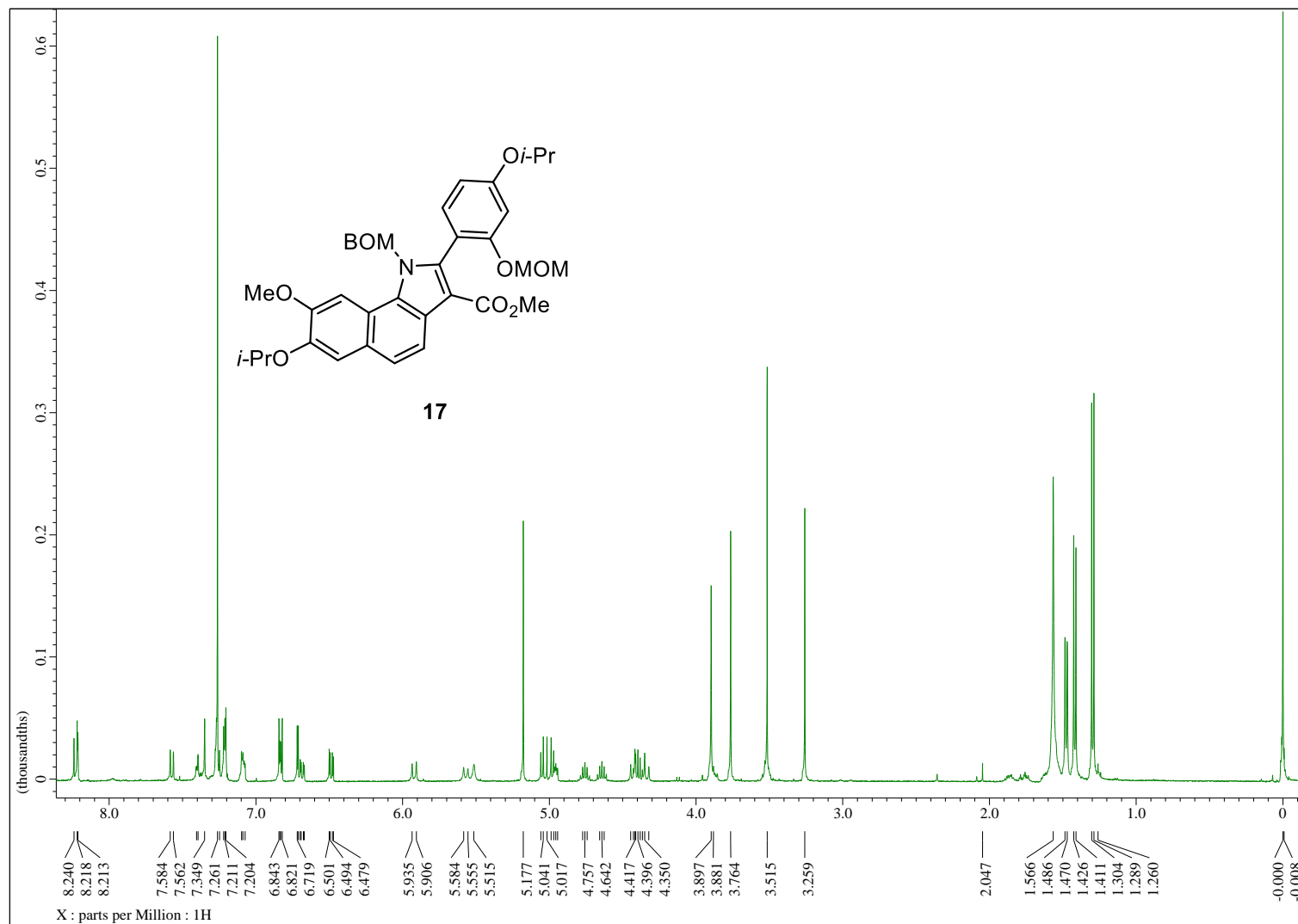


Fig. 40. ¹H NMR Spectrum of Compound 17 (400 MHz, CDCl₃)

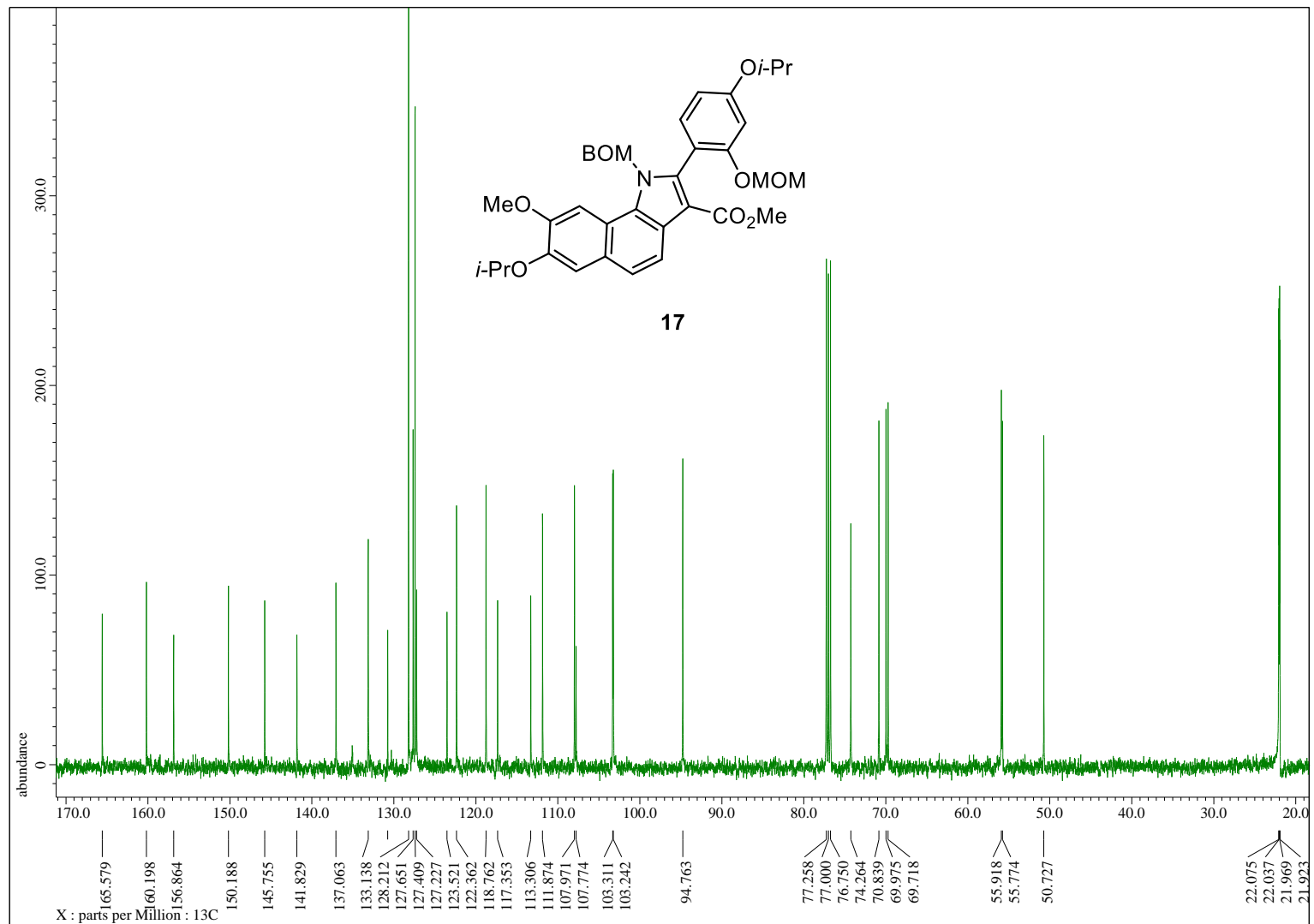


Fig. 41. ¹³C NMR Spectrum of Compound 17 (125 MHz, CDCl₃)

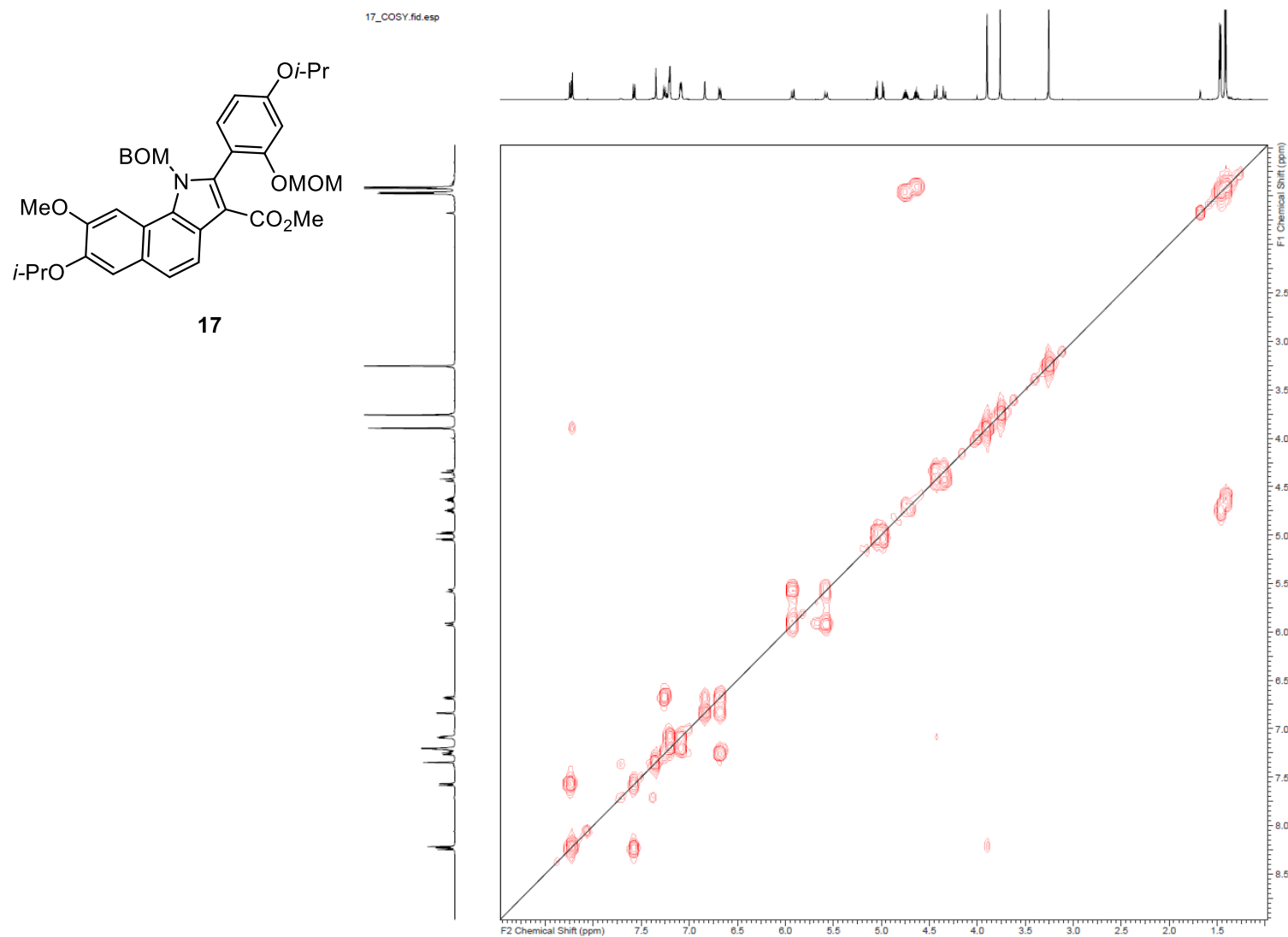


Fig. 42. COSY Spectrum of Compound **17**

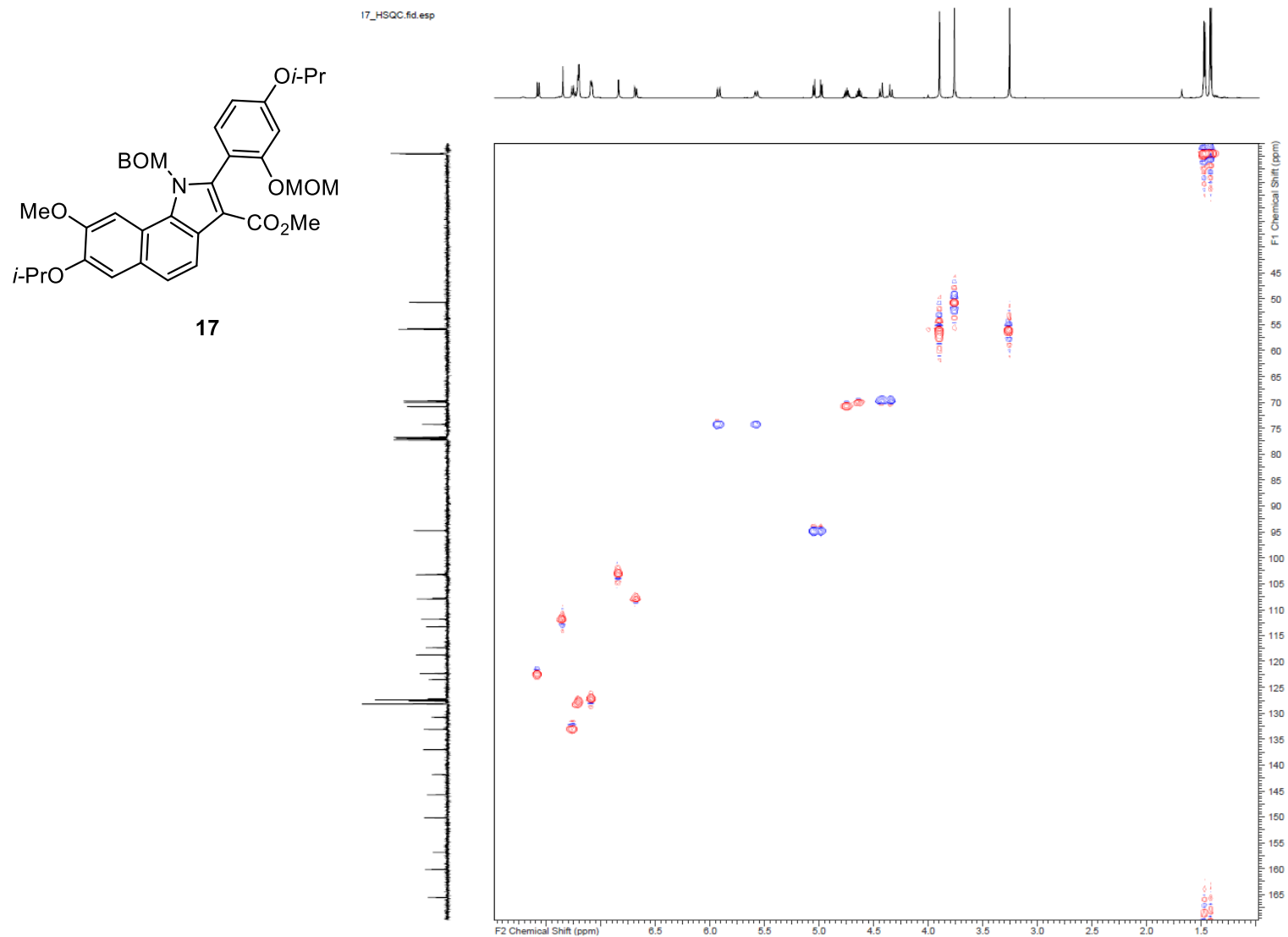
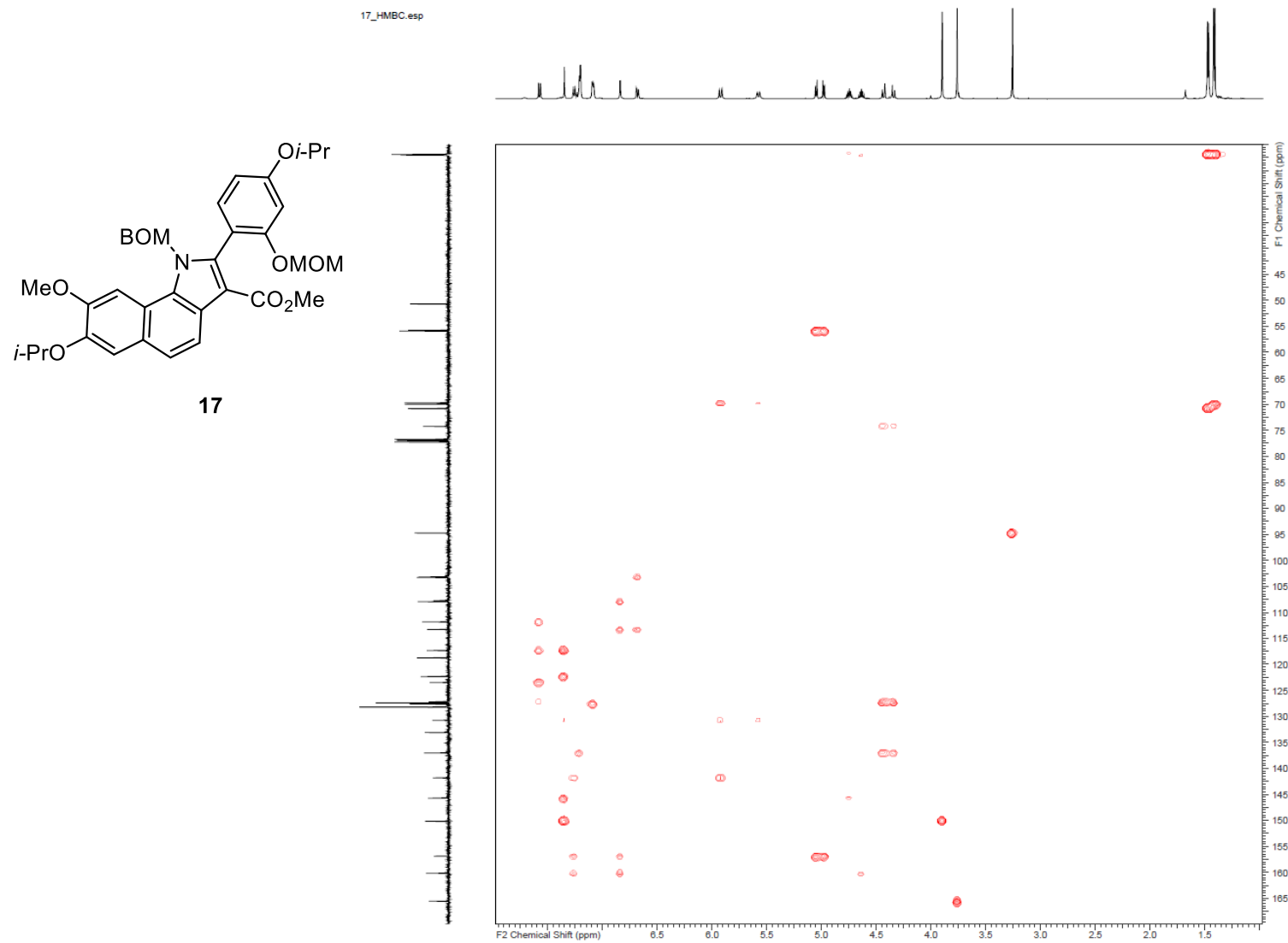


Fig. 43. HSQC Spectrum of Compound **17**



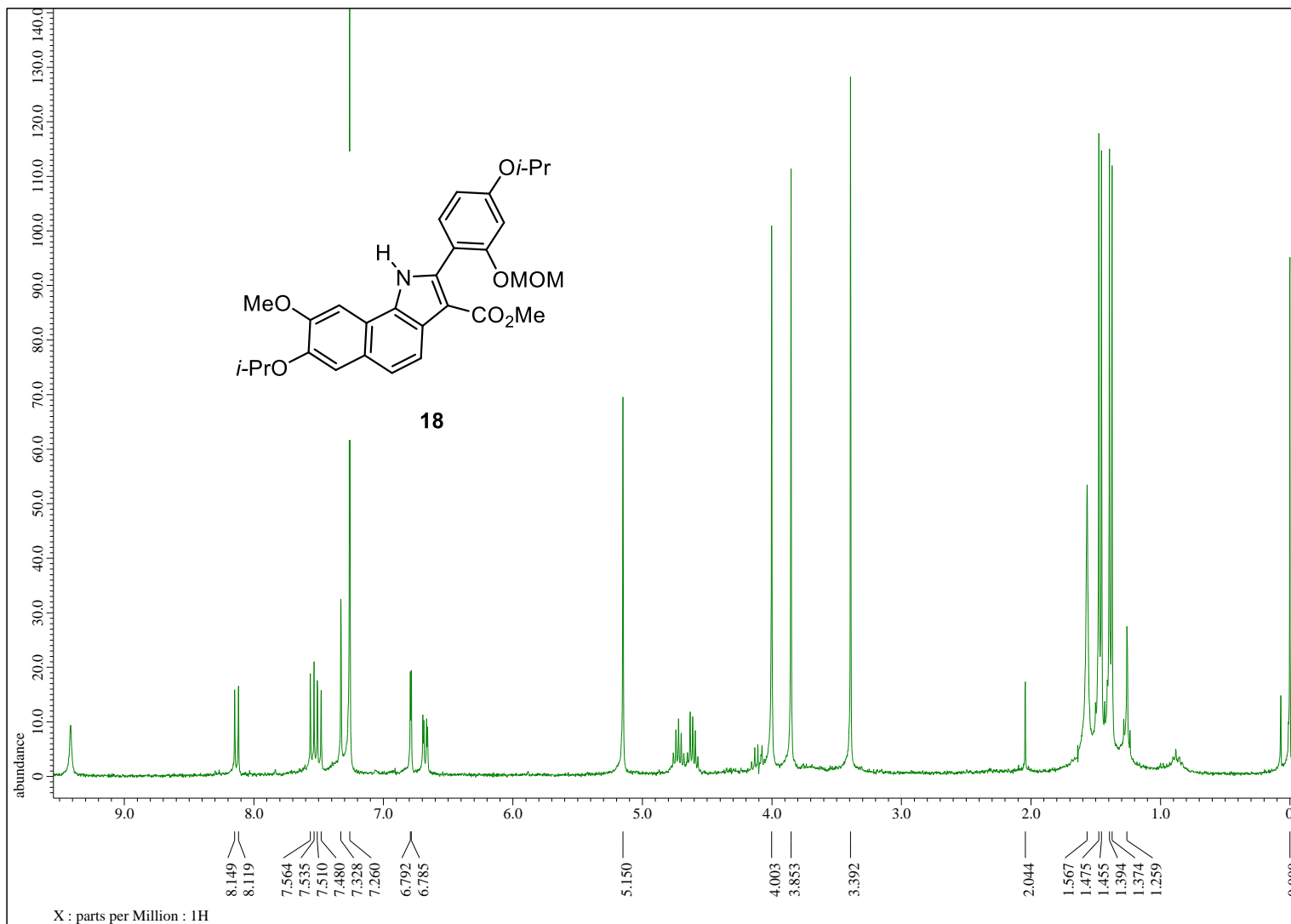


Fig. 45. ¹H NMR Spectrum of Compound **18** (300 MHz, CDCl₃)

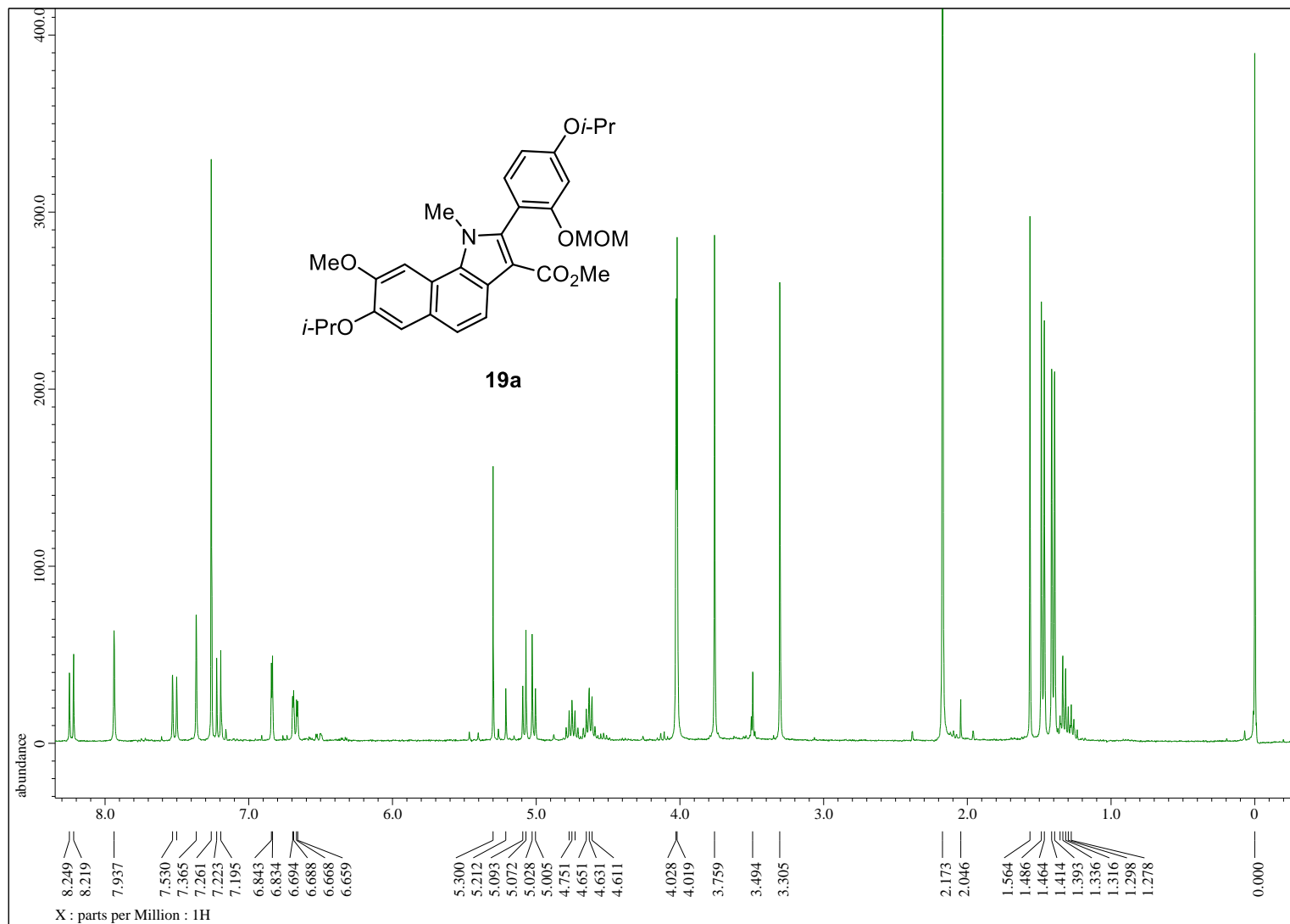


Fig. 46. ¹H NMR Spectrum of Compound **19a** (400 MHz, CDCl₃)

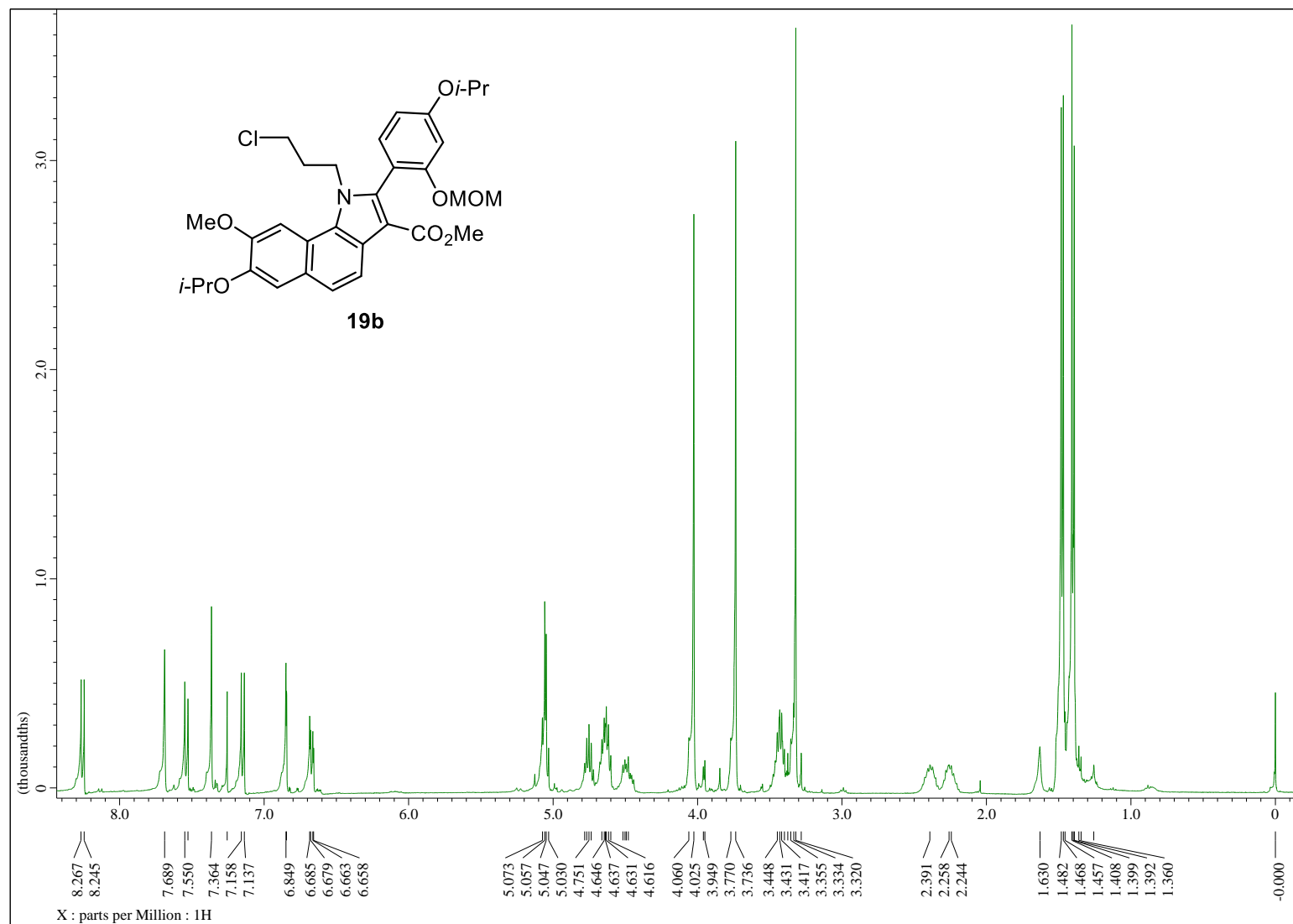


Fig. 47. ¹H NMR Spectrum of Compound **19b** (400 MHz, CDCl₃)

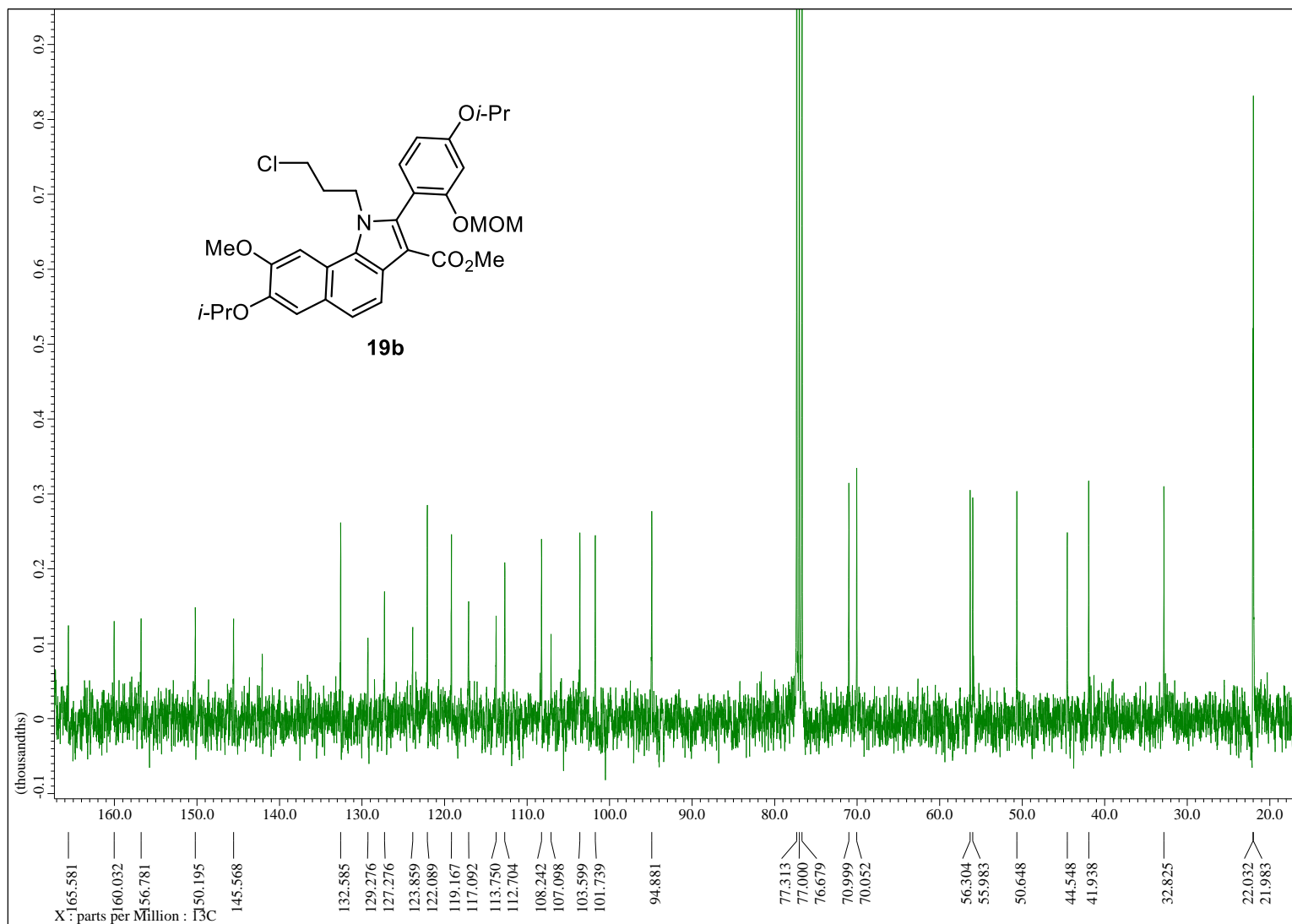


Fig. 48. ¹³C NMR Spectrum of Compound **19b** (100 MHz, CDCl₃)

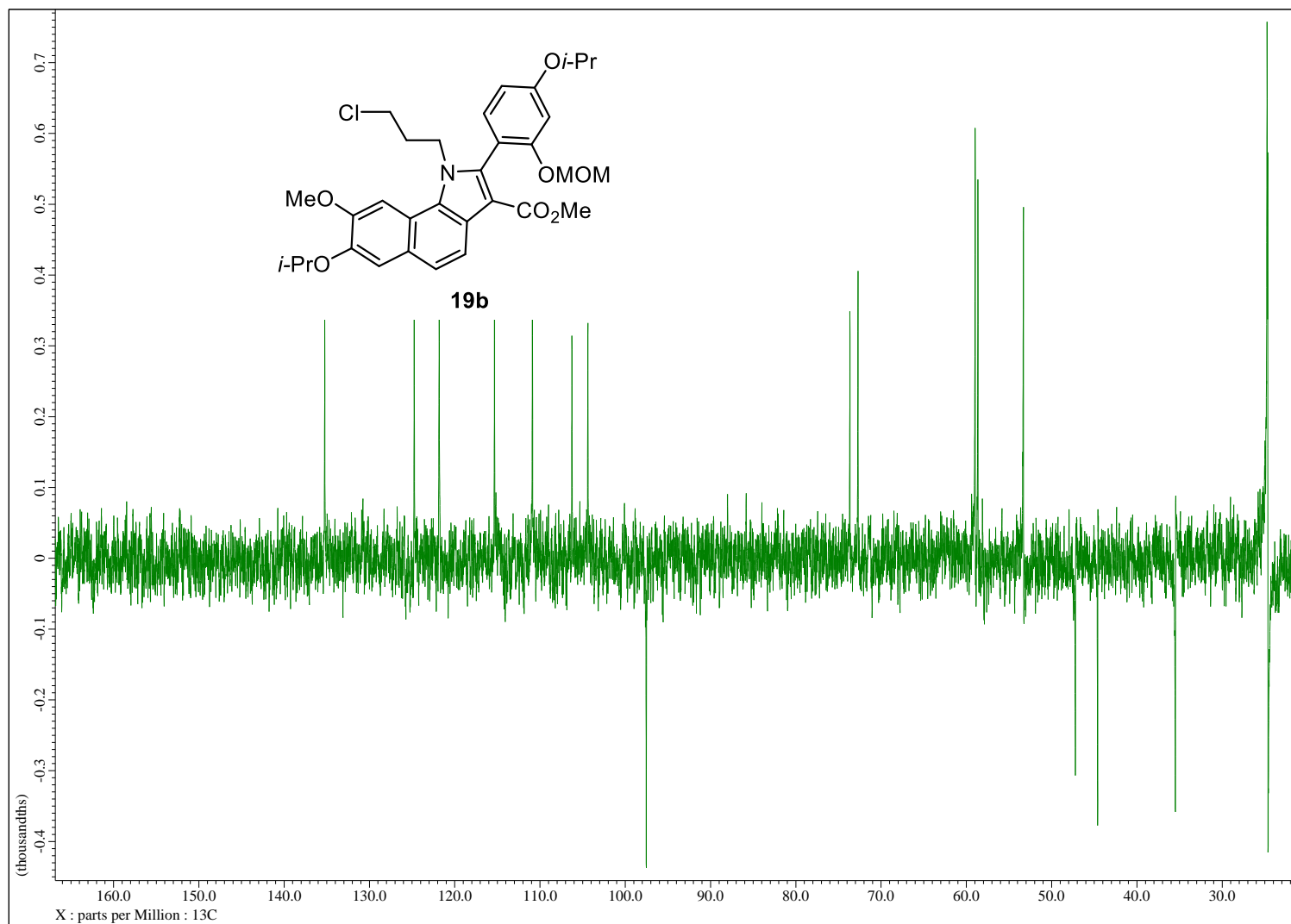


Fig. 49. DEPT Spectrum of 19b

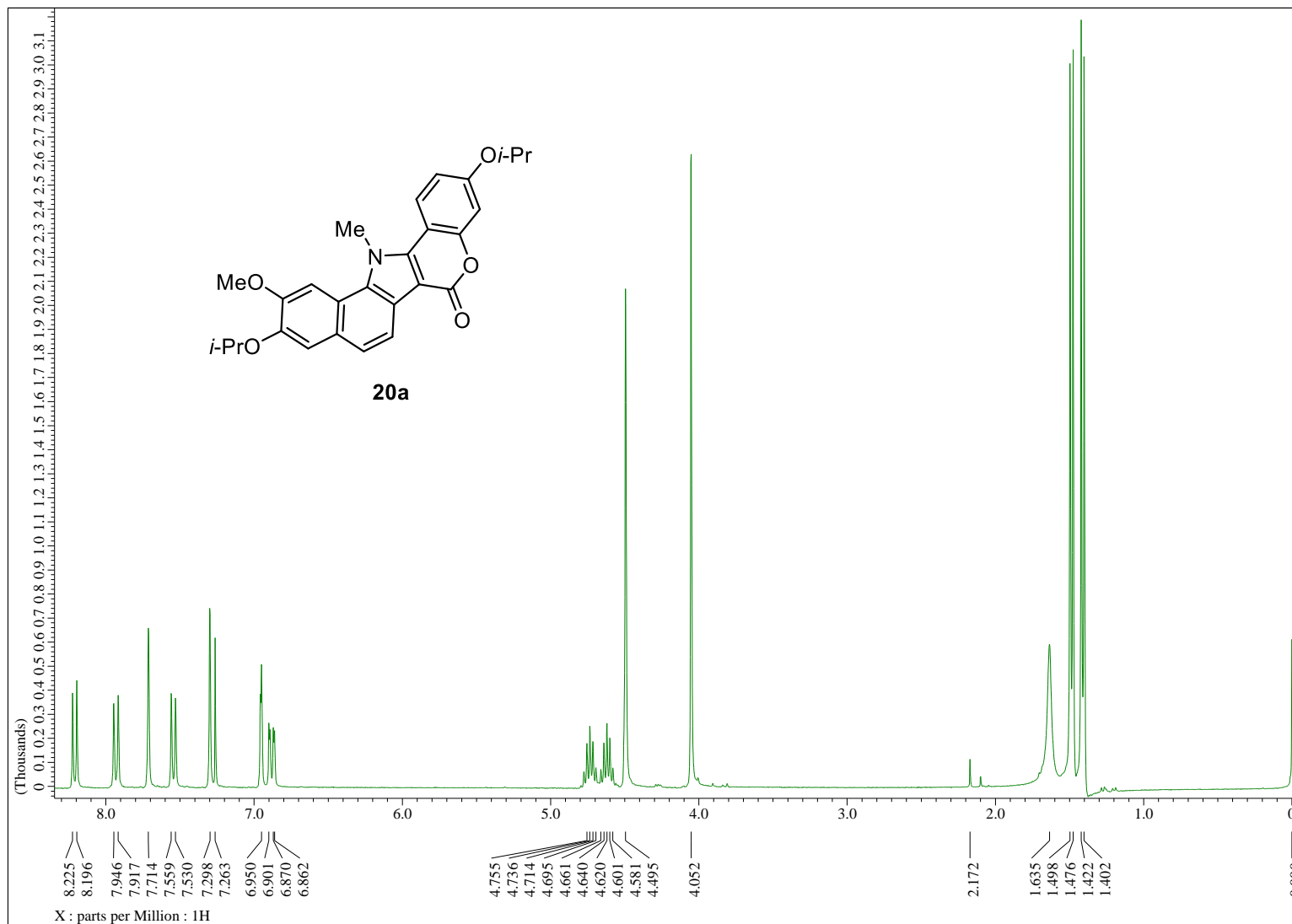


Fig. 50. ¹H NMR Spectrum of Compound **20a** (300 MHz, CDCl₃)

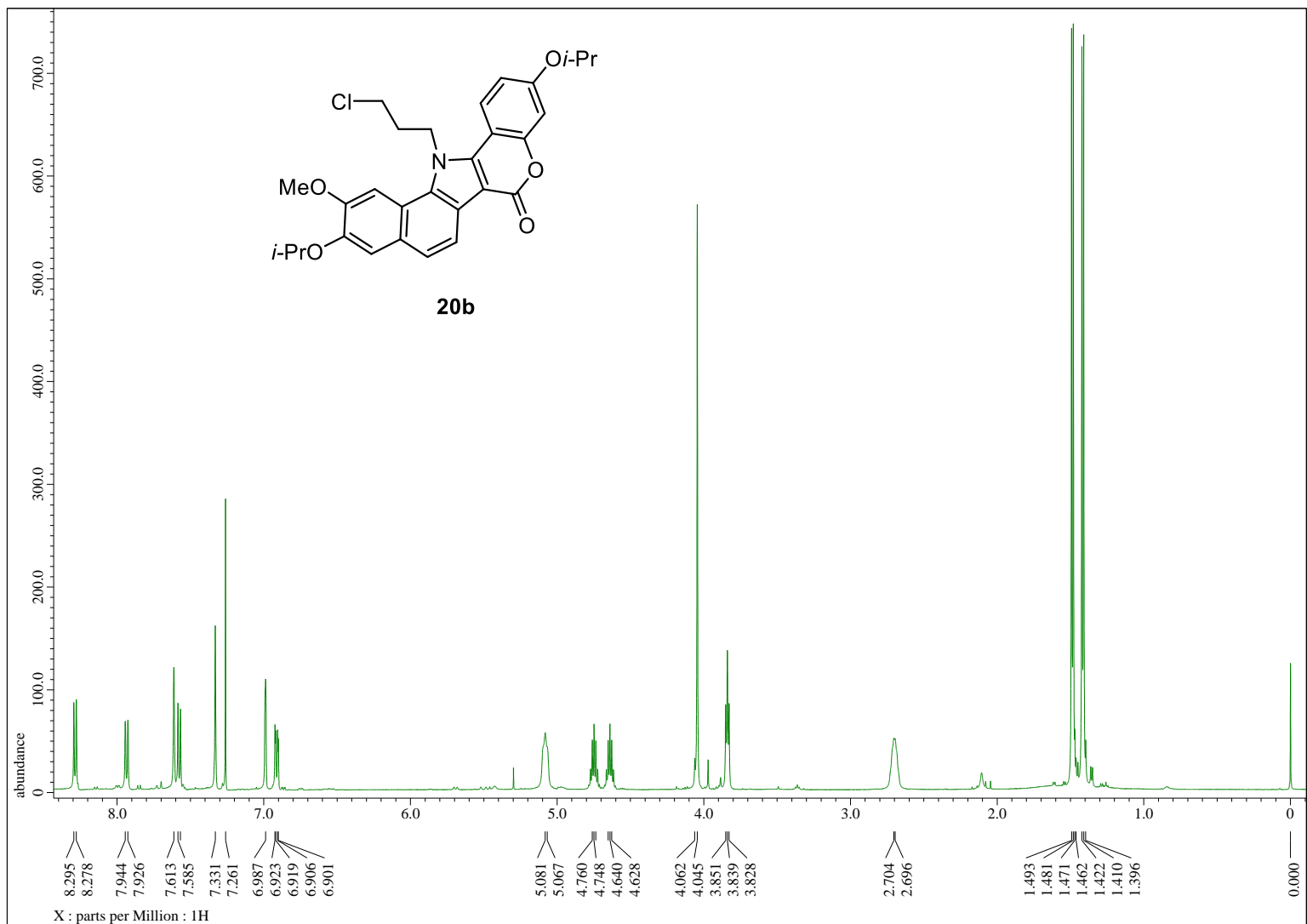


Fig. 51. ¹H NMR Spectrum of Compound **20b** (500 MHz, CDCl₃)

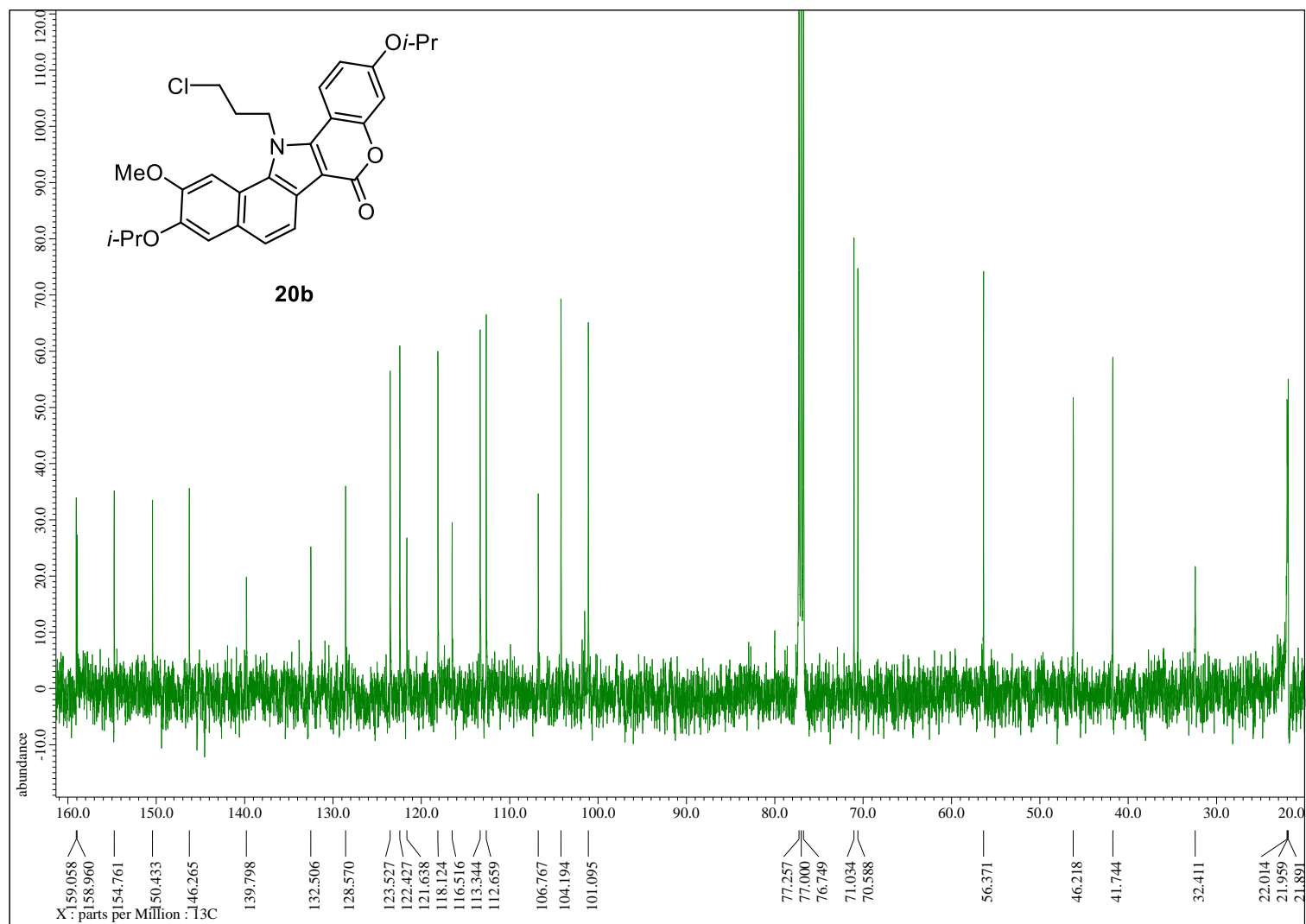


Fig. 52. ^{13}C NMR Spectrum of Compound **20b** (125 MHz, CDCl_3)

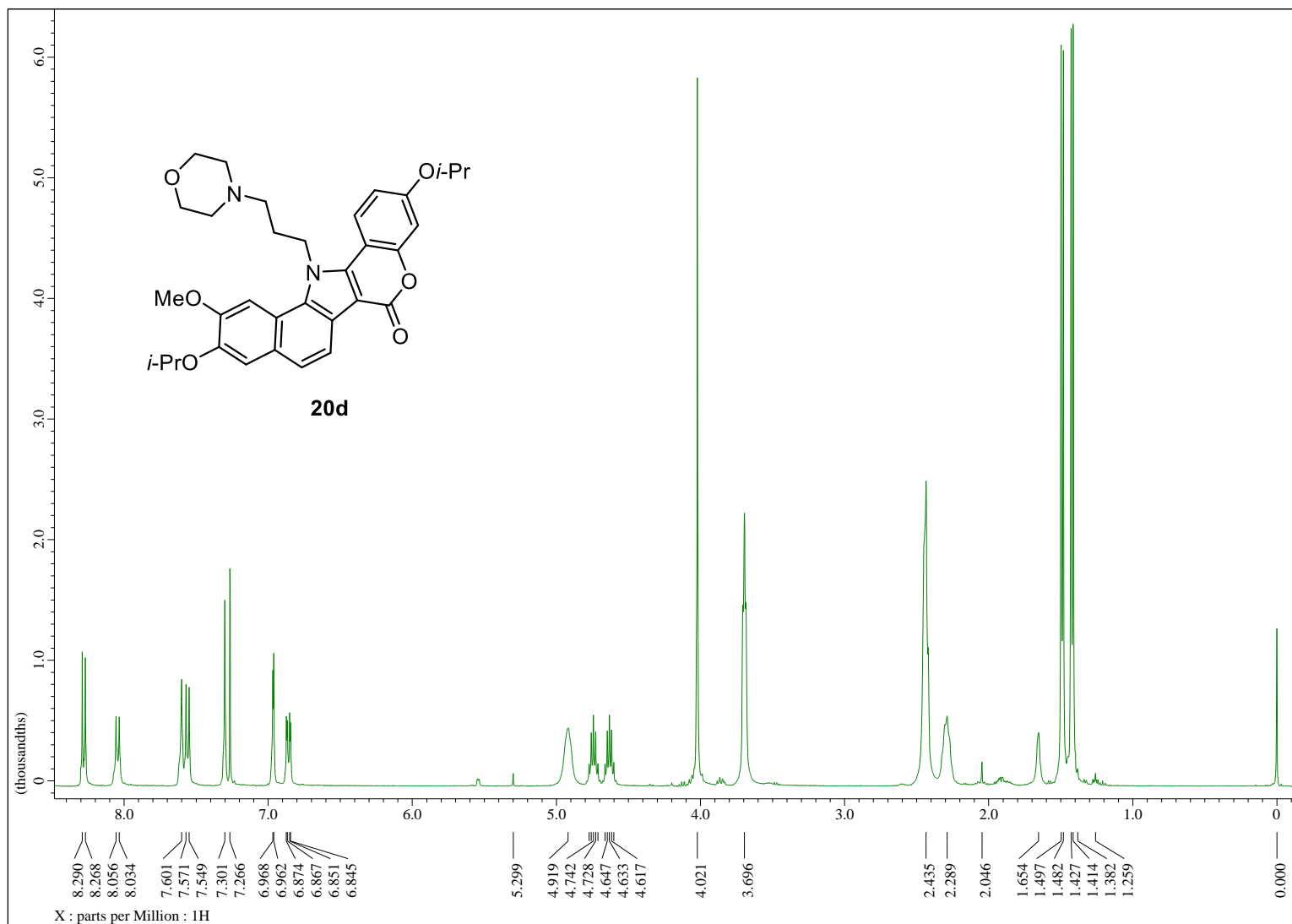


Fig. 53. ¹H NMR Spectrum of Compound **20d** (400 MHz, CDCl₃)

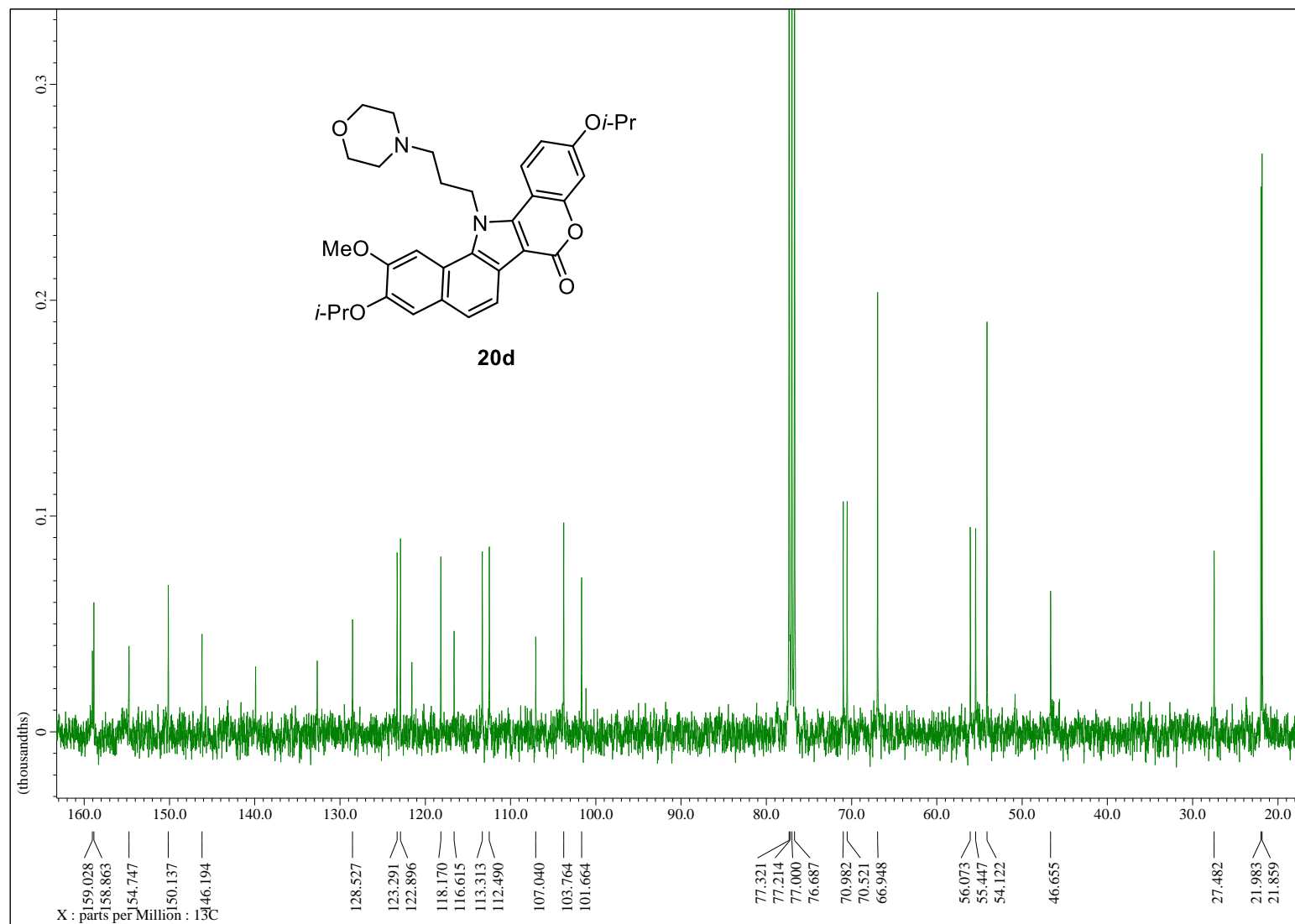


Fig. 54. ^{13}C NMR Spectrum of Compound **20d** (100 MHz, CDCl_3)

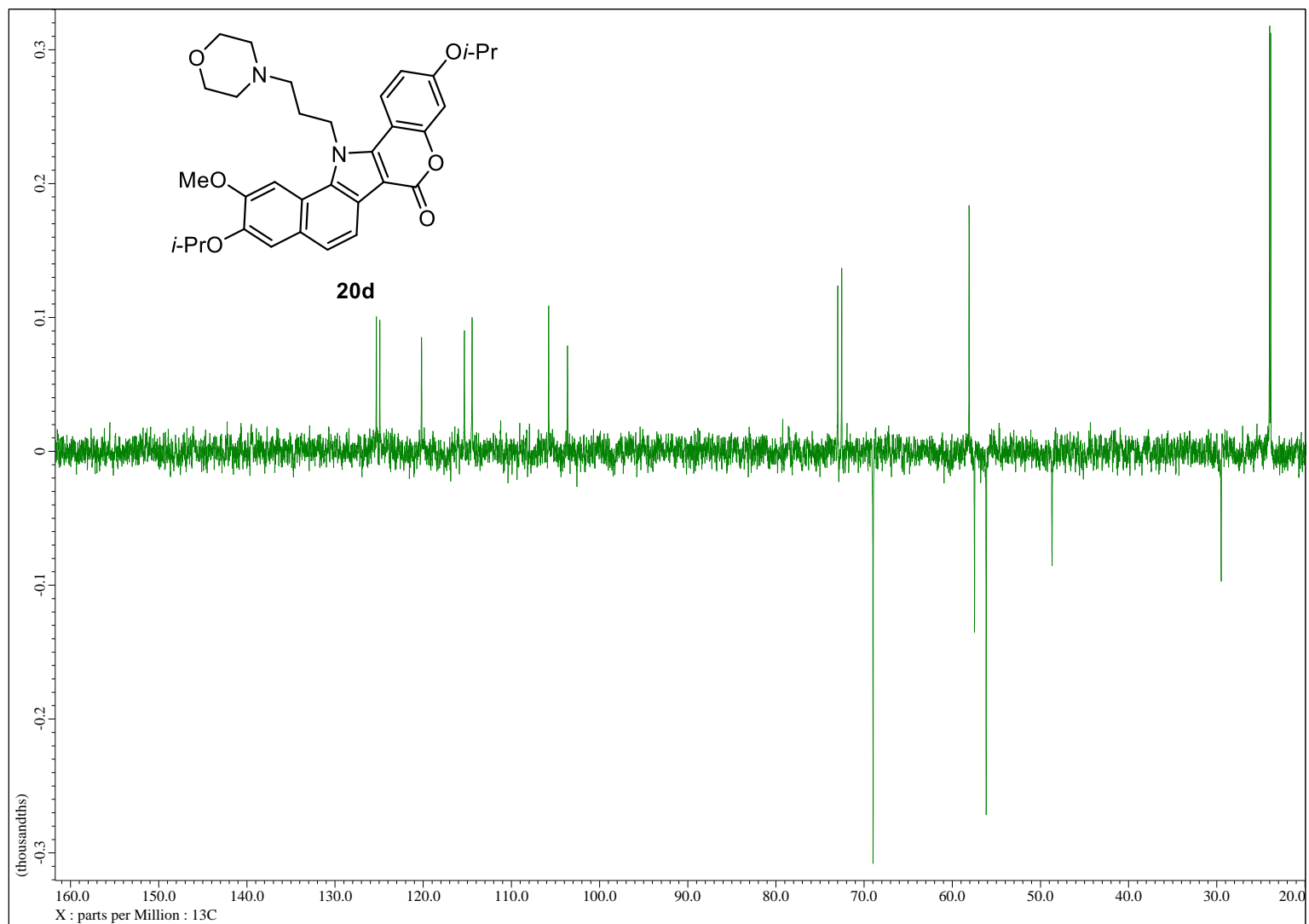


Fig. 55. DEPT Spectrum of Compound **20d** (100 MHz, CDCl₃)

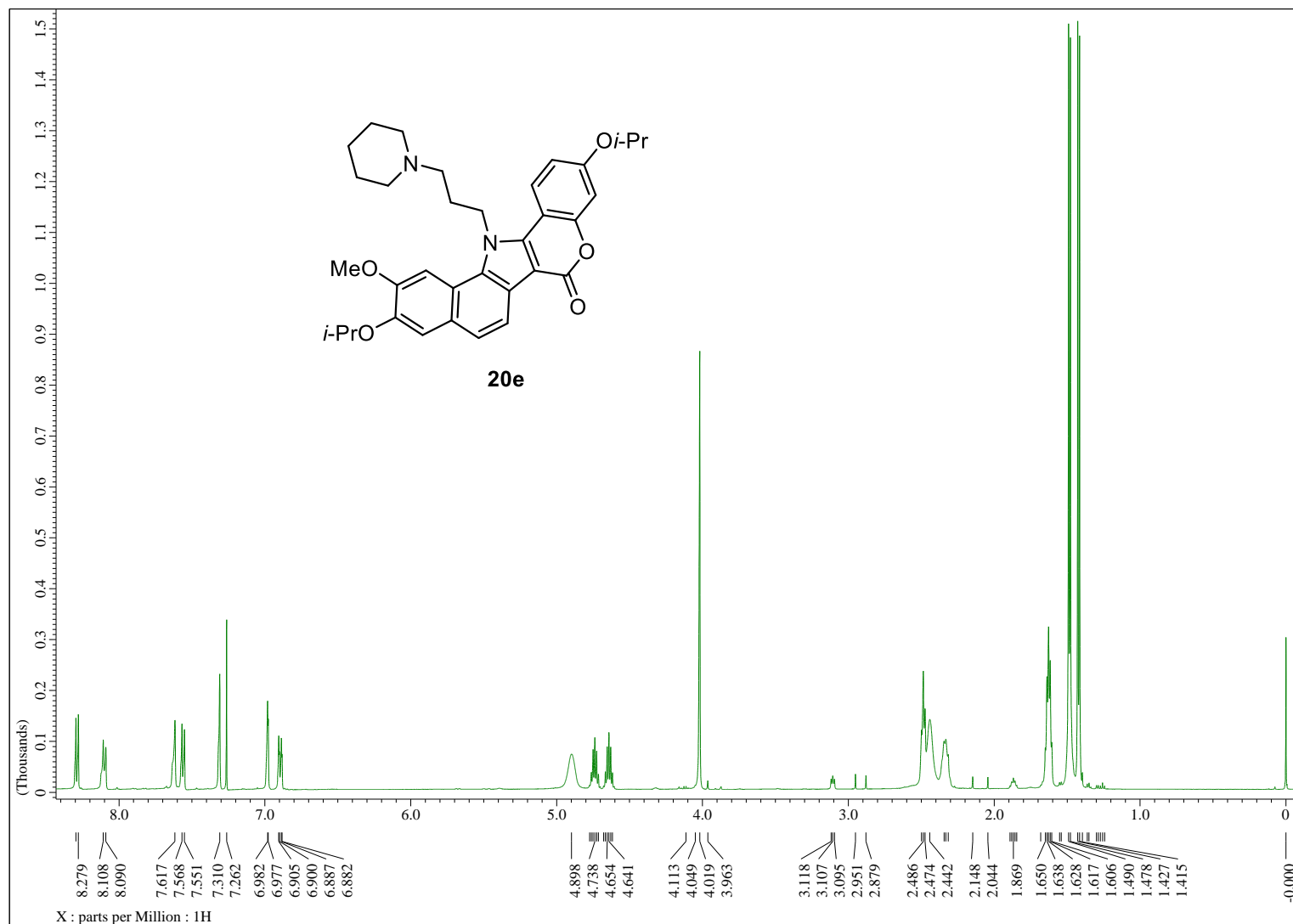


Fig. 56. ¹H NMR Spectrum of Compound **20e** (500 MHz, CDCl₃)

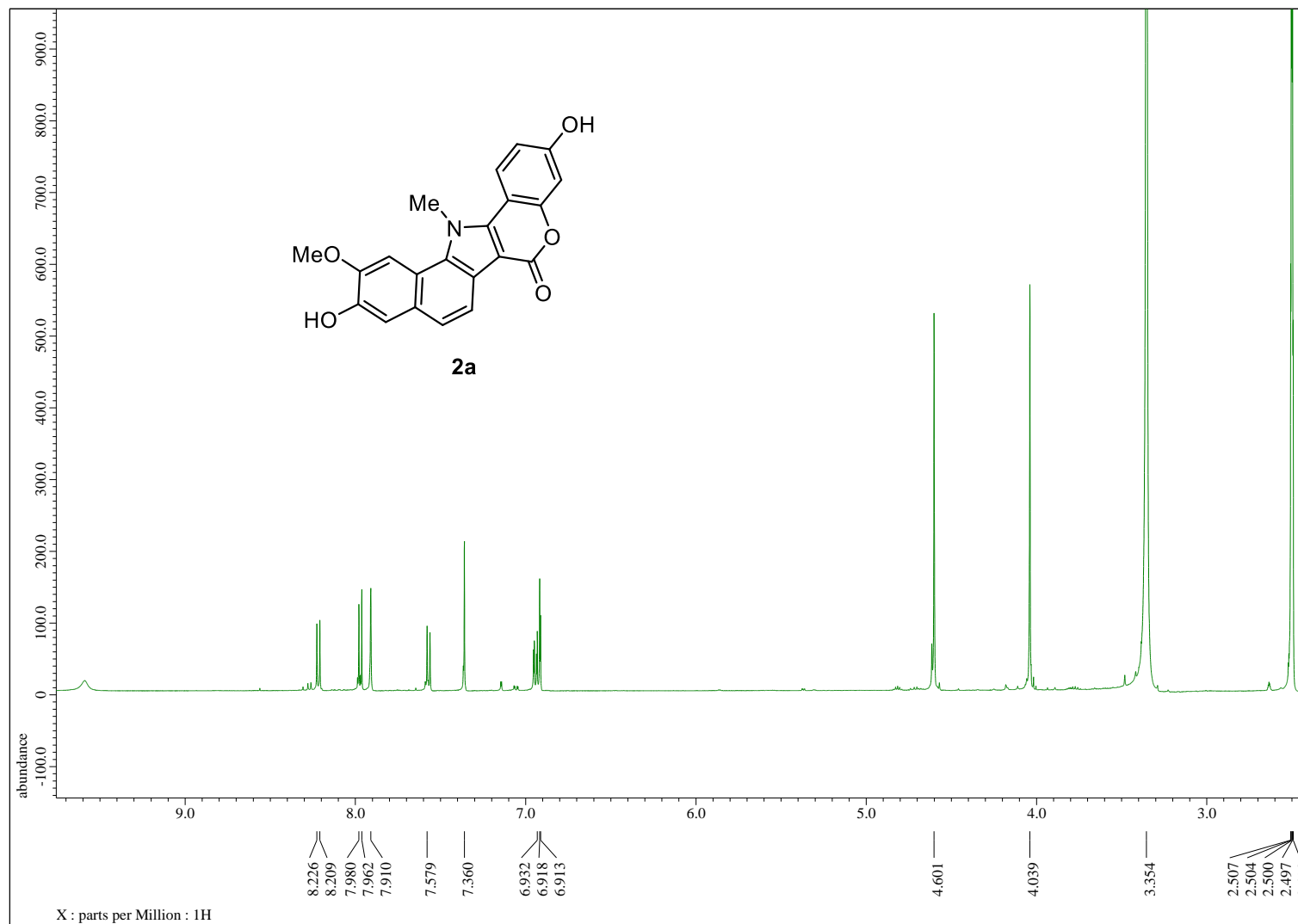


Fig. 58. ¹H NMR Spectrum of Compound 2a (500 MHz, DMSO-d₆)

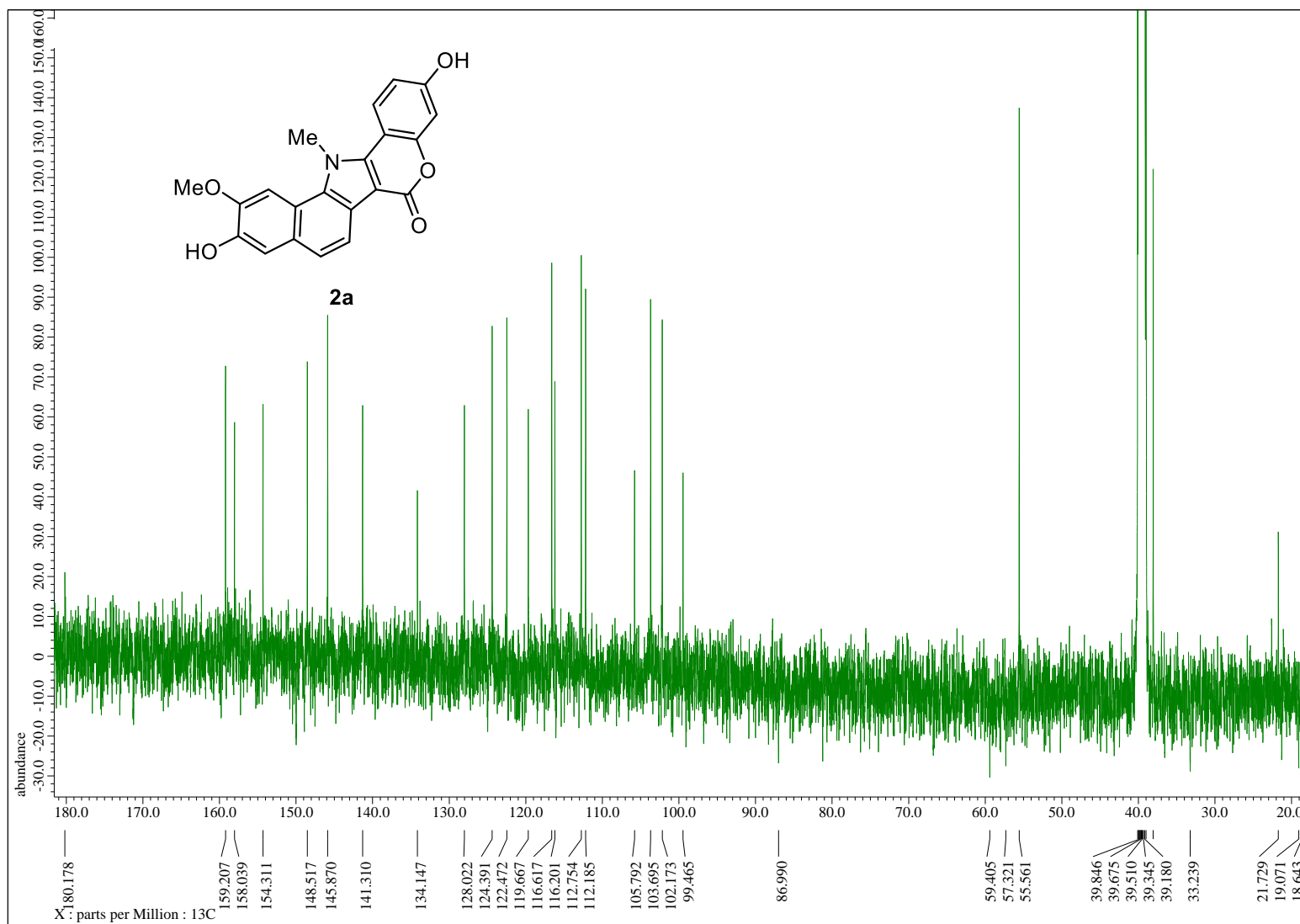


Fig. 59. ^{13}C NMR Spectrum of Compound **2a** (125 MHz, DMSO- d_6)

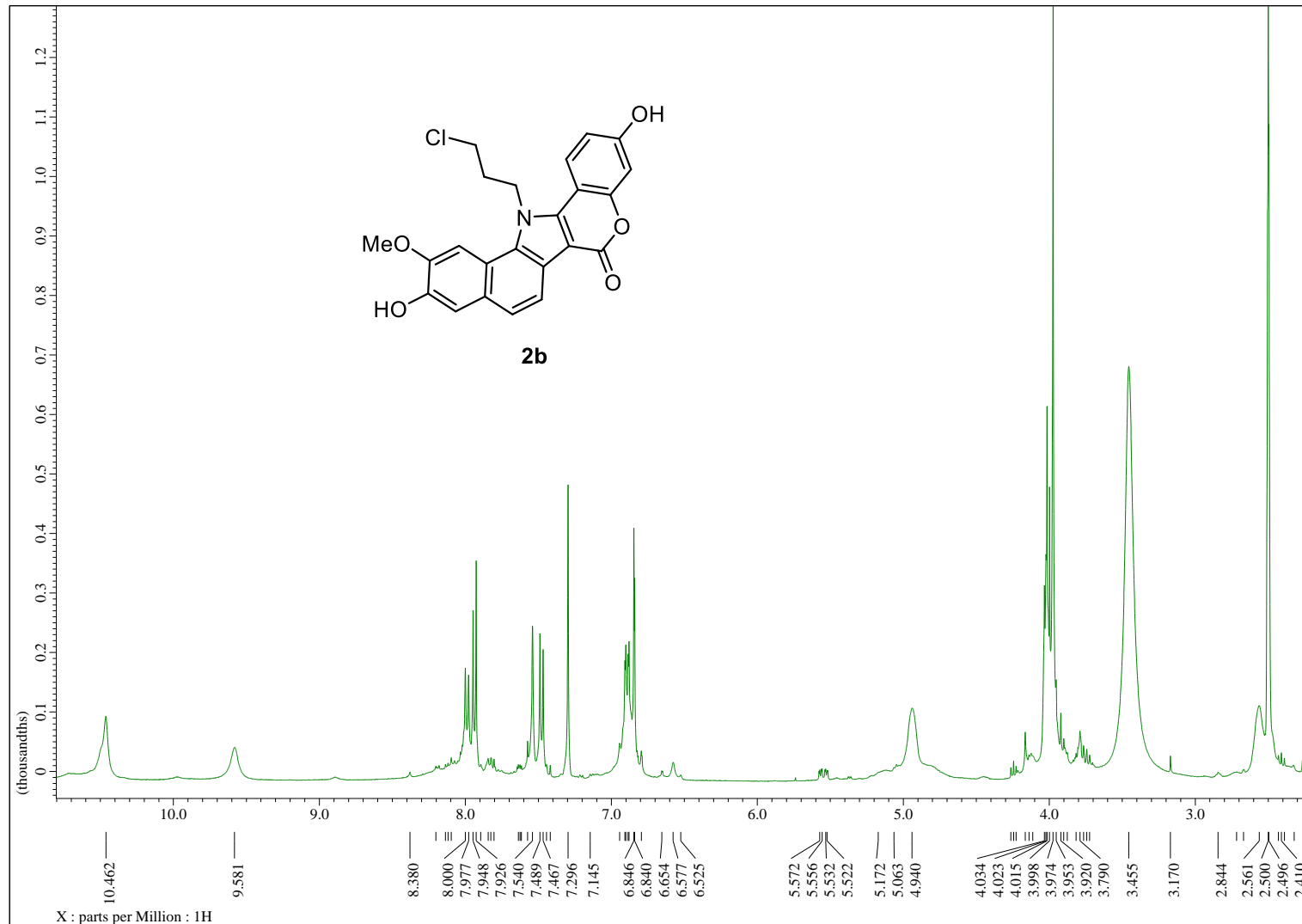


Fig. 60. ¹H NMR Spectrum of Compound **2b** (400 MHz, DMSO-d₆)

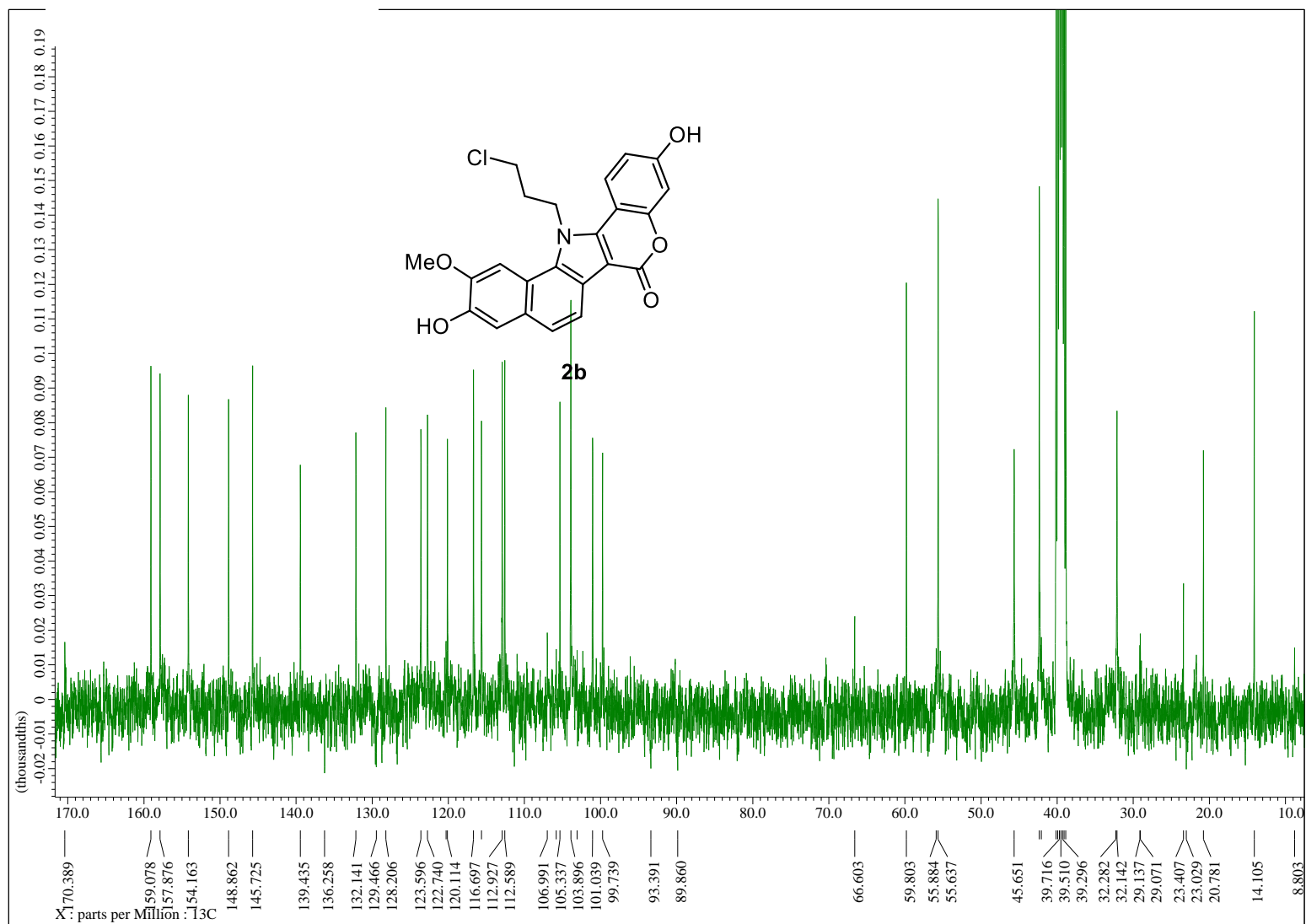


Fig. 61. ¹³C NMR Spectrum of Compound **2b** (100 MHz, DMSO-d₆)

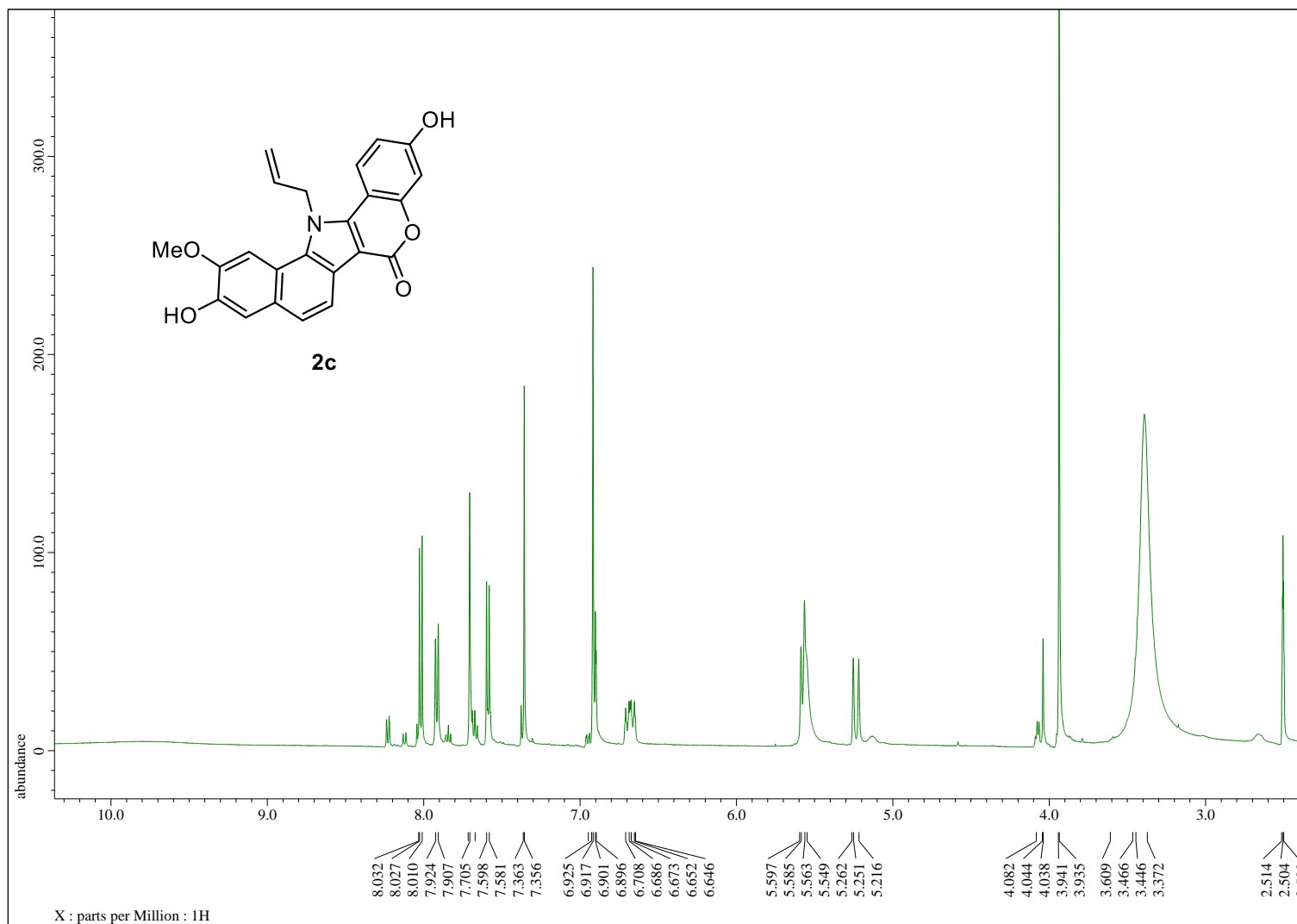


Fig. 62. ¹H NMR Spectrum of Compound **2c** (500 MHz, DMSO-d₆)

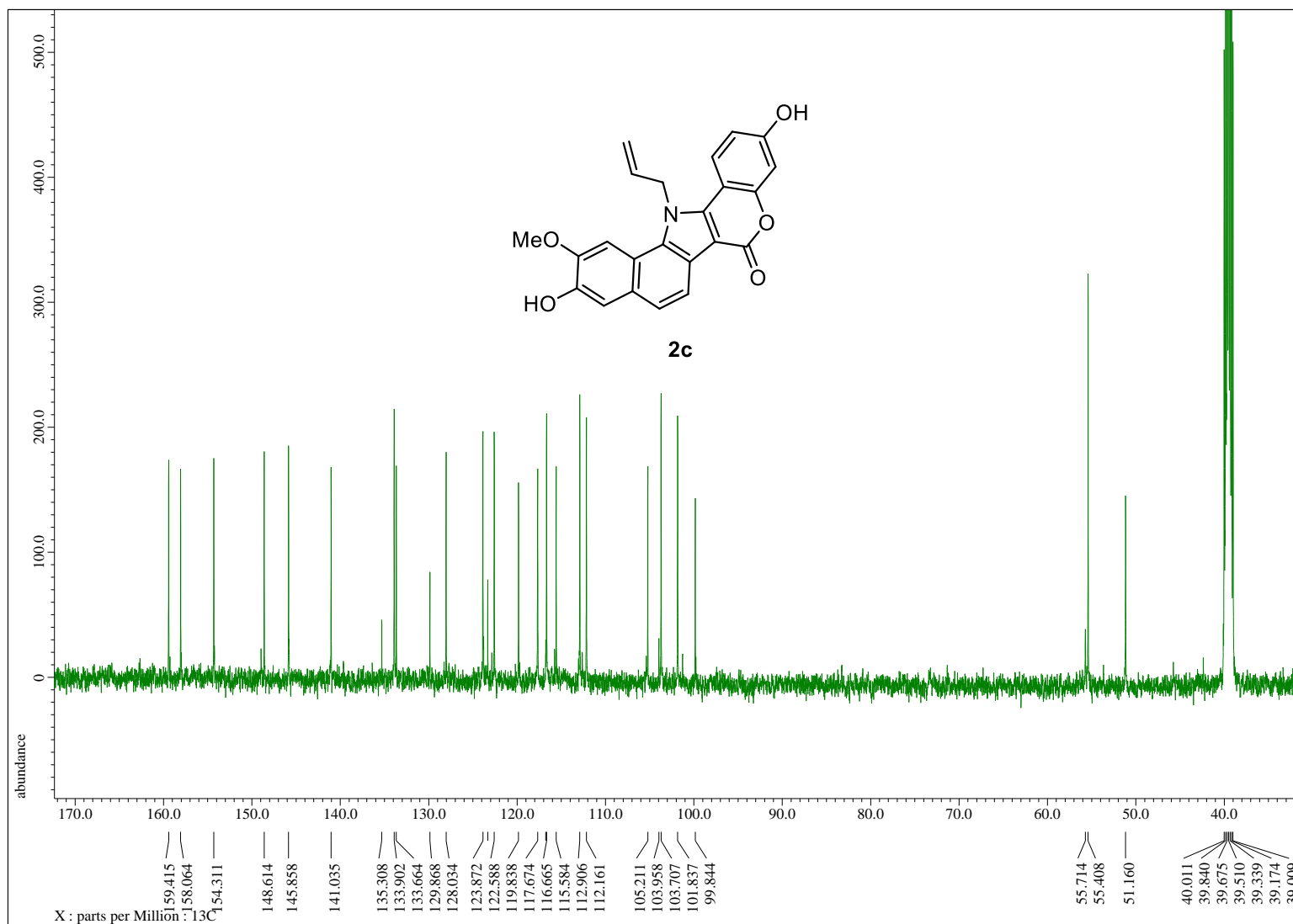


Fig. 63. ^{13}C NMR Spectrum of Compound **2c** (125 MHz, DMSO- d_6)

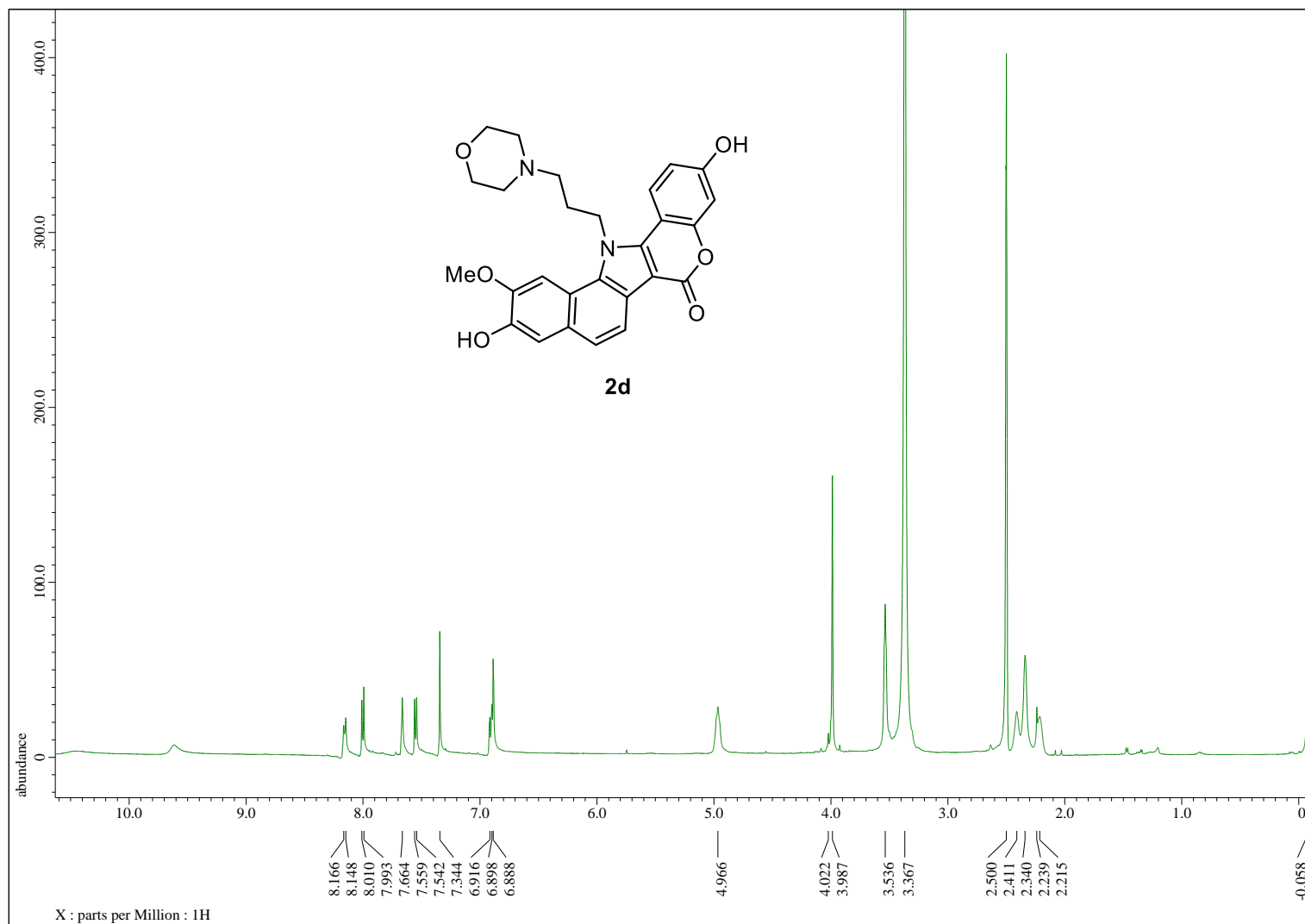


Fig. 64. ^1H NMR Spectrum of Compound **2d** (500 MHz, DMSO-d_6)

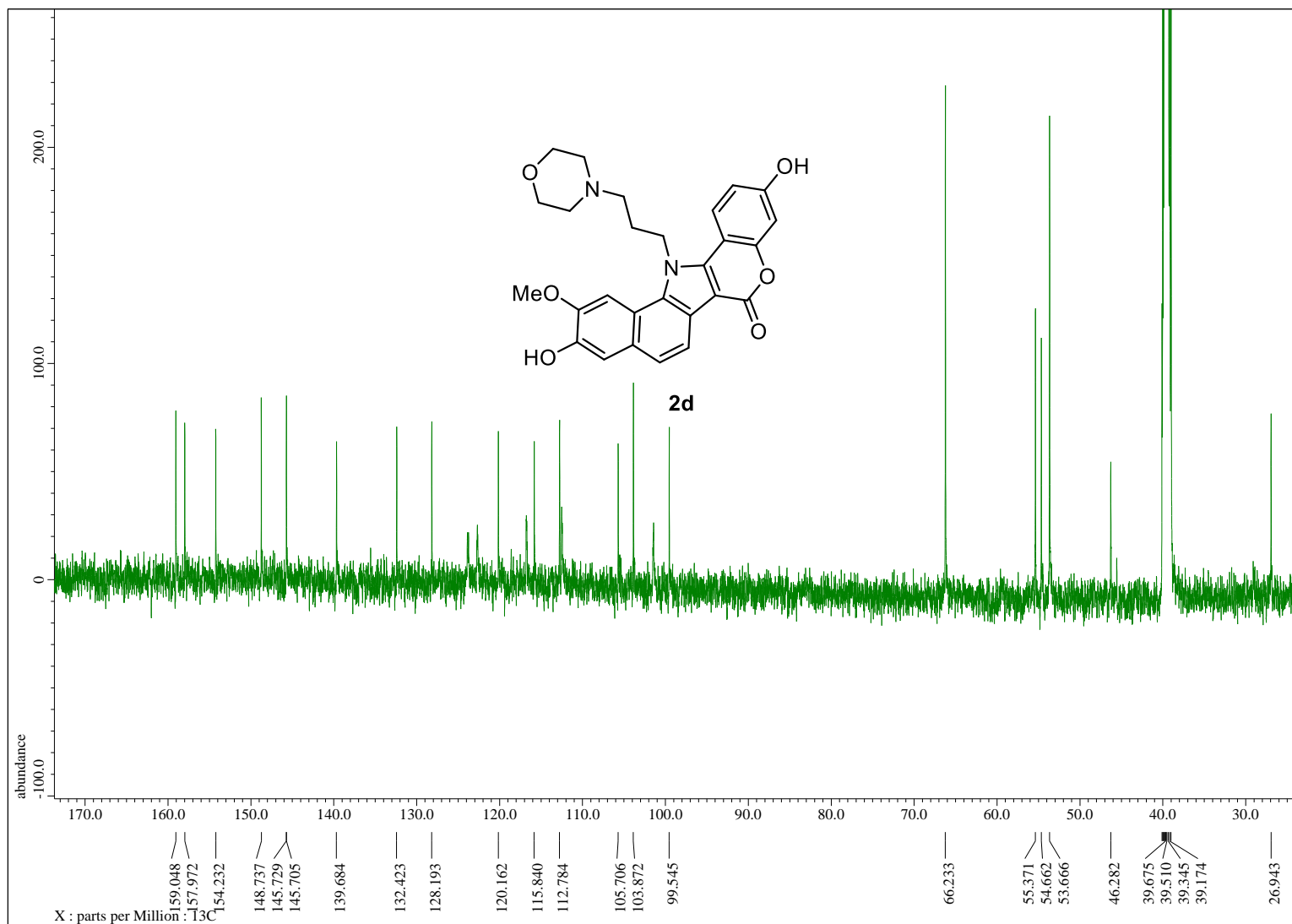


Fig. 65. ^{13}C NMR Spectrum of Compound **2d** (125 MHz, DMSO-d_6)

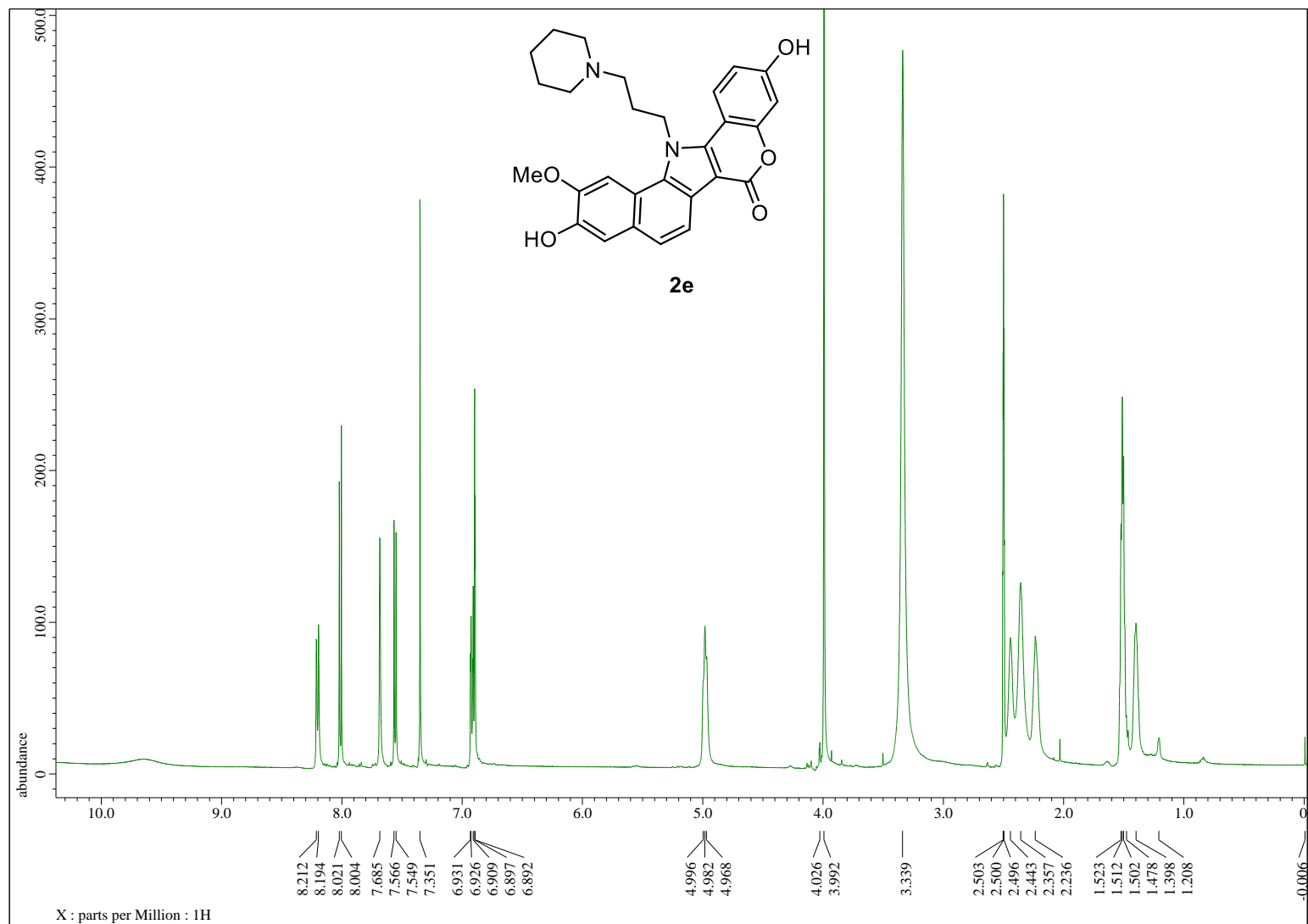


Fig. 66. ^1H NMR Spectrum of Compound **2e** (500 MHz, DMSO-d_6)

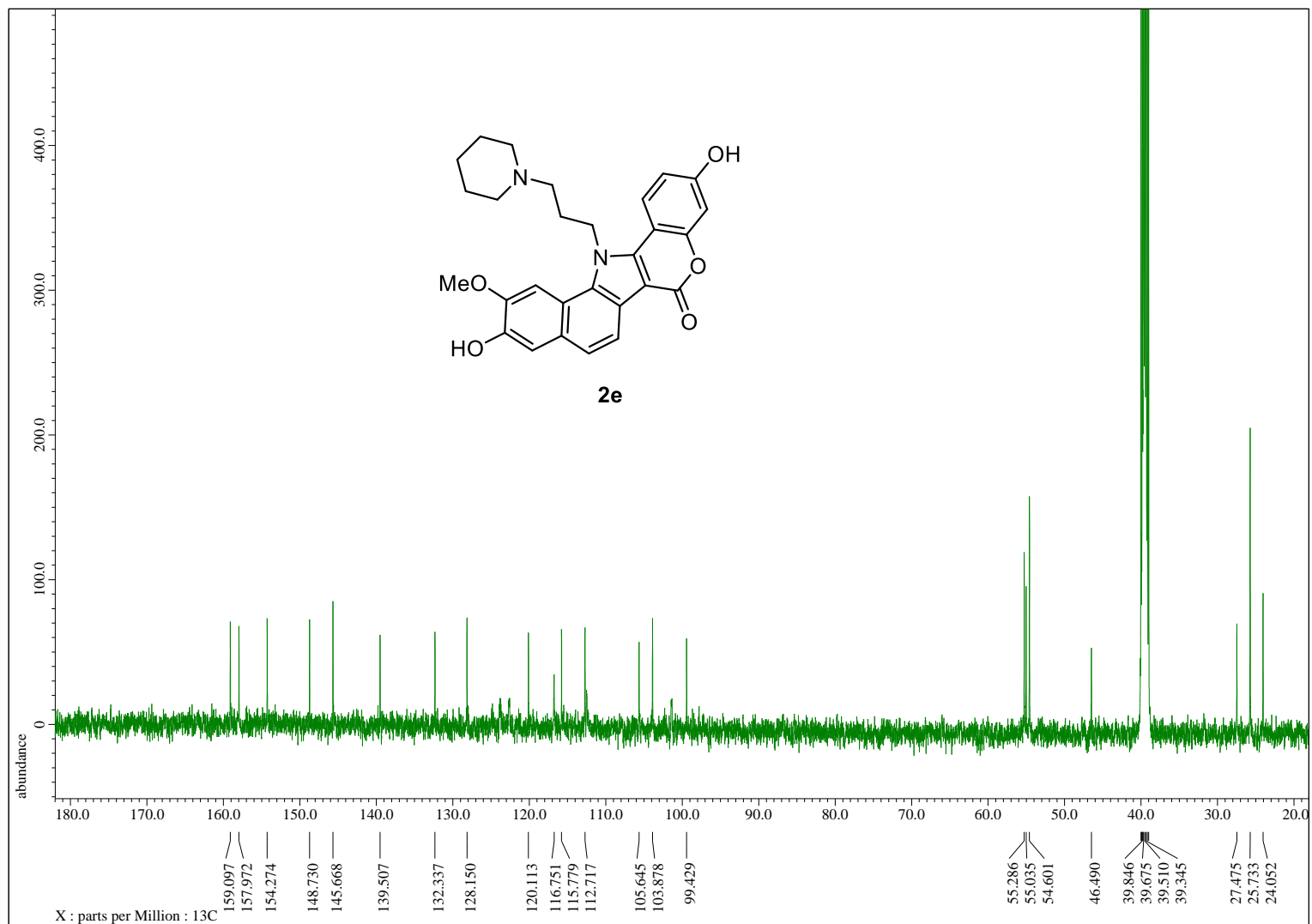


Fig. 67. ^{13}C NMR Spectrum of Compound **2e** (125 MHz, DMSO- d_6)