

Supplementary Material

Synthesis and structure determination of diastereomeric carbapenems in the Ad_NE-reaction of (±)-4,4-dimethyl-3-mercaptodihydrofuran-2(3H)-one with chiral carbapenem enol phosphate

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NMR data

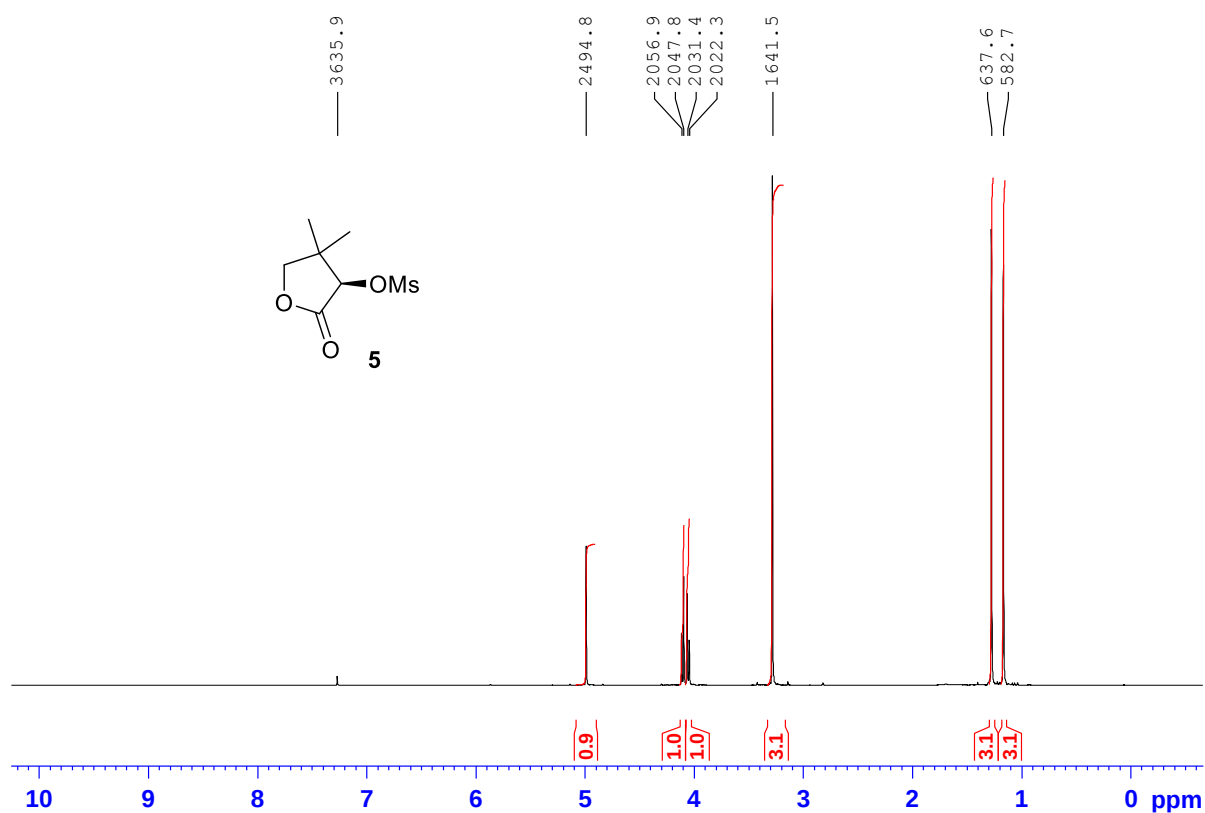


Figure S1. Complete ¹H NMR spectrum of compound 5 in CDCl₃, 500 MHz.

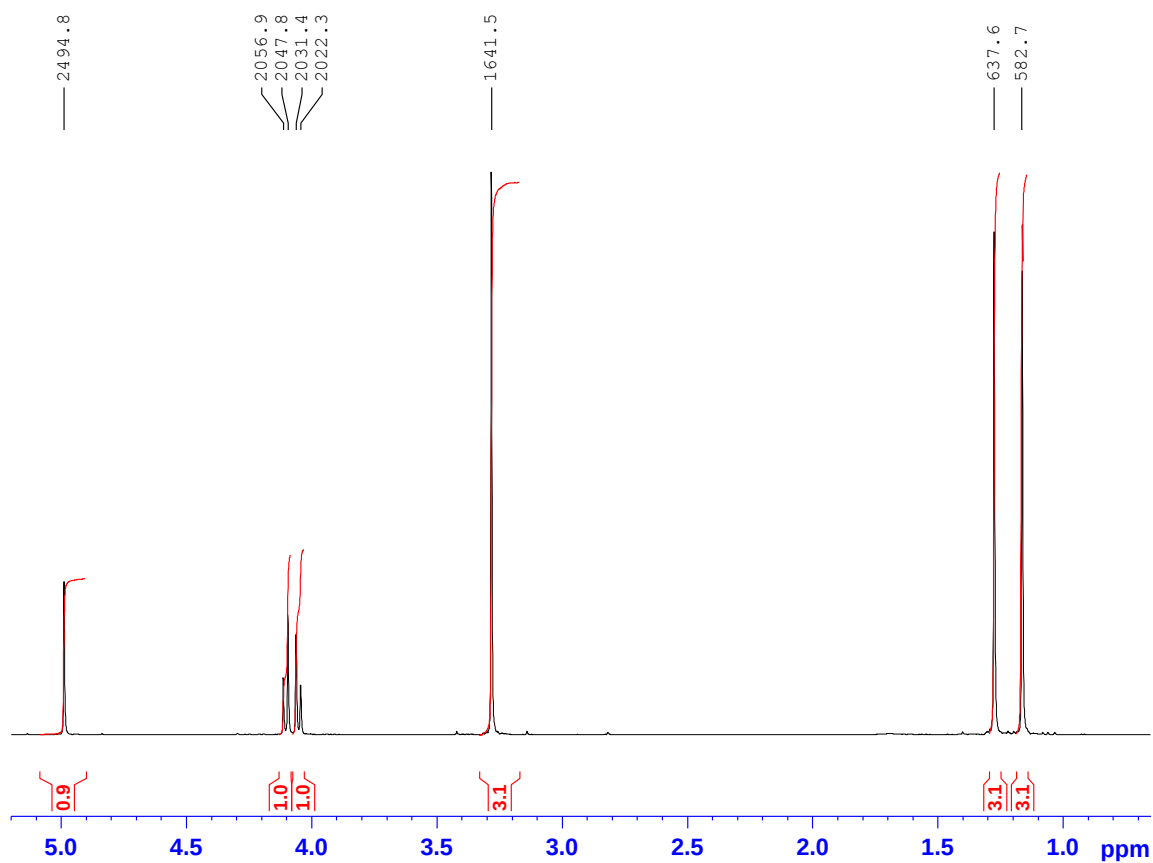


Figure S2. Expanded ¹H NMR spectrum of compound 5 in CDCl₃, 500 MHz.

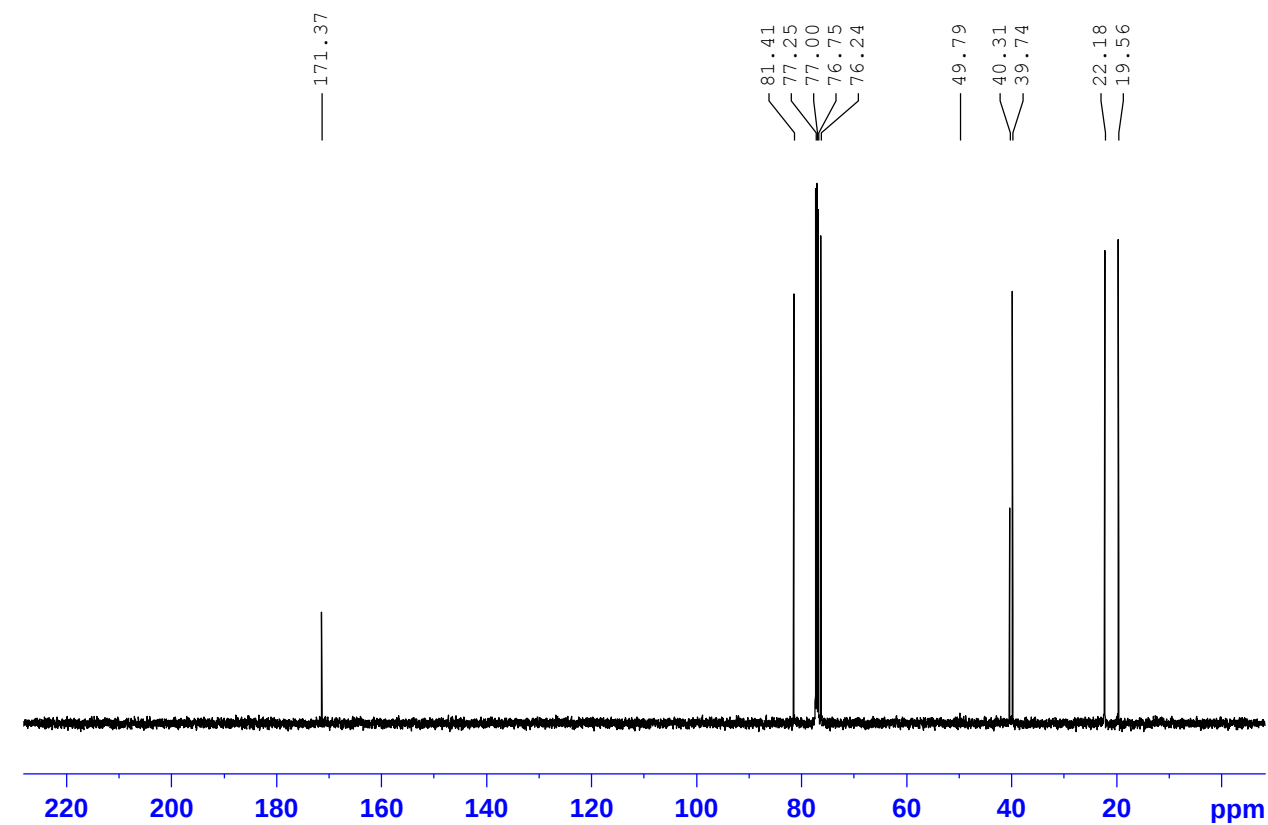


Figure S3. Complete $^{13}\text{C}\{^1\text{H}\}$ spectrum of compound 5 in CDCl_3 , 125 MHz.

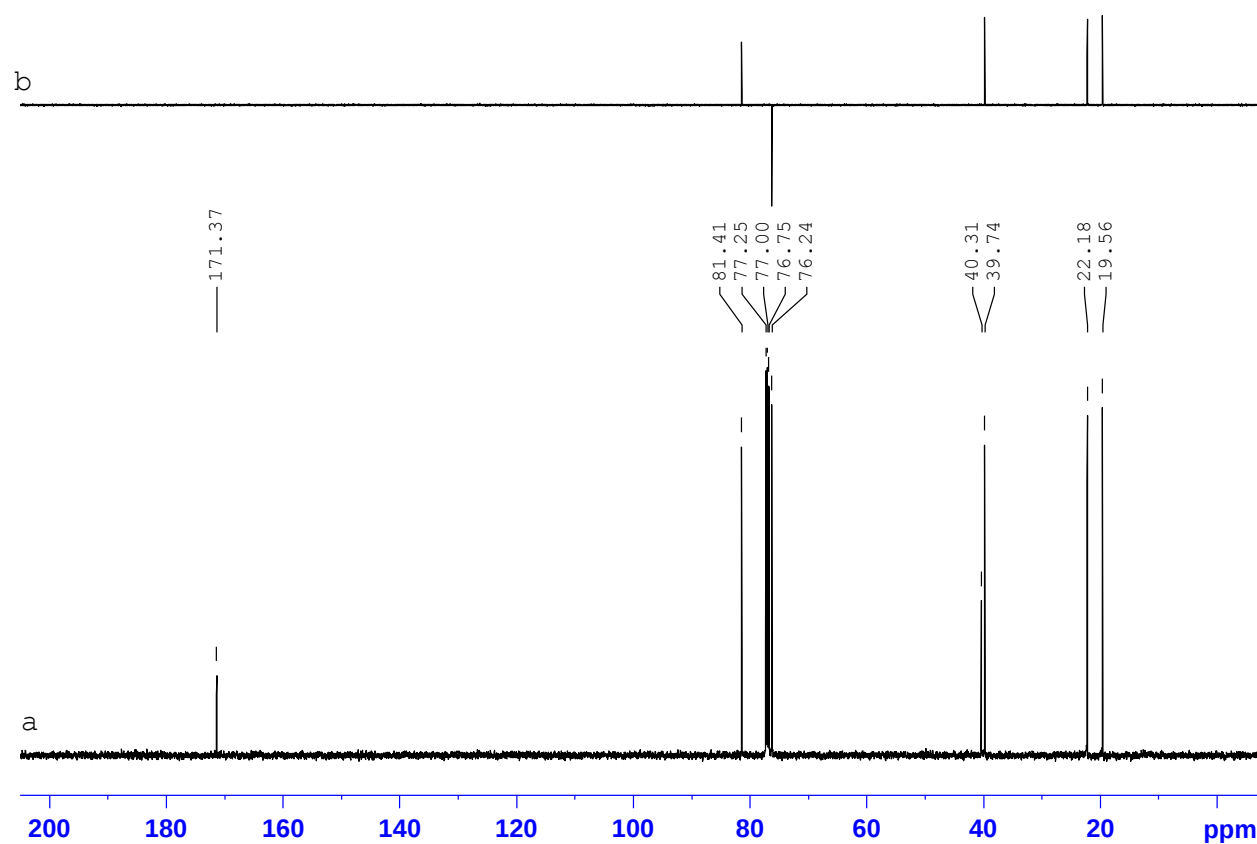


Figure S4. DEPT-135 editing $^{13}\text{C}\{^1\text{H}\}$ NMR spectrum of compound 5 in CDCl_3 , 125 MHz: a) $^{13}\text{C}\{^1\text{H}\}$ spectrum; b) DEPT-135.

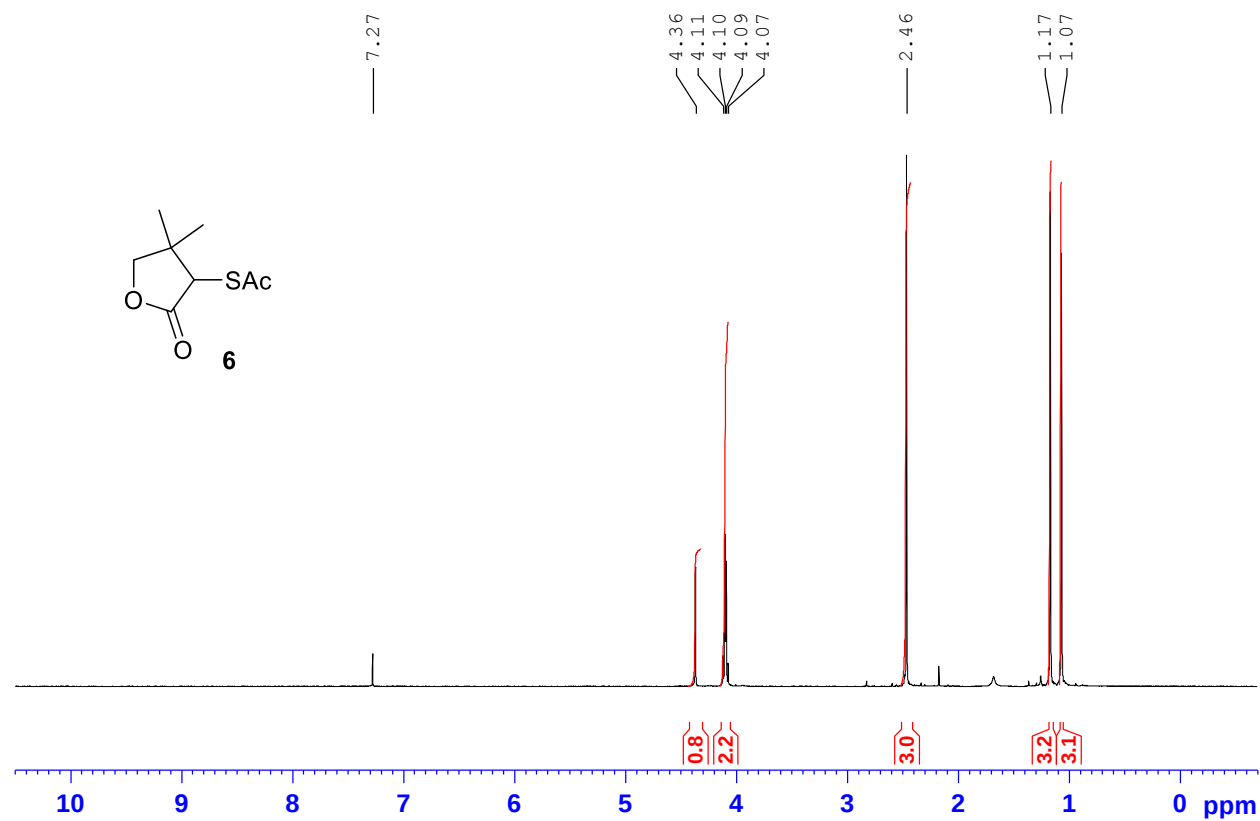


Figure S5. Complete ¹H NMR spectrum of compound 6 in CDCl₃, 500 MHz.

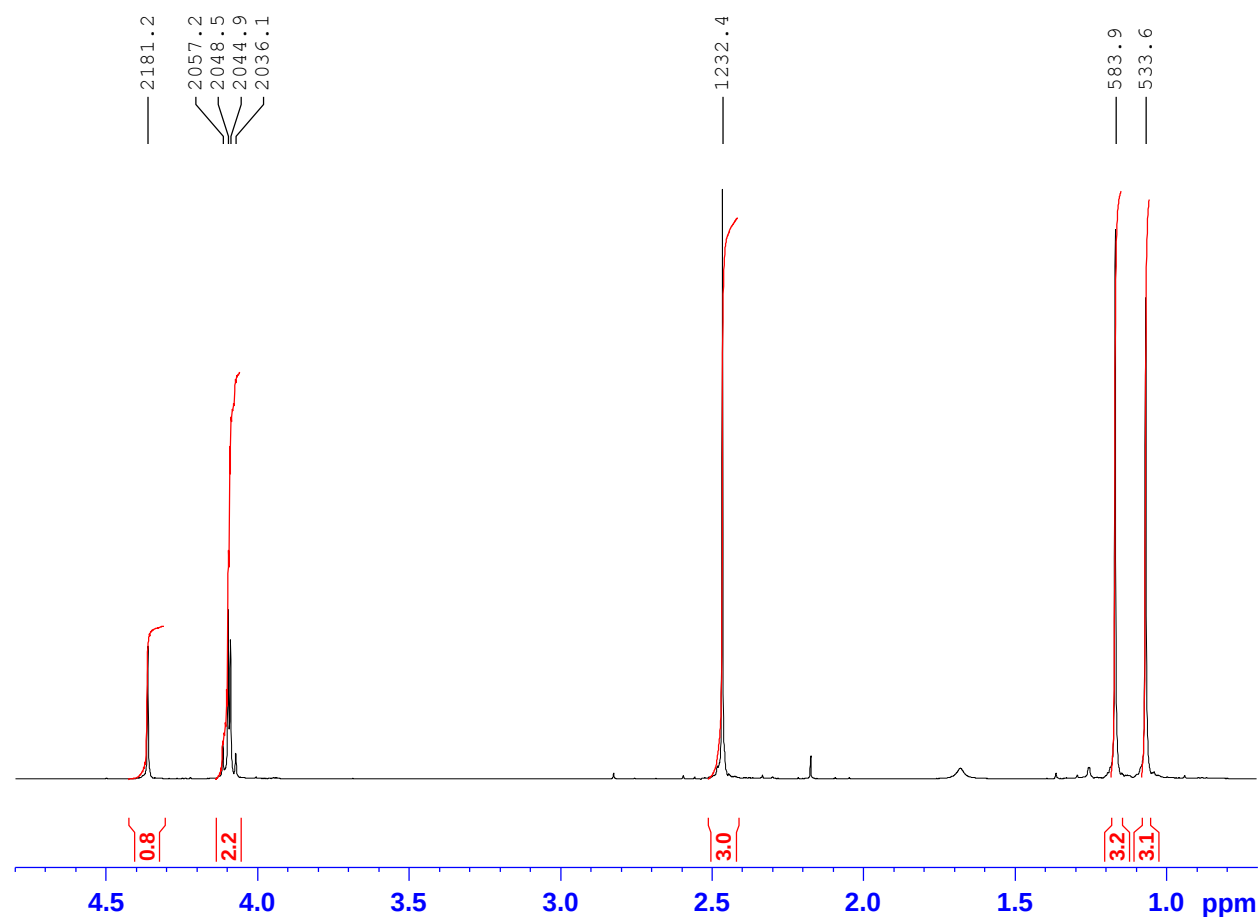


Figure S6. Expanded ¹H NMR spectrum of compound 6 in CDCl₃, 500 MHz.

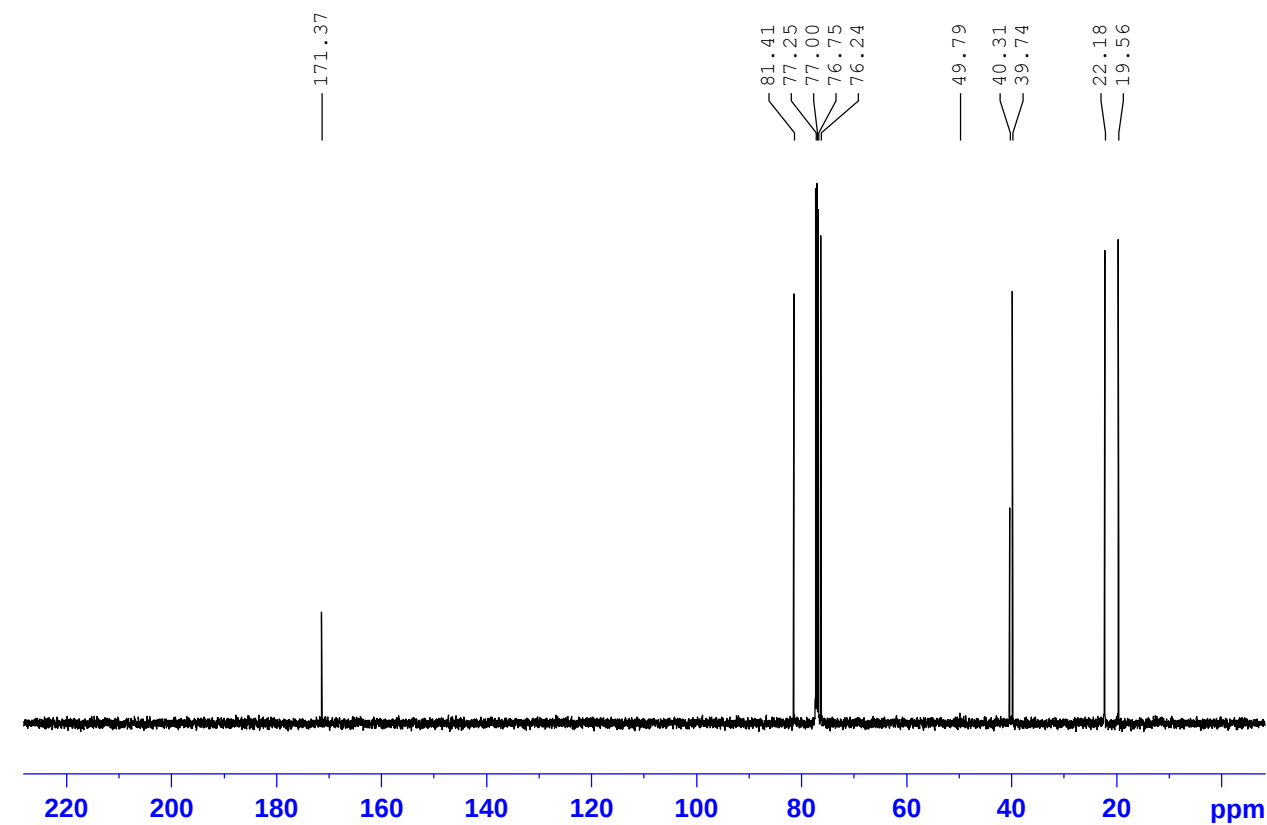


Figure S7. Complete $^{13}\text{C}\{^1\text{H}\}$ spectrum of compound **6** in CDCl_3 , 125 MHz.

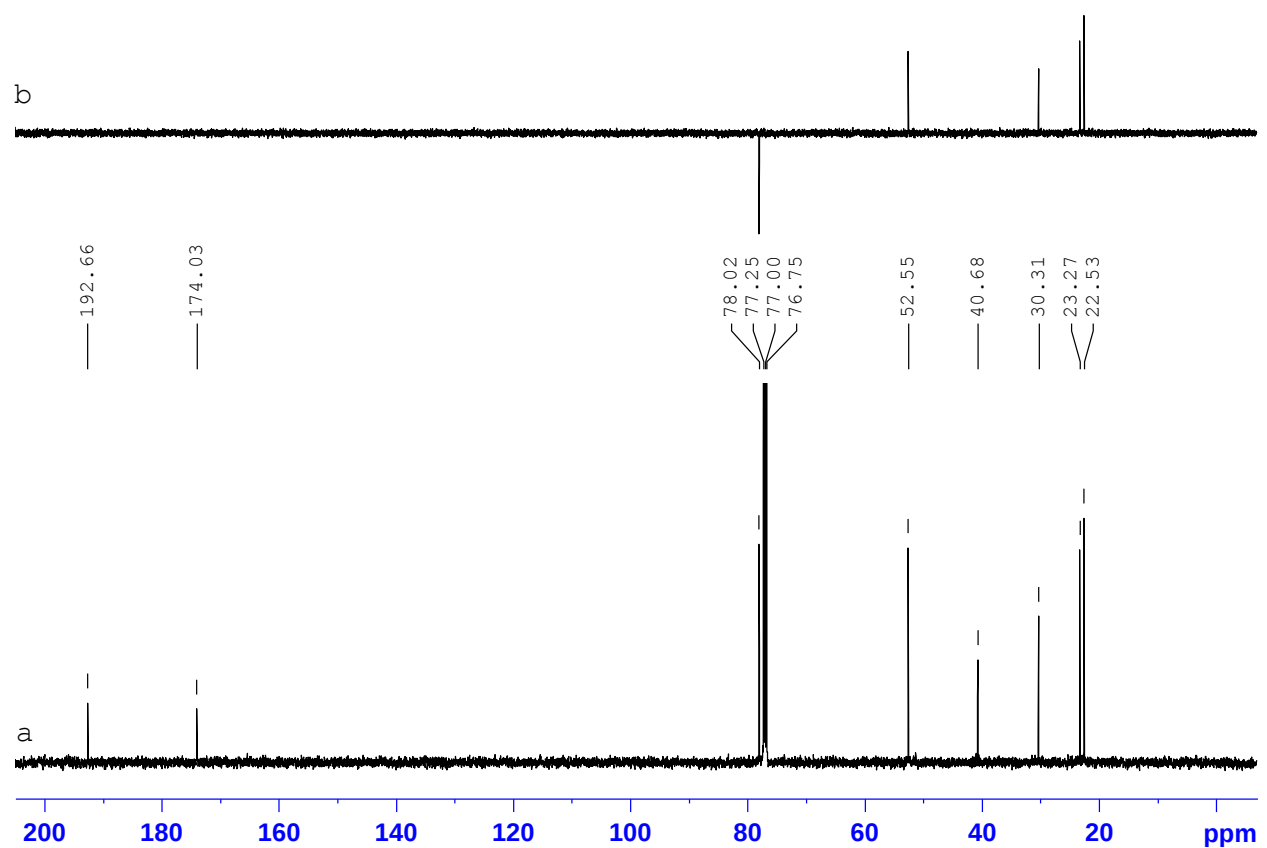


Figure S8. DEPT-135 editing $^{13}\text{C}\{^1\text{H}\}$ NMR spectrum of compound **6** in CDCl_3 , 125 MHz: a) $^{13}\text{C}\{^1\text{H}\}$ spectrum; b) DEPT-135.

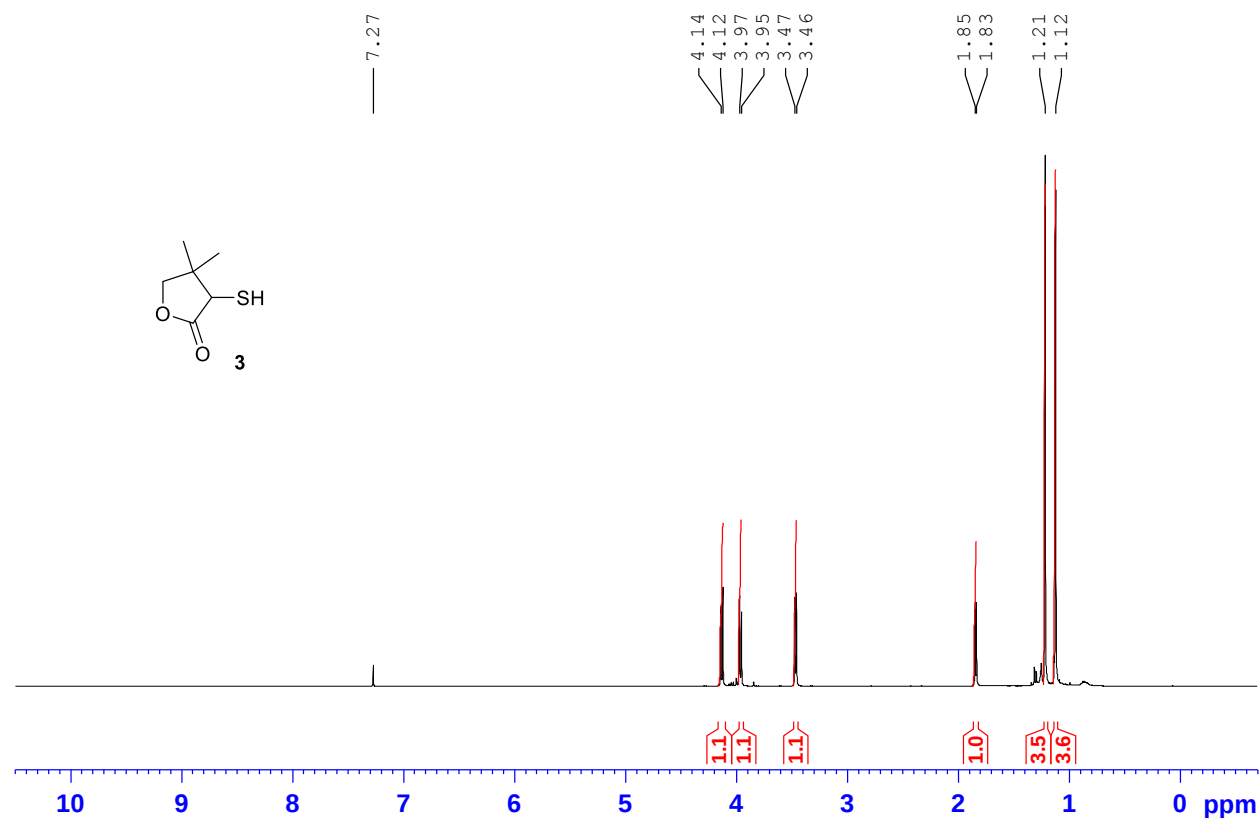


Figure S9. Complete ¹H NMR spectrum of compound 3 in CDCl₃, 500 MHz.

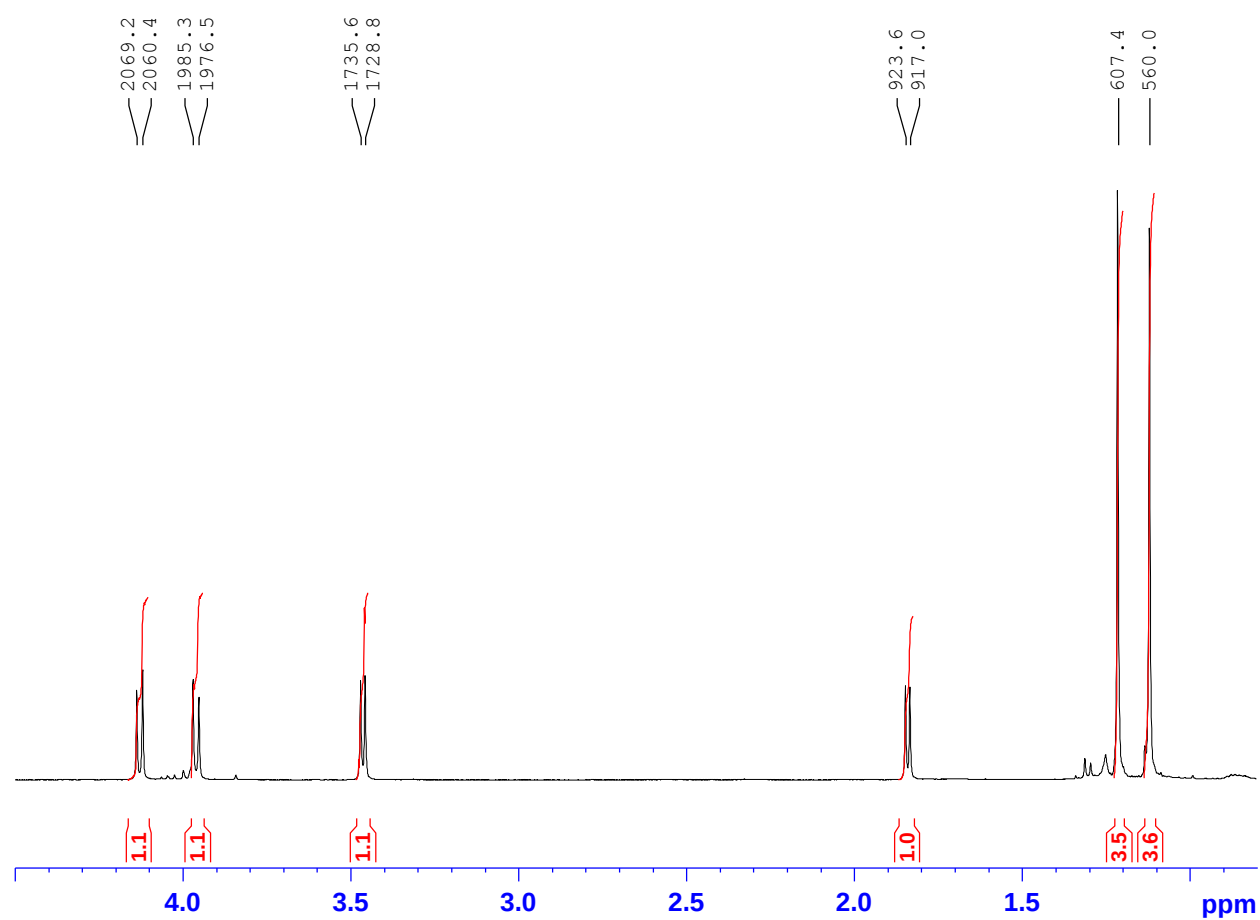


Figure S10. Expanded ¹H NMR spectrum of compound 3 in CDCl₃, 500 MHz.

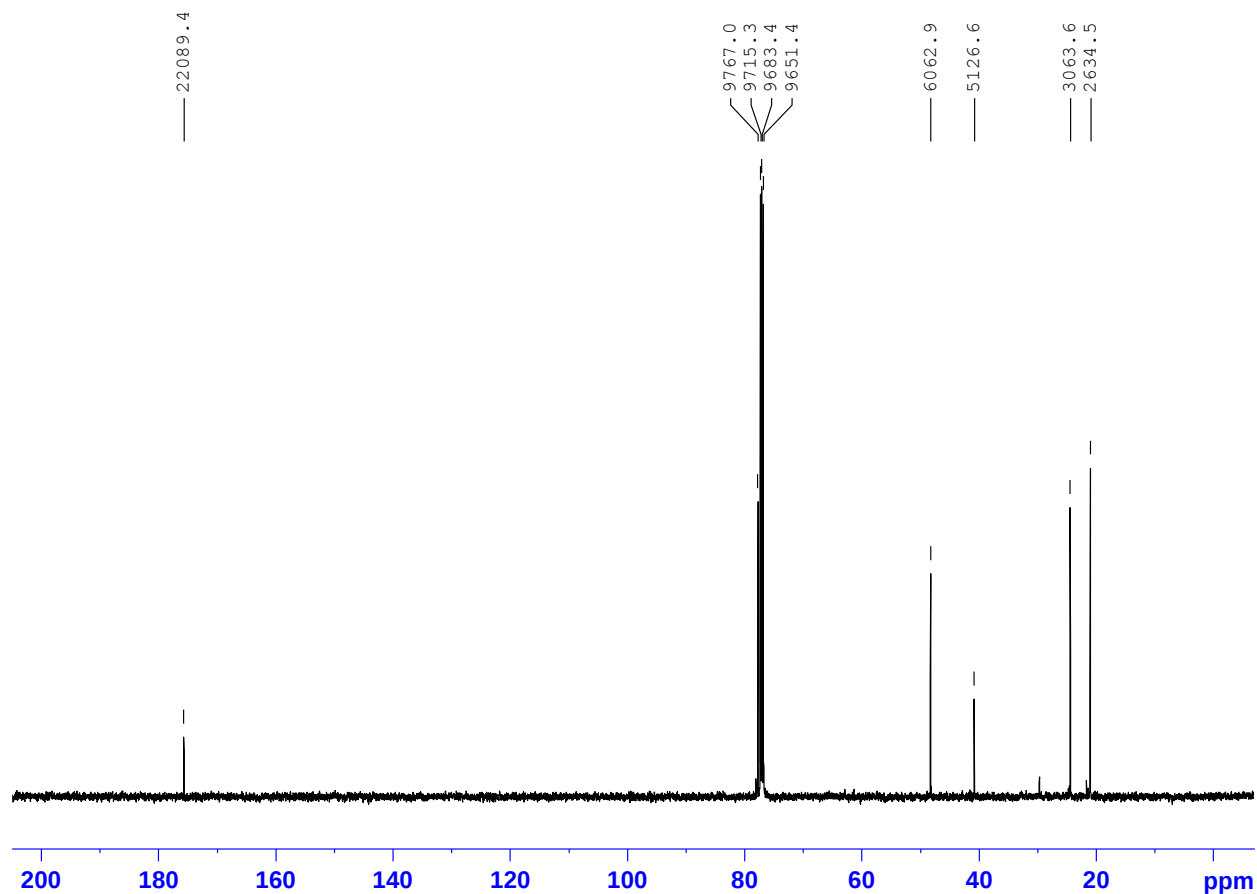


Figure S11. Complete $^{13}\text{C}\{^1\text{H}\}$ spectrum of compound **3** in CDCl_3 , 125 MHz.

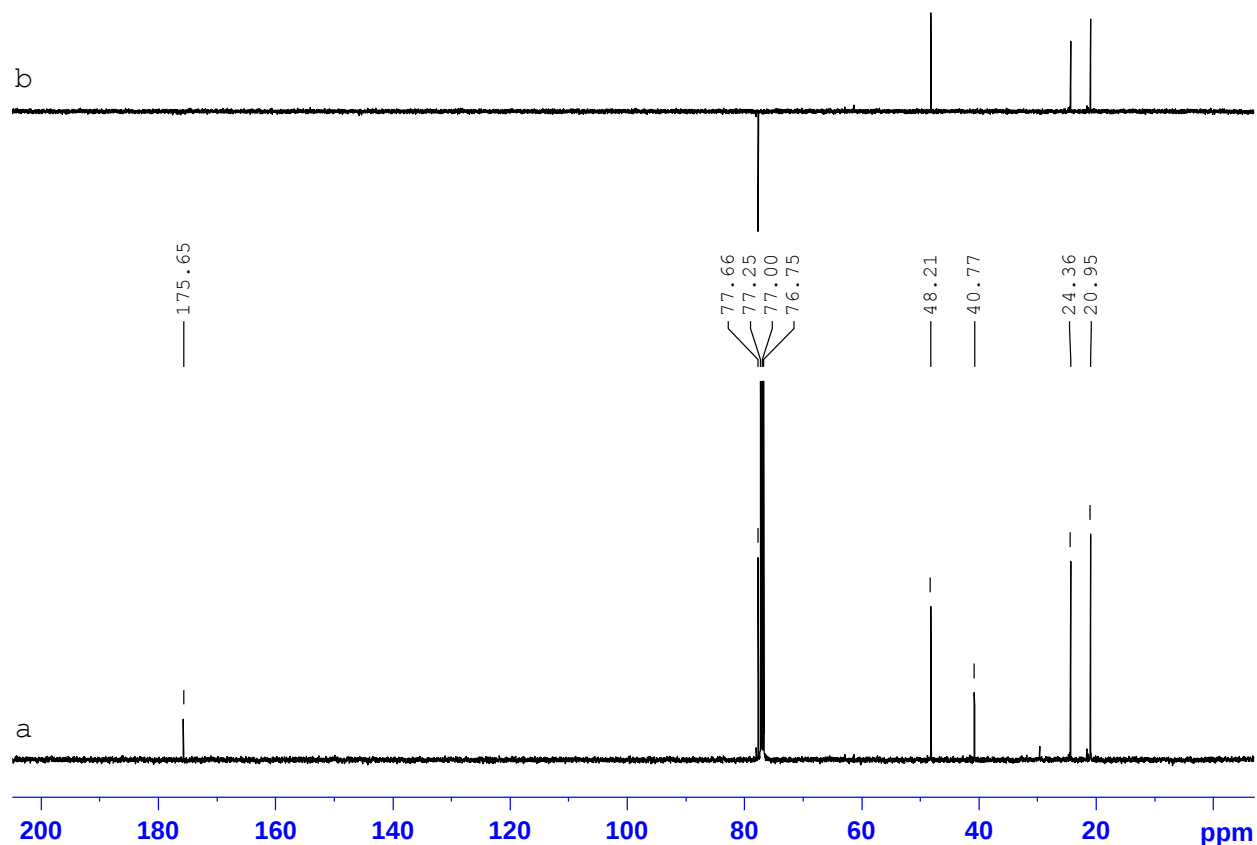


Figure S12. DEPT-135 editing $^{13}\text{C}\{^1\text{H}\}$ NMR spectrum of compound **3** in CDCl_3 , 125 MHz: a) $^{13}\text{C}\{^1\text{H}\}$ spectrum; b) DEPT-135.

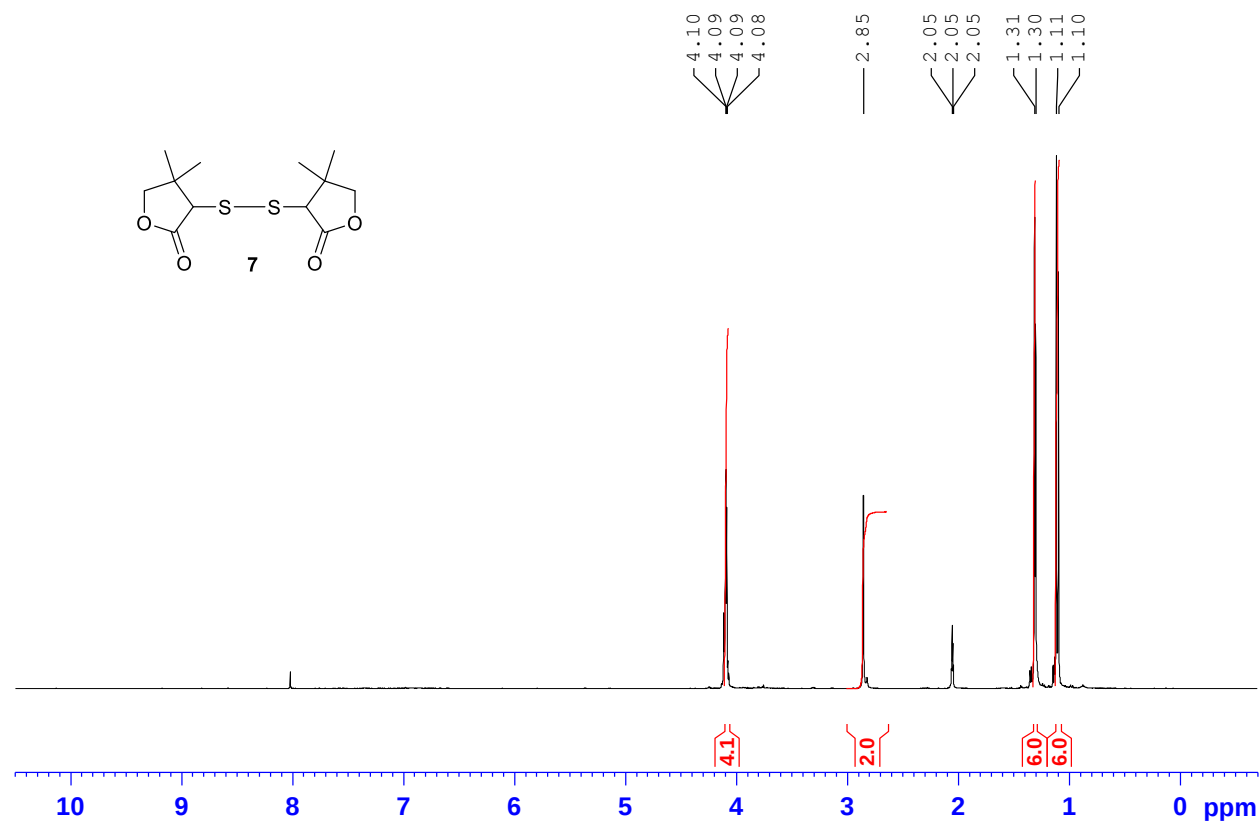


Figure S13. Complete ¹H NMR spectrum of compound 7 in Acetone-*d*₆, 500 MHz.

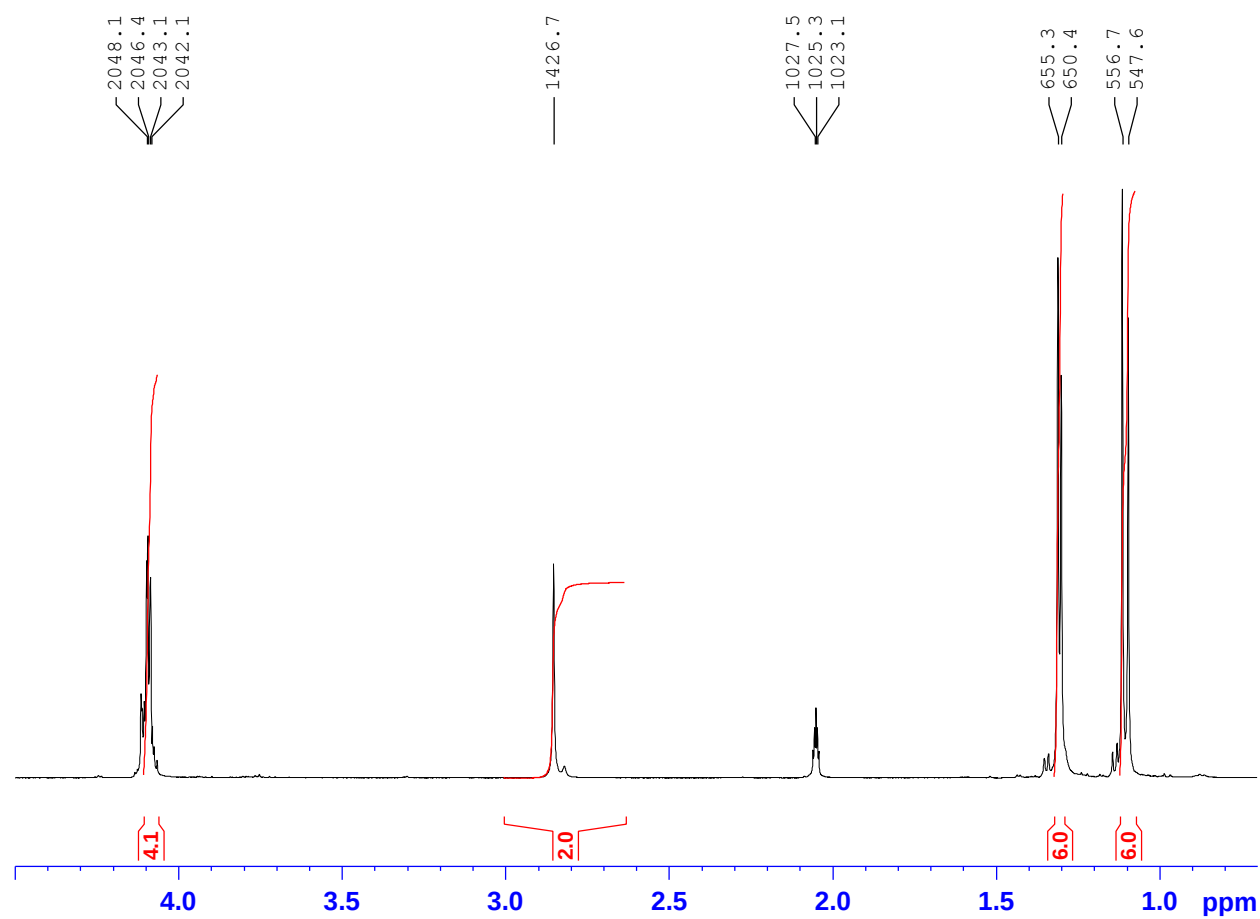


Figure S14. Expanded ¹H NMR spectrum of compound 7 in Acetone-*d*₆, 500 MHz.

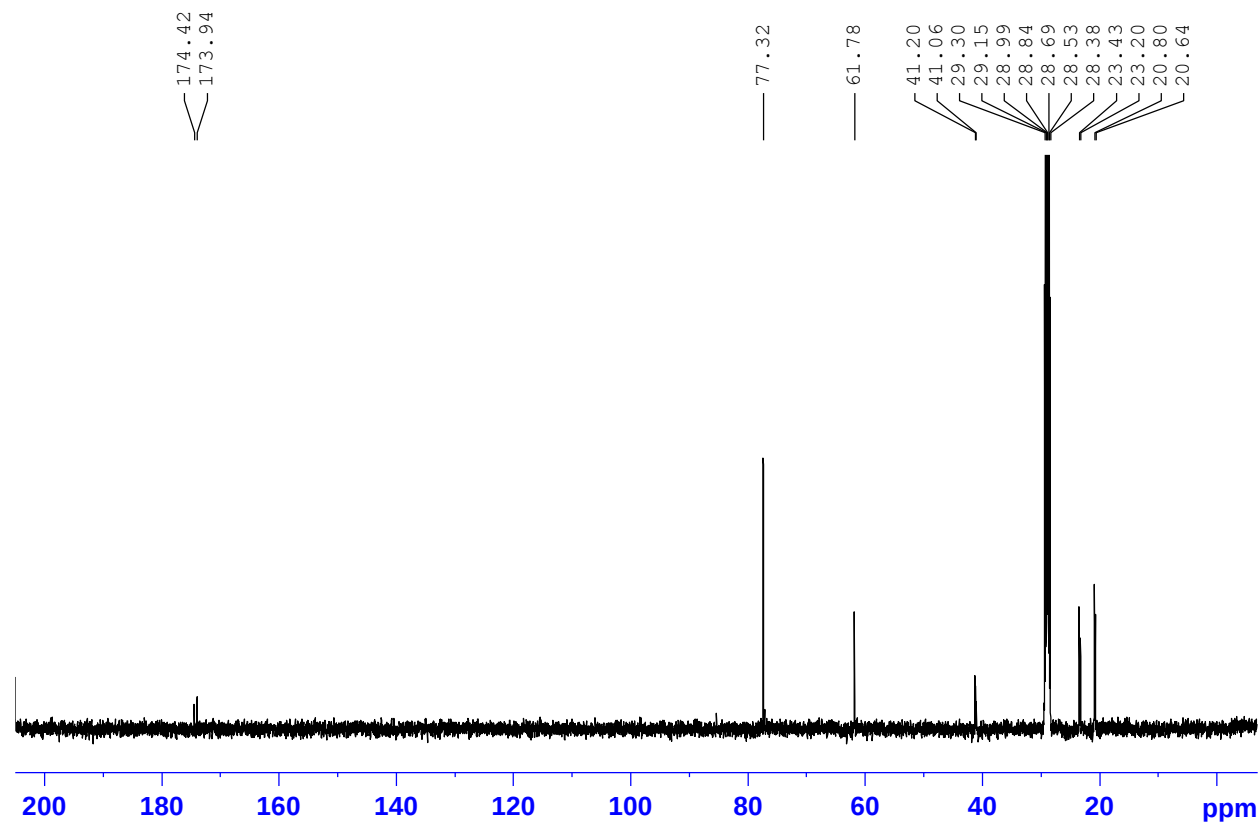


Figure S15. Complete $^{13}\text{C}\{^1\text{H}\}$ spectrum of compound 7 in $\text{Acetone-}d_6$, 125 MHz.

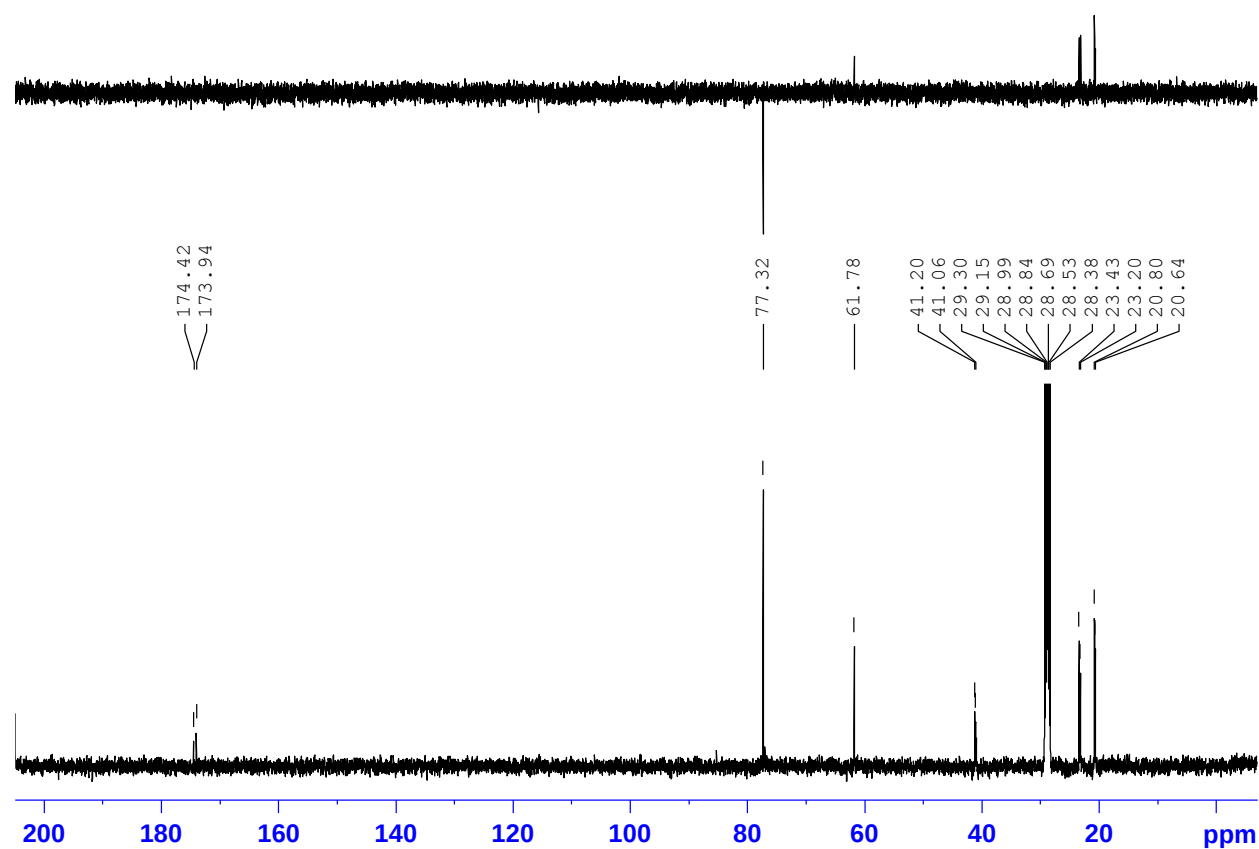


Figure S16. DEPT-135 editing $^{13}\text{C}\{^1\text{H}\}$ NMR spectrum of compound 7 in $\text{Acetone-}d_6$, 125 MHz: a) $^{13}\text{C}\{^1\text{H}\}$ spectrum; b) DEPT-135.

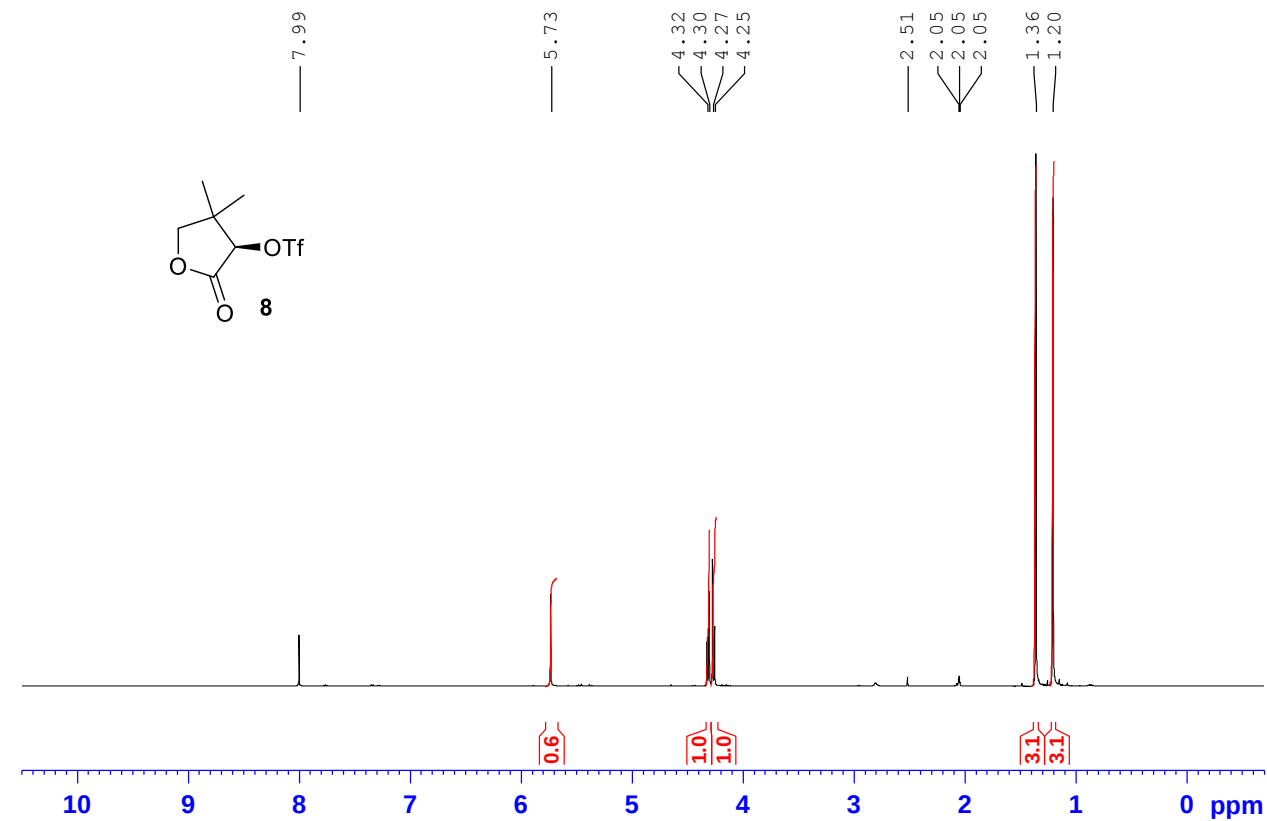


Figure S17. Complete ¹H NMR spectrum of compound **8** in Acetone-*d*₆, 500 MHz.

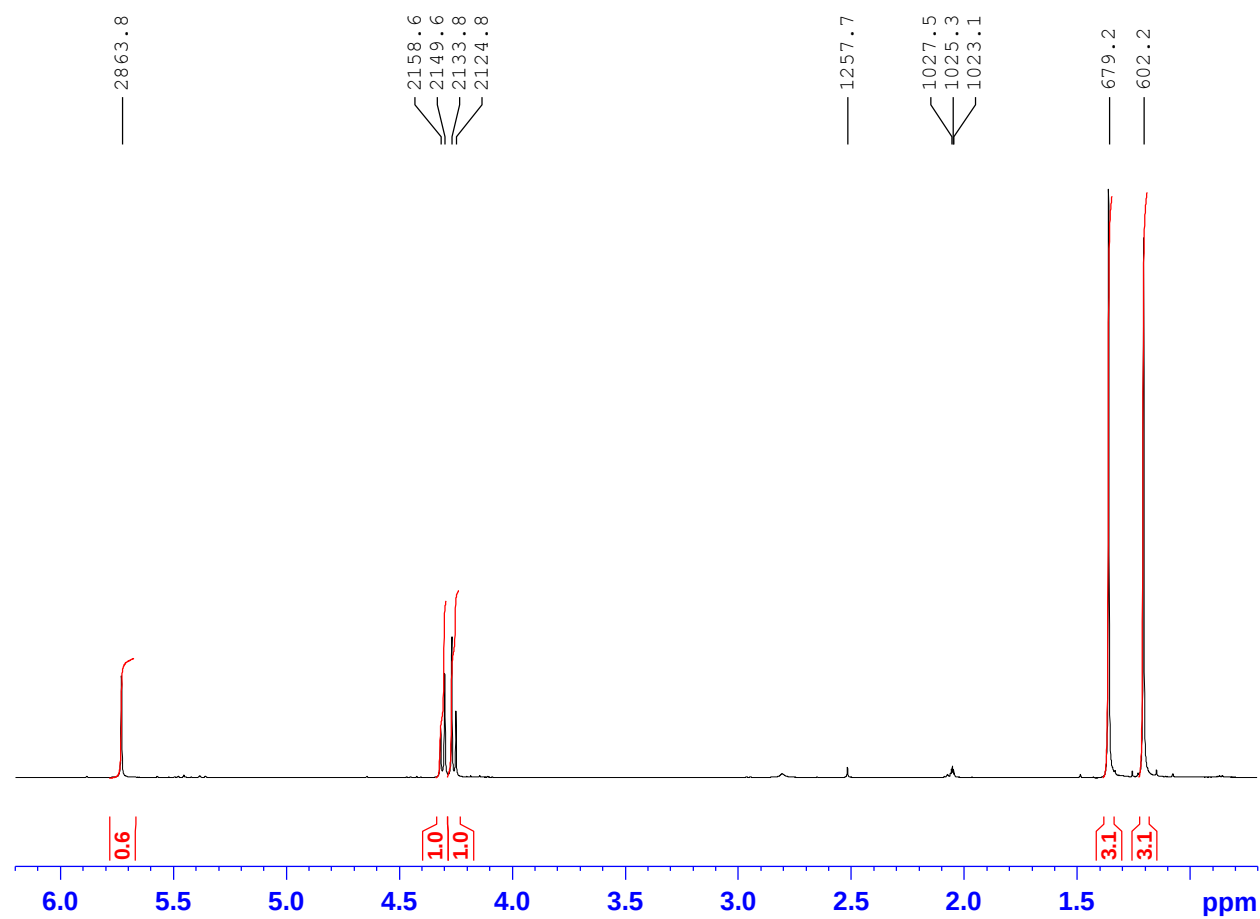


Figure S18. Expanded ¹H NMR spectrum of compound **8** in Acetone-*d*₆, 500 MHz.

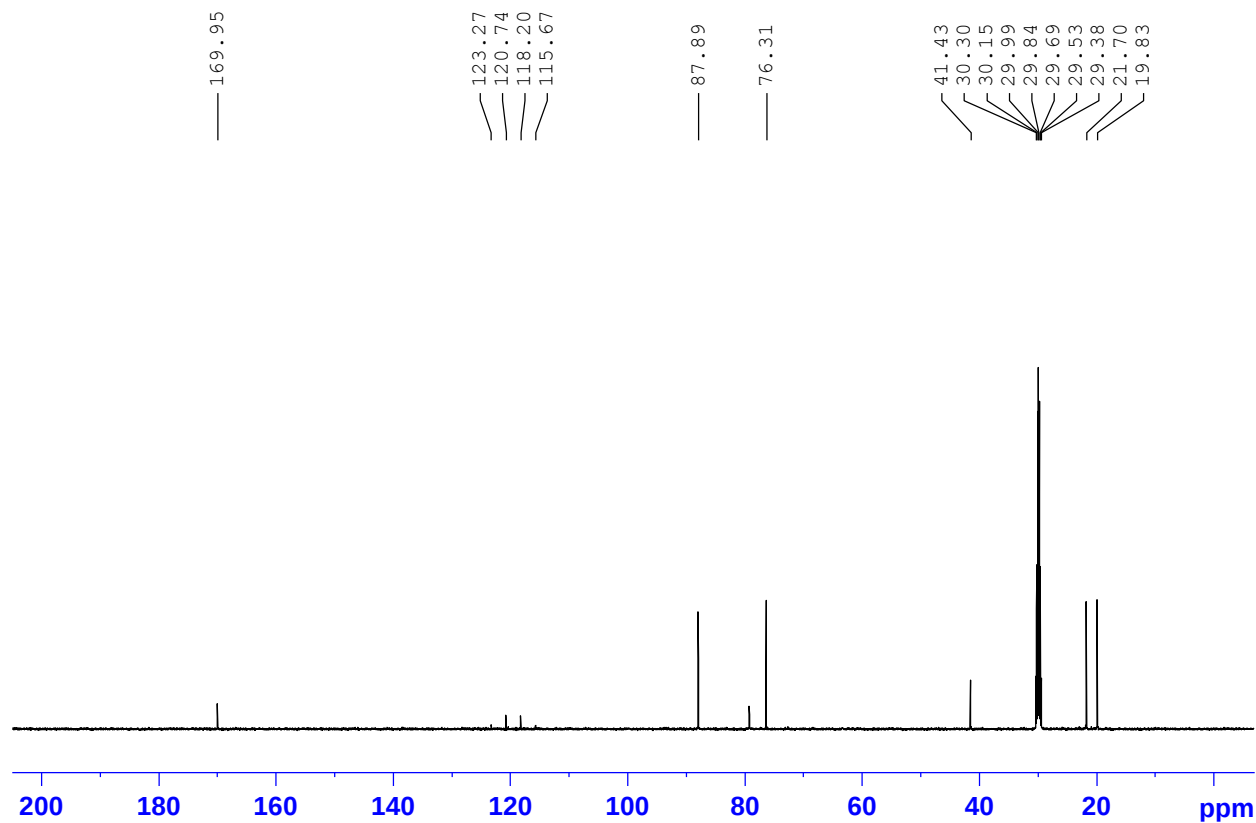


Figure S19. Complete $^{13}\text{C}\{^1\text{H}\}$ spectrum of compound **8** in Acetone- d_6 , 125 MHz.

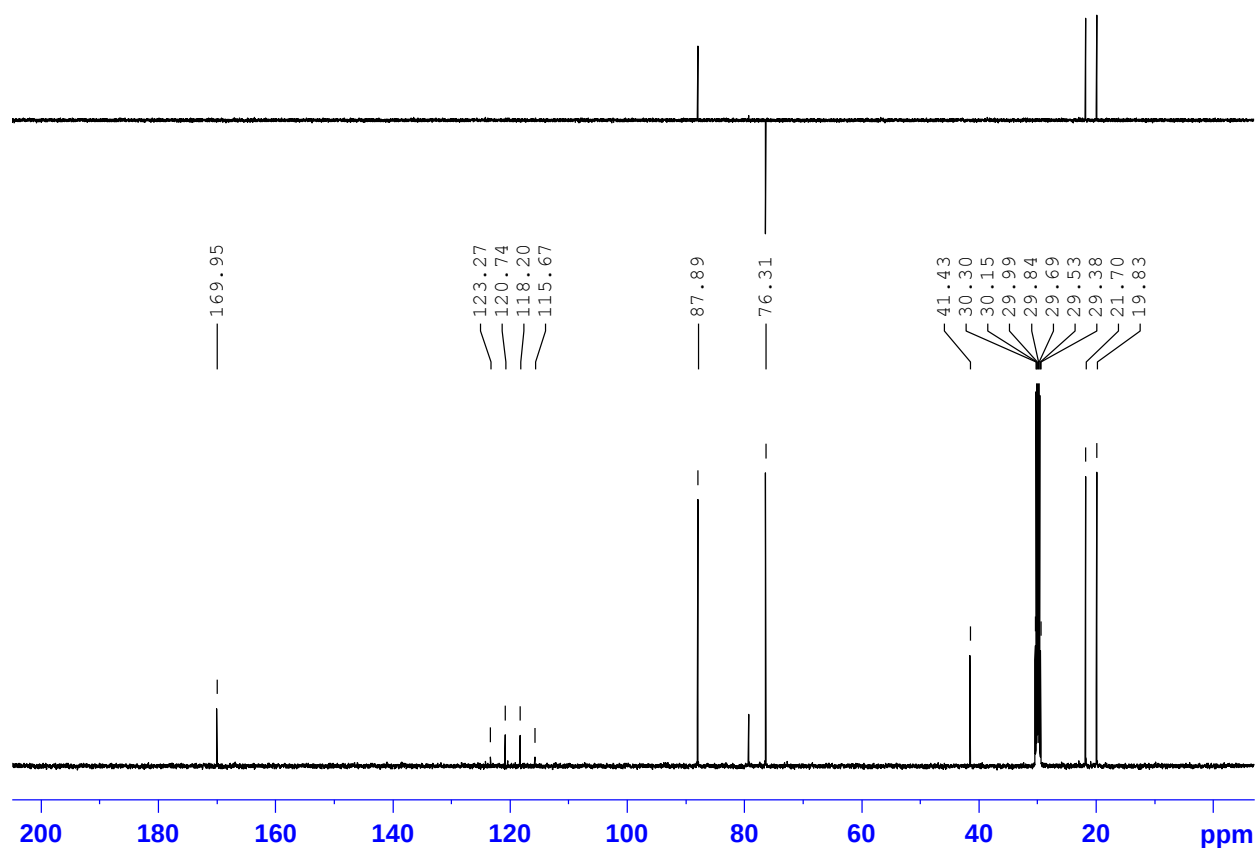


Figure S20. DEPT-135 editing $^{13}\text{C}\{^1\text{H}\}$ NMR spectrum of compound **8** in Acetone- d_6 , 125 MHz: a) $^{13}\text{C}\{^1\text{H}\}$ spectrum; b) DEPT-135.

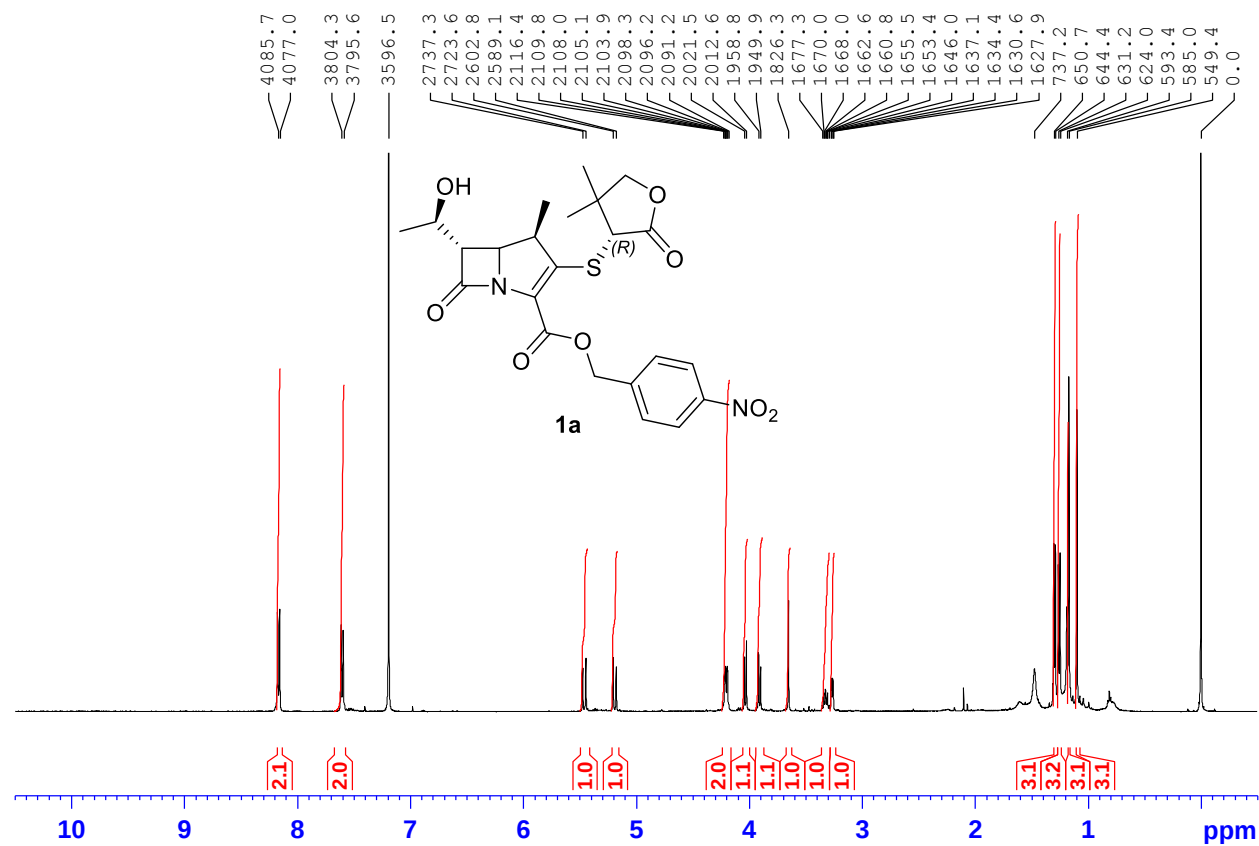


Figure S21. Complete ^1H NMR spectrum of compound **1a** in CDCl_3 , 500 MHz.

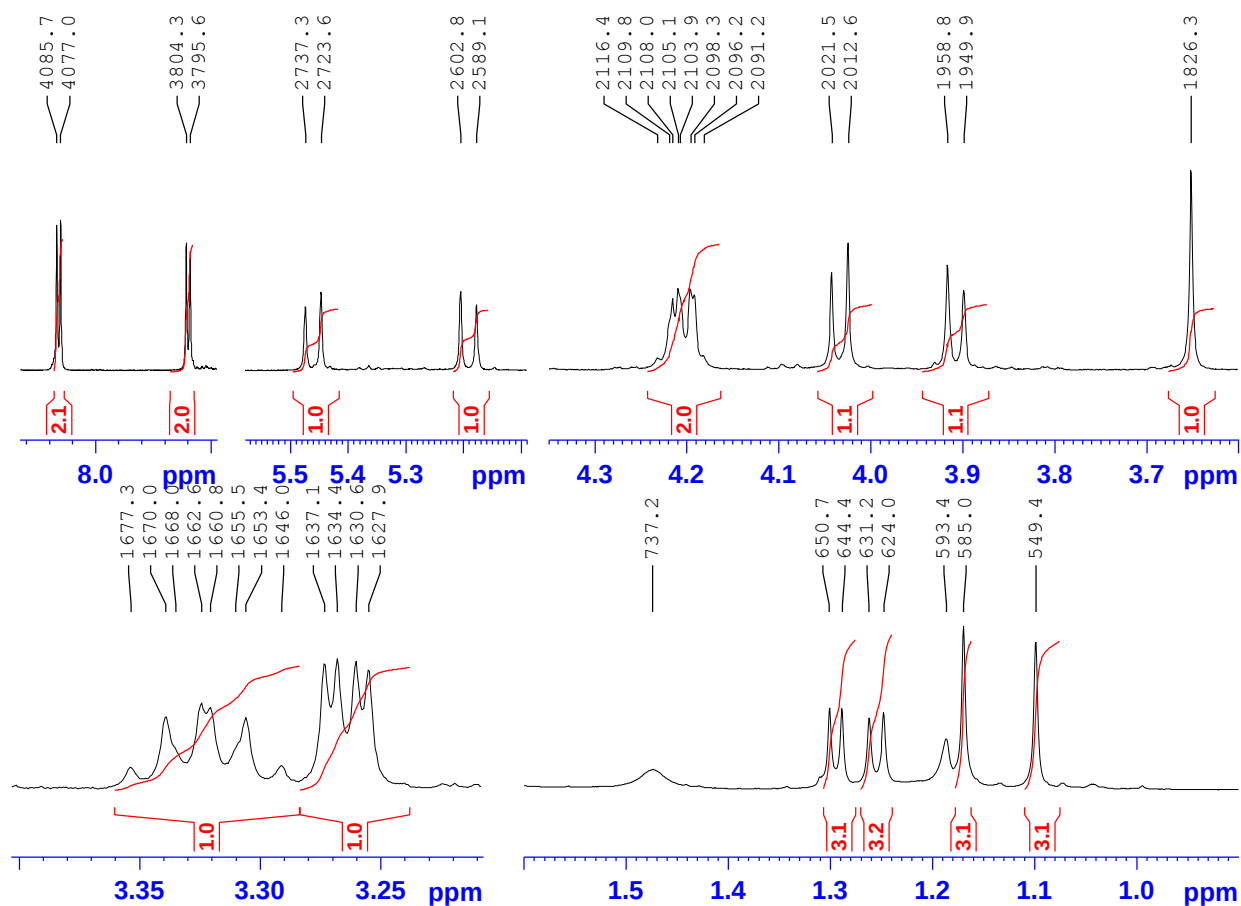
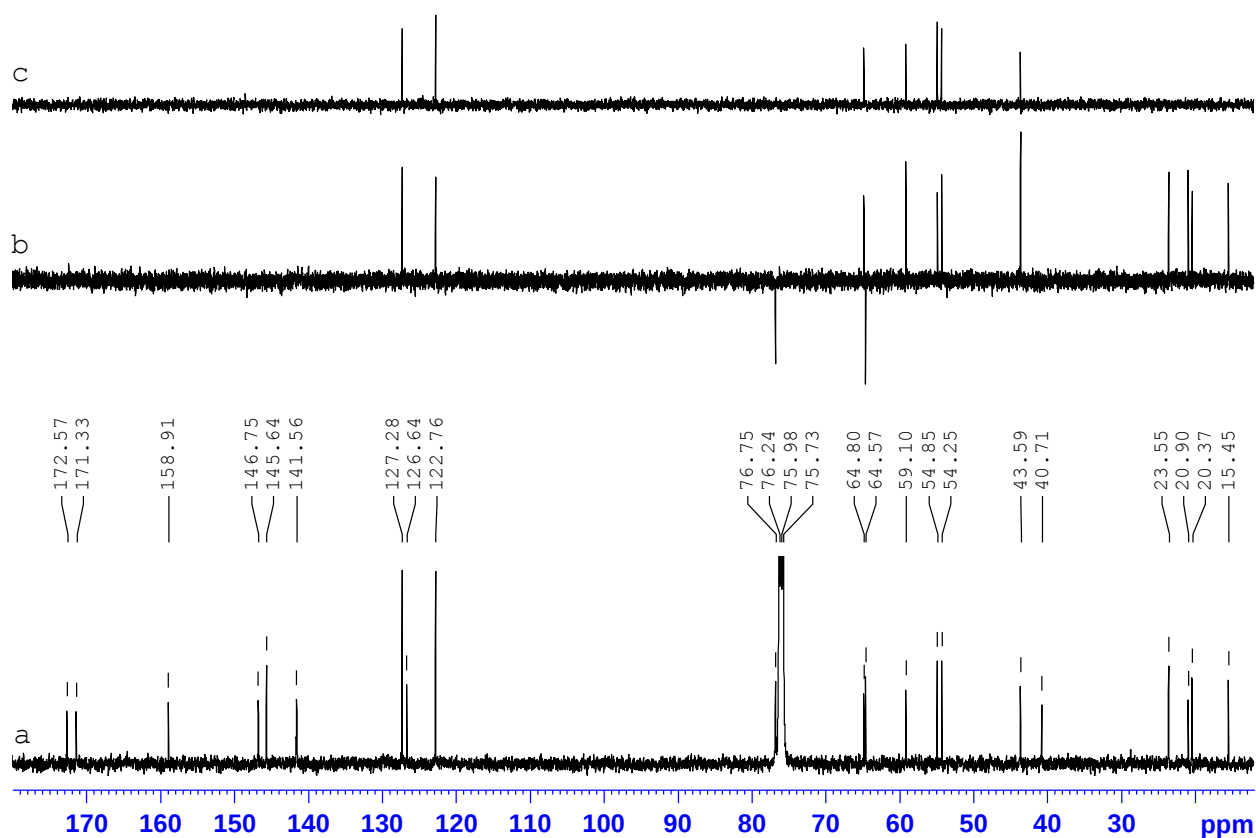
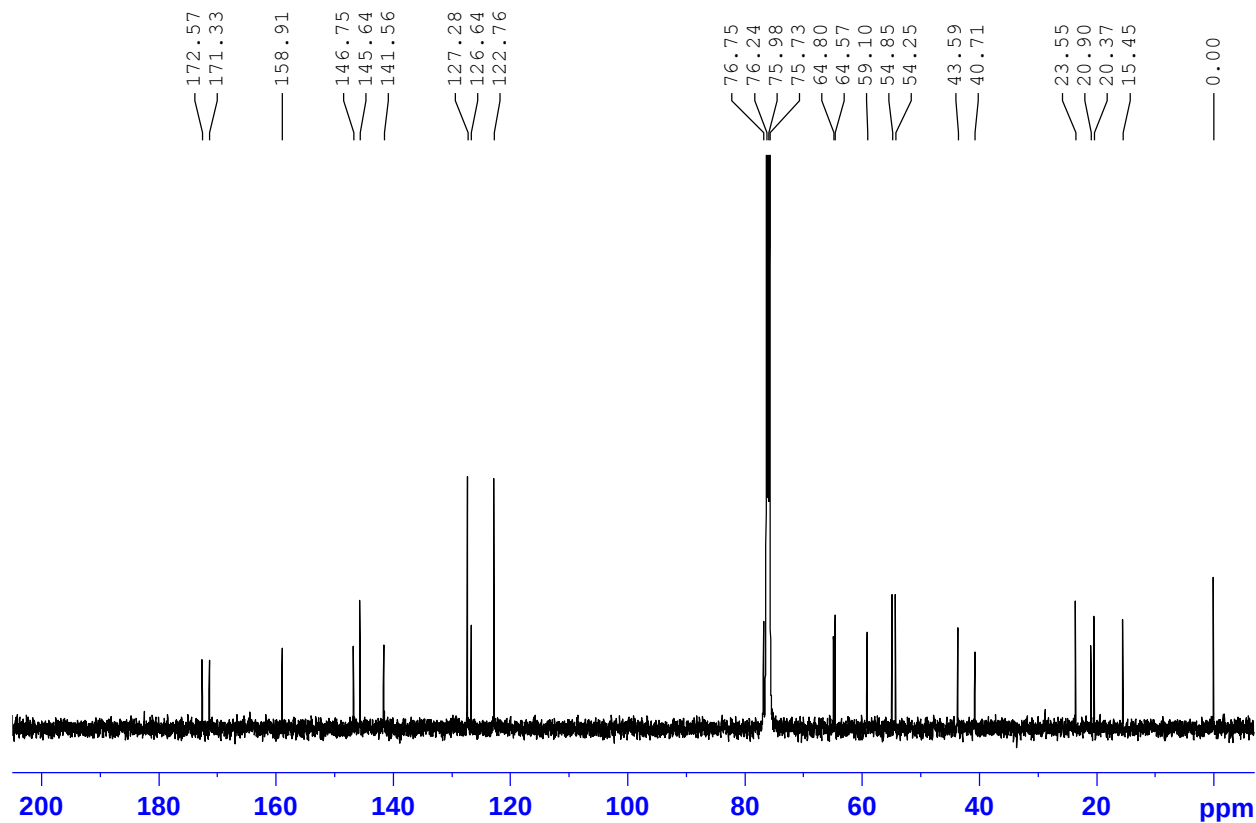


Figure S22. Expanded ^1H NMR spectrum of compound **1a** in CDCl_3 , 500 MHz.



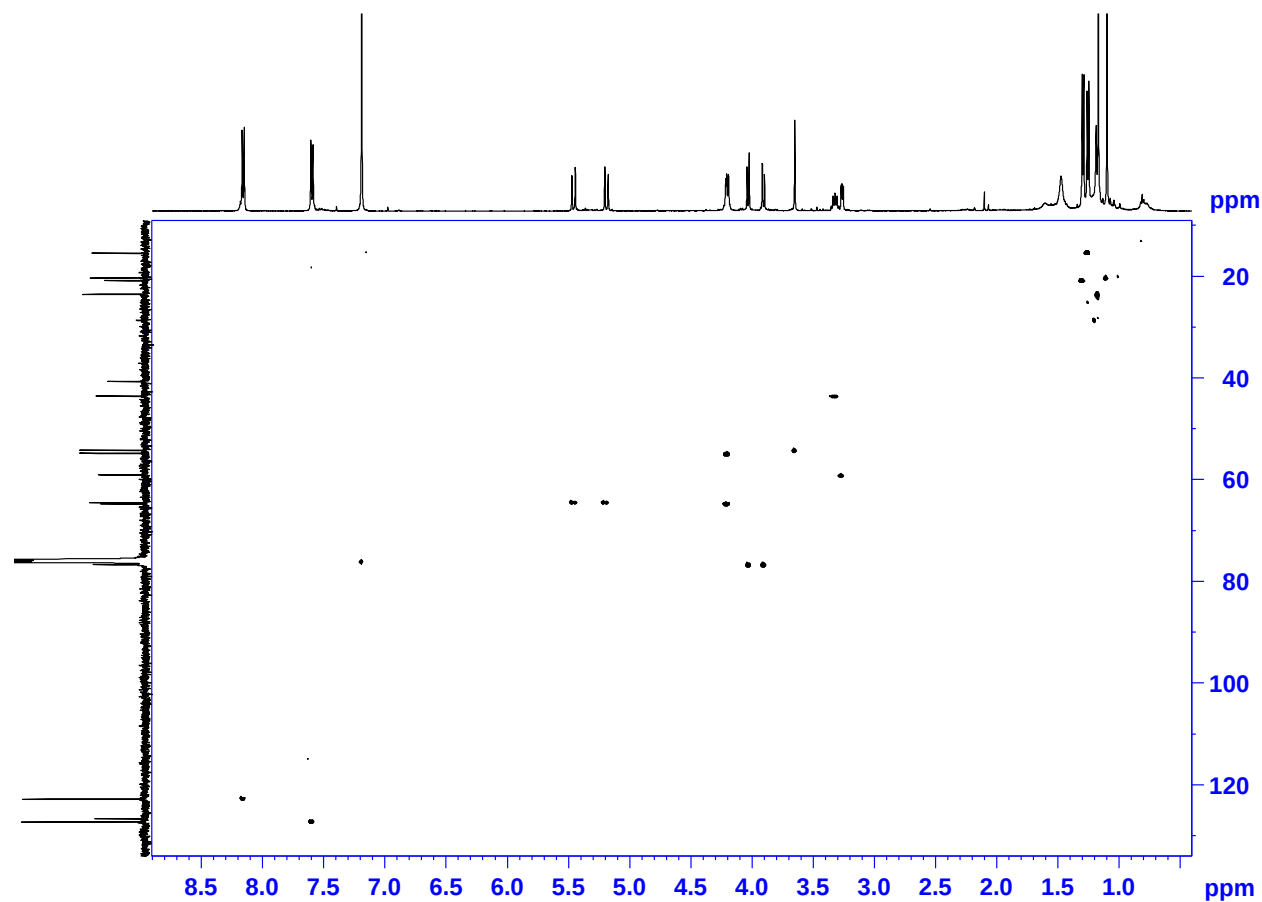


Figure S25. $\{^1\text{H}, ^{13}\text{C}\}$ HSQC NMR spectrum of compound **1a** in CDCl_3 , 500 MHz.

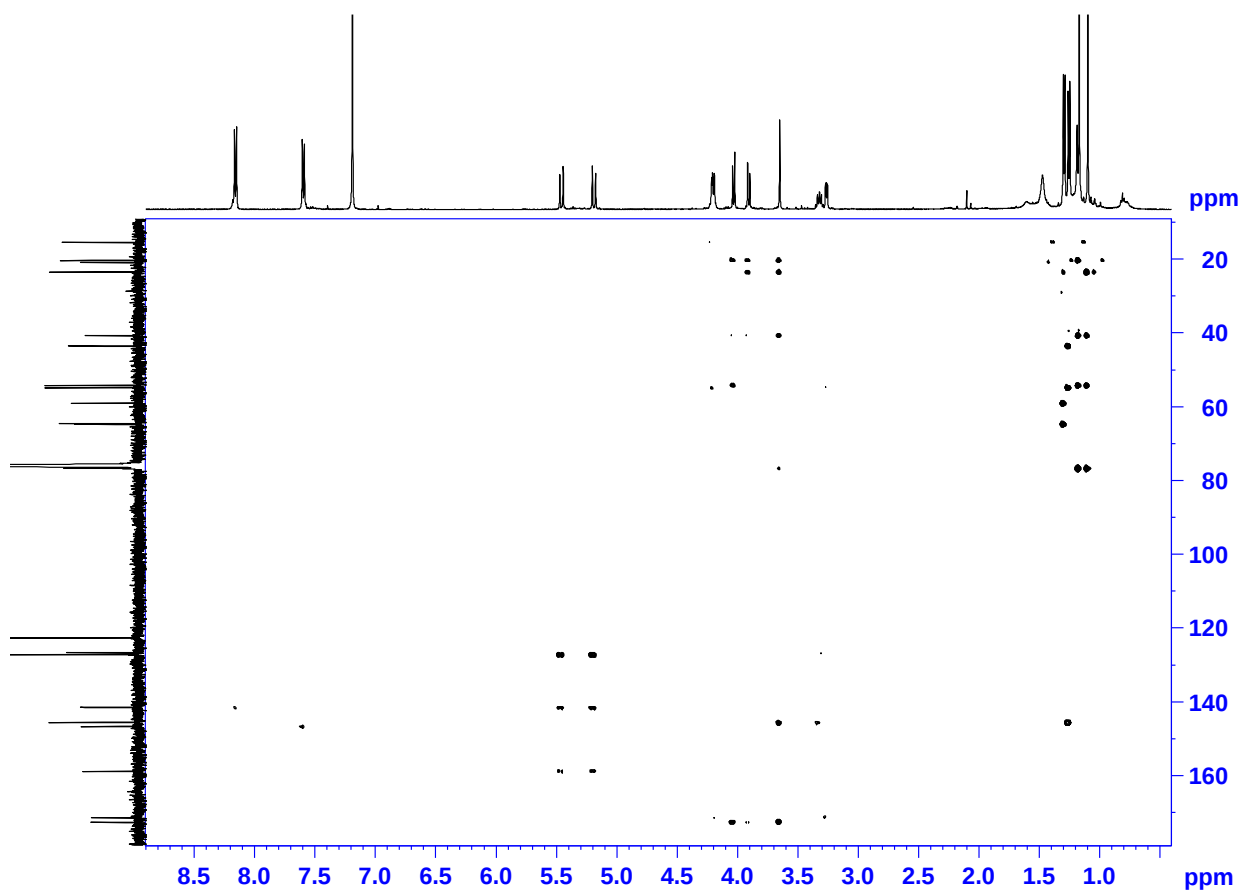


Figure S26. $\{^1\text{H}, ^{13}\text{C}\}$ HMBC NMR spectrum of compound **1a** in CDCl_3 , 500 MHz.

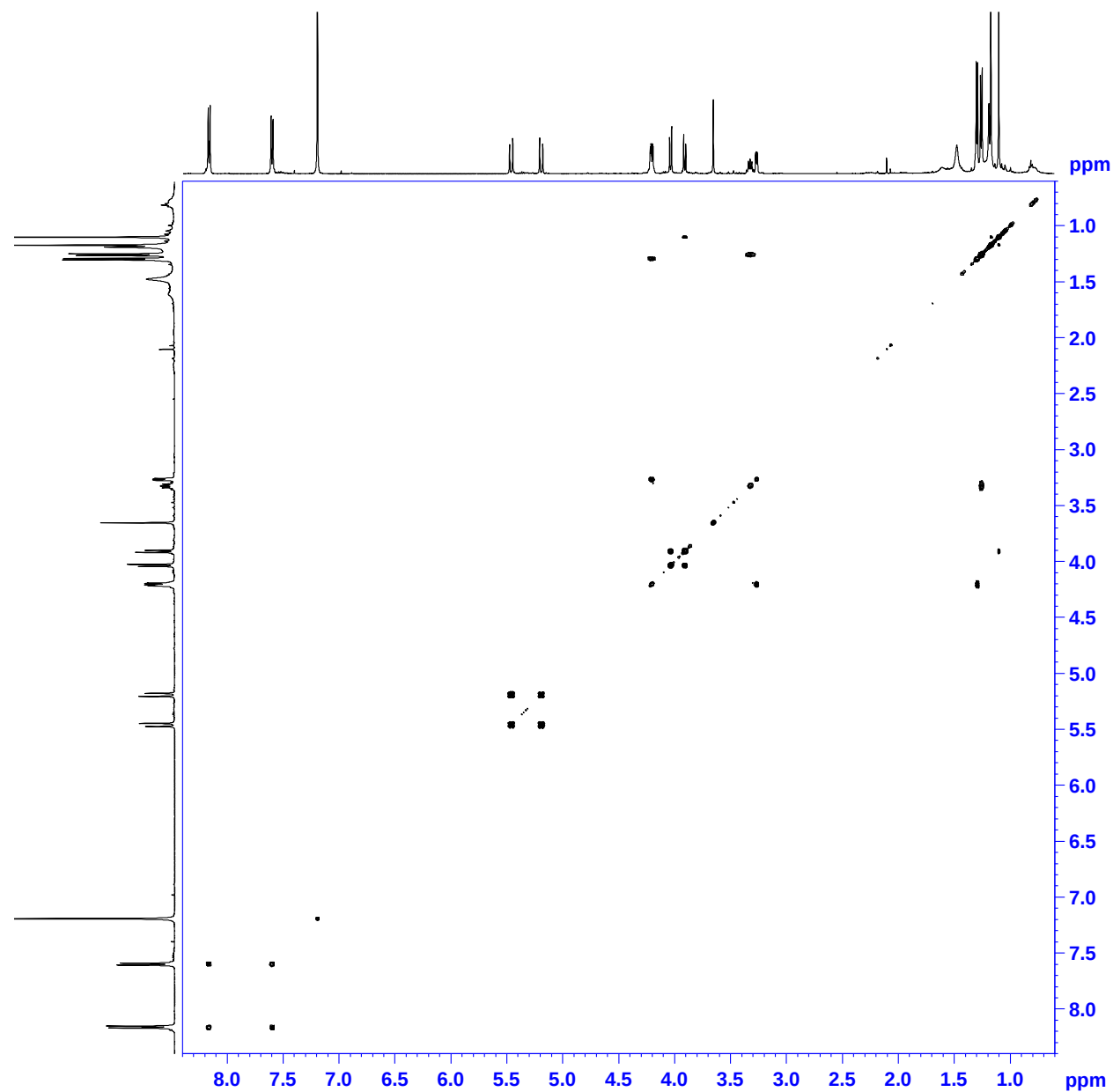


Figure S27. $\{^1\text{H}, ^1\text{H}\}$ COSY NMR spectrum of compound **1a** in CDCl_3 , 500 MHz.

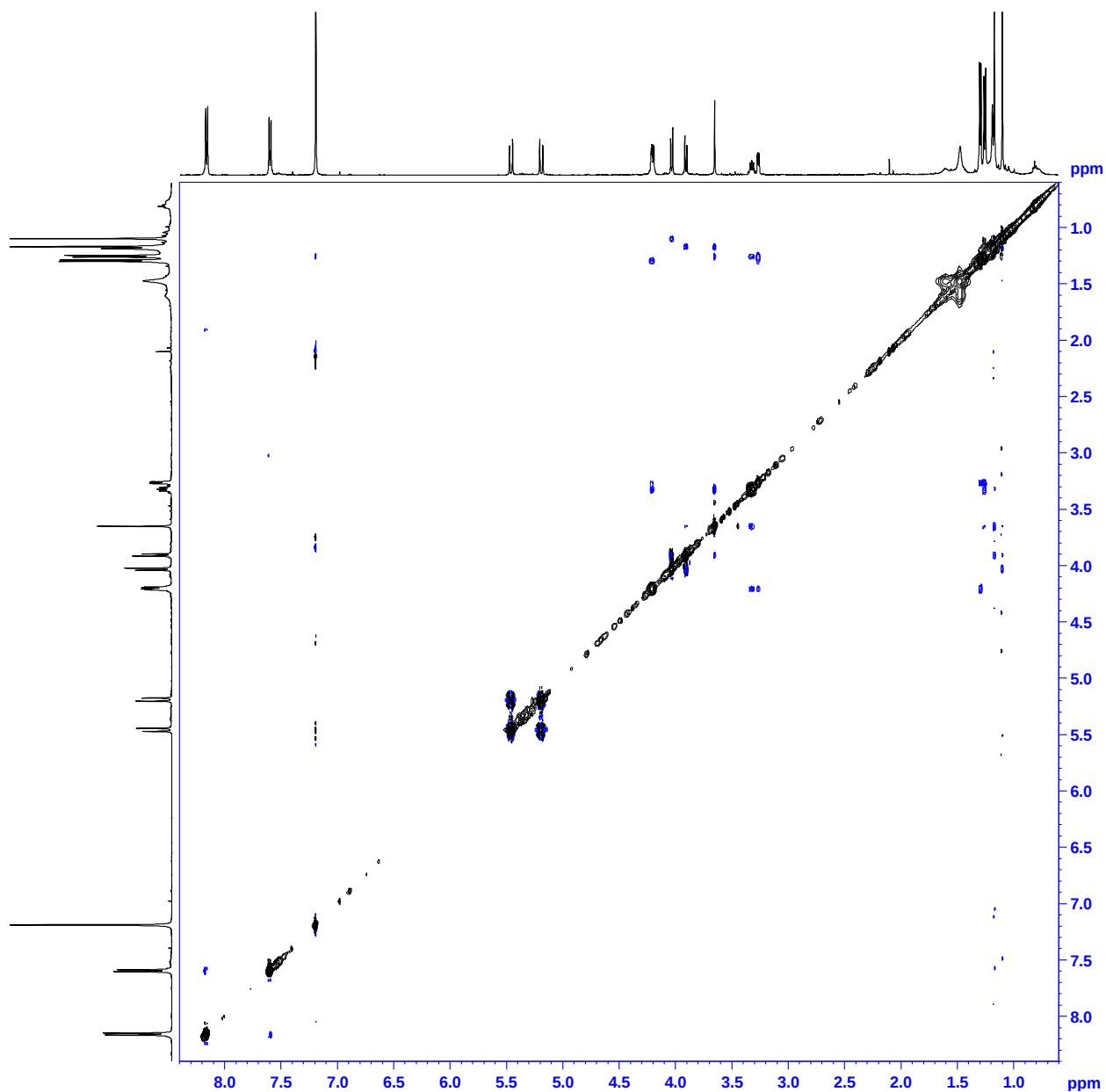


Figure S28. {¹H, ¹H} NOESY NMR spectrum of compound **1a** in CDCl₃, 500 MHz.

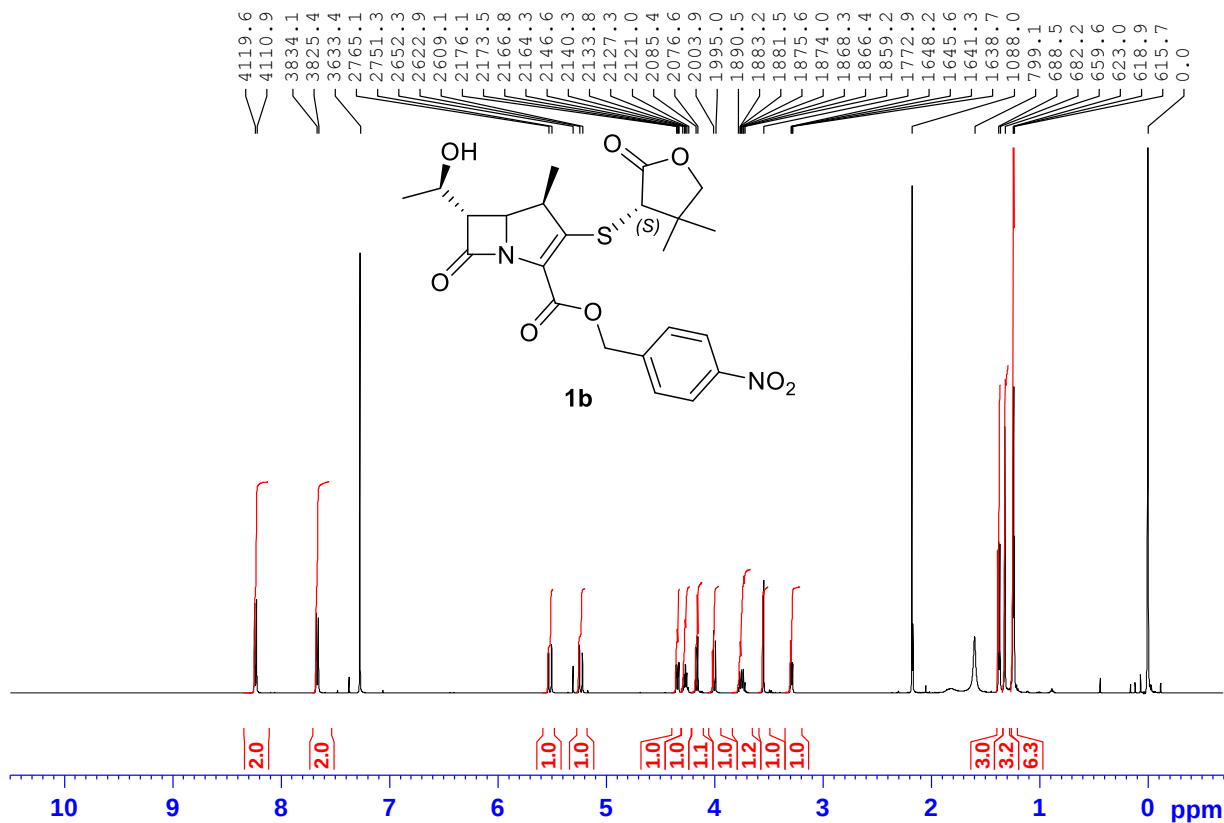


Figure S29. Complete ¹H NMR spectrum of compound **1b** in CDCl₃, 500 MHz.

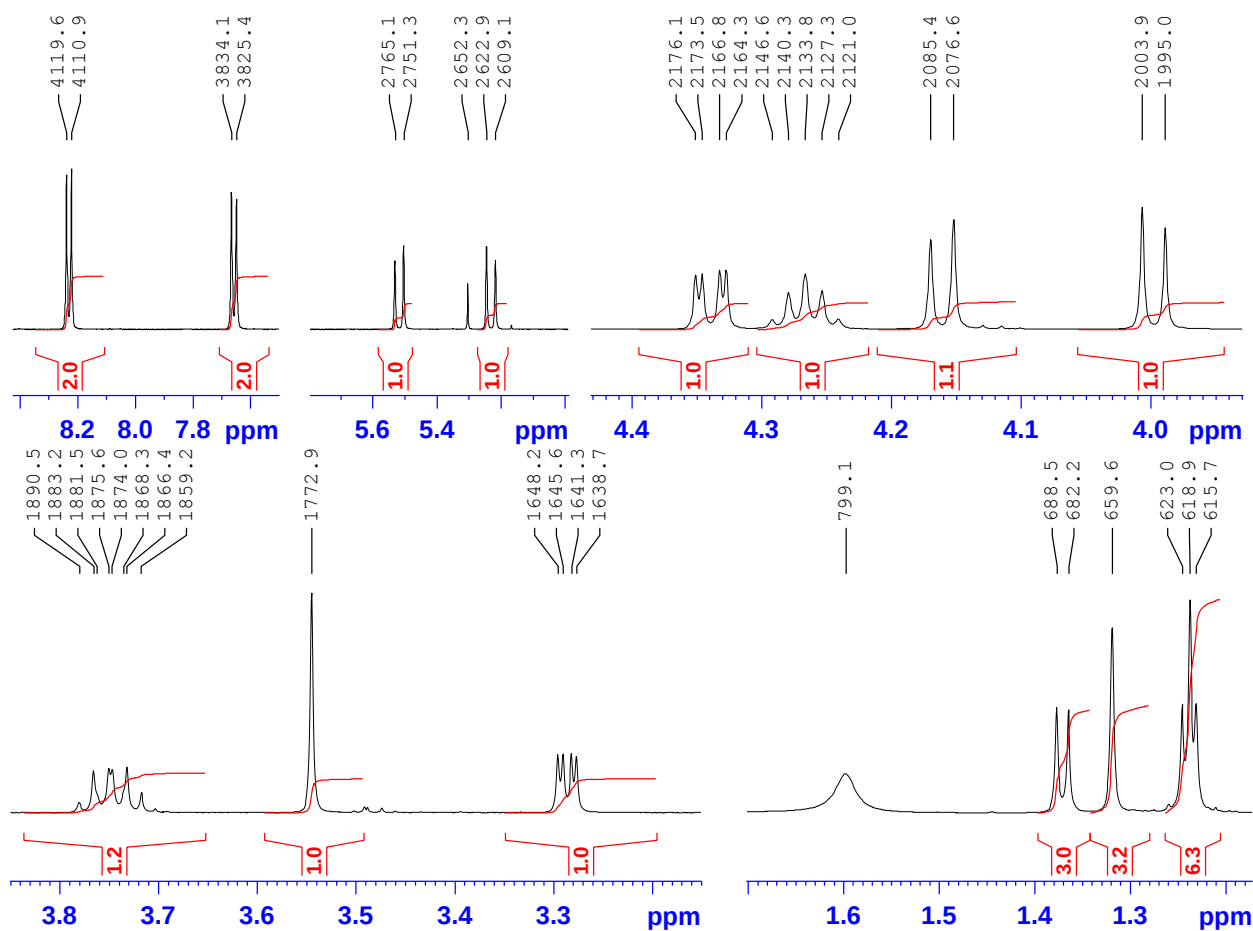
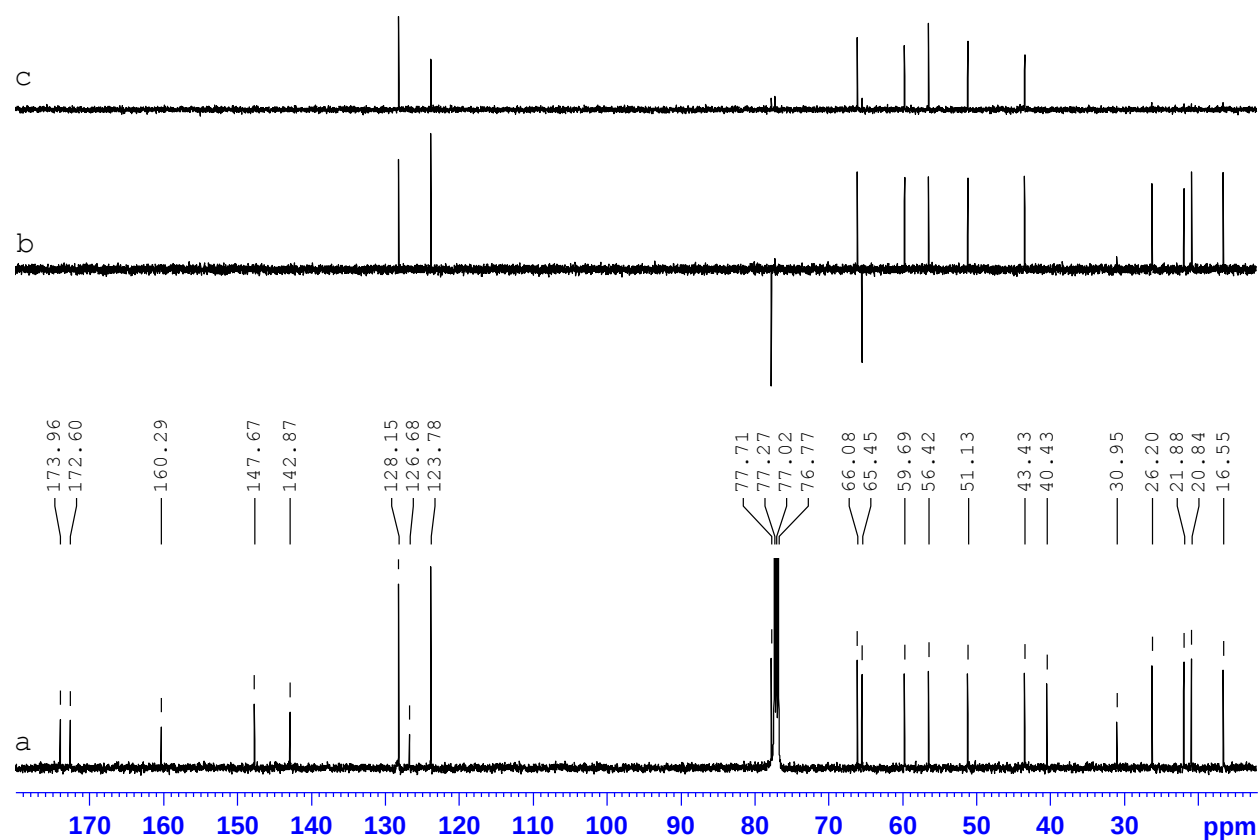
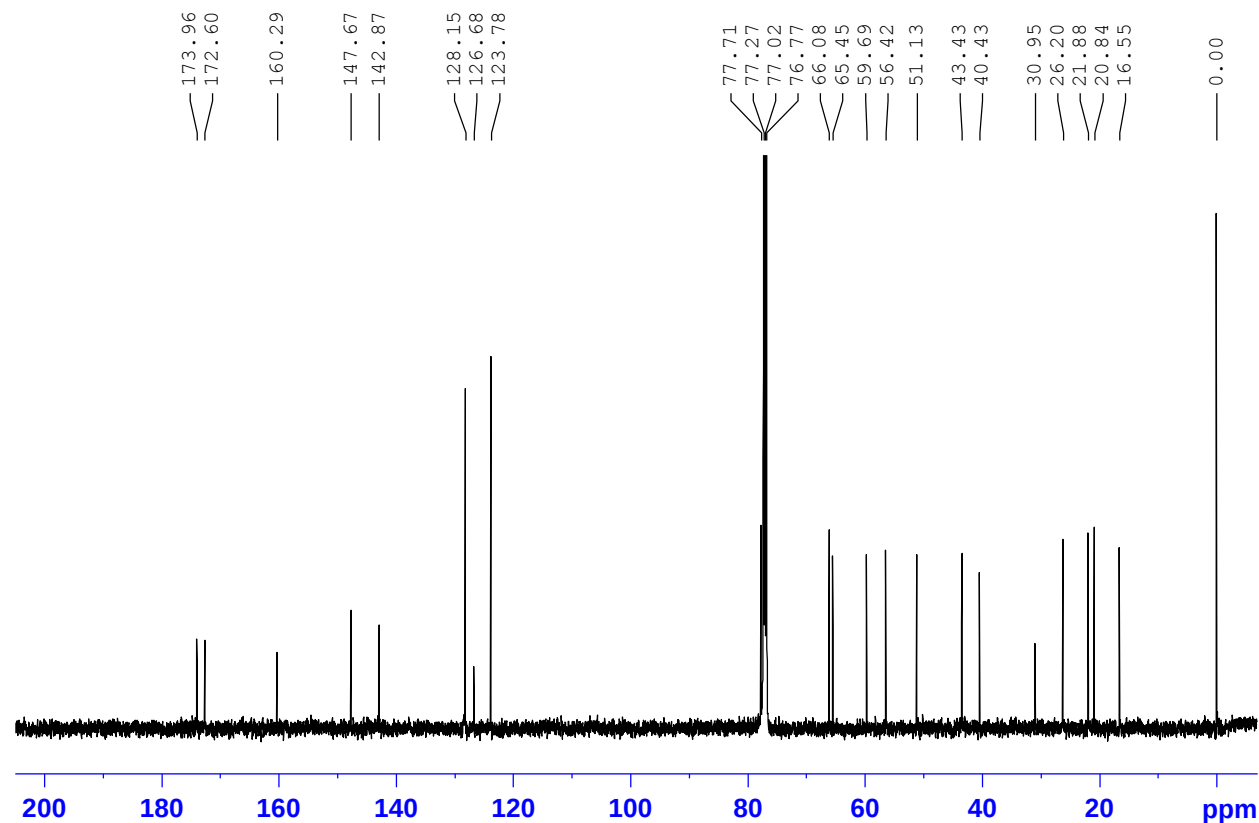


Figure S30. Expanded ¹H NMR spectrum of compound **1b** in CDCl₃, 500 MHz.



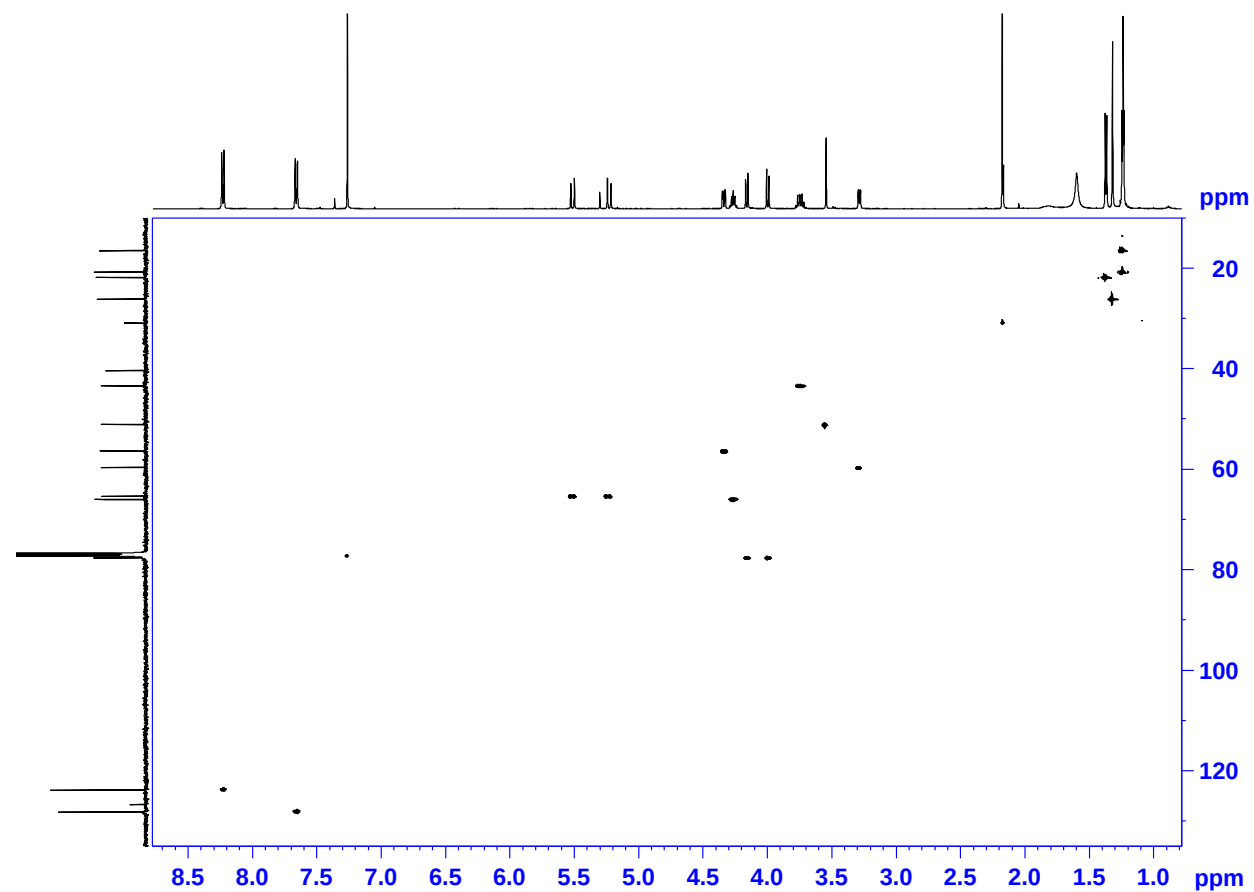


Figure S33. $\{^1\text{H}, ^{13}\text{C}\}$ HSQC NMR spectrum of compound **1b** in CDCl_3 , 500 MHz.

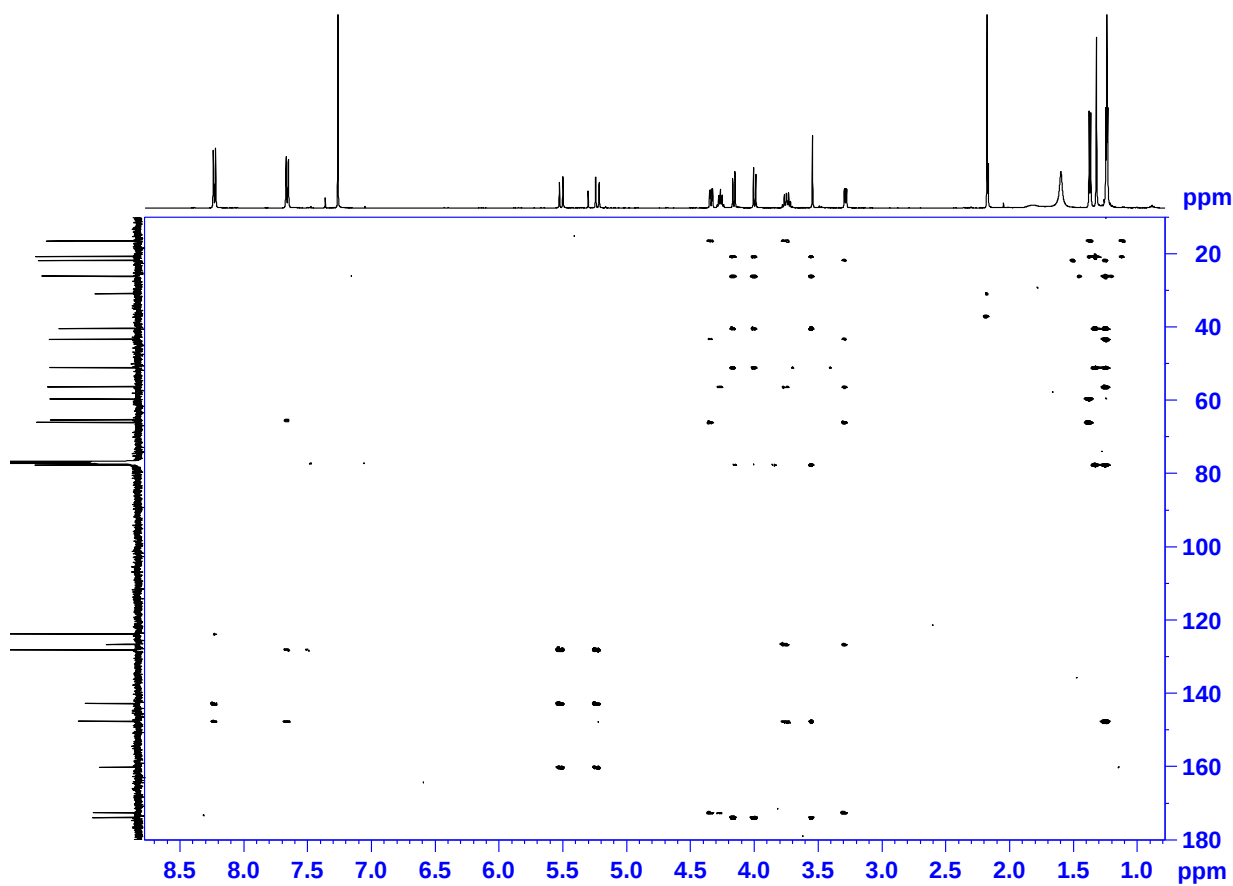


Figure S34. $\{^1\text{H}, ^{13}\text{C}\}$ HMBC NMR spectrum of compound **1b** in CDCl_3 , 500 MHz.

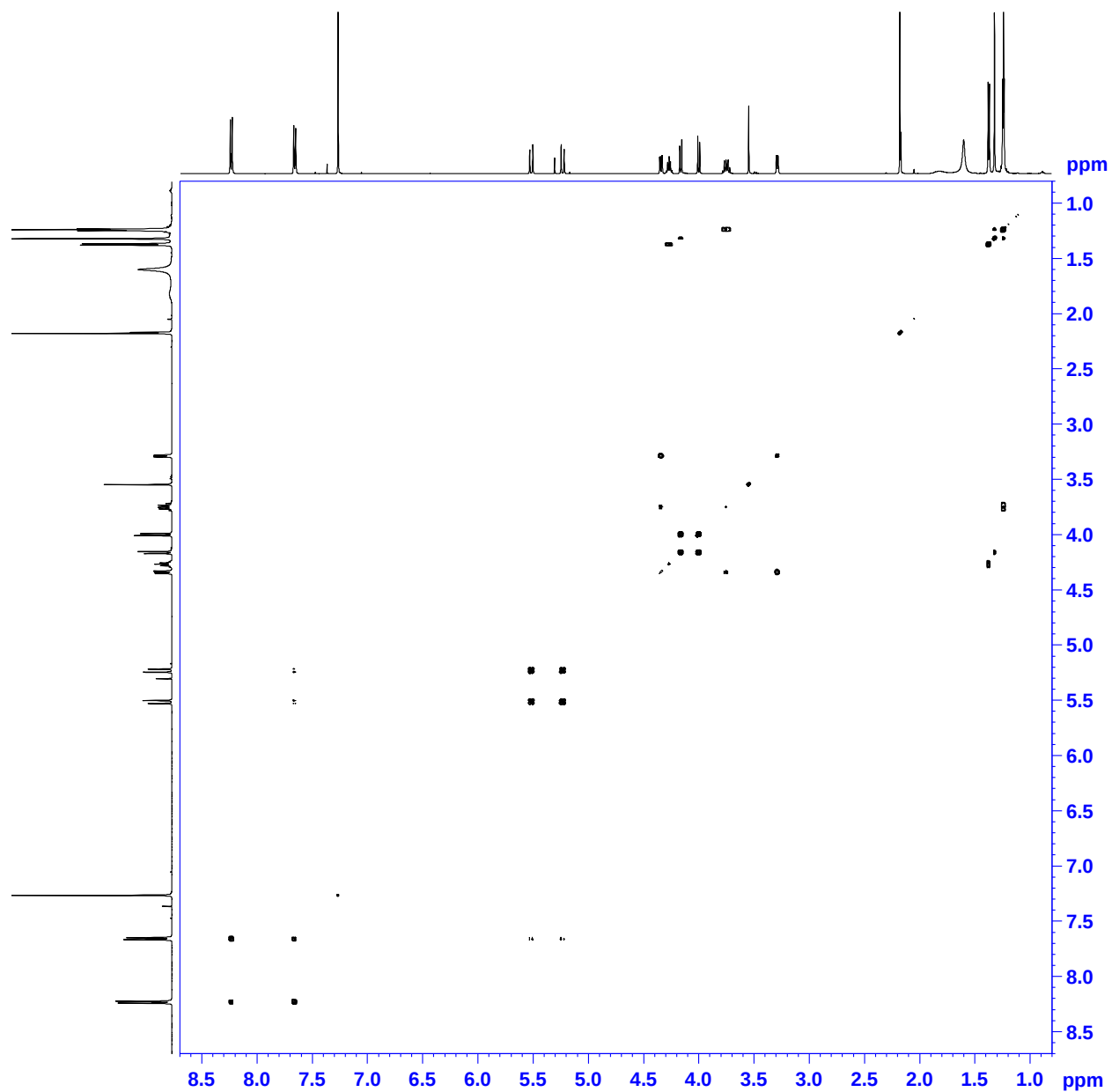


Figure S35. $\{^1\text{H}, ^1\text{H}\}$ COSY NMR spectrum of compound **1b** in CDCl_3 , 500 MHz.

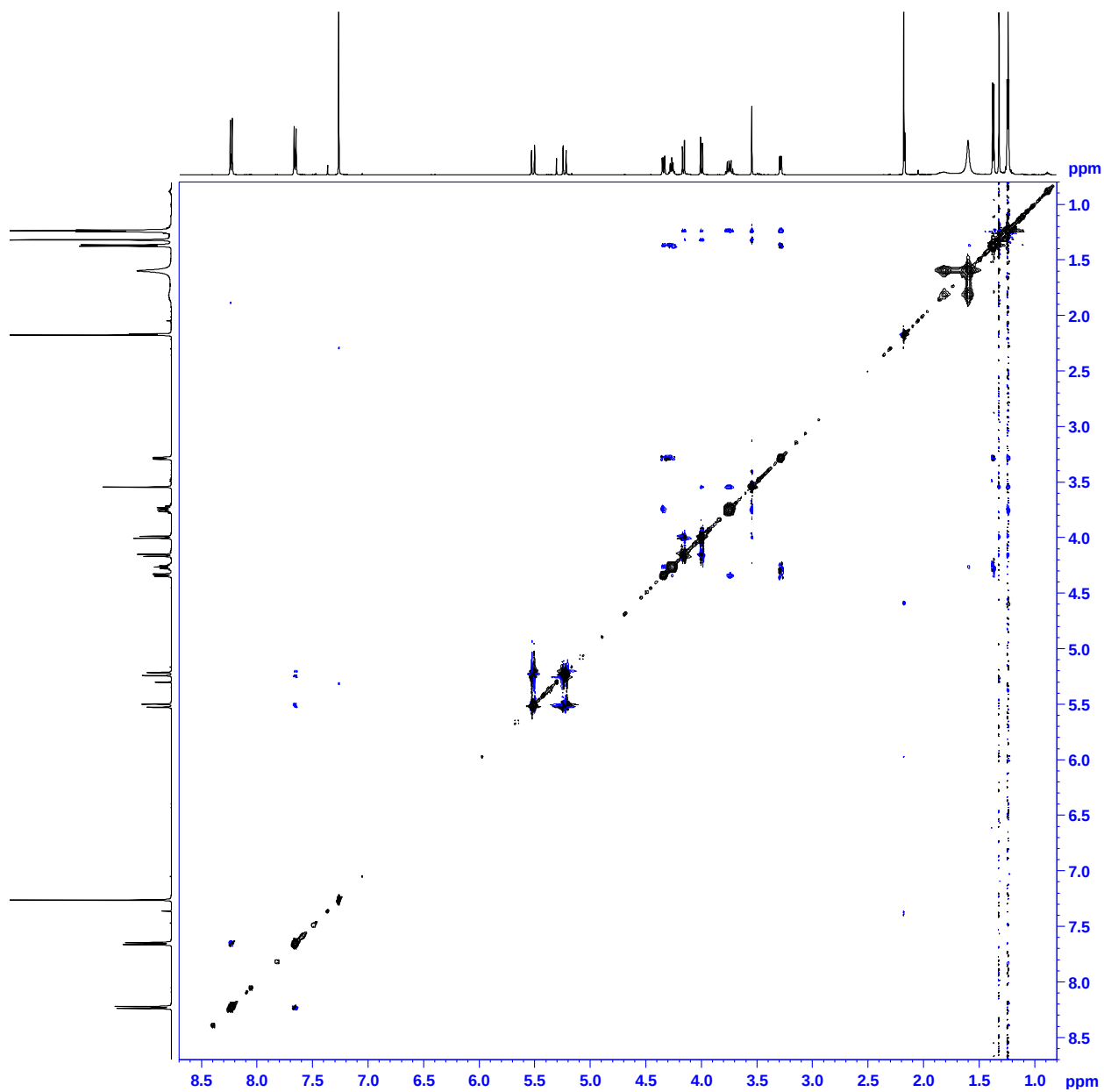


Figure S36. {¹H, ¹H} NOESY NMR spectrum of compound **1b** in CDCl₃, 500 MHz.

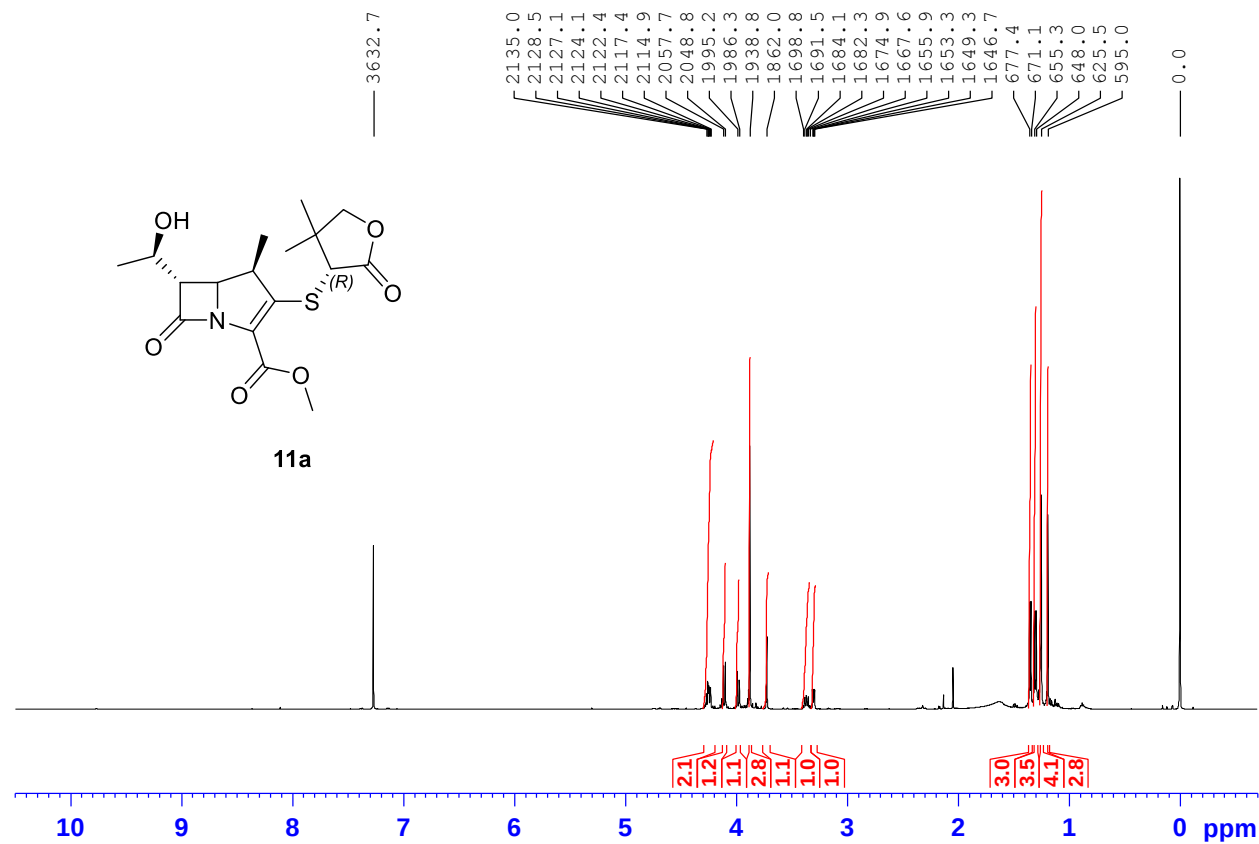


Figure S37. Complete ^1H NMR spectrum of compound **11a** in CDCl_3 , 500 MHz.

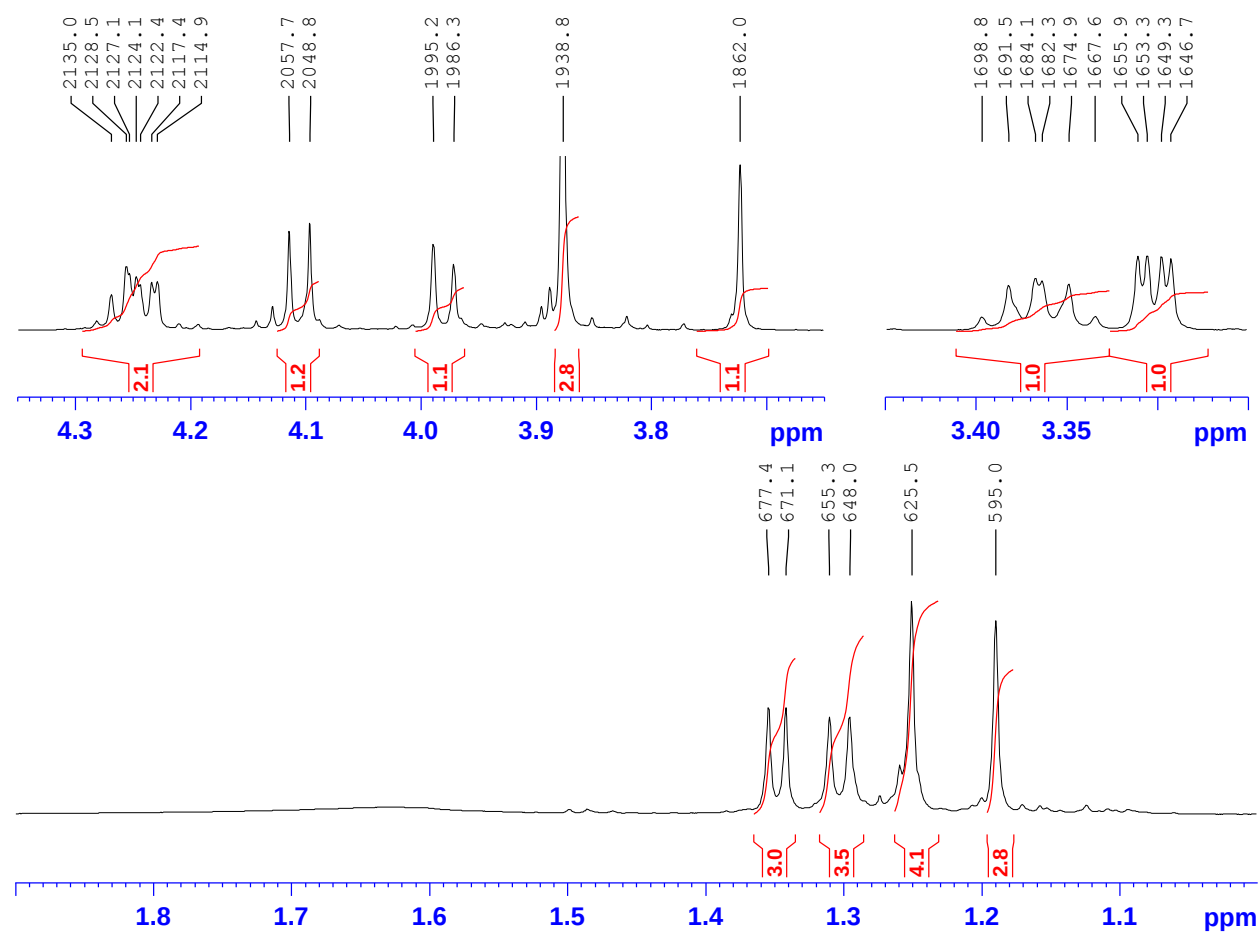
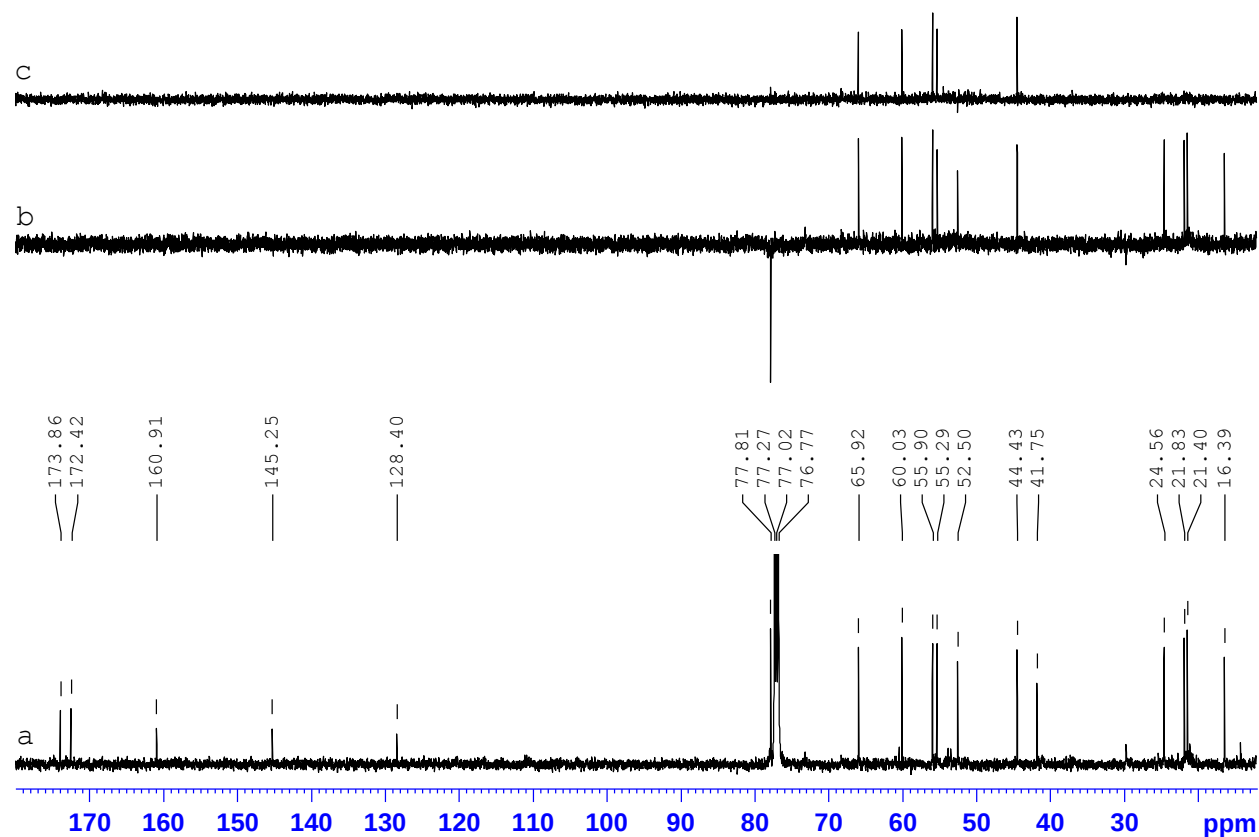
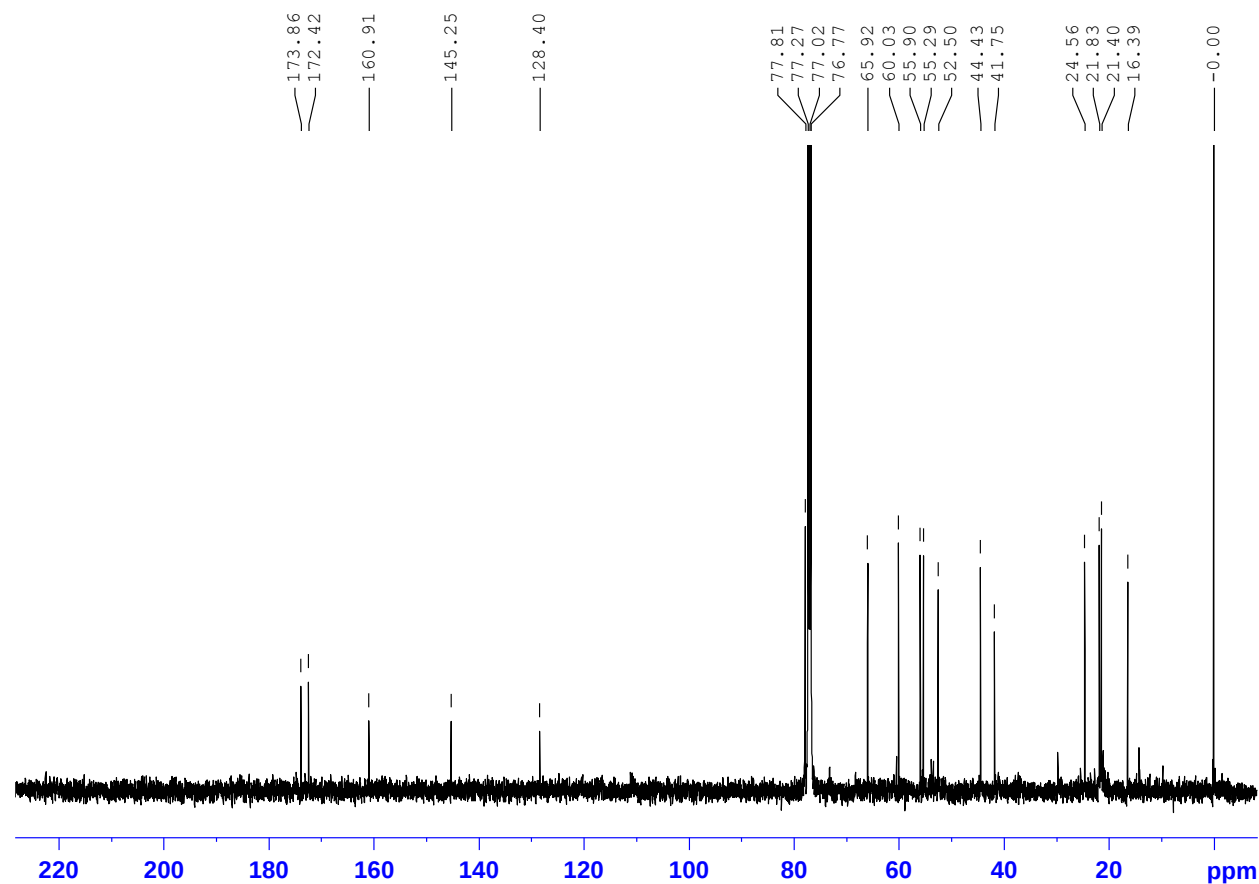


Figure S38. Expanded ^1H NMR spectrum of compound **11a** in CDCl_3 , 500 MHz.



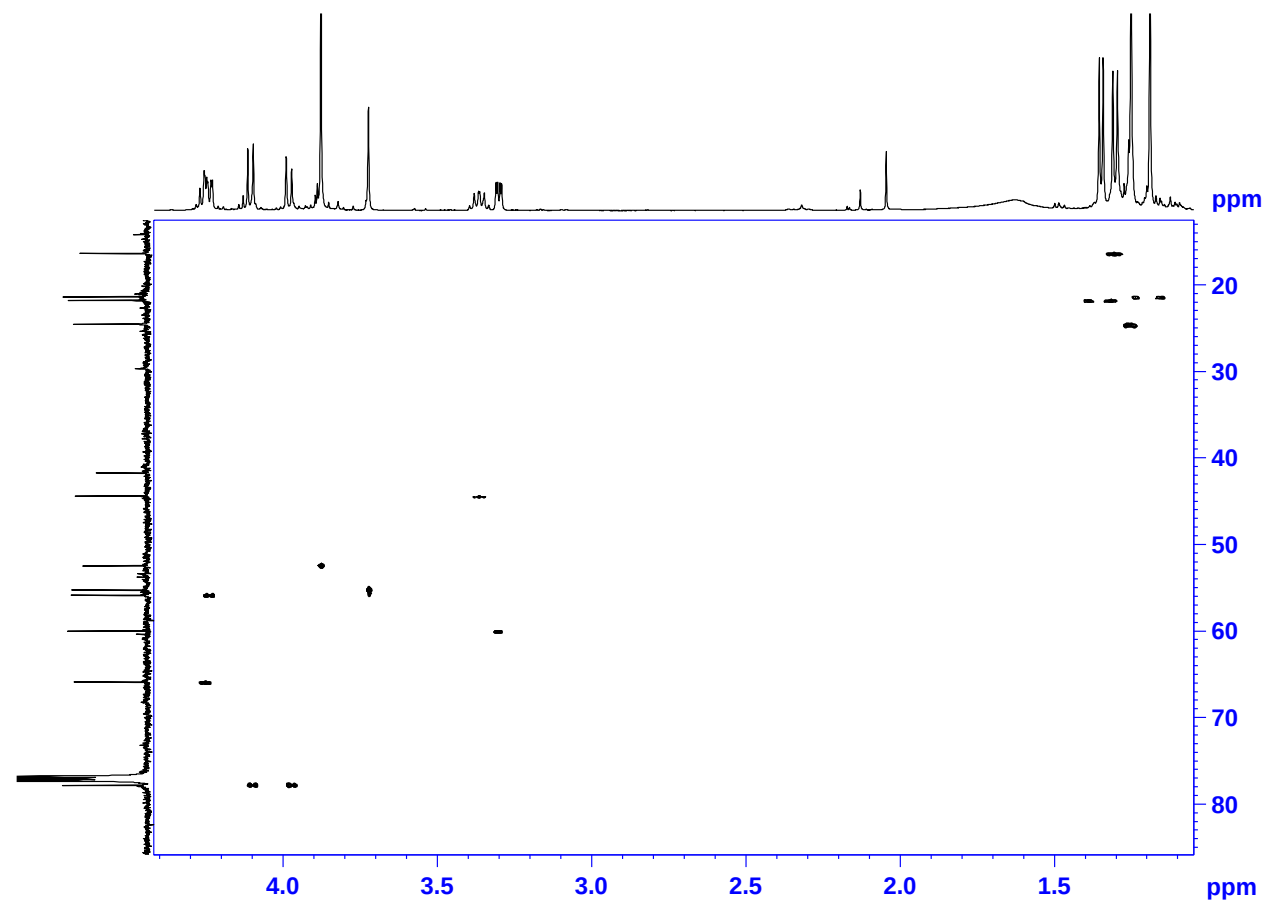


Figure S41. $\{^1\text{H}, ^{13}\text{C}\}$ HSQC NMR spectrum of compound **11a** in CDCl_3 , 500 MHz.

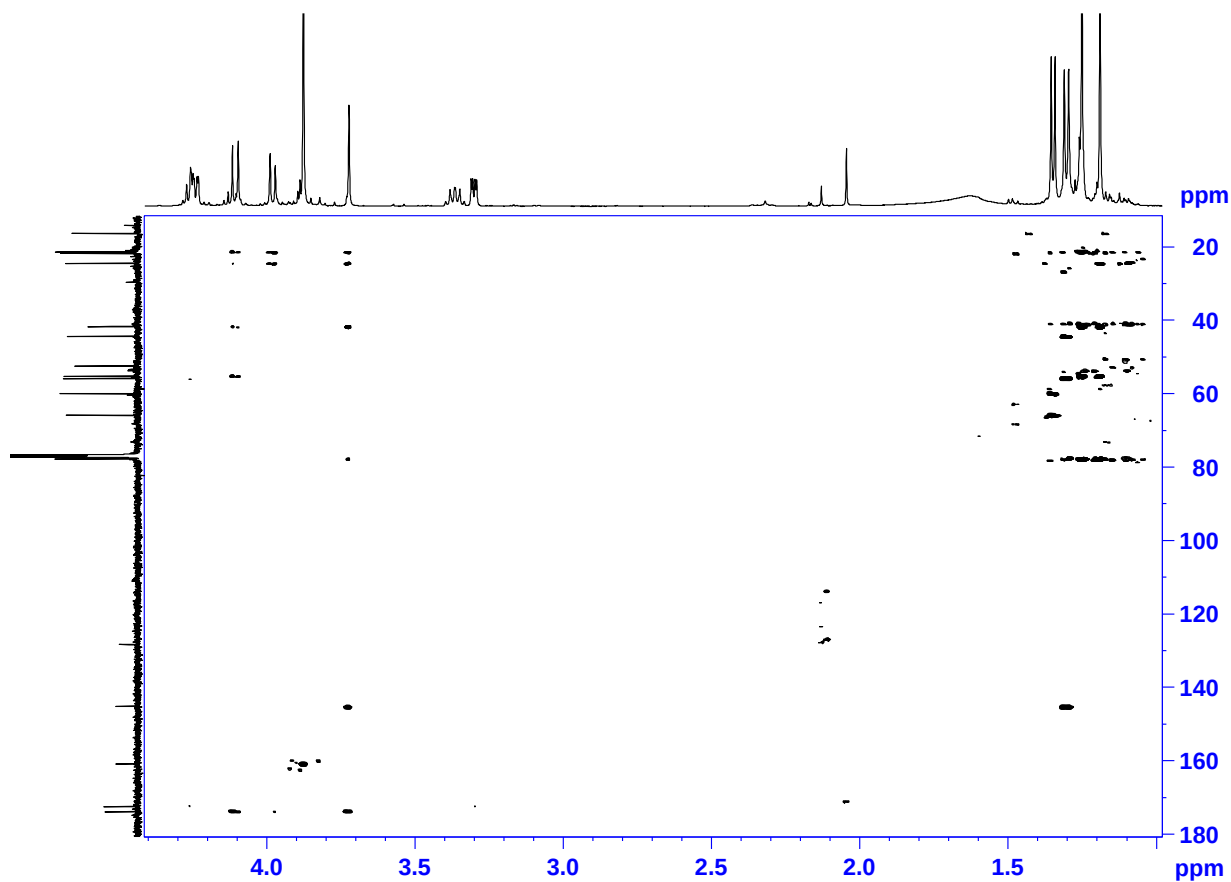


Figure S42. $\{^1\text{H}, ^{13}\text{C}\}$ HMBC NMR spectrum of compound **11a** in CDCl_3 , 500 MHz.

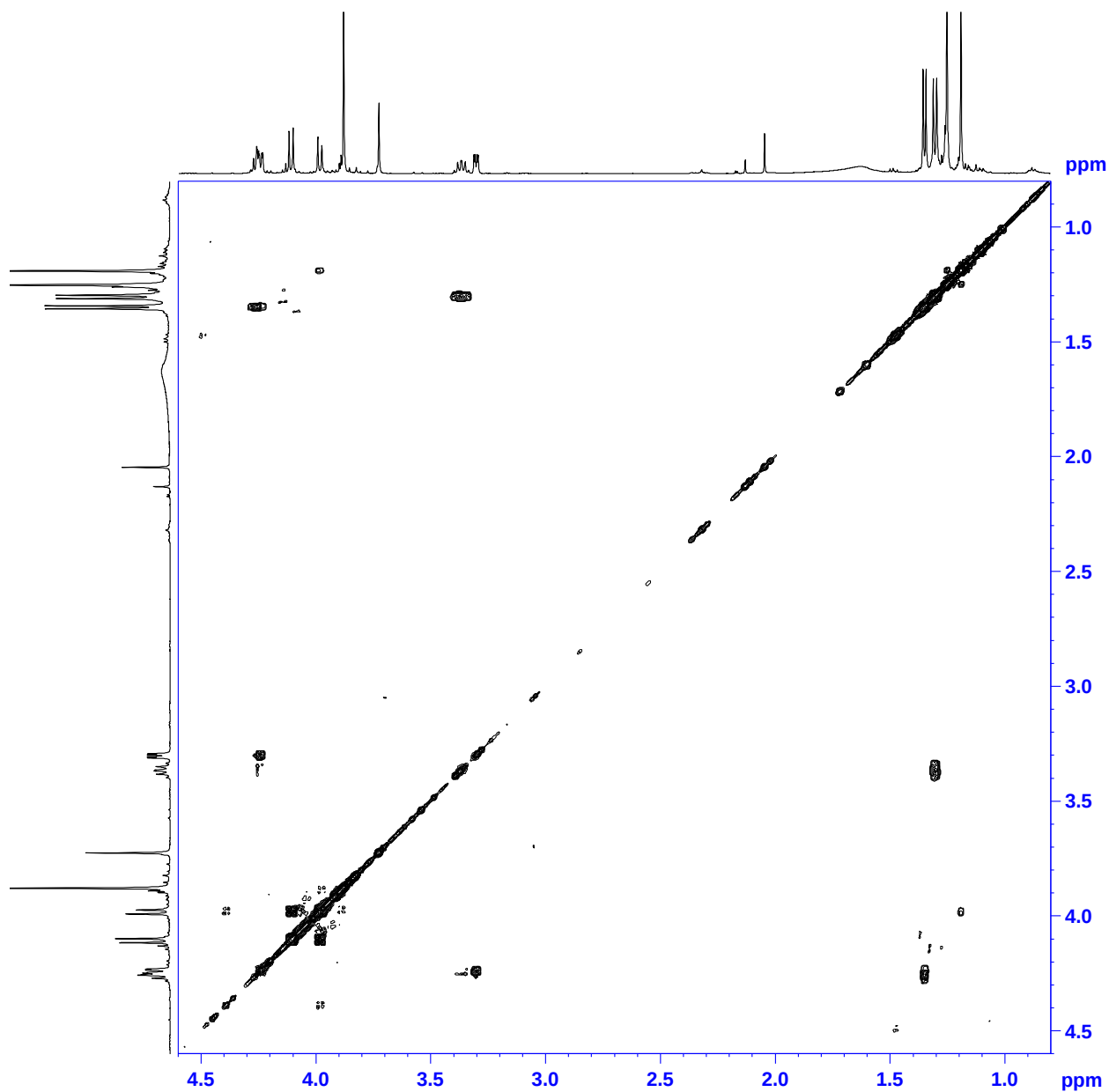


Figure S43. {¹H, ¹H} COSY NMR spectrum of compound **11a** in CDCl₃, 500 MHz.

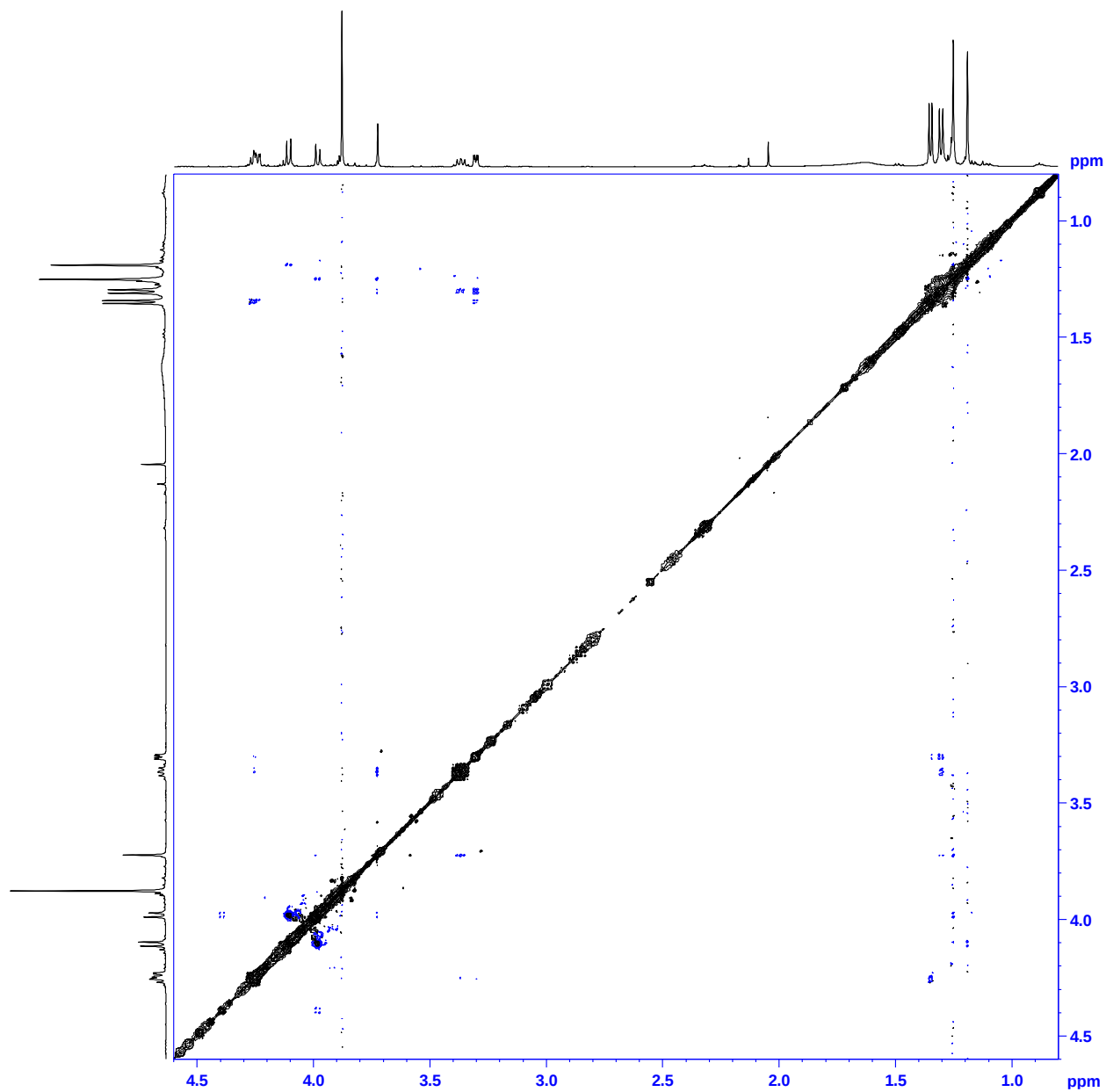


Figure S44. {¹H, ¹H} NOESY NMR spectrum of compound **11a** in CDCl₃, 500 MHz.

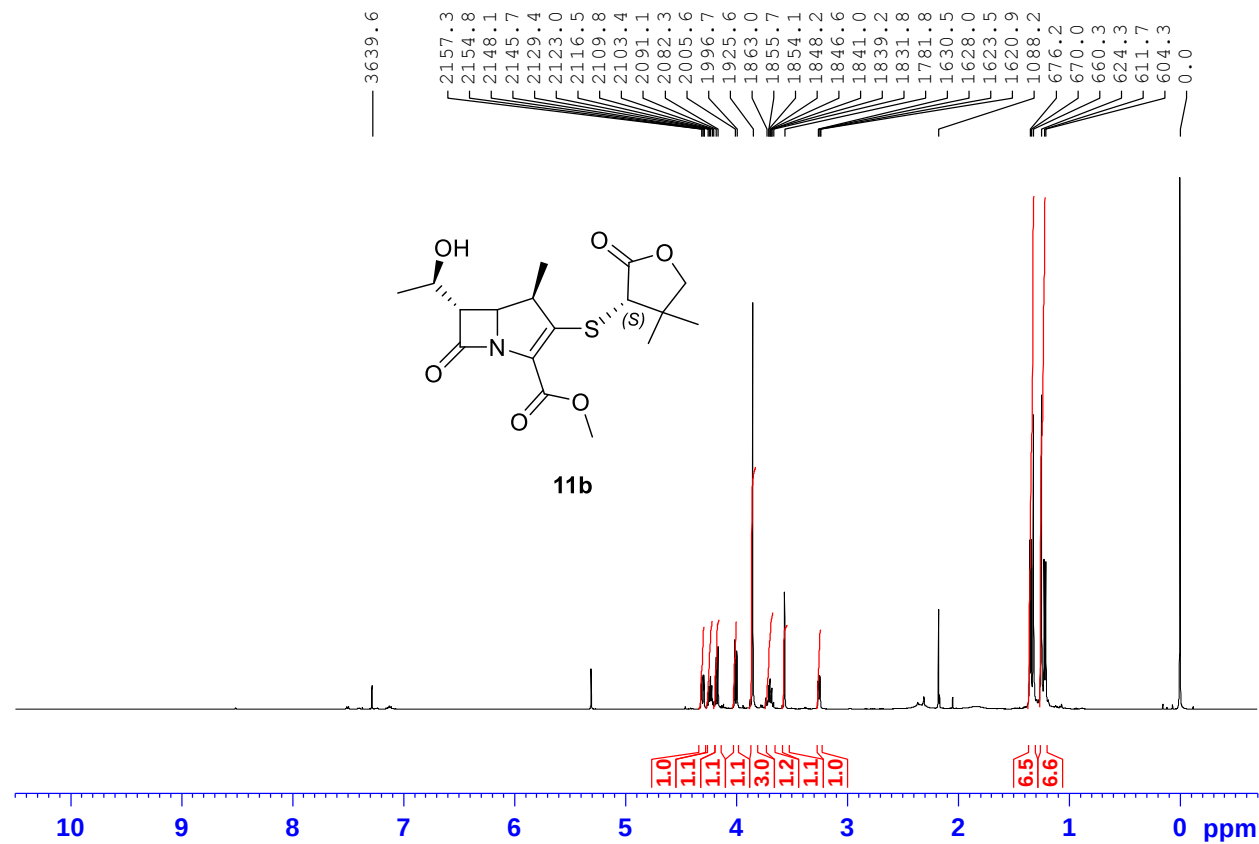


Figure S45. Complete ^1H NMR spectrum of compound **11b** in CDCl_3 , 500 MHz.

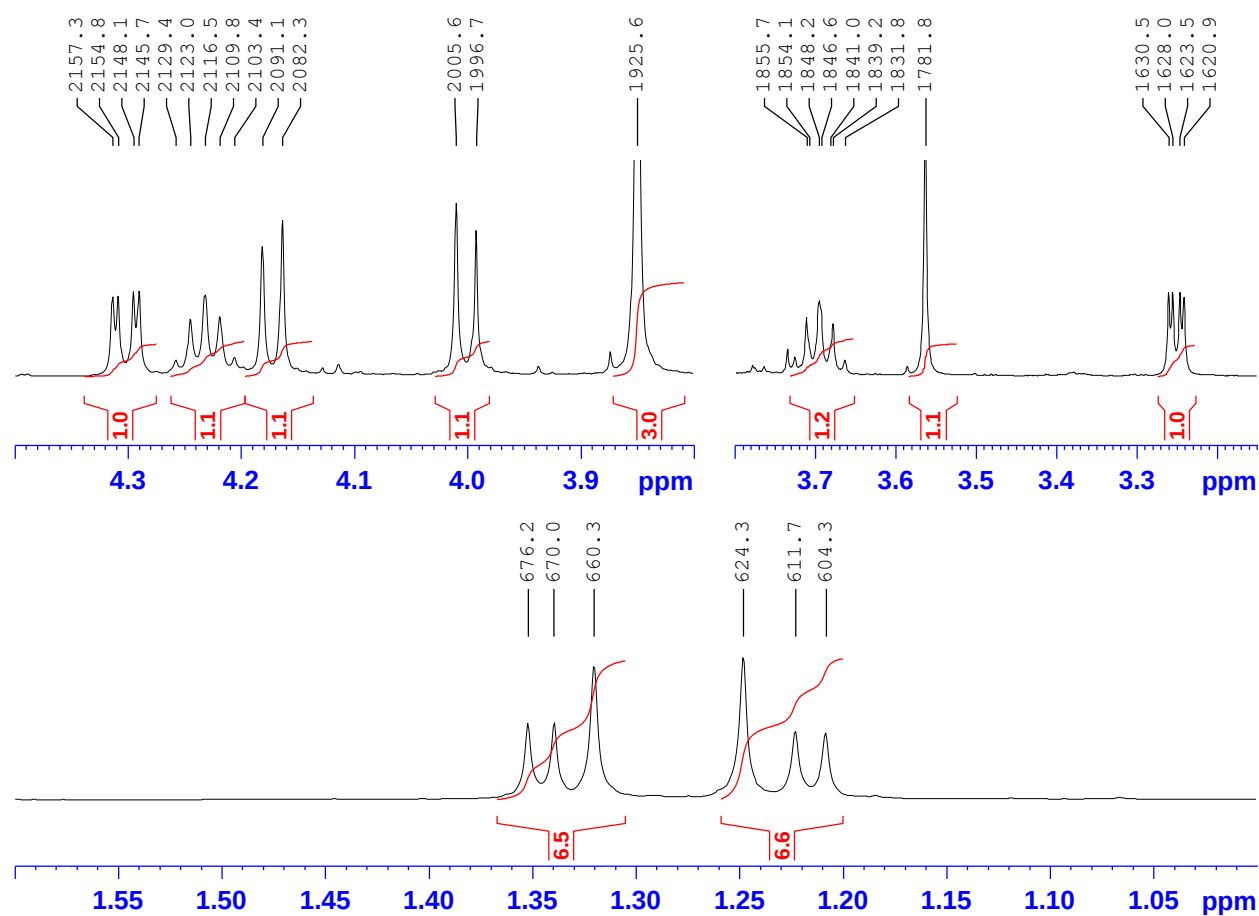
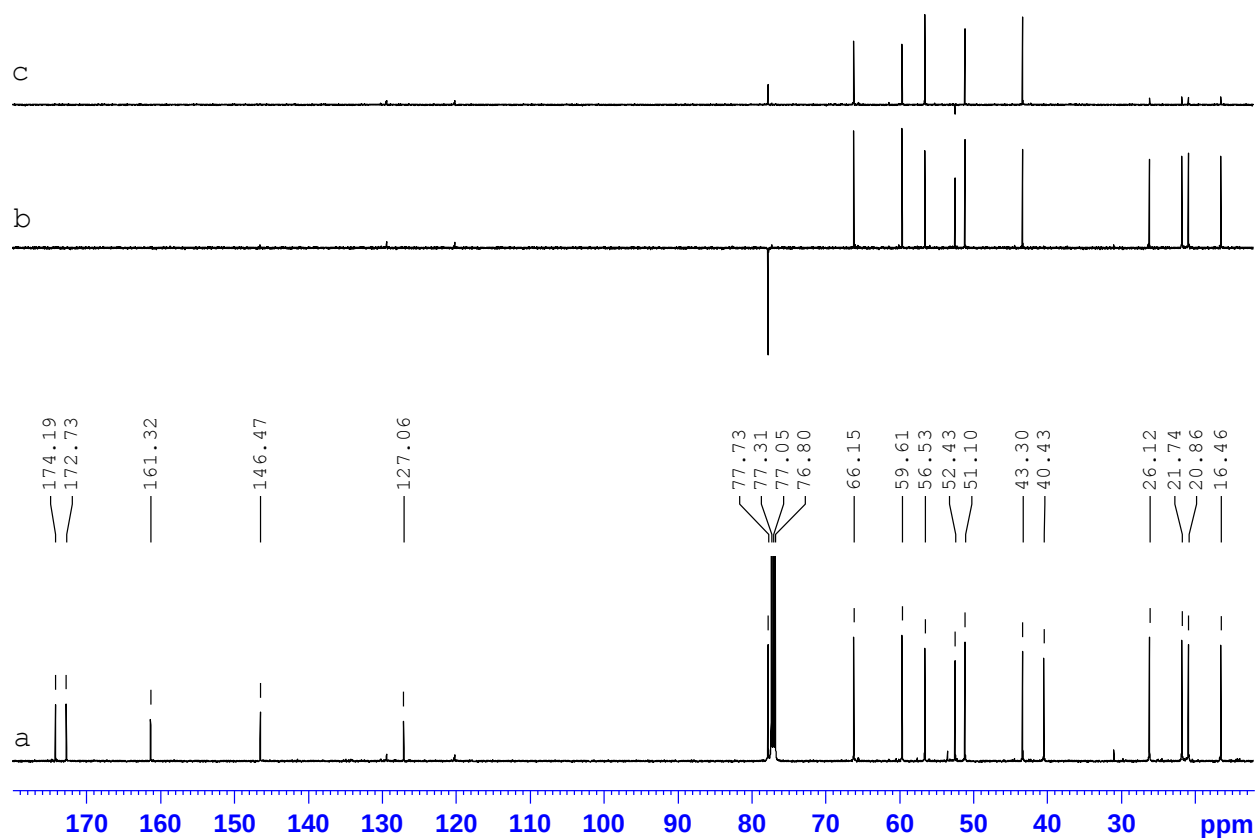
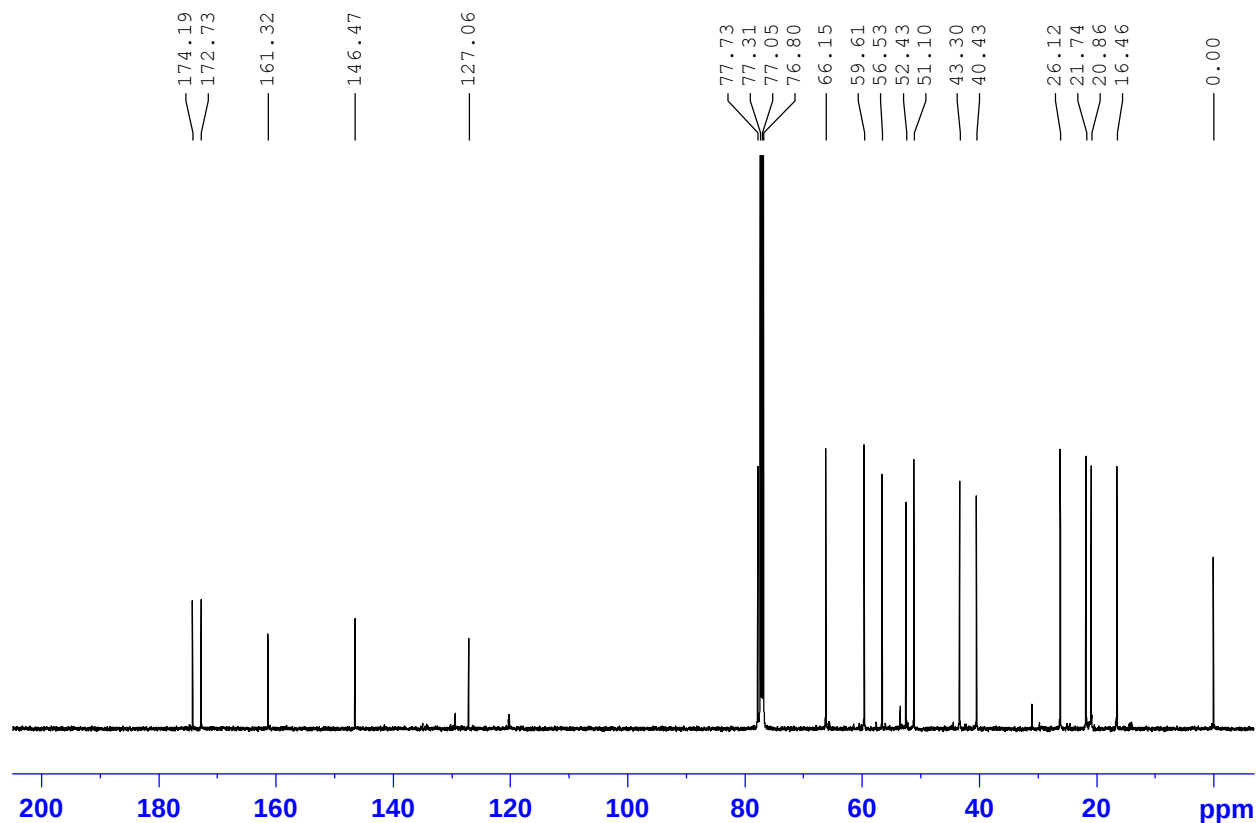


Figure S46. Expanded ^1H NMR spectrum of compound **11b** in CDCl_3 , 500 MHz.



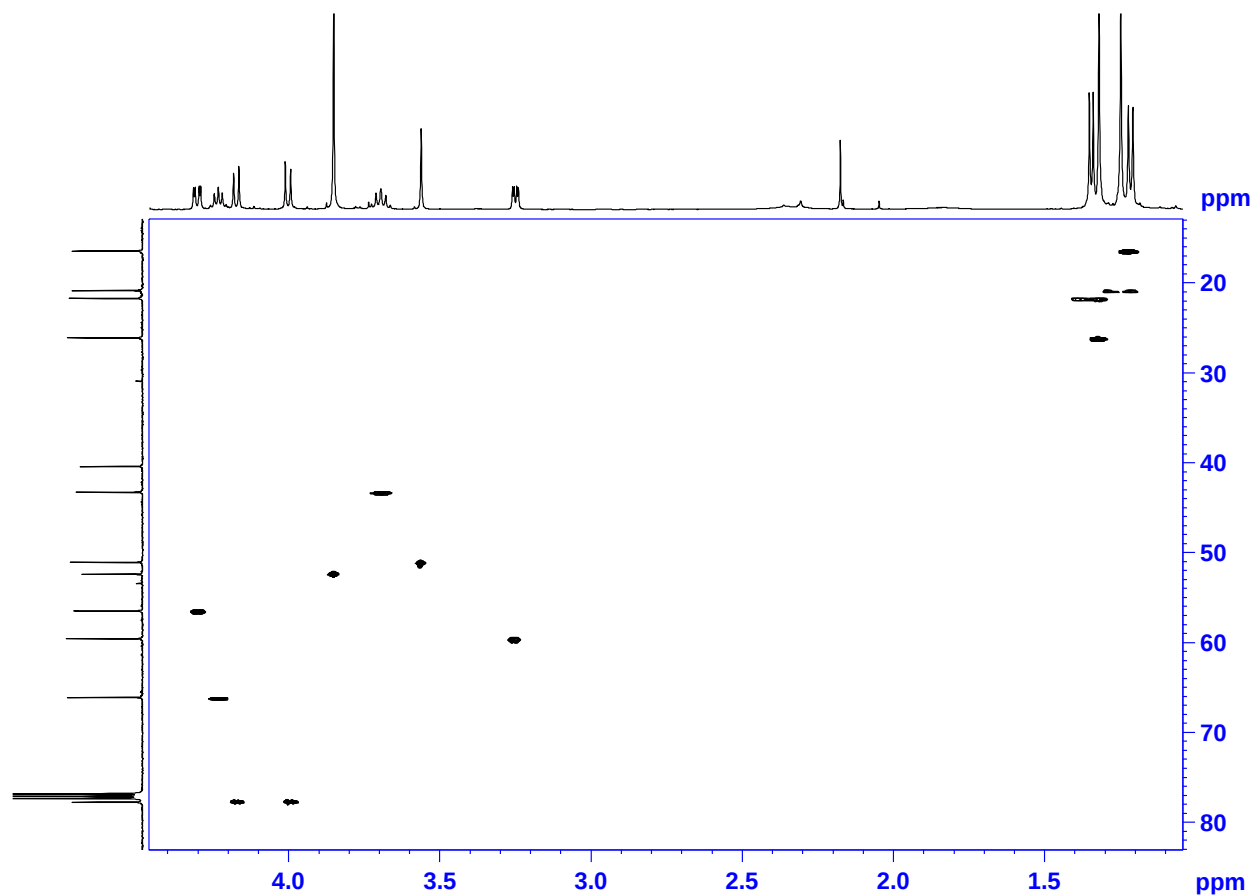


Figure S49. $\{^1\text{H}, ^{13}\text{C}\}$ HSQC NMR spectrum of compound **11b** in CDCl_3 , 500 MHz.

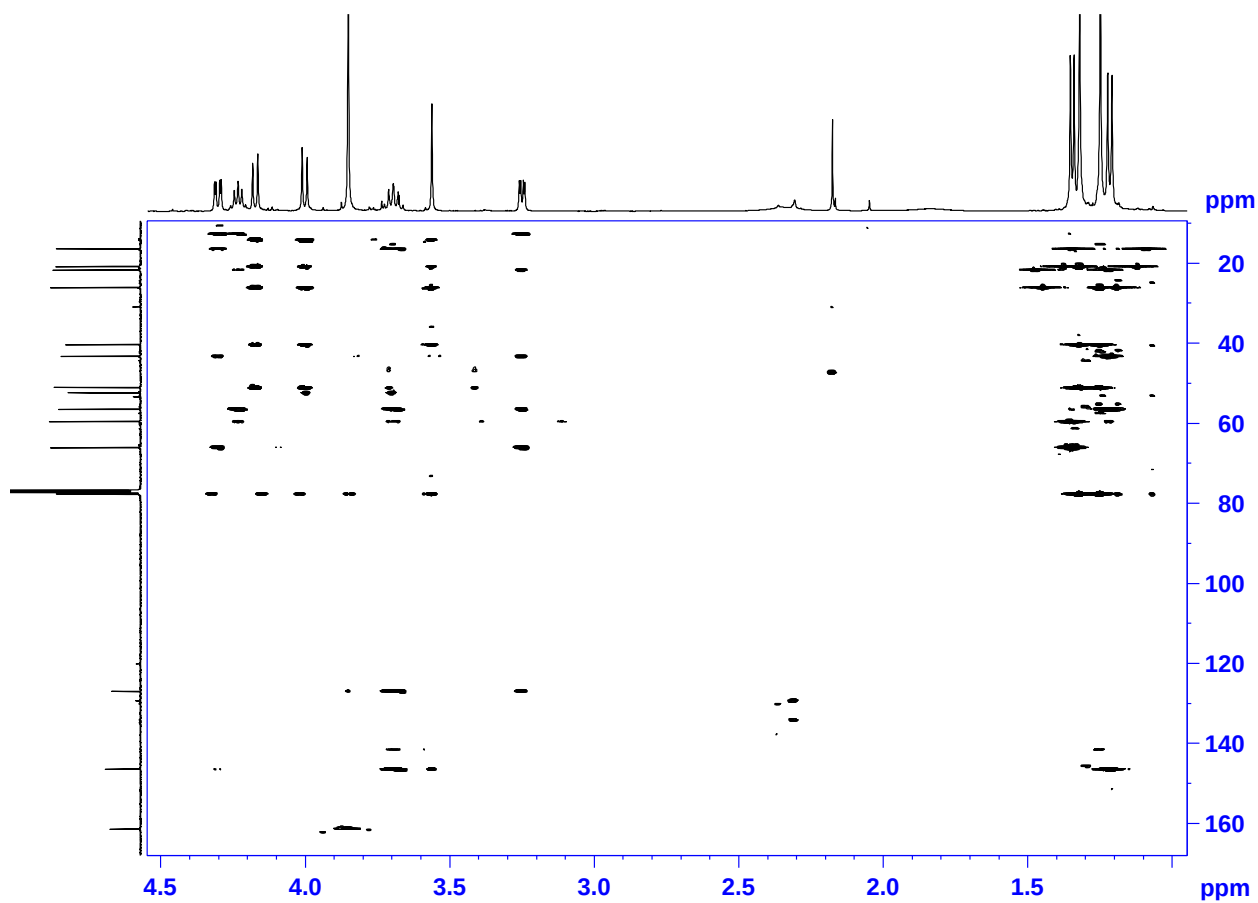


Figure S50. $\{^1\text{H}, ^{13}\text{C}\}$ HMBC NMR spectrum of compound **11b** in CDCl_3 , 500 MHz.

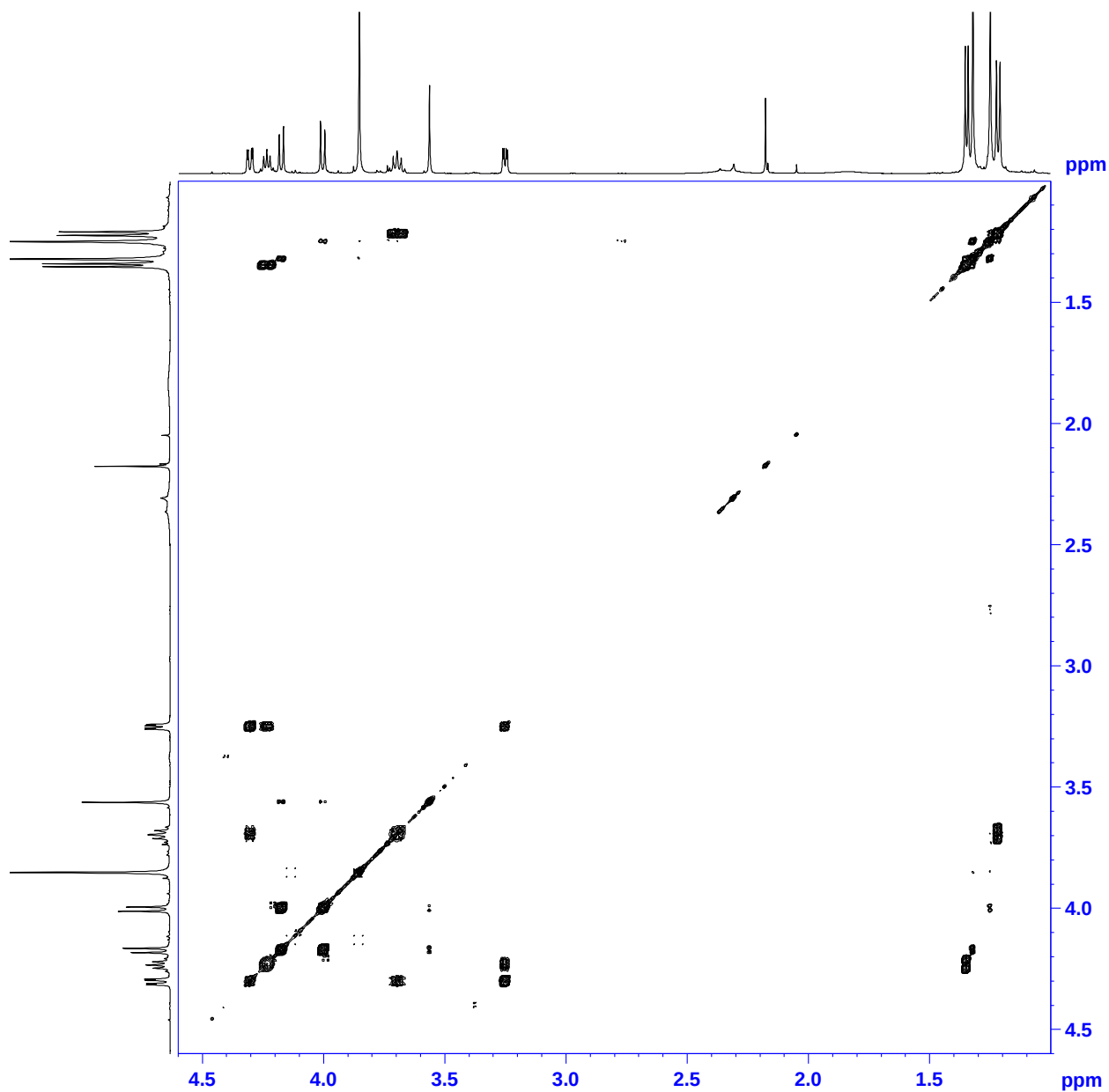


Figure S51. $\{^1\text{H}, ^1\text{H}\}$ COSY NMR spectrum of compound **11b** in CDCl_3 , 500 MHz.

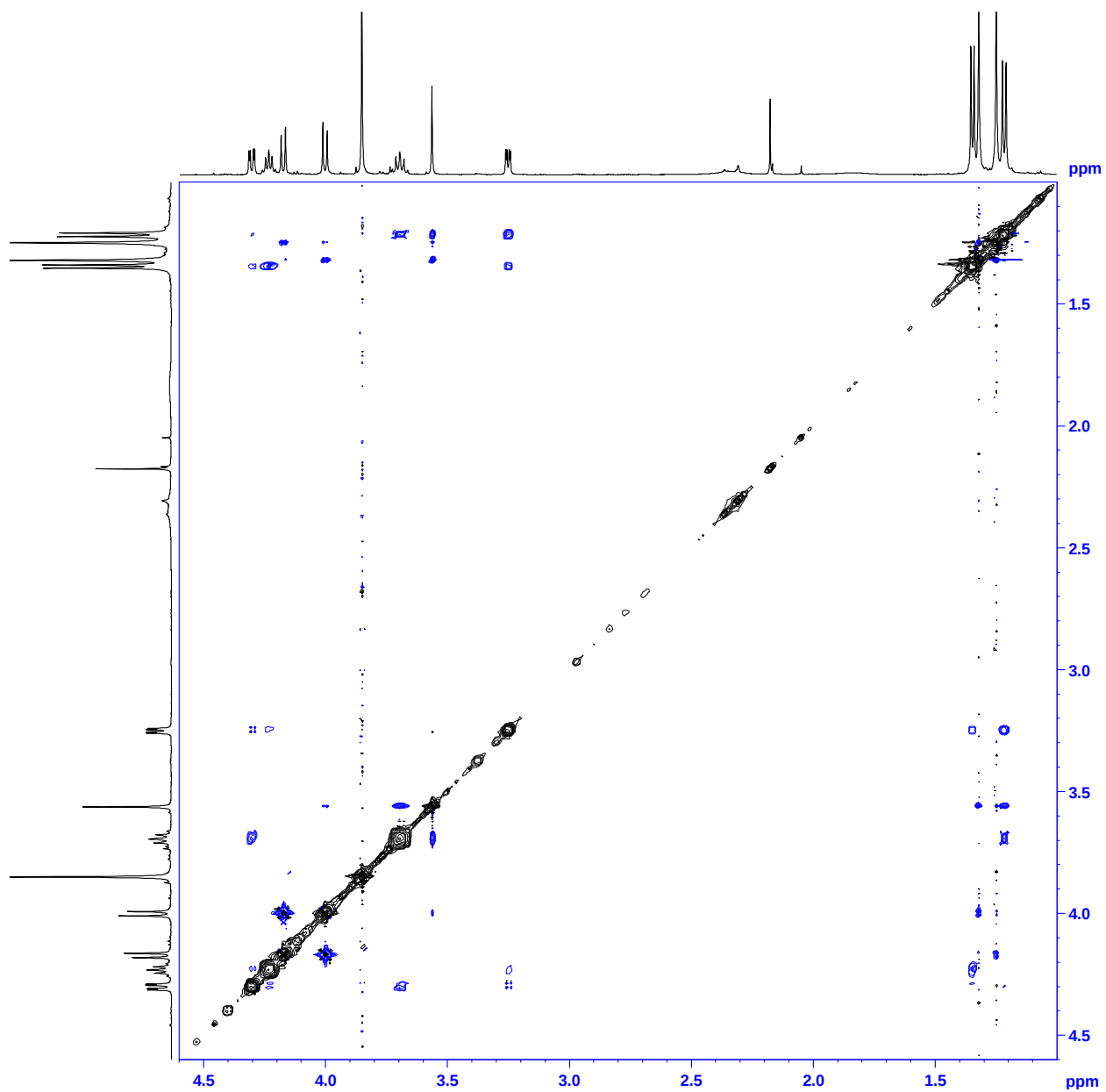


Figure S52. {¹H, ¹H} NOESY NMR spectrum of compound **11b** in CDCl₃, 500 MHz.

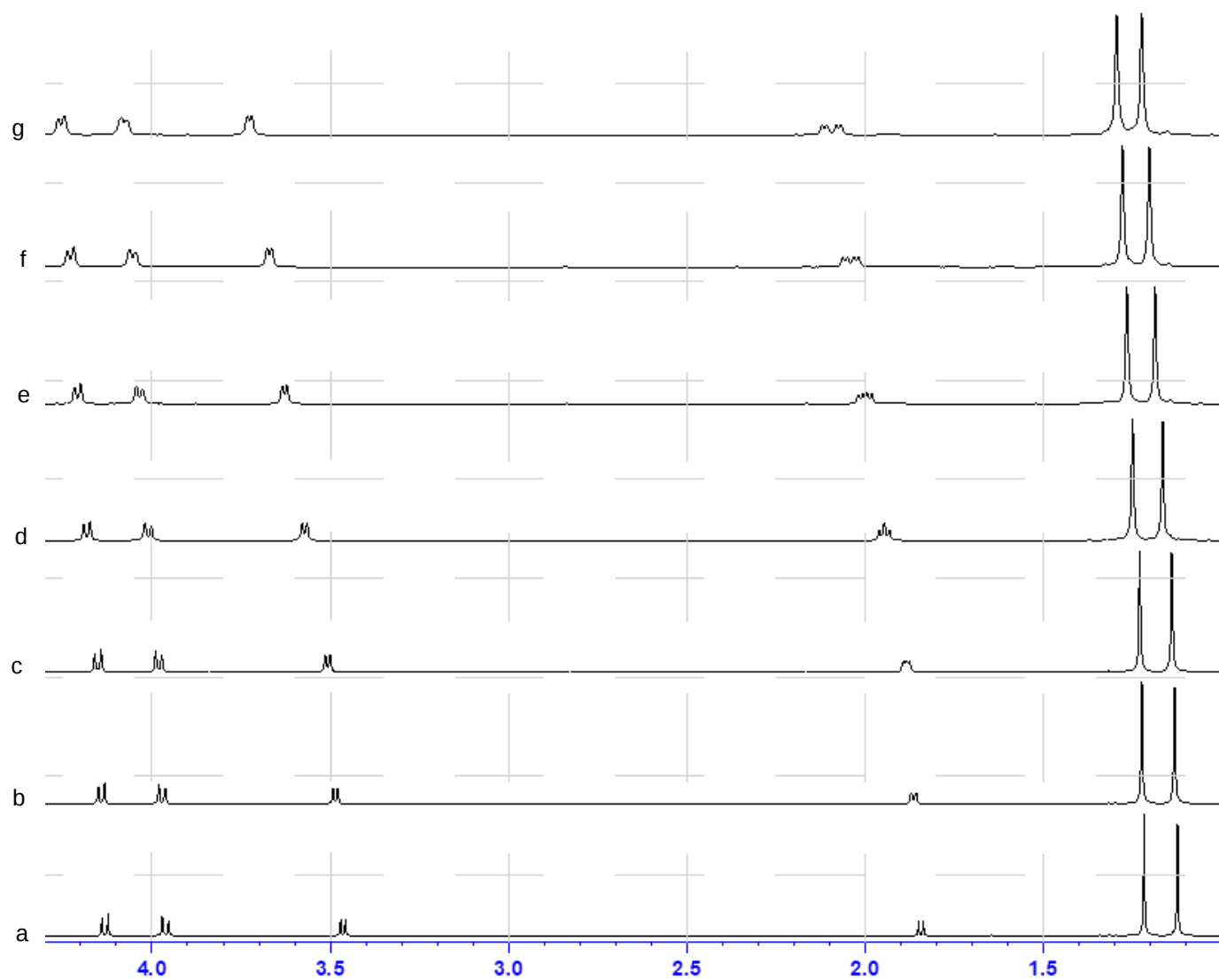


Figure S53. Spectrum $(\pm)\text{-3}$ (a) and spectra $(\pm)\text{-3}$ after each addition of $(-)\text{-Eu(hfc)}_3$ (b-g).

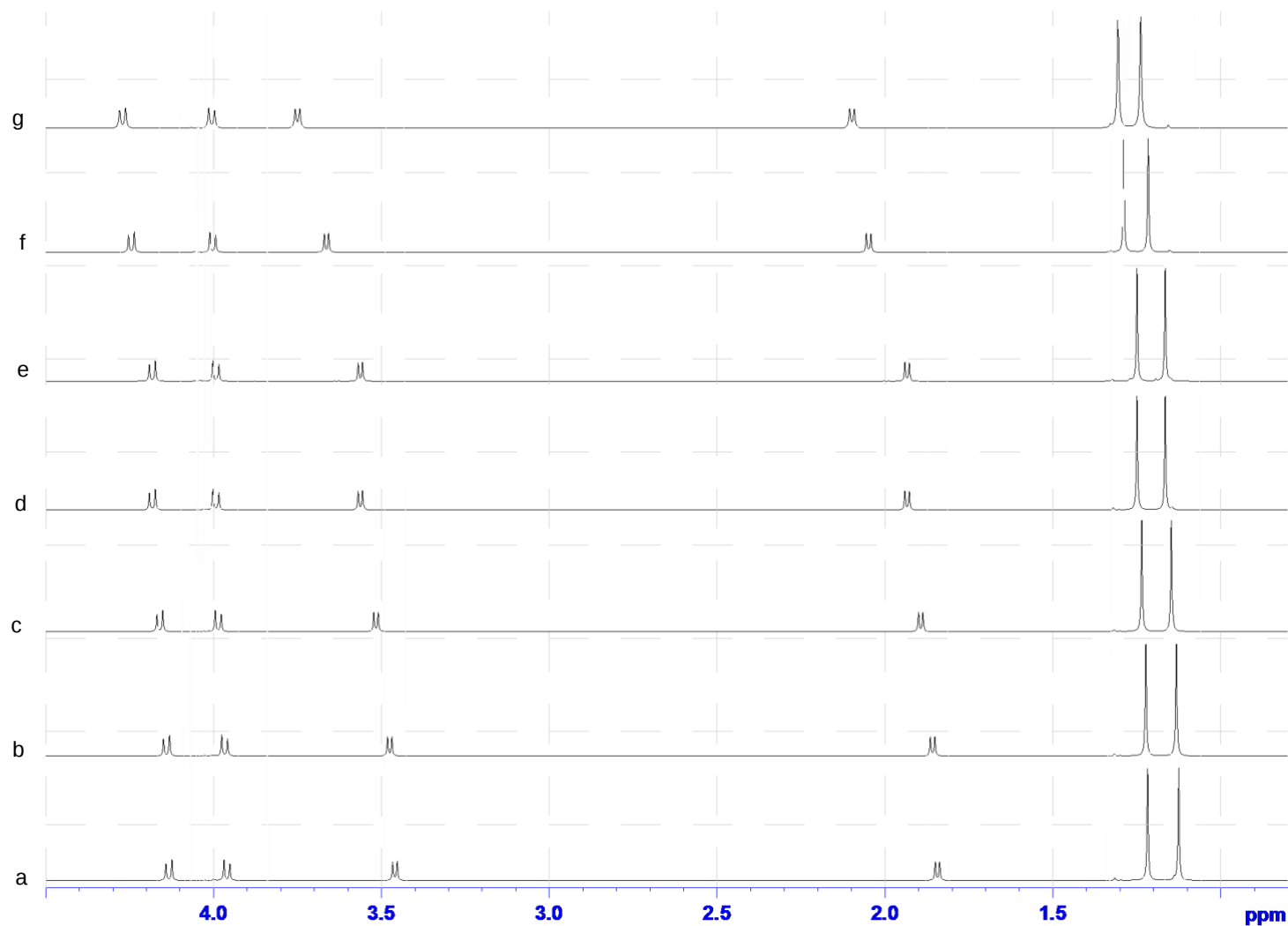


Figure S54. Spectrum S-3 (a) and spectra S-3 after each addition of $(-)\text{-Eu}(\text{hfc})_3$ (b-g).

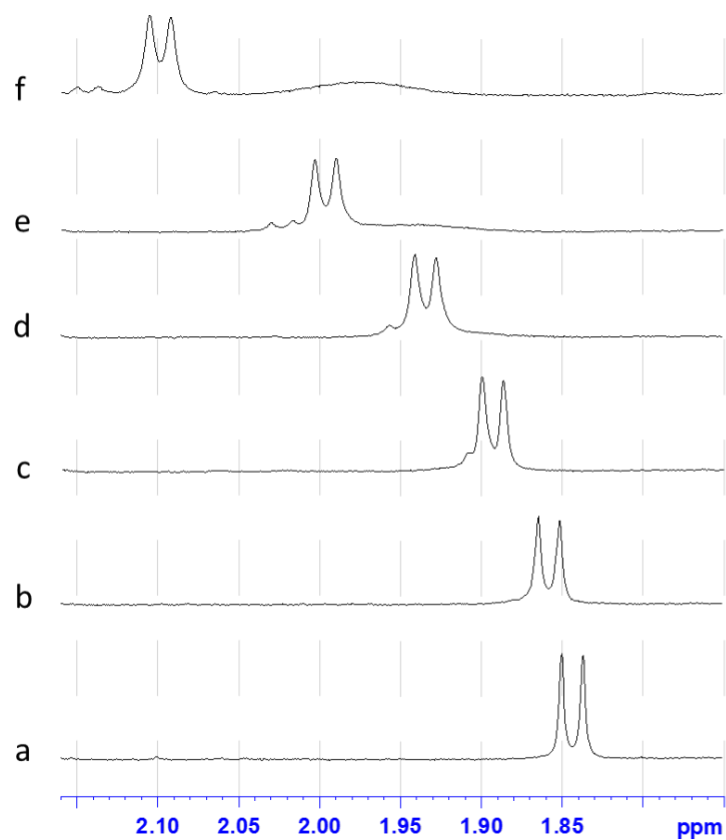


Figure S55. SH signal in the spectrum of *S*-3 (a) and spectra of *S*-3 after each addition of (-)-Eu (hfc)₃ (b-f).

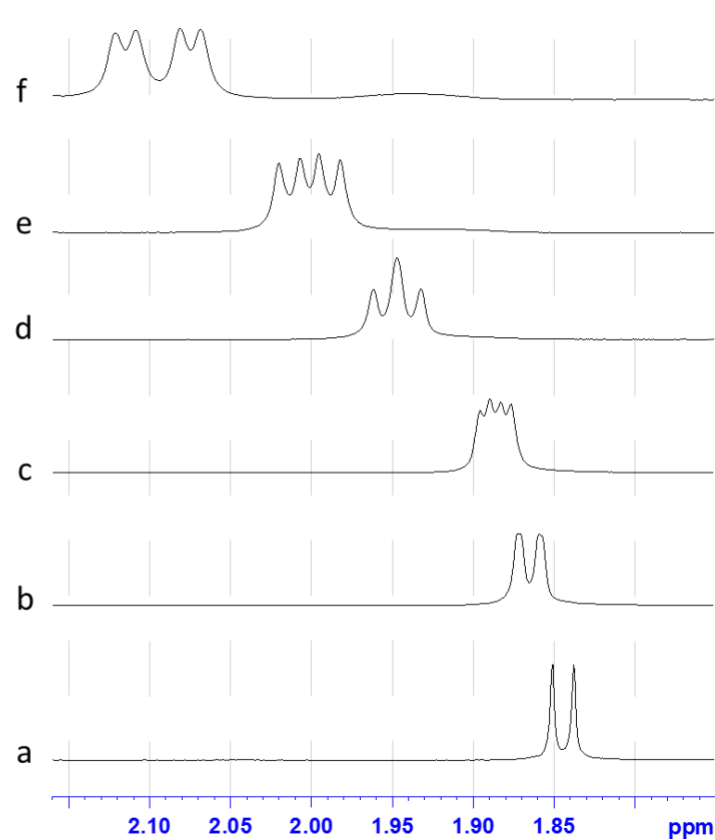


Figure S56. SH signal in the spectrum of (±)-3 (a) and spectra of (±)-3 after each addition of (-)-Eu (hfc)₃ (b-f).

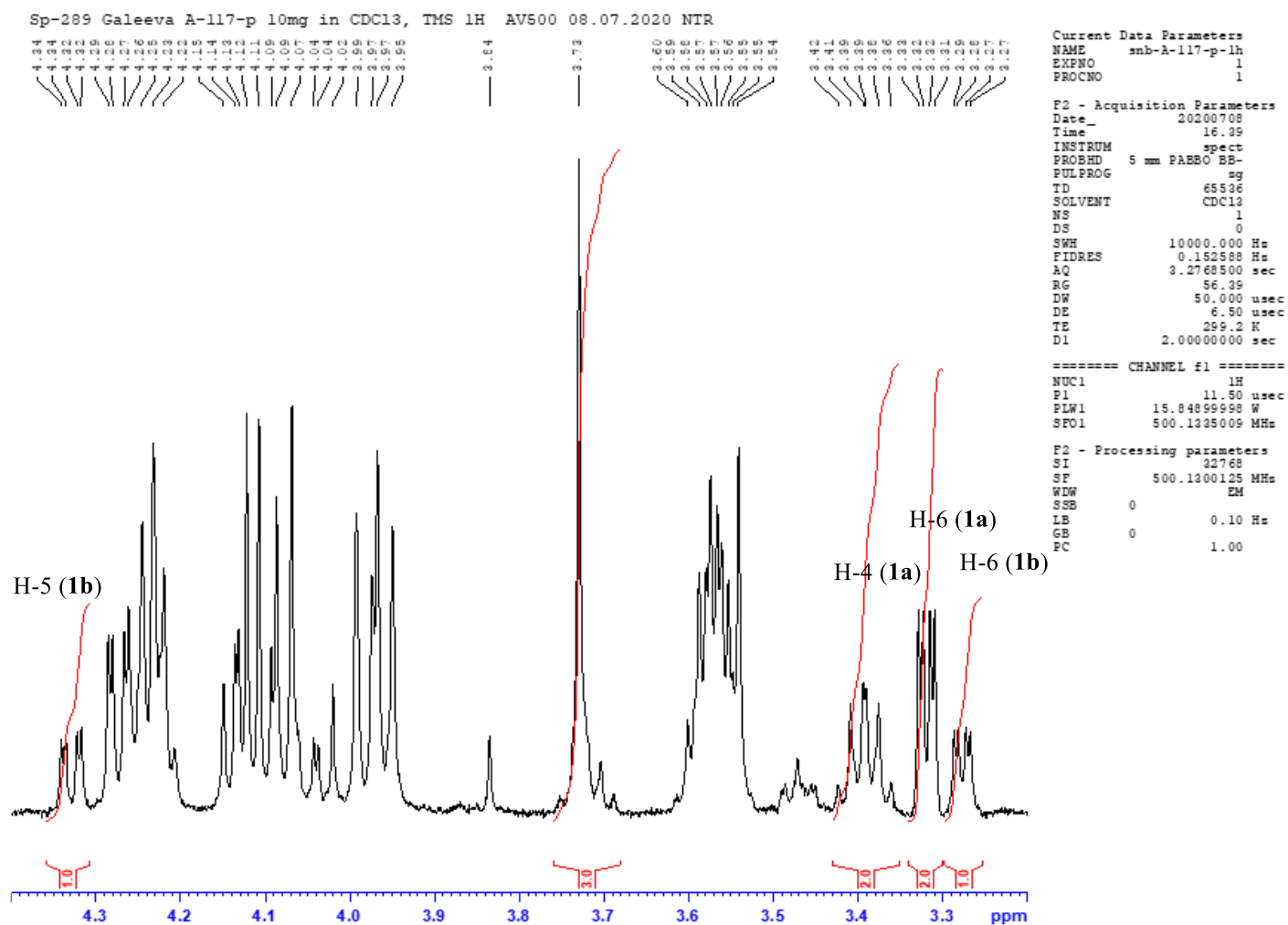


Figure S57. Part of ¹H NMR spectrum of reaction mixture after reaction 2 and 3, before column chromatography (**1a:1b** = 2:1, by integrated intensity of signals H-6)

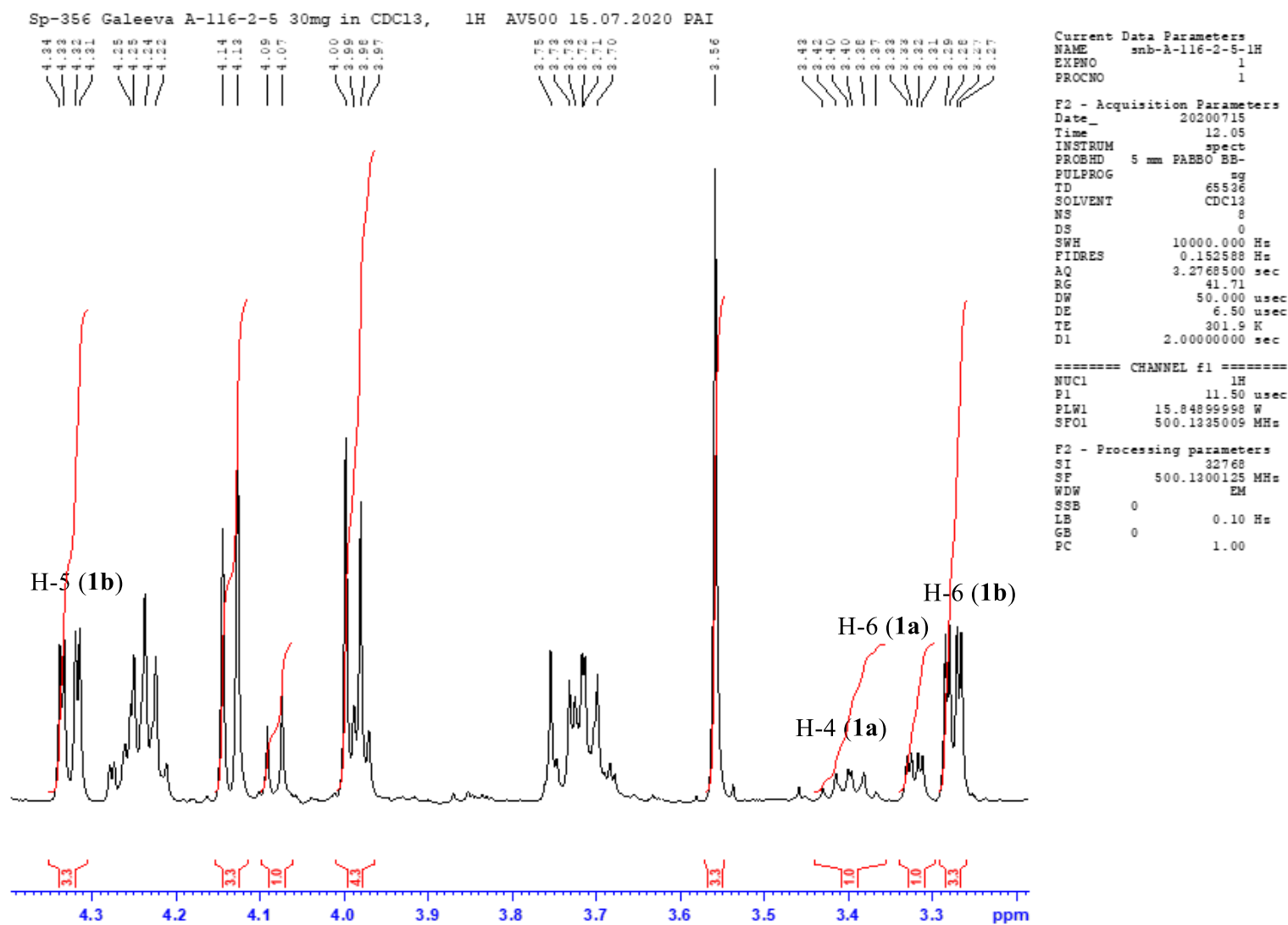


Figure S58. Part of ¹H NMR spectrum of mixture **1a**, **1b** after column chromatography on SiO₂ with CHCl₃-MeOH-Et₃N (**1a**:**1b** = 1:3.3).

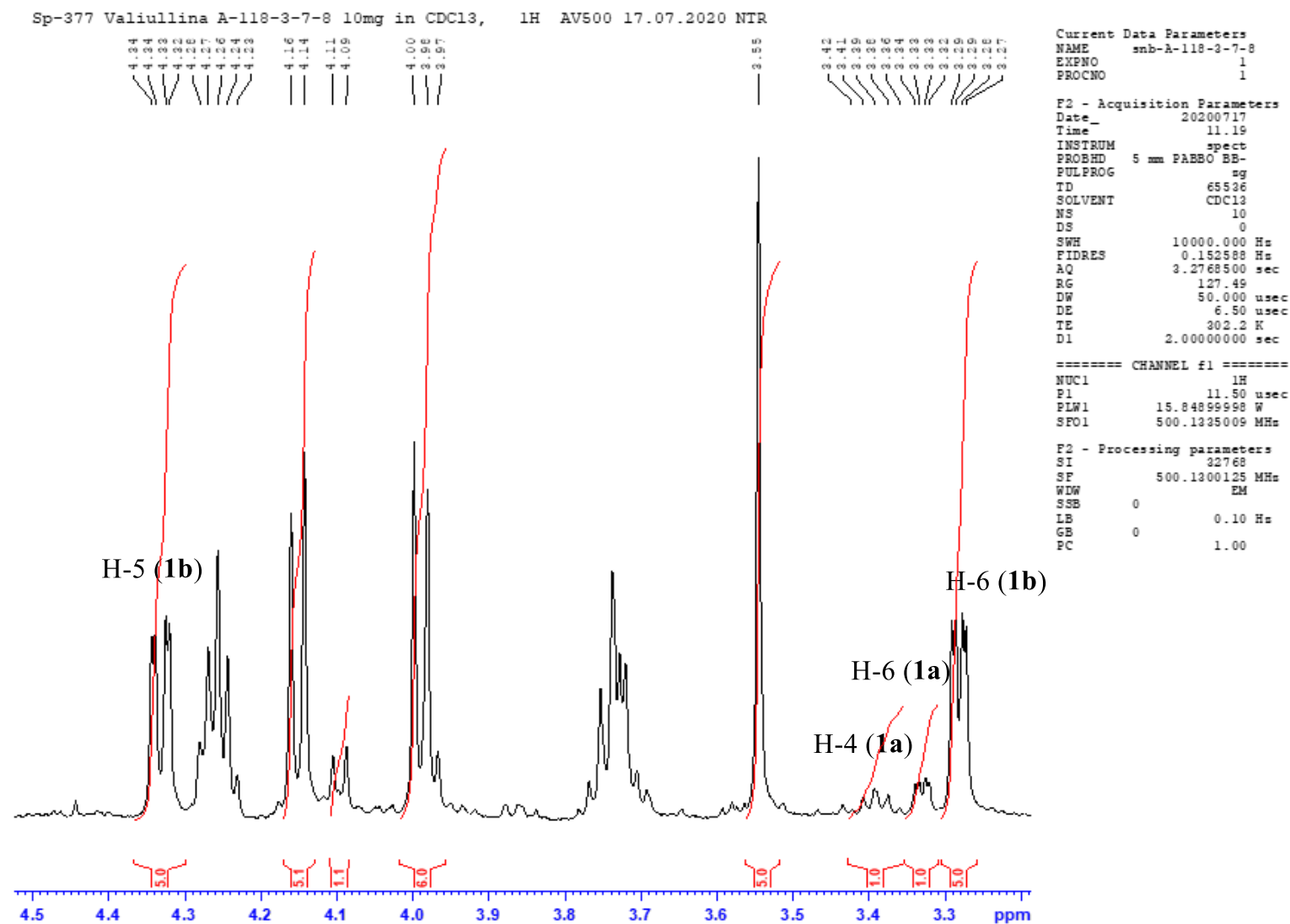


Figure S59. Part of ¹H NMR spectrum of mixture **1a**, **1b** after column chromatography **1a** on SiO₂ with CHCl₃-MeOH-Et₃N (**1a**:**1b** = 1:5).