

Supporting Information

A rapid entry to amino acids derived diverse 3,4-dihydropyrazines and dihydro[1,2,3]triazolo[1,5-a]pyrazines through 1,3-dipolar cycloaddition

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Fig. S-77: ^1H Spectra of (S,E)-ethyl 4-((tert-butoxycarbonyl)amino)-5-phenylpent-2-enoate **14b**.

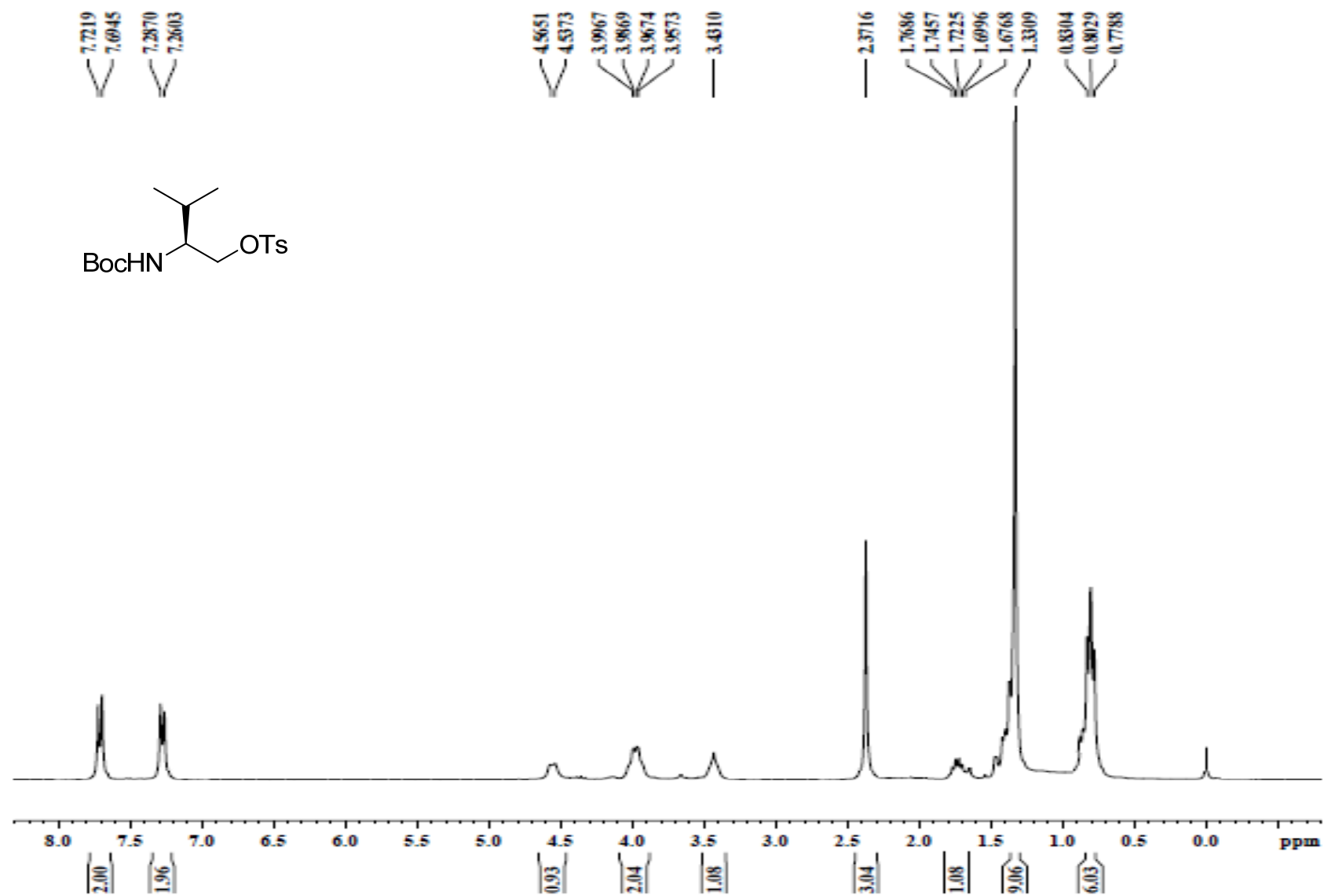
Fig. S-78: ^{13}C Spectra of (S,E)-ethyl 4-((tert-butoxycarbonyl)amino)-5-phenylpent-2-enoate **14b**.

Fig. S-79: ^1H Spectra of (S)-tert-butyl 5-hydroxy-1-phenylpentan-2-ylcarbamate **15b**.

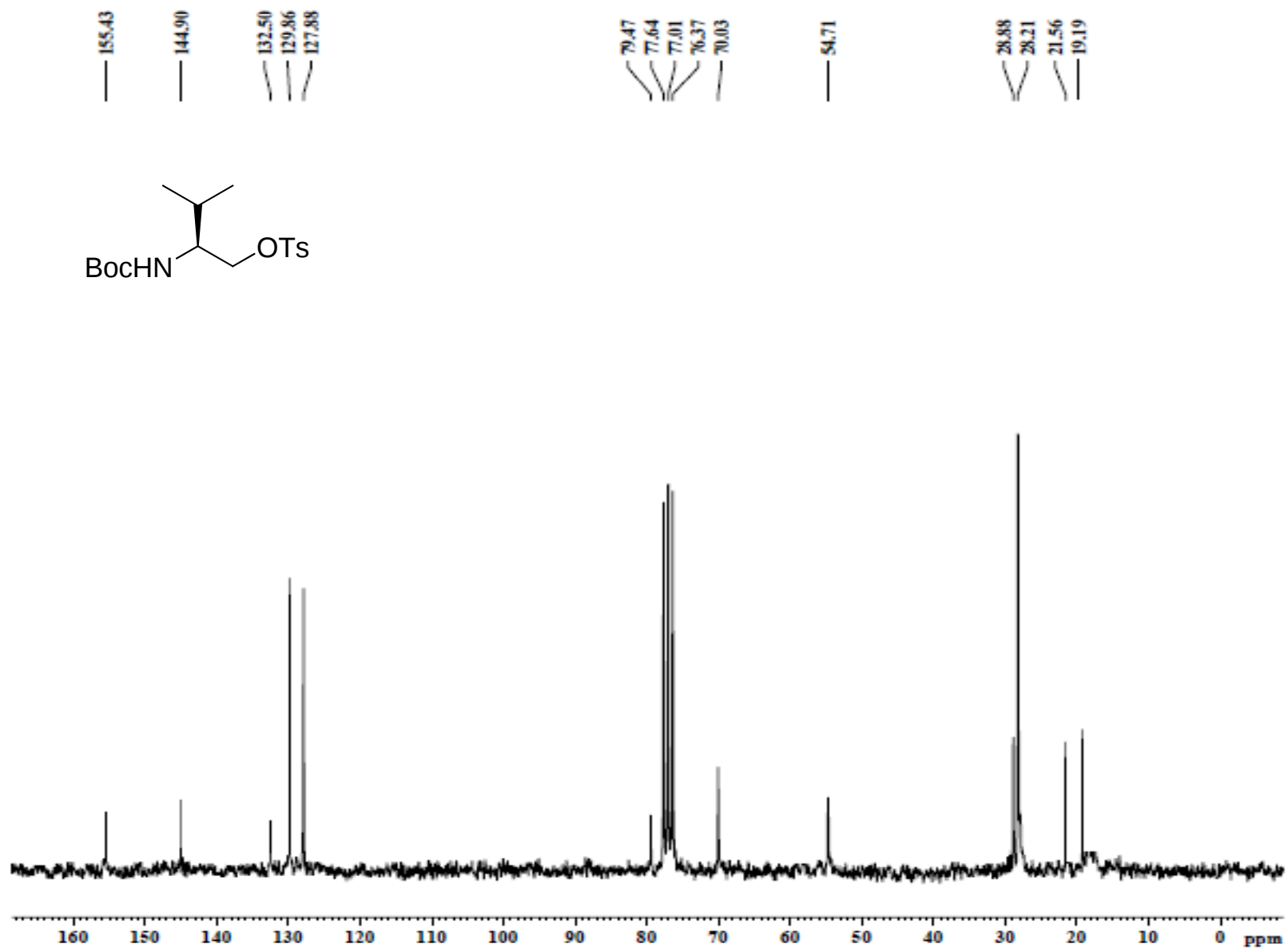
Fig. S-80: ^{13}C Spectra of (S)-tert-butyl 5-hydroxy-1-phenylpentan-2-ylcarbamate **15b**.

Fig. S-81: ^1H Spectra of (R)-tert-butyl 6-benzyl-6,7,8,9-tetrahydro-[1,2,3]triazolo[1,5-a][1,4]diazocine-5(4H)-carboxylate **19b**.

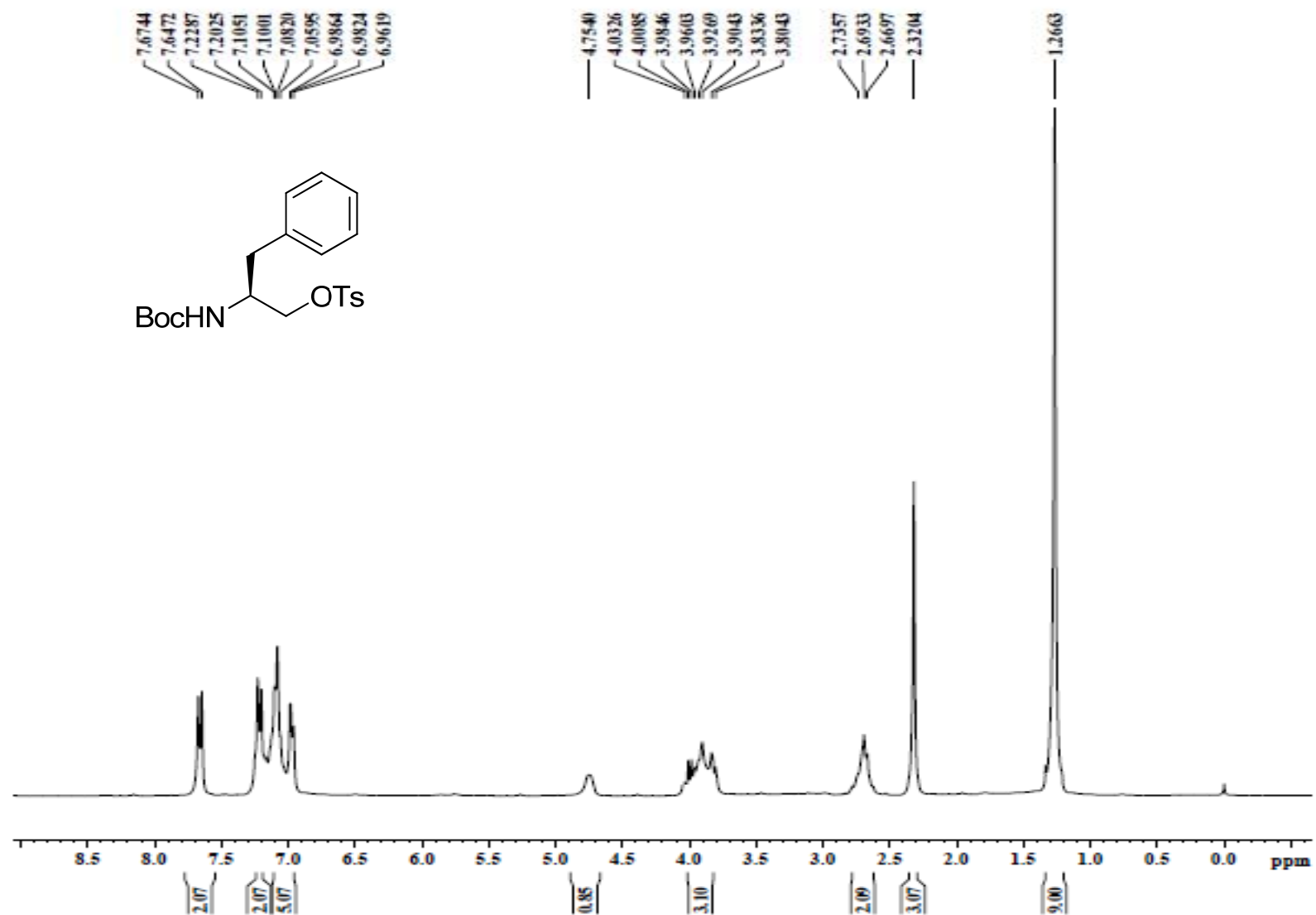
Fig. S-82: ^{13}C Spectra of (R)-tert-butyl 6-benzyl-6,7,8,9-tetrahydro-[1,2,3]triazolo[1,5-a][1,4]diazocine-5(4H)-carboxylate **19b**.



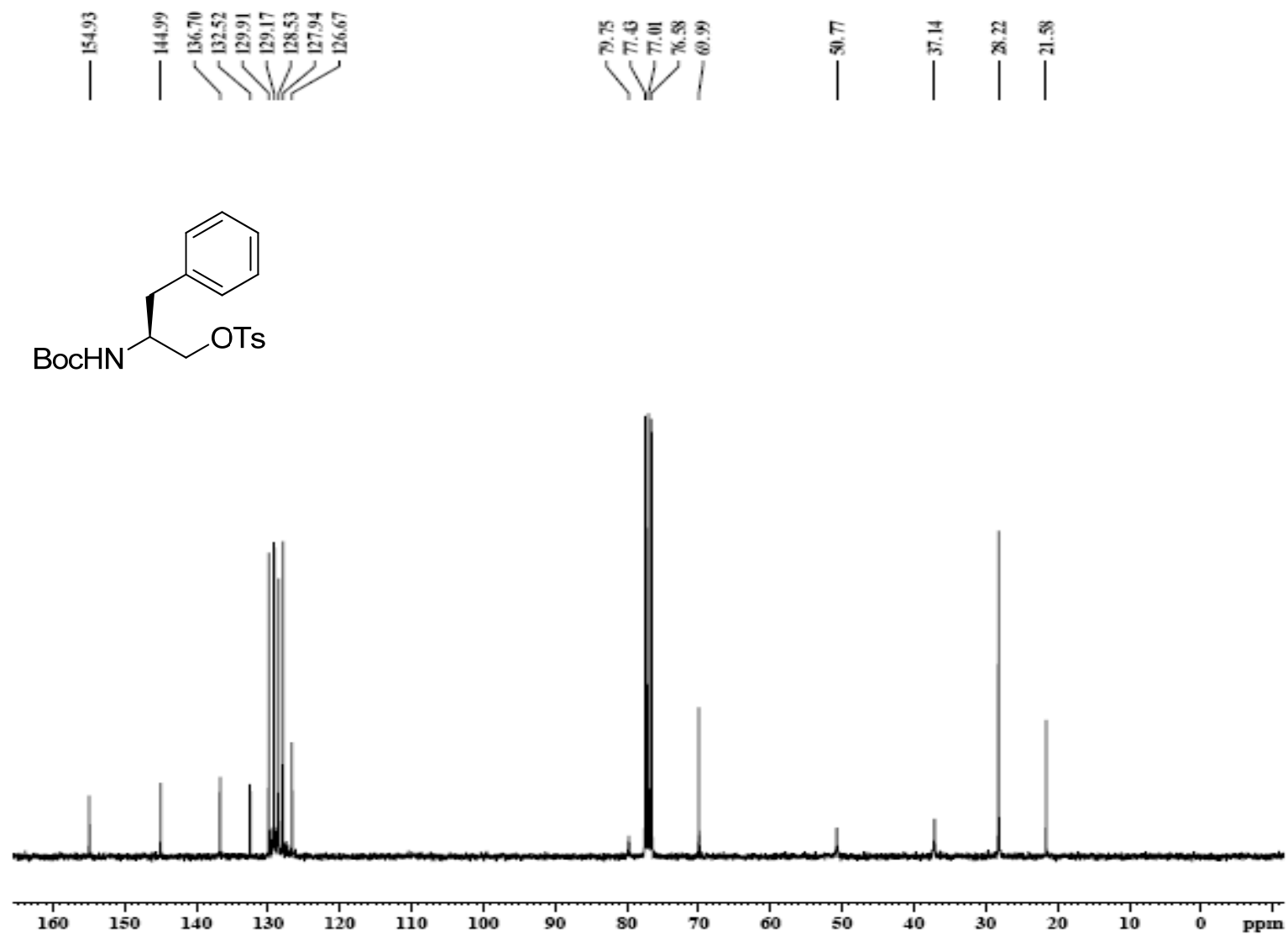
FigureS-1: ¹H spectrum(300 MHz, CDCl₃) of 5a.



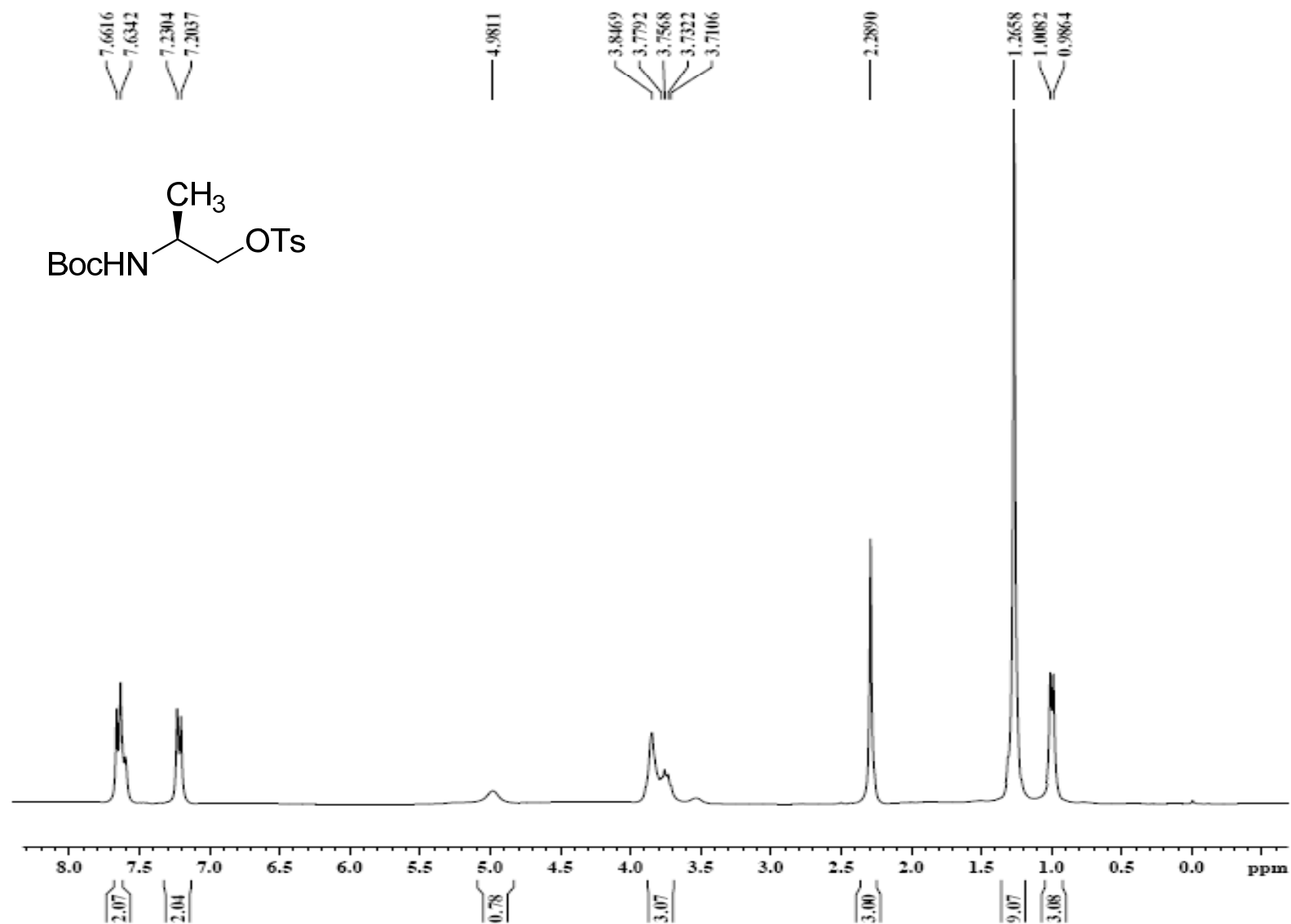
FigureS-2: ^{13}C spectrum(75 MHz, CDCl_3) of 5a.



FigureS-3: ¹H spectrum(300 MHz, CDCl₃) of **5b**.



FigureS-4: ^{13}C spectrum(75 MHz, CDCl_3) of **5b**.



FigureS-5: ¹H spectrum(300 MHz, CDCl₃) of 5c.

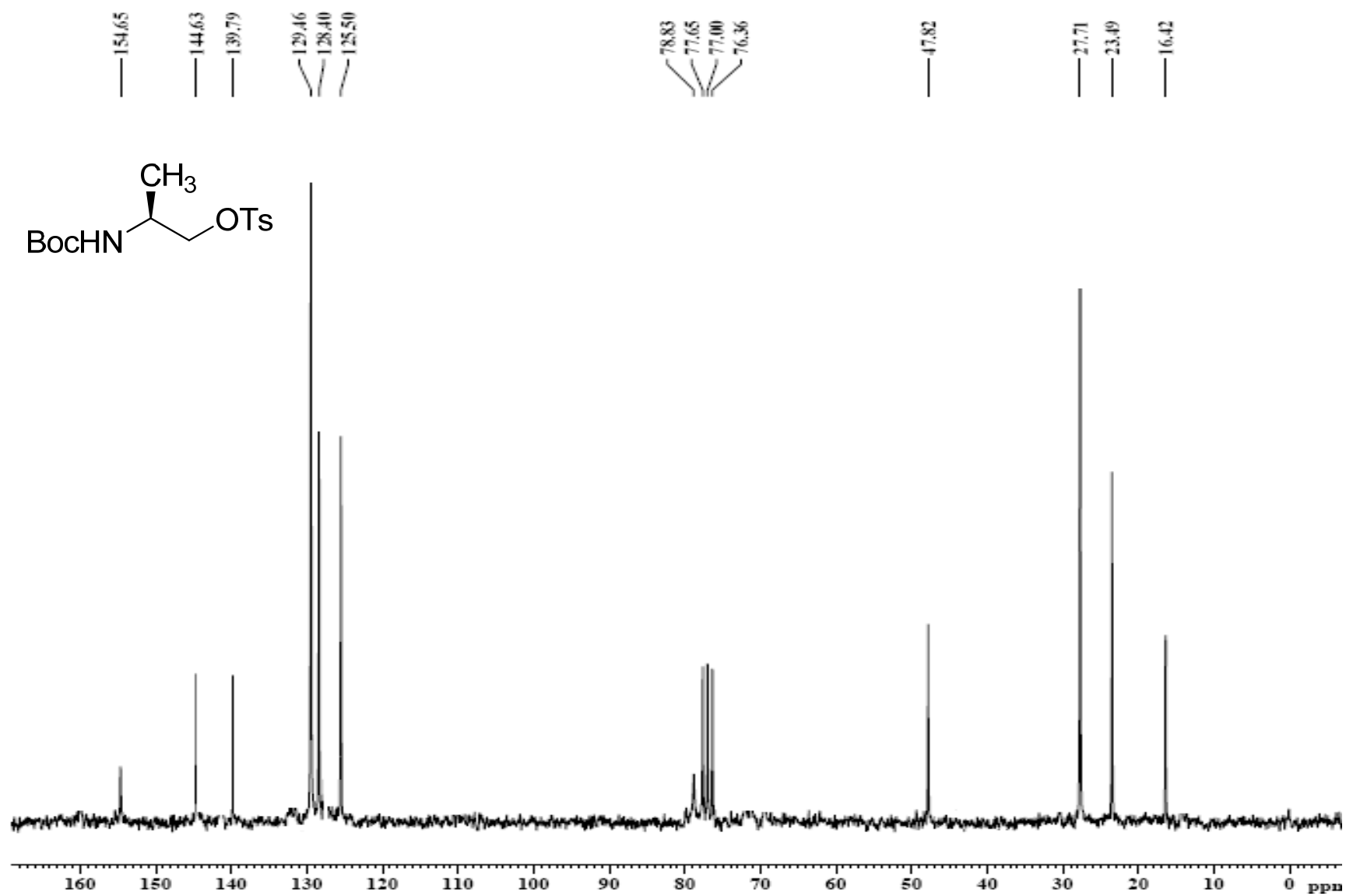
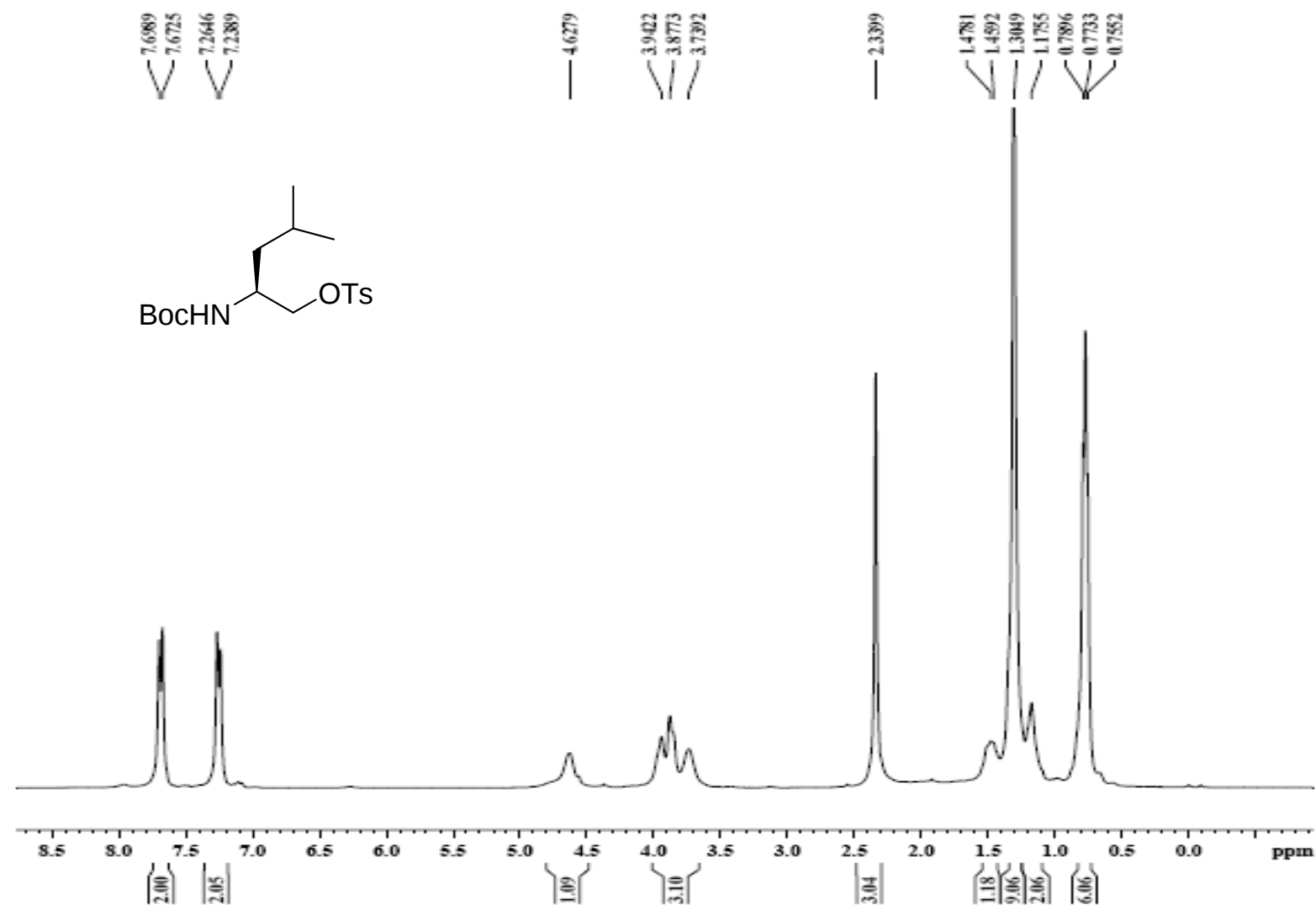
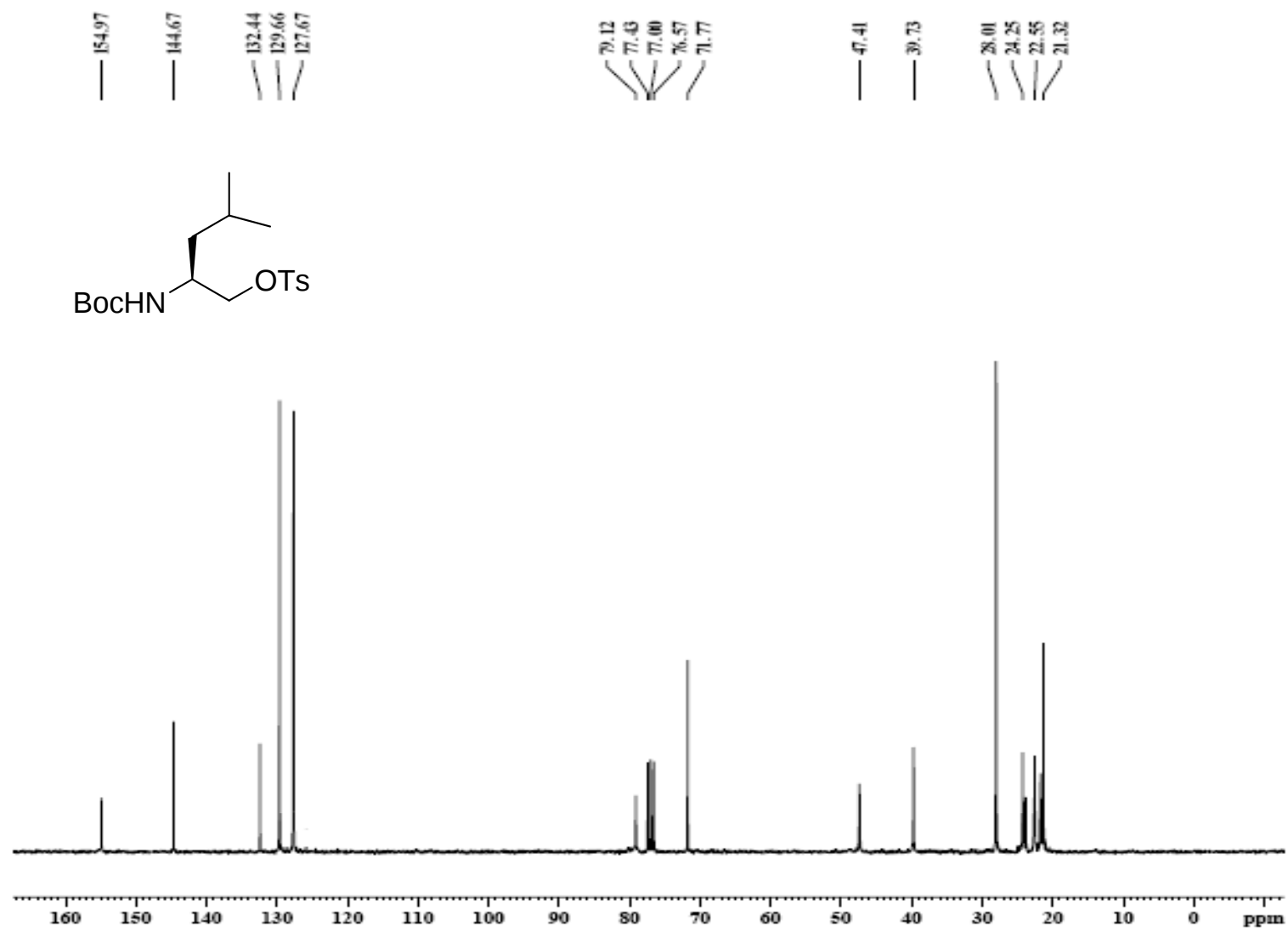


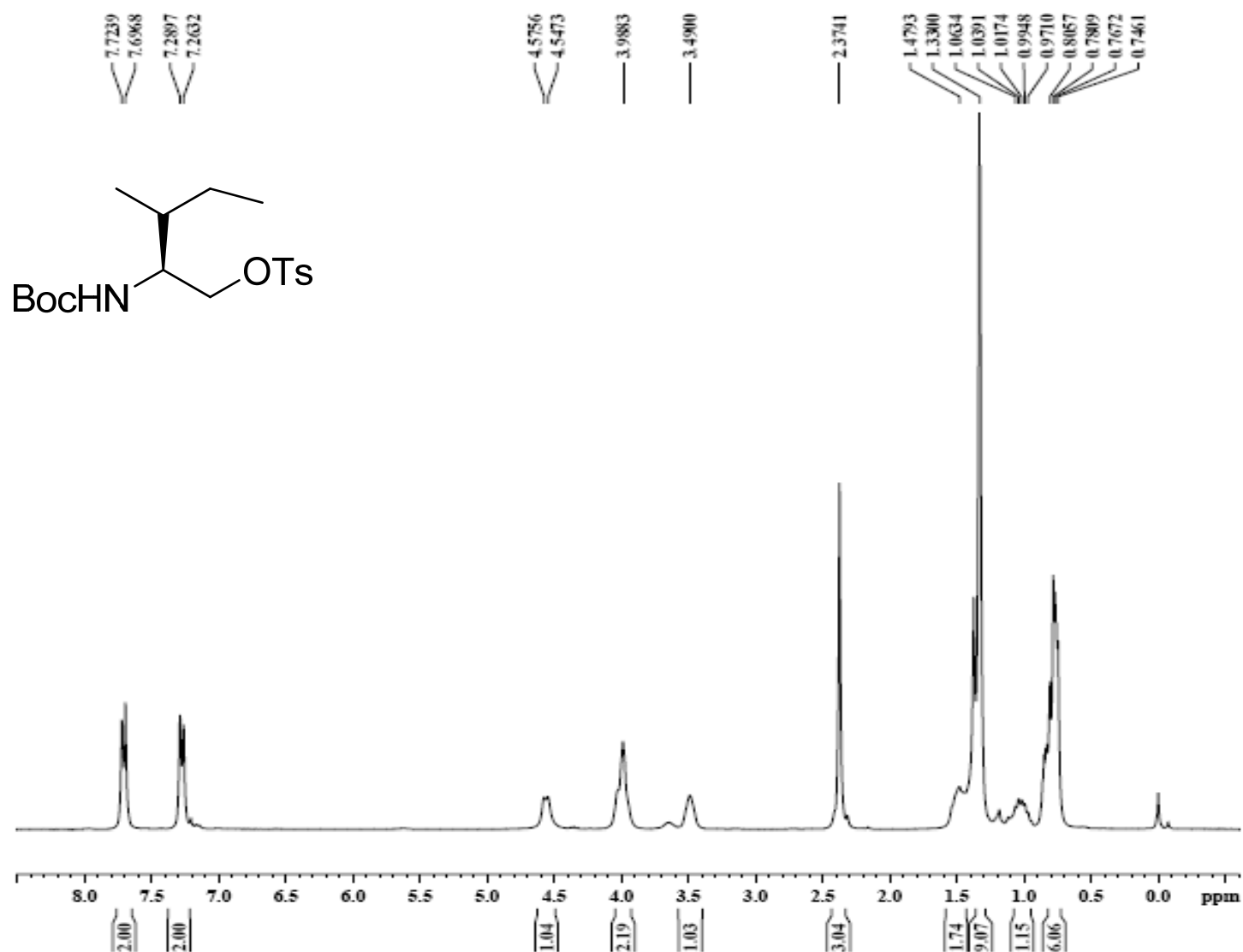
Figure S-6: ^{13}C spectrum (75 MHz, CDCl_3) of 5c.



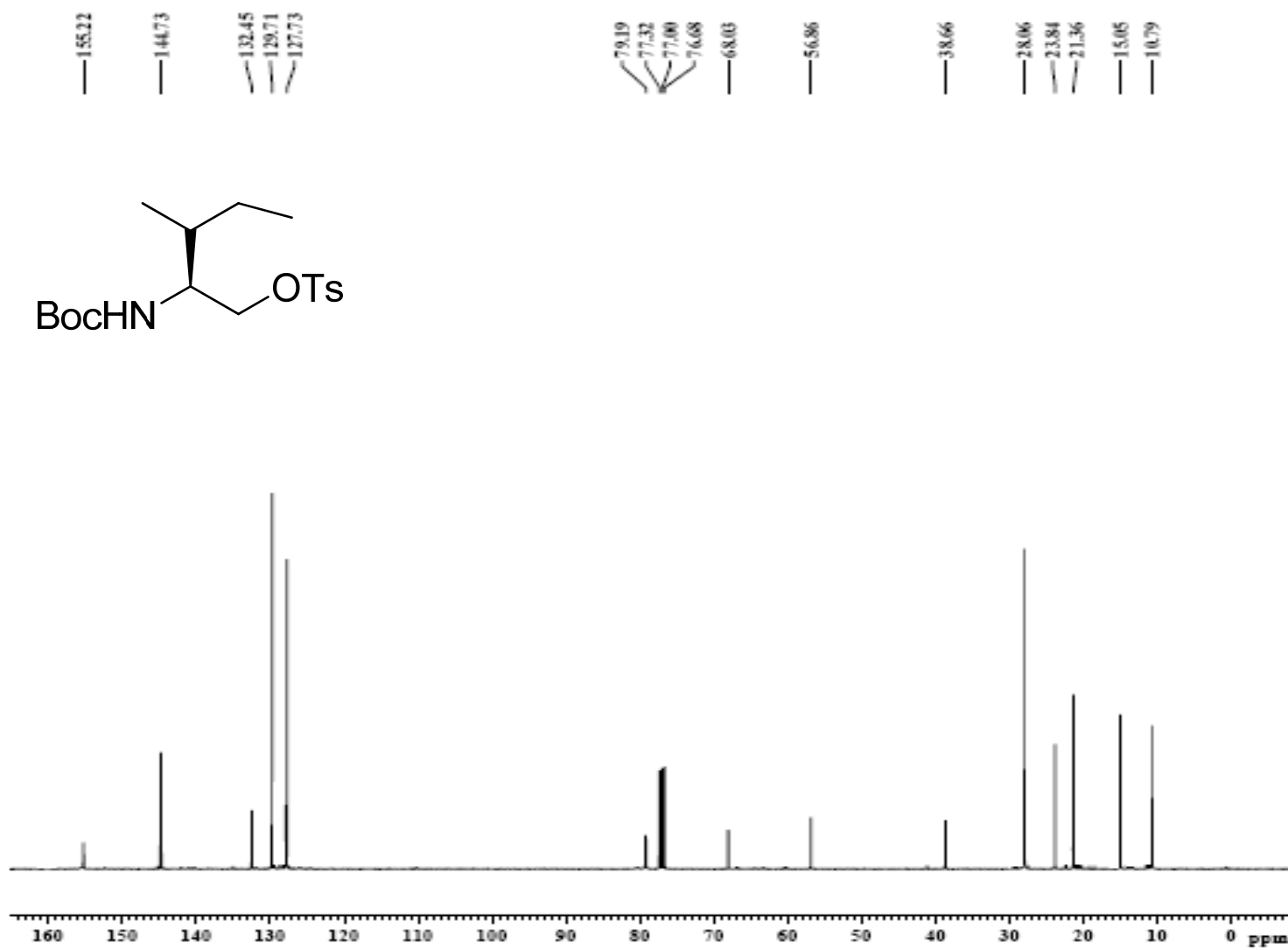
FigureS-7: ¹H spectrum(300 MHz, CDCl₃) of 5d.



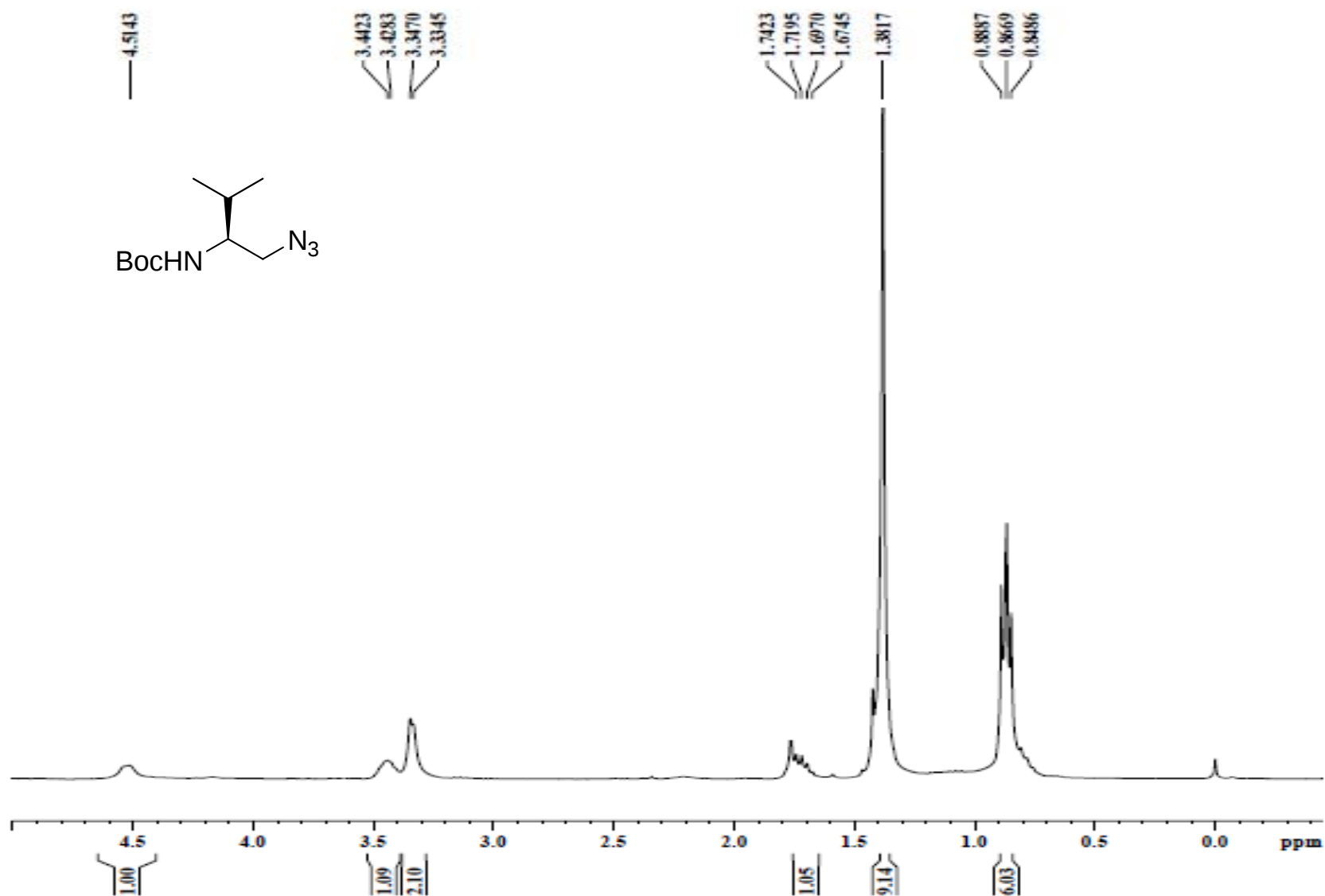
FigureS-8: ^{13}C spectrum (75 MHz, CDCl_3) of **5d**.



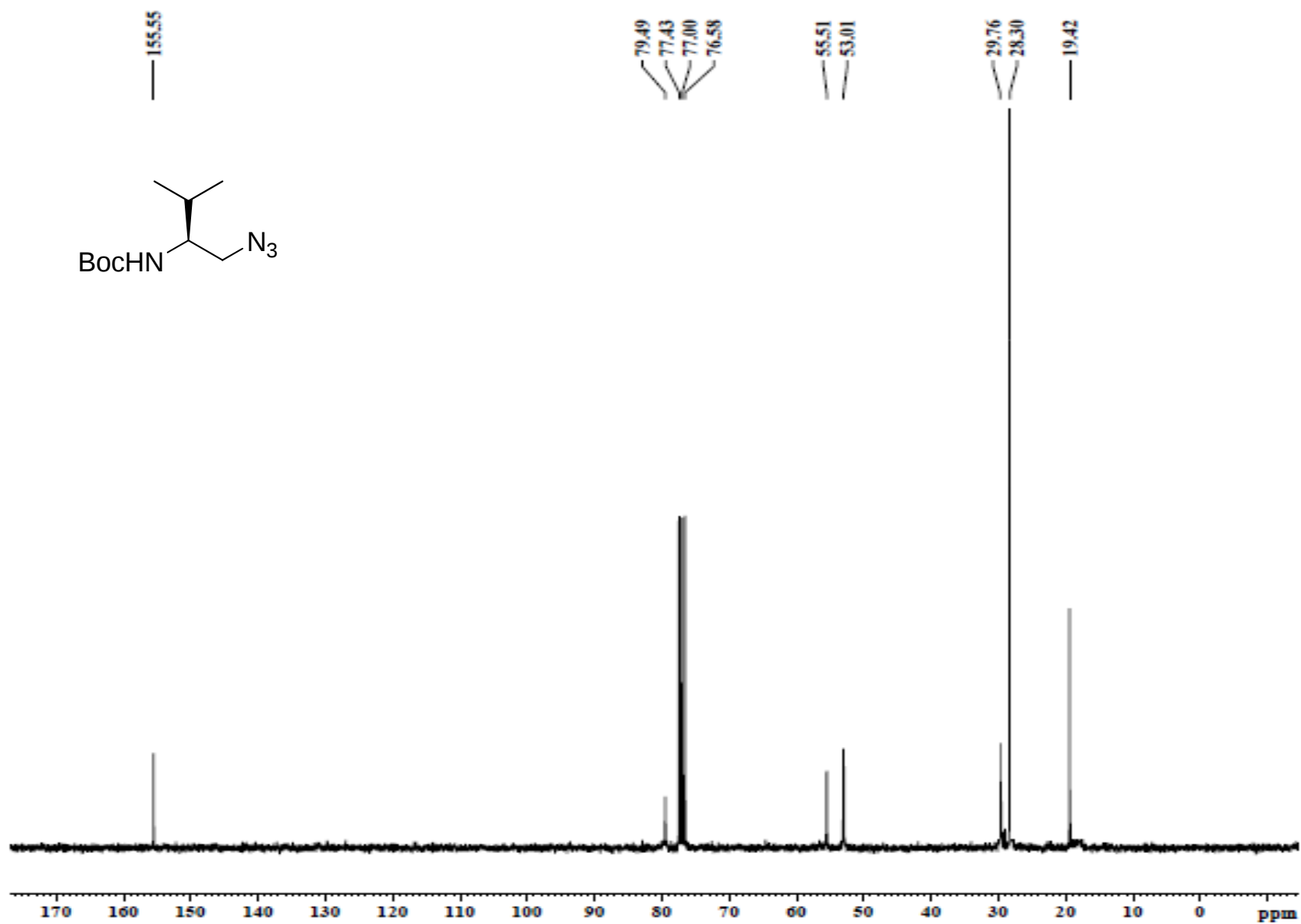
FigureS-9: ¹H spectrum(300 MHz, CDCl₃) of 5e.



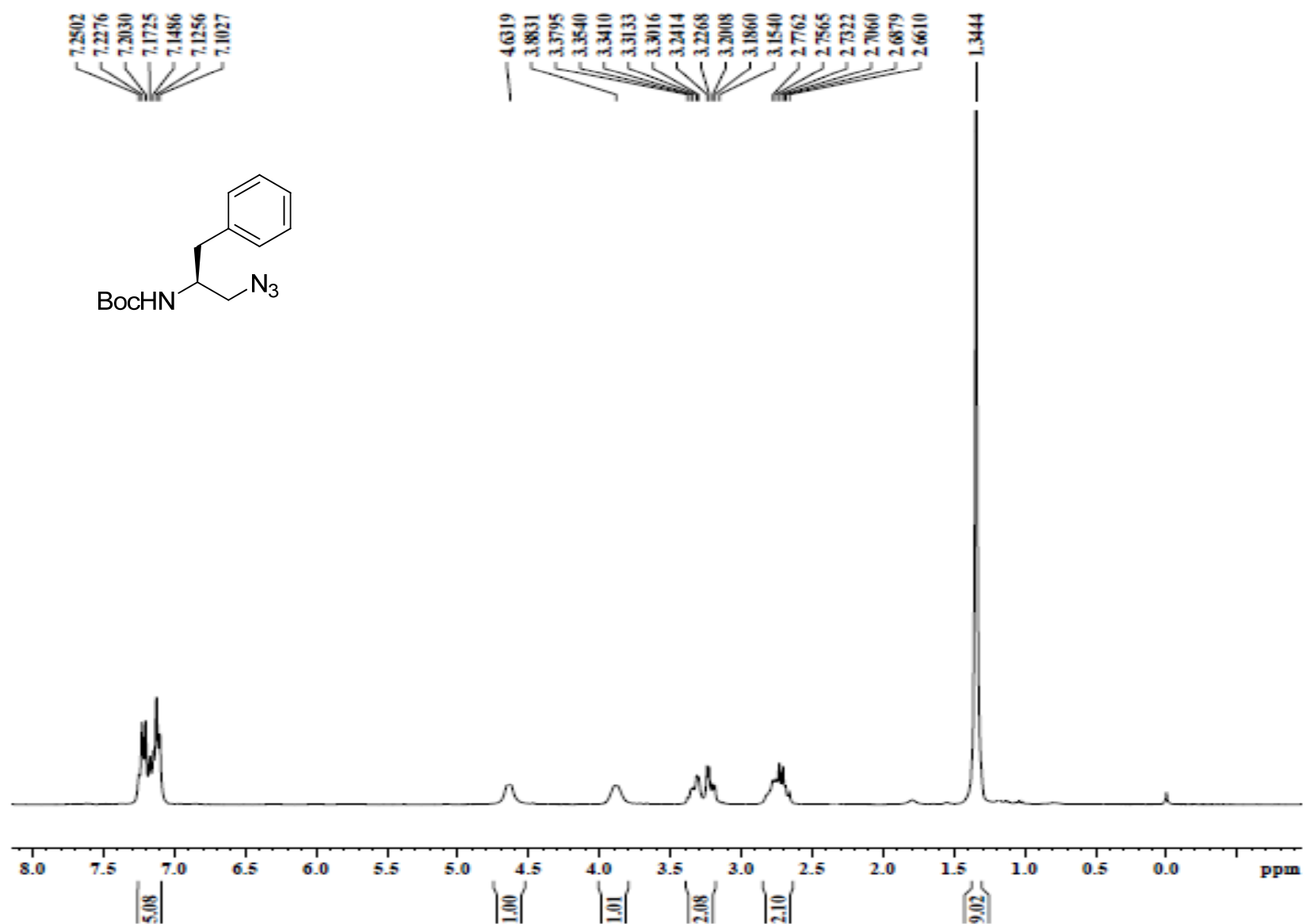
FigureS-10: ^{13}C spectrum (75 MHz, CDCl_3) of **5e**.



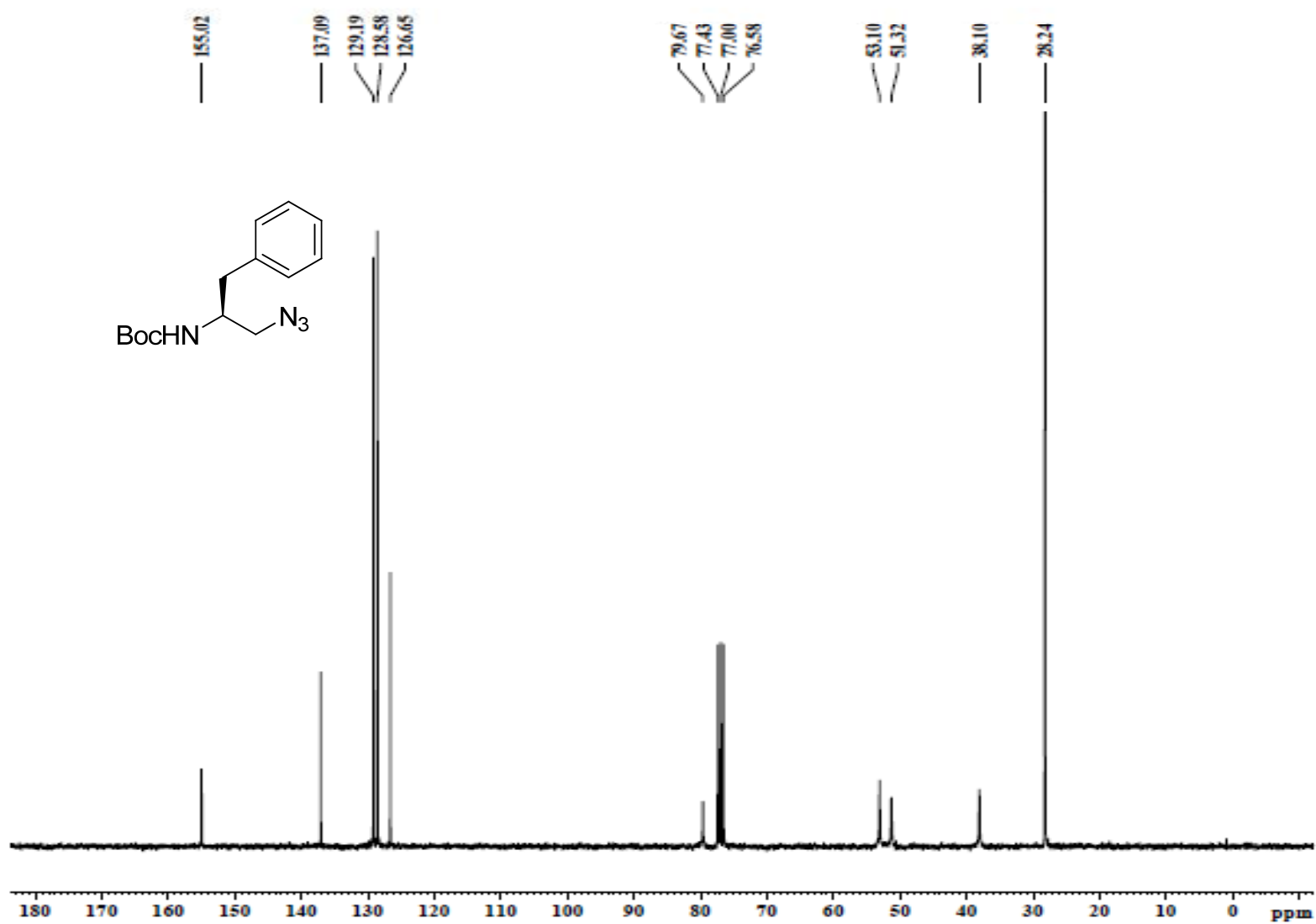
FigureS-11: ¹H spectrum (300 MHz, CDCl₃) of 6a.



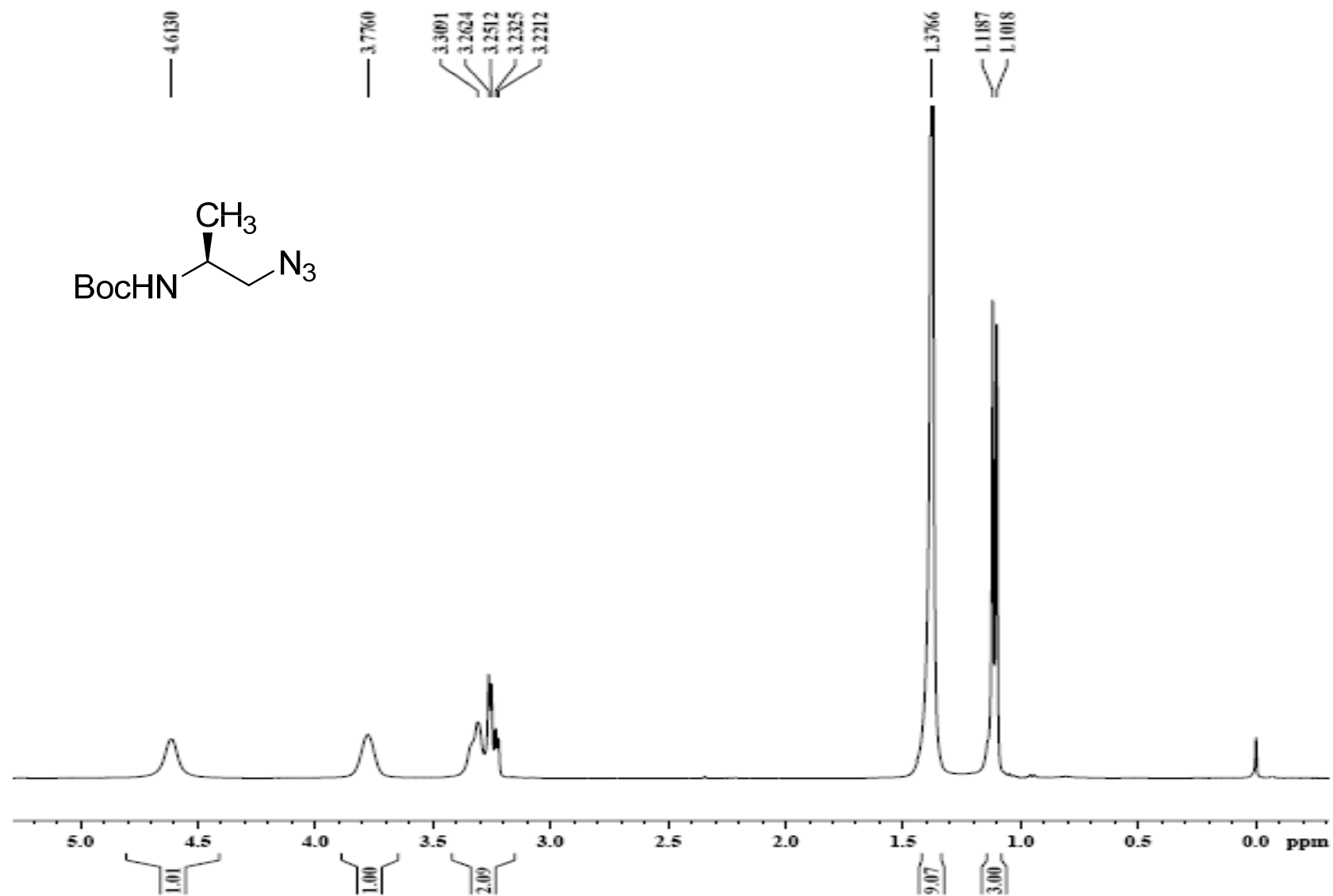
FigureS-12: ^{13}C spectrum (50 MHz, CDCl_3) of 6a.



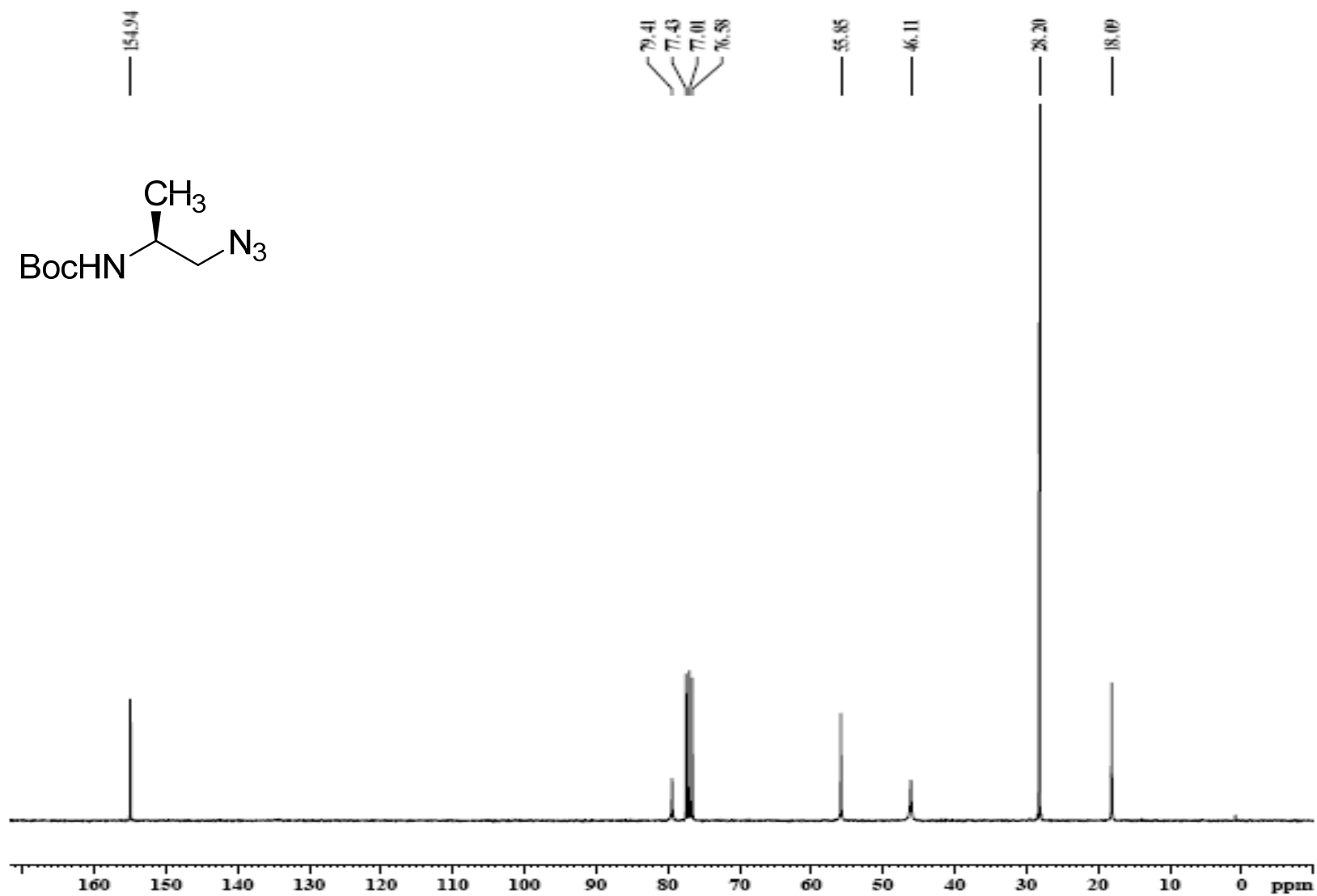
FigureS-13: ¹H spectrum (300 MHz, CDCl₃) of **6b**.



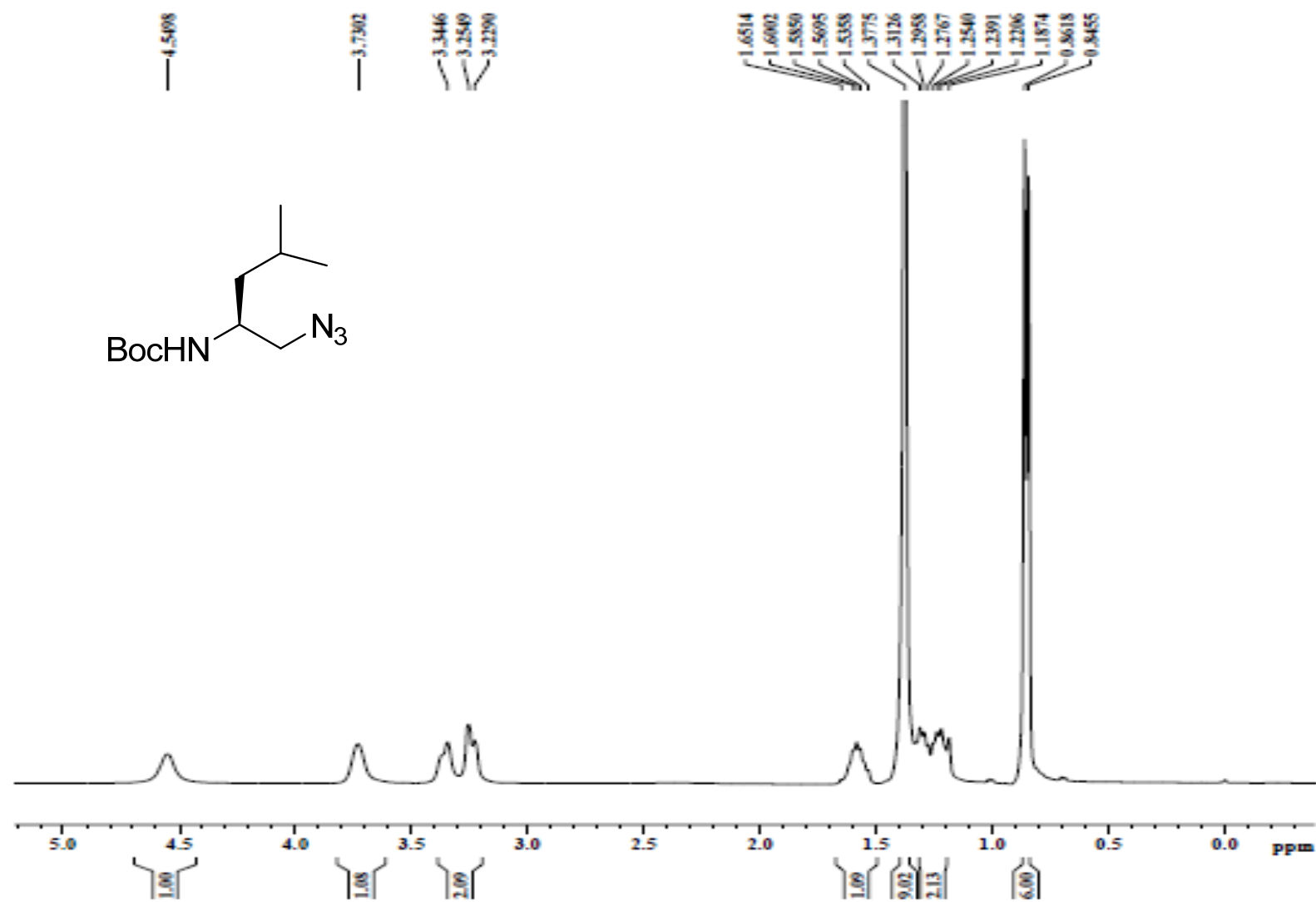
FigureS-14: ^{13}C spectrum (75 MHz, CDCl_3) of 6b.



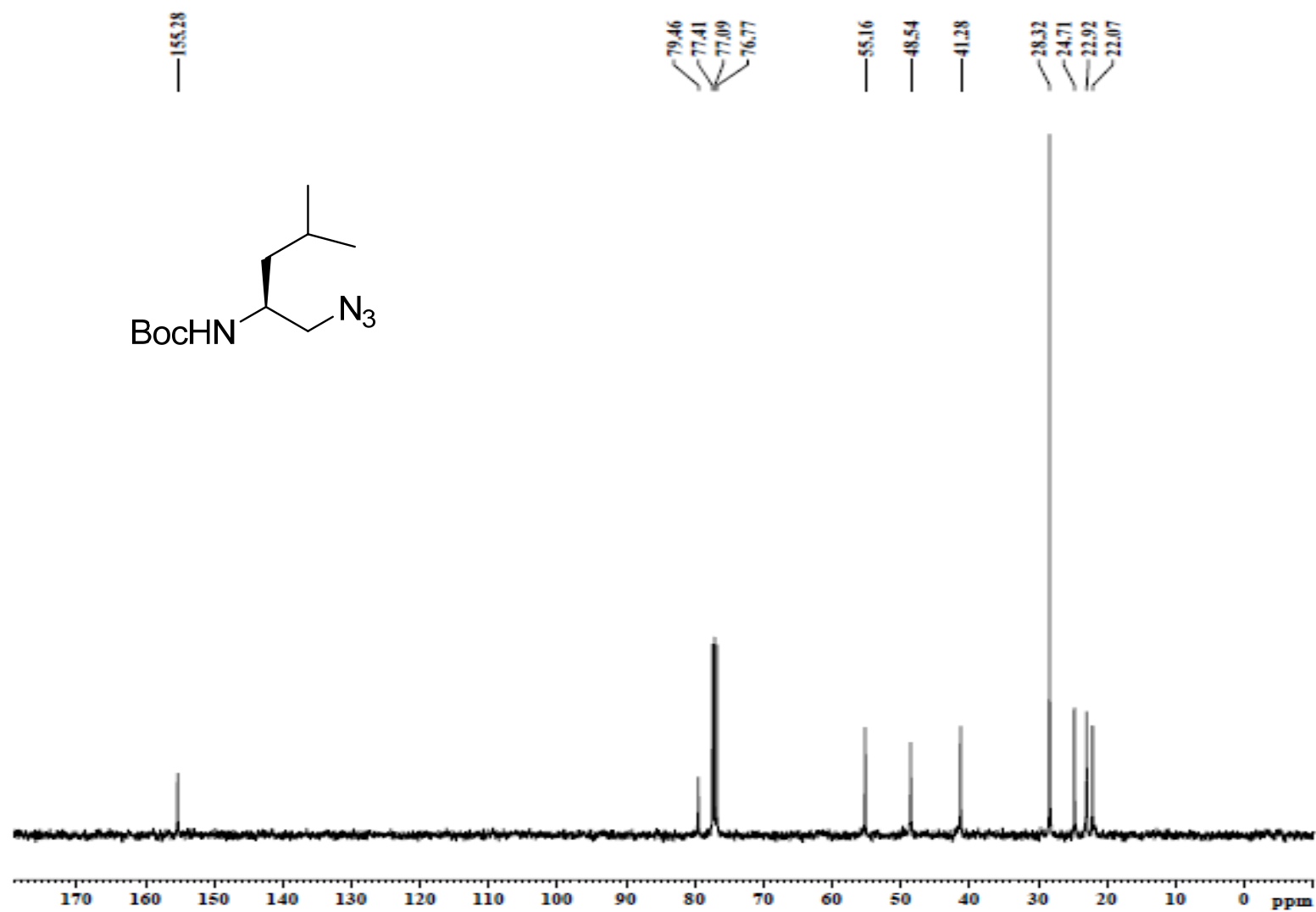
FigureS-15: ¹H spectrum (300 MHz, CDCl₃) of 6c.



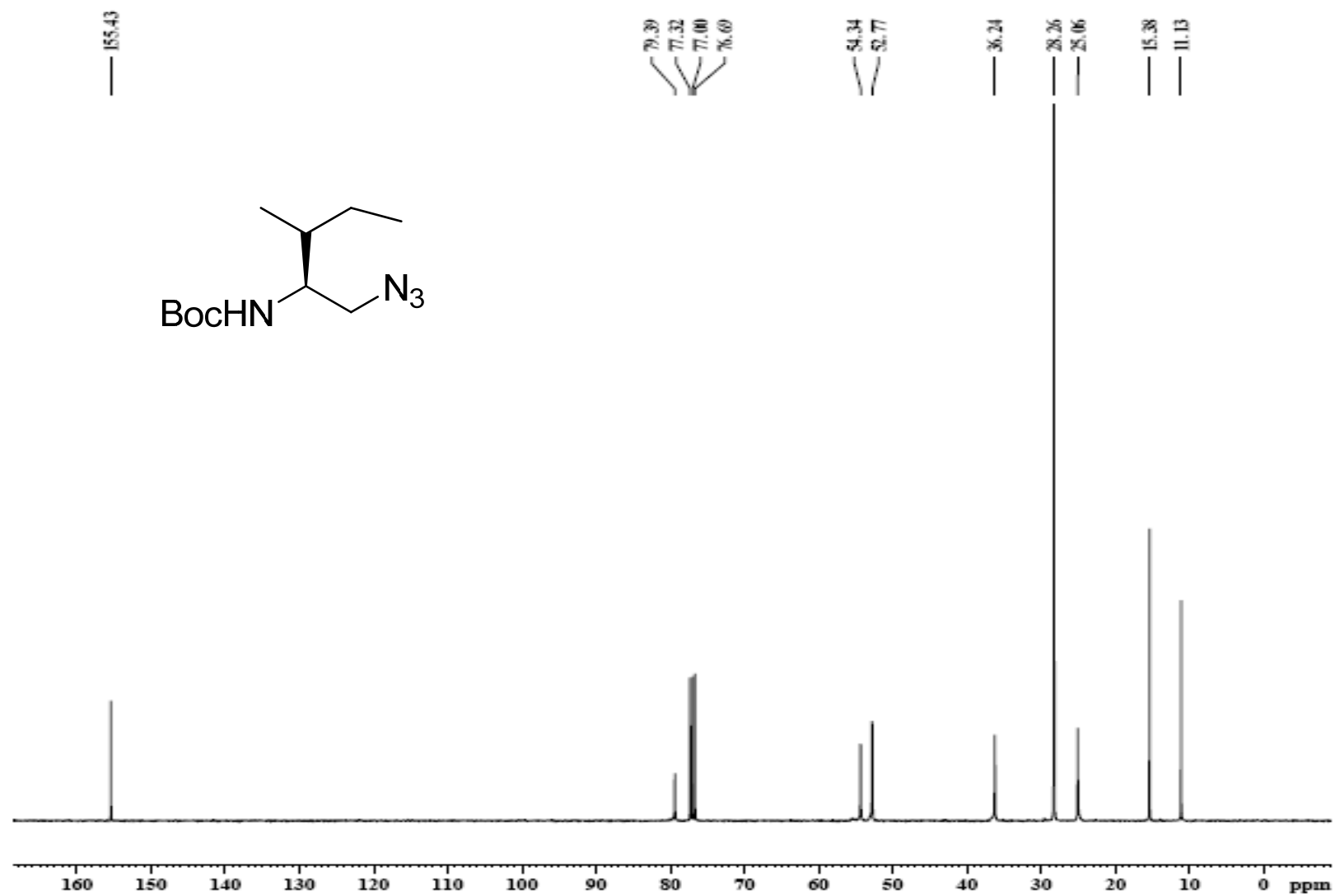
FigureS-16: ¹³C spectrum (75 MHz, CDCl₃) of 6c.



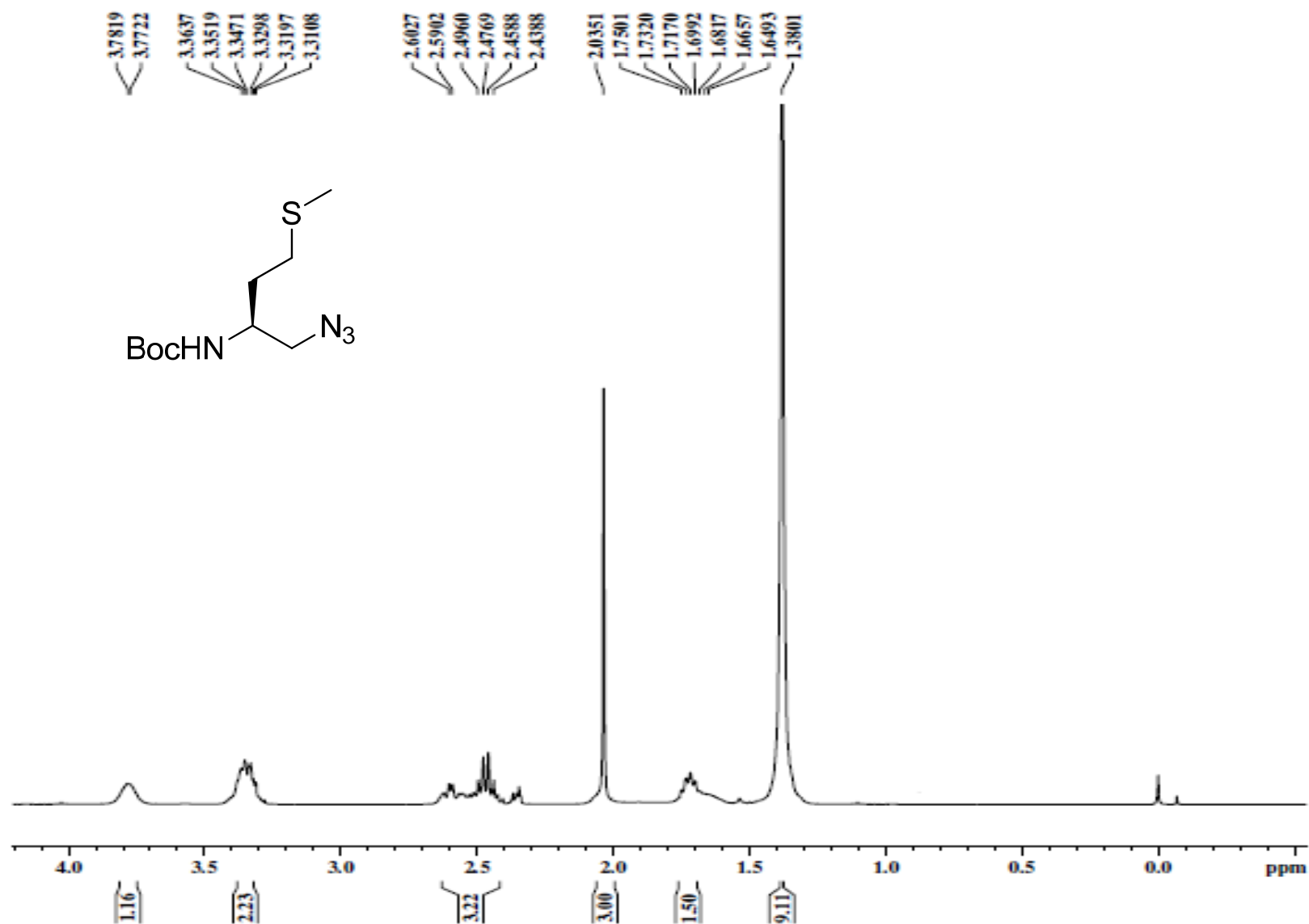
FigureS-17: ¹H spectrum (300 MHz, CDCl₃) of **6d**.



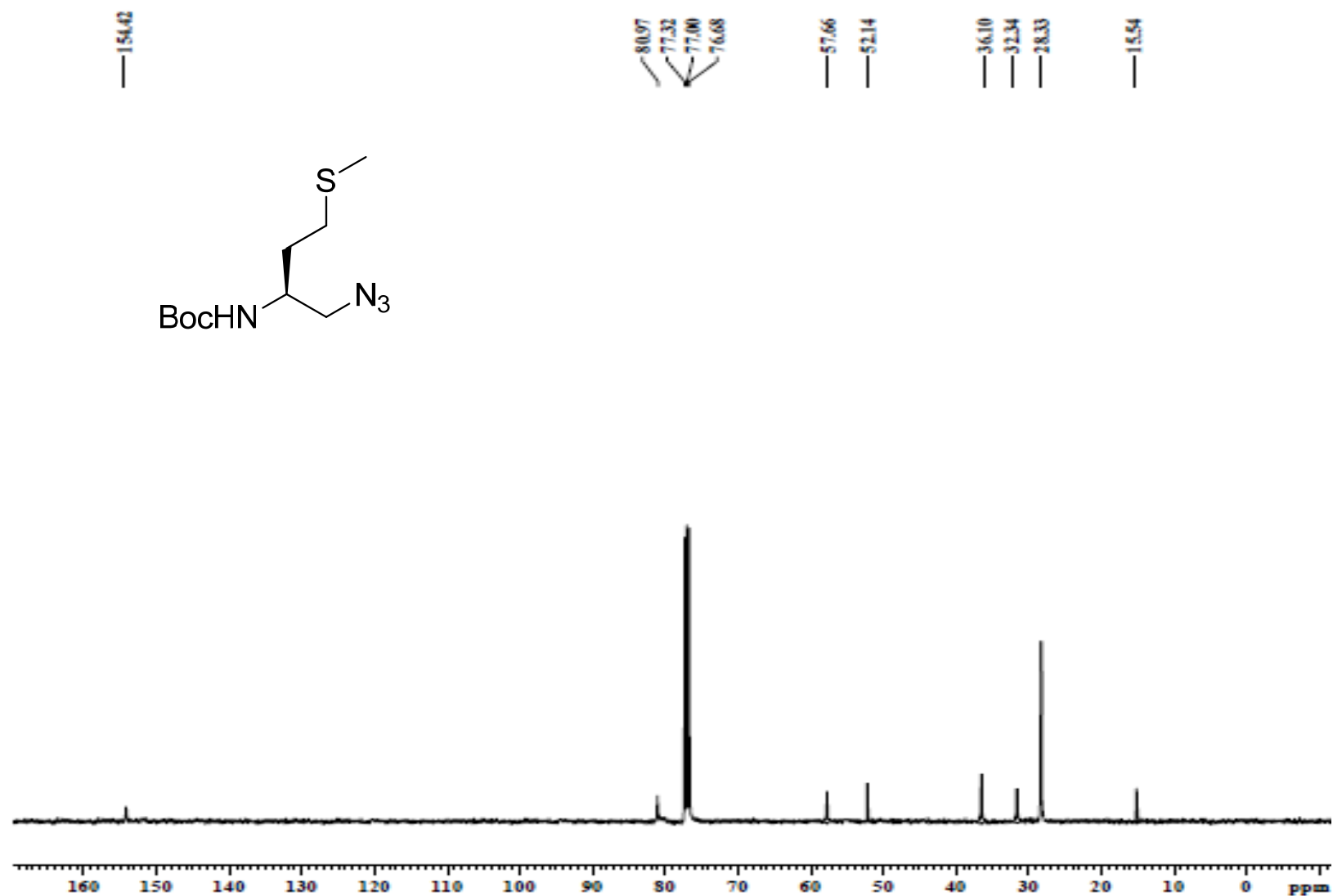
FigureS-18: ^{13}C spectrum (75 MHz, CDCl_3) of **6d**.



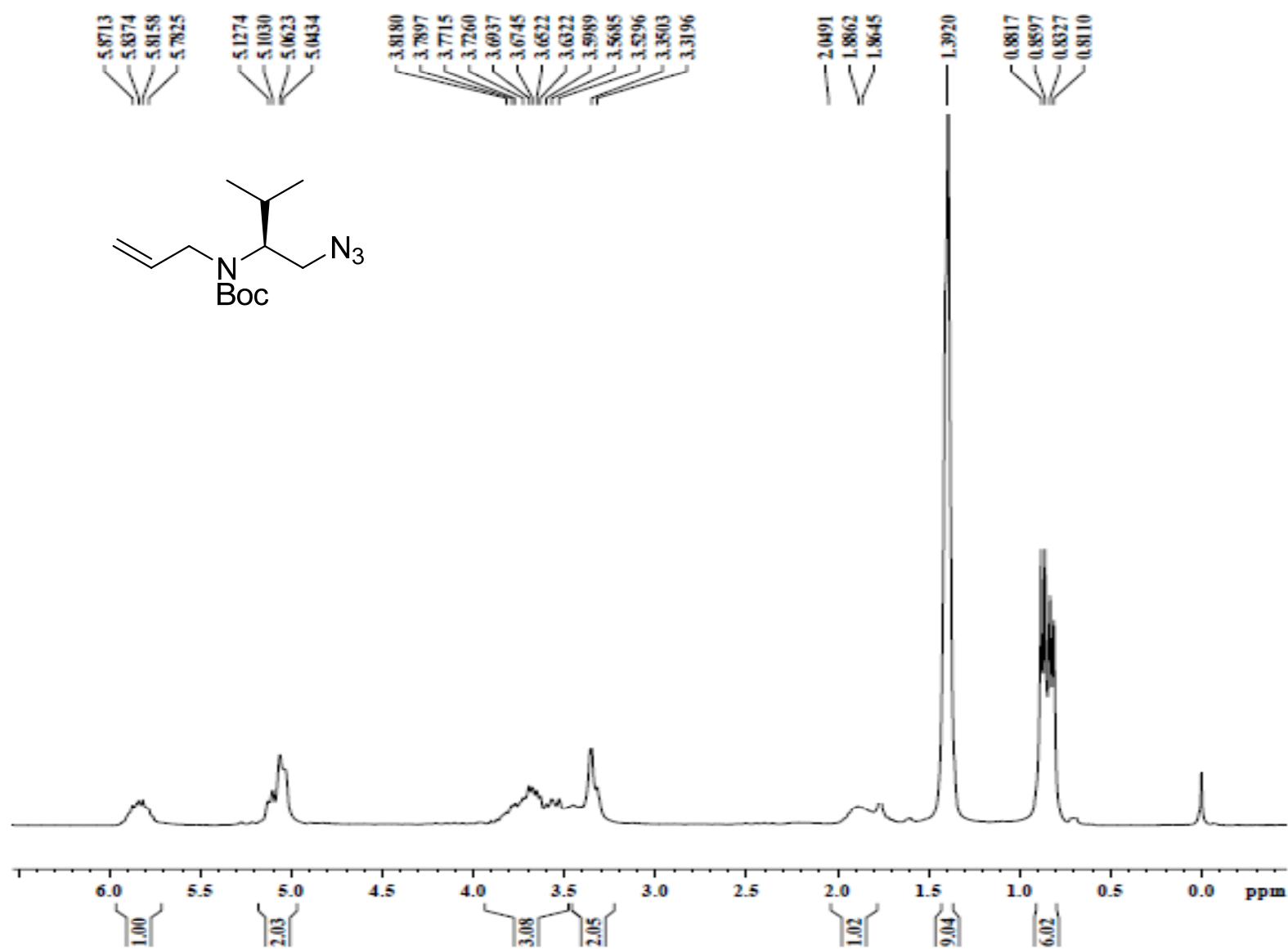
FigureS-20: ¹³C spectrum (75 MHz, CDCl₃) of **6e**.



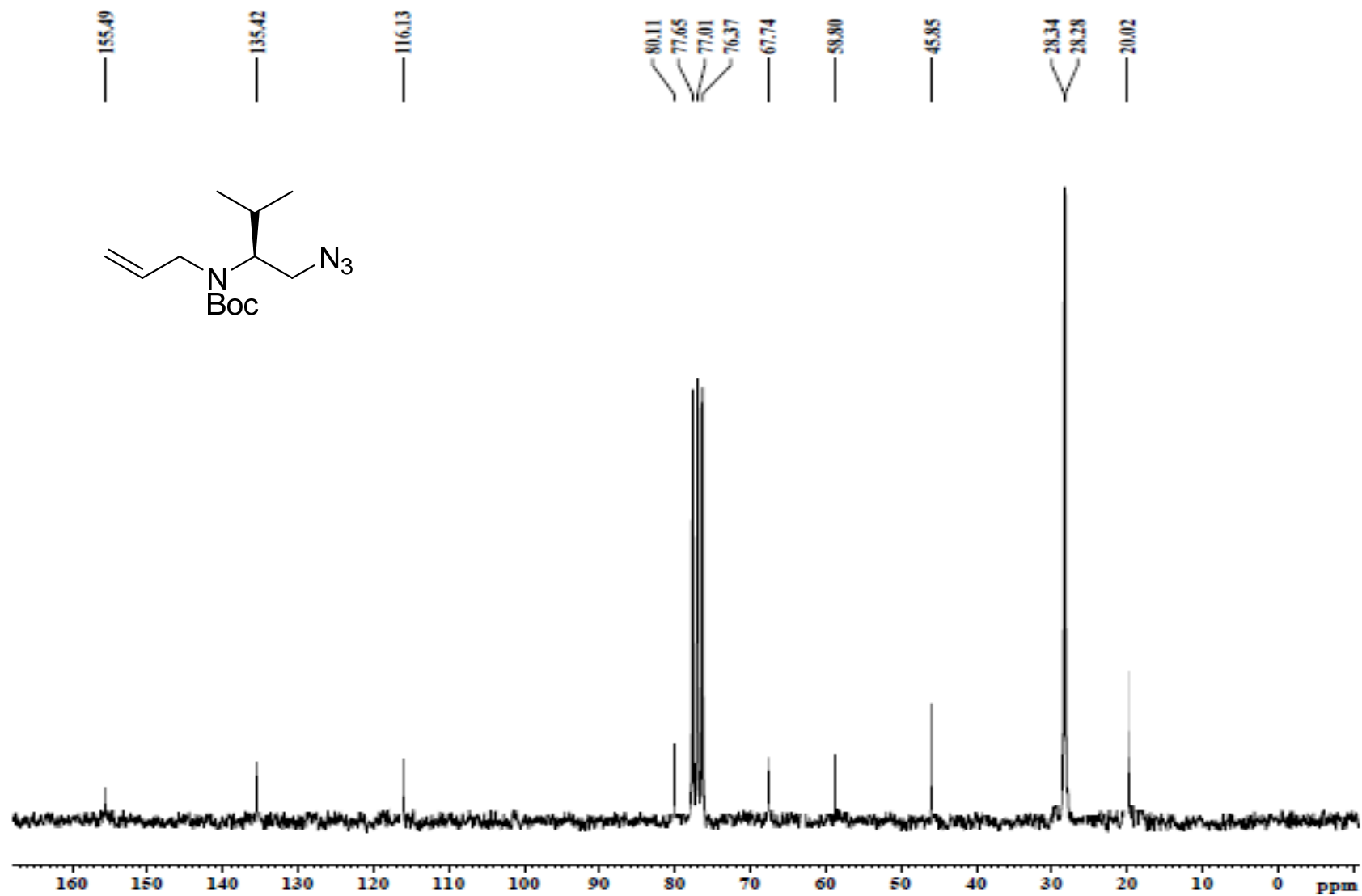
FigureS-21: ¹H spectrum (300 MHz, CDCl₃) of 6f.



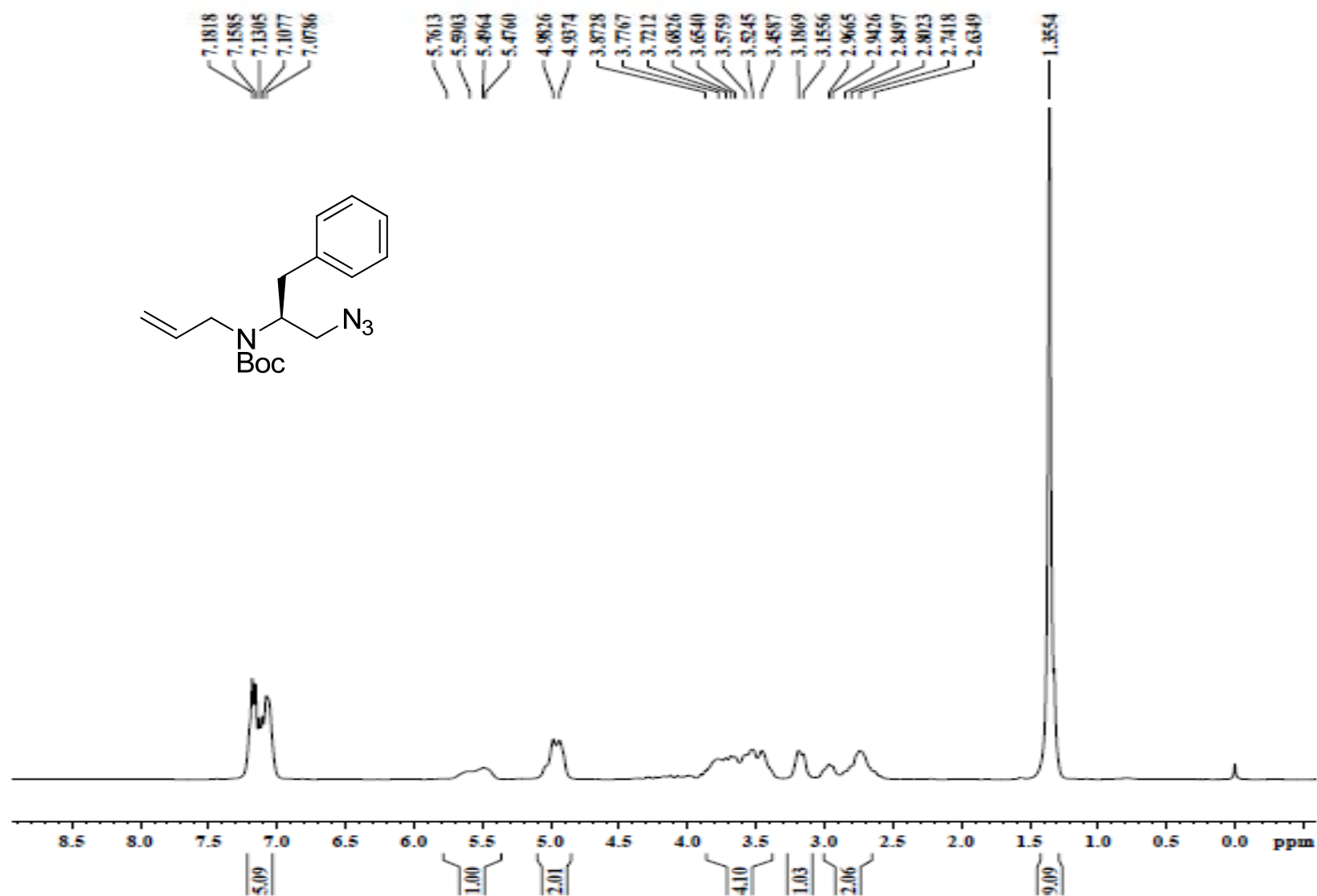
FigureS-22: ^{13}C spectrum (75 MHz, CDCl_3) of **6f**.



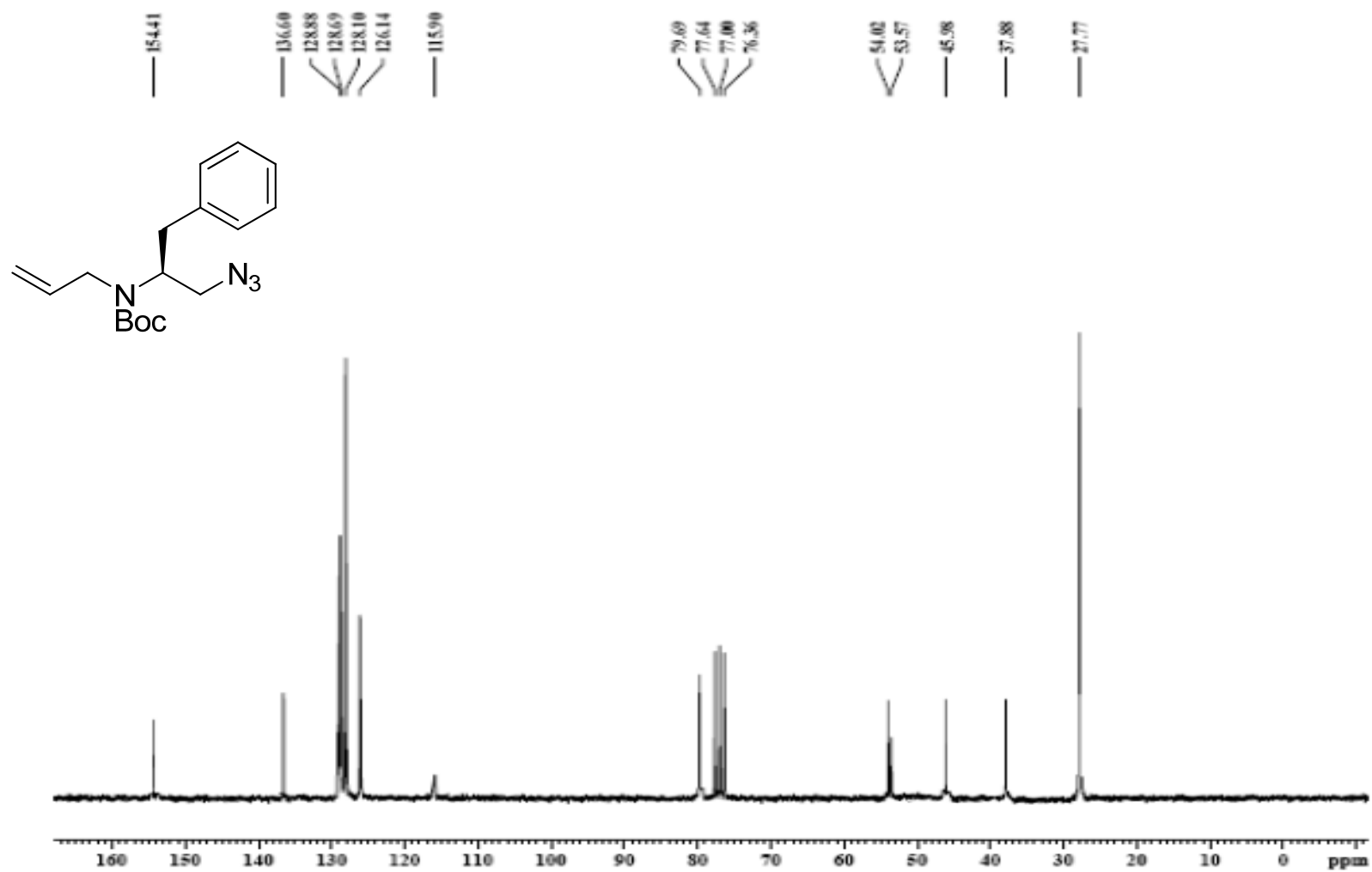
FigureS-23: ¹H spectrum (300 MHz, CDCl₃) of **7a**.



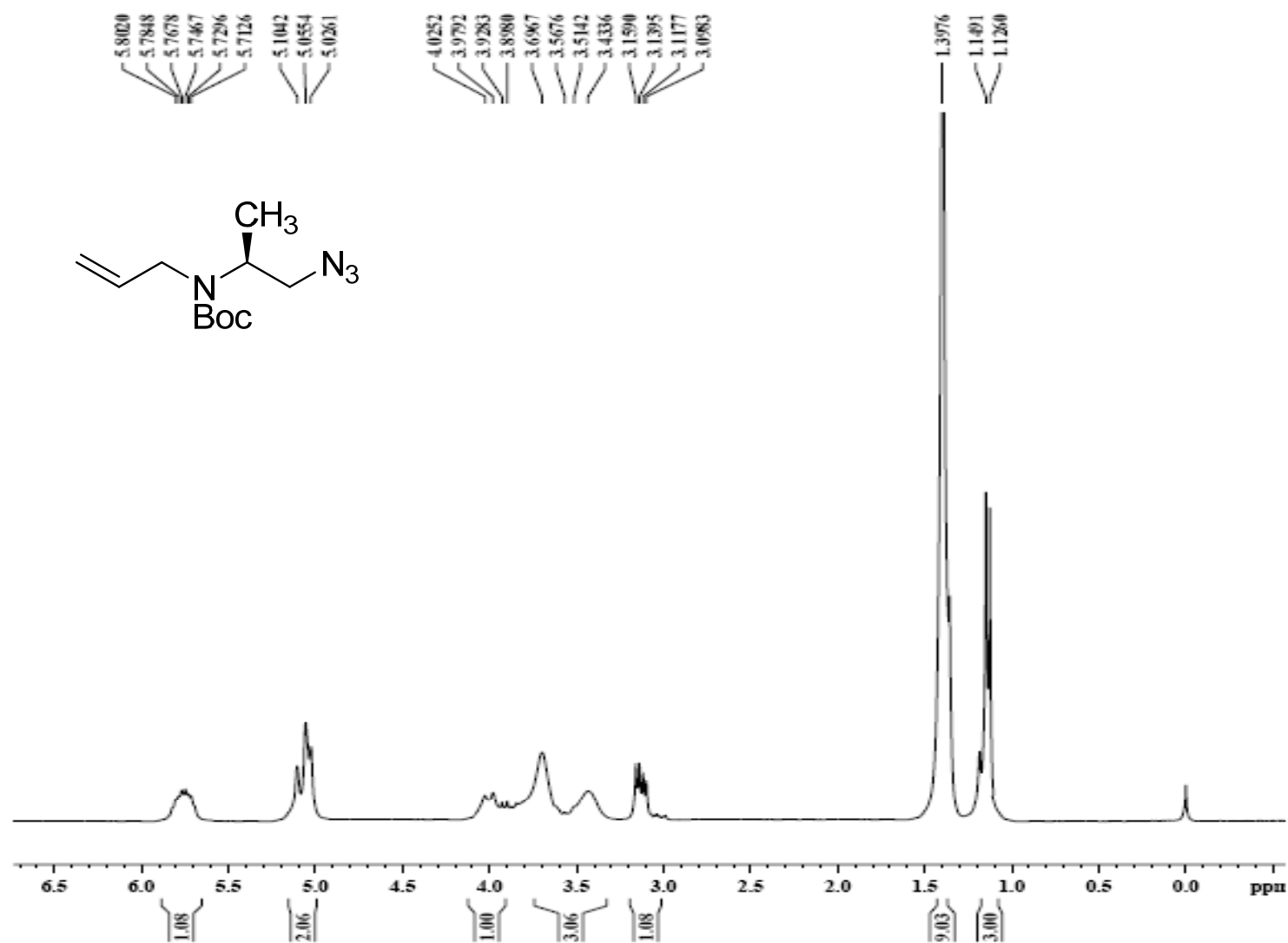
FigureS-24: ^{13}C spectrum (75 MHz, CDCl_3) of 7a.



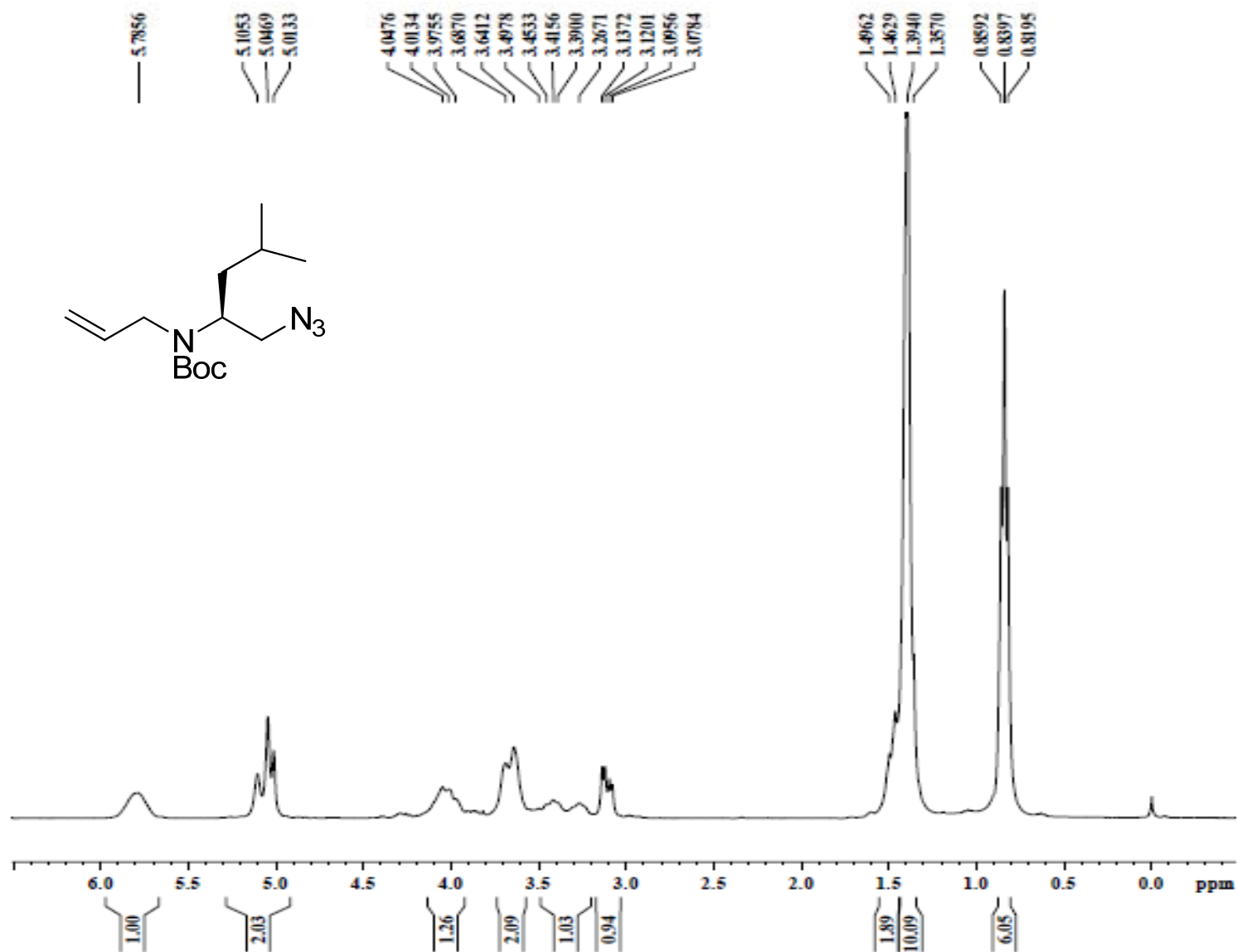
FigureS-25: ¹H spectrum (300 MHz, CDCl₃) of **7b**.



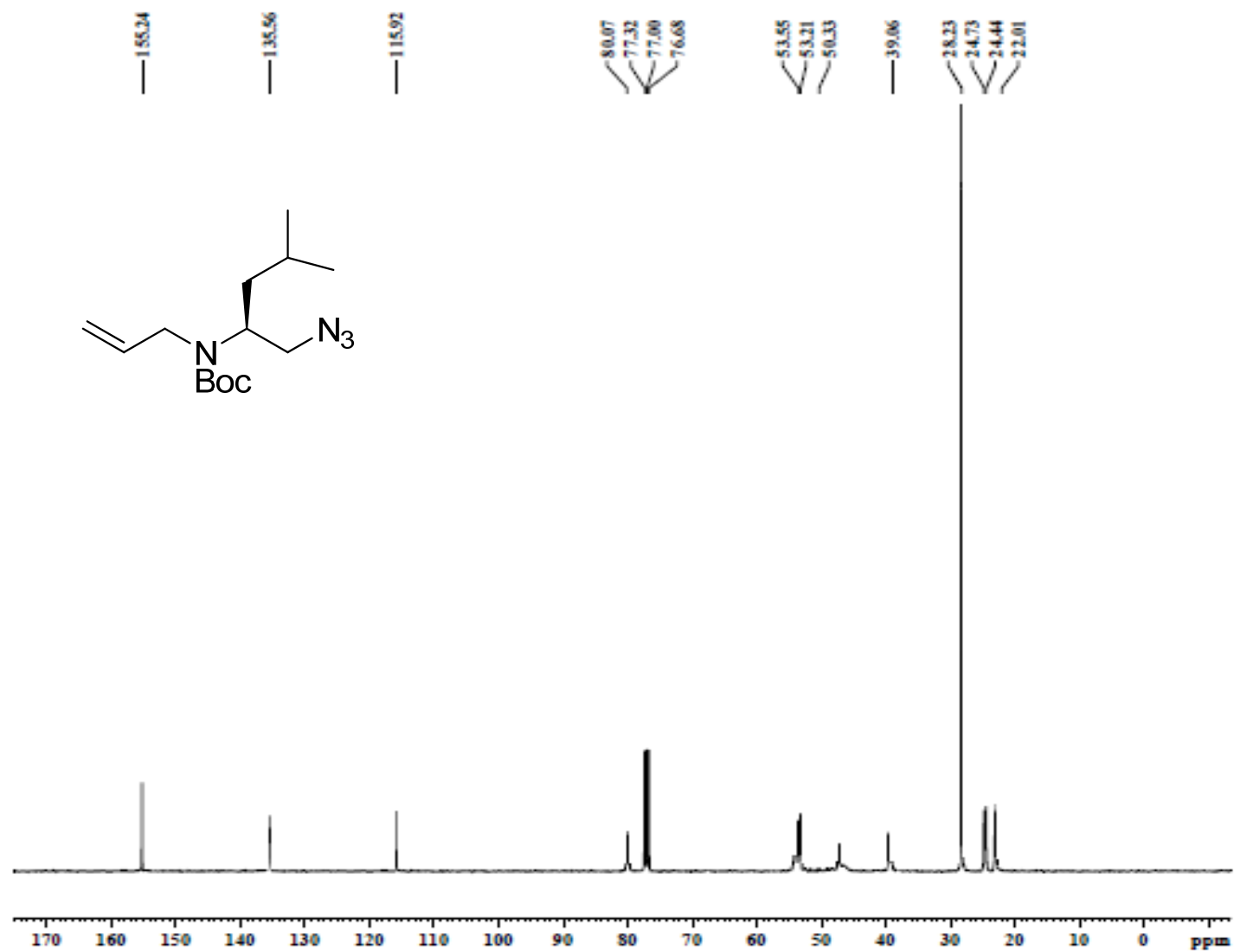
FigureS-26: ^{13}C spectrum (75 MHz, CDCl_3) of **7b**.



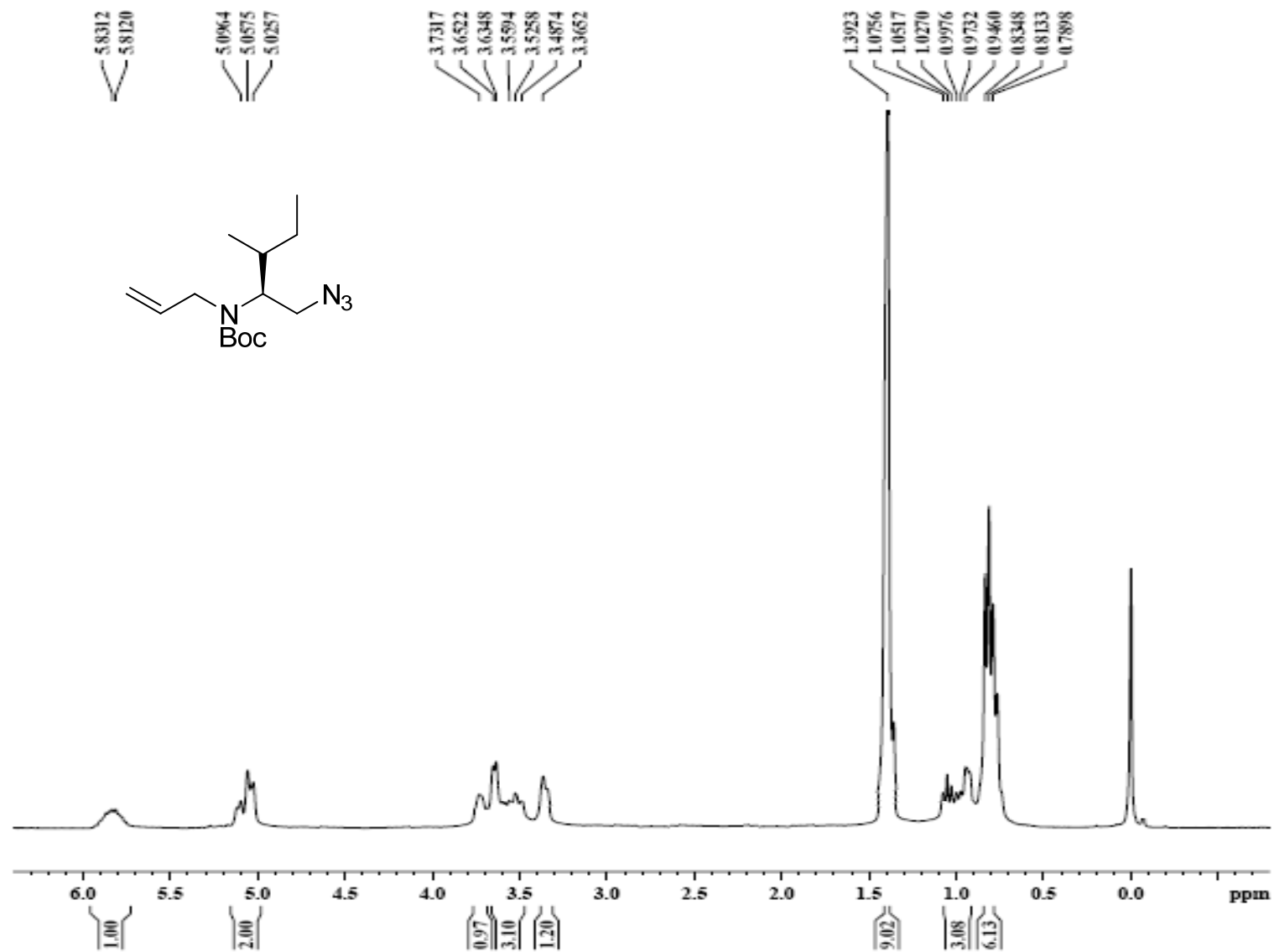
FigureS-27: ¹H spectrum (300 MHz, CDCl₃) of **7c**.



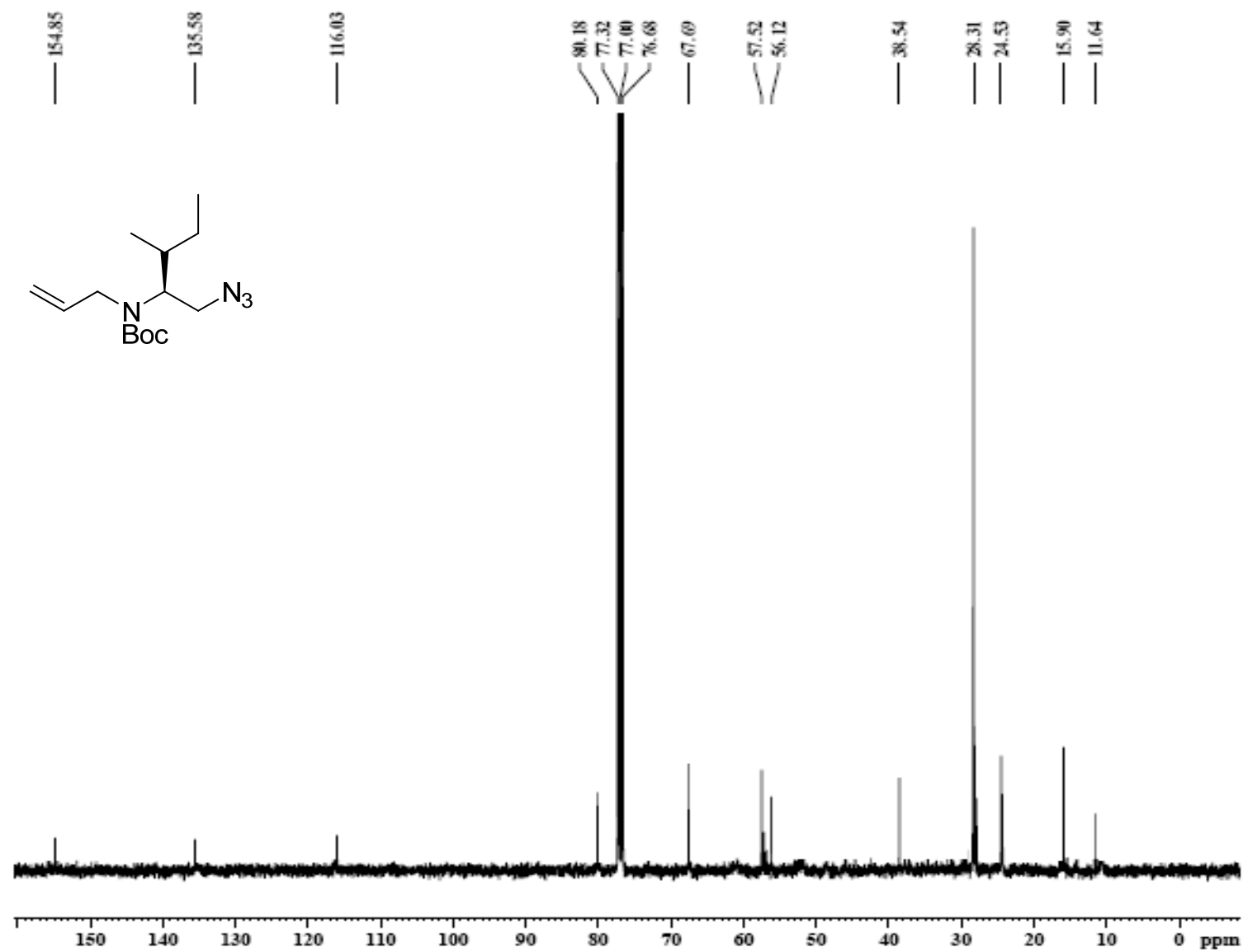
FigureS-28: ¹H spectrum (300 MHz, CDCl₃) of **7d**.



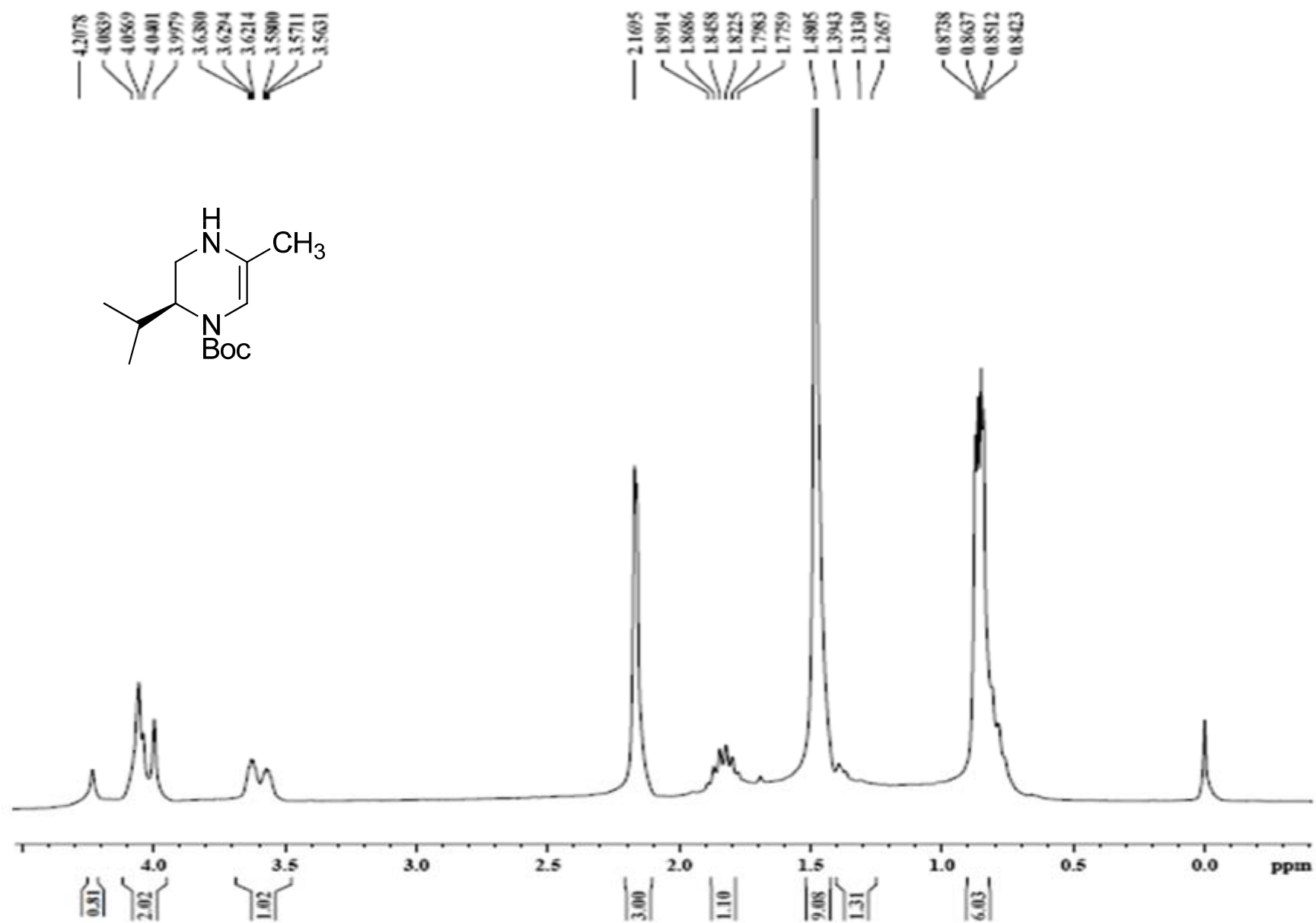
FigureS-29: ¹³C spectrum (75 MHz, CDCl₃) of **7d**.



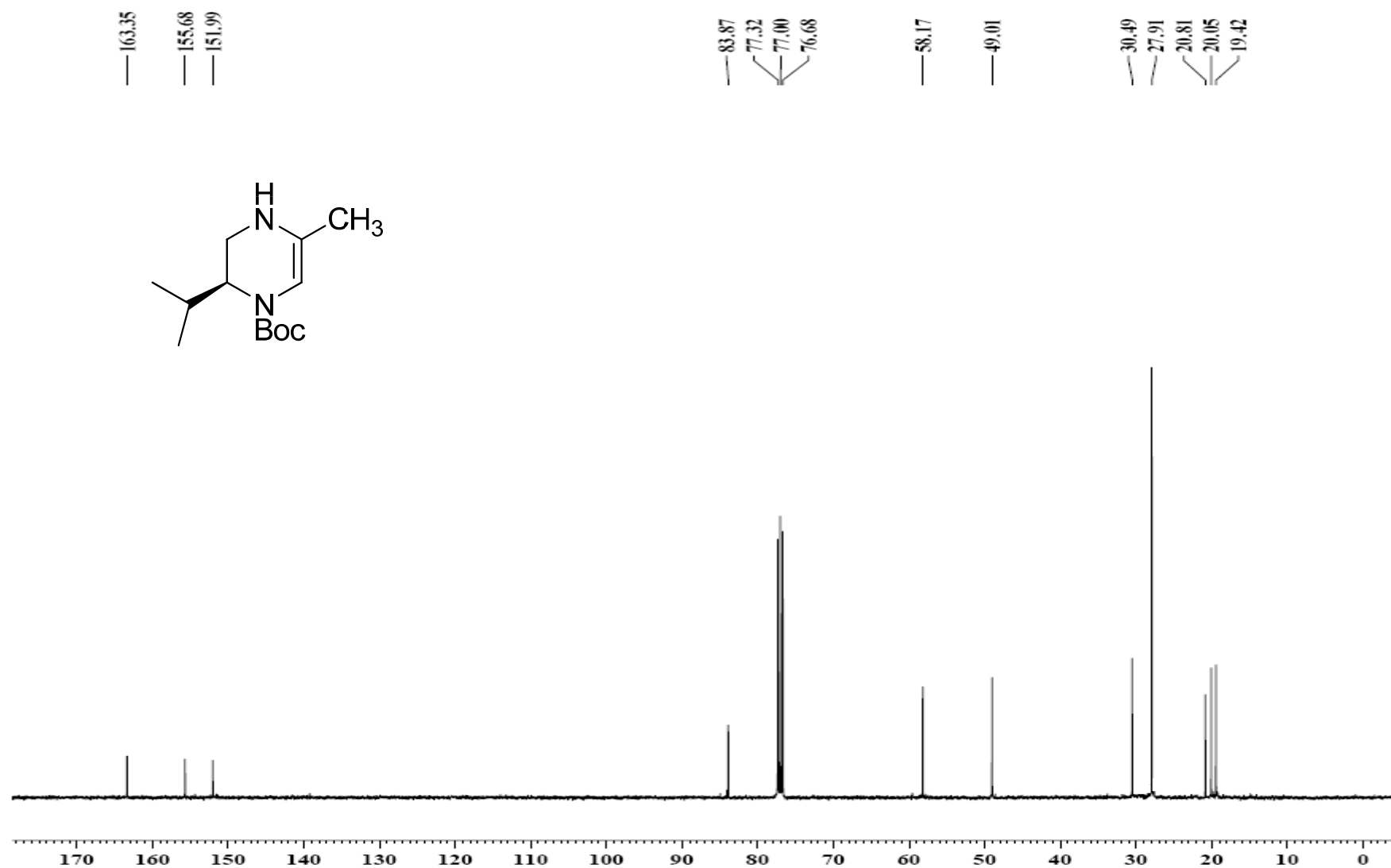
FigureS-30: ¹H spectrum (300 MHz, CDCl₃) of **7e**.



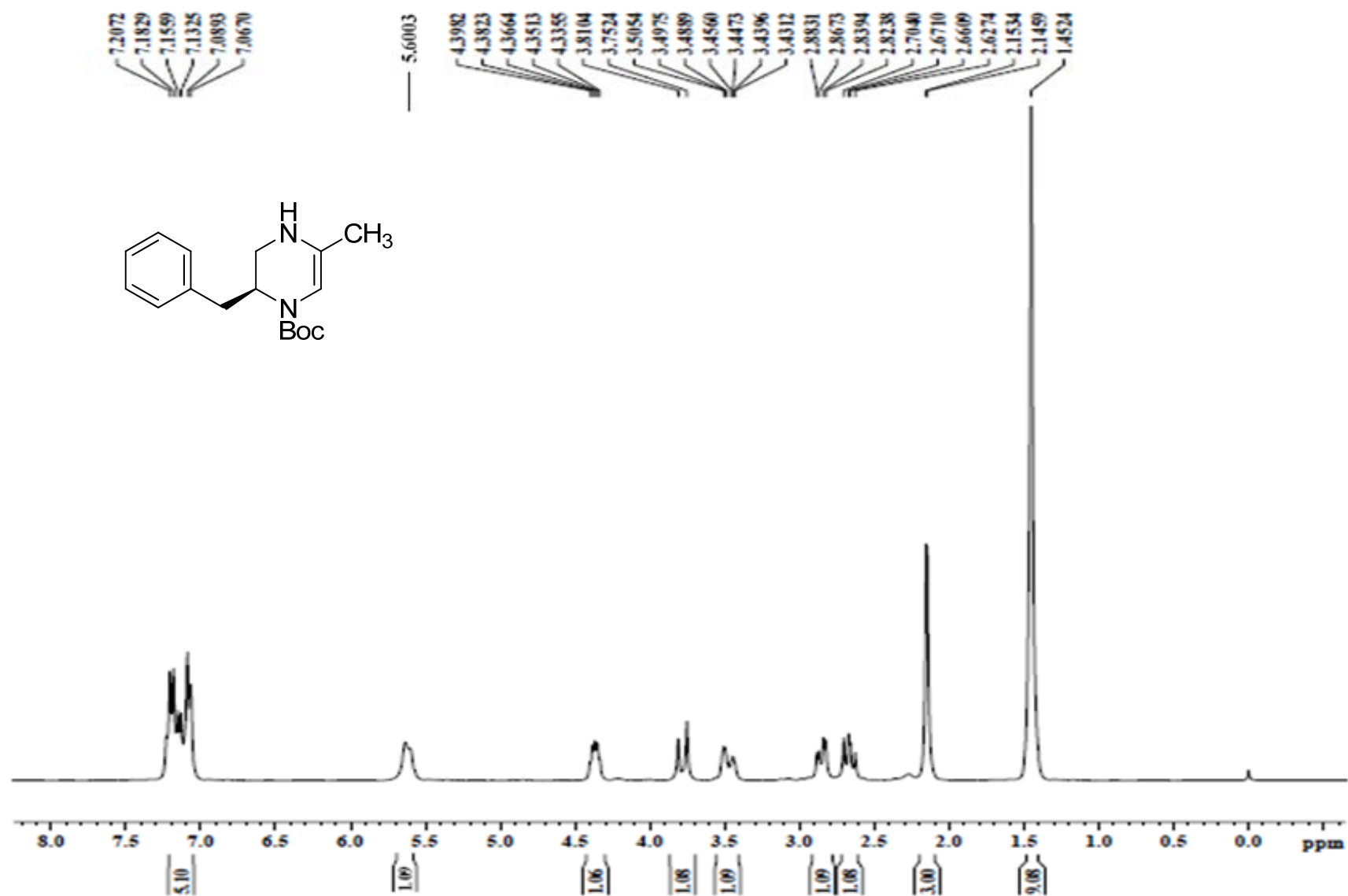
FigureS-31: ^{13}C spectrum (75 MHz, CDCl_3) of **7e**.



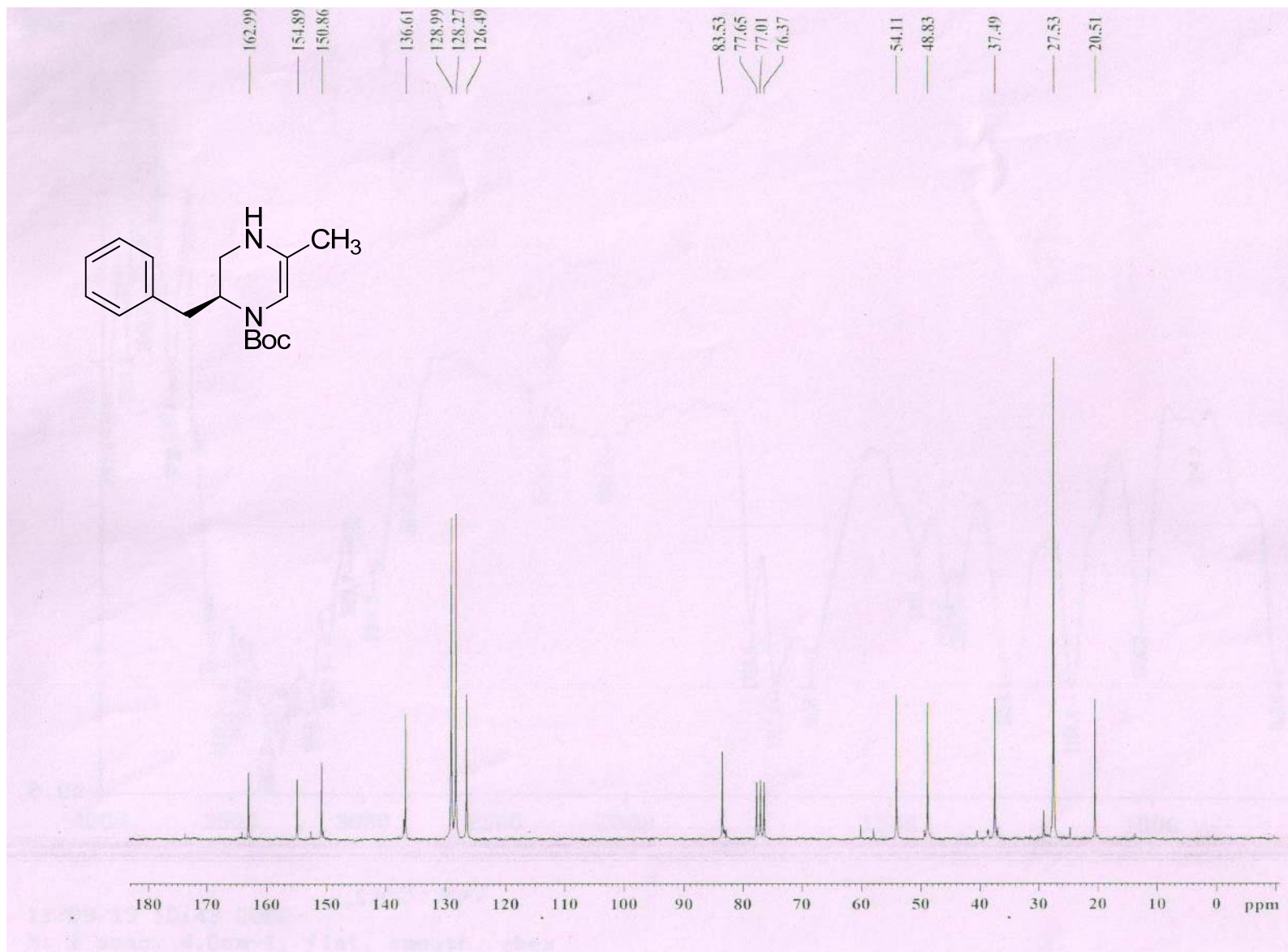
FigureS-32: ¹H spectrum (300 MHz, CDCl₃) of **8a**.



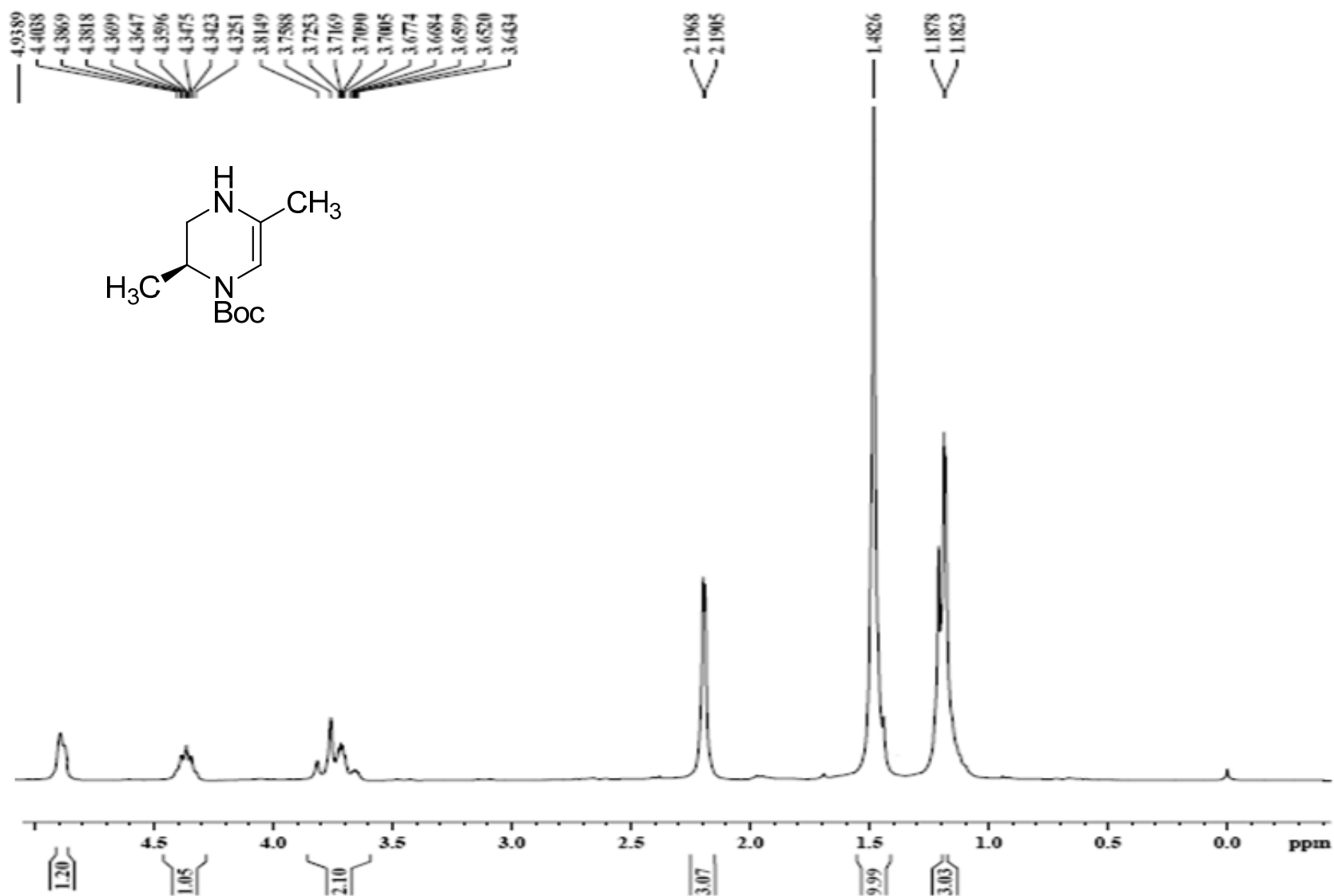
FigureS-33: ^{13}C spectrum (75 MHz, CDCl_3) of 8a.



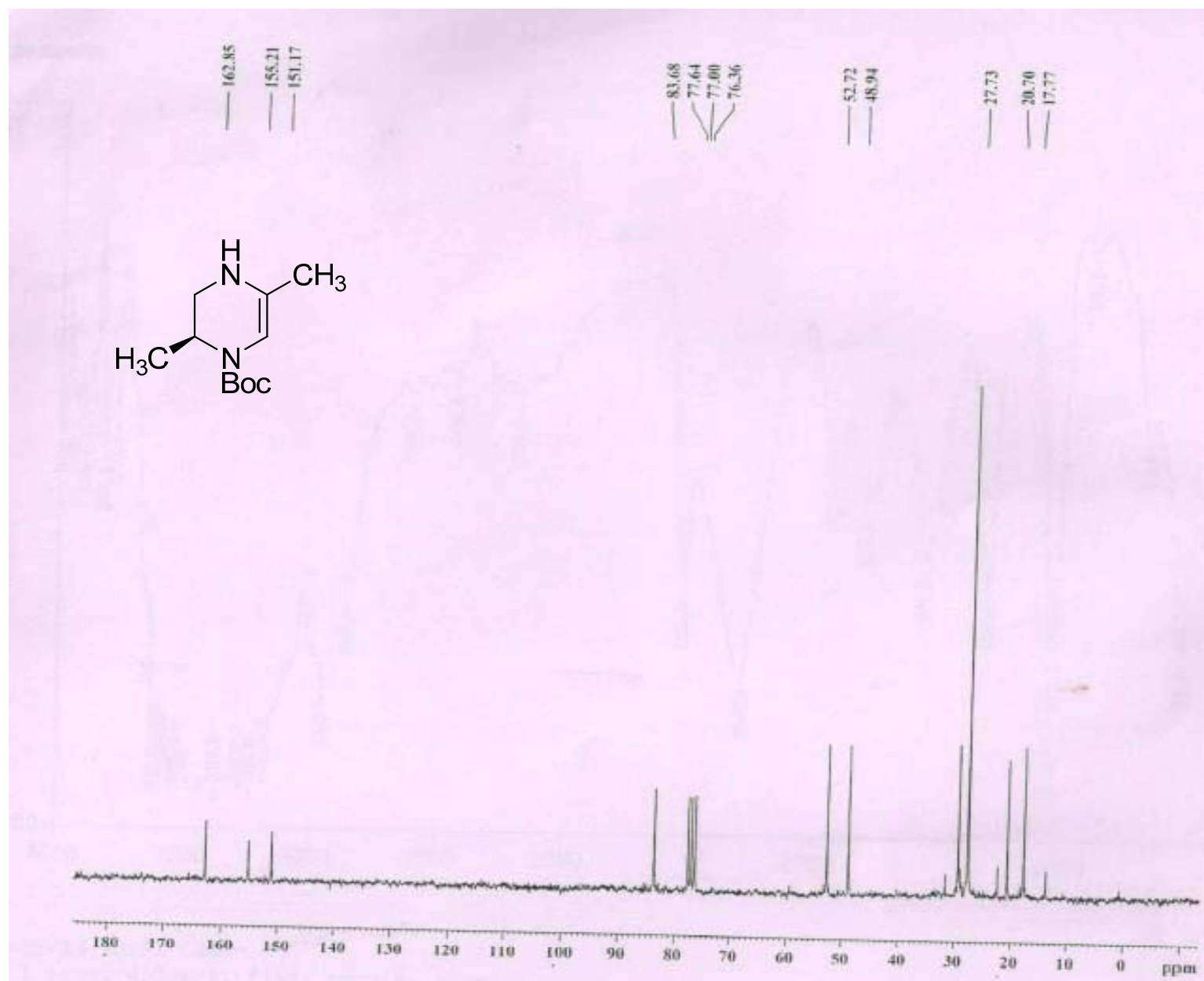
FigureS-34: ^1H spectrum (300 MHz, CDCl_3) of **8b**.



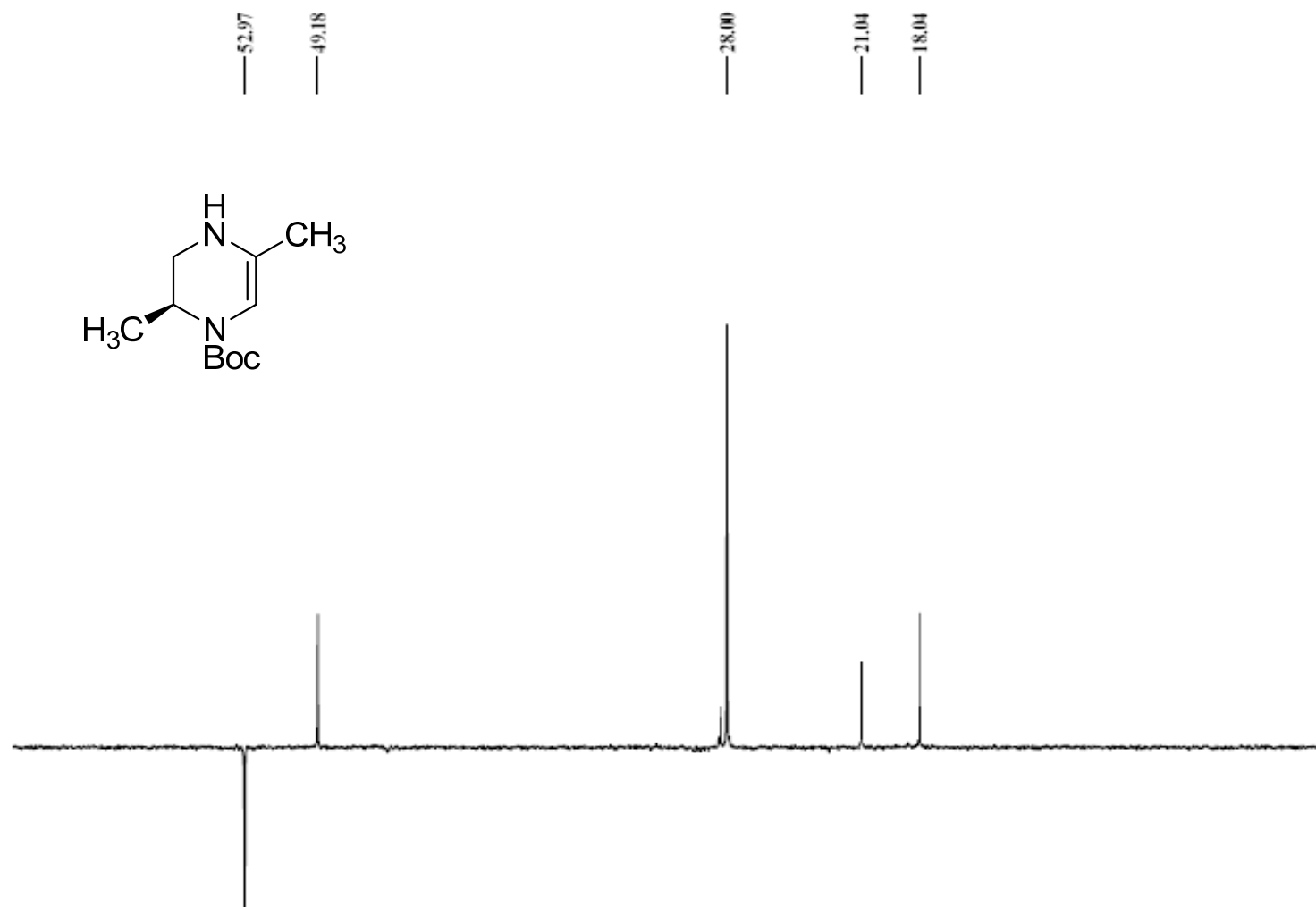
FigureS-35: ^{13}C spectrum (75 MHz, CDCl_3) of **8b**.



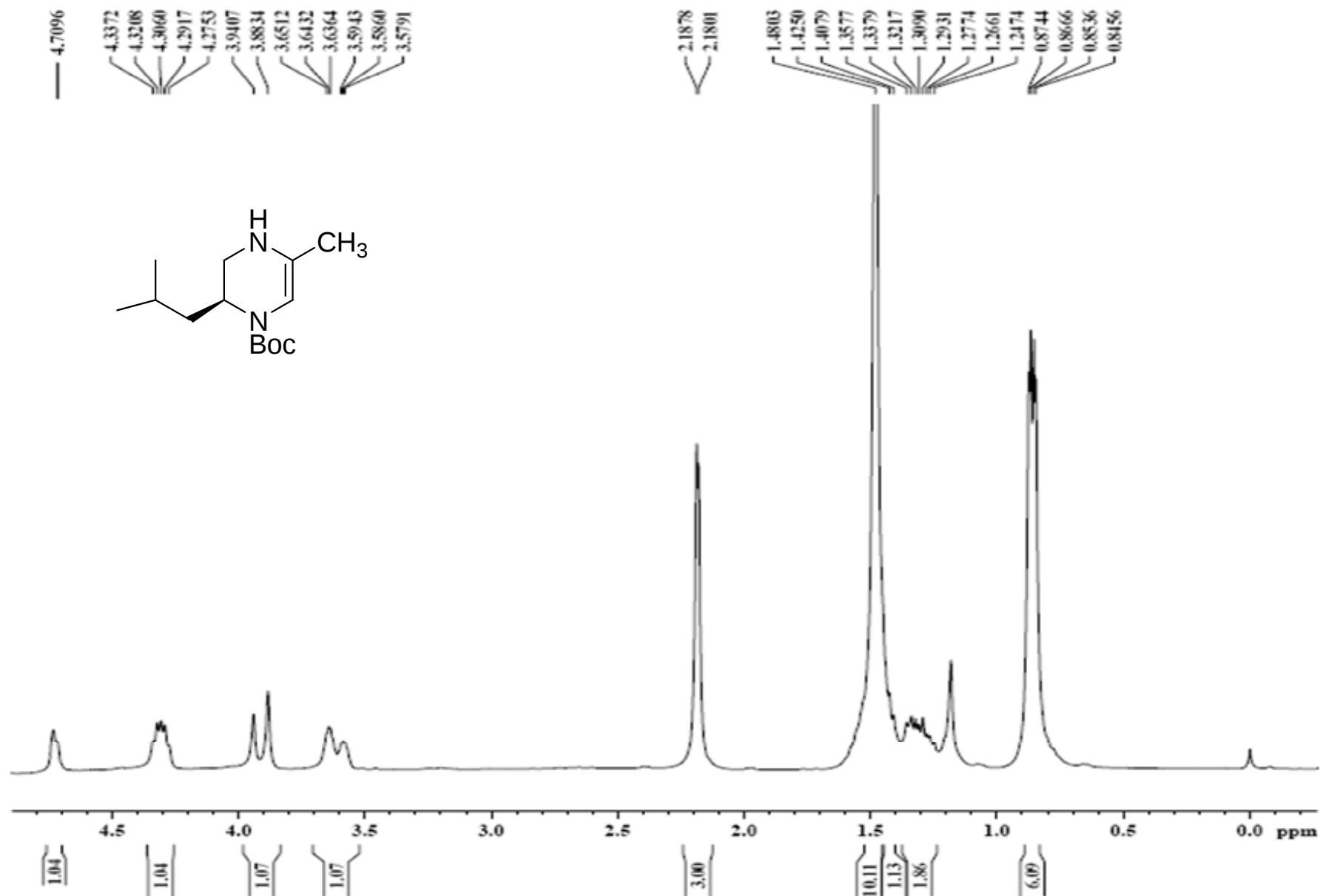
FigureS-36: ^1H spectrum (300 MHz, CDCl_3) of **8c**.



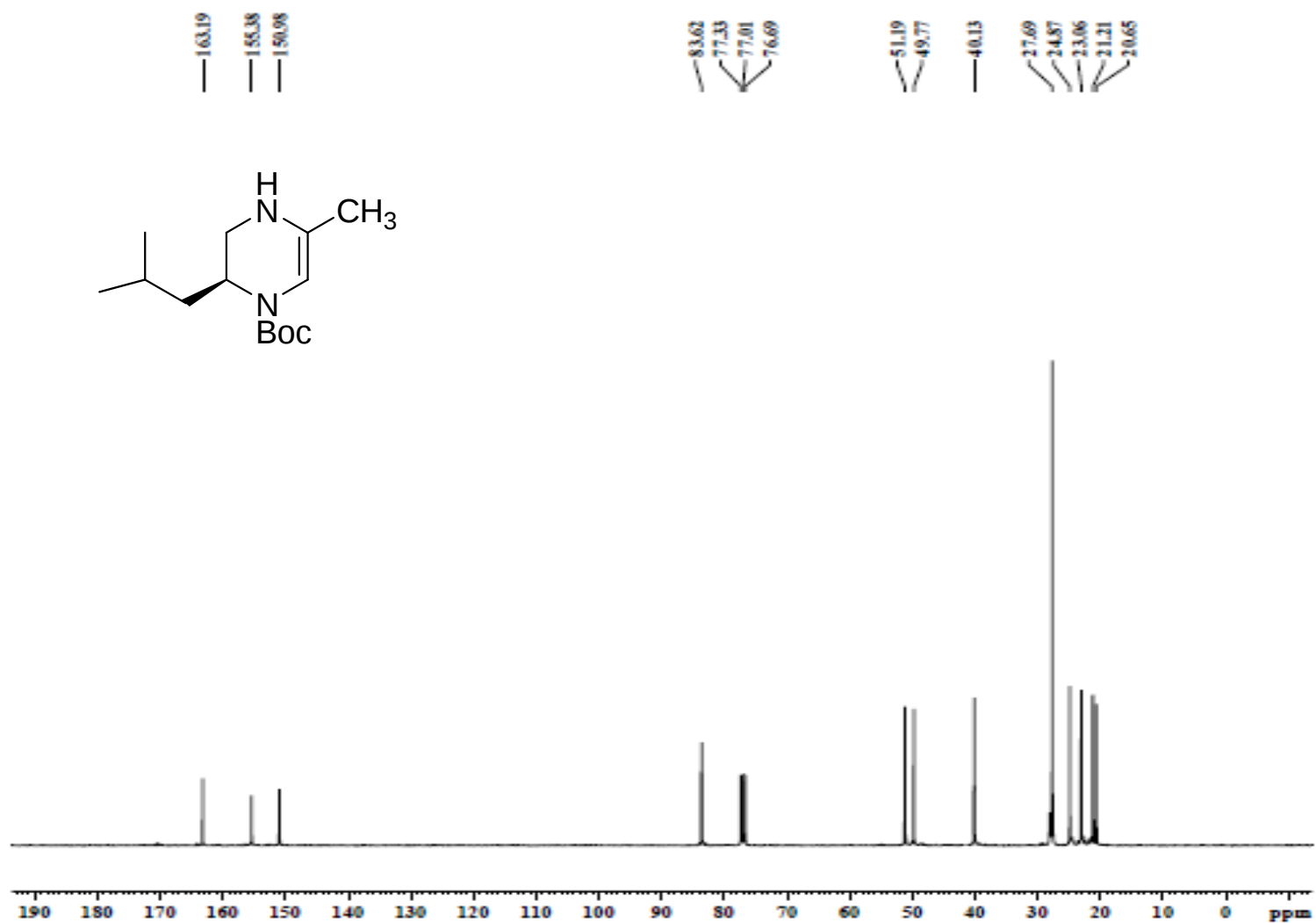
FigureS-37: ^{13}C spectrum (75 MHz, CDCl_3) of **8c**.



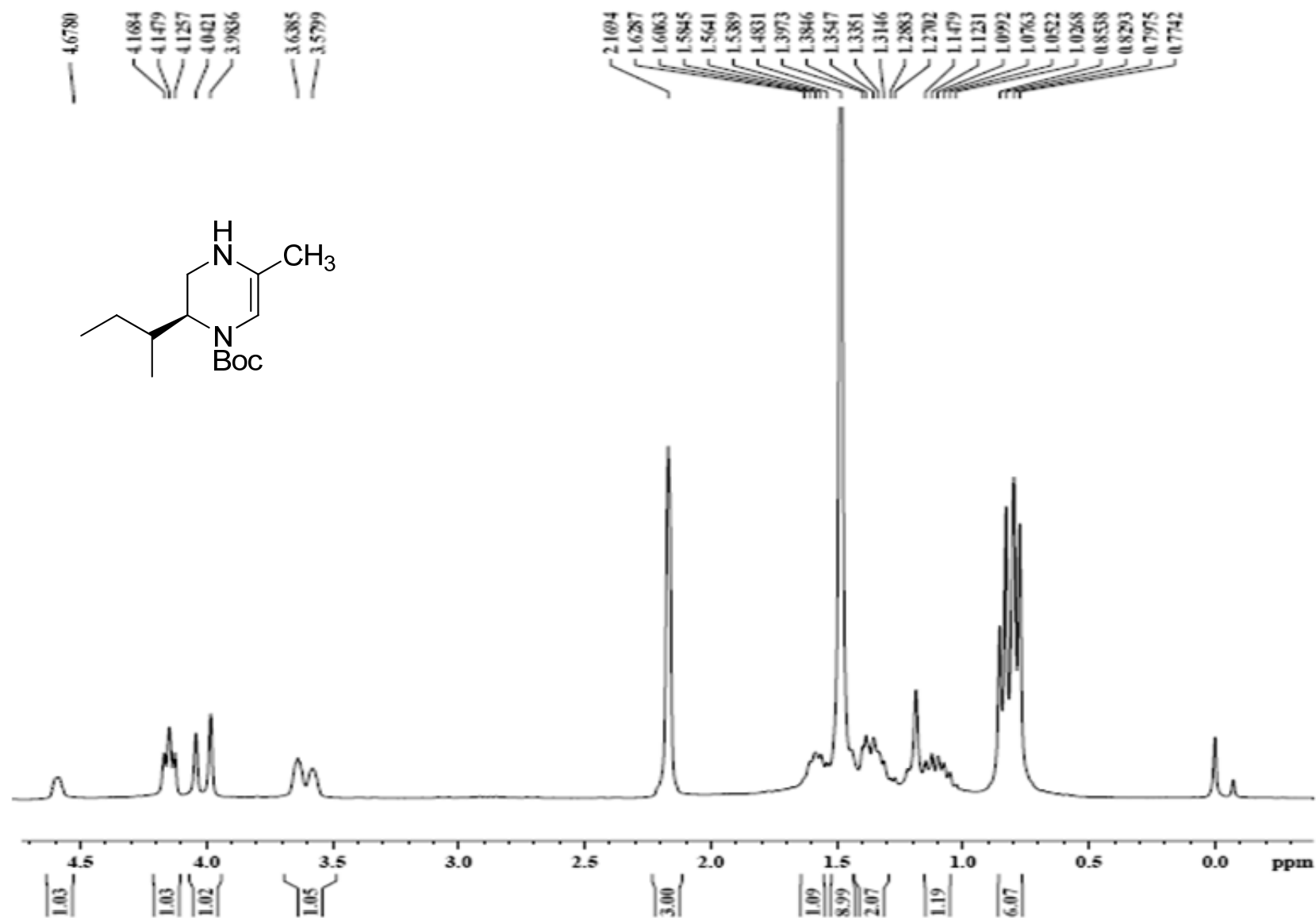
FigureS-38: DEPT 135 NMR spectra of **8c** (75 MHz, CDCl_3).



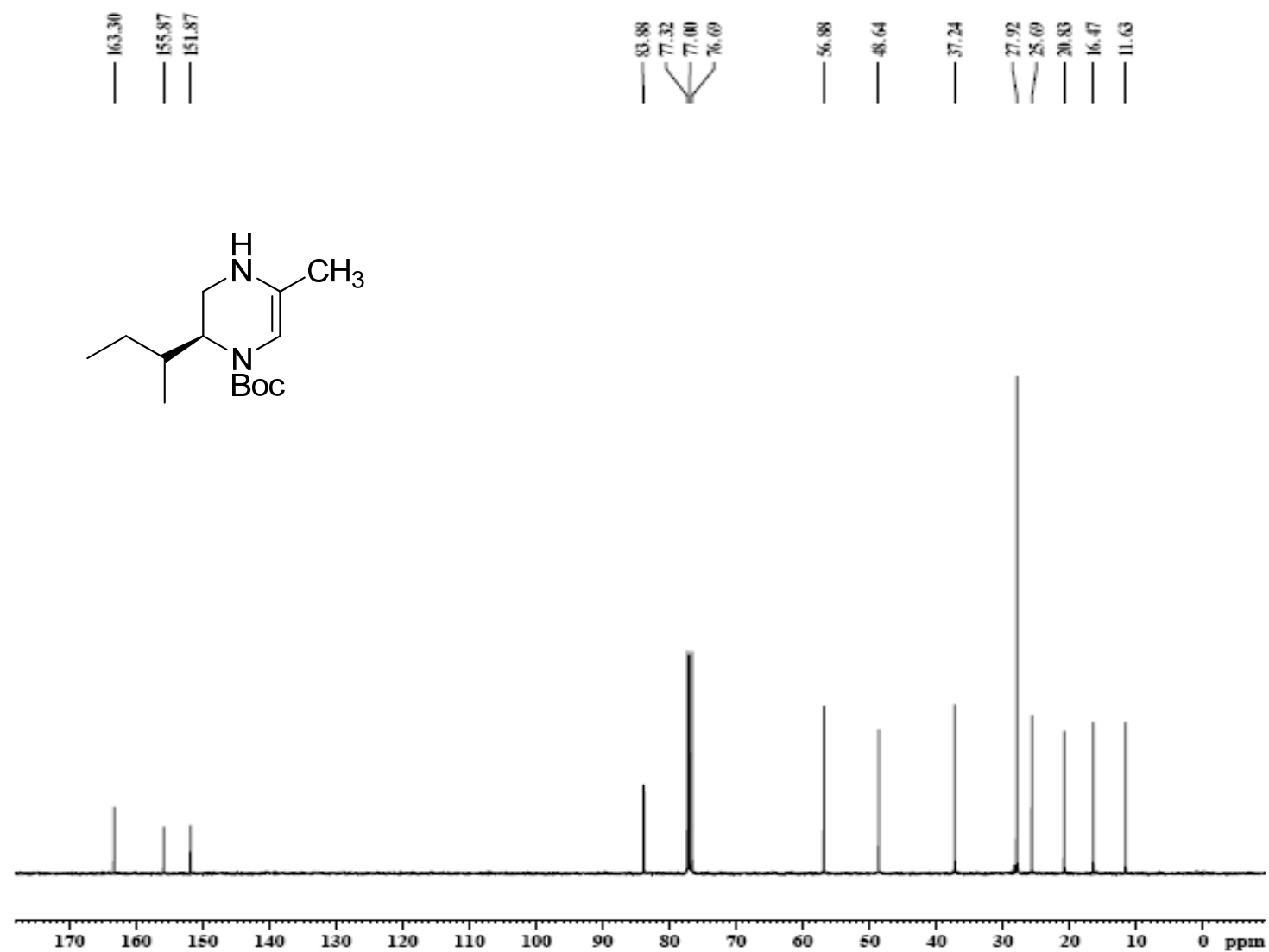
FigureS-39: ¹H spectrum (300 MHz, CDCl₃) of **8d**.



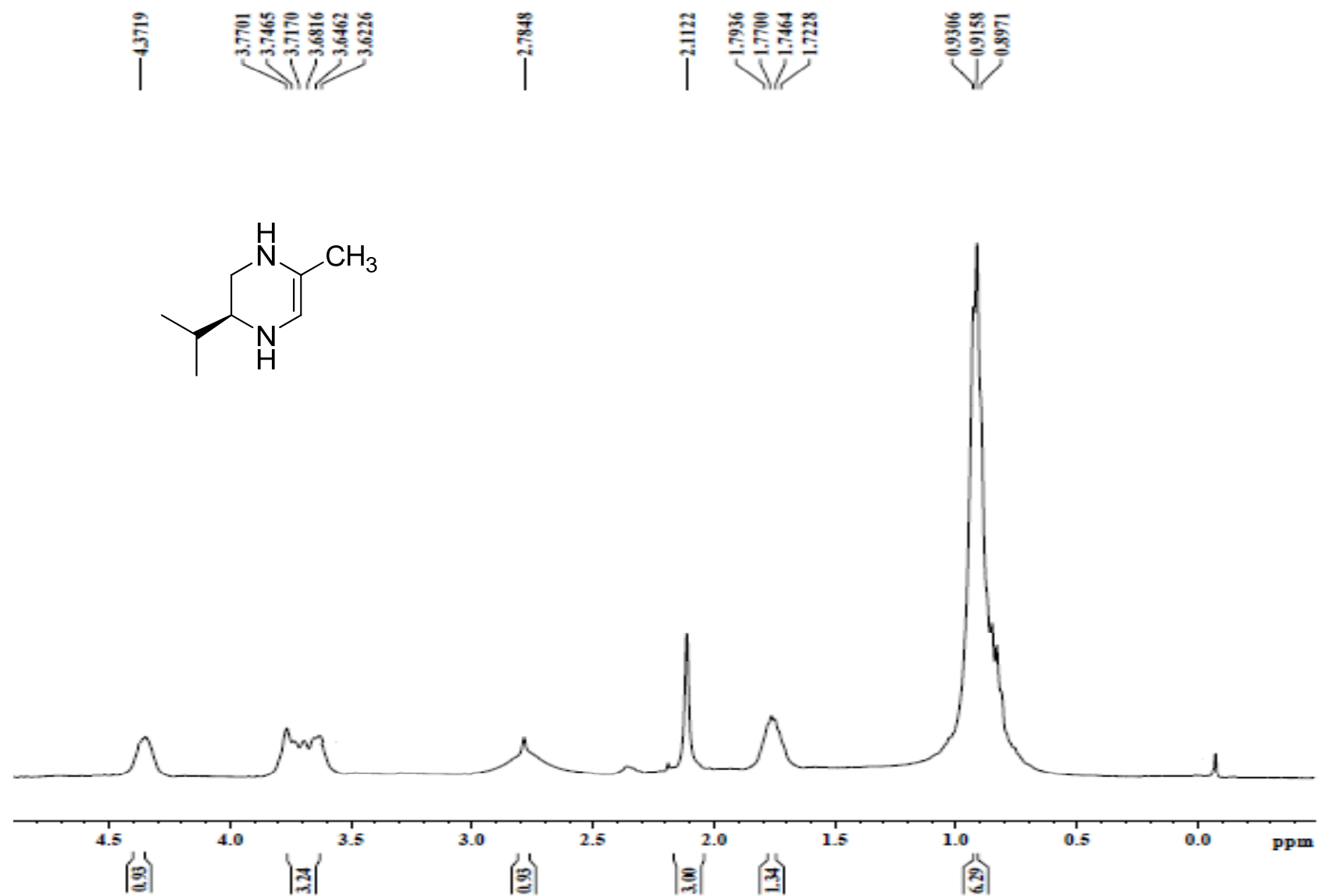
FigureS-40: ^{13}C spectrum (75 MHz, CDCl_3) of **8d**.



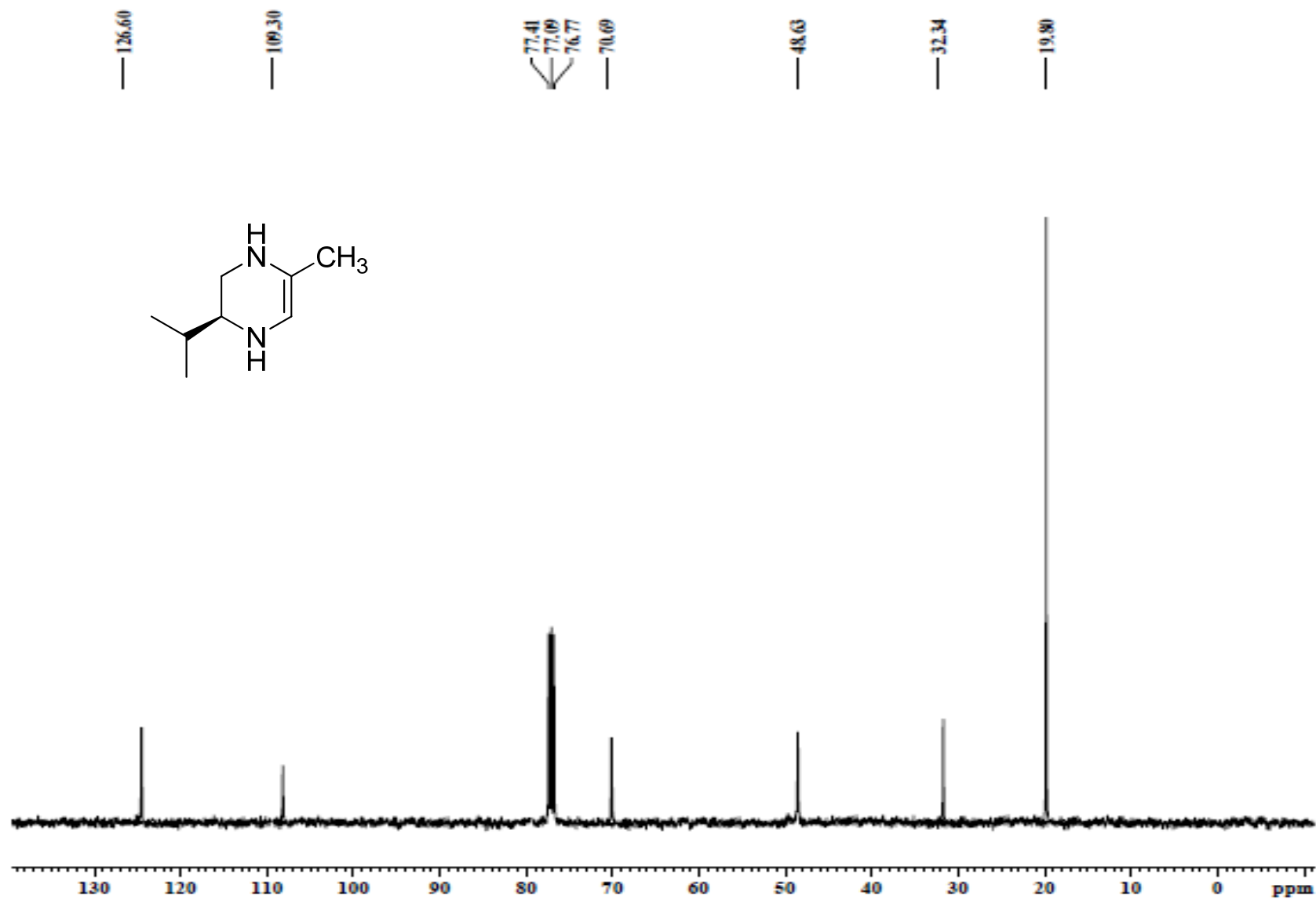
FigureS-41: ¹H spectrum (300 MHz, CDCl₃) of **8e**.



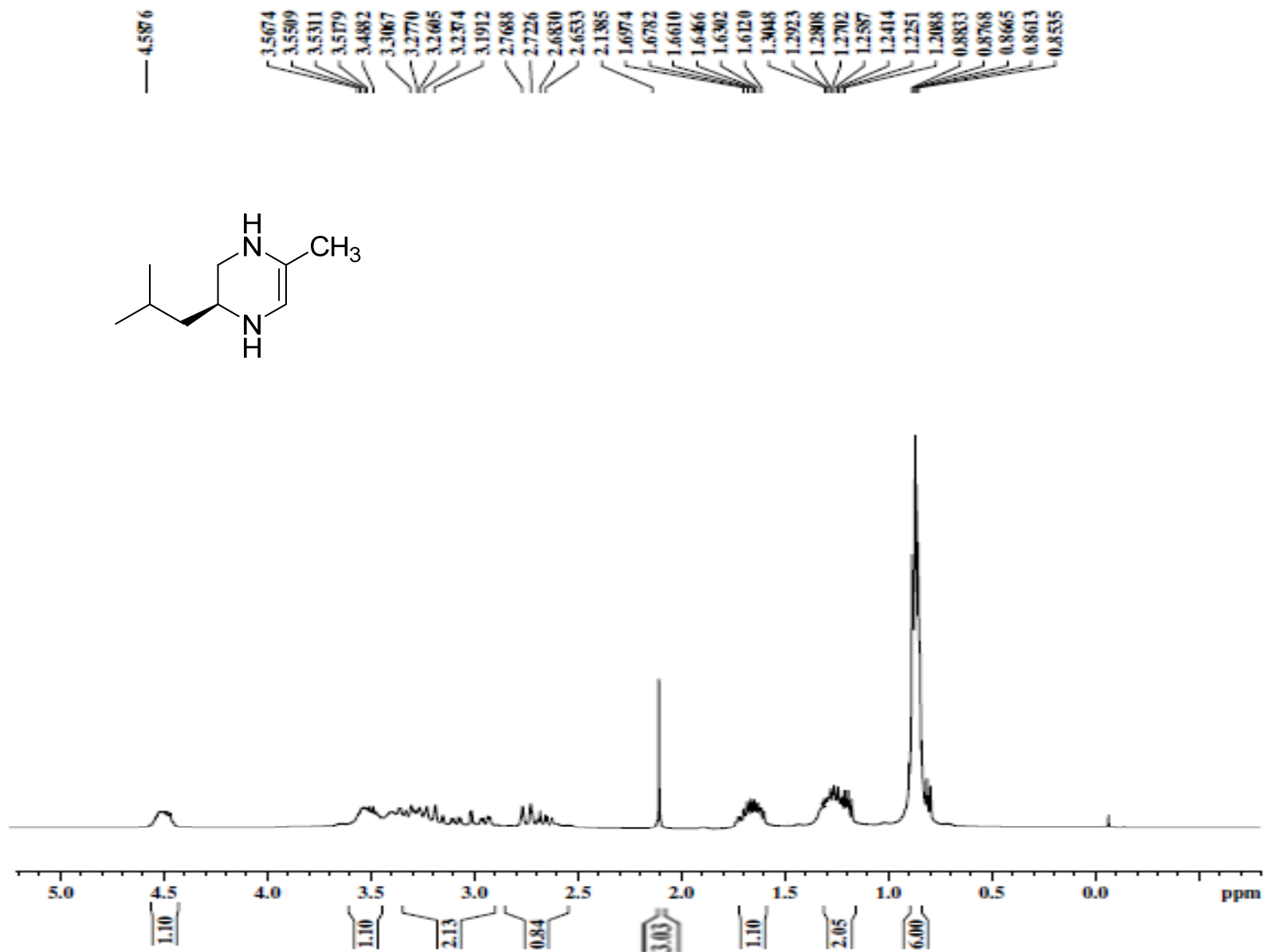
FigureS-42: ¹³C spectrum (75 MHz, CDCl₃) of **8e**.



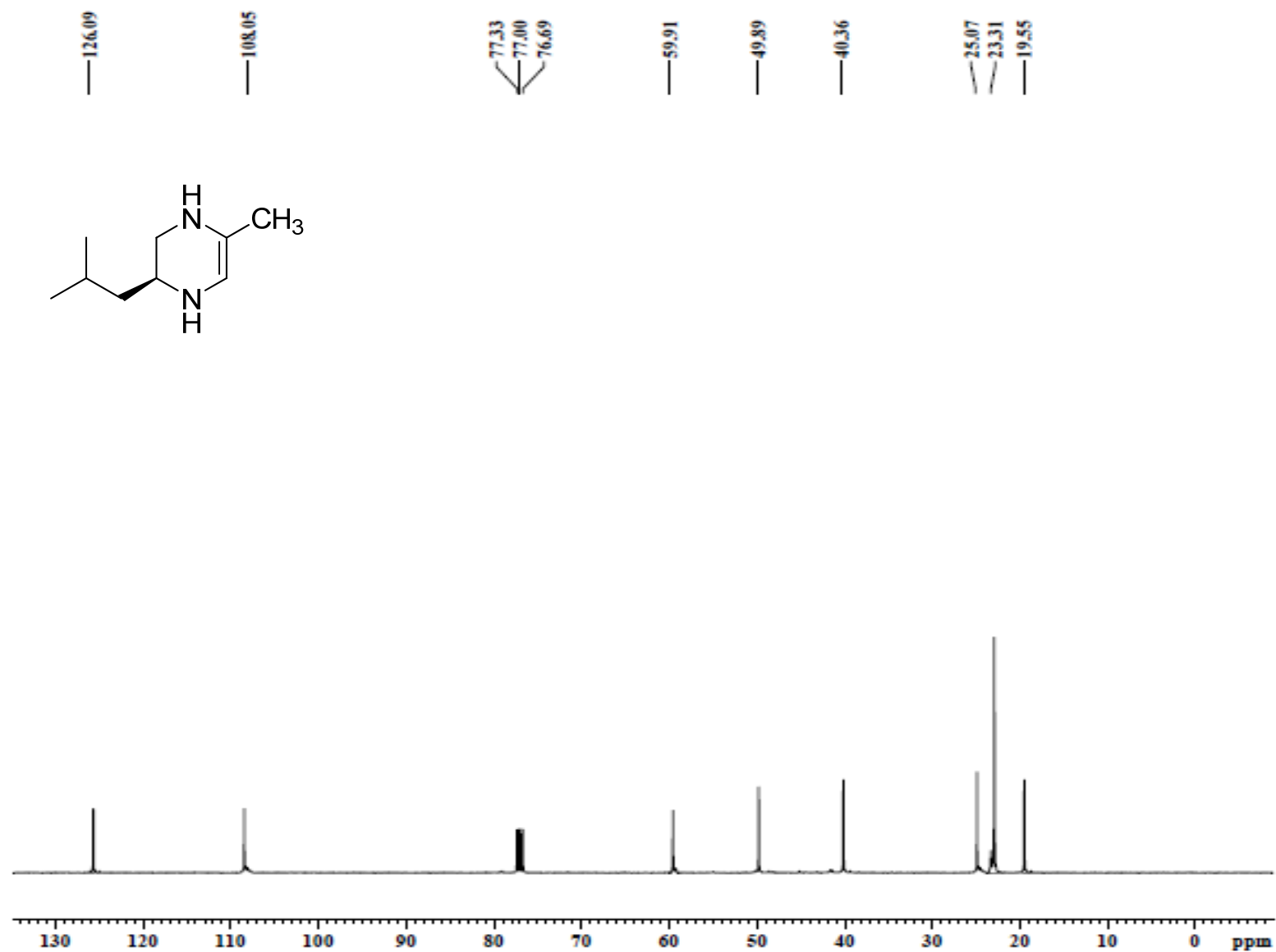
FigureS-43: ¹H spectrum (300 MHz, CDCl₃) of 9a.



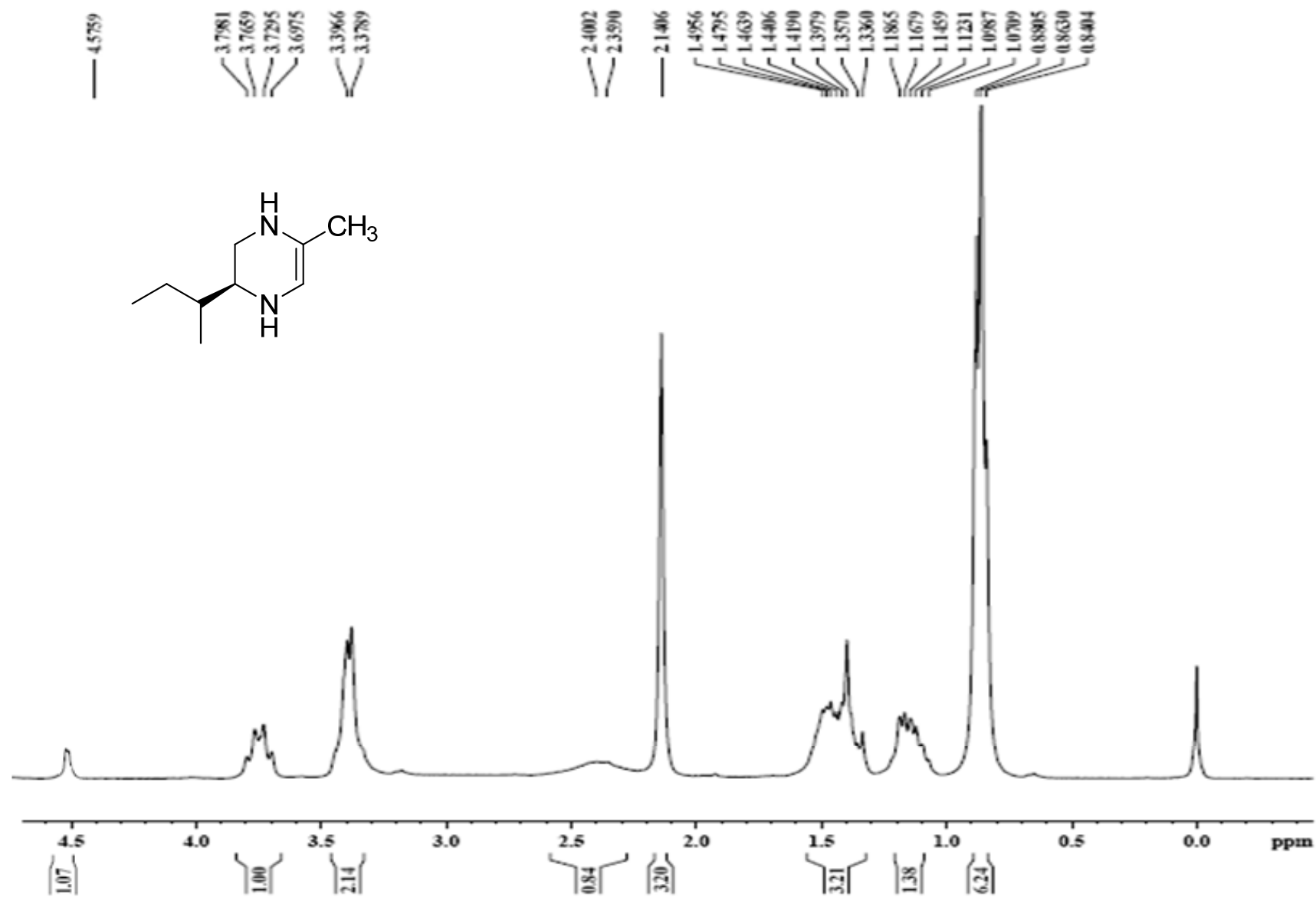
FigureS-44: ^{13}C spectrum (75 MHz, CDCl_3) of 9a.



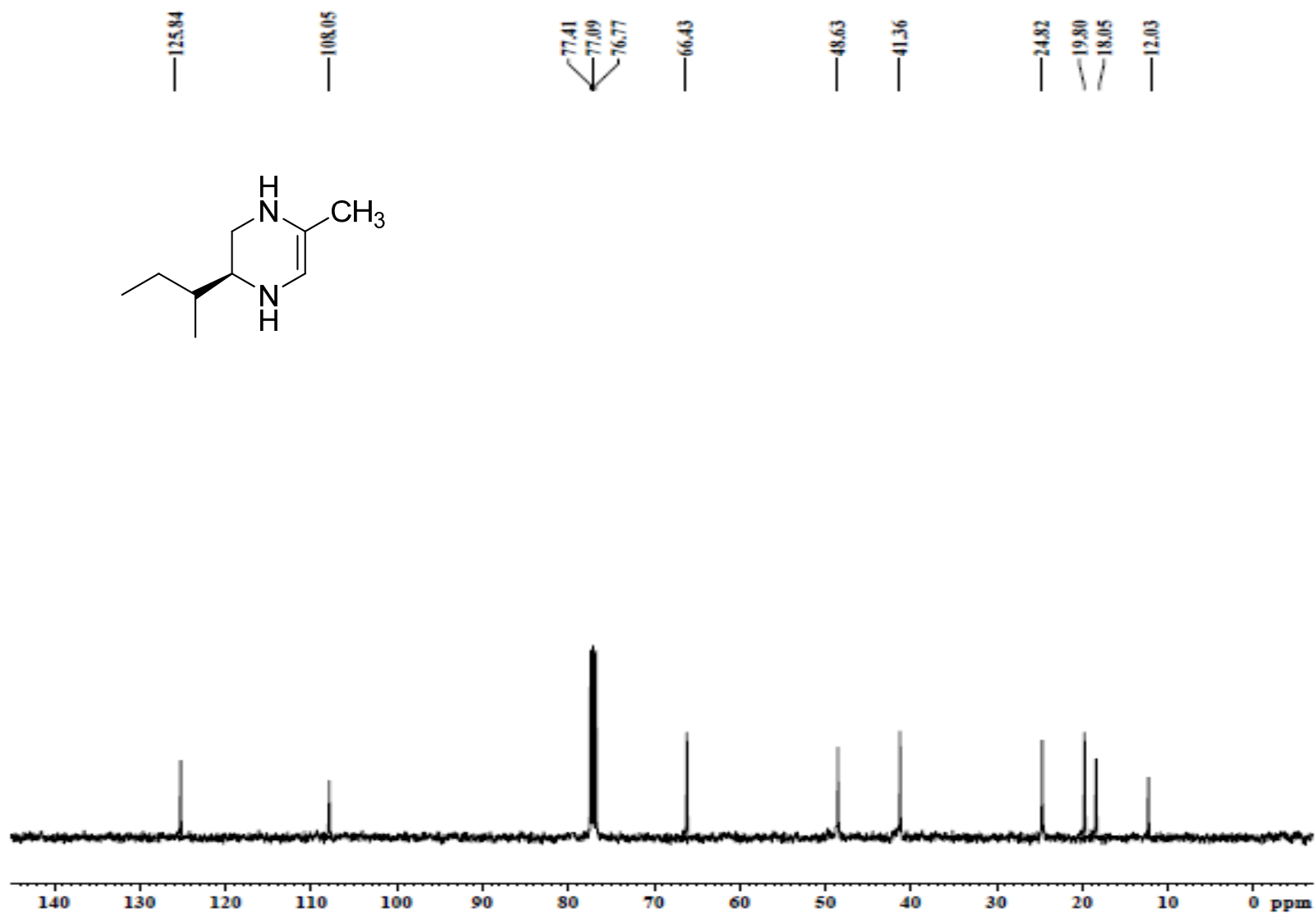
FigureS-45: ¹H spectrum (300 MHz, CDCl₃) of 9d.



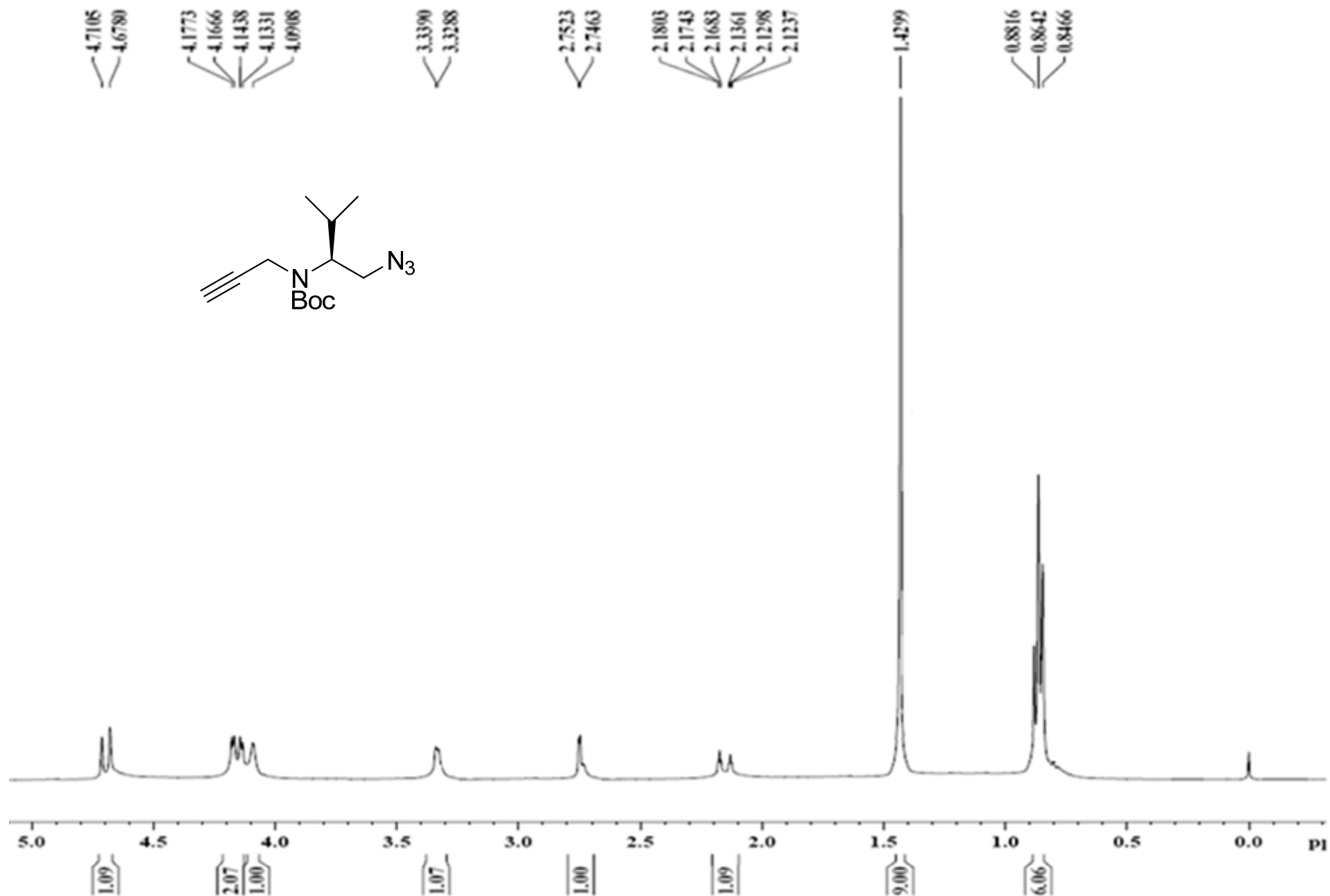
FigureS-46: ^{13}C spectrum (75 MHz, CDCl_3) of **9d**.



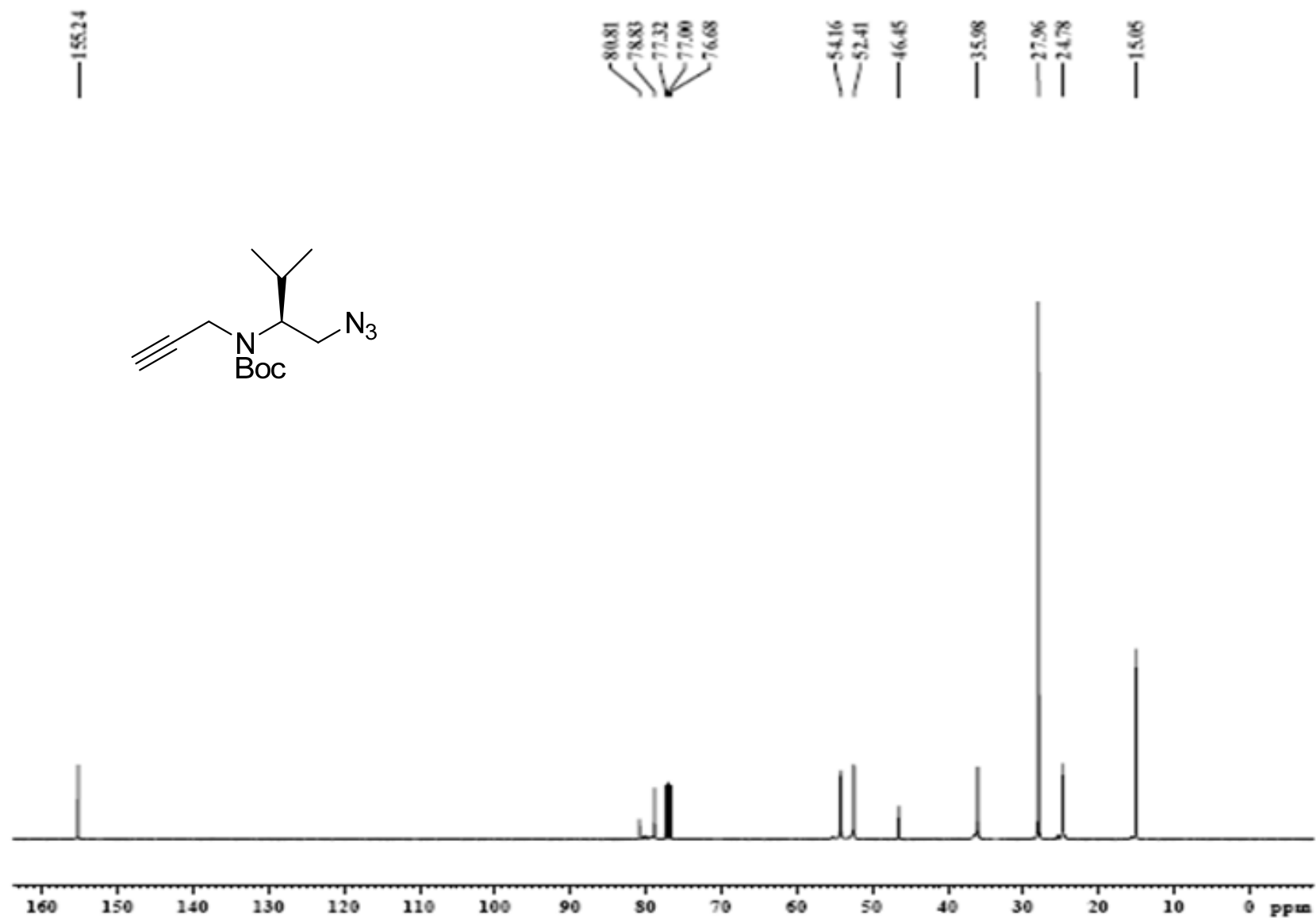
FigureS-47: ¹H spectrum (300 MHz, CDCl₃) of **9e**.



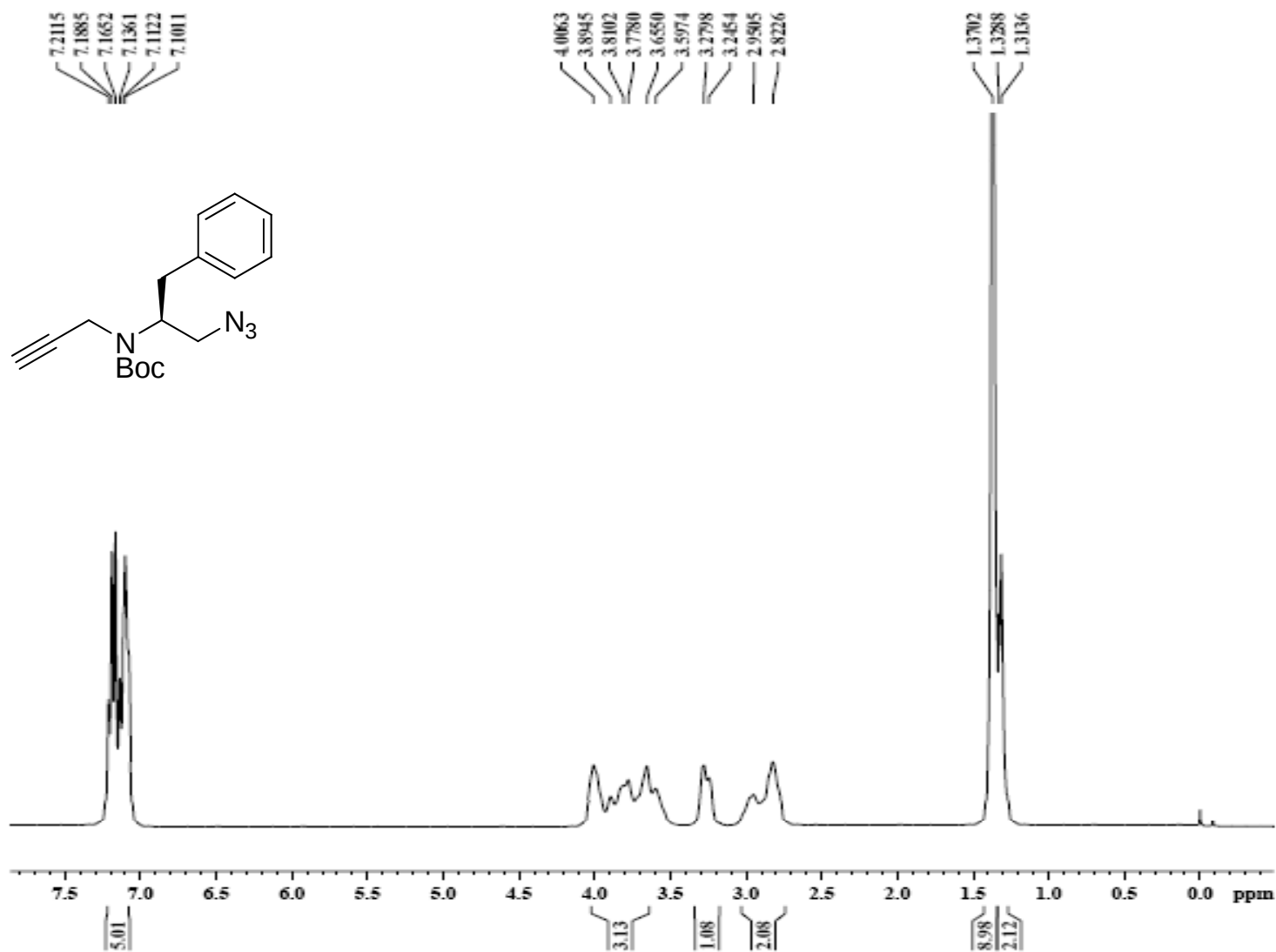
FigureS-48: ^{13}C spectrum (75 MHz, CDCl_3) of 9e.



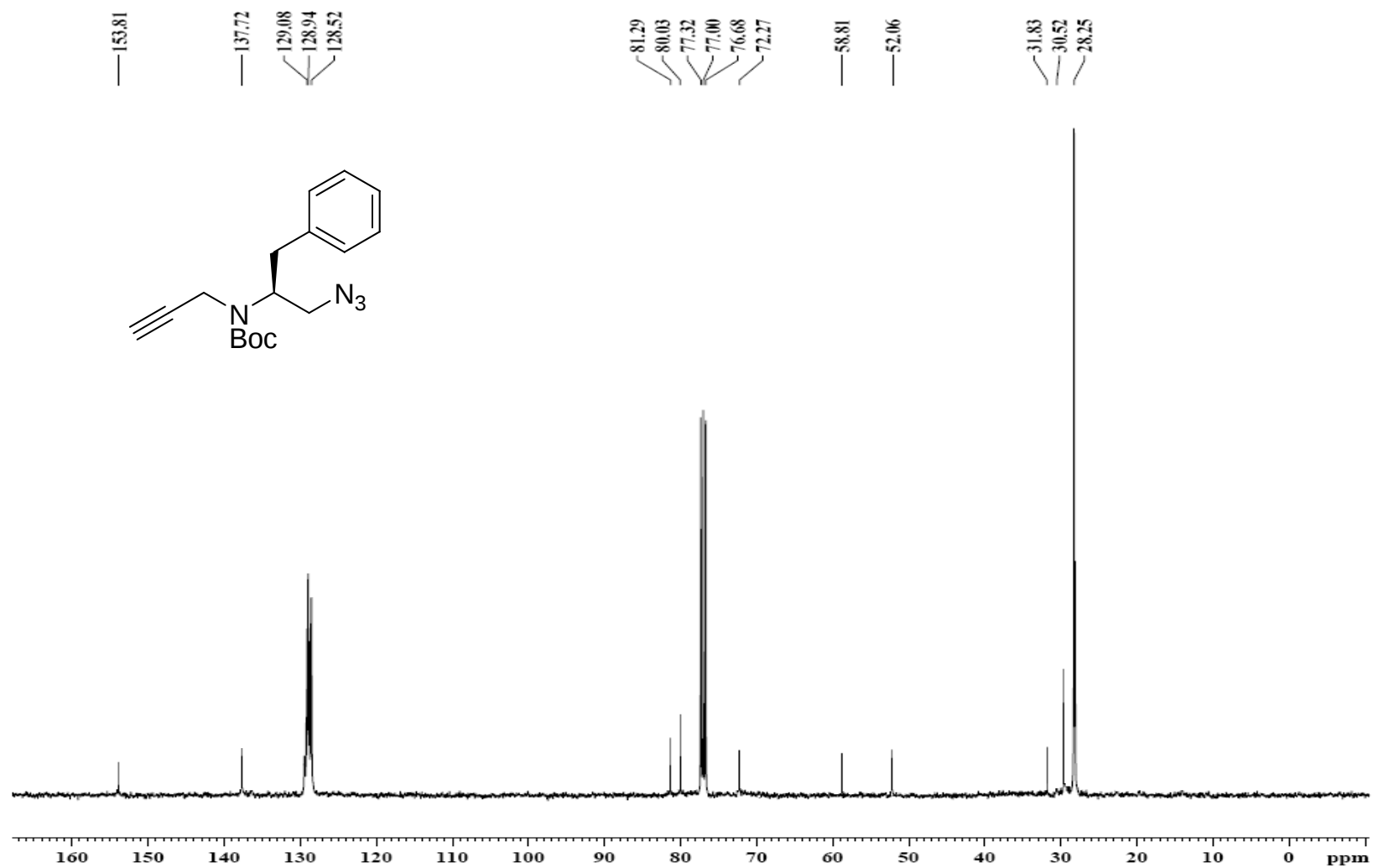
FigureS-49: ¹H spectrum (300 MHz, CDCl₃) of 10a.



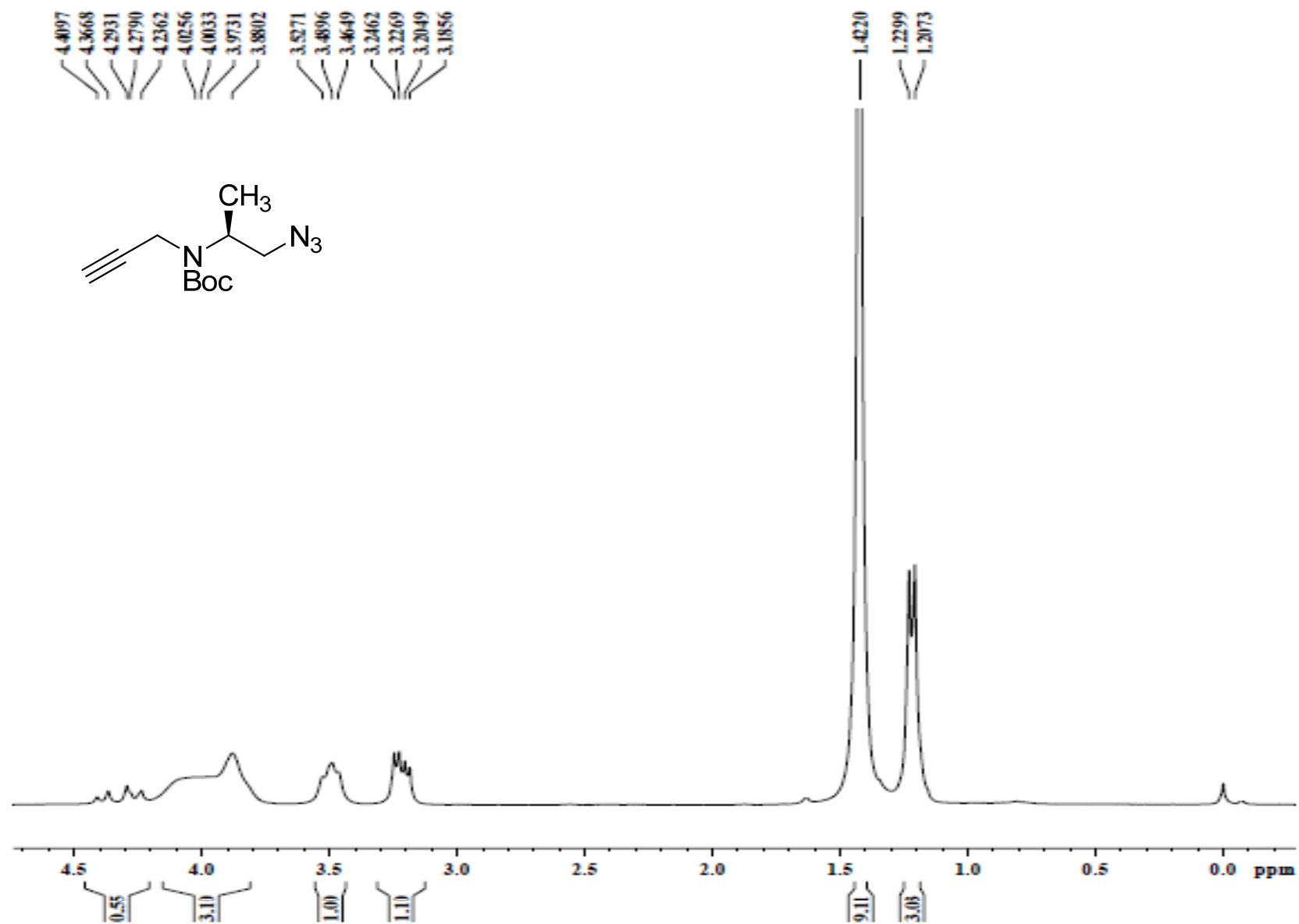
FigureS-50: ¹³C spectrum (75 MHz, CDCl₃) of **10a**.



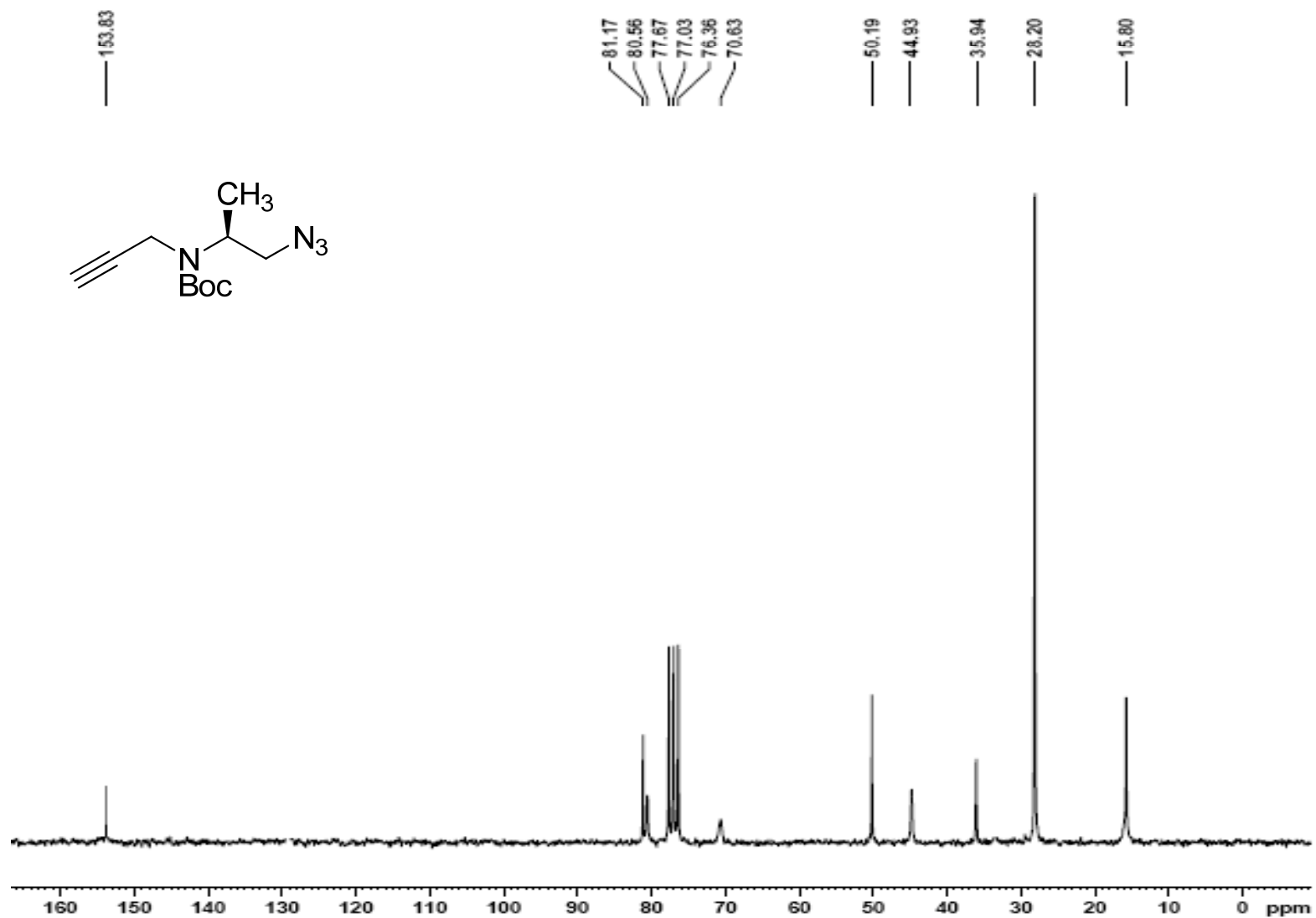
FigureS-51: ^1H spectrum (300 MHz, CDCl_3) of **10b**.



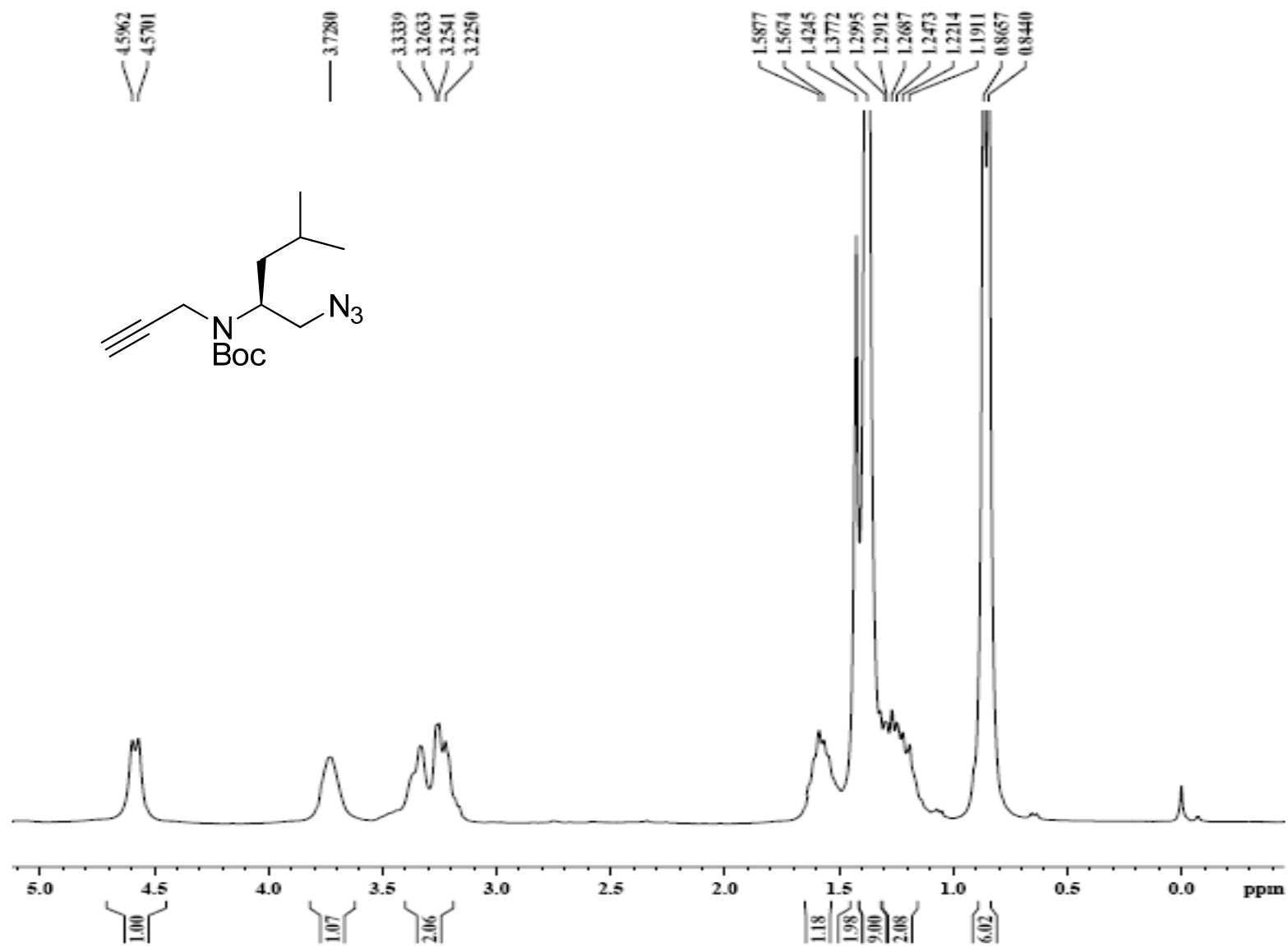
FigureS-52: ^{13}C spectrum (75 MHz, CDCl_3) of **10b**.



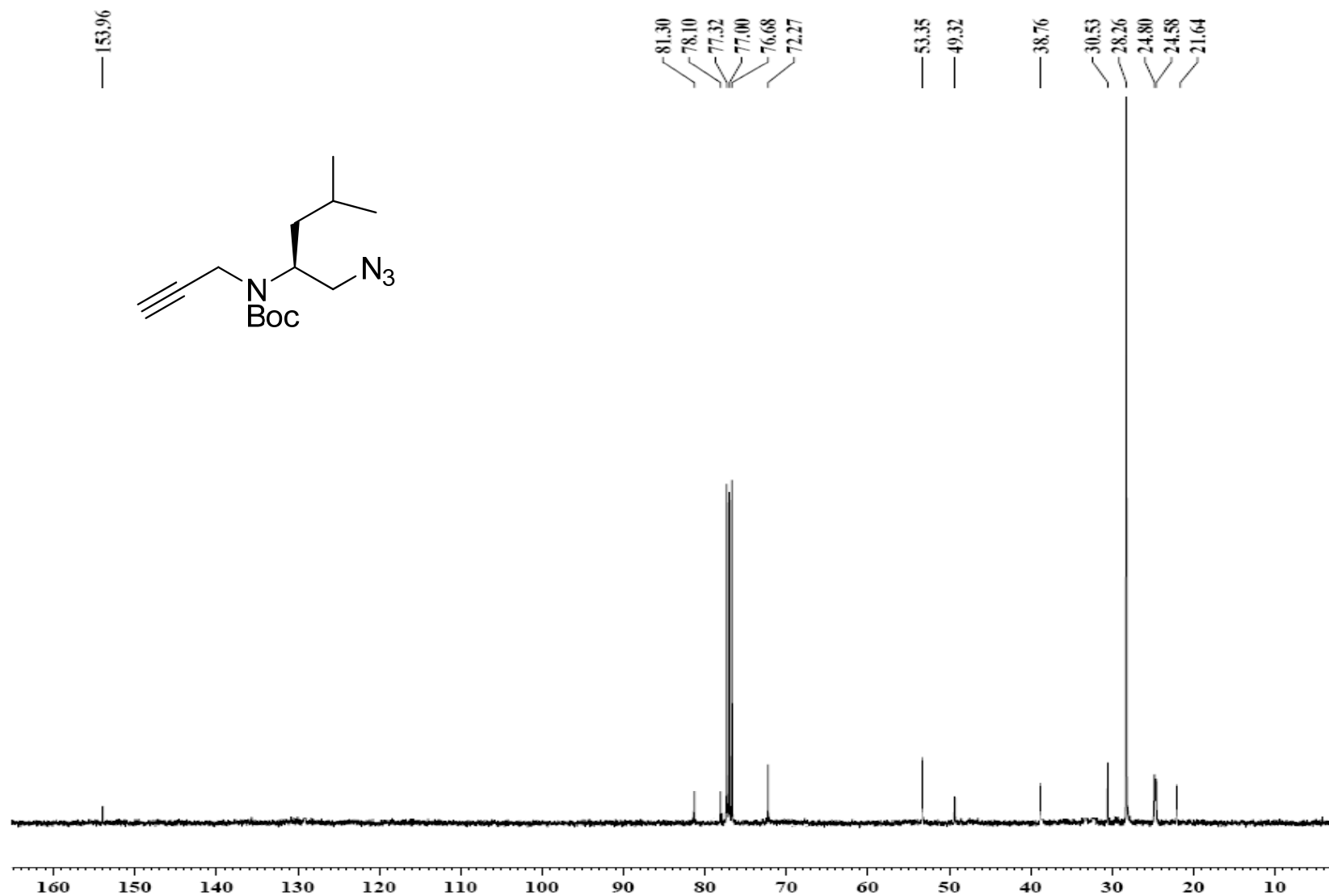
FigureS- 53: ^1H spectrum (300 MHz, CDCl_3) of **10c**.



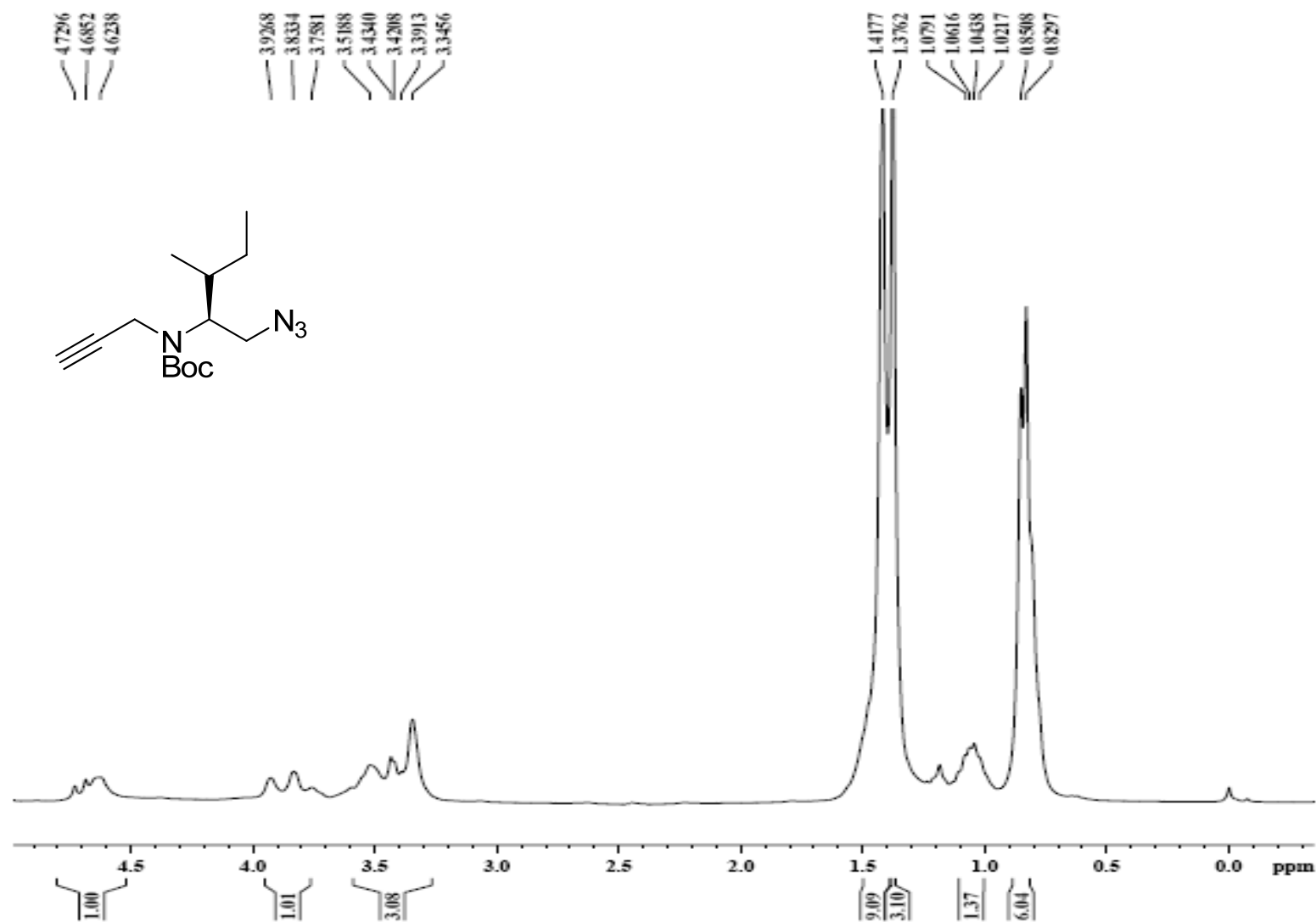
FigureS-54. ¹³C spectrum (75 MHz, CDCl₃) of **10c**.



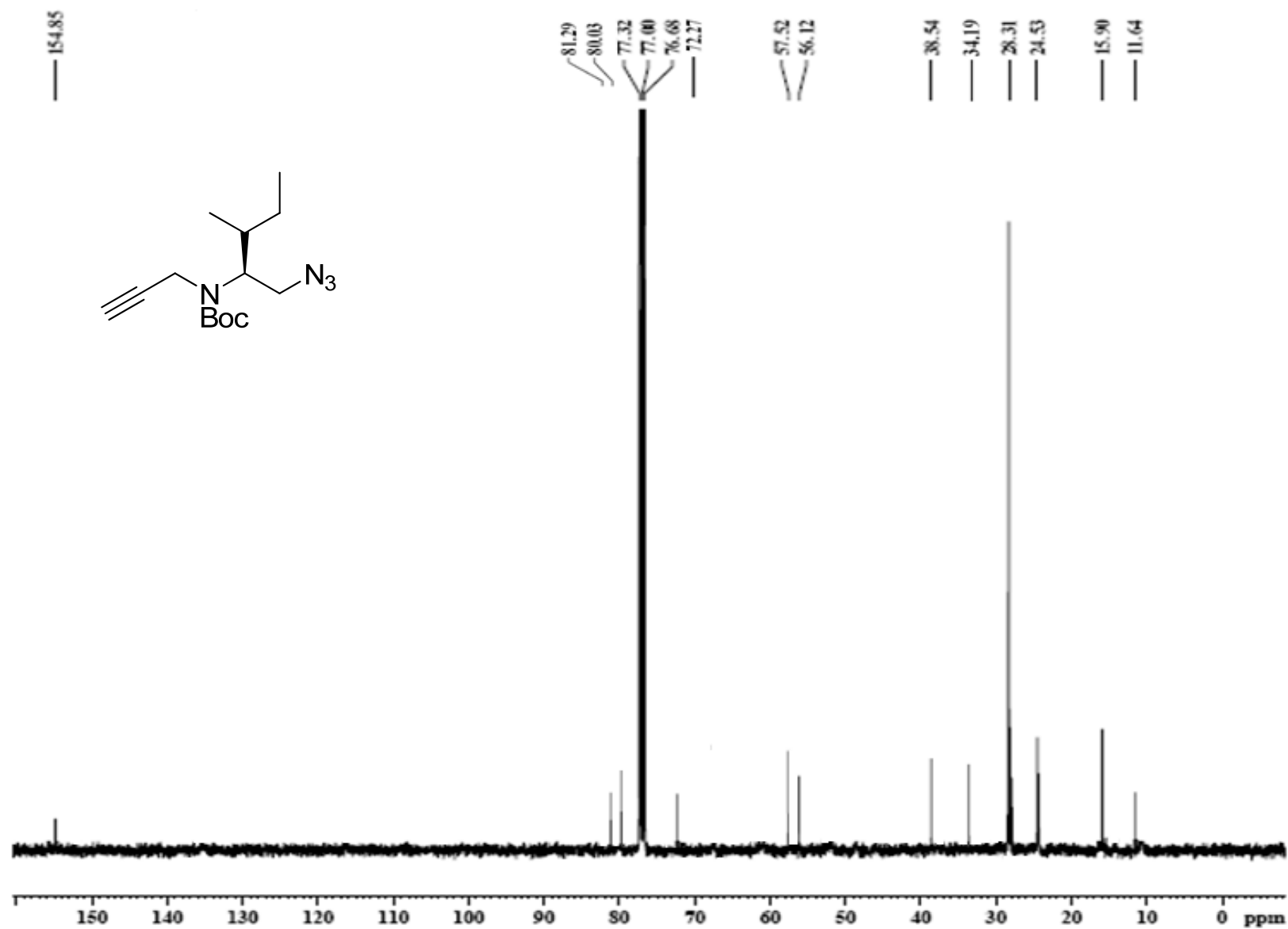
FigureS- 55: ¹H spectrum (300 MHz, CDCl₃) of **10d**.



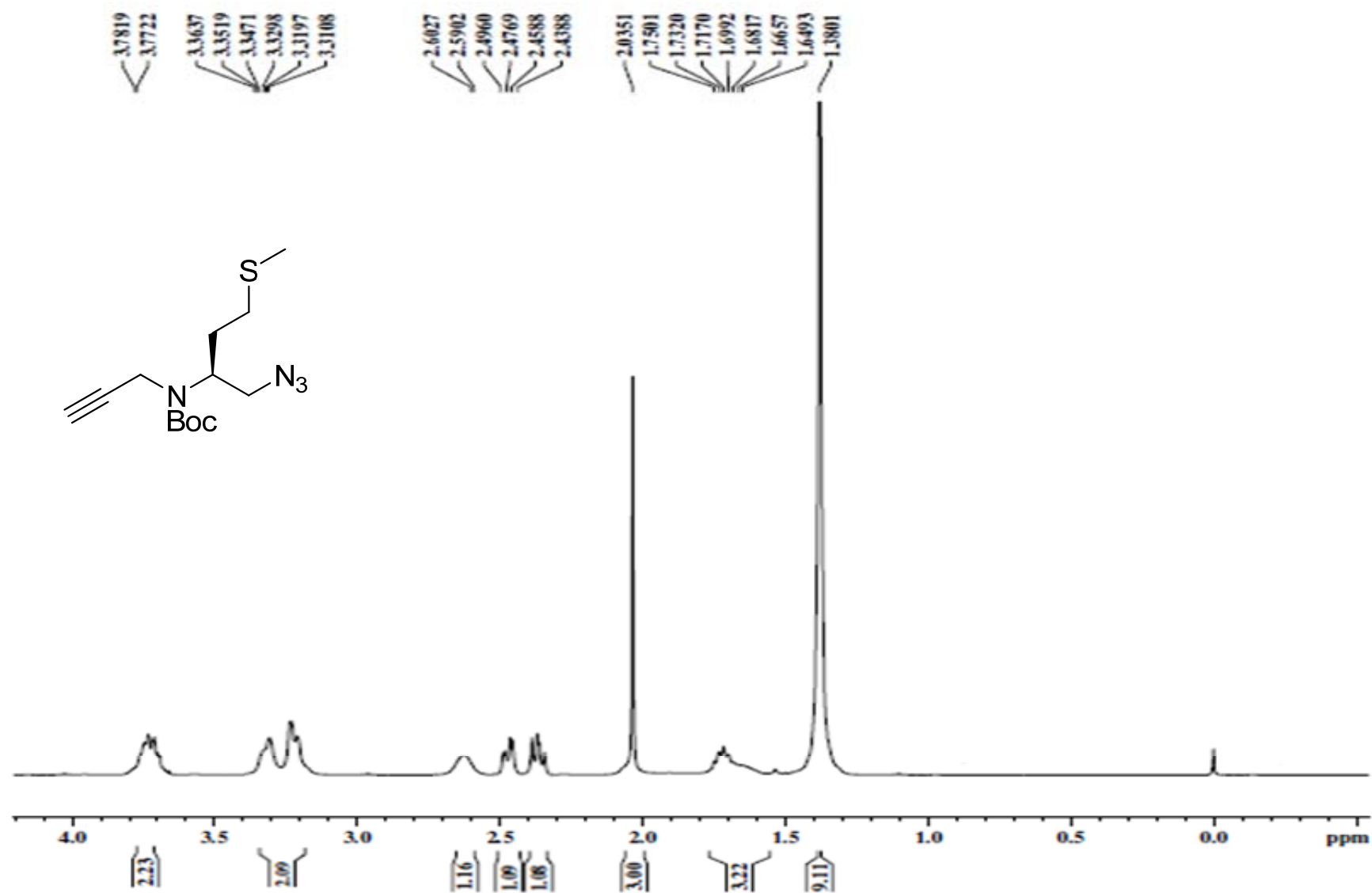
FigureS-56: ^{13}C spectrum (75 MHz, CDCl_3) of 10d.



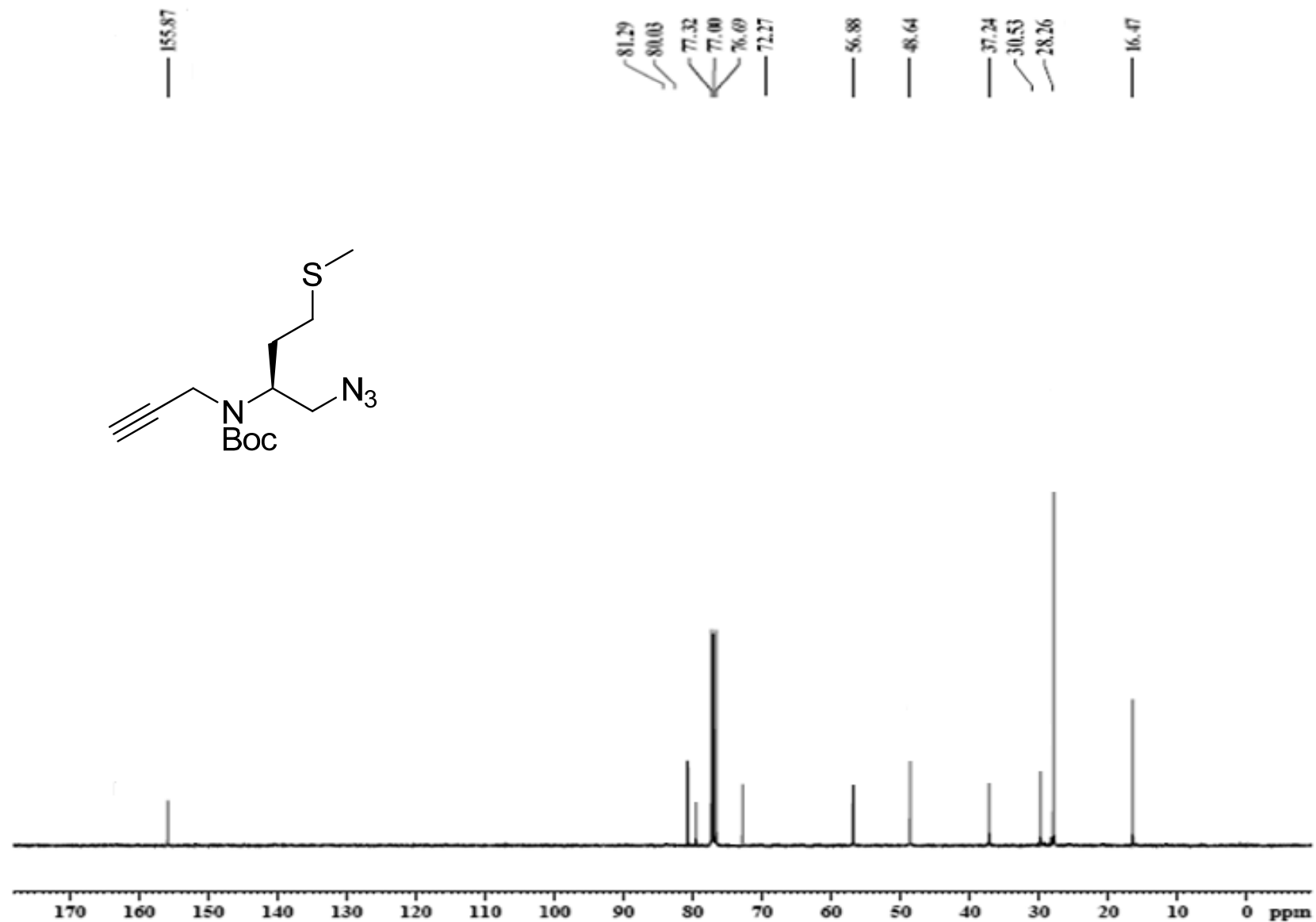
FigureS- 57: ¹H spectrum (300 MHz, CDCl₃) of **10e**.



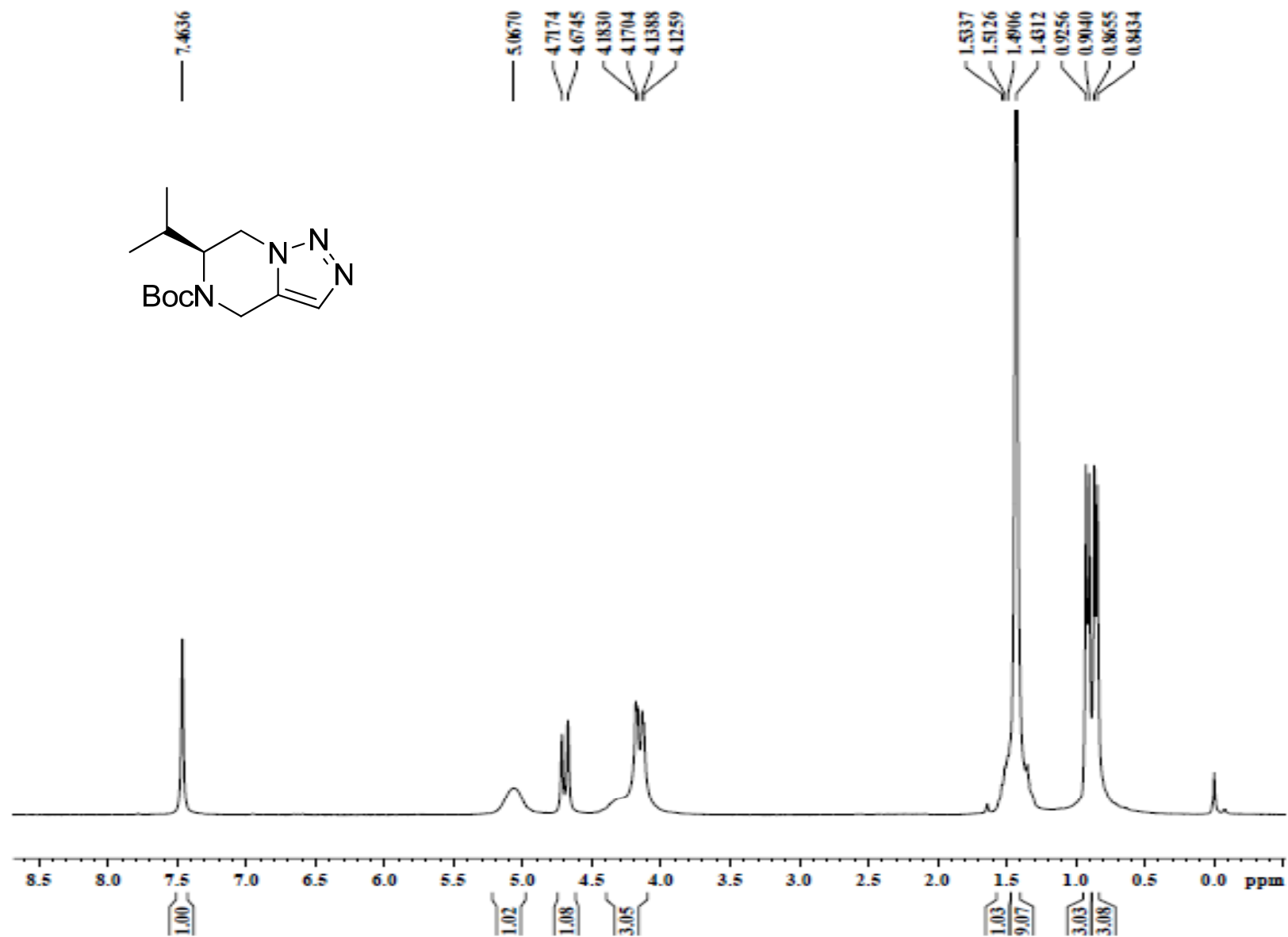
FigureS-58: ^{13}C spectrum (75 MHz, CDCl_3) of **10e**.



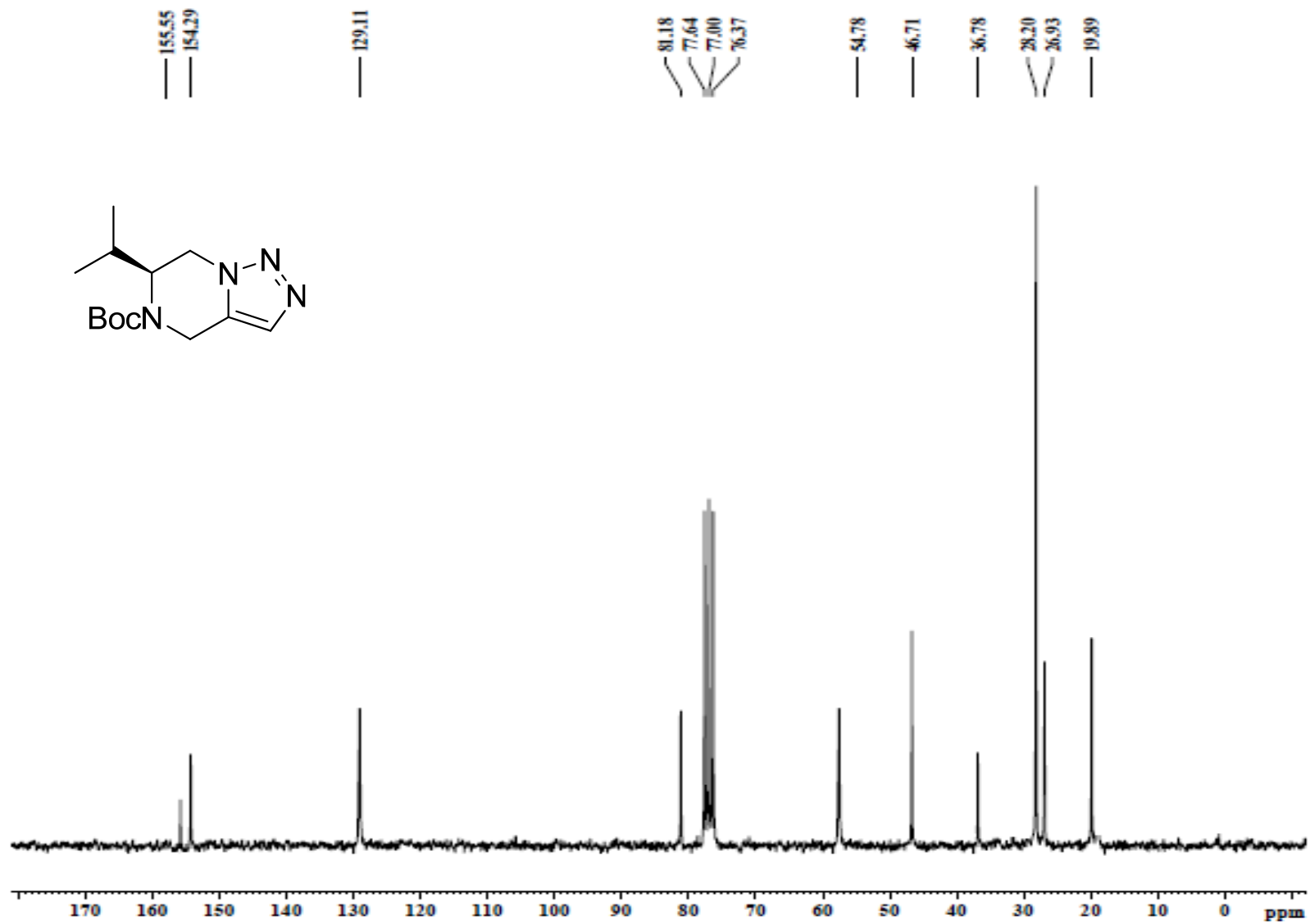
FigureS- 59: ¹H spectrum (300 MHz, CDCl₃) of **10f**.



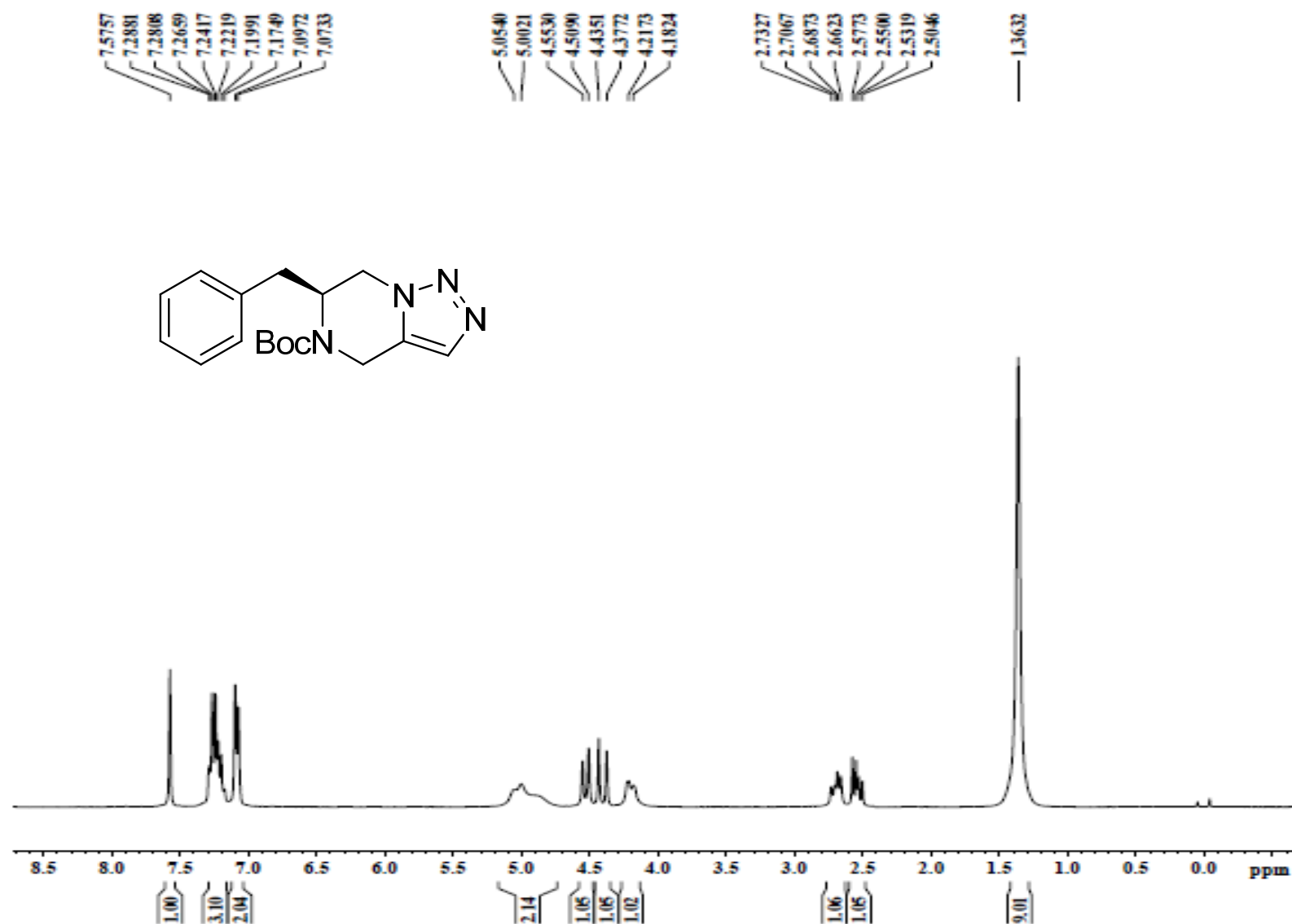
FigureS-60: ^{13}C spectrum (75 MHz, CDCl_3) of **10f**.



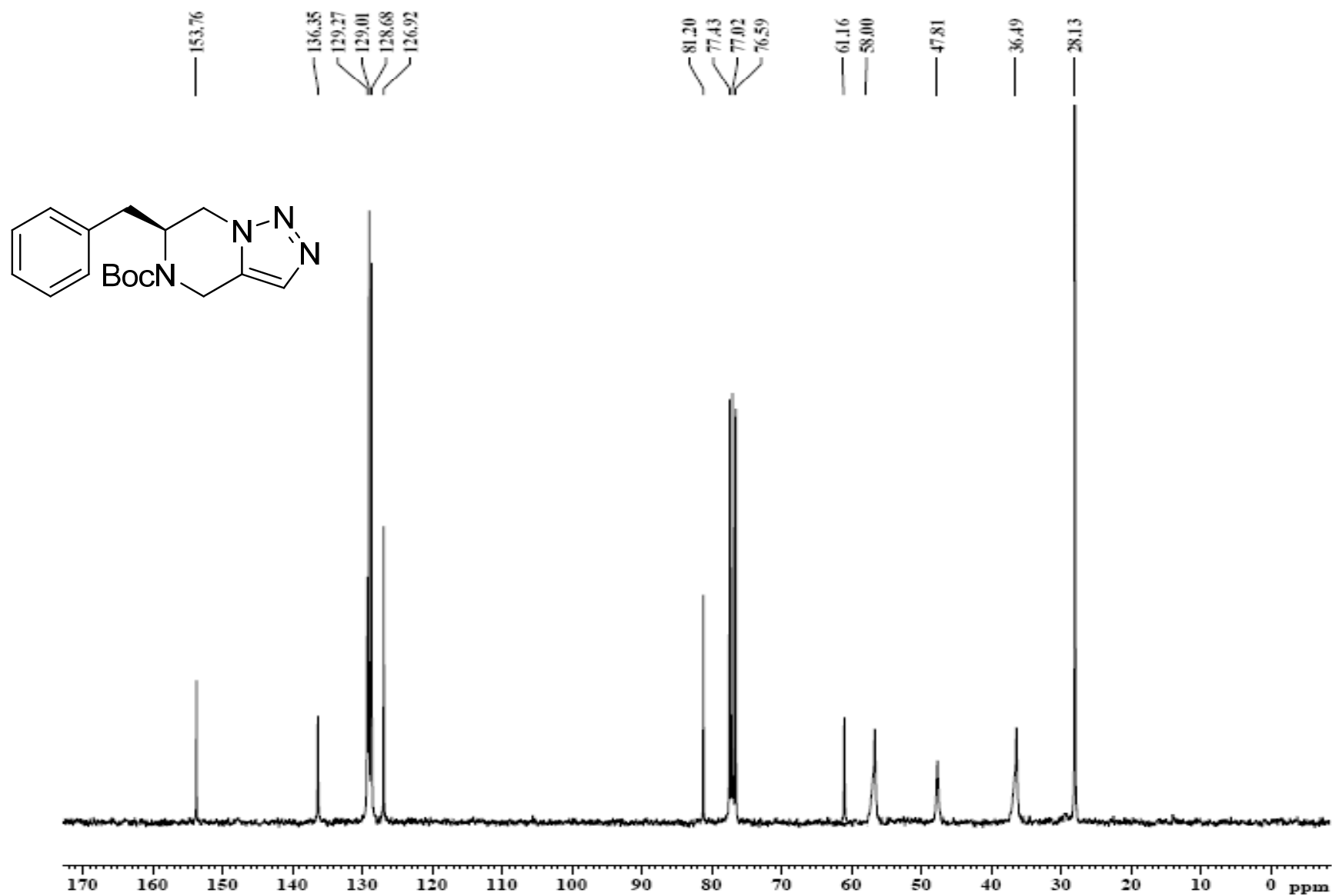
FigureS-61: ^1H spectrum (300 MHz, CDCl_3) of **11a**.



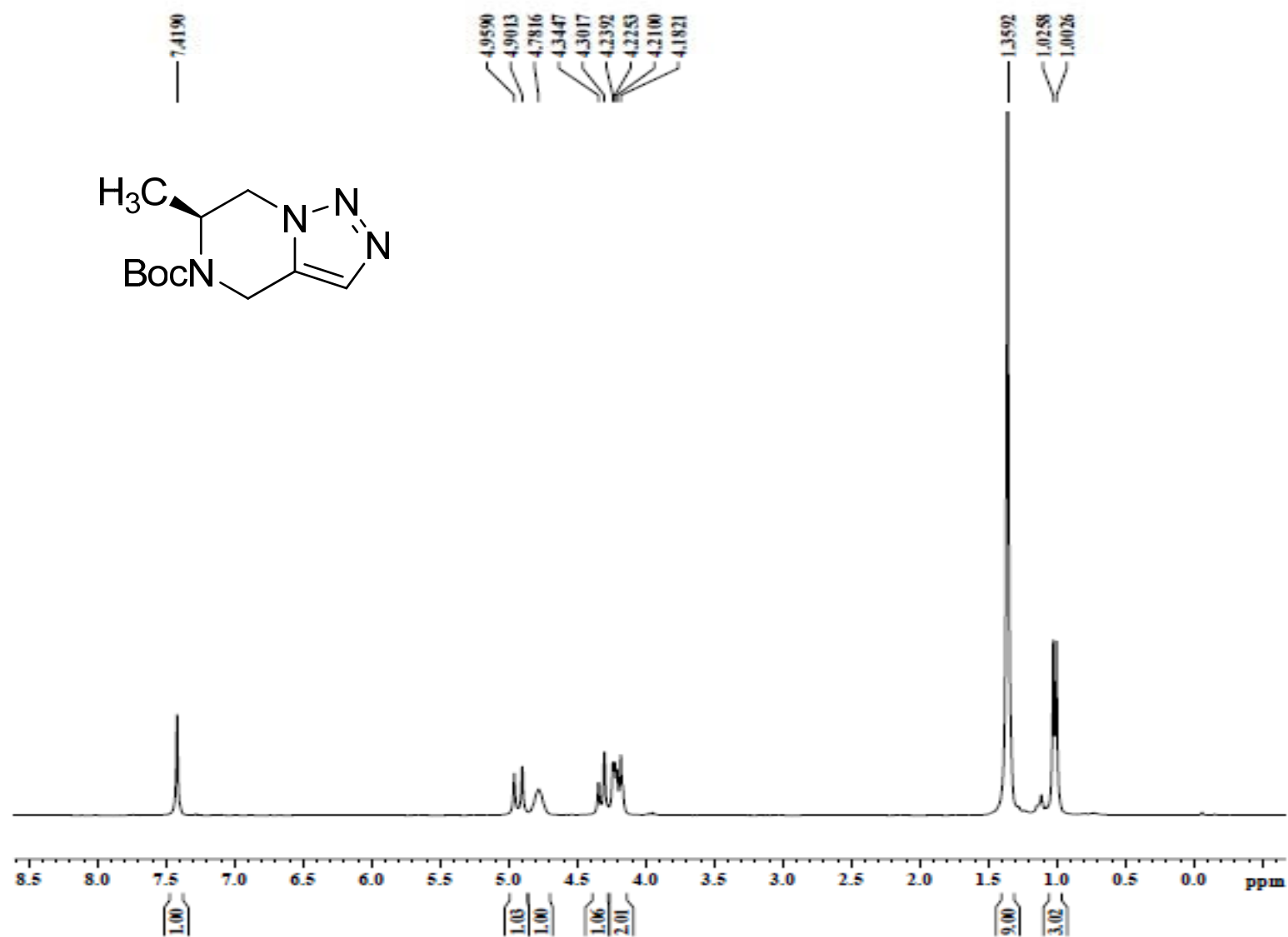
FigureS-62: ¹³C spectrum (50 MHz, CDCl₃) of **11a**.



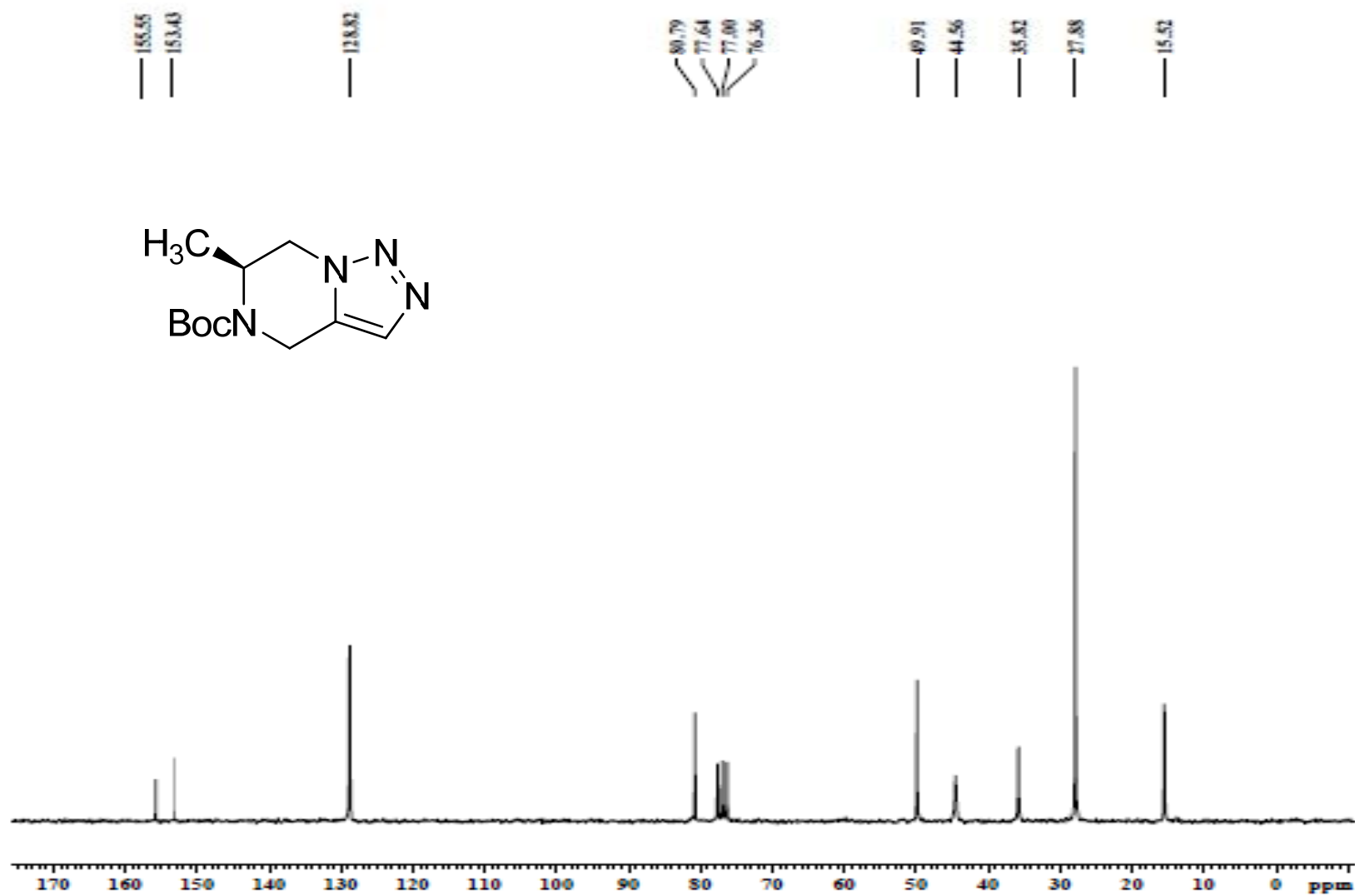
FigureS-63: ¹H spectrum (300 MHz, CDCl₃) of **11b**.



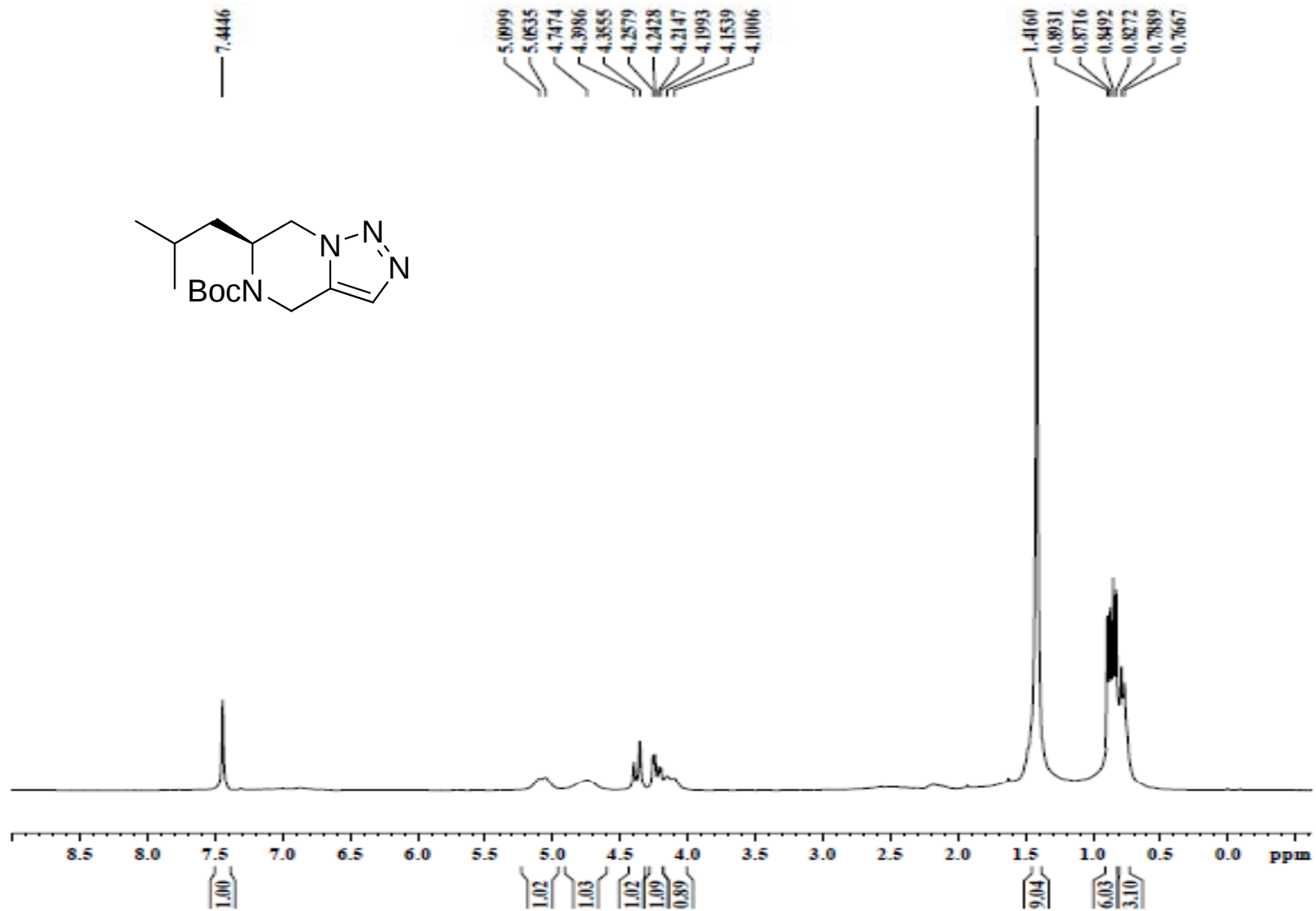
FigureS-64: ^{13}C spectrum (75 MHz, CDCl_3) of **11b**.



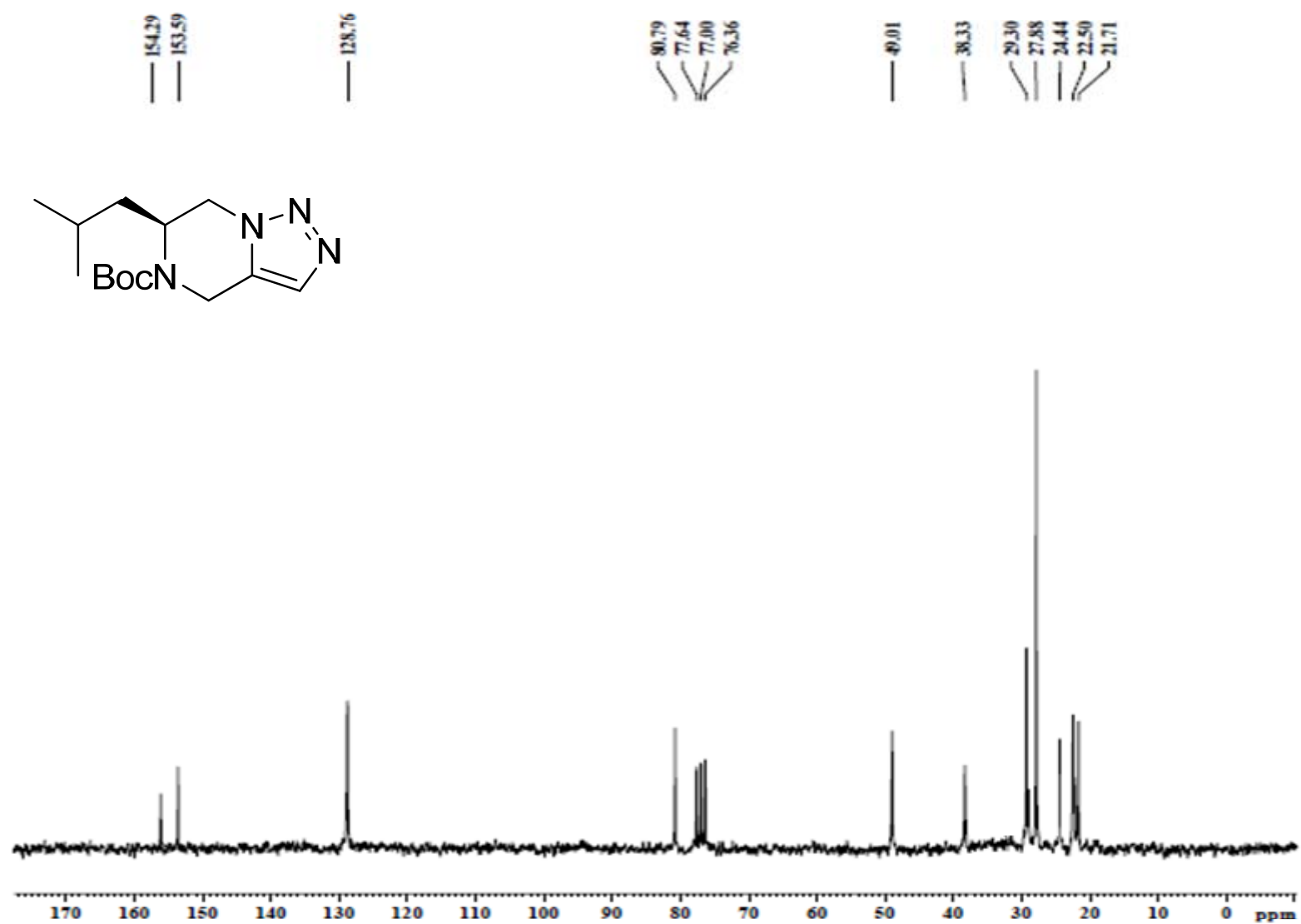
FigureS-65: ¹H spectrum (300 MHz, CDCl₃) of **11c**.



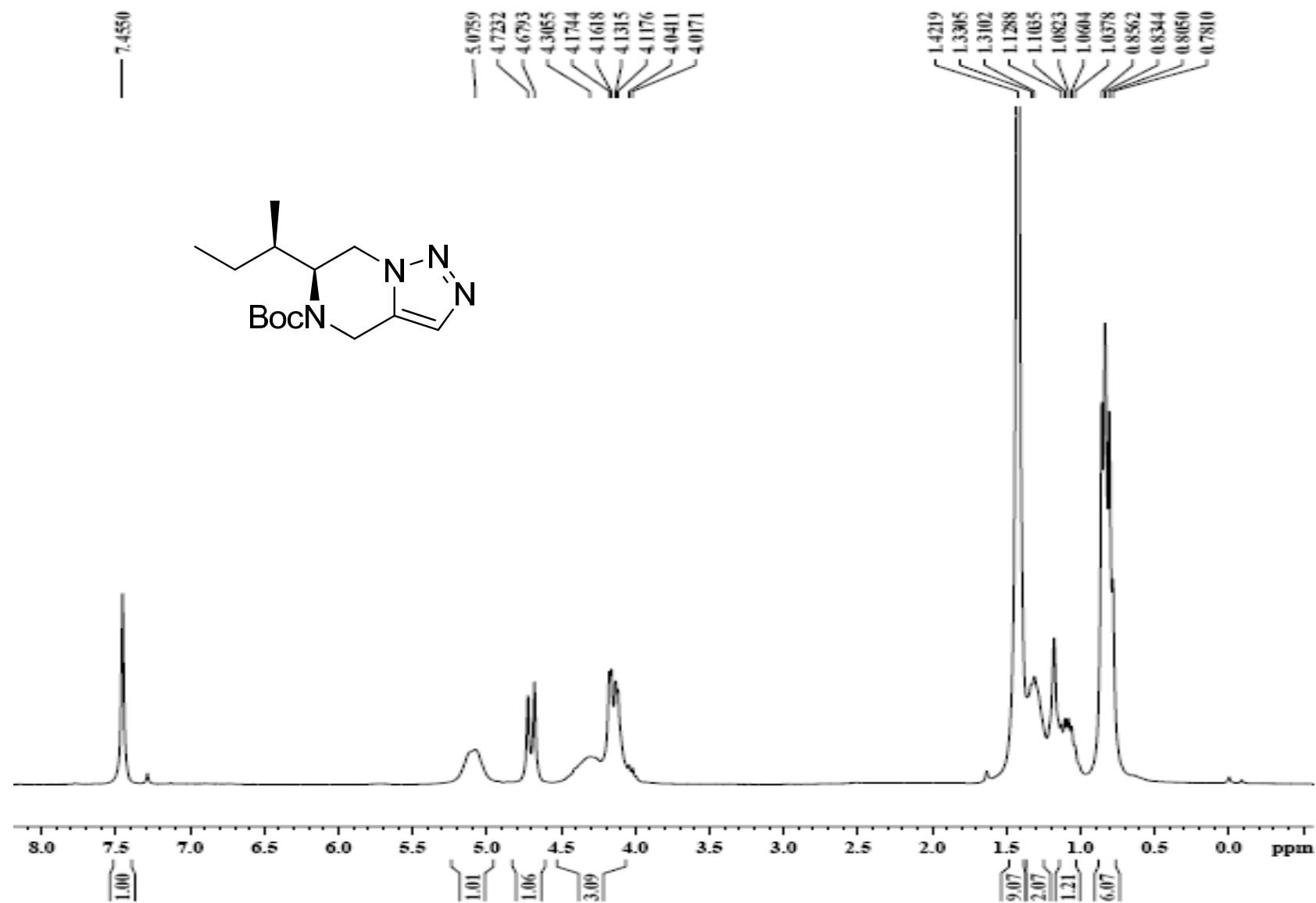
FigureS-66: ¹³C spectrum (50 MHz, CDCl₃) of **11c**.



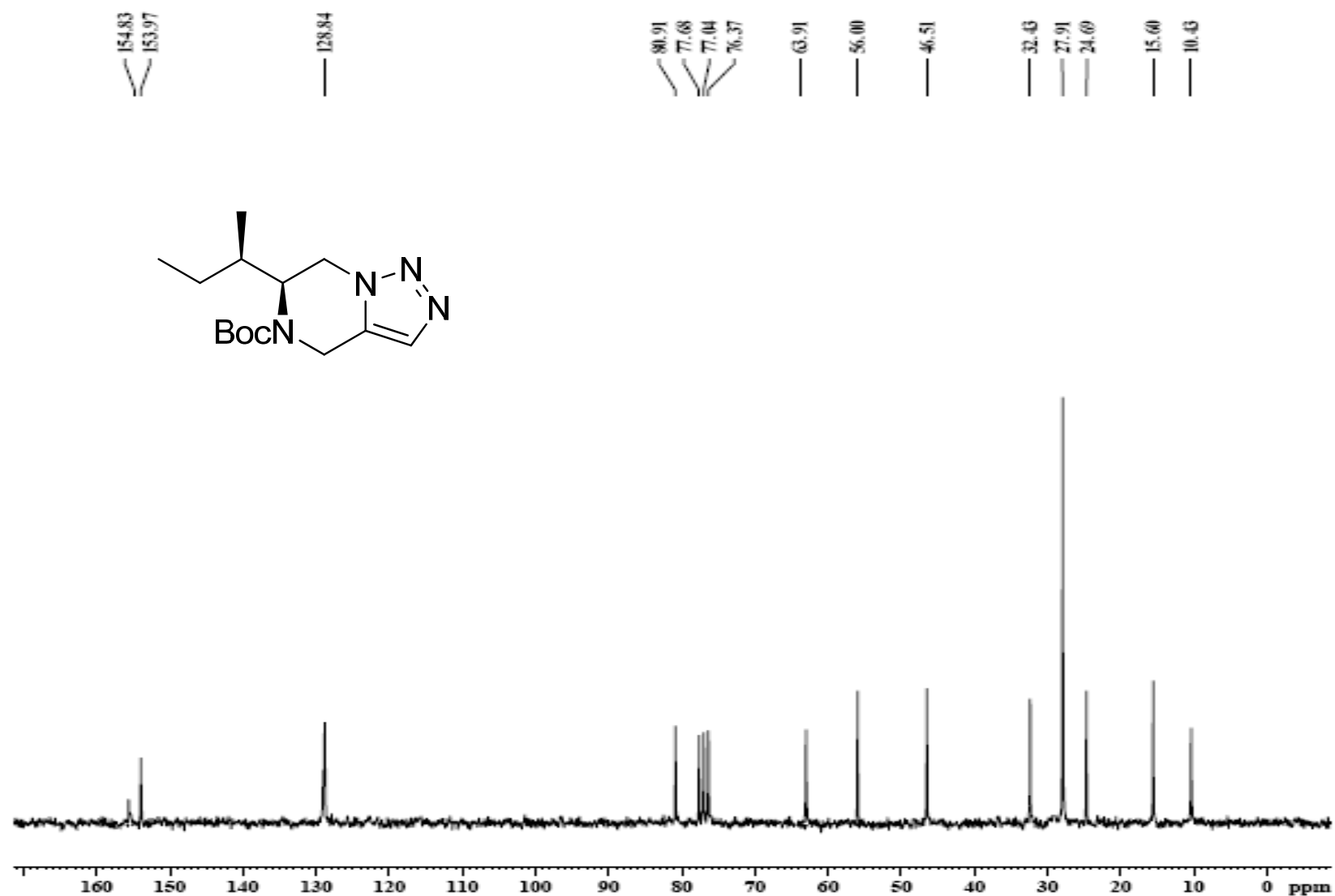
FigureS-67: ¹H spectrum (300 MHz, CDCl₃) of **11d**.



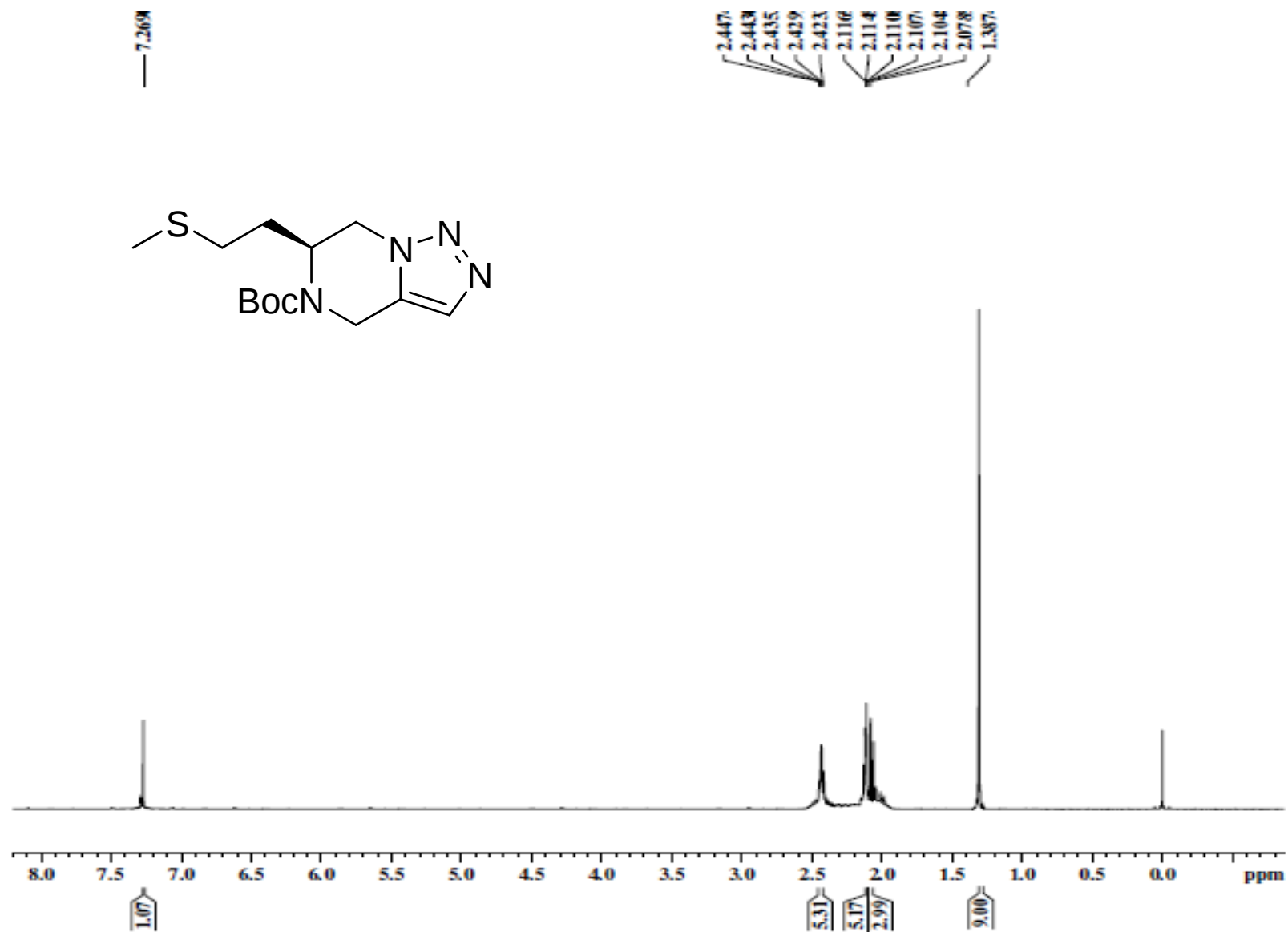
FigureS-68: ^{13}C spectrum (75 MHz, CDCl_3) of **11d**.



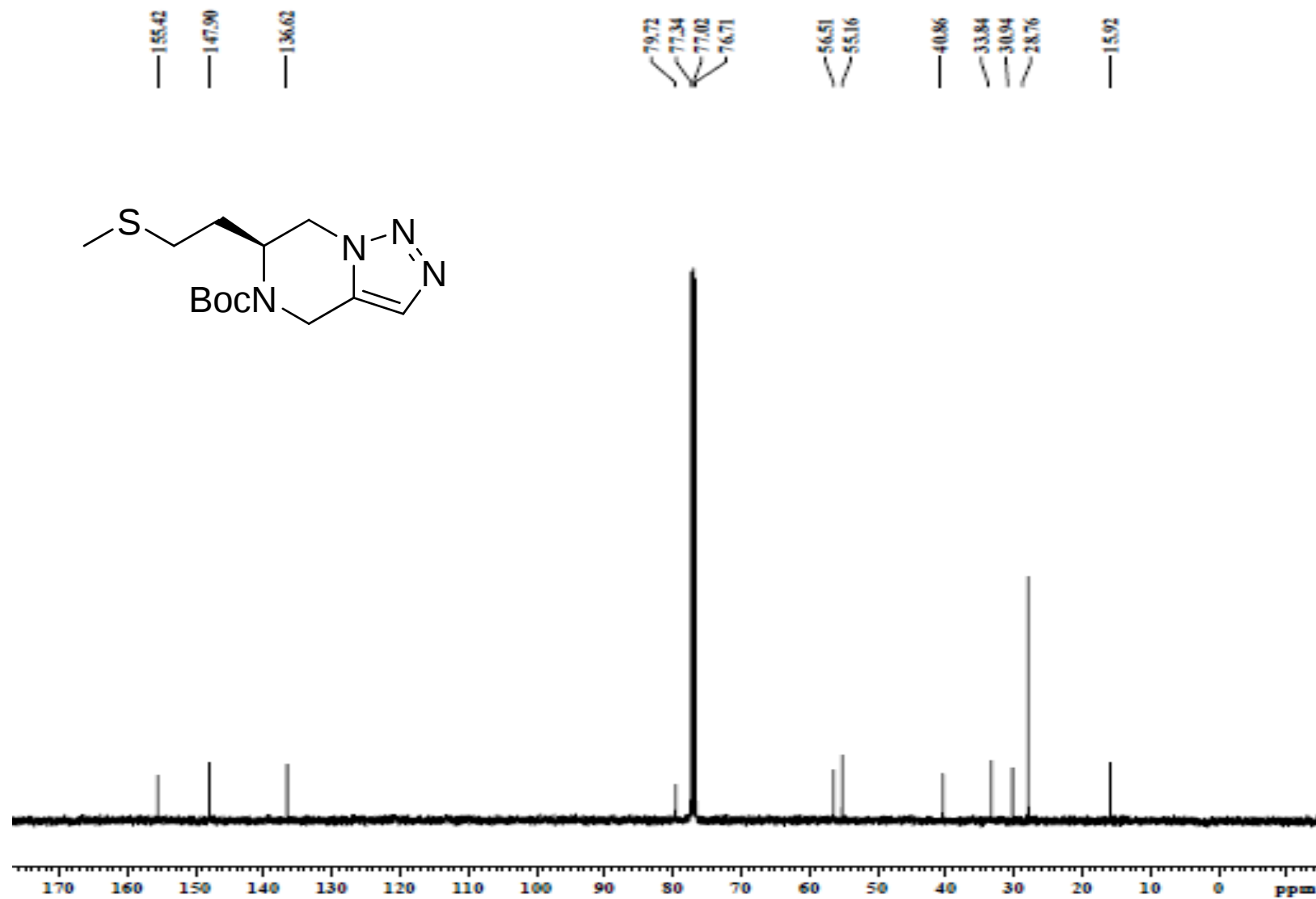
FigureS-69: ¹H spectrum (300 MHz, CDCl₃) of **11e**.



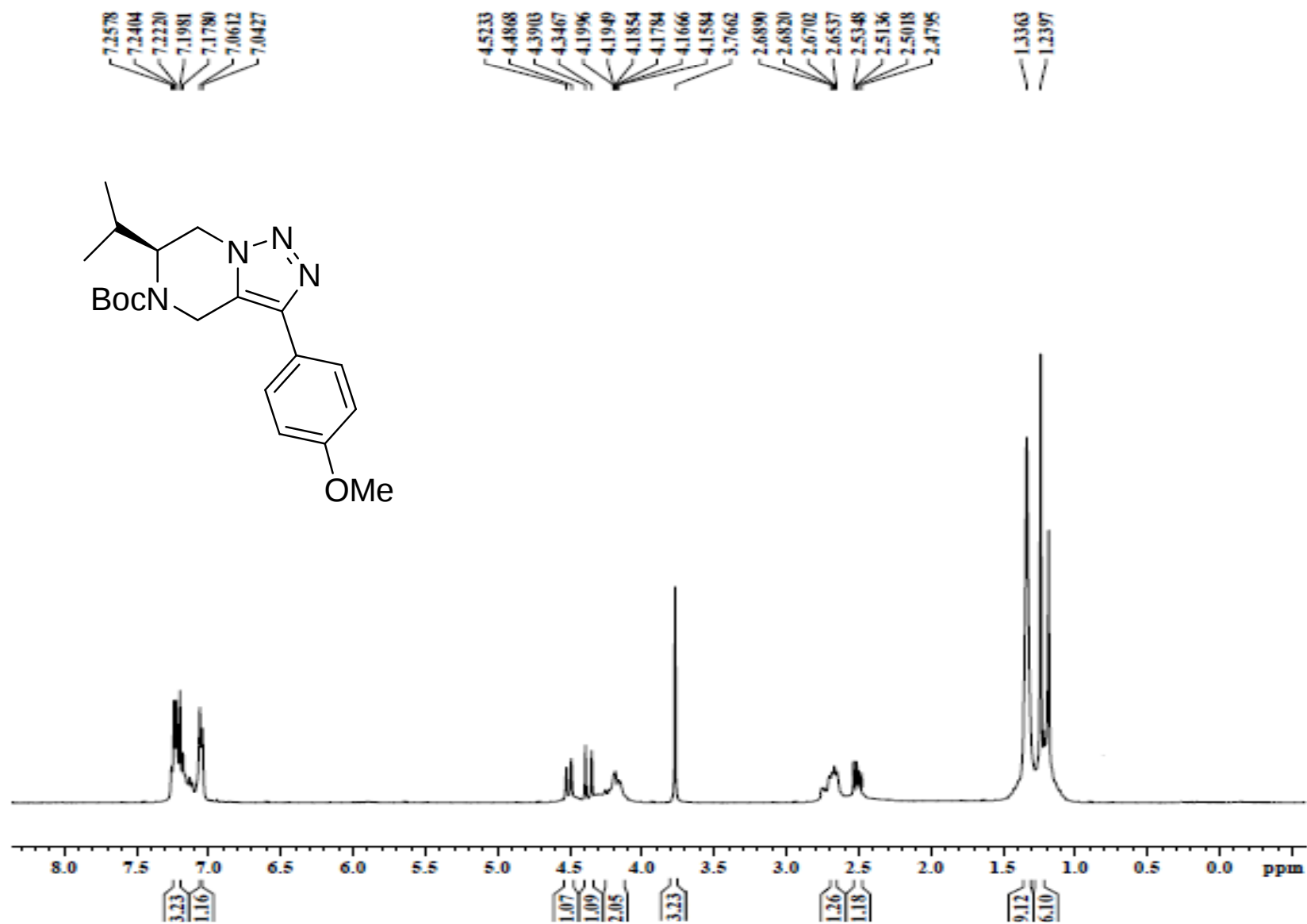
FigureS-70: ¹³C spectrum (75 MHz, CDCl₃) of **11e**.



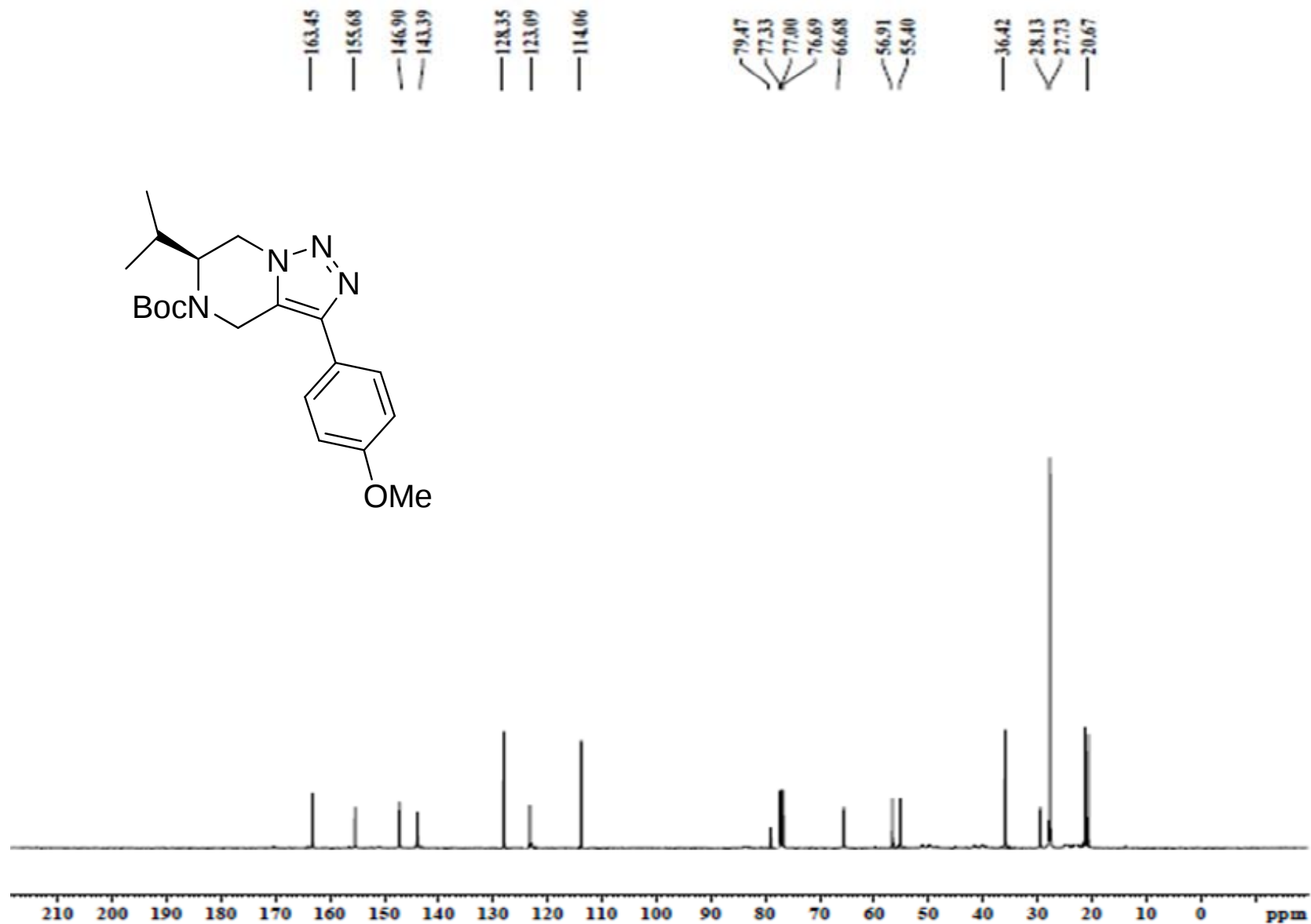
FigureS-71: ^1H spectrum (300 MHz, CDCl_3) of **11f**.



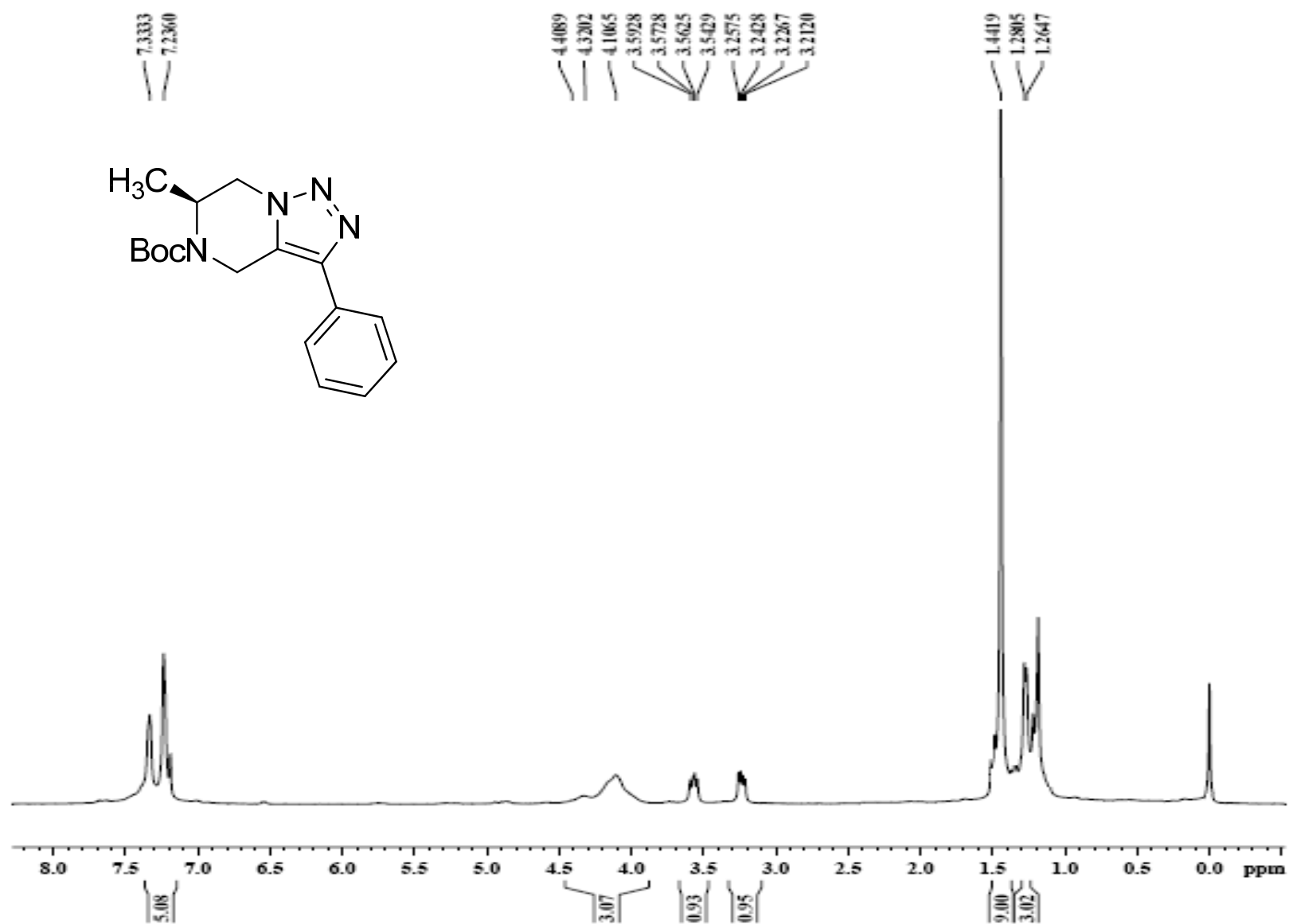
FigureS-72: ^{13}C spectrum (75 MHz, CDCl_3) of **11f**.



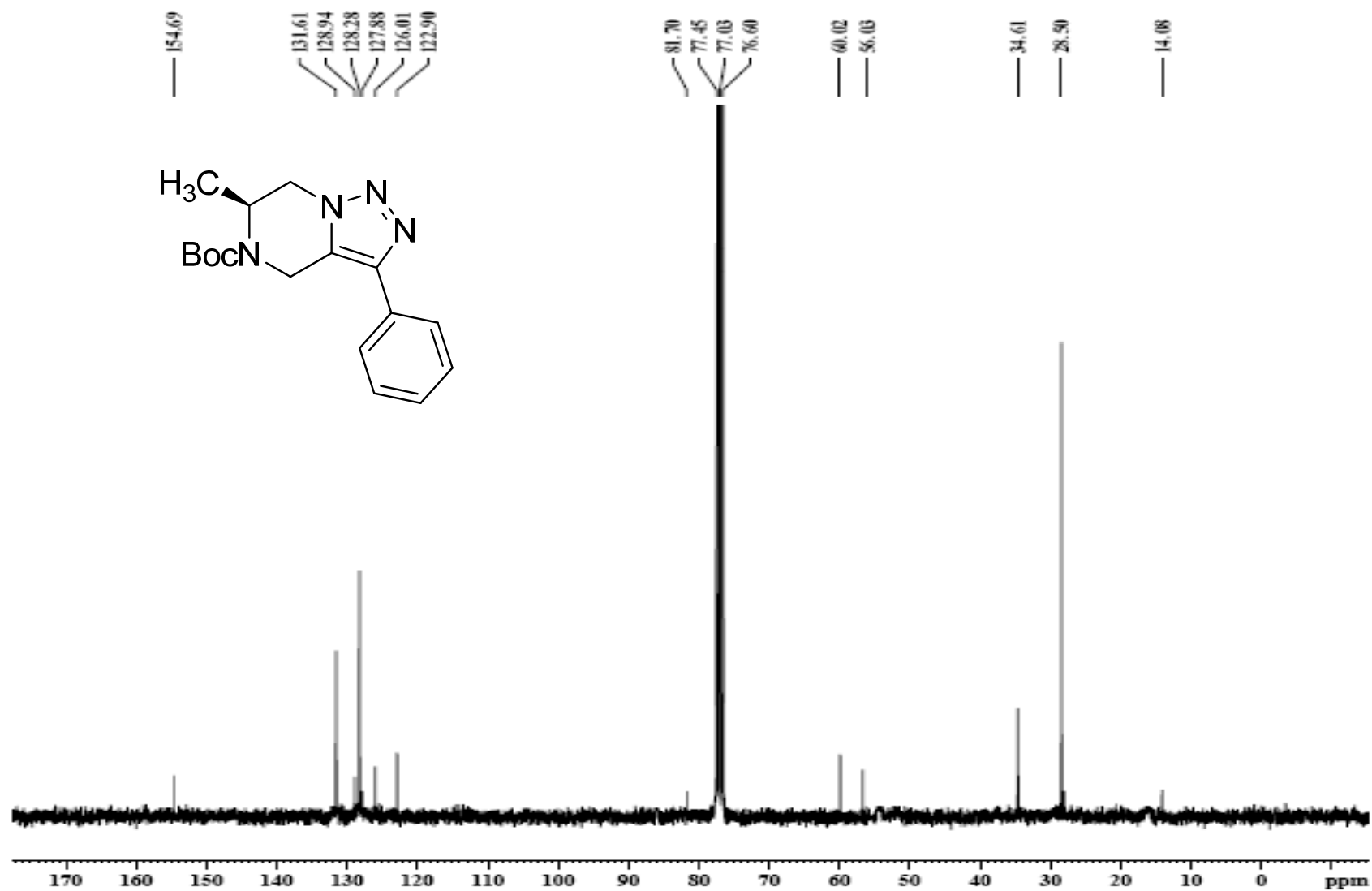
FigureS-73: ¹H spectrum (300 MHz, CDCl₃) of **12a**.



FigureS-74: ^{13}C spectrum (75 MHz, CDCl_3) of 12a.



FigureS-75: ¹H spectrum (300 MHz, CDCl₃) of **12c**.



FigureS-76: ¹³C spectrum (75 MHz, CDCl₃) of 12c.

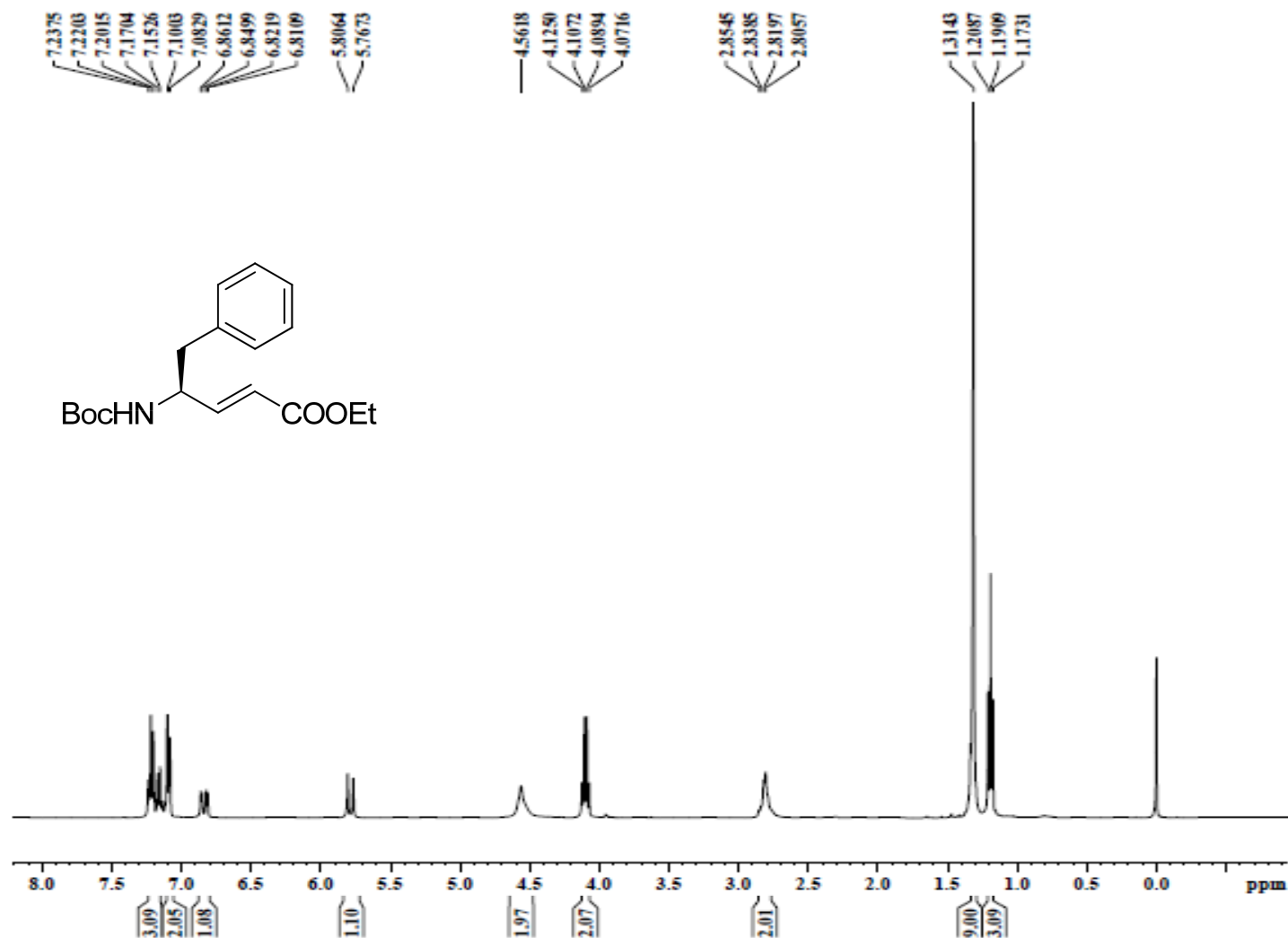
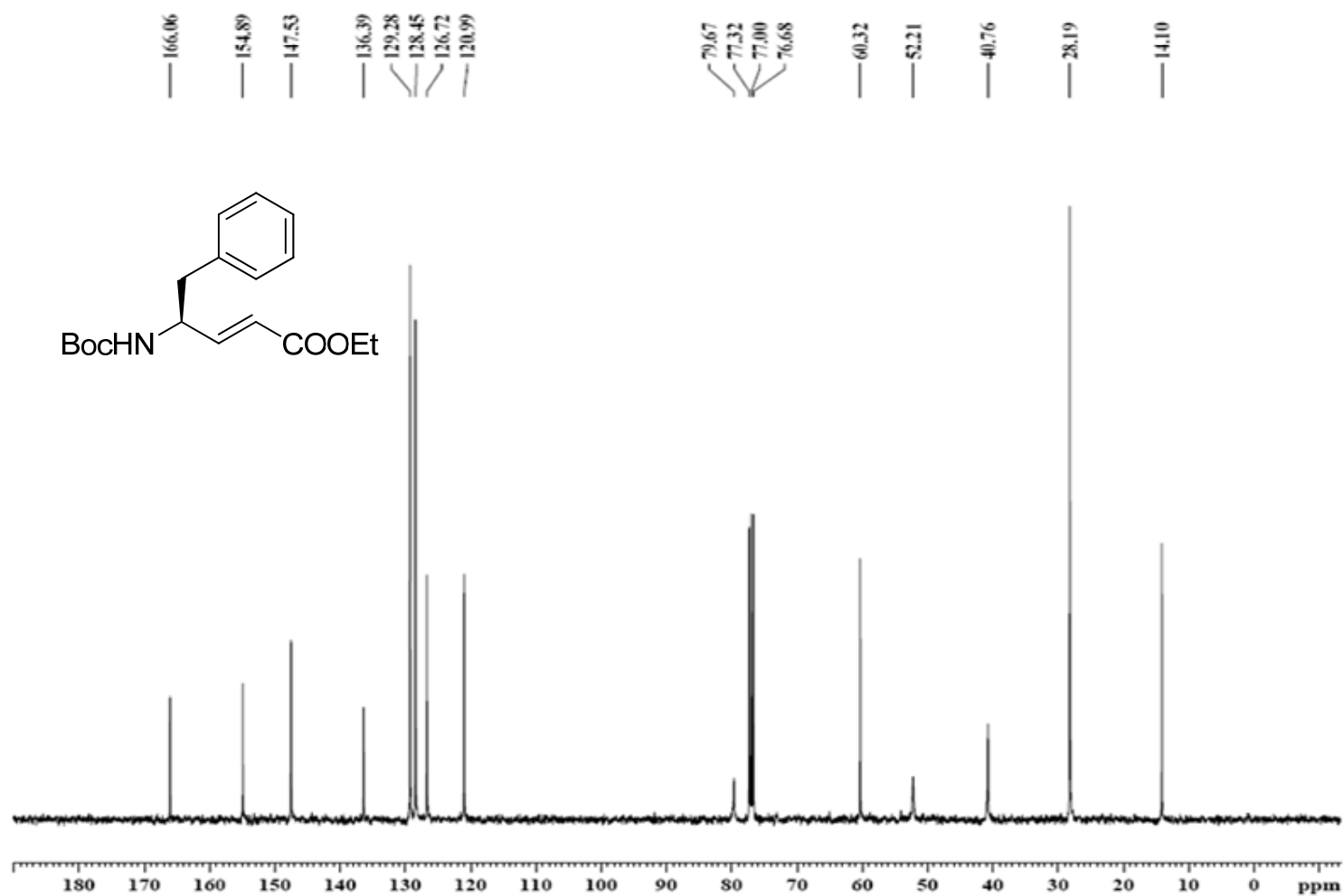


Figure S-77: ¹H spectrum (300 MHz, CDCl₃) of **14b**.



FigureS-78: ^{13}C spectrum (75 MHz, CDCl_3) of **14b**.

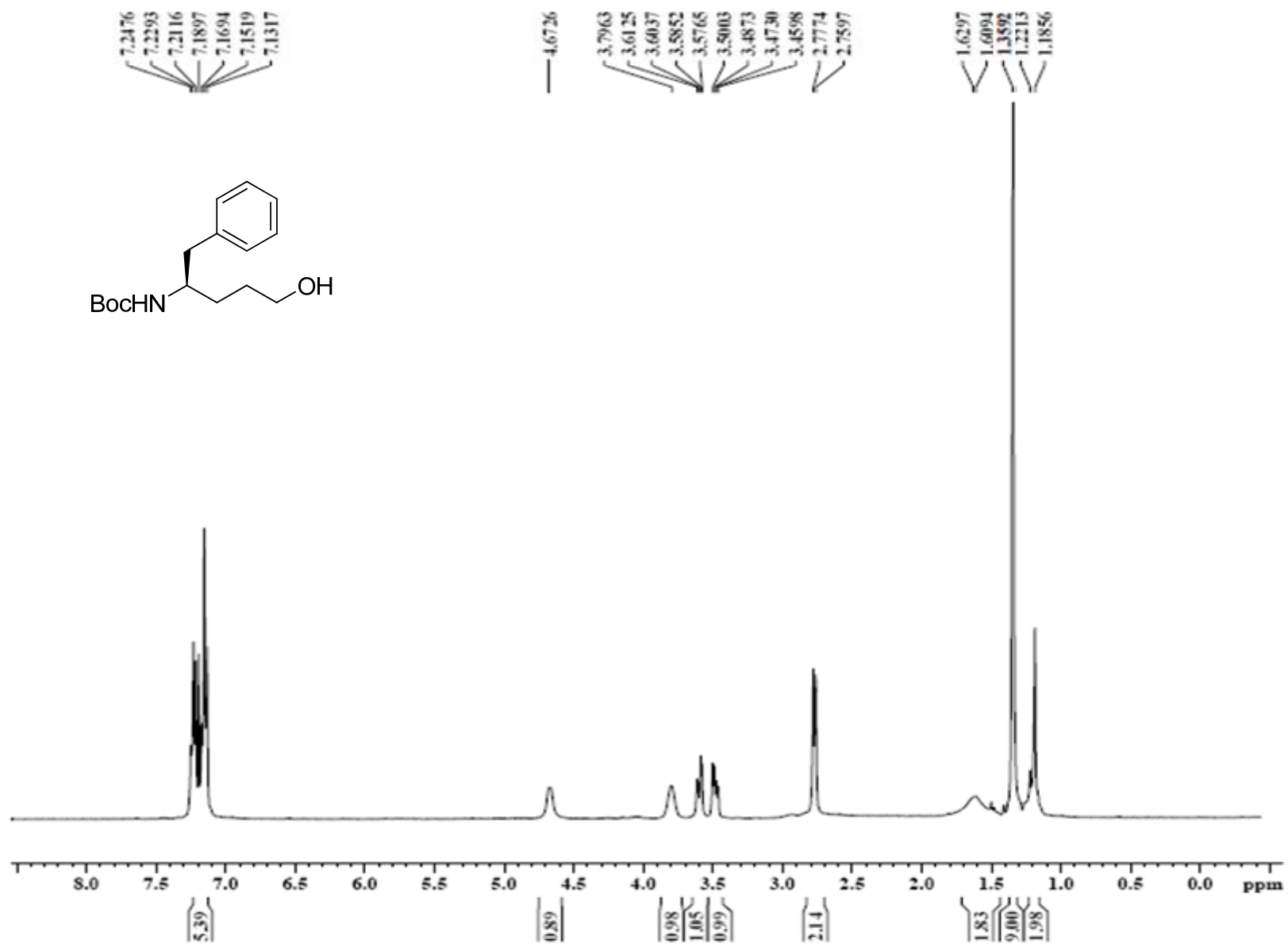


Figure S-79: ^1H spectrum (300 MHz, CDCl_3) of **15b**.

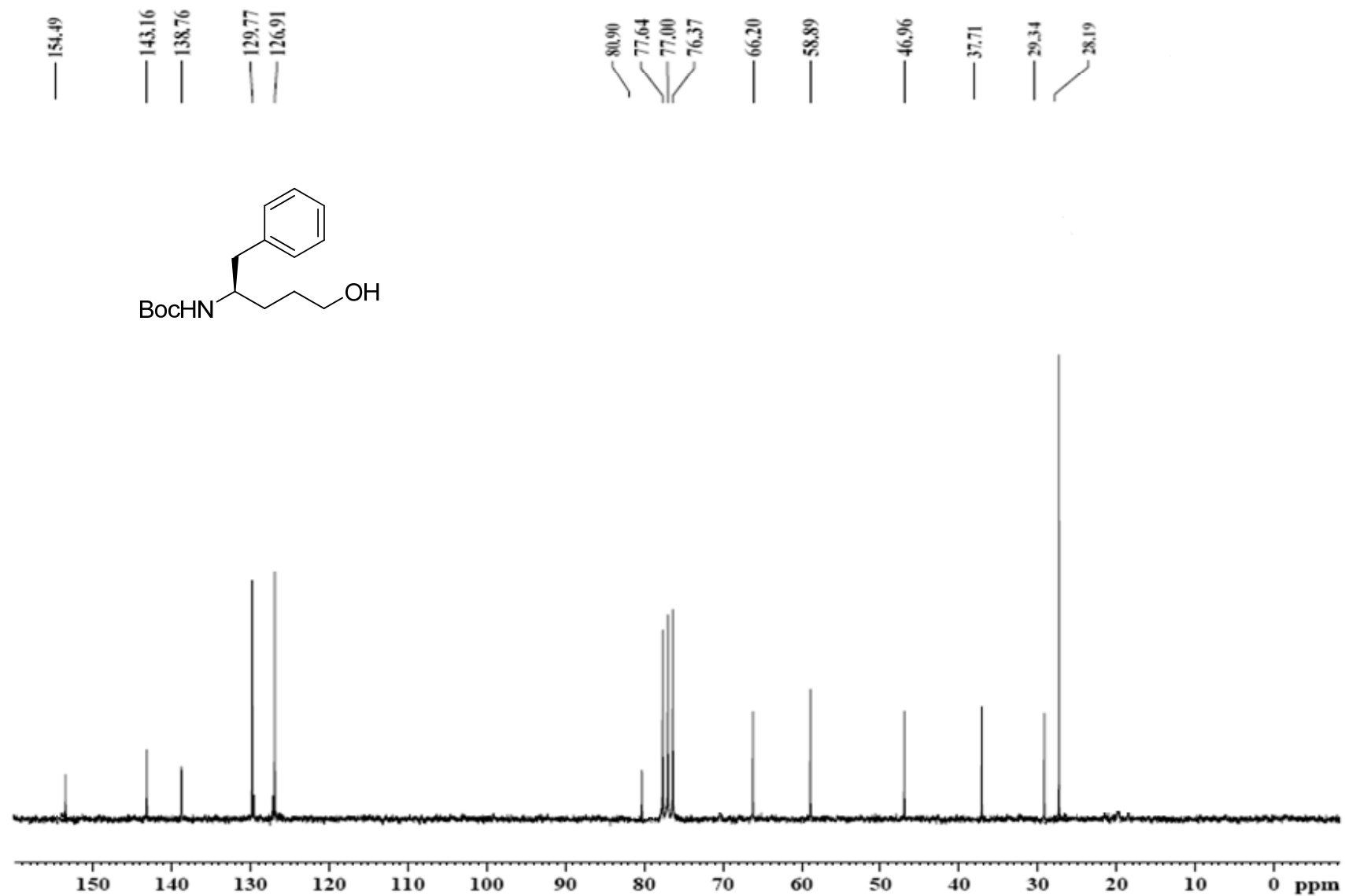


Figure S-80: ^{13}C spectrum (75 MHz, CDCl_3) of 15b.

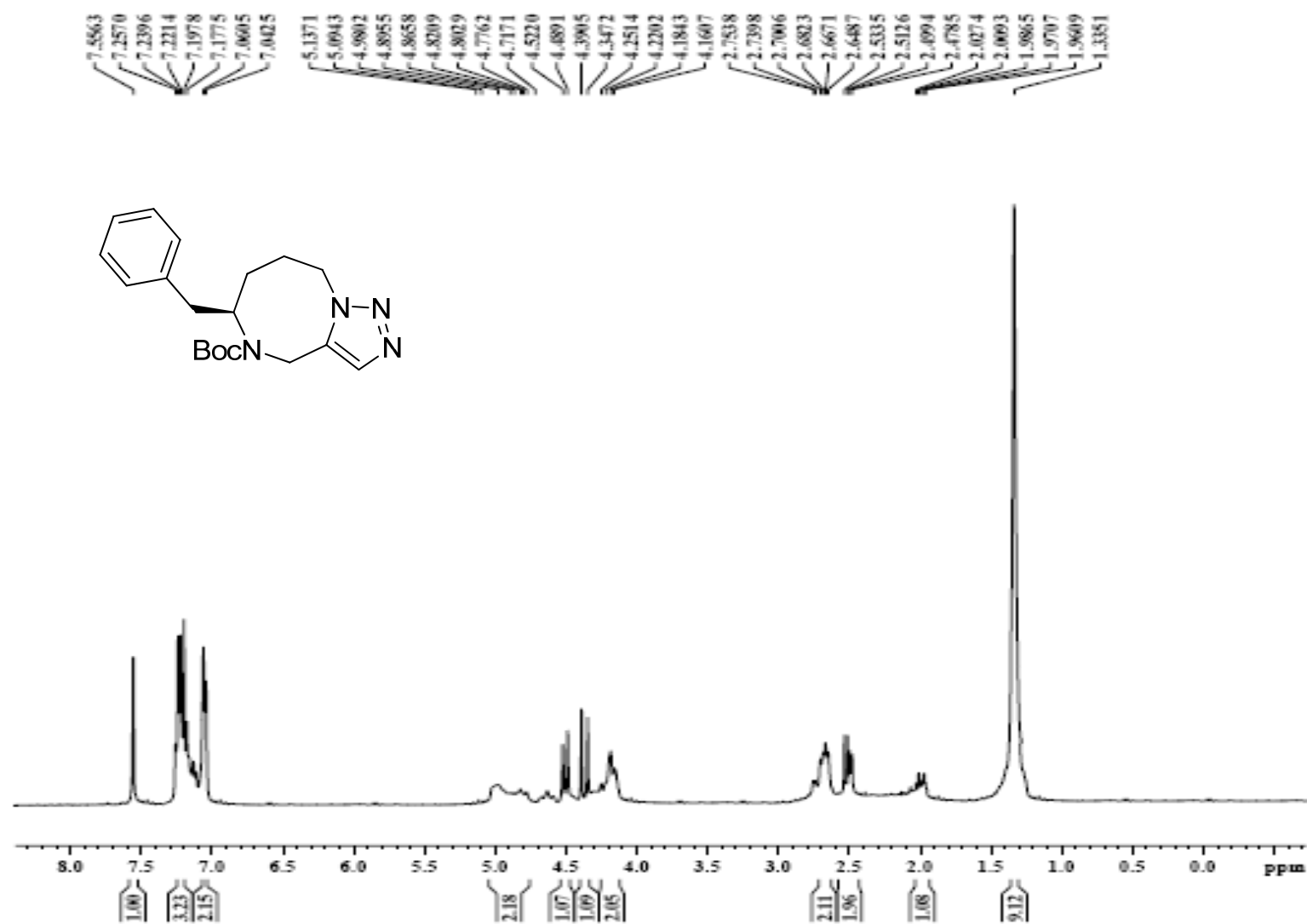


Figure S-81: ¹H spectrum (300 MHz, CDCl₃) of **19b**.

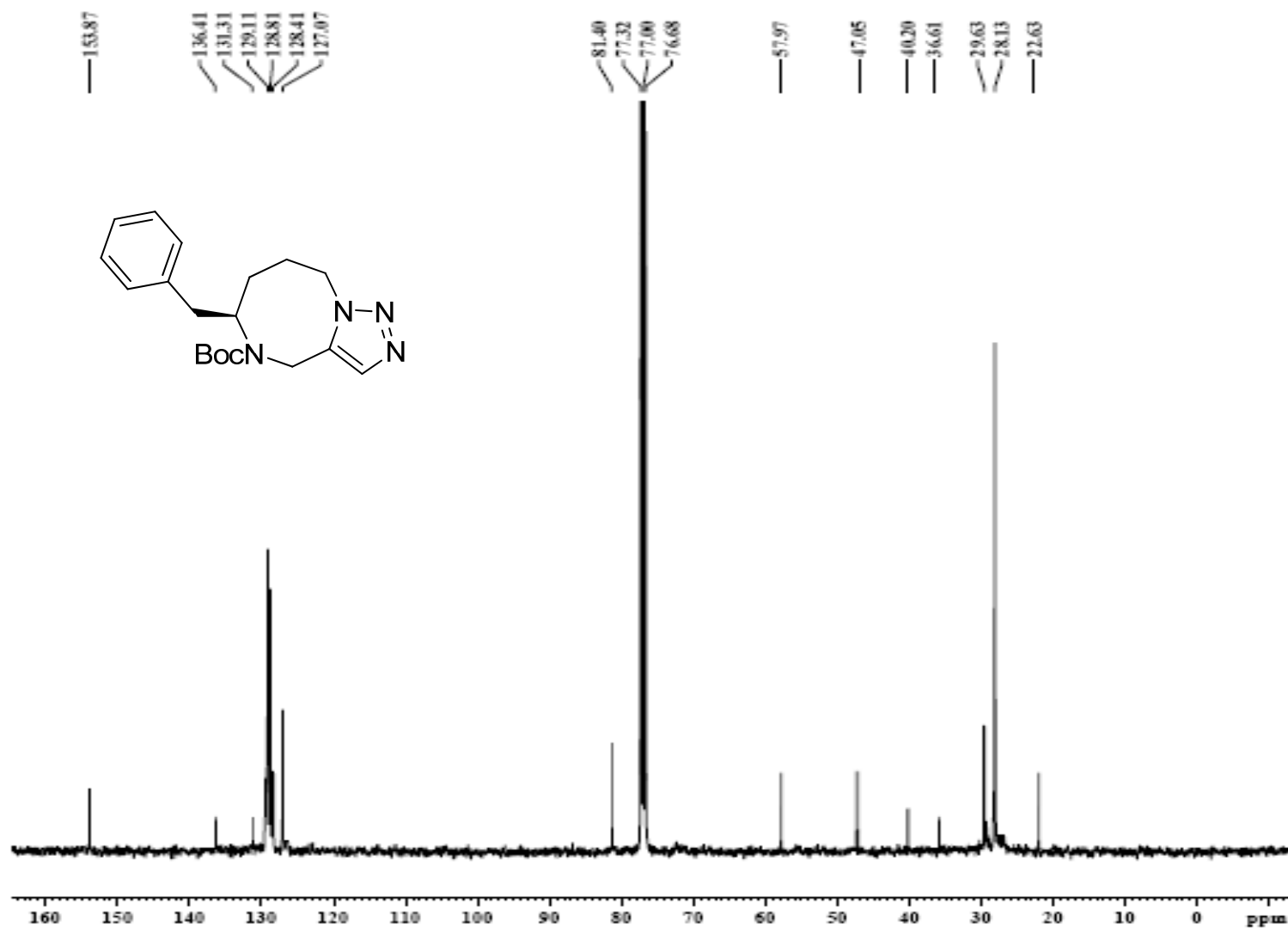


Figure S-82: ^{13}C spectrum (75 MHz, CDCl_3) of 19b.