

Supporting Information

Synthesis and Cytotoxicity Evaluation of Spirocyclic Bromotyrosine Clavatadine C Analogs

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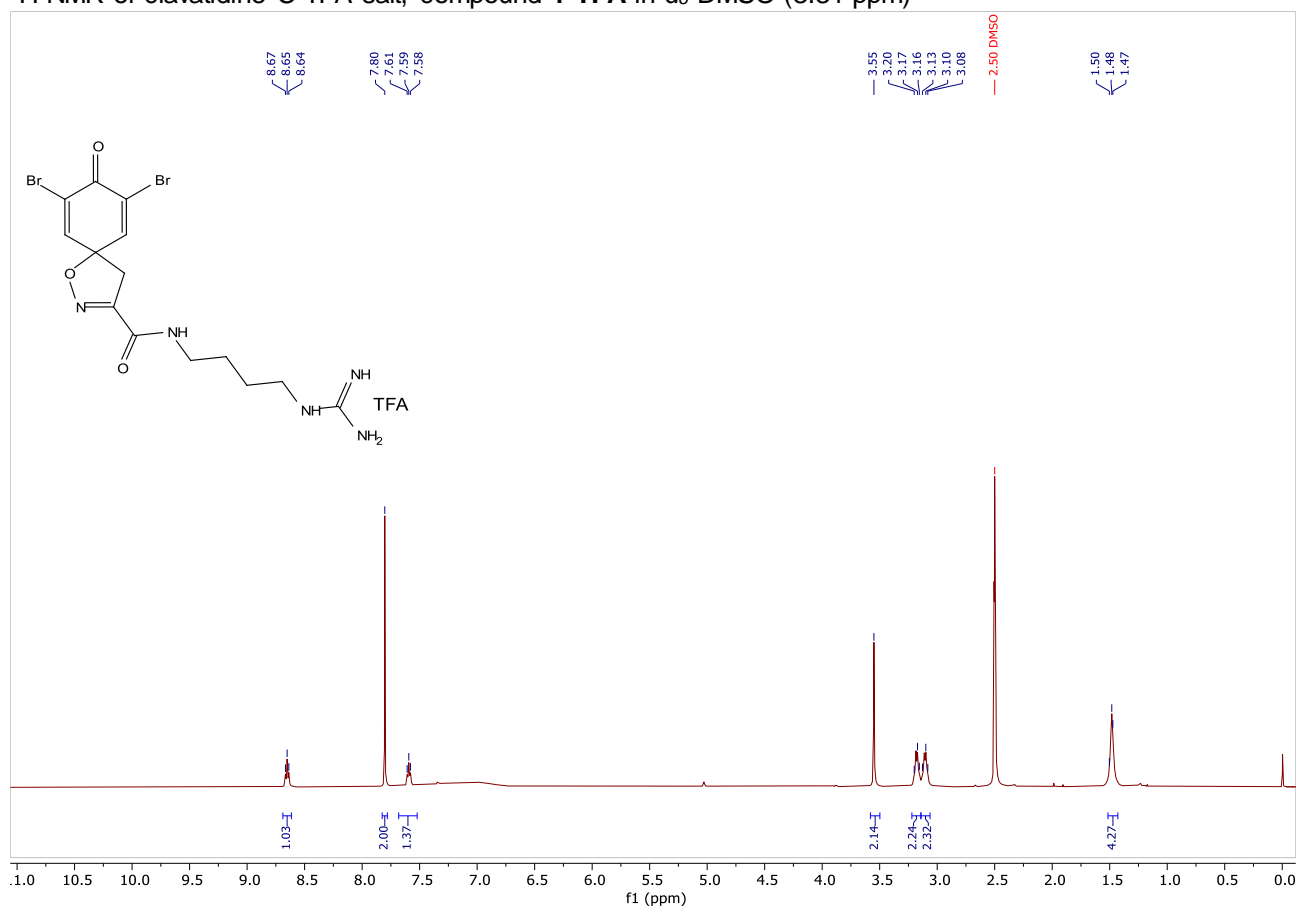
²Drug Research Program, Division of Pharmaceutical Biosciences, Faculty of Pharmacy, University of Helsinki, FI-00014 Finland

1. ¹H and ¹³C NMR spectra of the compounds

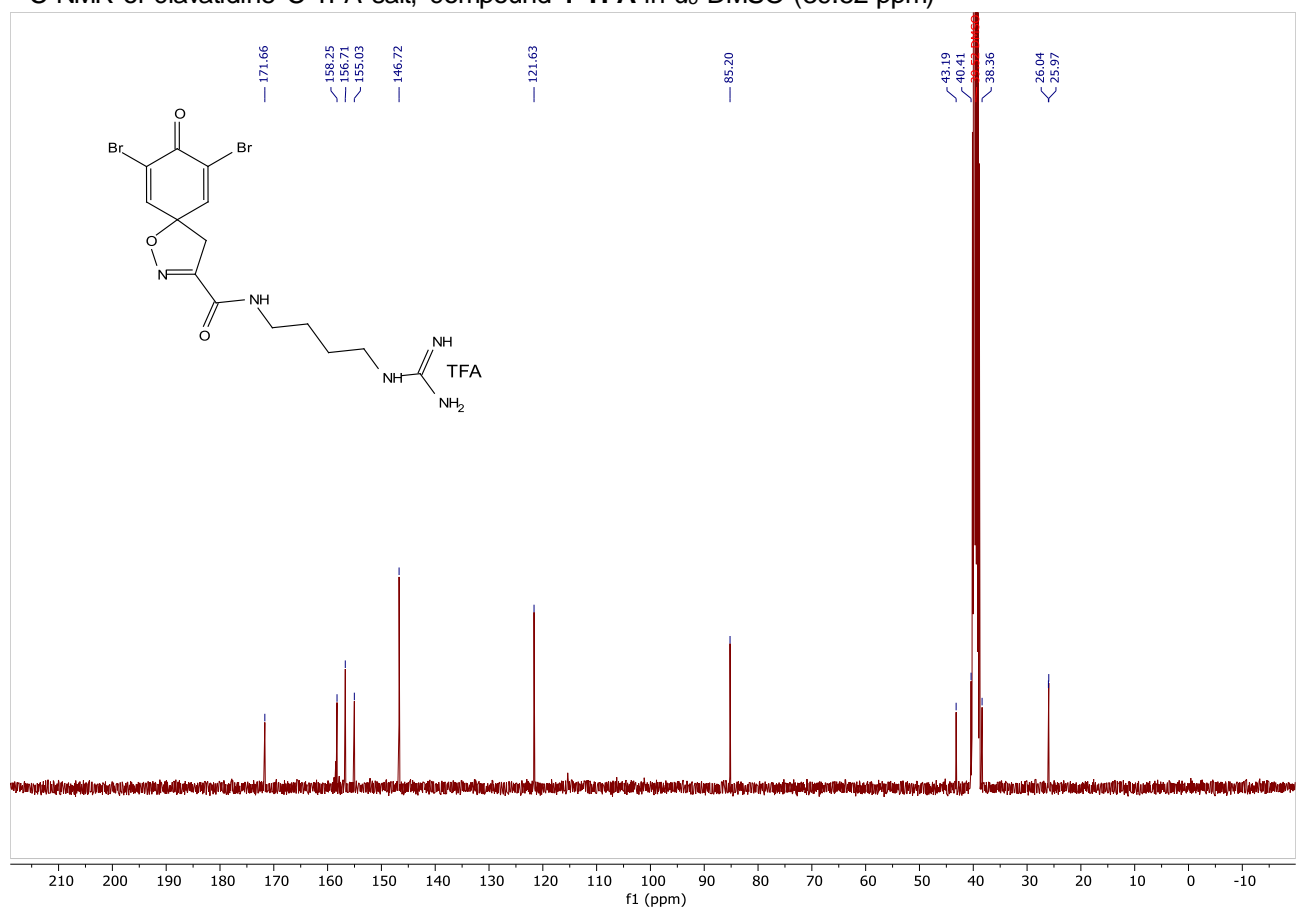
S2

1. NMR spectra

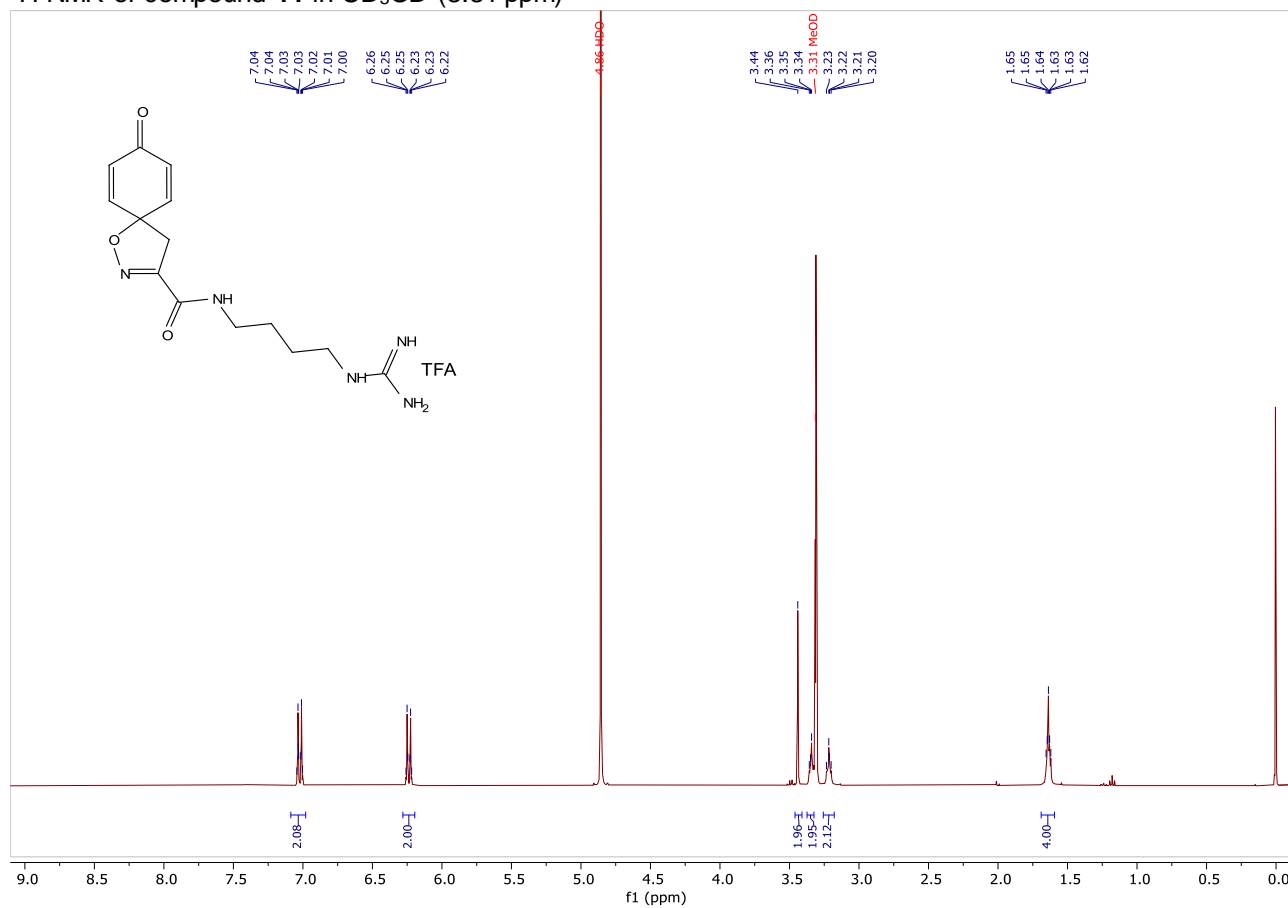
¹H NMR of clavatidine C TFA-salt, compound **1-TFA** in *d*₆-DMSO (3.31 ppm)



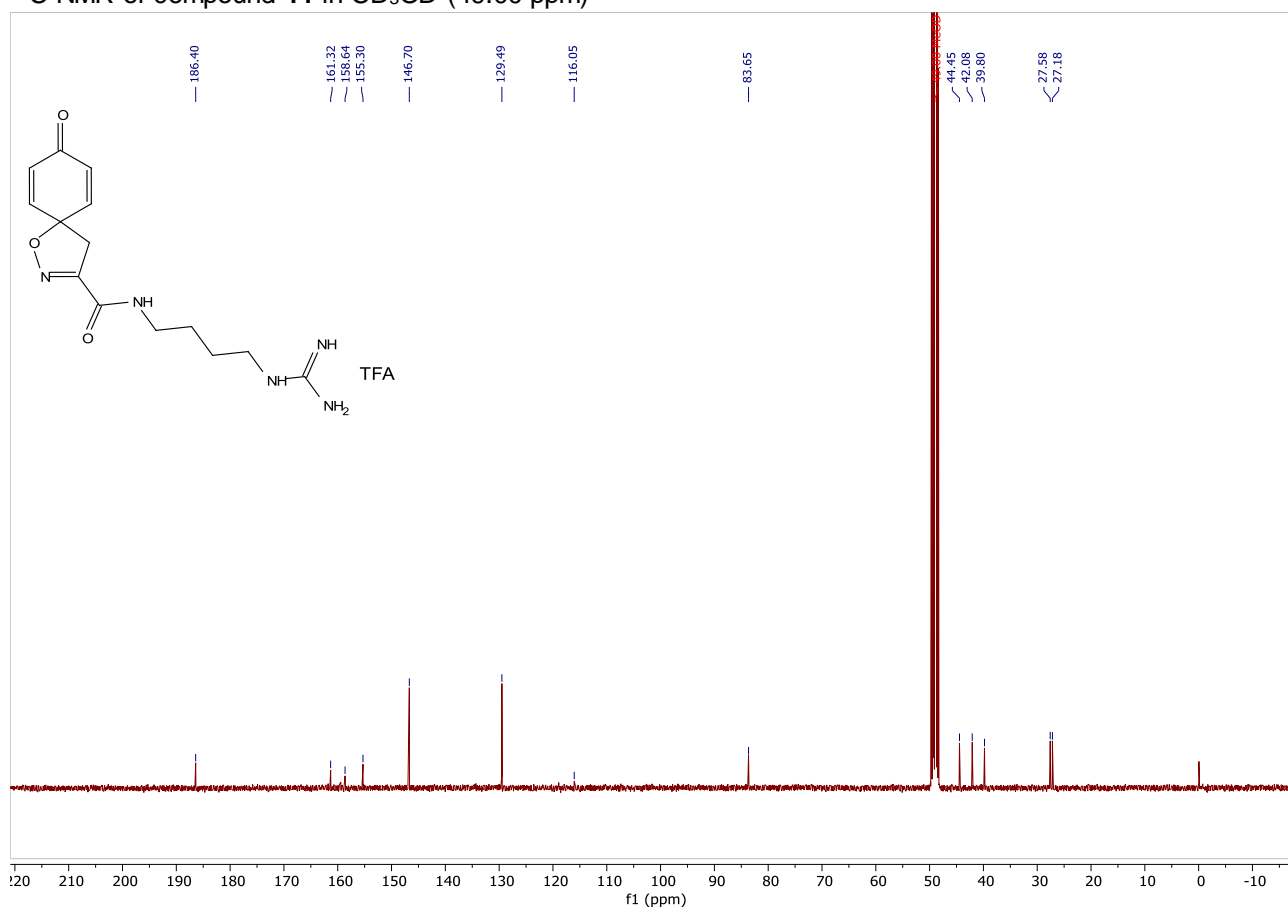
¹³C NMR of clavatidine C TFA-salt, compound **1-TFA** in *d*₆-DMSO (39.52 ppm)



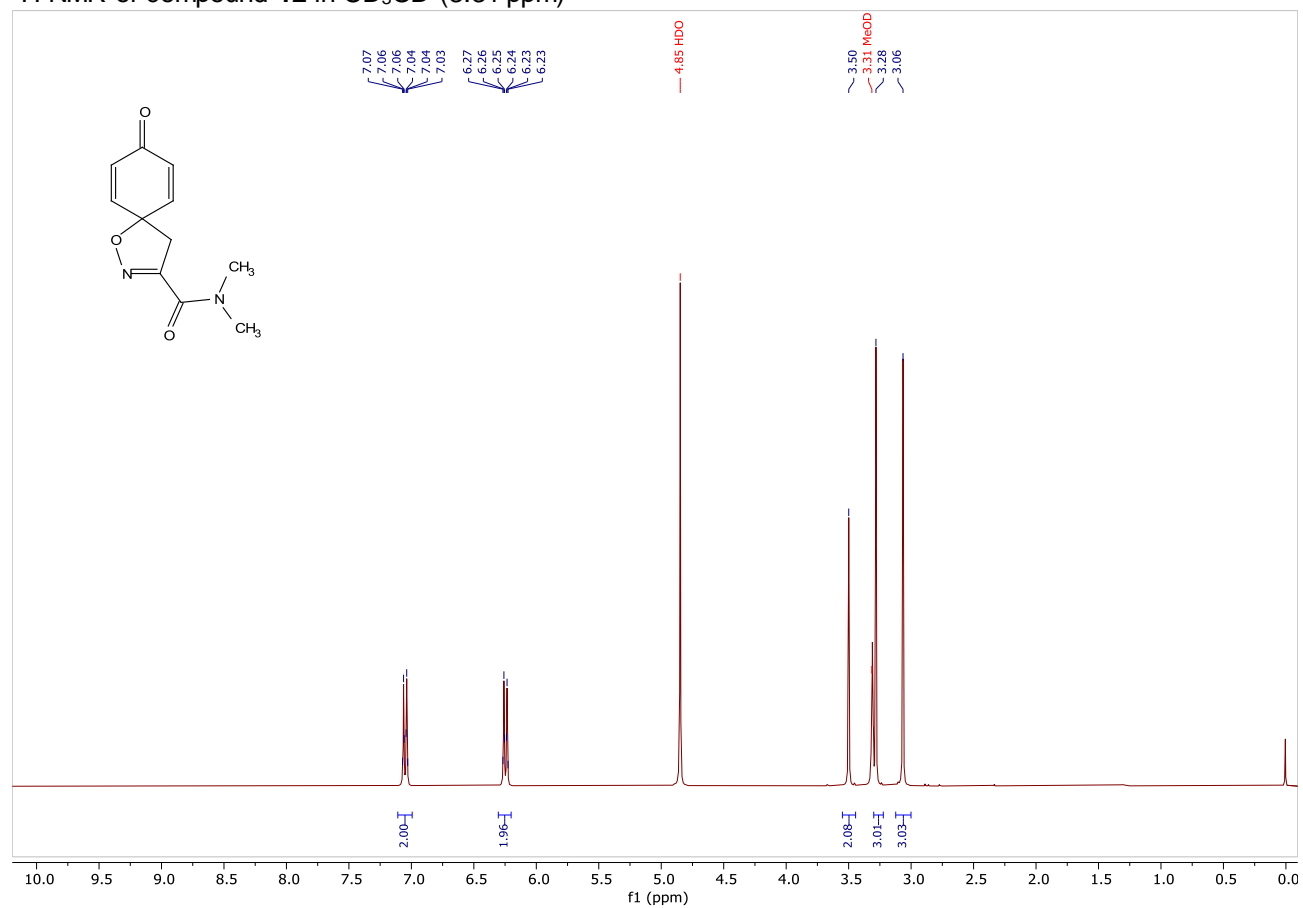
^1H NMR of compound **11** in CD_3OD (3.31 ppm)



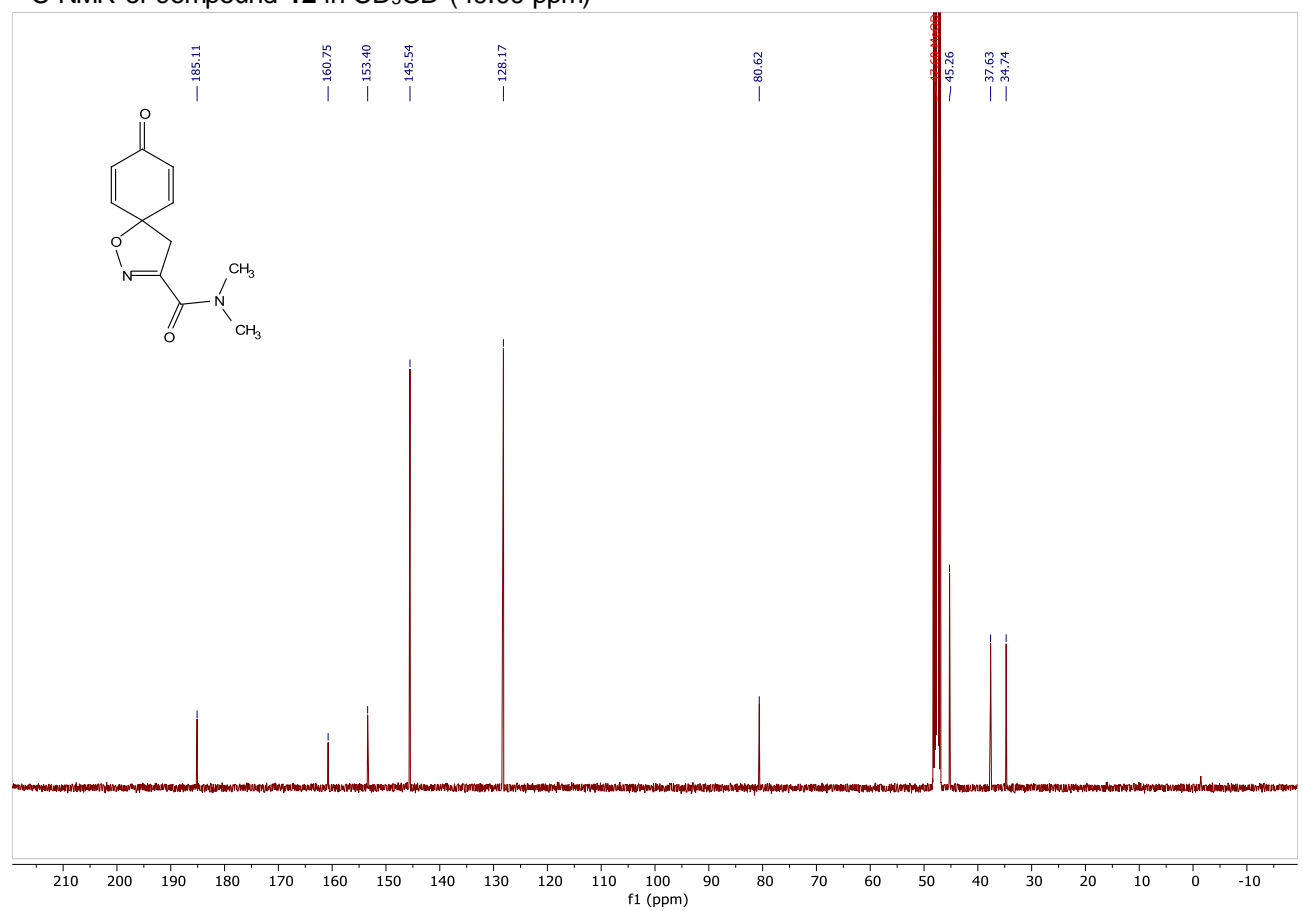
^{13}C NMR of compound **11** in CD_3OD (49.00 ppm)



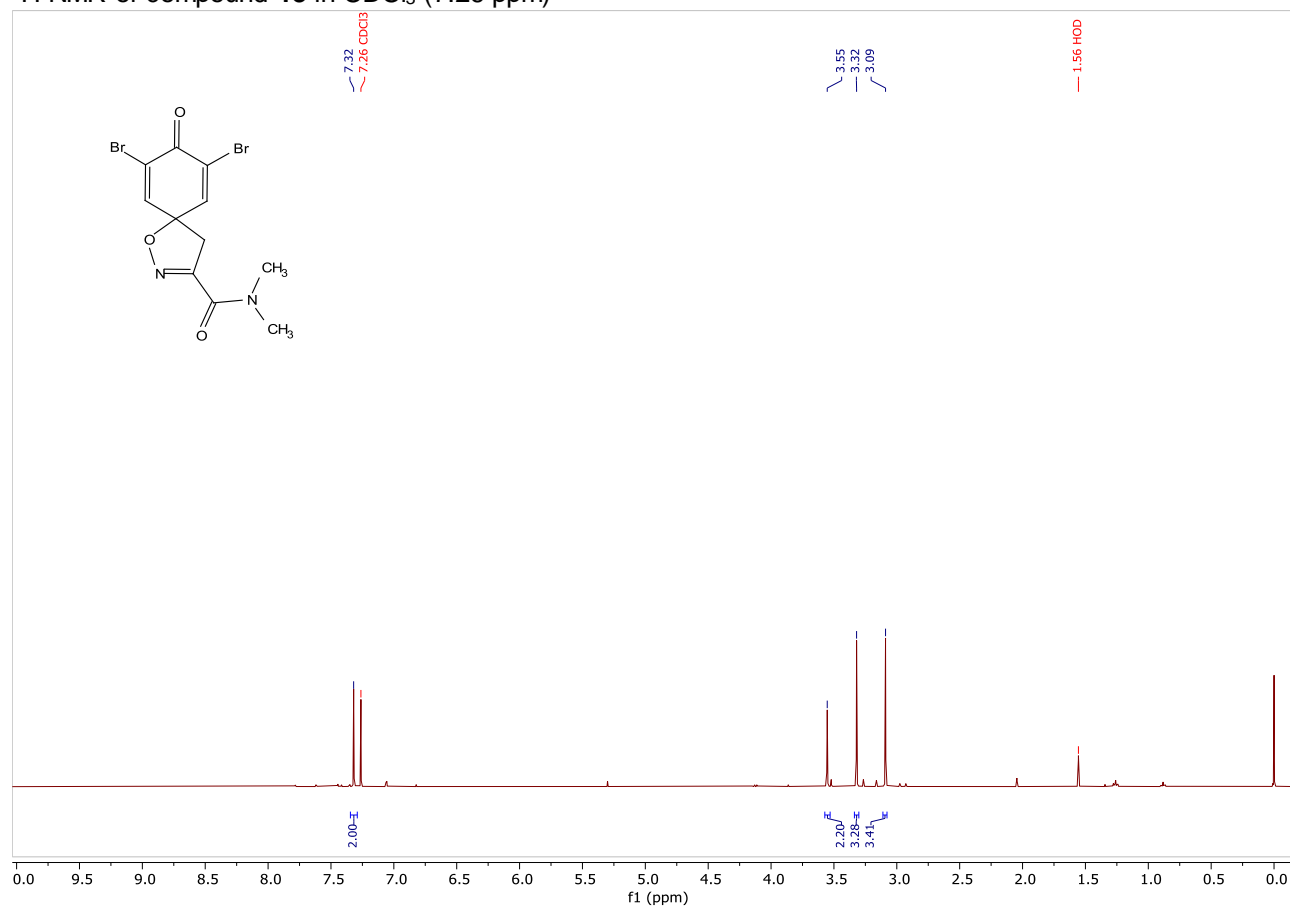
^1H NMR of compound **12** in CD_3OD (3.31 ppm)



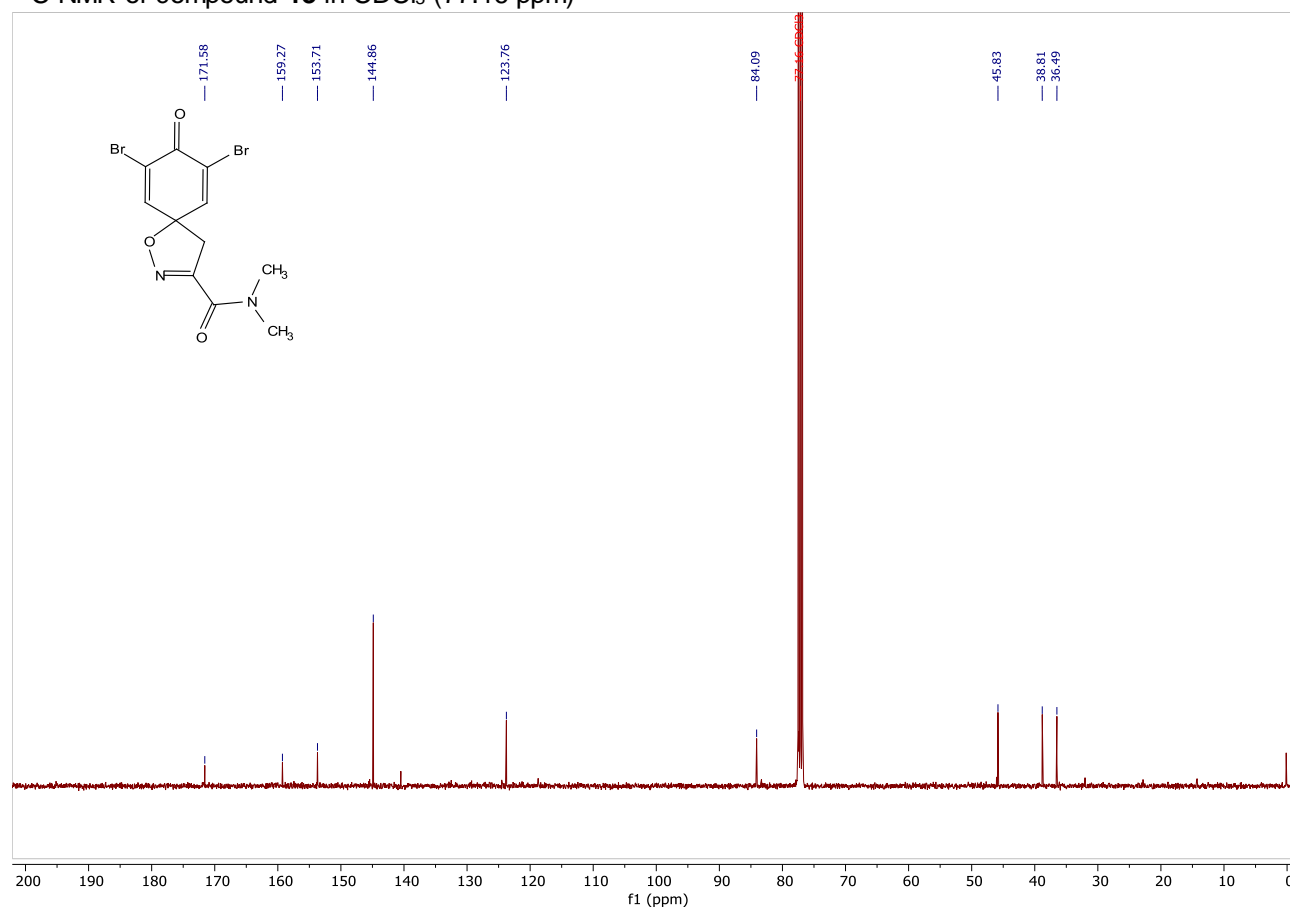
^{13}C NMR of compound **12** in CD_3OD (49.00 ppm)



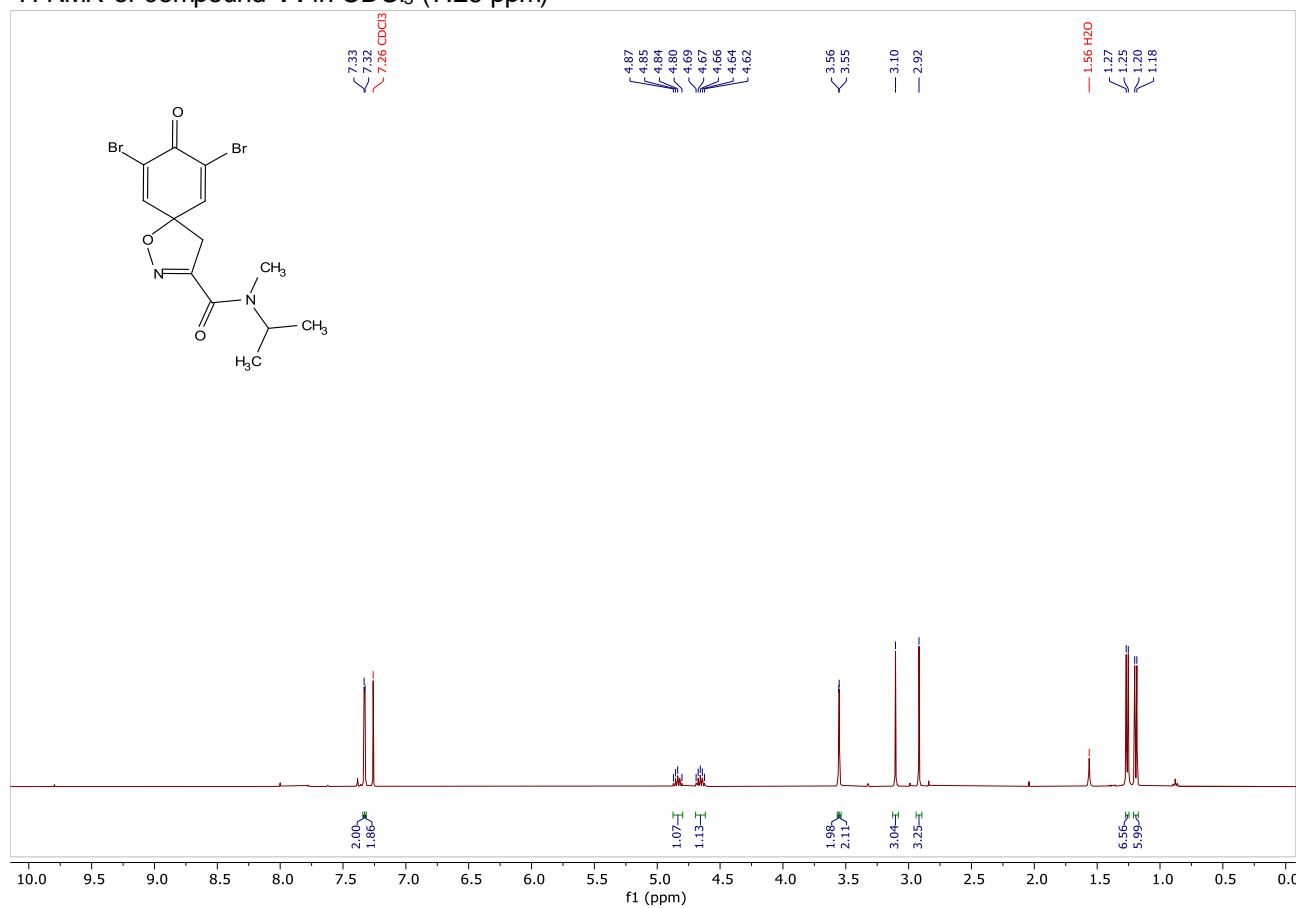
^1H NMR of compound **13** in CDCl_3 (7.26 ppm)



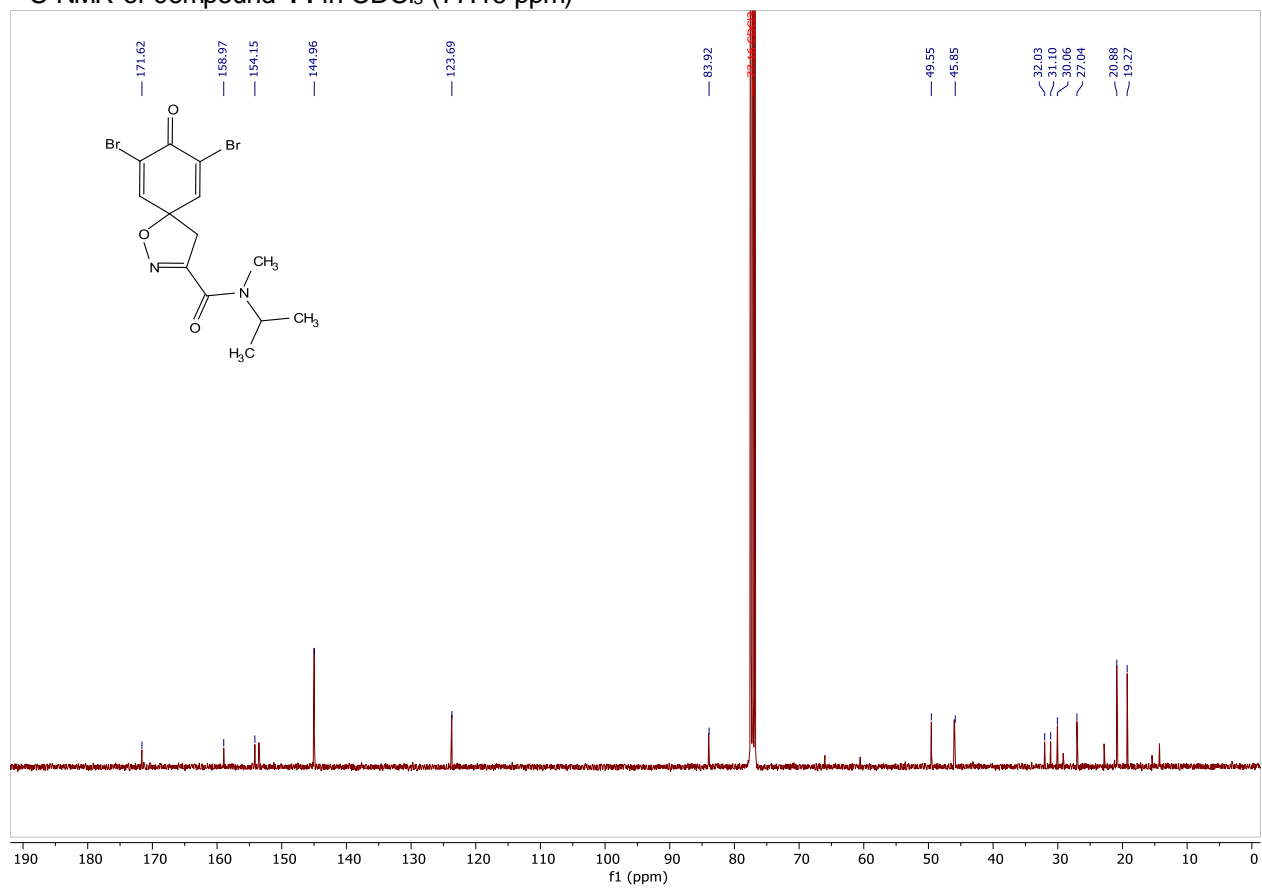
^{13}C NMR of compound **13** in CDCl_3 (77.16 ppm)



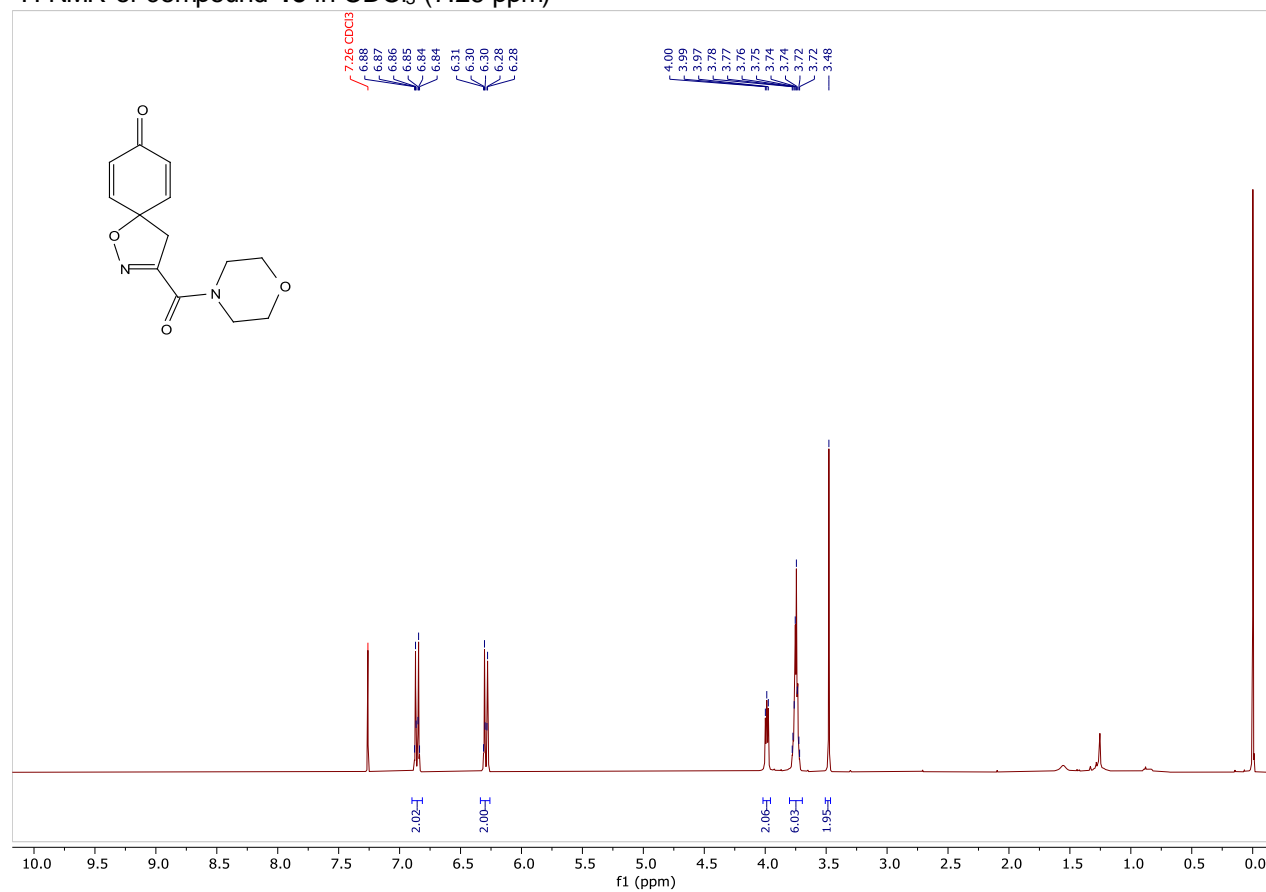
¹H NMR of compound **14** in CDCl₃ (7.26 ppm)



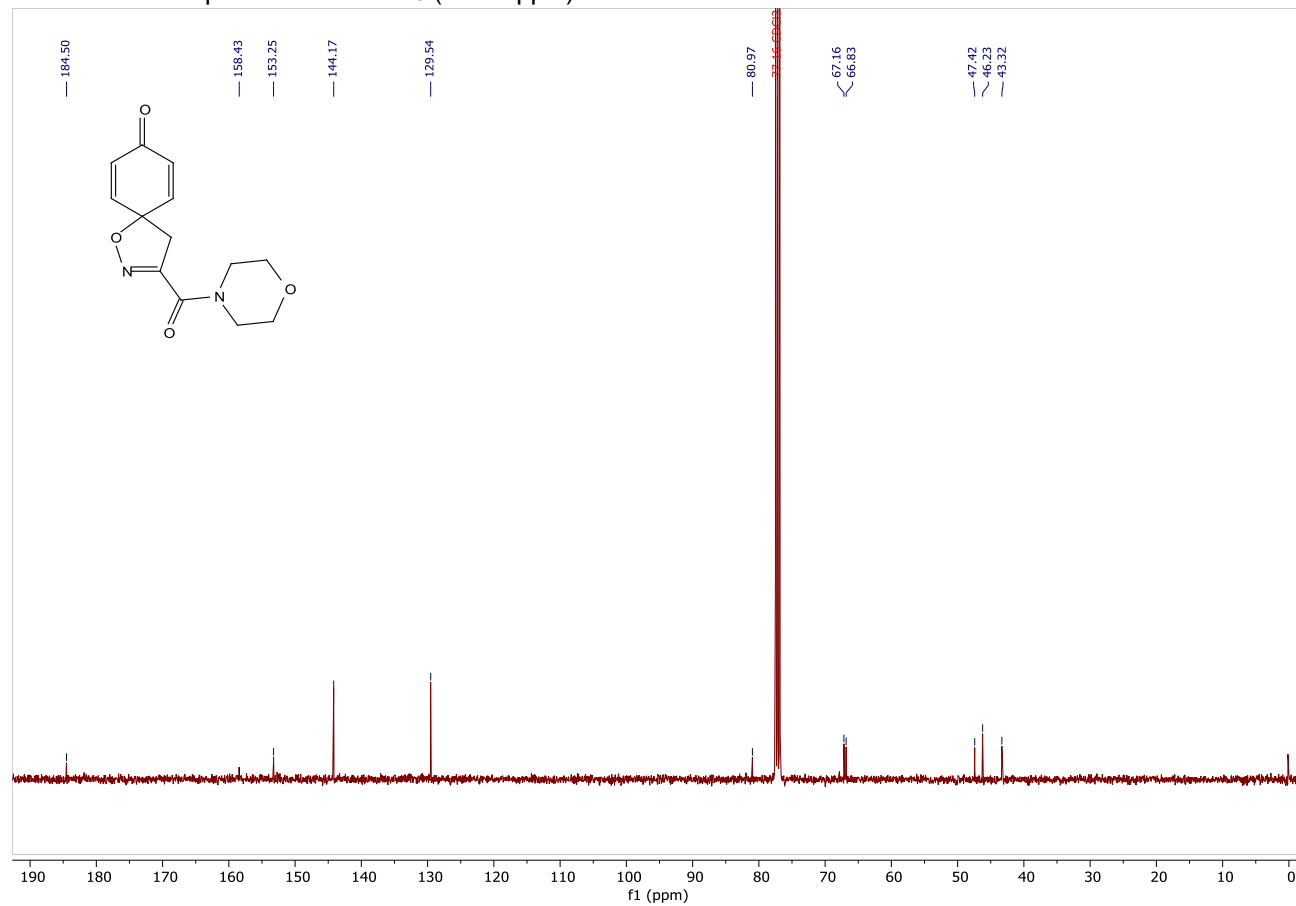
¹³C NMR of compound **14** in CDCl₃ (77.16 ppm)



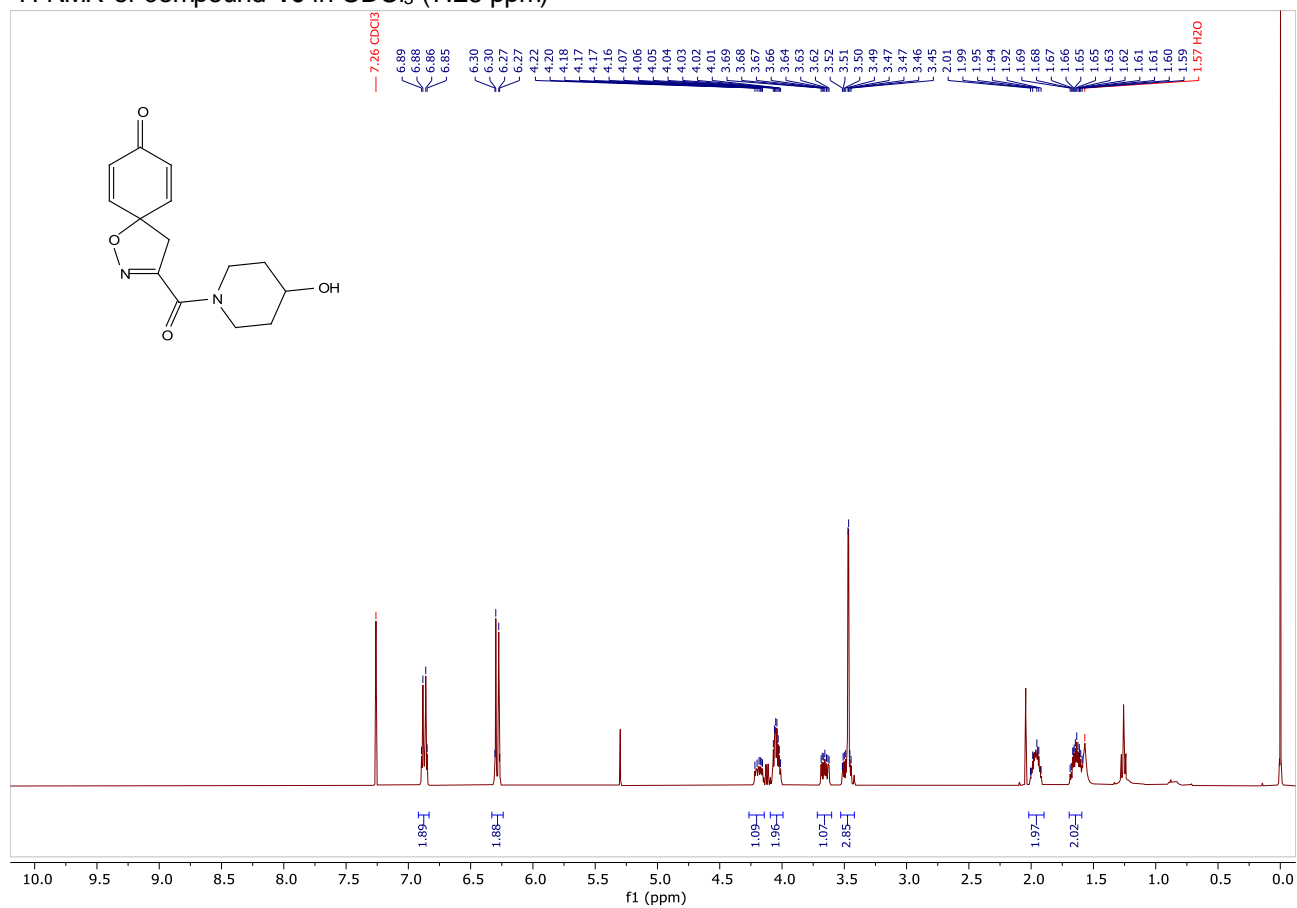
^1H NMR of compound **15** in CDCl_3 (7.26 ppm)



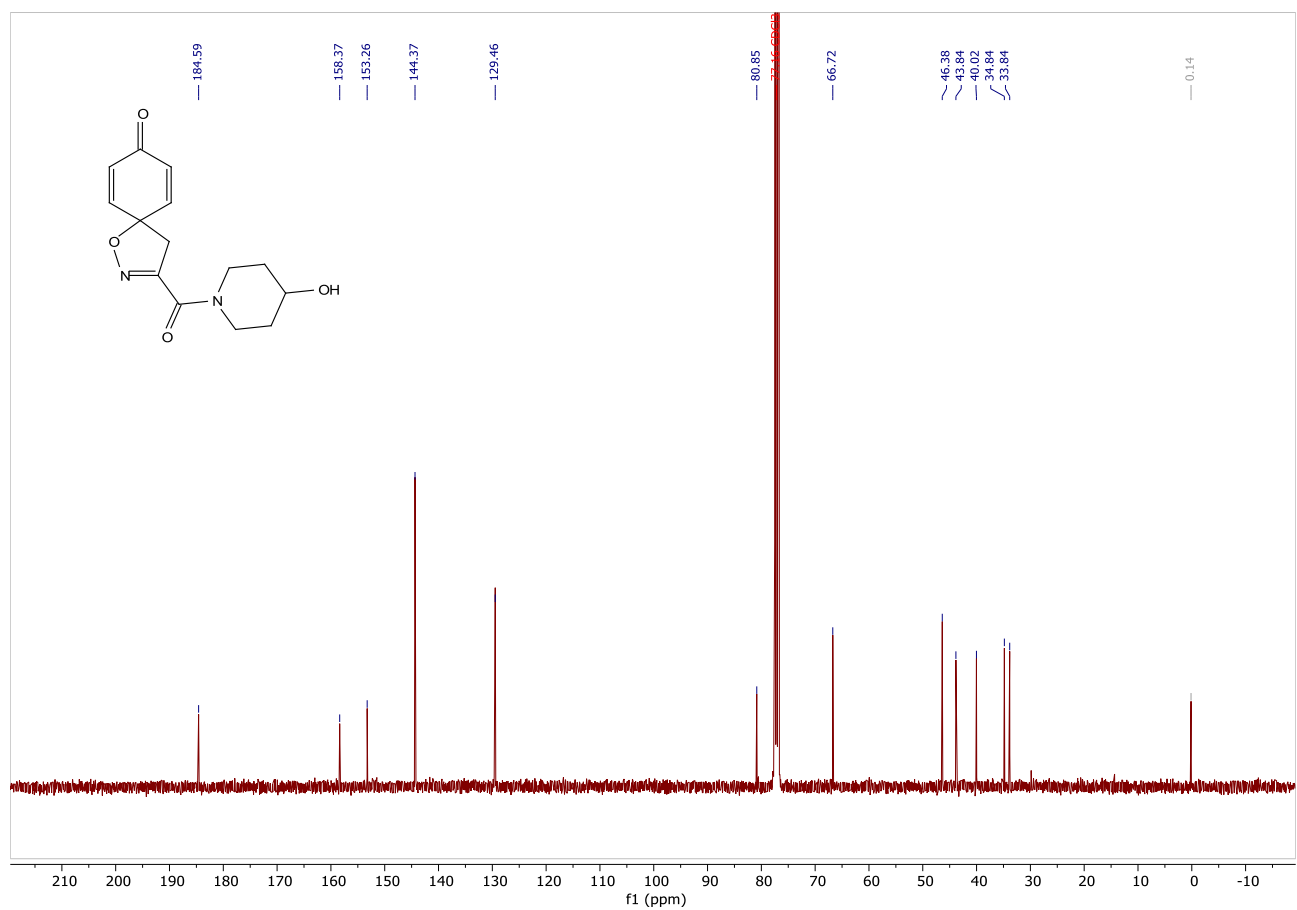
^{13}C NMR of compound **15** in CDCl_3 (77.16 ppm)



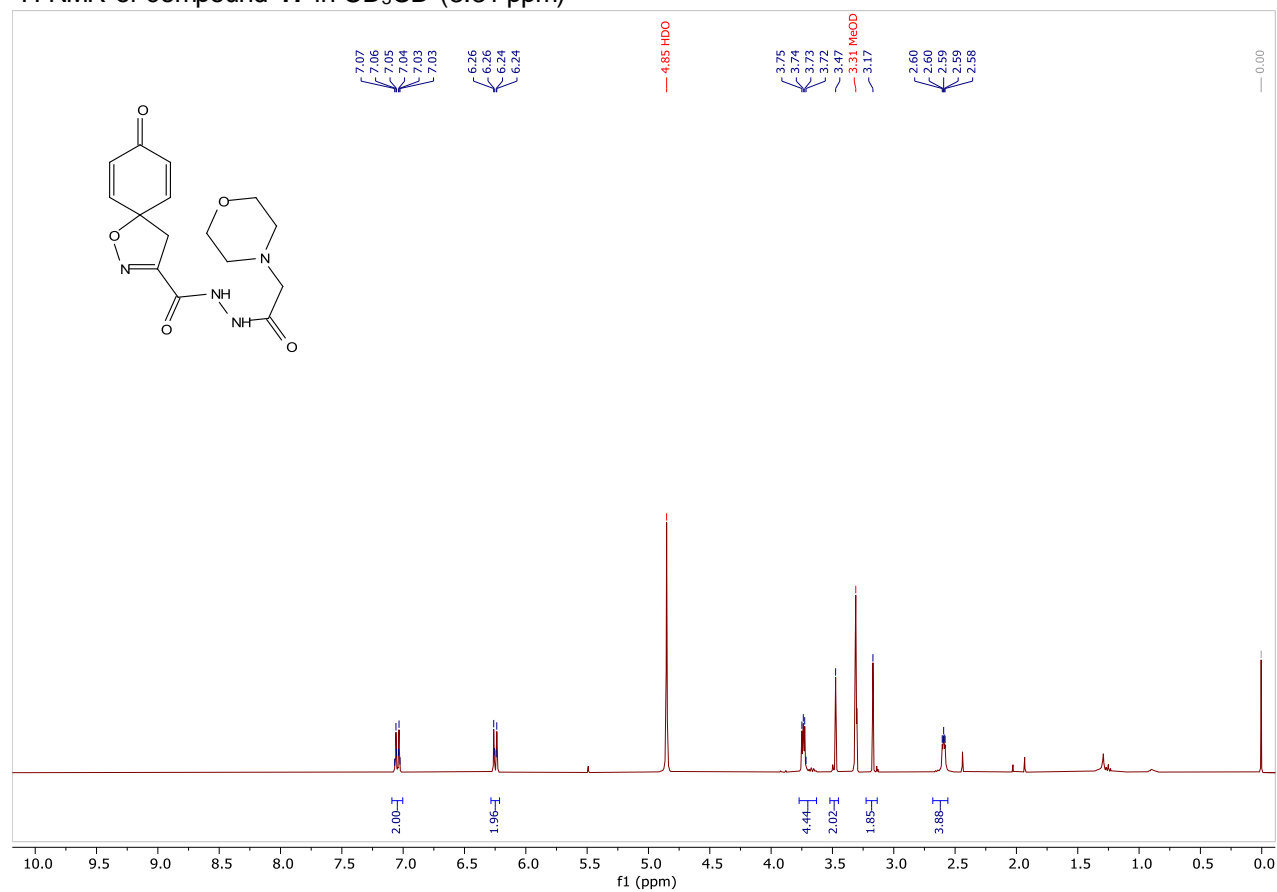
^1H NMR of compound **16** in CDCl_3 (7.26 ppm)



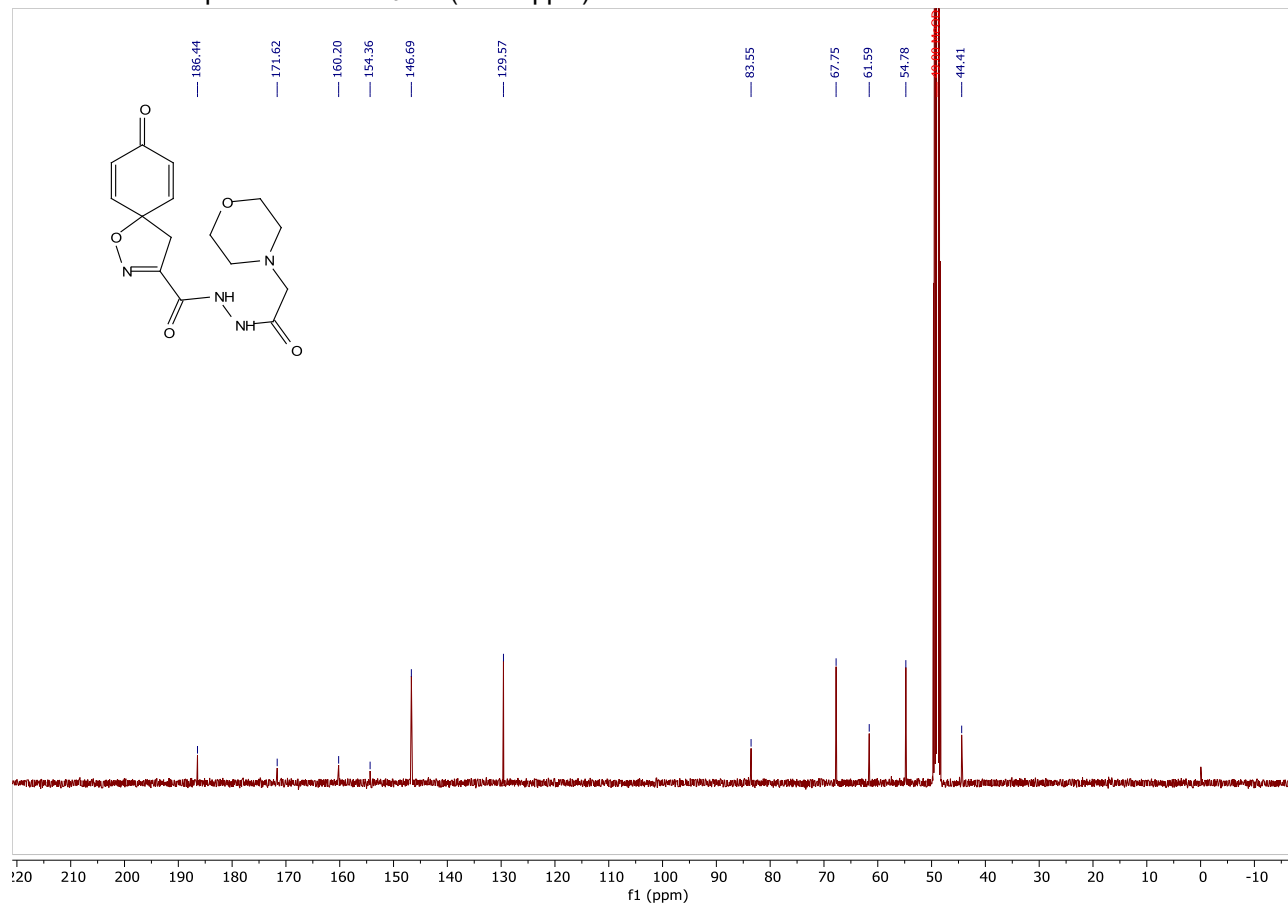
^{13}C NMR of compound **16** in CDCl_3 (77.16 ppm)



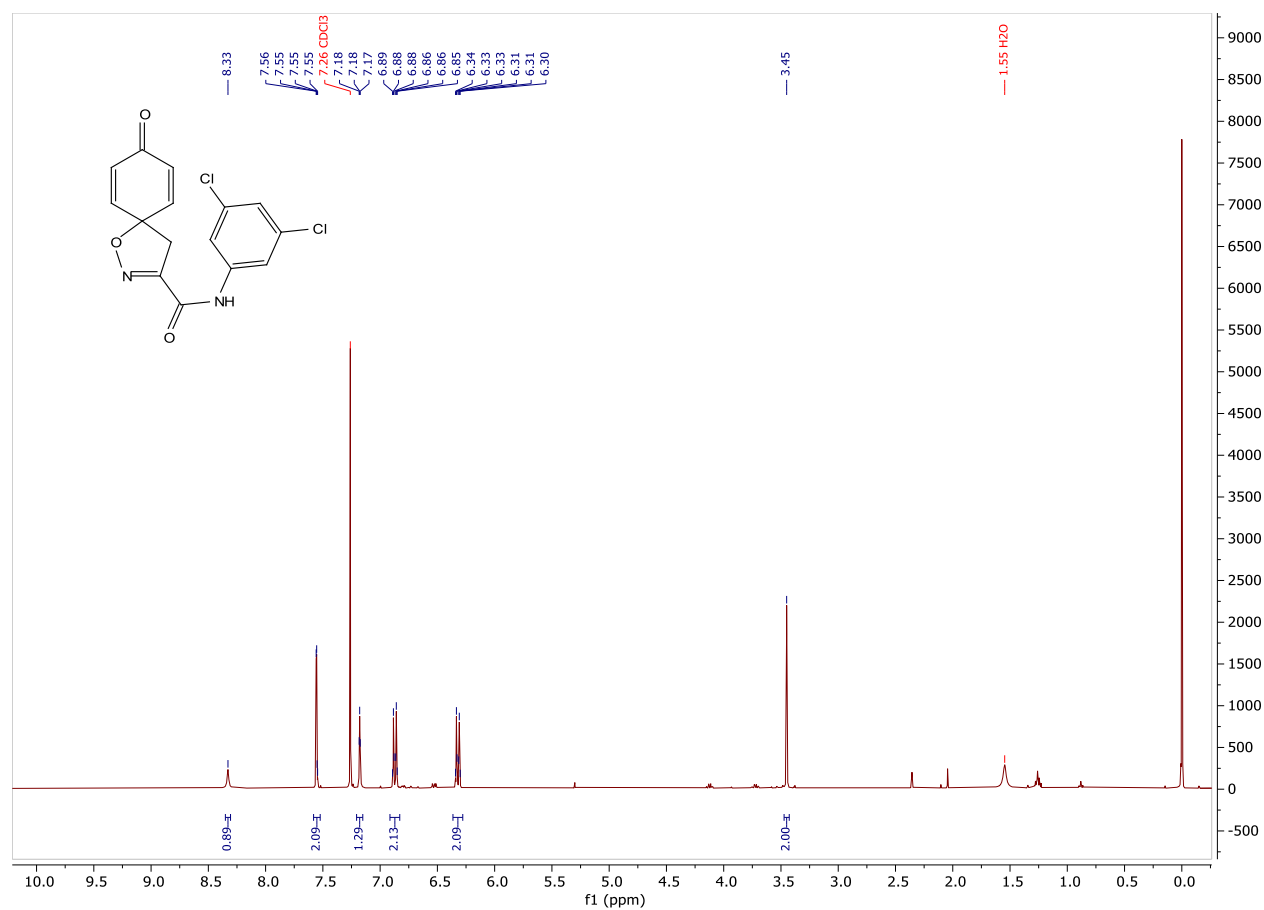
¹H NMR of compound **17** in CD₃OD (3.31 ppm)



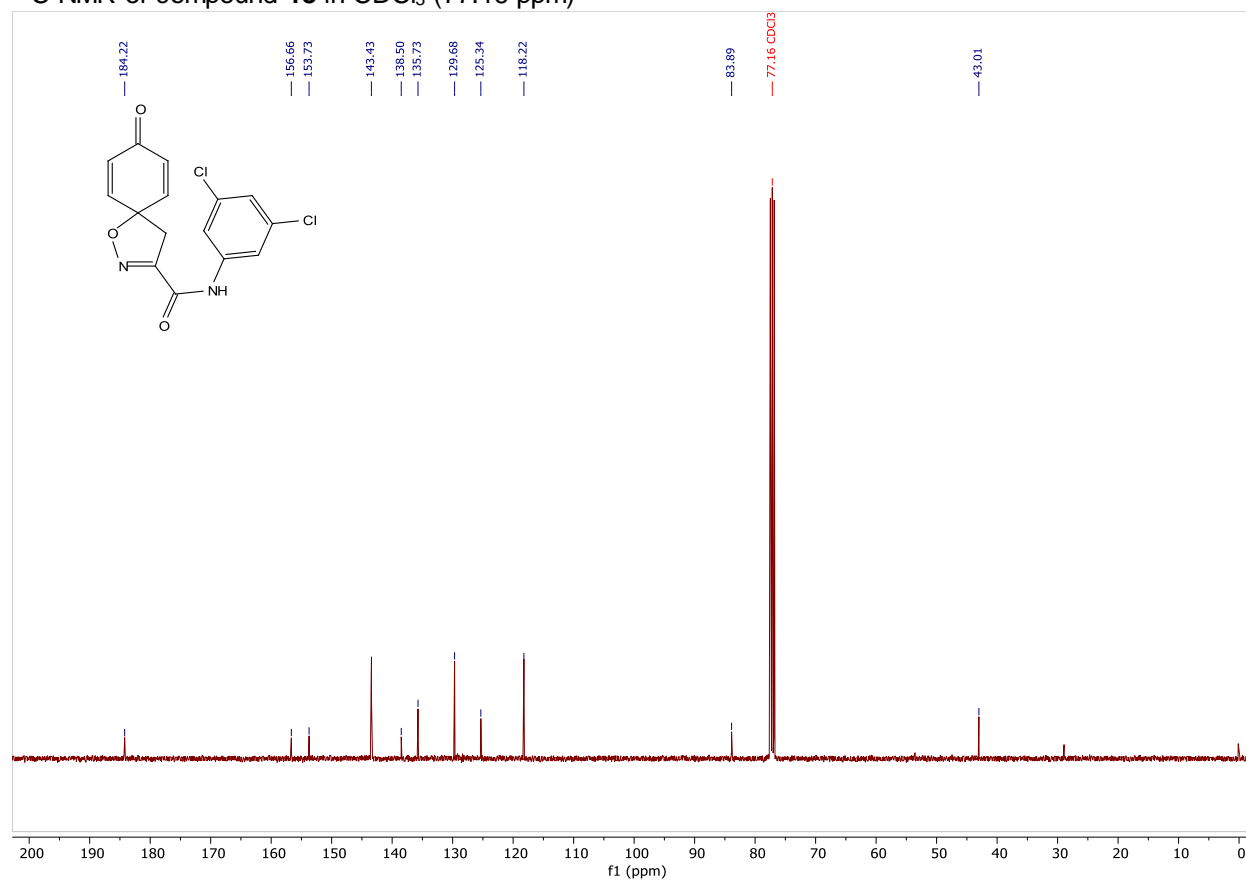
¹³C NMR of compound **17** in CD₃OD (49.00 ppm)



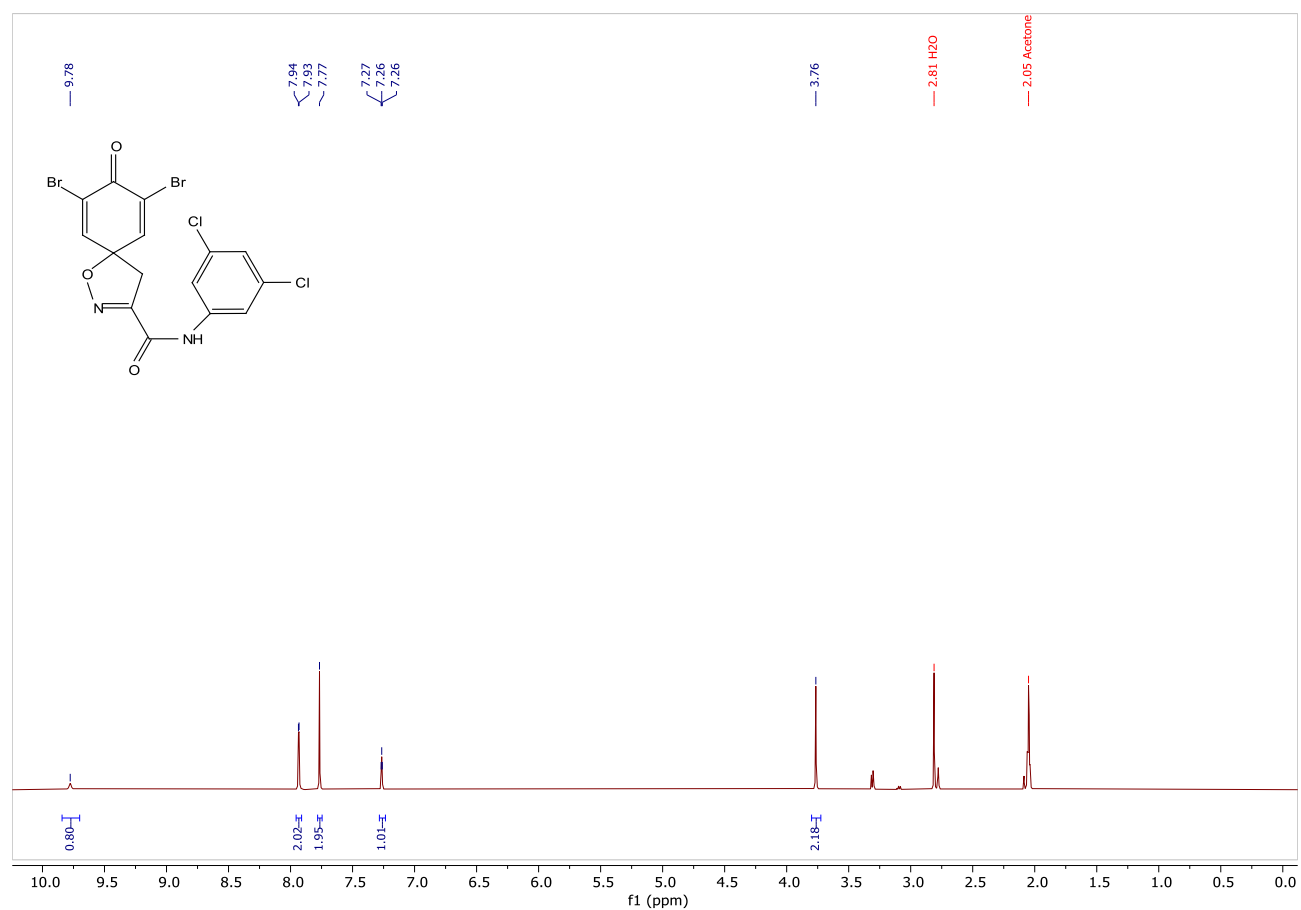
^1H NMR of compound **18** in CDCl_3 (7.26 ppm)



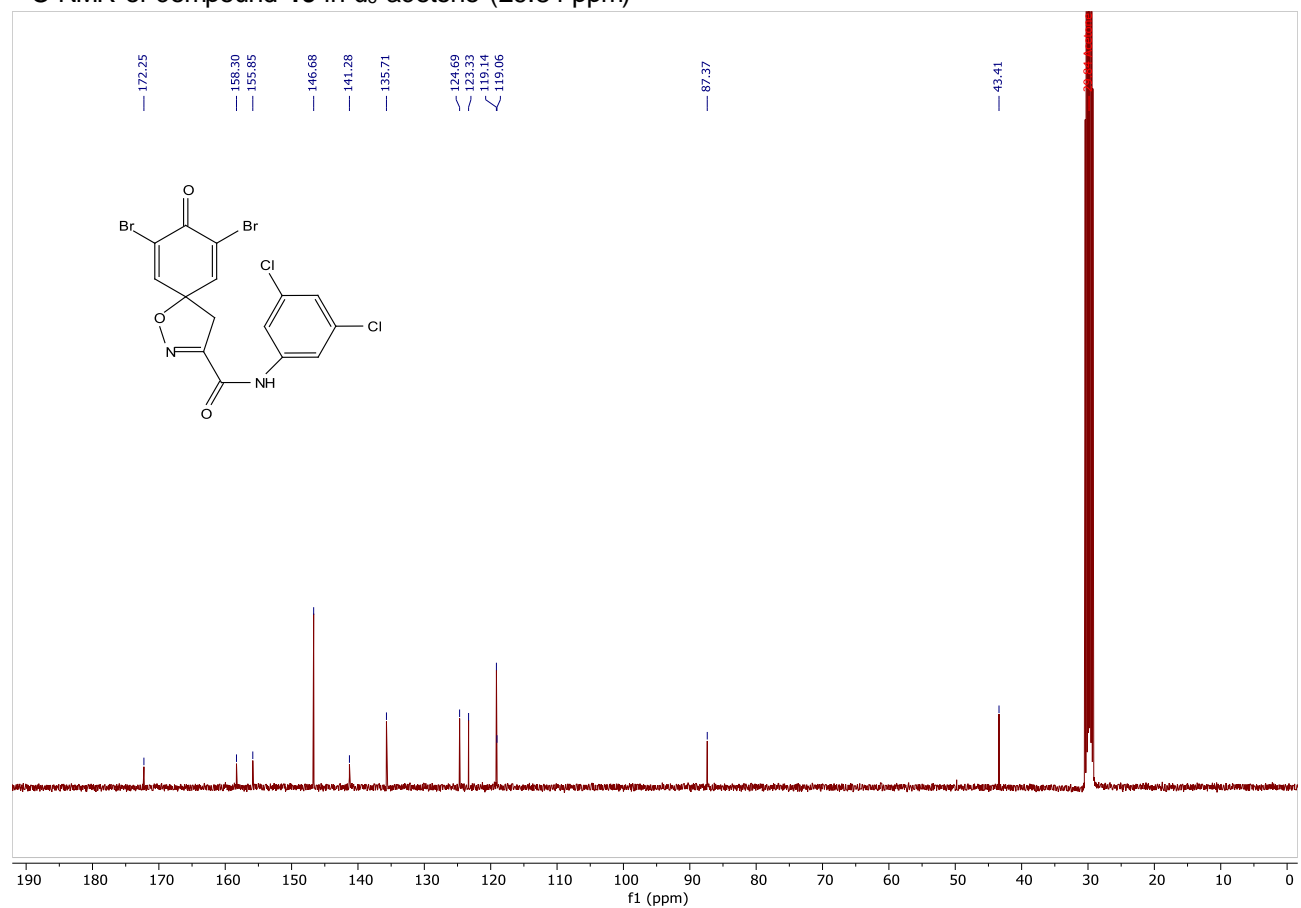
^{13}C NMR of compound **18** in CDCl_3 (77.16 ppm)



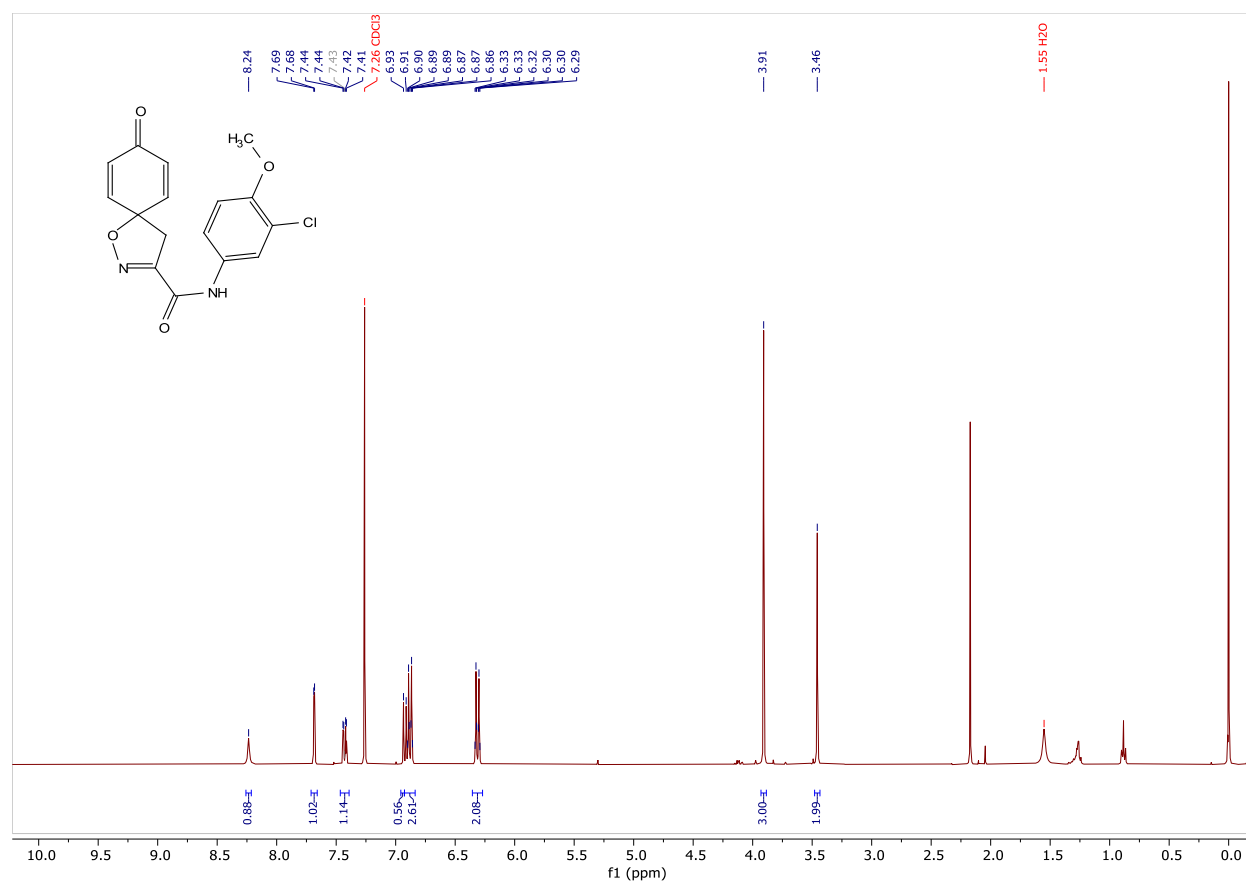
^1H NMR of compound **19** in d_6 -acetone (2.05 ppm)



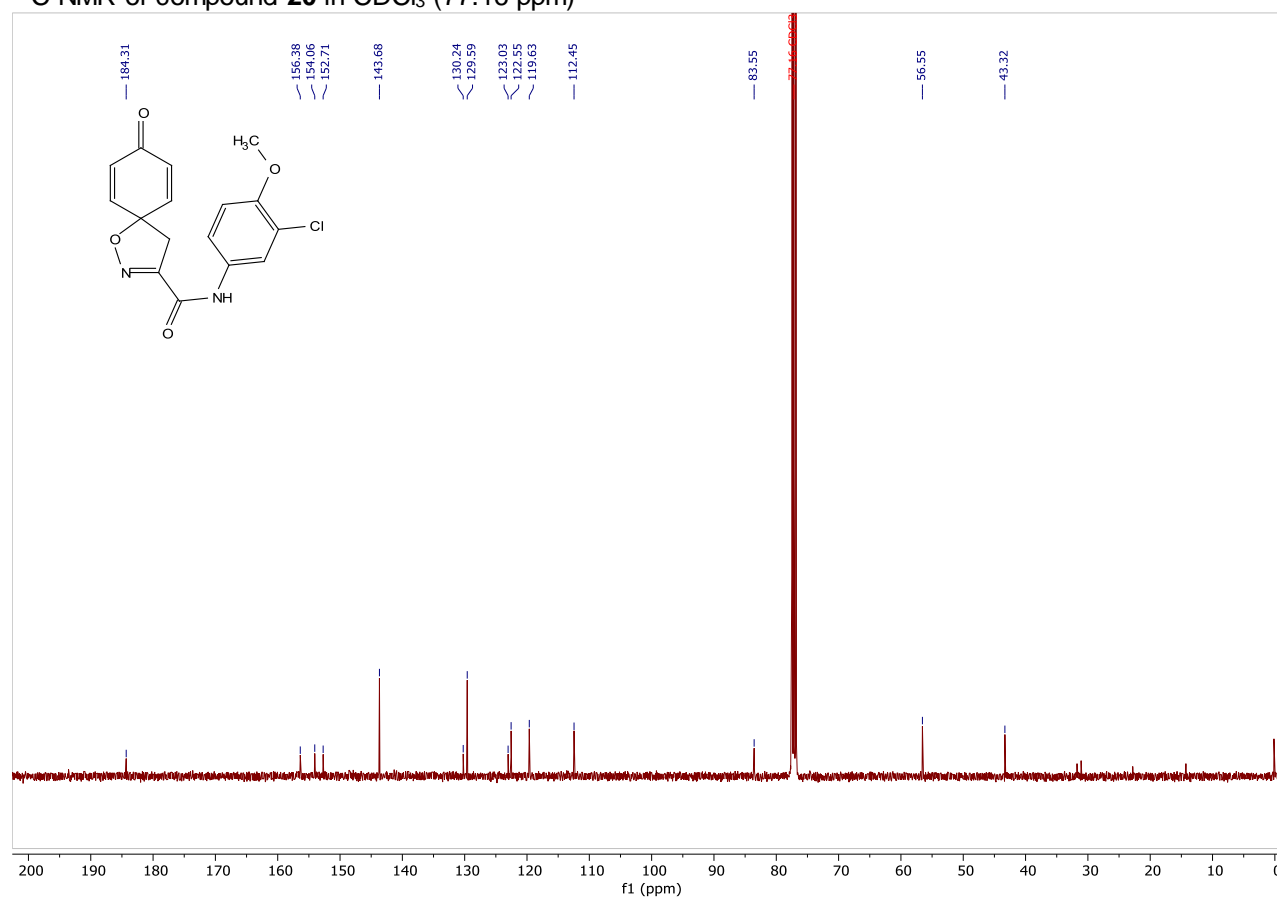
^{13}C NMR of compound **19** in d_6 -acetone (29.84 ppm)



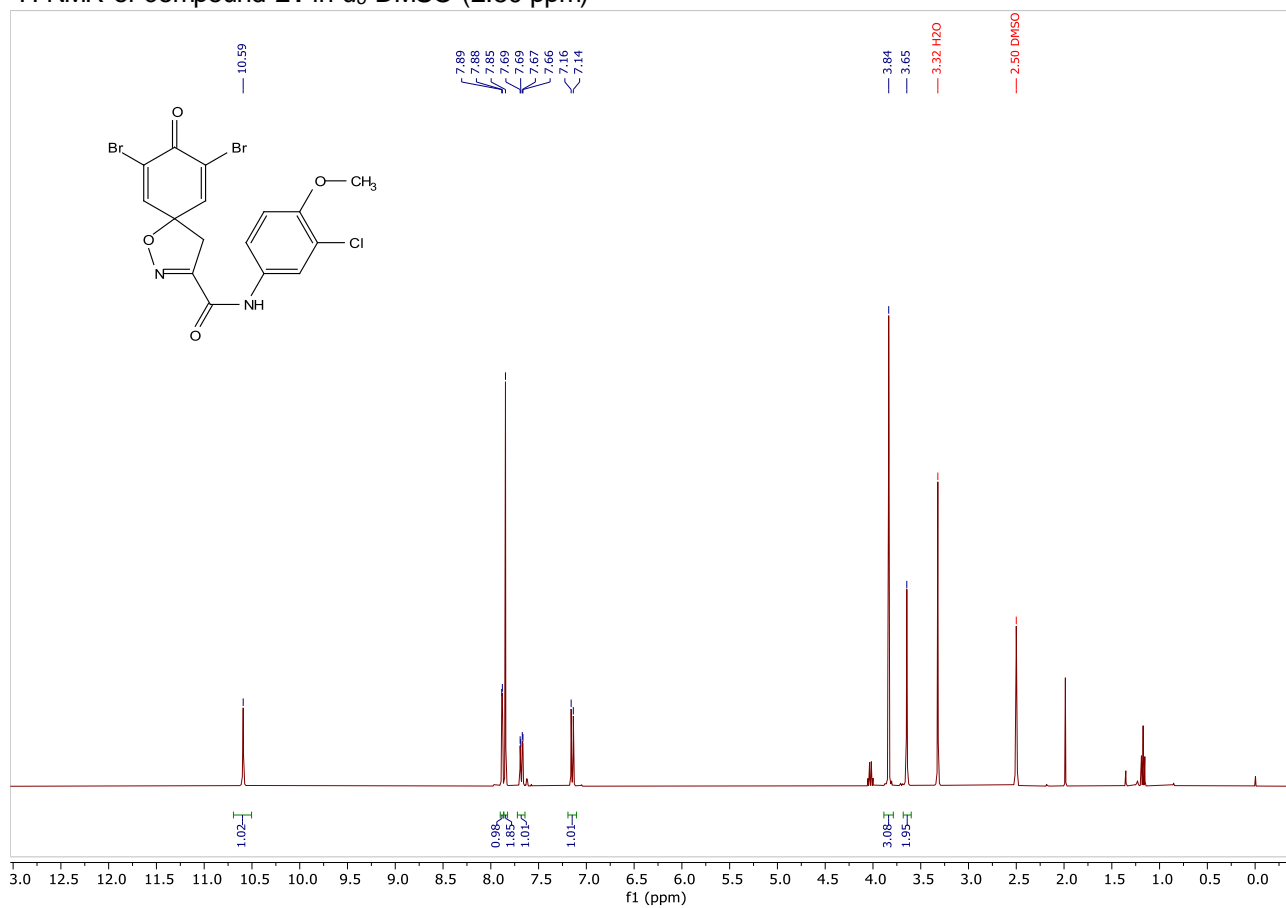
^1H NMR of compound **20** in CDCl_3 (7.26 ppm)



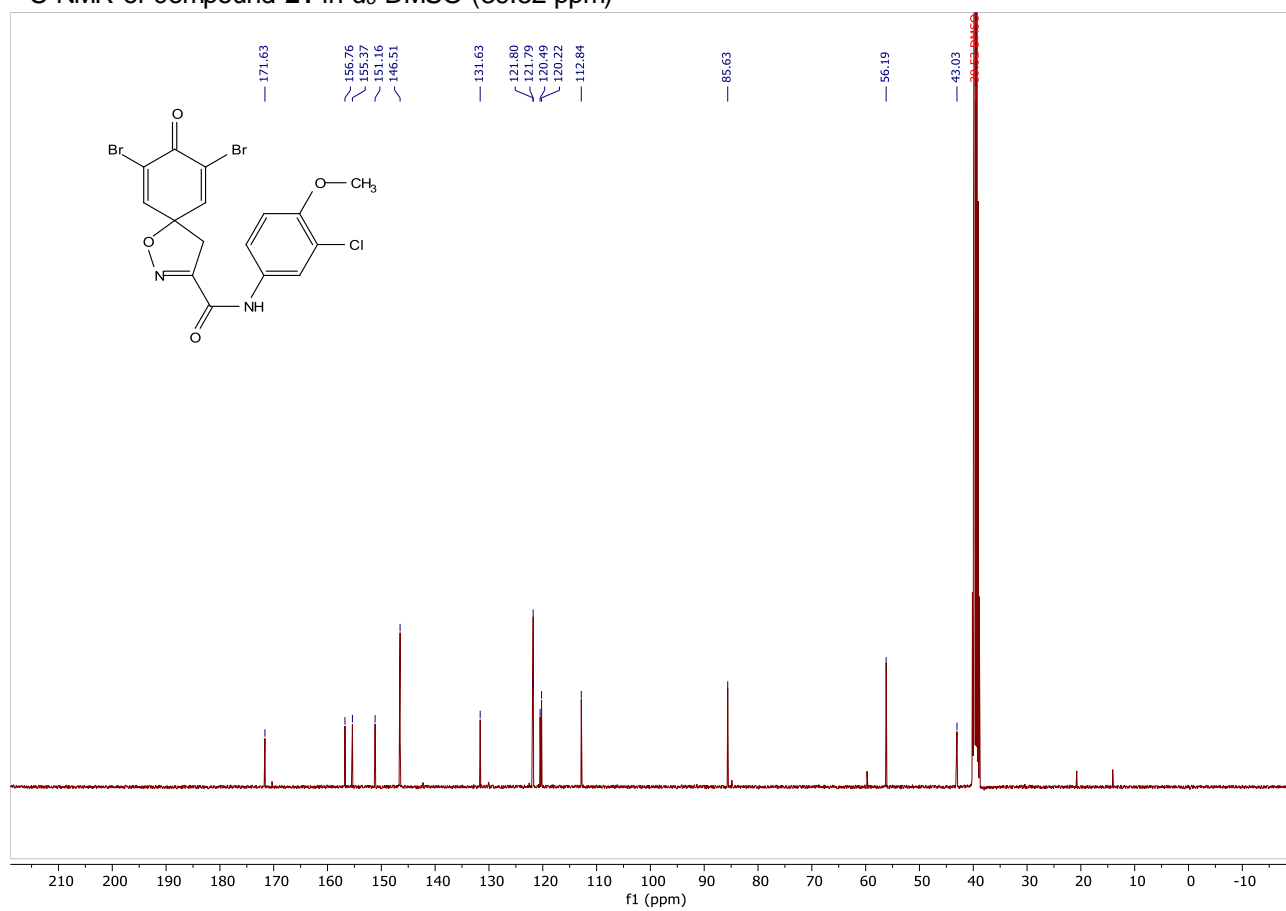
^{13}C NMR of compound **20** in CDCl_3 (77.16 ppm)



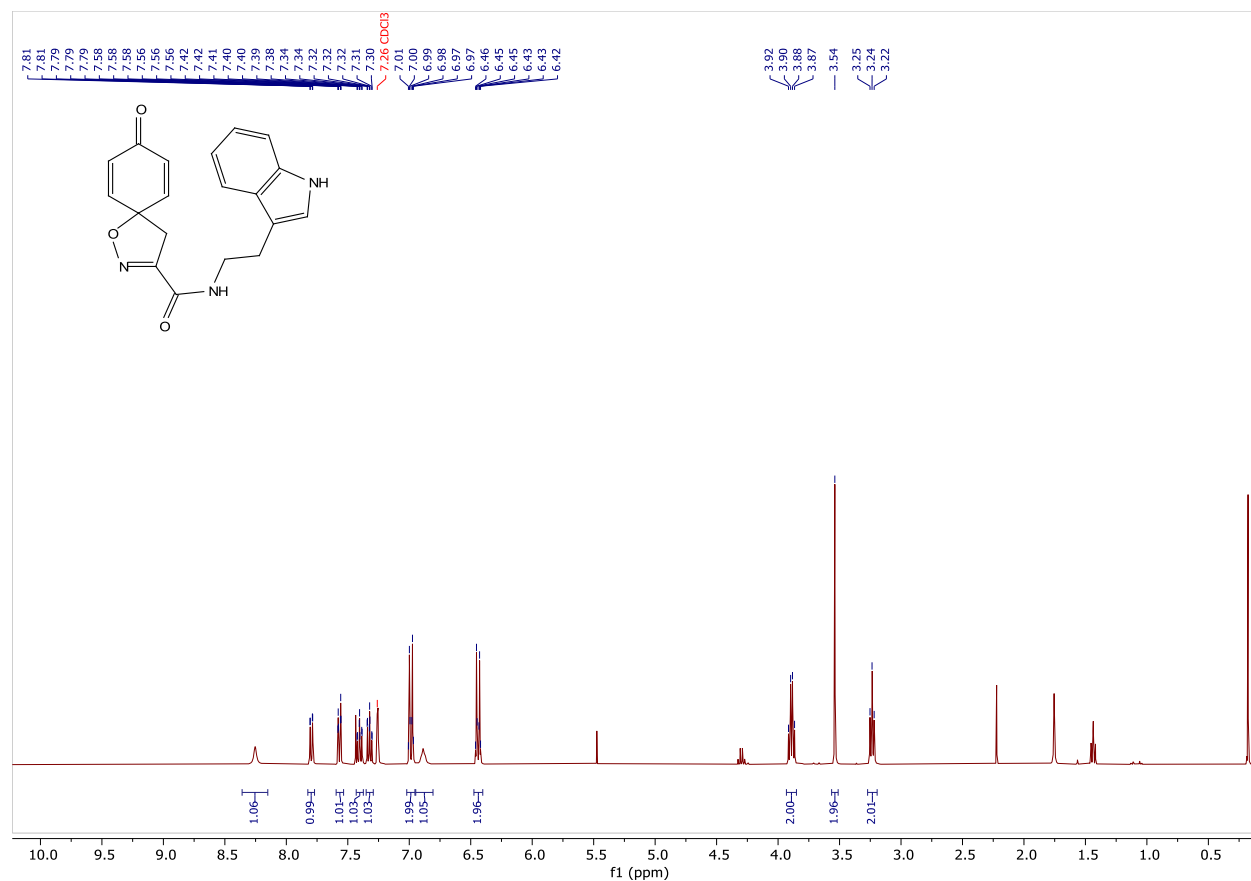
¹H NMR of compound **21** in d₆-DMSO (2.50 ppm)



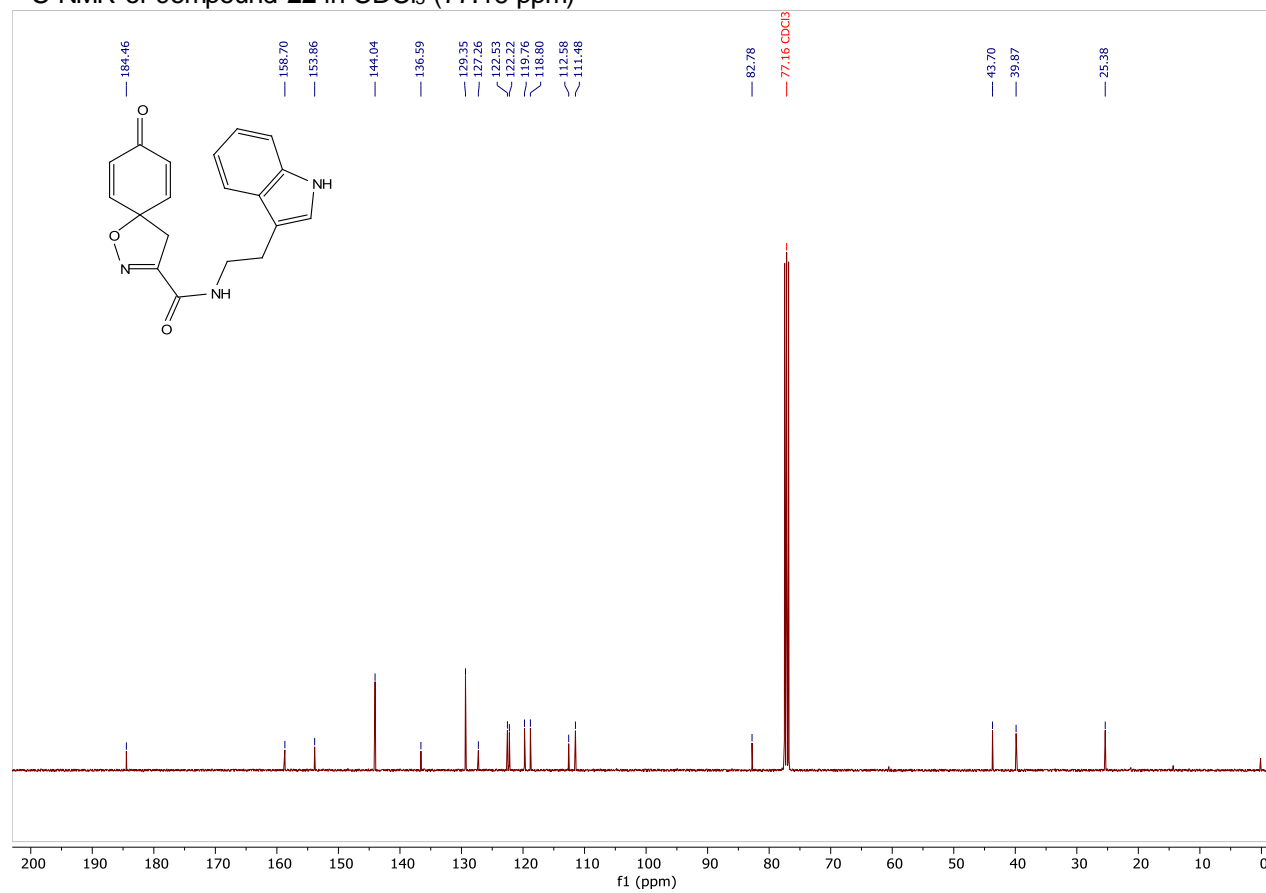
¹³C NMR of compound **21** in d₆-DMSO (39.52 ppm)



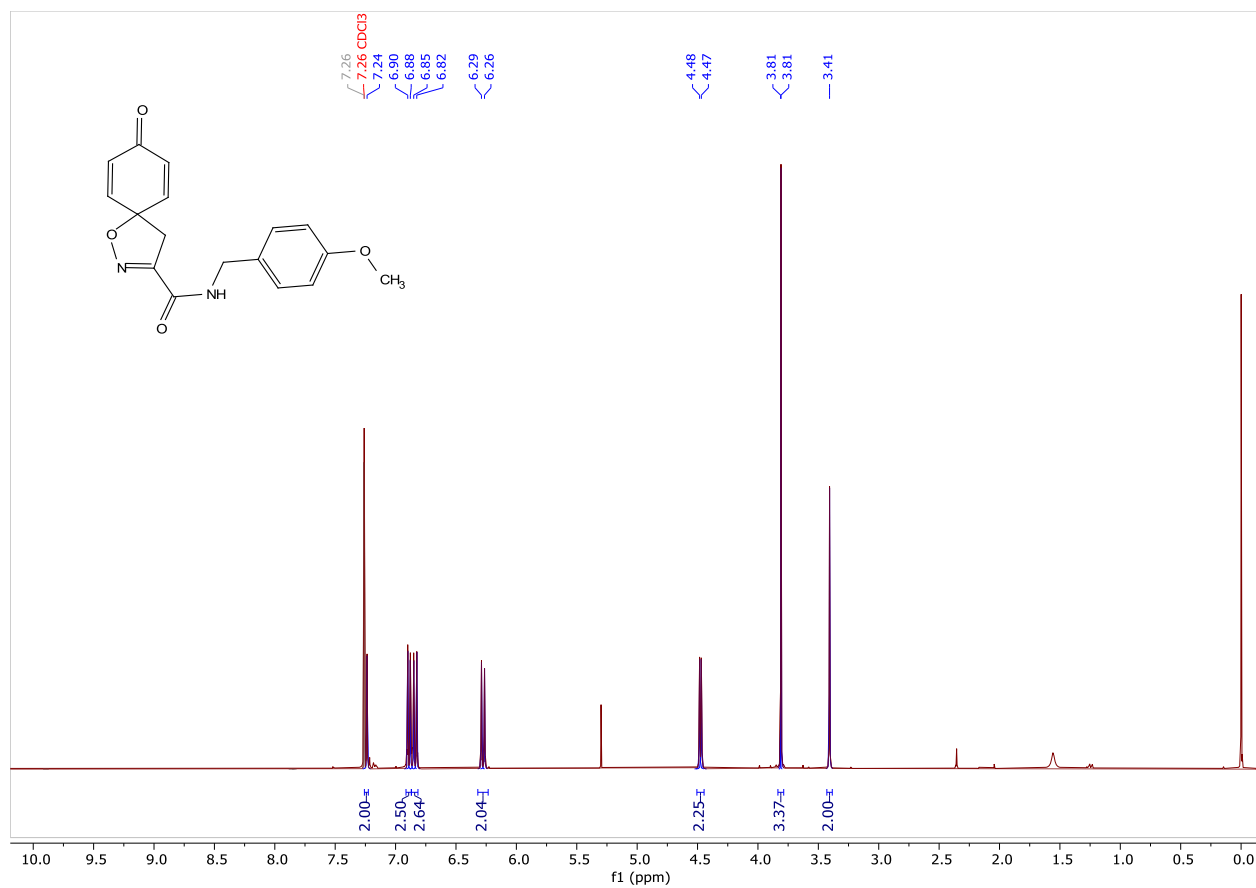
^1H NMR of compound **22** in CDCl_3 (7.26 ppm)



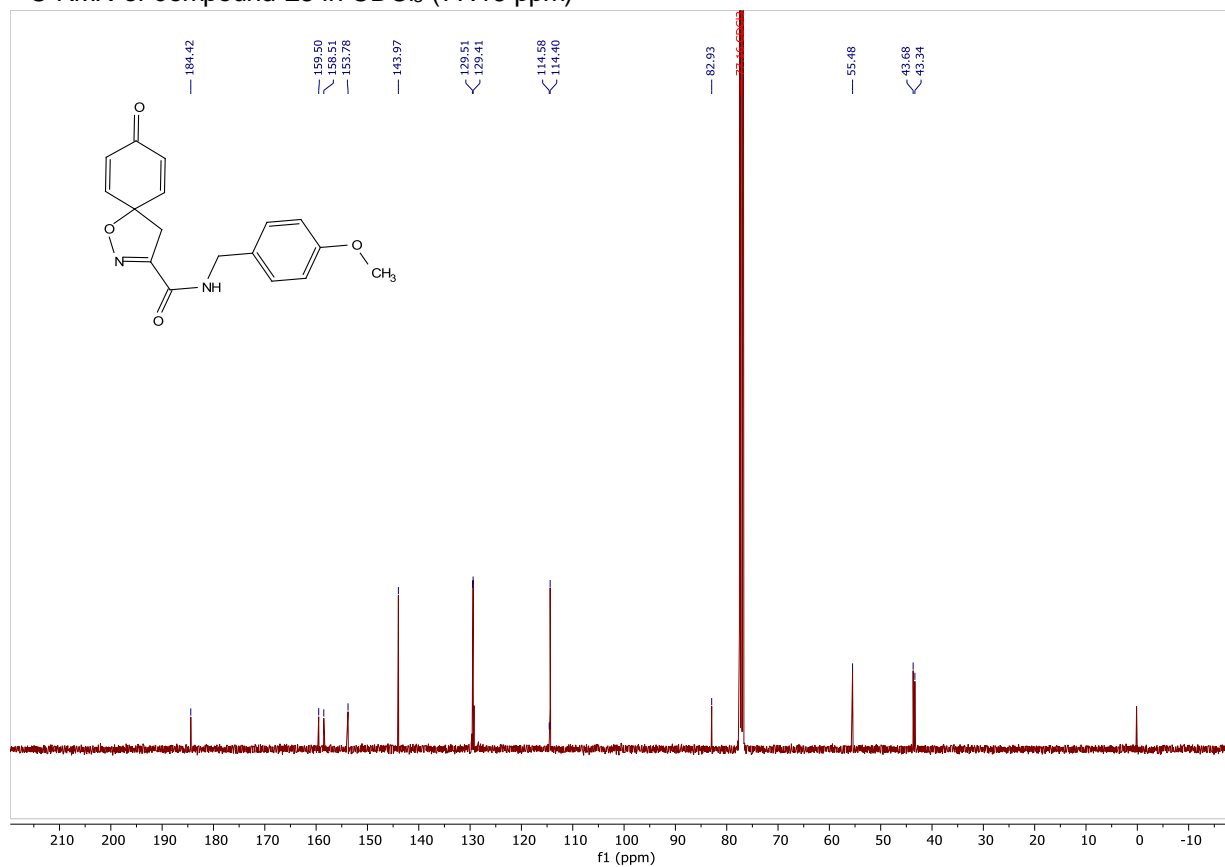
^{13}C NMR of compound **22** in CDCl_3 (77.16 ppm)



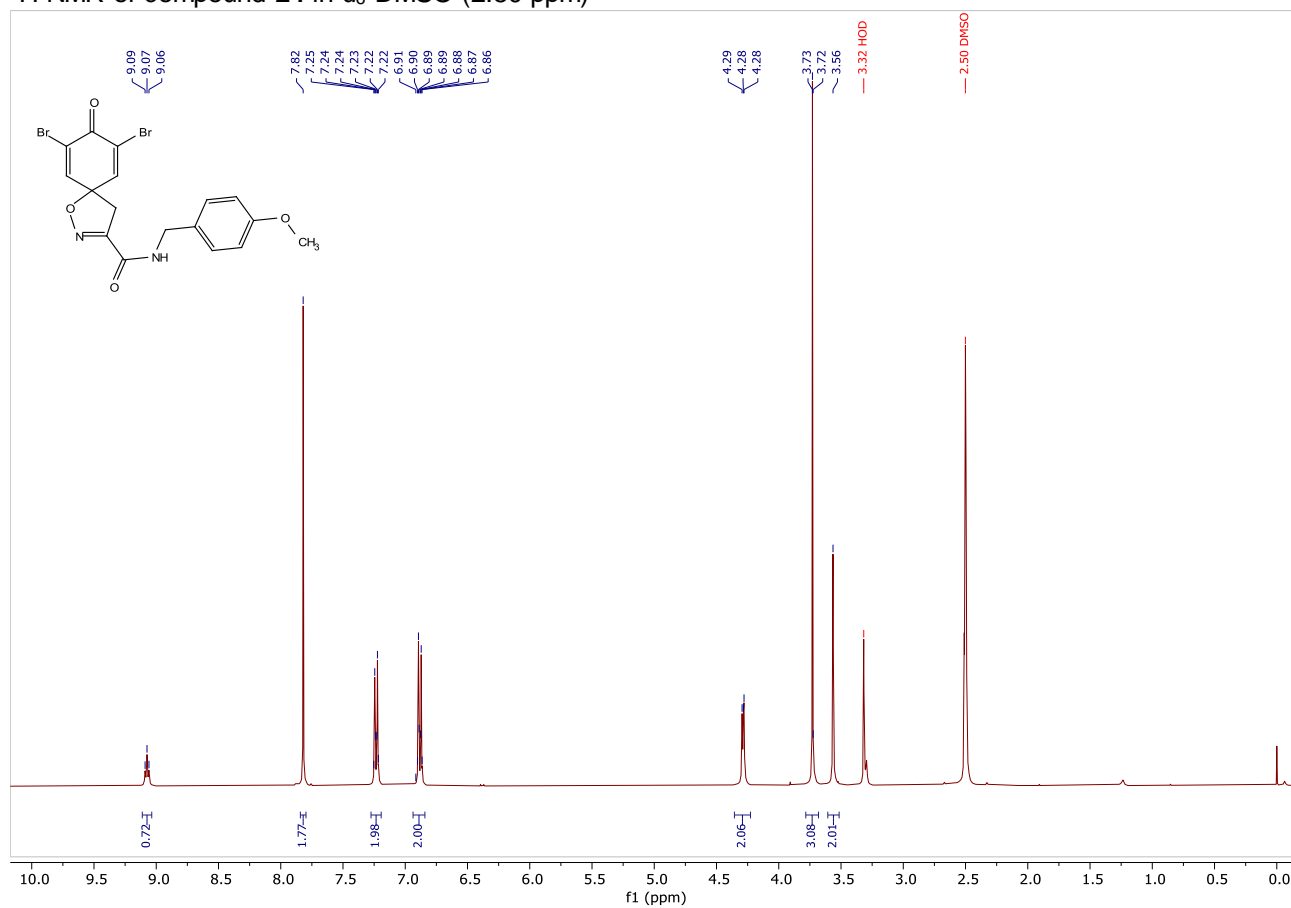
^1H NMR of compound **23** in CDCl_3 (7.26 ppm)



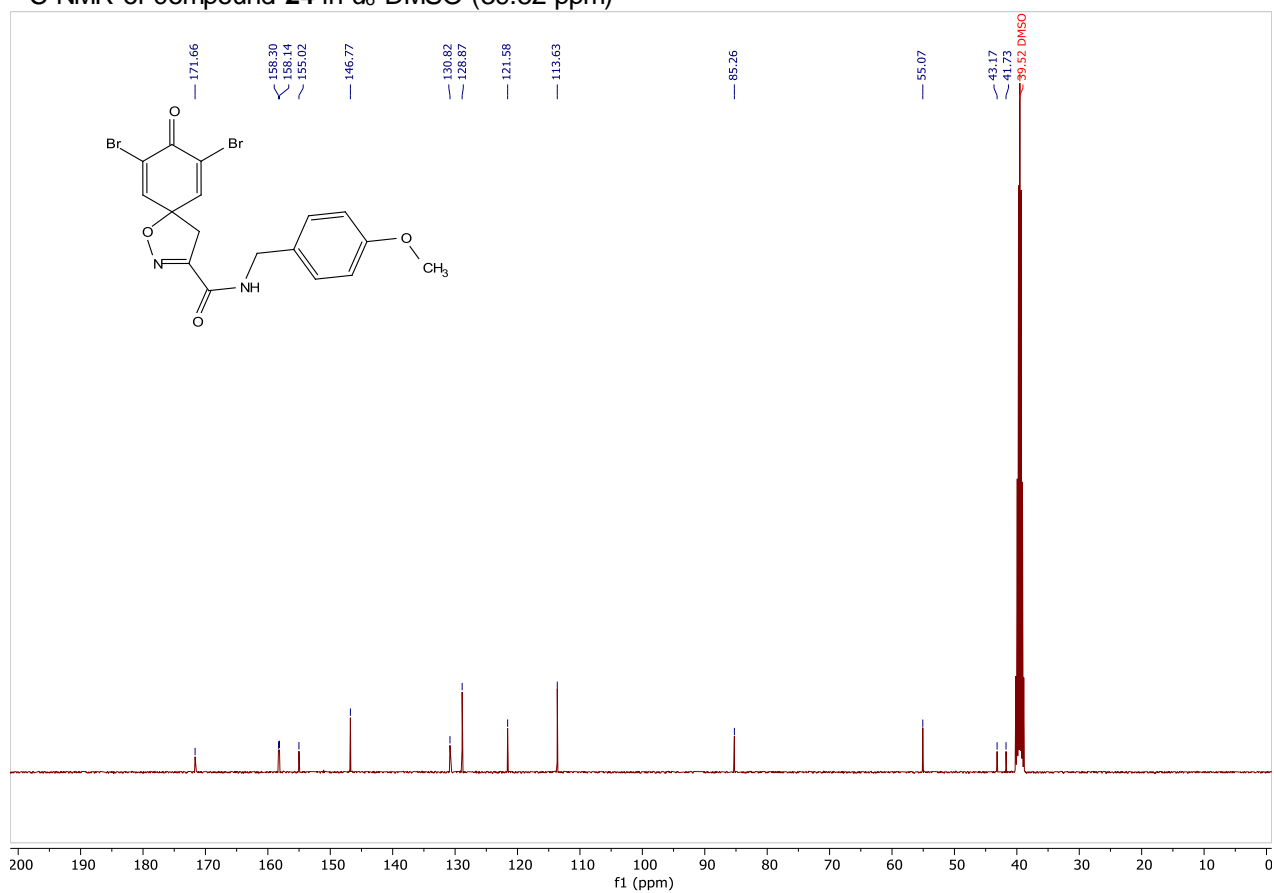
^{13}C NMR of compound **23** in CDCl_3 (77.16 ppm)



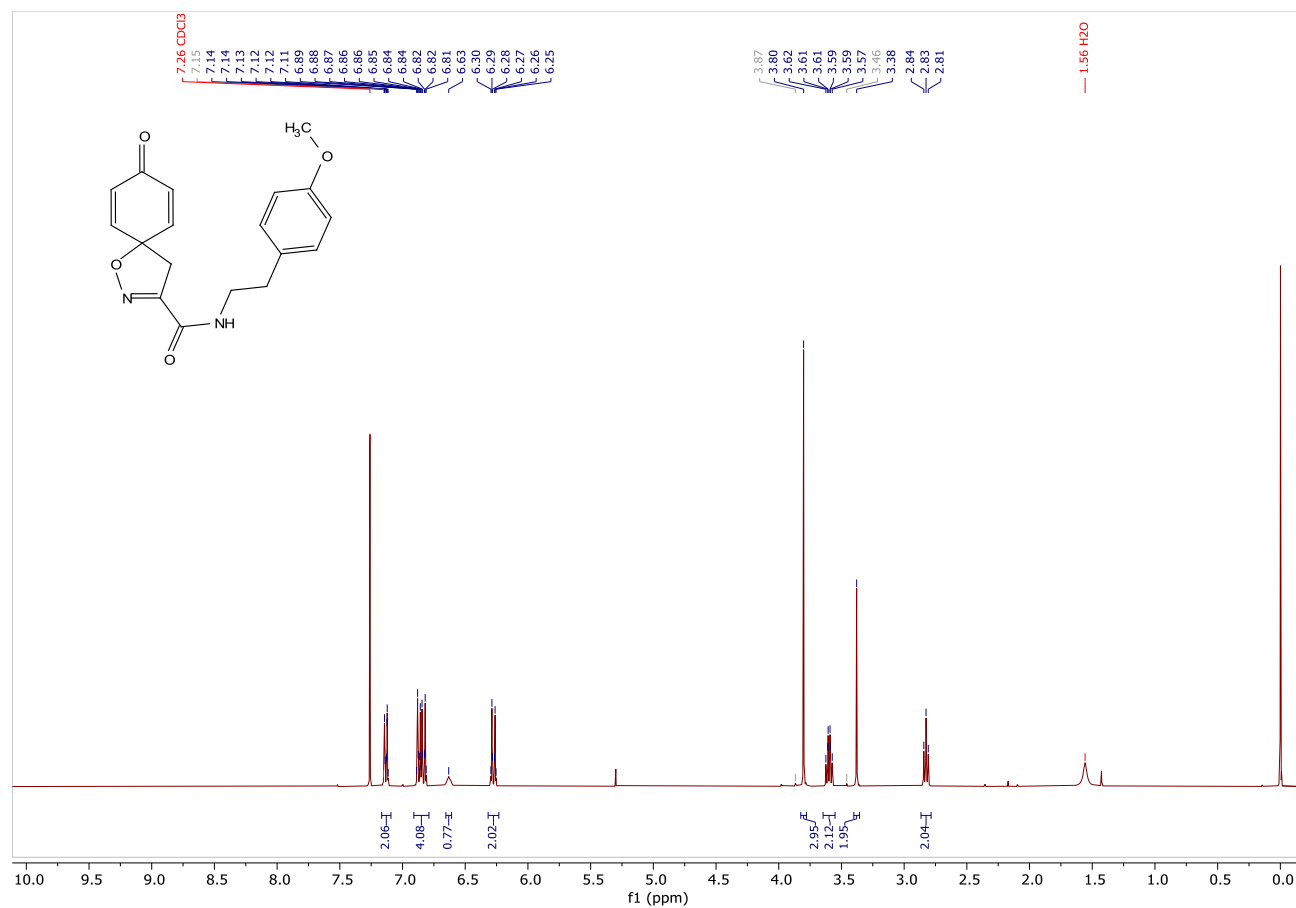
¹H NMR of compound **24** in d₆-DMSO (2.50 ppm)



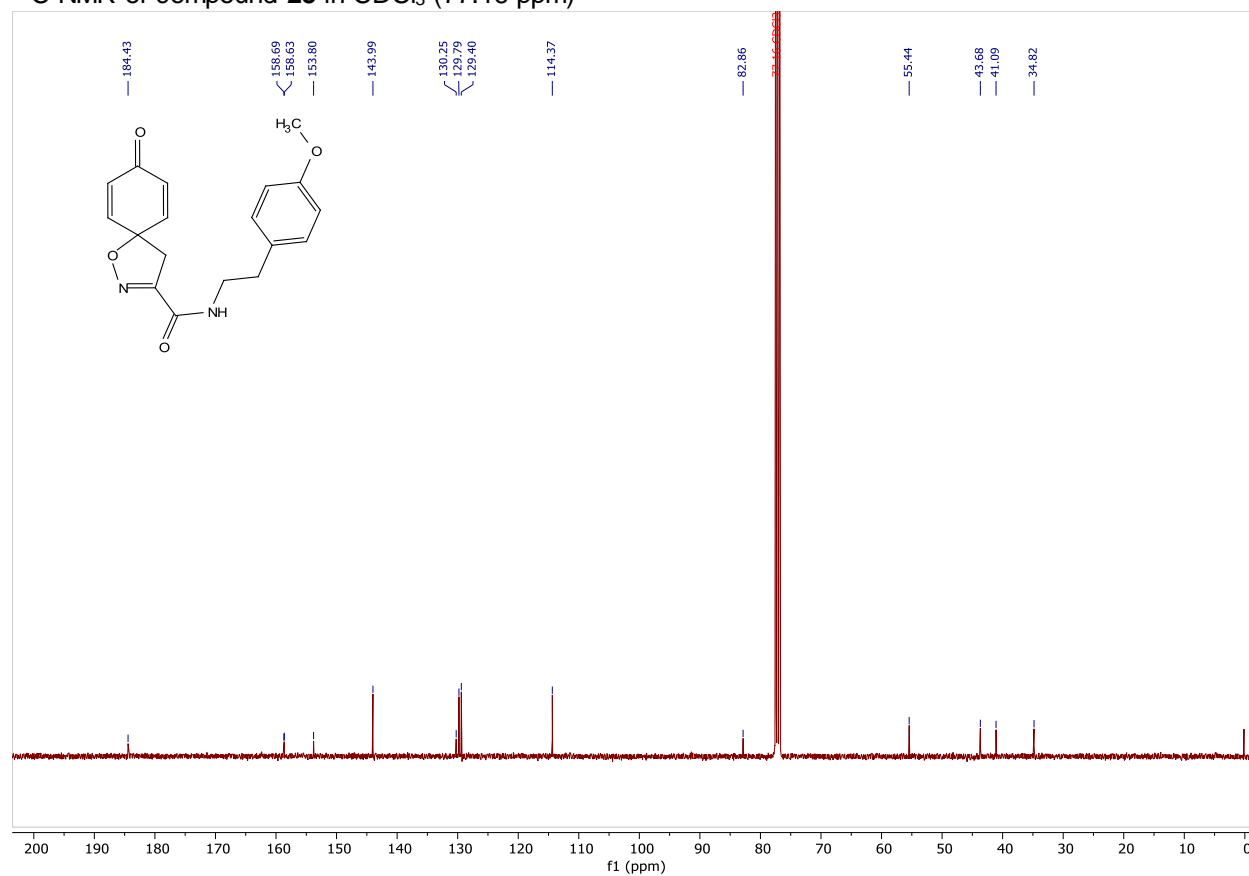
¹³C NMR of compound **24** in d₆-DMSO (39.52 ppm)



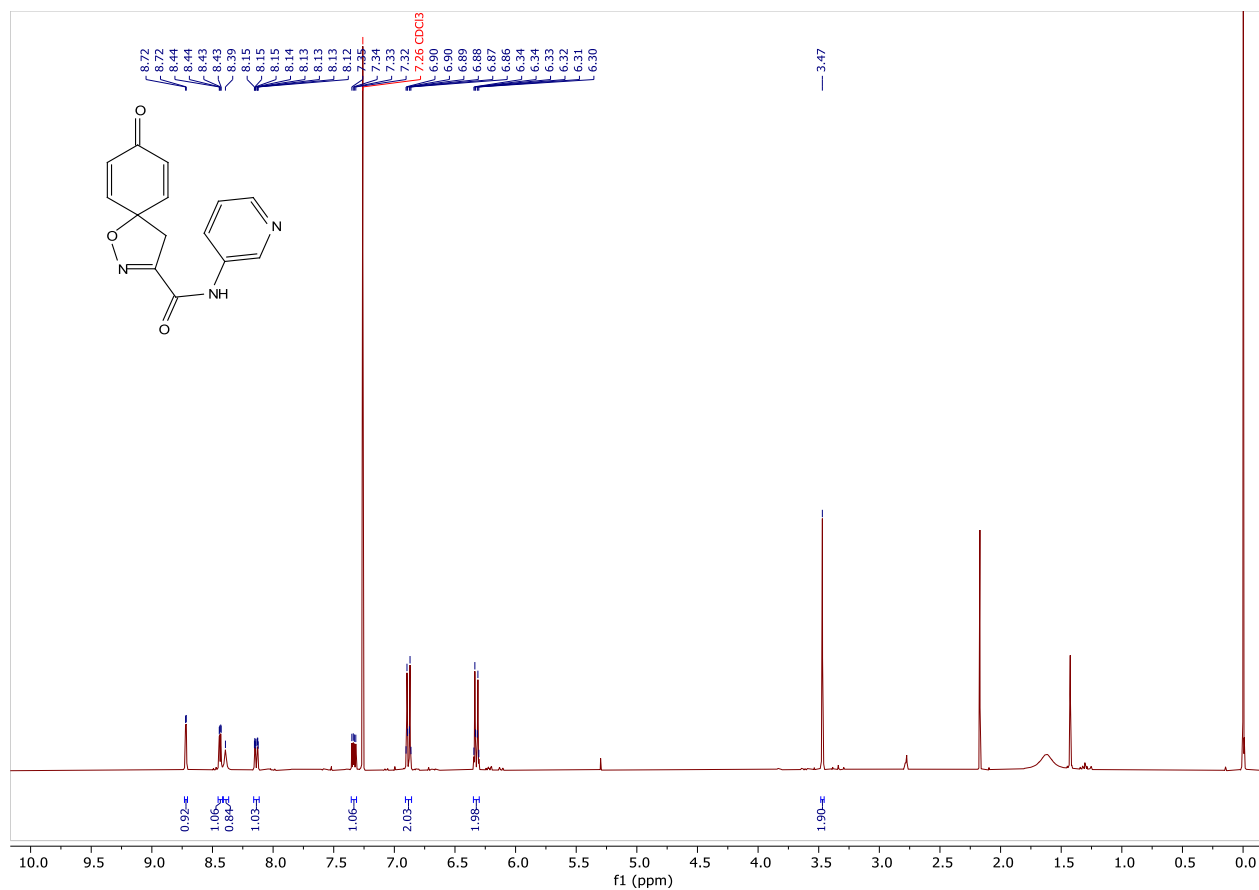
^1H NMR of compound **25** in CDCl_3 (7.26 ppm)



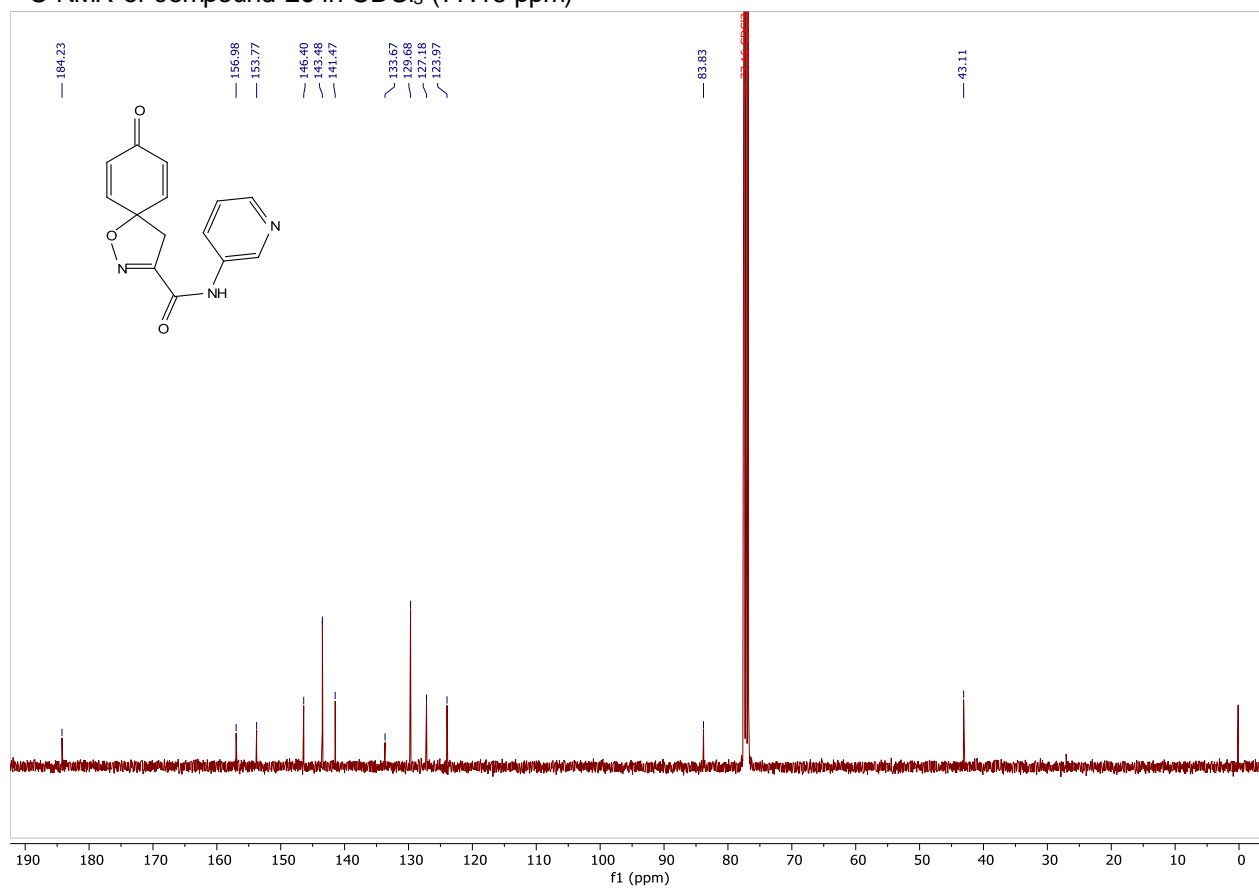
^{13}C NMR of compound **25** in CDCl_3 (77.16 ppm)



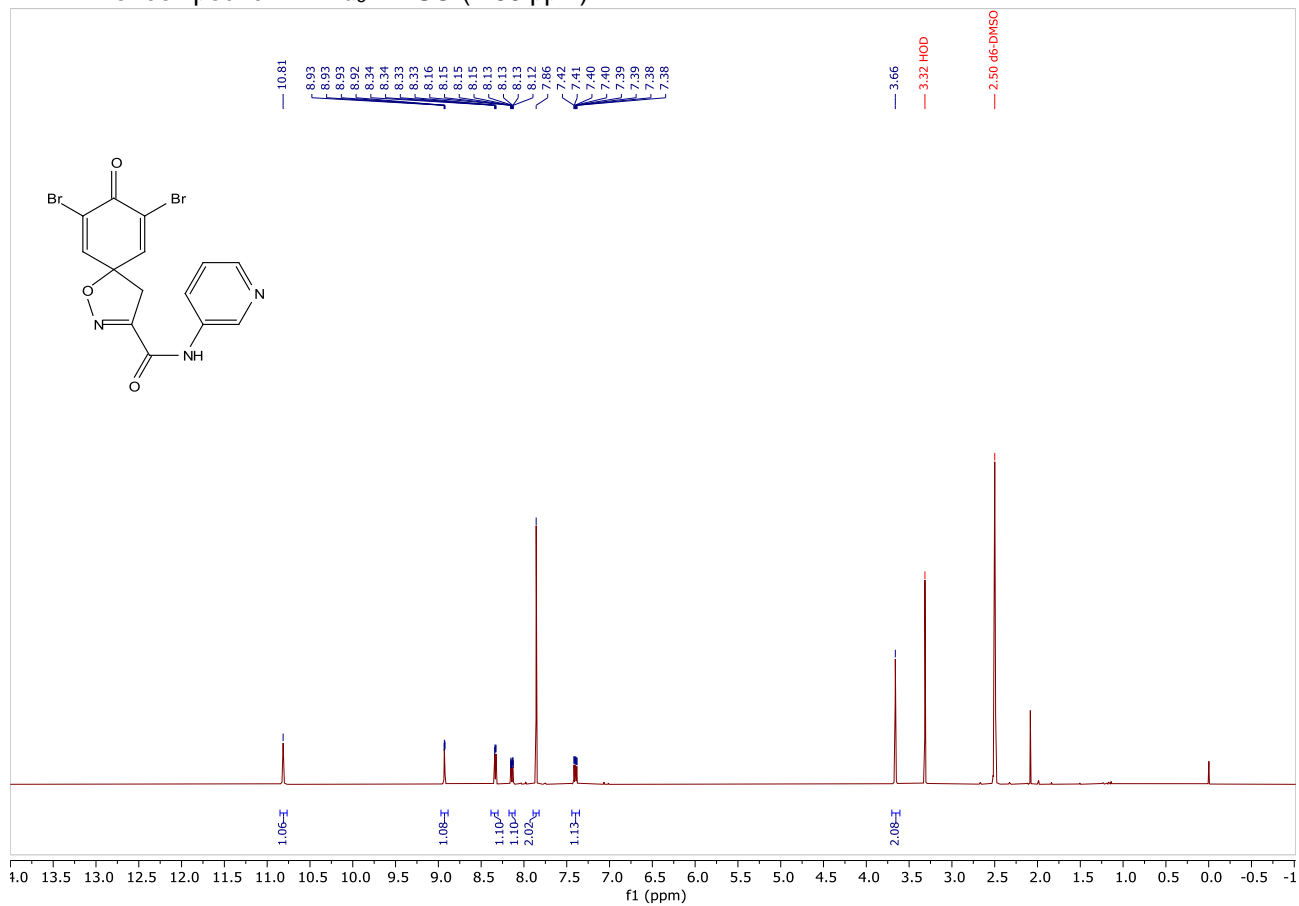
^1H NMR of compound **26** in CDCl_3 (7.26 ppm)



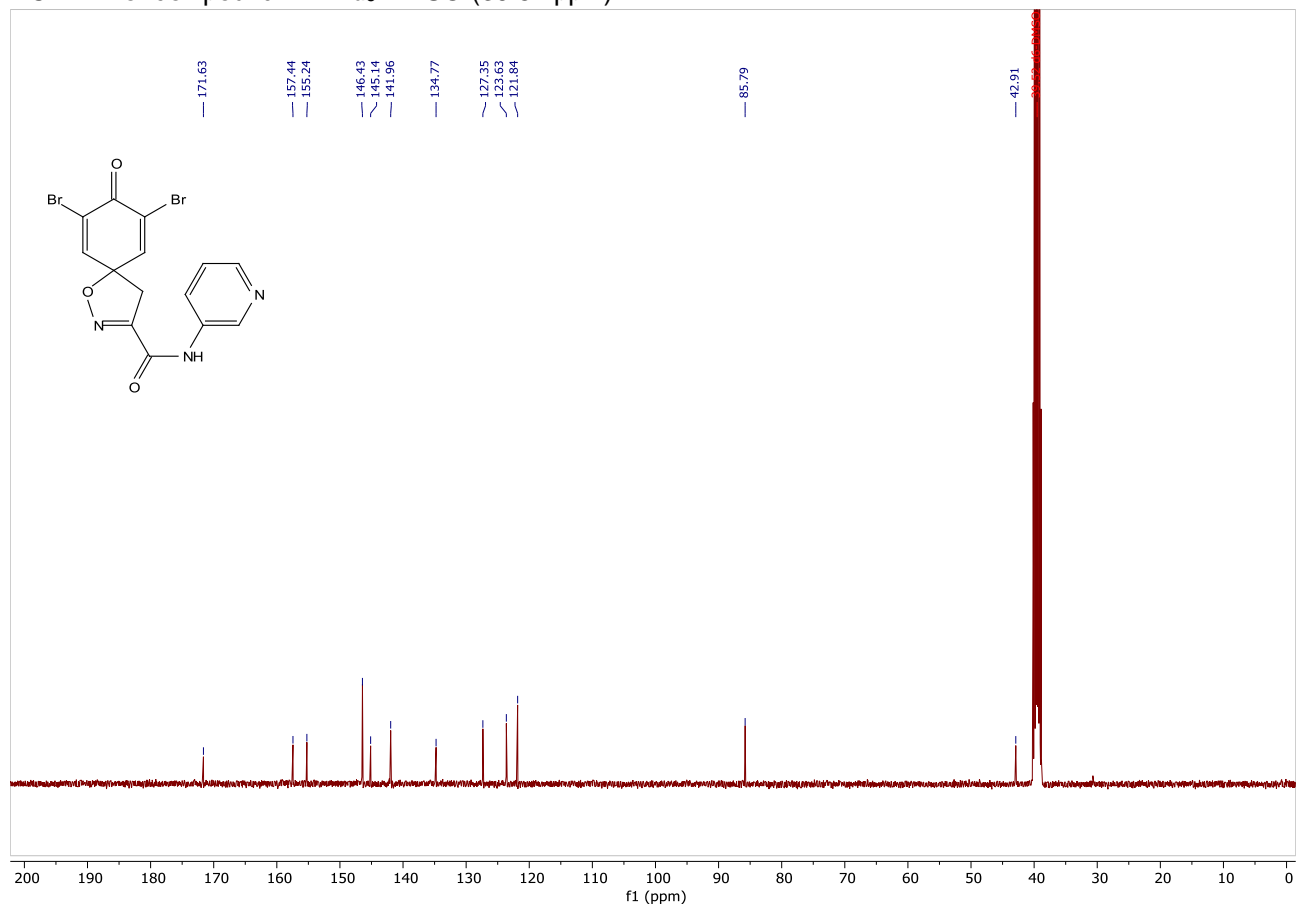
^{13}C NMR of compound **26** in CDCl_3 (77.16 ppm)



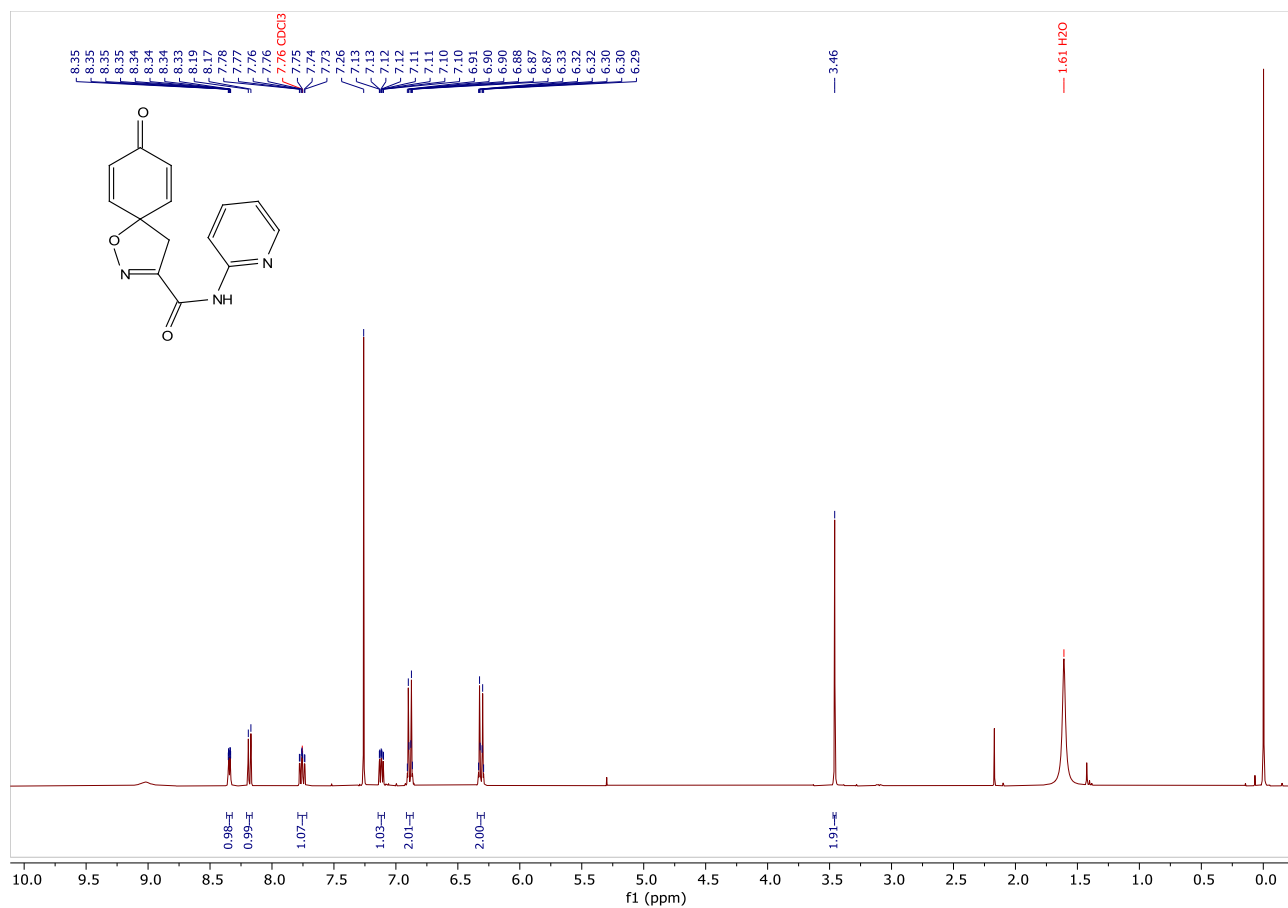
¹H NMR of compound **27** in d₆-DMSO (2.50 ppm)



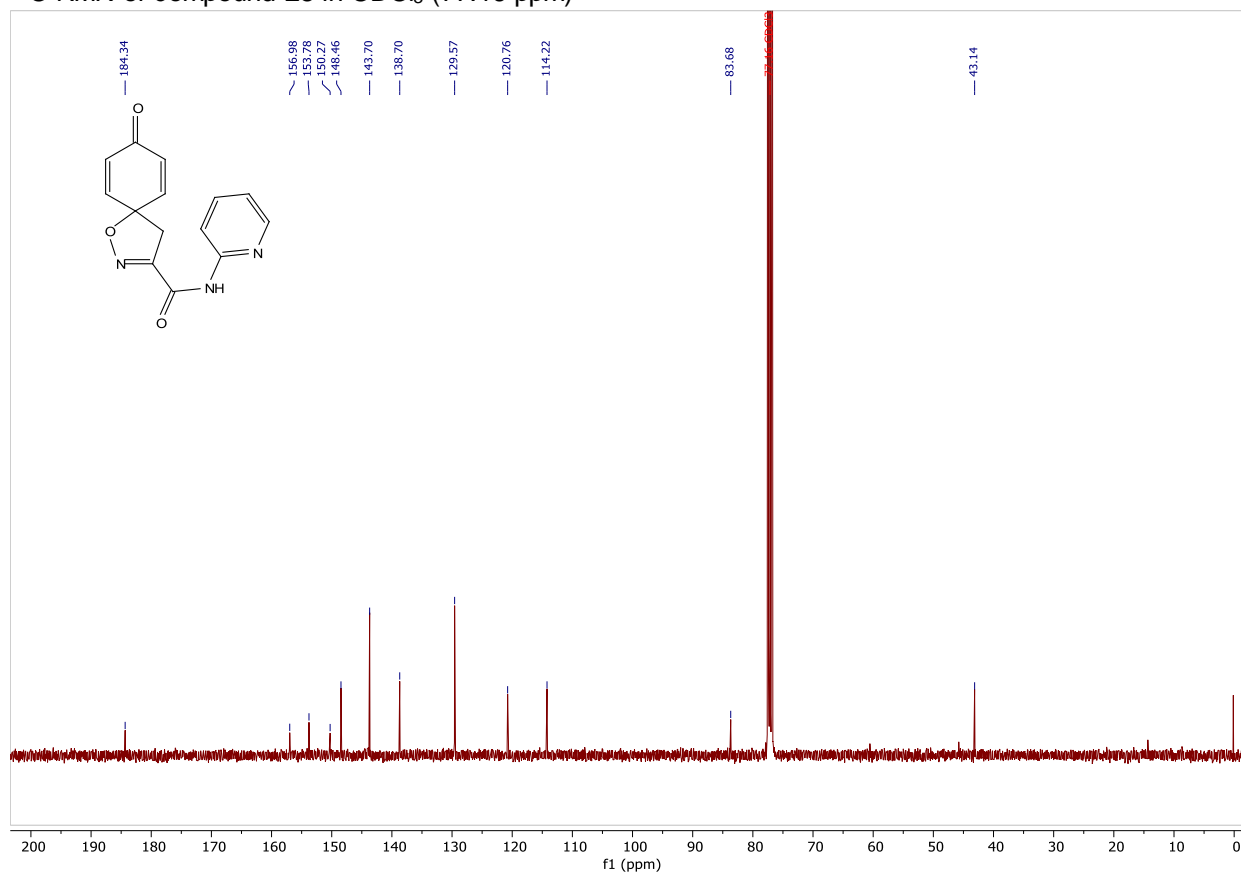
¹³C NMR of compound **27** in d₆-DMSO (39.52 ppm)



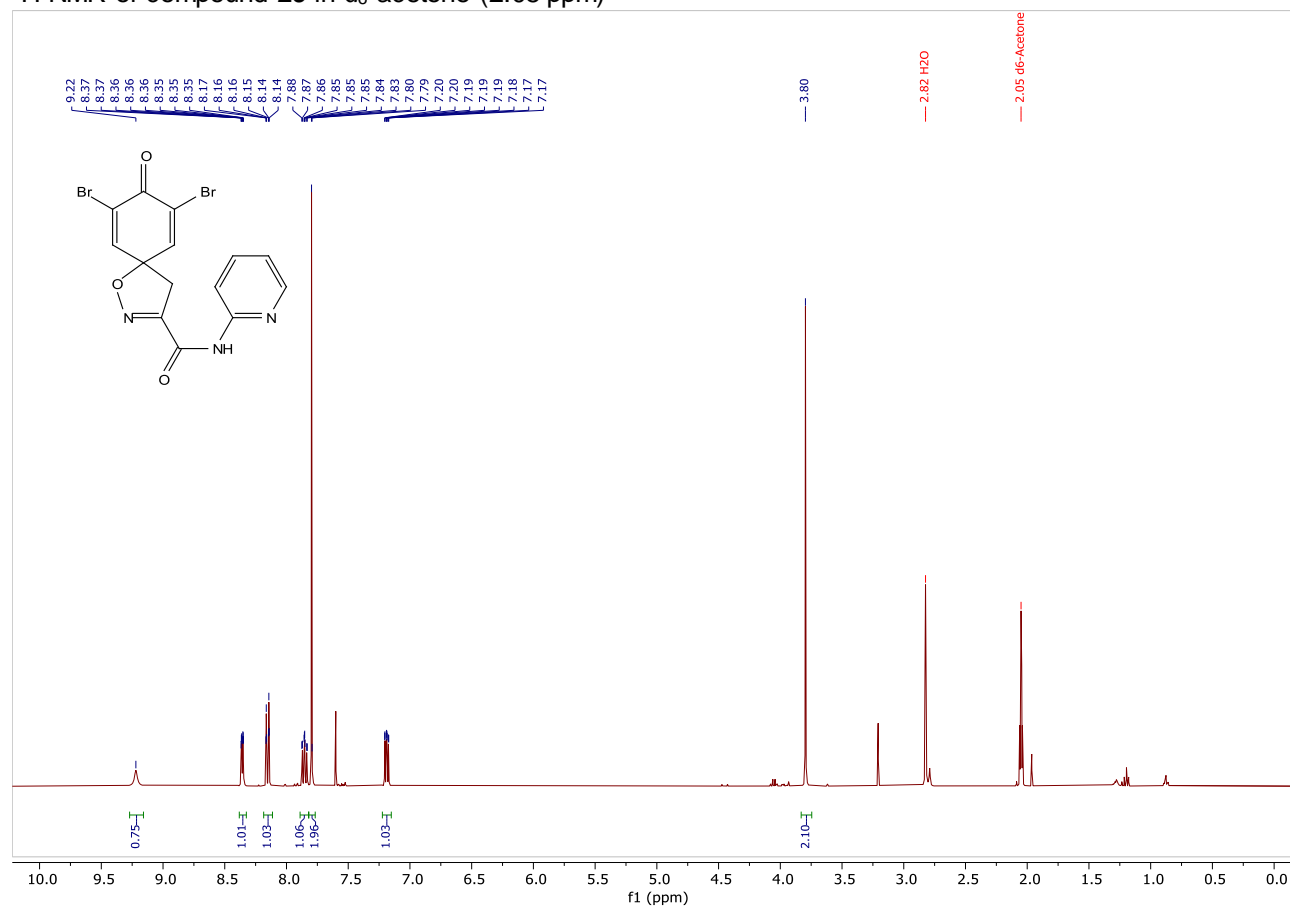
^1H NMR of compound **28** in CDCl_3 (7.26 ppm)



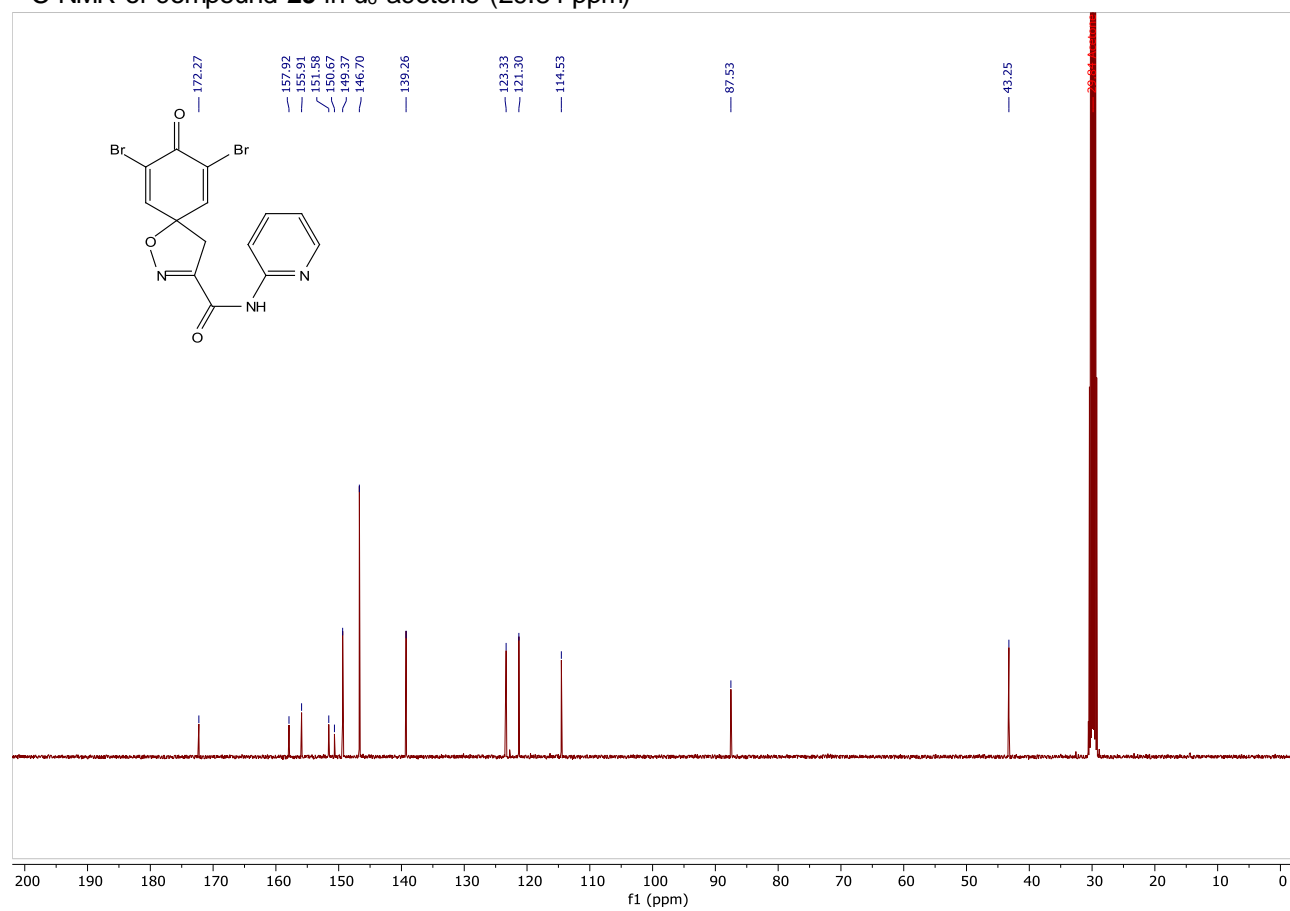
^{13}C NMR of compound **28** in CDCl_3 (77.16 ppm)



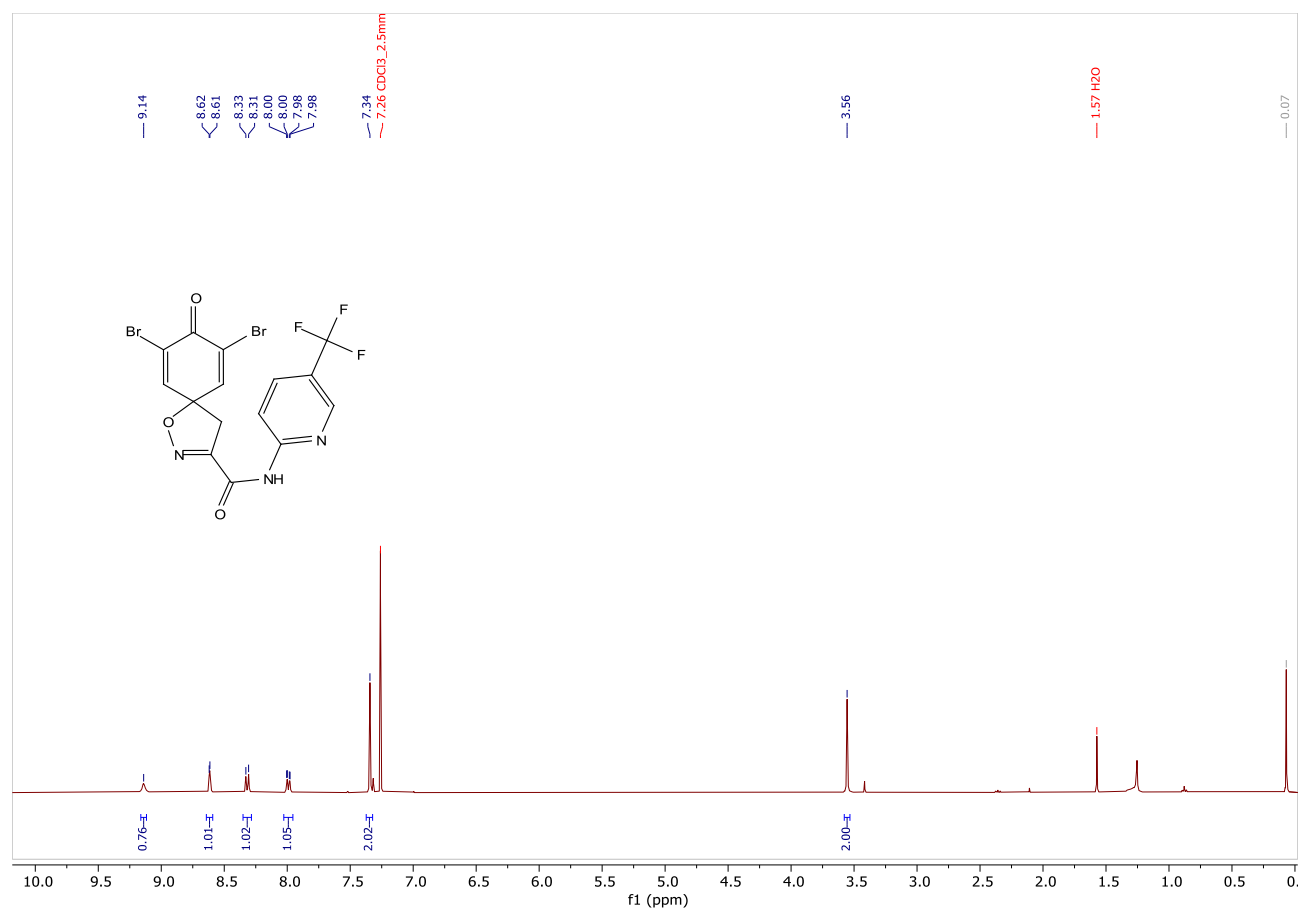
¹H NMR of compound **29** in d₆-acetone (2.05 ppm)



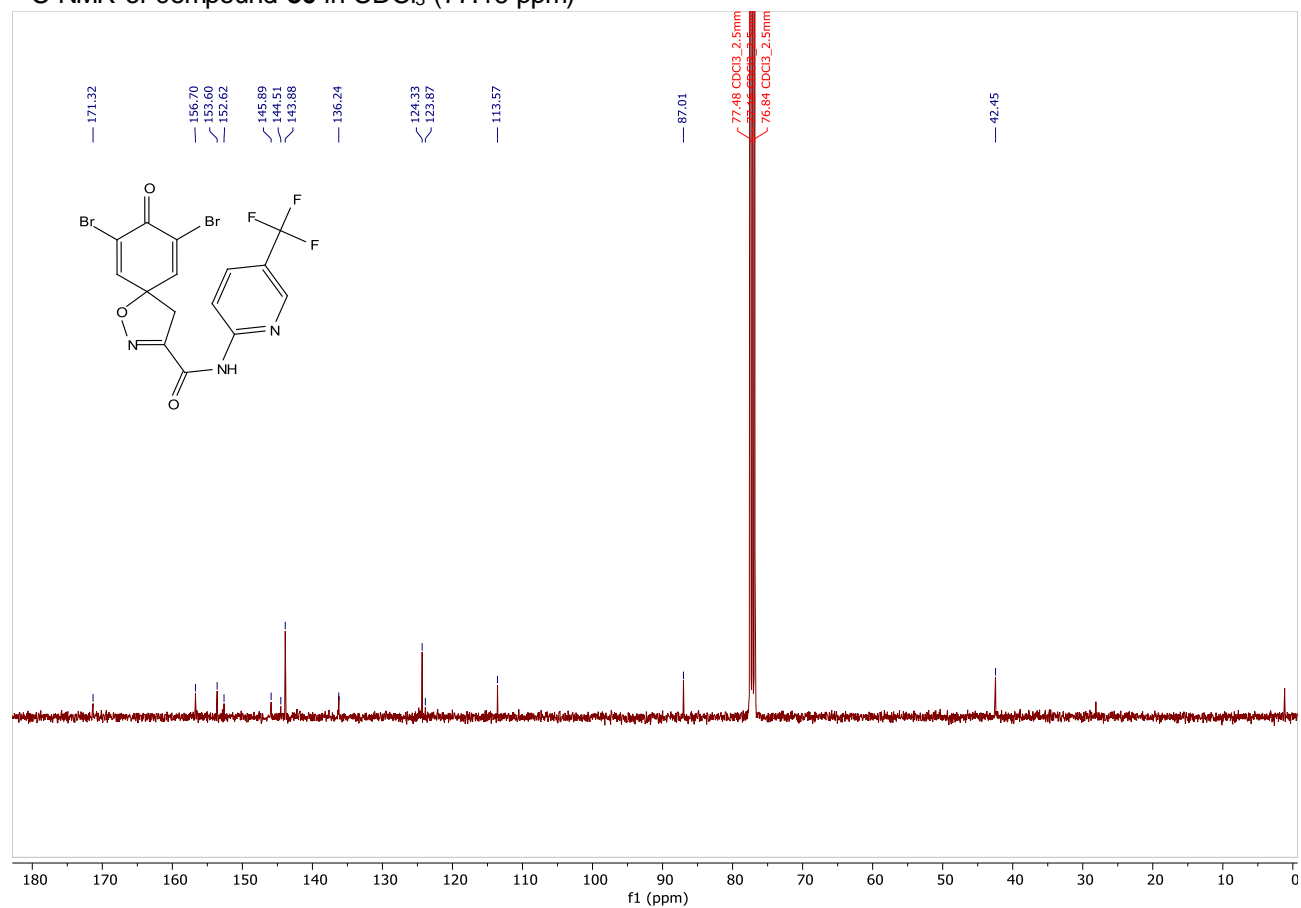
¹³C NMR of compound **29** in d₆-acetone (29.84 ppm)



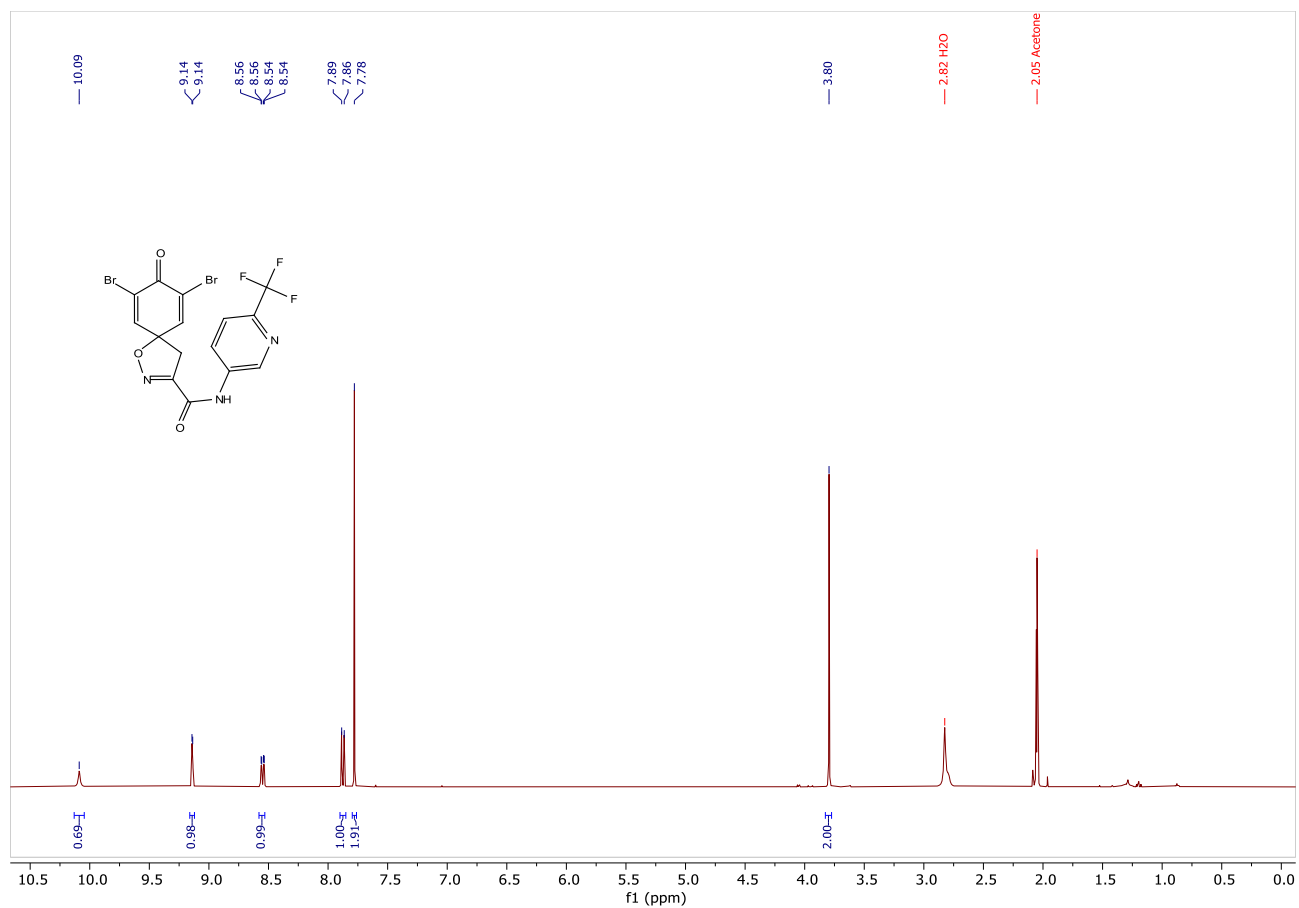
^1H NMR of compound **30** in CDCl_3 (7.26 ppm)



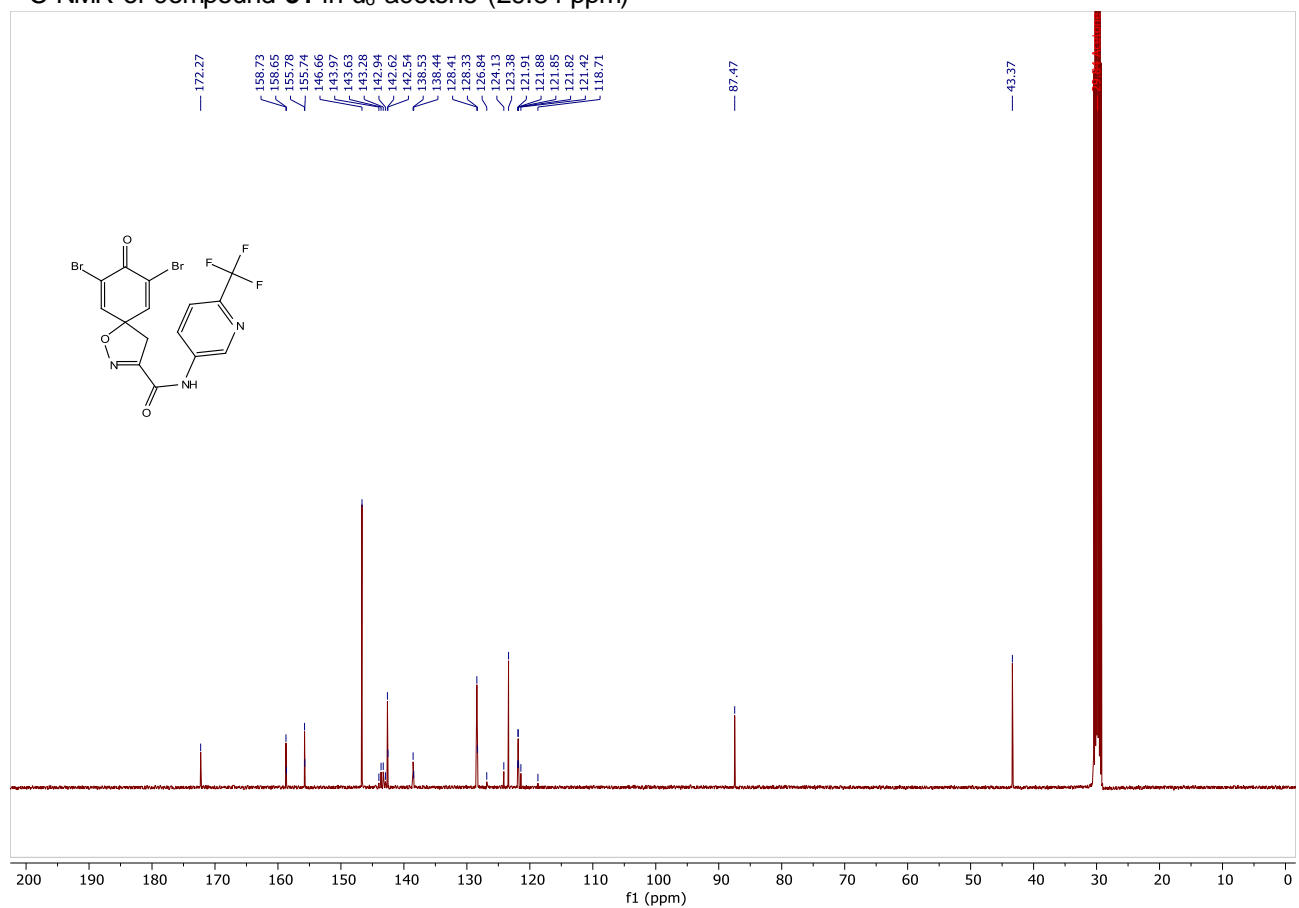
^{13}C NMR of compound **30** in CDCl_3 (77.16 ppm)



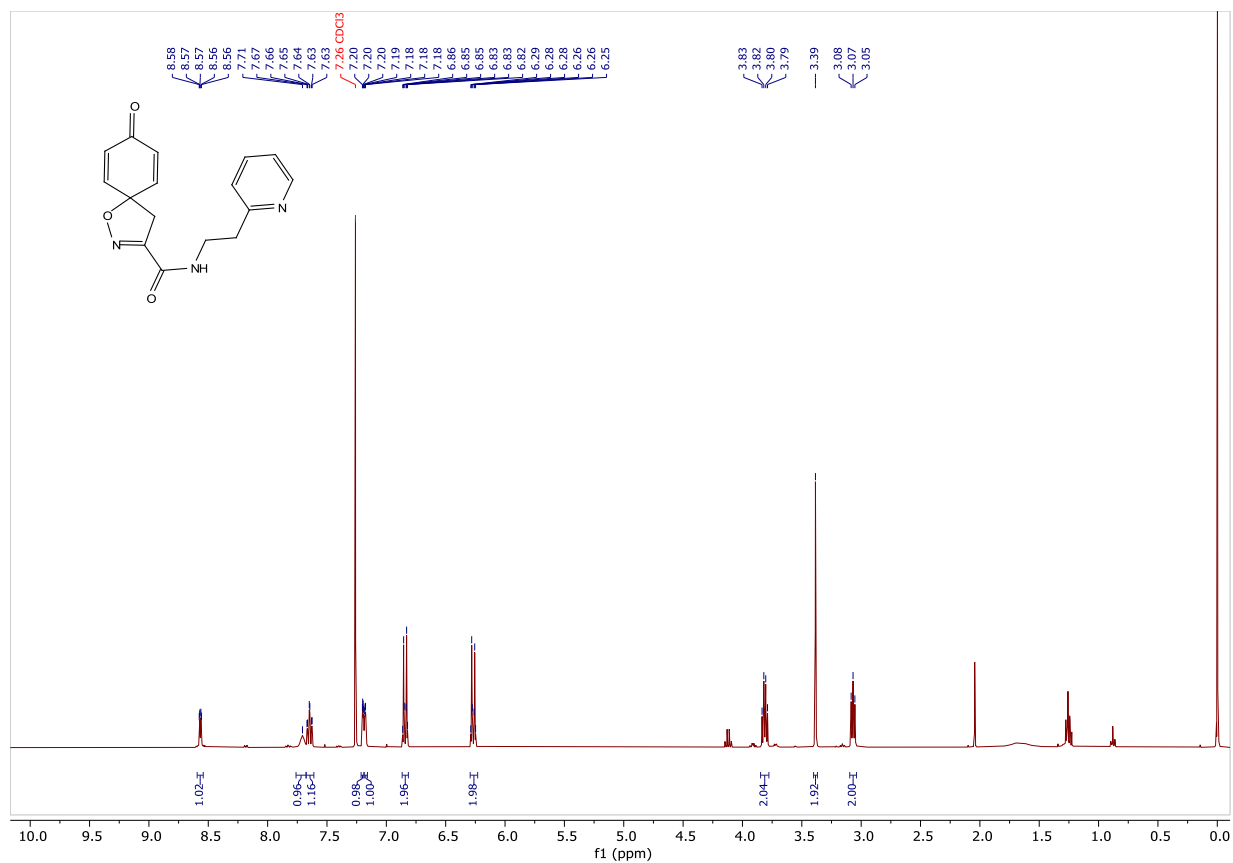
^1H NMR of compound **31** in d_6 -acetone (2.05 ppm)



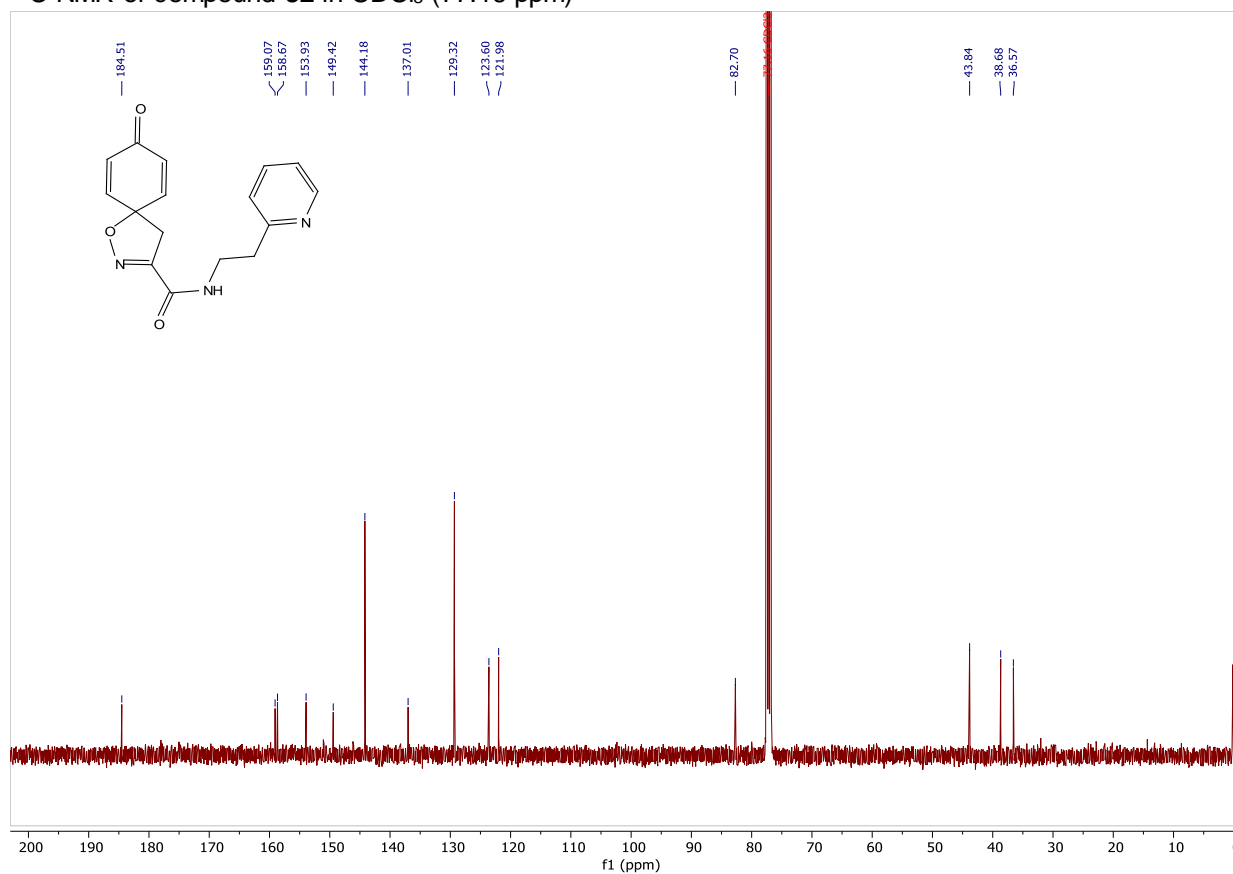
^{13}C NMR of compound **31** in d_6 -acetone (29.84 ppm)



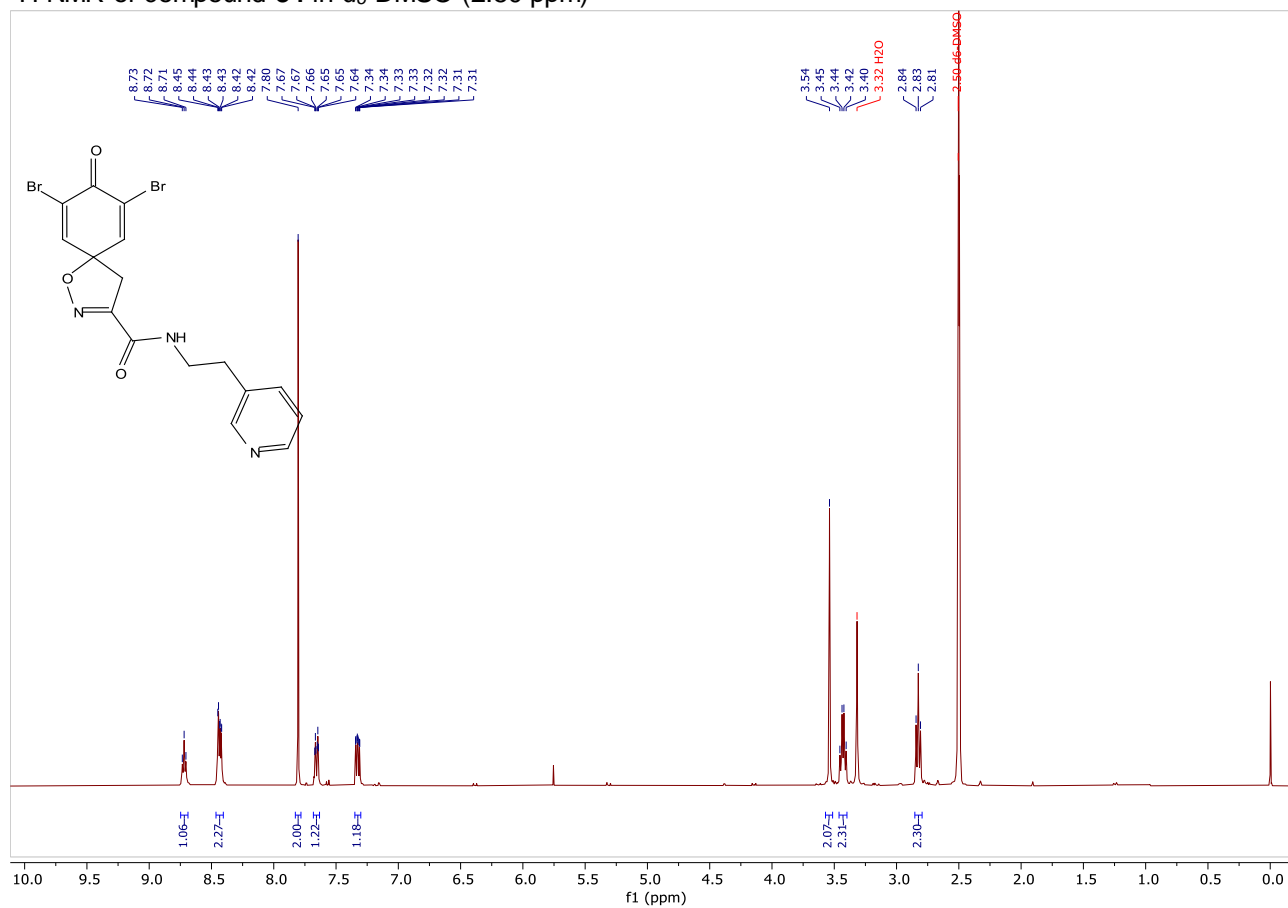
^1H NMR of compound **32** in CDCl_3 (7.26 ppm)



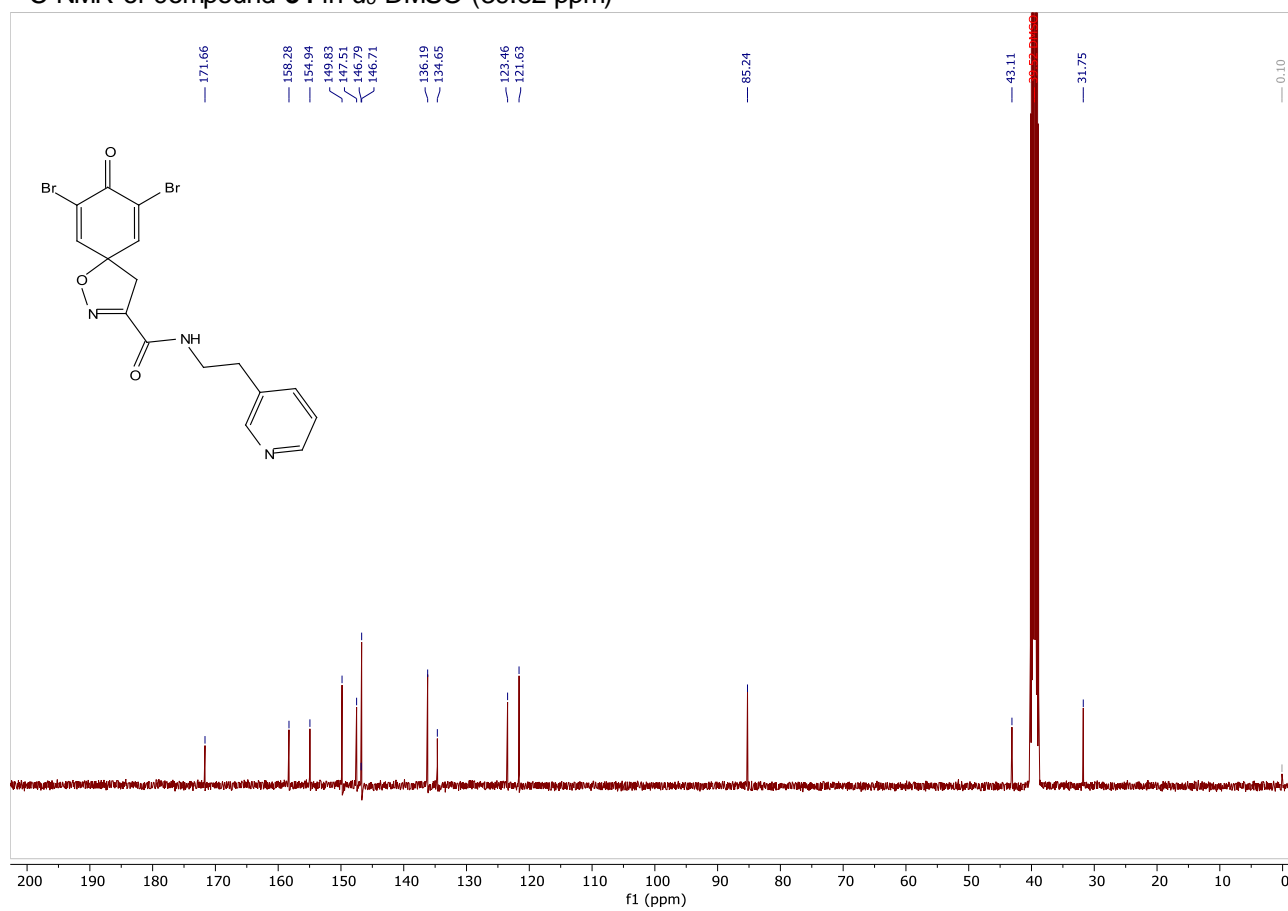
^{13}C NMR of compound **32** in CDCl_3 (77.16 ppm)



^1H NMR of compound **34** in d_6 -DMSO (2.50 ppm)



^{13}C NMR of compound **34** in d_6 -DMSO (39.52 ppm)



Chemical structure: N#Cc1ccc(NC(=O)C2=CNc3ccccc32)c1

¹H NMR spectrum (d₆-Acetone) showing peaks from 3.50 to 8.60 ppm. Integration values are provided below the baseline: 0.98, 1.01, 0.91, 1.00, 1.02, 2.06, 2.02, 2.09, 2.08. A solvent peak for 2.05 d₆-Acetone is marked at 2.05 ppm.

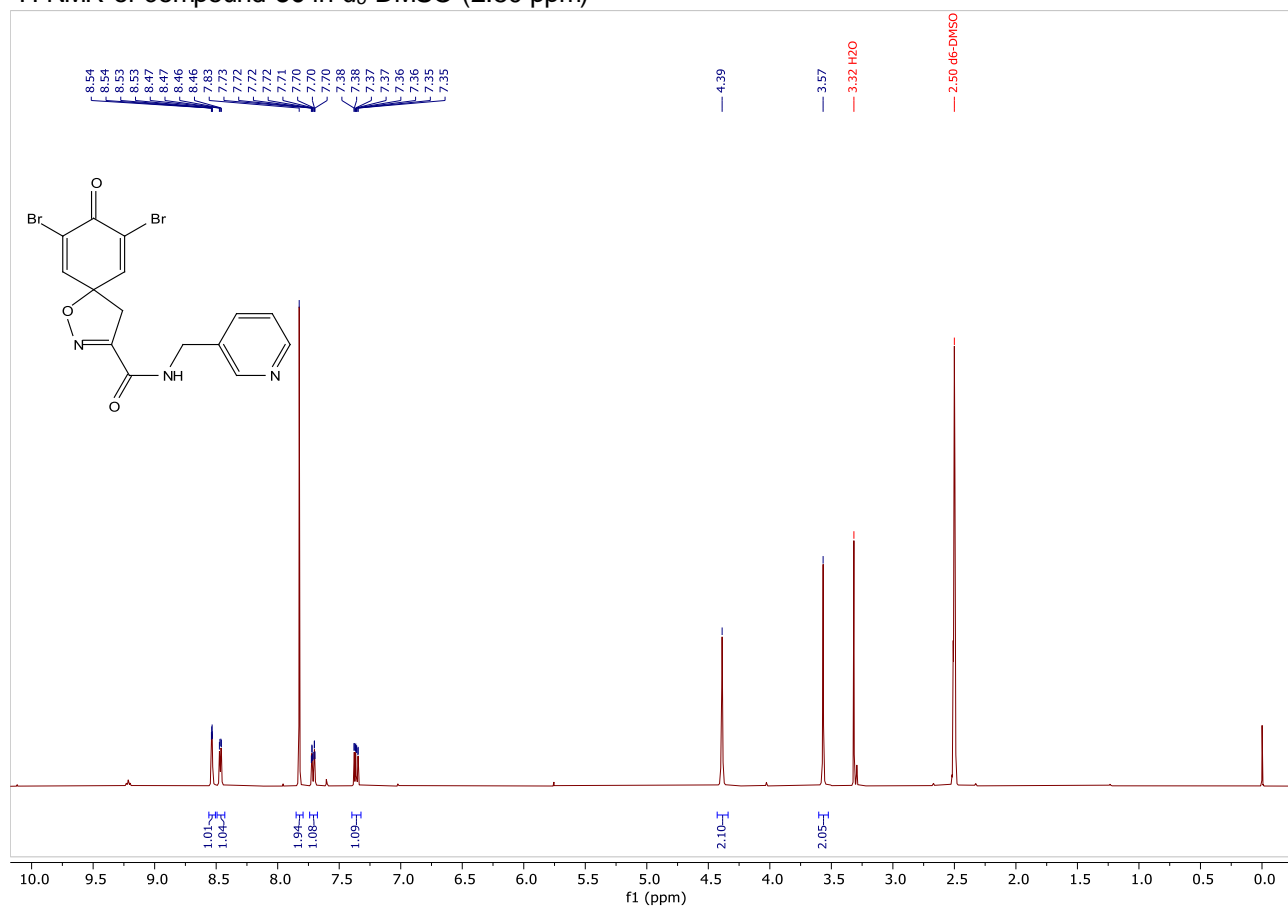
O=C1C(=O)N1Cc2cccnc2

Chemical structure: O=C1C(=O)N1Cc2cccnc2

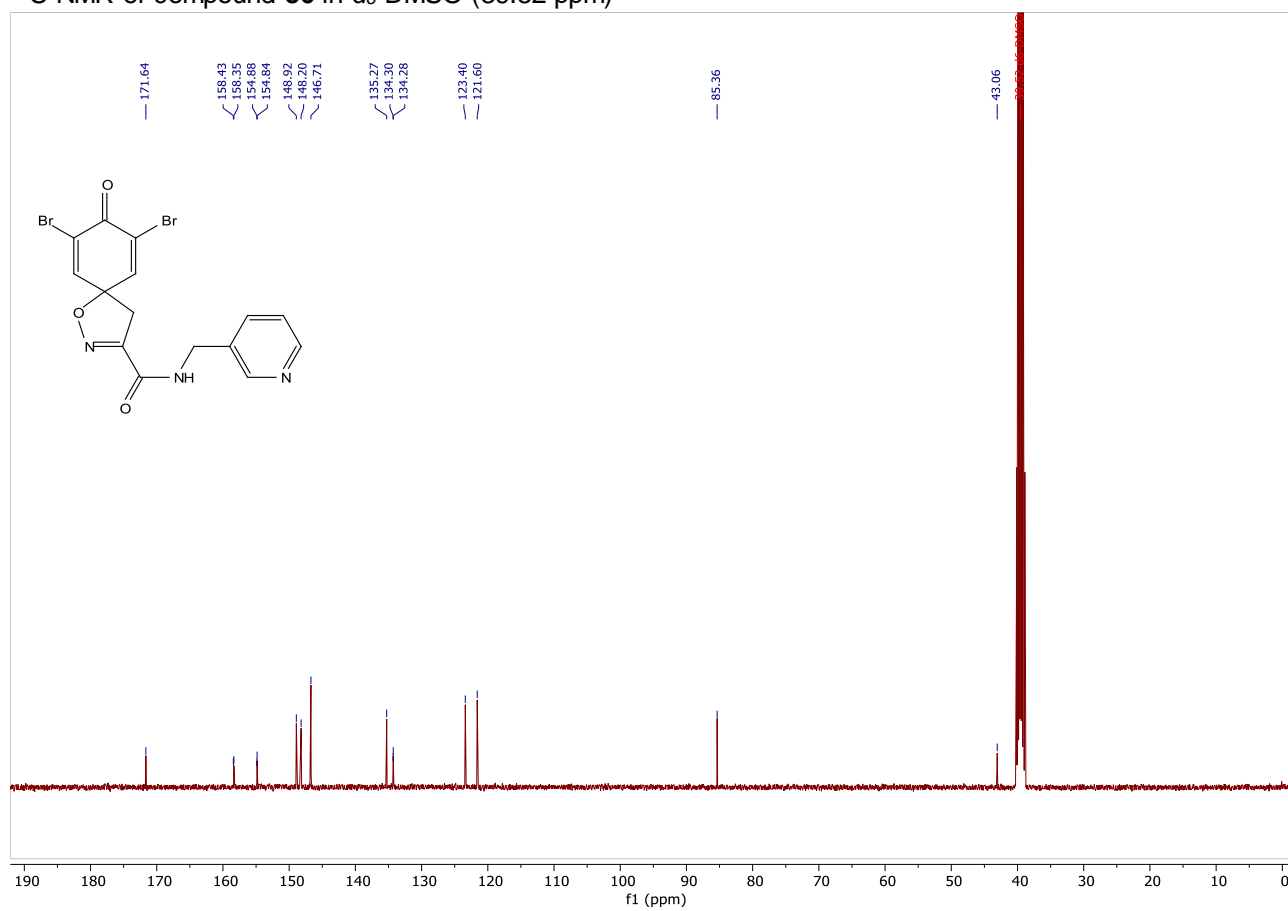
¹³C NMR peaks (ppm):

- 184.94
- 159.86
- 155.10
- 150.29
- 149.37
- 145.91
- 136.14
- 135.36
- 129.17
- 124.15
- 83.17
- 44.28
- 41.25
- 30.84 Acetone

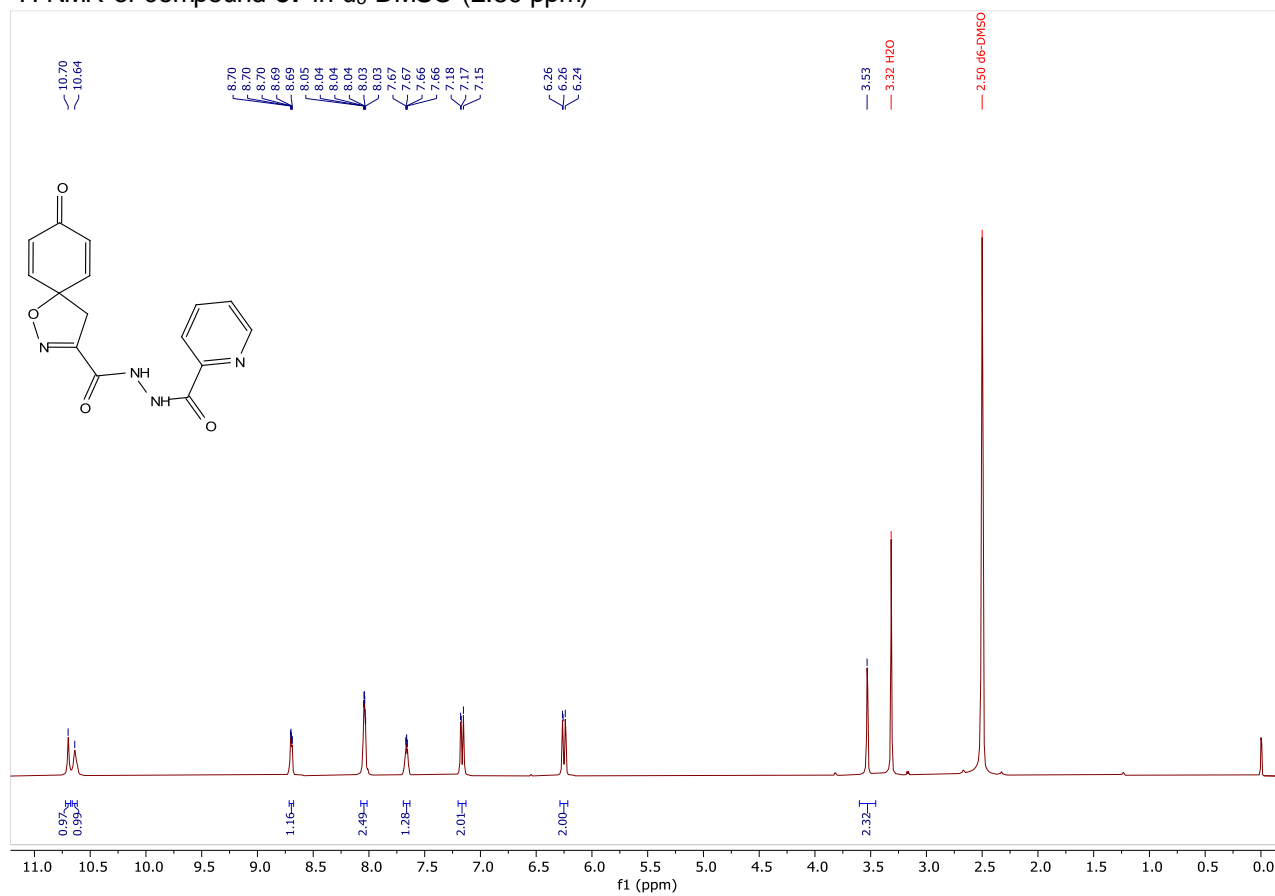
¹H NMR of compound **36** in d₆-DMSO (2.50 ppm)



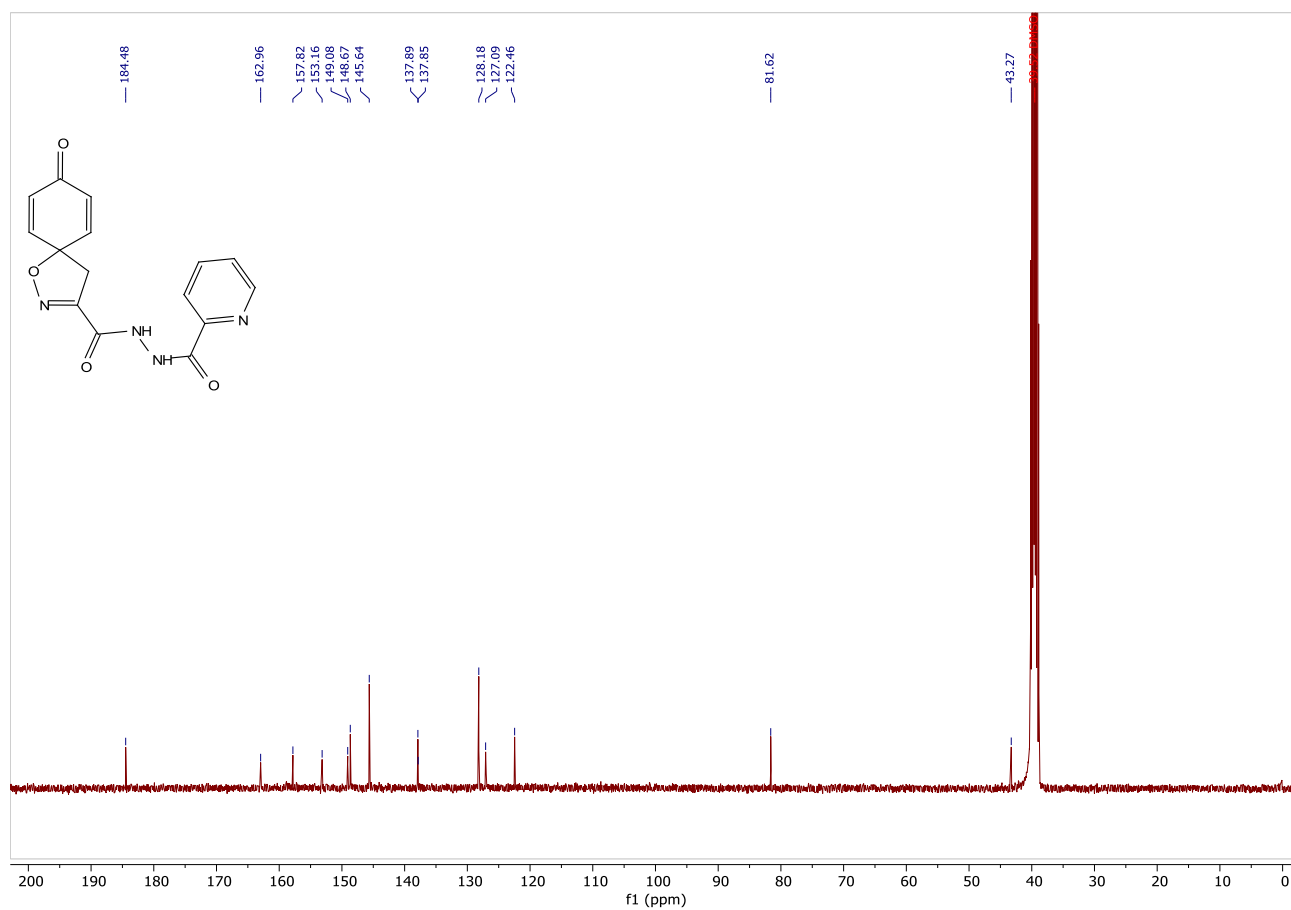
¹³C NMR of compound **36** in d₆-DMSO (39.52 ppm)



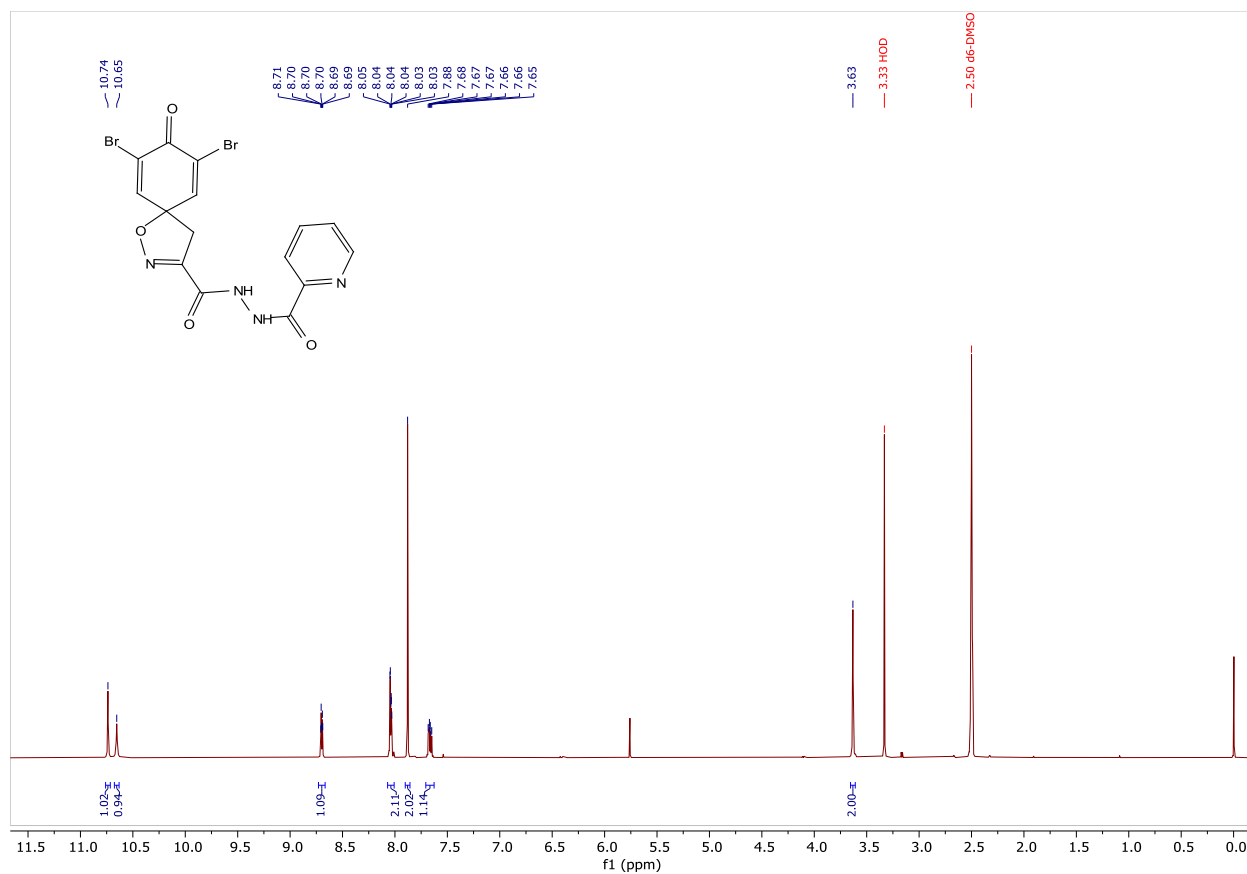
^1H NMR of compound **37** in d_6 -DMSO (2.50 ppm)



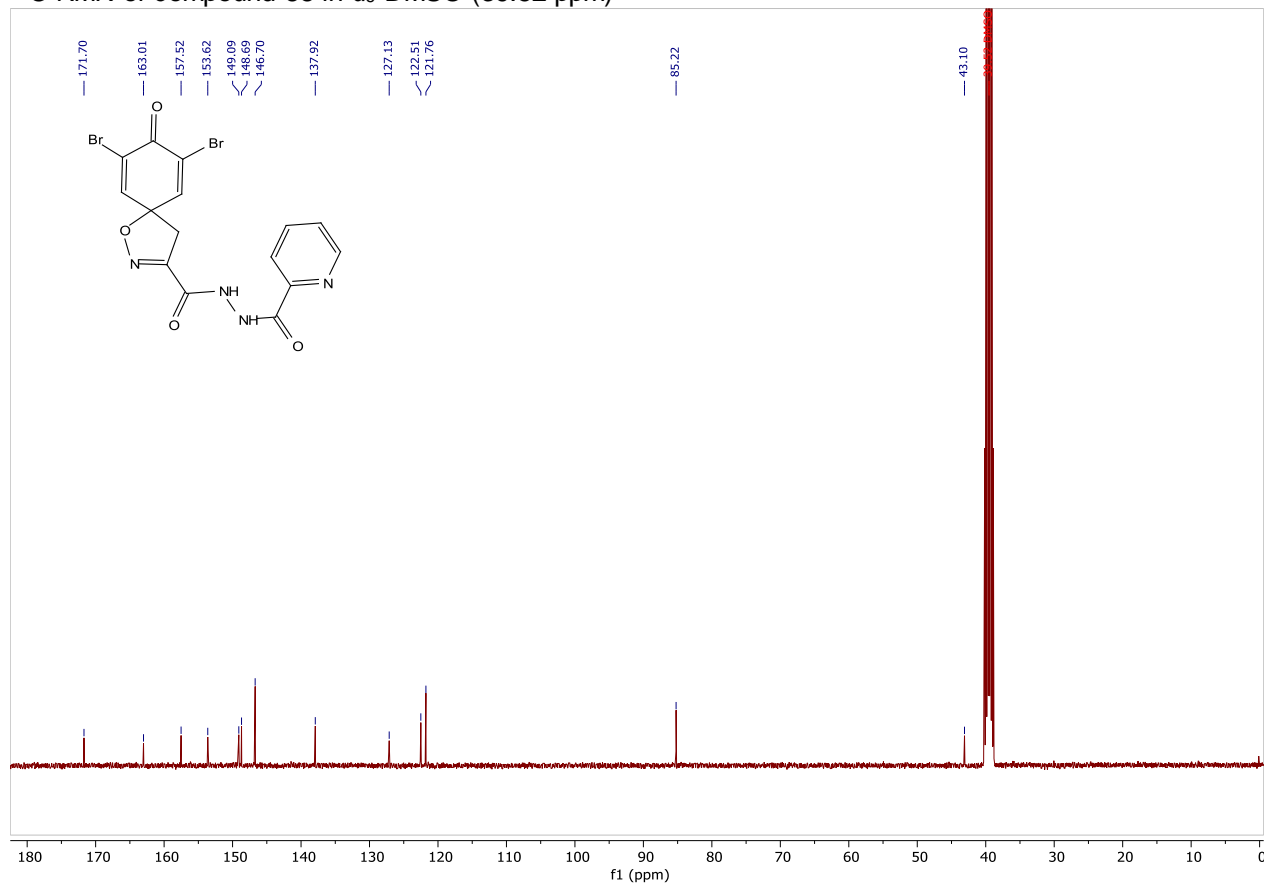
^{13}C NMR of compound **37** in d_6 -DMSO (39.52 ppm)



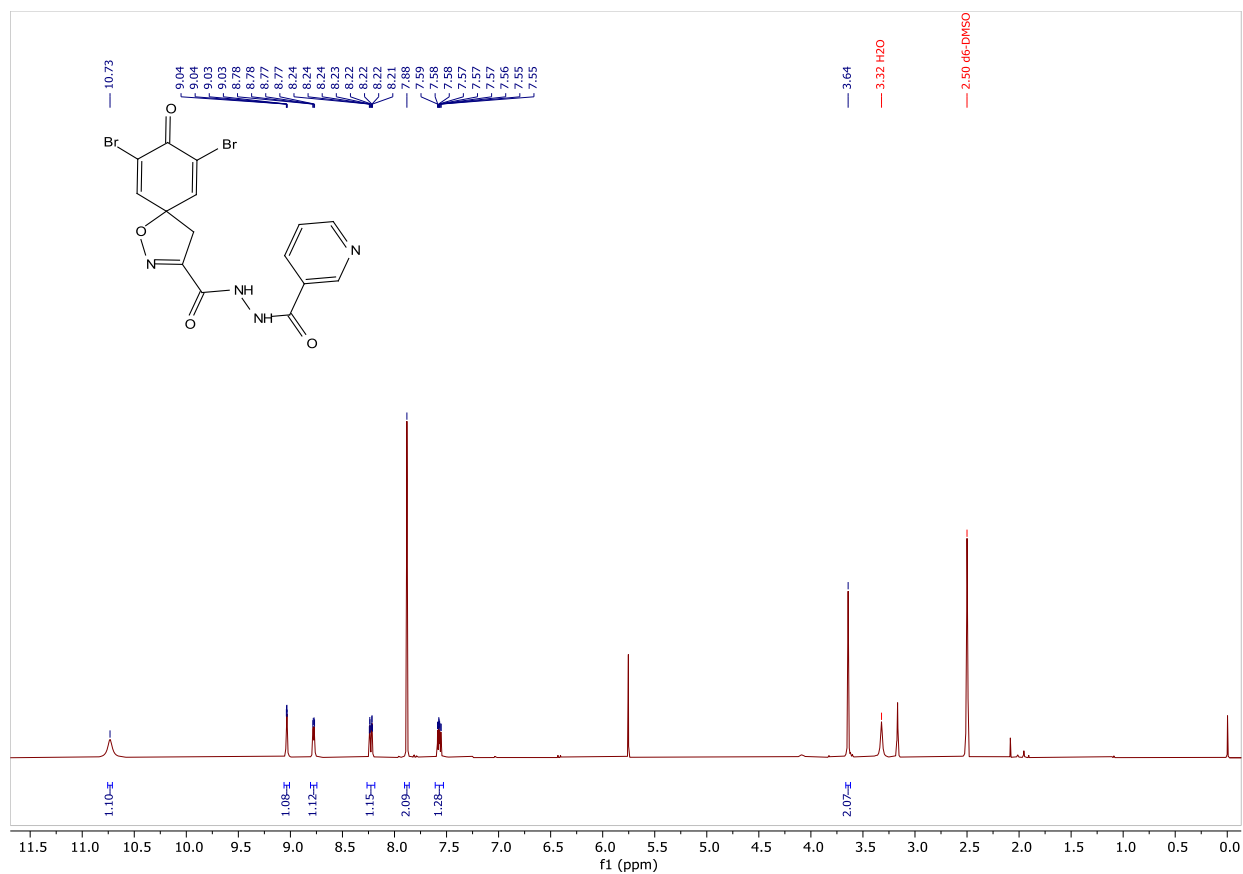
^1H NMR of compound **38** in d_6 -DMSO (2.50 ppm)



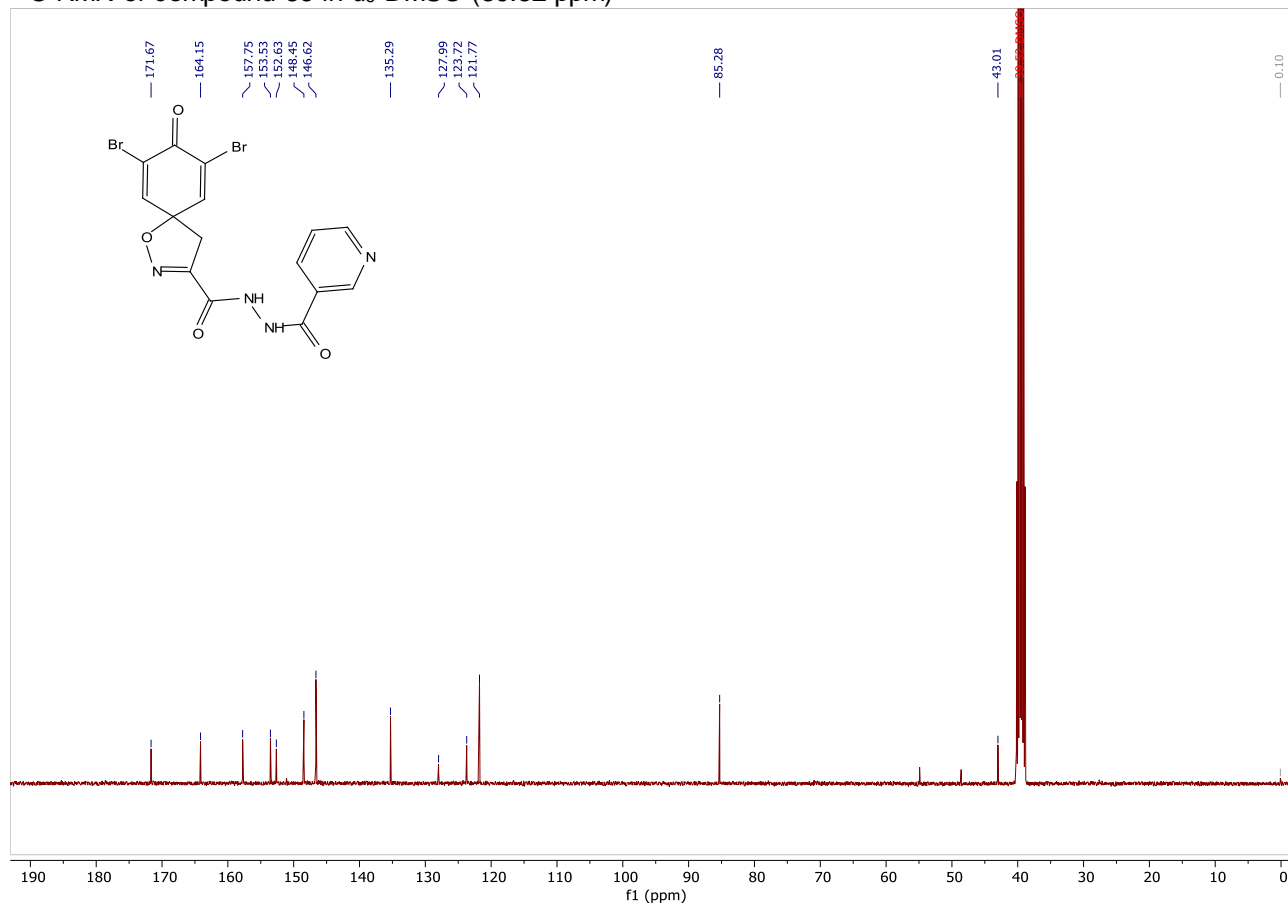
^{13}C NMR of compound **38** in d_6 -DMSO (39.52 ppm)



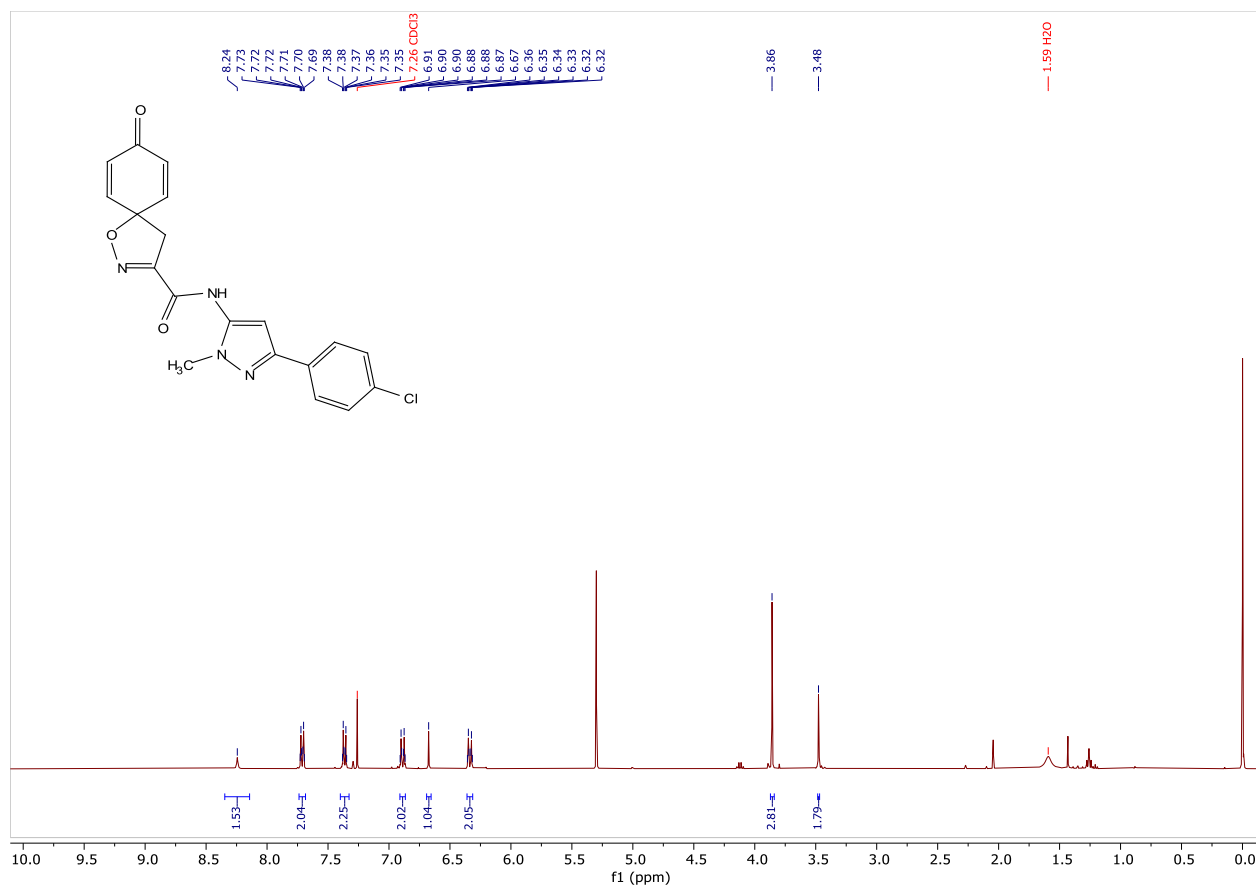
¹H NMR of compound **39** in d₆-DMSO (2.50 ppm)



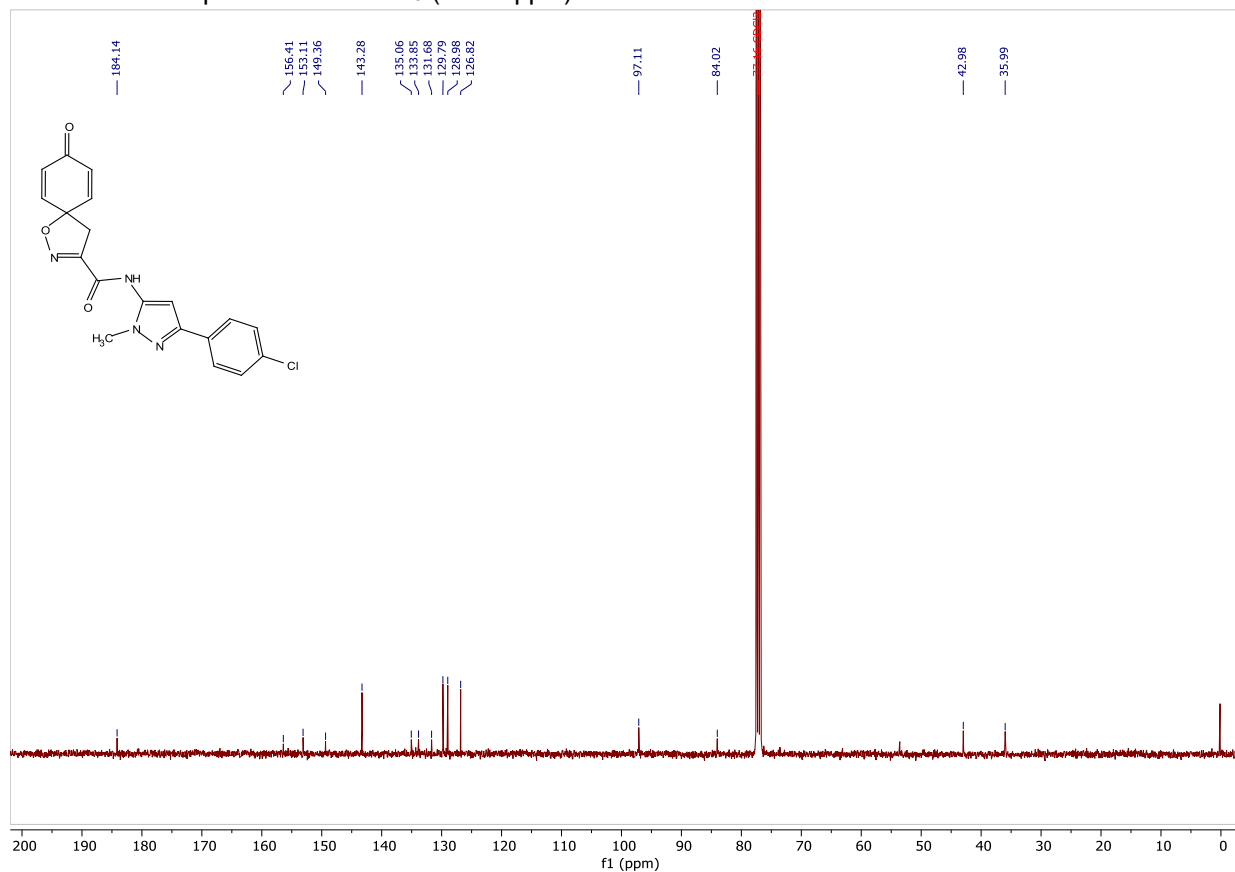
¹³C NMR of compound **39** in d₆-DMSO (39.52 ppm)



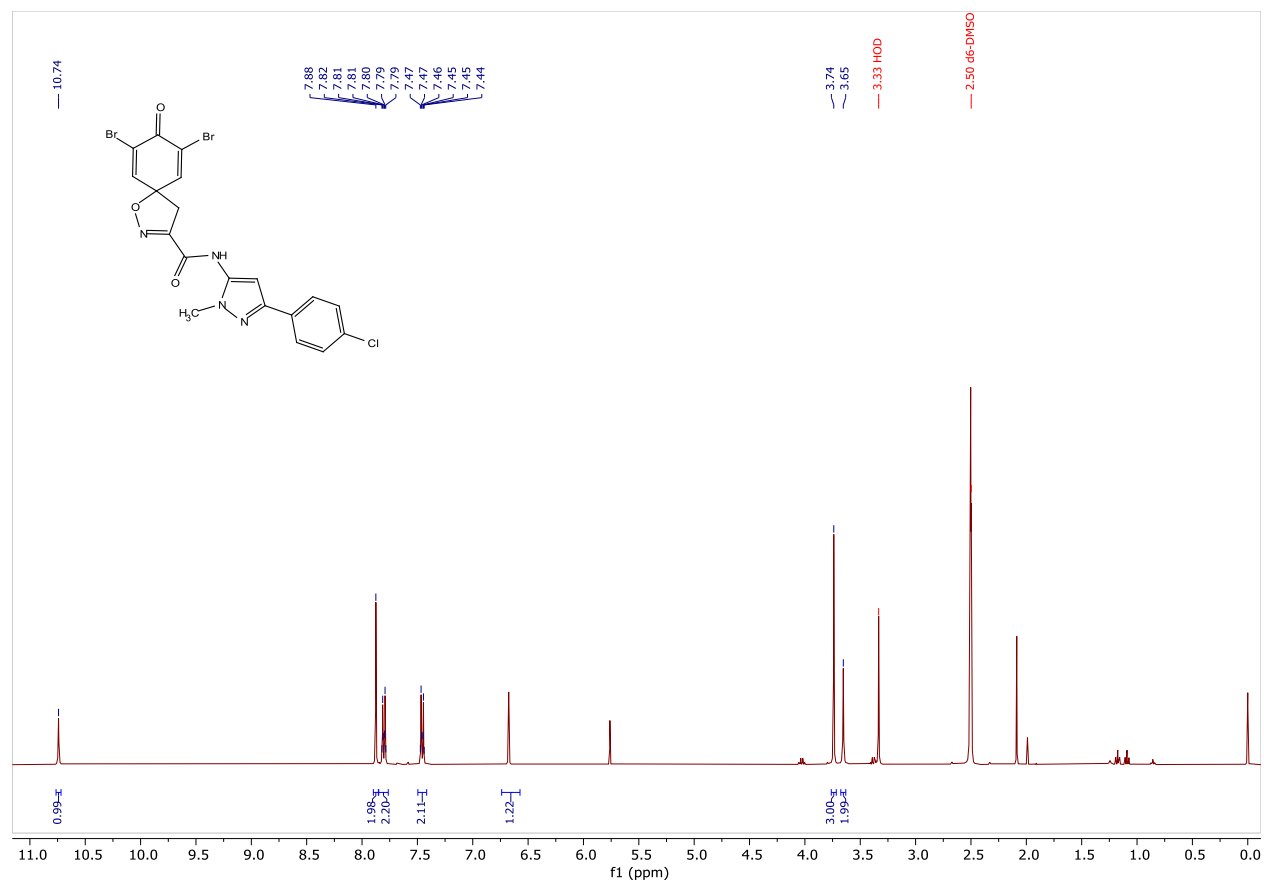
^1H NMR of compound **40** in CDCl_3 (7.26 ppm)



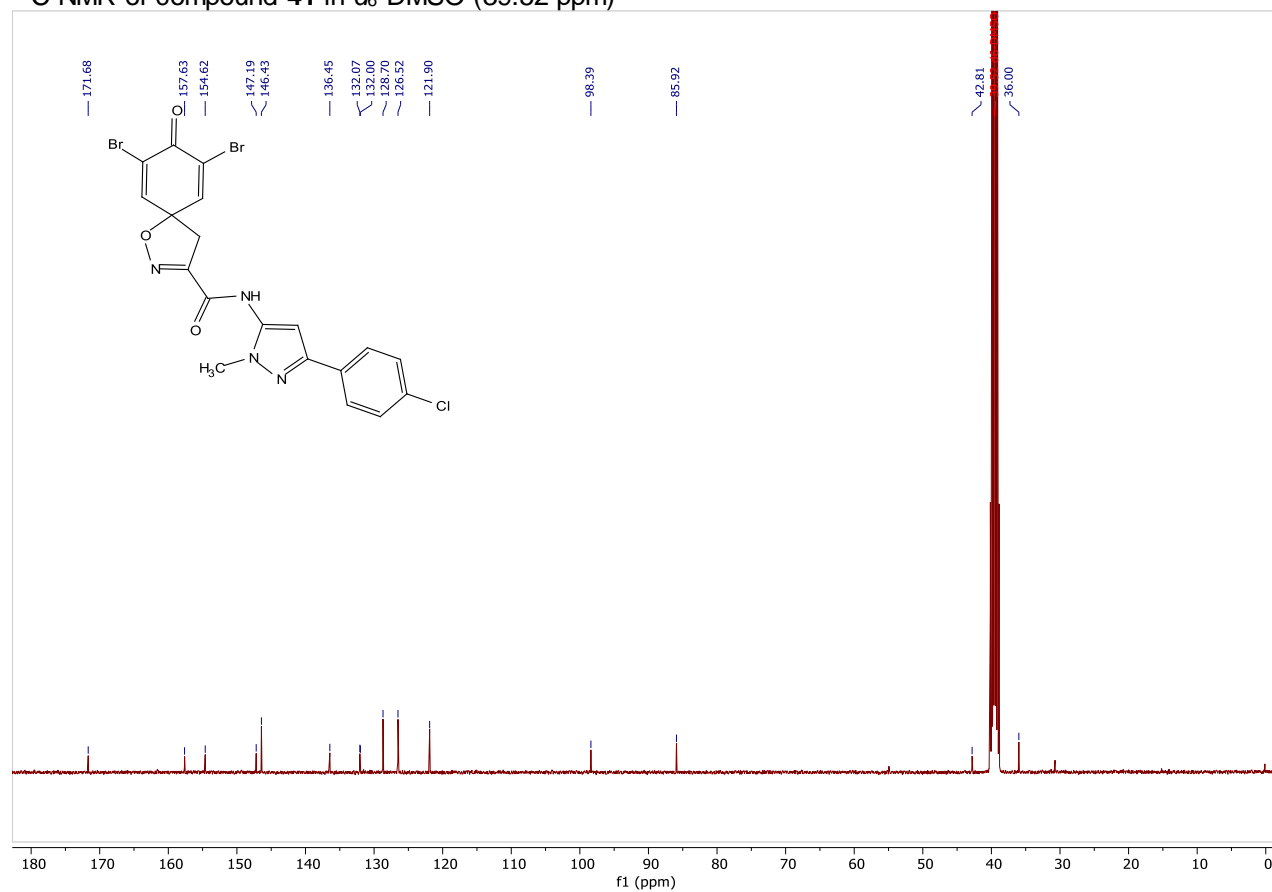
^{13}C NMR of compound **40** in CDCl_3 (77.16 ppm)



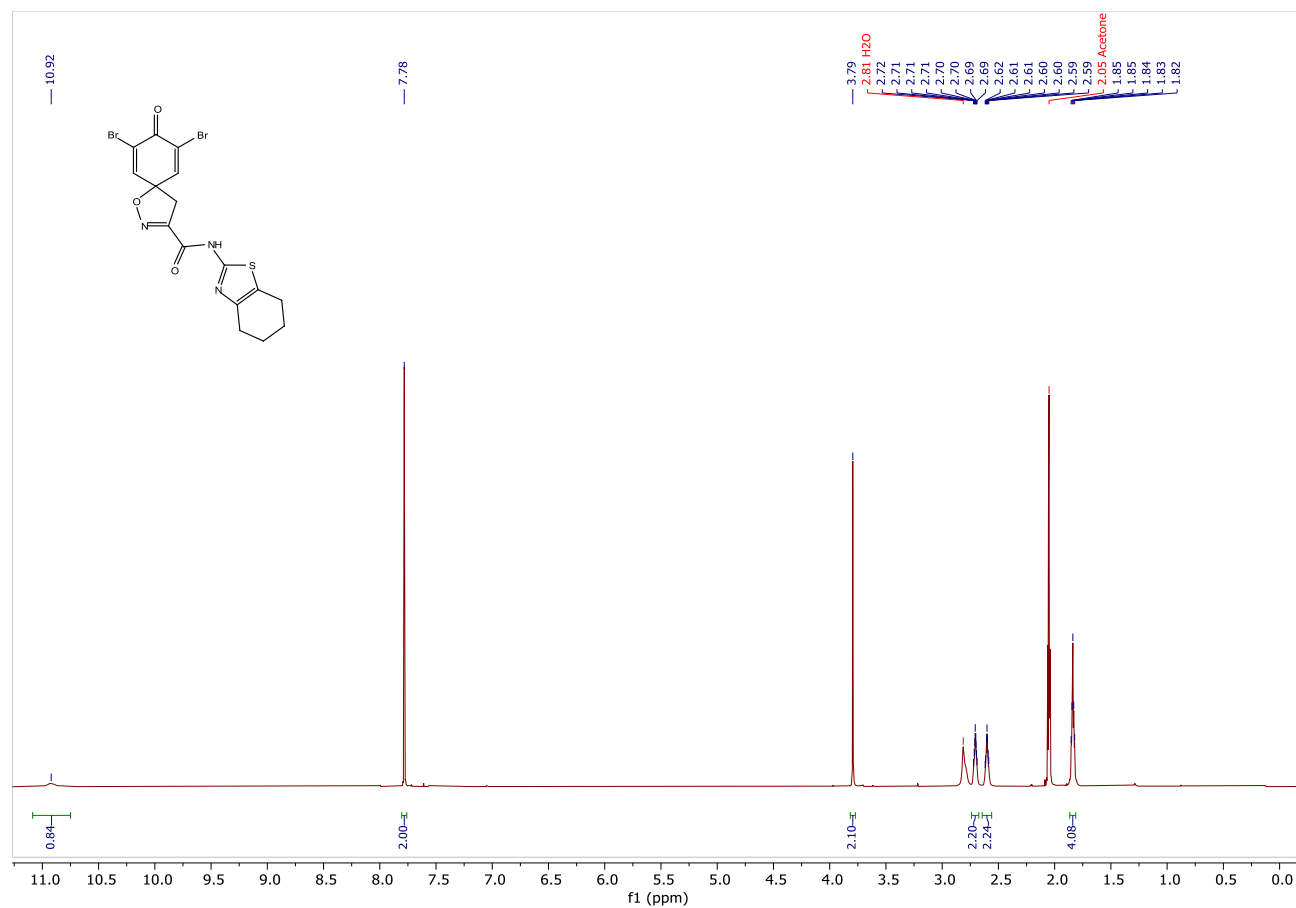
^1H NMR of compound **41** in d_6 -DMSO (2.50 ppm)



^{13}C NMR of compound **41** in d_6 -DMSO (39.52 ppm)



^1H NMR of compound **42** in d_6 -acetone (2.05 ppm)



^{13}C NMR of compound **42** in d_6 -acetone (29.84 ppm)

