

Electronic Supporting Information

For

**Co(II) mediated cascade cyclization of unactivated olefin
to afford *N*-alkylacetamided tetrahydropyridazine and
dihydropyrazole**

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Table S1: Classification of synthesized compounds as known and unknown.

Known	Unknown
NIL	2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j, 2k, 2l, 2m, 2n, 2o, 2p, 2q, 2r, 2s, 2t, 2u, 2v, 2w, 2x, 2y, 2z, 2za, 2zb, 2zc, 2zd, 2ze

Spectral data of final products:

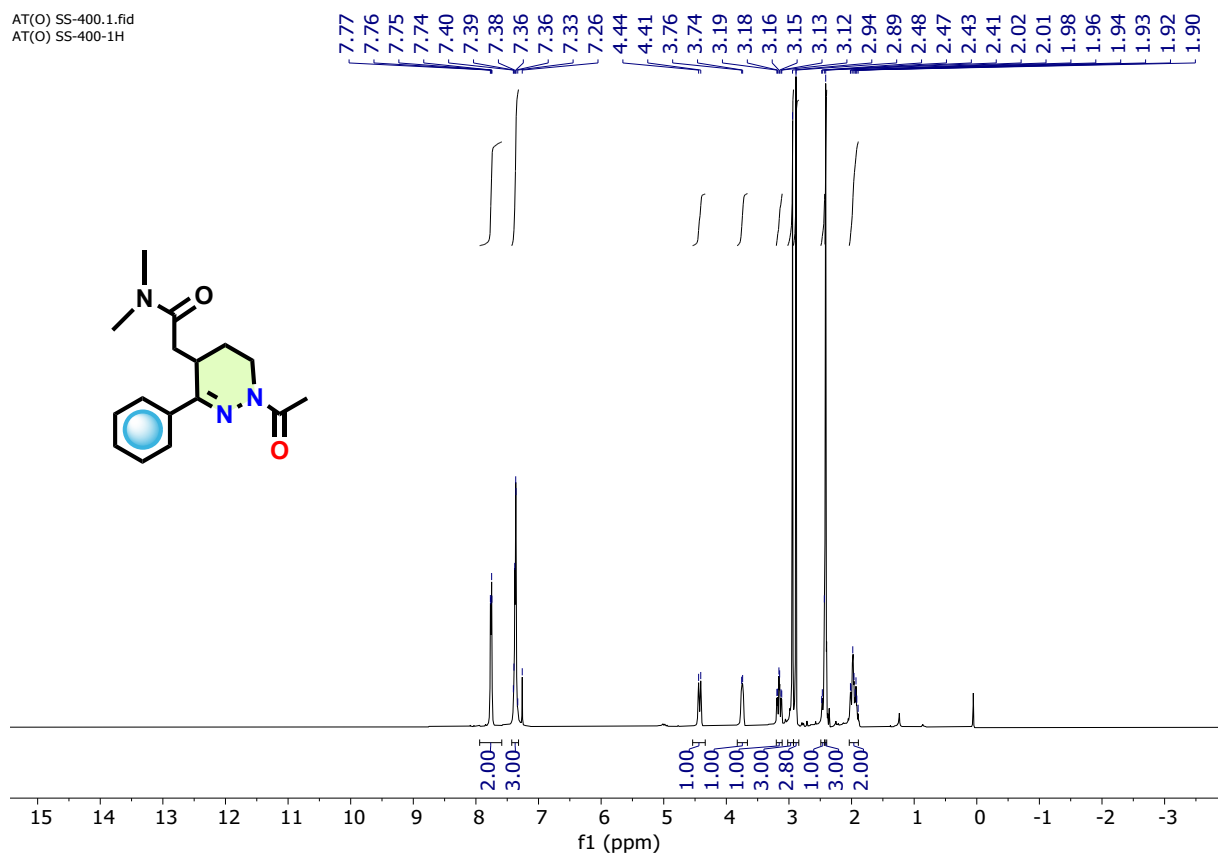


Figure S1. ^1H (400 MHz) NMR of **2a** compound in CDCl_3 .

AT(O)SS-400B(Benzaldehyd...MF-13C)-P.1.fid
AT(O)SS-400B-13C

172.45
169.82

149.09

135.91
129.31
128.68
125.84

77.40
77.09
76.77

37.03
35.64
35.10
35.02
26.90
22.09
21.40

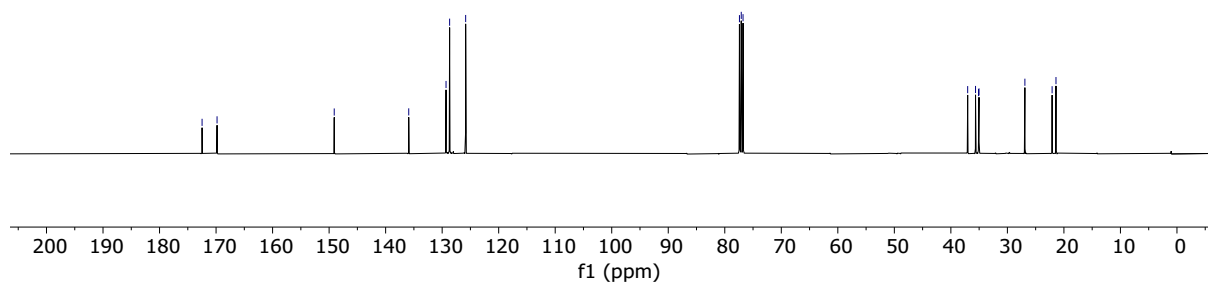
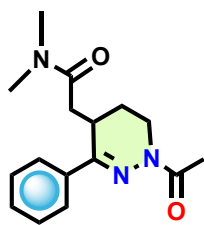


Figure S2. ^{13}C (100 MHz) NMR of **2a** compound in CDCl_3 .

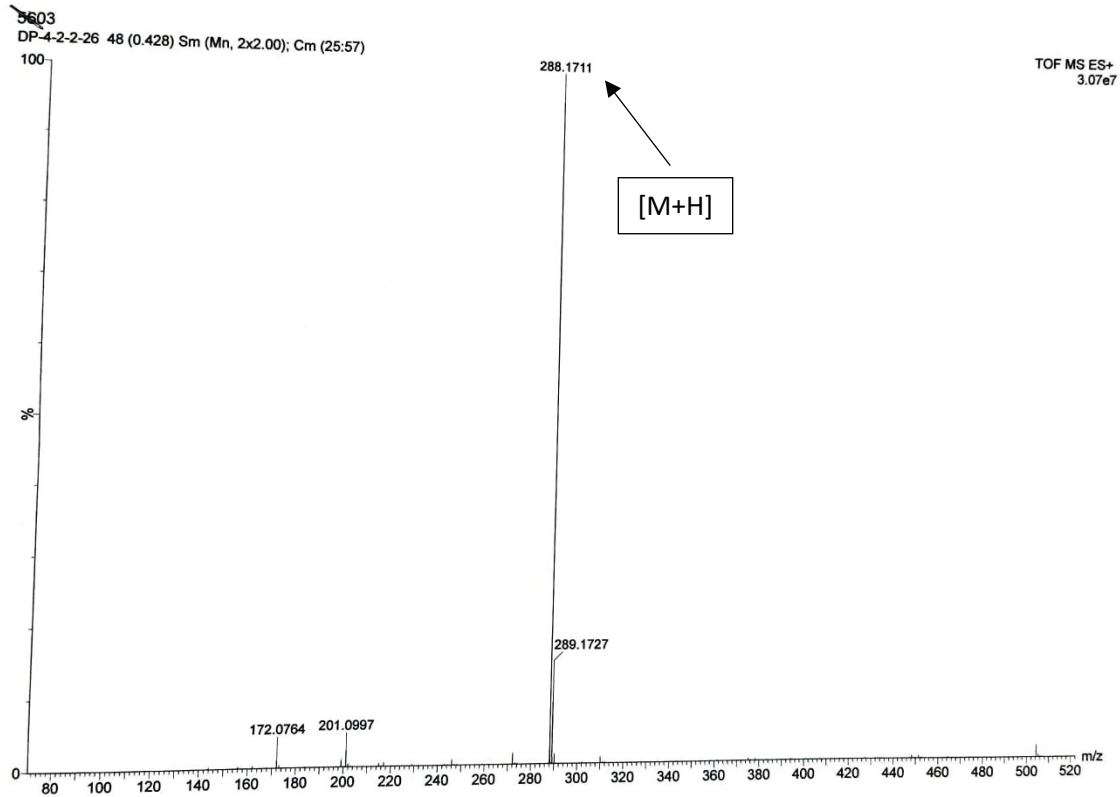


Figure S3. HRMS of Compound **2a**.

AT(O)SS-349.1.fid
AT(O)SS-349-1H

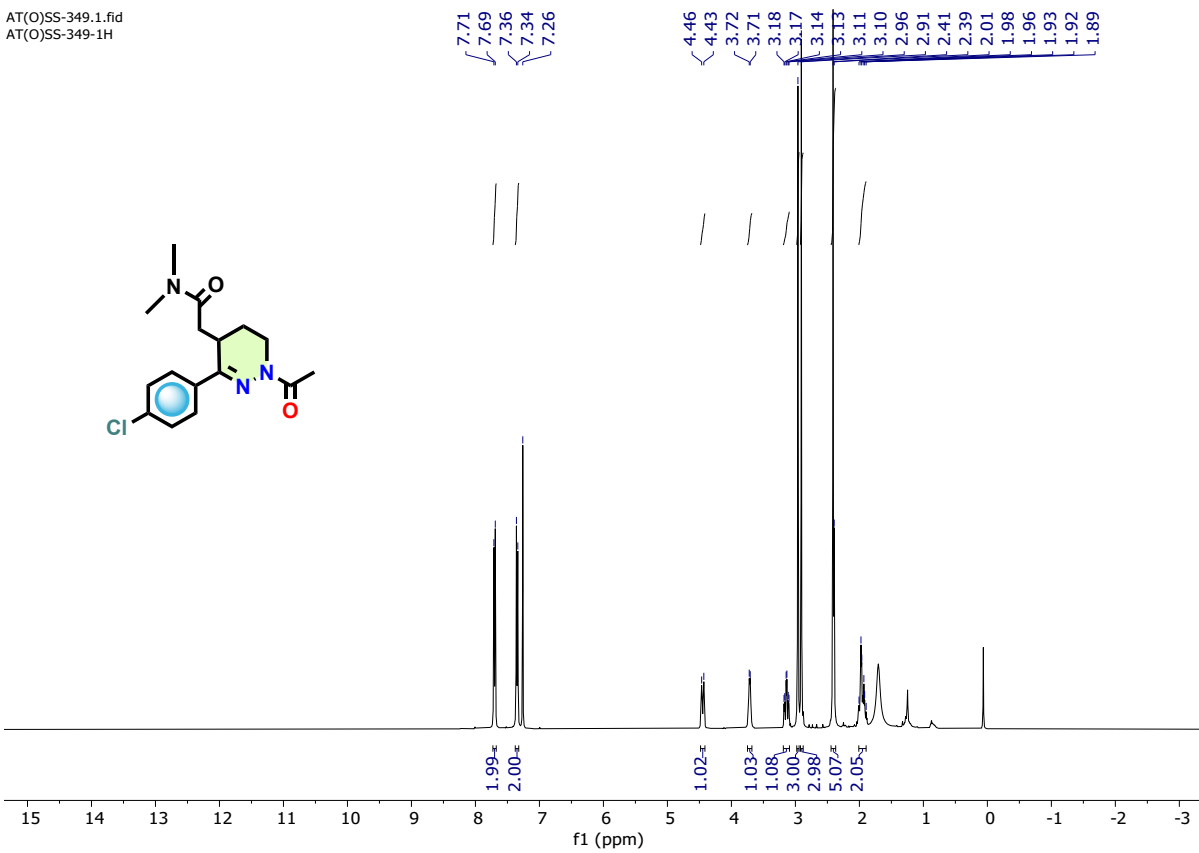


Figure S4. ¹H (400 MHz) NMR of **2b** compound in CDCl₃.

AT(O)-SS-349(A)(4-Cl-acepho+DMF-13C)fid
AT(O)-SS-349(A)-13C

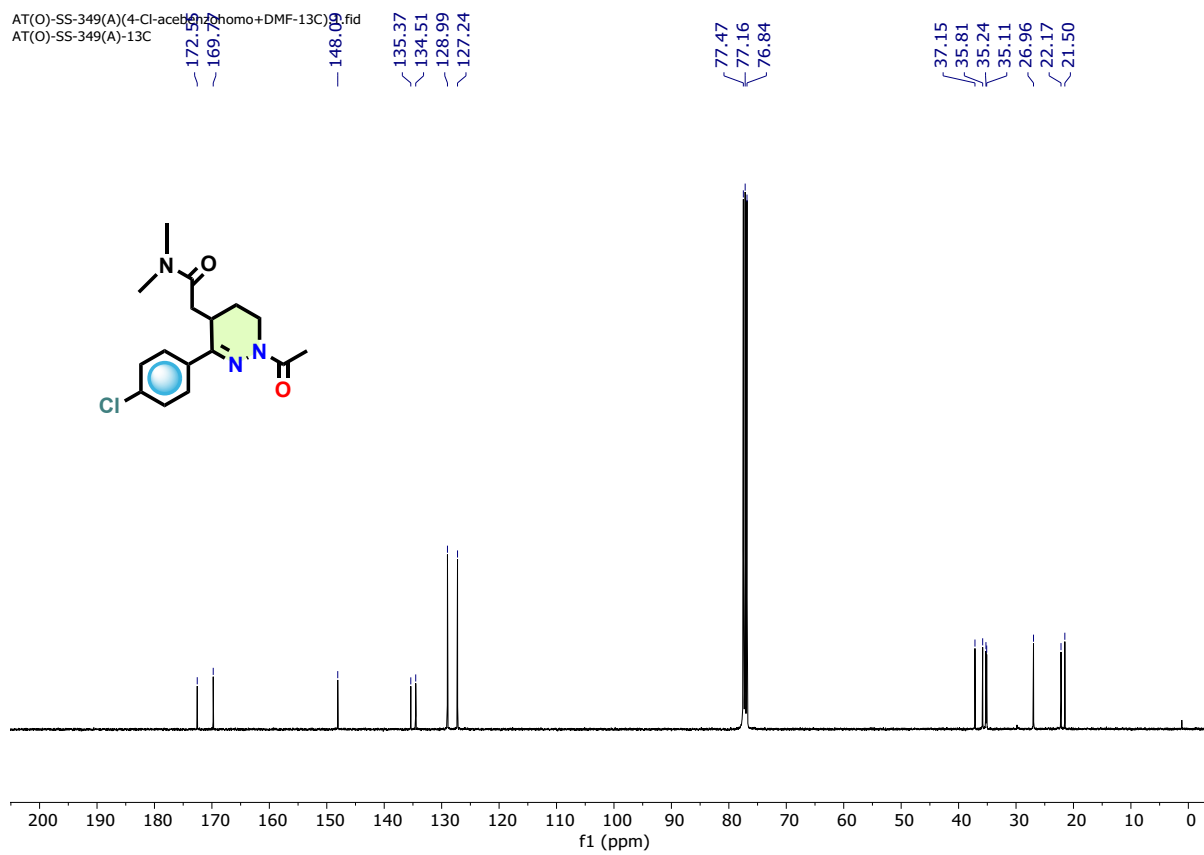


Figure S5. ^{13}C (100 MHz) NMR of **2b** compound in CDCl_3 .

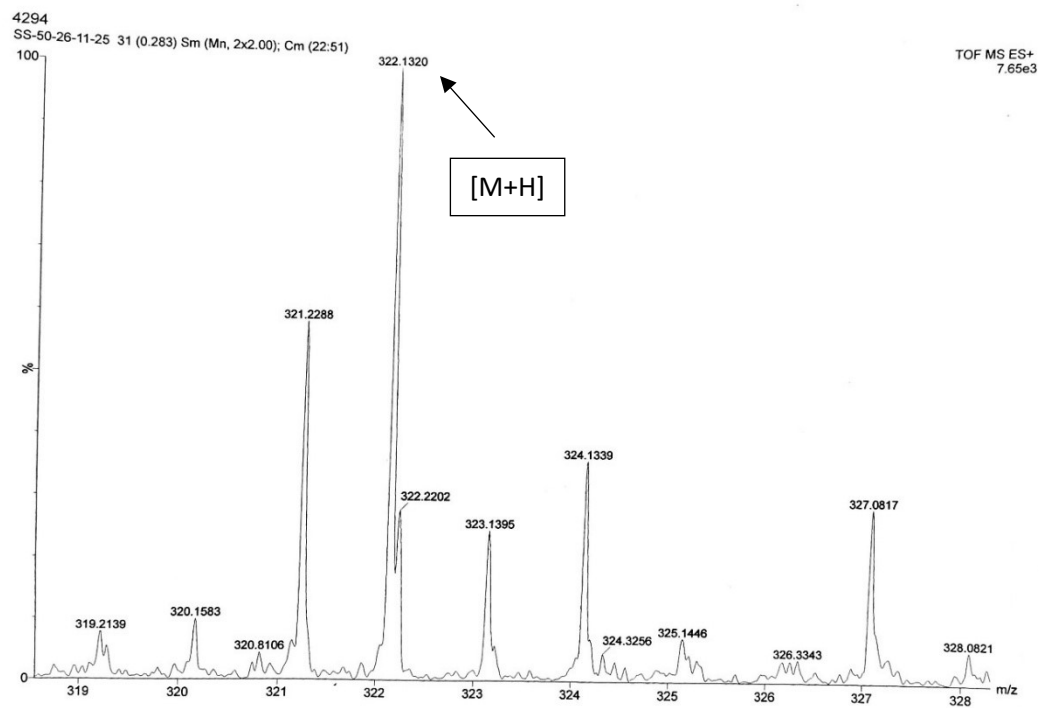
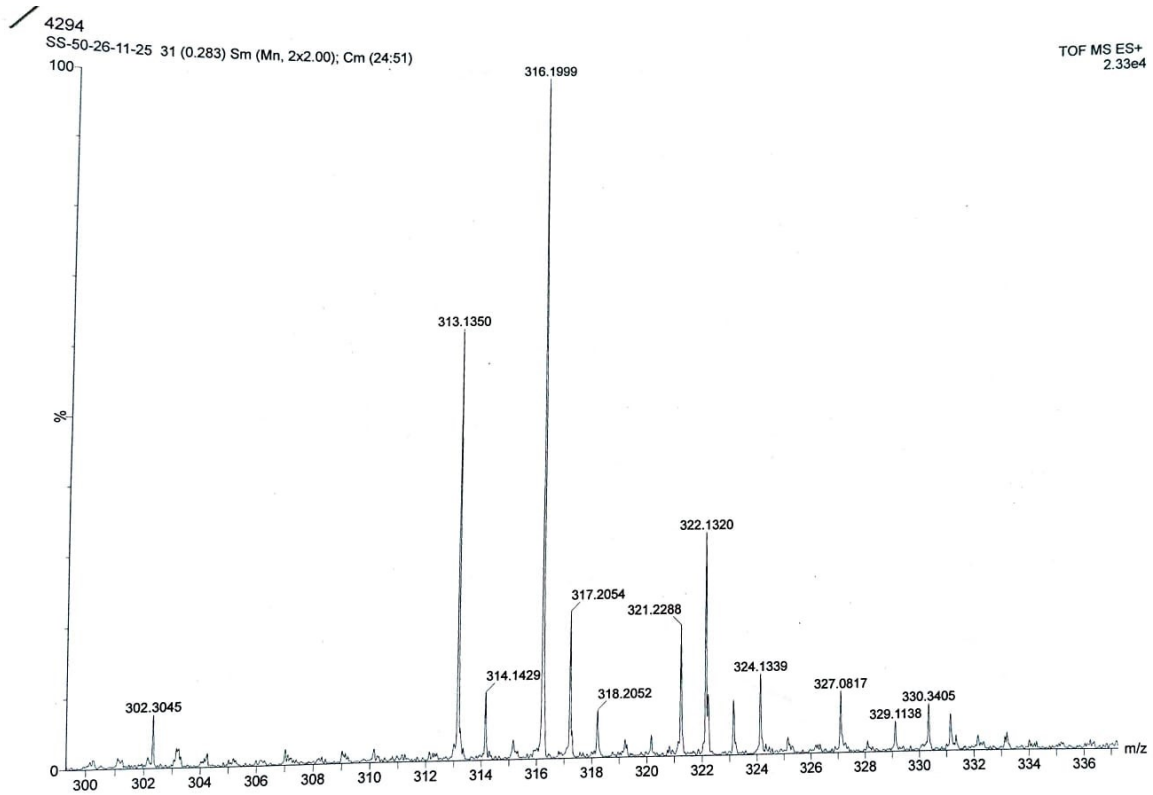


Figure S6. HRMS of Compound 2b.

AT(O)-SS-405.1.fid
AT(O)-SS-405-1H

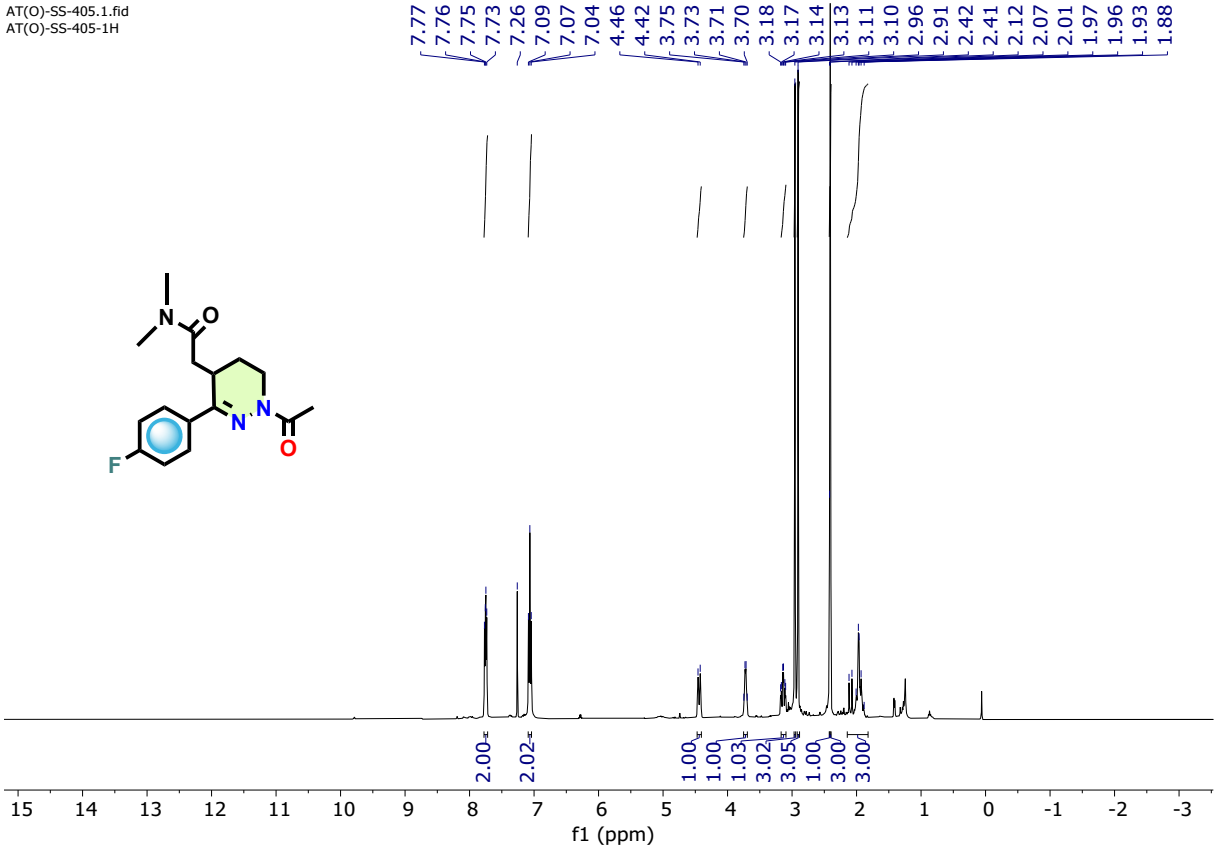


Figure S7. ¹H (400 MHz) NMR of **2c** compound in CDCl₃.

AT(O)-SS-405(4-F+DMF-1H+13-C+19F).3.fid
AT(O)-SS-405-19F

--111.85

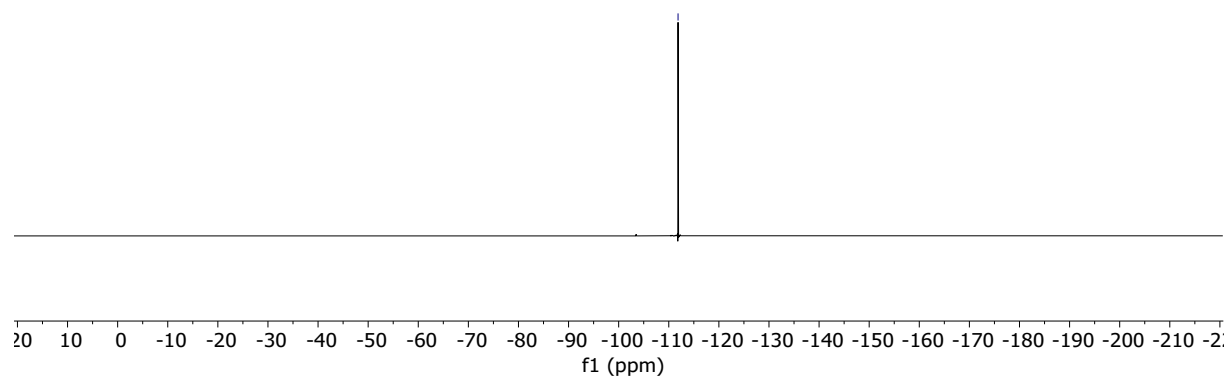
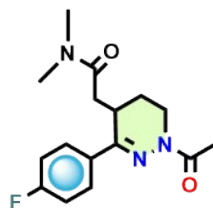


Figure S8. ¹⁹F (400 MHz) NMR of **2c** compound in CDCl₃.

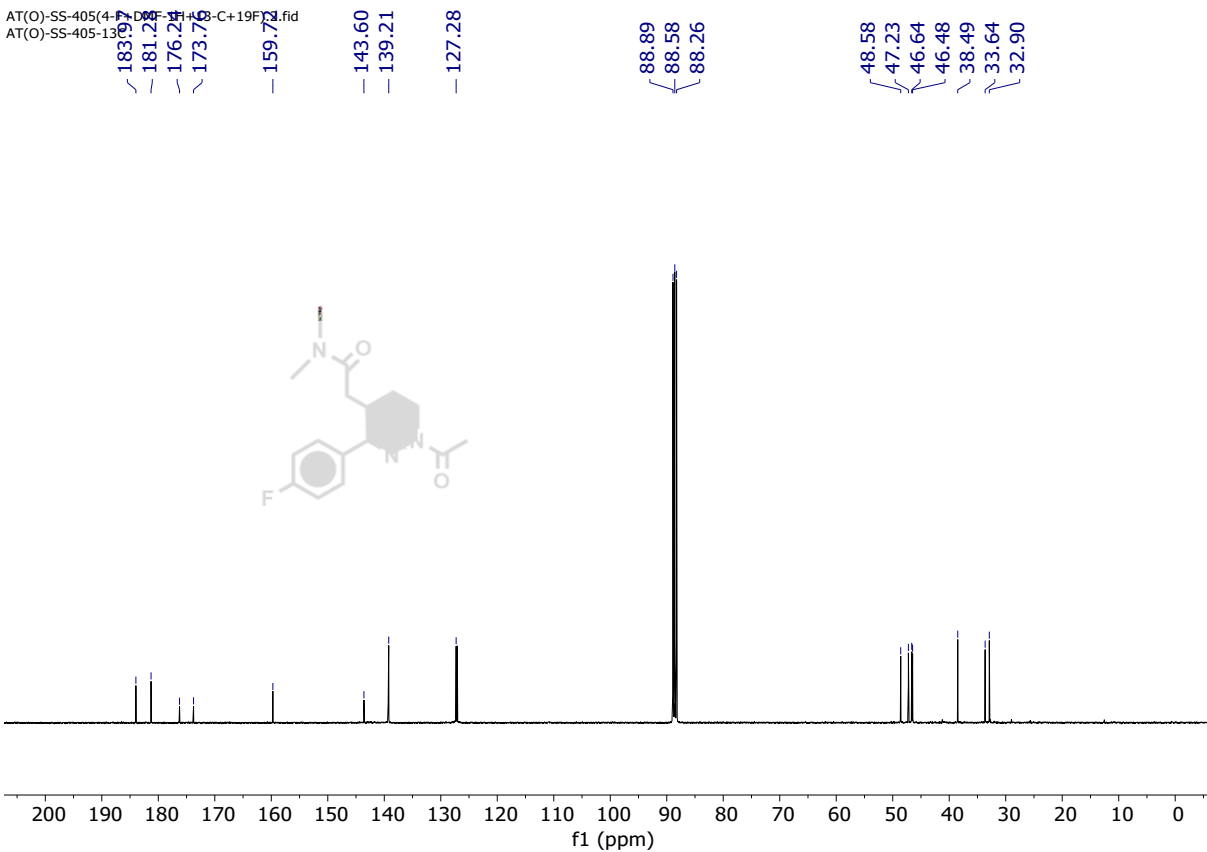


Figure S9. ^{13}C (100 MHz) NMR of **2c** compound in CDCl_3 .

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IISER-KOLKATA

1: TOF MS ES+
1.16e7

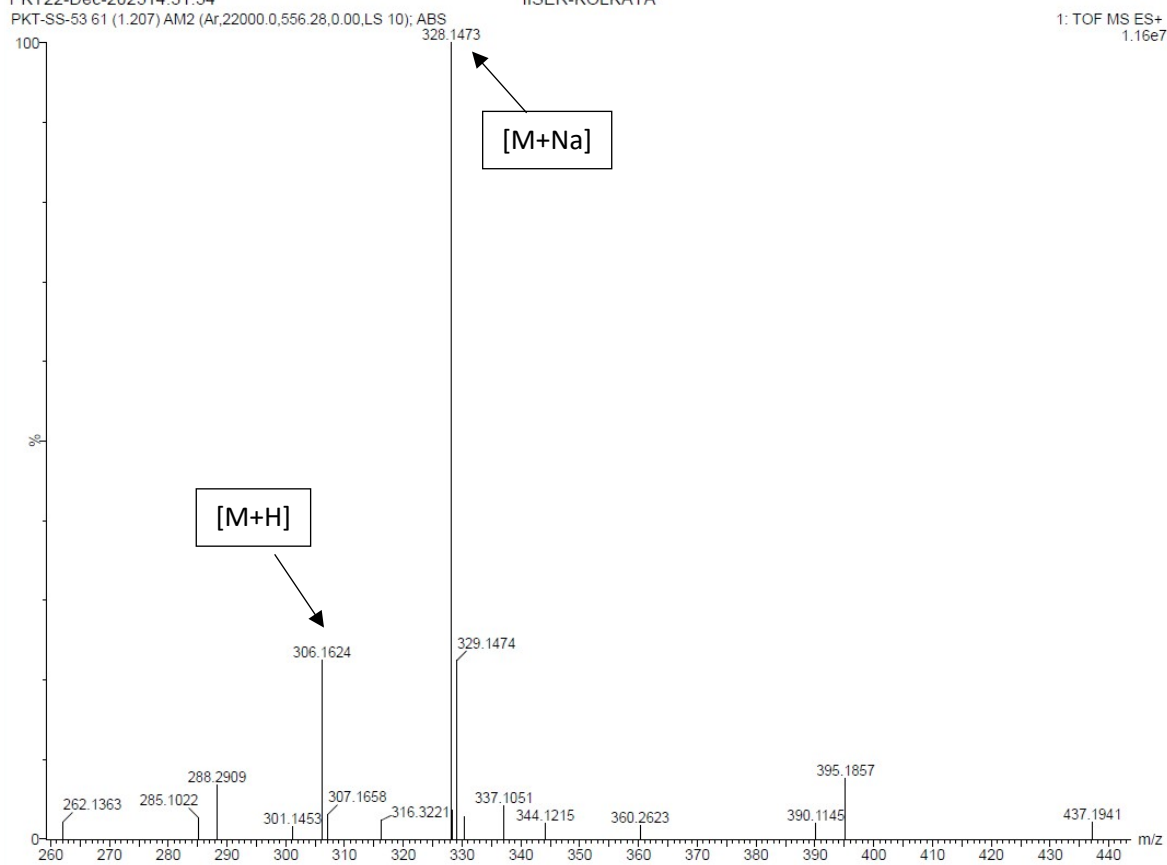


Figure S10. HRMS of Compound 2c.

AT(O)-SS-389(3-Br+DMF-1H).1.fid
AT(O)-SS-389-1H

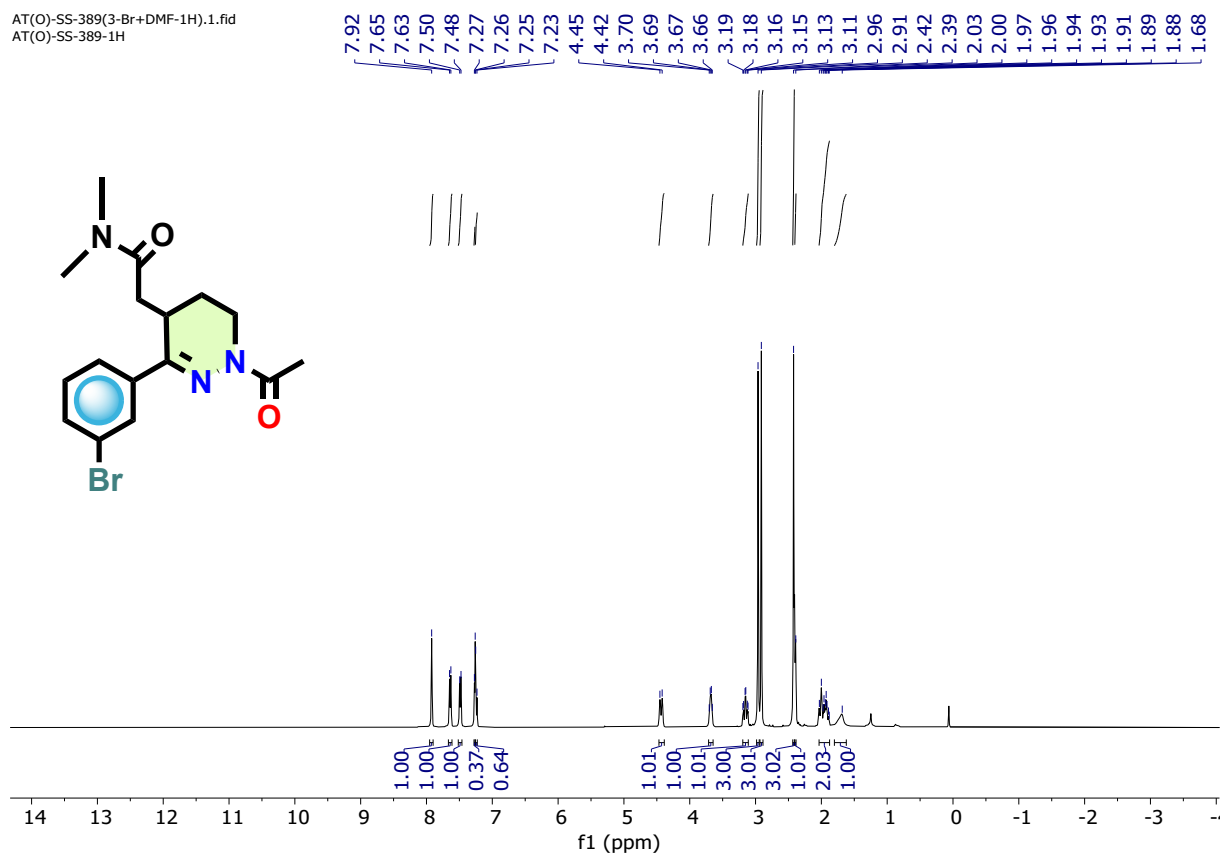


Figure S11. ¹H (400 MHz) NMR of 2d compound in CDCl₃.

AT(O)-SS-389(A)(3-Br+DMF-13C).1.fid
AT(O)-SS-389(A)-13C

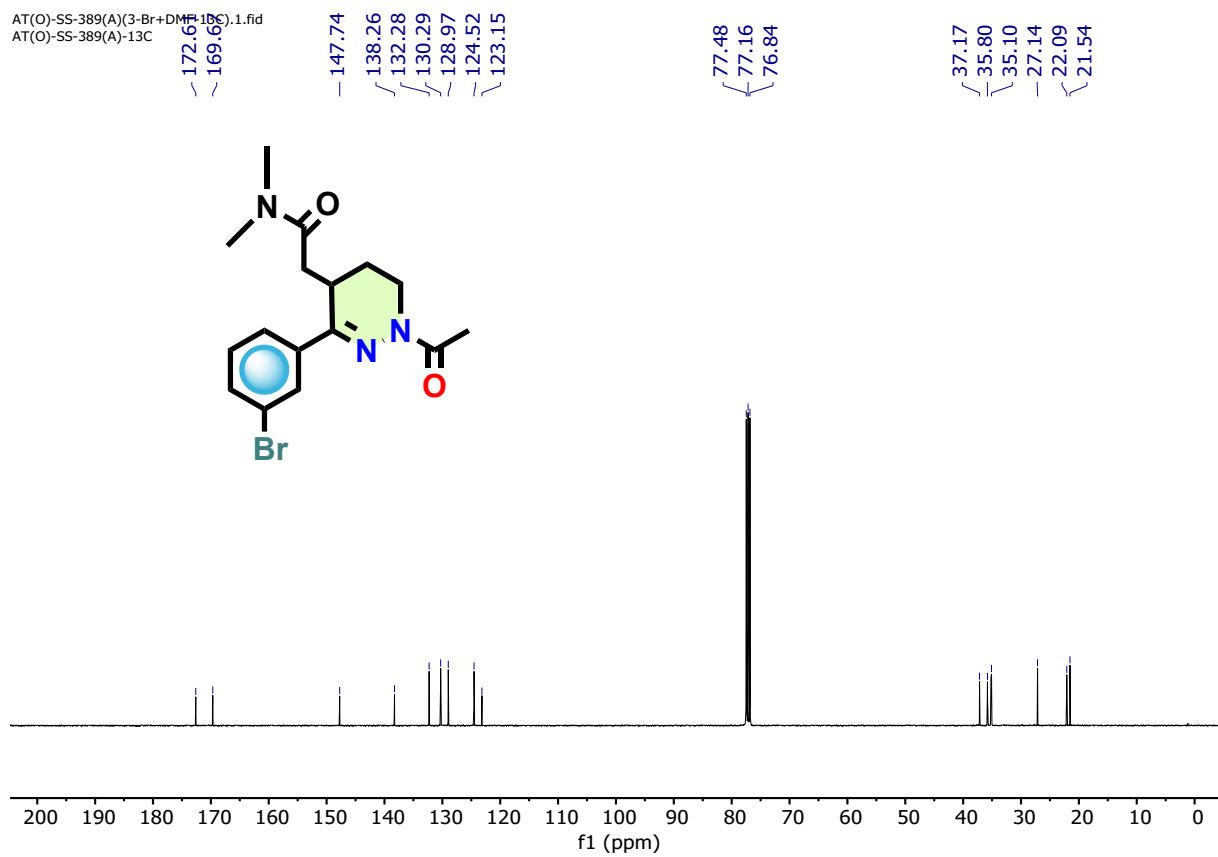


Figure S12. ¹³C (100 MHz) NMR of **2d** compound in CDCl₃.

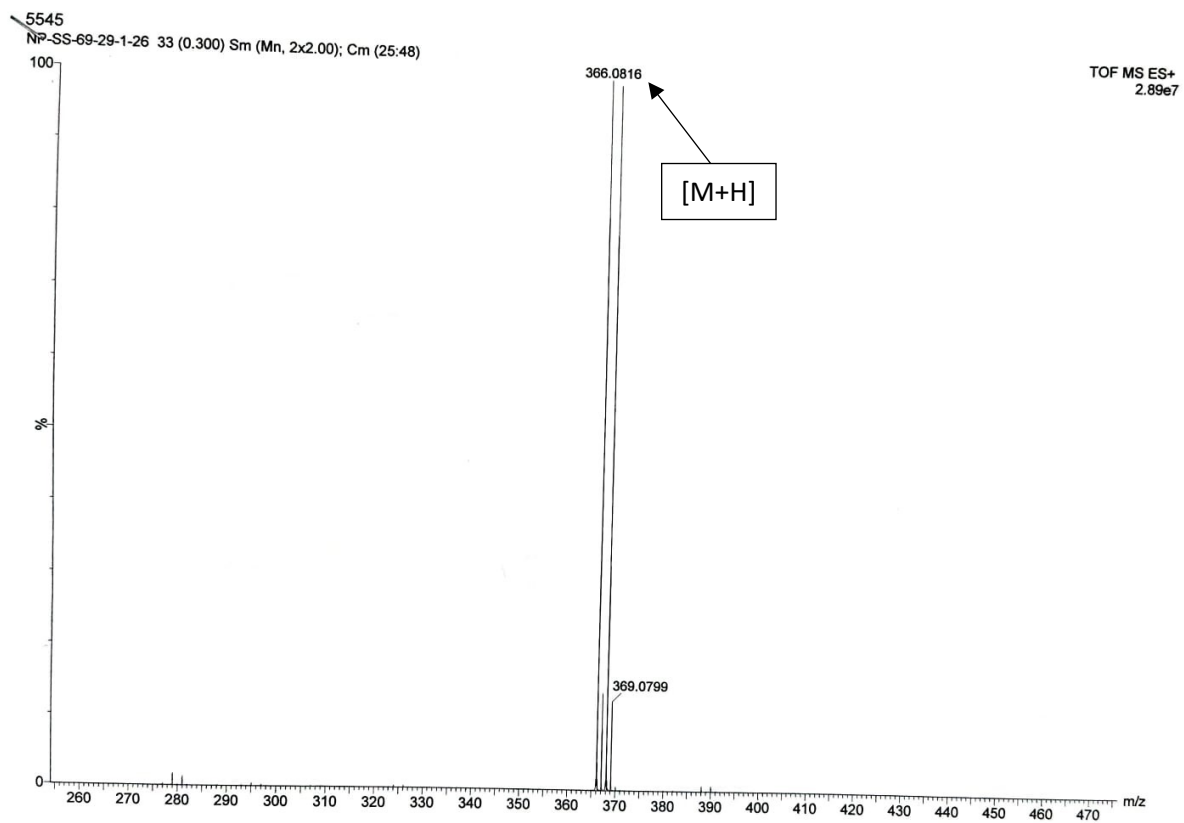


Figure S13. HRMS of compound **2d**.

AT(O)SS-401.1.fid
AT(O)SS-401-1H

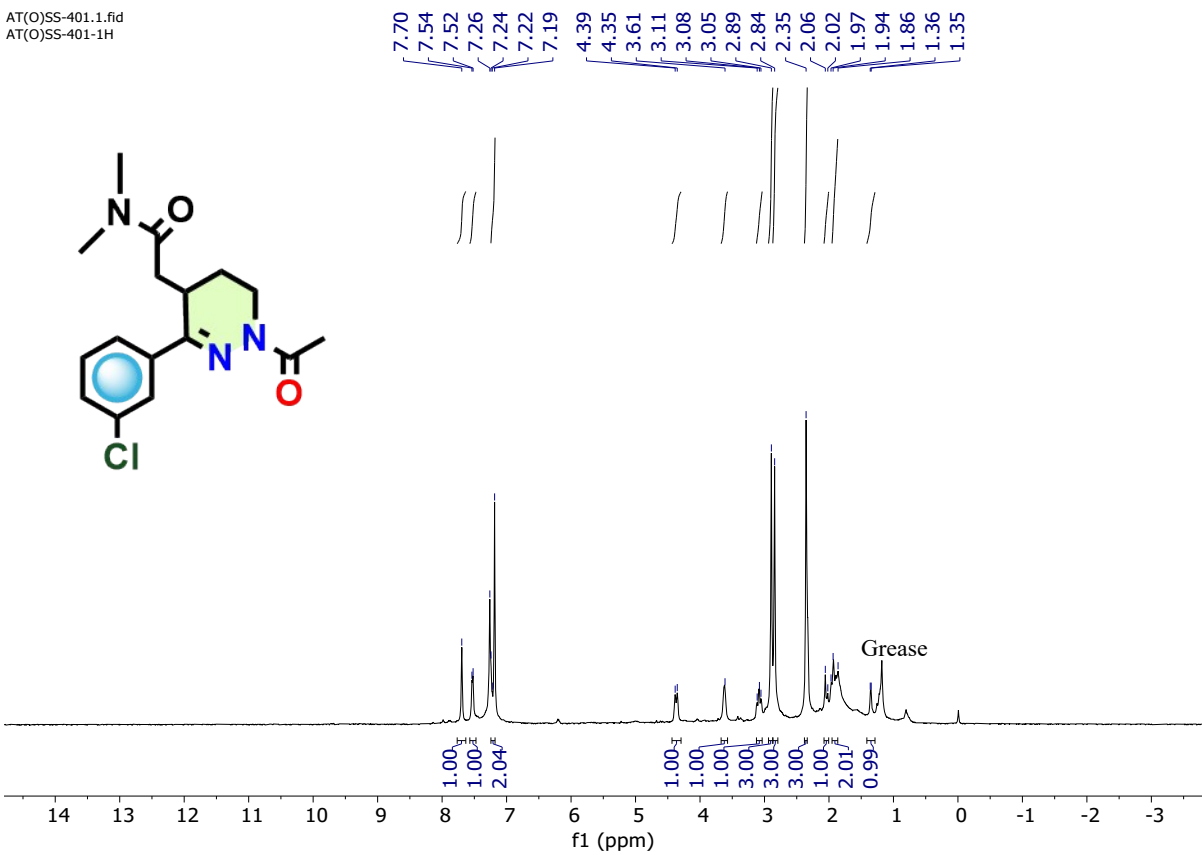


Figure S14. ^1H (400 MHz) NMR of **2e** compound in CDCl_3 .

AT(O)-SS-401(A)(3-Cl+DMF)
AT(O)-SS-401(A)-13C

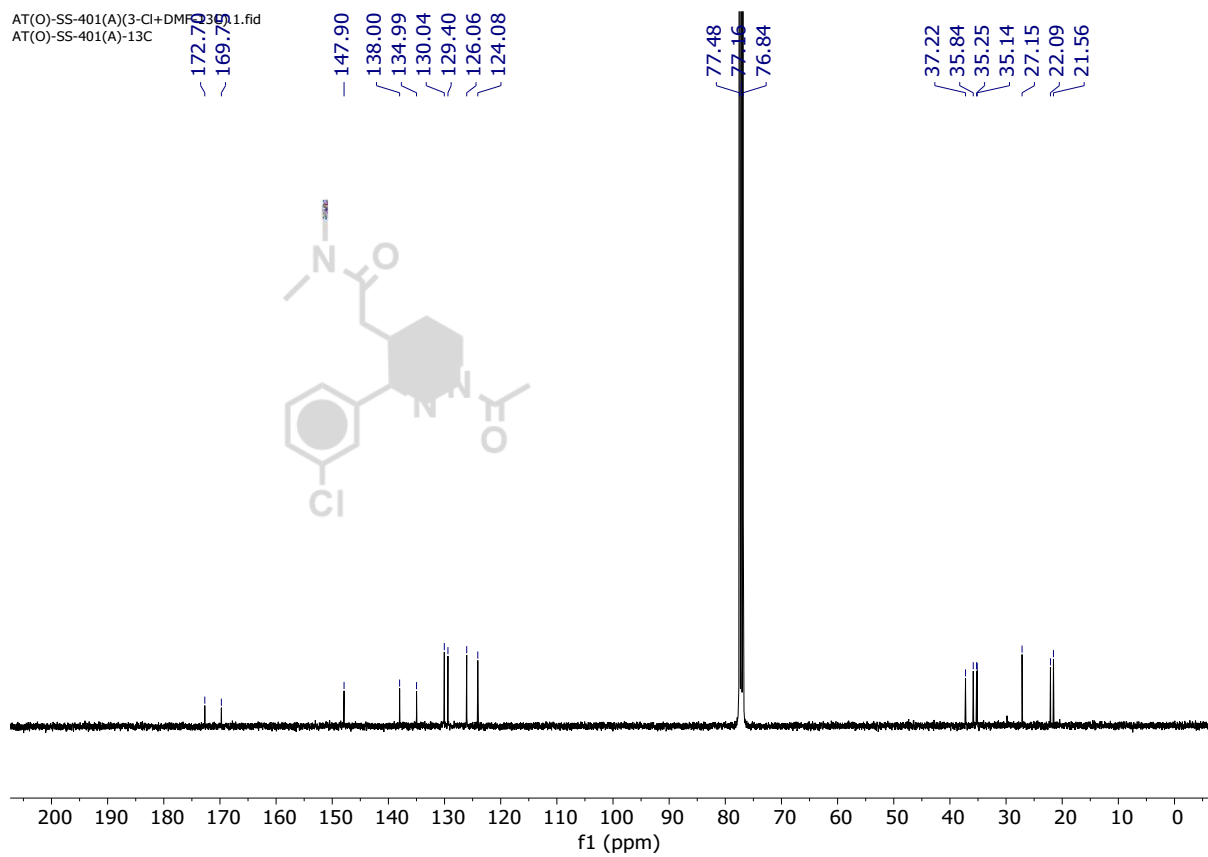


Figure S15. ^{13}C (100 MHz) NMR of **2e** compound in CDCl_3 .

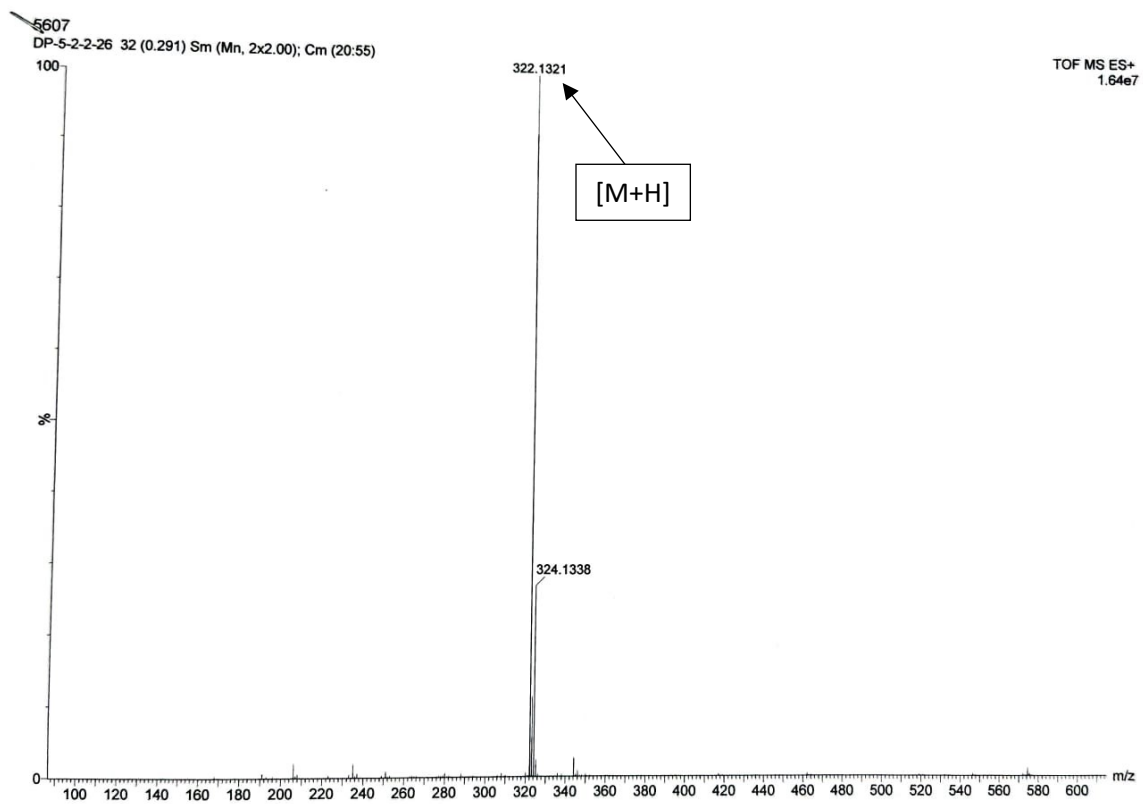


Figure S16. HRMS of compound **2e**.

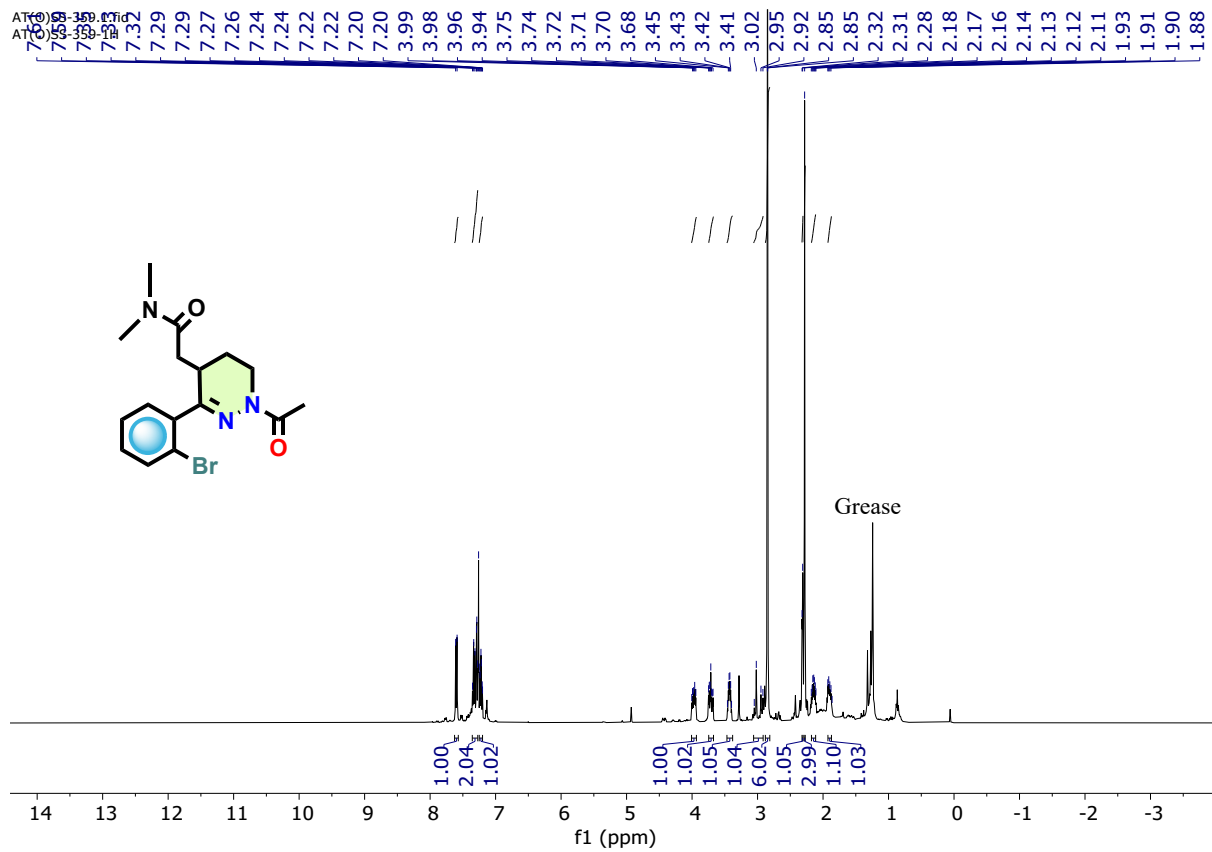


Figure S17. ¹H (400 MHz) NMR of **2f** compound in CDCl₃.

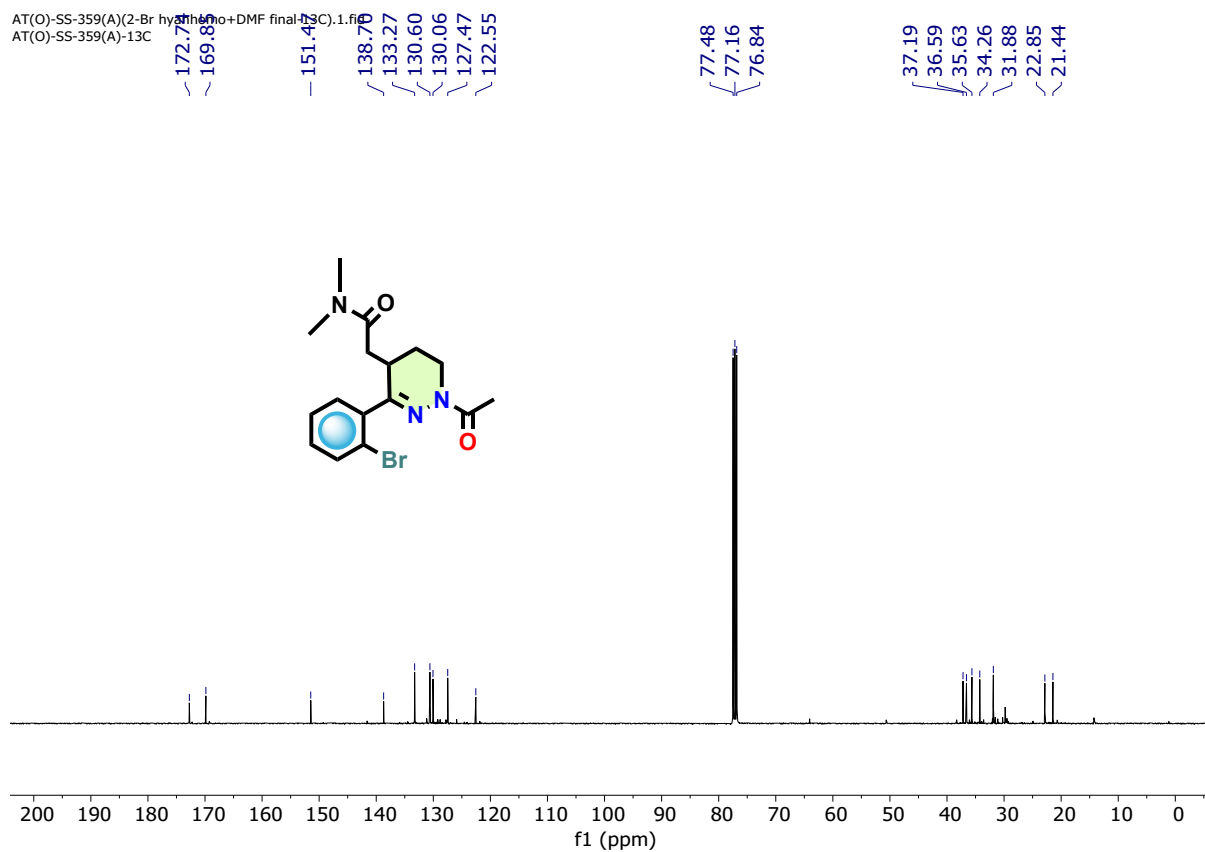


Figure S18. ^{13}C (100 MHz) NMR of **2f** compound in CDCl_3 .

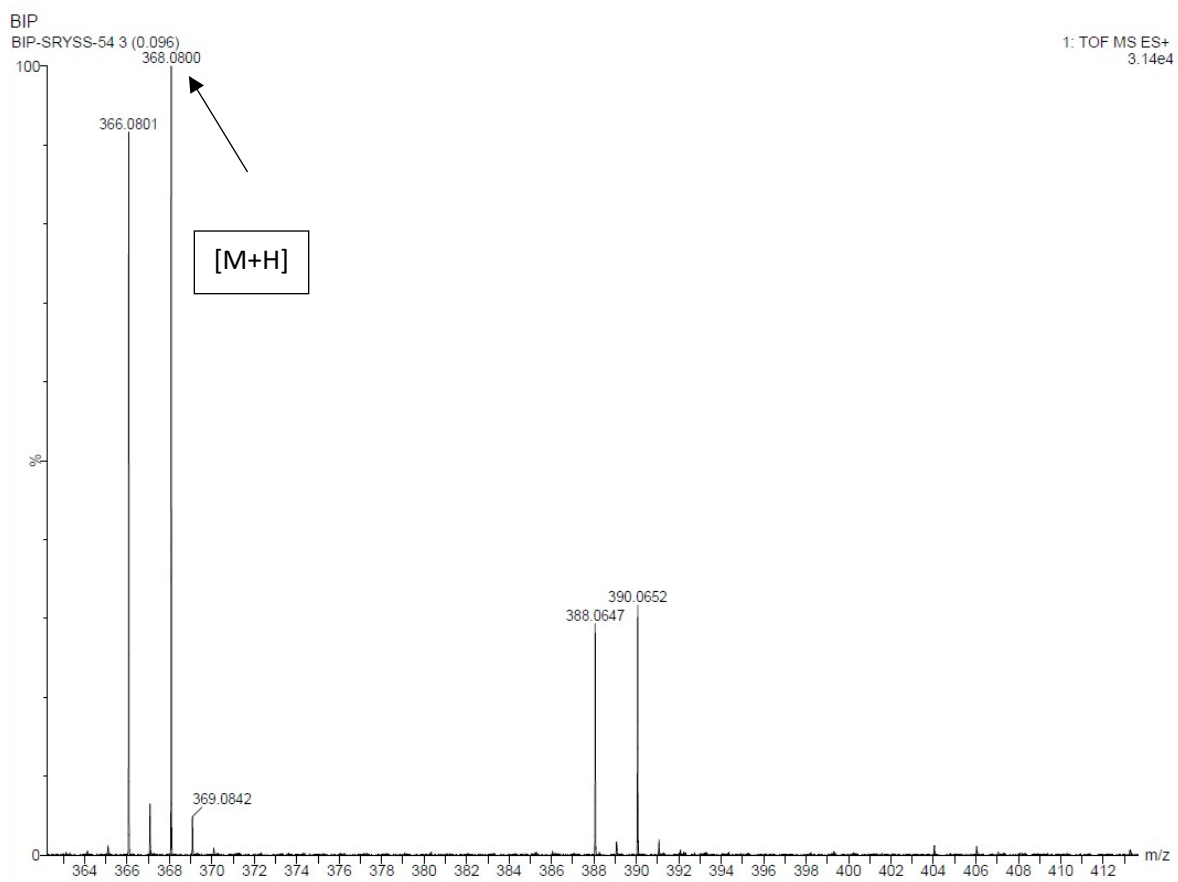


Figure S19. HRMS of compound **2f**.

AT(O)-SS-360-B(4-Me+DMF-1H),1.fid
AT(O)-SS-360-B-1H

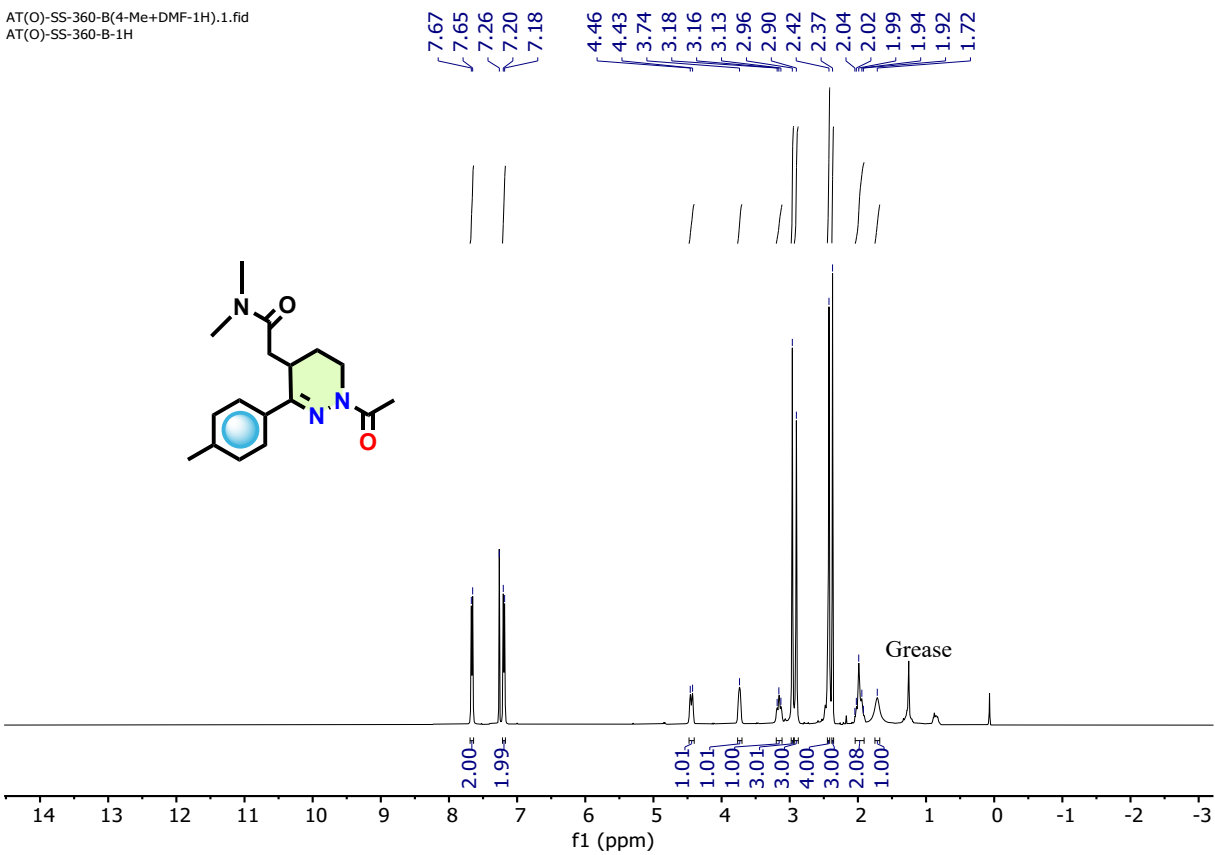


Figure S20. ^1H (400 MHz) NMR of **2g** compound in CDCl_3

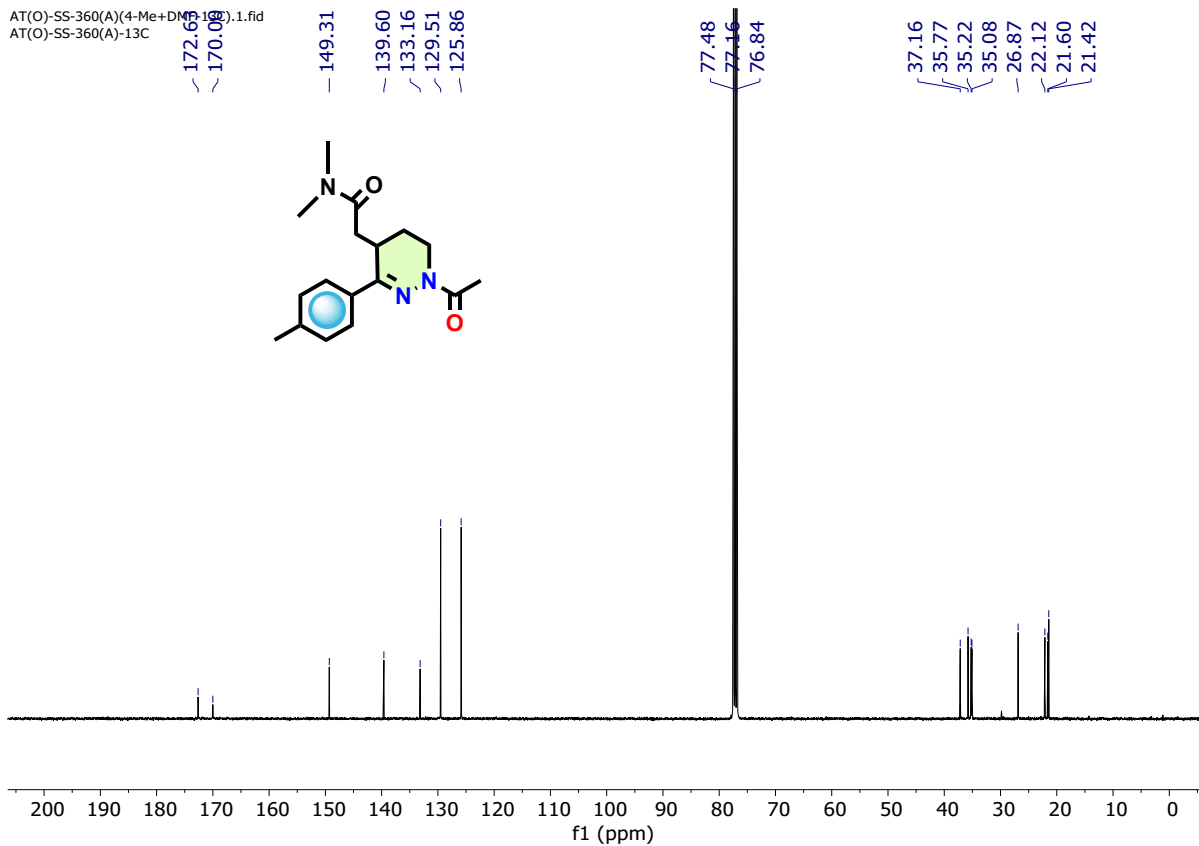


Figure S21. ¹³C (100 MHz) NMR of 2g compound in CDCl₃

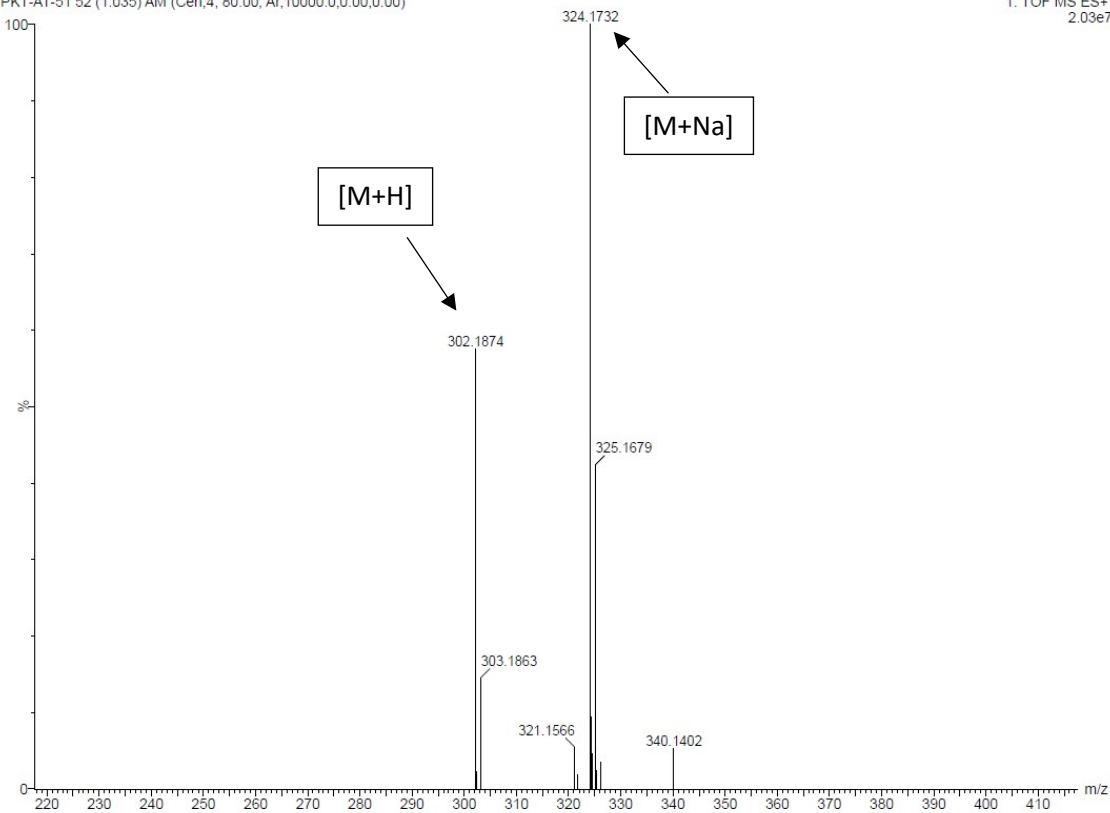


Figure S22. HRMS of compound **2g**.

AT(O)-SS-358.1.fid
AT(O)-SS-358-1H

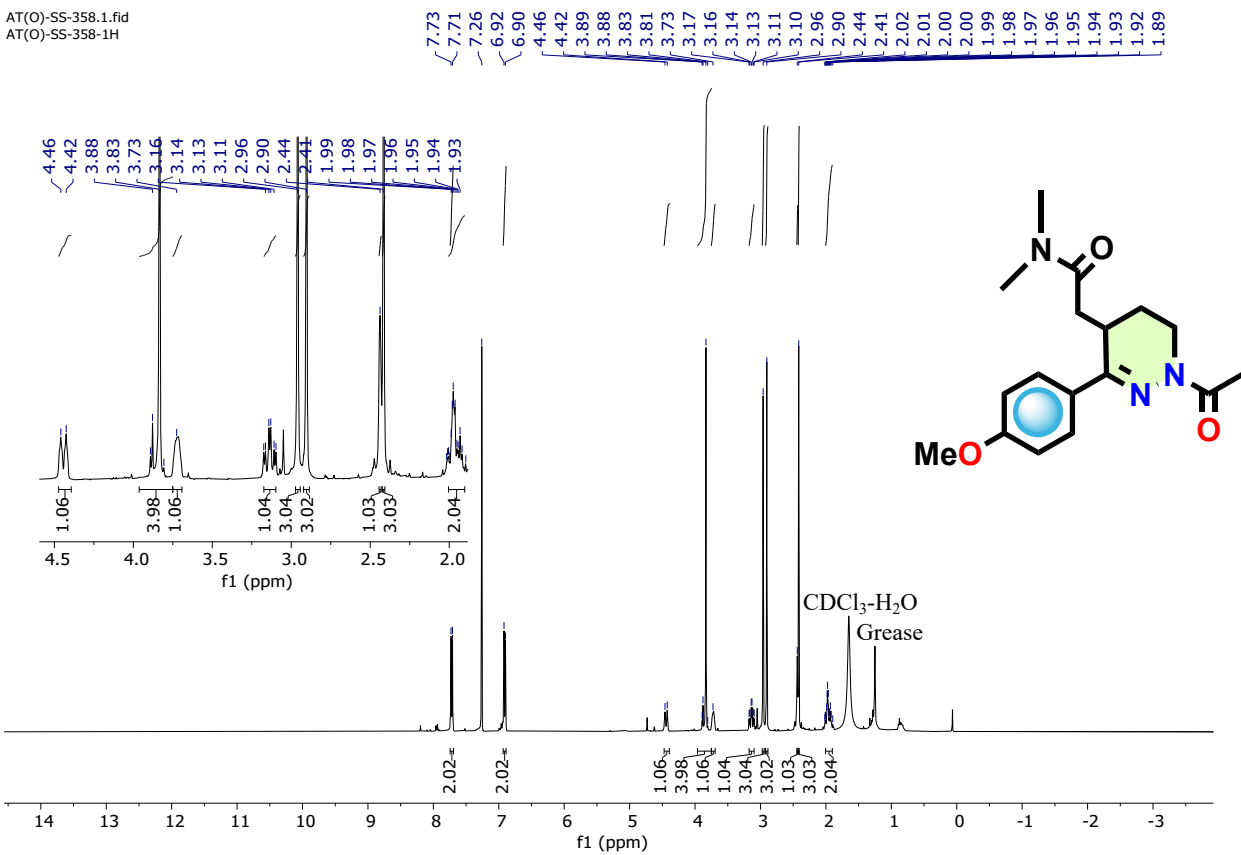


Figure S23. ¹H (400 MHz) NMR of **2h** compound in CDCl₃

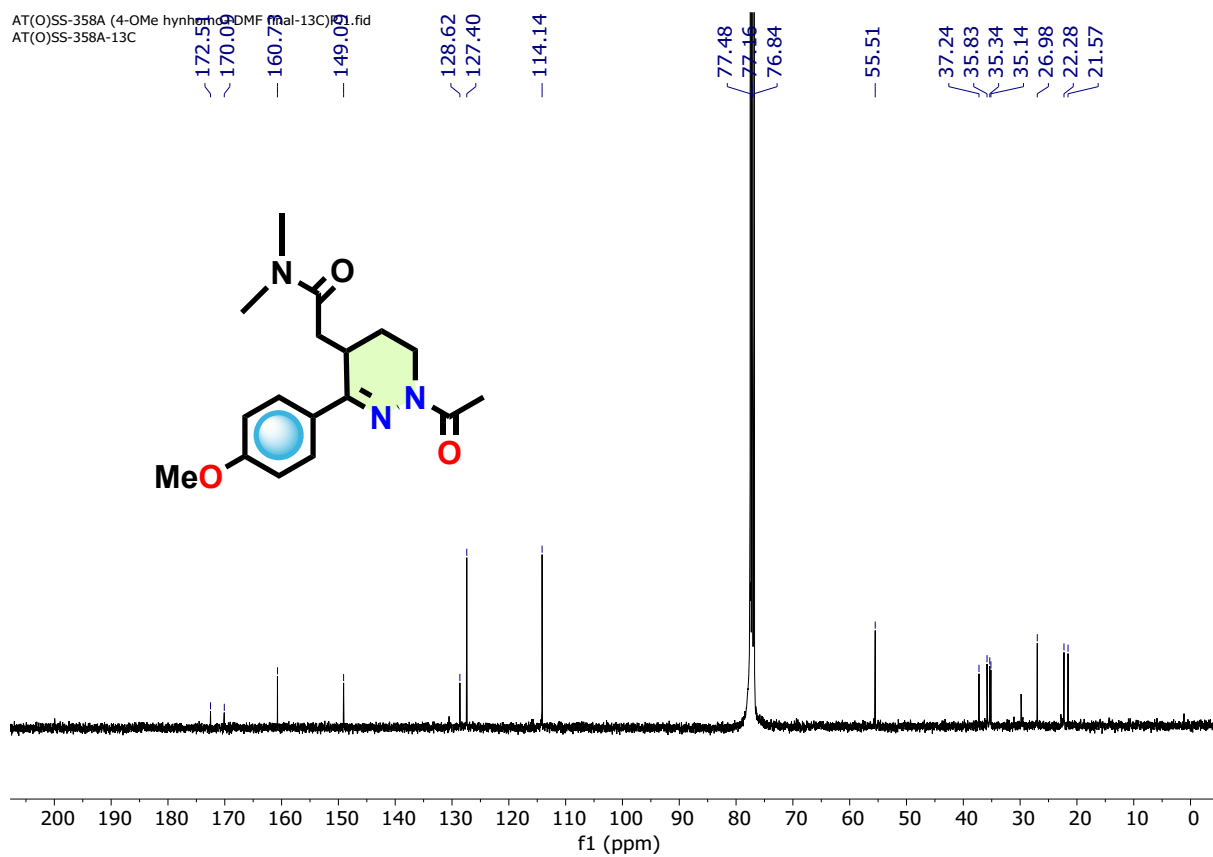


Figure S24. ¹³C (100 MHz) NMR of **2h** compound in CDCl₃

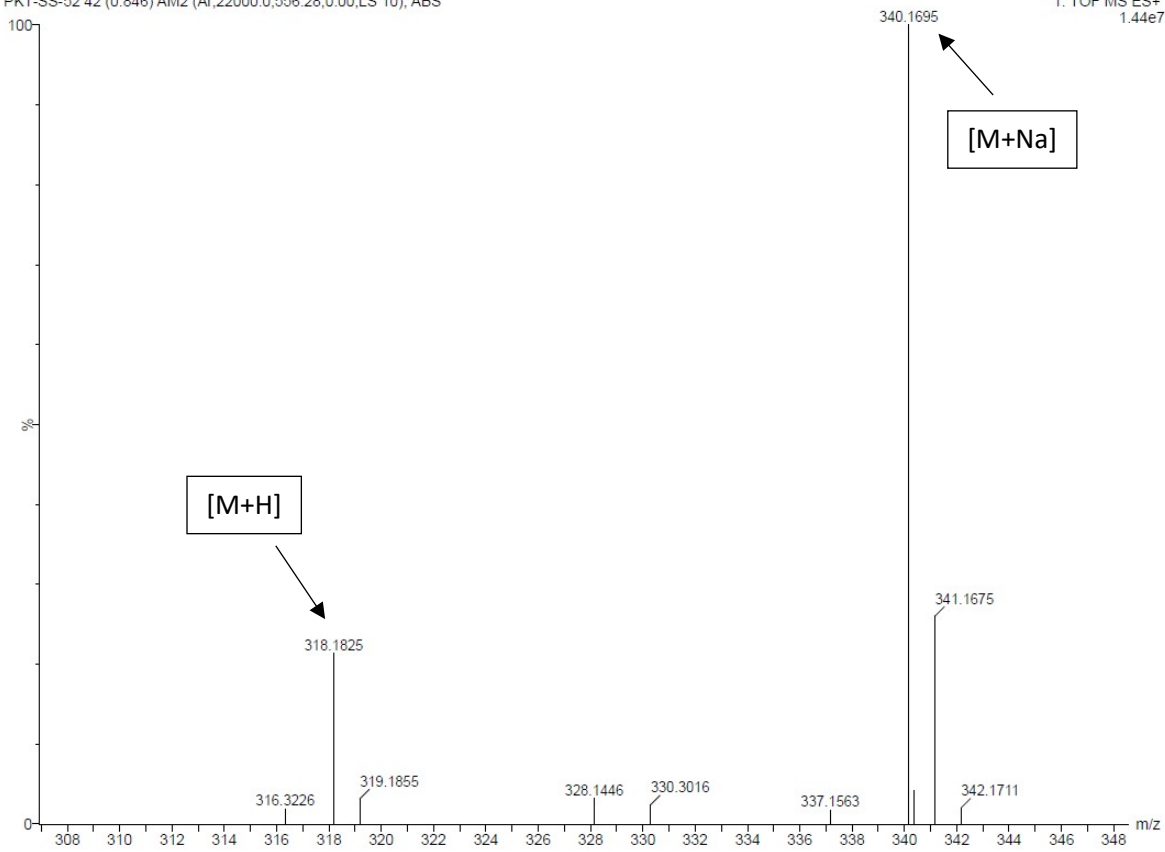


Figure S25. HRMS of compound 2h.

AT(O)SS-410.2.fid
AT(O)SS-410-13C

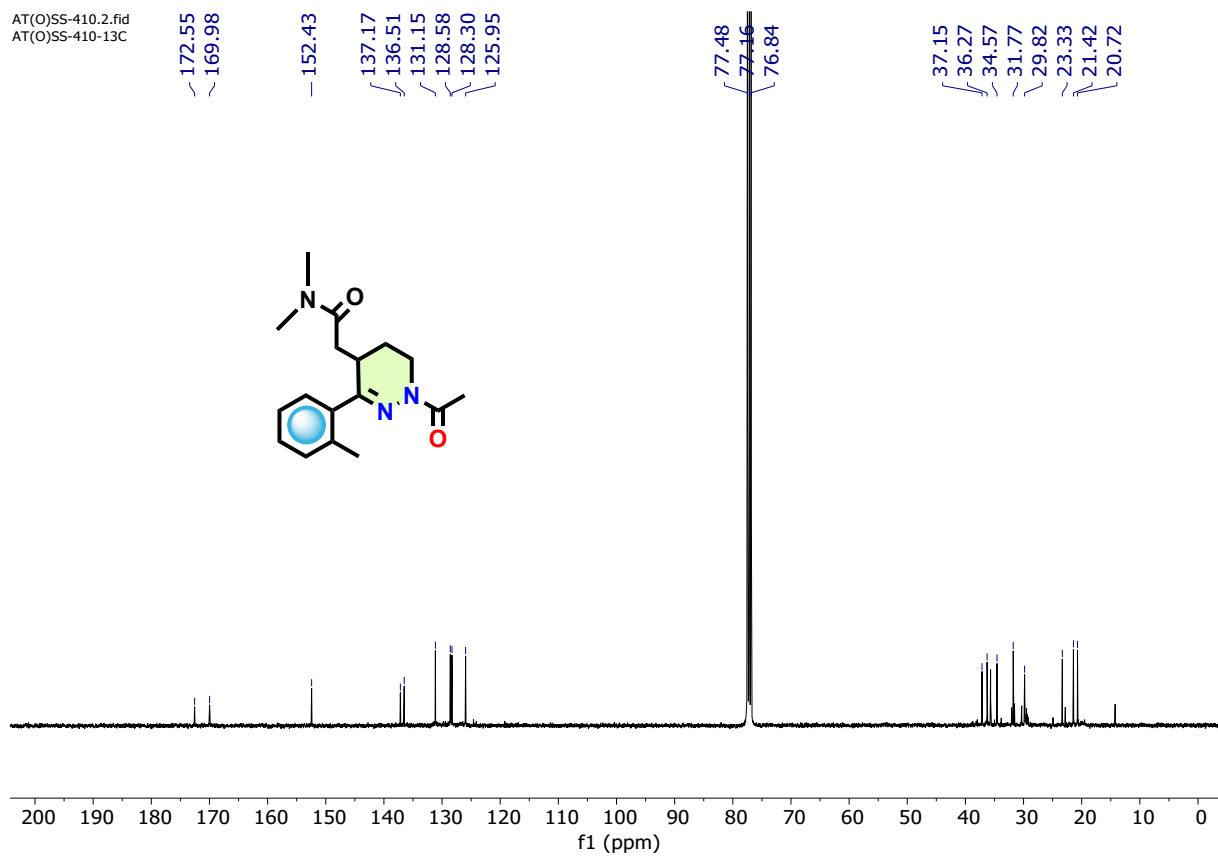


Figure S27: ^{13}C (100 MHz) NMR of **2i** compound in CDCl_3 .

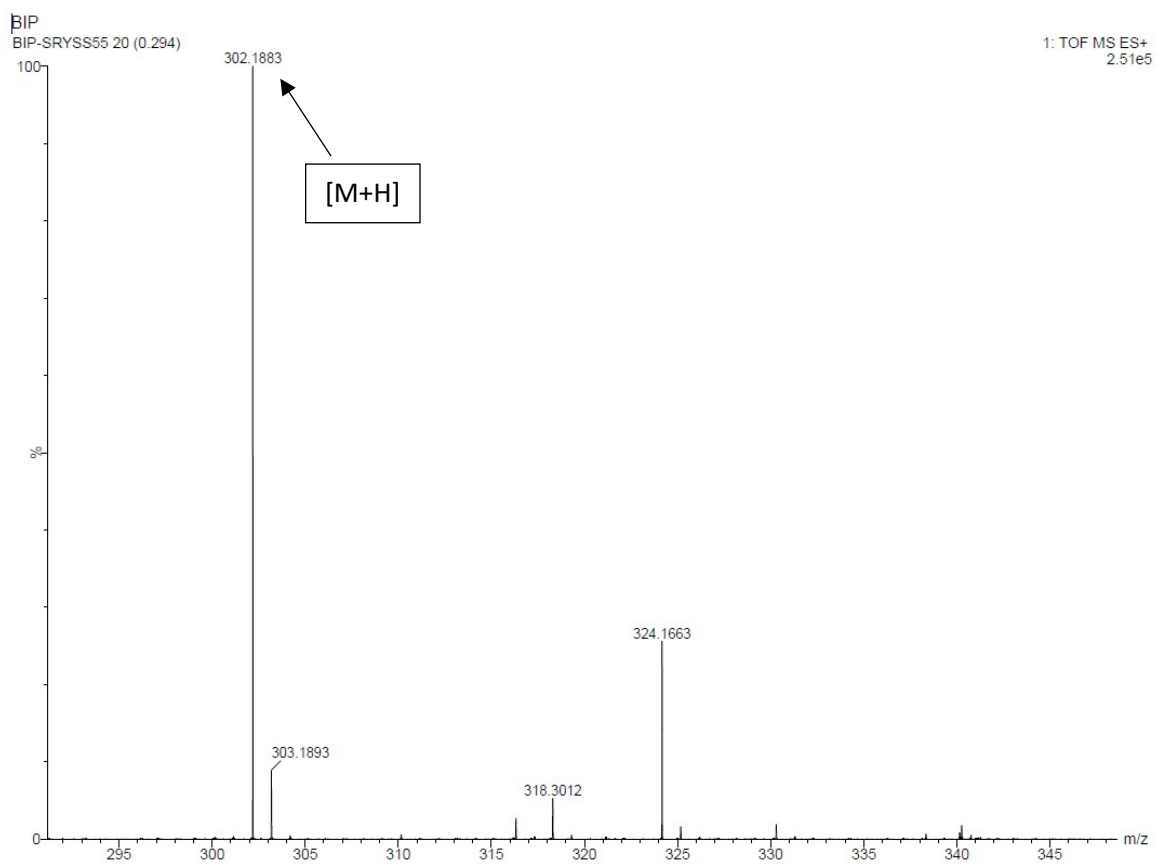


Figure S28. HRMS of compound **2i**.

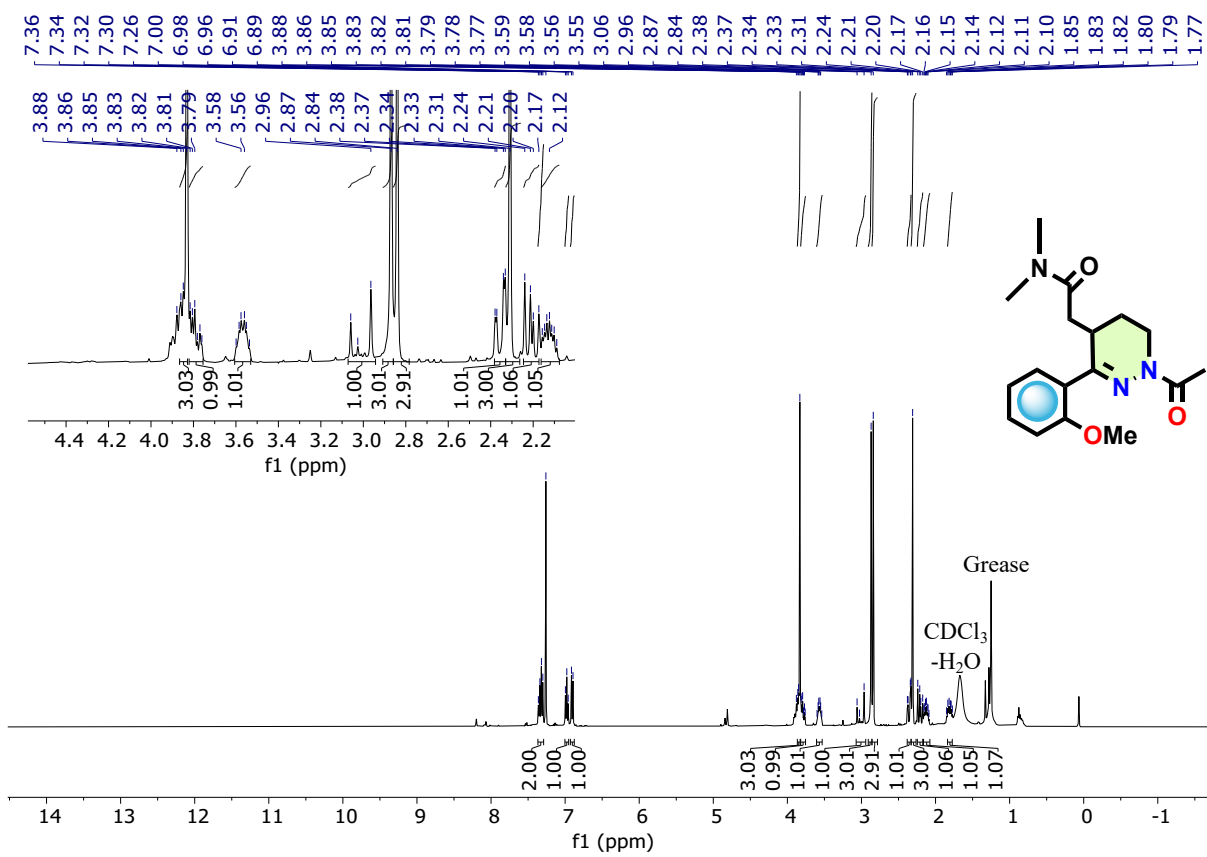


Figure S29. ^1H (400 MHz) NMR of **2j** compound in CDCl_3

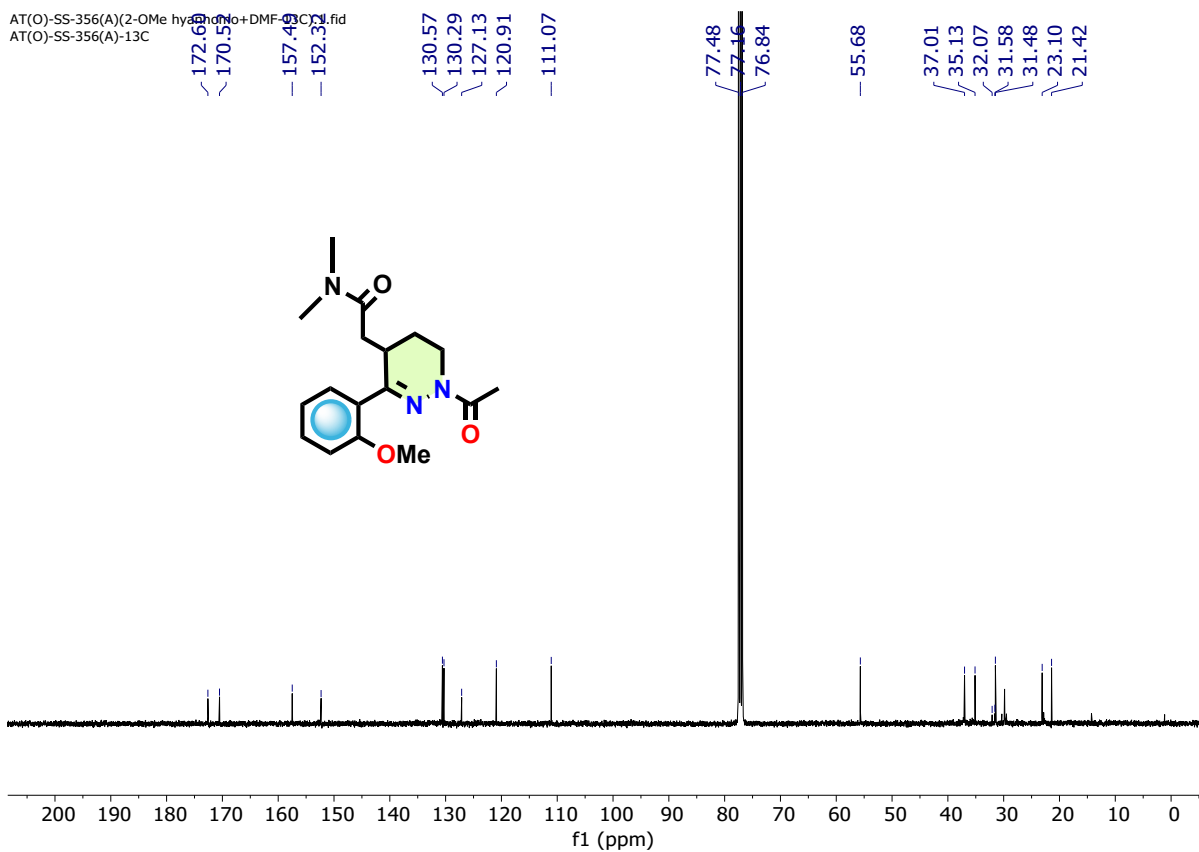


Figure S30: ^{13}C (100 MHz) NMR of **2j** compound in CDCl_3 .

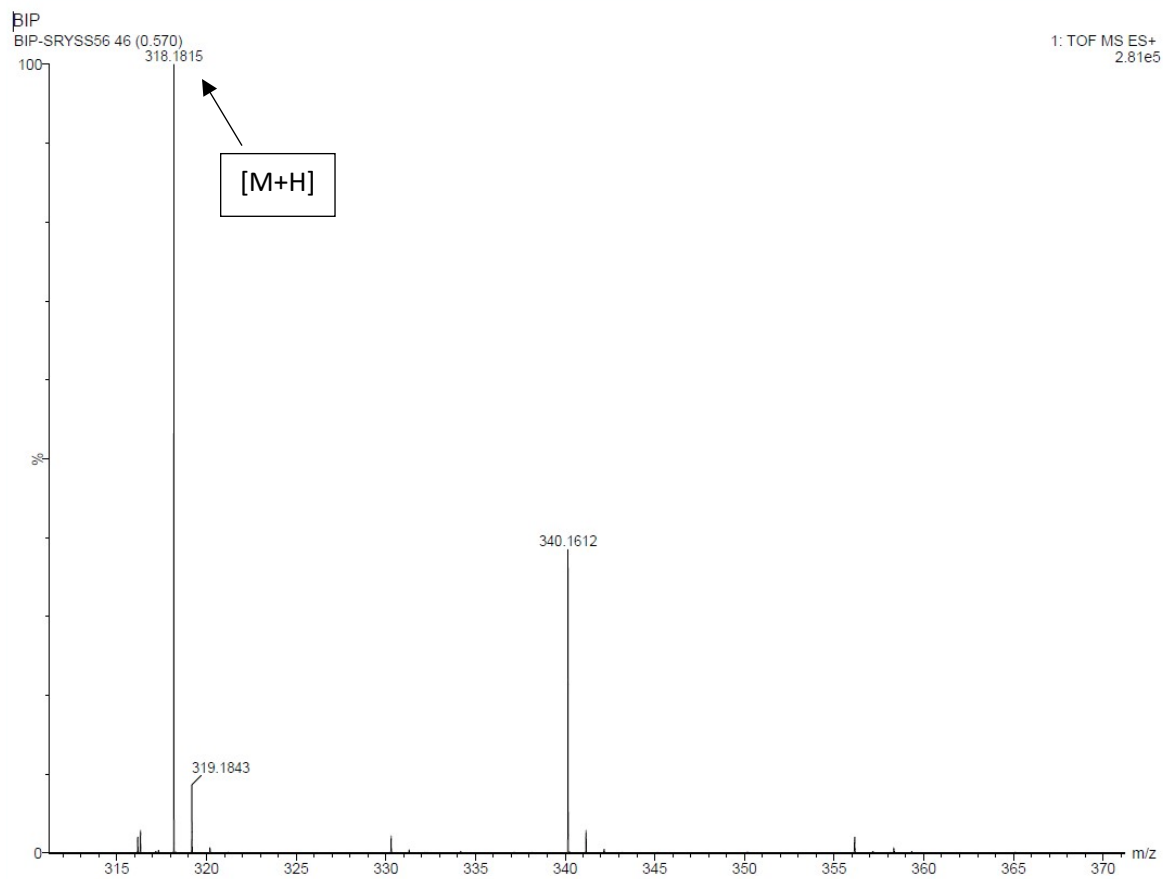


Figure S31. HRMS of compound **2j**.

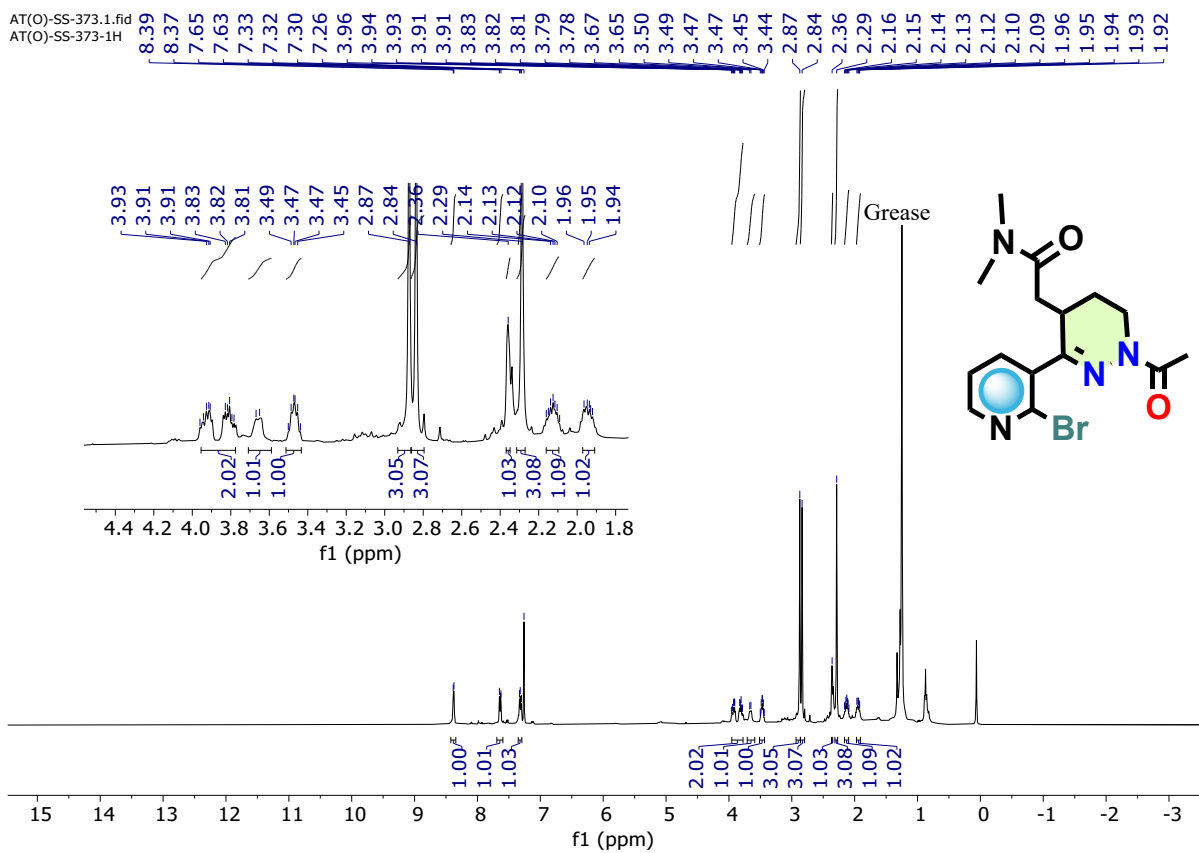


Figure S32. ^1H (400 MHz) NMR of **2k** compound in CDCl_3

AT(O)-SS-373(A).1.fid
AT(O)-SS-373(A)-13C

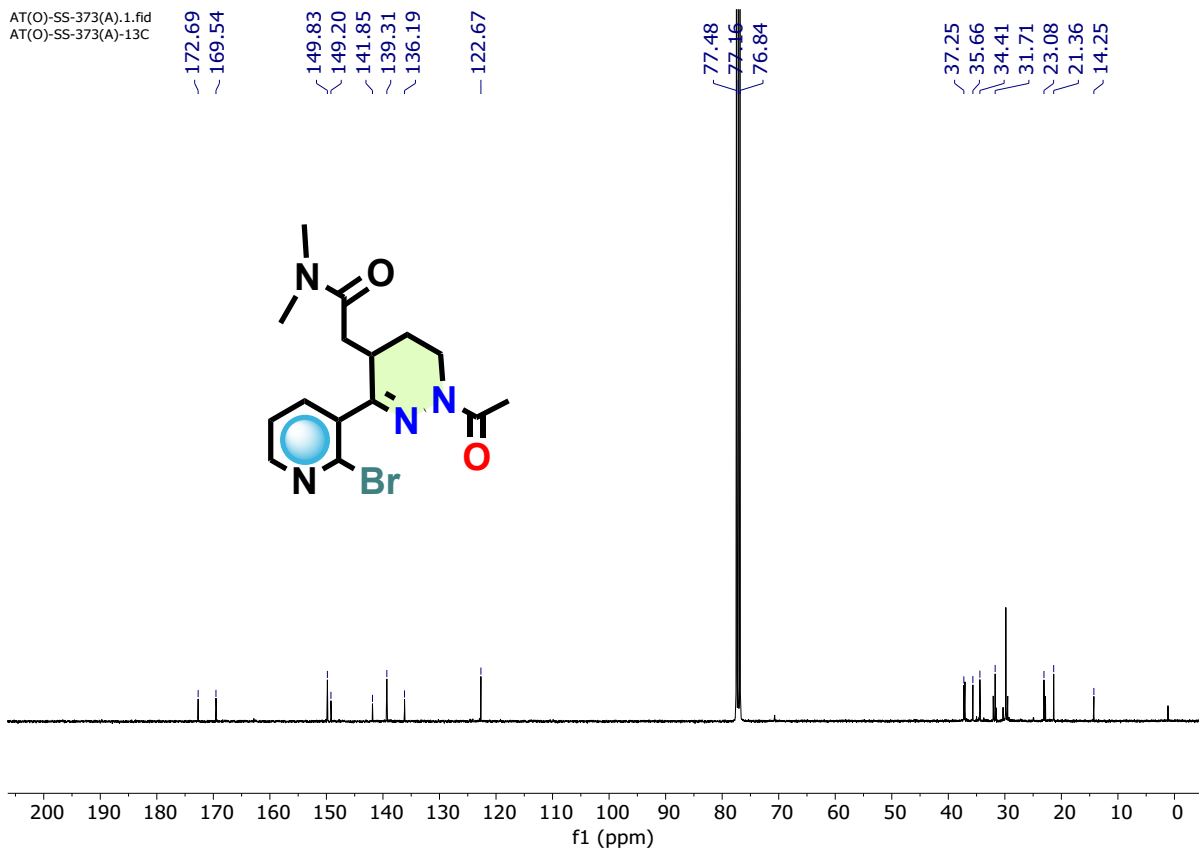


Figure S33. ^{13}C (100 MHz) NMR of **2k** compound in CDCl_3

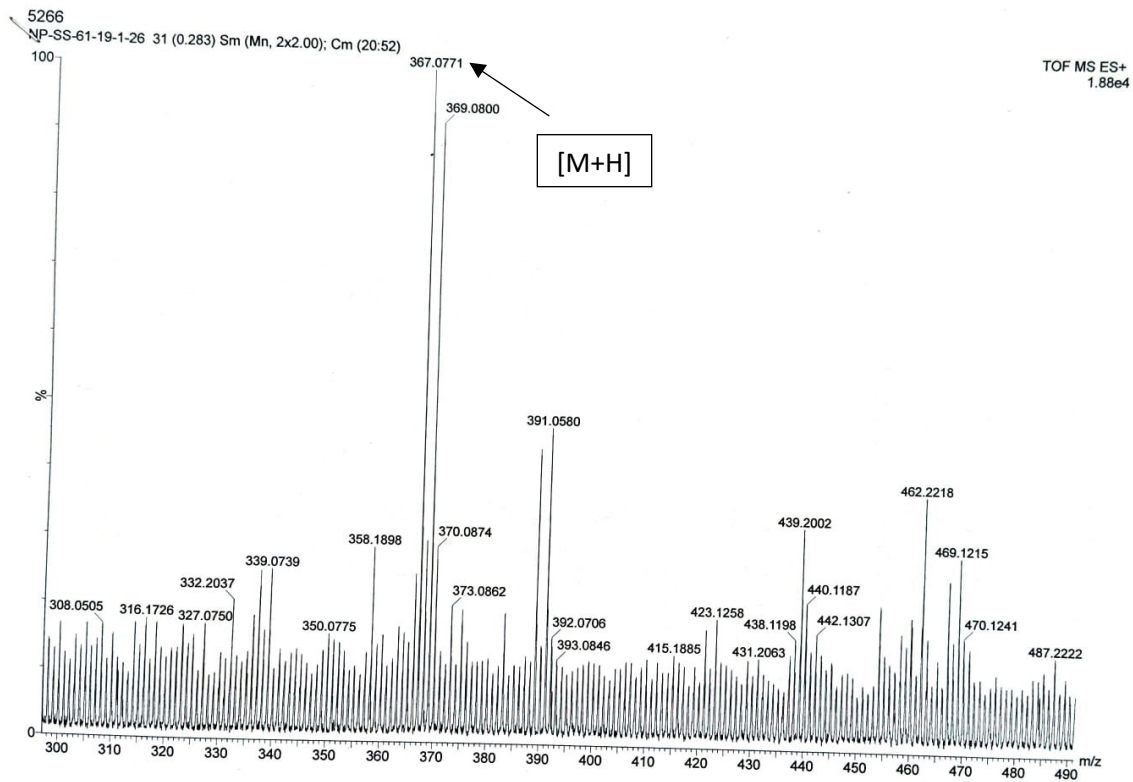


Figure S34. HRMS of compound 2k.

AT(O)SS-362(B)(Furan+DMF-final-1H).1.fid
AT(O)SS-362(B)-1H

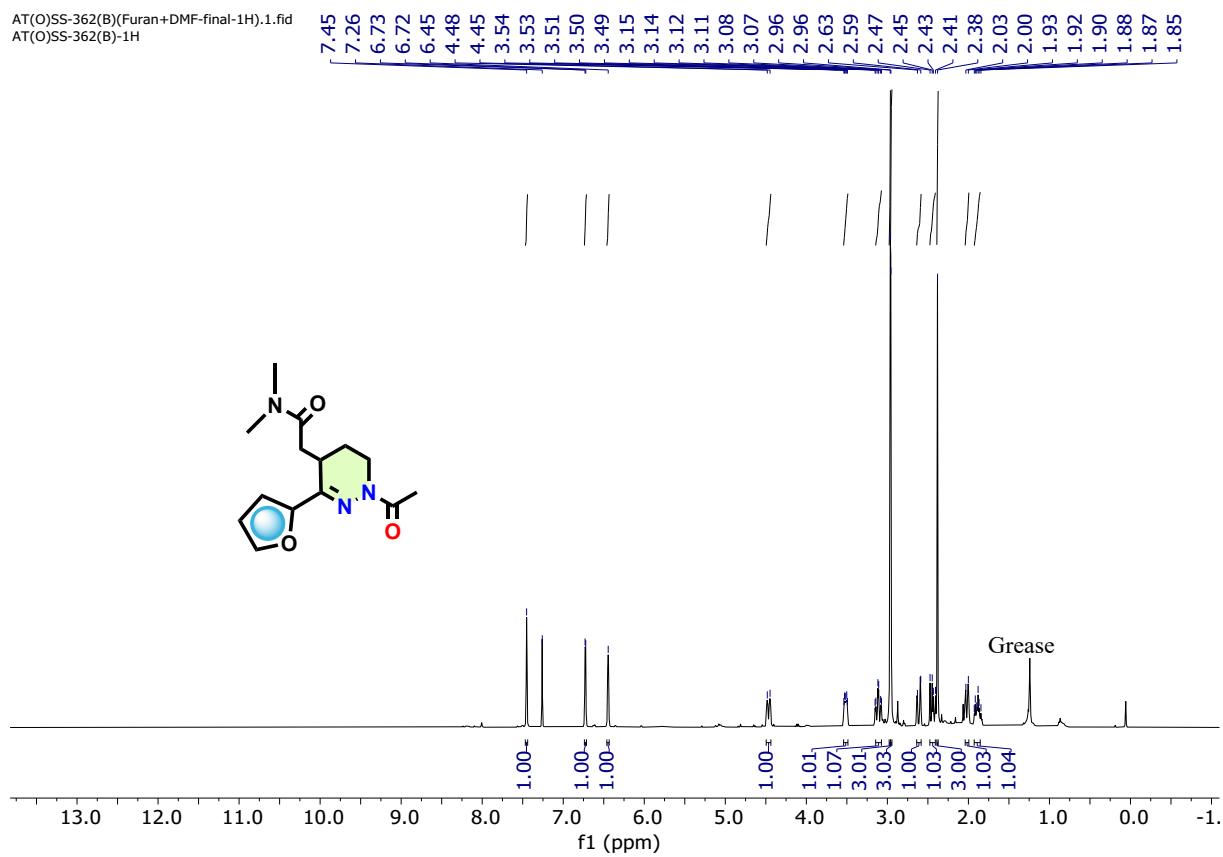


Figure S35. ^1H (400 MHz) NMR of **2l** compound in CDCl_3

AT(O)-SS-362A(Furan+DMF-fid)-13C
AT(O)-SS-362A-13C

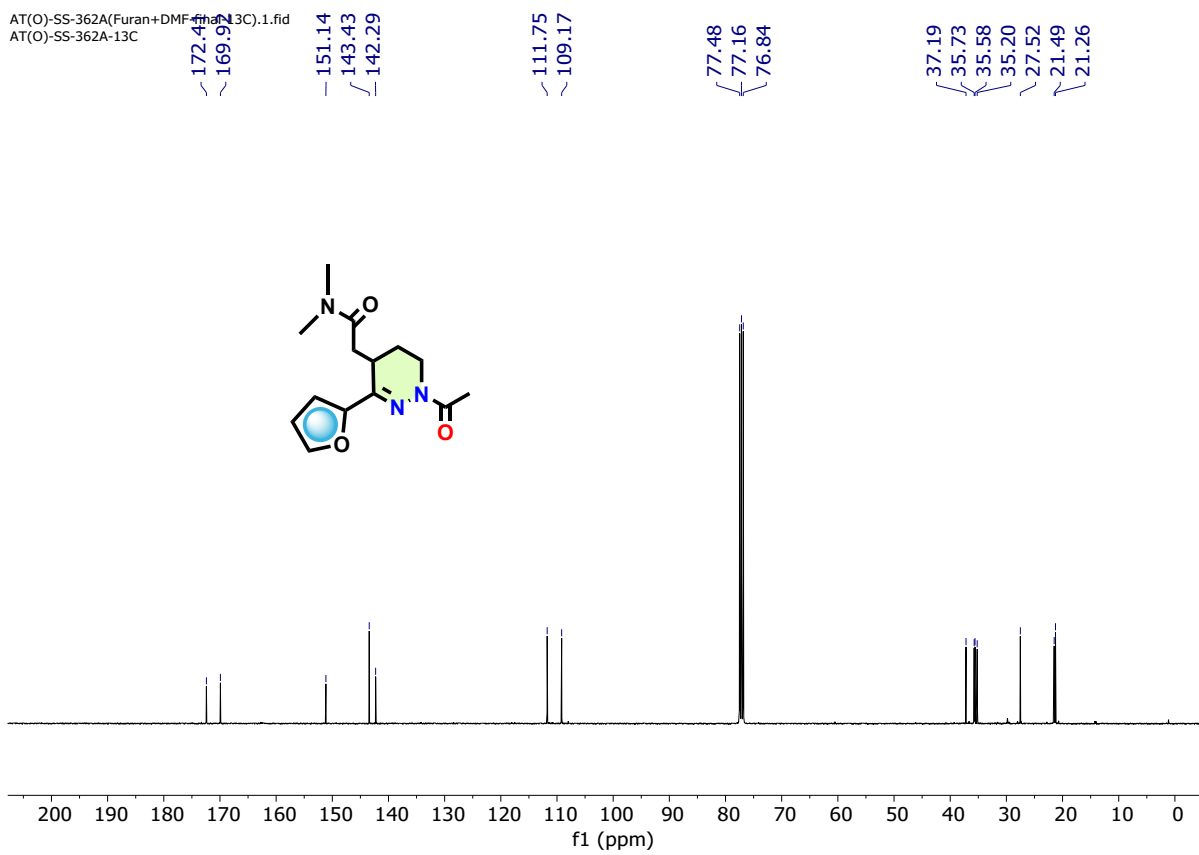


Figure S36. ^{13}C (100 MHz) NMR of **21** compound in CDCl_3

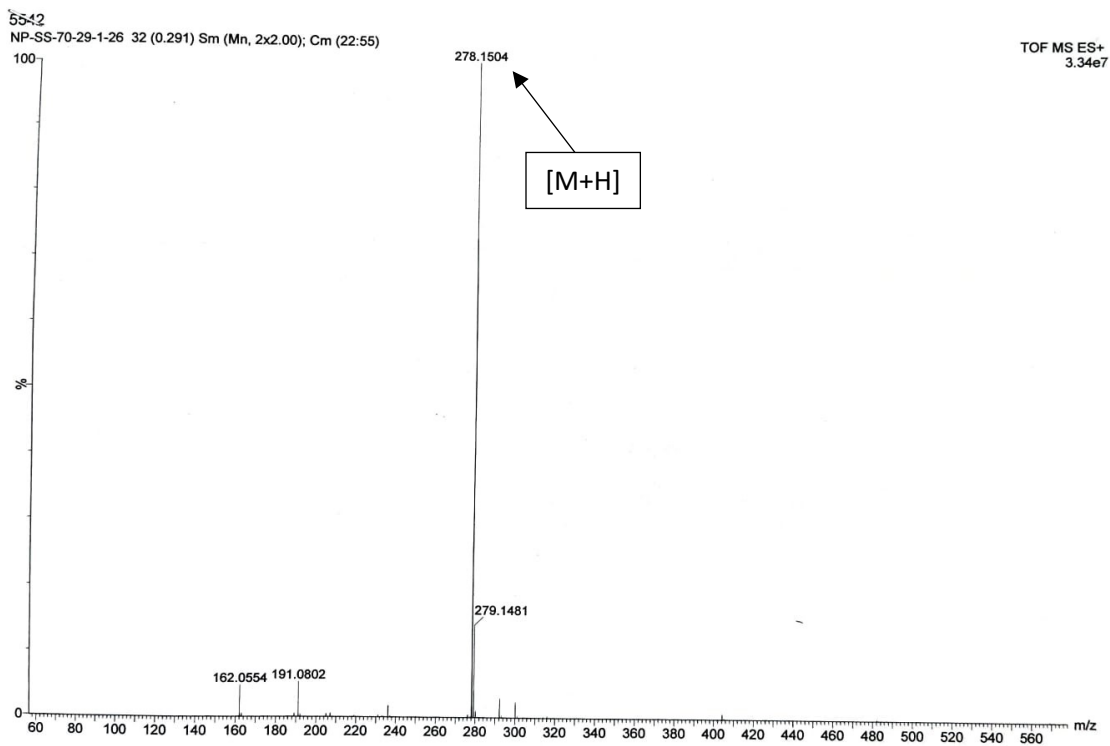


Figure S37. HRMS of compound **21**.

AT(O)SS-380-1.1.fid
AT(O)SS-381-1-1H

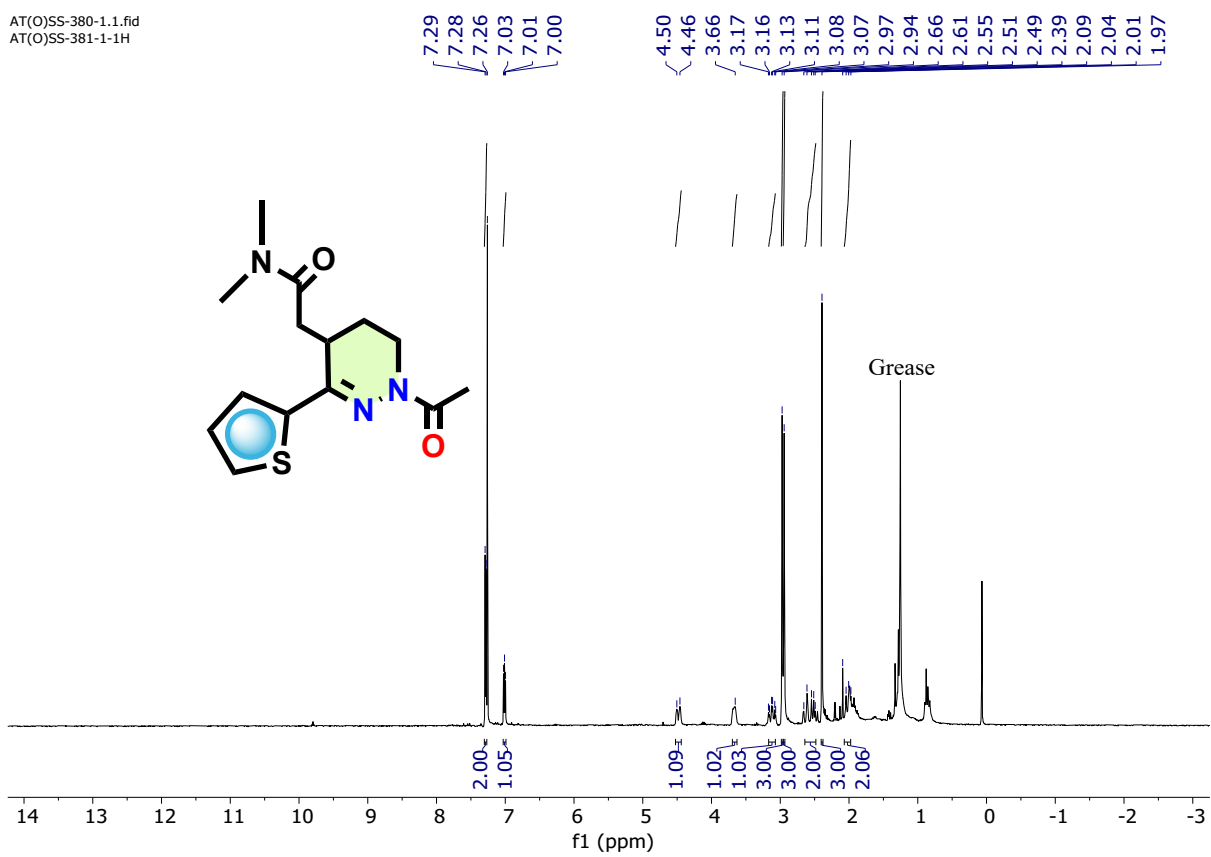


Figure S38. ¹H (300 MHz) NMR of **2m** compound in CDCl₃

AT(O)-SS-380(A).1.fid
AT(O)-SS-380(A)-13C

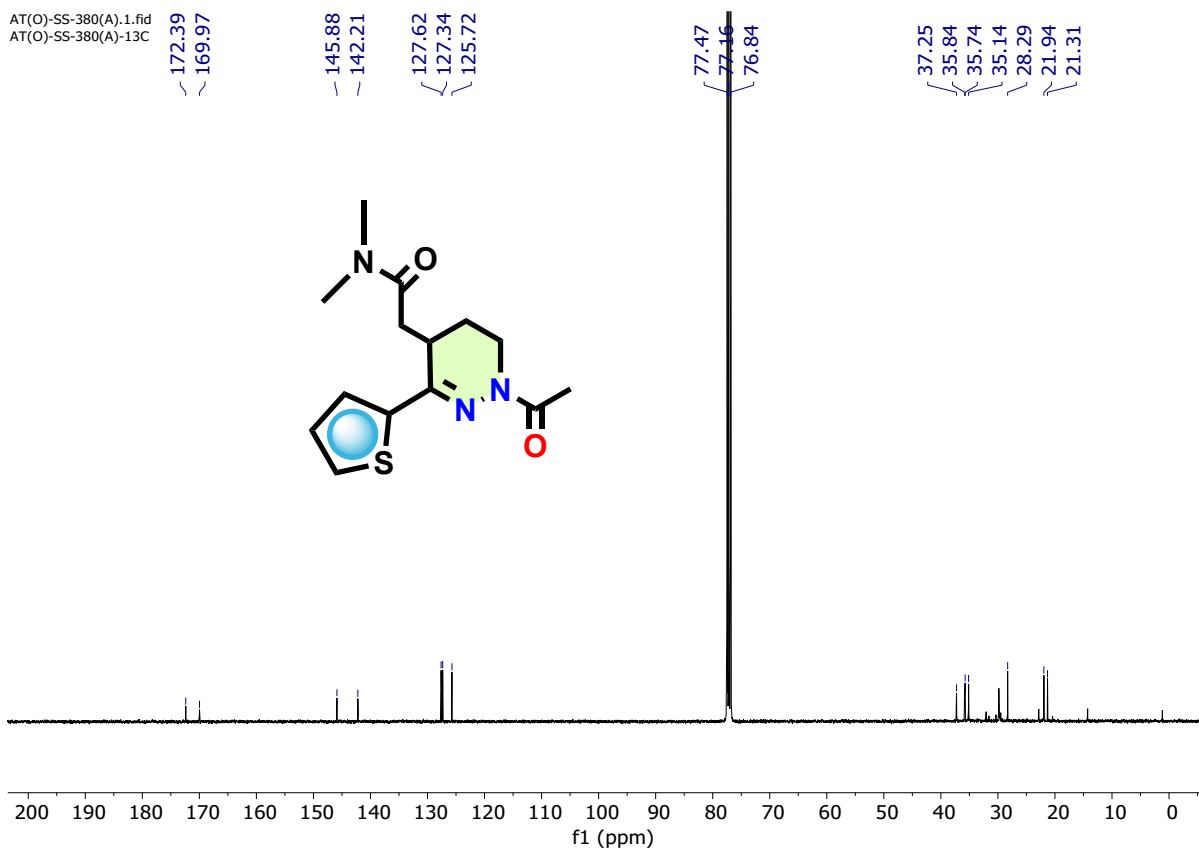


Figure S39. ^{13}C (100 MHz) NMR of **2m** compound in CDCl_3

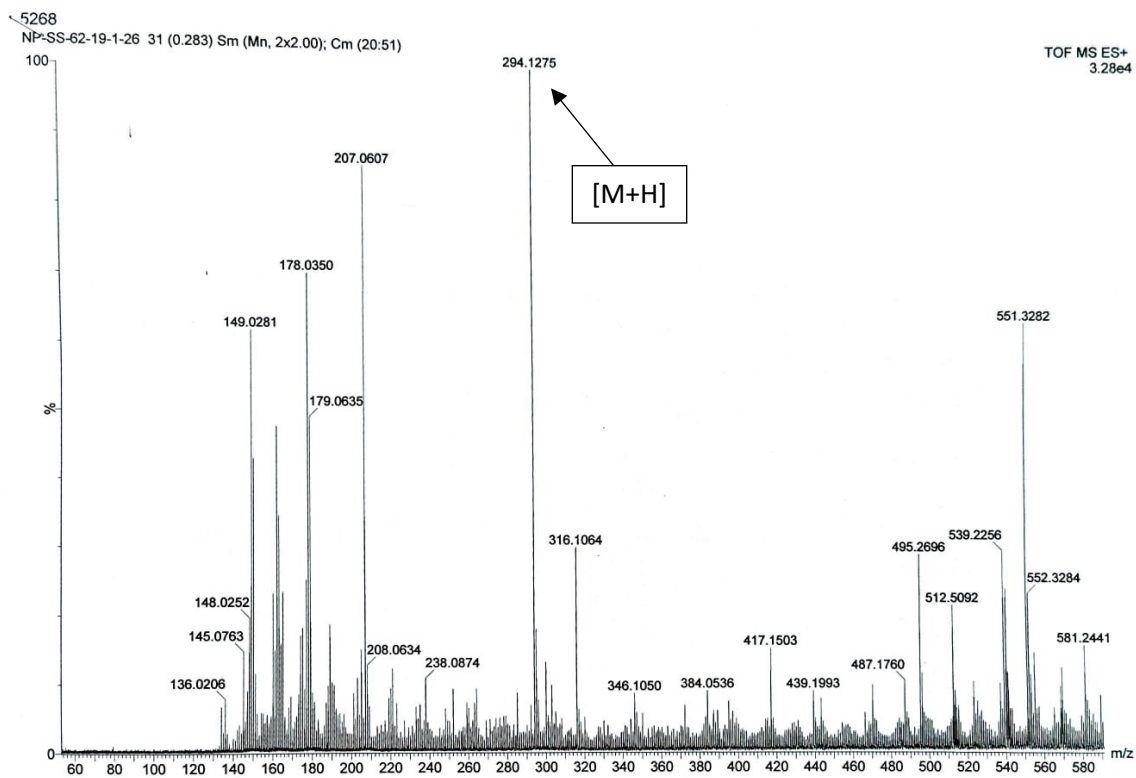


Figure S40. HRMS of compound 2m.

AT(O)SS-427.1.fid
RKN(O)-J35-RH-1H

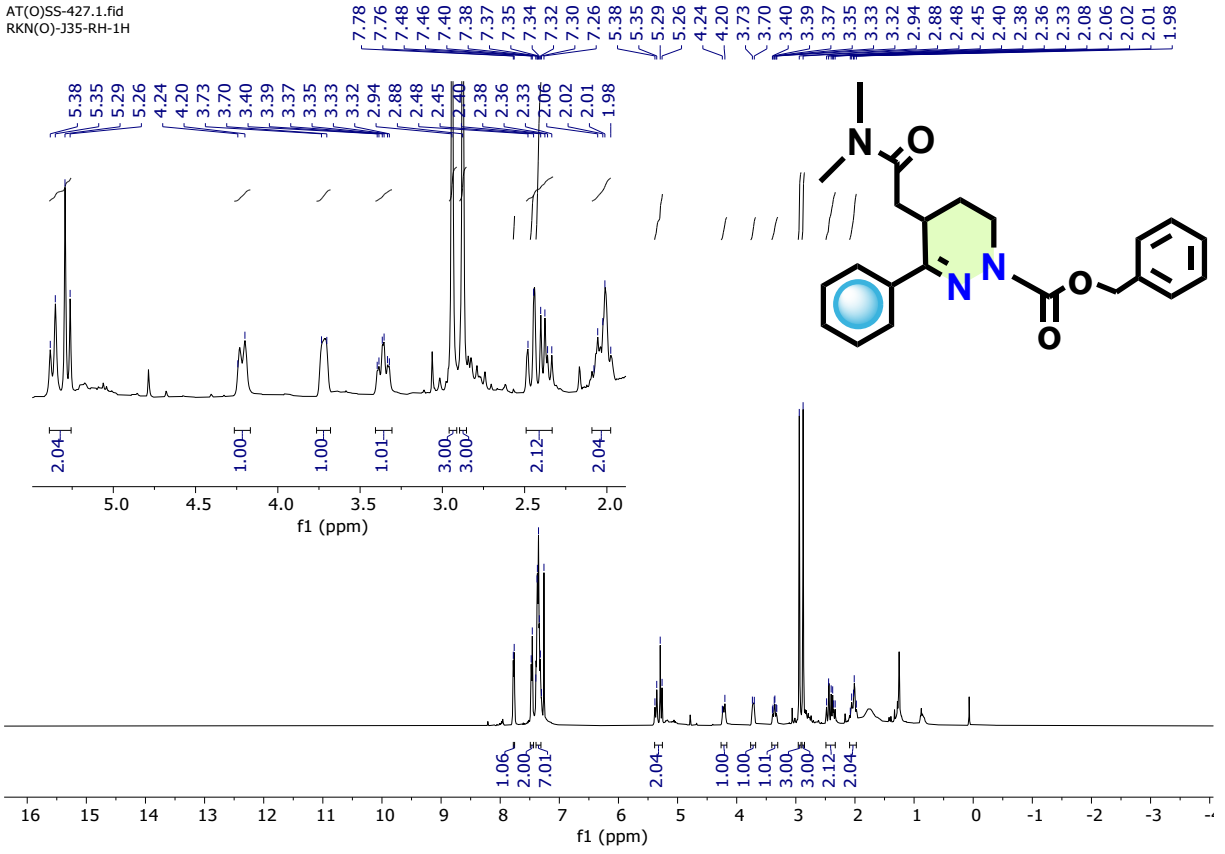


Figure S41. ¹H (400 MHz) NMR of **2n** compound in CDCl₃

AT(O)SS-426.2.fid
AT(O)SS-426-13C

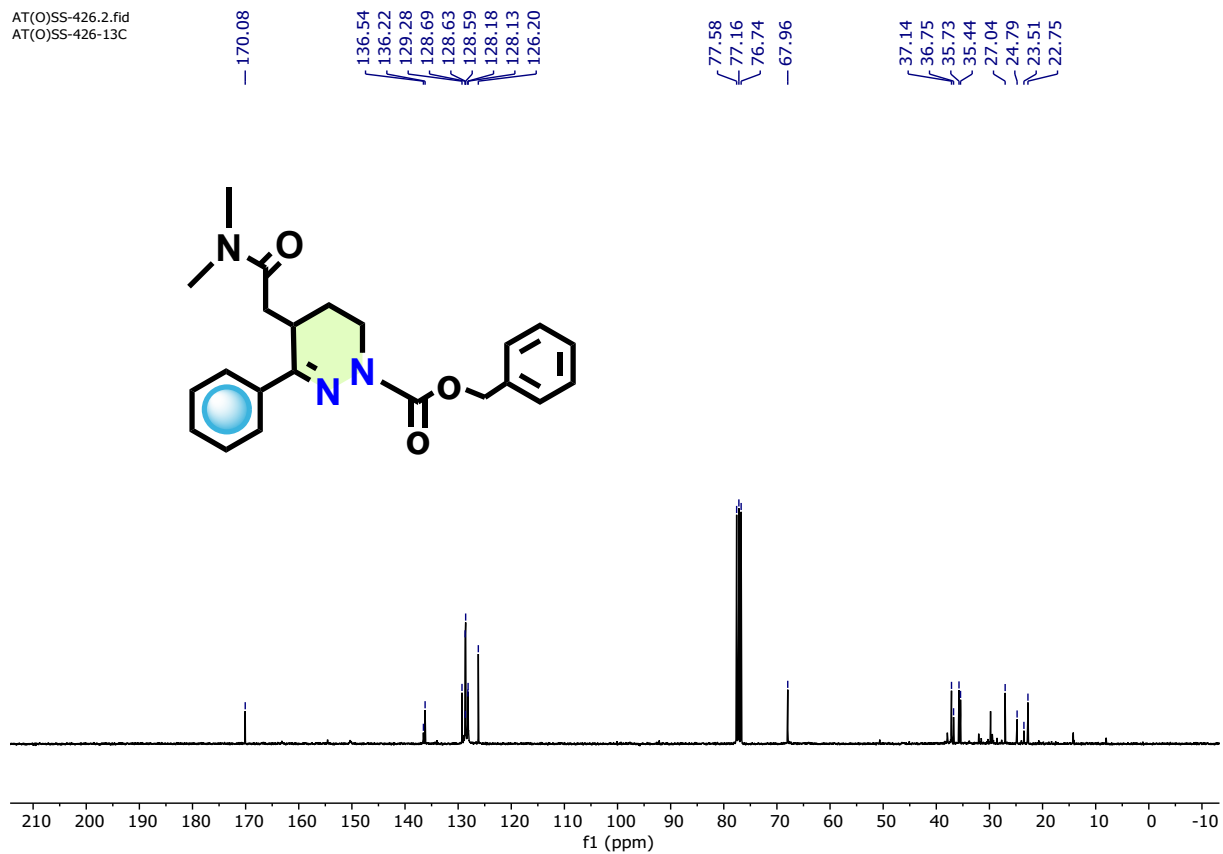


Figure S42. ^{13}C (75 MHz) NMR of **2n** compound in CDCl_3

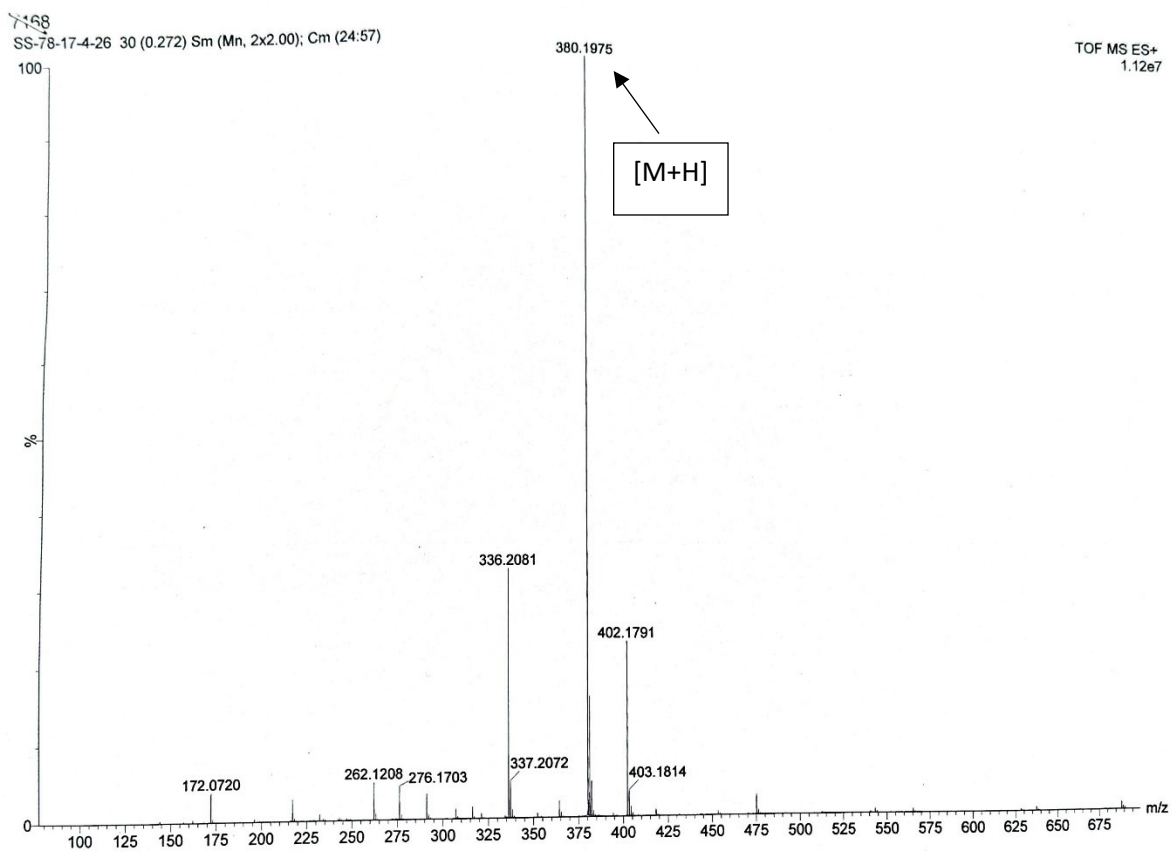


Figure S43. HRMS of compound **2n**.

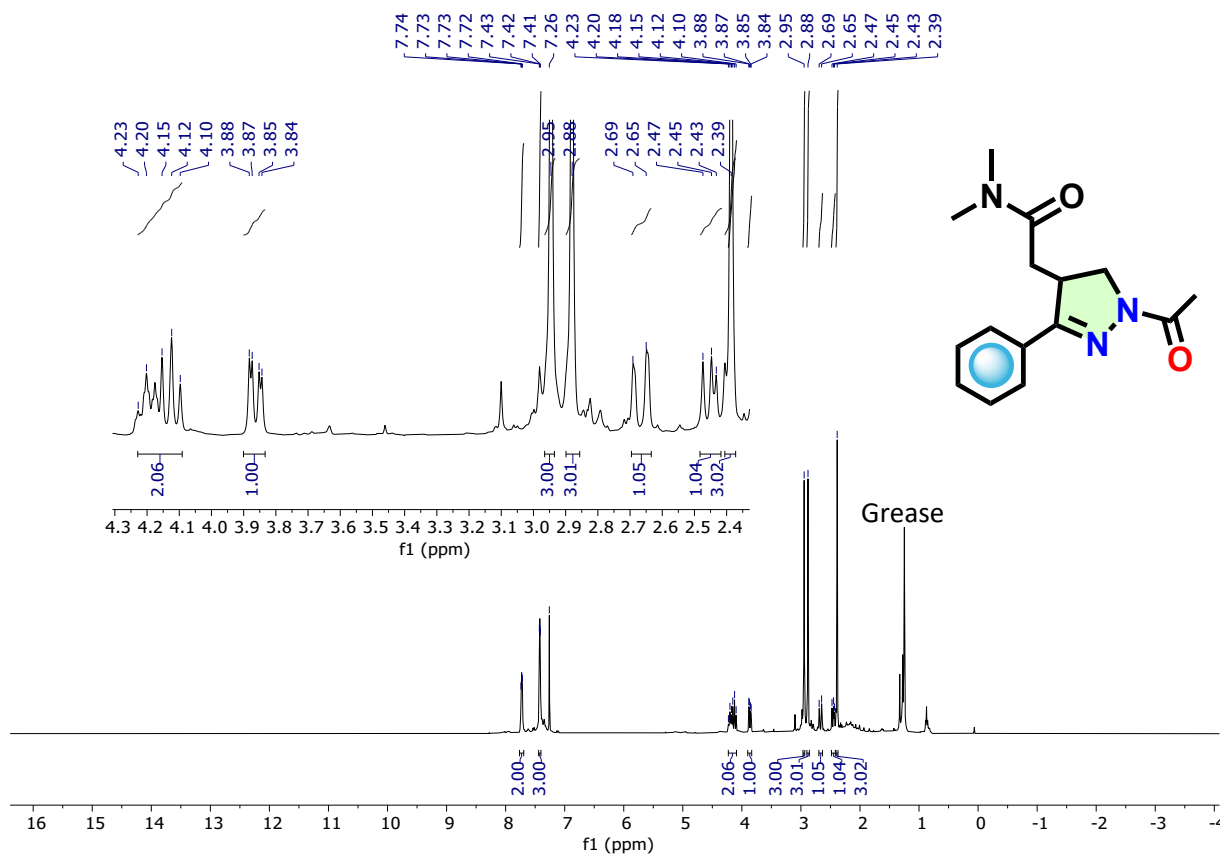


Figure S44. ¹H (400 MHz) NMR of **2o** compound in CDCl₃

AT(O)SS-423(A).1.fid
AT(O)SS-423(A)-13C

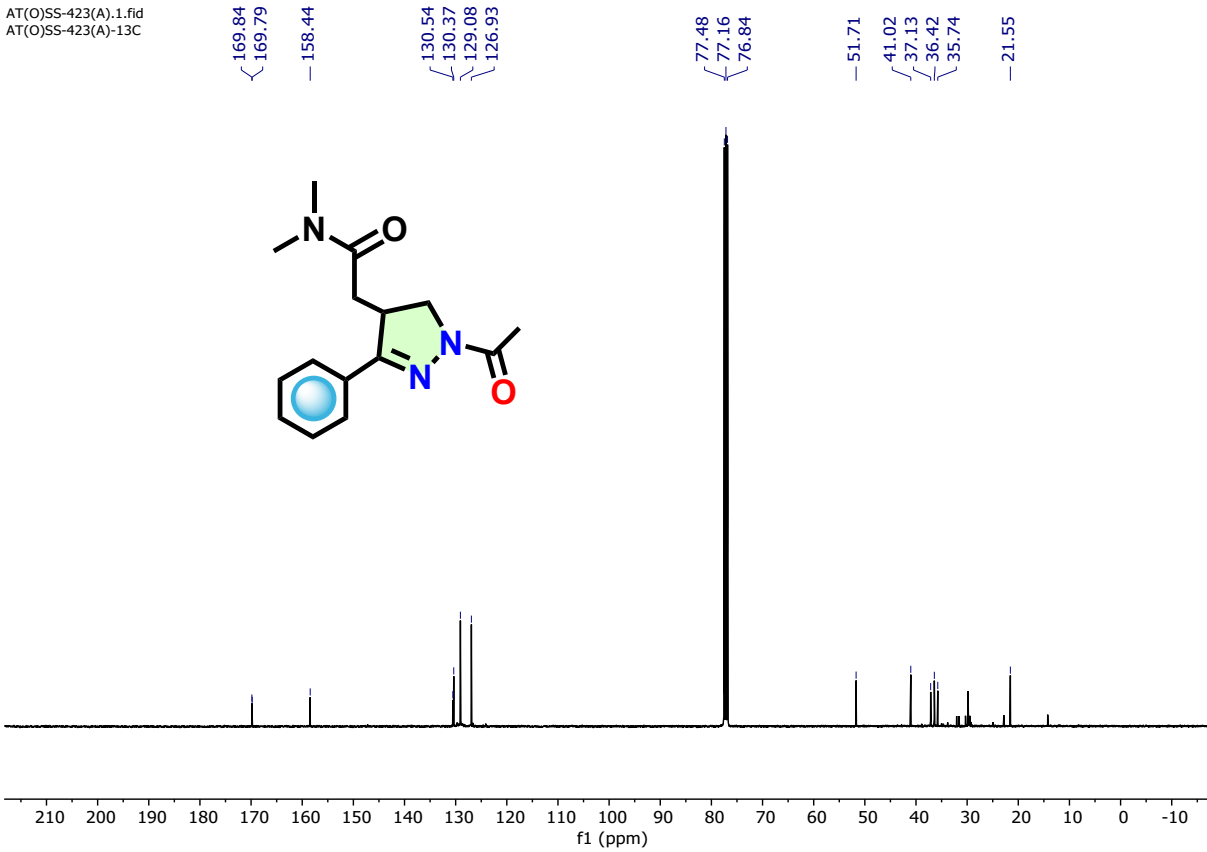


Figure S45. ^{13}C (100 MHz) NMR of **2o** compound in CDCl_3

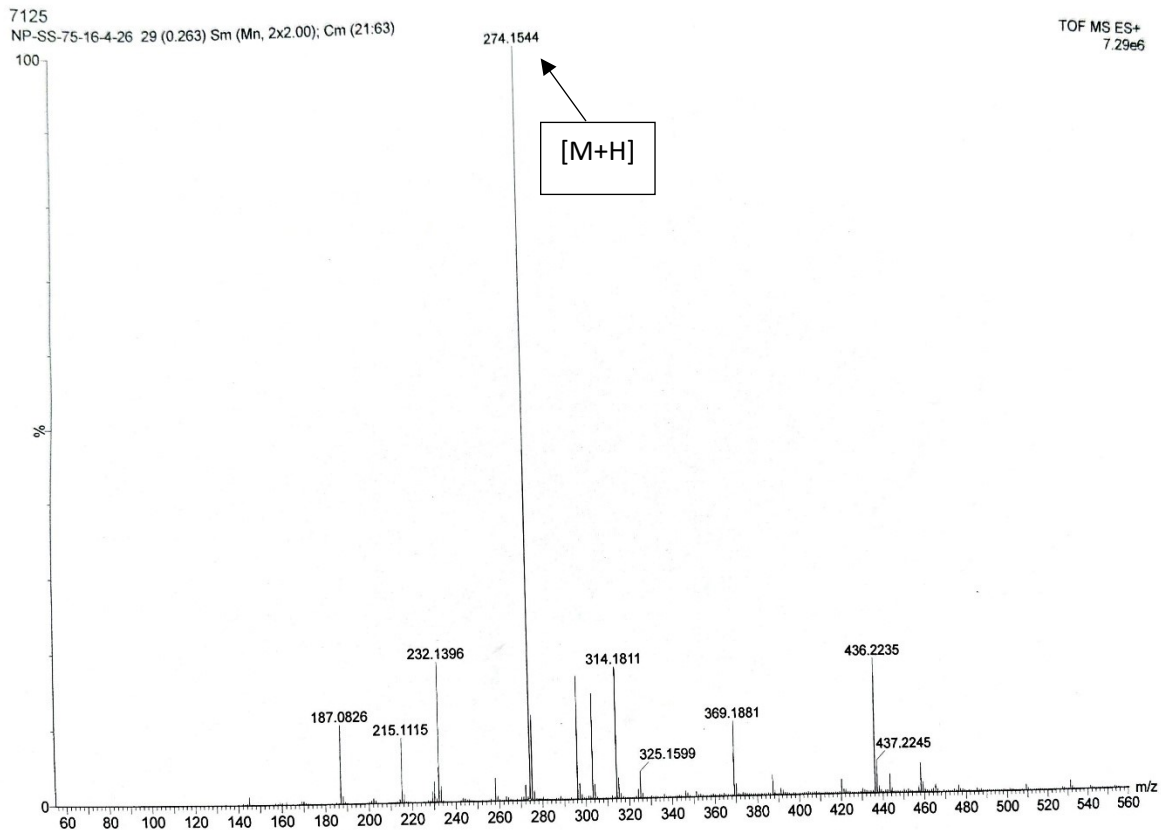


Figure S46. HRMS of compound 20.

AT(O)SS-424.1.fid
AT(O)SS-424-1H

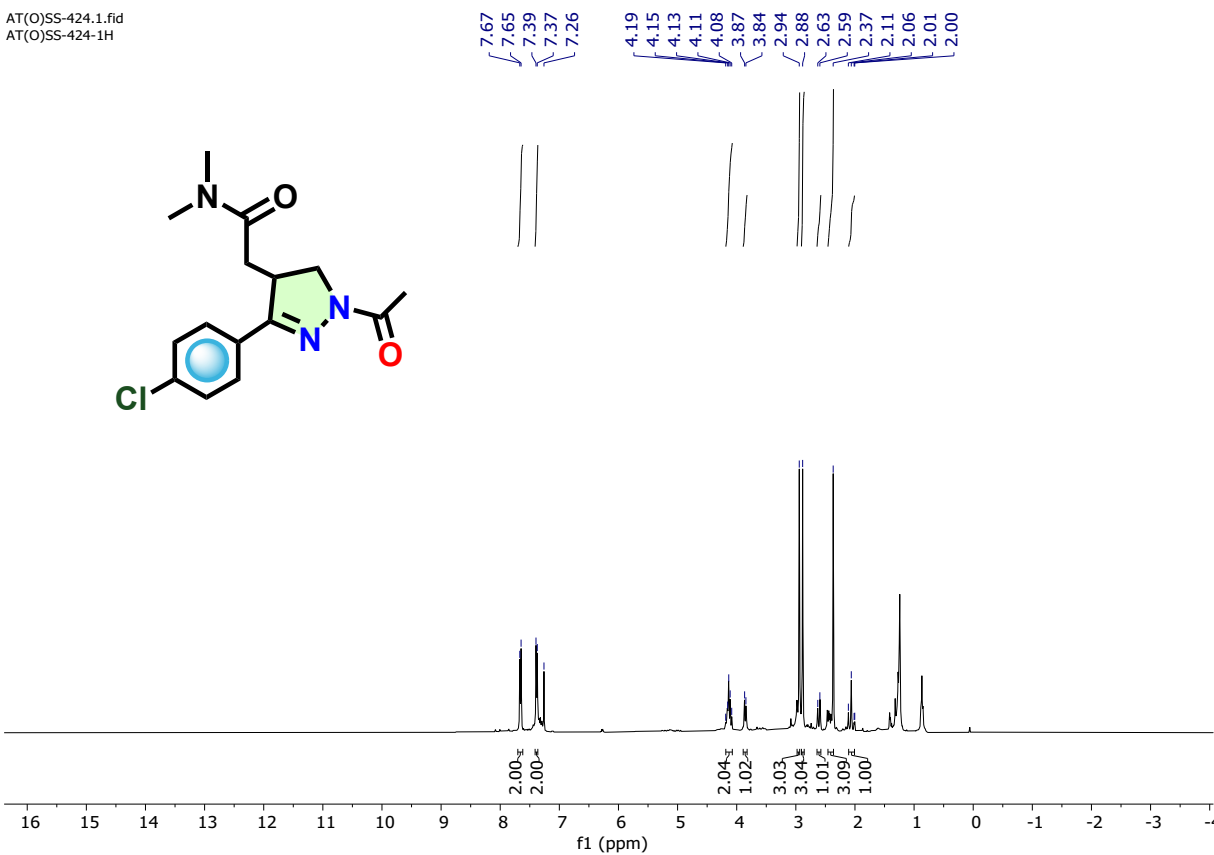


Figure S47. ¹H (400 MHz) NMR of **2p** compound in CDCl₃.

AT(O)SS-424(A).1.fid
AT(O)SS-424(A)-13C

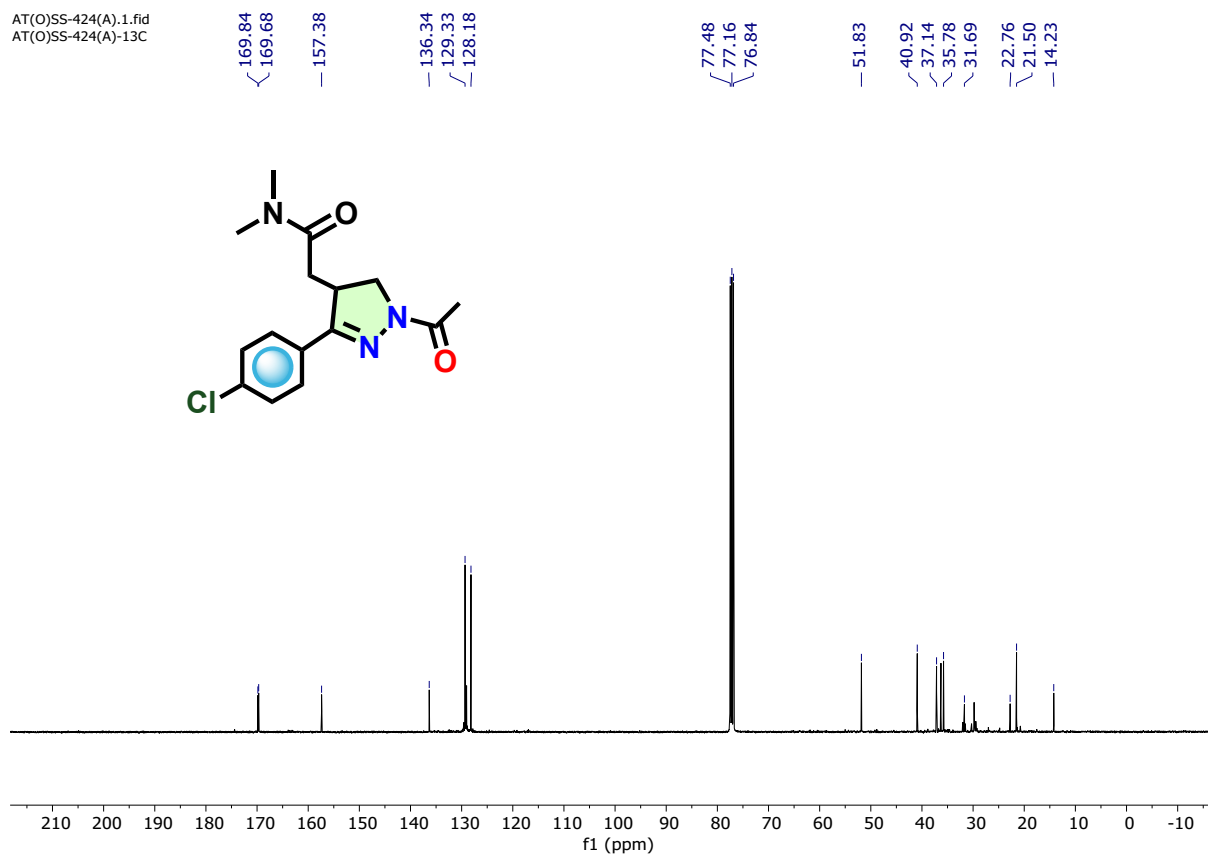


Figure S48. ^{13}C (100 MHz) NMR of **2p** compound in CDCl_3 .

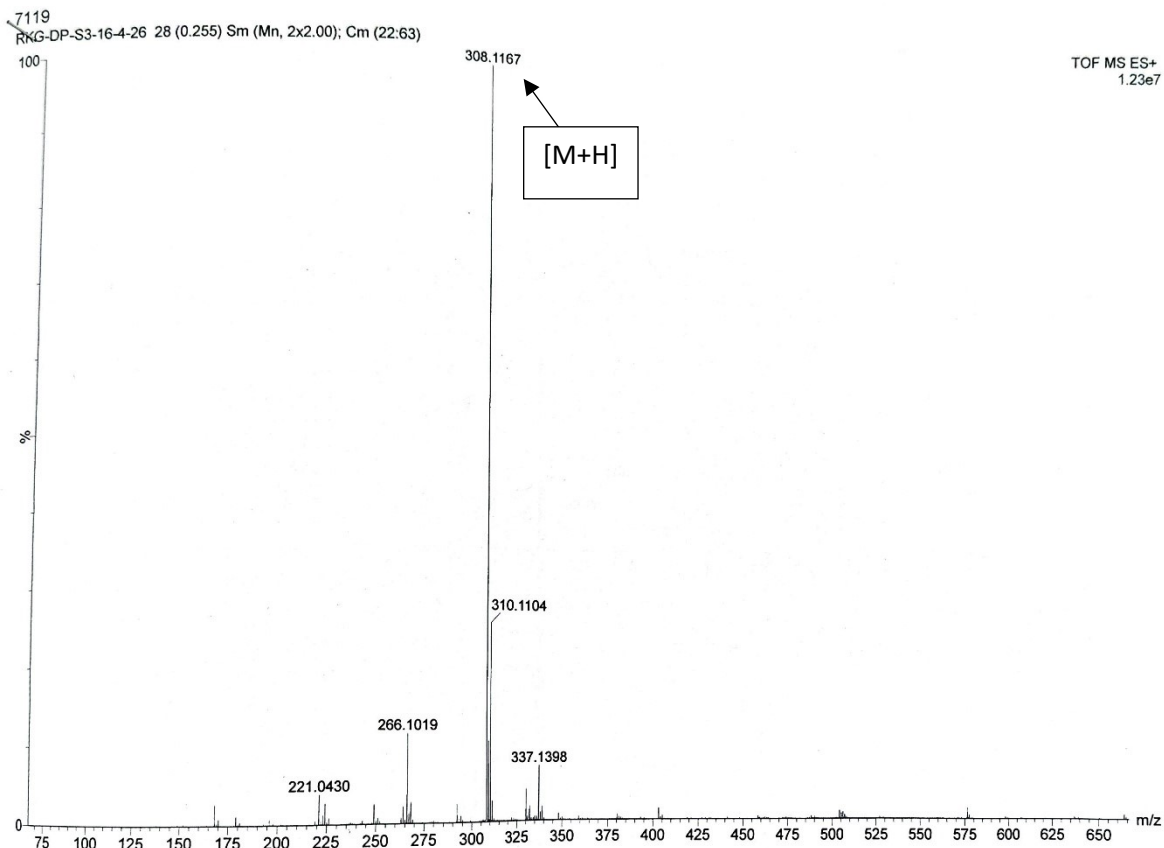


Figure S49. HRMS of compound **2p**.

AT(O)SS-425(4-Me+allyl+DMF-F)-1H+13C.1.fid
AT(O)SS-425-1H

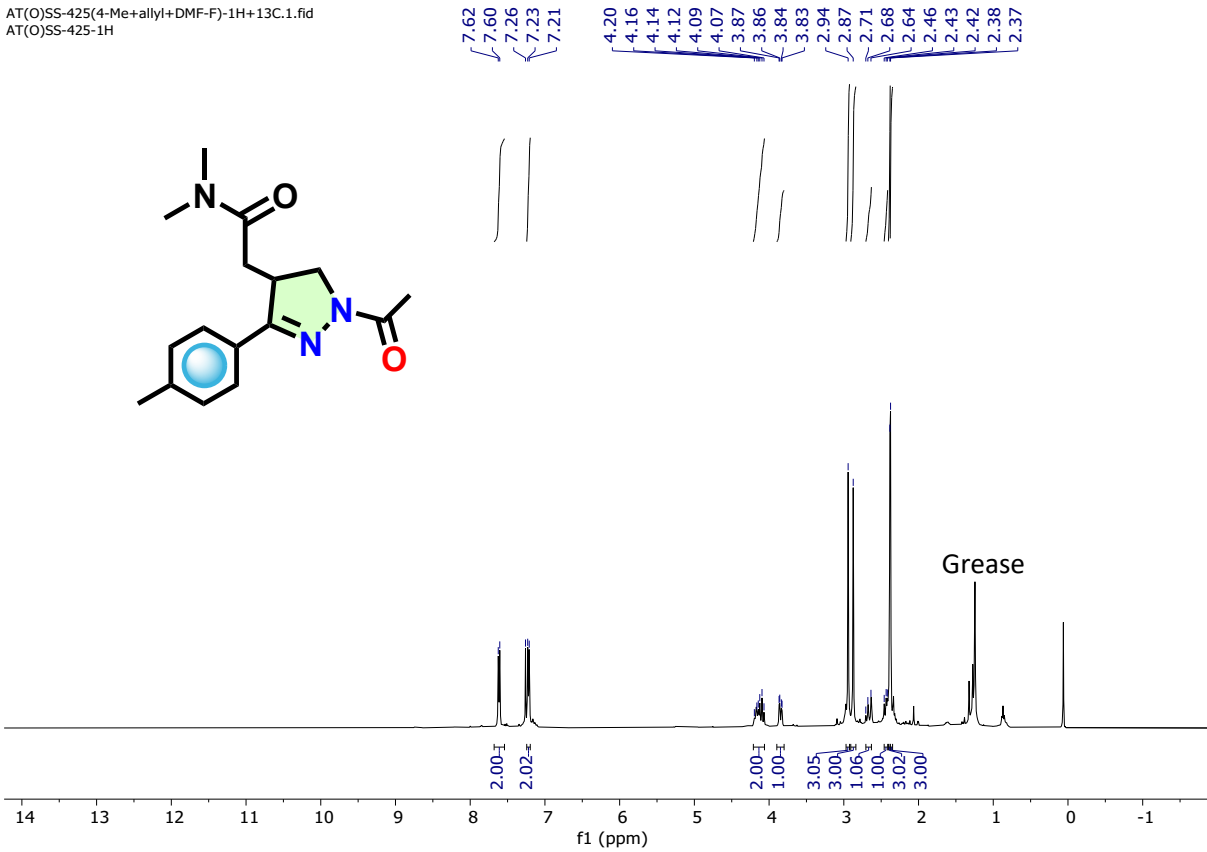


Figure S50. ^1H (400 MHz) NMR of **2q** compound in CDCl_3 .

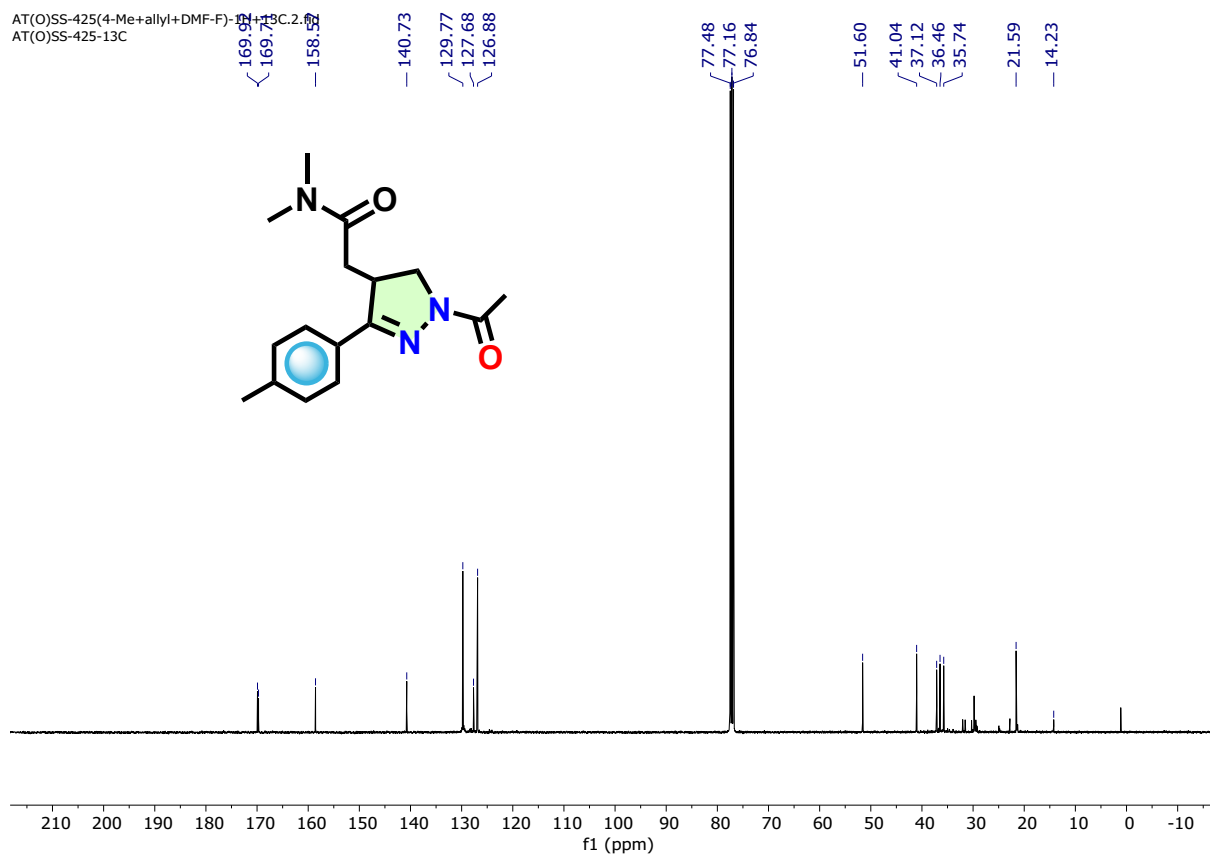


Figure S51. ^{13}C (100 MHz) NMR of **2q** compound in CDCl_3 .

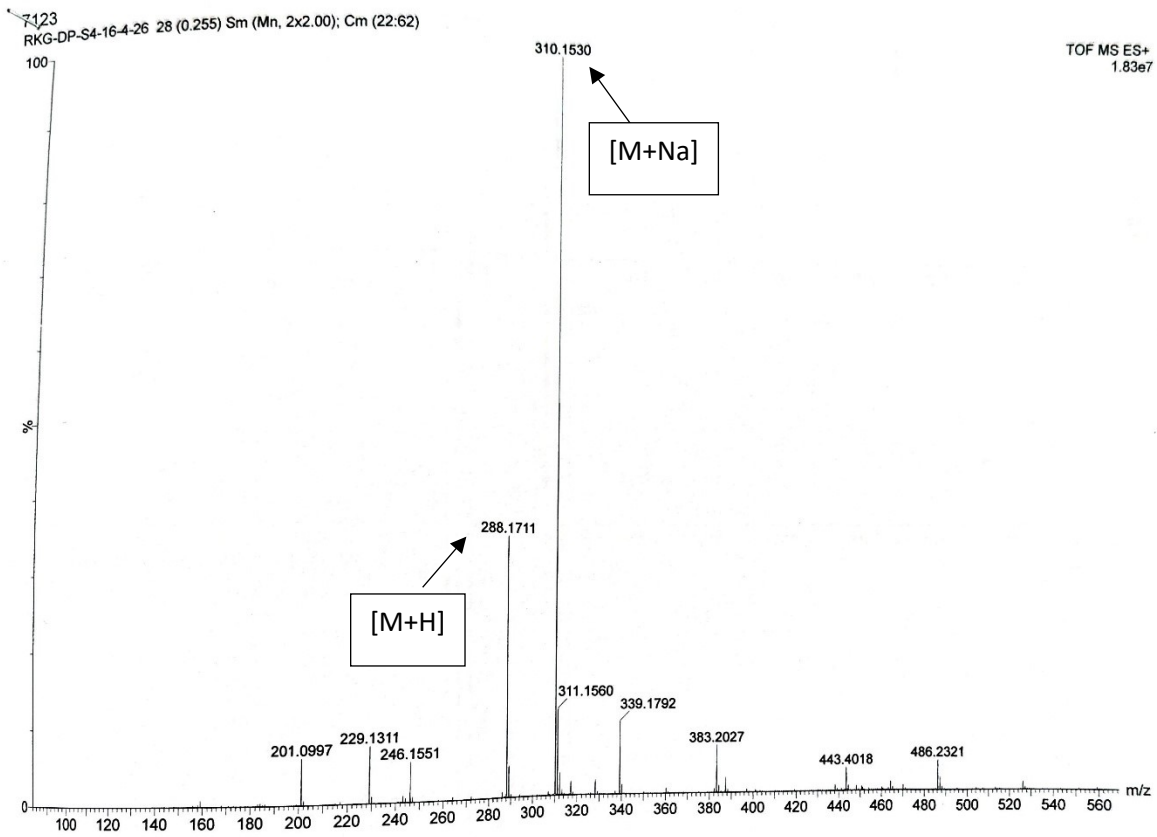


Figure S52. HRMS of compound 2q.

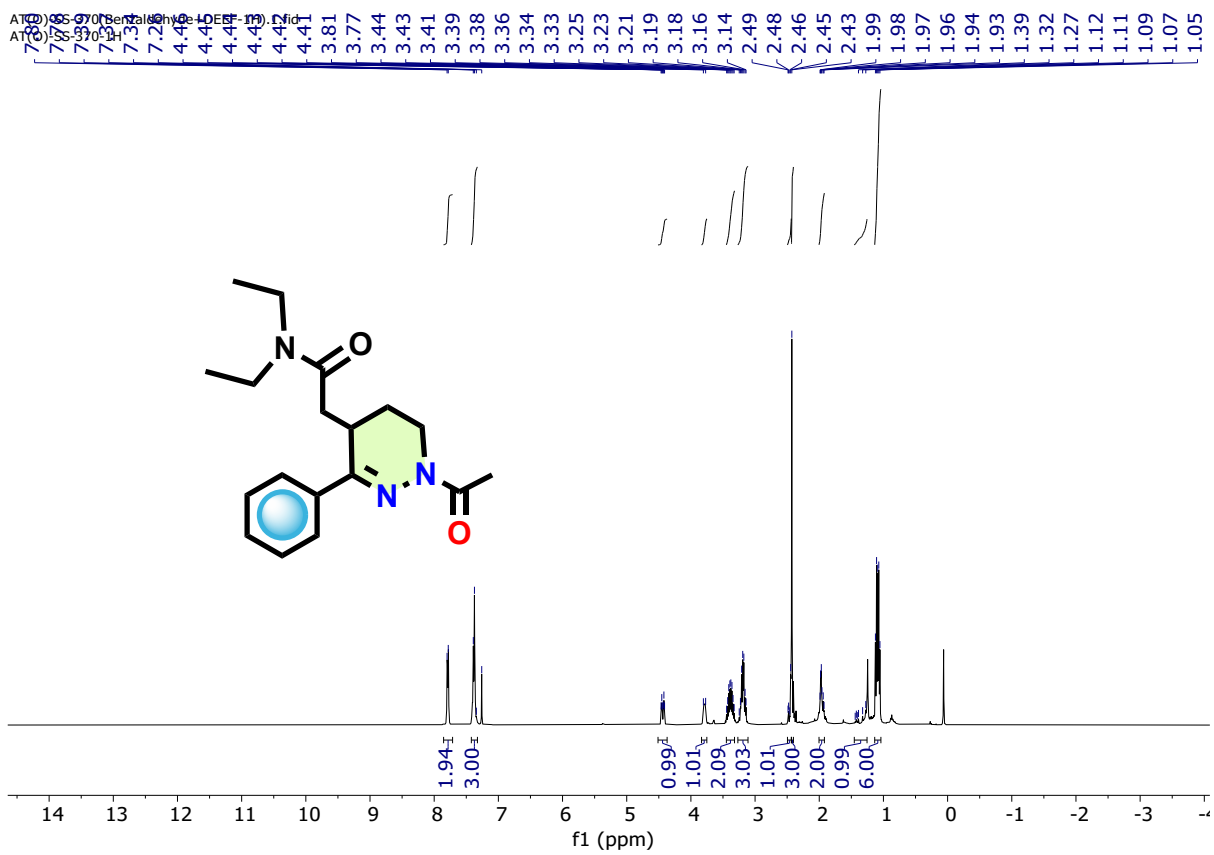


Figure S53. ¹H (400 MHz) NMR of **2r** compound in CDCl₃

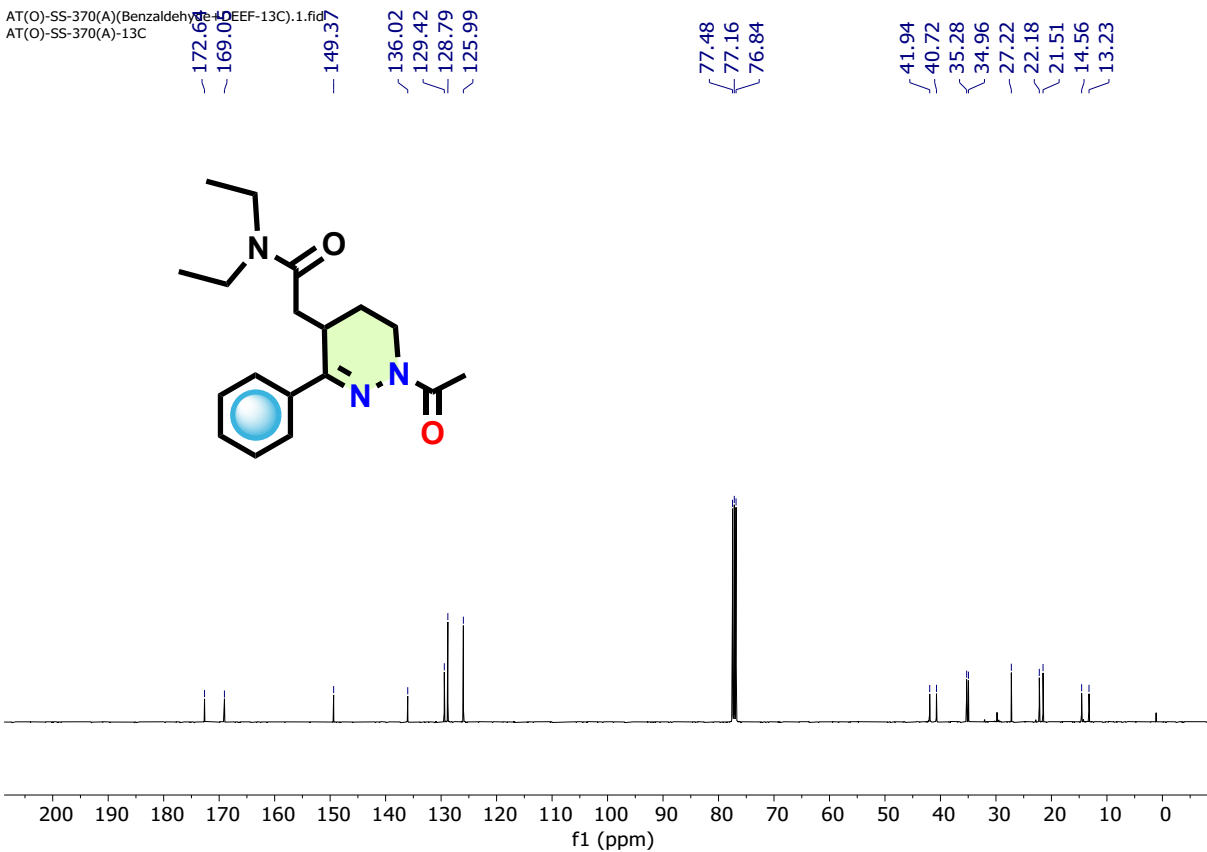


Figure 54 ^{13}C (100 MHz) NMR of **2r** compound in CDCl_3

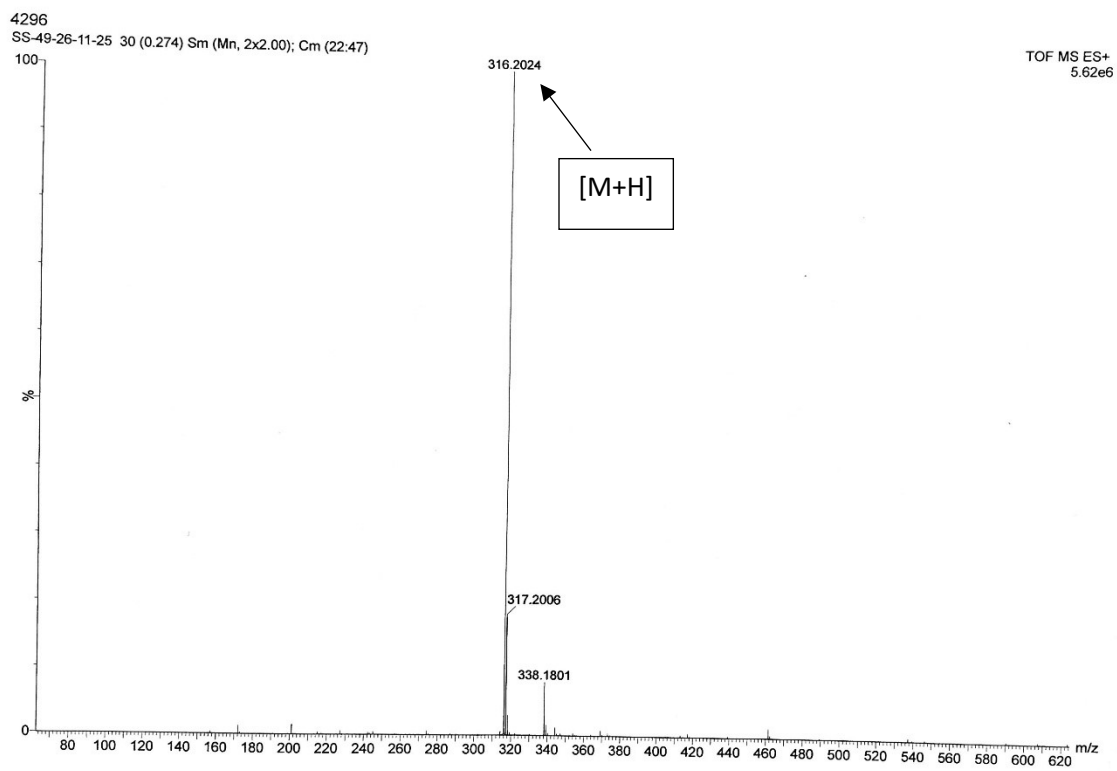


Figure S55. HRMS of compound **2r**.

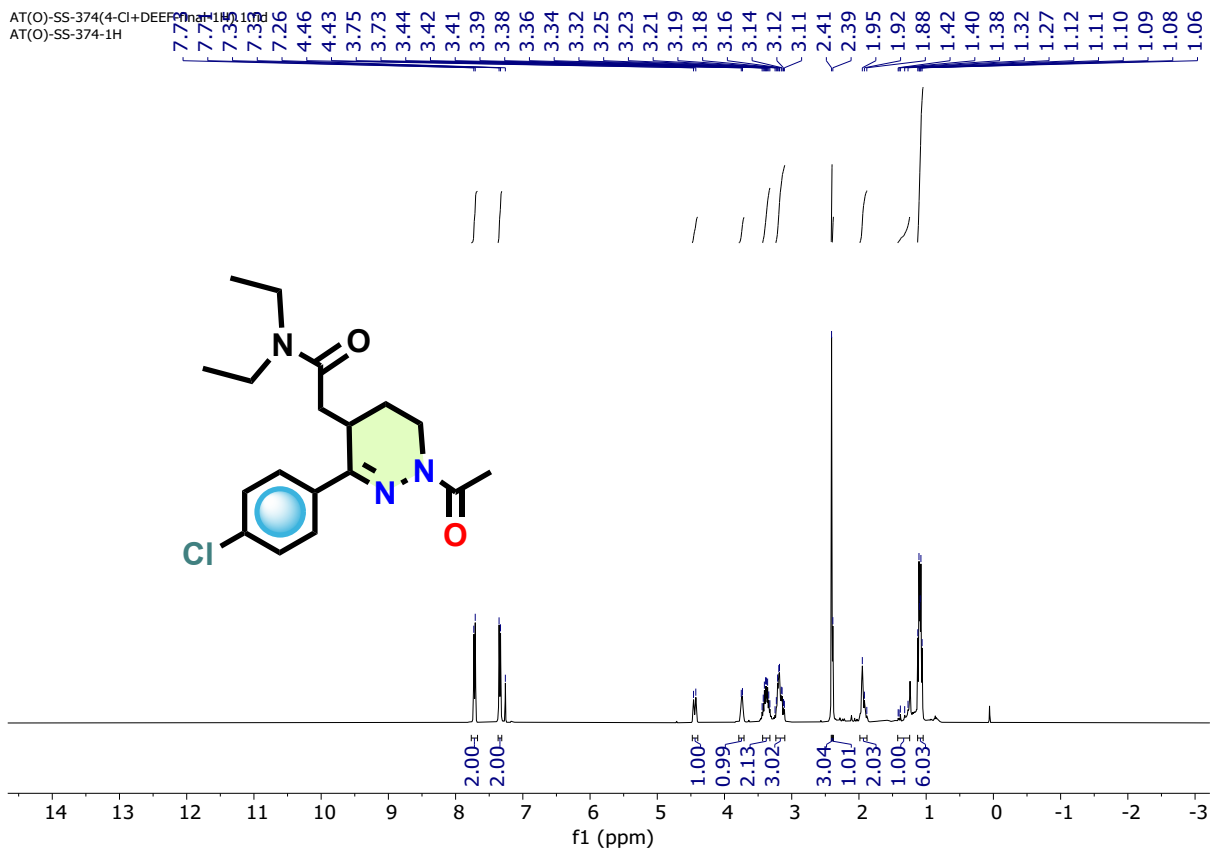


Figure S56. ¹H (400 MHz) NMR of **2s** compound in CDCl₃

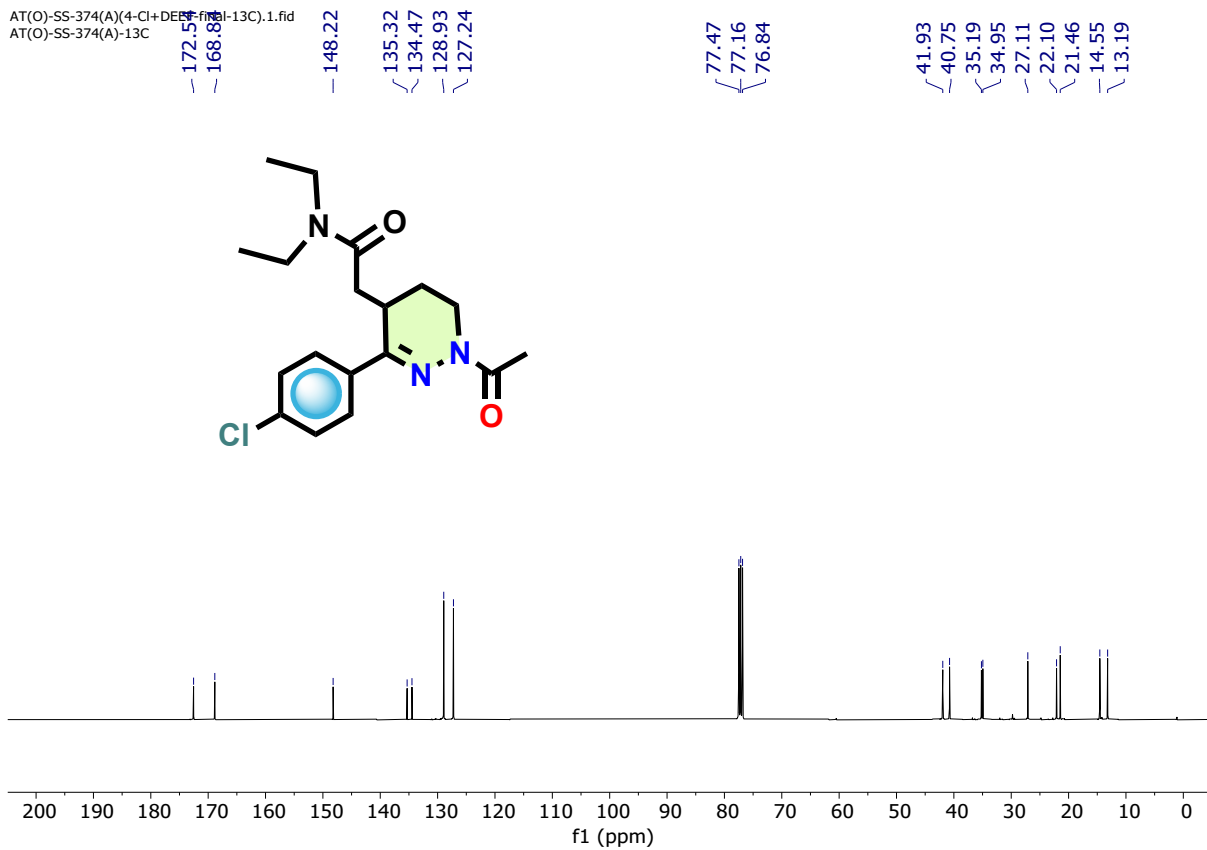


Figure S57. ^{13}C (100 MHz) NMR of **2s** compound in CDCl_3

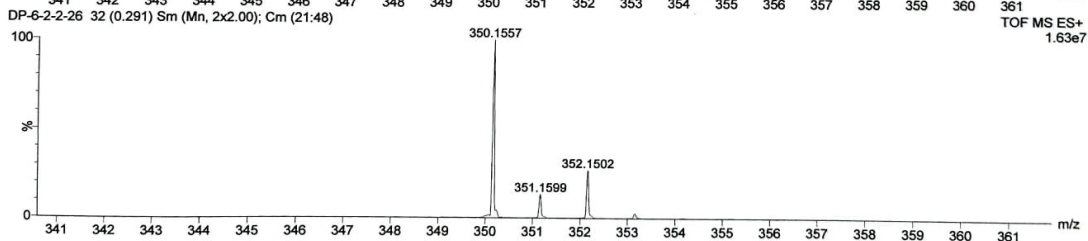
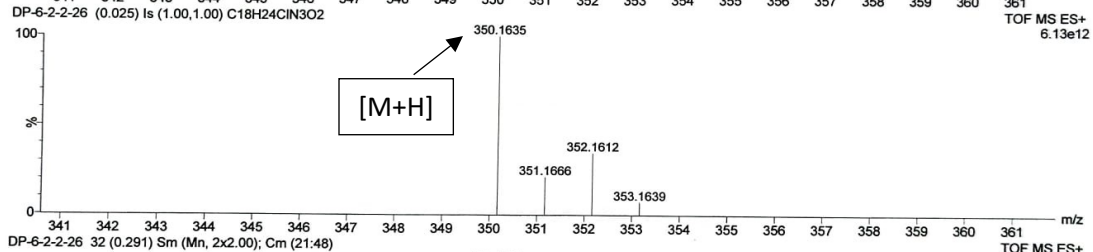
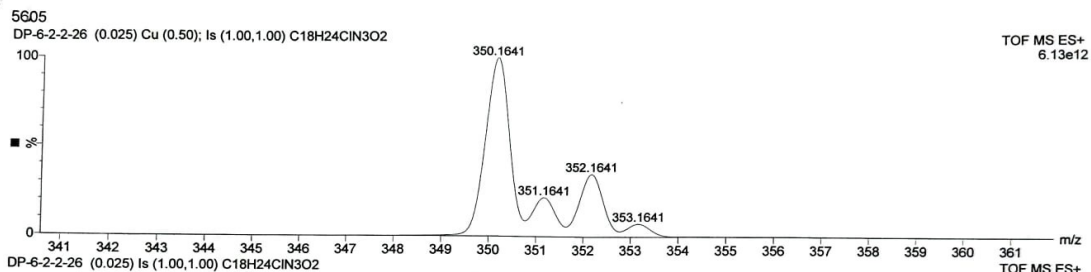
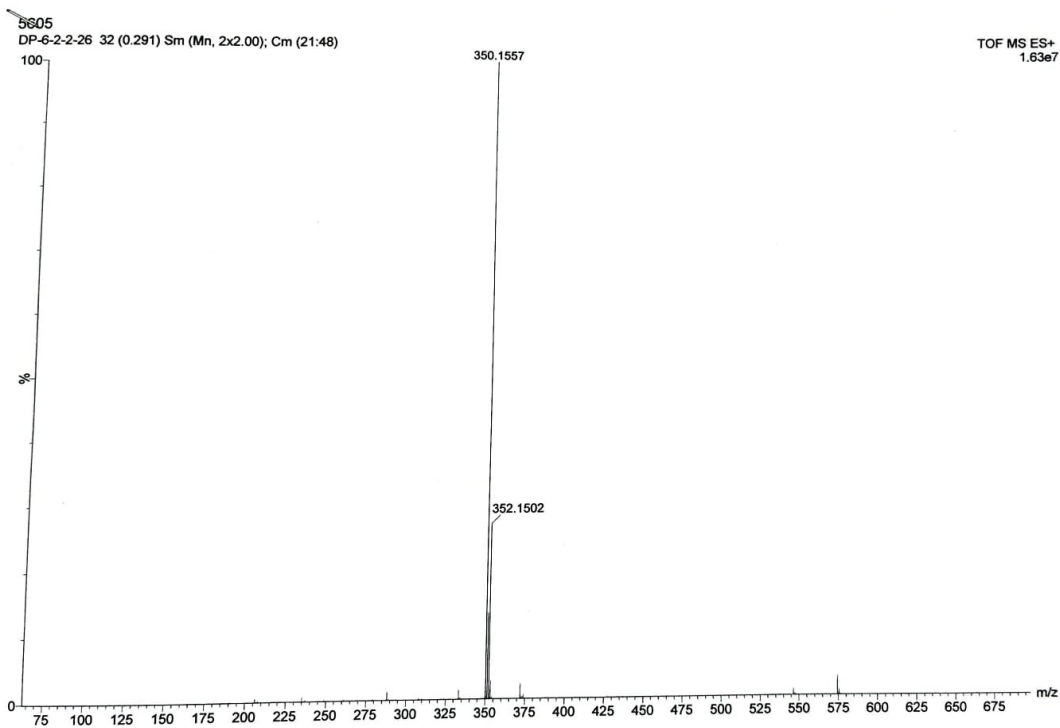


Figure S58. HRMS of compound 2s.

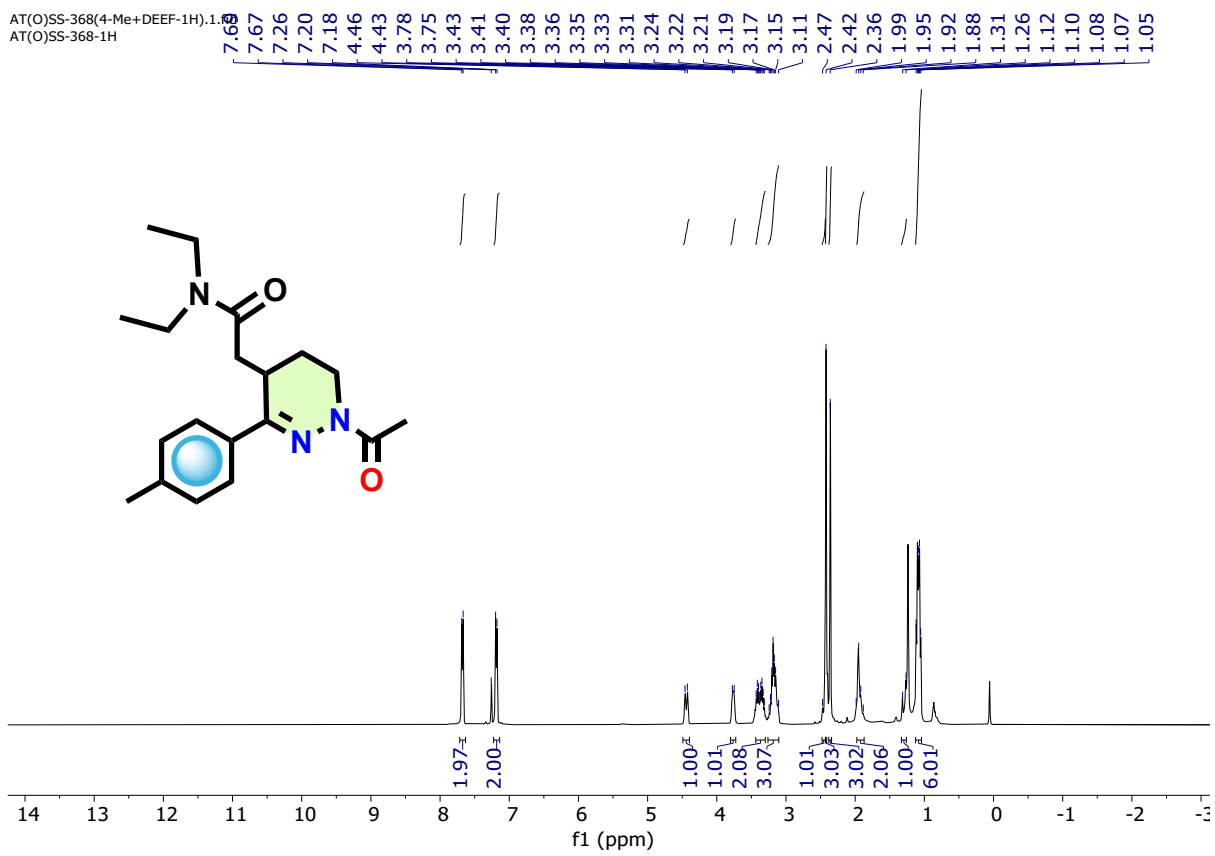


Figure S59. ¹H (400 MHz) NMR of **2t** compound in CDCl₃

AT(O)-SS-368(A)(4-Me+DEE).1.fid
AT(O)-SS-368(A)-13C

172.61
169.18

149.53

139.55

133.23

129.48

125.92

77.47

77.16

76.84

41.92

40.69

35.22

34.97

27.18

22.15

21.50

21.37

14.55

13.22

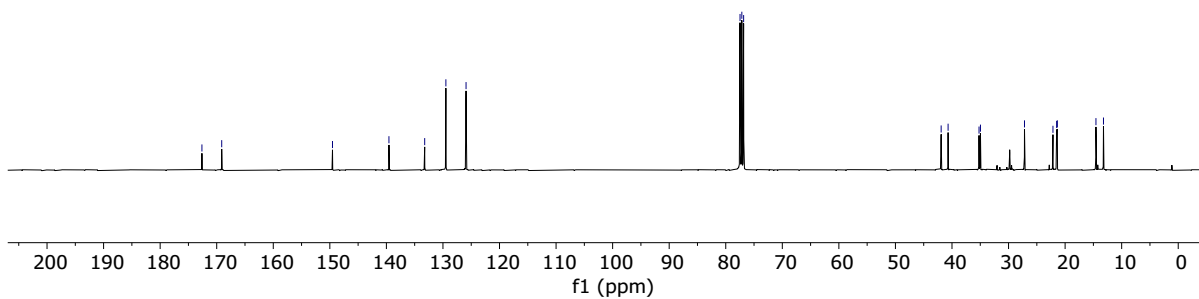
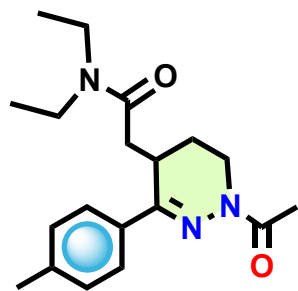


Figure S60. ^{13}C (100 MHz) NMR of **2t** compound in CDCl_3

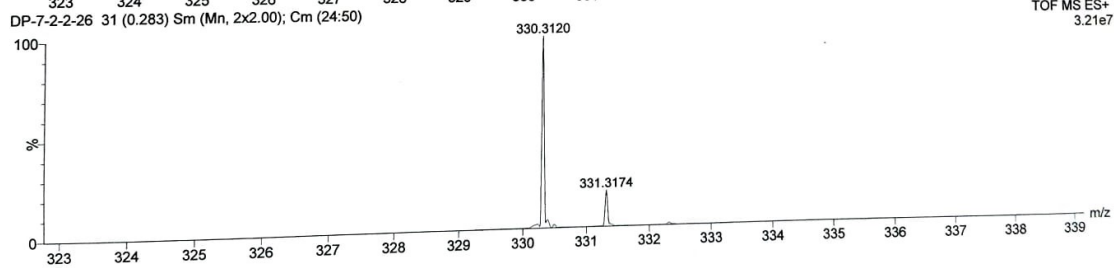
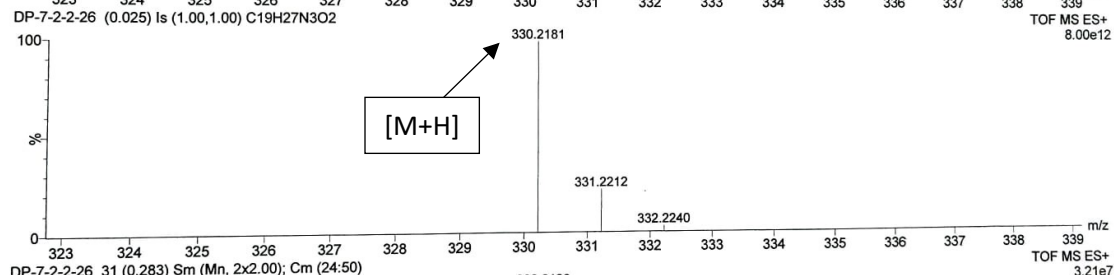
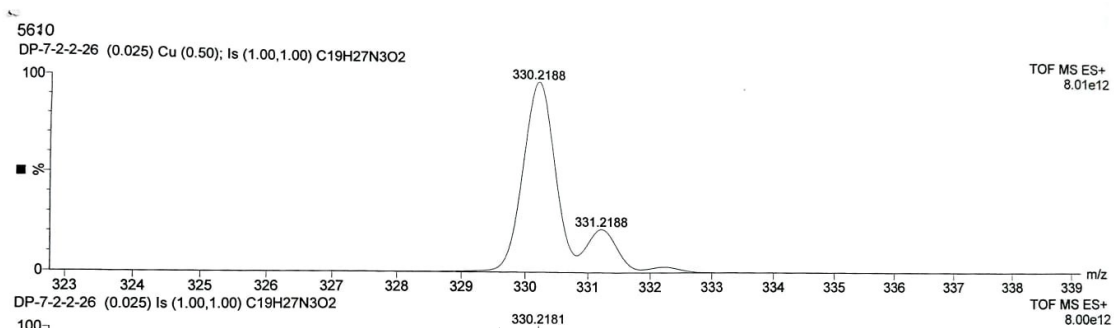
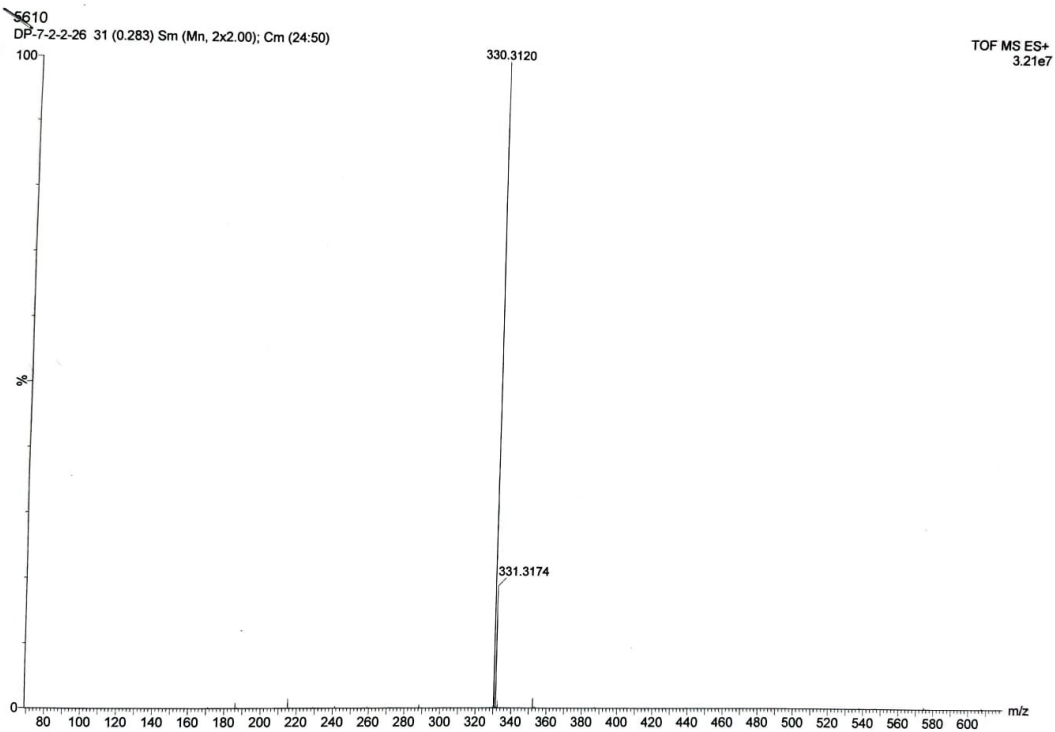


Figure S61. HRMS of compound 2t.

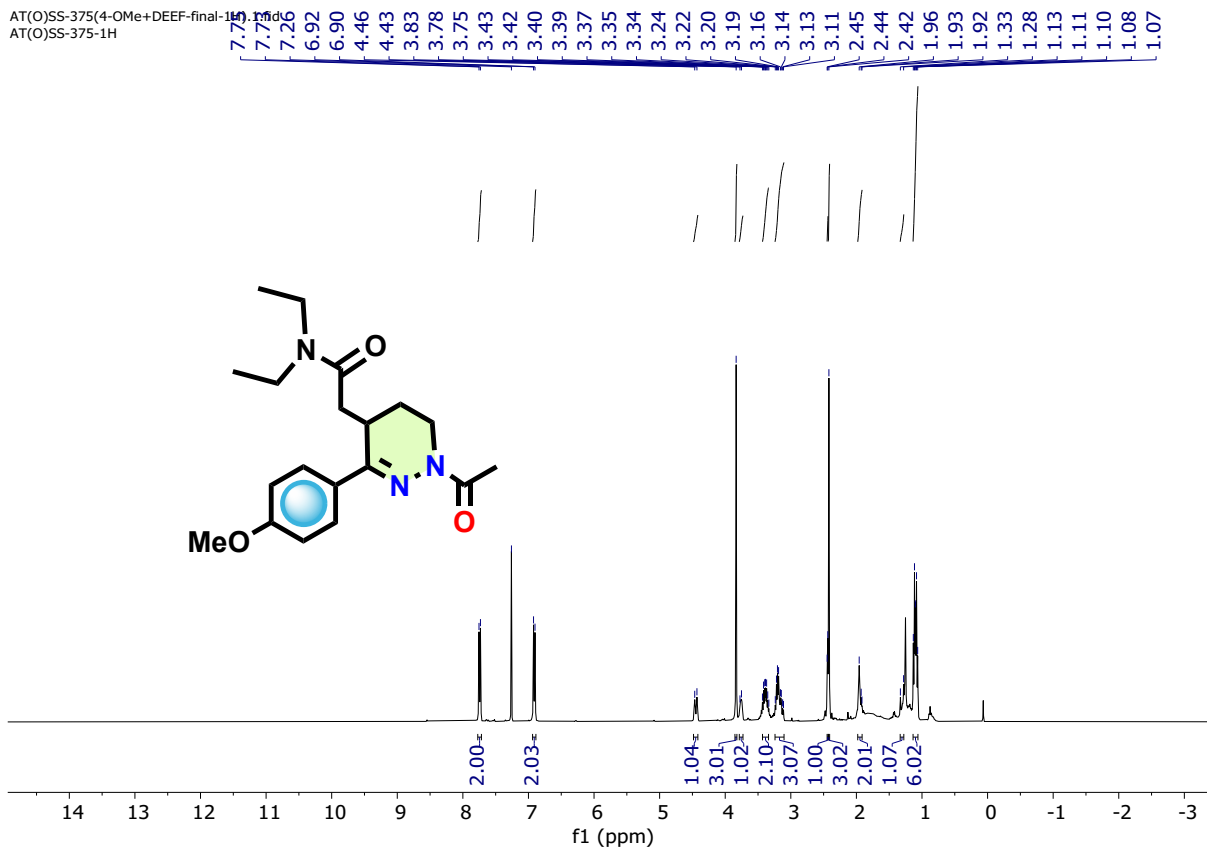


Figure S62. ^1H (400 MHz) NMR of **2u** compound in CDCl_3

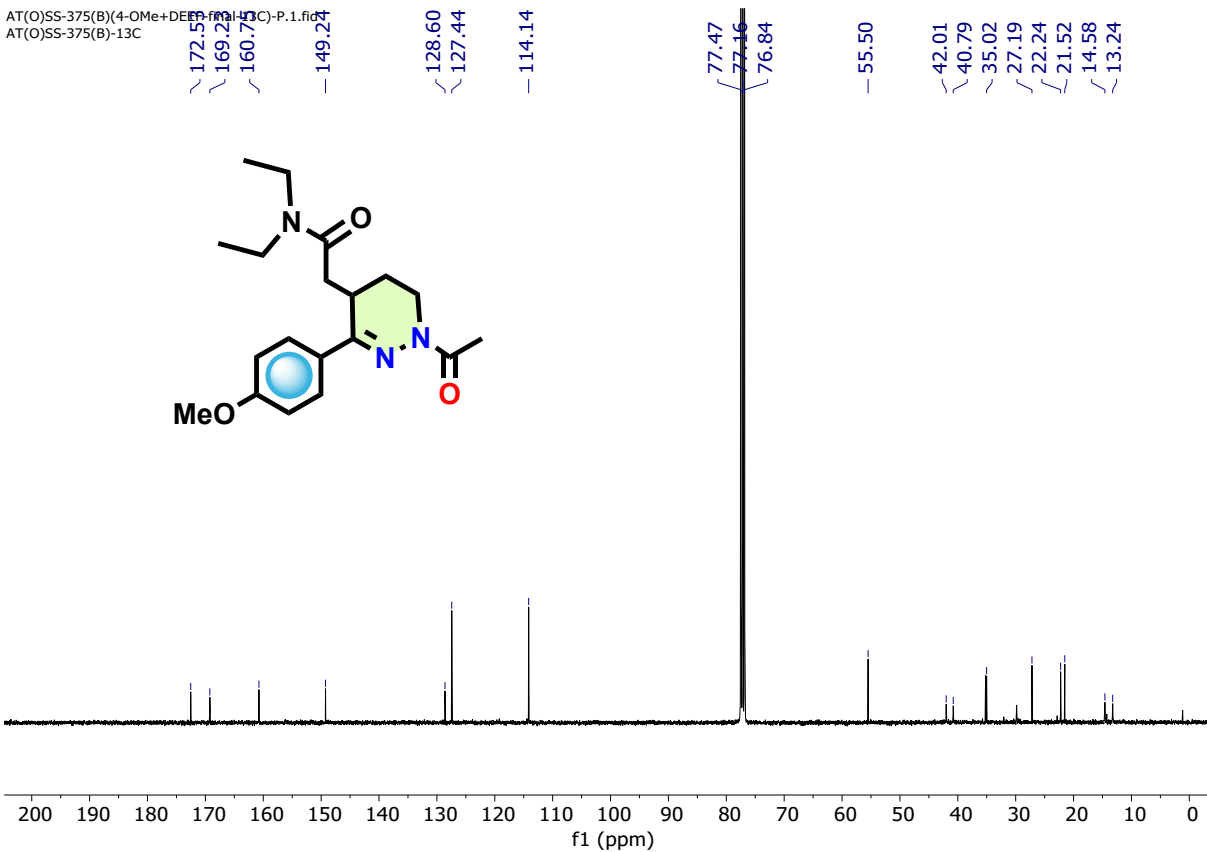


Figure S63. ^{13}C (100 MHz) NMR of **2u** compound in CDCl_3

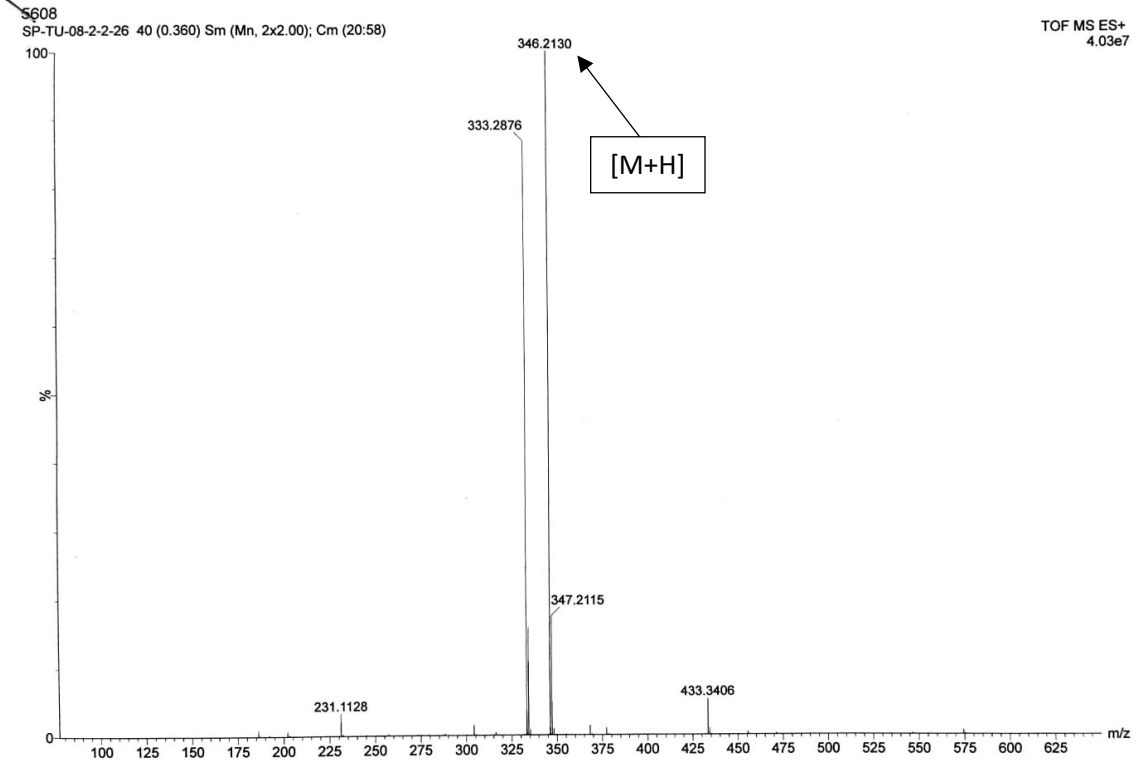


Figure S64. HRMS of compound **2u**.

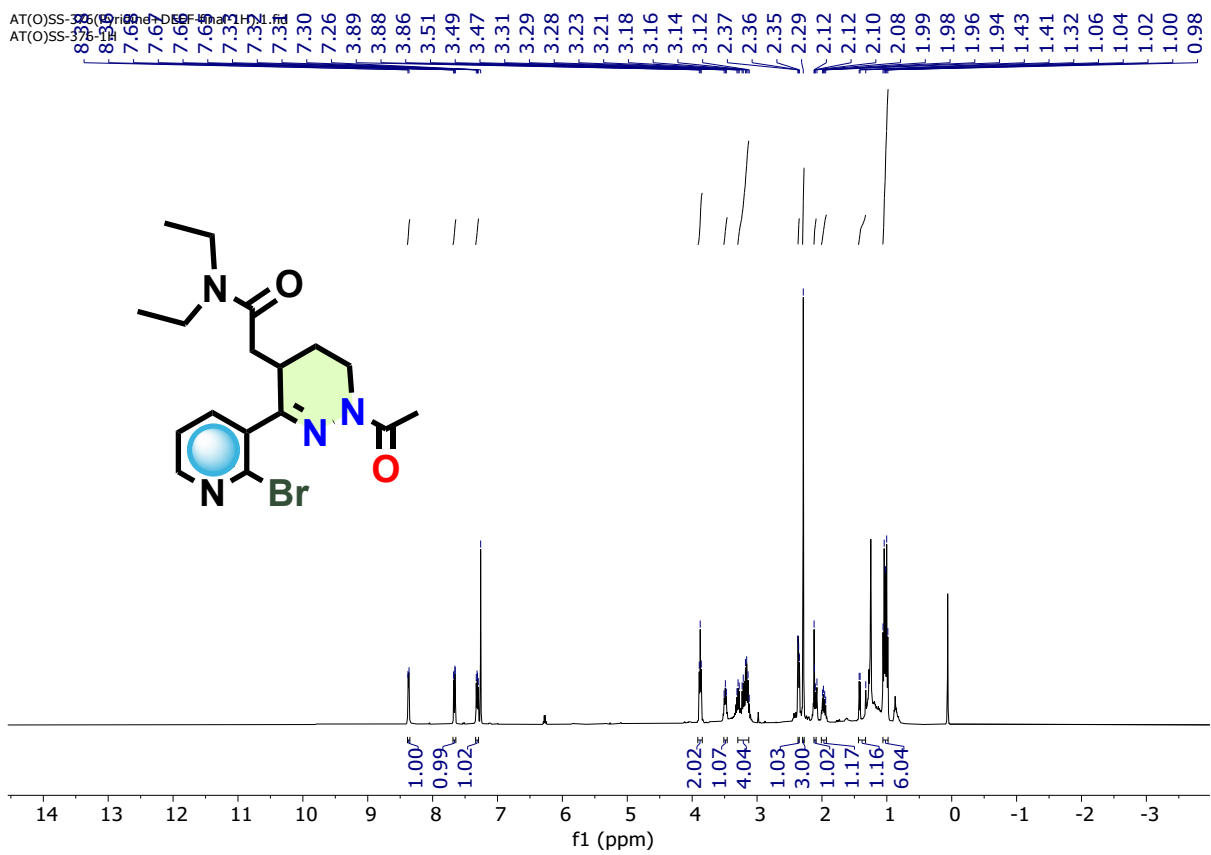


Figure S65. ^1H (400 MHz) NMR of **2v** compound in CDCl_3

AT(O)-SS-376(A).1.fid
AT(O)-SS-376(A)-13C

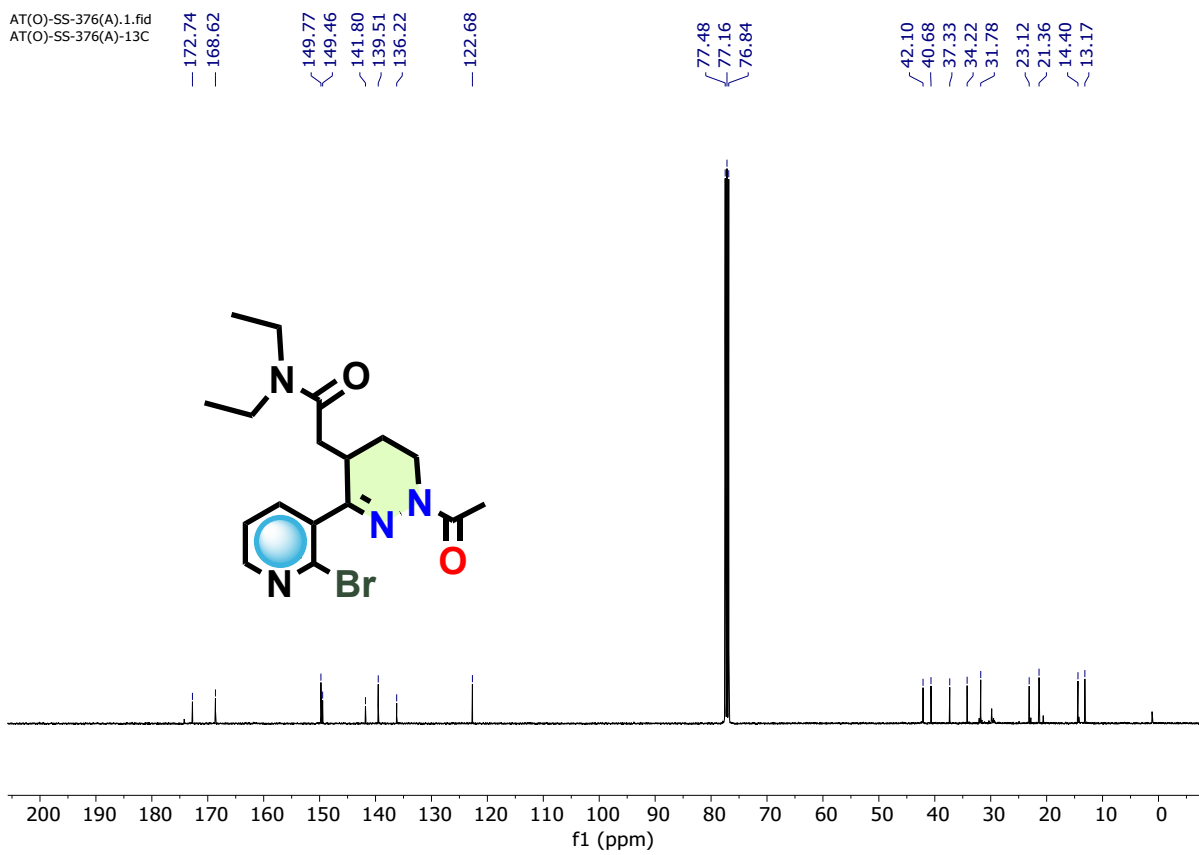


Figure S66. ^{13}C (100 MHz) NMR of **2v** compound in CDCl_3

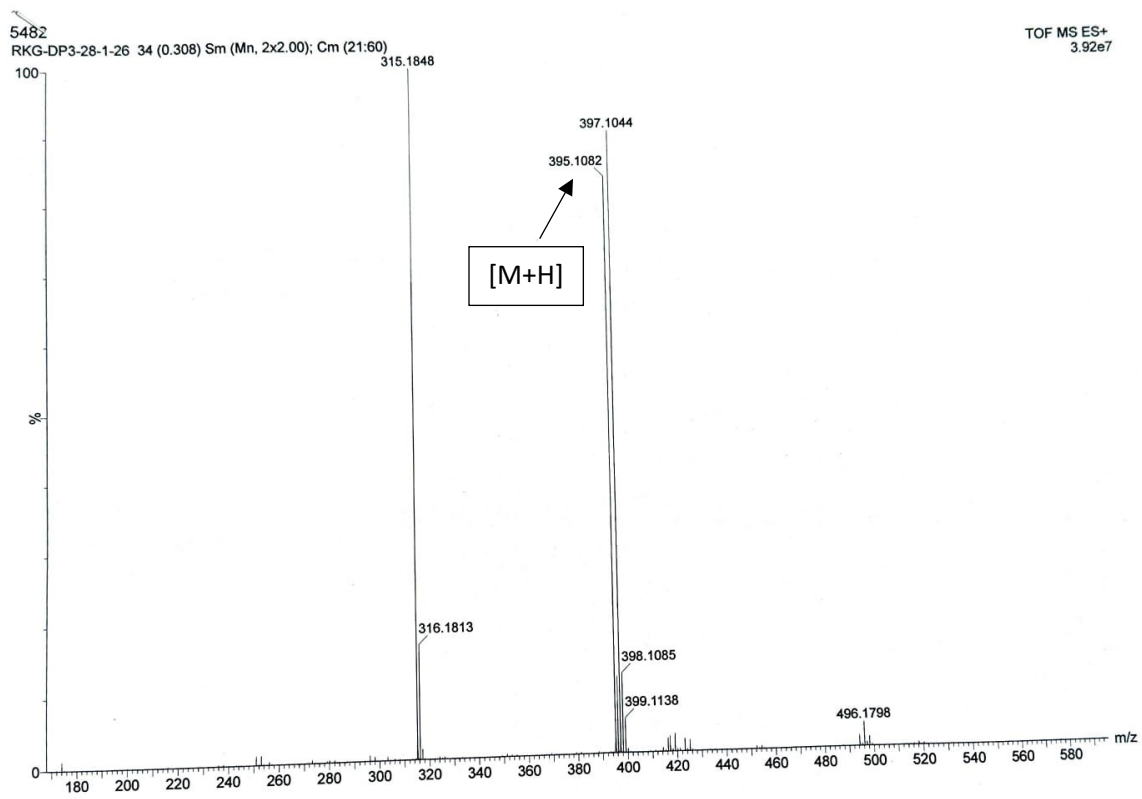


Figure S67. HRMS of compound **2v**.

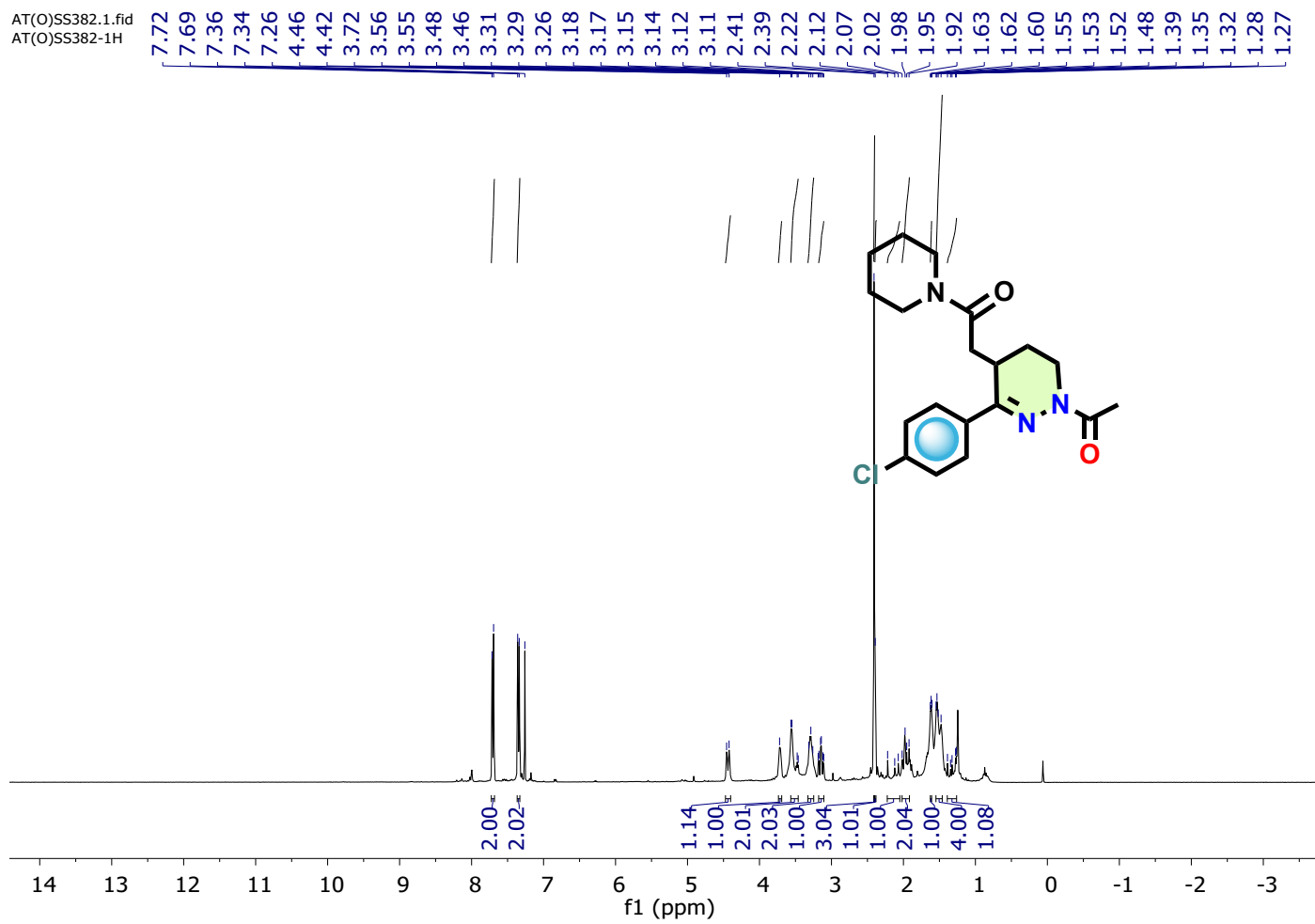


Figure S68. ^1H (400 MHz) NMR of **2w** compound in CDCl_3

AT(O)SS-382(A).1.fid
AT(O)SS-382-13C

172.56
167.97

148.19

135.35
134.52
128.97
127.24

77.47
77.16
76.84

46.57
43.22
35.17
34.81
27.03
26.59
25.63
24.49
22.11
21.49

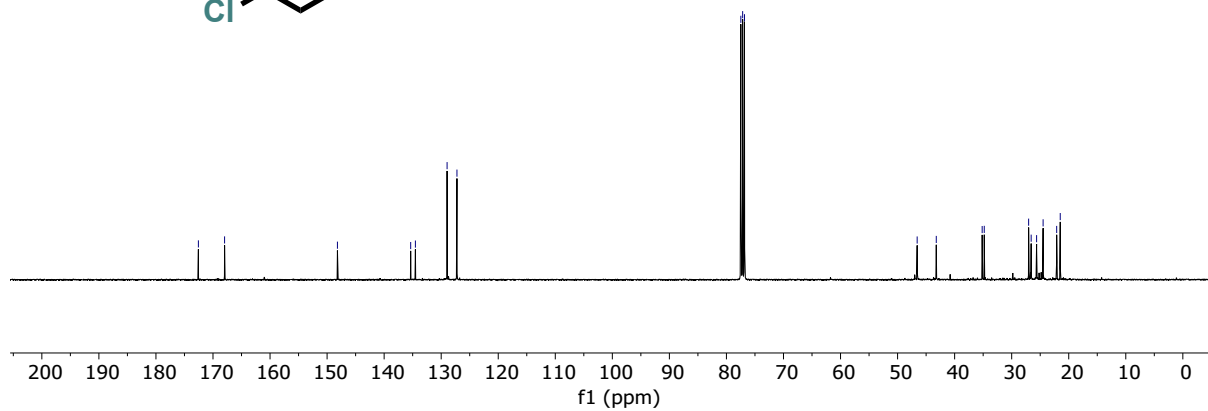
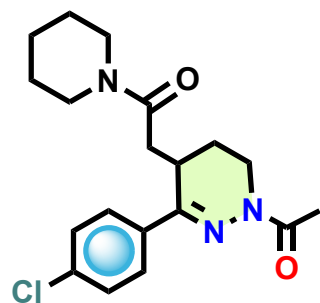


Figure S69. ¹³C (100 MHz) NMR of 2w compound in CDCl₃

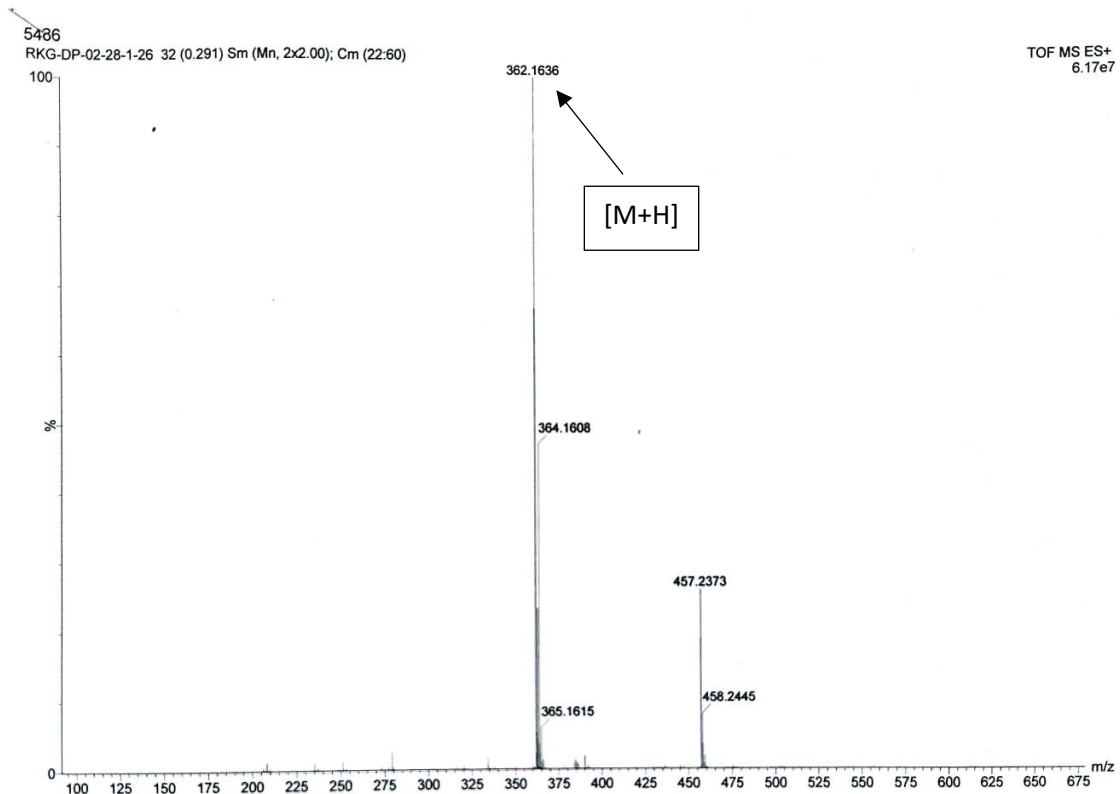


Figure S70. HRMS of compound 2w.

AT(O)SS383.1.fid
AT(O)SS383-1H

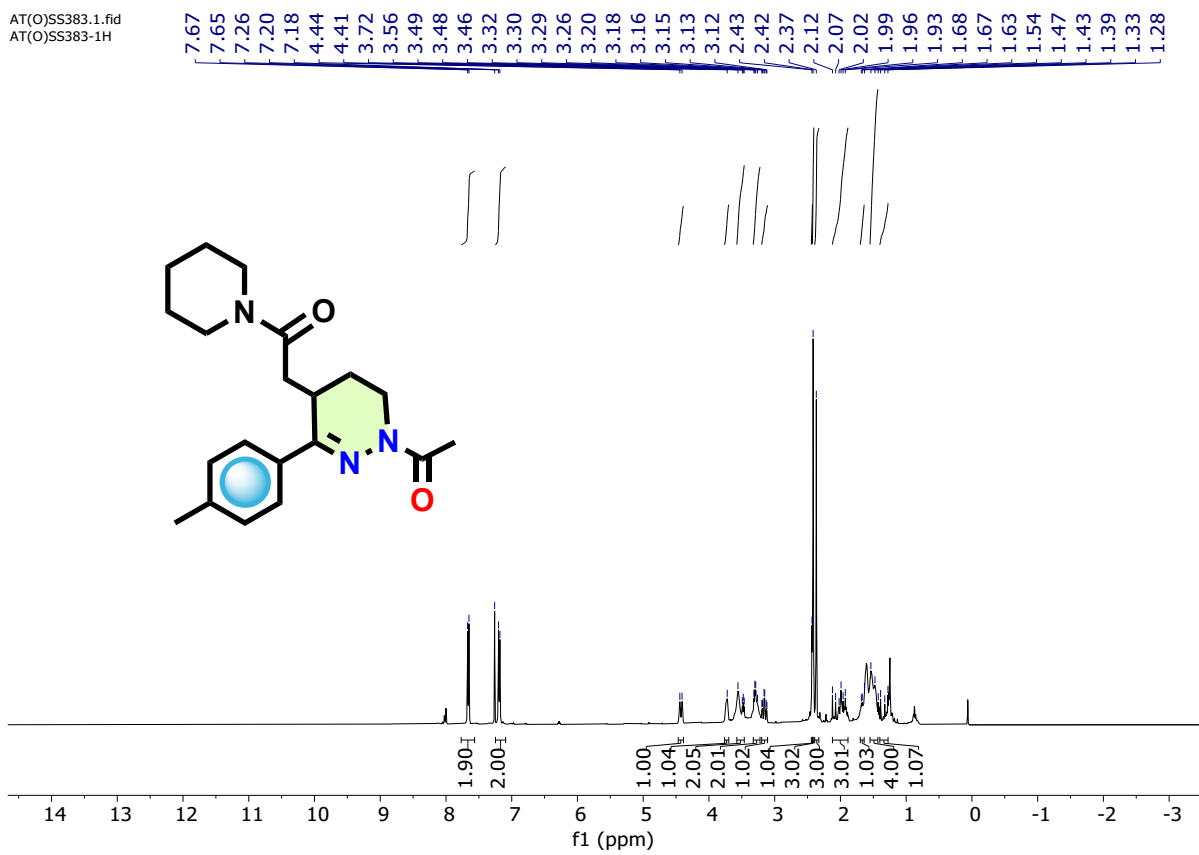


Figure S71. ¹H (400 MHz) NMR of **2x** compound in CDCl₃

AT(O)SS-383A.1.fid
AT(O)SS-383A-13C

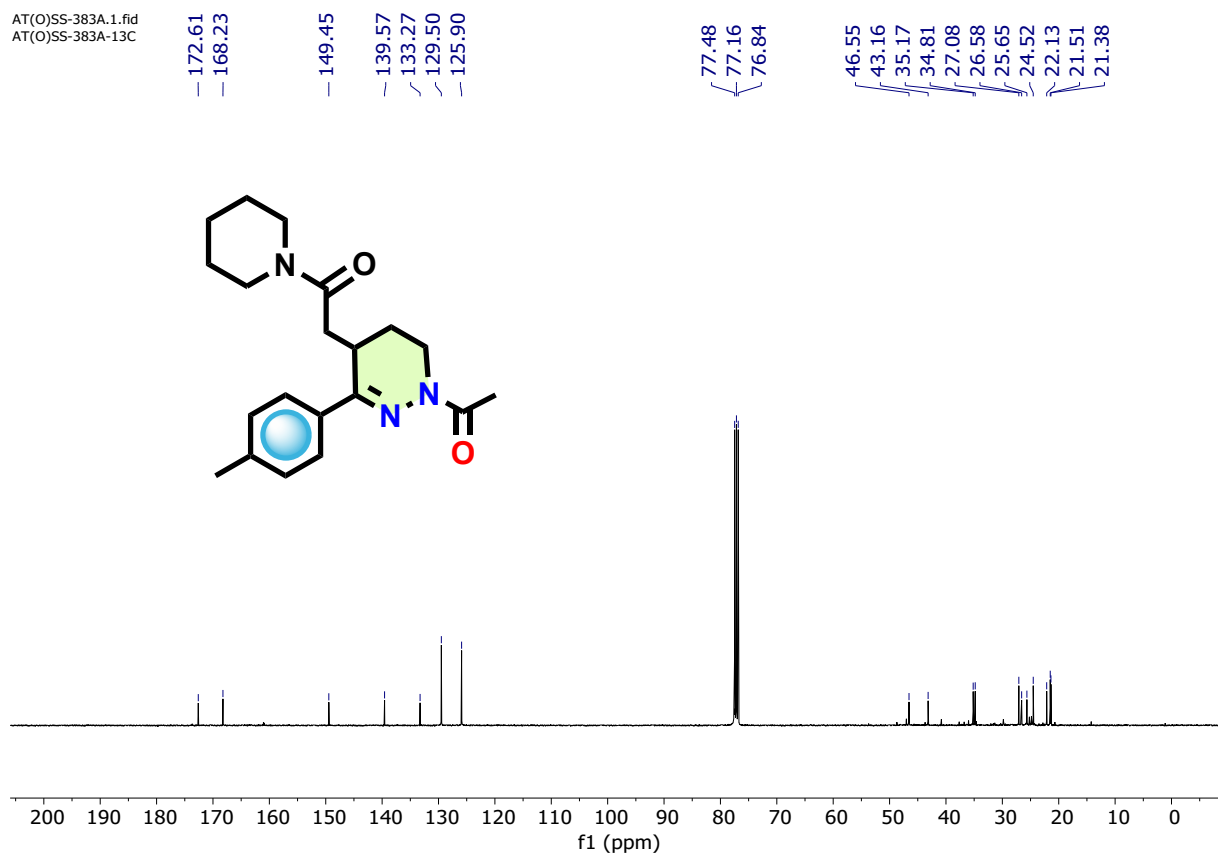


Figure S72. ^{13}C (100 MHz) NMR of **2x** compound in CDCl_3

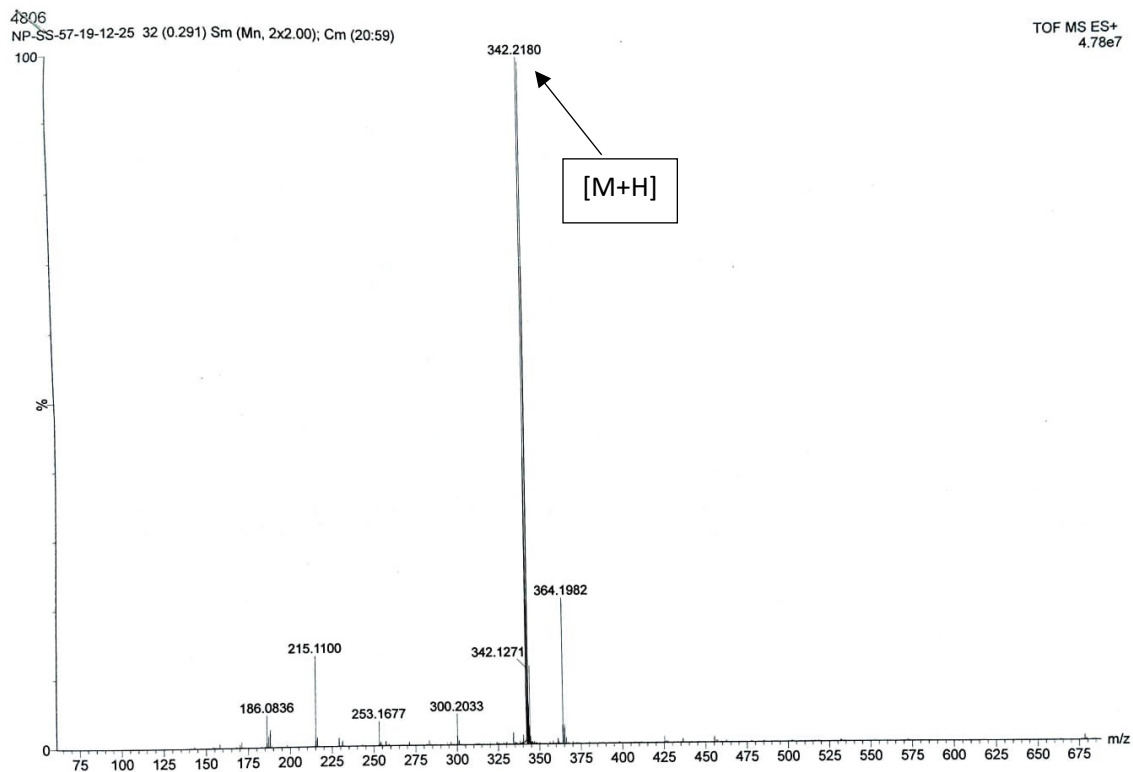


Figure S73. HRMS of compound **2x**.

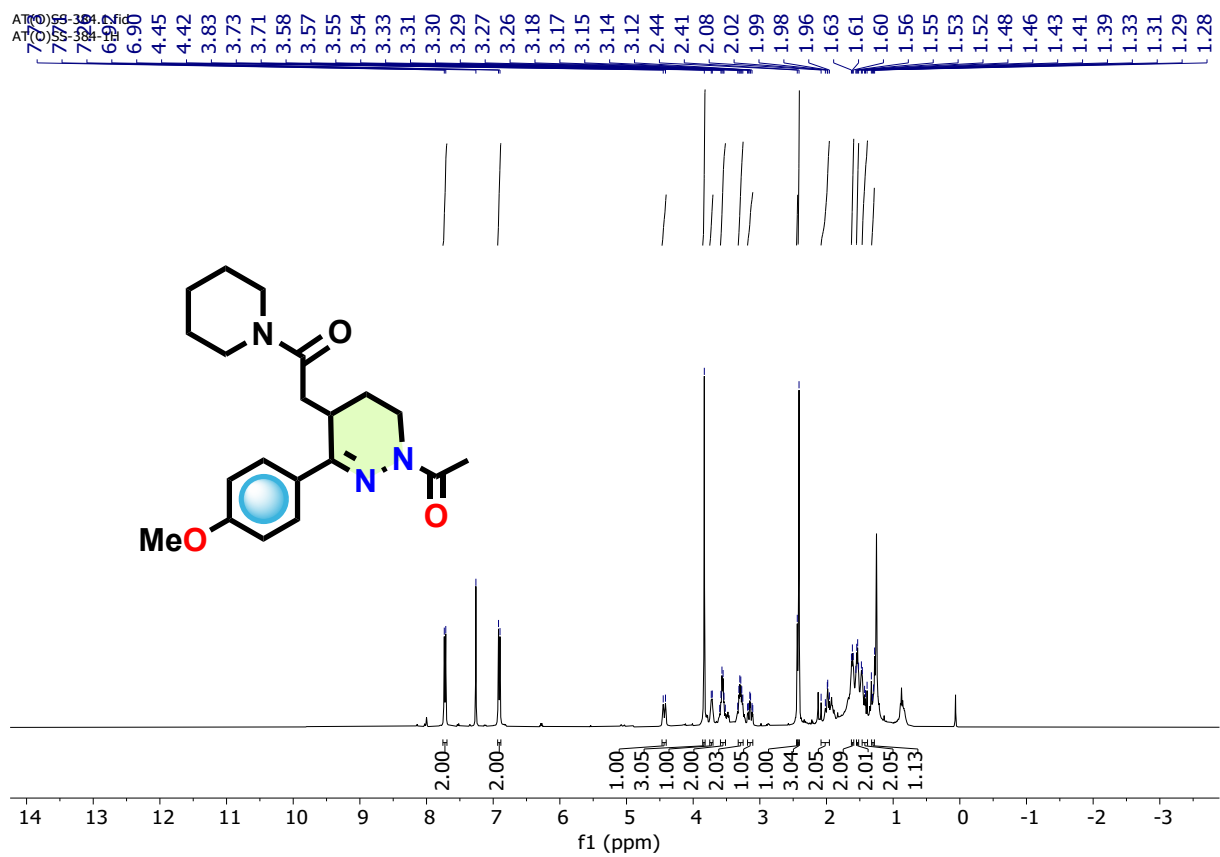


Figure S74. ¹H (400 MHz) NMR of **2y** compound in CDCl₃

AT(O)SS-384A.1.fid
AT(O)SS-384A-13C

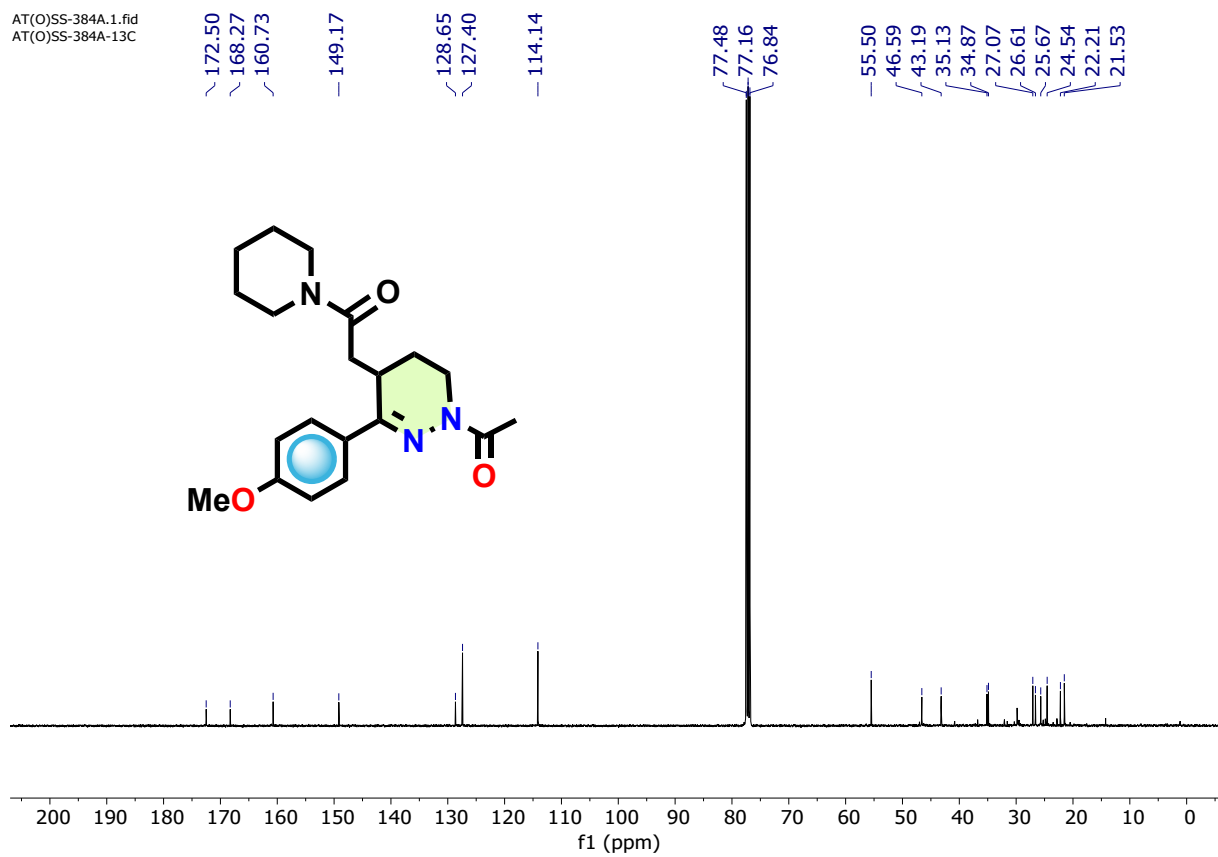


Figure S75. ¹³C (100 MHz) NMR of **2y** compound in CDCl₃

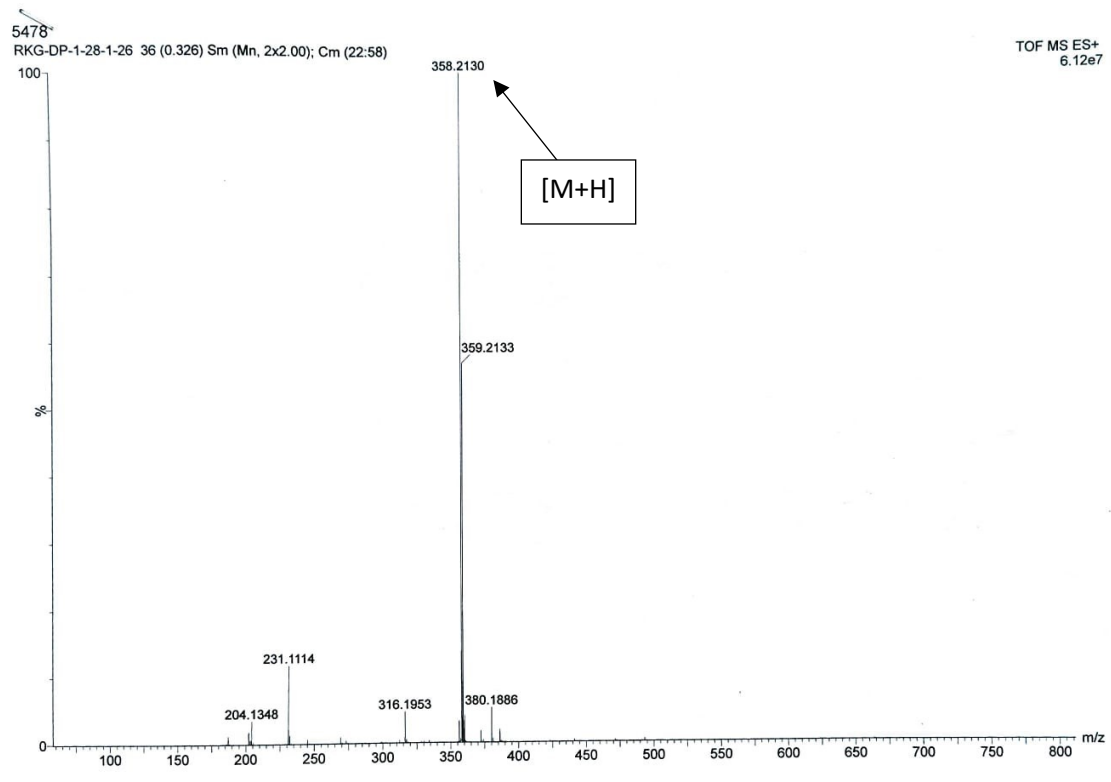


Figure S76. HRMS of compound 2y.

AT(O)-SS-407.1.fid
AT(O)-SS-407-1H

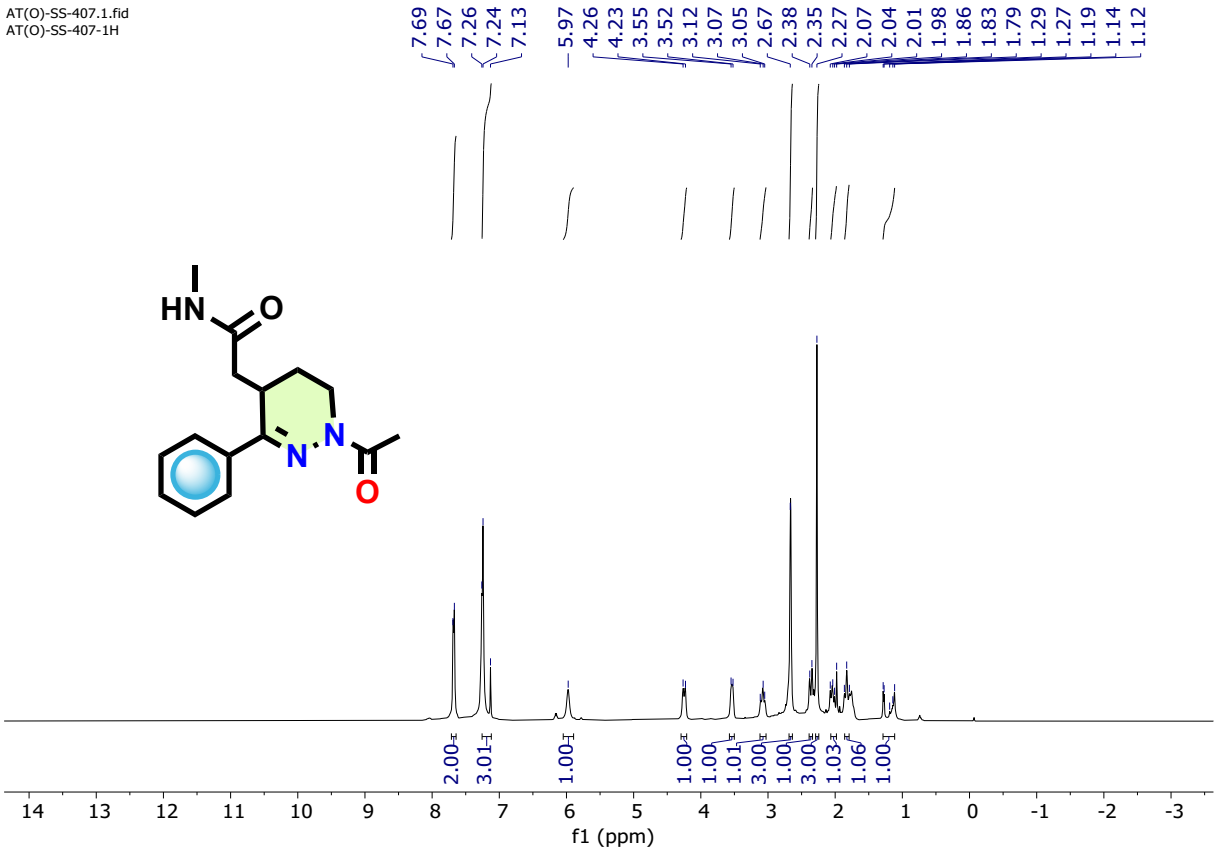


Figure S77. ¹H (400 MHz) NMR of **2z** compound in CDCl₃

AT(O)SS-407A(Benzaldehyde-N-Methyl-13C)-P2.fid
AT(O)SS-407A-13C

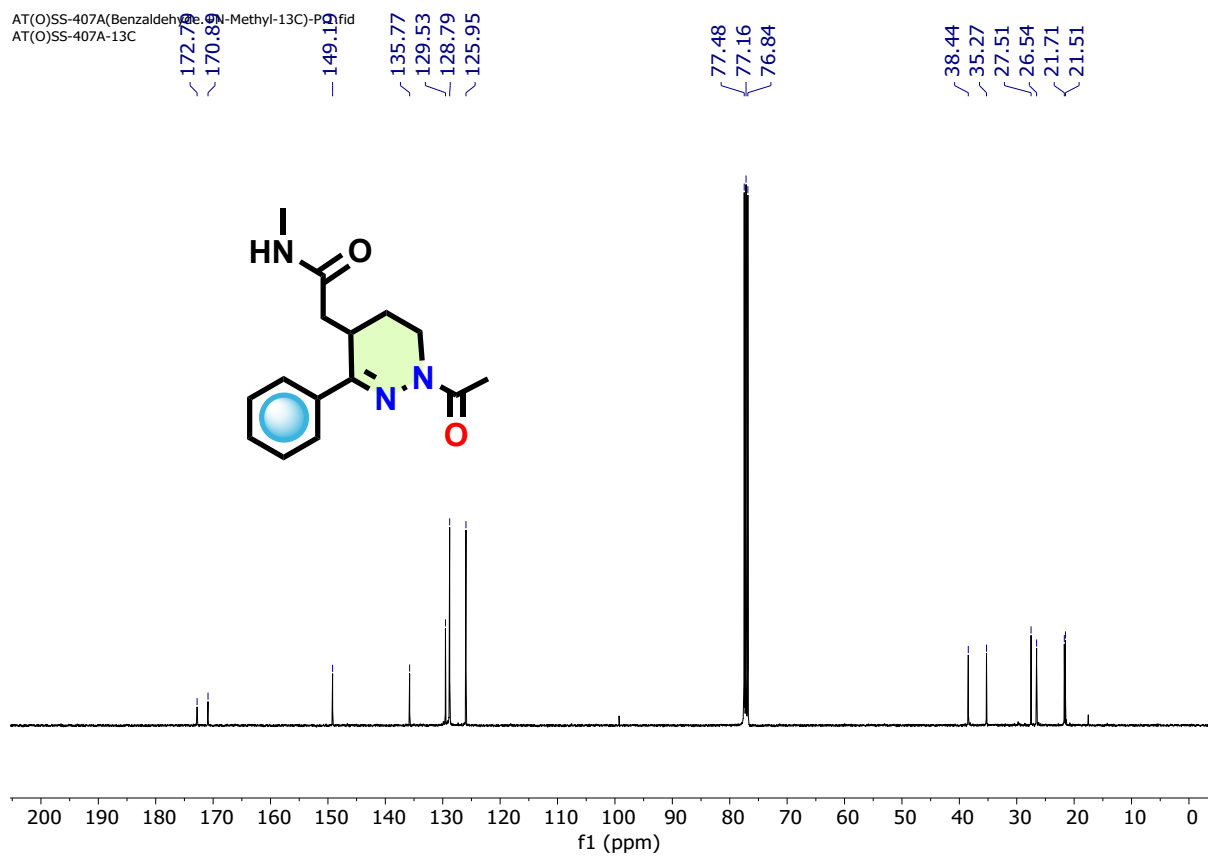


Figure S78. ¹³C (100 MHz) NMR of 2z compound in CDCl₃

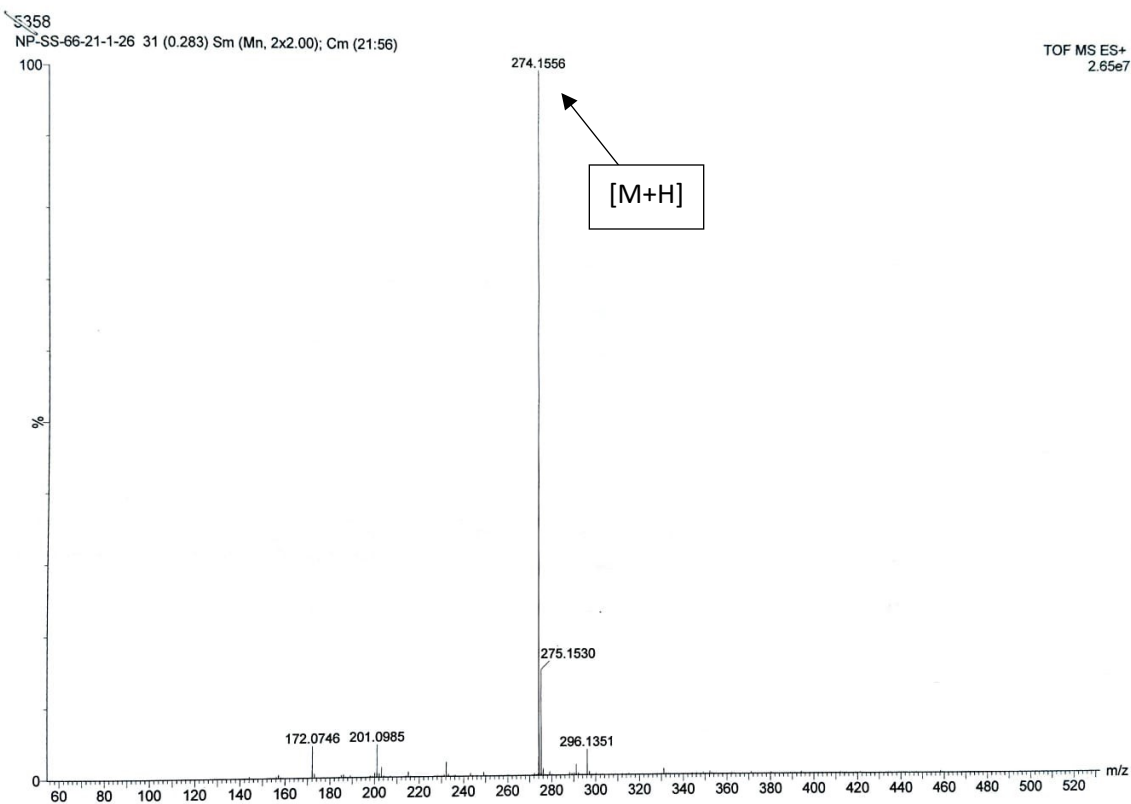


Figure S79. HRMS of compound **2z**.

AT(O)SS-386.1.fid
AT(O)SS-386-1H

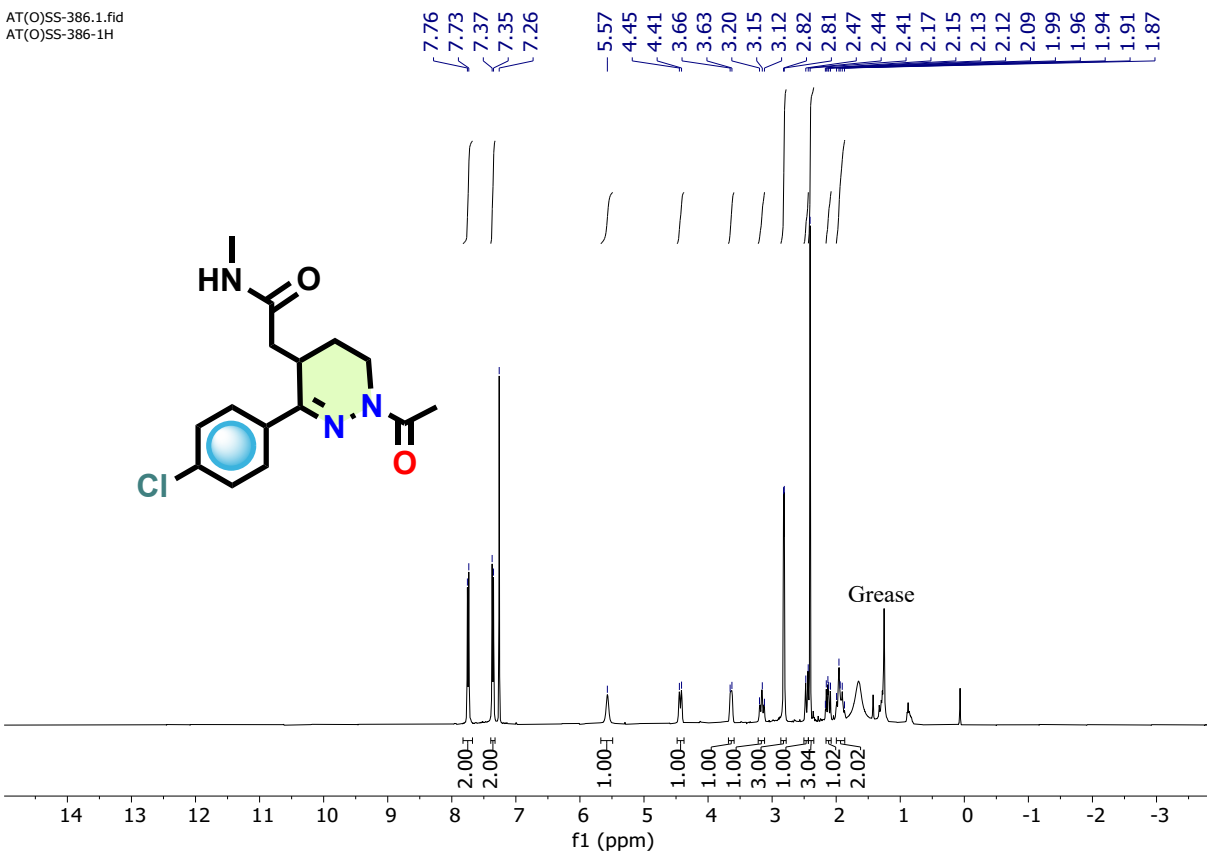
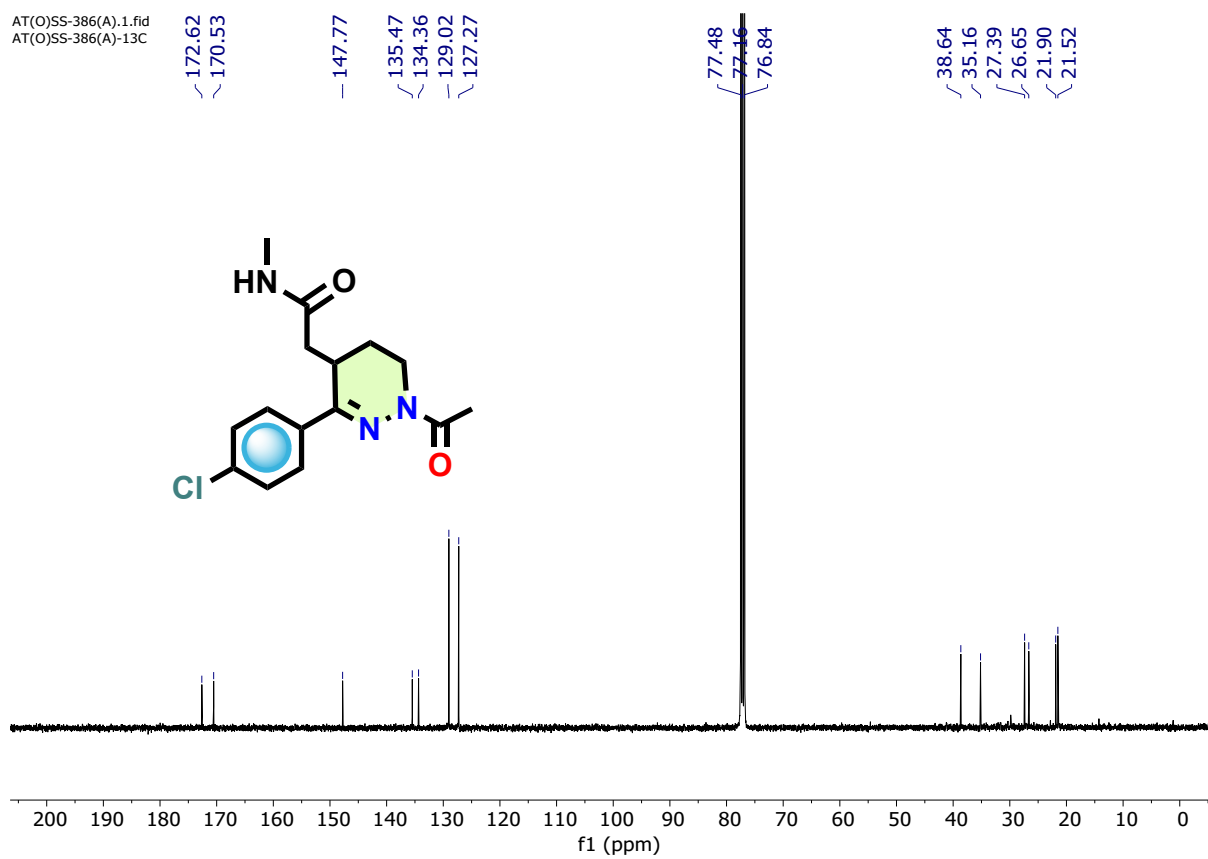


Figure S80. ^1H (400 MHz) NMR of **2a** compound in CDCl_3

AT(O)SS-386(A)-1.fid
AT(O)SS-386(A)-13C



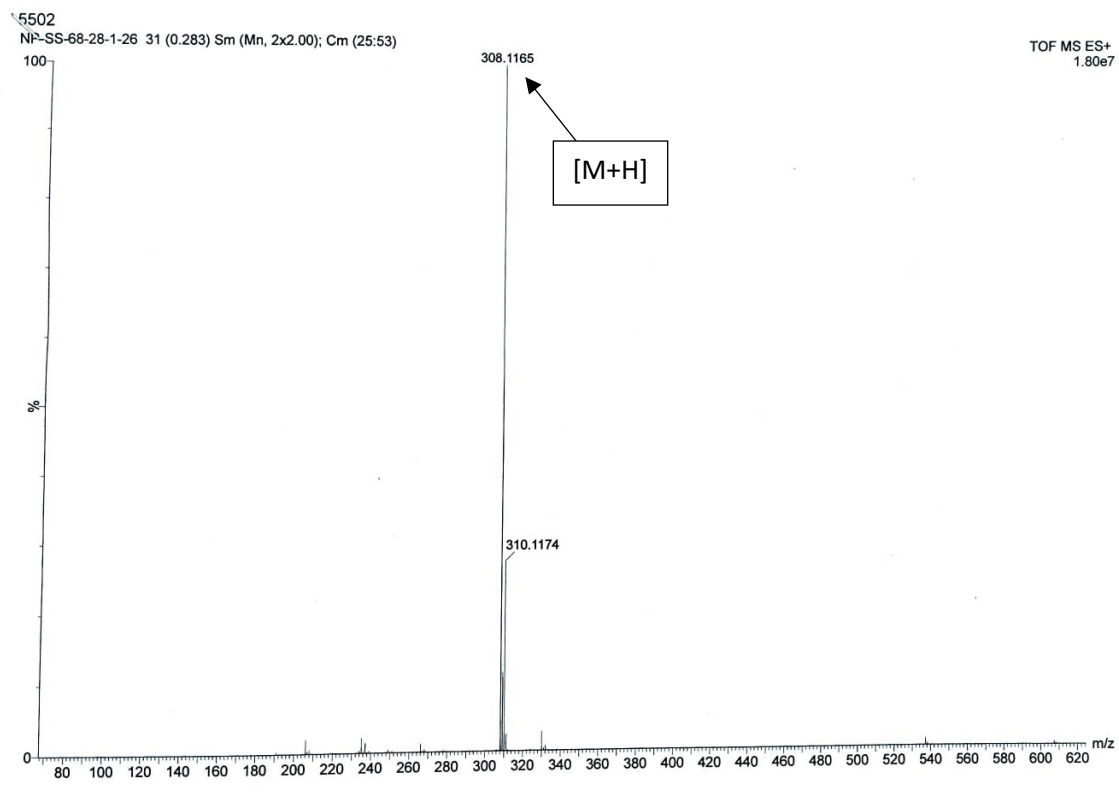


Figure S82. HRMS of compound **2za**.

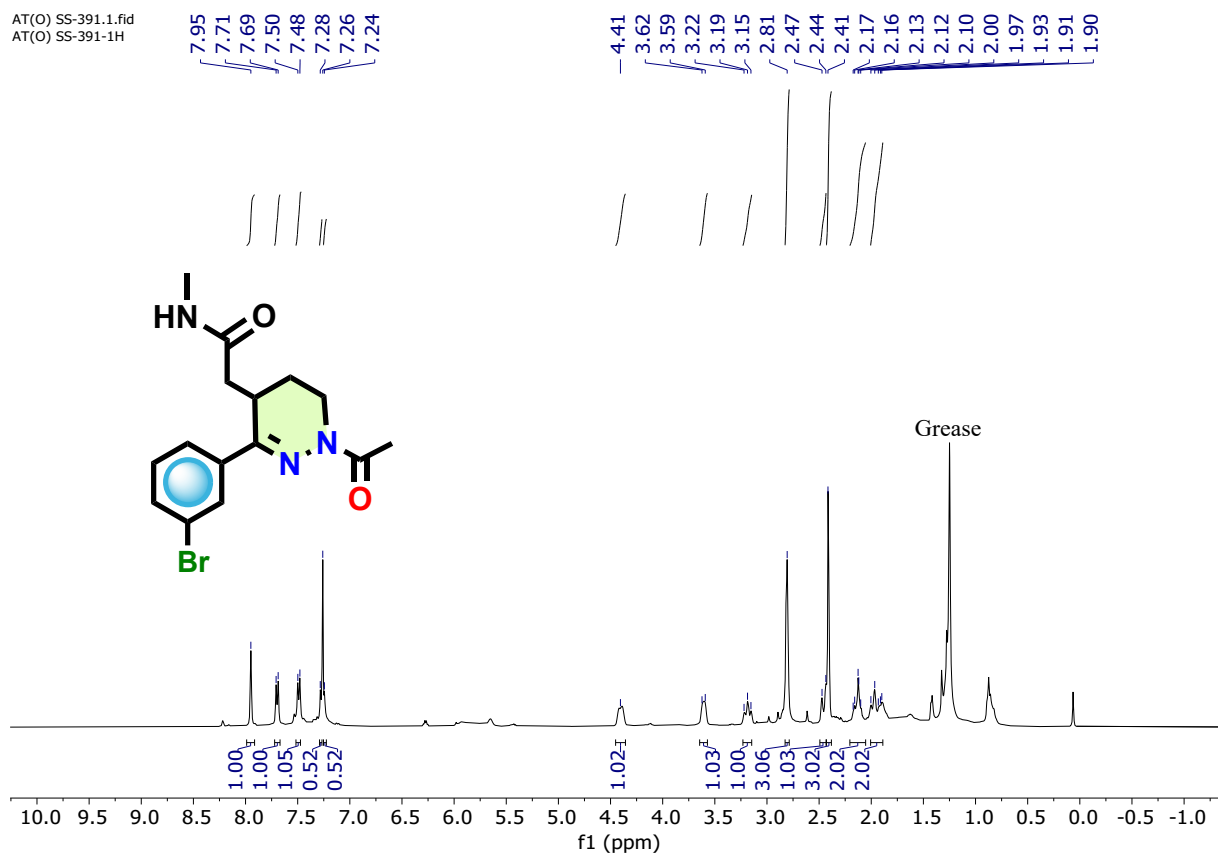


Figure S83. ¹H (400 MHz) NMR of **2b** compound in CDCl₃

AT(O)-SS-391(A)(3-Br acetyl.+N-Methyl-13C).1.fid
AT(O)-SS-391(A)- 13C

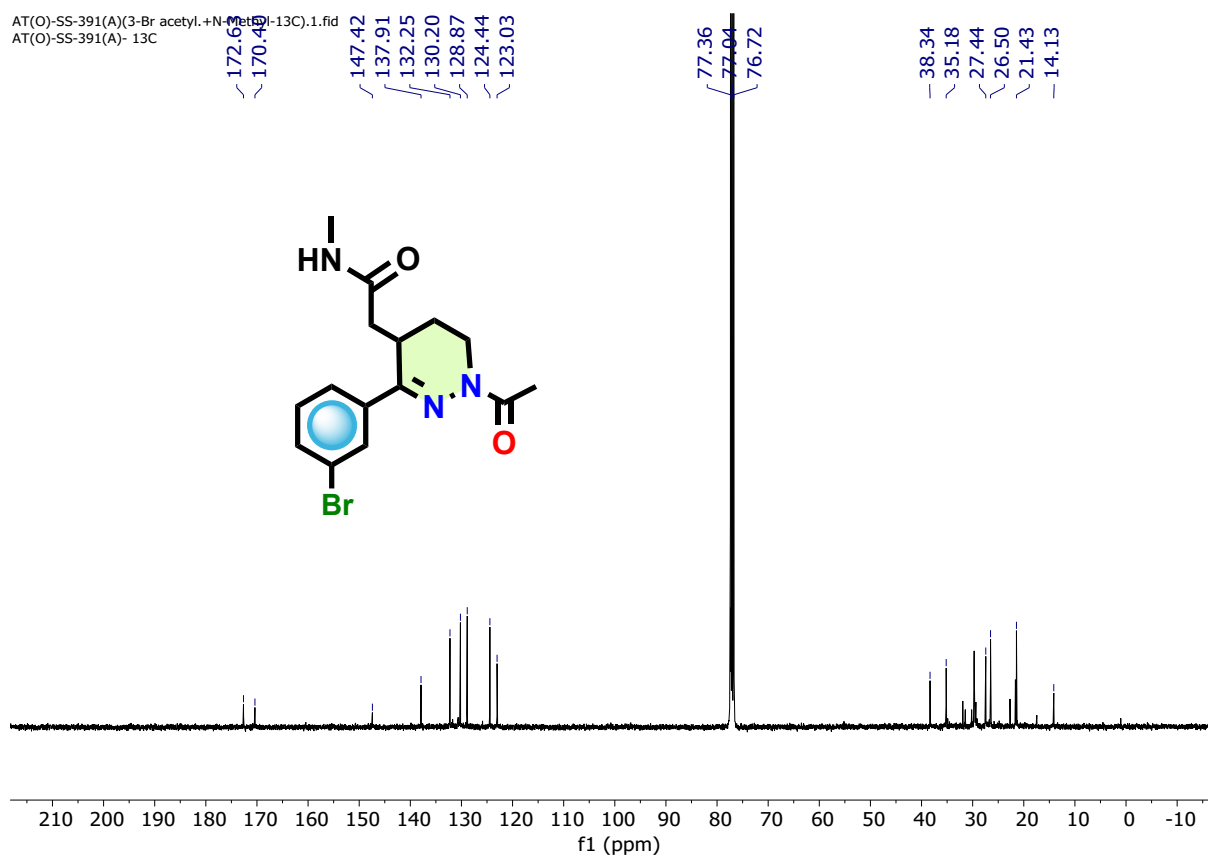


Figure S84. ¹³C (100 MHz) NMR of **2zb** compound in CDCl₃

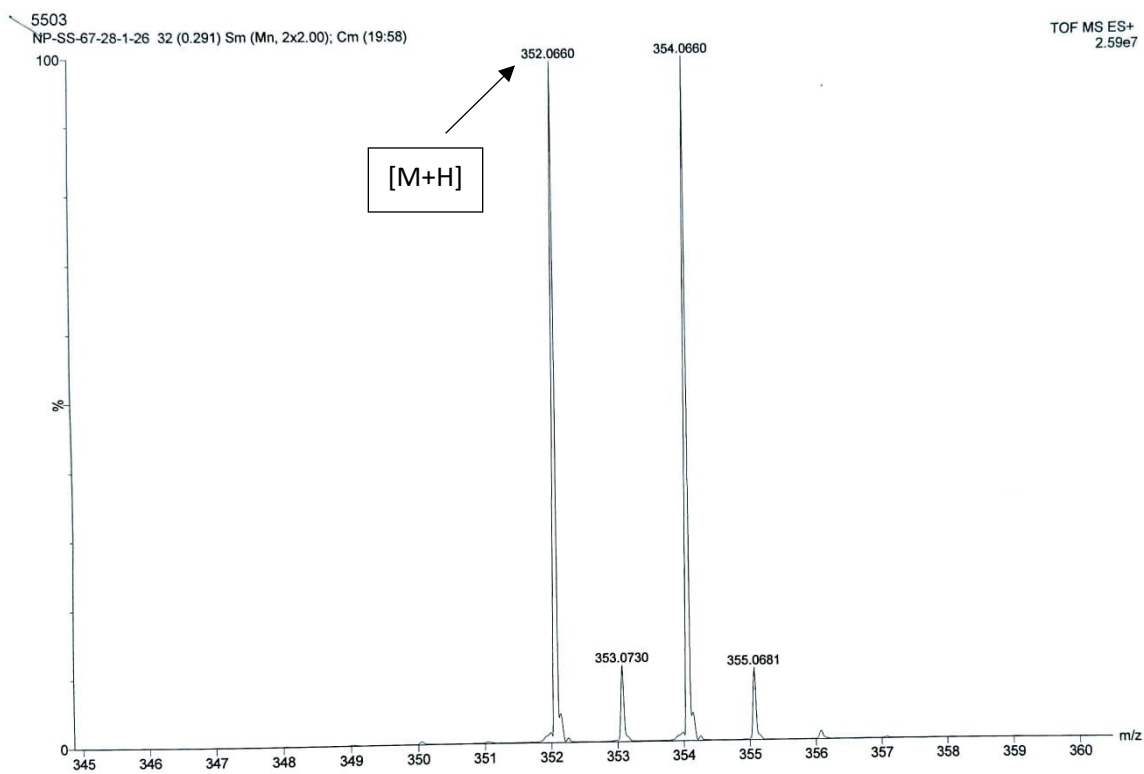


Figure S85. HRMS of compound **2zb**.

AT(O)-SS-409.1.fid
AT(O)-SS-409-1H

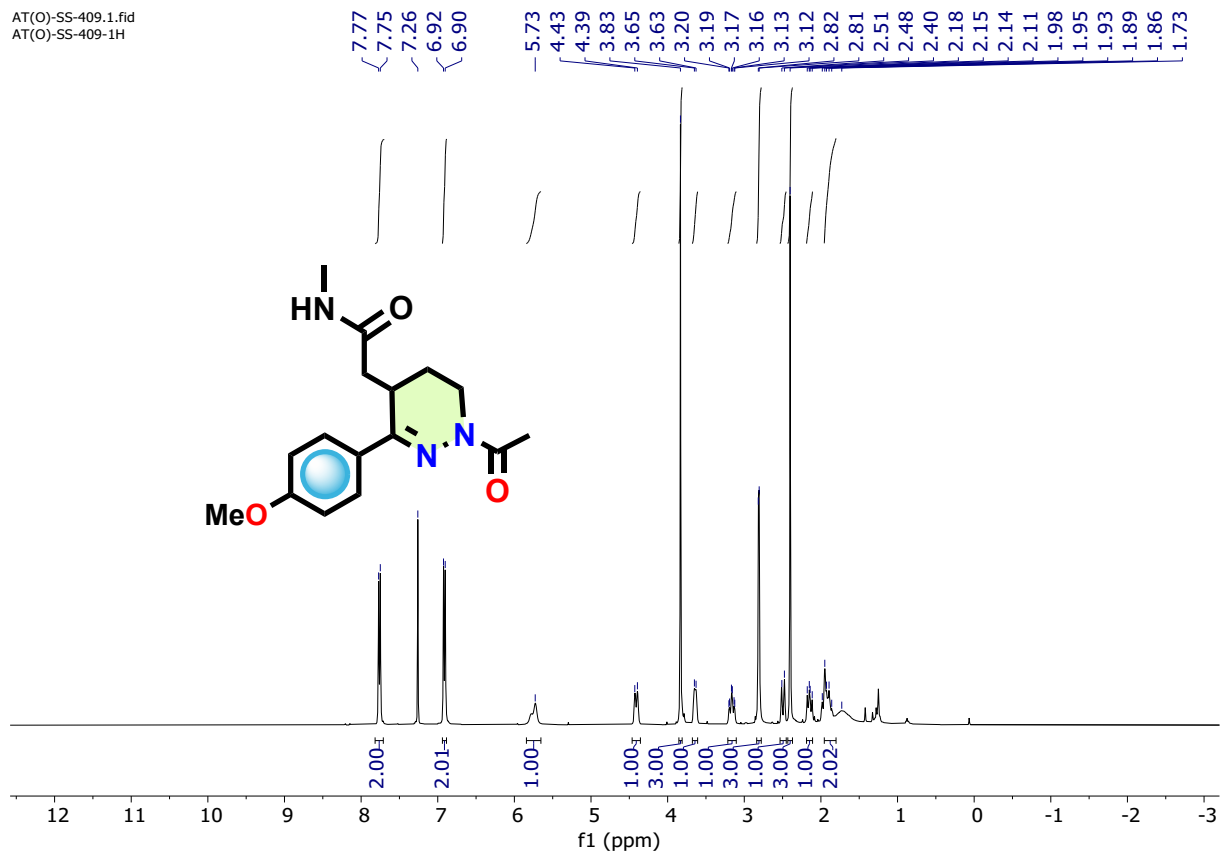


Figure S86. ¹H (400 MHz) NMR of **2zc** compound in CDCl₃

AT(O)SS-409A.1.fid
AT(O)SS-409A-13C

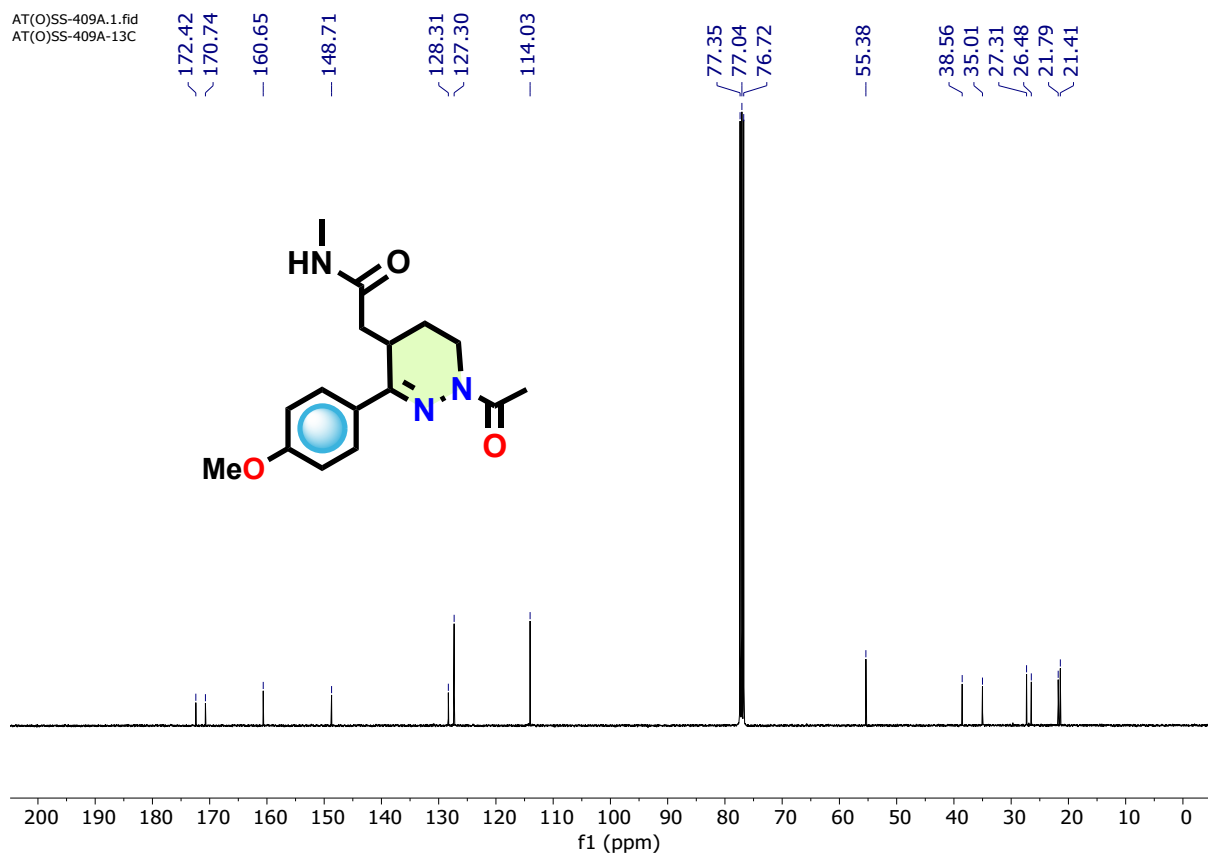


Figure S87. ^{13}C (100 MHz) NMR of **2zc** compound in CDCl_3

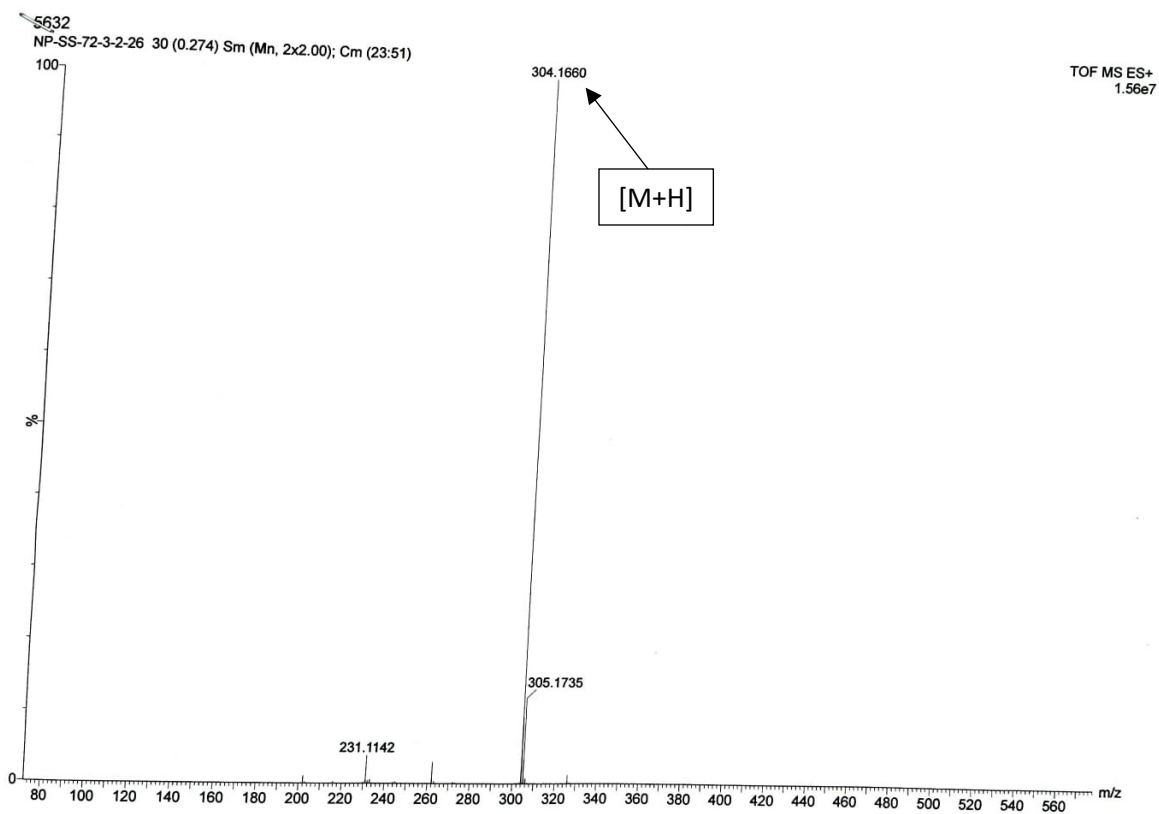


Figure S88. HRMS of **2zc** compound.

AT(O)-SS-390 (4-Me acetyl.+N-Methyl-1H).1.fid
AT(O)-SS-390-1H

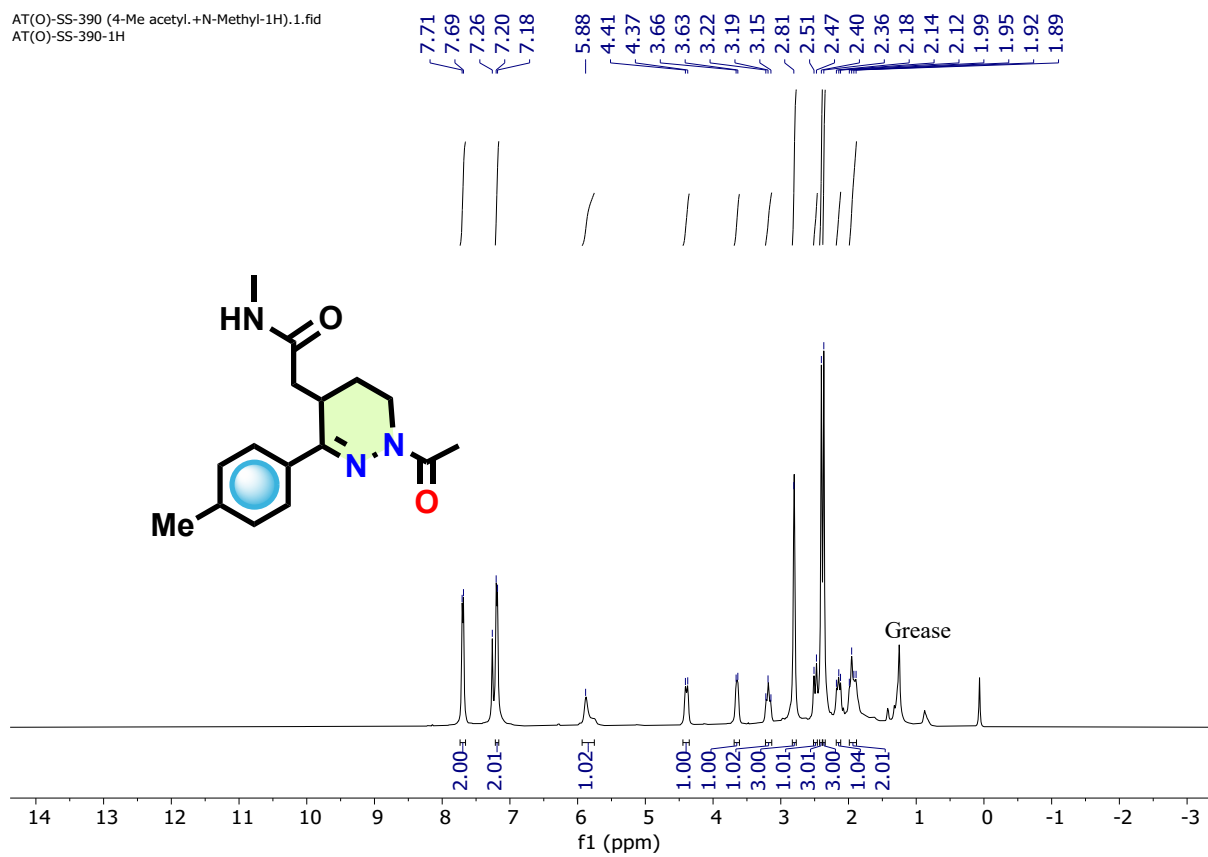


Figure S89. ^1H (400 MHz) NMR of **2zd** compound in CDCl_3

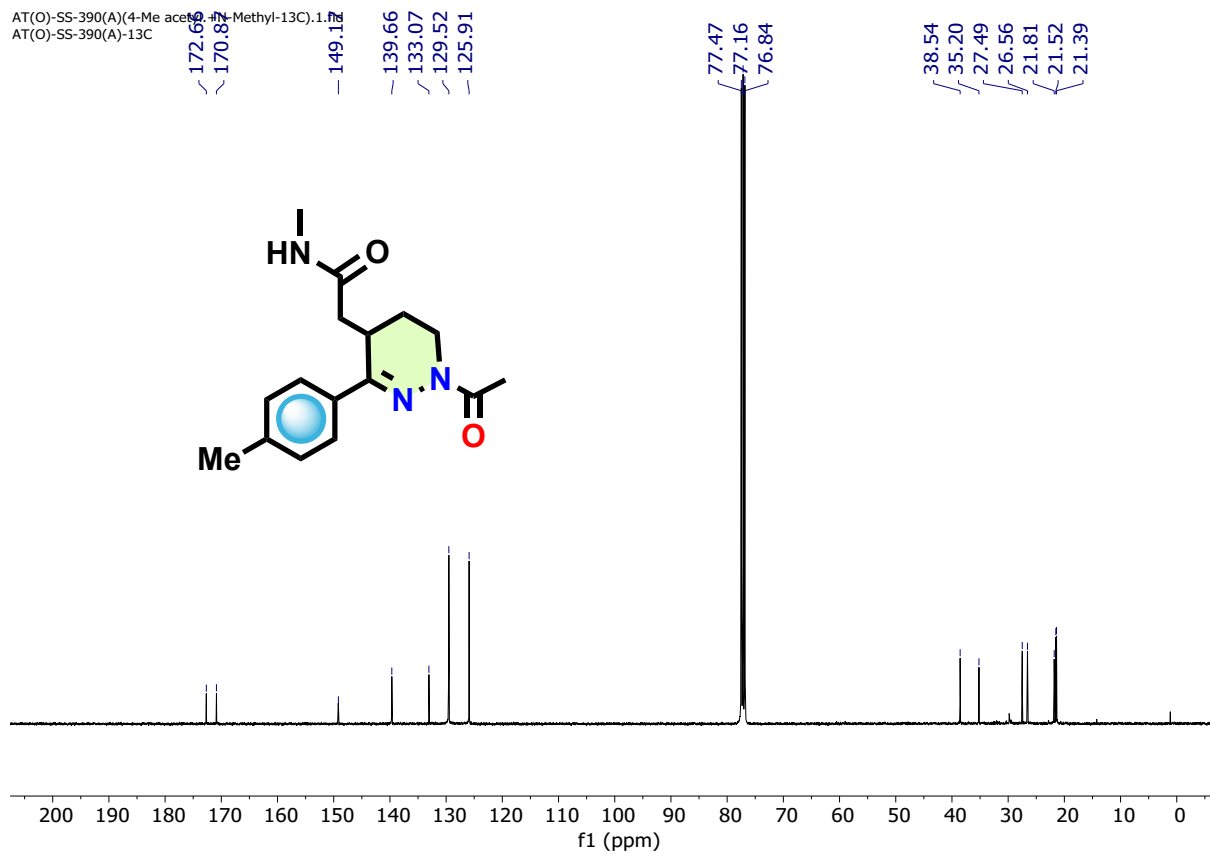


Figure S90. ^{13}C (100 MHz) NMR of **2zd** compound in CDCl_3

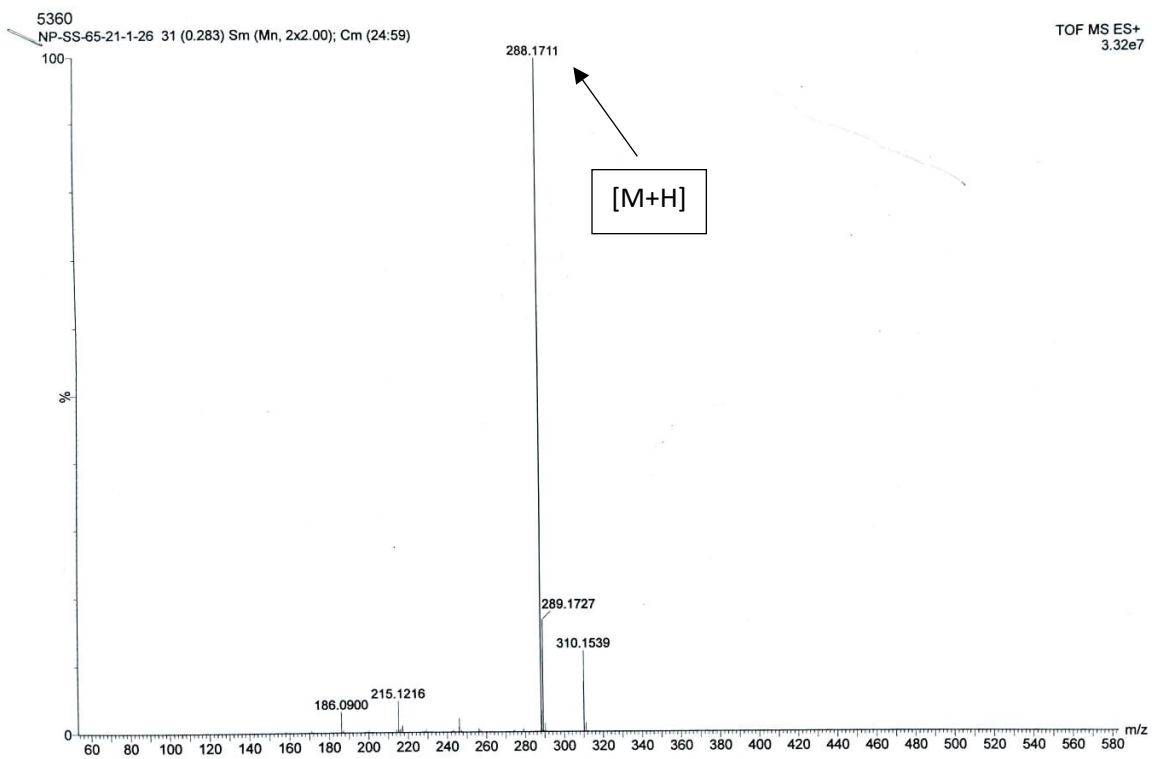


Figure S91. HRMS of compound **2zd**.

AT(O)-SS-411(A).1.fid
AT(O)-SS-411(A)-1H

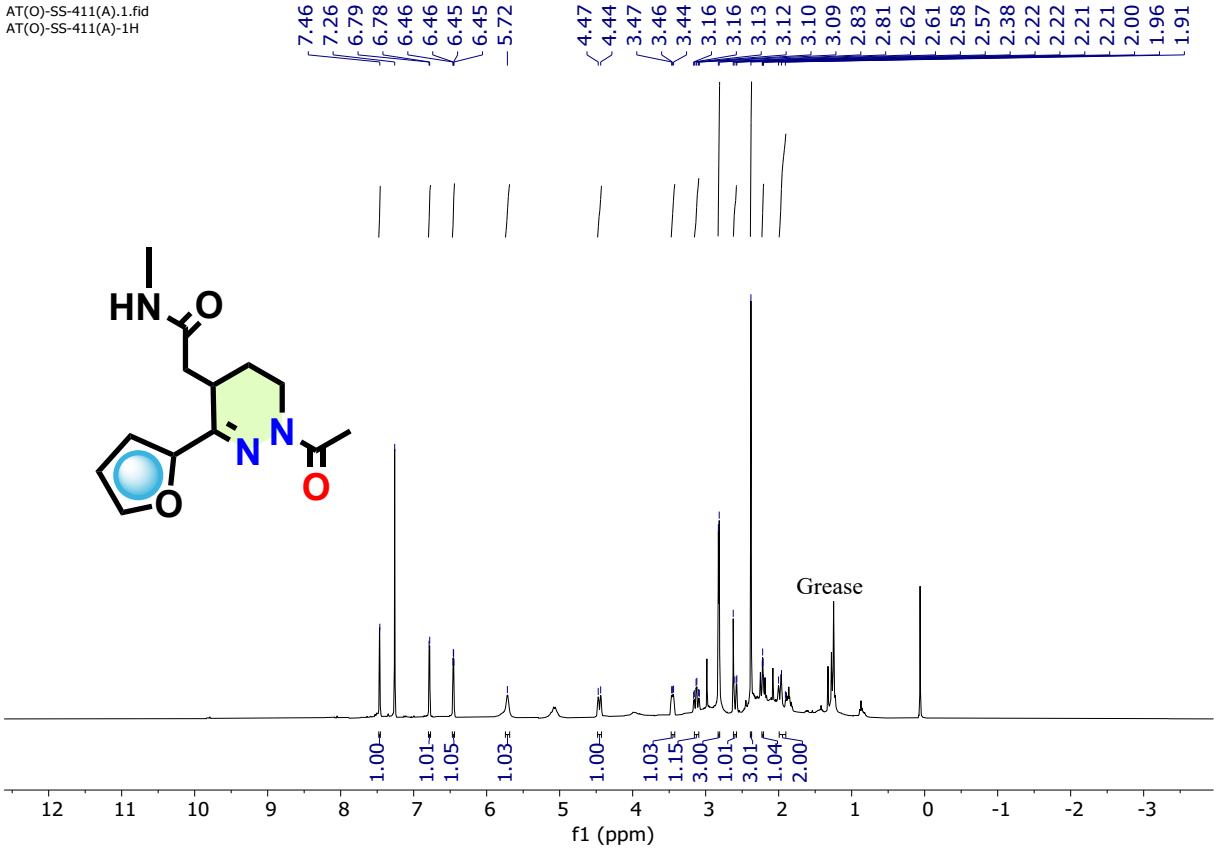


Figure S92. ¹H (400 MHz) NMR of **2ze** compound in CDCl₃.

AT(O)-SS-411(A).2.fid
AT(O)-SS-411(A)-13C

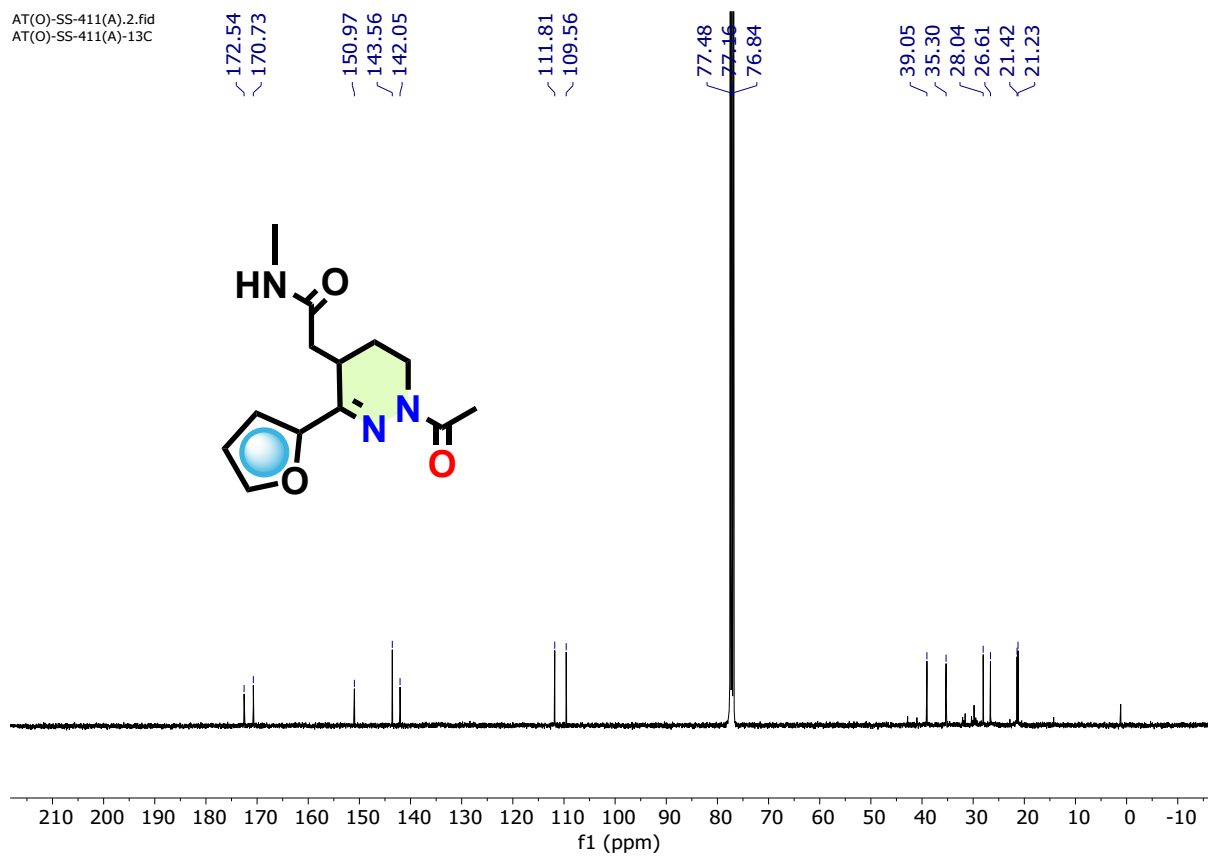


Figure S93. ^{13}C (100 MHz) NMR of **2ze** compound in CDCl_3

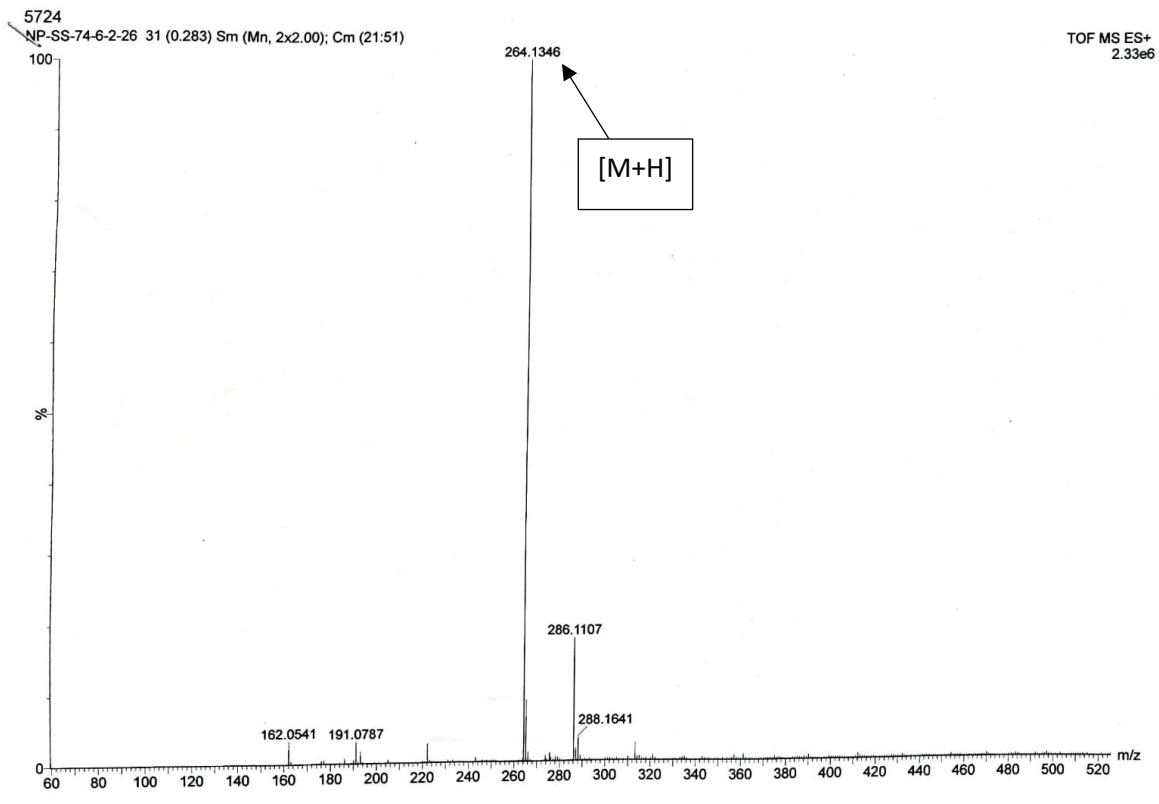


Figure S94. HRMS of compound **2ze**.

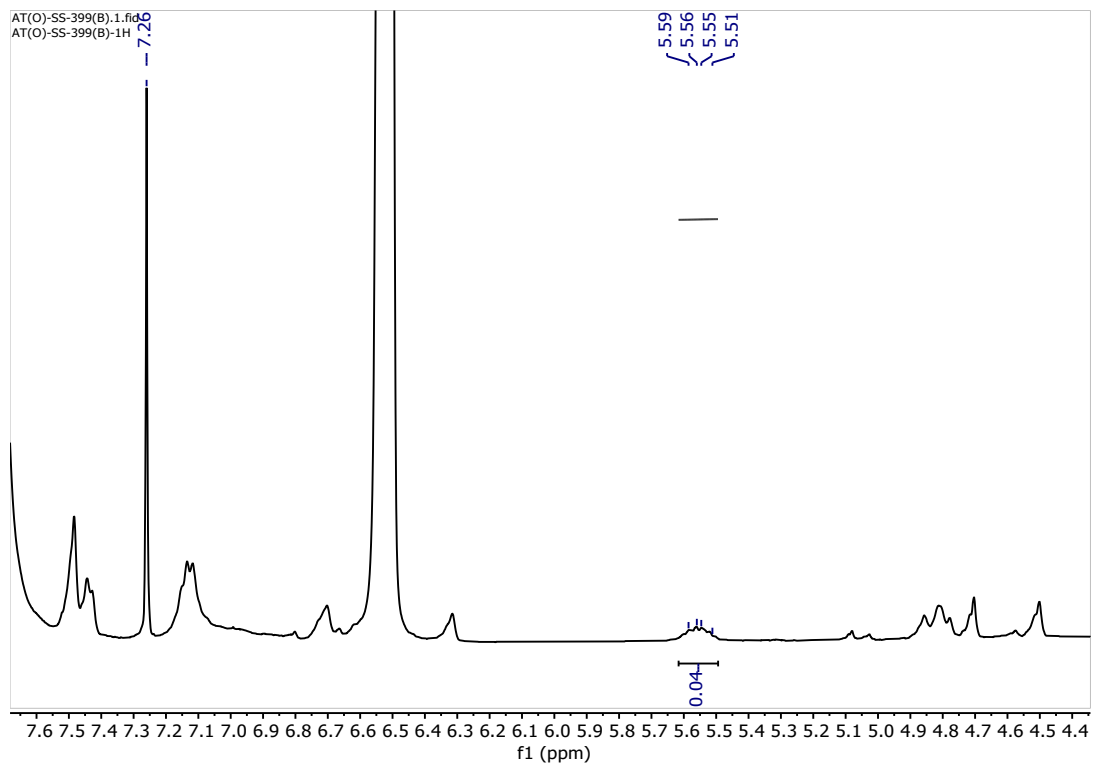
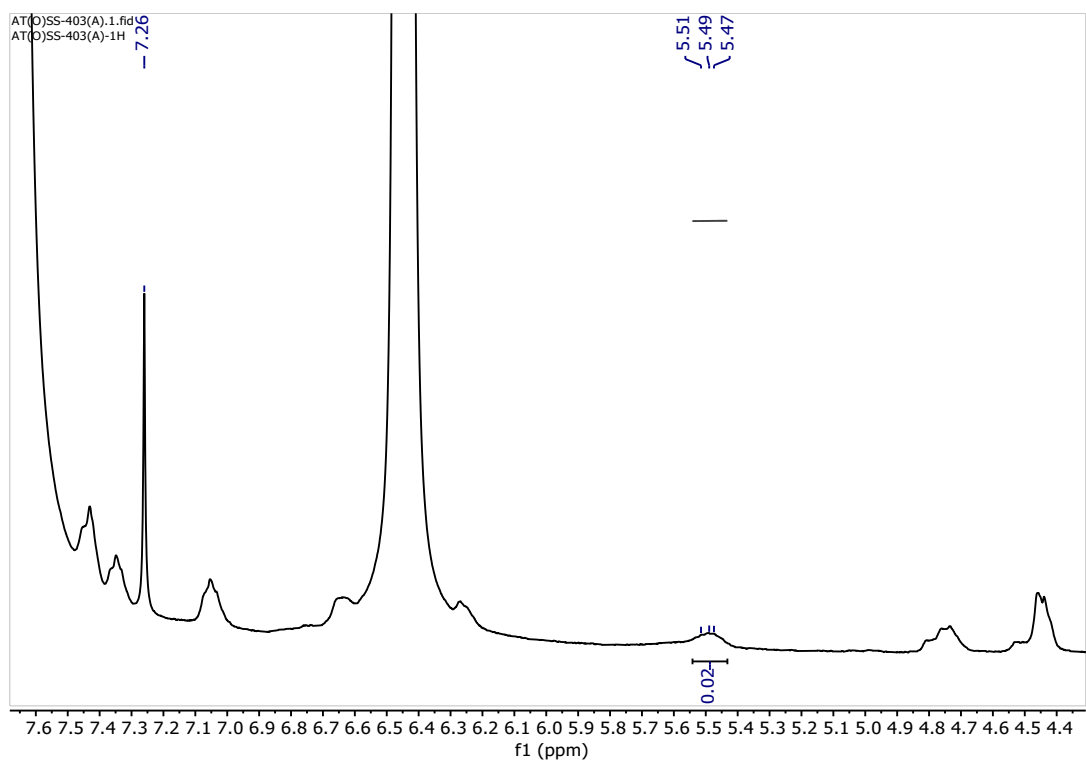


Figure S95. ^1H NMR for Hammett analysis between **2b** and **2a**.

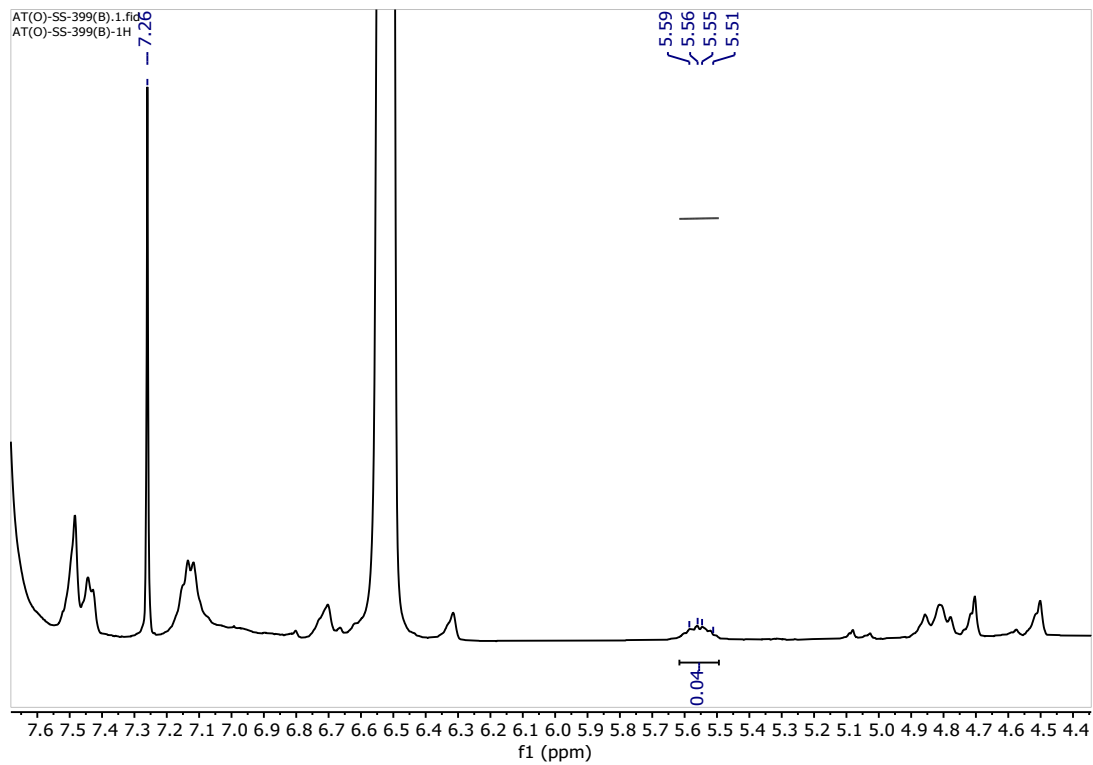
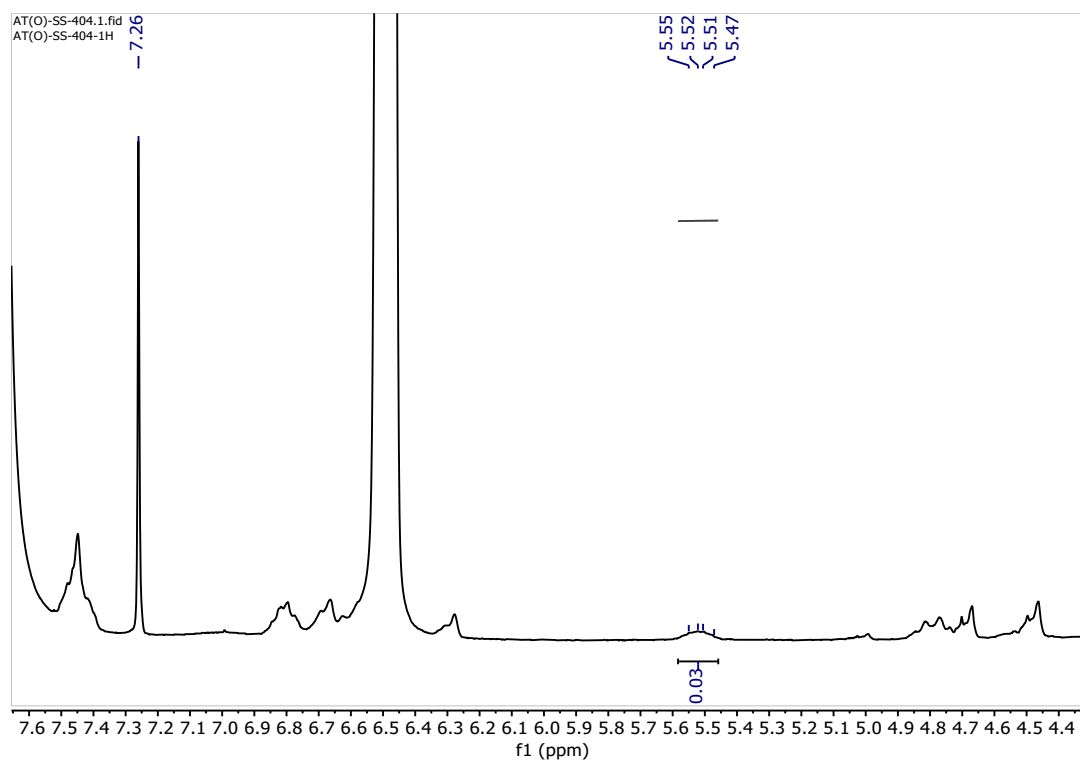


Figure S96. ^1H NMR for Hammett analysis between **2c** and **2a**.

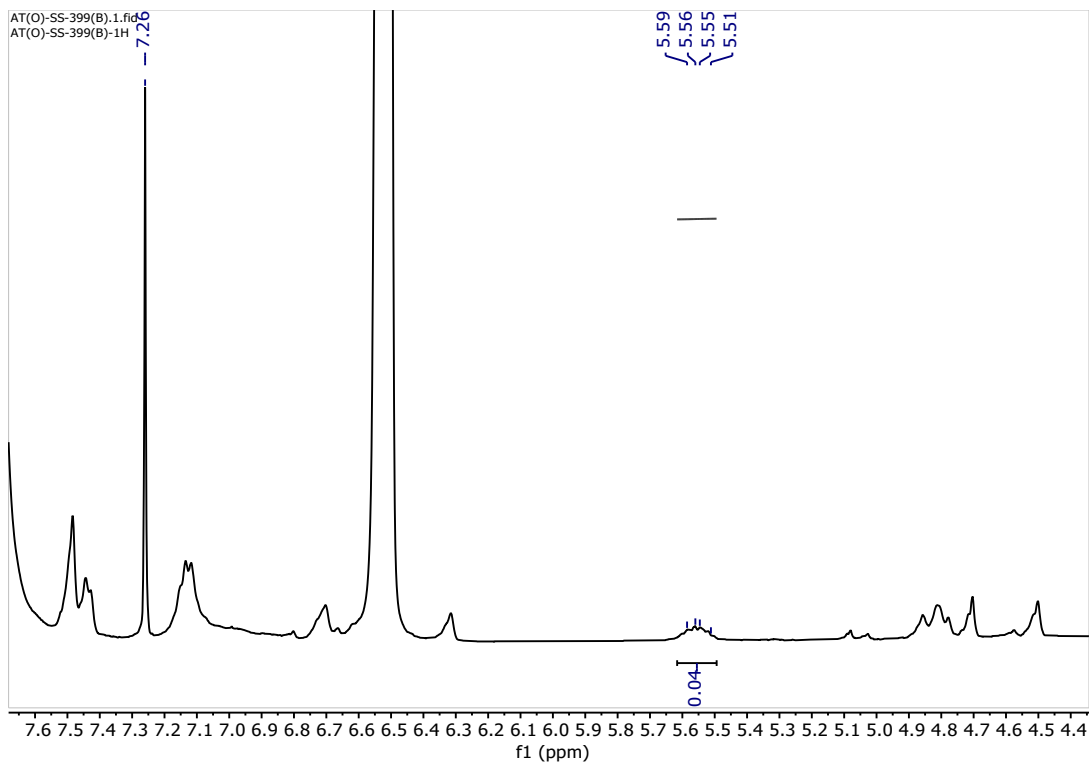
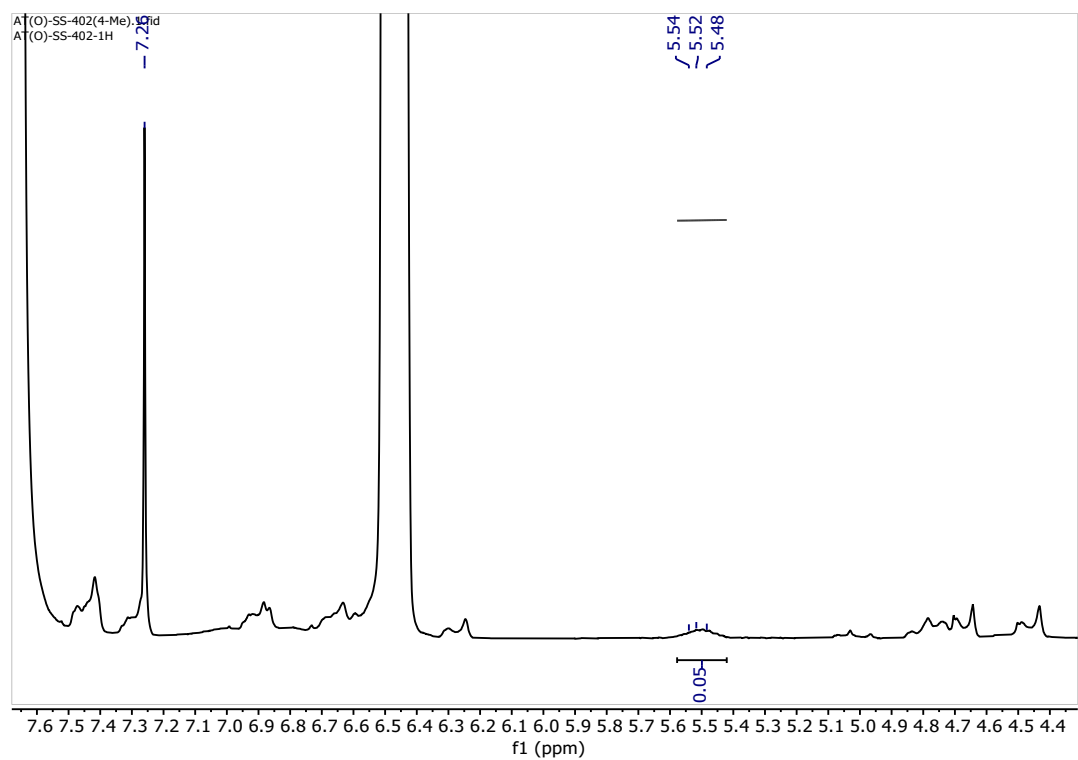


Figure S97. ¹H NMR for Hammett analysis between **2g** and **2a**.

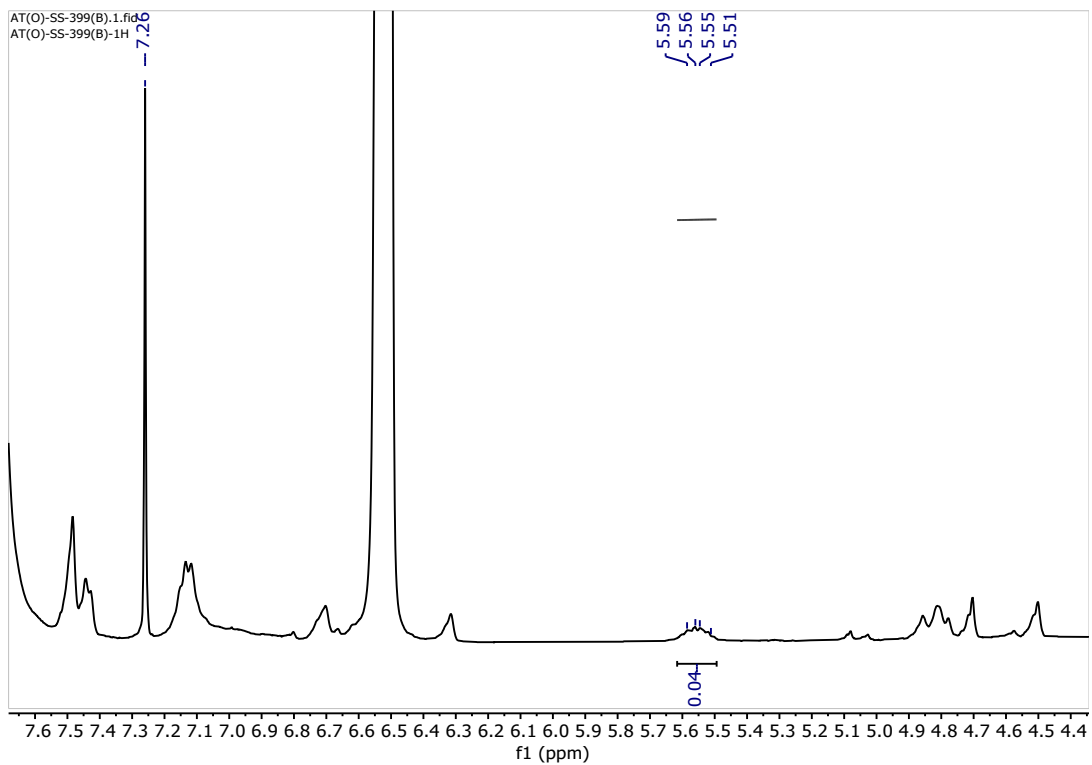
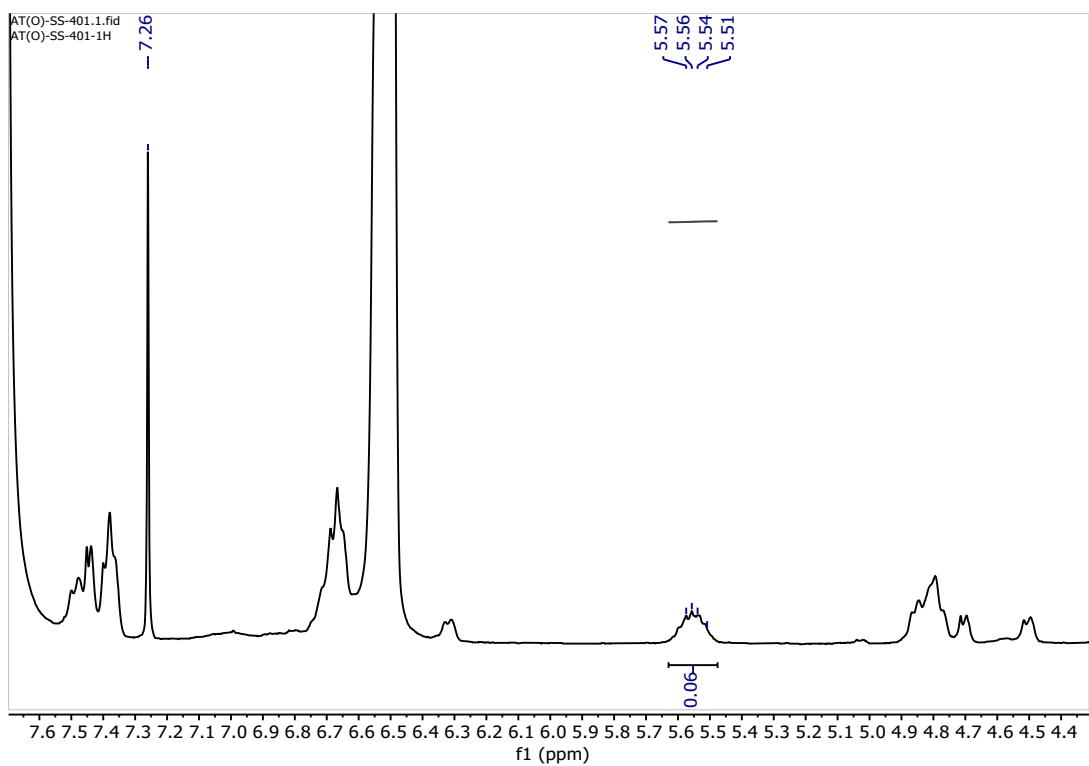


Figure S98. ^1H NMR for Hammett analysis between **2h** and **2a**.

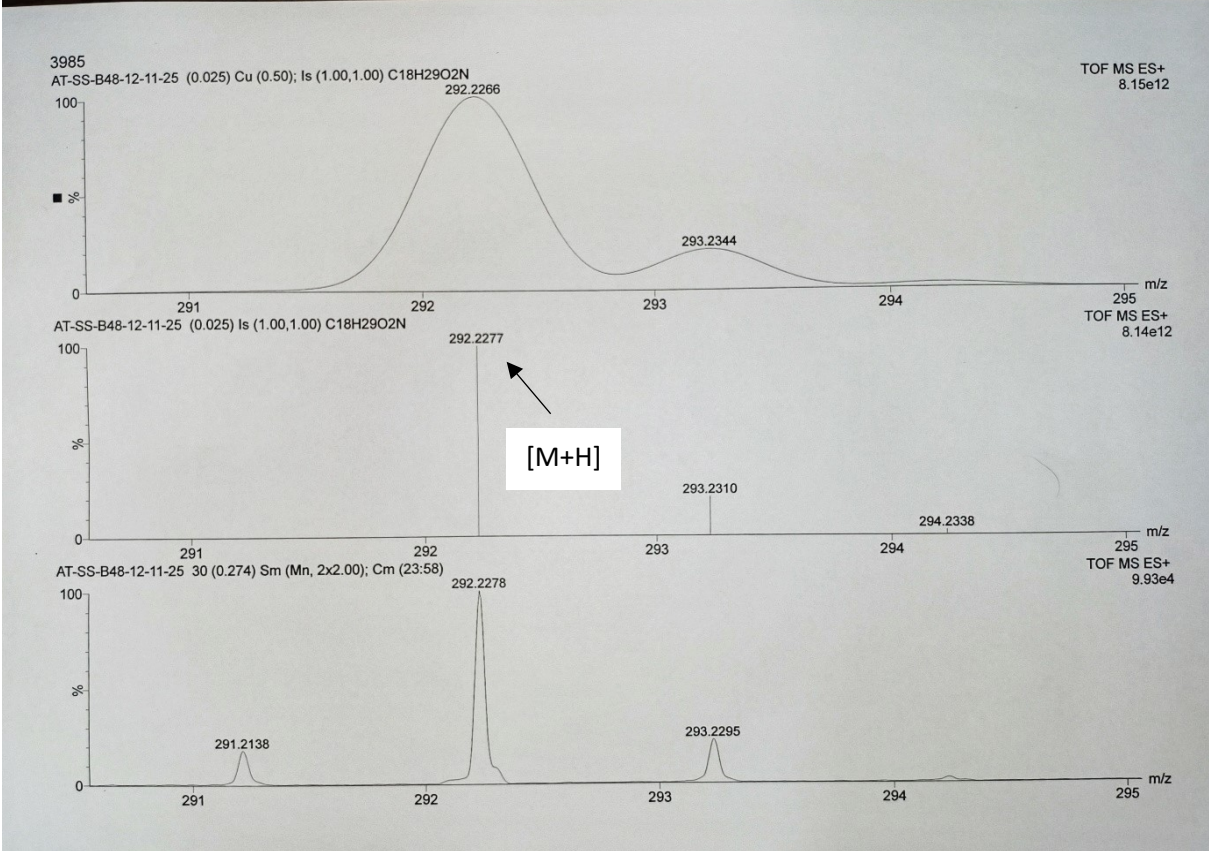
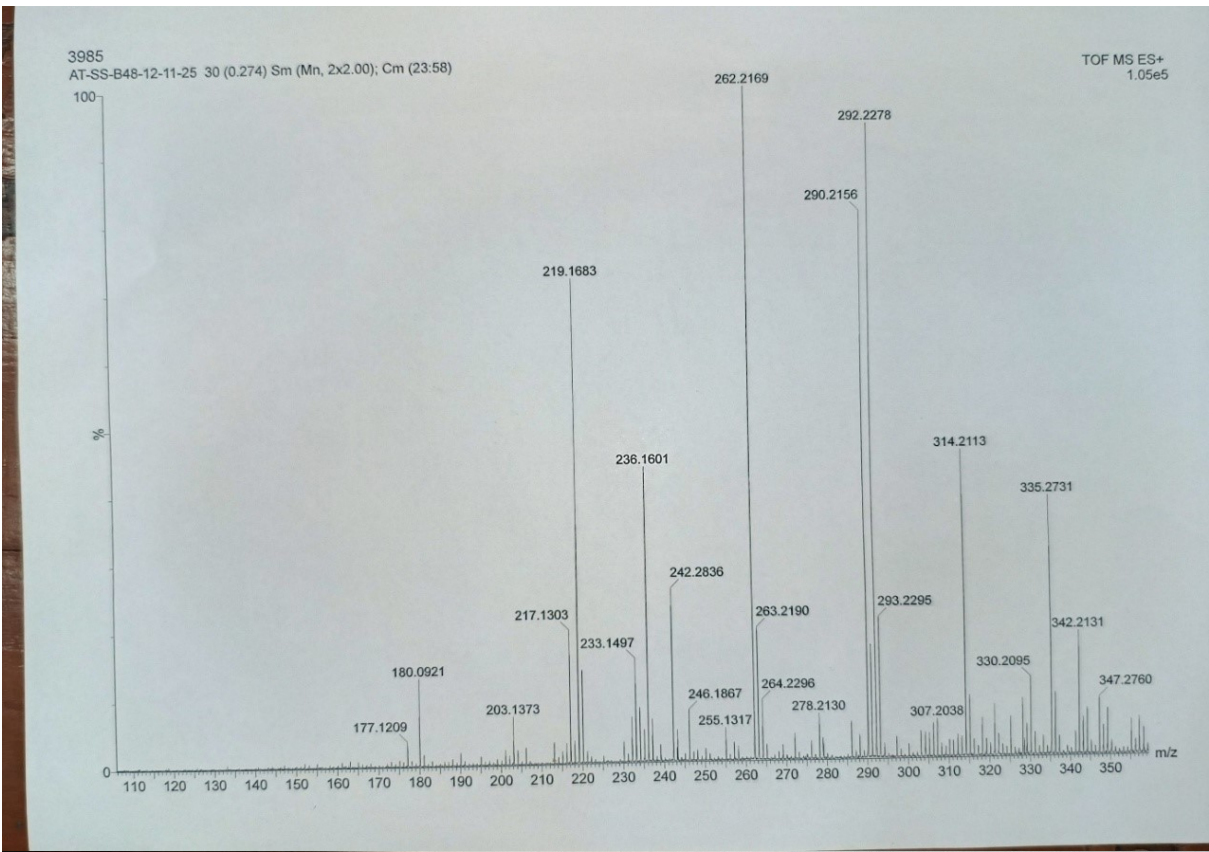


Figure S99. HRMS of BHT radical adduct 3

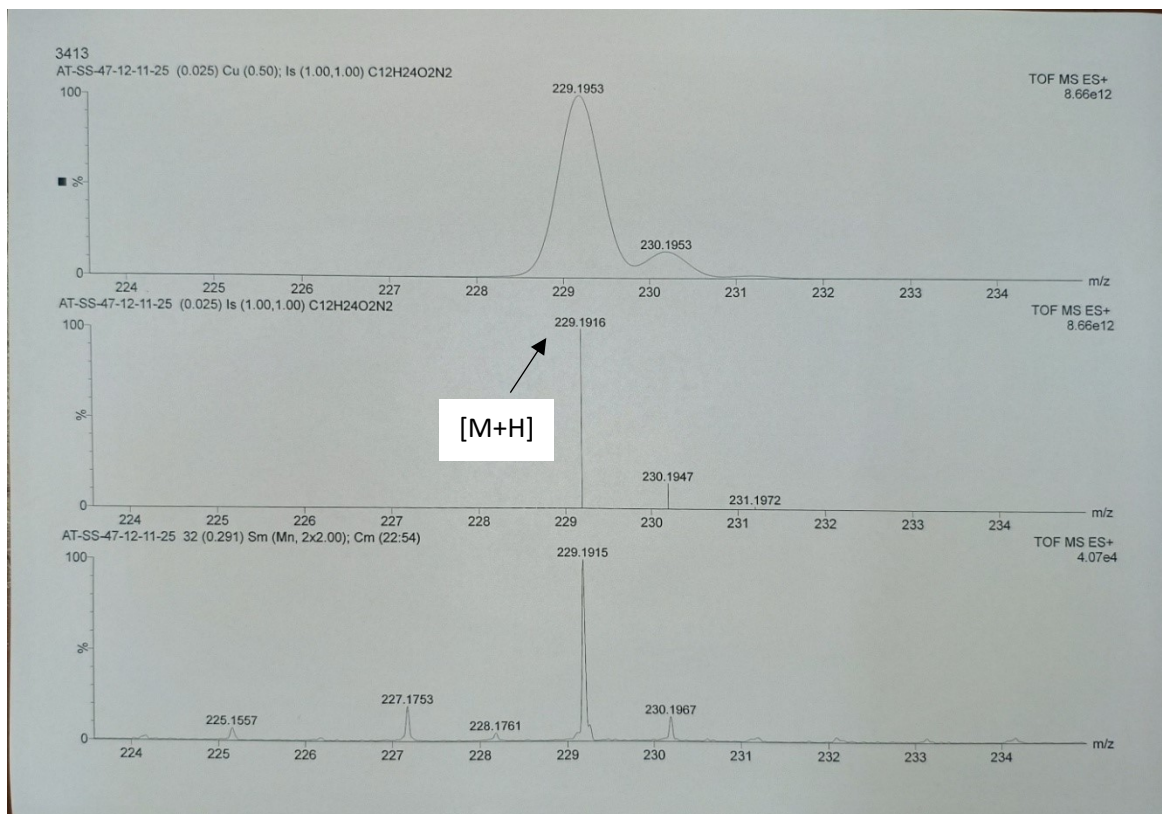
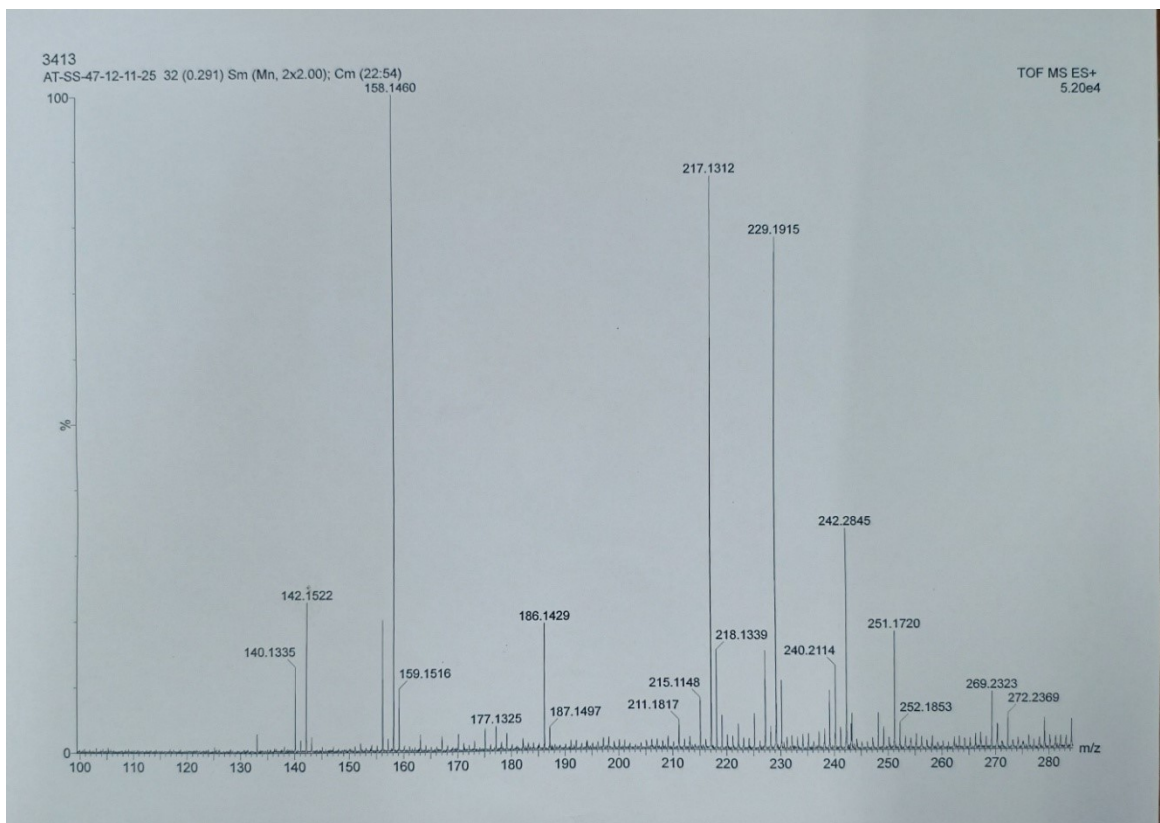


Figure S100. HRMS of TEMPO radical adduct 4