



Supporting Information

for

One-pot four-component sequential synthesis of S-alkyl dithiocarbamates using lipase as a biocatalyst

Mansour Shahedi, Pargol Tahmasebi pour and Zohreh Habibi

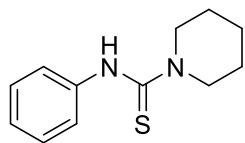
Beilstein J. Org. Chem. **2026**, 22, 1048–1056. [doi:10.3762/bjoc.22.83](https://doi.org/10.3762/bjoc.22.83)

Product characterization data and copies of NMR and MS spectra

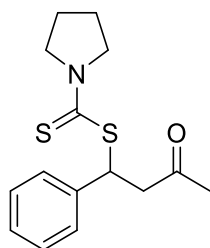
Table of contents

Characterization data for products:.....	S2
^1H NMR, ^{13}C NMR { ^1H } and mass spectra.....	S10

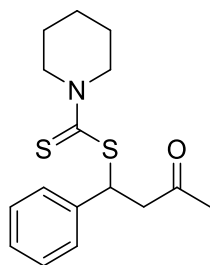
Characterization data for products:



N-Phenylpiperidine-1-carbothioamide [1], amorphous solid (white), ^1H NMR (300 MHz, chloroform-*d*) δ 7.38 – 7.27 (m, 2H), 7.13 (m, 3H), 3.78 (s, 4H), 1.67 (s, 6H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 182.7, 140.3, 129.1, 124.8, 122.6, 50.9, 25.5, 24.1.

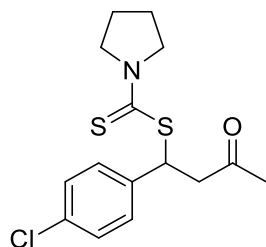


3-Oxo-1-phenylbutyl pyrrolidine-1-carbodithioate (6a) [2], yellow oil, isolated yield (96%, 28 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), ^1H NMR (300 MHz, chloroform-*d*) δ 7.49 – 7.38 (m, 2H), 7.38 – 7.22 (m, 3H), 5.62 (dd, $J = 9.9, 5.0$ Hz, 1H), 3.92 (t, $J = 6.8$ Hz, 2H), 3.68 – 3.45 (m, 3H), 3.18 (dd, $J = 16.4, 9.9$ Hz, 1H), 2.15 (s, 3H), 2.03 (m, 4H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 205.7, 191.0, 139.2, 128.7, 128.2, 127.7, 54.9, 50.5, 50.3, 49.9, 29.8, 26.0, 24.2. MS: (EI, 70 eV): $m/z = 293$ [M^+], Anal. Calcd for $\text{C}_{15}\text{H}_{19}\text{NOS}_2$: C 61.40; H 6.53; N 4.77; Found: C 61.15; H 6.13; N 4.70.

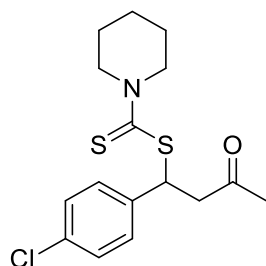


3-Oxo-1-phenylbutyl piperidine-1-carbodithioate (6b) [3], yellow oil, isolated yield (87% 26.72 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), ^1H NMR (300 MHz, chloroform-*d*) δ 7.46 – 7.37 (m, 2H), 7.34 – 7.25 (m, 3H), 5.58 (dd, $J = 10.1, 4.6$ Hz, 1H), 4.27 (d, $J = 33.0$ Hz, 2H), 3.83 (s, 2H), 3.54 (dd, $J = 16.3, 4.6$ Hz, 1H), 3.18 (dd, $J = 16.3, 10.2$ Hz, 1H), 2.14 (d, $J = 1.5$ Hz, 3H), 1.69 (s, 6H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 205.7, 190.9,

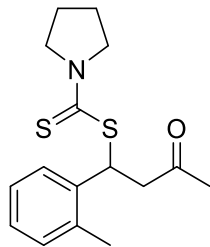
139.2, 128.7, 128.2, 127.7, 54.9, 50.5, 50.3, 49.9, 29.8, 26.0, 24.2. MS: (EI, 70 eV): $m/z = 307$ [M^+], Anal. Calcd for $C_{16}H_{21}NOS_2$: C 62.50; H 6.83; N 4.56; Found: C 62.55; H 6.61; N 4.40.



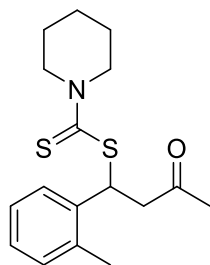
1-(4-Chlorophenyl)-3-oxobutyl pyrrolidine-1-carbodithioate (6c), brown oil, isolated yield (78%, 25.57 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), 1H NMR (300 MHz, chloroform-*d*) δ 7.37 (d, $J = 8.4$ Hz, 2H), 7.28 (d, $J = 8.5$ Hz, 2H), 5.59 (dd, $J = 9.7$, 5.0 Hz, 1H), 3.91 (t, $J = 6.9$ Hz, 2H), 3.57 (d, $J = 7.7$ Hz, 2H), 3.46 (dd, $J = 16.4$, 4.7 Hz, 1H), 3.14 (dd, $J = 16.7$, 9.7 Hz, 1H), 2.14 (s, 3H), 2.10 – 2.04 (m, 2H), 2.01 – 1.93 (m, 2H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 205.4, 190.5, 138.2, 133.4, 129.7, 128.8, 55.0, 50.6, 49.4, 46.42, 29.9, 26.0, 24.2. MS: (EI, 70 eV): $m/z = 328$ [M^+], Anal. Calcd for $C_{15}H_{18}ClNOS_2$: C 54.95; H 5.53; N 4.27; Found: C 54.56; H 5.19; N 4.01.



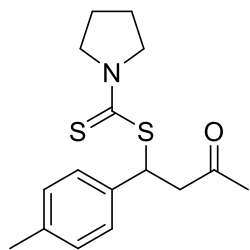
1-(4-Chlorophenyl)-3-oxobutyl piperidine-1-carbodithioate (6d), brown oil, isolated yield (72%, 24.61 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), 1H NMR (300 MHz, chloroform-*d*) δ 7.37 (d, $J = 8.1$ Hz, 3H), 7.29 (d, $J = 7.8$ Hz, 2H), 5.56 (m, 1H), 4.26 (m, 2H), 3.85 (m, 2H), 3.49 (dd, $J = 16.7$, 4.7 Hz, 1H), 3.14 (dd, $J = 16.7$, 4.5 Hz, 1H), 2.14 (s, 3H), 1.68 (s, 6H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 207.1, 198.2, 141.9, 136.4, 129.8, 129.4, 129.2, 128.8, 127.4, 50.9, 31.0, 27.7, 22.5. MS: (EI, 70 eV): $m/z = 341$ [M^+], Anal. Calcd for $C_{16}H_{20}ClNOS_2$: C 56.21; H 5.90; N 4.10; Found: C 56.13; H 5.83; N 4.20.



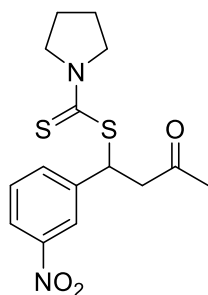
3-Oxo-1-(*o*-tolyl)butyl pyrrolidine-1-carbodithioate (6e), yellow oil, isolated yield (92%, 28.61 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), ^1H NMR (300 MHz, chloroform-*d*) δ 7.30 (d, $J = 8.4$ Hz, 1H), 7.19 (m, 3H), 5.71 (dd, $J = 10.8, 4.5$ Hz, 1H), 3.94 (t, $J = 6.8$ Hz, 2H), 3.67 – 3.45 (m, 3H), 3.29 (dd, $J = 16.5, 10.7$ Hz, 1H), 2.51 (s, 3H), 2.11 (s, 3H), 2.08 – 1.91 (m, 4H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 206.0, 191.3, 137.0, 136.3, 130.9, 127.8, 126.9, 126.1, 60.4, 54.8, 50.5, 49.3, 46.7, 29.6, 26.0, 24.2, 21.1, 19.7, 14.2. MS: (EI, 70 eV): $m/z = 307$ [M^+], Anal. Calcd for $\text{C}_{16}\text{H}_{21}\text{NOS}_2$: C 62.50; H 6.88; N 4.56; Found: C 62.35; H 6.63; N 4.49.



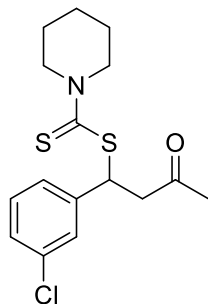
3-Oxo-1-(*o*-tolyl)butyl piperidine-1-carbodithioate (6f), yellow oil, isolated yield (84%, 27.31 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), ^1H NMR (300 MHz, chloroform-*d*) δ 7.28 (s, 2H), 7.20 (m, 2H), 5.70 (dd, $J = 10.9, 4.4$ Hz, 1H), 4.29 (s, 2H), 3.82 (s, 2H), 3.55 (dd, $J = 16.5, 4.4$ Hz, 1H), 3.29 (dd, $J = 16.5, 10.9$ Hz, 1H), 2.51 (s, 3H), 2.12 (s, 3H), 1.72 (s, 6H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 206.0, 194.1, 137.1, 136.3, 130.9, 127.8, 126.9, 126.1, 49.4, 47.5, 29.6, 24.2, 19.8. MS: (EI, 70 eV): $m/z = 321$ [M^+], Anal. Calcd for $\text{C}_{17}\text{H}_{23}\text{NOS}_2$: C 63.51; H 7.21; N 4.36; Found: C 63.37; H 7.33; N 4.10.



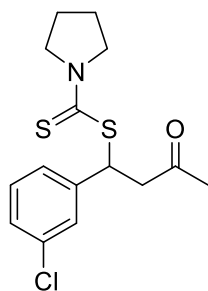
3-Oxo-1-(*p*-tolyl)butyl pyrrolidine-1-carbodithioate (6g), yellow oil, isolated yield (85%, 26.43 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), ^1H NMR (300 MHz, chloroform-*d*) δ 7.31 (d, $J = 7.8$ Hz, 2H), 7.13 (d, $J = 7.6$ Hz, 2H), 5.56 (dd, $J = 10.1, 5.0$ Hz, 1H), 3.92 (t, $J = 6.8$ Hz, 2H), 3.62 – 3.45 (m, 3H), 3.16 (dd, $J = 16.2, 10.2$ Hz, 1H), 2.32 (s, 3H), 2.14 (s, 3H), 2.01 (dq, $J = 19.5, 6.7$ Hz, 4H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 205.9, 191.1, 137.6, 136.0, 129.4, 128.1, 54.8, 50.5, 50.1, 49.9, 29.8, 26.0, 24.2, 21.1. MS: (EI, 70 eV): $m/z = 307$ [M^+], Anal. Calcd for $\text{C}_{16}\text{H}_{21}\text{NOS}_2$: C 62.50; H 6.88; N 4.56; Found: C 62.41; H 6.52; N 4.29.



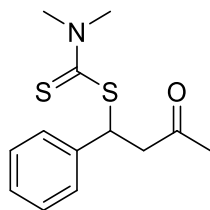
1-(3-Nitrophenyl)-3-oxobutyl pyrrolidine-1-carbodithioate (6h), brown oil, isolated yield (69%, 23.36 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 8:1), ^1H NMR (300 MHz, chloroform-*d*) δ 8.28 (s, 1H), 8.11 (d, $J = 8.5$ Hz, 1H), 7.84 (d, $J = 7.9$ Hz, 1H), 7.50 (q, $J = 8.0, 6.9$ Hz, 1H), 5.73 (dd, $J = 9.2, 5.1$ Hz, 1H), 3.91 (t, $J = 6.9$ Hz, 2H), 3.61 (t, $J = 6.9$ Hz, 2H), 3.48 (dd, $J = 17.4, 5.1$ Hz, 1H), 3.23 (dd, $J = 17.4, 9.2$ Hz, 1H), 2.17 (s, 3H), 2.13 – 1.97 (m, 4H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 204.7, 189.7, 148.2, 142.5, 135.2, 129.3, 123.1, 122.6, 55.1, 50.6, 49.3, 49.1, 30.0, 26.0, 24.2. MS: (EI, 70 eV): $m/z = 338$ [M^+], Anal. Calcd for $\text{C}_{15}\text{H}_{18}\text{N}_2\text{O}_3\text{S}_2$: C 53.23; H 5.36; N 8.28; Found: C 53.11; H 5.22; N 8.29.



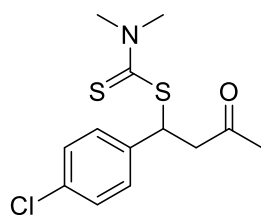
1-(3-Chlorophenyl)-3-oxobutyl piperidine-1-carbodithioate (6i), brown oil, isolated yield (81%, 28.7 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 8:1), ¹H NMR (300 MHz, chloroform-*d*) δ 7.41 (s, 1H), 7.27 (m, 3H), 5.58 (dd, *J* = 9.9, 4.8 Hz, 1H), 4.47 – 4.14 (m, 2H), 3.84 (s, 2H), 3.49 (dd, *J* = 16.8, 4.8 Hz, 1H), 3.15 (dd, *J* = 16.8, 9.9 Hz, 1H), 2.16 (s, 3H), 1.71 (s, 6H). ¹³C NMR (75 MHz, chloroform-*d*) δ 205.3, 193.1, 141.6, 134.4, 129.8, 128.5, 127.9, 126.7, 50.4, 49.80, 29.9, 24.2. MS: (EI, 70 eV): *m/z* = 341 [*M*⁺], Anal. Calcd for C₁₆H₂₀ClNOS₂: C 52.21; H 5.90; N 4.10; Found: C 52.01; H 5.97; N 4.02.



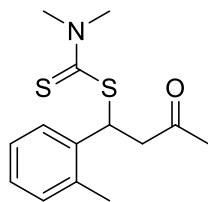
1-(3-Chlorophenyl)-3-oxobutyl pyrrolidine-1-carbodithioate (6j), brown oil, isolated yield (88%, 29.9 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 8:1), ¹H NMR (300 MHz, chloroform-*d*) δ 7.40 (s, 1H), 7.37 – 7.18 (m, 4H), 5.60 (dd, *J* = 9.5, 5.1 Hz, 1H), 3.91 (t, *J* = 6.9 Hz, 2H), 3.58 (t, *J* = 6.5 Hz, 2H), 3.45 (dd, *J* = 16.8, 5.1 Hz, 1H), 3.15 (dd, *J* = 16.9, 9.5 Hz, 1H), 2.15 (s, 3H), 2.10 – 1.94 (m, 4H). ¹³C NMR (75 MHz, chloroform-*d*) δ 205.2, 190.4, 141.8, 134.3, 129.8, 128.4, 127.9, 126.6, 55.0, 50.6, 49.6, 49.6, 29.9, 26.0, 24.2. MS: (EI, 70 eV): *m/z* = 327 [*M*⁺], Anal. Calcd for C₁₅H₁₈ClNOS₂: C 54.95; H 5.53; N 4.27; Found: C 54.91; H 5.22; N 4.54.



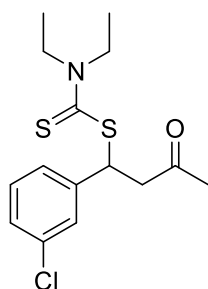
3-Oxo-1-phenylbutyl dimethylcarbamodithioate (6k), yellow oil, isolated yield (90%, 24.06 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), ¹H NMR (300 MHz, chloroform-*d*) δ 7.42 (d, *J* = 6.6 Hz, 2H), 7.32 (dd, *J* = 15.1, 7.9 Hz, 3H), 5.54 (dd, *J* = 10.0, 4.9 Hz, 1H), 3.52 (d, *J* = 16.9 Hz, 4H), 3.32 (s, 3H), 3.18 (dd, *J* = 16.3, 10.0 Hz, 1H), 2.15 (s, 3H). ¹³C NMR (75 MHz, chloroform-*d*) δ 205.7, 195.3, 139.0, 128.7, 128.3, 127.8, 51.5, 49.8, 45.2, 41.4, 29.8. MS: (EI, 70 eV): *m/z* = 267 [*M*⁺], Anal. Calcd for C₁₃H₁₇NOS₂: C 58.39; H 6.41; N 4.24; Found: C 58.61; H 6.09; N 4.68.



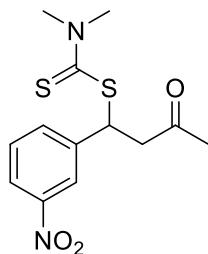
1-(4-Chlorophenyl)-3-oxobutyl dimethylcarbamodithioate (6l), brown oil, isolated yield (85%, 27.2 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 8:1), ¹H NMR (300 MHz, chloroform-*d*) δ 7.38 (d, *J* = 8.3 Hz, 2H), 7.30 (d, *J* = 8.3 Hz, 2H), 5.52 (dd, *J* = 9.8, 5.0 Hz, 1H), 3.54 (s, 3H), 3.47 (dd, *J* = 16.9, 4.8 Hz, 1H), 3.33 (s, 3H), 3.14 (dd, *J* = 16.8, 9.8 Hz, 1H), 2.15 (s, 3H). ¹³C NMR (75 MHz, chloroform-*d*) δ 205.30, 133.5, 129.7, 128.8, 77.4, 77.0, 76.6, 50.7, 49.6, 45.2, 41.4, 29.9. MS: (EI, 70 eV): *m/z* = 301.04 [*M*⁺], Anal. Calcd for C₁₃H₁₆ClNOS₂: C 51.73; H 5.34; N 4.64; Found: C 51.81; H 5.30; N 4.79.



3-Oxo-1-(*o*-tolyl)butyl dimethylcarbamodithioate (6m), yellow oil, isolated yield (89%, 25.04 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 9:1), ^1H NMR (300 MHz, chloroform-*d*) δ 7.34 – 7.27 (m, 1H), 7.24 – 7.14 (m, 3H), 5.64 (dd, $J = 10.8, 4.5$ Hz, 1H), 3.53 (m, 4H), 3.35 – 3.21 (m, 4H), 2.50 (s, 3H), 2.12 (s, 3H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 205.9, 195.7, 137.1, 136.2, 130.9, 130.2, 127.8, 126.9, 126.4, 126.1, 77.2, 49.1, 48.1, 45.14, 41.3, 29.6, 19.7. MS: (EI, 70 eV): $m/z = 281$ [M^+], Anal. Calcd for $\text{C}_{14}\text{H}_{19}\text{NOS}_2$: C 59.75; H 6.81; N 4.98; Found: C 59.31; H 6.12; N 4.89.



1-(3-Chlorophenyl)-3-oxobutyl diethylcarbamodithioate (6n), brown oil, isolated yield (87%, 29.7 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 8:1), ^1H NMR (300 MHz, chloroform-*d*) δ 7.53 (s, 1H), 7.40 (m, 4H), 5.54 (dd, $J = 9.9, 4.8$ Hz, 1H), 4.02 (m, 4H), 3.47 (dd, $J = 16.8, 4.8$ Hz, 1H), 3.14 (dd, $J = 16.8, 9.9$ Hz, 1H), 2.39 (s, 3H), 1.27 (m, 6H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 205.28, 193.2, 141.6, 134.3, 129.8, 128.1, 127.9, 126.4, 50.3, 49.4, 46.7, 29.9, 27.8, 12.5, 11.6. MS: (EI, 70 eV): $m/z = 329$ [M^+], Anal. Calcd for $\text{C}_{15}\text{H}_{20}\text{ClNOS}_2$: C 54.61; H 6.11; N 4.25; Found: C 54.81; H 6.02; N 4.69.

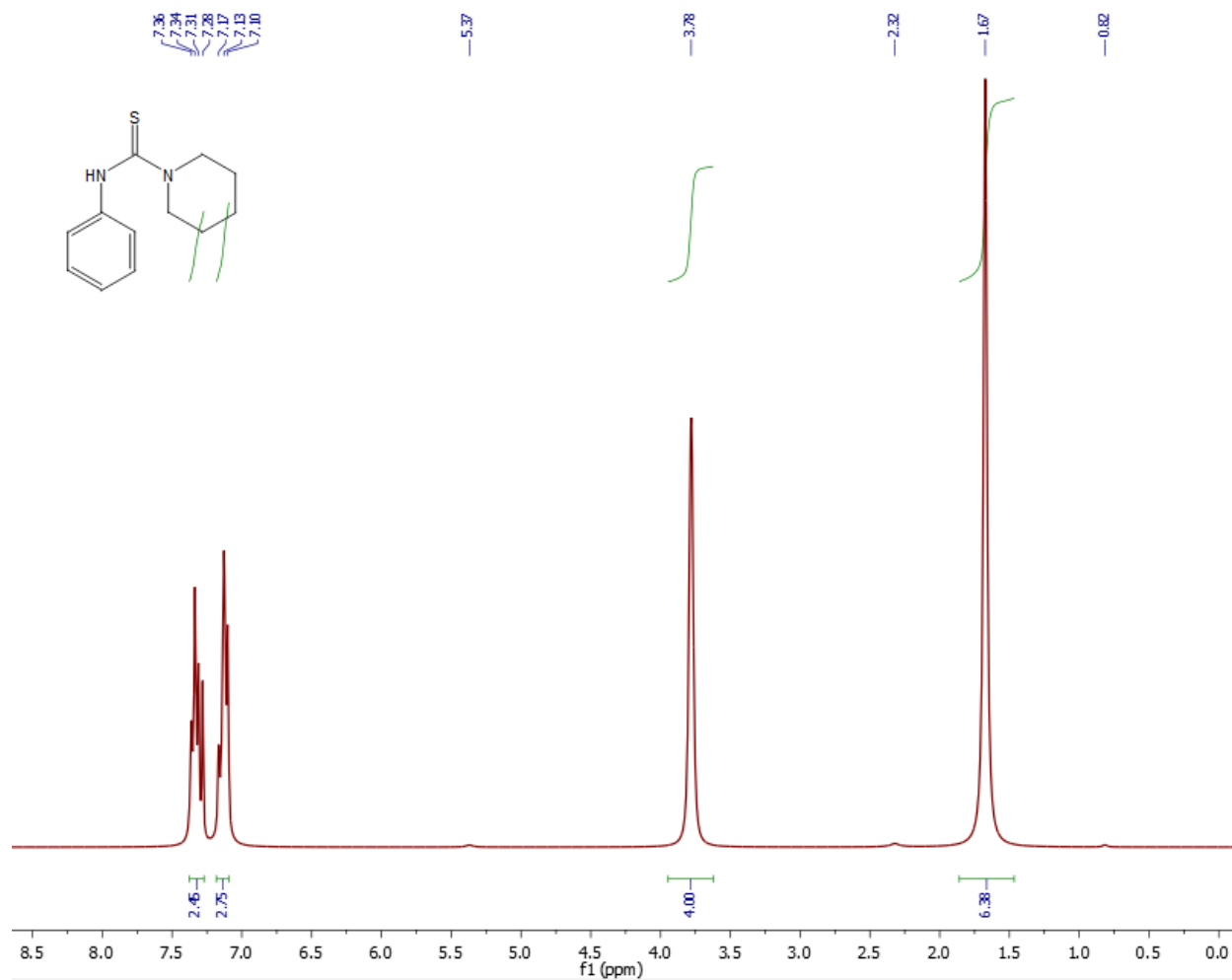


1-(3-Nitrophenyl)-3-oxobutyl dimethylcarbamodithioate (60), brown oil, isolated yield (76%, 26.5 mg), purification by preparative TLC (*n*-hexane/ethyl acetate 8:1), ^1H NMR (300 MHz, chloroform-*d*) δ 8.27 (s, 1H), 8.11 (d, $J = 8.2$ Hz, 1H), 7.83 (d, $J = 7.8$ Hz, 1H), 7.49 (t, $J = 8.0$ Hz, 1H), 5.65 (dd, $J = 9.3, 5.1$ Hz, 1H), 3.48 (m, 4H), 3.34 (s, 3H), 3.22 (dd, $J = 17.4, 9.3$ Hz, 1H), 2.16 (s, 3H). ^{13}C NMR (75 MHz, chloroform-*d*) δ 204.6, 194.1, 148.2, 142.4, 135.2, 129.3, 123.0, 122.6, 77.5, 77.0, 76.6, 50.3, 49.2, 45.4, 41.5, 30.0. MS: (EI, 70 eV): $m/z = 312$ [M^+], Anal. Calcd for $\text{C}_{13}\text{H}_{16}\text{N}_2\text{O}_3\text{S}_2$: C 49.98; H 5.16; N 8.97; Found: C 50.20; H 5.72; N 8.79.

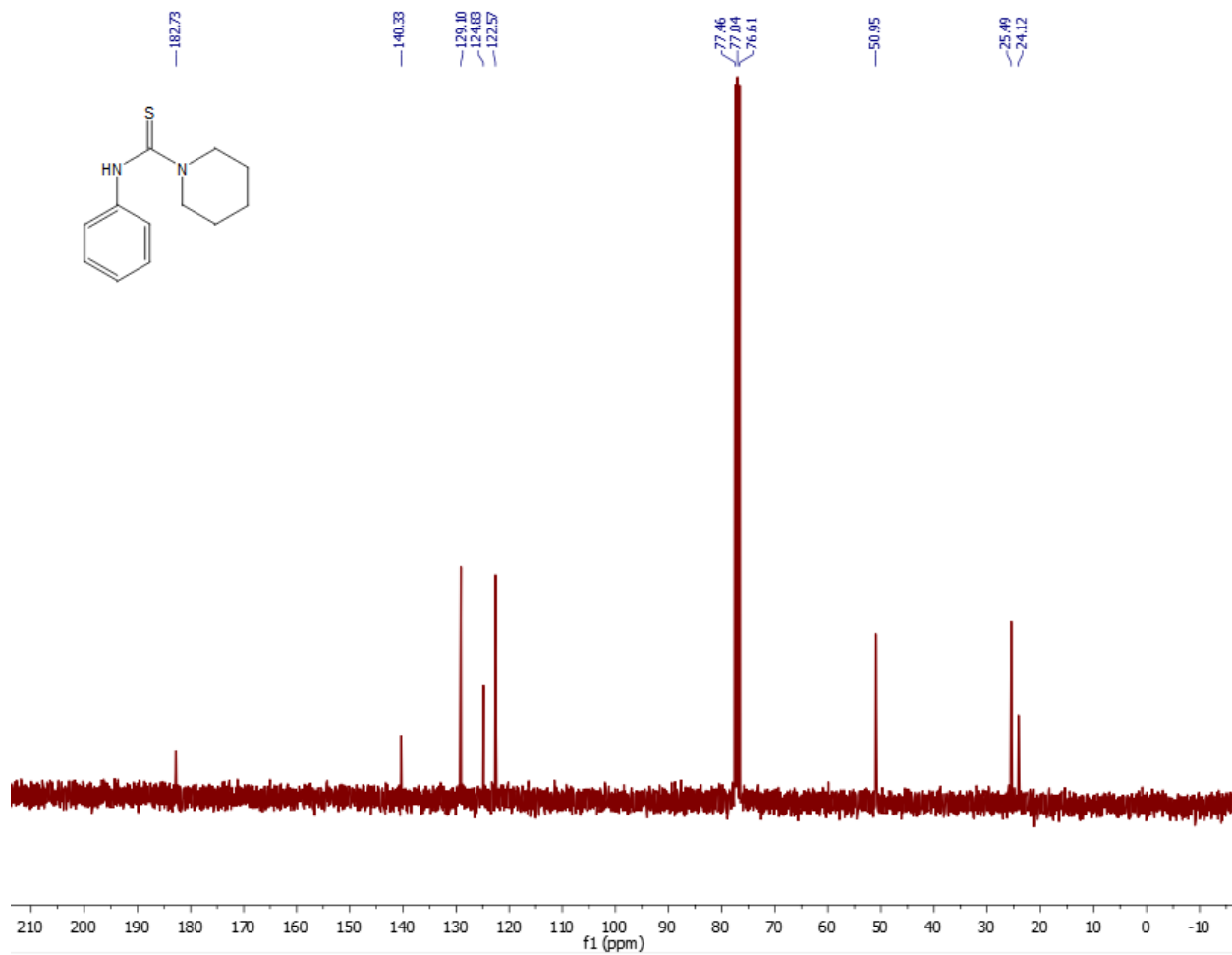
References

- (1) Štrukil, V.; Igrc, M.D.; Fábíán, L.; Eckert-Maksić, M.; Childs, S.L.; Reid, D.G.; Duer, M.J.; Halasz, I.; Mottillo, C.; Frišćić, T. *Green Chem.* **2012**, *14*, 2462.
- (2) Xia, S.; Wang, X.; Ge, Z.M.; Cheng, T.M.; Li, R.T. *Tetrahedron.* **2009**, *65*, 1005.
- (3) Azizi, N.; Gholibeglo, E.; Nayeri, S.D. *Monatsh. fur Chem.* **2012**, *143*, 1171.

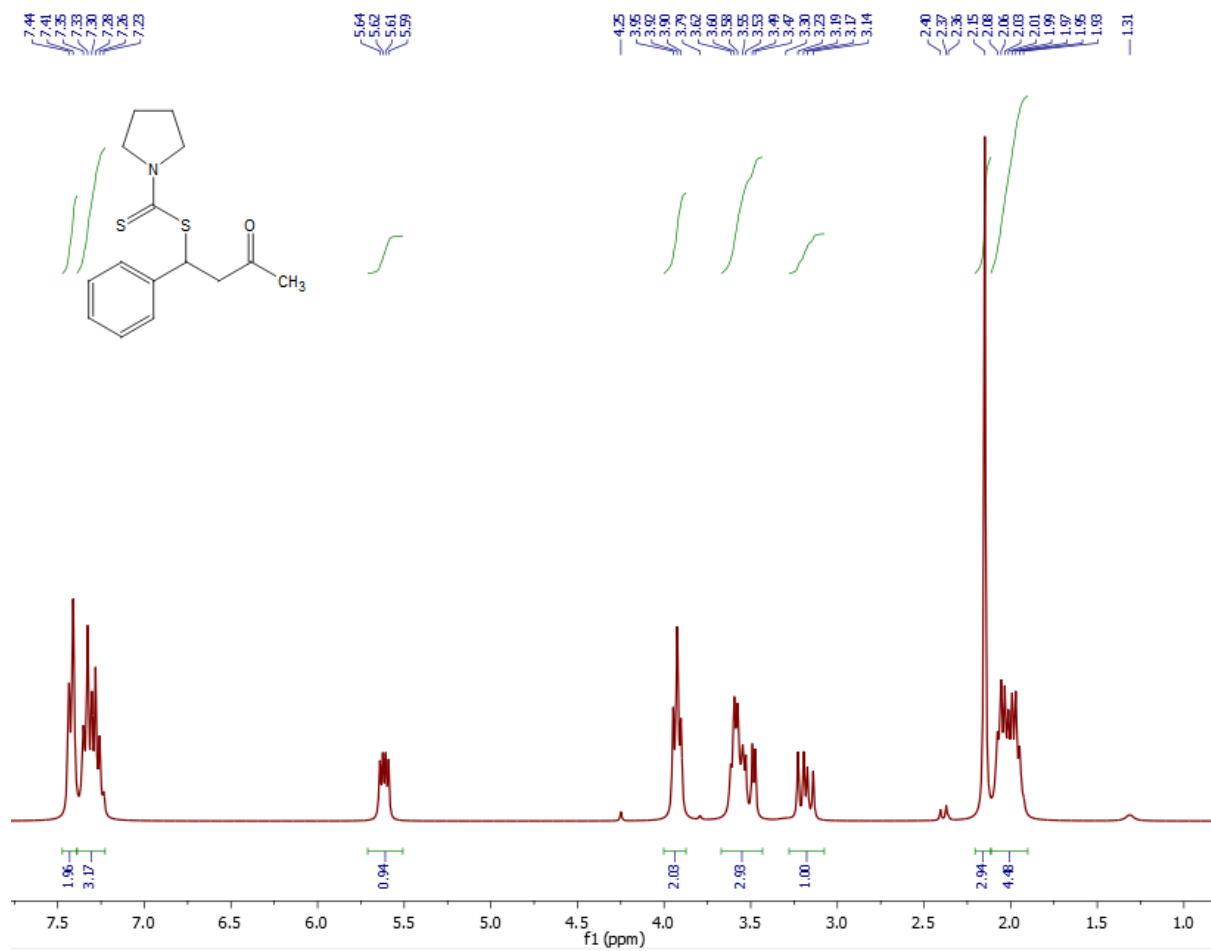
^1H NMR, ^{13}C NMR (^1H) and mass spectra



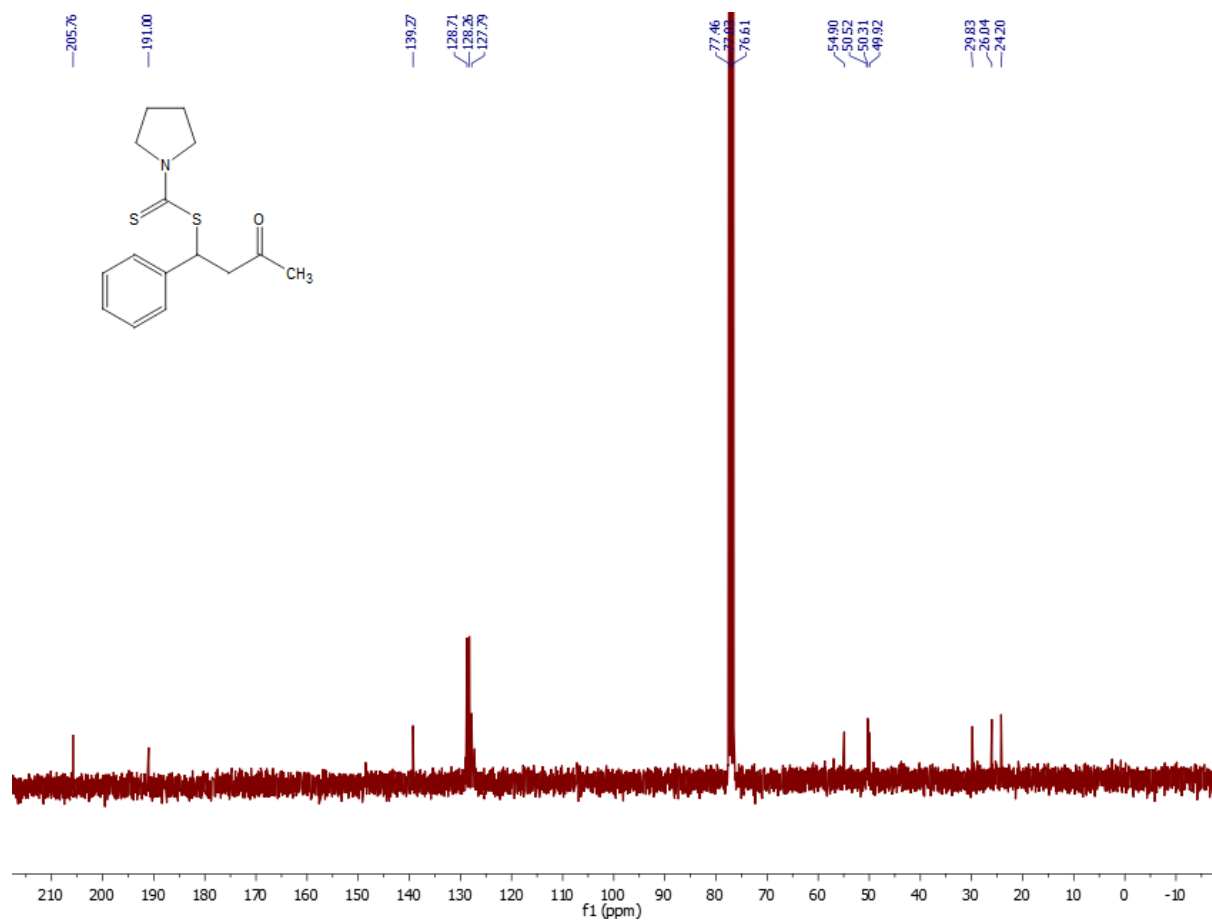
^1H NMR (300 MHz, chloroform-*d*) of thiourea



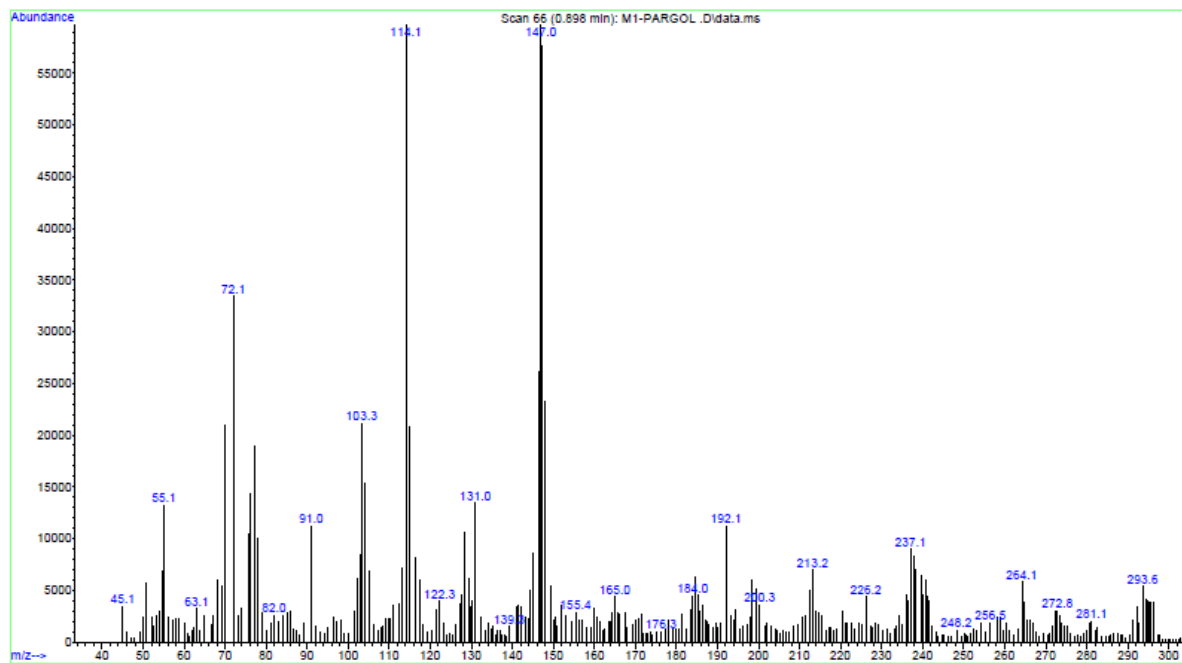
¹³C NMR {¹H} (75 MHz, chloroform-*d*) of thiourea



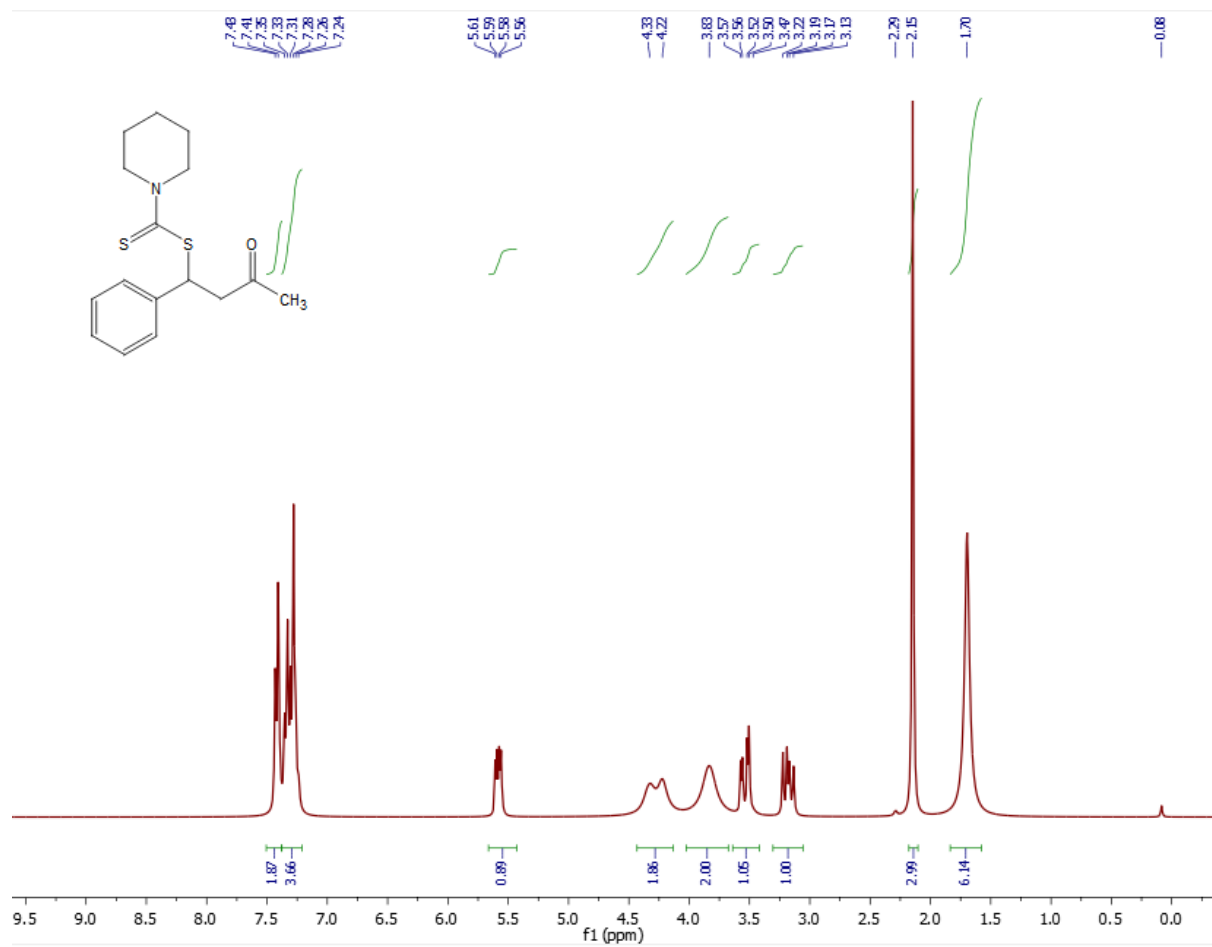
¹H NMR (300 MHz, chloroform-*d*) of compound **6a**



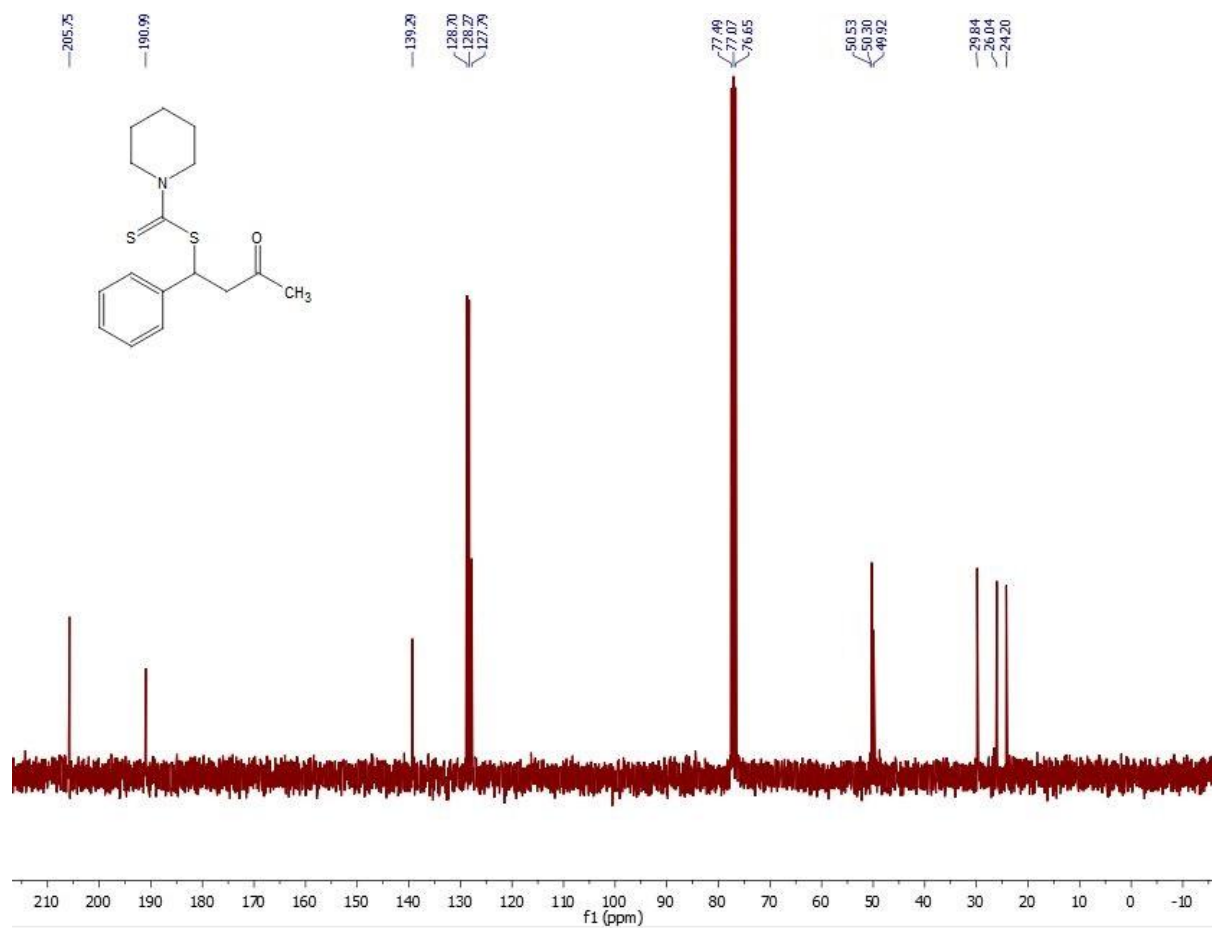
^{13}C NMR (^1H) (75 MHz, CDCl_3) of compound **6a**



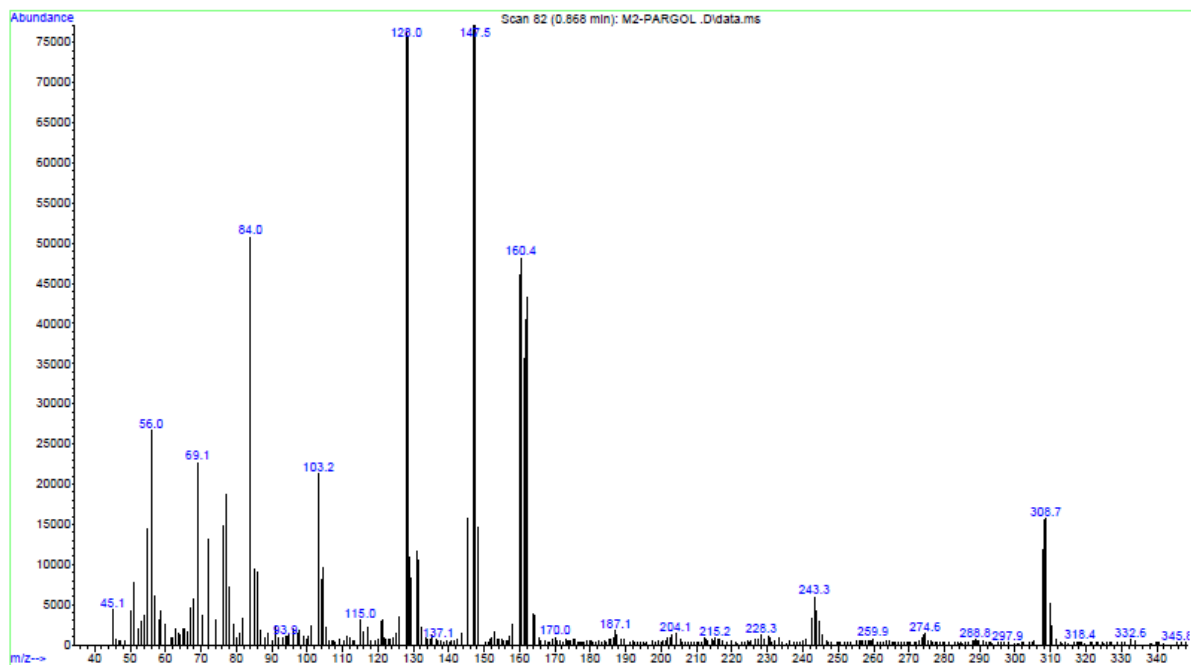
Mass spectrum of compound **6a**



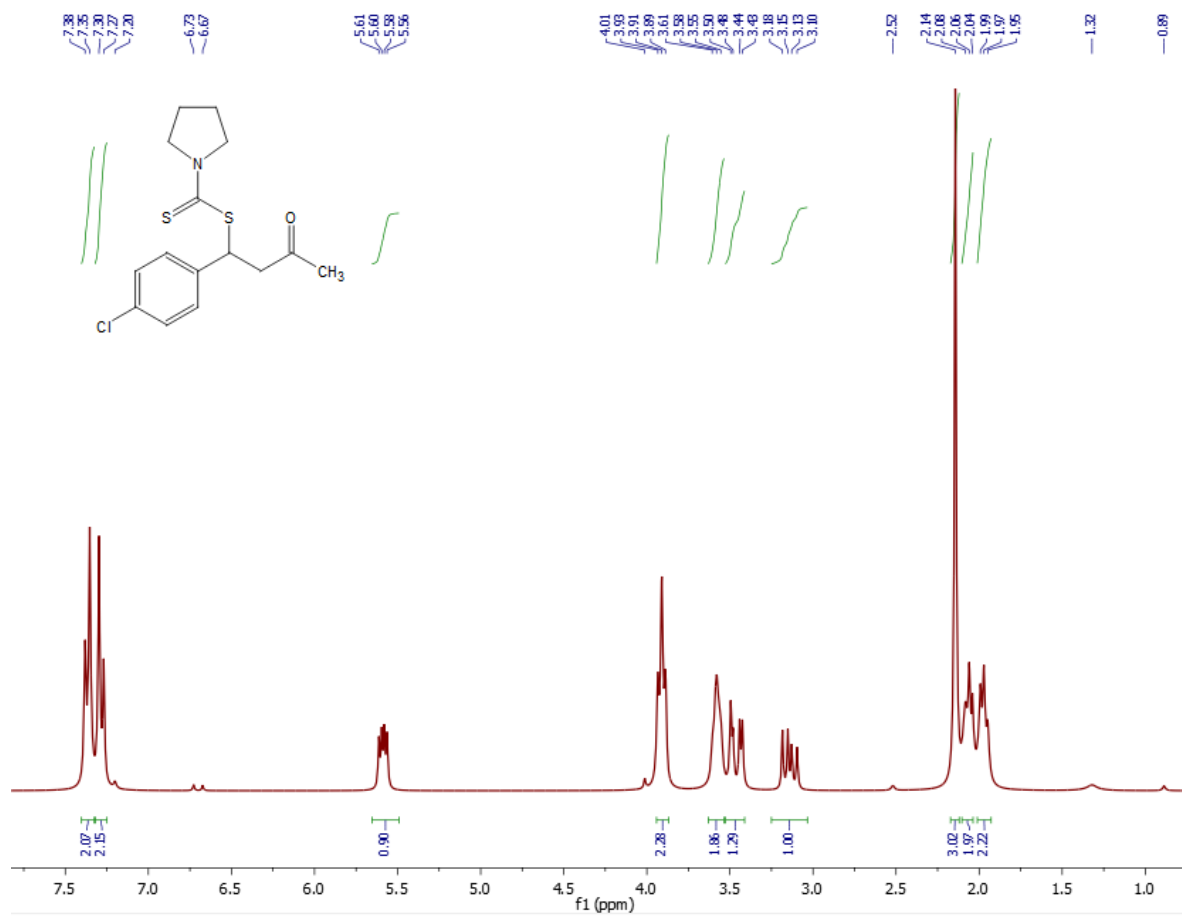
¹H NMR (300 MHz, chloroform-*d*) of compound **6b**



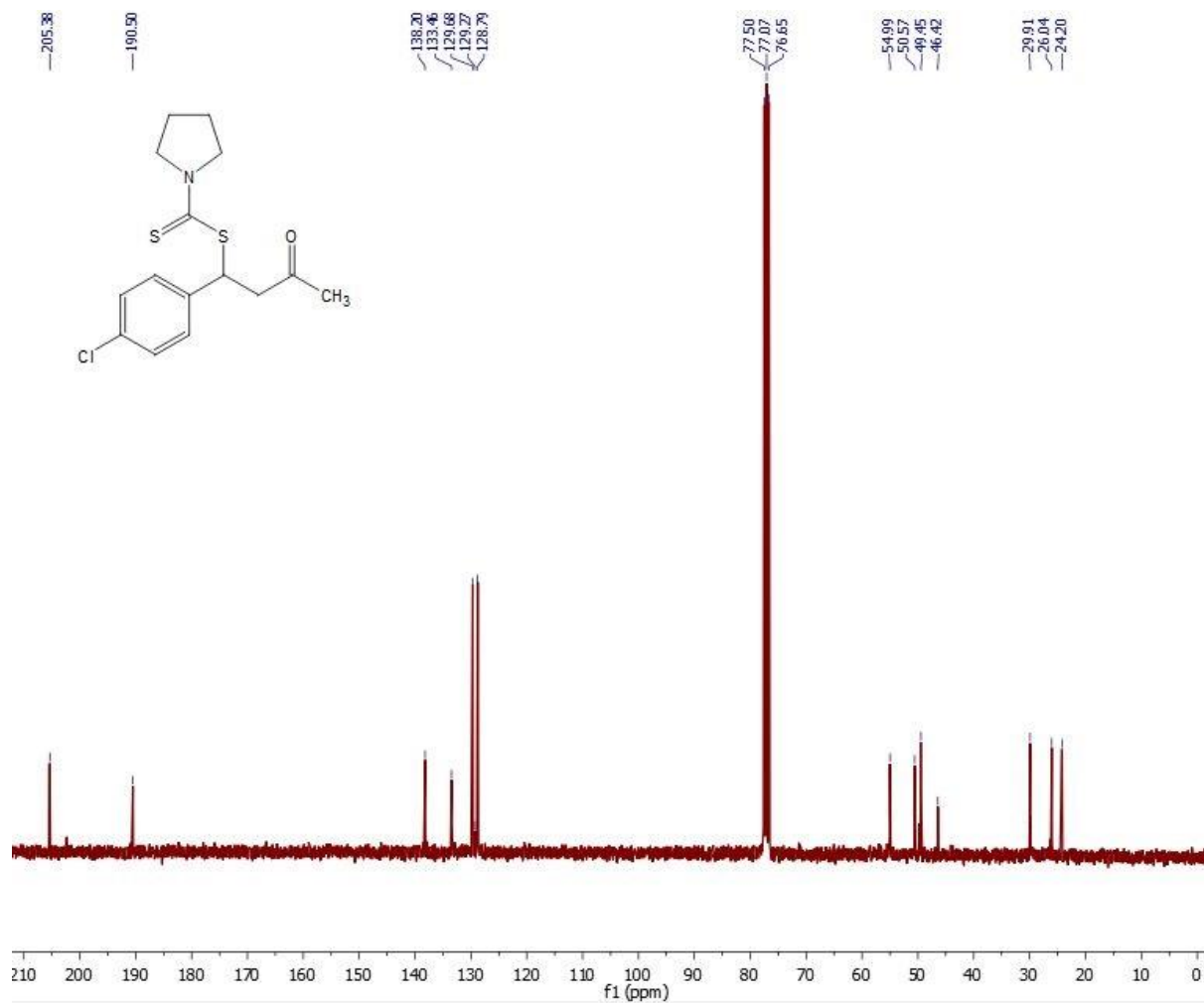
^{13}C NMR (^1H) (75 MHz, chloroform-*d*) of compound **6b**



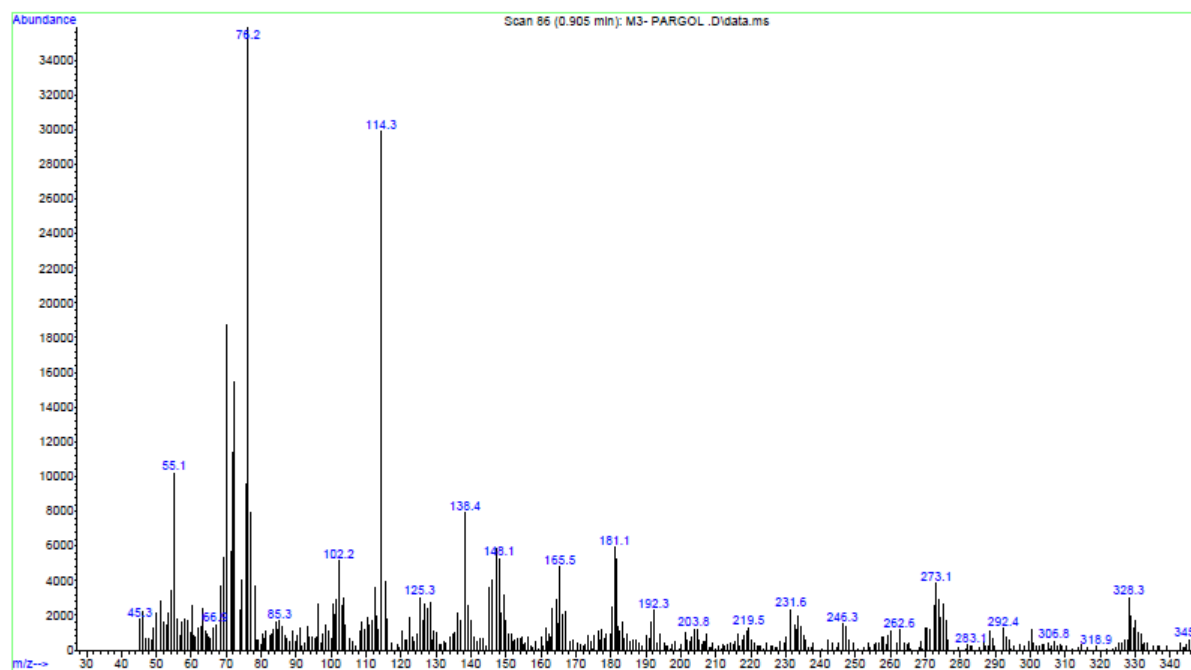
Mass spectrum of compound **6b**



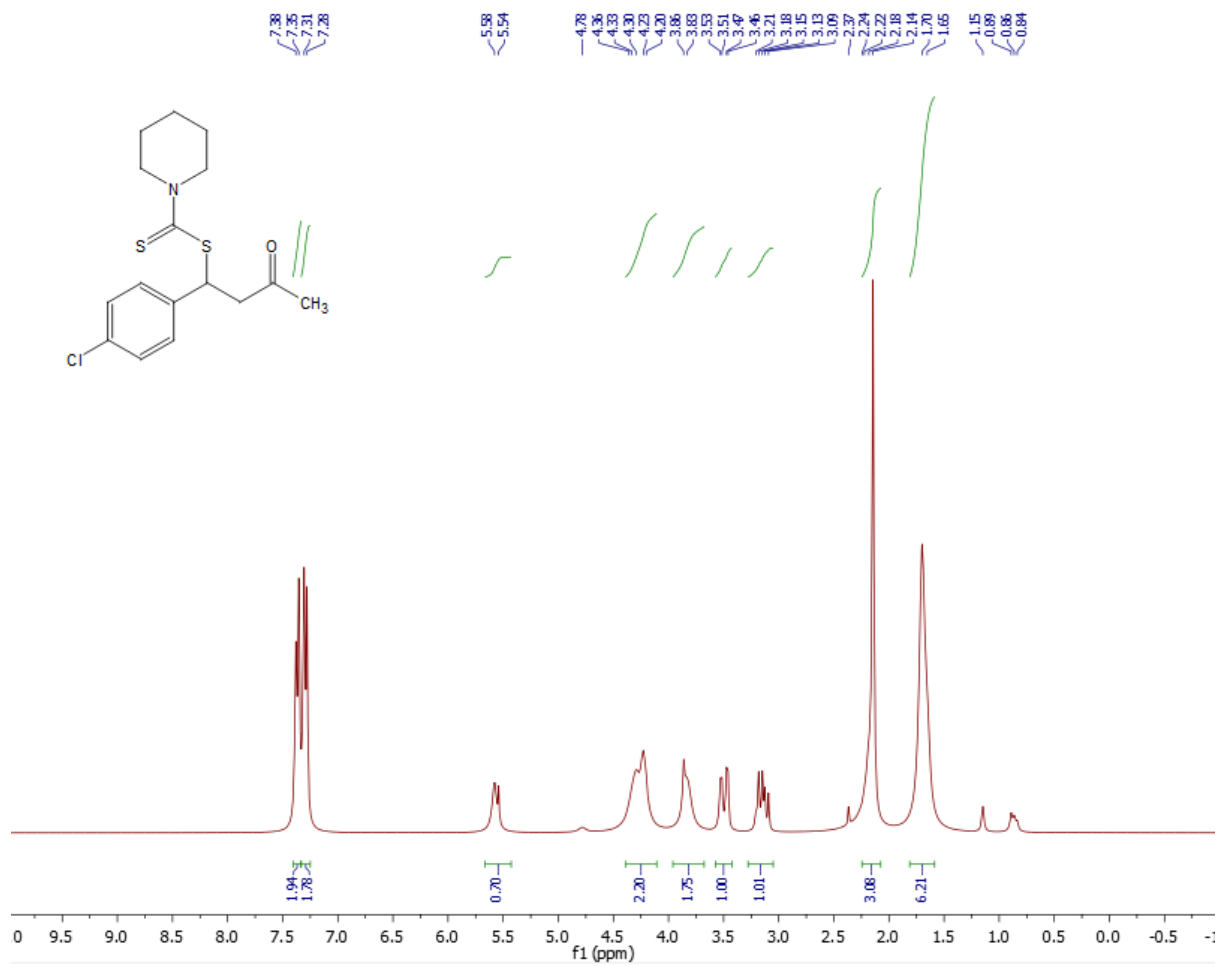
¹H NMR (300 MHz, chloroform-*d*) of compound **6c**



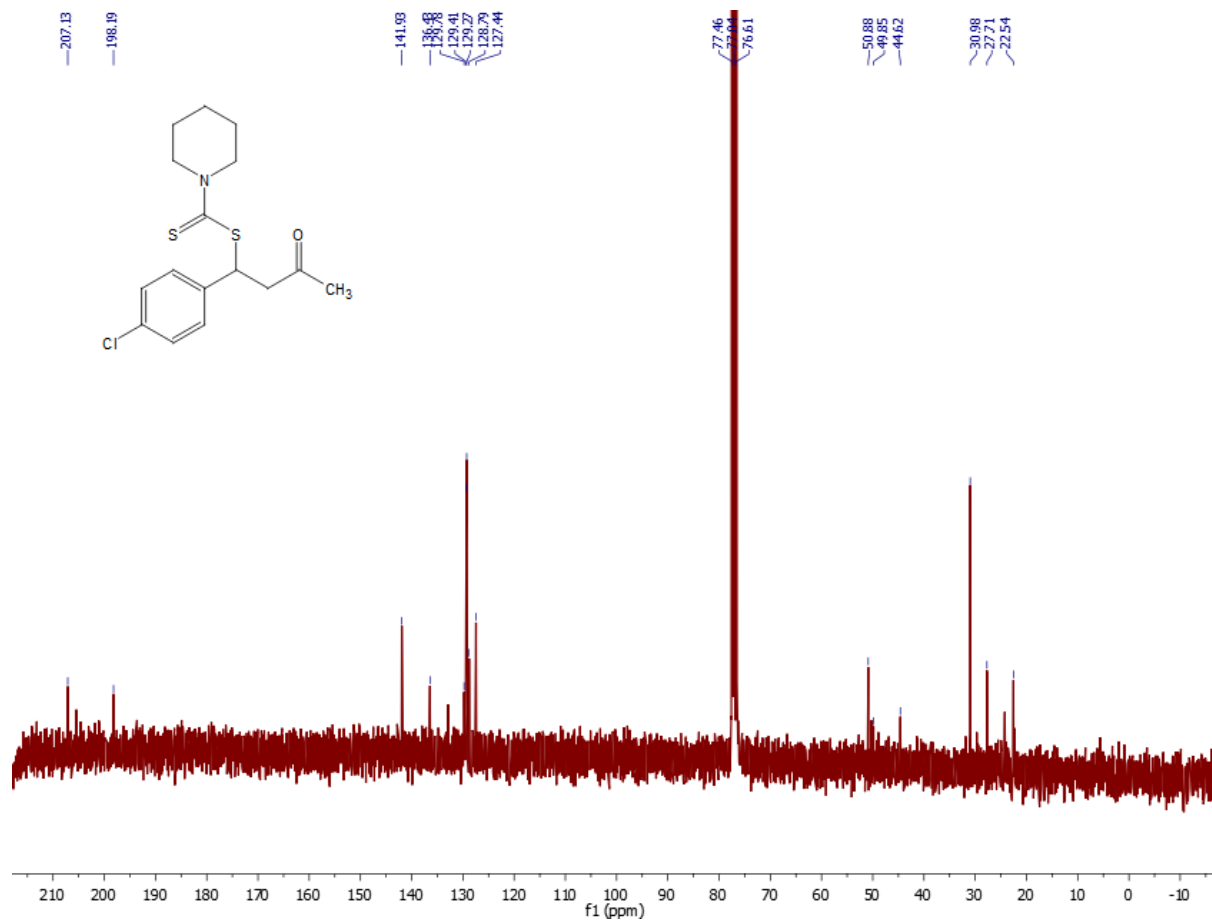
¹³C NMR {¹H} (75 MHz, chloroform-*d*) of compound **6c**



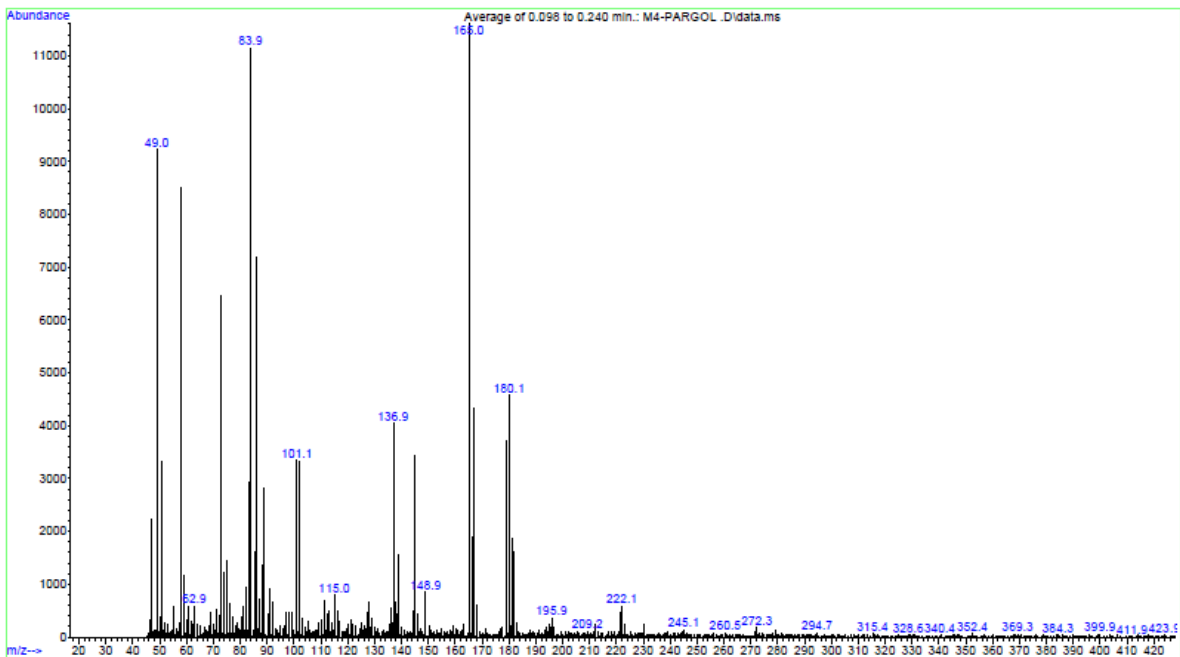
Mass spectrum of compound **6c**



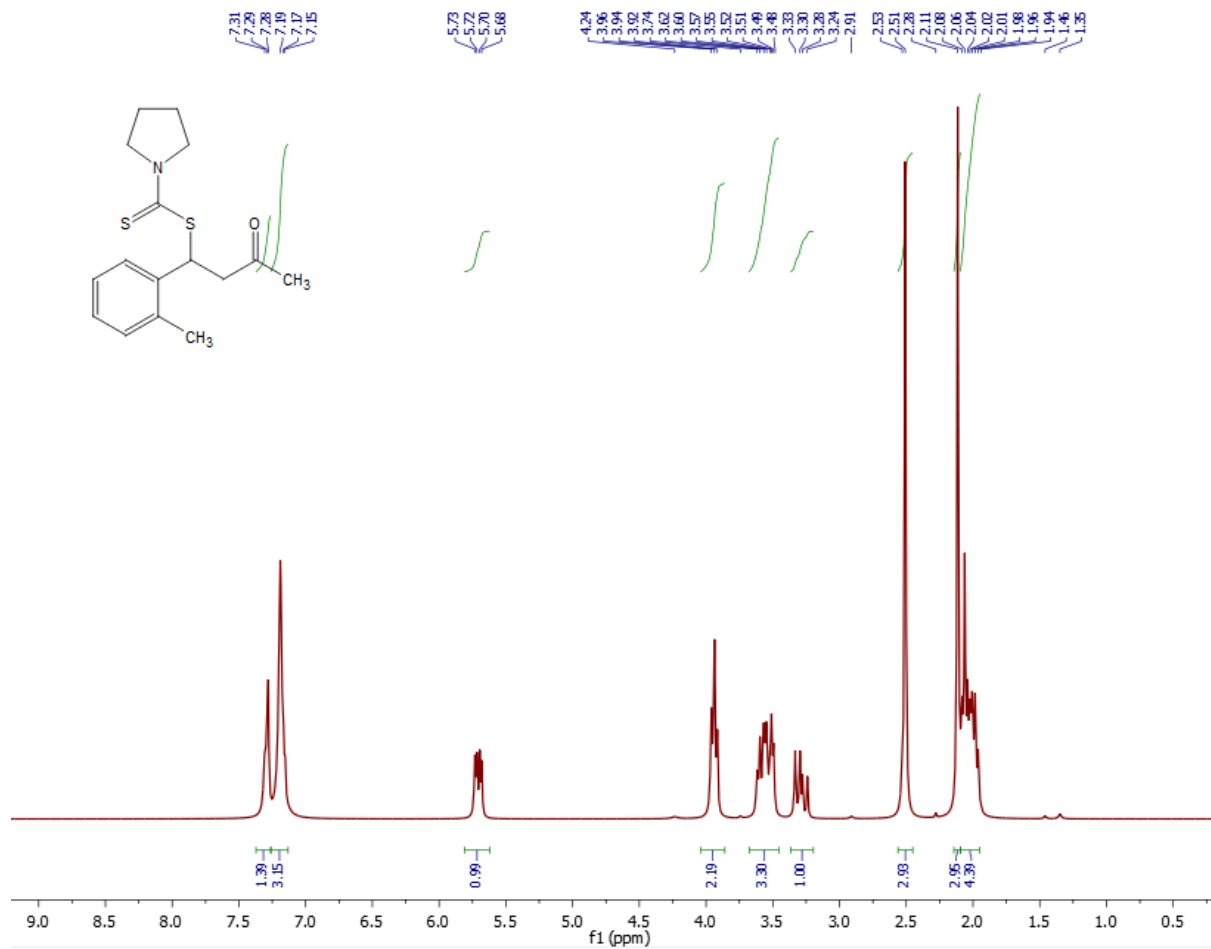
¹H NMR (300 MHz, chloroform-*d*) of compound **6d**



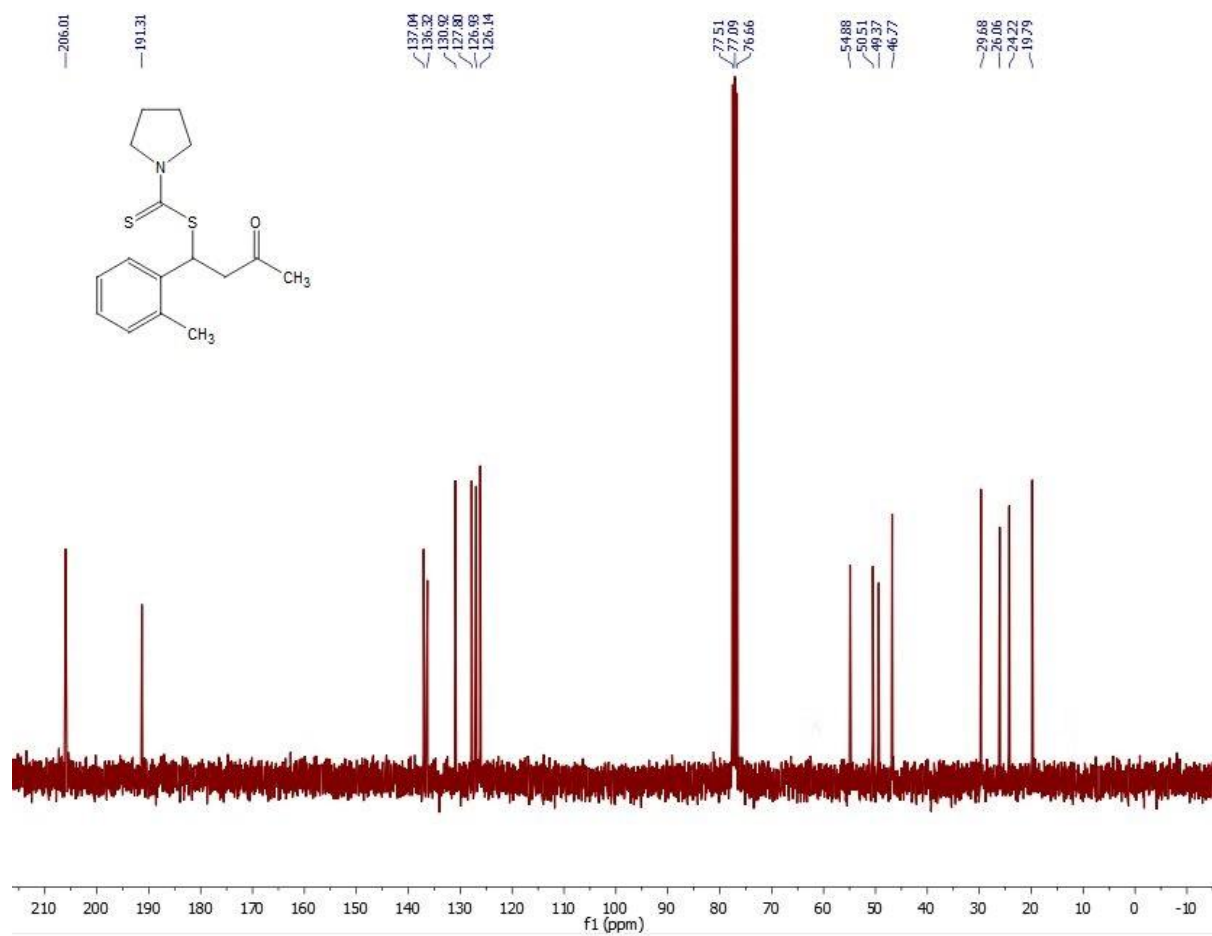
^{13}C NMR { ^1H } (75 MHz, chloroform- d) of compound **6d**



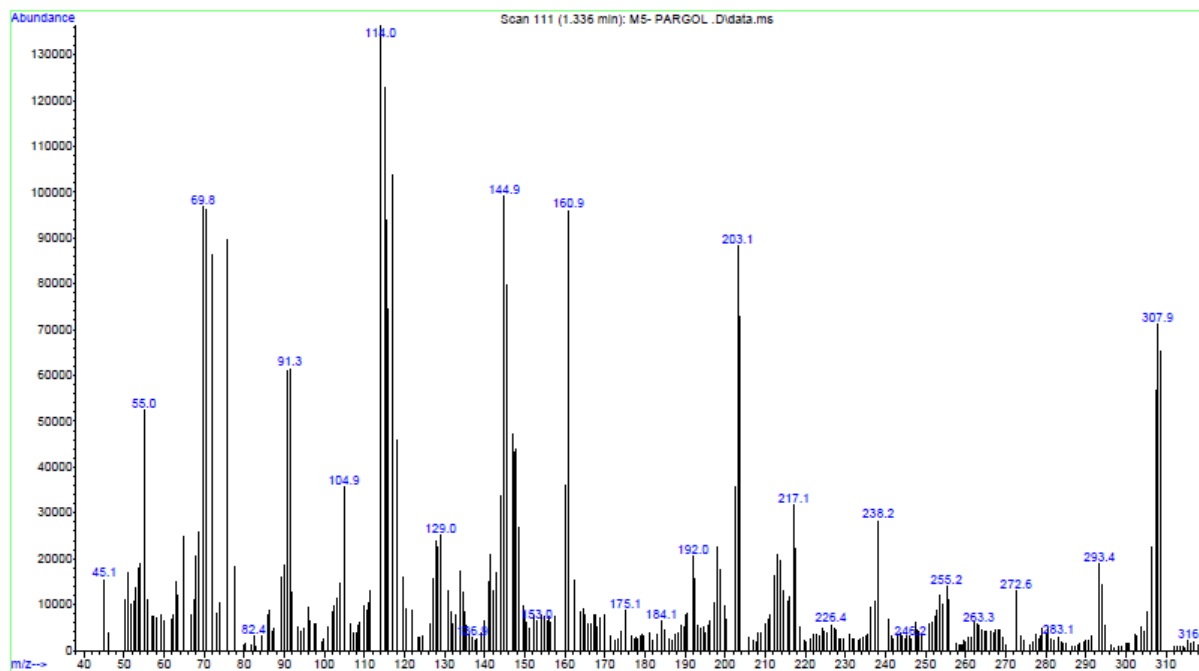
Mass spectrum of compound **6d**



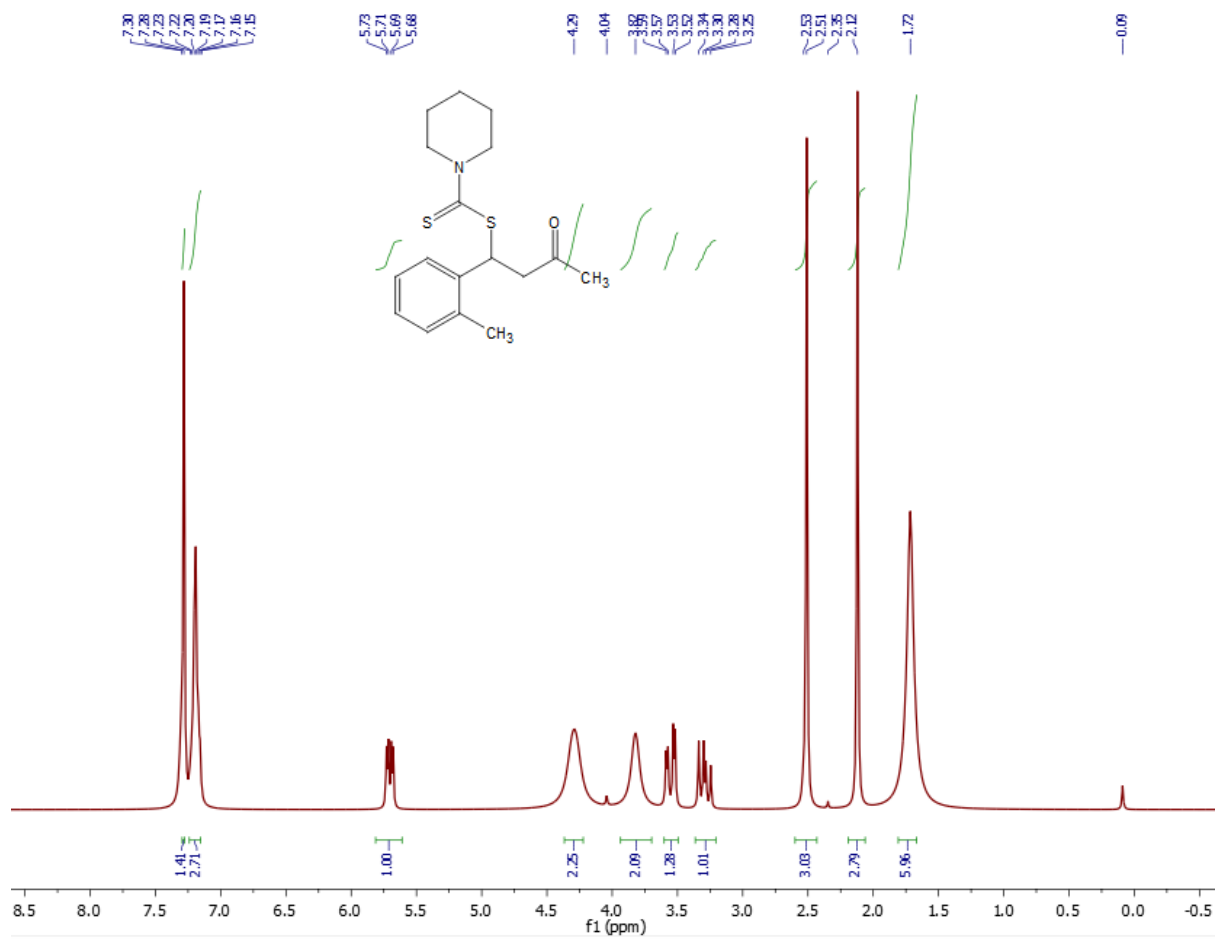
¹H NMR (300 MHz, chloroform-*d*) of compound **6e**



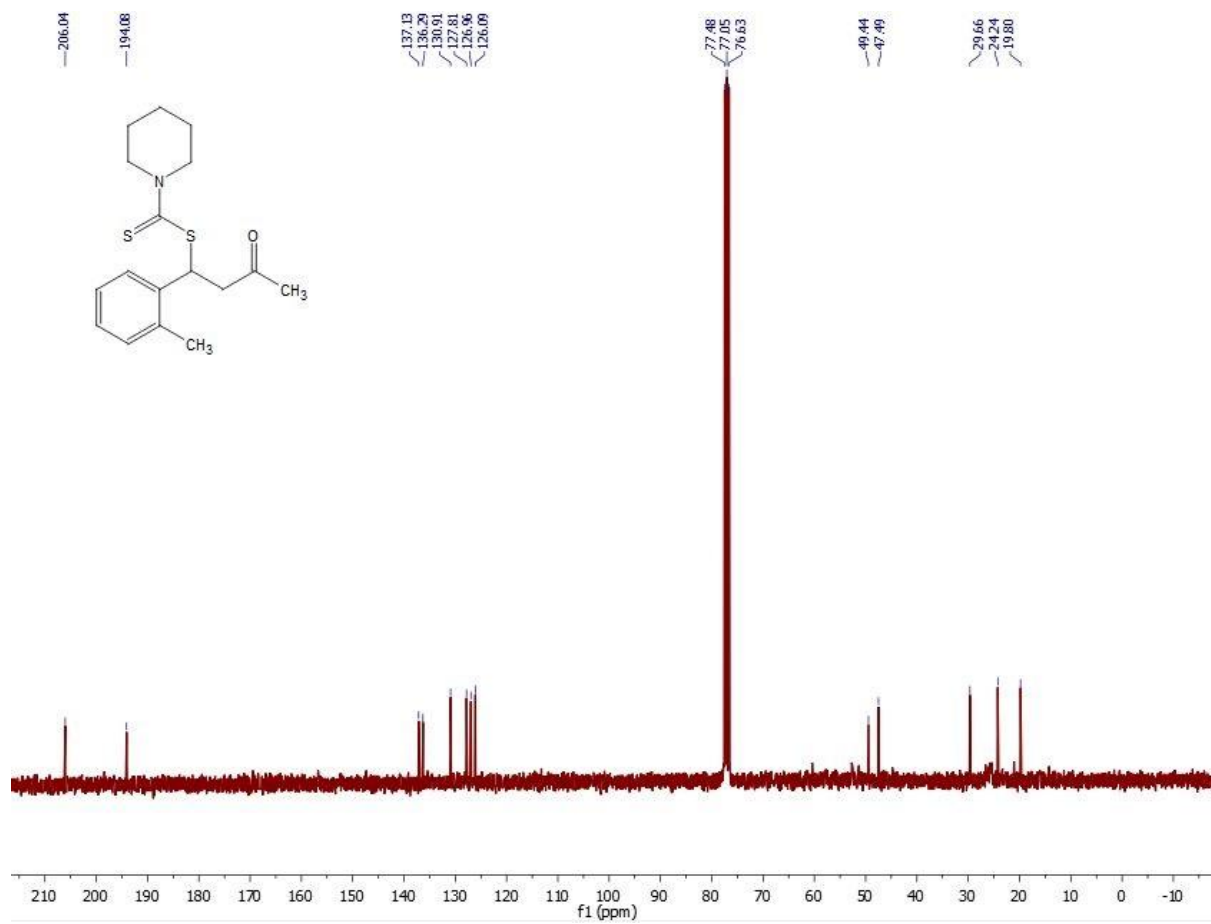
^{13}C NMR $\{^1\text{H}\}$ (75 MHz, chloroform-*d*) of compound **6e**



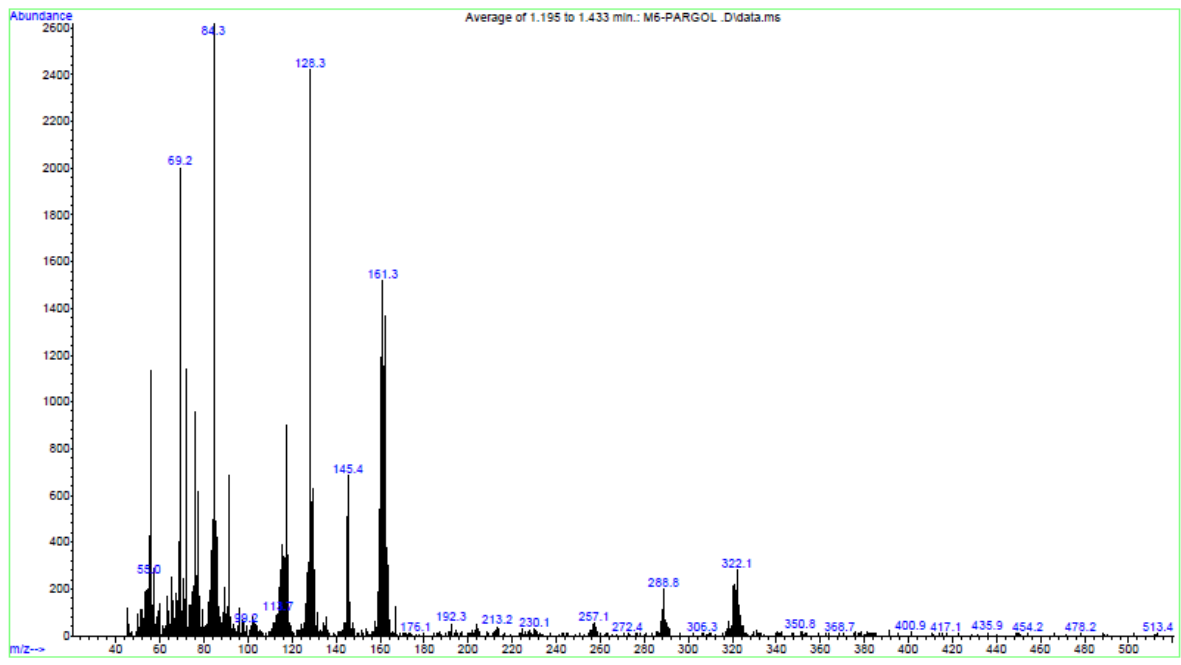
Mass spectrum of compound **6e**



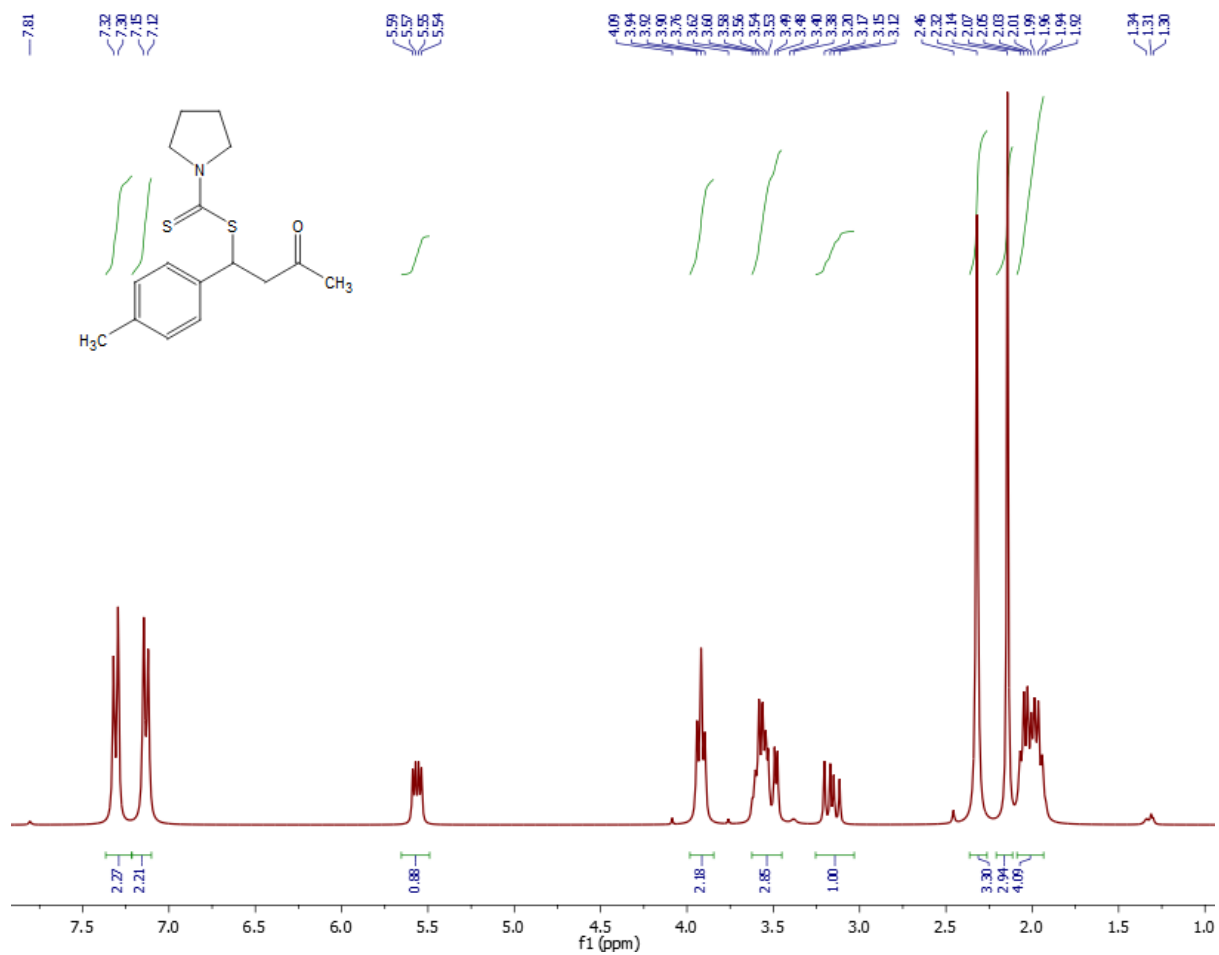
¹H NMR (300 MHz, chloroform-*d*) of compound **6f**



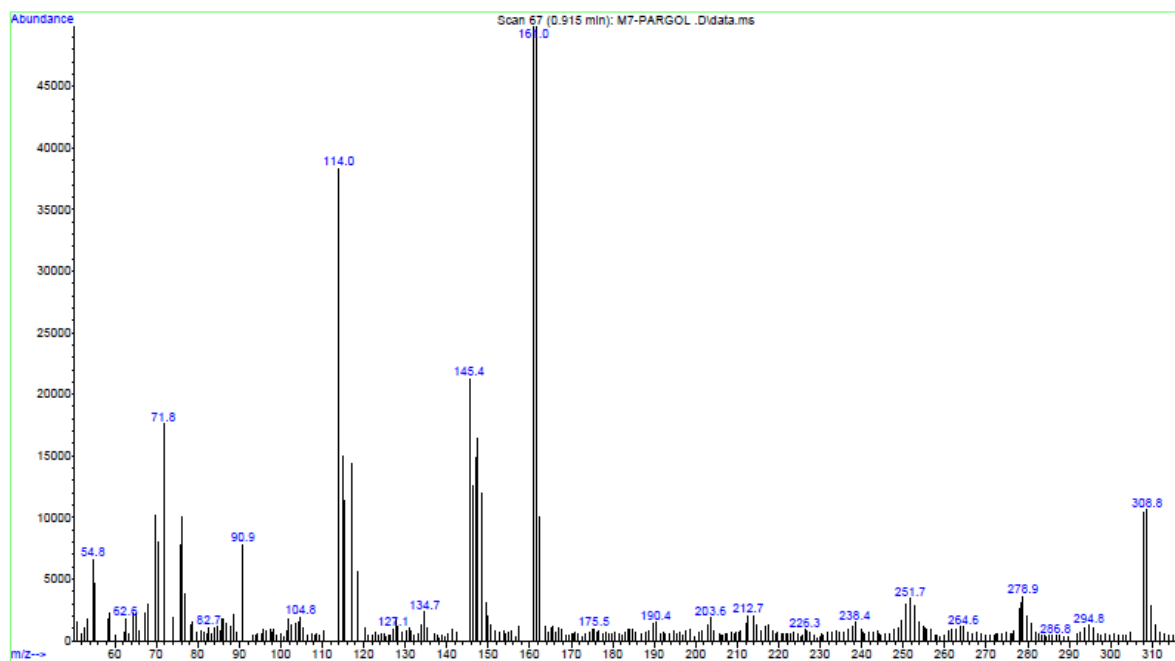
^{13}C NMR $\{^1\text{H}\}$ (75 MHz, chloroform-*d*) of compound **6f**



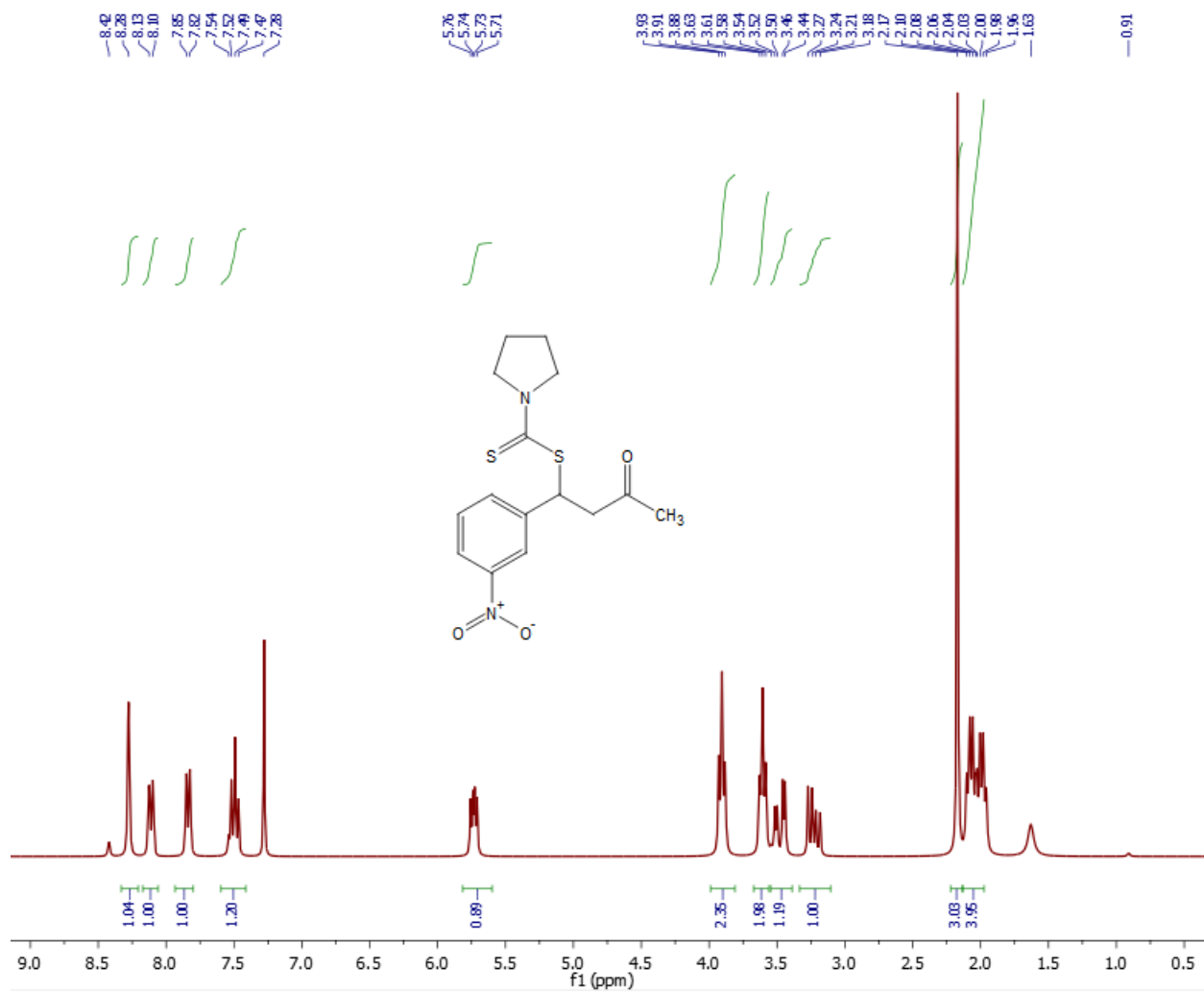
Mass spectrum of compound **6f**



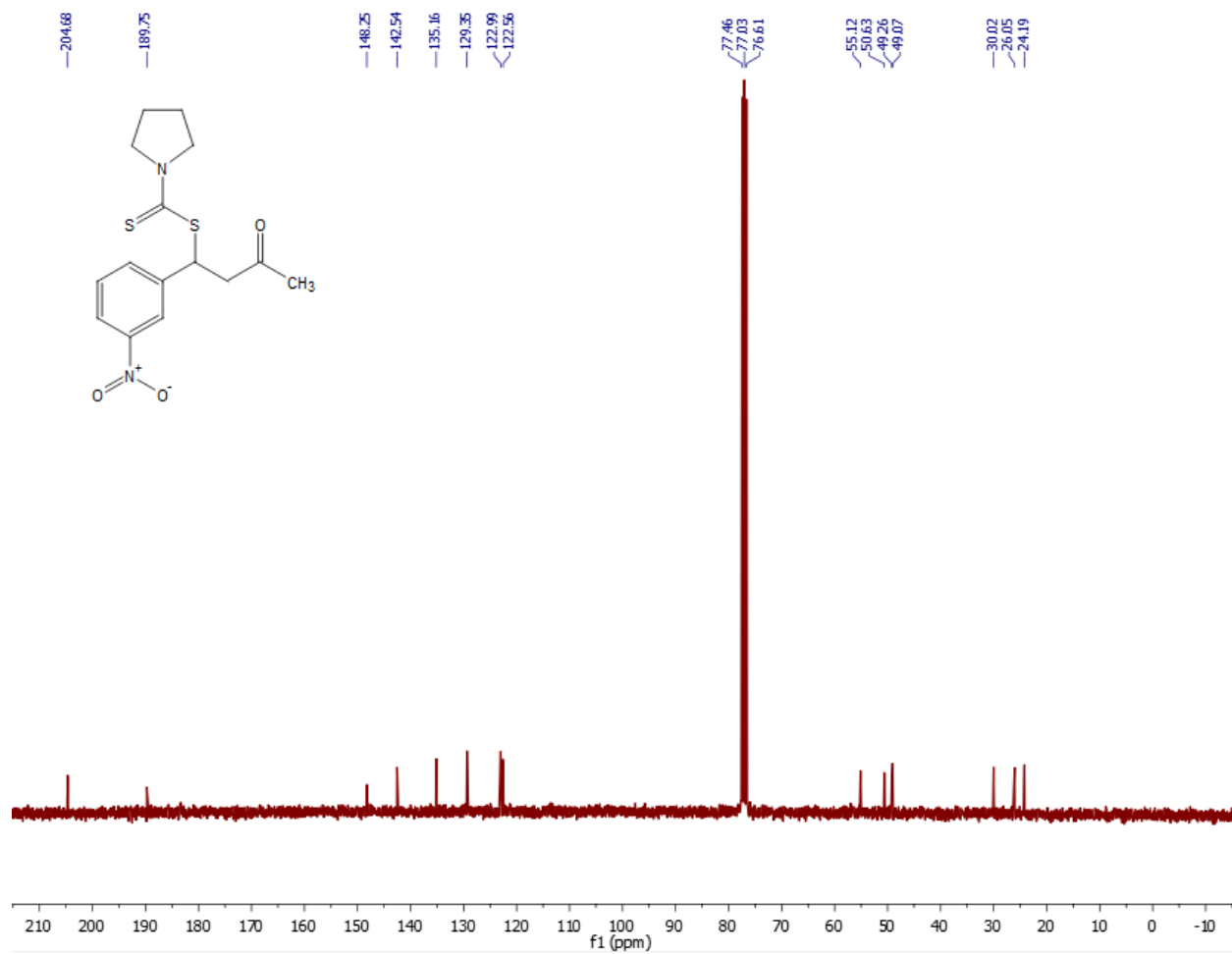
¹H NMR (300 MHz, chloroform-*d*) of compound **6g**



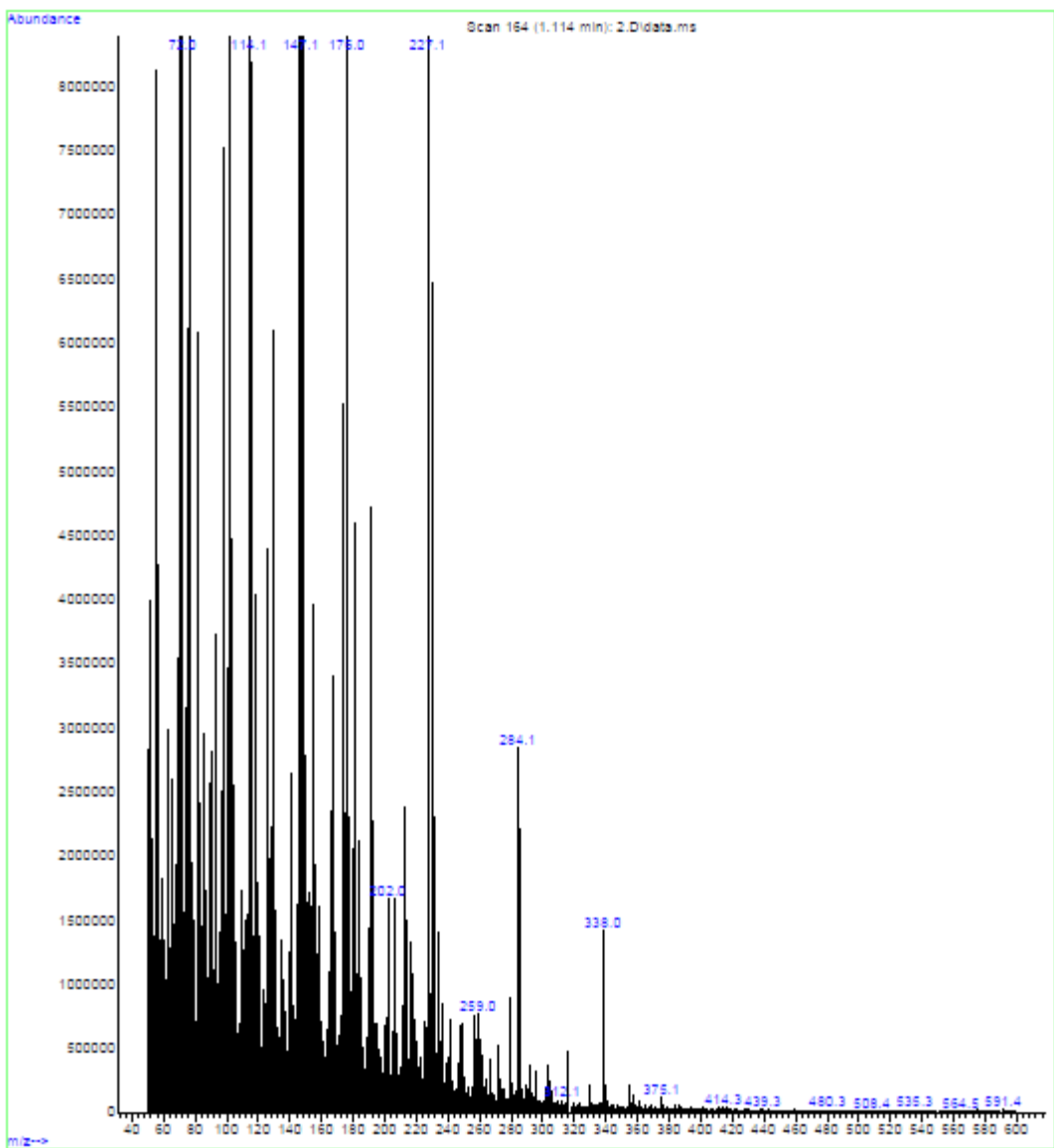
Mass spectrum of compound **6g**



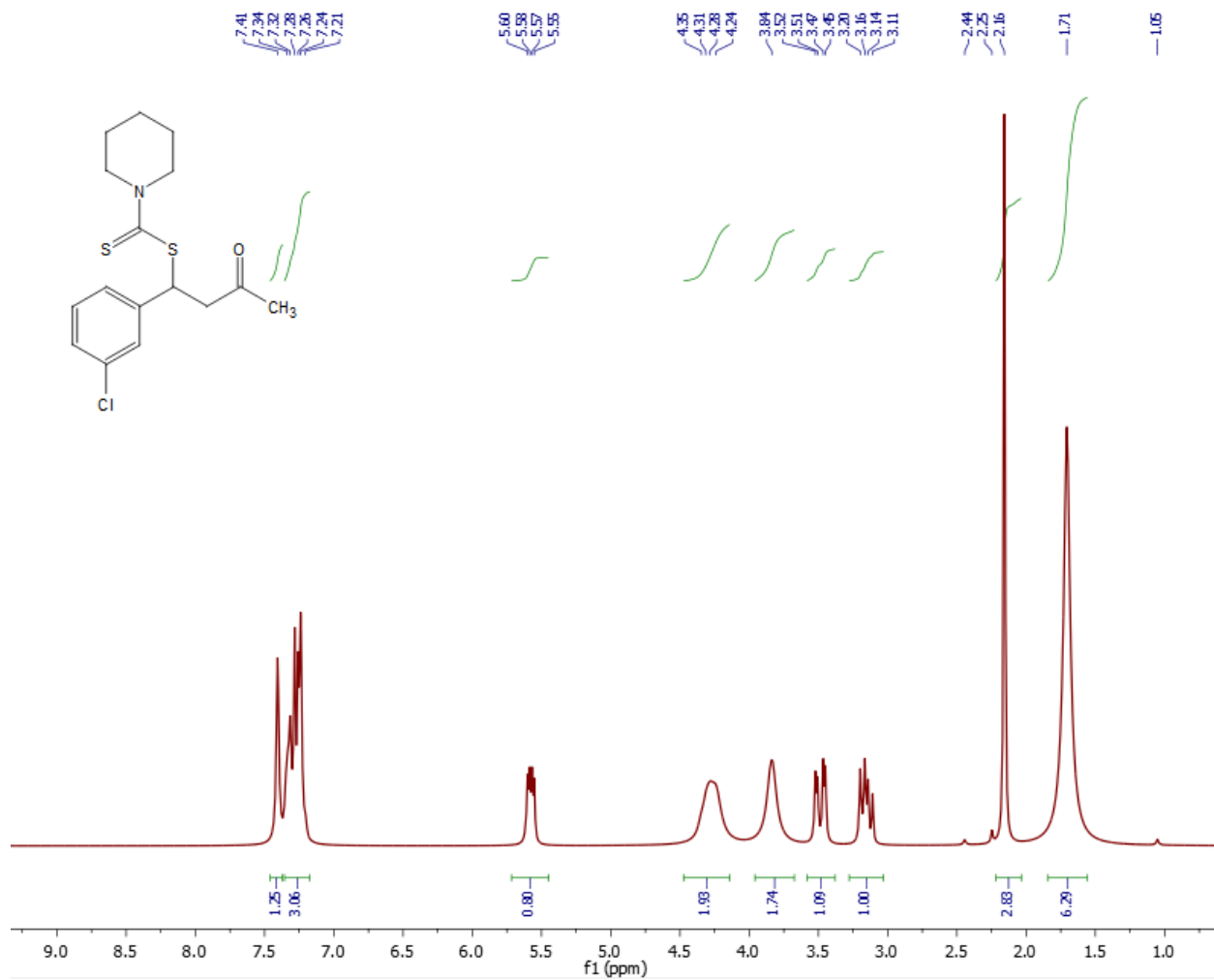
¹H NMR (300 MHz, chloroform-*d*) of compound **6h**



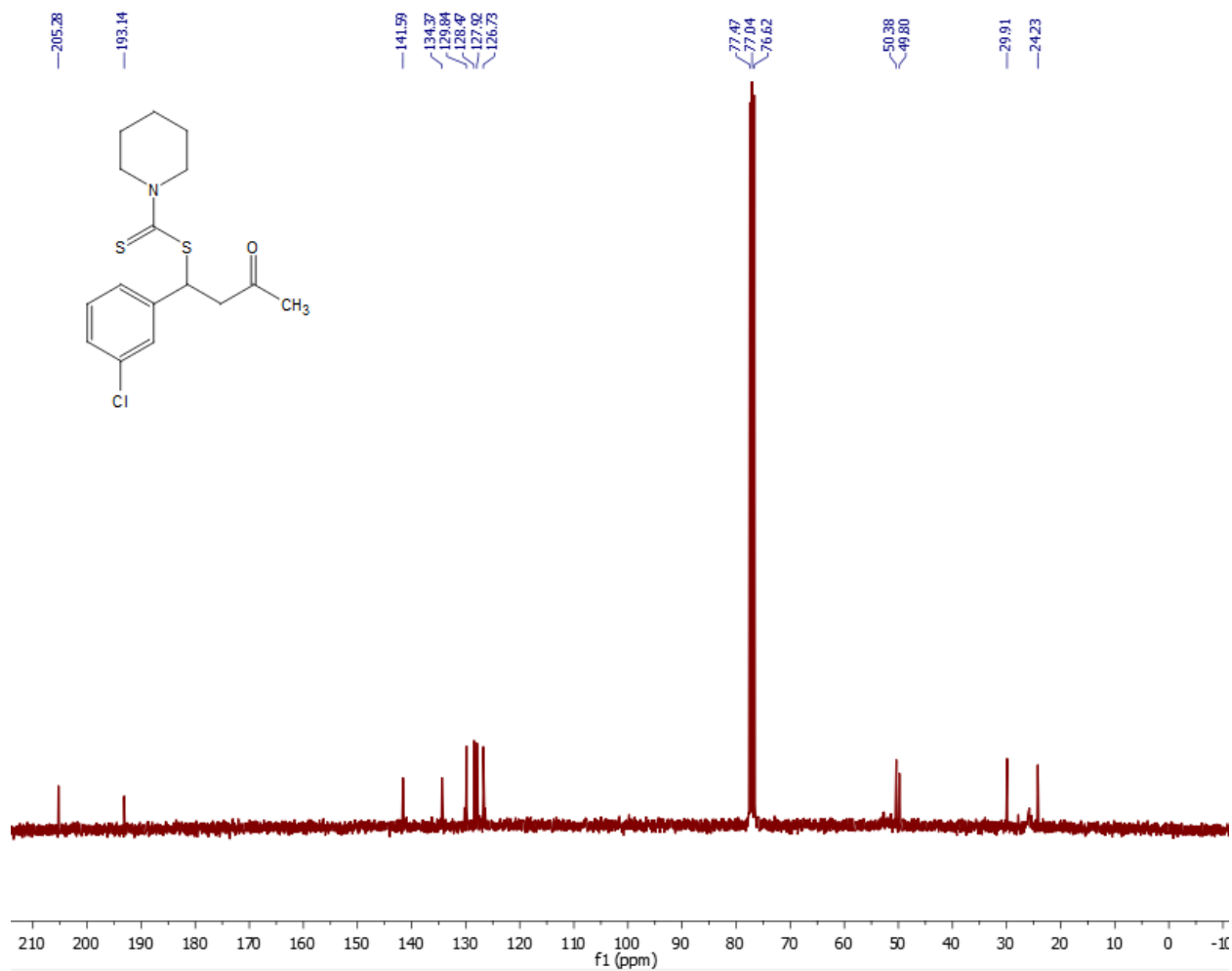
^{13}C NMR $\{^1\text{H}\}$ (75 MHz, chloroform-*d*) of compound **6h**



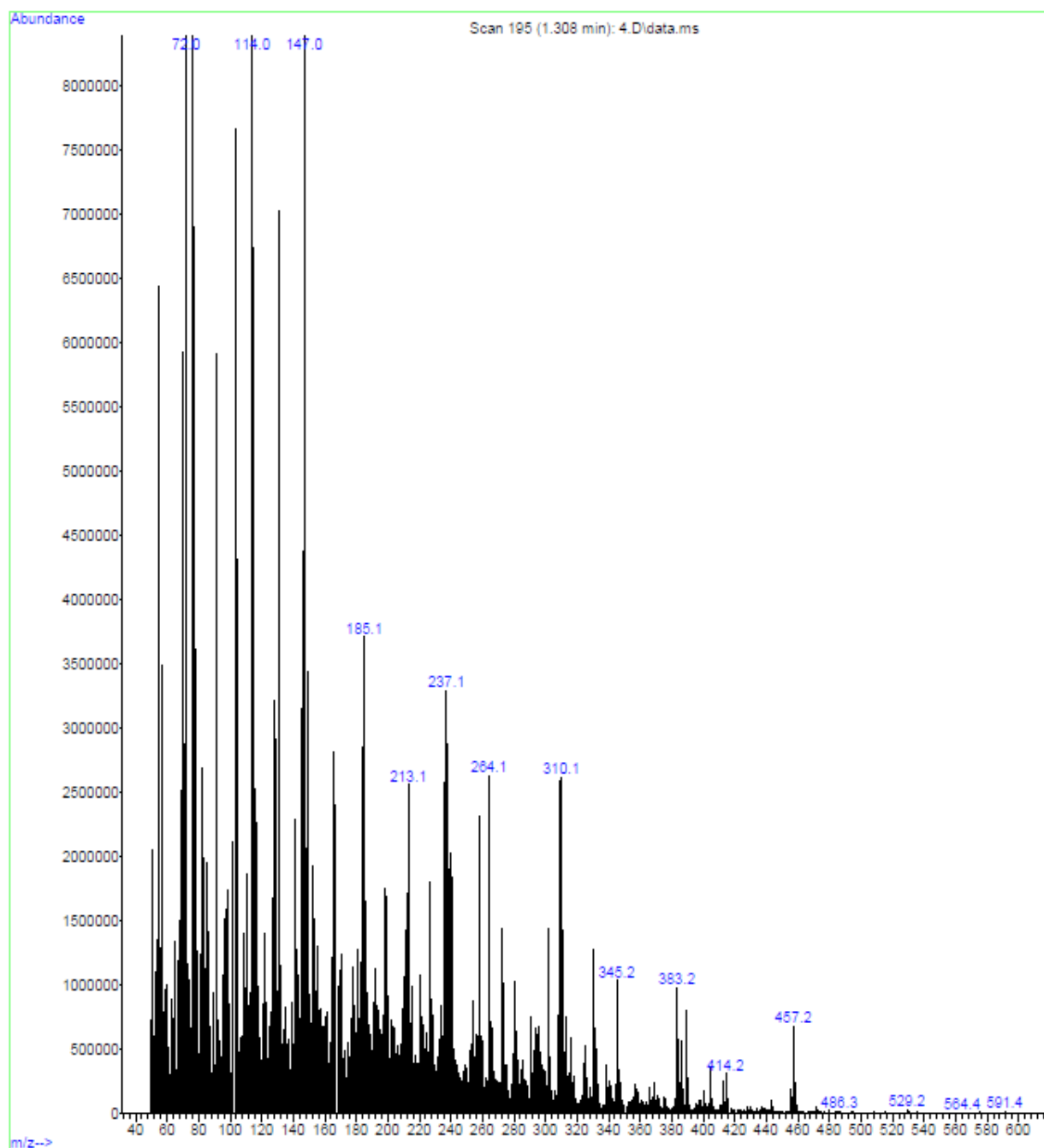
Mass spectrum of compound **6h**



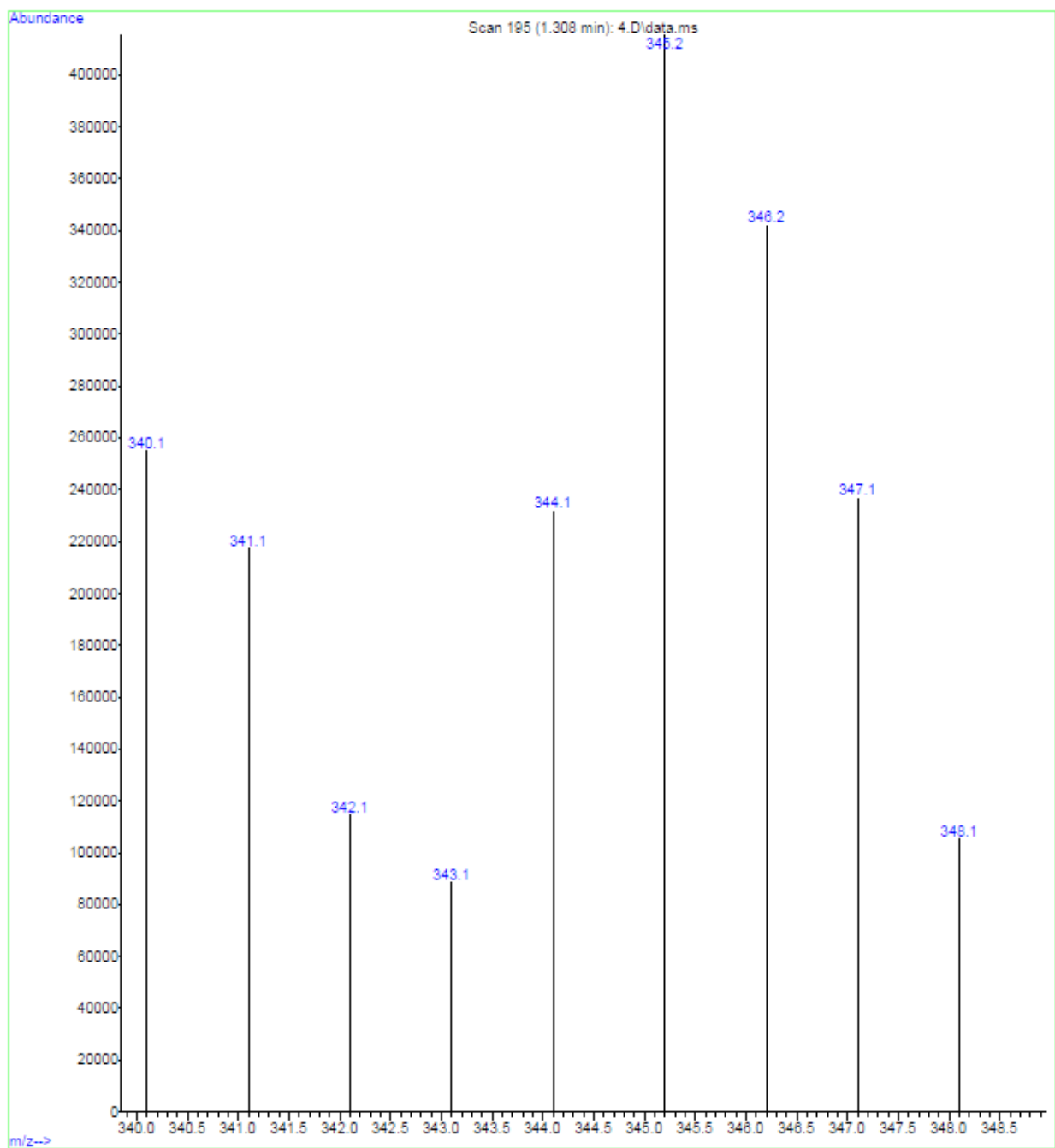
¹H NMR (300 MHz, chloroform-*d*) of compound **6i**



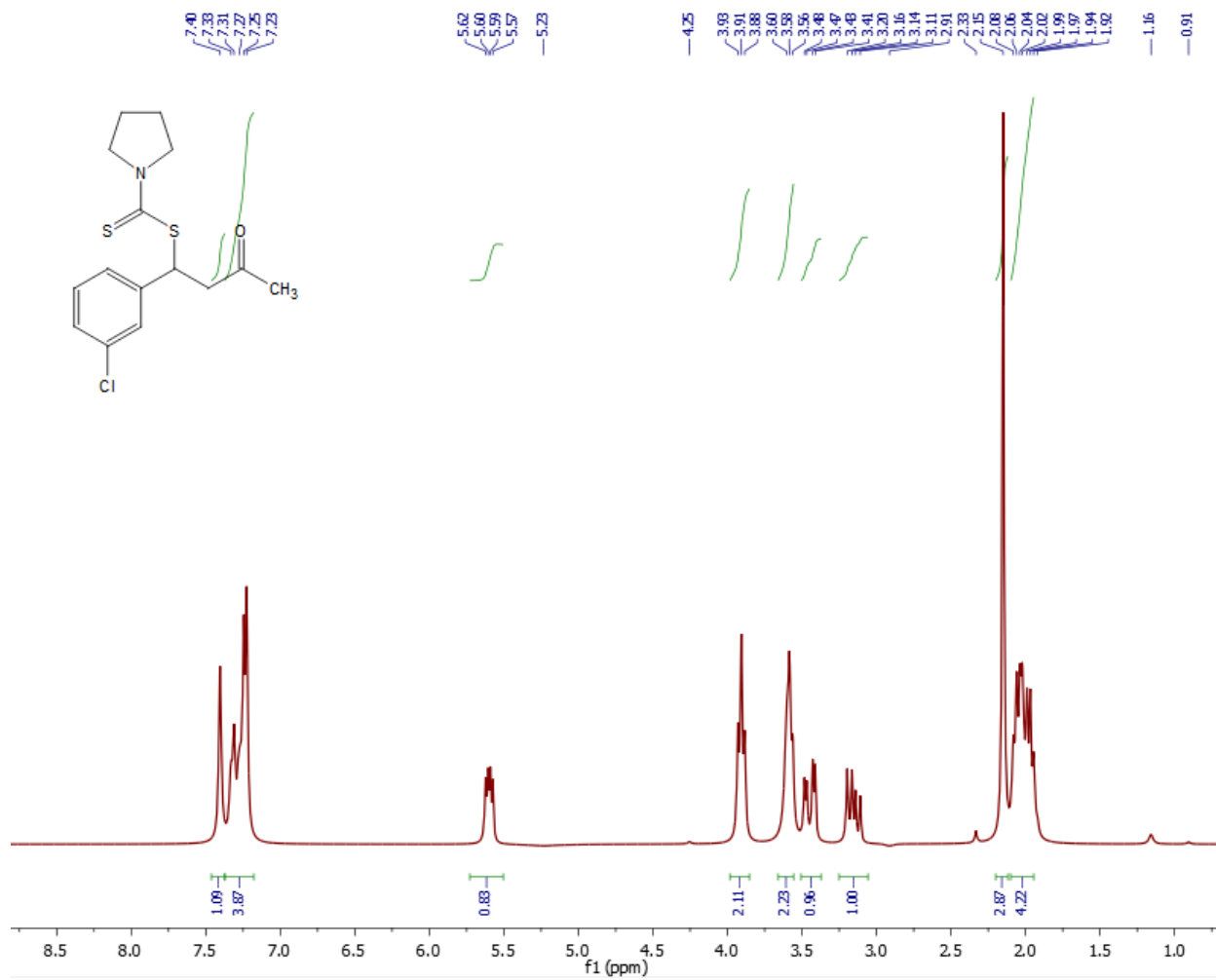
^{13}C NMR (^1H) (75 MHz, chloroform-*d*) of compound **6i**



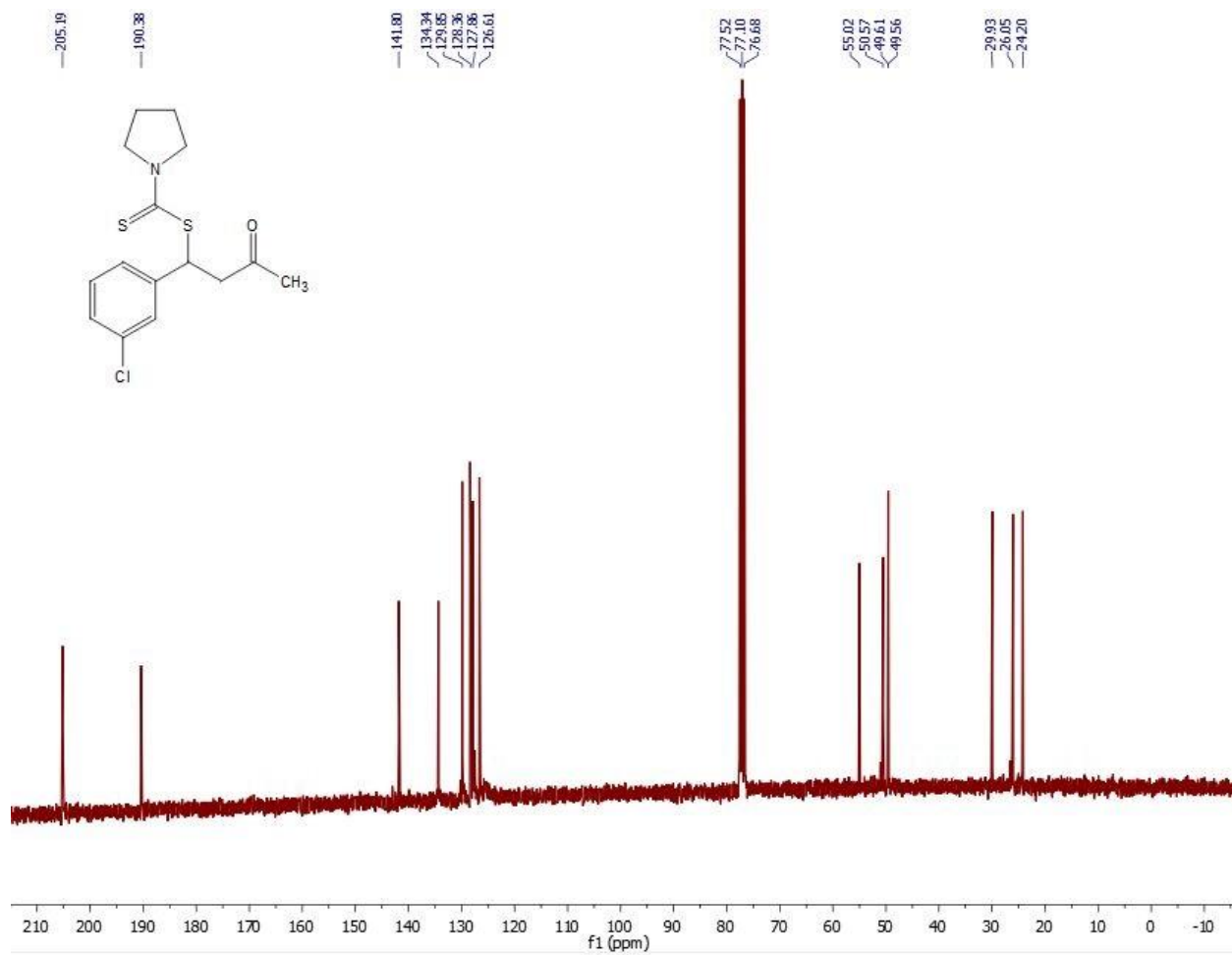
Mass spectrum of compound **6i**



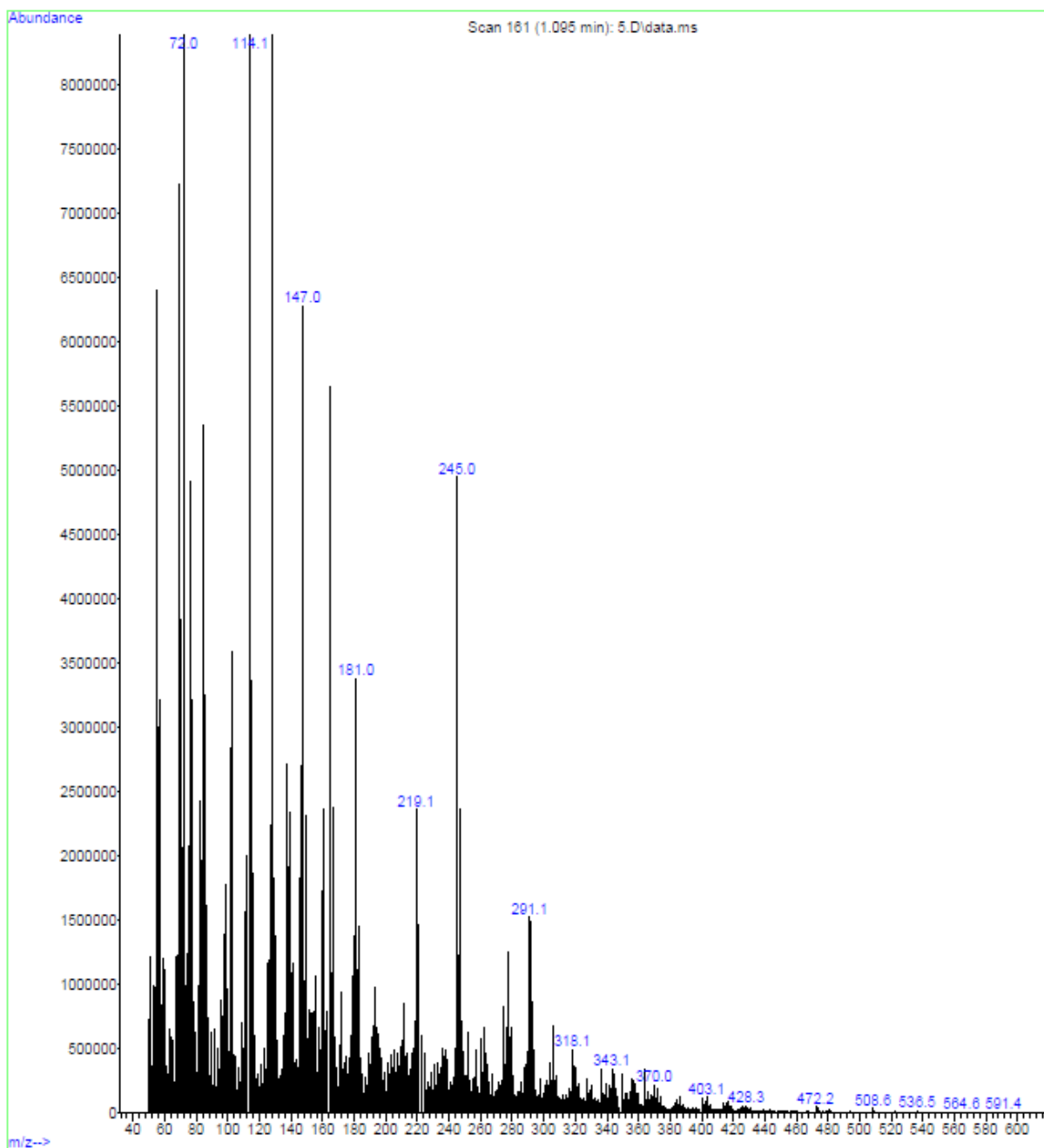
Mass spectrum of compound **6i**



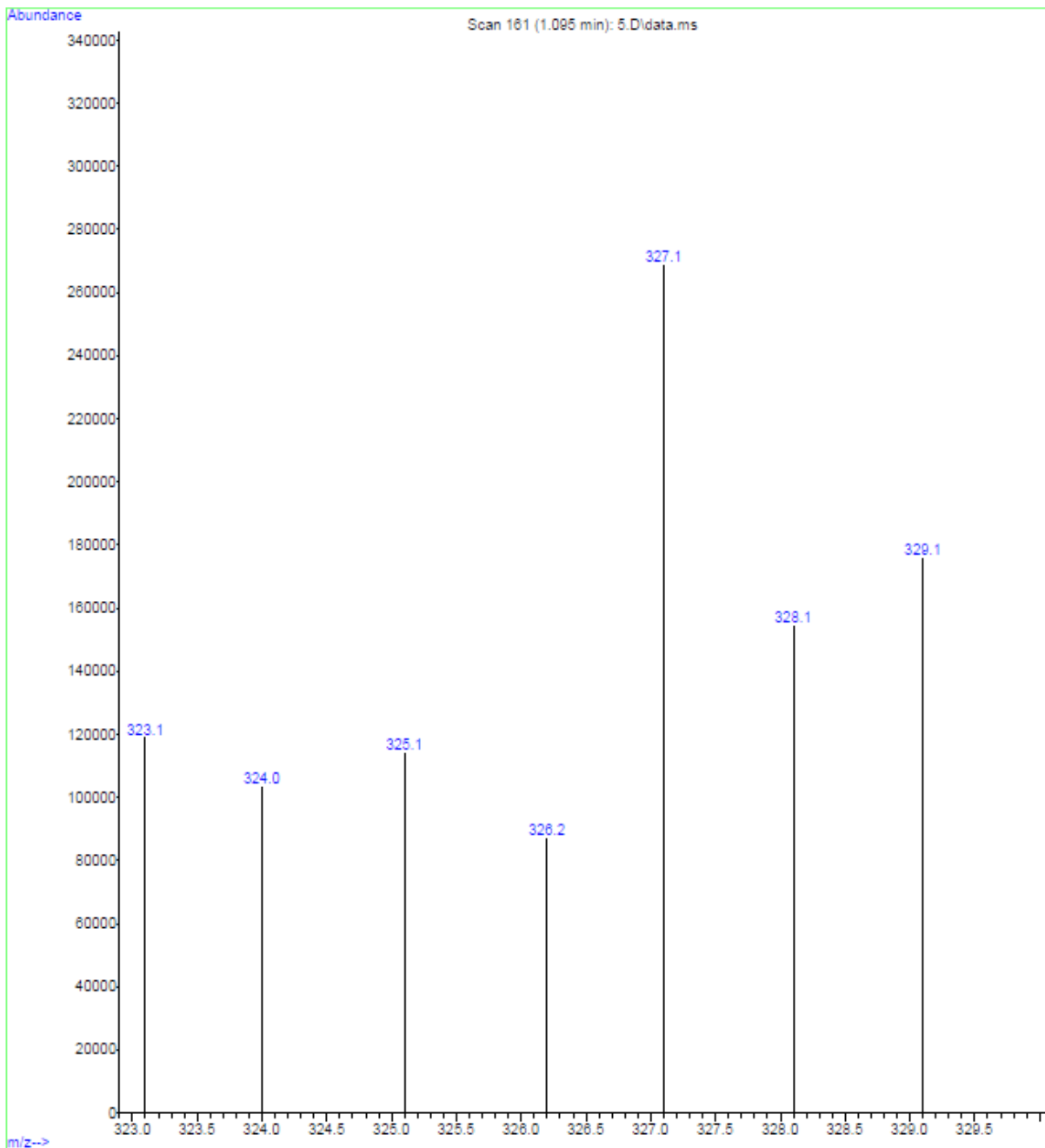
¹H NMR (300 MHz, chloroform-*d*) of compound **6j**



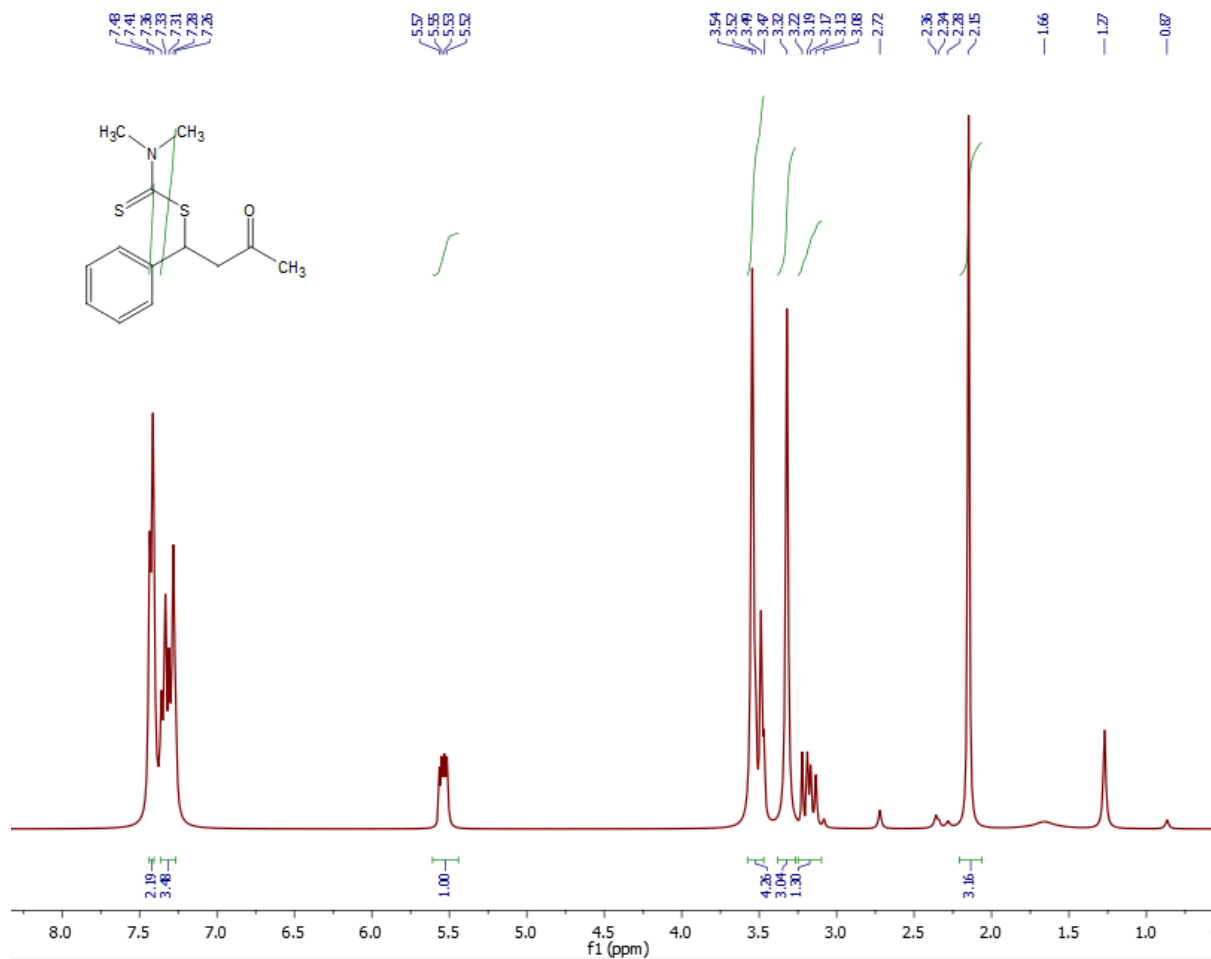
^{13}C NMR $\{^1\text{H}\}$ (75 MHz, chloroform-*d*) of compound **6j**



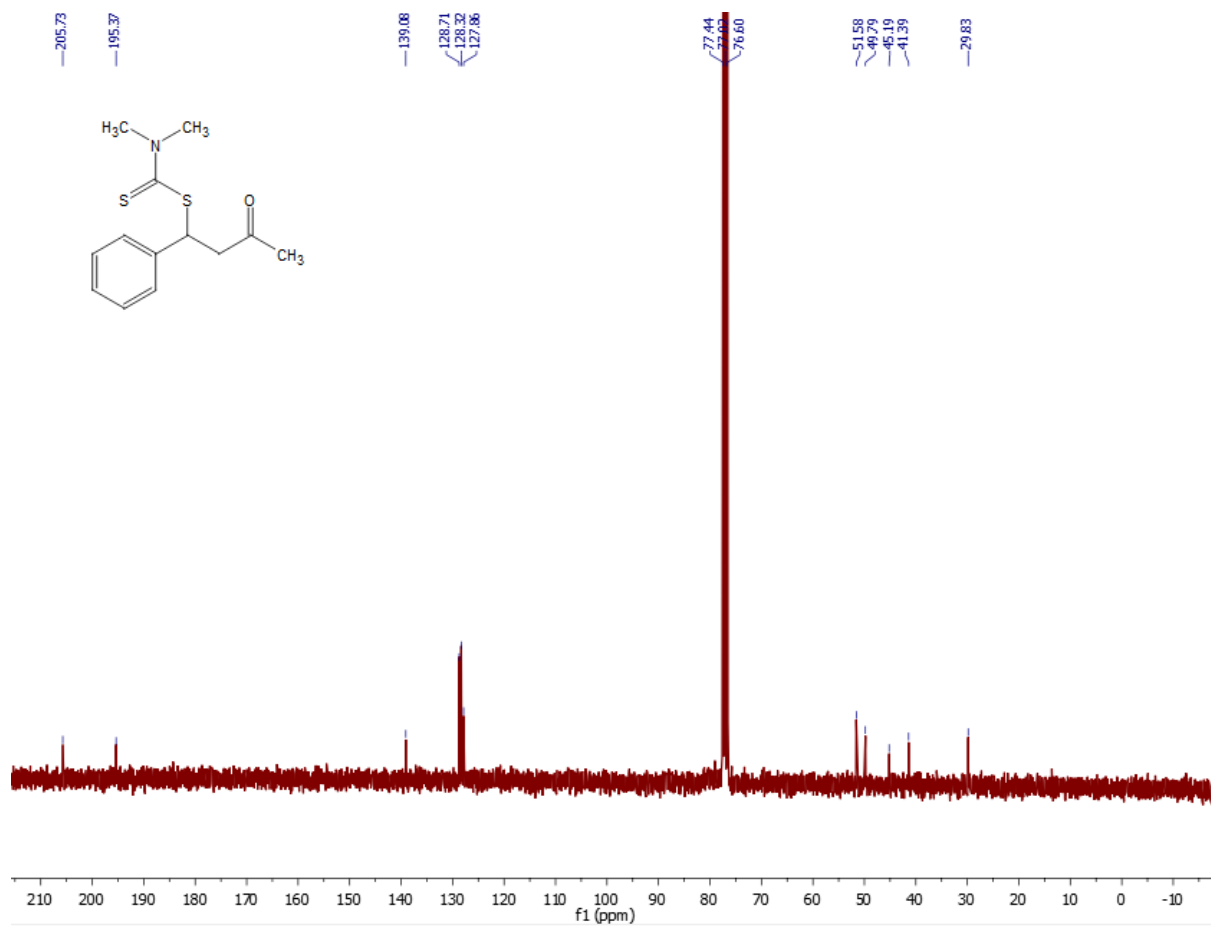
Mass spectrum of compound **6j**



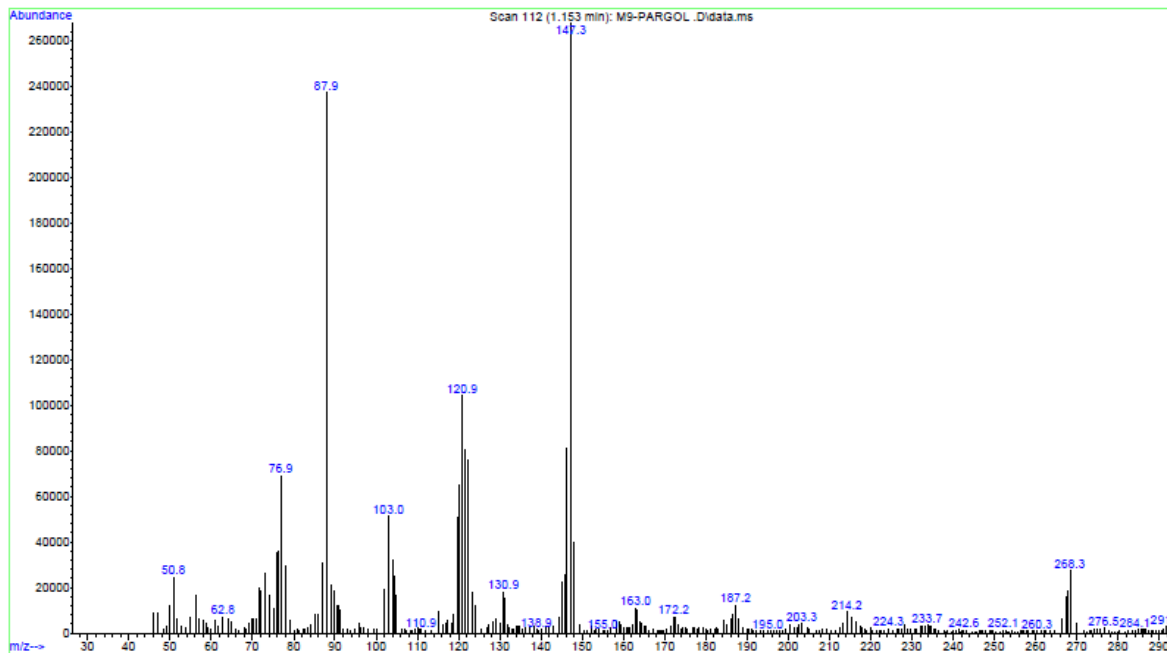
Mass spectrum of compound **6j**



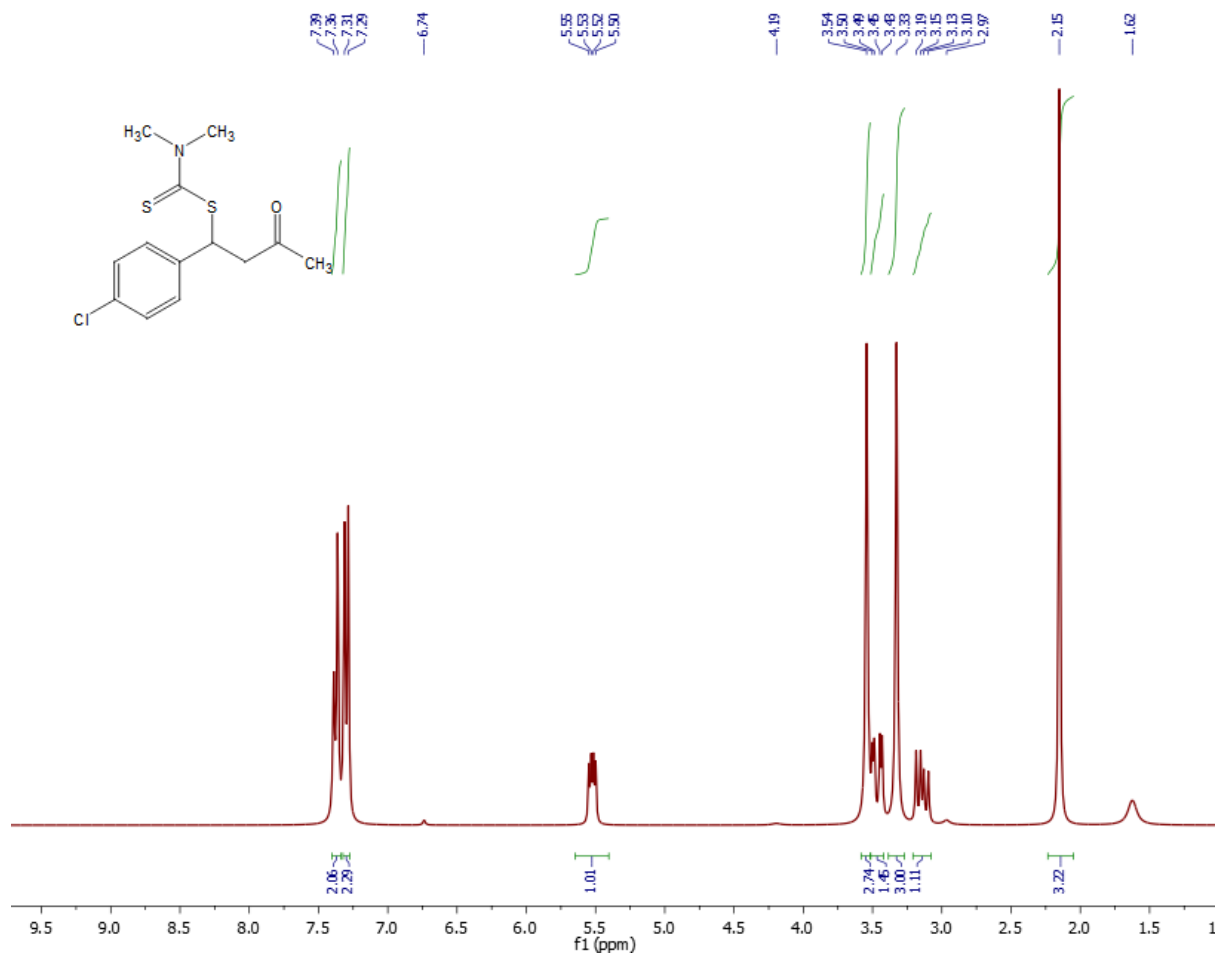
¹H NMR (300 MHz, chloroform-*d*) of compound **6k**



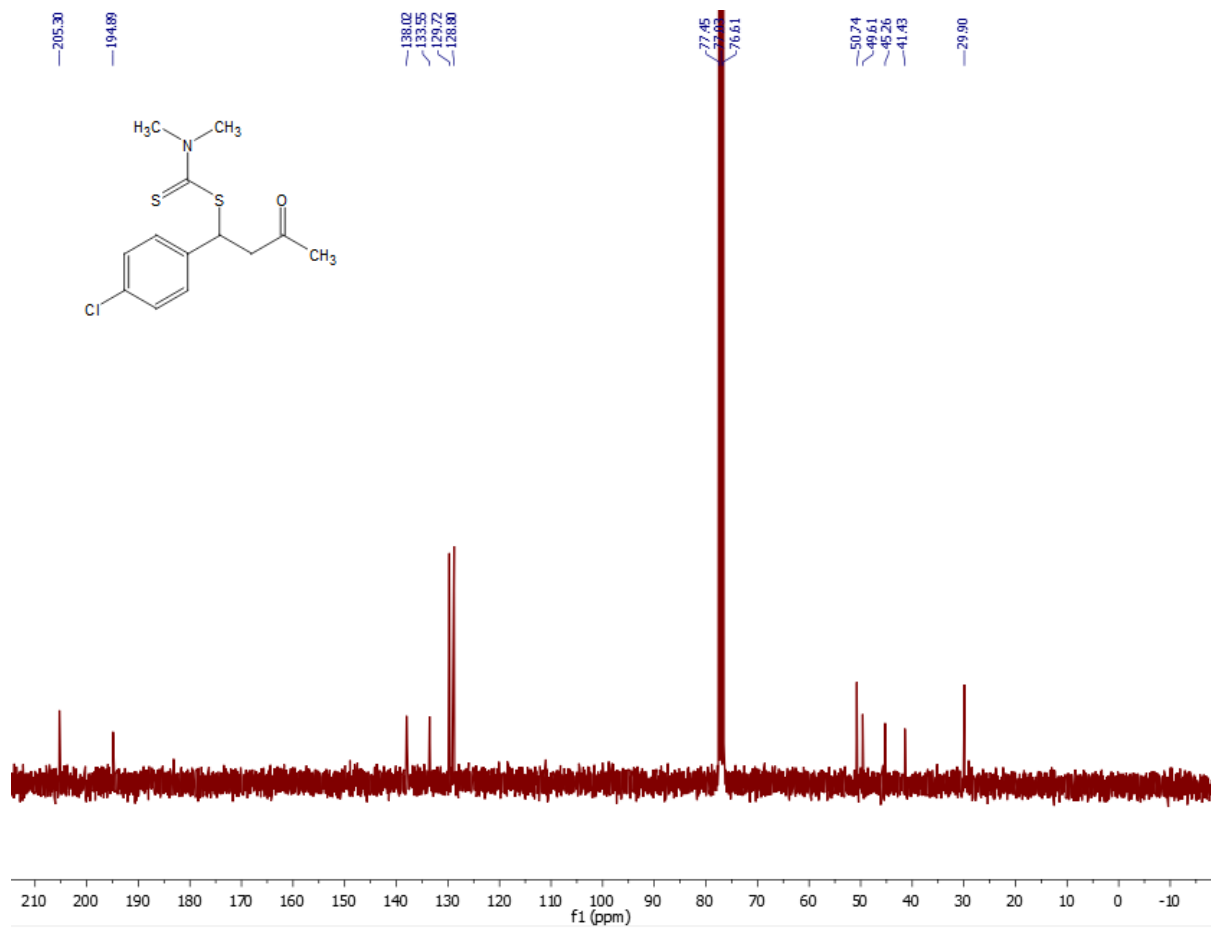
^{13}C NMR { ^1H } (75 MHz, chloroform-*d*) of compound **6k**



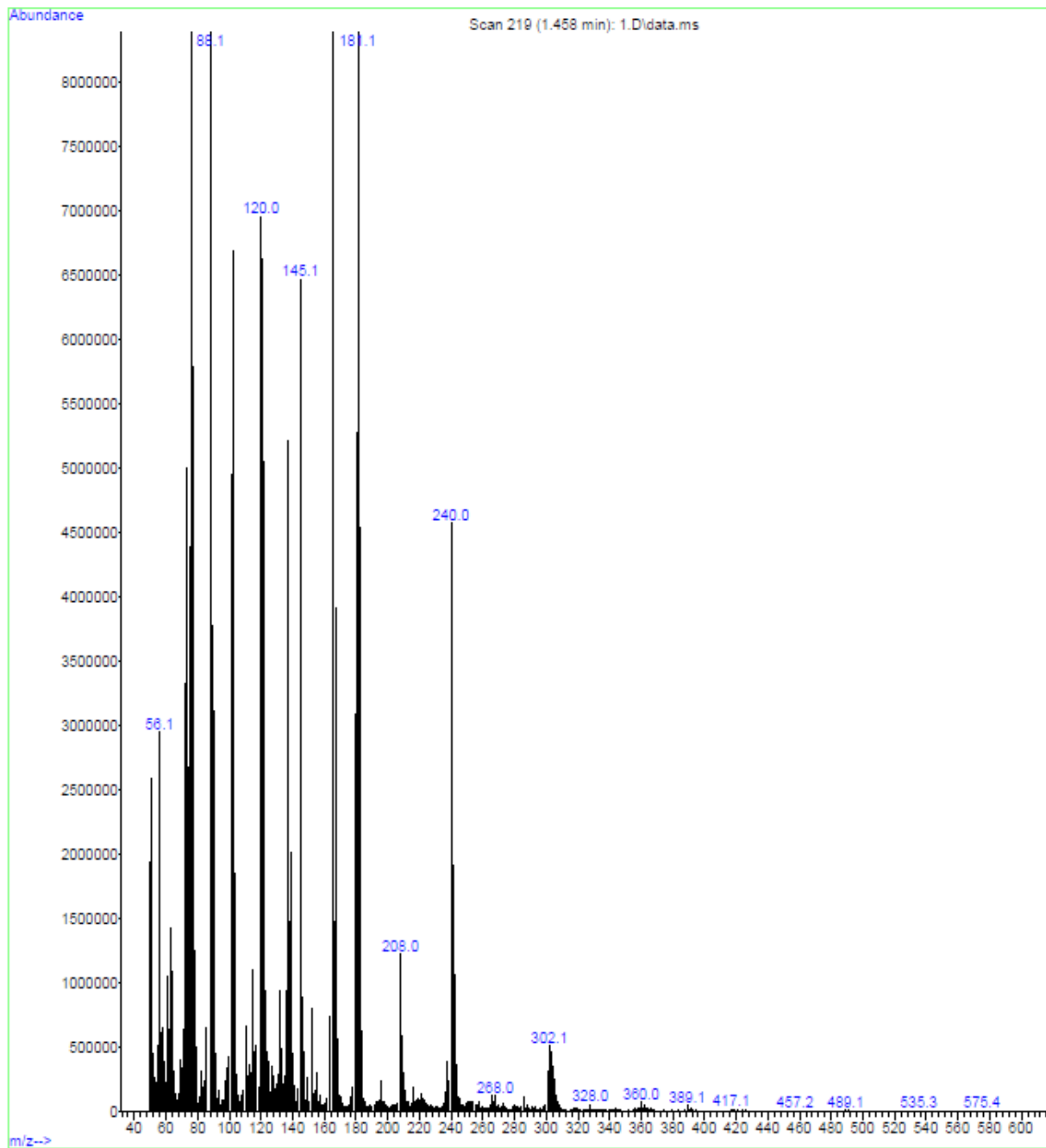
Mass spectrum of compound **6k**



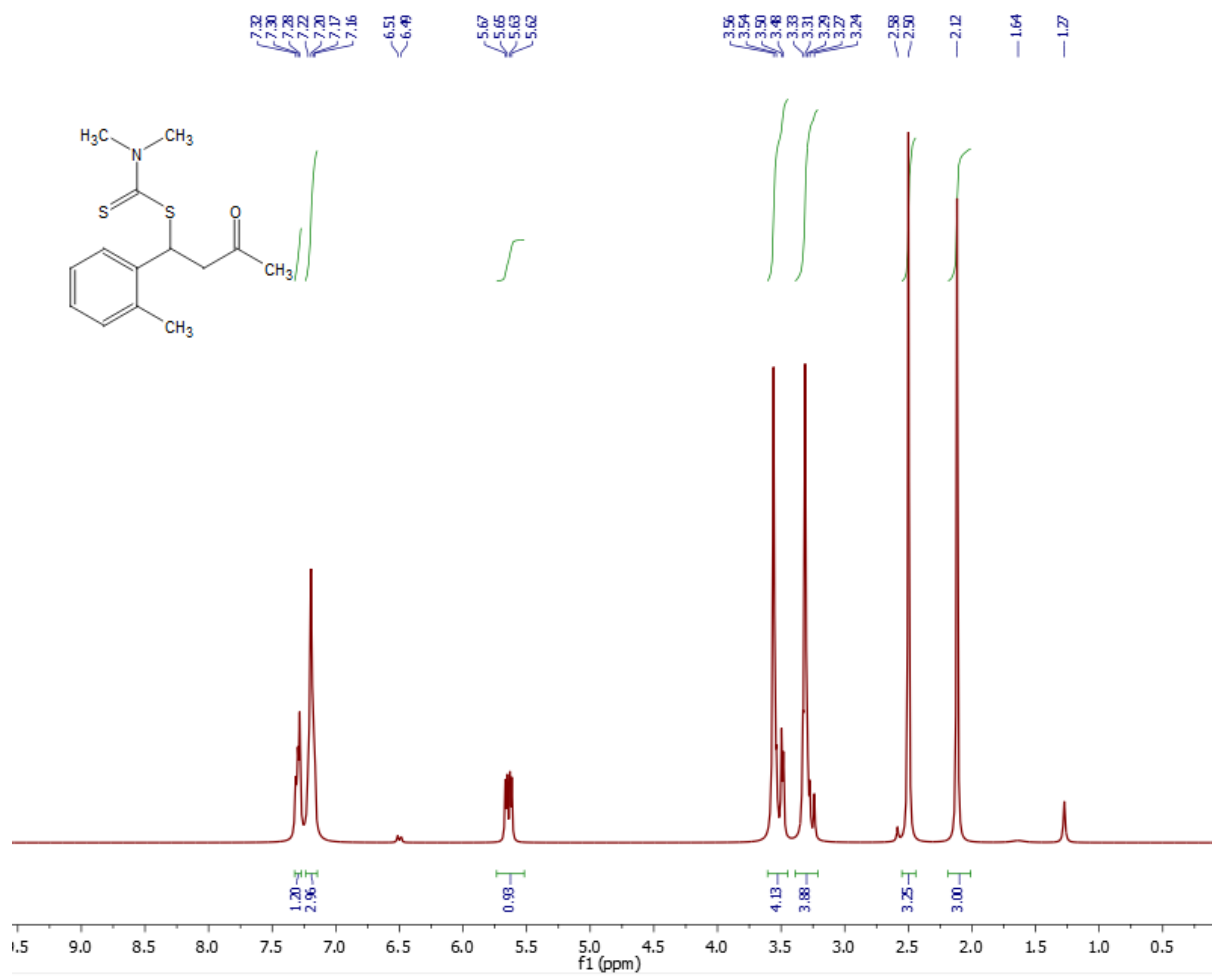
¹H NMR (300 MHz, chloroform-*d*) of compound **6l**



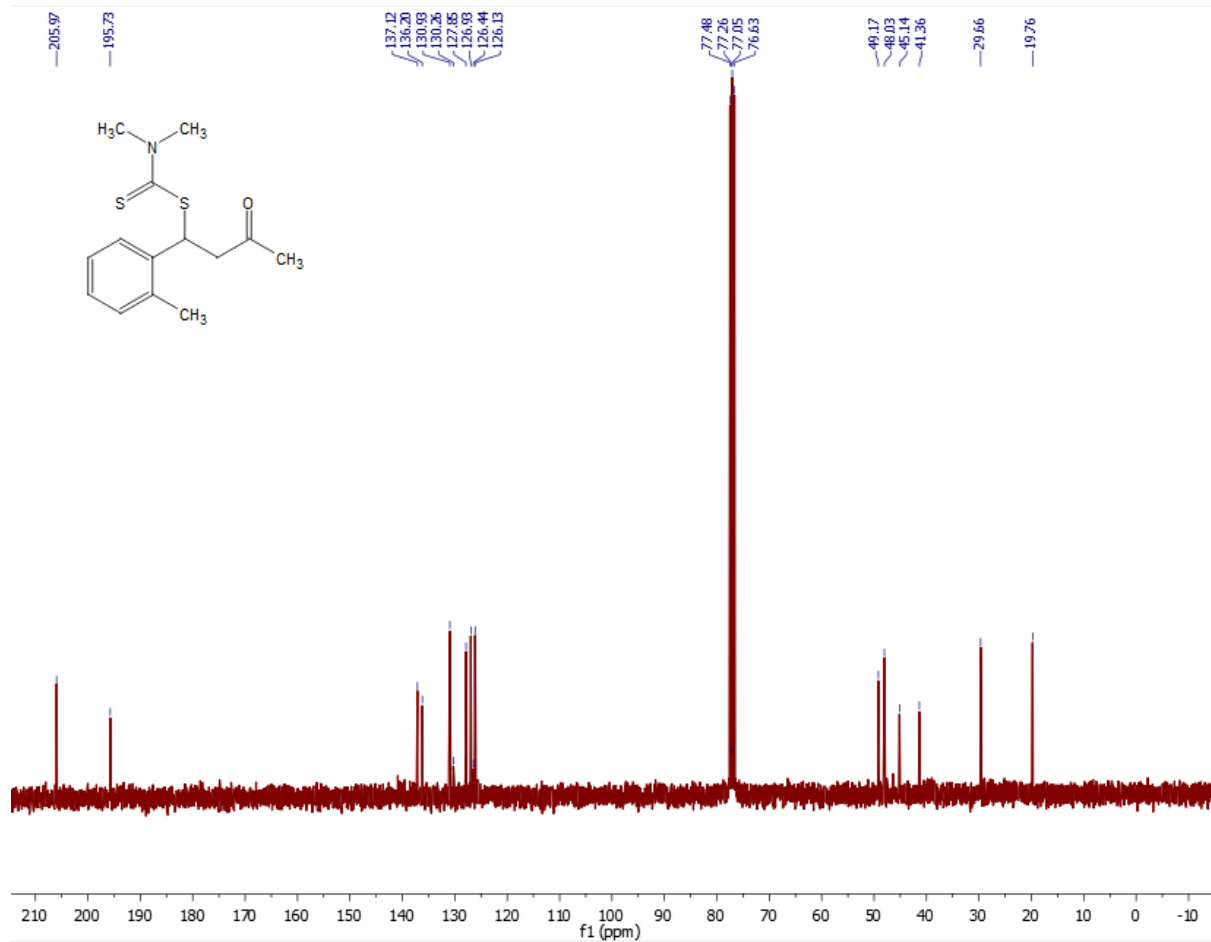
^{13}C NMR $\{^1\text{H}\}$ (75 MHz, chloroform-*d*) of compound **6I**



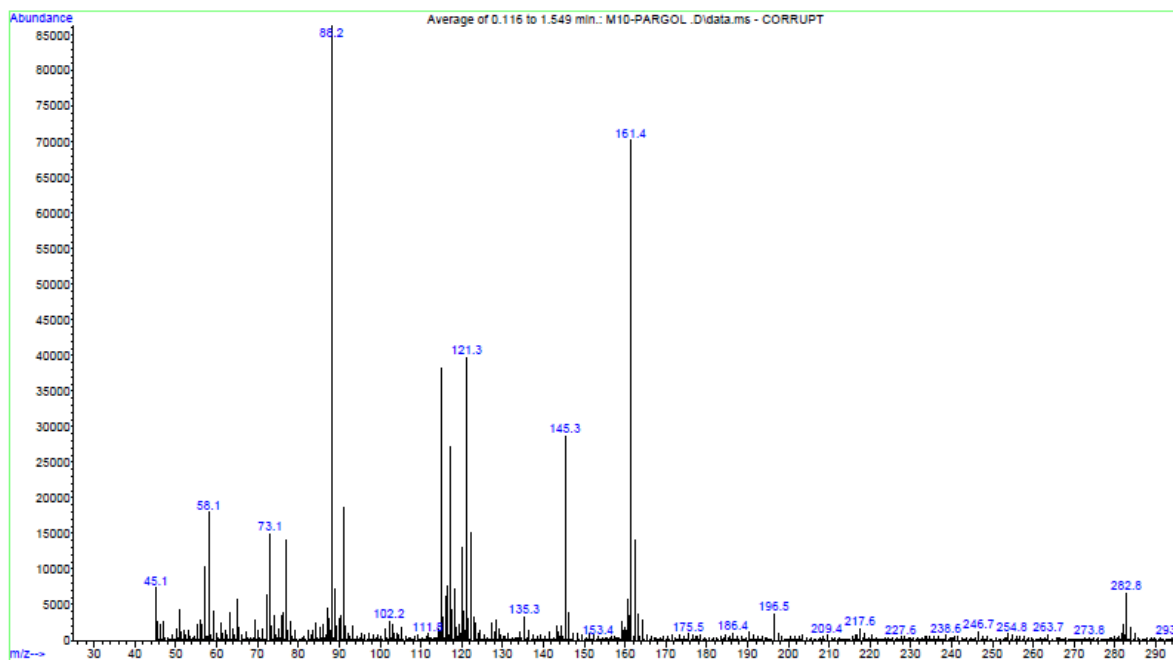
Mass spectrum of compound **61**



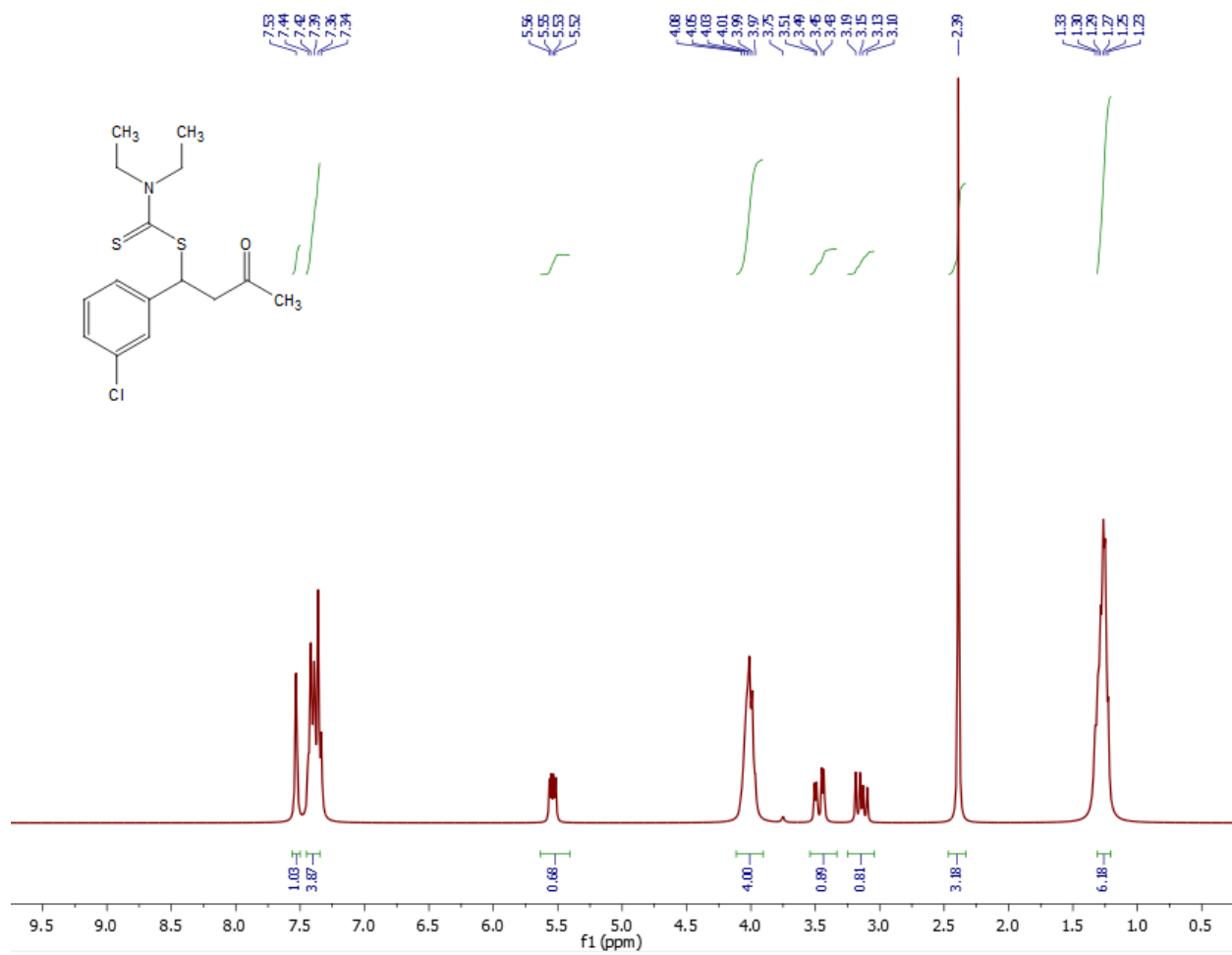
¹H NMR (300 MHz, chloroform-*d*) of compound **6m**



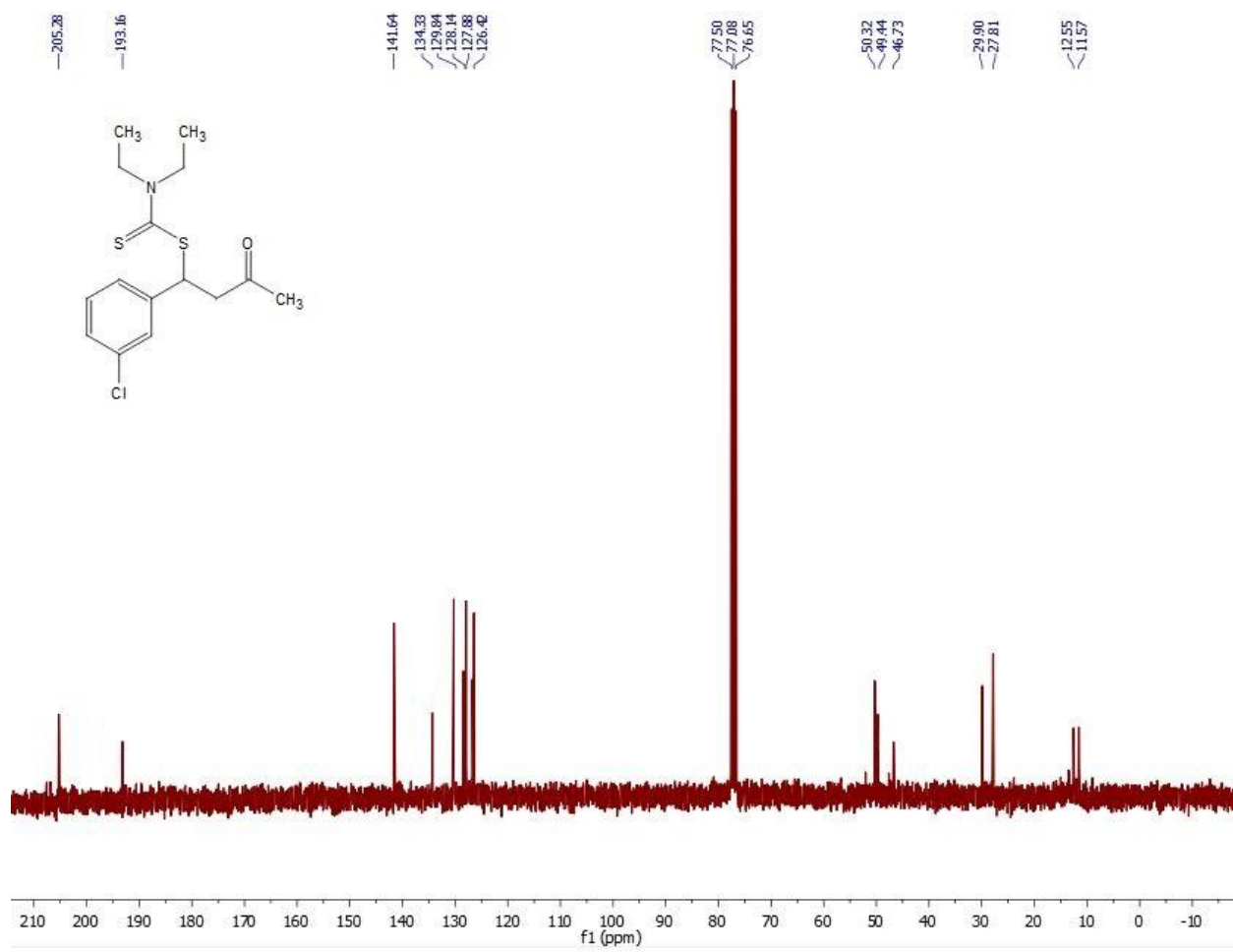
^{13}C NMR $\{^1\text{H}\}$ (75 MHz, chloroform-*d*) of compound **6m**



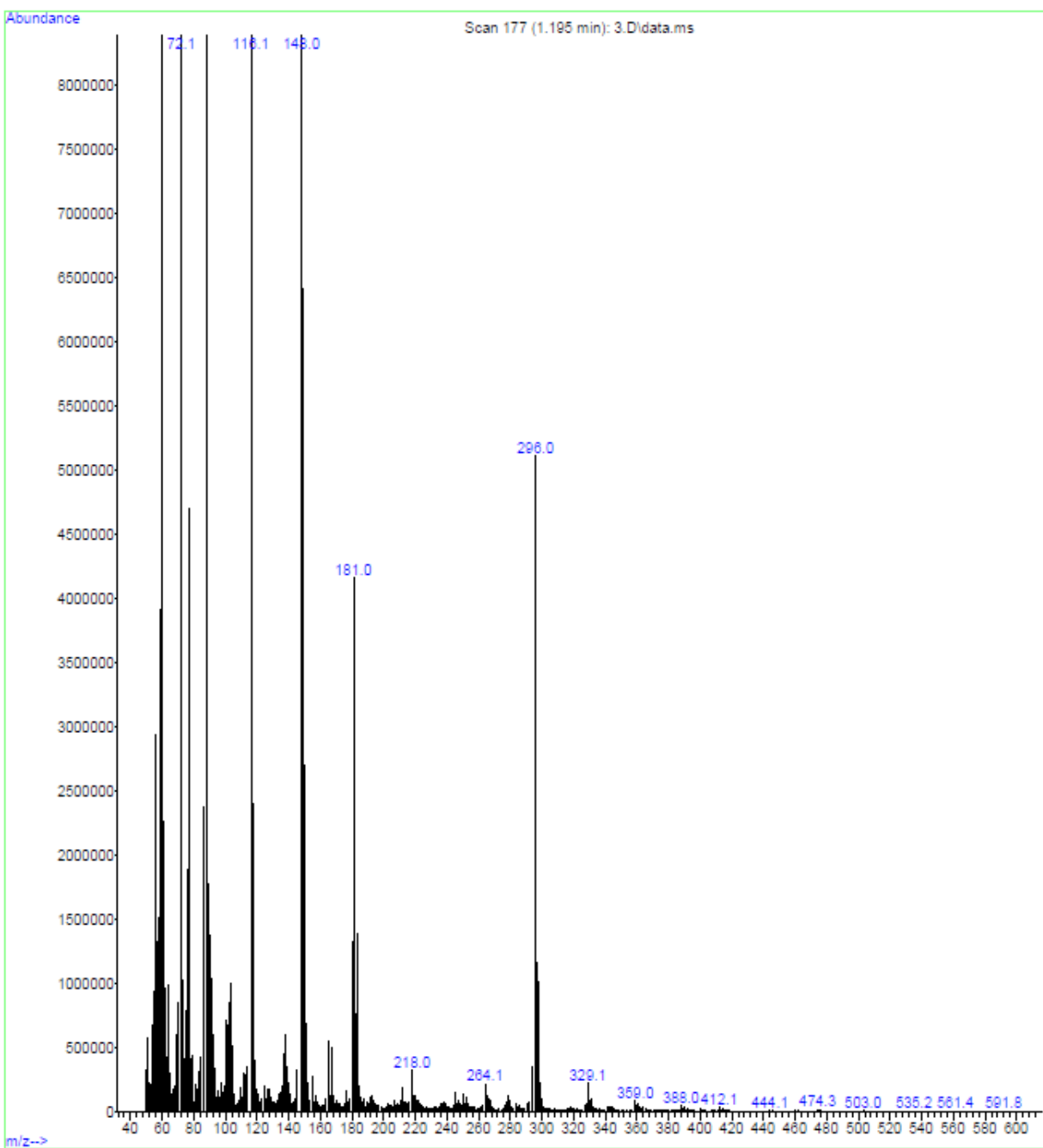
Mass spectrum of compound **6m**



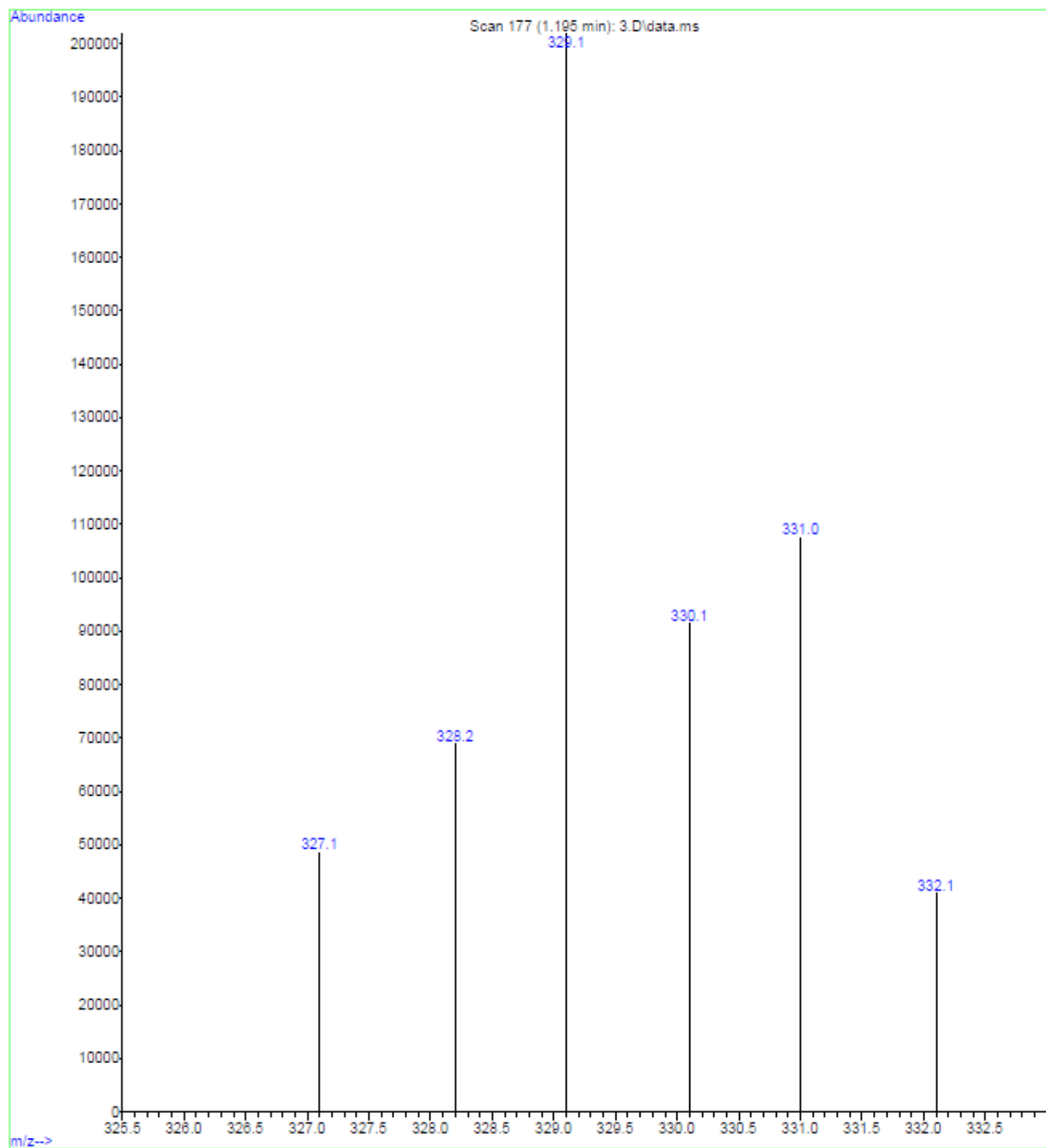
¹H NMR (300 MHz, chloroform-*d*) of compound **6n**



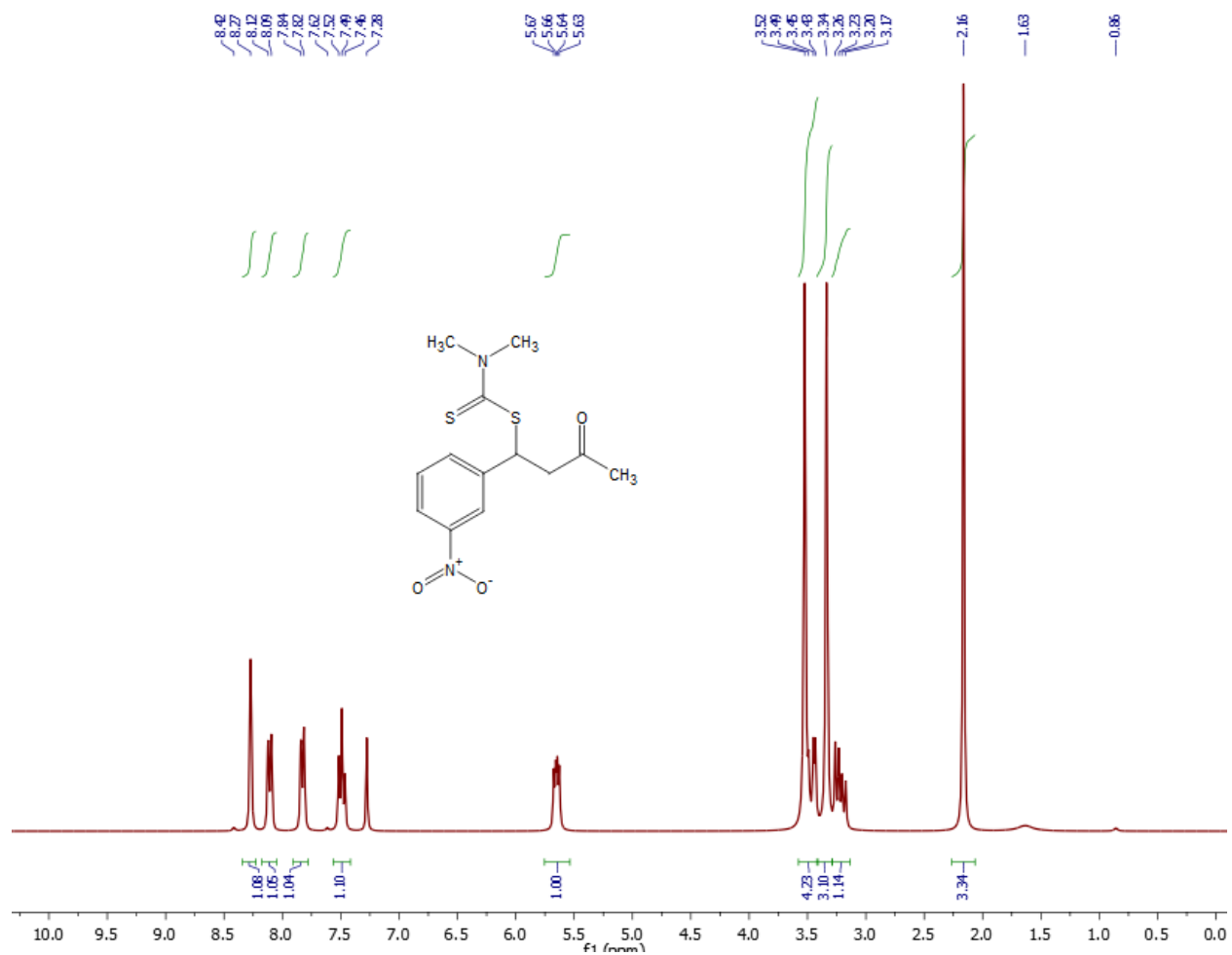
^{13}C NMR (^1H) (75 MHz, chloroform-*d*) of compound **6n**



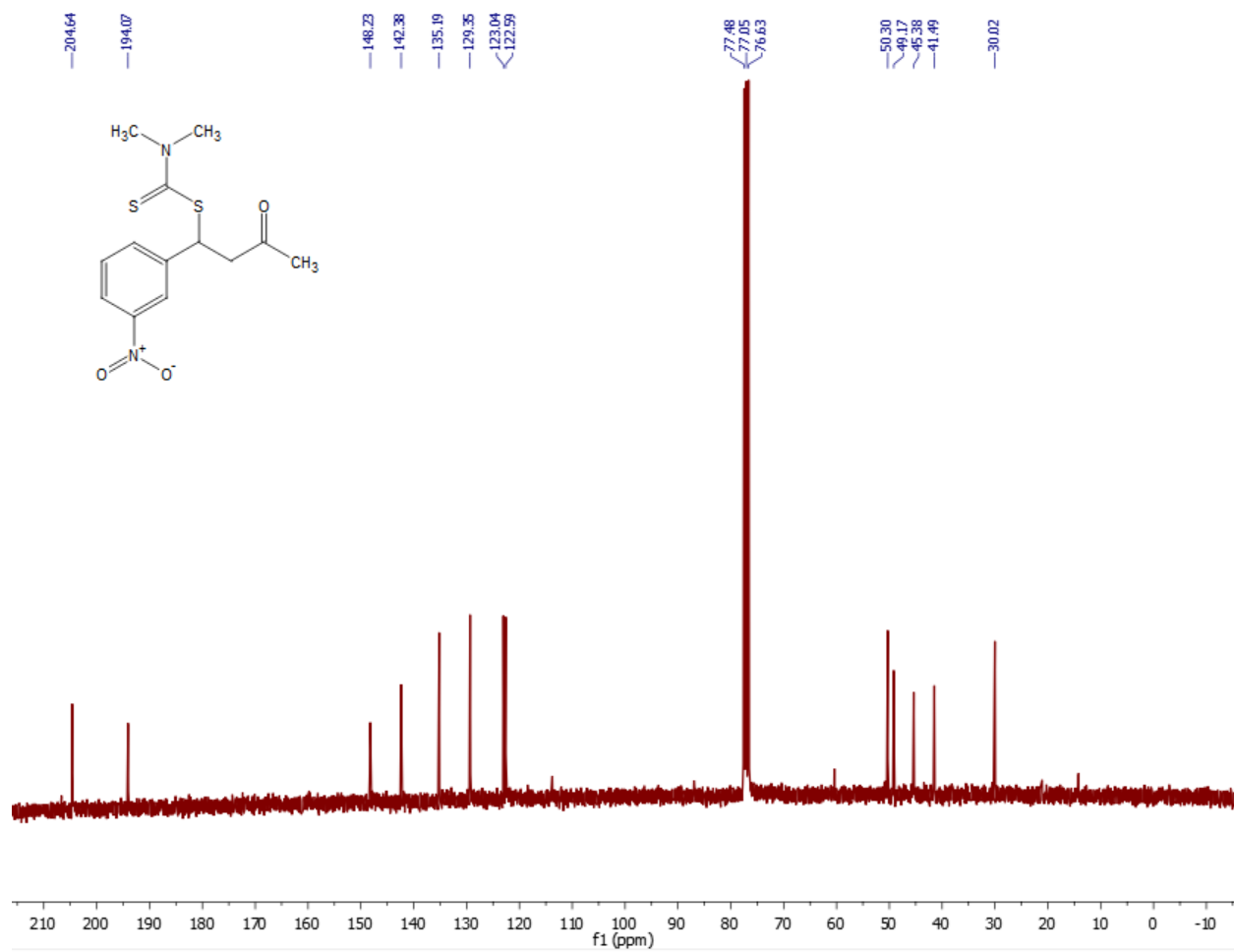
Mass spectrum of compound **6n**



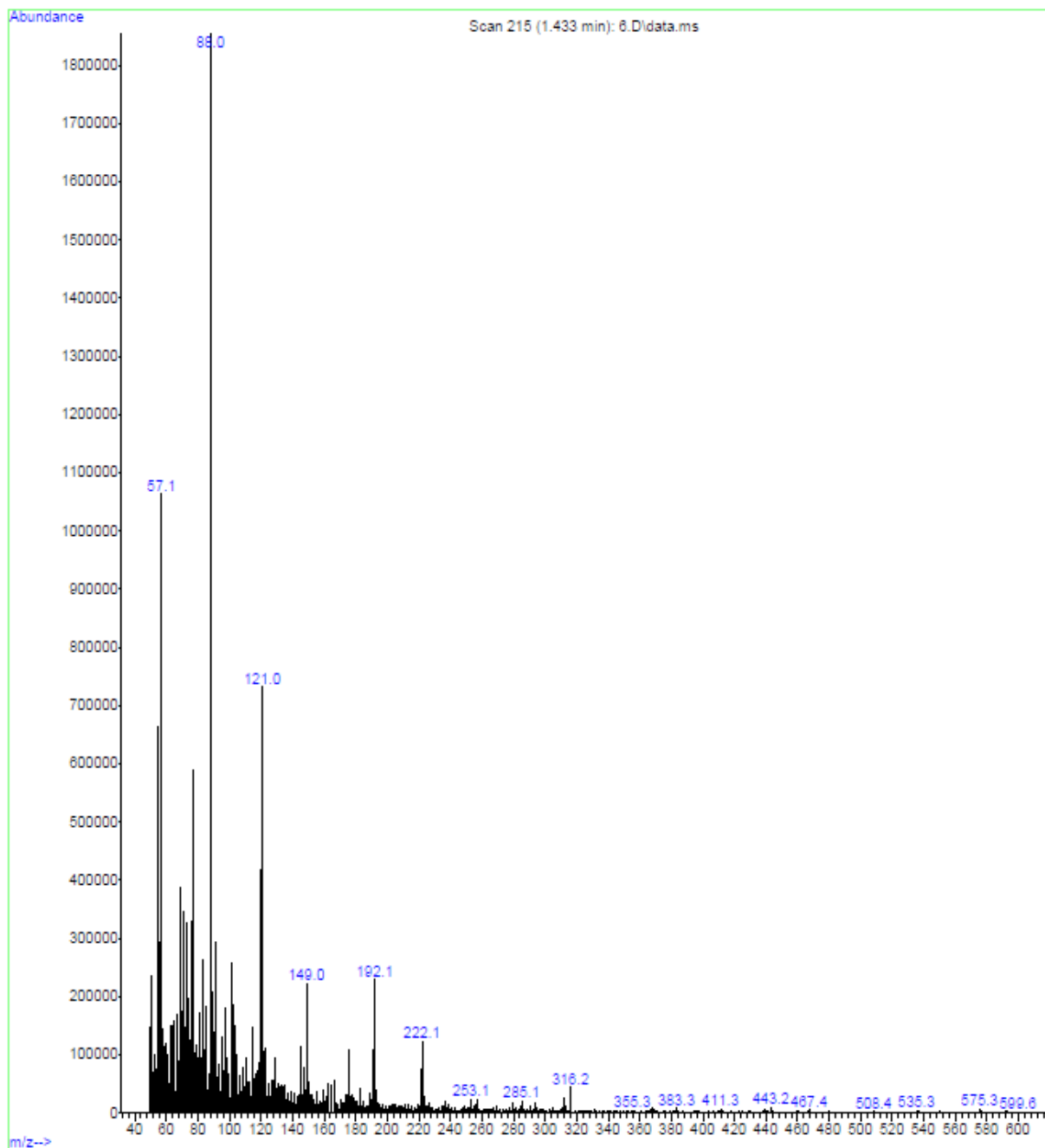
Mass spectrum of compound **6n**



^1H NMR (300 MHz, chloroform-*d*) of compound **60**



^{13}C NMR $\{^1\text{H}\}$ (75 MHz, chloroform-*d*) of compound **60**



Mass spectrum of compound **60**