Electronic Supplementary Material (ESI) for MedChemComm.

Continuous Flow Photochemistry as an Enabling Synthetic Technology: Synthesis of Substituted-6(5*H*)-Phenanthridinones for use as Poly(ADP-ribose) Polymerase Inhibitors

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Supplemental Information

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1. General information

^{1}H and ^{13}C NMR spectra were obtained using a 400MHz Bruker NMR spectrometer at 400 and 100 MHz, respectively. TMS or $CDCl_3$ were used as an internal NMR standard for spectral shifts unless otherwise specified. Anhydrous acetone was used as purchased from VWR and all other reagents were used as purchased without further purification.

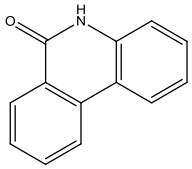
2. Experimental section

2.1 General procedure for the continuous-flow photochemical synthesis of phenanthridinone(s) and derivatives

A solution of starting material (corresponding 2-chloroanilide (benzamide) derivative) (0.1 mmol, 0.005 mmol/mL) in acetone (2mL) was passed continuously through the Vapourtec® UV-150 photochemical flow reactor using a Vapourtec® R2+/R4 flow chemistry system at a rate of 0.200 mL/min (reacting time 50min). The UV-150 reactor uses a medium-pressure pure Hg lamp (lamp power 75%, approximately 112.5 watts), a 10mL FEP reactor coil, and a filter (type 1, quartz, whole-wavelength range). The temperature was set and maintained at 60˚C using the Vapourtec R4 reactor module, and the UV reactor coil flow stream was passed through an 8 bar back pressure regulator, with the Vapourtec R2+ pressure limit set at 12 bar. The reaction stream of crude product was collected into a round-bottom flask which was covered by aluminum foil. Solvent acetone was removed by a rotary vacuum and the residue was loaded on silica gel and purified by column chromatography (Teledyne Isco CombiFlash Rf®) using 10% ethyl acetate in hexanes. The purified product was dried under vacuum and weighed.

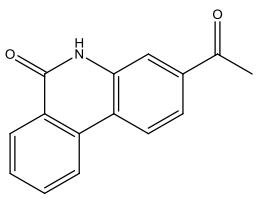
2.2 Characterization of phenanthridinone and derivatives

Phenanthridin-6(5*H*)-one (entry 1)



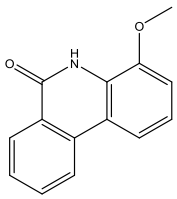
2-Chloro-*N*-phenylbenzamide was treated according to the general procedure as starting material. Purification by CombiFlash® Rf afforded the title compound (19.4 mg, 99%) as a pale yellow crystalline solid. R_f = 0.22(40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, DMSO) δ 11.71 (s, 1H), 8.51 (d, *J* = 8.1 Hz, 1H), 8.39 (d, *J* = 7.9 Hz, 1H), 8.33 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.91 – 7.82 (m, 1H), 7.65 (t, *J* = 7.3 Hz, 1H), 7.53 – 7.46 (m, 1H), 7.39 – 7.35 (m, 1H), 7.30 – 7.23 (m, 1H). ^{13}C NMR (100 MHz, DMSO) δ 161.27, 137.03, 134.72, 133.27, 130.03, 128.39, 127.93, 126.15, 123.72, 123.09, 122.73, 118.02, 116.57. $C_{13}H_9NO$ (ESI+, M+1) = 196.10.

3-Acetylphenanthridin-6(5*H*)-one (entry 2)



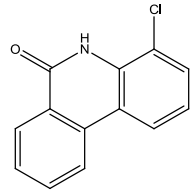
2-Chloro-*N*-(3-chloro-4-methylphenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf, affording the title compound (17.9 mg 76%) as pale yellow crystalline solid. R_f = 0.48 (40% Ethyl acetate/ Hexane) ^{1}H NMR (400 MHz, DMSO) δ 11.86 (s, 1H), 8.59 (d, *J* = 8.1 Hz, 1H), 8.54 (d, *J* = 8.4 Hz, 1H), 8.35 (dd, *J* = 7.9, 1.1 Hz, 1H), 7.94 – 7.88 (m, 2H), 7.82 (dd, *J* = 8.4, 1.7 Hz, 1H), 7.73 (t, *J* = 7.2 Hz, 1H), 2.64 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 197.70, 161.23, 137.50, 137.00, 133.78, 133.53, 129.59, 128.05, 126.83, 124.24, 123.97, 122.26, 121.81, 116.23, 27.30. $C_{15}H_{11}NO_2$ (ESI+, M+1) = 238.15.

2-Methoxyphenanthridin-6(5*H*)-one (entry 3)



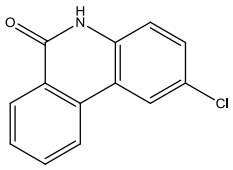
2-Chloro-*N*-(2-methoxyphenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf affording the title compound (18.1 mg, 80%) as a off-white solid. R_f = 0.25 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, DMSO) δ 10.61 (s, 1H, NH), 8.49 (d, *J* = 8.2 Hz, 1H), 8.35 (dd, *J* = 7.9, 1.1 Hz, 1H), 7.98 (d, *J* = 8.0 Hz, 1H), 7.89 – 7.83 (m, 1H), 7.65 (dd, *J* = 11.1, 3.9 Hz, 1H), 7.24 (t, *J* = 8.0 Hz, 1H), 7.17 (d, *J* = 7.3 Hz, 1H), 3.94 (s, 3H).^{13}C NMR (100 MHz, DMSO) δ 160.81, 146.72, 134.73, 133.38, 128.53, 128.05, 126.61, 126.30, 123.51, 122.67, 118.52, 115.39, 110.95, 56.54. $C_{14}H_{11}NO_2$ (ESI+, M+1) = 226.10.

4-Chlorophenanthridin-6(5*H*)-one (entry 4)



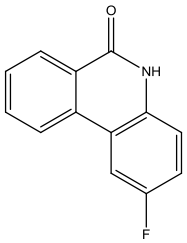
2-chloro-*N*-(2-chlorophenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf, affording the title compound (17 mg, 74%) as off-white solid. R_f = 0.11 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, DMSO) δ 10.82 (s, 1H), 8.56 (d, *J* = 8.2 Hz, 1H), 8.44 (d, *J* = 8.0 Hz, 1H), 8.36 (dd, *J* = 8.0, 1.1 Hz, 1H), 7.94 – 7.88 (m, 1H), 7.74 – 7.68 (m, 1H), 7.66 (dd, *J* = 7.8, 1.1 Hz, 1H), 7.30 (t, *J* = 8.0 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 161.27, 134.11, 133.84, 133.31, 130.26, 129.25, 128.10, 126.01, 123.62, 123.33, 122.99, 120.06, 119.75. $C_{13}H_8NOCl$ (ESI+, M+1) = 230.10.

2-Chlorophenanthridin-6(5*H*)-one (entry 5)



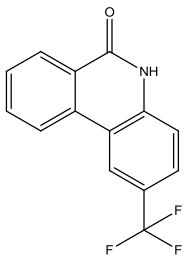
2-Chloro-*N*-(4-chlorophenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf affording the title compound (21.3 mg, 93%) as a yellow crystalline solid. R_f = 0.31 (40% Ethyl acetate/ Hexane) ^{1}H NMR (400 MHz, DMSO) δ 11.82 (s, 1H), 8.57 (d, *J* = 8.1 Hz, 1H), 8.48 (d, *J* = 2.2 Hz, 1H), 8.32 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.90 – 7.83 (m, 1H), 7.69 (t, *J* = 7.5 Hz, 1H), 7.54 (dd, *J* = 8.7, 2.2 Hz, 1H), 7.37 (d, *J* = 8.7 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 161.08, 135.8 0, 133.65, 133.43, 129.89, 129.11, 127.92, 127.03, 126.27, 123.59, 123.33, 119.61, 118.35. $C_{13}H_8NOCl$ (ESI+, M+1) = 230.10.

2-Fluorophenanthridin-6(5*H*)-one (entry 6)



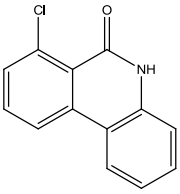
2-Chloro-*N*-(4-fluorophenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf affording the title compound (17 mg 80%) as off-white solid. R_f = 0.26 (40% Ethyl acetate/ Hexane)^{1}H NMR (400 MHz, DMSO) δ 11.76 (s, 1H, NH), 8.52 (d, *J* = 8.1 Hz, 1H), 8.33 (d, *J* = 7.9 Hz, 1H), 8.28 (d, *J* = 10.3 Hz, 1H), 7.86 (t, *J* = 7.6 Hz, 1H), 7.68 (t, *J* = 7.5 Hz, 1H), 7.38 (m, 2H). ^{13}C NMR (100 MHz, DMSO) δ 160.99, 158.31 (d, *J* = 233 Hz), 134.05 (d, *J* = 3 Hz), 133.62, 133.31, 129.05, 127.94, 126.29, 123.68, 119.31 (d, *J* = 8.4 Hz), 118.23 (d, *J* = 8.5 Hz), 117.66 (d, *J* = 24.2 Hz), 109.65 (d, *J* = 24.0 Hz). $C_{13}H_8NOF$ (ESI+, M+1) = 214.10.

2-(Trifluoromethyl)phenanthridin-6(5*H*)-one (entry 7)



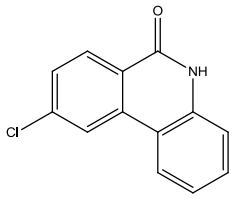
2-Chloro-*N*-(4-(trifluoromethyl)phenyl)benzamide was treated according to the general procedure as starting material. Major compound was separated and purified by CombiFlash® Rf affording the title compound (23mg, 86%). R_f = 0.39 (40% Ethyl acetate/ Hexane) ^{1}H NMR (400 MHz, DMSO) δ 12.03 (s, 1H, NH), 8.74 (s, 1H), 8.69 (d, *J* = 8.1 Hz, 1H), 8.34 (dd, *J* = 7.9, 1.0 Hz, 1H), 7.93 – 7.86 (m, 1H), 7.82 (dd, *J* = 8.6, 1.4 Hz, 1H), 7.72 (t, *J* = 7.5 Hz, 1H), 7.53 (d, *J* = 8.5 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 161.47, 139.77, 133.80, 133.64, 129.35, 127.96, 126.44 (q, *J* = 3.6 Hz), 126.34, 125.00 (q, *J* = 270 Hz), 123.75, 123.25 (q, *J* = 32.5 Hz), 121.39 (q, *J* = 3.8 Hz), 118.17, 117.42. $C_{14}H_8NOF_3$ (ESI+, M+1) = 264.15.

7-Chlorophenanthridin-6(5*H*)-one (entry 8)



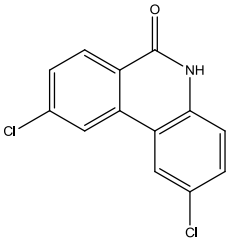
2,6-Dichloro-*N*-phenylbenzamide was treated according to the general procedure as starting material. Major Product was purified by CombiFlash® Rf, re-dissolved in 1 mL methanol and dried, affording the title compound (15.1 mg, 67%) as yellowish white solid. R_f = 0.32 (40% Ethyl acetate/ Hexane) ^{1}H NMR (400 MHz, DMSO) δ 11.67 (s, 1H), 8.51 (dd, *J* = 8.4, 1.0 Hz, 1H), 8.35 (t, *J* = 6.2 Hz, 1H), 7.76 (t, *J* = 8.0 Hz, 1H), 7.65 (dd, *J* = 7.8, 1.0 Hz, 1H), 7.53 – 7.47 (m, 1H), 7.33 (dd, *J* = 8.2, 1.0 Hz, 1H), 7.24 (ddd, *J* = 8.3, 7.2, 1.2 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 159.54, 138.02, 137.19, 134.98, 133.28, 131.69, 130.72, 124.30, 122.71, 122.58, 122.36, 117.31, 116.07. $C_{13}H_8NOCl$ (ESI+, M+1) = 230.15.

9-Chlorophenanthridin-6(5*H*)-one (entry 9)



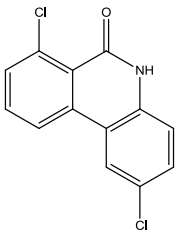
2,4-Dichloro-*N*-phenylbenzamide was treated according to the general procedure as starting material. Major Product was purified by CombiFlash® Rf, re-dissolved in 1 mL methanol and dried, affording the title compound (19 mg, 85%) as yellowish white solid. R_f = 0.33 (40% Ethyl acetate/ Hexane).^{1}H NMR (400 MHz, DMSO) δ 11.80 (s, 1H), 8.62 (d, *J* = 1.7 Hz, 1H), 8.45 (d, *J* = 8.0 Hz, 1H), 8.30 (d, *J* = 8.5 Hz, 1H), 7.68 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.53 (t, *J* = 7.3 Hz, 1H), 7.37 (d, *J* = 7.9 Hz, 1H), 7.27 (t, *J* = 7.3 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 160.64, 138.74, 137.49, 136.56, 130.81, 130.18, 128.56, 124.83, 124.29, 122.89, 122.86, 117.07, 116.65. $C_{13}H_8NOCl$ (ESI+, M+1) = 230.05.

2,9-dichlorophenanthridin-6(5*H*)-one (entry 10)



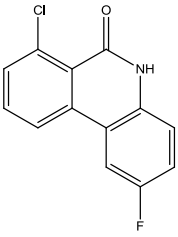
2,4-Dichloro-*N*-(4-chlorophenyl)benzamide was treated according to the general procedure as starting material. Major Product was separated and purified by CombiFlash® Rf, affording the title compound (19 mg, 83%) R_f = 0.35 (40% Ethyl acetate/ Hexane). ^{1}H NMR (400 MHz, DMSO) δ 11.89 (s, 1H), 8.70 (d, *J* = 1.9 Hz, 1H), 8.56 (d, *J* = 2.2 Hz, 1H), 8.29 (dd, *J* = 8.4, 4.5 Hz, 1H), 7.70 (dd, *J* = 8.5, 1.9 Hz, 1H), 7.56 (dd, *J* = 8.7, 2.2 Hz, 1H), 7.35 (d, *J* = 8.7 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 160.46, 138.94, 136.25, 135.47, 130.62, 130.09, 129.22, 127.24, 124.95, 123.88, 123.41, 118.61, 118.39. $C_{13}H_7NOCl_2$ (ESI+, M+1) = 264.05.

2,7-dichlorophenanthridin-6(5*H*)-one (entry 11)



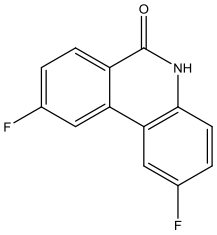
2,6-Dichloro-*N*-(4-chlorophenyl)benzamide was treated according to the general procedure as starting material. Major Product was separated and purified by CombiFlash® Rf, re-dissolved in 1 mL methanol and dried, affording the title compound (17 mg, 74%) as a white solid. R_f = 0.39 (40% Ethyl acetate/ Hexane). ^{1}H NMR (400 MHz, DMSO) δ 11.77 (s, 1H), 8.56 (dd, *J* = 8.3, 0.9 Hz, 1H), 8.45 (d, *J* = 2.2 Hz, 1H), 7.76 (t, *J* = 8.0 Hz, 1H), 7.71 – 7.66 (m, 1H), 7.57 – 7.51 (m, 1H), 7.32 (d, *J* = 8.7 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 159.35, 136.92, 135.97, 135.01, 133.42, 132.37, 130.58, 126.97, 123.85, 123.08, 122.51, 118.87, 117.86. $C_{13}H_7NOCl_2$ (ESI+, M+1) = 264.10.

7-chloro-2-fluorophenanthridin-6(5*H*)-one (entry 12)



2,6-dichloro-*N*-(4-fluorophenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf, re-dissolved in 1 mL methanol and dried, affording the title compound (15.5 mg, 67%) as white solid. R_f = 0.42 (40% Ethyl acetate/ Hexane). ^{1}H NMR (400 MHz, DMSO) δ 11.70 (s, 1H), 8.55 – 8.48 (m, 1H), 8.25 (dd, *J* = 10.7, 2.5 Hz, 1H), 7.77 (t, *J* = 8.0 Hz, 1H), 7.69 (dd, *J* = 7.8, 1.0 Hz, 1H), 7.44 – 7.30 (m, 2H). ^{13}C NMR (100 MHz, DMSO) δ 159.27, 158.18 (d, *J* = 236 Hz), 137.28 (d, *J* = 3 Hz), 135.03, 133.83, 133.31, 132.32, 123.19, 122.53, 118.53 (d, *J* = 8.7 Hz), 118.45 (d, *J* = 24.2 Hz), 117.77 (d, *J* = 8.4 Hz), 110.18 (d, *J* = 24.0 HZ). $C_{13}H_7NOClF$ (ESI+, M+1) = 248.15.

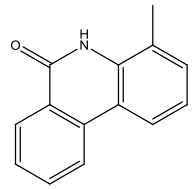
2,9-Difluorophenanthridin-6(5*H*)-one (entry 13)



2-chloro-4-fluoro-*N*-(4-fluorophenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf, re-dissolved in 1 mL methanol and dried, affording the title compound (18.8 mg, 84%) as white solid. R_f = 0.40 (40% Ethyl acetate/ Hexane). ^{1}H NMR (400 MHz, DMSO) δ 11.78 (s, 1H, NH), 8.41 – 8.33 (m, 1H), 8.36 (s, 1H), 8.29 (dd, *J* = 10.4, 2.3 Hz, 1H), 7.51 (td, *J* = 8.6, 2.3 Hz, 1H), 7.45 – 7.34 (m, 2H). ^{13}C NMR (100 MHz, DMSO) δ 165.53 (d, *J* = 247 Hz), 160.32, 158.17 (d, *J* = 236 Hz), 136.95 (d, *J* = 10.1 Hz), 134.11, 131.36 (d, *J* = 10.2 Hz), 123.14, 118.69 (d, *J* =

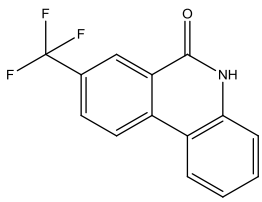
8.3Hz), 118.47 (d, *J* = 24.0 Hz), 118.33 (d, *J* = 8.3 Hz), 117.09 (d, *J* = 23.8 Hz), 110.23 (d, *J* = 24.0 Hz), 109.77 (d, *J* = 24.1 Hz). $C_{13}H_7NOF_2$ (ESI+, M+1) = 232.10.

4-Methylphenanthridin-6(5*H*)-one (entry 14)



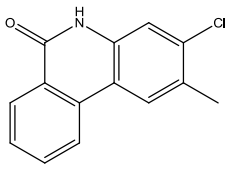
2-Chloro-*N*-(2-methylphenyl)benzamide was treated according to the general procedure as starting material. Major product was separated and purified by CombiFlash® Rf affording the title compound (4.4 mg, 21%) as a pale yellow crystalline solid R_f = 0.37 (40% Ethyl acetate/ Hexane) ^{1}H NMR (400 MHz, DMSO) δ 10.72 (s, 1H, NH), 8.52 (d, *J* = 8.2 Hz, 1H), 8.35 (dd, *J* = 7.9, 1.2 Hz, 1H), 8.27 (d, *J* = 8.0 Hz, 1H), 7.89 – 7.81 (m, 1H), 7.65 (dd, *J* = 11.1, 3.9 Hz, 1H), 7.36 (d, *J* = 7.2 Hz, 1H), 7.19 (t, *J* = 7.7 Hz, 1H), 2.48 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 161.66, 135.24, 135.00, 133.42, 131.48, 128.33, 127.93, 125.82, 124.65, 123.29, 122.46, 121.62, 118.02, 18.14. $C_{14}H_{11}NO$ (ESI+, M+1) = 210.15.

8-(Trifluoromethyl)phenanthridin-6(5*H*)-one (entry 15)



2-Chloro-*N*-phenyl-5-(trifluoromethyl)benzamide was treated according to the general procedure as starting material. Major product was purified by CombiFlash Rf®, re-dissolved in 1 mL methanol and dried, affording the title compound (6.7mg, 26%) as yellow crystalline solid. R_f =0.38 32 (40% Ethyl acetate/ Hexane). ^{1}H NMR (400 MHz, DMSO) δ 12.00 (s, 1H), 8.76 (d, *J* = 8.6 Hz, 1H), 8.56 (s, 1H), 8.49 (d, *J* = 7.9 Hz, 1H), 8.17 (dd, *J* = 8.5, 2.0 Hz, 1H), 7.63 – 7.54 (m, 1H), 7.44 – 7.38 (m, 1H), 7.36 – 7.29 (m, 1H). ^{13}C NMR (100 MHz, DMSO) δ 160.45, 138.09, 137.75, 131.46, 129.20 (q, *J* = 3.3 Hz), 128.57, 128.41 (q, *J* = 32.6 Hz), 126.31, 125.80, 124.88 (q, *J* = 4.1 Hz), 124.40 (q, *J* = 279 Hz), 123.18, 117.01, 116.88. $C_{14}H_8NOF_3$ (ESI+, M+1) = 264.10.

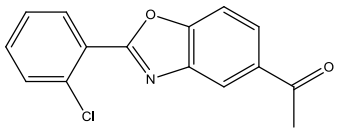
3-Chloro-2-methylphenanthridin-6(5*H*)-one (entry 16)



2-Chloro-*N*-(3-chloro-4-methylphenyl)benzamide was treated according to the general procedure as starting material. Purification by CombiFlash® Rf afforded the title compound (3.2 mg, 13%) as a white crystalline solid. R_f = 0.45 (40% Ethyl acetate/ Hexane). ^{1}H NMR (400 MHz, DMSO) δ 11.69 (s, 1H), 8.49 (d, *J* = 8.1 Hz, 1H), 8.40 (s, 1H), 8.30 (dd, *J* = 8.0, 1.1 Hz, 1H), 7.89 – 7.83

(m, 1H), 7.69 – 7.61 (m, 1H), 7.38 (s, 1H), 2.42 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 161.14, 136.09, 134.67, 134.00, 133.38, 129.49, 128.63, 127.98, 126.07, 125.99, 123.25, 117.12, 116.07, 19.68. $C_{14}H_{10}NOCl$ (ESI+, M+1) = 244.10.

1-(2-(2-Chlorophenyl)benzo[d]oxazol-5-yl)ethanone



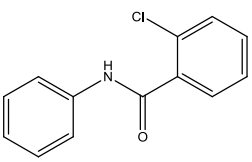
N-(5-acetyl-2-bromophenyl)-2-chlorobenzamide treated according to the general procedure as starting material. Major Product was purified by CombiFlash® Rf affording the title compound (17 mg, 63%) as a yellowish white crystalline solid. R_f = 0.47 (40% Ethyl acetate/ Hexane) ^{1}H NMR (400 MHz, DMSO) δ 8.50 (d, *J* = 1.5 Hz, 1H), 8.18 (dd, *J* = 7.7, 1.7 Hz, 1H), 8.09 (dd, *J* = 8.6, 1.7 Hz, 1H), 7.94 (d, *J* = 8.6 Hz, 1H), 7.74 (dd, *J* = 8.0, 1.1 Hz, 1H), 7.67 (td, *J* = 7.7, 1.7 Hz, 1H), 7.60 (td, *J* = 7.5, 1.2 Hz, 1H). ^{13}C NMR (100 MHz, DMSO) δ 197.57, 161.99, 153.31, 141.72, 134.75, 133.74, 132.78, 132.50, 131.85, 128.30, 126.72, 125.44, 121.54, 111.69, 27.47. $C_{15}H_{10}NO_2Cl$ (ESI+, M+1) = 272.10.

2.3 General procedure of the preparation of benzamide substrates (2-chloroanilides)

A round-bottom flask with magnetic stir-bar was cleaned and oven-dried. The corresponding acyl chloride (1.1 equiv.) and aniline (1 equiv.) were dissolved in tetrahydrofuran (THF) (5mL per 1mmol reagent) respectively to make two solutions, one of acyl chloride and one of the aniline. The solution of aniline was introduced to the flask and stirred in ice bath at 0℃ for 5 minutes. Triethylamine (1 equiv.) was added to the solution of aniline followed by addition of the solution of acyl chloride drop by drop at 0℃. The resulting reaction mixture was stirred at r.t. for overnight after removing the ice bath. The resulting product was filtered twice to remove the solid which was washed by THF. THF was then removed from the solution of crude product by vacuum and the residue was loaded on silica gel, separated and purified by column chromatography (CombiFlash® Rf). The purified product was then dried under vacuum.

2.4 Characterization of benzamide (2-chloroanilides) substrates

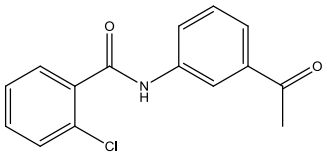
2-Chloro-*N*-phenylbenzamide



Aniline (93.2 mg, 1 mmol) and 2-chlorobenzoyl chloride (195 mg, 1.11 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (230 mg, 99%) as a white

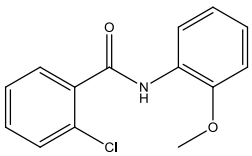
crystalline solid. R_f=0.61 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, CDCl3) δ 8.68 (s, 1H), 7.63 (d, J = 7.7 Hz, 2H), 7.47 (dd, J = 7.6, 1.4 Hz, 1H), 7.34-7.26 (m, 4H), 7.20 (dt, J-7.4, 1.6 Hz, 1H), 7.13 (t, J=7.2 Hz, 1H). ^{13}C NMR (100 MHz, CDCl3) δ 164.52, 137.56, 135.21, 131.72, 130.63, 130.39, 130.35, 129.15, 127.32, 124.89, 120.15.

_N_-(3-acetylphenyl)-2-chlorobenzamide



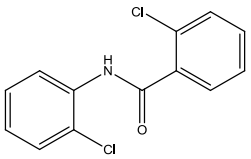
3'-Aminoacetophenone (135 mg, 1 mmol) and 2-chlorobenzoyl (194 mg, 1.1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (251 mmg, 92%). R_f=0.44. ^{1}H NMR (400 MHz, DMSO) δ 10.73 (s, 1H), 8.34 (s, 1H), 7.96 (d, J = 8.1 Hz, 1H), 7.74 (d, J = 7.8 Hz, 1H), 7.61 (ddd, J = 11.2, 7.6, 1.5 Hz, 2H), 7.57 – 7.45 (m, 3H), 2.59 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 198.09, 165.65, 139.74, 137.85, 137.15, 131.73, 130.38, 130.17, 129.73, 129.42, 127.77, 124.48, 124.36, 119.22, 27.24.

2-Chloro-_N_-(2-methoxyphenyl)benzamide



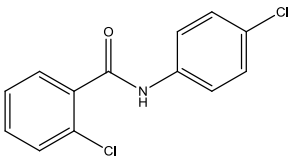
2-Methoxy-benzenamine (123 mg, 1 mmol) and 2-chlorobenzoyl chloride (193 mg, 1.1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (253 mg, 97%) as a white crystalline solid. R_f=0.68 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, DMSO) δ 9.63 (s, 1H), 7.93 (d, J = 7.9 Hz, 1H), 7.59-7.43(m, 4H), 7.17 (t, 1H), 7.09 (d, J = 7.7 Hz, 1H), 6.98 (t, J = 7.5 Hz, 1H), 3.82 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.32, 138.84, 138.29, 134.55, 132.23, 129.45, 128.99, 127.19, 126.06, 121.77, 90.22.

2-chloro-_N_-(2-chlorophenyl)benzamide



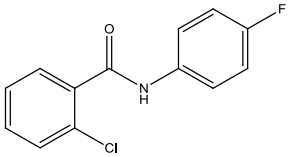
2-Chloroaniline (128 mg, 1 mmol) and 2-chlorobenzoyl chloride (194 mg, 1.1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (265 mg, 99%) as a off-white solid. R_f=0.77 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (d, *J* = 8.1 Hz, 1H), 8.52 (s, 1H), 7.84 (dd, *J* = 7.4, 1.5 Hz, 1H), 7.55 – 7.40 (m, 4H), 7.37 (t, *J* = 7.8 Hz, 1H), 7.13 (td, *J* = 7.8, 1.5 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.35, 134.77, 134.54, 132.02, 130.79, 130.61, 129.18, 127.84, 127.37, 125.13, 123.18, 121.82.

2-Chloro-*N*-(4-chlorophenyl)benzamide



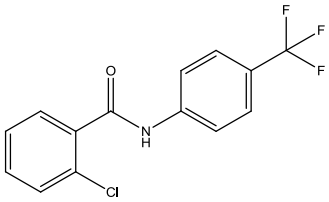
4-Chloroaniline (127.6 mg, 1 mmol) and 2-chlorobezoyl chloride (193 mg, 1.1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (231 mg, 99%) as a white crystalline solid. R_f=0.64 (40% Ethyl acetate/hexane). ^{1}H NMR (400MHz, DMSO): δ10.66 (s, 1H), 7.76 (d, J=8.8Hz, 2H), 7.61-7.45 (m, 4H), 7.42 (d, J=8.8Hz, 2H) ^{13}C NMR (100 MHz, DMSO) δ 165.47, 138.33, 137.17, 131.71, 130.36, 130.15, 129.40, 129.19, 127.88, 127.77, 121.55.

2-Chloro-*N*-(4-fluorophenyl)benzamide



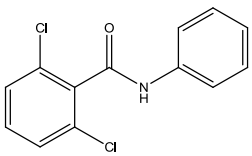
4-Fluoroaniline (111 mg, 1 mmol) and 2-chlorobezoyl chloride (202mg, 1.2 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (213mg, 99%) as white crystalline solid. R_f=0.64 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.76 (dd, *J* = 7.4, 1.7 Hz, 1H), 7.66 – 7.58 (m, 2H), 7.50 – 7.36 (m, 3H), 7.13 – 7.05 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.49, 159.72 (d, *J* = 242 Hz), 134.92, 132.53 (d, *J* = 2.8 Hz), 131.83, 130.60, 130.42, 130.40, 127.36, 122.03 (d, *J* = 8.0 Hz), 115.82 (d, *J* = 22.6 Hz).

2-Chloro-*N*-(4-(trifluoromethyl)phenyl)benzamide



4-(Trifluoromethyl)aniline (161 mg, 1 mmol) and 2-chlorobezoyl chloride (201mg, 1.1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (272 mg, 91%) as a white crystalline solid. R_f = 0.60 (40% Ethyl acetate/hexane).. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.15 (s, 1H), 7.79 (t, *J* = 7.2 Hz, 3H), 7.65 (d, *J* = 8.5 Hz, 2H), 7.51 – 7.37 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.67, 140.55, 134.57, 132.14, 130.59, 130.52, 130.50, 127.46, 126.44 (q, 3.8 Hz), 126.63 (q, *J* = 32.3 Hz), 124.03 (q, *J* = 269 Hz), 119.73.

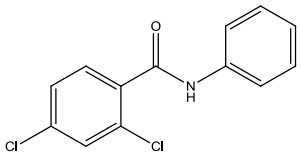
2,6-Dichloro-*N*-phenylbenzamide



Aniline (95.8 mg, 1.03 mmol) and 2,6-dichlrobenzoyl chloride (210 mg, 1 mmol) were treated according to the general procedure. Purification by

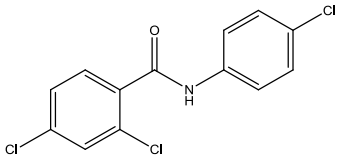
CombiFlash® Rf afforded the title compound (255 mg, 96%). R_f = 0.57 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 7.6 Hz, 2H), 7.53 (s, 1H), 7.44 – 7.36 (m, 4H), 7.32 (dd, *J* = 9.3, 6.5 Hz, 1H), 7.22 (dd, *J* = 9.1, 5.8 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.47, 137.17, 135.89, 132.44, 130.98, 129.19, 128.19, 125.22, 120.35.

2,4-Dichloro-*N*-phenylbenzamide



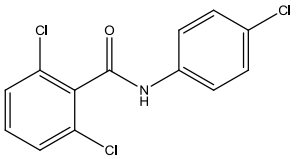
Aniline (96.7 mg, 1.04 mmol) and 2,4-dichlrobenzoyl chloride (209 mg, 1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (231 mg, 87%) as a yellow crystalline solid. R_f = 0.71 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.72 (d, *J* = 8.3 Hz, 1H), 7.65 (d, *J* = 7.9 Hz, 2H), 7.49 (d, *J* = 1.4 Hz, 1H), 7.45 – 7.35 (m, 3H), 7.21 (t, *J* = 7.4 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.49, 137.33, 137.26, 133.52, 131.47, 130.21, 129.20, 127.76, 125.10, 120.21.

2,4-Dichloro-*N*-(4-chlorophenyl)benzamide



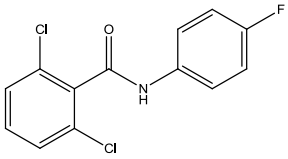
4-Chloroaniline (127.7 mg 1 mmol) and 2,4-dichlrobenzoyl chloride (213 mg, 1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (290 mg, 97%) as a white crystalline solid. R_f = 0.72 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, DMSO) δ 10.70 (s, 1H), 7.79 (d, *J* = 1.5 Hz, 1H), 7.74 (d, *J* = 8.7 Hz, 2H), 7.66 (d, *J* = 8.2 Hz, 1H), 7.57 (dd, *J* = 8.2, 1.4 Hz, 1H), 7.43 (d, *J* = 8.7 Hz, 2H). ^{13}C NMR (100 MHz, DMSO) δ 164.55, 138.14, 135.96, 135.47, 131.69, 130.83, 129.71, 129.24, 128.04, 127.98, 121.58.

2,6-Dichloro-*N*-(4-chlorophenyl)benzamide



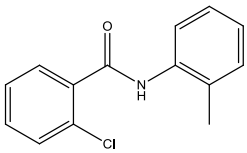
4-Chloroaniline (127.8 mg 1mmol), and 2,6-dichlorobenzoyl chloride (209 mg, 1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (254 mg 85%) as a white crystalline solid. R_f = 0.58 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, DMSO) δ 10.91 (s, 1H), 7.76 – 7.70 (m, 2H), 7.63 – 7.57 (m, 2H), 7.55 – 7.49 (m, 1H), 7.47 – 7.41 (m, 2H). ^{13}C NMR (100 MHz, DMSO) δ 162.60, 137.92, 136.56, 132.02, 131.62, 129.36, 128.76, 128.23, 121.52.

2,6-Dichloro-*N*-(4-fluorophenyl)benzamide *edit*



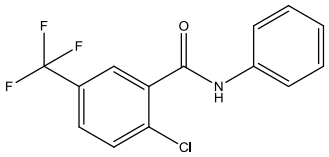
4-Fluoroaniline (115mg, 1mmol) and 2,6-dichlorobenzoyl chloride (216mg, 1mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (282 mg, 96%) as a white crystalline solid. R_f = 0.59 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, MeOD) δ 7.72 – 7.66 (m, 2H), 7.47 (m, 3H), 7.17 – 7.10 (m, 2H). ^{13}C NMR (100 MHz, MeOD) δ 163.71, 159.69 (d, *J* = 241 Hz), 136.10, 134.20 (d, *J* = 2.8 Hz), 131.90, 130.96, 127.92, 121.91 (d, *J* = 7.9 Hz), 115.09 (d, *J* = 22.5 Hz).

2-Chloro-*N*-(2-methylphenyl)benzamide



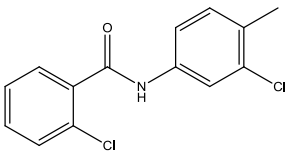
o-Toluidine (108 mg, 1 mmol) and 2-chlorobenzoyl (202 mg, 1.15 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (241 mg, 99%). R_f=0.61. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 8.0 Hz, 1H), 7.86 (dd, *J* = 7.3, 2.0 Hz, 1H), 7.84 (s, 1H, NH), 7.51 – 7.40 (m, 3H), 7.33 – 7.25 (m, 2H), 7.16 (t, *J* = 7.1 Hz, 1H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 165.57, 137.55, 136.23, 133.46, 131.40, 130.87, 130.37, 130.10, 129.45, 127.69, 126.47, 126.43, 126.42, 18.47.

2-Chloro-*N*-phenyl-5-(trifluoromethyl)benzamide *edit*



Aniline (96.4 mg 1.04 mmol) and 2-chloro-5-(trifluoromethyl)benzoyl chloride (243 mg 1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (290 mg, 97%) as brown crystalline solid. R_f = 0.72 (40% Ethyl acetate/hexane). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 1.5 Hz, 1H), 7.94 (s, 1H), 7.71 – 7.59 (m, 4H), 7.42 (t, *J* = 7.9 Hz, 2H), 7.23 (t, *J* = 7.4 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.06, 137.11, 135.94, 134.44, 131.10, 130.00 (q, *J* = 34.1 Hz), 129.25, 128.27 (q, *J* = 3.6 Hz), 127.50 (q, 3.8 Hz), 125.32, 123.22 (q, *J* = 271 Hz), 120.28.

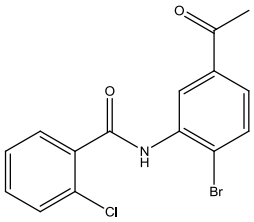
2-Chloro-*N*-(3-chloro-4-methylphenyl)benzamide



3-Chloro-4-methyl-benzenamine (142 mg, 1 mmol) and 2-chlorobenzoyl chloride (193 mg, 1.1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound

(280 mg, 99%) as a white crystalline solid. R_f=0.65 (40% Ethyl acetate/hexane). ^{1}H NMR (400MHz, DMSO): δ10.62 (s, 1H), 7.91 (s, 1H), 7.61-7.57(m, 2H), 7.55-7.45 (m, 3H), 7.33 (d, J = 8.5 Hz, 1H), 2.30 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 165.46, 138.48, 137.12, 133.50, 131.72, 130.98, 130.37, 130.16, 129.40, 127.77, 119.91, 118.64, 19.47.

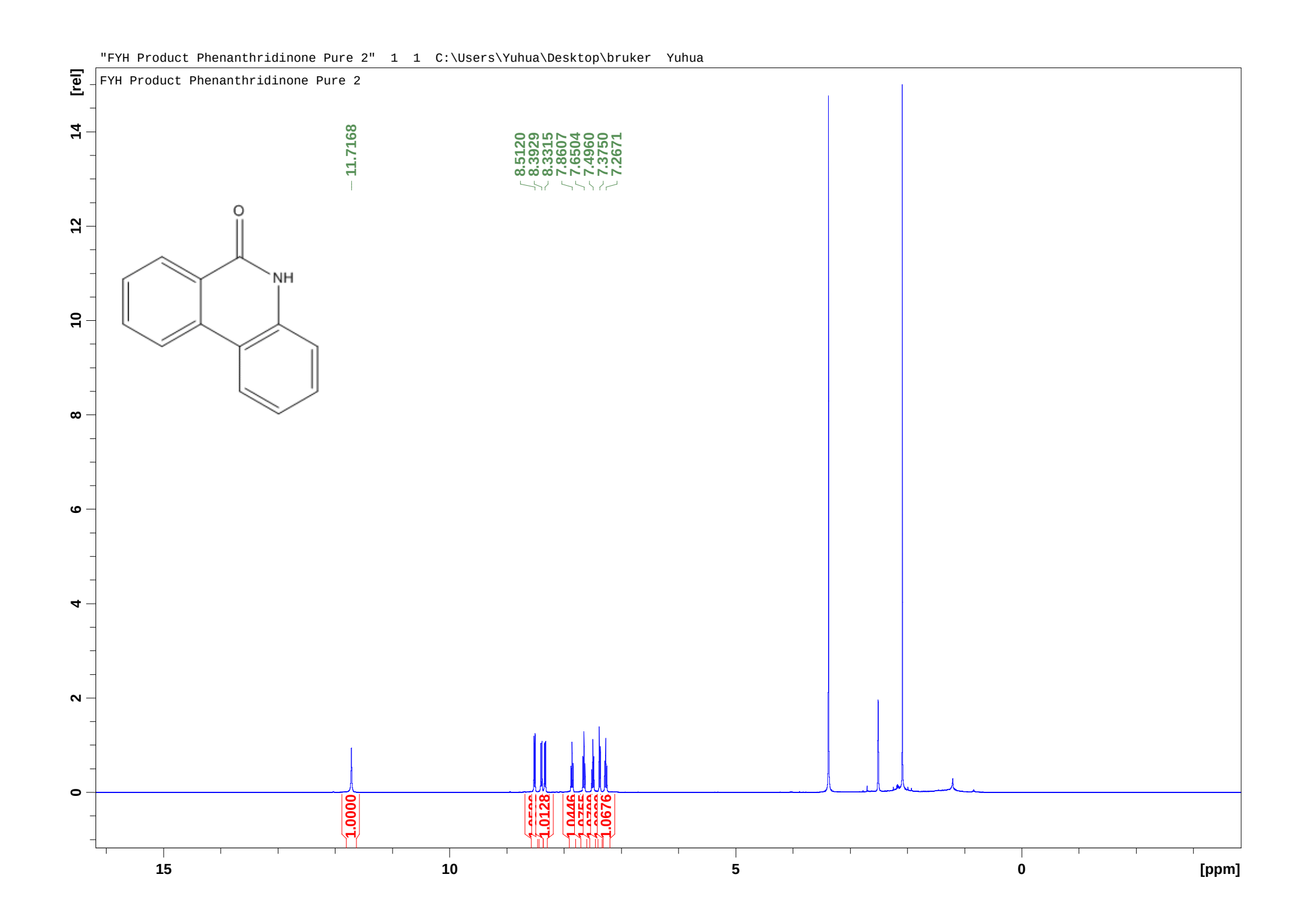
***N*-(3-acetylphenyl)-2-chloro-benzamide**



3'-Amino-4'-bromoacetophenone (214 mg, 1 mmol) and 2-chlorobenzoyl (193 mg, 1.1 mmol) were treated according to the general procedure. Purification by CombiFlash® Rf afforded the title compound (349 mg, 99%). R_f=0.58. 1H NMR (400 MHz, $CDCl_3$) δ 9.19 (s, 1H), 8.59 (s, 1H), 7.86 (d, J = 8 Hz, 1H), 7.72 (d, J = 8.4 Hz, 1H), 7.67 (dd, J = 8.4, 2.0 Hz, 1H), 7.56 - 7.42 (m, 3H), 2.68 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.23, 137.22, 136.05, 134.34, 132.80, 132.32, 130.79, 130.73, 127.49, 124.71, 122.08, 119.19, 118.75, 114.64, 26.77.

2.5 General procedure for the two-step (table 2) continuous-flow photochemical synthesis of phenanthridinone(s) and derivatives

The corresponding acyl chloride was dissolved in acetone (0.05 mmol/mL); and the appropriate aniline was dissolved in acetone as well (0.05 mmol/mL), and each placed/injected into the respective sample loops (2mL, A/B) of the Vapourtec® R2+/R4 system equipped with a stainless steel heating coil reactor (Vapourtec® HT Reactor, 10 mL) and photochemical coil reactor (Vapourtec® UV-150 ,10 mL). The chloride solution and the aniline solution were injected/flowed through the reactors respectively at a flow rate of 0.100 mL/min/each, and pumped into the heating coil reactor first (Temperature: 60 ℃) and then the UV coil reactor (Lamp power 75% (~ 112.5 watts), whole-wavelength range, temperature: 60 ℃). The pressure limit of the whole system was 12 Bar. The crude product was collected in a round bottom flask covered by aluminum foil and then preabsorbed onto silica gel, and solvent acetone removed by vacuum. The silica gel residue was loaded into an empty purification cartridge and the product was then separated and purified by column chromatography (CombiFlash® Rf, hexane/ethyl acetate). The solvent hexane/ethyl acetate was removed by vacuum and the product was dried under vacuum. All reactions provided products as described for the single step photochemical cyclization. Please see above entries for data.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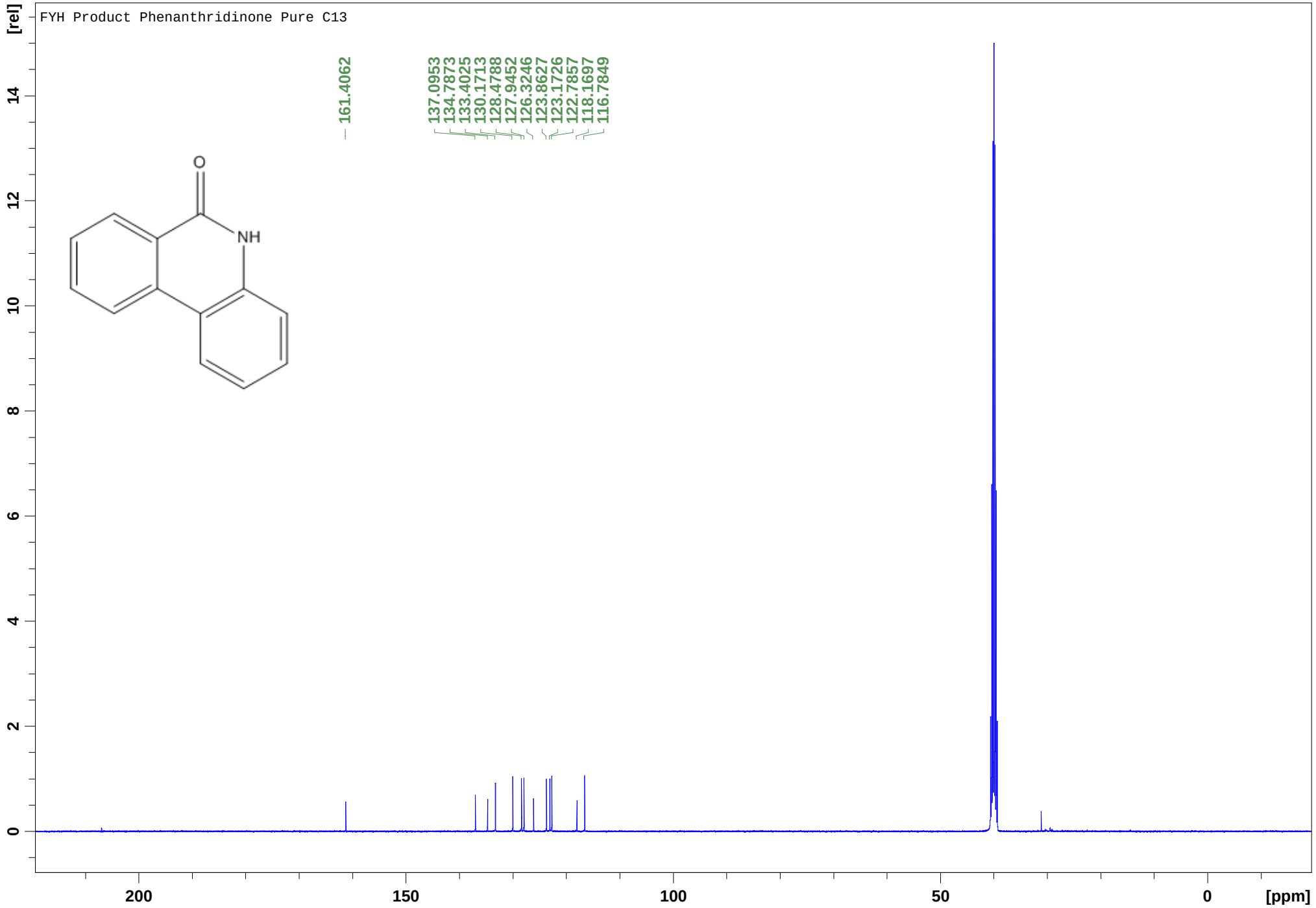
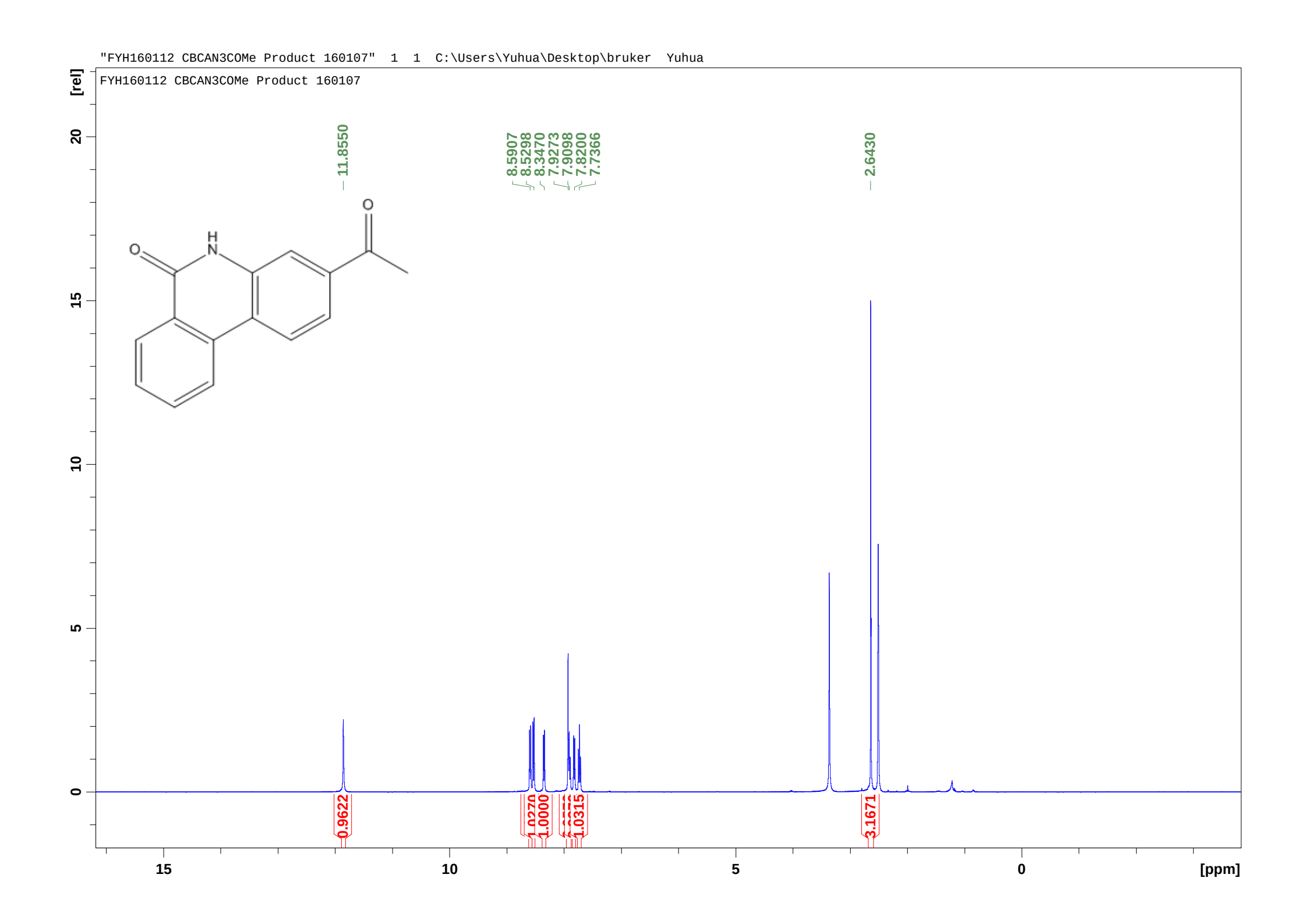
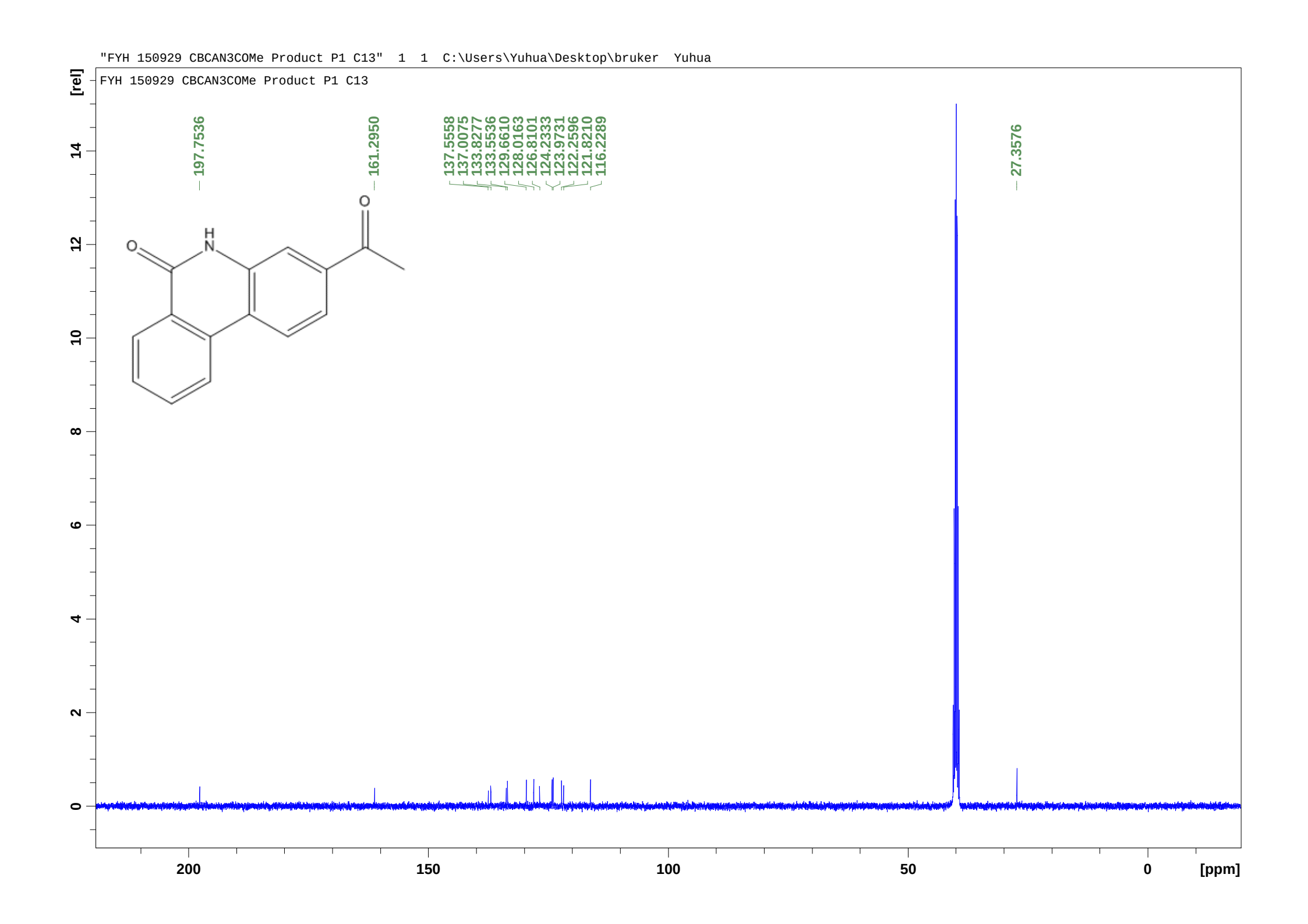
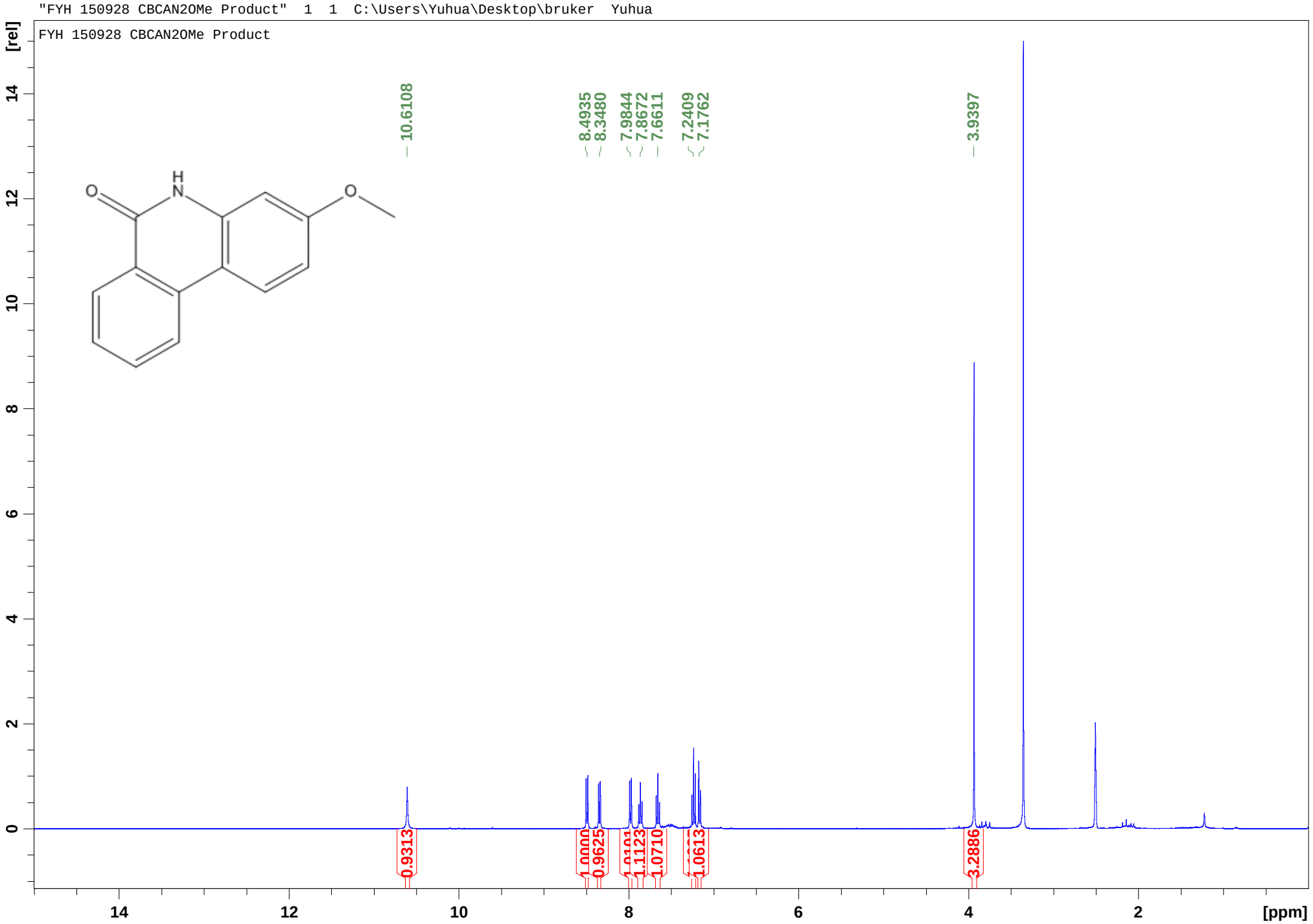
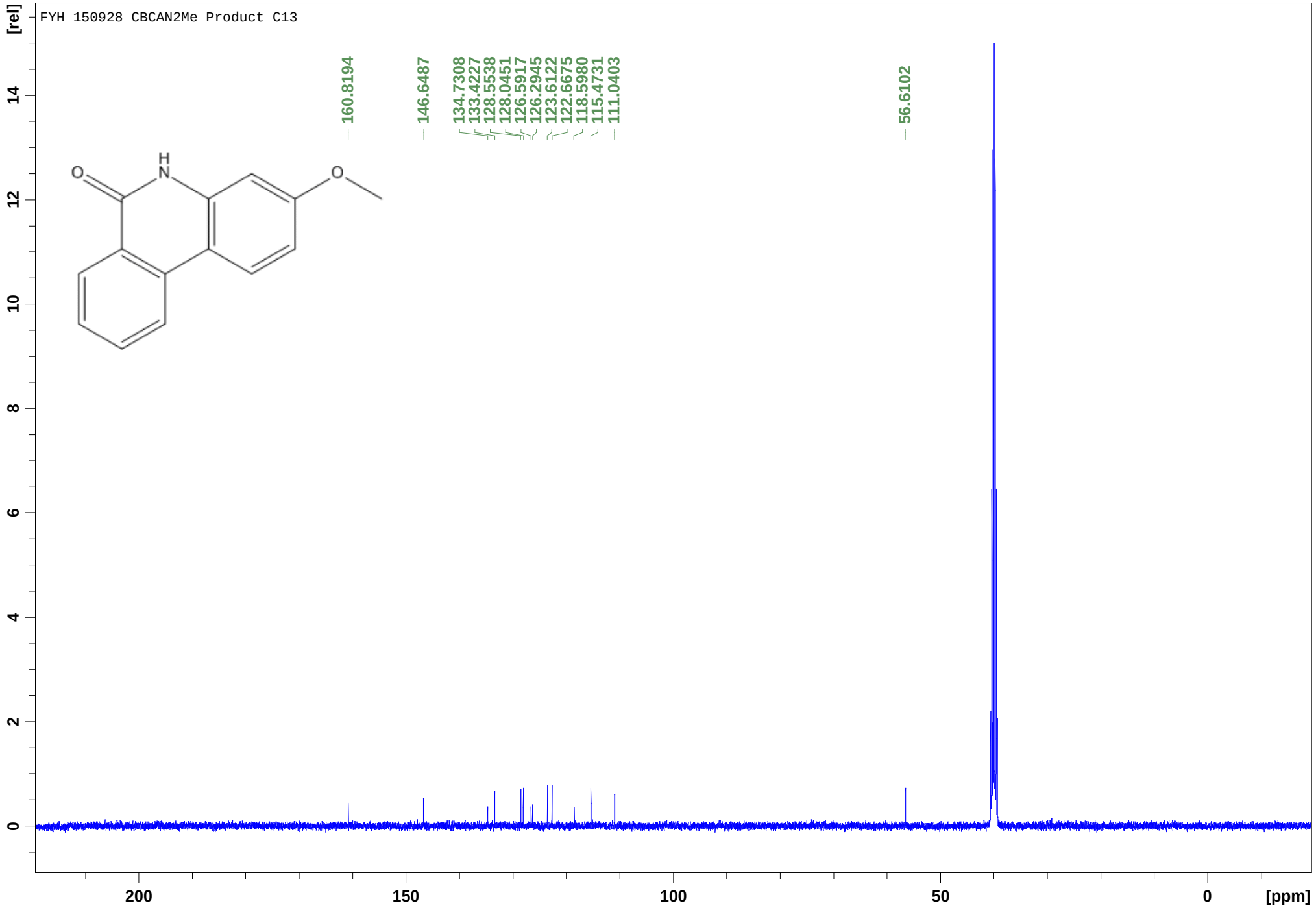


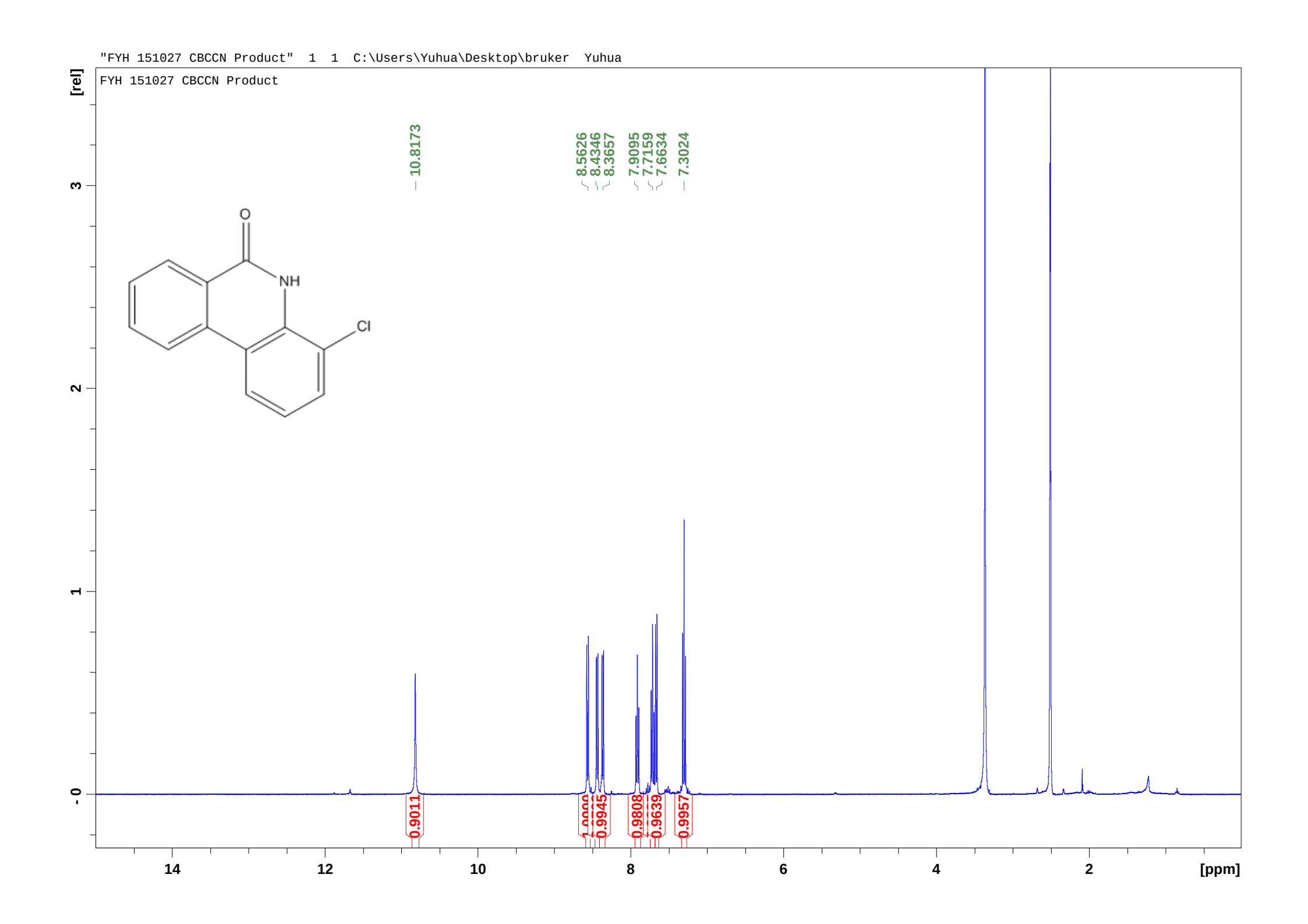

"FYH160112 CBCAN3COMe Product 160107" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH160112 CBCAN3COMe Product 160107
[rel]
20
15
10
5
0
11.8550
8.5907
8.5298
8.3470
7.9273
7.9098
7.8200
7.7366
2.6430
O
H
N
O
0.9622
1.0270
1.0000
1.0315
3.1671
15
10
5
0
[ppm]


"FYH 150929 CBCAN3COMe Product P1 C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 150929 CBCAN3COMe Product P1 C13
[rel]
197.7536
161.2950
137.5558
137.0075
133.8277
133.5536
129.6610
128.0163
126.8101
124.2333
123.9731
122.2596
121.8210
116.2289
27.3576
O
H
N
O
0
2
4
6
8
10
12
14
200
150
100
50
0
[ppm]


"FYH 150928 CBCAN2OMe Product" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 150928 CBCAN2OMe Product
[rel]
[ppm]
10.6108
8.4935
8.3480
7.9844
7.8672
7.6611
7.2409
7.1762
3.9397
0.9313
1.0000
0.9625
1.1123
1.0710
1.0613
3.2886

"FYH 150928 CBCAN2OMe Product C13 SubnameWrong" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua




"FYH 151027 CBCCN Product" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151027 CBCCN Product
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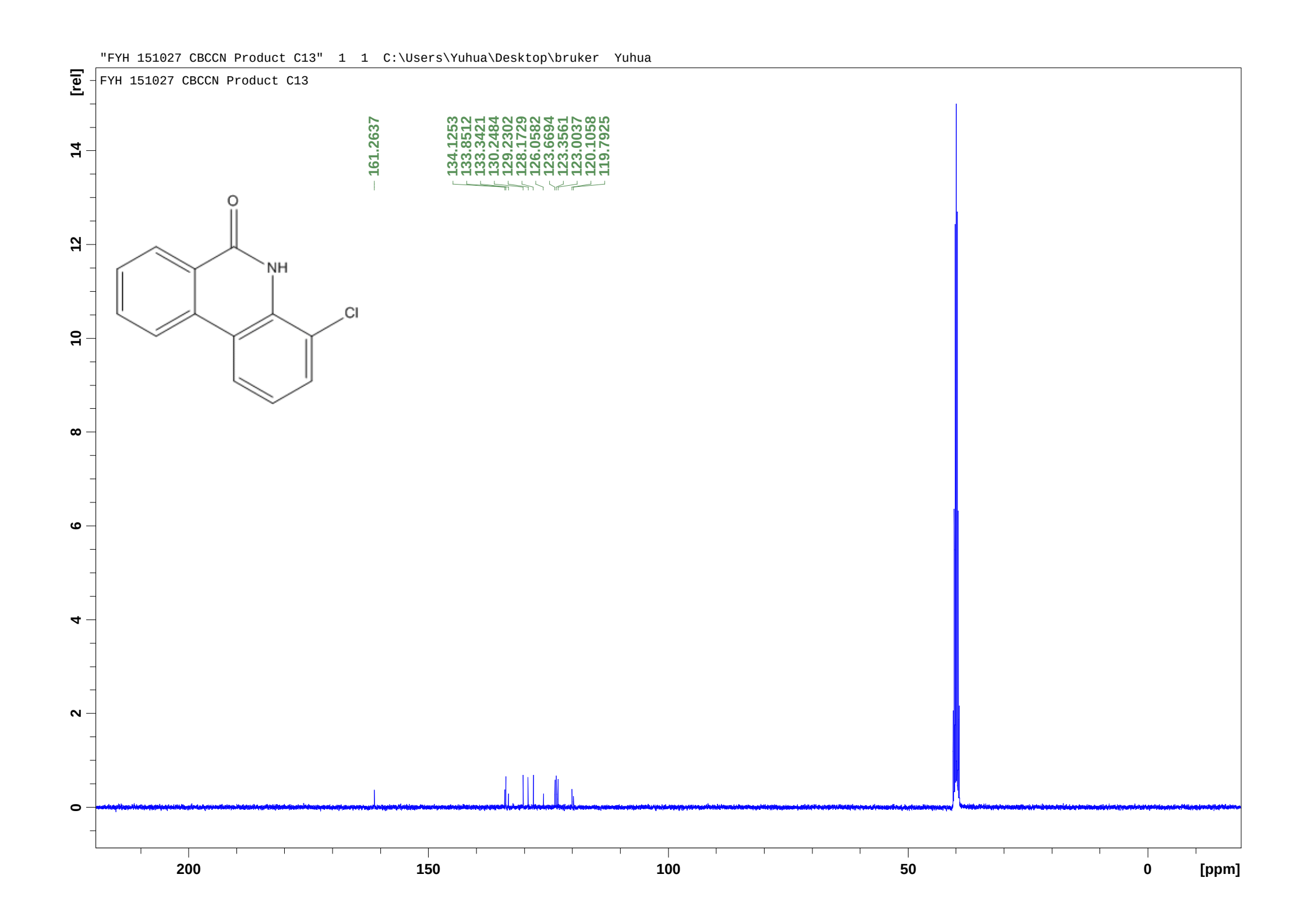
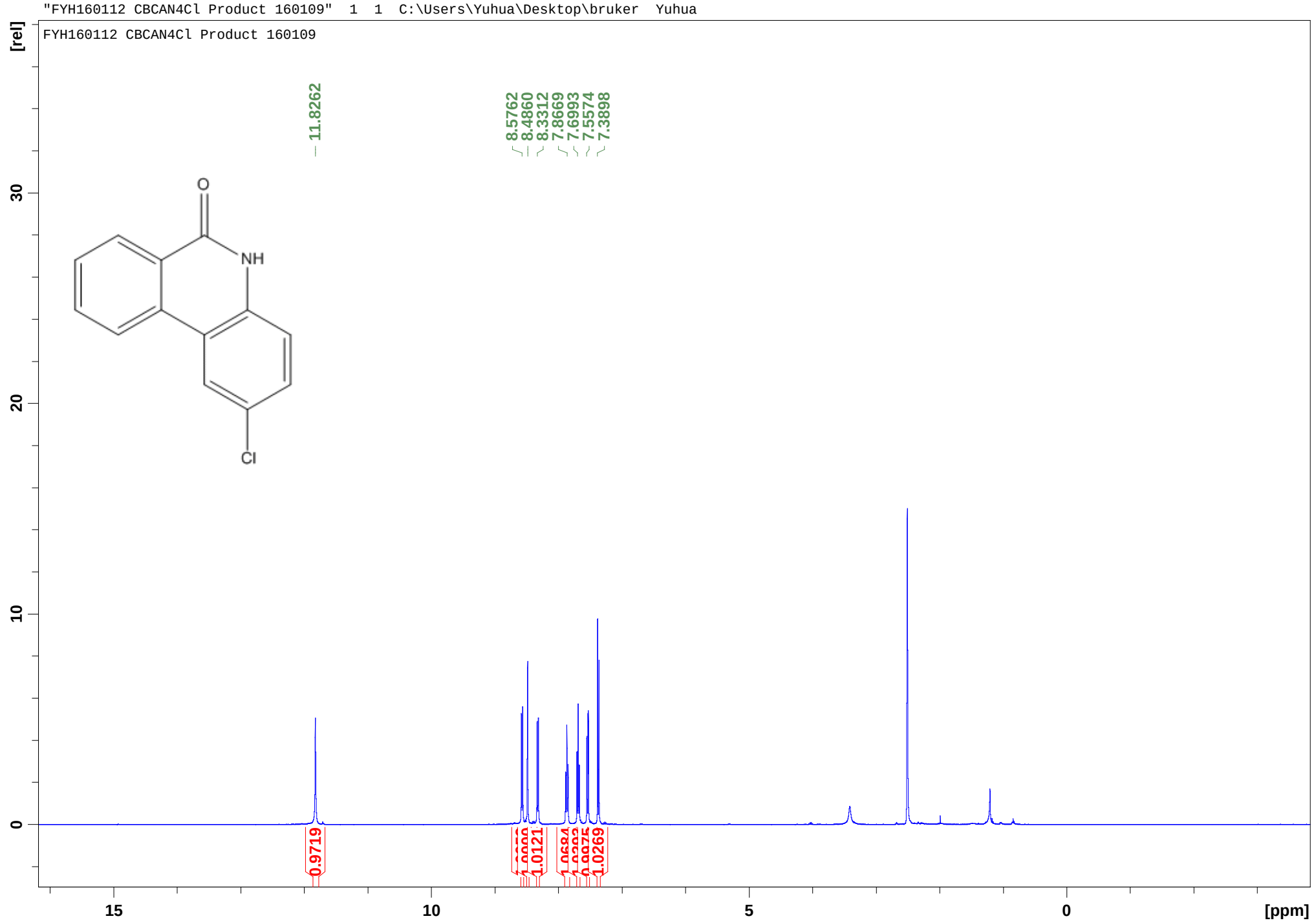
3
2
1
- 0
10.8173
8.5626
8.4346
8.3657
7.9095
7.7159
7.6634
7.3024
O
NH
Cl
0.9011
1.0000
0.9945
0.9808
0.9639
0.9957
14
12
10
8
6
4
2
[ppm]


"FYH 151027 CBCCN Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151027 CBCCN Product C13
161.2637
134.1253
133.8512
133.3421
130.2484
129.2302
128.1729
126.0582
123.6694
123.3561
123.0037
120.1058
119.7925
O
NH
Cl
[rel]
0
2
4
6
8
10
12
14
200
150
100
50
0
[ppm]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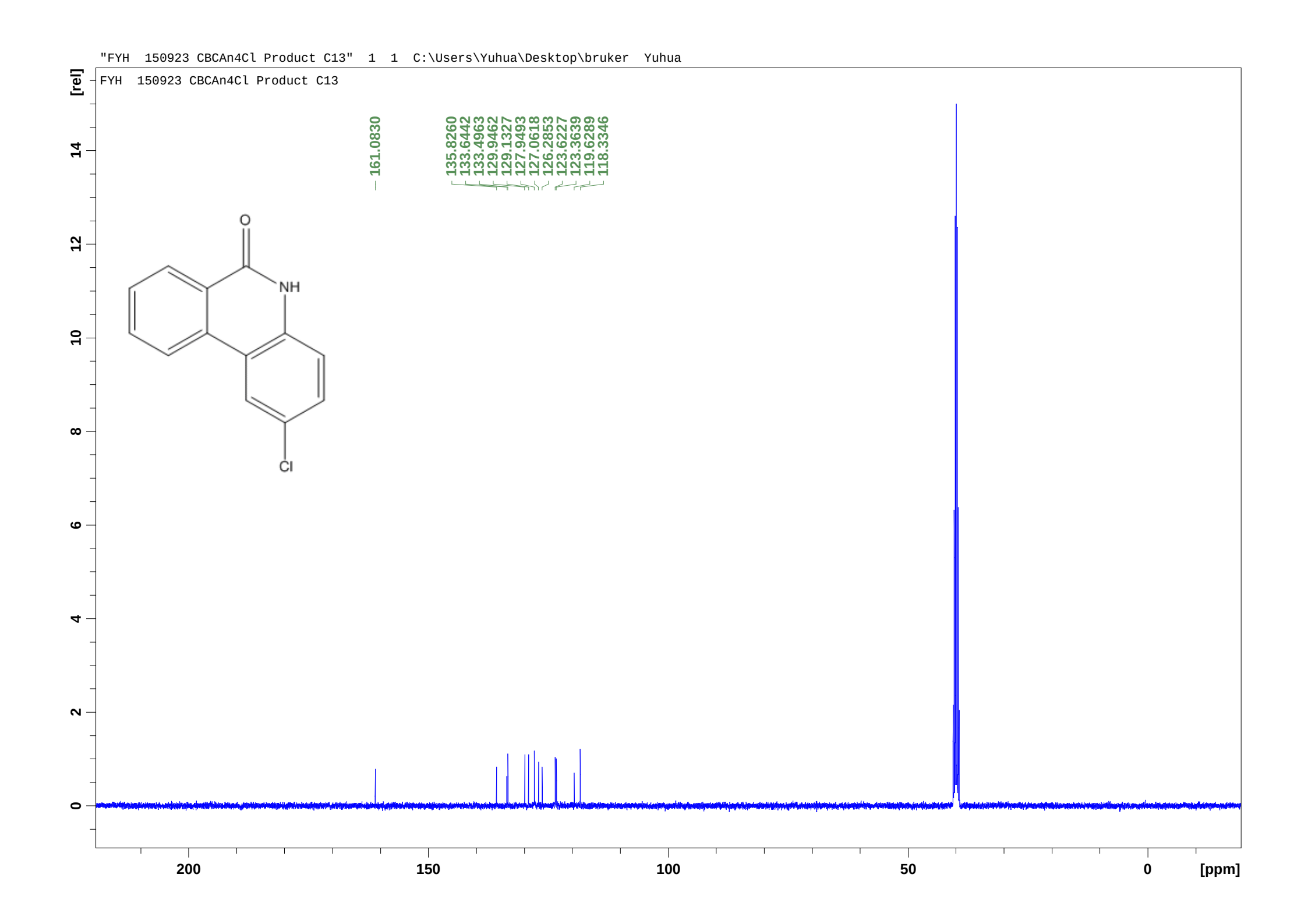
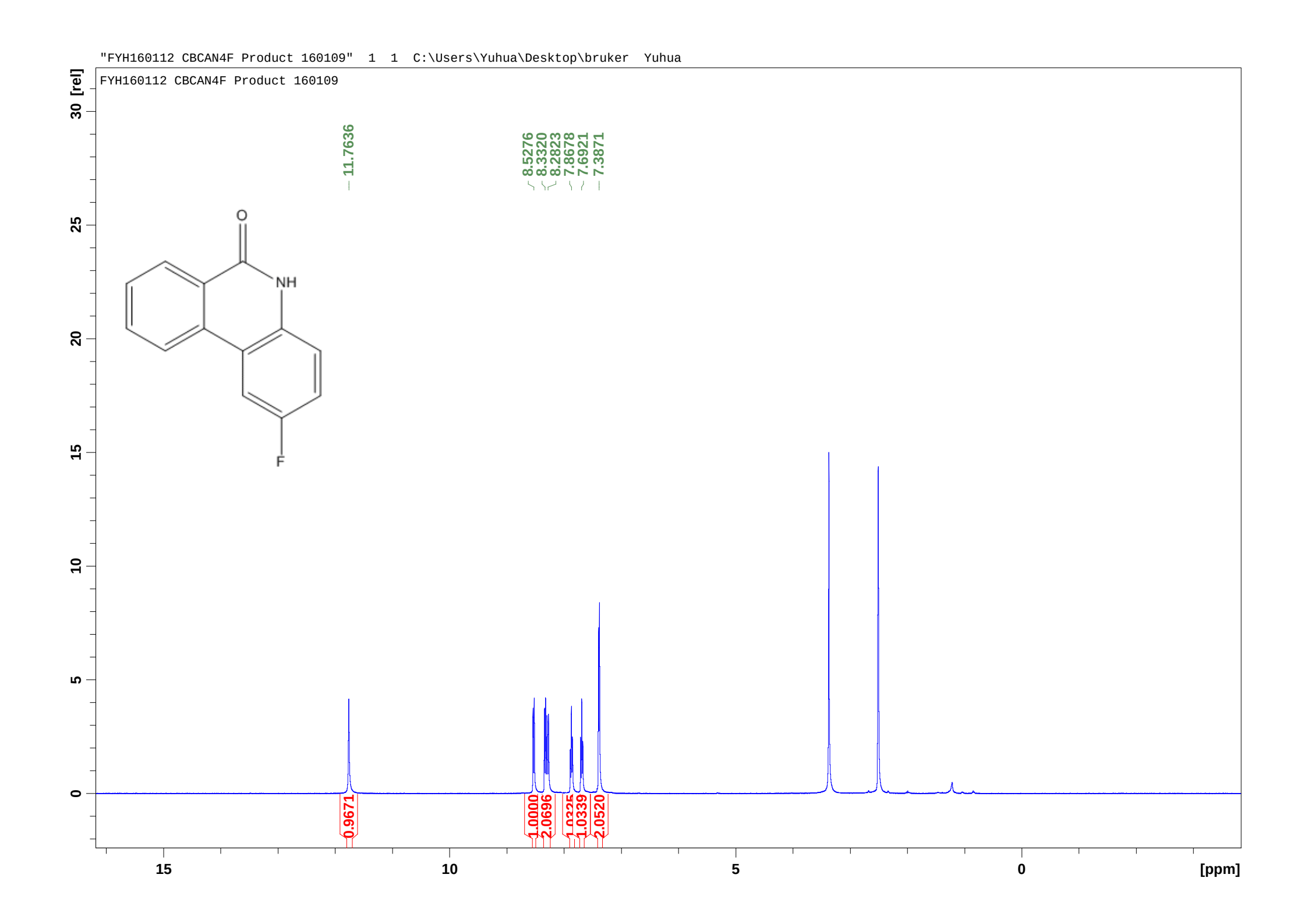
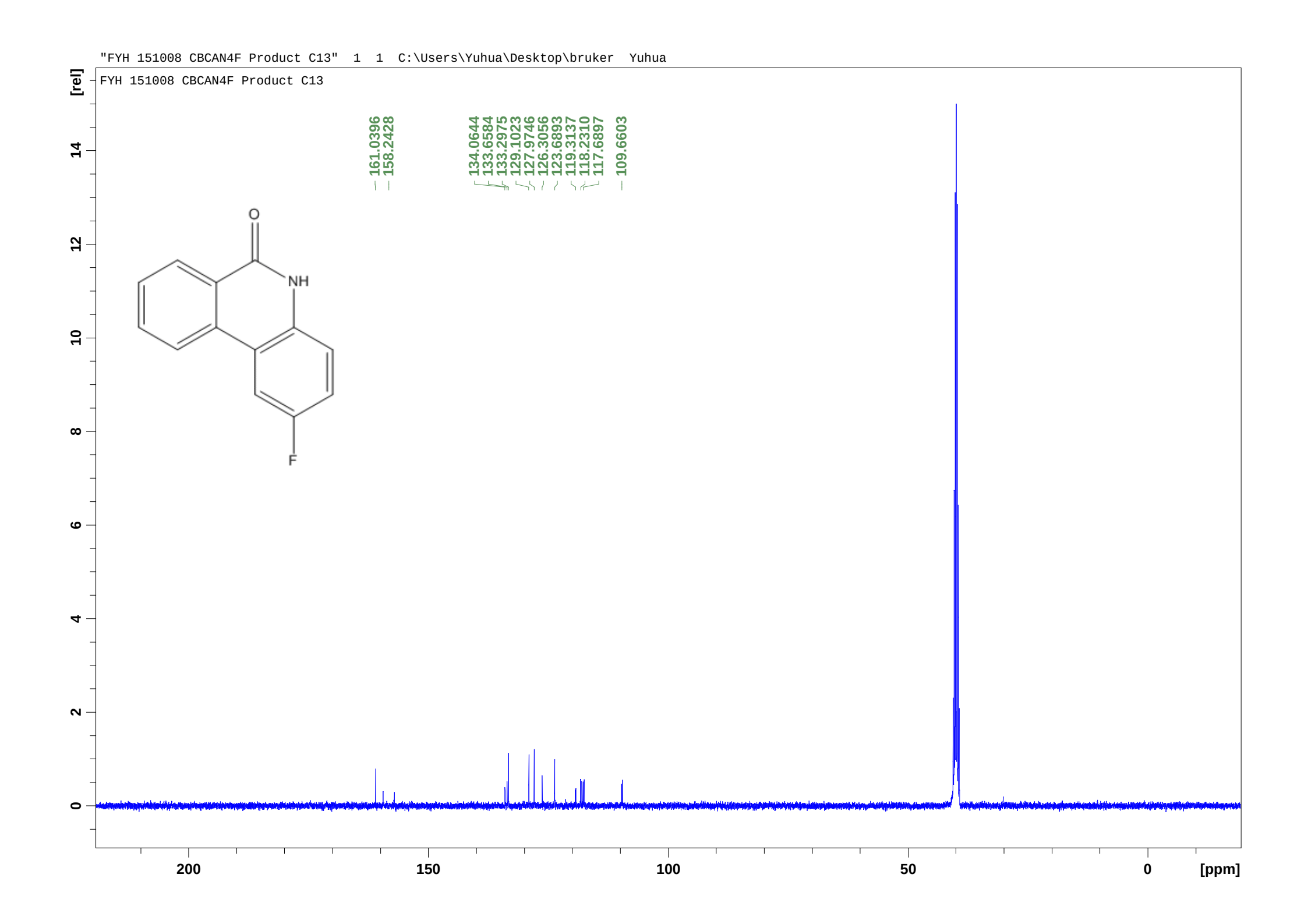
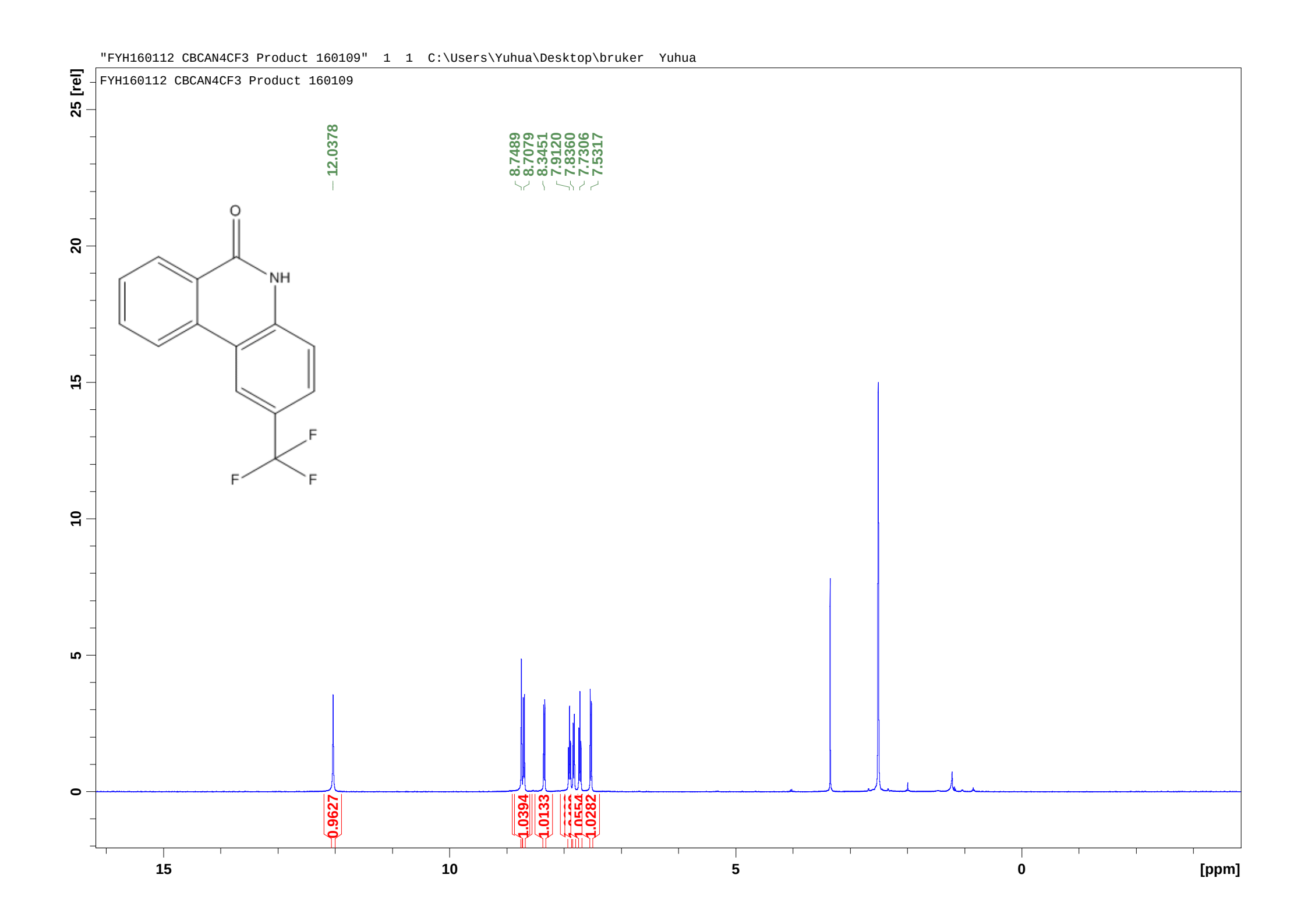
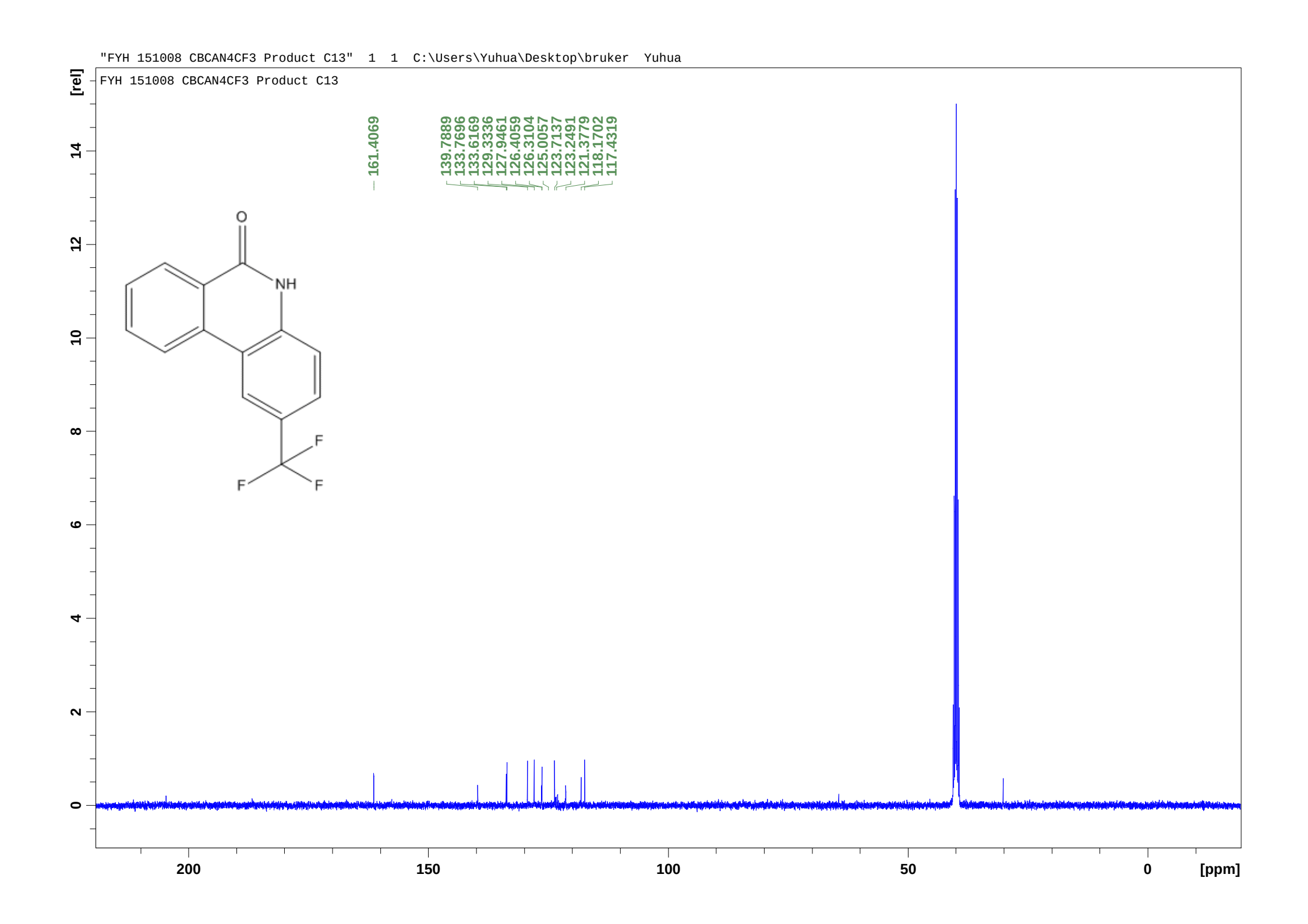
FYH160112 CBCAN4Cl Product 160109
[rel]
30
20
10
0
11.8262
8.5762
8.4860
8.3312
7.8669
7.6993
7.5574
7.3898
O
NH
Cl
0.9719
1.0121
1.0269
15
10
5
0
[ppm]


"FYH 150923 CBCAn4Cl Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 150923 CBCAn4Cl Product C13
[rel]
161.0830
135.8260
133.6442
133.4963
129.9462
129.1327
127.9493
127.0618
126.2853
123.6227
123.3639
119.6289
118.3346
O
NH
Cl
200
150
100
50
0
[ppm]

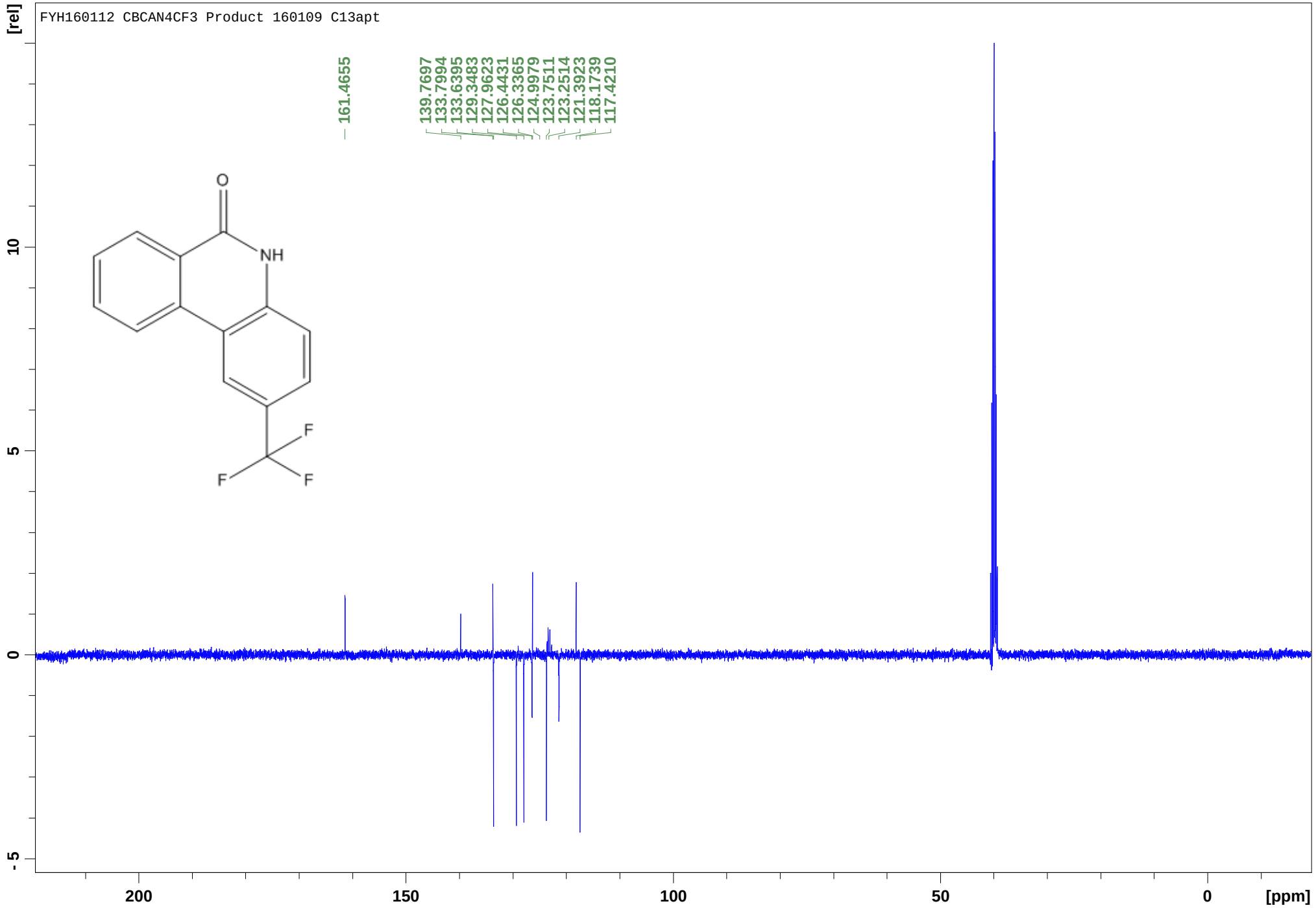

"FYH160112 CBCAN4F Product 160109" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH160112 CBCAN4F Product 160109
11.7636
8.5276
8.3320
8.2823
7.8678
7.6921
7.3871
O
NH
F
0.9671
1.0000
2.0696
1.0339
2.0520
30 [rel]
25
20
15
10
5
0
15
10
5
0
[ppm]

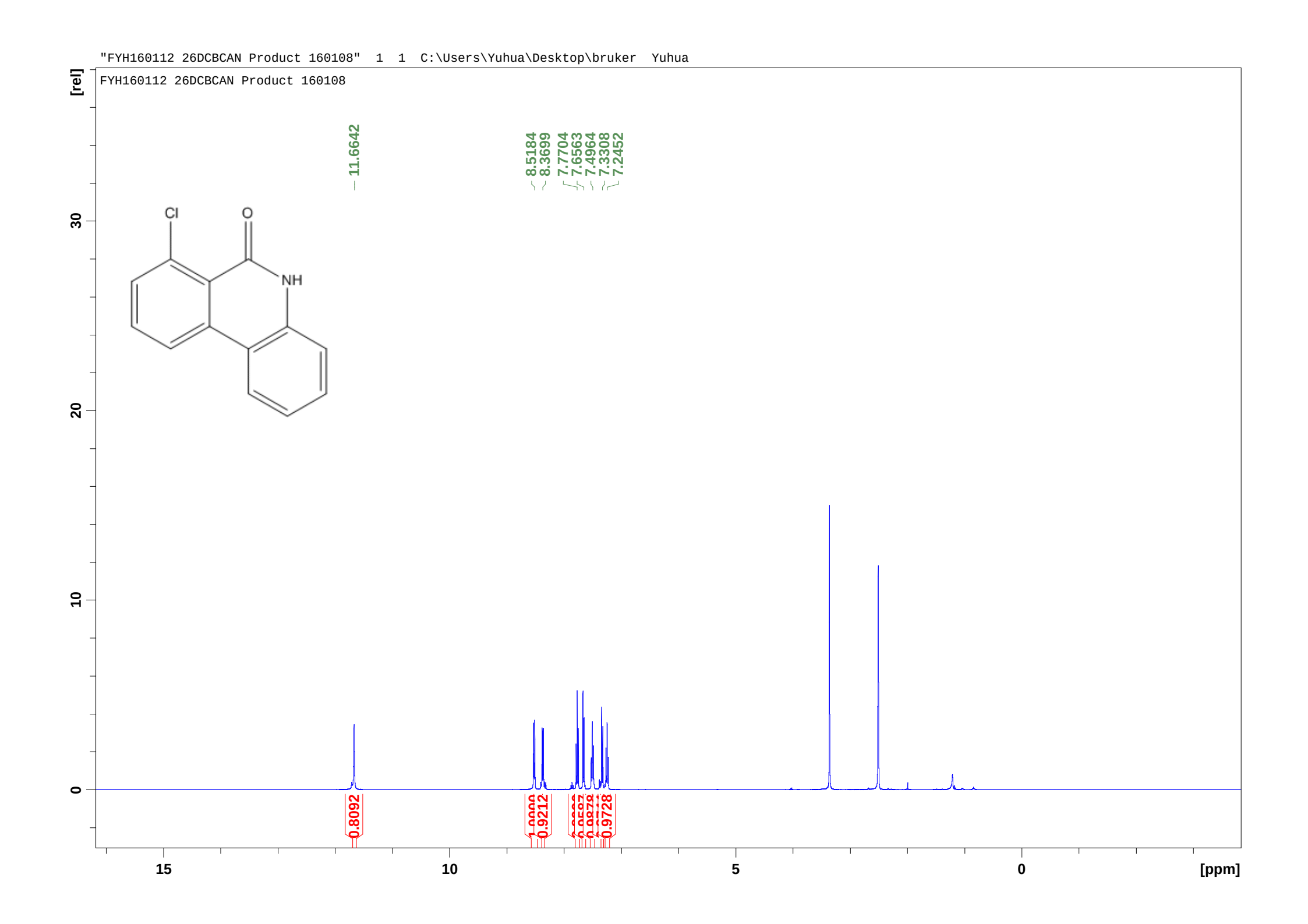

"FYH 151008 CBCAN4F Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151008 CBCAN4F Product C13
[rel]
161.0396
158.2428
134.0644
133.6584
133.2975
129.1023
127.9746
126.3056
123.6893
119.3137
118.2310
117.6897
109.6603
O
NH
F
[ppm]

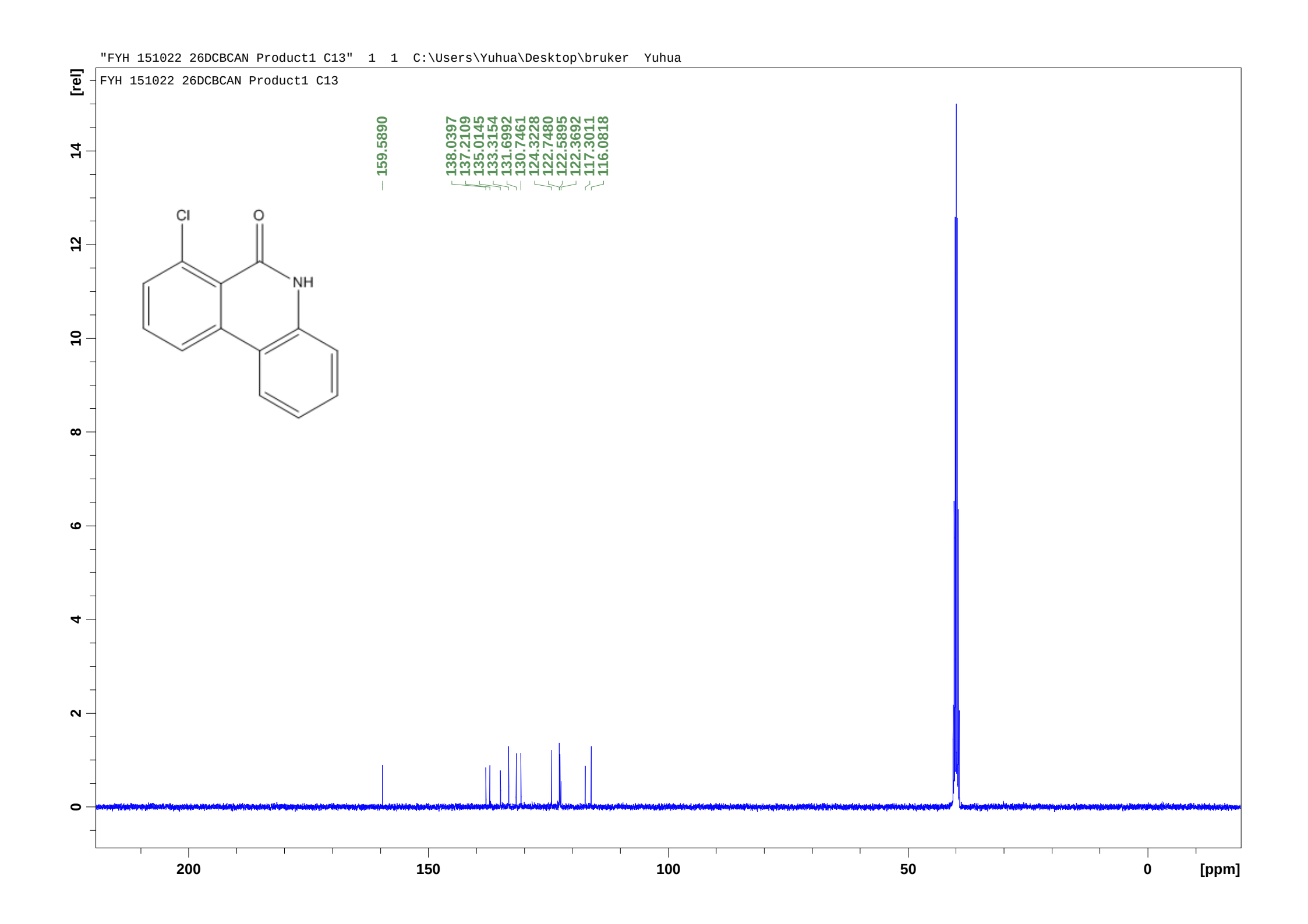

"FYH160112 CBCAN4CF3 Product 160109" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH160112 CBCAN4CF3 Product 160109
25 [rel]
20
15
10
5
0
12.0378
8.7489
8.7079
8.3451
7.9120
7.8360
7.7306
7.5317
O
NH
F
F
F
0.9627
1.0394
1.0133
1.0282
15
10
5
0
[ppm]

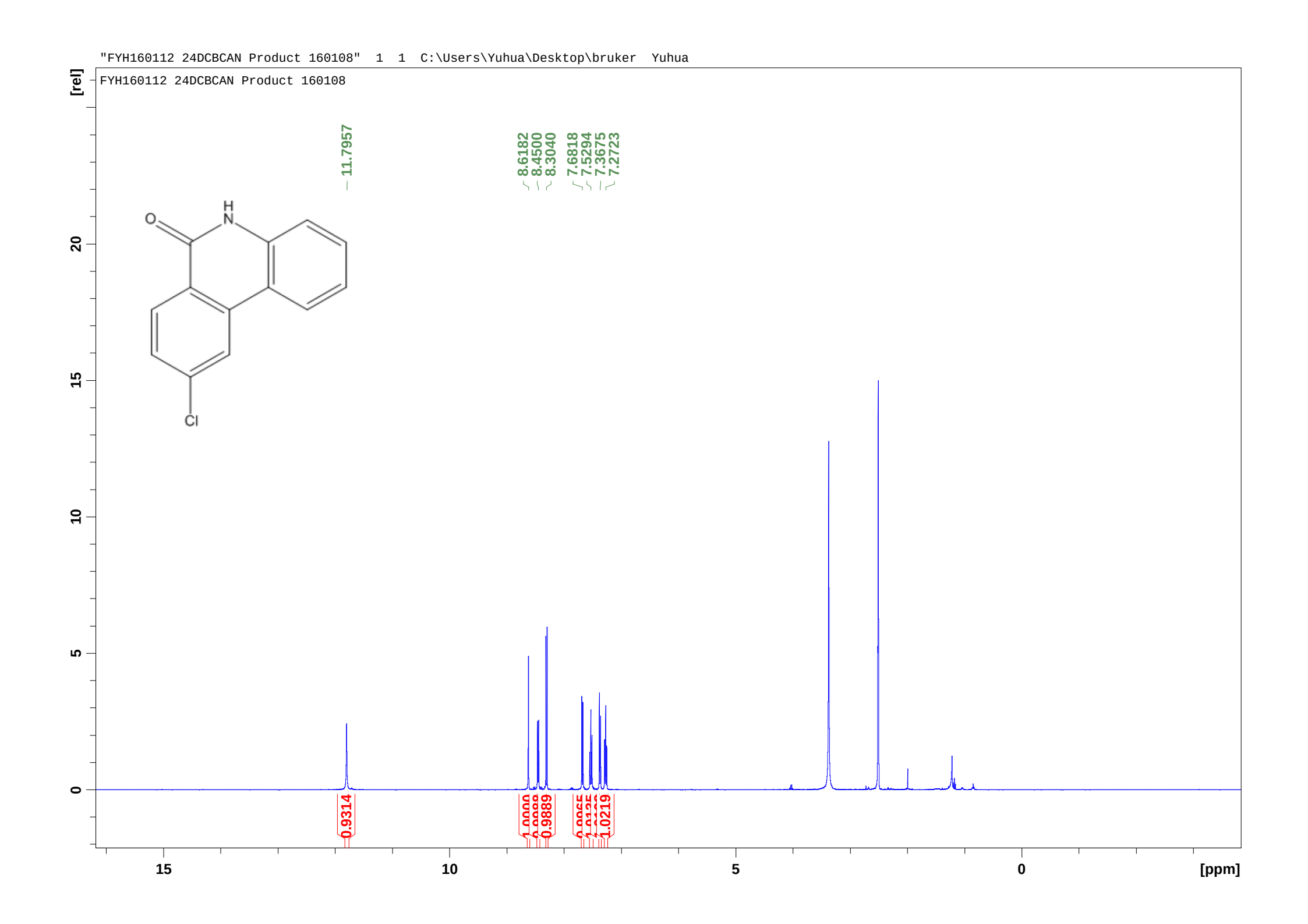

"FYH 151008 CBCAN4CF3 Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151008 CBCAN4CF3 Product C13
161.4069
139.7889
133.7696
133.6169
129.3336
127.9461
126.4059
126.3104
125.0057
123.7137
123.2491
121.3779
118.1702
117.4319
O
NH
F
F
F
[rel]
0
2
4
6
8
10
12
14
200
150
100
50
0
[ppm]

"FYH160112 CBCAN4CF3 Product 160109 C13apt" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua




"FYH160112 26DCBCAN Product 160108" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH160112 26DCBCAN Product 160108
[rel]
30
20
10
0
11.6642
8.5184
8.3699
7.7704
7.6563
7.4964
7.3308
7.2452
Cl
O
NH
0.8092
0.9212
0.9728
15
10
5
0
[ppm]


"FYH 151022 26DCBCAN Product1 C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151022 26DCBCAN Product1 C13
159.5890
138.0397
137.2109
135.0145
133.3154
131.6992
130.7461
124.3228
122.7480
122.5895
122.3692
117.3011
116.0818
Cl
O
NH
[rel]
0
2
4
6
8
10
12
14
200
150
100
50
0
[ppm]


"FYH160112 24DCBCAN Product 160108" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH160112 24DCBCAN Product 160108
[rel]
11.7957
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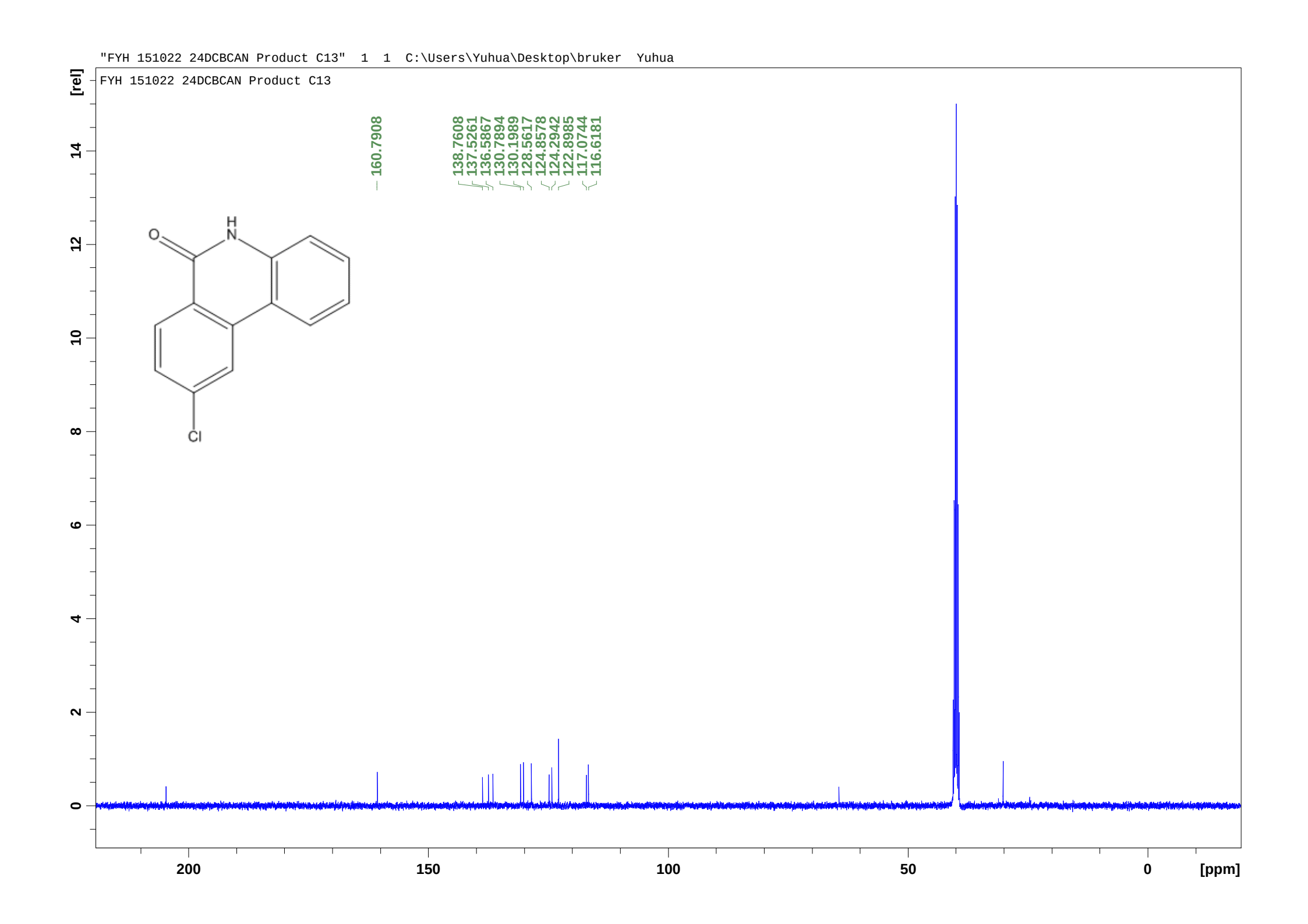
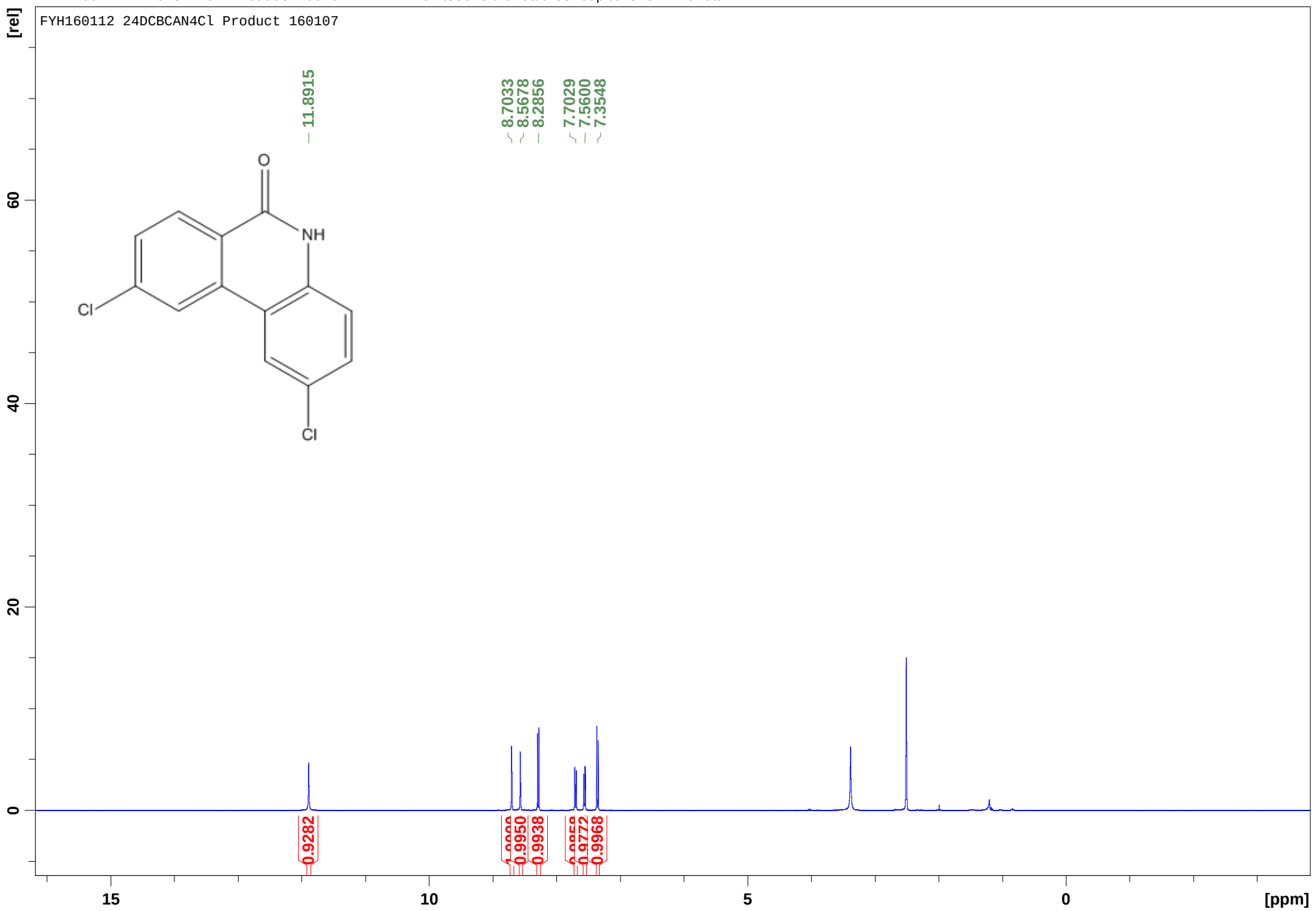
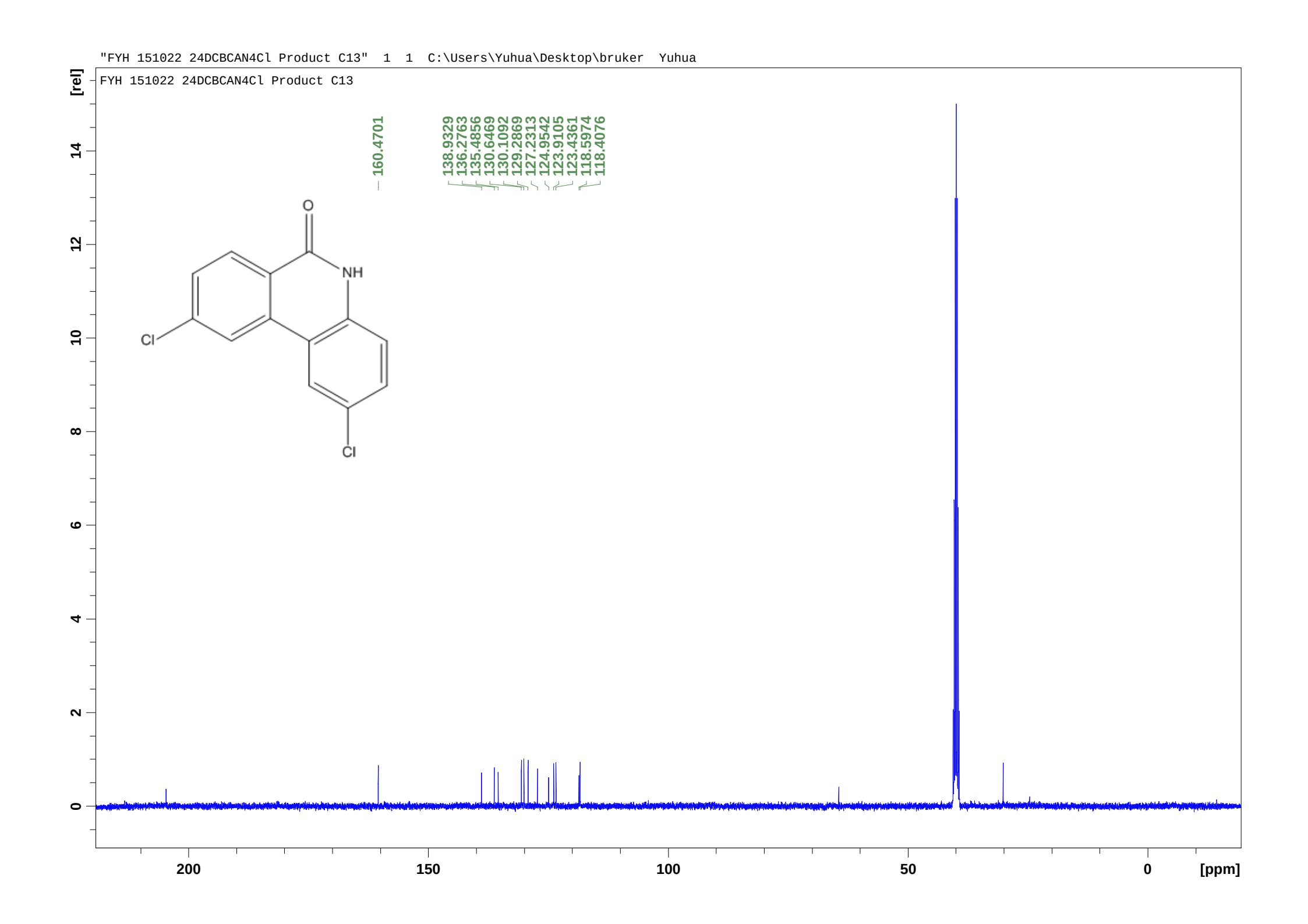
8.4500
8.3040
7.6818
7.5294
7.3675
7.2723
O
H
N
Cl
0.9314
1.0000
0.9889
1.0219
[ppm]


"FYH 151022 24DCBCAN Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151022 24DCBCAN Product C13
160.7908
138.7608
137.5261
136.5867
130.7894
130.1989
128.5617
124.8578
124.2942
122.8985
117.0744
116.6181
O
H
N
Cl
[rel]
0
2
4
6
8
10
12
14
200
150
100
50
0
[ppm]

"FYH160112 24DCBCAN4Cl Product 160107" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua

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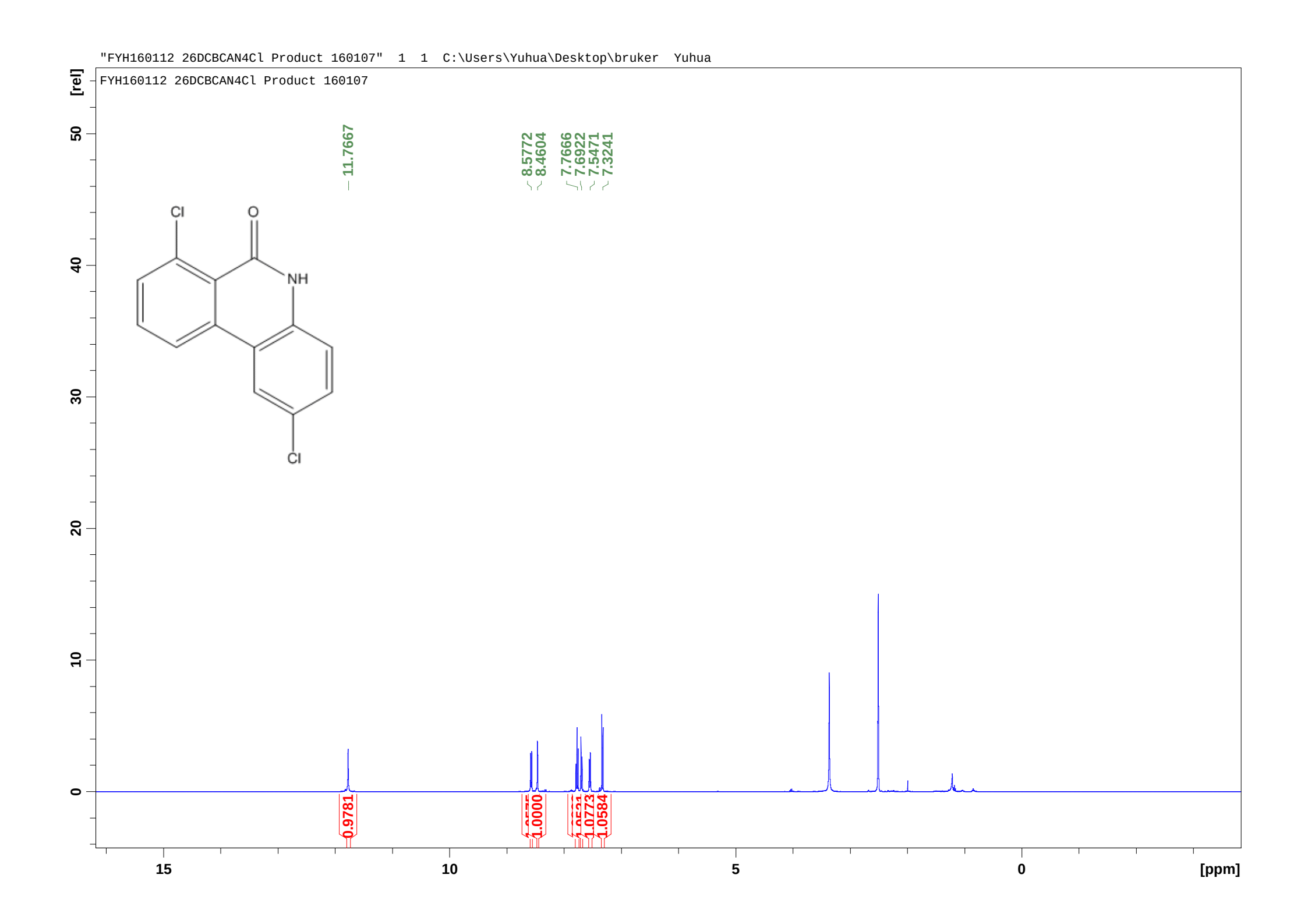
FYH 151022 24DCBCAN4Cl Product C13
[rel]
160.4701
138.9329
136.2763
135.4856
130.6469
130.1092
129.2869
127.2313
124.9542
123.9105
123.4361
118.5974
118.4076
O
NH
Cl
Cl
200
150
100
50
0
[ppm]


"FYH160112 26DCBCAN4Cl Product 160107" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH160112 26DCBCAN4Cl Product 160107
[rel]
50
40
30
20
10
0
11.7667
8.5772
8.4604
7.7666
7.6922
7.5471
7.3241
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O
NH
Cl
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1.0000
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1.0584
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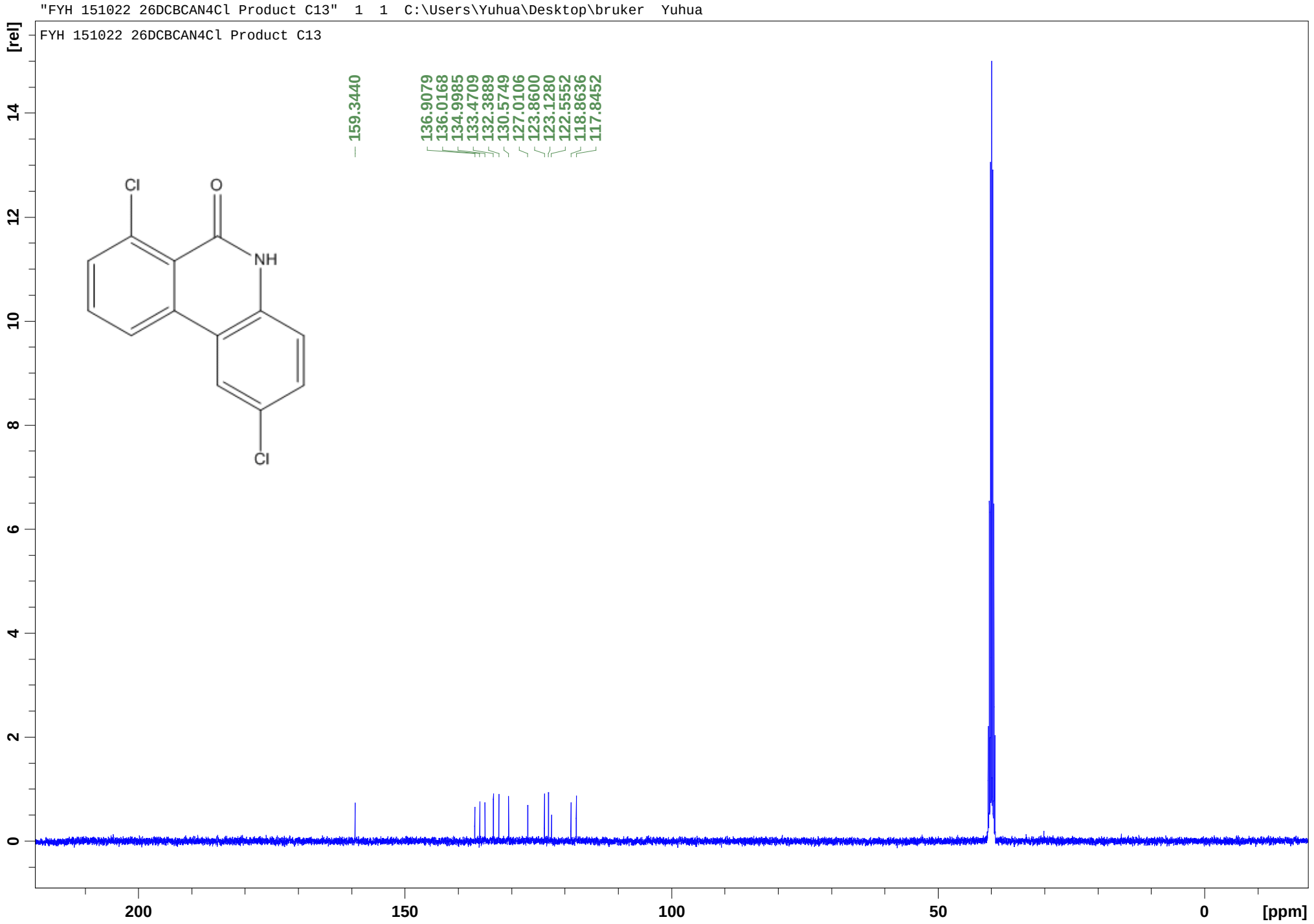
10
5
0
[ppm]


"FYH 151022 26DCBCAN4Cl Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151022 26DCBCAN4Cl Product C13
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136.0168
134.9985
133.4709
132.3889
130.5749
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122.5552
118.8636
117.8452
Cl
O
NH
Cl
[rel]
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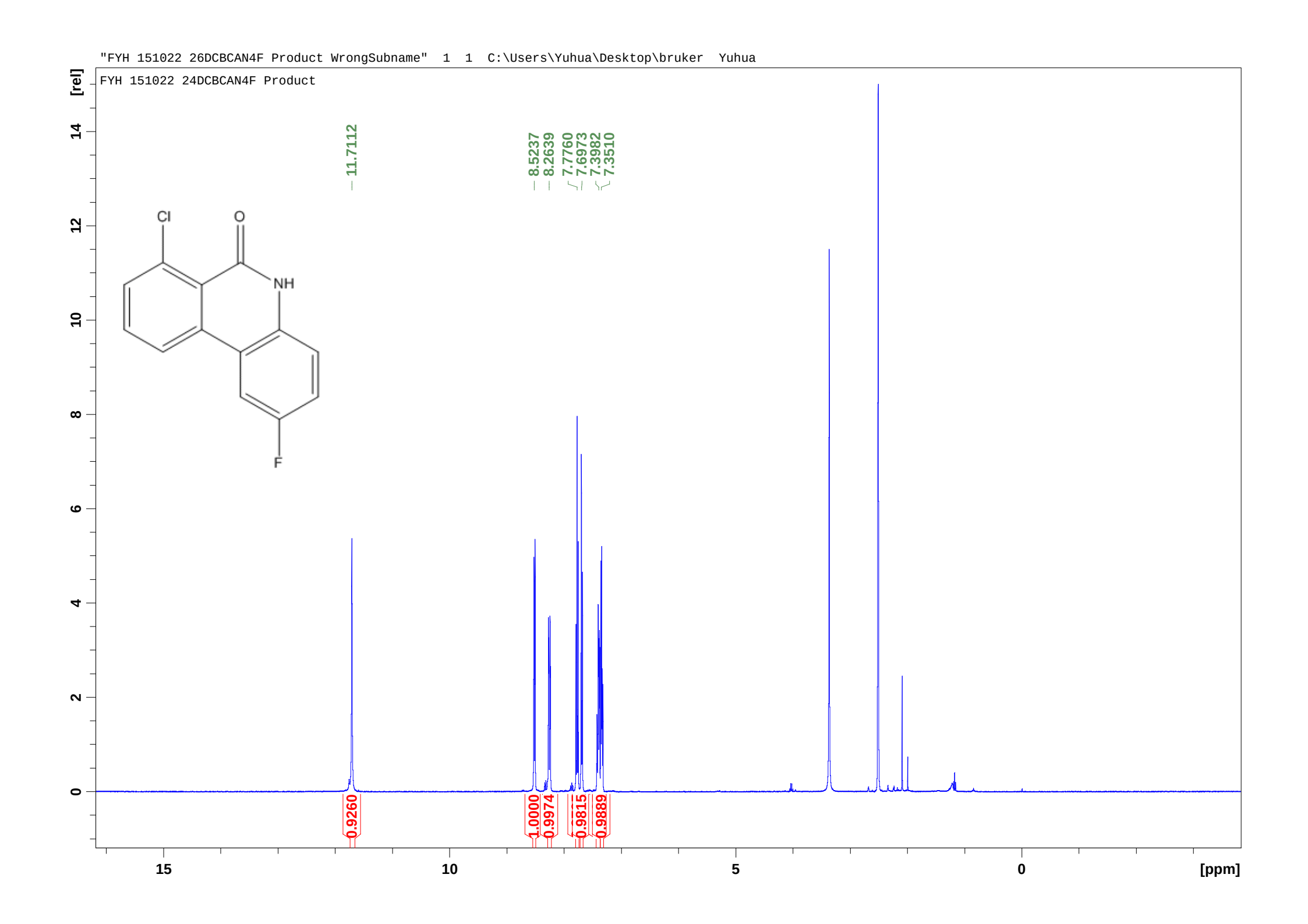
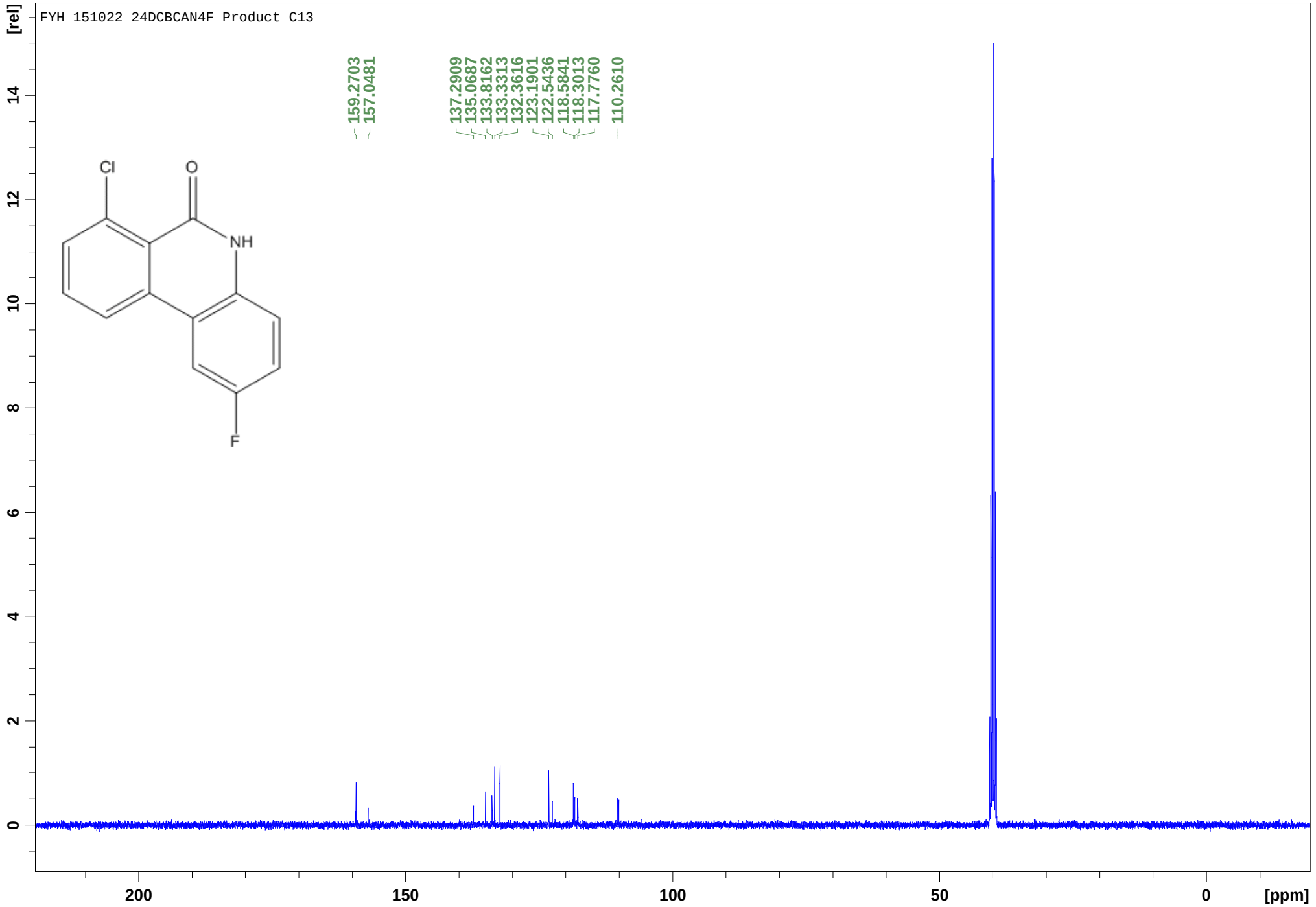
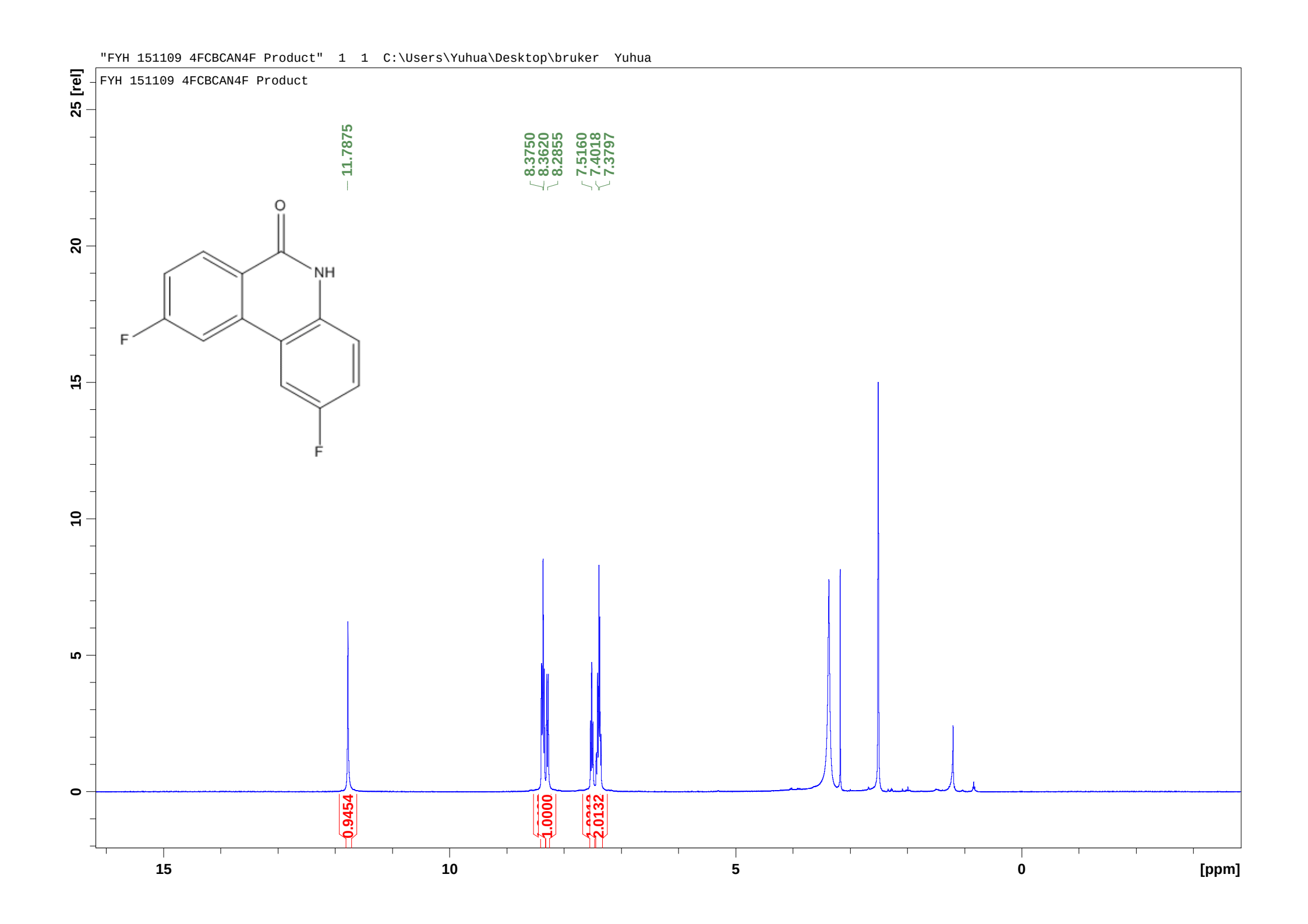
2
4
6
8
10
12
14
200
150
100
50
0
[ppm]


"FYH 151022 26DCBCAN4F Product WrongSubname" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151022 24DCBCAN4F Product
[rel]
14
12
10
8
6
4
2
0
11.7112
8.5237
8.2639
7.7760
7.6973
7.3982
7.3510
Cl
O
NH
F
0.9260
1.0000
0.9974
0.9815
0.9889
15
10
5
0
[ppm]

"FYH 151022 26DCBCAN4F Product C13 Wrong Subname" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua




"FYH 151109 4FCBCAN4F Product" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151109 4FCBCAN4F Product
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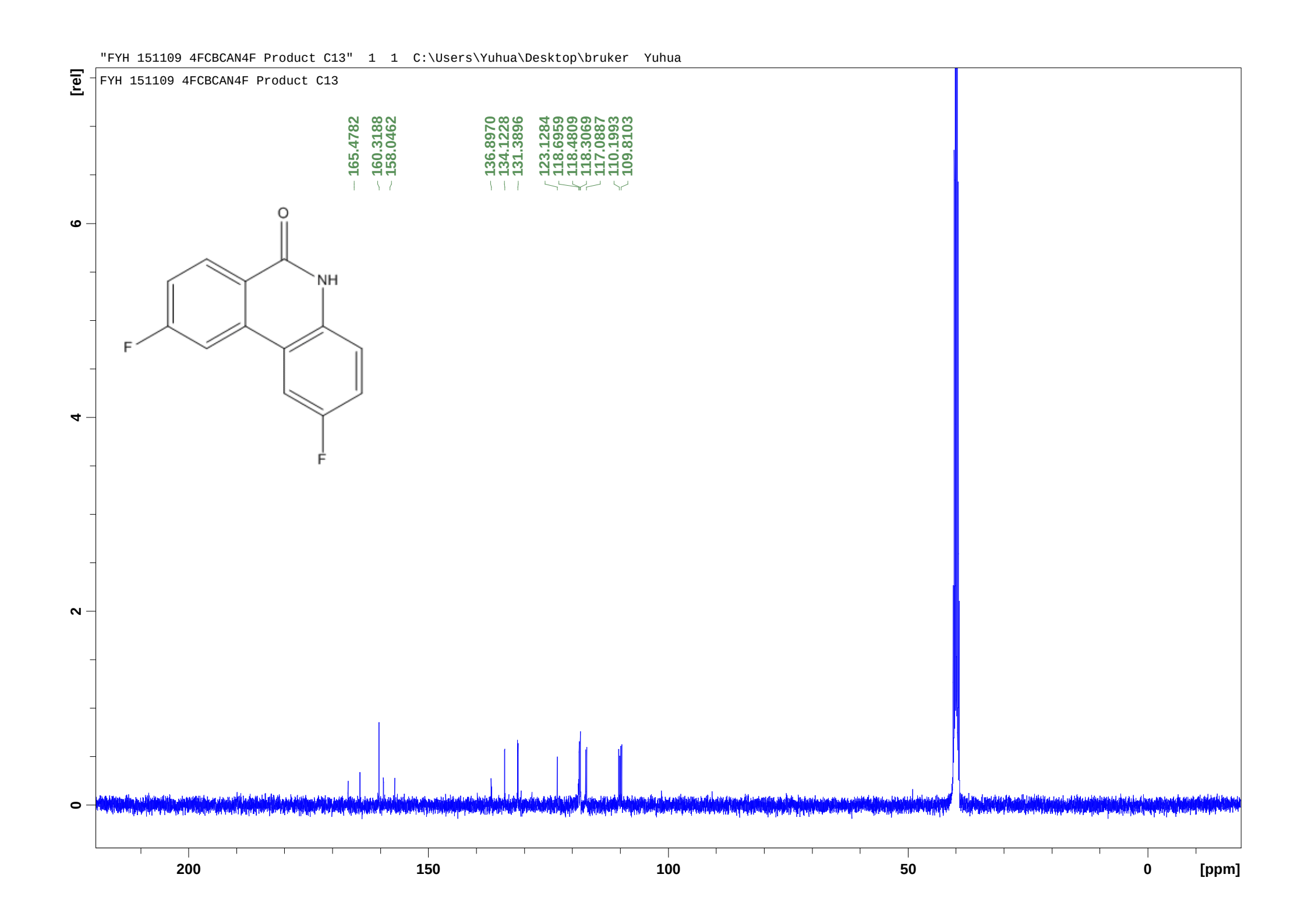
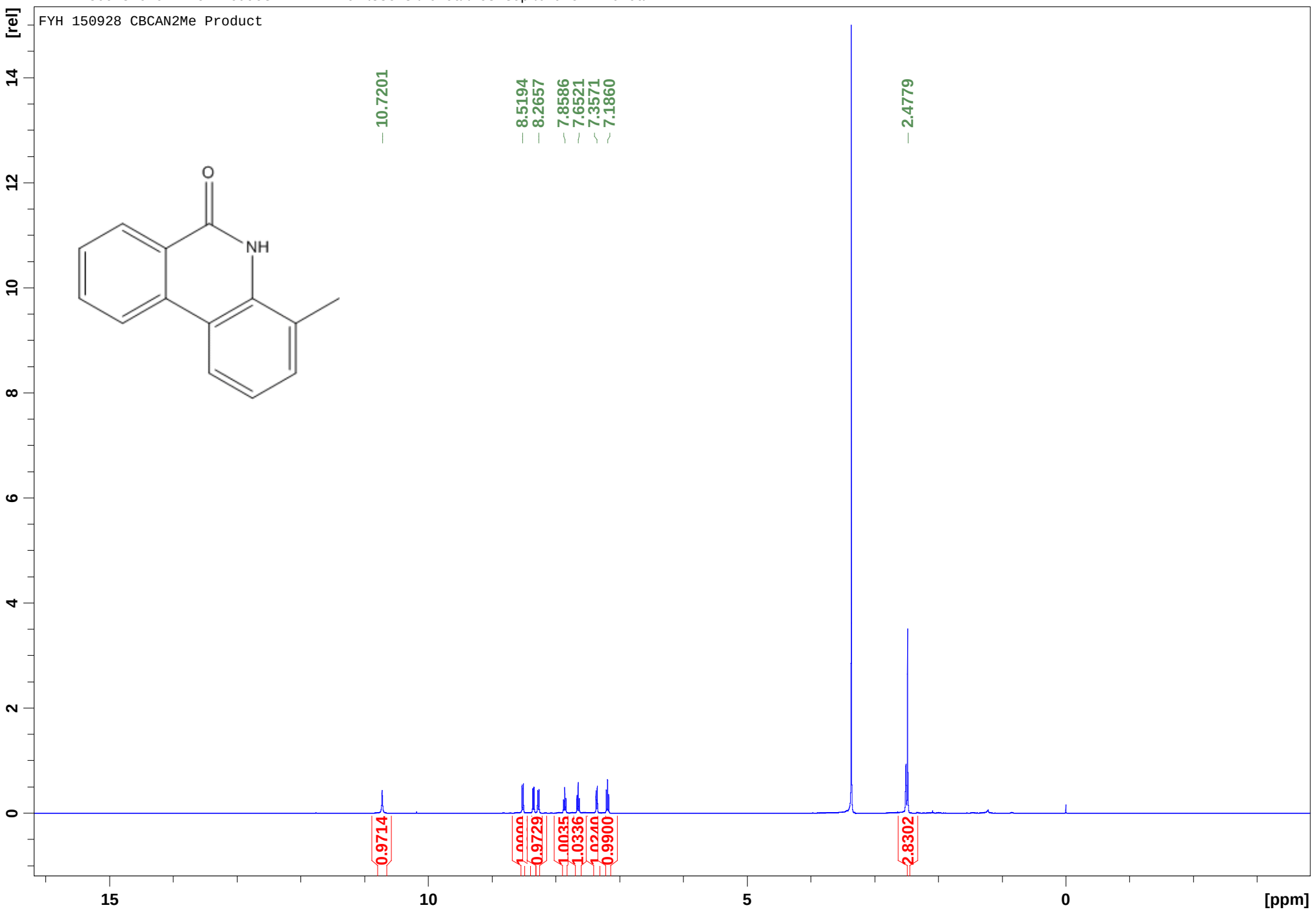
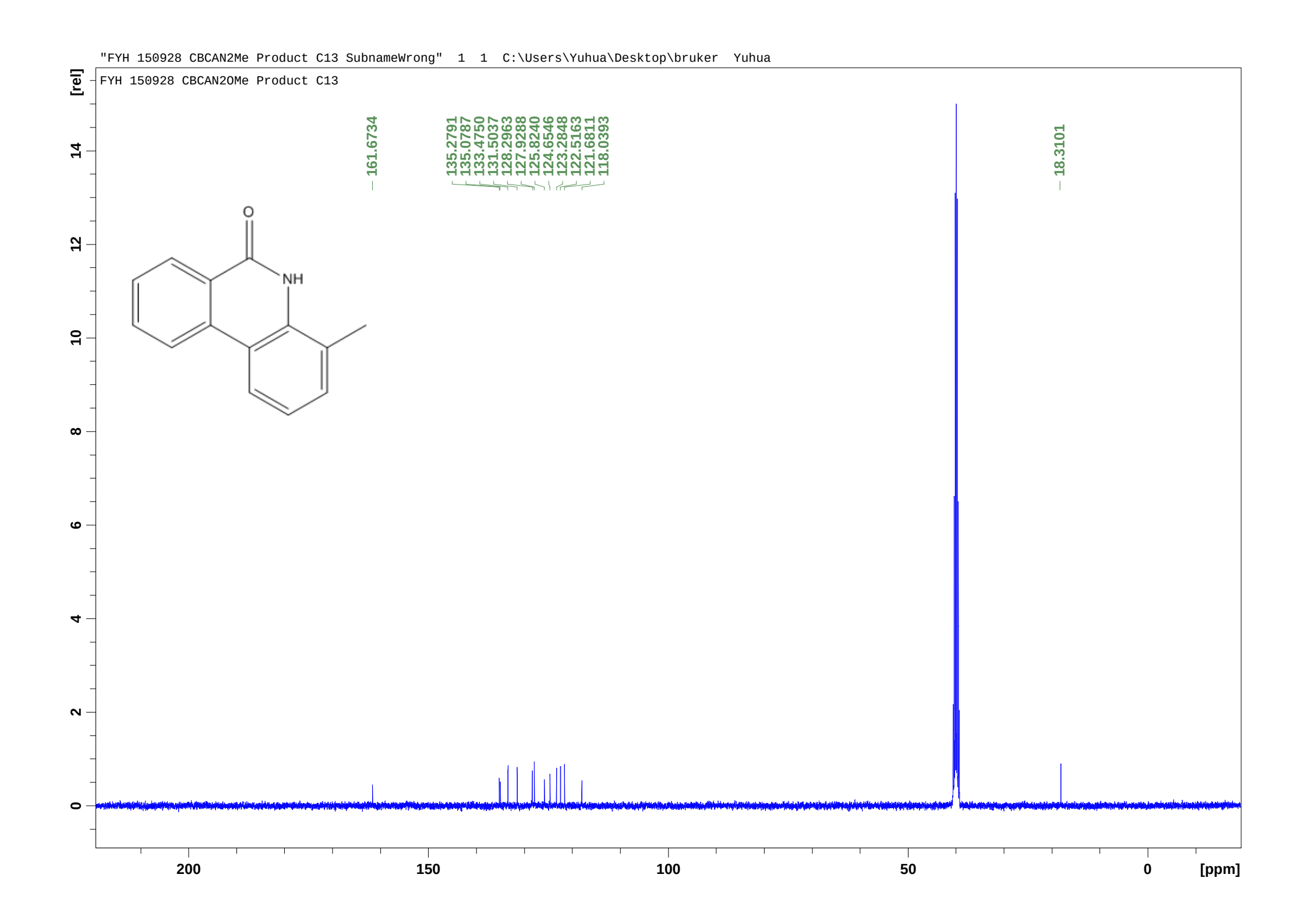
11.7875
8.3750
8.3620
8.2855
7.5160
7.4018
7.3797
O
NH
F
F
0.9454
1.0000
2.0132
15
10
5
0
[ppm]


"FYH 151109 4FCBCAN4F Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151109 4FCBCAN4F Product C13
165.4782
160.3188
158.0462
136.8970
134.1228
131.3896
123.1284
118.6959
118.4809
118.3069
117.0887
110.1993
109.8103
O
NH
F
F
[rel]
0
2
4
6
200
150
100
50
0
[ppm]

"FYH 150928 CBCAN2Me Product" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua




"FYH 150928 CBCAN2Me Product C13 SubnameWrong" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 150928 CBCAN2OMe Product C13
[rel]
161.6734
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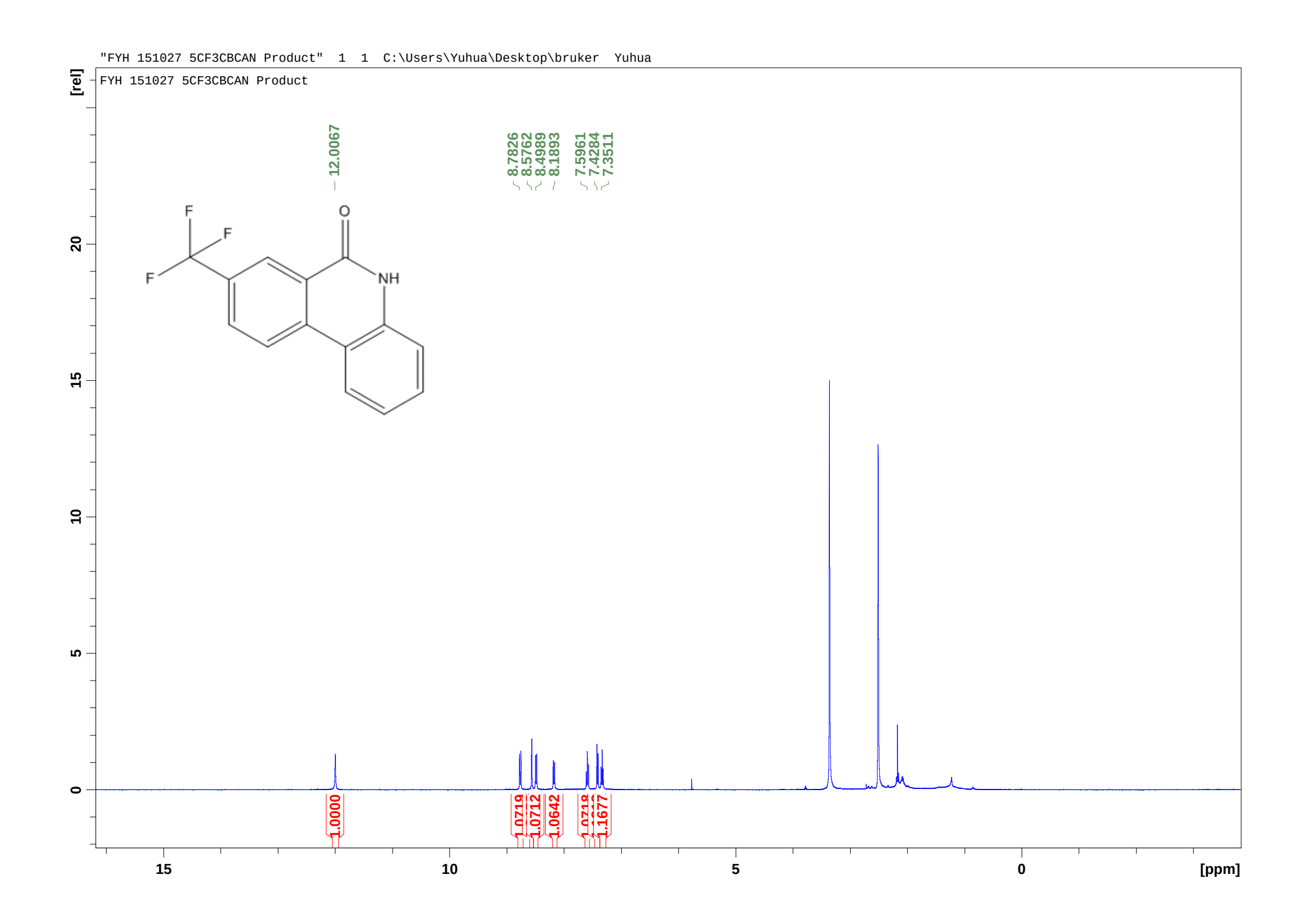
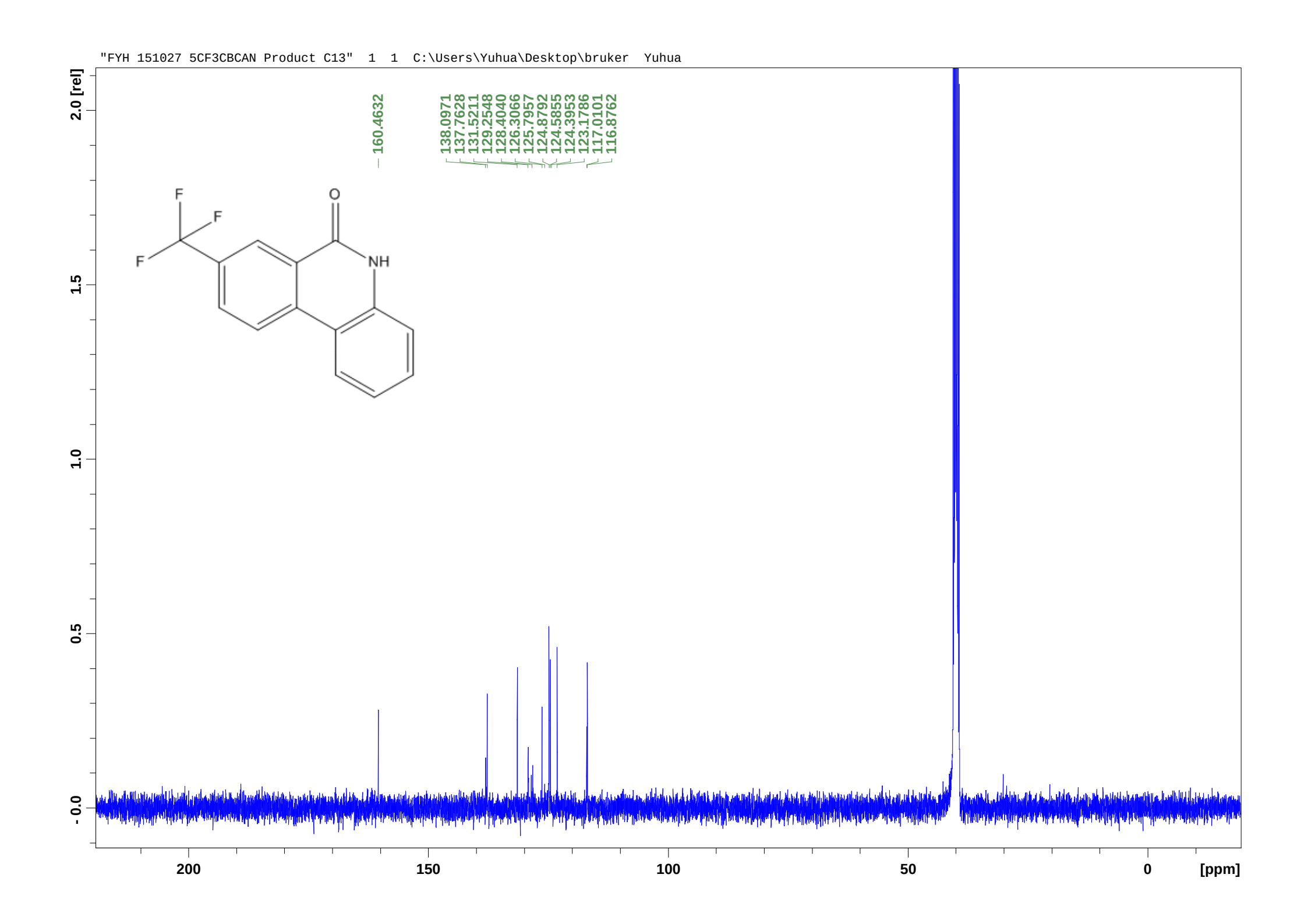
135.0787
133.4750
131.5037
128.2963
127.9288
125.8240
124.6546
123.2848
122.5163
121.6811
118.0393
18.3101
O
NH
0
2
4
6
8
10
12
14
200
150
100
50
0
[ppm]


"FYH 151027 5CF3CBCAN Product" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
FYH 151027 5CF3CBCAN Product
[rel]
12.0067
8.7826
8.5762
8.4989
8.1893
7.5961
7.4284
7.3511
F
F
F
O
NH
1.0000
1.0719
1.0712
1.0642
1.0719
1.1677
0
5
10
15
20
15
10
5
0
[ppm]


"FYH 151027 5CF3CBCAN Product C13" 1 1 C:\Users\Yuhua\Desktop\bruker Yuhua
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131.5211
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128.4040
126.3066
125.7957
124.8792
124.5855
124.3953
123.1786
117.0101
116.8762
F
F
F
O
NH
2.0 [rel]
1.5
1.0
0.5
- 0.0
200
150
100
50
0
[ppm]

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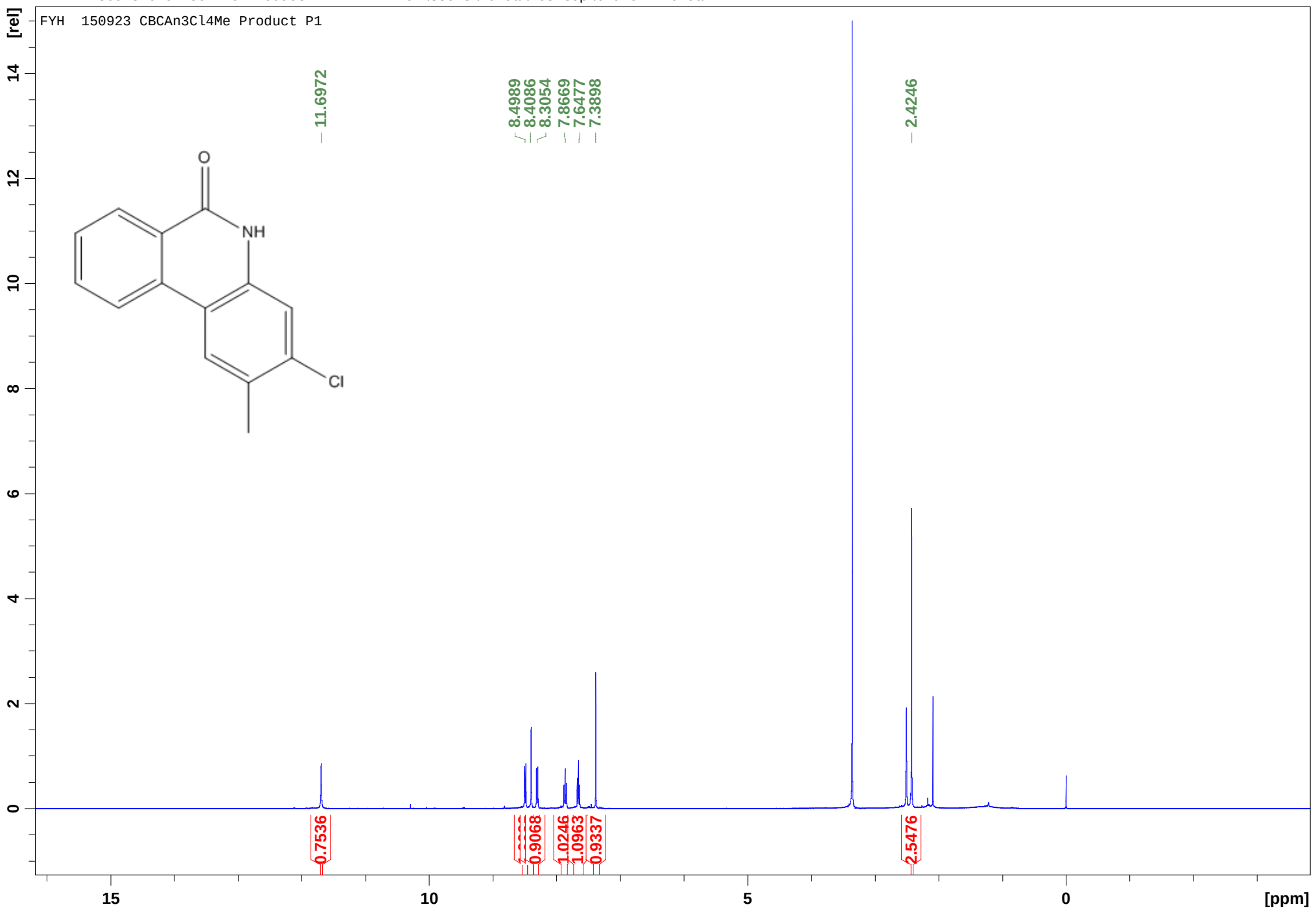

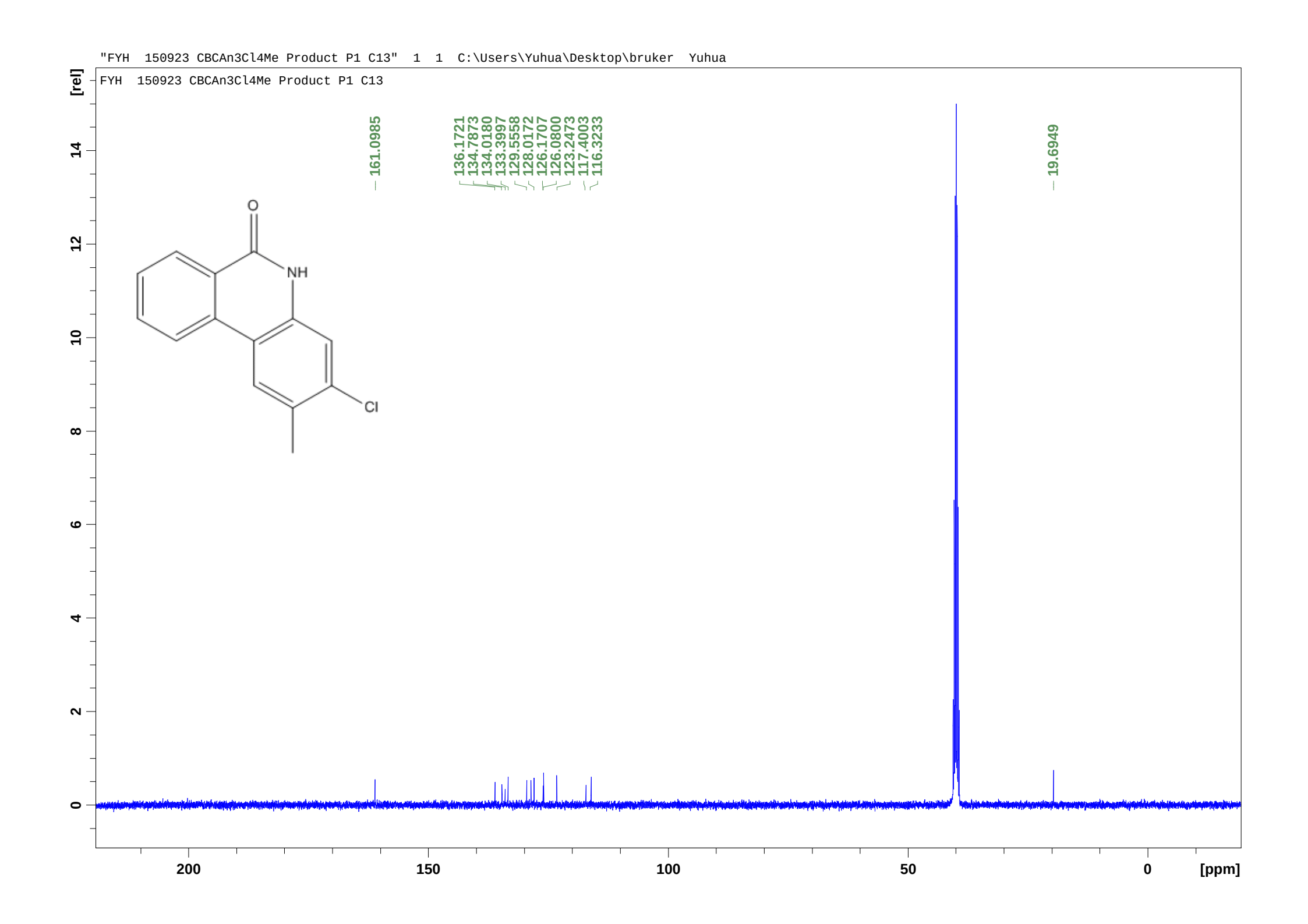
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134.0180
133.3997
129.5558
128.0172
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126.0800
123.2473
117.4003
116.3233
19.6949
O
NH
Cl
[ppm]