Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Synthesis and anti-cancer activity of 1, 4-disubstituted imidazo[4,5-*c*]quinolines

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SUPPORTING INFORMATION

Contents:

Procedures for preparation of compounds 3 and 4

Synthesis of (*E*)-N-(2-nitrobenzylidene)aniline: To a mixture of 2-nitrobenzaldehyde (2 g, 0.0132 mol) and aniline (1.478g, 0.0158 mol) in 30 ml of toluene, catalytic amount of acetic acid was added. The solution was stirred at 100 °C for 8hrs. The reaction mixture was cooled to room temperature on completion and solvent was removed under reduced pressure. The residue obtained, was diluted with water and extracted with ethyl acetate. The separated organic layer was then washed with brine solution and dried over anhydrous Na_2SO_4. Subsequently, organic layer was concentrated in vacuo and resulting residue purified by column chromatography using 15% ethylacetate/hexane as eluent.

Yield: 83%(2.4 g); yellow solid, m.p. 60-62 °C. R_f = 0.7 (Hexane / Ethyl acetate =8:2). IR (KBr, cm^{-1}): 3056, 2332, 1569, 1522, 1346, 1189. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.26 – 7.35 (m, 3H), 7.39 – 7.49 (m, 2H), 7.62 (t, *J* = 7.7 Hz, 1H), 7.74 (t, *J* = 7.5 Hz, 1H), 8.07 (d, *J* = 8.1 Hz, 1H), 8.32 (d, *J* = 7.8 Hz, 1H), 8.95 (s, 1H); ^{13}C NMR (75 MHz, $CDCl_3$): *δ* 121.2, 124.5, 127, 129.3, 129.7, 131.1, 131.2, 133.6, 149.3, 151, 155.9; ESI (m/z): 227.05$[M+H]^+$.

Synthesis of 5-(2-nitrophenyl)-1-phenyl-1*H*-imidazole (3): To a mixture of (*E*)-N-(2-nitrobenzylidene)aniline (2g, 0.088 mol) and tosylmethylisocyanide (2.07g, 0.0106 mol) in 30 ml of ACN:DMSO(3:1), K_2CO_3 (3.669g, 0.0265 mol)was added. The solution was then stirred at 80 °C for 6 hrs. On completion of the reaction as indicated by TLC, the reaction mixture was poured into water and extracted with ethyl acetate. The separated organic layer was then washed with brine and dried over anhydrous Na_2SO_4. Organic layer was subsequently concentrated in vacuo and residue was purified by column chromatography using 40% ethyl acetate/ hexane as eluent.

Yield: 78%(1.84 g). Light brown solid, m.p. 107-110 °C. R_f = 0.3(Hexane / Ethyl acetate = 5:5). IR (KBr, cm^{-1}): 3118, 1520, 1349,1159; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.09 (dd, *J* = 6.3, 2.9 Hz, 2H), 7.25 (s, 1H), 7.32 - 7.34 (m, 3H), 7.48 (dd, *J* = 15.0, 7.6 Hz, 2H), 7.61 (t, *J* = 7.5 Hz, 1H), 7.81 (s, 1H), 7.84 (d, *J* = 8.2 Hz, 1H);^{13}C NMR (101 MHz, $CDCl_3$): δ 124.4, 124.6, 125, 128.3, 128.4, 128.4, 129.5, 129.6, 133, 133.1, 135.6, 138.7, 148.6; ESI (m/z): 266$[M+H]^+$.

Synthesis of 2-(1-phenyl-1*H*-imidazol-5-yl)aniline (4a): To a solution of 5-(2-nitrophenyl)-1-phenyl-1*H*-imidazole (1.8g, 0.0067 mol) in ACN/water(1:0.1) at 0 °C, $NiCl_2$ $6H_2O$ (0.318g, 0.00134 mol) and $NaBH_4$ (1.0138g, 0.027 mol) were added. The reaction mixture was then stirred for 20 minutes, initially at 0 °C for 10 min and then at room temperature for the remaining duration. On completion of the reaction, resulting mixture was diluted with cold water and passed through celite pad. The solution obtained was then diluted with water and extracted with ethyl acetate. The organic layer was subsequently washed with brine and dried over Na_2SO_4. Dried organic layer was concentrated in vacuo and residue was purified by column chromatography with 50% ethylacetate/ hexane as eluent.

Yield:75%(1.19 g); colourless liquid, R_f = 0.2(Hexane / Ethyl acetate = 3:7). IR (KBr, cm^{-1}): 3475, 3370, 3206, 2359, 1613, 1495, 1460, 1251; ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.81 (s, 2H), 6.62 (td, *J* = 7.5, 1.1 Hz, 1H), 6.69 (dd, *J* = 8.1, 0.9 Hz, 1H), 6.85 (dd, *J* = 7.6, 1.5 Hz, 1H), 7.11 (ddd, *J* = 8.1, 7.4, 1.6 Hz, 1H), 7.15 – 7.19 (m, 2H), 7.26 (s, 1H), 7.30 – 7.37 (m, 3H), 7.82 (s, 1H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 114.4, 115.3, 118, 124.6, 127.8, 129.3, 129.4, 129.6, 129.7, 131.7, 136.4, 138.3, 145.4; ESI (m/z): 236.05$[M+H]^+$.

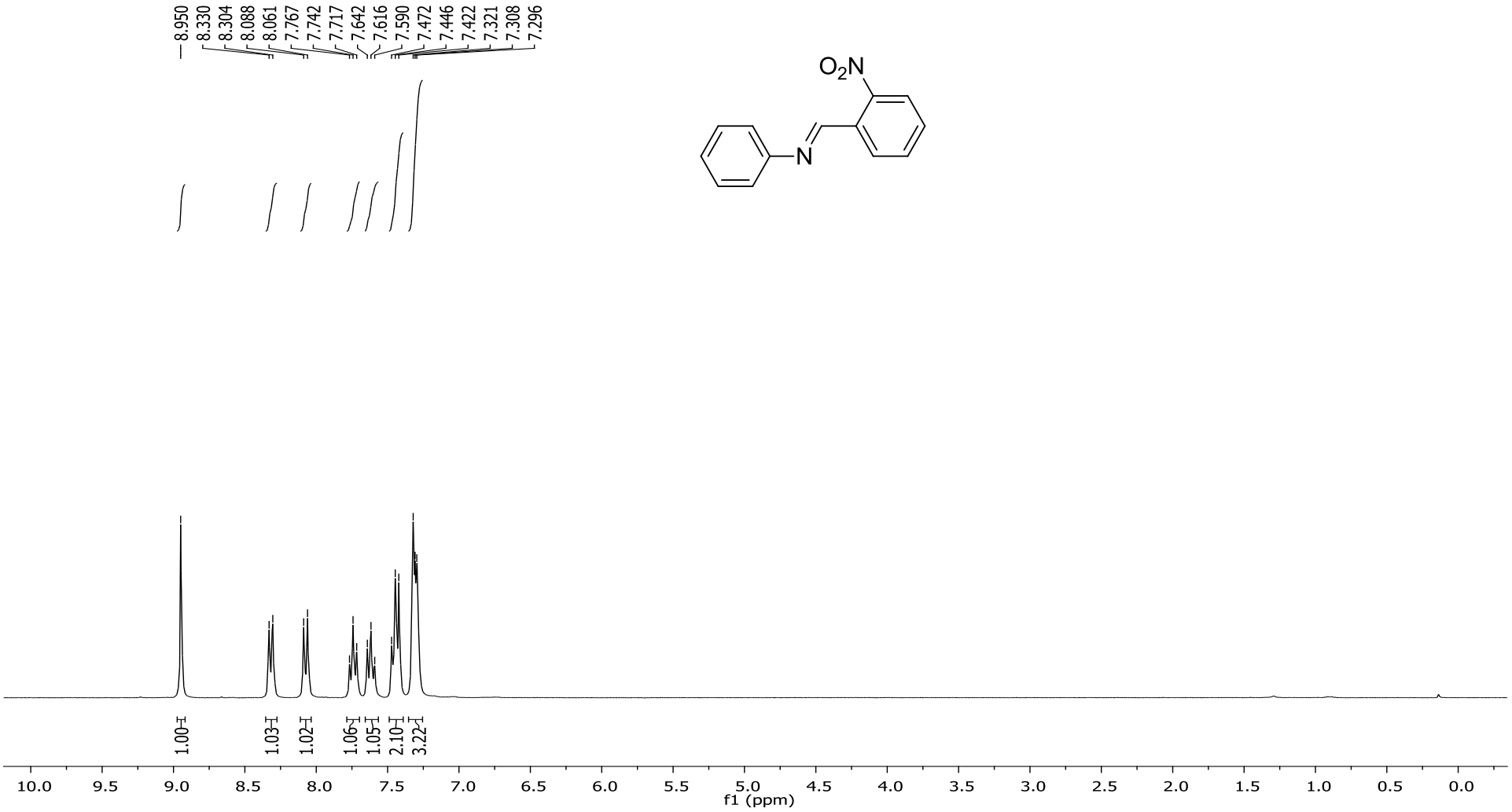
(*E*)-4-chloro-N-(2-nitrobenzylidene)aniline: To a mixture of 2-nitrobenzaldehyde (1.1 g, 0.0085 mol) and *p*-chloro aniline (1.5 g, 0.010 mol) in 15 ml of toluene, catalytic amount of acetic acid was added. The solution was stirred at 100 °C for 8hrs. The reaction mixture was cooled to room temperature on completion and solvent was removed under reduced pressure. The residue obtained, was diluted with water and extracted with ethyl acetate. The separated organic layer was then washed with brine solution and dried over anhydrous Na_2SO_4. Subsequently, organic layer was concentrated in vacuo and resulting residue purified by column chromatography using 15% ethylacetate/hexane as eluent.

Yield:87%; yellow solid; m.p. 67-70 °C; R_f = 0.9(Hexane / Ethyl acetate = 9: 1). IR (KBr, cm^{-1}): 2998, 2359, 1569, 1523, 1485, 1339, 1186, 1090; ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.22 (d, *J* = 8.2 Hz, 2H), 7.38 (d, *J* = 8.0 Hz, 2H), 7.63 (t, *J* = 7.3 Hz, 1H), 7.74 (t, *J* = 7.3 Hz, 1H), 8.07 (d, *J* = 7.9 Hz, 1H), 8.28 (d, *J* = 7.4 Hz, 1H), 8.91 (s, 1H); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*=122.5, 124.6, 129.4, 129.7, 130.8, 131.4, 132.5, 133.6, 149.2, 149.4, 156.2; ESI (m/z): 261.05$[M+H]^+$.

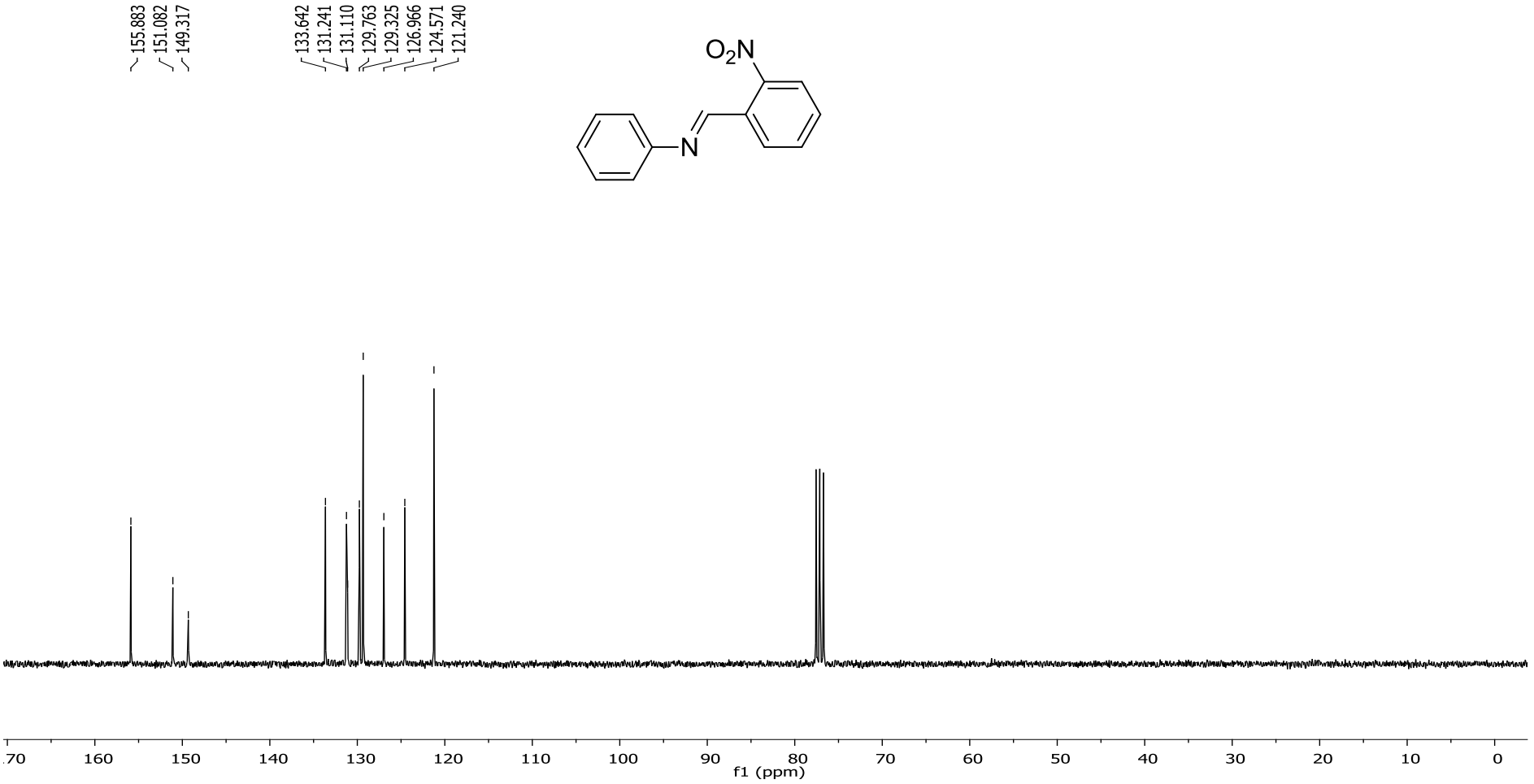
1-(4-chlorophenyl)-5-(2-nitrophenyl)-1*H*-imidazole: Yield:79%; yellow solid; m.p. 165-170 $^{\circ}$C; R_f = 0.9(Hexane / Ethyl acetate = 9: 1). IR (KBr, cm^{-1}): 3123, 3064,1687,1523,1495,1353,1091,1018; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.03 – 7.08 (m, 2H), 7.24 (d, *J* = 1.0 Hz, 1H), 7.29 –7.34 (m, 2H), 7.45 (dd, *J* = 7.6, 1.4 Hz, 1H), 7.51– 7.56 (m, 1H), 7.64 (td, *J* = 7.6, 1.3 Hz, 1H), 7.77 (d, *J* = 1.0 Hz, 1H), 7.90 (dd, *J* = 8.1, 1.1 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$): *δ* 124.2, 124.7, 126.3, 128.3, 129.7, 129.8, 130, 133, 133.2, 134.2, 134.3, 138.7, 148.7; ESI (m/z): 300.05$[M+H]^+$.

2-(1-(4-chlorophenyl)-1*H*-imidazol-5-yl)aniline (4b): Yield: 84%; yellow solid; m.p. 111-114 $^{\circ}$C; R_f = 0.9(Hexane / Ethyl acetate = 9: 1). IR (KBr, cm^{-1}): 3460, 3373, 3331, 3216, 2360, 1624, 1495, 1311, 1092; ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.80 (s, 2H), 6.65 (td, *J* = 7.5, 1.1 Hz, 1H), 6.69 (dd, *J* = 8.1, 0.8 Hz, 1H), 6.85 (dd, *J* = 7.6, 1.3 Hz, 1H), 7.09 -7.11 (m, 1H), 7.13 (dt, *J* = 4.6, 1.9 Hz, 2H), 7.25 (s, 1H), 7.28 -7.30 (m, 1H), 7.30 - 7.32 (m, 1H), 7.78 (s, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 114, 115.4, 118.2, 125.8, 129.3, 129.5, 129.8, 130, 131.7, 133.7, 135, 138.1, 145.5; ESI (m/z): 270.05$[M+H]^+$.

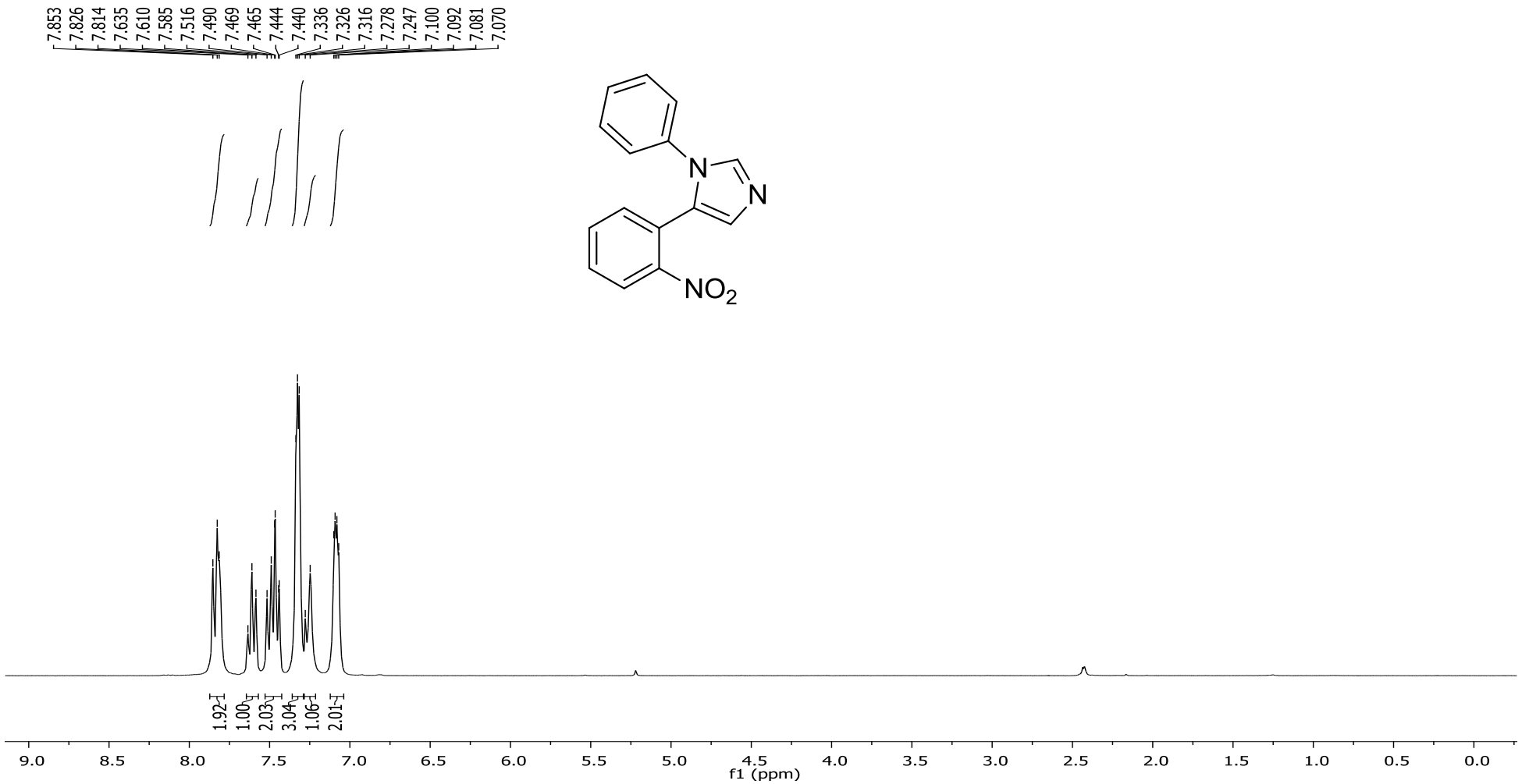
^{1}H NMR (300 MHz, $CDCl_3$) (E)-N-(2-nitrobenzylidene)aniline



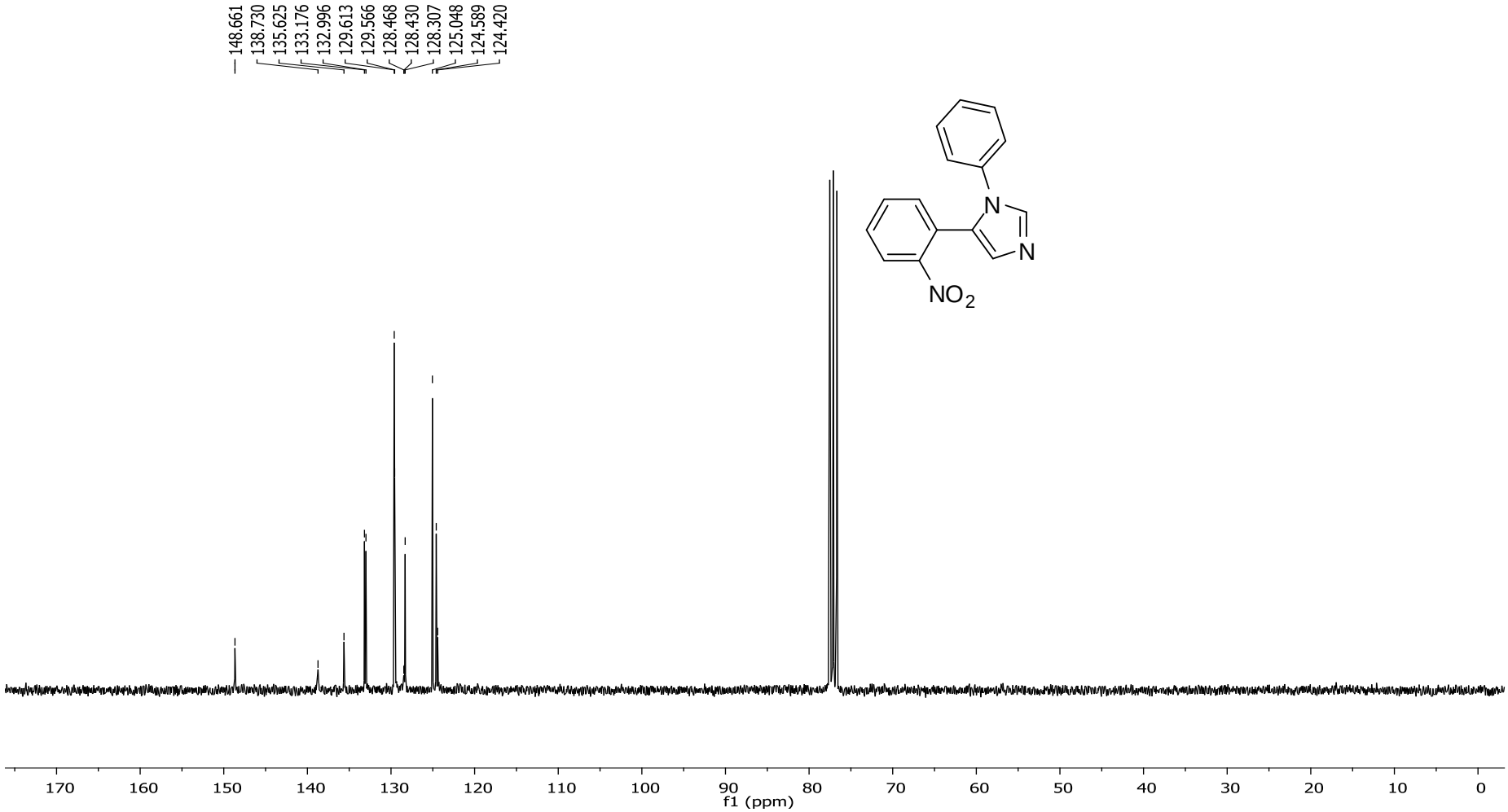
^{13}C NMR(75 MHz, $CDCl_3$) (E)-N-(2-nitrobenzylidene)aniline



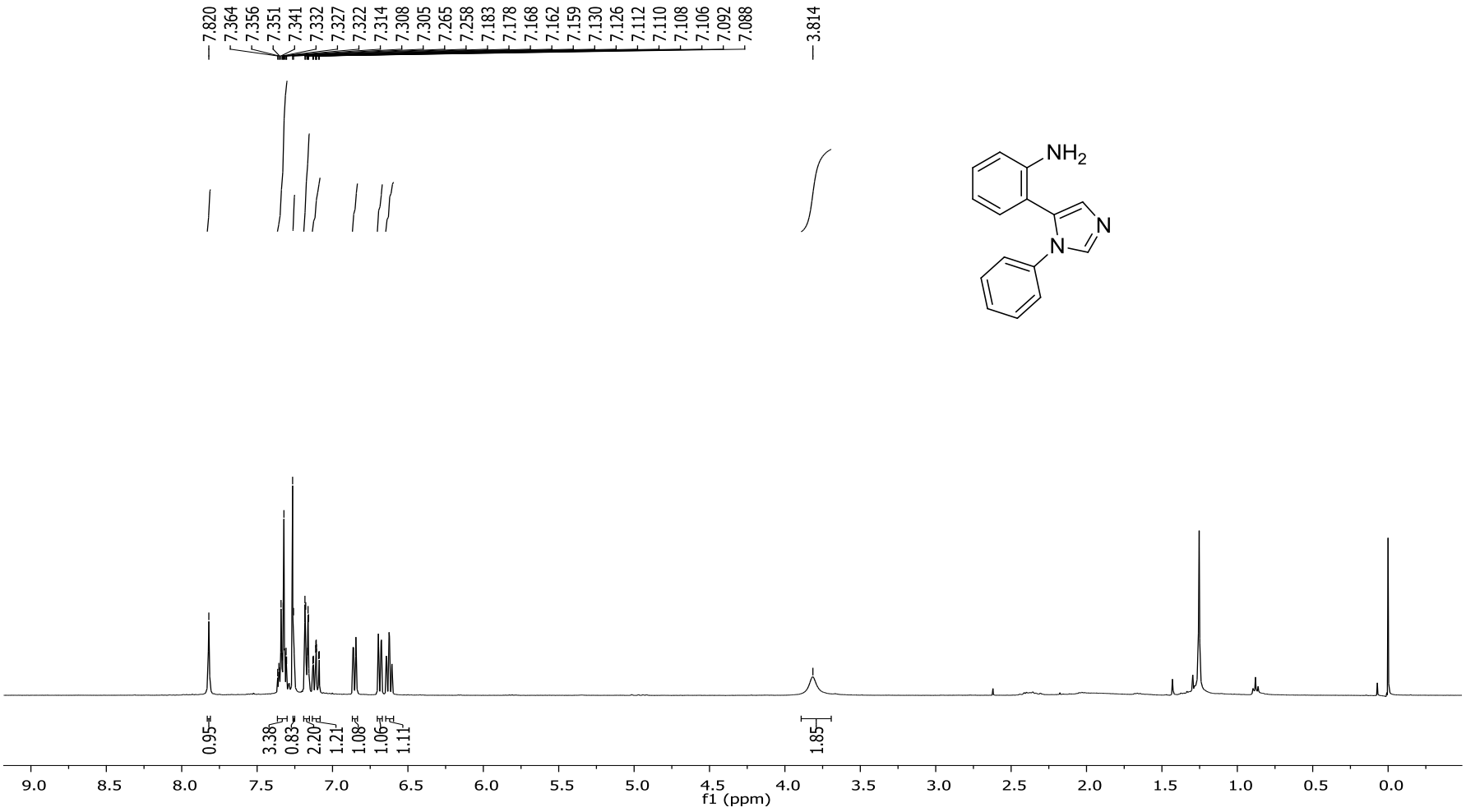
^{1}H NMR (400 MHz, $CDCl_3$): 5-(2-nitrophenyl)-1-phenyl-1*H*-imidazole (3)



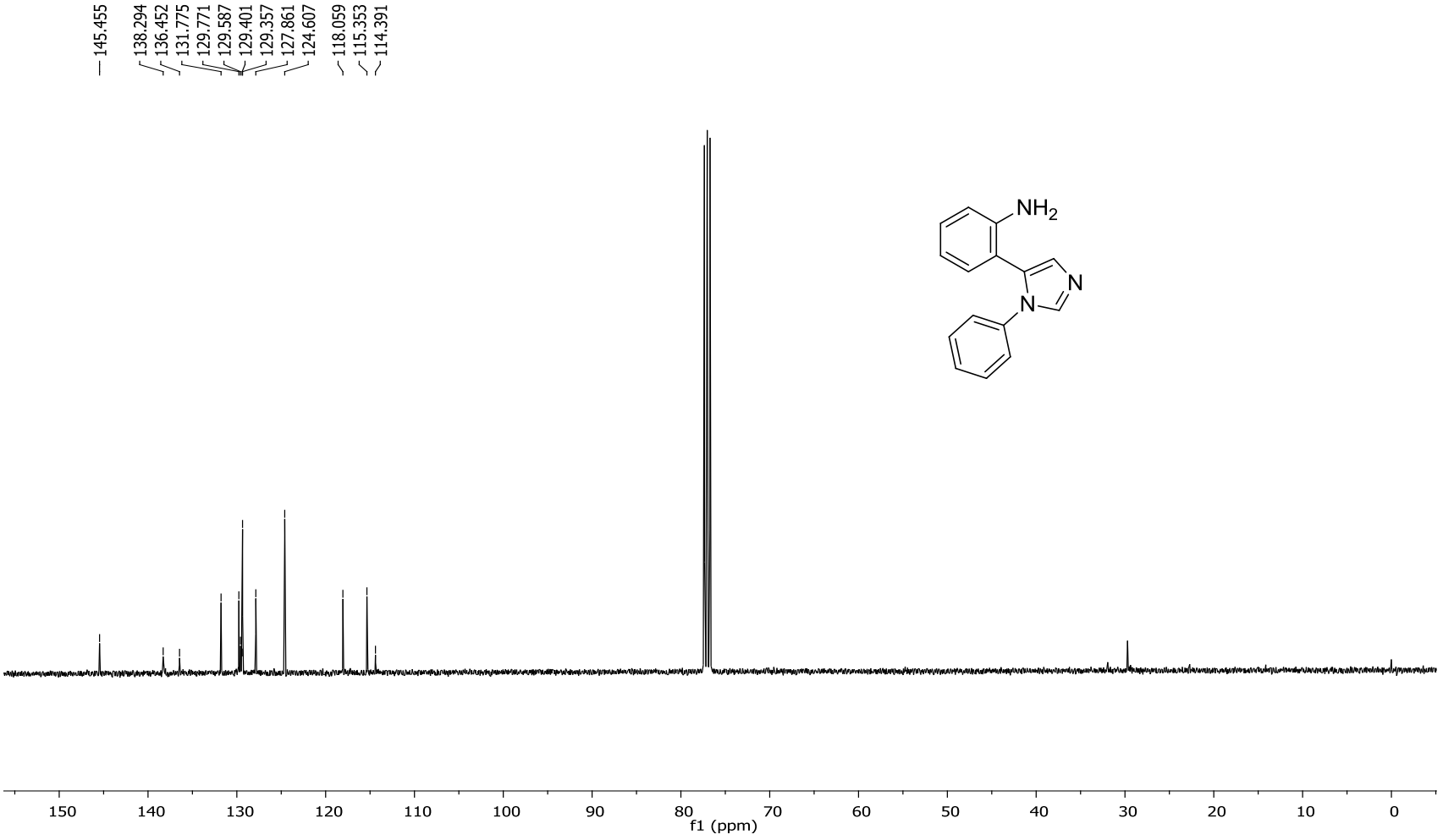
^{13}C NMR (101 MHz, $CDCl_3$): 5-(2-nitrophenyl)-1-phenyl-1*H*-imidazole (3)



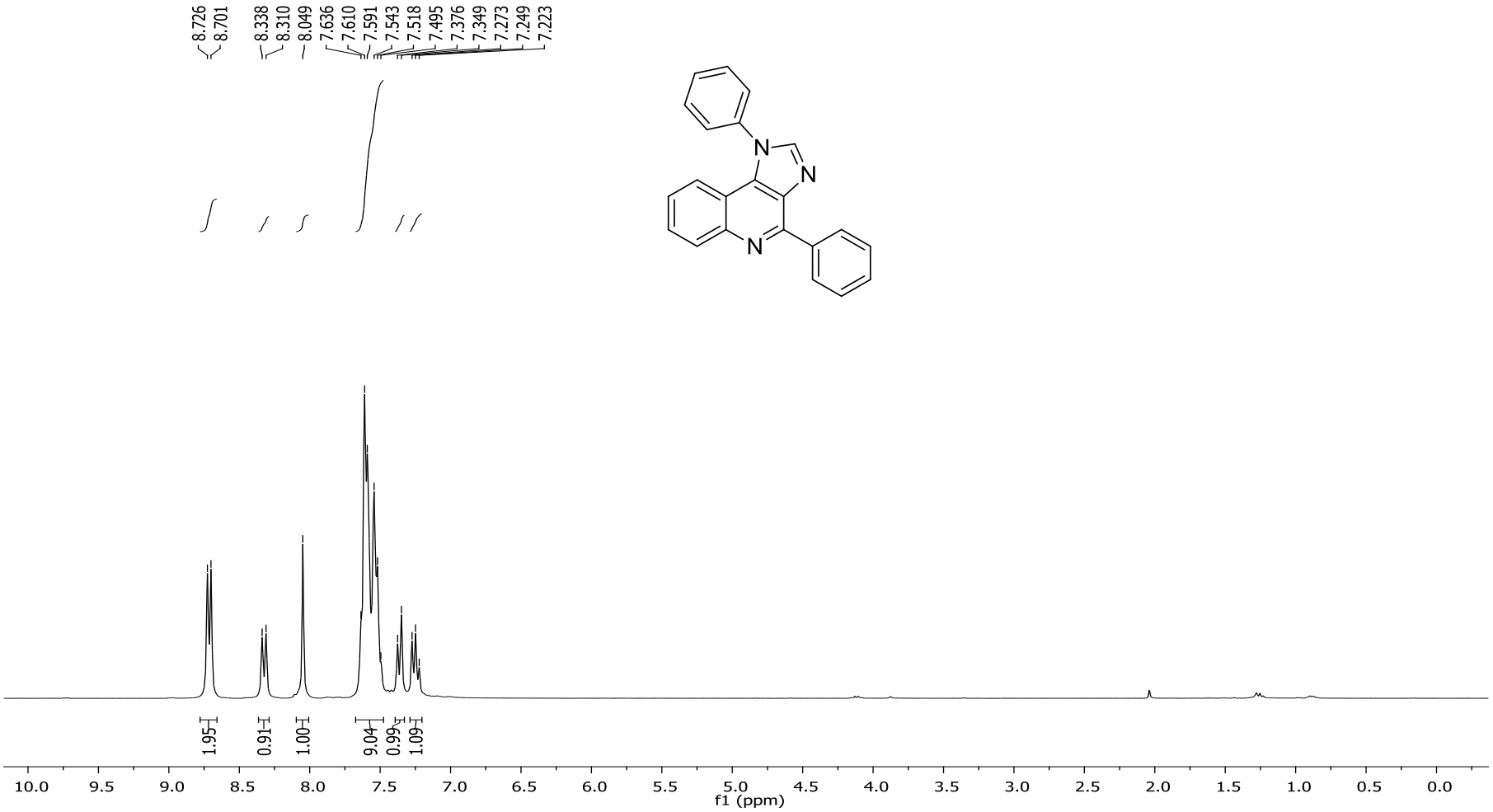
^{1}H NMR (400 MHz, $CDCl_3$): 2-(1-phenyl-1*H*-imidazol-5-yl)aniline (4a)



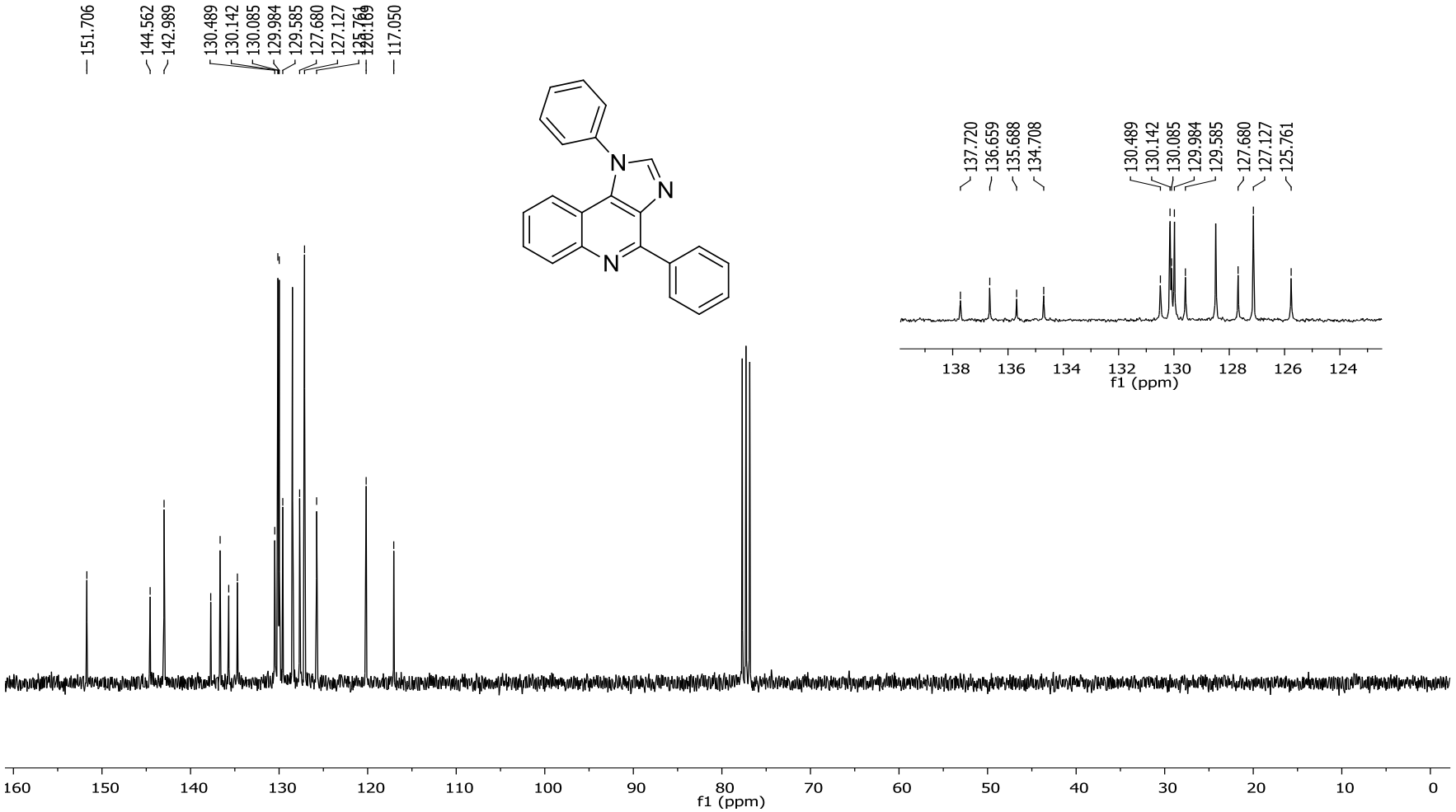
^{13}C NMR (101 MHz, $CDCl_3$): 2-(1-phenyl-1*H*-imidazol-5-yl)aniline (4a)



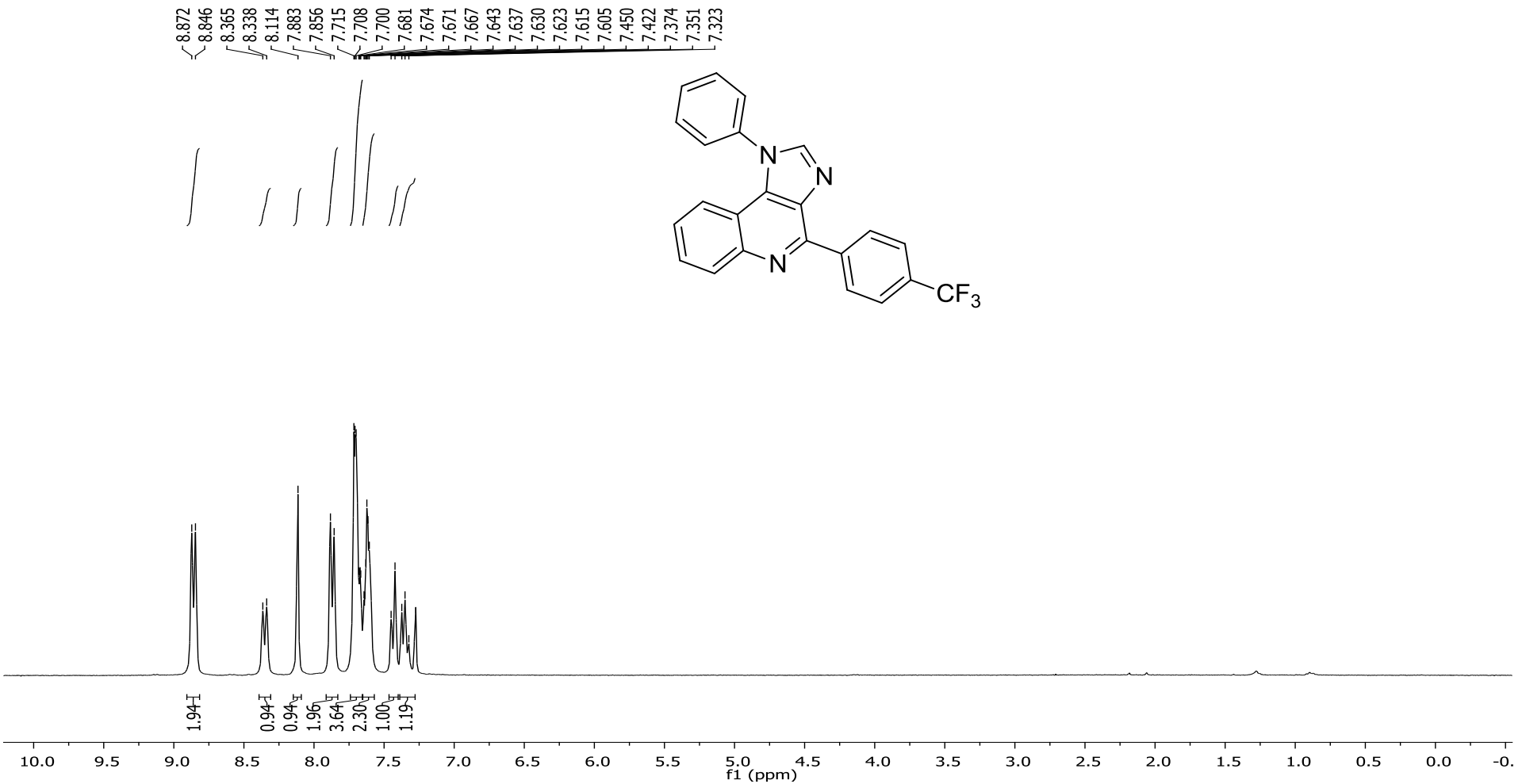
^{1}H NMR (300 MHz, $CDCl_3$): 1,4-diphenyl-1H-imidazo[4,5-c]quinoline (6a)



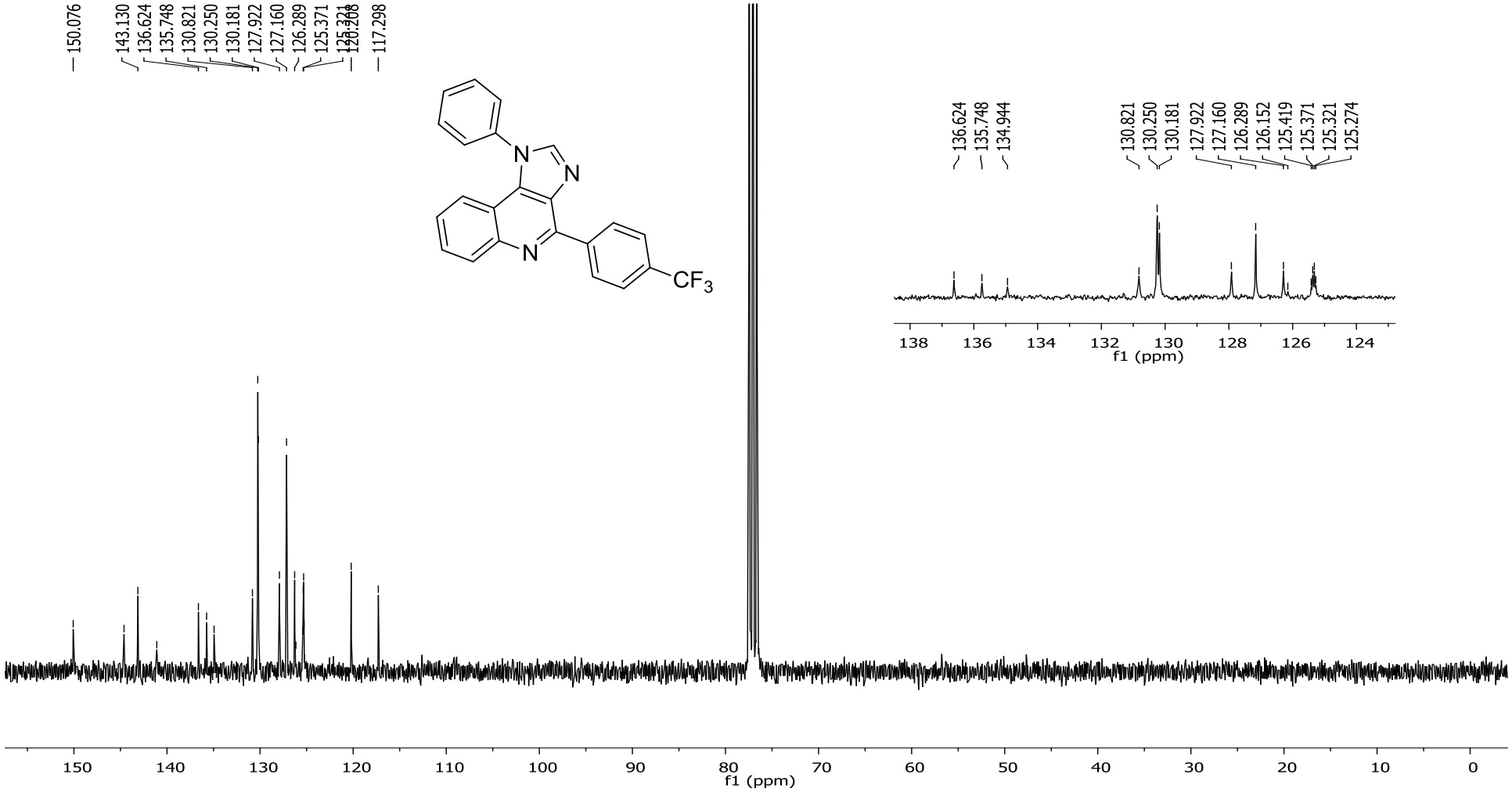
^{13}C NMR (75 MHz, $CDCl_3$): 1,4-diphenyl-1H-imidazo[4,5-c]quinoline (6a)



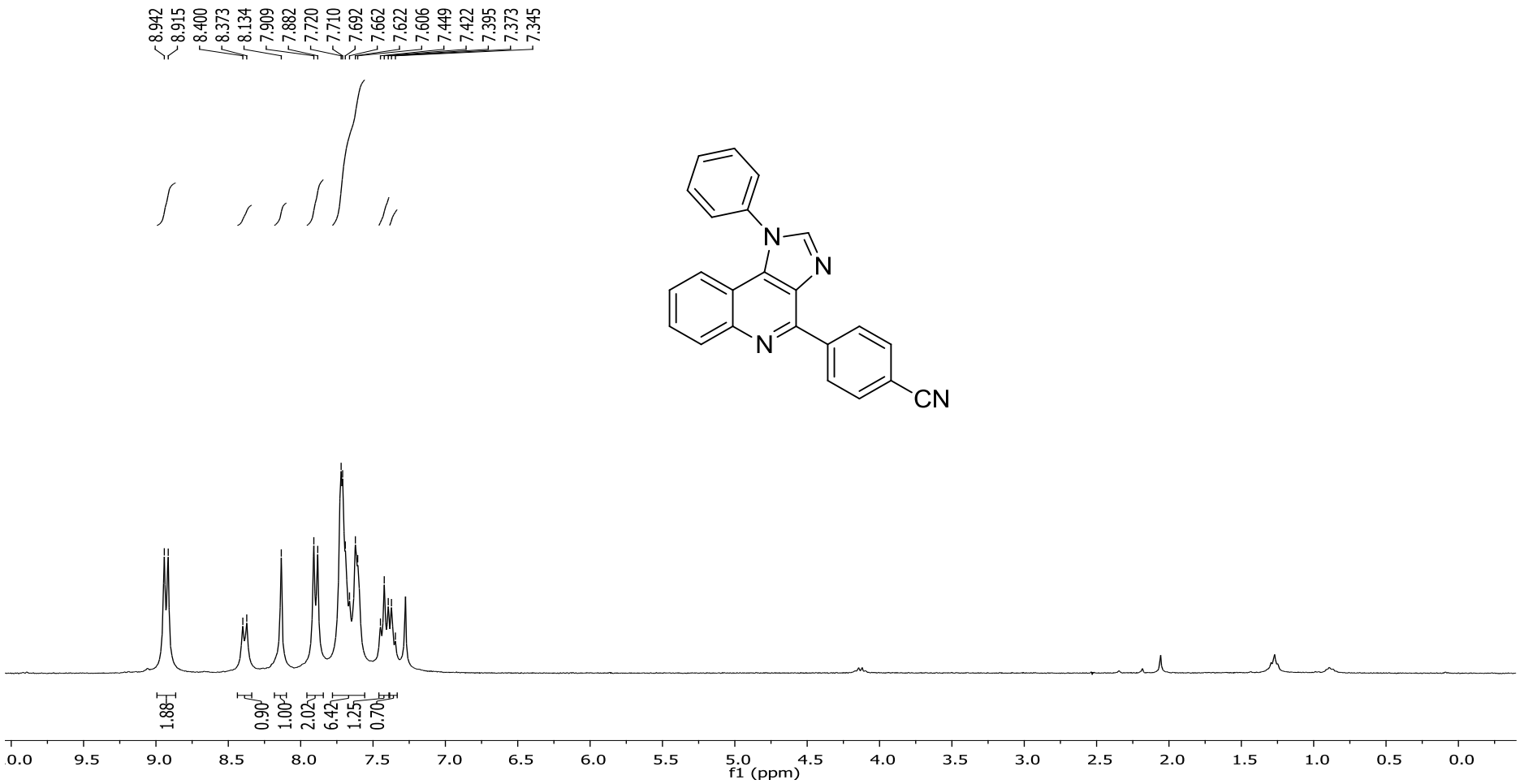
^{1}H NMR (300 MHz, $CDCl_3$): 1-phenyl-4-(4-(trifluoromethyl)phenyl)-1H-imidazo[4,5-c]quinoline (6b)



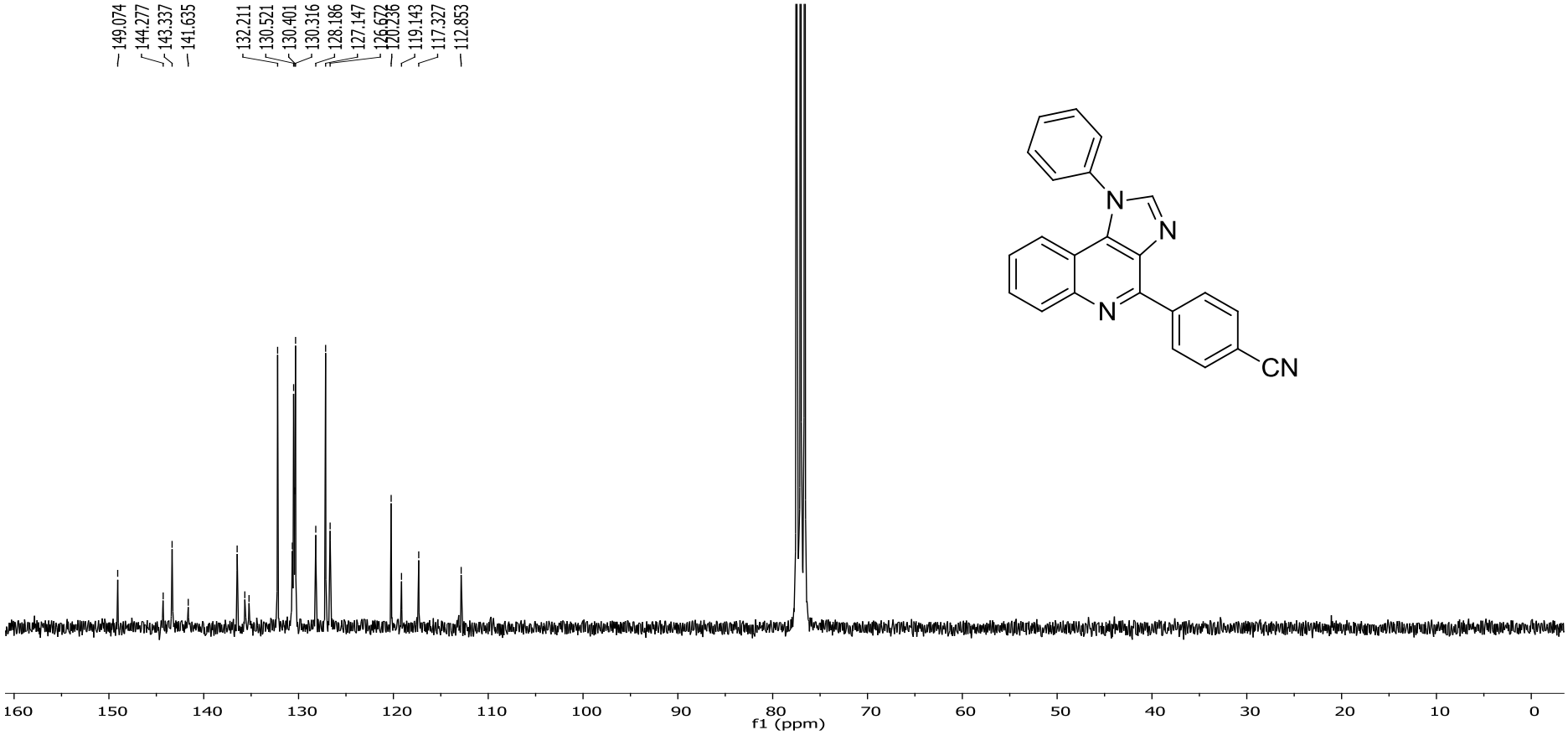
^{13}C-NMR (75 MHz, $CDCl_3$): 1-phenyl-4-(4-(trifluoromethyl)phenyl)-1H-imidazo[4,5-c]quinoline (6b)



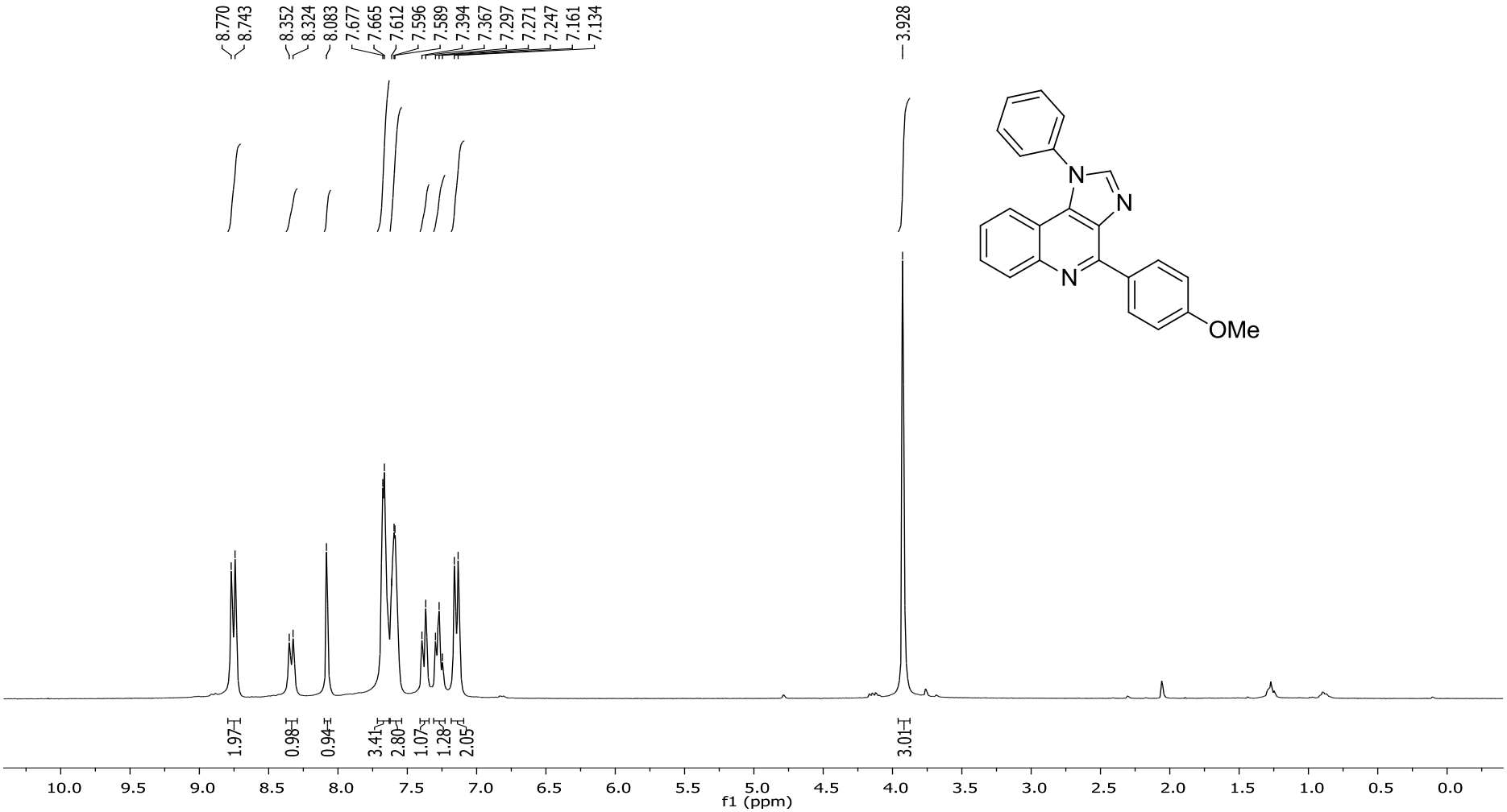
^{1}H NMR (300 MHz, $CDCl_3$): 4-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)benzonitrile (6c)



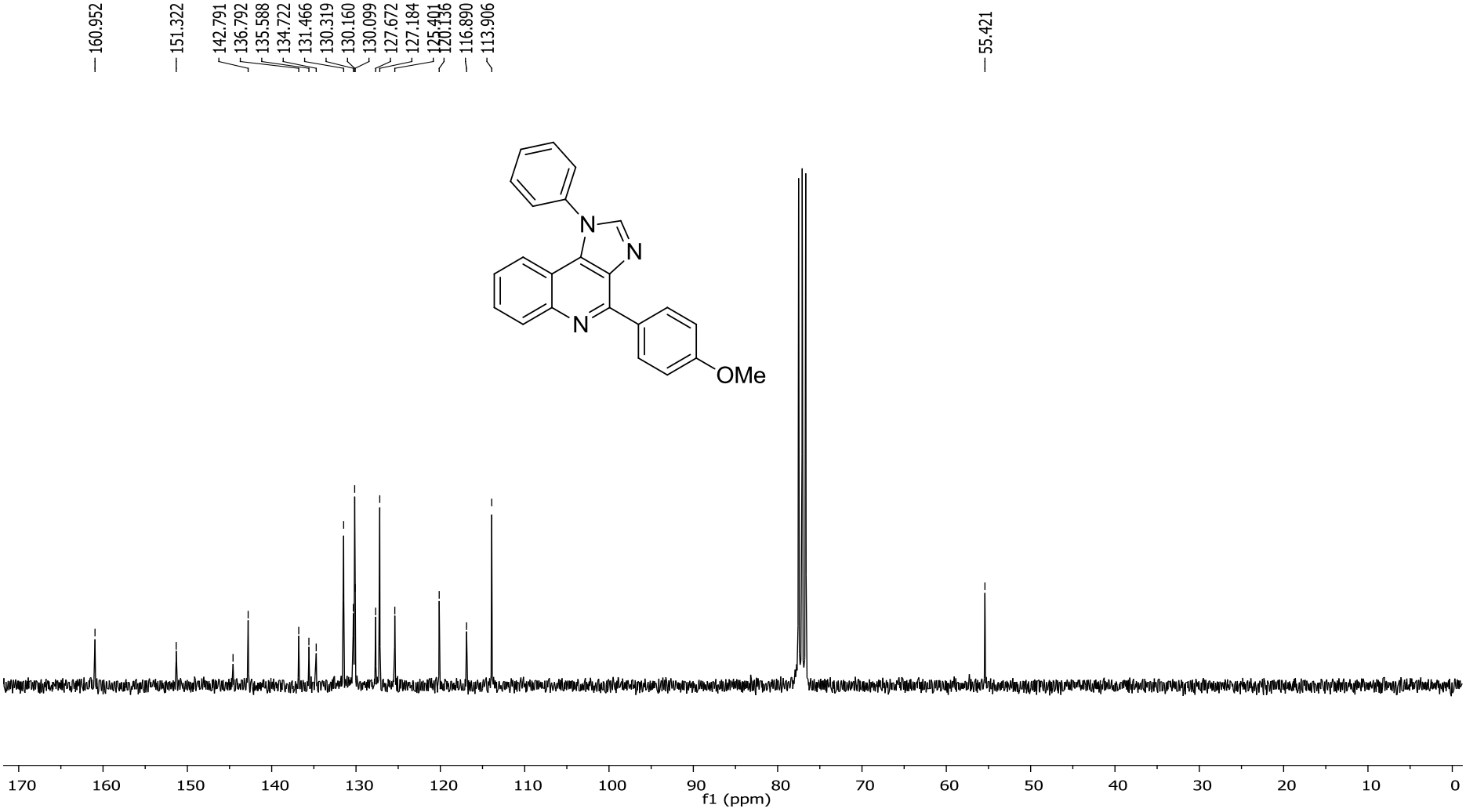
^{13}C-NMR (75 MHz, $CDCl_3$): 4-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)benzonitrile (6c)



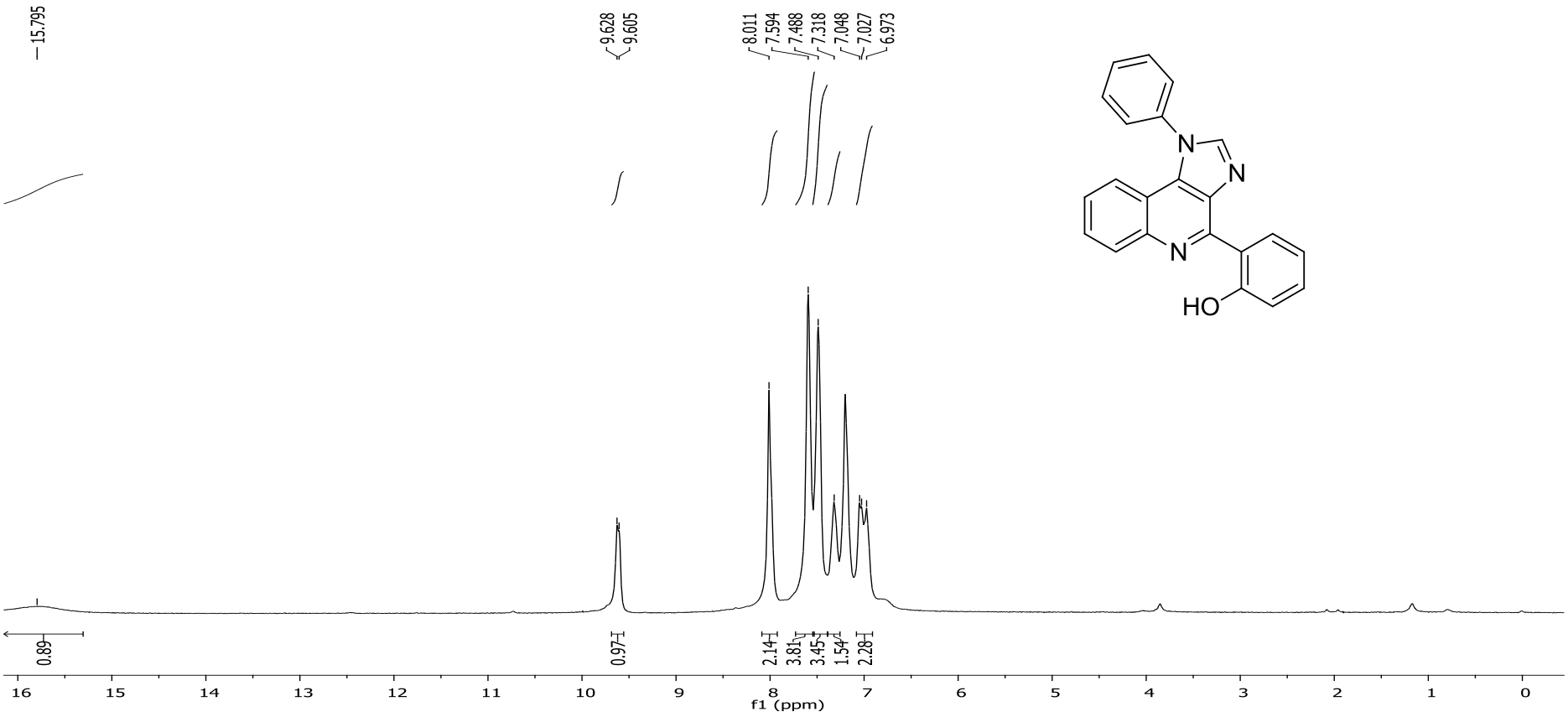
^{1}H NMR (300 MHz, $CDCl_3$): 4-(4-methoxyphenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6d)



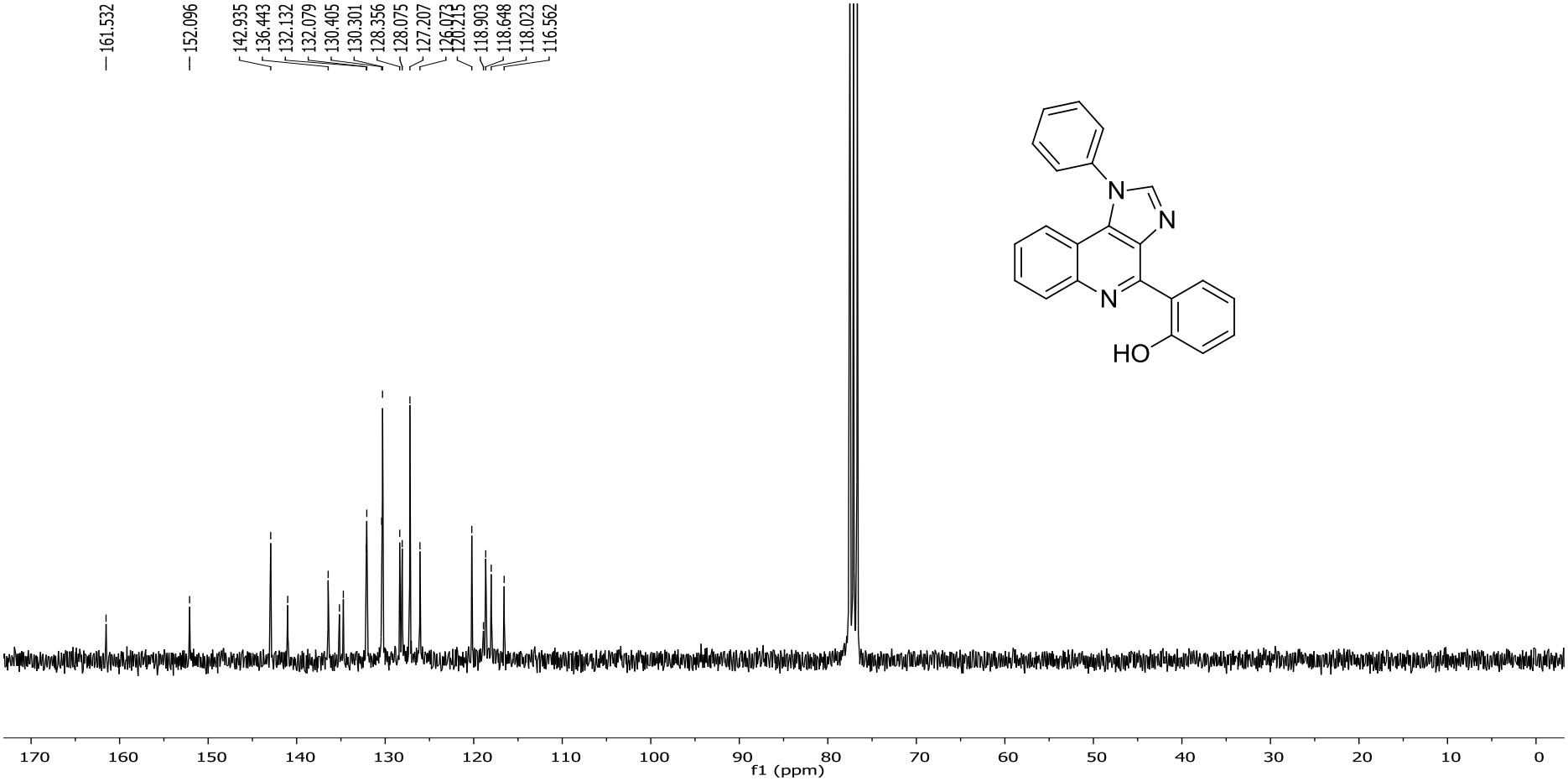
^{13}C NMR (75 MHz, $CDCl_3$): 4-(4-methoxyphenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6d)



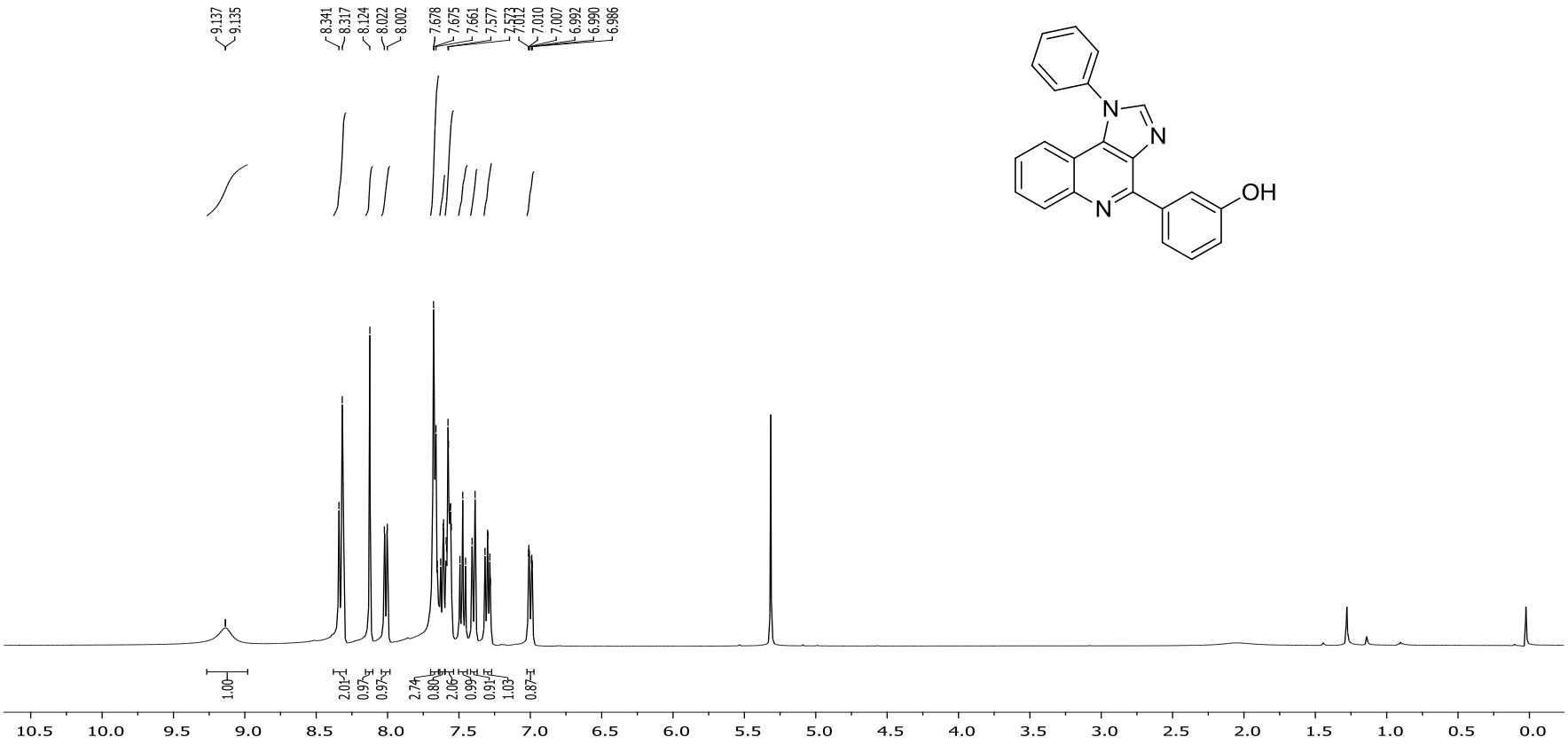
^{1}H NMR (300 MHz, $CDCl_3$): 2-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)phenol (6e)



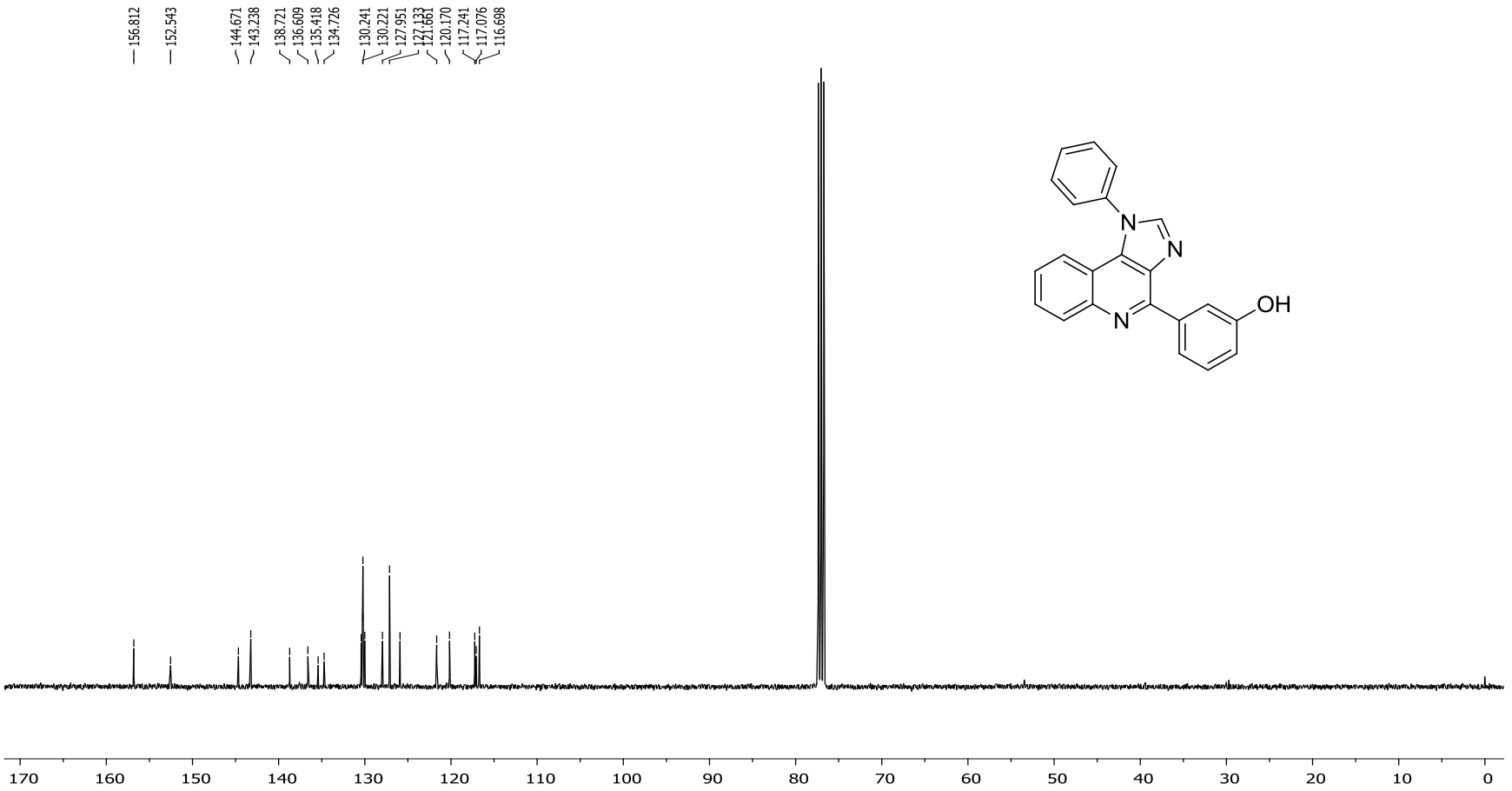
^{13}C NMR(75 MHz, $CDCl_3$): 2-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)phenol (6e)



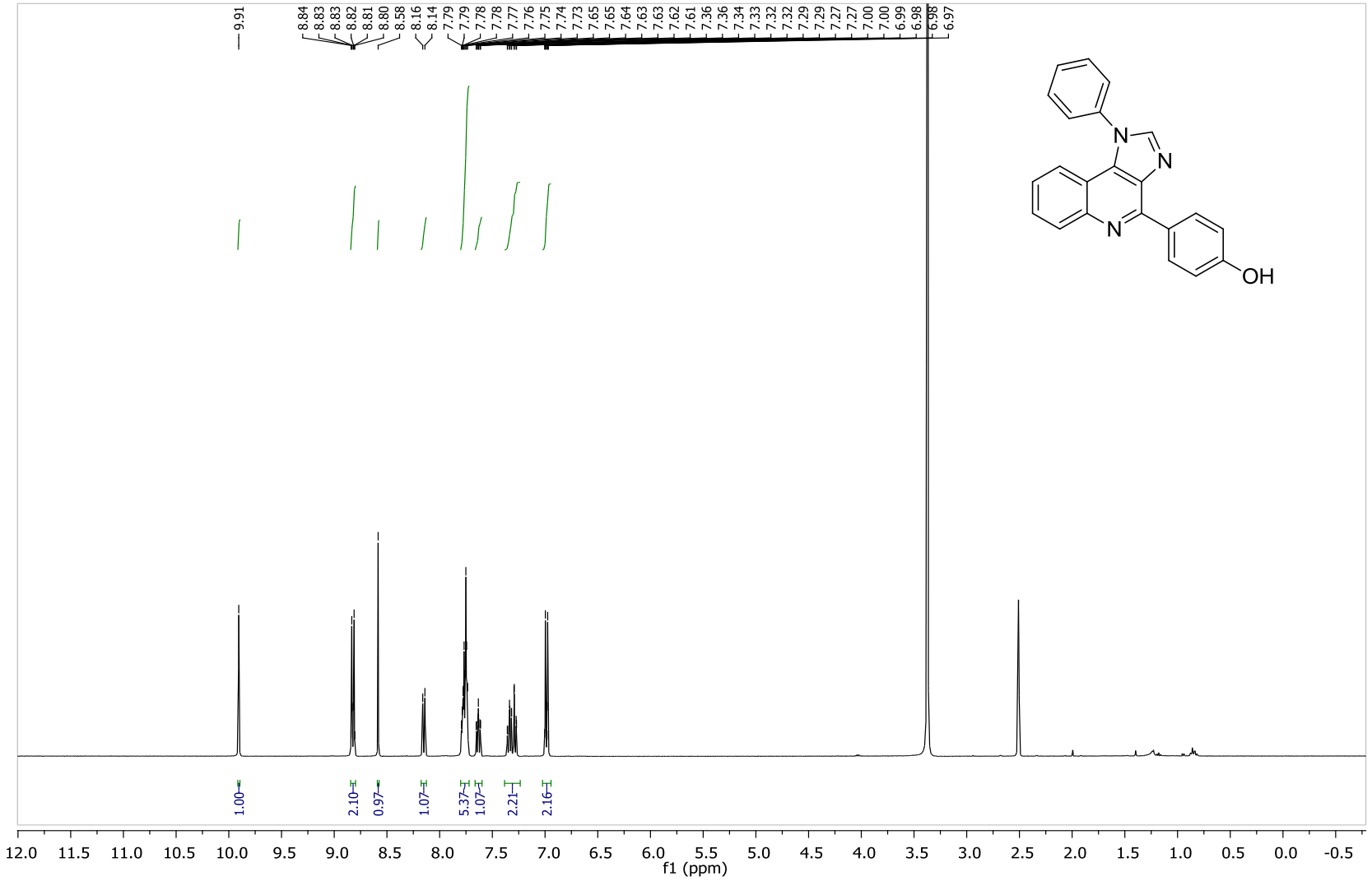
^{1}H NMR (400 MHz, $CDCl_3$): 3-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)phenol (6f)



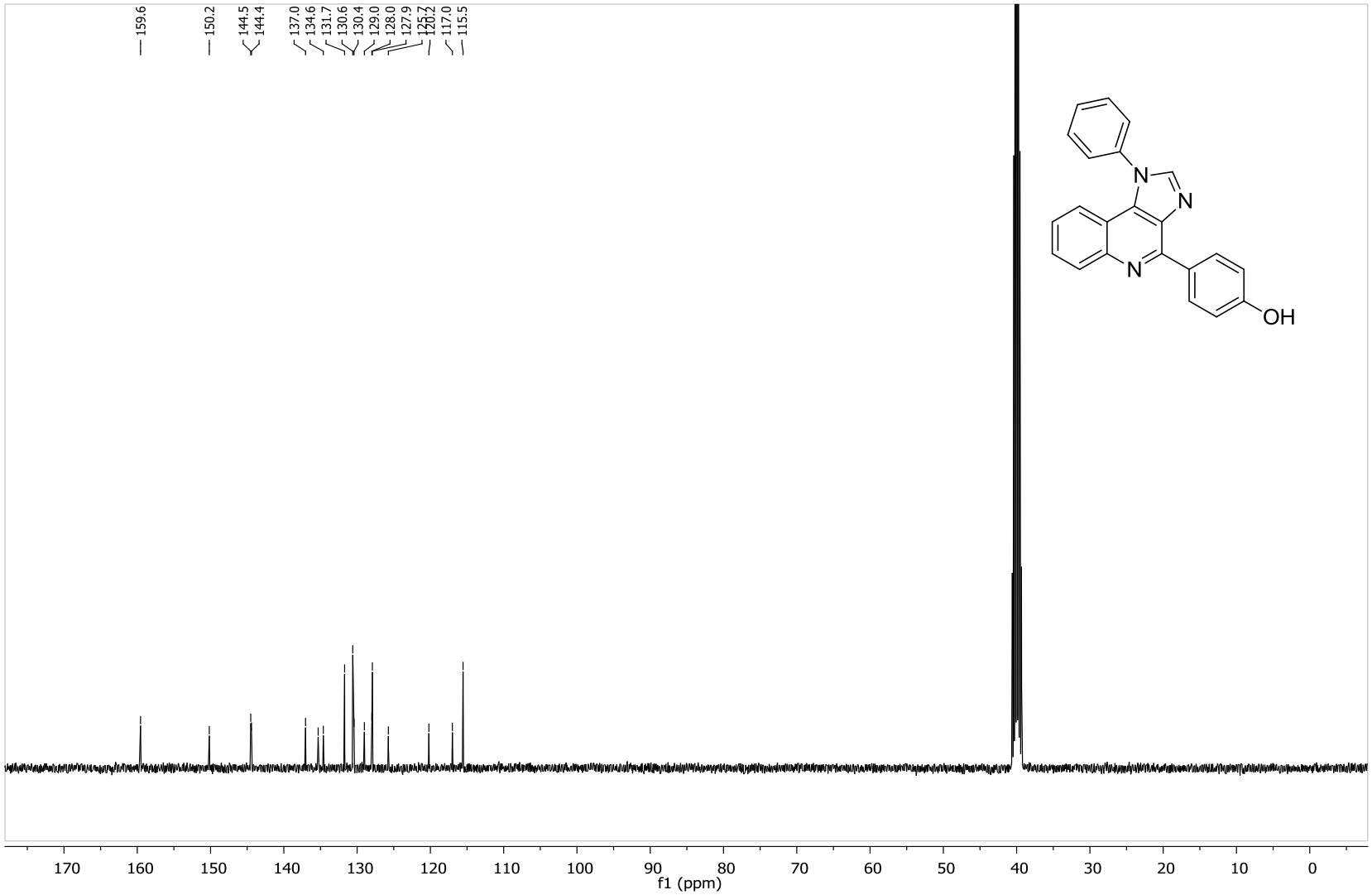
^{13}C NMR(101 MHz, $CDCl_3$): 3-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)phenol (6f)



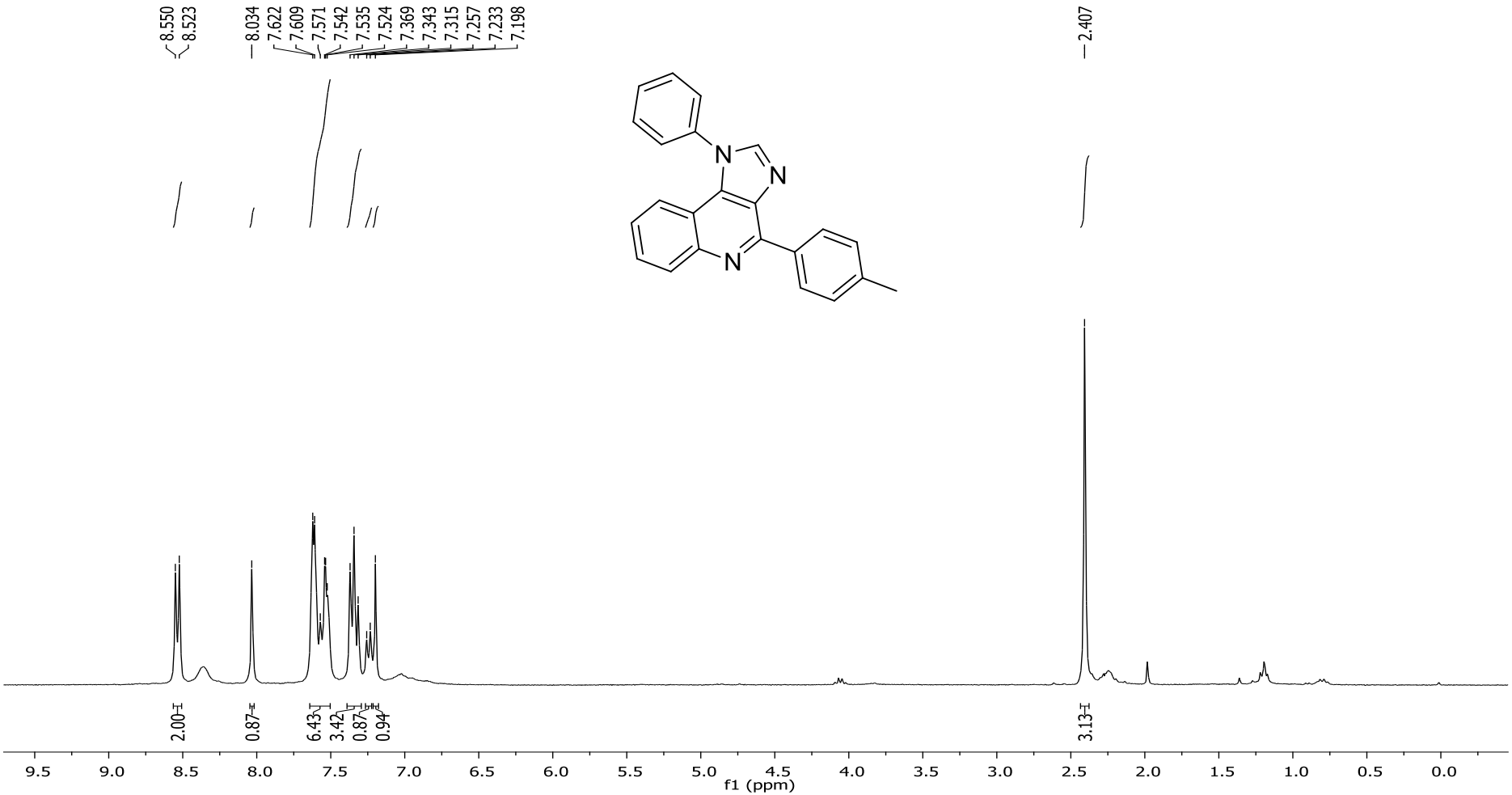
^{1}H NMR (400 MHz, DMSO-d_6): 4-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)phenol (6g)



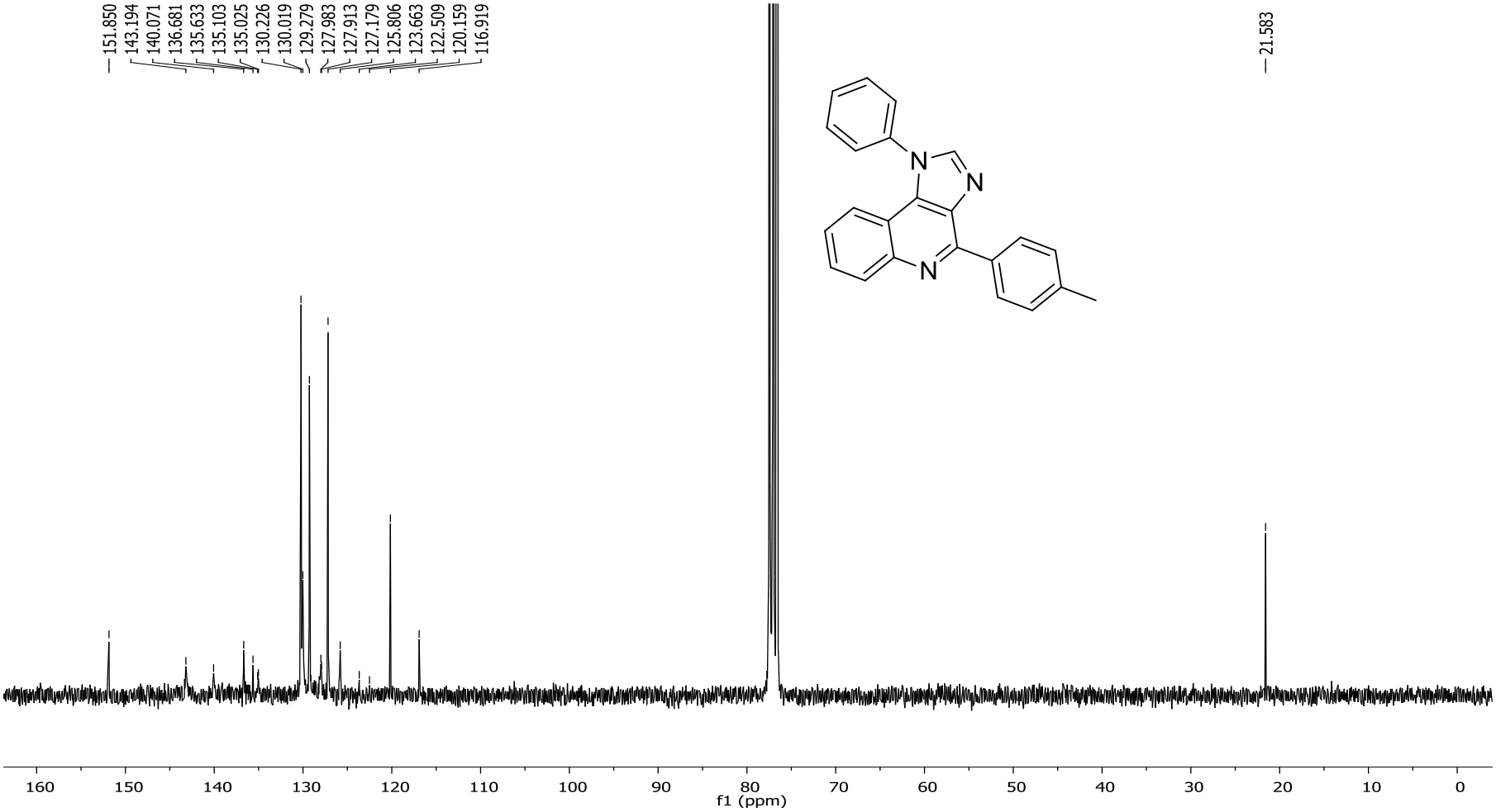
^{13}C NMR(101 MHz, $CDCl_3$): 4-(1-phenyl-1H-imidazo[4,5-c]quinolin-4-yl)phenol (6g)



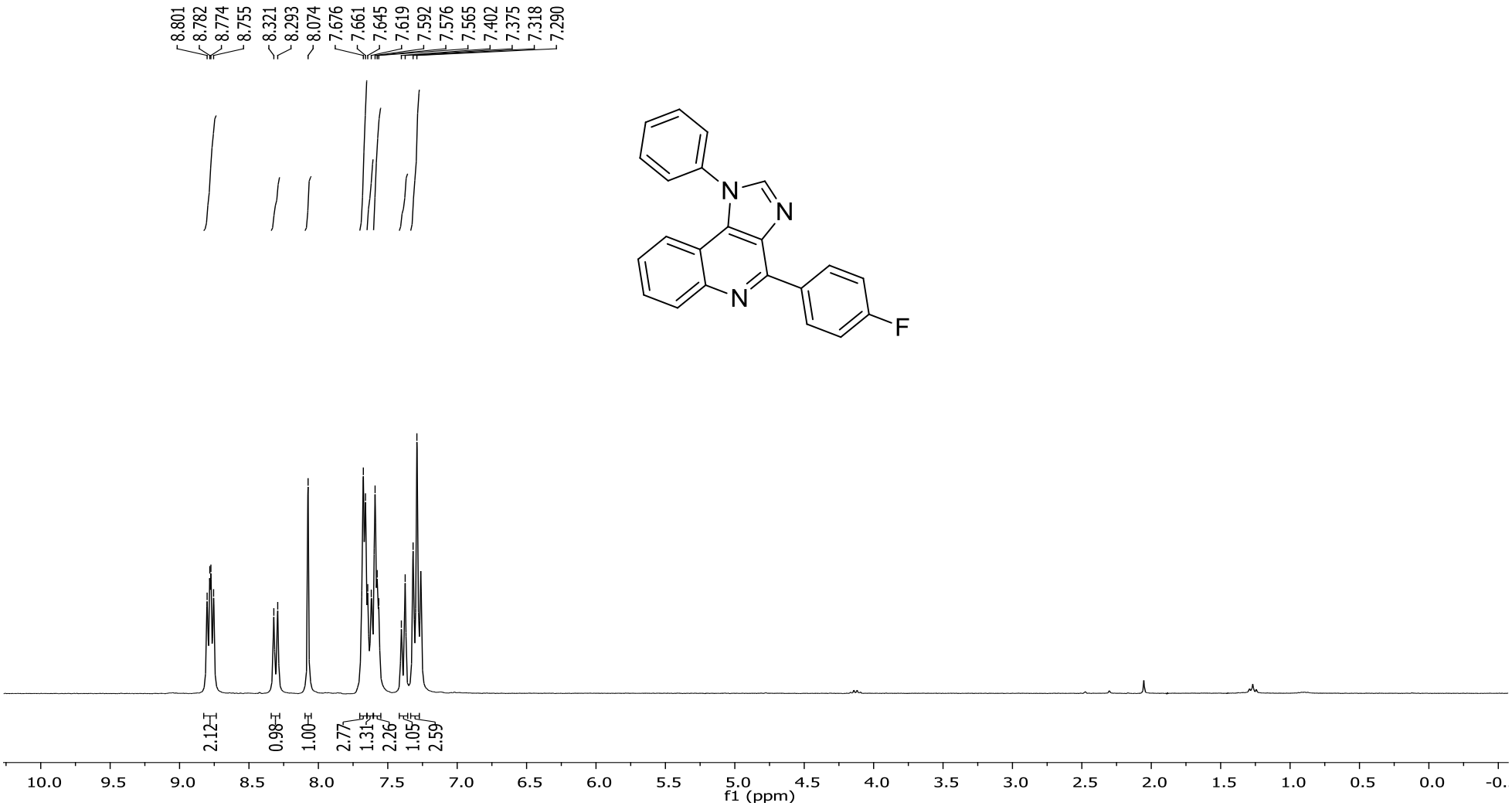
^{1}H NMR (300 MHz, $CDCl_3$): 1-phenyl-4-p-tolyl-1H-imidazo[4,5-c]quinoline (6h)



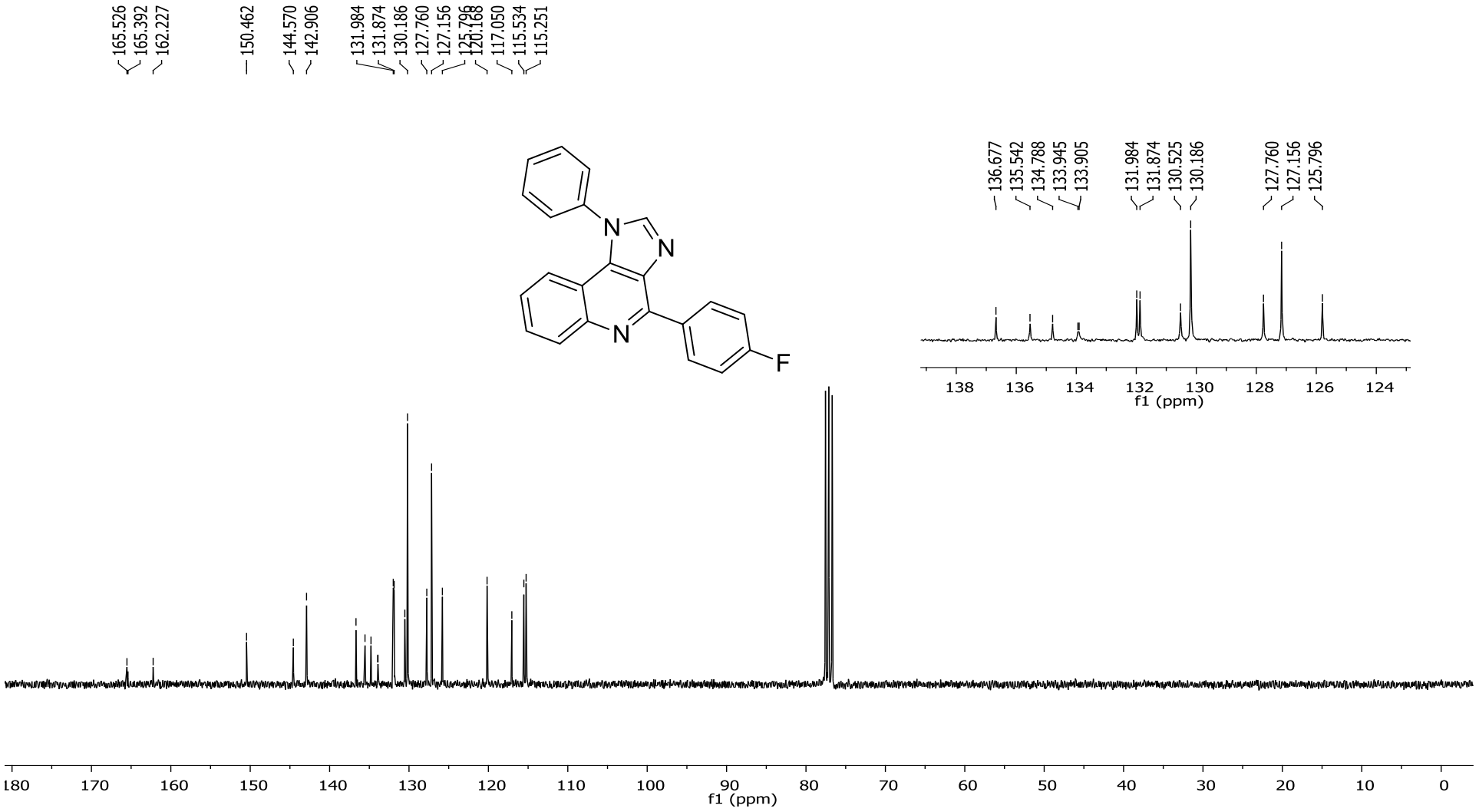
^{13}C NMR(75 MHz, $CDCl_3$): 1-phenyl-4-p-tolyl-1H-imidazo[4,5-c]quinoline (6h)



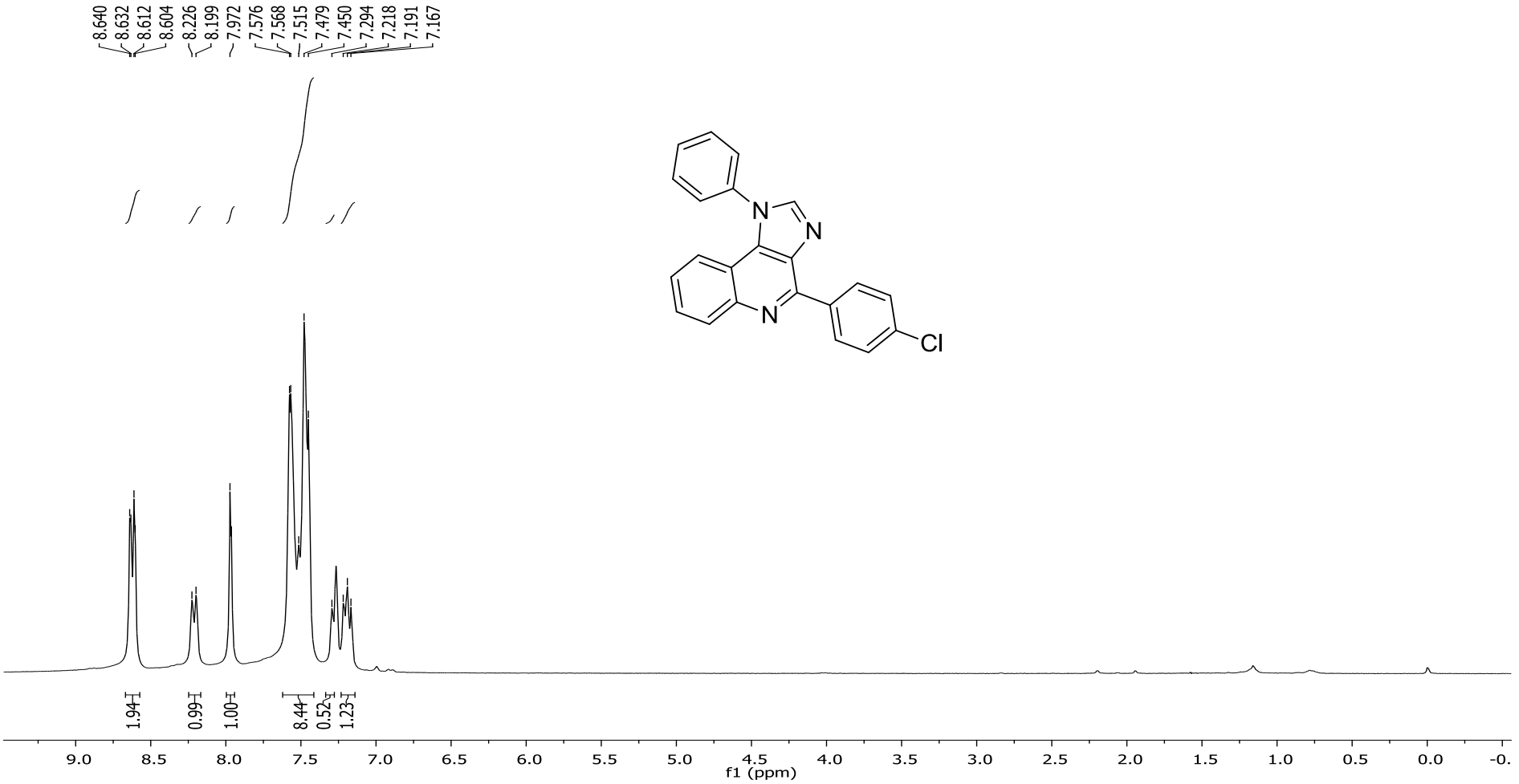
^{1}H NMR (300 MHz, $CDCl_3$): 4-(4-fluorophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6i)



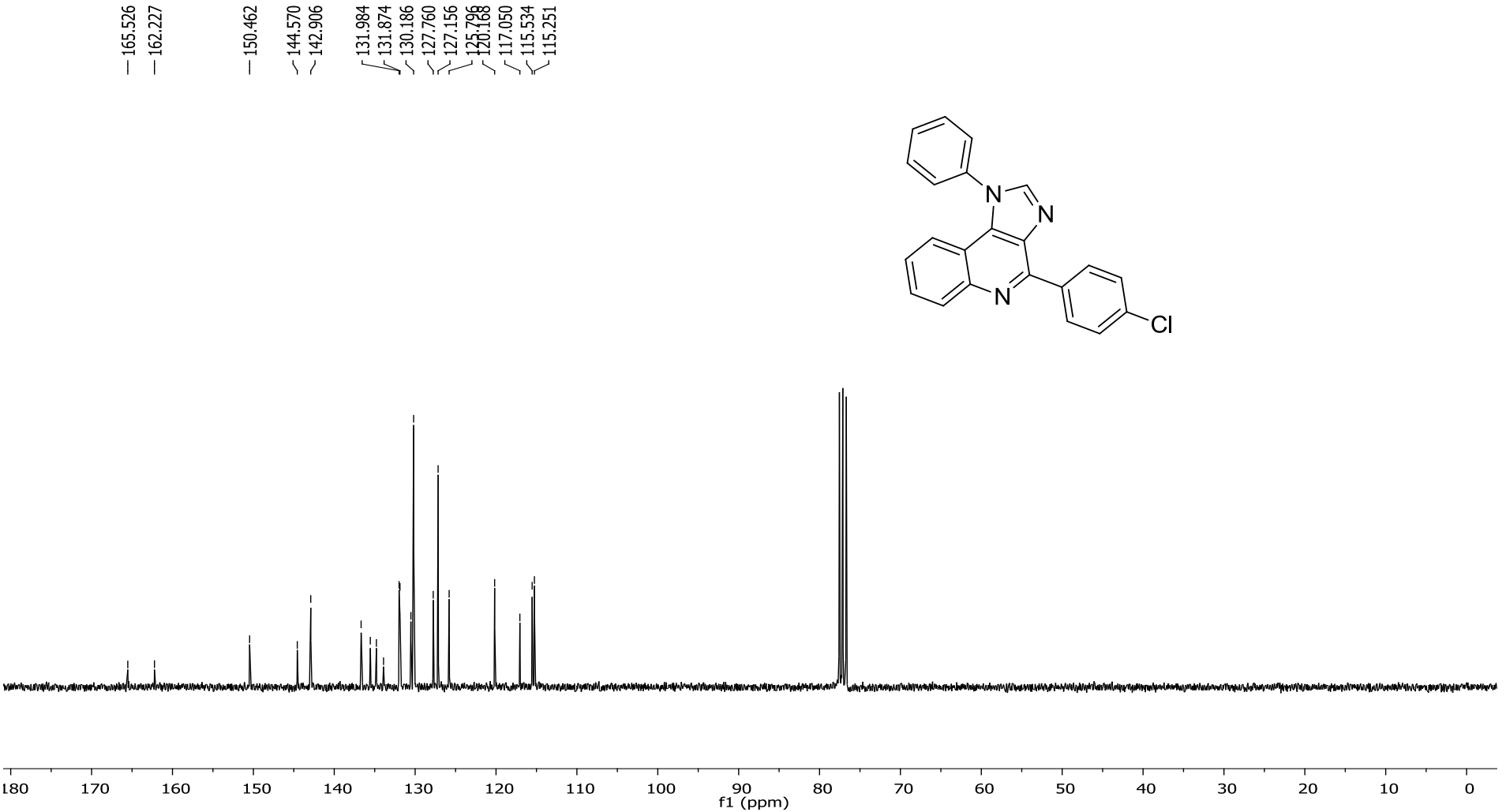
^{13}C NMR (75 MHz, $CDCl_3$): 4-(4-fluorophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6i)



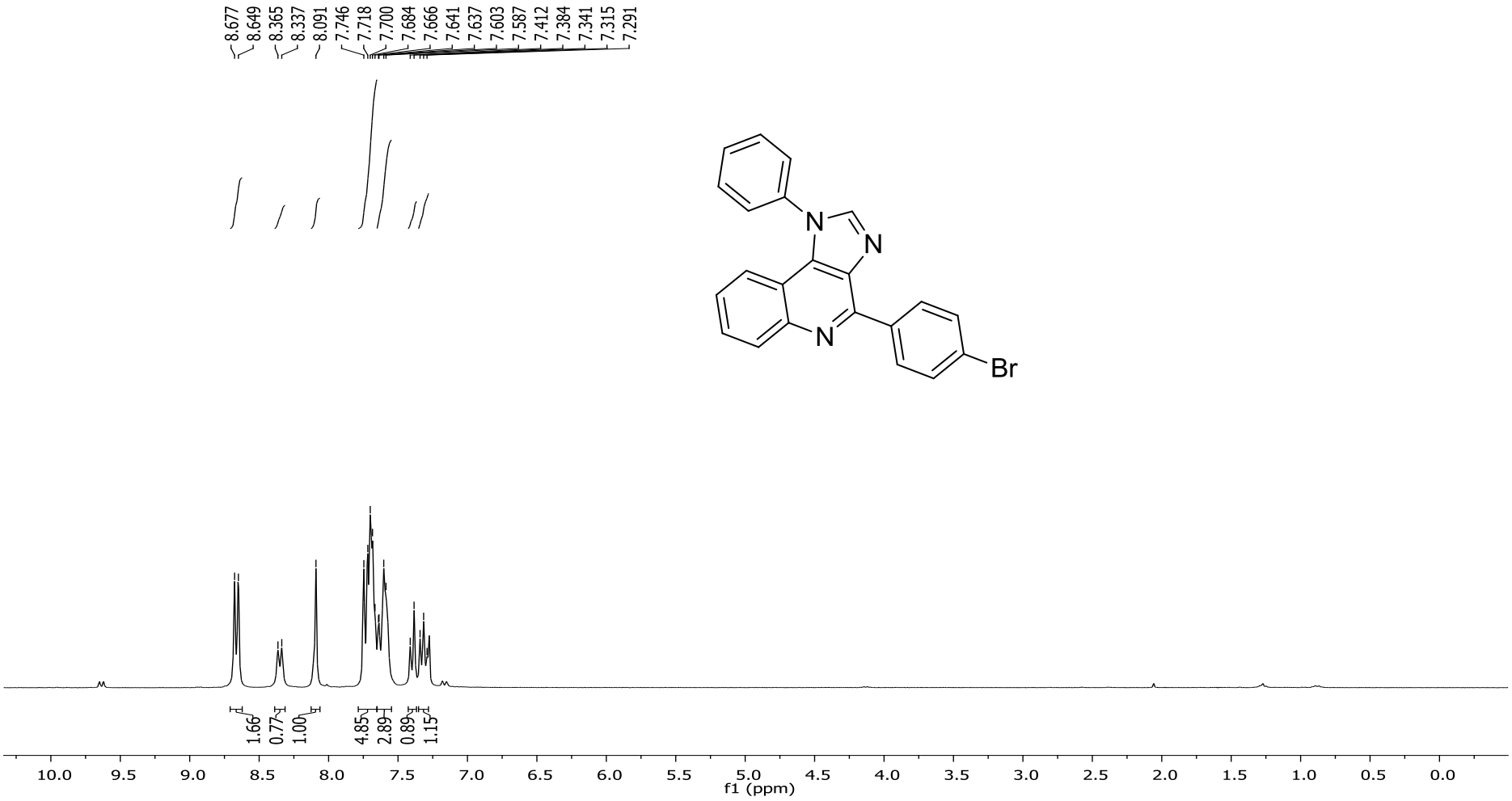
^{1}H NMR (300 MHz, $CDCl_3$): 4-(4-chlorophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6j)



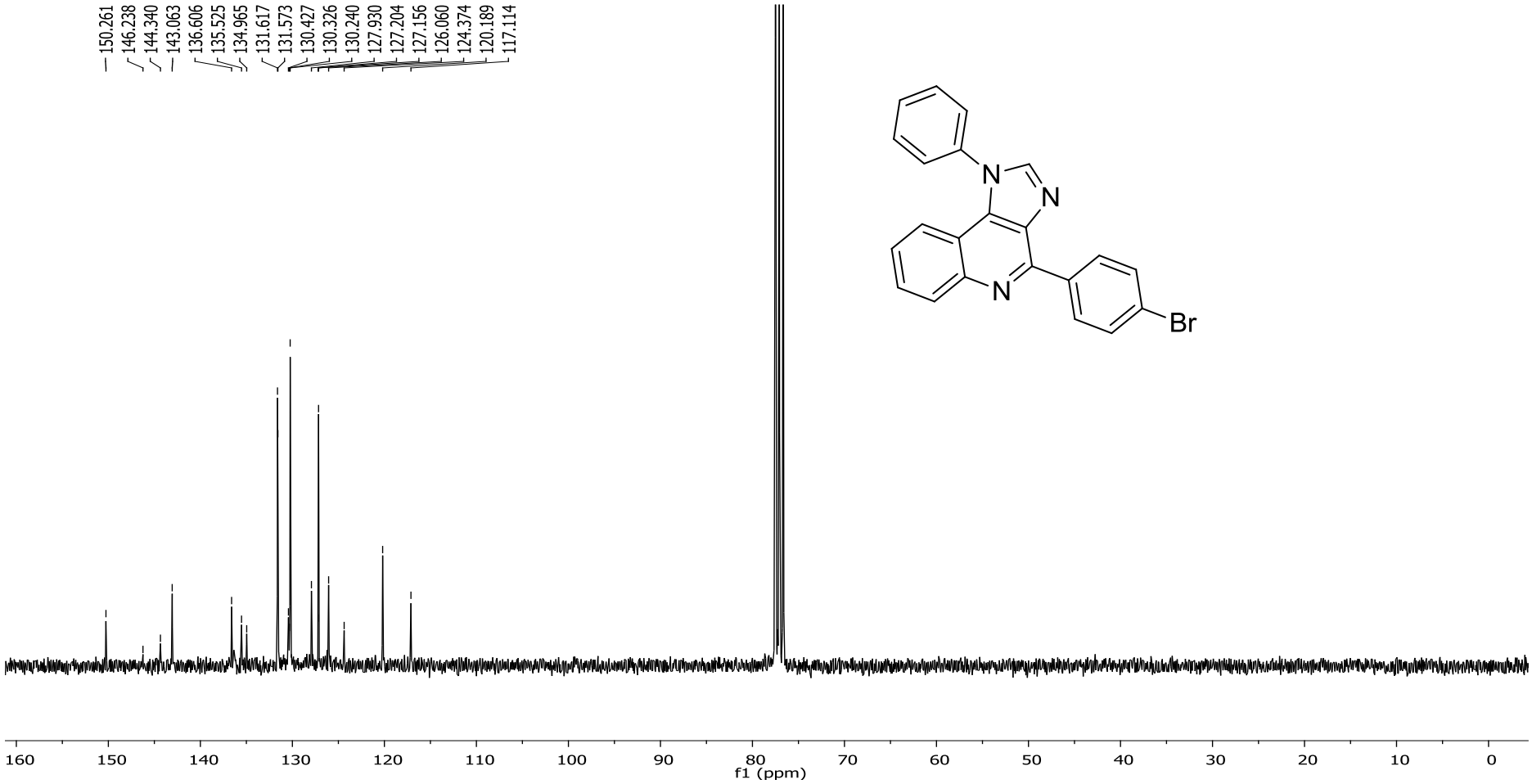
^{13}C NMR (75 MHz, $CDCl_3$): 4-(4-chlorophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6j)



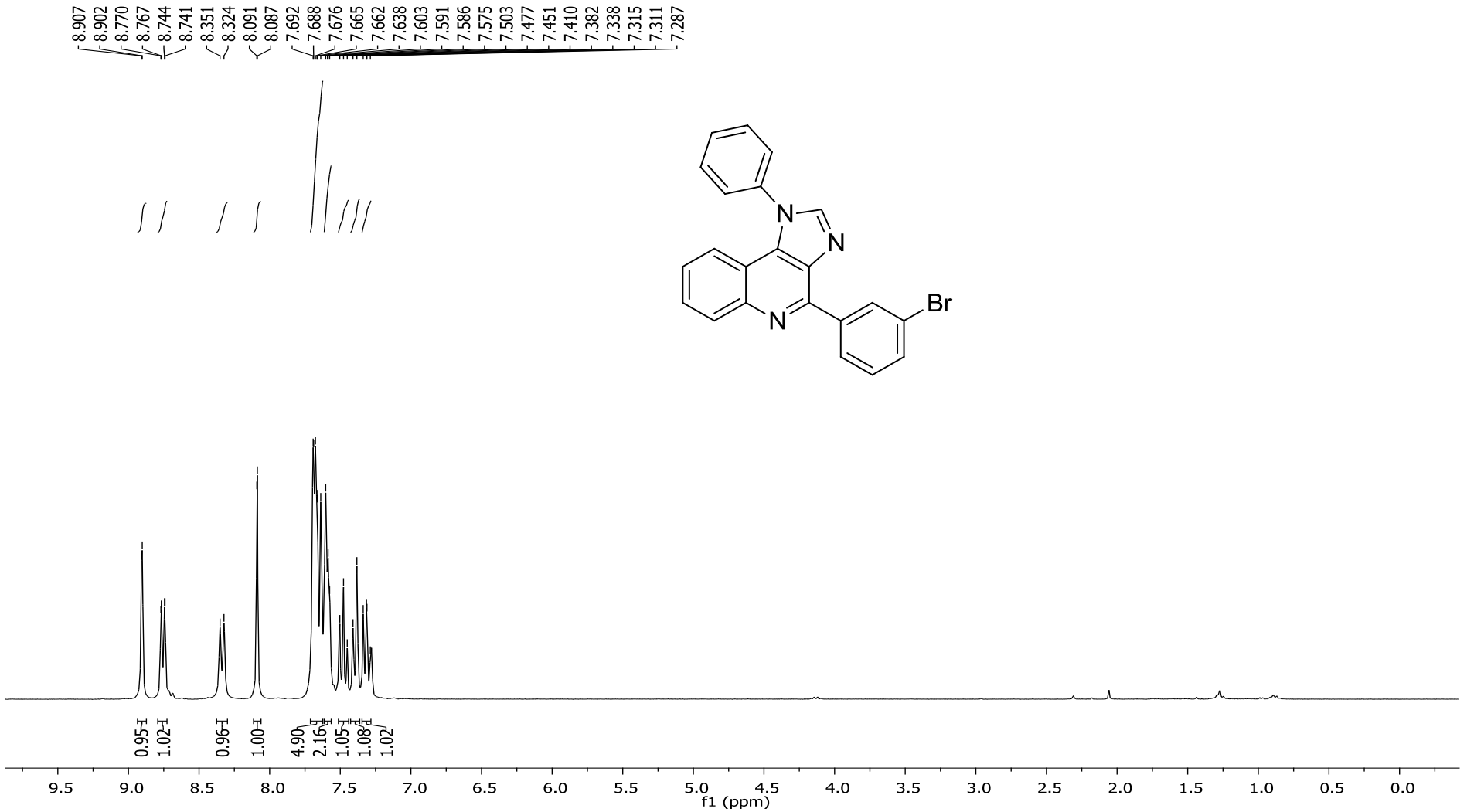
^{1}H NMR (300 MHz, $CDCl_3$): 4-(4-bromophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6k)



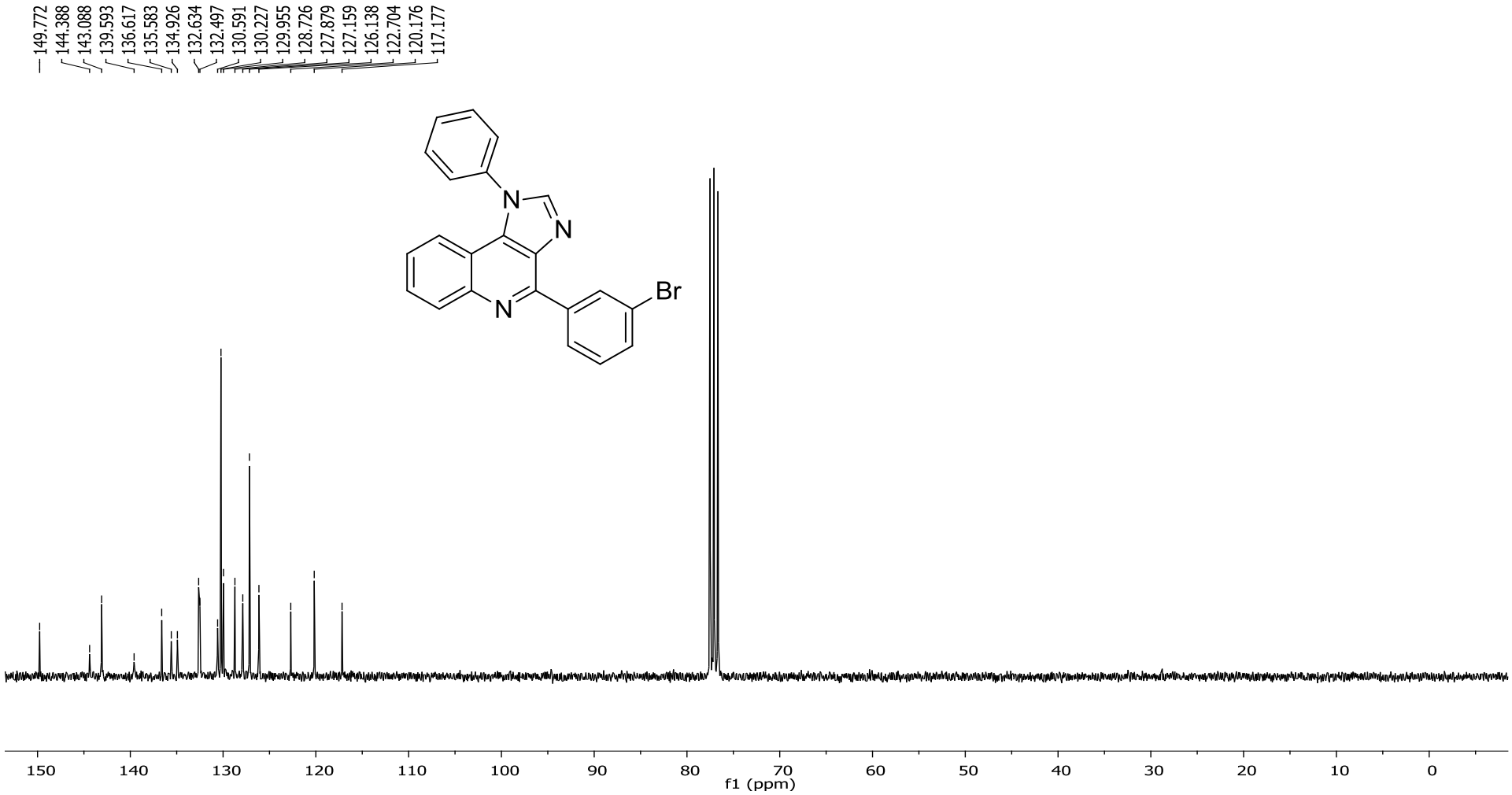
^{13}C-NMR(75 MHz, $CDCl_3$): 4-(4-bromophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6k)



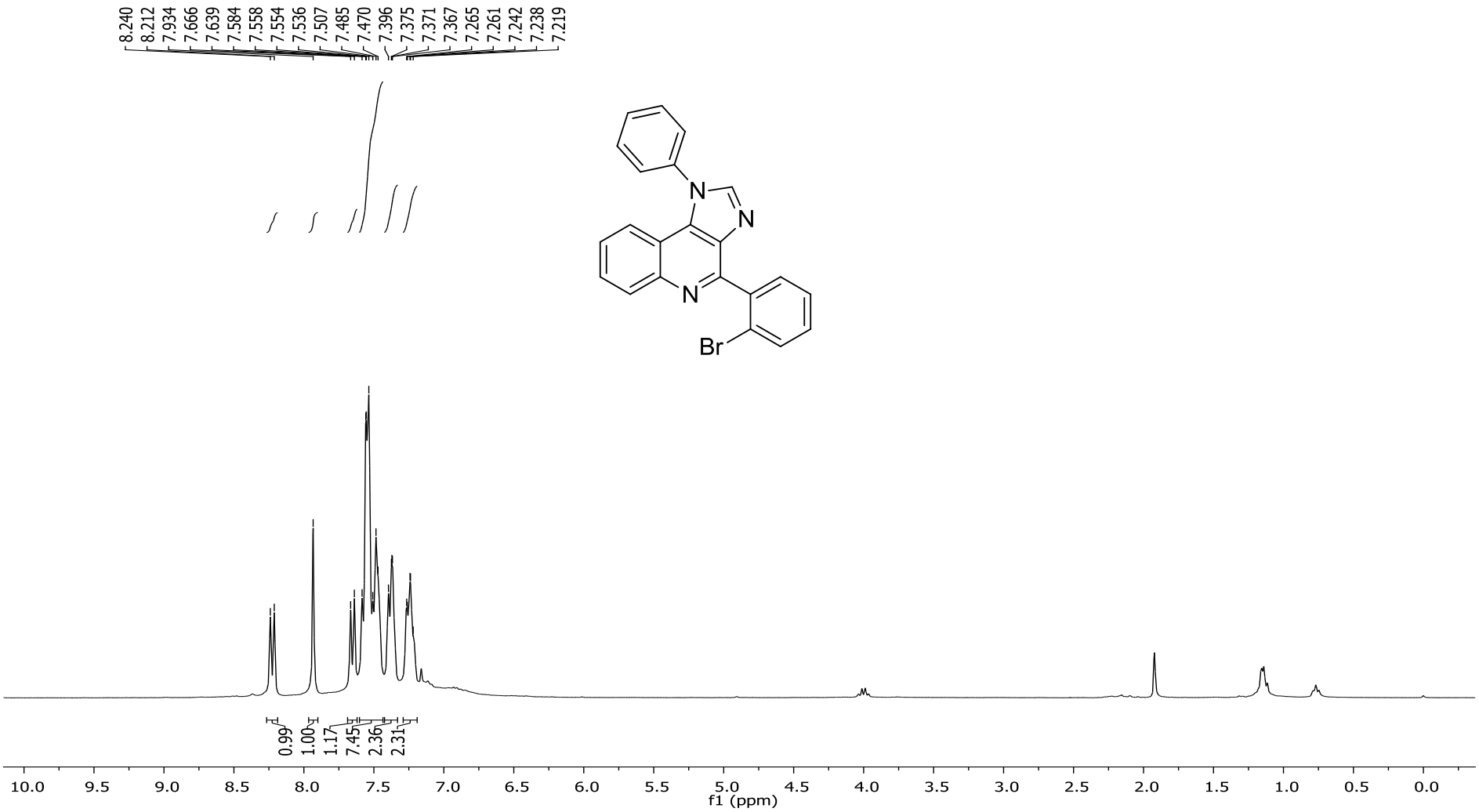
^{1}H NMR (300 MHz, $CDCl_3$): 4-(3-bromophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6l)



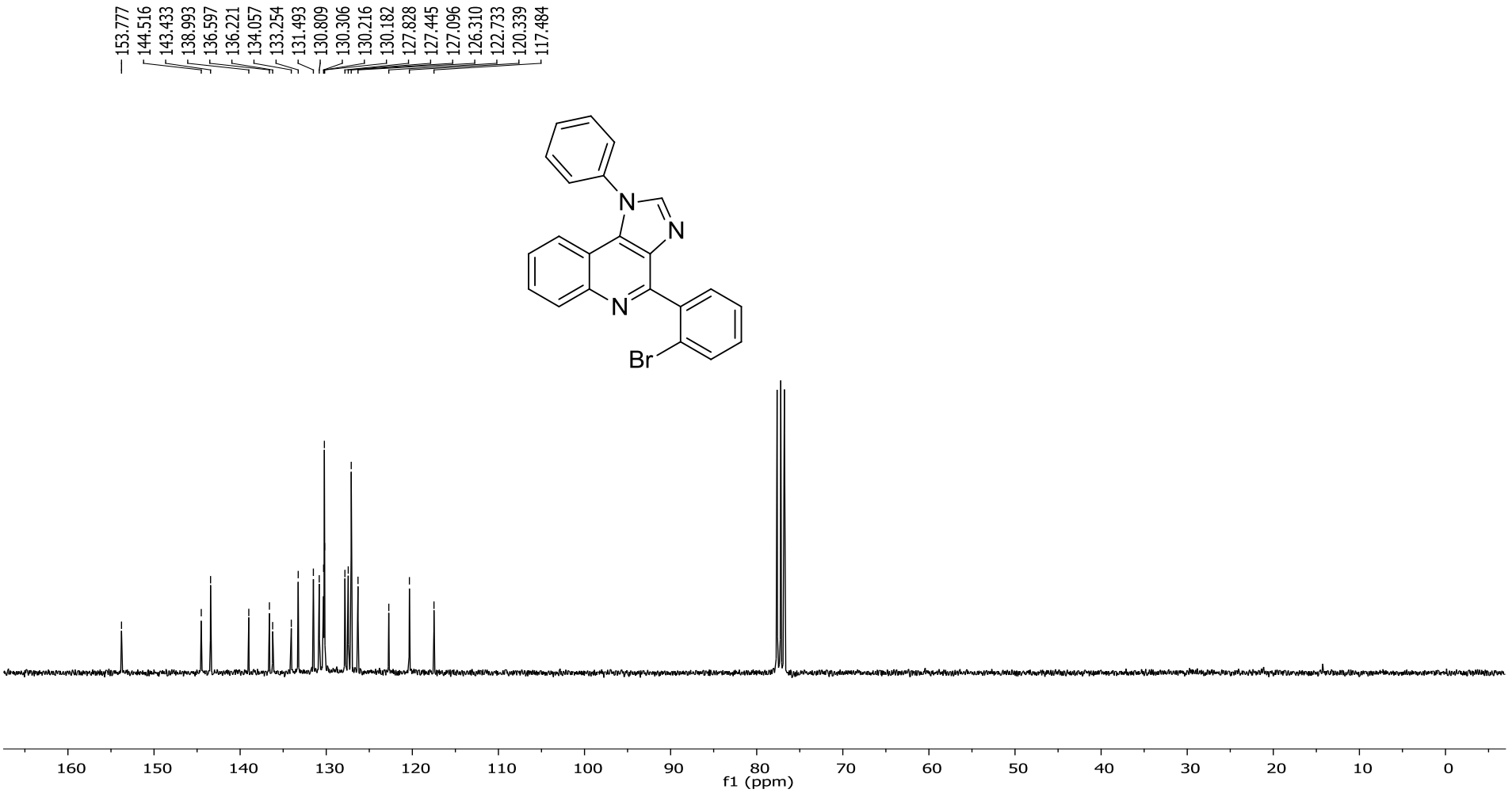
^{13}C NMR(75 MHz, $CDCl_3$): 4-(3-bromophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6l)



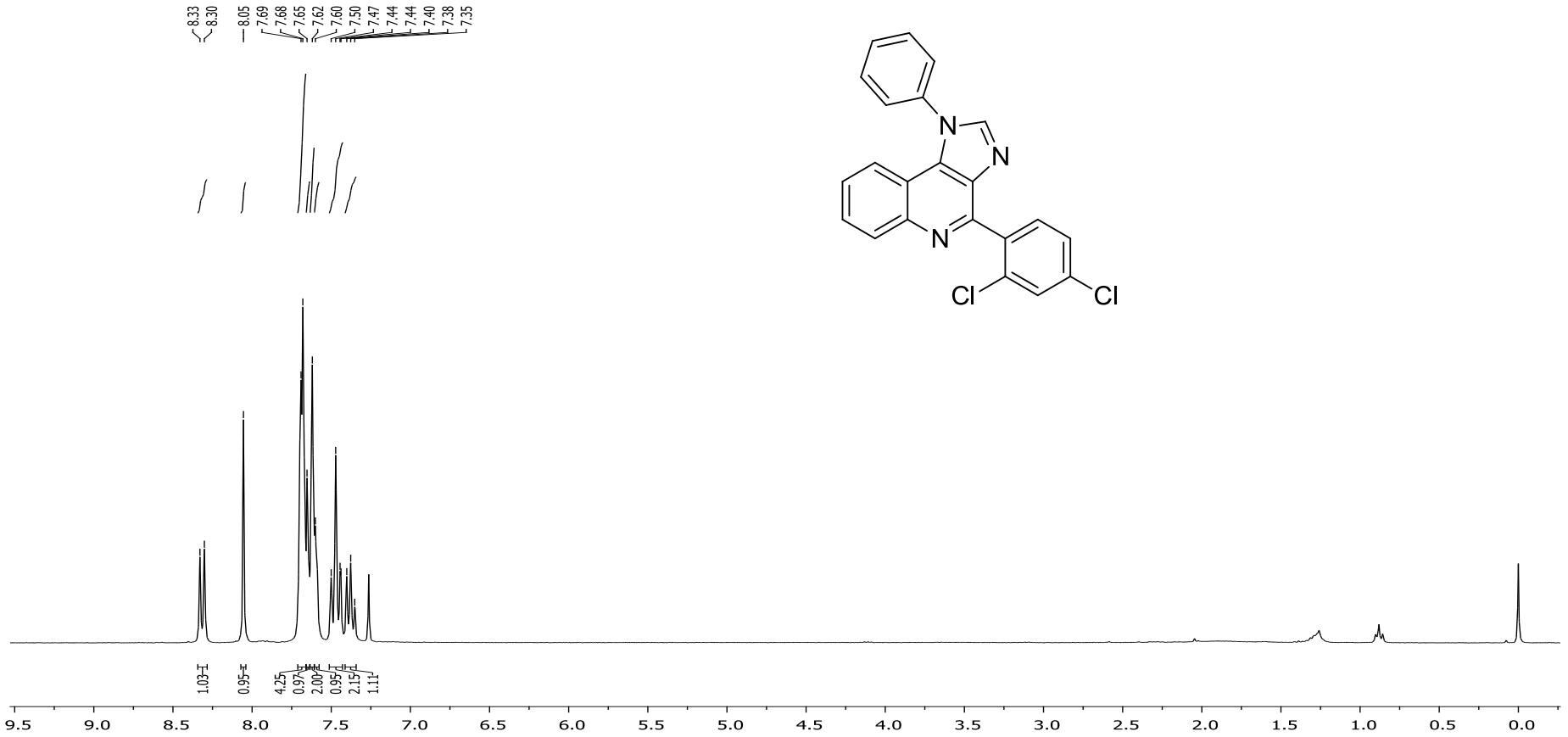
^{1}H NMR (300 MHz, $CDCl_3$): 4-(2-bromophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6m)



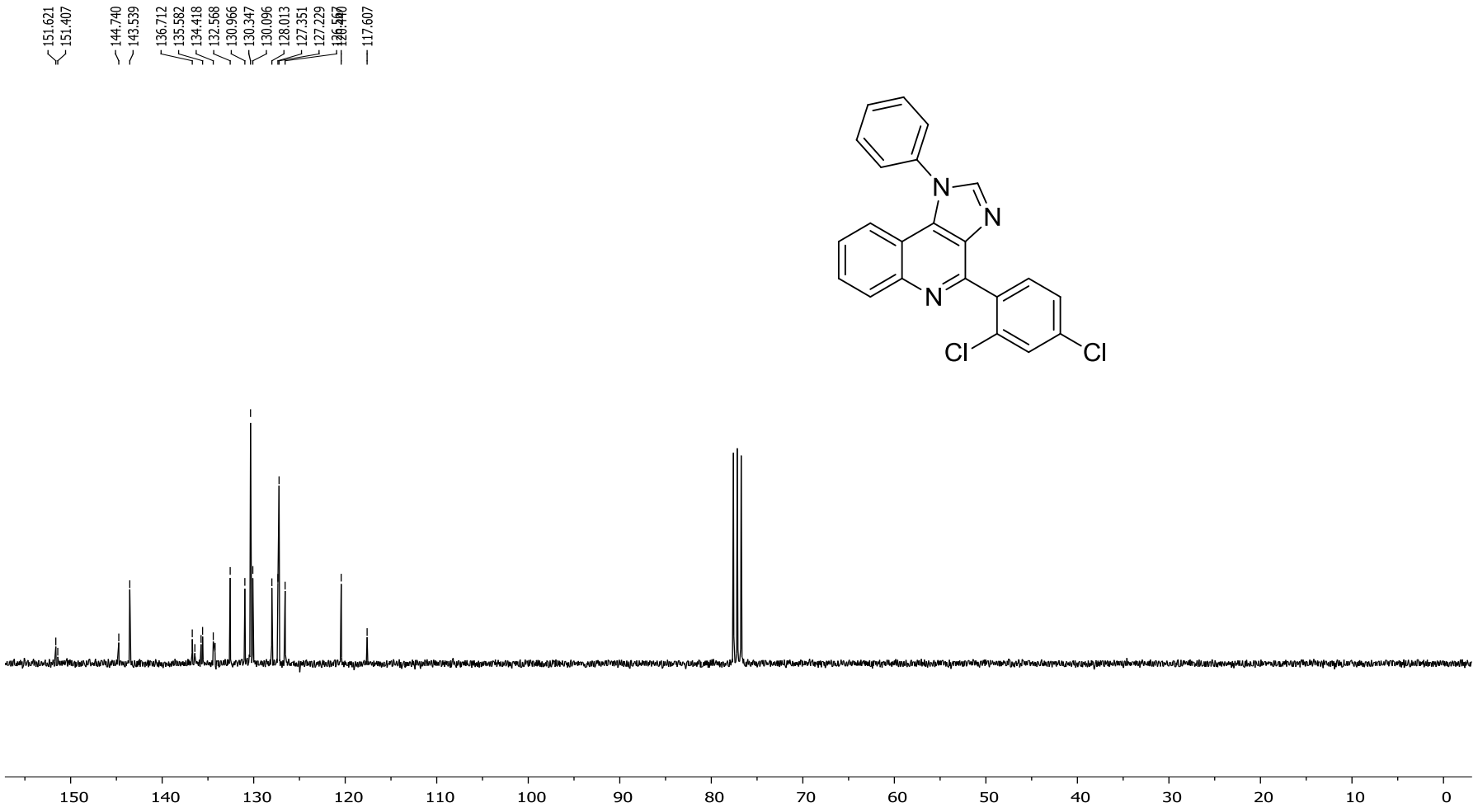
^{13}C NMR(75 MHz, $CDCl_3$): 4-(2-bromophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6m)



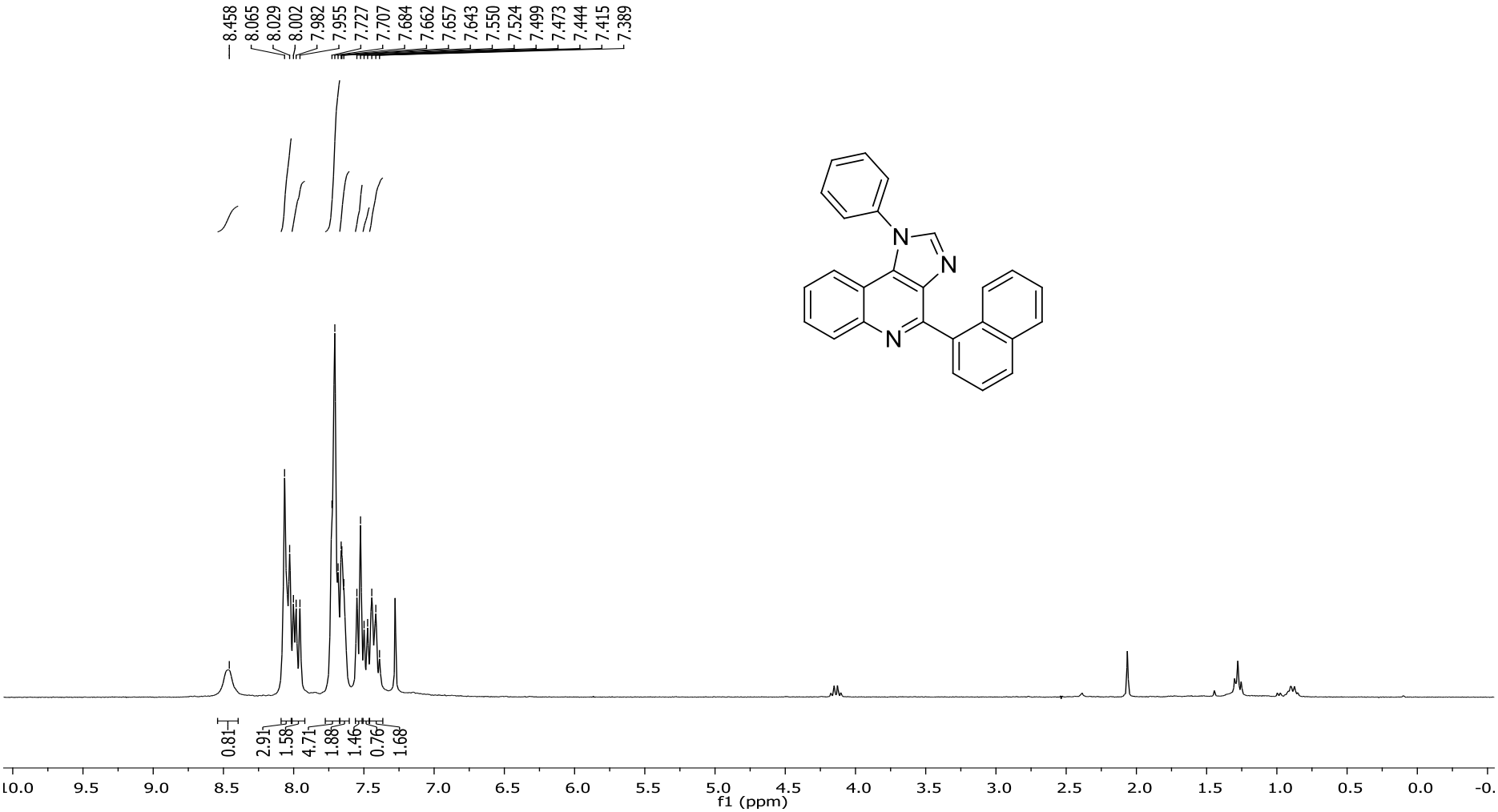
^{1}H NMR(300 MHz, $CDCl_3$): 4-(2,4-dichlorophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6n)



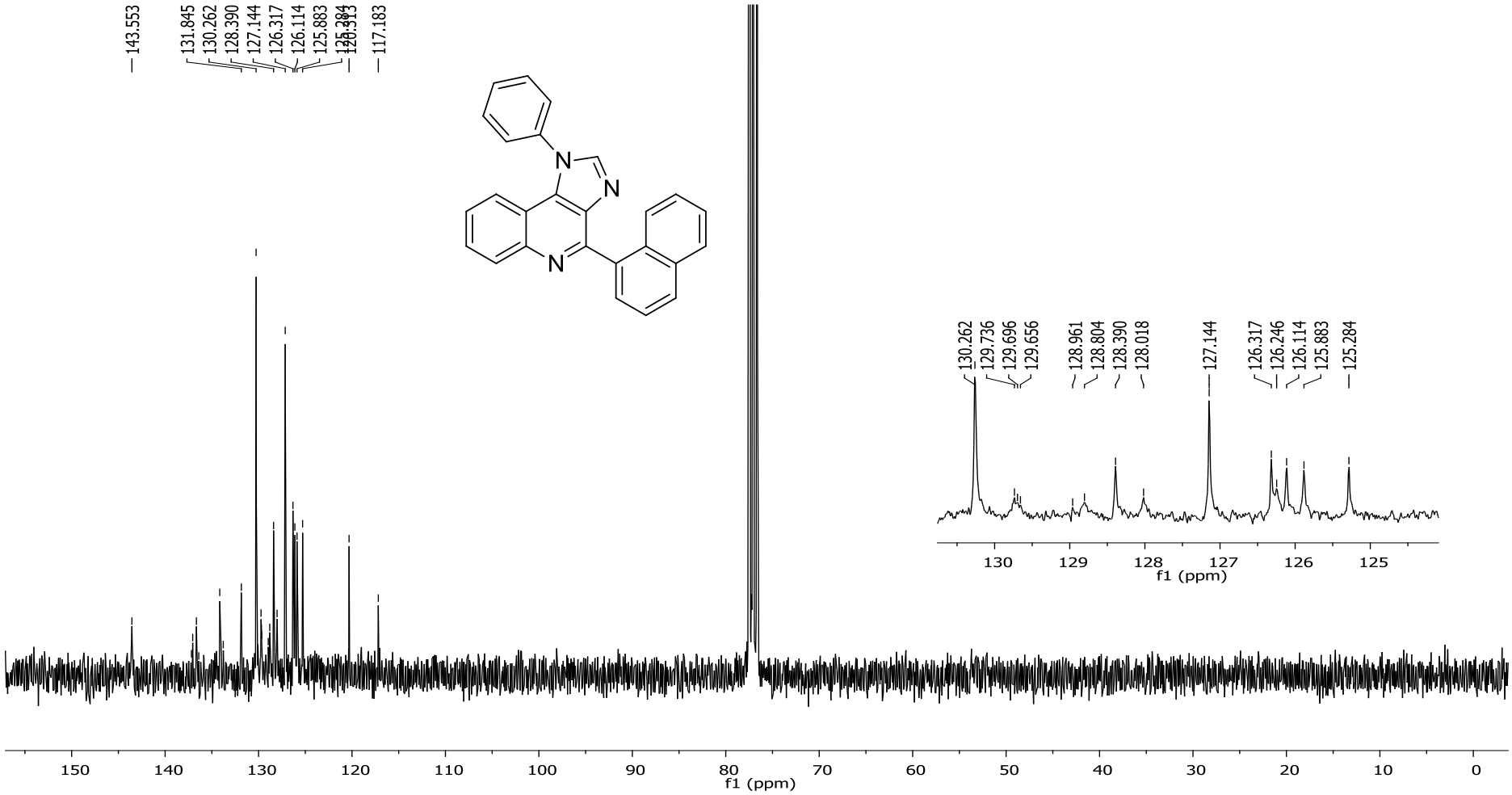
^{13}C NMR(75 MHz, $CDCl_3$): 4-(2,4-dichlorophenyl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6n)



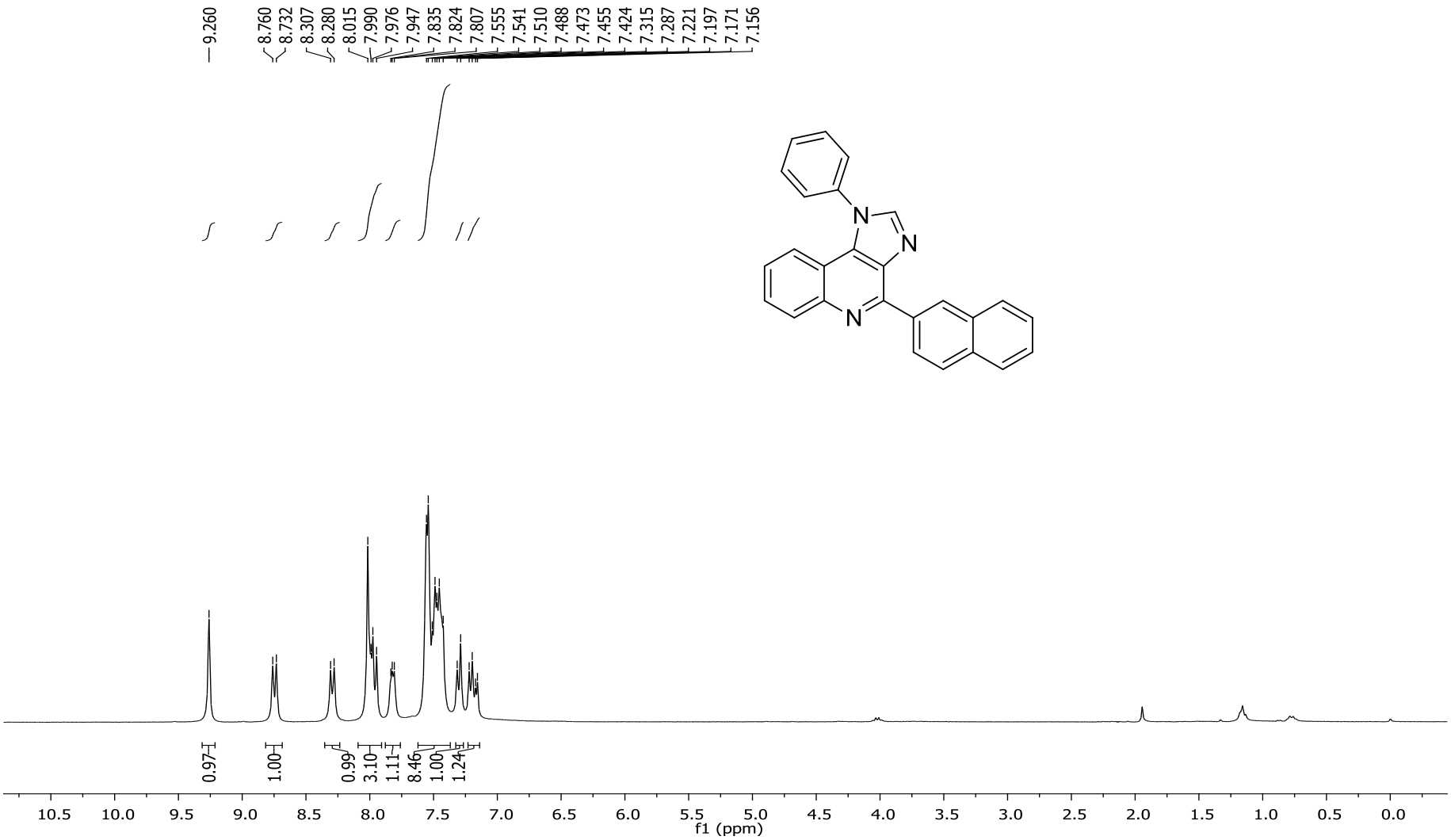
^{1}H NMR (300 MHz, $CDCl_3$): 4-(naphthalen-1-yl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6o)



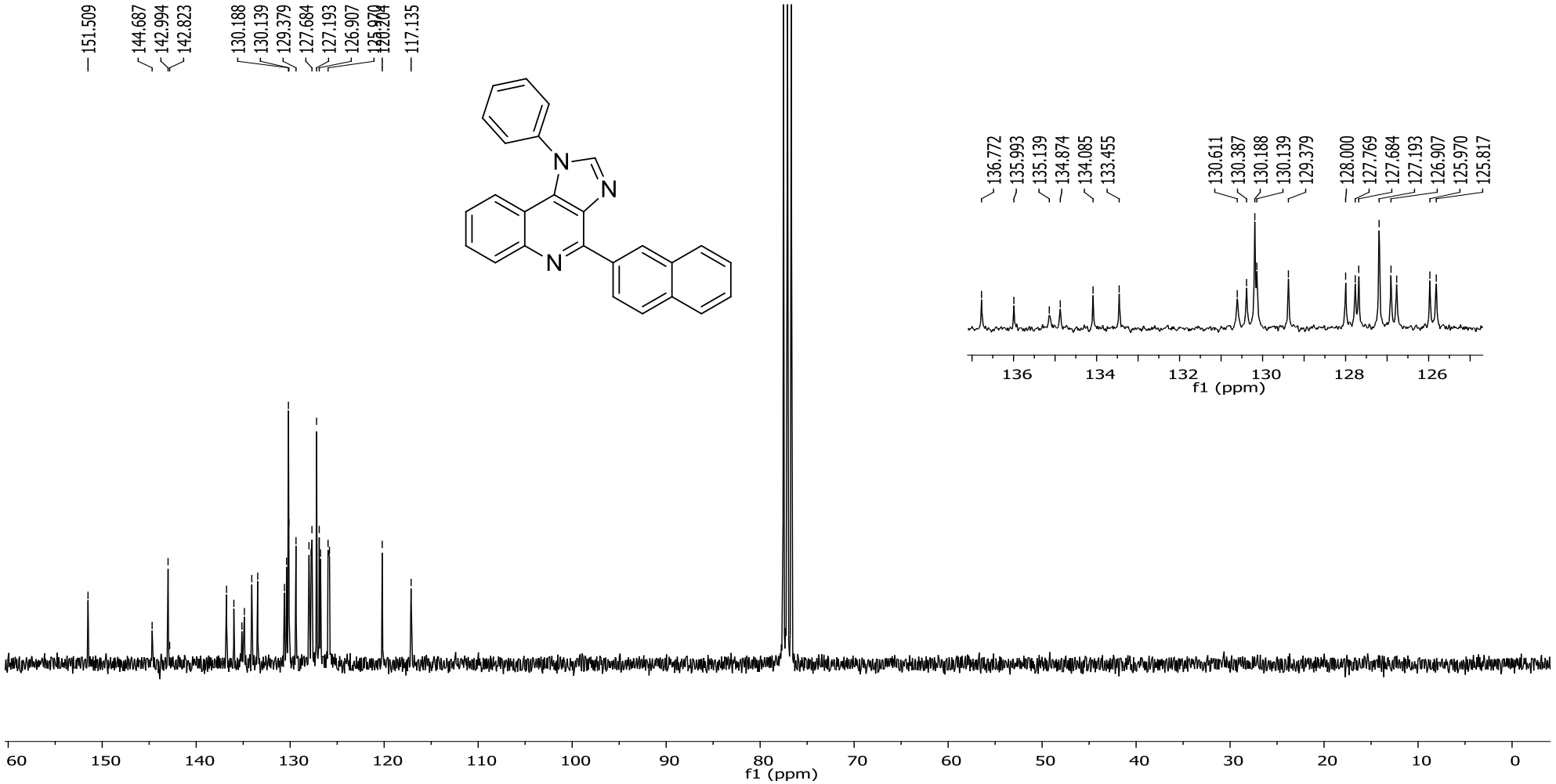
^{13}C NMR(75 MHz, $CDCl_3$): 4-(naphthalen-1-yl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6o)



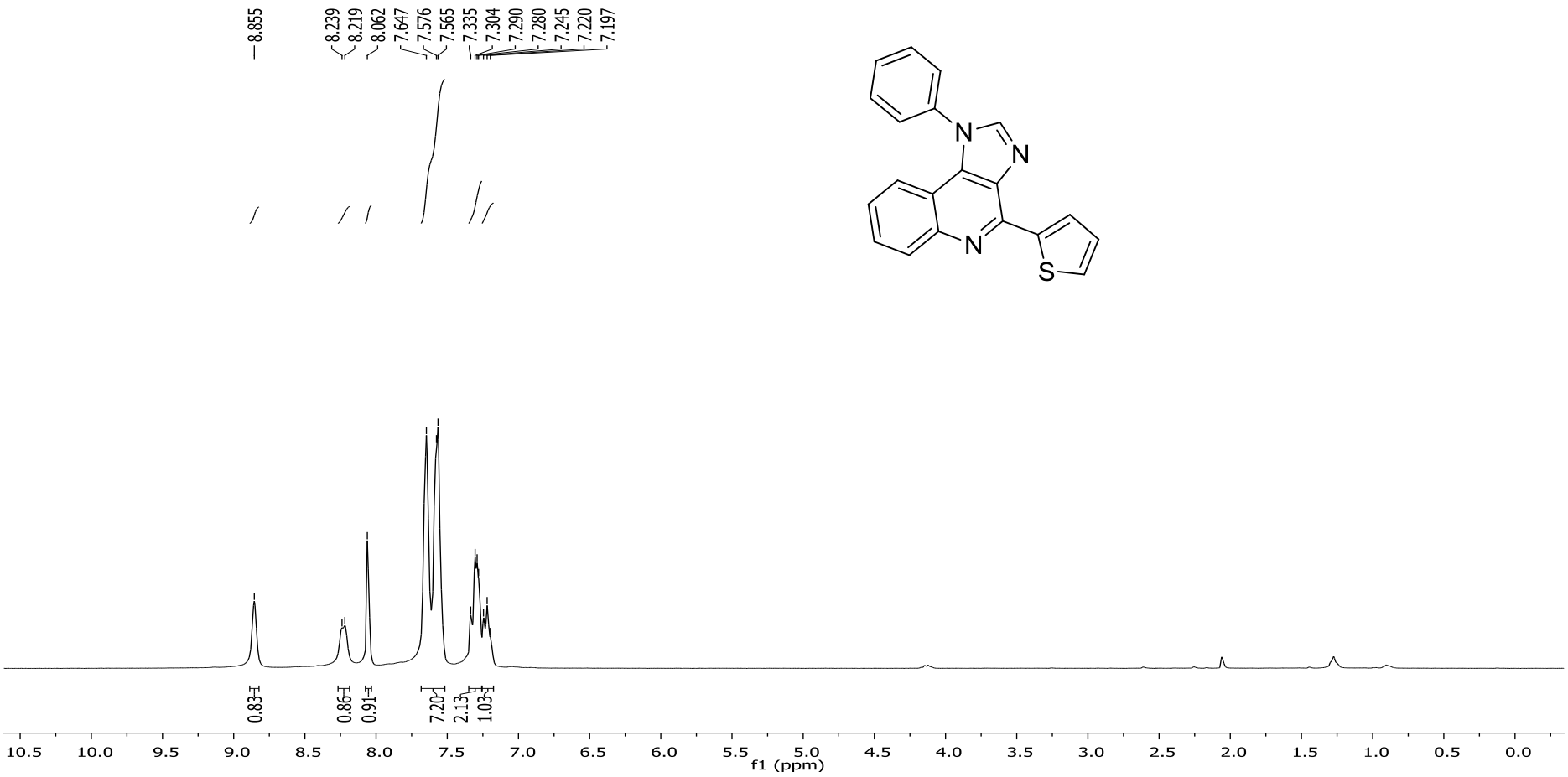
^{1}H NMR (300 MHz, $CDCl_3$): 4-(naphthalen-2-yl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6p)



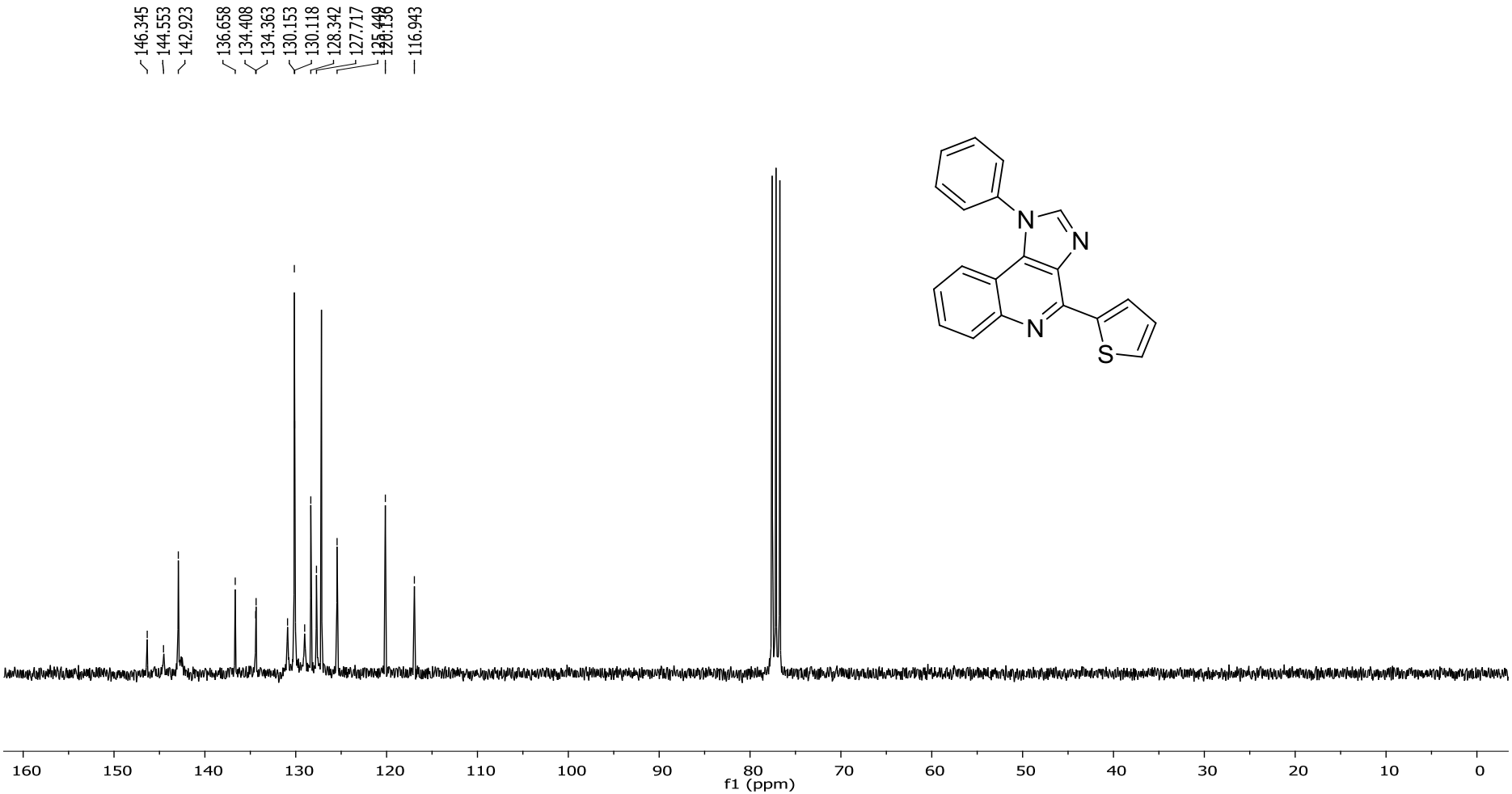
^{13}C NMR(75 MHz, $CDCl_3$): 4-(naphthalen-2-yl)-1-phenyl-1H-imidazo[4,5-c]quinoline (6p)



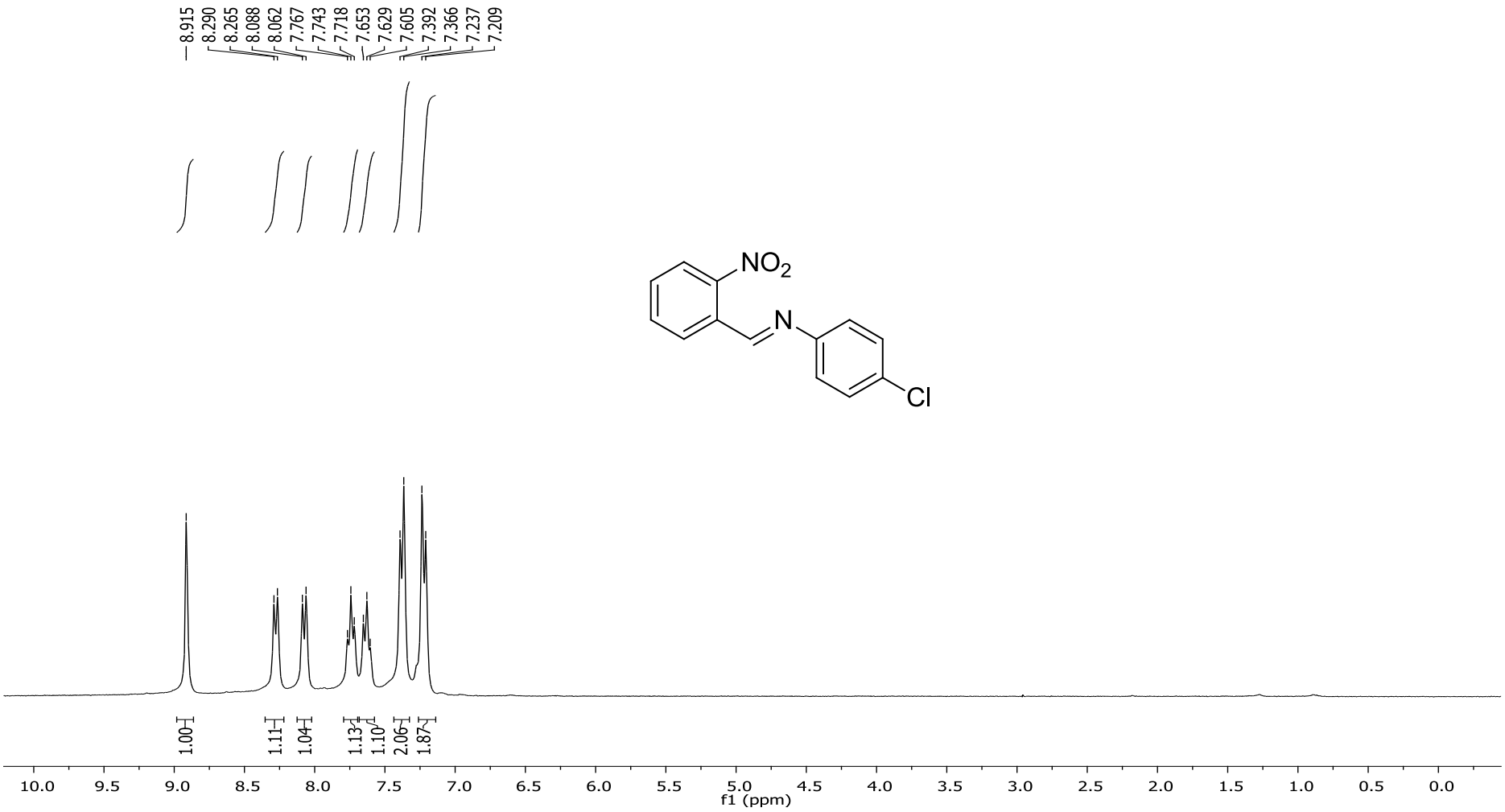
^{1}H NMR (300 MHz, $CDCl_3$): 1-phenyl-4-(thiophen-2-yl)-1H-imidazo[4,5-c]quinoline (6q)



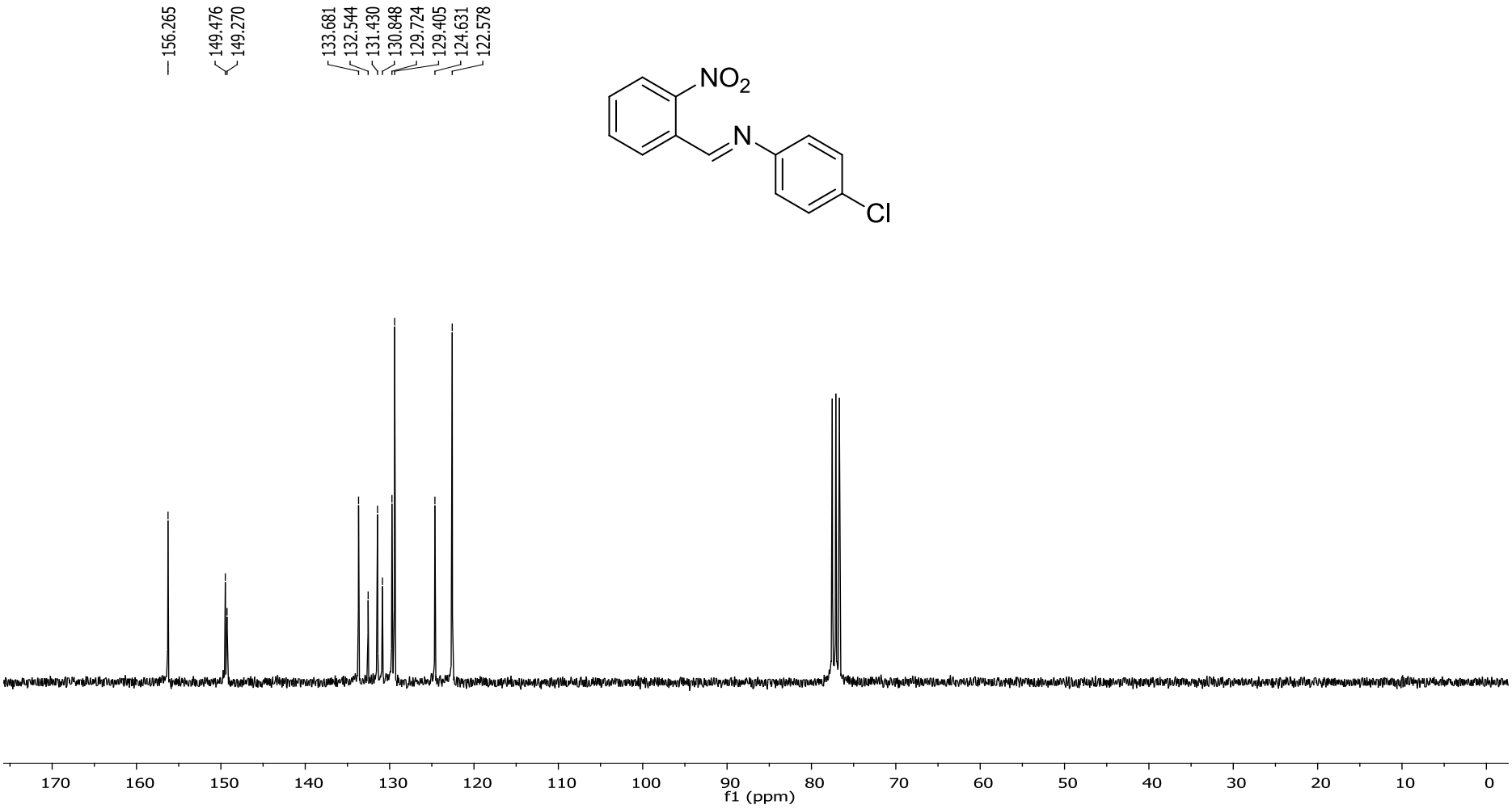
^{13}C-NMR(75 MHz, $CDCl_3$): 1-phenyl-4-(thiophen-2-yl)-1H-imidazo[4,5-c]quinoline (6q)



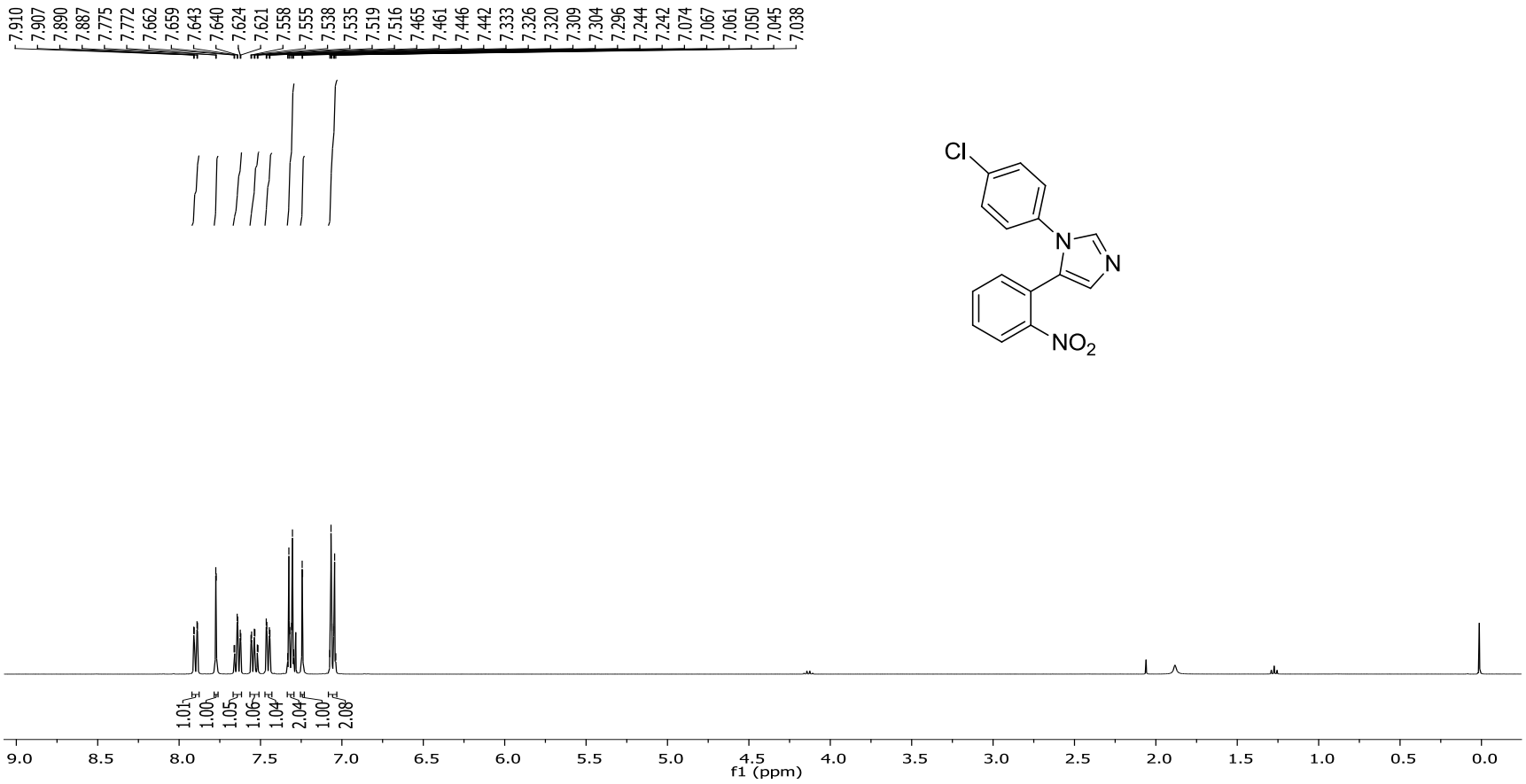
^{1}H NMR (300 MHz, $CDCl_3$): (E)-4-chloro-N-(2-nitrobenzylidene)aniline



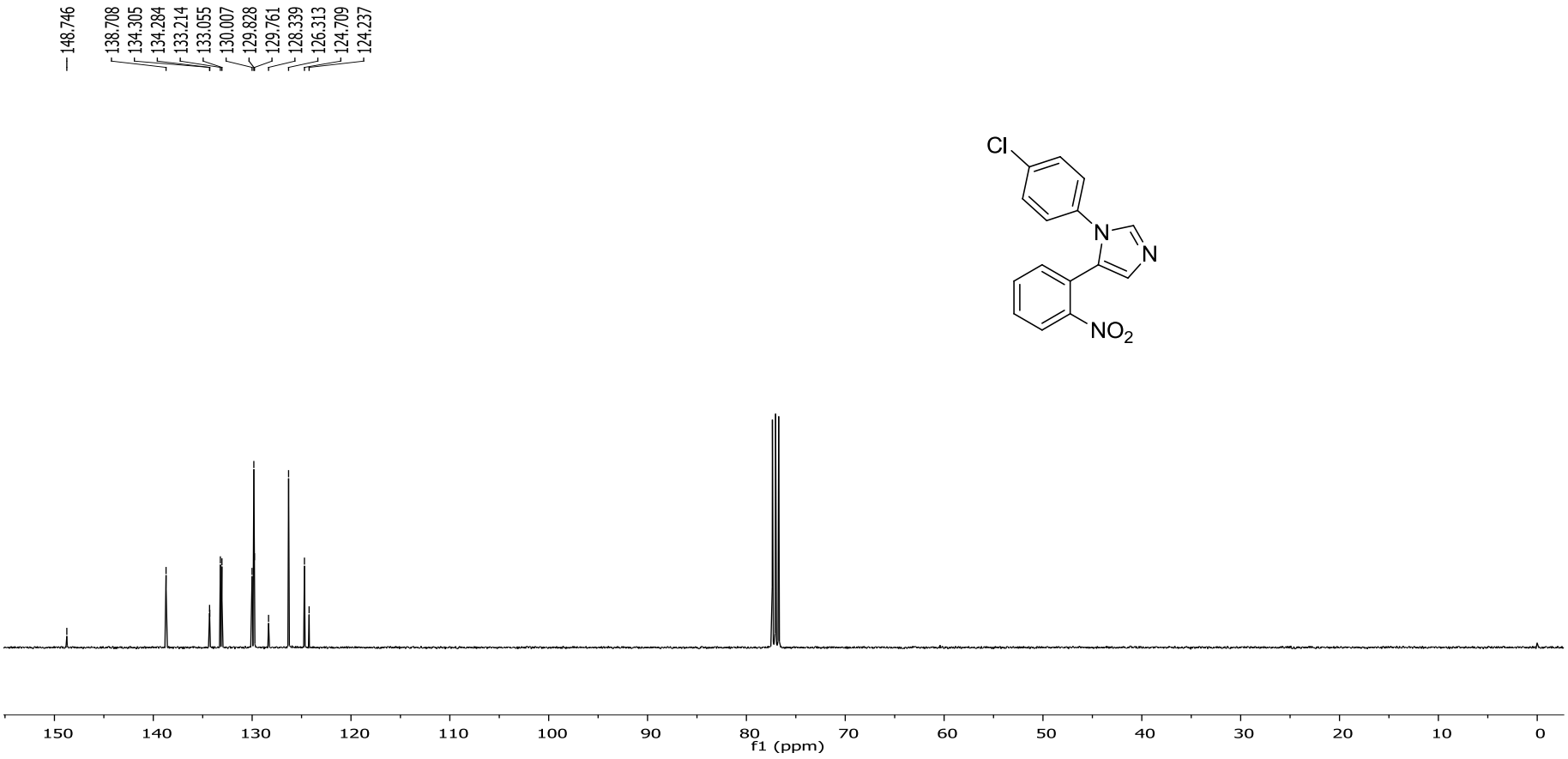
^{13}C NMR(75 MHz, $CDCl_3$): (E)-4-chloro-N-(2-nitrobenzylidene)aniline



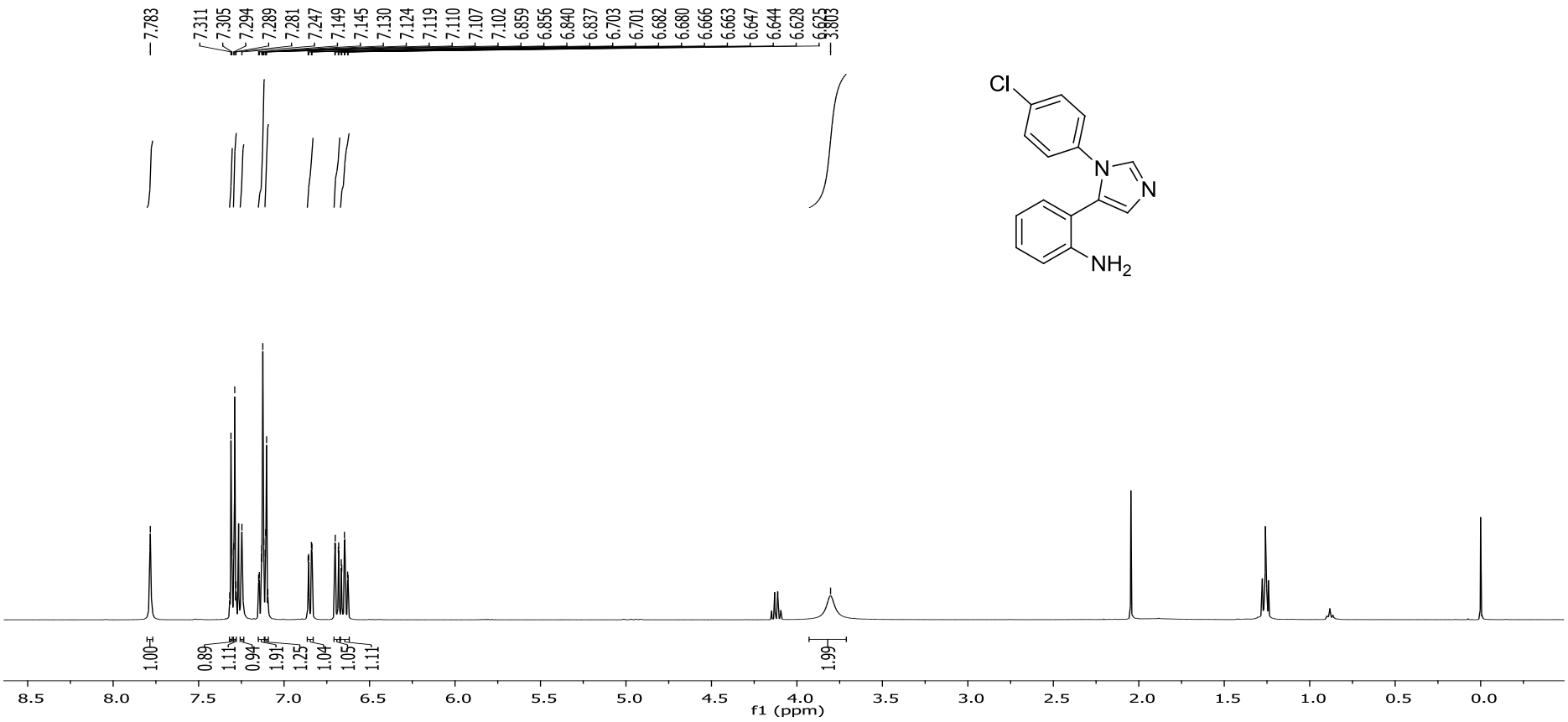
^{1}H NMR (300 MHz, $CDCl_3$): 5-(2-nitrophenyl)-1-phenyl-1H-imidazole



^{13}C NMR (75 MHz, $CDCl_3$): 5-(2-nitrophenyl)-1-phenyl-1H-imidazole

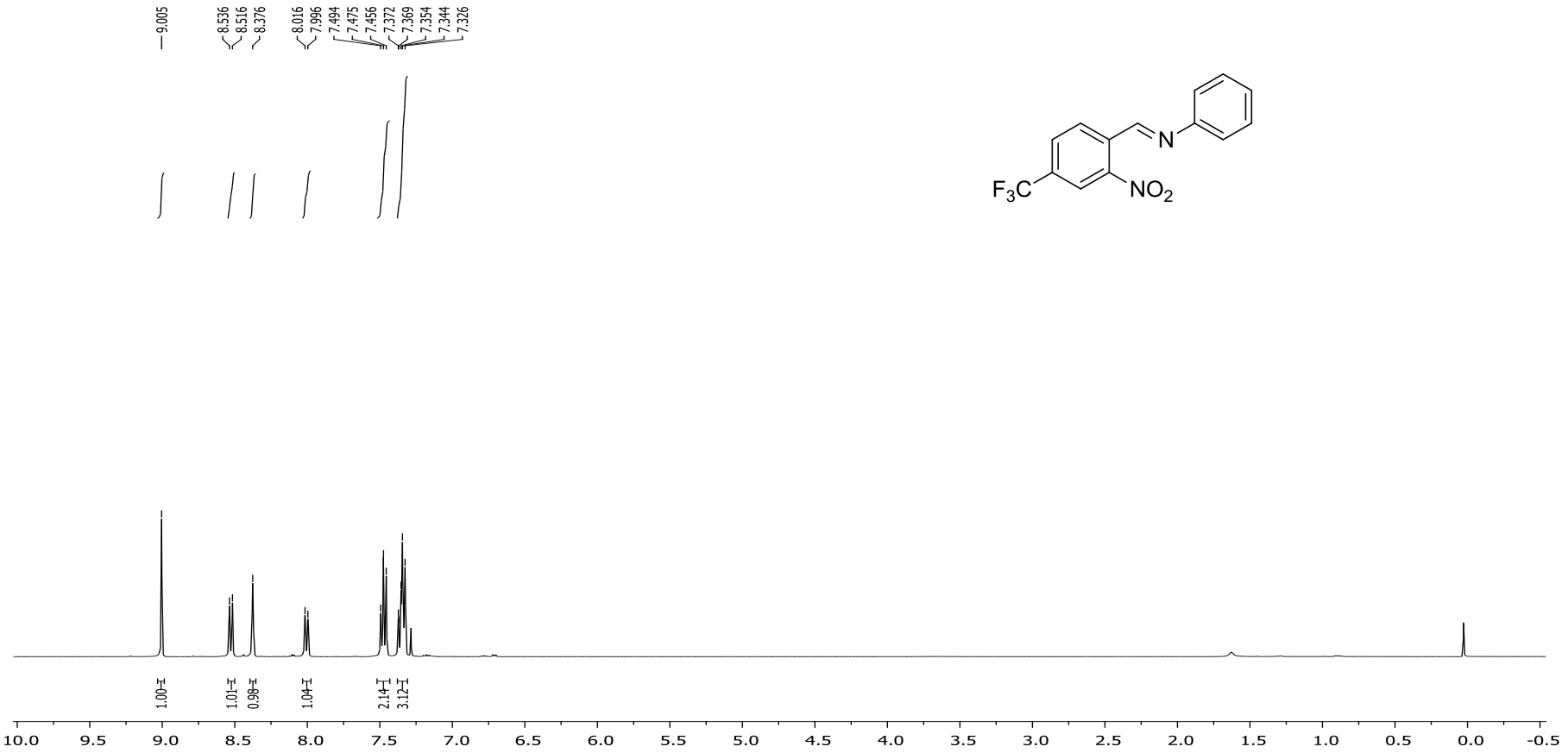


^{1}H NMR (400 MHz, $CDCl_3$): 2-(1-(4-chlorophenyl)-1H-imidazol-5-yl)aniline (4b)

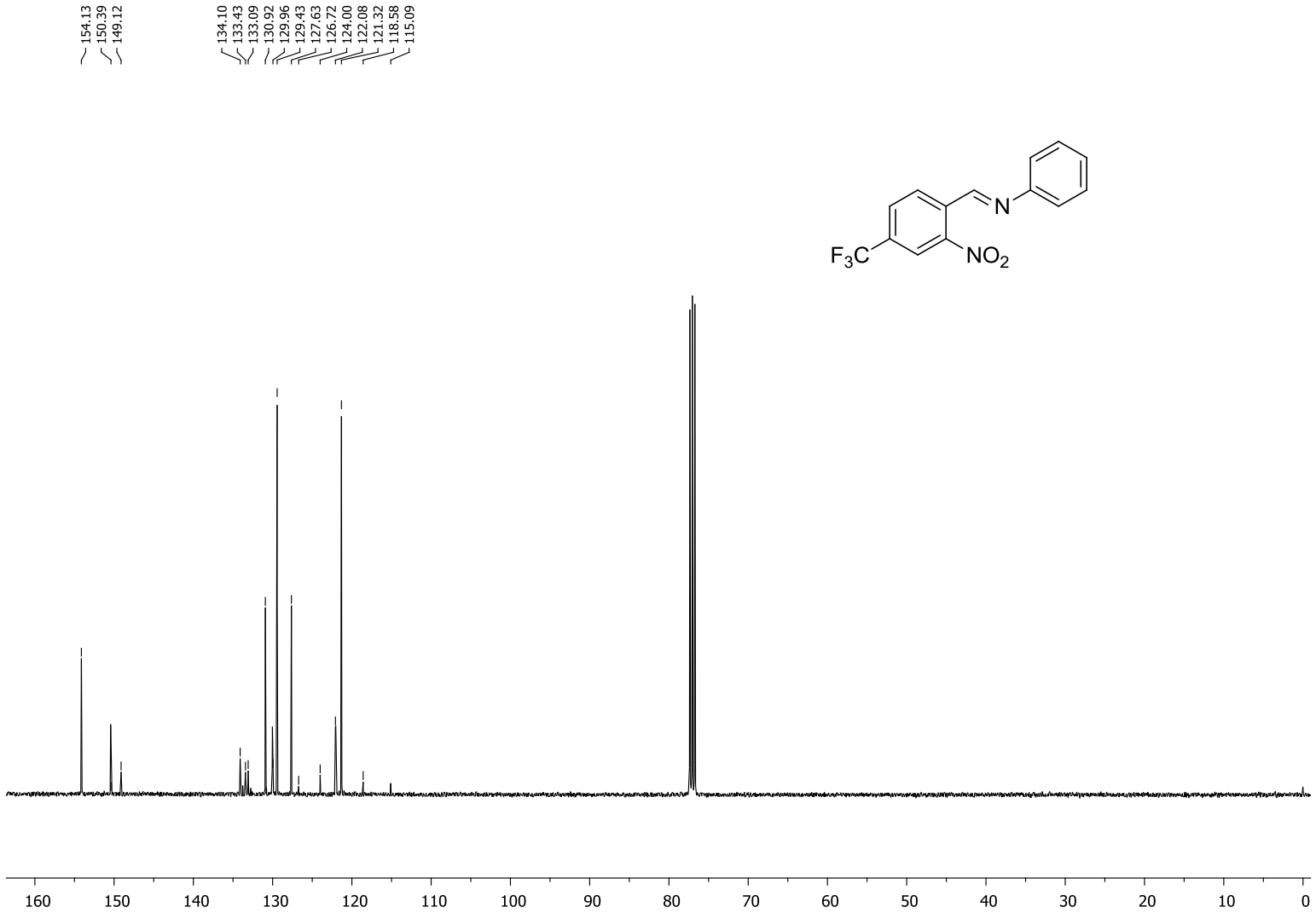


^{13}C NMR (101 MHz, $CDCl_3$): 2-(1-(4-chlorophenyl)-1H-imidazol-5-yl)aniline (4b)

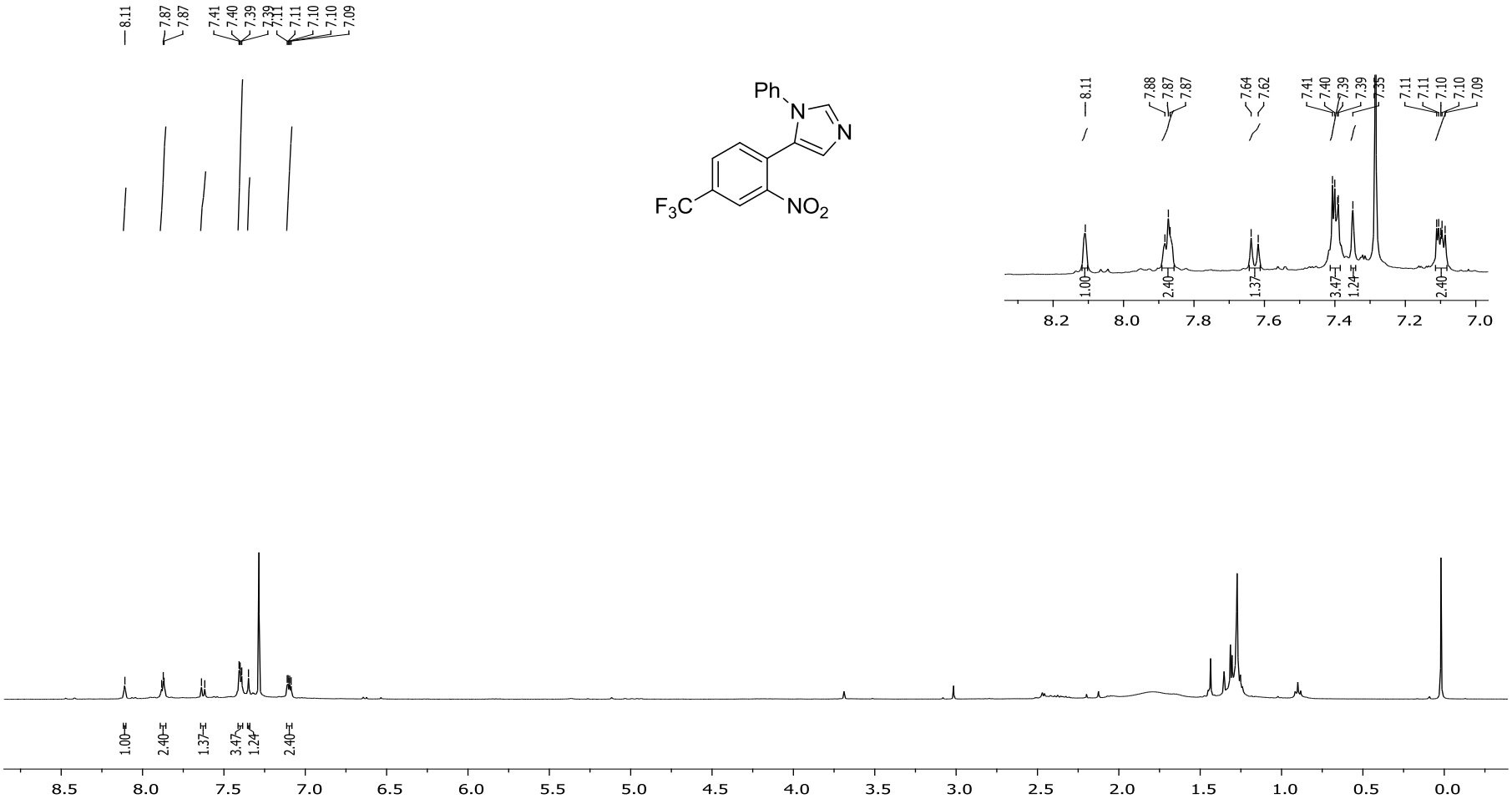
^{1}H NMR (400 MHz, $CDCl_3$): (E)-N-(2-nitro-4-(trifluoromethyl)benzylidene)aniline



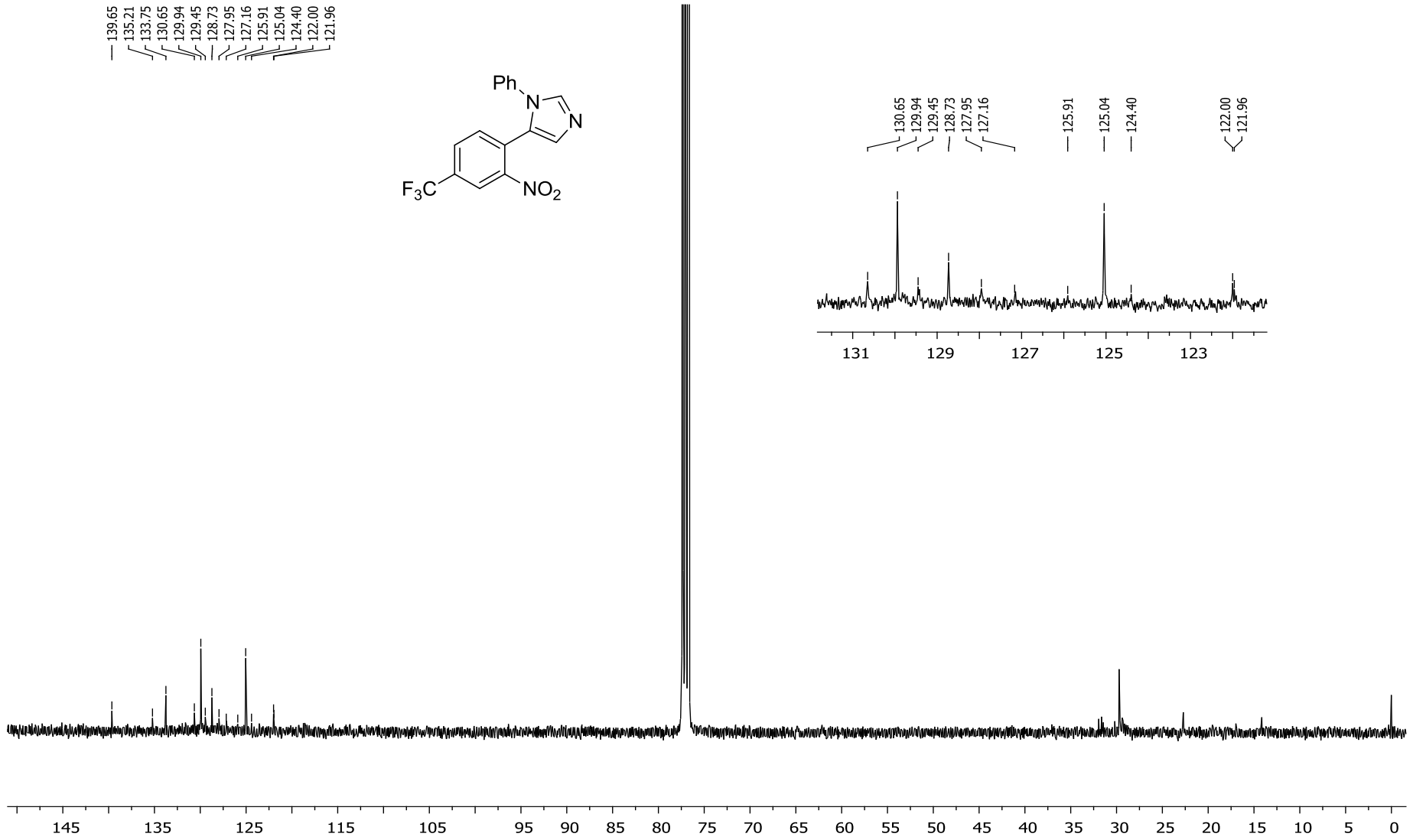
^{13}C NMR (101 MHz, $CDCl_3$): (E)-N-(2-nitro-4-(trifluoromethyl)benzylidene)aniline



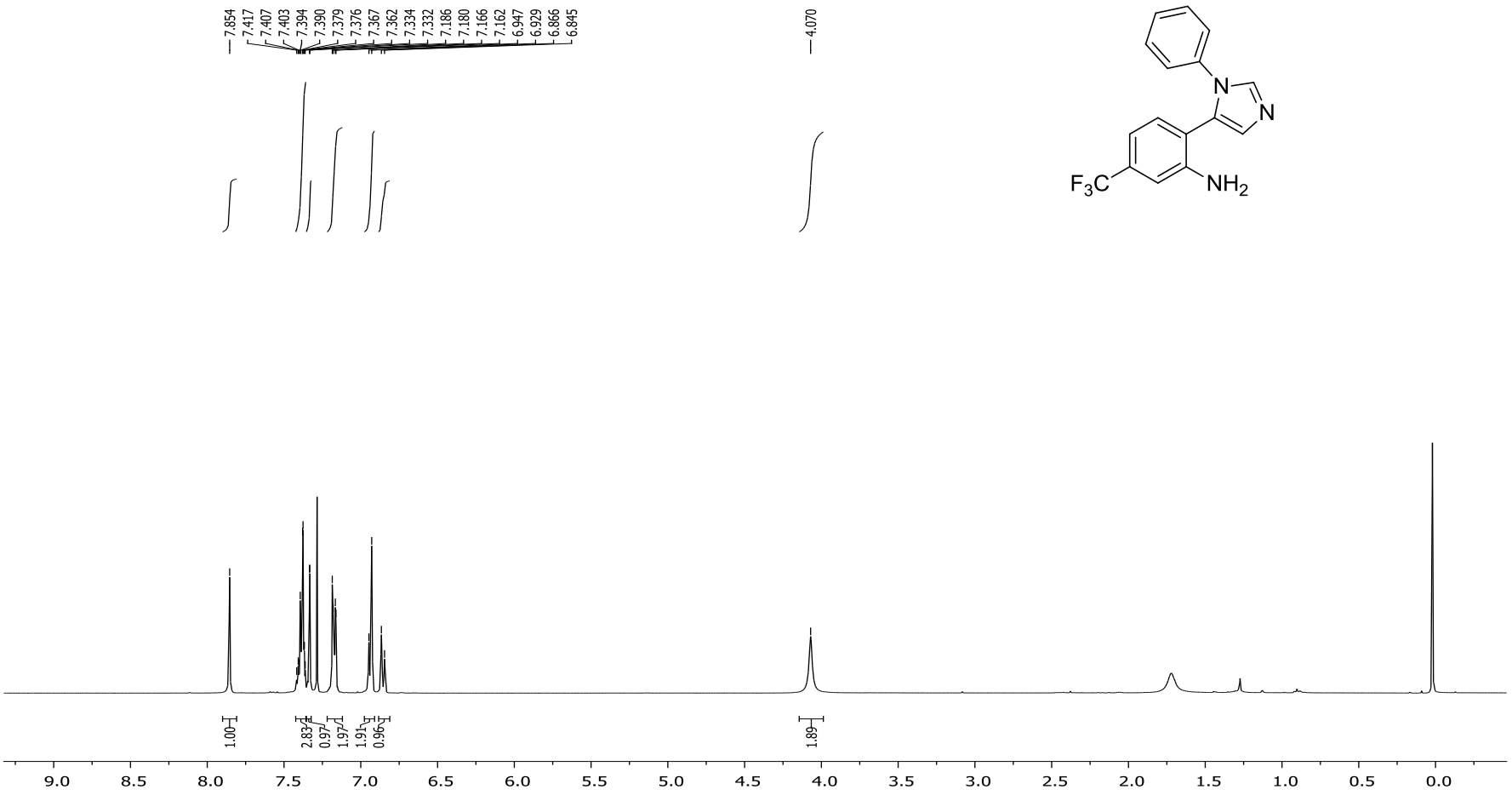
^{1}H NMR (400 MHz, $CDCl_3$): 5-(2-nitro-4-(trifluoromethyl)phenyl)-1-phenyl-1H-imidazole



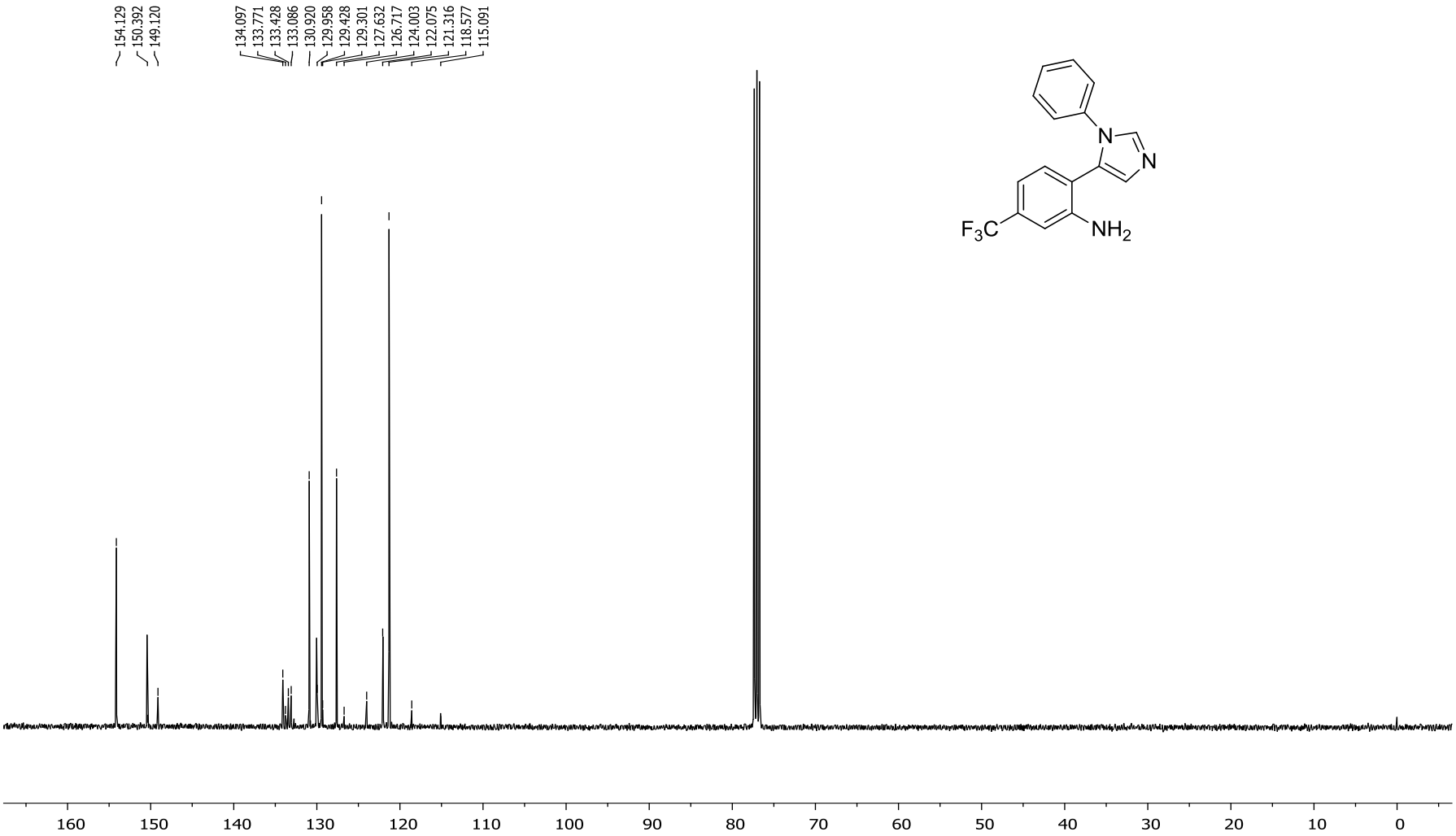
^{13}C NMR (101 MHz, $CDCl_3$): 5-(2-nitro-4-(trifluoromethyl)phenyl)-1-phenyl-1H-imidazole



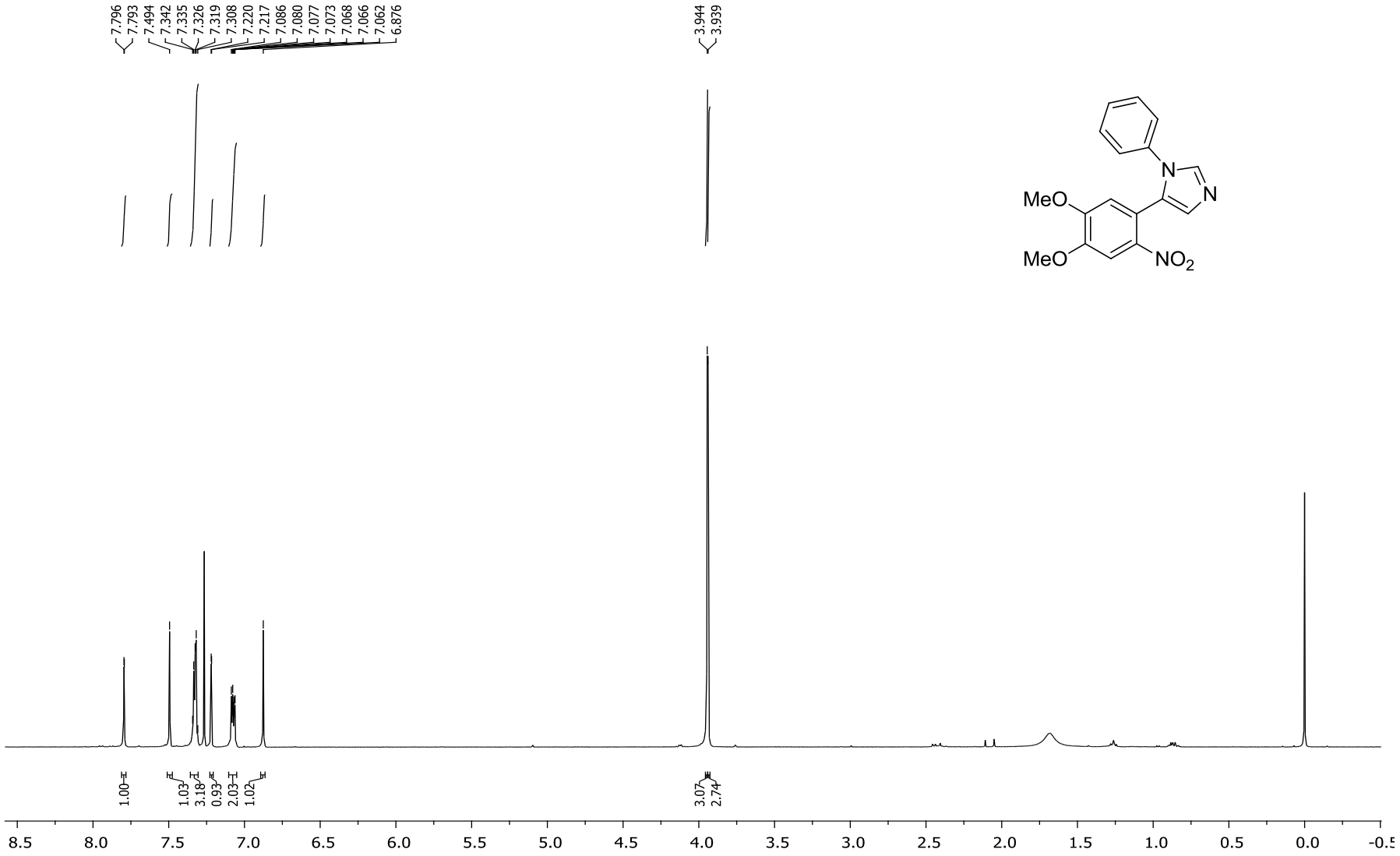
^{1}H NMR (400 MHz, $CDCl_3$): 2-(1-phenyl-1*H*-imidazol-5-yl)-5-(trifluoromethyl)aniline



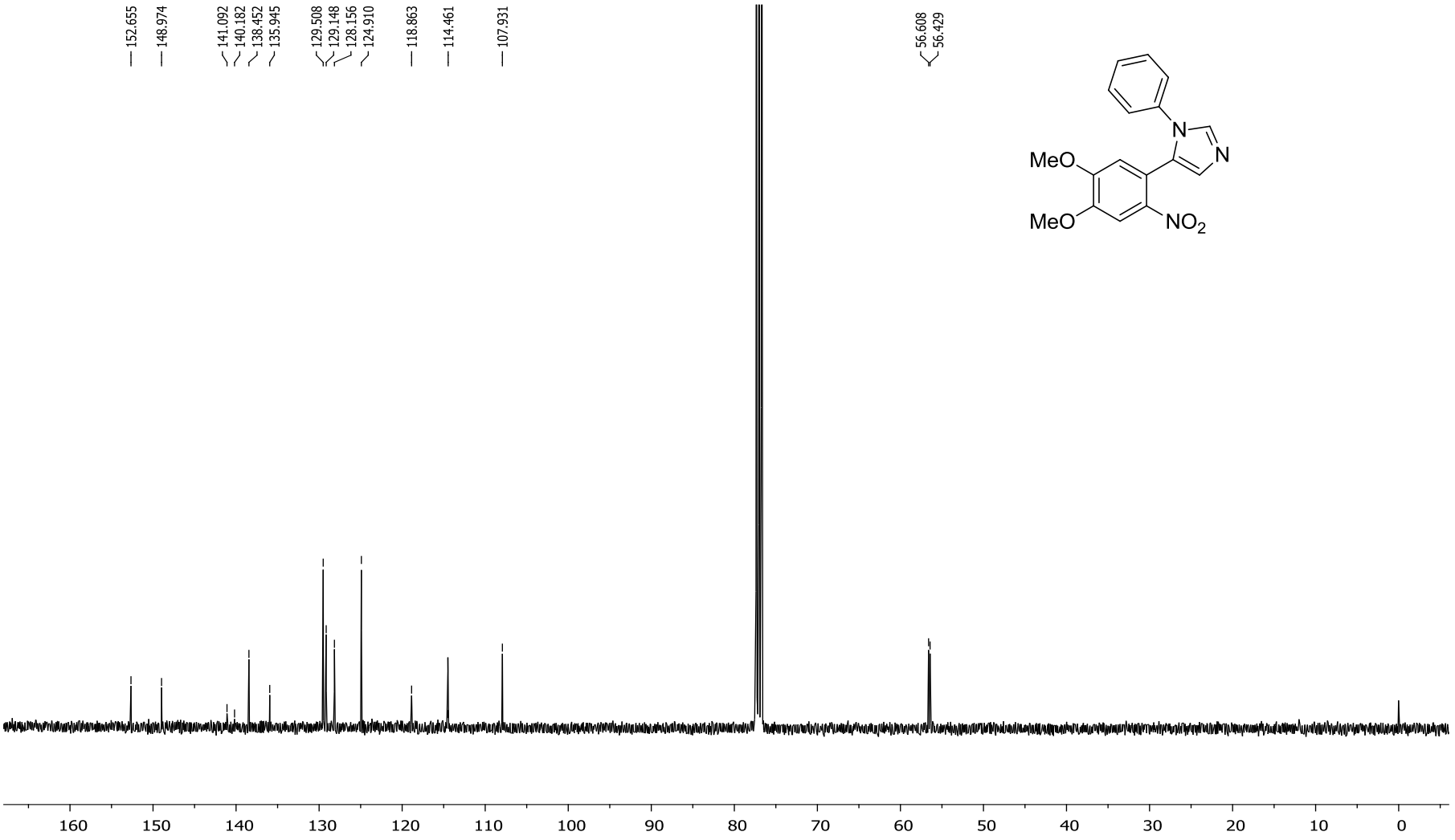
^{13}C NMR (101 MHz, $CDCl_3$): 2-(1-phenyl-1*H*-imidazol-5-yl)-5-(trifluoromethyl)aniline



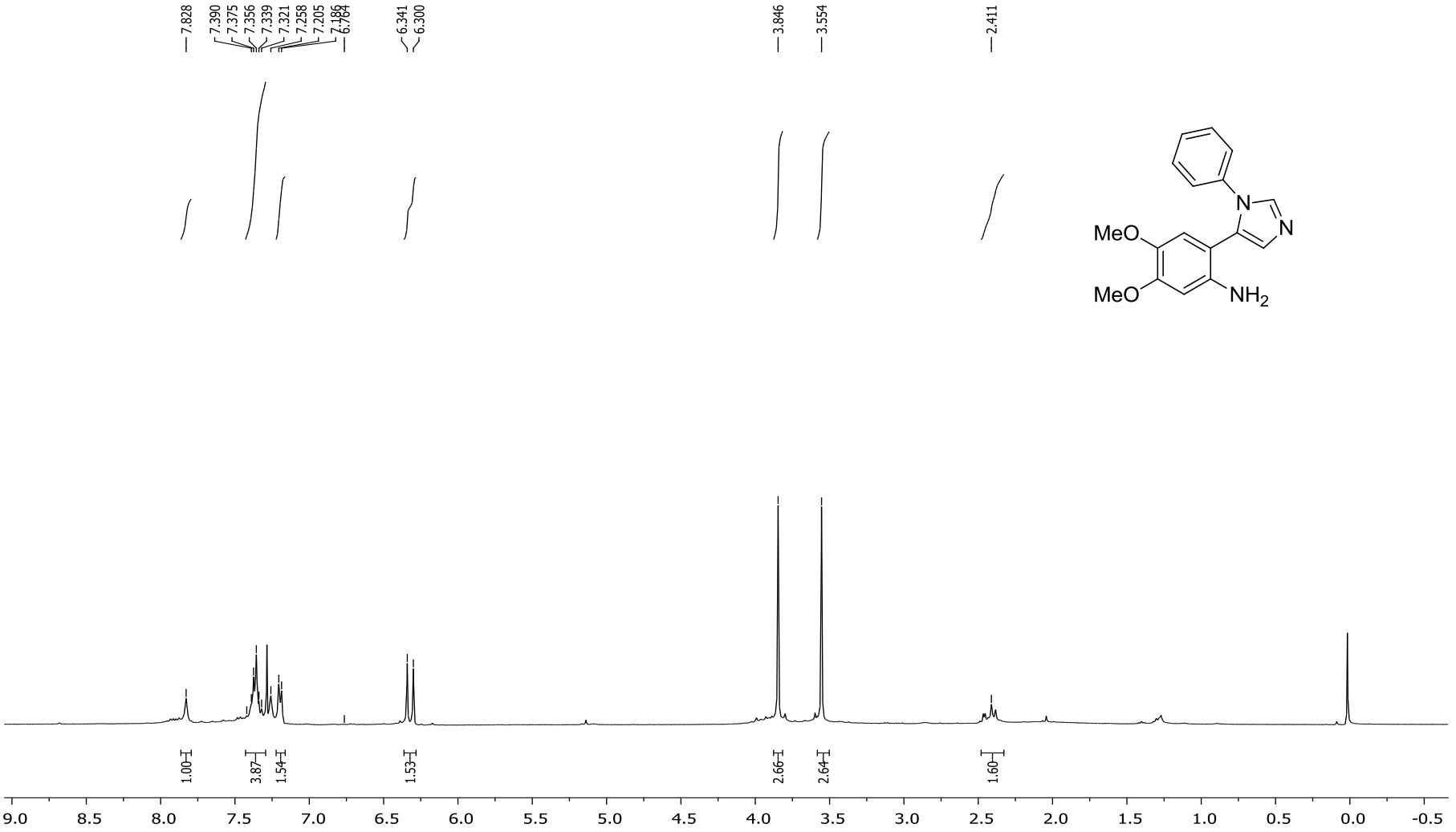
5-(4, 5-dimethoxy-2-nitrophenyl)-1-phenyl-1*H*-imidazole



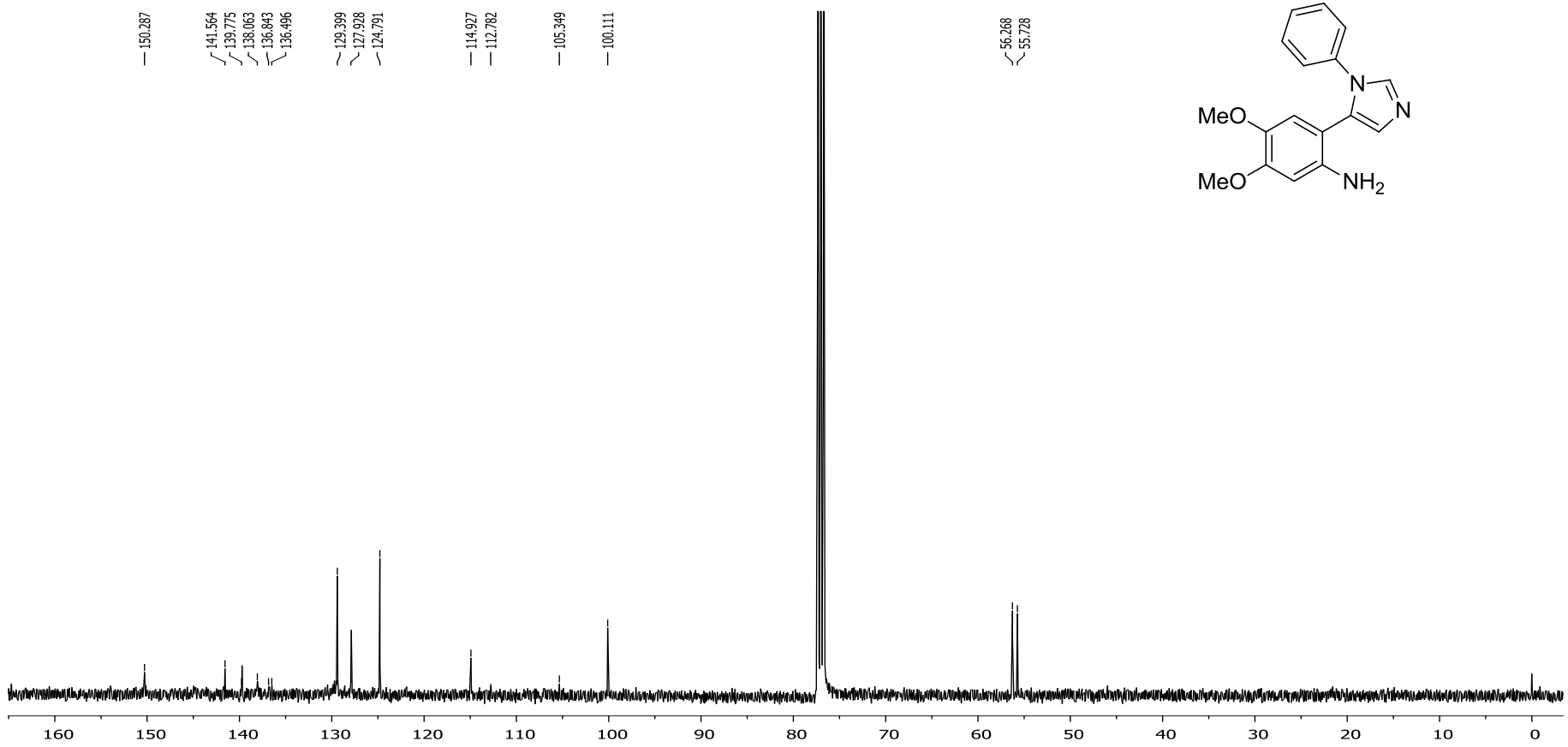
^{13}C NMR (101 MHz, $CDCl_3$): 5-(4, 5-dimethoxy-2-nitrophenyl)-1-phenyl-1*H*-imidazole



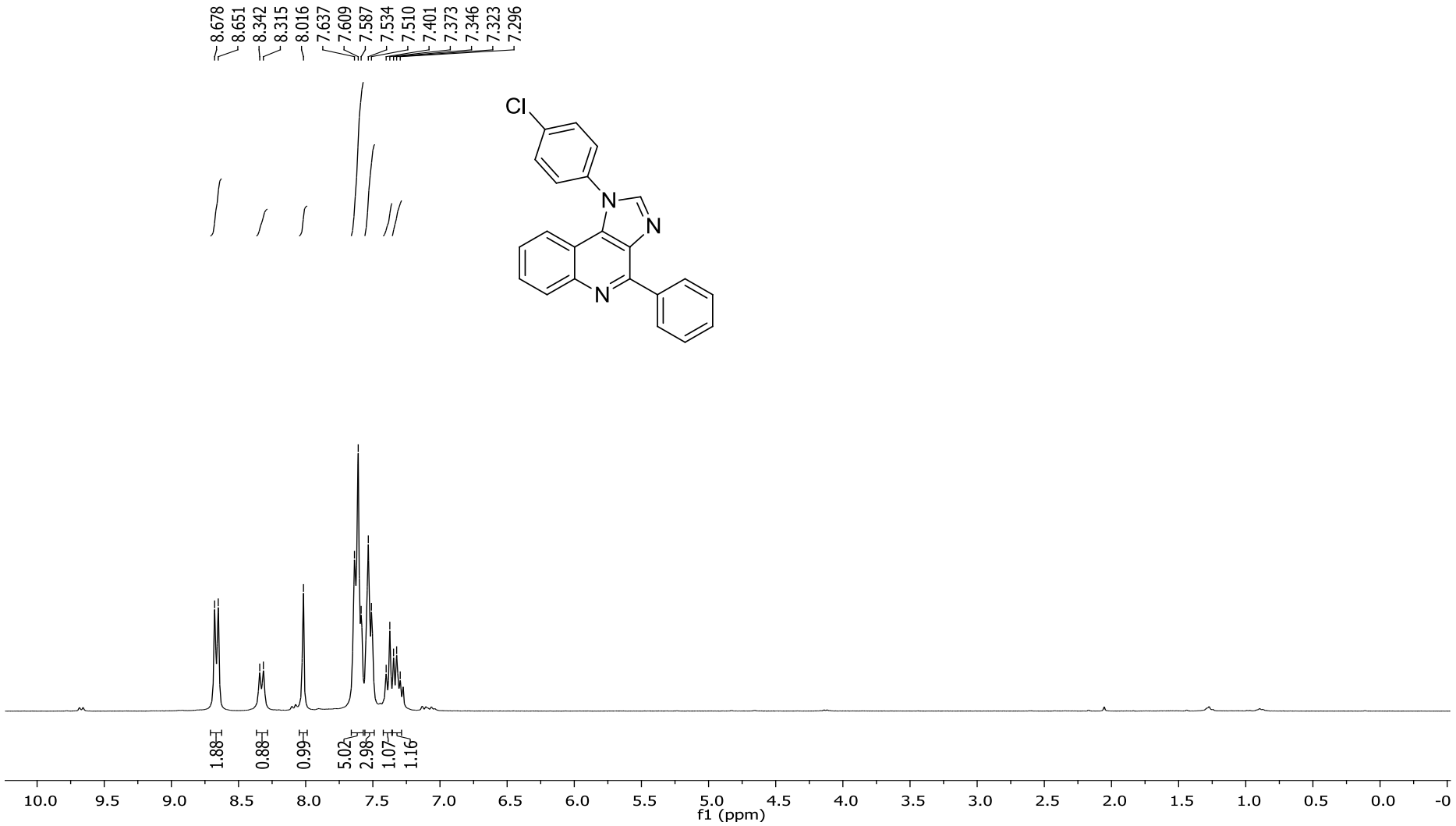
4, 5-dimethoxy-2-(1-phenyl-1*H*-imidazol-5-yl)aniline



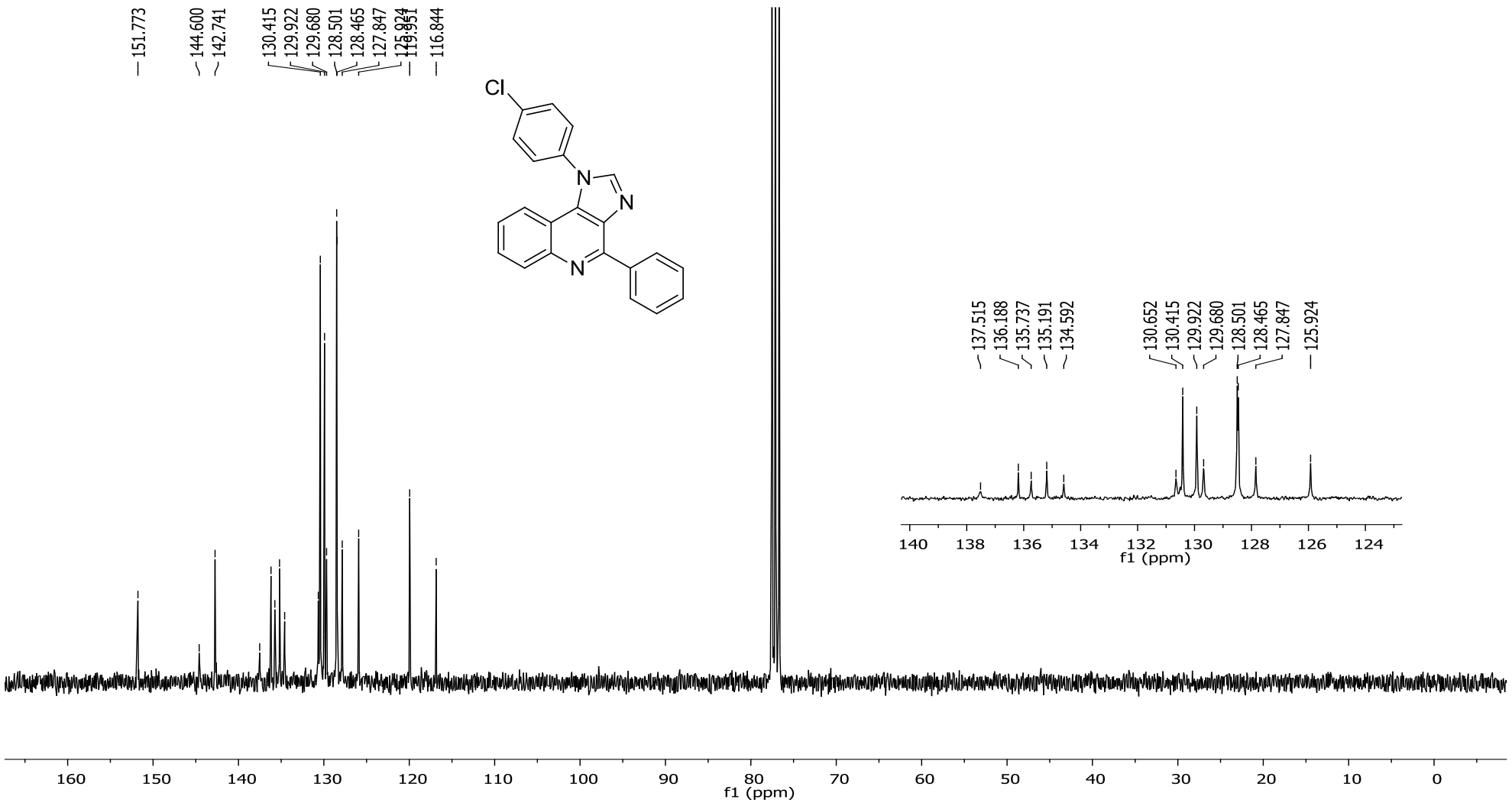
^{13}C NMR (101 MHz, $CDCl_3$): 4, 5-dimethoxy-2-(1-phenyl-1*H*-imidazol-5-yl)aniline



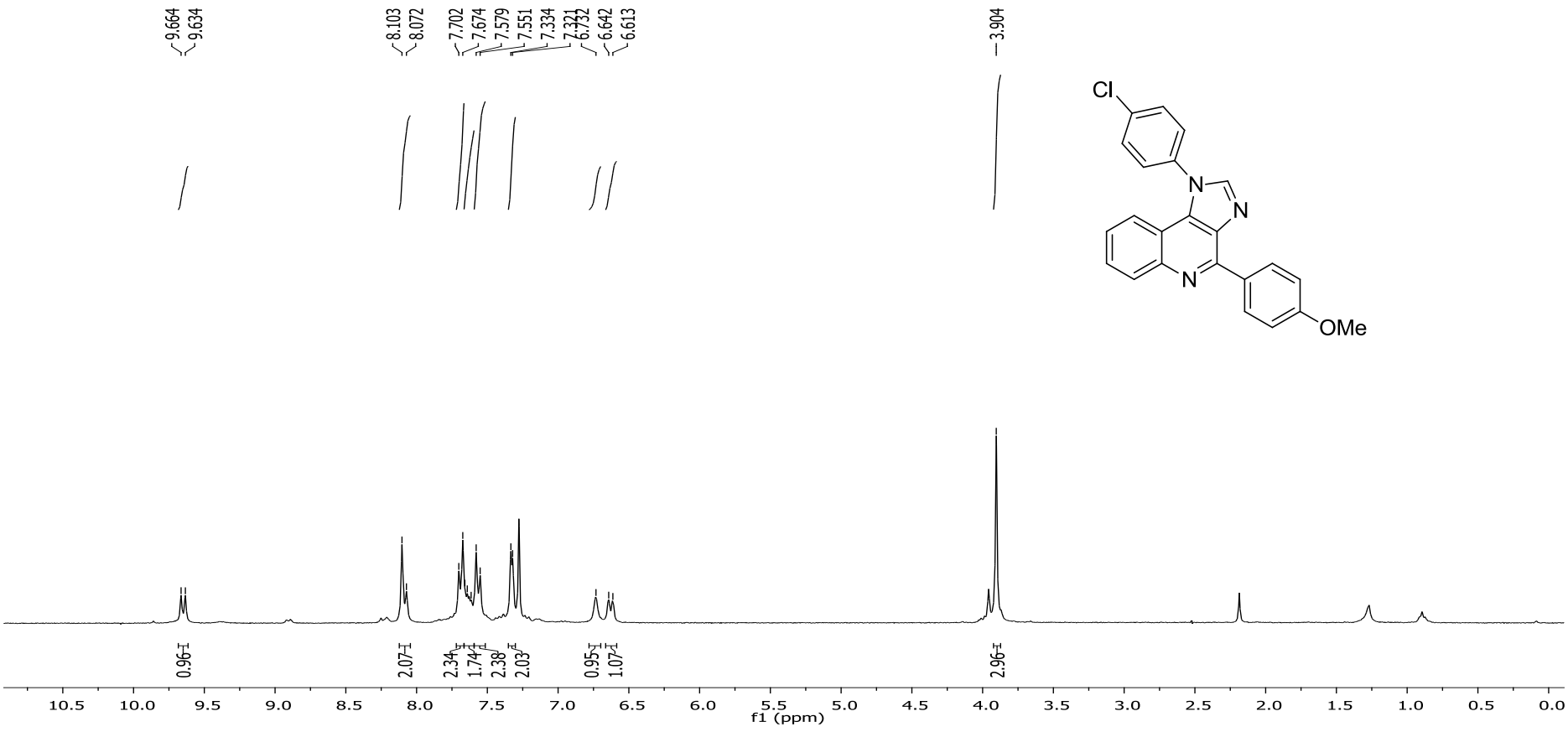
^{1}H NMR (300 MHz, $CDCl_3$) 1-(4-chlorophenyl)-4-phenyl-1*H*-imidazo[4,5-*c*]quinoline (8a)



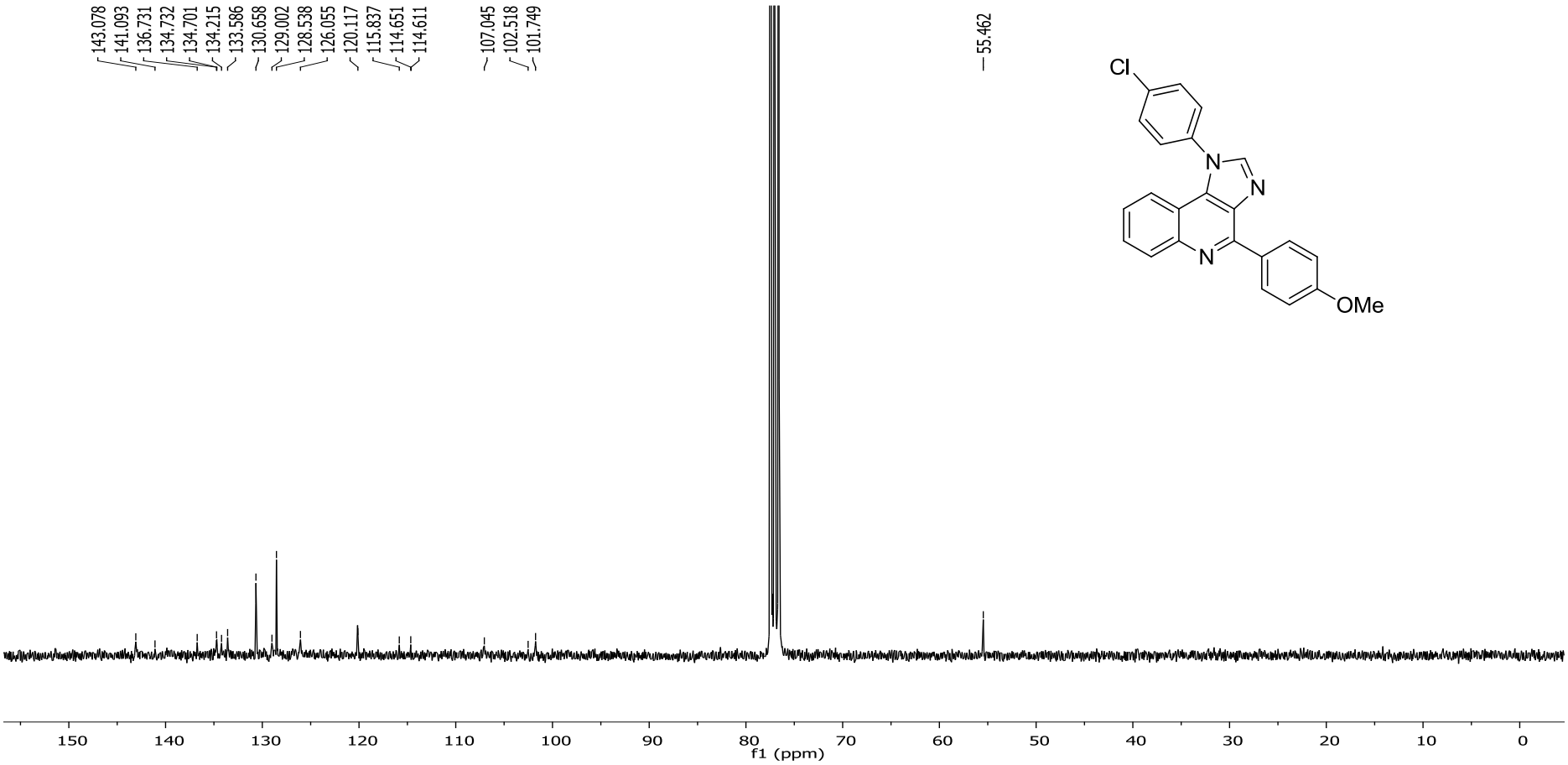
^{13}C NMR(75 MHz, $CDCl_3$): 1-(4-chlorophenyl)-4-phenyl-1*H*-imidazo[4,5-*c*]quinoline (8a)



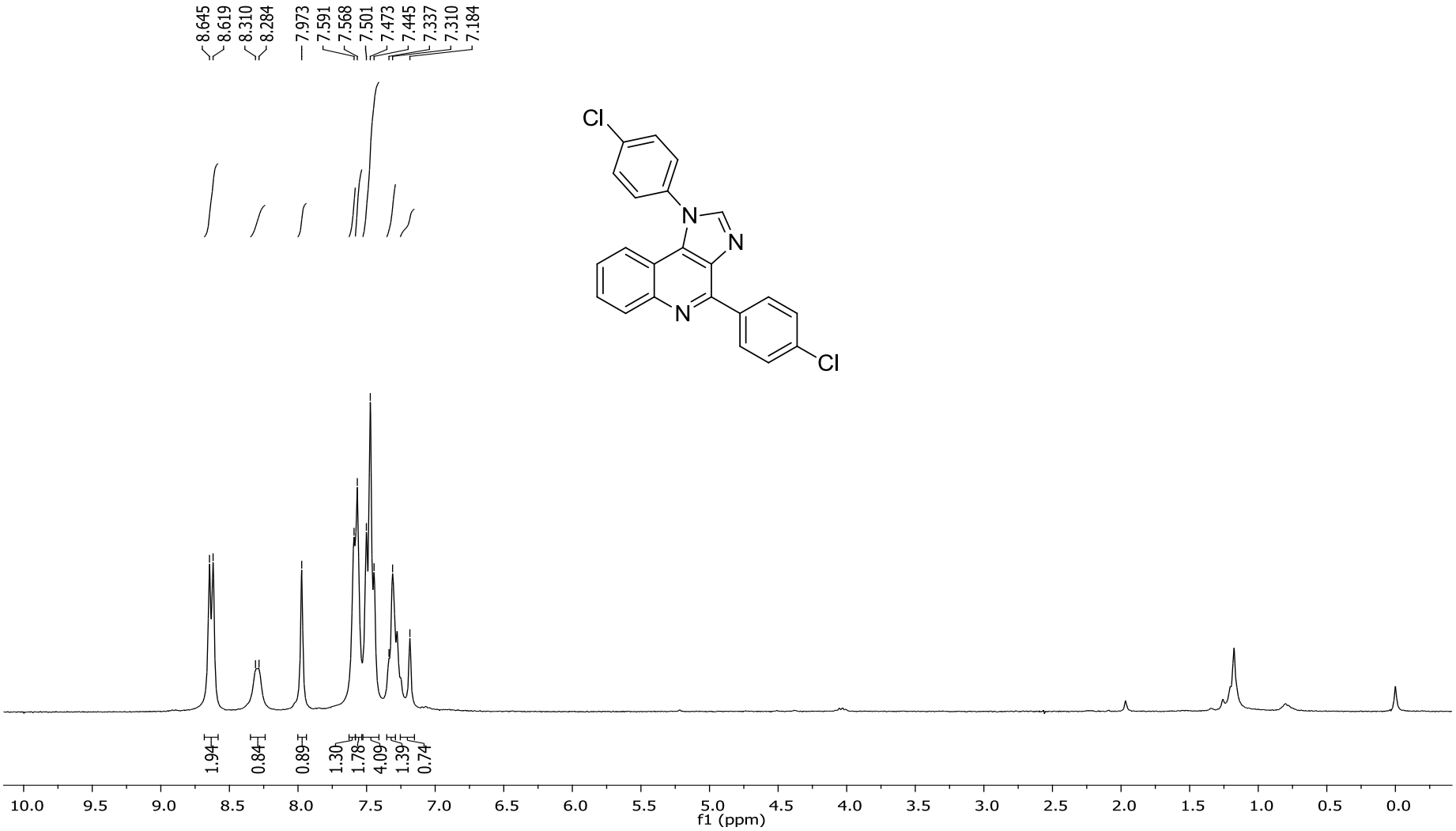
^{1}H NMR (300 MHz, $CDCl_3$) : 1-(4-chlorophenyl)-4-(4-methoxyphenyl)-1*H*-imidazo[4,5-*c*]quinoline (8b)



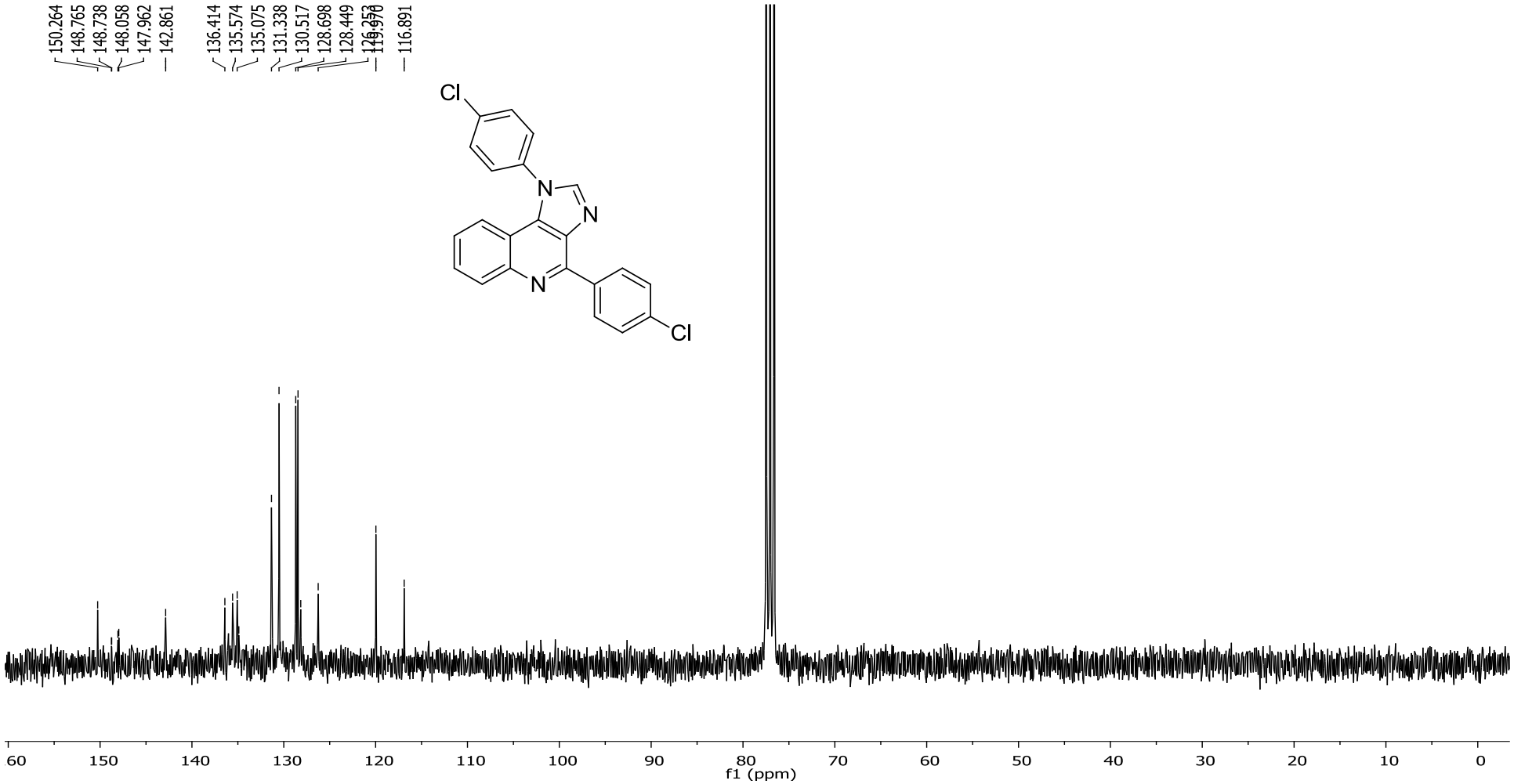
^{13}C NMR(75 MHz, $CDCl_3$) 1-(4-chlorophenyl)-4-(4-methoxyphenyl)-1*H*-imidazo[4,5-*c*]quinoline (8b)



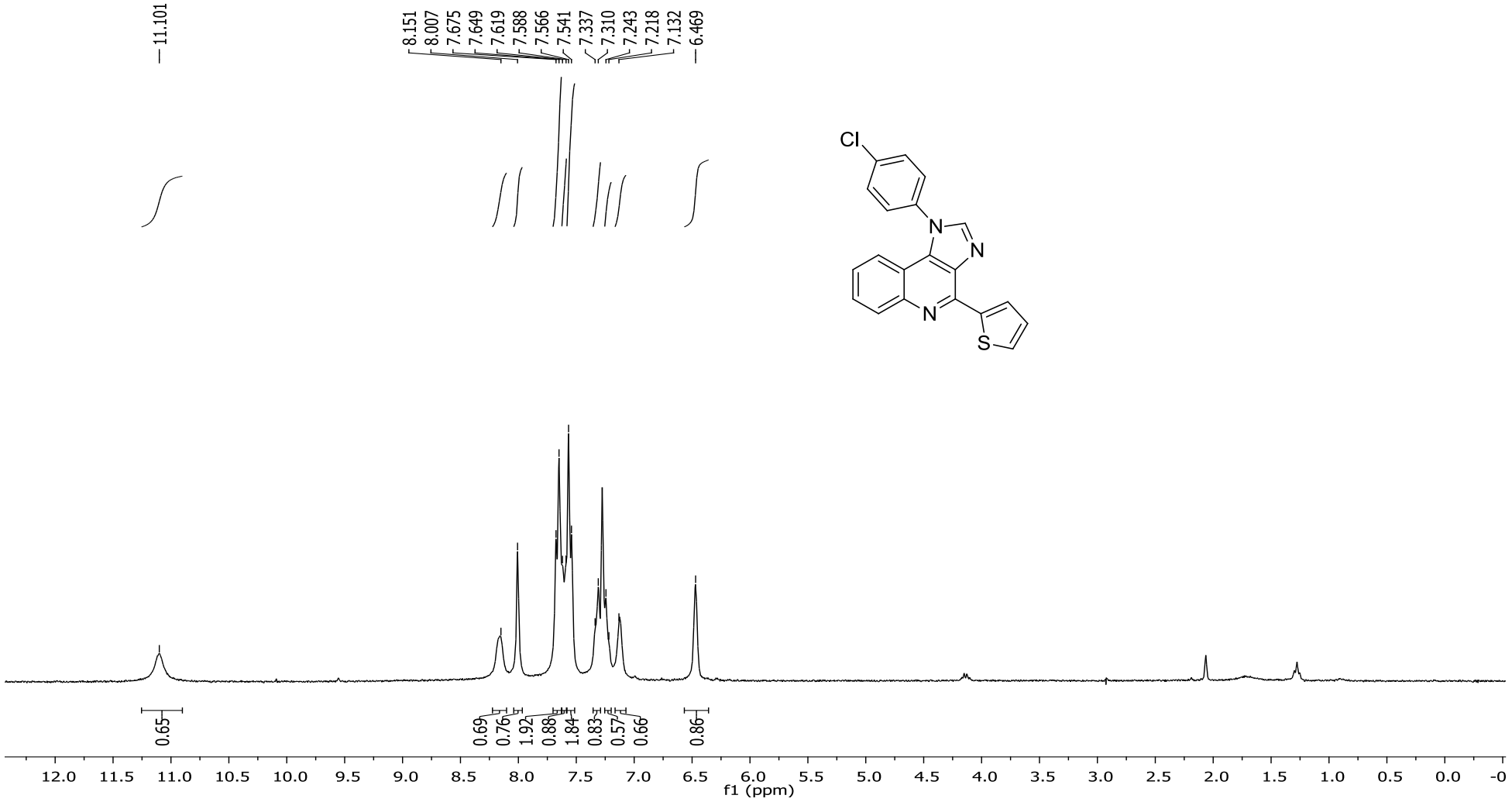
^{1}H NMR (300 MHz, $CDCl_3$): 1,4-bis(4-chlorophenyl)-1*H*-imidazo[4,5-*c*]quinoline (8c)



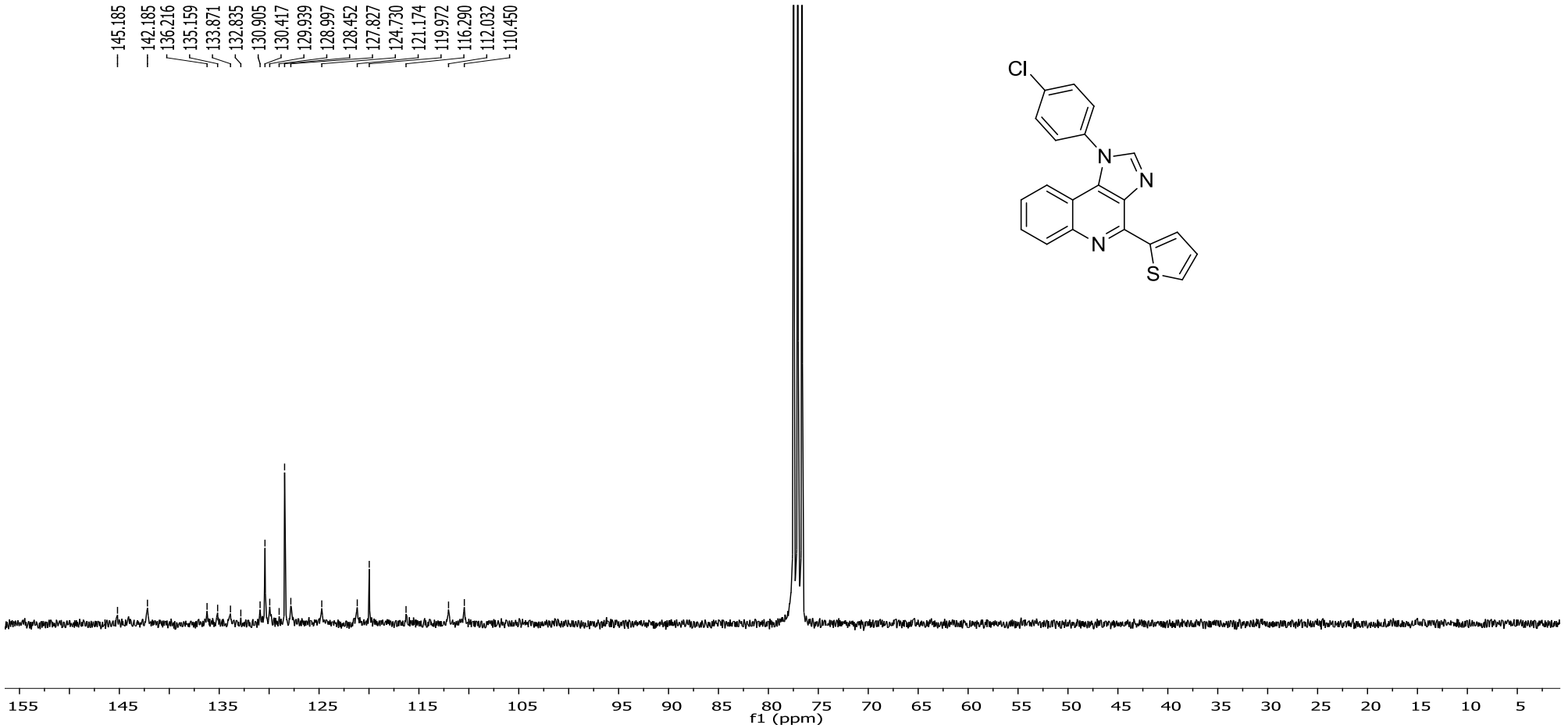
^{13}C NMR(75 MHz, $CDCl_3$): 1,4-bis(4-chlorophenyl)-1*H*-imidazo[4,5-*c*]quinoline (8c)



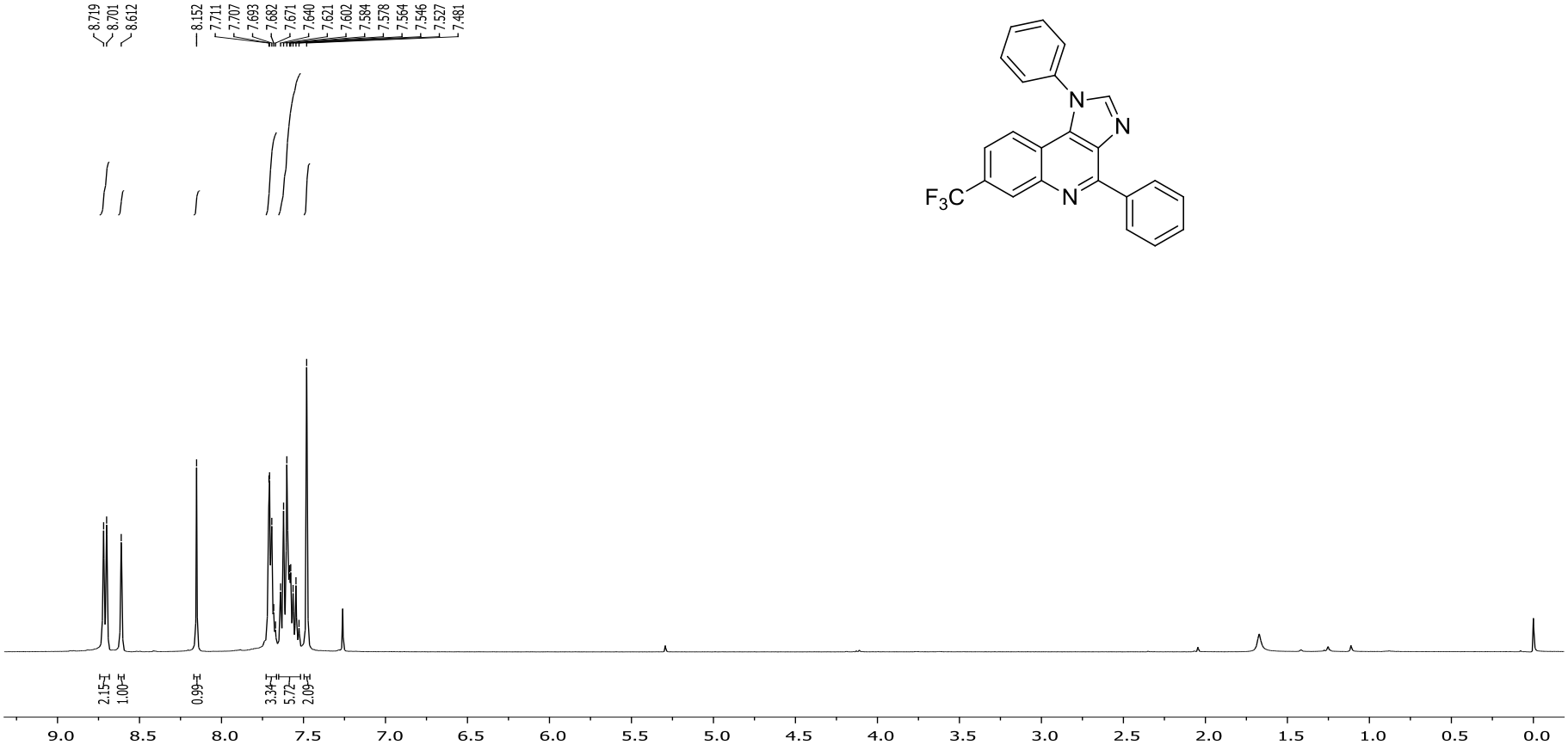
^{1}H NMR (300 MHz, $CDCl_3$): 1-(4-chlorophenyl)-4-(thiophen-2-yl)-1*H*-imidazo[4,5-*c*]quinoline (8d)



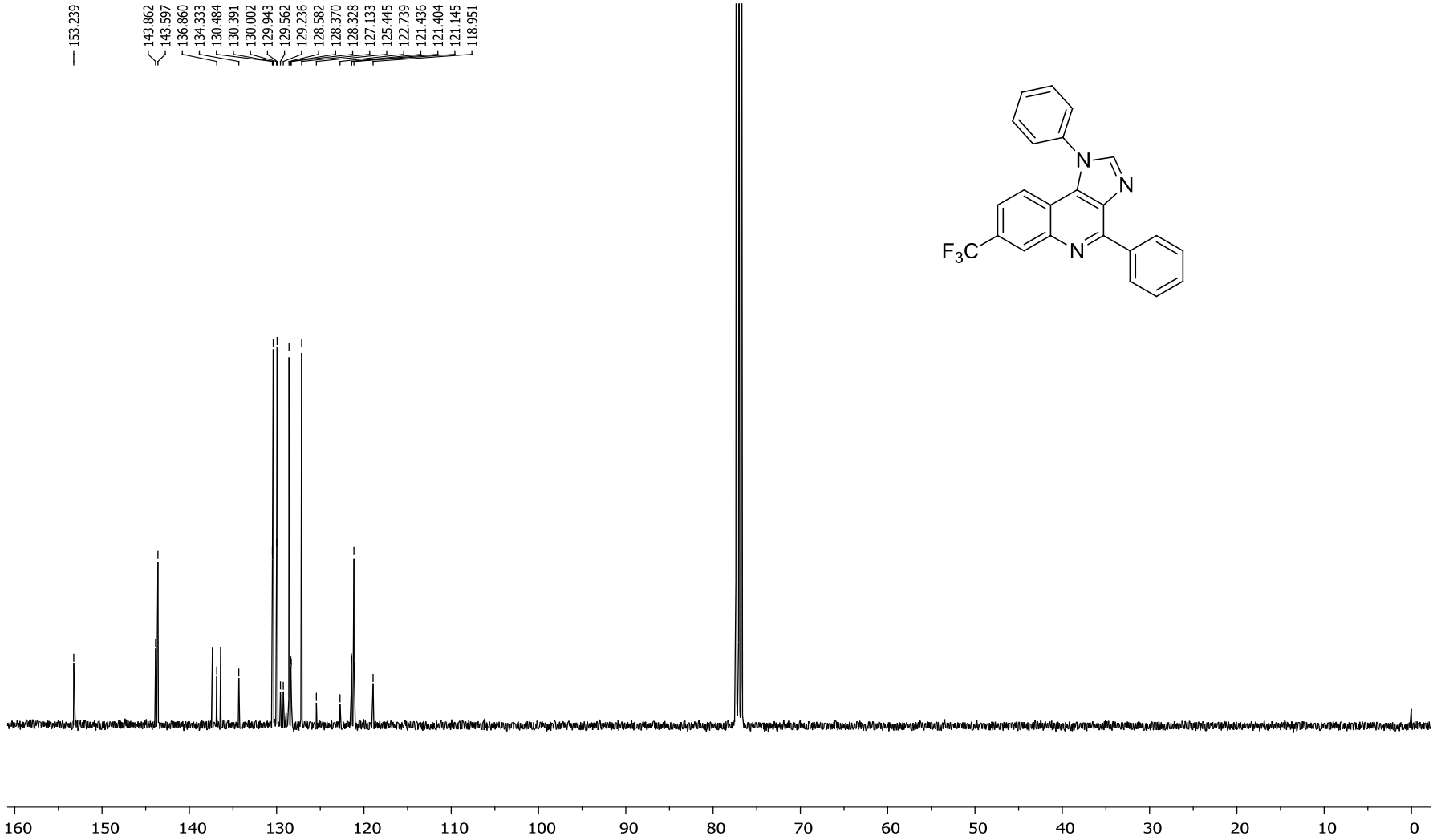
^{13}C NMR(75 MHz, $CDCl_3$): 1-(4-chlorophenyl)-4-(thiophen-2-yl)-1*H*-imidazo[4,5-*c*]quinoline (8d)



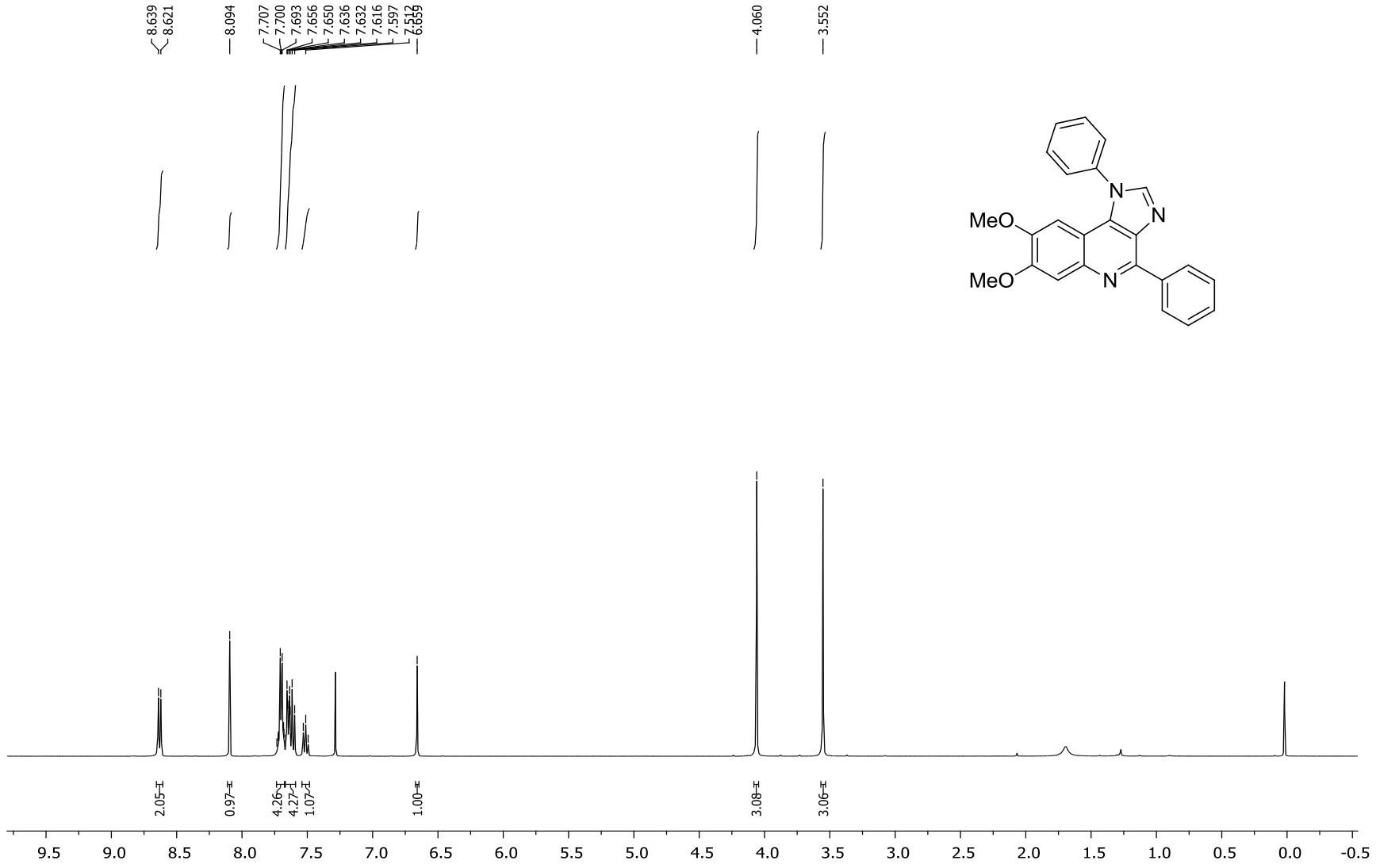
^{1}H NMR (400 MHz, $CDCl_3$): 1, 4-diphenyl-7-(trifluoromethyl)-1*H*-imidazo[4,5-*c*]quinoline (8e)



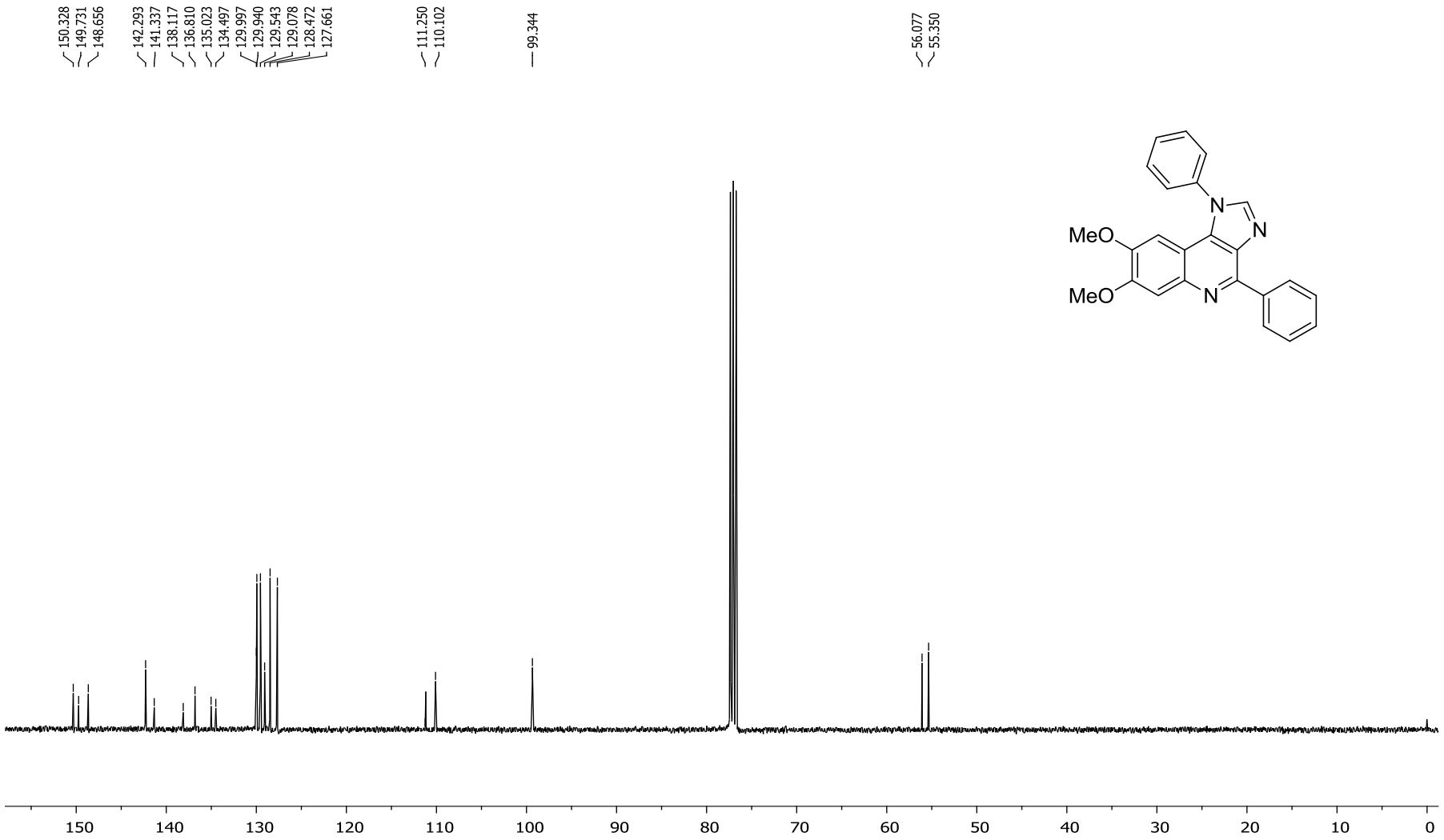
^{13}C NMR(101 MHz, $CDCl_3$): 1, 4-diphenyl-7-(trifluoromethyl)-1*H*-imidazo[4,5-*c*]quinoline (8e)



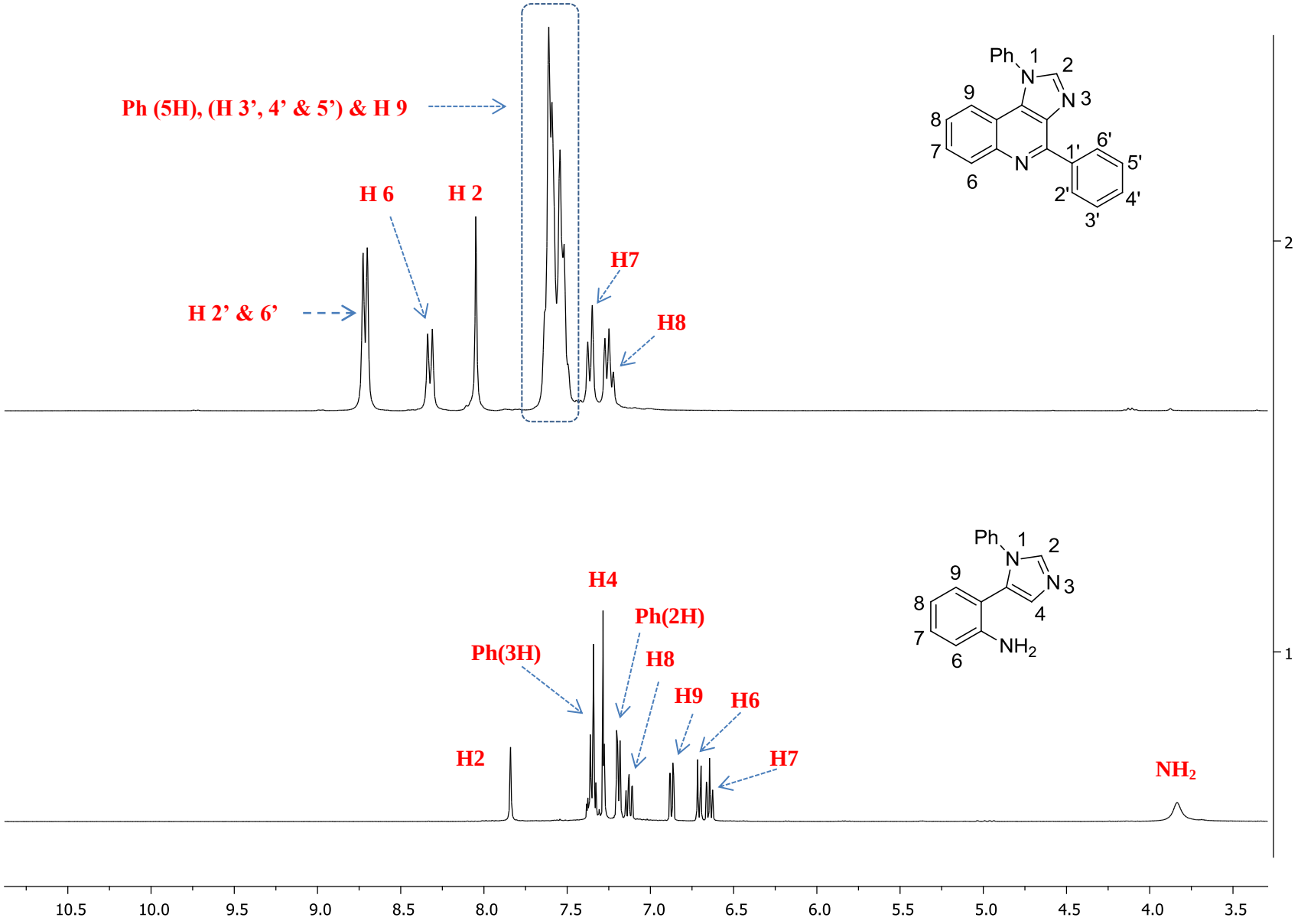
^{1}H NMR (400 MHz, $CDCl_3$): 7, 8-dimethoxy-1, 4-diphenyl-1*H*-imidazo[4,5-*c*]quinoline (8f)



^{13}C NMR(101 MHz, $CDCl_3$): 7, 8-dimethoxy-1, 4-diphenyl-1*H*-imidazo[4,5-*c*]quinoline (8f)

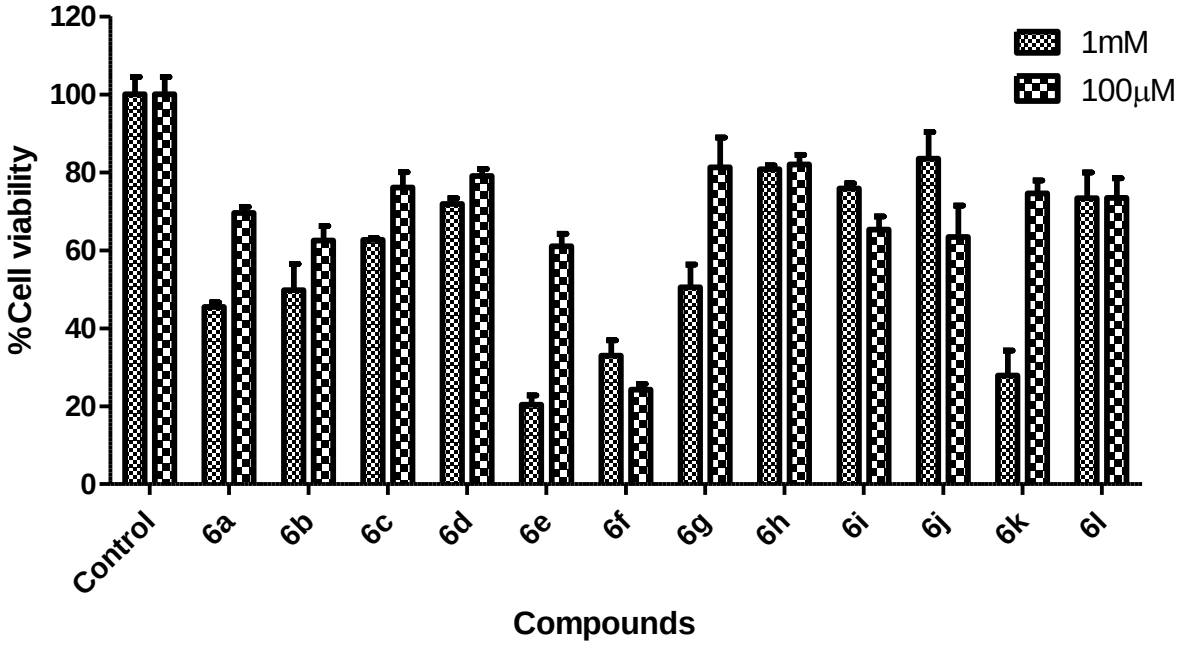


Overlay of ^{1}H NMR spectra of 1, 4-diphenyl-1*H*-imidazo[4,5-*c*]quinoline (6a) and 2-(1-phenyl-1*H*-imidazol-5-yl)aniline (4a)

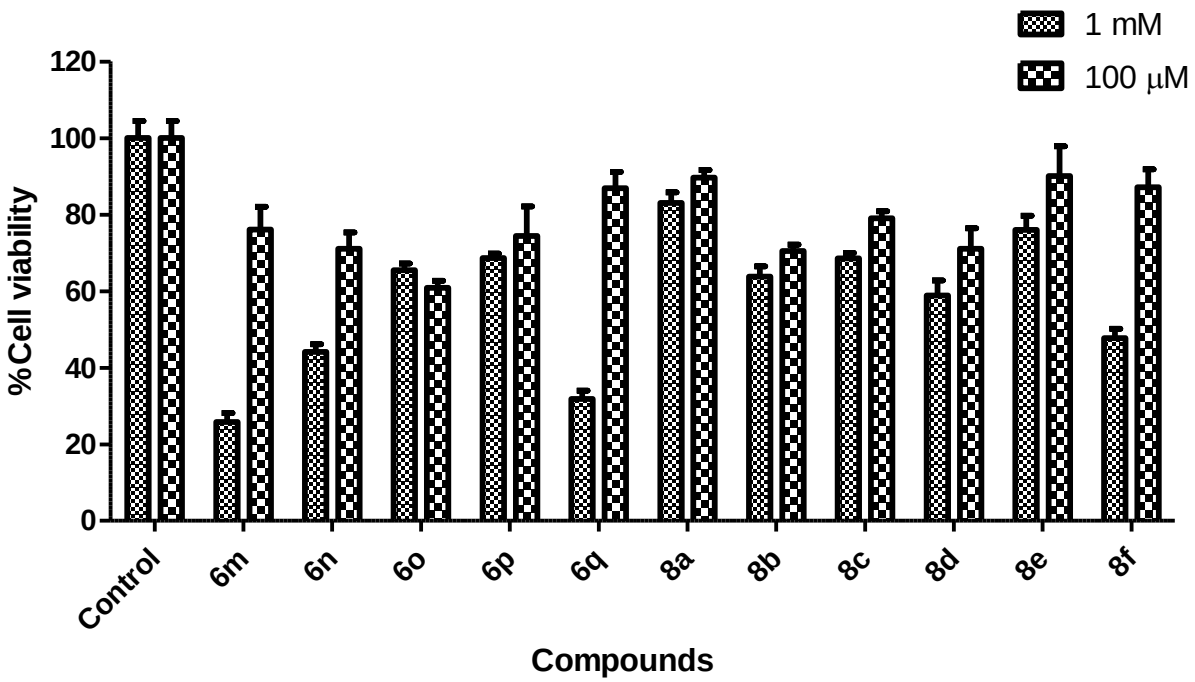


MTT Assay:

Anticancer activity was determined using MTT assay.[1,2] Briefly, cells were seeded at 10,000cells/well in 100µl of medium in 96-well plates and incubated for 24 hr. Cells were treated with drug compounds at two concentrations (1mM and 100µM) in triplicates and incubated for 24 hrs. Stock solutions were diluted in such a way that final DMSO concentration was 1%.50µl of 5 mg/mL 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT; Himedia Laboratories Pvt. Ltd., Mumbai, India) was added and incubated for 4 hours. Formazan crystals were dissolved in 150µl of DMSO and evaluated spectrophotometrically at 570nm and 650nm using Spectramax M4 (Molecular Devices, USA).



2A



2B

Figure A and B: Cytotoxicity of 23 novel compounds was evaluated in murine melanoma cell line (B16F10). Cell viability was measured by *in vitro* MTT assay. Cells were treated with drug molecules for 24 hours at two concentrations 1mM and 100μM (n=3). Data represent mean values of measurements ± s.d.

References:

1] Johan van Meerloo, Gertjan J.L. Kaspers, Jacqueline Cloos, “Cell Sensitivity Assays: The MTT Assay”, Cancer Cell Culture: Methods and Protocols, Second Edition, Methods in Molecular Biology, vol. 731, 237-245

2] Kornelius Kerl, David Ries, Rebecca Unland, Christiane Borchert, Natalia Moreno, Martin Hasselblatt,Heribert Jürgens, Marcel Kool, Dennis Gorlich, Maria Eveslage, Manfred Jung, Michael Meisterernstand, Michael Frühwald, “The histone deacetylase inhibitor SAHA acts insynergism with fenretinide and doxorubicin to control growth of rhabdoid tumor cells”, BMC Cancer 2013, 13:286