Synlett

Accounts and Rapid Communications in Chemical Synthesis

Supporting Information
for DOI: 10.1055/s-0037-1610176

Thieme

Supporting information

Synthesis of (2-Aminophenyl)(naphthalen-2-yl)methanones *via* Intramolecular Rearrangement of (*E*)-3-Styrylquinolin-4(1*H*)-ones under Irradiation with 365 nm UV Light

Sisi Jing, Yun He, Tao Wang, Jin Zhang, Anqi Cheng, Yong Liang† and Zunting Zhang*

Key Laboratory of the Ministry of Education for Medicinal Resources and Natural Pharmaceutical Chemistry, National Engineering Laboratory for Resource Development of Endangered Crude Drugs in Northwest of China, and School of Chemistry and Chemical Engineering, Shaanxi Normal University, Xi'an 710119, People's Republic of China.

E-mail: zhangzunting@sina.com

Table of Contents

1. General Experimental Procedure

All reagents in reactions were purchased from commercial sources. THF was distilled from sodium/benzophenone immediately prior to use. Thin-layer chromatography (TLC) used silica gel 60 GF254 plates. The silica gel (size 200-300 mesh) was used for the column chromatography. ^{1}H NMR yields shown were determined with 1,3,5-trimethoxybenzene as internal standard. ^{1}H NMR and ^{13}C NMR spectra were recorded on Bruker 400 or 600 MHz Spectrometer (^{1}H: 400 MHz or 600 MHz, ^{13}C: 101 MHz or 151 MHz) using $CDCl_3$, DMSO-d_6 or CF_3COOD as the solvent. Chemical shifts (δ) were expressed in ppm and the coupling constants (*J*) were expressed in Hz. Melting points were measured using X-5 melting point apparatus and were uncorrected. IR spectra were recorded using a Nicollet 170SX FT-IR spectrophotometer and high resolution mass spectrometry (HRMS) was recorded using the electron-spray quadrupole-time-of-flight ionization (ESI-Q-TOF) technique. The irradiation experiments were performed in a WATTECS WP-TEC-1020 photo-chemical reactor equipped with a 10 W lamp.

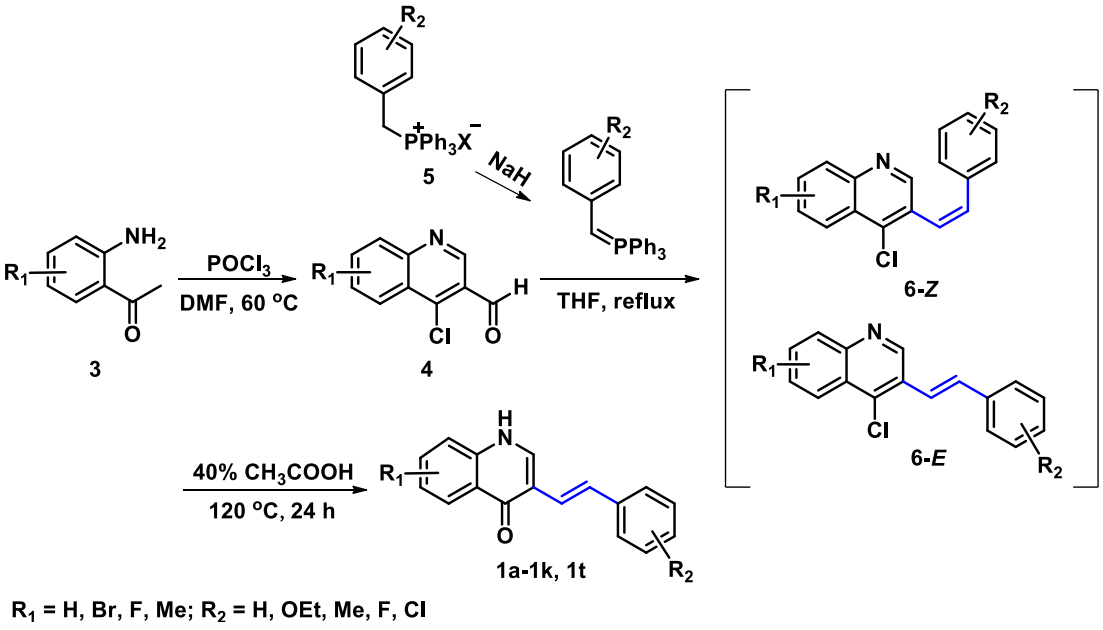
1-1. Synthesis of (*E*)-3-Styrylquinolin-4(1*H*)-ones 1a-1k and 1t

(*E*)-3-styrylquinolin-4(1*H*)-ones **1a-1k** and **1t** were prepared according to the literature procedure (**Scheme 1**).[1, 2] $POCl_3$ (123.4 mmol) was added dropwise to 25 mL dry *N*,*N*-dimethylformamide (DMF) at 0 ^{o}C under argon, and the mixture was stirred for 15 min at room temperature. Then a solution of **3** 1-(2-aminophenyl) ethanones (20.6 mmol) in dry DMF (3 mL) was added dropwise. The reaction solution was heated to 60 ^{o}C and stirred for 4 h. The reaction was stopped by poured into 100 g ice and 100 mL water, and neutralized with $NaHCO_3$. The formed solid was filtered off, dissolved into 200 mL CH_2Cl_2 and washed with 3 × 200 mL water. The organic layer was dried over Na_2SO_4 and concentrated under reduced pressure. The resulting solid was purified by column chromatography on silica gel (petroleum ether: ethyl acetate = 20:1-10:1) to afford 4-chloroquinoline-3-carbaldehydes **4**.

A mixture of sodium hydride (6.0 mmol) and appropriate phosphonium halide (6.0 mmol) in 50 mL dry THF was refluxed 3 h (R_2 = H, Me, F, Cl) or 1 h (R_2 = OEt) under argon. When the solution turned into orange, and the suspension of the

phosphonium salt disappeared, it indicated that ylide was formed. Subsequently, 4-chloroquinoline-3-carbaldehydes **4** (2.0 mmol) was added at the same temperature under magnetic stirring for 1 h. After the reaction mixture was cooled to room temperature, it was poured into 80 g ice and 80 mL water and acidified with 2M HCl solution until the pH was adjusted to 5. The mixture was extracted with 3 × 80 mL CH_2Cl_2 and then the organic phases were combined, dried over Na_2SO_4 and concentrated under reduced pressure. The resulting solid was purified by column chromatography on silica gel (petroleum ether: ethyl acetate = 30:1-15:1) to get **6-(*Z*)** and **6-(*E*)**.

A suspension of a mixture of (*Z*)- and (*E*)-4-chloro-3-styrylquinolines **6** (1.0 mmol) was stirred under 120 ^{o}C for 24 h in 40% aqueous formic acid (32 mL). The resulting suspension was cooled for 30 min in ice-water, and then Na_2CO_3 was added to adjust the value of pH to 5, and the precipitate of (*E*)-3-styrylquinolin-4(1*H*)-ones derivatives **1a-1k** and **1t** were collected by suction filtration and washed with water without the need for further purification.

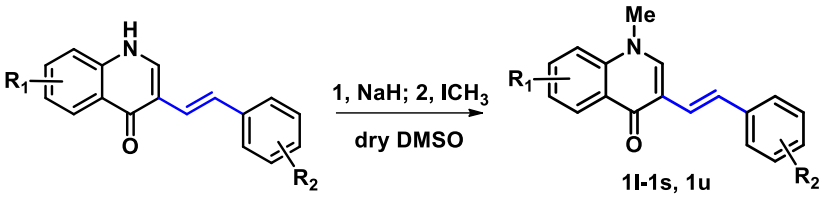


Scheme 1 Synthesis of (*E*)-3-Styrylquinolin-4(1*H*)-ones **1a-1k** and **1t**.

1-2. Synthesis of (*E*)-3-Styrylquinolin-4(1*H*)-ones 1l-1s and 1u

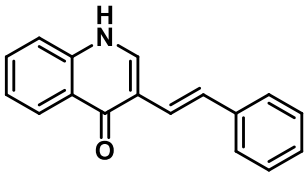
(*E*)-3-styrylquinolin-4(1*H*)-ones **1l-1s** and **1u** were prepared according to the literature procedure (**Scheme 2**).[1-3] A stirred suspension of (*E*)-3-styrylquinolin-

4(1*H*)-ones (0.5 mmol) in dry dimethyl sulfoxide (DMSO, 2.5 mL) was treated with NaH (0.75 mmol) at room temperature. The mixture was stirred for further 2 h until hydrogen evolution ceased and then treated with iodomethane (0.75 mmol). After (*E*)-3-styryl-4-quinolones had disappeared completely, the reaction solution was quenched with cold water and acidified with dilute hydrochloric acid until the pH reached 4-5. The mixture was extracted with 3 × 15 mL CH_2Cl_2 and washed with 3 × 15 mL water. The organic phases were combined, dried over Na_2SO_4 and concentrated under reduced pressure. The resulting solid was purified by column chromatography on silica gel to get **1l-1s** and **1u**.



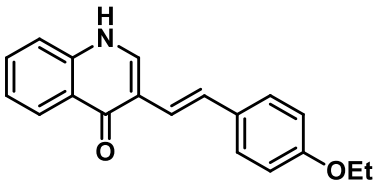
Scheme 2 Synthesis of (*E*)-3-Styrylquinolin-4(1*H*)-ones **1l-1s** and **1u**.

2. Spectroscopic data



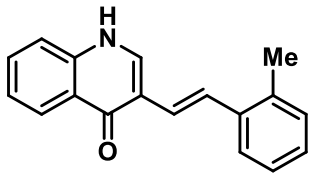
(*E*)-3-styrylquinolin-4(1*H*)-one (1a)[4]

227.3 mg. Yield: 37%. White soild. m.p. 258.2-260.1 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 12.15 (s, 1H), 8.29 (s, 1H), 8.21 (d, *J* = 8.0 Hz, 1H), 7.80 (d, *J* = 16.3 Hz, 1H), 7.65 (t, *J* = 7.6 Hz, 1H), 7.58-7.56 (m, 1H), 7.51 (d, *J* = 7.6 Hz, 2H), 7.35 (t, *J* = 7.6 Hz, 3H), 7.24-7.20 (m, 2H); HRMS (ESI): calculated for $C_{17}H_{13}NO$ $[M + H]^+$ 248.1070, found 248.1066.



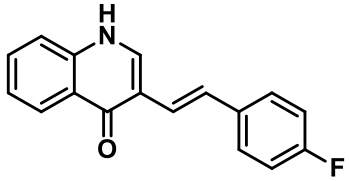
(*E*)-3-(4-ethoxystyryl)quinolin-4(1*H*)-one (1b)[5]

253.3 mg. Yield: 34%. White soild. m.p. 268.6-269.2 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 12.08 (s, 1H), 8.24 (s, 1H), 8.20 (d, J = 8.0 Hz, 1H), 7.70 (d, J = 16.3 Hz, 1H), 7.66-7.62 (m, 1H), 7.57-7.55 (m, 1H), 7.42 (d, J = 8.6 Hz, 2H), 7.34 (t, J = 7.4 Hz, 1H), 7.06 (d, J = 16.3 Hz, 1H), 6.91 (d, J = 8.6 Hz, 2H), 4.03 (q, J = 6.9 Hz, 2H), 1.33 (t, J = 6.9 Hz, 3H); HRMS (ESI): calculated for $C_{19}H_{17}NO_2$ $[M + H]^+$ 292.1332, found 292.1330.



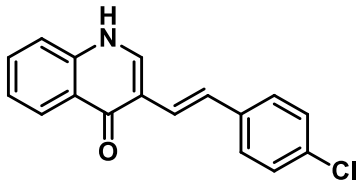
(*E*)-3-(2-methylstyryl)quinolin-4(1*H*)-one (1c)

216.7 mg. Yield: 34%. White soild. m.p. 266.1-270.0 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 12.14 (s, 1H), 8.70-7.88 (m, 3H), 7.60 (s, 3H), 7.36-7.13 (m, 5H), 2.38 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 175.3, 139.1, 138.6, 137.3, 134.8, 131.4, 130.2, 126.6, 126.1, 125.4, 125.2, 125.5, 124.4, 124.2, 123.4, 118.3, 117.1, 19.6; IR (KBr), v (cm^{-1}) 3526, 3078, 1510, 1385, 1250, 962, 767, 694, 501; HRMS (ESI): calculated for $C_{18}H_{15}NO$ $[M + H]^+$ 262.1227, found 262.1226.



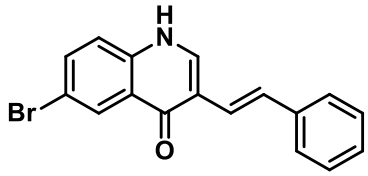
(*E*)-3-(4-fluorostyryl)quinolin-4(1*H*)-one (1d)

225.3 mg. Yield: 40%. White soild. m.p. 294.9-296.3 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 12.15 (s, 1H), 8.26 (s, 1H), 8.21 (d, J = 8.0 Hz, 1H), 7.79 (d, J = 16.3 Hz, 1H), 7.67-7.63 (m, 1H), 7.58-7.52 (m, 3H), 7.35 (t, J = 7.4 Hz, 1H), 7.20-7.13 (m, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 175.2, 161.1 (d, ^1J = 249.9 Hz), 138.8, 138.6, 135.0 (d, ^4J = 3.0 Hz), 131.4, 127.5 (d, ^3J = 8.0 Hz), 125.4, 125.4, 125.4, 124.1 (d, ^5J = 2.0 Hz), 123.4, 118.4, 116.7, 115.5 (d, ^2J = 21.5 Hz); IR (KBr), v (cm^{-1}) 3479, 2991, 2907, 1510, 1227, 1148, 964, 760, 704, 527; HRMS (ESI): calculated for $C_{17}H_{12}FNO$ $[M + H]^+$ 266.0976, found 266.0972.



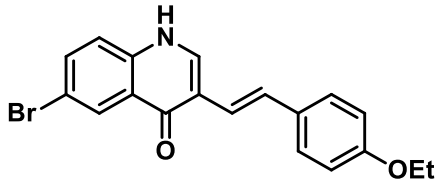
(*E*)-3-(4-chlorostyryl)quinolin-4(1*H*)-one (1e)[2]

238.9 mg. Yield: 35%. Yellow soild. m.p. > 300 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 12.16 (s, 1H), 8.28 (s, 1H), 8.21 (d, J = 7.9 Hz, 1H), 7.80 (d, J = 16.3 Hz, 1H), 7.67-7.63 (m, 1H), 7.57 (d, J = 8.2 Hz, 1H), 7.51 (d, J = 8.4 Hz, 2H), 7.40-7.32 (m, 3H), 7.22 (d, J = 16.3 Hz, 1H); HRMS (ESI): calculated for $C_{17}H_{12}ClNO$ $[M + H]^+$ 282.0680, found 282.0676.



(*E*)-6-bromo-3-styrylquinolin-4(1*H*)-one (1f)

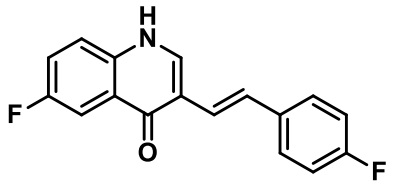
295.8 mg. Yield: 39%. Yellow soild. m.p. > 300 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 12.30 (s, 1H), 8.33 (s, 1H), 8.28 (d, J = 2.0 Hz, 1H), 7.83-7.76 (m, 2H), 7.55 (d, J = 8.8 Hz, 1H), 7.51 (d, J = 7.6 Hz, 2H), 7.36 (t, J = 7.6 Hz, 2H), 7.24-7.18 (m, 2H); ^{13}C NMR (150 MHz, DMSO-d_6) δ 173.8, 139.2, 138.3, 137.5, 134.1, 128.7, 127.5, 127.2, 126.9, 126.7, 125.8, 123.7, 121.1, 117.2, 116.1; IR (KBr), v (cm^{-1}) 3416, 2991, 2025, 1614, 1385, 1069, 812, 621, 523; HRMS (ESI): calculated for $C_{17}H_{12}BrNO$ $[M + H]^+$ 326.0175, found 326.0175.



(*E*)-6-bromo-3-(4-ethoxystyryl)quinolin-4(1*H*)-one (1g)

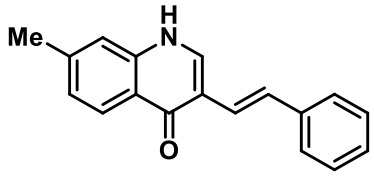
343.2 mg. Yield: 36%. Yellow soild. m.p. > 300 ℃. ^{1}H NMR (400 MHz, CF_3COOD) δ 8.83 (s, 1H), 8.63 (d, J = 1.3 Hz, 1H), 8.05-8.03 (m, 1H), 7.85 (d, J = 9.0 Hz, 1H), 7.47 (d, J = 8.6 Hz, 2H), 7.14 (s, 2H), 7.00 (d, J = 8.6 Hz, 2H), 4.25 (q, J = 7.0 Hz, 2H), 1.42 (t, J = 7.1 Hz, 3H); ^{13}C NMR (100 MHz, CF_3COOD) δ 164.1, 157.9, 141.8, 138.5, 137.2, 136.4, 129.8, 128.4, 125.7, 123.8, 120.7, 120.5, 118.8, 116.0, 112.6,

66.0, 12.5; IR (KBr), ν (cm^{-1}) 3526, 3045, 1506, 1252, 1043, 960, 814, 528; HRMS (ESI): calculated for $C_{19}H_{16}BrNO_2$ $[M + H]^+$ 370.0437, found 370.0435.



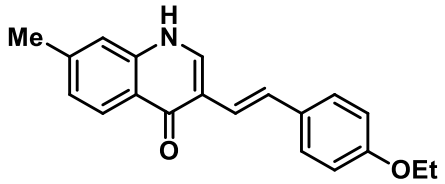
(*E*)-6-fluoro-3-(4-fluorostyryl)quinolin-4(1*H*)-one (1h)

243.5 mg. Yield: 36%. Yellow soild. m.p. > 300 ℃. ^{1}H NMR (600 MHz, DMSO-d_6) δ 12.29 (s, 1H), 8.30 (s, 1H), 7.84-7.83 (m, 1H), 7.80 (d, J = 16.5 Hz, 1H), 7.66-7.64 (m, 1H), 7.58-7.52 (m, 3H), 7.18 (t, J = 8.7 Hz, 2H), 7.14 (d, J = 16.3 Hz, 1H); ^{13}C NMR (150 MHz, DMSO-d_6) δ 174.3 (d, ^4J = 2.0 Hz), 161.2 (d, ^1J = 244.3 Hz), 158.5 (d, ^1J = 242.1 Hz), 139.0, 135.3, 134.9 (d, ^4J = 2.8 Hz), 127.5 (d, ^3J = 7.8 Hz), 126.4 (d, ^3J = 6.3 Hz), 125.8, 123.8 (d, ^5J = 1.4 Hz), 121.2 (d, ^3J = 8.2 Hz), 120.3 (d, ^2J = 25.8 Hz), 116.0, 115.5 (d, ^2J = 21.3 Hz), 109.3 (d, ^2J = 21.2 Hz); IR (KBr), ν (cm^{-1}) 3414, 3003, 2841, 1506, 1238, 1146, 970, 824, 569; HRMS (ESI): calculated for $C_{17}H_{11}F_2NO$ $[M + H]^+$ 284.0882, found 284.0876.



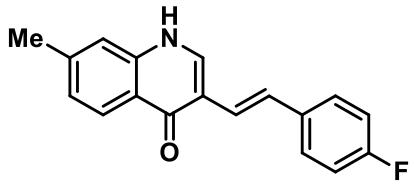
(*E*)-7-methyl-3-styrylquinolin-4(1*H*)-one (1i)

214.1 mg. Yield: 32%. Yellow soild. m.p. 294.7-295.6 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 12.01 (s, 1H), 8.22 (s, 1H), 8.09 (d, J = 8.4 Hz, 1H), 7.78 (d, J = 16.3 Hz, 1H), 7.50 (d, J = 7.6 Hz, 2H), 7.37-7.33 (m, 3H), 7.22-7.16 (m, 3H), 2.43 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 175.1, 141.6, 138.8, 138.6, 138.5, 128.6, 126.7, 126.4, 125.7, 125.4, 125.2, 124.2, 123.4, 117.5, 116.6, 21.2; IR (KBr), ν (cm^{-1}) 3416, 3080, 2920, 1512, 1375, 1229, 960, 743, 691, 500; HRMS (ESI): calculated for $C_{18}H_{15}NO$ $[M + H]^+$ 262.1227, found 262.1222.



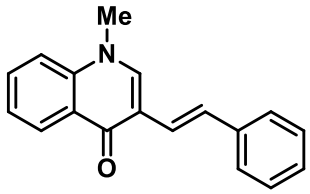
(*E*)-3-(4-ethoxystyryl)-7-methylquinolin-4(1*H*)-one (1j)

265.4 mg. Yield: 36%. White soild. m.p. 284.0-284.7 ℃. ^{1}H NMR (400 MHz, CF_3COOD) δ 8.69 (s, 1H), 8.34 (d, *J* = 8.7 Hz, 1H), 7.71 (s, 1H), 7.63 (d, *J* = 8.7 Hz, 1H), 7.46 (d, *J* = 8.3 Hz, 2H), 7.17-7.07 (m, 2H), 6.99 (d, *J* = 8.4 Hz, 2H), 4.26 (q, *J* = 6.9 Hz, 2H), 2.58 (s, 3H), 1.41 (t, *J* = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, CF_3COOD) δ 165.2, 157.7, 148.4, 140.8, 138.3, 136.3, 131.3, 130.1, 128.2, 122.7, 117.9, 117.6, 117.5, 116.1, 113.2, 66.1, 20.1, 12.5; IR (KBr), *v* (cm^{-1}) 3416, 3057, 2874, 1616, 1520, 1387, 1074, 750, 609, 492; HRMS (ESI): calculated for $C_{20}H_{19}NO_2$ $[M + H]^+$ 306.1489, found 306.1484.



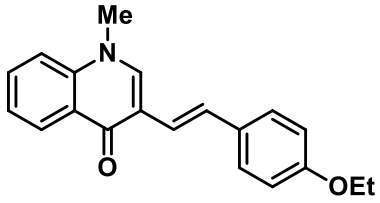
(*E*)-3-(4-fluorostyryl)-7-methylquinolin-4(1*H*)-one (1k)

226.1 mg. Yield: 32%. Yellow soild. m.p. > 300 ℃. ^{1}H NMR (600 MHz, DMSO-d_6) δ 12.01 (s, 1H), 8.20 (s, 1H), 8.08 (d, *J* = 8.2 Hz, 1H), 7.77 (d, *J* = 16.3 Hz, 1H), 7.56-7.48 (m, 2H), 7.32 (s, 1H), 7.19-7.10 (m, 4H), 2.42 (d, *J* = 12.6 Hz, 3H); ^{13}C NMR (150 MHz, DMSO-d_6) δ 175.1, 161.1 (d, ^{1}J = 243.7 Hz), 141.6, 138.7, 138.6, 135.1 (d, ^{4}J = 2.8 Hz), 127.4 (d, ^{3}J = 7.8 Hz), 125.4, 125.2, 125.2, 124.2, 123.4, 117.5, 116.5, 115.5 (d, ^{2}J = 21.2 Hz), 21.2; IR (KBr), *v* (cm^{-1}) 3524, 3072, 2910, 1508, 1464, 1229, 960, 770, 690, 494; HRMS (ESI): calculated for $C_{18}H_{14}FNO$ $[M + H]^+$ 280.1132, found 280.1129.



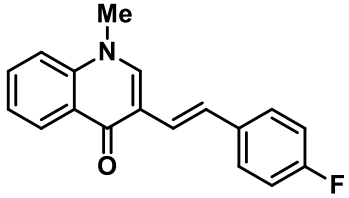
(*E*)-1-methyl-3-styrylquinolin-4(1*H*)-one (1l)[1]

109.7 mg. Yield: 31%. White soild. m.p. 137.8-138.7 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.44 (d, *J* = 8.0 Hz, 1H), 7.57 (d, *J* = 16.3 Hz, 1H), 7.52-7.49 (m, 2H), 7.45 (d, *J* = 7.6 Hz, 2H), 7.32-7.28 (m, 3H), 7.23-7.19 (m, 2H), 7.00 (d, *J* = 16.3 Hz, 1H), 3.68 (s, 3H); HRMS (ESI): calculated for $C_{18}H_{15}NO$ $[M + H]^+$ 262.1227, found 262.1223.



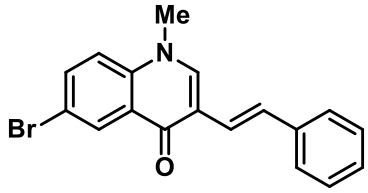
(*E*)-3-(4-ethoxystyryl)-1-methylquinolin-4(1*H*)-one (1m)[5]

114.4 mg. Yield: 26%. White soild. m.p. 140.7-142.0 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (d, *J* = 8.0 Hz, 1H), 7.54-7.47 (m, 3H), 7.37 (d, *J* = 8.4 Hz, 2H), 7.30 (t, *J* = 7.5 Hz, 1H), 7.26-7.23 (m, 1H), 6.90 (d, *J* = 16.3 Hz, 1H), 6.82 (d, *J* = 8.5 Hz, 2H), 4.01 (q, *J* = 6.9 Hz, 2H), 3.70 (s, 3H), 1.40 (t, *J* = 7.0 Hz, 3H); HRMS (ESI): calculated for $C_{20}H_{19}NO_2$ $[M + H]^+$ 306.1489, found 306.1486.



(*E*)-3-(4-fluorostyryl)-1-methylquinolin-4(1*H*)-one (1n)[5]

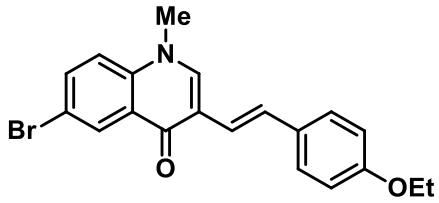
122.8 mg. Yield: 35%. Yellow soild. m.p. 162.6-163.0 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.41 (d, *J* = 8.0 Hz, 1H), 7.53-7.46 (m, 3H), 7.35-7.31 (m, 2H), 7.29-7.26 (m, 1H), 7.17 (d, *J* = 8.5 Hz, 1H), 6.94 (t, *J* = 8.6 Hz, 2H), 6.82 (d, *J* = 16.3 Hz, 1H), 3.66 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.0, 161.9 (d, ^{1}J = 247.1 Hz), 142.4, 139.1, 134.4 (d, ^{4}J = 3.2 Hz), 131.7, 127.6 (d, ^{3}J =7.9 Hz), 126.8, 126.7, 126.5, 123.7, 122.5 (d, ^{5}J = 2.2 Hz), 117.9, 115.4, 115.4 (d, ^{2}J = 21.6 Hz), 40.8; HRMS (ESI): calculated for $C_{18}H_{14}FNO$ $[M + H]^+$ 280.1132, found 280.1129.



(*E*)-6-bromo-1-methyl-3-styrylquinolin-4(1*H*)-one (1o)

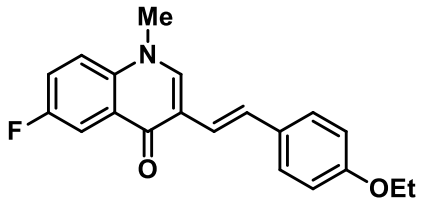
144.1 mg. Yield: 33%. Yellow soild. m.p. 228.1-230.6 ℃. ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.41 (s, 1H), 8.33 (d, *J* = 2.0 Hz, 1H), 7.86 (dd, *J* = 9.1, 2.2 Hz, 1H), 7.73-7.65 (m, 2H), 7.49 (d, *J* = 7.7 Hz, 2H), 7.36 (t, *J* = 7.5 Hz, 2H), 7.23 (t, *J* = 7.3 Hz, 1H), 7.14 (d, *J* = 16.2 Hz, 1H), 3.89 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 173.3, 144.5, 138.2, 138.0, 134.2, 128.7, 127.9, 127.4, 127.2, 127.0, 125.8, 123.0,

119.6, 117.2, 116.6, 40.5; IR (KBr), ν (cm^{-1}) 3416, 3057, 1580, 1483, 1333, 1115, 972, 752, 694, 519; HRMS (ESI): calculated for $C_{18}H_{14}BrNO$ $[M + H]^+$ 340.0332, found 340.0331.



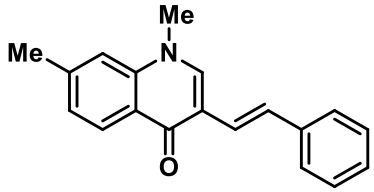
(*E*)-6-bromo-3-(4-ethoxystyryl)-1-methylquinolin-4(1*H*)-one (1p)

176.2 mg. Yield: 33%. Yellow soild. m.p. 191.6-192.7 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.36 (d, J = 2.4 Hz, 1H), 7.43 (dd, J = 9.0, 2.3 Hz, 1H), 7.36-7.26 (m, 4H), 6.99 (d, J = 9.0 Hz, 1H), 6.80 (d, J = 8.6 Hz, 2H), 6.72 (d, J = 16.3 Hz, 1H), 4.00 (q, J = 7.0 Hz, 2H), 3.62 (s, 3H), 1.41 (t, J = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.5, 158.5, 141.7, 137.7, 134.3, 130.6, 129.1, 127.9, 127.5, 127.3, 119.8, 118.8, 117.5, 117.4, 114.7, 63.5, 41.0, 14.9; IR (KBr), ν (cm^{-1}) 3410, 2978, 2881, 1580, 1472, 1250, 1047, 810, 600; HRMS (ESI): calculated for $C_{20}H_{18}BrNO_2$ $[M + H]^+$ 384.0594, found 384.0592.



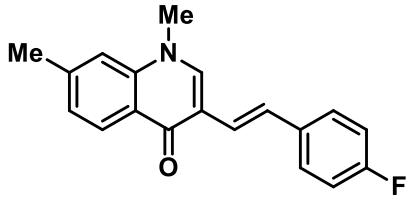
(*E*)-3-(4-ethoxystyryl)-6-fluoro-1-methylquinolin-4(1*H*)-one (1q)

130.9 mg. Yield: 23%. Yellow soild. m.p. 148.6-149.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (d, J = 9.1 Hz, 1H), 7.44-7.40 (m, 2H), 7.32 (d, J = 8.5 Hz, 2H), 7.20-7.19 (m, 2H), 6.82-6.76 (m, 3H), 4.01 (q, J = 7.0 Hz, 2H), 3.69 (s, 3H), 1.40 (t, J = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.0 (d, ^4J = 2.4 Hz), 159.1 (d, ^1J = 246.2 Hz), 158.4, 141.7, 135.6, 130.7, 127.9, 127.7 (d, ^3J = 6.9 Hz), 127.4, 120.0 (d, ^2J = 25.3 Hz), 120.0, 117.8, 117.6 (d, ^3J = 7.8 Hz), 114.6, 111.3 (d, ^2J = 22.7 Hz), 63.5, 41.1, 14.9; IR (KBr), ν (cm^{-1}) 3414, 3003, 1649, 1531, 1356, 1279, 1194, 1067, 937, 841, 621, 492; HRMS (ESI): calculated for $C_{20}H_{18}FNO_2$ $[M + H]^+$ 324.1395, found 324.1395.



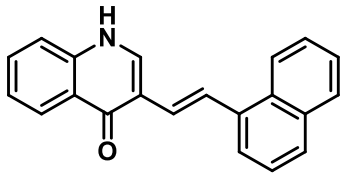
(*E*)-1,7-dimethyl-3-styrylquinolin-4(1*H*)-one (1r)

97.7 mg. Yield: 23%. Yellow soild. m.p. 166.3-167.2 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.30 (d, *J* = 8.2 Hz, 1H), 7.52 (d, *J* = 16.3 Hz, 1H), 7.43-7.40 (m, 3H), 7.29 (t, *J* = 7.5 Hz, 2H), 7.21-7.17 (m, 1H), 7.09 (d, *J* = 8.2 Hz, 1H), 6.94 (d, *J* = 16.2 Hz, 2H), 3.64 (s, 3H), 2.37 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.0, 142.5, 142.1, 139.3, 138.4, 128.6, 127.7, 127.0, 126.8, 126.3, 125.4, 124.6, 122.8, 117.8, 115.3, 40.9, 22.1; IR (KBr), *v* (cm^{-1}) 3524, 3300, 1732, 1574, 1452, 1248, 1121, 968, 748, 694, 554; HRMS (ESI): calculated for $C_{19}H_{17}NO$ $[M + H]^+$ 276.1383, found 276.1383.



(*E*)-3-(4-fluorostyryl)-1,7-dimethylquinolin-4(1*H*)-one (1s)

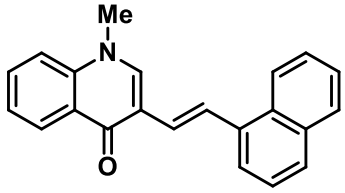
114.3 mg. Yield: 25%. Yellow soild. m.p. 206.1-207.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 8.4 Hz, 1H), 7.53 (d, *J* = 16.3 Hz, 1H), 7.49 (s, 1H), 7.39-7.36 (m, 2H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.02 (s, 1H), 6.97 (t, *J* = 8.7 Hz, 2H), 6.88 (d, *J* = 16.4 Hz, 1H), 3.71 (s, 3H), 2.42 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.1, 162.1 (d, ^{1}J = 247.0 Hz), 142.7, 142.2, 139.5, 134.6 (d, ^{4}J = 2.9 Hz), 127.7 (d, ^{3}J = 8.1 Hz), 127.0, 126.8, 125.6, 124.7, 122.6 (d, ^{5}J = 2.0 Hz), 118.0, 115.5 (d, ^{2}J = 21.4 Hz), 115.2, 40.9, 22.2; IR (KBr), *v* (cm^{-1}) 3645, 3306, 3045, 1873, 1576, 1504, 1323, 1219, 1121, 970, 771, 698, 525; HRMS (ESI): calculated for $C_{19}H_{16}FNO$ $[M + H]^+$ 294.1289, found 294.1289.



(*E*)-3-(2-(naphthalen-1-yl)vinyl)quinolin-4(1*H*)-one (1t)

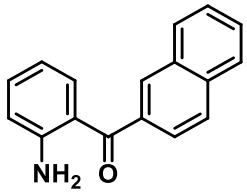
291.2 mg. Yield: 41%. Yellow soild. m.p. 243.9-244.2 ℃. ^{1}H NMR (400 MHz,

DMSO-d_6) δ 12.53 (s, 1H), 8.68 (d, J = 16.0 Hz, 1H), 8.51 (s, 1H), 8.34 (d, J = 8.3 Hz, 1H), 8.28 (d, J = 8.0 Hz, 1H), 7.94 (d, J = 8.0 Hz, 1H), 7.84-7.82 (m, 2H), 7.71-7.65 (m, 2H), 7.61-7.52 (m, 3H), 7.42-7.39 (m, 1H), 7.32 (d, J = 16.0 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 174.7, 139.7, 138.6, 135.6, 133.5, 131.6, 130.7, 128.5, 127.1, 126.5, 126.1, 125.9, 125.9, 125.4, 125.2, 123.9, 123.7, 123.4, 122.2, 118.6, 117.0; IR (KBr), v (cm^{-1}) 3711, 3518, 3304, 3036, 2793, 1736, 1487, 1321, 959, 783, 698, 515; HRMS (ESI): calculated for $C_{21}H_{15}NO$ $[M + H]^+$ 298.1227, found 298.1223.



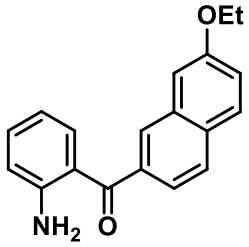
(*E*)-1-methyl-3-(2-(naphthalen-1-yl)vinyl)quinolin-4(1*H*)-one (1u)

126.0 mg. Yield: 33%. Yellow soild. m.p. 181.1-181.9 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.62 (d, J = 15.9 Hz, 1H), 8.51 (d, J = 7.8 Hz, 1H), 8.33 (d, J = 7.8 Hz, 1H), 7.84-7.81 (m, 1H), 7.72 (d, J = 8.1 Hz, 1H), 7.67 (d, J = 7.1 Hz, 1H), 7.56 (s, 1H), 7.53 (d, J = 8.6 Hz, 1H), 7.50-7.45 (m, 2H), 7.41 (t, J = 7.7 Hz, 1H), 7.34 (t, J = 7.5 Hz, 1H), 7.22 (d, J = 8.5 Hz, 1H), 6.97 (d, J = 16.0 Hz, 1H), 3.67 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.4, 143.2, 139.2, 136.1, 133.8, 131.8, 131.4, 128.5, 127.5, 127.1, 126.9, 126.0, 125.8, 125.6, 124.3, 123.9, 122.8, 118.5, 115.4, 40.9; IR (KBr), v (cm^{-1}) 3416, 3038, 2924, 1736, 1614, 1495, 1317, 1115, 960, 770, 550; HRMS (ESI): calculated for $C_{22}H_{17}NO$ $[M + H]^+$ 312.1383, found 312.1382.



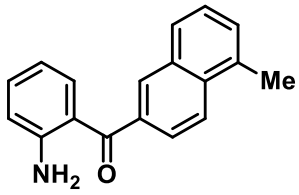
(2-Aminophenyl)(naphthalen-2-yl)methanone (2a)[6]

37.1 mg. Yield: 75%. Yellow soild. m.p. 108.1-109.0 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13 (s, 1H), 7.94-7.90 (m, 3H), 7.79-7.76 (m, 1H), 7.61-7.51 (m, 3H), 7.34-7.30 (m, 1H), 6.79-7.76 (m, 1H), 6.65-6.61 (m, 1H), 6.09 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.1, 151.0, 137.4, 134.7, 134.3, 132.4, 130.2, 129.2, 128.1, 127.9, 127.8, 126.8, 125.9, 118.6, 117.2, 115.7; HRMS (ESI): calculated for $C_{17}H_{13}NO$ $[M + H]^+$ 248.1070, found 248.1067.



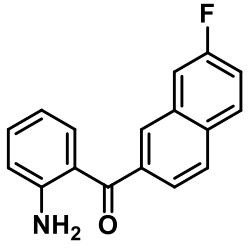
(2-Aminophenyl)(7-ethoxynaphthalen-2-yl)methanone (2b)

48.3 mg. Yield: 83%. Yellow soild. m.p. 104.7-105.2 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.83-7.76 (m, 2H), 7.60 (dd, *J* = 8.4, 1.7 Hz, 1H), 7.51 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.31-7.27 (m, 1H), 7.24-7.21(m, 1H), 7.17-7.16 (m, 1H), 6.75-6.73 (m, 1H), 6.63-6.58 (m, 1H), 6.07 (s, 2H), 4.14 (q, *J* = 7.0 Hz, 2H), 1.47 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.3, 157.6, 151.0, 137.9, 134.8, 134.2, 133.8, 130.2, 129.3, 128.9, 127.8, 123.6, 121.0, 118.7, 117.1, 115.7, 107.6, 63.7, 14.9; IR (KBr), *v* (cm^{-1}) 3665, 3474, 3348, 1917, 1576, 1232, 1036, 889, 851, 750, 530; HRMS (ESI): calculated for $C_{19}H_{17}NO_2$ $[M + H]^+$ 292.1332, found 292.1330.



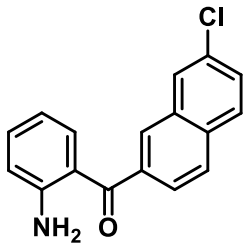
(2-Aminophenyl)(5-methylnaphthalen-2-yl)methanone (2c)

36.6 mg. Yield: 70%. Yellow soild. m.p. 115.1-116.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13 (d, *J* = 1.3 Hz, 1H), 8.10-8.07 (m, 1H), 7.82 (dd, *J* = 8.8, 1.8 Hz, 1H), 7.79-7.77 (m, 1H), 7.54-7.52 (m, 1H), 7.47-7.42 (m, 2H), 7.34-7.30 (m, 1H), 6.77 (d, *J* = 8.5 Hz, 1H), 6.63 (t, *J* = 7.4 Hz, 1H), 6.10 (s, 2H), 2.74 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.1, 151.0, 137.1, 134.7, 134.5, 134.3, 133.9, 132.6, 130.7, 128.5, 127.6, 126.5, 125.7, 124.4, 118.7, 117.2, 115.7, 19.5; IR (KBr), *v* (cm^{-1}) 3674, 3464, 3352, 3157, 1720, 1618, 1258, 1157, 750, 677, 525; HRMS (ESI): calculated for $C_{18}H_{15}NO$ $[M + H]^+$ 262.1227, found 262.1225.



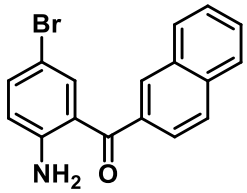
(2-Aminophenyl)(7-fluoronaphthalen-2-yl)methanone (2d)

38.2 mg. Yield: 72%. Yellow soild. m.p. 90.3-91.1 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (s, 1H), 7.94-7.86 (m, 2H), 7.73-7.70 (m 1H), 7.54-7.48 (m, 2H), 7.38-7.30 (m, 2H), 6.78-6.76 (m, 1H), 6.64-6.60 (m, 1H), 6.15 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 161.1 (d, ^{1}J = 248.2 Hz), 151.2, 138.5, 134.7, 134.5, 133.3 (d, ^{3}J = 9.4 Hz), 131.6, 130.3 (d, ^{3}J = 9.0 Hz), 129.1 (d, ^{4}J = 5.4 Hz), 128.1, 125.2 (d, ^{4}J = 2.4 Hz), 118.3, 118.1 (d, ^{2}J = 28.3 Hz), 117.2, 115.7, 112.1 (d, ^{2}J = 20.7 Hz); IR (KBr), ν (cm^{-1}) 3476, 3379, 3061, 1919, 1805, 1585, 1448, 1292, 1231, 1155, 847, 754, 615, 471; HRMS (ESI): calculated for $C_{17}H_{12}FNO$ $[M + H]^+$ 266.0976, found 266.0972.



(2-Aminophenyl)(7-chloronaphthalen-2-yl)methanone (2e)

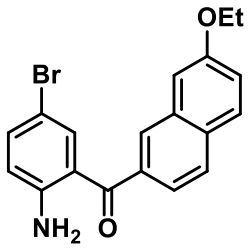
43.3 mg. Yield: 77%. Yellow soild. m.p. 148.1-149.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 (s, 1H), 7.90 (m, 2H), 7.84 (d, J = 8.8 Hz, 1H), 7.77-7.74 (m, 1H), 7.53-7.46 (m, 2H), 7.32 (t, J = 7.7 Hz, 1H), 6.77 (d, J = 8.3 Hz, 1H), 6.61 (t, J = 7.5 Hz, 1H), 6.14 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 198.7, 151.2, 138.5, 134.6, 134.6, 133.1, 132.8, 132.6, 129.5, 128.9, 128.6, 128.1, 127.7, 126.1, 118.2, 117.2, 115.8; IR (KBr), ν (cm^{-1}) 3665, 3464, 3358, 3180, 1919, 1630, 1448, 1335, 1256, 1144, 968, 854, 748, 656, 532; HRMS (ESI): calculated for $C_{17}H_{12}ClNO$ $[M + H]^+$ 282.0680, found 282.0678.



(2-Amino-5-bromophenyl)(naphthalen-2-yl)methanone (2f)

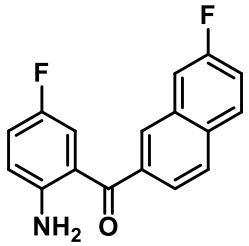
56.6 mg. Yield: 87%. Yellow soild. m.p. 127.2-128.0 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13 (s, 1H), 7.96-7.90 (m, 3H), 7.77 (d, J = 8.3 Hz, 1H), 7.64-7.55 (m, 3H), 7.38-7.35 (m, 1H), 6.69-6.64 (m, 1H), 6.12 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.8, 149.8, 136.9, 136.6, 136.3, 134.8, 132.4, 130.2, 129.3, 128.4, 128.1, 127.9,

126.9, 125.6, 119.8, 118.9, 106.8; HRMS (ESI): calculated for $C_{17}H_{12}BrNO$ $[M + H]^+$ 326.0175, found 326.0171.



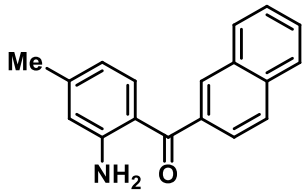
(2-Amino-5-bromophenyl)(7-ethoxynaphthalen-2-yl)methanone (2g)

64.9 mg. Yield: 88%. Yellow soild. m.p. 130.8-131.9 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.84-7.77 (m, 2H), 7.61 (d, *J* = 2.3 Hz, 1H), 7.58-7.56 (m, 1H), 7.36-7.33 (m, 1H), 7.26-7.23 (m, 1H), 7.19-7.18 (m, 1H), 6.64 (d, *J* = 8.8 Hz, 1H), 6.07 (s, 2H), 4.14 (q, *J* = 7.0 Hz, 2H), 1.48 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.2, 157.7, 149.8, 137.1, 136.8, 136.3, 133.8, 130.3, 129.3, 128.9, 128.1, 123.4, 121.3, 120.0, 118.9, 107.7, 106.8, 63.7, 14.9; IR (KBr), *v* (cm^{-1}) 3427, 3321, 2976, 2868, 1906, 1620, 1304, 1221, 1121, 883, 818, 719, 625, 519; HRMS (ESI): calculated for $C_{19}H_{16}BrNO_2$ $[M + H]^+$ 370.0437, found 370.0432.



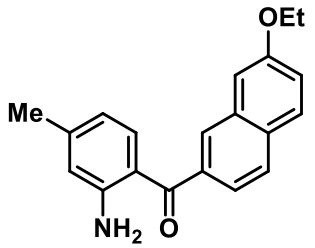
(2-Amino-5-fluorophenyl)(7-fluoronaphthalen-2-yl)methanone (2h)

52.1 mg. Yield: 92%. Yellow soild. m.p. 131.7-132.0 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 (s, 1H), 7.93-7.87 (m, 2H), 7.71-7.69 (m, 1H), 7.53 (dd, *J* = 9.5, 2.4 Hz, 1H), 7.39-7.34 (m, 1H), 7.18 (dd, *J* = 9.6, 2.9 Hz, 1H), 7.11-7.06 (m, 1H), 6.74-6.71 (m, 1H), 5.97 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.8 (d, ^4J = 1.8 Hz), 161.2 (d, ^1J = 248.6 Hz), 153.3 (d, ^1J = 236.2 Hz), 147.6, 137.8, 133.3 (d, ^3J = 9.3 Hz), 131.7, 130.4 (d, ^3J = 9.1 Hz), 129.2 (d, ^4J = 5.5 Hz), 128.3, 124.9 (d, ^4J = 2.6 Hz), 122.5 (d, ^2J = 23.6 Hz), 119.0 (d, ^2J = 22.8 Hz), 118.4 (d, ^2J = 25.4 Hz), 118.4 (d, ^3J = 6.8 Hz), 117.9 (d, ^3J = 5.8 Hz), 112.2 (d, ^2J = 20.7 Hz); IR (KBr), *v* (cm^{-1}) 3447, 3337, 1620, 1551, 1460, 1373, 1234, 1194, 1103, 980, 837, 687, 559, 476; HRMS (ESI): calculated for $C_{17}H_{11}F_2NO$ $[M + H]^+$ 284.0882, found 284.0883.



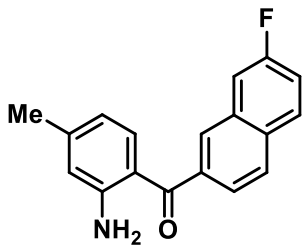
(2-Amino-4-methylphenyl)(naphthalen-2-yl)methanone (2i)

44.4 mg. Yield: 85%. Yellow soild. m.p. 139.7-141.7 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.11 (s, 1H), 7.93-7.90 (m, 3H), 7.76 (d, *J* = 8.4 Hz, 1H), 7.60-7.53 (m, 2H), 7.42 (d, *J* = 8.2 Hz, 1H), 6.58 (s, 1H), 6.44 (d, *J* = 8.1 Hz, 1H), 6.14 (s, 2H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.6, 151.3, 145.4, 137.7, 134.9, 134.6, 132.5, 129.8, 129.1, 128.0, 127.9, 127.7, 126.7, 125.9, 117.2, 116.4, 21.8; IR (KBr), *v* (cm^{-1}) 3651, 3454, 3331, 3161, 2922, 1911, 1583, 1227, 1196, 906, 775, 739, 571; HRMS (ESI): calculated for $C_{18}H_{15}NO$ $[M + H]^+$ 262.1227, found 262.1224.



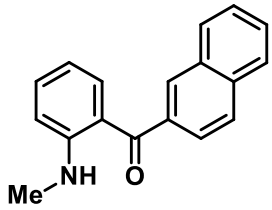
(2-Amino-4-methylphenyl)(7-ethoxynaphthalen-2-yl)methanone (2j)

54.3 mg. Yield: 89%. Yellow soild. m.p. 104.2-105.1 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (s, 1H), 7.81-7.75 (m, 2H), 7.57 (d, *J* = 8.1 Hz, 1H), 7.40 (d, *J* = 8.0 Hz, 1H), 7.22 (d, *J* = 8.8 Hz, 1H), 7.15 (s, 1H), 6.54 (s, 1H), 6.41 (d, *J* = 7.9 Hz, 1H), 6.12 (s, 2H), 4.15-4.10(m, 2H), 2.27 (s, 3H), 1.46 (t, *J* = 6.7 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 157.6, 151.3, 145.3, 138.2, 134.9, 133.7, 130.0, 129.3, 128.5, 127.7, 123.6, 120.9, 117.2, 117.1, 116.4, 107.5, 63.7, 21.8, 14.9; IR (KBr), *v* (cm^{-1}) 3663, 3477, 3342, 2986, 1913, 1572, 1520, 1236, 1043, 837, 731, 546; HRMS (ESI): calculated for $C_{20}H_{19}NO_2$ $[M + H]^+$ 306.1489, found 306.1489.



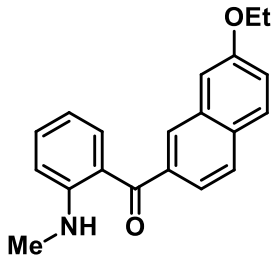
(2-Amino-4-methylphenyl)(7-fluoronaphthalen-2-yl)methanone (2k)

41.9 mg. Yield: 75%. Yellow soild. m.p. 173.3-173.7 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.02 (s, 1H), 7.95-7.84 (m, 2H), 7.69 (d, *J* = 8.4 Hz, 1H), 7.53-7.50 (m, 1H), 7.39-7.32 (m, 2H), 6.57 (s, 1H), 6.43 (d, *J* = 8.2 Hz, 1H), 6.18 (s, 2H), 2.30 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.4, 161.1 (d, ^{1}J = 238.1 Hz), 151.5, 145.7, 138.8, 134.8, 133.3 (d, ^{3}J = 9.2 Hz), 131.43, 130.3 (d, ^{3}J = 9.0 Hz), 128.8, 128.8, 128.0, 125.2 (d, ^{4}J = 2.5 Hz), 118. 0 (d, ^{2}J = 25.5 Hz), 117. 2 (d, ^{4}J = 1.5 Hz) 116.1, 112.0 (d, ^{2}J = 20.7 Hz), 21.8; IR (KBr), *v* (cm^{-1}) 3477, 3341, 2918, 1618, 1229, 851, 773, 544, 478; HRMS (ESI): calculated for $C_{18}H_{14}FNO$ $[M + H]^+$ 280.1132, found 280.1130.



(2-(Methylamino)phenyl)(naphthalen-2-yl)methanone (2l)[7]

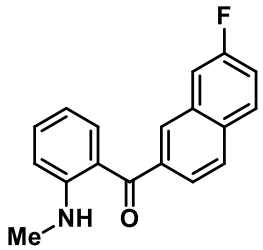
41.8 mg. Yield: 80%. Yellow soild. m.p. 100.7-101.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.56 (s, 1H), 8.09 (s, 1H), 7.94-7.90 (m, 3H), 7.77-7.74 (m, 1H), 7.60-7.53 (m, 3H), 7.44 (t, *J* = 7.8 Hz, 1H), 6.80 (d, *J* = 8.5 Hz, 1H), 6.57 (t, *J* = 7.4 Hz, 1H), 3.00 (d, *J* = 4.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.3, 152.8, 137.9, 135.6, 135.1, 134.5, 132.5, 129.8, 129.1, 128.0, 127.9, 127.6, 126.7, 125.9, 117.6, 113.8, 111.2, 29.6; HRMS (ESI): calculated for $C_{18}H_{15}NO$ $[M + H]^+$ 262.1227, found 262.1226.



(7-Ethoxynaphthalen-2-yl)(2-(methylamino)phenyl)methanone (2m)

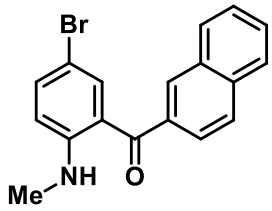
56.7 mg. Yield: 93%. Yellow soild. m.p. 92.9-94.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.52 (d, *J* = 4.0 Hz, 1H), 7.93 (s, 1H), 7.81-7.75 (m, 2H), 7.56-7.53 (m, 2H), 7.42-7.38 (m, 1H), 7.23-7.20 (m, 1H), 7.15 (d, *J* = 2.2 Hz, 1H), 6.76 (d, *J* = 8.5 Hz, 1H), 6.53 (t, *J* = 7.5 Hz, 1H), 4.12 (q, *J* = 7.0 Hz, 2H), 2.96 (d, *J* = 5.0 Hz, 3H), 1.46

(t, J = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.5, 157.6, 152.8, 138.4, 135.7, 135.1, 133.7, 129.9, 129.3, 128.5, 127.7, 123.6, 120.8, 117.7, 113.8, 111.2, 107.5, 63.6, 29.6, 14.9; IR (KBr), v (cm^{-1}) 3418, 2928, 1917, 1616, 1391, 1238, 843, 743, 563; HRMS (ESI): calculated for $C_{20}H_{19}NO_2$ $[M + H]^+$ 306.1489, found 306.1487.



(7-Fluoronaphthalen-2-yl)(2-(methylamino)phenyl)methanone (2n)

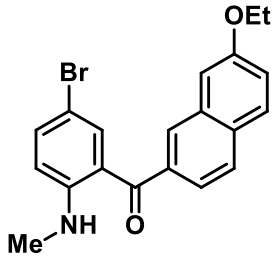
47.4 mg. Yield: 85%. Yellow soild. m.p. 114.3-114.7 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (s, 1H), 8.00 (s, 1H), 7.92-7.86 (m, 2H), 7.69-7.67 (m, 1H), 7.53-7.50 (m, 2H), 7.46-7.42 (m, 1H), 7.37-7.33 (m, 1H), 6.80 (d, J = 8.5 Hz, 1H), 6.56 (t, J = 7.5 Hz, 1H), 3.00 (d, J = 5.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.0, 161.1 (d, ^1J = 248.4 Hz), 152.9, 139.0, 135.6, 135.3, 133.3 (d, ^3J = 9.3 Hz), 131.3, 130.3 (d, ^3J = 9.1 Hz), 128.7 (d, ^4J = 5.4 Hz), 128.0, 125.2 (d, ^4J = 2.5 Hz), 117.9 (d, ^2J = 25.4 Hz), 117.3, 113.9, 112.0 (d, ^2J = 20.4 Hz), 111.3, 29.6; IR (KBr), v (cm^{-1}) 3526, 3333, 2891, 1570, 1506, 1231, 852, 750, 525; HRMS (ESI): calculated for $C_{18}H_{14}FNO$ $[M + H]^+$ 280.1132, found 280.1132.



(5-Bromo-2-(methylamino)phenyl)(naphthalen-2-yl)methanone (2o)

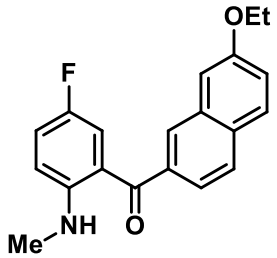
58.3 mg. Yield: 86%. Yellow soild. m.p. 131.4-132.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.47 (d, J = 3.7 Hz, 1H), 8.08 (s, 1H), 7.95-7.90 (m, 3H), 7.73-7.70 (m, 1H), 7.65 (d, J = 2.5 Hz, 1H), 7.62-7.55 (m, 2H), 7.49 (dd, J = 9.0, 2.3 Hz, 1H), 6.69 (d, J = 9.1 Hz, 1H), 2.97 (d, J = 5.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.2, 151.6, 137.6, 137.2, 137.1, 134.7, 132.5, 129.9, 129.2, 128.3, 127.9, 126.9, 125.7, 119.0, 113.3, 105.2, 29.7; IR (KBr), v (cm^{-1}) 3686, 3358, 3146, 1726, 1626, 1504, 1167, 1134, 924,

802, 559; HRMS (ESI): calculated for $C_{18}H_{14}BrNO$ $[M + H]^+$ 340.0332, found 340.0335.



(5-Bromo-2-(methylamino)phenyl)(7-ethoxynaphthalen-2-yl)methanone (2p)

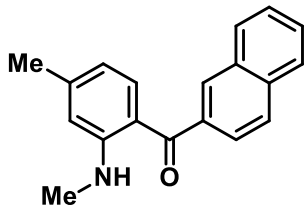
69.0 mg. Yield: 90%. Yellow soild. m.p. 167.3-167.7 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.44 (d, *J* = 4.4 Hz, 1H), 7.93 (s, 1H), 7.83 (d, *J* = 8.4 Hz, 1H), 7.78 (d, *J* = 8.9 Hz, 1H), 7.64-7.63 (m, 1H), 7.54-7.52 (m, 1H), 7.47-7.44 (m, 1H), 7.25-7.23 (m, 1H), 7.19-7.18 (m, 1H), 6.66 (d, *J* = 9.1 Hz, 1H), 4.15 (q, *J* = 7.0 Hz, 2H), 2.95 (t, *J* = 6.4 Hz, 3H), 1.48 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.5, 157.7, 151.5, 137.6, 137.6, 137.1, 133.8, 130.1, 129.3, 128.6, 128.0, 123.4, 121.2, 119.1, 113.2, 107.6, 105.1, 63.7, 29.7, 14.9; IR (KBr), *v* (cm^{-1}) 3684, 3329, 2922, 1624, 1267, 1227, 918, 808, 569; HRMS (ESI): calculated for $C_{20}H_{18}BrNO_2$ $[M + H]^+$ 384.0594, found 384.0595.



(7-Ethoxynaphthalen-2-yl)(5-fluoro-2-(methylamino)phenyl)methanone (2q)

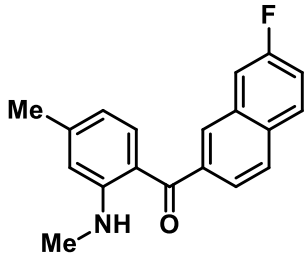
62.0 mg. Yield: 96%. Yellow soild. m.p. 112.3-113.4 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29 (d, *J* = 4.2 Hz, 1H), 7.95 (s, 1H), 7.84-7.77 (m, 2H), 7.57-7.55 (m, 1H), 7.29-7.16 (m, 4H), 6.73-6.69 (m, 1H), 4.15 (q, *J* = 7.0 Hz, 2H), 2.96 (d, *J* = 5.0 Hz, 3H), 1.48 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.5 (d, ^4J = 2.4 Hz), 157.7, 152.3 (d, ^1J = 234.1 Hz), 149.6, 137.7, 133.7, 130.1, 129.3, 128.6, 127.9, 123.4, 122.8 (d, ^2J = 20.0 Hz), 121.1, 120.1 (d, ^2J = 22.7 Hz), 117.2 (d, ^3J = 5.5 Hz), 112.3 (d, ^3J = 6.9 Hz), 107.5, 63.7, 29.9, 14.9; IR (KBr), *v* (cm^{-1}) 3674, 3368, 3140, 2984,

1952, 1520, 1389, 1227, 943, 847, 555; HRMS (ESI): calculated for $C_{20}H_{18}FNO_2$ [M + H]$^+$ 324.1395, found 324.1391.



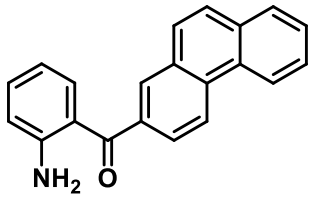
(4-Methyl-2-(methylamino)phenyl)(naphthalen-2-yl)methanone (2r)

52.3 mg. Yield: 95%. Yellow soild. m.p. 122.9-123.4 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.66 (s, 1H), 8.07 (s, 1H), 7.93-7.89 (m, 3H), 7.74-7.72 (m, 1H), 7.59-7.53 (m, 2H), 7.46 (d, *J* = 8.2 Hz, 1H), 6.61 (s, 1H), 6.39 (d, *J* = 8.2 Hz, 1H), 3.00 (d, *J* = 5.0 Hz, 3H), 2.38 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.8, 153.1, 146.3, 138.2, 135.8, 134.4, 132.5, 129.5, 129.0, 128.0, 127.9, 127.5, 126.7, 125.9, 115.5, 115.3, 111.4, 29.6, 22.4; IR (KBr), *v* (cm^{-1}) 3665, 3331, 2930, 1732, 1556, 1269, 820, 775, 565; HRMS (ESI): calculated for $C_{19}H_{17}NO$ [M + H]$^+$ 276.1383, found 276.1383.



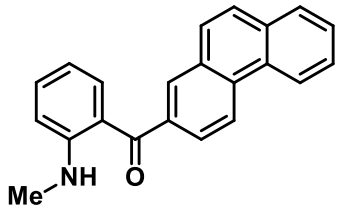
(7-Fluoronaphthalen-2-yl)(4-methyl-2-(methylamino)phenyl)methanone (2s)

45.7 mg. Yield: 78%. Yellow soild. m.p. 126.8-127.7 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.67 (d, *J* = 3.3 Hz, 1H), 7.97 (s, 1H), 7.91-7.86 (m, 2H), 7.65 (d, *J* = 8.1 Hz, 1H), 7.52-7.49 (m, 1H), 7.40 (d, *J* = 8.1 Hz, 1H), 7.37-7.32 (m, 1H), 6.60 (s, 1H), 6.37 (d, *J* = 8.2 Hz, 1H), 2.99 (d, *J* = 5.0 Hz, 3H), 2.37 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.5, 161.1 (d, ^1J = 248.2 Hz), 153.2, 146.5, 139.3, 135.7, 133.3 (d, ^3J = 9.5 Hz), 131.3, 130.3 (d, ^3J = 9.1 Hz), 128.5 (d, ^4J = 5.5 Hz), 128.0, 125.3 (d, ^4J = 2.5 Hz), 117.8 (d, ^2J = 25.5 Hz), 115.4, 115.3, 112.0 (d, ^2J = 20.6 Hz), 111.4, 29.6, 22.5; IR (KBr), *v* (cm^{-1}) 3007, 3335, 3053, 2926, 1907, 1556, 1512, 1412, 1263, 1113, 908, 849, 714, 584, 474; HRMS (ESI): calculated for $C_{19}H_{16}FNO$ [M + H]$^+$ 294.1289, found 294.1287.



(2-Aminophenyl)(phenanthren-2-yl)methanone (2t)

29.7 mg. Yield: 50%. Yellow soild. m.p. 167.3-167.9 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.77-8.72 (m, 2H), 8.18 (s, 1H), 7.96-7.92 (m, 2H), 7.82-7.77 (m, 2H), 7.73-7.65 (m, 2H), 7.56 (d, *J* = 8.1 Hz, 1H), 7.35-7.32 (m, 1H), 6.79 (d, *J* = 8.3 Hz, 1H), 6.64 (t, *J* = 7.5 Hz, 1H), 6.13 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 151.1, 138.0, 134.8, 134.4, 132.8, 132.2, 131.3, 130.2, 130.0, 128.8, 127.9, 127.5, 127.3, 127.1, 126.9, 123.3, 122.8, 118.6, 117.2, 115.8; IR (KBr), *v* (cm^{-1}) 3661, 3468, 3331, 1713, 1576, 1231, 1153, 910, 752, 675, 428; HRMS (ESI): calculated for $C_{21}H_{15}NO$ $[M + H]^+$ 298.1227, found 298.1224.



(2-(Methylamino)phenyl)(phenanthren-2-yl)methanone (2u)

33.6 mg. Yield: 54%. Yellow soild. m.p. 142.6-143.3 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.77-8.72 (m, 2H), 8.59-8.58 (m, 1H), 8.14 (s, 1H), 7.94-7.90 (m, 2H), 7.82-7.77 (m, 2H), 7.72-7.64 (m, 2H), 7.60 (dd, *J* = 8.0, 1.0 Hz, 1H), 7.45 (t, *J* = 7.7 Hz, 1H), 6.81 (d, *J* = 8.6 Hz, 1H), 6.58 (t, *J* = 7.6 Hz, 1H), 3.01 (d, *J* = 5.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.1, 152.9, 138.6, 135.7, 135.2, 132.8, 132.0, 131.4, 130.0, 130.0, 128.8, 127.9, 127.5, 127.3, 127.1, 126.9, 123.2, 122.8, 117.7, 113.9, 111.3, 29.6; IR (KBr), *v* (cm^{-1}) 3653, 3443, 3310, 3167, 1680, 1616, 1414, 1259, 744, 712, 567; HRMS (ESI): calculated for $C_{22}H_{17}NO$ $[M + H]^+$ 312.1383, found 312.1380.

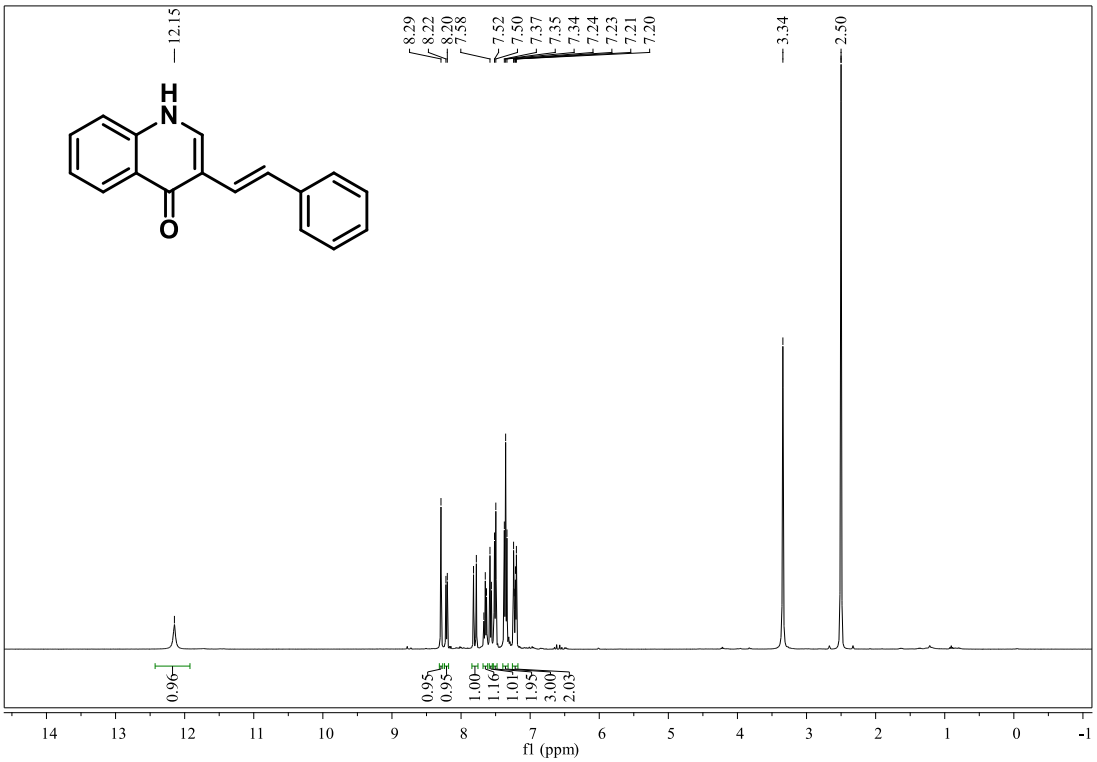
3. References

1. Seixas, R. S. G. R.; Silva, A. M. S.; Alkorta, I.; Elguero, J. *Monatsh. Chem.*, 2011, **142**, 731-742.
2. Seixas, R. S. G. R.; Silva, A. M. S.; Cavaleiro, J. A. S. *Synlett*, 2010, **15**, 2257-2262.
3. Seubert, C. K.; Sun, Y.; Thiel, W. R. *Dalton Trans.*, 2009, **38**, 4971-4977.
4. Almeida, A. I. S.; Silva, A. M. S.; Cavaleiro, J. A. S. *Synlett*, 2010, **3**, 462-466.

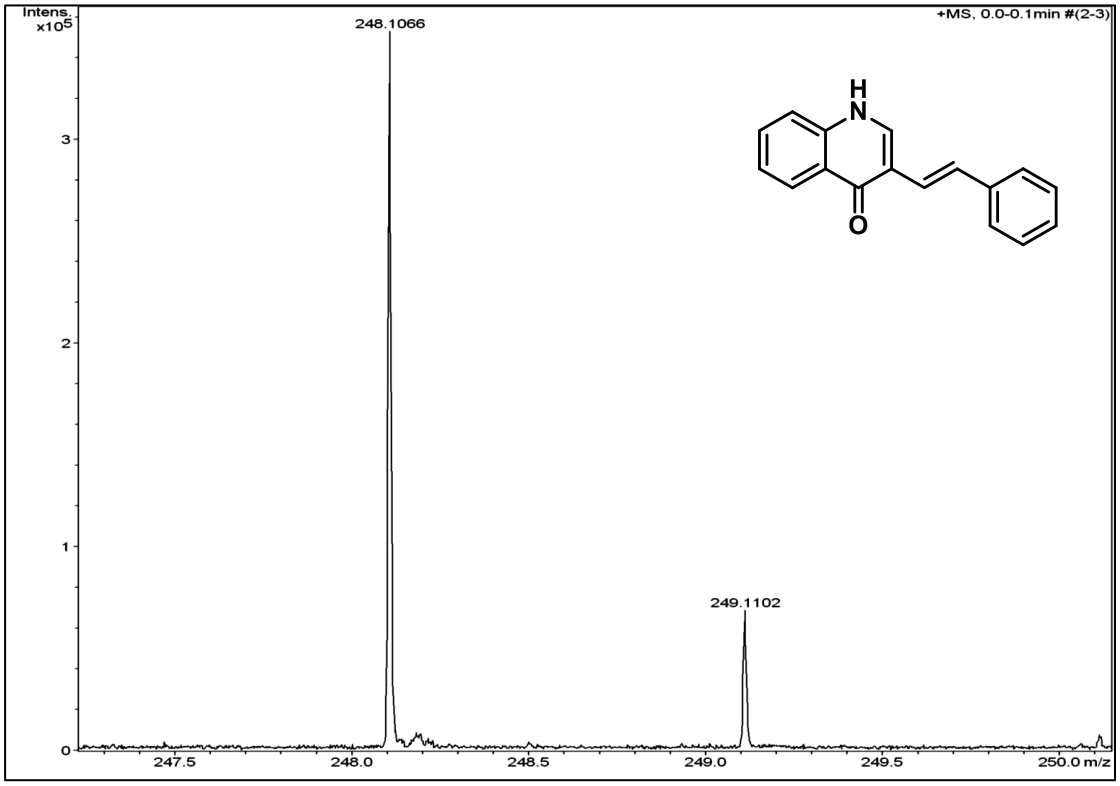
5. Seixas, R. S. G. R.; Almeida, A. I. S.; Pereira, S. I. G.; Cavaleiro, J. A. S.; Silva, A. M. S. *Monatsh. Chem.*, 2014, **145**, 1803-1816.
6. Chen, J.; Li, J.; Su, W. *Molecules*, 2014, **19**, 6439-6449.
7. Susanti, D.; Ng, L. L. R.; Chan, P. W. H. *Adv. Synth.catal.*, 2014, **356**, 353-358.

4. ^{1}H NMR, ^{13}C NMR and HRMS Spectra

(*E*)-3-styrylquinolin-4(1*H*)-one (1a)

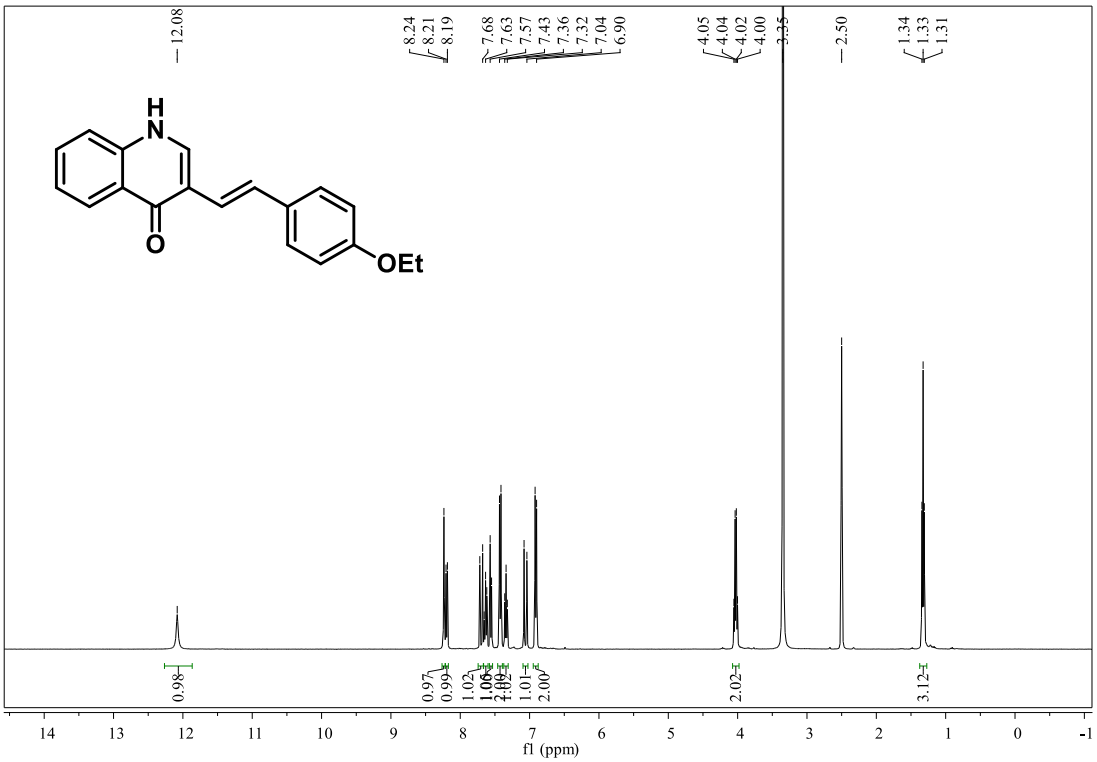


400 MHz, ^{1}H NMR in DMSO-d_6

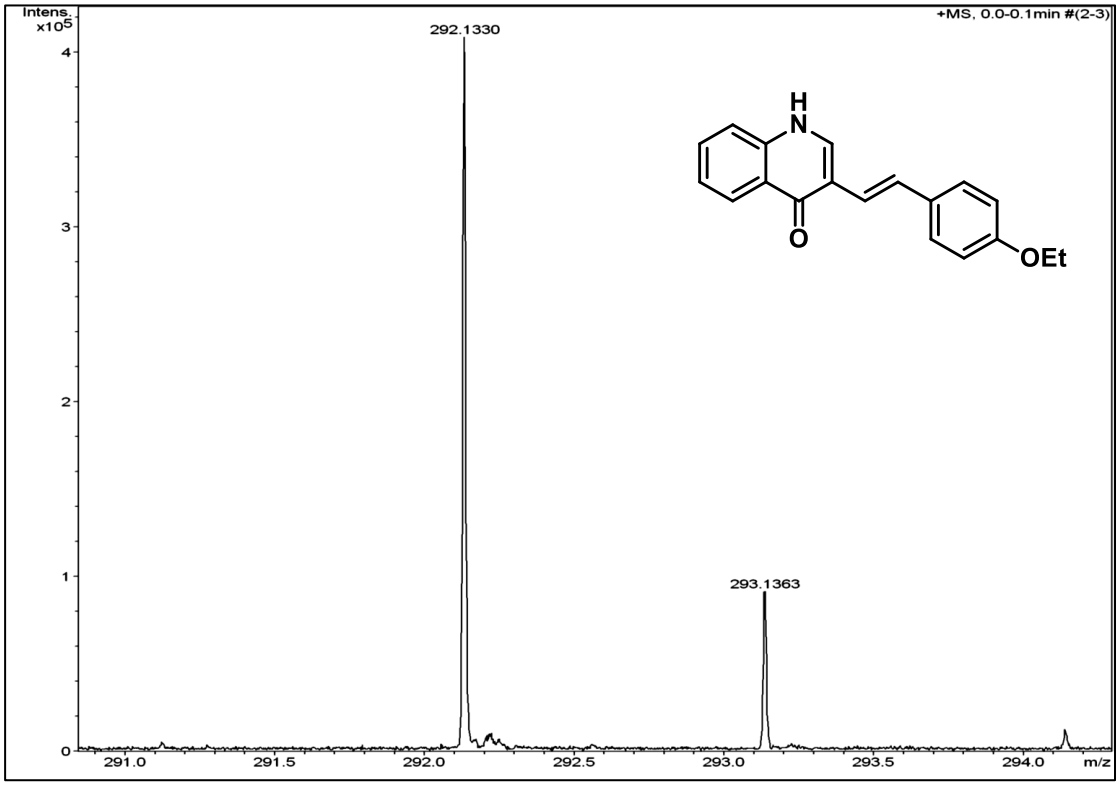


HRMS (MeOH)

(*E*)-3-(4-ethoxystyryl)quinolin-4(1*H*)-one (1b)

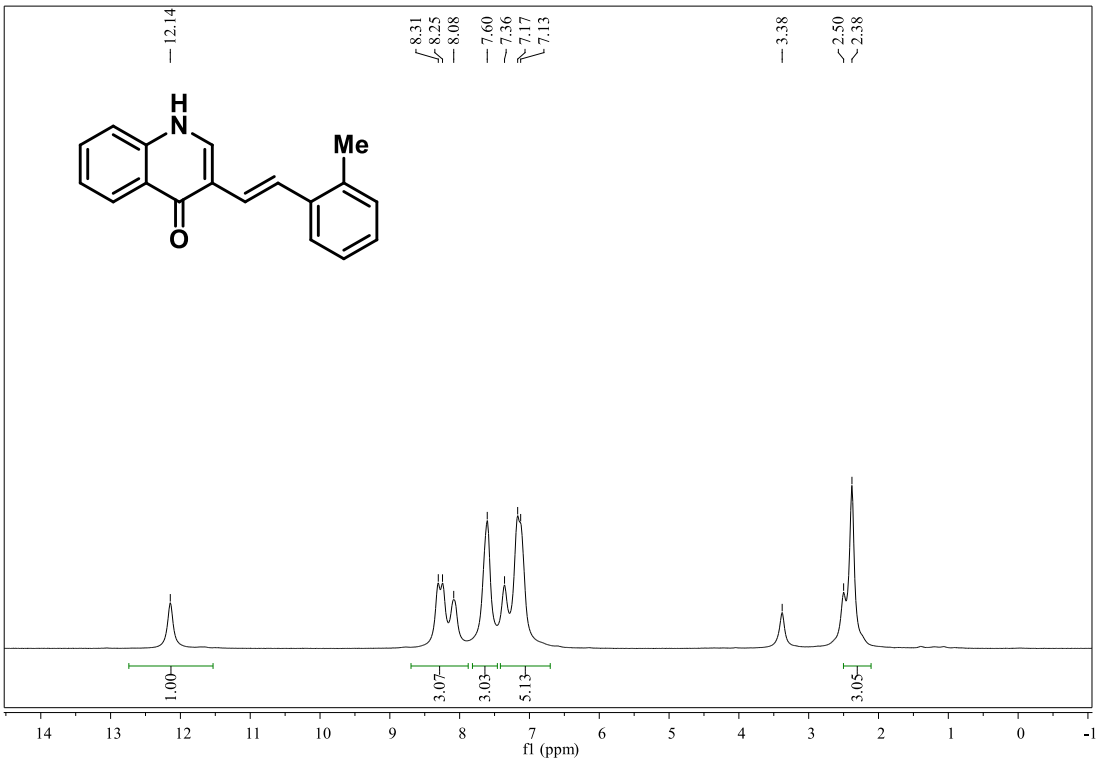


400 MHz, ^{1}H NMR in DMSO-d_6

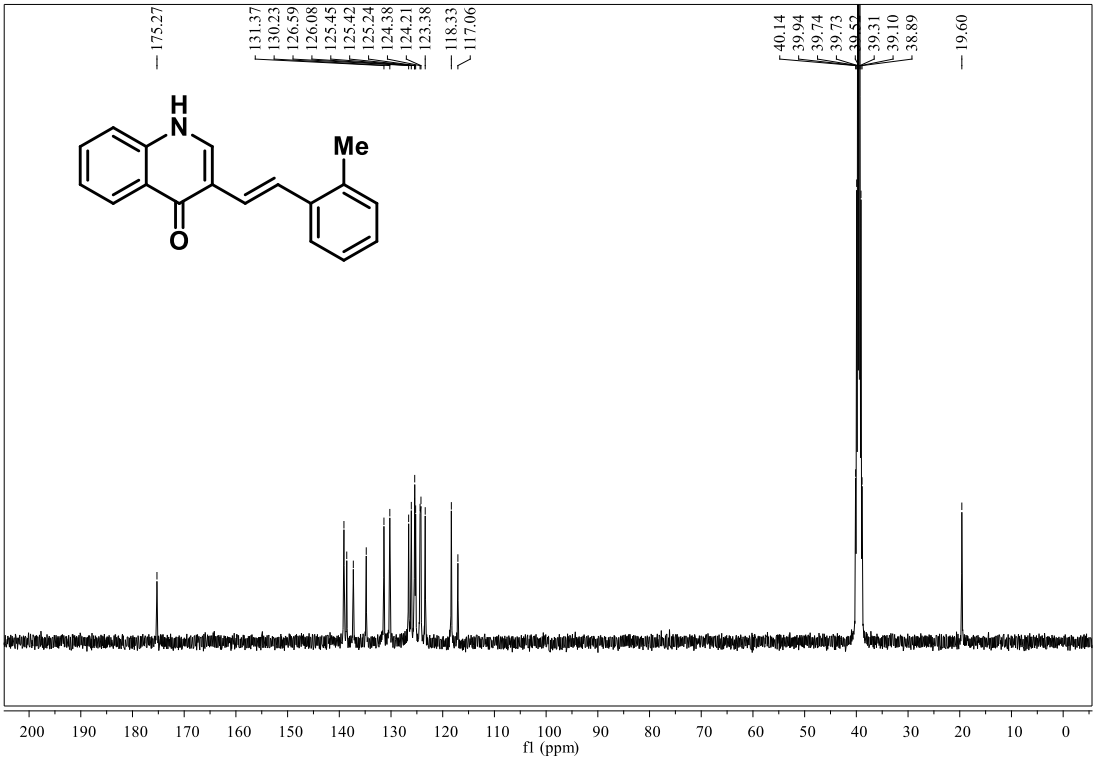


HRMS (MeOH)

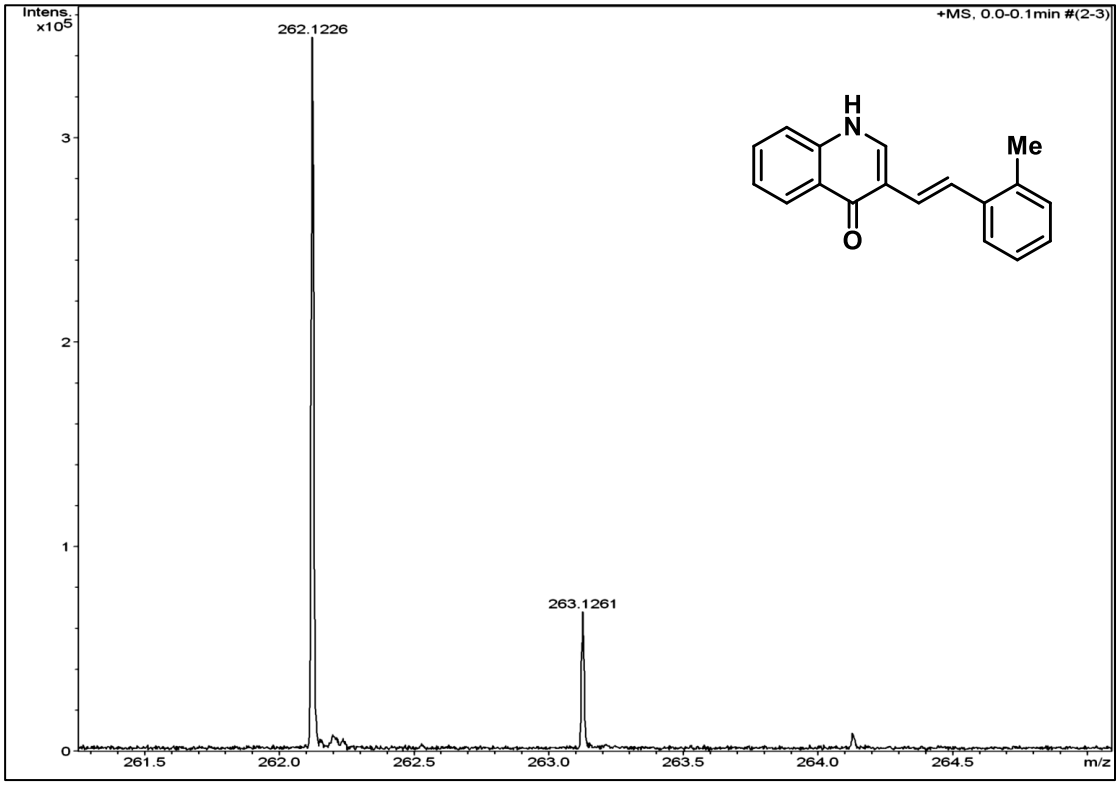
(*E*)-3-(2-methylstyryl)quinolin-4(1*H*)-one (1c)



400 MHz, ^{1}H NMR in DMSO-d_6

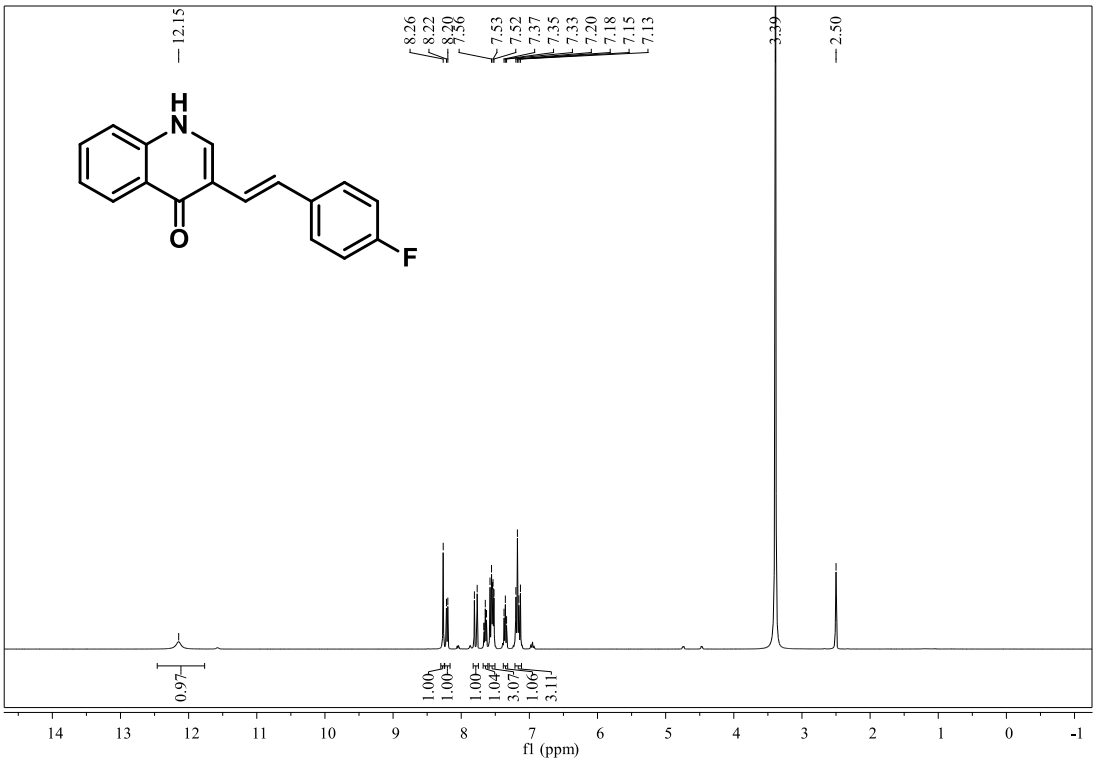


100 MHz, ^{13}C NMR in DMSO-d_6

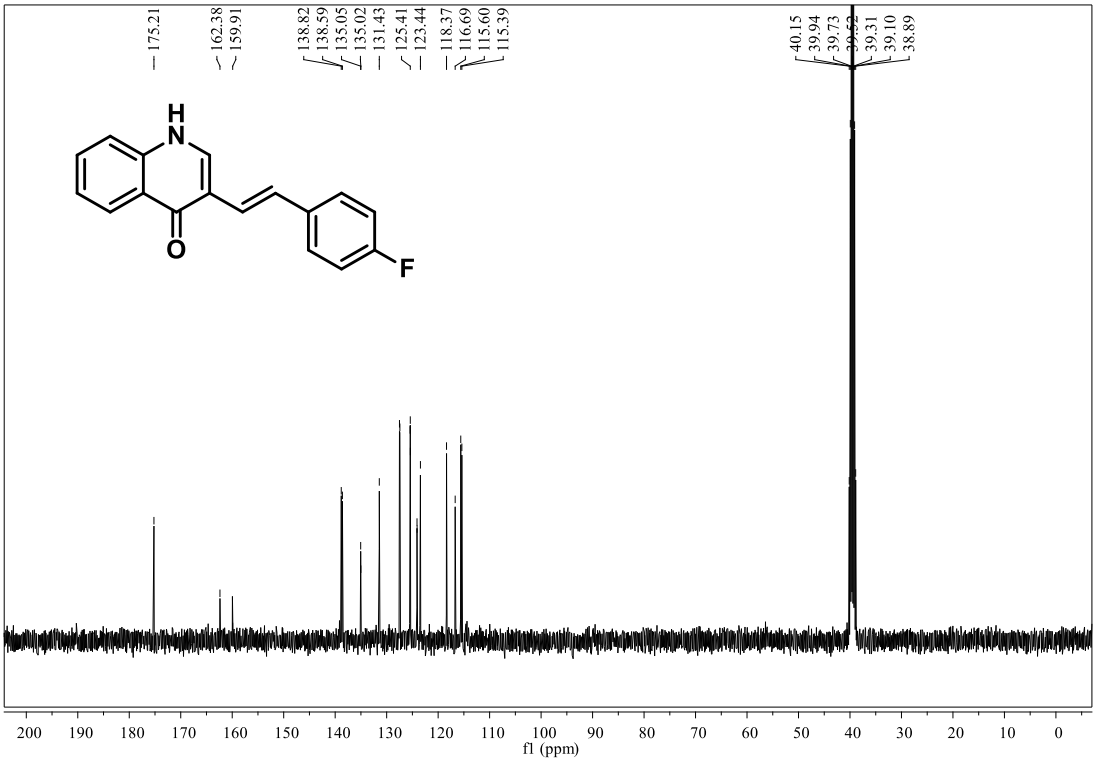


HRMS (MeOH)

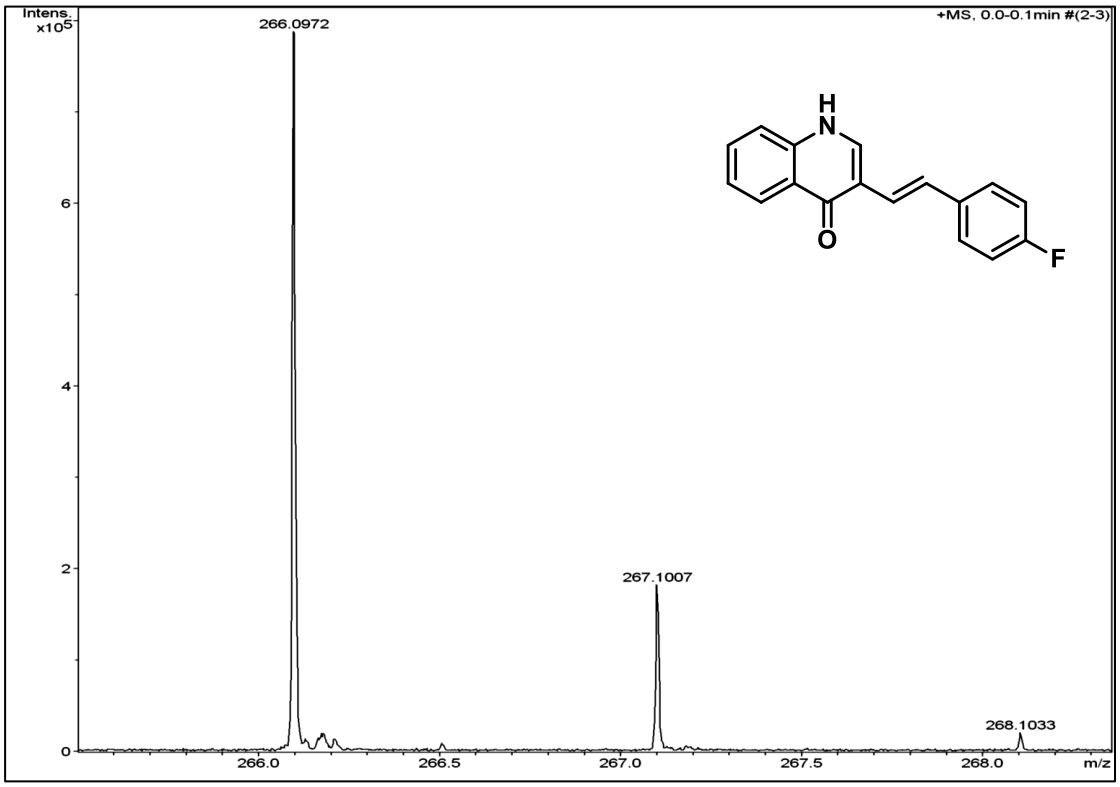
(*E*)-3-(4-fluorostyryl)quinolin-4(1*H*)-one (1d)



400 MHz, ^{1}H NMR in DMSO-d_6

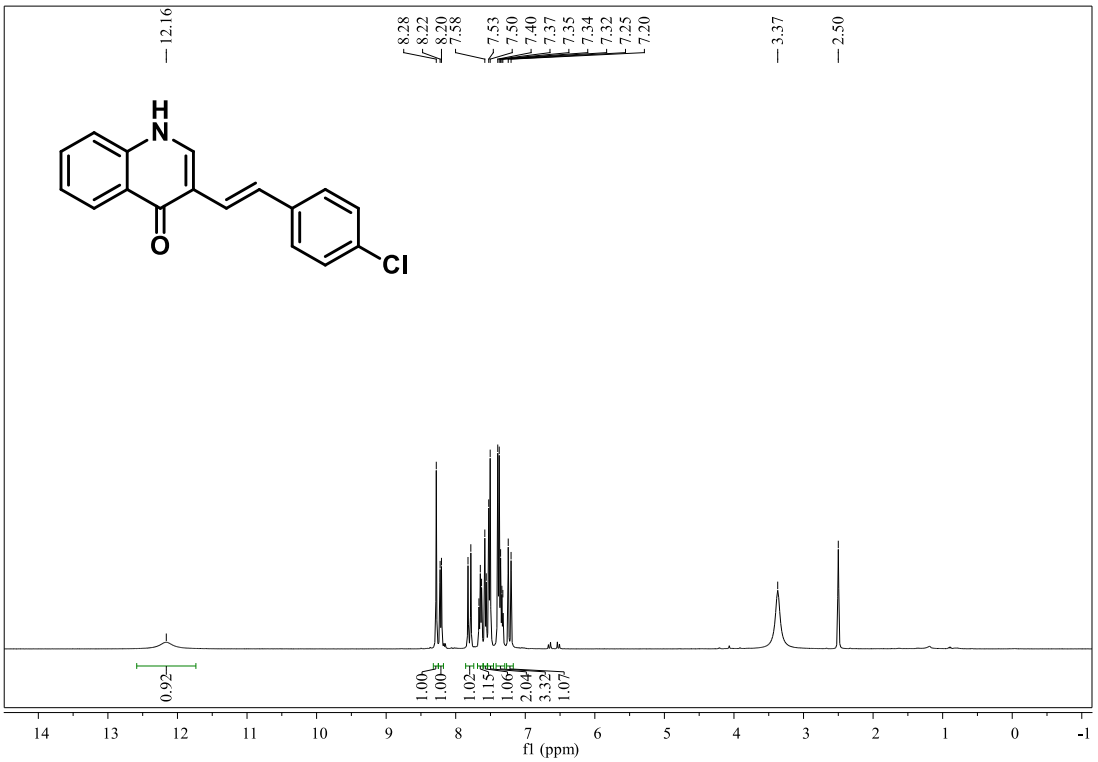


100 MHz, ^{13}C NMR in DMSO-d_6

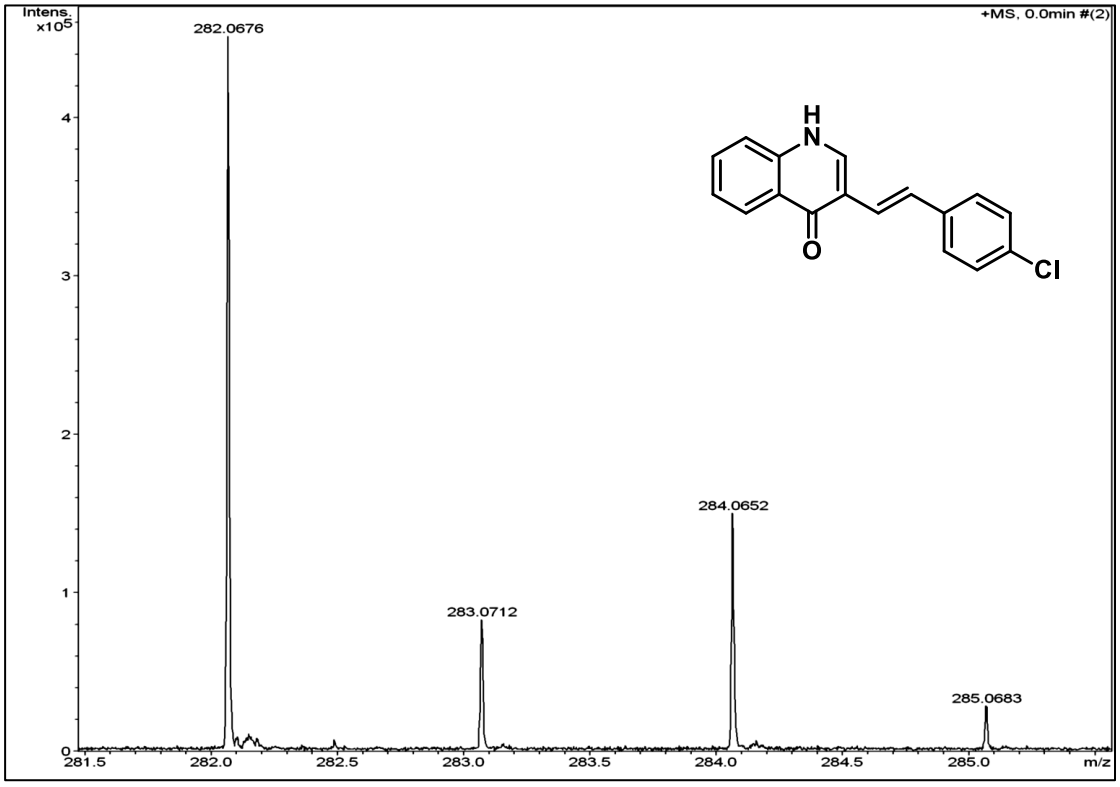


HRMS (MeOH)

(*E*)-3-(4-chlorostyryl)quinolin-4(1*H*)-one (1e)

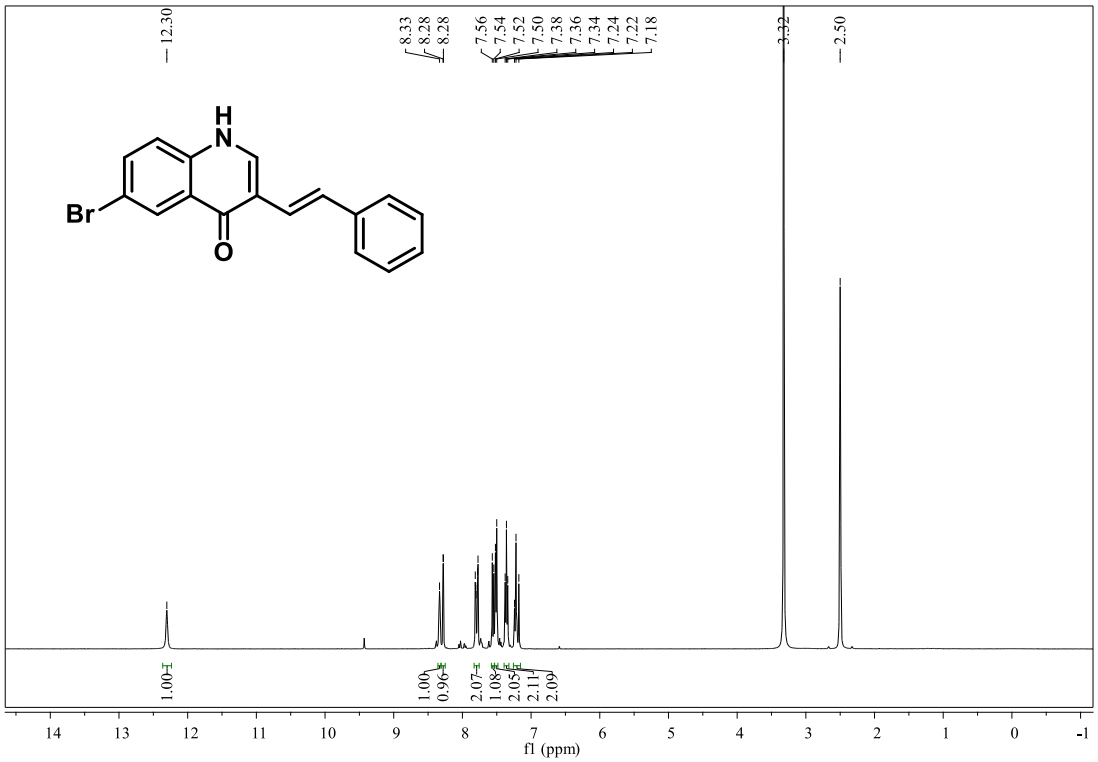


400 MHz, ^{1}H NMR in DMSO-d_6

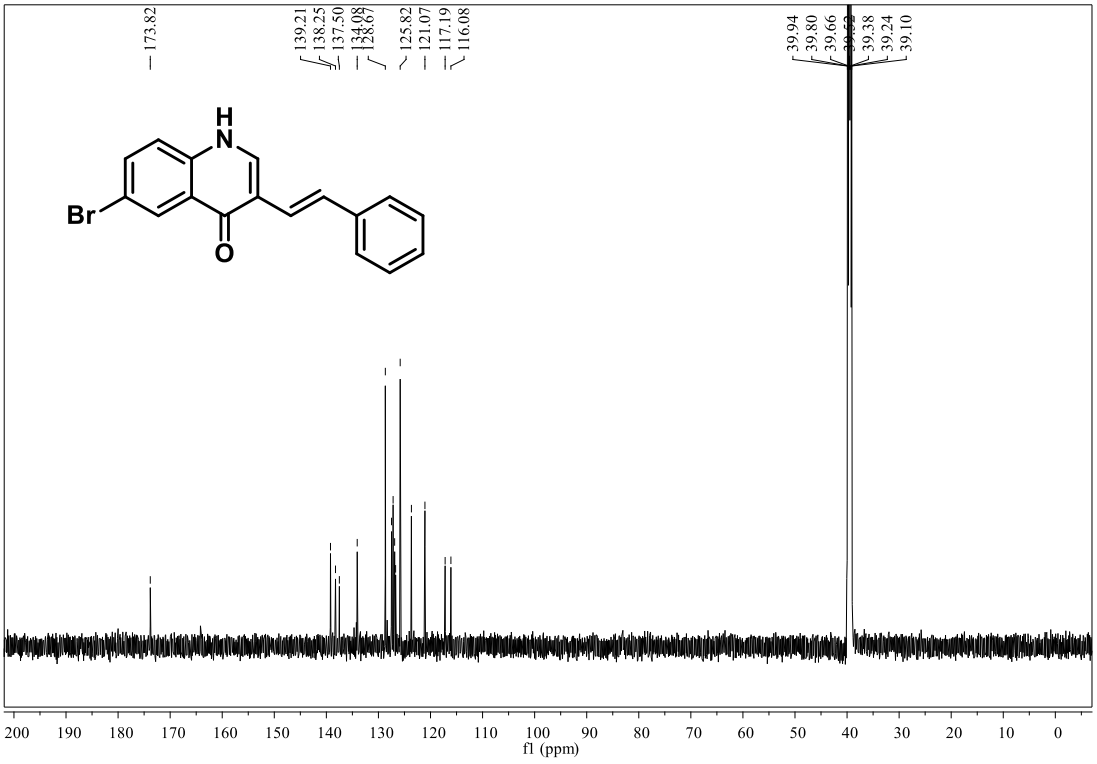


HRMS (MeOH)

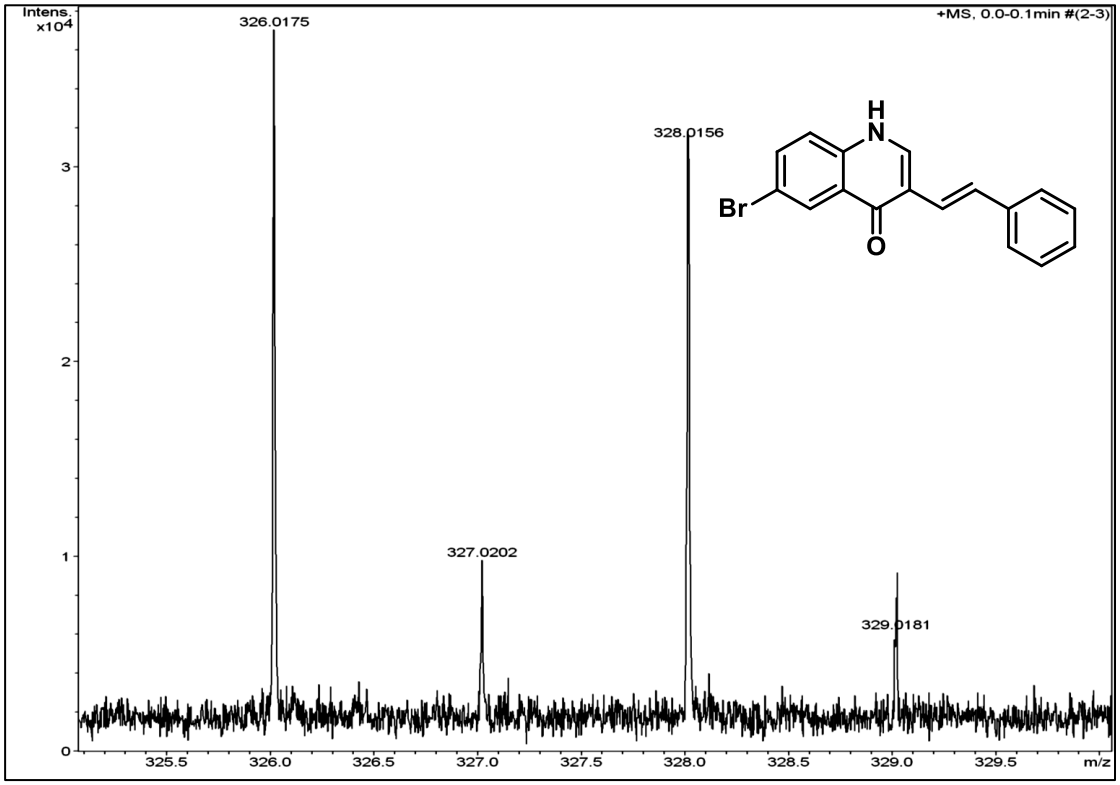
(*E*)-6-bromo-3-styrylquinolin-4(1*H*)-one (1f)



400 MHz, ^{1}H NMR in DMSO-d_6

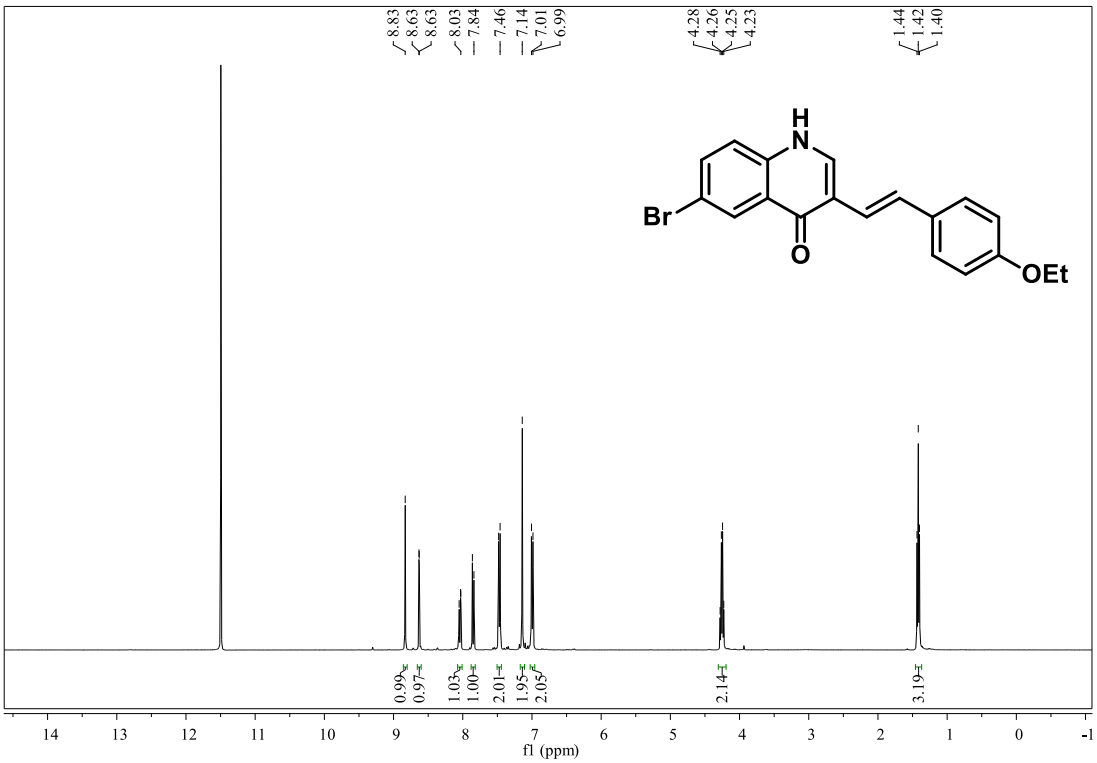


150 MHz, ^{13}C NMR in DMSO-d_6

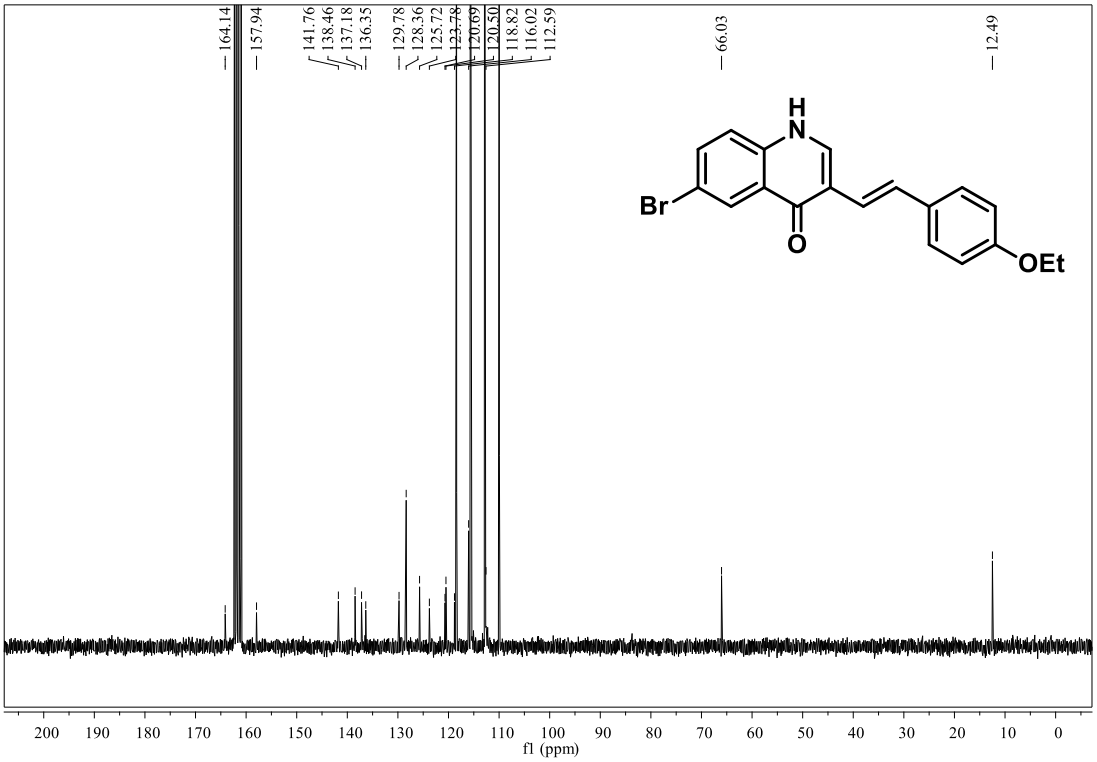


HRMS (MeOH)

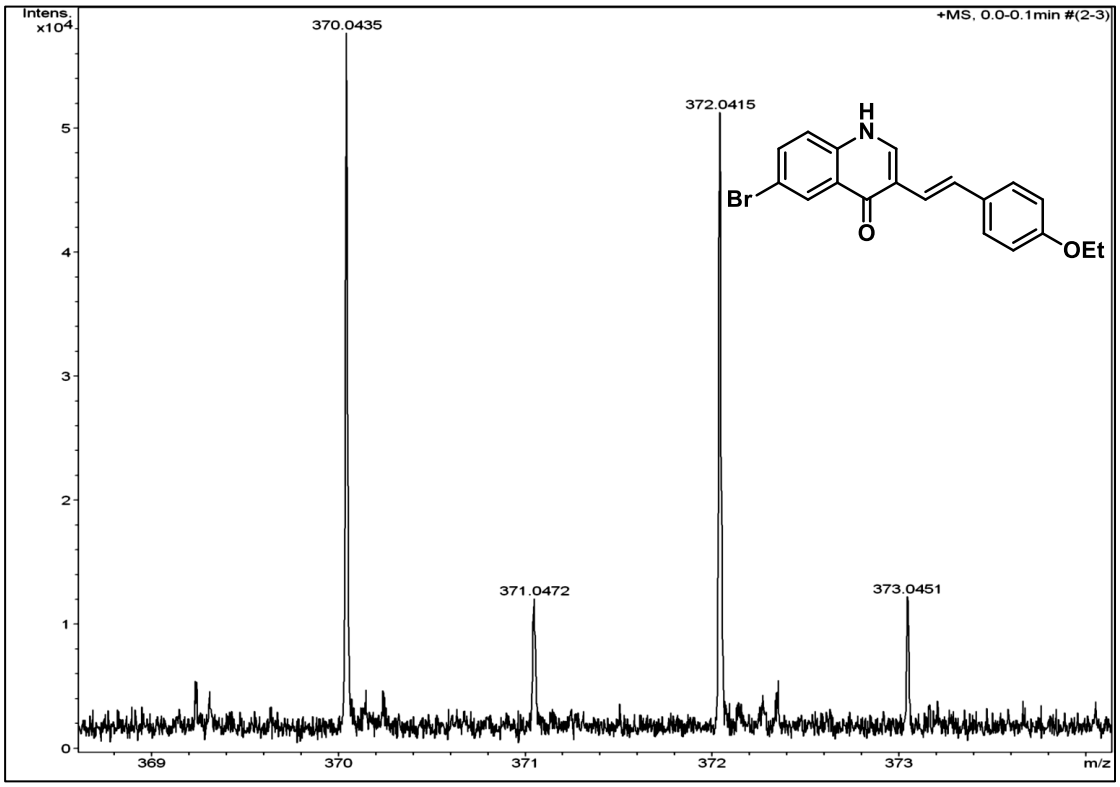
(*E*)-6-bromo-3-(4-ethoxystyryl)quinolin-4(1*H*)-one (1g)



400 MHz, ^{1}H NMR in CF_3COOD

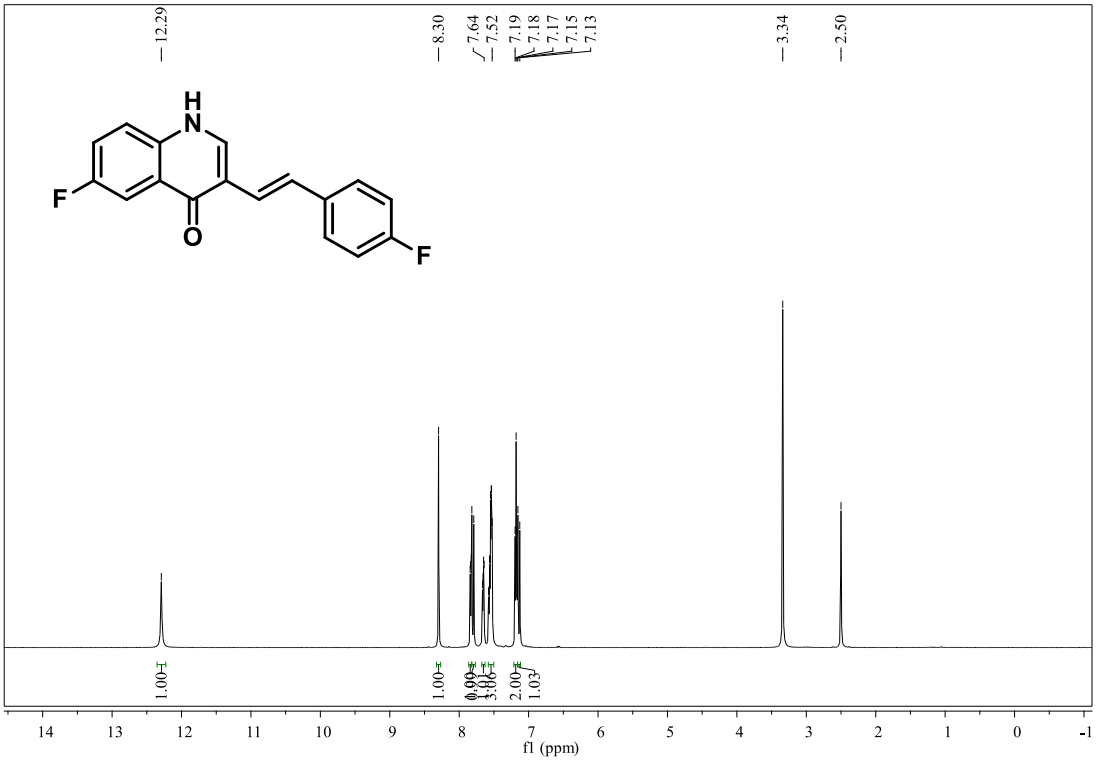


100 MHz, ^{13}C NMR in CF_3COOD

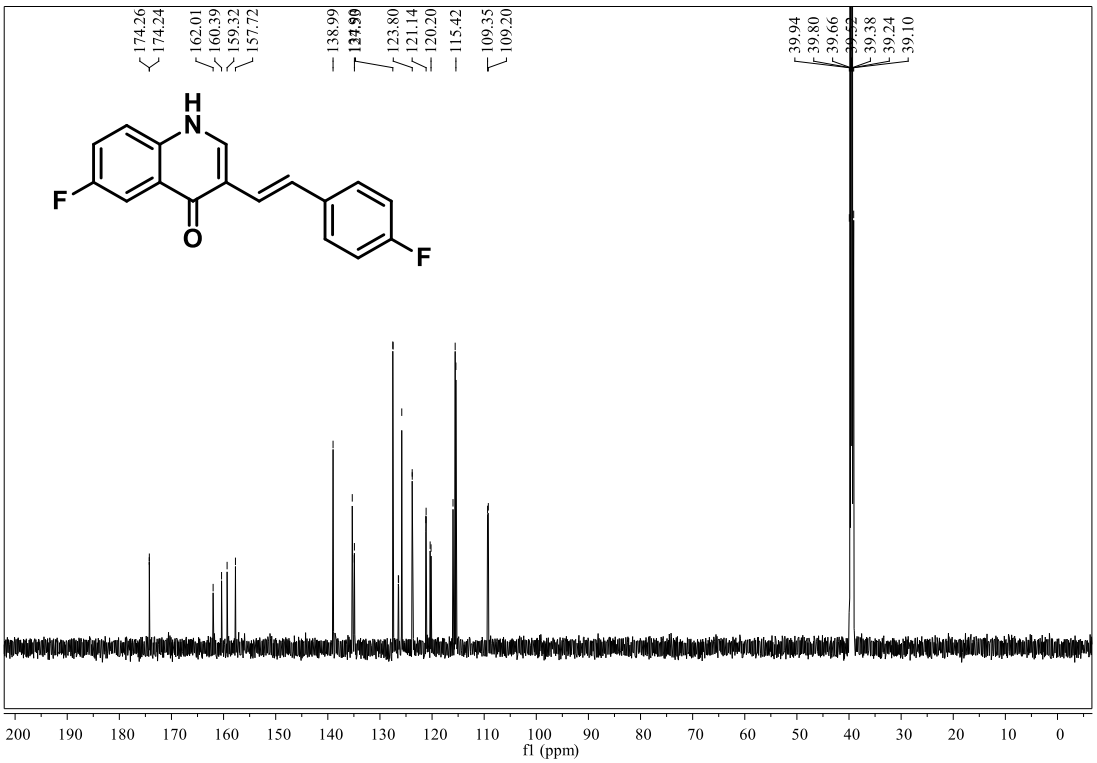


HRMS (MeOH)

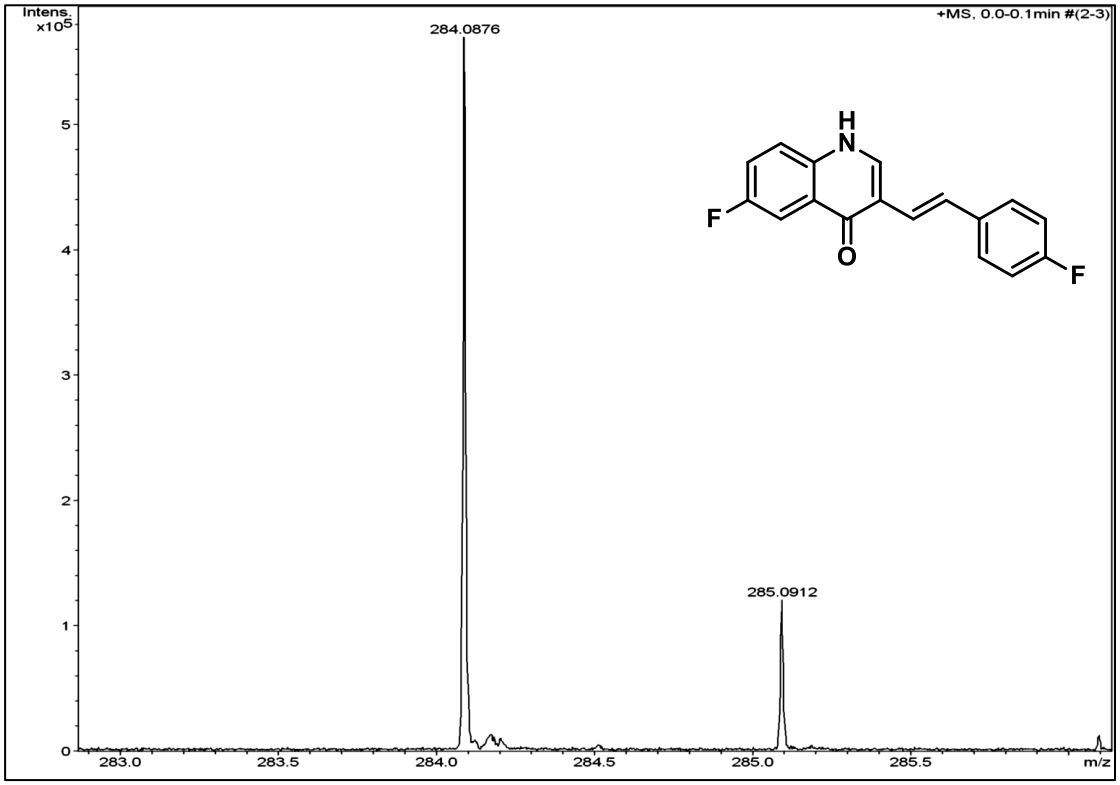
(*E*)-6-fluoro-3-(4-fluorostyryl)quinolin-4(1*H*)-one (1h)



600 MHz, ^{1}H NMR in DMSO-d_6

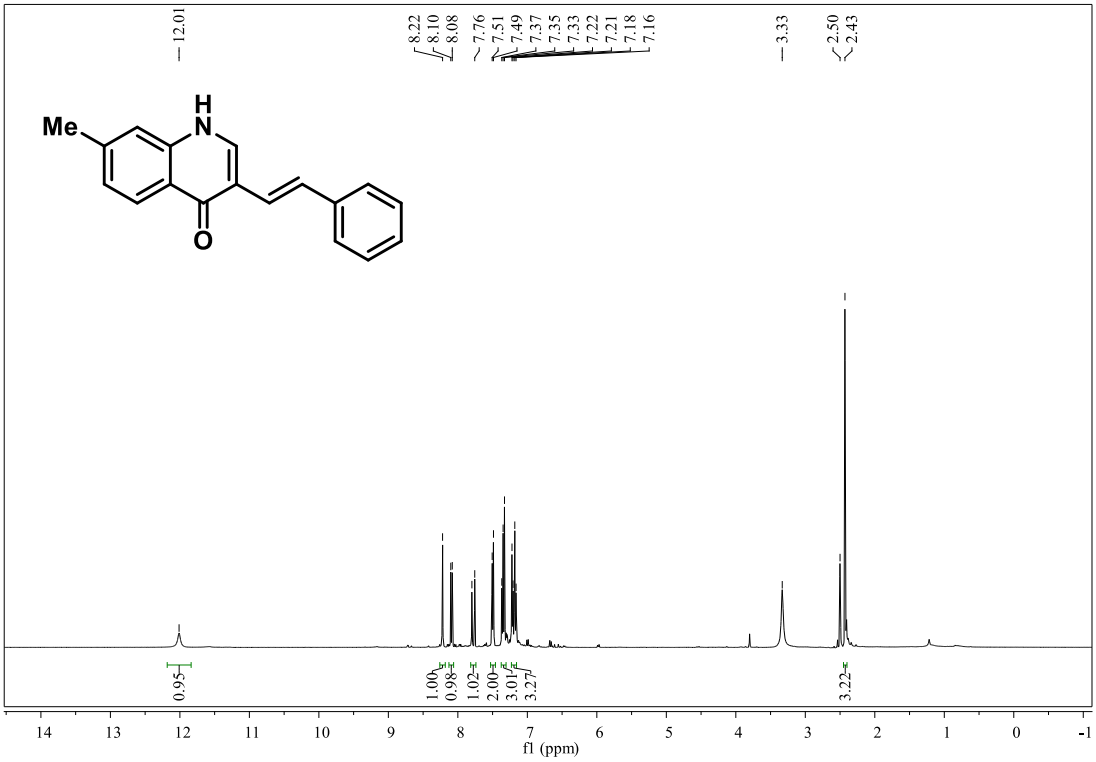


150 MHz, ^{13}C NMR in DMSO-d_6

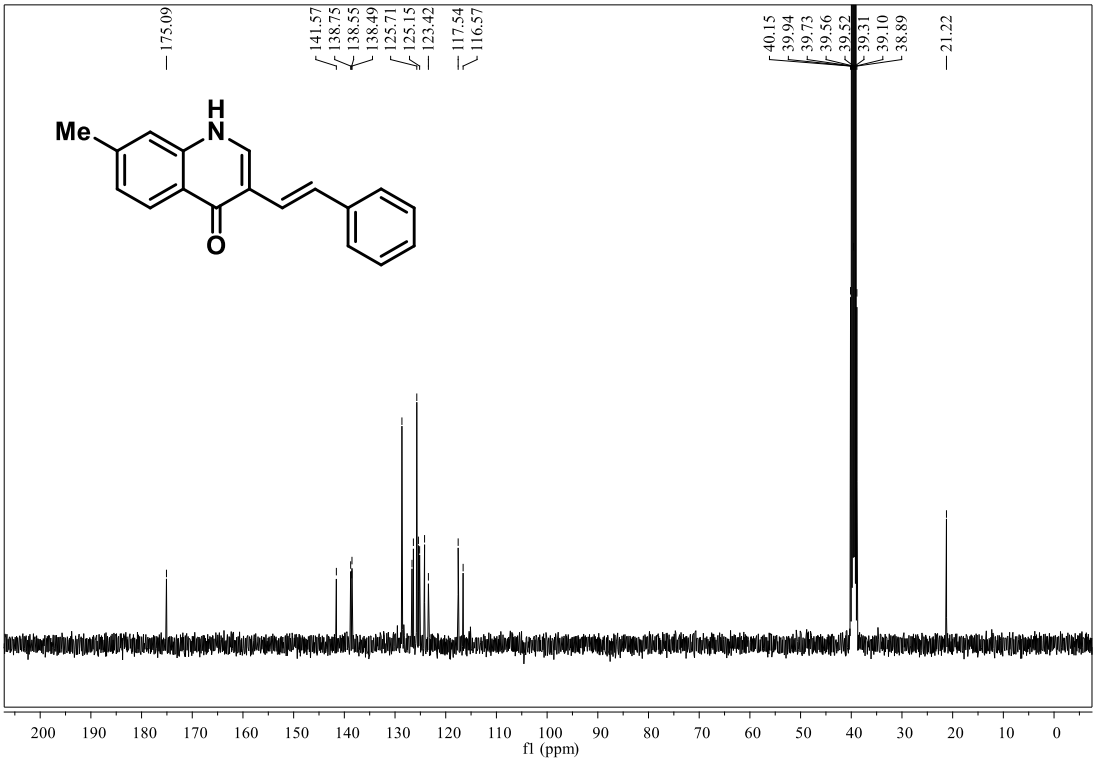


HRMS (MeOH)

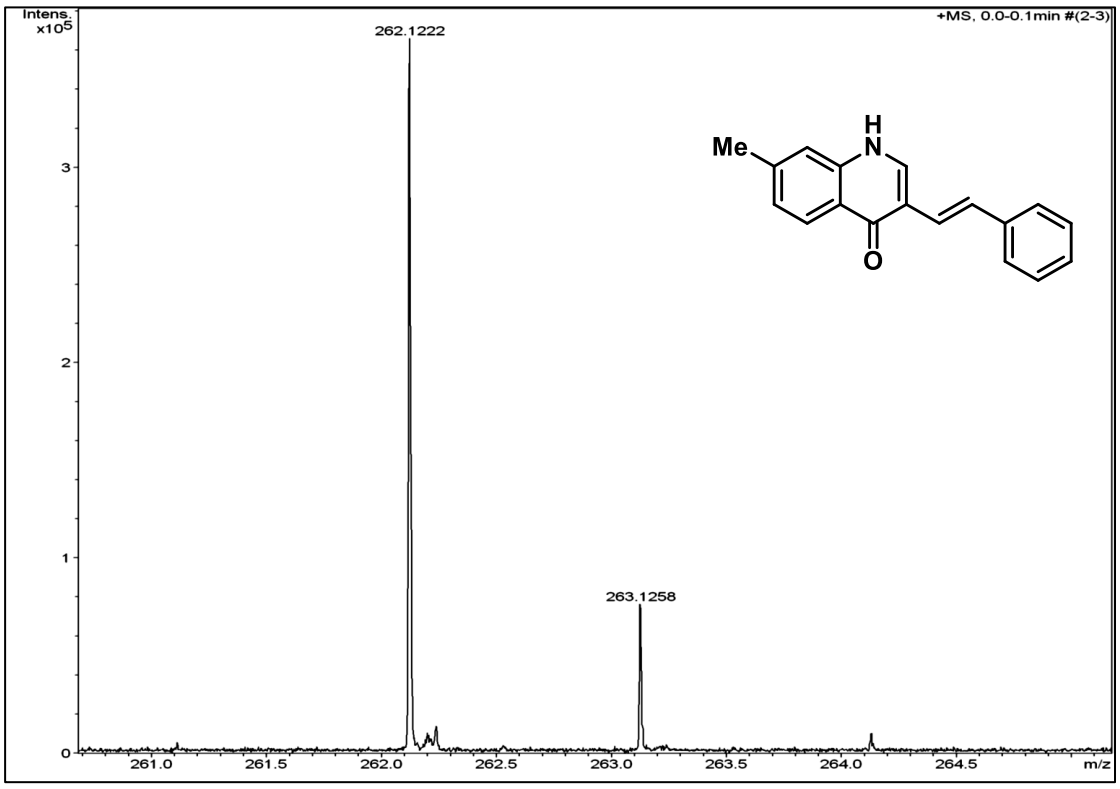
(*E*)-7-methyl-3-styrylquinolin-4(1*H*)-one (1i)



400 MHz, ^{1}H NMR in DMSO-d_6

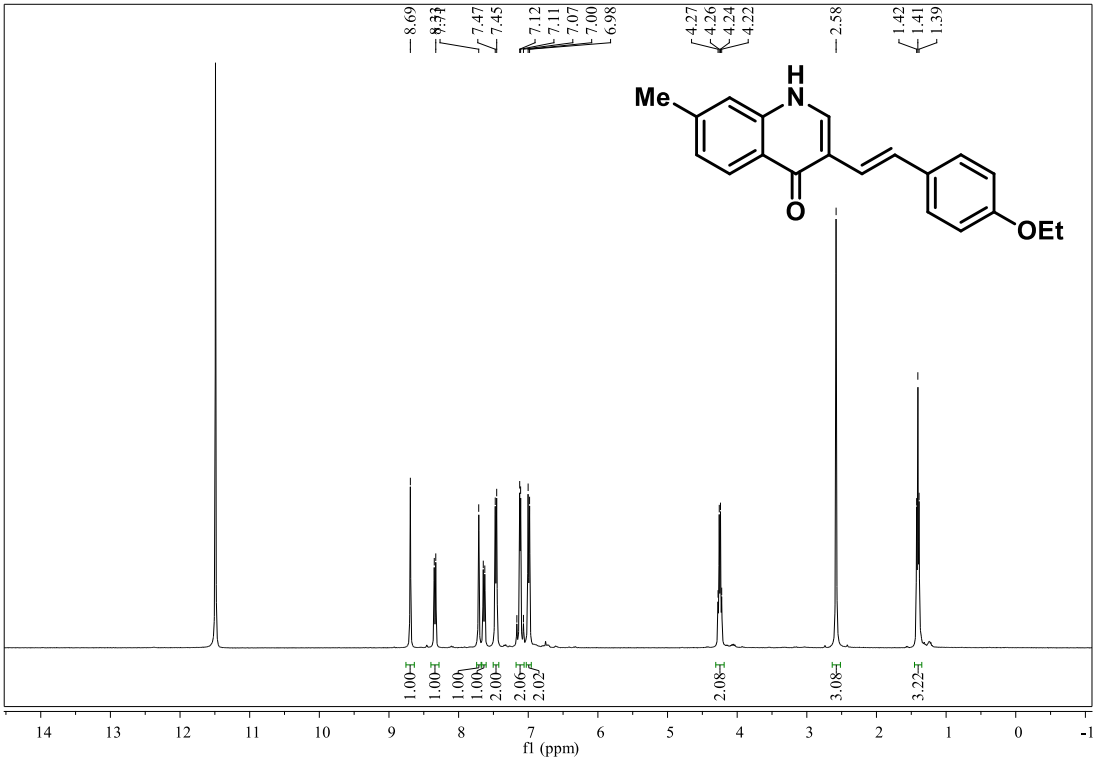


100 MHz, ^{13}C NMR in DMSO-d_6

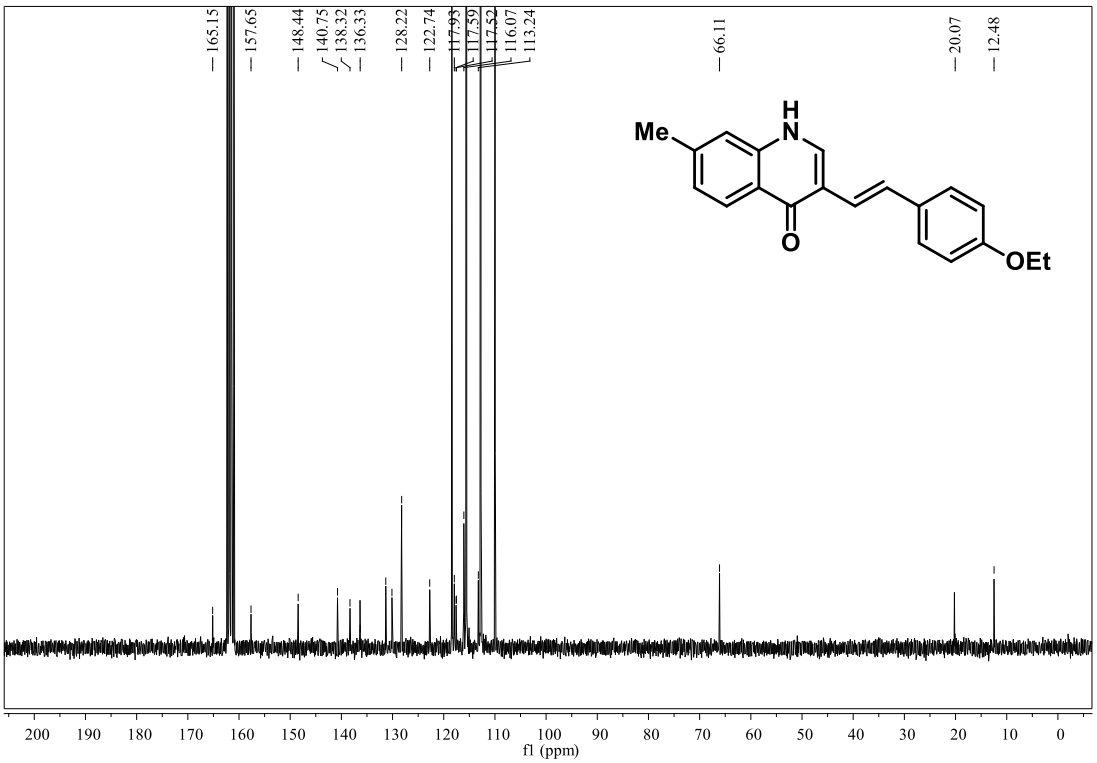


HRMS (MeOH)

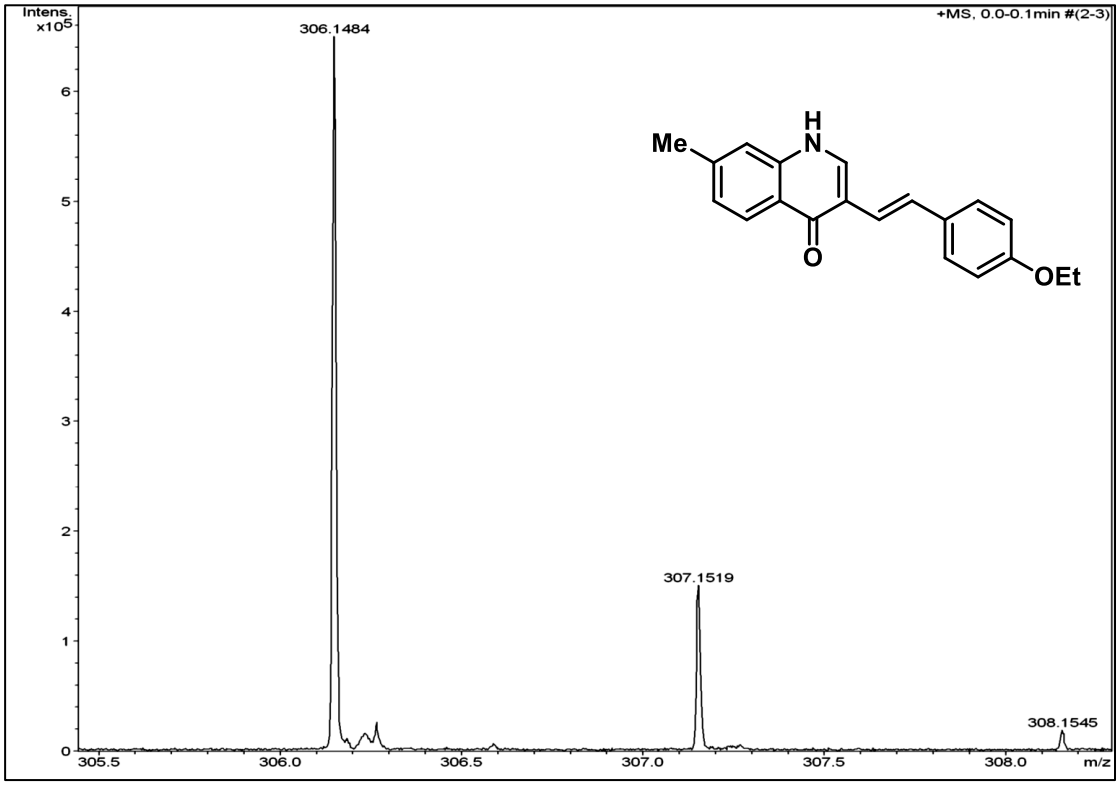
(*E*)-3-(4-ethoxystyryl)-7-methylquinolin-4(1*H*)-one (1j)



400 MHz, ^{1}H NMR in CF_3COOD

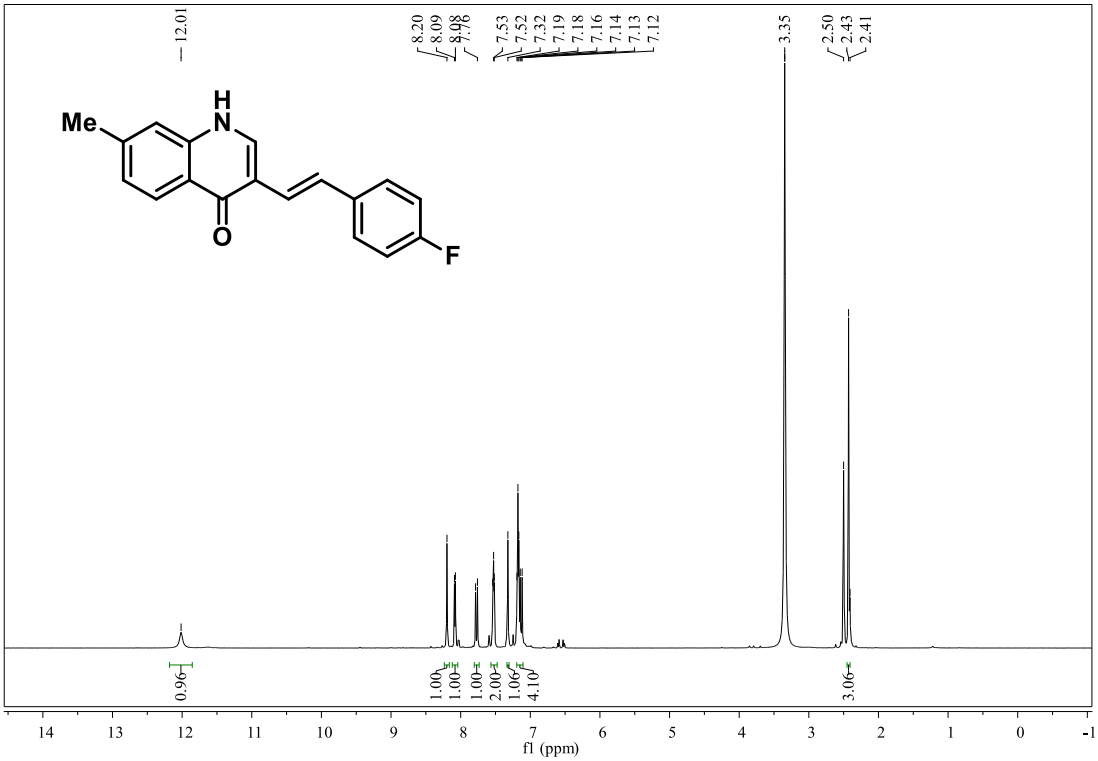


100 MHz, ^{13}C NMR in CF_3COOD

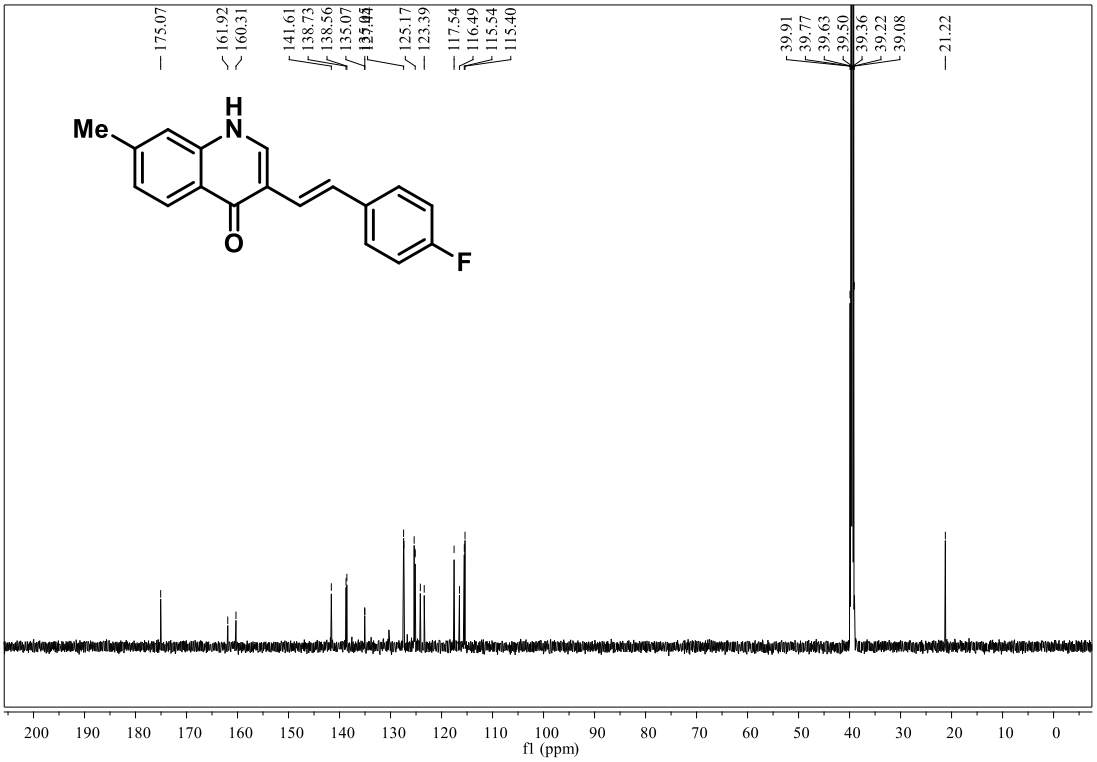


HRMS (MeOH)

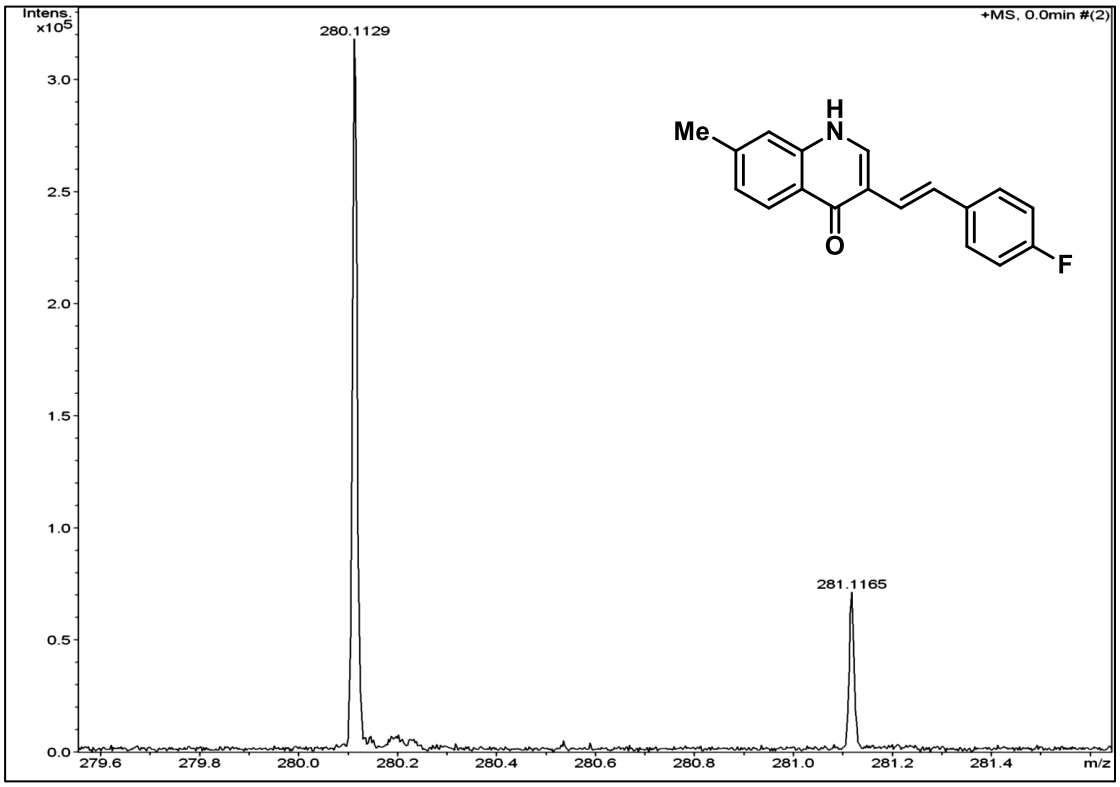
(*E*)-3-(4-fluorostyryl)-7-methylquinolin-4(1*H*)-one (1k)



600 MHz, ^{1}H NMR in DMSO-d_6

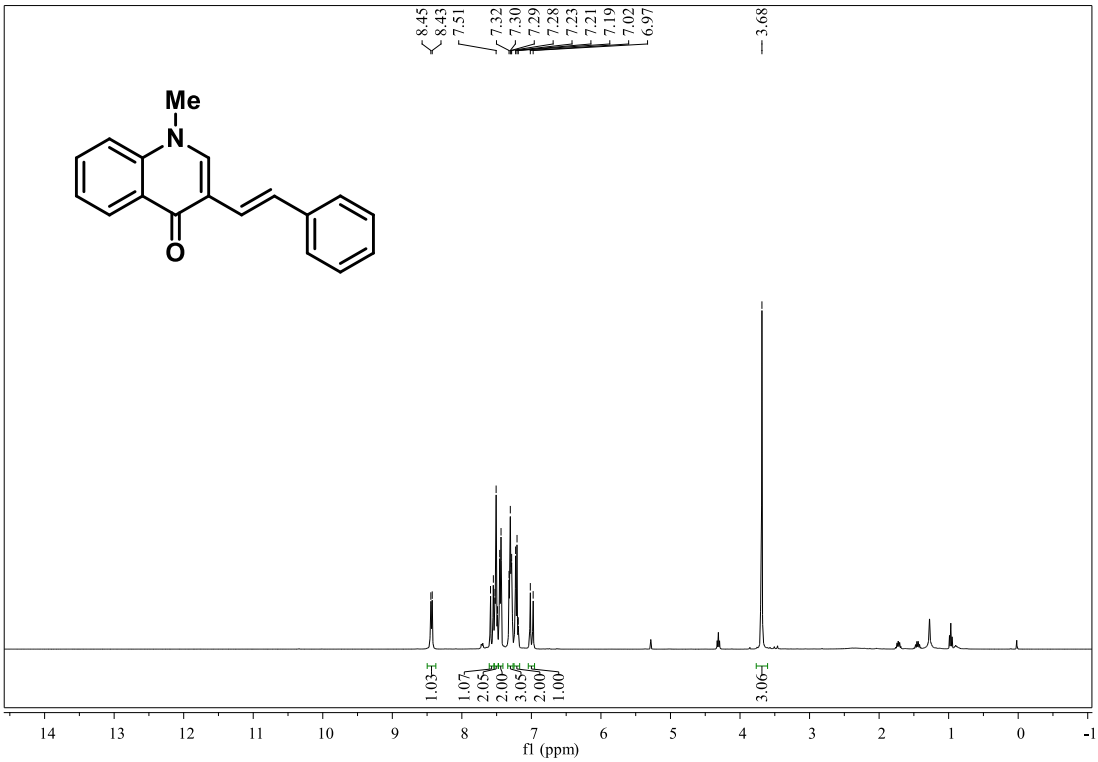


150 MHz, ^{13}C NMR in DMSO-d_6

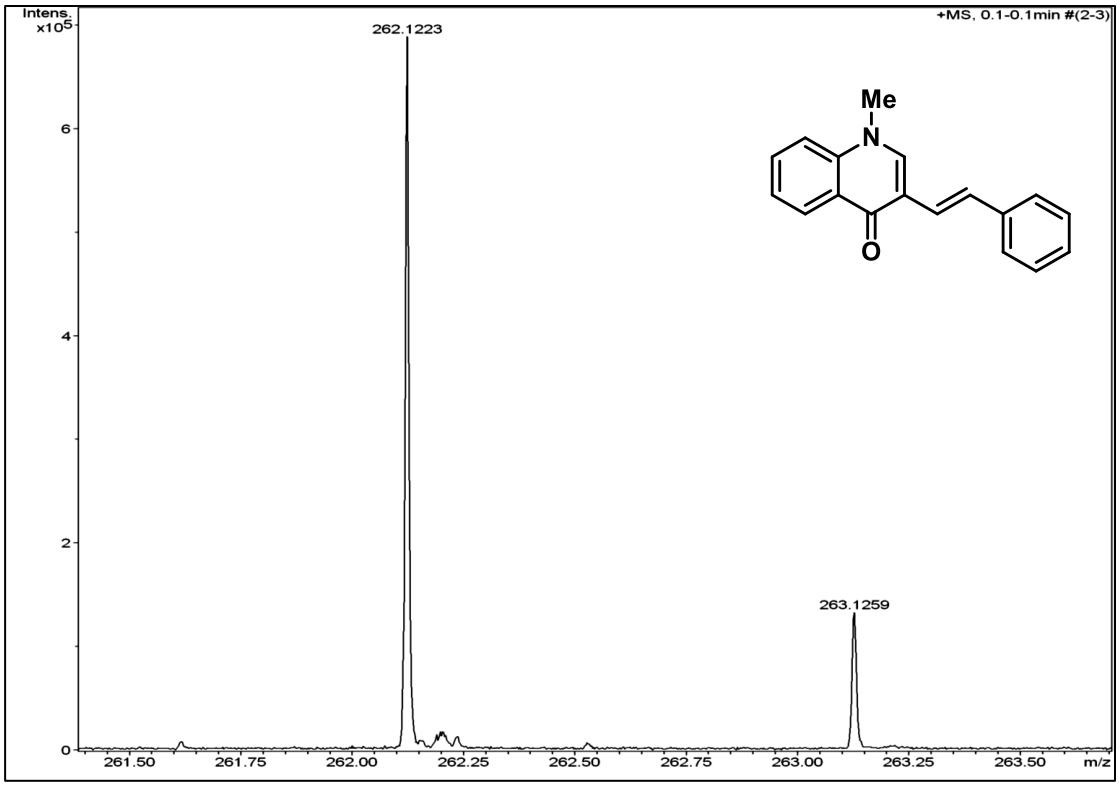


HRMS (MeOH)

(*E*)-1-methyl-3-styrylquinolin-4(1*H*)-one (1l)

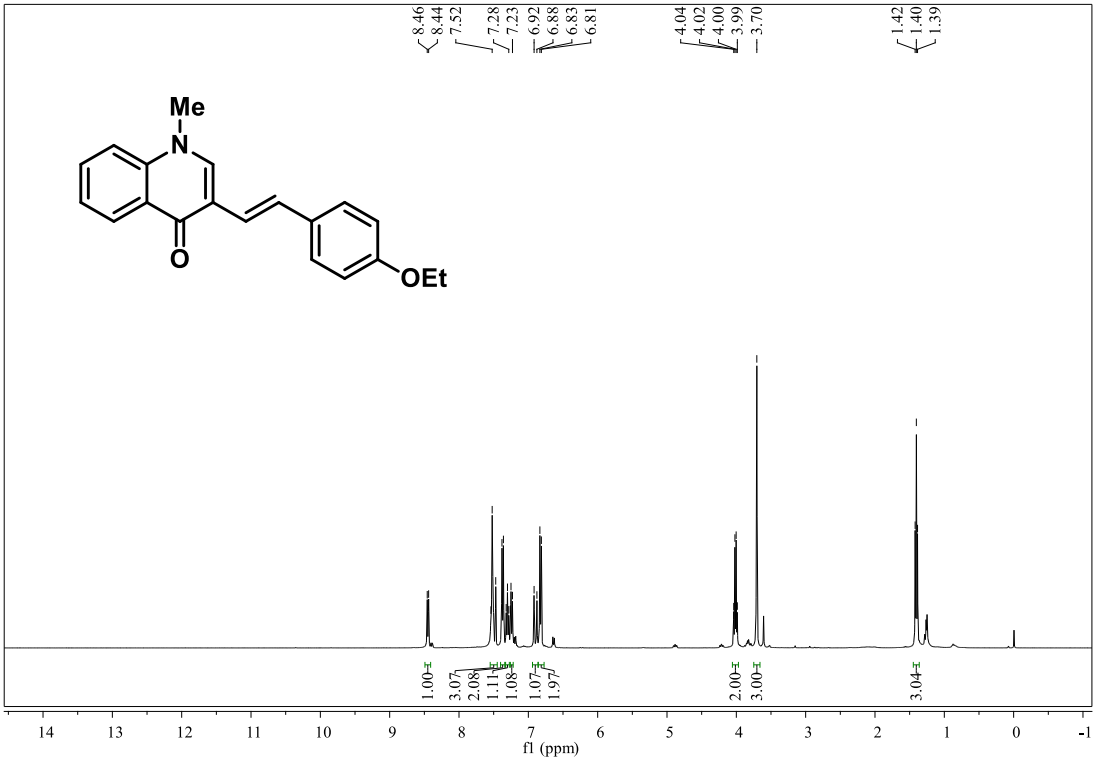


400 MHz, ^{1}H NMR in $CDCl_3$

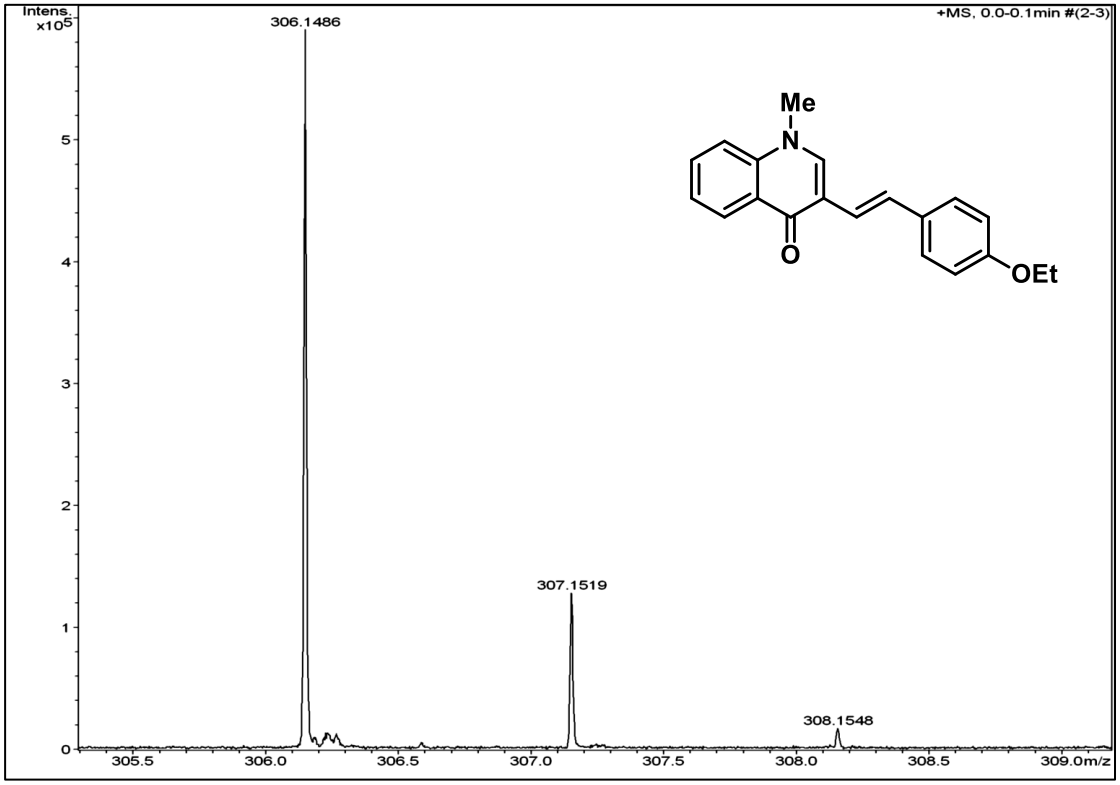


HRMS (MeOH)

(*E*)-3-(4-ethoxystyryl)-1-methylquinolin-4(1*H*)-one (1m)

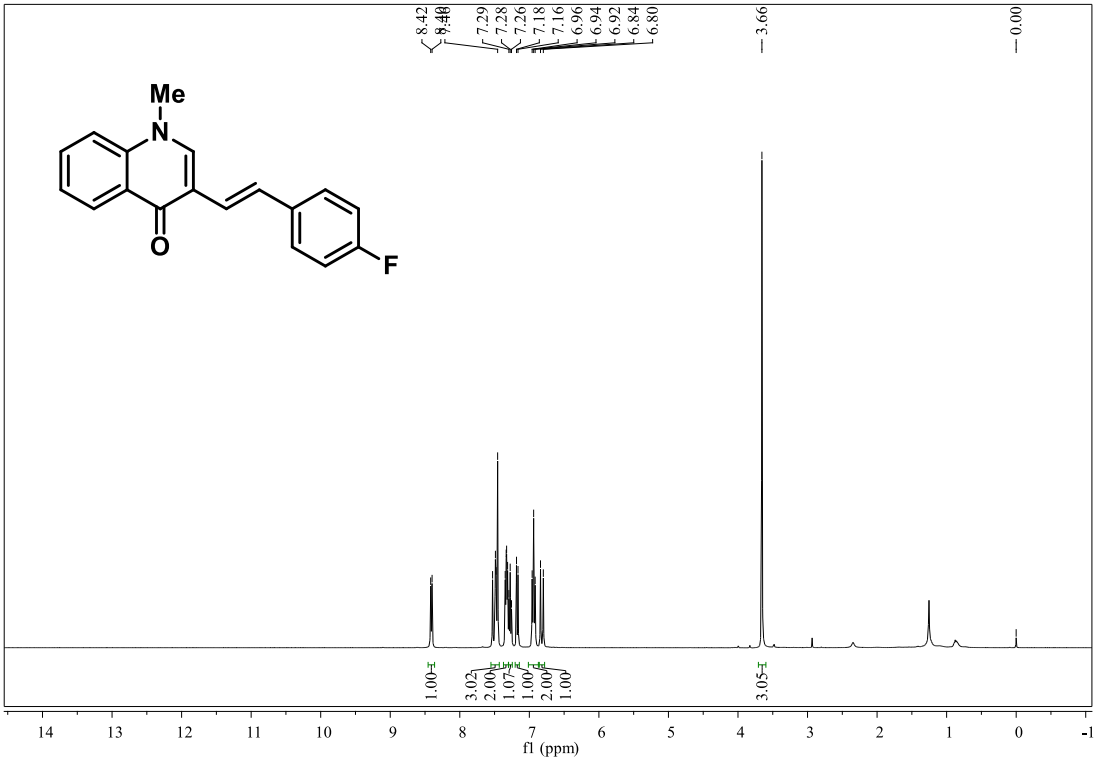


400 MHz, ^{1}H NMR in $CDCl_3$

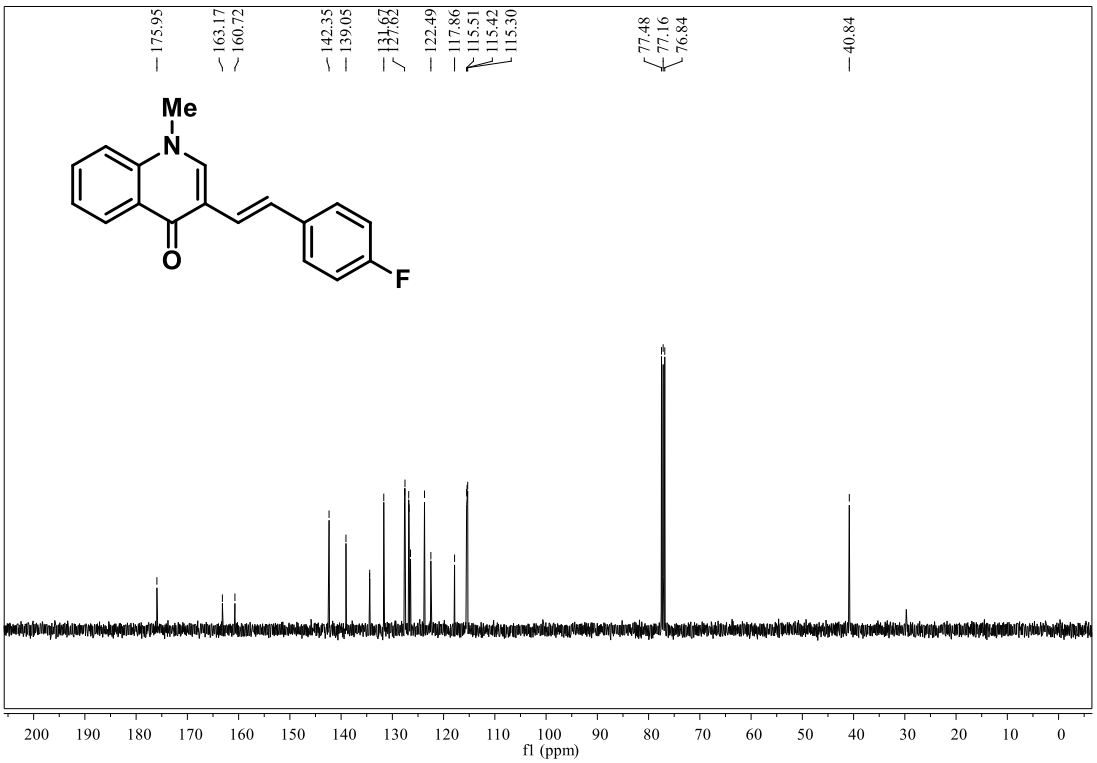


HRMS (MeOH)

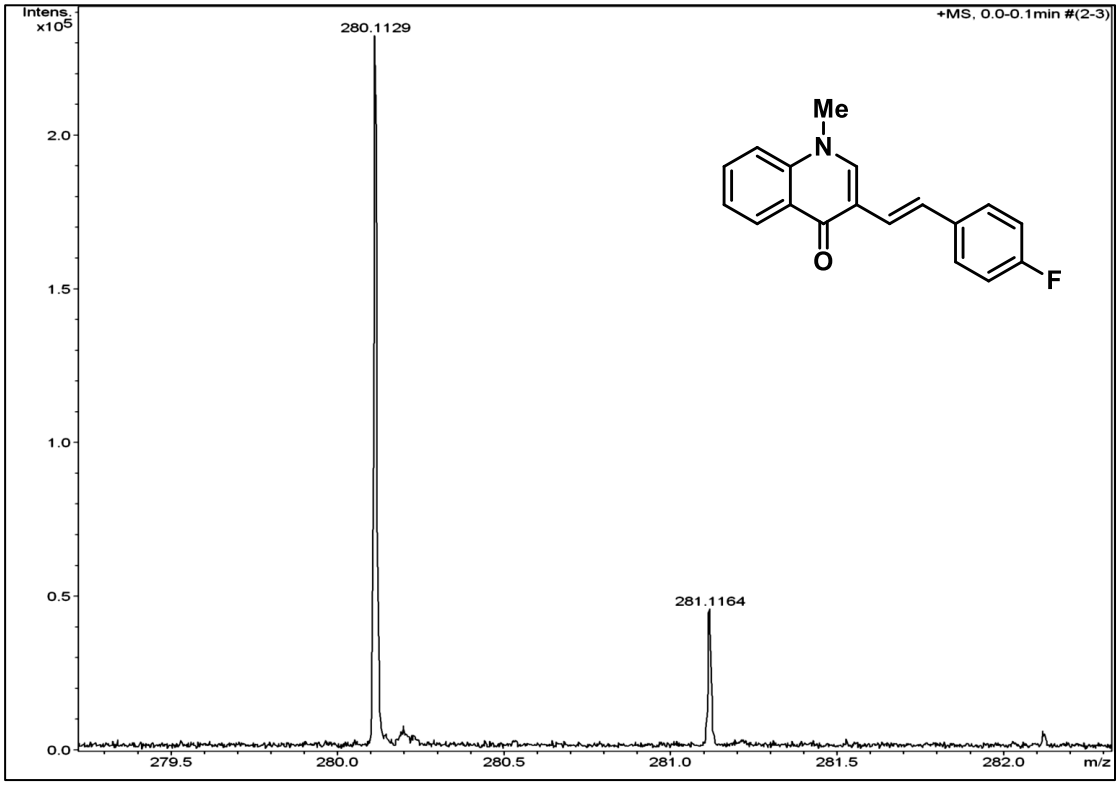
(*E*)-3-(4-fluorostyryl)-1-methylquinolin-4(1*H*)-one (1n)



400 MHz, ^{1}H NMR in $CDCl_3$

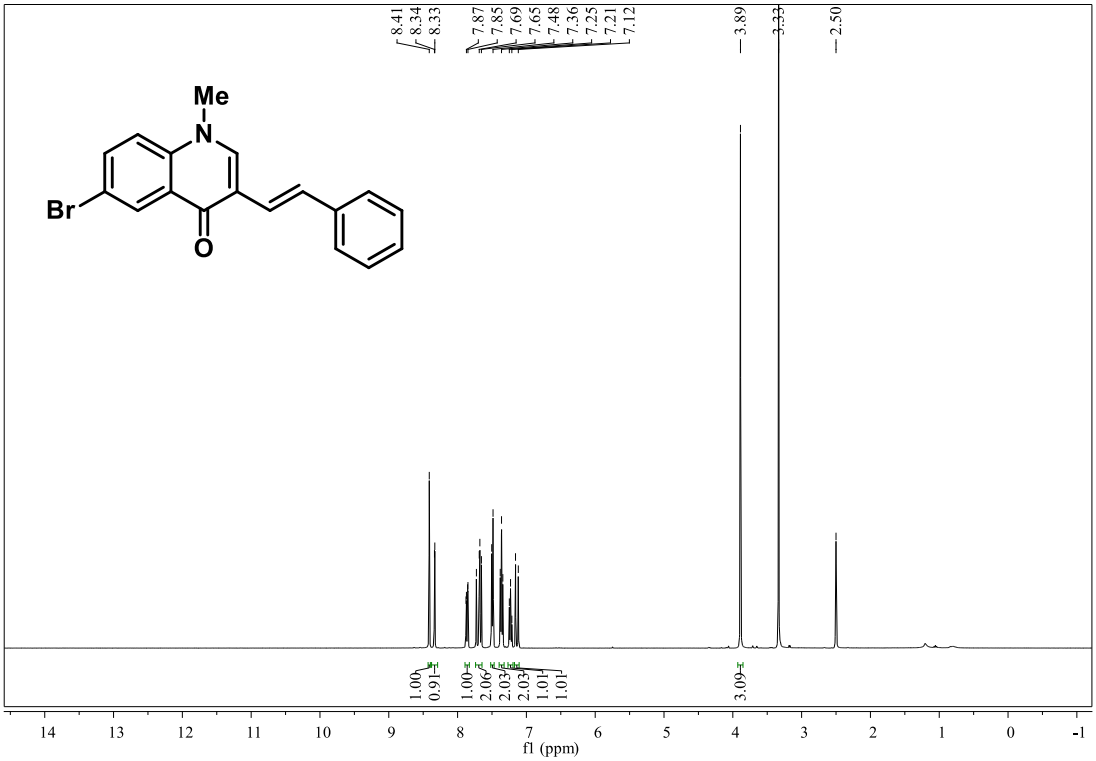


100 MHz, ^{13}C NMR in $CDCl_3$

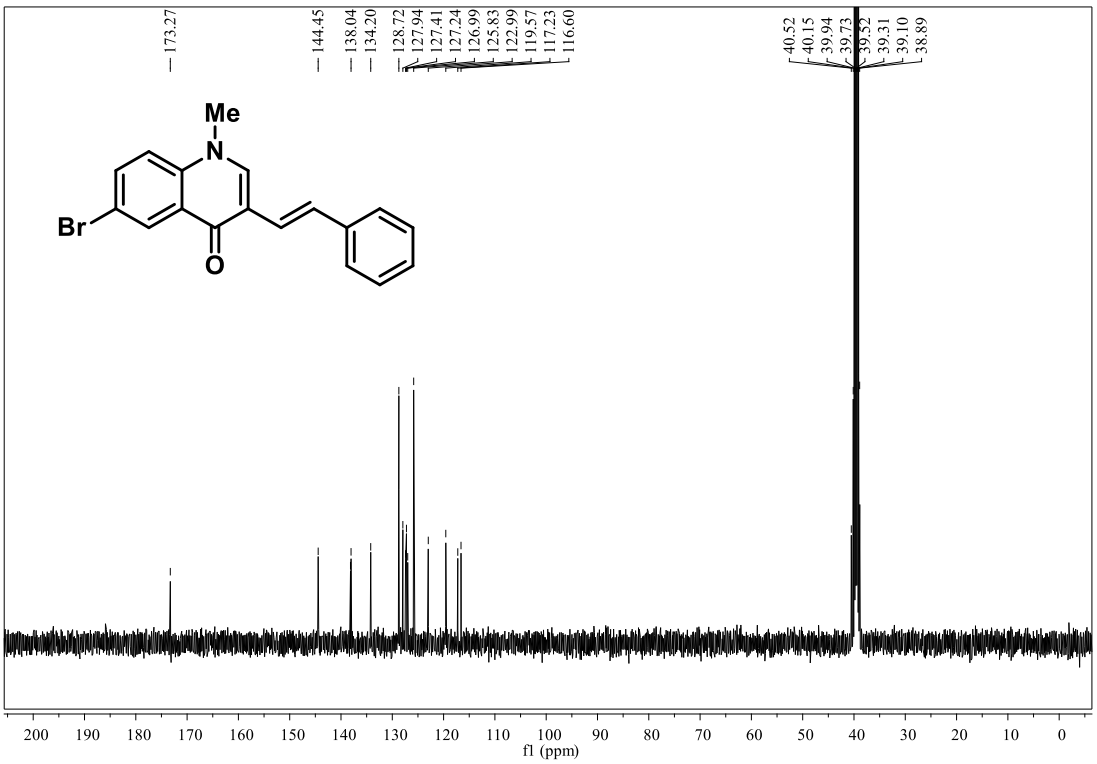


HRMS (MeOH)

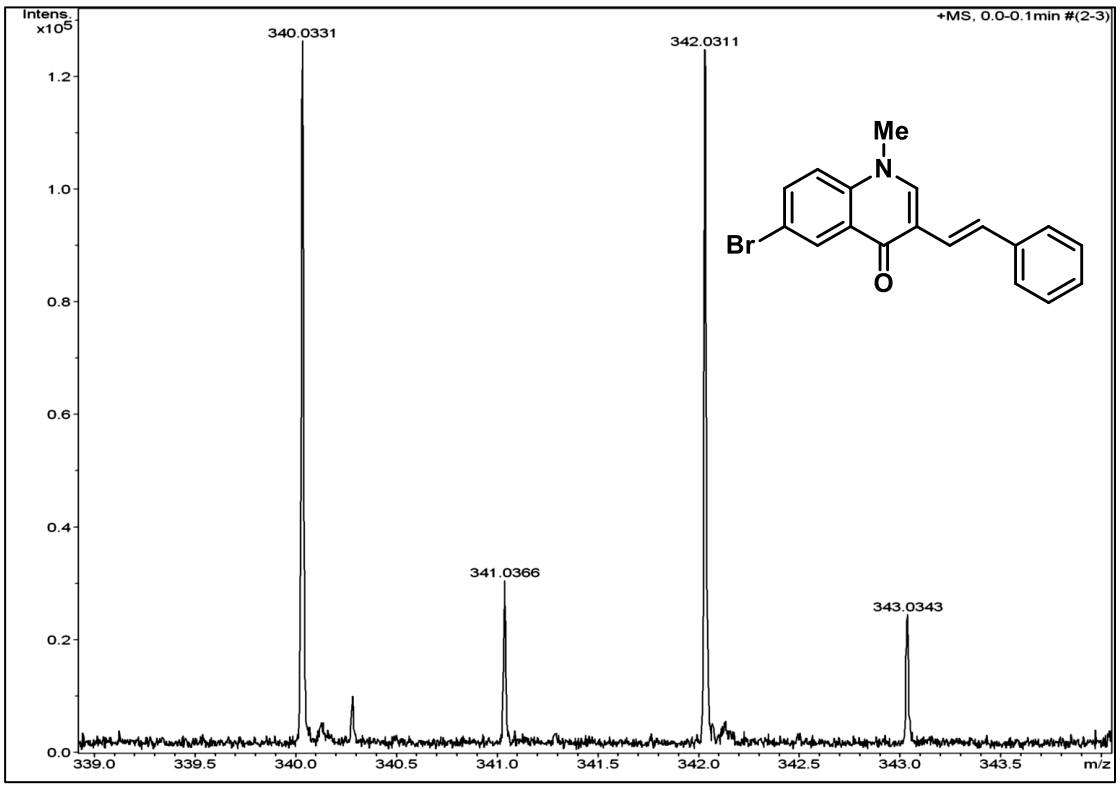
(*E*)-6-bromo-1-methyl-3-styrylquinolin-4(1*H*)-one (1o)



400 MHz, ^{1}H NMR in DMSO-d_6

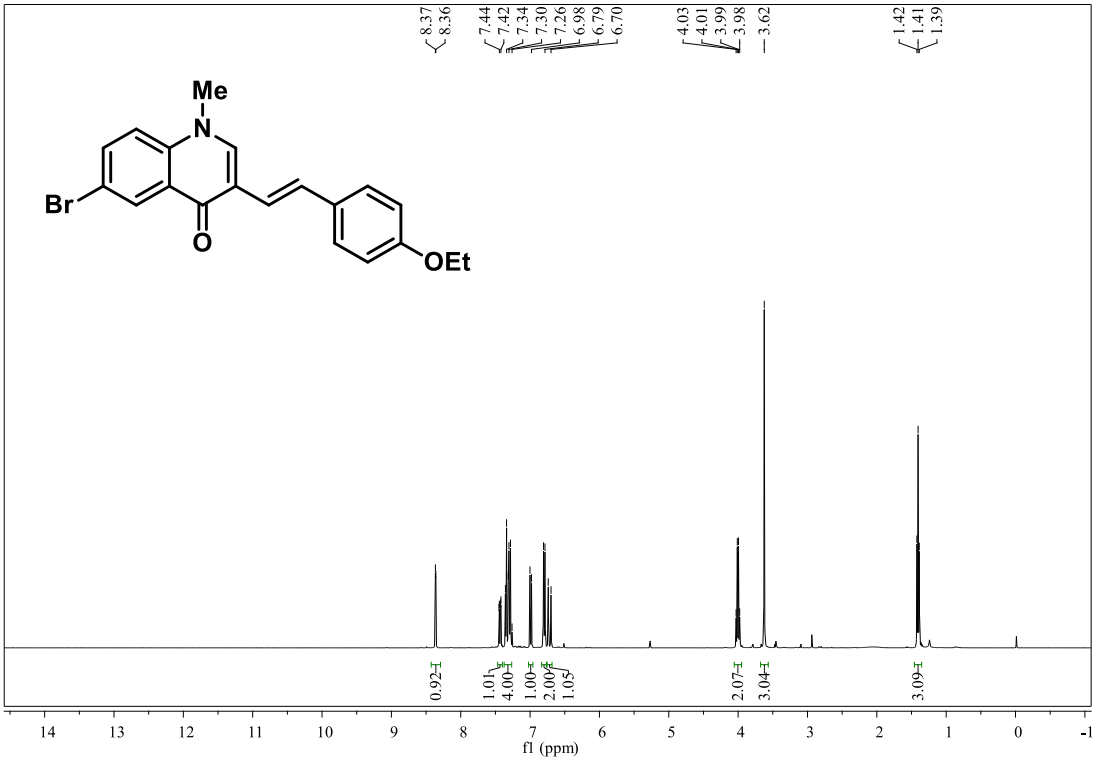


100 MHz, ^{13}C NMR in DMSO-d_6

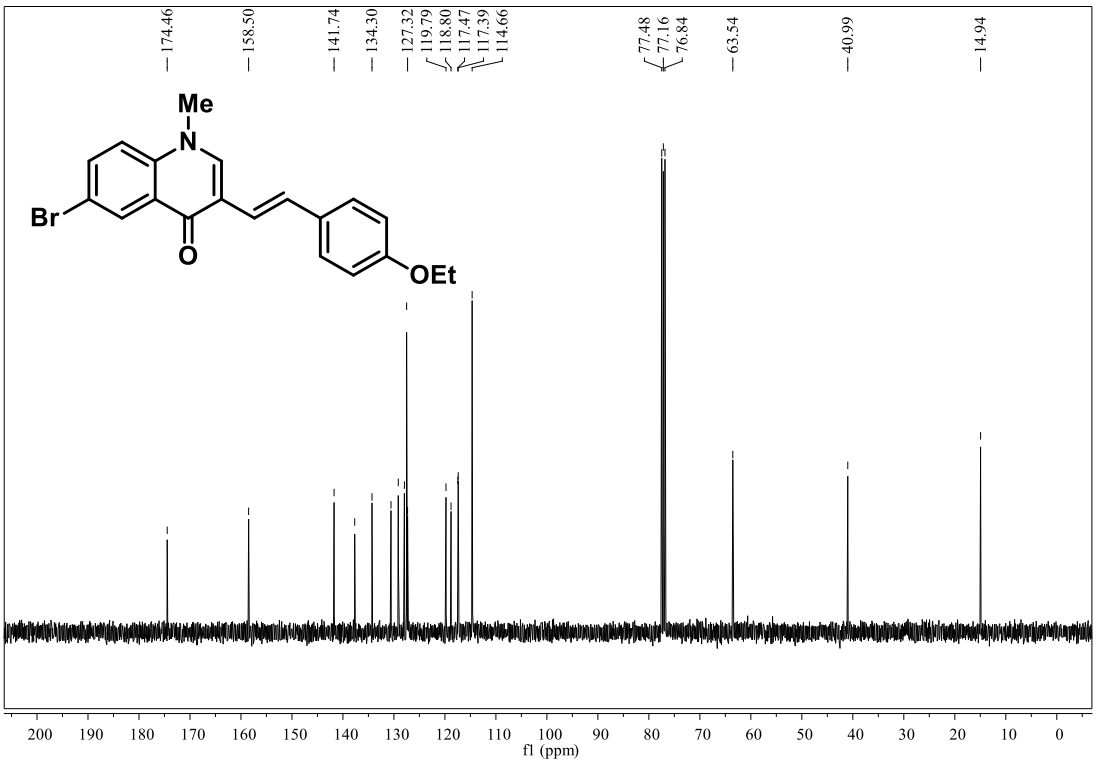


HRMS (MeOH)

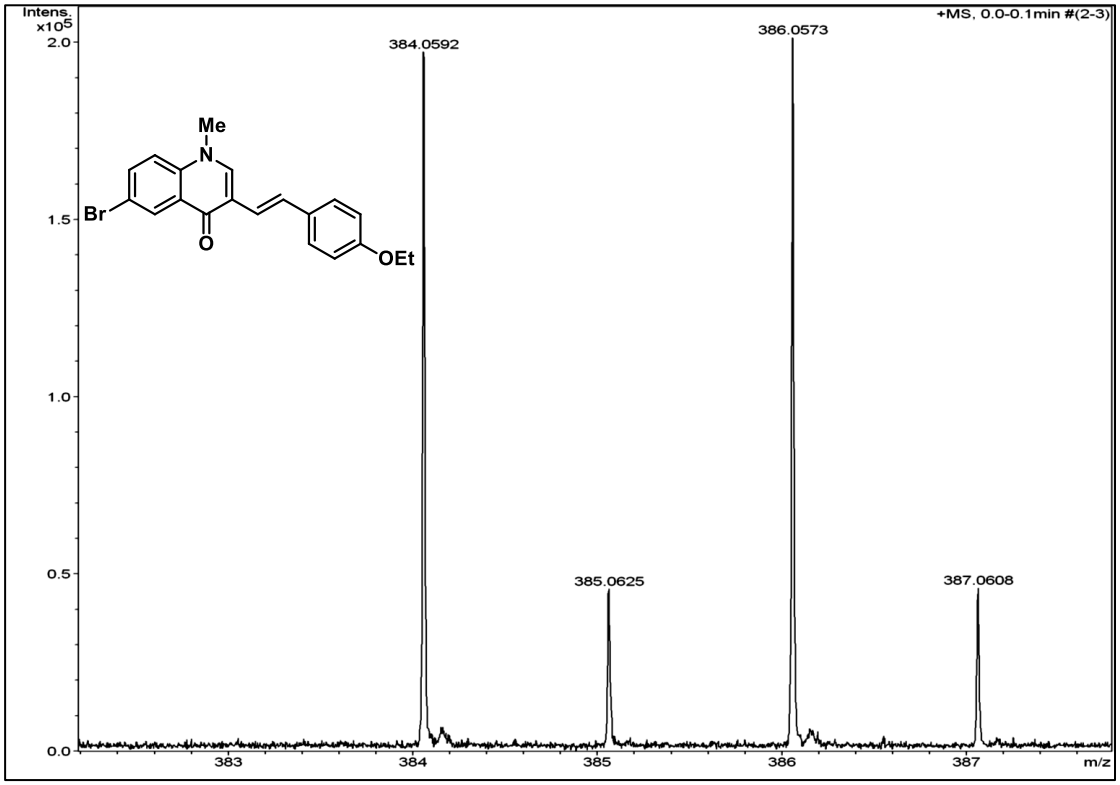
(*E*)-6-bromo-3-(4-ethoxystyryl)-1-methylquinolin-4(1*H*)-one (1p)



400 MHz, ^{1}H NMR in $CDCl_3$

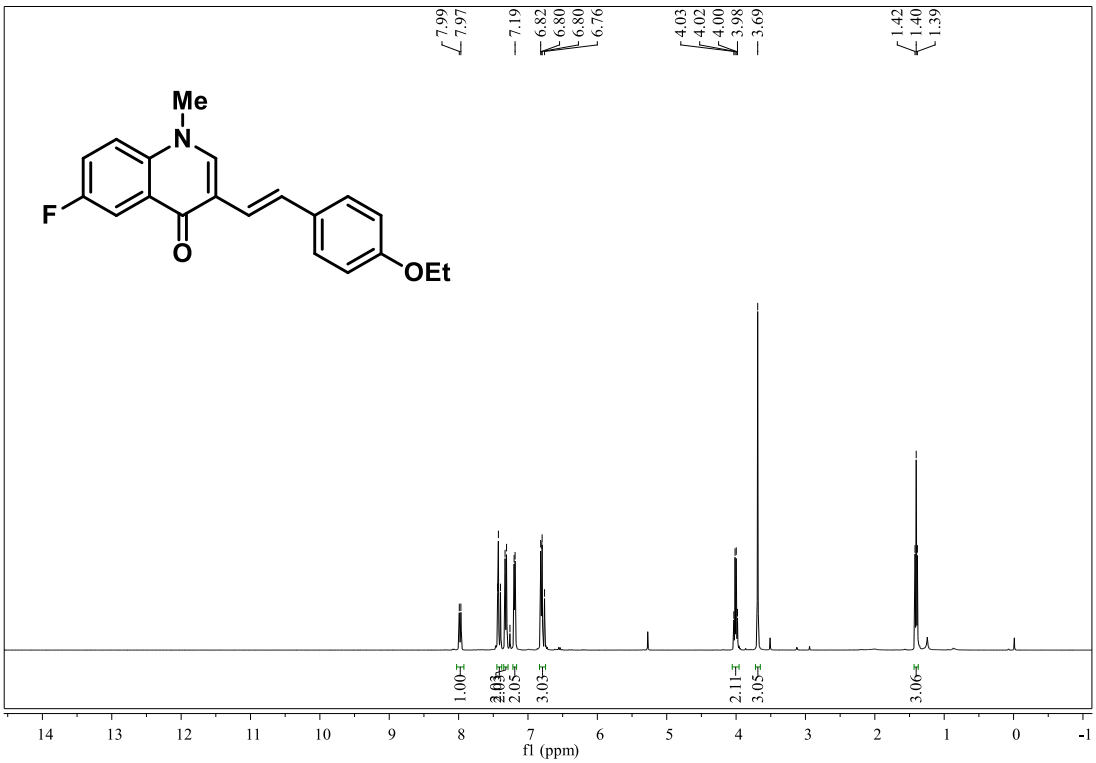


100 MHz, ^{13}C NMR in $CDCl_3$

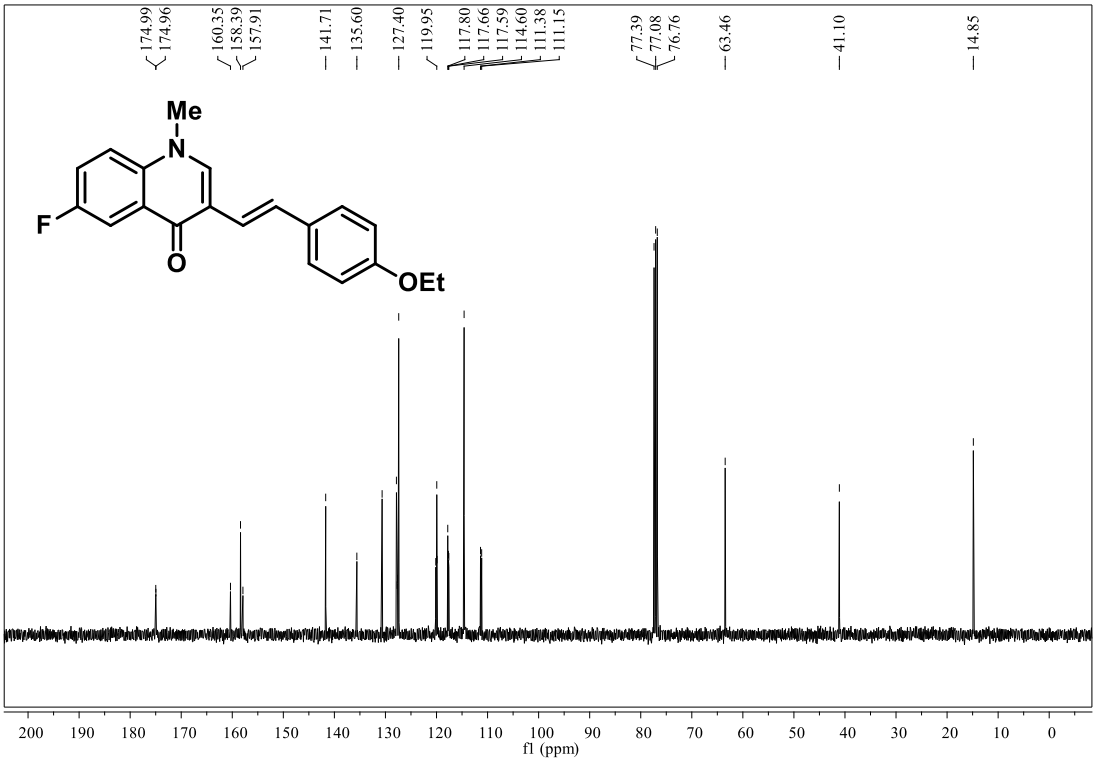


HRMS (MeOH)

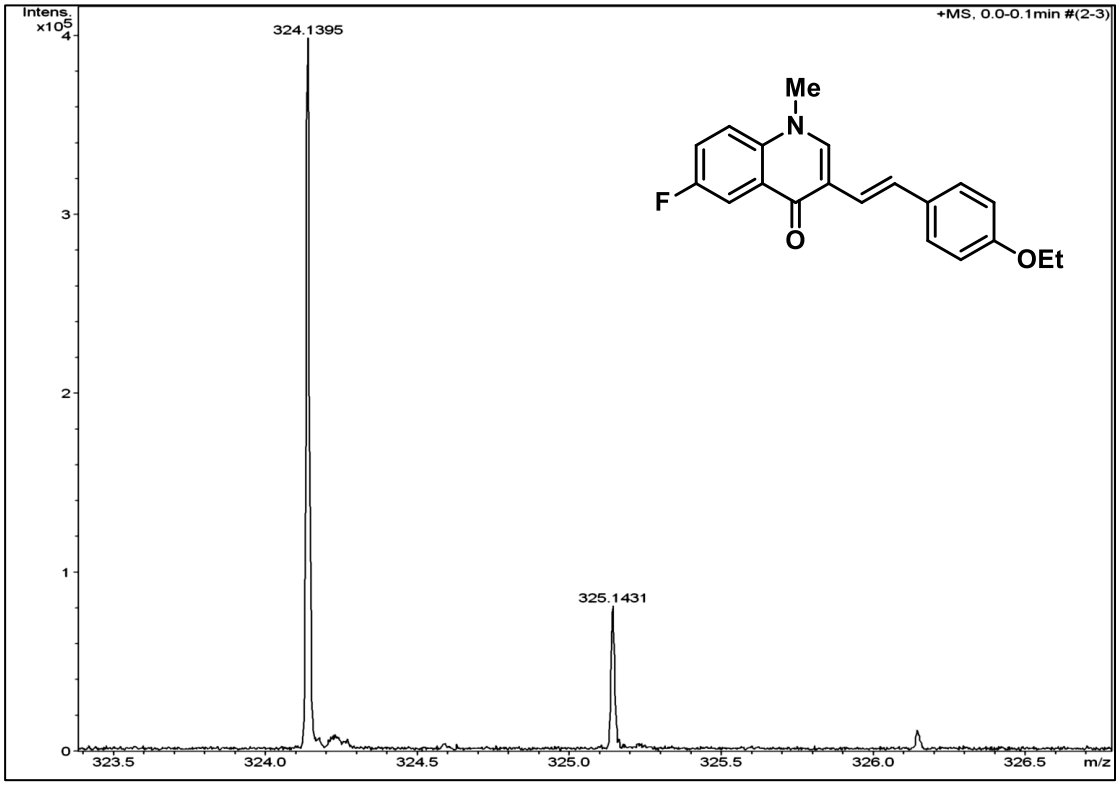
(*E*)-3-(4-ethoxystyryl)-6-fluoro-1-methylquinolin-4(1*H*)-one (1q)



400 MHz, ^{1}H NMR in $CDCl_3$

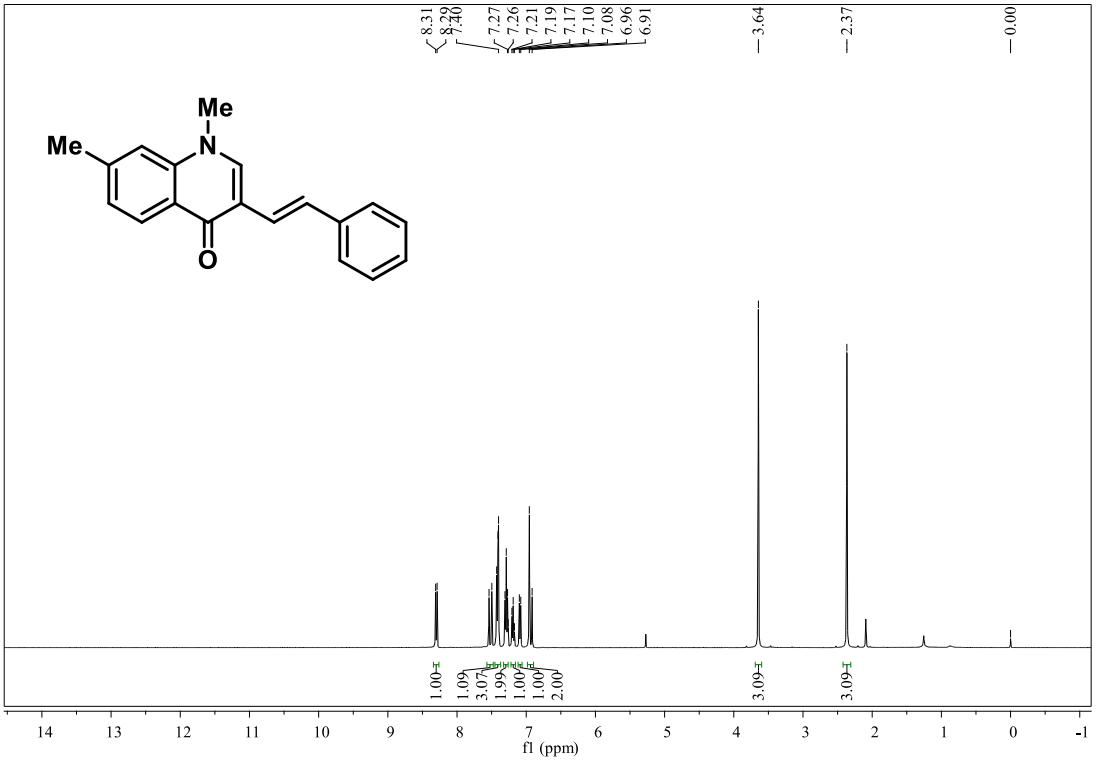


100 MHz, ^{13}C NMR in $CDCl_3$

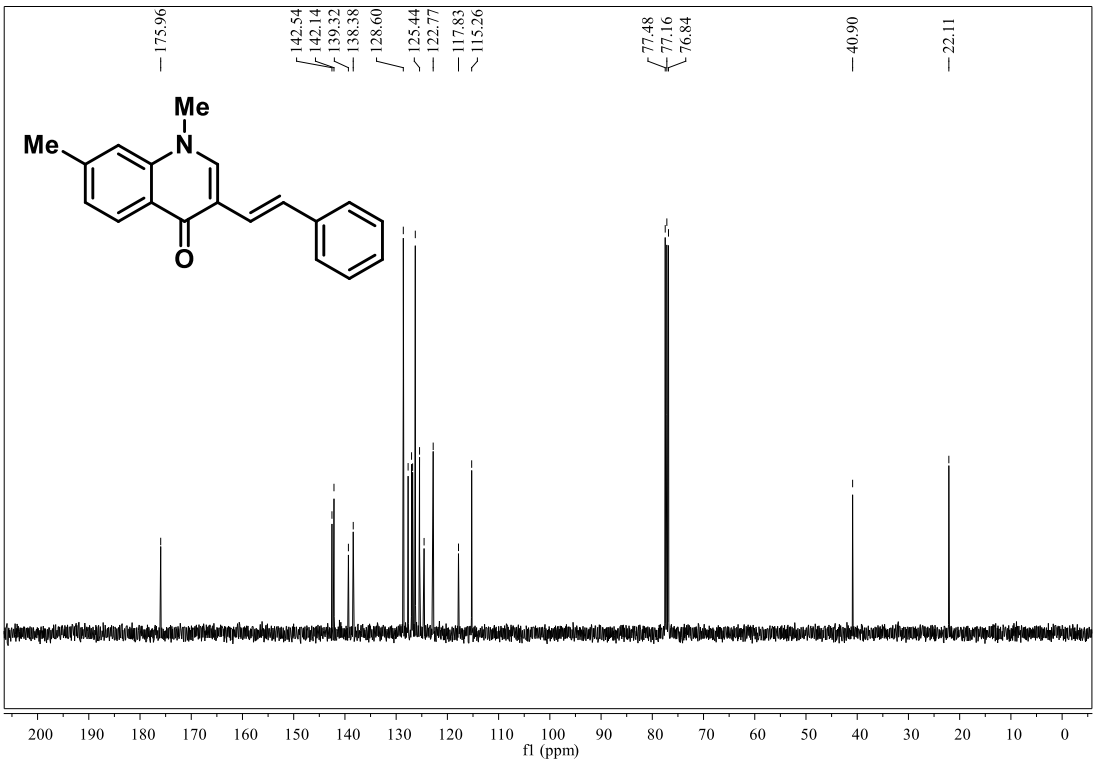


HRMS (MeOH)

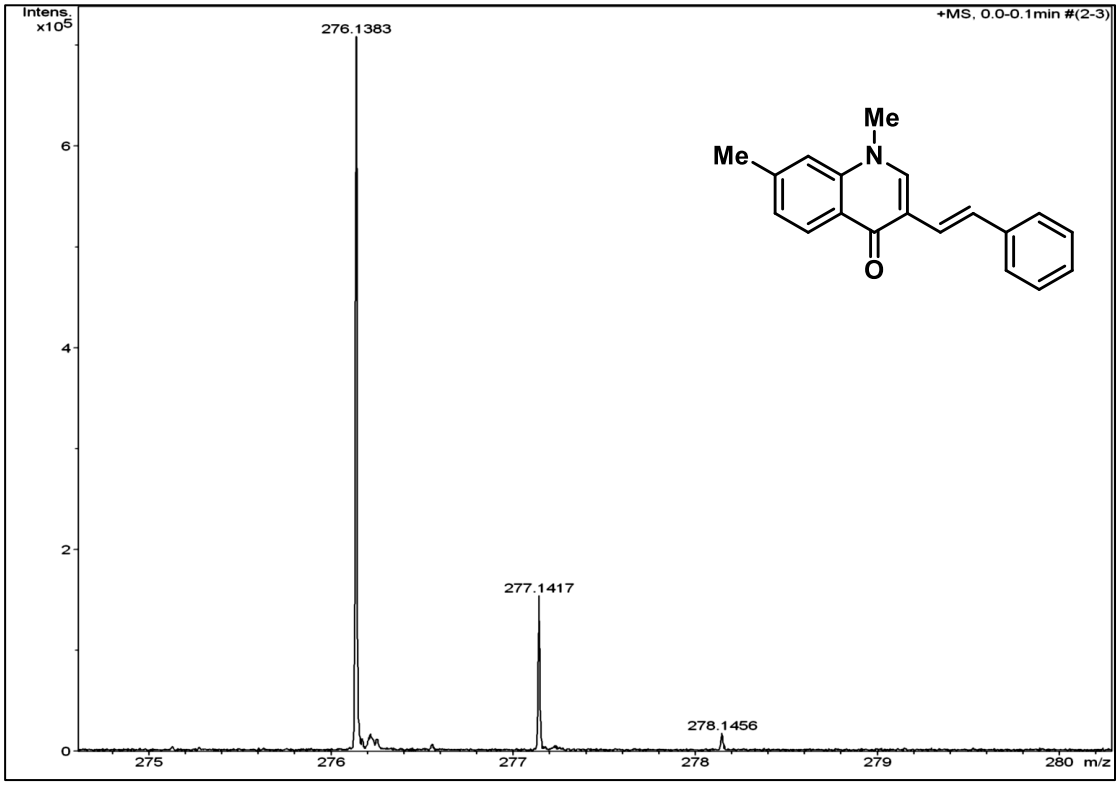
(*E*)-1,7-dimethyl-3-styrylquinolin-4(1*H*)-one (1r)



400 MHz, ^{1}H NMR in $CDCl_3$

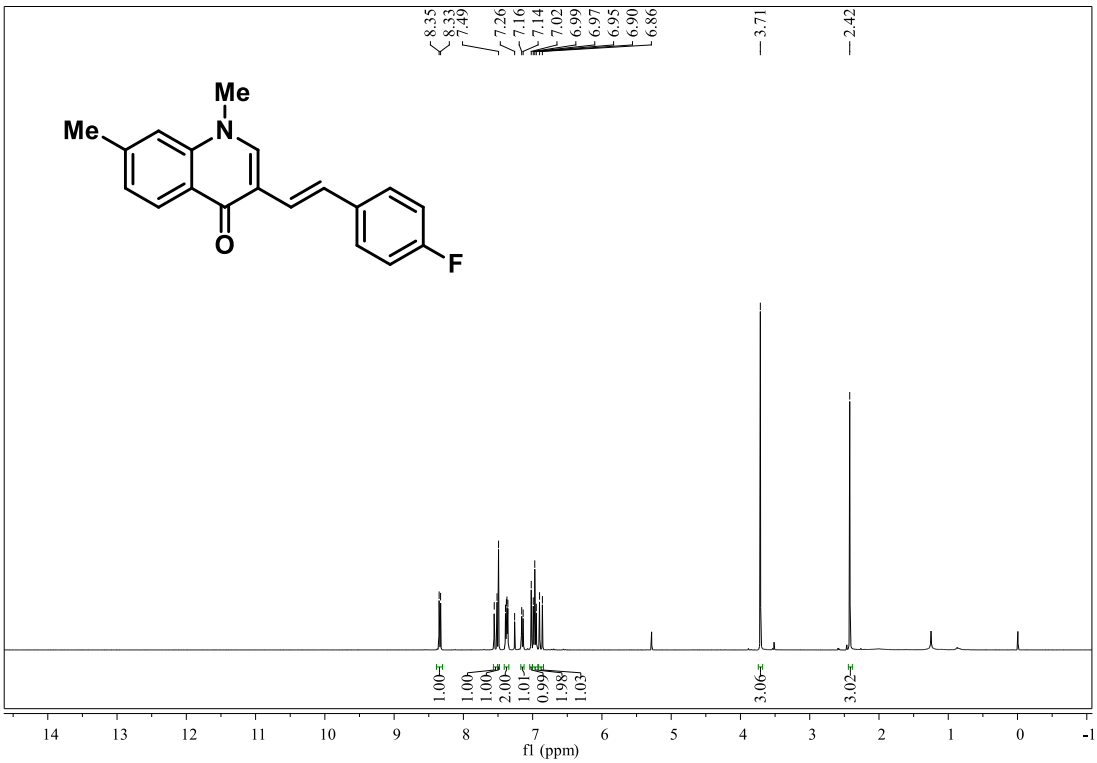


100 MHz, ^{13}C NMR in $CDCl_3$

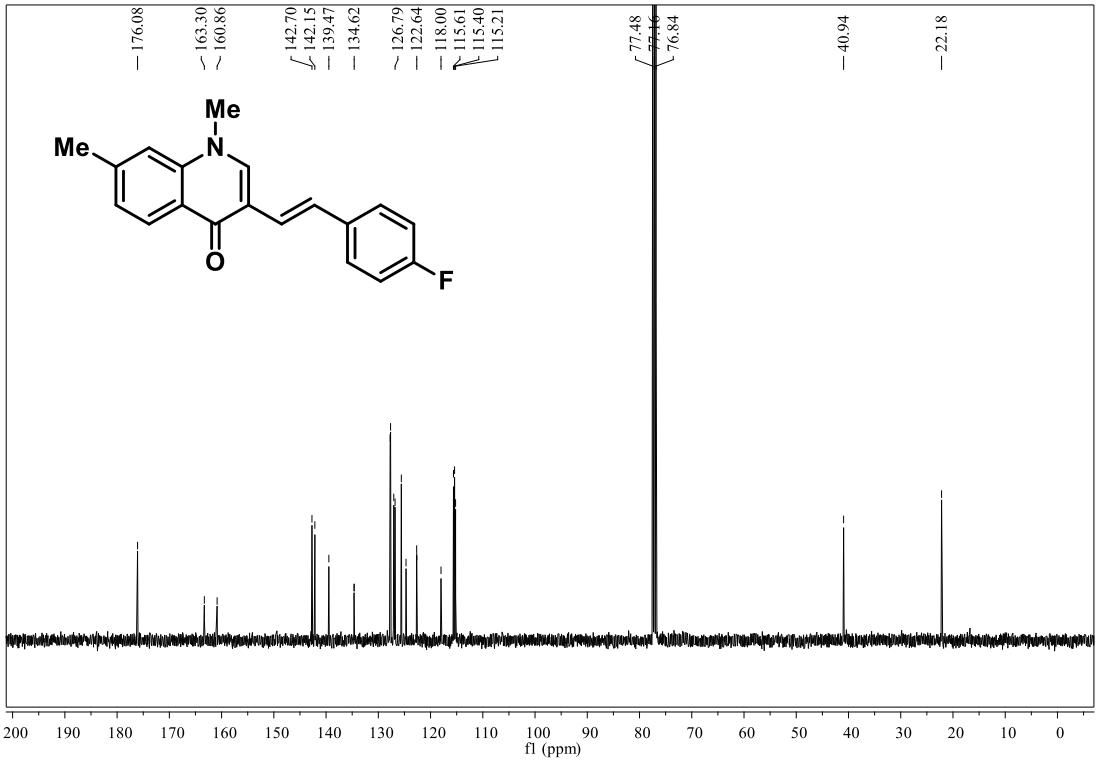


HRMS (MeOH)

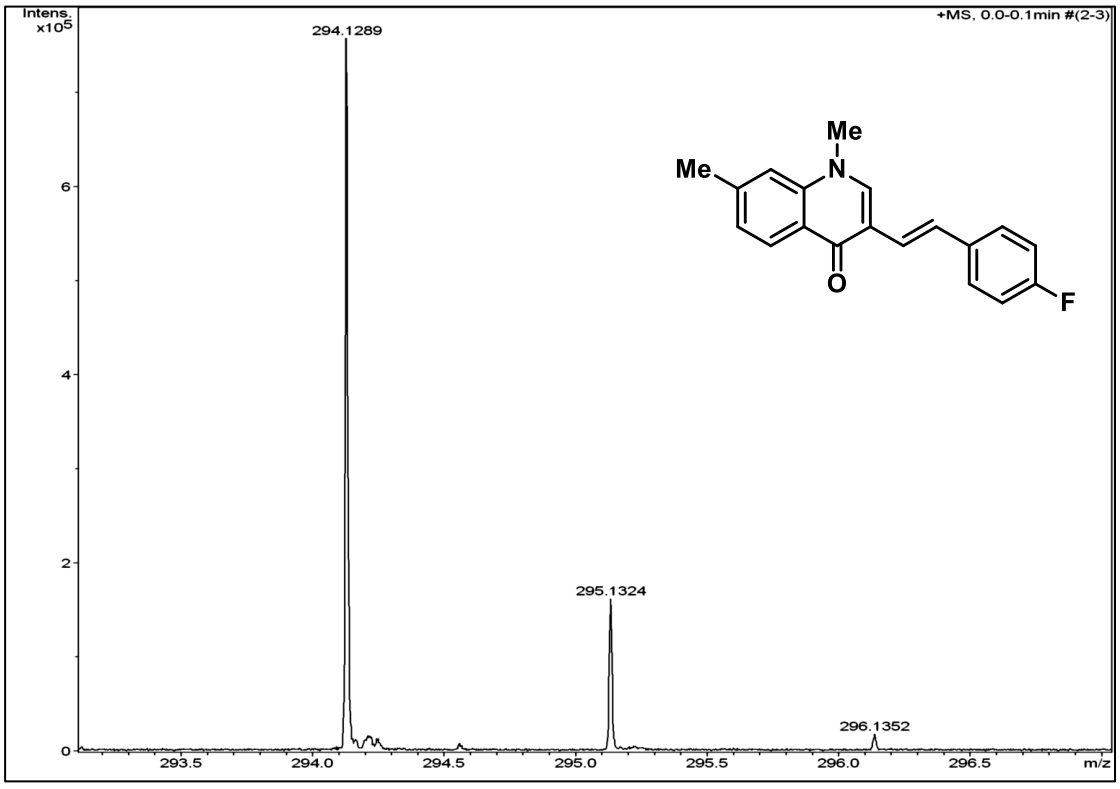
(*E*)-3-(4-fluorostyryl)-1,7-dimethylquinolin-4(1*H*)-one (1s)



400 MHz, ^{1}H NMR in $CDCl_3$

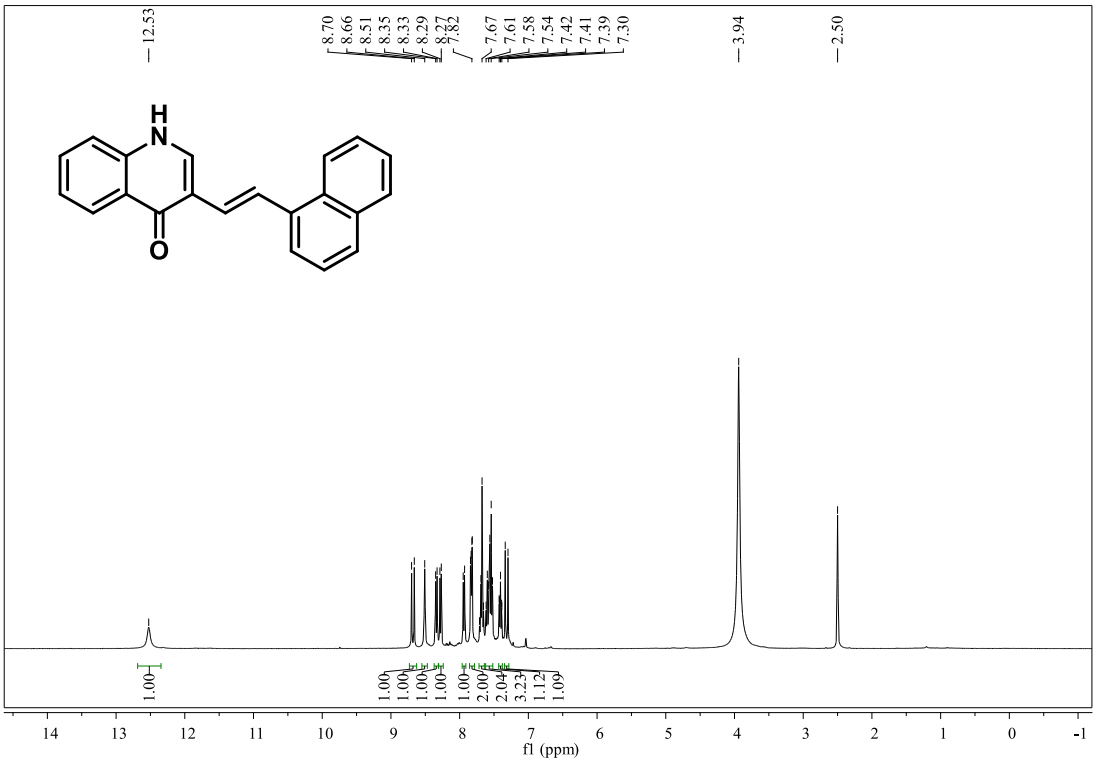


100 MHz, ^{13}C NMR in $CDCl_3$

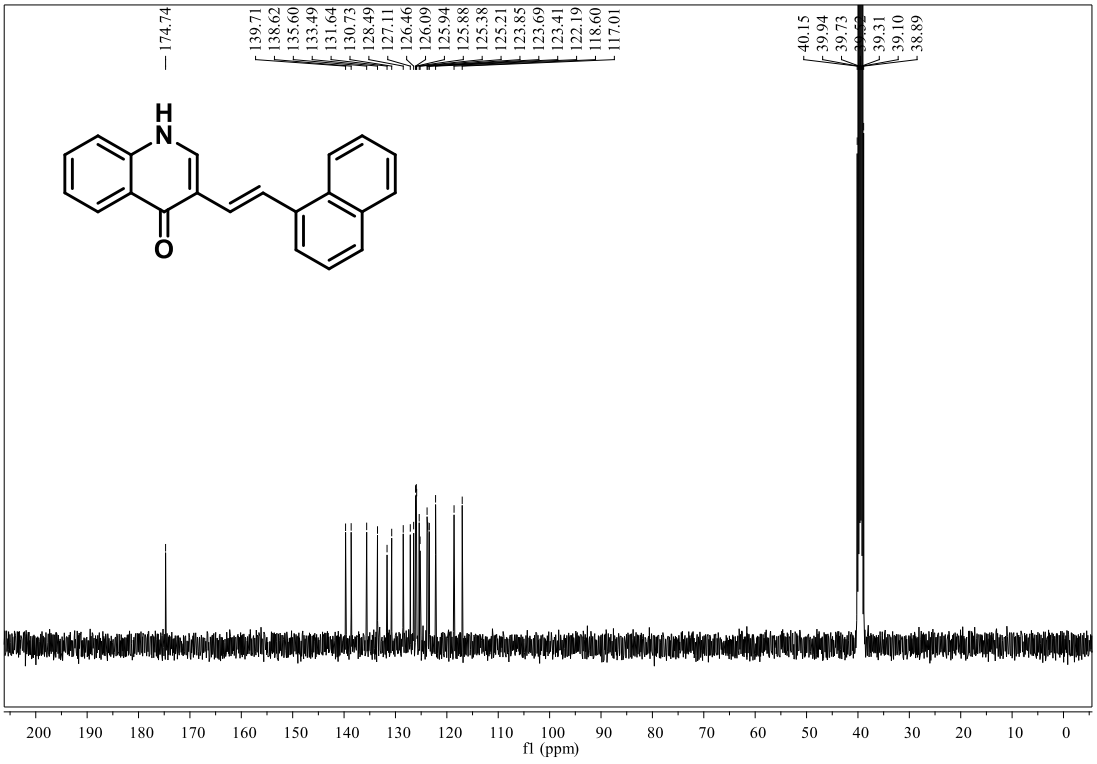


HRMS (MeOH)

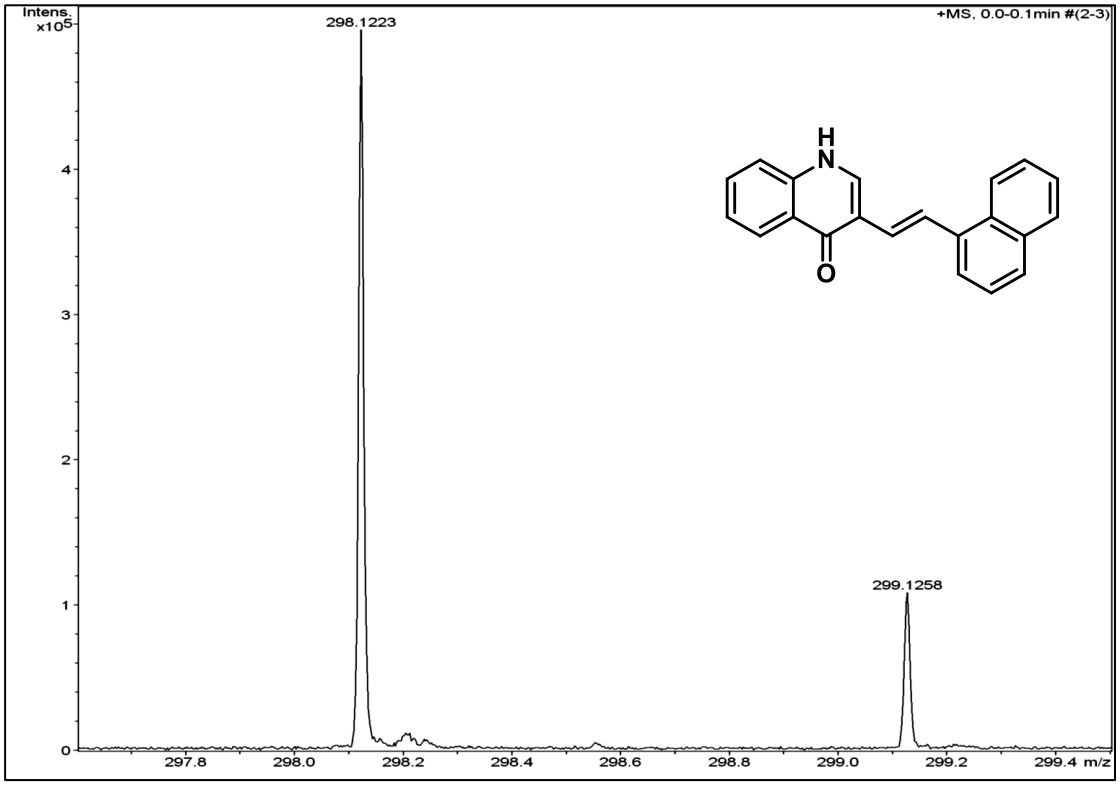
(*E*)-3-(2-(naphthalen-1-yl)vinyl)quinolin-4(1*H*)-one (1t)



400 MHz, ^{1}H NMR in DMSO-d_6

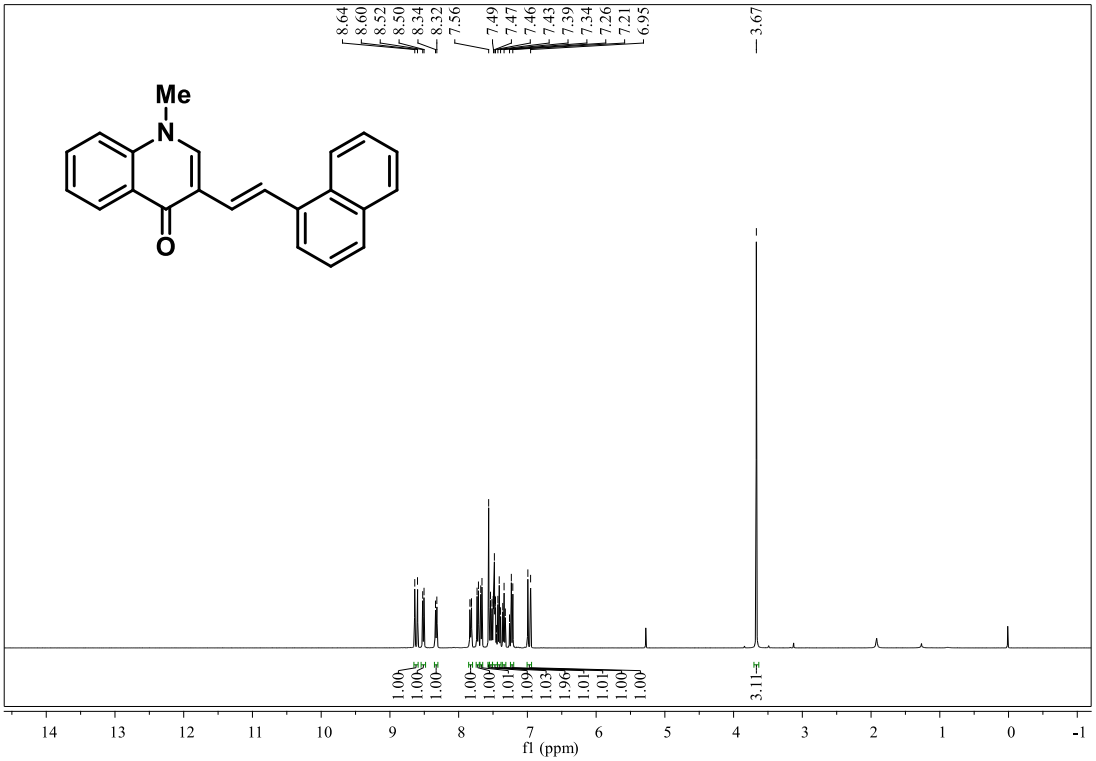


100 MHz, ^{13}C NMR in DMSO-d_6

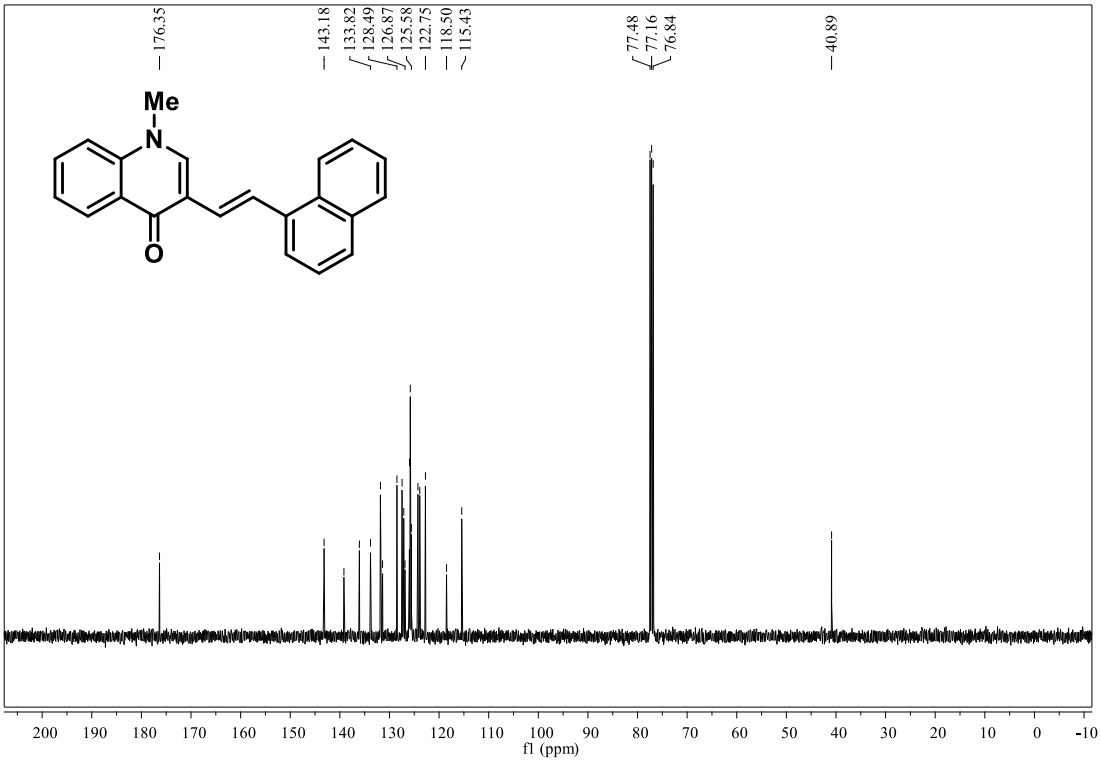


HRMS (MeOH)

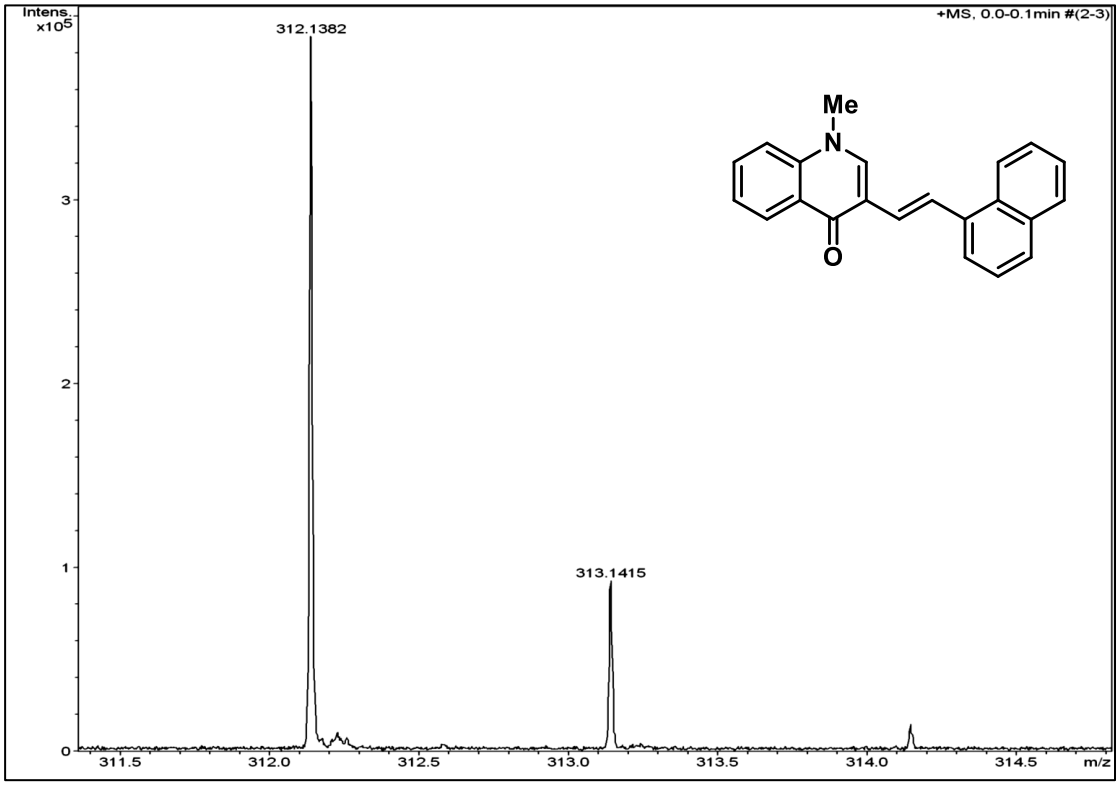
(*E*)-1-methyl-3-(2-(naphthalen-1-yl)vinyl)quinolin-4(1*H*)-one (1u)



400 MHz, ^{1}H NMR in $CDCl_3$

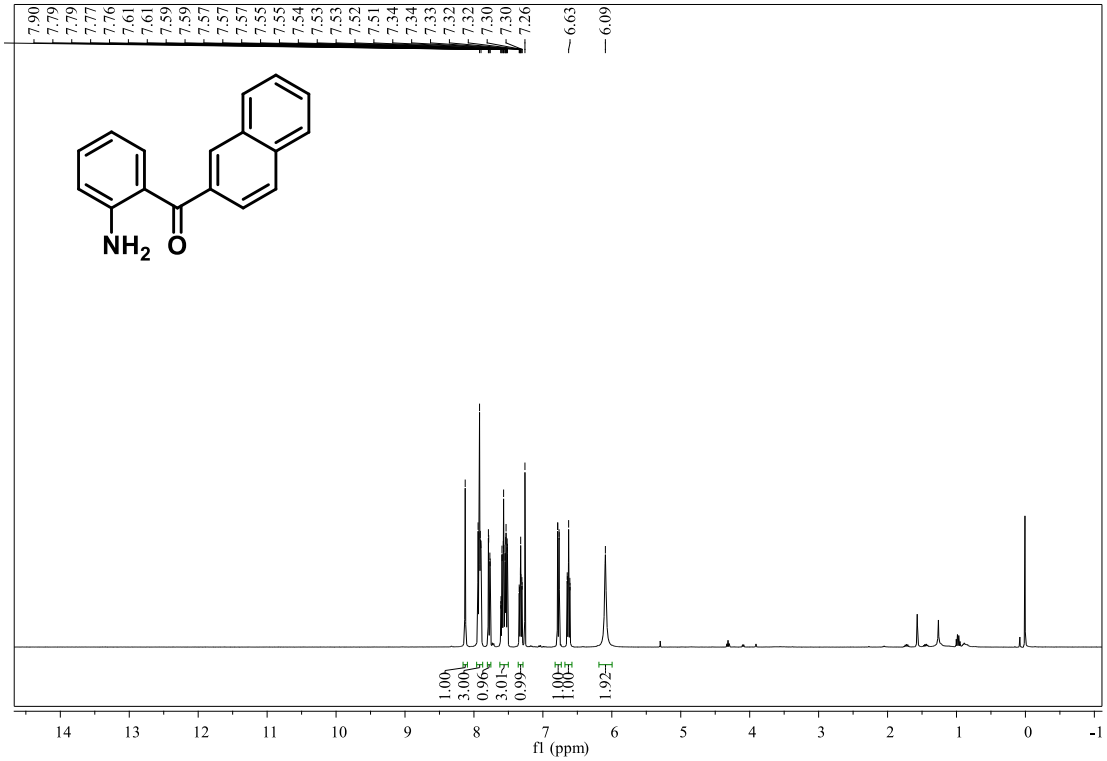


100 MHz, ^{13}C NMR in $CDCl_3$

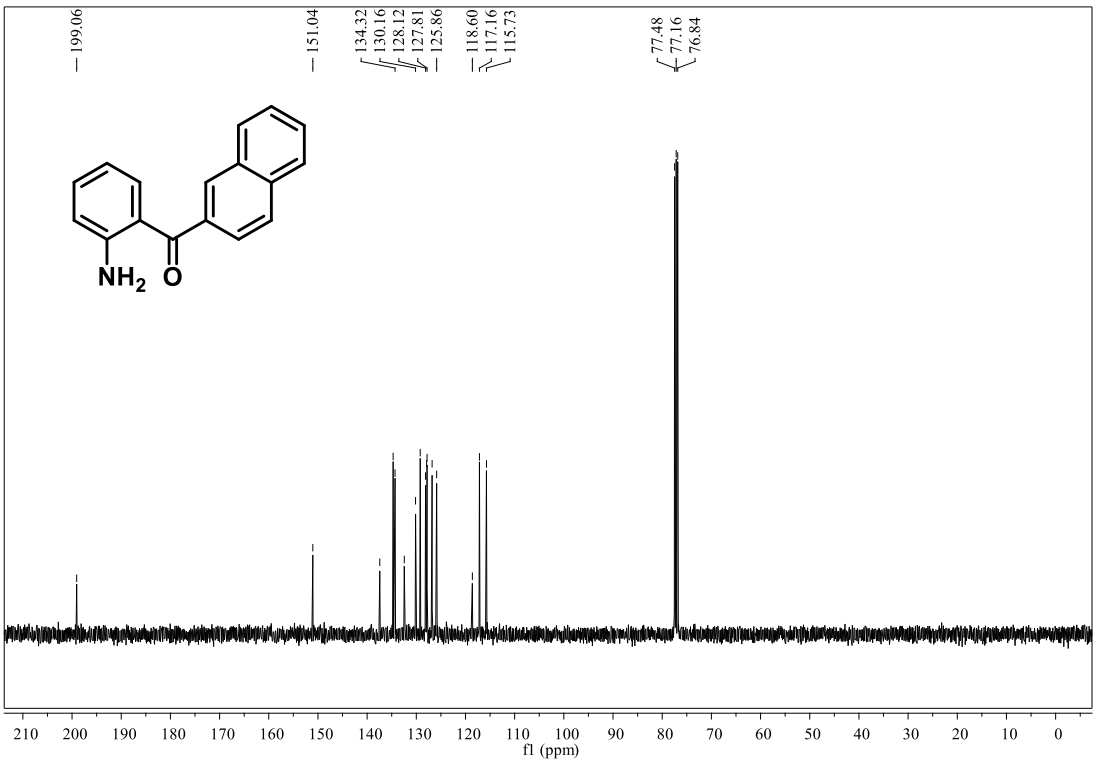


HRMS (MeOH)

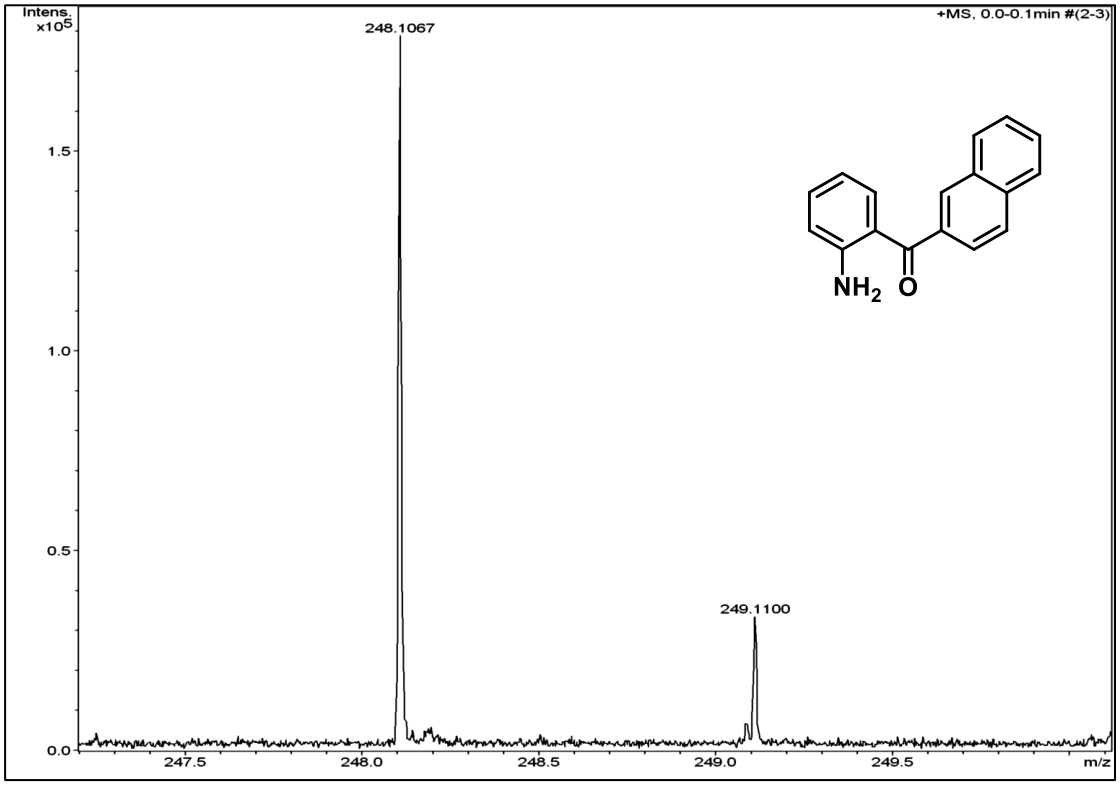
(2-Aminophenyl)(naphthalen-2-yl)methanone (2a)



400 MHz, ^{1}H NMR in $CDCl_3$

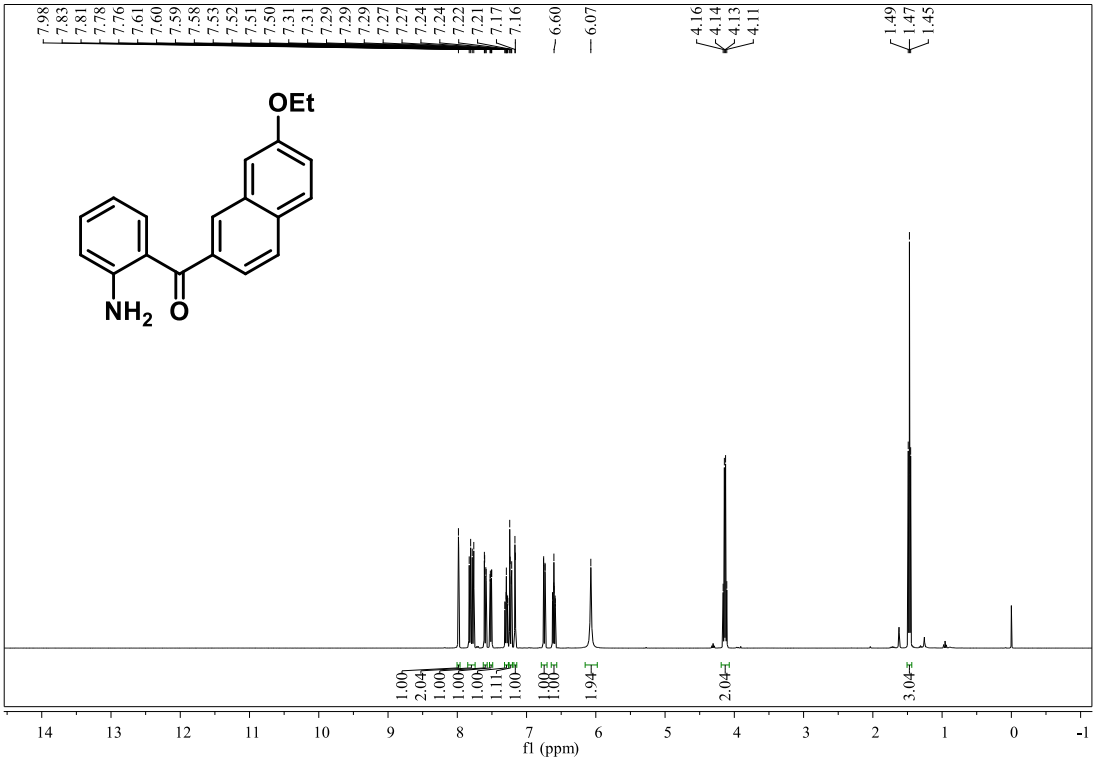


100 MHz, ^{13}C NMR in $CDCl_3$

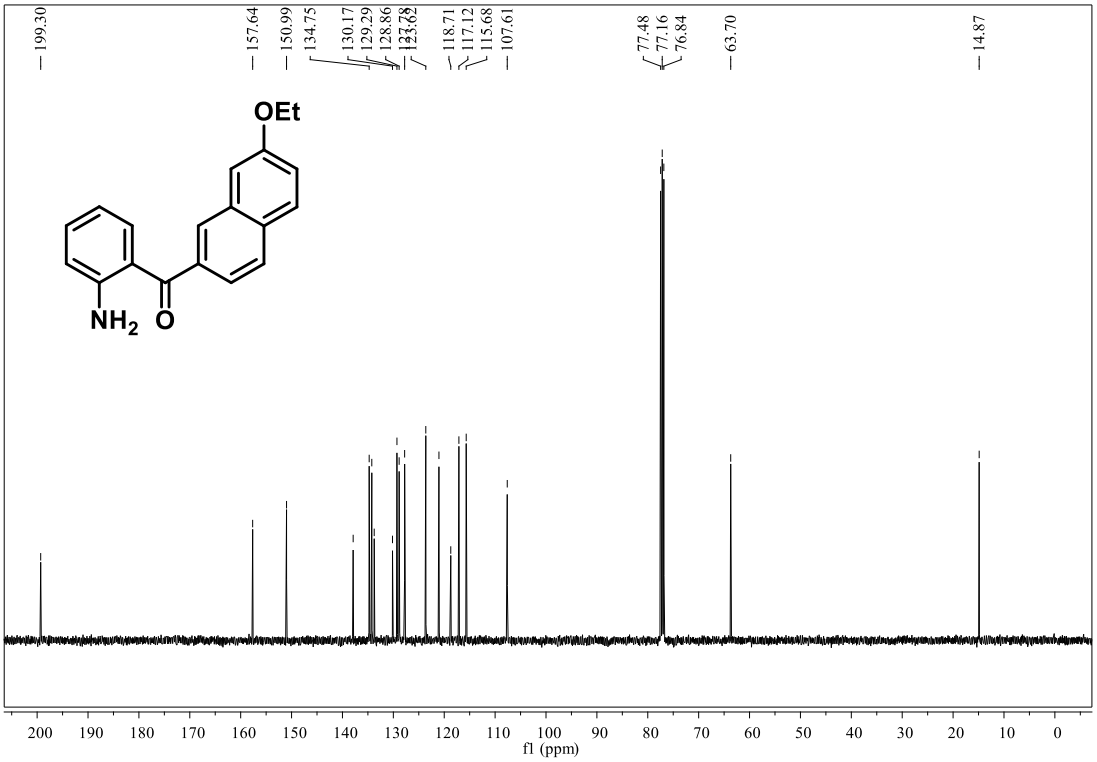


HRMS (MeOH)

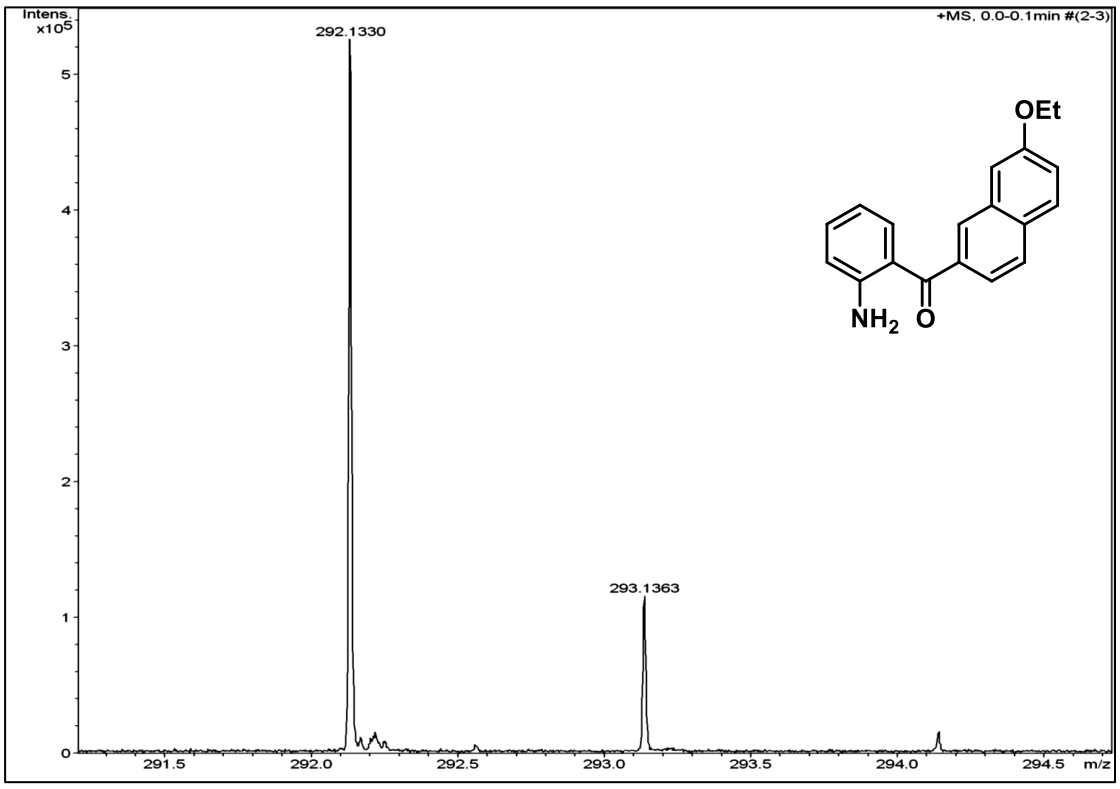
(2-Aminophenyl)(7-ethoxynaphthalen-2-yl)methanone (2b)



400 MHz, ^{1}H NMR in $CDCl_3$

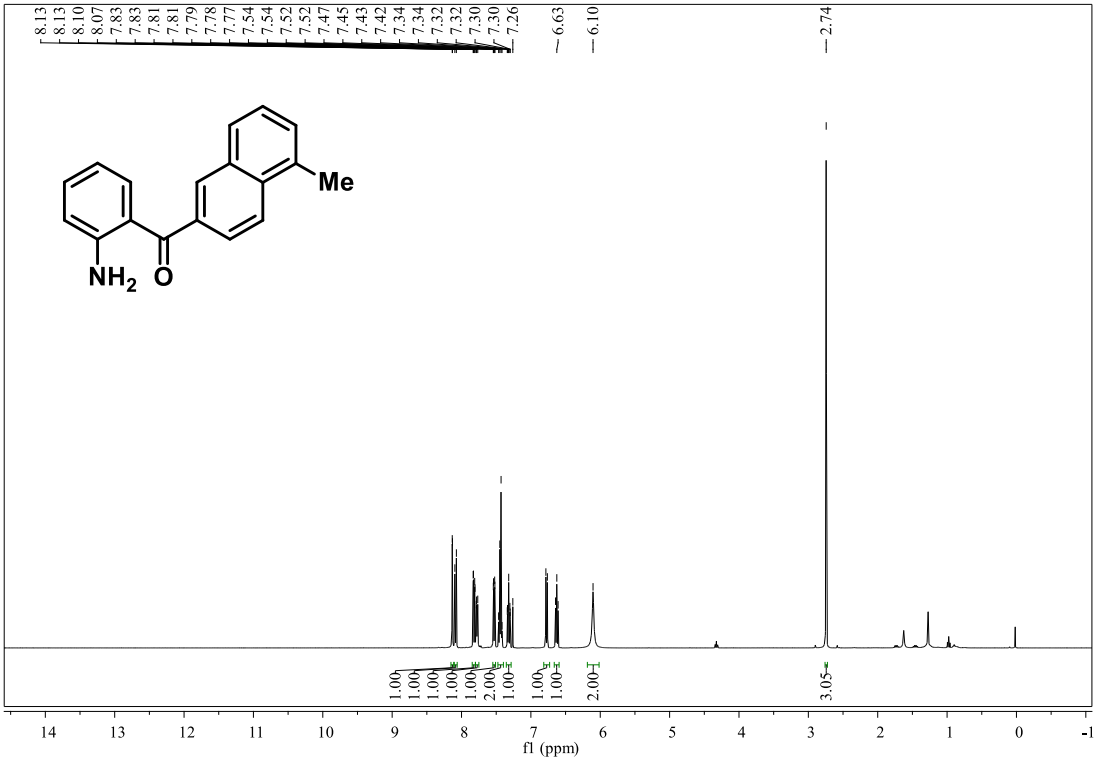


100 MHz, ^{13}C NMR in $CDCl_3$

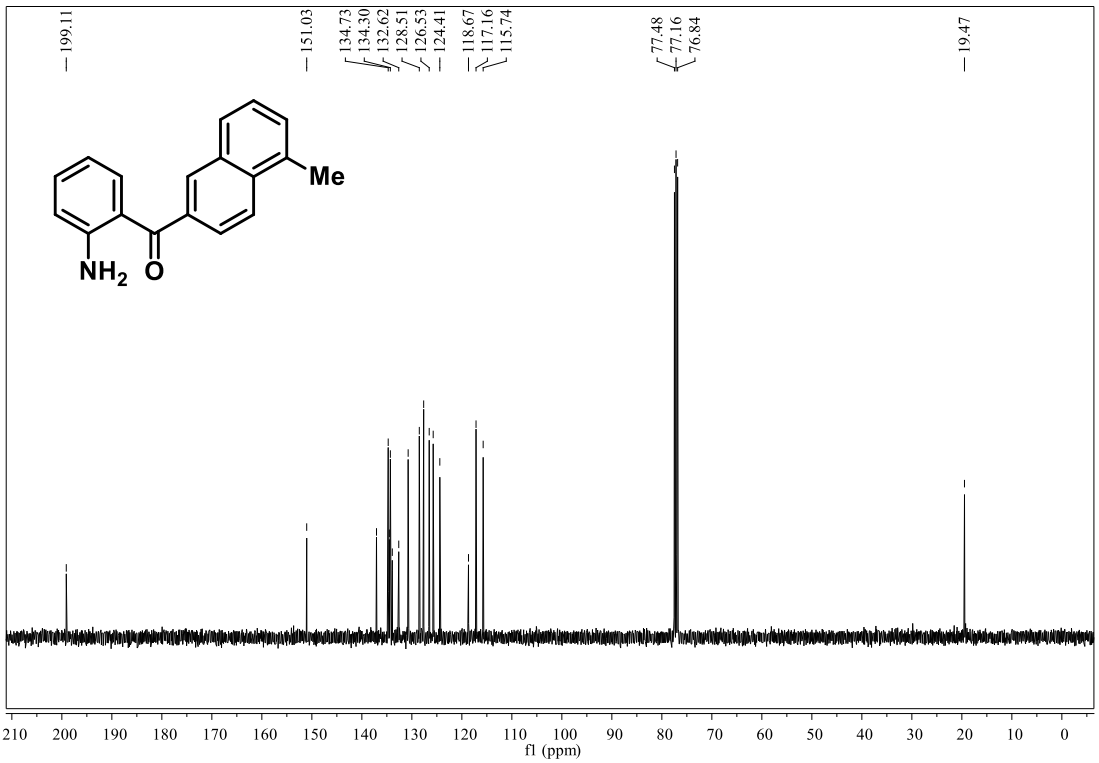


HRMS (MeOH)

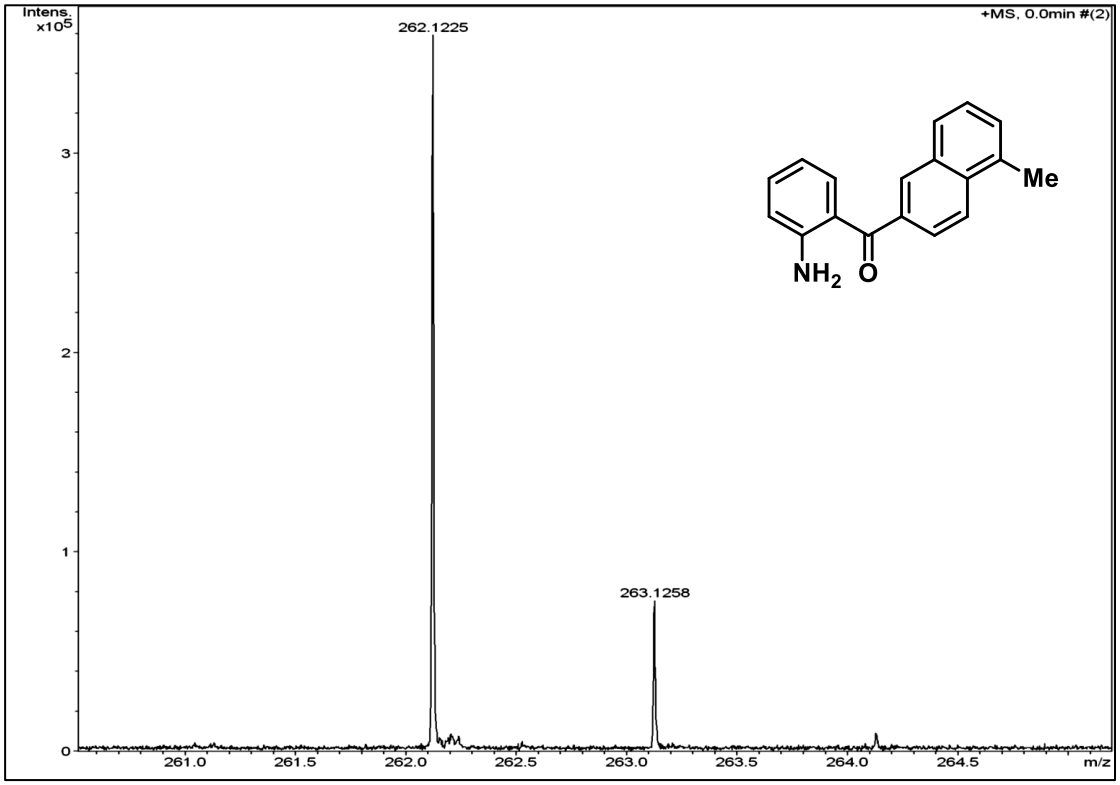
(2-Aminophenyl)(5-methylnaphthalen-2-yl)methanone (2c)



400 MHz, ^{1}H NMR in $CDCl_3$

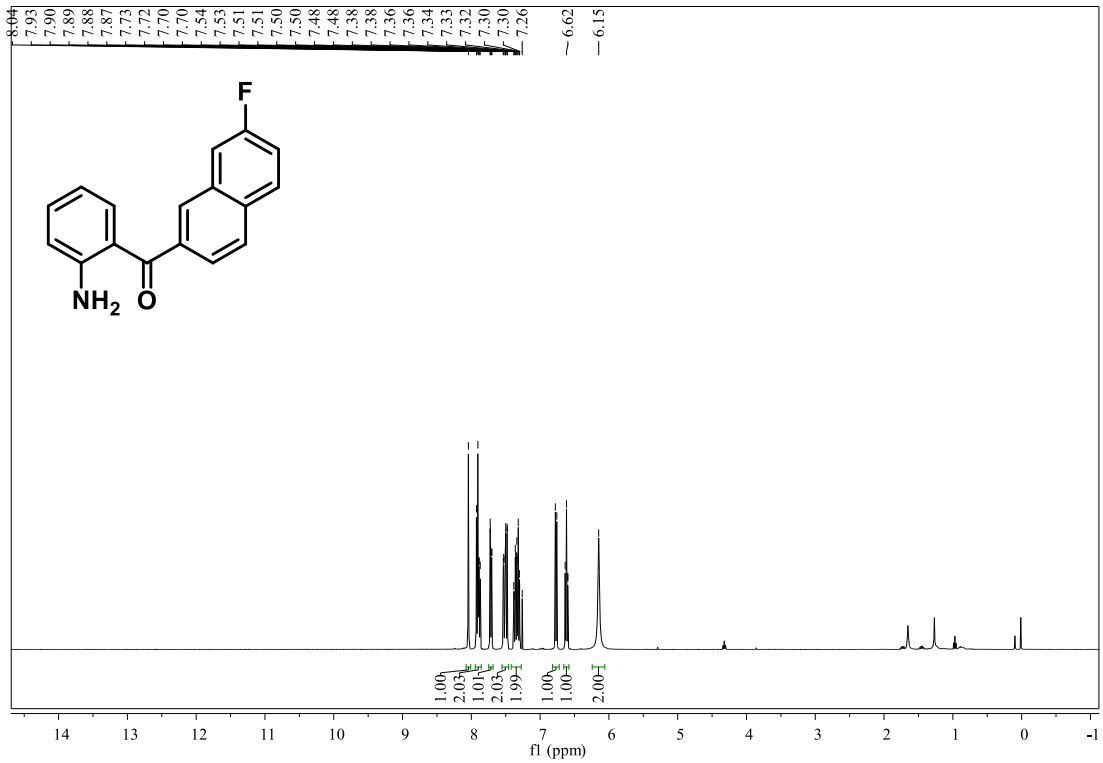


100 MHz, ^{13}C NMR in $CDCl_3$

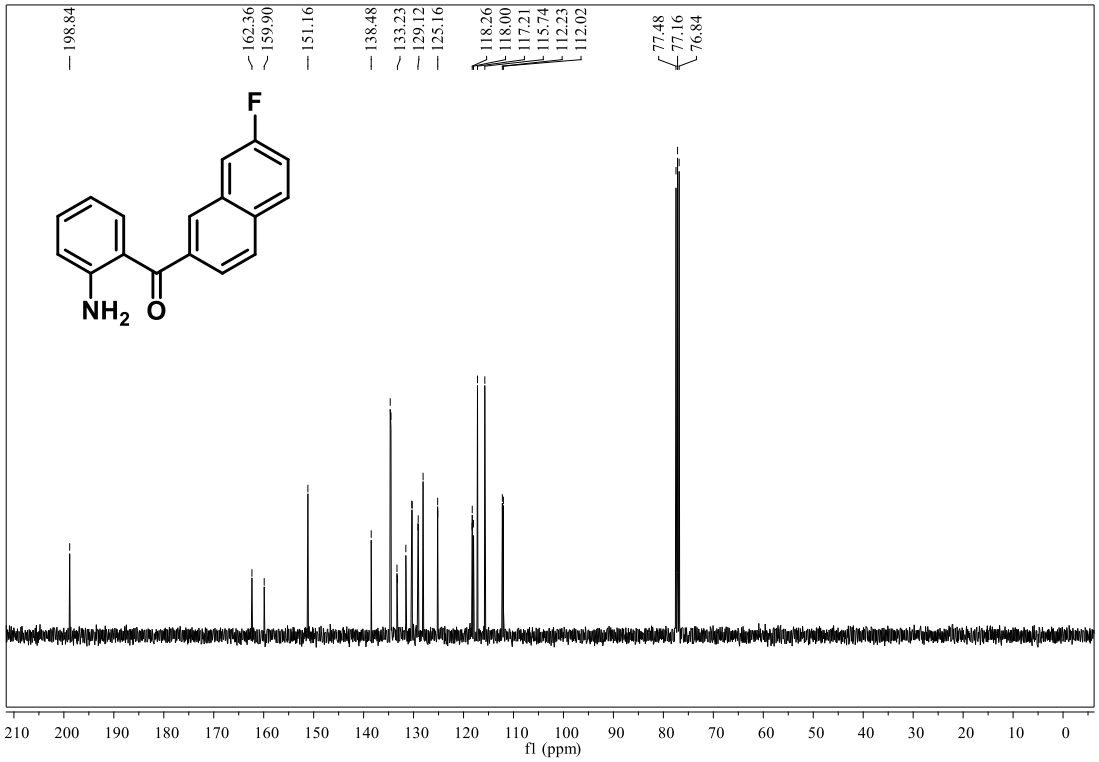


HRMS (MeOH)

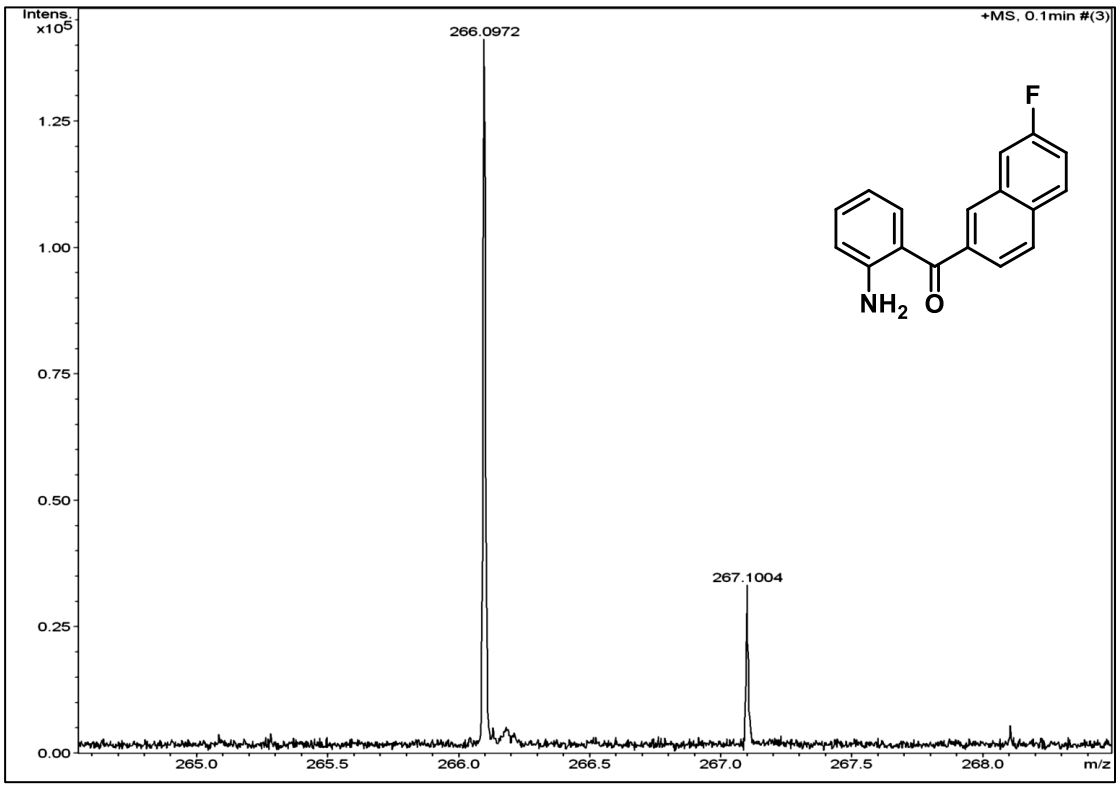
(2-Aminophenyl)(7-fluoronaphthalen-2-yl)methanone (2d)



400 MHz, ^{1}H NMR in $CDCl_3$

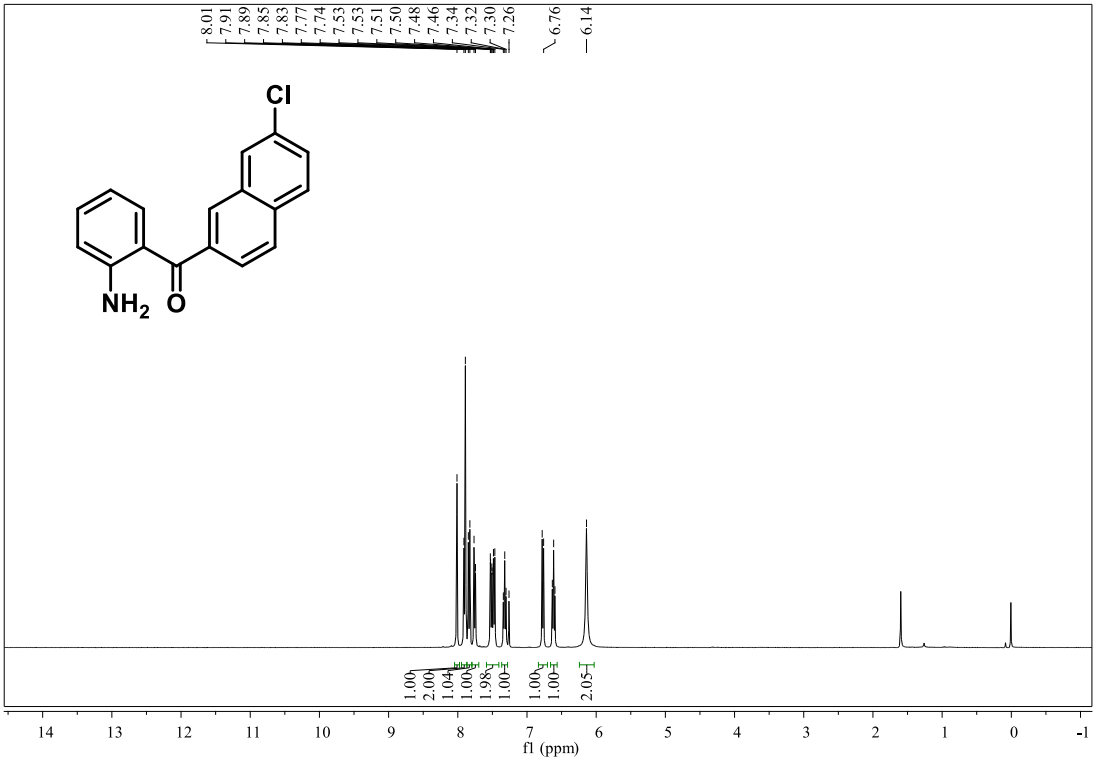


100 MHz, ^{13}C NMR in $CDCl_3$

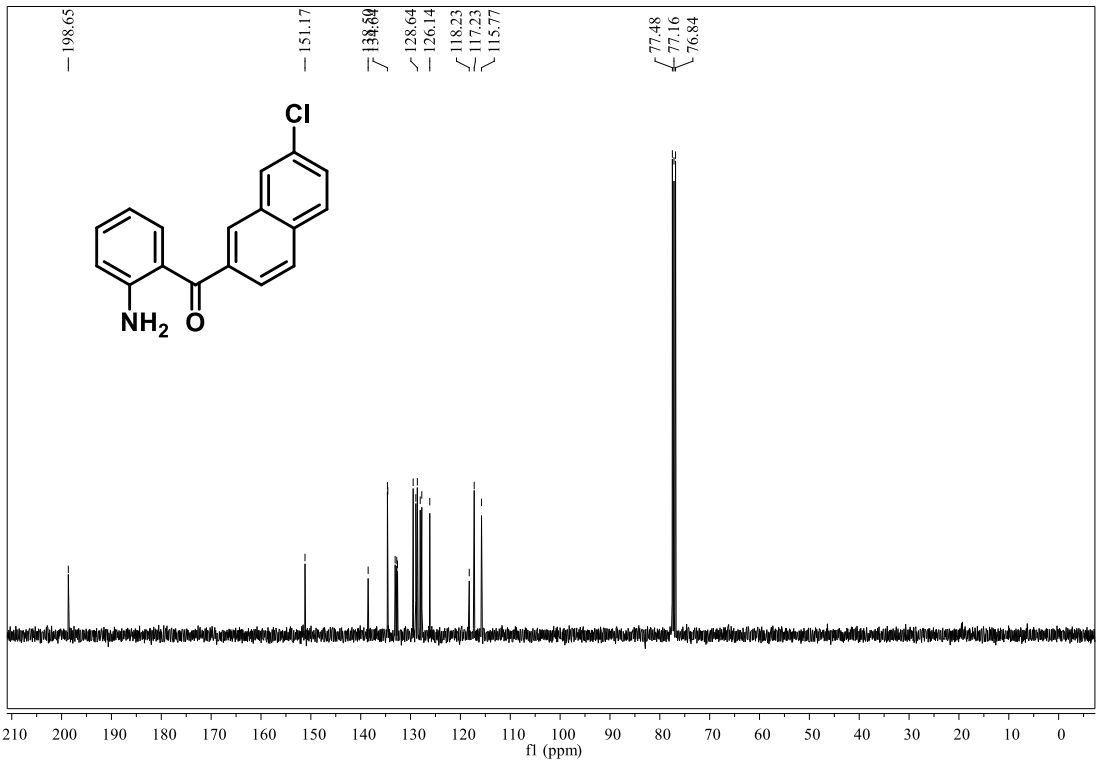


HRMS (MeOH)

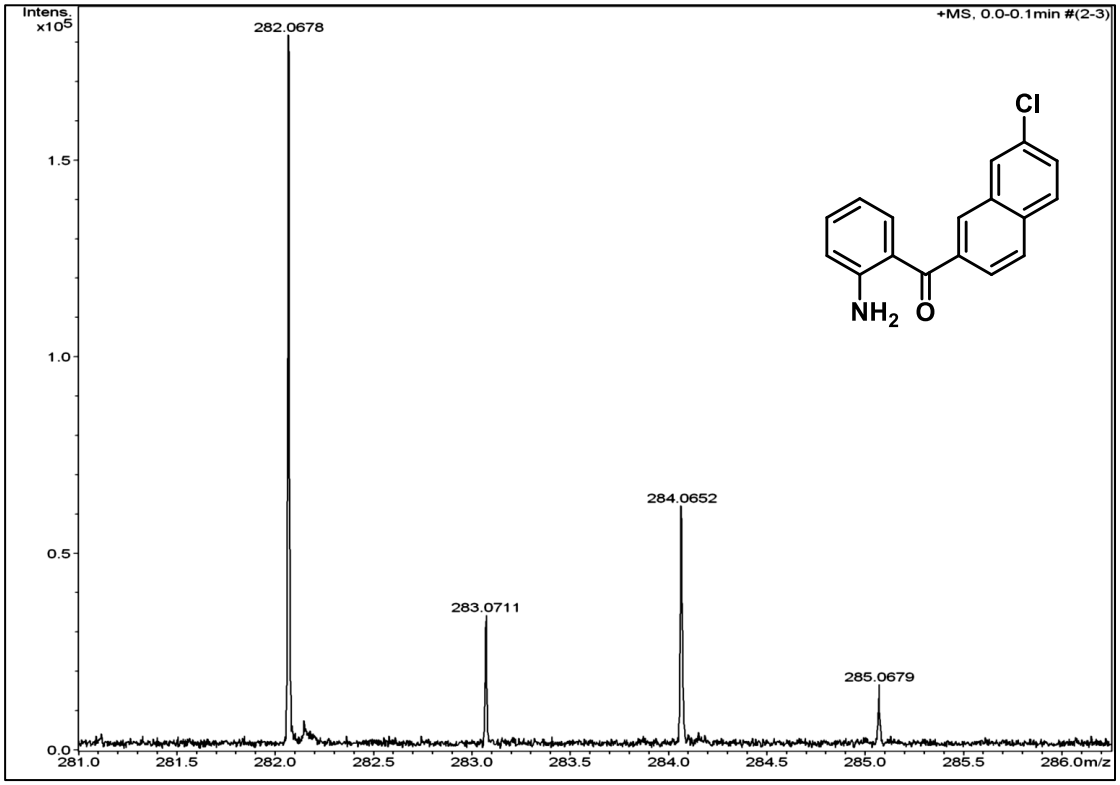
(2-Aminophenyl)(7-chloronaphthalen-2-yl)methanone (2e)



400 MHz, ^{1}H NMR in $CDCl_3$

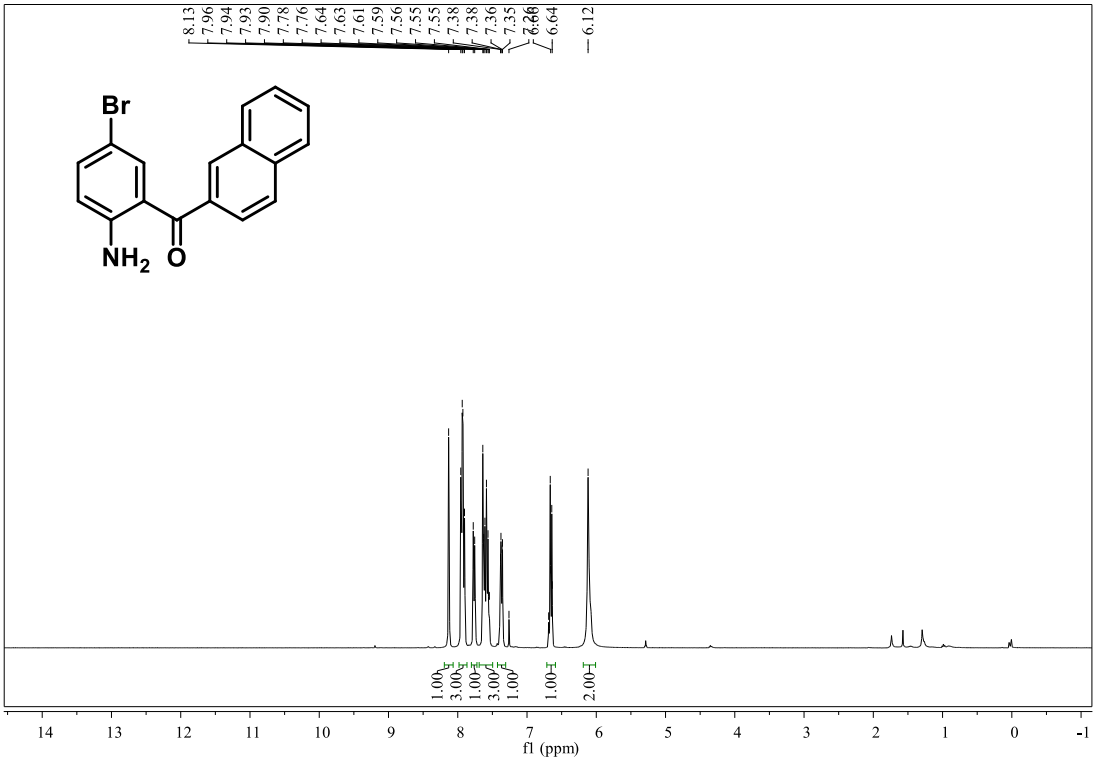


100 MHz, ^{13}C NMR in $CDCl_3$

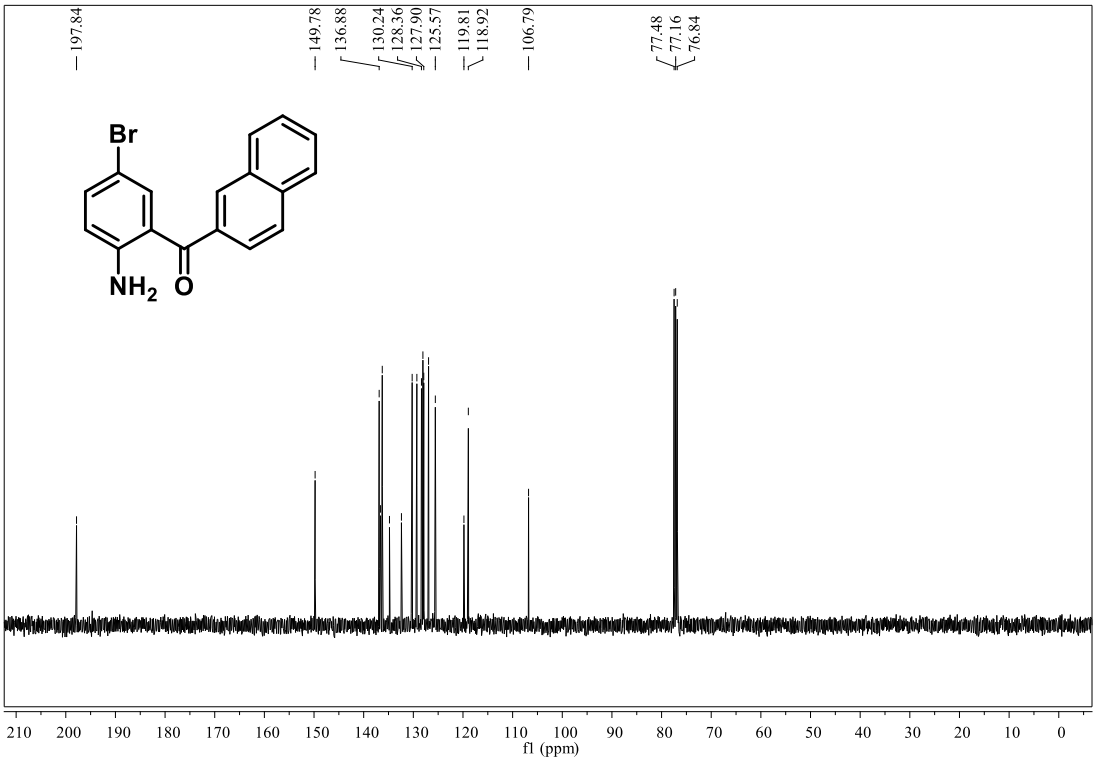


HRMS (MeOH)

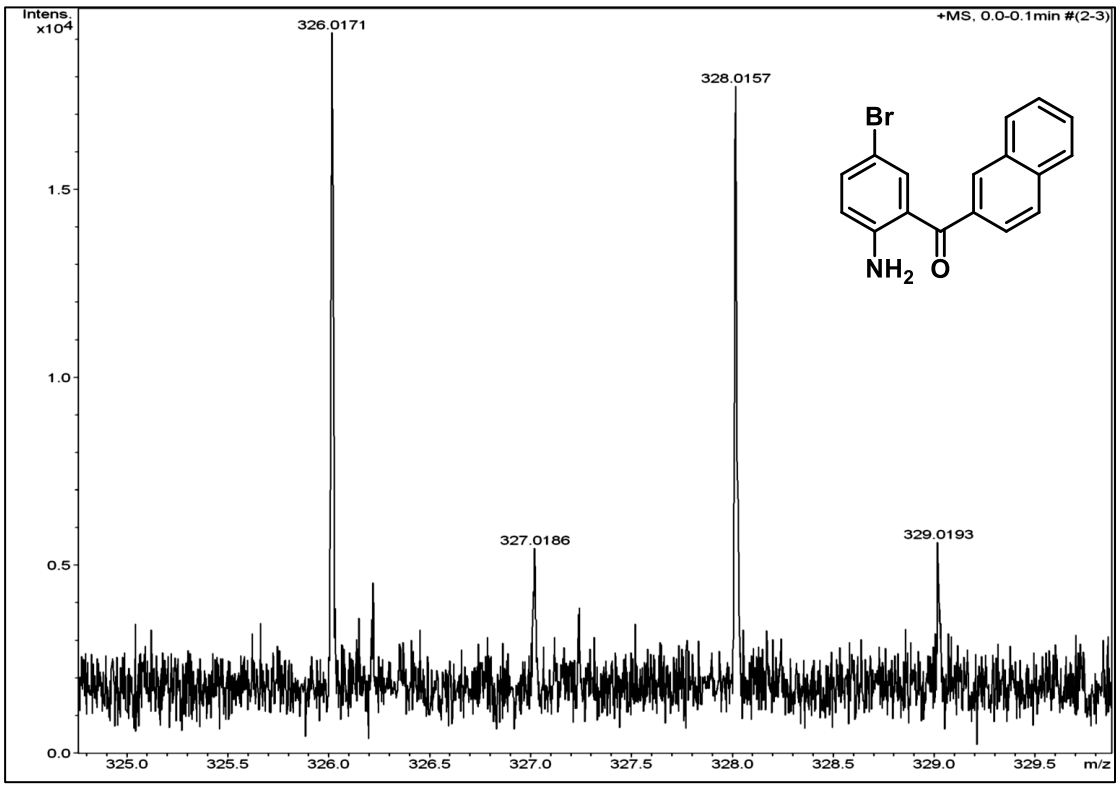
(2-Amino-5-bromophenyl)(naphthalen-2-yl)methanone (2f)



400 MHz, ^{1}H NMR in $CDCl_3$

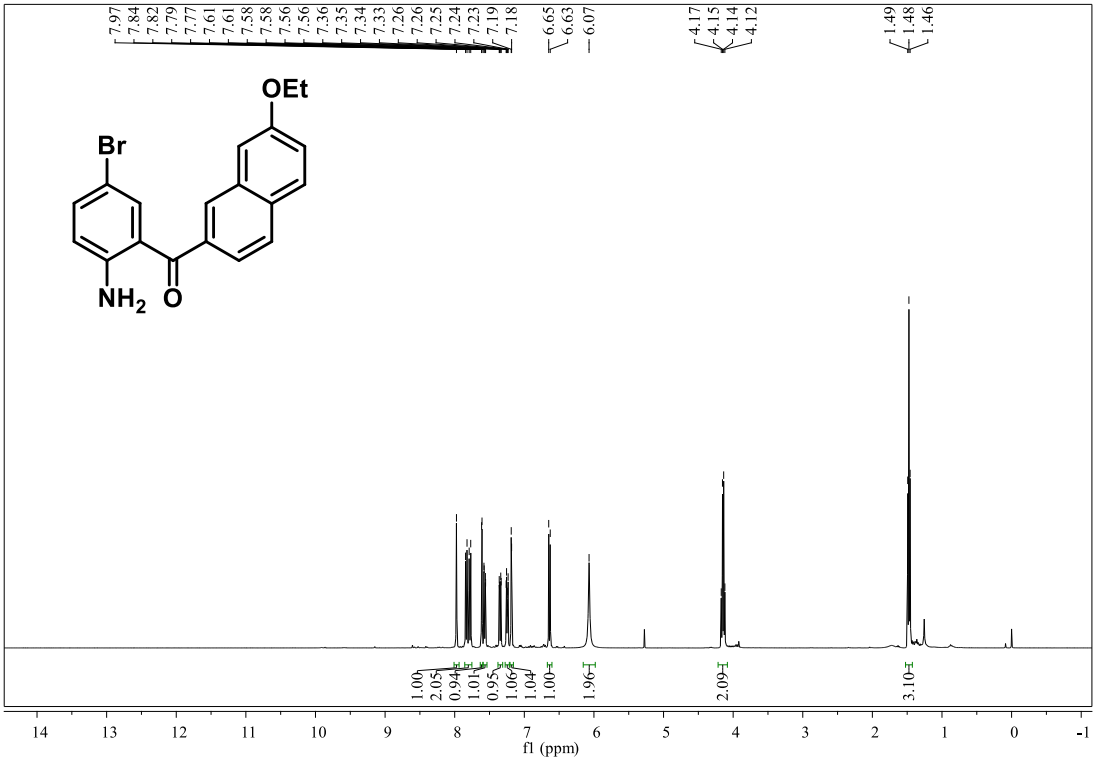


100 MHz, ^{13}C NMR in $CDCl_3$

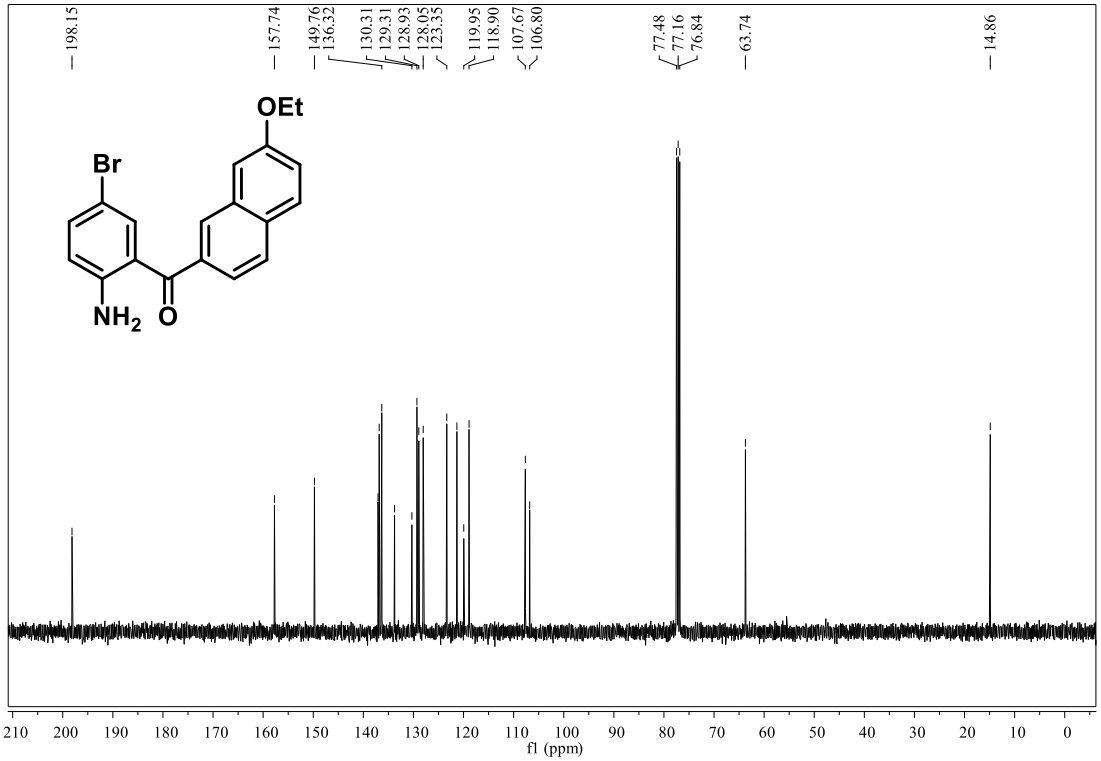


HRMS (MeOH)

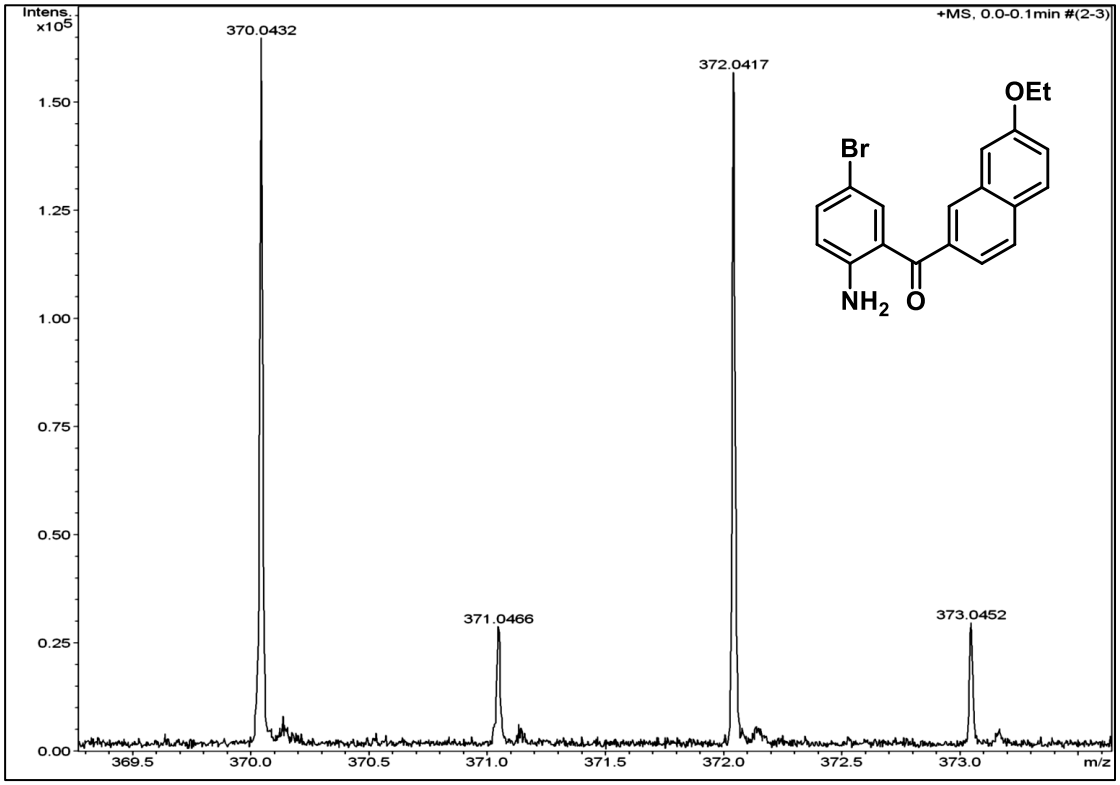
(2-Amino-5-bromophenyl)(7-ethoxynaphthalen-2-yl)methanone (2g)



400 MHz, ^{1}H NMR in $CDCl_3$

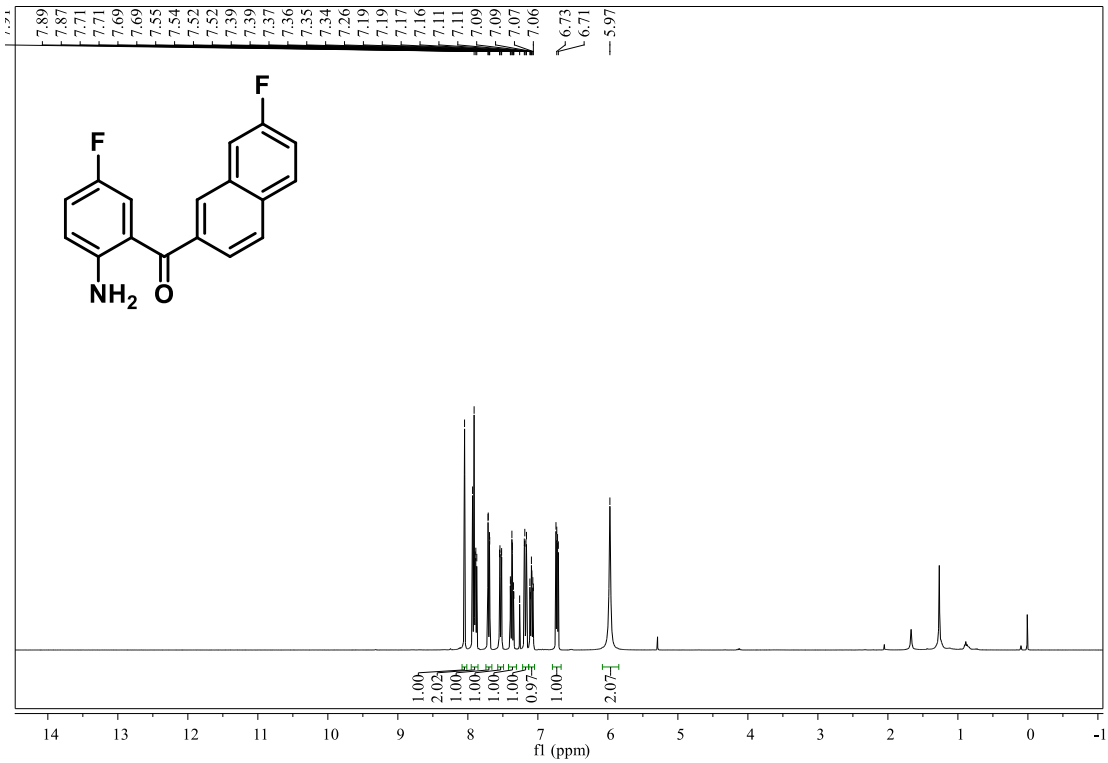


100 MHz, ^{13}C NMR in $CDCl_3$

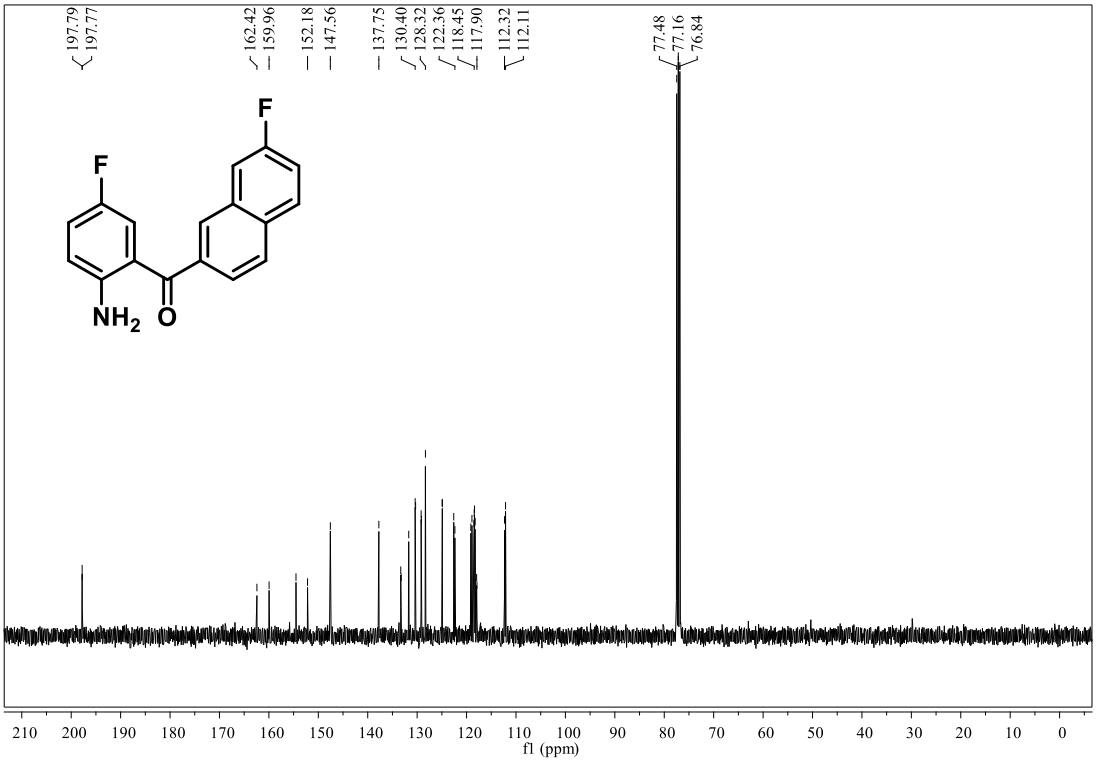


HRMS (MeOH)

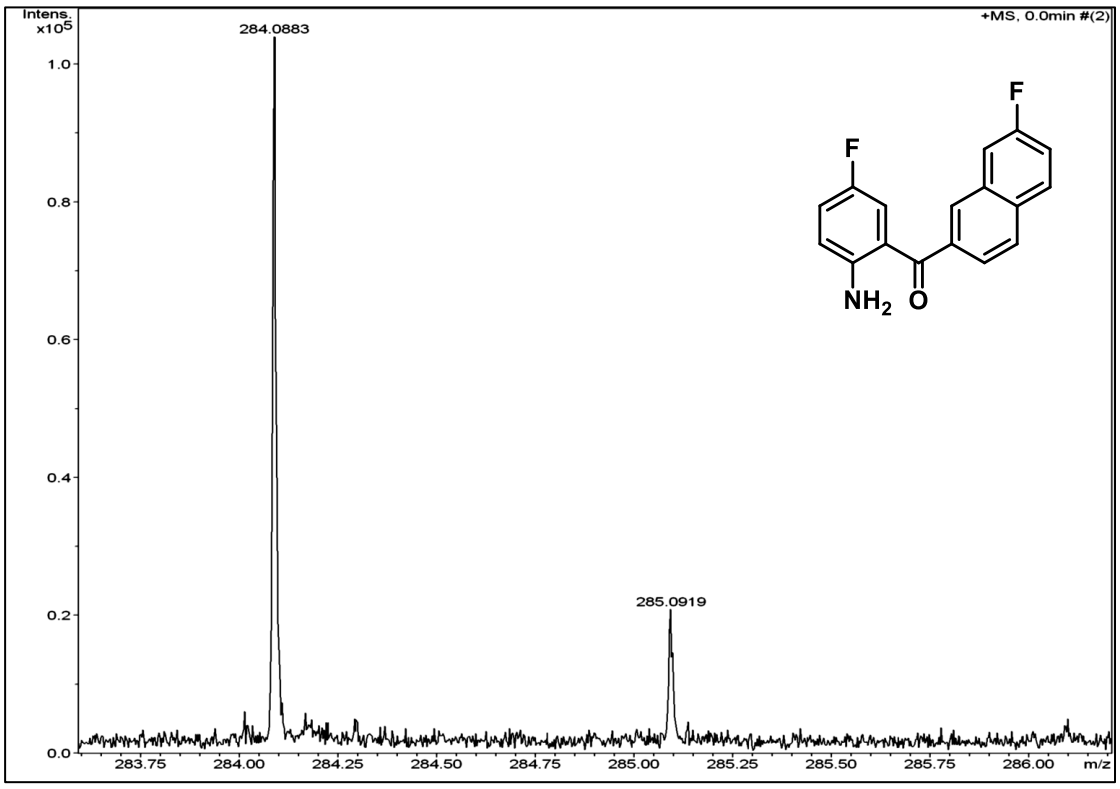
(2-Amino-5-fluorophenyl)(7-fluoronaphthalen-2-yl)methanone (2h)



400 MHz, ^{1}H NMR in $CDCl_3$

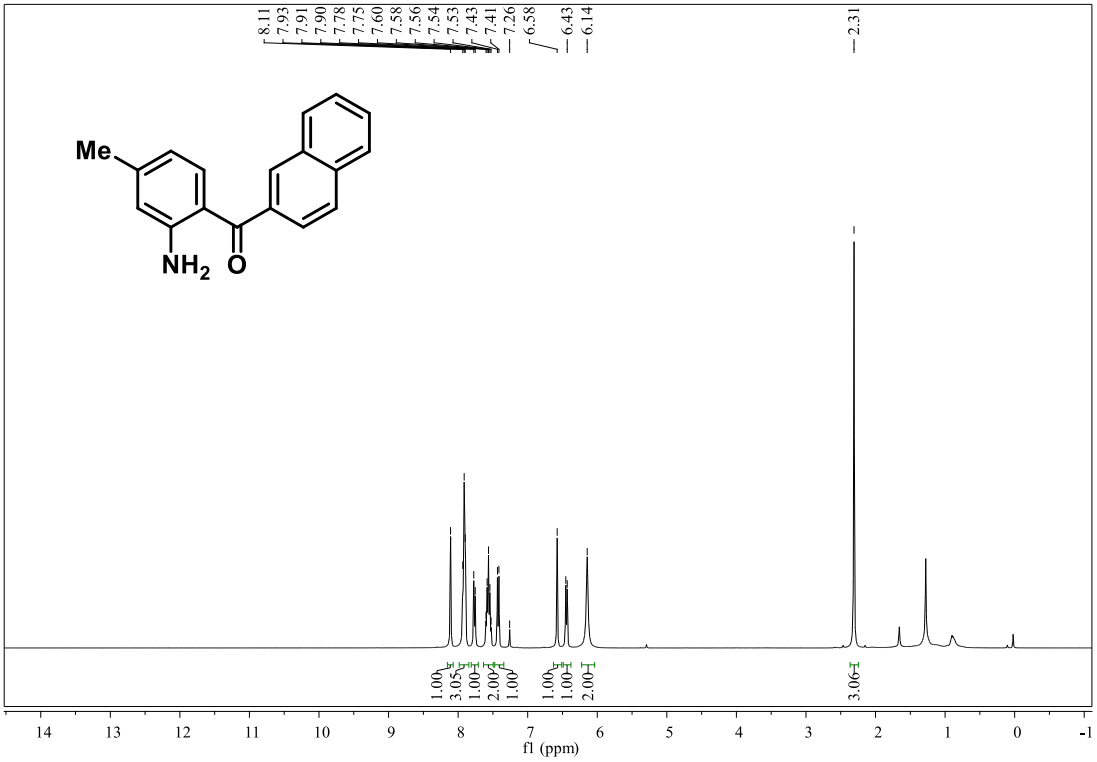


100 MHz, ^{13}C NMR in $CDCl_3$

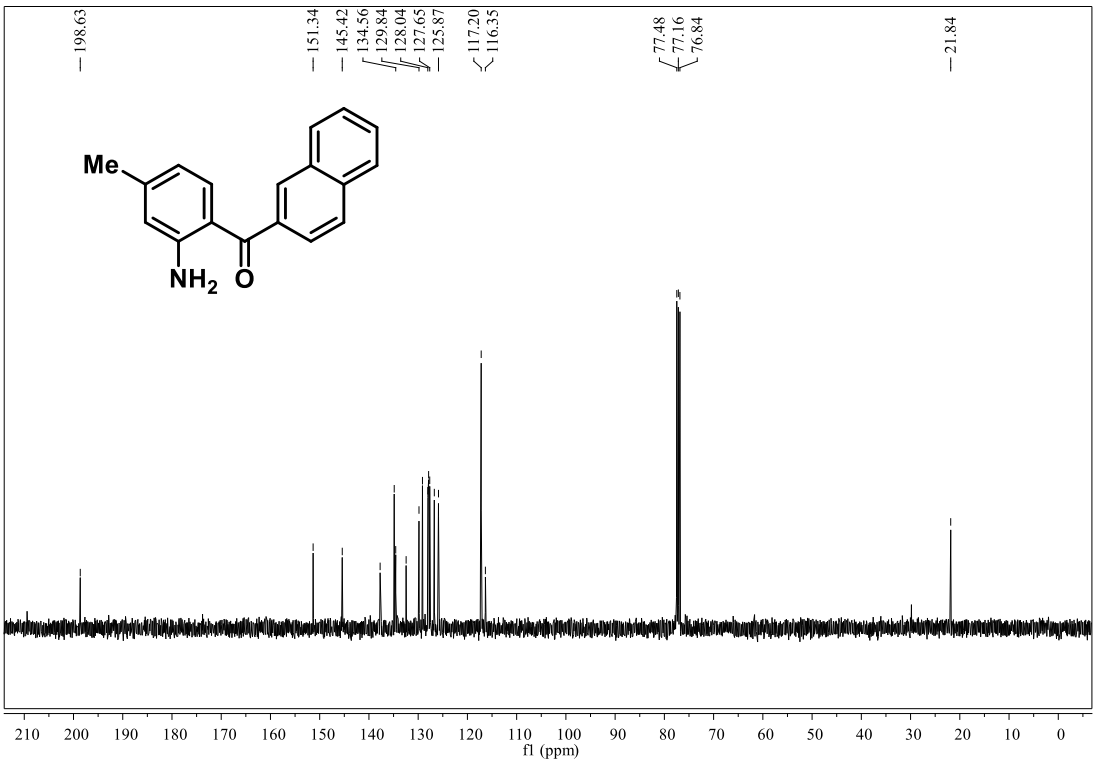


HRMS (MeOH)

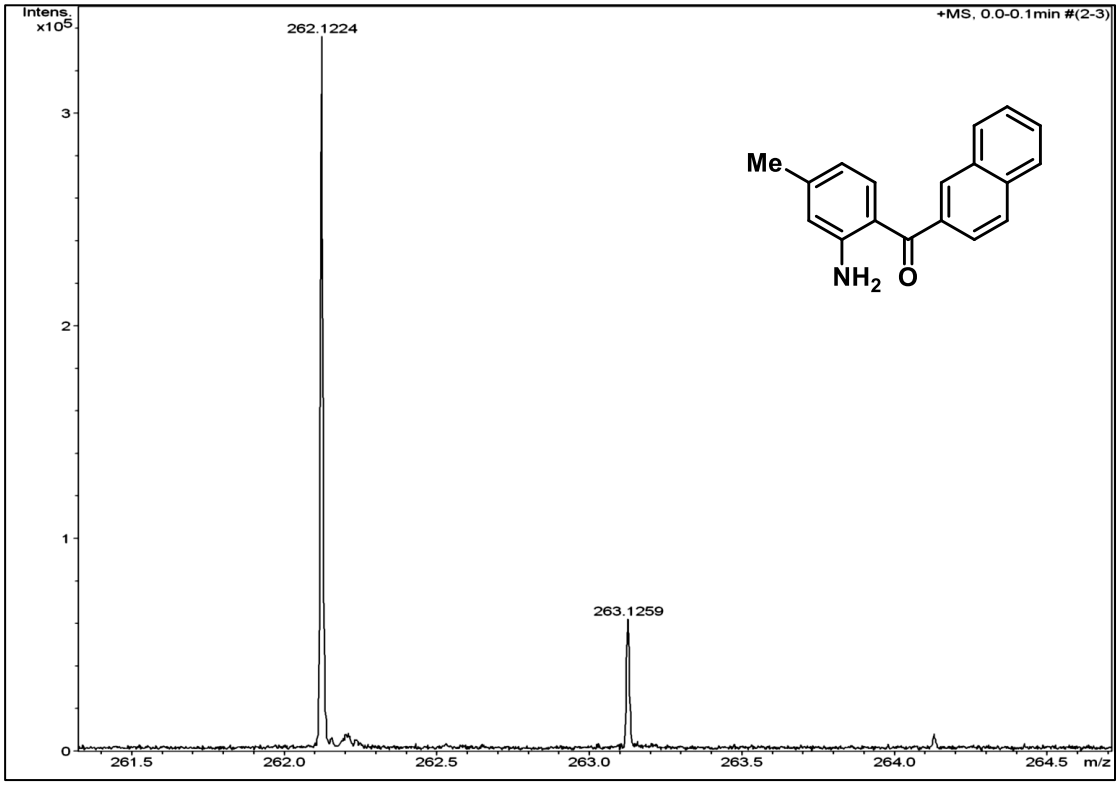
(2-Amino-4-methylphenyl)(naphthalen-2-yl)methanone (2i)



400 MHz, ^{1}H NMR in $CDCl_3$

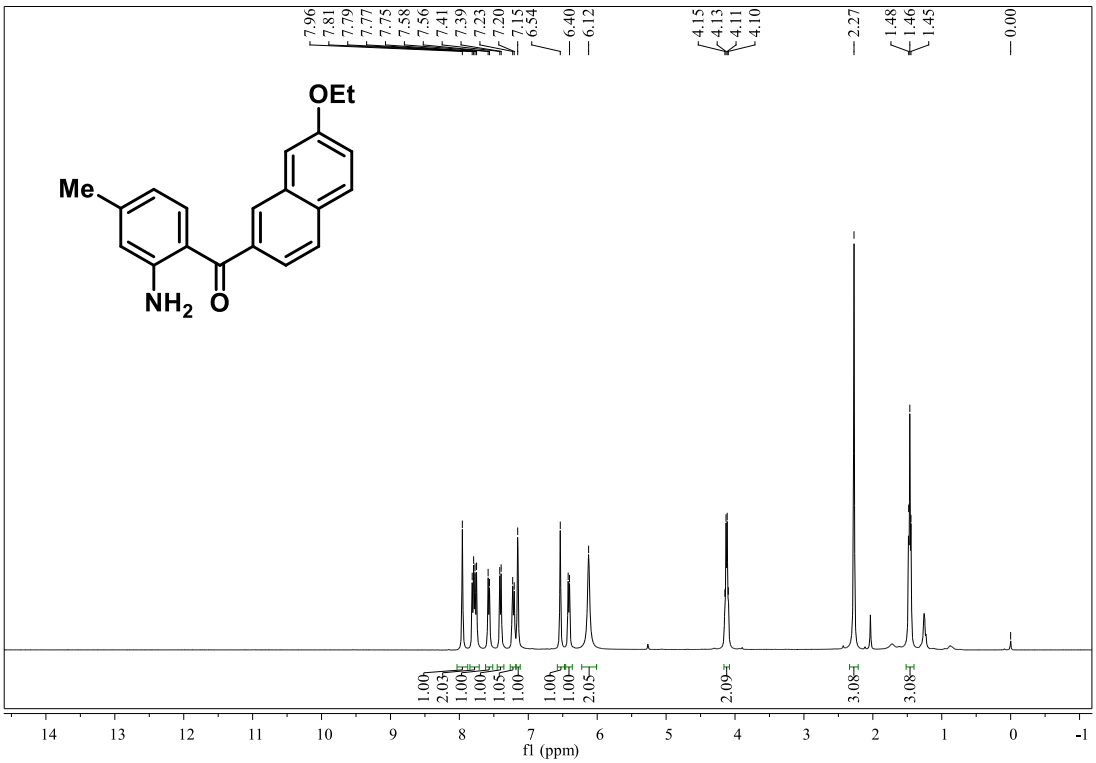


100 MHz, ^{13}C NMR in $CDCl_3$

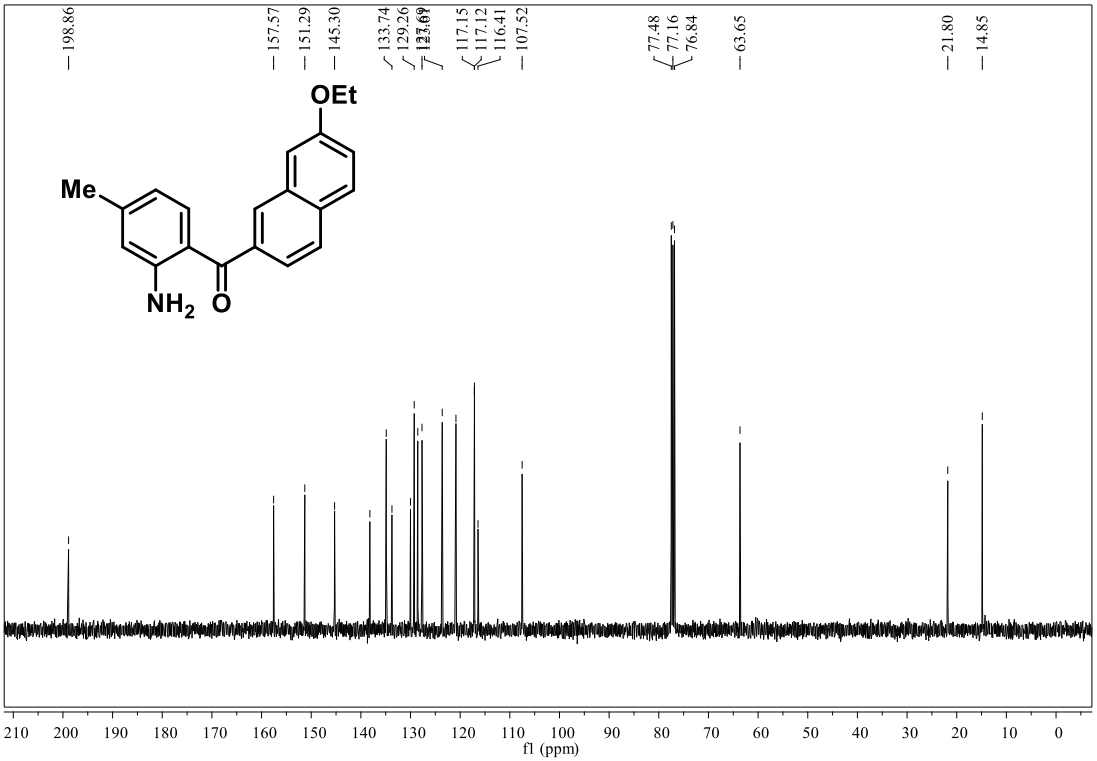


HRMS (MeOH)

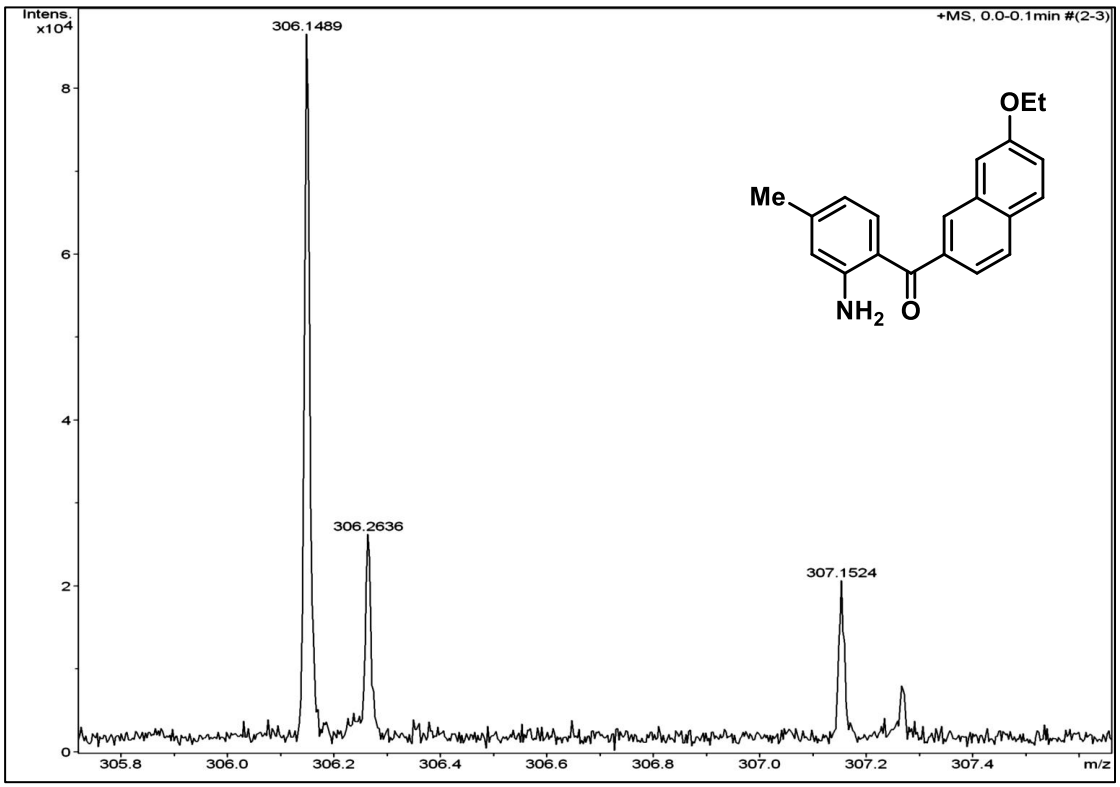
(2-Amino-4-methylphenyl)(7-ethoxynaphthalen-2-yl)methanone (2j)



400 MHz, ^{1}H NMR in $CDCl_3$

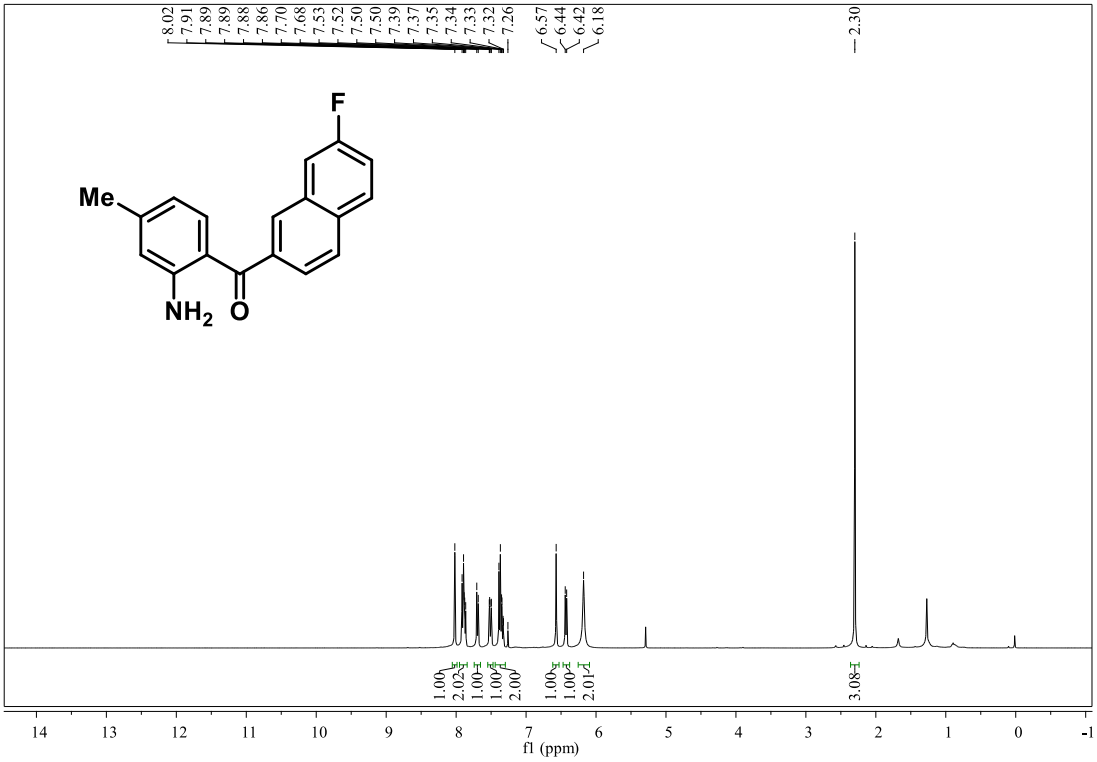


100 MHz, ^{13}C NMR in $CDCl_3$

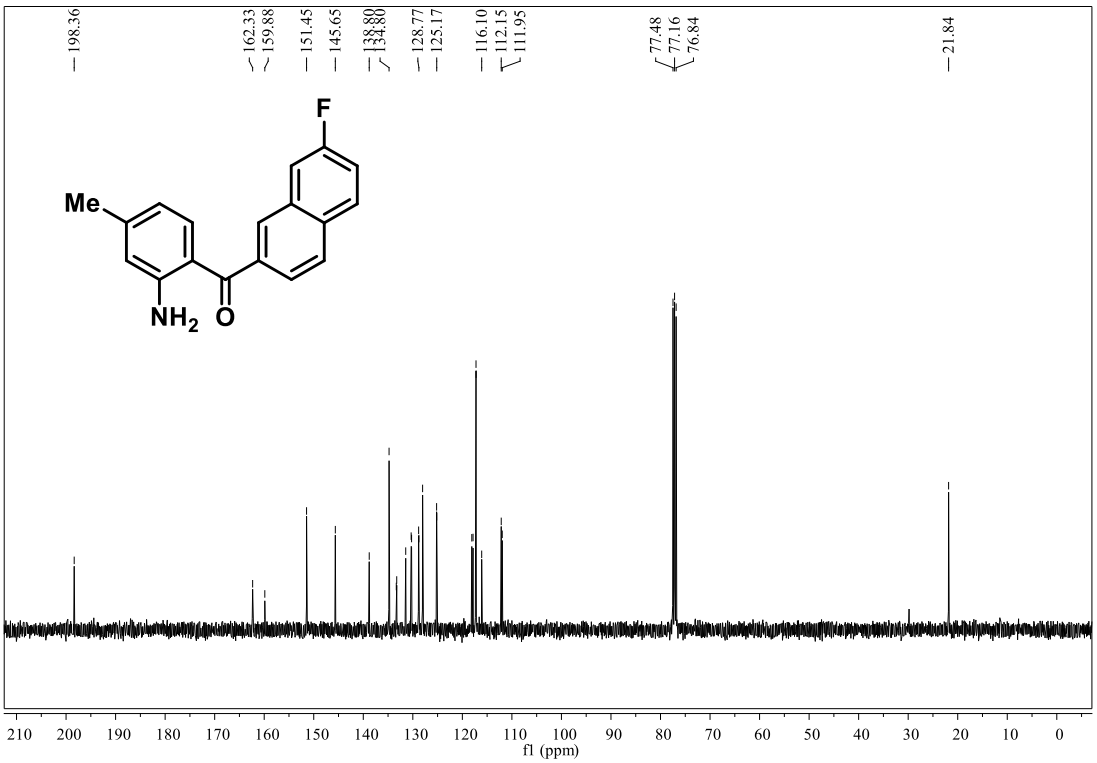


HRMS (MeOH)

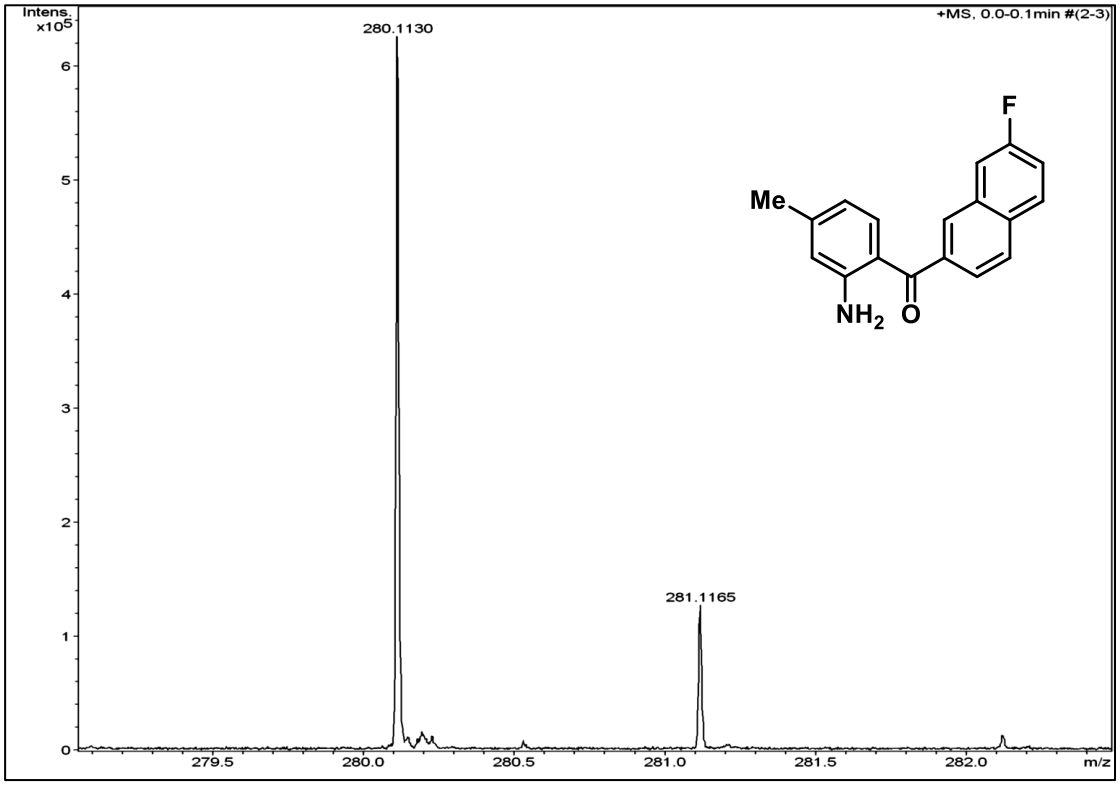
(2-Amino-4-methylphenyl)(7-fluoronaphthalen-2-yl)methanone (2k)



400 MHz, ^{1}H NMR in $CDCl_3$

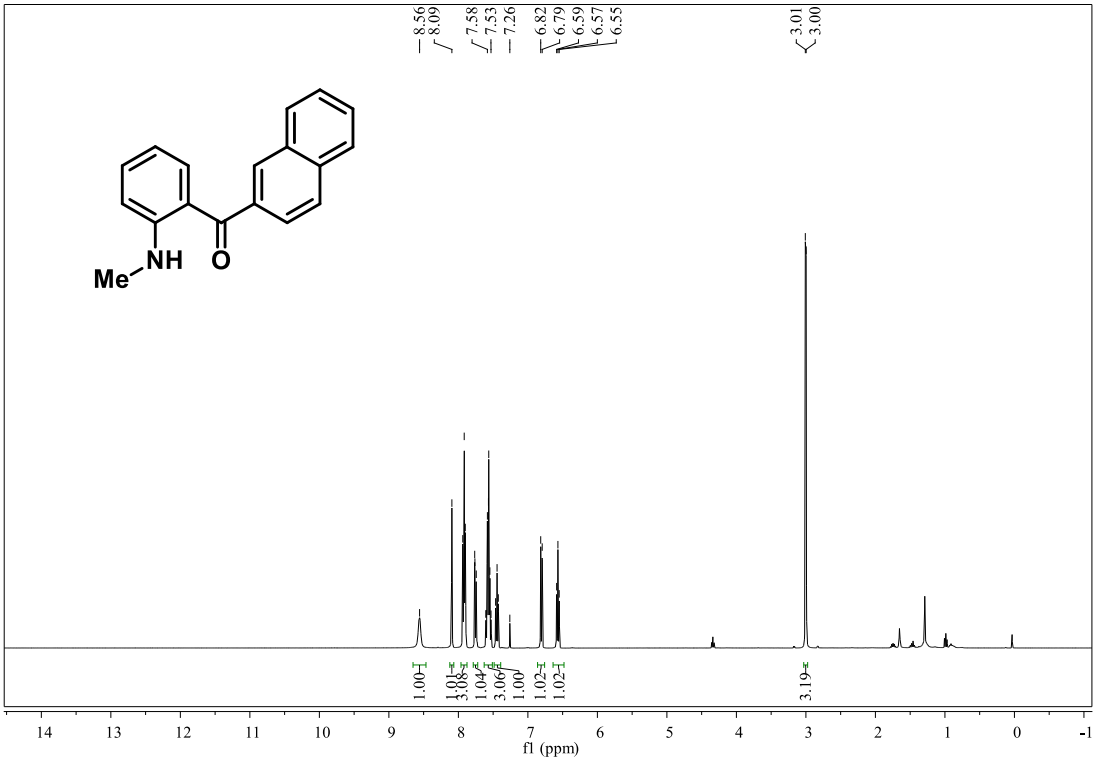


100 MHz, ^{13}C NMR in $CDCl_3$

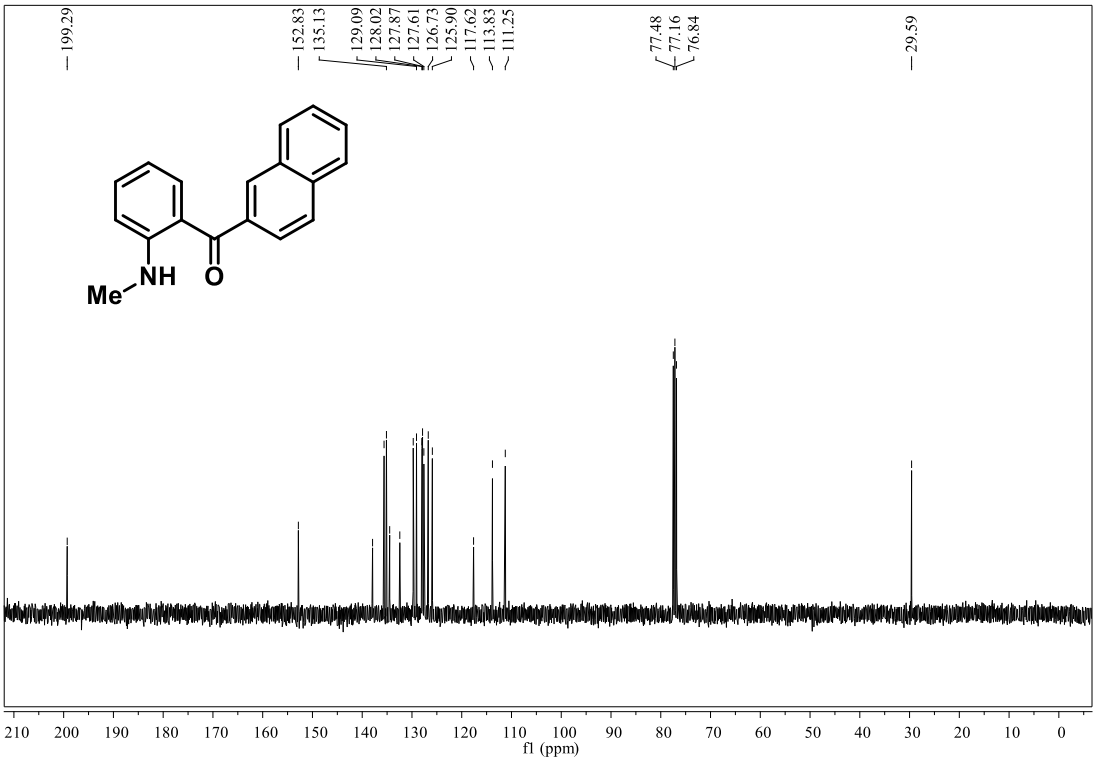


HRMS (MeOH)

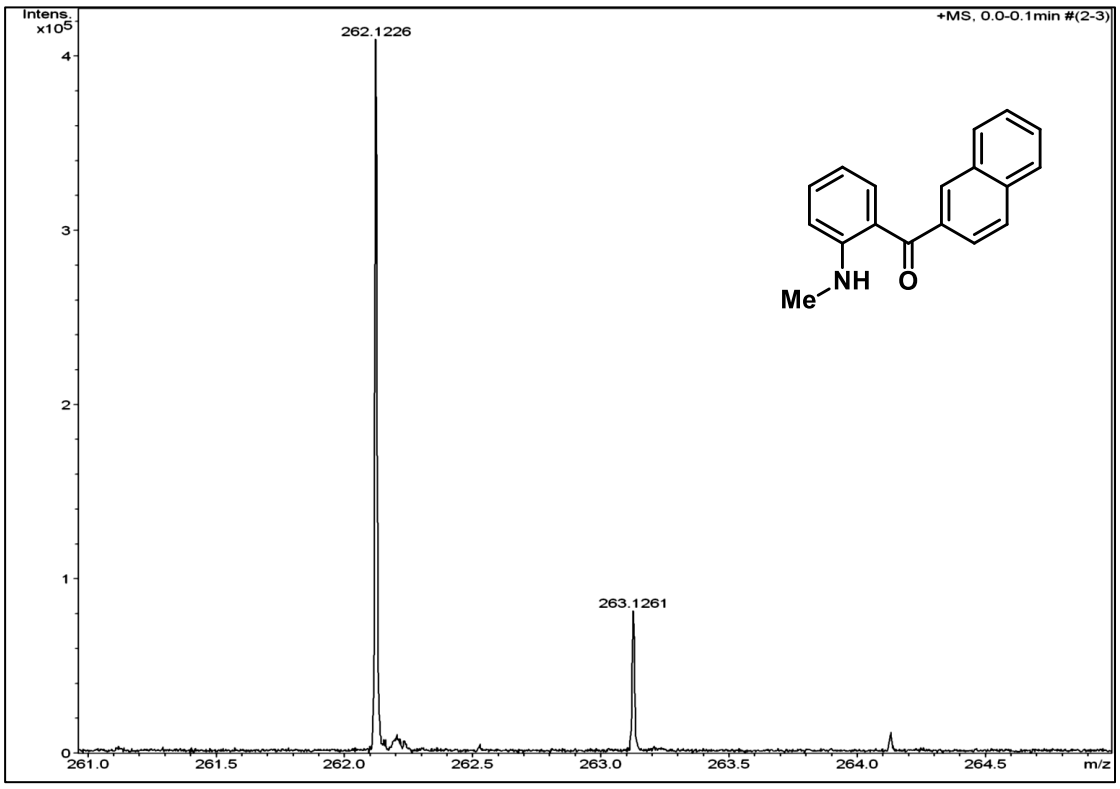
(2-(Methylamino)phenyl)(naphthalen-2-yl)methanone (2l)



400 MHz, ^{1}H NMR in $CDCl_3$

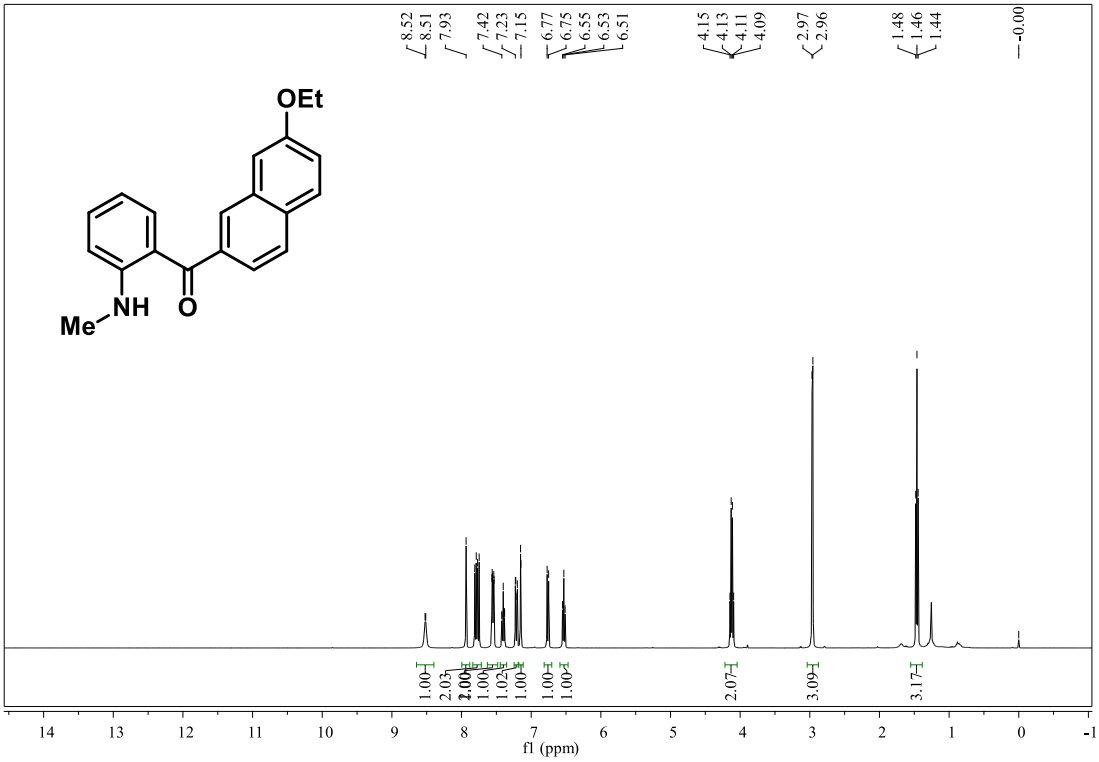


100 MHz, ^{13}C NMR in $CDCl_3$

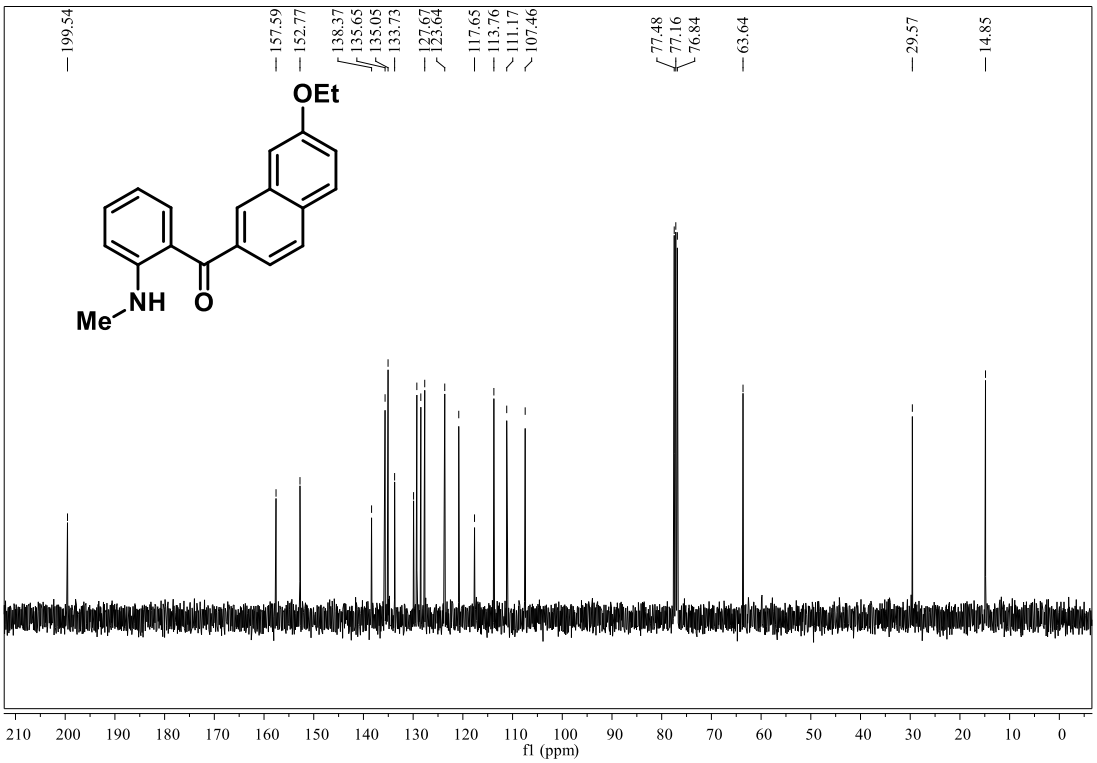


HRMS (MeOH)

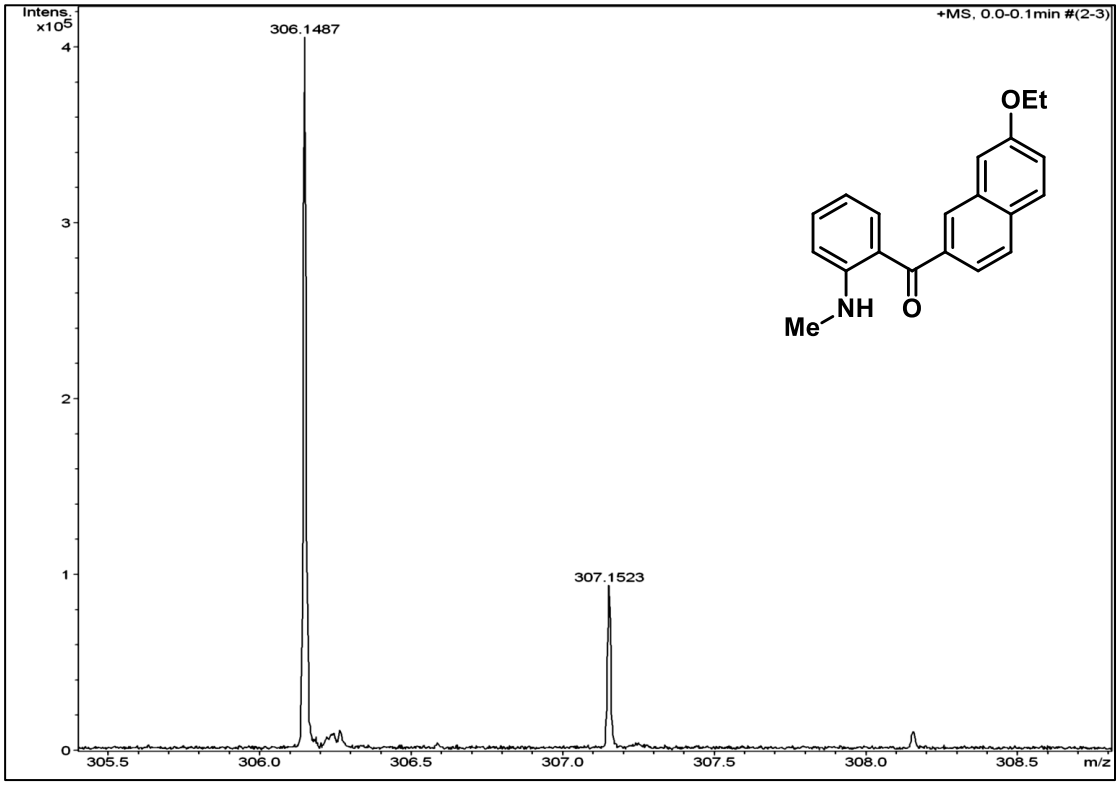
(7-Ethoxynaphthalen-2-yl)(2-(methylamino)phenyl)methanone (2m)



400 MHz, ^{1}H NMR in $CDCl_3$

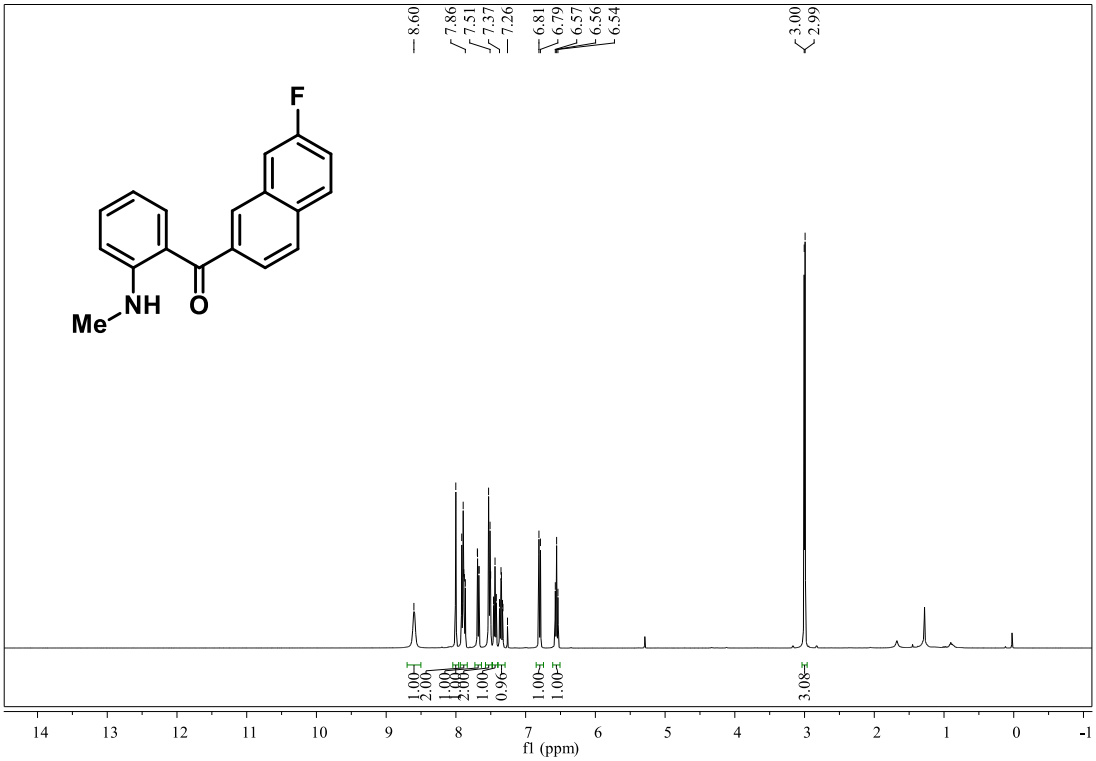


100 MHz, ^{13}C NMR in $CDCl_3$

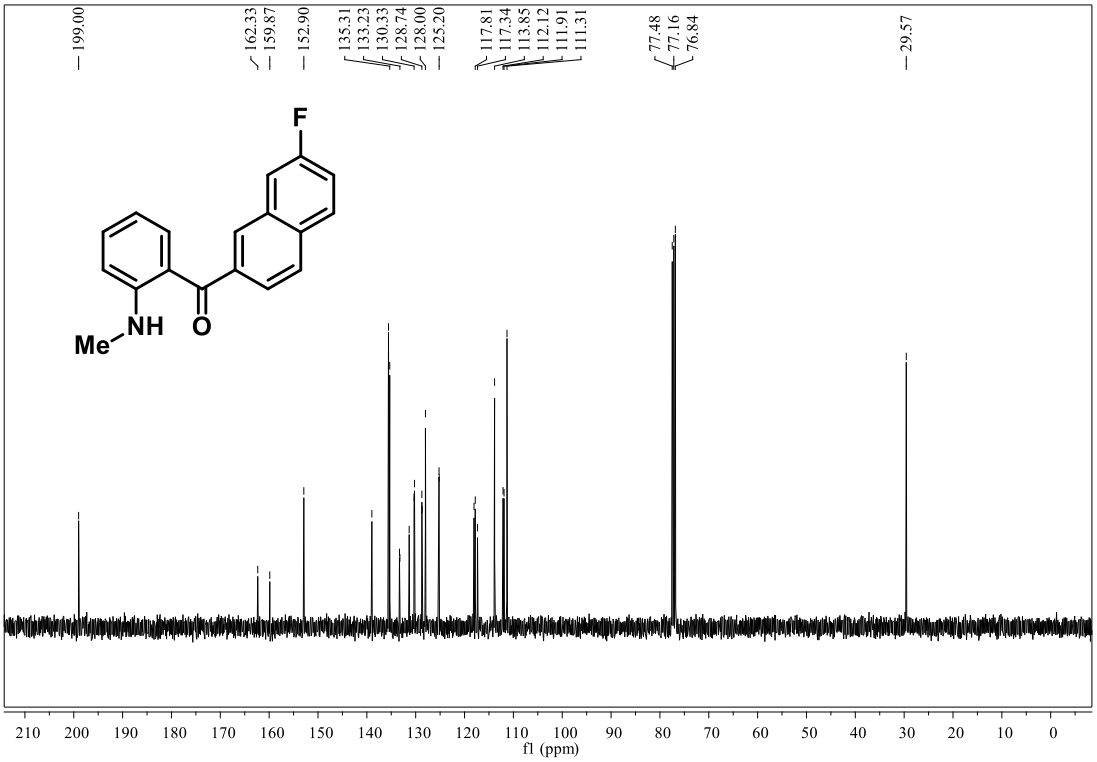


HRMS (MeOH)

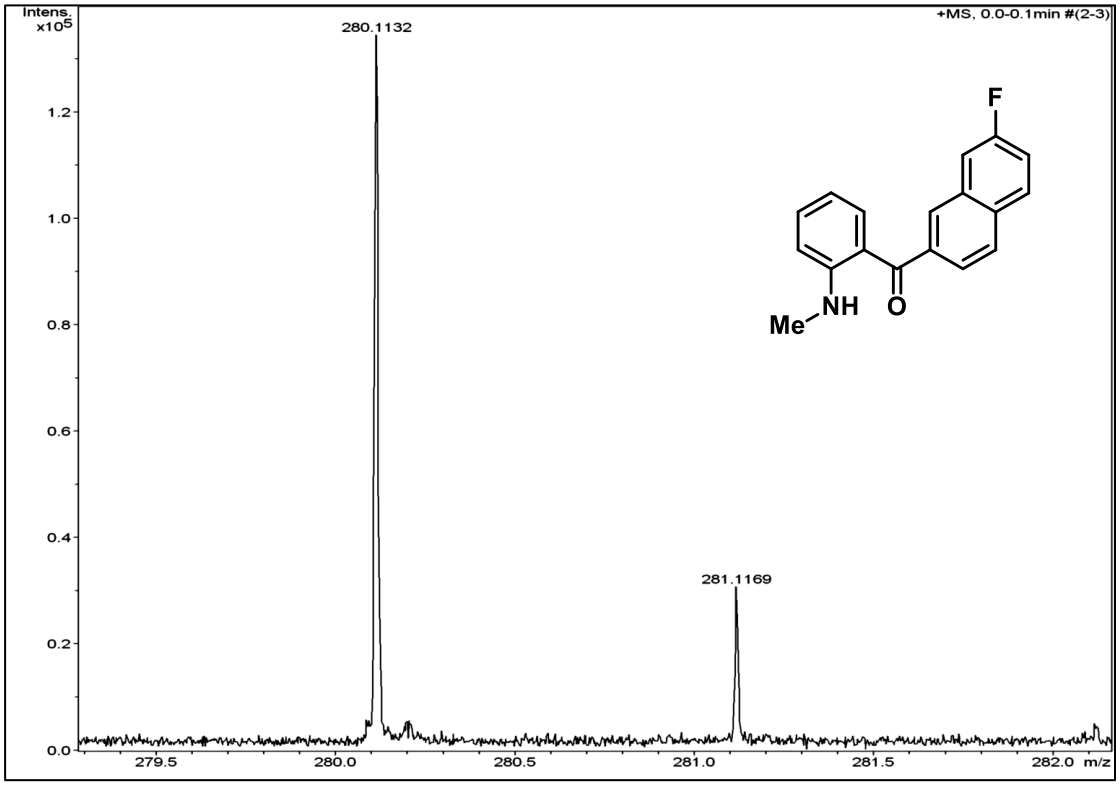
(7-Fluoronaphthalen-2-yl)(2-(methylamino)phenyl)methanone (2n)



400 MHz, ^{1}H NMR in $CDCl_3$

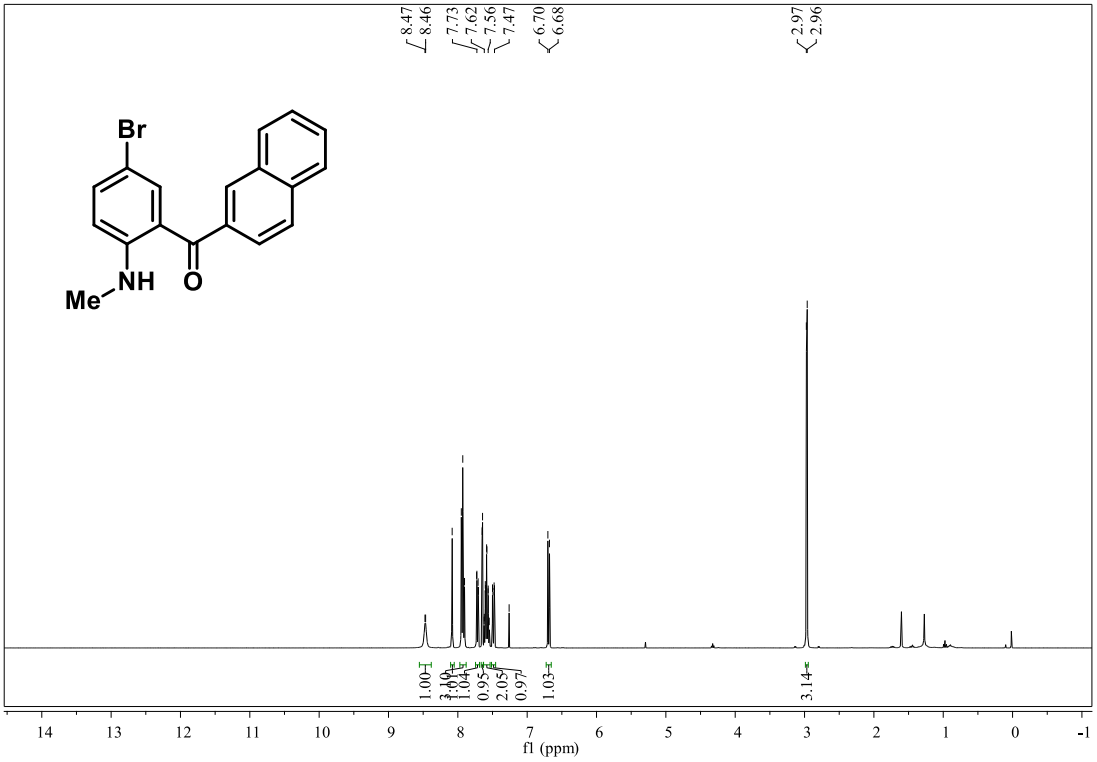


100 MHz, ^{13}C NMR in $CDCl_3$

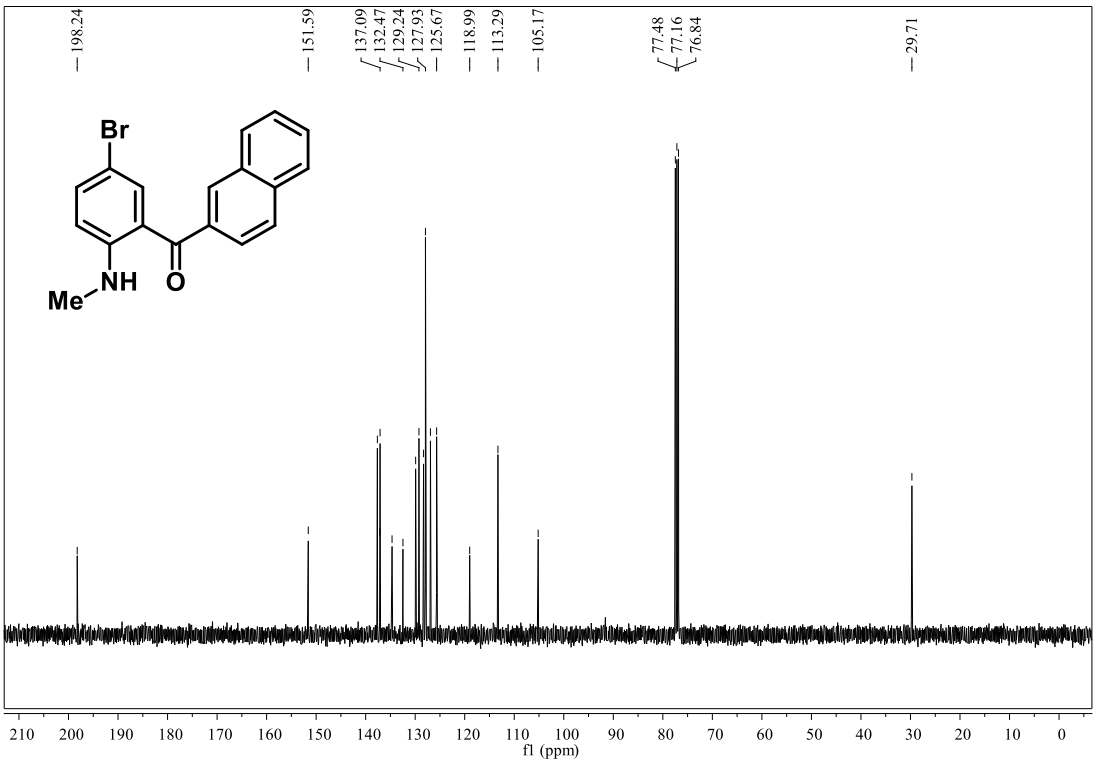


HRMS (MeOH)

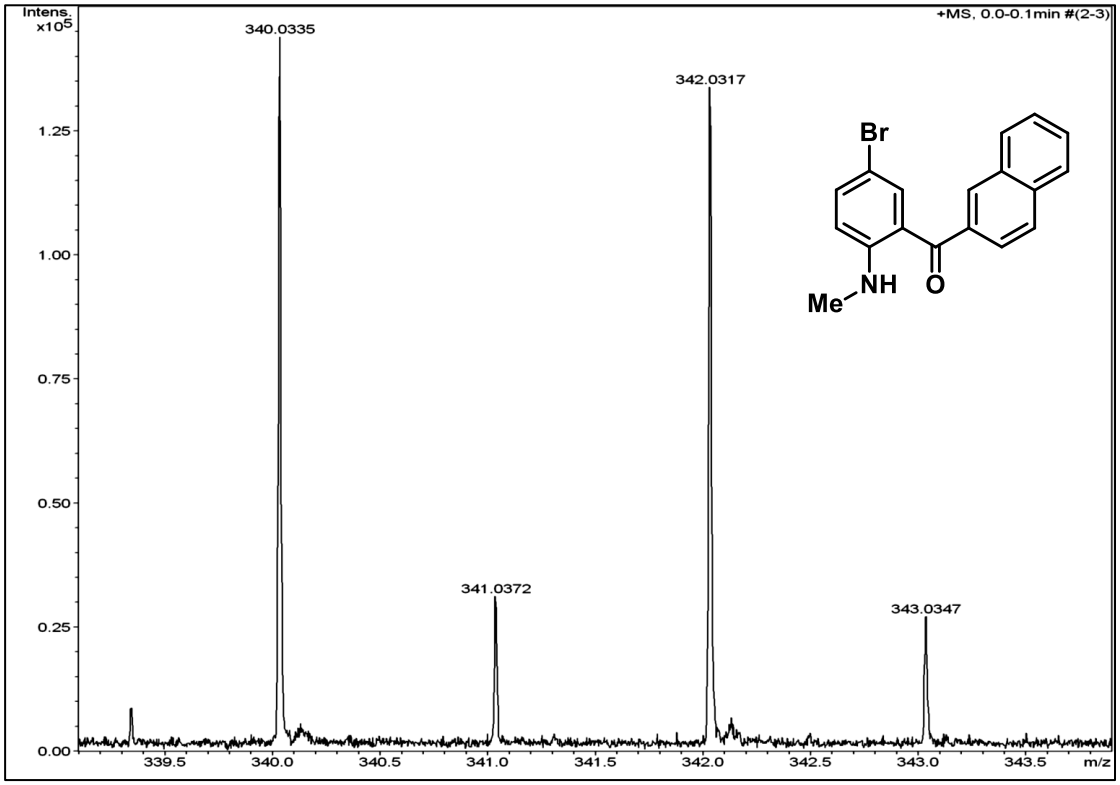
(5-Bromo-2-(methylamino)phenyl)(naphthalen-2-yl)methanone (2o)



400 MHz, ^{1}H NMR in $CDCl_3$

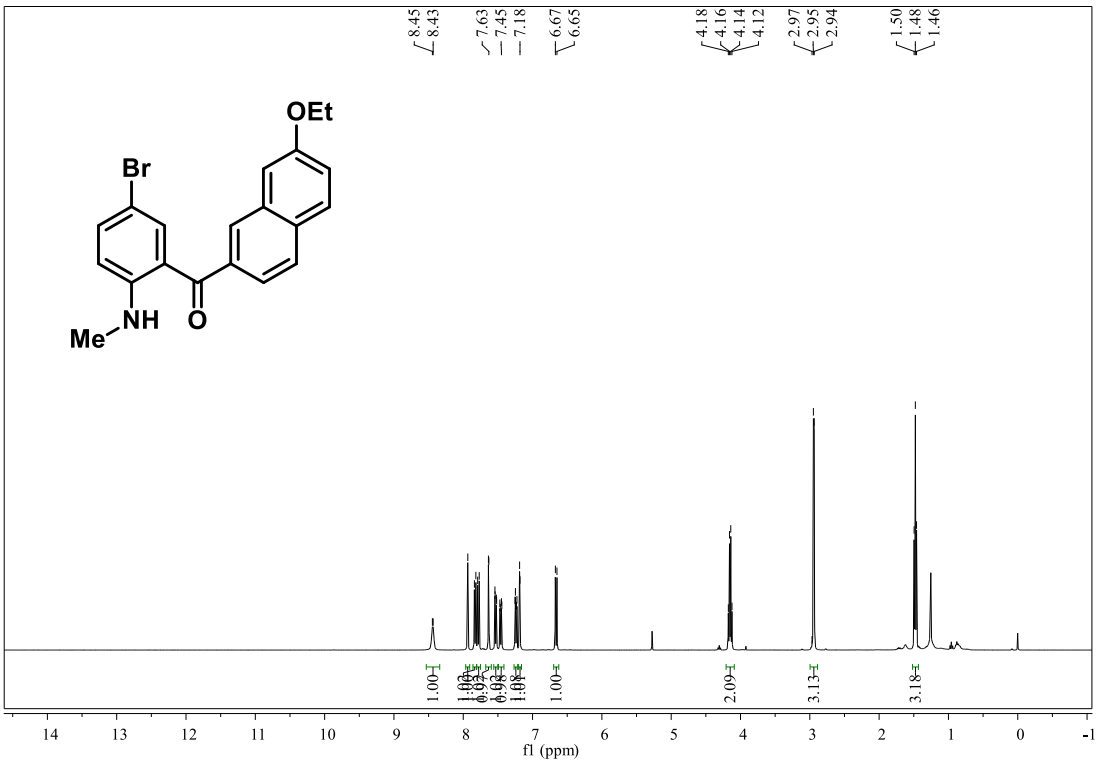


100 MHz, ^{13}C NMR in $CDCl_3$

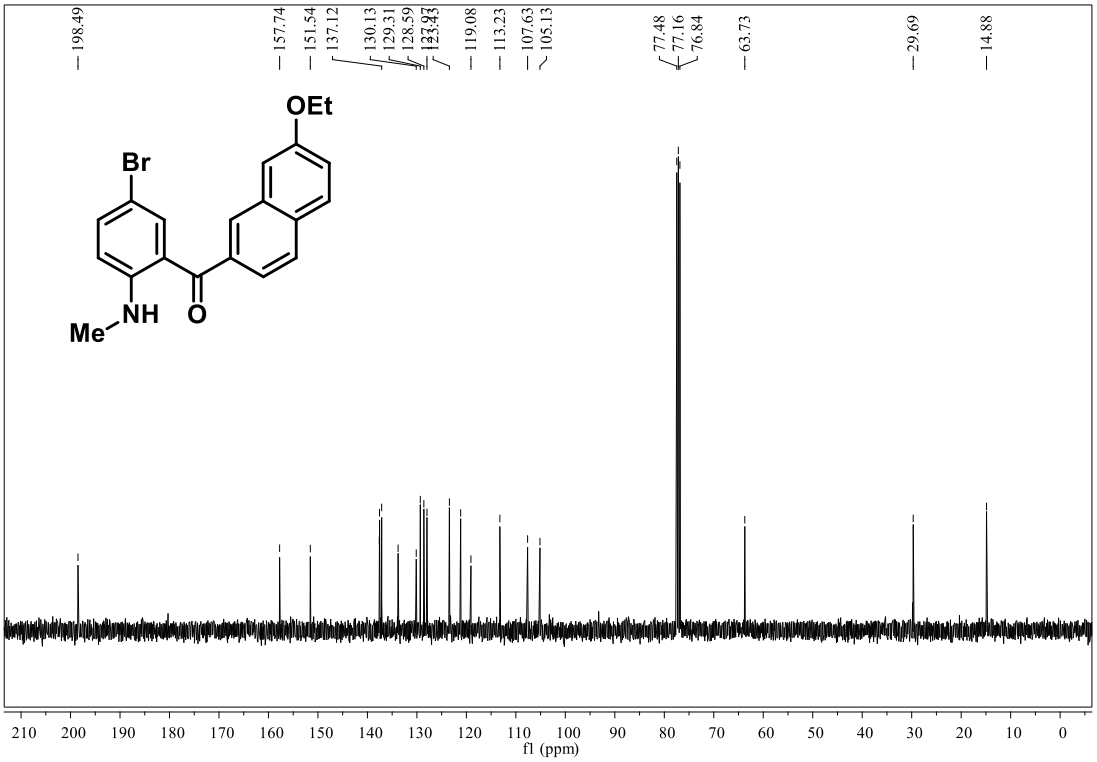


HRMS (MeOH)

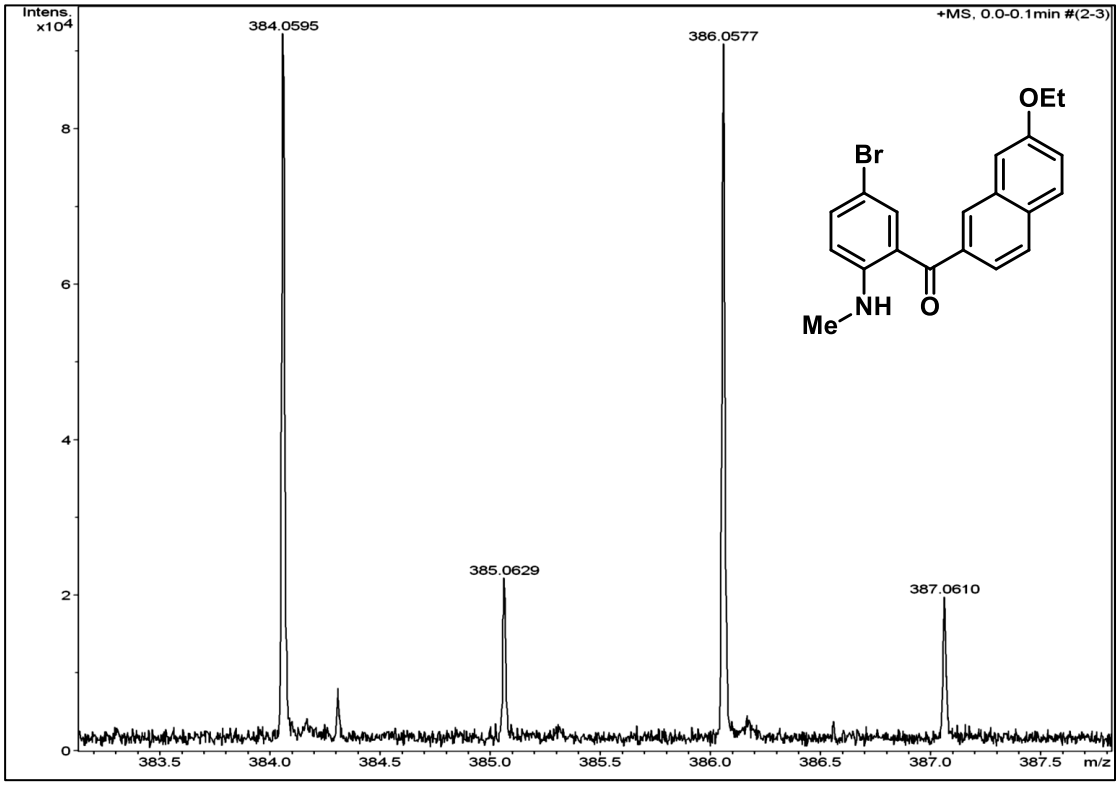
(5-Bromo-2-(methylamino)phenyl)(7-ethoxynaphthalen-2-yl)methanone (2p)



400 MHz, ^{1}H NMR in $CDCl_3$

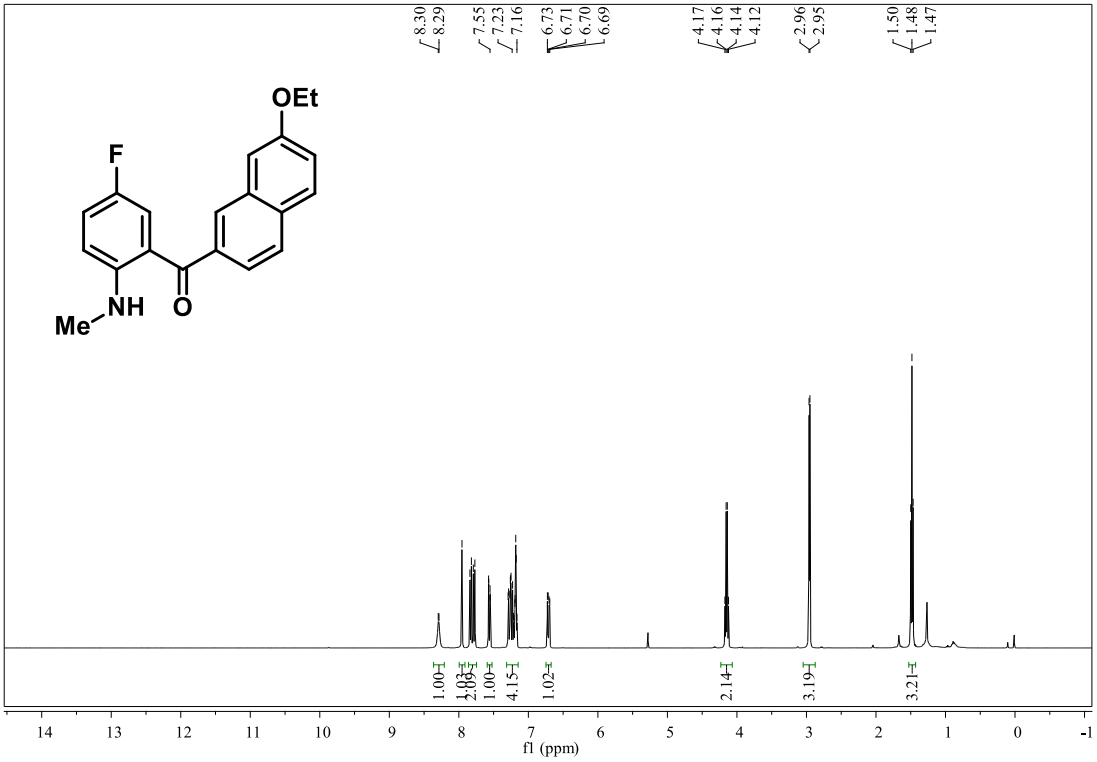


100 MHz, ^{13}C NMR in $CDCl_3$

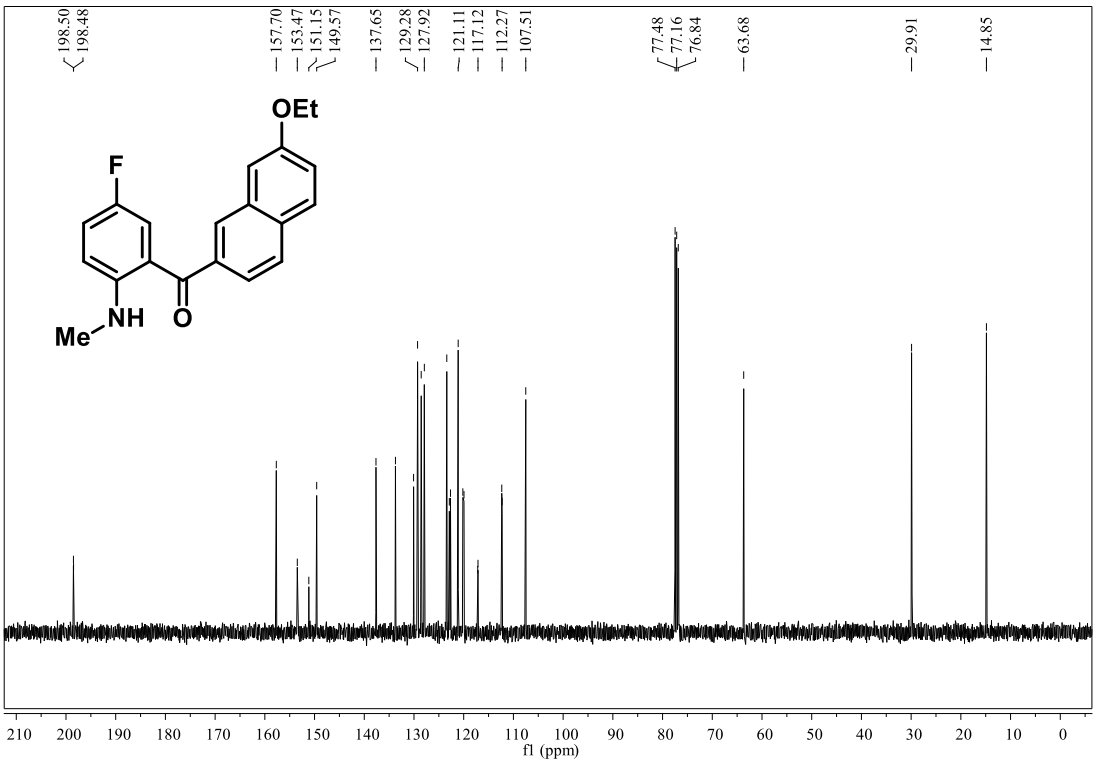


HRMS (MeOH)

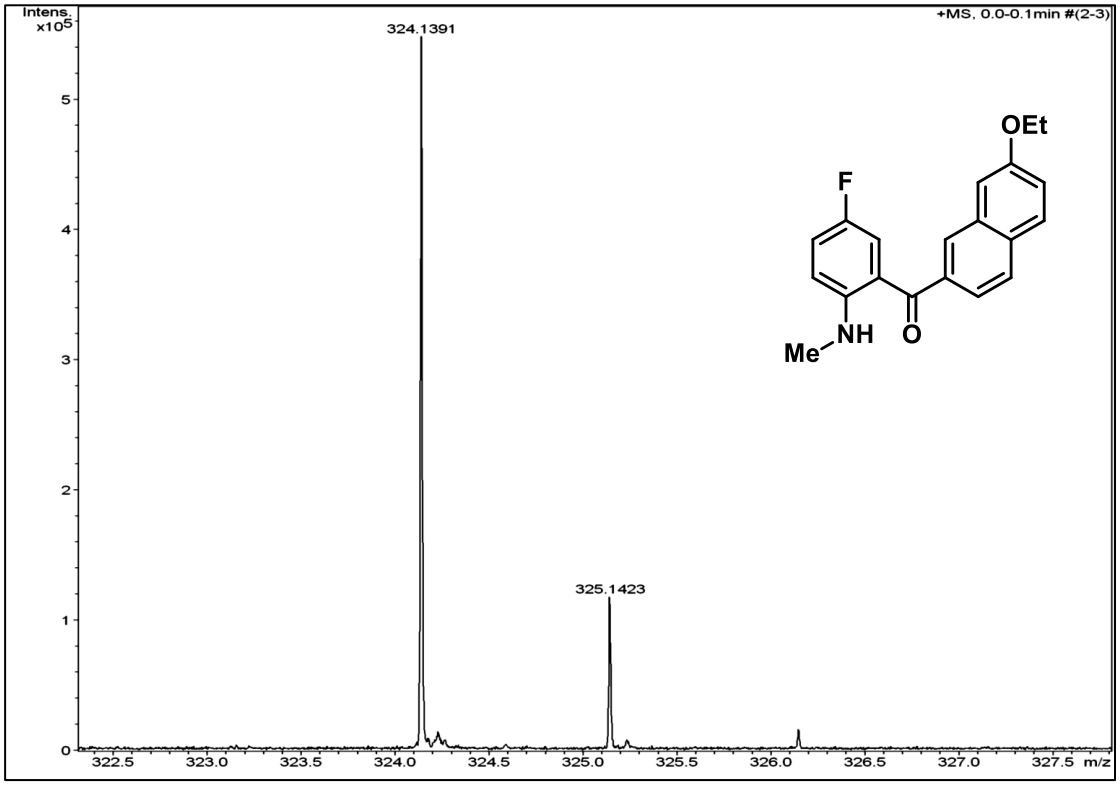
(7-Ethoxynaphthalen-2-yl)(5-fluoro-2-(methylamino)phenyl)methanone (2q)



400 MHz, ^{1}H NMR in $CDCl_3$

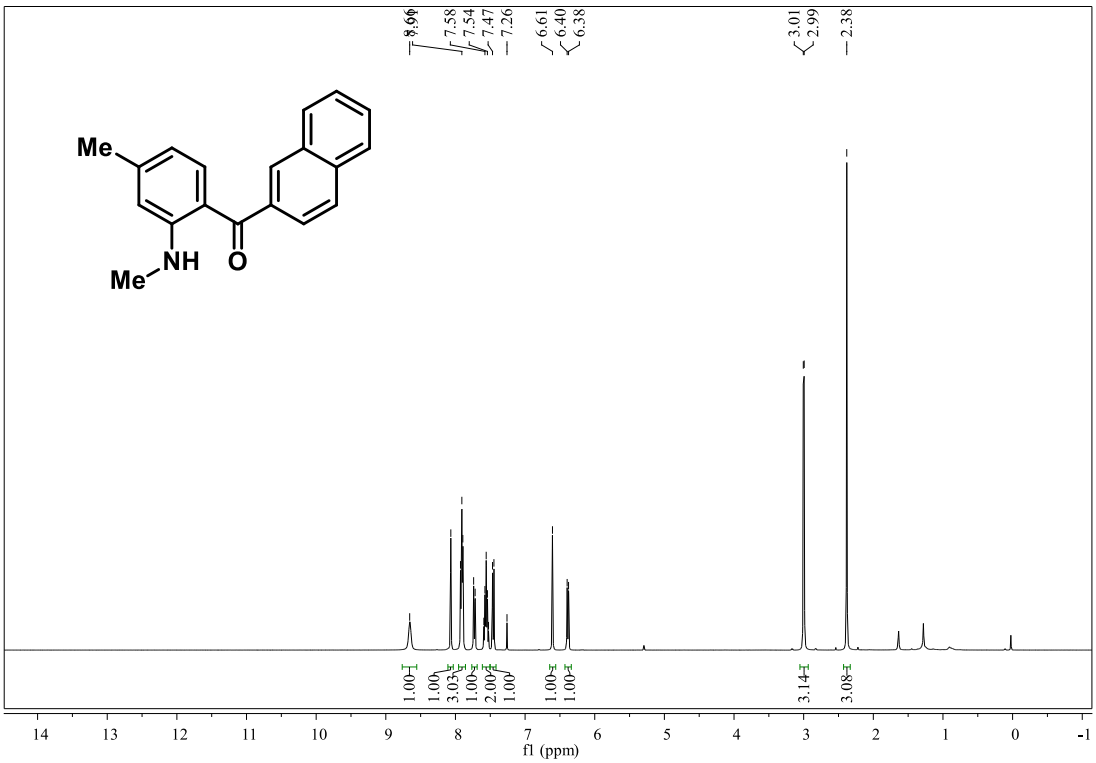


100 MHz, ^{13}C NMR in $CDCl_3$

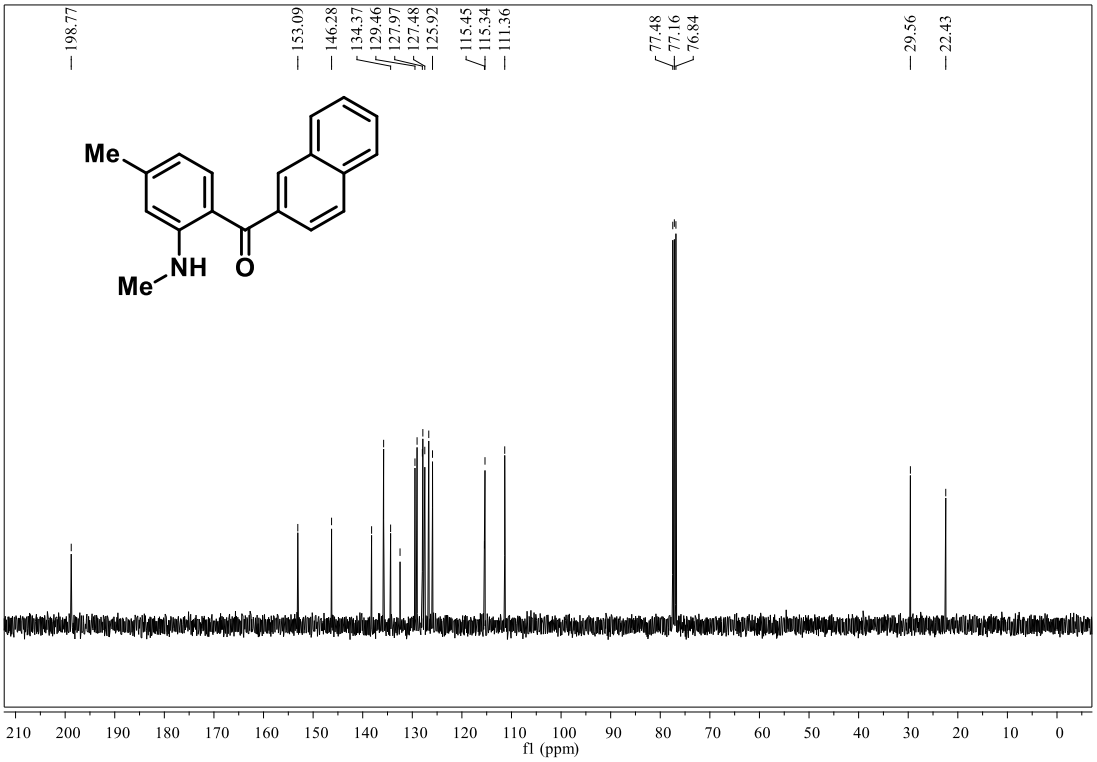


HRMS (MeOH)

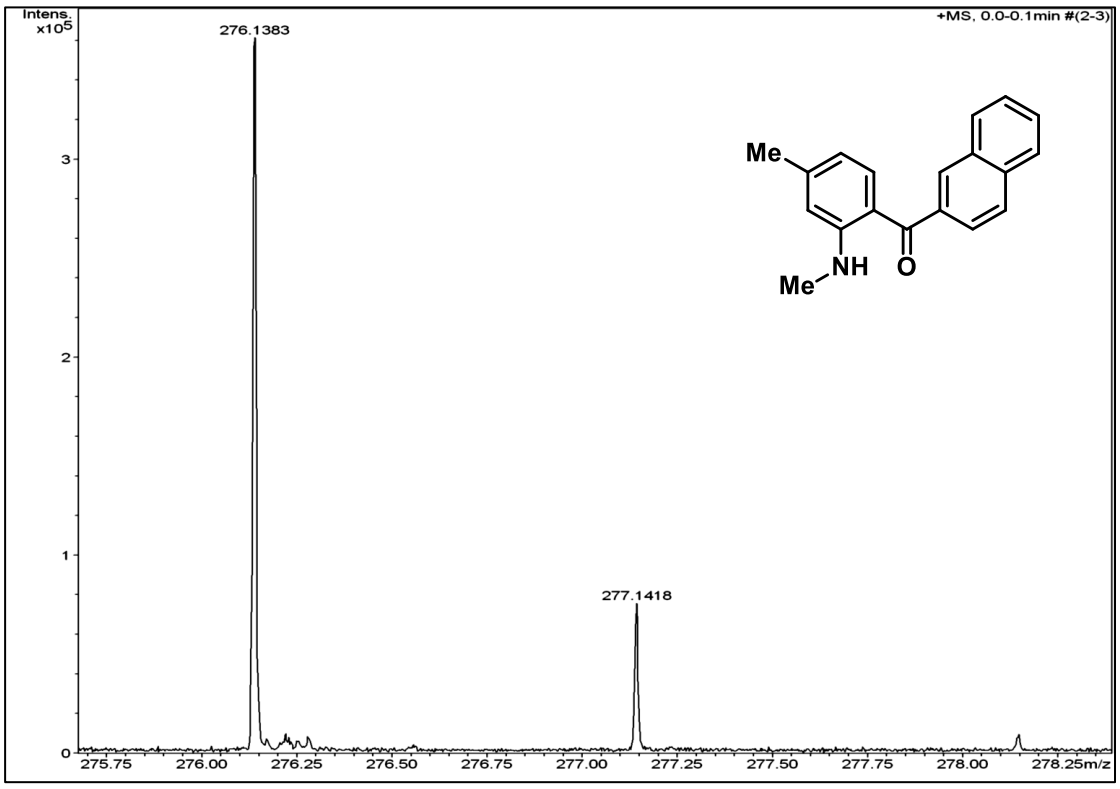
(4-Methyl-2-(methylamino)phenyl)(naphthalen-2-yl)methanone (2r)



400 MHz, ^{1}H NMR in $CDCl_3$

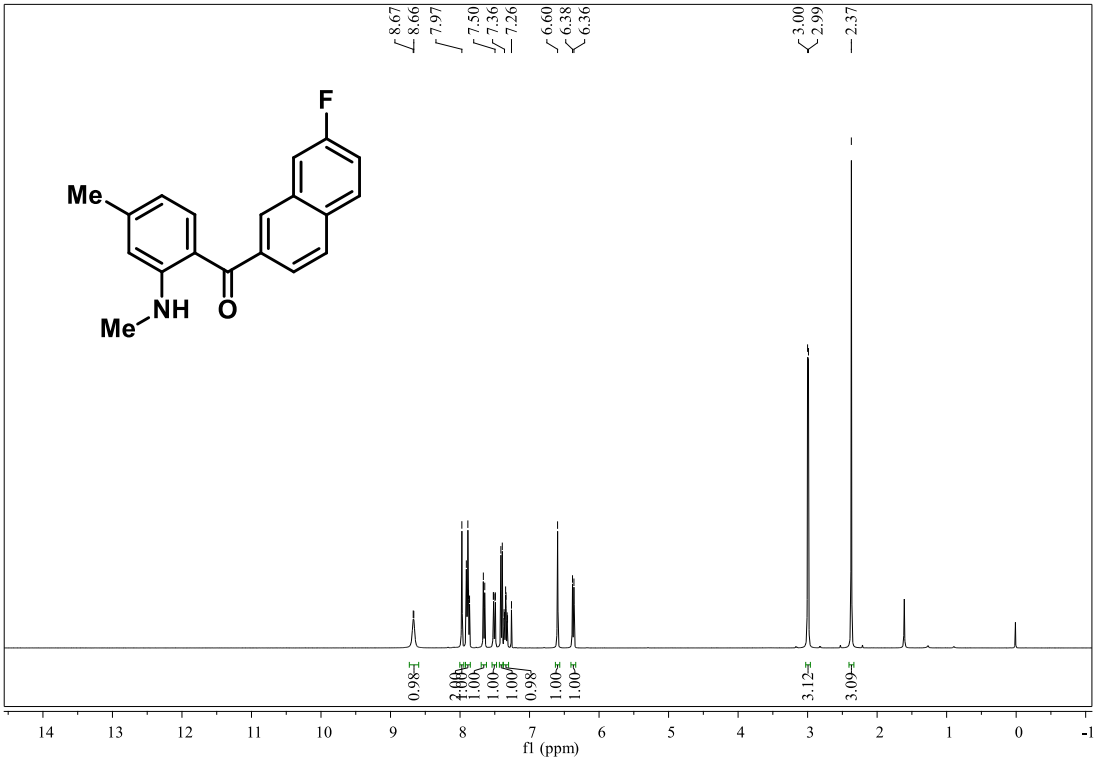


100 MHz, ^{13}C NMR in $CDCl_3$

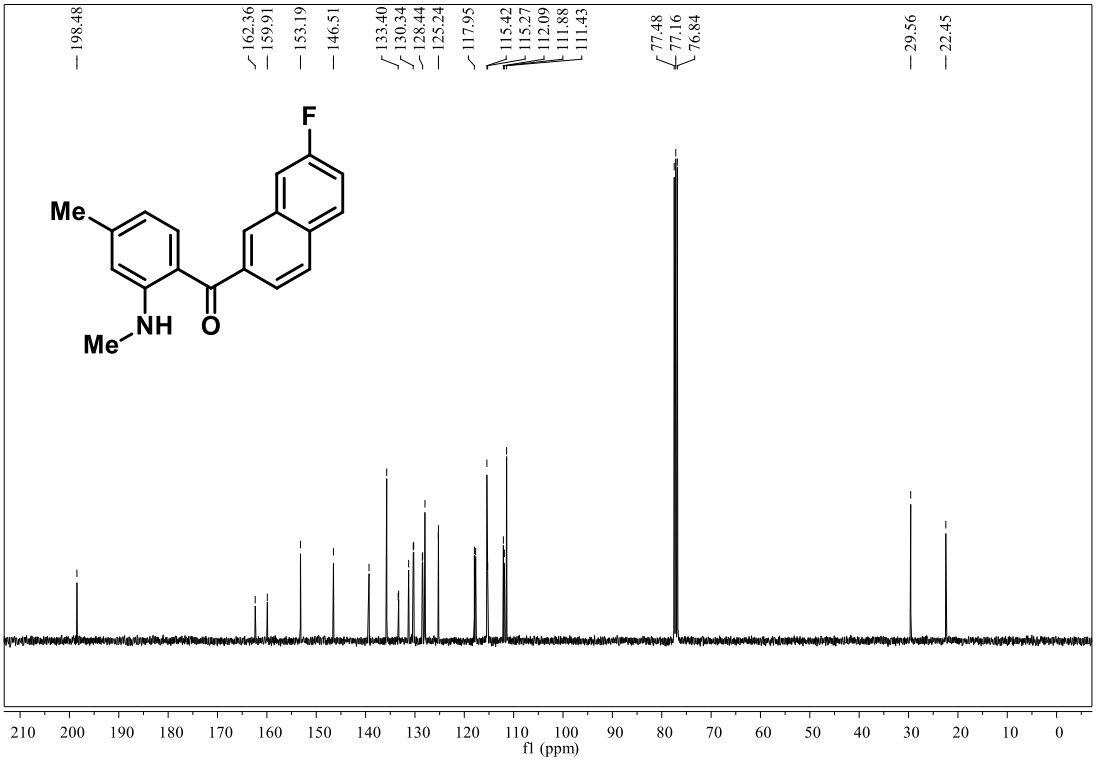


HRMS (MeOH)

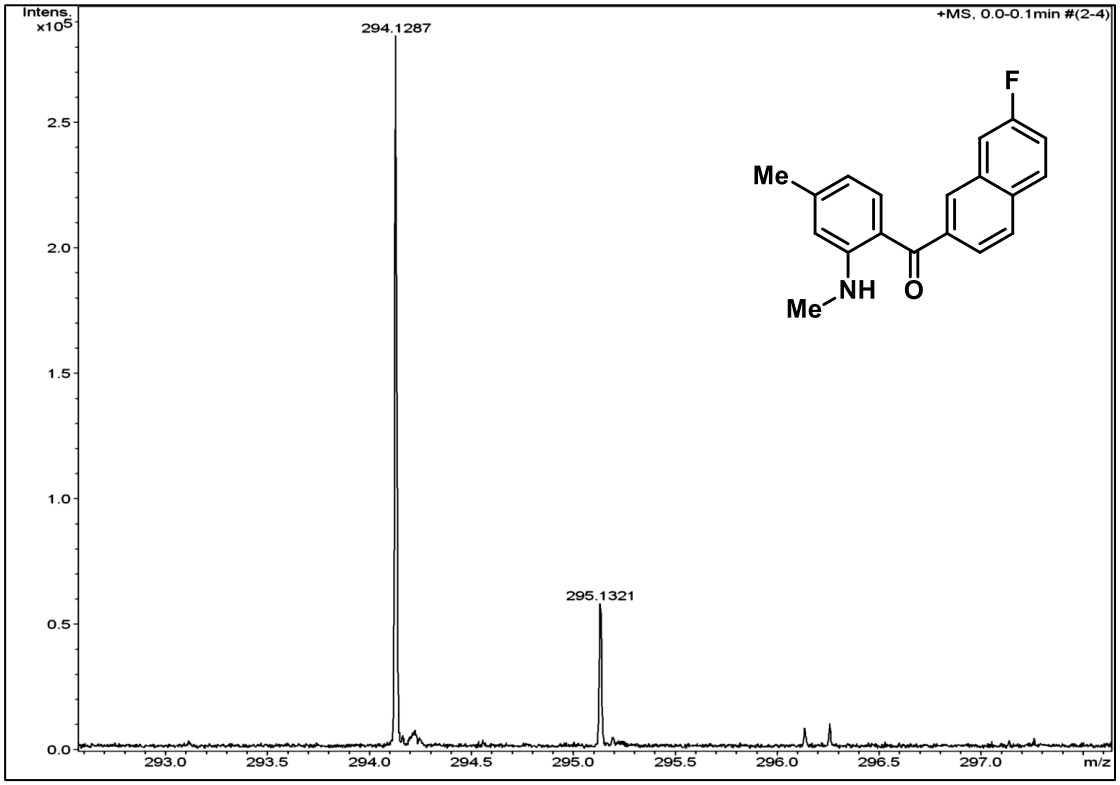
(7-Fluoronaphthalen-2-yl)(4-methyl-2-(methylamino)phenyl)methanone (2s)



400 MHz, ^{1}H NMR in $CDCl_3$

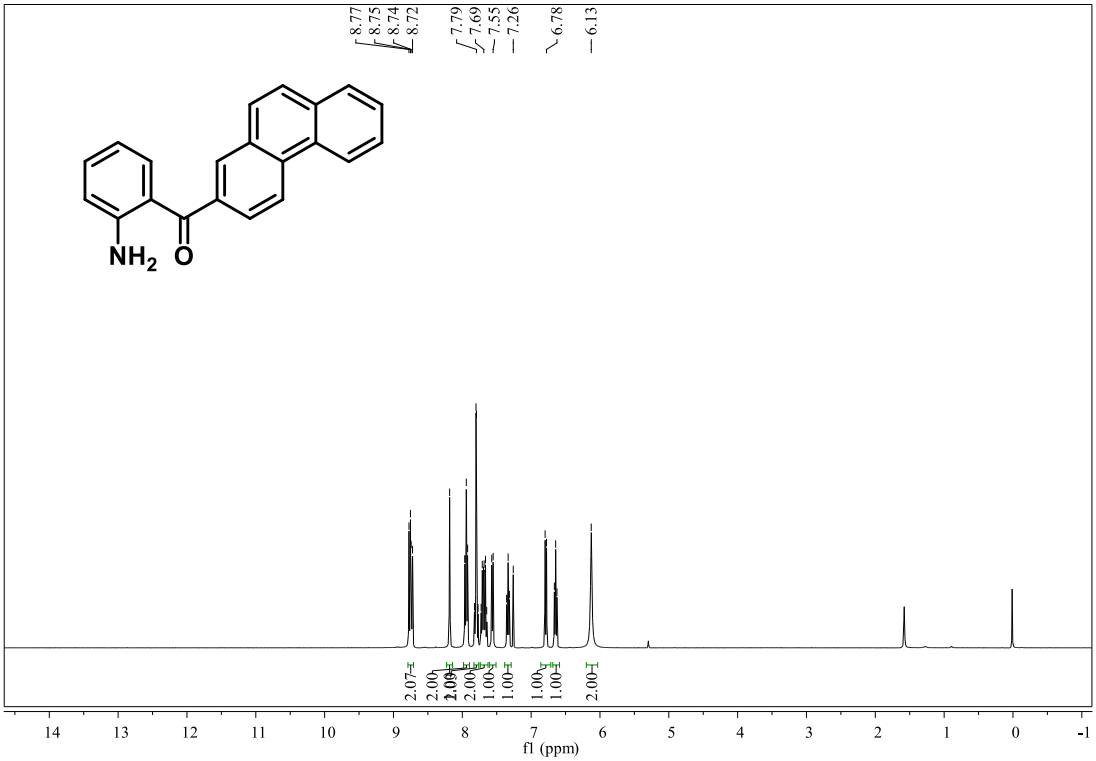


100 MHz, ^{13}C NMR in $CDCl_3$

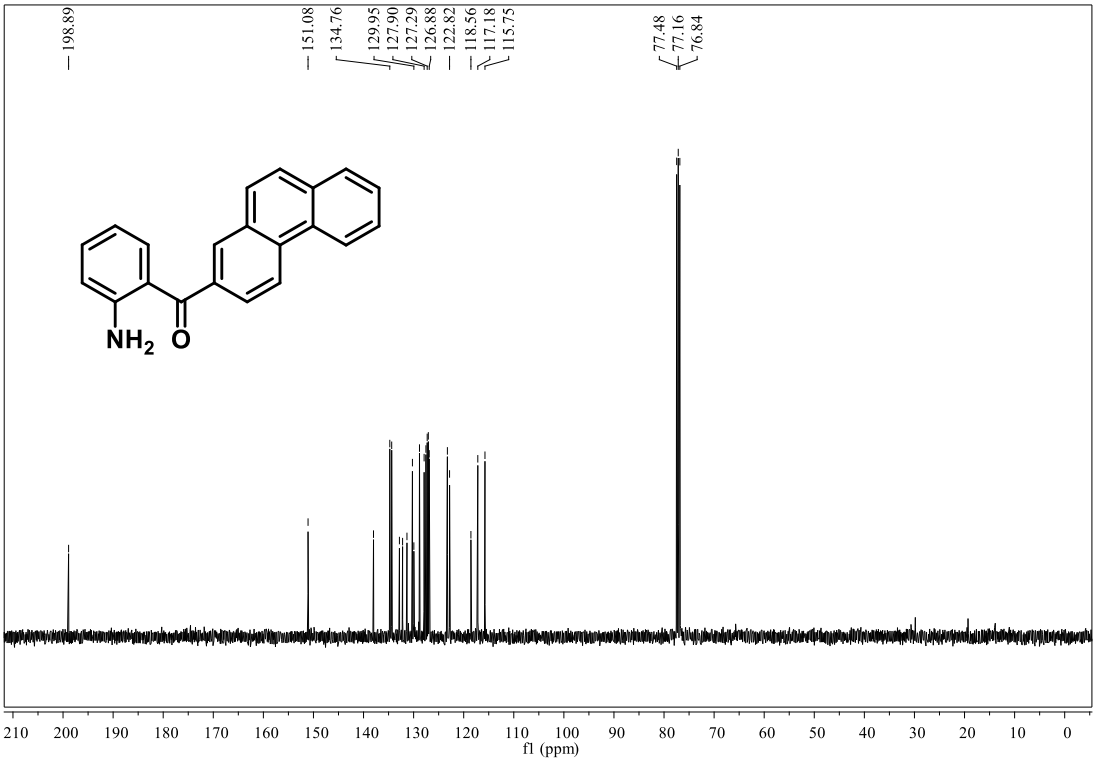


HRMS (MeOH)

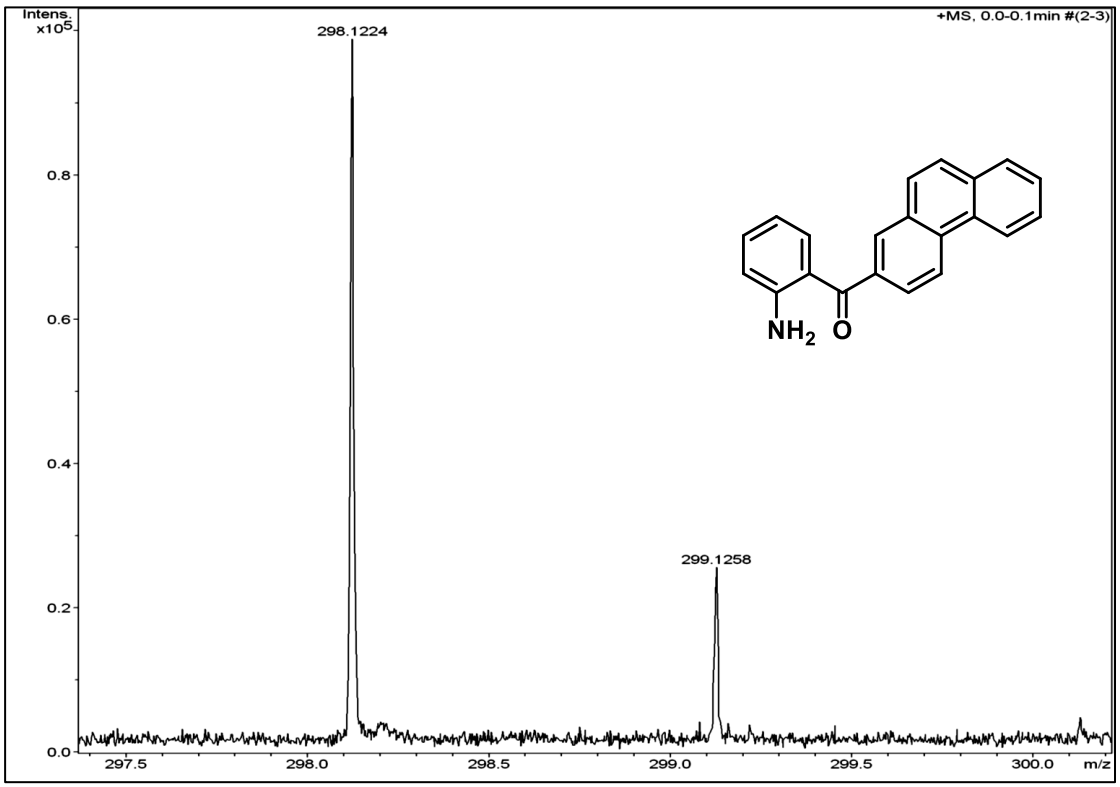
(2-Aminophenyl)(phenanthren-2-yl)methanone (2t)



400 MHz, ^{1}H NMR in $CDCl_3$

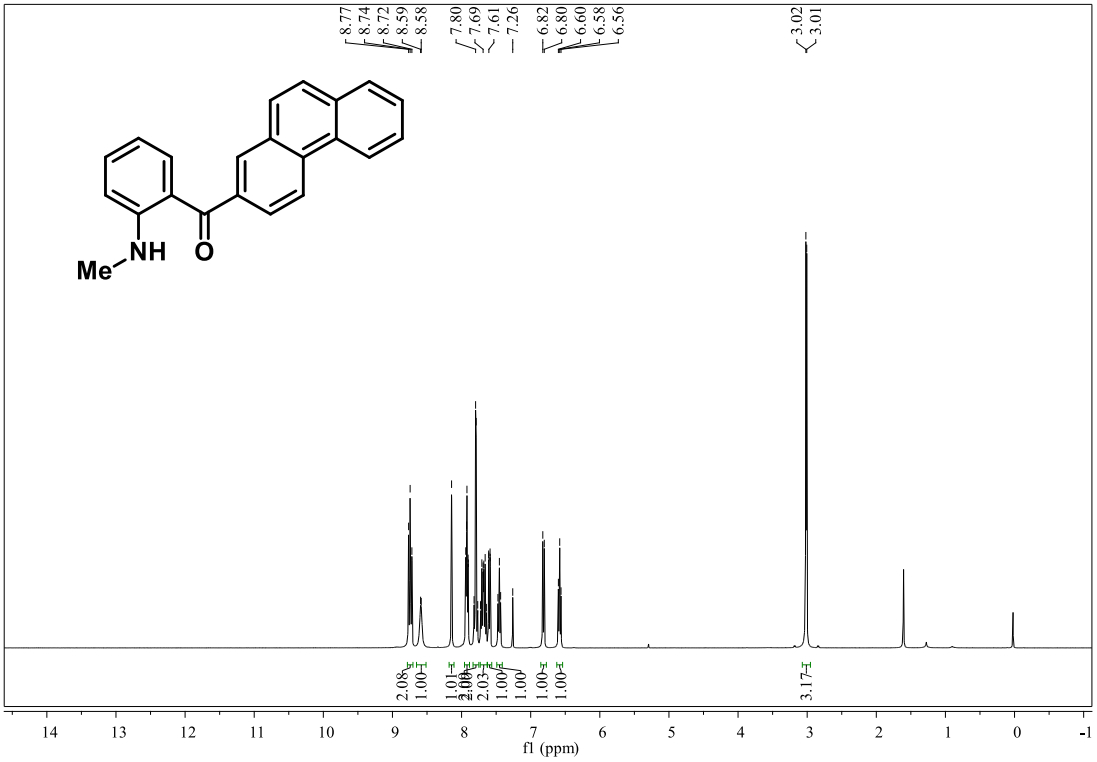


100 MHz, ^{13}C NMR in $CDCl_3$

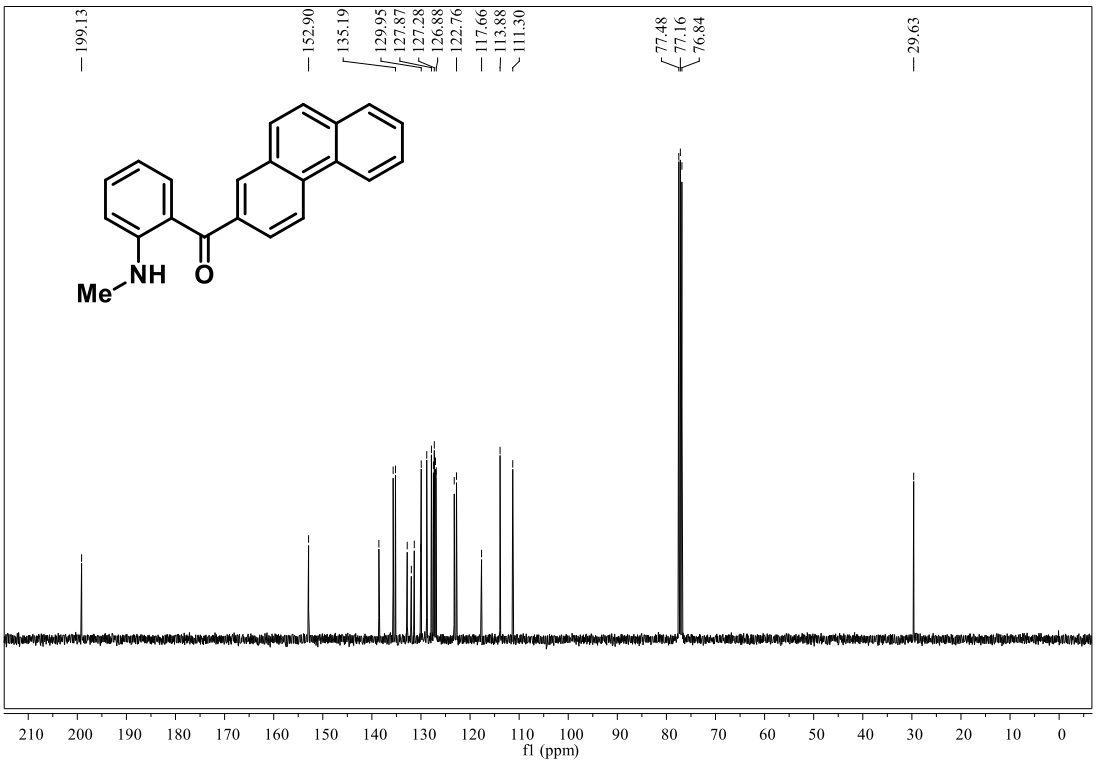


HRMS (MeOH)

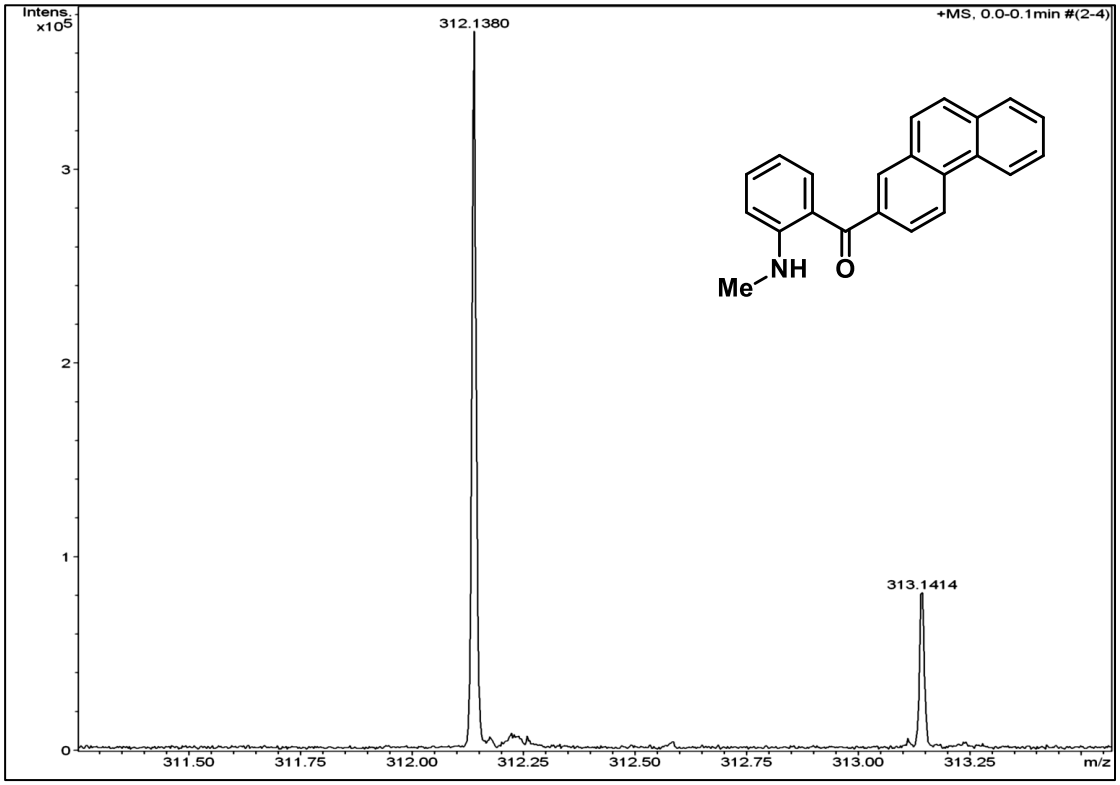
(2-(Methylamino)phenyl)(phenanthren-2-yl)methanone (2u)



400 MHz, ^{1}H NMR in $CDCl_3$



100 MHz, ^{13}C NMR in $CDCl_3$


Intens.
x10^5
+MS, 0.0-0.1min #(2-4)
312.1380
313.1414
NH
O
Me
0
1
2
3
311.50
311.75
312.00
312.25
312.50
312.75
313.00
313.25
m/z

HRMS (MeOH)