Supporting Information for Publication

Regioselective synthesis of spiro quinazolinones via sequential hydroalkoxylation and intramolecular amide-cyclization of alkynol ureas

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Experimental section:

General information:

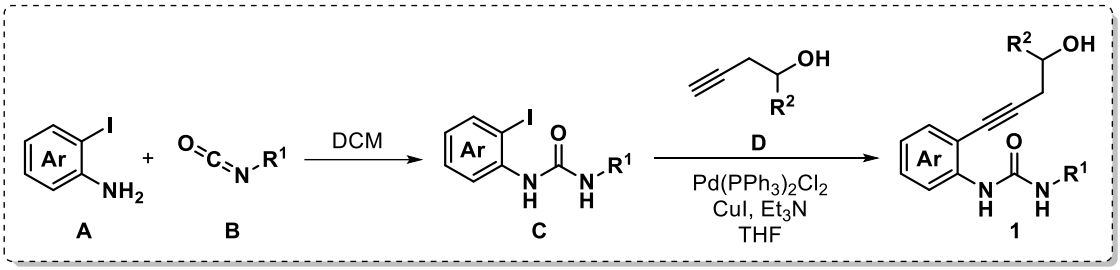
All the reagents were of reagent grade (AR grade) and were used as purchased without further purification. Silica gel (60-120 mesh size) was used for column chromatography. Reactions were monitored by TLC on silica gel GF254 (0.25 mm). Melting points were recorded in an open capillary tube and are uncorrected. Fourier transform-infra red (FT-IR) spectra were recorded as neat liquid or KBr pellets. NMR spectra were recorded in $CDCl_3$ with tetramethylsilane as the internal standard for ^{1}H (500 MHz and 400 MHz) or ^{13}C (125 MHz and 100 MHz) NMR. Chemical shifts (δ) are reported in ppm with abbreviations, s = singlet, d = doublet, dd = doublet of doublets, dt = doublet of triplets, t = triplet, td = triplet of doublets, tt = triplet of triplets, q = quartet, qd = quartet of doublets, p = quintet, h = sextet, m = multiplet and spin-spin coupling constants (*J*) are given in Hz. HRMS spectra were recorded using Q-TOF mass spectrometer.

Trifluoromethanesulfonic acid (reagent grade, 100 mL bottle) was purchased from Spectrochem and used without further purification. It is highly advisable to handle trifluoromethanesulfonic acid using glass(micro) syringes and steel needles. Disposable plastic syringes and needles should be avoided, as they may dissolve/melt in the presence of TfOH. After using triflic acid, two layers of PTFE tape were applied, followed by a layer of parafilm, to seal the bottle cap, and it was stored in the freezer at -5°C.

The starting materials, **1a**, **1b**, **1d**, **1e**, **1f**, **1s**, **1t**, **1u**, **1v** and **3** were synthesized according to the literature report, and the spectroscopic data of the compounds are in good agreement with the literature data.[1]

General experimental procedure and characterization data of the compounds 1c, 1g-1k, 1m-1r, 1w-1y, 1aa and 1ab:

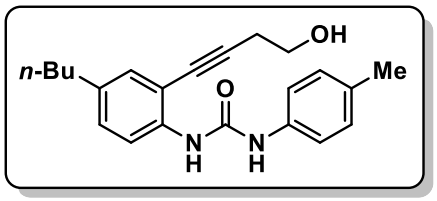
Schematic representation of starting materials **1c**, **1g-1k**, **1m-1r**, **1w-1y**, **1aa** and **1ab**:



To a solution of substituted 2-iodoaniline **A** (2.0 mmol, 1.0 equiv.) in DCM (5.0 mL) under N_2 atmosphere, substituted phenyl isocyanate **B** (2.2 mmol, 1.1 equiv.) was added dropwise. The reaction mixture was stirred overnight at room temperature to obtain a white precipitate, which was then filtered and washed with n-hexane to obtain a substituted 1,3-diphenyl urea **C**.

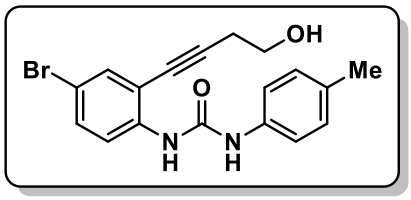
To a mixture of $Pd(PPh_3)_2Cl_2$ (0.04 mmol, 0.04 equiv.), CuI (0.02 mmol, 0.02 equiv.) and iodo substituted 1,3-diphenyl urea derivatives **C** (1.0 mmol, 1.0 equiv.) in dry THF (5.0 mL) under N_2 atmosphere, triethylamine (5.0 mmol, 5.0 equiv.) was added. The reaction mixture was stirred for 10 minutes at room temperature, after which substituted homo propargylic alcohol **D** (1.2 mmol, 1.2 equiv.) was added dropwise over a period of 5 minutes. The reaction mixture was stirred for 3.0 hours (monitored by TLC analysis) before filtering through a pad of celite. The solids were washed with ethyl acetate, and the combined filtrates were concentrated in a rotary evaporator. The crude product was then purified by column chromatography to provide the corresponding product **1**.

1-(4-Butyl-2-(4-hydroxybut-1-yn-1-yl)phenyl)-3-(*p*-tolyl)urea (1c):



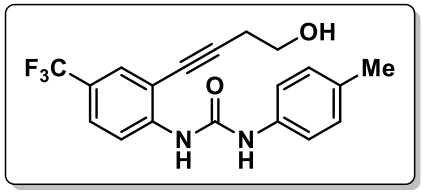
White solid; R_f (Hexane:EtOAc, 3:2) 0.60; mp 137-139 °C. Yield 315 mg, 90%. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 (d, *J* = 8.2 Hz, 1H), 7.85 (s, 1H), 7.49 (s, 1H), 7.24 (d, *J* = 8.4 Hz, 2H), 7.05 (d, *J* = 10.7 Hz, 3H), 7.02 (s, 1H), 3.82 (q, *J* = 5.9 Hz, 2H), 3.07 (s, 1H), 2.59 (t, *J* = 5.7 Hz, 2H), 2.48 (t, *J* = 7.7 Hz, 2H), 2.26 (s, 3H), 1.57–1.49 (m, 2H), 1.32 (h, *J* = 7.4 Hz, 2H), 0.91 (t, *J* = 7.3 Hz, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.4, 138.6, 136.5, 136.1, 133.2, 130.1, 129.7, 129.5, 120.7, 118.4, 111.9, 94.5, 79.1, 61.5, 34.8, 33.6, 24.0, 22.3, 20.9, 14.1. IR (KBr, neat) 3321, 2955, 2926, 2859, 1666, 1589, 1529, 1509, 1414, 1310, 1292, 1250, 1207, 1042, 936, 895, 815, 736, 507 cm^{-1}. HRMS (ESI) calcd. for $C_{22}H_{27}N_2O_2$ $(M + H)^+$ 351.2067, found 351.2070.

1-(4-Bromo-2-(4-hydroxybut-1-yn-1-yl)phenyl)-3-(*p*-tolyl)urea (1g):



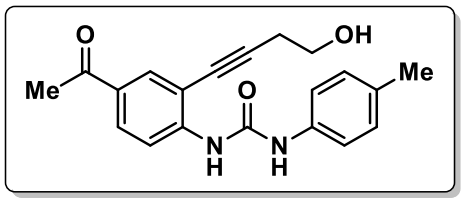
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 183-185 °C. Yield 328 mg, 88%. ^{1}H NMR (400 MHz, $CDCl_3$/DMSO-d_6) δ 8.37 (s, 1H), 8.27 (s, 1H), 8.24 (d, *J* = 8.9 Hz, 1H), 7.40 (d, *J* = 2.3 Hz, 1H), 7.37–7.32 (m, 3H), 7.09 (d, *J* = 8.0 Hz, 2H), 5.10 (s, 1H), 3.89 (q, *J* = 5.1 Hz, 2H), 2.72 (t, *J* = 5.7 Hz, 2H), 2.29 (s, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 152.6, 140.4, 136.4, 132.5, 132.2, 131.8, 129.4, 119.4, 119.2, 113.4, 113.1, 97.2, 77.4, 60.7, 24.1, 20.7. IR (KBr, neat) 3311, 1680, 1600, 1571, 1549, 1512, 1403, 1295, 1208, 1039, 811, 752, 690, 573, 508 cm^{-1}. HRMS (ESI) calcd. for $C_{18}H_{18}BrN_2O_2$ $(M + H)^+$ 373.0546, found 373.0540.

1-(2-(4-Hydroxybut-1-yn-1-yl)-4-(trifluoromethyl)phenyl)-3-(*p*-tolyl)urea (1h):



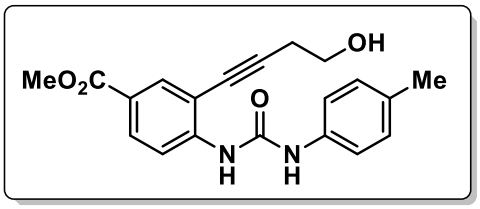
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 156-158 °C. Yield 341 mg, 94%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.43 (d, *J* = 8.6 Hz, 1H), 8.21 (s, 1H), 7.67 (s, 1H), 7.46 (d, *J* = 9.9 Hz, 2H), 7.24 (d, *J* = 8.6 Hz, 2H), 7.03 (d, *J* = 7.9 Hz, 2H), 3.93 (t, *J* = 5.7 Hz, 2H), 2.88 (s, 1H), 2.67 (t, *J* = 5.7 Hz, 2H), 2.26 (s, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.8, 143.9, 135.6, 133.4, 129.7, 126.9, 126.1 (q, *J* = 3.9 Hz), 124.1 (q, *J* = 270.5 Hz), 123.5 (q, *J* = 32.7 Hz), 120.1, 117.1, 111.5, 96.7, 78.0, 61.5, 24.0, 20.8. IR (KBr, neat) 3318, 2891, 1685, 1610, 1590, 1539, 1514, 1427, 1334, 1315, 1260, 1203, 1166, 1118, 1074, 1039, 897, 839, 813, 705, 643, 508 cm^{-1}. HRMS (ESI) calcd. for $C_{19}H_{18}F_3N_2O_2$ $(M + H)^+$ 363.1315, found 363.1315.

1-(4-Acetyl-2-(4-hydroxybut-1-yn-1-yl)phenyl)-3-(*p*-tolyl)urea (1i):



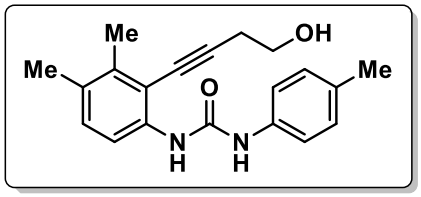
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 175-177 °C. Yield 296 mg, 88%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.40 (d, *J* = 8.7 Hz, 1H), 8.27 (s, 1H), 7.84–7.81 (m, 2H), 7.77 (s, 1H), 7.28 (d, *J* = 8.3 Hz, 2H), 7.07 (d, *J* = 8.0 Hz, 2H), 3.93 (t, *J* = 5.6 Hz, 2H), 3.04 (s, 1H), 2.68 (t, *J* = 5.7 Hz, 2H), 2.50 (s, 3H), 2.28 (s, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 196.9, 152.5, 145.3, 135.8, 133.4, 130.4, 130.3, 130.0, 129.7, 120.2, 116.7, 111.3, 96.1, 78.4, 61.7, 26.4, 24.0, 20.9. IR (KBr, neat) 3339, 2927, 2885, 1669, 1577, 1512, 1409, 1359, 1289, 1253, 1196, 1143, 1044, 819, 729cm^{-1}; HRMS (ESI) calcd. for $C_{20}H_{21}N_2O_3$ $(M + H)^+$ 337.1547, found 337.1547.

Methyl 3-(4-hydroxybut-1-yn-1-yl)-4-(3-(*p*-tolyl)ureido)benzoate (1j):



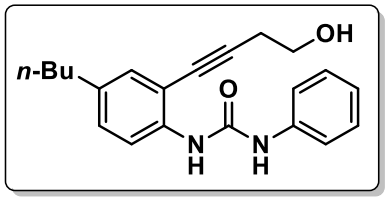
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 152-154 °C. Yield 300 mg, 85%; ^{1}H NMR (400 MHz, $CDCl_3$/DMSO-d_6) δ 8.56 (s, 1H), 8.51–8.46 (m, 1H), 8.42–8.36 (m, 1H), 7.95–7.91 (m, 1H), 7.89–7.84 (m, 1H), 7.37–7.31 (m, 2H), 7.08–7.02 (m, 2H), 5.26 (s, 1H), 3.89–3.82 (m, 5H), 2.73–2.66 (m, 2H), 2.28–2.23 (m, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 166.2, 152.2, 145.1, 136.2, 132.2, 131.6, 130.4, 129.3, 122.5, 119.1, 116.7, 111.1, 96.7, 77.7, 60.7, 51.8, 24.0, 20.6. IR (KBr, neat) 3325, 2951, 1708, 1606, 1581, 1511, 1435, 1286, 1249, 1193, 1116, 1038, 815, 764, 734, 541, 507 cm^{-1}. HRMS (ESI) calcd. for $C_{20}H_{21}N_2O_4$ $(M + H)^+$ 353.1496, found 353.1496.

1-(2-(4-Hydroxybut-1-yn-1-yl)-3,4-dimethylphenyl)-3-(*p*-tolyl)urea (1k):



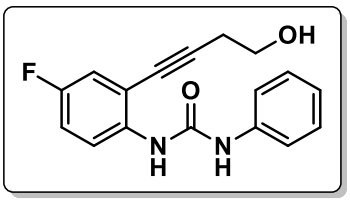
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 191-193 °C. Yield 277 mg, 86%; ^{1}H NMR (500 MHz, $CDCl_3$/DSO-d_6) δ 8.63 (s, 1H), 8.30 (s, 1H), 8.28 (s, 1H), 7.59–7.56 (m, 3H), 7.27 (d, *J* = 8.2 Hz, 2H), 5.27 (t, *J* = 6.2 Hz, 1H), 4.06 (q, *J* = 5.9 Hz, 2H), 2.90 (t, *J* = 5.8 Hz, 2H), 2.49 (s, 3H), 2.45 (s, 3H), 2.36 (s, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DSO-d_6) δ 152.8, 138.7, 137.6, 136.7, 131.6, 130.9, 129.4, 129.1, 119.3, 118.9, 108.9, 94.5, 78.5, 60.7, 24.0, 20.6, 20.1, 18.7. IR (KBr, neat) 3342, 2926, 1664, 1599, 1513, 1436, 1275, 1266, 1047, 753, 724, 696, 541 cm^{-1}; HRMS (ESI) calcd. for $C_{20}H_{23}N_2O_2$ $(M + H)^+$ 323.1754, found 323.1754.

1-(4-Butyl-2-(4-hydroxybut-1-yn-1-yl)phenyl)-3-phenylurea (1m):



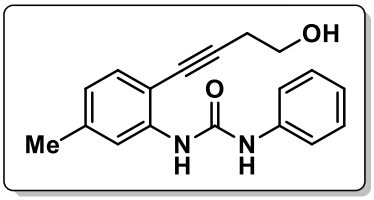
White solid; R_f (Hexane:EtOAc, 3:2) 0.60; mp 135-137 °C. Yield 289 mg, 86%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 (d, *J* = 8.3 Hz, 1H), 7.95 (s, 1H), 7.78–7.73 (m, 1H), 7.36 (d, *J* = 7.8 Hz, 2H), 7.21 (t, *J* = 7.6 Hz, 2H), 7.06 (s, 1H), 7.04 (d, *J* = 8.7 Hz, 1H), 6.98 (t, *J* = 7.4 Hz, 1H), 3.83 (q, *J* = 4.6 Hz, 2H), 3.31 (s, 1H), 2.61 (t, *J* = 5.6 Hz, 2H), 2.46 (t, *J* = 7.6 Hz, 2H), 1.52 (p, *J* = 7.3 Hz, 2H), 1.31 (h, *J* = 7.5 Hz, 2H), 0.91 (t, *J* = 7.3 Hz, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.3, 138.8, 138.5, 136.7, 130.0, 129.4, 129.1, 123.3, 120.0, 118.4, 112.1, 94.7, 79.2, 61.6, 34.8, 33.6, 24.0, 22.3, 14.0. IR (KBr, neat) 3324, 2926, 2856, 1690, 1588, 1550, 1526, 1498, 1442, 1303, 1257, 1214, 1036, 824, 746, 692, 505 cm^{-1}. HRMS (ESI) calcd. for $C_{21}H_{25}N_2O_2$ $(M + H)^+$ 337.1911, found 337.1917.

1-(4-Fluoro-2-(4-hydroxybut-1-yn-1-yl)phenyl)-3-phenylurea (1n):



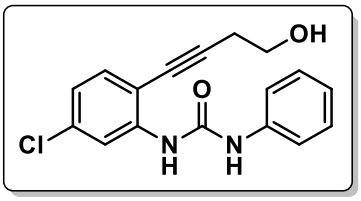
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 175-177 °C. Yield 283 mg, 95%; ^{1}H NMR (400 MHz, $CDCl_3$/DMSO-d_6) δ 8.36 (s, 1H), 8.23–8.19 (m, 2H), 7.44 (d, *J* = 7.8 Hz, 2H), 7.25 (d, *J* = 4.0 Hz, 1H), 7.22 (d, *J* = 8.2 Hz, 1H), 7.00-6.90 (m, 3H), 5.10–5.00 (m, 1H), 3.85 (q, *J* = 5.9 Hz, 2H), 2.67 (t, *J* = 5.6 Hz, 2H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 157.1 (d, *J* = 239.0 Hz), 152.8, 139.3, 137.6 (d, *J* = 2.3 Hz), 128.9, 122.6, 119.6 (d, *J* = 8.3 Hz), 119.0, 116.4 (d, *J* = 23.6 Hz), 116.0, 115.8, 96.9, 78.0, 60.8, 24.1. ^{19}F NMR (470 MHz, $CDCl_3$/DMSO-d_6/C_6F_6) δ -125.0. IR (KBr, neat) 3231, 2927, 1667, 1599, 1534, 1499, 440, 1311, 1255, 1201, 1166, 0144, 940, 869, 751, 693, 510 cm^{-1}. HRMS (ESI) calcd. for $C_{17}H_{16}FN_2O_2$ $(M + H)^+$ 299.1190, found 299.1190.

1-(2-(4-Hydroxybut-1-yn-1-yl)-5-methylphenyl)-3-phenylurea (1o):



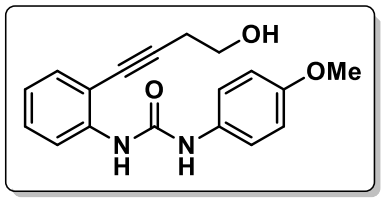
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 143-145 °C. Yield 265 mg, 90%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.09 (s, 1H), 8.00 (s, 1H), 7.77 (s, 1H), 7.39 (d, *J* = 7.9 Hz, 2H), 7.24 (t, *J* = 7.8 Hz, 2H), 7.13 (d, *J* = 7.8 Hz, 1H), 7.00 (t, *J* = 7.3 Hz, 1H), 6.71 (d, *J* = 7.8 Hz, 1H), 3.87 (t, *J* = 5.5 Hz, 2H), 2.64 (t, *J* = 5.7 Hz, 2H), 2.31 (s, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.1, 140.8, 139.8, 138.9, 129.8, 129.1, 123.3, 122.8, 119.8, 118.8, 108.9, 94.5, 79.2, 61.7, 24.1, 22.1. IR (KBr, neat) 3314, 2928, 1679, 1603, 1542, 1498, 1475, 1433, 1317, 1294, 1250, 1213, 1047, 839, 805, 745, 690, 504 cm^{-1}. HRMS (ESI) calcd. for $C_{18}H_{19}N_2O_2$ $(M + H)^+$ 295.1441, found 295.1442.

1-(5-Chloro-2-(4-hydroxybut-1-yn-1-yl)phenyl)-3-phenylurea (1p):



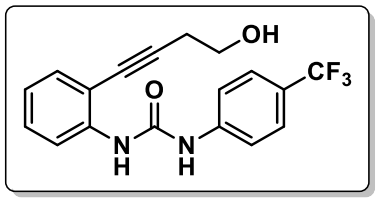
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 150-152 °C. Yield 293 mg, 93%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.39 (d, *J* = 2.1 Hz, 1H), 8.12 (s, 1H), 7.73 (s, 1H), 7.37–7.34 (m, 2H), 7.25–7.20 (m, 2H), 7.11 (d, *J* = 8.2 Hz, 1H), 7.01 (t, *J* = 7.4 Hz, 1H), 6.85 (dd, *J* = 8.2, 2.1 Hz, 1H), 3.94 (q, *J* = 5.9 Hz, 2H), 2.79 (t, *J* = 6.7 Hz, 1H), 2.69 (t, *J* = 5.6 Hz, 2H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.6, 142.1, 138.6, 135.2, 130.5, 129.2, 123.4, 121.8, 119.7, 117.8, 109.7, 96.1, 78.5, 61.8, 24.1. IR (KBr, neat) 3324, 2930, 1680, 1601, 1569, 1551, 1523, 1499, 1441, 1417, 1314, 1246, 1208, 1043, 809, 749, 692, 504 cm^{-1}; HRMS (ESI) calcd. for $C_{17}H_{16}ClN_2O_2$ $(M + H)^+$ 315.0895, found 315.0896.

1-(2-(4-Hydroxybut-1-yn-1-yl)phenyl)-3-(4-methoxyphenyl)urea (1q):



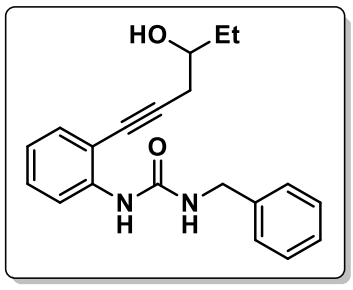
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 154-156 °C. Yield 264 mg, 85%; ^{1}H NMR (500 MHz, $CDCl_3$/DMSO-d_6) δ 8.31 (d, *J* = 8.3 Hz, 1H), 8.17 (s, 1H), 8.04 (s, 1H), 7.37 (d, *J* = 9.0 Hz, 2H), 7.31–7.27 (m, 2H), 6.92 (td, *J* = 7.6, 1.2 Hz, 1H), 6.84 (d, *J* = 8.8 Hz, 2H), 4.53 (s, 1H), 3.88 (t, *J* = 5.1 Hz, 2H), 3.78 (s, 3H), 2.68 (t, *J* = 5.7 Hz, 2H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 155.8, 153.3, 141.2, 132.0, 130.2, 129.1, 121.8, 121.5, 118.0, 114.3, 111.6, 95.6, 78.8, 61.1, 55.6, 24.1. IR (KBr, neat) 3318, 2944, 1668, 1608, 1578, 1537, 1509, 1447, 1301, 1241, 1215, 1177, 1036, 830, 753, 521 cm^{-1}. HRMS (ESI) calcd. for $C_{18}H_{19}N_2O_3$ $(M + H)^+$ 311.1390, found 311.1396.

1-(2-(4-Hydroxybut-1-yn-1-yl)phenyl)-3-(4-(trifluoromethyl)phenyl)urea (1r):



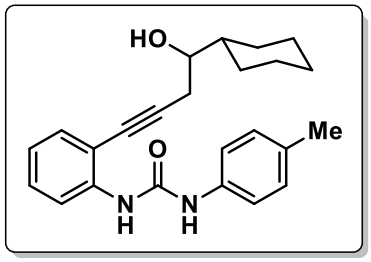
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 171-173 °C. Yield 293 mg, 84%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (d, *J* = 8.4 Hz, 1H), 8.22 (s, 1H), 8.05 (s, 1H), 7.50 (d, *J* = 8.6 Hz, 2H), 7.45 (d, *J* = 8.7 Hz, 2H), 7.29 (td, J = 7.9, 1.1 Hz, 1H), 7.24 (dd, *J* = 7.8, 1.0 Hz, 1H), 6.93 (td, *J* = 7.5, 1.1 Hz, 1H), 4.02 (q, *J* = 5.7 Hz, 2H), 2.75 (t, *J* = 5.6 Hz, 2H), 2.70 (t, *J* = 6.5 Hz, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.4, 142.4, 140.8, 129.9, 129.5, 126.3 (q, *J* = 3.7 Hz), 124.5 (q, *J* = 32.3 Hz), 124.4 (q, *J* = 269.7 Hz), 122.1, 118.2, 117.8, 111.6, 95.3, 79.3, 62.1, 24.2. ^{19}F NMR (470 MHz, $CDCl_3$/C_6F_6) δ -65.04. IR (KBr, neat) 3328, 2927, 2858, 1661, 1605, 1584, 1534, 1450, 1411, 1321, 1257, 1164, 1115, 1067, 842, 752, 701, 592 cm^{-1}. HRMS (ESI) calcd. for $C_{18}H_{16}F_3N_2O_2$ $(M + H)^+$ 349.1158, found 349.1158.

1-Benzyl-3-(2-(4-hydroxyhex-1-yn-1-yl)phenyl)urea (1w):



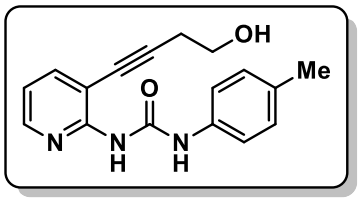
White solid; R_f (Hexane:EtOAc, 7:3) 0.60; mp 125-127 °C. Yield 313 mg, 97%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.26 (d, *J* = 8.3 Hz, 1H), 8.12 (s, 1H), 7.30–7.27 (m, 4H), 7.25–7.18 (m, 3H), 6.85 (td, *J* = 7.5, 1.2 Hz, 1H), 6.41 (s, 1H), 4.39 (d, *J* = 5.7 Hz, 2H), 3.97–3.71 (m, 2H), 2.70 (dd, *J* = 17.1, 4.0 Hz, 1H), 2.50 (dd, *J* = 17.1, 6.3 Hz, 1H), 1.64–1.51 (m, 2H), 0.88 (t, *J* = 7.4 Hz, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 155.6, 141.7, 139.6, 130.0, 129.1, 128.6, 127.6, 127.1, 121.1, 117.9, 111.4, 94.9, 79.2, 72.1, 43.9, 29.2, 28.0, 10.3. IR (KBr, neat) 3325, 2965, 2930, 1669, 1545, 1450, 1305, 1245, 1217, 1100, 1025, 979, 840, 752, 697, 477cm^{-1}. HRMS (ESI) calcd. for $C_{20}H_{23}N_2O_2$ $(M + H)^+$ 323.1754, found 323.1757.

1-(2-(4-Cyclohexyl-4-hydroxybut-1-yn-1-yl)phenyl)-3-(*p*-tolyl)urea (1x):



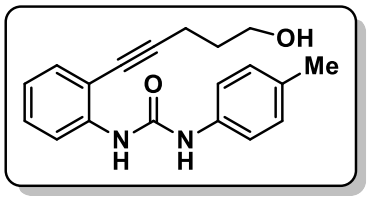
White solid; R_f (Hexane:EtOAc, 7:3) 0.60; mp 133-135 °C. Yield 301 mg, 80%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.27 (d, *J* = 8.3 Hz, 1H), 8.16 (s, 1H), 7.86 (s, 1H), 7.24 (d, *J* = 7.9 Hz, 2H), 7.21 (d, *J* = 7.8 Hz, 1H), 7.17 (d, *J* = 8.3 Hz, 1H), 6.98 (d, *J* = 8.0 Hz, 2H), 6.83 (t, *J* = 7.5 Hz, 1H), 3.58–3.53 (m, 1H), 2.96 (d, *J* = 7.8 Hz, 1H), 2.62 (dd, *J* = 17.1, 3.6 Hz, 1H), 2.48 (dd, *J* = 17.1, 8.1 Hz, 1H), 2.21 (s, 3H), 1.97–1.92 (m, 1H), 1.73 (d, *J* = 12.5 Hz, 2H), 1.64 (t, *J* = 13.4 Hz, 2H), 1.48–1.41 (m, 1H), 1.27–1.08 (m, 3H), 1.04–0.95 (m, 2H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.2, 141.5, 136.4, 132.4, 129.6, 129.5, 129.1, 121.3, 119.4, 117.5, 111.6, 95.6, 79.2, 76.0, 43.2, 29.2, 29.0, 26.3, 26.0, 25.95, 25.93, 20.8. IR (KBr, neat) 3320, 3039, 2923, 2852, 161, 1603, 1578, 1534, 1512, 1448, 1406, 1309, 1293, 1247, 1204, 1106, 1031, 815, 748, 703, 507 cm^{-1}. HRMS (ESI) calcd. for $C_{24}H_{29}N_2O_2$ $(M + H)^+$ 377.2224, found 377.2225.

1-(3-(4-Hydroxybut-1-yn-1-yl)pyridin-2-yl)-3-(*p*-tolyl)urea (1y):



White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 128-130°C. Yield 266 mg, 90%. ^{1}H NMR (500 MHz, $CDCl_3$) δ 11.67 (s, 1H), 8.15 (d, *J* = 5.3 Hz, 1H), 7.91 (s, 1H), 7.65 (d, *J* = 7.6 Hz, 1H), 7.46 (d, *J* = 8.6 Hz, 2H), 7.14 (d, *J* = 8.0 Hz, 2H), 6.87 (dd, *J* = 7.3, 5.1 Hz, 1H), 3.90 (t, *J* = 6.2 Hz, 2H), 2.92 (s, 1H), 2.78 (t, *J* = 6.1 Hz, 2H), 2.32 (s, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.2, 152.5, 144.9, 140.6, 135.8, 133.3, 129.6, 120.5, 116.5, 107.3, 97.7, 75.6, 60.8, 24.0, 21.0. IR (KBr, neat) 3393, 2948, 2231, 1679, 1610, 1582, 1556, 1478, 1409, 1315, 1258, 1226, 1048, 814, 749, 510 cm^{-1}. HRMS (ESI) calcd. for $C_{17}H_{18}N_3O_2$ $(M + H)^+$ 296.1394, found 296.1394.

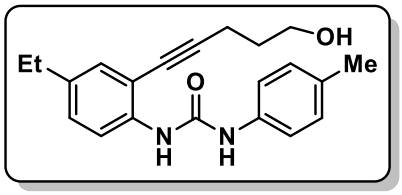
1-(2-(5-Hydroxypent-1-yn-1-yl)phenyl)-3-(*p*-tolyl)urea (1aa):



White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 146-148 °C. Yield 284 mg, 92%. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.33 (d, *J* = 8.3 Hz, 1H), 8.03 (s, 1H), 8.00 (s, 1H), 7.32 (d, *J* = 8.5 Hz, 3H), 7.28 (t, *J* = 7.9 Hz, 1H), 7.10 (d, *J* = 7.5 Hz, 2H), 6.95 (t, *J* = 7.5 Hz, 1H), 3.96 (t, *J* = 4.8 Hz, 2H), 2.91 (s, 1H), 2.60 (t, *J* = 5.8 Hz, 2H), 2.32 (s, 3H), 1.91–1.86 (m, 2H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.4, 141.1, 136.1, 133.0, 130.9, 129.6, 129.0, 121.6, 120.3, 119.0, 111.9, 96.8, 77.2, 63.1, 30.6, 20.9, 17.4. IR (KBr, neat) 3326,

2932, 1672, 1605, 1579, 1537, 1513, 1448, 1297, 1252, 1208, 1046, 816, 752, 508 cm^{-1}. HRMS (ESI) calcd. for $C_{19}H_{21}N_2O_2$ $(M + H)^+$ 309.1598, found 309.1598.

1-(4-Ethyl-2-(5-hydroxypent-1-yn-1-yl)phenyl)-3-(*p*-tolyl)urea (1ab):

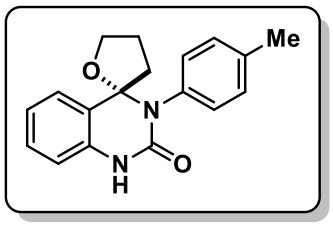


White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 131-133 °C. Yield 306 mg, 91%. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.14 (d, *J* = 8.5 Hz, 1H), 7.79 (s, 1H), 7.75 (s, 1H), 7.27 (s, 1H), 7.25 (s, 1H), 7.09 (s, 1H), 7.07–7.04 (m, 3H), 3.90 (t, *J* = 5.5 Hz, 2H), 2.65 (s, 1H), 2.55–2.50 (m, 4H), 2.27 (s, 3H), 1.82 (p, *J* = 5.9 Hz, 2H), 1.17 (t, *J* = 7.6 Hz, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.4, 138.7, 137.7, 136.2, 133.0, 130.1, 129.7, 128.7, 120.5, 118.4, 112.0, 96.2, 77.6, 63.1, 30.7, 28.1, 20.9, 17.3, 15.7. IR (KBr, neat) 3307, 2961, 1672, 1610, 1583, 1511, 1413, 1293, 1252, 1201, 1061, 894, 812, 750, 507 cm^{-1}. HRMS (ESI) calcd. for $C_{21}H_{25}N_2O_2$ $(M + H)^+$ 337.1911, found 337.1911.

General experimental procedure and characterization data of the compounds 2a-2x, 2aa, 2ab:

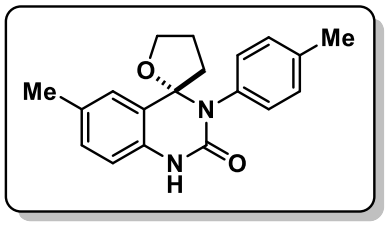
To an ice-cold suspension of alkynol substituted diphenyl urea **1** (0.4 mmol, 1.0 equiv.) in DCM (4.0 mL), triflic acid (0.8 mmol, 2.0 equiv.) was added under N_2 atmosphere. The reaction was continued to stir at room temperature till all the starting material was consumed, as evident by TLC. It was then treated with saturated $NaHCO_3$ solution, and the organic layer was extracted with DCM (2 x 10 mL). The combined organic layers were further washed with brine, followed by drying over anhydrous Na_2SO_4. The organic phase was concentrated in a rotary evaporator to give the crude product, which was then subjected to column chromatography over silica gel to provide the final product.

(*S*)-3'-(*p*-Tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2a):



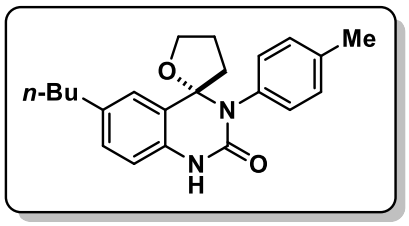
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 239-241 °C. Yield 117 mg, 99%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.57–8.39 (m, 1H), 7.28 (d, *J* = 7.9 Hz, 2H), 7.25–718 (m, 4H), 7.00 (t, *J* = 7.6 Hz, 1H), 6.71 (d, *J* = 7.9 Hz, 1H), 3.87 (q, *J* = 7.6 Hz, 1H), 3.69 (td, *J* = 7.9, 5.3 Hz, 1H), 2.50–2.44 (m, 1H), 2.40–2.35 (m, 4H), 1.90–1.83 (m, 1H), 1.43–1.34 (m, 1H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.9, 137.8, 135.4, 134.9, 131.2, 129.6, 129.3, 125.1, 124.3, 122.2, 114.4, 97.2, 69.6, 39.2, 26.1, 21.3. IR (KBr, neat) 3202, 3060, 2922, 2855, 1668, 1600, 1502, 1404, 1271, 1189, 1025, 932, 786, 748, 661, 507 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{19}N_2O_2$ $(M + H)^+$ 295.1441, found 295.1441.

(*S*)-6'-Methyl-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2b):



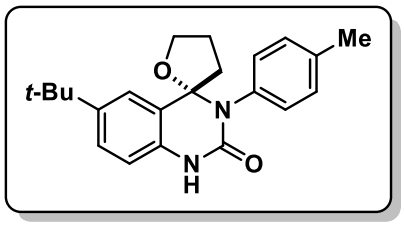
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 241-243 °C. Yield 122 mg, 99%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.51 (s, 1H), 7.29 (d, *J* = 8.0 Hz, 2H), 7.23 (d, *J* = 8.2 Hz, 2H), 7.07 (s, 1H), 7.02 (dd, *J* = 8.0, 1.9 Hz, 1H), 6.63 (d, *J* = 8.1 Hz, 1H), 3.89 (q, *J* = 7.6 Hz, 1H), 3.68 (td, *J* = 7.9, 5.2 Hz, 1H), 2.51–2.44 (m, 1H), 2.41 (s, 3H), 2.40–2.34 (m, 1H), 2.31 (s, 3H), 1.91–1.83 (m, 1H), 1.41–1.34 (m, 1H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.9, 137.7, 135.5, 132.5, 131.5, 131.2, 130.0, 129.5, 125.2, 124.1, 114.3, 97.2, 69.6, 39.3, 26.1, 21.3, 21.1. IR (KBr, neat) 3197, 3058, 2916, 1663, 1605, 1501, 1438, 1375, 1268, 1041, 935, 750, 654, 578, 465 cm^{-1}; HRMS (ESI) calcd. for $C_{19}H_{21}N_2O_2$ $(M + H)^+$ 309.1598, found 309.1598.

(*S*)-6'-Butyl-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2c):



White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 184-186 °C. Yield 139 mg, 99%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.35–8.29 (m, 1H), 7.29 (d, *J* = 8.2 Hz, 2H), 7.23 (d, *J* = 8.1 Hz, 2H), 7.07 (s, 1H), 7.03 (dd, *J* = 8.2, 1.9 Hz, 1H), 6.64 (d, *J* = 8.0 Hz, 1H), 3.89 (q, *J* = 7.6 Hz, 1H), 3.69 (td, *J* = 7.9, 5.1 Hz, 1H), 2.57 (t, *J* = 7.8 Hz, 2H), 2.51–2.44 (m, 1H), 2.40 (s, 3H), 2.39–2.35 (m, 1H), 1.91–1.83 (m, 1H), 1.61–1.53 (m, 2H), 1.42–1.31 (m, 3H), 0.93 (t, *J* = 7.3 Hz, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.9, 137.7, 136.8, 135.6, 132.6, 131.2, 129.6, 129.3, 124.7, 124.1, 114.2, 97.3, 69.6, 39.2, 35.4, 34.0, 26.2, 22.4, 21.3, 14.1. IR (KBr, neat) 3195, 3041, 2925, 2869, 1671, 1604, 1510, 1423, 1395, 1268, 1194, 1102, 1055, 1025, 815, 736, 642, 512 cm^{-1}; HRMS (ESI) calcd. for $C_{22}H_{27}N_2O_2$ $(M + H)^+$ 351.2067, found 351.2067.

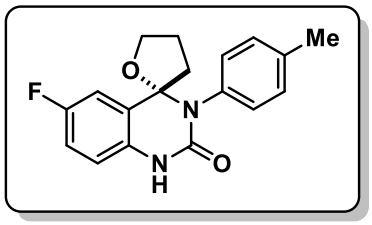
(*S*)-6'-(*tert*-Butyl)-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2d):



White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 211-213 °C. Yield 135 mg, 96%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.37 (s, 1H), 7.22–7.17 (m, 3H), 7.17–7.14 (m, 3H), 6.58 (d, *J* = 8.3 Hz, 1H), 3.82 (q, *J* = 7.6 Hz, 1H), 3.61 (td, *J* = 7.8, 5.2 Hz, 1H), 2.44–2.37 (m, 1H), 2.32 (s, 3H), 2.31–2.26 (m, 1H),

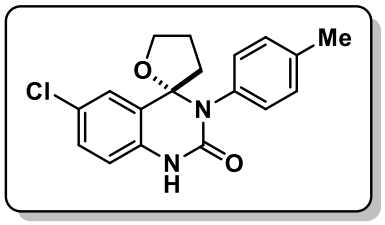
1.85–1.76 (m, 1H), 1.38–1.29 (m, 1H), 1.22 (s, 9H). $^{13}C\{^{1}H\}$ NMR (125 MHz, $CDCl_3$) δ 152.9, 145.0, 137.7, 135.5, 132.4, 131.2, 129.5, 126.5, 123.6, 121.3, 114.0, 97.4, 69.6, 39.3, 34.5, 31.5, 26.2, 21.3. IR (KBr, neat) 3228, 3049, 2956, 2869, 1671, 1605, 1510, 120, 1388, 1261, 1146, 1106, 1032, 954, 886, 824, 732, 644, 513 cm^{-1}; HRMS (ESI) calcd. for $C_{22}H_{27}N_2O_2$ $(M + H)^+$ 351.2067, found 351.2078.

(*S*)-6'-Fluoro-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2e):



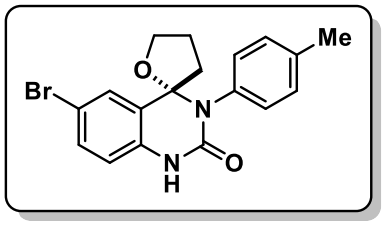
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 236-238 °C. Yield 122 mg, 98%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.03 (s, 1H), 7.28–7.20 (m, 4H), 6.97 (dd, *J* = 9.3, 2.8 Hz, 1H), 6.89 (td, *J* = 8.5, 2.8 Hz, 1H), 6.65 (dd, *J* = 8.8, 4.7 Hz, 1H), 3.87 (q, *J* = 7.6 Hz, 1H), 3.65 (td, *J* = 7.9, 5.3 Hz, 1H), 2.51–2.45 (m, 1H), 2.40 (s, 3H), 2.34–2.28 (m, 1H), 1.91–1.82 (m, 1H), 1.47–1.33 (m, 1H); $^{13}C\{^{1}H\}$ NMR (125 MHz, $CDCl_3$) δ 158.2 (d, *J* = 238.0 Hz), 153.0, 137.9, 135.1, 131.18, 131.16, 129.6, 125.6 (d, *J* = 6.8 Hz), 116.3 (d, *J* = 23.1 Hz), 115.8 (d, *J* = 7.8 Hz), 111.6 (d, *J* = 24.2 Hz), 96.8 (d, *J* = 1.8 Hz), 69.8, 39.3, 26.1, 21.4; ^{19}F NMR (470 MHz, $CDCl_3$) δ -124.18. IR (KBr, neat) 3205, 2982, 2924, 2870, 1671, 1610, 1506, 1417, 1390, 1264, 1171, 1051, 1024, 862, 815, 753, 642, 513 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{18}FN_2O_2$ $(M + H)^+$ 313.1347, found 313.1359.

(*S*)-6'-Chloro-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2f):



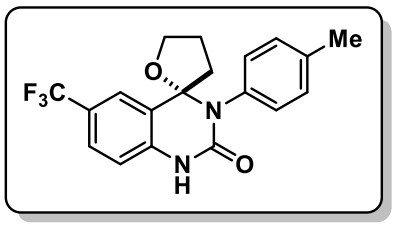
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 229-231 °C. Yield 126 mg, 96%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.13 (s, 1H), 7.27–7.22 (m, 5H), 7.11 (dd, *J* = 8.5, 2.3 Hz, 1H), 6.61 (d, *J* = 8.5 Hz, 1H), 3.88 (q, *J* = 7.5 Hz, 1H), 3.65 (td, *J* = 7.9, 5.4 Hz, 1H), 2.51–2.44 (m, 1H), 2.41 (s, 3H), 2.35–2.27 (m, 1H), 1.91–1.82 (m, 1H), 1.45–1.34 (m, 1H); $^{13}C\{^{1}H\}$ NMR (125 MHz, $CDCl_3$) δ 152.9, 138.0, 135.1, 133.6, 131.2, 129.6, 129.2, 126.9, 125.8, 124.9, 116.0, 96.8, 69.8, 39.5, 26.0, 21.3. IR (KBr, neat) 3209, 2935, 1675, 1600, 1495, 1417, 1385, 1269, 1054, 880, 817, 751, 726, 645, 509 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{18}ClN_2O_2$ $(M + H)^+$ 329.1051, found 329.1051.

(*S*)-6'-Bromo-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2g):



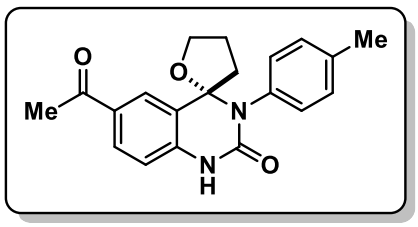
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 239-241 °C. Yield 143 mg, 96%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.98 (s, 1H), 7.37 (d, *J* = 2.2 Hz, 1H), 7.29–7.22 (m, 5H), 6.57 (d, *J* = 8.5 Hz, 1H), 3.89 (q, *J* = 7.6 Hz, 1H), 3.65 (td, *J* = 7.9, 5.4 Hz, 1H), 2.52–2.45 (m, 1H), 2.41 (s, 3H), 2.35–2.28 (m, 1H), 1.92–1.82 (m, 1H), 1.45–1.34 (m, 1H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.8, 138.0, 135.0, 134.1, 132.1, 131.1, 129.7, 127.9, 126.3, 116.3, 114.2, 96.7, 69.9, 39.6, 26.0, 21.4. IR (KBr, neat) 3239, 3080, 2928, 2873, 1672, 1596, 1494, 1417, 1379, 1262, 1032, 941, 873, 820, 752, 642, 510 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{18}BrN_2O_2$ $(M + H)^+$ 373.0546, found 373.0547.

(*S*)-3'-(*p*-Tolyl)-6'-(trifluoromethyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2h):



White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 184-186 °C. Yield 136 mg, 94%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.34 (s, 1H), 7.50 (s, 1H), 7.38 (d, *J* = 8.2 Hz, 1H), 7.31–7.23 (m, 4H), 6.73 (d, *J* = 8.3 Hz, 1H), 3.91 (t, *J* = 7.9 Hz, 1H), 3.67 (q, *J* = 7.3 Hz, 1H), 2.57–2.48 (m, 1H), 2.42 (s, 3H), 2.37–2.29 (m, 1H), 1.93–1.86 (m, 1H), 1.47–1.39 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.7, 138.2, 137.8, 134.8, 131.1, 129.7, 126.4 (q, *J* = 3.6 Hz), 124.6, 124.34 (q, *J* = 269.7 Hz), 124.26 (q, *J* = 32.6 Hz), 122.5 (q, *J* = 3.9 Hz), 114.9, 96.8, 70.0, 39.9, 26.0, 21.3. IR (KBr, neat) 3245, 2956, 2878, 1676, 1607, 1512, 1429, 1393, 1322, 1261, 1163, 1113, 1077, 1033, 836, 667, 509 cm^{-1}; HRMS (ESI) calcd. for $C_{19}H_{18}F_3N_2O_2$ $(M + H)^+$ 363.1315, found 363.1315.

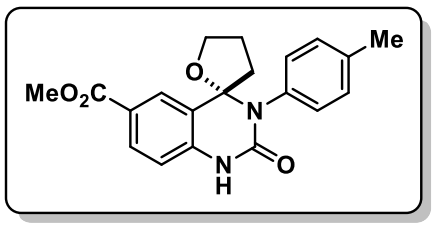
(*S*)-6'-Acetyl-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2i):



White solid; R_f (Hexane:EtOAc, 2:3) 0.50; mp 240-242 °C. Yield 87 mg, 65%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.50 (s, 1H), 7.94 (d, *J* = 1.9 Hz, 1H), 7.76 (dd, *J* = 8.4, 1.9 Hz, 1H), 7.34–7.23 (m, 4H), 6.72 (d, *J* = 8.4 Hz, 1H), 3.93 (q, *J* = 7.7 Hz, 1H), 3.70 (td, *J* = 8.0, 5.1 Hz, 1H), 2.55 (s, 3H), 2.51–2.44 (m, 1H), 2.42 (s, 3H), 2.40–2.37 (m, 1H), 1.94–1.89 (m, 1H), 1.43–1.33 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 196.5, 152.7, 139.2, 138.1, 135.0, 131.5, 131.1, 130.2, 129.7, 126.0, 124.3, 114.5, 96.9, 69.9, 39.6, 26.4, 26.1, 21.4. IR (KBr, neat) 3243, 2958, 2925, 1674, 1604,

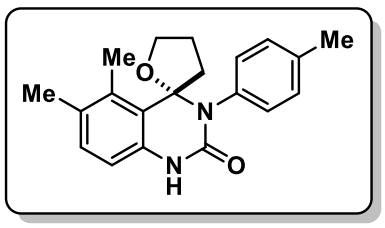
1512, 1424, 1390, 1357, 1326, 1288, 1243, 1151, 1032, 829, 753, 642, 506 cm^{-1}; HRMS (ESI) calcd. for $C_{20}H_{21}N_2O_3$ $(M + H)^+$ 337.1547, found 337.1547.

Methyl (*S*)-2'-oxo-3'-(*p*-tolyl)-2',3',4,5-tetrahydro-1'*H*,3*H*-spiro[furan-2,4'-quinazoline]-6'-carboxylate (2j):



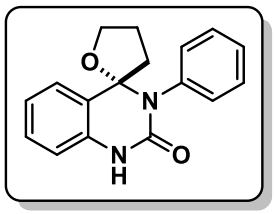
White solid; R_f (Hexane:EtOAc, 2:3) 0.50; mp 258-260 °C. Yield 124 mg, 88%; ^1H NMR (400 MHz, $CDCl_3$) δ 9.41 (s, 1H), 7.97 (d, *J* = 1.8 Hz, 1H), 7.83 (dd, *J* = 8.4, 1.9 Hz, 1H), 7.27–7.23 (m, 4H), 6.68 (d, *J* = 8.4 Hz, 1H), 3.95–3.87 (m, 4H), 3.71 (td, *J* = 8.0, 5.0 Hz, 1H), 2.53–2.37 (m, 5H), 1.97–1.87 (m, 1H), 1.44–1.31 (m, 1H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 166.7, 152.7, 139.0, 138.1, 135.0, 131.1, 130.8, 129.7, 127.4, 124.0, 123.8, 114.5, 96.9, 69.8, 52.1, 39.5, 26.1, 21.3. IR (KBr, neat) 3250, 2951, 2877, 1716, 1676, 1614, 1513, 1422, 1389, 1293, 1244, 1110, 1033, 897, 846, 767, 667, 644, 514 cm^{-1}; HRMS (ESI) calcd. for $C_{20}H_{21}N_2O_4$ $(M + H)^+$ 353.1496, found 353.1497.

(*S*)-5',6'-Dimethyl-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2k):



White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 180-182 °C. Yield 115 mg, 89%; ^1H NMR (400 MHz, $CDCl_3$) δ 9.41 (s, 1H), 7.97 (d, *J* = 1.8 Hz, 1H), 7.83 (dd, *J* = 8.4, 1.9 Hz, 1H), 7.27–7.23 (m, 4H), 6.68 (d, *J* = 8.4 Hz, 1H), 3.95–3.87 (m, 4H), 3.71 (td, *J* = 8.0, 5.0 Hz, 1H), 2.53–2.37 (m, 5H), 1.97–1.87 (m, 1H), 1.44–1.31 (m, 1H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) 152.9, 138.0, 137.7, 135.7, 132.7, 131.2, 130.4, 129.6, 125.8, 121.6, 115.3, 97.2, 69.5, 39.1, 26.2, 21.3, 19.6, 19.5. IR (KBr, neat) 3197, 2923, 2867, 1665, 1599, 1510, 1414, 1379, 1265, 1199, 1033, 867, 819, 732, 656, 565, 524, 463 cm^{-1}; HRMS (ESI) calcd. for $C_{20}H_{23}N_2O_2$ $(M + H)^+$ 323.1754, found 323.1759.

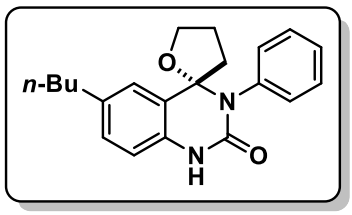
(*S*)-3'-Phenyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2l):



White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 198-200 °C. Yield 108 mg, 96%; ^1H NMR (400 MHz, $CDCl_3$) δ 8.83–8.57(m, 1H), 7.46–7.37 (m, 5H), 7.29 (d, *J* = 7.8 Hz, 1H), 7.23–7.18 (m, 1H), 7.01 (t, *J* = 7.6 Hz, 1H), 6.72 (d, *J* = 7.9 Hz, 1H), 3.88 (q, *J* = 7.6 Hz, 1H), 3.68 (td, *J* = 8.0, 5.1 Hz, 1H), 2.52–2.44 (m, 1H), 2.43–2.35 (m, 1H), 1.90–1.82

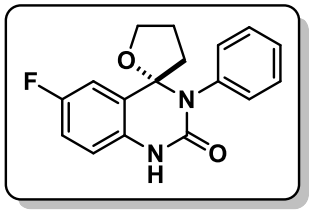
(m, 1H), 1.38–1.31 (m, 1H). $^{13}C\{^{1}H\}$ NMR (125 MHz, $CDCl_3$) δ 152.8, 138.1, 134.8, 131.6, 129.3, 128.9, 128.0, 125.0, 124.3, 122.2, 114.4, 97.2, 69.6, 39.3, 26.1. IR (KBr, neat) 3204, 3057, 2977, 2925, 2873, 1664, 1600, 1491, 1407, 1323, 1269, 1191, 1033, 989, 809, 752, 704, 642, 546 cm^{-1}; HRMS (ESI) calcd. for $C_{17}H_{17}N_2O_2$ $(M + H)^+$ 281.1285, found 281.1303.

(*S*)-6'-Butyl-3'-phenyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2m):



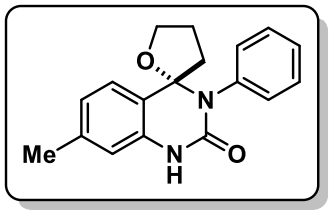
White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 156-158 °C. Yield 133 mg, 99%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.57–8.42 (m, 1H), 7.47–7.37 (h, *J* = 7.0, 6.0 Hz, 5H), 7.07 (s, 1H), 7.03 (d, *J* = 7.85 Hz, 1H), 6.65 (d, *J* = 8.1 Hz, 1H), 3.89 (q, *J* = 7.7 Hz, 1H), 3.67 (td, *J* = 8.0, 5.1 Hz, 1H), 2.57 (t, *J* = 7.8 Hz, 2H), 2.50–2.44 (m, 1H), 2.42–2.36 (m, 1H), 1.91–1.83 (m, 1H), 1.61–1.54 (m, 2H), 1.40–1.31 (m, 3H), 0.93 (t, *J* = 7.4 Hz, 3H); $^{13}C\{^{1}H\}$ NMR (125 MHz, $CDCl_3$) δ 152.8, 138.3, 136.8, 132.6, 131.6, 129.4, 128.8, 128.0, 124.6, 124.1, 114.3, 97.3, 69.6, 39.3, 35.4, 33.9, 26.1, 22.4, 14.0. IR (KBr, neat) 3209, 3050, 2955, 2928, 2866, 1669, 1607, 1514, 1423, 1392, 1266, 1192, 1030, 828, 734, 703, 646, 550 cm^{-1}; HRMS (ESI) calcd. for $C_{21}H_{25}N_2O_2$ $(M + H)^+$ 337.1911, found 337.1911.

(*S*)-6'-Fluoro-3'-phenyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2n):



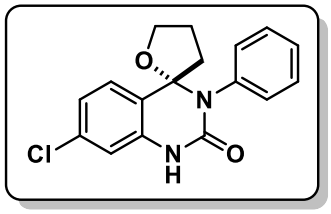
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 247-249 °C. Yield 116 mg, 97%; ^{1}H NMR (400 MHz, $CDCl_3$/DMSO-d_6) δ 8.95 (s, 1H), 7.41–7.32 (m, 5H), 6.95 (dd, *J* = 9.4, 2.7 Hz, 1H), 6.90 (td, *J* = 8.4, 2.7 Hz, 1H), 6.74 (dd, *J* = 8.8, 4.7 Hz, 1H), 3.84 (q, *J* = 7.7 Hz, 1H), 3.64–3.58 (m, 1H), 2.48–2.41 (m, 1H), 2.34–2.26 (m, 1H), 1.88–1.78 (m, 1H), 1.39–1.28 (m, 1H). $^{13}C\{^{1}H\}$ NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 158.1 (d, *J* = 238.1 Hz), 152.5, 137.9, 131.5, 131.3, 128.8, 128.0, 125.5 (d, *J* = 6.8 Hz), 116.2 (d, *J* = 22.9 Hz), 115.6 (d, *J* = 7.8 Hz), 111.5 (d, *J* = 24.3 Hz), 96.8, 69.6, 39.2, 25.9. ^{19}F NMR (470 MHz, $CDCl_3$/C_6F_6) δ -123.9. IR (KBr, neat) 3202, 2923, 2853, 1663, 1506, 1425, 1393, 1262, 1191, 1034, 794, 754, 707, 645, 552 cm^{-1}; HRMS (ESI) calcd. for $C_{17}H_{16}FN_2O_2$ $(M + H)^+$ 299.1190, found 299.1191.

(*S*)-7'-Methyl-3'-phenyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2o):



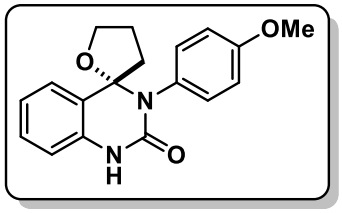
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 218-220 °C. Yield 115 mg, 98%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (s, 1H), 7.49–7.33 (m, 5H), 7.19 (d, *J* = 8.0 Hz, 1H), 6.85 (d, *J* = 8.0 Hz, 1H), 6.56 (s, 1H), 3.77 (s, 2H), 2.42 (t, *J* = 7.8 Hz, 2H), 2.30 (s, 3H), 2.08–1.71 (m, 1H), 1.52–1.20 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.7, 139.7, 138.2, 134.7, 131.5, 128.9, 128.1, 125.1, 123.4, 121.5, 114.6, 69.4, 39.0, 26.2, 21.2. IR (KBr, neat) 3209, 2974, 2872, 1667, 1595, 489, 1411, 1270, 1189, 1031, 871, 805, 702, 523, 458 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{19}N_2O_2$ $(M + H)^+$ 295.1441, found 295.1447.

(*S*)-7'-Chloro-3'-phenyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2p):



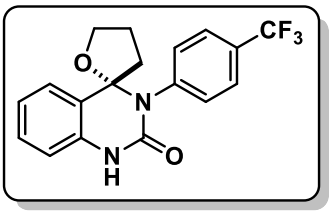
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 245-247 °C. Yield 122 mg, 97%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (s, 1H), 7.48–7.34 (m, 5H), 7.20 (d, *J* = 8.4 Hz, 1H), 6.97 (dd, *J* = 8.4, 2.1 Hz, 1H), 6.73 (d, *J* = 2.1 Hz, 1H), 3.87 (q, *J* = 7.6 Hz, 1H), 3.65 (td, *J* = 8.0, 5.3 Hz, 1H), 2.52–2.45 (m, 1H), 2.32 (dt, *J* = 14.1, 8.3 Hz, 1H), 1.90–1.80 (m, 1H), 1.41–1.30 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.7, 137.7, 136.0, 134.9, 131.4, 129.0, 128.3, 126.4, 122.9, 122.3, 114.3, 96.9, 69.8, 39.5, 26.0. IR (KBr, neat) 3211, 2961, 2872, 1674, 1596, 1493, 1413, 1377, 1315, 1251, 1087, 1035, 953, 865, 803, 764, 701, 575, 487, 447 cm^{-1}; HRMS (ESI) calcd. for $C_{17}H_{16}ClN_2O_2$ $(M + H)^+$ 315.0895, found 315.0895.

(*S*)-3'-(4-Methoxyphenyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2q):



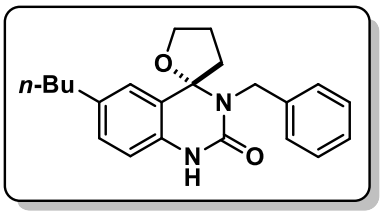
White solid; R_f (Hexane:EtOAc, 3:7) 0.40; mp 267-269 °C. Yield 123 mg, 99%; ^{1}H NMR (400 MHz, $CDCl_3$/DMSO-d_6) δ 8.37 (s, 1H), 7.38–7.27 (m, 3H), 7.23 (td, *J* = 7.6, 1.4 Hz, 1H), 7.02 (td, *J* = 7.6, 1.2 Hz, 1H), 6.94 (dt, *J* = 9.1, 1.4 Hz, 2H), 6.78 (dd, *J* = 8.1, 1.2 Hz, 1H), 3.88 (q, *J* = 7.7 Hz, 1H), 3.84 (s, 3H), 3.71 (td, *J* = 7.9, 5.1 Hz, 1H), 2.51–2.36 (m, 2H), 1.93–1.84 (m, 1H), 1.45–1.34 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 159.1, 152.7, 134.9, 132.4, 130.7, 129.3, 125.1, 124.2, 122.1, 114.2, 114.1, 97.2, 69.6, 55.5, 39.2, 26.1. IR (KBr, neat) 3189, 2919, 1660, 1602, 1506, 1429, 1243, 1171, 1033, 821, 756, 667, 538 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{19}N_2O_3$ $(M + H)^+$ 311.1390, found 311.1391.

(*S*)-3'-(4-(Trifluoromethyl)phenyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2r):



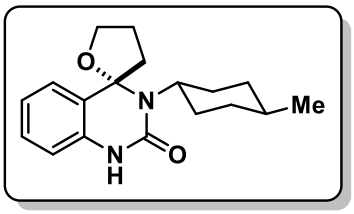
White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 268-270 °C. Yield 127 mg, 91%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.67 (s, 1H), 7.71 (d, *J* = 8.3 Hz, 2H), 7.57 (d, *J* = 8.2 Hz, 2H), 7.30 (d, *J* = 7.9 Hz, 1H), 7.24 (td, *J* = 7.7, 1.4 Hz, 1H), 7.05 (td, *J* = 7.6, 0.9 Hz, 1H), 6.73 (d, *J* = 7.9 Hz, 1H), 3.91 (q, *J* = 7.4 Hz, 1H), 3.66 (td, *J* = 7.8, 5.3 Hz, 1H), 2.42 (d, *J* = 6.3 Hz, 1H), 2.40 (d, *J* = 7.0 Hz, 1H), 1.96–1.87 (m, 1H), 1.44–1.33 (m, 1H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.6, 141.6, 134.5, 132.1, 130.2 (q, *J* = 32.4 Hz), 129.5, 125.9 (q, *J* = 3.7 Hz), 124.9, 124.3, 124.2 (q, *J* = 270.5 Hz), 122.6, 114.5, 97.3, 69.7, 39.4, 26.0. ^{19}F NMR (470 MHz, $CDCl_3$/C_6F_6) δ -65.7. IR (KBr, neat) 3209, 3066, 2925, 1671, 1601, 1501, 1403, 1321, 1269, 1162, 119, 1064, 1022, 934, 748, 704, 640, 584 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{16}F_3N_2O_2$ $(M + H)^+$ 349.1158, found 349.1158.

(*S*)-3'-Benzyl-6'-butyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2s):



White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 156-158 °C. Yield 137 mg, 98%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.05 (s, 1H), 7.39 (d, *J* = 7.6 Hz, 2H), 7.29 (t, *J* = 7.6 Hz, 2H), 7.21 (t, *J* = 7.4 Hz, 1H), 7.00 (s, 1H), 6.97 (d, *J* = 8.2 Hz, 1H), 6.53 (d, *J* = 8.0 Hz, 1H), 4.80 (d, *J* = 15.5 Hz, 1H), 4.65 (d, *J* = 15.5 Hz, 1H), 4.25–4.17 (m, 2H), 2.56 (t, *J* = 7.8 Hz, 2H), 2.33–2.27 (m, 1H), 2.23–2.17 (m, 1H), 2.14–2.03 (m, 2H), 1.57 (p, *J* = 7.5 Hz, 2H), 1.36 (h, *J* = 7.4 Hz, 2H), 0.93 (t, *J* = 7.4 Hz, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 154.2, 139.9, 136.6, 132.2, 129.1, 128.3, 127.3, 126.7, 125.0, 124.0, 114.0, 96.9, 70.2, 45.4, 39.1, 35.3, 34.0, 25.6, 22.5, 14.1. IR (KBr, neat) 3194, 3042, 2927, 2867, 1663, 1605, 1511, 1436, 1401, 1354, 1263, 1050, 953, 825, 707, 643, 599, 506 cm^{-1}; HRMS (ESI) calcd. for $C_{22}H_{27}N_2O_2$ $(M + H)^+$ 351.2067, found 351.2070.

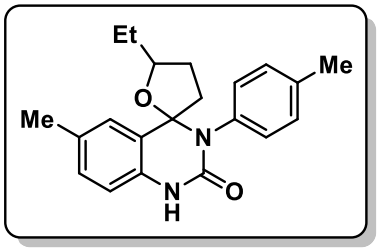
(*S*)-3'-((1*r*,4*S*)-4-Methylcyclohexyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2t):



White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 203-205 °C. Yield 101 mg, 84%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.13 (s, 1H), 7.20–7.17 (m, 2H), 6.95 (t, *J* = 7.6 Hz, 1H), 6.71 (d, *J* = 8.1 Hz, 1H), 4.23–4.24 (m, 2H), 3.27 (s, 1H), 2.82 (q, *J* = 12.6 Hz, 1H), 2.43 (qd, *J* = 12.5, 3.6 Hz, 1H), 2.38–2.31 (m, 1H), 2.21–2.12 (m, 3H), 1.84–1.75 (m, 2H), 1.74–1.71 (m, 1H), 1.69–1.65 (m, 1H), 1.53–1.43 (m, 1H), 1.04–0.95 (m, 2H), 0.90 (d, *J* = 6.5 Hz, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.4, 134.7, 129.0, 125.5,

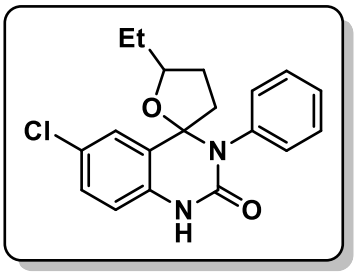
124.6, 121.7, 113.2, 97.7, 70.8, 55.6, 41.0, 36.0, 35.8, 31.9, 30.7, 30.6, 25.8, 22.6. IR (KBr, neat) 3195, 3058, 2916, 1663, 1605, 1501, 1438, 1375, 1268, 1041, 750, 578, 465 cm^{-1}; HRMS (ESI) calcd. for $C_{18}H_{25}N_2O_2$ $(M + H)^+$ 301.1911, found 301.1919.

5-Ethyl-6'-methyl-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2u):



White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 214-216 °C. Yield 133 mg, 99% (d.r. = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.46 (d, *J* = 13.5 Hz, 0.5H), 8.37 (d, *J* = 13.2 Hz, 0.5H), 7.29 (d, *J* = 8.0 Hz, 2H), 7.22 (d, *J* = 8.0 Hz, 2H), 7.10 (s, 1H), 7.01 (t, *J* = 6.9 Hz, 1H), 6.62 (t, *J* = 7.9 Hz, 1H), 3.96–3.90 (m, 0.5H), 3.38–3.33 (m, 0.5H), 2.58–2.53 (m, 0.5H), 2.51–2.47 (m, 1H), 2.41 (s, 3H), 2.33 (s, 1.5H), 2.32 (s, 1.5H), 2.30–2.23 (m, 0.5H), 1.89–1.83 (m, 0.5H), 1.77–1.39 (m, 3H), 1.27–1.19 (m, 0.5H), 0.87 (t, *J* = 7.4 Hz, 1.5H), 0.84 (t, *J* = 7.5 Hz, 1.5H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.05, 152.97, 137.8, 137.6, 135.5, 135.1, 132.5, 132.2, 131.7, 131.5, 131.4, 129.9, 129.8, 129.4, 129.3, 125.24, 125.19, 125.0, 124.5, 114.4, 114.2, 97.1, 96.5, 82.6, 40.2, 39.3, 31.5, 31.4, 28.7, 28.0, 21.3, 21.2, 10.6, 10.4. IR (KBr, neat) 3212, 3037, 2962, 2925, 1671, 1605, 1512, 1421, 1390, 1266, 1024, 820, 756, 641, 515, 437 cm^{-1}; HRMS (ESI) calcd. for $C_{21}H_{25}N_2O_2$ $(M + H)^+$ 337.1911, found 337.1913.

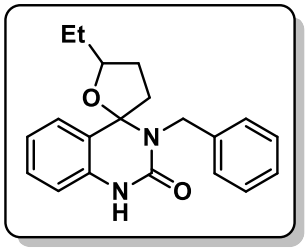
6'-Chloro-5-ethyl-3'-phenyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2v):



White solid; R_f (Hexane:EtOAc, 1:1) 0.60; mp 152-154 °C. Yield 132 mg, 96% (d.r. = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.28–9.24 (m, 0.5H), 9.18–9.15 (m, 0.5H), 7.46–7.36 (m, 5H), 7.26–7.24 (m, 1H), 7.12–7.09 (m, 1H), 6.61 (dd, *J* = 8.5, 3.8 Hz, 1H), 3.96–3.90 (m. 0.5H), 3.29–3.24 (m, 0.5H), 2.57–2.48 (m, 1H), 2.43–2.36 (m, 0.5H), 2.29–2.24 (m, 0.5H), 1.97–1.82 (m, 1H), 1.72–1.67 (m, 0.5H), 1.66–1.60 (m, 0.5H), 1.59–1.52 (m, 0.5H), 1.48–1.38 (m, 1H), 1.22–1.13 (m, 0.5H), 0.86 (t, *J* = 7.4 Hz, 2H), 0.82 (t, *J* = 7.5 Hz, 2H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.94, 152.88, 137.9, 137.3, 133.6, 133.4, 132.0, 129.2, 129.1, 128.8, 128.7, 128.3, 128.1, 127.1, 126.9, 126.8, 126.3, 124.8, 116.1, 115.9, 96.6, 96.1, 83.03, 82.97, 40.4, 39.7, 31.3, 31.2, 28.6, 27.9, 10.6, 10.4. IR (KBr, neat) 3250, 2964, 2930, 2873, 1673, 1597, 1494, 1415, 1381, 1261, 1086, 981, 943, 822,

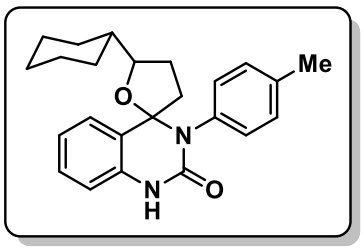
753, 702, 639, 554 cm^{-1}; HRMS (ESI) calcd. for $C_{19}H_{20}ClN_2O_2$ $(M + H)^+$ 343.1208, found 343.1211.

3'-Benzyl-5-ethyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2w):



White solid; R_f (Hexane:EtOAc, 3:2) 0.50; mp 205-207 °C. Yield 126 mg, 98% (d.r. = 3:2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.16–9.04 (m, 1H, minor), 8.97–8.85 (m, 1H, major), 7.41 (d, *J* = 7.3 Hz, 2H, major), 7.35 (d, *J* = 7.4 Hz, 2H, minor), 7.30–7.25 (m, 3H), 7.22–7.17 (m, 1H), 7.17–7.11 (m, 1H), 6.99–6.94 (m, 1H), 6.61 (d, *J* = 7.9, 1H, minor), 6.58 (d, *J* = 7.9, 1H, major), 4.96 (d, *J* = 16.0 Hz, 1H, minor), 4.88 (d, *J* = 15.3 Hz, 1H), 4.63 (d, *J* = 16.0 Hz, 1H, minor), 4.53 (d, *J* = 15.3 Hz, 1H, major), 4.25–4.13 (m, 1H), 2.44–2.28 (m, 3H, minor), 2.20–2.04 (m, 3H, major), 1.89–1.75 (m, 1H), 1.70–1.56 (m, 2H), 0.98 (t, *J* = 7.4 Hz, 3H, major), 0.95 (t, *J* = 7.4 Hz, 3H, minor). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 154.0, 153.8, 139.9, 134.5, 134.4, 129.1, 129.0, 128.4, 128.3, 127.7, 127.0, 126.7, 126.6, 125.8, 125.0, 124.7, 124.6, 122.0, 114.3, 113.9, 96.5, 96.4, 83.8, 82.4, 45.4, 45.3, 40.5, 38.9, 31.2, 31.1, 28.7, 28.6, 10.7, 10.5. IR (KBr, neat) 3198, 3122, 3057, 2965, 2922, 2873, 1664, 1501, 1494, 1435, 1404, 1355, 1321, 1266, 1174, 1061, 1027, 944, 848, 807, 754, 735, 698, 653, 601, 503 cm^{-1}; HRMS (ESI) calcd. for $C_{20}H_{23}N_2O_2$ $(M + H)^+$ 323.1754, found 323.1758.

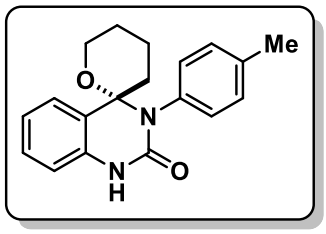
5-Cyclohexyl-3'-(*p*-tolyl)-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (2x):



White solid; R_f (Hexane:EtOAc, 7:3) 0.50; mp 226-228 °C. Yield 148 mg, 98% (d.r. = 3:2); ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.63 (s, 1H, minor), 8.57 (s, 1H, major), 7.32 (d, *J* = 7.7 Hz, 3H, minor), 7.29 (d, *J* = 7.8 Hz, 3H, major), 7.23 (d, *J* = 7.7 Hz, 2H), 7.19 (t, *J* = 7.7 Hz, 1H), 7.02–6.98 (m, 1H), 6.72 (t, *J* = 7.5 Hz, 1H), 3.67–3.62 (m, 1H, minor), 3.07–3.03 (m, 1H, major), 2.55–2.45 (m, 1H), 2.42 (s, 3H), 2.40–2.35 (m, 1H, minor), 2.30–2.25 (m, 1H, major), 1.97–1.92 (m, 1H), 1.85–1.79 (m, 1H, minor), 1.72–1.61 (m, 4H), 1.49 (d, *J* = 13.0 Hz, 1H, major), 1.42–1.34 (m, 1H), 1.26–1.07 (m, 3H), 1.03–0.75 (m, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.1, 153.0, 137.8, 137.6, 135.5, 134.9, 134.8, 134.5, 131.8, 129.4, 129.3, 129.00, 128.98, 125.5, 125.1, 125.0, 124.9, 122.1, 122.0, 114.4, 114.2, 96.5, 96.2, 85.64, 85.56, 43.0, 42.9, 40.2, 39.4, 30.6, 30.1, 29.9, 29.8, 29.0, 28.8, 26.54, 26.51, 26.04, 26.02, 25.82, 25.78, 21.4, 21.3. IR (KBr, neat) 3211,

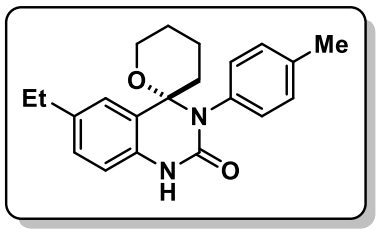
3057, 2922, 285, 1669, 16001503, 1403, 1322, 1265, 1175, 1106, 1025, 866, 814, 786, 750, 702, 658, 508 cm^{-1}; HRMS (ESI) calcd. for $C_{24}H_{29}N_2O_2$ $(M + H)^+$ 377.2224, found 377.2225.

(*S*)-3'-(*p*-Tolyl)-3,4,5,6-tetrahydro-1'*H*-spiro[pyran-2,4'-quinazolin]-2'(3'*H*)-one (2aa):



White solid; R_f (Hexane:EtOAc, 2:3) 0.40; mp 168-170 °C. Yield 121 mg, 98%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 8.0 Hz, 1H), 7.54 (d, *J* = 7.7 Hz, 2H), 7.34 (t, *J* = 7.7 Hz, 1H), 7.30–7.27 (m, 3H), 7.09 (t, *J* = 7.7 Hz, 1H), 6.84 (d, *J* = 8.0 Hz, 1H), 4.35 (dd, *J* = 13.1, 6.2 Hz, 1H), 3.68–3.62 (m, 1H), 3.54 (td, *J* = 11.5, 2.9 Hz, 1H), 2.91–2.80 (m, 1H), 2.53–2.33 (m, 5H), 1.81–1.66 (m, 2H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.5, 138.5, 135.9, 134.6, 131.0, 129.9, 129.7, 127.7, 120.6, 119.5, 115.1, 89.5, 62.1, 34.6, 29.5, 27.9, 21.5. IR (KBr, neat) 3222, 3061, 2941, 1675, 1597, 1495, 1401, 1266, 1166, 1073, 1025, 870, 753, 704, 567 cm^{-1}; HRMS (ESI) calcd. for $C_{19}H_{21}N_2O_2$ $(M + H)^+$ 309.1598, found 309.1598.

(*S*)-6'-Ethyl-3'-(*p*-tolyl)-3,4,5,6-tetrahydro-1'*H*-spiro[pyran-2,4'-quinazolin]-2'(3'*H*)-one (2ab):



White solid; R_f (Hexane:EtOAc, 2:3) 0.40; mp 154-156°C. Yield 132 mg, 98%; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.54 (s, 1H), 7.33 (s, 1H), 7.23–7.09 (m, 4H), 7.06 (dd, *J* = 8.1, 1.8 Hz, 1H), 6.68 (d, *J* = 8.0 Hz, 1H), 3.45–3.41 (m, 1H), 3.29–3.22 (m, 1H), 2.60 (q, *J* = 7.6 Hz, 2H), 2.32 (s, 3H), 2.03–1.91 (m, 2H), 1.86–1.77 (m, 1H), 1.67–1.61 (m, 1H), 1.55–1.50 (m, 1H), 1.46–1.37 (m, 1H), 1.19 (t, *J* = 7.6 Hz, 3H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 154.4, 137.8, 137.4, 136.1, 133.7, 131.0, 129.7, 128.6, 124.6, 123.7, 114.7, 87.2, 62.6, 30.3, 28.7, 24.0, 21.4, 20.2, 16.1. IR (KBr, neat) 2960, 2931, 2870, 1671, 1601, 1510, 1423, 1391, 1265, 1074, 1029, 1006, 823, 757, 658, 515 cm^{-1}; HRMS (ESI) calcd. for $C_{21}H_{25}N_2O_2$ $(M + H)^+$ 337.1911, found 337.1911.

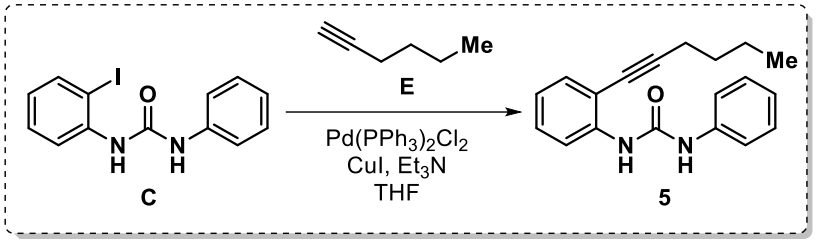
Experimental procedure for gram-scale synthesis of compound 2l:

To an ice-cold suspension of 1-(2-(4-hydroxybut-1-yn-1-yl)phenyl)-3-phenylurea (**1l**) (1.0 g, 3.6 mmol, 1.0 equiv.) in DCM (15.0 mL), triflic acid (0.6 mL, 7.2 mmol, 2.0 equiv.) was added slowly under N_2 atmosphere. The reaction was continued to stir for 4.5 h at room temperature, and the progress of the reaction was monitored by TLC. It was then treated with saturated $NaHCO_3$ solution, and the organic layer was extracted with DCM (2 x 30 mL). The combined organic layers were further washed with brine, followed by drying over anhydrous Na_2SO_4.

The organic phase was concentrated in a rotary evaporator to give the crude product, which was then subjected to column chromatography over silica gel to provide the final product **2l** as a white solid in 92% yield (930 mg).

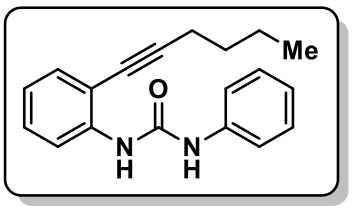
Experimental procedure and characterization data of compound 5:

Schematic representation of starting material **5**:



To a mixture of $Pd(PPh_3)_2Cl_2$ (0.04 mmol, 0.04 equiv.), CuI (0.02 mmol, 0.02 equiv.) and 1-(2-iodophenyl)-3-phenylurea (**C**) (1.0 mmol, 1.0 equiv.) in dry THF (5.0 mL) under N_2 atmosphere, triethylamine (5.0 mmol, 5.0 equiv.) was added. The reaction mixture was stirred for 10 minutes at room temperature, after which 1-hexyne (**E**) (1.2 mmol, 1.2 equiv.) was added dropwise over a period of 5 minutes. The reaction mixture was stirred for 5.0 hours (monitored by TLC analysis) before filtering through a pad of celite. The solids were washed with ethyl acetate, and the combined filtrates were concentrated in a rotary evaporator. The crude product was then purified by column chromatography to provide the corresponding product **5** in 96% yield (281 mg).

1-(2-(Hex-1-yn-1-yl)phenyl)-3-phenylurea (5):



White solid; R_f (Hexane:EtOAc, 4:1) 0.60; mp 142-144°C. Yield 281 mg, 96%. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13 (d, *J* = 8.3 Hz, 1H), 7.44 (s, 1H), 7.33–7.29 (m, 4H), 7.25 (dd, *J* = 7.7, 1.6 Hz, 1H), 7.22–7.16 (m, 2H), 7.15–7.08 (m, 1H), 6.88 (t, *J* = 7.5 Hz, 1H), 2.17 (t, *J* = 6.8 Hz, 2H), 1.41–1.28 (m, 4H), 0.84 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 153.2, 139.6, 137.7, 137.7, 131.9, 129.6, 129.0, 125.30, 125.27, 123.1, 122.5, 118.92, 118.89, 112.9, 97.6, 76.1, 30.8, 22.2, 19.3, 13.7. IR (KBr, neat) 3327, 2957, 2928, 2870, 1657, 1600, 1579, 1549, 1499, 1446, 1303, 1250, 1214, 751, 693, 508 cm^{-1}. HRMS (ESI) calcd. for $C_{19}H_{21}N_2O$ $(M + H)^+$ 293.1648, found 293.1647.

Experimental procedure of control experiment:

Experimental procedure of scheme 3a:

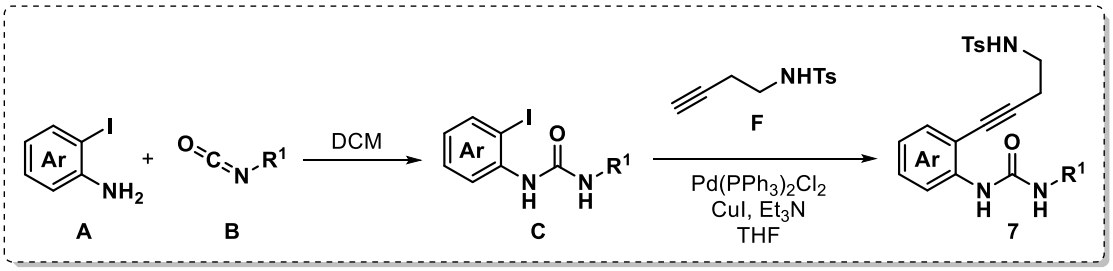
To an ice-cold solution of 4-(2-(3-phenylureido)phenyl)but-3-yn-1-yl 4-methylbenzene-sulfonate (**3**) (174 mg, 0.4 mmol, 1.0 equiv) in DCM (4.0 mL), triflic acid (0.07 mL, 0.8 mmol, 2.0 equiv.) was added slowly under N_2 atmosphere. The reaction was continued to stir for 5 h at room temperature, and the progress of the reaction was monitored by TLC. To collect the starting material, the reaction mixture was treated with saturated $NaHCO_3$ solution, and the organic layer was extracted with DCM (2 x 10 mL). The combined organic layers were further washed with brine, followed by drying over anhydrous Na_2SO_4. The organic phase was concentrated in a rotary evaporator which was then subjected to column chromatography over silica gel to get the unreacted starting material **3** in 86% yield.

Experimental procedure of scheme 3b:

To an ice-cold solution of 1-(2-(hex-1-yn-1-yl)phenyl)-3-phenylurea (**5**) (117 mg, 0.4 mmol, 1.0 equiv) in DCM (4.0 mL), triflic acid (0.07 mL, 0.8 mmol, 2.0 equiv.) was added slowly under N_2 atmosphere. The reaction was continued to stir for 5 h at room temperature, and the progress of the reaction was monitored by TLC. To collect the starting material, the reaction mixture was treated with saturated $NaHCO_3$ solution, and the organic layer was extracted with DCM (2 x 10 mL). The combined organic layers were further washed with brine, followed by drying over anhydrous Na_2SO_4. The organic phase was concentrated in a rotary evaporator which was then subjected to column chromatography over silica gel to get the unreacted starting material **5** in 83% yield.

General experimental procedure and characterization data of the compounds 7a and 7b:

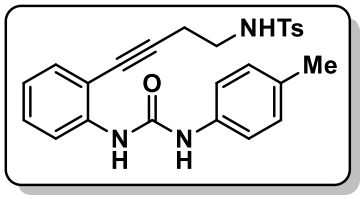
Schematic representation of starting materials **7a** and **7b**:



To a solution of substituted 2-iodoaniline **A** (2.0 mmol, 1.0 equiv.) in DCM (5.0 mL) under N_2 atmosphere, substituted phenyl isocyanate **B** (2.2 mmol, 1.1 equiv.) was added dropwise. The reaction mixture was stirred overnight at room temperature to obtain a white precipitate, which was then filtered and washed with n-hexane to obtain a substituted 1,3-diphenyl urea **C**.

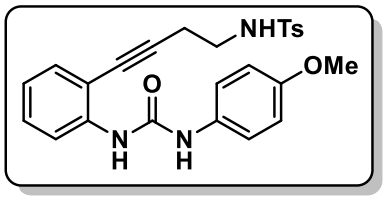
To a mixture of $Pd(PPh_3)_2Cl_2$ (0.04 mmol, 0.04 equiv.), CuI (0.02 mmol, 0.02 equiv.) and iodo substituted 1,3-diphenyl urea derivatives **C** (1.0 mmol, 1.0 equiv.) in dry THF (5.0 mL) under N_2 atmosphere, triethylamine (5.0 mmol, 5.0 equiv.) was added. The reaction mixture was stirred for 10 minutes at room temperature, after which homo propargylic sulfonamide **F** (1.2 mmol, 1.2 equiv.) in dry THF (1.0 mL) was added dropwise over a period of 5 minutes. The reaction mixture was stirred for 3.0 hours (monitored by TLC analysis) before filtering through a pad of celite. The solids were washed with ethyl acetate, and the combined filtrates were concentrated in a rotary evaporator. The crude product was then purified by column chromatography to provide the corresponding product **7**.

4-Methyl-N-(4-(2-(3-(*p*-tolyl)ureido)phenyl)but-3-yn-1-yl)benzenesulfonamide (7a):



White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 154-156 °C. Yield 439 mg, 98%. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.25 (d, *J* = 8.4 Hz, 1H), 7.84 (d, *J* = 11.7 Hz, 1H), 7.75 (d, *J* = 7.8 Hz, 2H), 7.65 (s, 1H), 7.35 (d, *J* = 8.0 Hz, 2H), 7.30 (d, *J* = 7.7 Hz, 1H), 7.26 (d, *J* = 8.2 Hz, 3H), 7.06 (d, *J* = 8.0 Hz, 2H), 6.92 (t, *J* = 7.6 Hz, 1H), 5.56–5.46 (m, 1H), 3.15–3.10 (m, 2H), 2.64–2.59 (m, 2H), 2.40 (s, 3H), 2.28 (s, 3H). $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 153.3, 144.1, 140.5, 136.6, 136.2, 133.0, 132.0, 130.1, 129.6, 129.3, 127.0, 122.1, 120.7, 119.4, 120.0, 92.9, 78.6, 41.9, 21.7, 21.6, 20.9. IR (KBr, neat) 3359, 2922, 1677, 1600, 1578, 1531, 1515, 1446, 1301, 1247, 1202, 1154, 1092, 917, 814, 753, 662, 548, 507 cm^{-1}. HRMS (ESI) calcd. for $C_{25}H_{26}N_3O_3S$ $(M + H)^+$ 448.1689, found 448.1689.

***N*-(4-(2-(3-(4-Methoxyphenyl)ureido)phenyl)but-3-yn-1-yl)-4-methylbenzenesulfonamide (7b):**

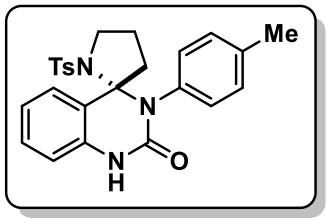


White solid; R_f (Hexane:EtOAc, 1:1) 0.40; mp 120-122 °C. Yield 445 mg, 96%. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.19 (d, *J* = 8.4 Hz, 1H), 7.70 (d, *J* = 7.9 Hz, 3H), 7.57 (s, 1H), 7.31 (d, *J* = 8.4 Hz, 2H), 7.24–7.18 (m, 4H), 6.87 (t, *J* = 7.5 Hz, 1H), 6.76 (d, *J* = 8.3 Hz, 2H), 5.62 (s, 1H), 3.72 (s, 3H), 3.06 (s, 2H), 2.54 (t, *J* = 5.8 Hz, 2H), 2.36 (s, 3H). $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 156.2, 153.6, 144.0, 140.4, 136.6, 132.0, 131.5, 130.0, 129.9, 129.2, 127.1, 127.0, 123.1, 122.0, 119.2, 114.4, 111.9, 92.9, 78.5, 55.6, 41.9, 21.62, 21.57. IR (KBr, neat) 3361, 2932, 1674, 1601, 1579, 1532, 1508, 1445, 1301, 1241, 1211, 1153, 1091, 1035, 813, 753, 735, 661, 547 cm^{-1}. HRMS (ESI) calcd. for $C_{25}H_{26}N_3O_4S$ $(M + H)^+$ 464.1639, found 464.1636.

General experimental procedure and characterization data of the compounds 8a and 8b:

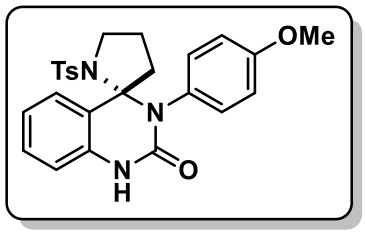
To an ice-cold suspension of alkynyl-benzenesulfonamide substituted diphenyl urea **7** (0.4 mmol, 1.0 equiv.) in DCM (4.0 mL), triflic acid (1.2 mmol, 3.0 equiv.) was added under N_2 atmosphere. The reaction was continued to stir at room temperature for 48 h. It was then treated with saturated $NaHCO_3$ solution, and the organic layer was extracted with DCM (2 x 10 mL). The combined organic layers were further washed with brine, followed by drying over anhydrous Na_2SO_4. The organic phase was concentrated in a rotary evaporator to give the crude product, which was then subjected to column chromatography over silica gel to provide the final product **8**.

(*S*)-3'-(*p*-Tolyl)-1-tosyl-1'*H*-spiro[pyrrolidine-2,4'-quinazolin]-2'(3'*H*)-one (8a):



White solid; R_f (Hexane:EtOAc, 2:3) 0.50; mp 220-222 °C. Yield 161 mg, 90%; ^{1}H NMR (500 MHz, $CDCl_3$/DMSO-d_6) δ 9.05 (s, 1H), 7.73 (d, *J* = 8.1 Hz, 1H), 7.25–7.23 (m, 1H), 7.14 (d, *J* = 8.2 Hz, 1H), 7.06 (t, *J* = 7.8 Hz, 2H), 6.90 (d, *J* = 7.3 Hz, 2H), 6.85–6.78 (m, 3H), 6.45–6.35 (m, 2H), 3.60 (t, *J* = 8.7 Hz, 1H), 3.09 (q, *J* = 8.2 Hz, 1H), 2.61 (dd, *J* = 14.1, 8.1 Hz, 1H), 2.52–2.46 (m, 1H), 2.42–2.37 (m, 1H), 2.32 (s, 3H), 2.25 (s, 3H), 0.81–0.71 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 151.7, 142.3, 137.8, 137.1, 136.5, 135.5, 131.4, 131.1, 130.1, 129.4, 129.0, 128.8, 126.5, 126.4, 121.1, 120.0, 114.5, 83.8, 49.6, 45.1, 22.2, 21.3, 21.2. IR (KBr, neat) 3068, 2988, 2922, 1676, 1602, 1509, 1413, 1340, 1226, 1215, 1155, 1112, 1059, 1004, 980, 885, 817, 753, 671, 595, 572, 549, 529 cm^{-1}; HRMS (ESI) calcd. for $C_{25}H_{26}N_3O_3S$ $(M + H)^+$ 448.1689, found 448.1689.

(*S*)-3'-(4-Methoxyphenyl)-1-tosyl-1'*H*-spiro[pyrrolidine-2,4'-quinazolin]-2'(3'*H*)-one (8b):



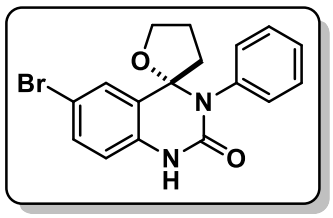
White solid; R_f (Hexane:EtOAc, 3:7) 0.50; mp 220-222 °C. Yield 150 mg, 81%; ^{1}H NMR (400 MHz, $CDCl_3$/Methanol-d_4) δ 7.82 (dd, *J* = 8.8, 2.6 Hz, 1H), 7.18–7.12 (m, 2H), 7.05 (dd, *J* = 8.9, 3.0 Hz, 1H), 6.96 (d, *J* = 8.1 Hz, 2H), 6.92 (dd, *J* = 8.8, 3.0 Hz, 1H), 6.88 (d, *J* = 8.1 Hz, 2H), 6.80 (d, *J* = 8.0 Hz, 1H), 6.49–6.44 (m, 2H), 3.83 (s, 3H), 3.66 (t, *J* = 8.4 Hz, 1H), 3.15 (td, *J* = 9.5, 6.7 Hz, 1H), 2.69–2.53 (m, 2H), 2.31 (s, 3H), 1.57–1.49 (m, 1H), 0.90–0.78 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$/DMSO-d_6) δ 158.9, 151.6, 142.3, 137.1, 136.4, 132.6, 132.2, 130.7, 129.3, 128.9, 128.8, 126.6, 126.43, 126.38, 120.9, 119.8, 114.4, 114.3, 114.1, 83.8, 55.2, 49.6, 45.1, 22.1, 21.2. IR

(KBr, neat) 3065, 2928, 1675, 1603, 1511, 1413, 1339, 1249, 1157, 1113, 1008, 980, 836, 752, 672, 573, 548 cm^{-1}; HRMS (ESI) calcd. for $C_{25}H_{26}N_3O_4S$ $(M + H)^+$ 464.1639, found 464.1639.

Experimental procedure and characterization data of compound 9:[2]

To an ice-cold solution of spiro-furan quinazolinone derivative **2l** (113 mg, 0.4 mmol, 1.0 equiv.) in DCM (3.0 mL), N-Bromo succinimide (NBS) (85 mg, 0.48 mmol, 1.2 equiv.) was added portion wise over a period of 5 minutes. The reaction was stirred for 1.0 hour at room temperature, and the progress of the reaction was monitored by TLC. It was then treated with saturated $Na_2S_2O_3$ solution, and the organic layer was extracted with DCM (2 x 10 mL). The combined organic layers were further washed with brine, followed by drying over anhydrous Na_2SO_4. The organic phase was concentrated in a rotary evaporator to give the crude product, which was then subjected to column chromatography over silica gel to provide the final product **9** as a white solid in 98% yield (141 mg).

(*S*)-6'-Bromo-3'-phenyl-4,5-dihydro-1'*H*,3*H*-spiro[furan-2,4'-quinazolin]-2'(3'*H*)-one (9):



White solid; R_f (Hexane:EtOAc, 1:1) 0.50; mp 194-196 °C. Yield 141 mg, 98%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.28 (s, 1H), 7.47–7.44 (m, 1H), 7.43– 7.38 (m, 4H), 7.37 – 7.37 (d, *J* = 1.6 Hz, 1H), 7.25 (dd, *J* = 8.5, 2.2 Hz, 1H), 6.55 (d, *J* = 8.5 Hz, 1H), 3.93–3.83 (tm, 1H), 3.67–3.57 (m, 1H), 2.52–2.42 (m, 1H), 2.37–2.26 (m, 1H), 1.91–1.80 (m, 1H), 1.41–1.31 (m, 1H). ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 152.7, 137.7, 134.0, 132.2, 131.5, 129.0, 128.2, 127.9, 126.3, 116.4, 114.4, 96.8, 69.9, 39.7, 26.0. IR (KBr, neat) 3224, 2958, 1774, 1705, 1670, 1595, 1491, 1418, 1380, 1262, 1181, 1031, 817, 702, 641, 549, 510 cm^{-1}. HRMS (ESI) calcd. for $C_{17}H_{16}BrN_2O_2$ $(M + H)^+$ 359.0390, found 359.0390.

References:

1. S. Biswas, S. Shit, B. K. Behera, A. K. Sahu and A. K. Saikia, *Chem. Commun*., 2023, **59**, 14301-14304.
2. B. Altenburg, M. Frings, J.-H. Schöbel, J. Goßen, K. Pannen, K. Vanderliek, G. Rossetti, S. Koschmieder, N. Chatain, C. Bolm, *ACS Med. Chem. Lett*., 2020, **11**, 1928-1934.

Figure S1. ^{1}H spectrum of compound **1c** (400 MHz, $CDCl_3$)

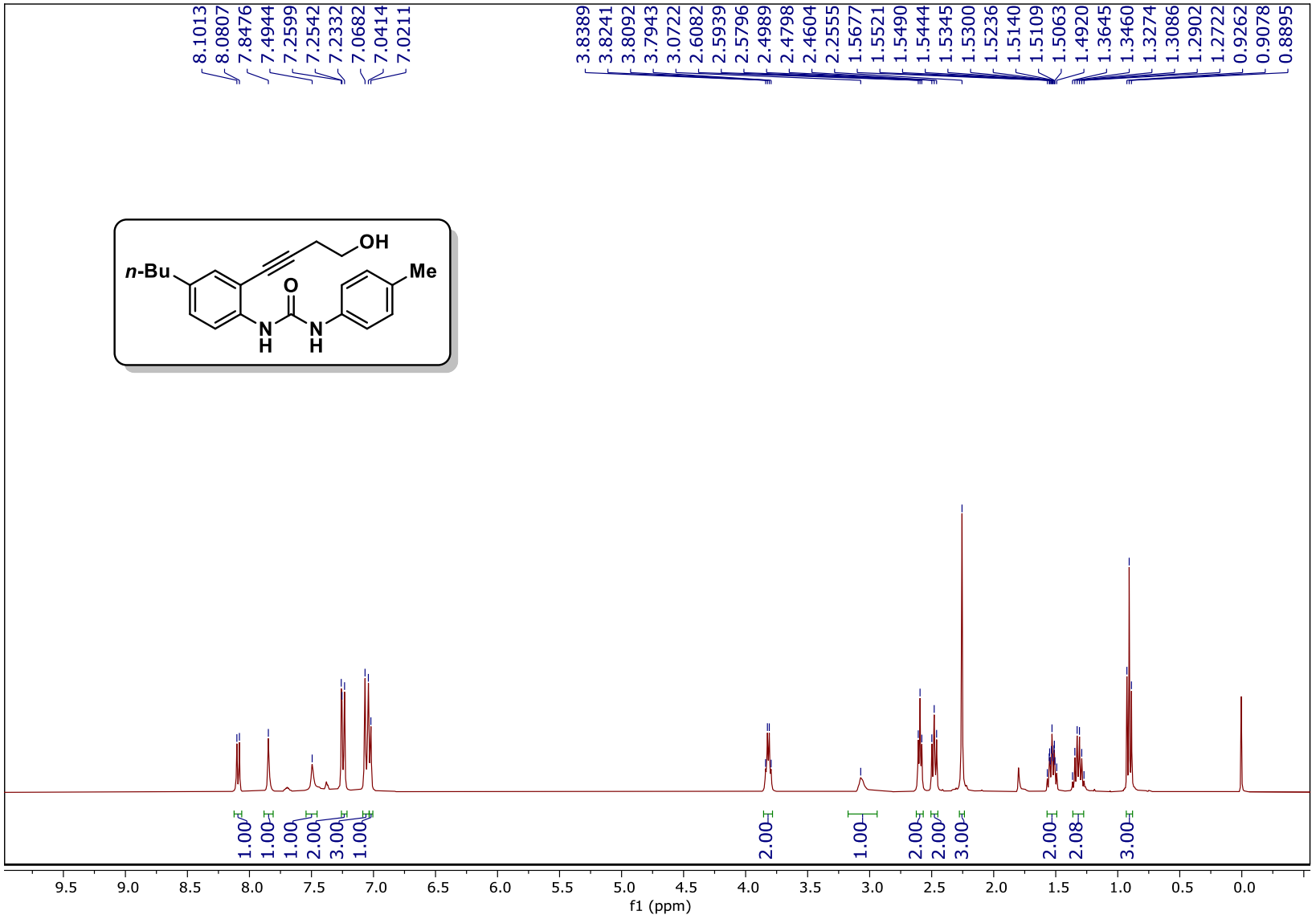


Figure S2. ^{13}C spectrum of compound **1c** (125 MHz, $CDCl_3$)

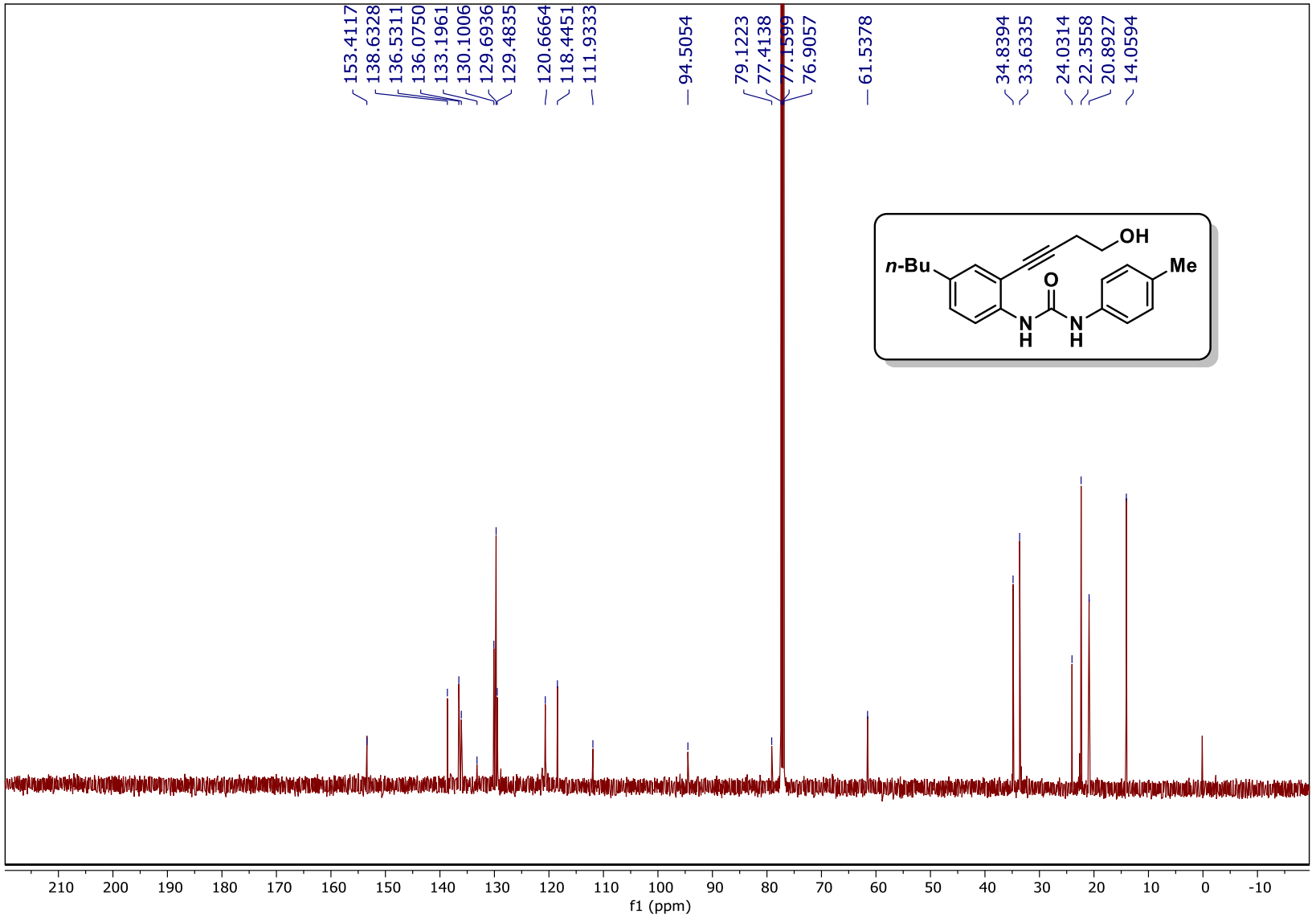


Figure S3. HRMS spectrum of **1c**

Sample Name		**Position**	P1-B7	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC290.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	04-07-2023 17:03:11 (UTC+05:30)

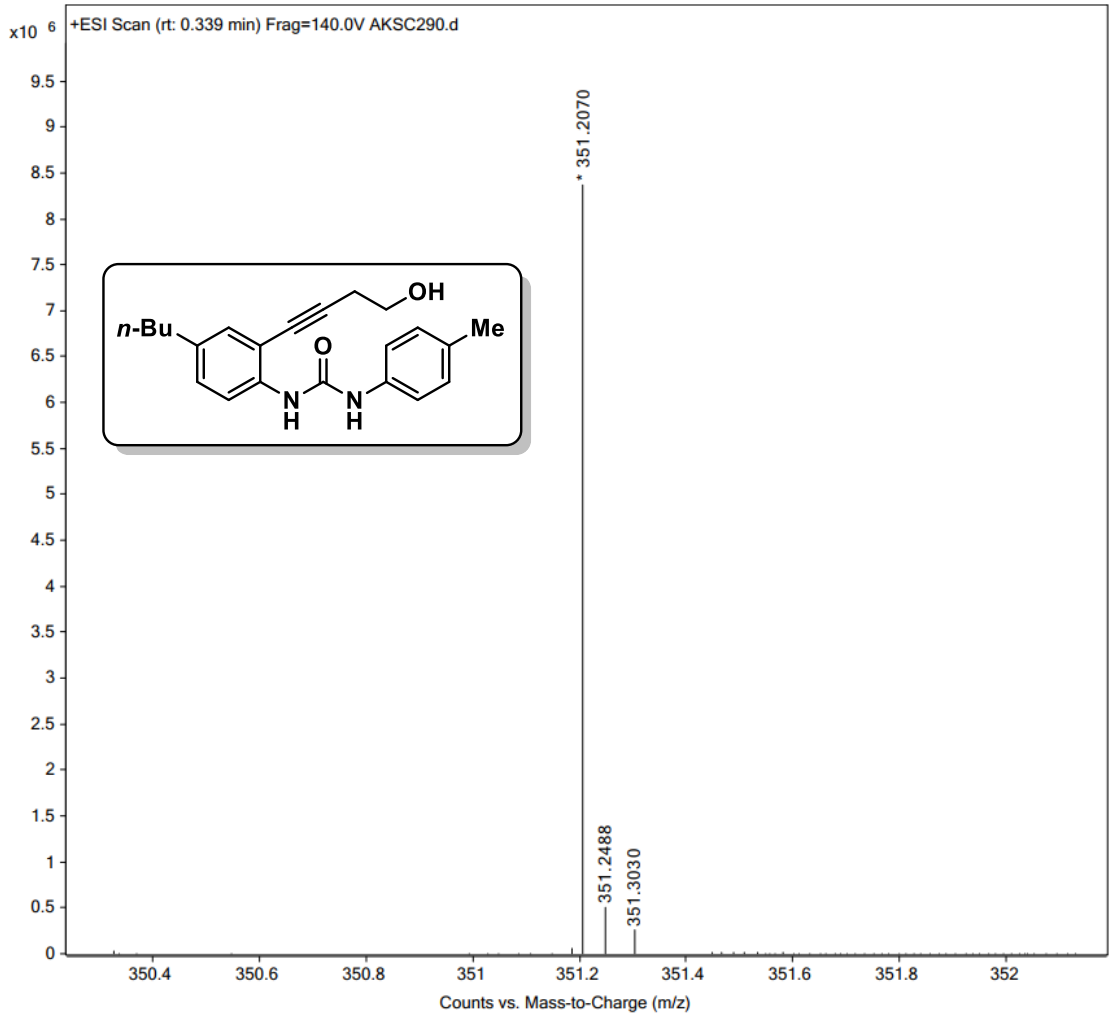


Figure S4. ^{1}H spectrum of compound **1g** (400 MHz, $CDCl_3$/DMSO-d_6)

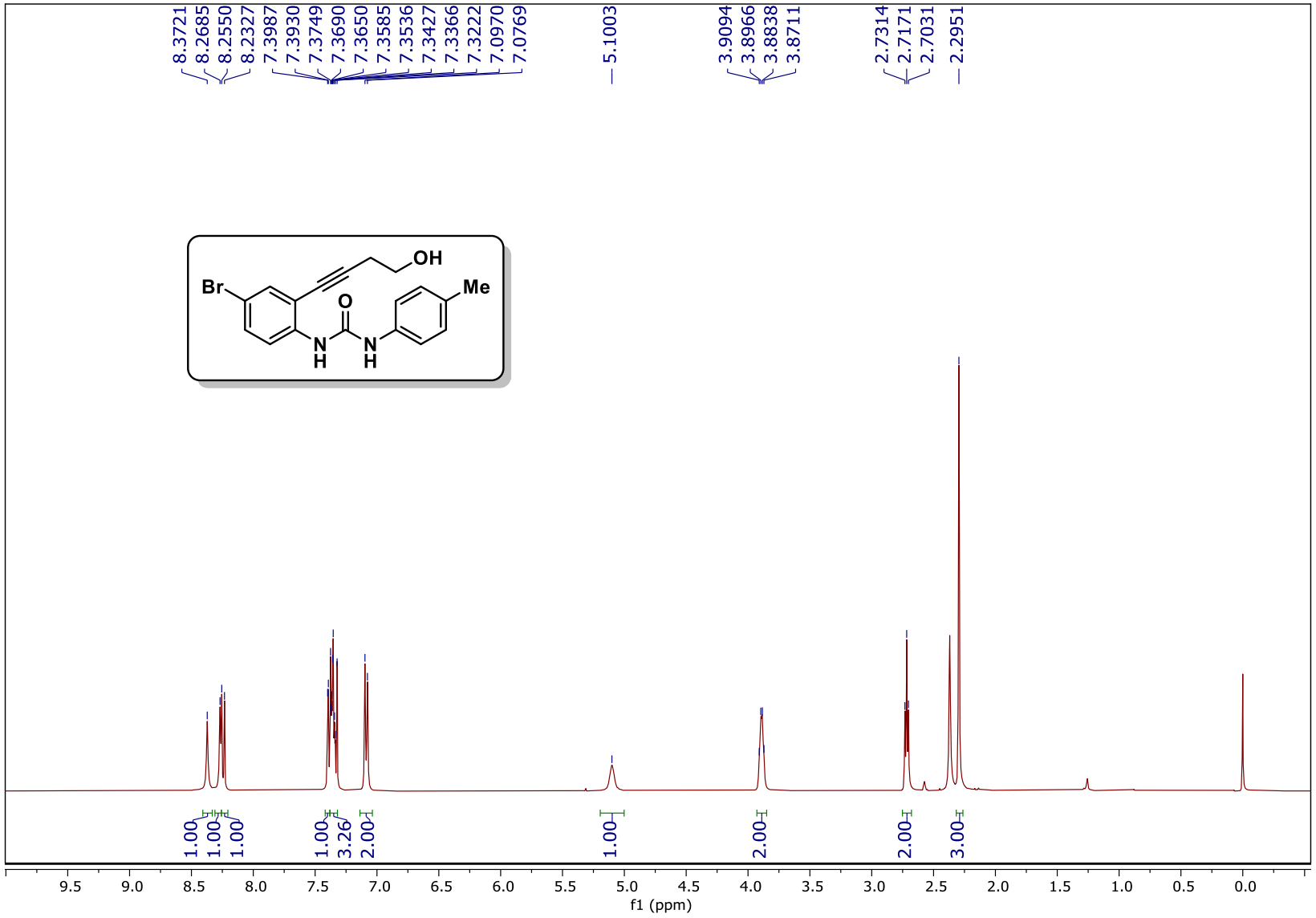


Figure S5. ^{13}C spectrum of compound **1g** (125 MHz, $CDCl_3$/DMSO-d_6)

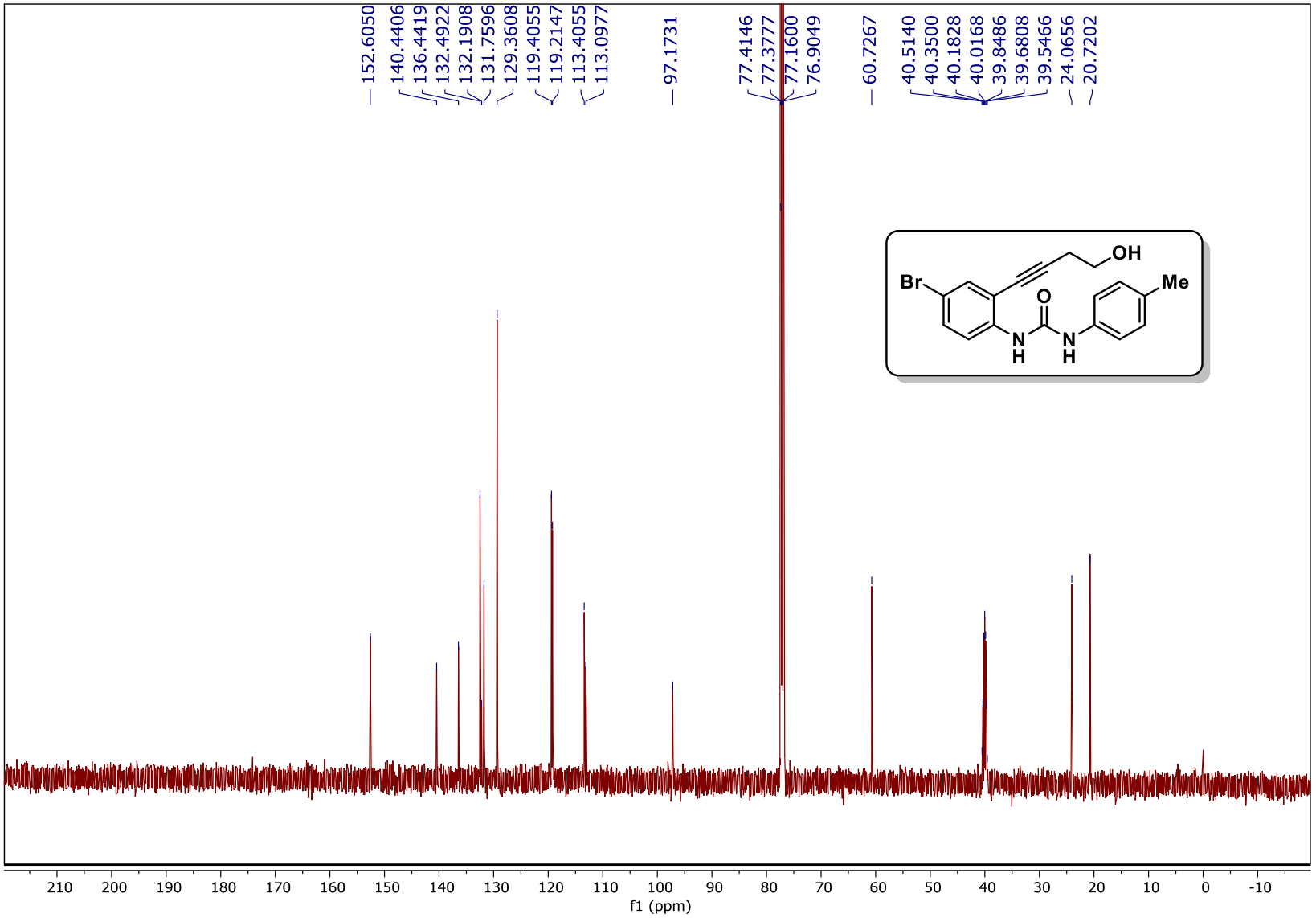


Figure S6. HRMS spectrum of **1g**

Sample Name		**Position**	P1-A2	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC286.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	11-07-2023 16:57:05 (UTC+05:30)

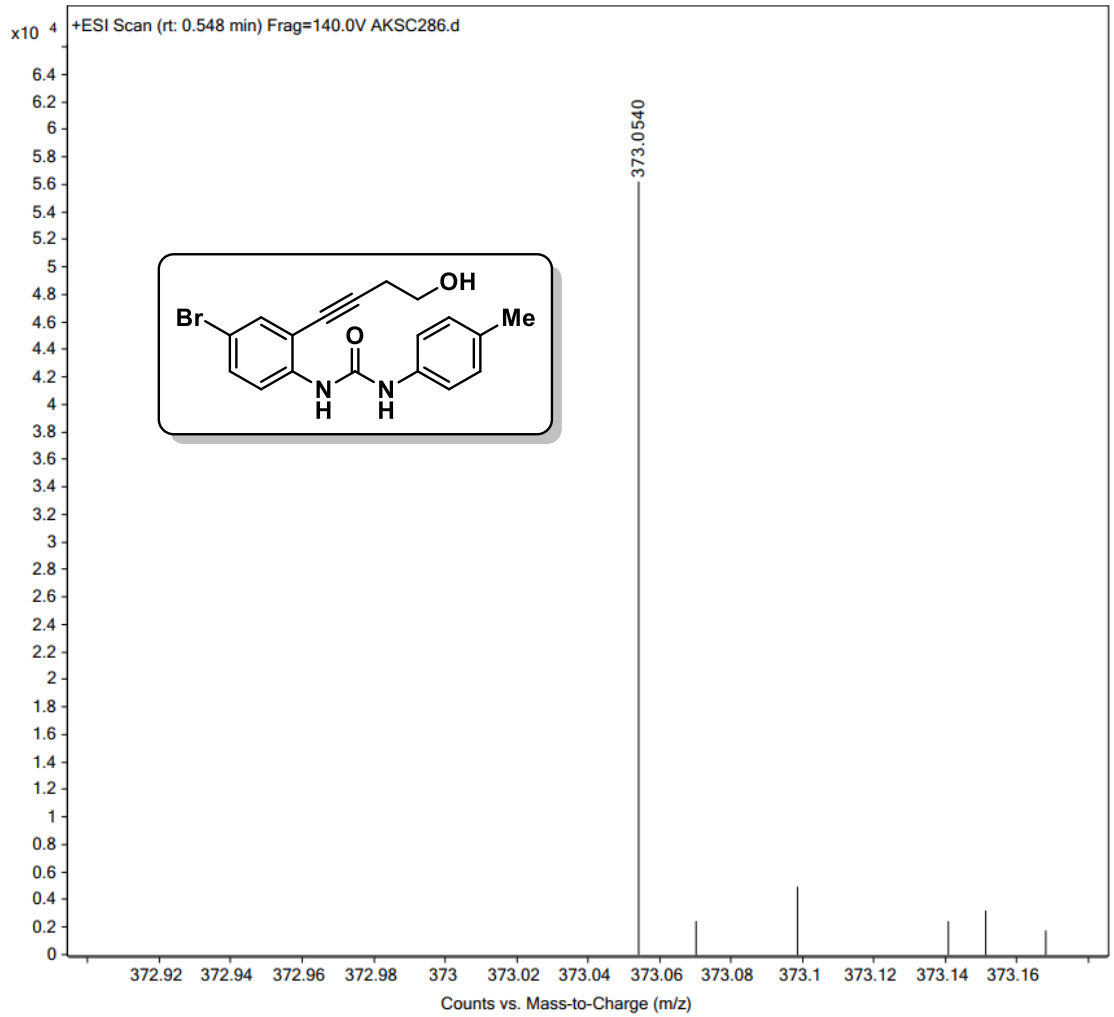


Figure S7. ^{1}H spectrum of compound **1h** (400 MHz, $CDCl_3$)

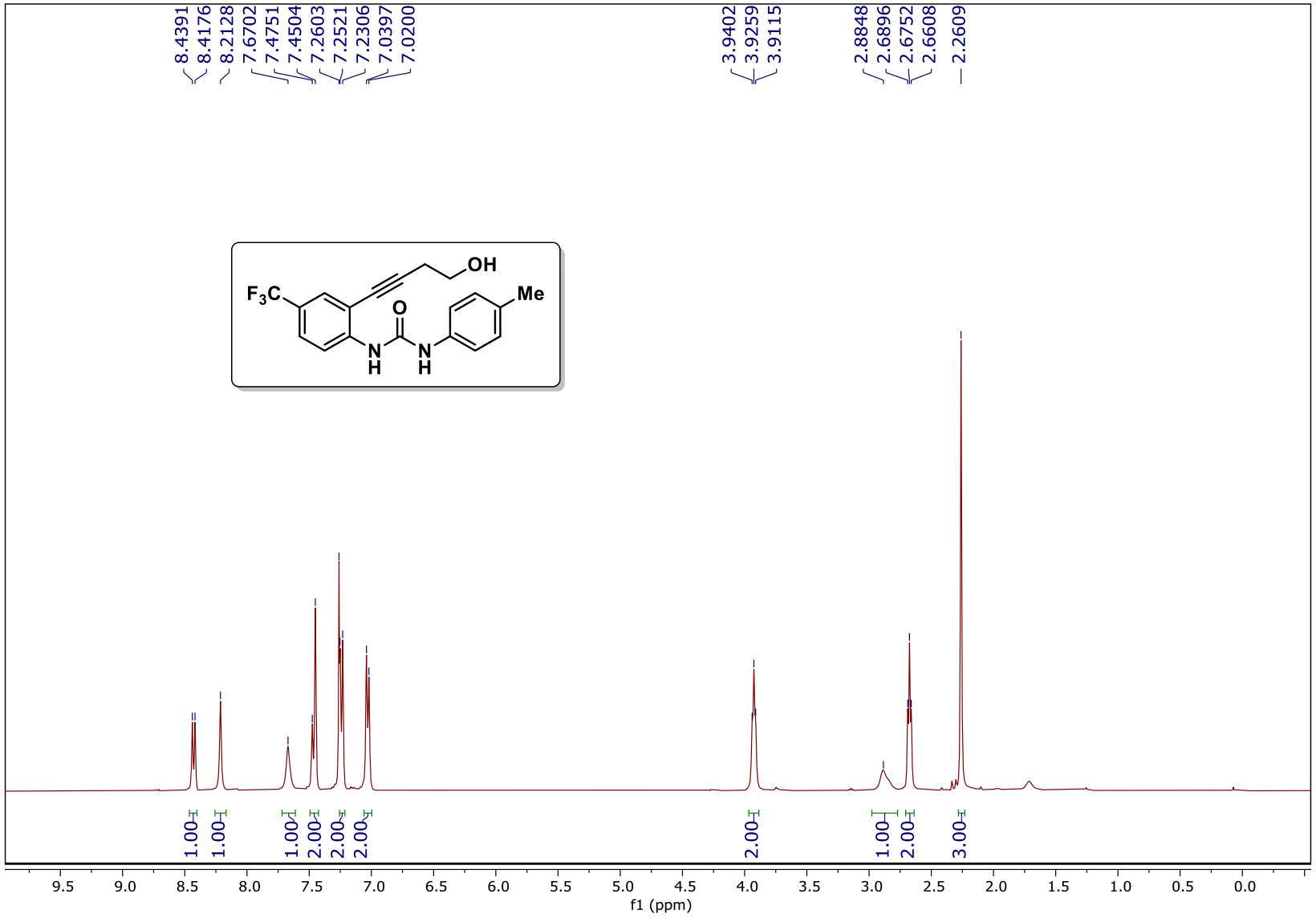


Figure S8. ^{13}C spectrum of compound **1h** (125 MHz, $CDCl_3$)

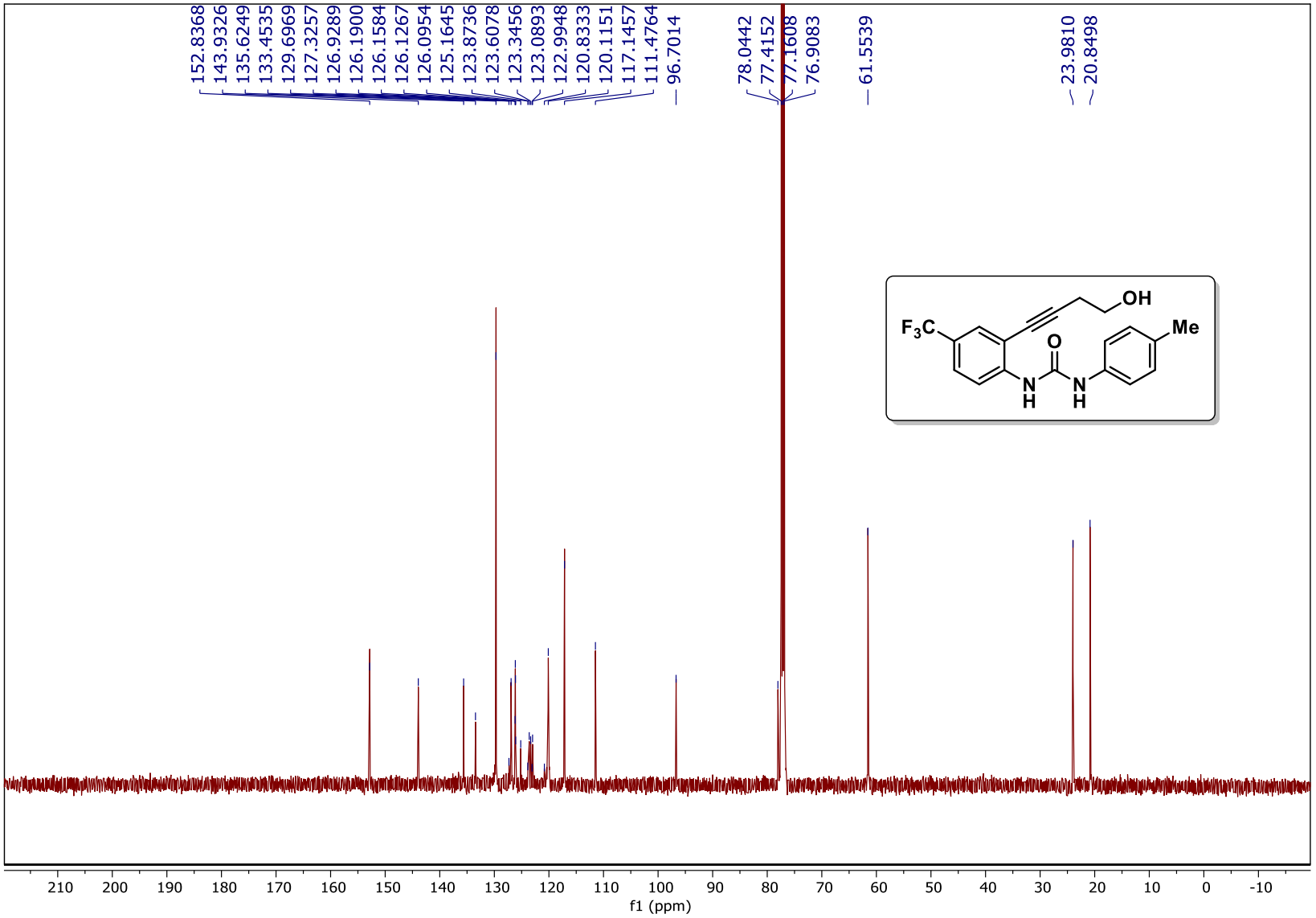


Figure S9. HRMS spectrum of **1h**

Sample Name	Sample9	**Position**	P1-A9	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	SP-C-444.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	28-12-2023 10:48:42 (UTC+05:30)

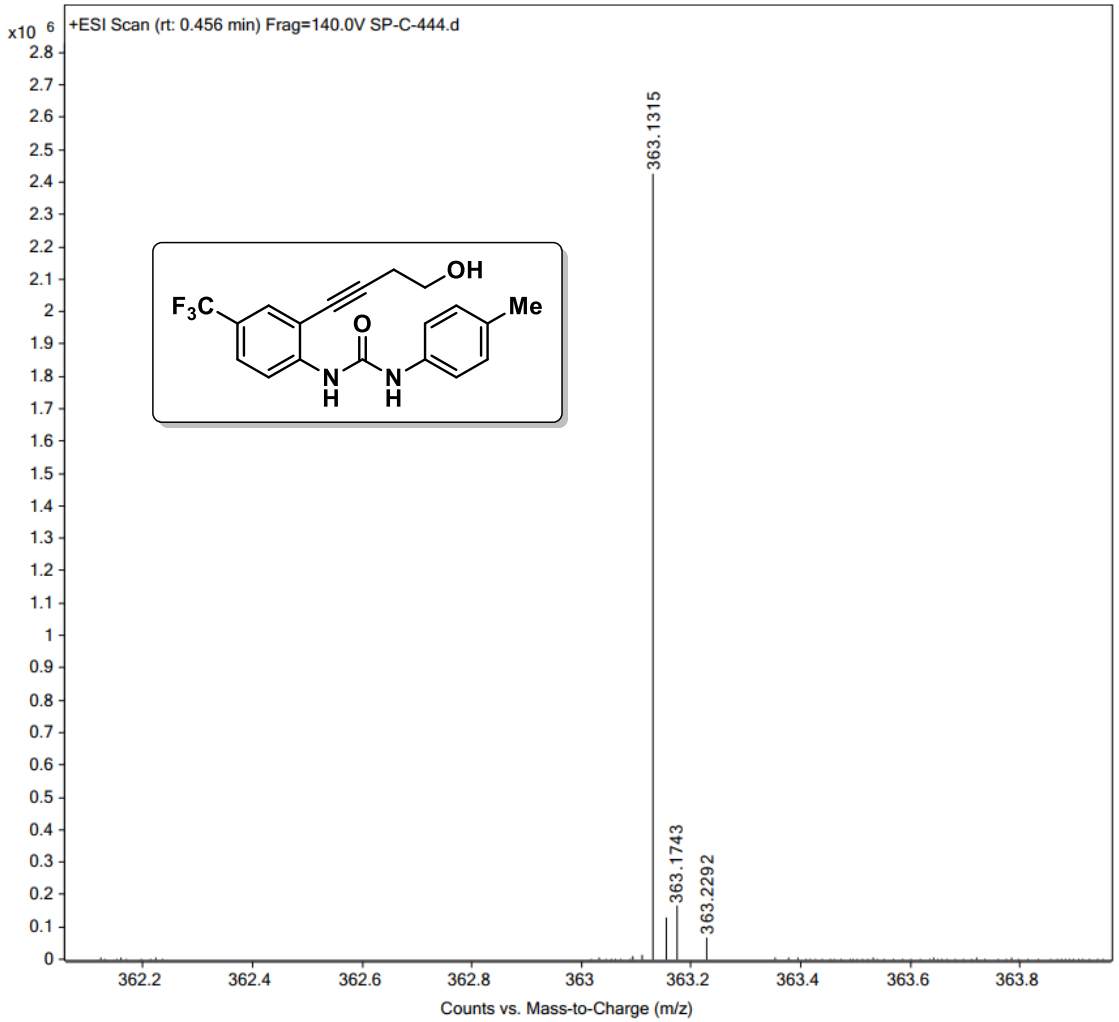


Figure S10. ^{1}H spectrum of compound **1i** (500 MHz, $CDCl_3$)

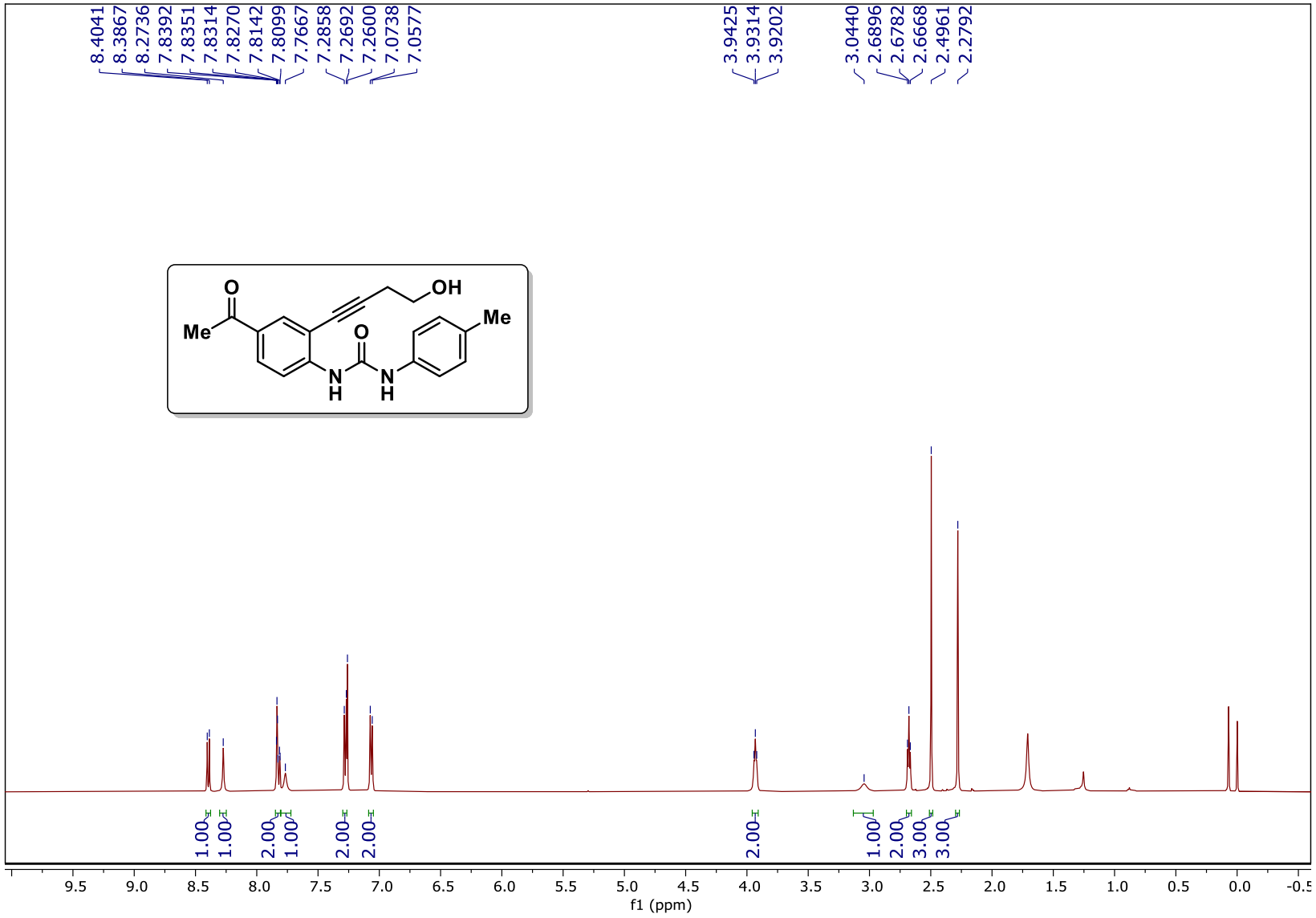


Figure S11. ^{13}C spectrum of compound **1i** (125 MHz, $CDCl_3$)

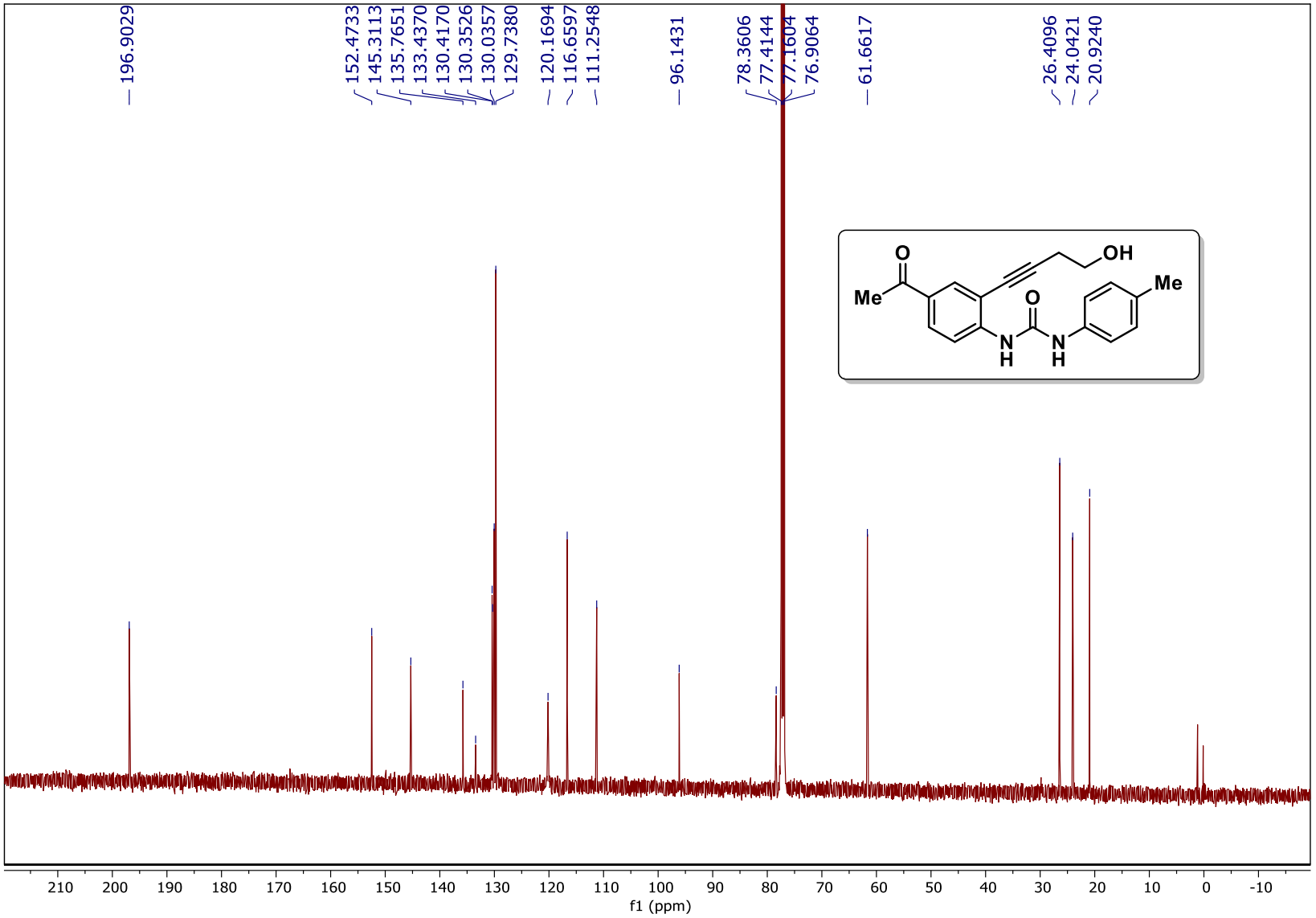


Figure S12. HRMS spectrum of **1i**

Sample Name	Sample1	**Position**	P1-A1	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-375.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	13-02-2024 09:58:21 (UTC+05:30)

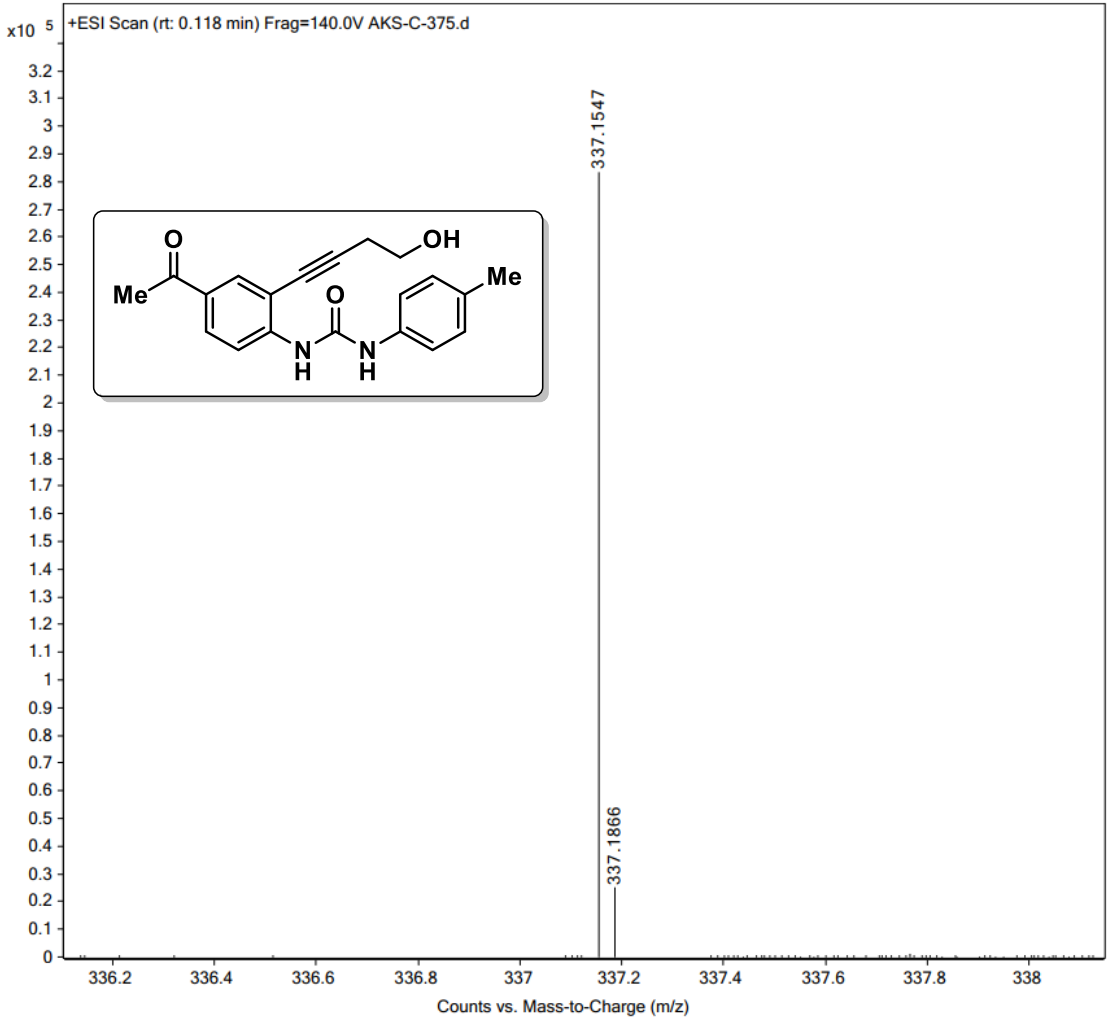


Figure S13. ^{1}H spectrum of compound **1j** (400 MHz, $CDCl_3$/DMSO-d_6)

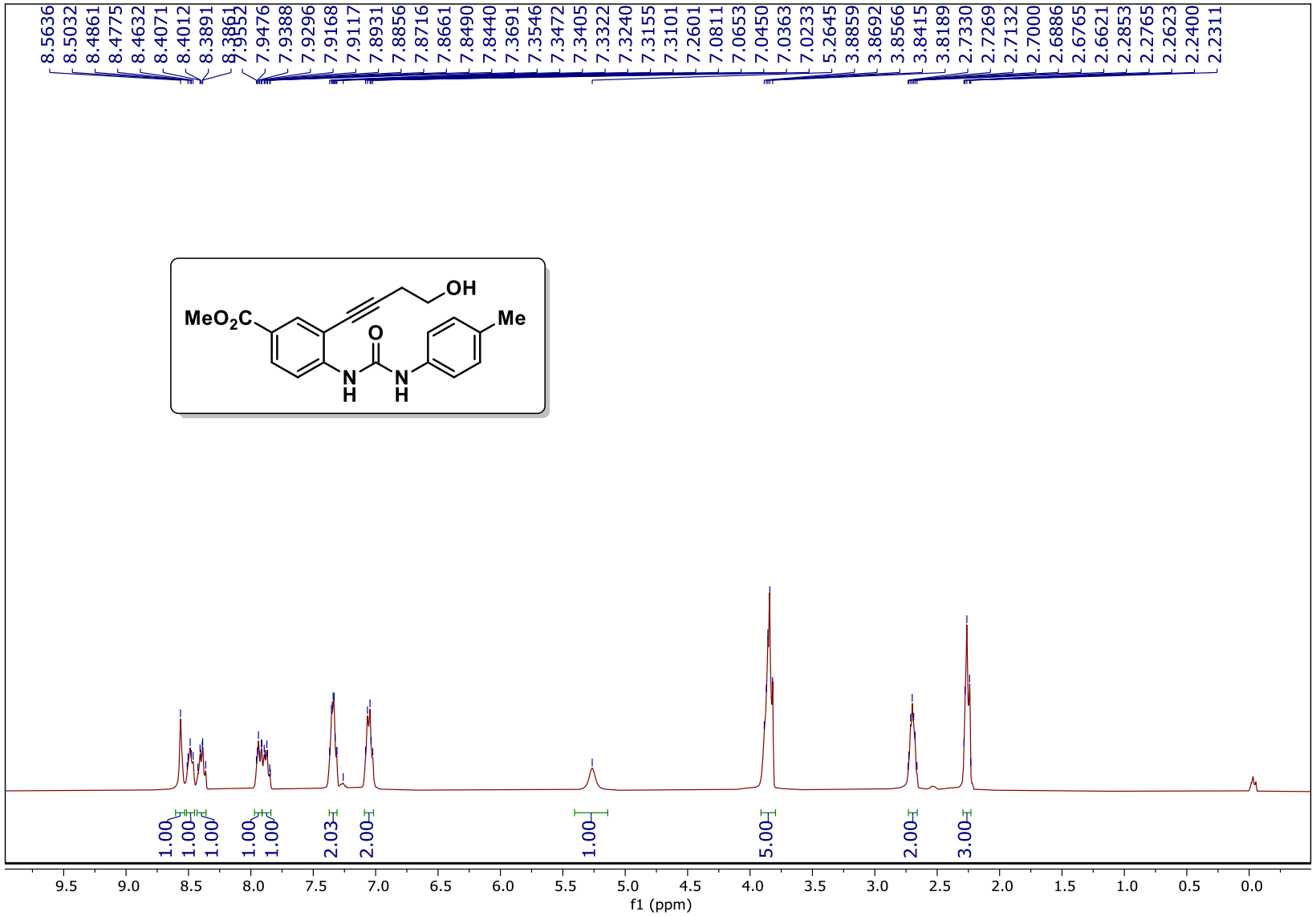


Figure S14. ^{13}C spectrum of compound **1j** (125 MHz, $CDCl_3$/DMSO-d_6)

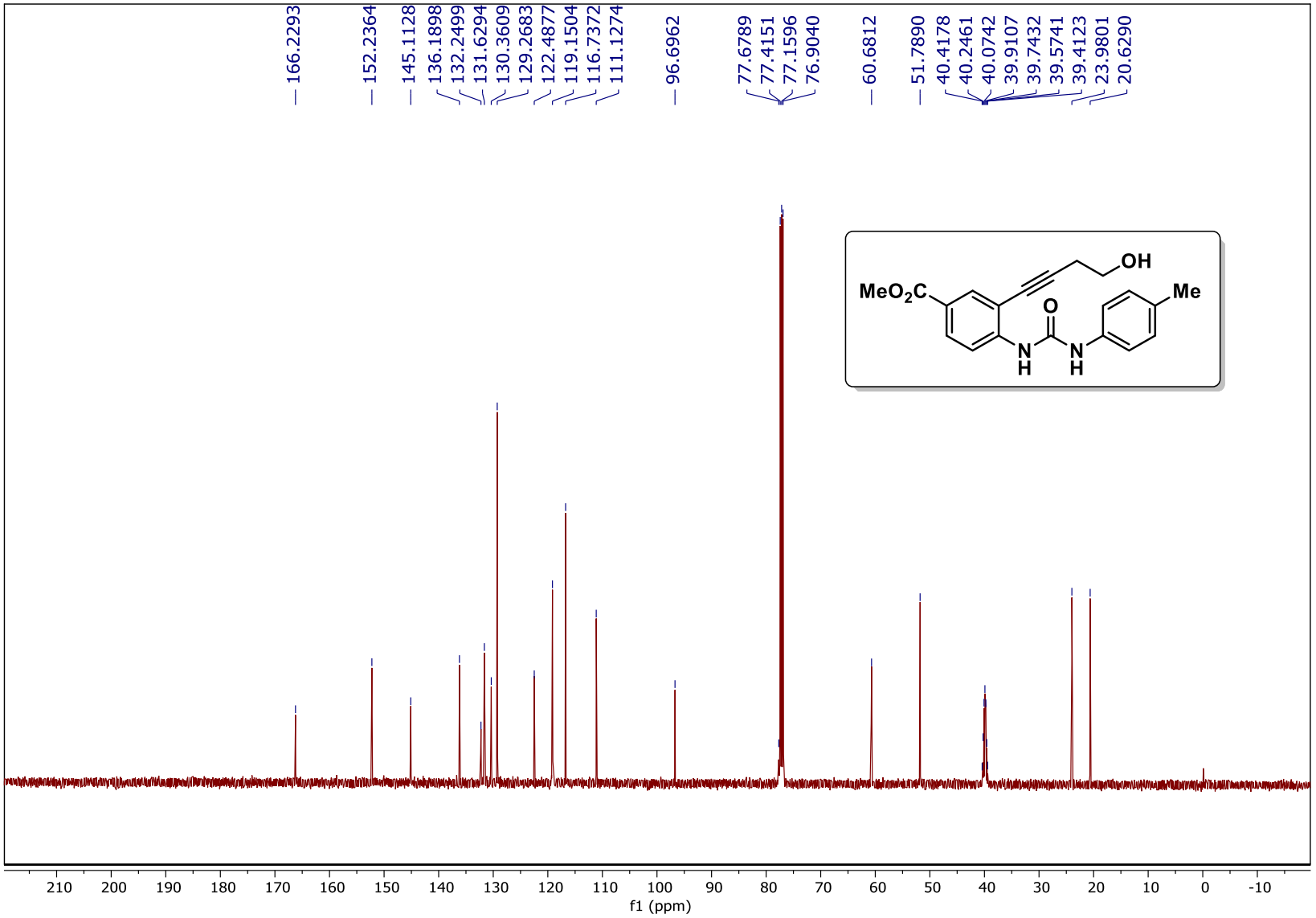


Figure S15. HRMS spectrum of **1j**

Sample Name	Sample51	**Position**	P1-E7	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-345.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	21-09-2023 12:36:39 (UTC+05:30)

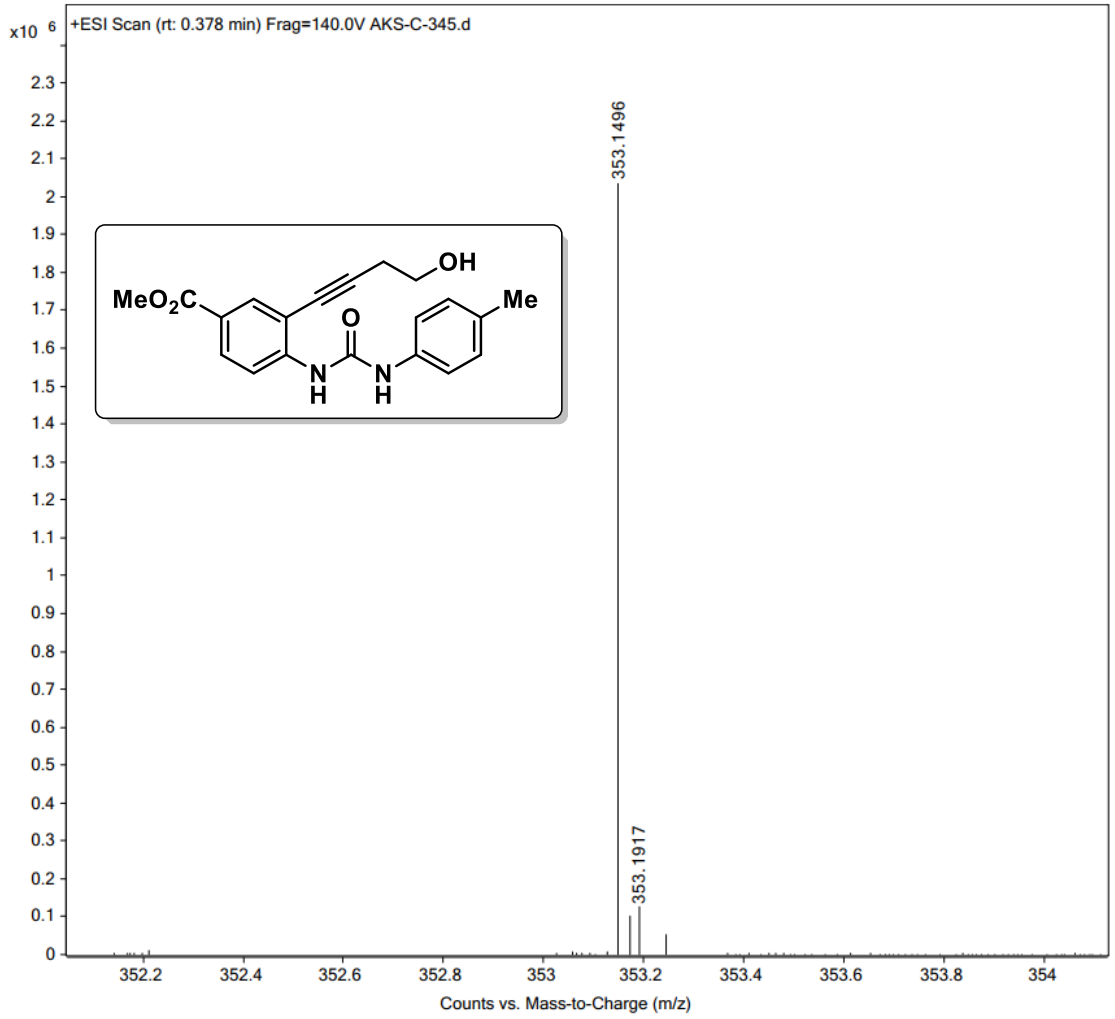


Figure S16. ^{1}H spectrum of compound **1k** (500 MHz, $CDCl_3$/DMSO-d_6)

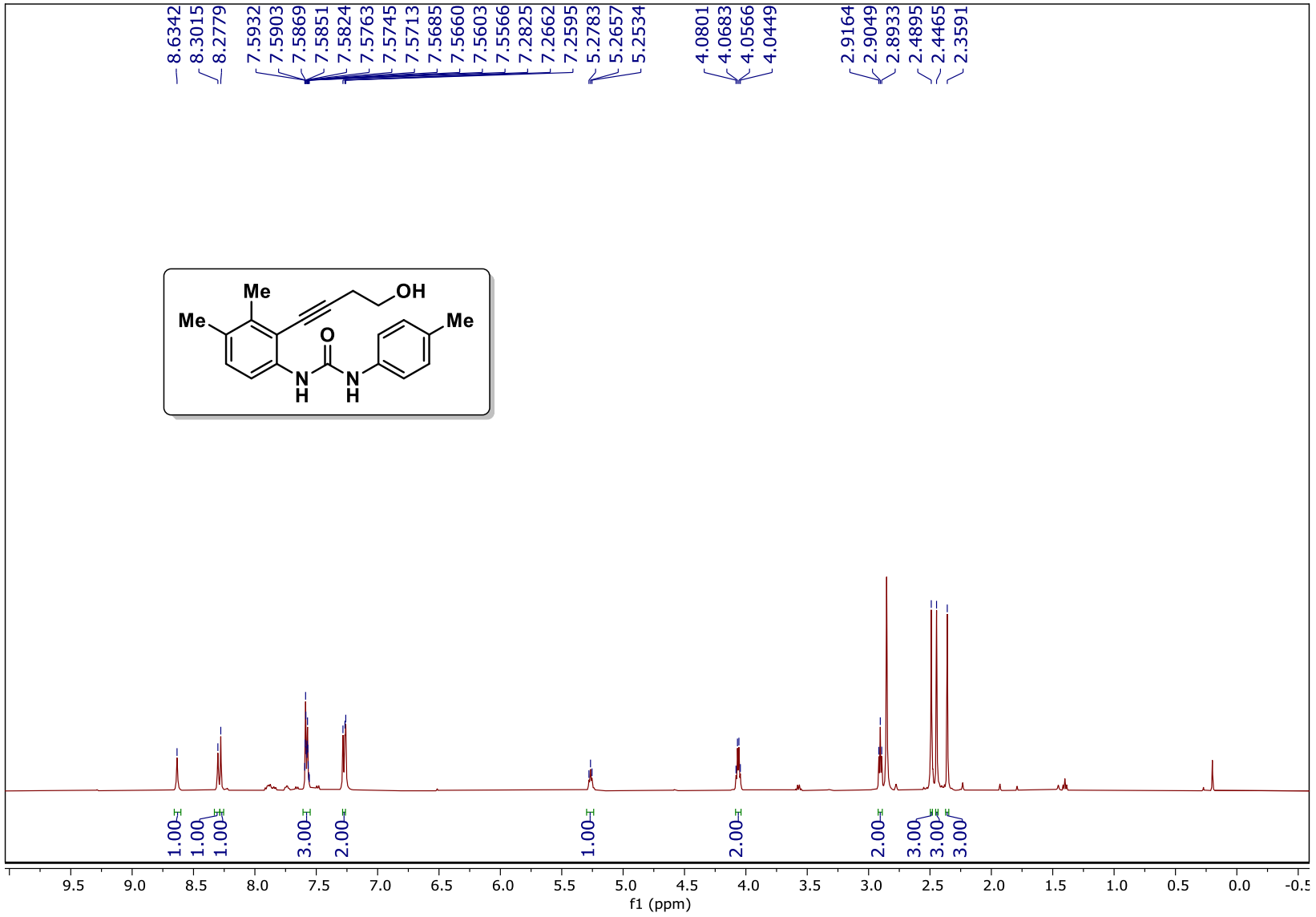


Figure S17. ^{13}C spectrum of compound **1k** (125 MHz, $CDCl_3$/DMSO-d_6)

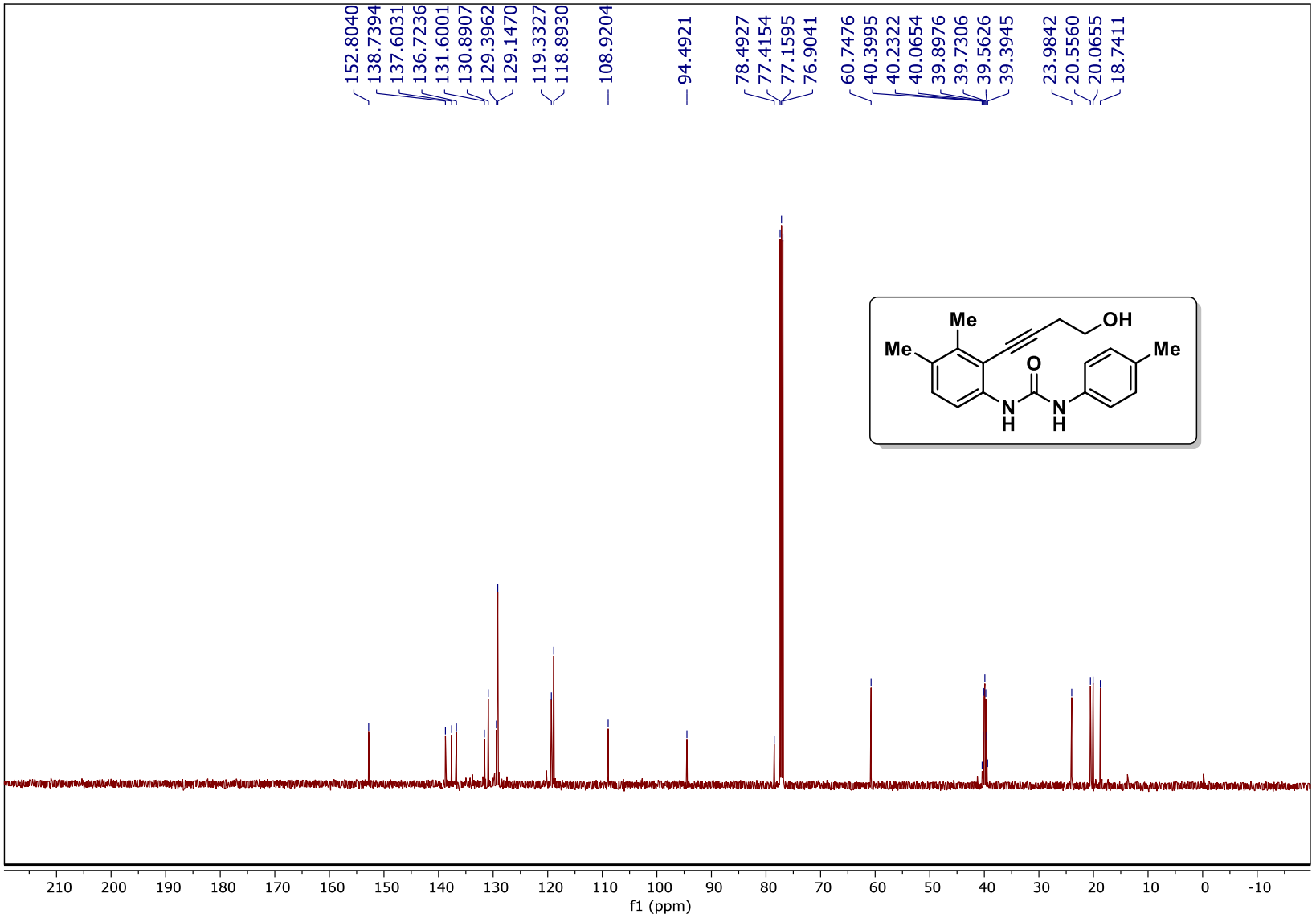


Figure S18. HRMS spectrum of **1k**

Sample Name		**Position**	P1-B10	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-291.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	13-02-2024 16:10:22 (UTC+05:30)

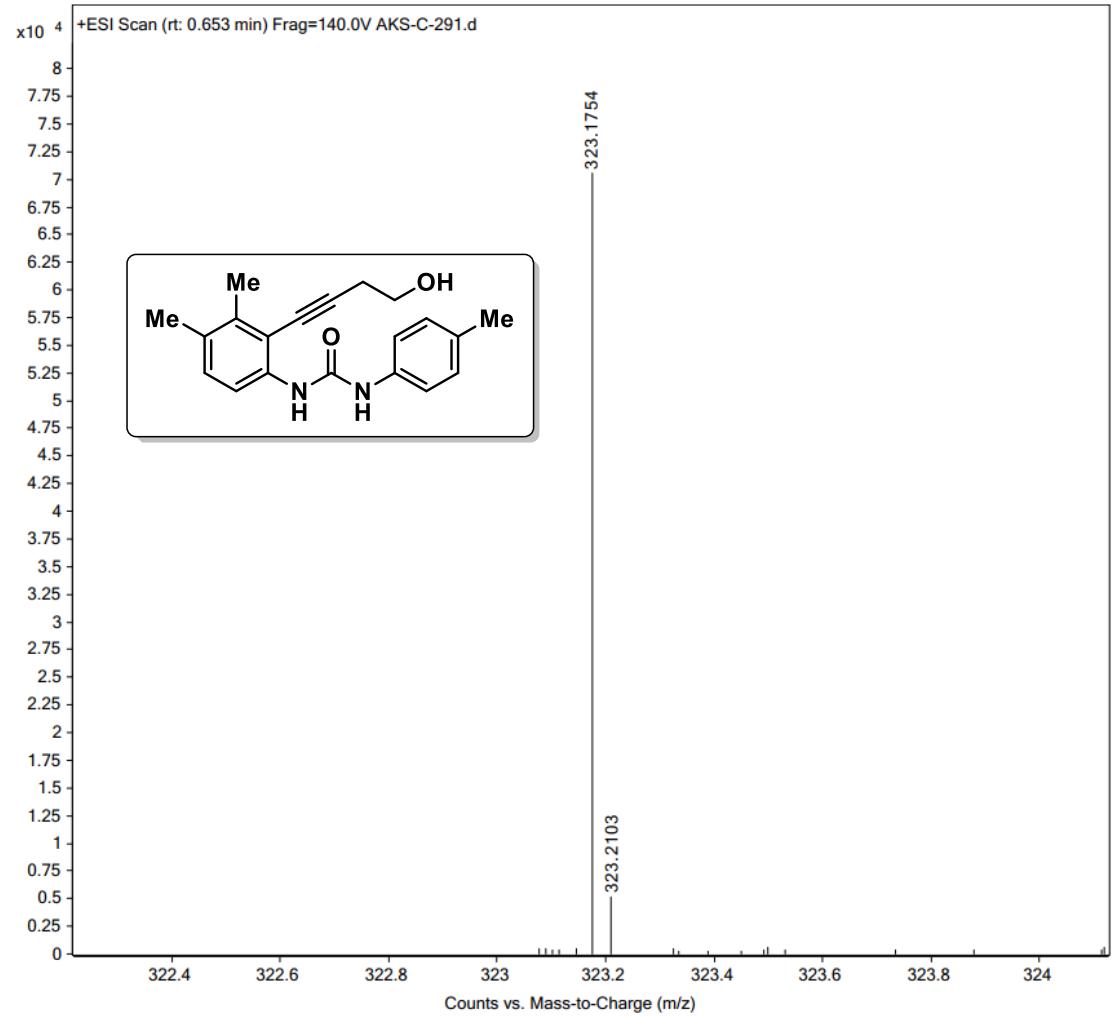


Figure S19. ^{1}H spectrum of compound **1m** (400 MHz, $CDCl_3$)

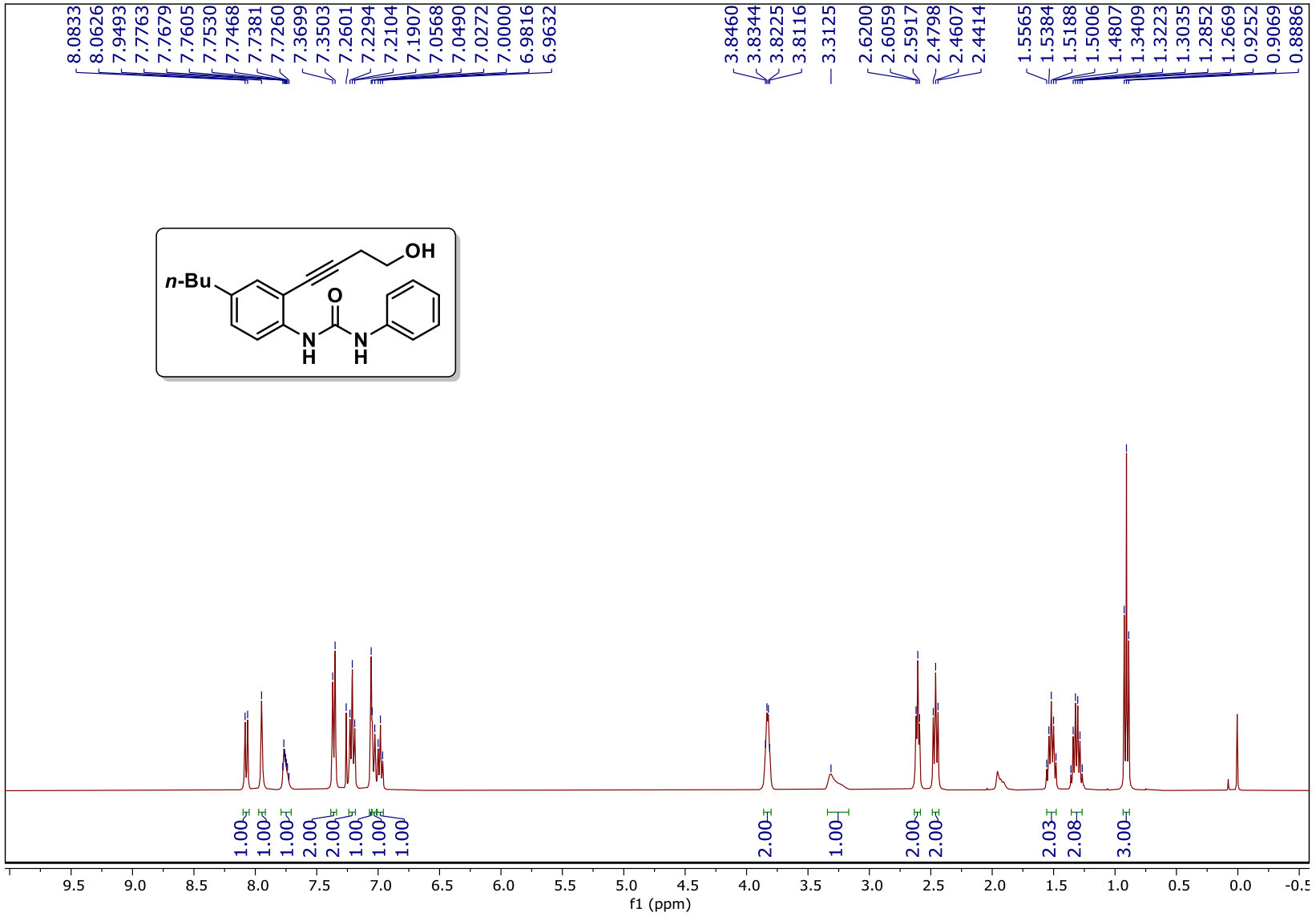


Figure S20. ^{13}C spectrum of compound **1m** (125 MHz, $CDCl_3$)

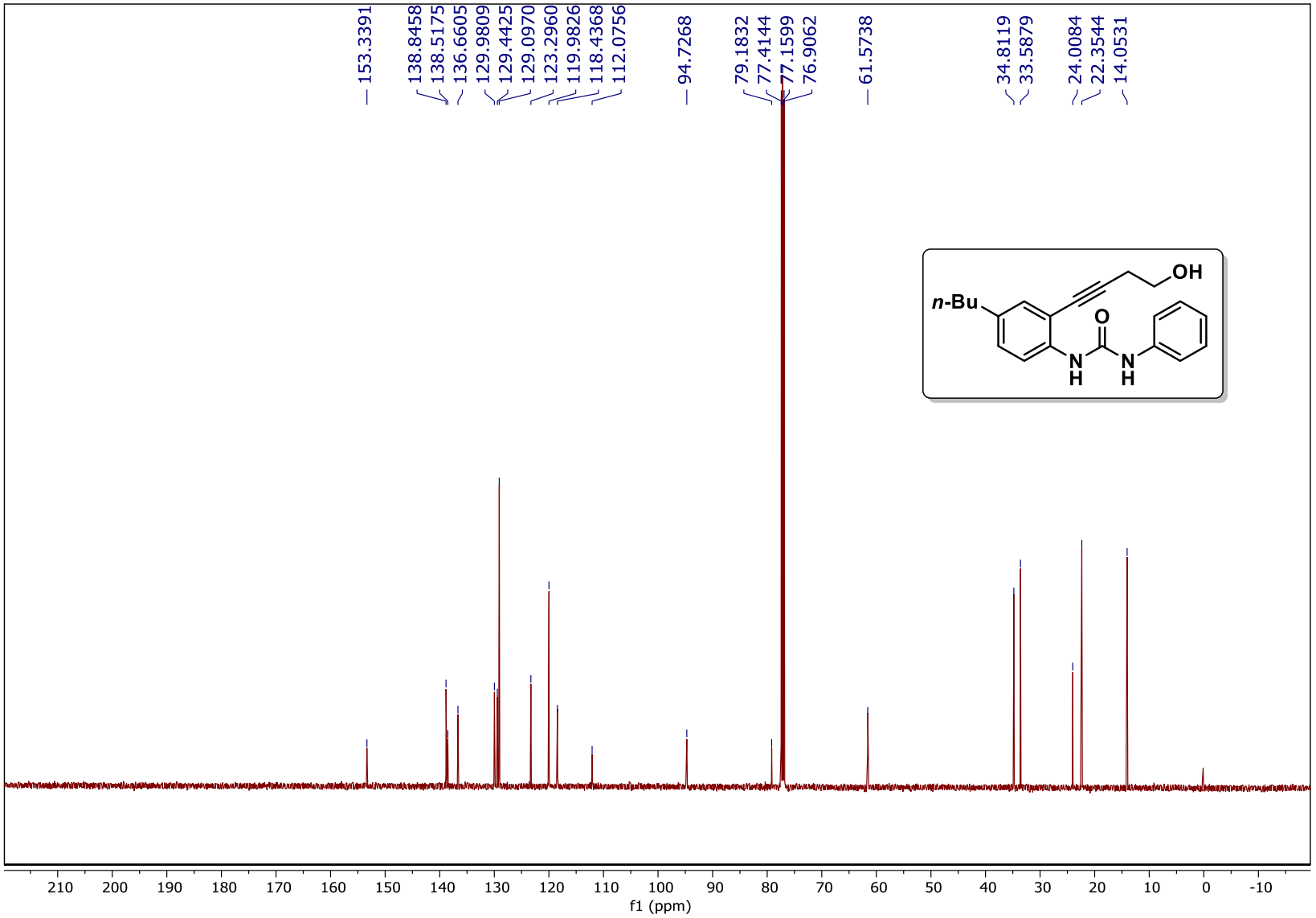


Figure S21. HRMS spectrum of **1m**

Sample Name	Sample35	**Position**	P1-D2	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-302.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	20-07-2023 12:50:00 (UTC+05:30)

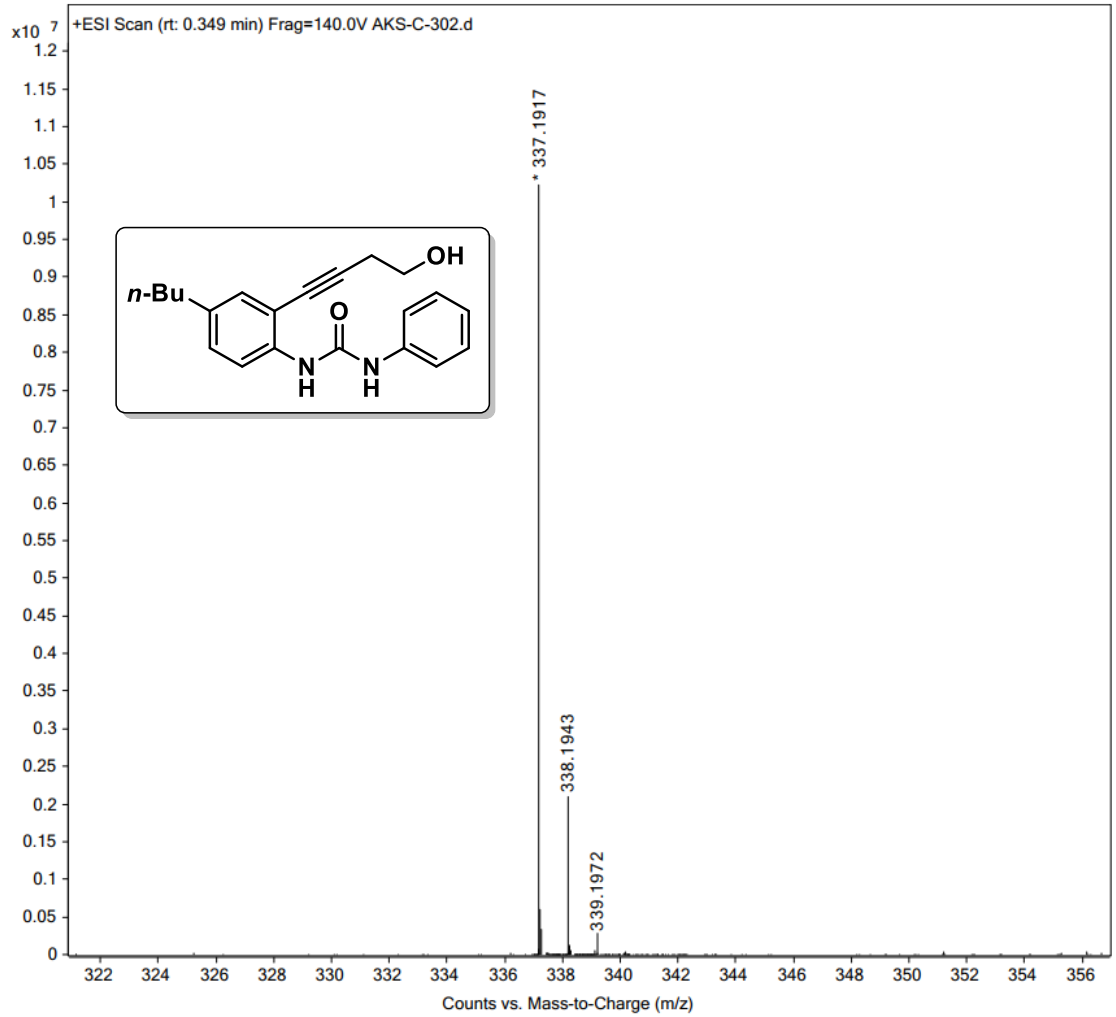


Figure S22. ^{1}H spectrum of compound **1n** (400 MHz, $CDCl_3$/DMSO-d_6)

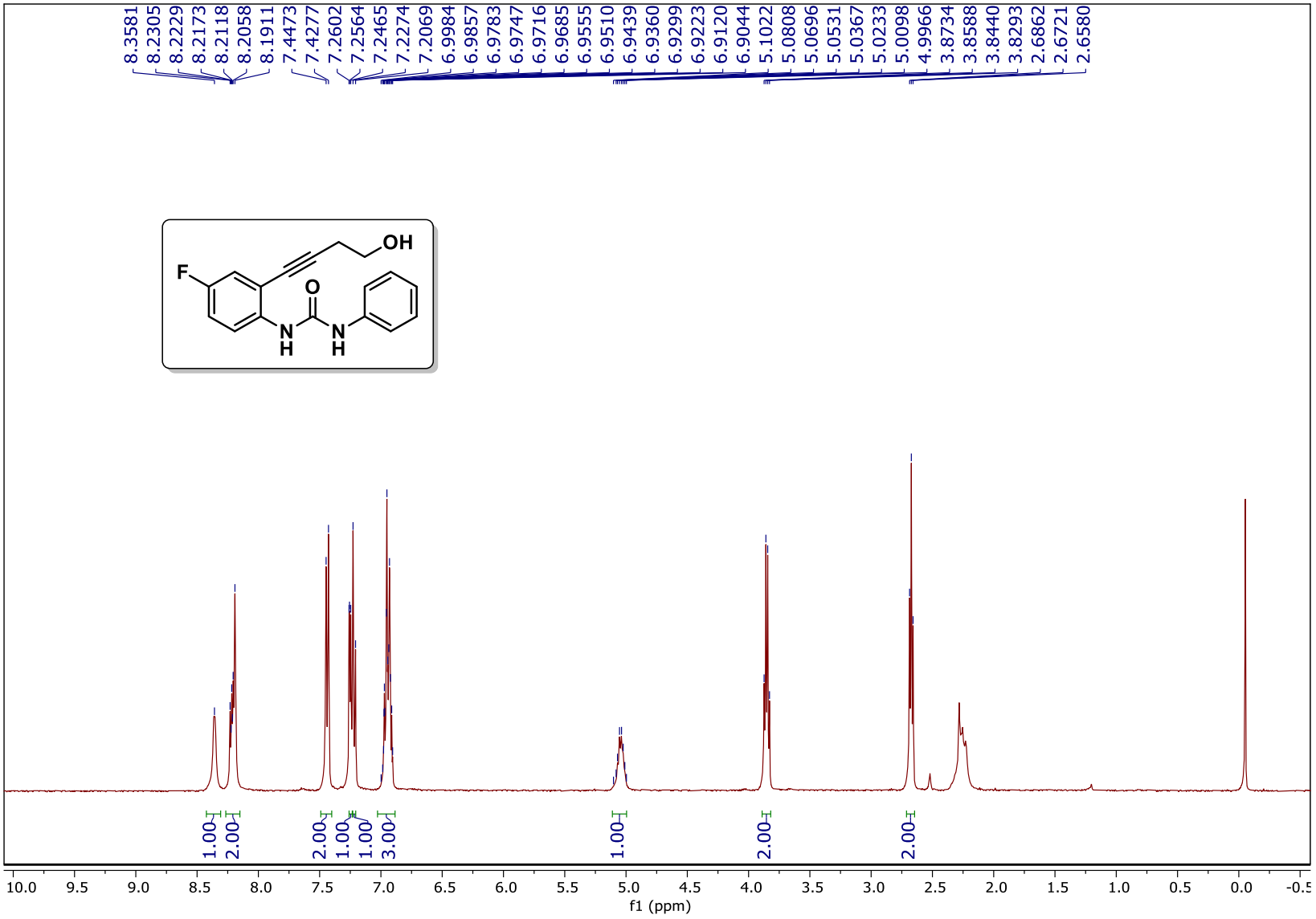


Figure S23. ^{13}C spectrum of compound **1n** (125 MHz, $CDCl_3$/DMSO-d_6)

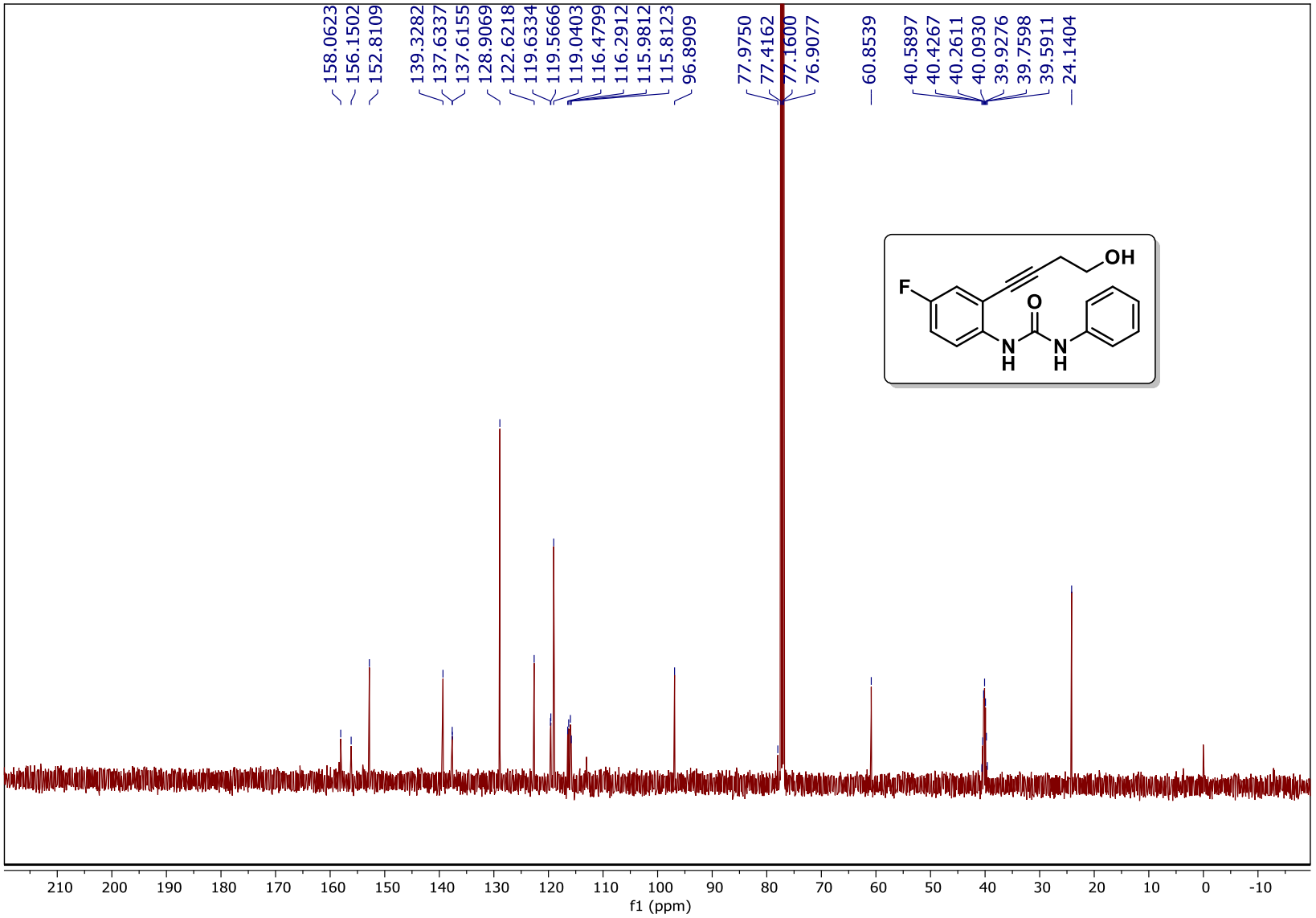


Figure S24. ^{19}F spectrum of compound **1n** (470 MHz, $CDCl_3$/DMSO-d_6/C_6F_6)

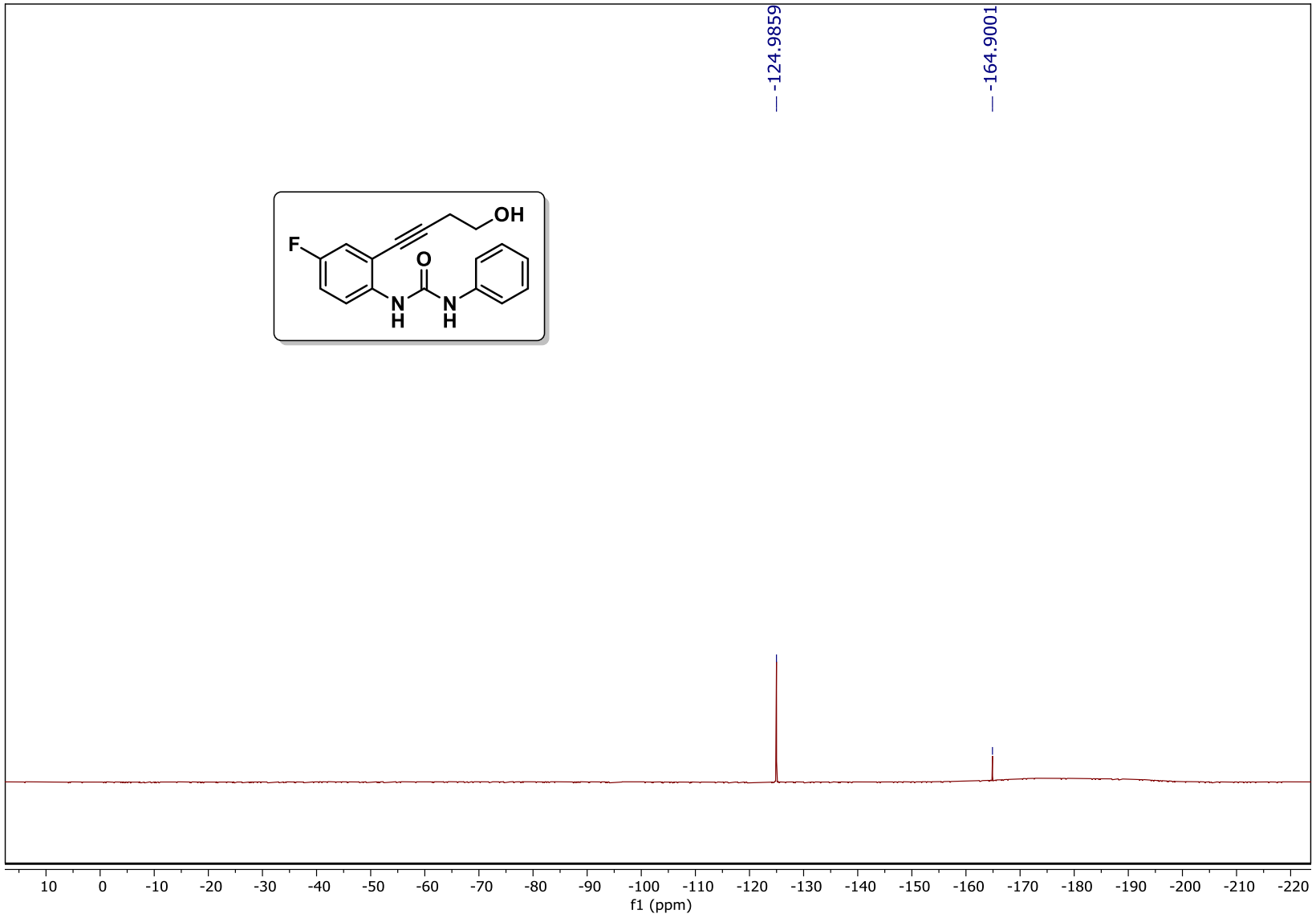


Figure S25. HRMS spectrum of **1n**

Sample Name	Sample9	**Position**	P1-A9	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-299.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	10-07-2023 09:59:19 (UTC+05:30)

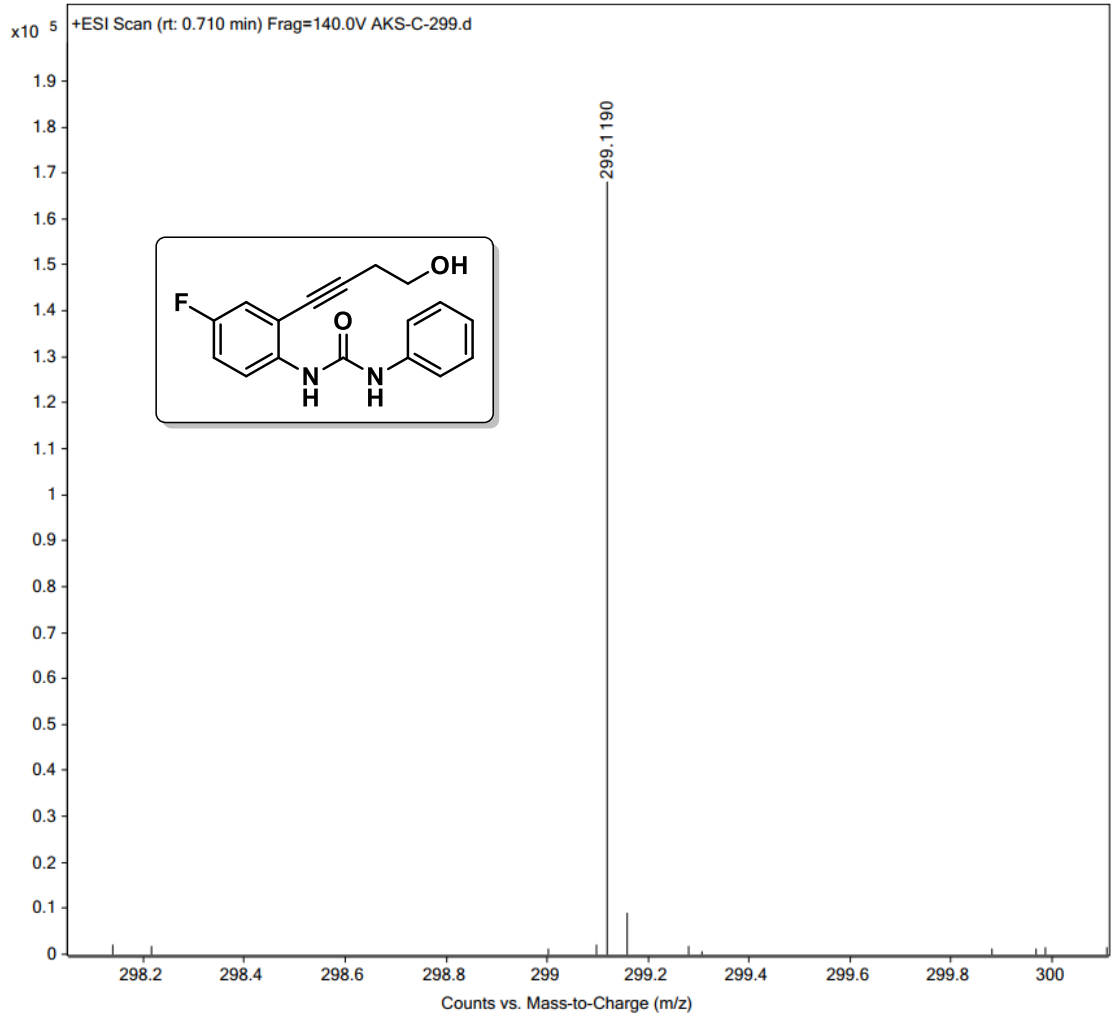


Figure S26. ^{1}H spectrum of compound **1o** (500 MHz, $CDCl_3$)

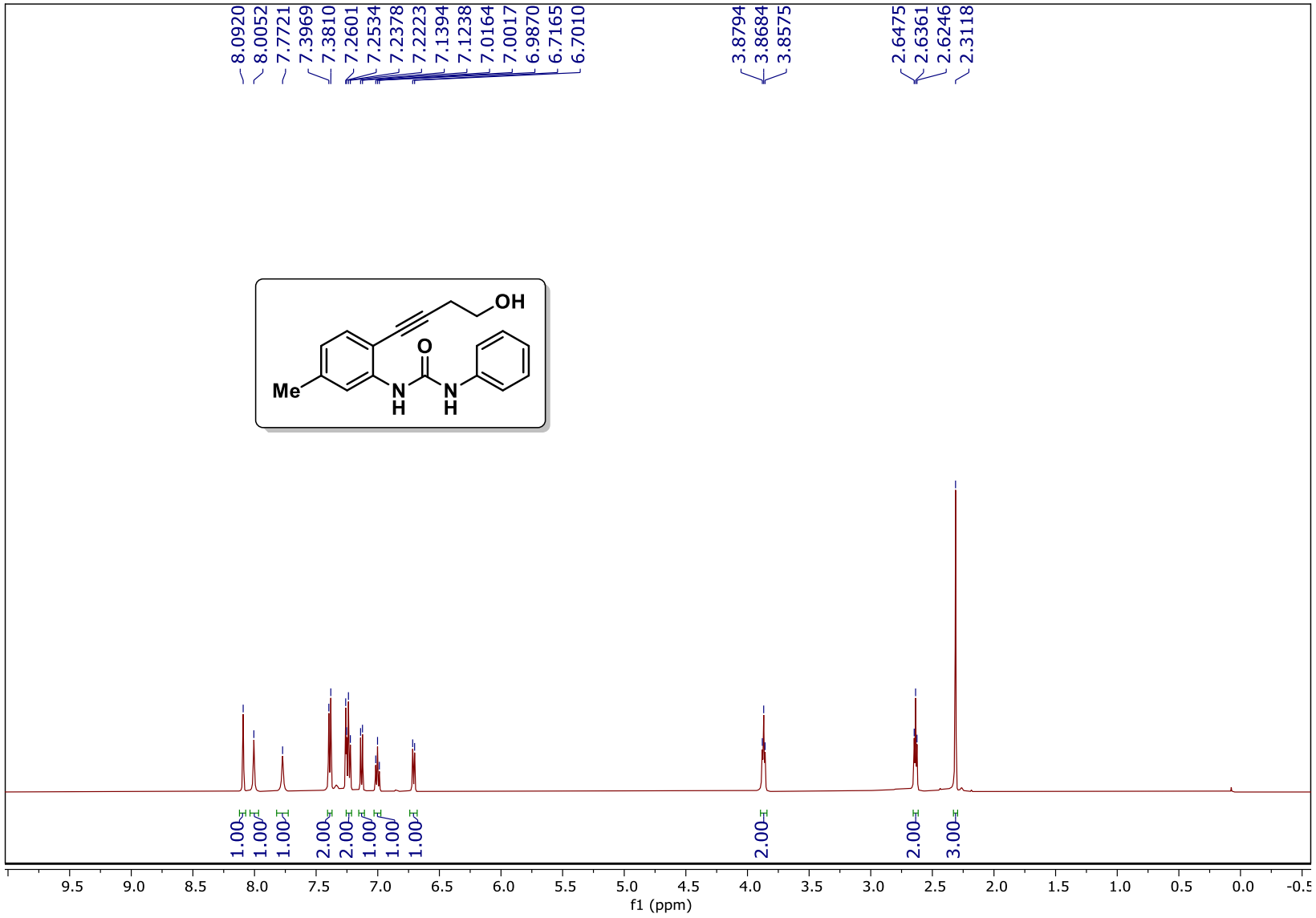


Figure S27. ^{13}C spectrum of compound **1o** (125 MHz, $CDCl_3$)

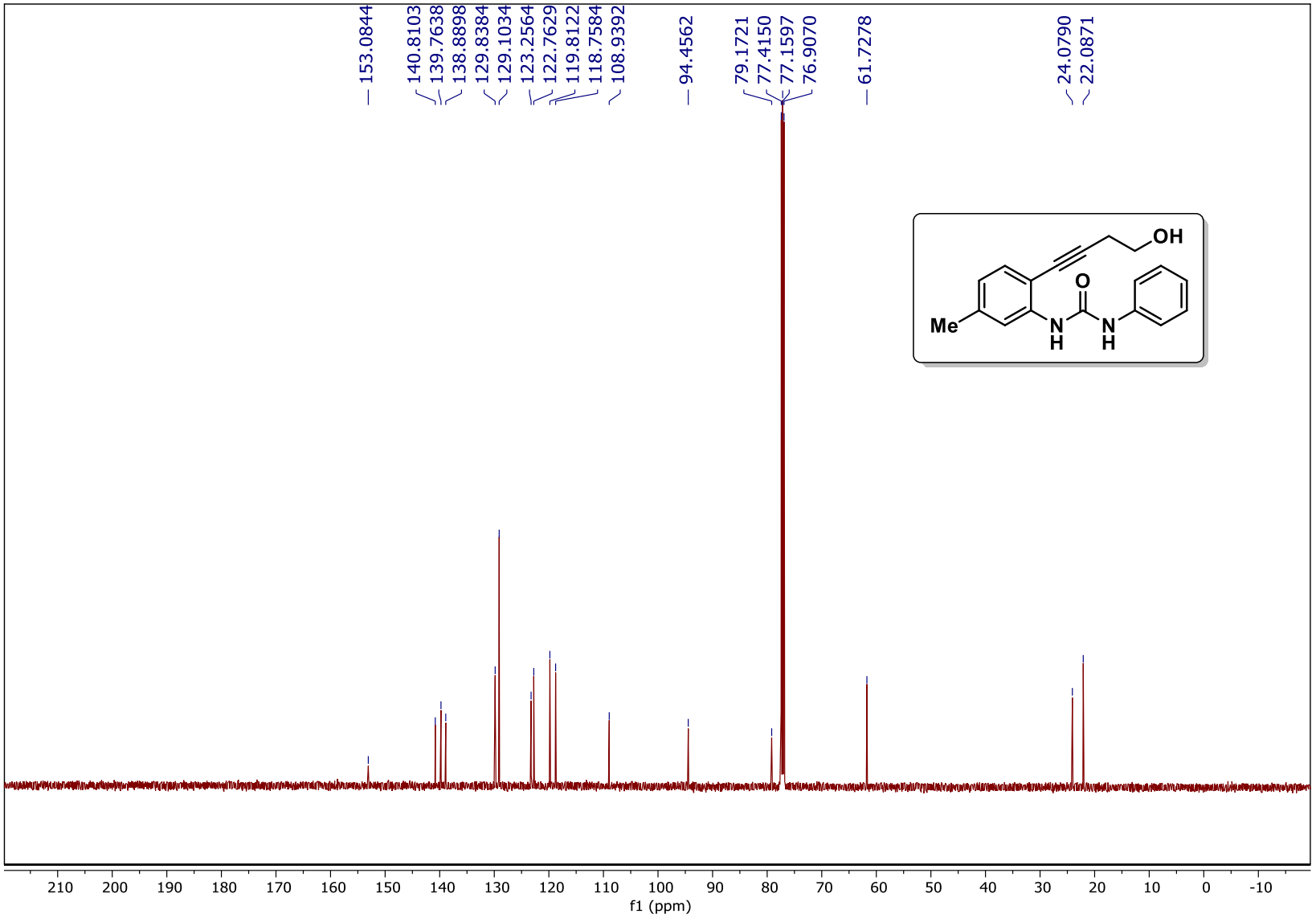


Figure S28. HRMS spectrum of **1o**

Sample Name	Sample22	**Position**	P1-B11	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-445-.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	14-12-2023 15:39:59 (UTC+05:30)

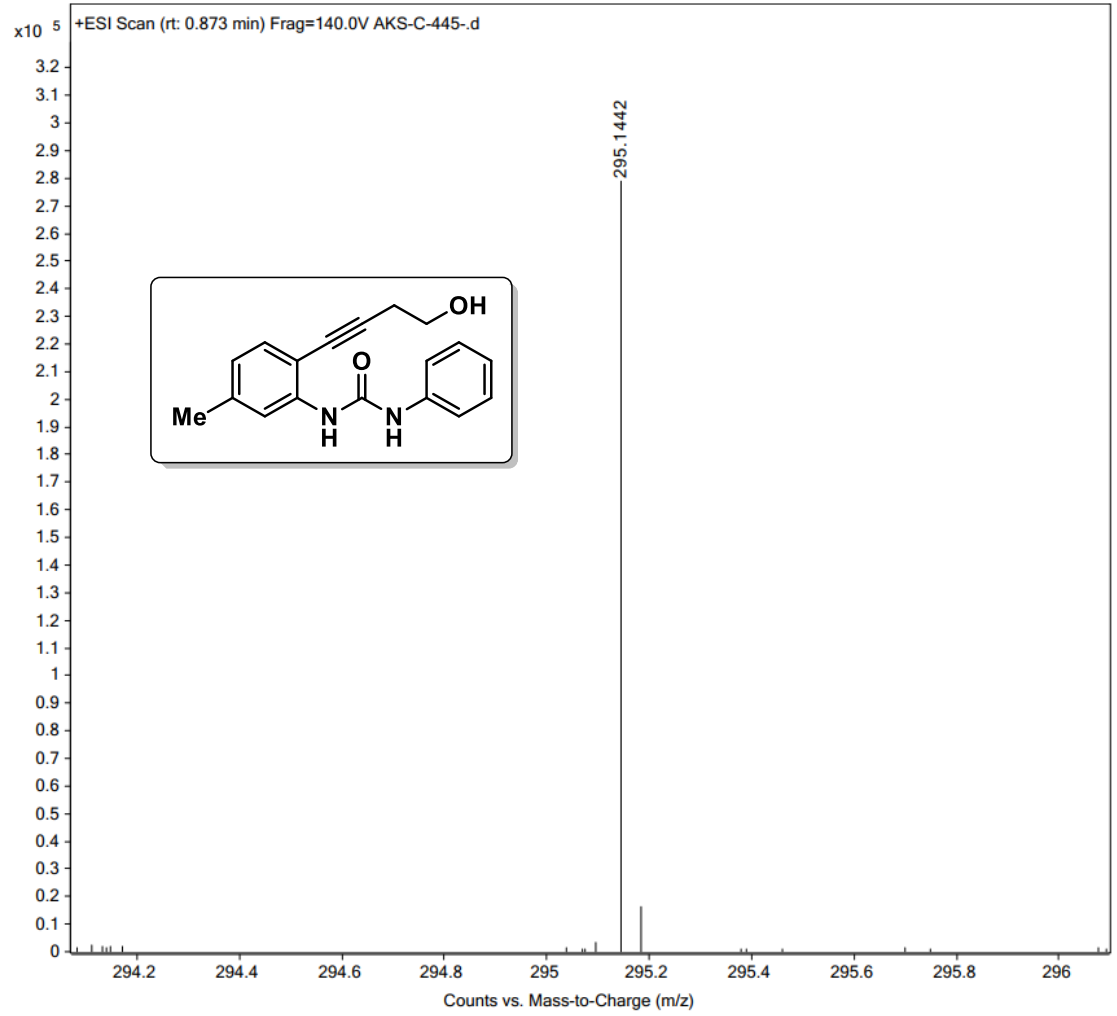


Figure S29. ^{1}H spectrum of compound **1p** (400 MHz, $CDCl_3$)

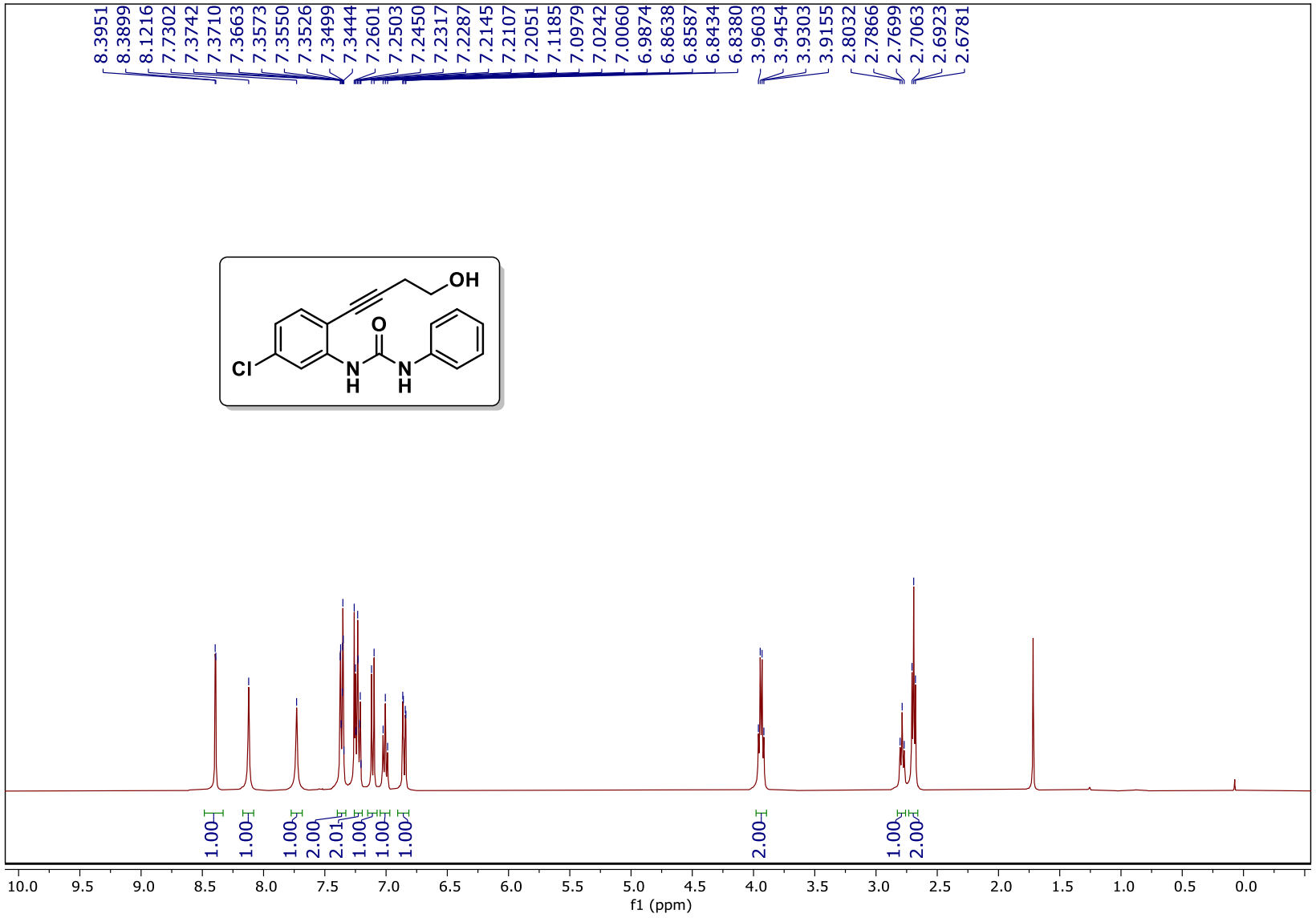


Figure S30. ^{13}C spectrum of compound **1p** (125 MHz, $CDCl_3$)

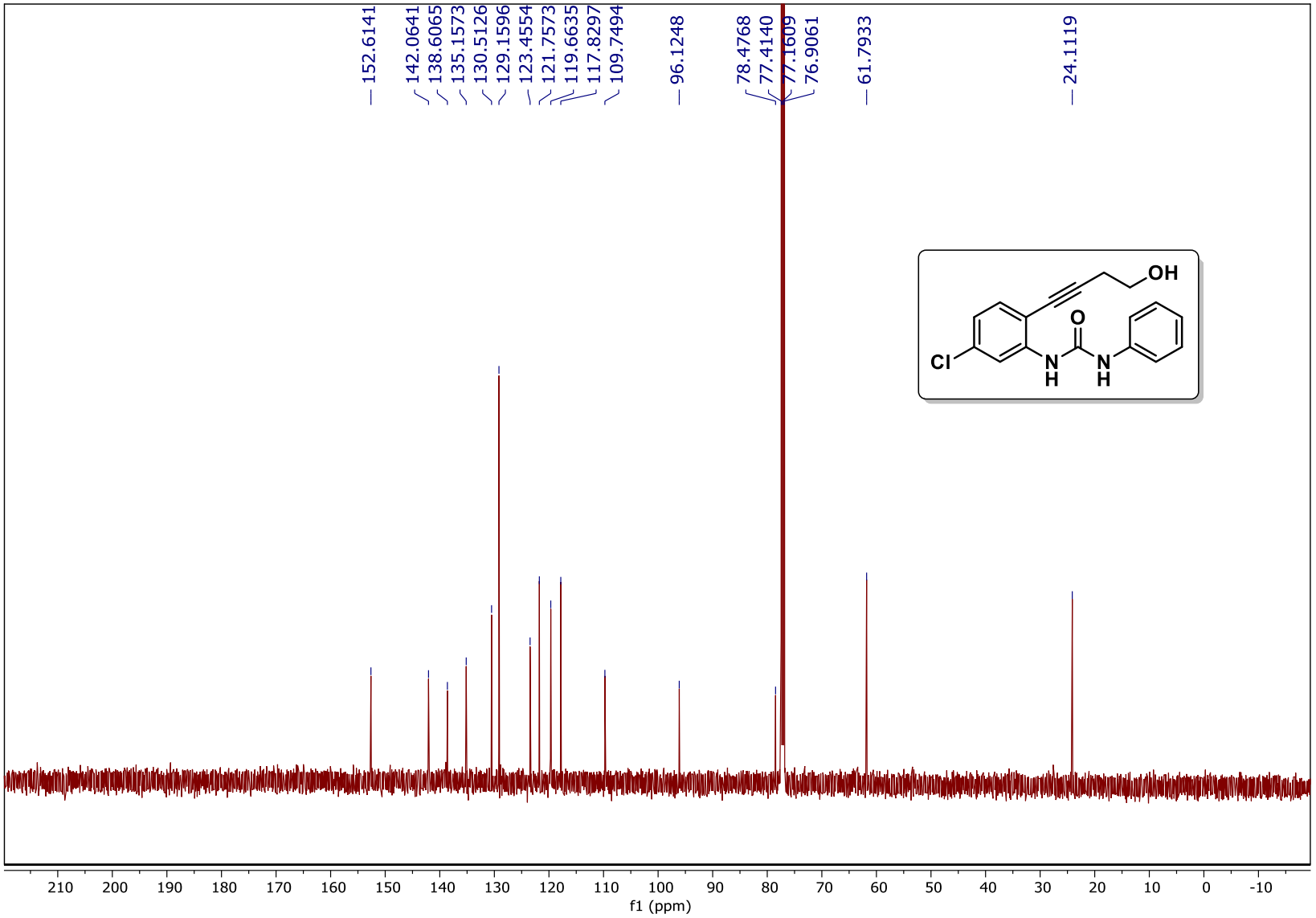


Figure S31. HRMS spectrum of **1p**

Sample Name	Sample15	**Position**	P1-A10	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC466.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	16-02-2024 16:30:52 (UTC+05:30)

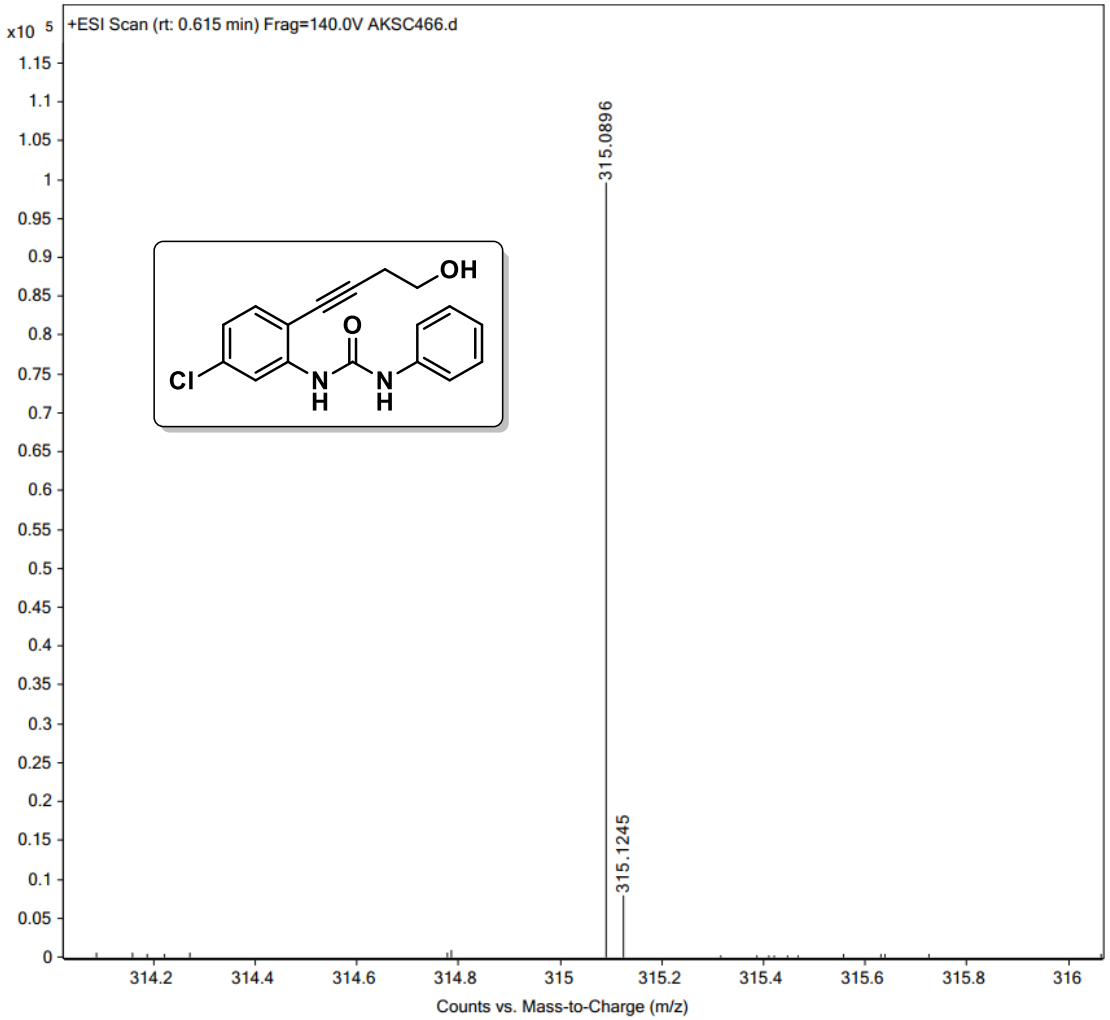


Figure S32. ^{1}H spectrum of compound **1q** (500 MHz, $CDCl_3$/DMSO-d_6)

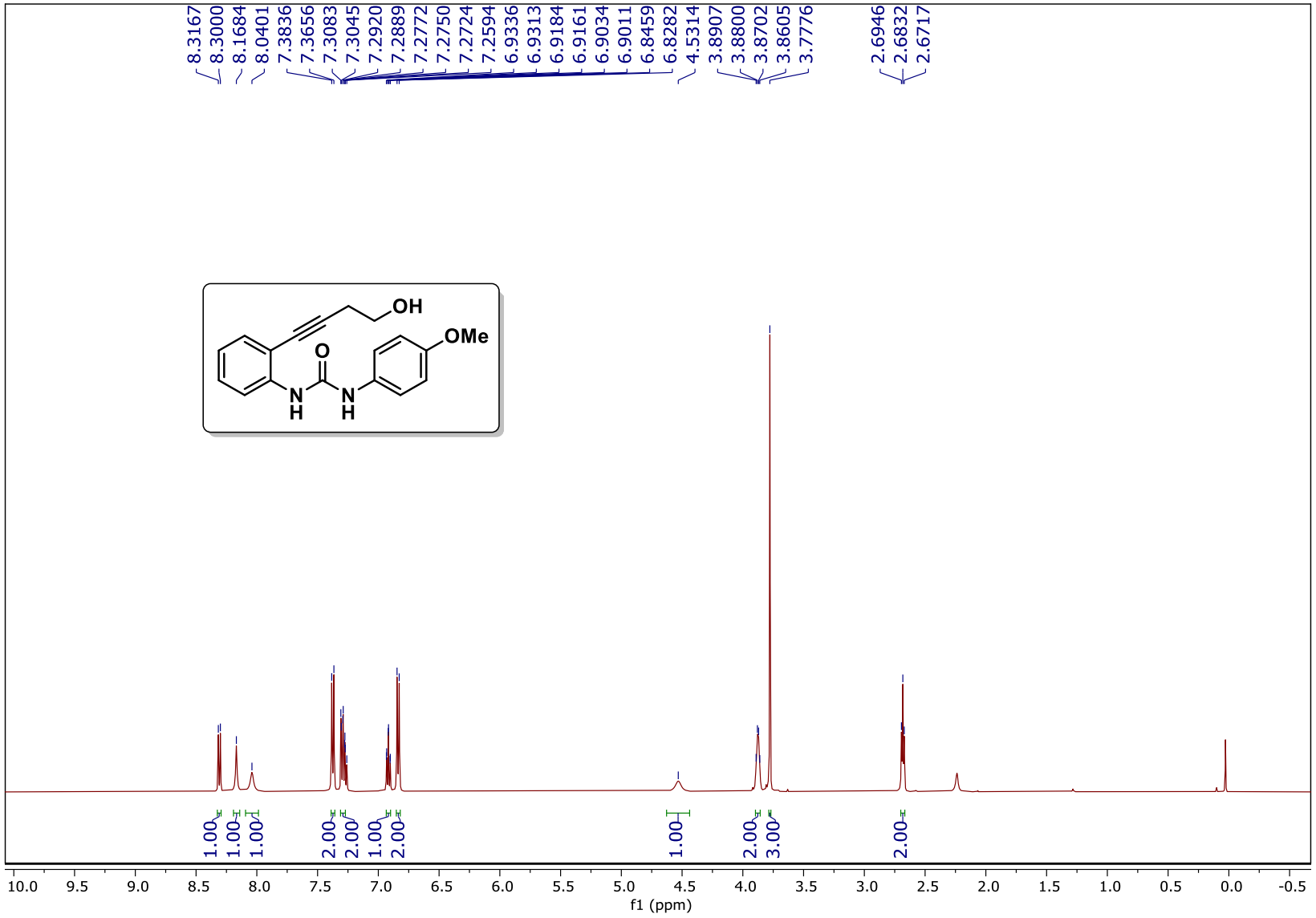


Figure S33. ^{13}C spectrum of compound **1q** (125 MHz, $CDCl_3$/DMSO-d_6)

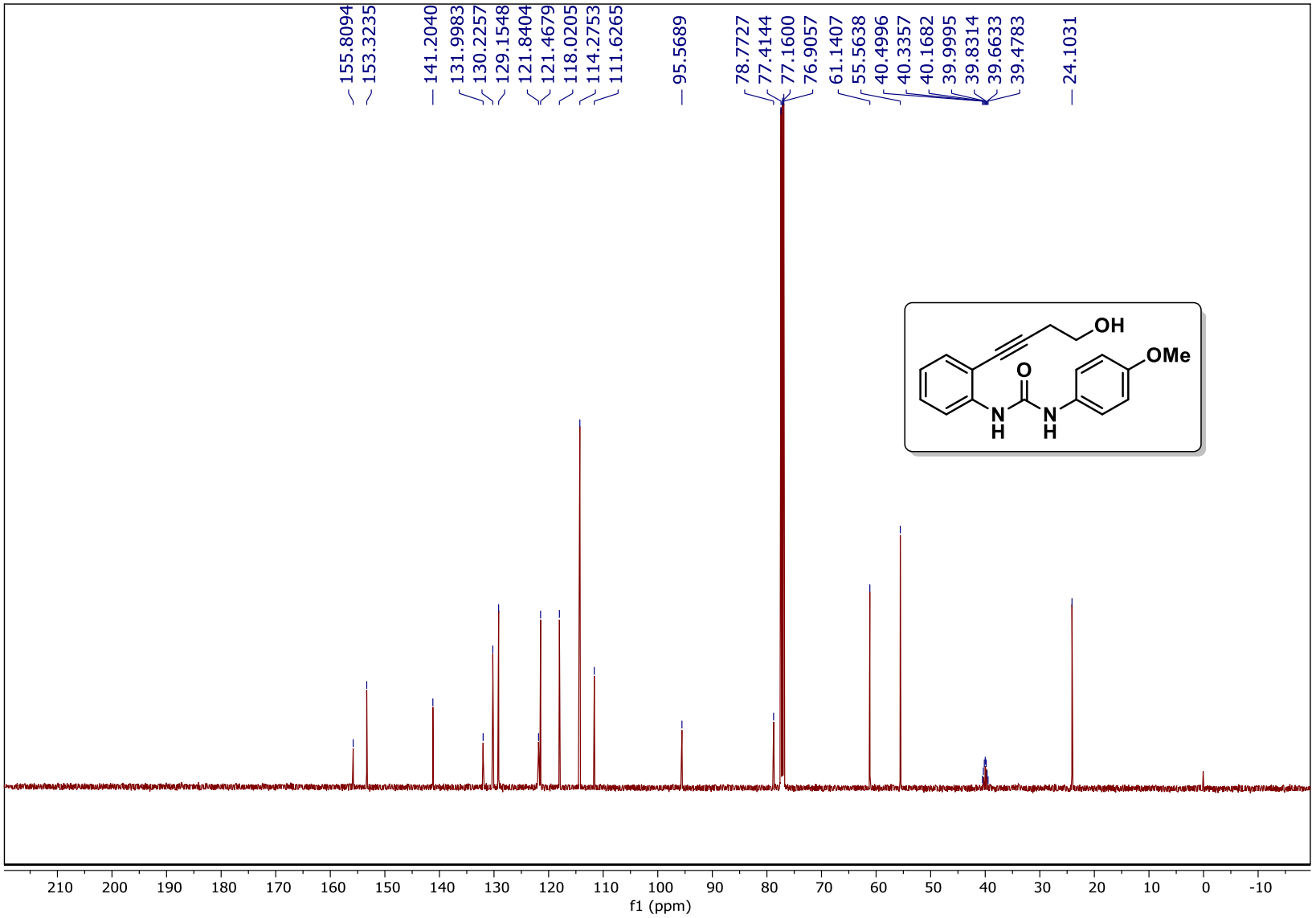


Figure S34. HRMS spectrum of **1q**

Sample Name	Sample15	**Position**	P1-B4	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-378.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	26-09-2023 10:40:16 (UTC+05:30)

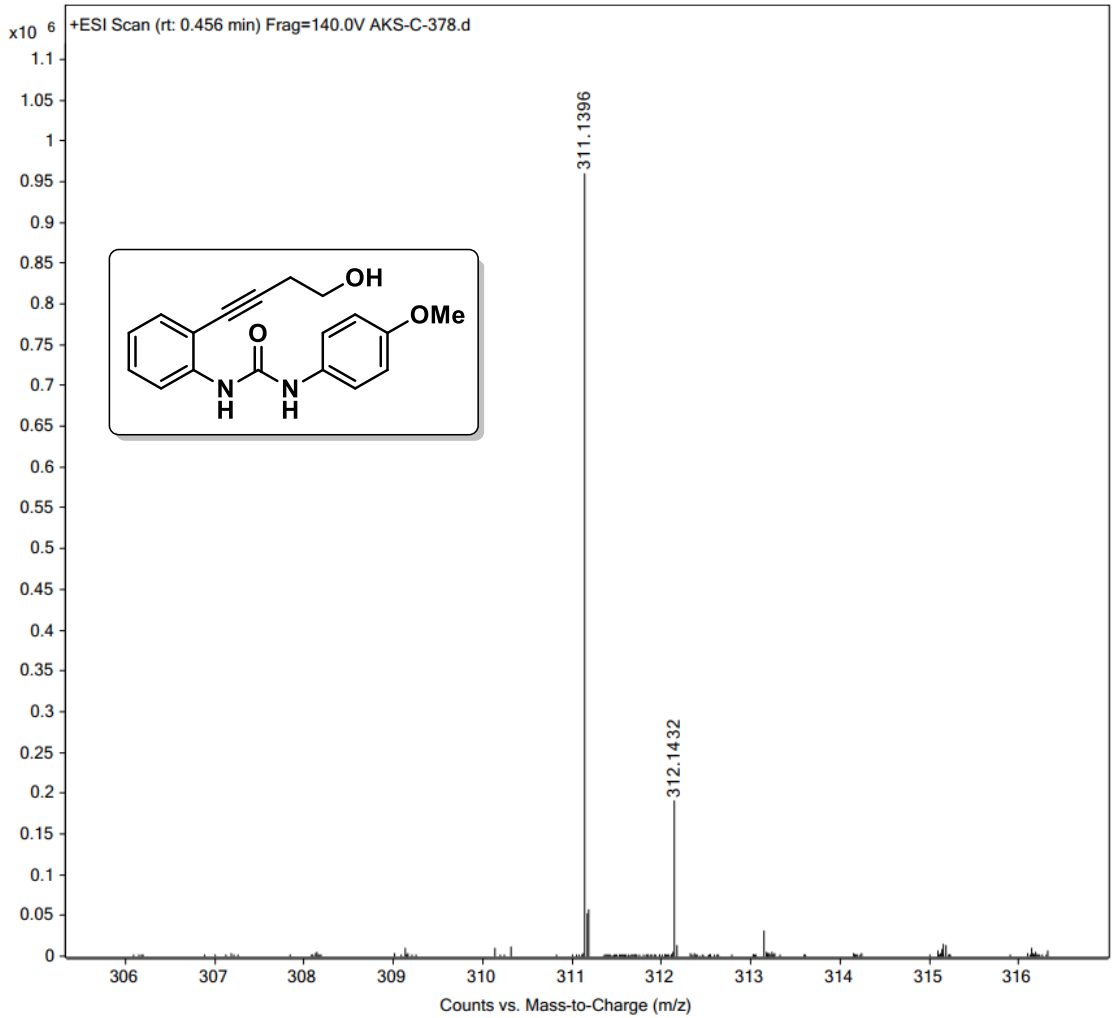


Figure S35. ^{1}H spectrum of compound **1r** (400 MHz, $CDCl_3$)

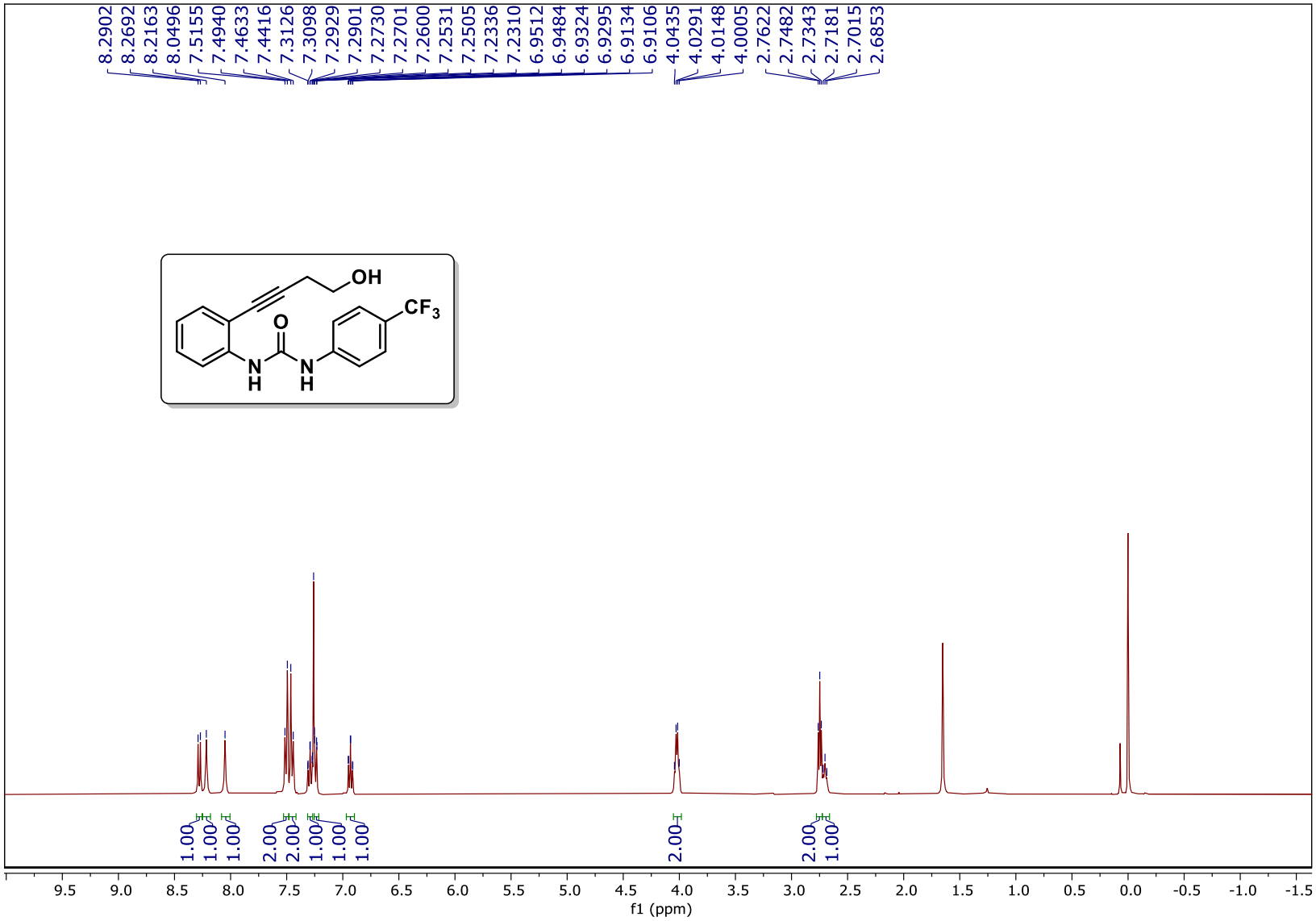


Figure S36. ^{13}C spectrum of compound **1r** (125 MHz, $CDCl_3$)

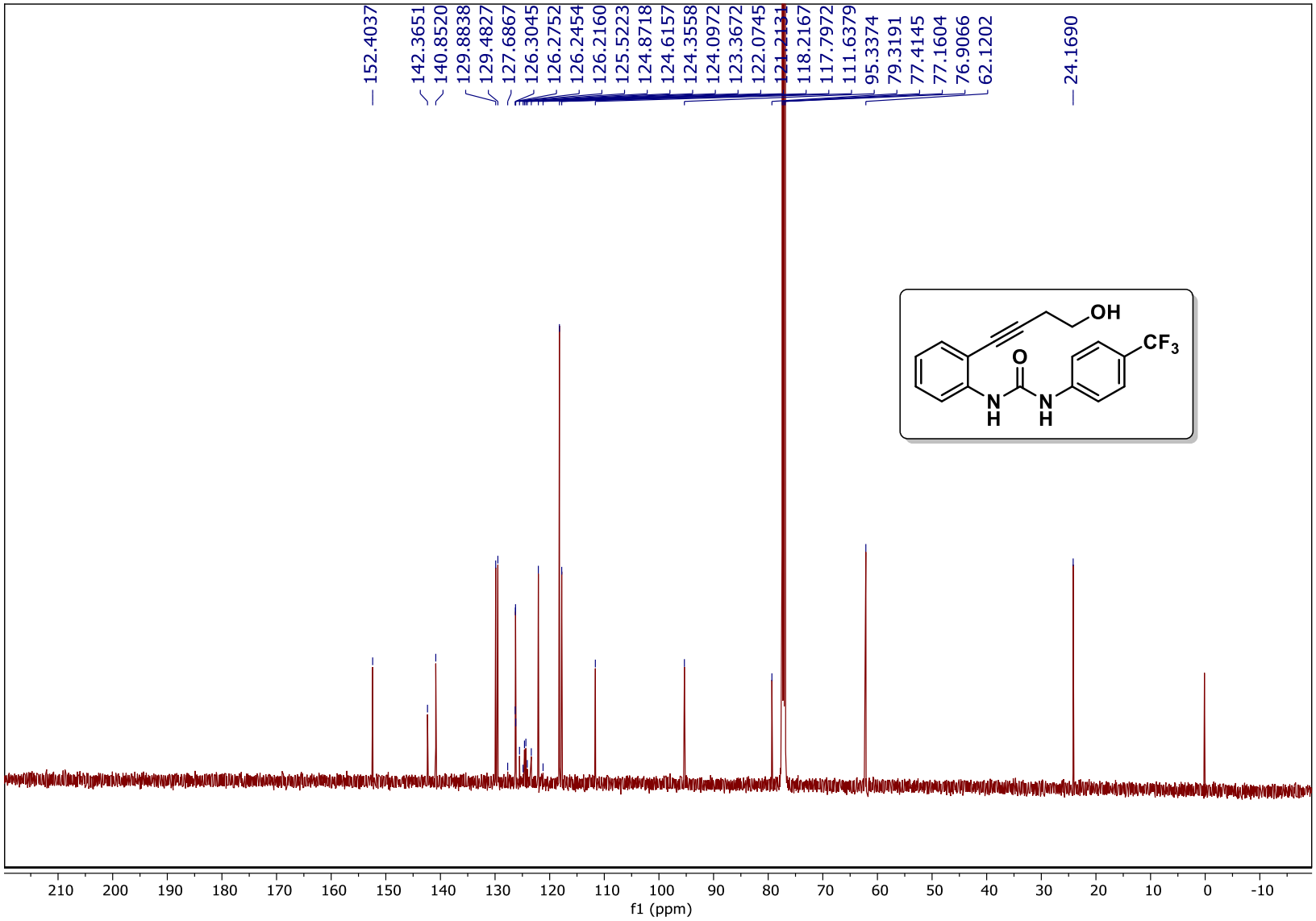


Figure S37. ^{19}F spectrum of compound **1r** (470 MHz, $CDCl_3/C_6F_6$)

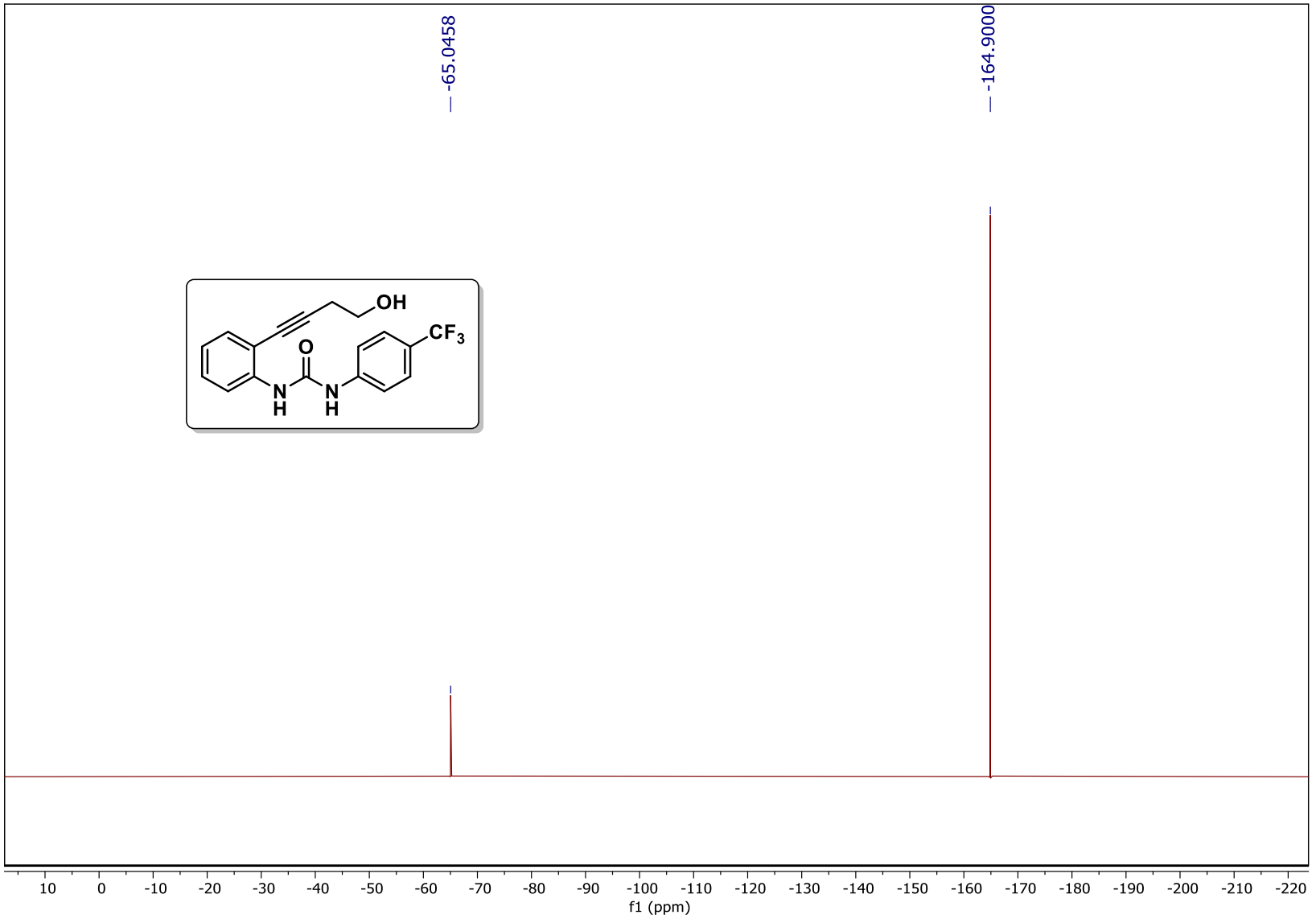


Figure S38. HRMS spectrum of **1r**

Sample Name	Sample20	**Position**	P1-B9	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	SP-C-368.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	21-09-2023 11:29:14 (UTC+05:30)

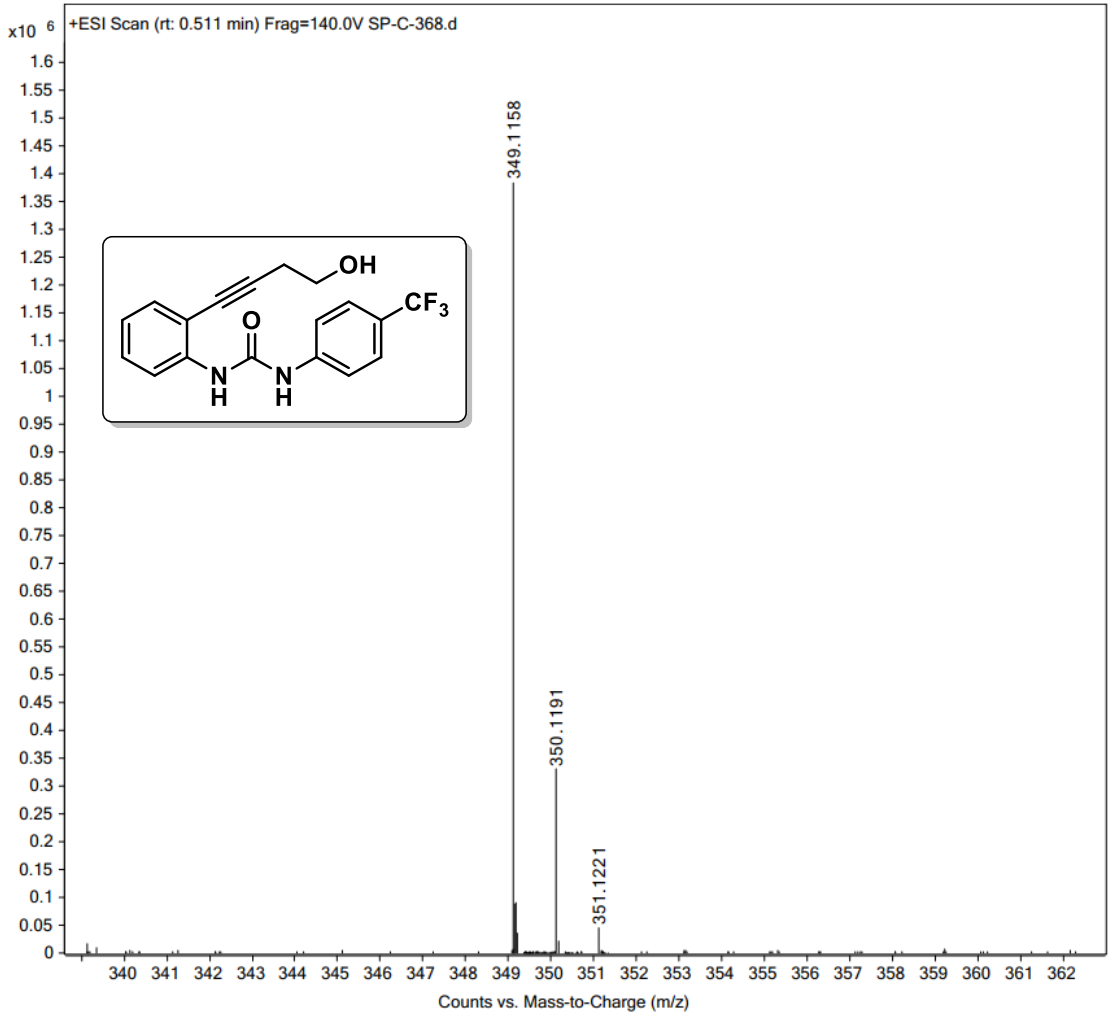


Figure S39. ^{1}H spectrum of compound **1w** (400 MHz, $CDCl_3$)

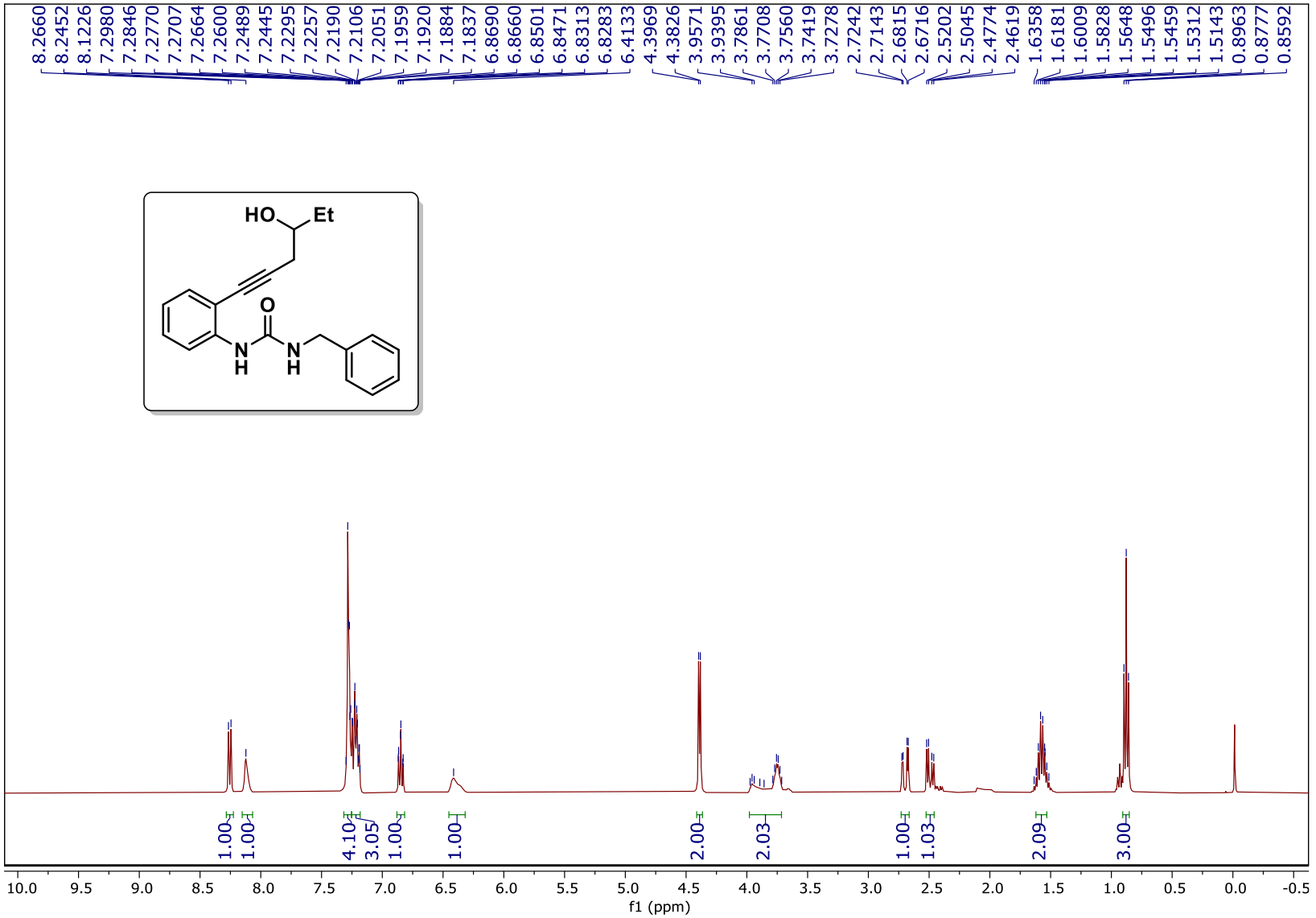


Figure S40. ^{13}C spectrum of compound **1w** (125 MHz, $CDCl_3$)

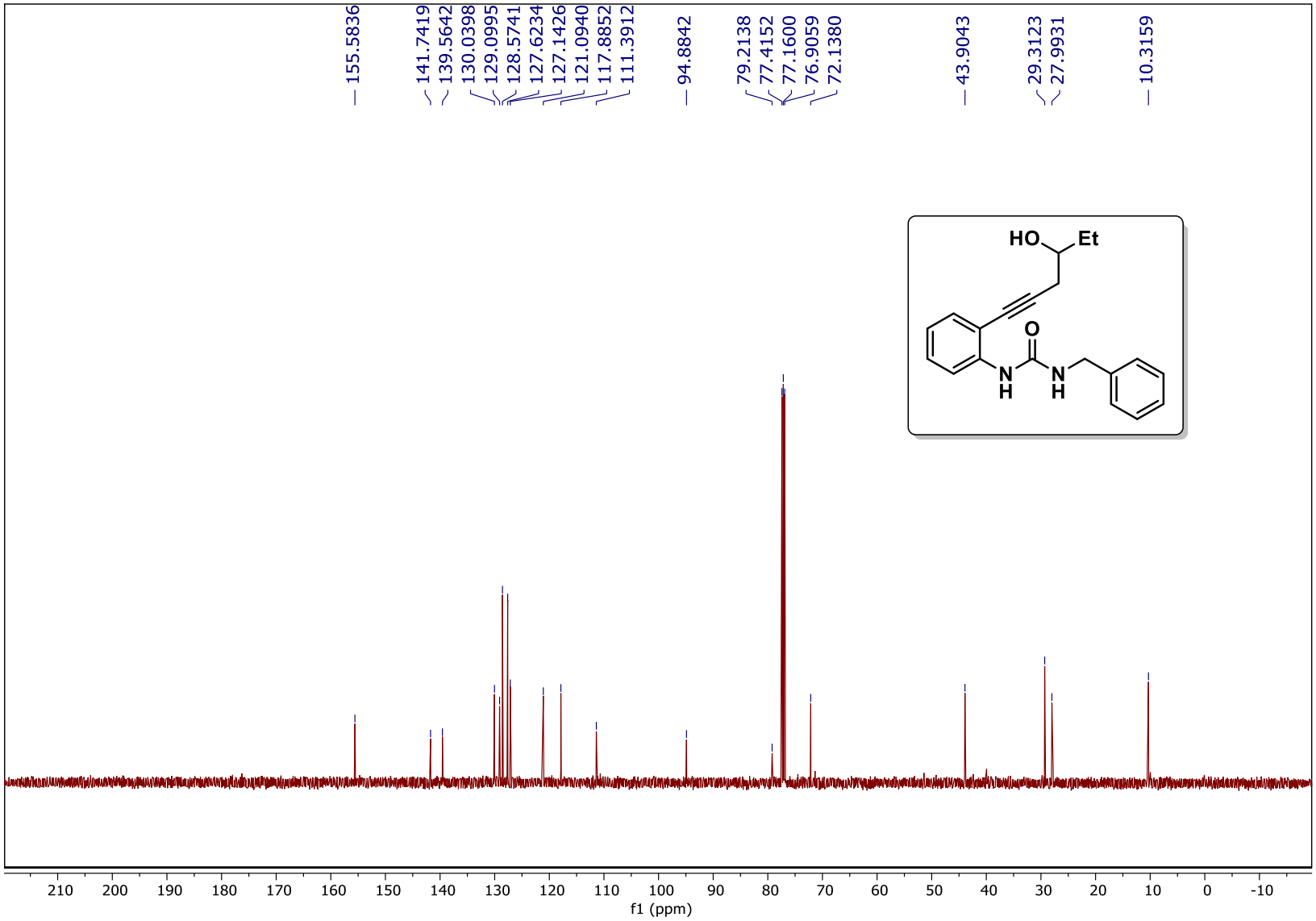


Figure S41. HRMS spectrum of **1w**

Sample Name	Sample17	**Position**	P1-B6	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-371.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	26-09-2023 10:49:11 (UTC+05:30)

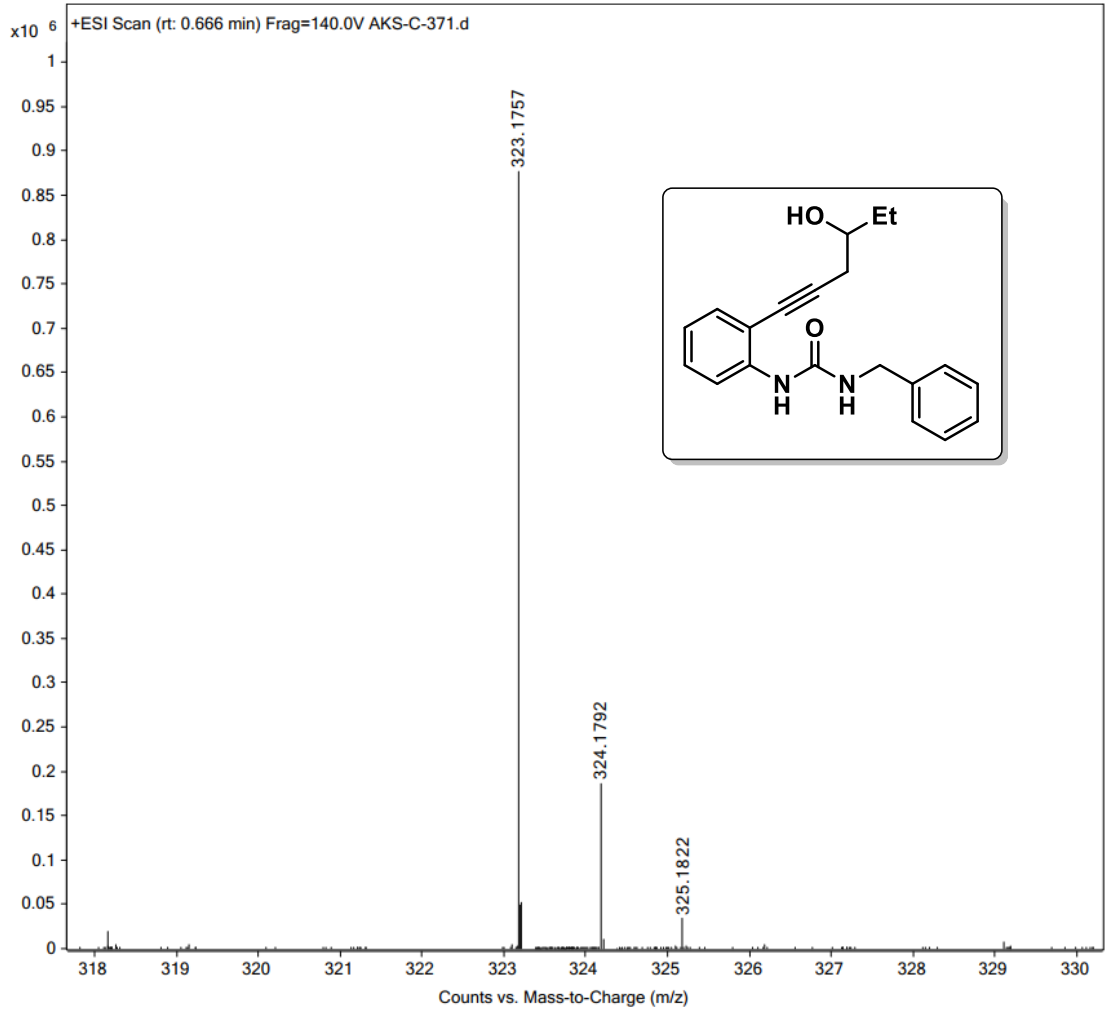


Figure S42. ^{1}H spectrum of compound **1x** (500 MHz, $CDCl_3$)

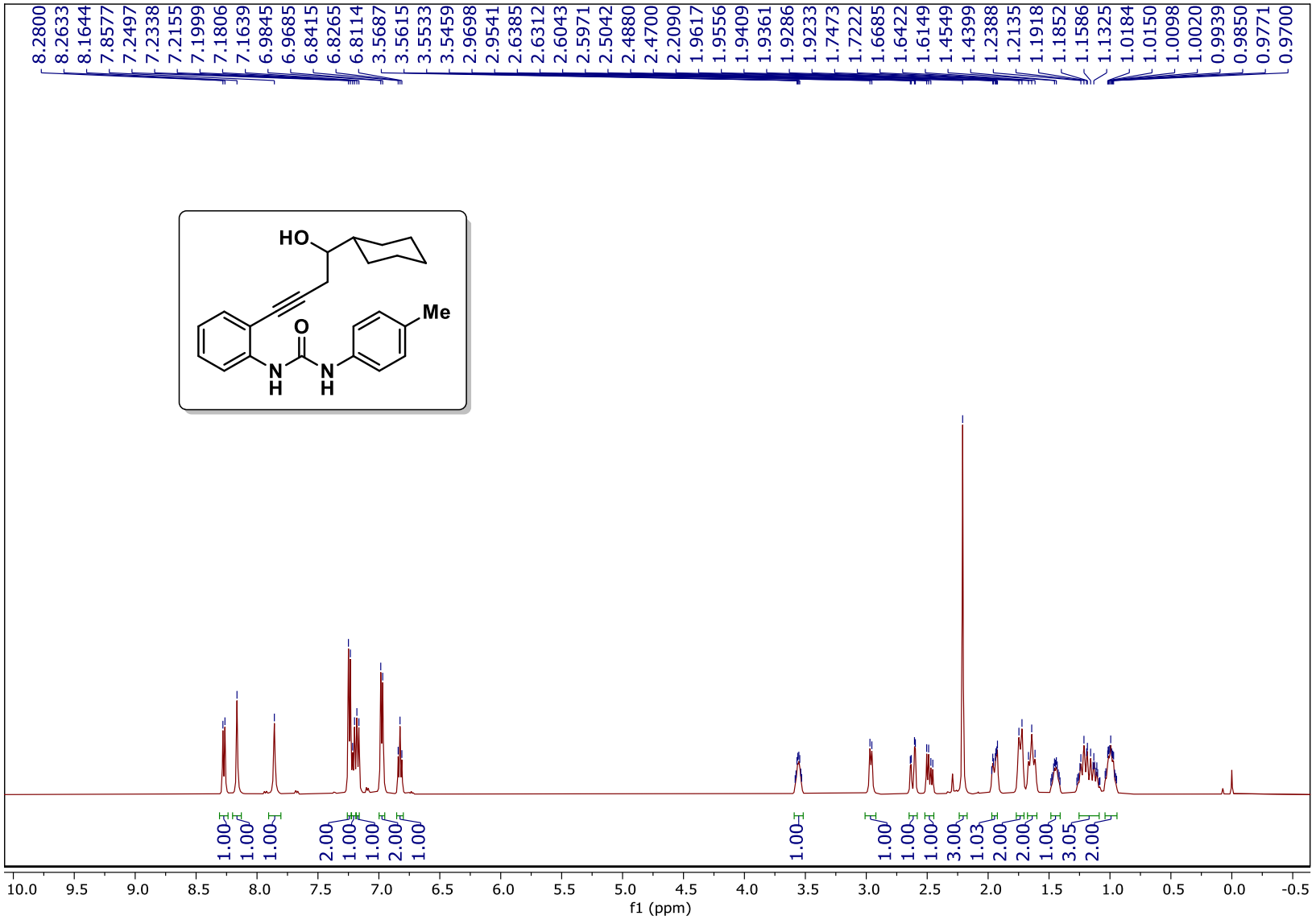


Figure S43. ^{13}C spectrum of compound **1x** (125 MHz, $CDCl_3$)

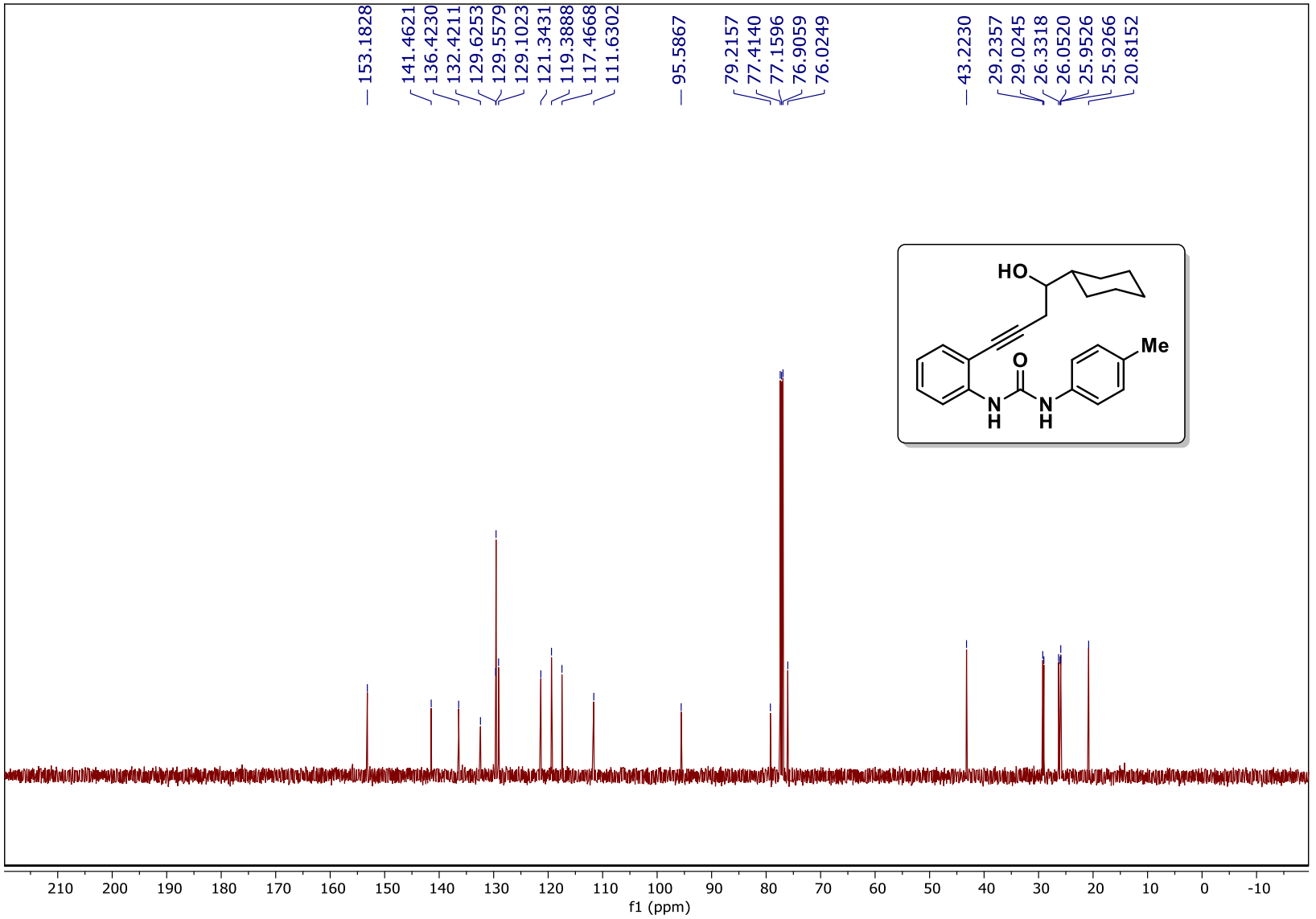


Figure S44. HRMS spectrum of **1x**

Sample Name	Sample15	**Position**	P1-B3	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-360.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	25-09-2023 10:12:41 (UTC+05:30)

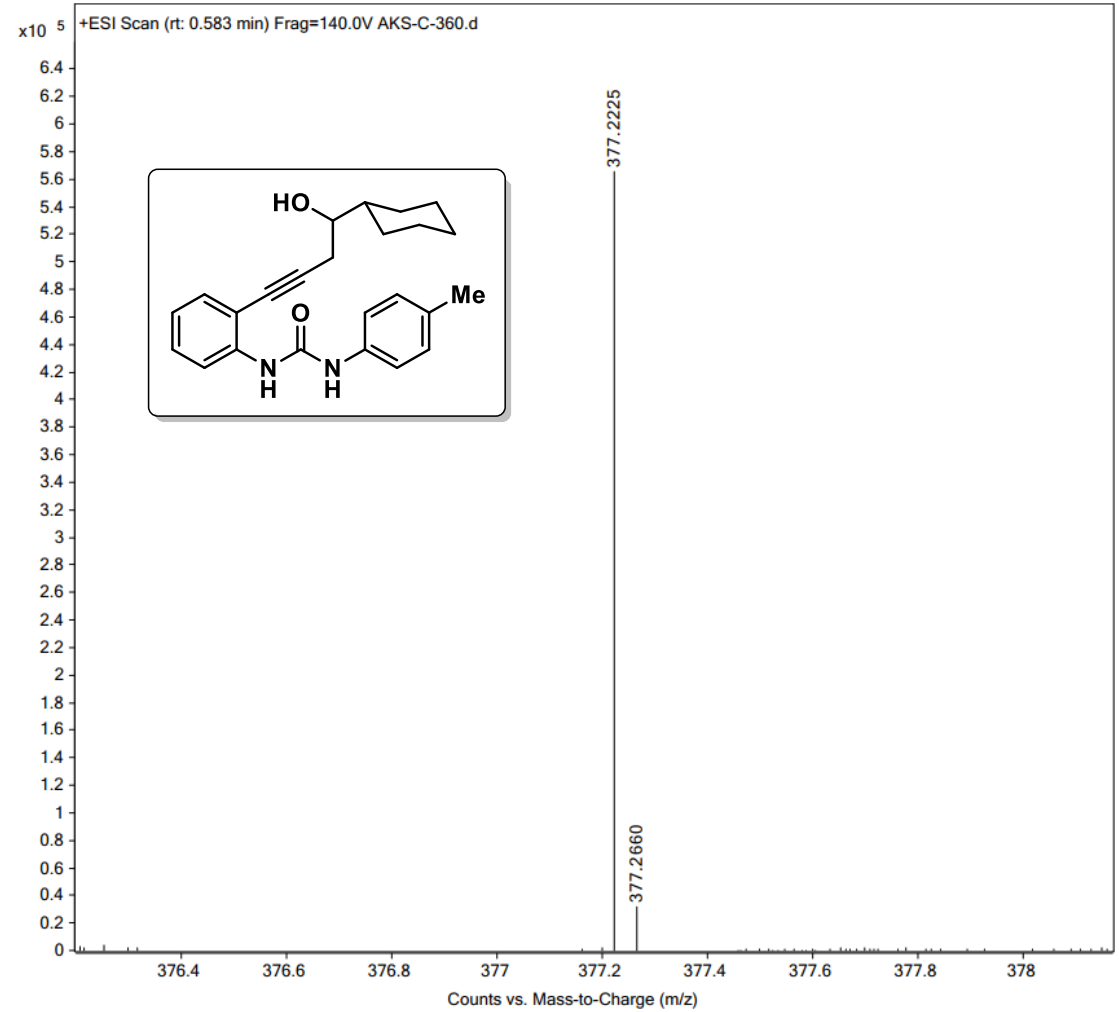


Figure S45. ^{1}H spectrum of compound **1y** (500 MHz, $CDCl_3$)

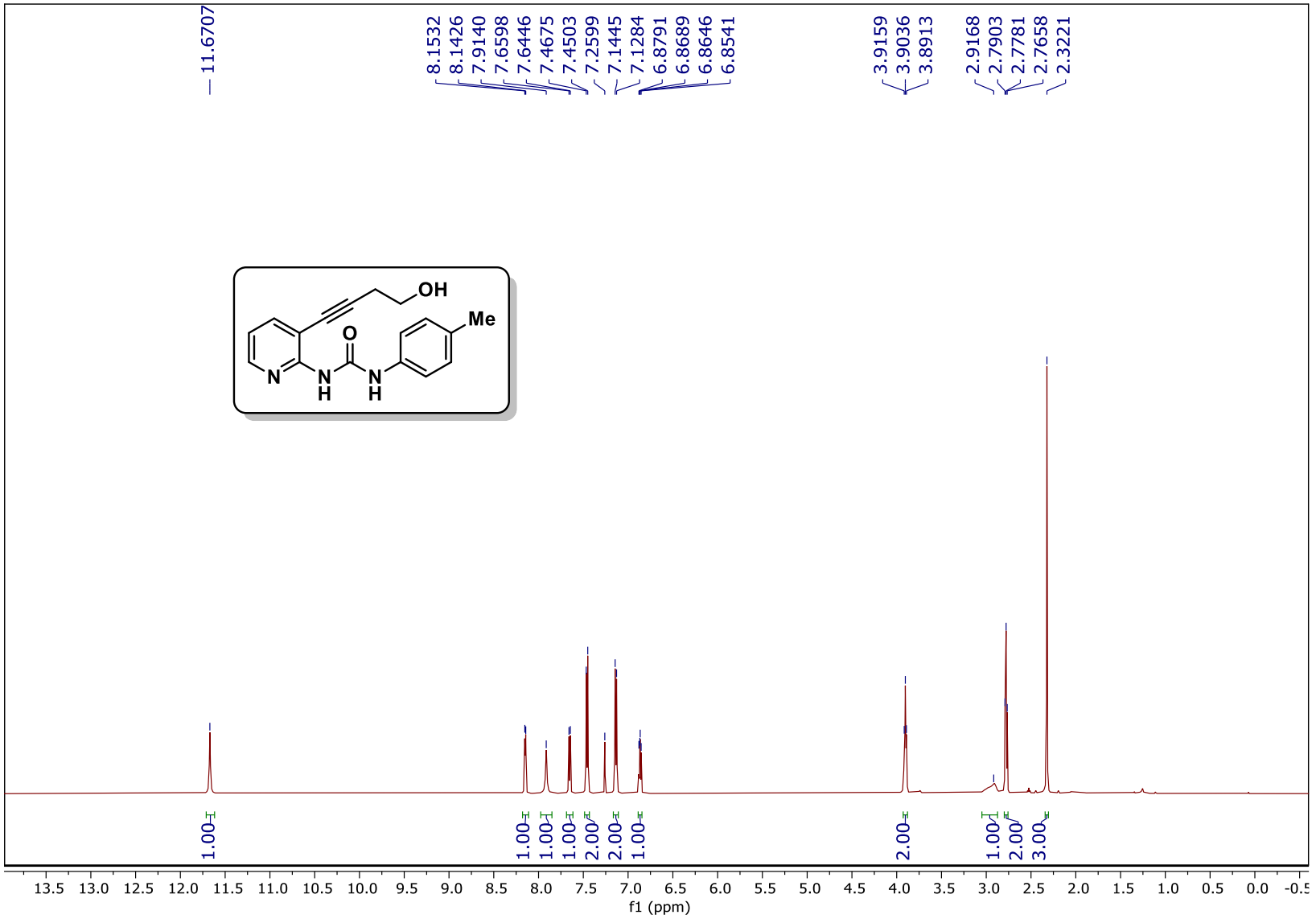


Figure S46. ^{13}C spectrum of compound **1y** (125 MHz, $CDCl_3$)

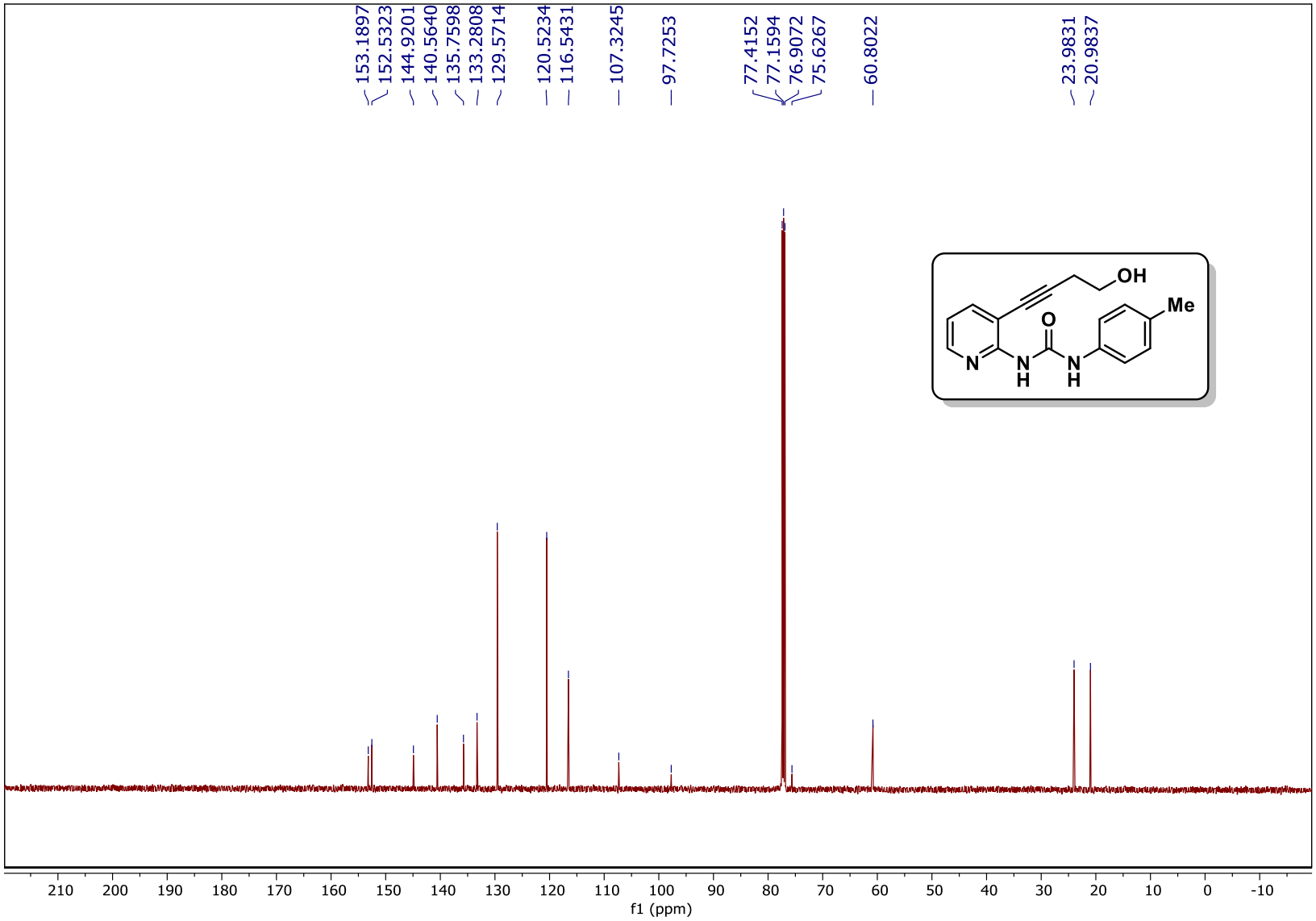


Figure S47. HRMS spectrum of **1y**

Sample Name	Sample14	**Position**	P1-A9	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC473.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	12-01-2024 15:02:50 (UTC+05:30)

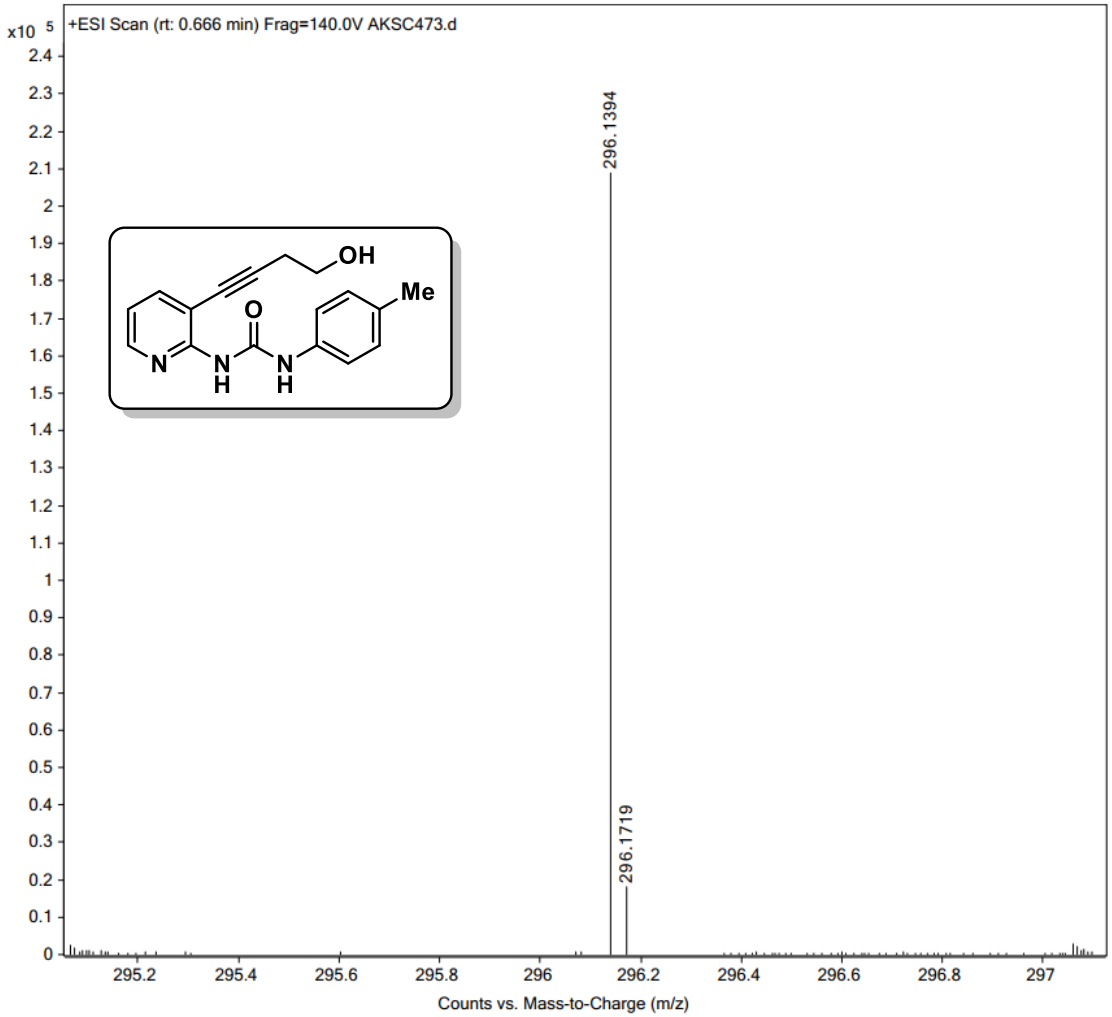


Figure S48. ^{1}H spectrum of compound **1aa** (500 MHz, $CDCl_3$)

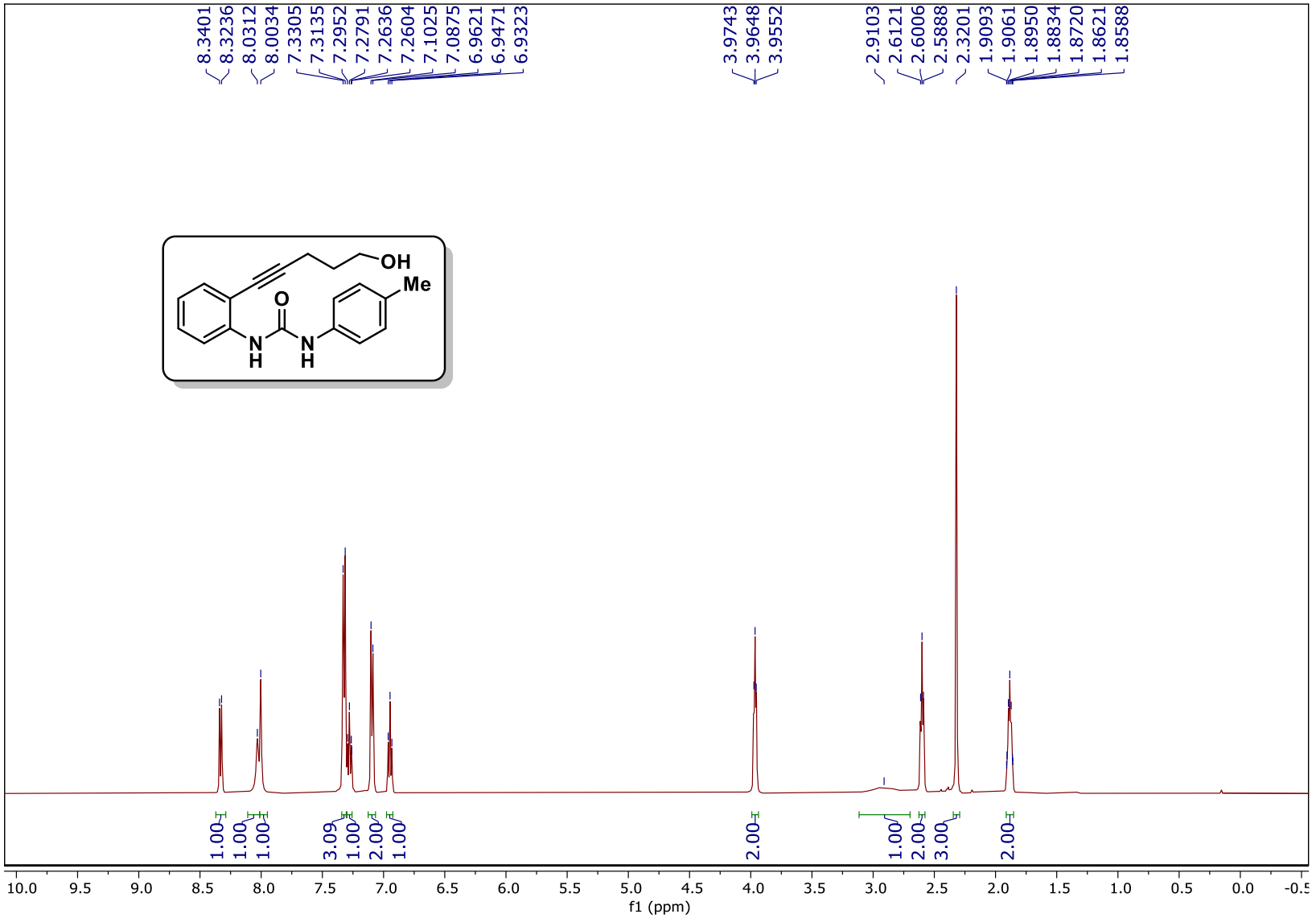


Figure S49. ^{13}C spectrum of compound **1aa** (125 MHz, $CDCl_3$)

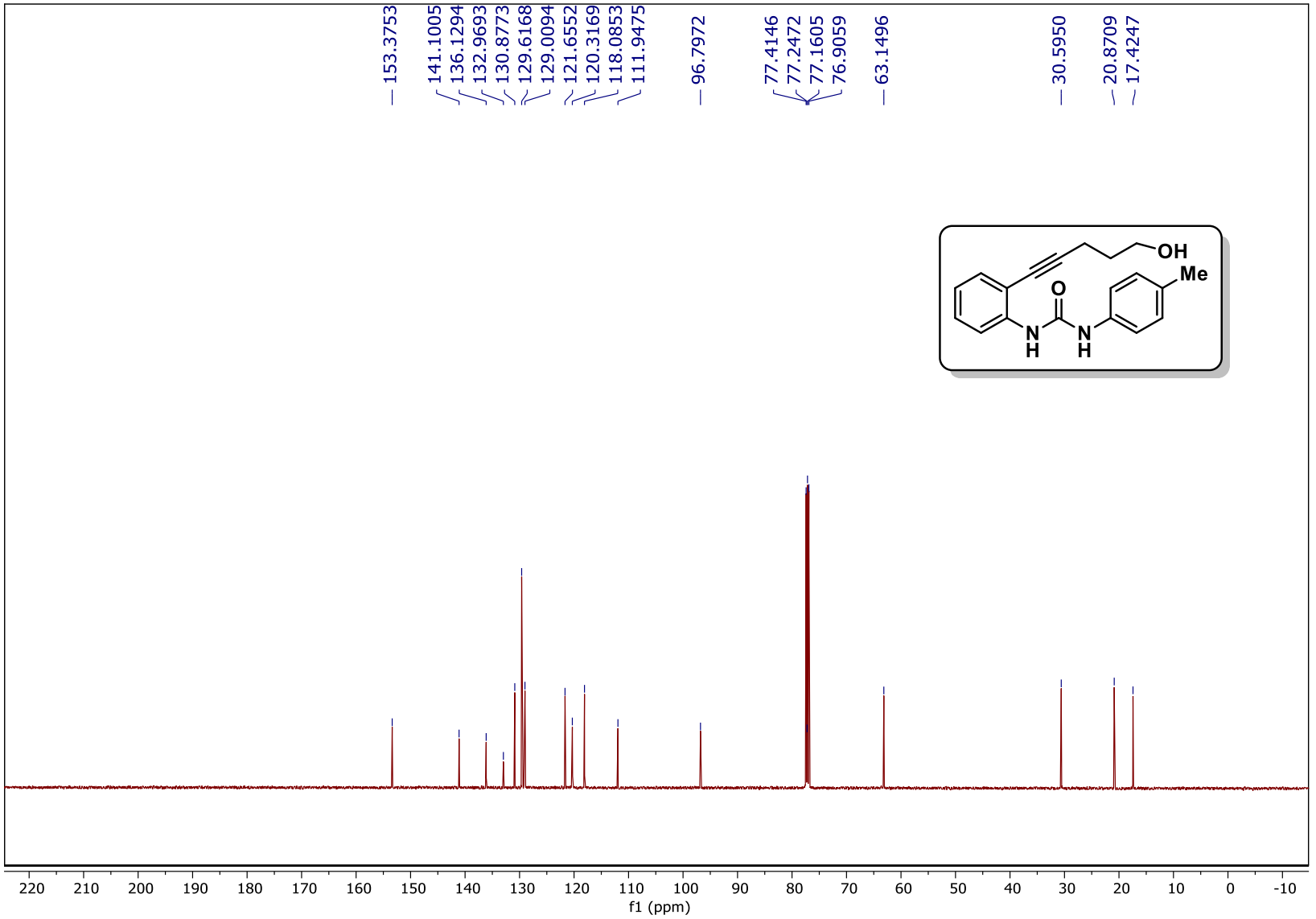


Figure S50. HRMS spectrum of **1aa**

Sample Name		**Position**	P1-A3	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC114.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	03-10-2023 15:08:05 (UTC+05:30)

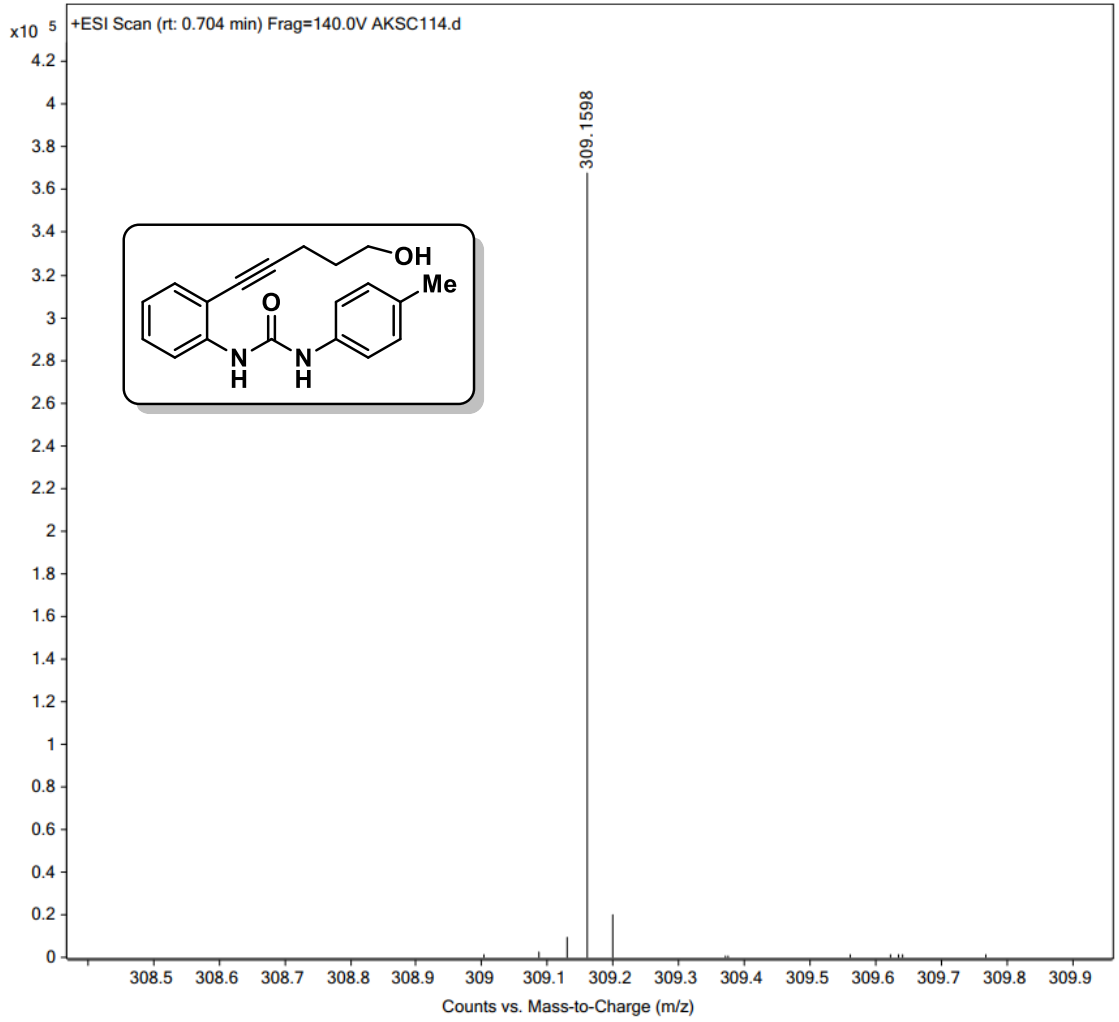


Figure S51. ^{1}H spectrum of compound **1ab** (500 MHz, $CDCl_3$)

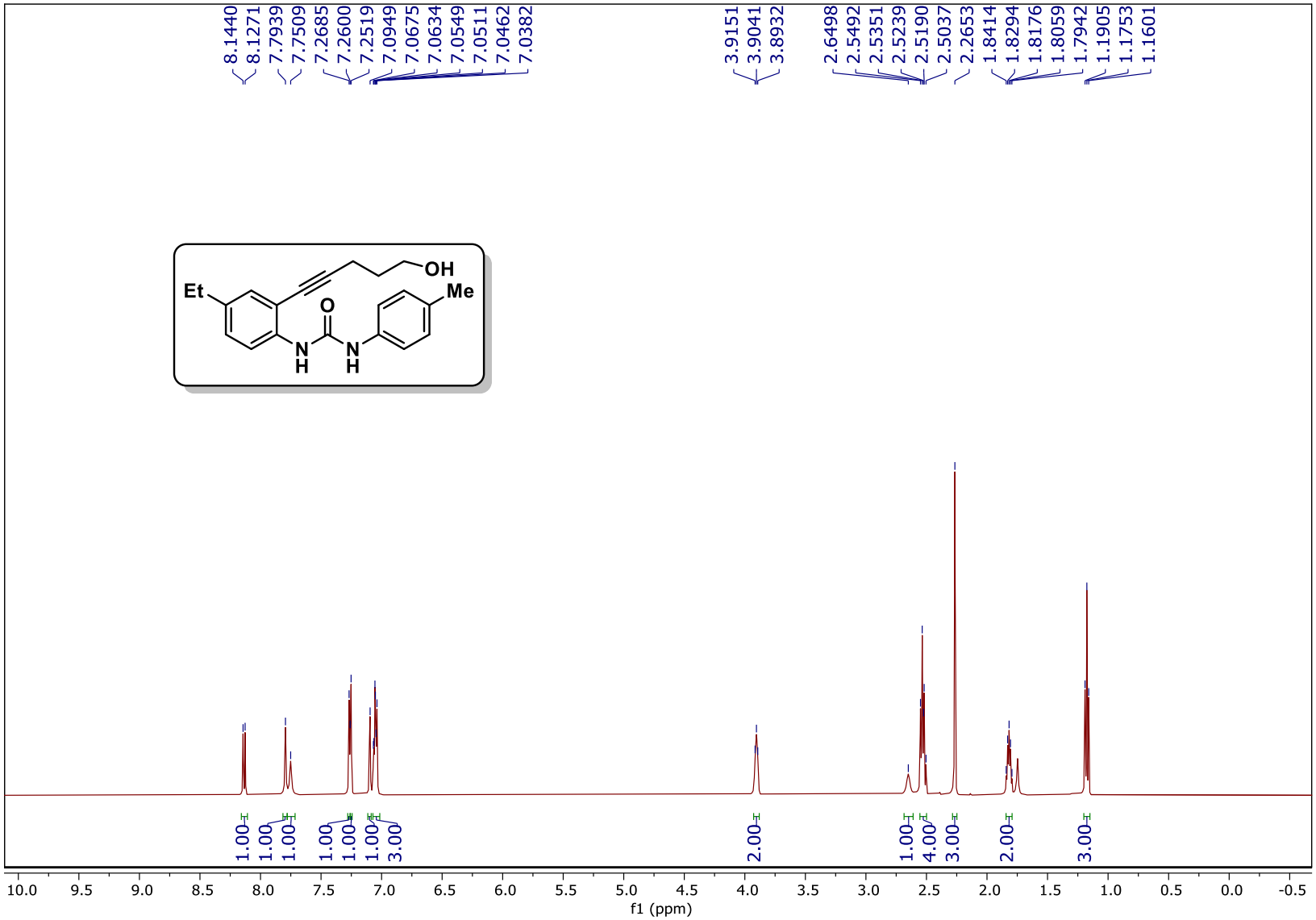


Figure S52. ^{13}C spectrum of compound **1ab** (125 MHz, $CDCl_3$)

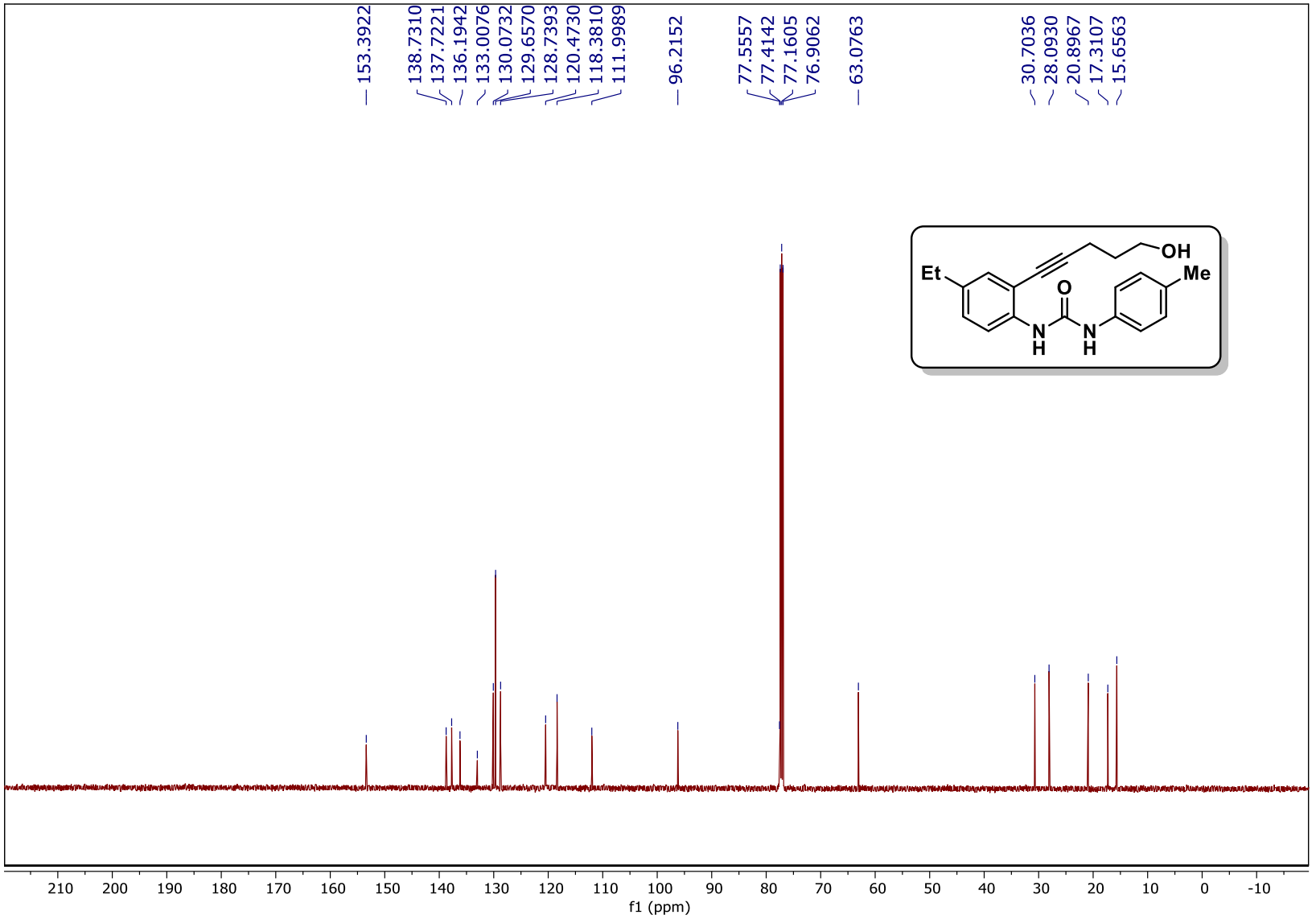


Figure S53. HRMS spectrum of **1ab**

Sample Name	Sample23	**Position**	P1-C1	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC474.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	19-01-2024 10:32:01 (UTC+05:30)

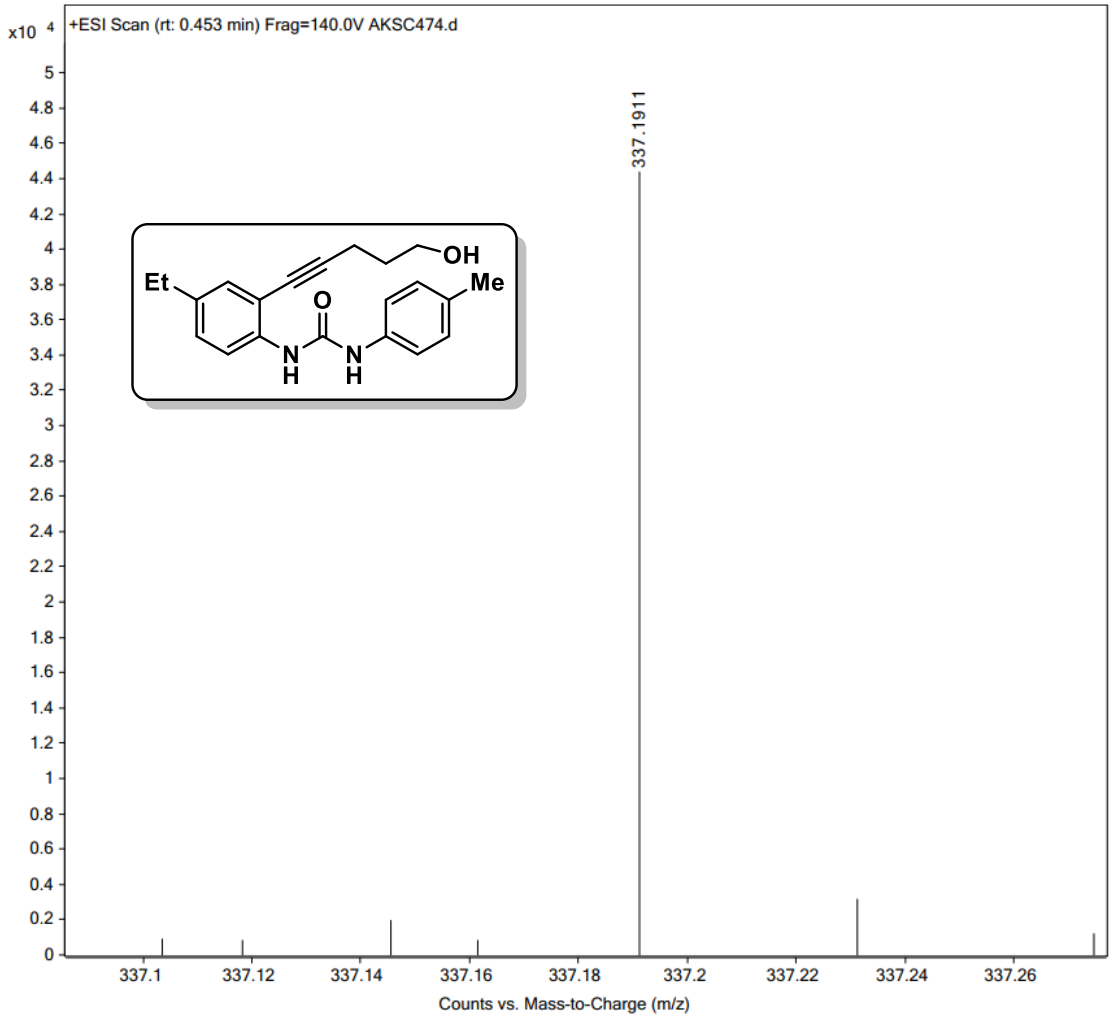


Figure S54. ^{1}H spectrum of compound **2a** (500 MHz, $CDCl_3$)

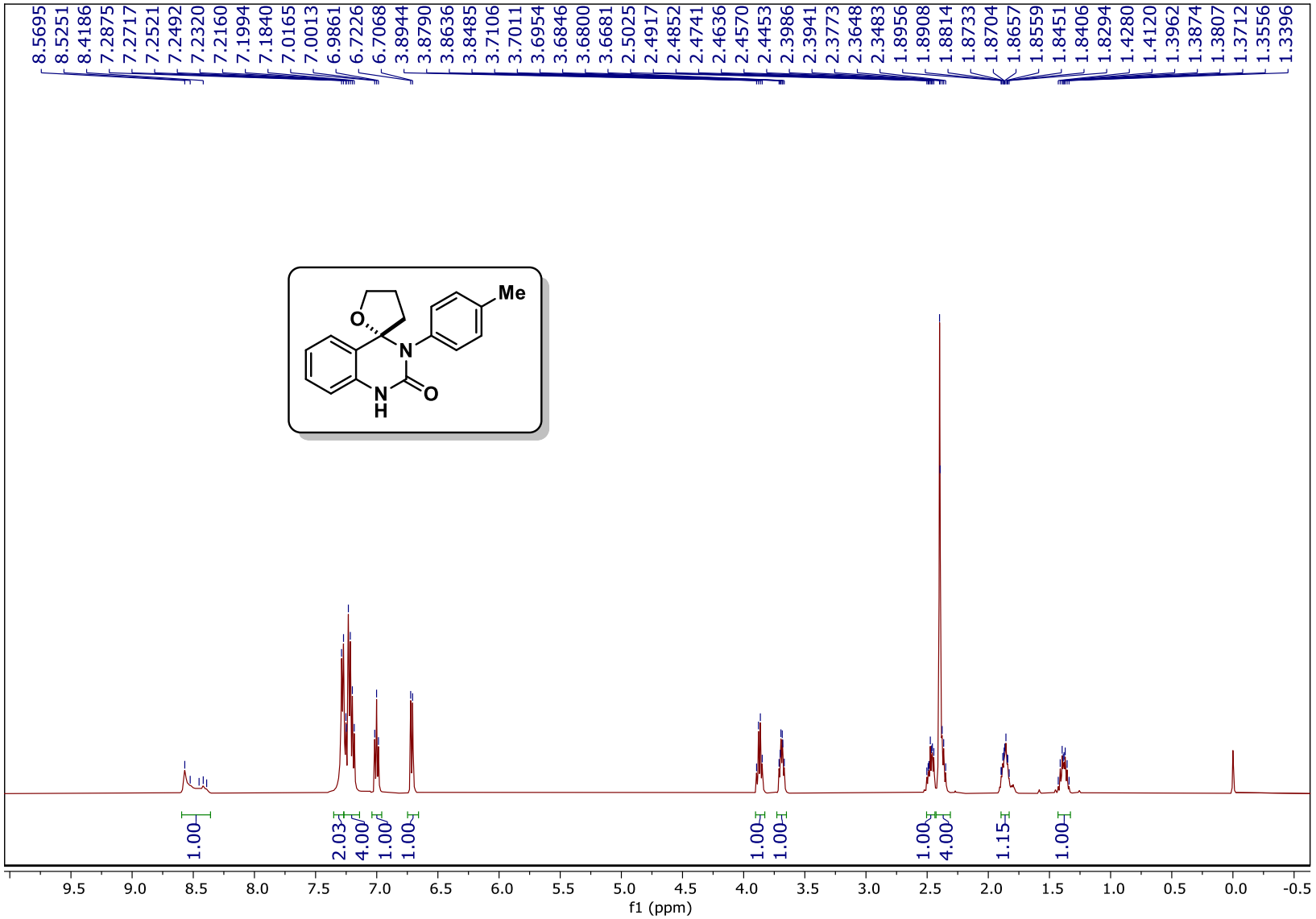


Figure S55. ^{13}C spectrum of compound **2a** (125 MHz, $CDCl_3$)

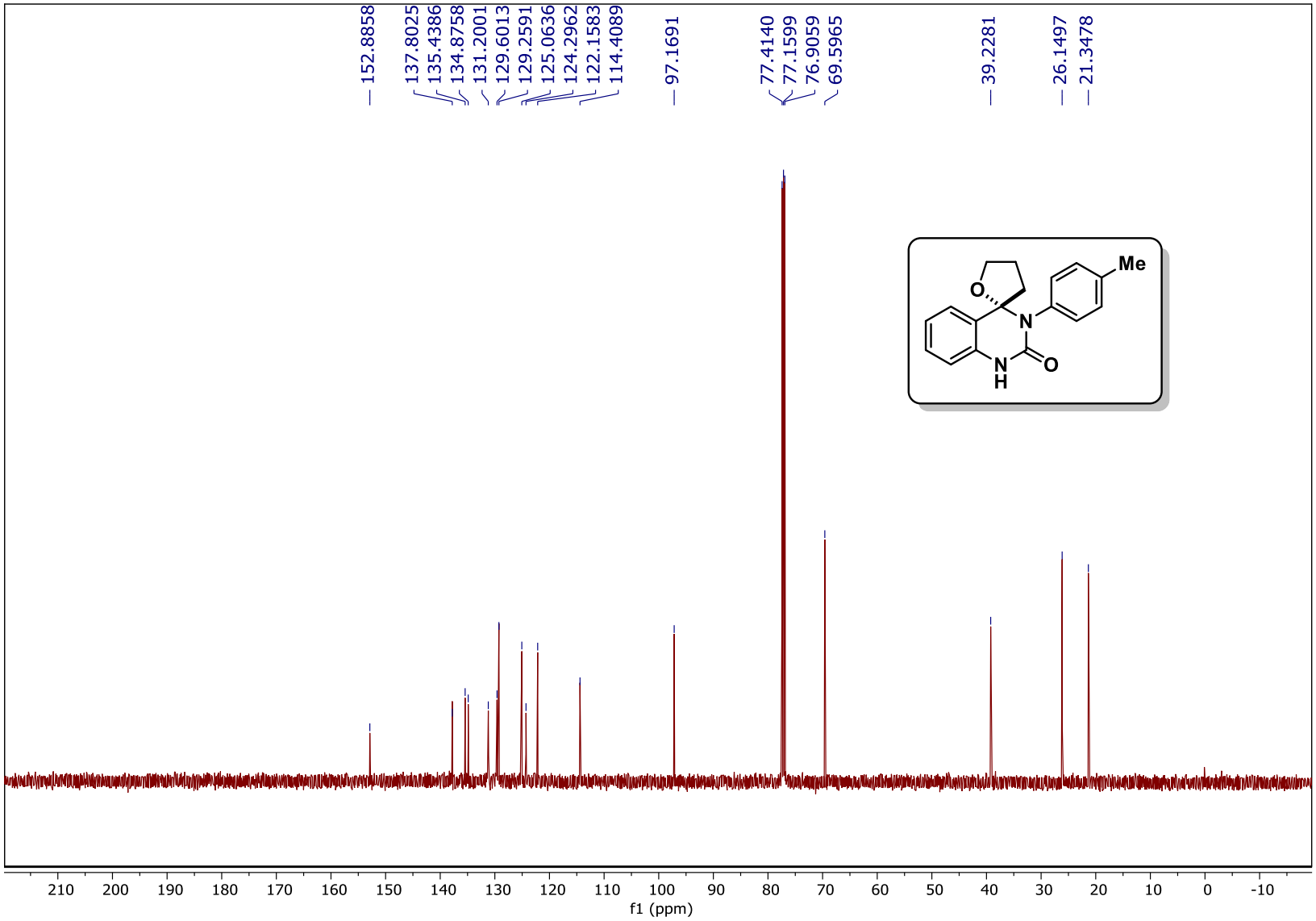


Figure S56. HRMS spectrum of **2a**

Sample Name	Sample24	**Position**	P1-C1	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	SB C 210.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	22-05-2023 10:56:16 (UTC+05:30)

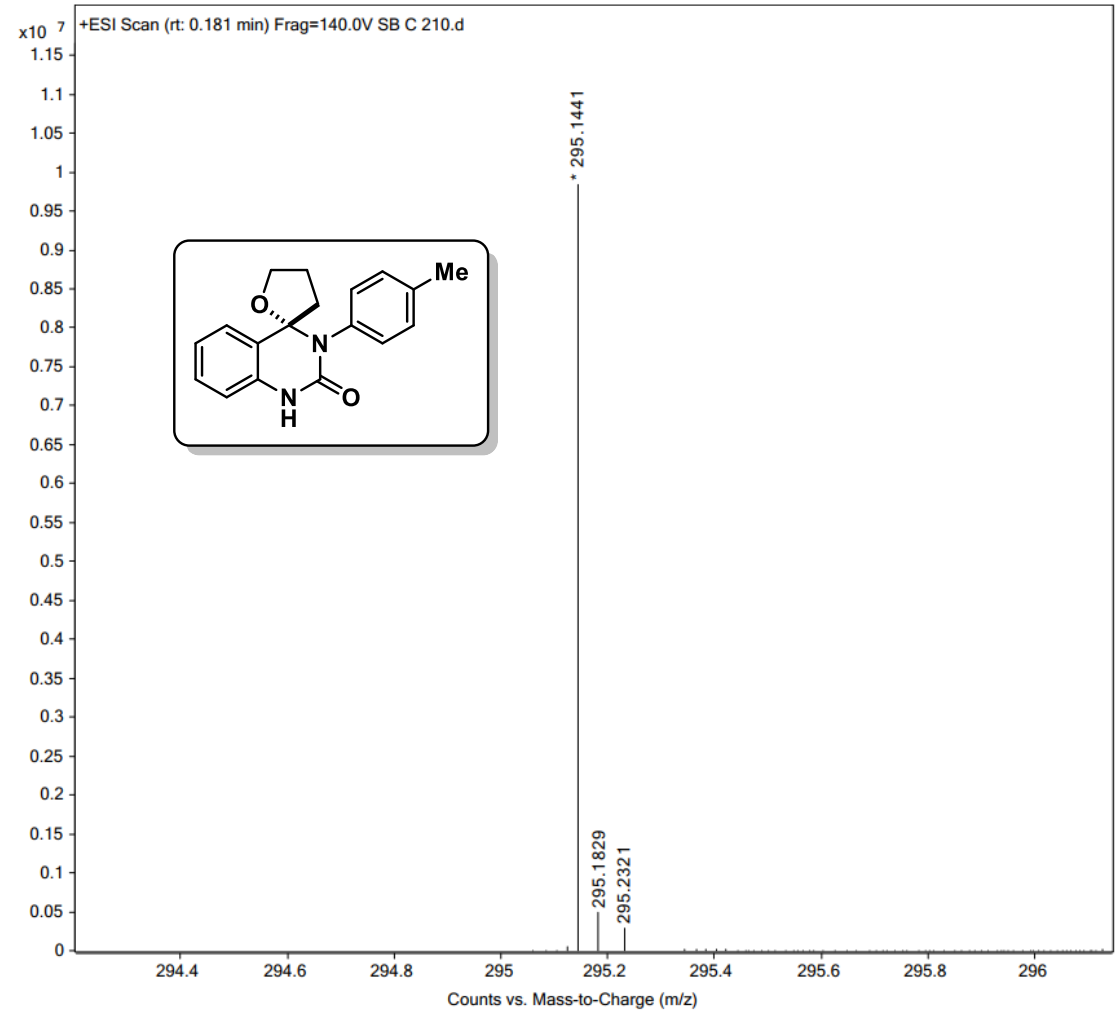


Figure S57. ^{1}H spectrum of compound **2b** (400 MHz, $CDCl_3$)

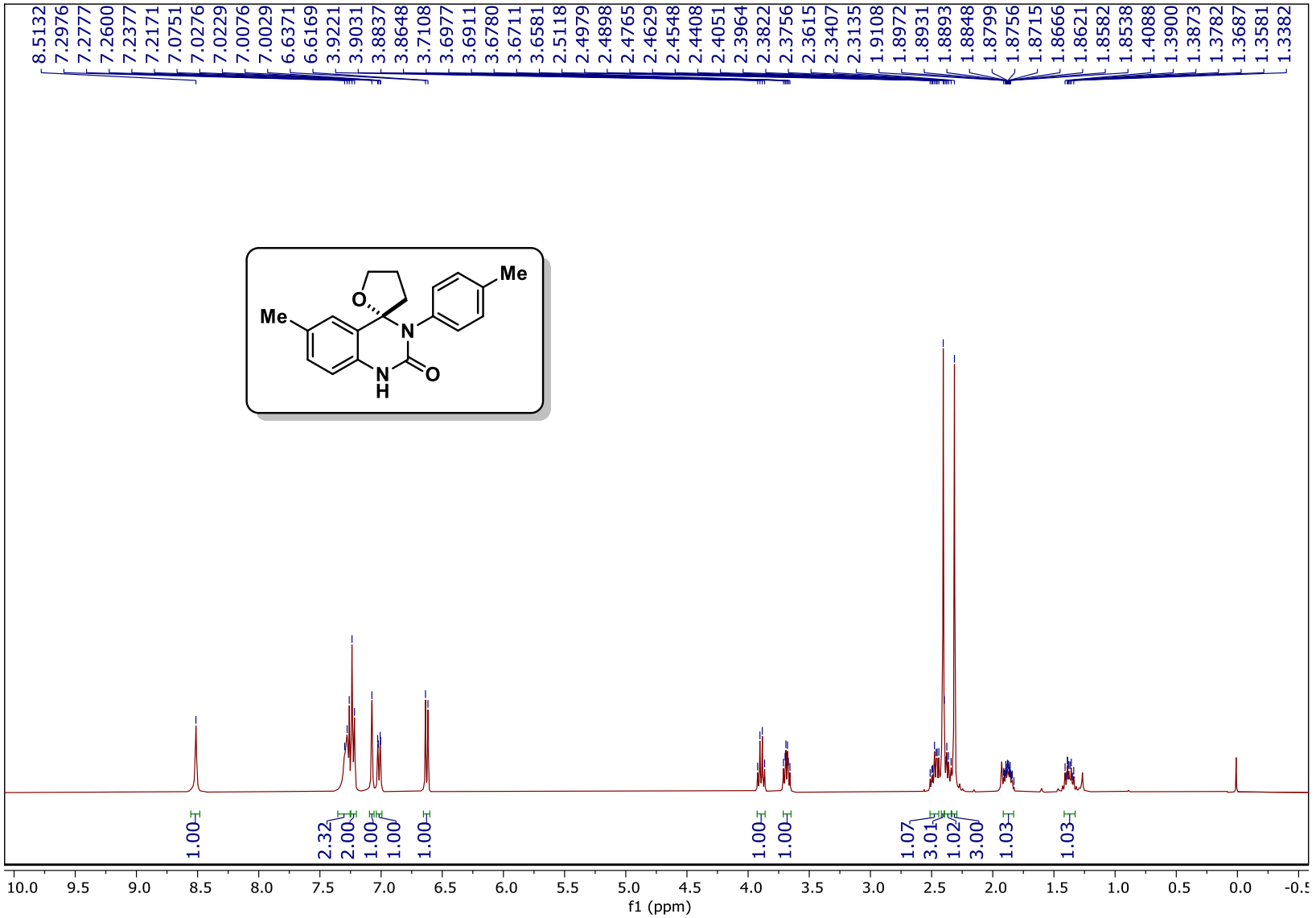


Figure S58. ^{13}C spectrum of compound **2b** (125 MHz, $CDCl_3$)

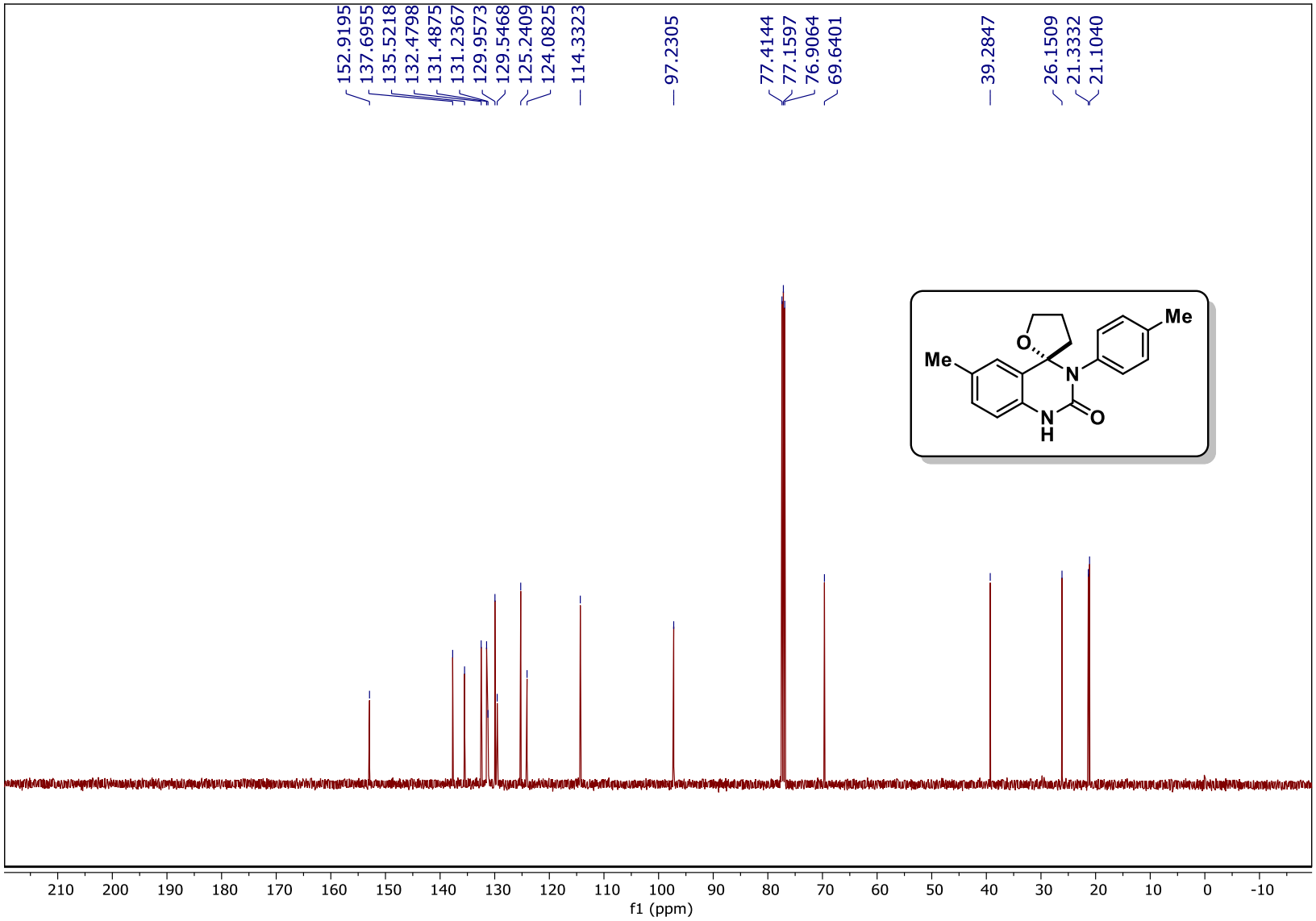


Figure S59. HRMS spectrum of **2b**

Sample Name	Sample12	**Position**	P1-A10	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-255.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	12-06-2023 15:24:32 (UTC+05:30)

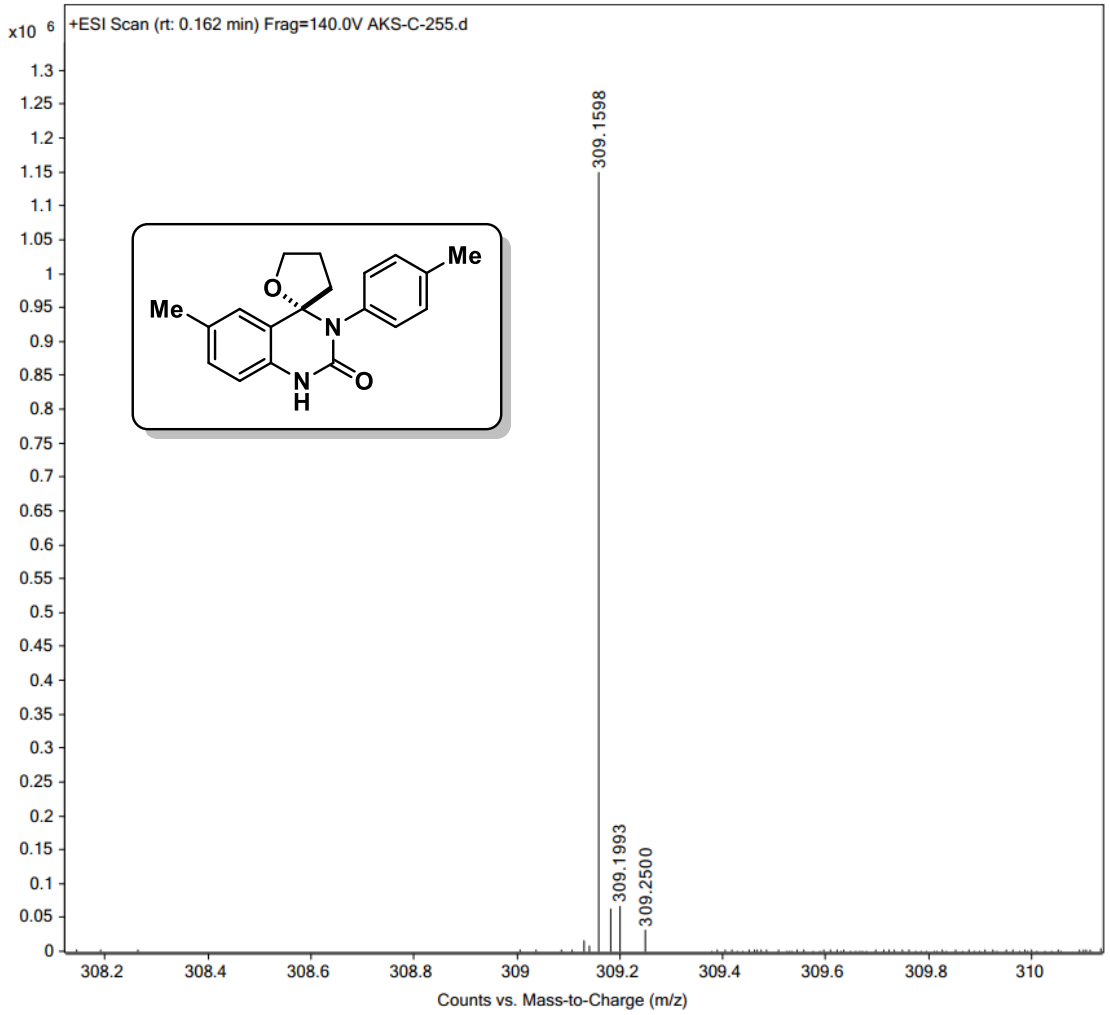


Figure S60. ^{1}H spectrum of compound **2c** (400 MHz, $CDCl_3$)

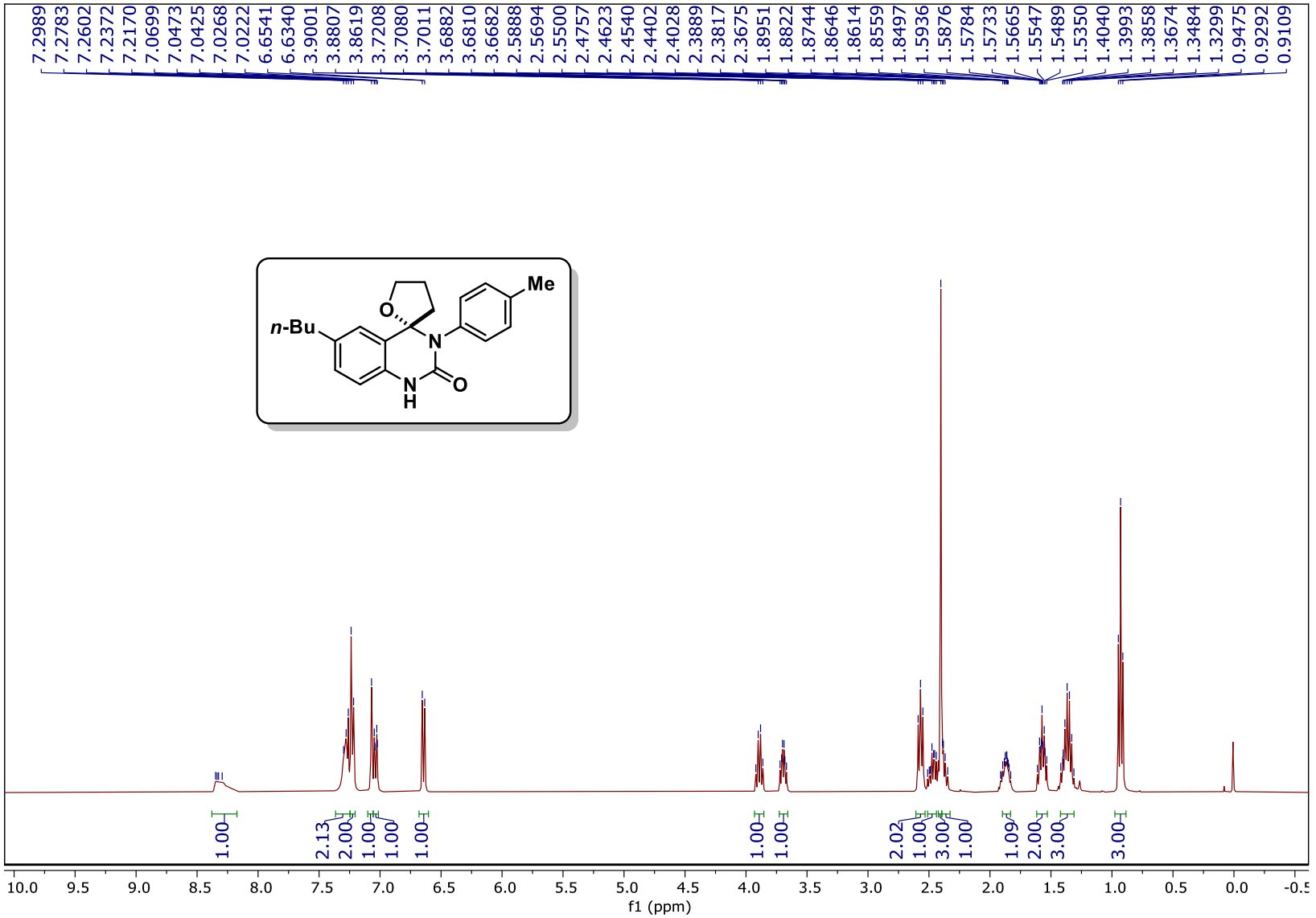


Figure S61. ^{13}C spectrum of compound **2c** (125 MHz, $CDCl_3$)

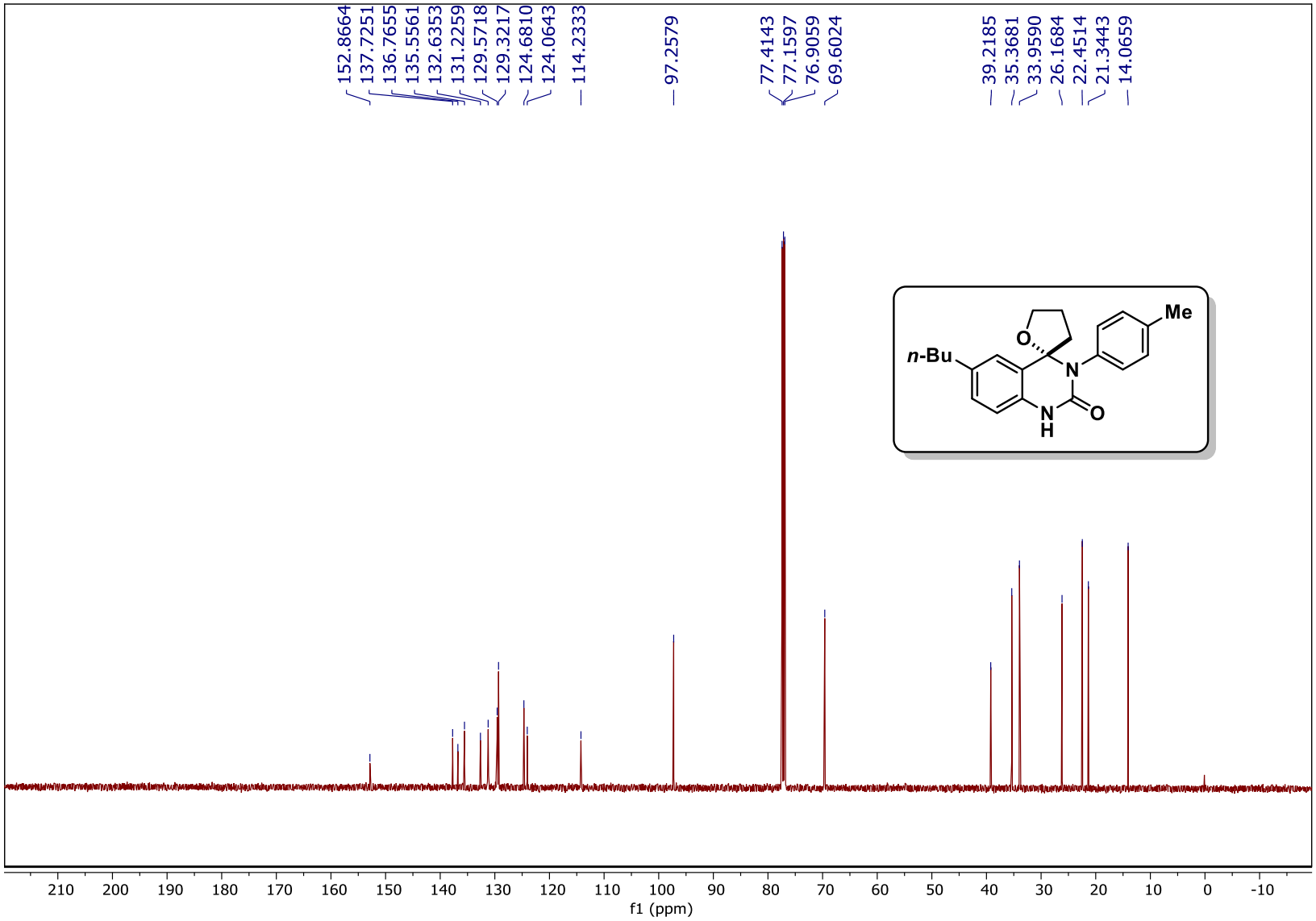


Figure S62. HRMS spectrum of **2c**

Sample Name		**Position**	P1-B8	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC293.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	04-07-2023 17:05:15 (UTC+05:30)

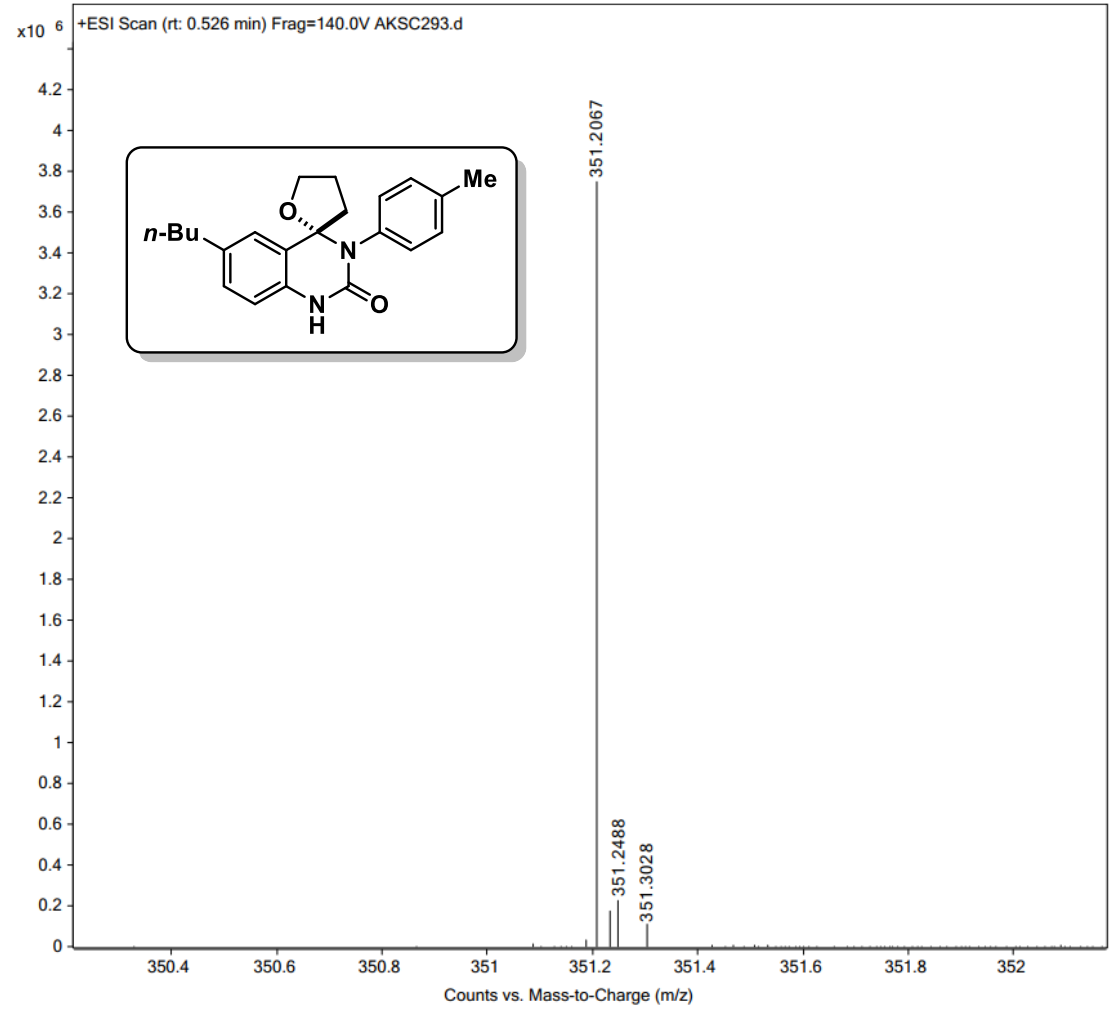


Figure S63. ^{1}H spectrum of compound **2d** (400 MHz, $CDCl_3$)

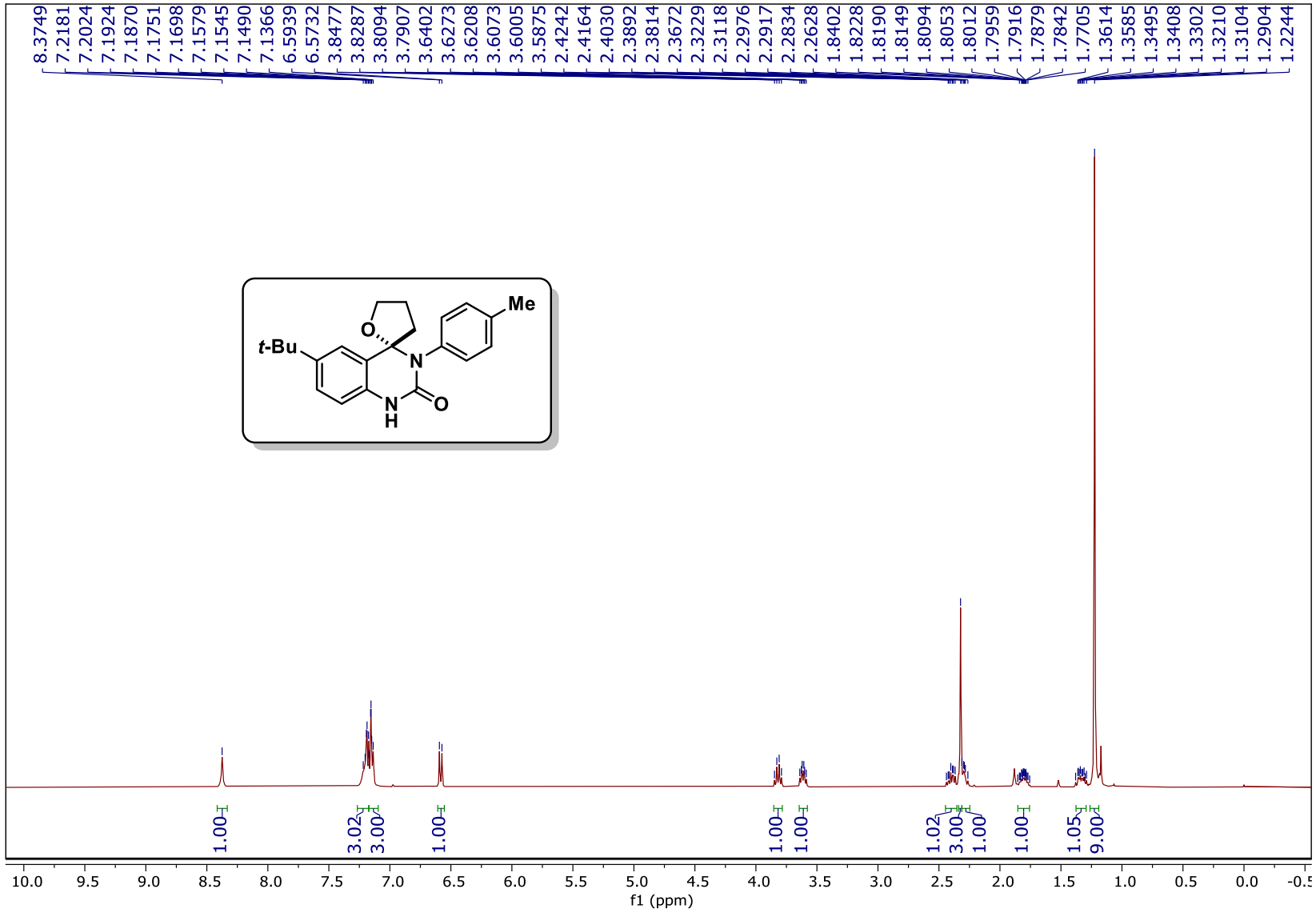


Figure S64. ^{13}C spectrum of compound **2d** (125 MHz, $CDCl_3$)

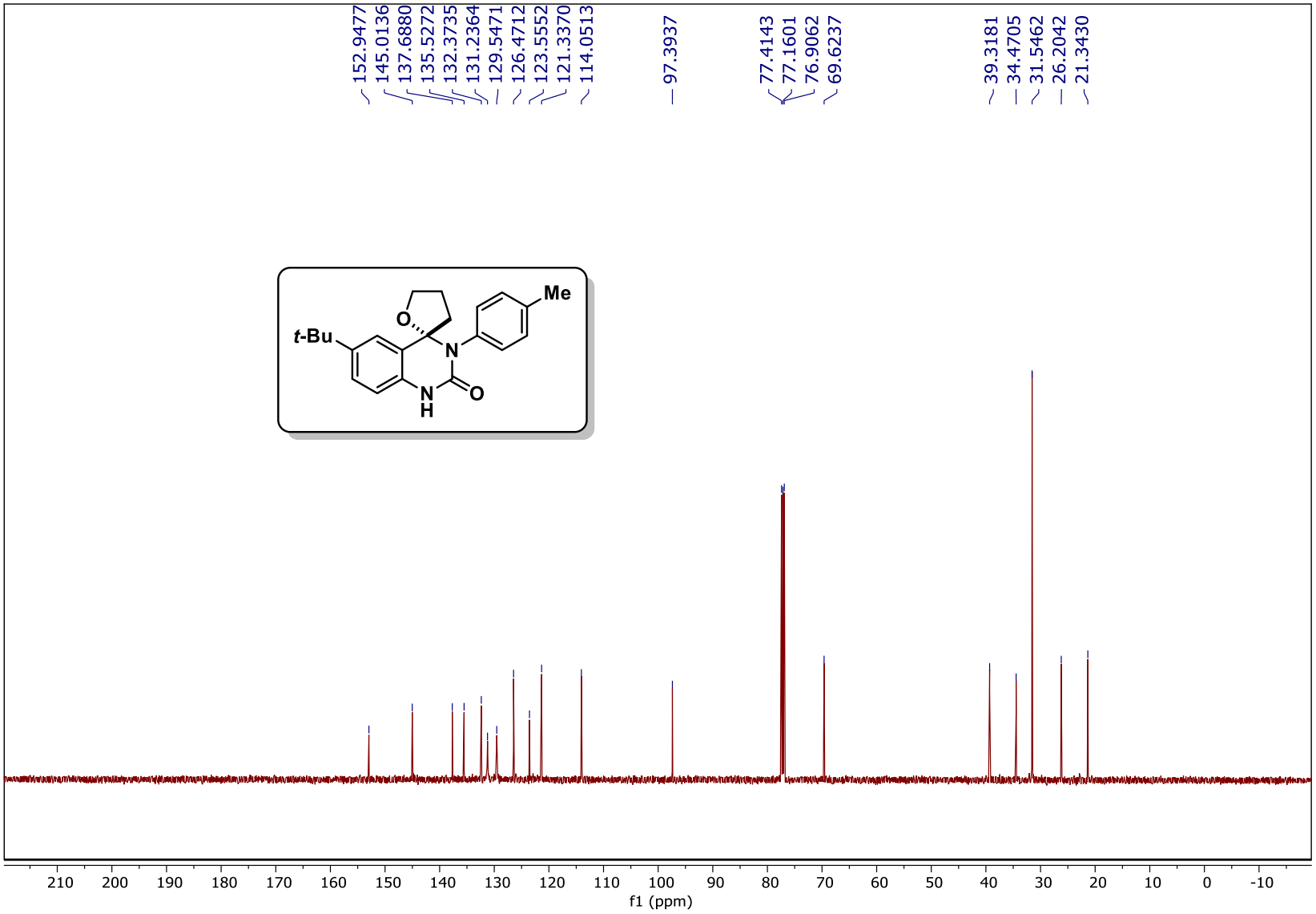


Figure S65. HRMS spectrum of **2d**

Sample Name	Sample13	**Position**	P1-B2	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-259.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	05-06-2023 10:41:08 (UTC+05:30)

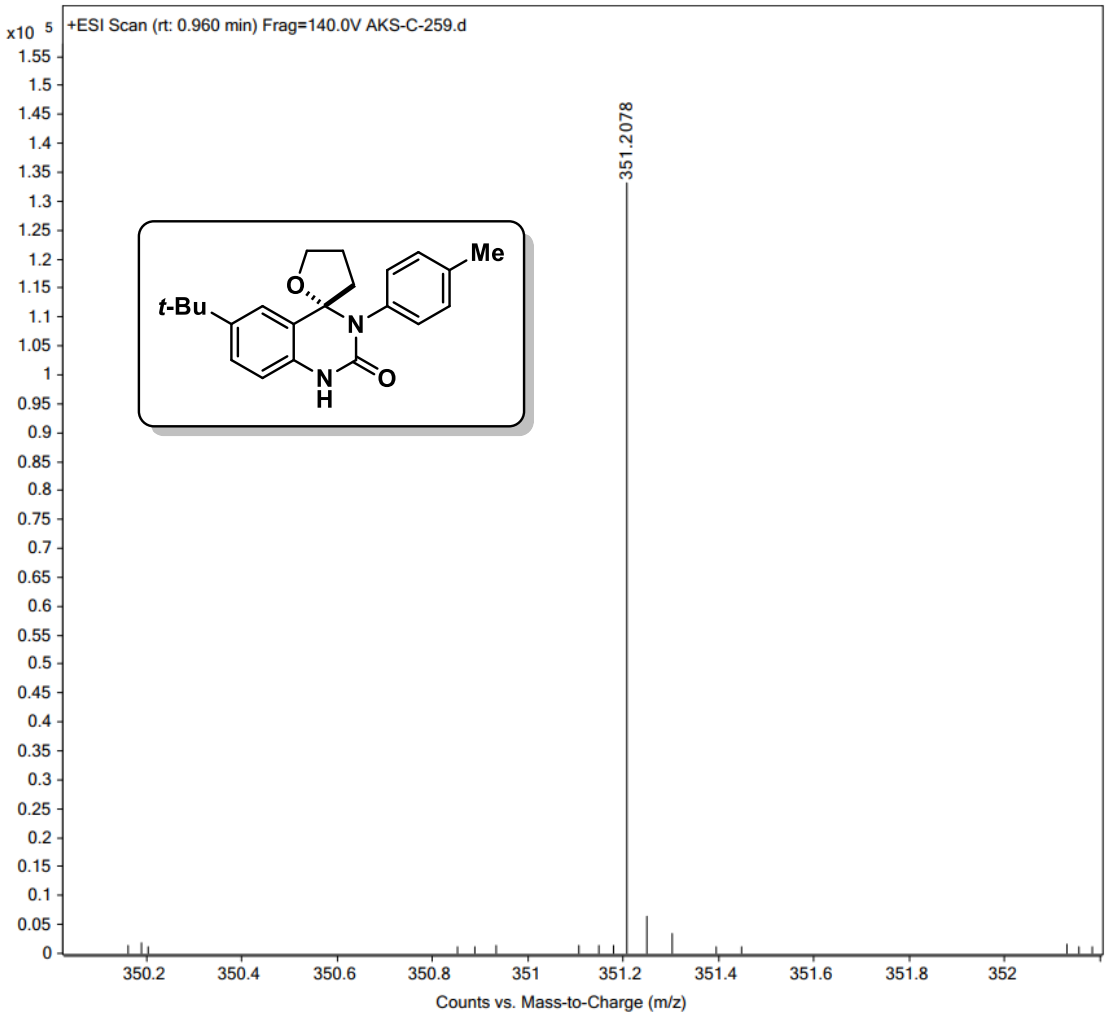


Figure S66. ^{1}H spectrum of compound **2e** (500 MHz, $CDCl_3$)

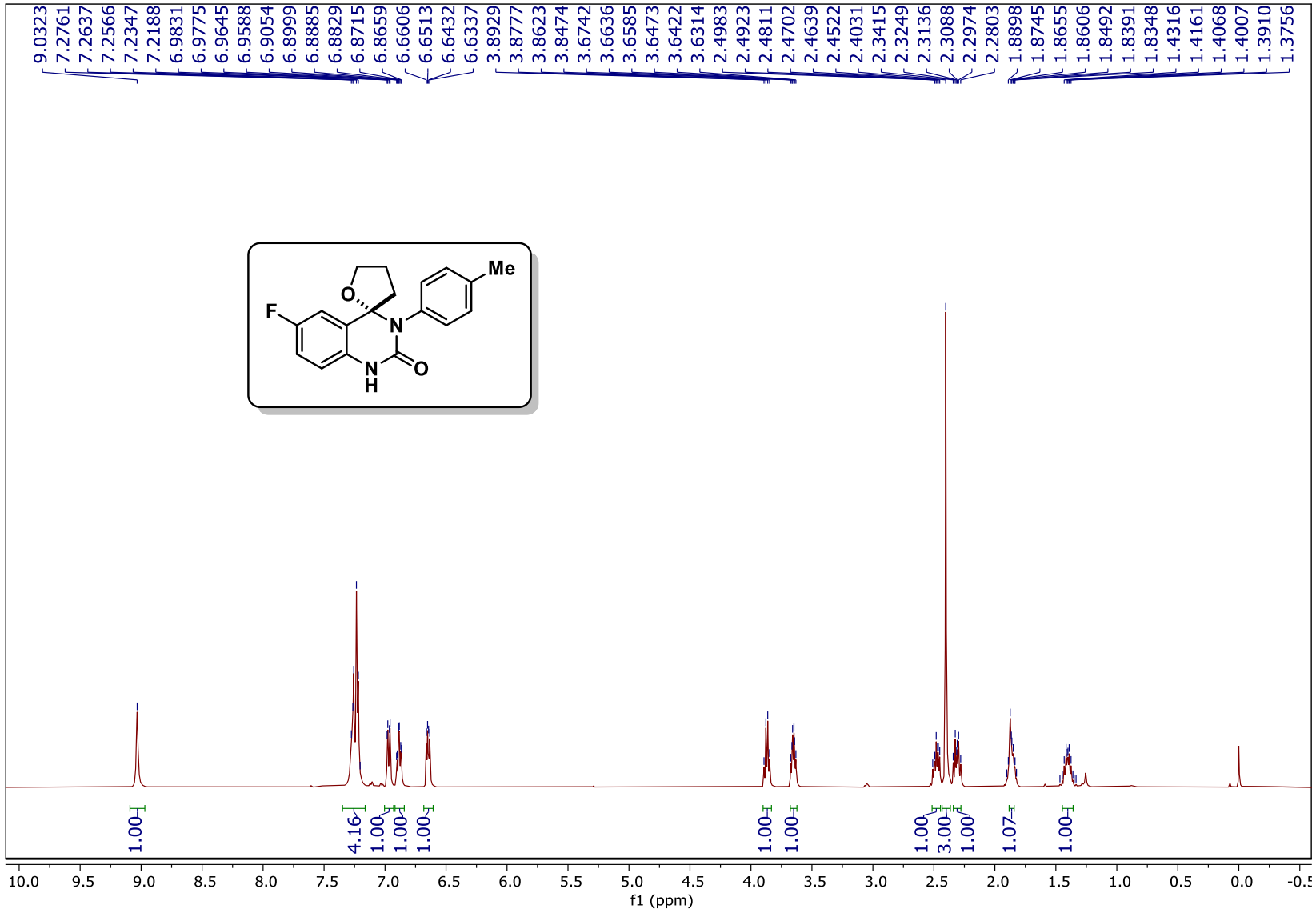


Figure S67. ^{13}C spectrum of compound **2e** (125 MHz, $CDCl_3$)

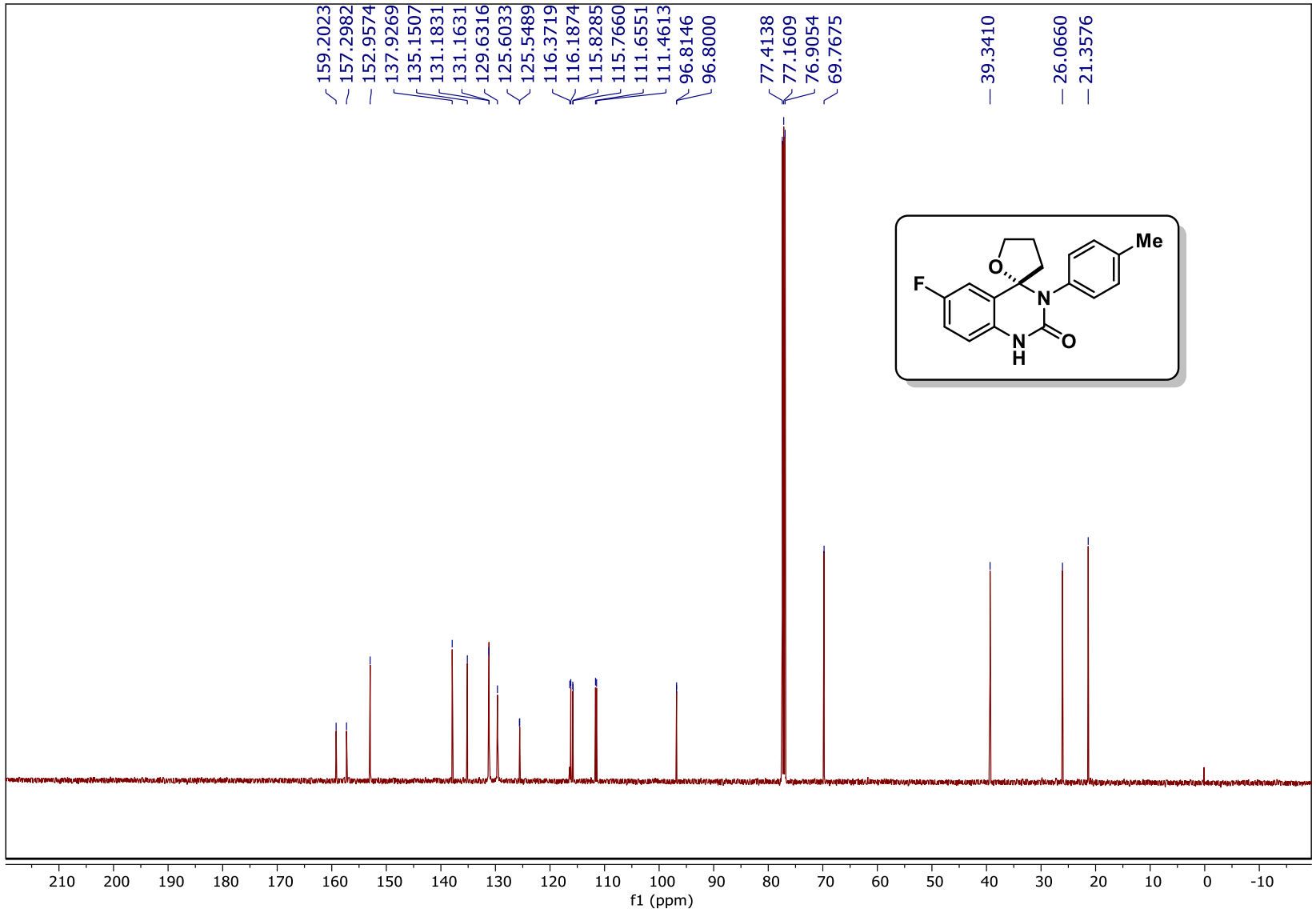


Figure S68. ^{19}F spectrum of compound **2e** (470 MHz, $CDCl_3$)

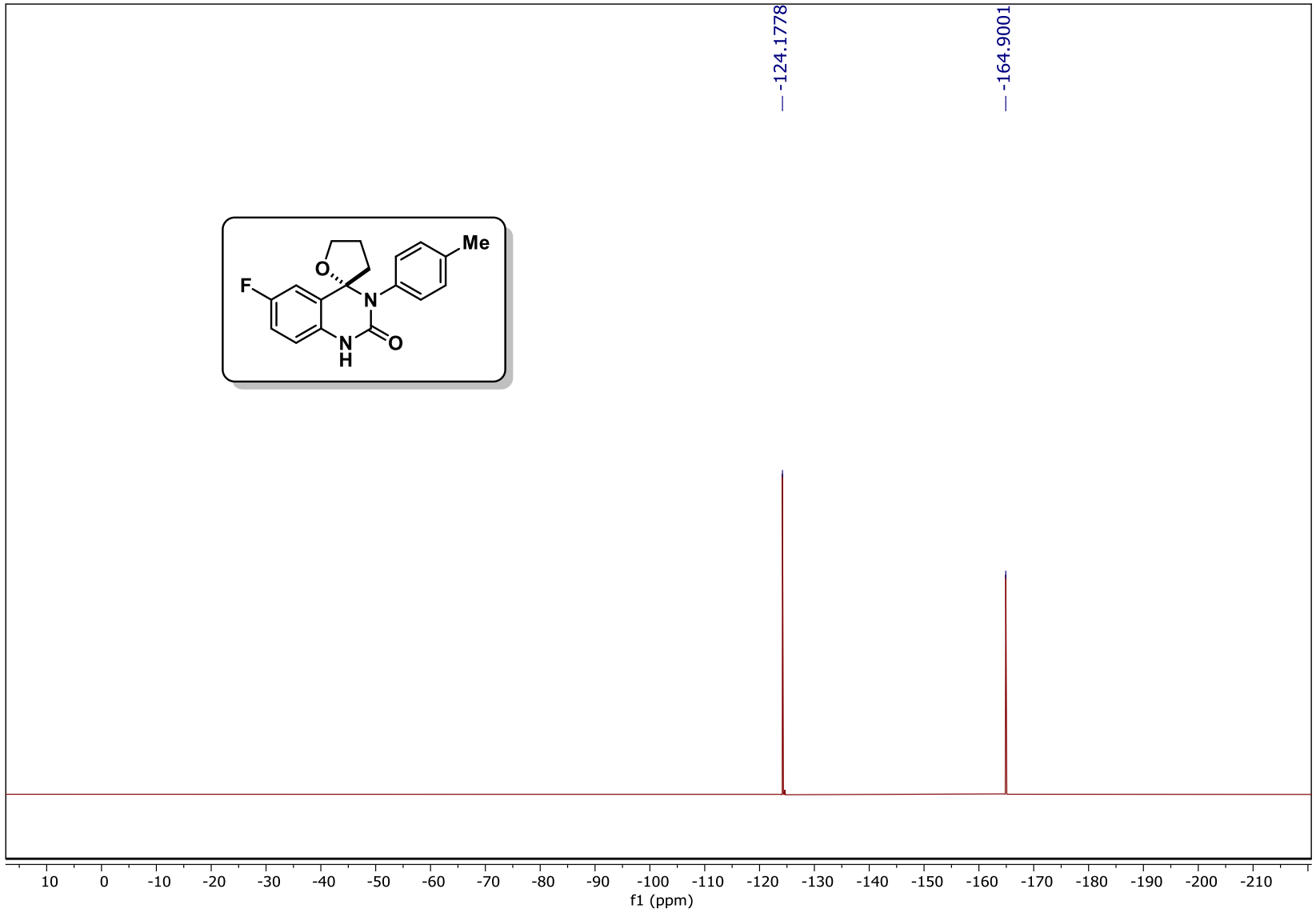


Figure S69. HRMS spectrum of **2e**

Sample Name	Sample3	**Position**	P1-A3	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-260.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	12-06-2023 09:57:28 (UTC+05:30)

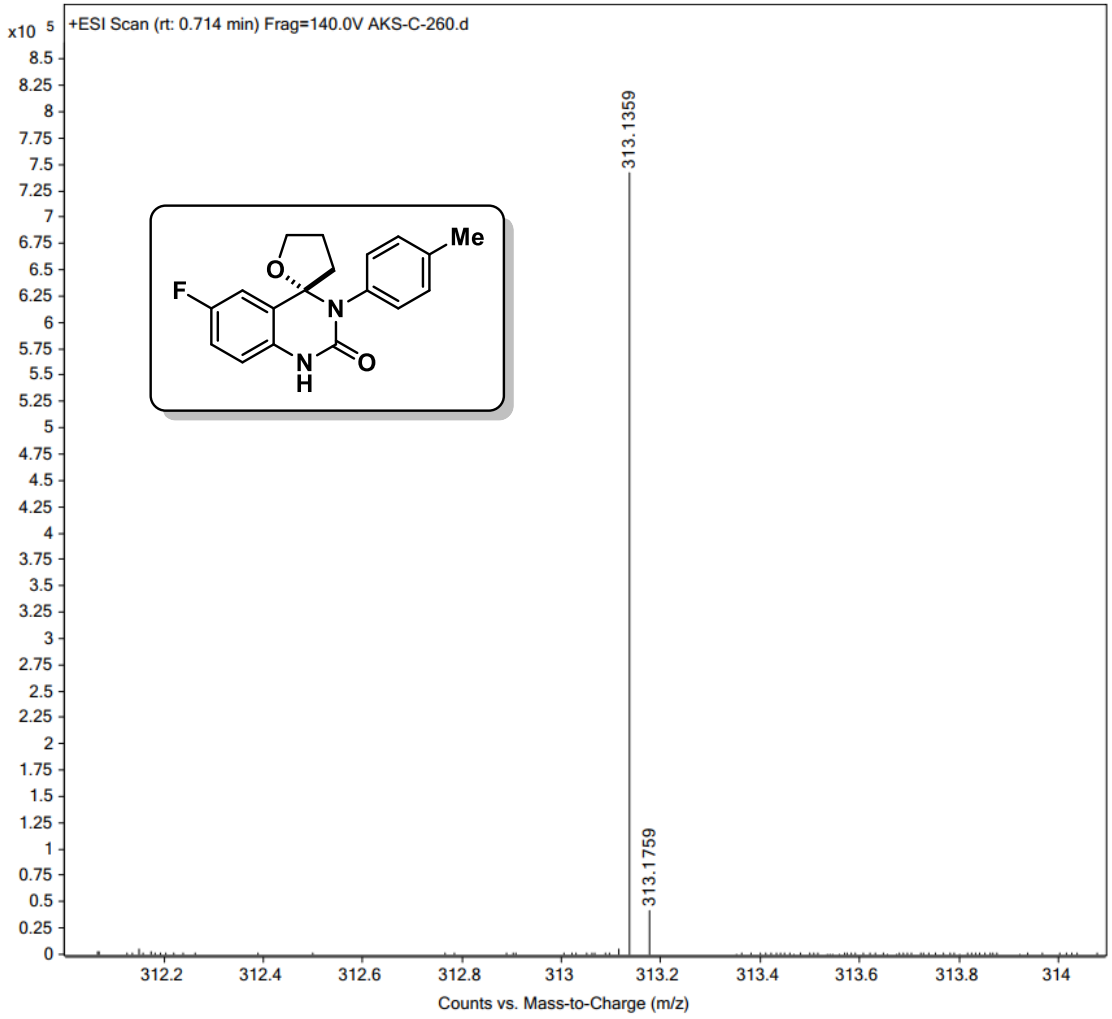


Figure S70. ^{1}H spectrum of compound **2f** (400 MHz, $CDCl_3$)

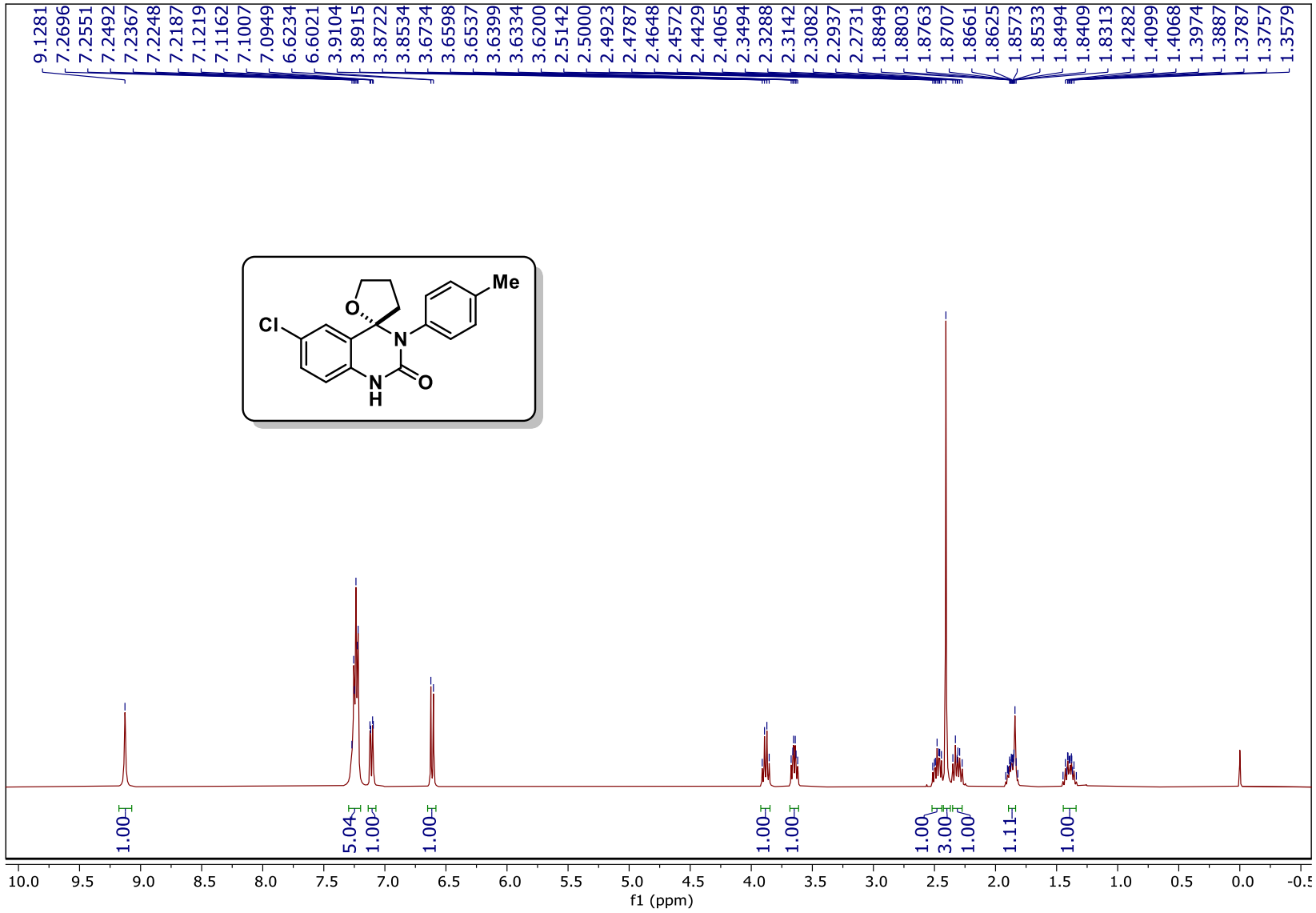


Figure S71. ^{13}C spectrum of compound **2f** (125 MHz, $CDCl_3$)

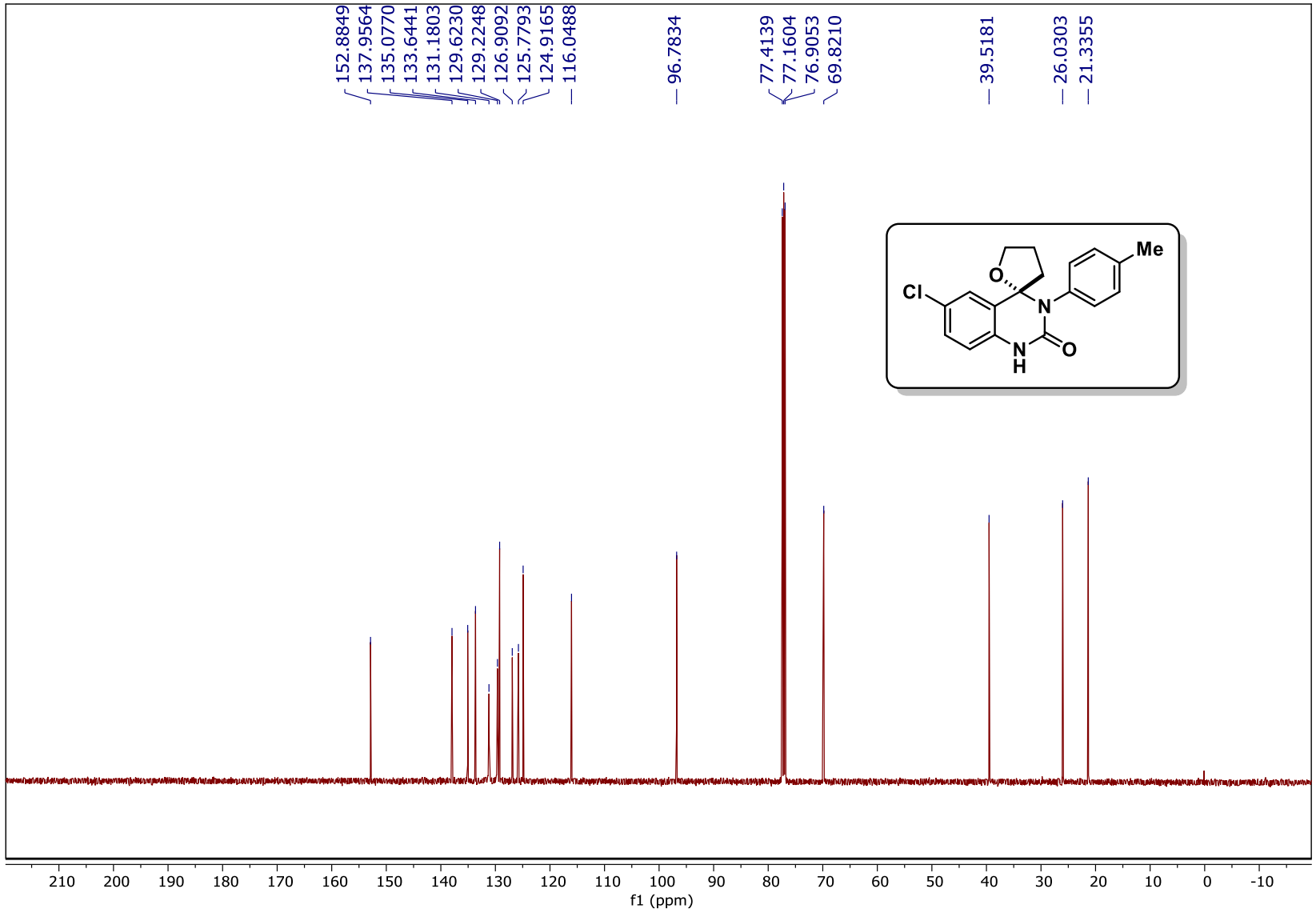


Figure S72. HRMS spectrum of **2f**

Sample Name	Sample16	**Position**	P1-B5	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-287.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	03-07-2023 10:18:19 (UTC+05:30)

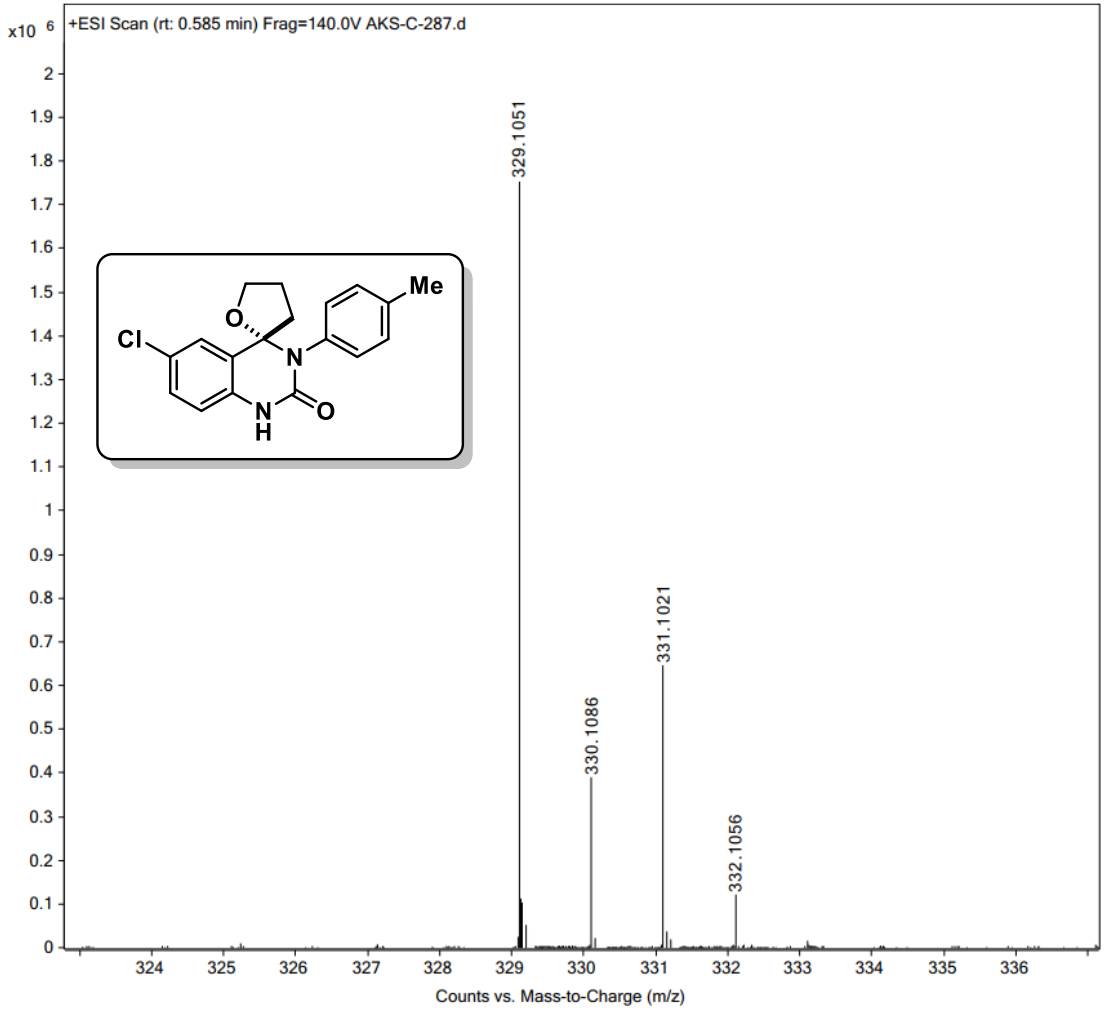


Figure S73. ^{1}H spectrum of compound **2g** (400 MHz, $CDCl_3$)

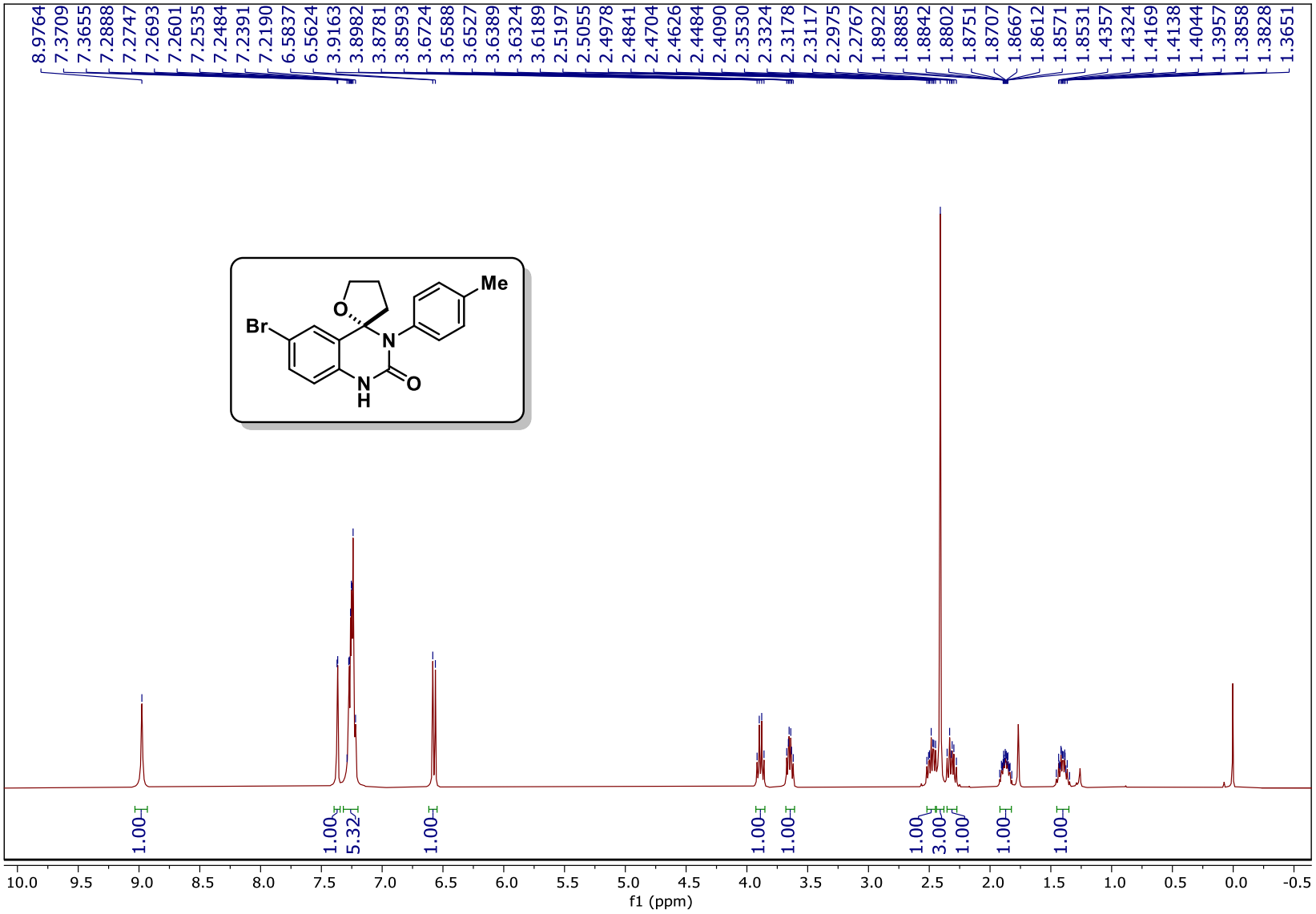


Figure S74. ^{13}C spectrum of compound **2g** (125 MHz, $CDCl_3$)

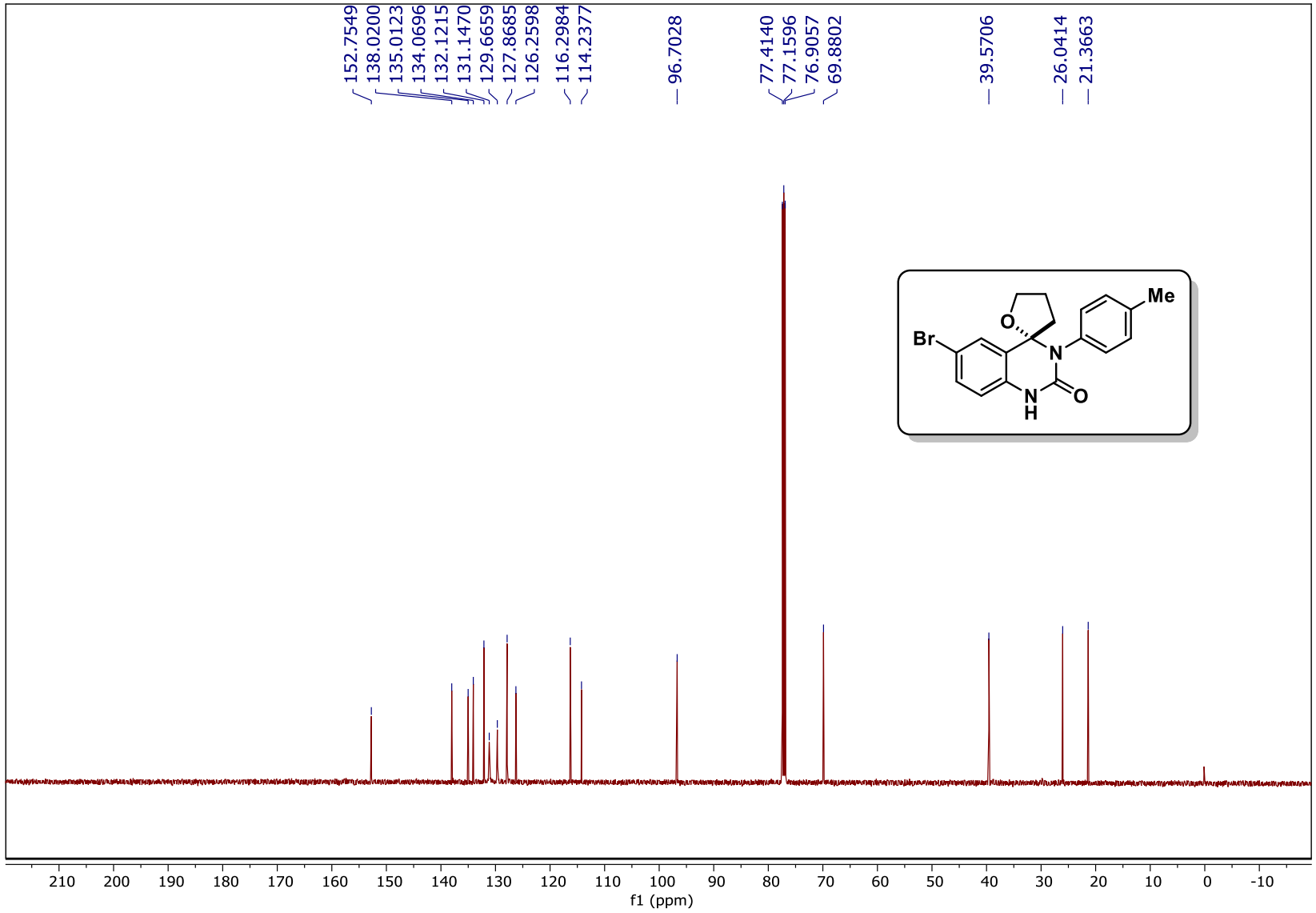


Figure S75. HRMS spectrum of **2g**

Sample Name		**Position**	P1-A3	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC292.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	11-07-2023 16:59:09 (UTC+05:30)

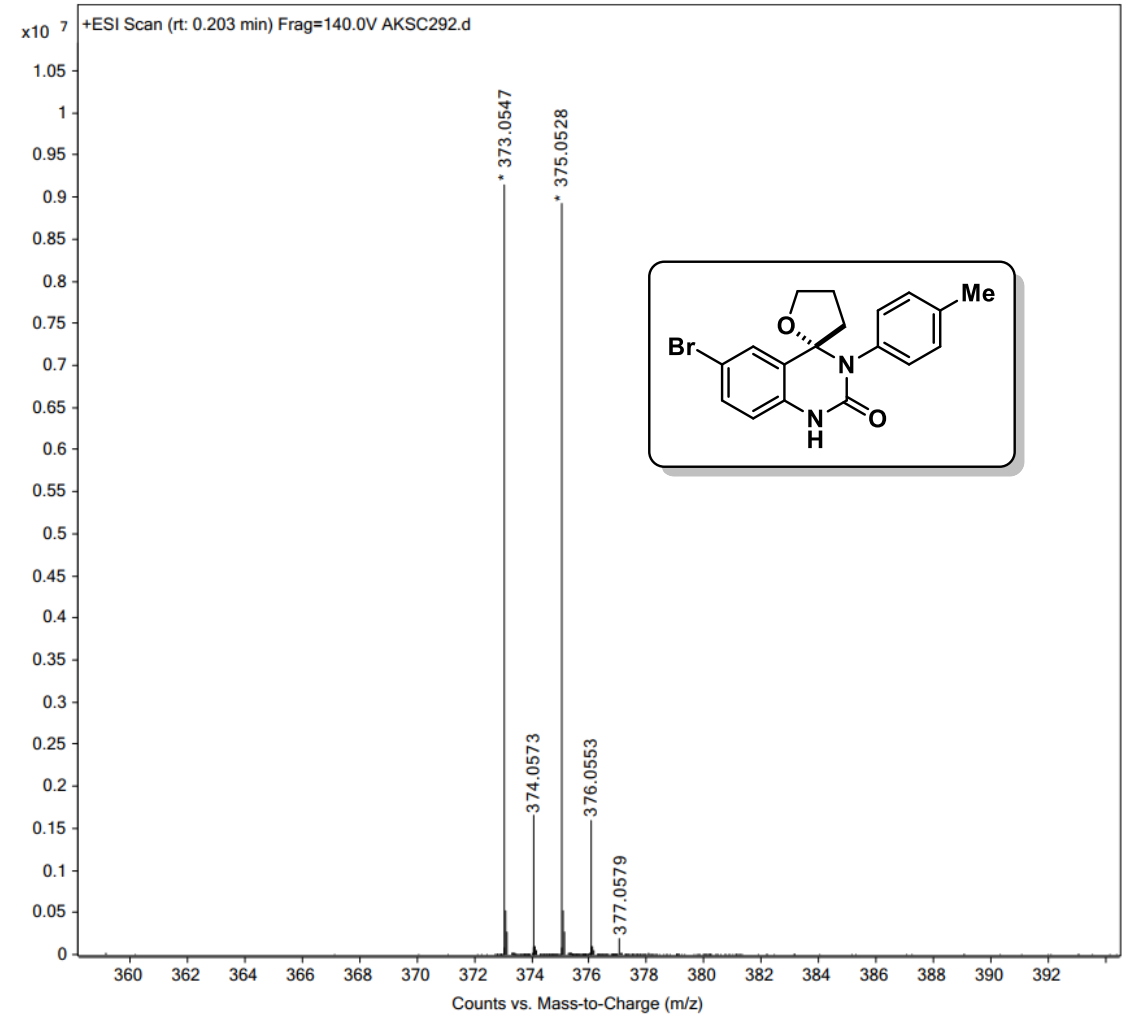


Figure S76. ^{1}H spectrum of compound **2h** (500 MHz, $CDCl_3$)

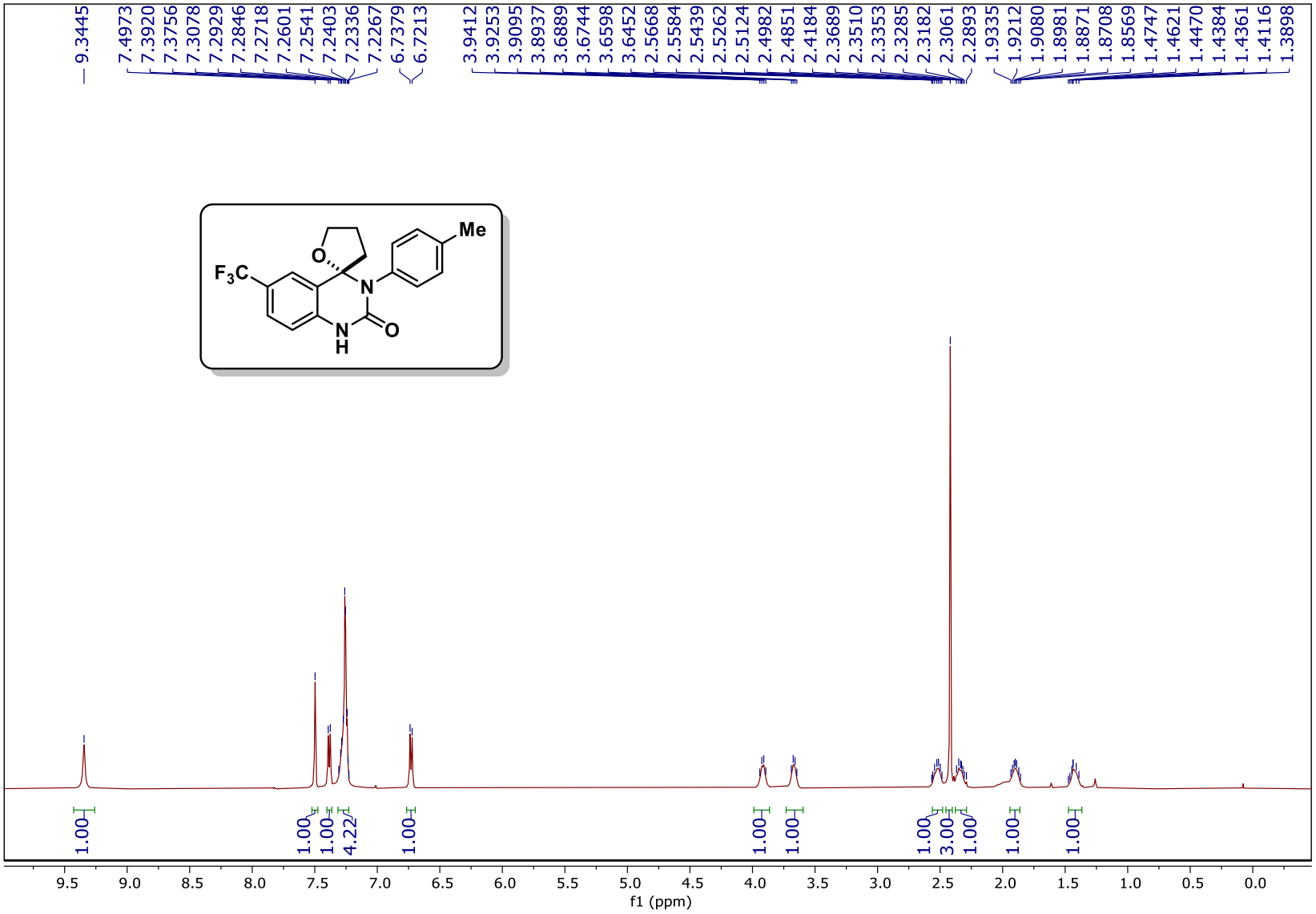


Figure S77. ^{13}C spectrum of compound **2h** (125 MHz, $CDCl_3$)

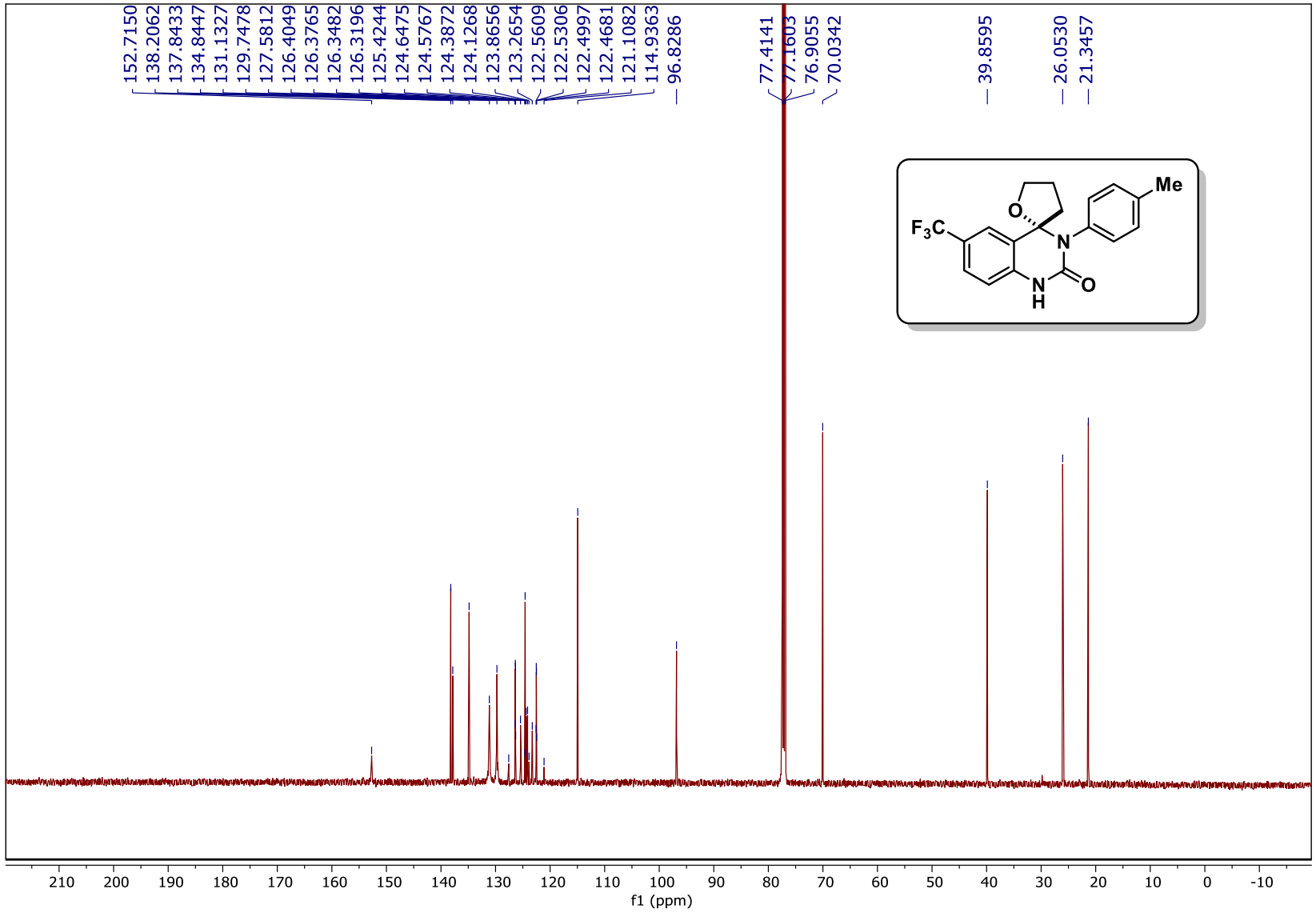


Figure S78. HRMS spectrum of **2h**

Sample Name	Sample10	**Position**	P1-A10	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	SP-C-447.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	28-12-2023 10:54:02 (UTC+05:30)

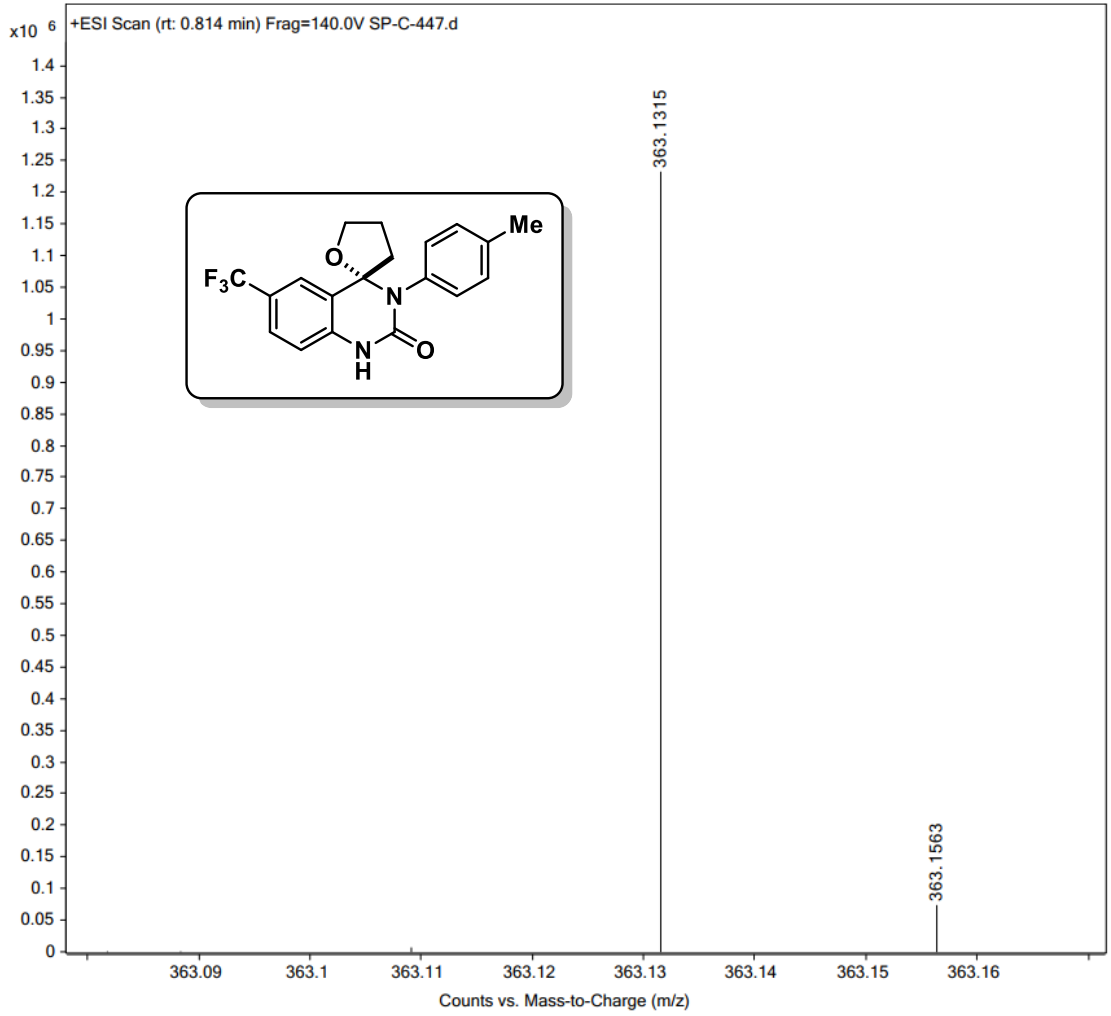


Figure S79. ^{1}H spectrum of compound **2i** (400 MHz, $CDCl_3$)

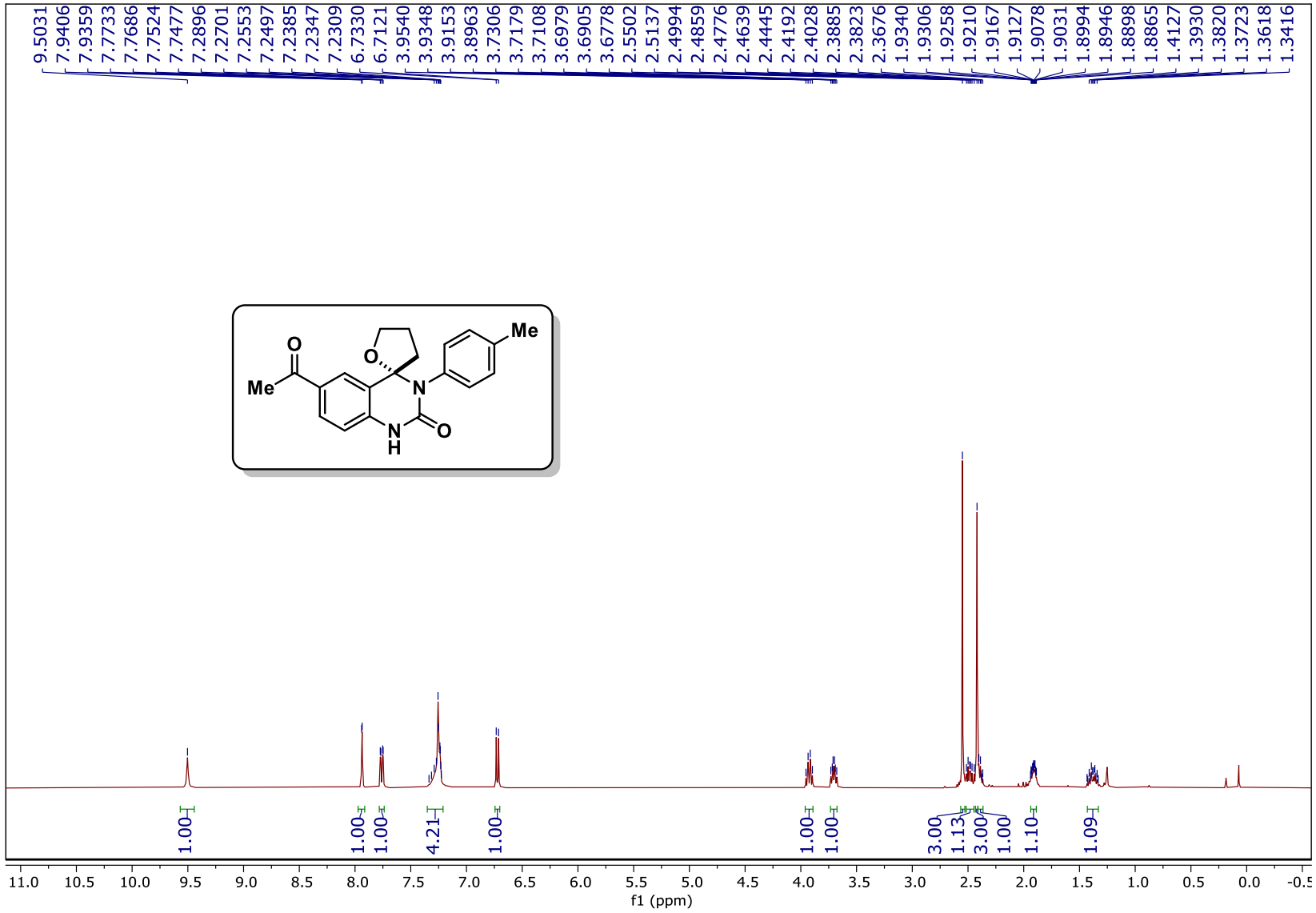


Figure S80. ^{13}C spectrum of compound **2i** (125 MHz, $CDCl_3$)

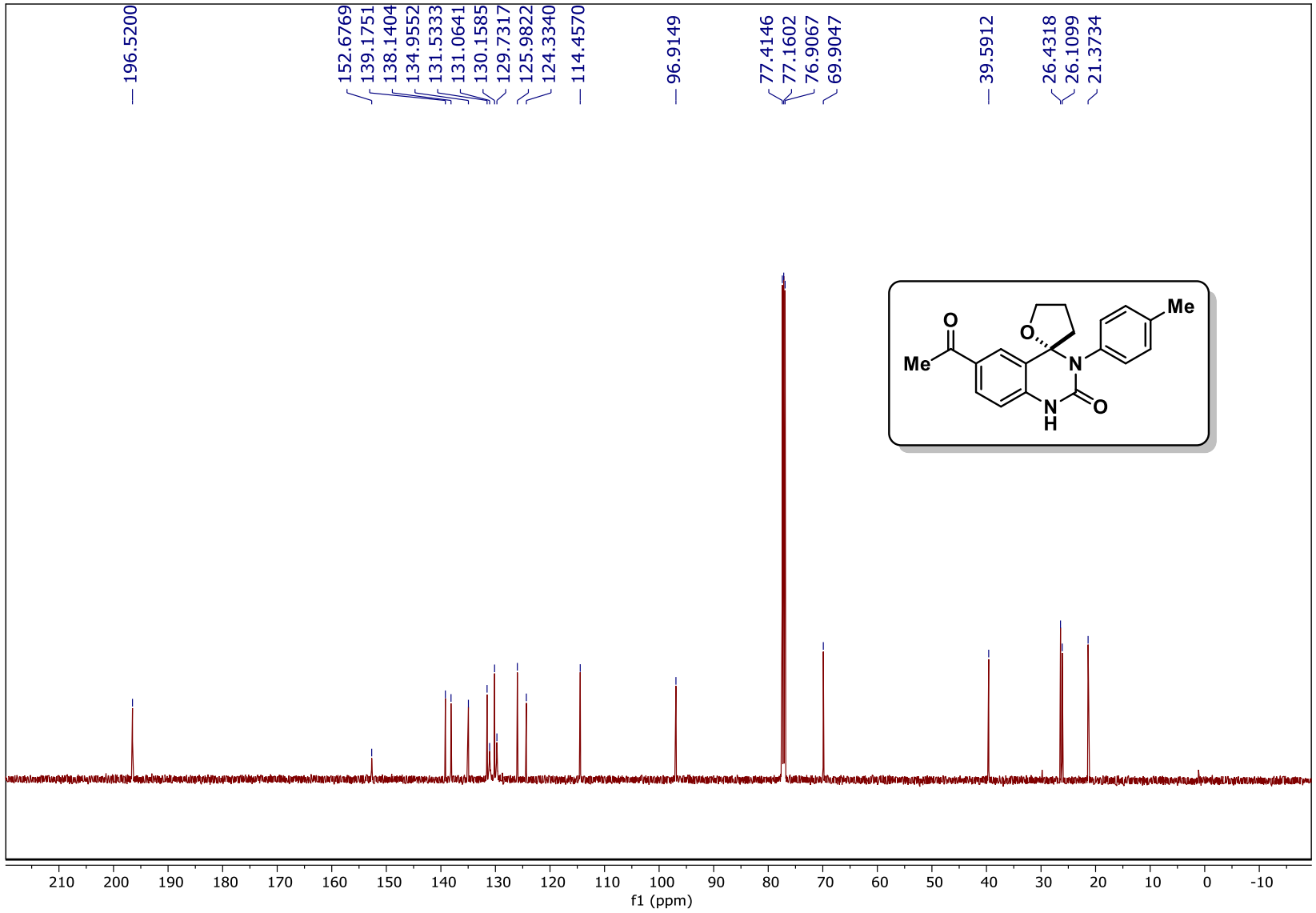


Figure S81. HRMS spectrum of **2i**

Sample Name	Sample2	**Position**	P1-A2	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-496.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	13-02-2024 10:00:15 (UTC+05:30)

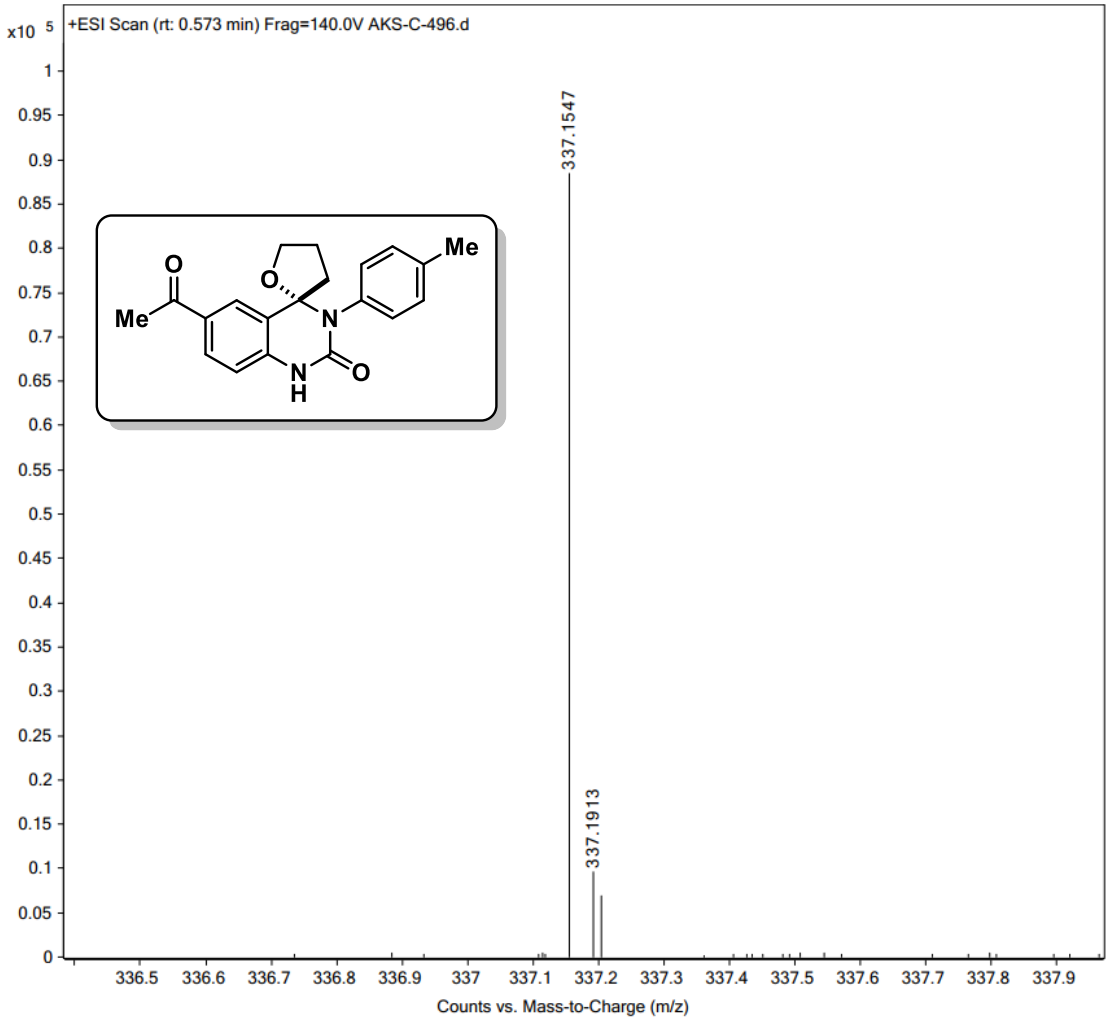


Figure S82. ^{1}H spectrum of compound **2j** (400 MHz, $CDCl_3$)

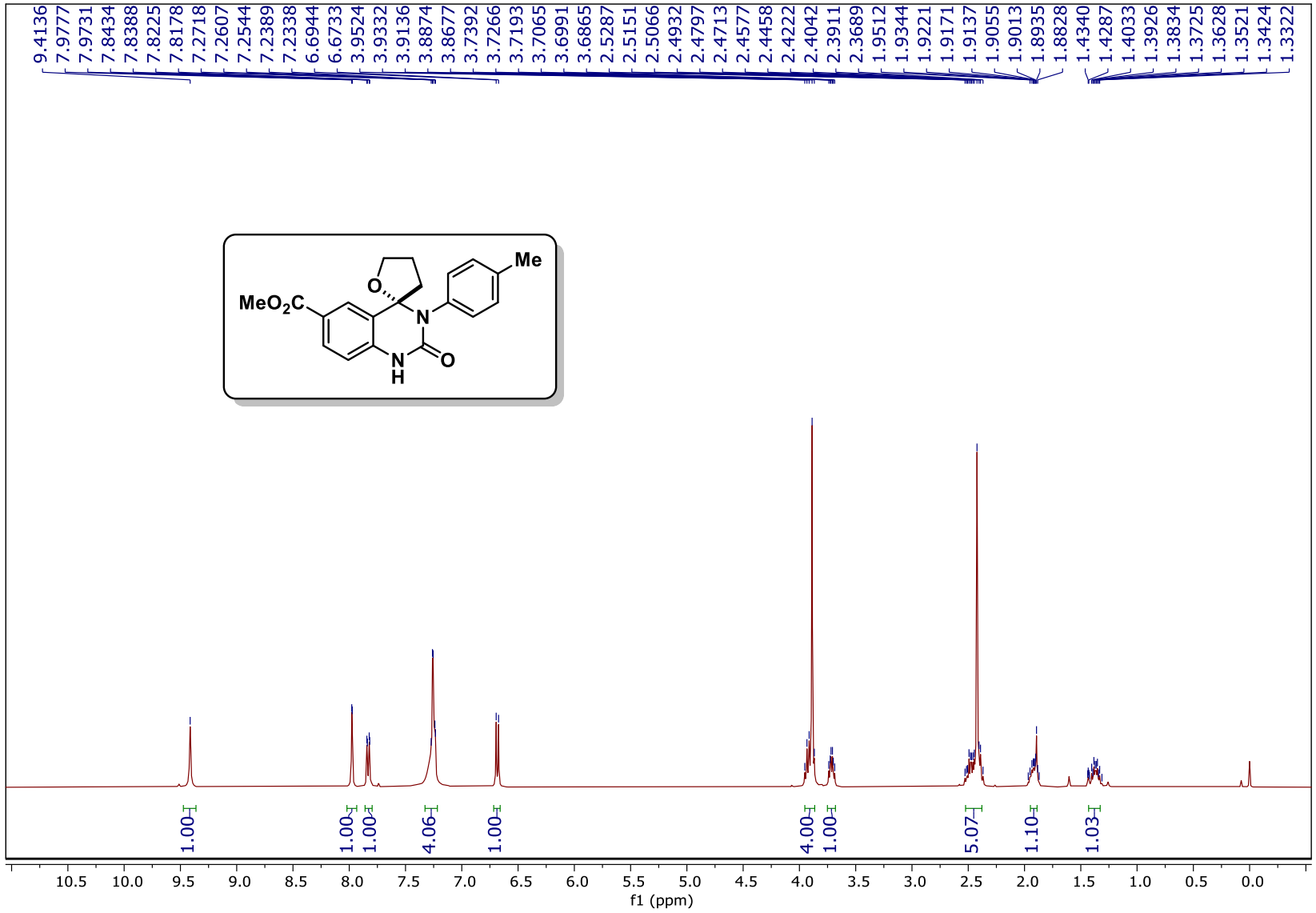


Figure S83. ^{13}C spectrum of compound **2j** (125 MHz, $CDCl_3$)

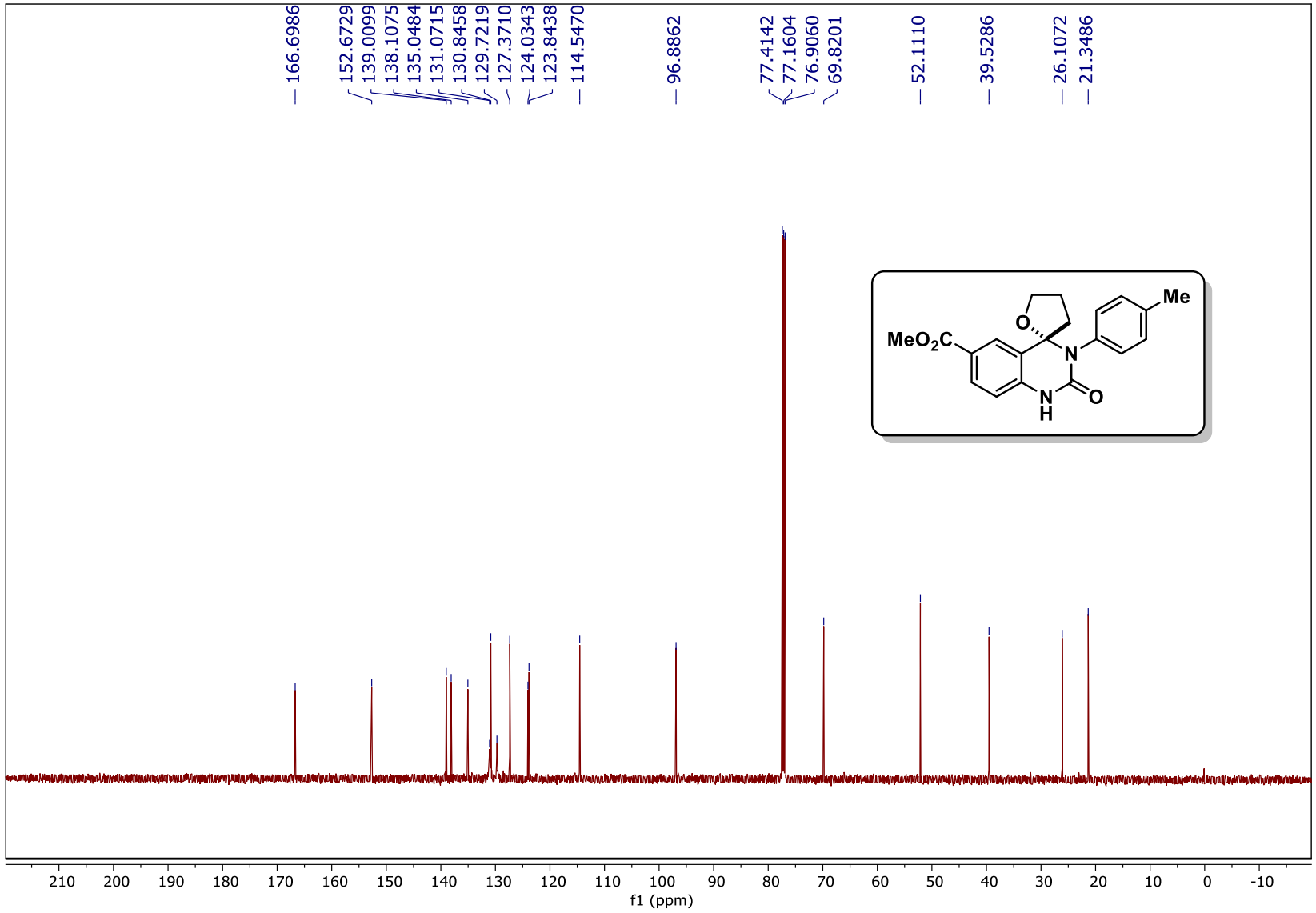


Figure S84. HRMS spectrum of **2j**

Sample Name	Sample52	**Position**	P1-E8	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-346.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	21-09-2023 12:38:31 (UTC+05:30)

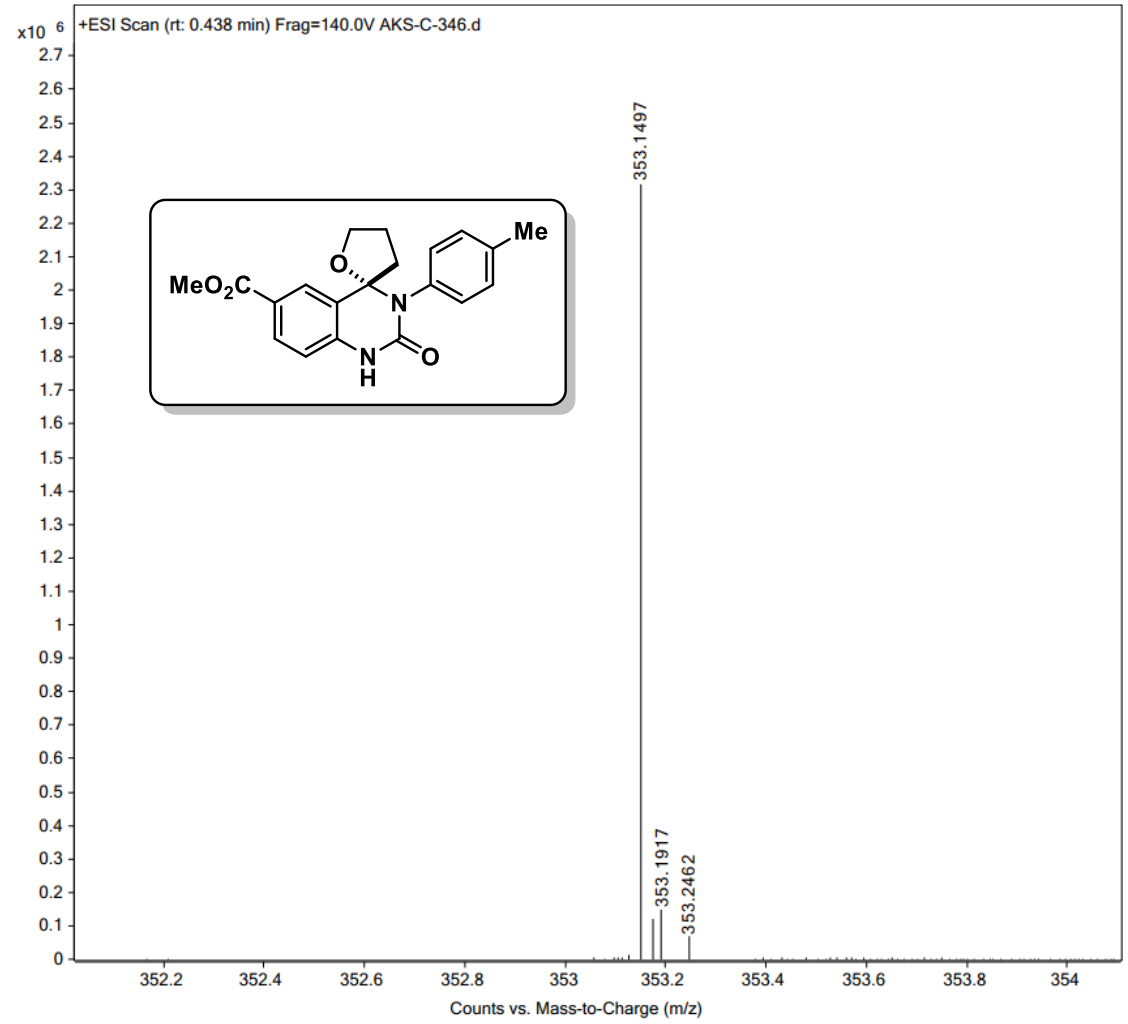


Figure S85. ^{1}H spectrum of compound **2k** (500 MHz, $CDCl_3$)

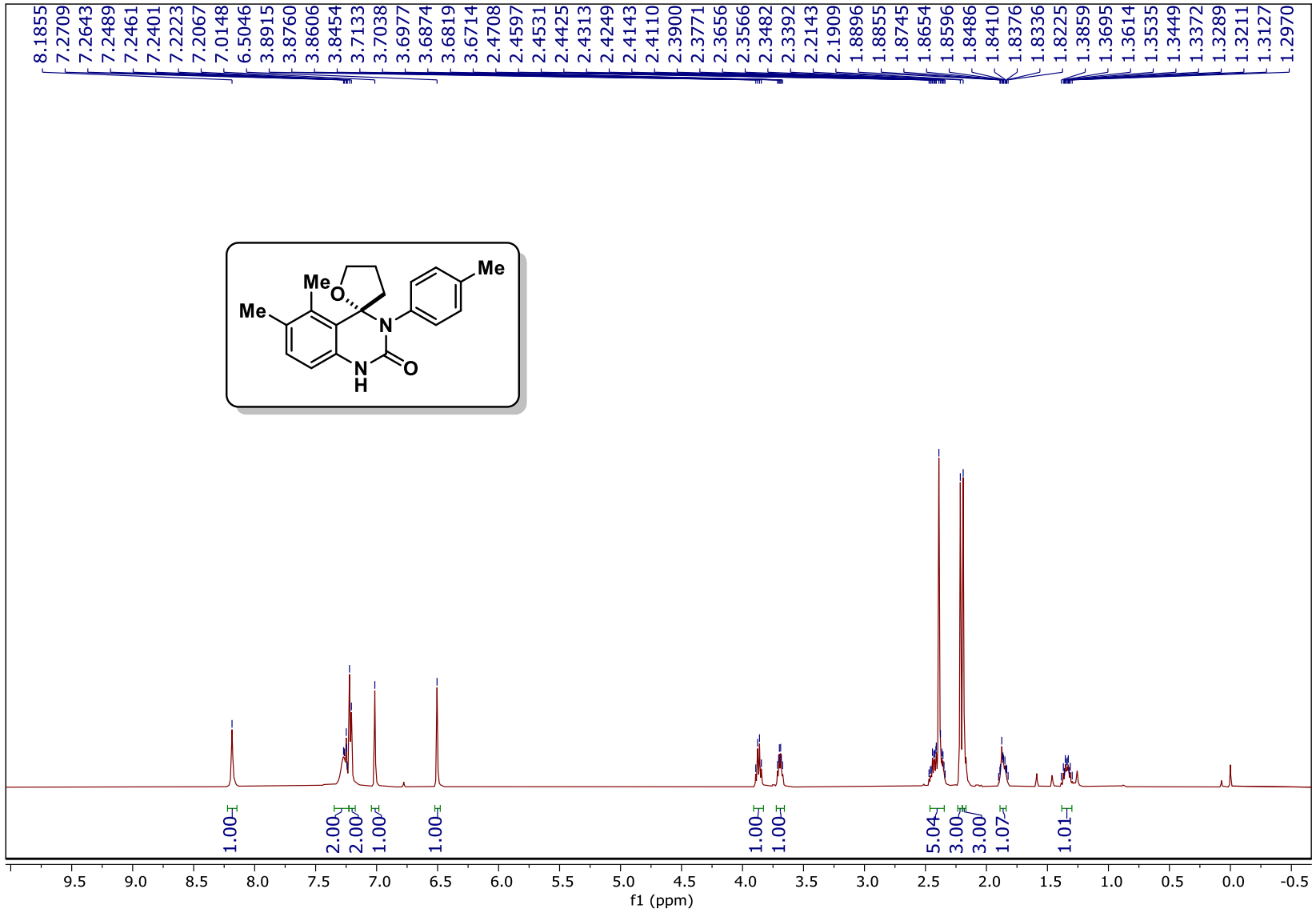


Figure S86. ^{13}C spectrum of compound **2k** (125 MHz, $CDCl_3$)

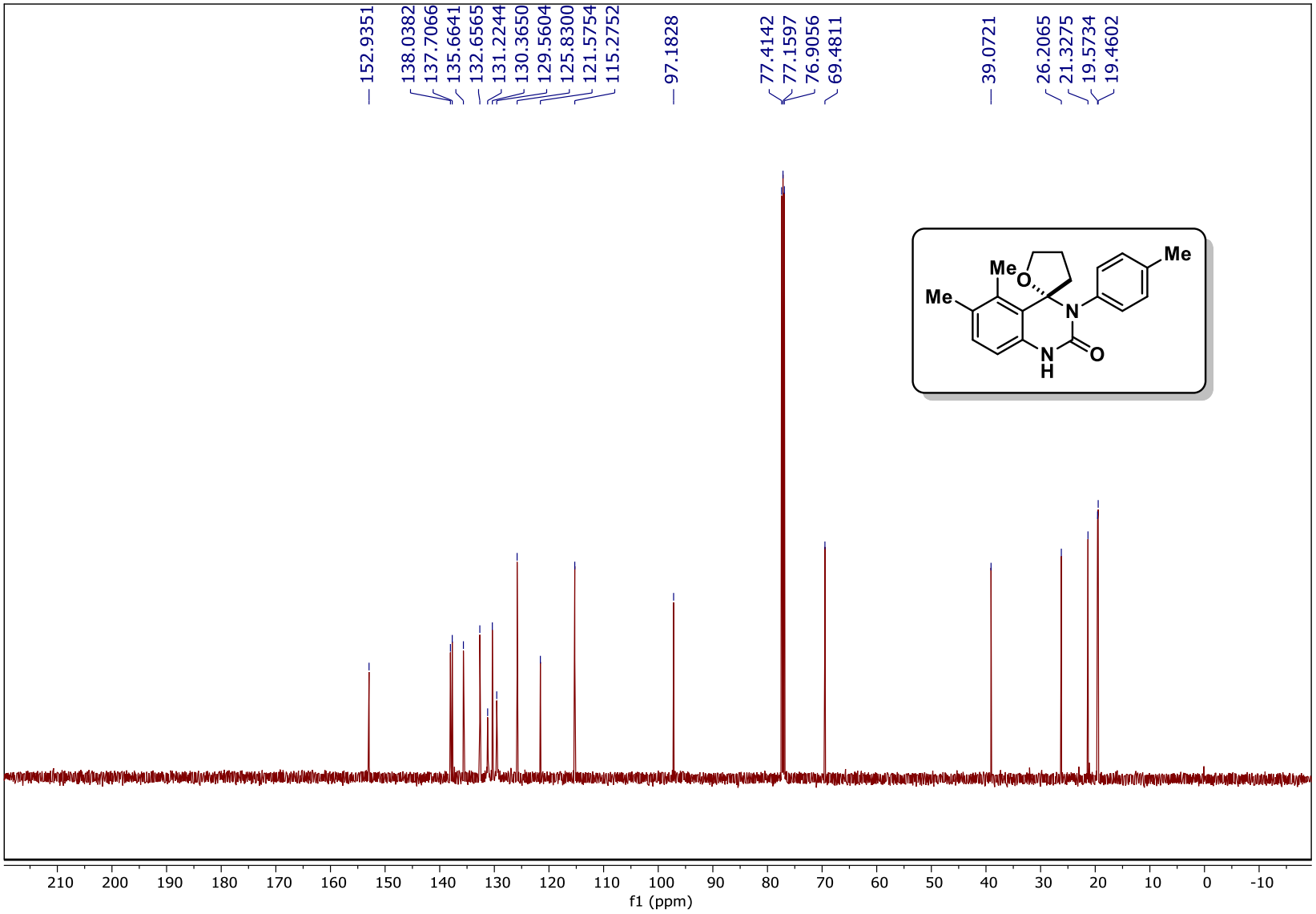


Figure S87. HRMS spectrum of **2k**

Sample Name	Sample5	**Position**	P1-A5	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC294.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	22-09-2023 10:21:20 (UTC+05:30)

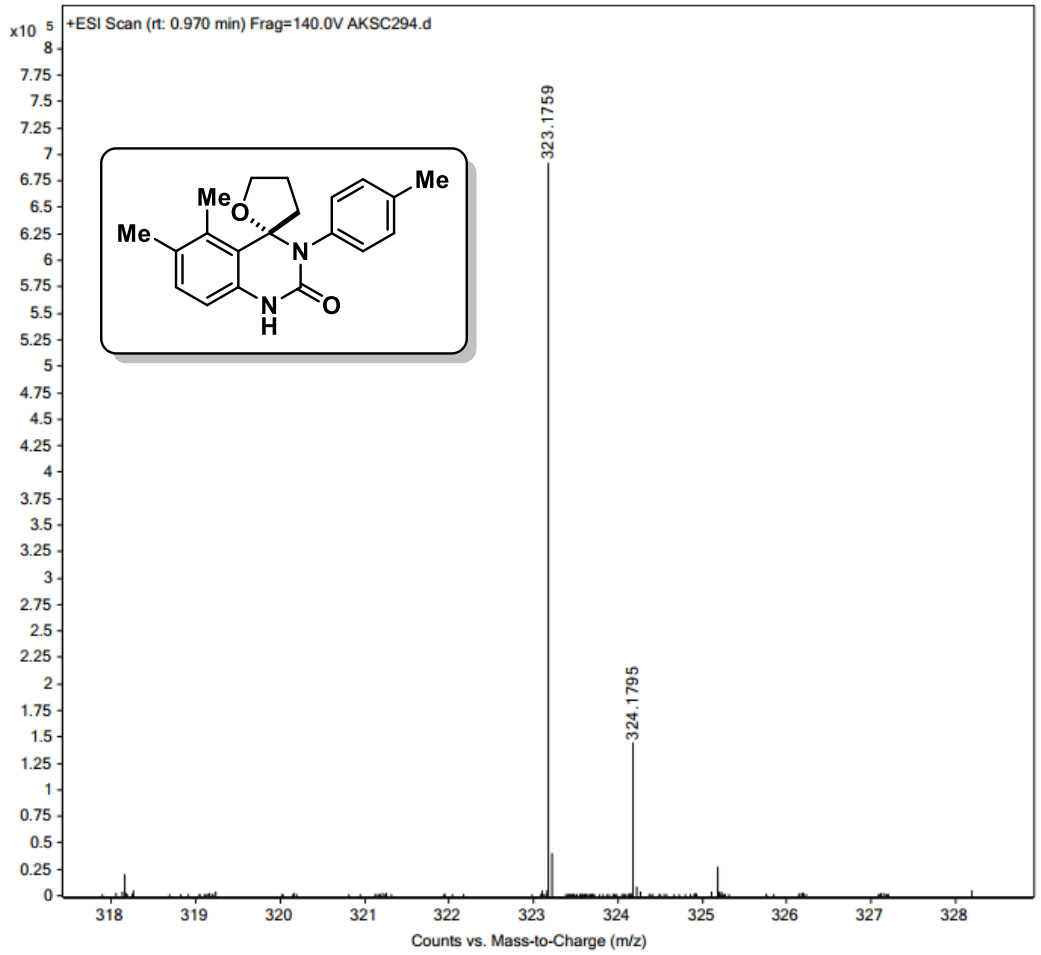


Figure S88. ^{1}H spectrum of compound **2l** (400 MHz, $CDCl_3$)

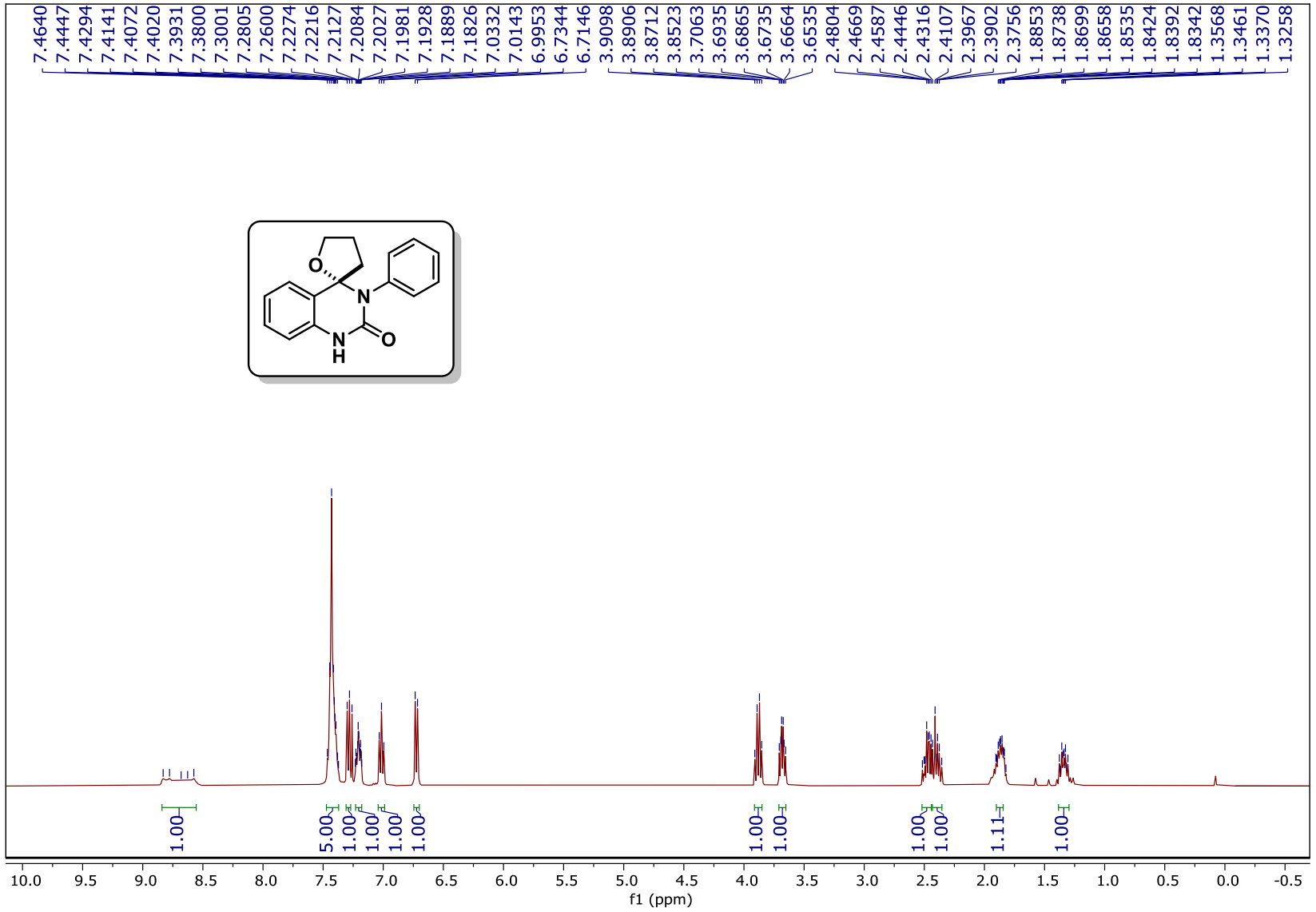


Figure S89. ^{13}C spectrum of compound **2l** (125 MHz, $CDCl_3$)

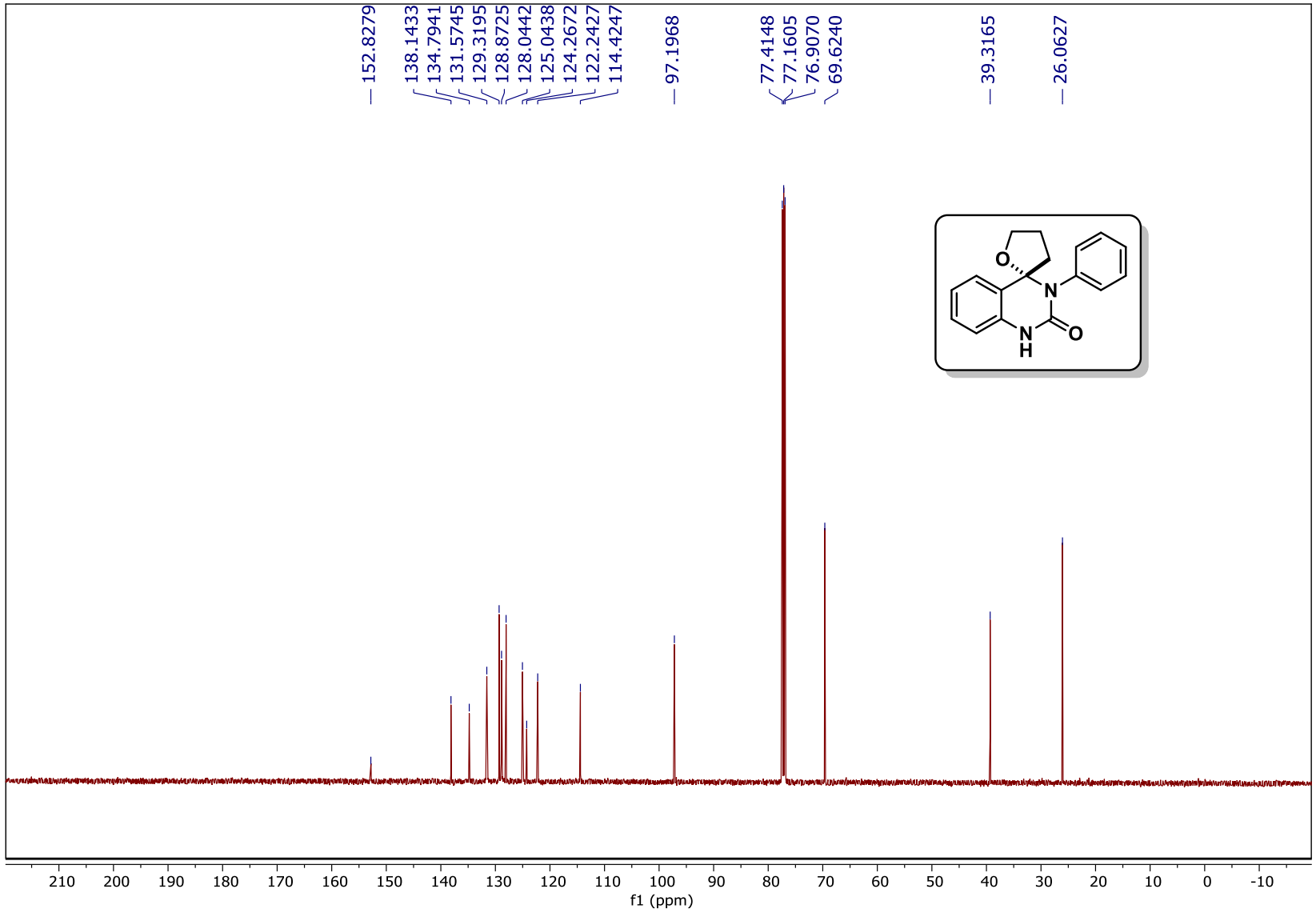


Figure S90. HRMS spectrum of **2l**

Sample Name	Sample8	**Position**	P1-A8	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC253B.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	02-06-2023 15:23:46 (UTC+05:30)

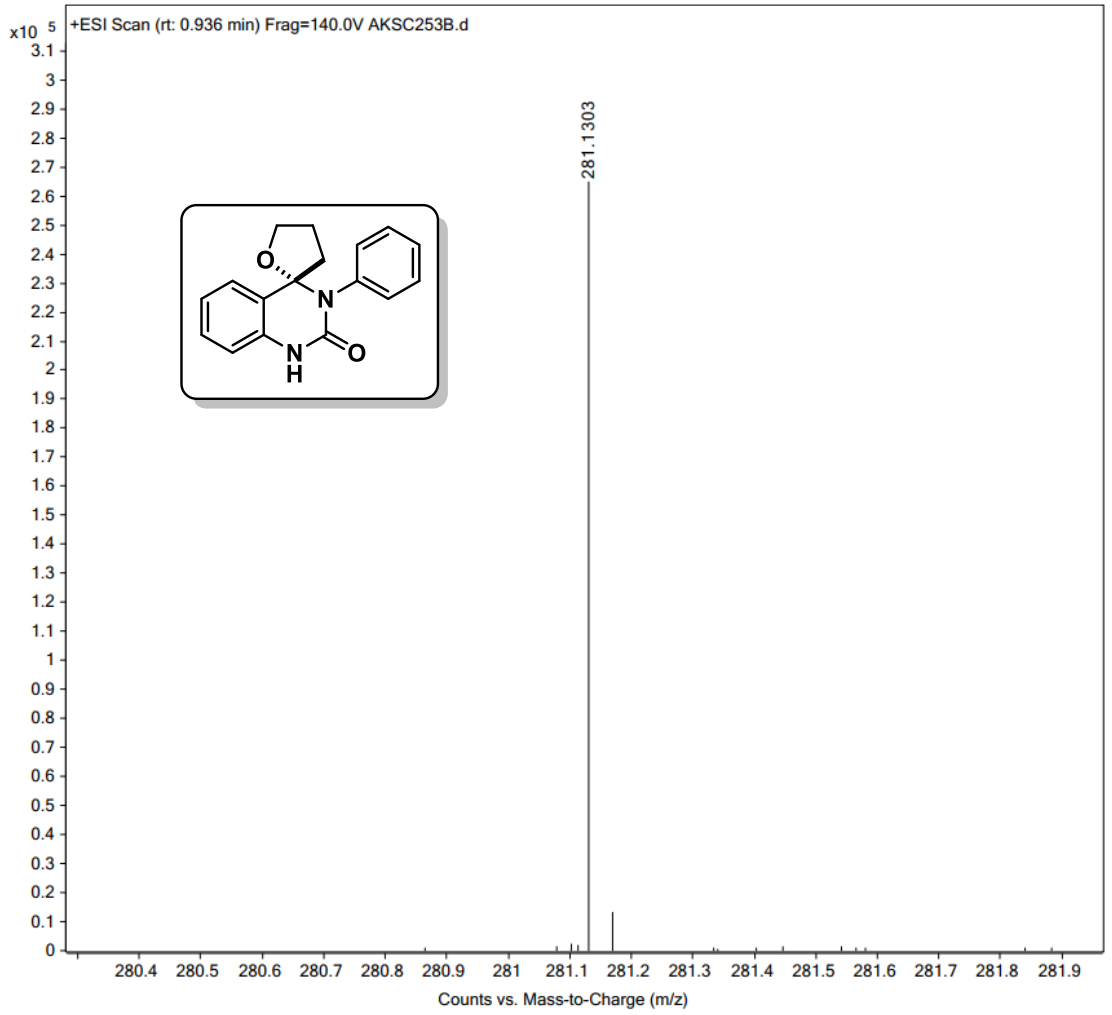


Figure S91. ^{1}H spectrum of compound **2m** (500 MHz, $CDCl_3$)

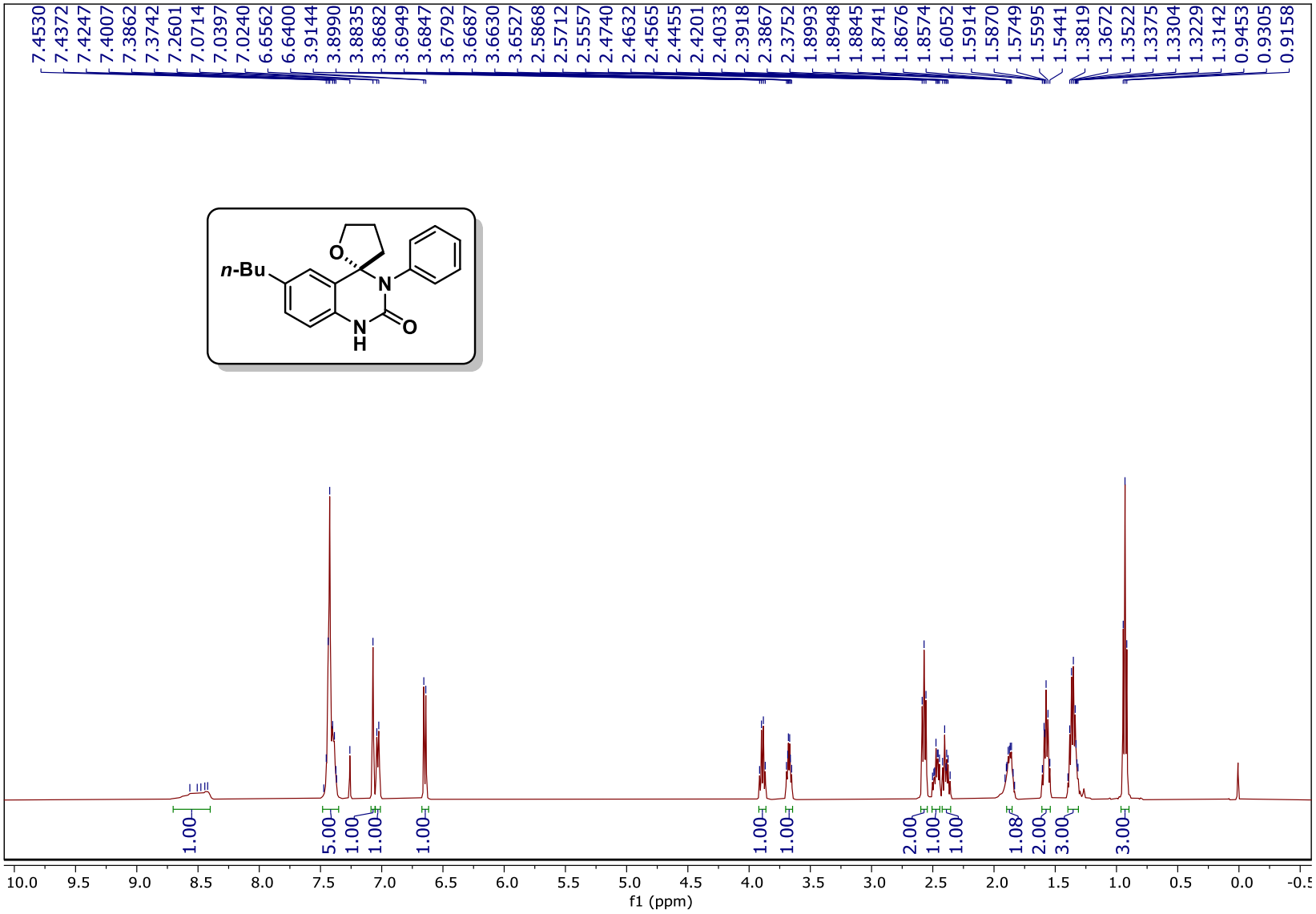


Figure S92. ^{13}C spectrum of compound **2m** (125 MHz, $CDCl_3$)

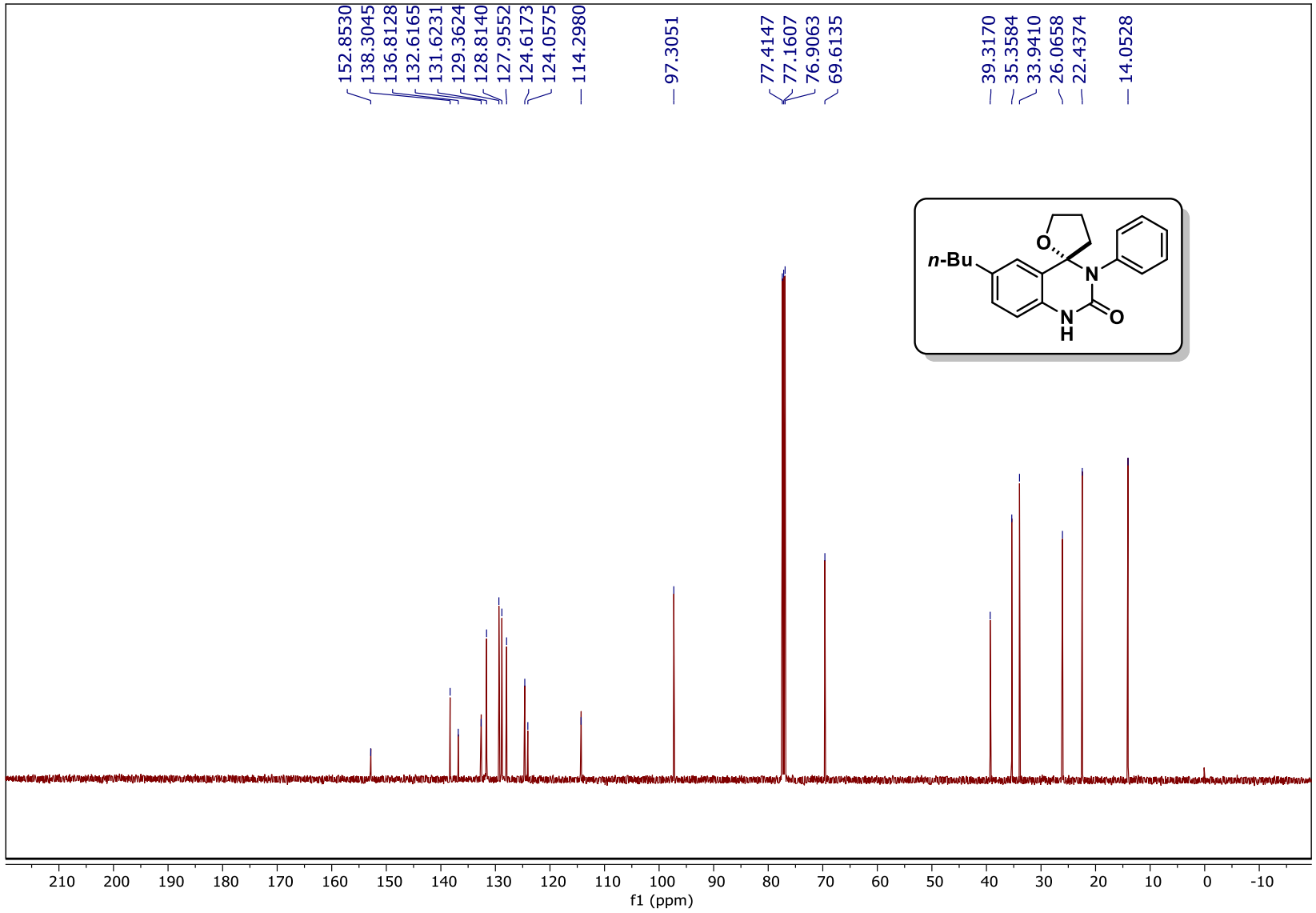


Figure S93. HRMS spectrum of **2m**

Sample Name	Sample36	**Position**	P1-D3	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-303.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	20-07-2023 12:52:04 (UTC+05:30)

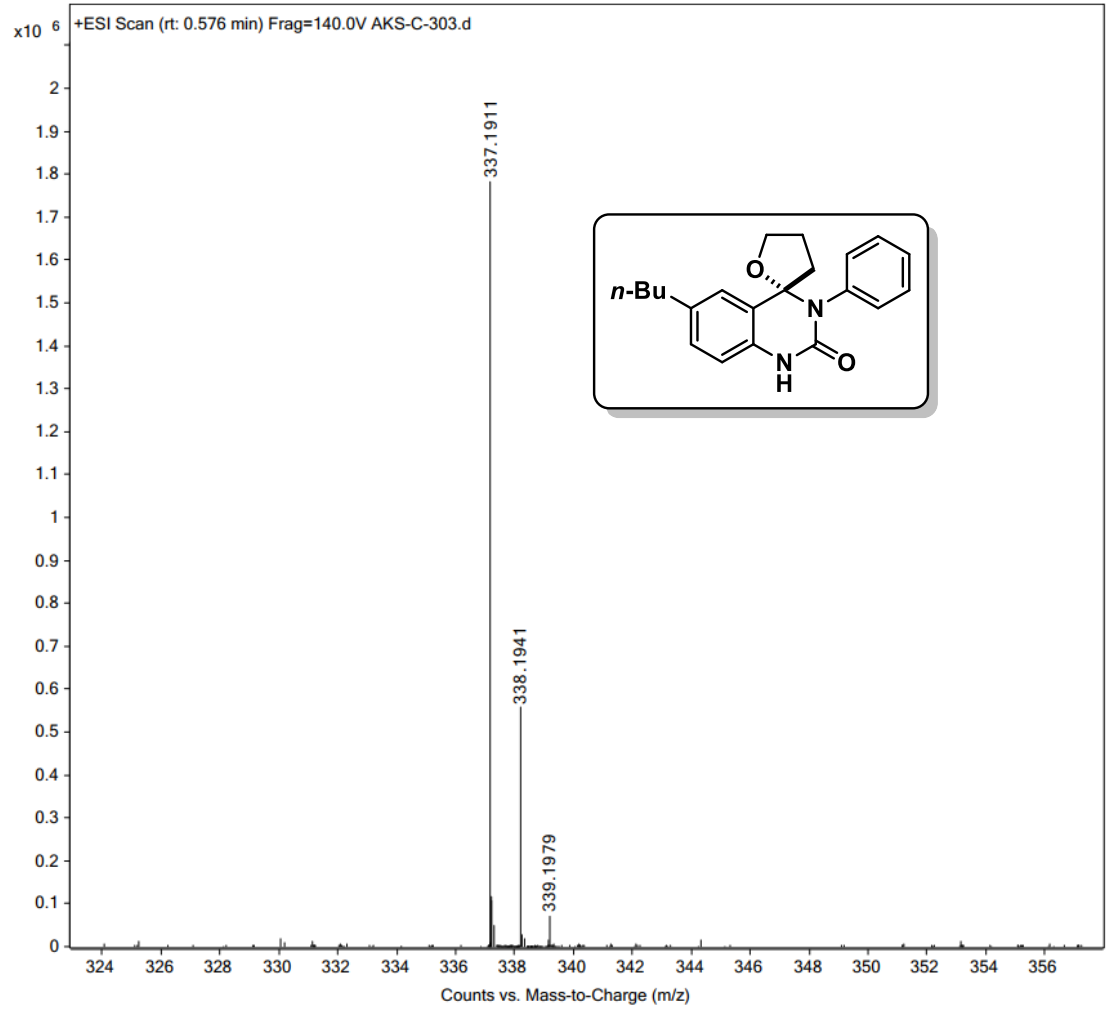


Figure S94. ^{1}H spectrum of compound **2n** (400 MHz, $CDCl_3$/DMSO-d_6)

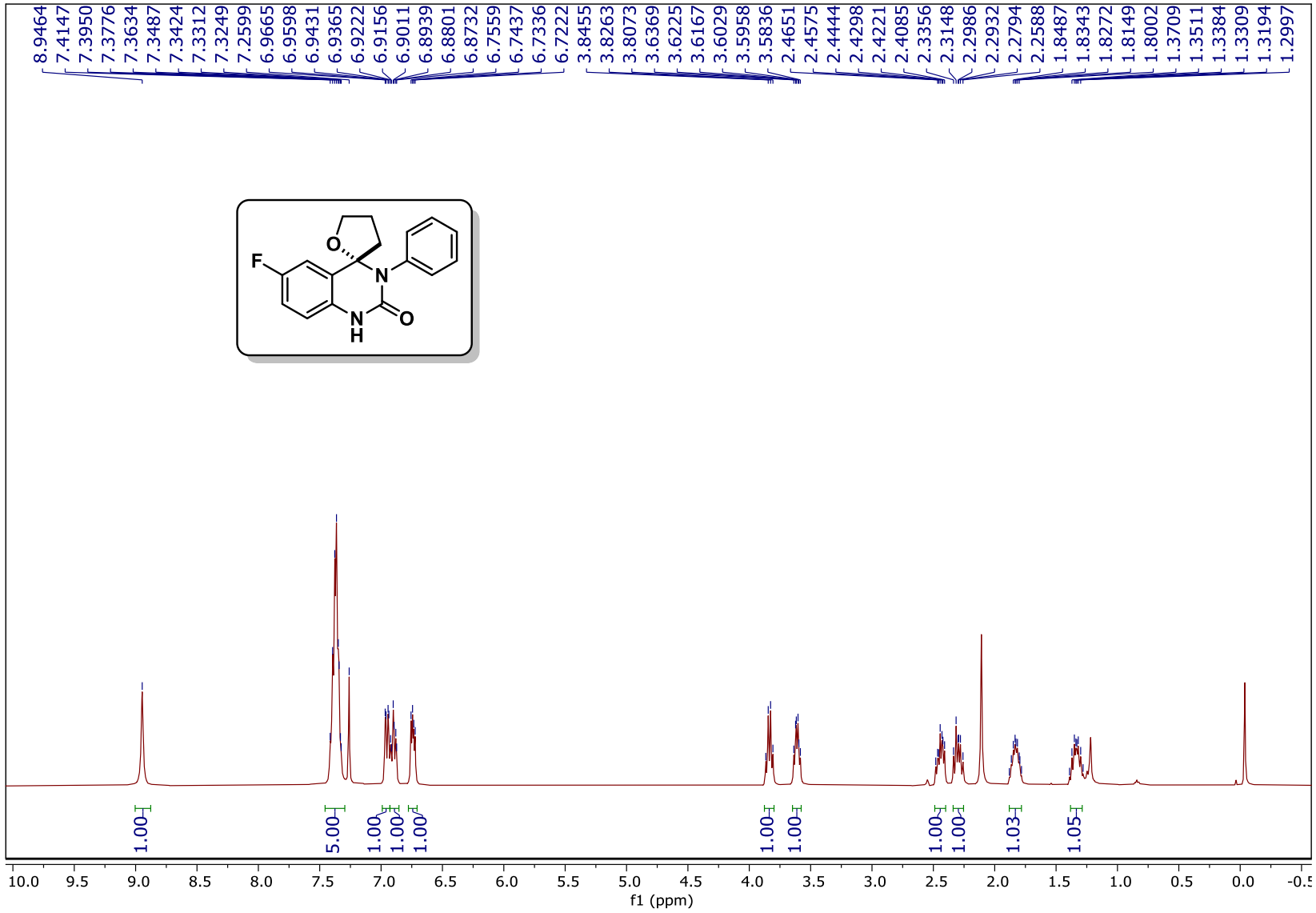


Figure S95. ^{13}C spectrum of compound **2n** (125 MHz, $CDCl_3$/DMSO-d_6)

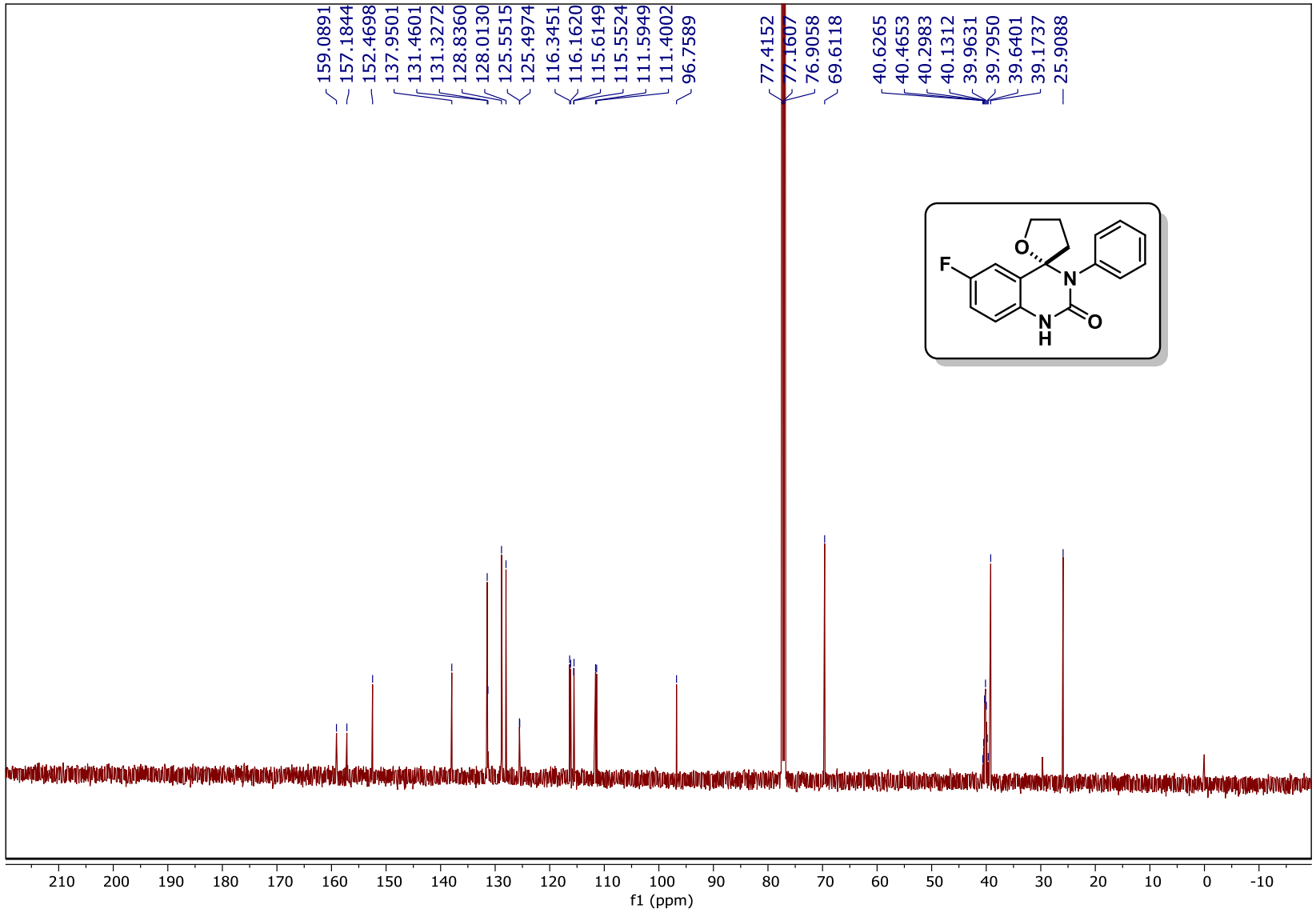


Figure S96. ^{19}F spectrum of compound **2n** (470 MHz, $CDCl_3/C_6F_6$)

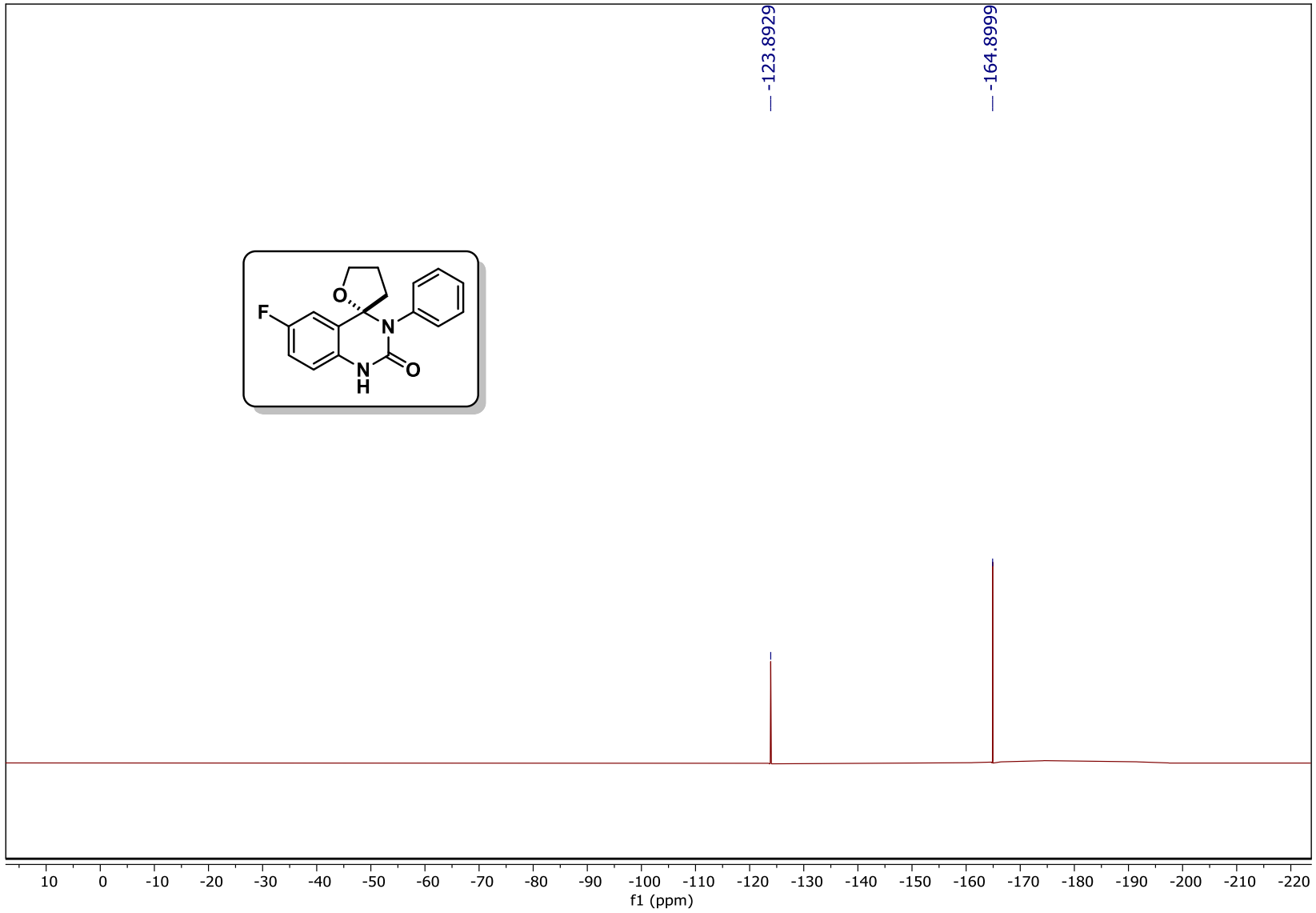


Figure S97. HRMS spectrum of **2n**

Sample Name		**Position**	P1-A4	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC300.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	11-07-2023 17:01:15 (UTC+05:30)

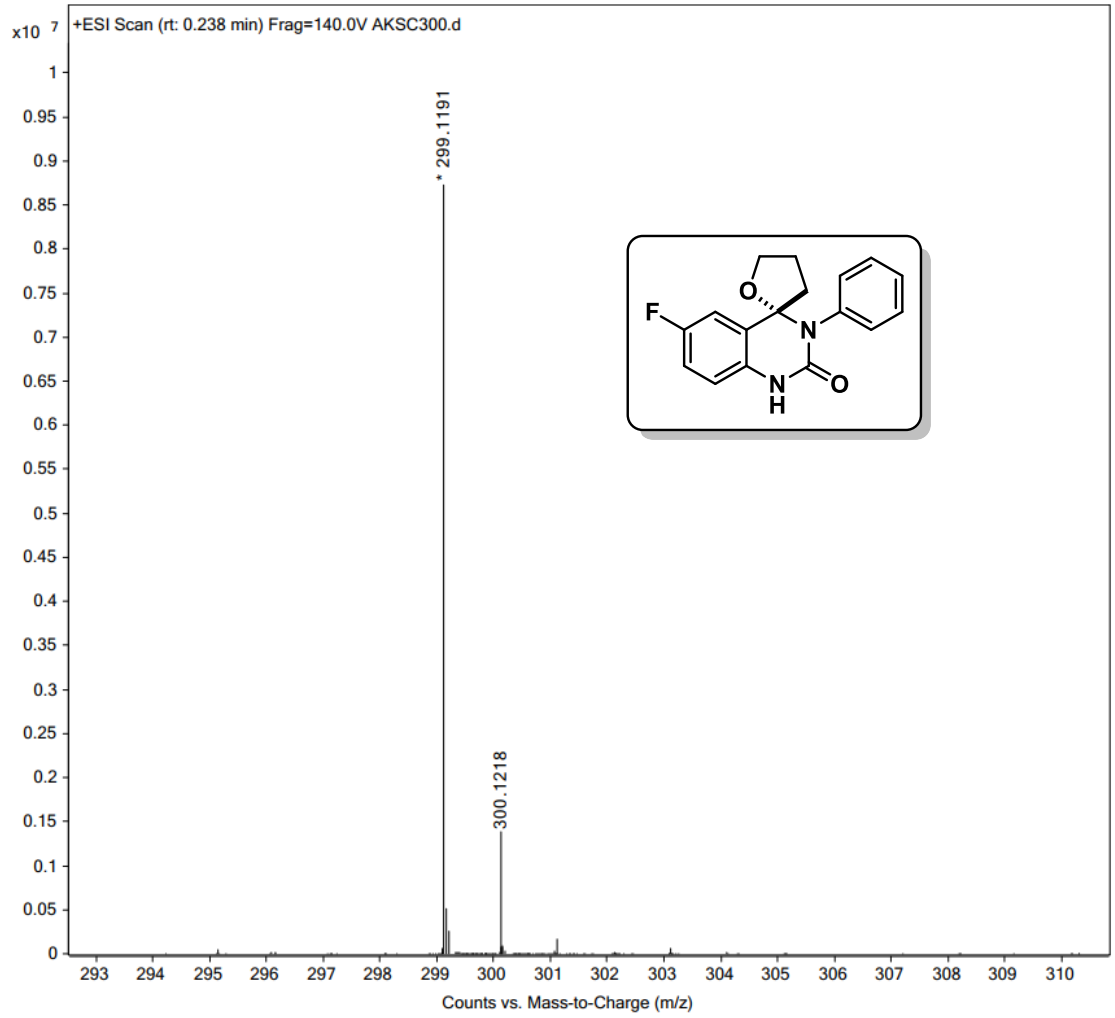


Figure S98. ^{1}H spectrum of compound **2o** (400 MHz, $CDCl_3$)

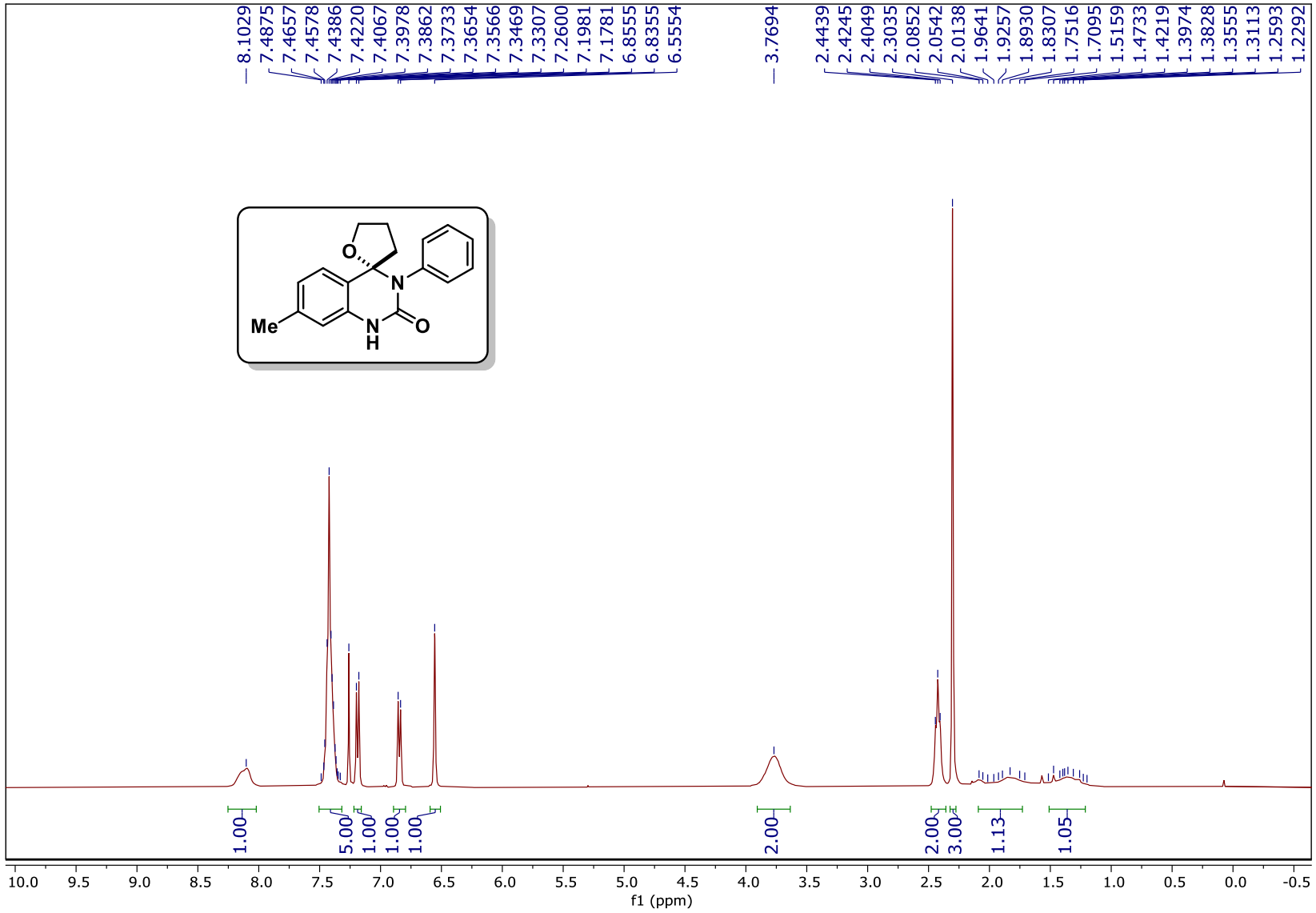


Figure S99. ^{13}C spectrum of compound **2o** (125 MHz, $CDCl_3$)

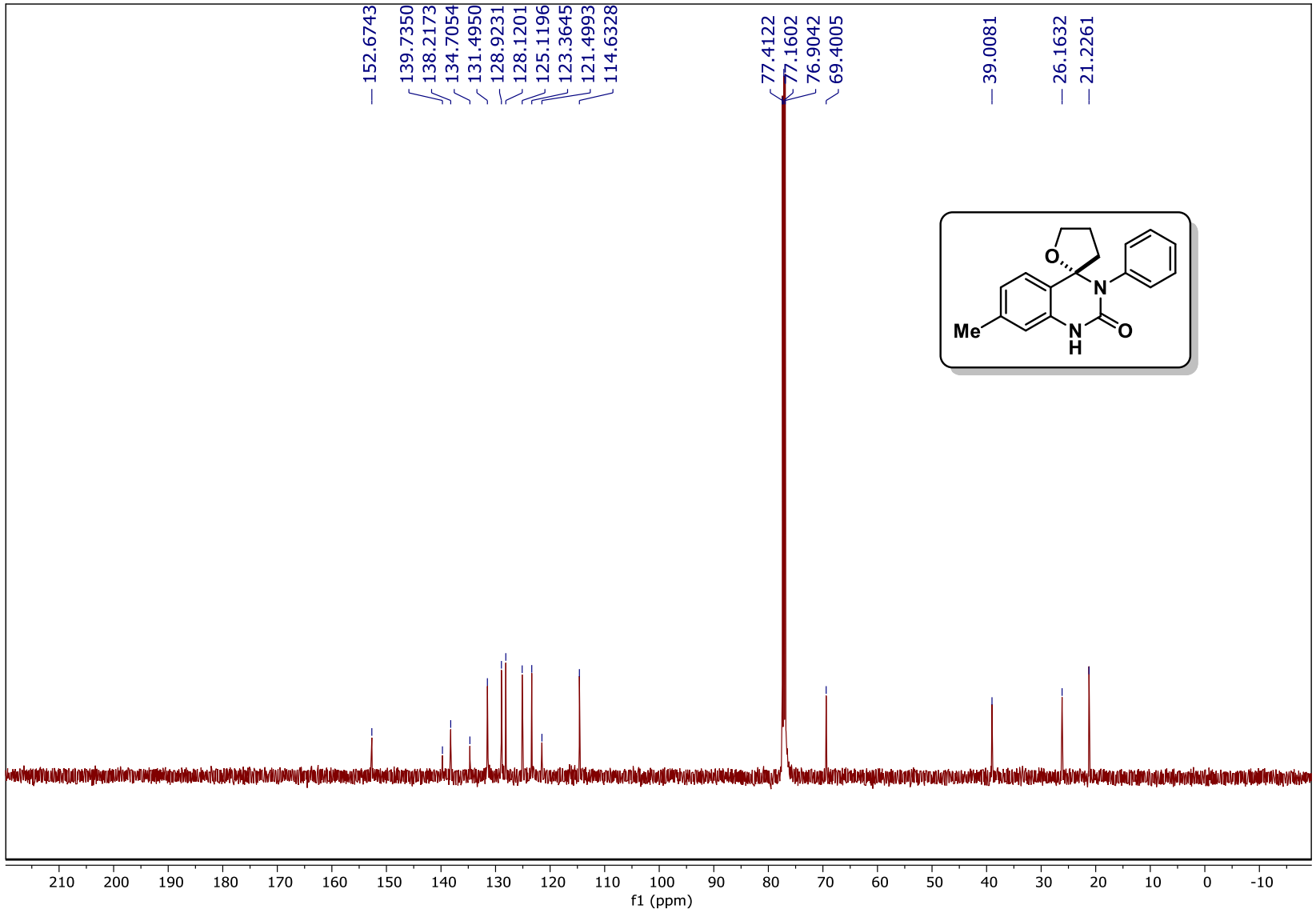


Figure S100. HRMS spectrum of **2o**

Sample Name	Sample23	**Position**	P1-C1	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-448.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	14-12-2023 15:41:52 (UTC+05:30)

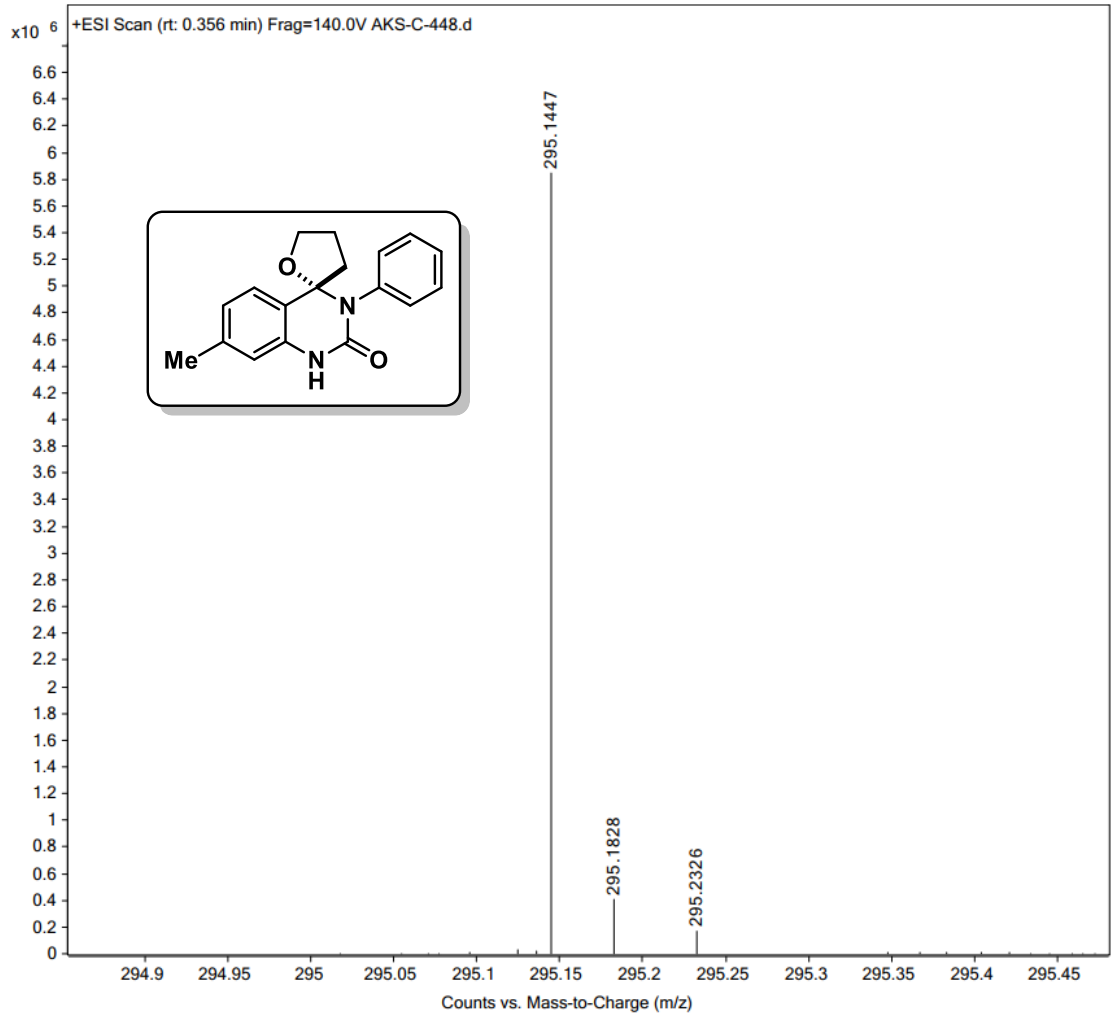


Figure S101. ^{1}H spectrum of compound **2p** (400 MHz, $CDCl_3$)

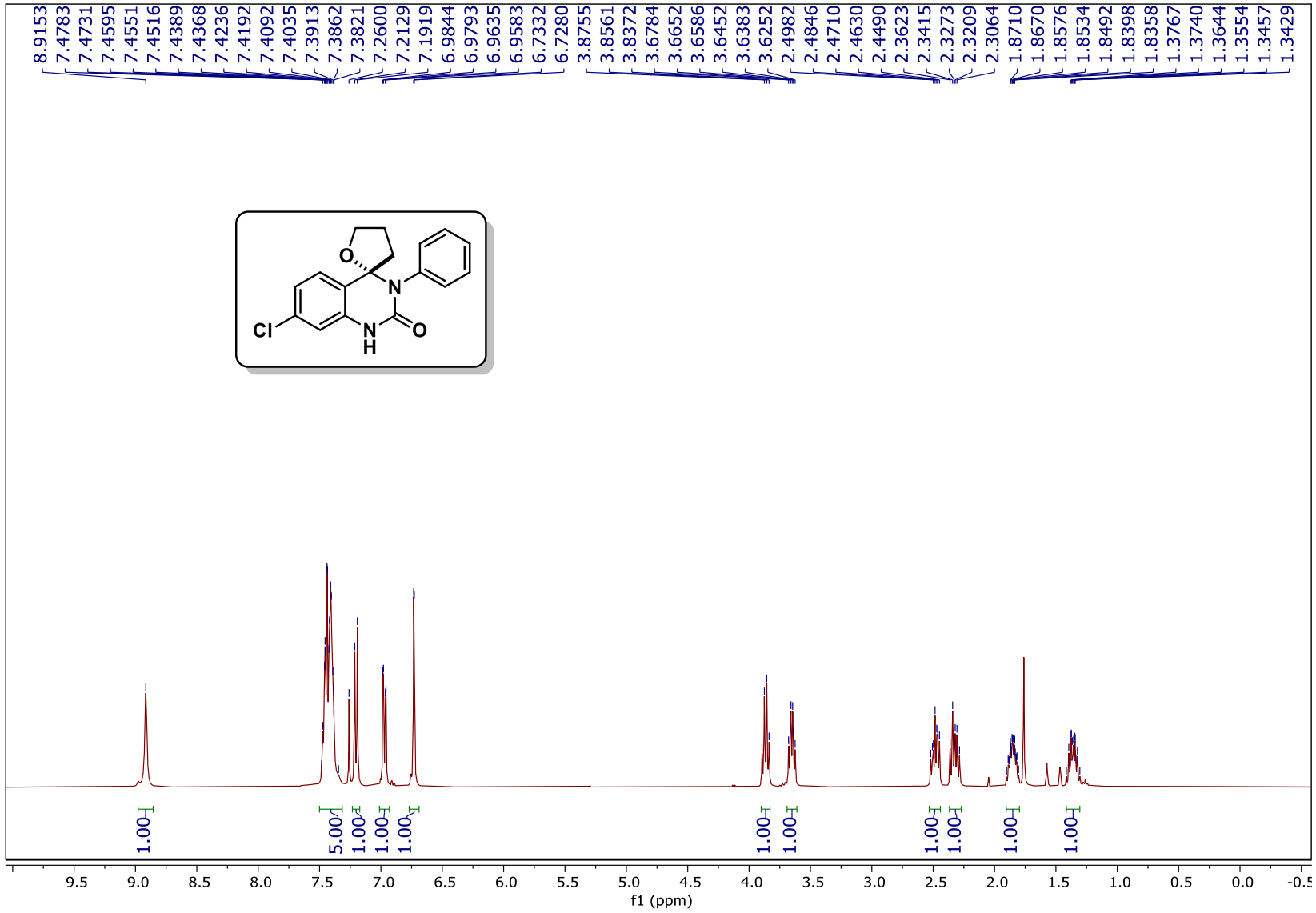


Figure S102. ^{13}C spectrum of compound **2p** (125 MHz, $CDCl_3$)

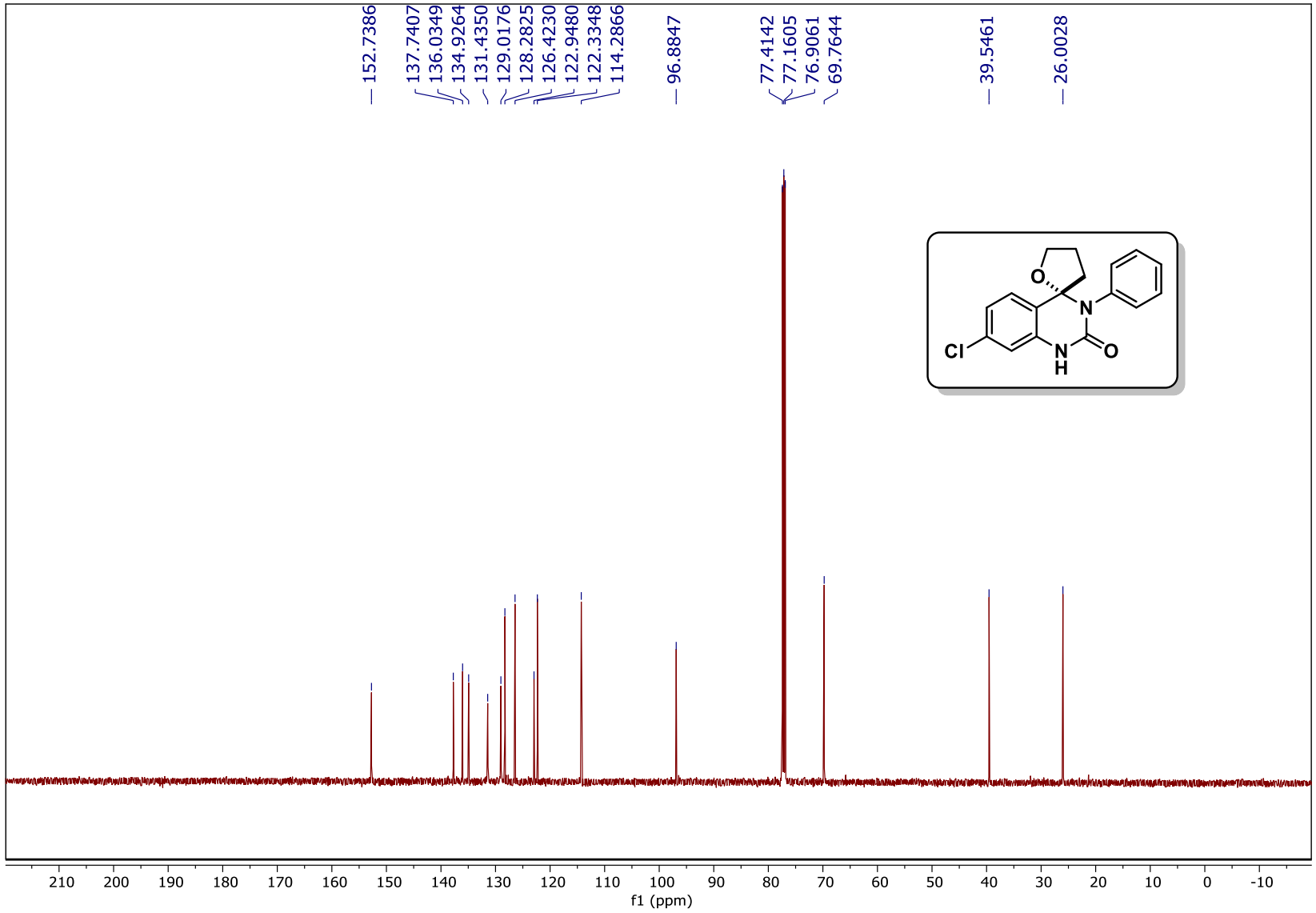


Figure S103. HRMS spectrum of **2p**

Sample Name	Sample22	**Position**	P1-B11	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC471.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	19-01-2024 10:30:13 (UTC+05:30)

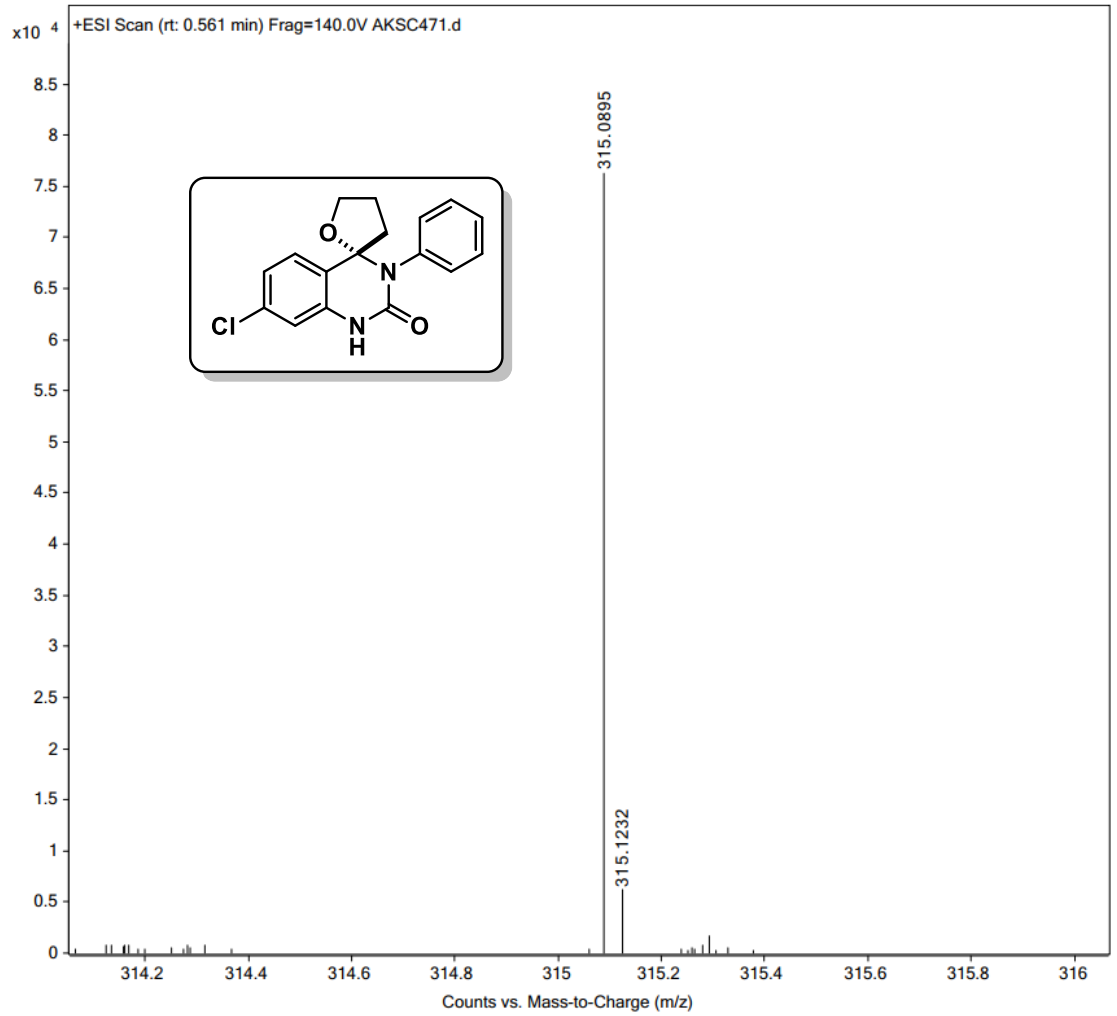


Figure S104. ^{1}H spectrum of compound **2q** (400 MHz, $CDCl_3$/DMSO-d_6)

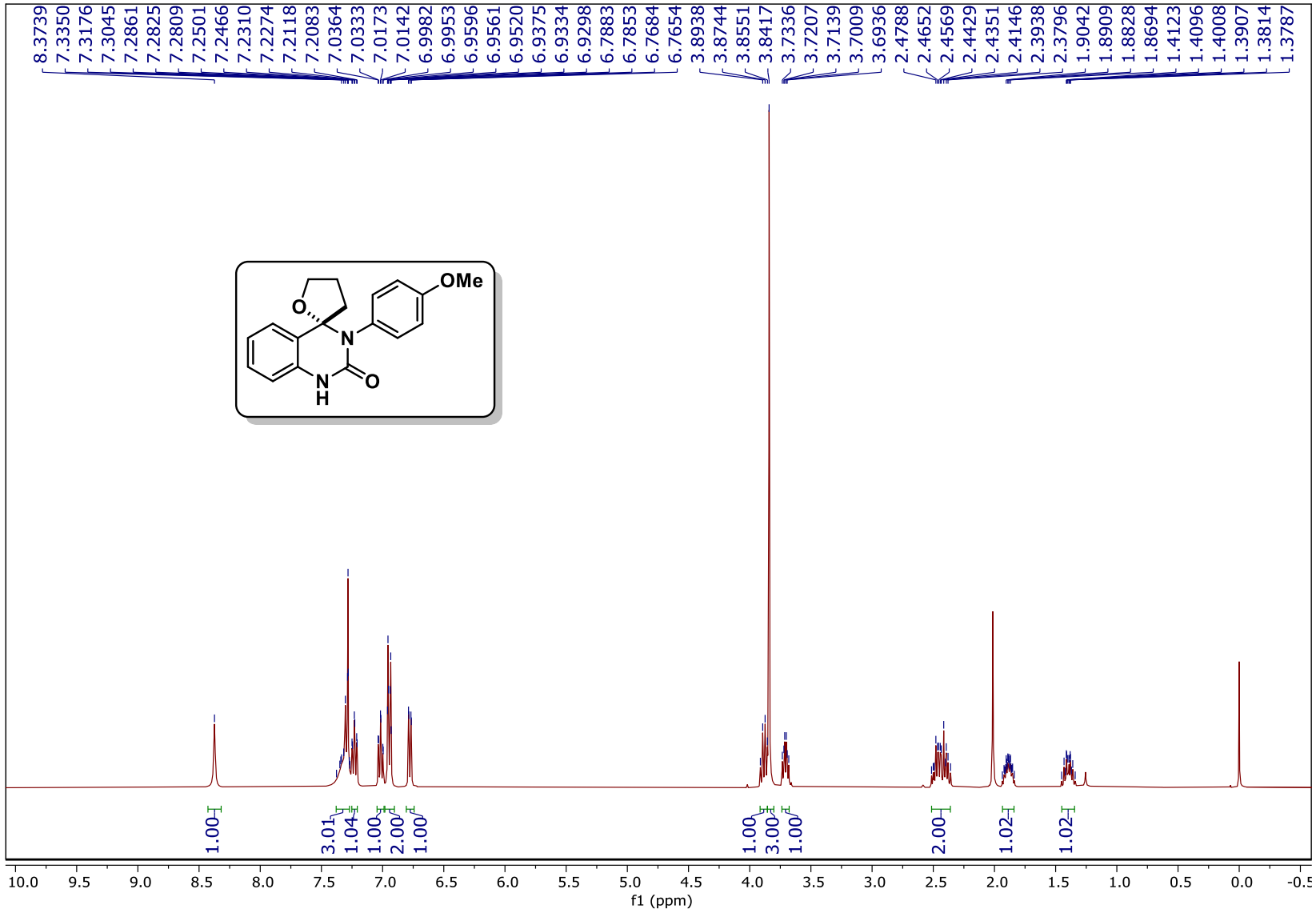


Figure S105. ^{13}C spectrum of compound **2q** (125 MHz, $CDCl_3$/DMSO-d_6)

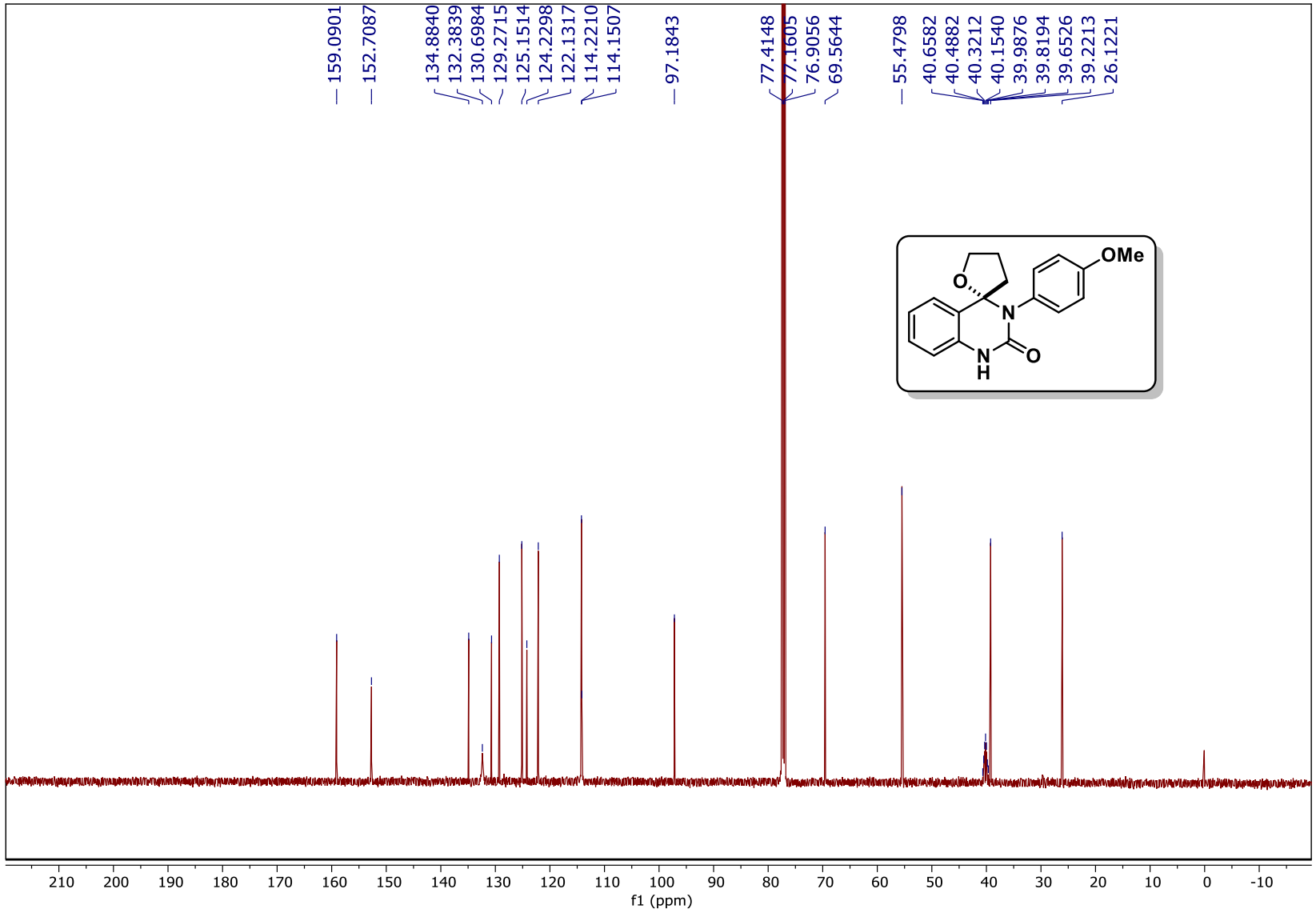


Figure S106. HRMS spectrum of **2q**

Sample Name		**Position**	P1-A4	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC377.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	03-10-2023 15:09:52 (UTC+05:30)

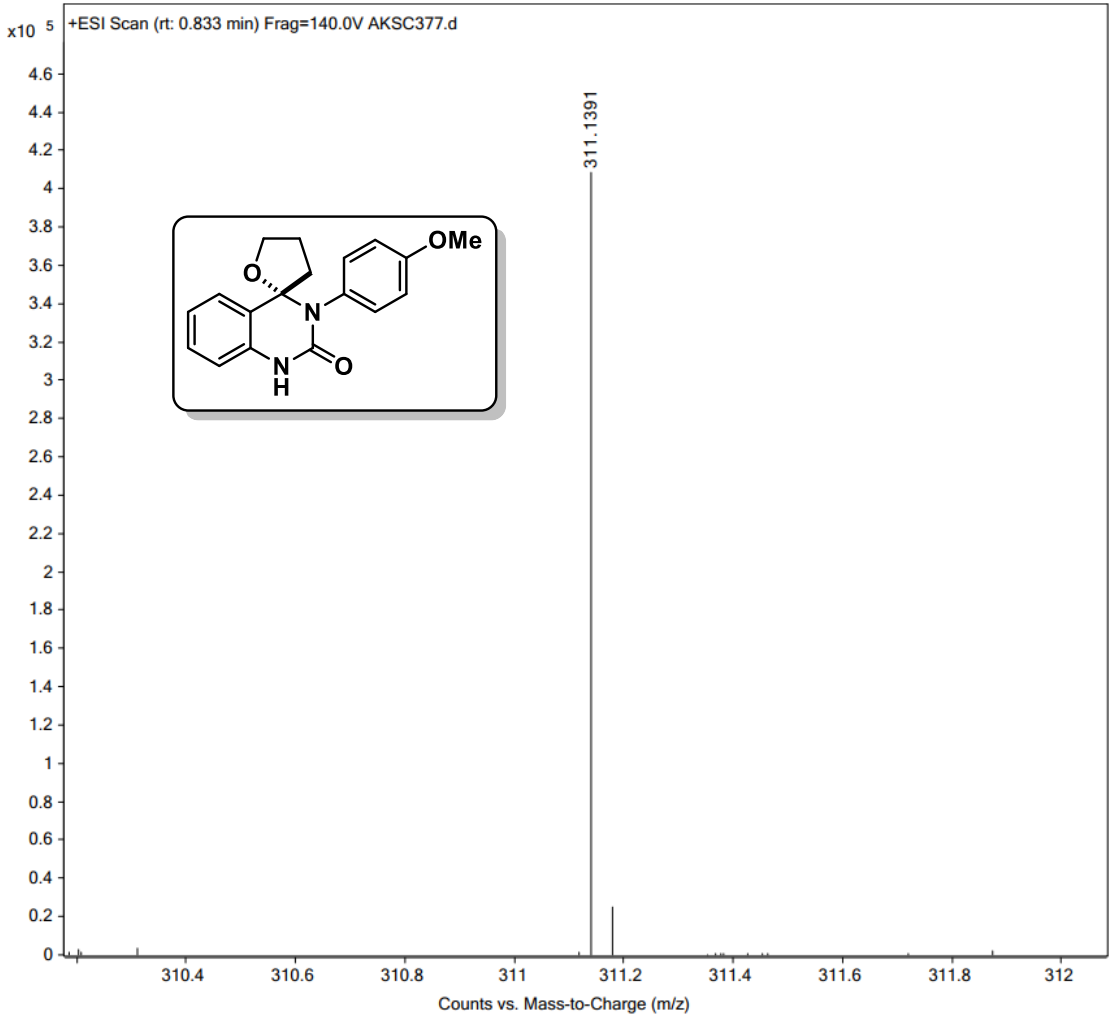


Figure S107. ^{1}H spectrum of compound **2r** (400 MHz, $CDCl_3$)

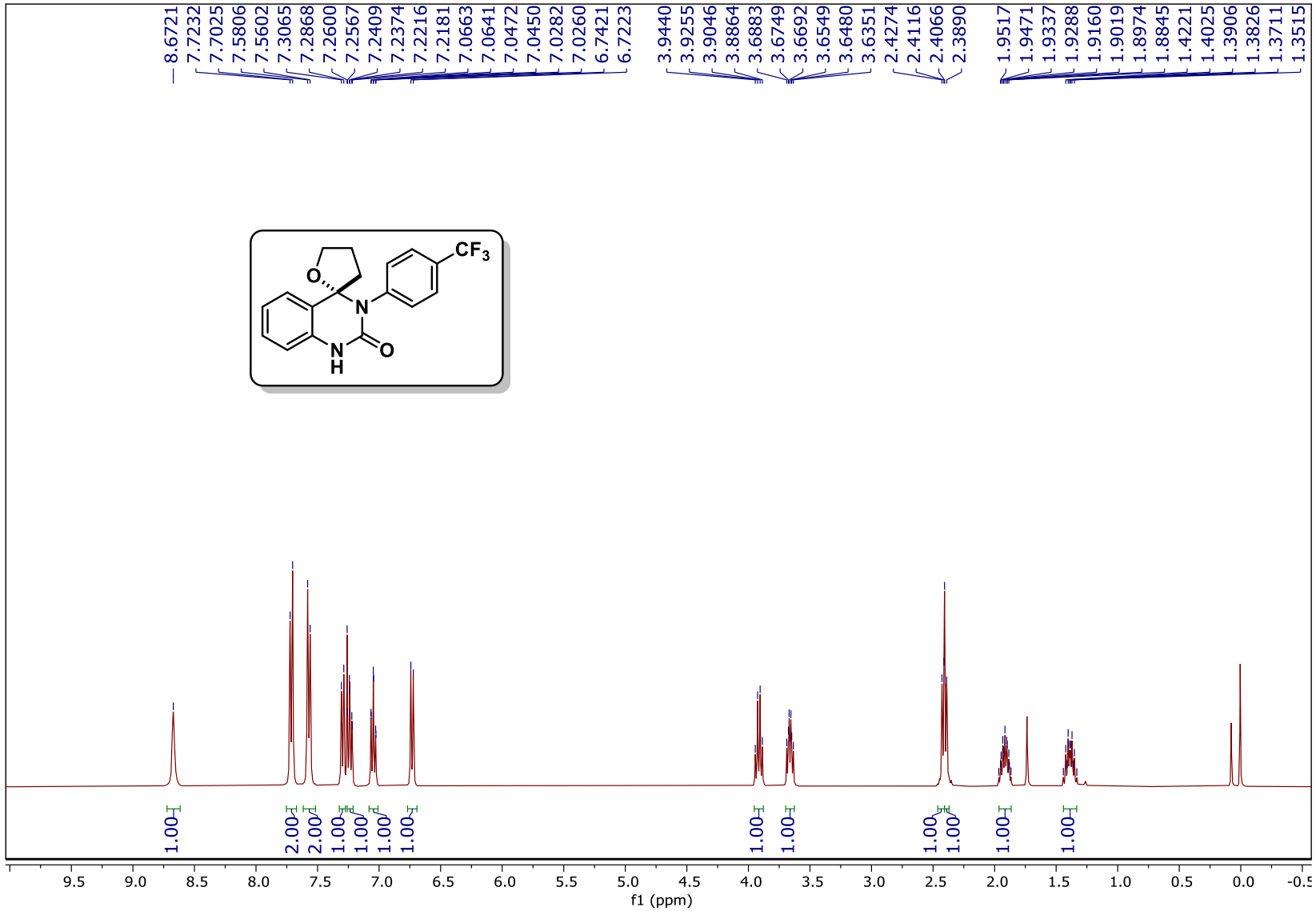


Figure S108. ^{13}C spectrum of compound **2r** (125 MHz, $CDCl_3$)

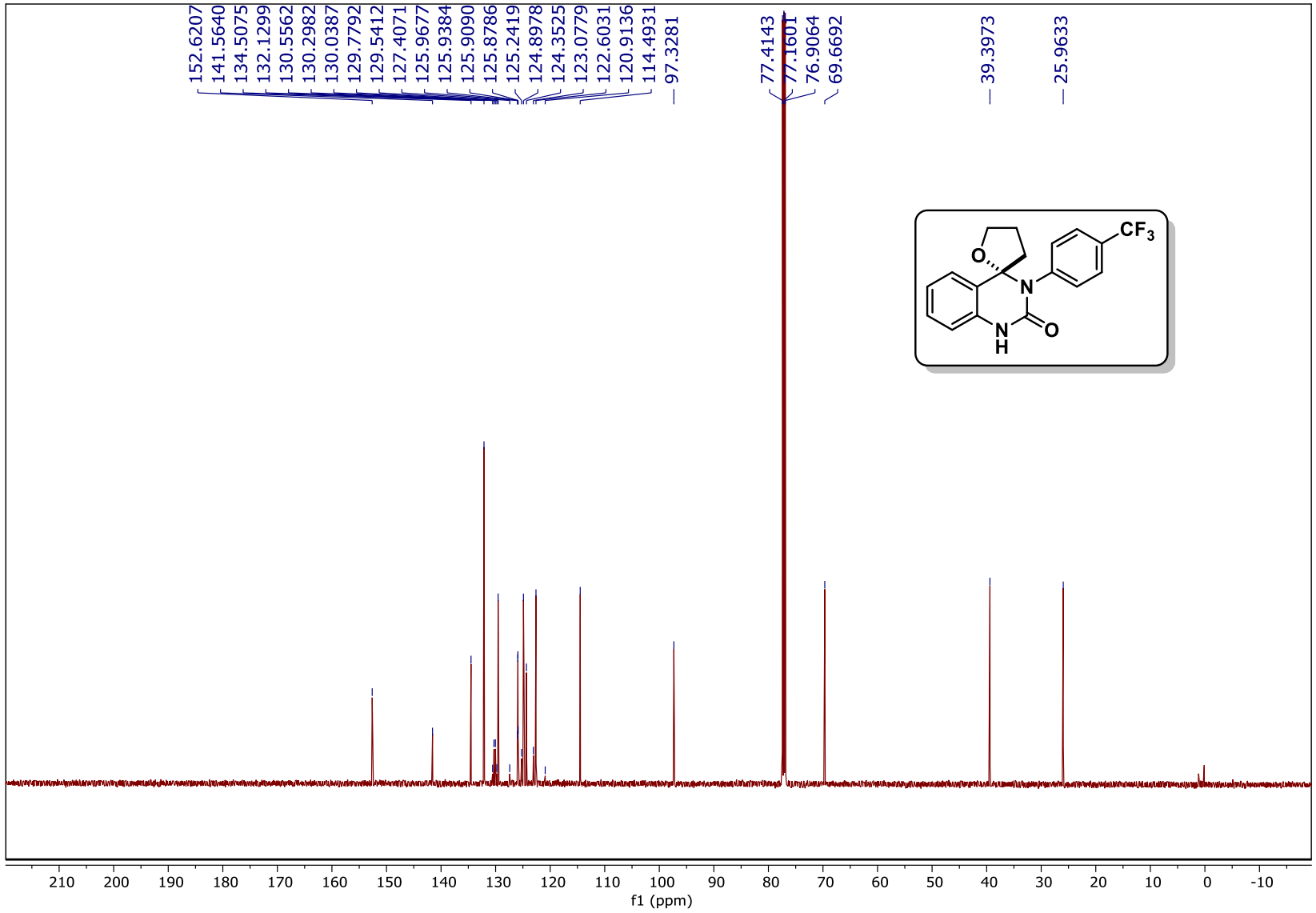


Figure S109. ^{19}F spectrum of compound **2r** (470 MHz, $CDCl_3/C_6F_6$)

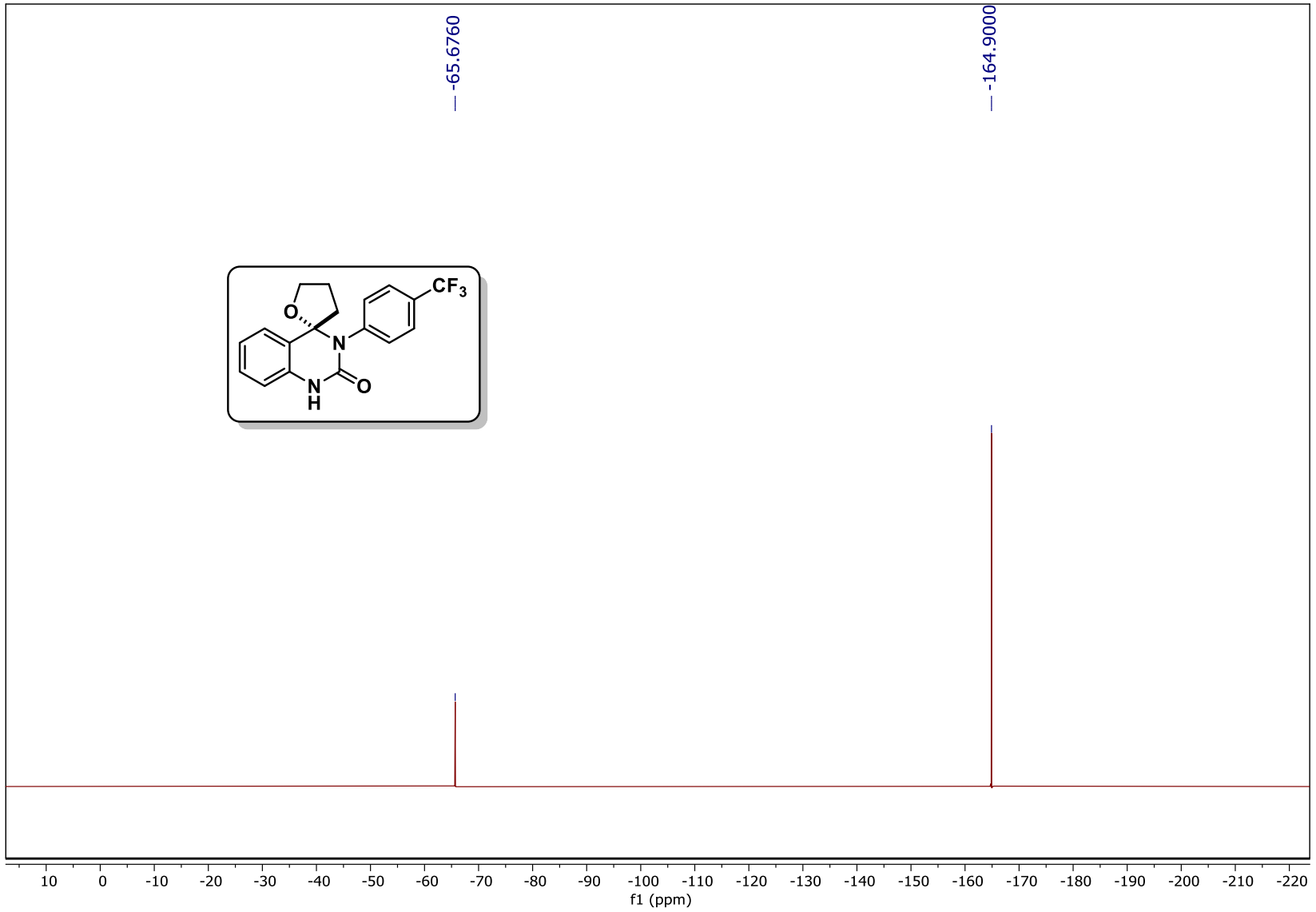


Figure S110. HRMS spectrum of **2r**

Sample Name	Sample22	**Position**	P1-B11	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	SP-C-369.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	21-09-2023 11:32:53 (UTC+05:30)

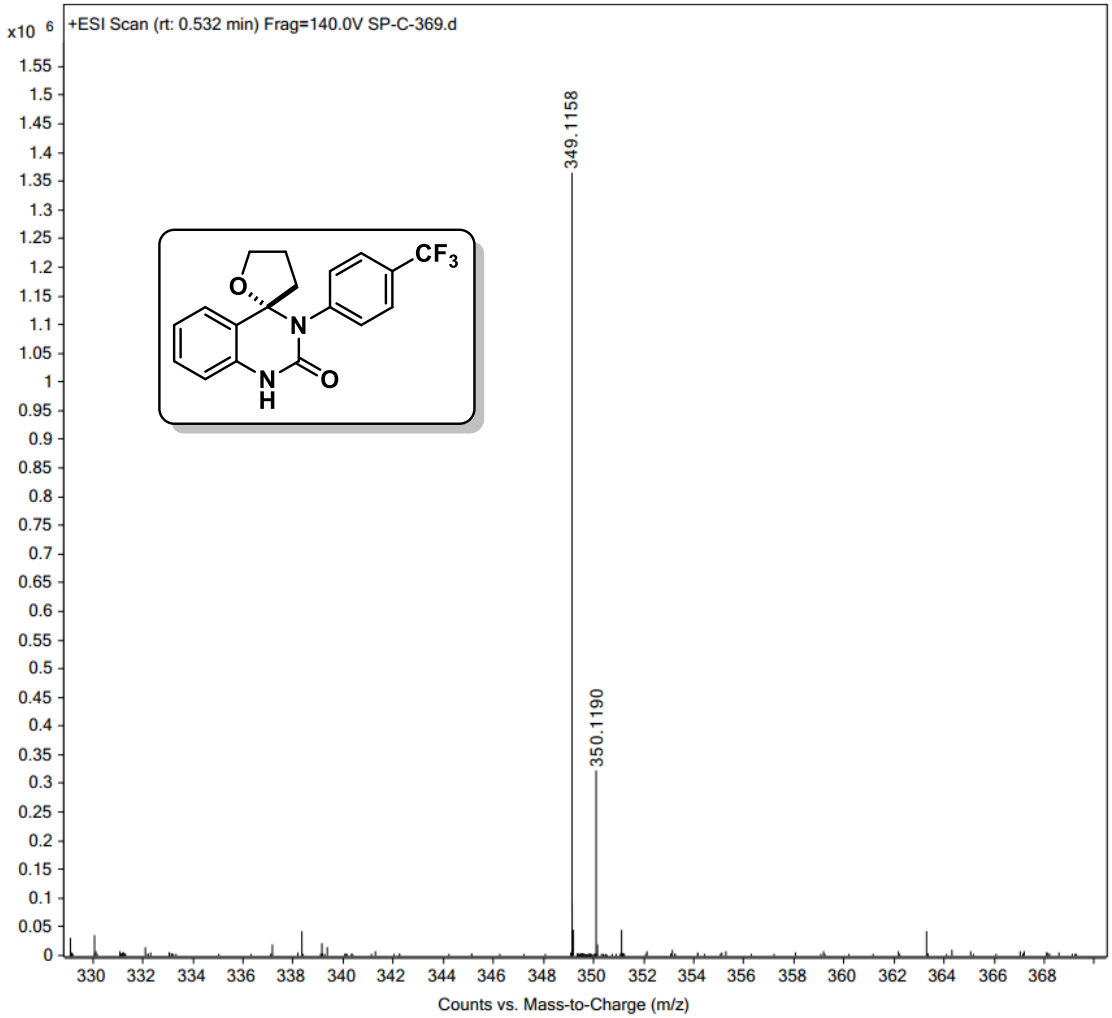


Figure S111. ^{1}H spectrum of compound **2s** (500 MHz, $CDCl_3$)

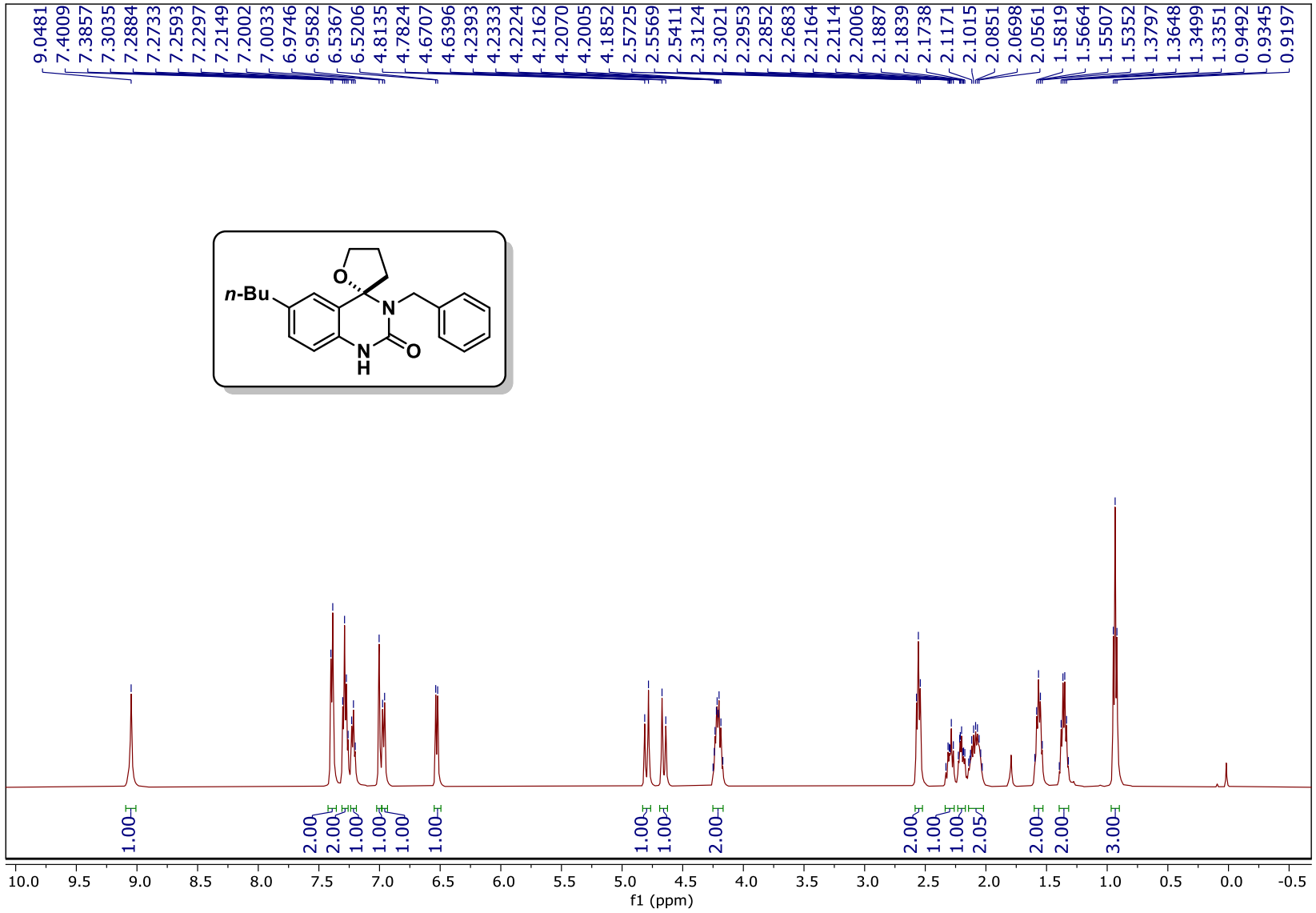


Figure S112. ^{13}C spectrum of compound **2s** (125 MHz, $CDCl_3$)

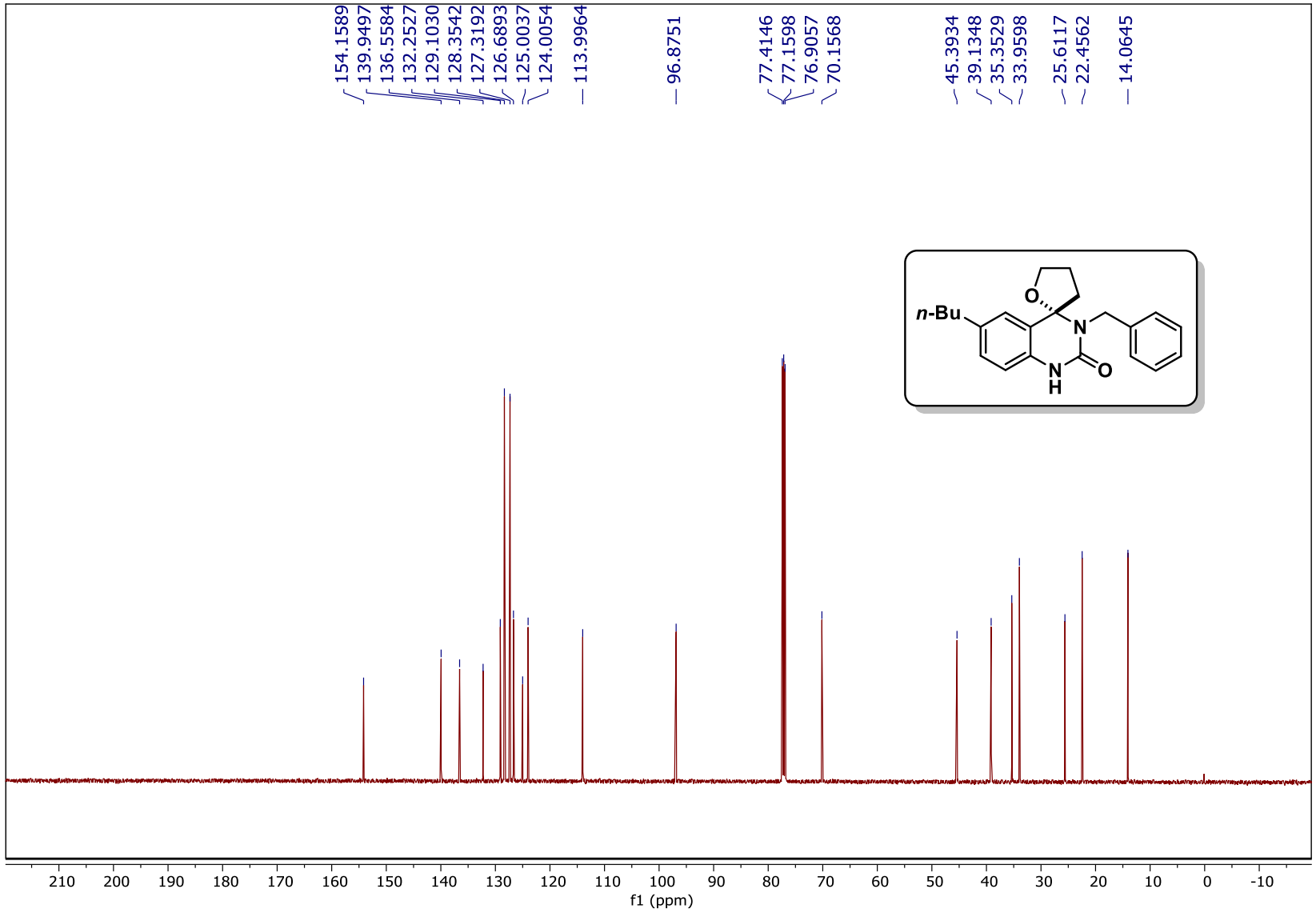


Figure S113. HRMS spectrum of **2s**

Sample Name	Sample15	**Position**	P1-B4	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-328.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	25-09-2023 15:30:22 (UTC+05:30)

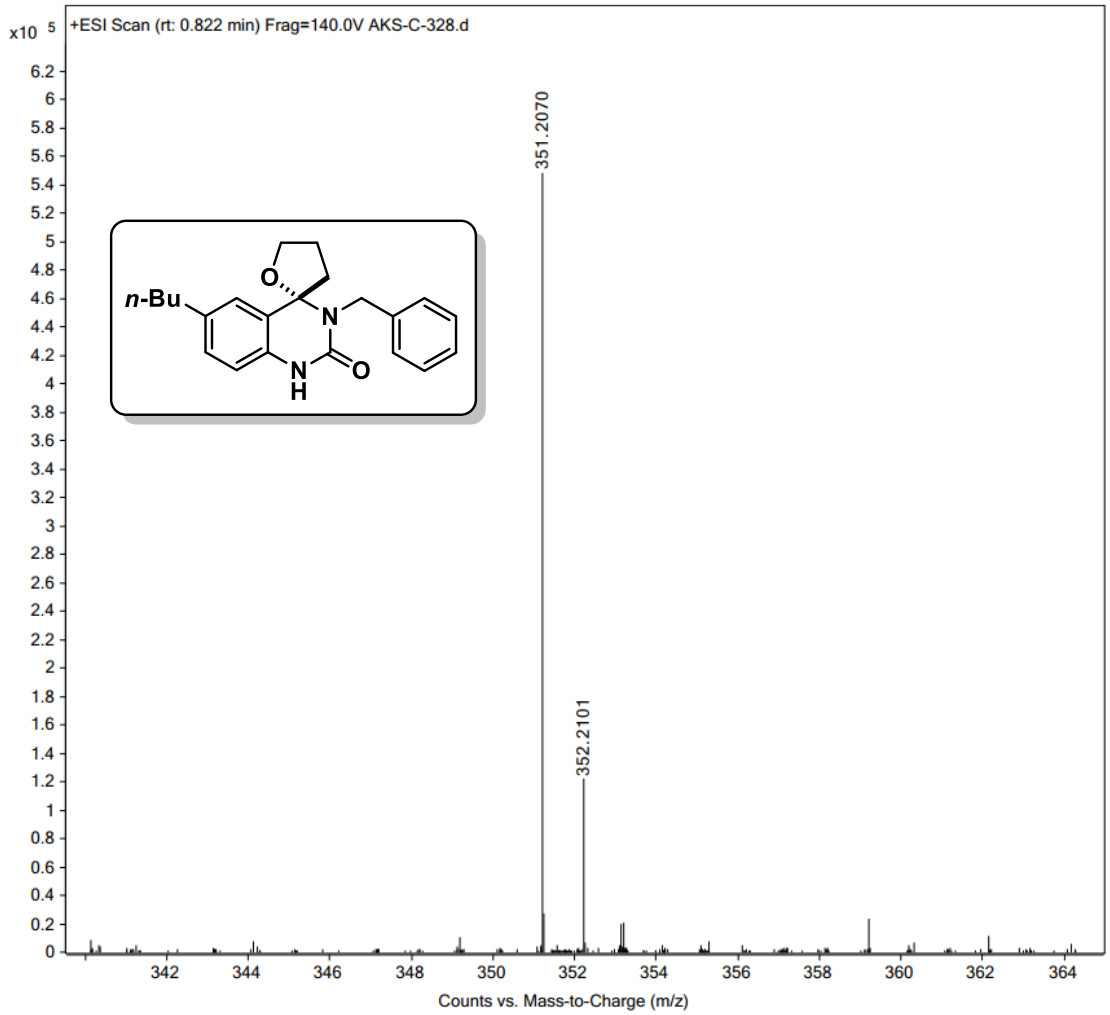


Figure S114. ^{1}H spectrum of compound **2t** (500 MHz, $CDCl_3$)

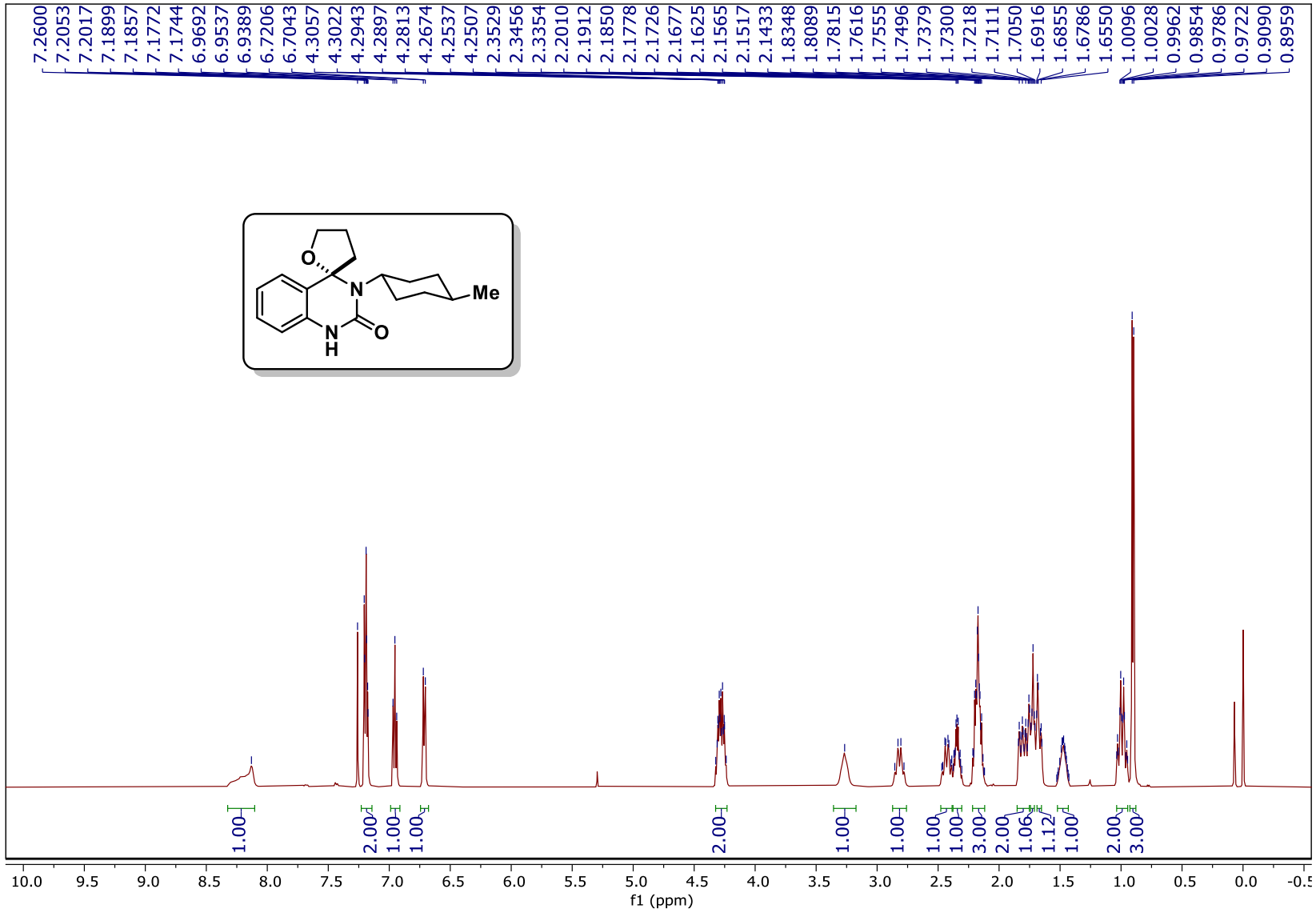


Figure S115. ^{13}C spectrum of compound **2t** (125 MHz, $CDCl_3$)

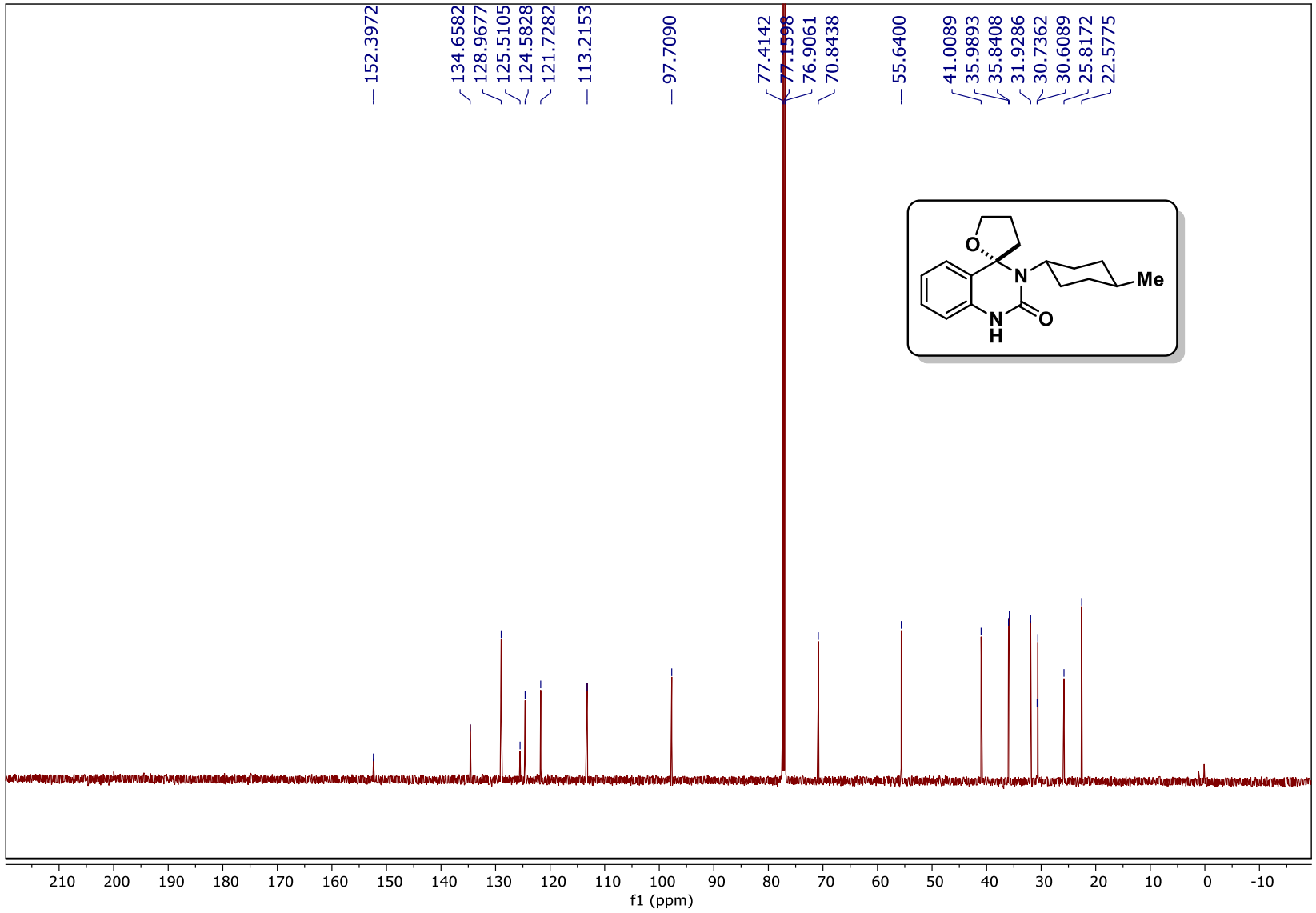


Figure S116. HRMS spectrum of **2t**

Sample Name	Sample7	**Position**	P1-A5	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC366.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	11-08-2023 14:47:41 (UTC+05:30)

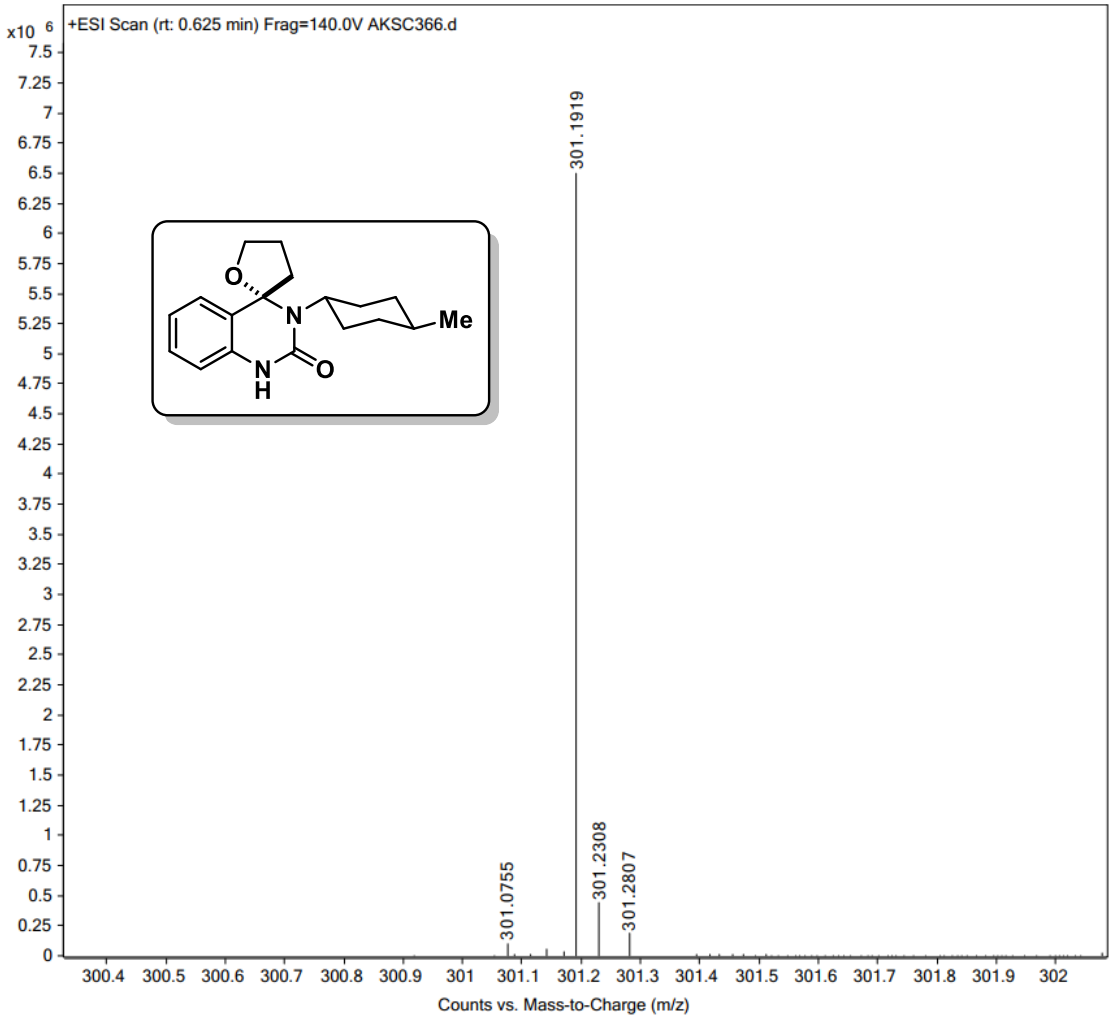


Figure S117. ^{1}H spectrum of compound **2u** (500 MHz, $CDCl_3$)

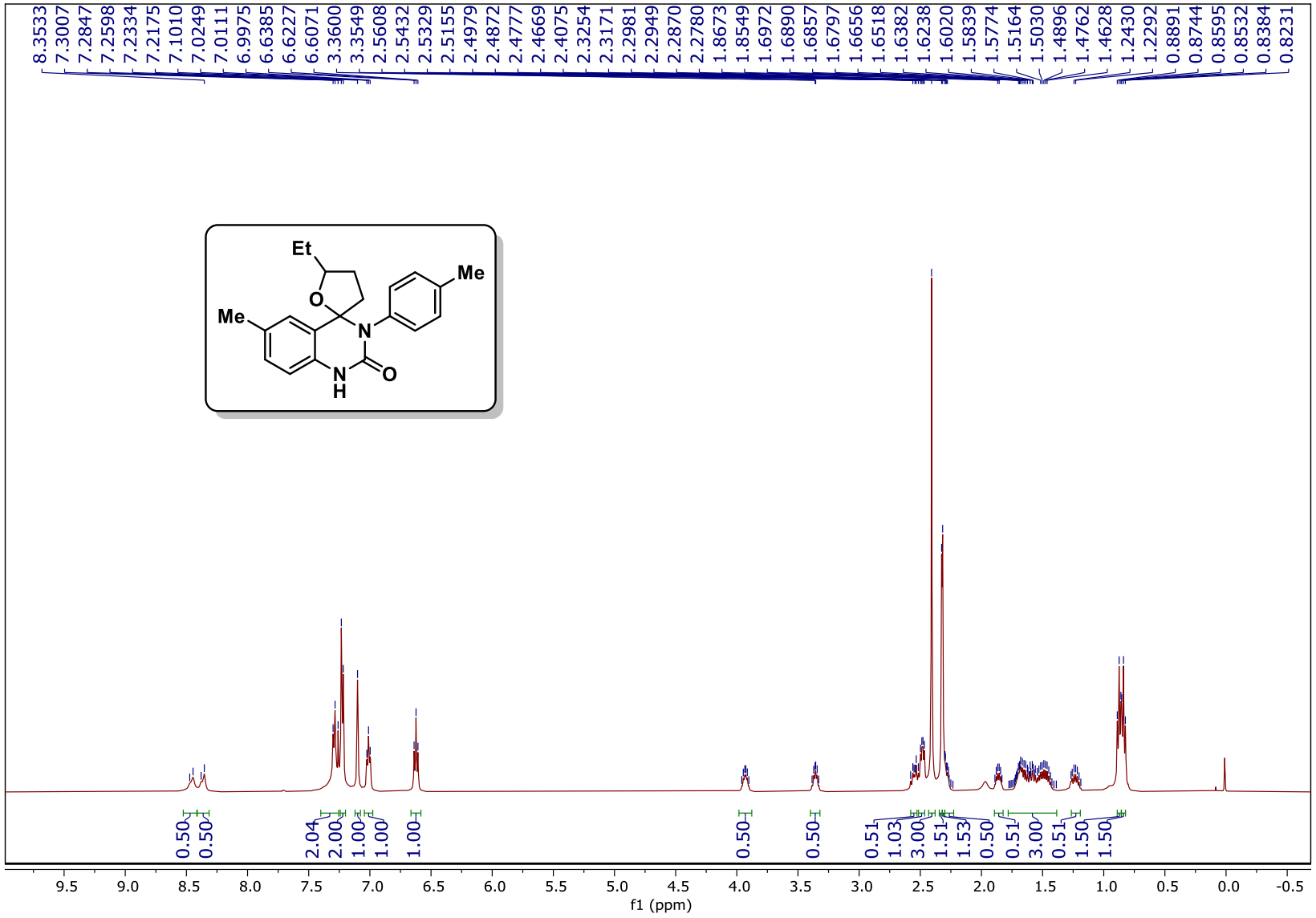


Figure S118. ^{13}C spectrum of compound **2u** (125 MHz, $CDCl_3$)

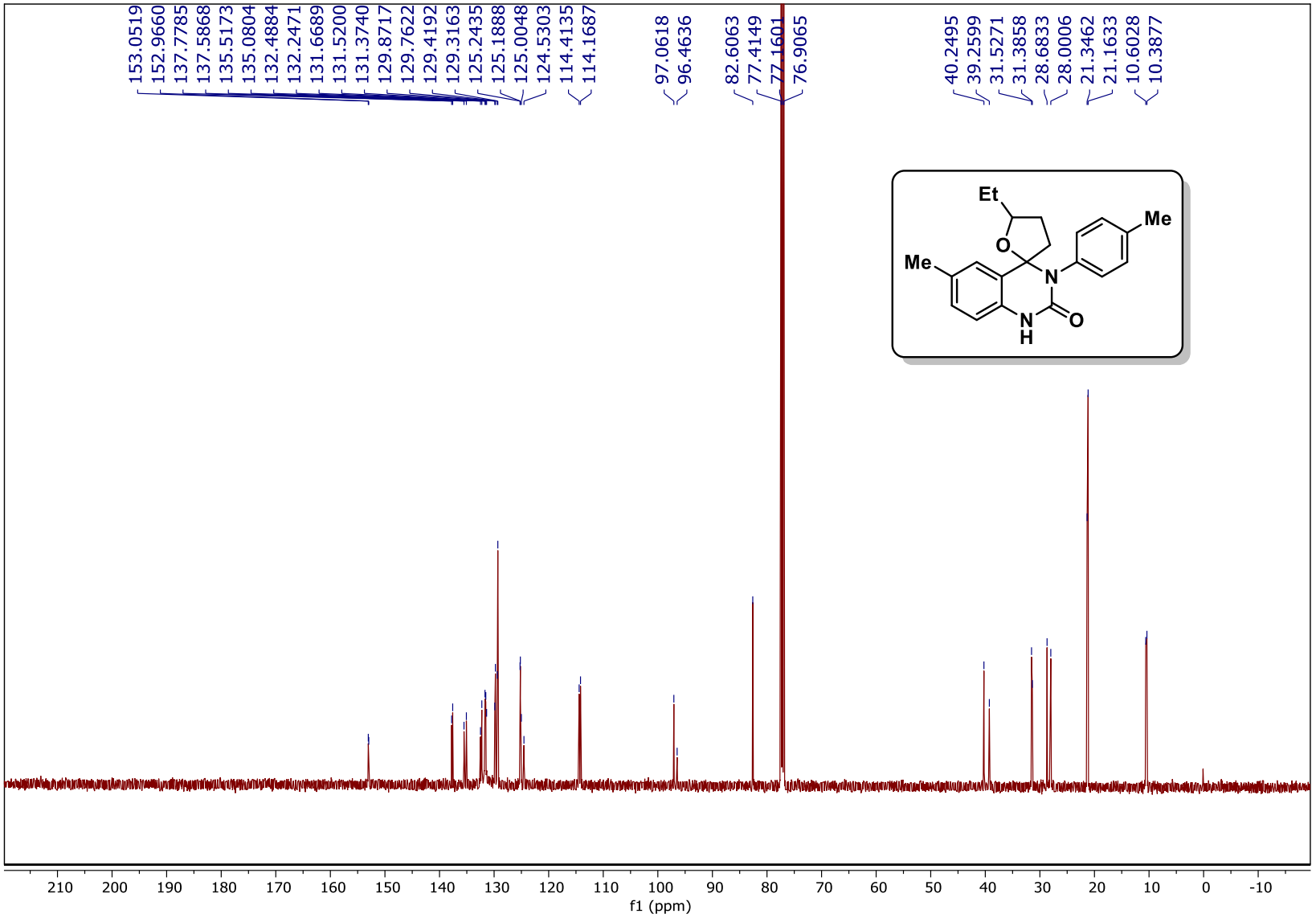


Figure S119. HRMS spectrum of **2u**

Sample Name	Sample16	**Position**	P1-B5	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-365.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	25-09-2023 15:32:10 (UTC+05:30)

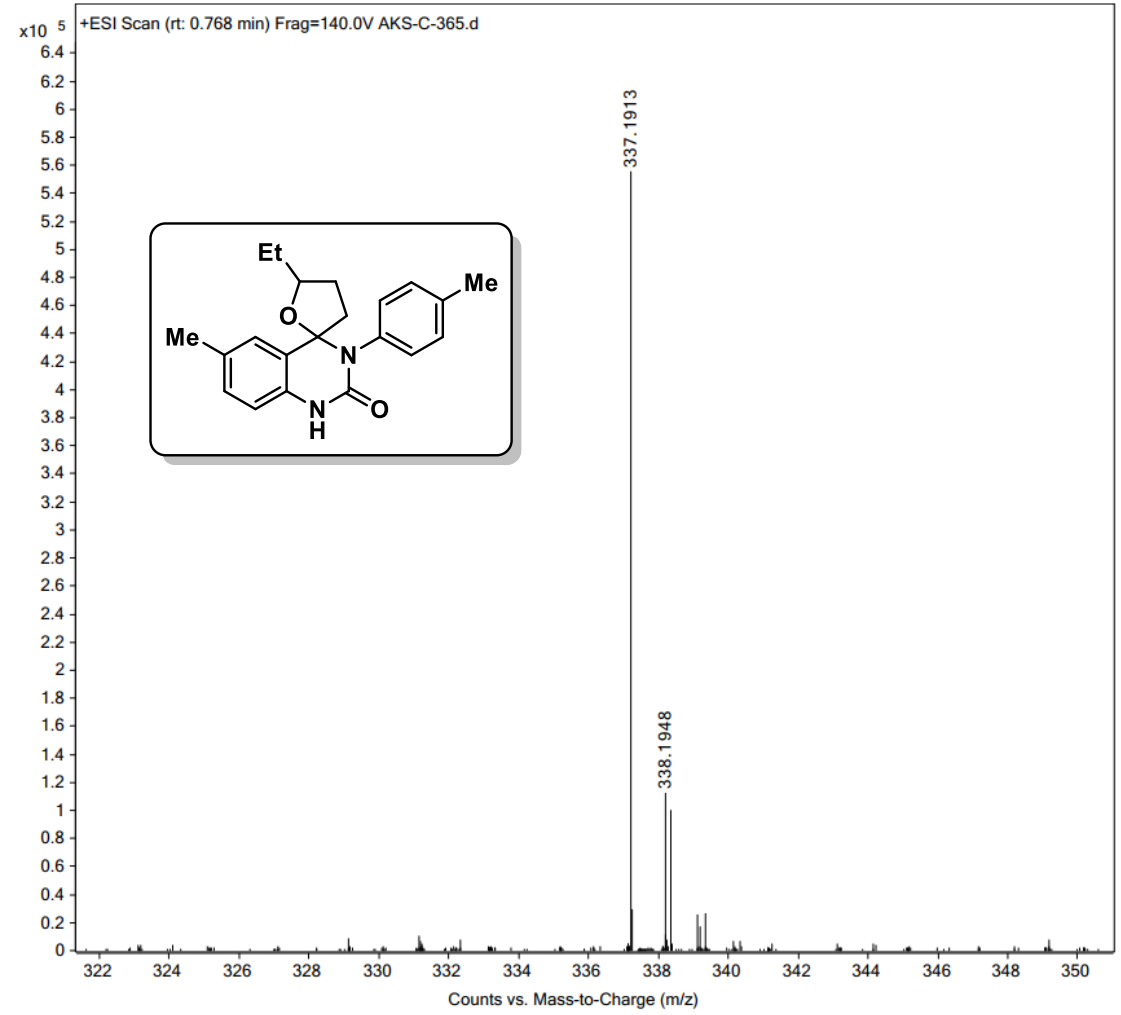


Figure S120. ^{1}H spectrum of compound **2v** (500 MHz, $CDCl_3$)

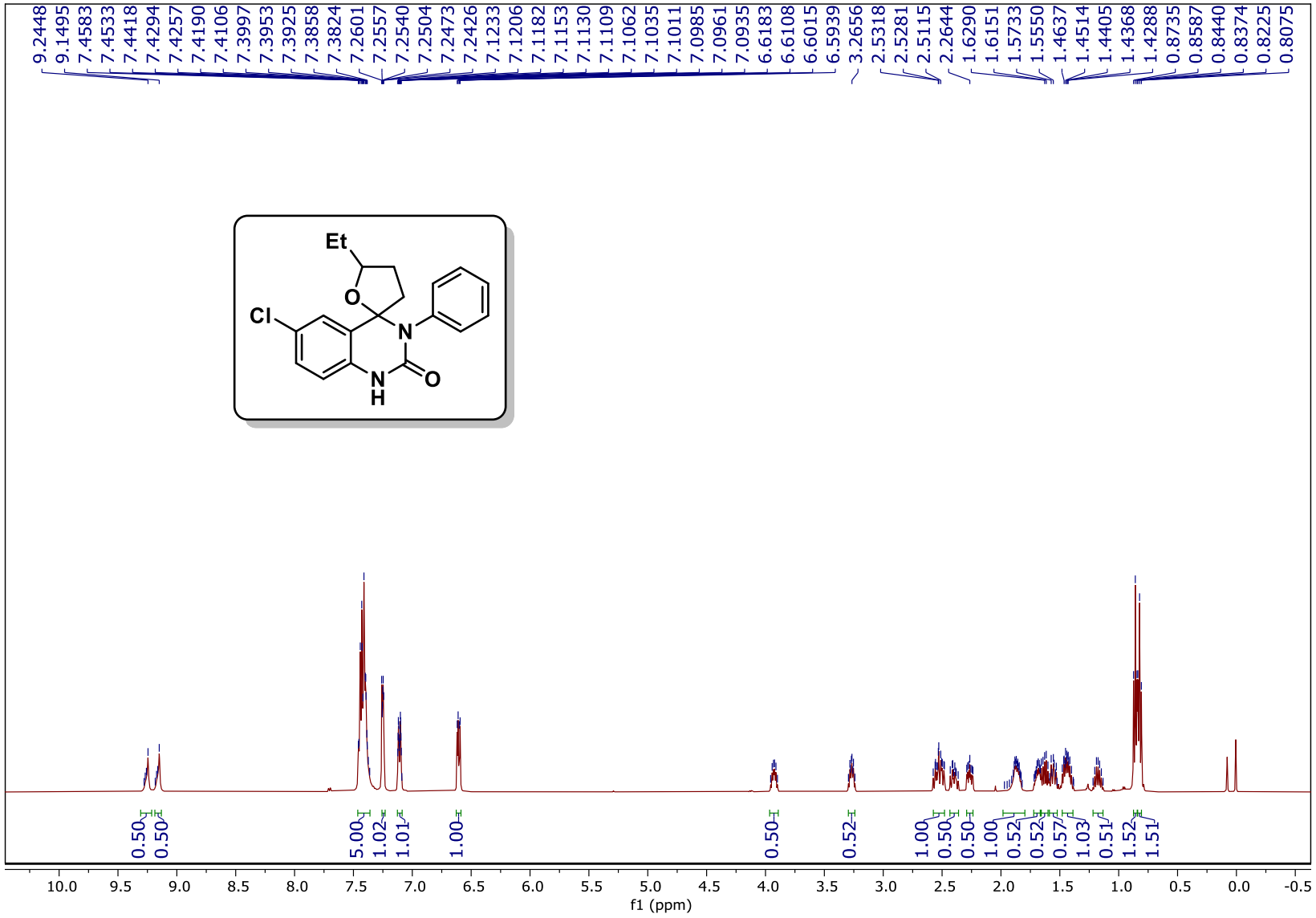


Figure S121. ^{13}C spectrum of compound **2v** (125 MHz, $CDCl_3$)

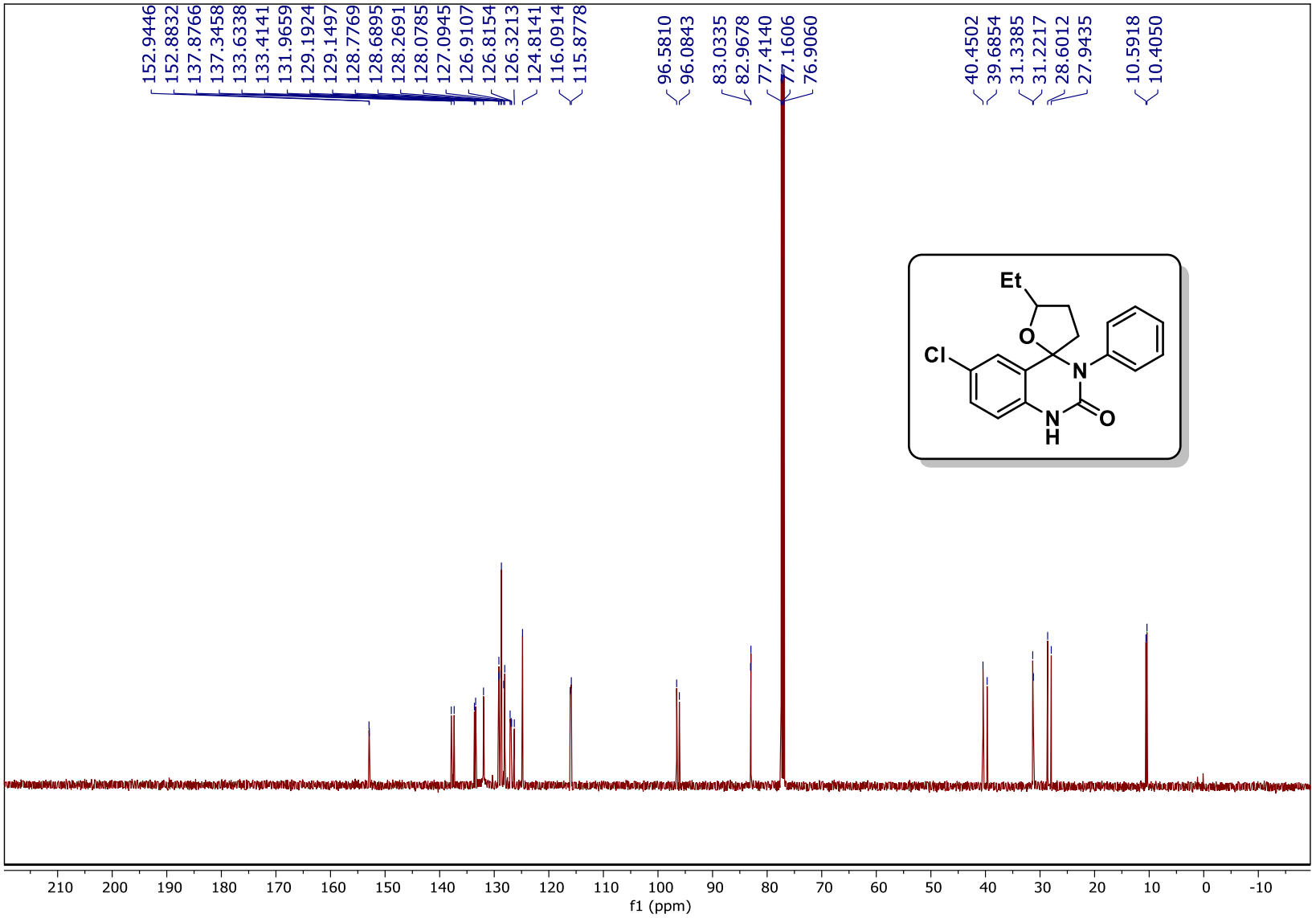


Figure S122. HRMS spectrum of **2v**

Sample Name	Sample16	**Position**	P1-B5	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-366.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	26-09-2023 10:47:24 (UTC+05:30)

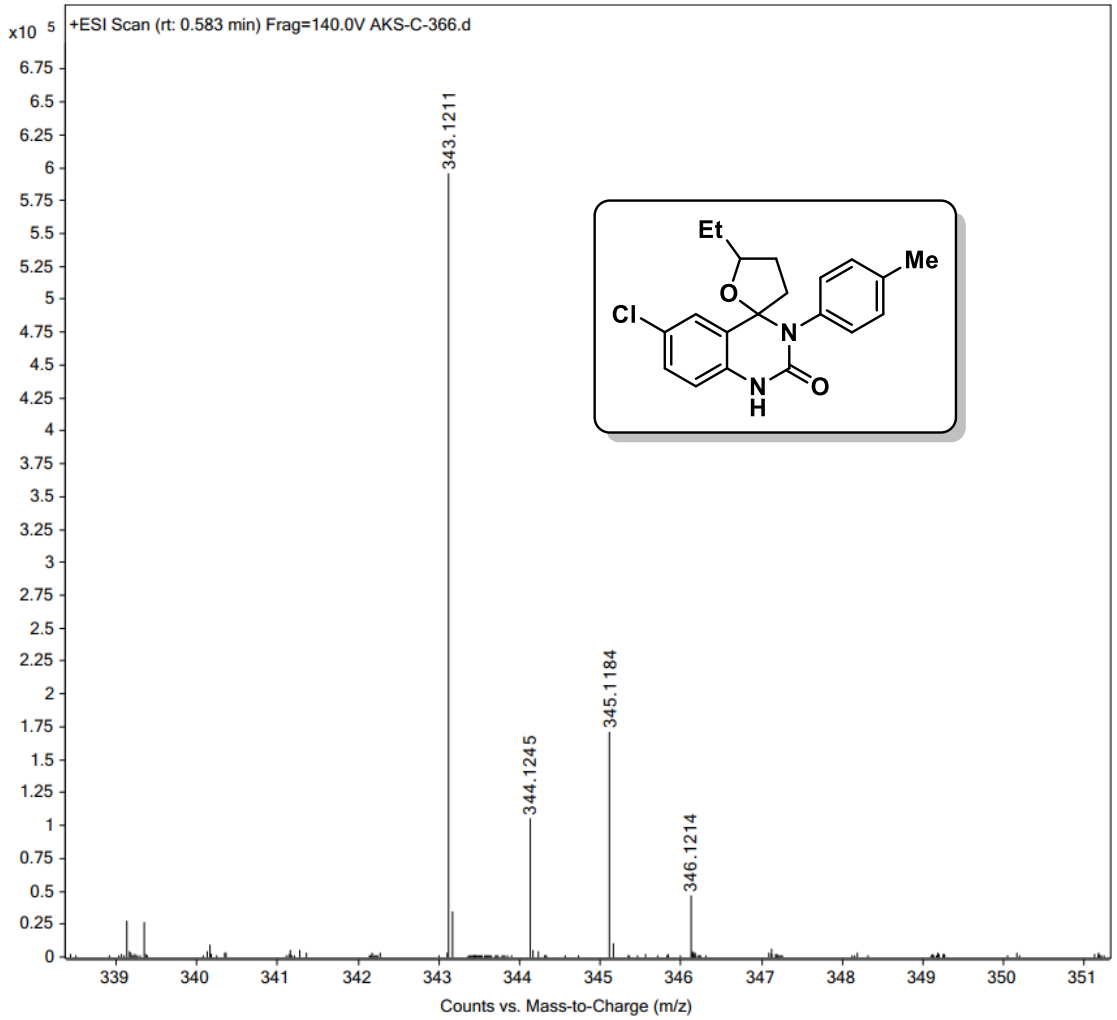


Figure S123. ^{1}H spectrum of compound **2w** (400 MHz, $CDCl_3$)

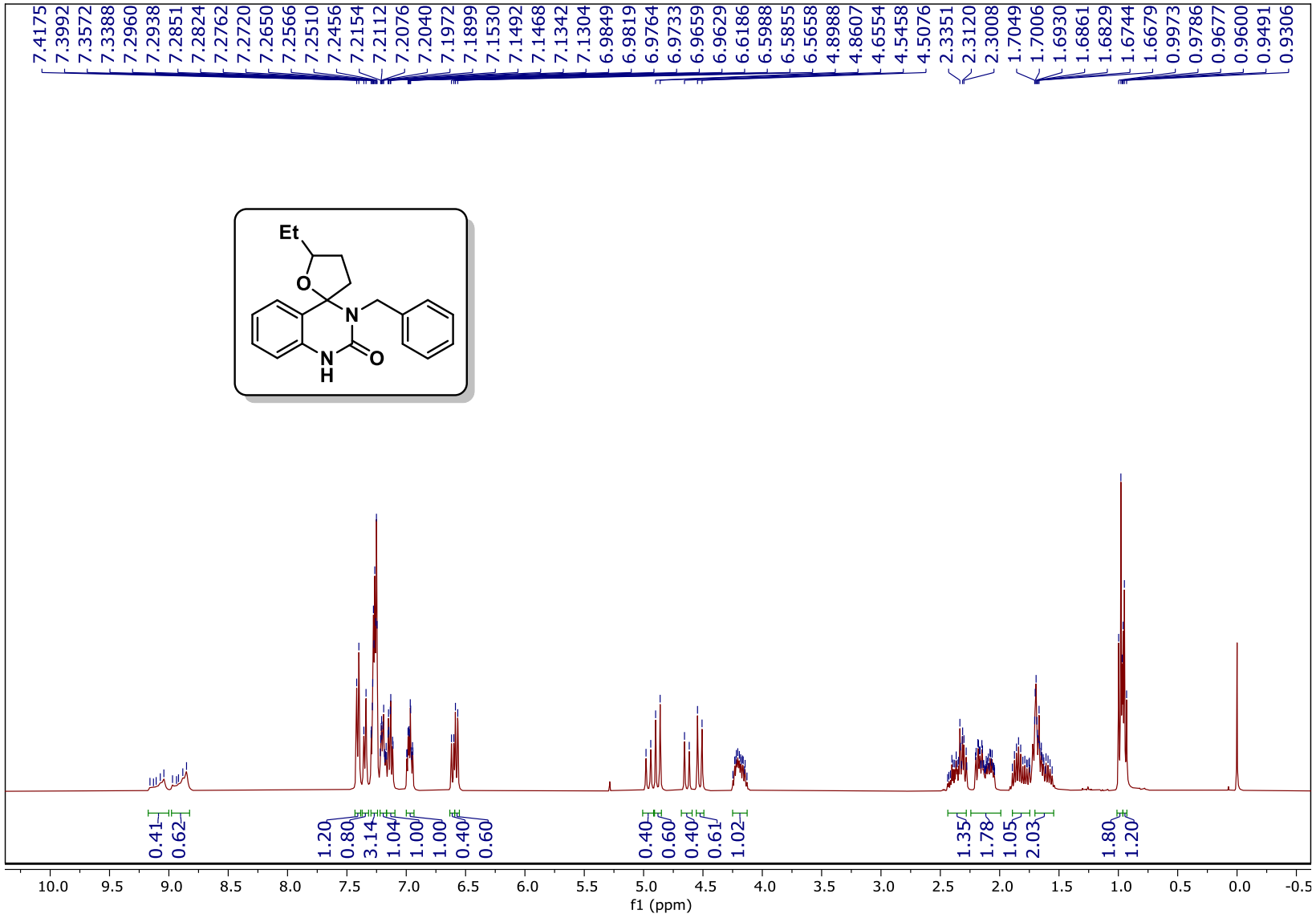


Figure S124. ^{13}C spectrum of compound **2w** (125 MHz, $CDCl_3$)

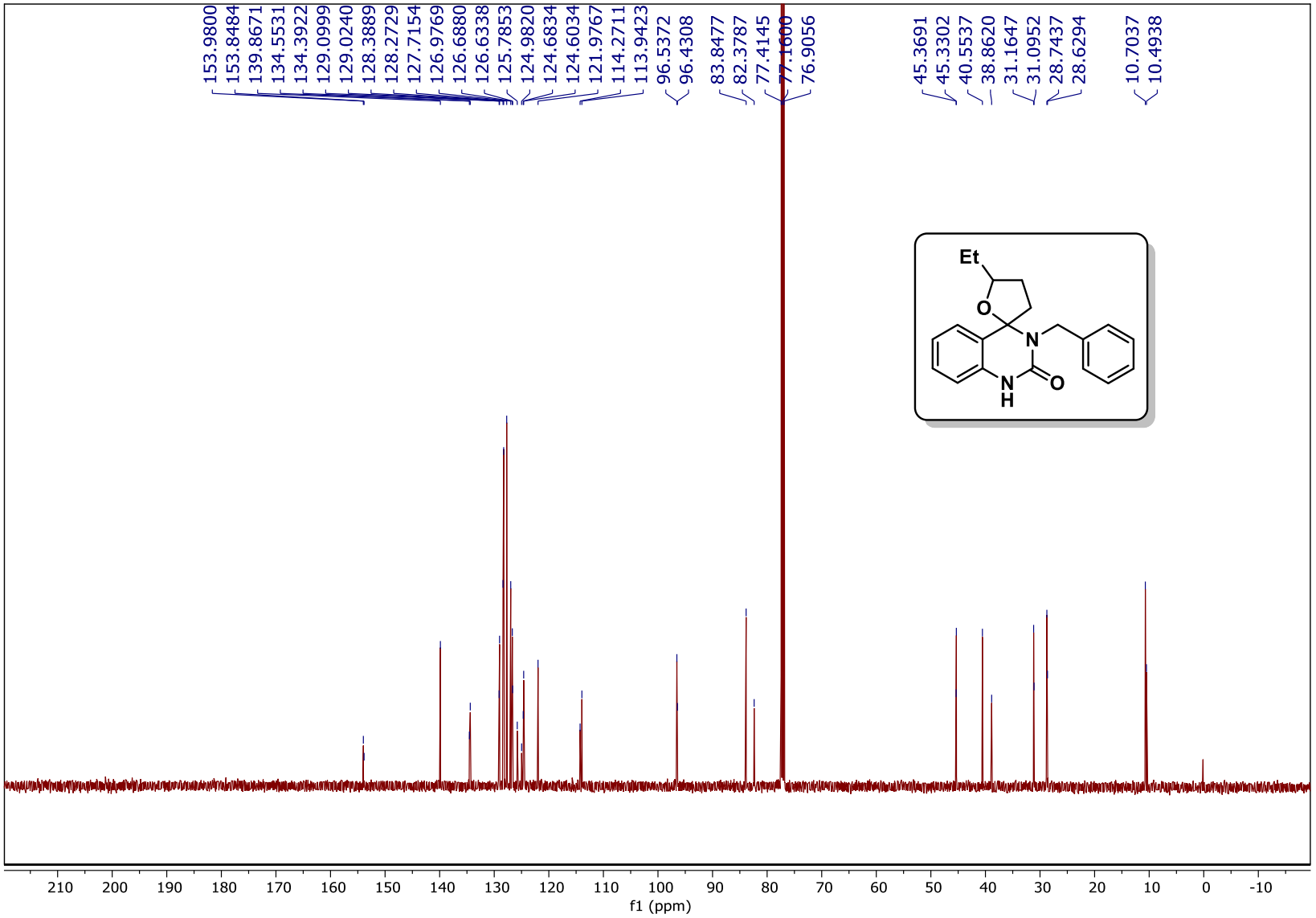


Figure S125. HRMS spectrum of **2w**

Sample Name	Sample18	**Position**	P1-B7	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-372.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	26-09-2023 10:50:59 (UTC+05:30)

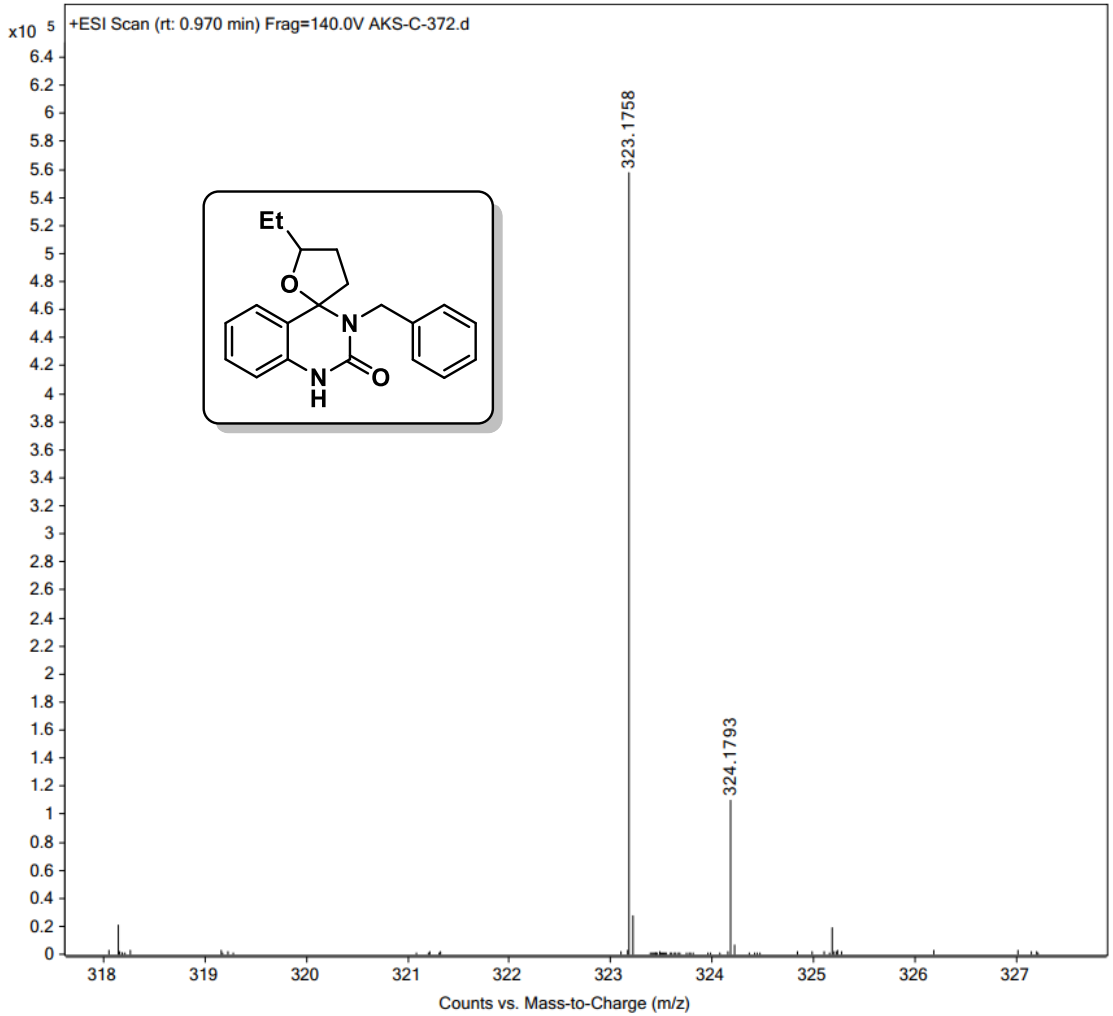


Figure S126. ^{1}H spectrum of compound **2x** (500 MHz, $CDCl_3$)

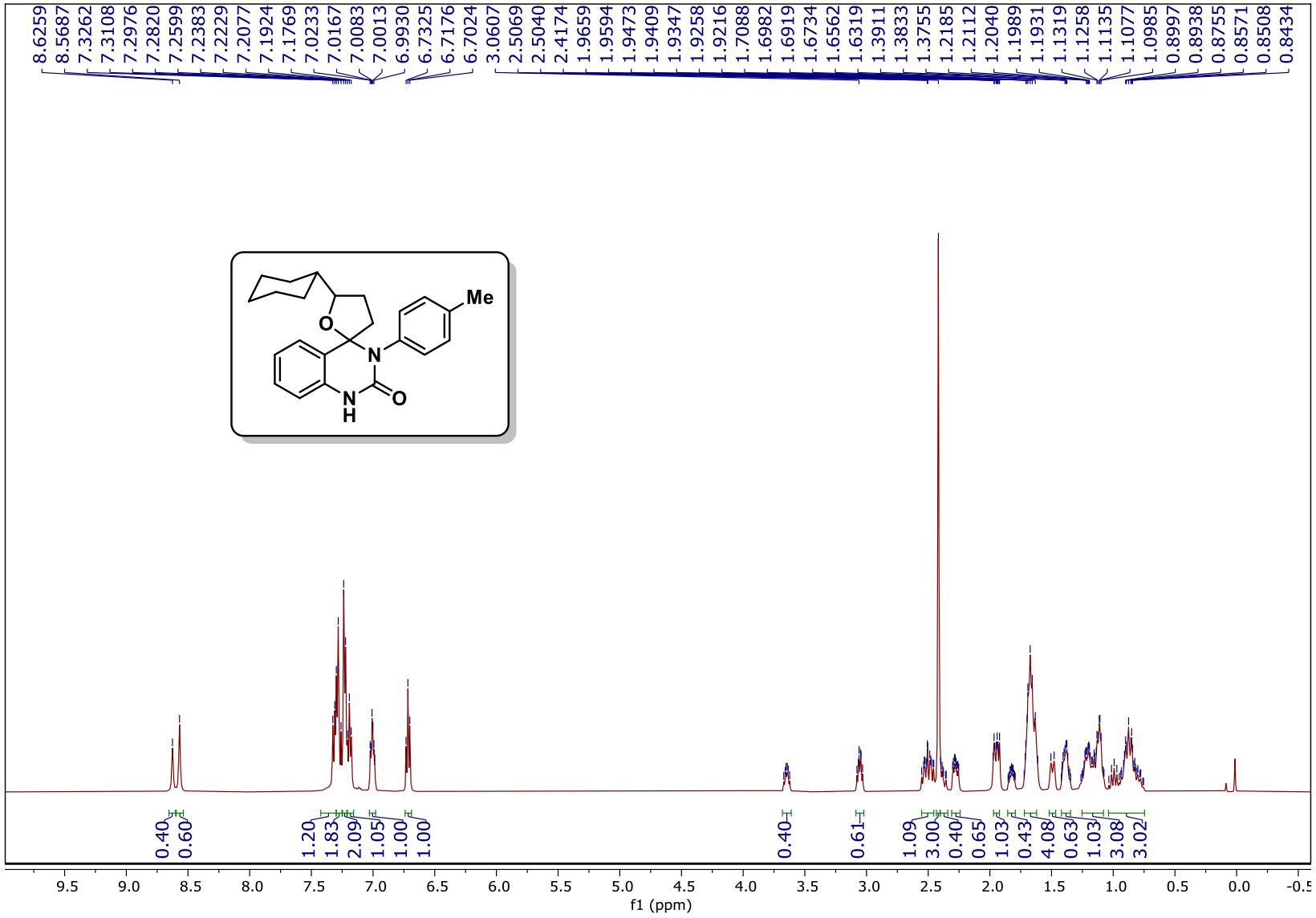


Figure S127. ^{13}C spectrum of compound **2x** (125 MHz, $CDCl_3$)

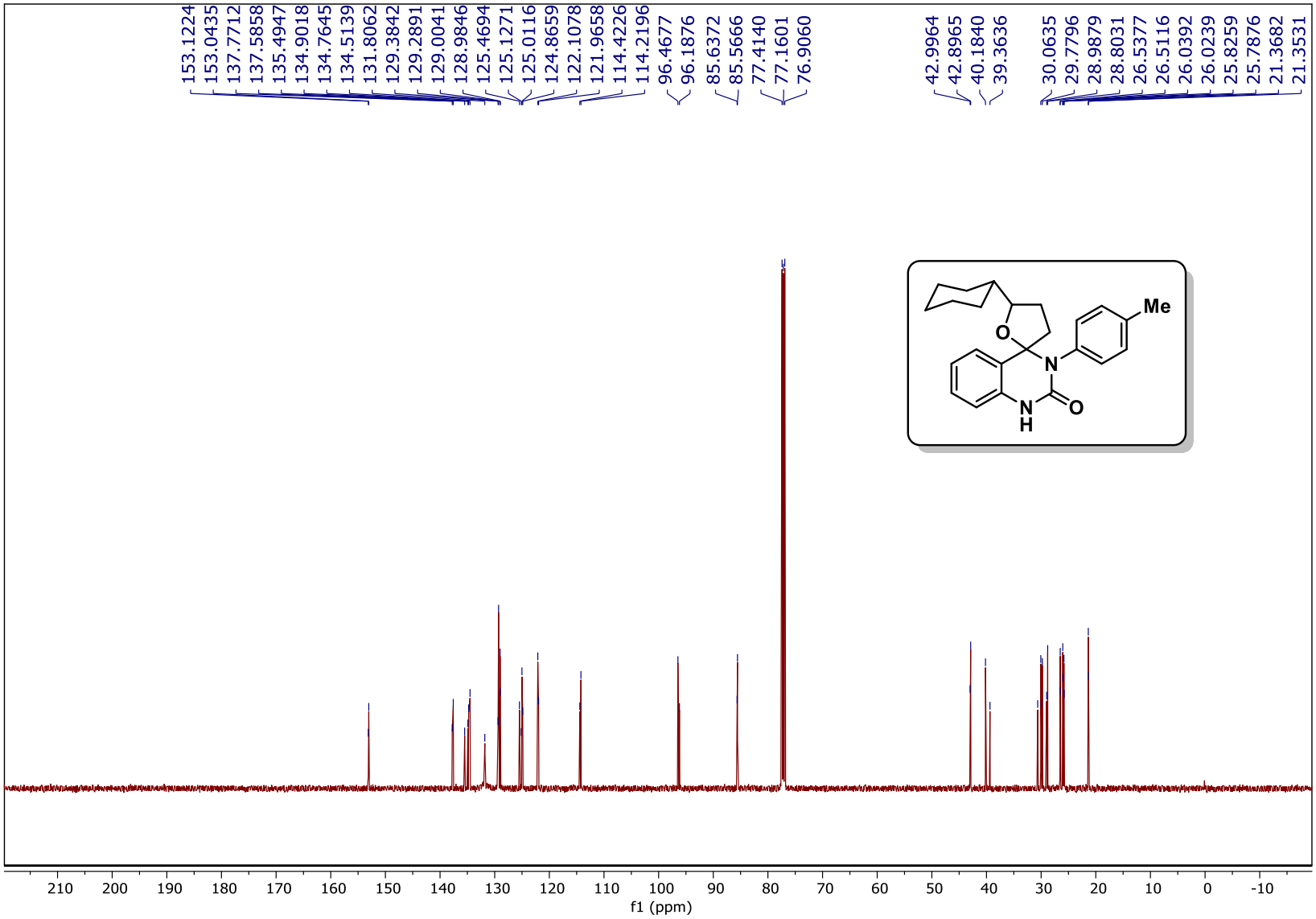


Figure S128. HRMS spectrum of **2x**

Sample Name	Sample16	**Position**	P1-B4	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-363.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	25-09-2023 10:14:28 (UTC+05:30)

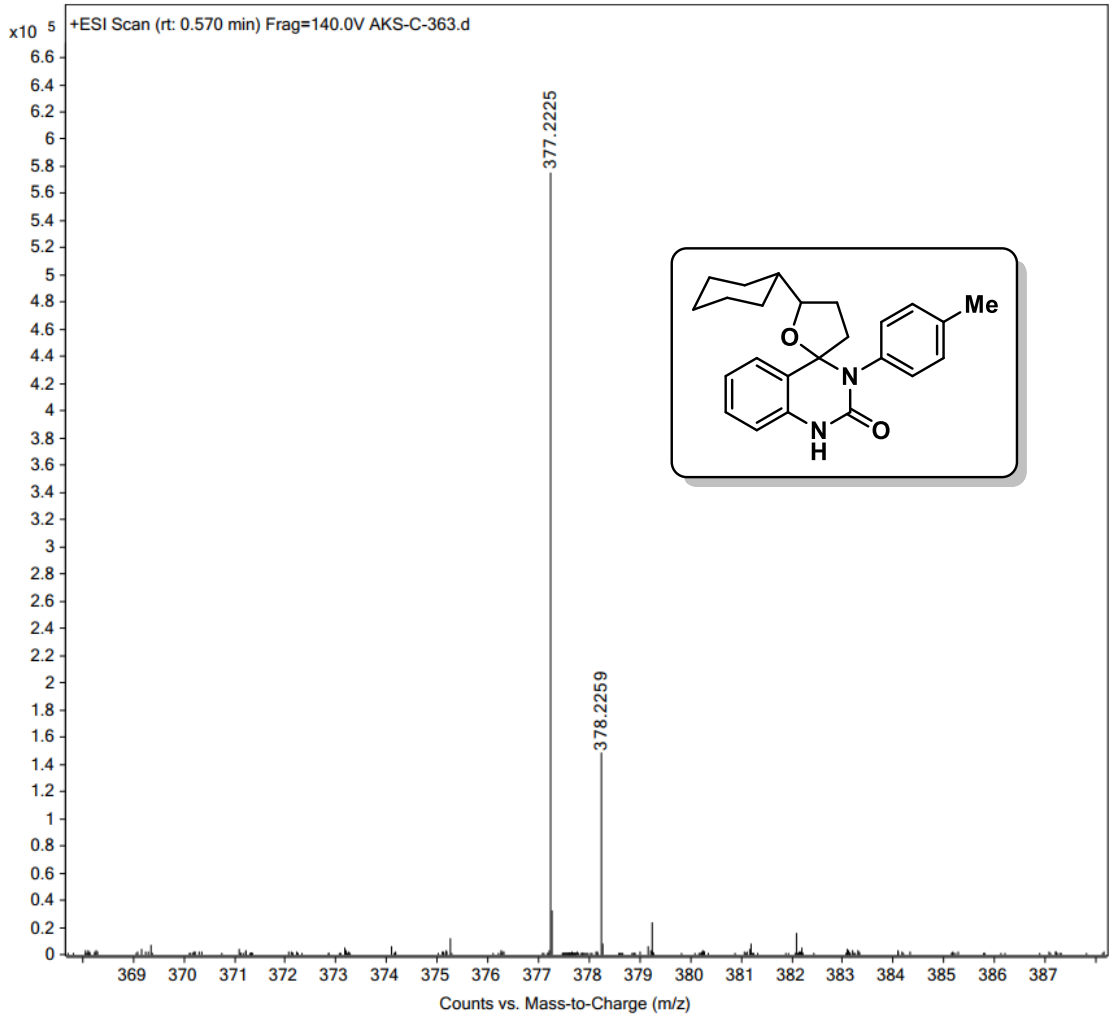


Figure S129. ^{1}H spectrum of compound **2aa** (400 MHz, $CDCl_3$)

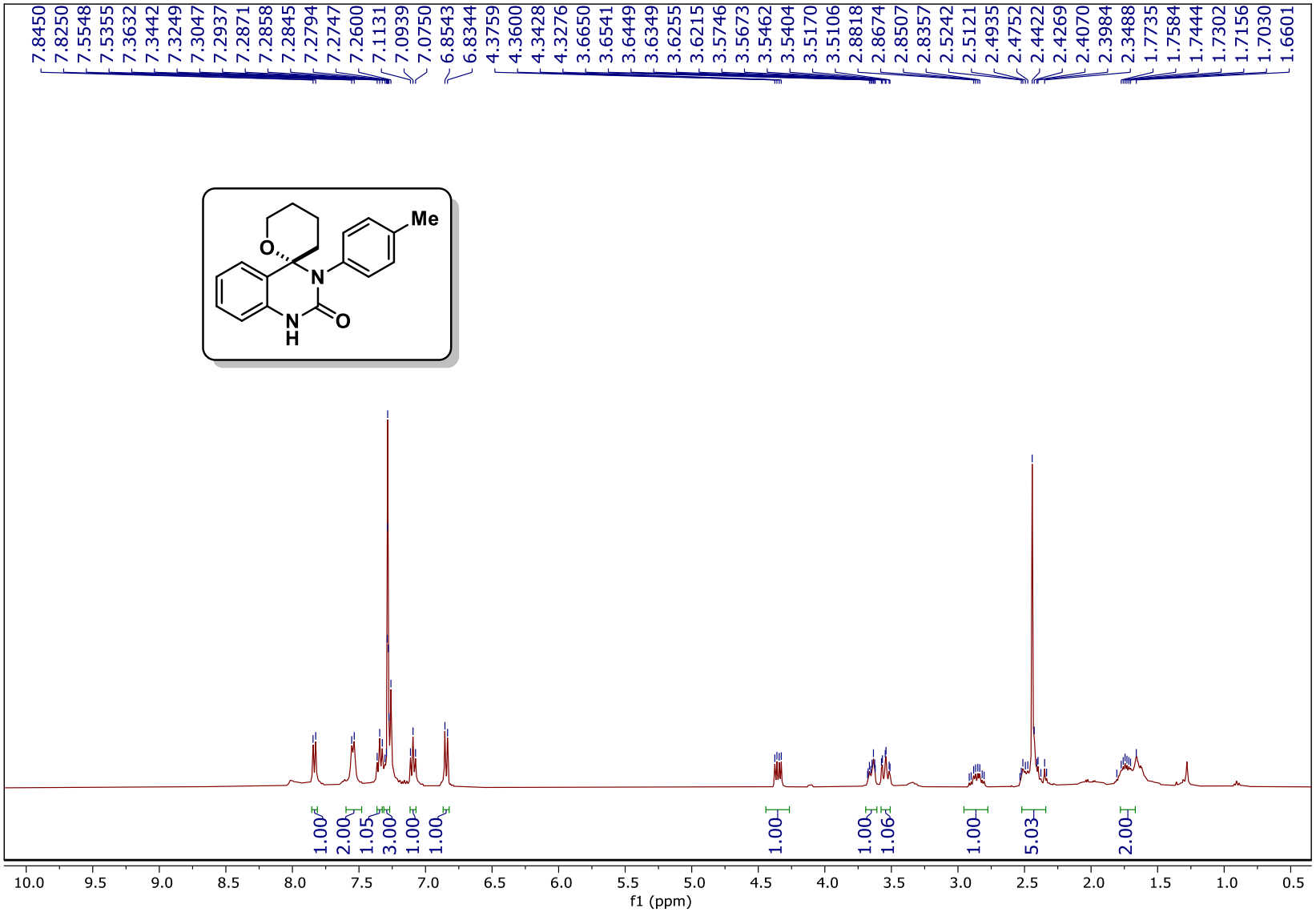


Figure S130. ^{13}C spectrum of compound **2aa** (125 MHz, $CDCl_3$)

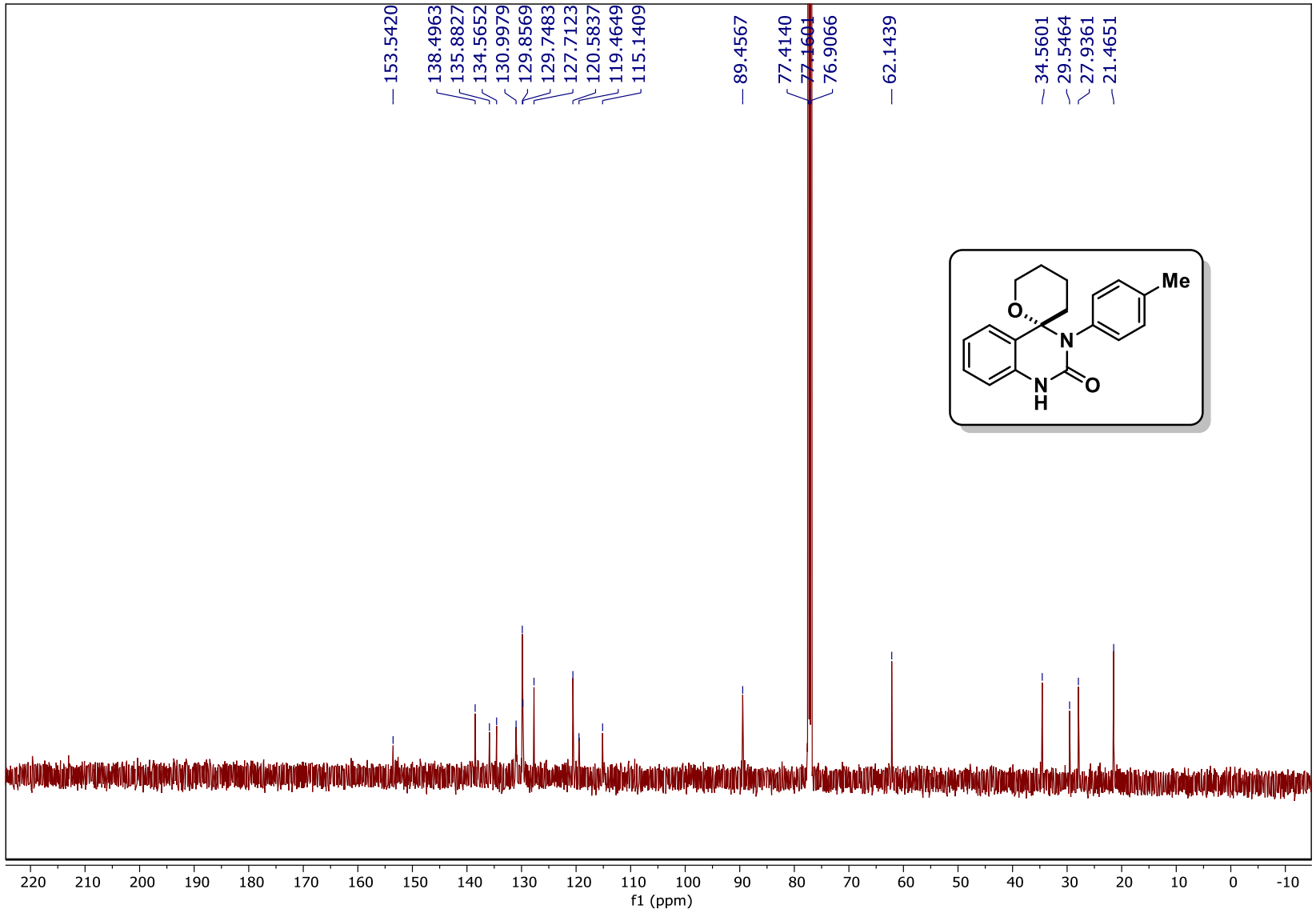


Figure S131. HRMS spectrum of **2aa**

Sample Name		**Position**	P1-A2	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	SB-C-419.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	26-12-2023 15:35:09 (UTC+05:30)

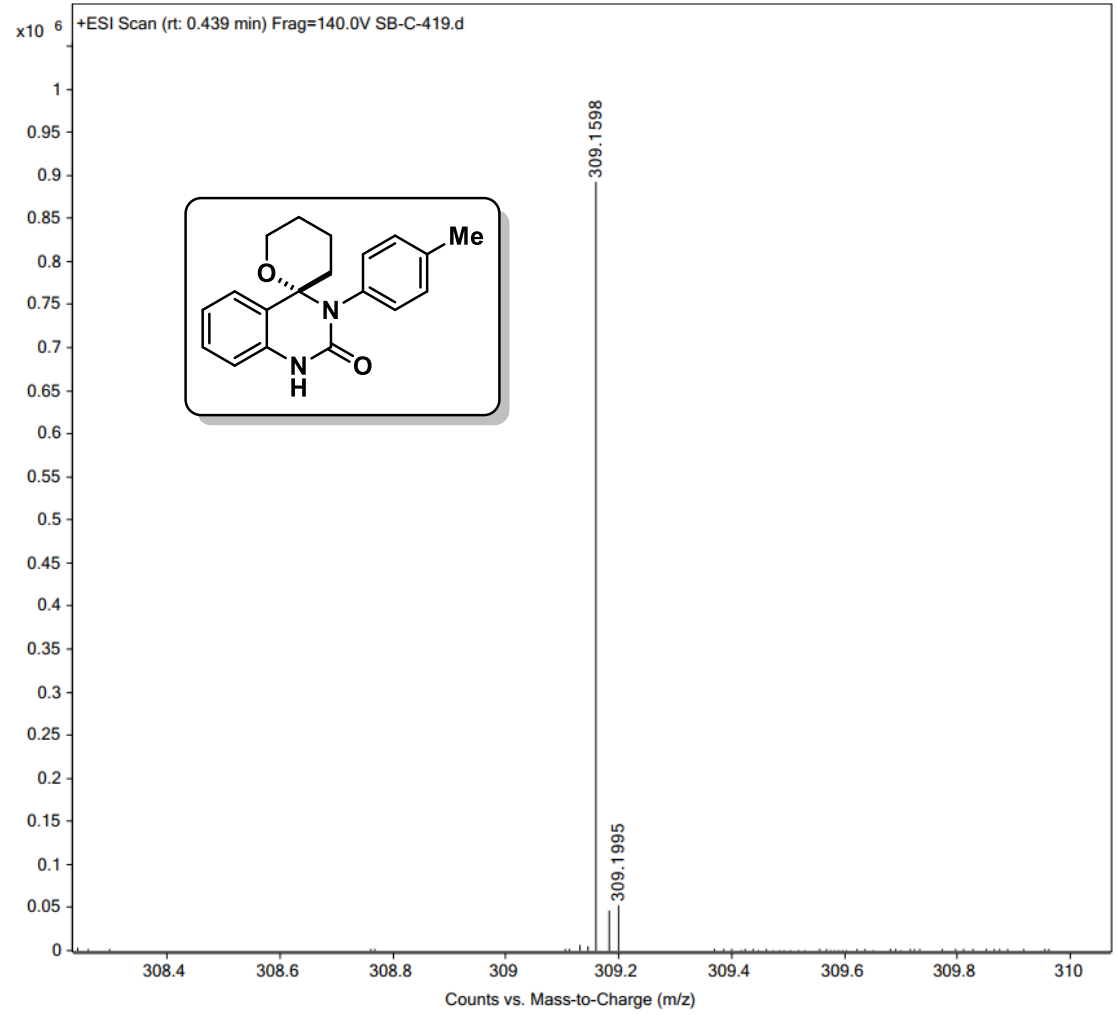


Figure S132. ^{1}H spectrum of compound **2ab** (500 MHz, $CDCl_3$)

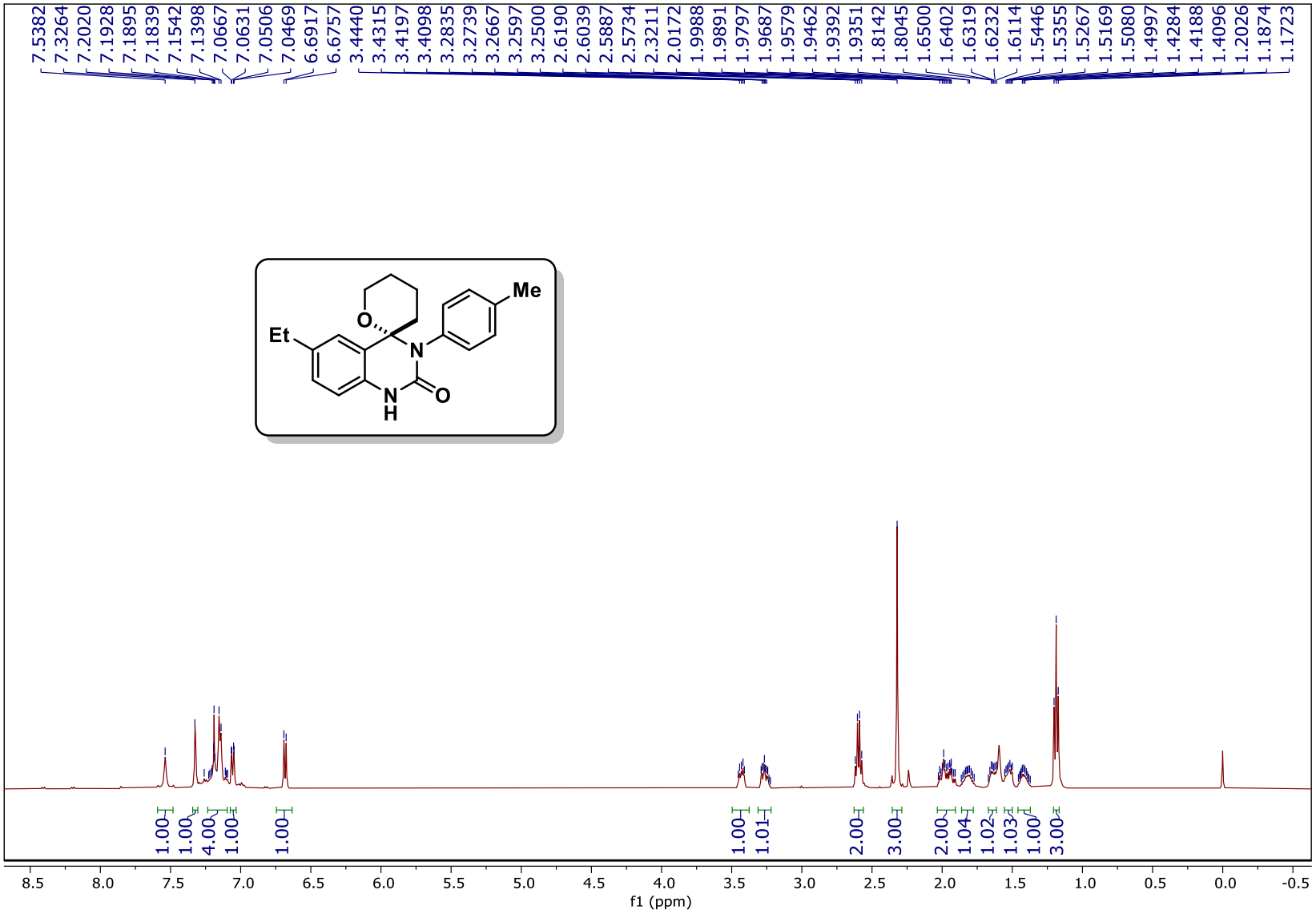


Figure S133. ^{13}C spectrum of compound **2ab** (125 MHz, $CDCl_3$)

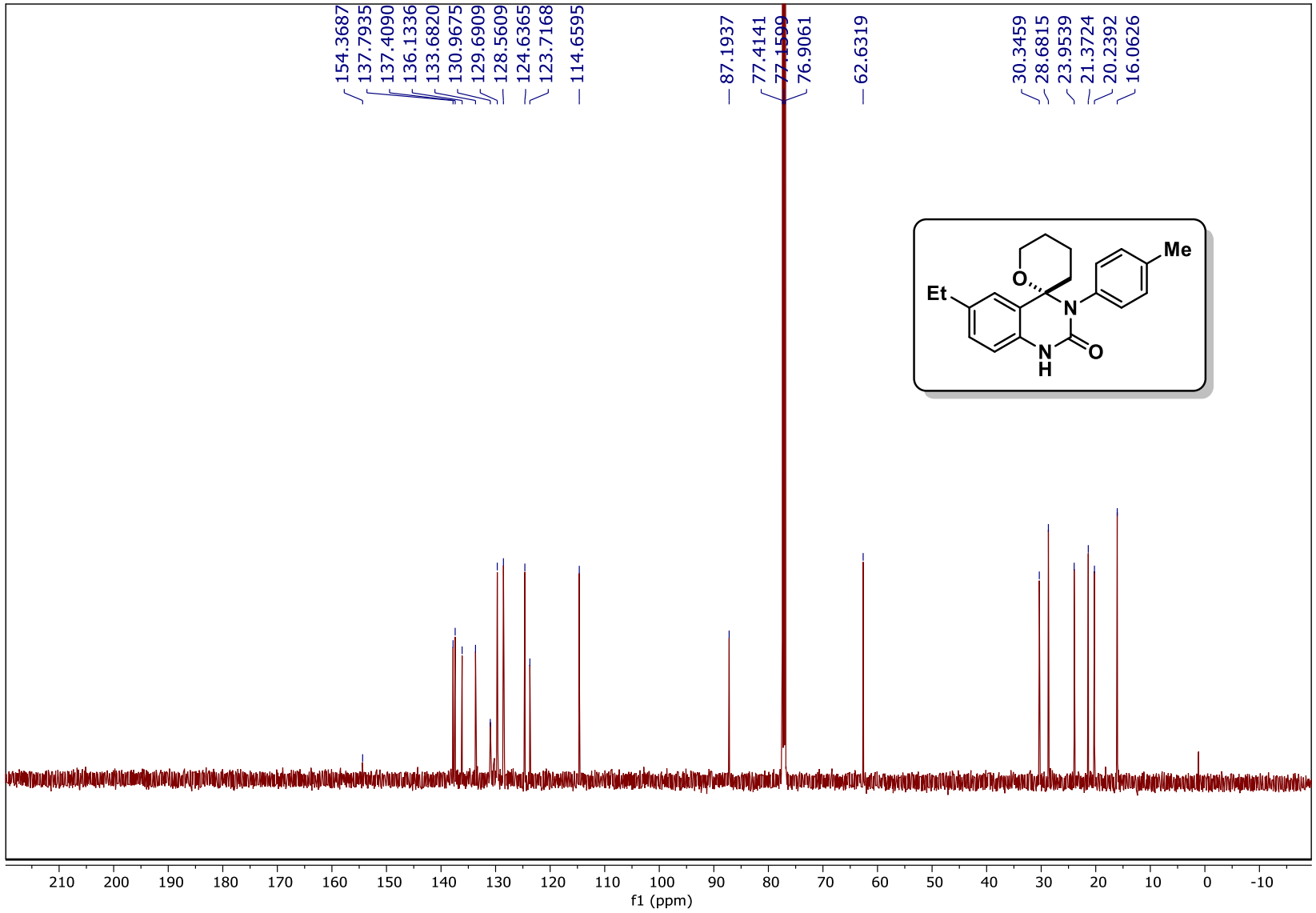


Figure S134. HRMS spectrum of **2ab**

Sample Name	Sample14	**Position**	P1-B3	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-477.d
ACQ Method	DIRECT MASS POSITIVE_ACN1500.m	**Comment**		**Acquired Time**	18-01-2024 16:42:01 (UTC+05:30)

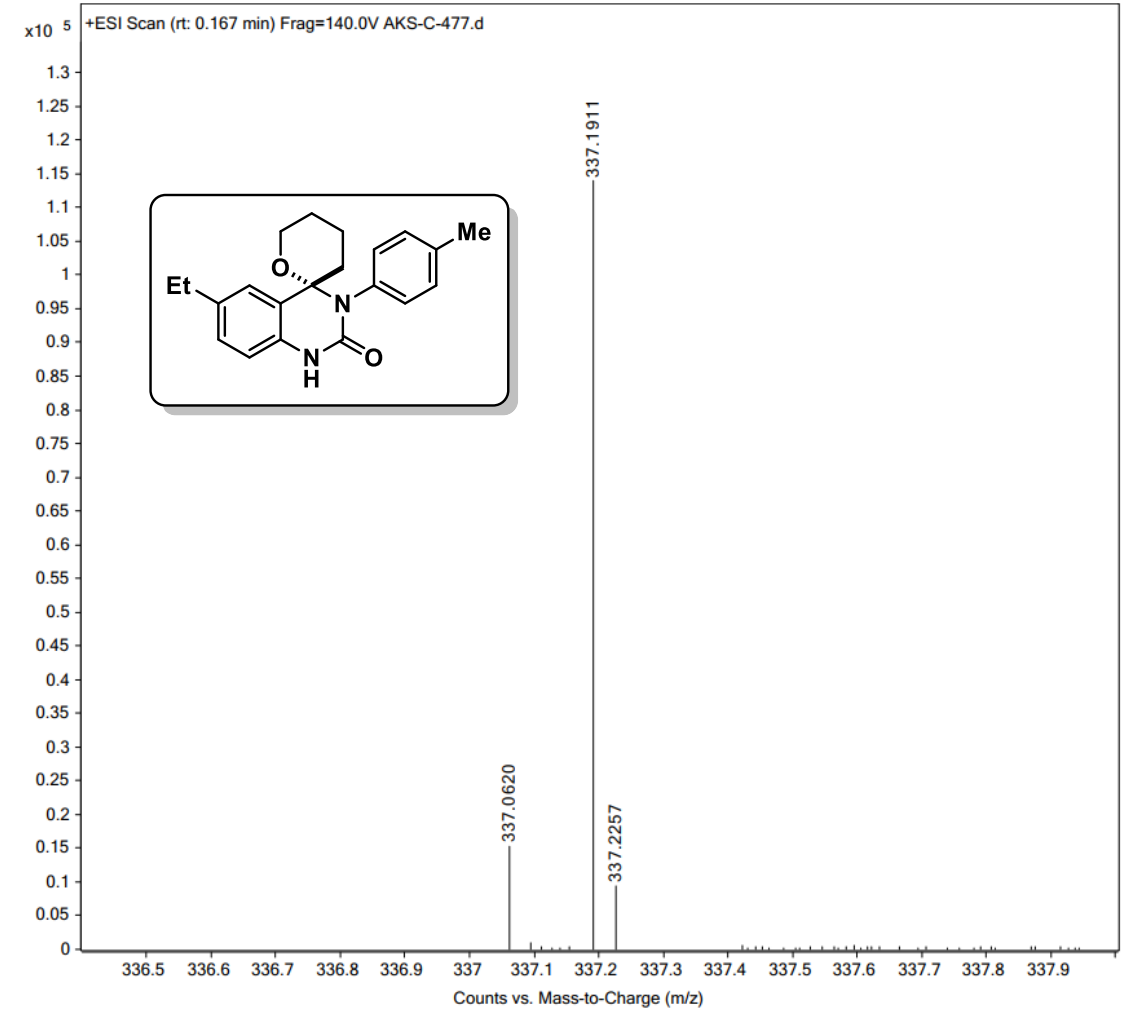


Figure S135. ^{1}H spectrum of compound **5** (400 MHz, $CDCl_3$)

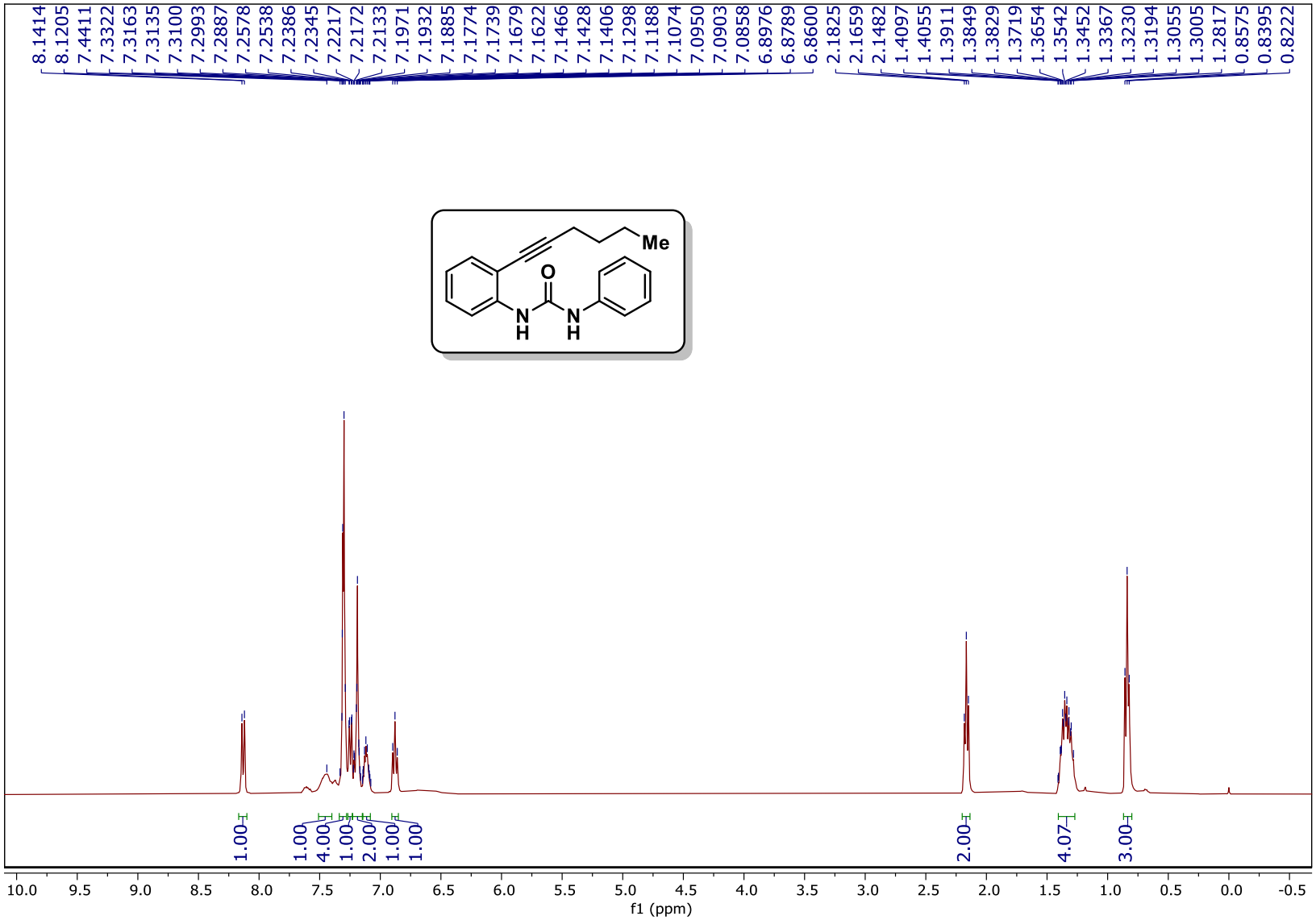


Figure S136. ^{13}C spectrum of compound **5** (125 MHz, $CDCl_3$)

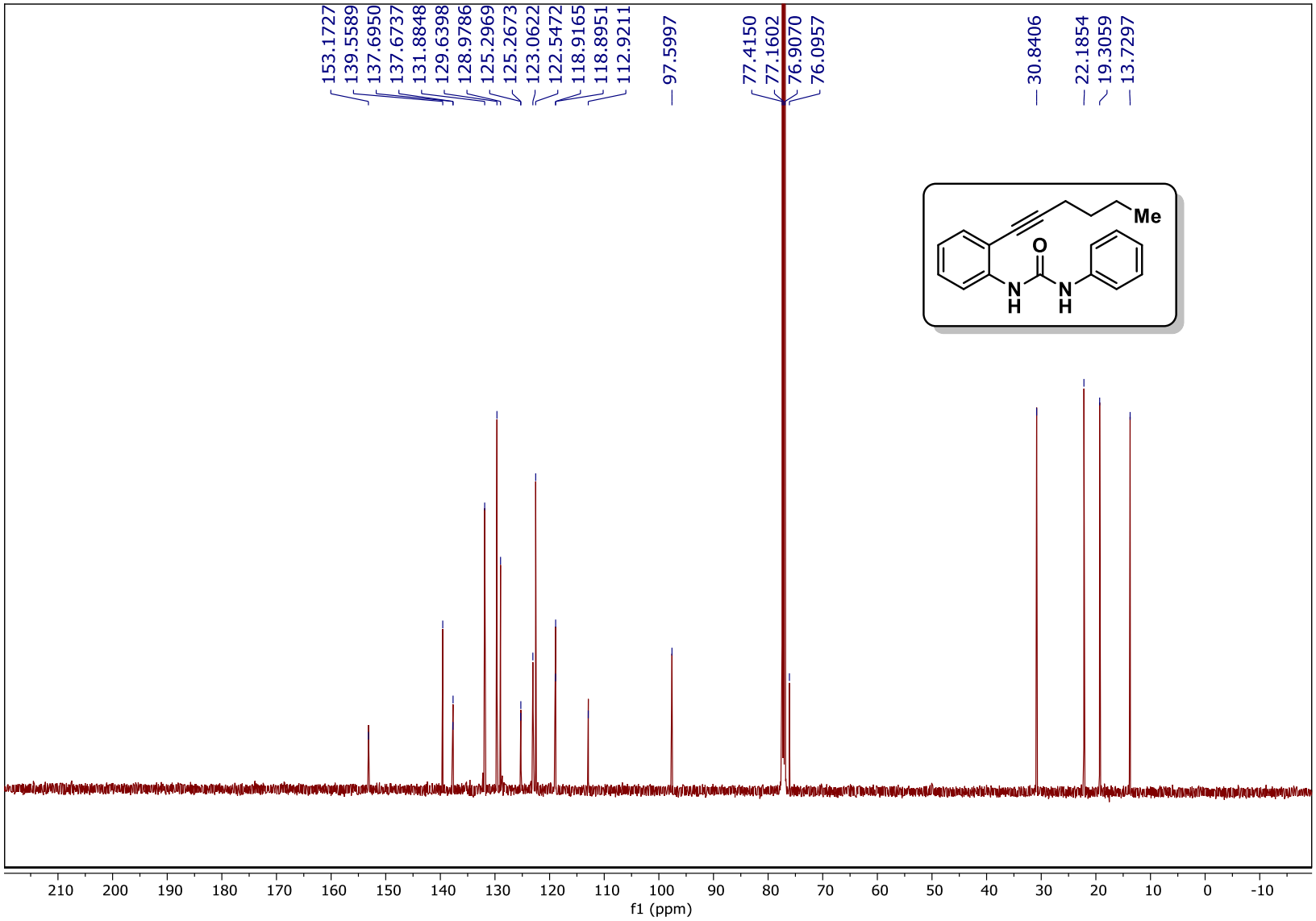


Figure S137. HRMS spectrum of **5**

Sample Name		**Position**	P1-B11	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-427.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	13-02-2024 16:12:10 (UTC+05:30)

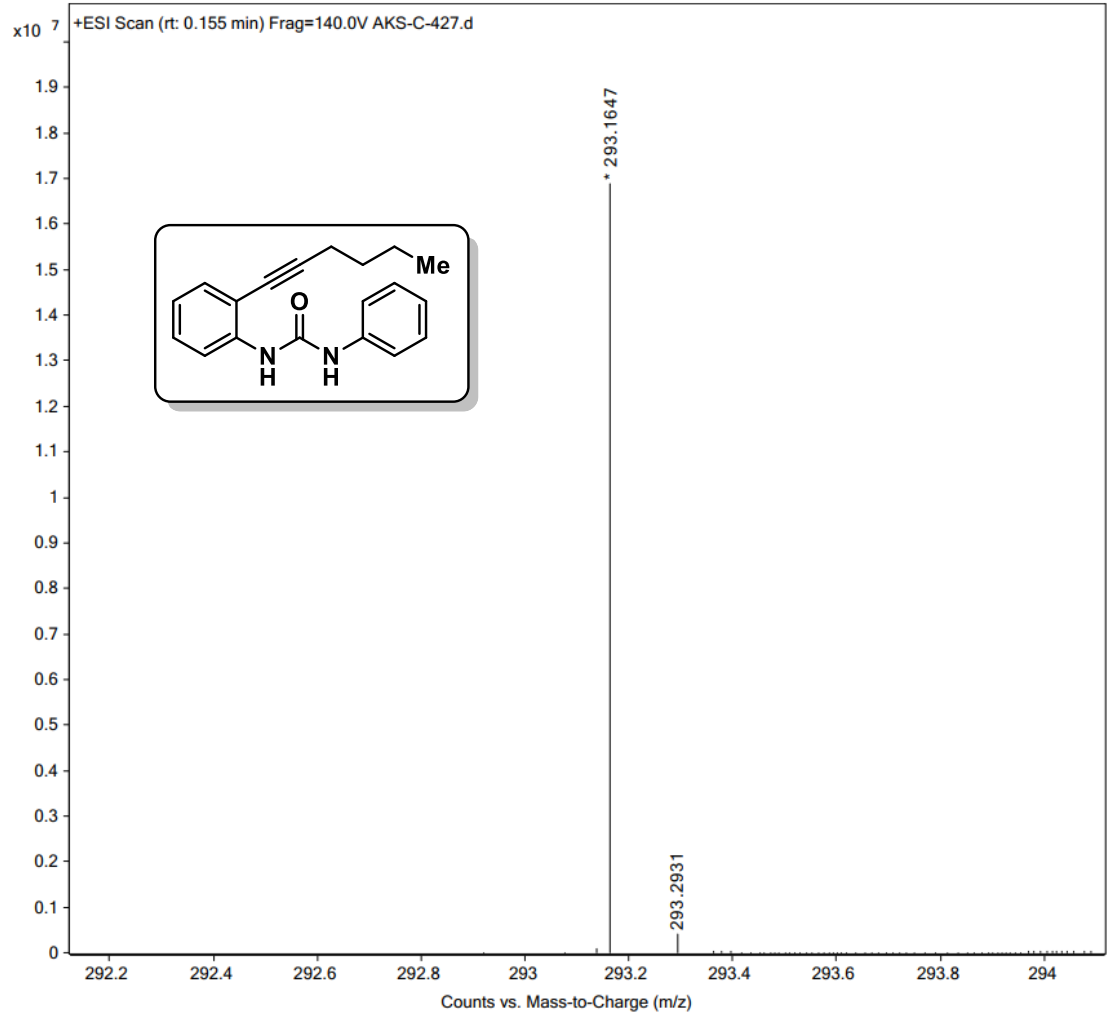


Figure S138. ^{1}H spectrum of compound **7a** (500 MHz, $CDCl_3$)

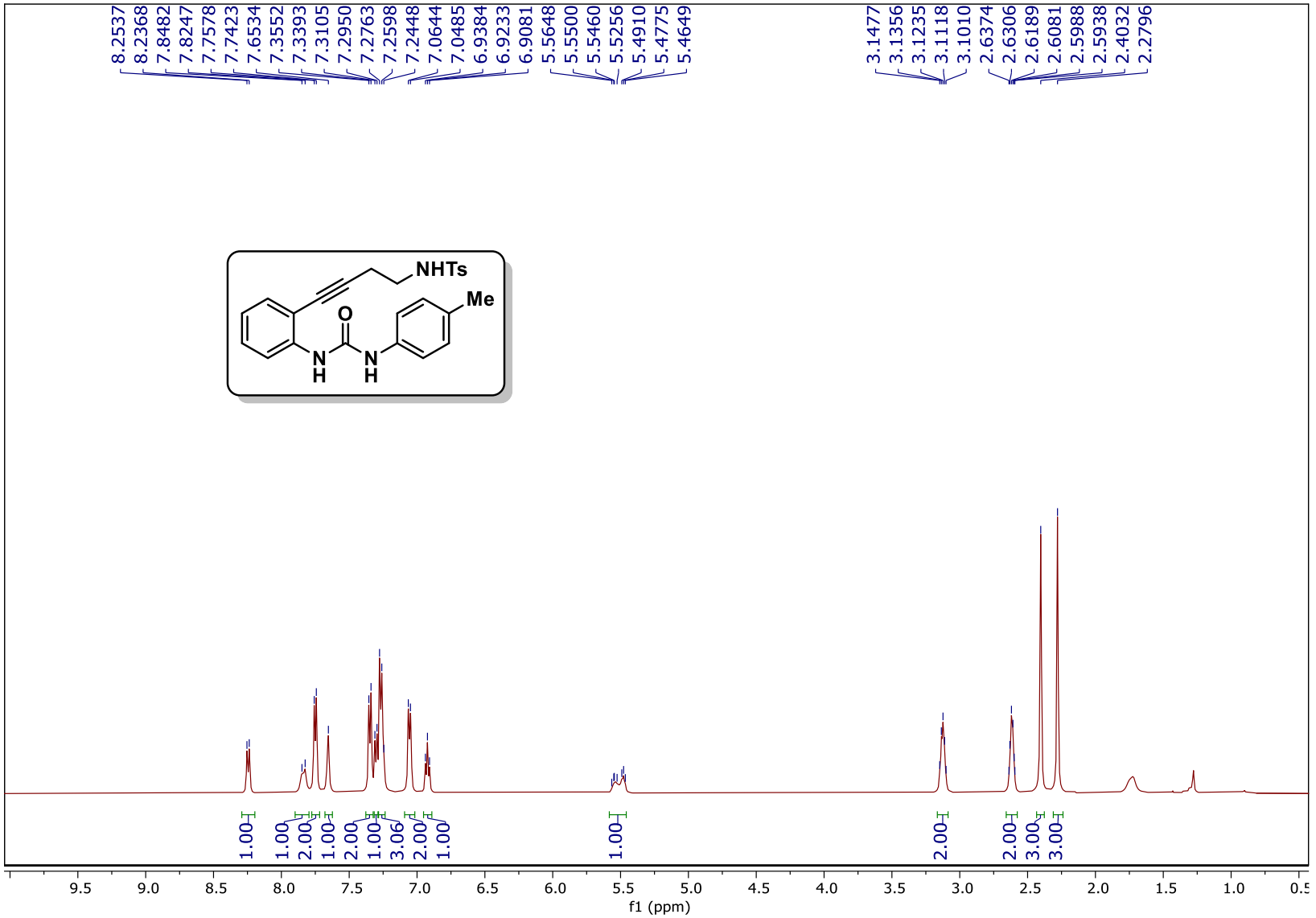


Figure S139. ^{13}C spectrum of compound **7a** (125 MHz, $CDCl_3$)

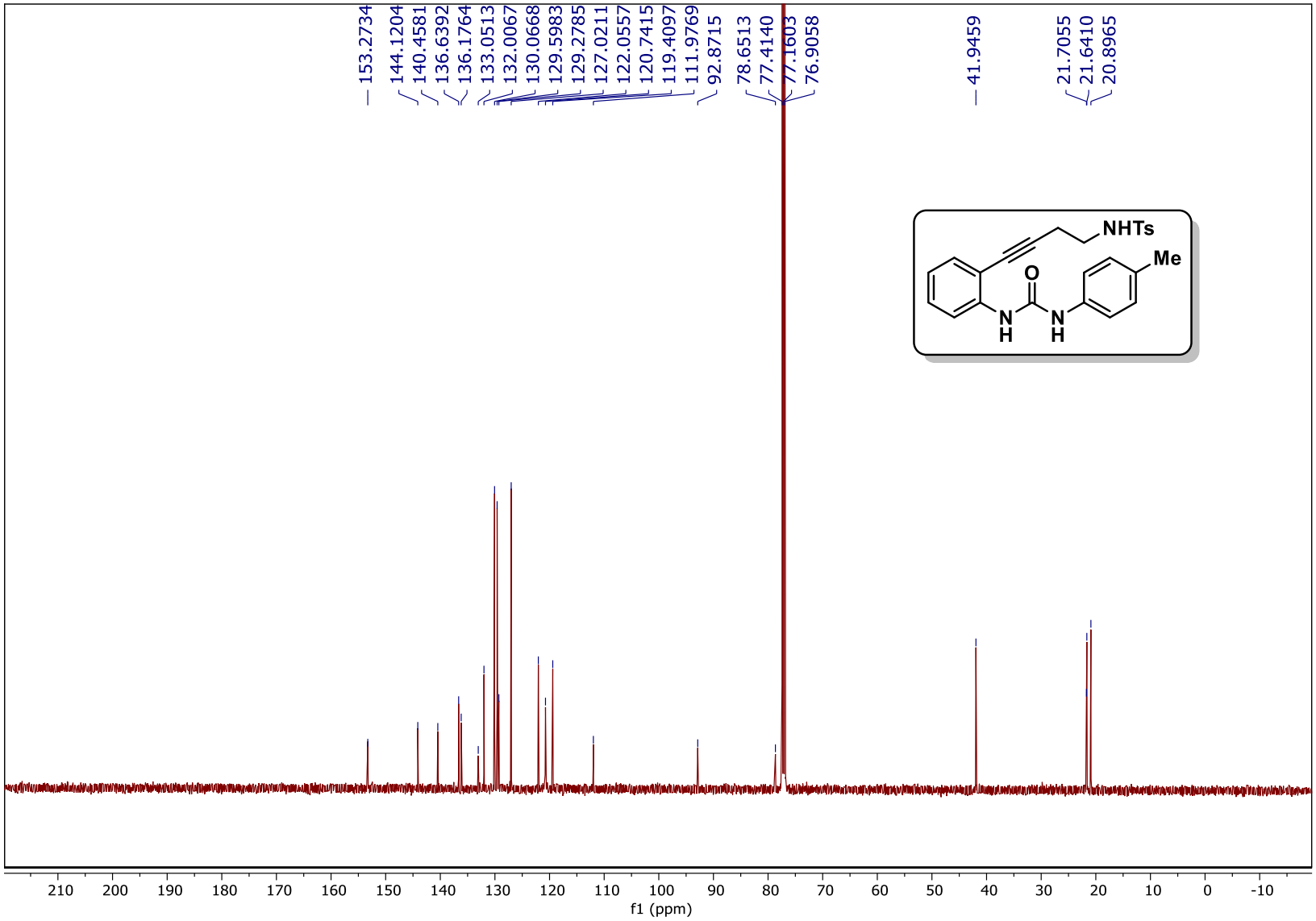


Figure S140. HRMS spectrum of **7a**

Sample Name	Sample27	**Position**	P1-C4	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	SB C 201.d
ACQ Method	DIRECT MASS_POSITIVE_01_1.m	**Comment**		**Acquired Time**	22-05-2023 11:02:25 (UTC+05:30)

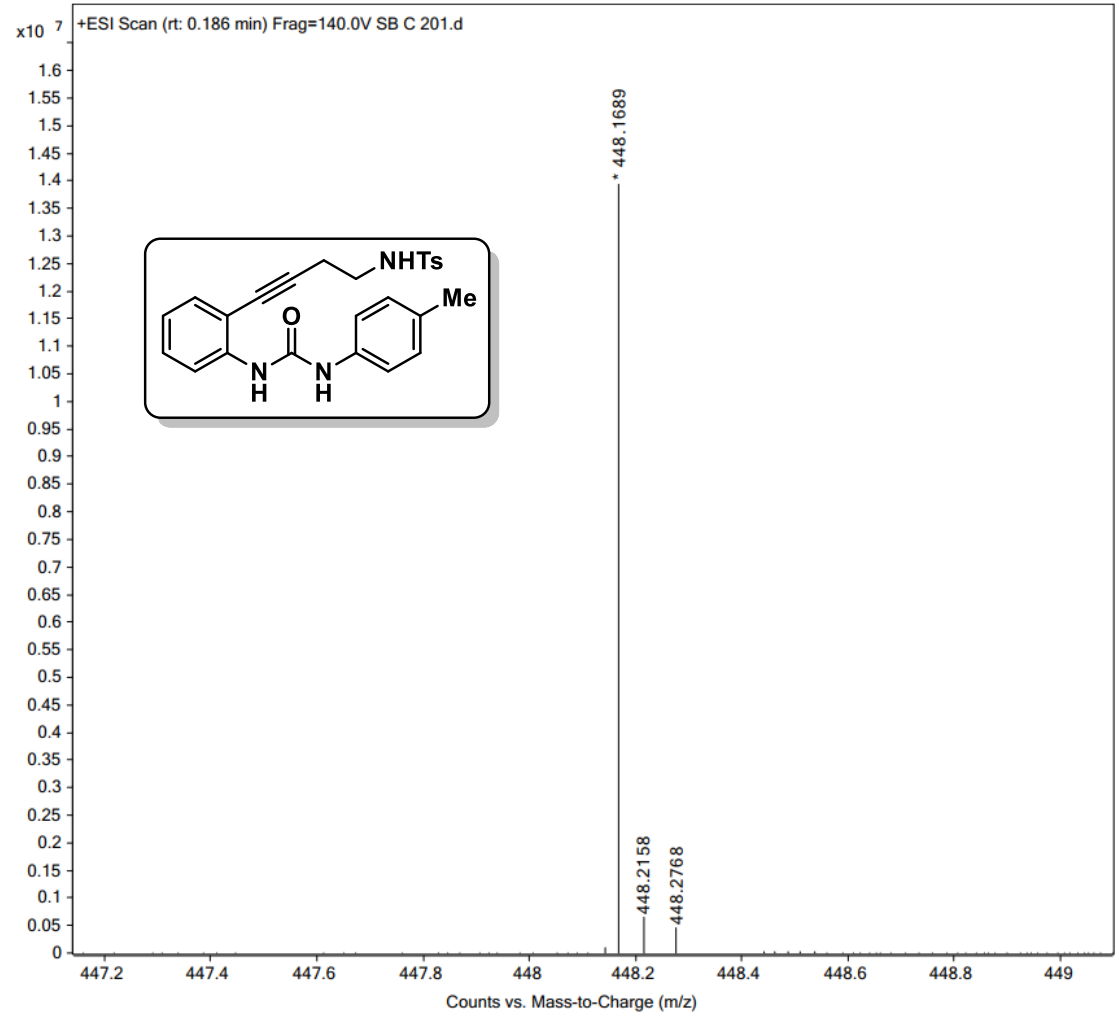


Figure S141. ^{1}H spectrum of compound **7b** (400 MHz, $CDCl_3$)

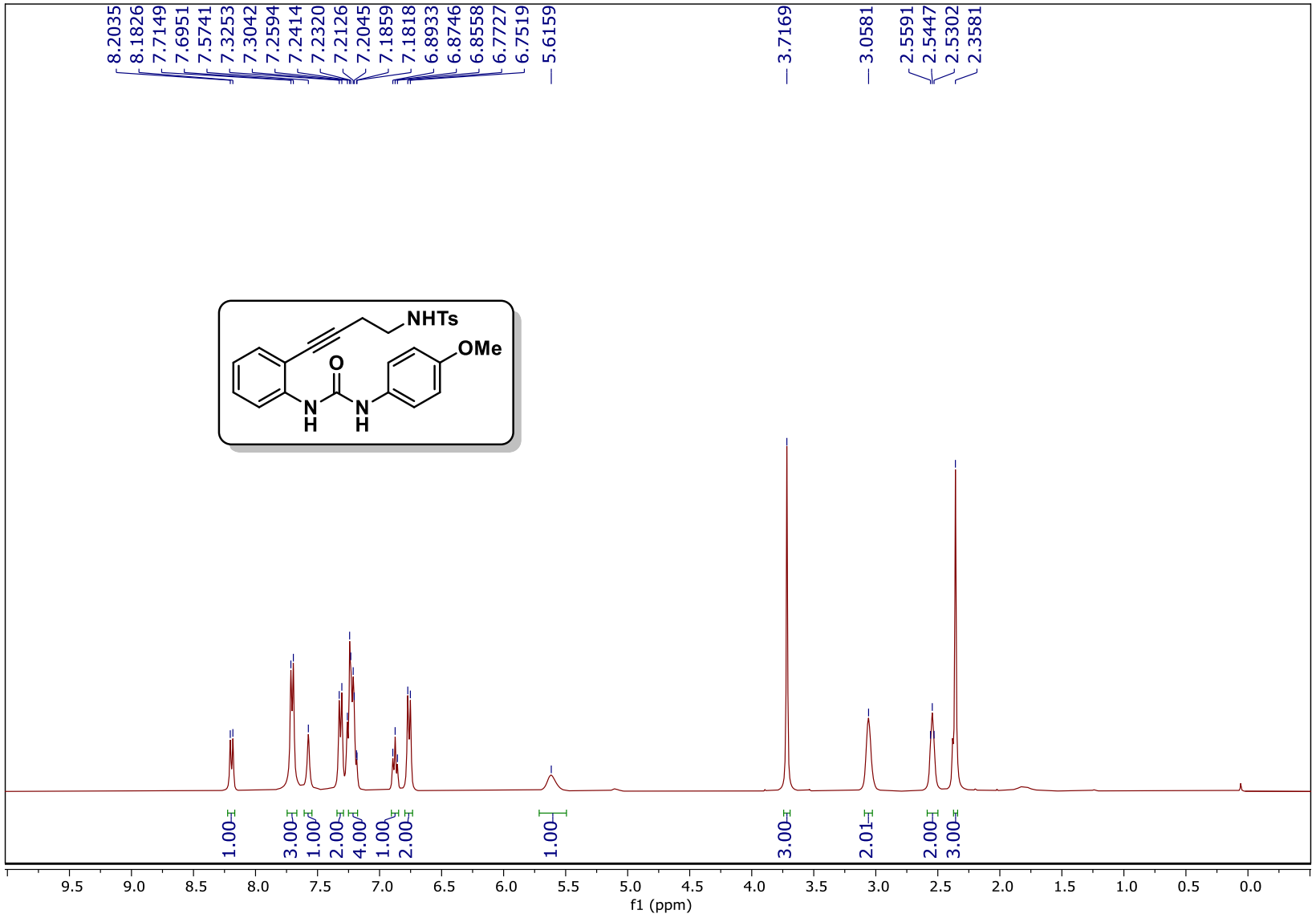


Figure S142. ^{13}C spectrum of compound **7b** (125 MHz, $CDCl_3$)

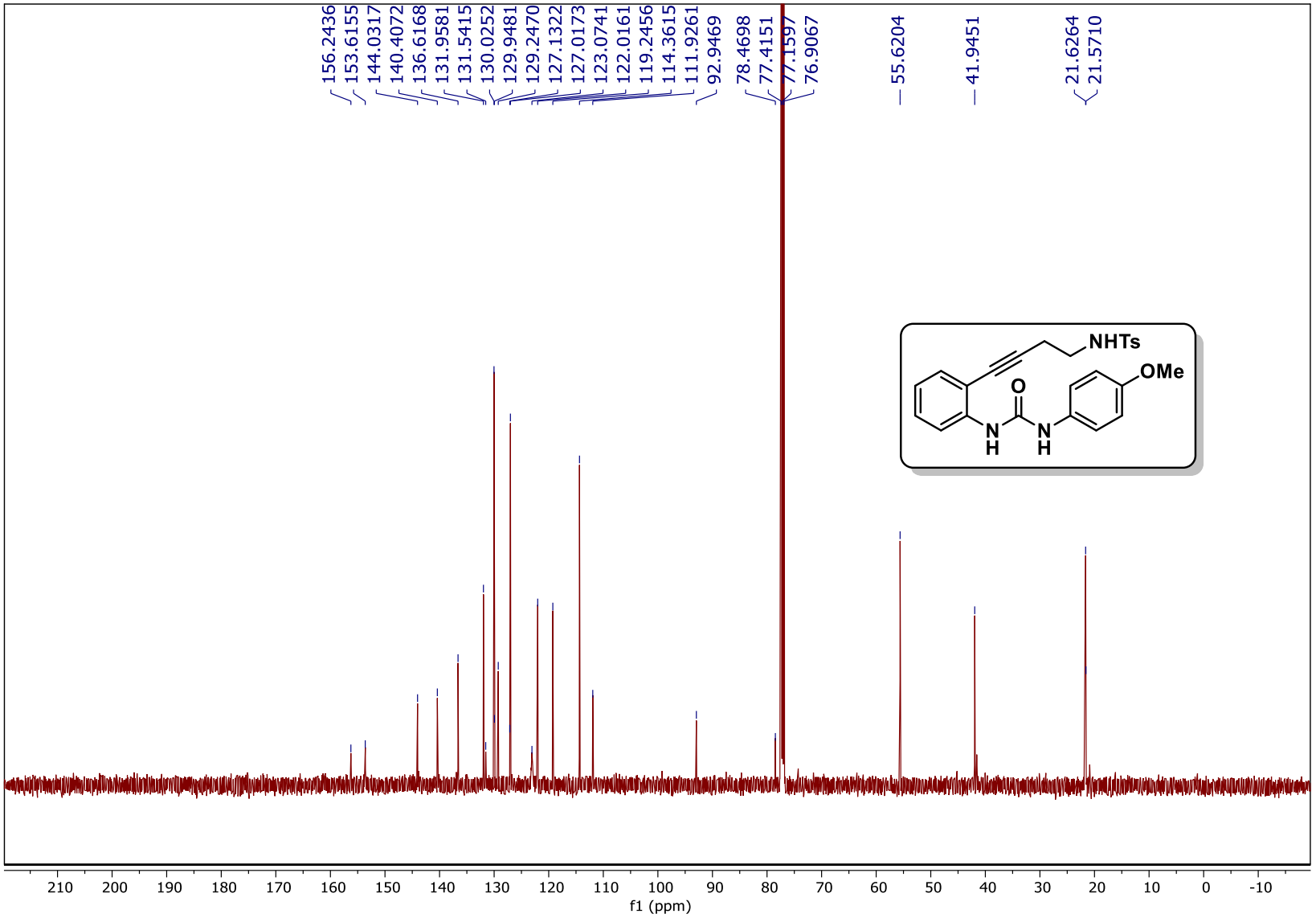


Figure S143. HRMS spectrum of **7b**

Sample Name	Sample60	**Position**	P1-C6	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	spc431.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	29-02-2024 16:36:11 (UTC+05:30)

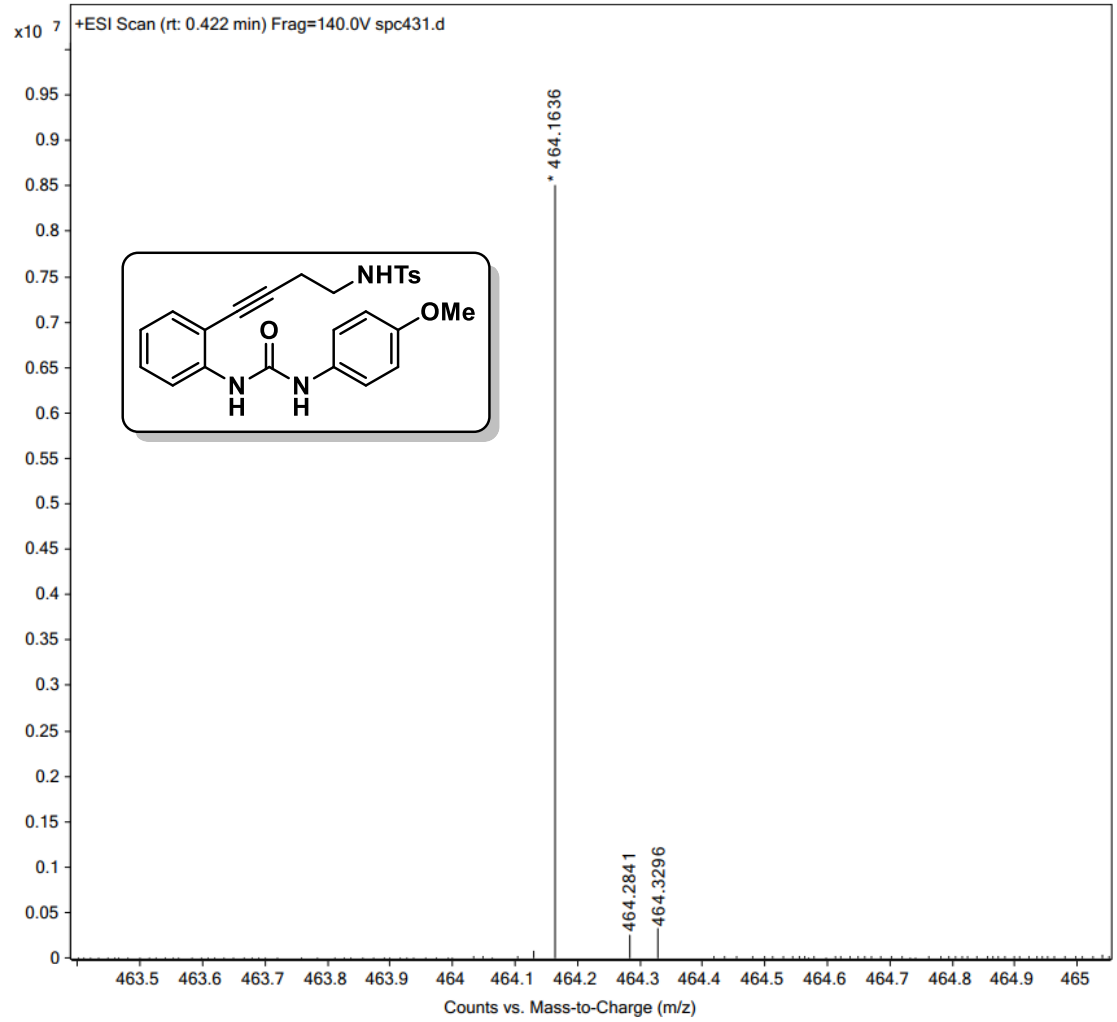


Figure S144. ^{1}H spectrum of compound **8a** (500 MHz, $CDCl_3$/DMSO-d_6)

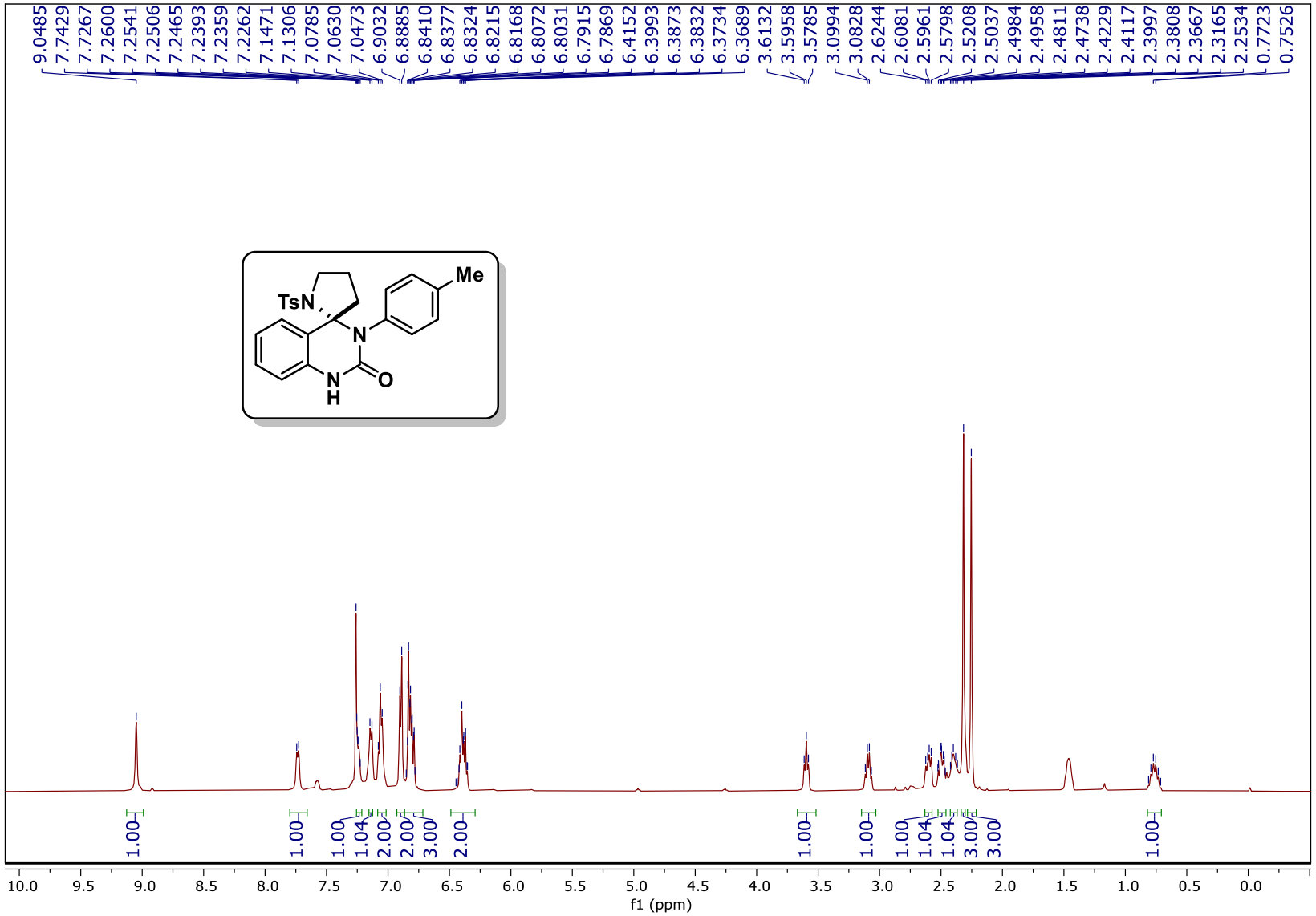


Figure S145. ^{13}C spectrum of compound **8a** (125 MHz, $CDCl_3$/DMSO-d_6)

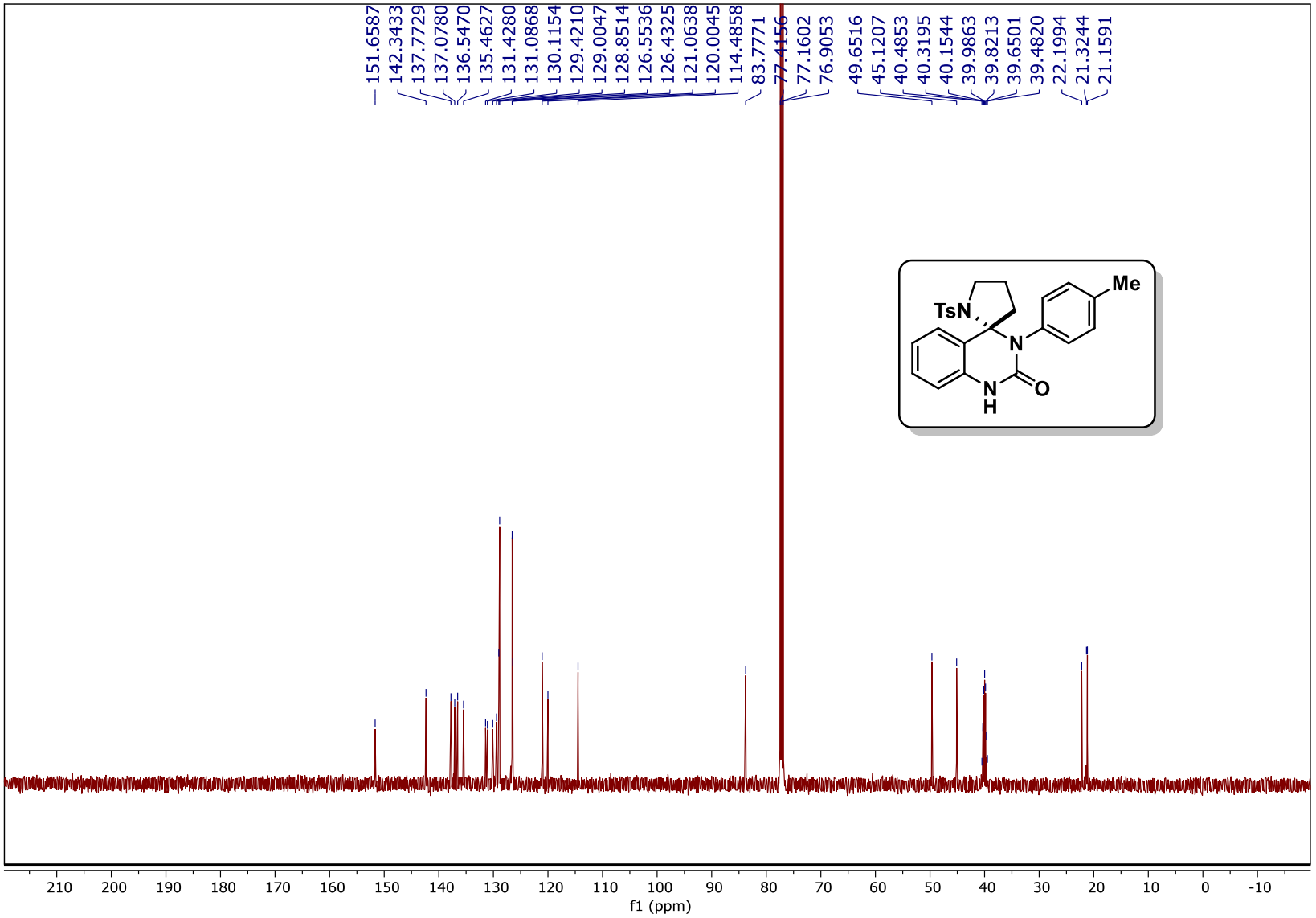


Figure S146. HRMS spectrum of **8a**

Sample Name	Sample5	**Position**	P1-A5	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-460.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	09-01-2024 15:05:04 (UTC+05:30)

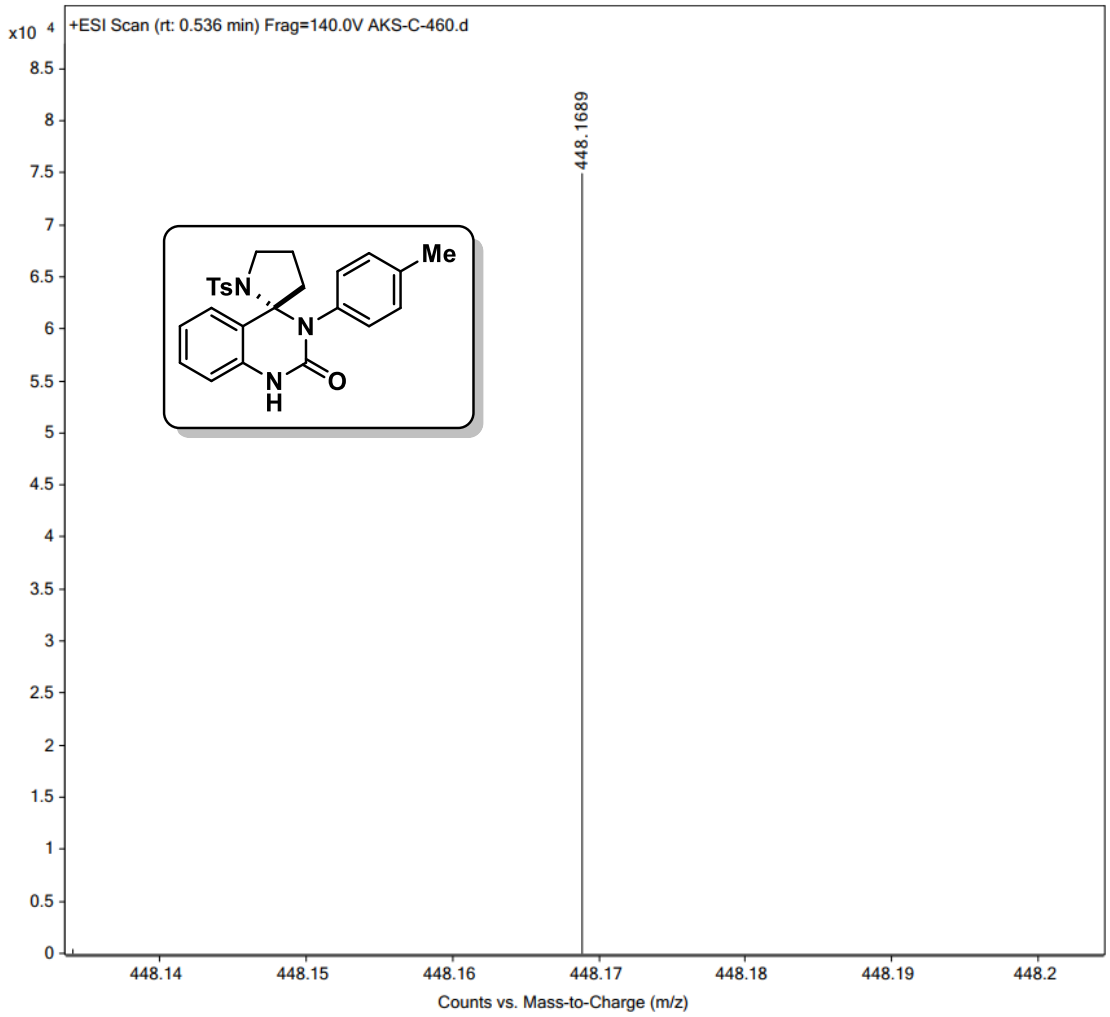


Figure S147. ^{1}H spectrum of compound **8b** (400 MHz, $CDCl_3$/Methanol-d_4)

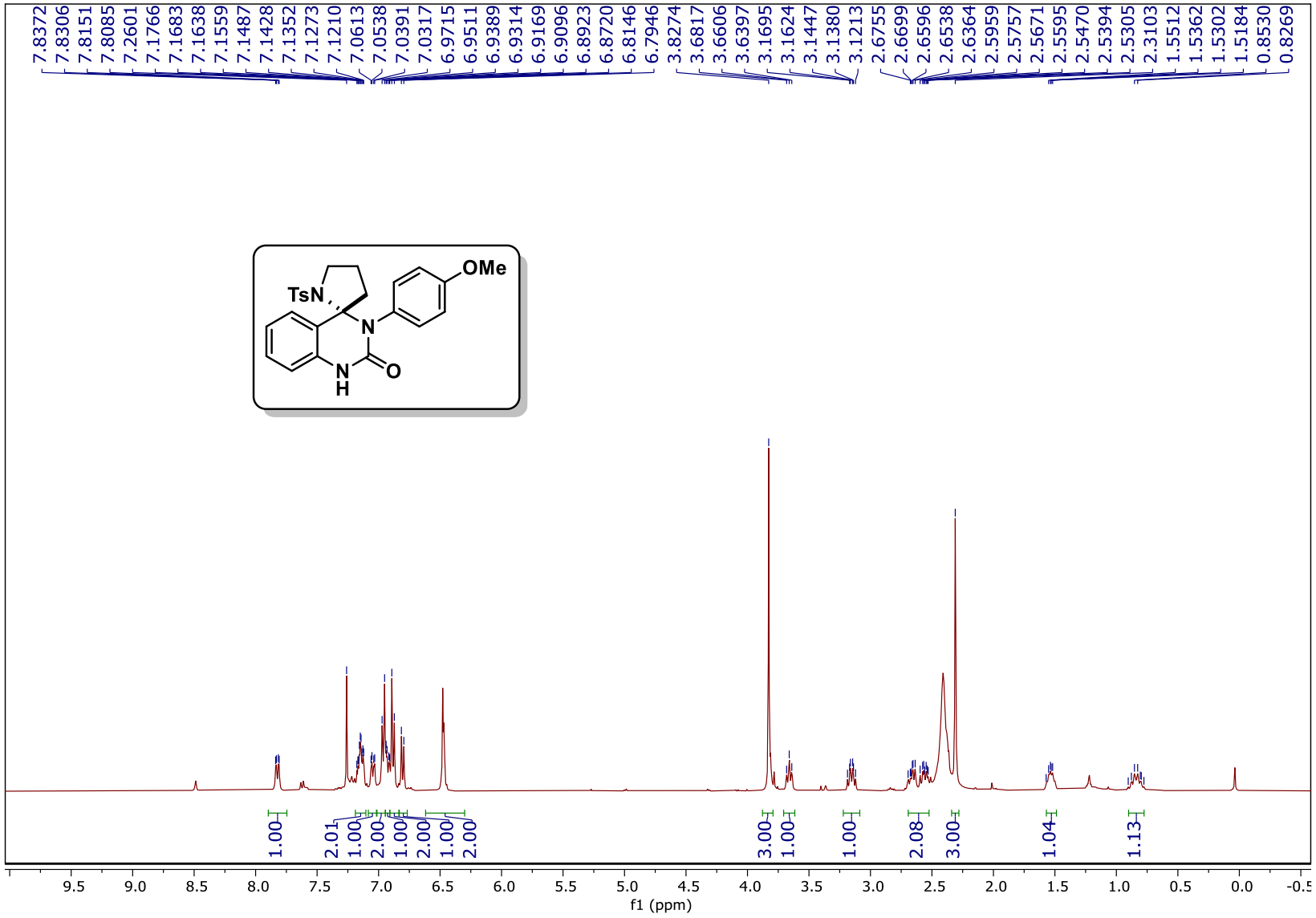


Figure S148. ^{13}C spectrum of compound **8b** (125 MHz, $CDCl_3$/DMSO-d_6)

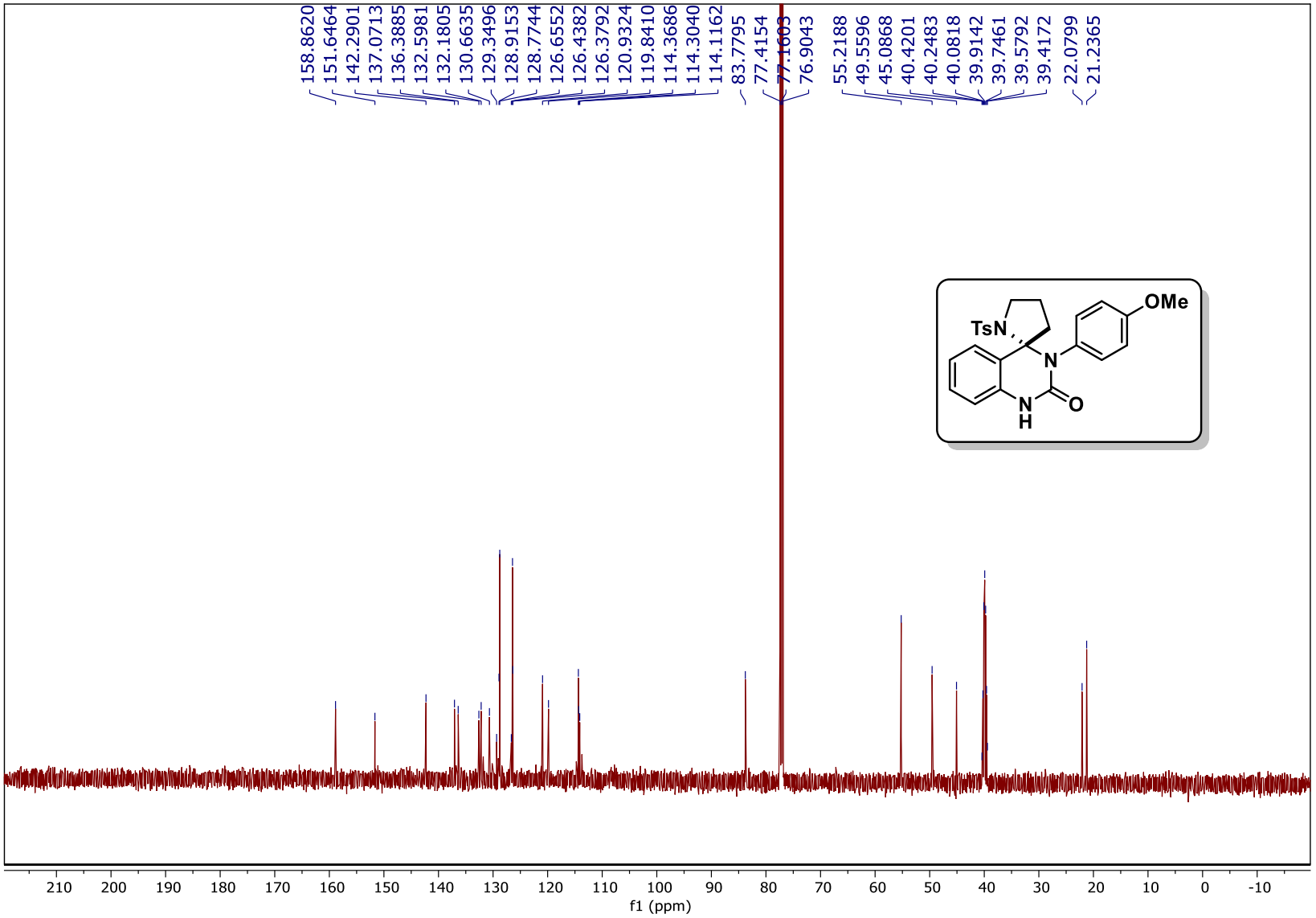


Figure S149. HRMS spectrum of **8b**

Sample Name	Sample13	**Position**	P1-B2	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKS-C-465.d
ACQ Method	DIRECT MASS POSITIVE_ACN1500.m	**Comment**		**Acquired Time**	18-01-2024 16:39:26 (UTC+05:30)

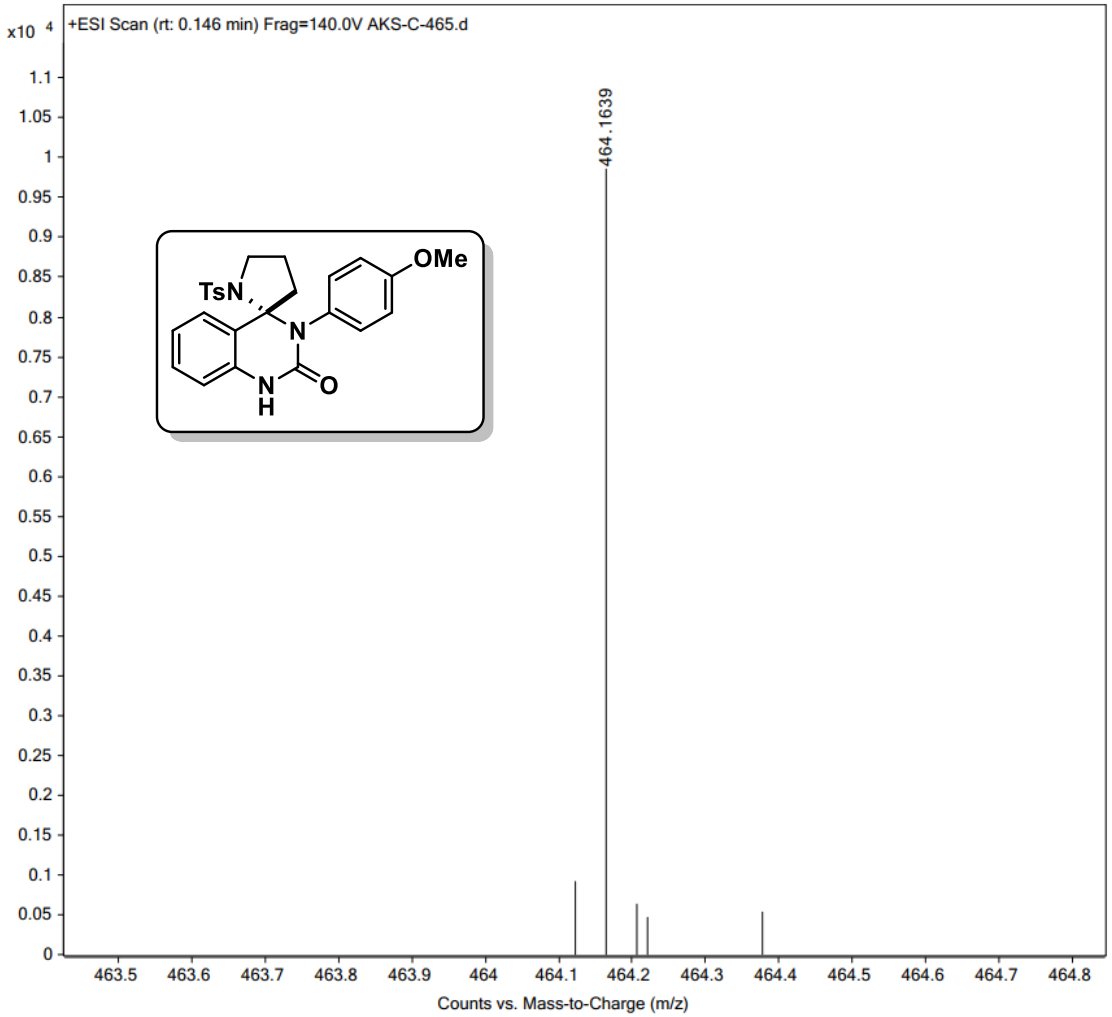


Figure S150. ^{1}H spectrum of compound **9** (400 MHz, $CDCl_3$)

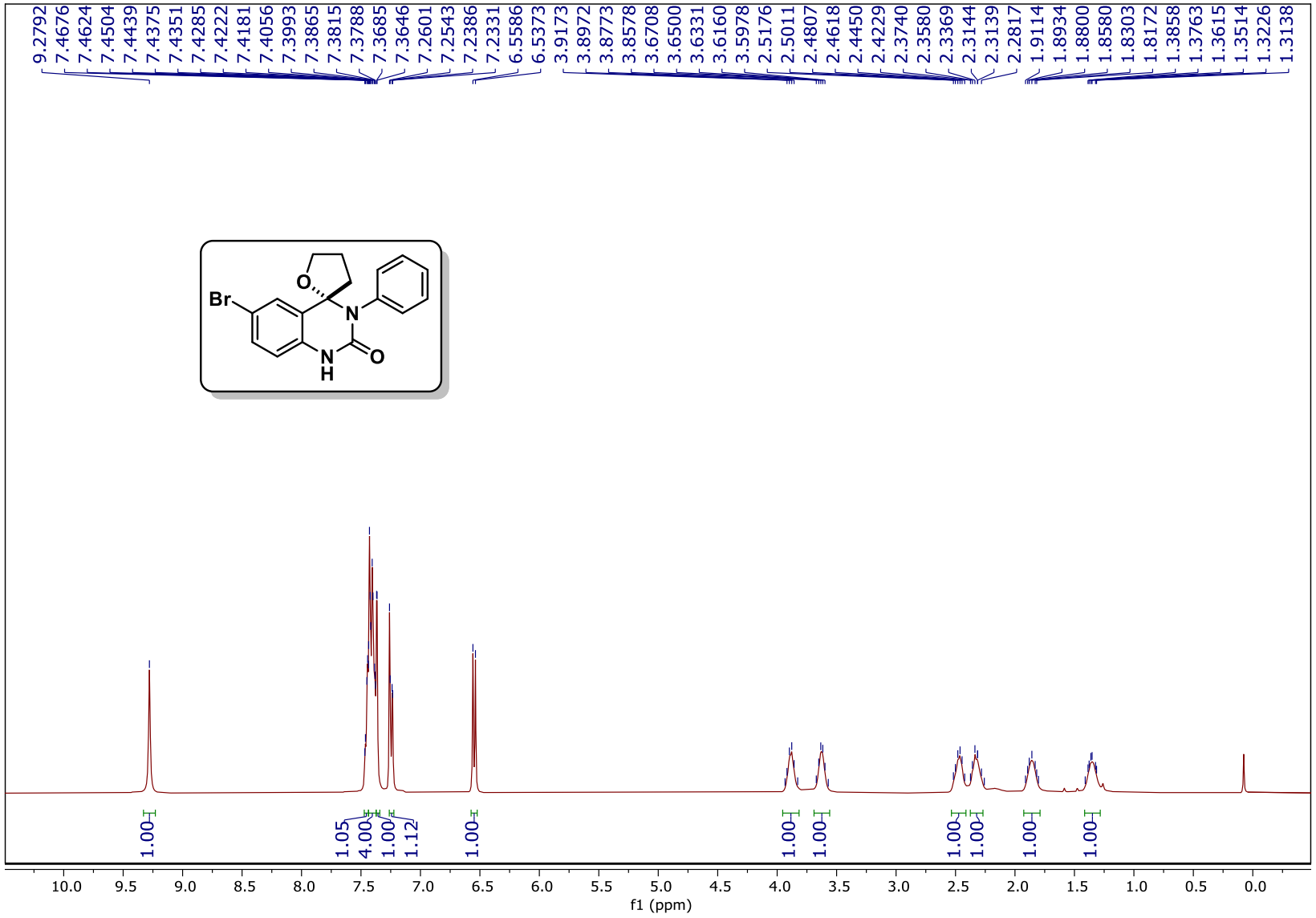


Figure S151. ^{13}C spectrum of compound **9** (125 MHz, $CDCl_3$)

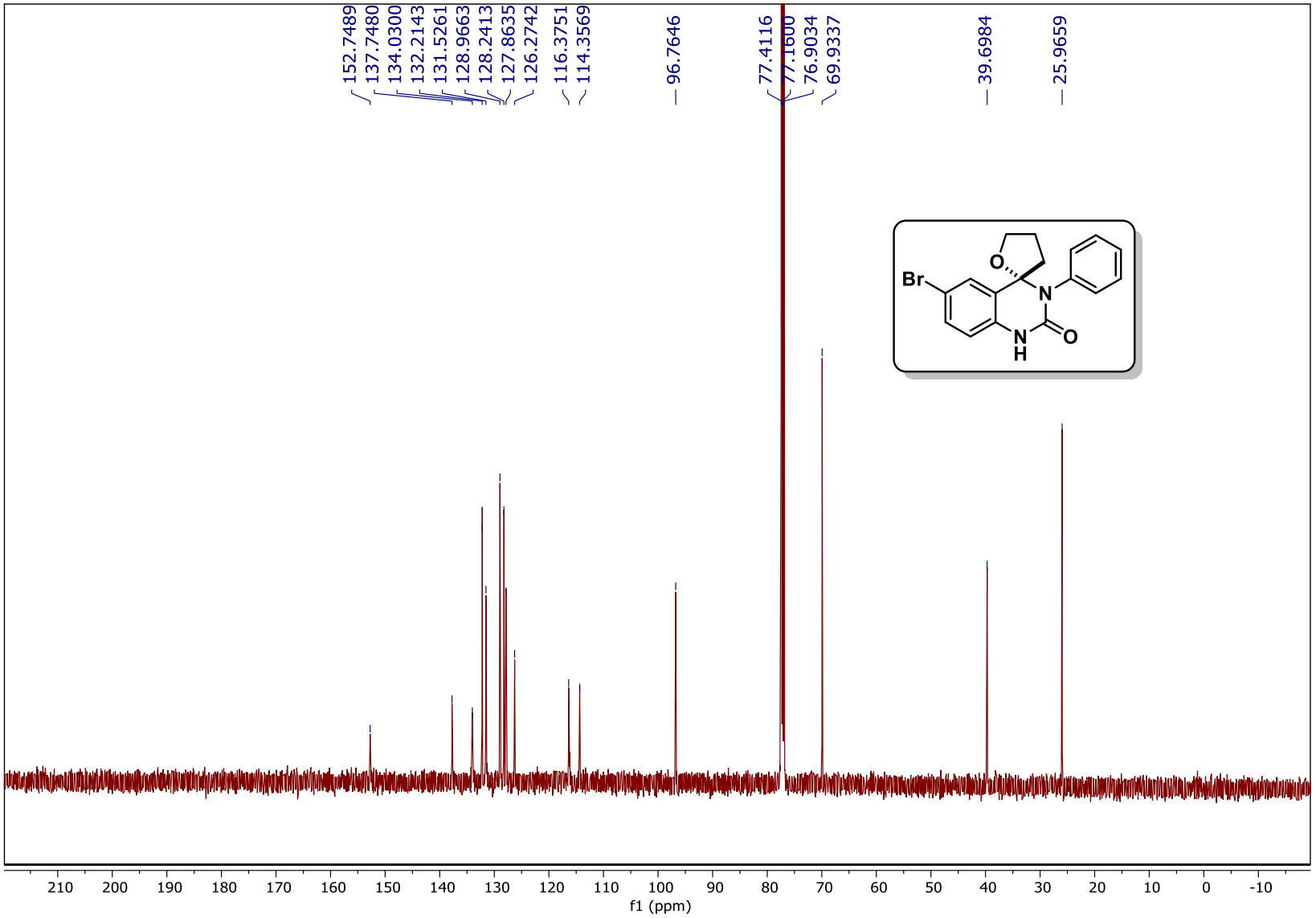
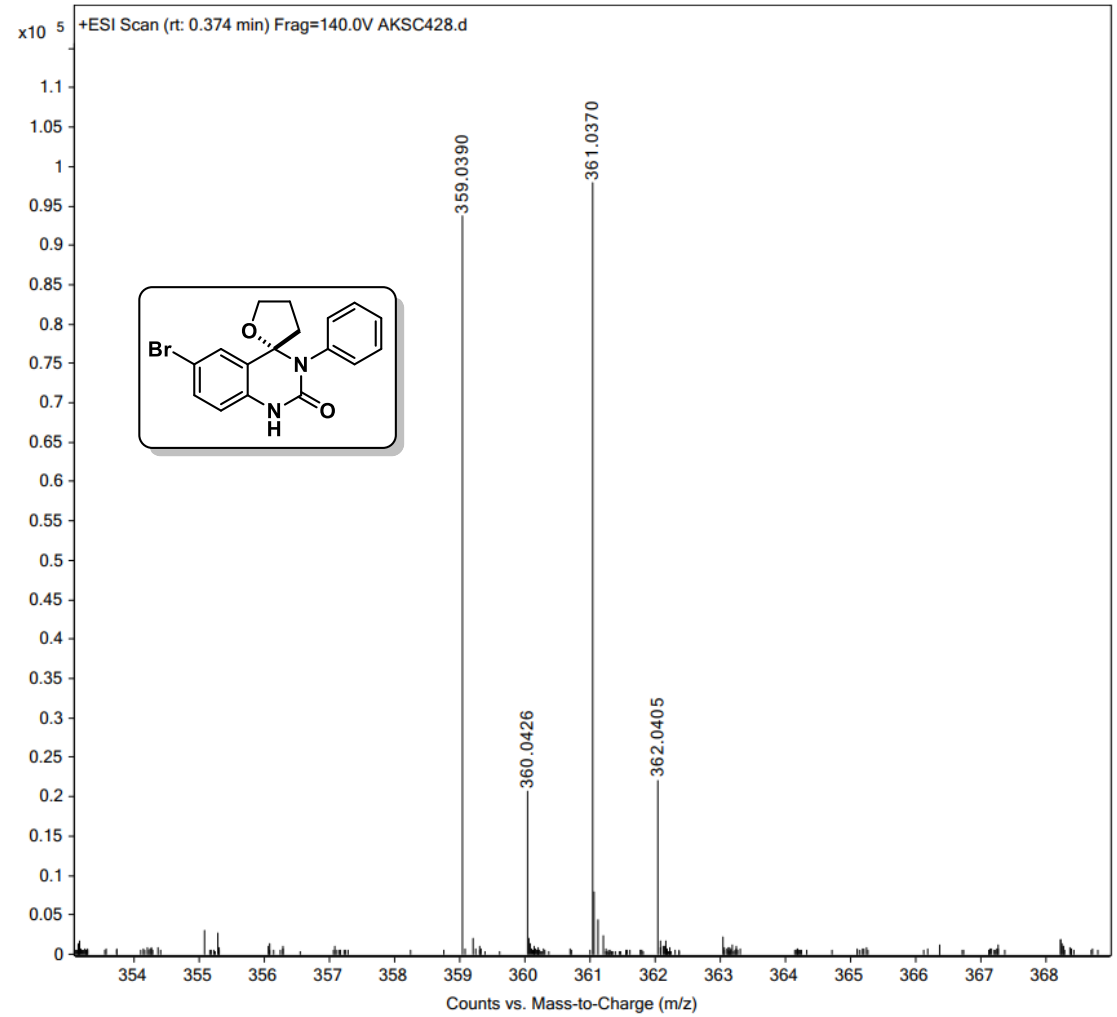


Figure S152. HRMS spectrum of **9**

Sample Name	Sample14	**Position**	P1-A9	**Instrument Name**	QTOF
User Name	SYSTEM (SYSTEM)	**Inj Vol**	5	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	AKSC428.d
ACQ Method	DIRECT MASS_POSITIVE_100_1500.m	**Comment**		**Acquired Time**	16-02-2024 16:29:05 (UTC+05:30)



Single crystal X-ray diffraction

Single crystal of compound **2a** was obtained by slow evaporation of hexane and ethyl acetate solution (4:1). Bruker APEX-II CCD diffractometer was used to collect the intensity data. The instrument is equipped with a fine focus 1.75 kW sealed tube Mo Kα radiation (λ = 0.71073 Å) at 297(2) K. The data acquisition was done with the APEX4 software. APEX4 software was implemented for data integration and reduction. Multi-scan empirical absorption corrections were employed to the data using the program APEX4. Structures were solved by direct methods using SHELXL-2019 software and refined with full-matrix least-squares on F2 using SHELXL-2019/1.[3] Structural illustrations have been drawn with ORTEP-3 for Windows.[4] The detailed data collection and structure refinement are summarized in Table S1. CCDC-2334015 contained supplementary crystallographic data for this paper.

References:

3. G. M. Sheldrick, SHELXS-2014, Program for the crystal structure solution; University of Göttingen: Göttingen, Germany, 2014.
4. L. J. Farrugia, XRDIFF: simulation of X-ray diffraction patterns, *J. Appl. Crystallogr.*, 1997, **30**, 565.

Table S1. Crystal parameters of compound **2a**

Identification code	SB-210
CCDC:	2334015
Empirical formula	$C_{18}H_{18}N_2O_2$
Formula weight	294.34
Temperature	297(2) K
Wavelength	0.71073 Å
Crystal system	Monoclinic
Space group	P 21/n
Unit cell dimensions	a = 12.5261(6) Å α = 90°
	b = 7.3772(4) Å β = 98.222(2)°
	c = 16.8208(9) Å γ = 90°
Volume	1538.39(14) $Å^3$
Z	4
Density (calculated)	1.271 mg/m^3
Absorption coefficient	0.084 mm^{-1}
F(000)	624
Crystal size	0.32 × 0.31 × 0.25 mm^3
Theta range for data collection	3.806 to 50.088°
Index ranges	$-14 \leq h \leq 14$, $-8 \leq k \leq 8$, $-20 \leq l \leq 20$
Reflections collected	32704
Independent reflections	2718 [R_{int} = 0.0527, R_{sigma} = 0.0323]
Completeness to theta = 25.02	99.9%
Refinement method	Full-matrix least-squares on F2
Data / restraints / parameters	2718/0/200
Goodness-of-fit on F2	1.189
Final R indices [I>2sigma(I)]	**R_1** = 0.0730
	wR_2 = 0.1298
R indices (all data)	**R_1** = 0.1141
	wR_2 = 0.1506
Extinction coefficient	n/a
Largest diff. peak and hole	0.145 and -0.171 $e.Å^{-3}$

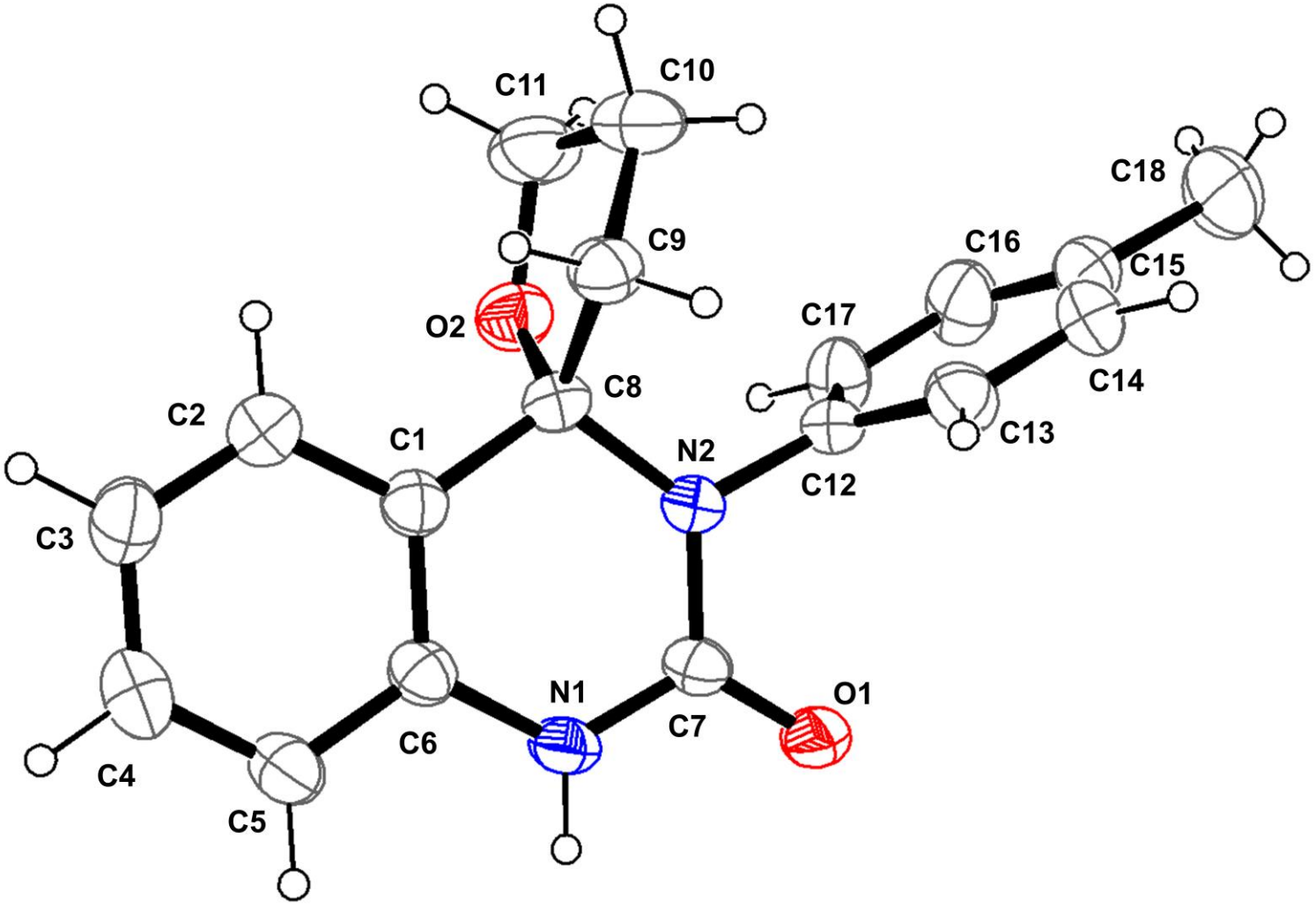


Figure S153. ORTEP diagram of compound **2a** with thermal ellipsoid of 30% probability.