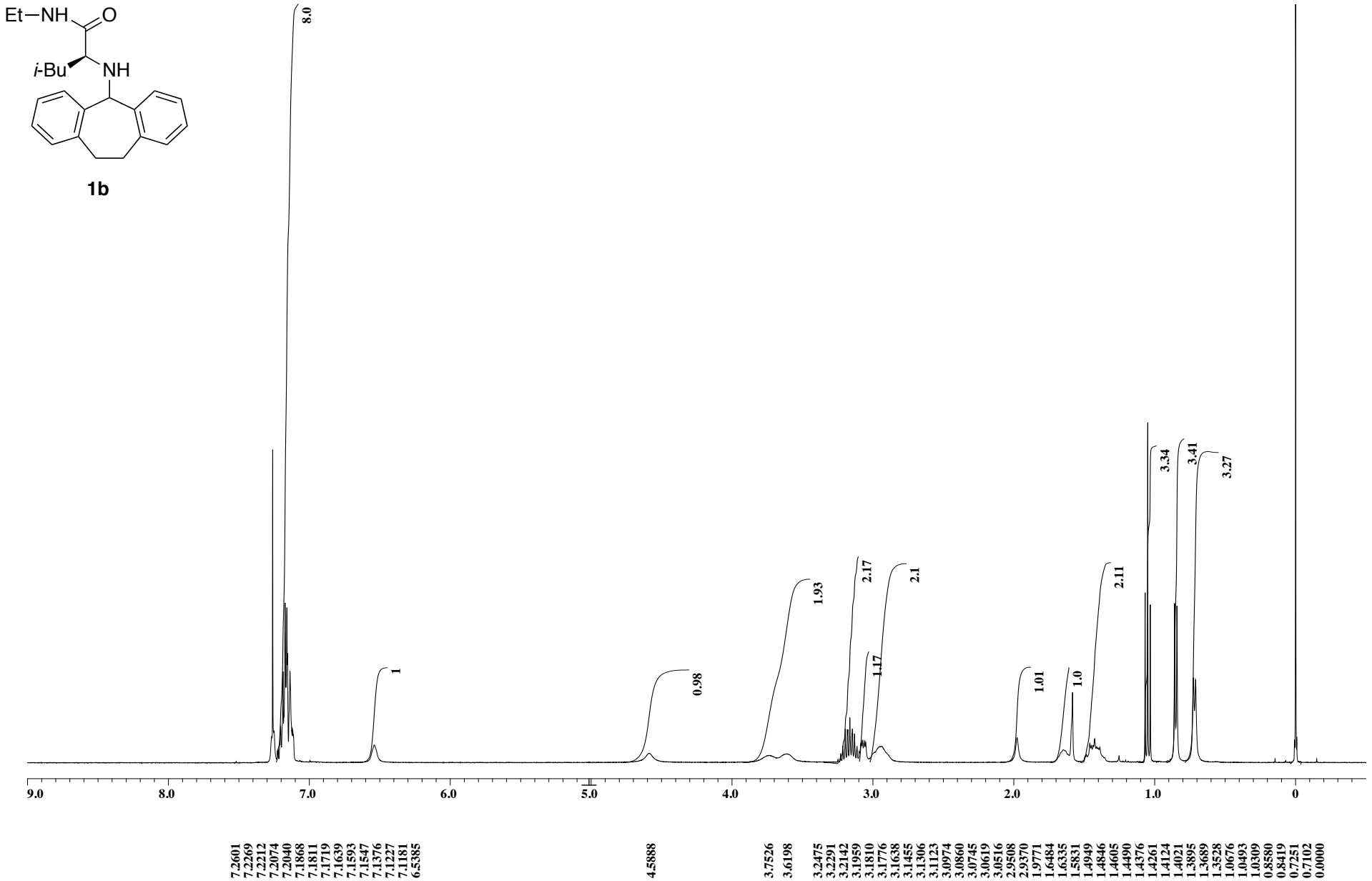
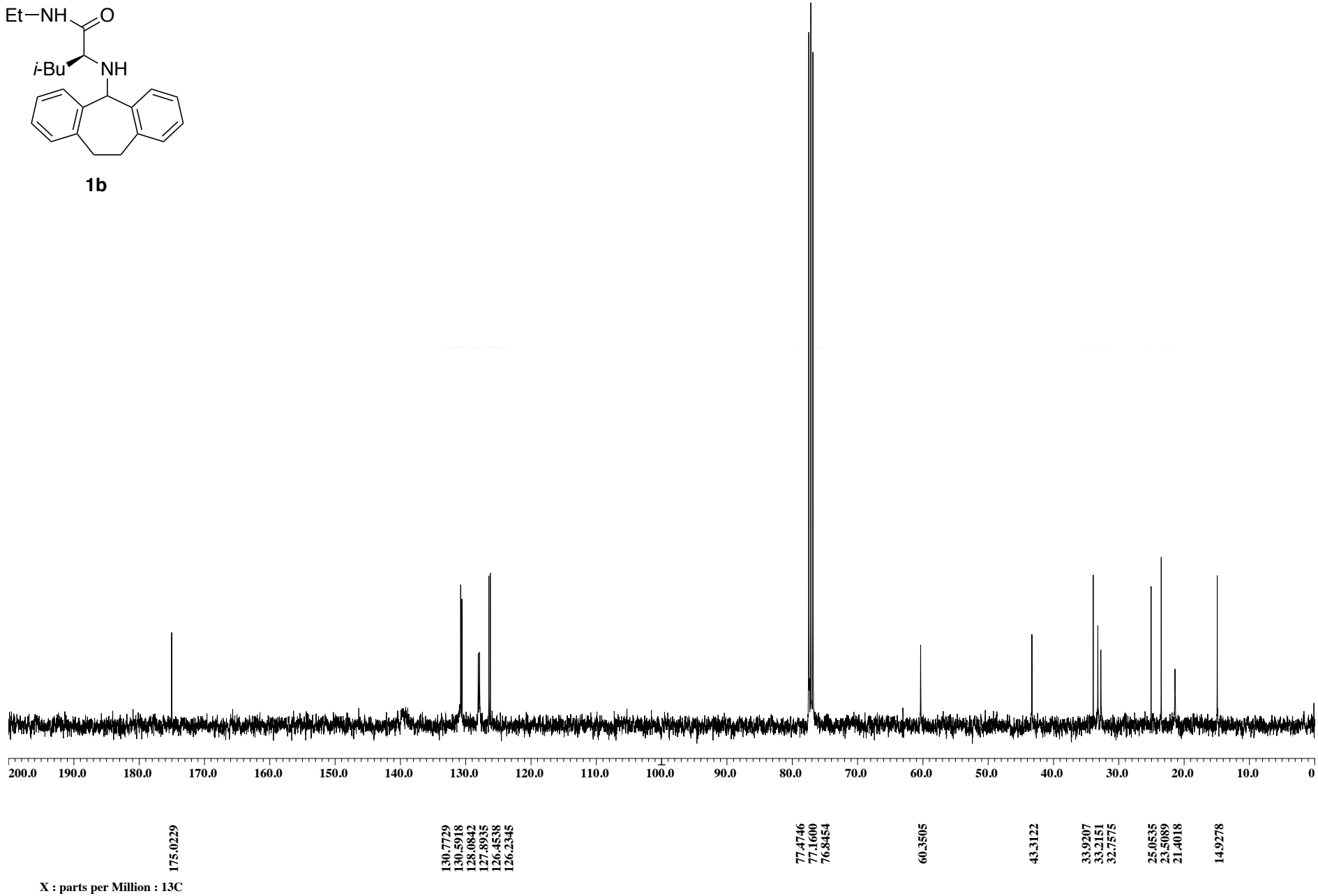
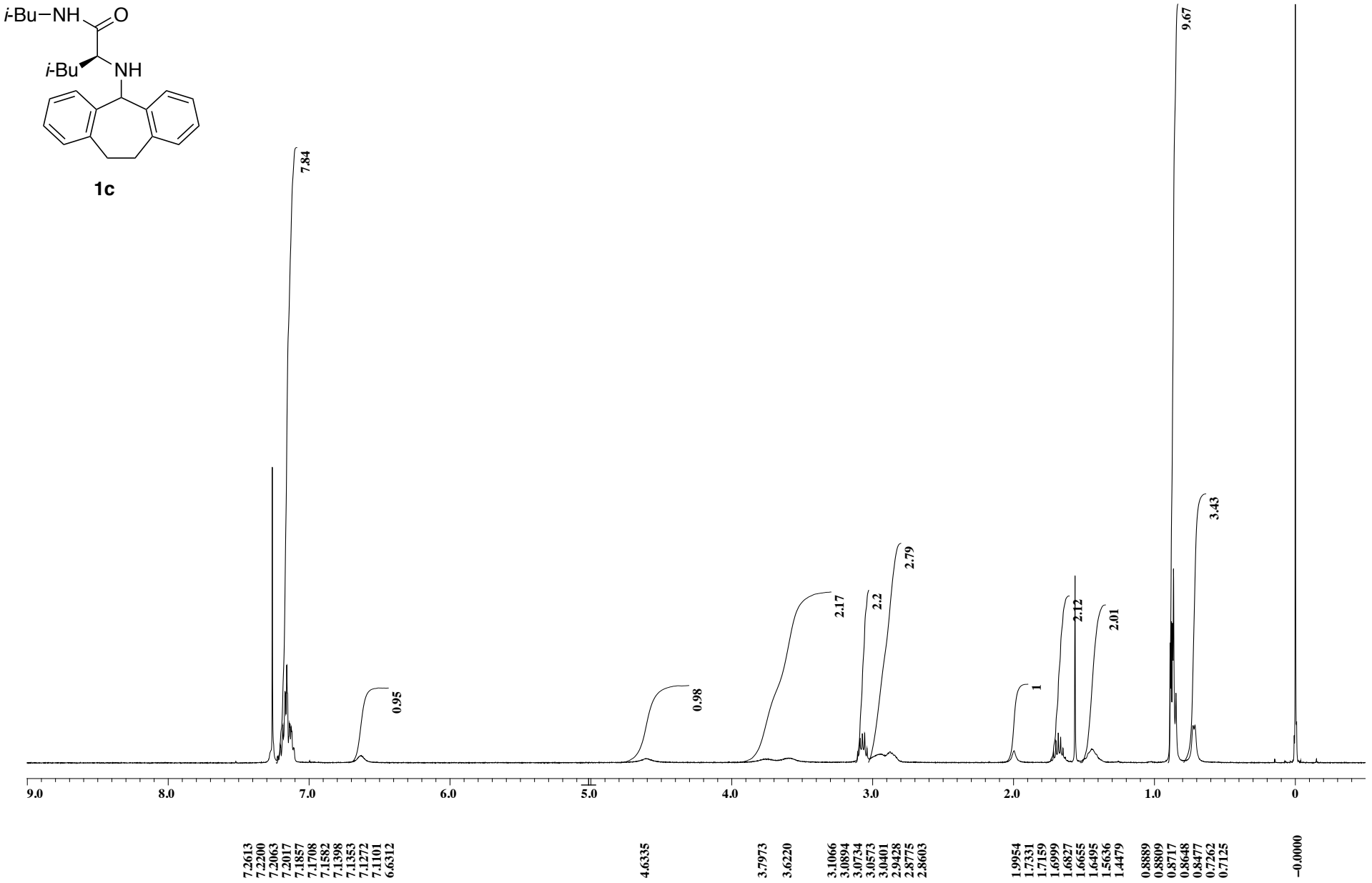


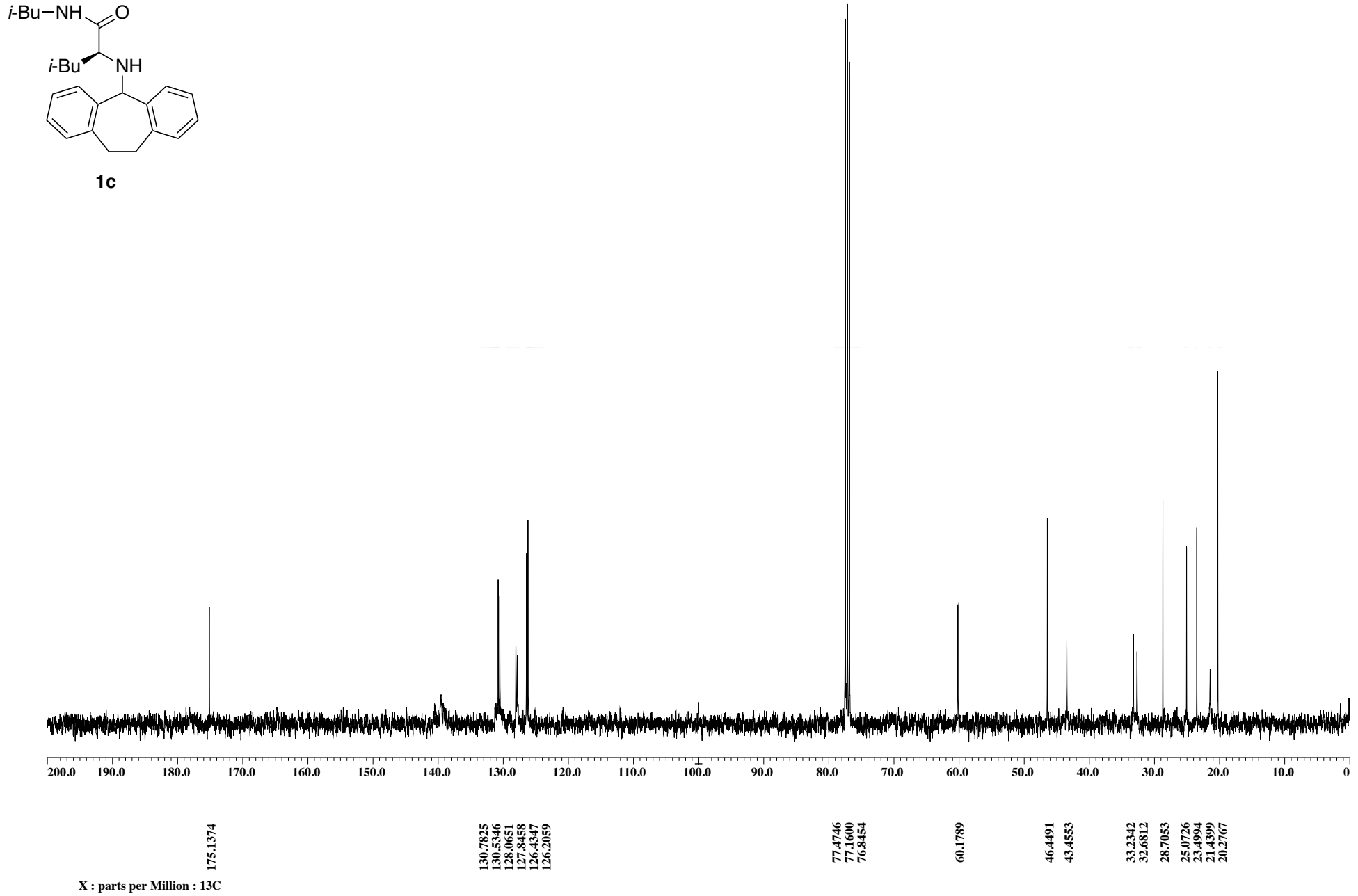

$^1$H NMR spectrum of **1b** ($CDCl_3$, 400 MHz)



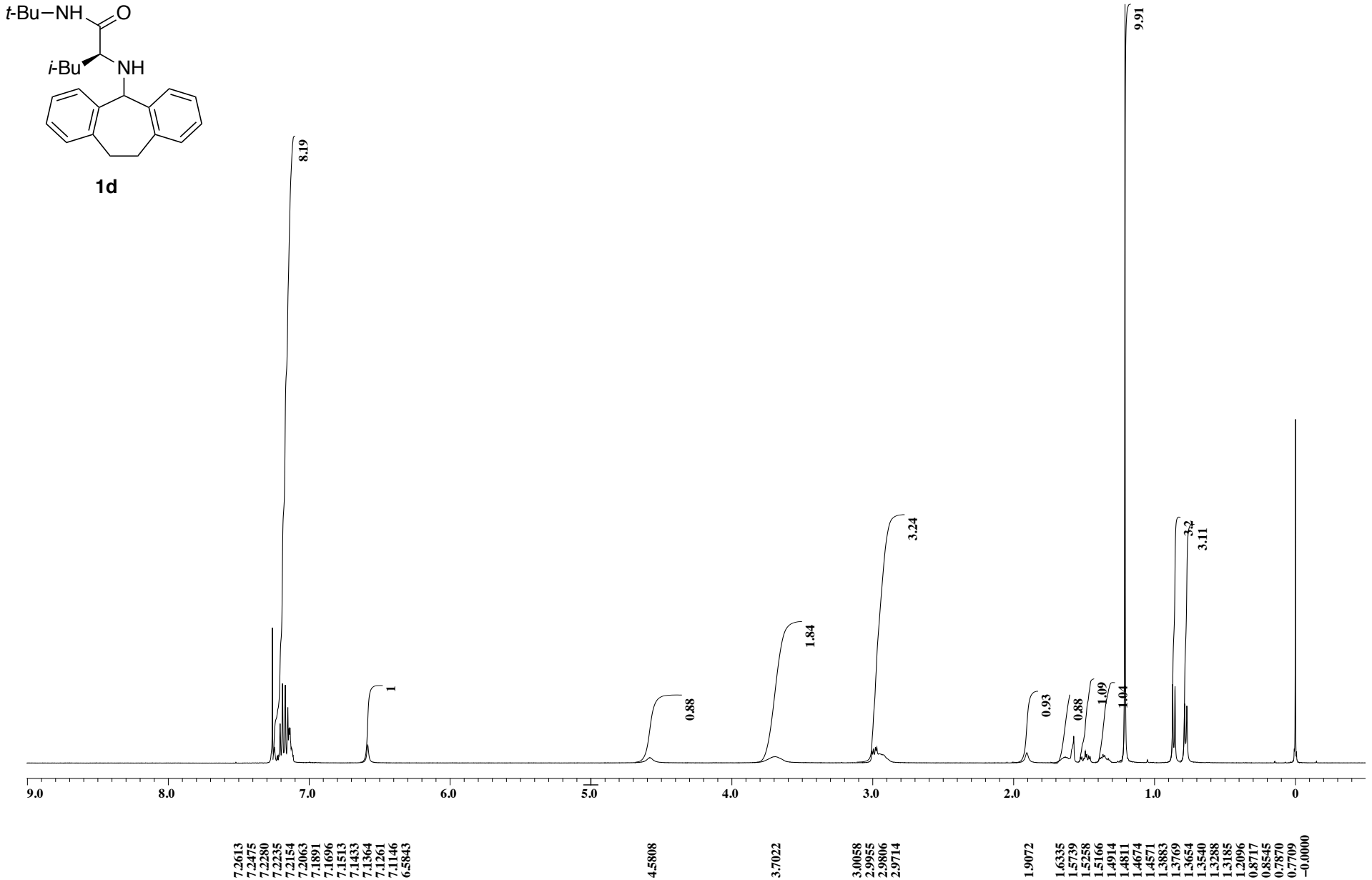

$^{13}$C NMR spectrum of **1b** ($CDCl_3$, 100 MHz)



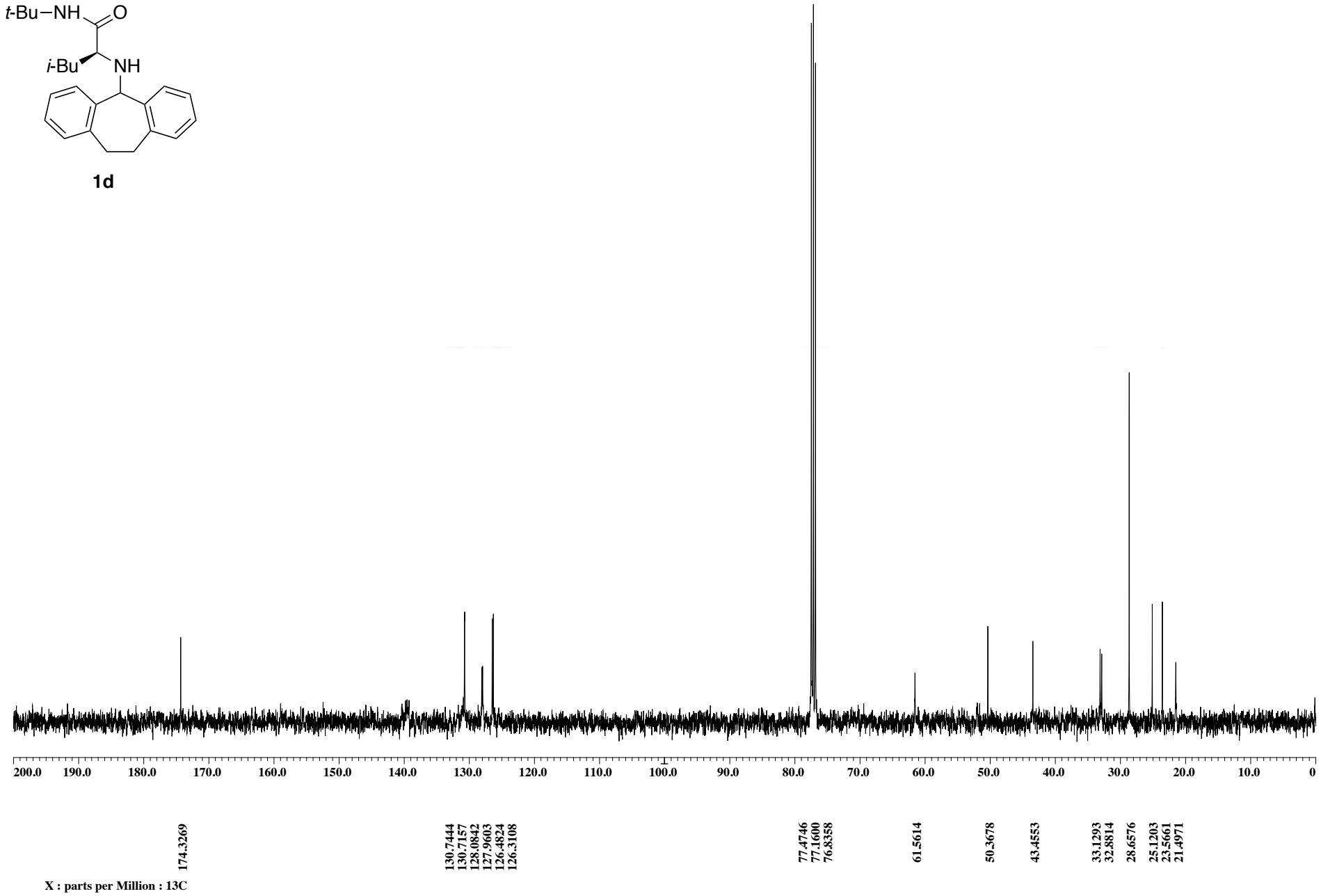

$^{1}$H NMR spectrum of **1c** ($CDCl_3$, 400 MHz)



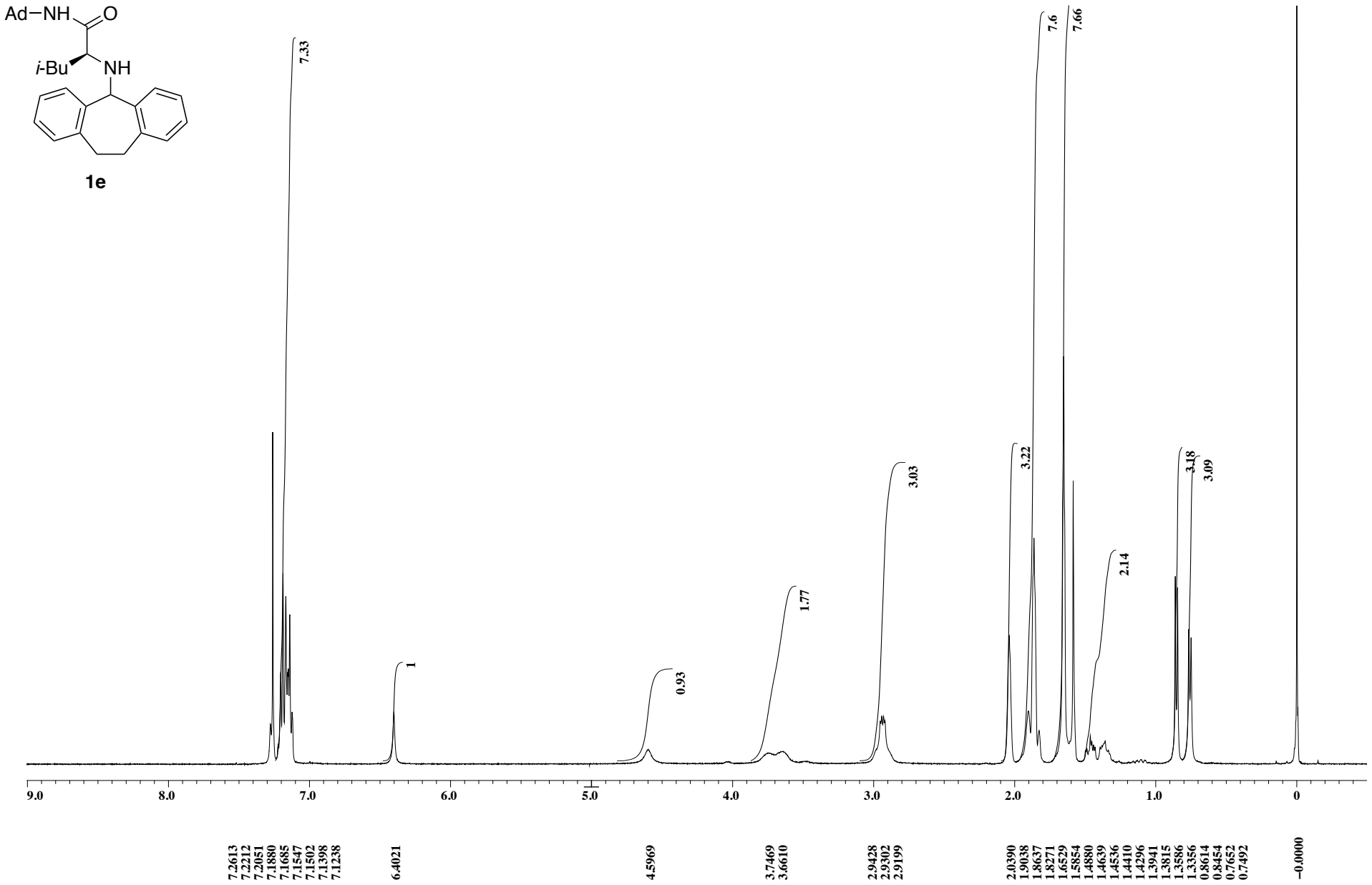

$^{13}$C NMR spectrum of **1c** ($CDCl_3$, 100 MHz)



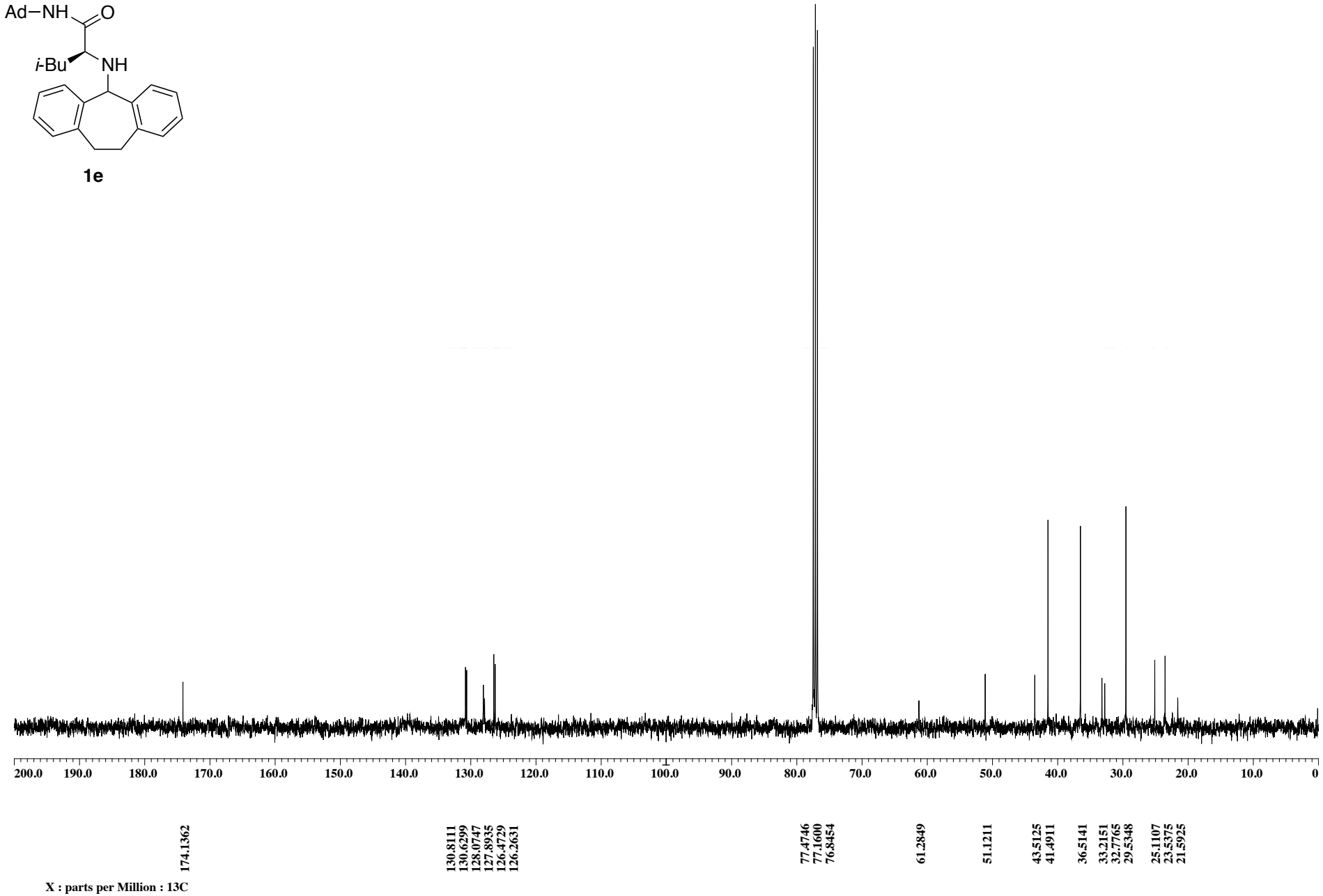

$^{1}$H NMR spectrum of **1d** ($CDCl_3$, 400 MHz)



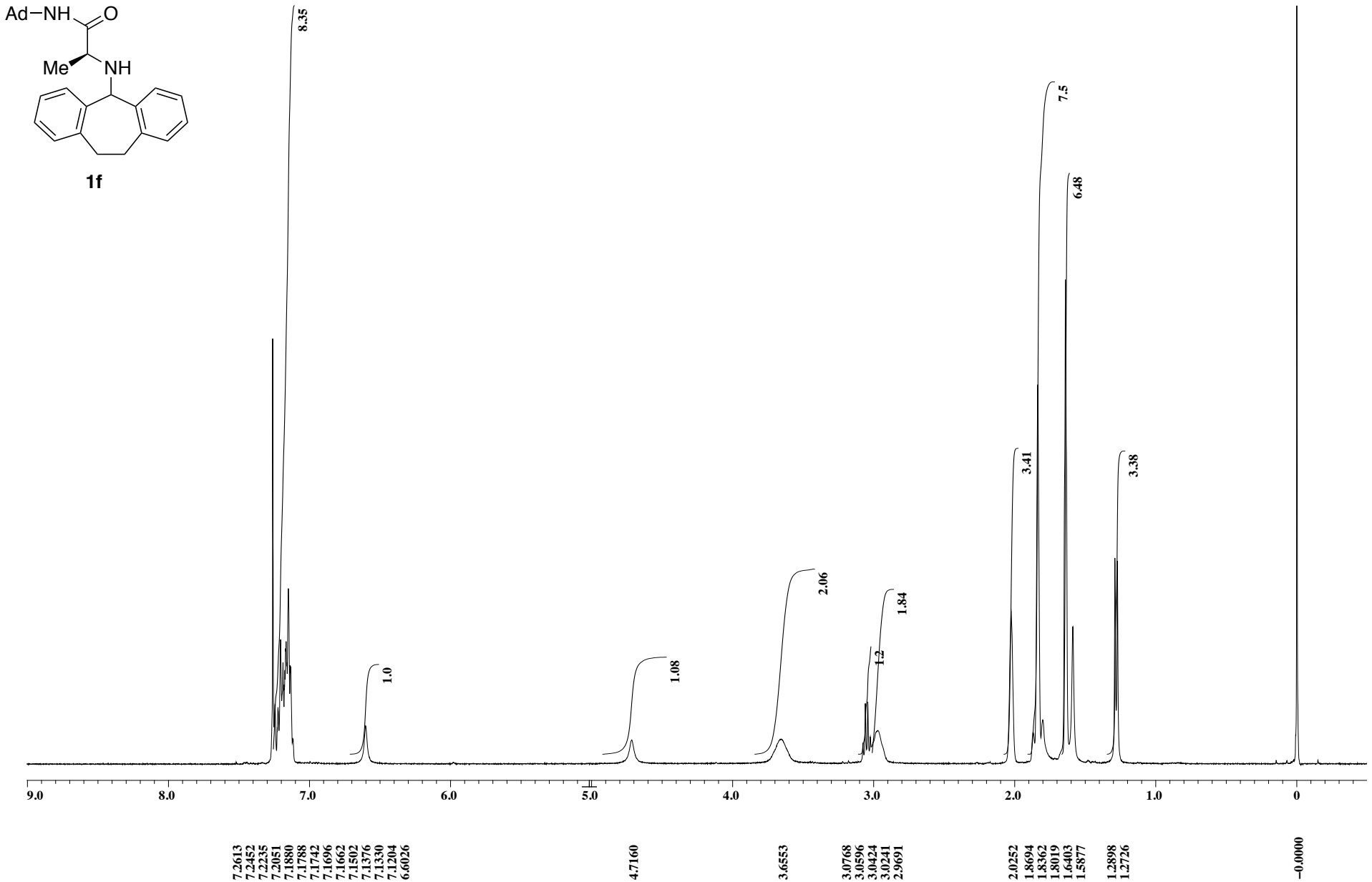

$^{13}$C NMR spectrum of **1d** ($CDCl_3$, 100 MHz)



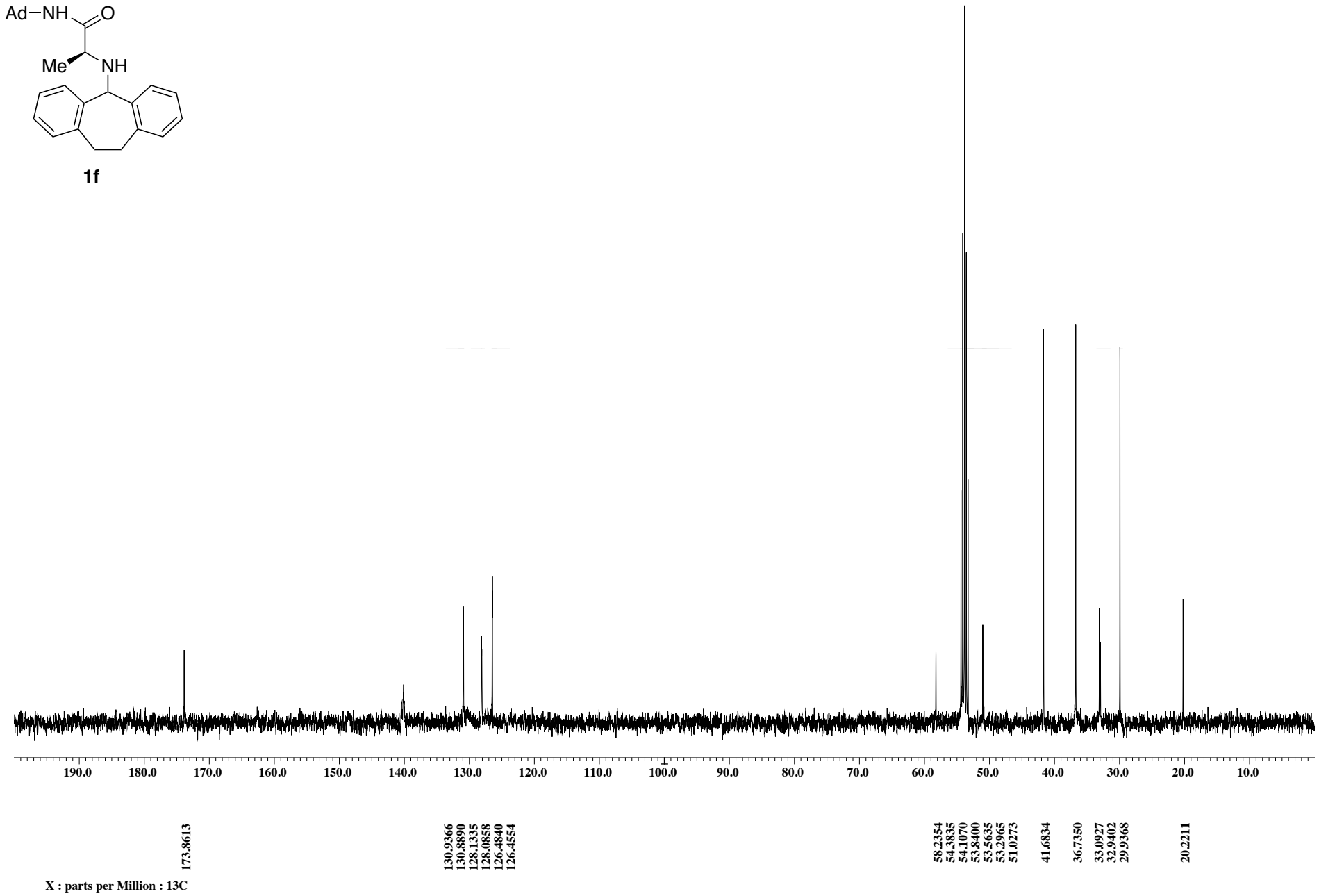

$^{1}$H NMR spectrum of **1e** ($CDCl_3$, 400 MHz)



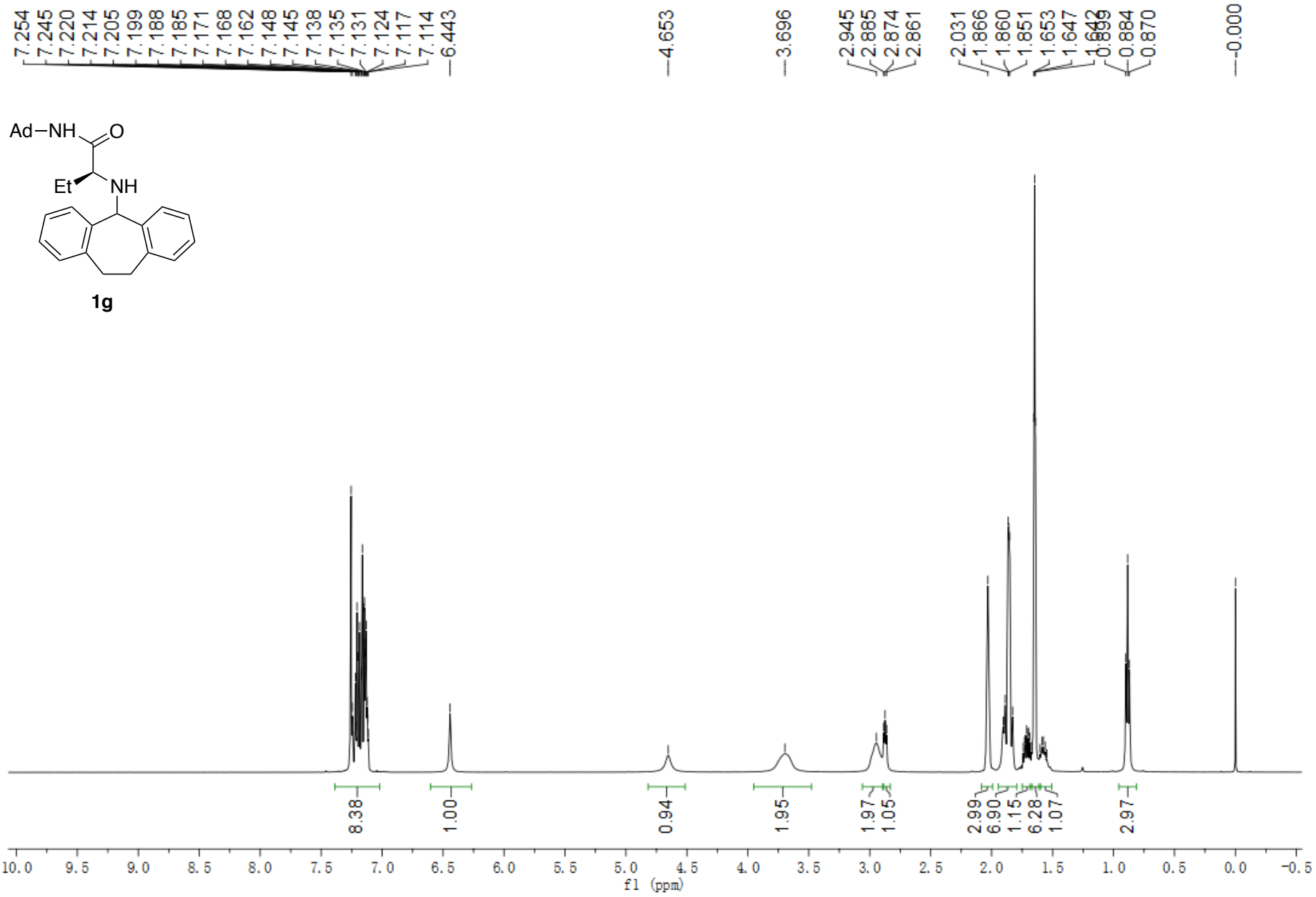

$^{13}$C NMR spectrum of **1e** ($CDCl_3$, 100 MHz)



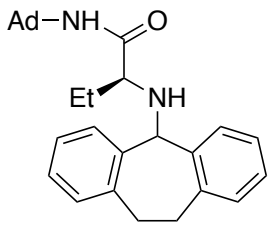

$^{1}$H NMR spectrum of **1f** ($CDCl_3$, 400 MHz)



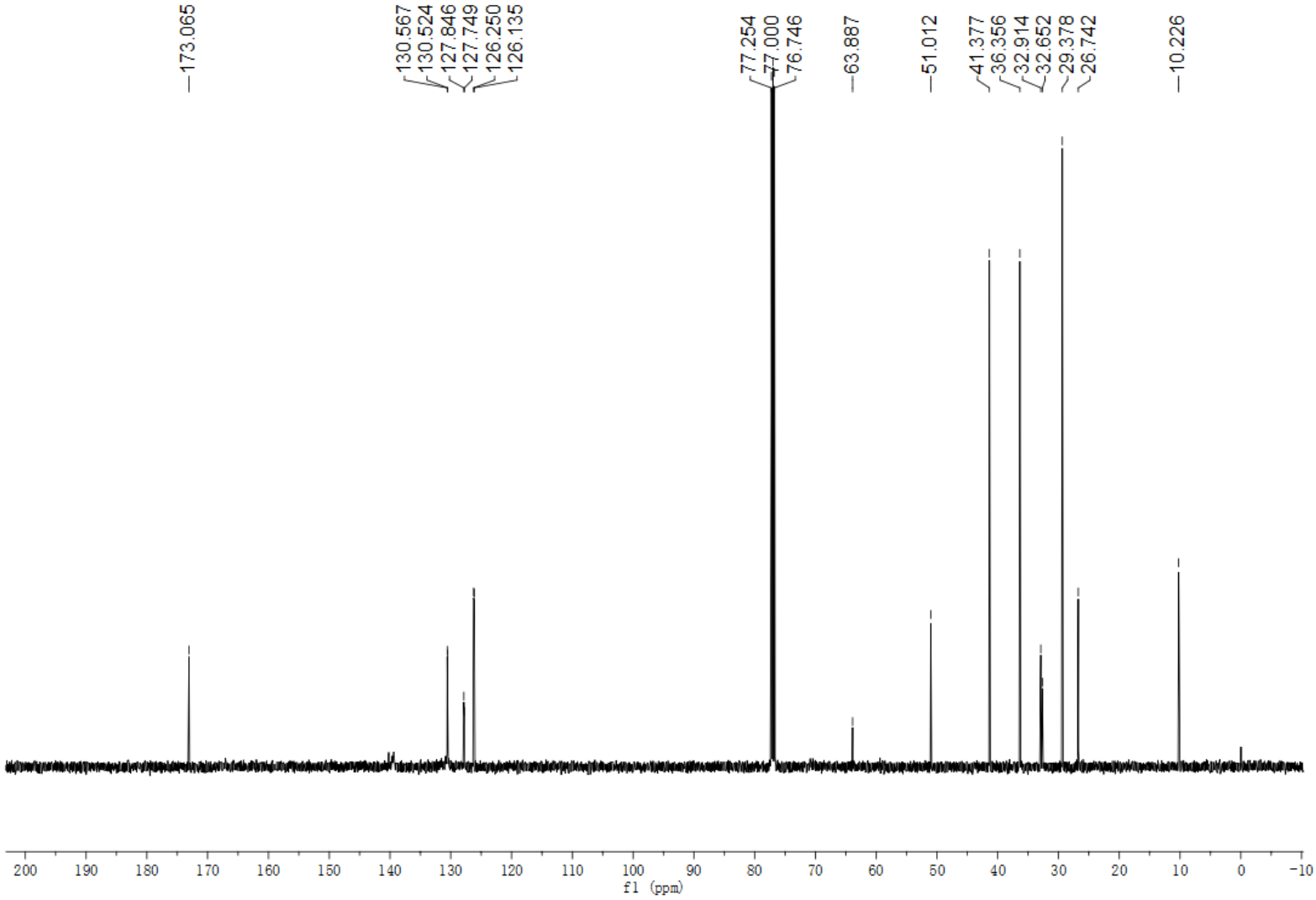

$^{13}C$ NMR spectrum of **1f** ($CD_2Cl_2$, 100 MHz)



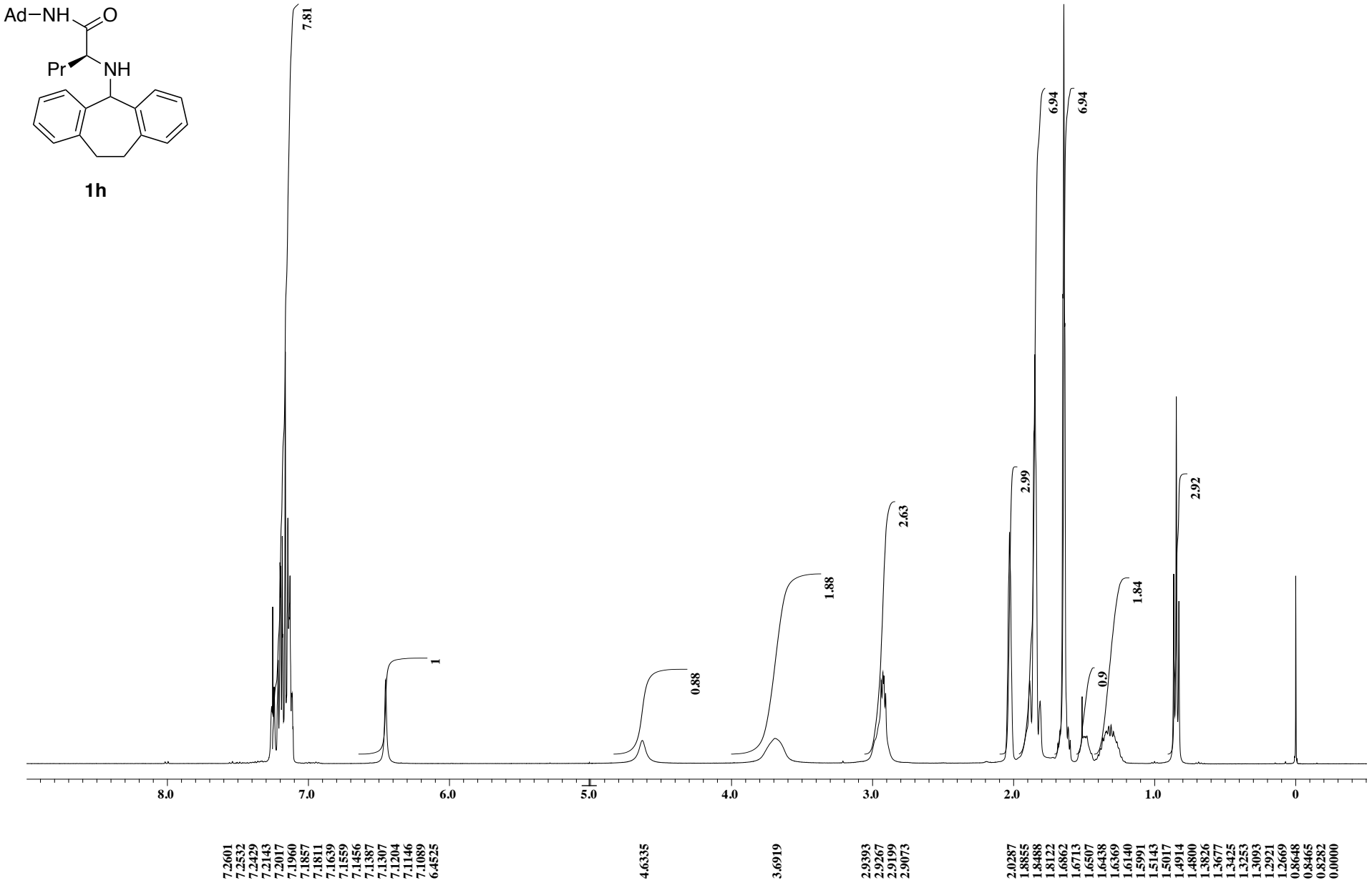

$^1$H NMR spectrum of **1g** ($CDCl_3$, 500 MHz)



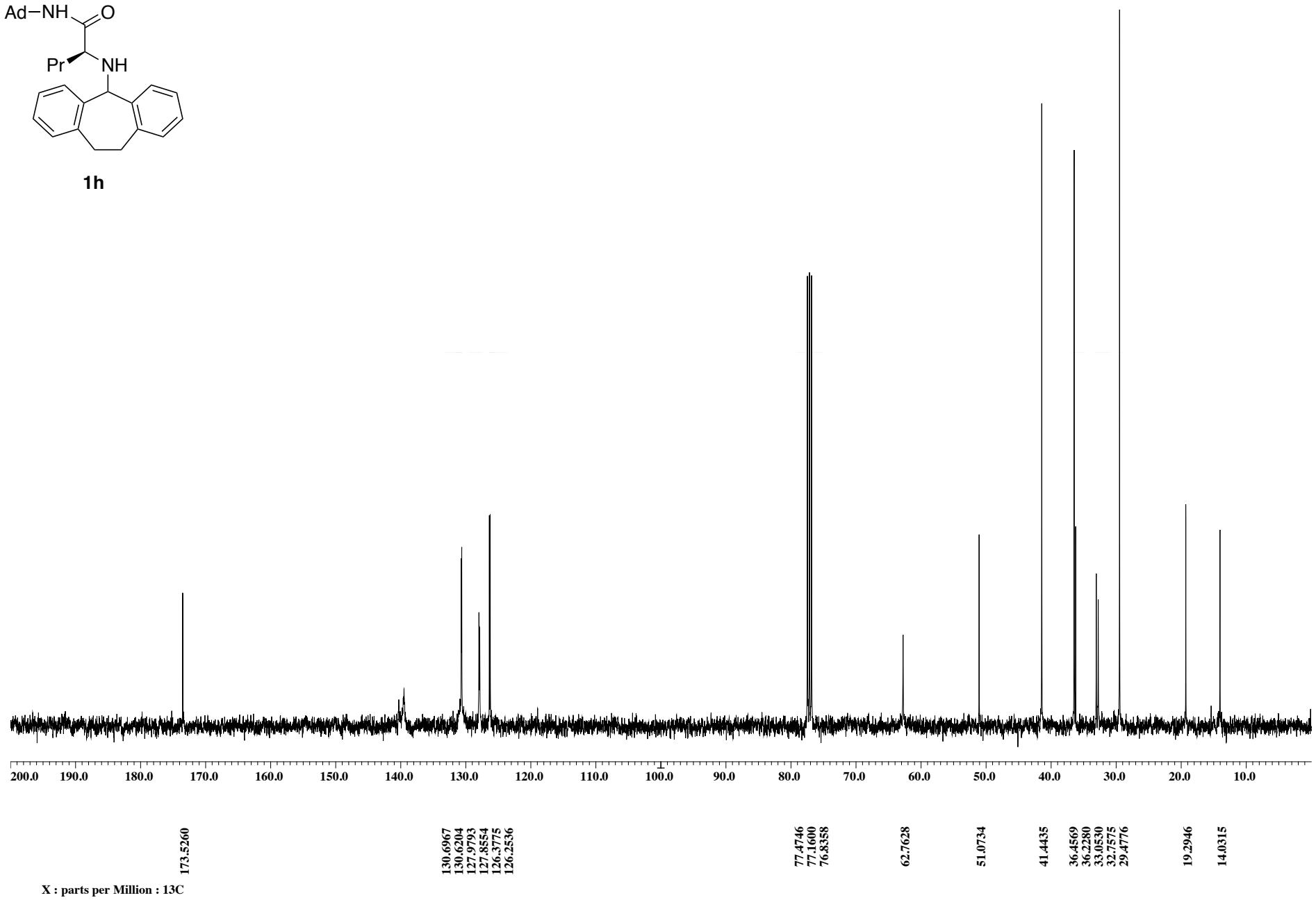

**1g**



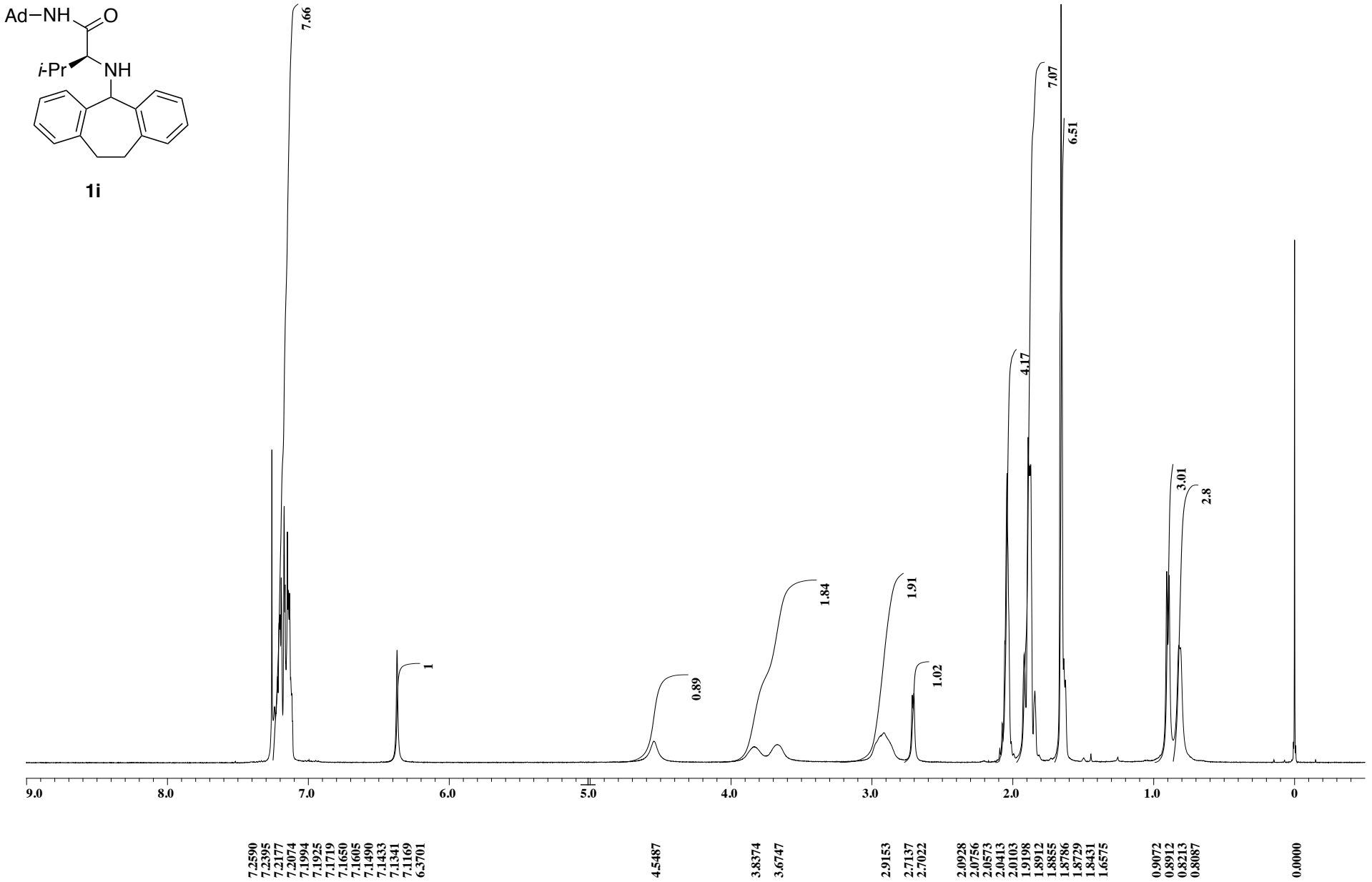

$^{13}$C NMR spectrum of **1g** ($CDCl_3$, 126 MHz)



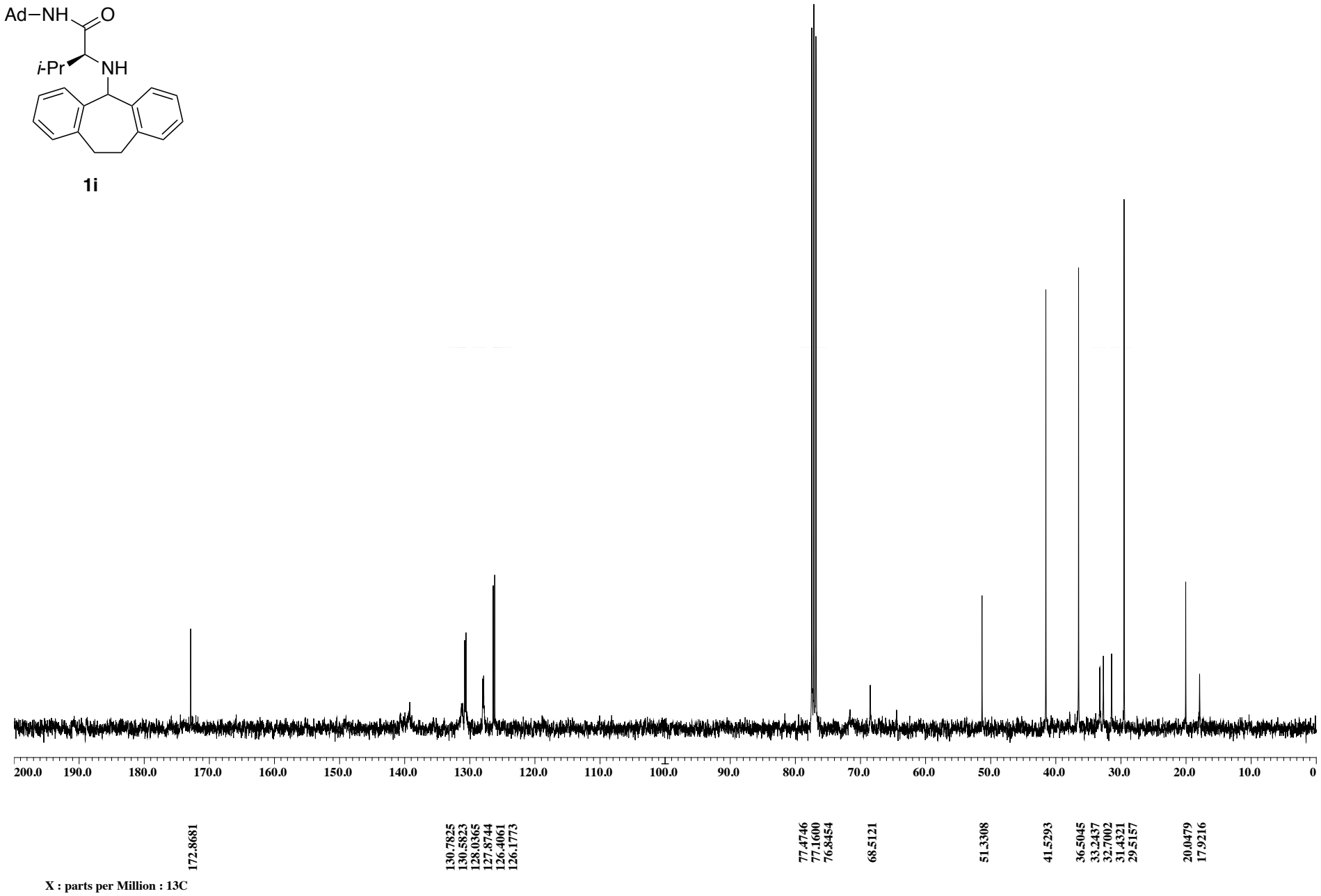

$^1$H NMR spectrum of **1h** ($CDCl_3$, 400 MHz)



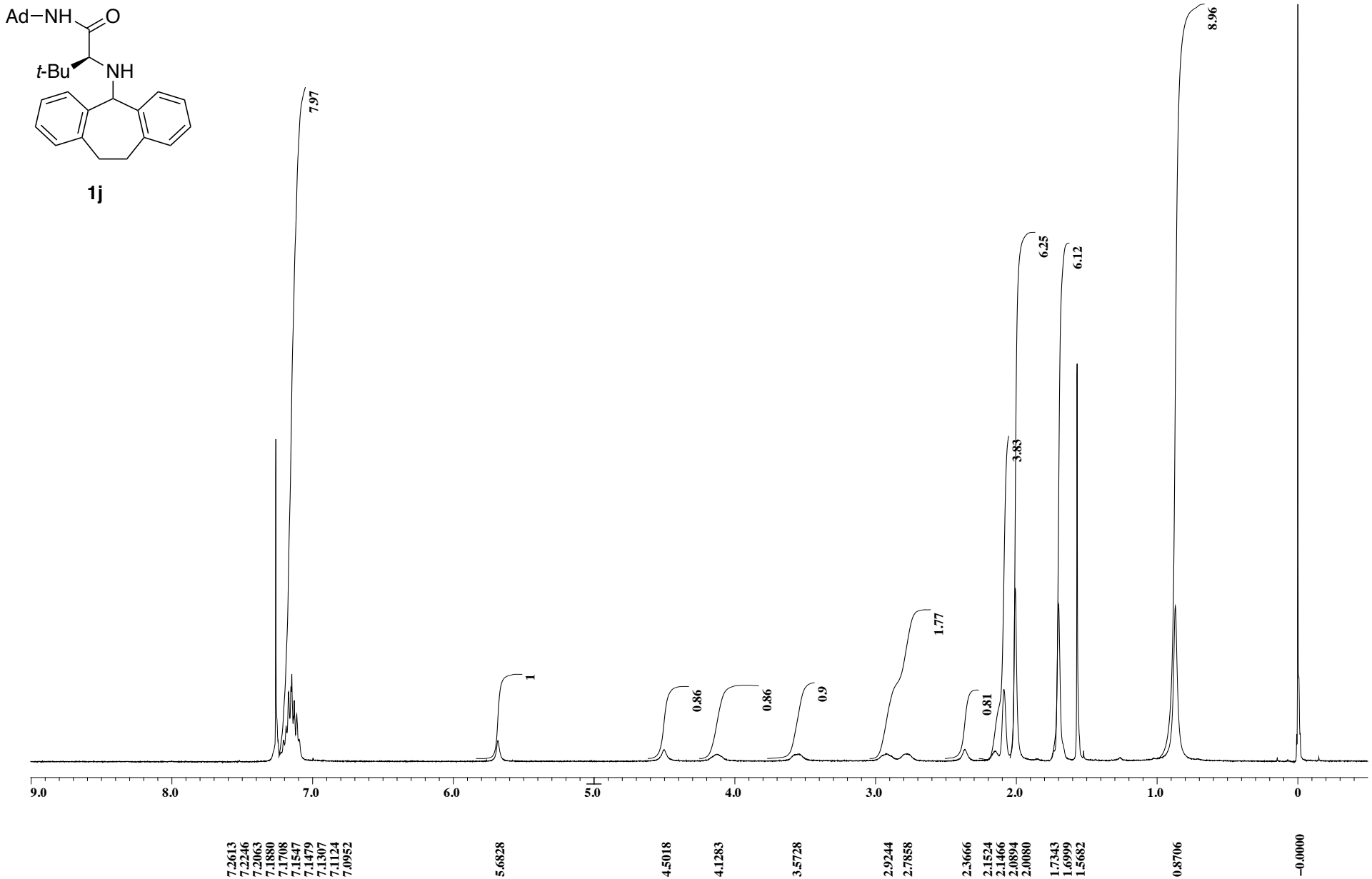

$^{13}$C NMR spectrum of **1h** ($CDCl_3$, 100 MHz)



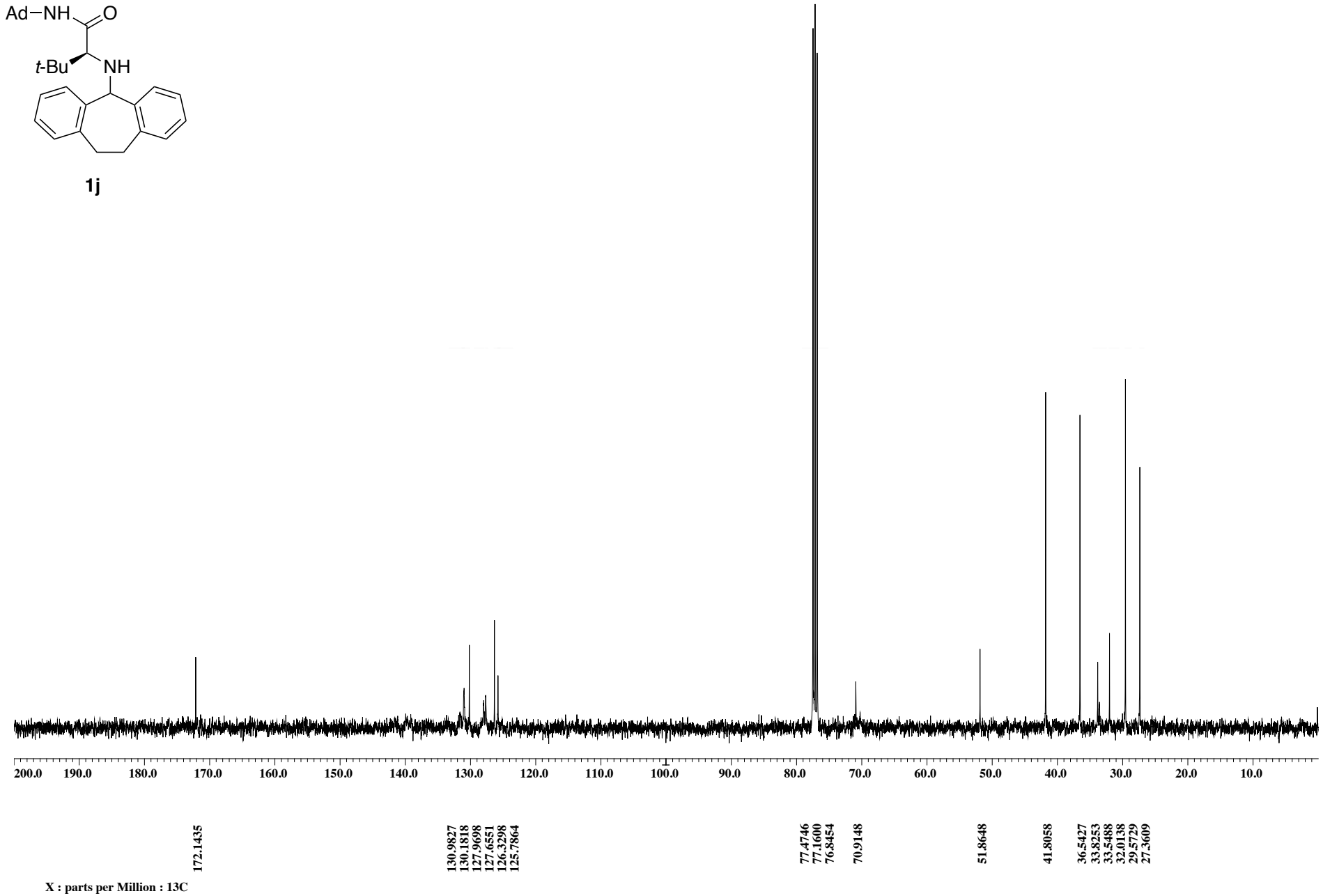

$^1$H NMR spectrum of **1i** ($CDCl_3$, 400 MHz)



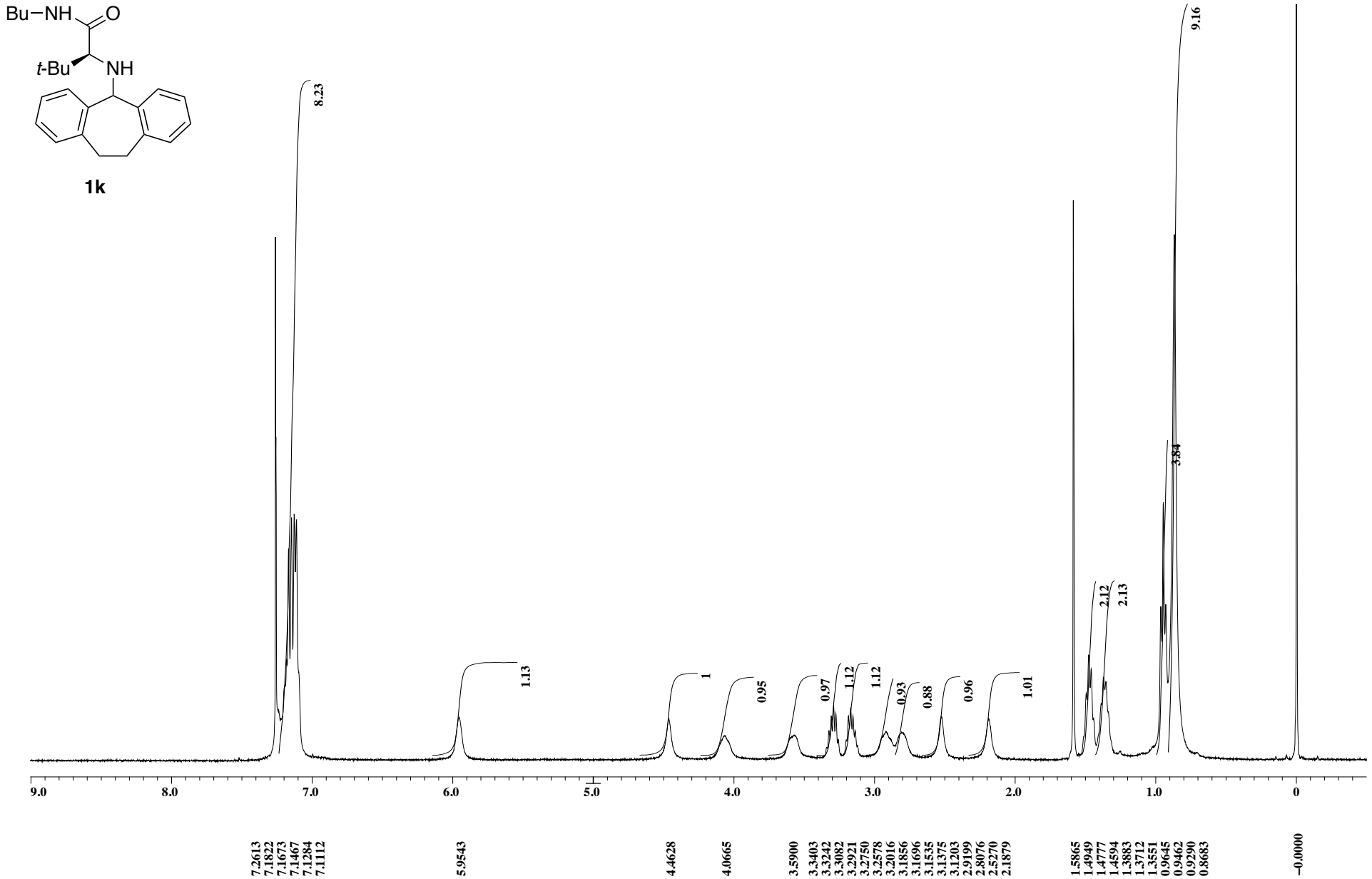

$^{13}$C NMR spectrum of **1i** ($CDCl_3$, 100 MHz)



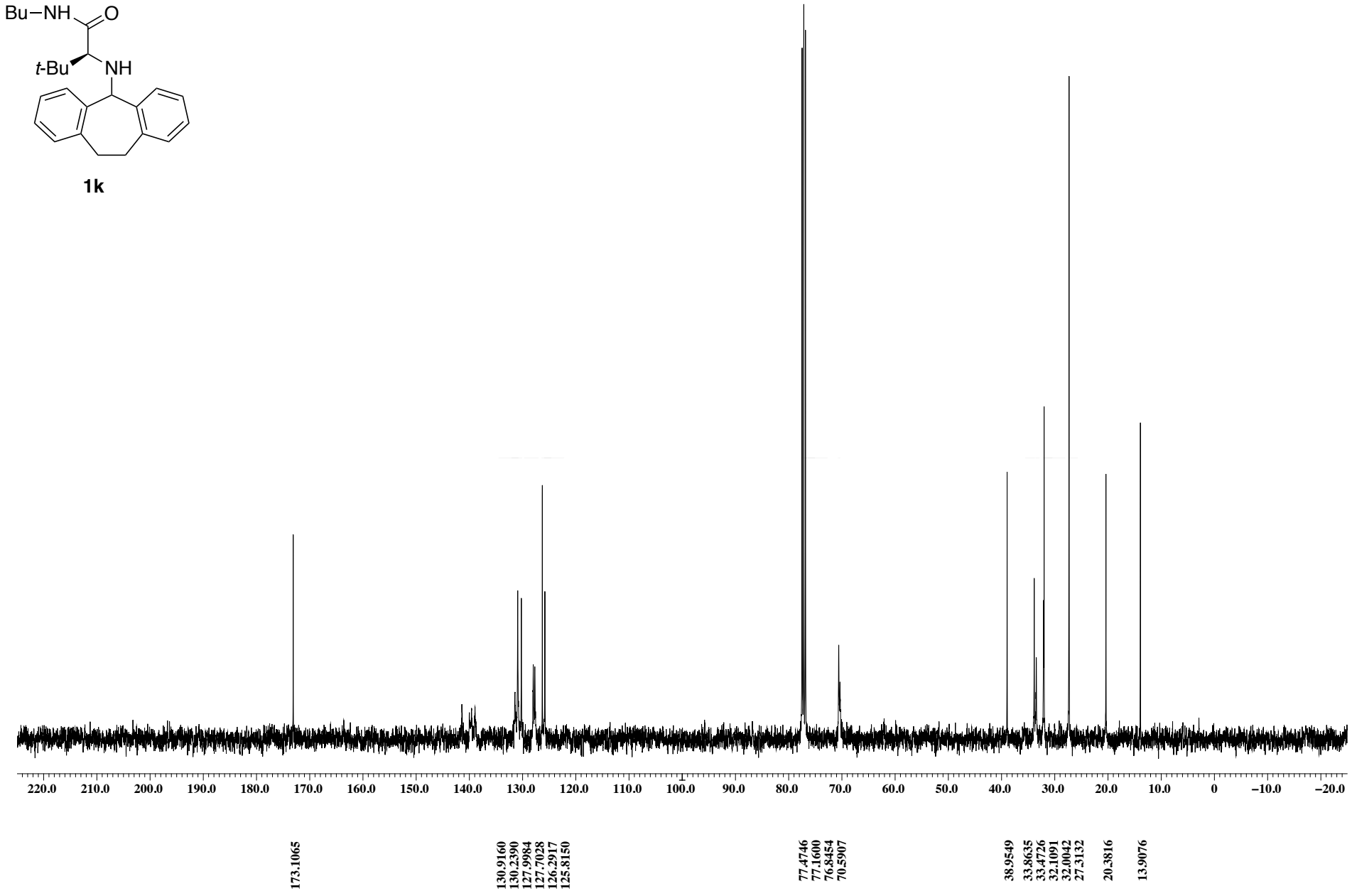

$^{1}$H NMR spectrum of **1j** ($CDCl_3$, 400 MHz)



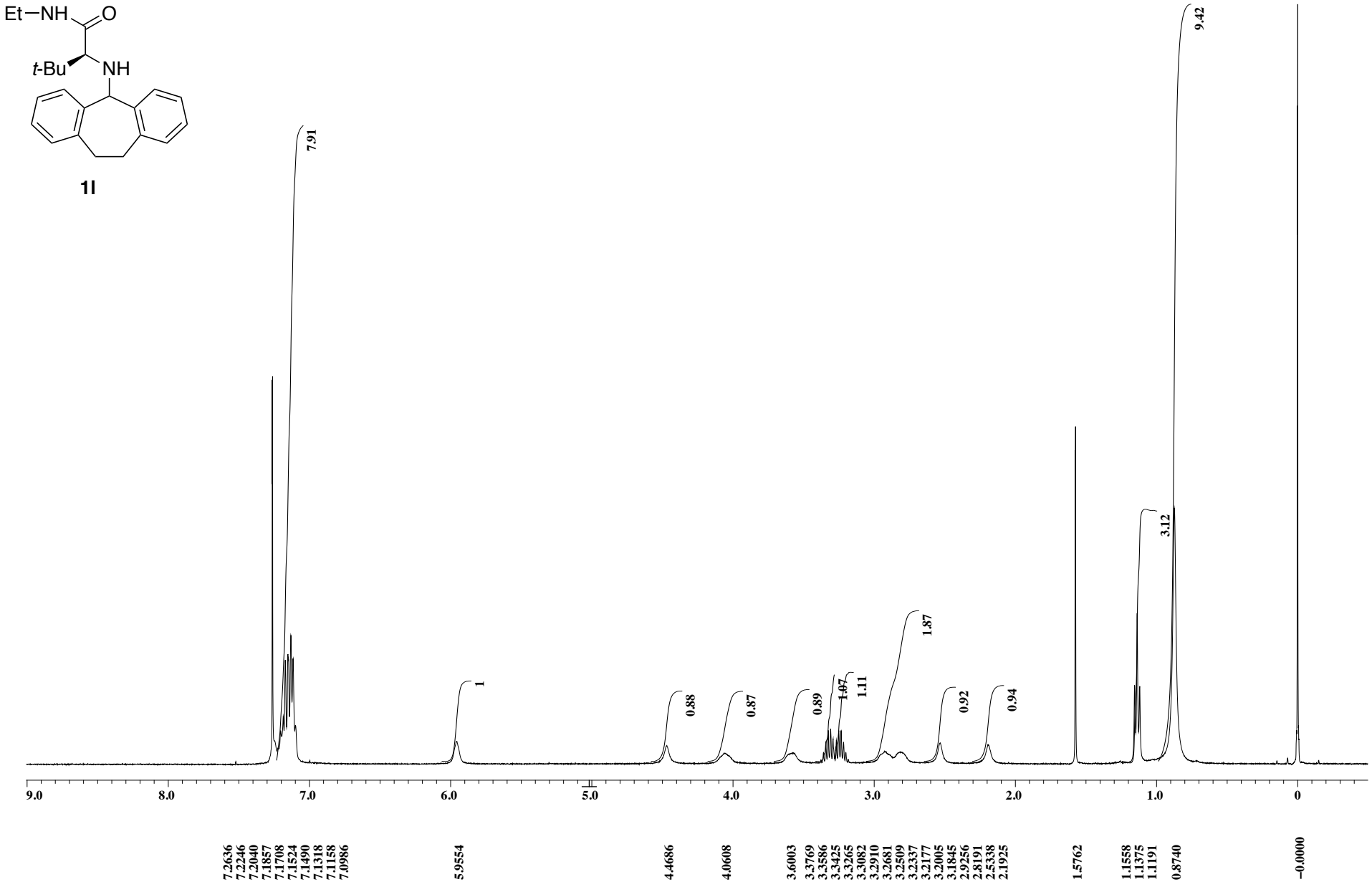

$^{13}$C NMR spectrum of **1j** ($CDCl_3$, 100 MHz)



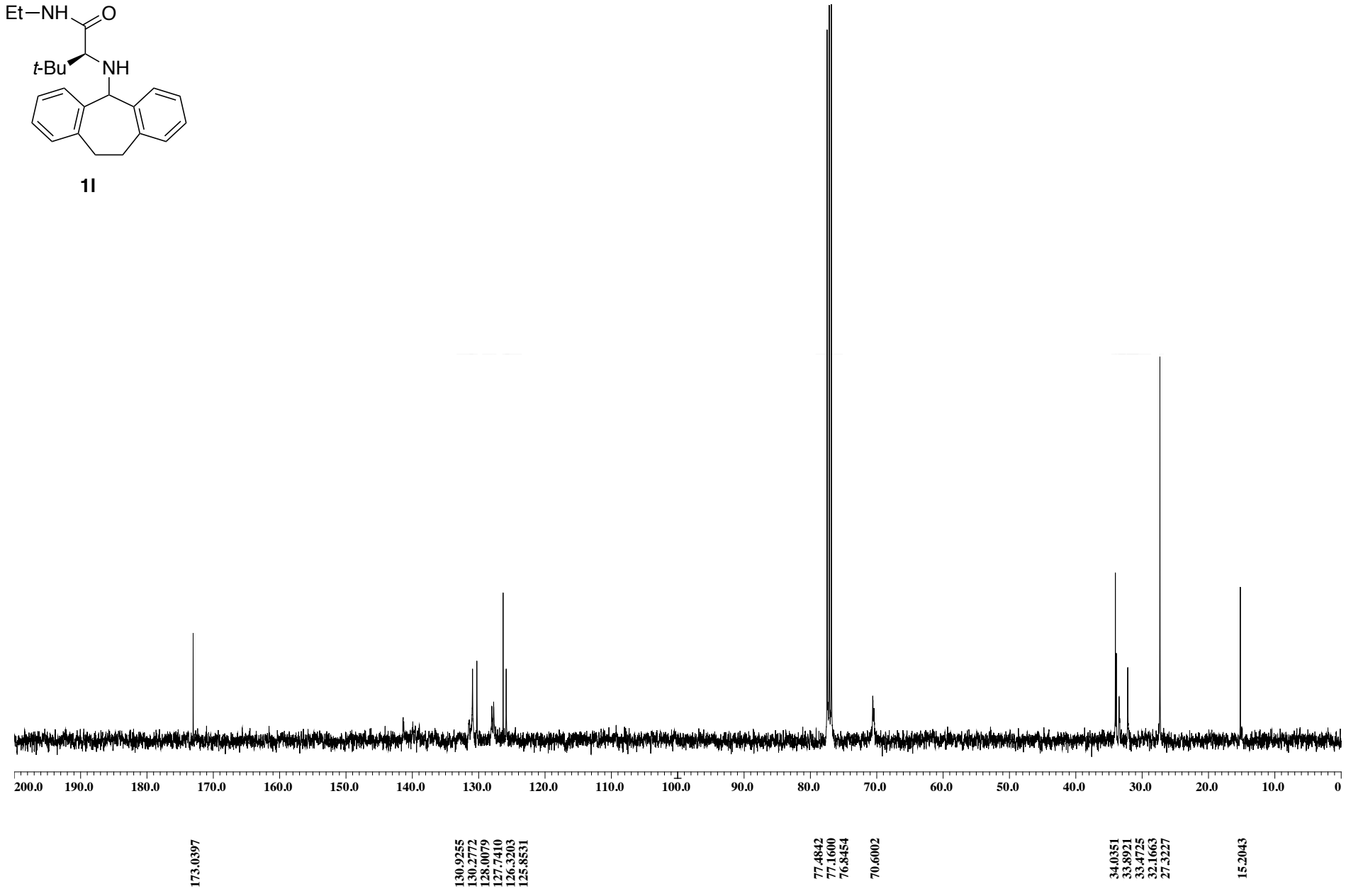

$^{1}$H NMR spectrum of **1k** ($CDCl_3$, 400 MHz)



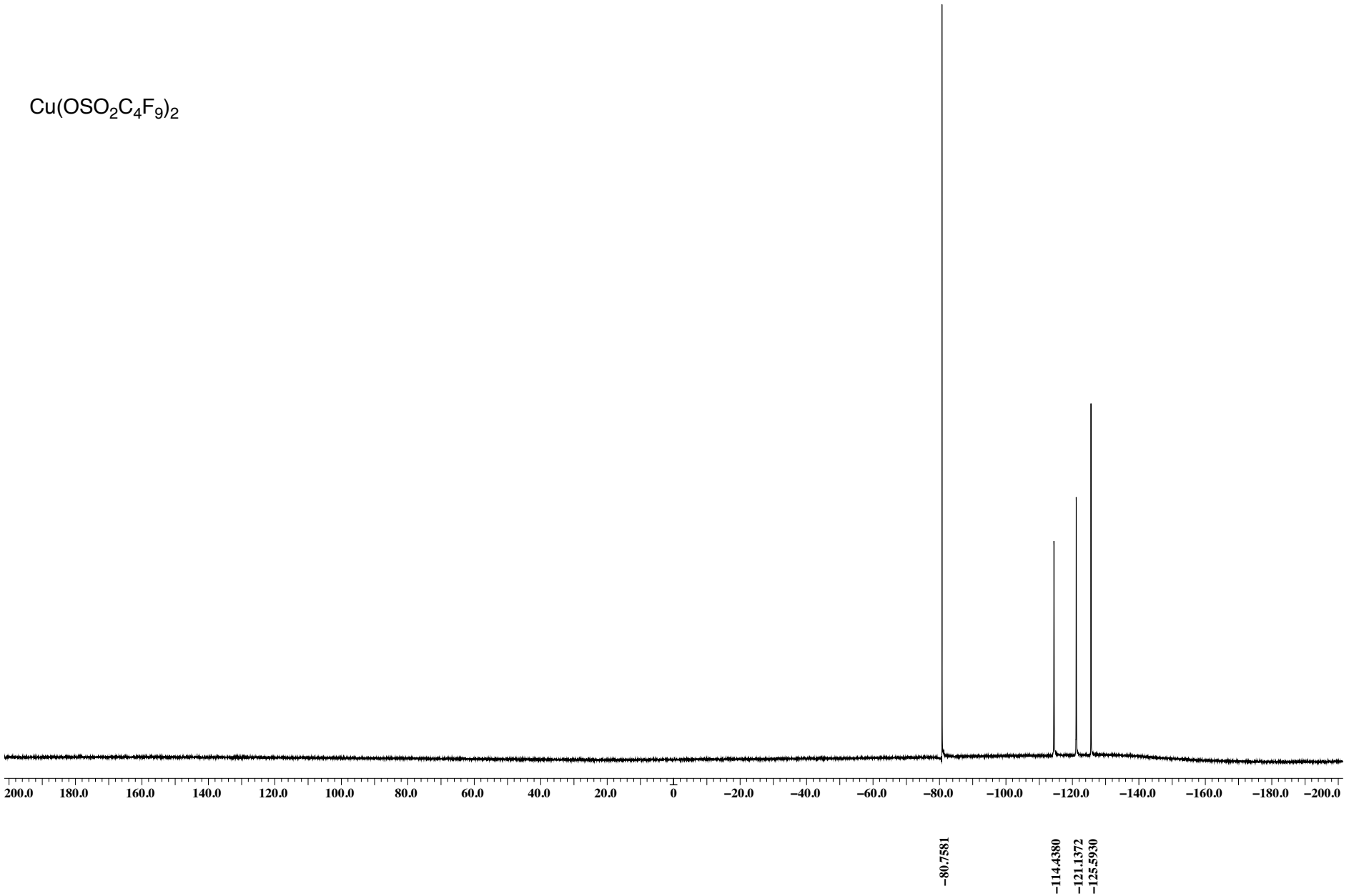

$^{13}$C NMR spectrum of **1k** ($CDCl_3$, 100 MHz)



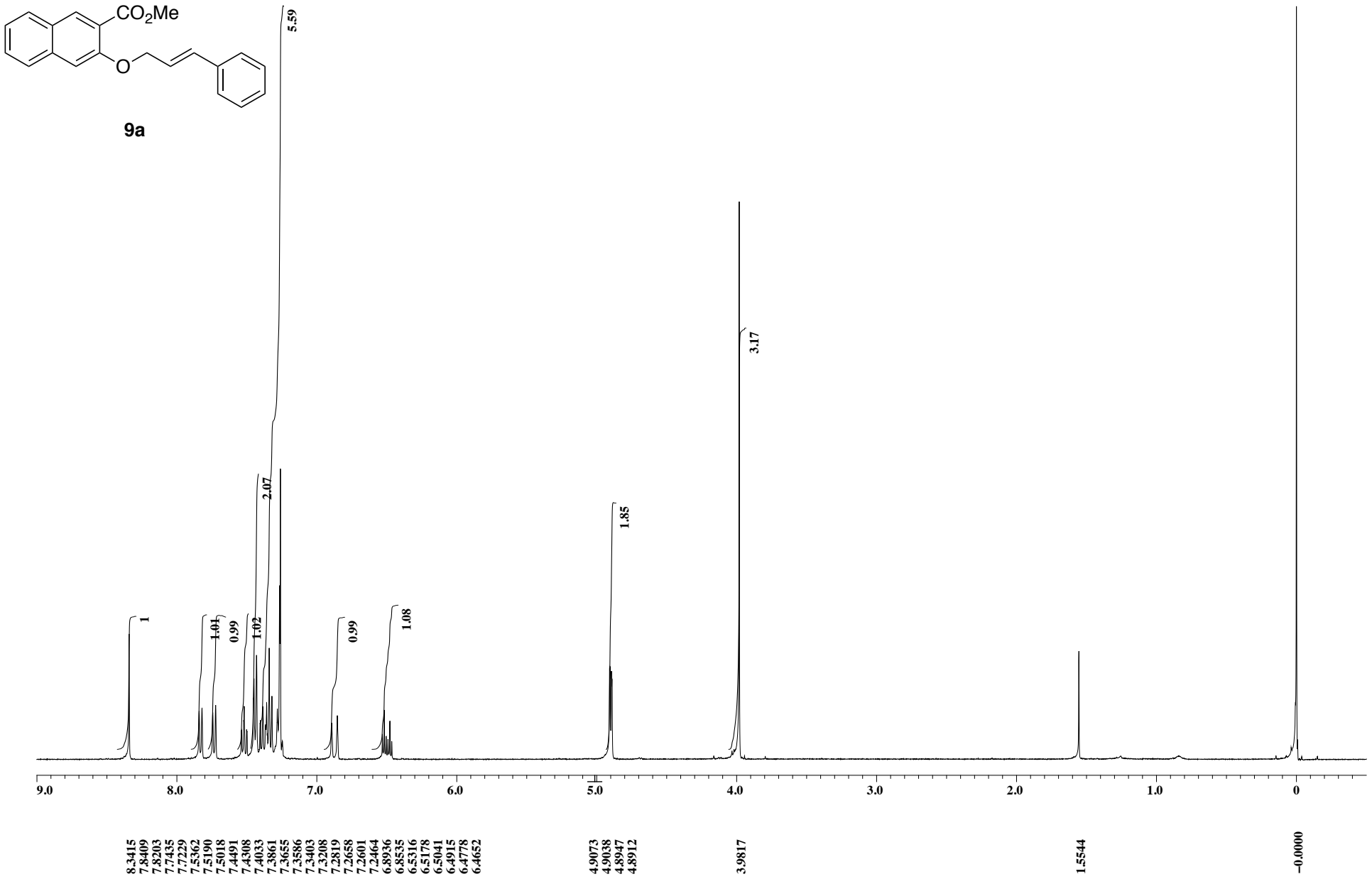

$^1$H NMR spectrum of **1l** ($CDCl_3$, 400 MHz)



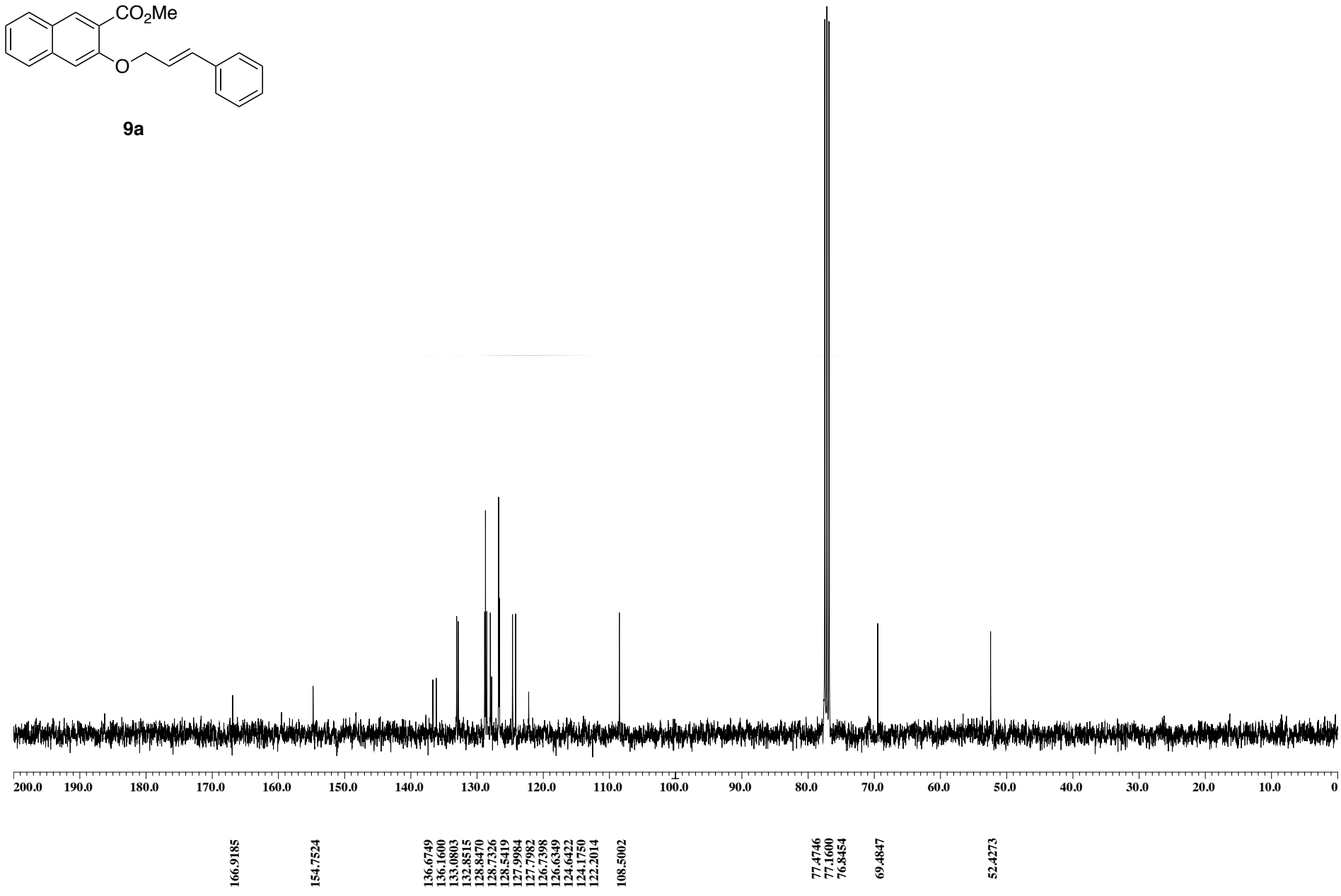

$^{13}$C NMR spectrum of **1l** ($CDCl_3$, 100 MHz)



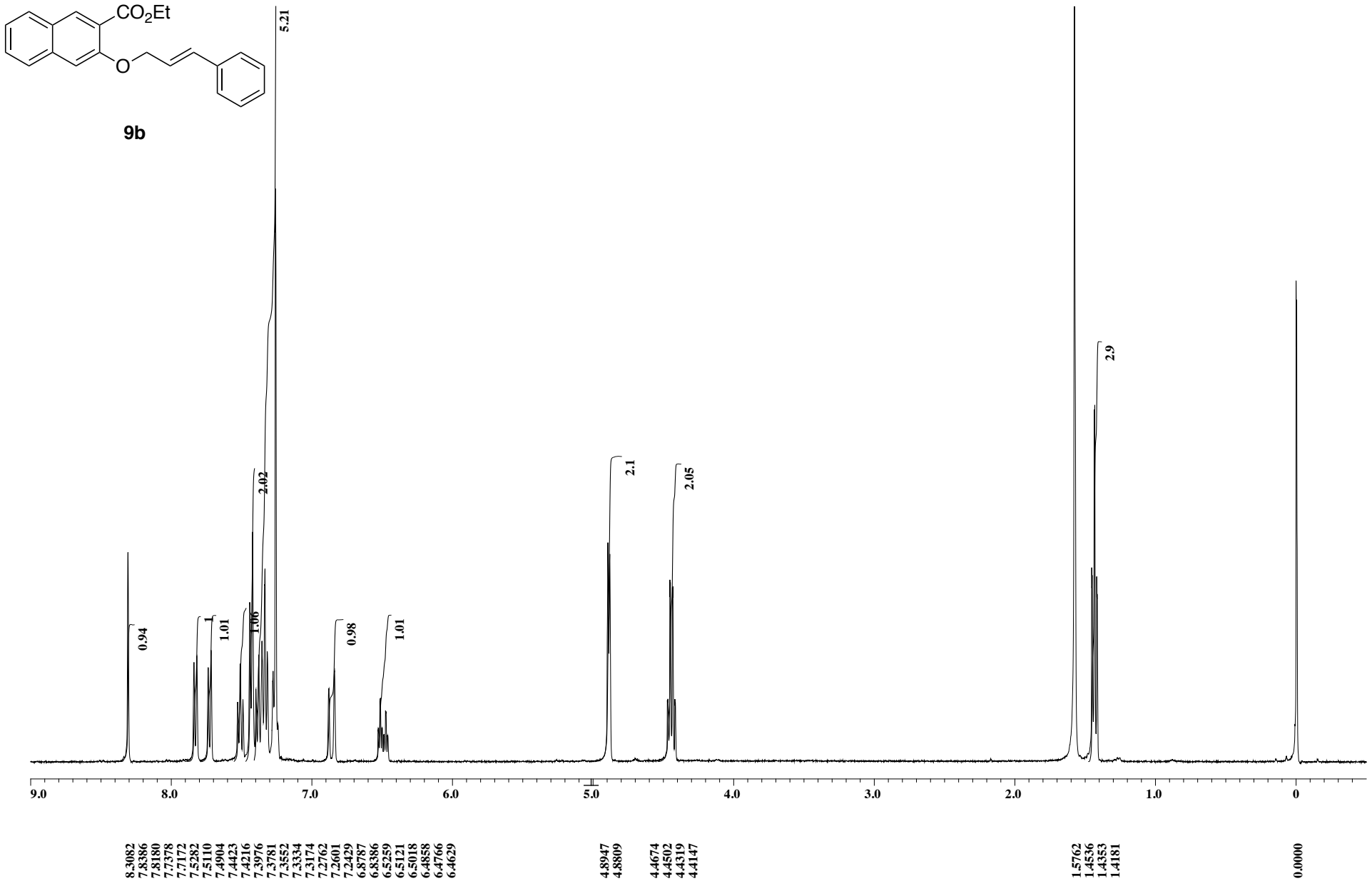

$^{19}$F NMR spectrum of **Cu(OSO$_2$C$_4$F$_9$)$_2$** (CD$_3$CN, 376 MHz)



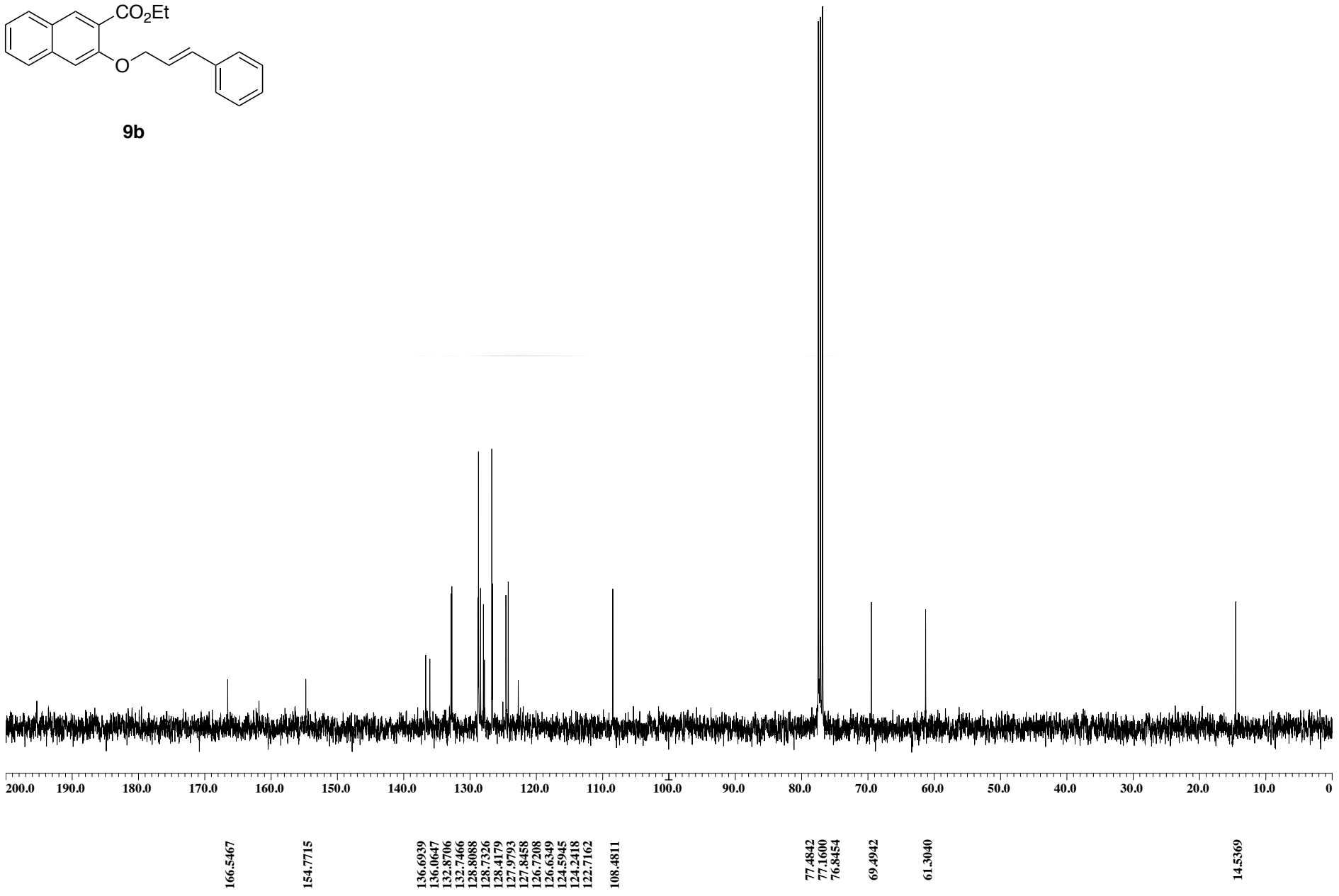

$^1$H NMR spectrum of **9a** ($CDCl_3$, 400 MHz)



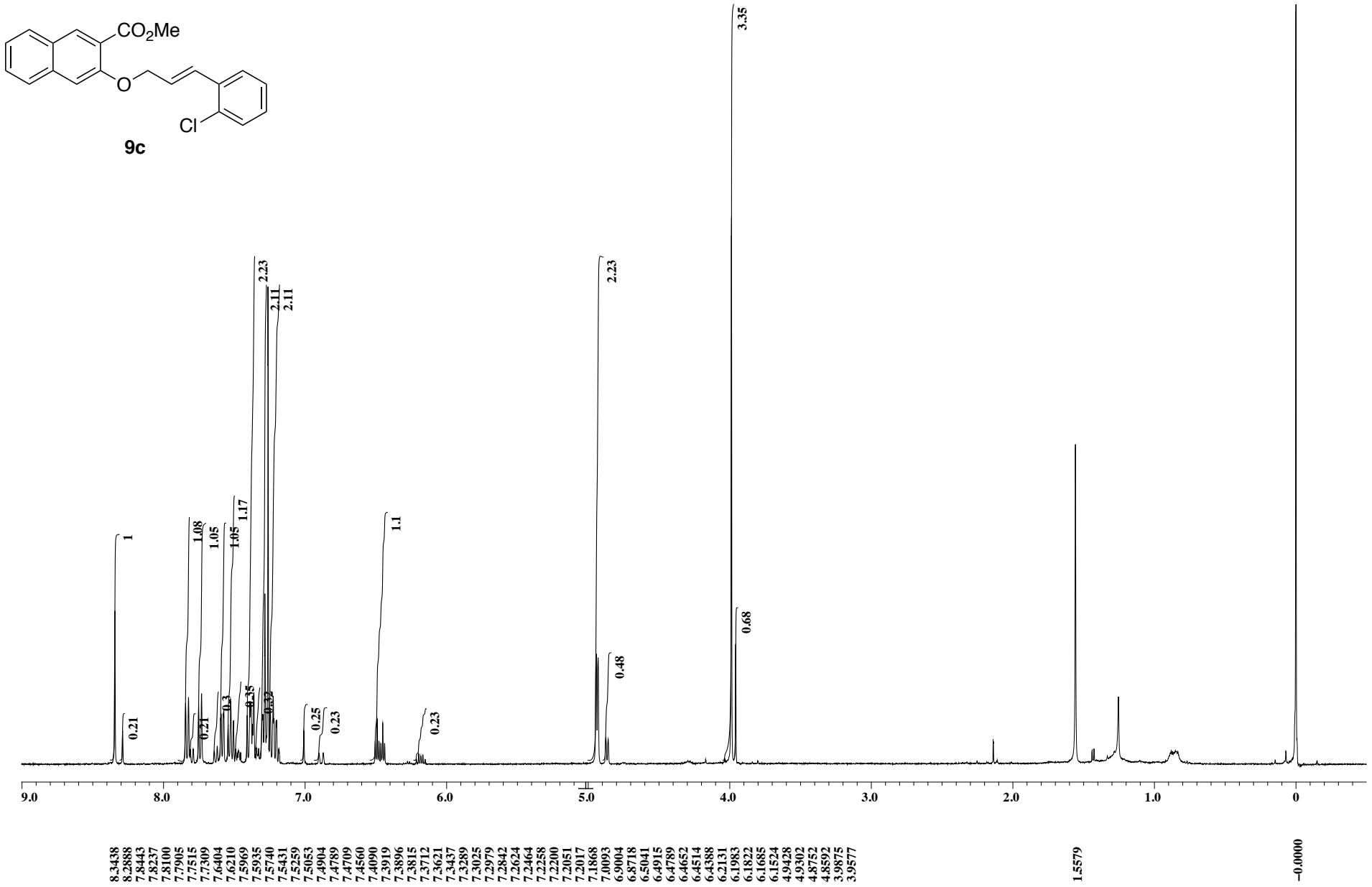

$^{13}$C NMR spectrum of **9a** ($CDCl_3$, 100 MHz)



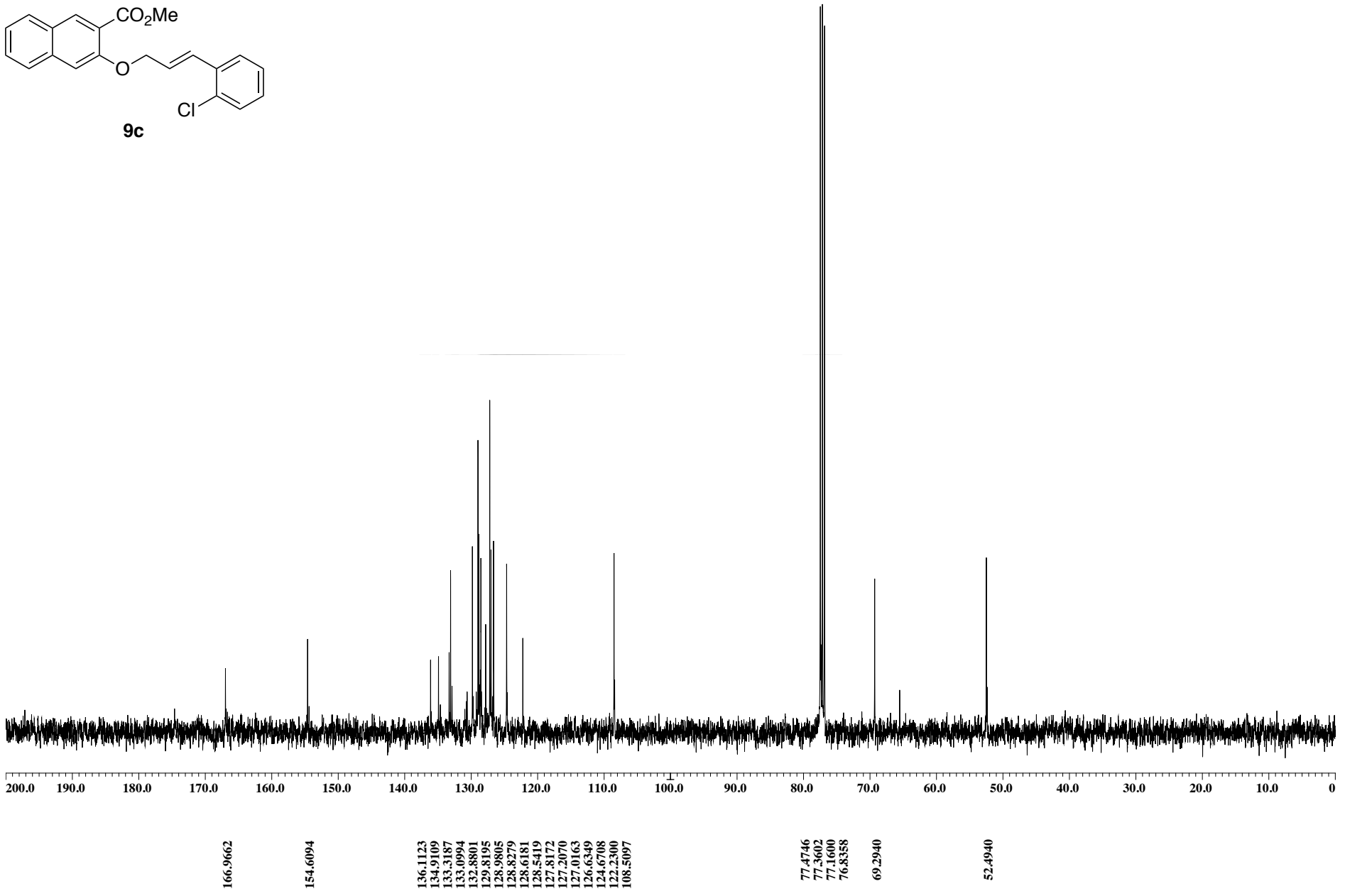

$^1$H NMR spectrum of **9b** ($CDCl_3$, 400 MHz)



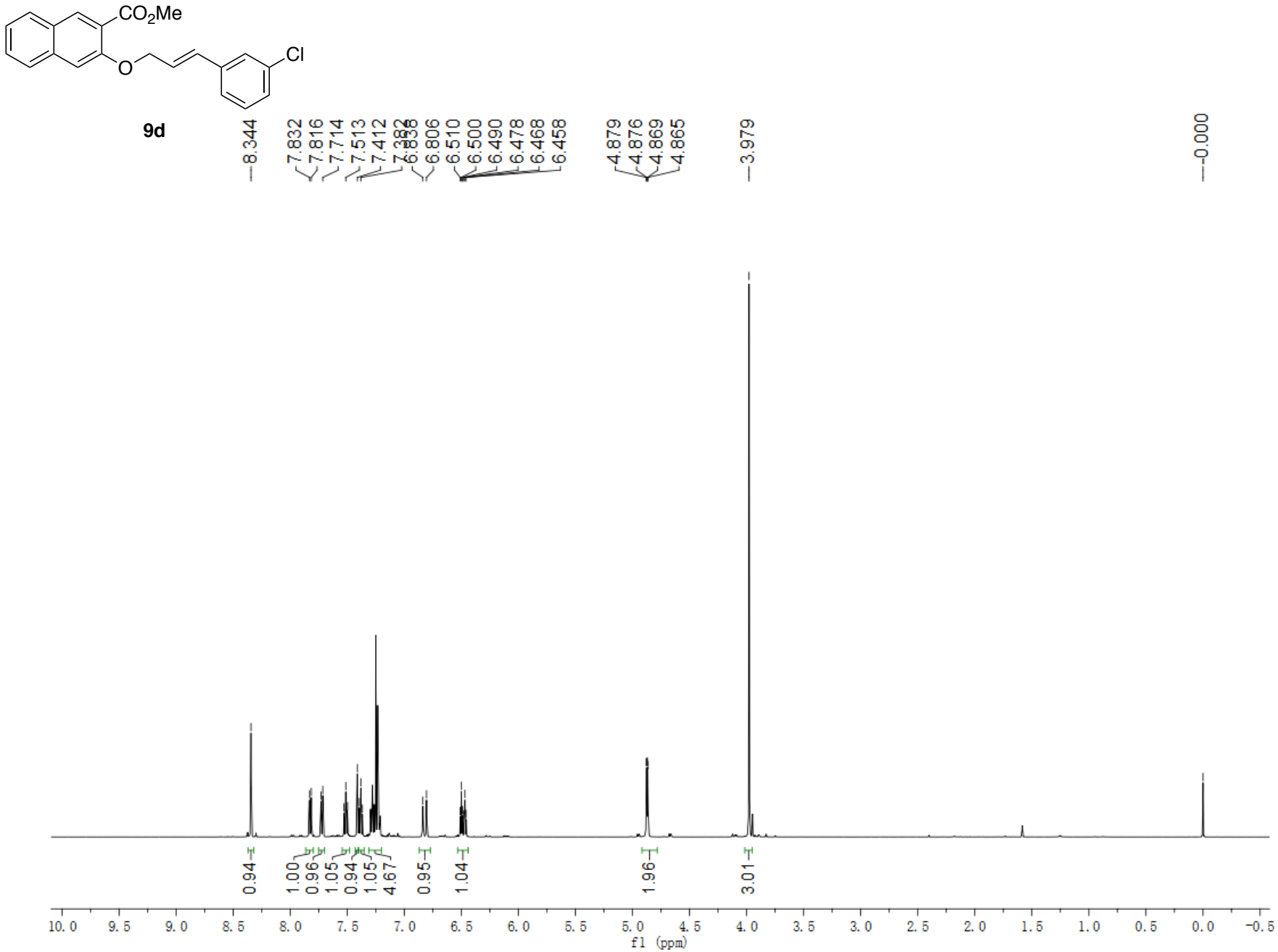

$^{13}$C NMR spectrum of **9b** ($CDCl_3$, 100 MHz)



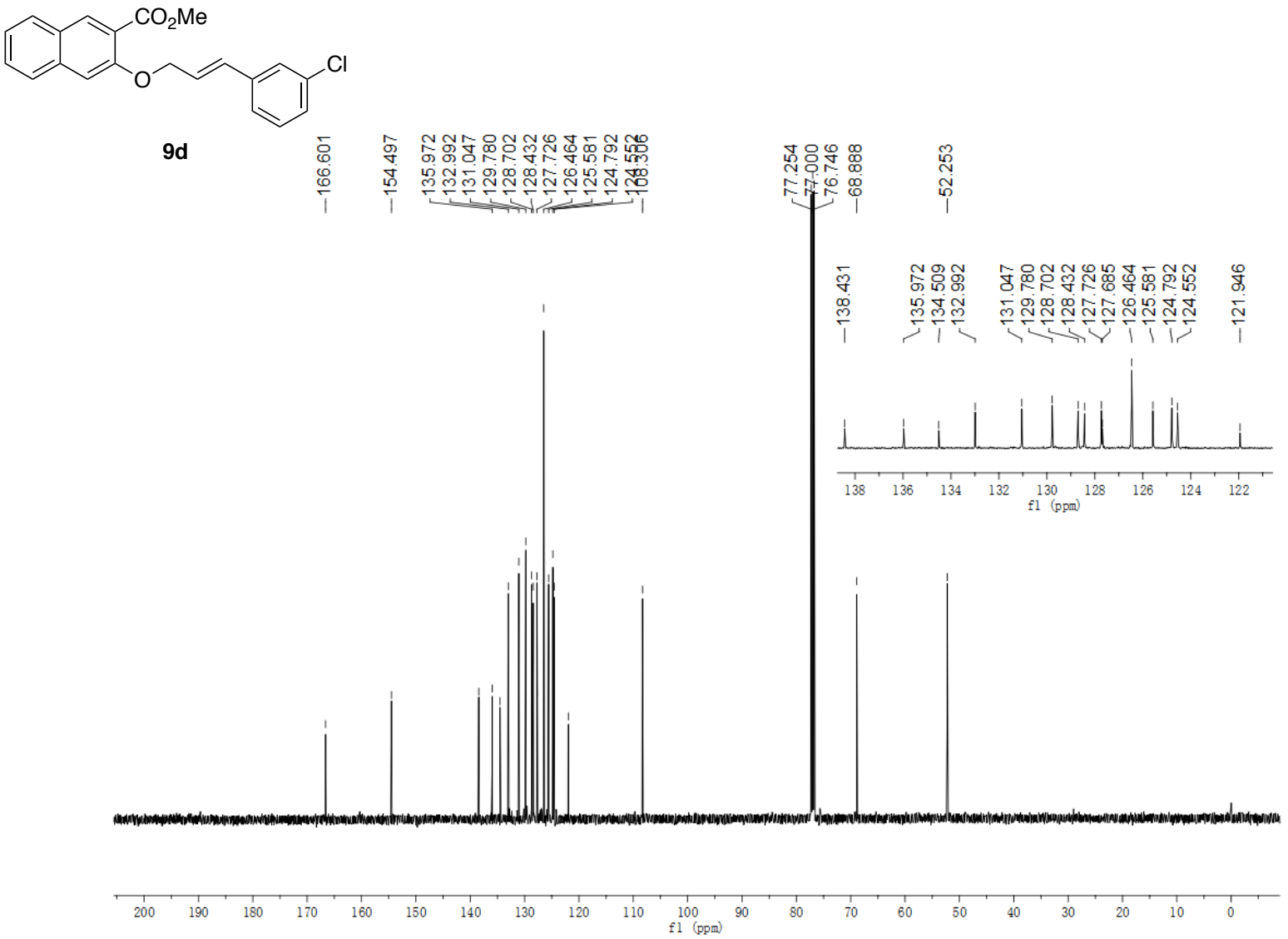

$^1$H NMR spectrum of **9c** ($CDCl_3$, 400 MHz)



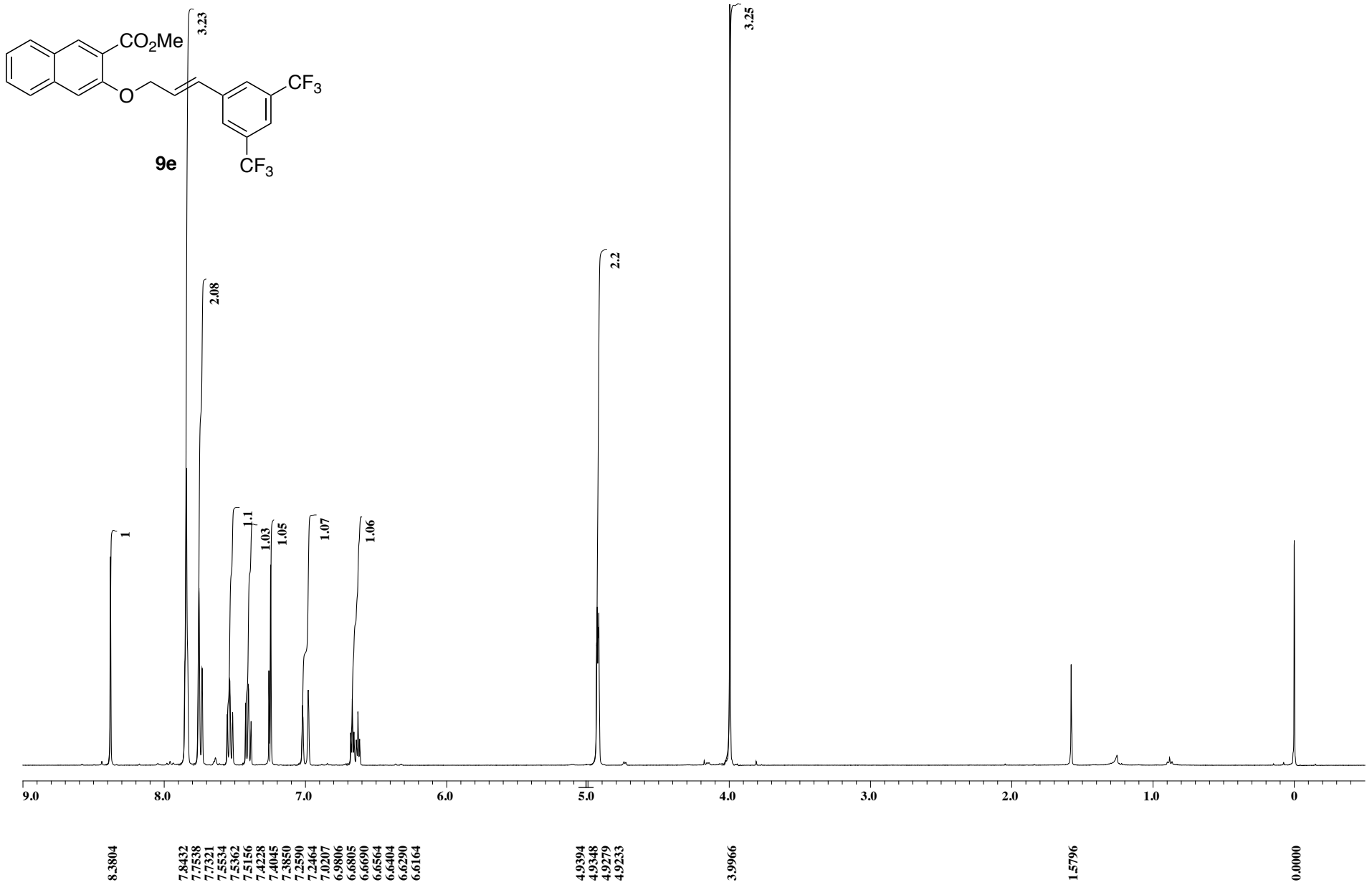

$^{13}$C NMR spectrum of **9c** ($CDCl_3$, 100 MHz)



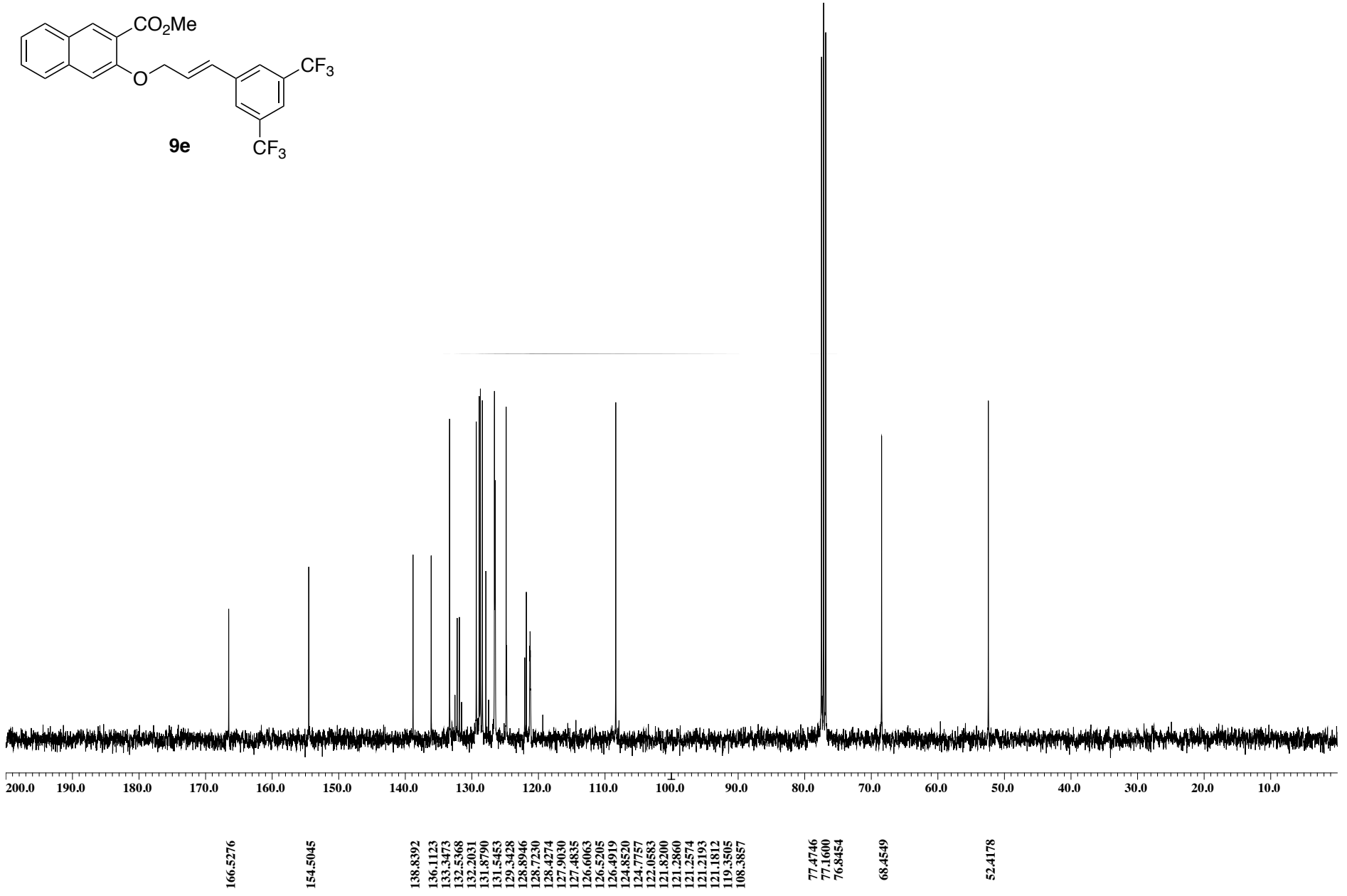

$^1$H NMR spectrum of **9d** ($CDCl_3$, 500 MHz)




$^{13}$C NMR spectrum of **9d** ($CDCl_3$, 126 MHz)

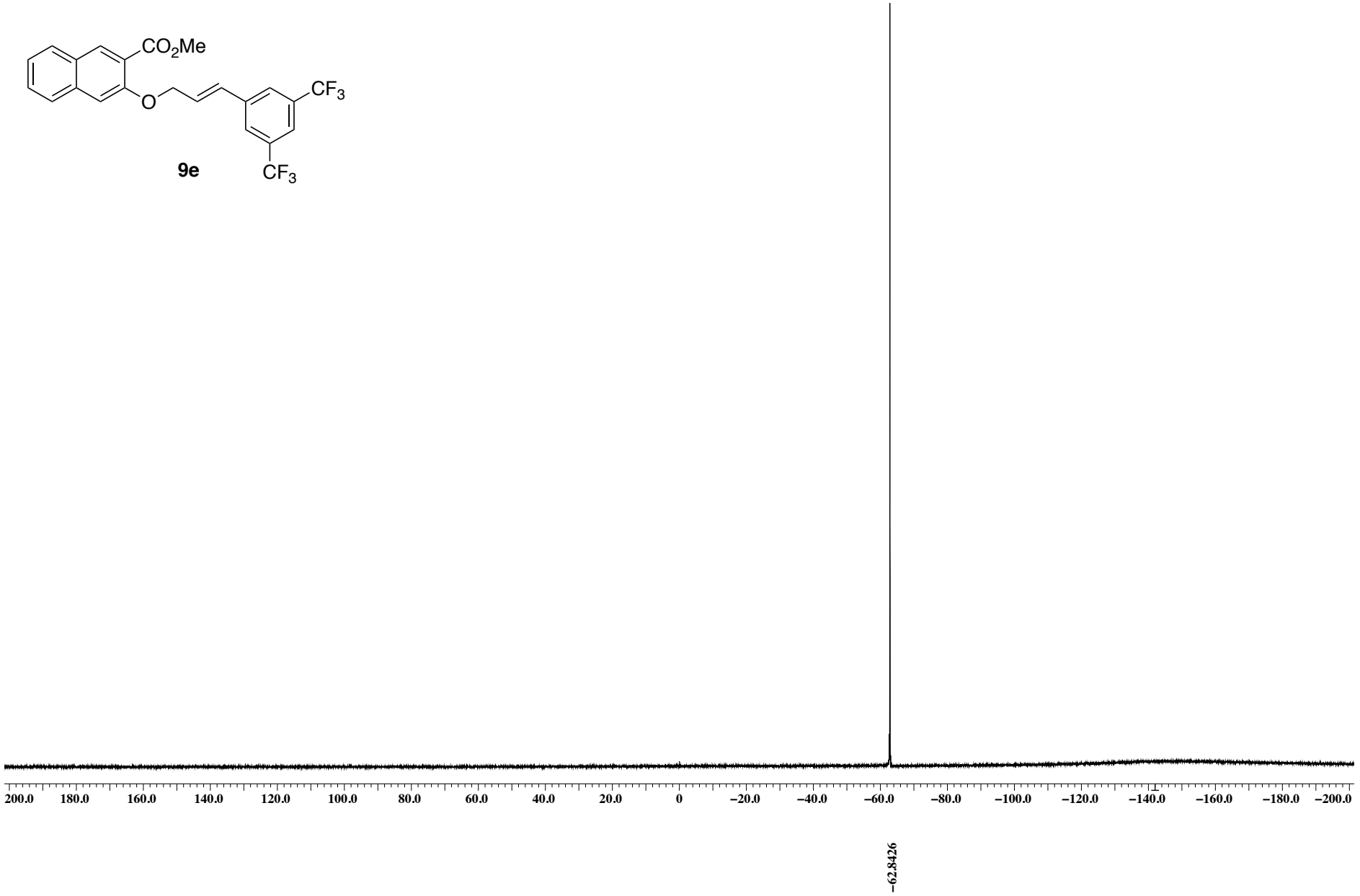



$^1$H NMR spectrum of **9e** ($CDCl_3$, 400 MHz)

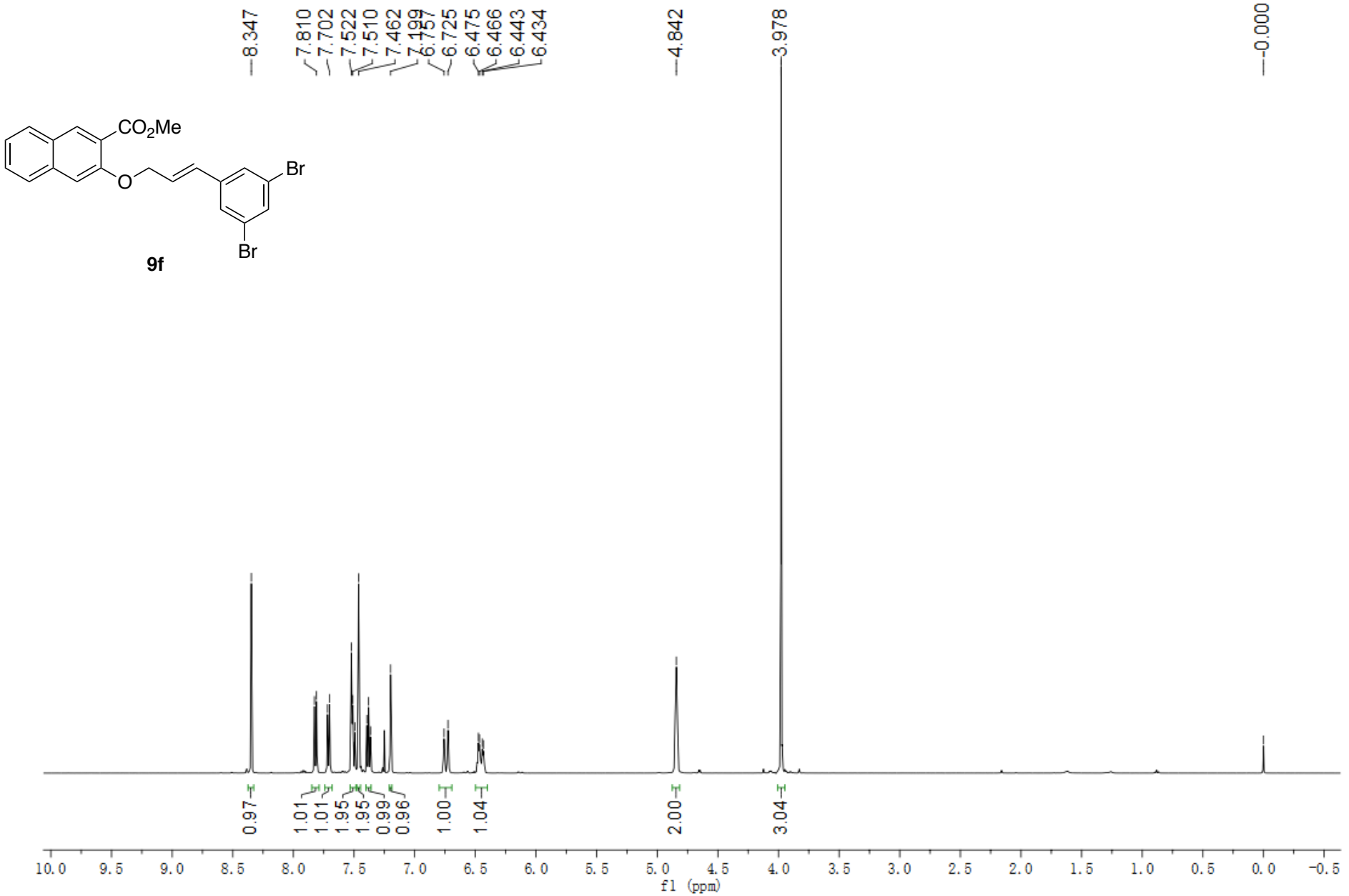



$^{13}$C NMR spectrum of **9e** ($CDCl_3$, 100 MHz)

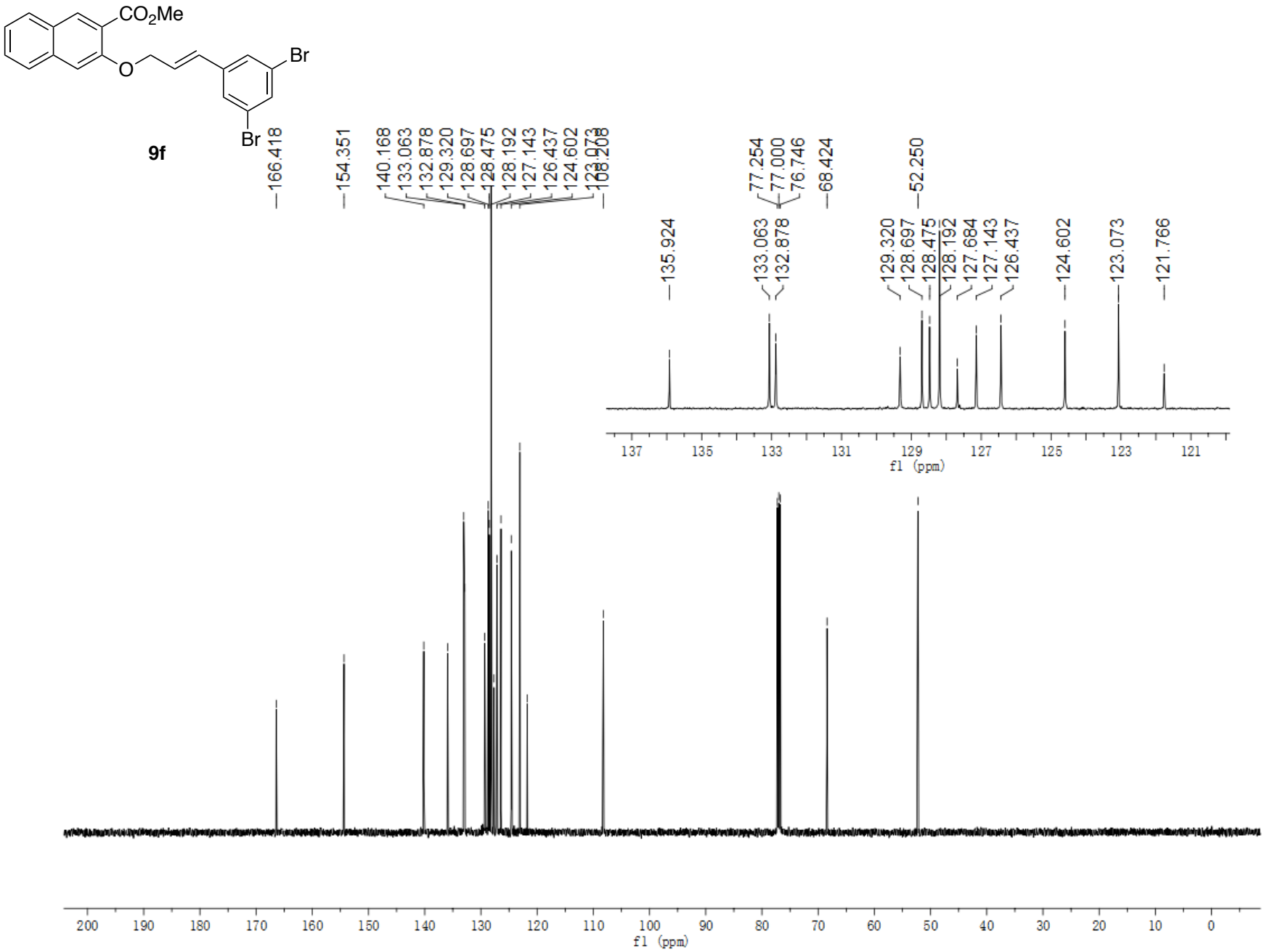
**9e**



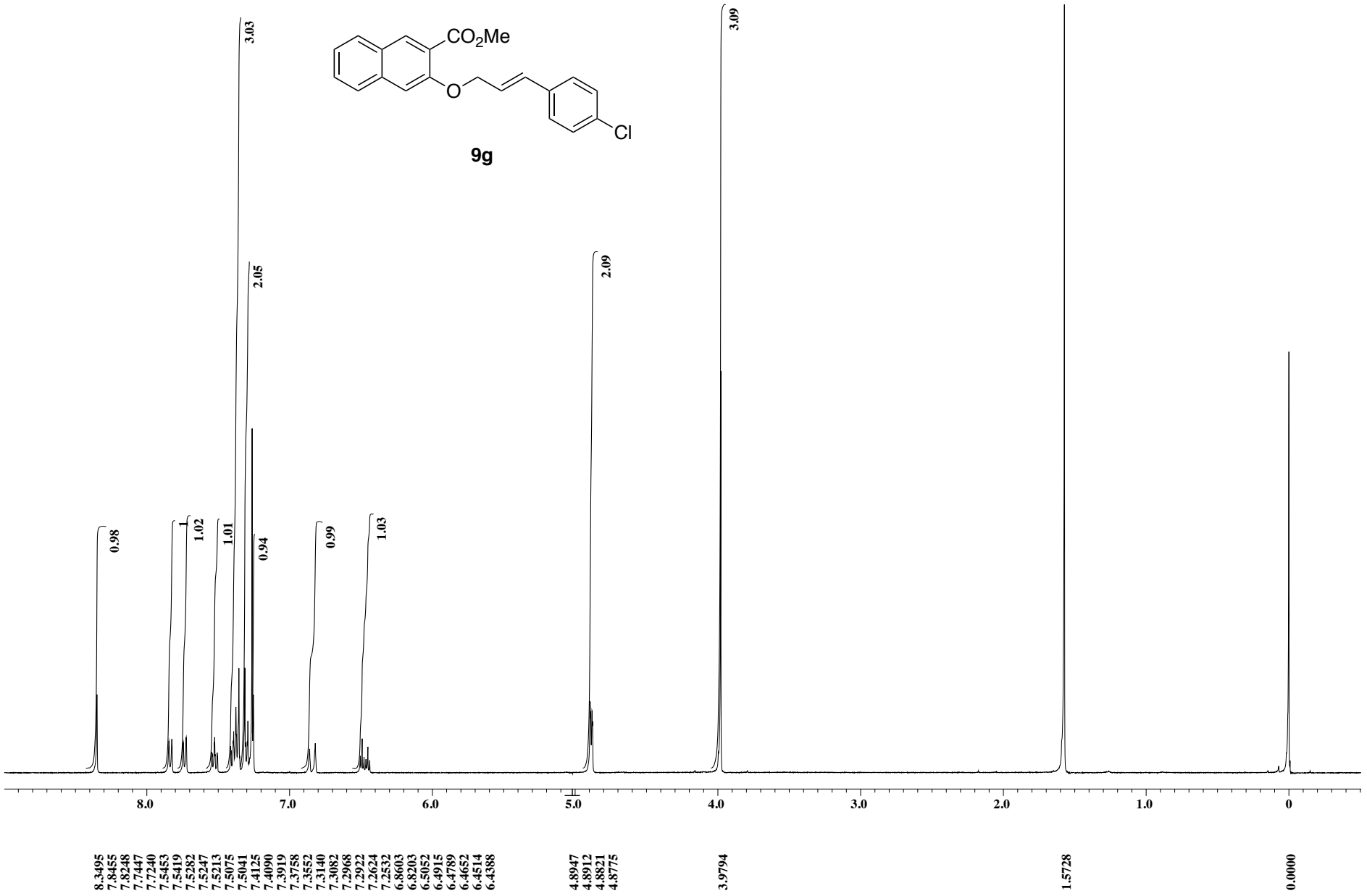

$^{19}$F NMR spectrum of **9e** ($CDCl_3$, 376 MHz)



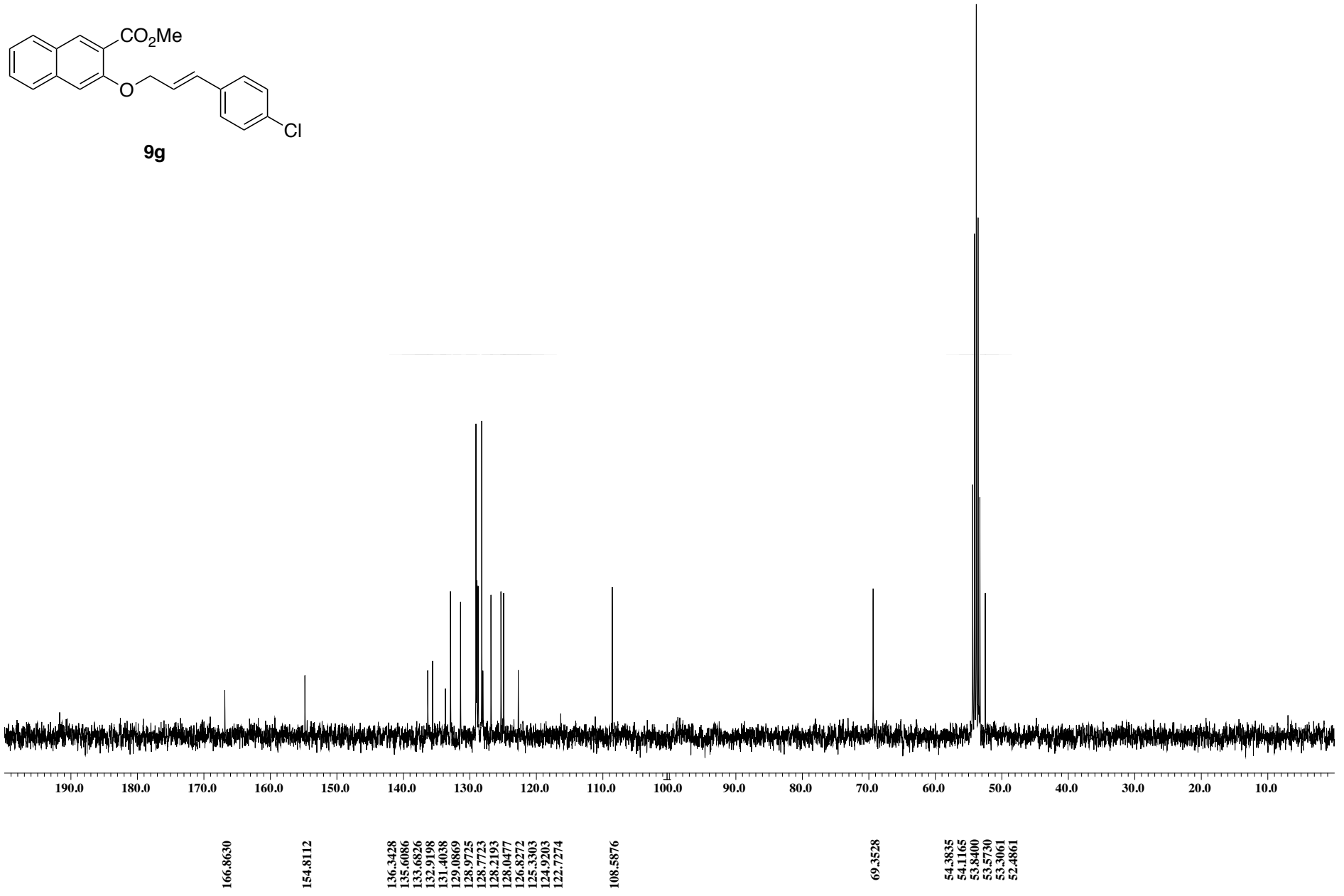

$^{1}$H NMR spectrum of **9f** ($CDCl_3$, 500 MHz)



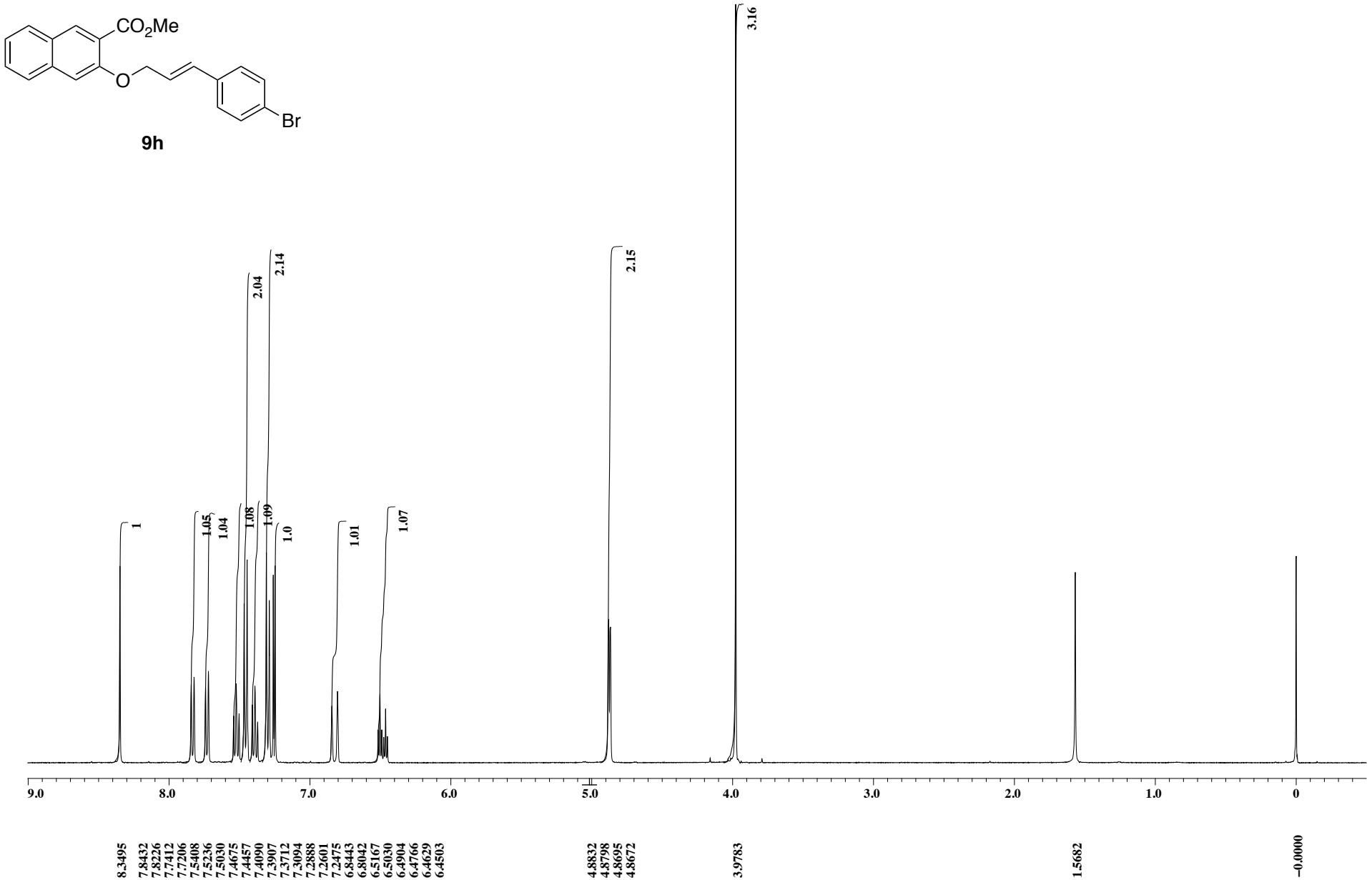

$^{13}$C NMR spectrum of **9f** ($CDCl_3$, 126 MHz)



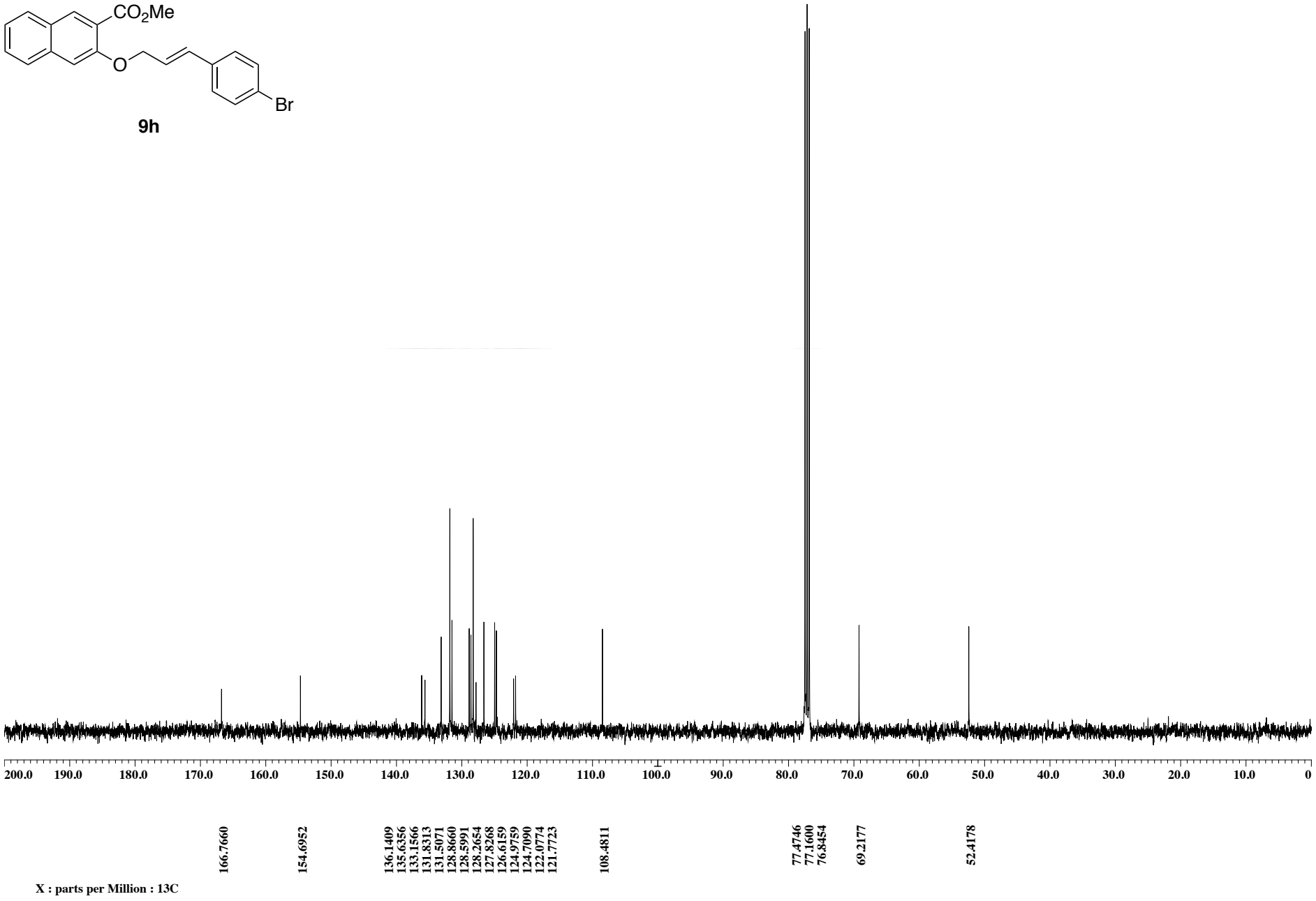

$^{1}$H NMR spectrum of **9g** ($CDCl_3$, 400 MHz)



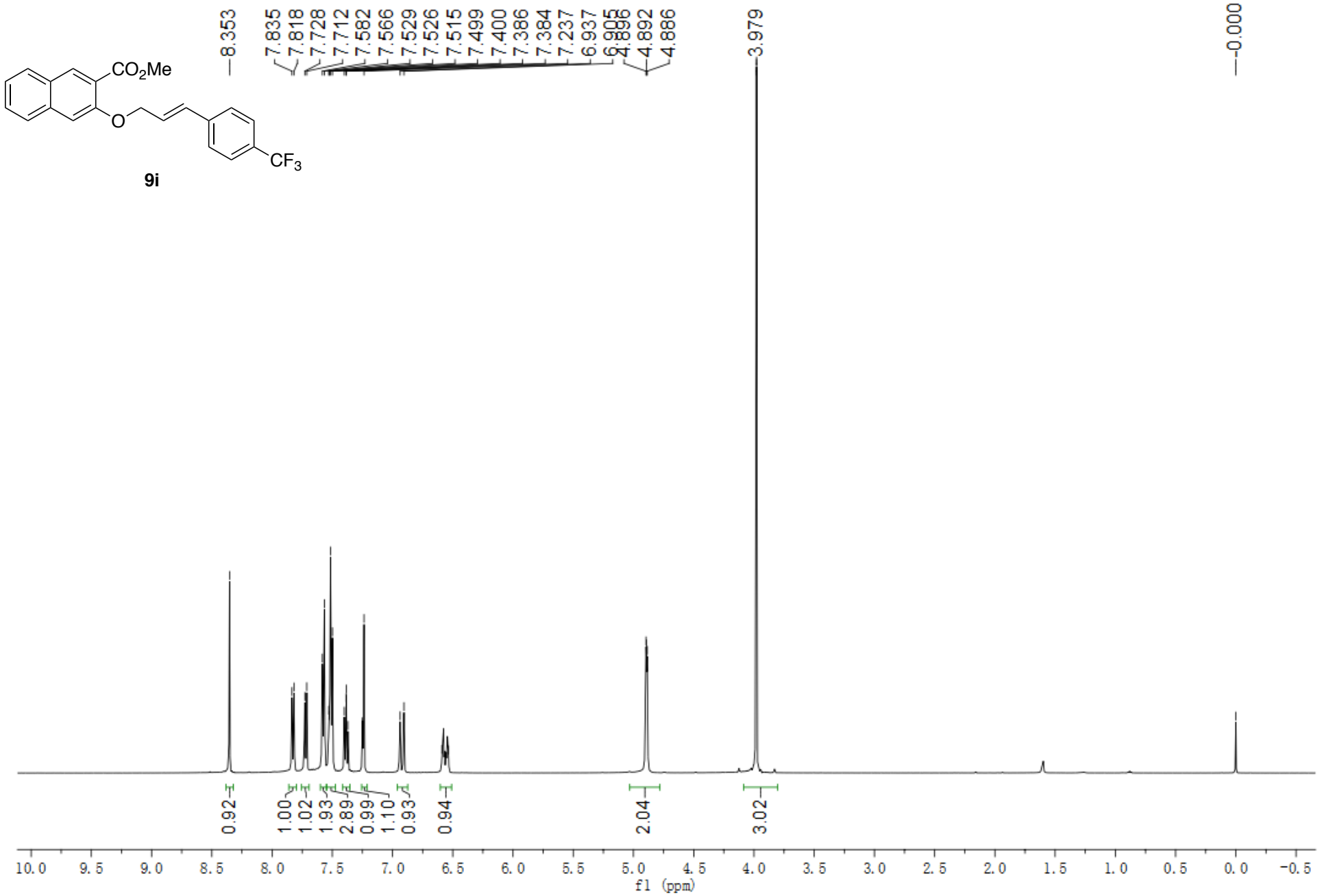

$^{13}$C NMR spectrum of **9g** ($CD_2Cl_2$, 100 MHz)



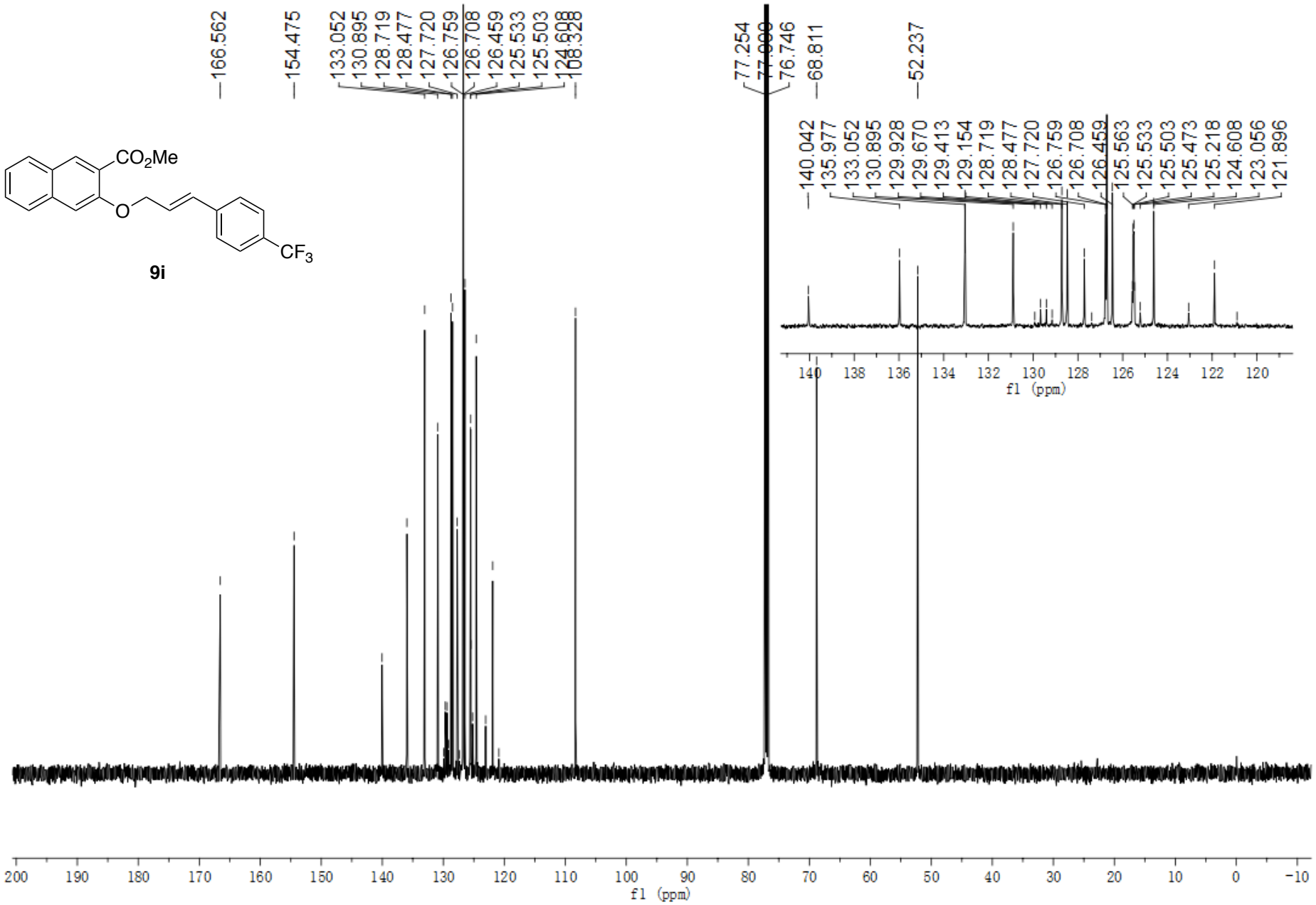

$^1$H NMR spectrum of **9h** ($CDCl_3$, 400 MHz)



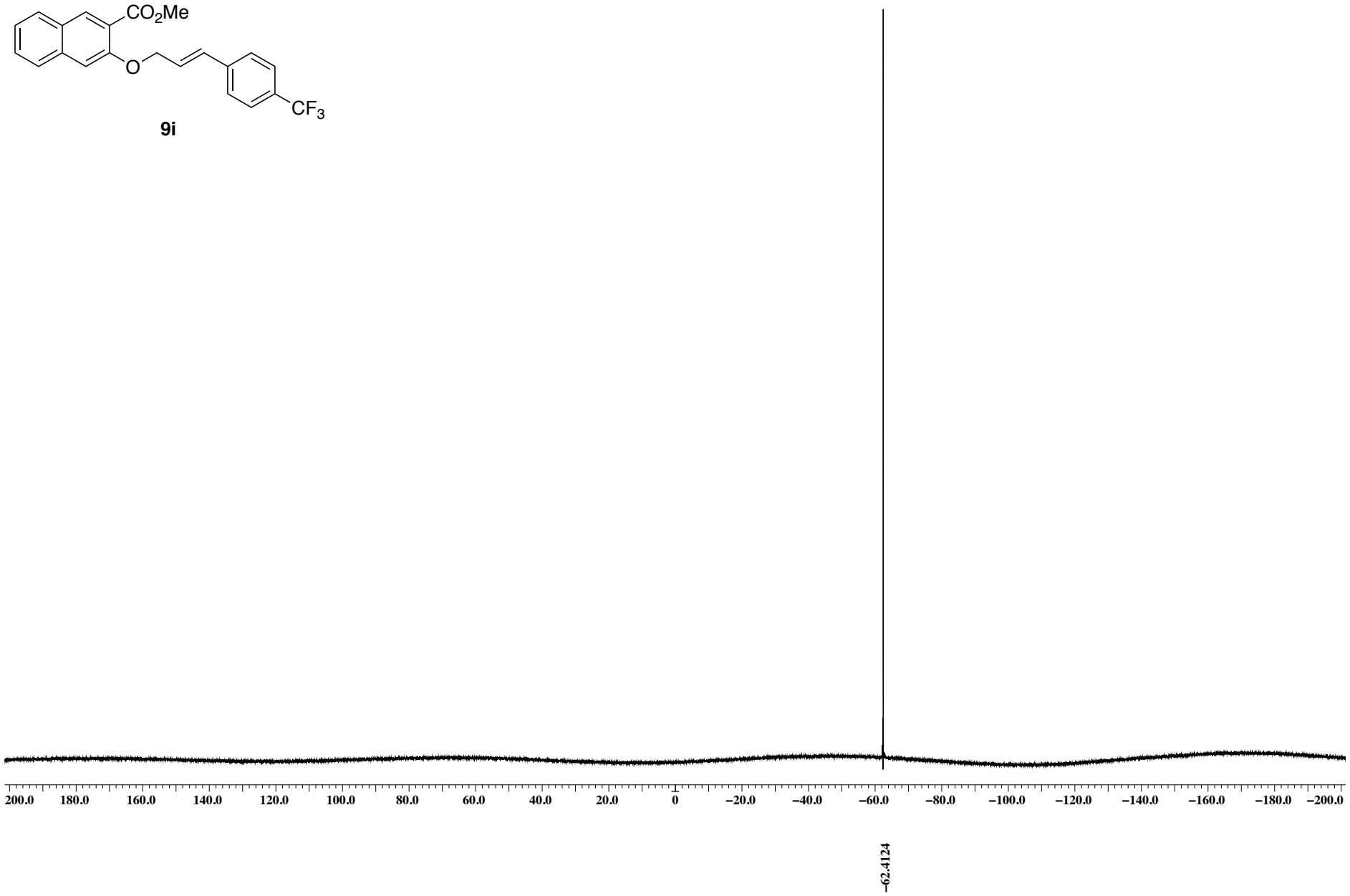

$^{13}$C NMR spectrum of **9h** ($CDCl_3$, 100 MHz)



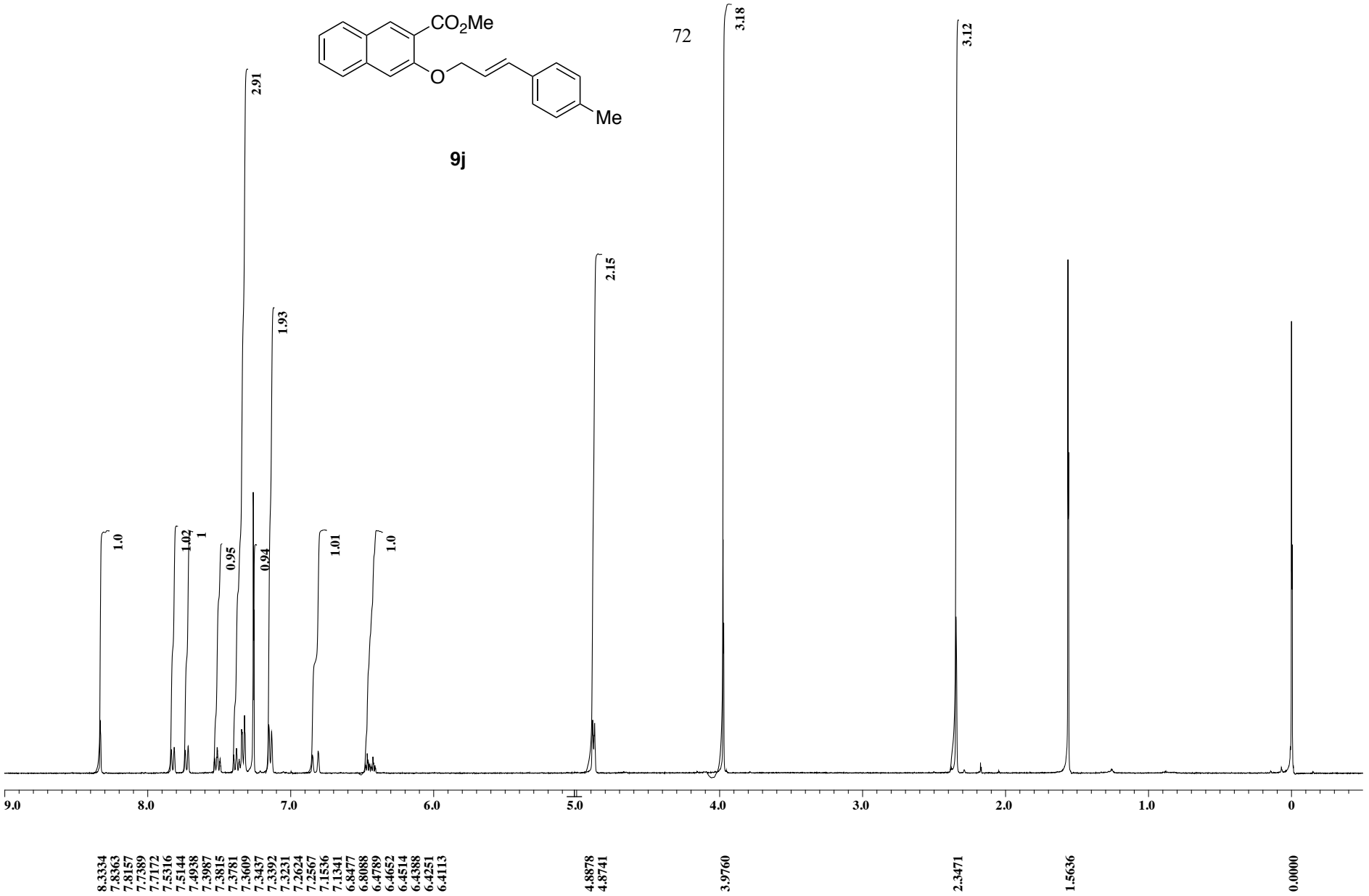

$^1$H NMR spectrum of **9i** ($CDCl_3$, 500 MHz)




$^{13}$C NMR spectrum of **9i** ($CDCl_3$, 126 MHz)

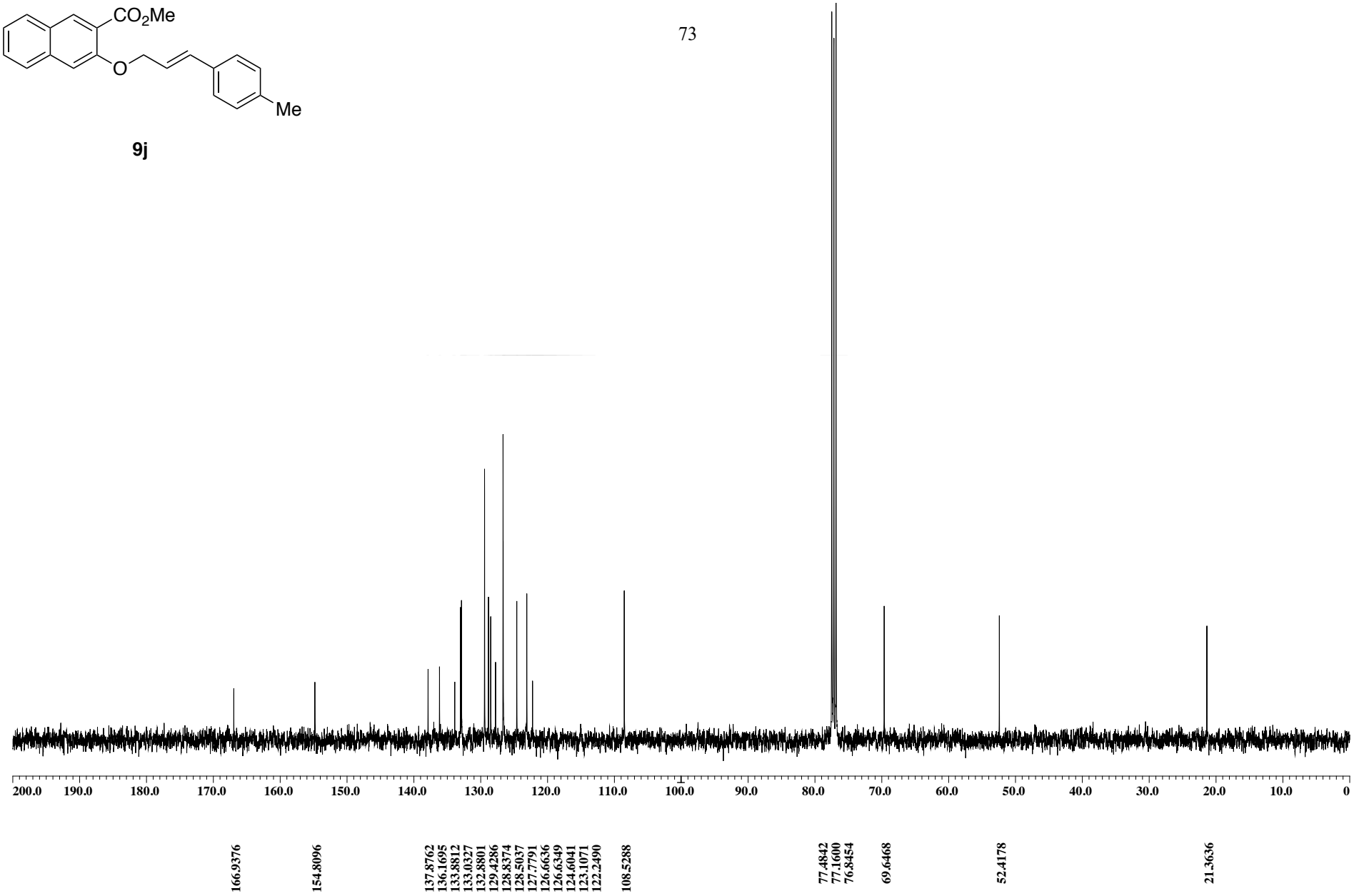



$^{19}$F NMR spectrum of **9i** ($CDCl_3$, 376 MHz)

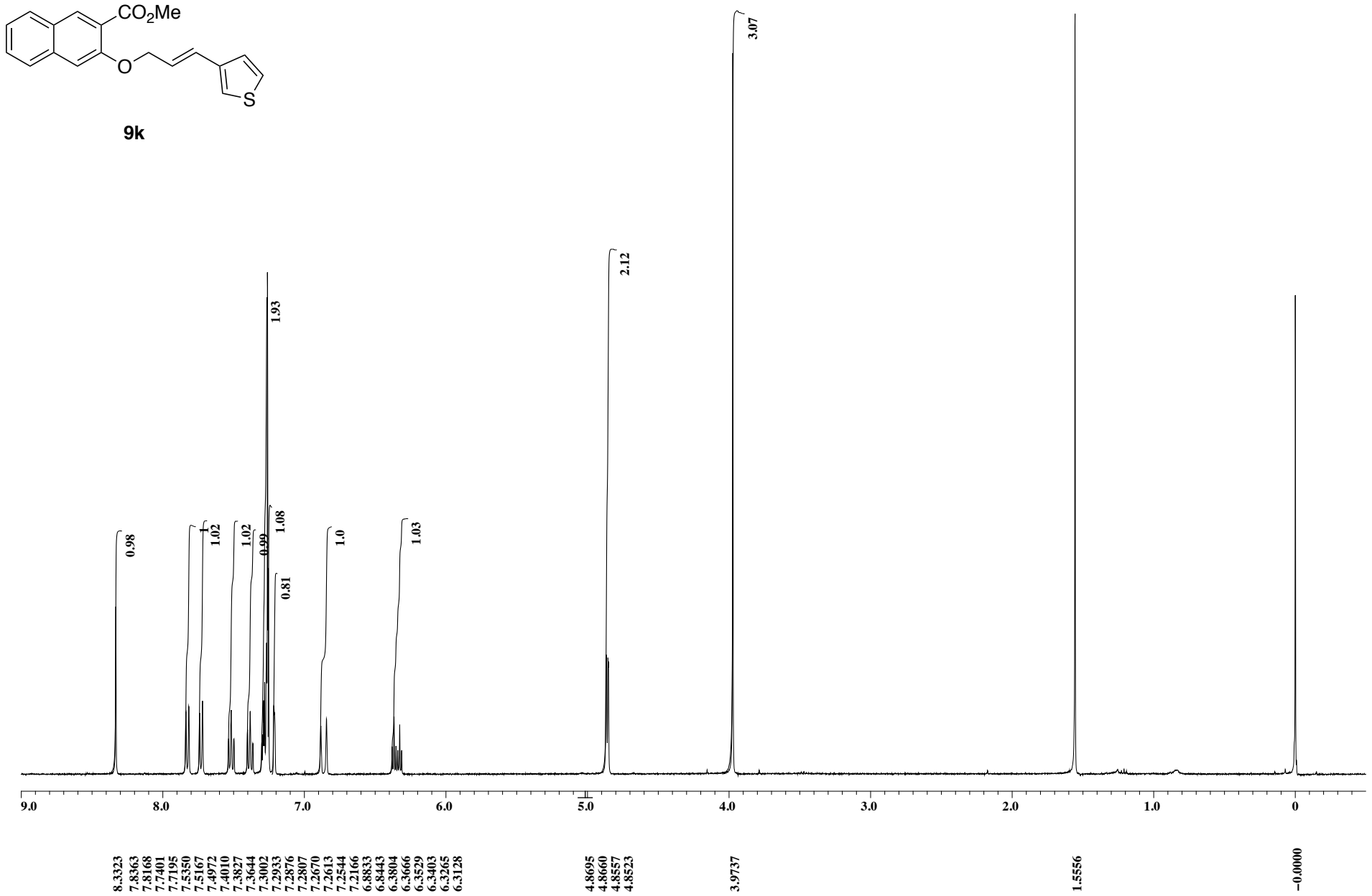



$^1$H NMR spectrum of **9j** ($CDCl_3$, 400 MHz)

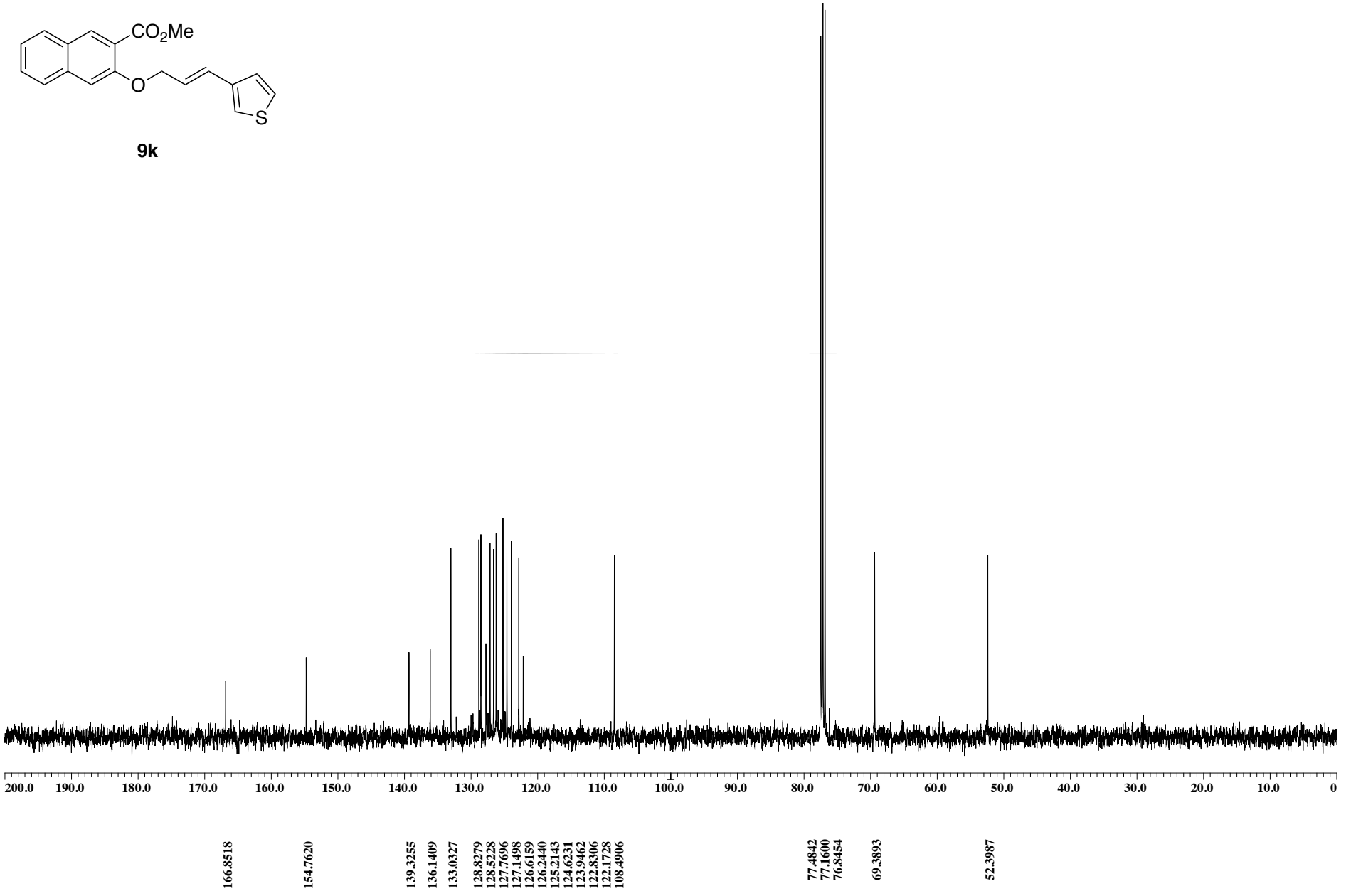
**9j**



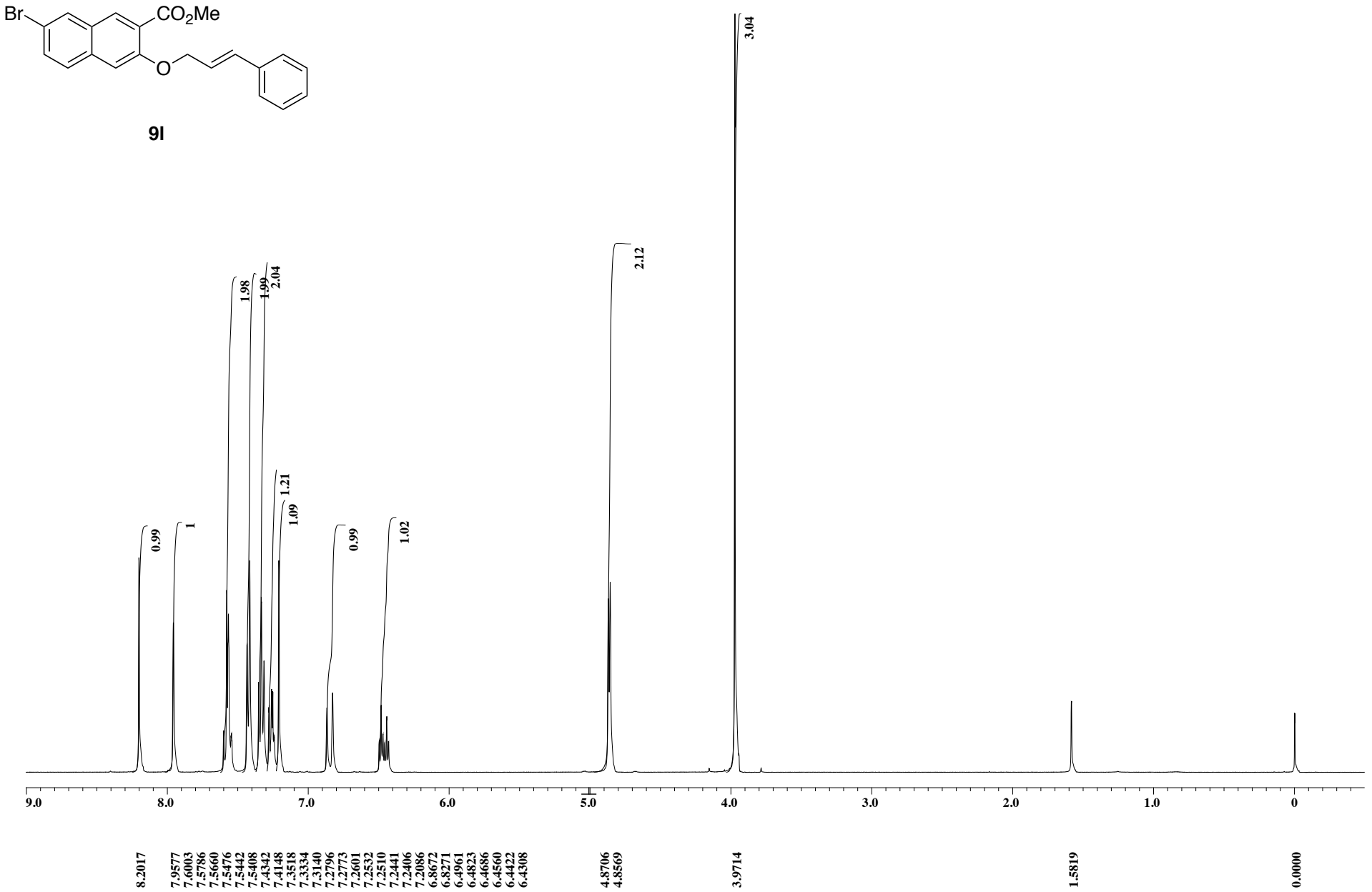

$^{13}$C NMR spectrum of **9j** ($CDCl_3$, 100 MHz)




$^1$H NMR spectrum of **9k** ($CDCl_3$, 400 MHz)

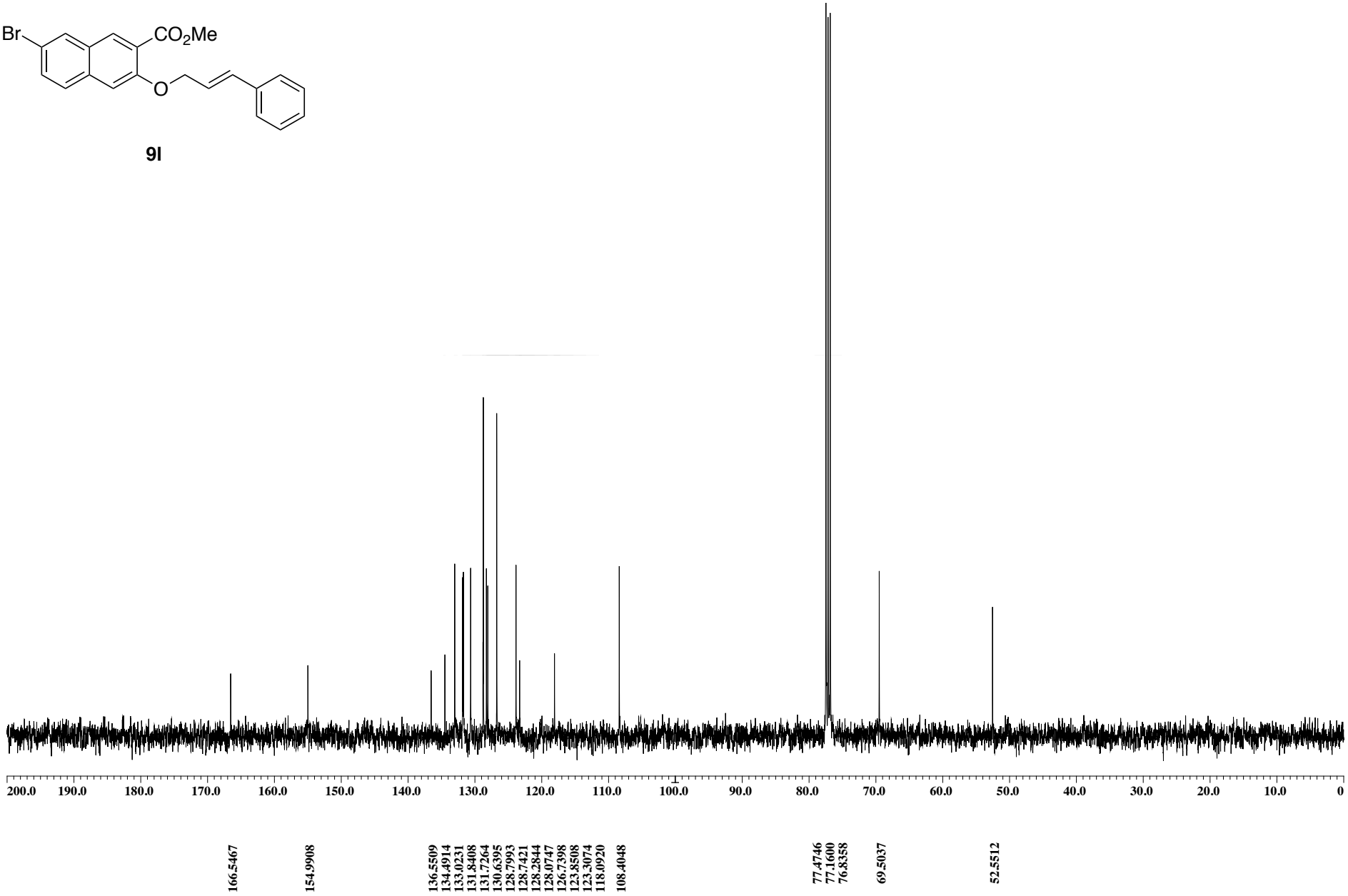



$^{13}$C NMR spectrum of **9k** ($CDCl_3$, 100 MHz)

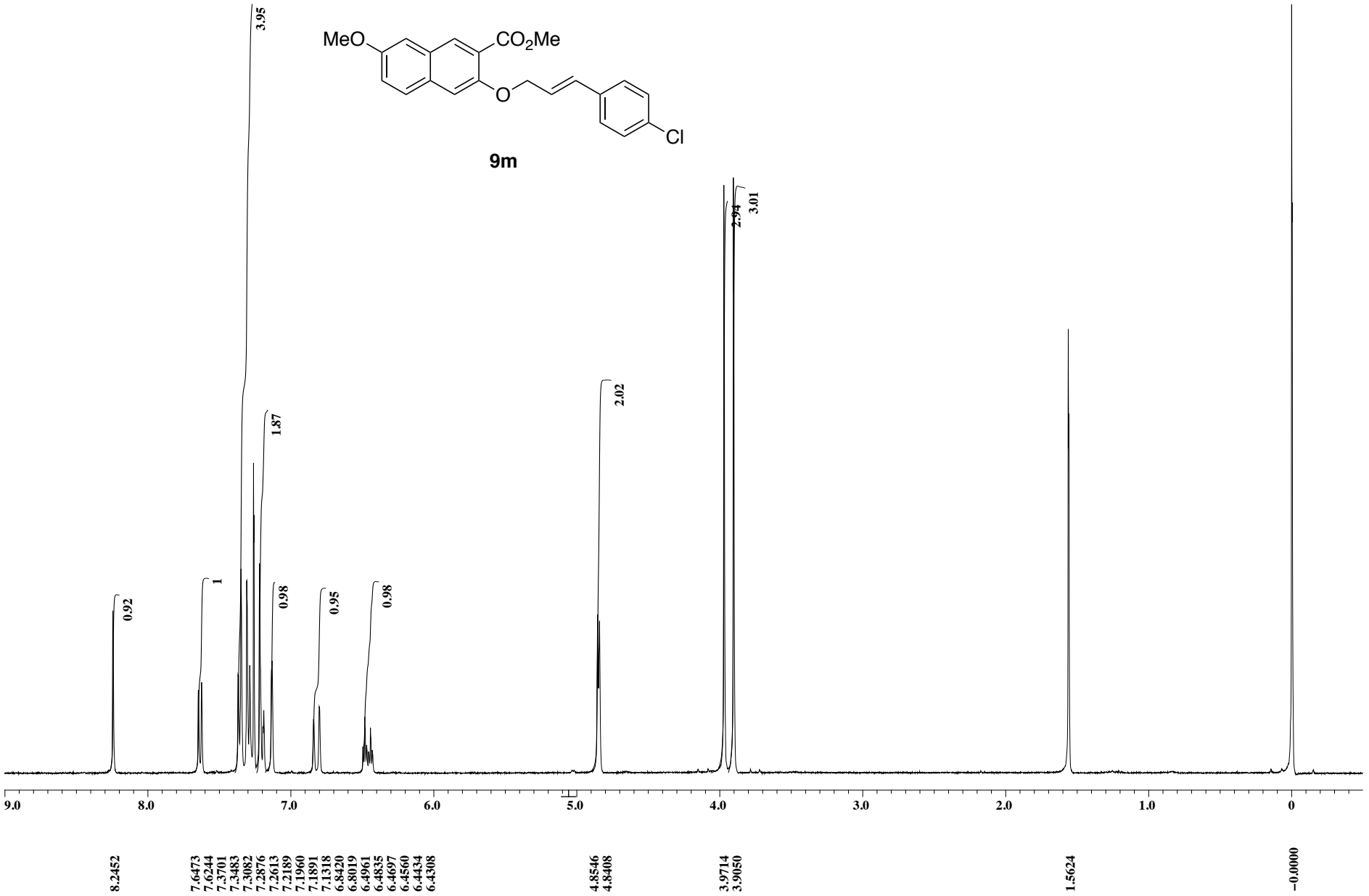



$^1$H NMR spectrum of **9l** ($CDCl_3$, 400 MHz)

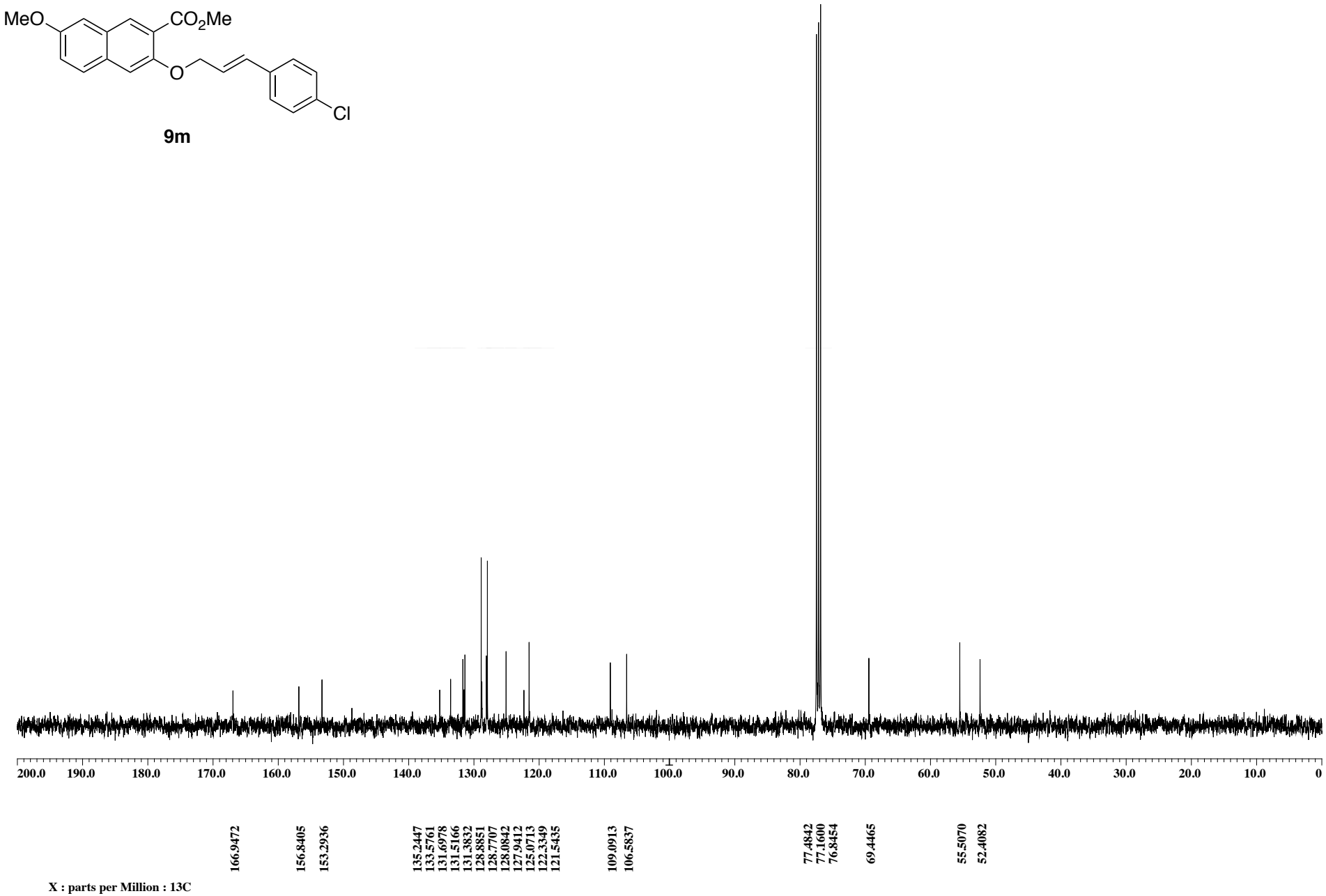
**9l**



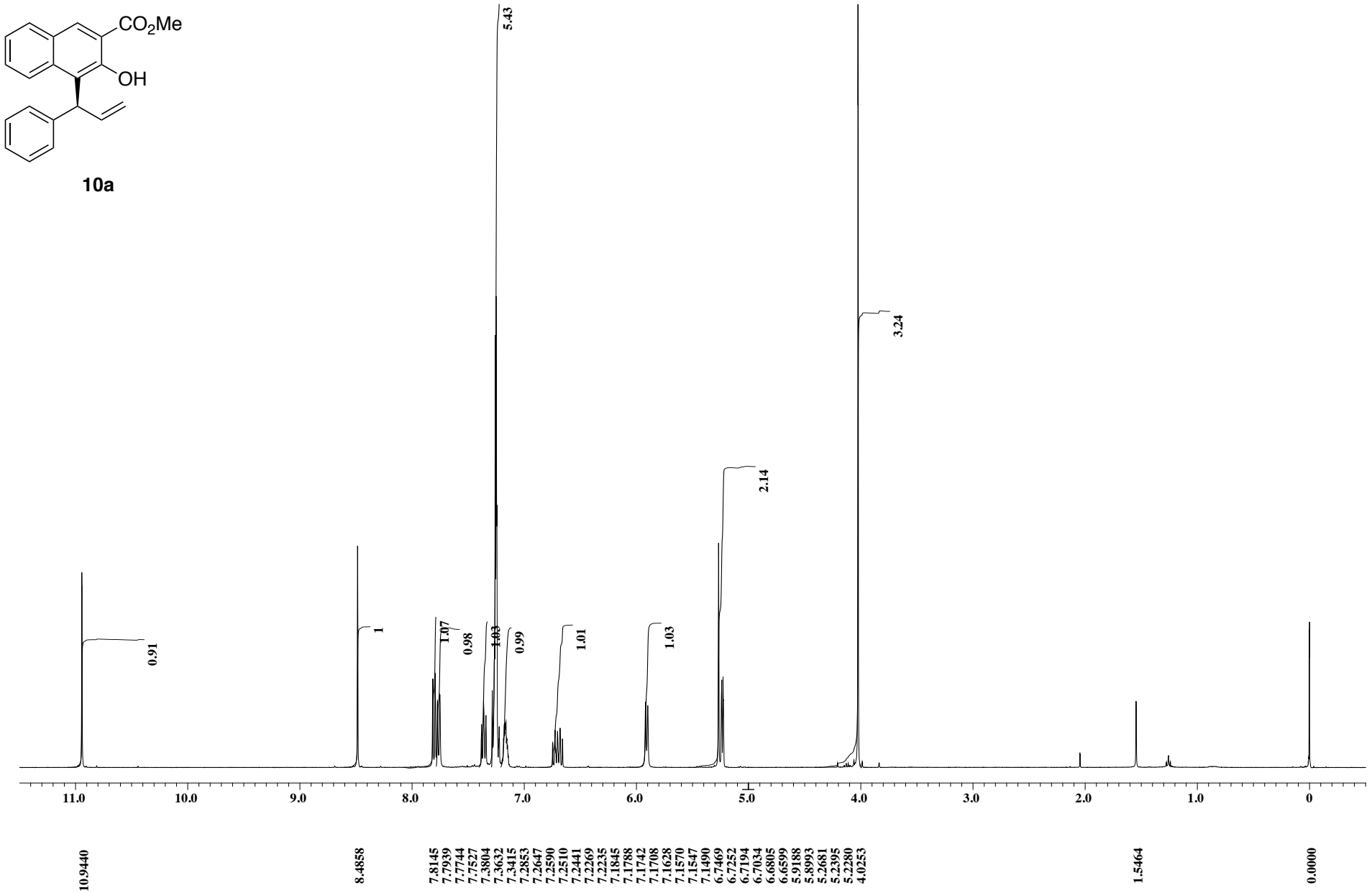

$^{13}$C NMR spectrum of **9l** ($CDCl_3$, 100 MHz)



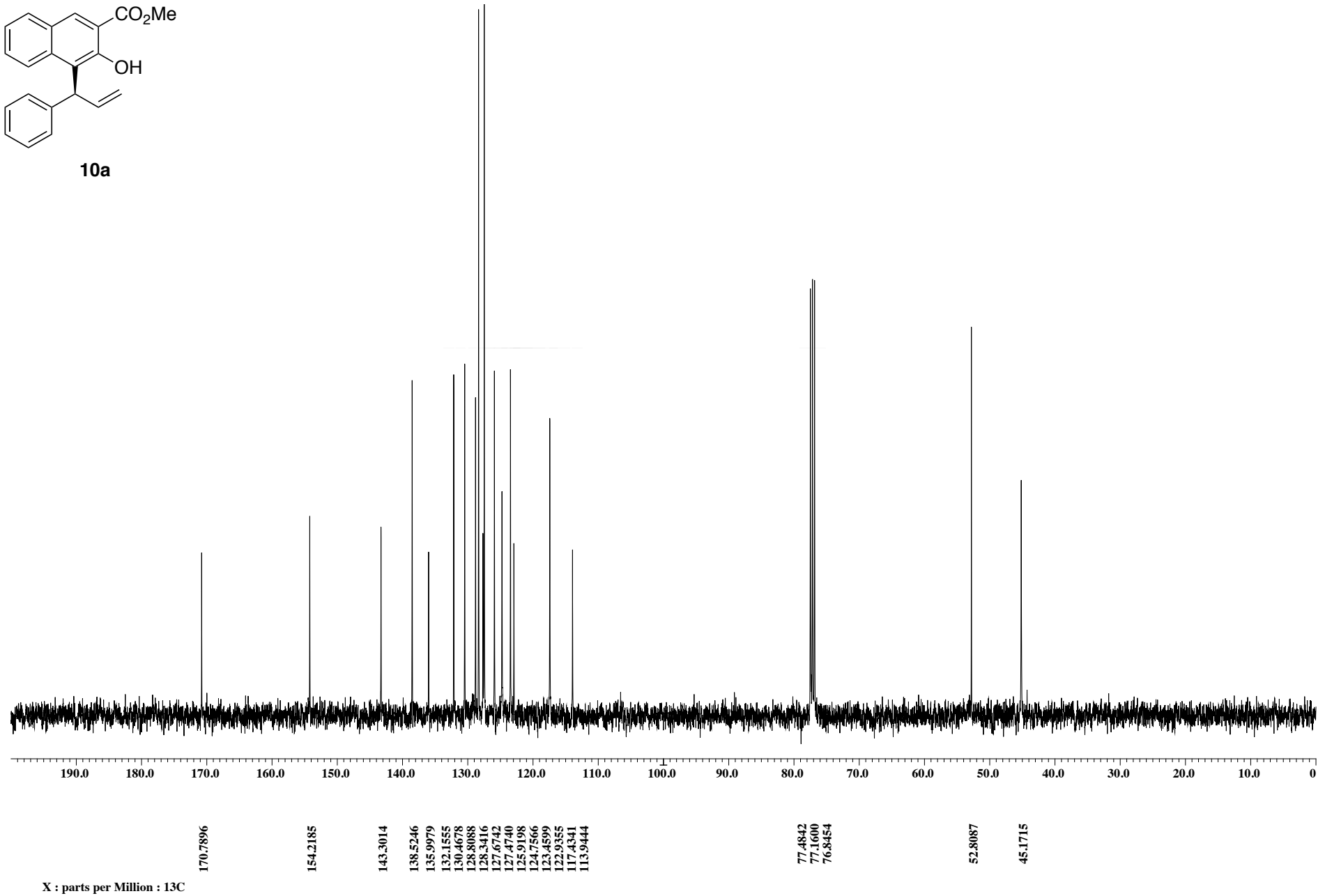

$^{1}$H NMR spectrum of **9m** ($CDCl_3$, 400 MHz)



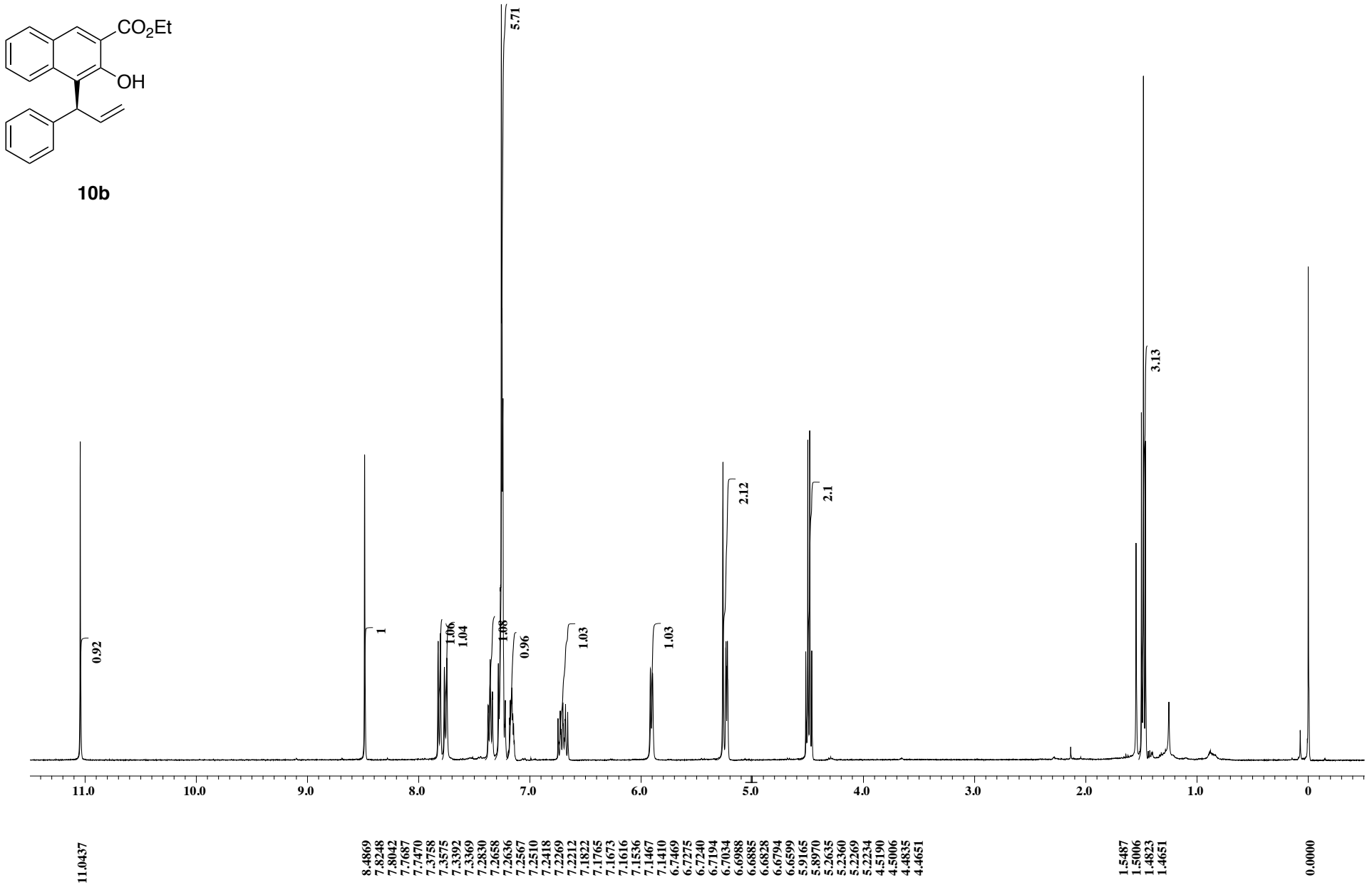

$^{13}$C NMR spectrum of **9m** ($CDCl_3$, 100 MHz)



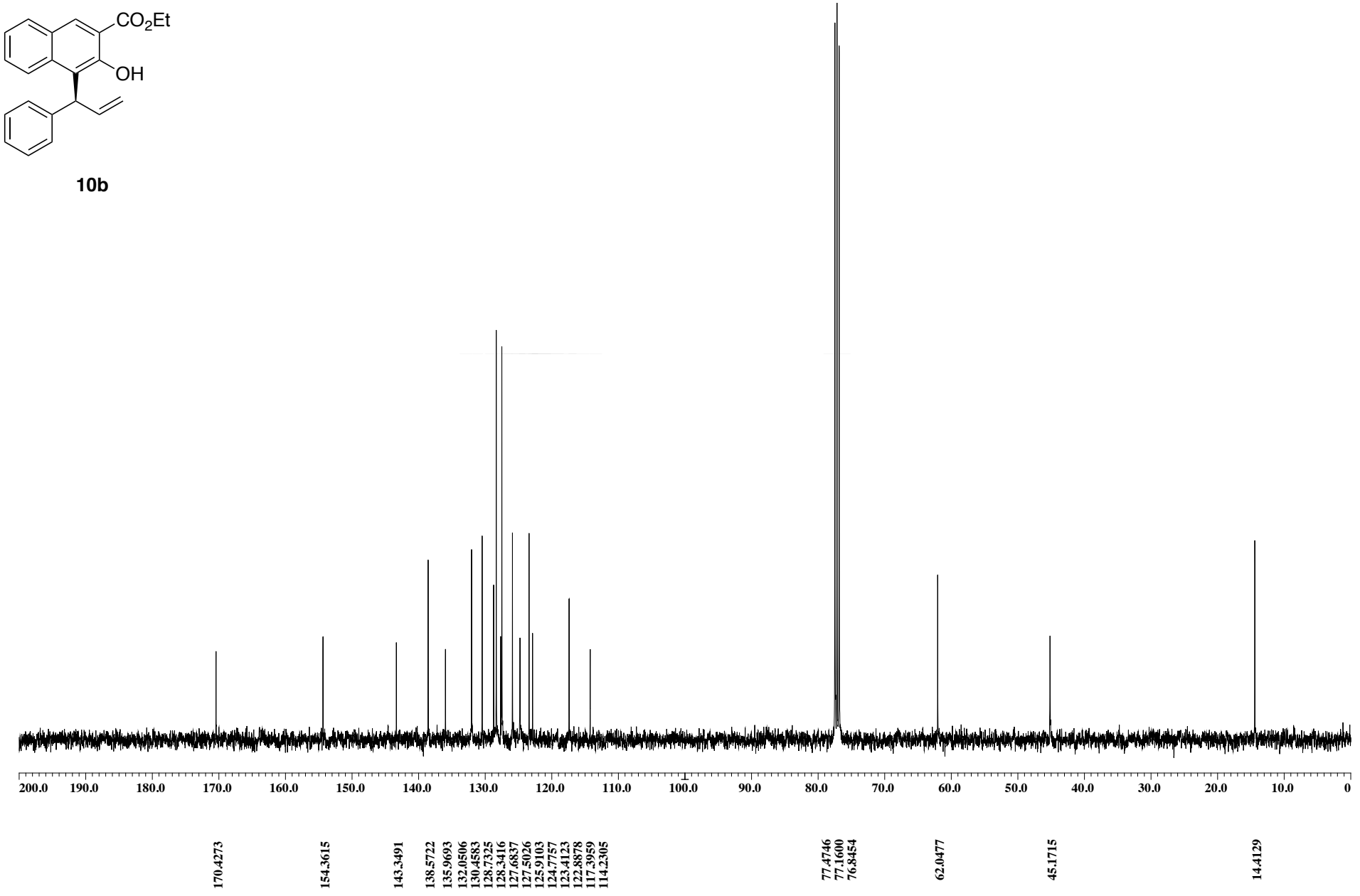

$^1$H NMR spectrum of **10a** ($CDCl_3$, 400 MHz)



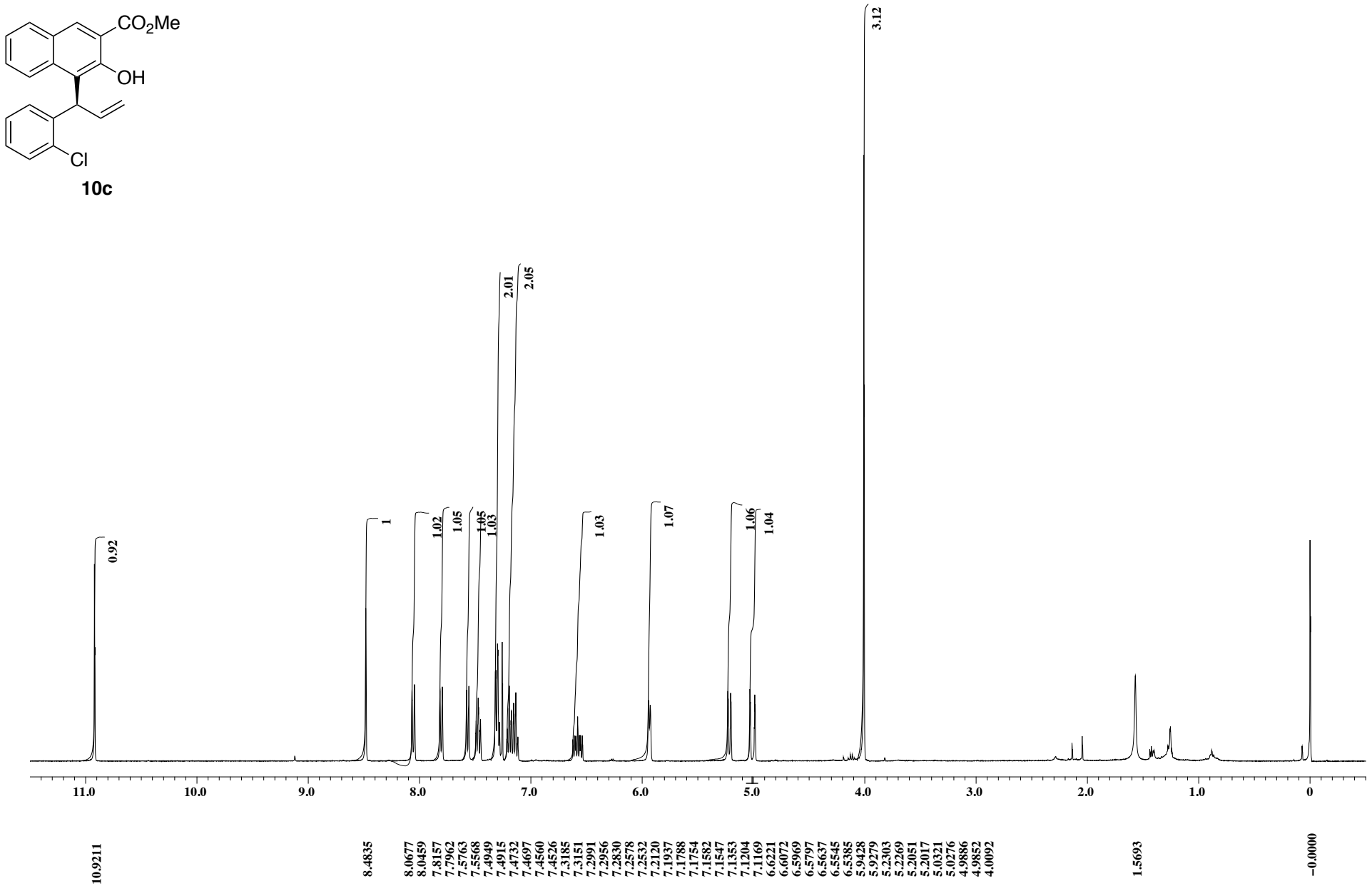

$^{13}$C NMR spectrum of **10a** ($CDCl_3$, 100 MHz)



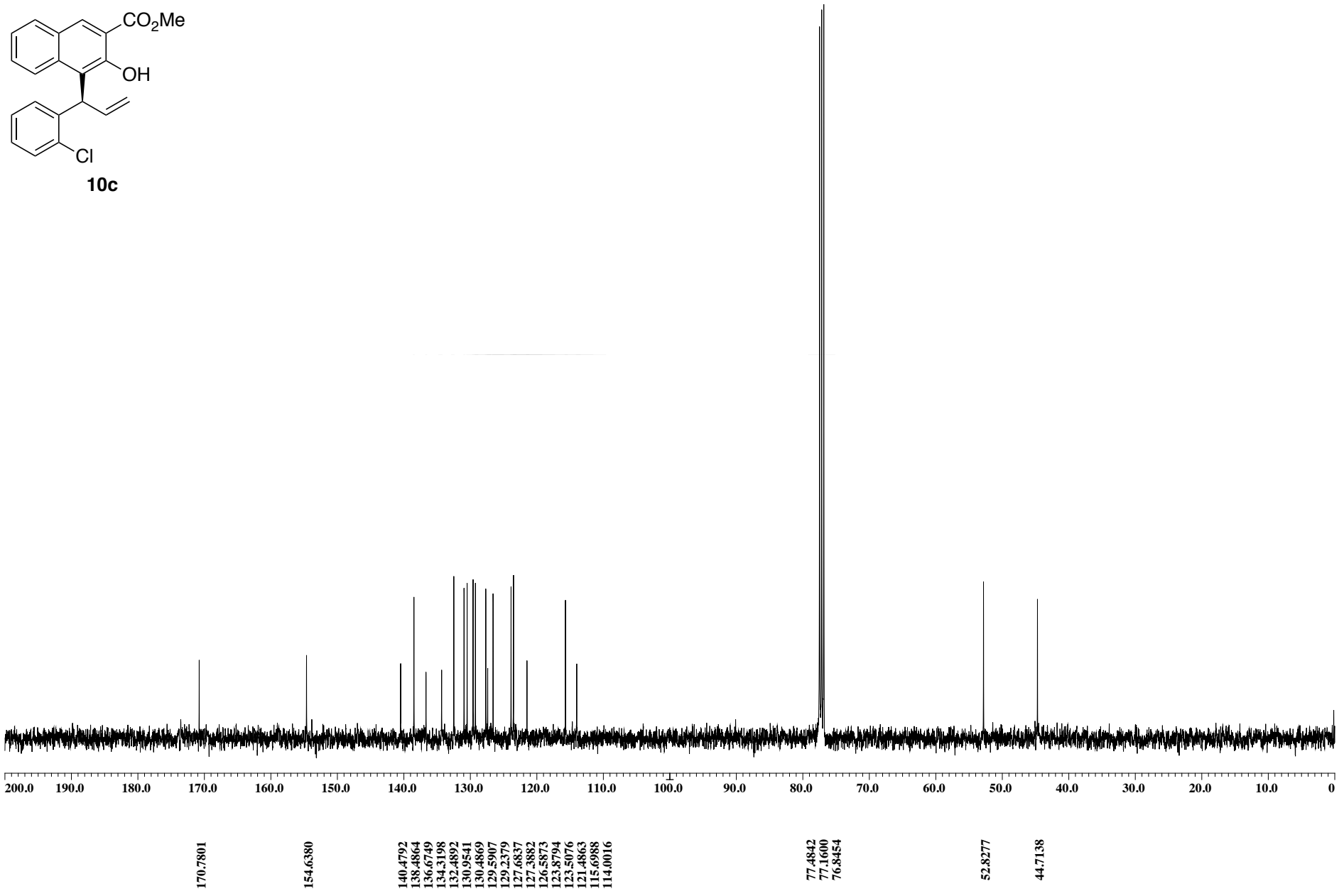

$^1$H NMR spectrum of **10b** ($CDCl_3$, 400 MHz)



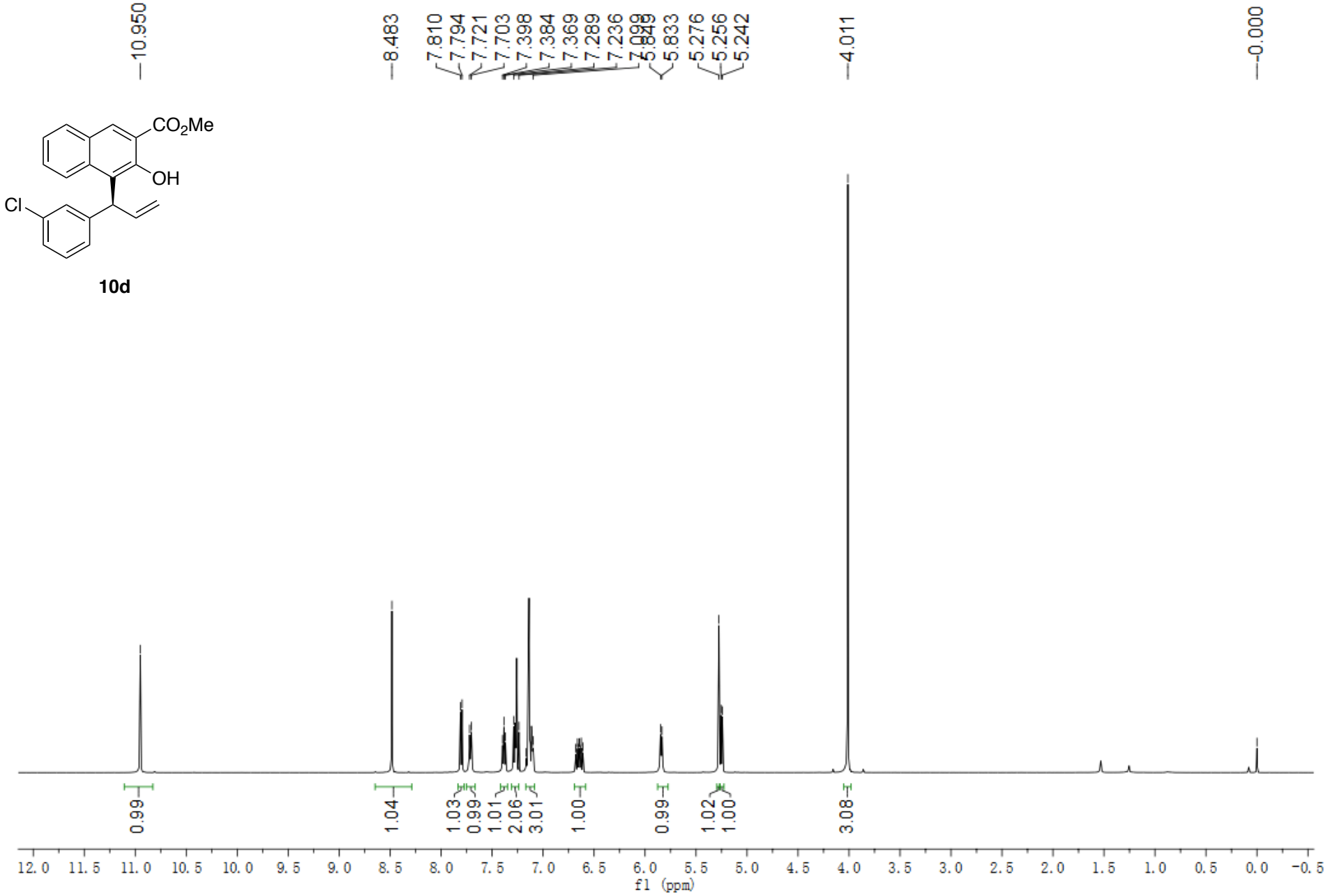

$^{13}$C NMR spectrum of **10b** ($CDCl_3$, 100 MHz)



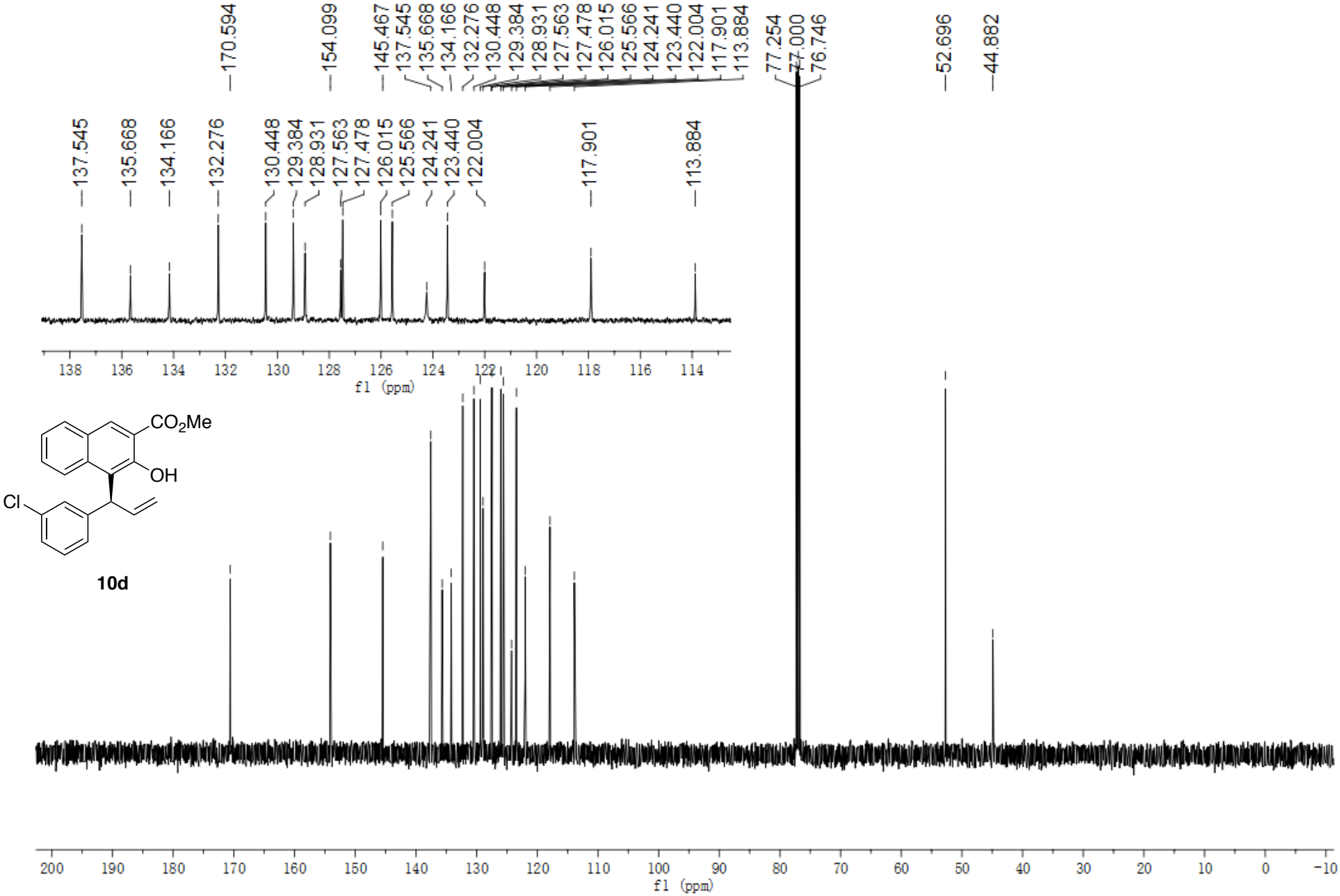

$^1$H NMR spectrum of **10c** ($CDCl_3$, 400 MHz)



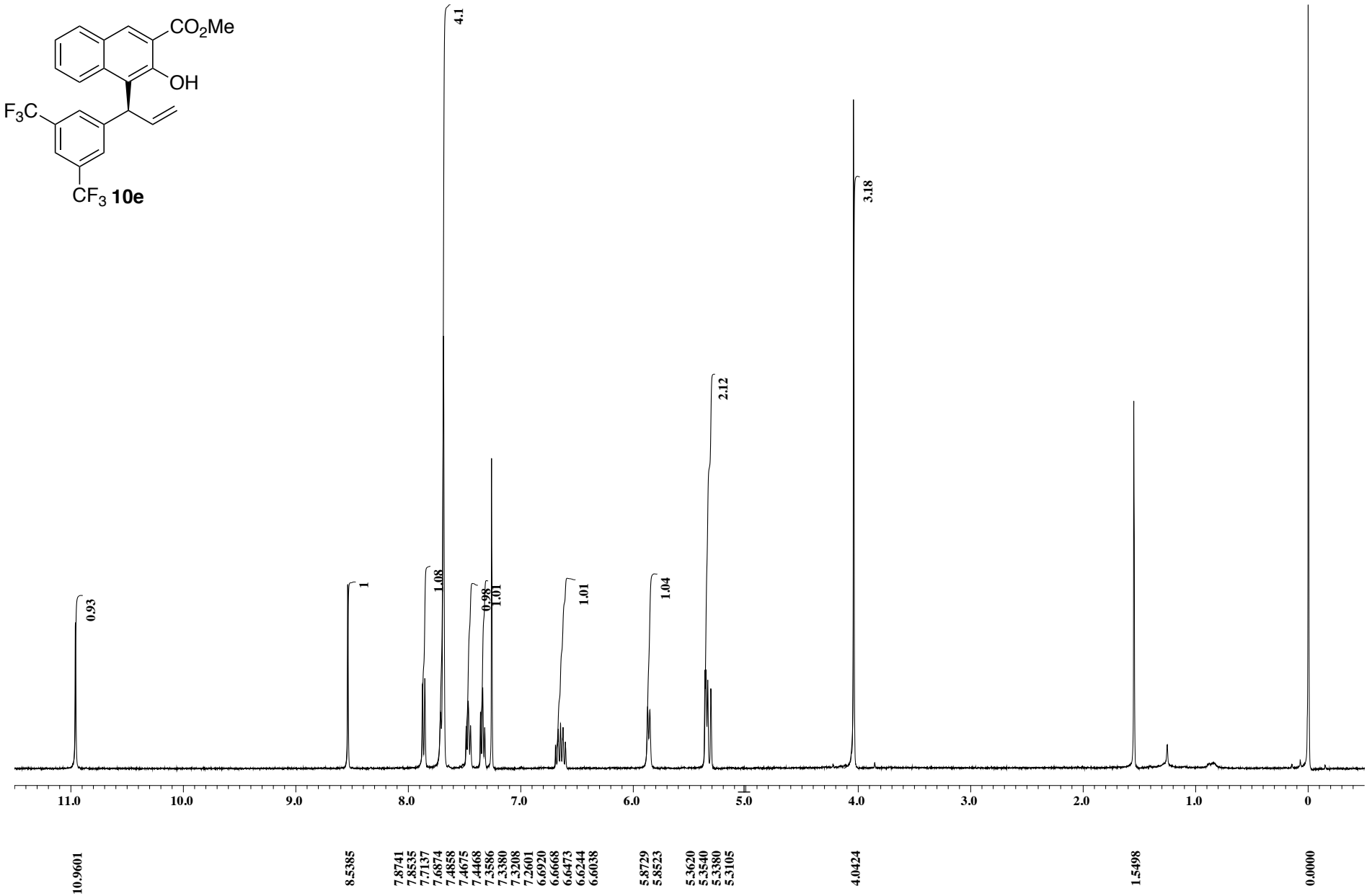

$^{13}$C NMR spectrum of **10c** ($CDCl_3$, 100 MHz)



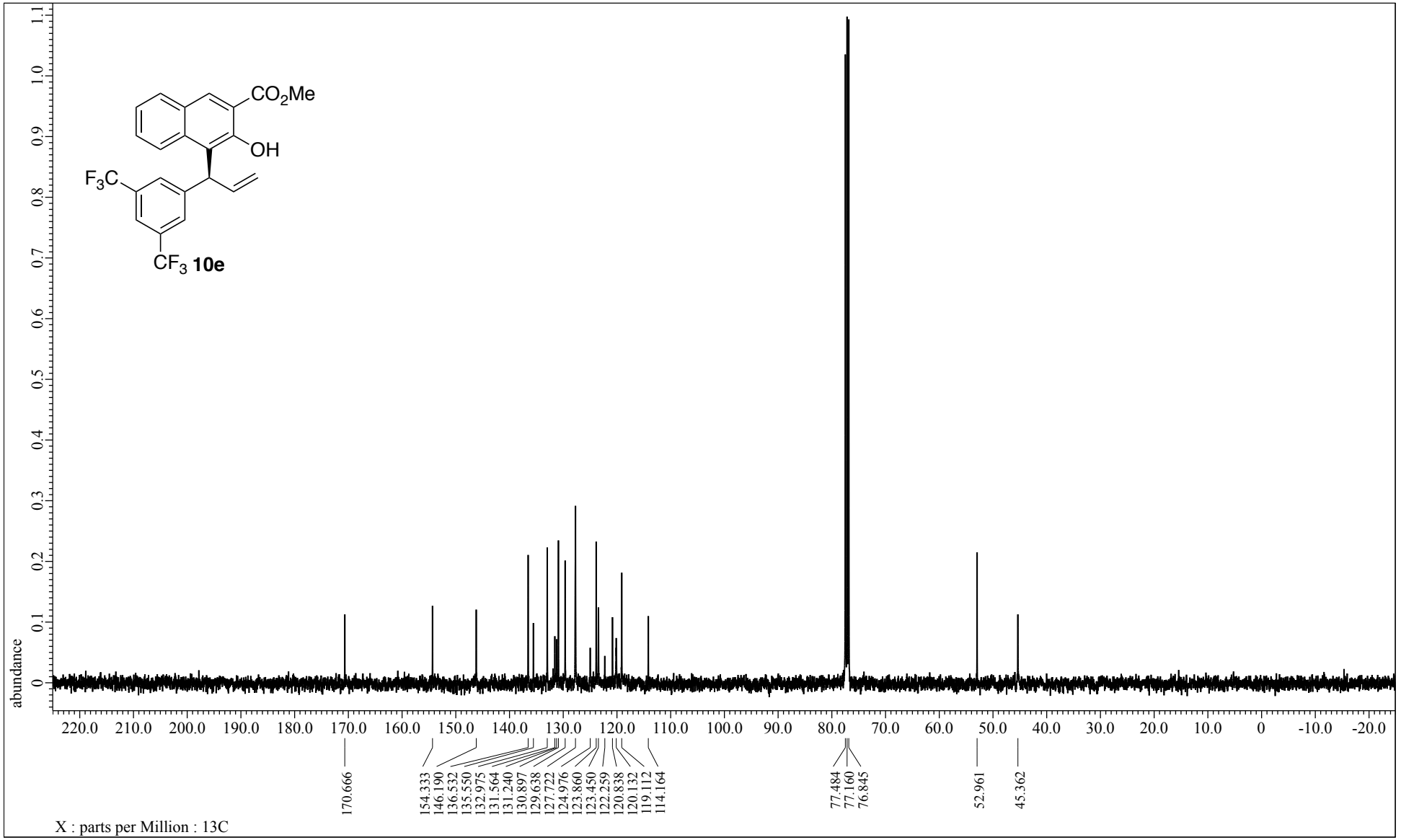

$^{1}$H NMR spectrum of **10d** ($CDCl_3$, 500 MHz)



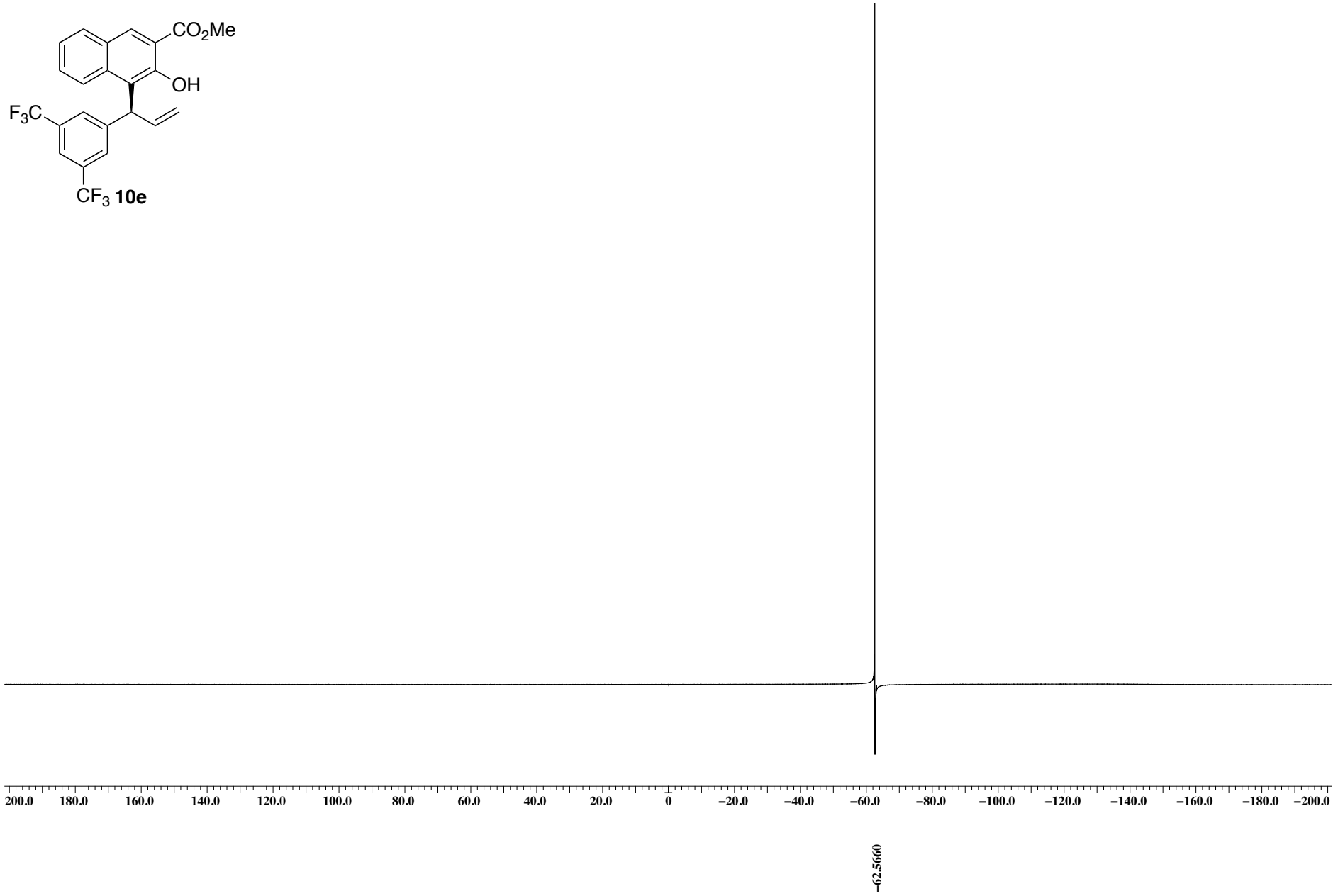

$^{13}$C NMR spectrum of **10d** ($CDCl_3$, 126 MHz)



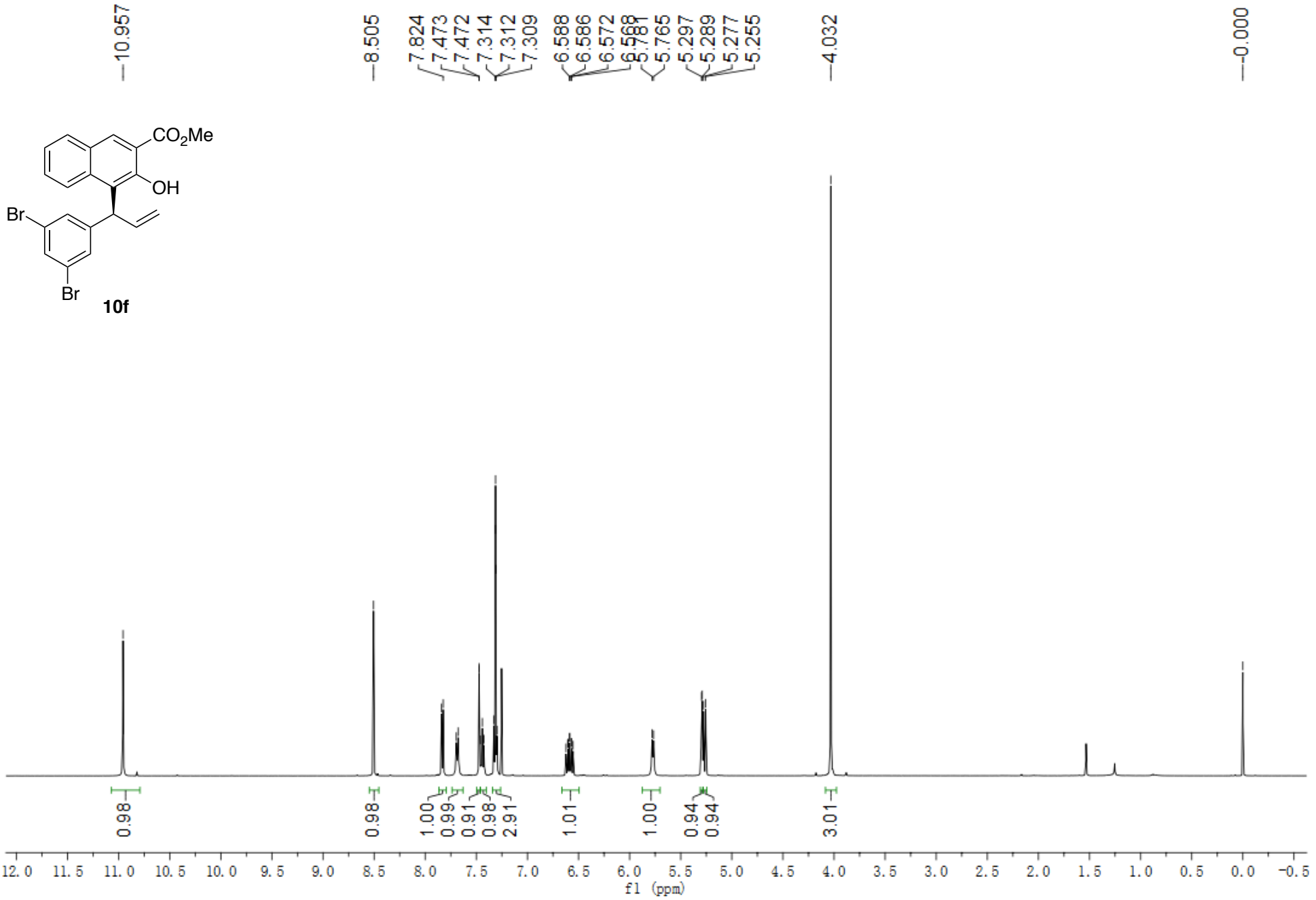

$^1$H NMR spectrum of **10e** ($CDCl_3$, 400 MHz)



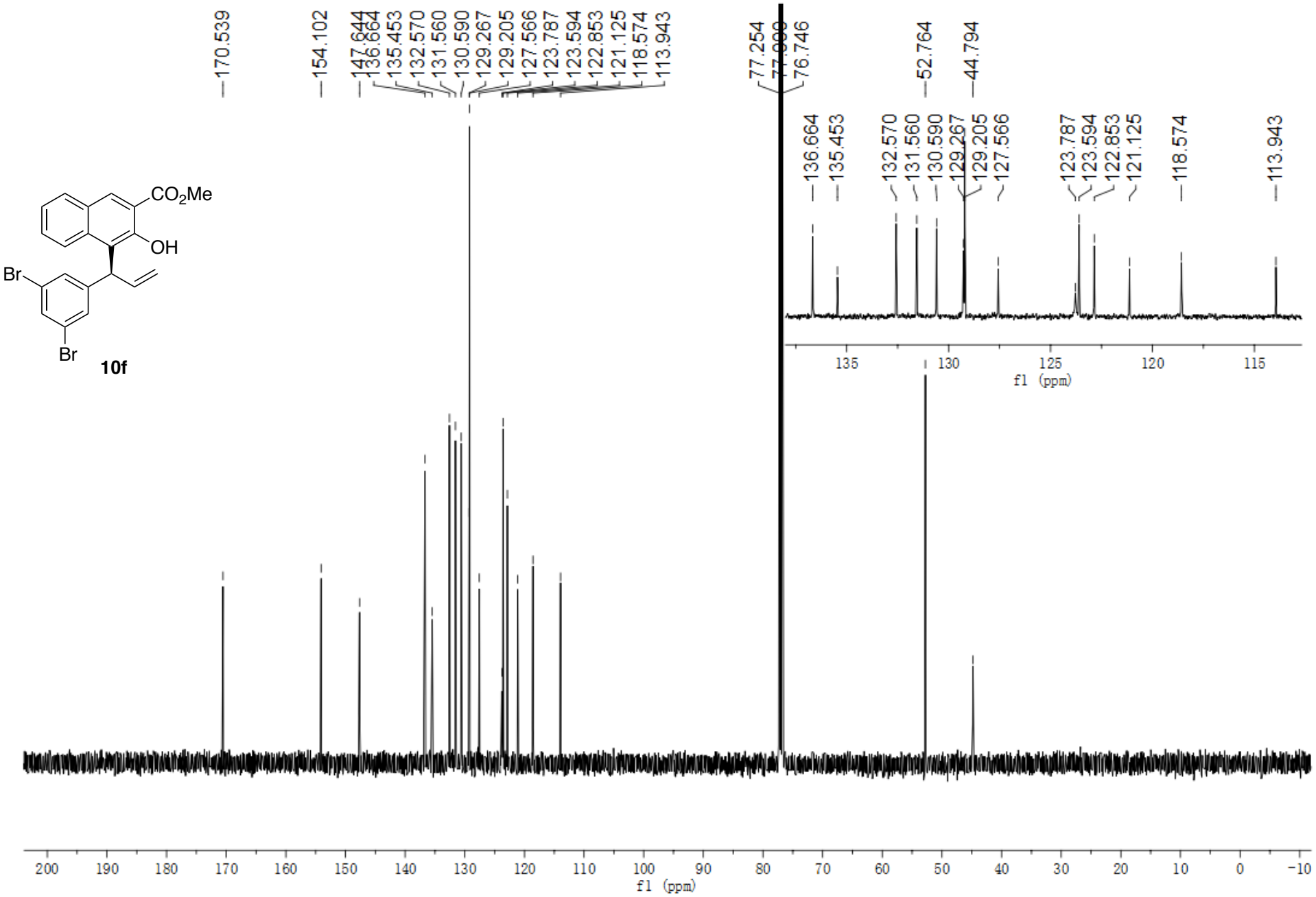

$^{13}$C NMR spectrum of **10e** ($CDCl_3$, 126 MHz)



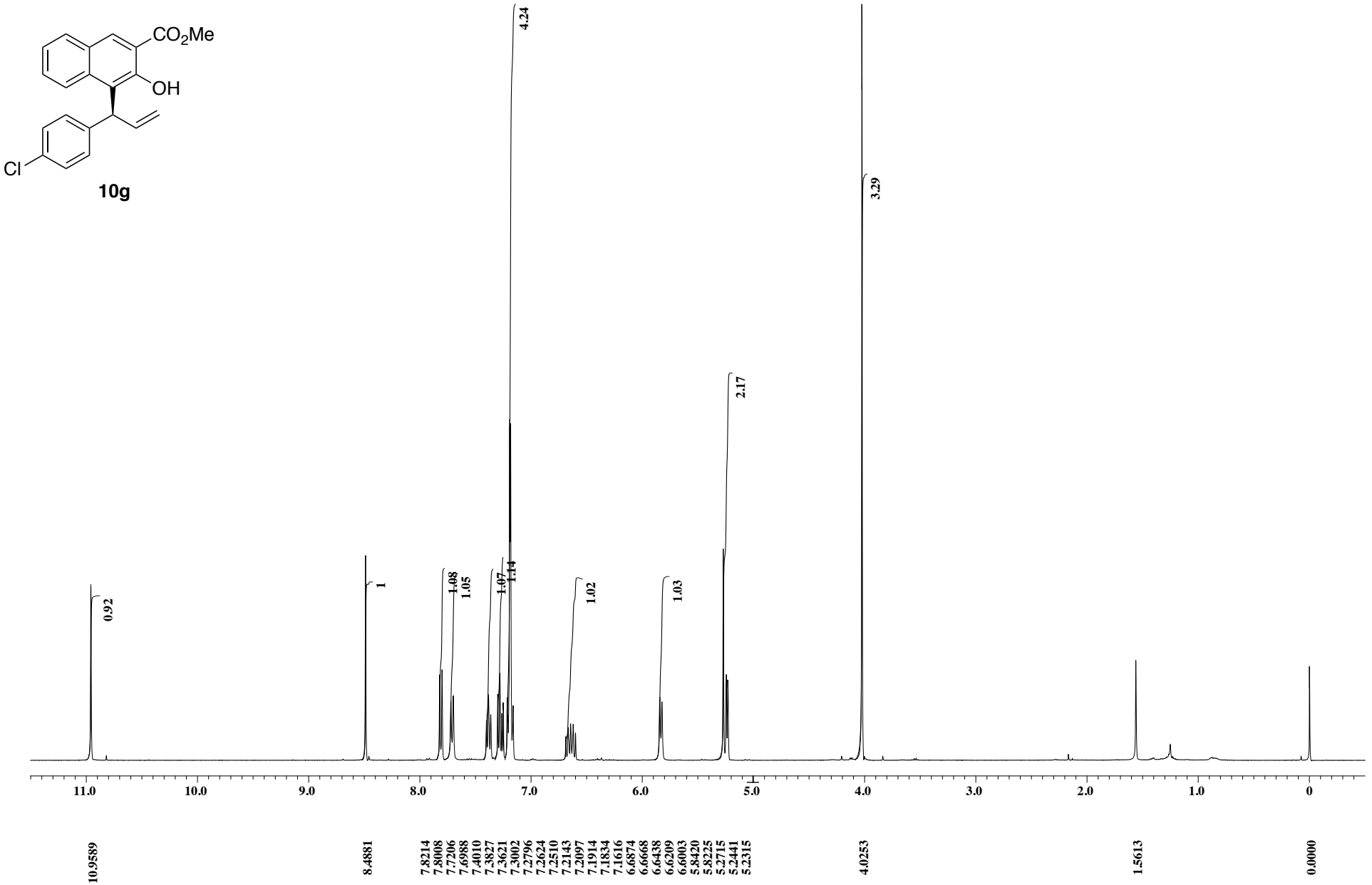

$^{19}$F NMR spectrum of **10e** ($CDCl_3$, 376 MHz)



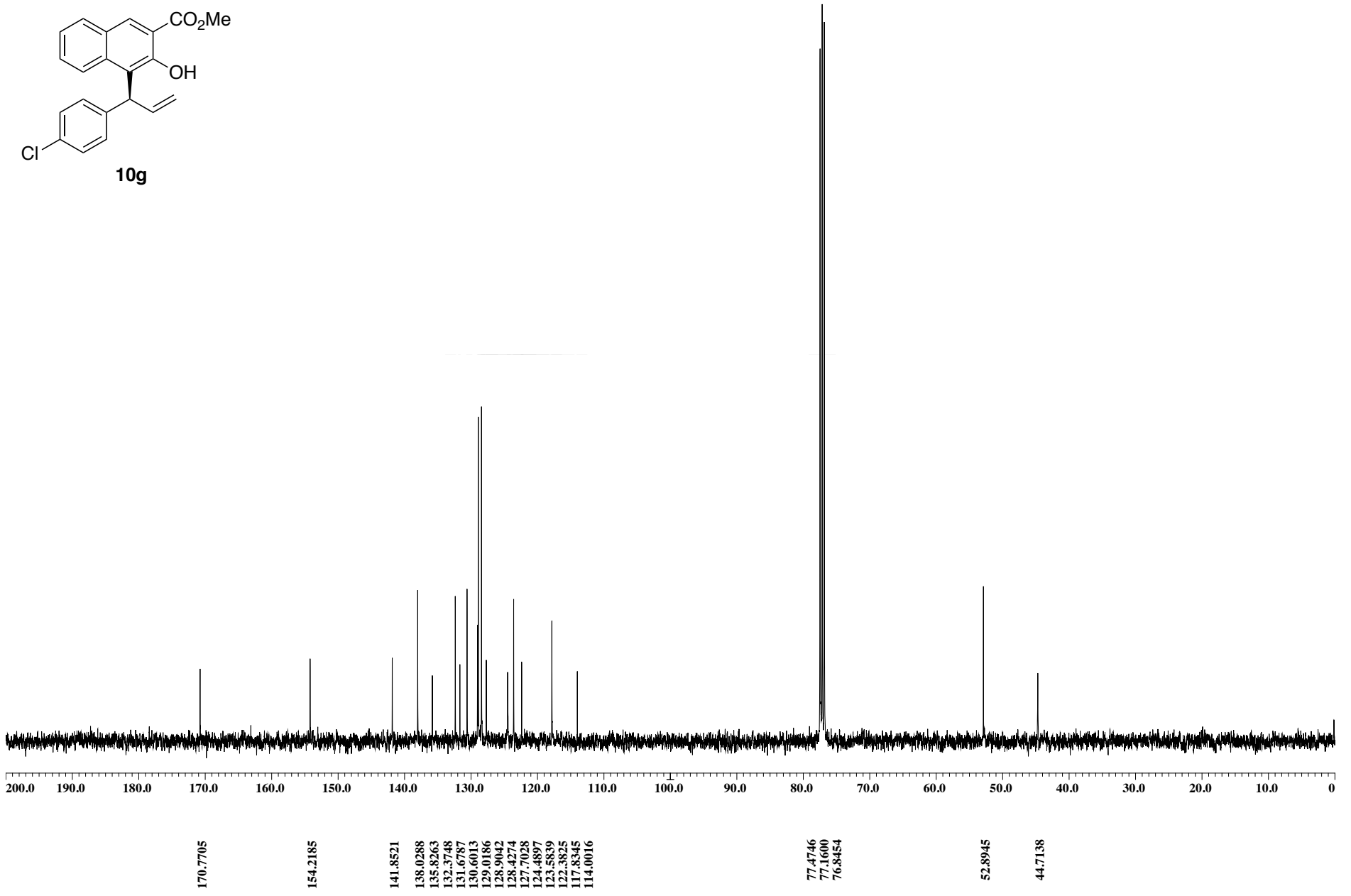

$^{1}$H NMR spectrum of **10f** ($CDCl_3$, 500 MHz)



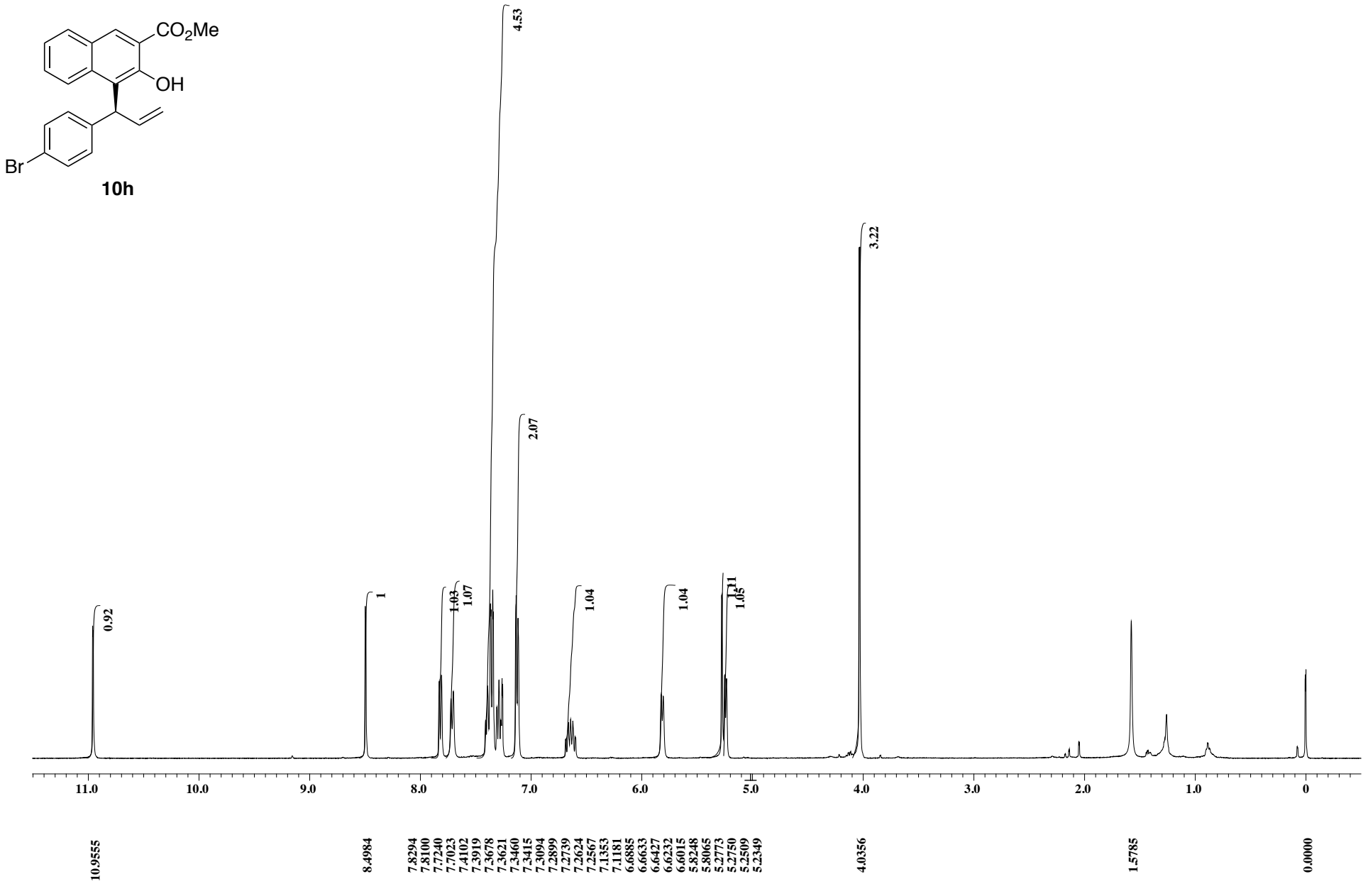

$^{13}$C NMR spectrum of **10f** ($CDCl_3$, 126 MHz)



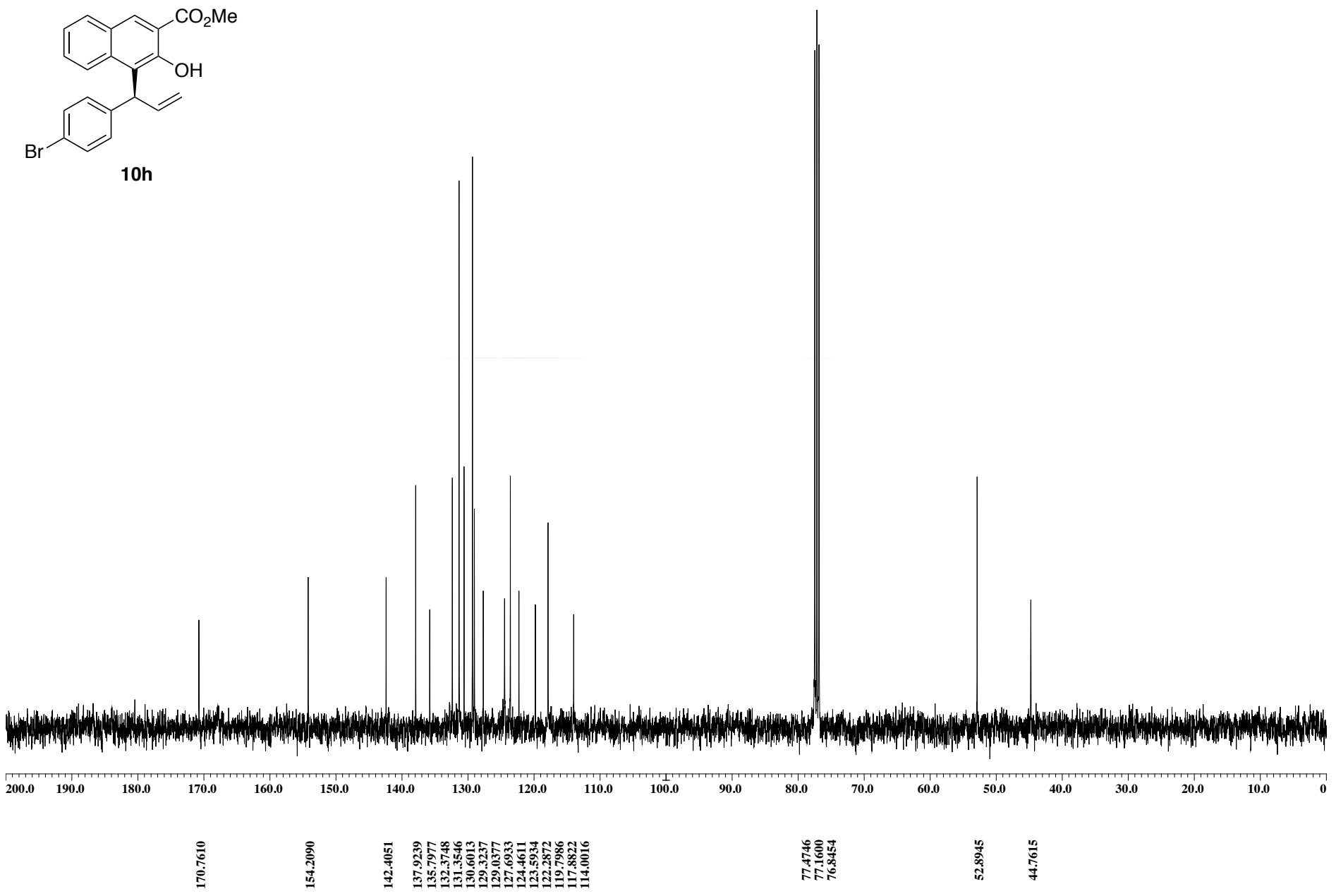

$^1$H NMR spectrum of **10g** ($CDCl_3$, 400 MHz)



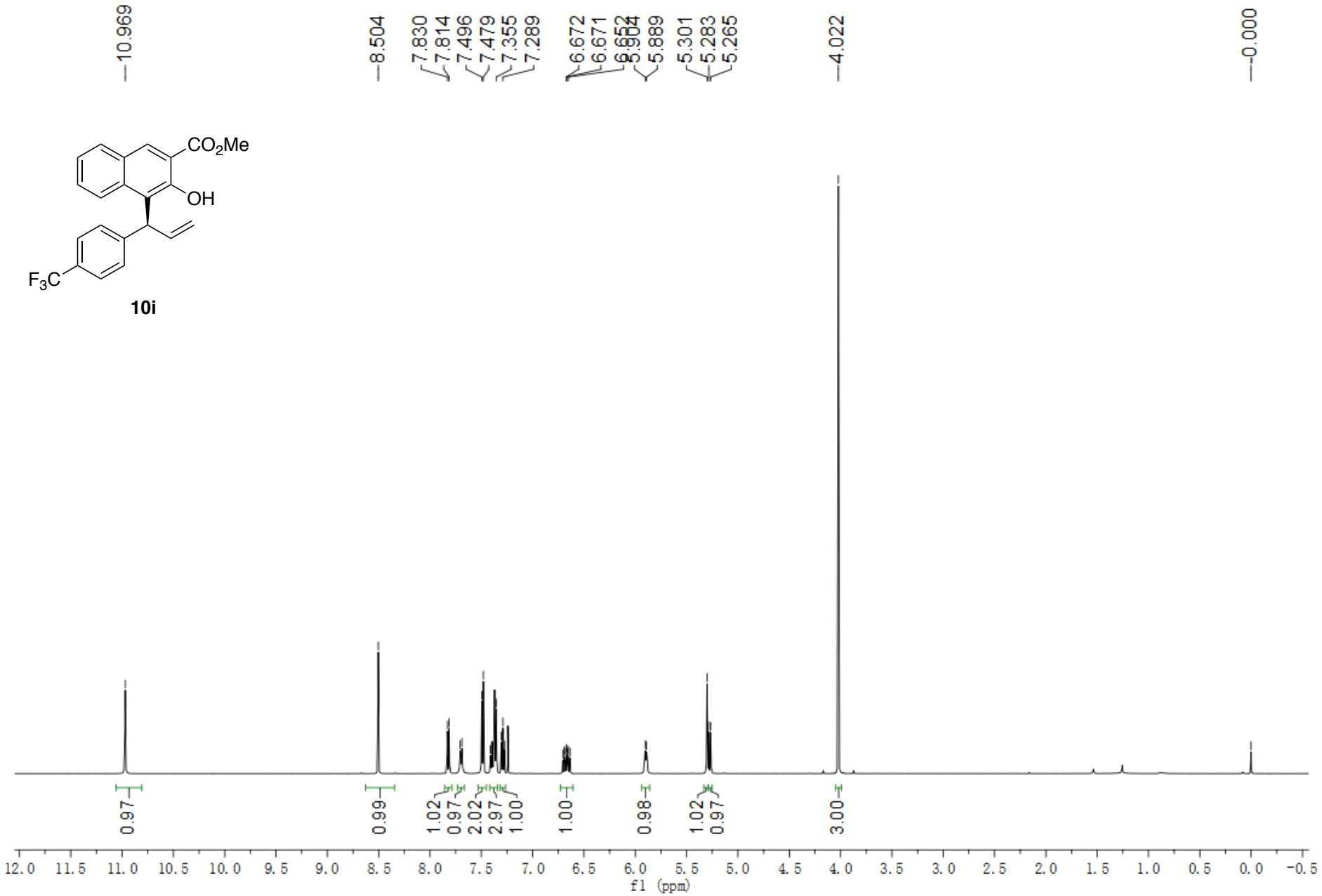

$^{13}$C NMR spectrum of **10g** ($CDCl_3$, 100 MHz)



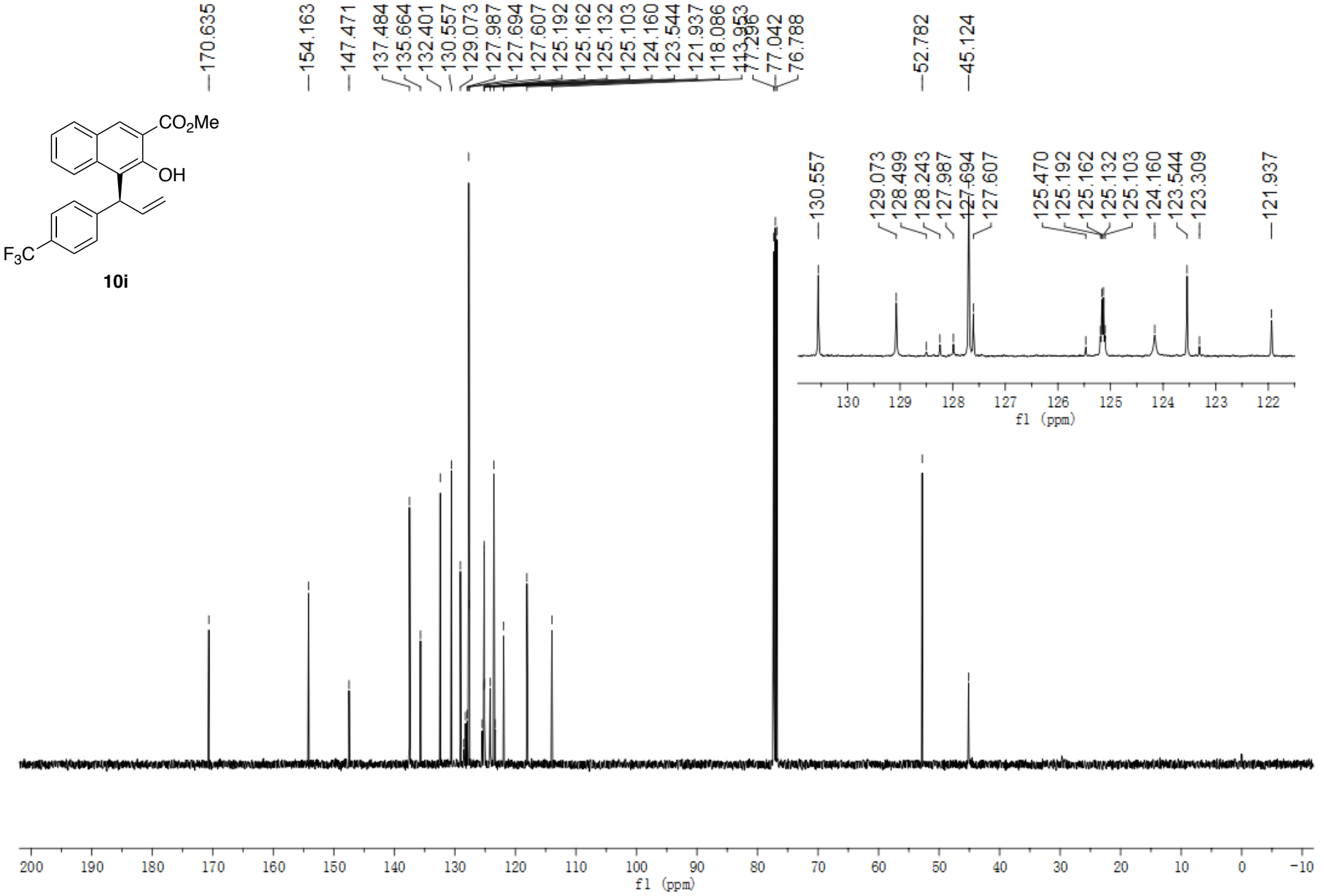

$^1$H NMR spectrum of **10h** ($CDCl_3$, 400 MHz)



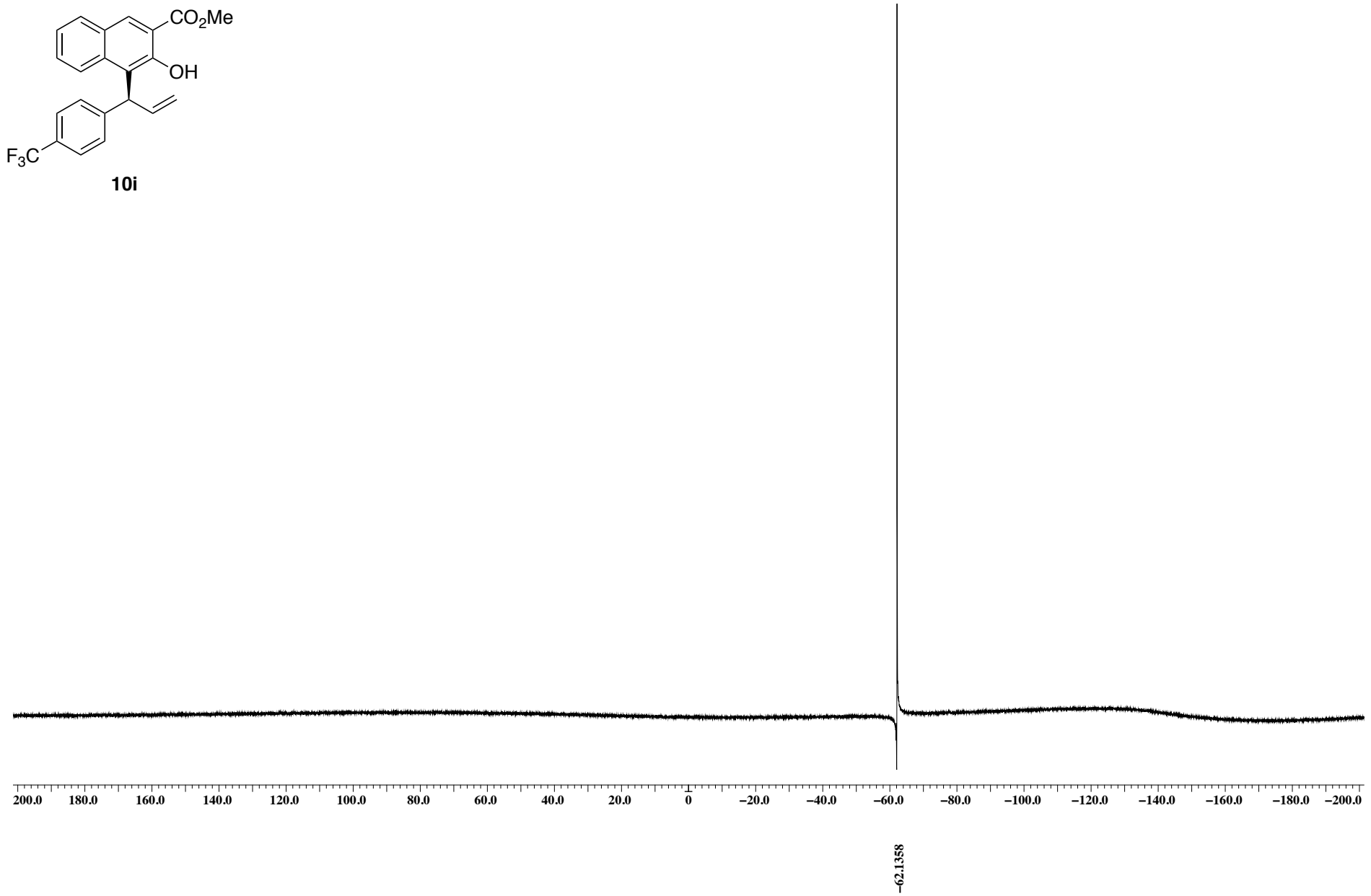

$^{13}$C NMR spectrum of **10h** ($CDCl_3$, 100 MHz)



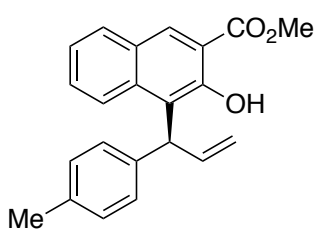

$^1$H NMR spectrum of **10i** ($CDCl_3$, 500 MHz)



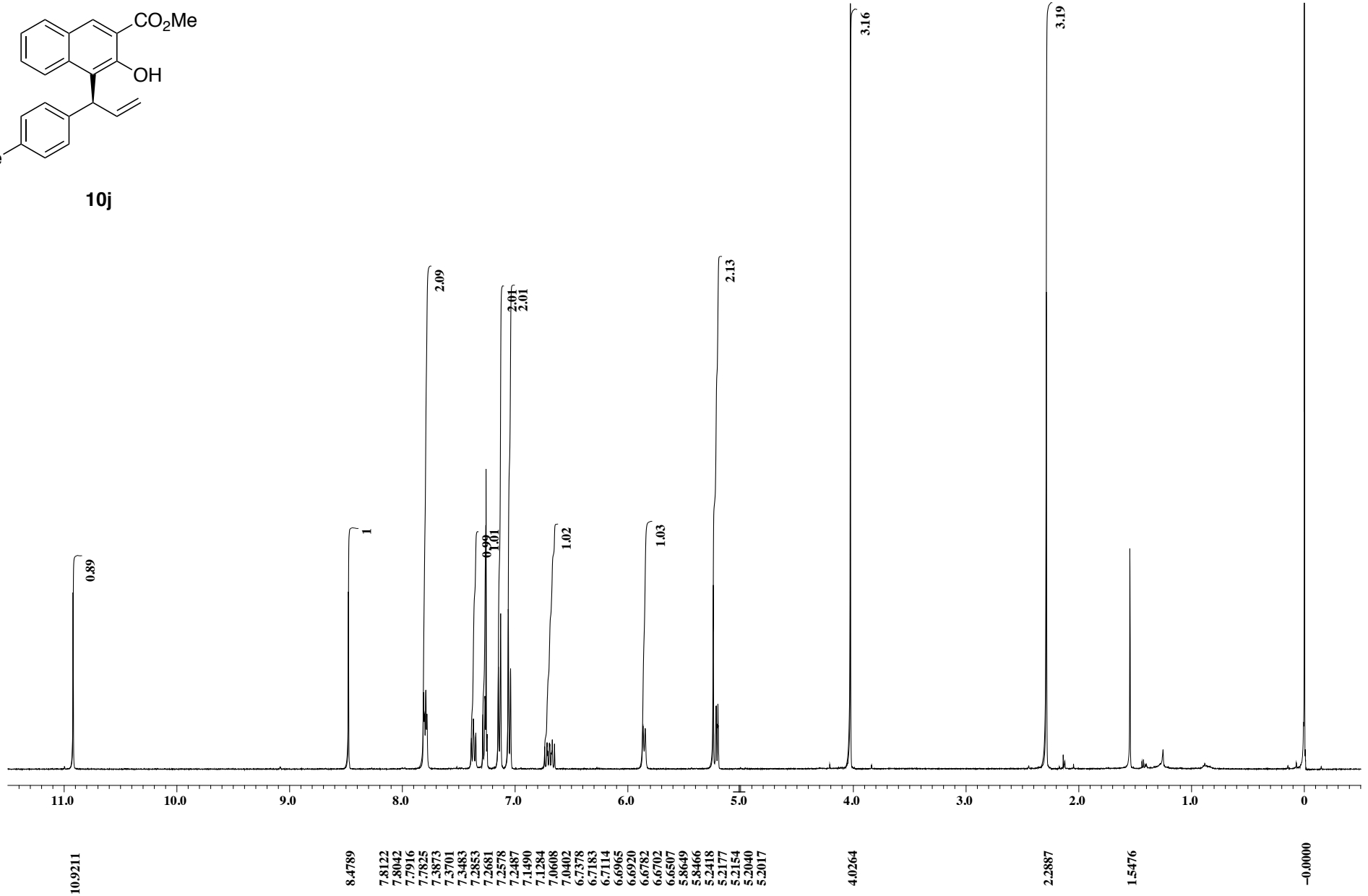

$^{13}$C NMR spectrum of **10i** ($CDCl_3$, 126 MHz)



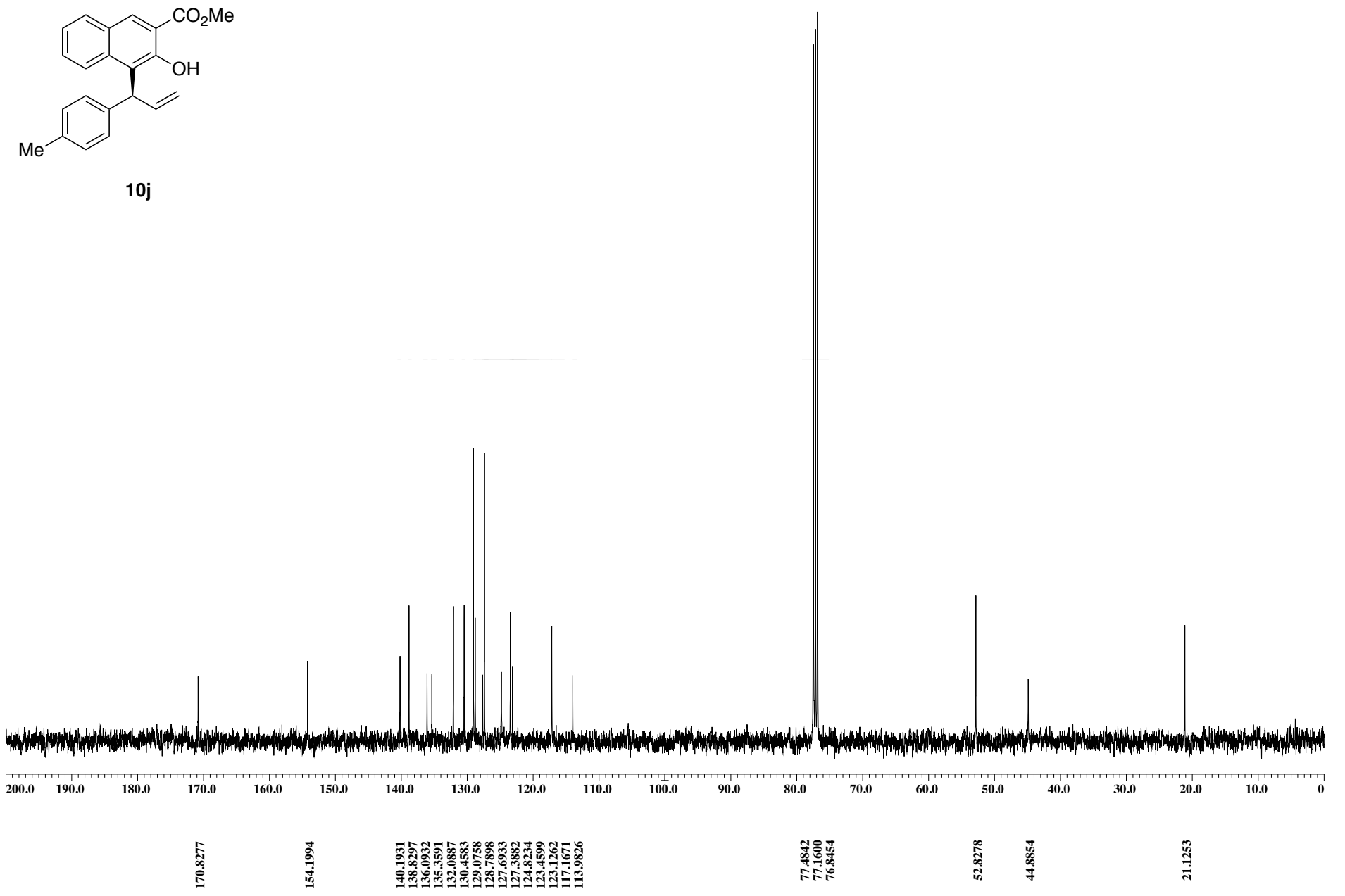

$^{19}$F NMR spectrum of **10i** ($CDCl_3$, 376 MHz)



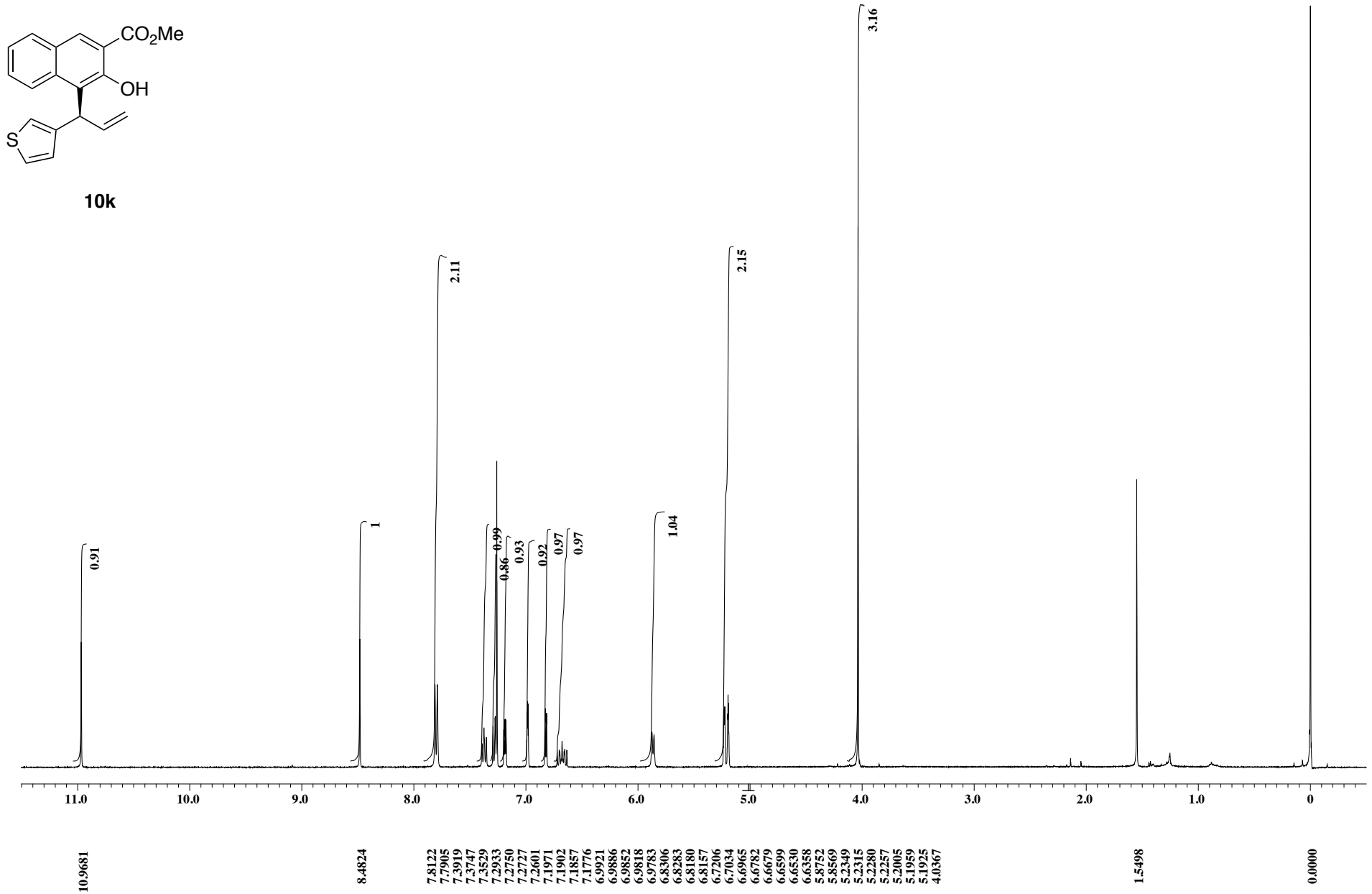

**10j**



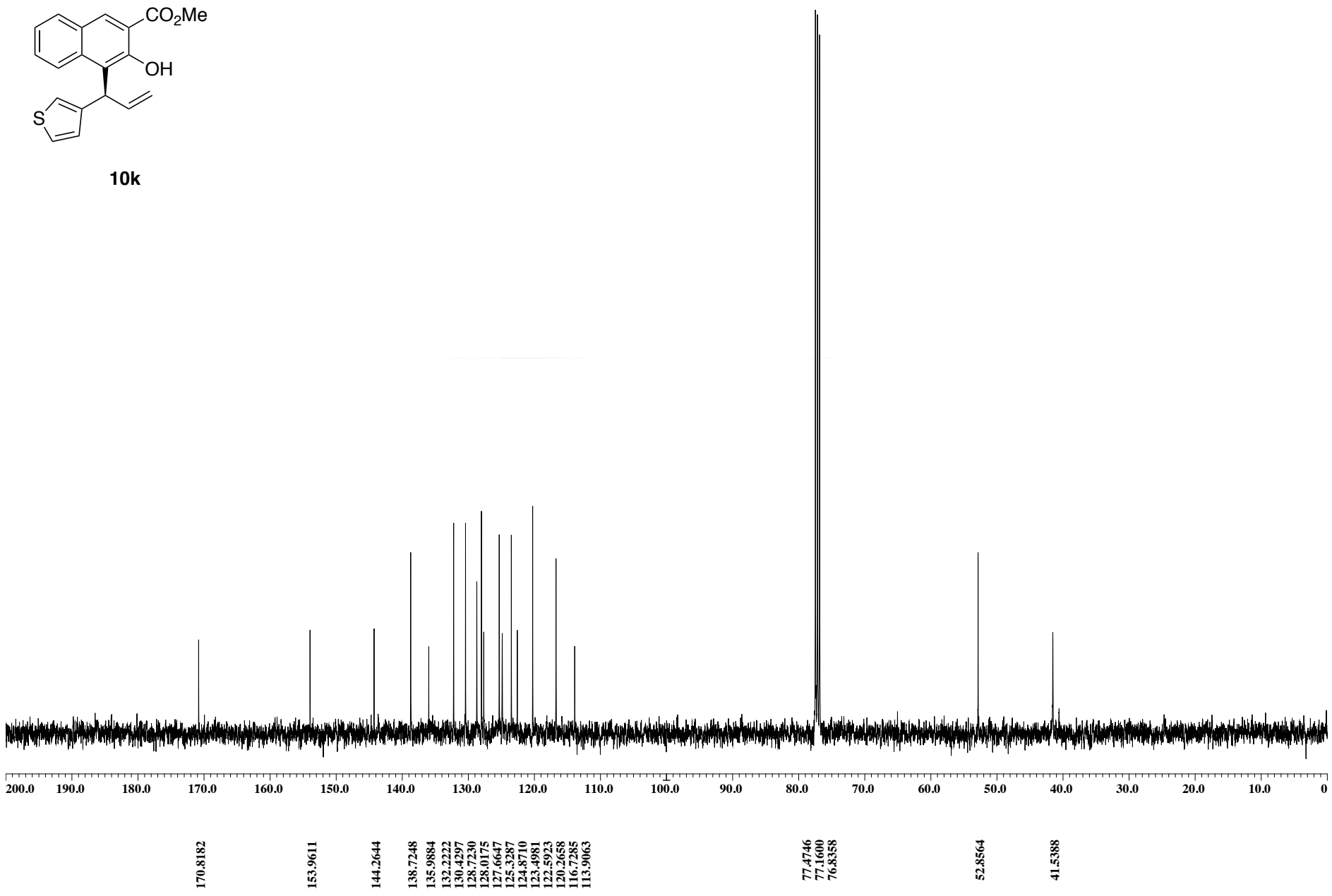

$^{1}$H NMR spectrum of **10j** ($CDCl_3$, 400 MHz)



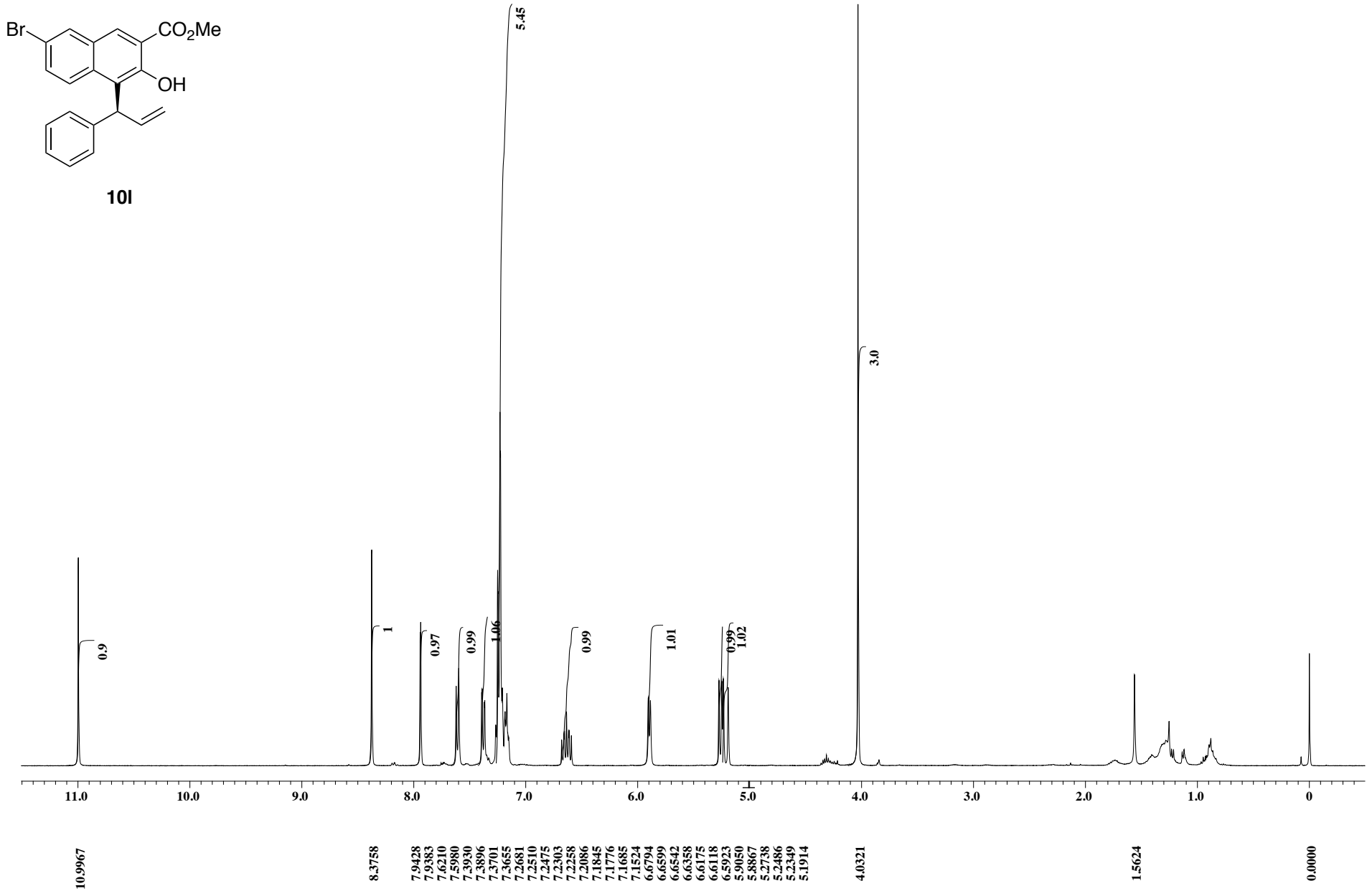

$^{13}$C NMR spectrum of **10j** ($CDCl_3$, 100 MHz)




$^1$H NMR spectrum of **10k** ($CDCl_3$, 400 MHz)

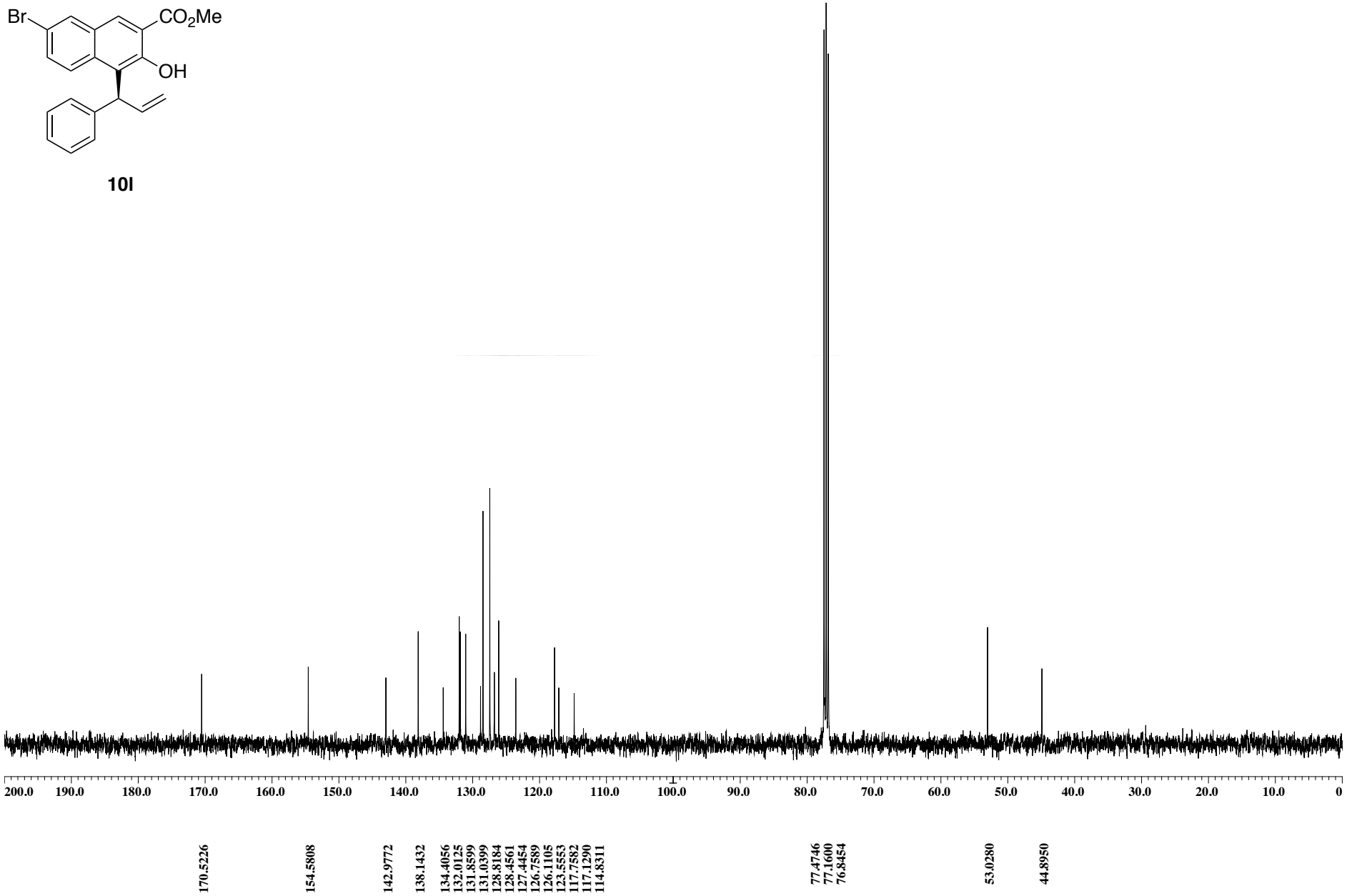



$^{13}$C NMR spectrum of **10k** ($CDCl_3$, 100 MHz)

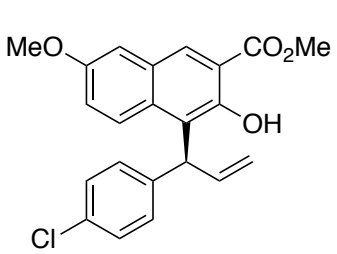



$^{1}$H NMR spectrum of **10l** ($CDCl_3$, 400 MHz)

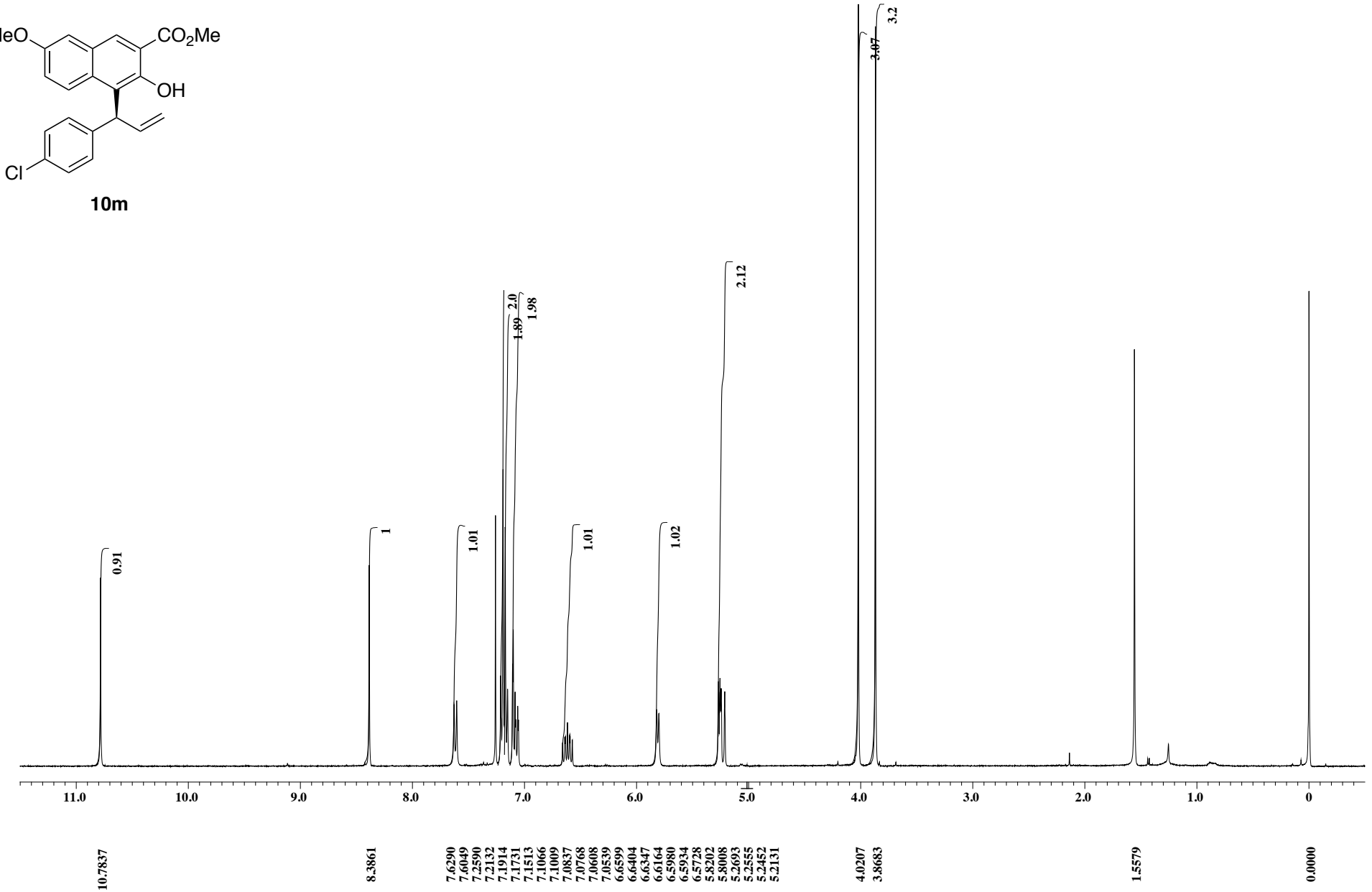
**10l**



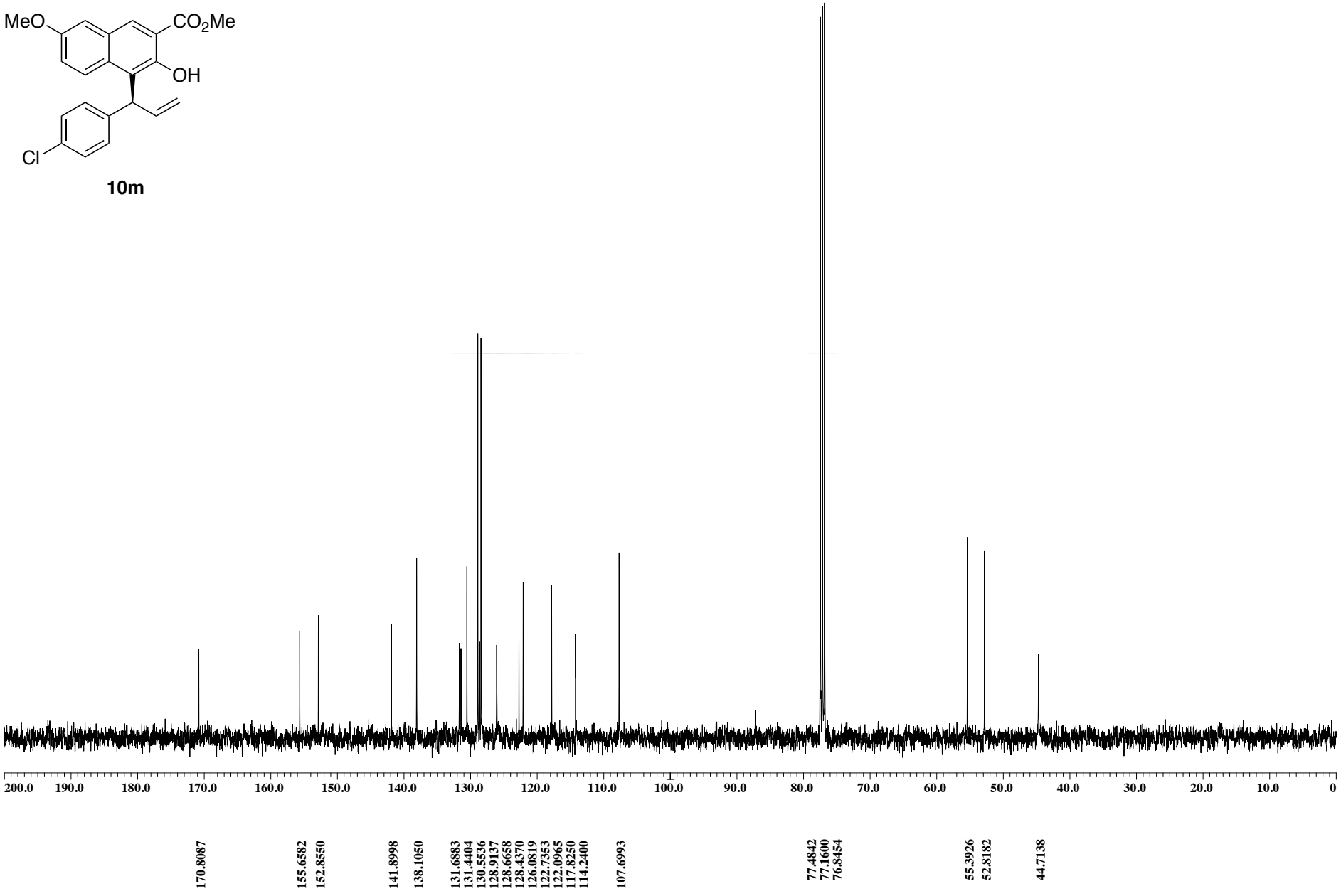

$^{13}$C NMR spectrum of **10l** ($CDCl_3$, 100 MHz)



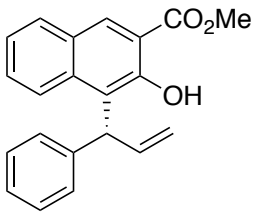

**10m**



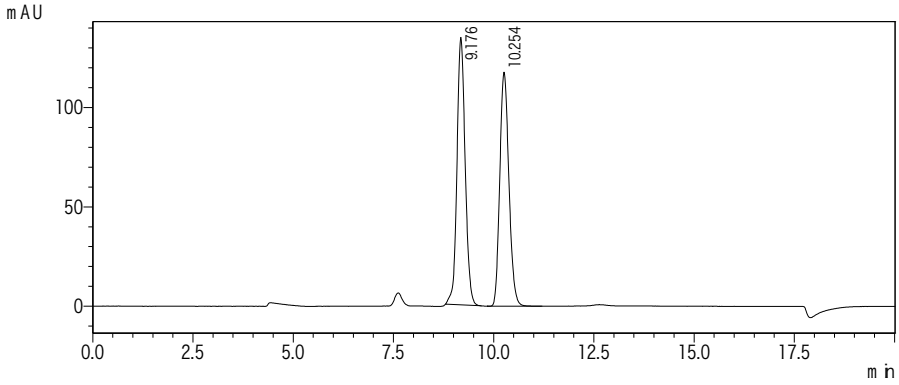

$^1$H NMR spectrum of **10m** ($CDCl_3$, 400 MHz)




$^{13}$C NMR spectrum of **10m** ($CDCl_3$, 100 MHz)

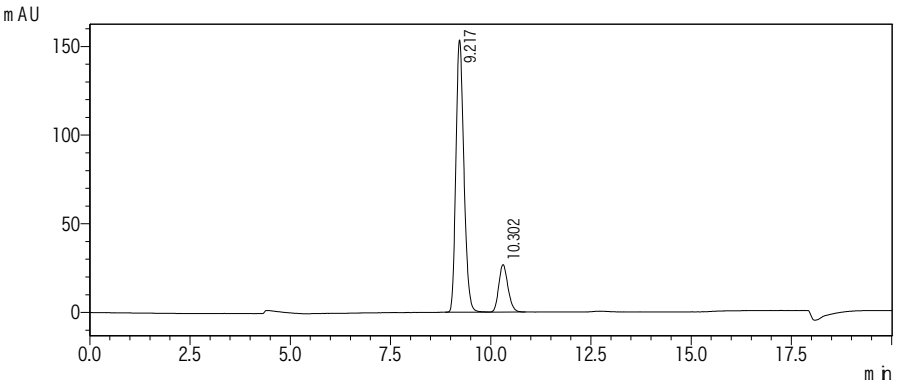



**10a**



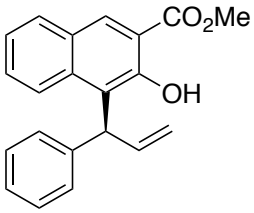

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 9.176 | 1915985 | 134650 | 50.687 |
| 2 | 10.254 | 1864057 | 117813 | 49.313 |
| Total | | 3780042 | 252464 | 100.000 |

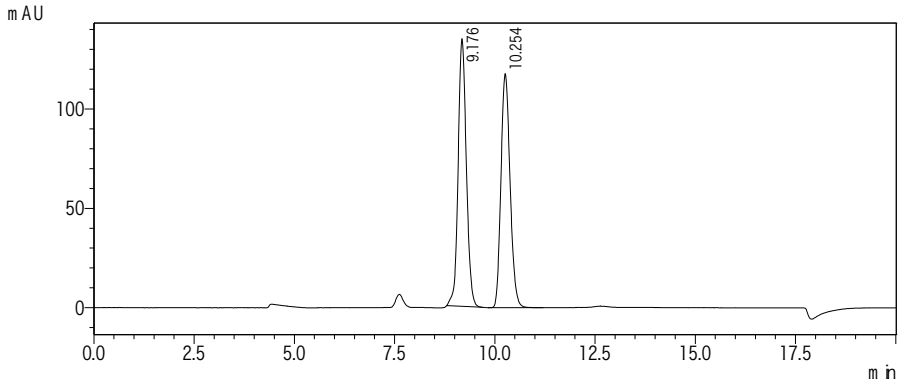



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 9.217 | 2127857 | 153547 | 83.282 |
| 2 | 10.302 | 427138 | 26740 | 16.718 |
| Total | | 2554994 | 180286 | 100.000 |

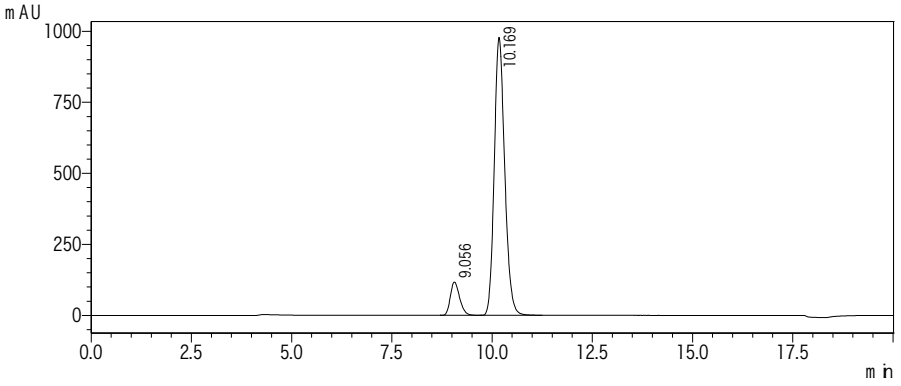



**10a**



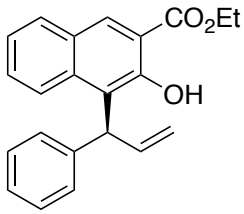

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 9.176 | 1915985 | 134650 | 50.687 |
| 2 | 10.254 | 1864057 | 117813 | 49.313 |
| Total | | 3780042 | 252464 | 100.000 |

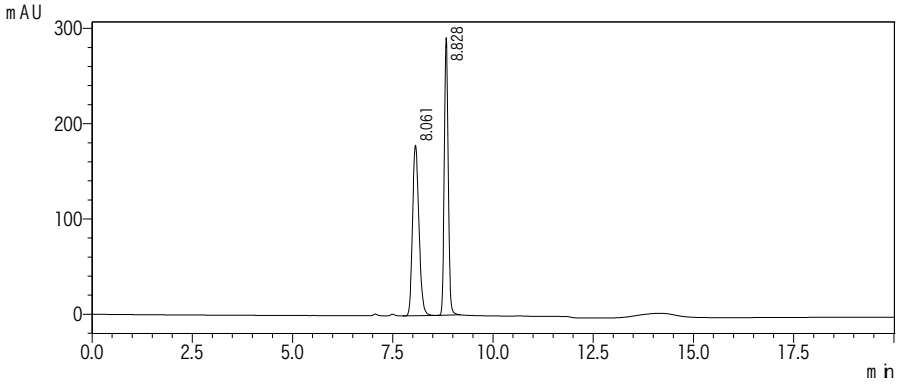



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 9.056 | 1898137 | 117222 | 9.664 |
| 2 | 10.169 | 17742848 | 978587 | 90.336 |
| Total | | 19640986 | 1095809 | 100.000 |

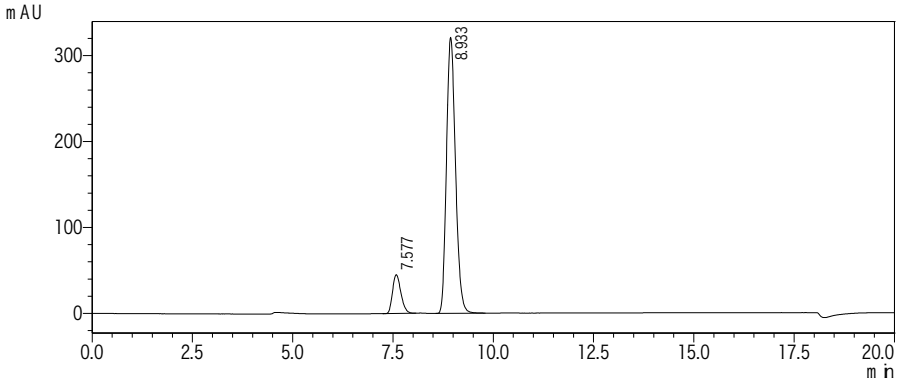



**10b**



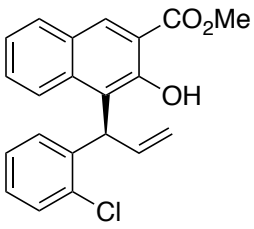

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 8.061 | 1997345 | 179021 | 50.150 |
| 2 | 8.828 | 1985389 | 291262 | 49.850 |
| Total | | 3982733 | 470284 | 100.000 |

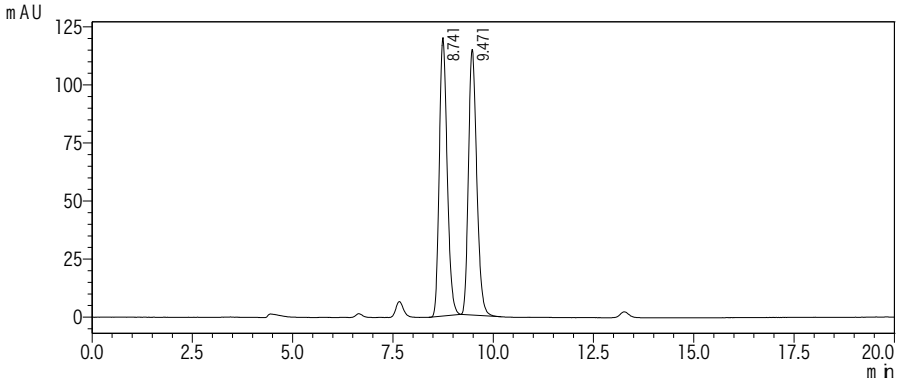



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.577 | 657155 | 45296 | 11.541 |
| 2 | 8.933 | 5036932 | 321359 | 88.459 |
| Total | | 5694086 | 366655 | 100.000 |

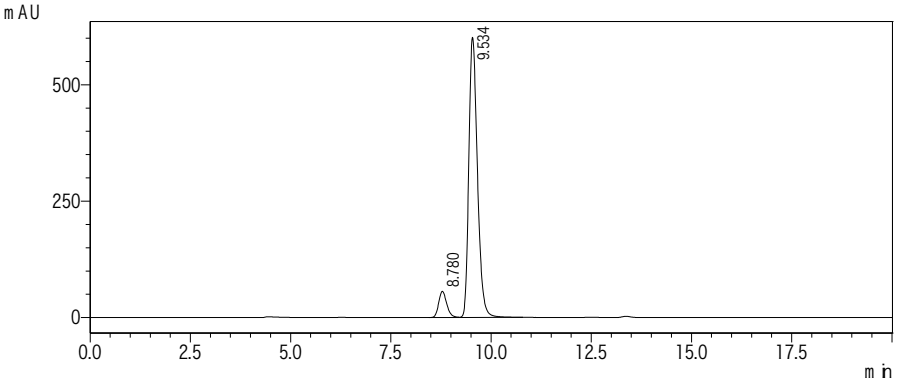



**10c**



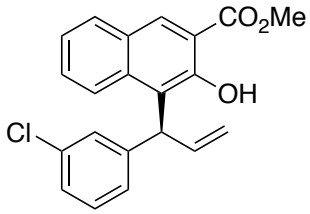

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 8.741 | 1638190 | 119905 | 49.861 |
| 2 | 9.471 | 1647322 | 114375 | 50.139 |
| Total | | 3285512 | 234280 | 100.000 |

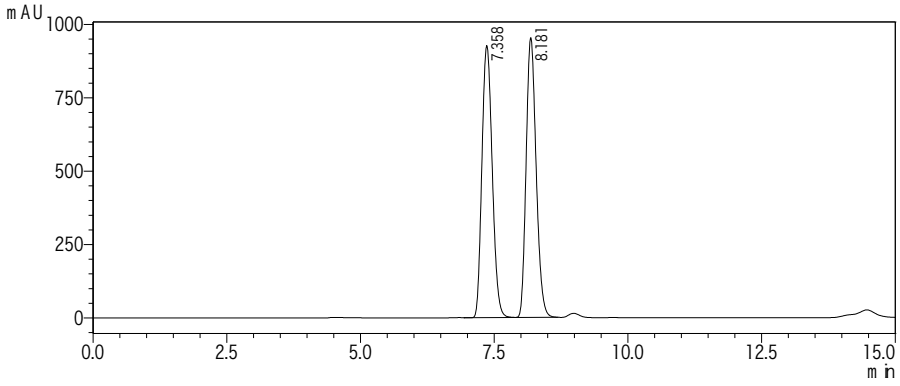



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 8.780 | 783072 | 56072 | 8.026 |
| 2 | 9.534 | 8973764 | 601833 | 91.974 |
| Total | | 9756837 | 657905 | 100.000 |

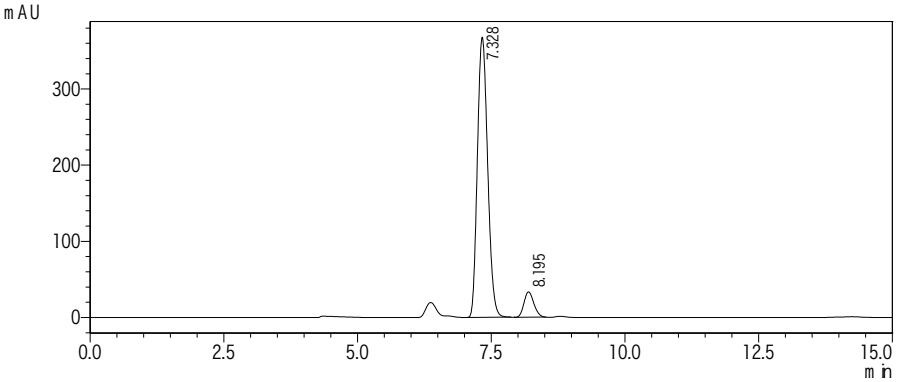



**10d**



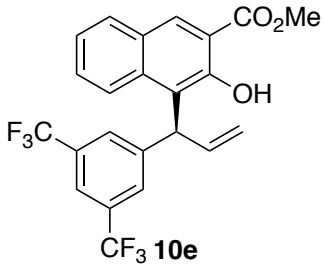

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.358 | 12423427 | 926617 | 50.080 |
| 2 | 8.181 | 12383658 | 952985 | 49.920 |
| Total | | 24807085 | 1879603 | 100.000 |

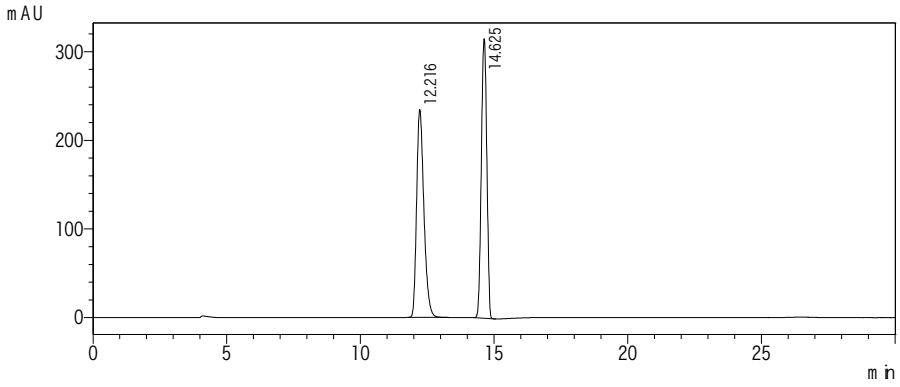



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.328 | 4906332 | 367718 | 92.016 |
| 2 | 8.195 | 425716 | 33235 | 7.984 |
| Total | | 5332048 | 400953 | 100.000 |

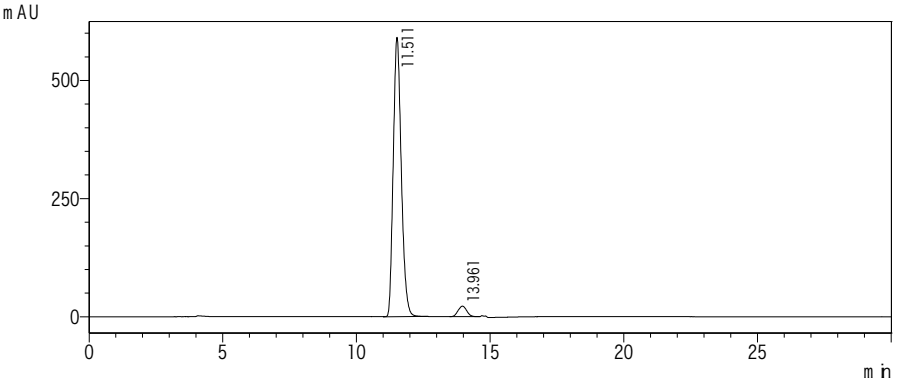



**10e**



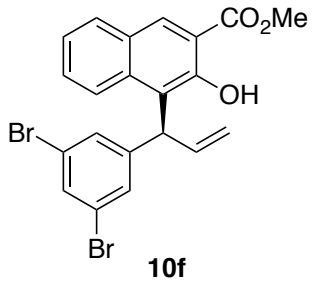

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 12.216 | 4439452 | 234796 | 49.744 |
| 2 | 14.625 | 4485228 | 315426 | 50.256 |
| Total | | 8924680 | 550222 | 100.000 |

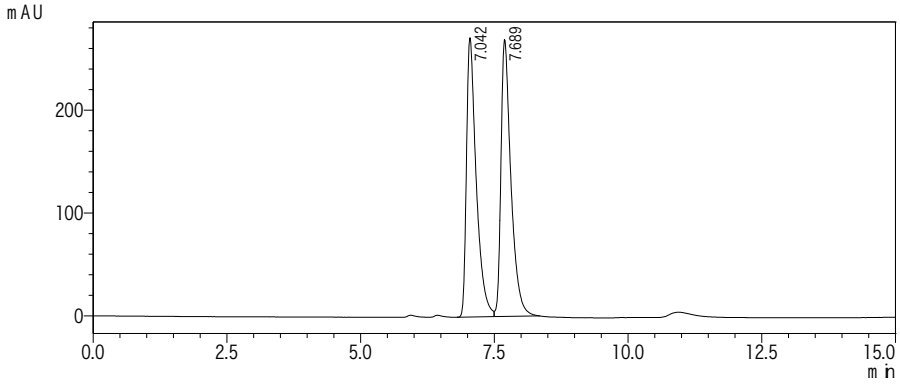



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 11.511 | 12321093 | 591298 | 96.105 |
| 2 | 13.961 | 499349 | 22245 | 3.895 |
| Total | | 12820442 | 613543 | 100.000 |

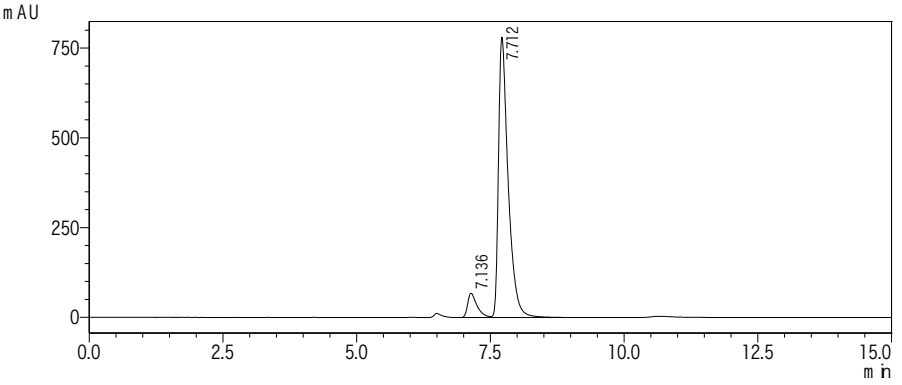



**10f**



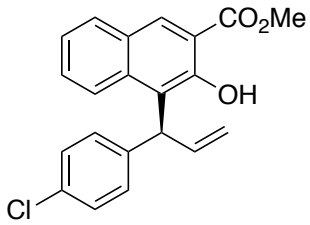

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.042 | 3445932 | 271750 | 49.660 |
| 2 | 7.689 | 3493114 | 269283 | 50.340 |
| Total | | 6939046 | 541033 | 100.000 |

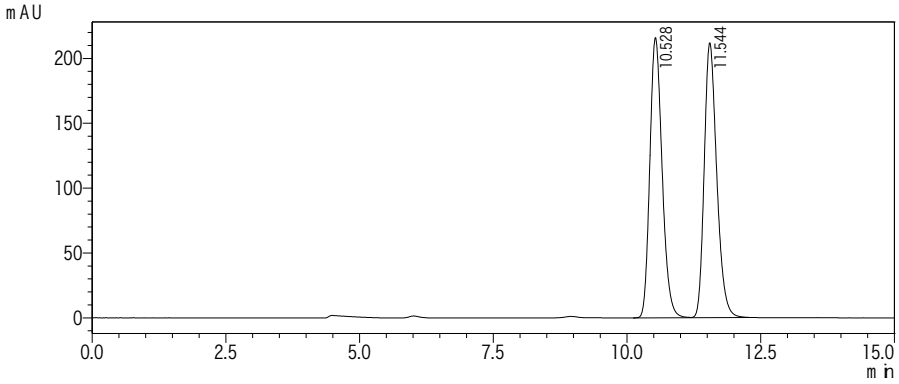



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.136 | 827194 | 67898 | 7.765 |
| 2 | 7.712 | 9825733 | 780683 | 92.235 |
| Total | | 10652927 | 848582 | 100.000 |

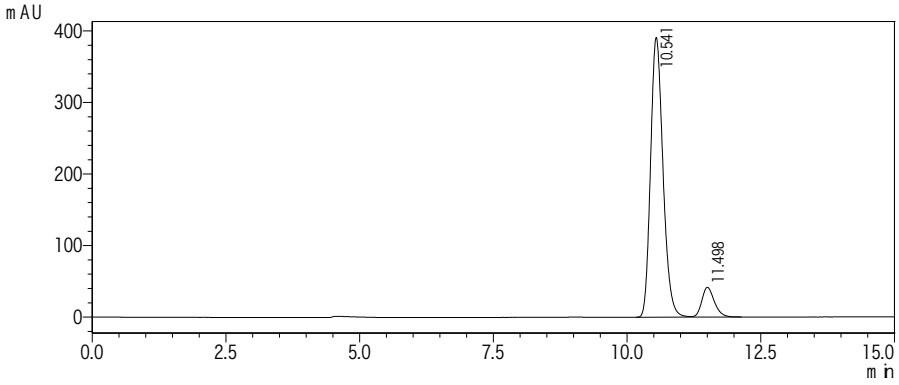



**10g**



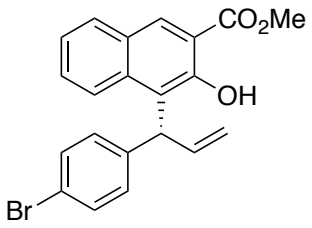

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 10.528 | 3455434 | 215984 | 50.072 |
| 2 | 11.544 | 3445527 | 211942 | 49.928 |
| Total | | 6900962 | 427926 | 100.000 |

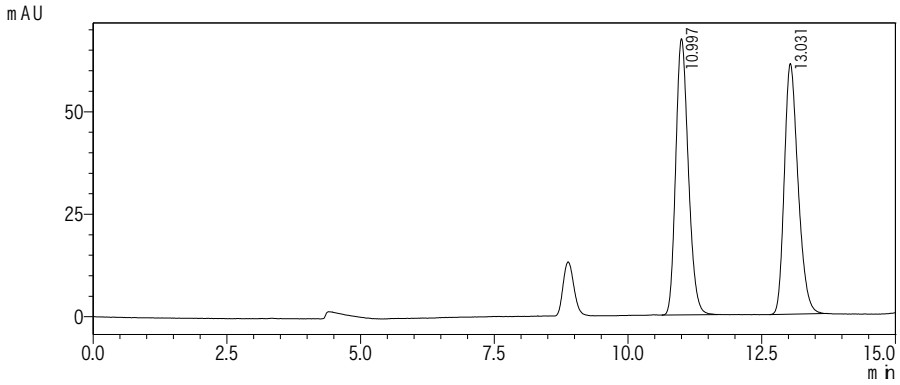



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 10.541 | 6338516 | 391398 | 90.320 |
| 2 | 11.498 | 679310 | 41605 | 9.680 |
| Total | | 7017826 | 433003 | 100.000 |

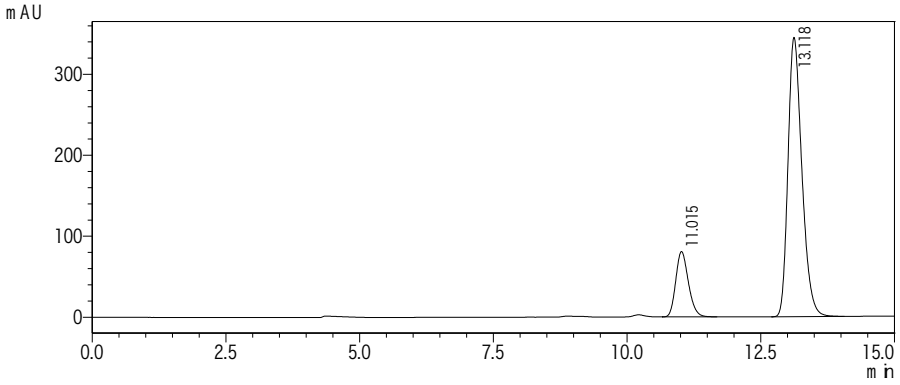



**10h**



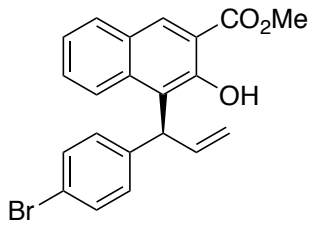

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 10.997 | 1099679 | 67374 | 50.178 |
| 2 | 13.031 | 1091889 | 61181 | 49.822 |
| Total | | 2191568 | 128555 | 100.000 |

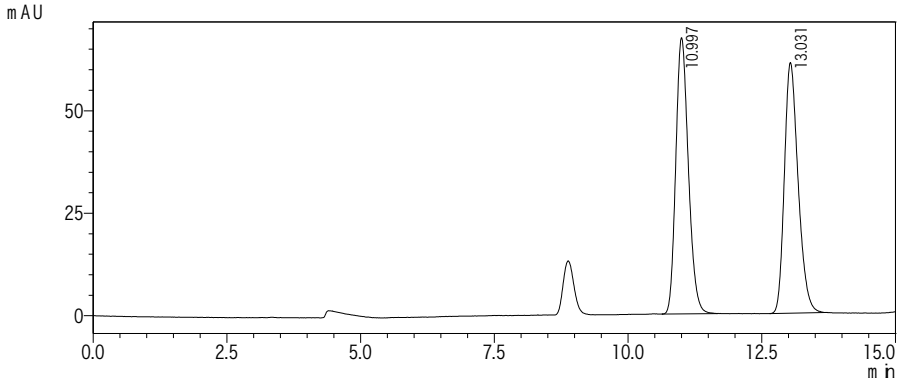



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 11.015 | 1325381 | 80812 | 17.530 |
| 2 | 13.118 | 6235105 | 345193 | 82.470 |
| Total | | 7560485 | 426005 | 100.000 |

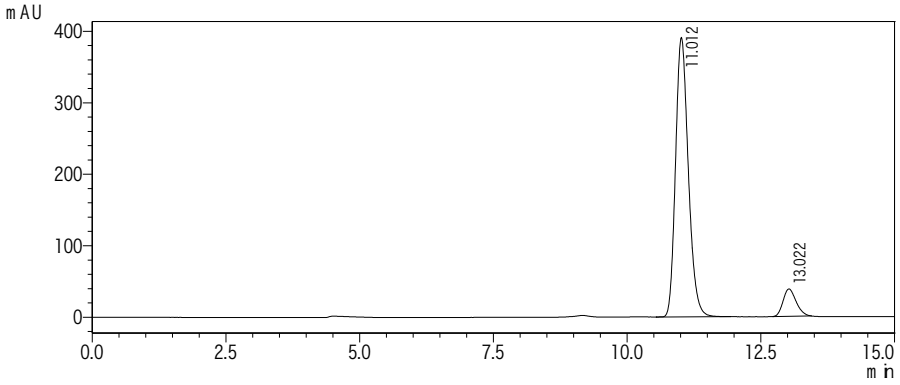



**10h**



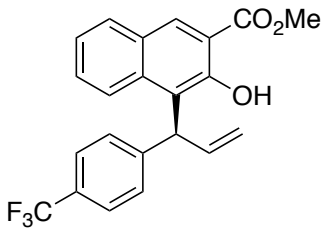

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 10.997 | 1099679 | 67374 | 50.178 |
| 2 | 13.031 | 1091889 | 61181 | 49.822 |
| Total | | 2191568 | 128555 | 100.000 |

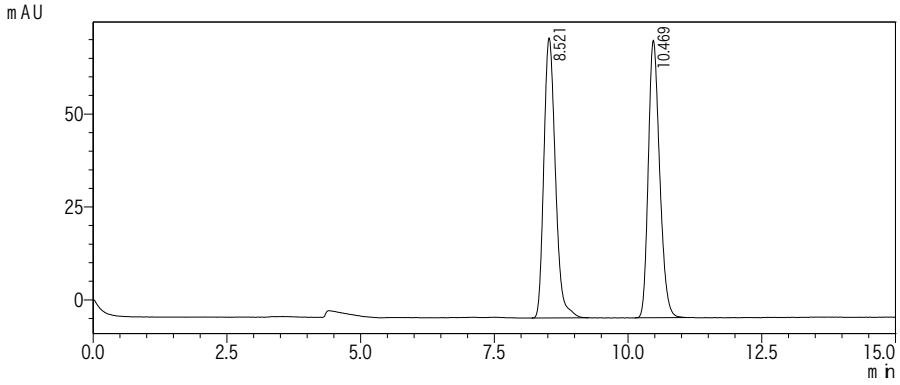



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 11.012 | 6483706 | 391231 | 90.932 |
| 2 | 13.022 | 646595 | 38338 | 9.068 |
| Total | | 7130301 | 429569 | 100.000 |

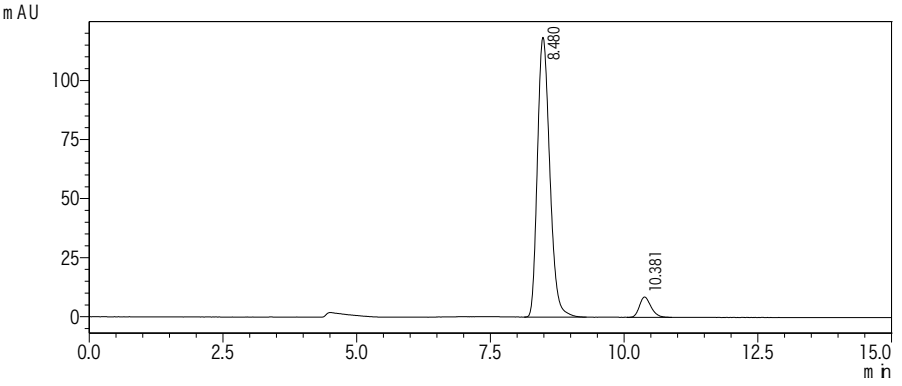



**10i**



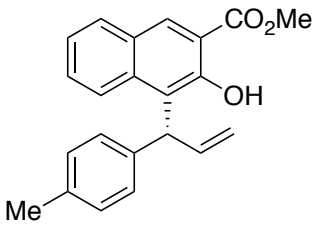

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 8.521 | 1129462 | 75404 | 50.634 |
| 2 | 10.469 | 1101162 | 74712 | 49.366 |
| Total | | 2230624 | 150116 | 100.000 |

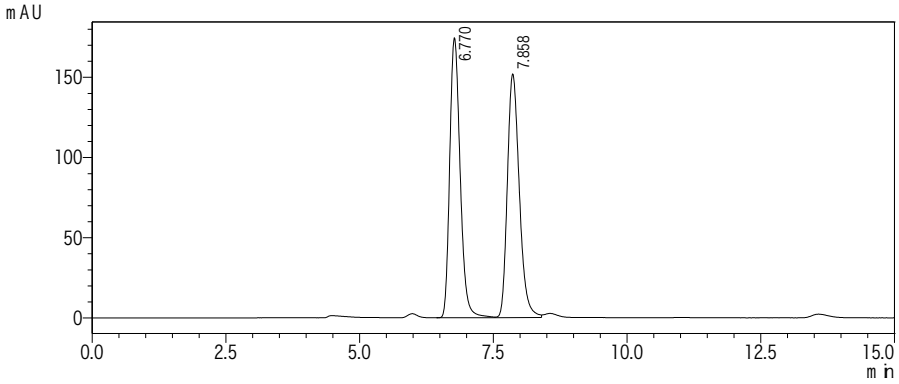



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 8.480 | 1899966 | 118453 | 93.637 |
| 2 | 10.381 | 129109 | 8622 | 6.363 |
| Total | | 2029075 | 127074 | 100.000 |

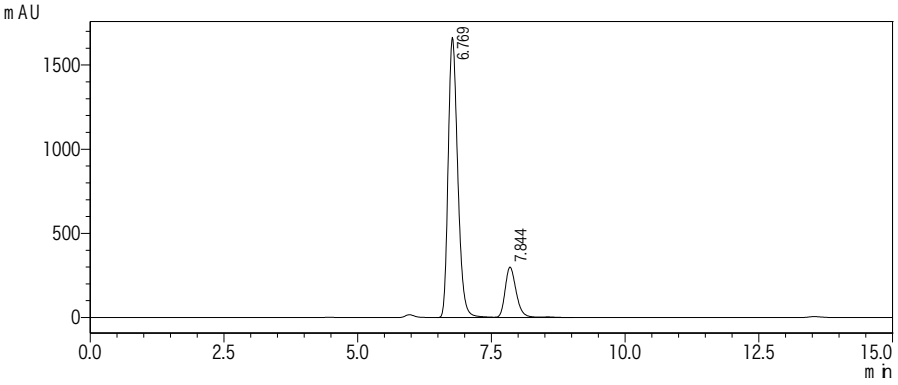



**10j**



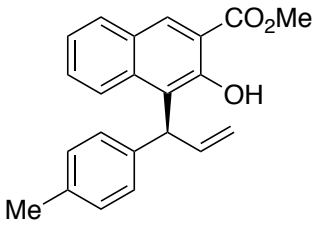

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.770 | 2377804 | 174593 | 50.123 |
| 2 | 7.858 | 2366101 | 152002 | 49.877 |
| Total | | 4743905 | 326595 | 100.000 |

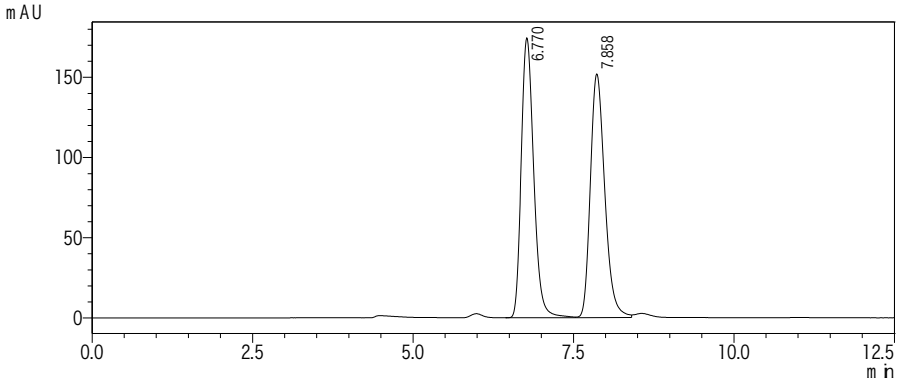



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.769 | 20709941 | 1665211 | 82.617 |
| 2 | 7.844 | 4357416 | 299935 | 17.383 |
| Total | | 25067357 | 1965145 | 100.000 |

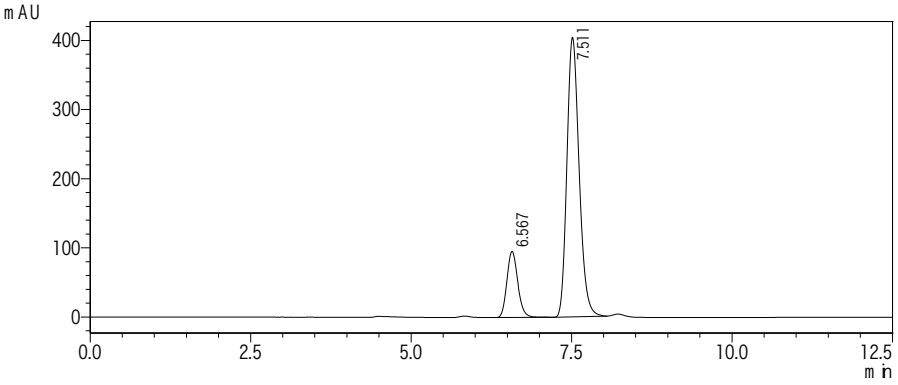



**10j**



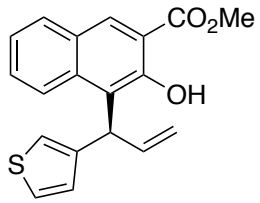

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.770 | 2377804 | 174593 | 50.123 |
| 2 | 7.858 | 2366101 | 152002 | 49.877 |
| Total | | 4743905 | 326595 | 100.000 |

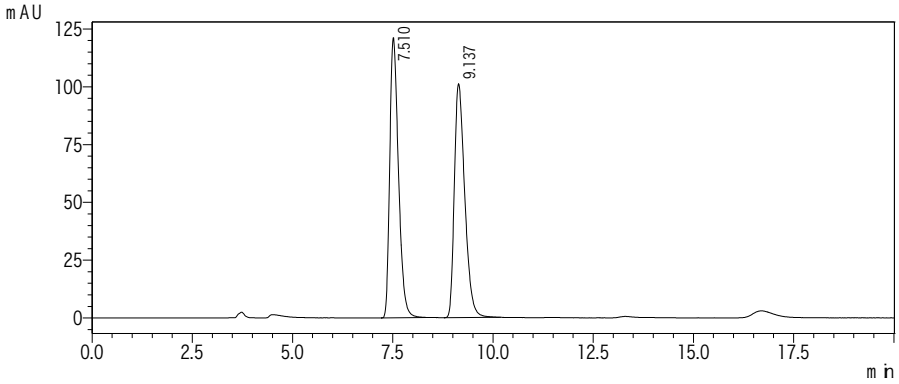



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.567 | 1143788 | 95863 | 17.637 |
| 2 | 7.511 | 5341348 | 404471 | 82.363 |
| Total | | 6485136 | 500334 | 100.000 |

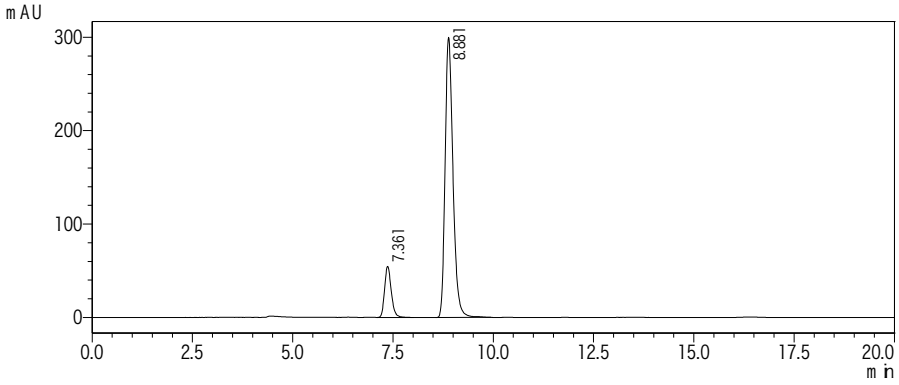



**10k**



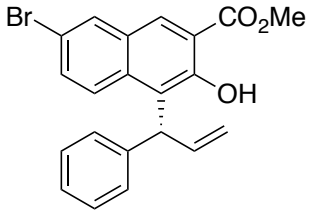

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.510 | 1830279 | 121179 | 50.035 |
| 2 | 9.137 | 1827752 | 101160 | 49.965 |
| Total | | 3658032 | 222339 | 100.000 |

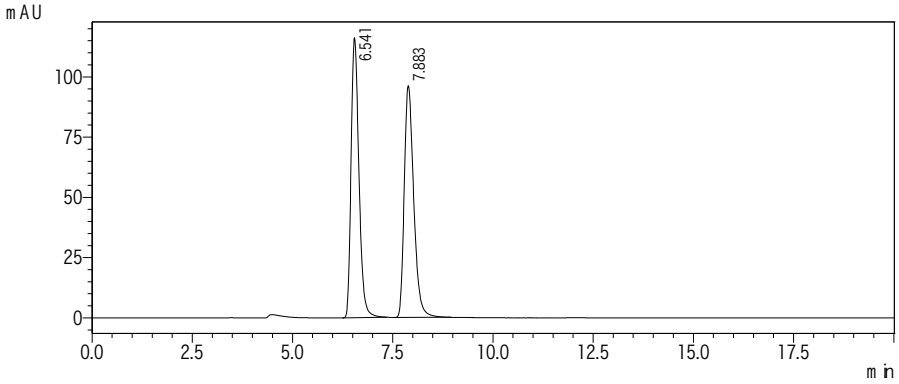



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.361 | 630797 | 54647 | 13.333 |
| 2 | 8.881 | 4100340 | 300076 | 86.667 |
| Total | | 4731137 | 354723 | 100.000 |

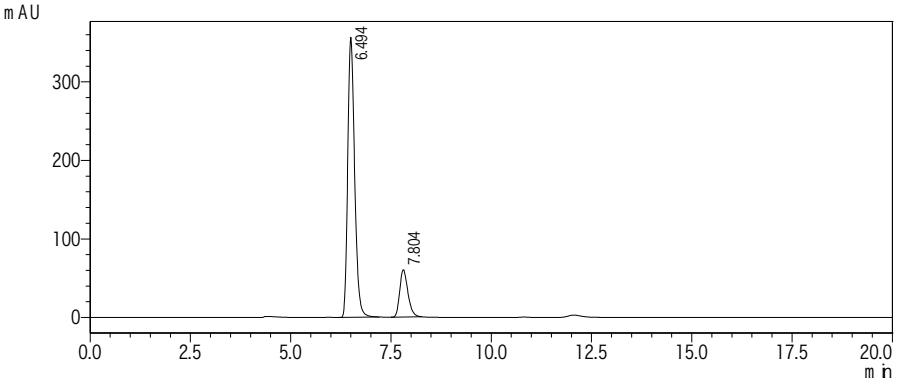



**10l**



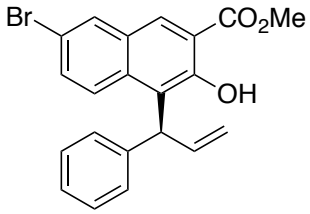

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.541 | 1580415 | 116227 | 49.994 |
| 2 | 7.883 | 1580766 | 96156 | 50.006 |
| Total | | 3161181 | 212383 | 100.000 |

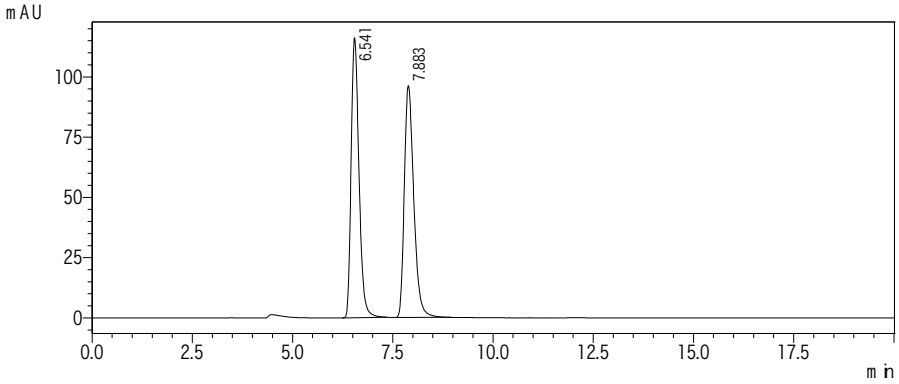



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.494 | 4255219 | 356821 | 83.307 |
| 2 | 7.804 | 852682 | 60325 | 16.693 |
| Total | | 5107901 | 417146 | 100.000 |

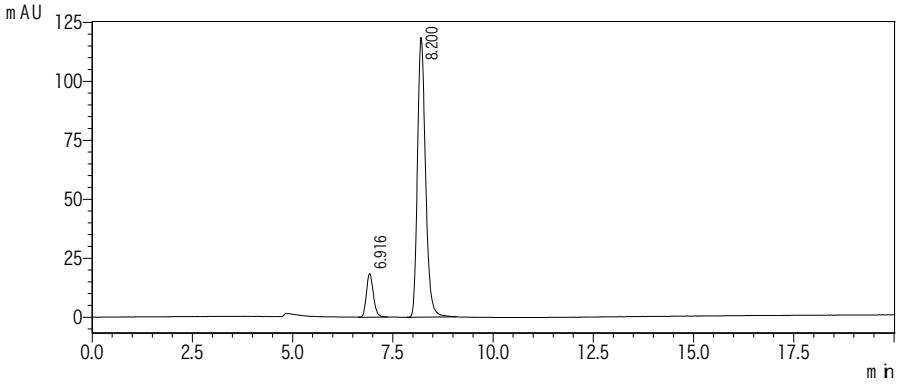



**10l**



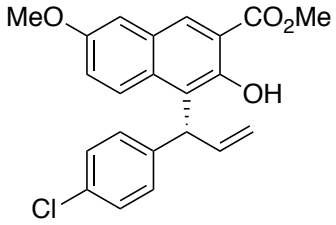

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.541 | 1580415 | 116227 | 49.994 |
| 2 | 7.883 | 1580766 | 96156 | 50.006 |
| Total | | 3161181 | 212383 | 100.000 |

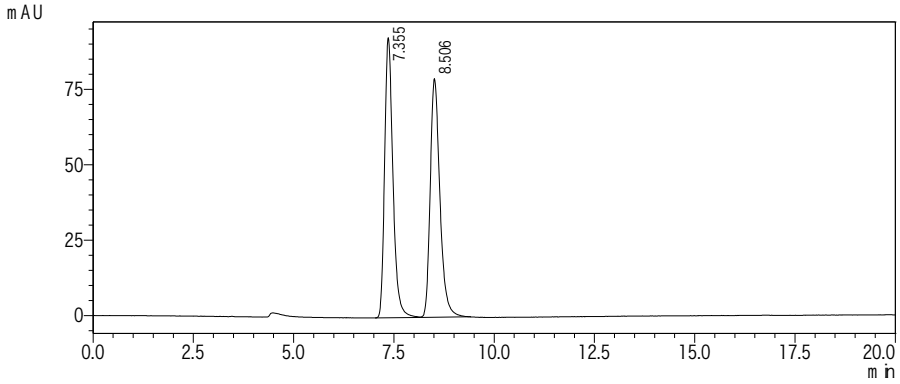



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 6.916 | 221085 | 18451 | 11.698 |
| 2 | 8.200 | 1668802 | 118700 | 88.302 |
| Total | | 1889887 | 137151 | 100.000 |

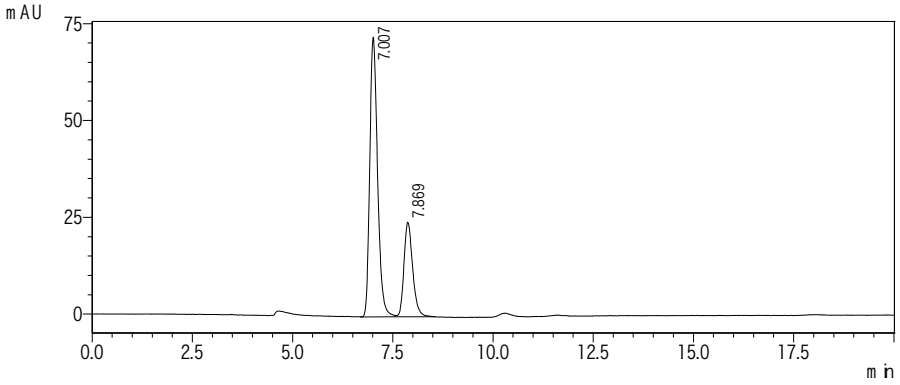



**10m**



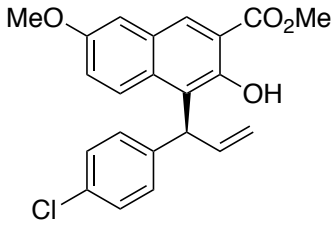

PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.355 | 1338527 | 92841 | 50.221 |
| 2 | 8.506 | 1326755 | 79053 | 49.779 |
| Total | | 2665282 | 171894 | 100.000 |

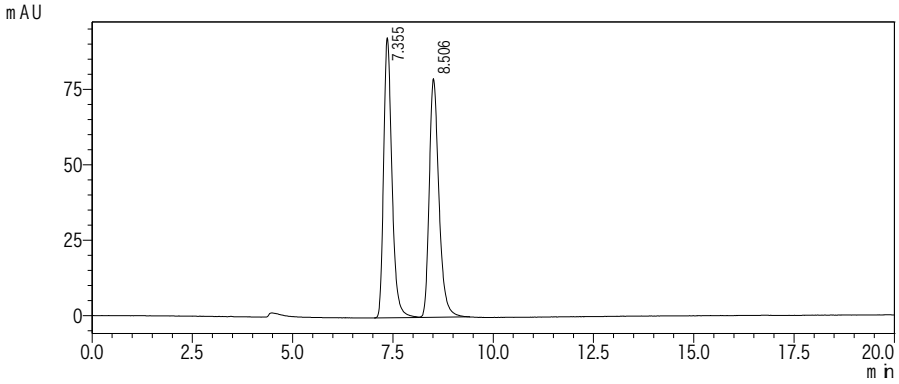



PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.007 | 977828 | 72224 | 72.510 |
| 2 | 7.869 | 370720 | 24446 | 27.490 |
| Total | | 1348548 | 96670 | 100.000 |

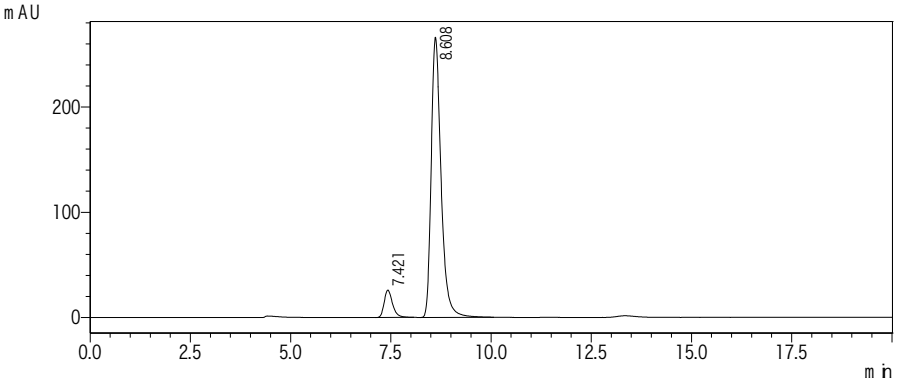



**10m**




PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.355 | 1338527 | 92841 | 50.221 |
| 2 | 8.506 | 1326755 | 79053 | 49.779 |
| Total | | 2665282 | 171894 | 100.000 |




PDA Ch1 240nm

| Peak No. | RT (min) | Area | Height | % Area |
|---|---|---|---|---|
| 1 | 7.421 | 377228 | 26062 | 7.658 |
| 2 | 8.608 | 4548610 | 266246 | 92.342 |
| Total | | 4925838 | 292308 | 100.000 |