# Supplementary information

## Synthesis, cytotoxic evaluation and DNA binding study of 9-fluoro-*6H*-indolo[2,3-*b*]quinoxaline derivatives

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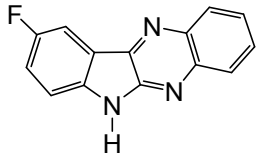
## 1. Experimental Section

### 1.1. Synthesis of 9-Fluoro-*6H*-indolo[2,3-*b*]quinoxaline (2a)

*9-Fluoro-6H-indolo-[2,3-b]quinoxaline*

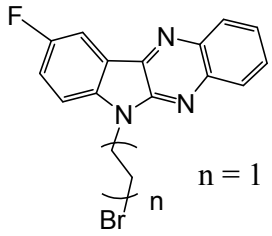



Yellow solid, Yield: 92% (8.6 g); m.p. >250 ℃; IR (KBr, $cm^{-1}$): 1585 (C=N), 1483 (C-C, Ar), 1280 (C-F), 805 (C-H, Ar); $^1H$ NMR (600 MHz, DMSO-$d_6$, 298 K): δ 12.09 (s, 1H, -NH), 8.27 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.15 (dd, $J_1$ = 7.8 Hz, $J_2$ = 1.8 Hz, 1H, Ar-H), 8.10 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.84 (t, J = 7.8 Hz, 1H, Ar-H), 7.75 (t, $J$ = 7.8 Hz, 1H, Ar-H), 7.62-7.58 (m, 2H, Ar-H); ESI-

MS: m/z 240.2 $[M+H]^+$.

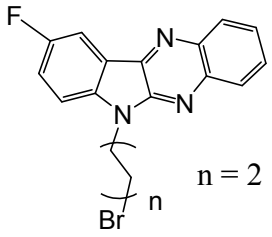
**1.2. Synthesis of compounds 3 serials**

*6-(2-Bromoethyl)-9-fluoro-6H-indolo[2,3-b]quinoxaline (**3-1**)*




Light yellow solid, yield 80%; m.p. 175-176 ℃; IR (KBr, $cm^{-1}$): 2940, 2845 (C-H, alkyl), 1585 (C=N), 1483 (C-C, Ar), 1280 (C-F), 805 (C-H, Ar); $^1H$ NMR (600 MHz, DMSO-$d_6$): δ 8.30 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.16 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.13 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.79 (td, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.72 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.50 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 7.45 (td, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.87 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.89 (t, $J$ = 7.2 Hz, 2H, -$CH_2$); $^{13}C$ NMR (150 MHz, $CDCl_3$): δ 158.16 (d, $^1J_{CF}$ = 238.5 Hz), 145.63, 140.62, 140.22, 139.50, 139.24, 129.42 (d, $^2J_{CF}$ = 19.5 Hz), 127.85, 126.53, 120.33 (d, $^3J_{CF}$ = 9.0 Hz), 118.52 (d, $^2J_{CF}$ = 25.5 Hz),110.30 (d, $^3J_{CF}$ = 9.0 Hz), 108.97, 108.81, 43.38, 28.39; ESI-MS: m/z 344.3 $[M+H]^+$.

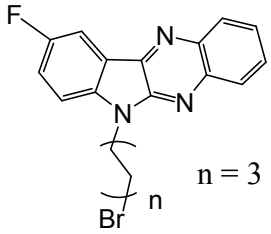
*6-(2-Bromobutyl)-9-fluoro-6H-indolo[2,3-b]quinoxaline (**3-2**)*




Light yellow solid, yield 73% ; m.p. 145.9-146.6 ℃; IR (KBr, cm-1): 2921, 2779 (C-H, alkyl), 1629 (C-C, Ar), 1497 (C=N), 1289 (C-F), 841 (C-H, Ar); $^1H$ NMR (600MHz, $CDCl_3$): δ 8.29 (dd, $J_1$ = 8.4 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 8.15 (dd, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.13

(d, $J$ = 8.4 Hz, 1H, Ar-H), 7.80 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.70 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.43-7.45 (m, 2H), 4.54 (t, $J$ = 6.6 Hz, 2H, -$CH_2$), 3.51 (t, $J$ = 6.6 Hz, 2H, -$CH_2$), 2.15 (qui, $J$ = 6.6 Hz, 2H, -$CH_2$), 1.96 (qui, $J$ = 6.6 Hz, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 158.05 (d, $^1J_{CF}$ = 238.5 Hz), 146.05, 140.79, 140.30, 139.24, 139.21, 129.43, 129.20, 127.84, 126.23, 120.24 (d, $^3J_{CF}$ = 9.0 Hz), 118.53 (d, $^2J_{CF}$ = 24.0 Hz), 110.15 (d, $^3J_{CF}$ = 9.0 Hz), 108.94 (d, $^2J_{CF}$ = 24.0 Hz), 40.49, 32.94, 29.81, 27.02; ESI-MS: m/z 372.1 $[M+H]^+$.

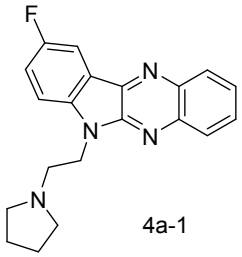
*6-(2-Bromohexyl)-9-fluoro-6H-indolo[2,3-b]quinoxaline (**3-3**)*




Light yellow solid, yield 78%; m.p. 97.3-97.6 ℃; IR (KBr, $cm^{-1}$): 2935, 2867 (C-H, alkyl), 1587 (C=N), 1489 (C-C, Ar), 1281 (C-F), 809 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$): δ 8.31 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.19 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.15 (dd, $J_1$ = 7.8 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 7.78 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.70 (td, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.40-7.46 (m, 2H , Ar-H), 4.50 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.38 (t, $J$ = 6.6 Hz, 2H, -$CH_2$), 1.97 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.83 (qui, $J$ = 6.6 Hz, 2H, -$CH_2$) ,1.56 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.44 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 157.96 (d, $^1J_{CF}$ = 238.5 Hz), 146.07, 140.86, 140.49, 139.28 (d, $^4J_{CF}$ = 3.8 Hz), 139.21, 129.43, 129.12, 127.85, 126.12, 120.16 (d, $^3J_{CF}$ = 9.0 Hz), 118. 43 (d, $^2J_{CF}$ = 25.5 Hz), 110.17 (d, $^3J_{CF}$ = 9.0 Hz), 108.85 (d, $^2J_{CF}$ = 24.0 Hz), 41.35, 33.66, 32.56, 28.29, 27.77, 26.16; ESI-MS: m/z 401.2$[M+H]^+$.

**1.3. Synthesis of compounds 4 serials**

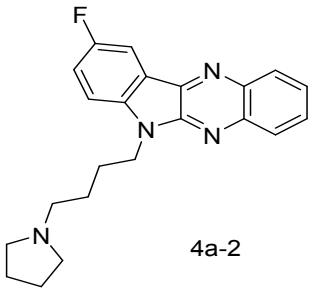
*9-Fluoro-6-(2-(pyrrolidin-1-yl)ethyl)-6H-indolo[2,3-b]quinoxaline (**4a-1**)*



4a-1

Light yellow solid, yield 88%; m.p. 114.7-115.7 ℃; IR (KBr, $cm^{-1}$): 2945, 2857 (C-H, alkyl), 1583 (C=N), 1487 (C-C, Ar), 1278 (C-F), 856 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$): δ 8.29 (dd, $J_1$ =8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.16 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.14 (dd, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 7.77 (td, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.69 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.48 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 7.43 (td, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.64 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.00 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.68 (t, $J$ = 6.6 Hz, 4H, -$CH_2$), 1.78-1.81 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 158.08 (d, $^1J_{CF}$ = 238.5 Hz), 146.40, 140.77, 140.32, 139.41 (d, $^4J_{CF}$ = 3.3 Hz), 139.33, 129.53, 129.32, 127.67, 126.27, 120.39 (d, $^3J_{CF}$ = 9.0 Hz), 118.52 (d, $^2J_{CF}$ = 25.5 Hz), 110.18 (d, $^3J_{CF}$ = 8.0 Hz), 108.96 (d, $^2J_{CF}$ = 24.0 Hz), 55.39, 54.32, 49.01, 39.03; HRMS (ESI) m/z calcd for $C_{20}H_{19}FN_4$: 335.1666, $[M+H]^+$, found: 335.1664.

*9-Fluoro-6-(2-(pyrrolidin-1-yl)butyl)-6H-indolo[2,3-b]quinoxaline (**4a-2**)*

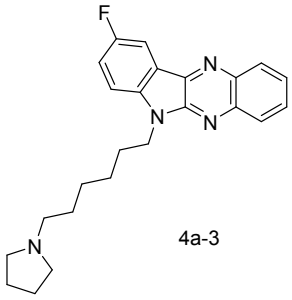


4a-2

Light yellow solid, yield 59%, ; m.p. 40.8-42.6 ℃; IR (KBr, $cm^{-1}$): 2947, 2874 (C-H, alkyl), 1584 (C=N), 1489 (C-C, Ar), 1273 (C-F), 841 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$): δ 8.23 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.07-8.10 (m, 2H, Ar-H),7.72 (td, $J_1$ =7.2 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.66

(td, $J_1$ =7.2 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.34-7.36 (m, 2H, Ar-H), 4.43 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.48 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.41-2.43 (m, 4H, -$CH_2$), 1.95 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.69-1.73 (m, 4H, -$CH_2$), 1.56 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 158.01 (d, $^1J_{CF}$ = 238.5 Hz), 146.07, 140.80, 140.42, 139.36 (d, $^4J_{CF}$ = 4.5 Hz), 139.27, 129.49, 129.11, 127.75, 126.10, 120.19 (d, $^3J_{CF}$ = 9.0 Hz), 118.49 (d, $^2J_{CF}$ = 25.5 Hz), 110.29 (d, $^3J_{CF}$ = 9.0 Hz), 108.81 (d, $^2J_{CF}$ = 24.0 Hz), 55.55, 53.89, 41.18, 26.38, 25.49, 23.37; HRMS (ESI) m/z calcd for $C_{22}H_{23}FN_4$ : 363.1979, $[M+H]^+$ ,found: 363.1975.

*9-Fluoro-6-(2-(pyrrolidin-1-yl)hexyl)-6H-indolo[2,3-b]quinoxaline (**4a-3**)*

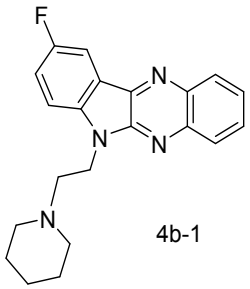



4a-3

Light yellow solid, yield 61%, ; m.p. 91.0-93.8 ℃; IR (KBr, $cm^{-1}$): 2945, 2872 (C-H, alkyl), 1586 (C=N), 1482 (C-C, Ar), 1281 (C-F), 845 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$): δ 8.28 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.18 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.13 (d, $J$ = 7.8 Hz, 1H, Ar-H), 7.77 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.68 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.40-7.45 (m, 2H, Ar-H), 4.48 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.56 (br s, 4H, -$CH_2$), 2.46 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.95 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.78-1.80 (m, 4H, -$CH_2$), 1.54 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.38-1.45 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 159.91 (d, $^1J_{CF}$ = 238.5 Hz), 146.05, 140.88, 140.54, 139.33 (d, $^4J_{CF}$ = 4.5 Hz), 129.43, 129.05, 127.86, 126.03, 120.12 (d, $^3J_{CF}$ = 9.0 Hz), 118.36 (d, $^2J_{CF}$ = 25.1 Hz), 110.23 (d, $^3J_{CF}$ = 9.0 Hz), 108.77 (d, $^2J_{CF}$ = 24.0 Hz), 56.51, 54.21, 41.51, 28.91, 28.38, 27.33, 26.98, 23.37; HRMS (ESI) m/z calcd for $C_{24}H_{27}FN_4$: 391.2292,

[M+H]$^+$, found: 391.2287.

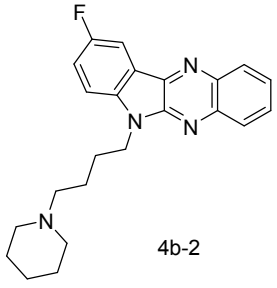
*9-Fluoro-6-(2-(piperidin-1-yl)ethyl)-6H-indolo[2,3-b]quinoxaline (**4b-1**)*




4b-1

Light yellow solid, yield 68%; m.p. 156.7-157.9 ℃; IR (KBr, cm$^{-1}$): 2937, 2857 (C-H, alkyl), 1587 (C=N), 1485 (C-C, Ar), 1281 (C-F), 805 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$): δ 8.28 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.14 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.12 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.76 (td, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.68 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.48 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 7.42 (td, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.61 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.81 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.54 (br s, 4H, -$CH_2$), 1.54 (qui, $J$ = 6.6 Hz, 4H, -$CH_2$), 1.46-1.38 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 157.95 (d, $^1J_{CF}$ = 240 Hz), 146.05, 140.86, 140.71, 139.41 (d, $^4J_{CF}$ = 3.8 Hz), 139.24, 129.41, 129.04, 127.91, 126.07, 120.14 (d, $^3J_{CF}$ = 9.0 Hz), 118.35 (d, $^2J_{CF}$ = 25.5 Hz), 110.51 (d, $^3J_{CF}$ = 9.0 Hz), 108.67 (d, $J$ = 24.0 Hz), 56.72, 54.93, 39.58, 25.95, 24.23; HRMS (ESI) m/z calcd for $C_{21}H_{21}FN_4$: 349.1823, [M+H]$^+$, found: 349.1820.

*9-Fluoro-6-(2-(piperidin-1-yl)butyl)-6H-indolo[2,3-b]quinoxaline (**4b-2**)*

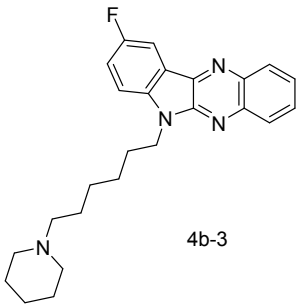



4b-2

Light yellow solid, yield 89%; m.p. 125.2-127.3 ℃; IR (KBr, cm$^{-1}$): 2950, 2852 (C-H, alkyl),

1583 (C=N), 1487 (C-C, Ar), 1277 (C-F), 766 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$): δ 8.29 (dd, $J_1$ = 8.4 Hz, $J_2$ = 0.6Hz, 1H, Ar-H), 8.16 (dd, $J_1$ = 7.8 Hz, $J_2$ = 1.8 Hz, 1H, Ar-H), 8.13(dd, $J_1$ = 8.4 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 7.77 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.68 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.45 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 7.43 (td, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.51 (t, $J$ = 7.2 Hz, 2H, -$CH_2$ ), 2.36 (t, $J$ = 7.8 Hz, 2H, -$CH_2$ ), 2.33-2.34 (br s, 4H, -$CH_2$), 1.97 (qui, $J$ = 6.6 Hz, 2H, -$CH_2$), 1.61 (qui, $J$ = 7.8 Hz, 2H, -$CH_2$), 1.54 (qui, $J$ = 5.4 Hz, 4H, -$CH_2$), 1.39-1.41 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 157.96 (d, $^1J_{CF}$ = 240.0 Hz), 146.06, 140.86, 140.52, 139.39 (d, $^4J_{CF}$ = 4.5 Hz), 139.22, 129.46, 129.11, 127.83, 126.09, 120.15 (d, $^3J_{CF}$ = 9.0 Hz), 118.42 (d, $^2J_{CF}$ = 25.5 Hz), 110.37 (d, $^3J_{CF}$ = 9.0 Hz), 108.81 (d, $^2J_{CF}$ = 24.0 Hz), 58.66, 54.57, 41.35, 26.47, 25.81, 24.33, 24.15; HRMS (ESI) m/z calcd for $C_{23}H_{25}FN_4$: 377.2136, $[M+H]^+$, found: 377.2134.

*9-Fluoro-6-(2-(piperidin-1-yl)hexyl)-6H-indolo[2,3-b]quinoxaline (**4b-3**)*

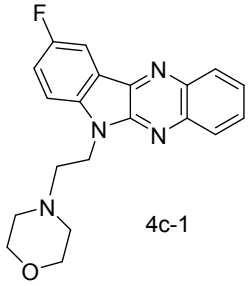



4b-3

Light yellow solid, yield 82%; m.p. 85.4-87.3 ℃; IR (KBr, $cm^{-1}$): 2934, 2856 (C-H, alkyl), 1579 (C=N), 1482 (C-C, Ar), 1276 (C-F), 802 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$) : δ 8.29 (dd, $J_1$ = 8.4 Hz, $J_2$ =0.6 Hz, 1H, Ar-H), 8.16 (dd, $J_1$ = 7.8 Hz, $J_2$ =1.8 Hz, 1H, Ar-H), 8.13 (dd, $J_1$ = 7.8 Hz, $J_2$ =0.6 Hz, 1H, Ar-H), 7.77 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H)), 7.68 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.42-7.45 (m, 2H, Ar-H), 4.48 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.31 (br s, 4H, -$CH_2$), 2.23 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.95 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.55 (qui, $J$ = 6.0 Hz, 4H, -

$CH_2$), 1.35-1.49 (m, 8H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 157.94 (d, $^1J_{CF}$ = 240.0 Hz), 146.08, 140.89, 140.56, 139.36 (d, $^4J_{CF}$ = 4.5 Hz), 139.22, 129.44, 129.07, 127.87, 126.05, 120.14 (d, $^3J_{CF}$ = 9.0 Hz), 118.38 (d, $^2J_{CF}$ = 25.5 Hz), 110.25 (d, $^3J_{CF}$ = 9.0 Hz), 108.79 (d, $^2J_{CF}$ = 24.0 Hz), 59.42, 54.61, 41.52, 28.39, 27.35, 26.97, 26.74, 25.92, 24.44; HRMS (ESI) m/z calcd for $C_{25}H_{29}FN_4$: 405.2449, $[M+H]^+$, found: 405.2441.

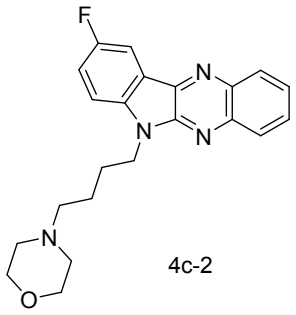
*4-(2-(9-Fluoro-6H-indolo[2,3-b]quinoxalin-6-yl)ethyl)morpholine (**4c-1**)*



4c-1

Light yellow solid, yield 69%; m.p. 162.7-163.3 ℃; IR (KBr, $cm^{-1}$): 2931, 2854 (C-H, alkyl), 1584 (C=N), 1489 (C-C, Ar), 1284 (C-F), 809 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$): δ 8.29 (dd, $J_1$ =7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.16 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.11 (dd, $J_1$ = 7.8 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 7.77 (td, $J_1$ =7.2 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.69 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.41-7.47 (m, 2H, Ar-H), 4.62 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.61 (t, $J$ = 4.2 Hz, 4H, -$CH_2$), 2.86 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.60 (br s, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 158.01 (d, $^1J_{CF}$ = 240.0 Hz), 146.19, 140.81, 140.51, 139.38 (d, $^4J_{CF}$ = 4.5 Hz), 139.30, 129.46, 129.15, 127.82, 126.18, 120.31 (d, $^3J_{CF}$ = 9.0 Hz), 118.38 (d, $^2J_{CF}$ = 25.5 Hz), 110.29 (d, $^3J_{CF}$ = 9.0 Hz), 108.83 (d, $^2J_{CF}$ = 24.0 Hz), 66.86, 56.39, 53.83, 39.13; HRMS (ESI) m/z calcd for $C_{20}H_{19}FN_4O$: 351.1615, $[M+H]^+$, found: 351.1613.

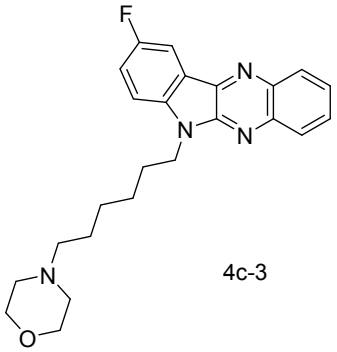
*4-(2-(9-Fluoro-6H-indolo[2,3-b]quinoxalin-6-yl)butyl)morpholine (**4c-2**)*



4c-2

Light yellow liquid, yield 83%; IR (KBr, $cm^{-1}$): 2925, 2872 (C-H, alkyl), 1585 (C=N), 1489 (C-C, Ar), 1294 (C-F), 845 (C-H, Ar); $^1H$ NMR (600 MHz, $CDCl_3$): δ 8.24 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.10 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.07 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.73 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.65 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.33-7.38 (m, 2H, Ar-H), 4.50-4.43 (m, 2H, $-CH_2$), 3.65 (t, $J$ = 4.8 Hz, 4H, $-CH_2$), 2.42-2.32 (m, 6H, $-CH_2$), 1.95 (qui, $J$ = 7.2 Hz, 2H, $-CH_2$), 1.56 (qui, $J$ = 7.2 Hz, 2H, $-CH_2$); $^{13}C$ NMR (150 MHz, $CDCl_3$): δ 157.99 (d, $^1J_{CF}$ = 238.5 Hz), 146.10, 140.85, 140.44, 139.35 (d, $^4J_{CF}$ = 4.5 Hz), 139.27, 129.49, 129.14, 127.79, 126.12, 120.23 (d, $^3J_{CF}$ = 9.0 Hz), 118.40 (d, $^2J_{CF}$ = 25.5 Hz), 110.23 (d, $^3J_{CF}$ = 9.0 Hz), 108.85 (d, $^2J_{CF}$ = 24.0 Hz), 66.77, 58.21, 53.61, 41.24, 26.22, 23.69; HRMS (ESI) m/z calcd for $C_{22}H_{23}FN_4O$: 379.1928, $[M+H]^+$ , found: 379.1923.

*4-(2-(9-Fluoro-6H-indolo[2,3-b]quinoxalin-6-yl)hexyl)morpholine (**4c-3**)*

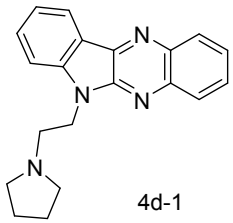


4c-3

Light yellow solid, yield 76%, ; m.p. 102.4-103.9 ℃; IR (KBr, $cm^{-1}$): 2940, 2879 (C-H, alkyl), 1584 (C=N), 1489 (C-C, Ar), 12791 (C-F), 804 (C-H, Ar); $^1H$ NMR (600 MHz, $CDCl_3$, 298 K): δ 8.29 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.17 (dd, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.13 (d, $J$

= 8.4 Hz, 1H, Ar-H), 7.78 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.69 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.41-7.45 (m, 2H, Ar-H), 4.49 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.68 (t, $J$ = 4.8 Hz, 4H, -$CH_2$), 2.38 (br s, 4H, -$CH_2$), 2.27 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.95 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.51-1.36 (m, 6H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 157.87 (d, $^1J_{CF}$ = 240.0 Hz), 145.96, 140.81, 140.42, 139.22 (d, $^4J_{CF}$ = 3.0 Hz), 139.16, 129.41, 129.02, 127.81, 126.01, 120.06 (d, $^3J_{CF}$ = 9.0 Hz), 118.30 (d, $^2J_{CF}$ = 25.5 Hz), 110.14 (d, $^3J_{CF}$ = 9.0 Hz), 108.71 (d, $^2J_{CF}$ = 24.0 Hz), 66.95, 58.97, 53.74, 41.40, 28.36, 27.11, 26.91, 26.39; HRMS (ESI) m/z calcd for $C_{24}H_{27}FN_4O$: 407.2241, $[M+H]^+$, found: 407.2240.

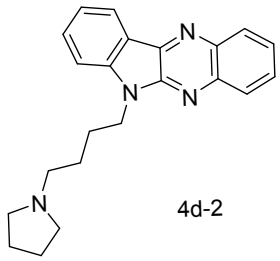
*6-(2-(Pyrrolidin-1-yl)ethyl)-6H-indolo[2,3-b]quinoxaline (**4d-1**)*



4d-1

Light yellow solid, yield 92%, ; m.p. 86.1-87.6 ℃; IR (KBr, $cm^{-1}$):2921, 2842 (C-H, alkyl), 1587 (C=N), 1489 (C-C, Ar), 756 (C-H, Ar); $^1$H NMR (600 MHz, $CDCl_3$, 298 K): δ 8.48 (d, $J$ =7.8 Hz, 1H, Ar-H), 8.40 (dd, $J_1$ = 7.8 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 8.14 (dd, $J_1$ = 8.4 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 7.75 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.66-7.71 (m, 2H, Ar-H), 7.53 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.38 (t, $J$ = 7.8 Hz, 1H, Ar-H), 4.66 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.01 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.69 (br s, 4H, -$CH_2$), 1.80 (br s, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): 145.65, 144.42, 140.65, 140.03, 139.28, 130.90, 129.33, 128.67, 127.81, 125.85, 122.73, 120.78, 119.58, 109.51, 55.59, 54.17, 41.28, 26.47; HRMS (ESI) m/z calcd for $C_{20}H_{20}N_4$: 317.1760, $[M+H]^+$, found: 317.1756.

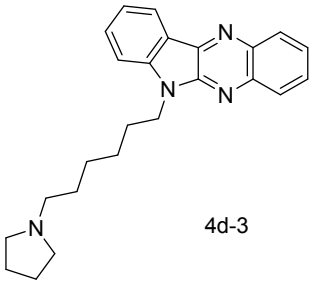
*6-(2-(Pyrrolidin-1-yl)butyl)-6H-indolo[2,3-b]quinoxaline (**4d-2**)*



4d-2

Light yellow solid, yield 93%; m. p. 78.6-79.4 ℃; IR (KBr, $cm^{-1}$): 2923, 2772 (C-H, alkyl), 1584 (C=N), 1489 (C-C, Ar), 754 (C-H, Ar); 1H NMR (600 MHz, $CDCl_3$): δ 8.48 (d, $J$ = 7.8 Hz, 1H, Ar-H), 8.30 (dd, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.13 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.76 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.66-7.70 (m, 2H, Ar-H), 7.49 (d, $J$ = 7.8 Hz, 1H, Ar-H), 7.38 (t, $J$ = 7.8 Hz, 1H, Ar-H), 4.52 (t, $J$ = 7.2 Hz, 2H, $-CH_2$), 2.51 (t, $J$ = 7.2 Hz, 2H, $-CH_2$), 2.45 (br s, 4H, $-CH_2$), 2.01 (qui, $J$ = 7.2 Hz, 2H, $-CH_2$), 1.86-1.76 (m, 4H, $-CH_2$), 1.64 (qui, $J$ = 7.2 Hz, 2H, $-CH_2$); $^{13}C$ NMR (150 MHz, $CDCl_3$): δ 145.68, 144.41, 140.65, 140.05, 139.29, 130.89, 129.34, 128.64, 127.80, 125.85, 122.74, 120.77, 119.53, 109.53, 55.96, 54.17, 41.28, 26.59, 26.46, 23.40; HRMS (ESI) m/z calcd for $C_{22}H_{24}N_4$: 345.2073, $[M+H]^+$, found: 345.2070.

*6-(2-(Pyrrolidin-1-yl)hexyl)-6H-indolo[2,3-b]quinoxaline (**4d-3**)*



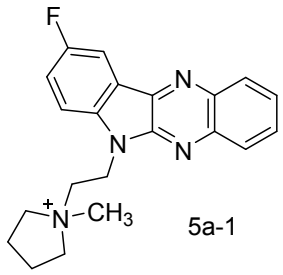
4d-3

Light yellow solid, yield 90%; m. p. 102.9-103.6 ℃; IR (KBr, $cm^{-1}$):2940, 2779 (C-H, alkyl), 1583 (C=N), 1488 (C-C, Ar), 774 (C-H, Ar); 1H NMR (600 MHz, $CDCl_3$): δ 8.49 (d, $J$ = 7.8 Hz, 1H, Ar-H), 8.30 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.14 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.75 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.66-7.11 (m, 2H, Ar-H), 7.48 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.38 (t, $J$ = 7.8 Hz, 1H, Ar-H), 4.49 (t, $J$ = 7.2 Hz, 2H, $-CH_2$), 2.43-2.47 (m, 4H, $-CH_2$), 2.38 (t, $J$ = 7.2 Hz, 2H, $-CH_2$),

1.97 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.73-1.76 (m, 4H, -$CH_2$), 1.50 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.40-1.45 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, $CDCl_3$): δ 145.67, 144.44, 140.66, 140.04, 139.26, 130.91, 129.33, 128.66, 127.83, 125.86, 122.74, 120.74, 119.49, 109.52, 56.53, 54.21, 41.39, 28.90, 28.38, 27.36, 27.00, 23.37; HRMS (ESI) m/z calcd for $C_{24}H_{28}N_4$: 373.2386, $[M+H]^+$, found: 373.2385.

**1.4. Synthesis of compounds 5 serials**

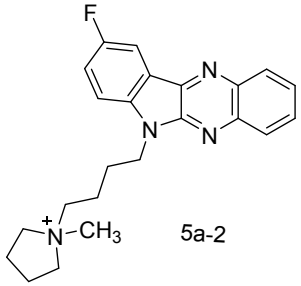
*9-Fluoro-6-(2-(N-methylpyrrolidin-1-yl)ethyl)-6H-indolo[2,3-b]quinoxaline iodide (**5a-1**)*



5a-1

Light yellow solid, yield 87%; m. p. >250 ℃; IR (KBr, $cm^{-1}$): 2950, 2879 (C-H, alkyl), 1588 (C=N), 1487 (C-C, Ar), 1283 (C-F), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.31 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.24 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.16 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.01 (dd, $J_1$ = 8.4 Hz, $J_2$ = 3.6 Hz, 1H, Ar-H), 7.91 (t, $J$ = 7.8 Hz, 1H, Ar-H), 7.81 (t, $J$ = 7.8 Hz, 1H, Ar-H), 7.76 (td, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.02 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.94 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.71-3.58 (m, 4H, -$CH_2$), 3.29 (s, 3H, -$CH_3$), 2.08-2.15 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.26 (d, $^1J_{CF}$ = 234.0 Hz), 145.77, 140.45, 140.37, 139.65 (d, $^4J_{CF}$ = 3.0 Hz), 139.33, 130.14, 129.66, 128.12, 127.19, 120.24 (d, $^3J_{CF}$ = 9.0 Hz), 119.36 (d, $^2J_{CF}$ = 22.5 Hz), 112.67 (d, $^3J_{CF}$ = 9.0 Hz), 108.77 (d, $^2J_{CF}$ = 24.0 Hz), 64.62, 60.16, 48.32, 36.66, 21.53; HRMS (ESI) m/z calcd for $C_{21}H_{22}FN_4I$: 349.1823, $[M-I]^+$, found: 349.1821.

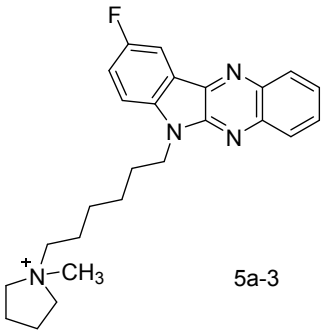
*9-Fluoro-6-(2-(N-methylpyrrolidin-1-yl)butyl)-6H-indolo[2,3-b]quinoxaline iodide (**5a-2**)*




5a-2

Light yellow solid, yield 84%; m. p. 220.5-221.2 ℃; IR (KBr, $cm^{-1}$): 2947, 2872 (C-H, alkyl), 1589 (C=N), 1489 (C-C, Ar), 1283 (C-F), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.28 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.21 (d, $J$ = 7.8 Hz, 1H, Ar-H), 8.13 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.91 (dd, $J_1$ = 8.4 Hz, $J_2$ = 3.6 Hz, 1H, Ar-H), 7.87 (t, $J$ = 7.8 Hz, 1H, Ar-H), 7.77 (t, $J$ = 6.6 Hz, 1H, Ar-H), 7.70 (t, $J$ = 9.0 Hz, 1H, Ar-H), 4.56 (t, $J$ = 6.6 Hz, 2H, -$CH_2$), 3.51-3.40 (m, 6H, -$CH_2$), 2.94 (s, 3H, -$CH_3$), 2.13-2.10 (m, 4H, -$CH_2$), 1.97-1.89 (m, 2H, -$CH_2$), 1.88-1.76 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$) : δ 157.88 (d, $^1J_{CF}$ = 235.5 Hz), 145.94, 140.86, 140.53, 139.39 (d, $^4J_{CF}$ = 4.5 Hz), 139.03, 129.93, 129.64, 127.88, 126.72, 119.72 (d, $^3J_{CF}$ = 9.0 Hz), 119.22 (d, $^2J_{CF}$ = 22.5 Hz), 112.33 (d, $^3J_{CF}$ = 9.0 Hz), 108.56 (d, $^2J_{CF}$ = 24.0 Hz), 64.03, 63.05, 48.23, 40.88, 25.42, 21.62, 20.94; HRMS (ESI) m/z calcd for $C_{23}H_{26}FN_4I$: 377.2136, $[M-I]^+$, found: 377.2131.

*9-Fluoro-6-(2-(N-methylpyrrolidin-1-yl)hexyl)-6H-indolo[2,3-b]quinoxaline iodide (**5a-3**)*

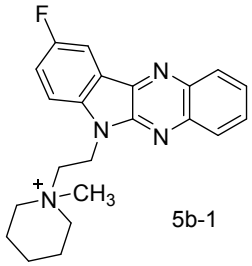



5a-3

Light yellow solid, yield 80%; m. p. 105.9-106.8 ℃; IR (KBr, $cm^{-1}$): 2937, 2842 (C-H, alkyl), 1584 (C=N), 1482 (C-C, Ar), 1277 (C-F), 844 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.28 (dd, $J_1$ = 8.4 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 8.20 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.14 (dd,

$J_1$ = 8.4 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 7.89-7.84 (m, 2H, Ar-H), 7.76 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.80 (td, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.53 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.39-3.46 (m, 2H, -$CH_2$), 3.21-3.27 (m, 2H, -$CH_2$), 2.92 (s, 3H, -$CH_3$), 1.99-2.09 (m, 4H, -$CH_2$), 1.95-1.88 (m, 2H, -$CH_2$), 1.67-1.58 (m, 2H, -$CH_2$), 1.42-1.32 (m, 4H, -$CH_2$), 1.29-1.23 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 157.78 (d, $^1J_{CF}$ = 235.5 Hz), 145.87, 140.92, 140.59, 139.22 (d, $^4J_{CF}$ = 4.5 Hz), 138.94, 129.87, 129.59, 128.02, 126.69, 119.54 (d, $^3J_{CF}$ = 9.0 Hz), 119.25 (d, $^2J_{CF}$ = 25.5 Hz), 112.33 (d, $^3J_{CF}$ = 9.0 Hz), 108.50 (d, $^2J_{CF}$ = 24.0 Hz), 63.81, 63.35, 47.97, 46.02, 41.33, 28.14, 26.26, 23.31, 21.50; HRMS (ESI) m/z calcd for $C_{25}H_{30}FN_4I$: 405.2449, $[M-I]^+$, found: 405.2450.

*9-Fluoro-6-(2-(N-methylpiperidin-1-yl)ethyl)-6H-indolo[2,3-b]quinoxaline iodide (**5b-1**)*

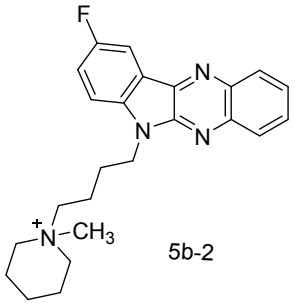


5b-1

Light yellow solid, yield 64%; m. p. >250 ℃; IR (KBr, $cm^{-1}$): 2937, 2842 (C-H, alkyl), 1589 (C=N), 1482 (C-C, Ar), 1281 (C-F), 754 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.32 (dd, $J_1$ =8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.25 (dd, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.16 (dd, $J_1$ =8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H),7.99 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 7.91 (td, $J_1$ =7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.81 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.76 (td, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.01 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.87 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.62 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.52 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.31(s, 3H, -$CH_3$), 1.87 (qui, $J$ = 7.2 Hz, 4H, -$CH_2$), 1.61-1.51 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.22 (d, $^1J_{CF}$ = 235.5 Hz), 145.79, 140.49, 140.42, 139.72 (d, $^4J_{CF}$ = 3.0 Hz), 139.38, 130.16, 129.69, 128.10, 127.18, 120.28

(d, $^{3}J_{CF}$ = 9.0 Hz), 119.35 (d, $^{2}J_{CF}$ = 25.5 Hz), 112.56 (d, $^{3}J_{CF}$ = 9.0 Hz), 108.80 (d, $^{2}J_{CF}$ = 25.5 Hz), 61.15, 58.65, 48.35, 35.09, 21.01, 19.76; HRMS (ESI) m/z calcd for $C_{22}H_{24}FN_4I$: 363.1979, $[M-I]^+$, found: 363.1978.

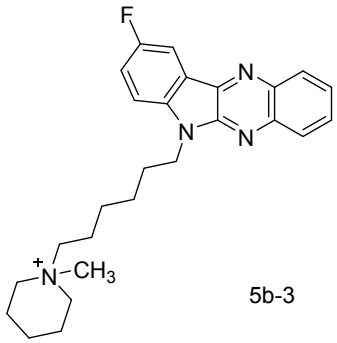
*9-Fluoro-6-(2-(N-methylpiperidin-1-yl)butyl)-6H-indolo[2,3-b]quinoxaline iodide (**5b-2**)*



5b-2

Light yellow solid, yield 83%; m. p. 229.3-230.4 ℃; IR (KBr, $cm^{-1}$): 2940, 2857 (C-H, alkyl), 1584 (C=N), 1488 (C-C, Ar), 1281 (C-F), 748 (C-H, Ar); $^{1}$H NMR (600 MHz, DMSO-$d_6$): δ 8.30 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.23 (dd, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.14 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.91 (dd, $J_1$ = 9.0 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 7.87 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7,77 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.70 (td, $J_1$ = 9.0 Hz, $J_2$ = 3.0 Hz, 1H, Ar-H), 4.58 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.27 (t, $J$ = 6.6 Hz, 4H, -$CH_2$), 2.95 (s, 3H, -$CH_3$), 1.95 (qui, J = 7.2 Hz, 4H, -$CH_2$), 1.83-1.77 (m, 2H, -$CH_2$), 1.77-1.70 (m, 4H, -$CH_2$), 1.55-1.44 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 157.93 (d, $^{1}J_{CF}$ = 235.5 Hz), 146.00, 140.90, 140.56, 139.45 (d, $^{4}J_{CF}$ = 4.5 Hz), 139.06, 129.98, 129.67, 127.89, 126.78, 119.78 (d, $^{3}J_{CF}$ = 9.0 Hz), 119.28 (d, $^{2}J_{CF}$ = 25.5 Hz), 112.39 (d, $^{3}JCF$ = 9.0 Hz), 108.5 (d, $^{2}J_{CF}$ = 24.0 Hz), 62.17, 60.60, 47.83, 40.87, 25.36, 21.10, 19.73, 18.95; HRMS (ESI) m/z calcd for $C_{24}H_{28}FN_4I$: 391.2292, $[M-I]^+$, found: 391.2289.

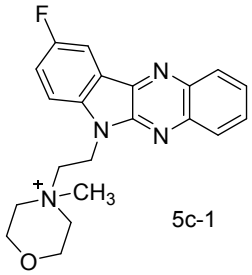
*9-Fluoro-6-(2-(N-methylpiperidin-1-yl)hexyl)-6H-indolo[2,3-b]quinoxaline iodide (**5b-3**)*



5b-3

Light yellow solid, yield 63%; m. p. 230.3-231.2 ℃; IR (KBr, $cm^{-1}$): 2945, 2853 (C-H, alkyl), 1589 (C=N), 1482(C-C, Ar), 1278 (C-F), 755 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.28 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.20 (dd, $J_1$ = 7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.14 (d, $J$ = 7.8 Hz, 1H, Ar-H), 7.84-7.90 (m, 2H, Ar-H), 7.77 (t, $J$ = 7.8 Hz, 1H, Ar-H), 7.68 (td, $J_1$ =9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.54 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.27-3.17 (m, 6H, -$CH_2$), 2.92 (s, 3H, -$CH_3$), 1.95-1.87 (m, 2H, -$CH_2$), 1.65-1.78 (s, 4H, -$CH_2$), 1.62-1.54 (m, 2H, -$CH_2$), 1.53-1.43 (m, 2H, -$CH_2$), 1.42-1.30 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$) : δ 157.84 (d, $^1J_{CF}$ = 235.5 Hz), 145.98, 141.00, 140.64, 139.30 (d, $^4J_{CF}$ = 4.5 Hz), 139.00, 129.92, 129.64, 128.03, 126.74, 119.62 (d, $^3J_{CF}$ = 9.0 Hz), 119.30 (d, $^2J_{CF}$ = 25.5 Hz), 112.36 (d, $^3J_{CF}$ = 9.0 Hz), 108.57 (d, $^2J_{CF}$ = 24.0 Hz), 62.58, 60.38, 47.59, 41.36, 28.14, 26.29, 26.02, 21.34, 21.10, 19.71; HRMS (ESI) m/z calcd for $C_{26}H_{32}FN_4I$: 419.2605, $[M-I]^+$, found: 419.2604.

*4-(2-(9-fluoro-6H-indolo[2,3-b]quinoxalin-6-yl)ethyl)-4-methylmorpholine iodide (**5c-1**)*

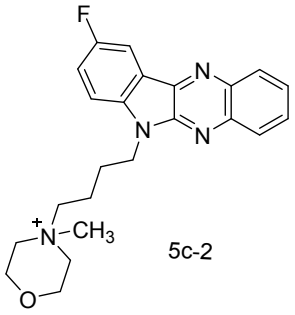


5c-1

Light yellow solid, yield 84%; m. p. 239.8-241.3 ℃; IR (KBr, $cm^{-1}$): 2937, 2842 (C-H, alkyl), 1587 (C=N), 1489(C-C, Ar), 1276 (C-F), 817 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.32

(d, $J$ = 8.4 Hz, 1H, Ar-H), 8.25 (dd, $J_1$ =7.8 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.16 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.01 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 7.91 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2, 1H, Ar-H), 7.81 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2, 1H, Ar-H), 7.76 (td, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.04 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 4.04 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.95-4.02 (m, 4H, -$CH_2$), 3.68-3.75 (m, 2H, -$CH_2$), 3.67-3.61 (m, 2H, -$CH_2$), 3.45 (s, 3H, -$CH_3$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.23 (d, $^1J_{CF}$ = 237.0 Hz), 145.76, 140.46, 140.40, 139.72 (d, $^4J_{CF}$ = 3.0 Hz), 139.37, 130.16, 129.67, 128.13, 127.21, 120.27 (d, $^3J_{CF}$ = 9.0 Hz), 119.34 (d, $^2J_{CF}$ = 25.5 Hz), 112.62 (d, $^3J_{CF}$ = 9.0 Hz), 108.80 (d, $^2J_{CF}$ = 24.0 Hz), 60.24, 60.00, 47.54, 41.25, 34.93; HRMS (ESI) m/z calcd for $C_{21}H_{22}FN_4OI$: 365.1772, $[M-I]^+$, found: 365.1767.

*4-(2-(9-Fluoro-6H-indolo[2,3-b]quinoxalin-6-yl)butyl)-4-methylmorpholine iodide (**5c-2**)*

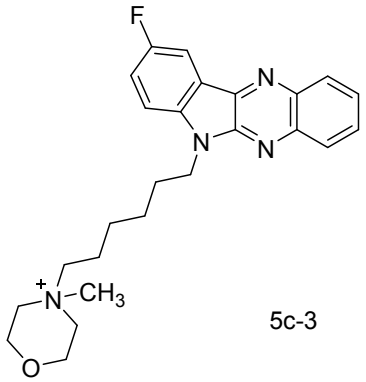


5c-2

Light yellow solid, yield 93%; m. p. 123.4-125.7 ℃; IR (KBr, cm$^{-1}$): 2943, 2879 (C-H, alkyl), 1585 (C=N), 1487(C-C, Ar), 1278 (C-F), 809 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.29 (d, $J$ = 7.8 Hz, 1H, Ar-H), 8.21 (dd, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.14 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.96 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.0 Hz, 1H, Ar-H), 7.87 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2, 1H, Ar-H), 7.77 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.69 (td, $J_1$ =9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.58 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.90 (br s, 4H, -$CH_2$), 3.63 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.42 (br s, 4H, -$CH_2$), 3.12 (s, 3H, -$CH_3$), 1,96-1.92 (m, 2H, -$CH_2$), 1.88-1.82 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 157.92 (d, $^1J_{CF}$ = 235.5 Hz), 146.01, 140.97, 140.59, 139.48 (d, $^4J_{CF}$ = 3.0 Hz),

139.07, 129.97, 129.66, 127.92, 126,78, 119.76 (d, $^{3}J_{CF}$ = 9.0 Hz), 119.31 (d, $^{2}J_{CF}$ = 25.5 Hz), 112.49 (d, $^{3}J_{CF}$ = 9.0 Hz), 108.59 (d, $^{2}J_{CF}$ = 24.0 Hz), 60.29, 59.47, 52.57, 40.96, 25.32, 18.81, 7.72; HRMS (ESI) m/z calcd for $C_{23}H_{26}FN_4OI$: 393.2085, $[M-I]^+$, found: 393.2086.

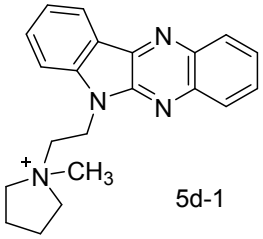
*4-(2-(9-fluoro-6H-indolo[2,3-b]quinoxalin-6-ylhexyl)-4-methylmorpholine iodide (**5c-3**)*




5c-3

Light yellow solid, yield 77%; m. p. 236.4-237.6 ℃; IR (KBr, $cm^{-1}$): 2937, 2872 (C-H, alkyl), 1588 (C=N), 1482 (C-C, Ar), 1281 (C-F), 815 (C-H, Ar); $^{1}$H NMR (600 MHz, DMSO-$d_6$): δ 8.29 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.22 (dd, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.15 (dd, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.90-7.85 (m, 2H, Ar-H), 7.77 (td, $J_1$ = 8.4 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.69 (td, $J_1$ = 8.4 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 4.55 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.90-3.83 (m, 4H, -$CH_2$), 3.36-3.42(m, 2H, -$CH_2$), 3.06 (s, 3H, -$CH_3$), 2.48-2.52 (m, 4H, -$CH_2$), 1.92 (qui, $J$ = 7.2 Hz, 4H, -$CH_2$), 1.65-1.58 (m, 2H, -$CH_2$), 1.43-1.32 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 157.87 (d, $^{1}J_{CF}$ = 237.0 Hz), 146.02, 141.05, 140.67, 139.33 (d, $^{4}J_{CF}$ = 3.0 Hz), 139.02, 129.95, 129.66, 128.04, 126.77, 119.65 (d, $^{3}J_{CF}$ = 9.0 Hz), 119.32(d, $^{2}J_{CF}$ = 25.5 Hz), 112.39 (d, $^{3}J_{CF}$ = 9.0 Hz), 108.62 (d, $^{2}J_{CF}$ = 24.0 Hz), 64.06, 60.25, 59.35, 46.61, 41.39, 28.18, 26.32, 25.98, 21.14; HRMS (ESI) m/z calcd for $C_{25}H_{30}FN_4OI$: 421.2398, $[M-I]^+$, found: 421.2395.

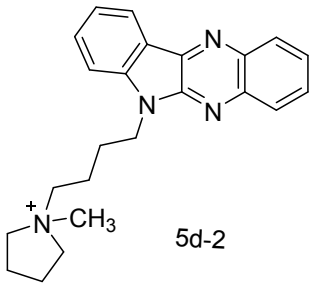
*6-(2-(N-methypyrrolidin-1-yl)ethyl)-6H-indolo[2,3-b]quinoxaline iodide (**5d-1**)*



5d-1

Light yellow solid, yield 90%; m. p. >250 ℃; IR (KBr, $cm^{-1}$): 2945, 2857 (C-H, alkyl), 1584 (C=N), 1488 (C-C, Ar), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.43 (d, *J* = 7.8 Hz, 1H, Ar-H), 8.31(d, *J* = 8.4 Hz, 1H, Ar-H), 8.16 (dd, $J_1$ = 8.4 Hz, $J_2$ = 0.6 Hz, 1H, Ar-H), 7.96 (d, *J* = 8.4 Hz, 1H, Ar-H), 7.88 (t, *J* = 7.8 Hz, 1H, Ar-H), 7.86 (t, *J* = 7.8 Hz, 1H, Ar-H), 7.80 (t, *J* = 7.8 Hz, 1H, Ar-H), 7.49 (t, *J* = 7.8 Hz, 1H, Ar-H), 5.02 (t, *J* = 7.2 Hz, 2H, -$CH_2$), 3.96 (t, *J* = 7.2 Hz, 2H, -$CH_2$), 3.58-3.76 (m, 4H, -$CH_2$), 3.30 (s, 3H, -$CH_3$), 2.07-2.19 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 145.32, 144.08, 140.26, 140.16, 139.45, 132.02, 129.75, 129.62, 128.09, 127.02, 122.86, 122.16, 119.53, 111.21, 64.61, 60.20, 48.32, 36.51, 21.54; HRMS (ESI) m/z calcd for $C_{21}H_{23}N_4I$: 331.1914, $[M-I]^+$, found: 331.1917.

*6-(2-(N-methypyrrolidin-1-yl)butyl)-6H-indolo[2,3-b]quinoxaline iodide (**5d-2**)*

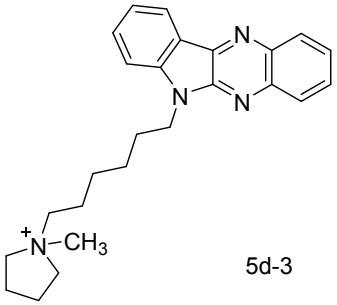


5d-2

Light yellow solid, yield 86%; m. p. 209.8-210.6 ℃; IR (KBr, $cm^{-1}$): 2947, 2842 (C-H, alkyl), 1587 (C=N), 1488 (C-C, Ar), 842 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.42 (d, *J* = 7.8 Hz, 1H, Ar-H), 8.29 (d, *J* =7.8 Hz, 1H, Ar-H), 8.14 (d, *J* = 7.8 Hz, 1H, Ar-H), 7.83-7.88 (m, 2H, Ar-H), 7.81 (t, *J* = 7.8 Hz, 1H, Ar-H), 7.76 (t, *J* = 7.8 Hz, 1H, Ar-H), 7.45 (t, *J* = 7.2 Hz, 1H, Ar-H), 4.57 (t, *J* = 7.2 Hz, 2H, -$CH_2$), 3.53-3.47 (m, 2H, -$CH_2$), 3.39-3.46 (m, 4H, -$CH_2$), 2.96 (s, 3H, -$CH_3$), 2.12-2.02 (m, 4H, -$CH_2$),1.98-1.91(m, 2H, -$CH_2$), 1.91-1.82 (m, 2H, -$CH_2$); $^{13}$C NMR (150

MHz, DMSO-$d_6$): δ 145.54, 144.54, 140.31, 140.01, 139.16, 131.87, 129.60, 129.54, 127.86, 126.53, 122.73, 121.56, 119.08, 110.99, 64.04, 63.06, 48.24, 40.75, 25.41, 21.64, 20.96; HRMS (ESI) m/z calcd for $C_{23}H_{27}N_4I$: 359.2230, $[M-I]^+$, found: 359.2225.

*6-(2-(N-methypyrrolidin-1-yl)hexyl)-6H-indolo[2,3-b]quinoxaline iodide (**5d-3**)*

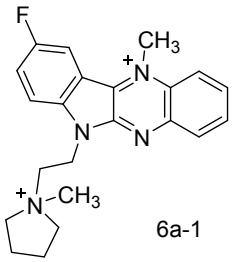



5d-3

Light yellow solid, yield 82%; m. p. 105.9-106.8 ℃; IR (KBr, $cm^{-1}$): 2938, 2853 (C-H, alkyl), 1587 (C=N), 1483 (C-C, Ar), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.41 (d, $J$ = 7.8 Hz, 1H, Ar-H), 8.29 (d, $J$ = 7.8 Hz, 1H, Ar-H), 8.14 (d, $J$ = 8.4 Hz, 1H, Ar-H), 7.79-7.86 (m, 3H, Ar-H), 7.75 (td, $J_1$ = 7.2 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 7.44 (td, $J_1$ = 7.2 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 4.54 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.91 (s, 3H, -$CH_3$), 2.10-1.98 (m, 4H, -$CH_2$), 1.97-1.90 (m, 2H, -$CH_2$), 1.68-1.58 (m, 2H, -$CH_2$), 1.41-1.33(m, 4H, -$CH_2$), 1.24 (t, J = 7.2 Hz, 4H, -$CH_2$), 1.14-1.07 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 145.22, 144.66, 140.41, 139.93, 139.09, 131.91, 129.58, 129.51, 128.016, 126.56, 122.73, 121.46, 119.00, 111.01, 63.99, 61.17, 52.52, 45.91, 40.28, 28.14, 26.09, 23.31, 21.49; HRMS (ESI) m/z calcd for $C_{25}H_{31}N_4I$: 387.2543, $[M-I]^+$, found: 387.2539.

**1.5. Synthesis of compounds 6 serials**

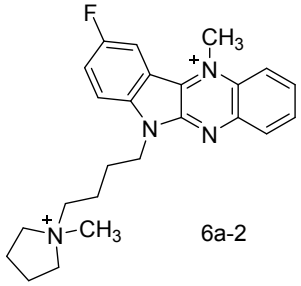
*9-Fluoro-6-(2-(N-methylpyrrolidin-1-yl)ethyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6a-1**)*



6a-1

Brick red solid , yield 74%; m. p. 231.5-232.3 ℃; IR (KBr, $cm^{-1}$): 2945, 2857 (C-H, alkyl), 1583 (C=N), 1487 (C-C, Ar), 1278 (C-F), 856 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$, 298 K): δ 8.94-8.96 (m, 1H, Ar-H), 8.92 (dd, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.55-8.57 (m, 1H, Ar-H), 8.26-8.28 (m, 3H, Ar-H), 8.21 (td, $J_1$ = 9.0 Hz, $J_2$ = 1.8 Hz, 1H, Ar-H), 5.21 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 5.12 (s, 3H, -$CH_3$), 3.94 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.67-3.58 (m, 4H, -$CH_2$), 3.28 (s, 3H, -$CH_3$), 2.20-2.08 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.50 (d, $^1J_{CF}$ = 238.5 Hz), 147.70, 143.35, 141.35, 132.35 (d, $^4J_{CF}$ = 4.5 Hz), 130.17, 129.97, 128.13, 127.21, 125.32 (d, $^2J_{CF}$ = 25.5 Hz), 119.19, 114.36 (d, $^3J_{CF}$ = 9.0 Hz), 114.14 (d, $^2J_{CF}$ = 25.5 Hz), 113.34 (d, $^3J_{CF}$ = 9.0 Hz), 64.69, 64.59, 48.18, 41.13, 37.23, 21.45; HRMS (ESI) m/z calcd for $C_{22}H_{25}FN_4$/2: 182.1026, [$M^{2+}$/2], found: 182.1026.

*9-Fluoro-6-(4-(N-methylpyrrolidin-1-yl)butyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6a-2**)*

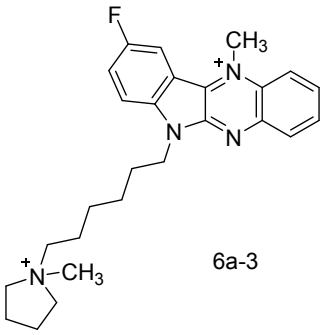


6a-2

Brick red solid , yield 65%; m. p. 232.8-233.4 ℃; IR (KBr, $cm^{-1}$): 2942, 2845 (C-H, alkyl), 1584 (C=N), 1489 (C-C, Ar), 1281 (C-F), 851 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.91-8.94 (m, 1H, Ar-H), 8.90 (dd, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.51-8.53 (m, 1H, Ar-H), 8.21-

8.26 (m, 3H, Ar-H), 8.14 (td, $J_1$ = 9.0 Hz, $J_2$ = 1.8 Hz, 1H, Ar-H), 5.11 (s, 3H, -$CH_3$), 4.74 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.49-3.44 (m, 4H, -$CH_2$), 2.94 (s, 3H, -$CH_3$), 2.93-2.91 (m, 2H, -$CH_2$), 2.13-2.06 (m, 4H, -$CH_2$), 1.99-1.94 (m, 2H, -$CH_2$), 1.87-1.82 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$) : δ 158.17 (d, $^1J_{CF}$ = 238.5 Hz), 147.77, 146.00, 143.81, 141.43, 129.93 (d, $^4J_{CF}$ = 4.5 Hz), 129.65, 128.85, 127.88, 126.78, 125.30 (d, $^2J_{CF}$ = 25.5 Hz), 119.12, 112.52 (d, $^3J_{CF}$ = 9.0 Hz), 112.33 (d, $^3J_{CF}$ = 9.0 Hz), 108.64 (d, $^2J_{CF}$ = 24.0 Hz), 64.04, 62.97, 51.02, 48.18, 41.04, 22.58, 21.59, 20.75; HRMS (ESI) m/z calcd for $C_{24}H_{29}FN_4$/2: 196.1182, [$M^{2+}$/2], found 196.1183.

*9-Fluoro-6-(6-(N-methylpyrrolidin-1-yl)hextyl)-11-N- ethyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6a-3**)*

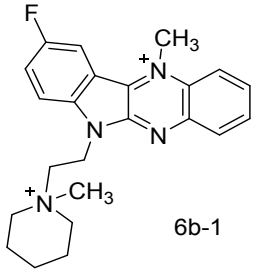



6a-3

Brick red solid , yield 87%; m. p. 226.5-231.6 ℃; IR (KBr, $cm^{-1}$): 2921, 2584 (C-H, alkyl), 1589 (C=N), 1487 (C-C, Ar), 1289 (C-F), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.90-8.95 (m, 1H, Ar-H), 8.89 (dd, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.52 (dd, $J_1$ = 6.6 Hz, $J_2$ = 3.0 Hz, 1H, Ar-H), 8.21-8.24 (m, 3H, Ar-H), 8.12 (td, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.10 (s, 3H, -$CH_3$), 4.72 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.40-3.45 (m, 4H, -$CH_2$), 3.25 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.93 (s, 3H, -$CH_3$), 2.03-2.09 (m, 4H, -$CH_2$), 1.88-1.96 (m, 2H, -$CH_2$), 1.61-1.68 (m, 2H, -$CH_2$), 1.38-1.46 (m, 2H, -$CH_2$), 1.37-1.31 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.14 (d, $^1J_{CF}$ = 238.5 Hz), 147.72, 143.97, 141.48, 132.08, 131.91, 131.48, 129.84, 128.86, 125.26 (d, $^2J_{CF}$ = 25.5 Hz), 119.12, 114.16 (d, $^3J_{CF}$ = 9.0 Hz), 113.90 (d, $^2J_{CF}$ = 25.5 Hz), 112.69 (d, $^3J_{CF}$ = 10.5

Hz), 63.86, 63.44, 47.92, 42.21, 41.06, 28.20 26.09, 26.03, 23.32, 21.51; HRMS (ESI) m/z calcd for $C_{26}H_{33}FN_4/2$: 210.1339, [$M^{2+}/2$], found: 210.1339.

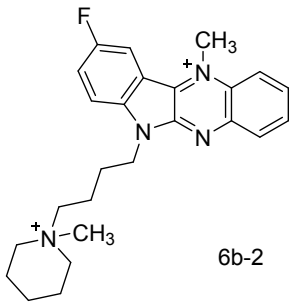
*9-Fluoro-6-(2-(N-methylpiperidin-1-yl)ethyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6b-1**)*



6b-1

Brick red solid , yield 70%; m. p. 241.9-242.4 ℃; IR (KBr, $cm^{-1}$): 2943, 2837 (C-H, alkyl), 1586 (C=N), 1487 (C-C, Ar), 1283 (C-F), 836 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.92-8.94 (m, 1H, Ar-H), 8.88 (dd, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.50-8.52 (m, 1H, Ar-H), 8.29 (dd, $J_1$ = 8.4 Hz, $J_2$ = 4.2 Hz, 1H, Ar-H), 8.24-8.26 (m, 2H, Ar-H), 8.19 (td, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.19 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 5.10 (s, 3H, -$CH_3$), 3.86 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.60-3.68 (m, 2H, -$CH_2$), 3.48-3.57 (m, 2H, -$CH_2$), 3.31 (s, 3H, -$CH_3$), 1.75-1.90 (m, 4H, -$CH_2$), 1.46-1.59 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.45 (d, $^1J_{CF}$ = 238.5 Hz), 147.79, 143.39, 141.40, 132.40, 132.31, 132.27, 129.93, 129.11, 125.26 (d, $^2J_{CF}$ = 25.5 Hz), 119.28, 114.36 (d, $^3J_{CF}$ = 9.0 Hz), 114.16 (d, $^2J_{CF}$ = 25.5 Hz), 113.49 (d, $^3J_{CF}$ = 10.5 Hz), 61.26, 58.12, 48.54, 41.27, 35.74, 20.96, 19.78; HRMS (ESI) m/z calcd for $C_{23}H_{27}FN_4/2$: 189.1104, [$M^{2+}/2$], found: 189.1102.

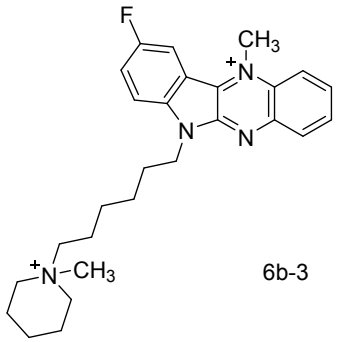
*9-Fluoro-6-(2-(N-methylpiperidin-1-yl)butyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6b-2**)*



6b-2

Brick red solid , yield 66%; m. p. 233.2-234.0 ℃; IR (KBr, $cm^{-1}$): 2941, 2845 (C-H, alkyl), 1589 (C=N), 1489 (C-C, Ar), 1283 (C-F), 842 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.92-8.94 (m, 1H, Ar-H), 8.90 (dd, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.51-8.54 (m, 1H, Ar-H), 8.21-8.26 (m, 3H, Ar-H), 8.14 (td, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.11 (s, 3H, -$CH_3$), 4.75 (t, J = 7.2 Hz, 2H, -$CH_2$), 3.25-3.29 (m, 4H, -$CH_2$), 2.94 (s, 3H, -$CH_3$), 1.92-1.95 (m, 2H, -$CH_2$), 1.80-1.84 (m, 2H, -$CH_2$), 1.71-1.80 (m, 6H, -$CH_2$), 1.69-1.70 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.22 (d, $^1J_{CF}$ = 238.5 Hz), 147.79, 143.85, 141.46，132.07 (d, $^4J_{CF}$ = 3.0 Hz), 129.74, 128.88, 129.74, 128.88, 125.30 (d, $^2J_{CF}$ = 25.5 Hz), 119.14, 114.13 (d, $^3J_{CF}$ = 9.0 Hz), 113.97 (d, $^2J_{CF}$ = 22.1 Hz), 112.78 (d, $^3J_{CF}$ = 10.5 Hz), 60.67, 60.63, 47.79, 41.72, 41.08, 25.35, 21.14, 19.73, 18.85; HRMS (ESI) m/z calcd for $C_{25}H_{31}FN_4$/2: 203.1260, [$M^{2+}$/2], found: 203.1261.

*9-Fluoro-6-(2-(N-methylpiperidin-1-yl)hexyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate* (**6b-3**)

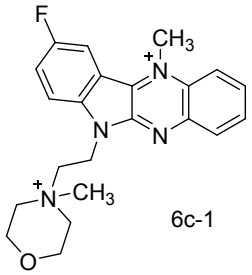


6b-3

Brick red solid , yield 55%; m. p. 234.2-234.4 ℃; IR (KBr, $cm^{-1}$): 2937, 2857 (C-H, alkyl), 1589 (C=N), 1487 (C-C, Ar), 1283 (C-F), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.90-

8.93 (m, 1H, Ar-H), 8.88 (d, J = 8.4 Hz, 1H, Ar-H), 8.52-8.54 (m, 1H, Ar-H), 8.20-8.27 (m, 3H, Ar-H), 8.12 (t, *J* = 8.4 Hz, 1H, Ar-H), 5.10 (s, 3H, -$CH_3$), 4.72 (t, *J*= 7.2 Hz, 2H, -$CH_2$), 3.18-3.29 (m, 6H, -$CH_2$), 2.93 (s, 3H, -$CH_3$), 1.81-1.97 (m, 2H, -$CH_2$), 1.69-1.80 (m, 4H, -$CH_2$), 1.57-1.66 (m, 2H, -$CH_2$), 1.48-1.54 (m, 2H, -$CH_2$), 1.32-1.47 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$) : δ 158.93 (d, $^1J_{CF}$ = 238.5 Hz), 1147.73, 143.99, 141.49, 132.09, 131.95, 131.46 (d, $^4J_{CF}$ = 4.5 Hz), 129.85, 128.87, 125.25 (d, $^2J_{CF}$ = 25.5 Hz), 119.08, 114.13 (d, $^3J_{CF}$ = 9.0 Hz), 113.87 (d, $^2J_{CF}$ = 25.5 Hz), 112.70 (d, $^3J_{CF}$ = 10.5 Hz), 62.62, 60.48, 47.62, 42.23, 41.05, 28.18, 26.10, 25.96, 21.34, 21.10, 19.70; HRMS (ESI) m/z calcd for $C_{27}H_{35}FN_4$/2: 217.1417, [$M^{2+}$/2], found: 217.1417.

*9-Fluoro-6-(2-(N-methylmorpholine-1-yl)ethyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6c-1**)*

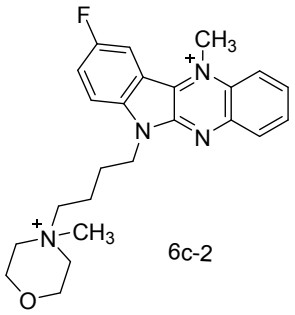


6c-1

Brick red solid , yield 62%; m. p. >250 ℃; IR (KBr, $cm^{-1}$): 2943, 2860 (C-H, alkyl), 1589 (C=N), 1488 (C-C, Ar), 1282 (C-F), 841 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.98-8.93 (m, 1H, Ar-H), 8.88 (dd, $J_1$ = 9.0 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 8.54-8.60 (m, 1H, Ar-H), 8.22-8.28 (m, 3H, Ar-H), 8.14 (td, $J_1$ = 7.2 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.25 (t, *J* = 7.2 Hz, 2H, -$CH_2$), 5.12 (s, 3H, -$CH_3$), 4.06-4.08 (m, 2H, -$CH_2$), 3.94-4.01 (m, 4H, -$CH_2$), 3.73-3.79 (m, 2H, -$CH_2$), 3.62-3.66 (m, 2H, -$CH_2$), 3.47 (s, 3H, -$CH_3$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.25 (d, $^1J_{CF}$ = 238.5 Hz), 145.79, 143.33, 141.38, 140.45 (d, $^3J_{CF}$ = 10.5 Hz), 139.76 (d, $^4J_{CF}$ = 3.0 Hz), 139.39, 130.18, 129.69, 128.15, 127.23, 119.37 (d, $^2J_{CF}$ = 25.5 Hz), 112.65 (d, $^3J_{CF}$ = 9.0 Hz), 108.84 (d, $^2J_{CF}$ = 25.5 Hz), 60.23, 59.98, 47.53, 41.29, 35.59, 34.92; HRMS (ESI) m/z calcd for

$C_{22}H_{25}FN_4O/2$:190.1002, [$M^{2+}/2$], found: 190.1006.

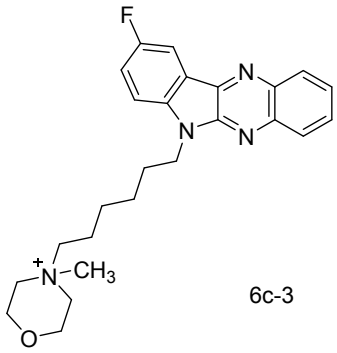
*9-Fluoro-6-(2-(N-methylmorpholine-1-yl)butyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6c-2**)*




6c-2

Brick red solid, yield 64%; m. p. 237.9-238.8 ℃; IR (KBr, $cm^{-1}$): 2921, 2857 (C-H, alkyl), 1589 (C=N), 1489 (C-C, Ar), 1282 (C-F), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.91-8.98 (m, 1H, Ar-H), 8.88 (dd, $J_1$ = 9.0 Hz, $J_2$ = 3.0 Hz, 1H, Ar-H), 8.58-8.47 (m, 1H, Ar-H), 8.28-8.19 (m, 3H, Ar-H), 8.14 (td, $J_1$ = 7.2 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.11 (s, 3H, -$CH_3$), 4.75 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.87-3.90 (m, 4H, -$CH_2$), 3.53-3.60 (m, 2H, -$CH_2$), 3.39-3.43 (m, 4H, -$CH_2$), 3.08 (s, 3H, -$CH_3$), 1.91-1.98 (m, 2H, -$CH_2$), 1.80-1.90 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): δ 158.22 (d, $^1J_{CF}$ = 238.5 Hz), 147.79, 143.85, 141.48, 132.18, 131.98, 131.61 (d, $^4J_{CF}$ = 3.0 Hz), 129.75, 128.89, 125.30 (d, $^2J_{CF}$ = 25.5 Hz), 119.13, 114.09 (d, $^3J_{CF}$ = 9.0 Hz), 113.97 (d, $^2J_{CF}$ = 27.0 Hz), 112.79 (d, $^3J_{CF}$ = 10.5 Hz), 60.28, 59.56, 51.02, 41.72, 41.08, 25.26, 22.57, 18.69; HRMS (ESI) m/z calcd for $C_{24}H_{29}FN_4O/2$: 204.1157, [$M^{2+}/2$], found: 204.1157.

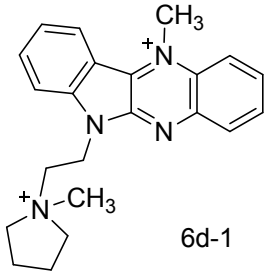
*9-Fluoro-6-(2-(N-methylmorpholine-1-yl)hexyl)-11-N-methyl-6H-indolo[2,3-b] quinoxaline hexafluorophosphate (**6c-3**)*



6c-3

Brick red solid , yield 56%; m. p. 234.3-234.9 ℃; IR (KBr, $cm^{-1}$): 2923, 2842 (C-H, alkyl), 1585 (C=N), 1489 (C-C, Ar), 1292 (C-F), 840 (C-H, Ar); $^1H$ NMR (600 MHz, DMSO-$d_6$): δ 8.91-8.93 (m, 1H, Ar-H), 8.87 (dd, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.52-8.54 (m, 1H, Ar-H), 8.21-8.24 (m, 3H, Ar-H), 8.12 (td, $J_1$ = 9.0 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 5.10 (s, 3H, -$CH_3$), 4.73 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.88-3.92 (m, 4H, -$CH_2$), 3.44-3.39 (m, 2H, -$CH_2$), 3.38-3.35 (m, 4H, -$CH_2$), 3.09 (s, 3H, -$CH_3$), 1.94 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.65 (qui, $J$ = 7.2 Hz, 2H, -$CH_2$), 1.41-1.47(m, 2H, -$CH_2$), 1.33-1.40 (m, 2H, -$CH_2$); $^{13}C$ NMR (150 MHz, DMSO-$d_6$): δ 158.11 (d, $^1J_{CF}$ = 237.0 Hz), 147.77, 143.94, 141.50, 132.08, 131.89, 131.53 (d, $^4J_{CF}$ = 4.5 Hz), 129.86. 128.89, 125.20 (d, $^2J_{CF}$ = 25.5 Hz), 119.20, 114.25 (d, $^3J_{CF}$ = 9.0 Hz), 113.92 (d, $^2J_{CF}$ = 25.5 Hz), 112.83 (d, $^3J_{CF}$ = 10.5 Hz), 60.26, 59.39, 46.68, 42.26, 41.25, 28.22, 26.10, 25.87, 22.59, 21.16; HRMS (ESI) m/z calcd for $C_{26}H_{33}FN_4O/2$: 218.1313, [$M^{2+}$/2], found: 218.1314.

*6-(2-(N-methypyrrolidin-1-yl)ethyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6d-1**)*

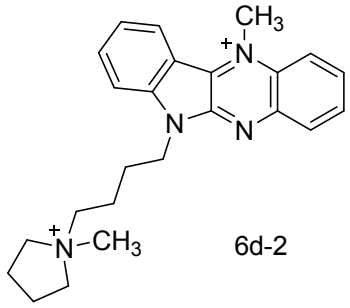


6d-1

Brick red solid , yield 78%; m. p. >250 ℃; IR (KBr, $cm^{-1}$): 2921, 2844 (C-H, alkyl), 1589

(C=N), 1483 (C-C, Ar), 840 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.96 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.92 (dd, $J_1$ = 6.6 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.55 (dd, $J_1$ = 6.6 Hz, $J_2$ = 2.4 Hz, 1H, Ar-H), 8.21-8.26 (m, 4H, Ar-H), 7.71-7.75 (m, 1H, Ar-H), 5.20 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 5.14 (s, 3H, -$CH_3$), 3.96 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.66-3.71 (m, 2H, -$CH_2$), 3.62-3.65 (m, 2H, -$CH_2$), 3.30 (s, 3H, -$CH_3$), 2.19-2.05 (m, 4H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): 147.47, 146.87, 140.96, 137.32, 132.83, 132.02, 131.94, 129.89, 129.07, 128.88, 123.89, 119.08, 113.27, 112.68, 64.74, 59.77, 48.28, 41.10, 37.07, 21.50; HRMS (ESI) m/z calcd for $C_{22}H_{26}N_4$/2: 173.1079, [$M^{2+}$/2], found: 173.1073.

*6-(2-(N-methypyrrolidin-1-yl)butyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate (**6d-2**)*

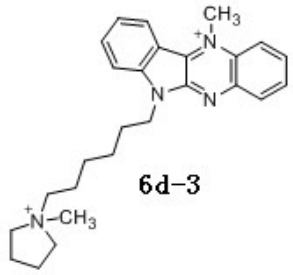


6d-2

Brick red solid , yield 90%; m. p. 249.2-249.8 ℃; IR (KBr, cm$^{-1}$): 2925, 2854 (C-H, alkyl), 1589 (C=N), 1487 (C-C, Ar), 845 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.95 (d, $J$ = 8.4 Hz, 1H, Ar-H), 8.93-8.87 (m, 1H, Ar-H), 8.55-8.47 (m, 1H, Ar-H), 8.26-8.20 (m, 2H, Ar-H), 8.19-8.12 (m, 2H, Ar-H), 7.69 (td, $J_1$ = 7.8 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 5.12 (s, 3H, -$CH_3$), 4.73 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.42-3.46 (m, 4H, -$CH_2$), 3.00 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.95 (s, 3H, -$CH_3$), 2.07-2.10 (m, 4H, -$CH_2$), 1.93-1.99 (m, 2H, -$CH_2$), 1.85-1.92 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): 147.59, 147.32, 141.04, 137.19, 132.32, 131.82, 131.53, 129.67, 128.81, 123.38, 119.04, 112.82, 112.49, 64.04, 62.98, 51.02, 48.16, 25.32, 22.56, 21.60, 20.77; HRMS (ESI) m/z

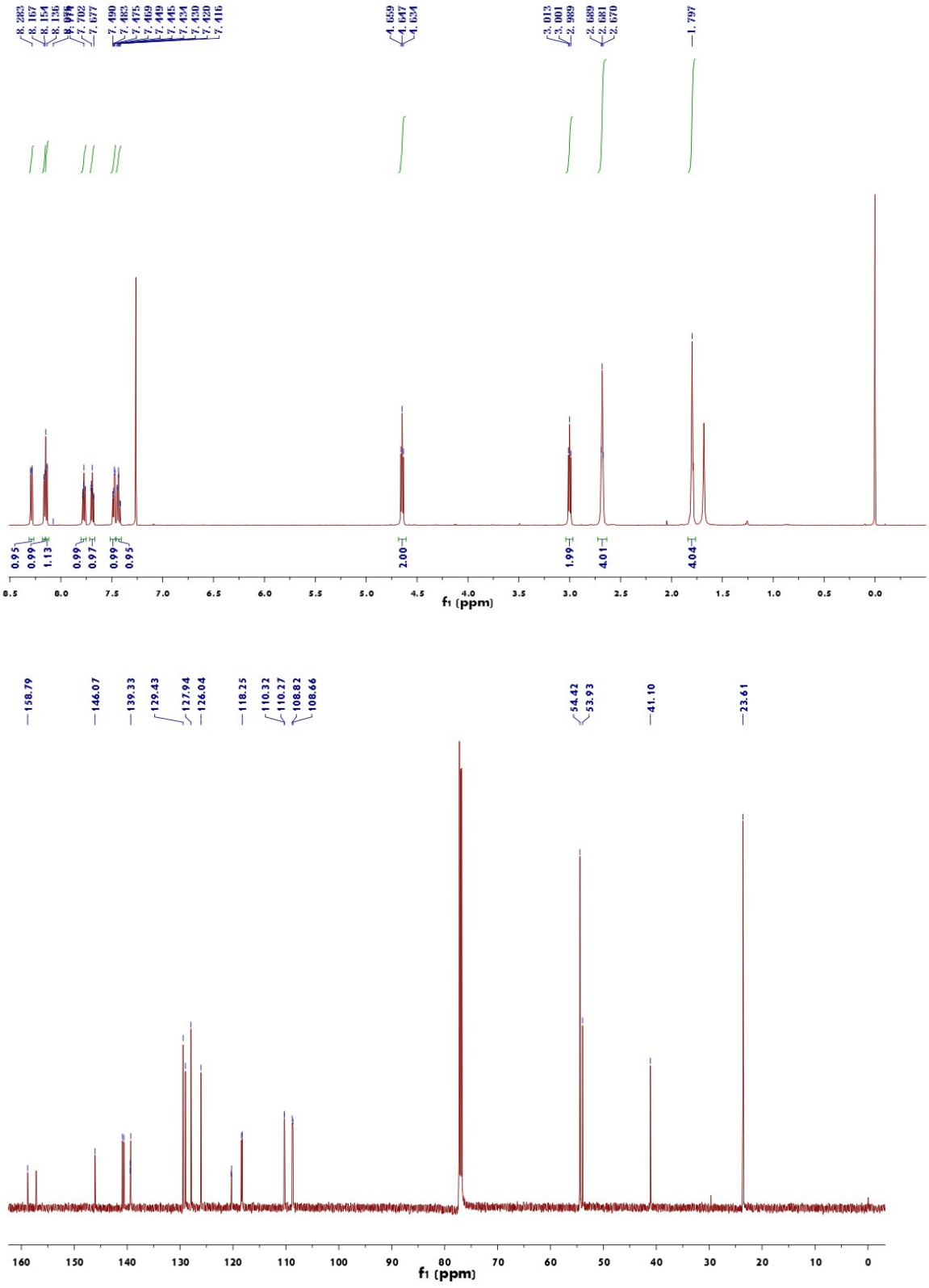
calcd for $C_{24}H_{30}N_4/2$: 187.1235, [$M^{2+}/2$], found: 187.1230.

*6-(2-(N-methypyrrolidin-1-yl)hexyl)-11-N-methyl-6H-indolo[2,3-b]quinoxaline hexafluorophosphate* (**6d-3**)

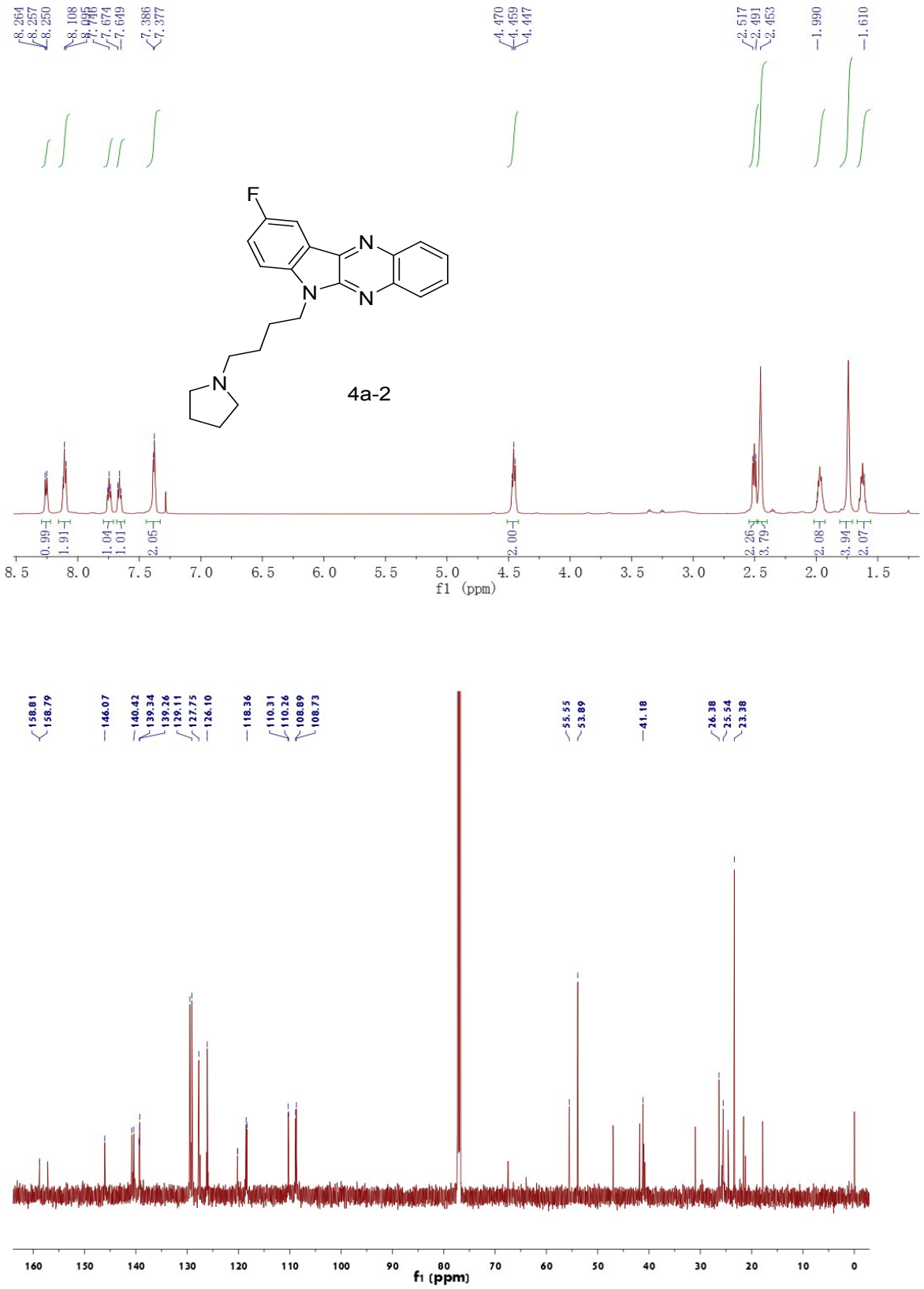



Brick red solid , yield 88%; m. p. 236.2-236.6 ℃; IR (KBr, cm-1): 2923, 2584 (C-H, alkyl), 1583 (C=N), 1489 (C-C, Ar), 844 (C-H, Ar); $^1$H NMR (600 MHz, DMSO-$d_6$): δ 8.93 (d, J = 7.8 Hz, 1H, Ar-H), 8.91-8.84 (m, 1H, Ar-H), 8.54-8.46 (m, 1H, Ar-H), 8.25-8.17 (m, 2H, Ar-H), 8.17-8.01 (m, 2H, Ar-H), 7.67 (td, $J_1$ = 7.2 Hz, $J_2$ = 1.2 Hz, 1H, Ar-H), 5.10 (s, 3H, -$CH_3$), 4.70 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 3.50-3.36 (m, 4H, -$CH_2$), 3.25 (t, $J$ = 7.2 Hz, 2H, -$CH_2$), 2.93 (s, 3H, -$CH_3$), 2.09-2.10 (m, 4H, -$CH_2$), 1.89-2.00 (m, 2H, -$CH_2$), 1.60-1.70 (m, 2H, -$CH_2$) 1.40-1.46 (m, 2H, -$CH_2$), 1.33-1.39 (m, 2H, -$CH_2$); $^{13}$C NMR (150 MHz, DMSO-$d_6$): 147.50, 141.08, 137.15, 132.21, 132.11, 131.74, 131.52, 129.78, 128.81, 128.75, 123.27, 118.99, 112.75, 112.53, 63.90, 63.50, 48.01, 42.04, 42.01, 28.13, 26.11, 26.04, 23.31, 21.55; HRMS (ESI) m/z calcd for $C_{26}H_{34}N_4/2$: 201.1392, [$M^{2+}/2$], found: 201.1386.

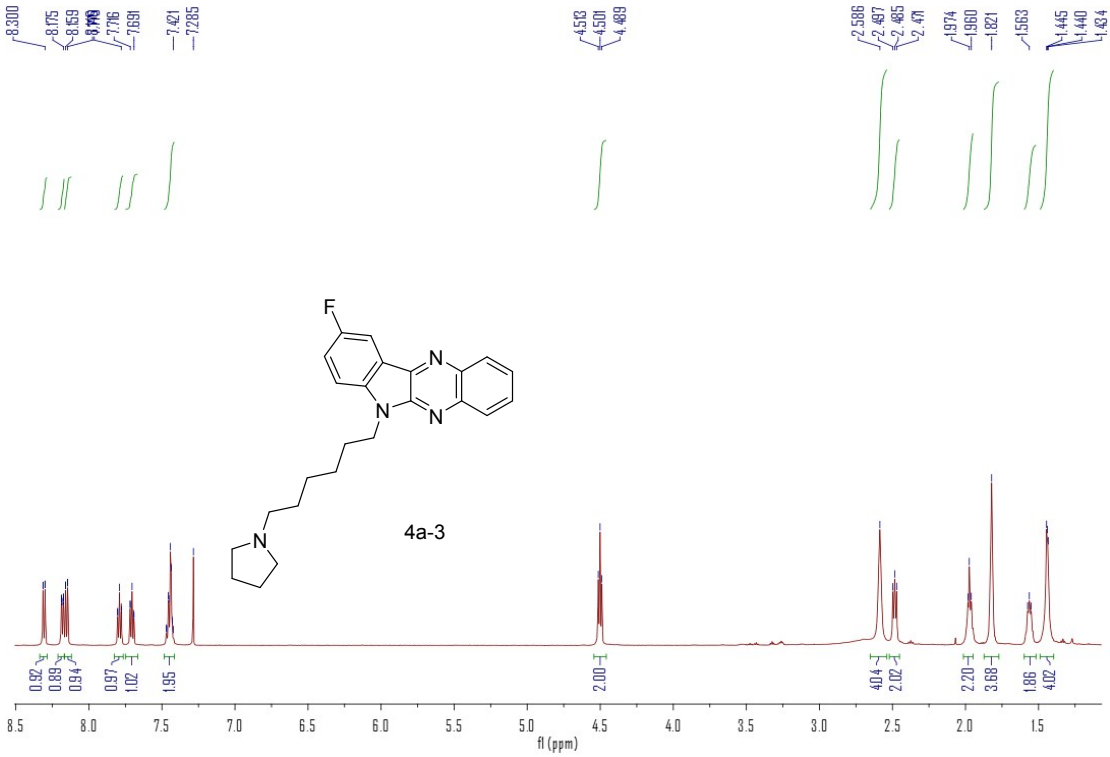
2. $^{1}H$ NMR and $^{13}C$ NMR

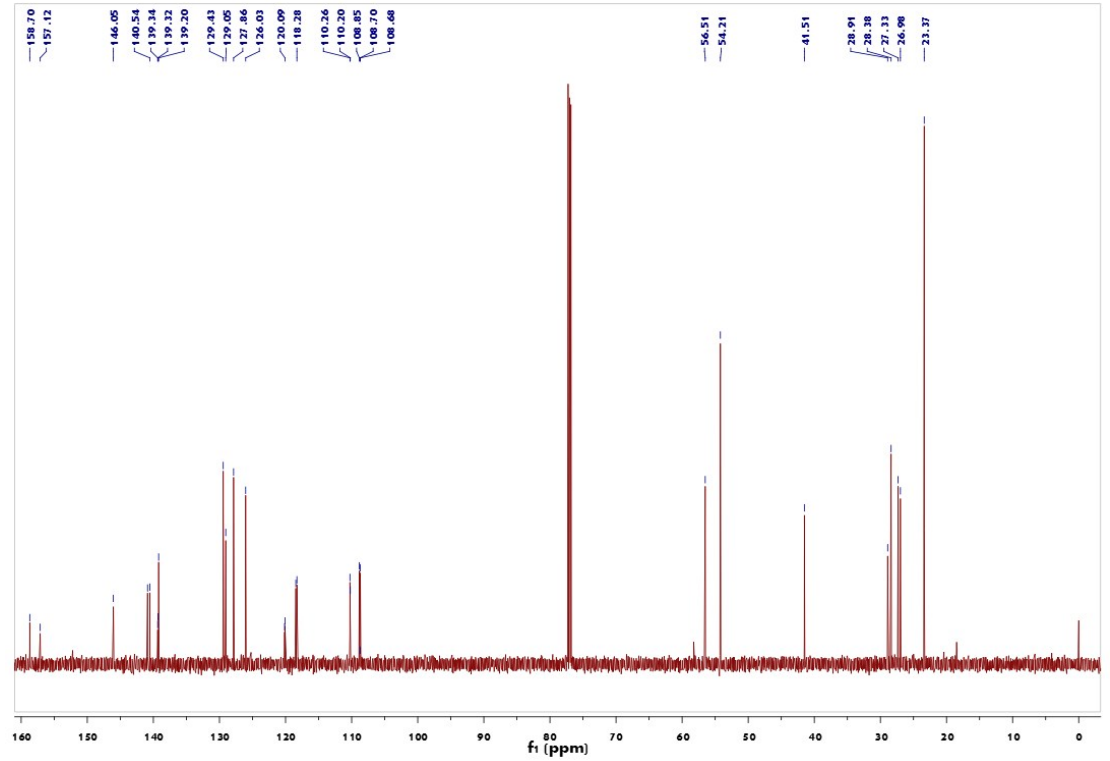



$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4a-1** in $CDCl_3$

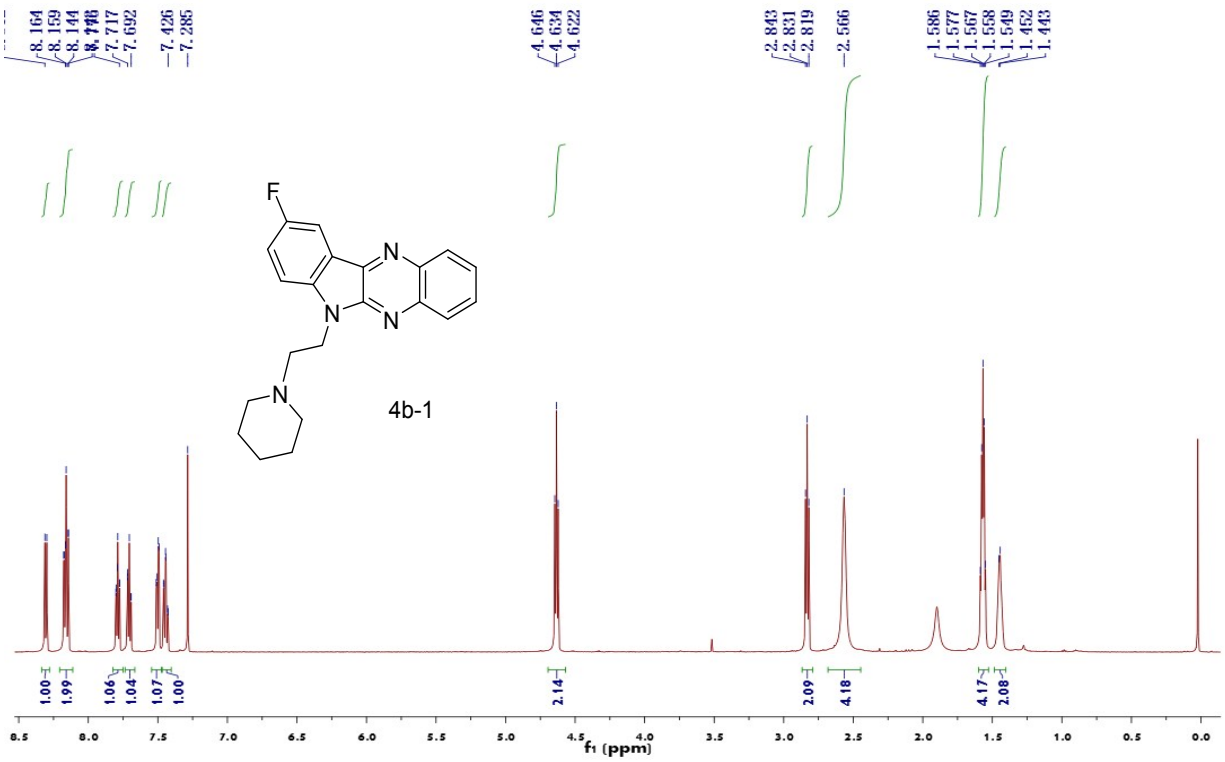


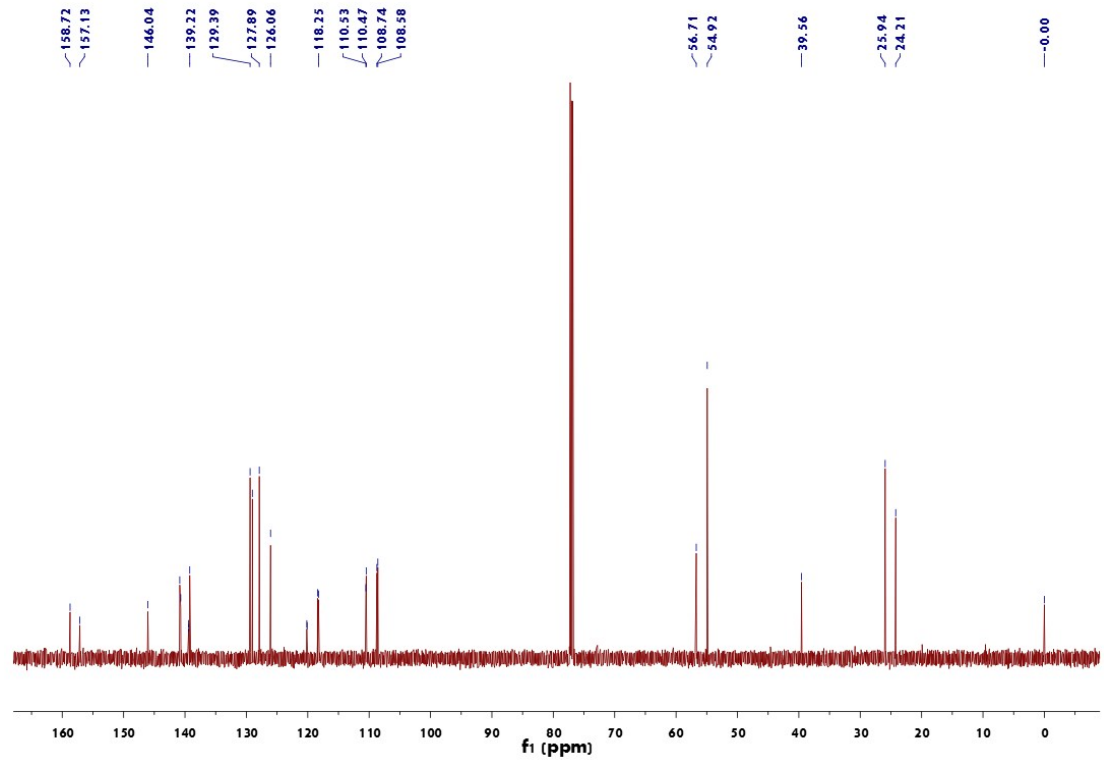

$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4a-2** in $CDCl_3$



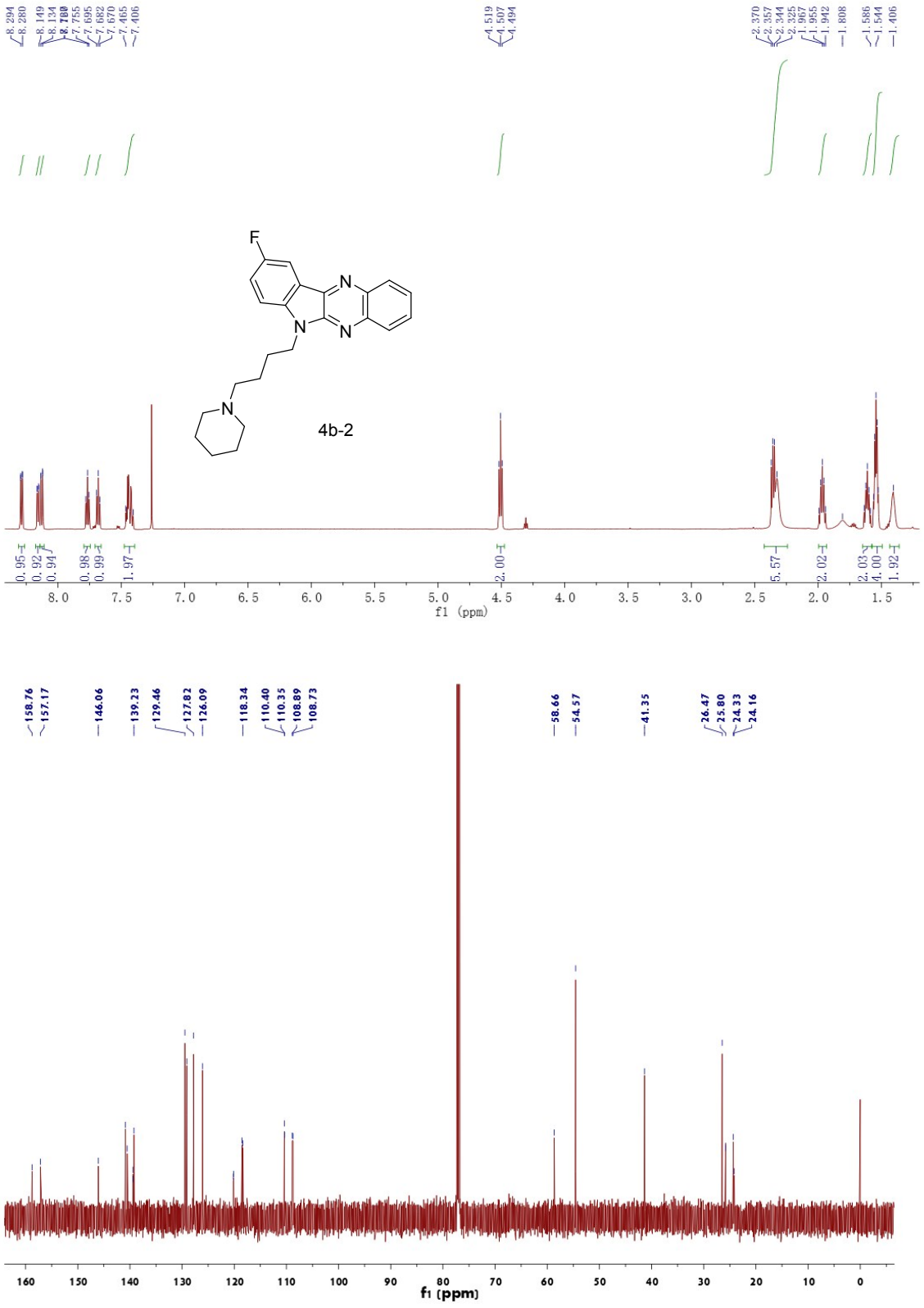




$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4a-3** in $CDCl_3$

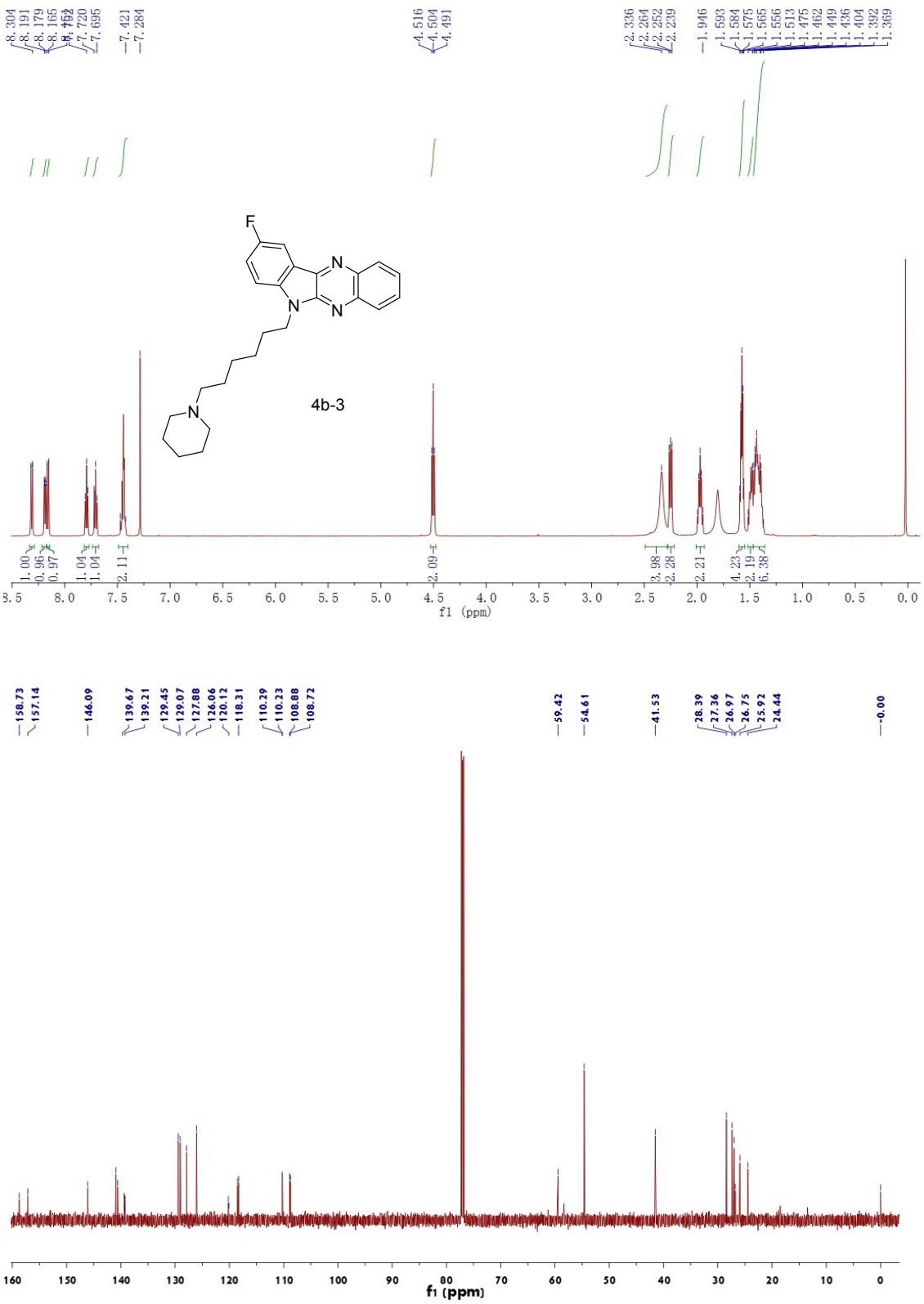


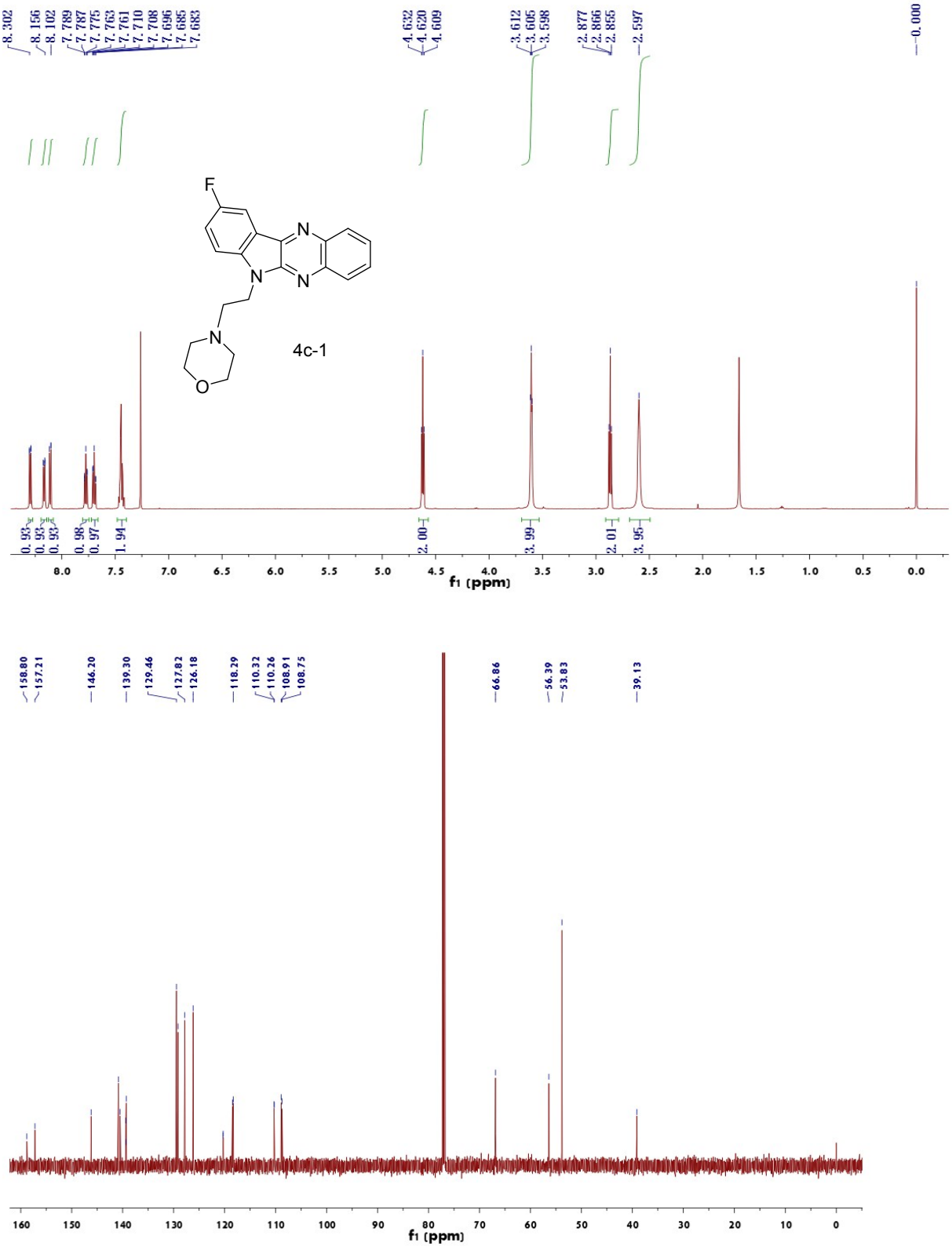

$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4b-1** in $CDCl_3$



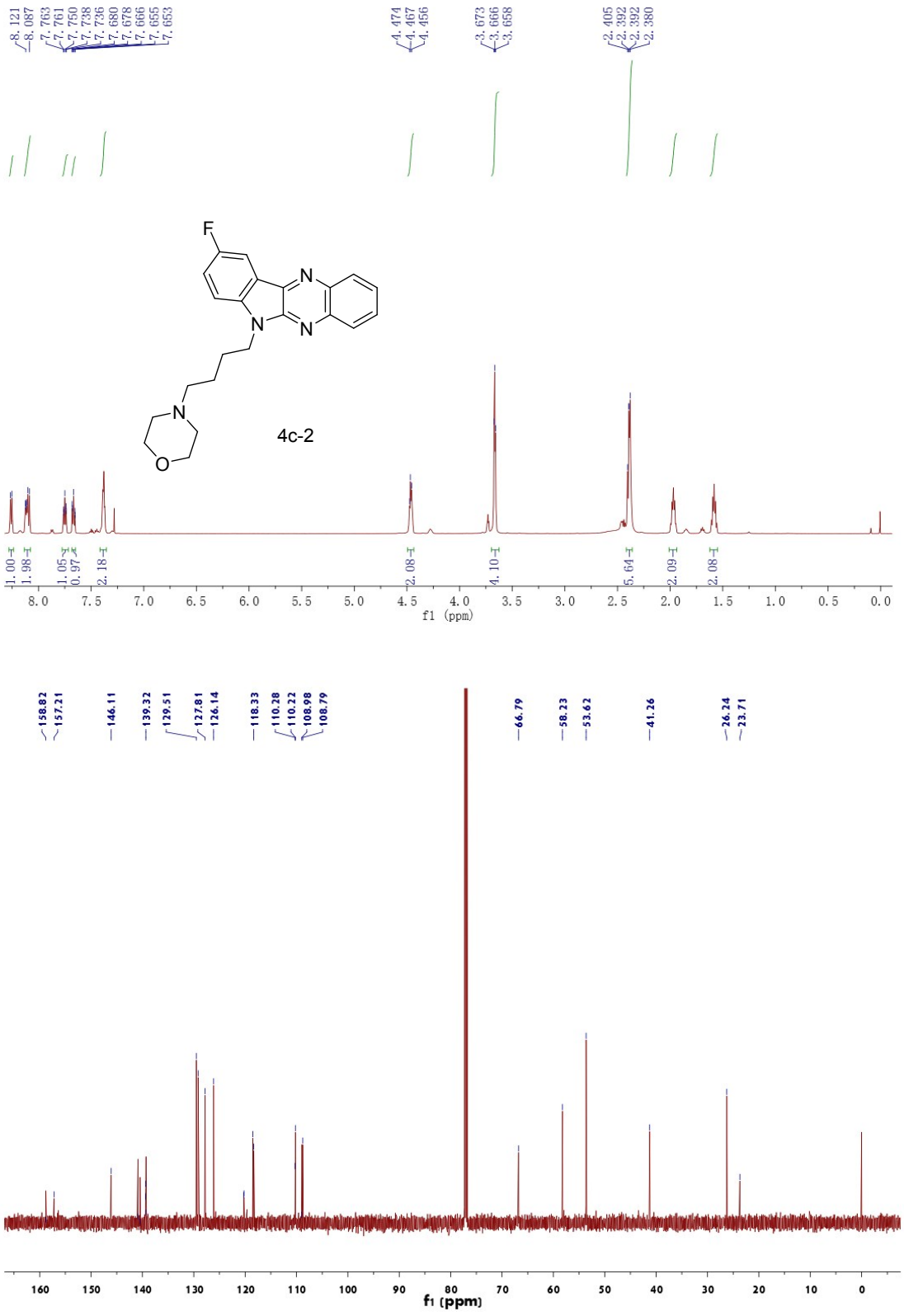

$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4b-2** in $CDCl_3$



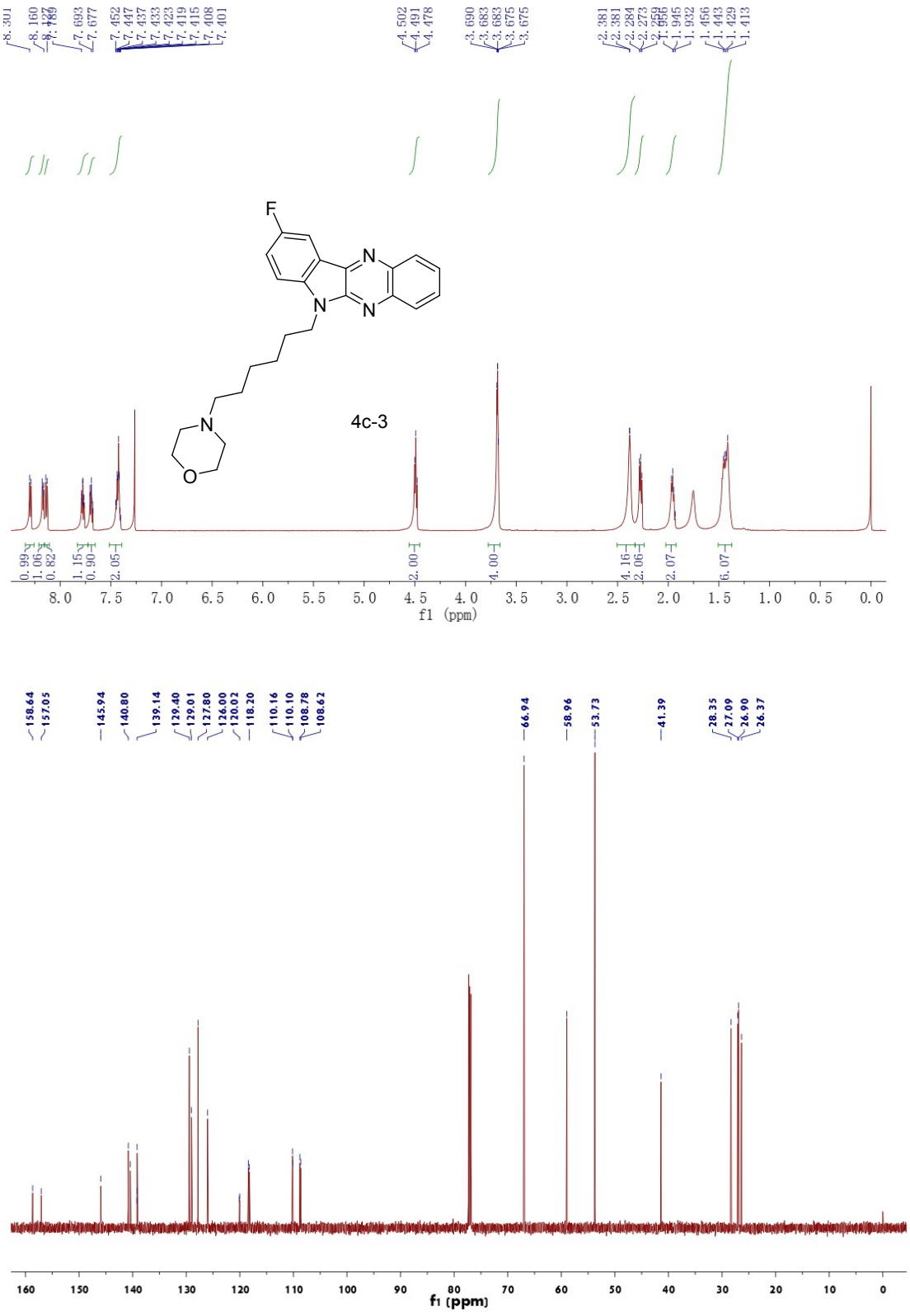

$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4b-3** in $CDCl_3$



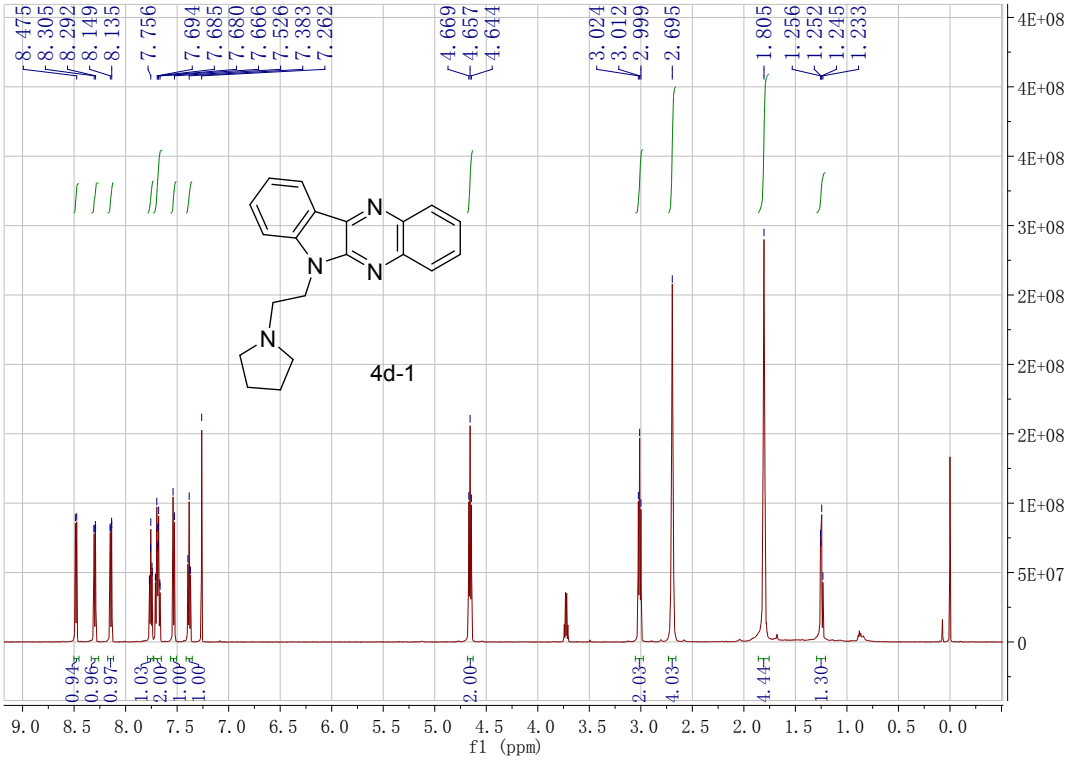

$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4c-1** in $CDCl_3$

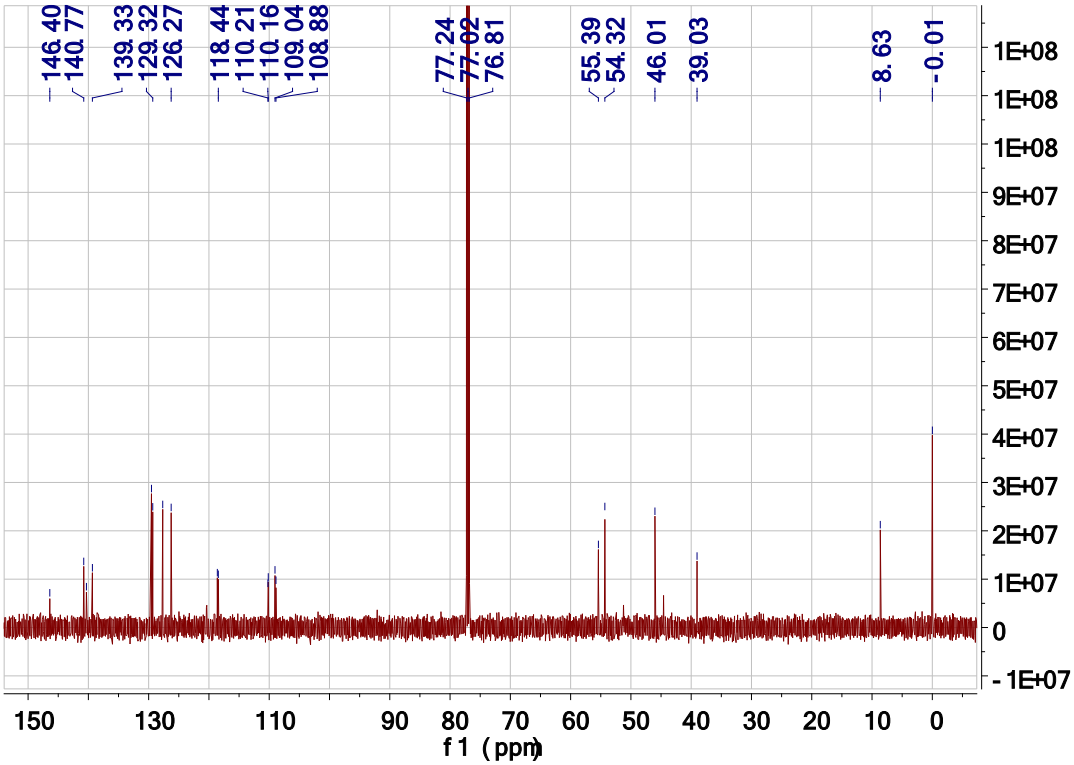



$^{1}H$（600MHz）and $^{13}C$(150MHz) NMR spectra of **4c-2** in $CDCl_3$

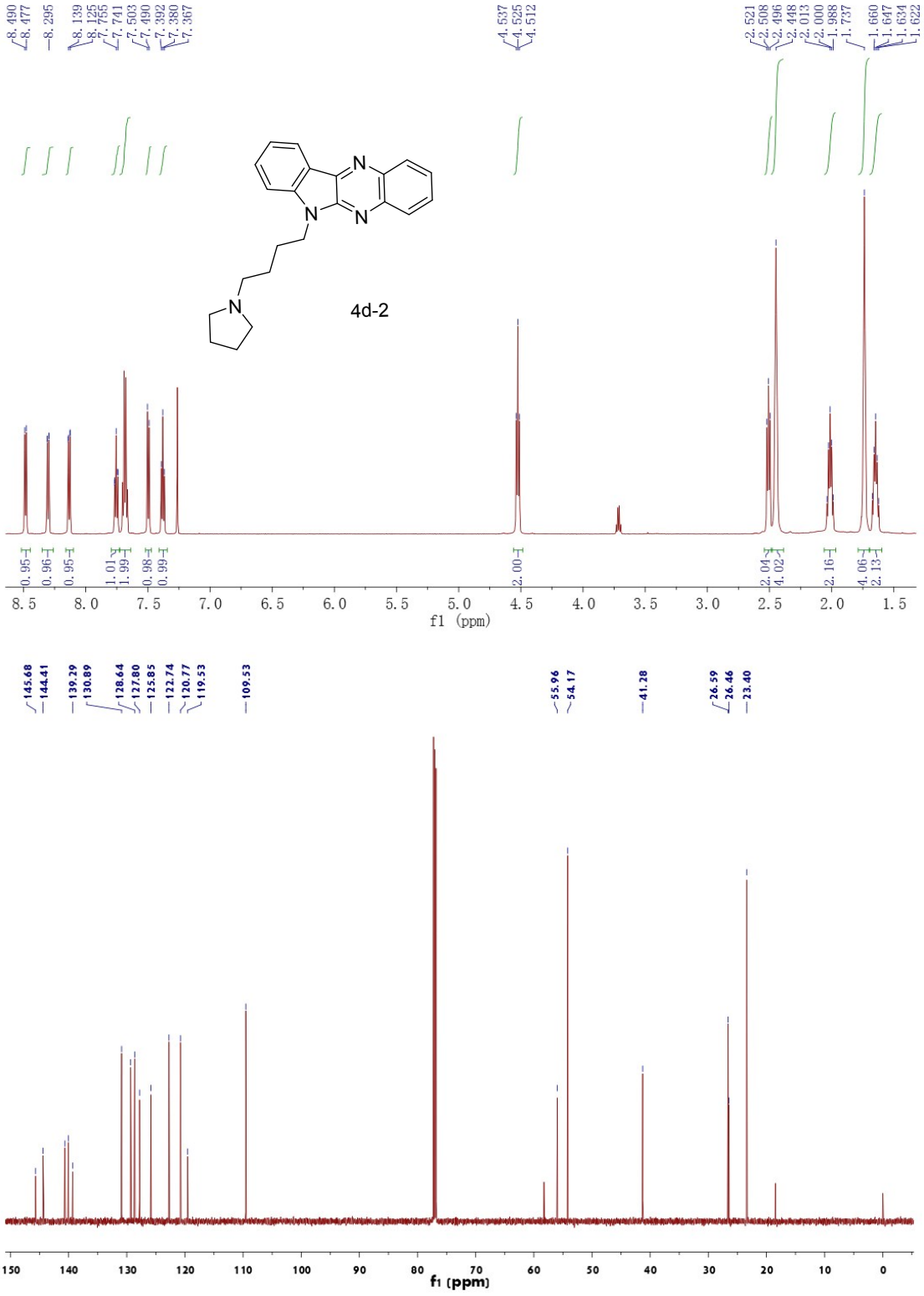



$^{1}H$（600MHz）and $^{13}C$(150MHz) NMR spectra of **4c-3** in $CDCl_3$

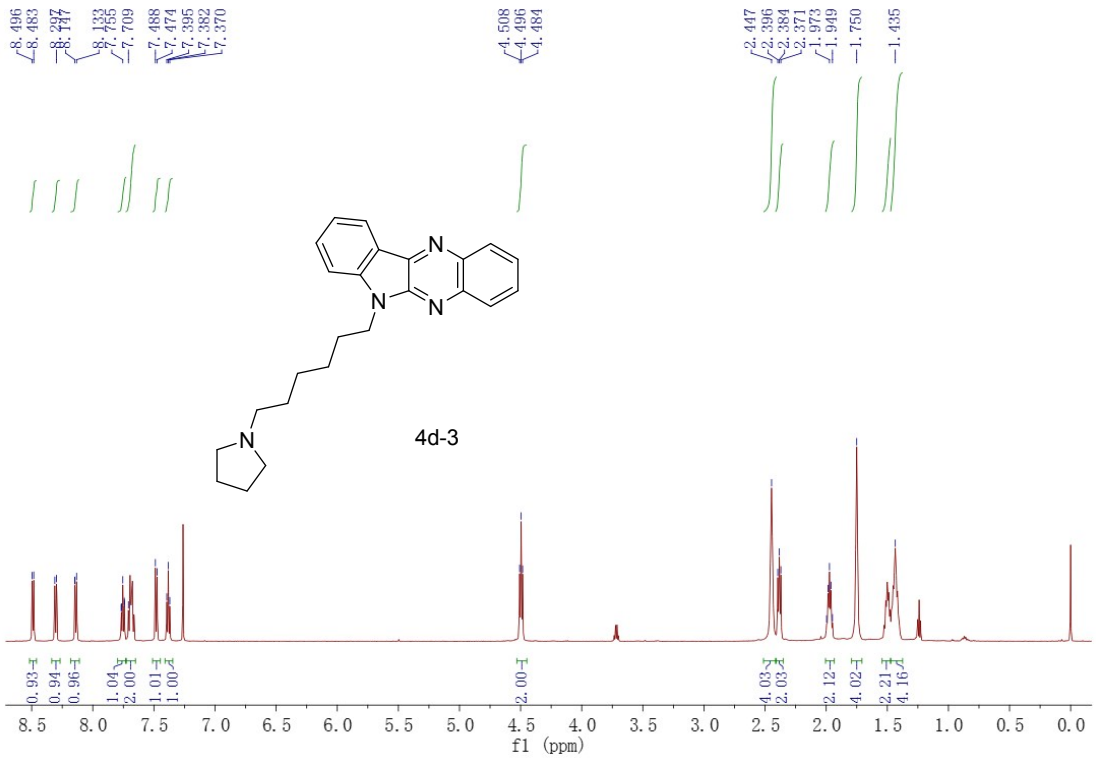


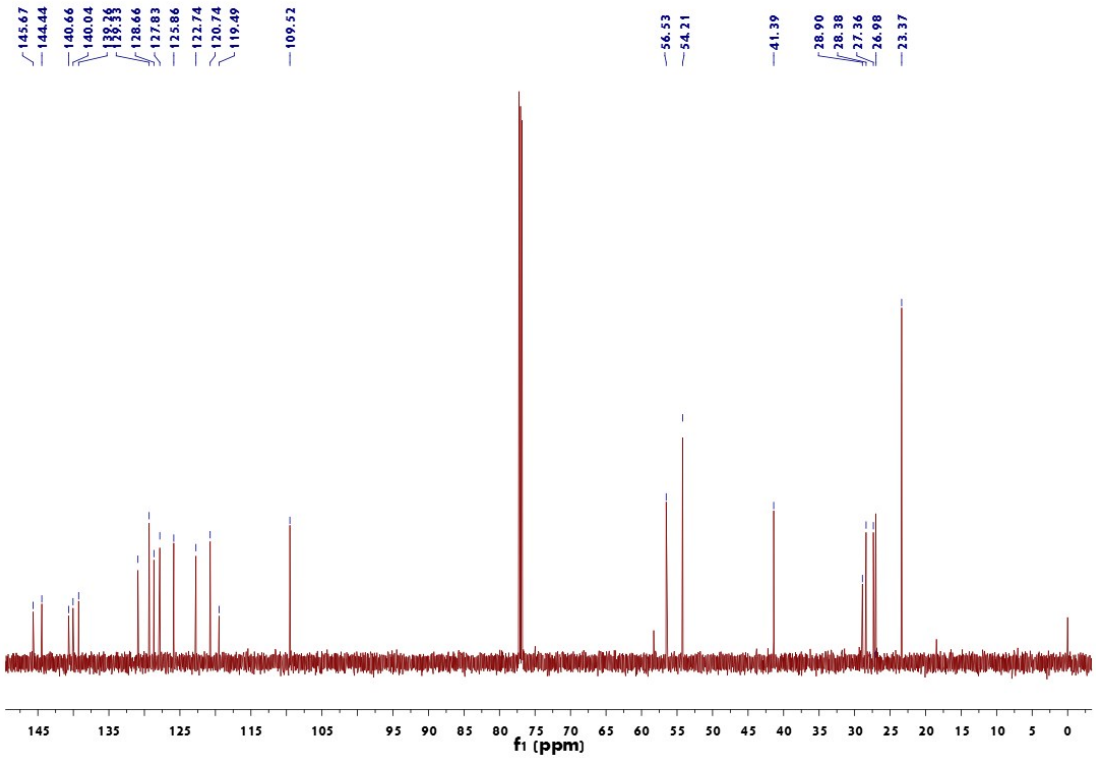




$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **4d-1** in $CDCl_3$

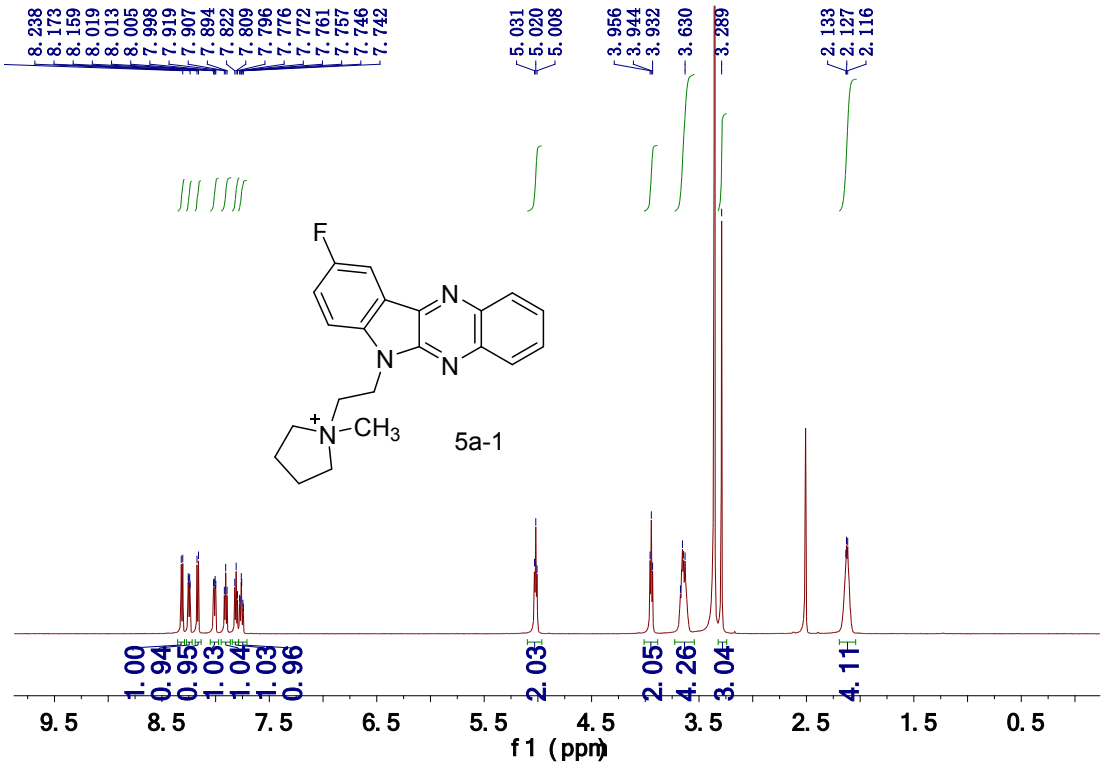


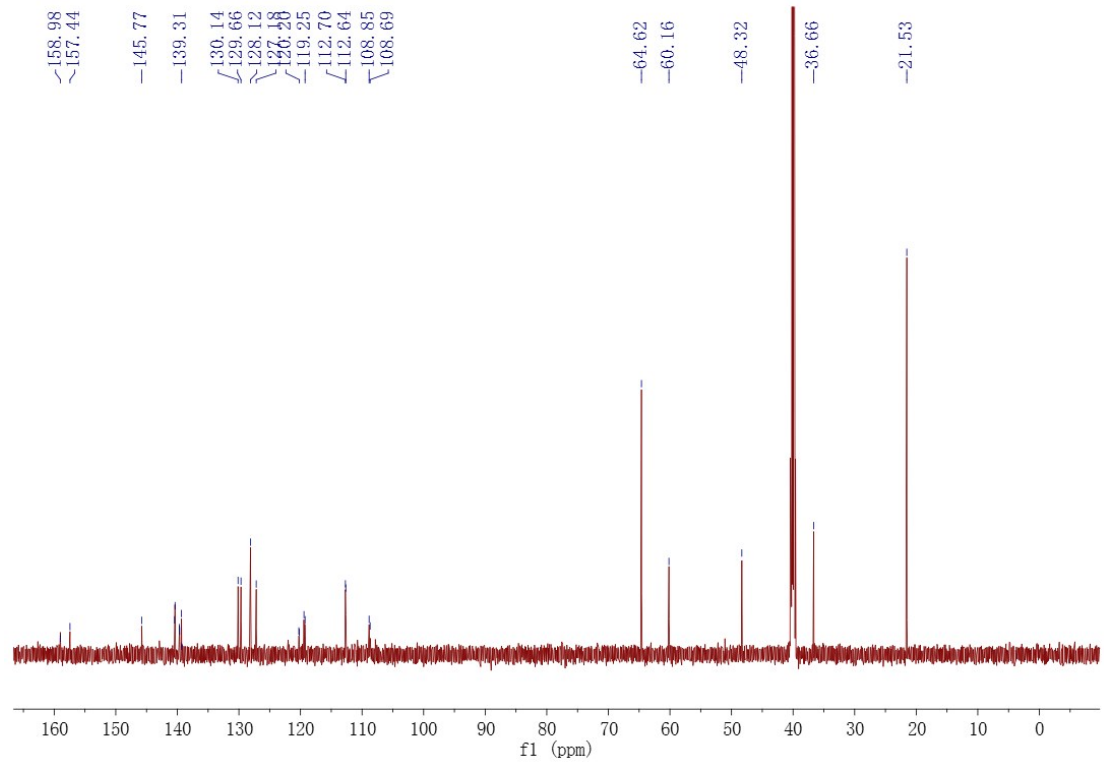

$^{1}H$（600MHz）and $^{13}C$(150MHz) NMR spectra of **4d-2** in $CDCl_3$



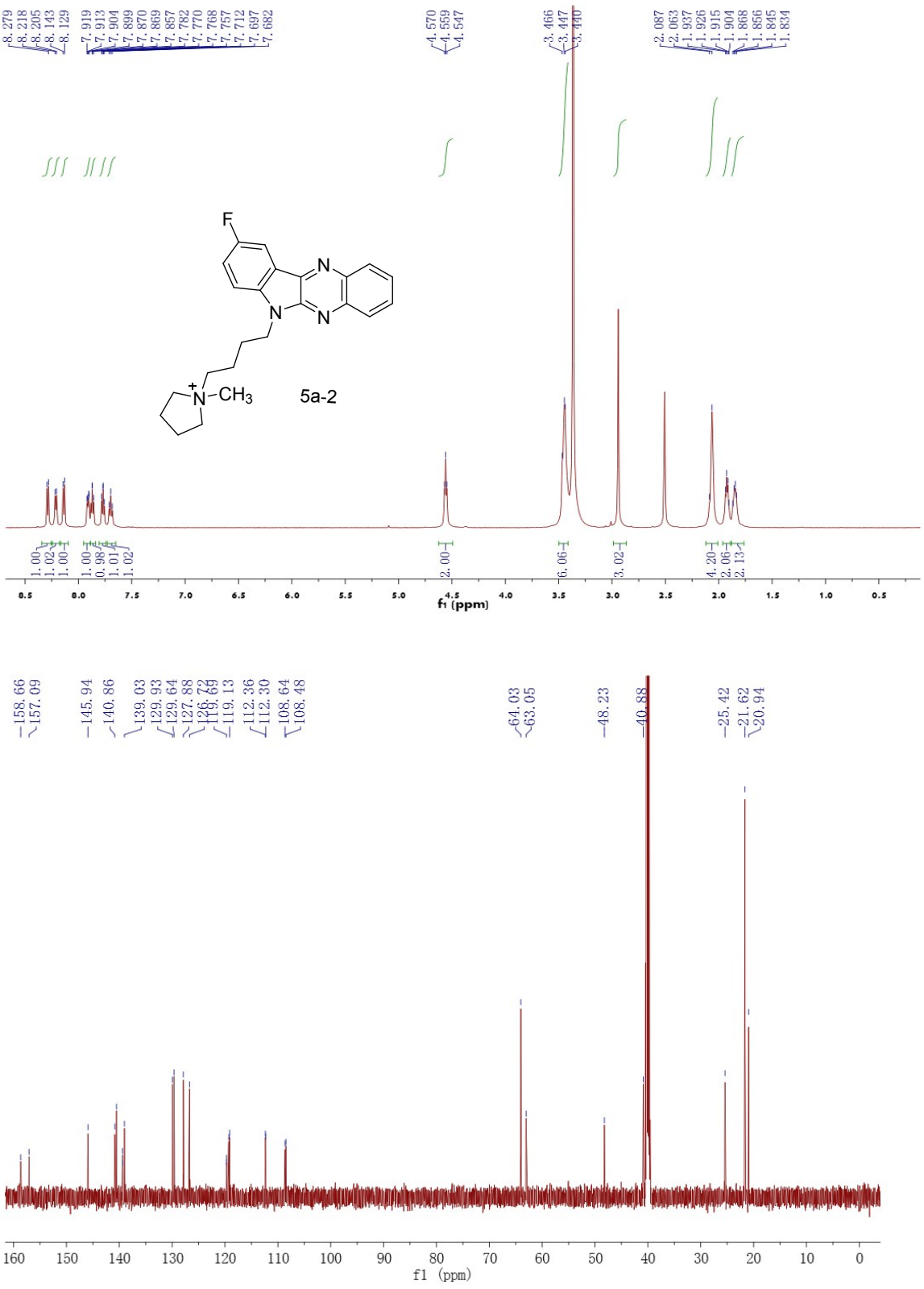




$^{1}H$（600 MHz）and $^{13}C$(150 MHz) NMR spectra of **4d-3** in $CDCl_3$

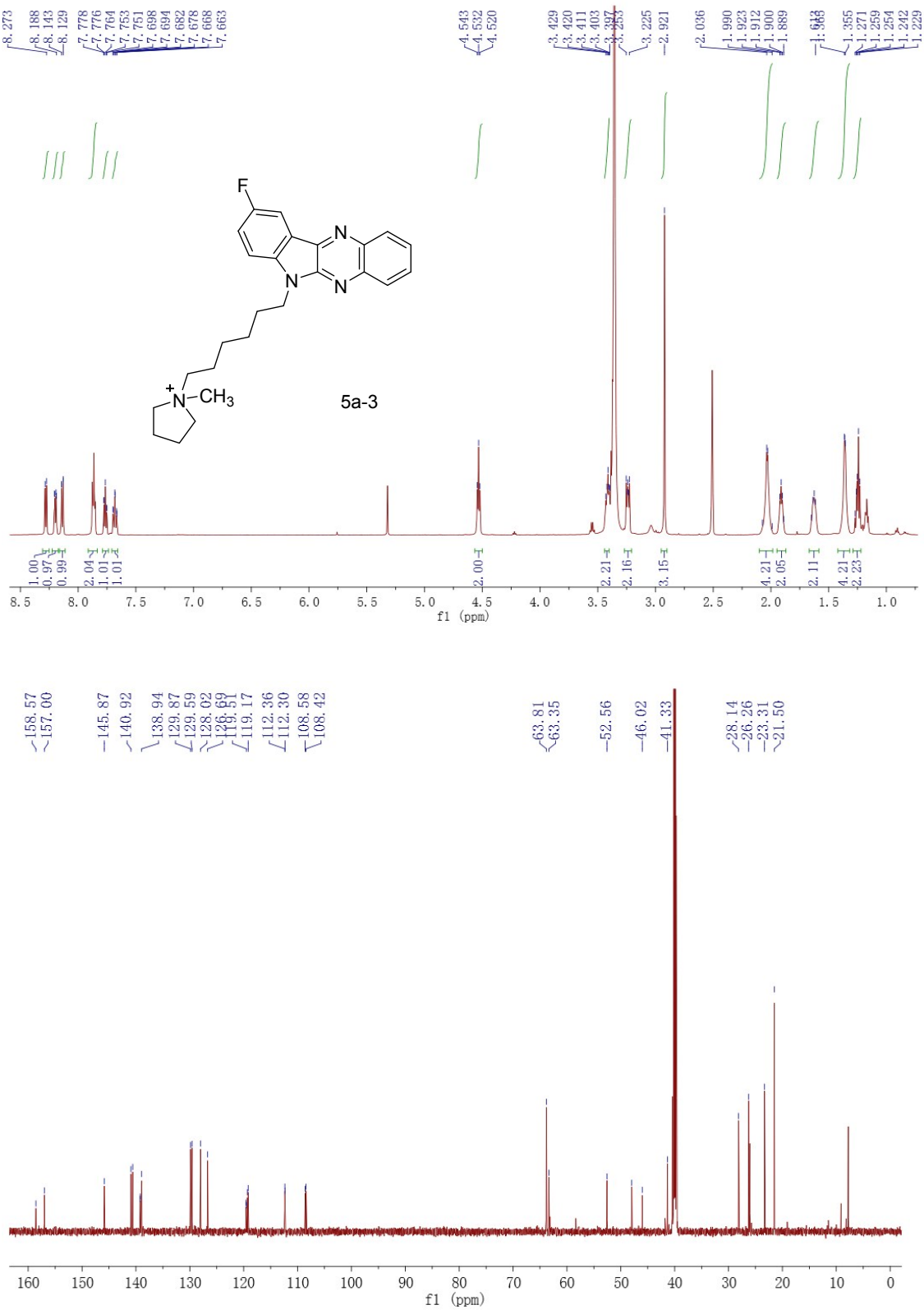


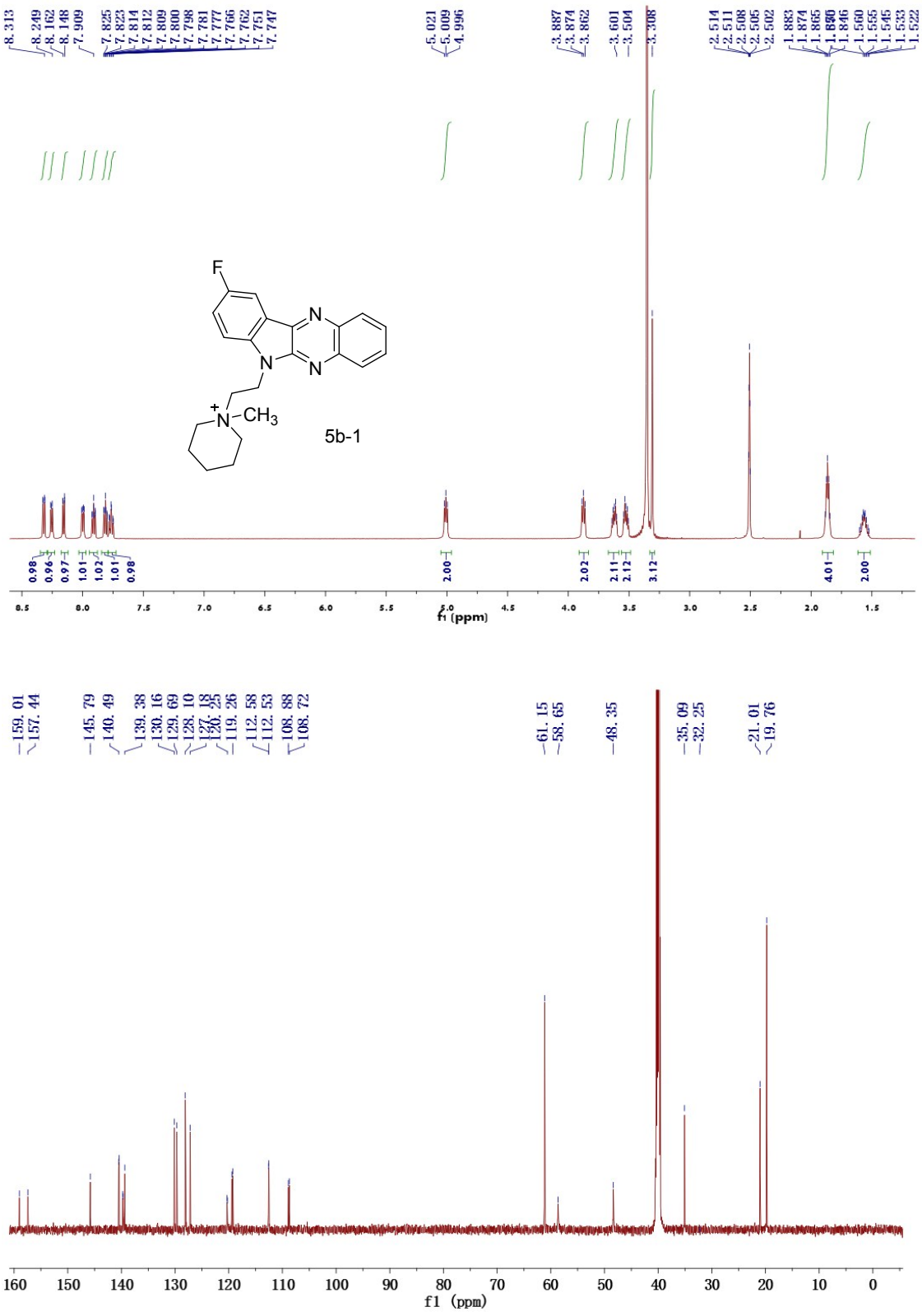

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5a-1** in DMSO-$d_6$



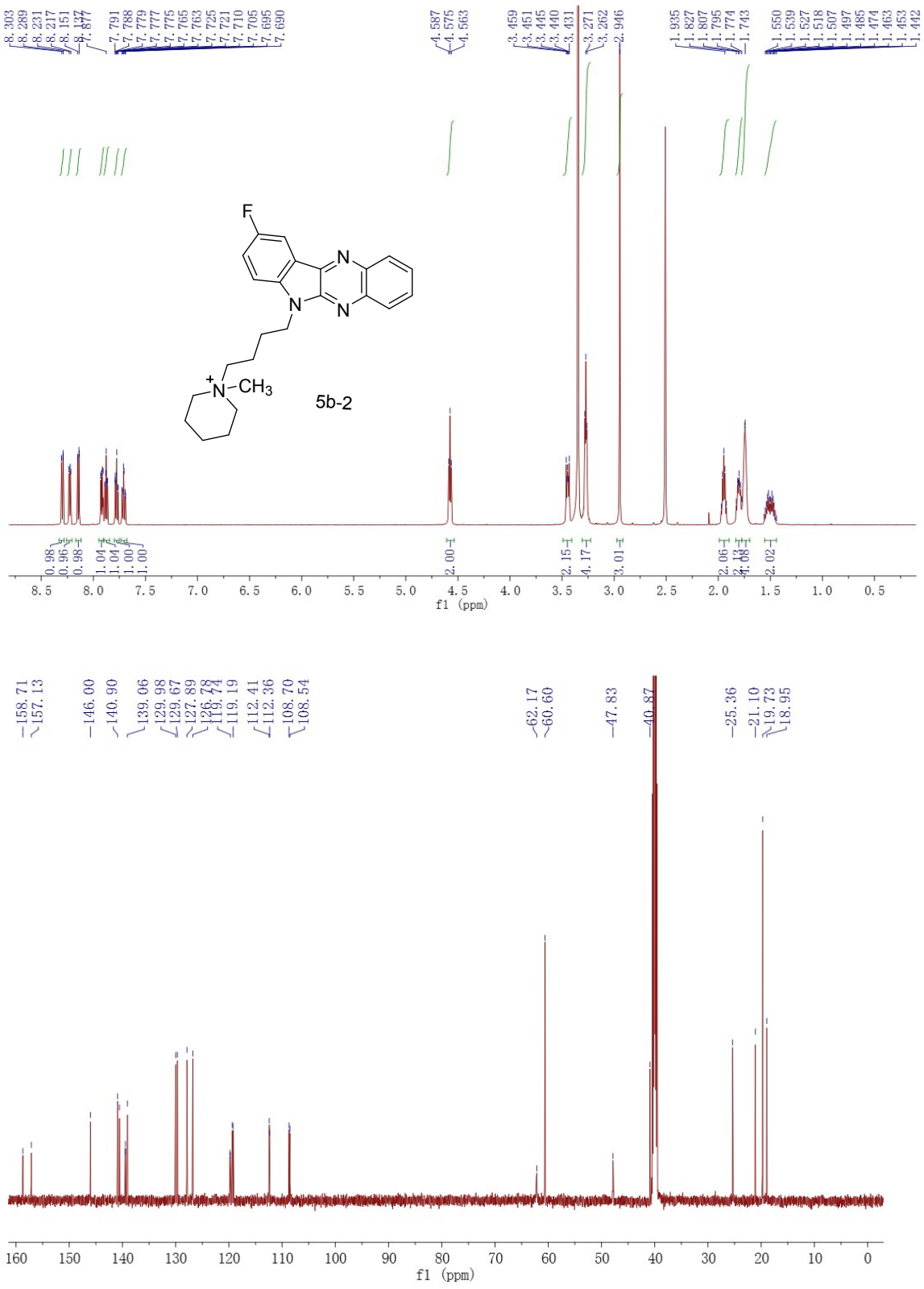

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5a-2** in DMSO-$d_6$



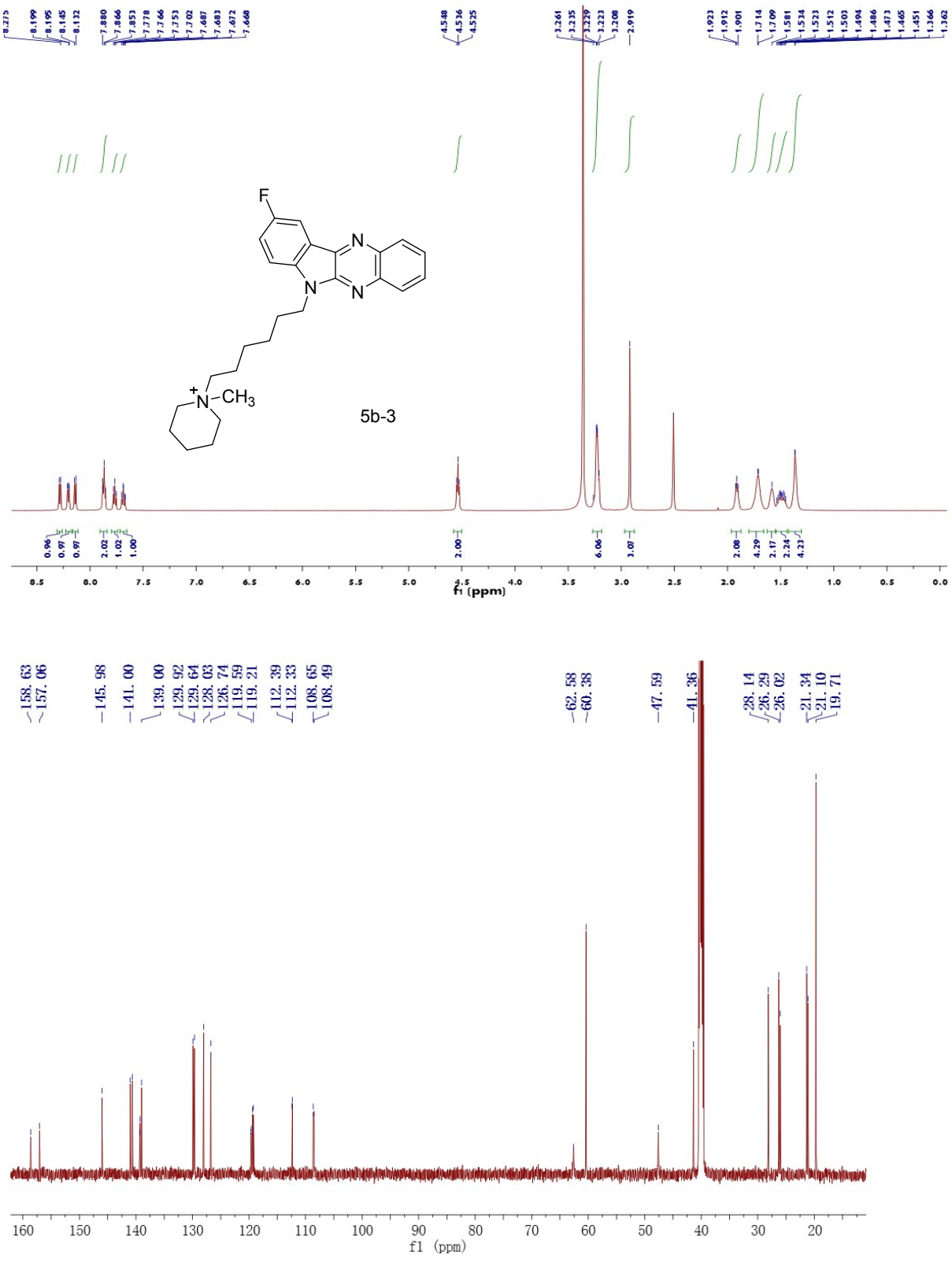

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5a-3** in DMSO-$d_6$



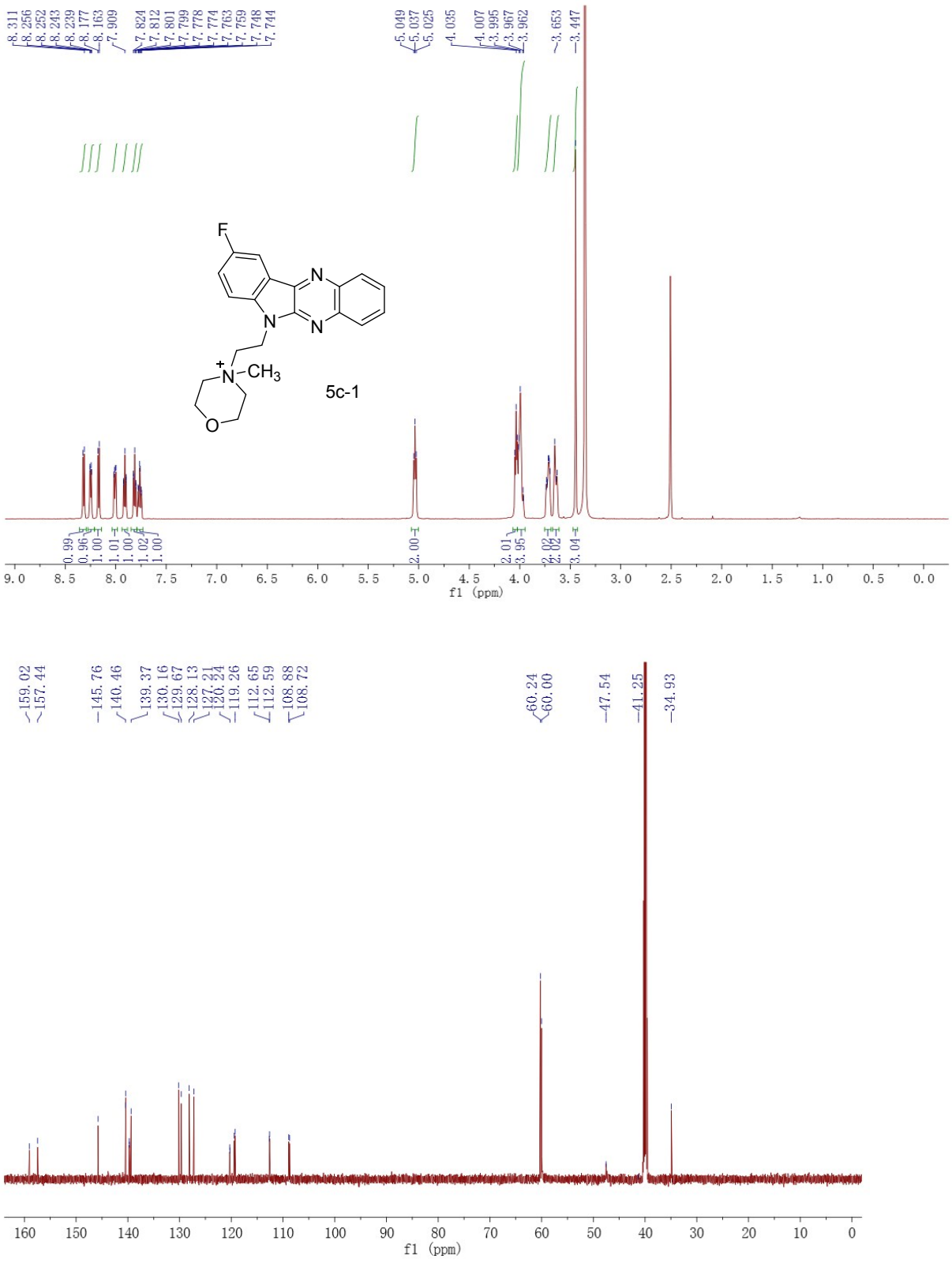

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5b-1** in DMSO-$d_6$



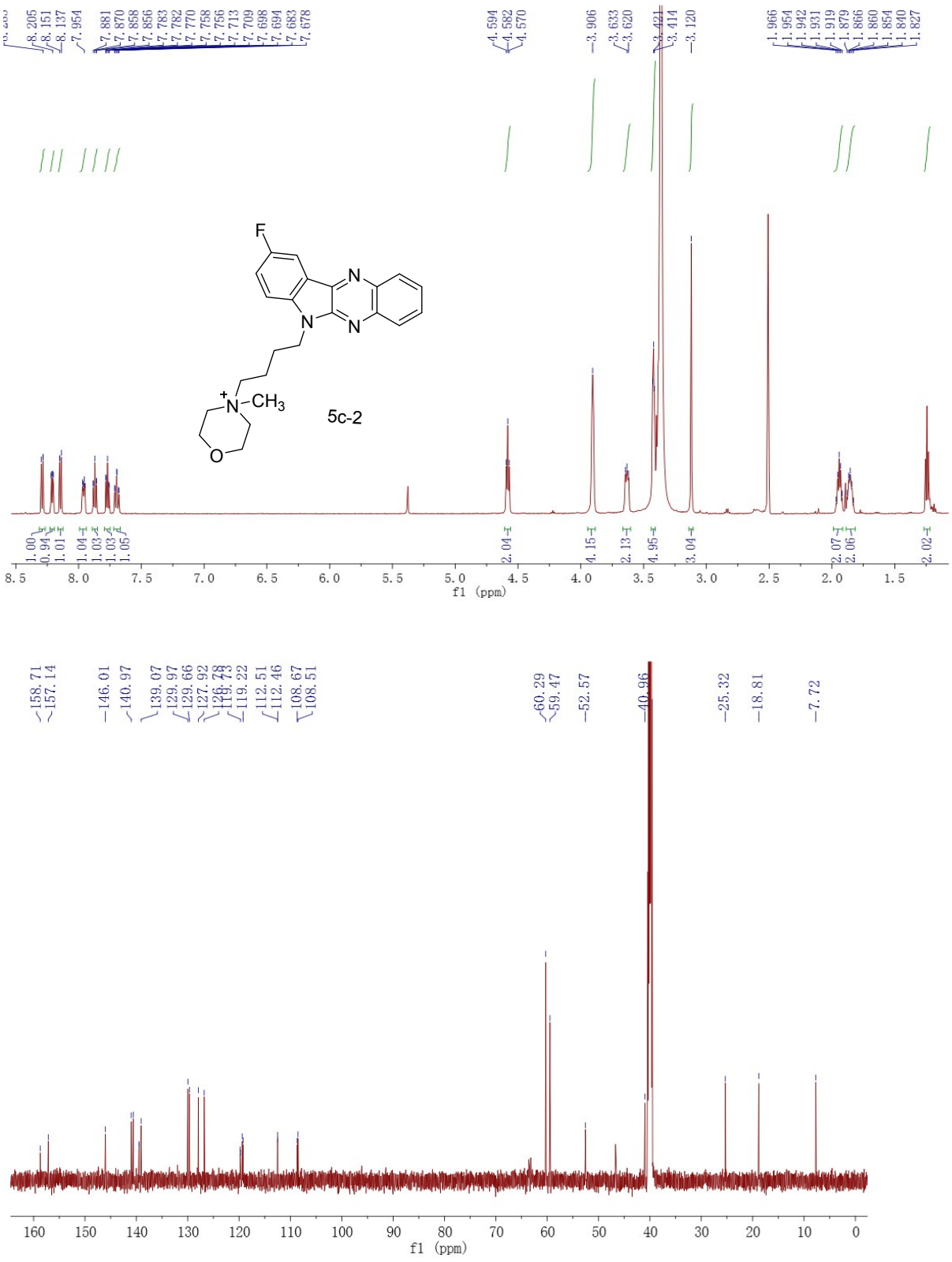

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5b-2** in DMSO-$d_6$



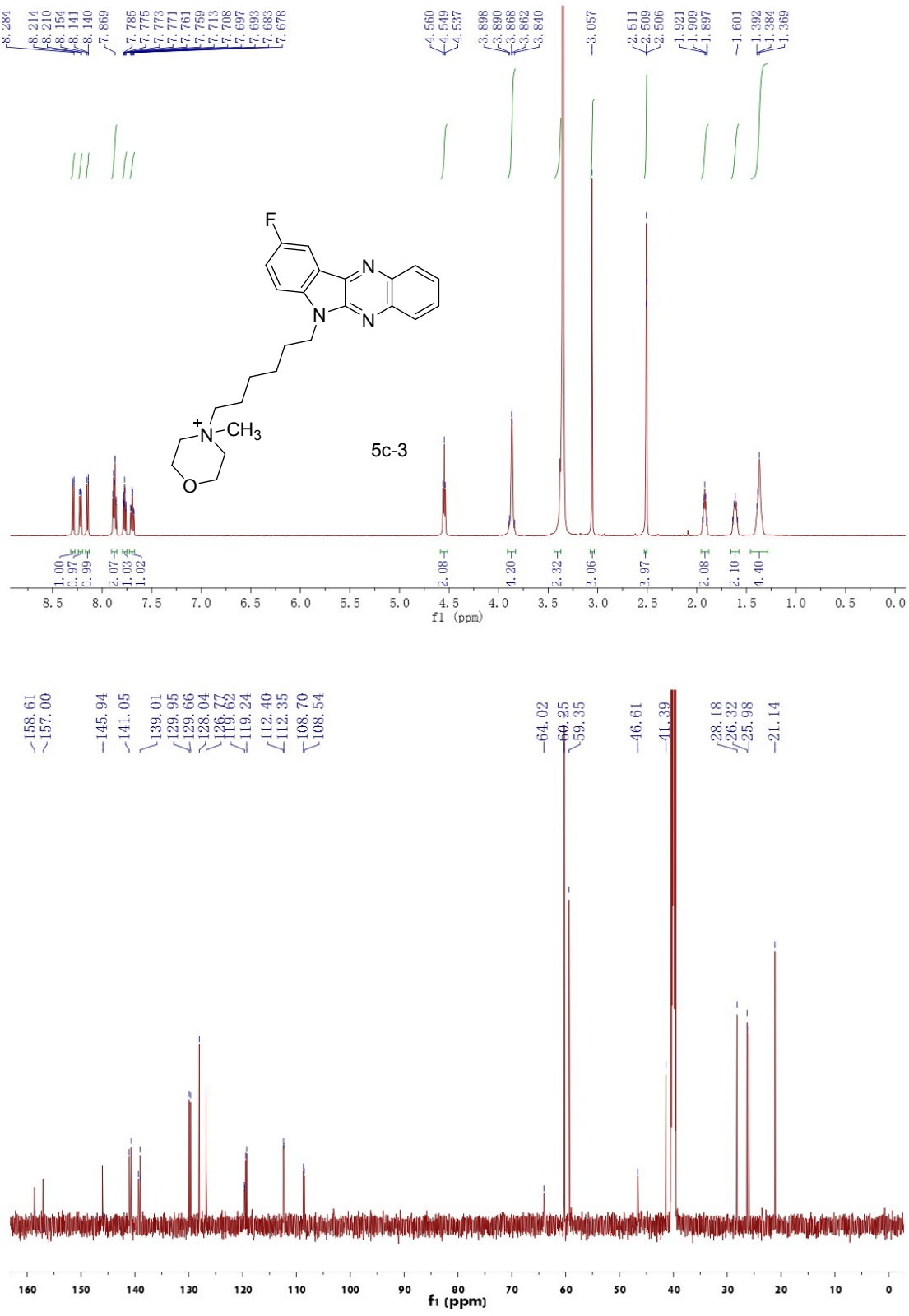

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5b-3** in DMSO-$d_6$



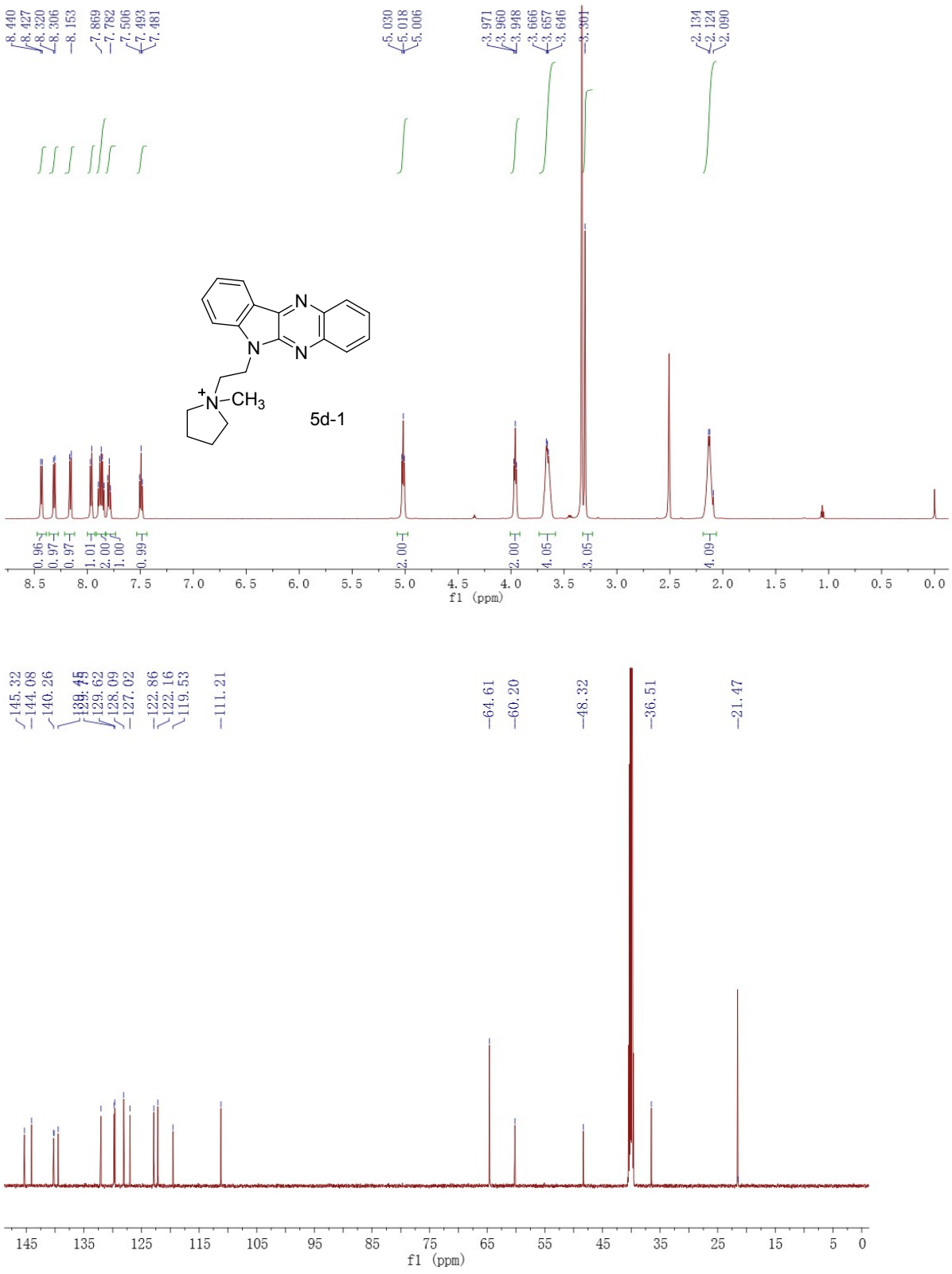

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5c-1** in DMSO-$d_6$



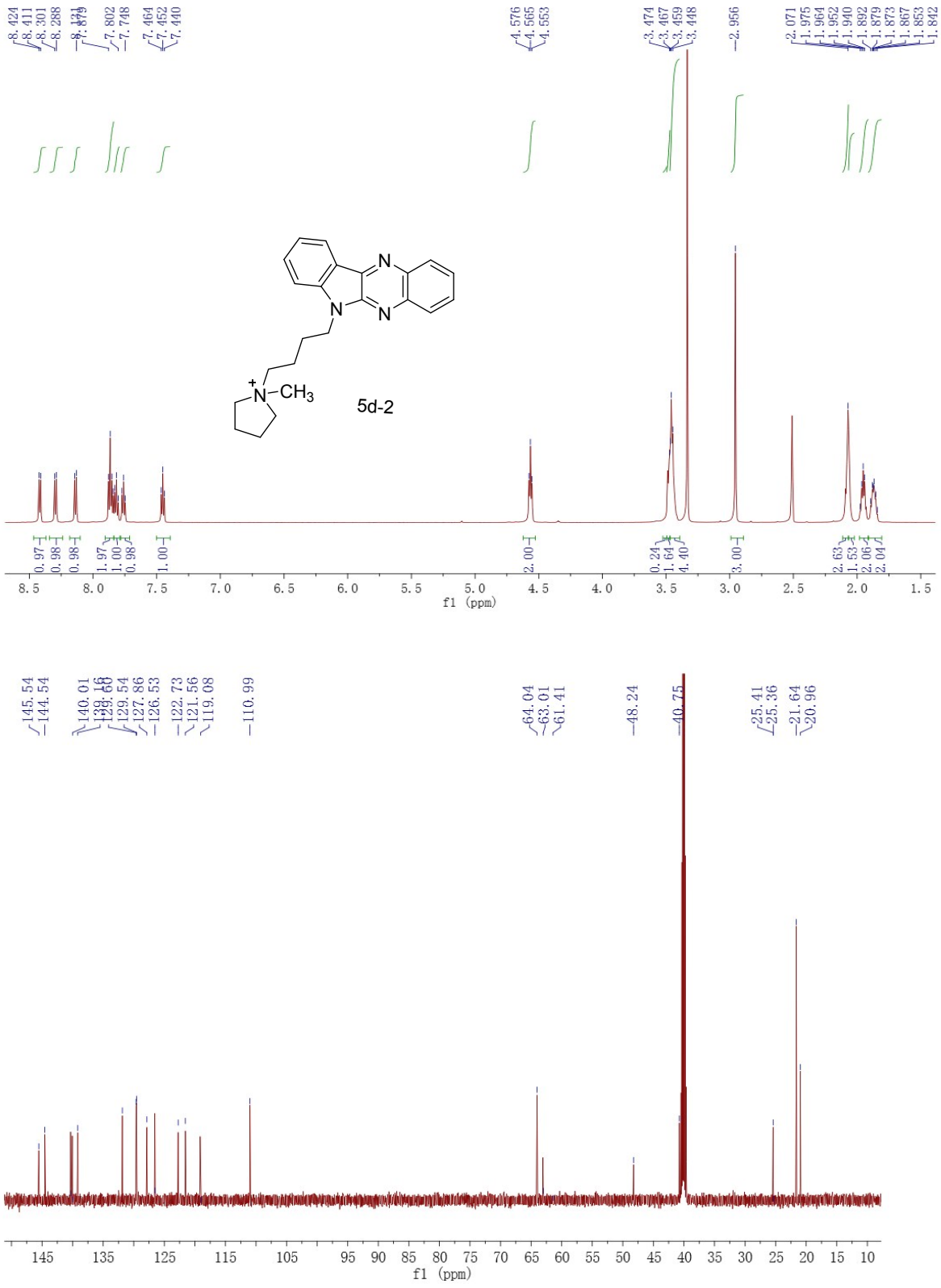

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5c-2** in DMSO-$d_6$



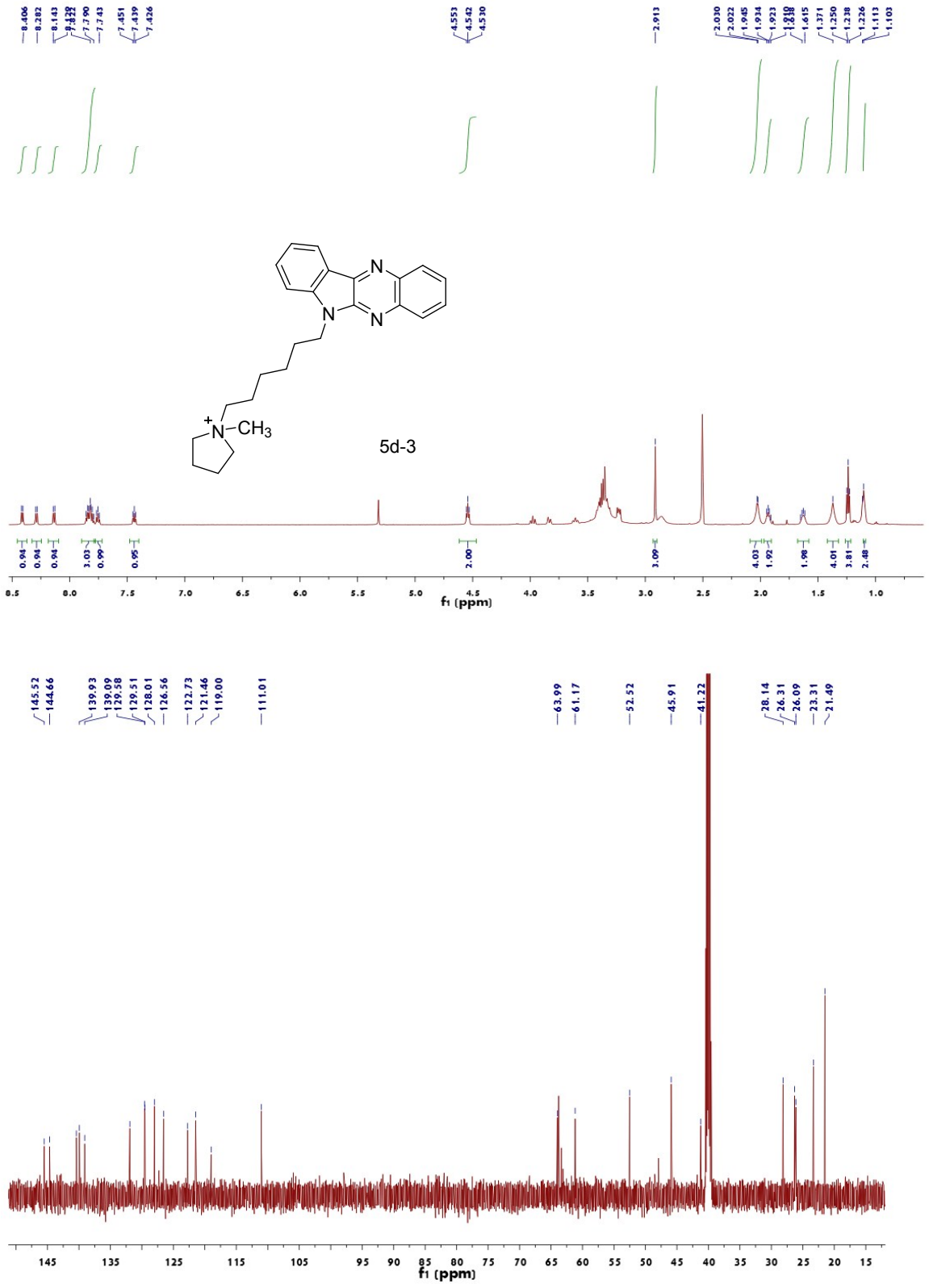

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5c-3** in DMSO-$d_6$



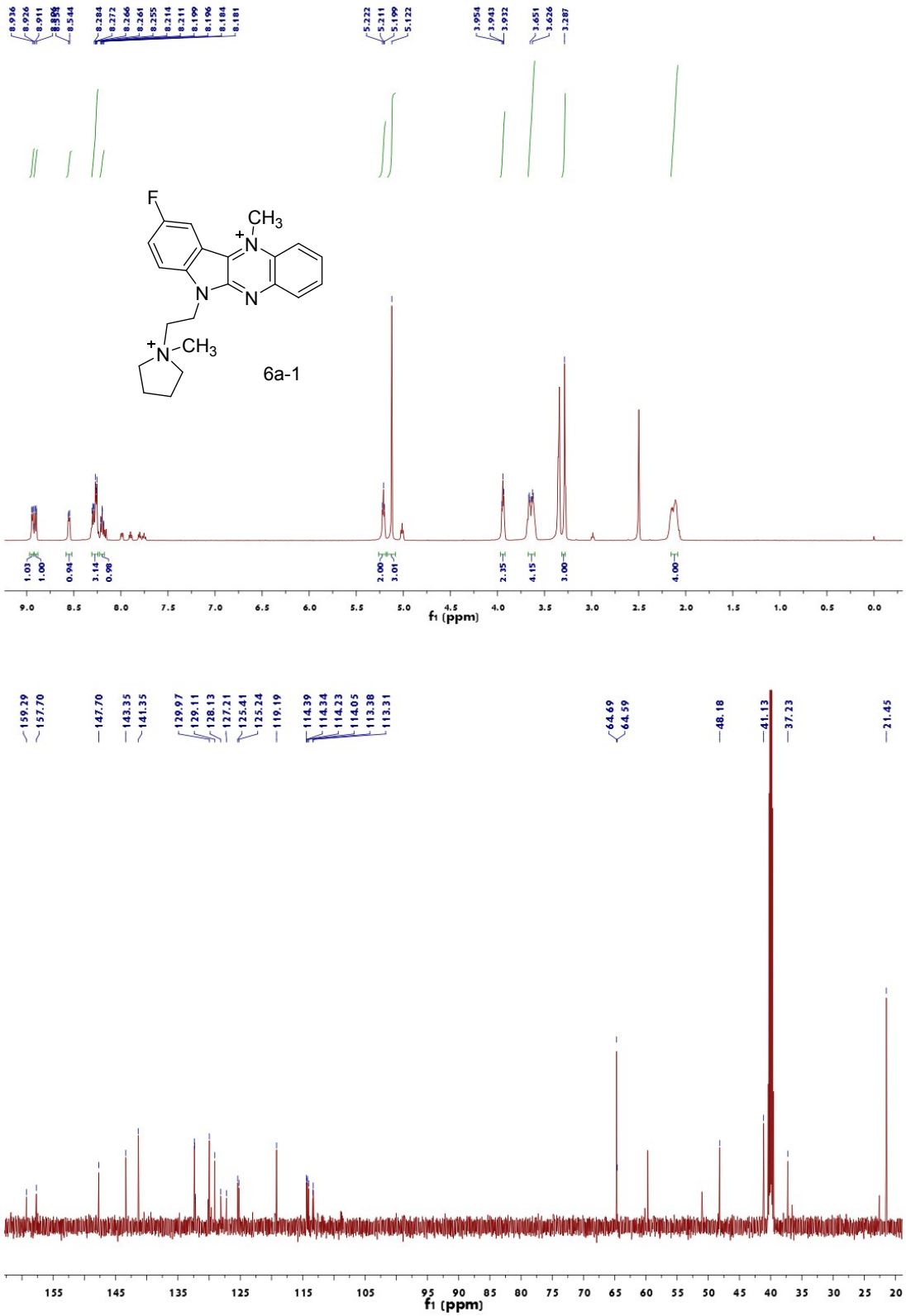

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5d-1** in DMSO-$d_6$



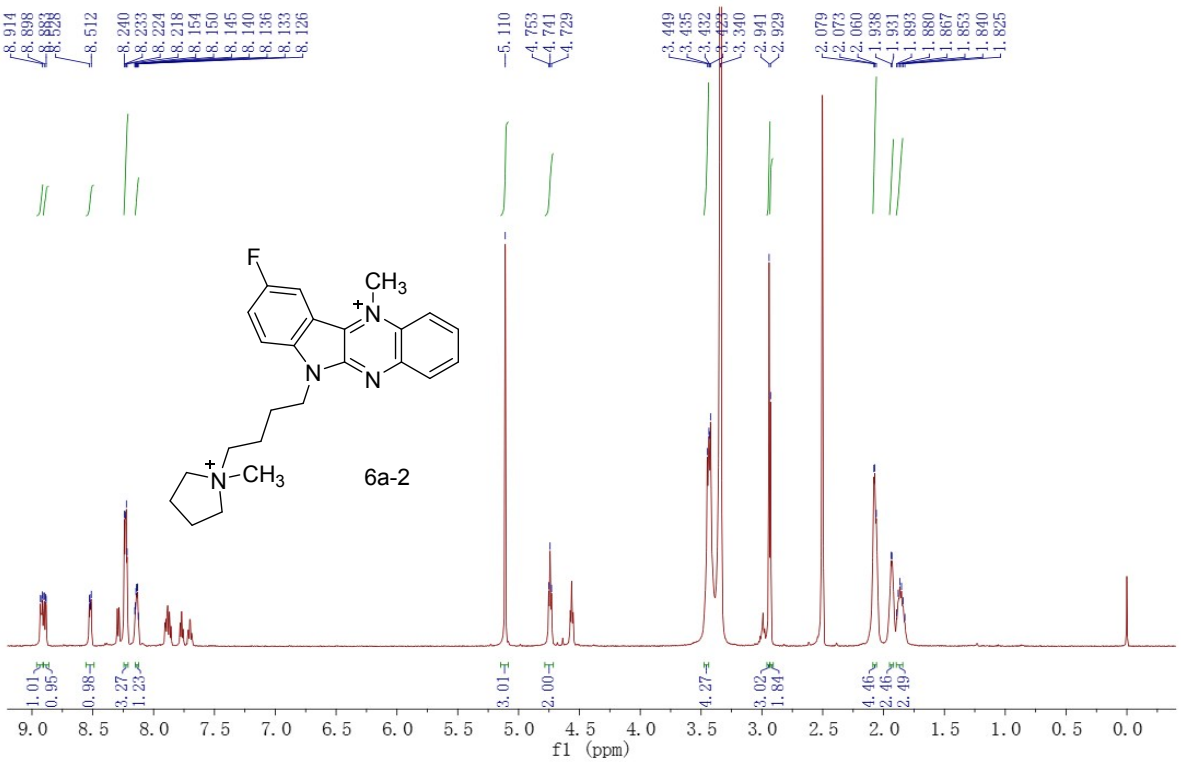

$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5d-2** in DMSO-$d_6$

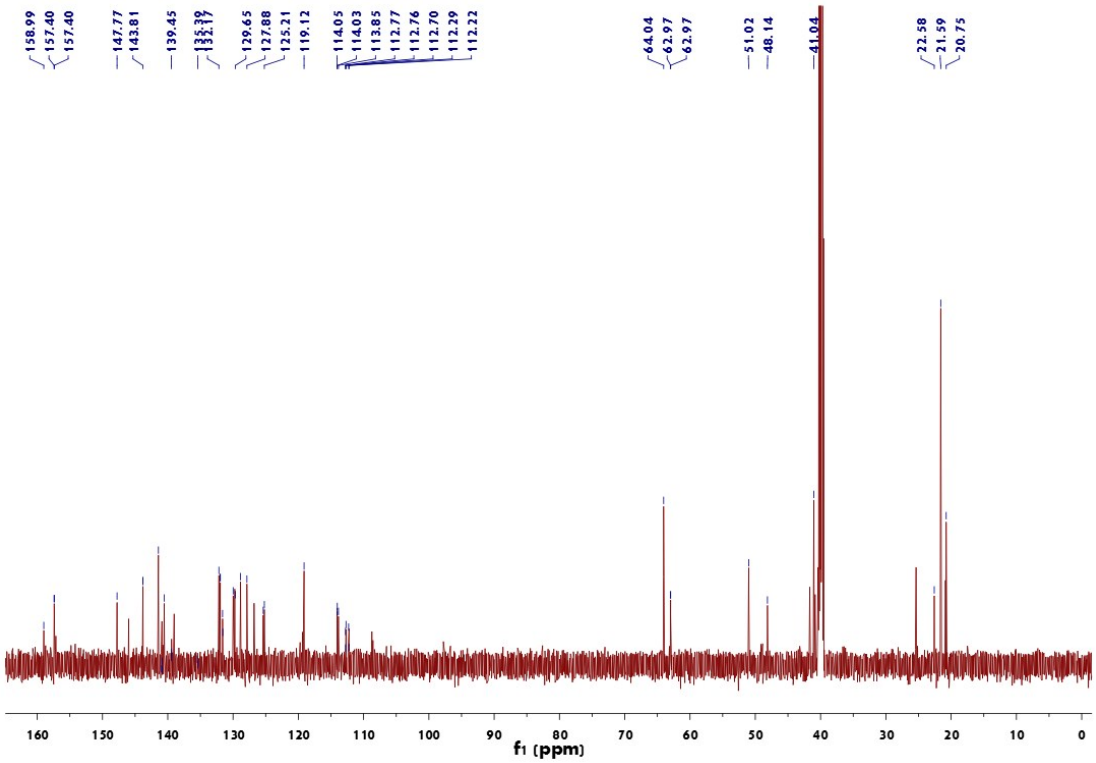



$^{1}$H（600 MHz）and $^{13}$C (150 MHz) NMR spectra of **5d-3** in DMSO-$d_6$

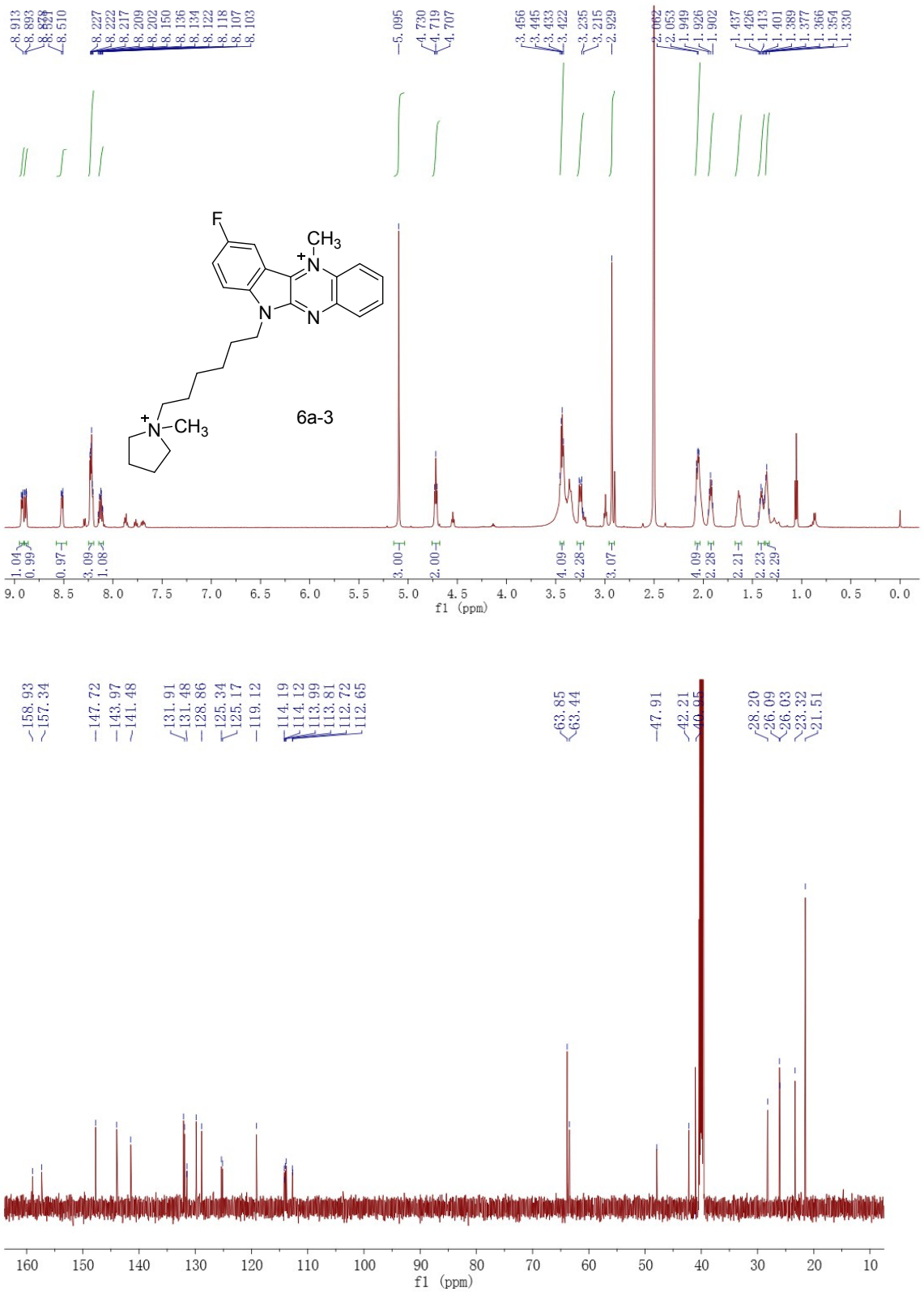



$^{1}$H（600MHz）and $^{13}$C(150MHz) NMR spectra of **6a-1** in DMSO-$d_6$

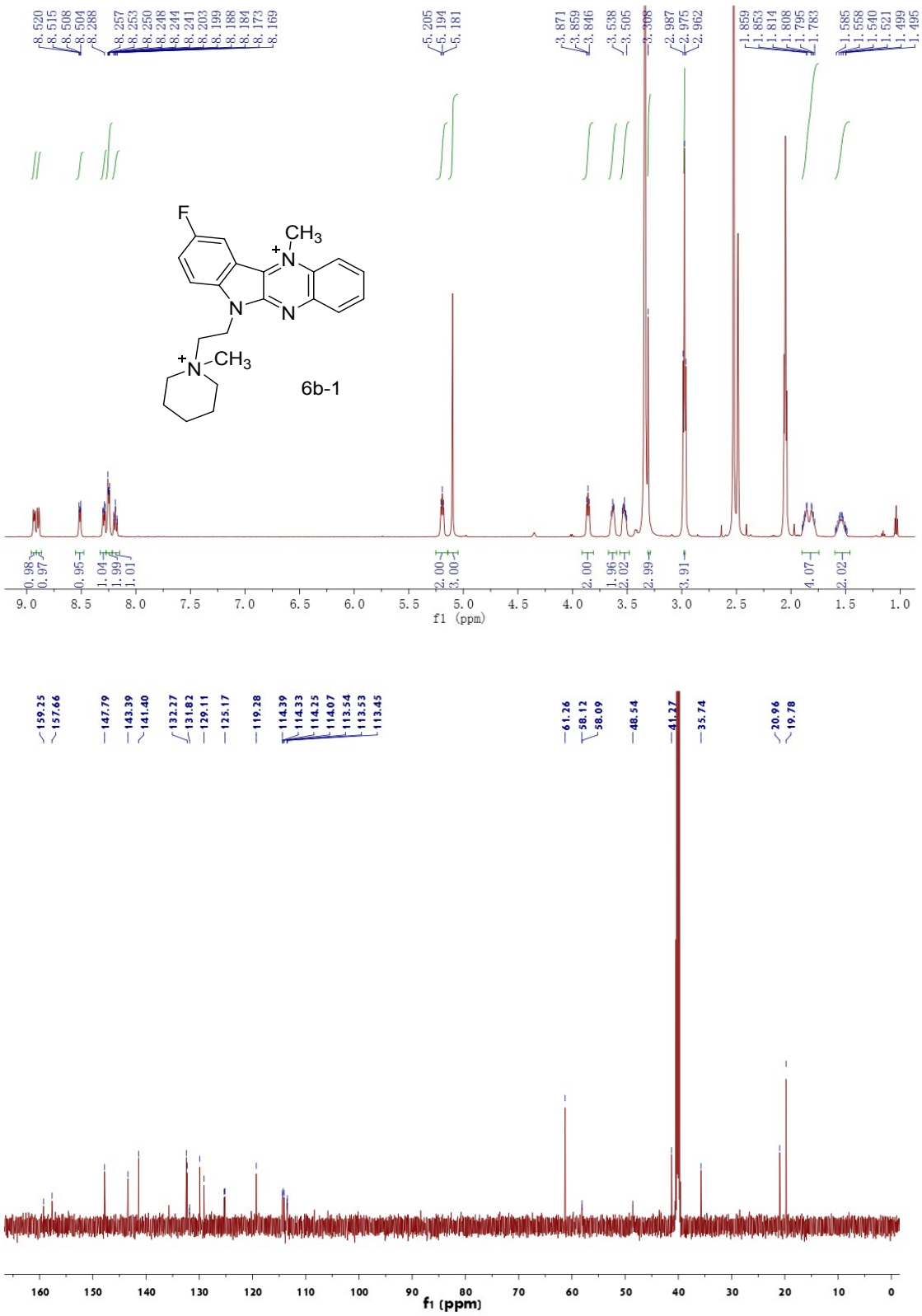


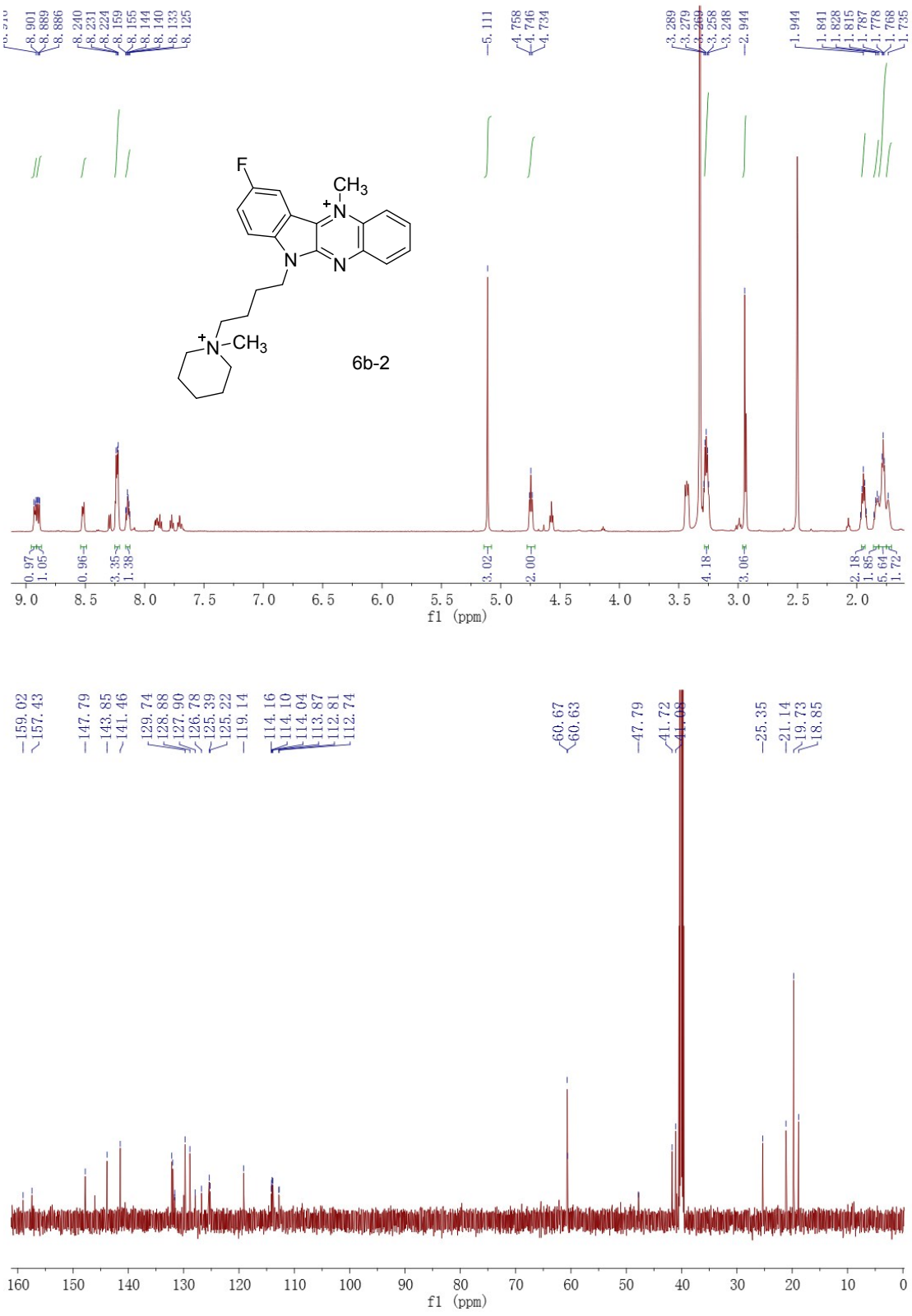

$^{1}$H（600MHz）and $^{13}$C(150MHz) NMR spectra of **6a-2** in DMSO-$d_6$



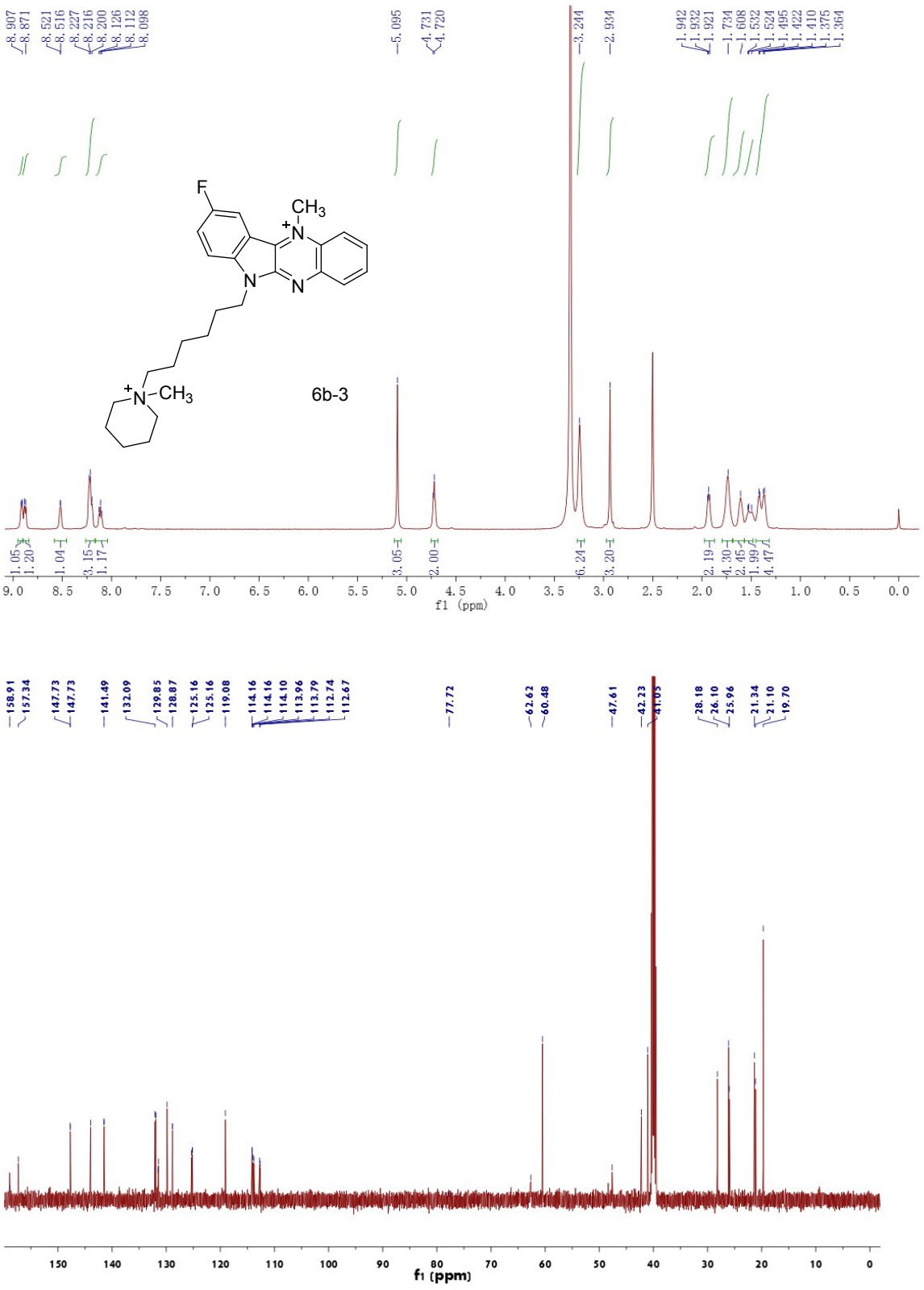

$^{1}$H（600MHz）and $^{13}$C(150MHz) NMR spectra of **6a-3** in DMSO-$d_6$



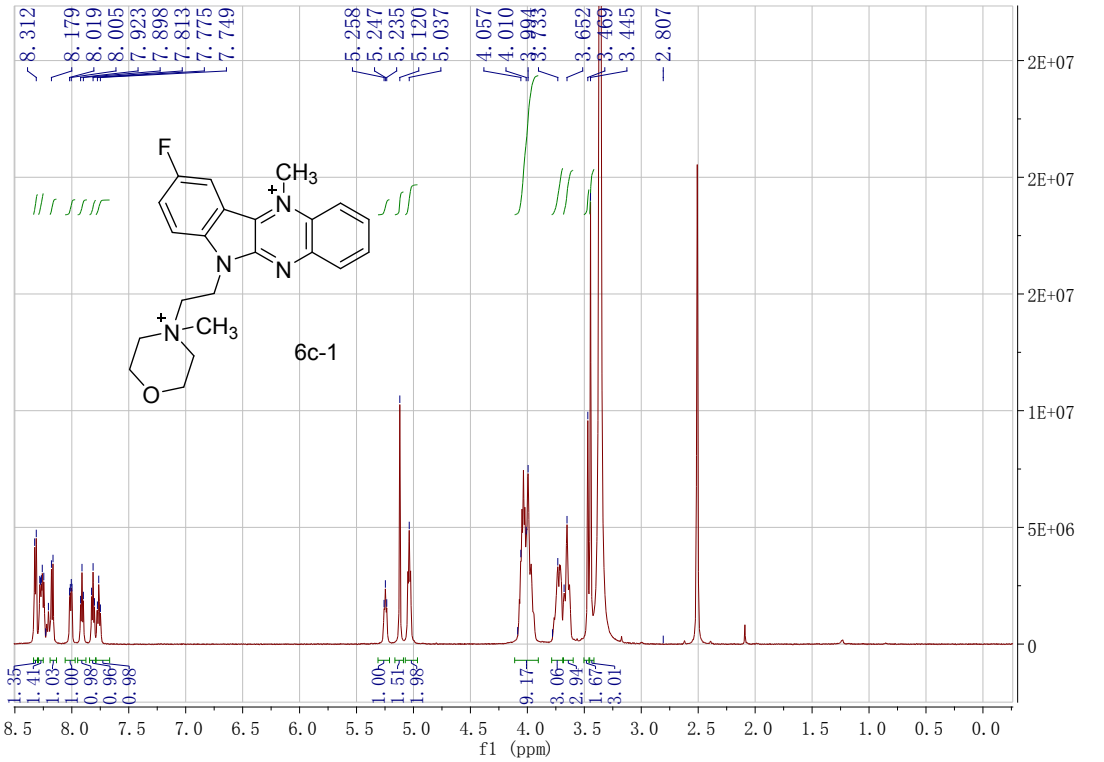

$^{1}$H（600MHz）and $^{13}$C(150MHz) NMR spectra of **6b-1** in DMSO-$d_6$

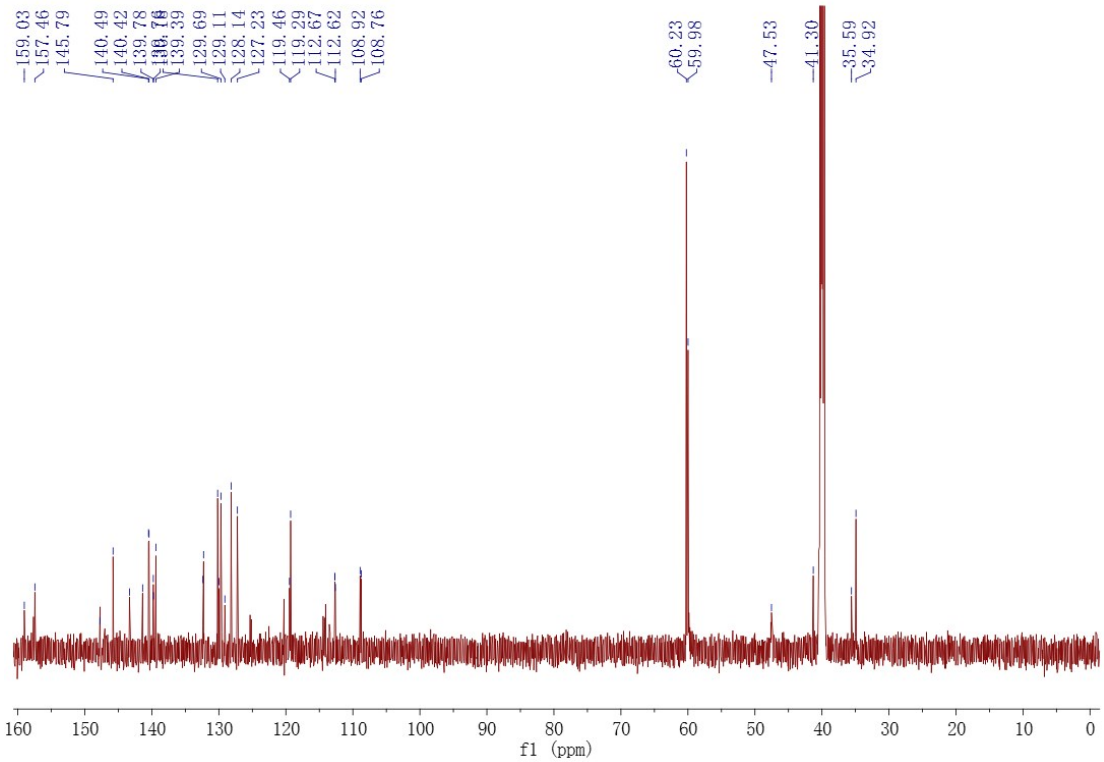



$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6b-2** in DMSO-$d_6$

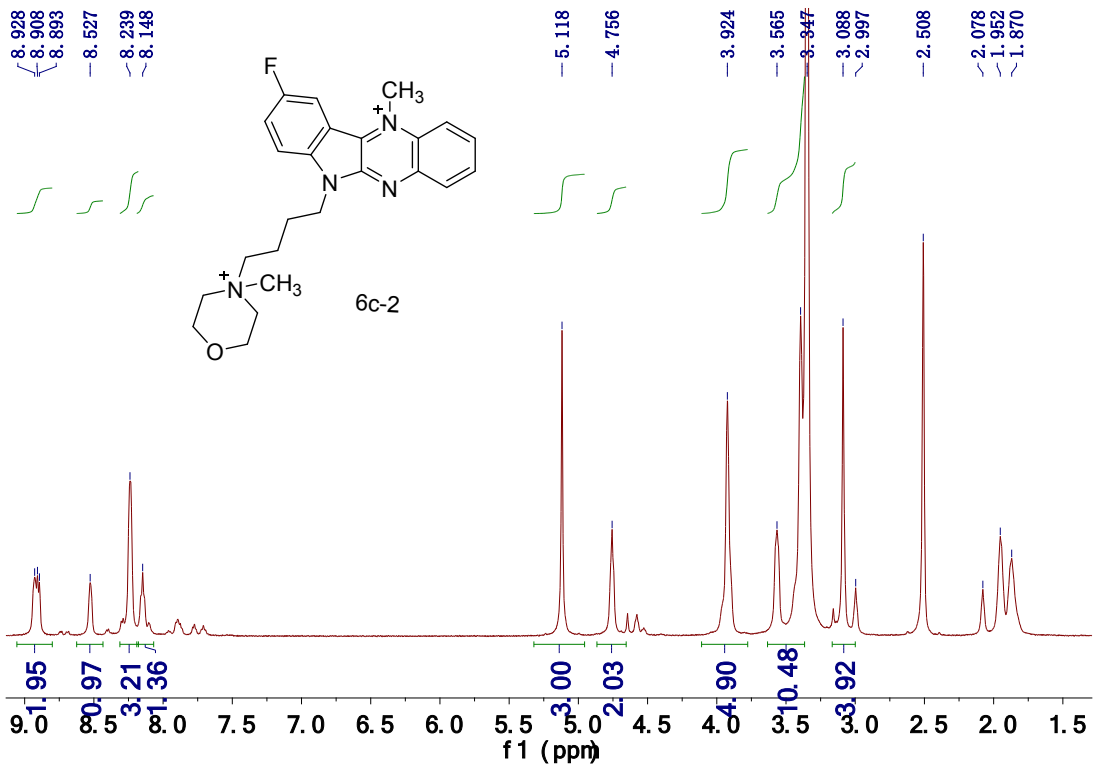


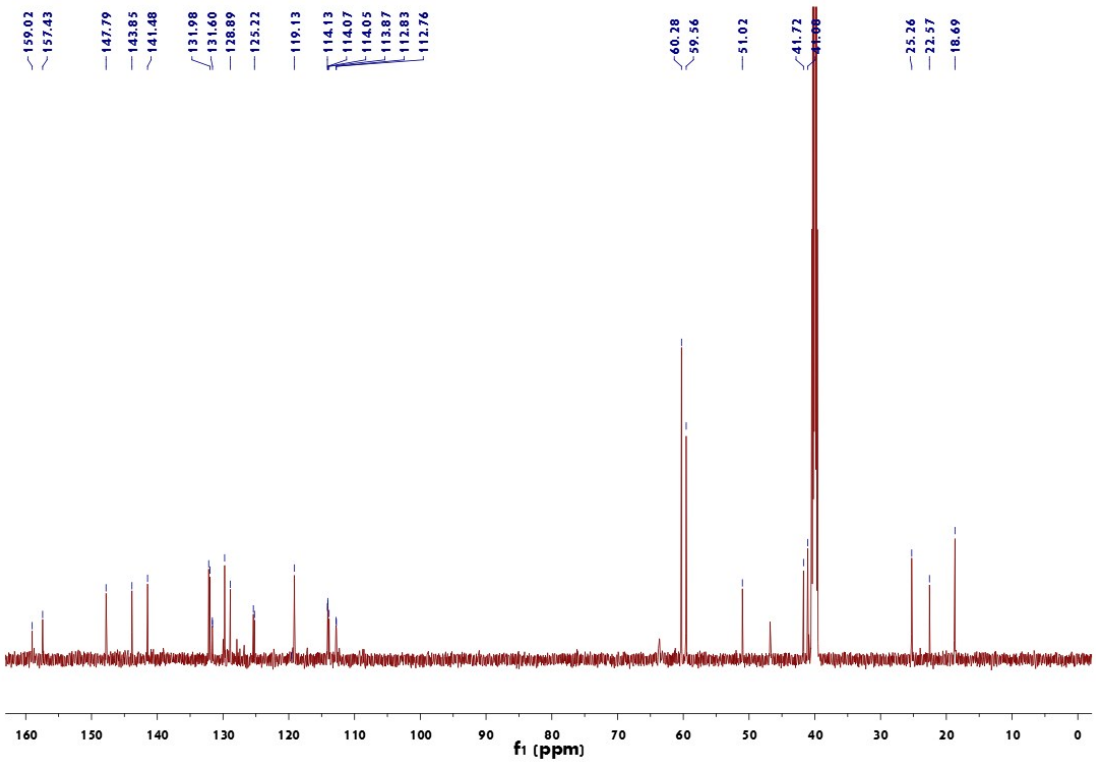

$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6b-3** in DMSO-$d_6$



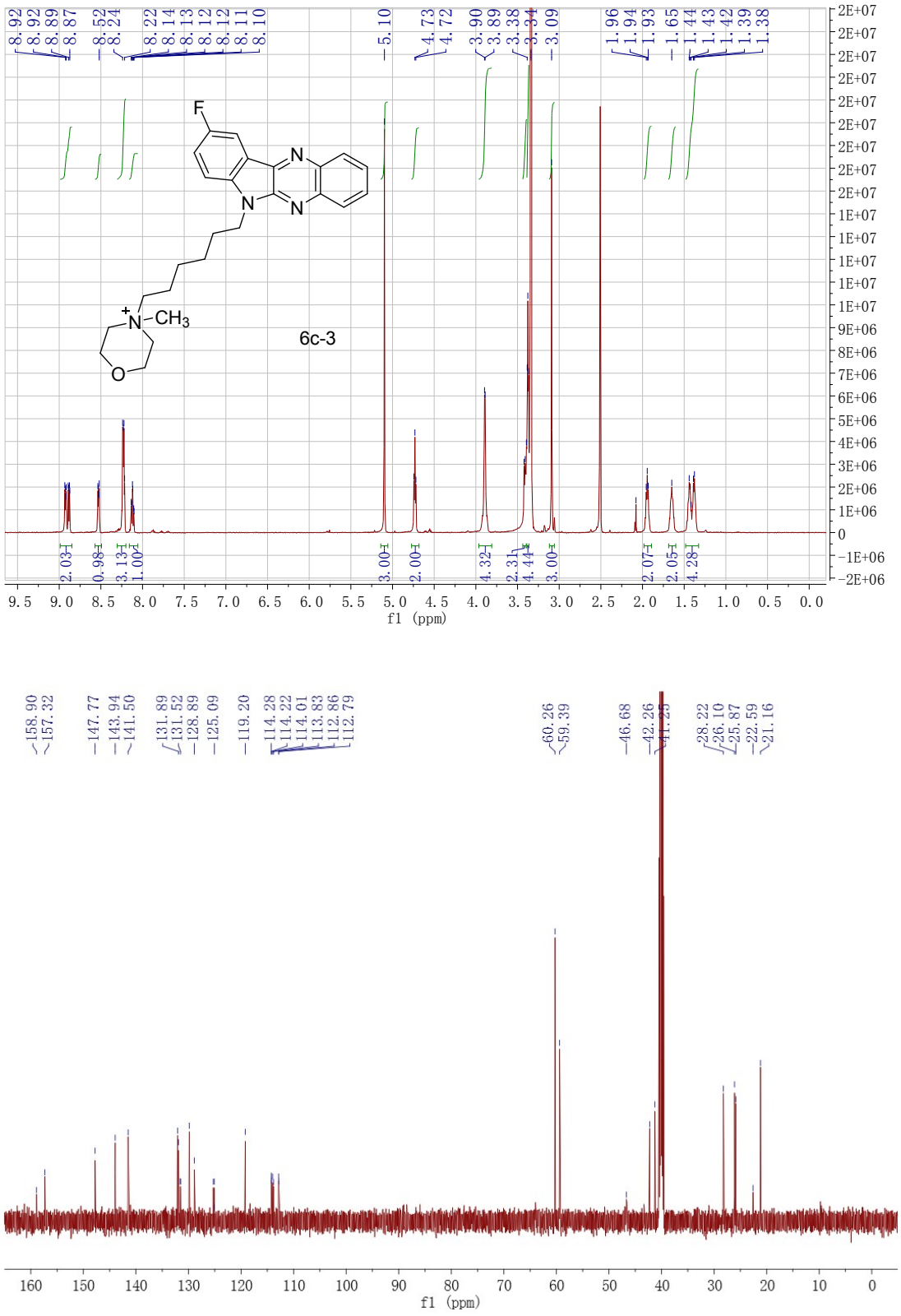




$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6c-1** in DMSO-$d_6$

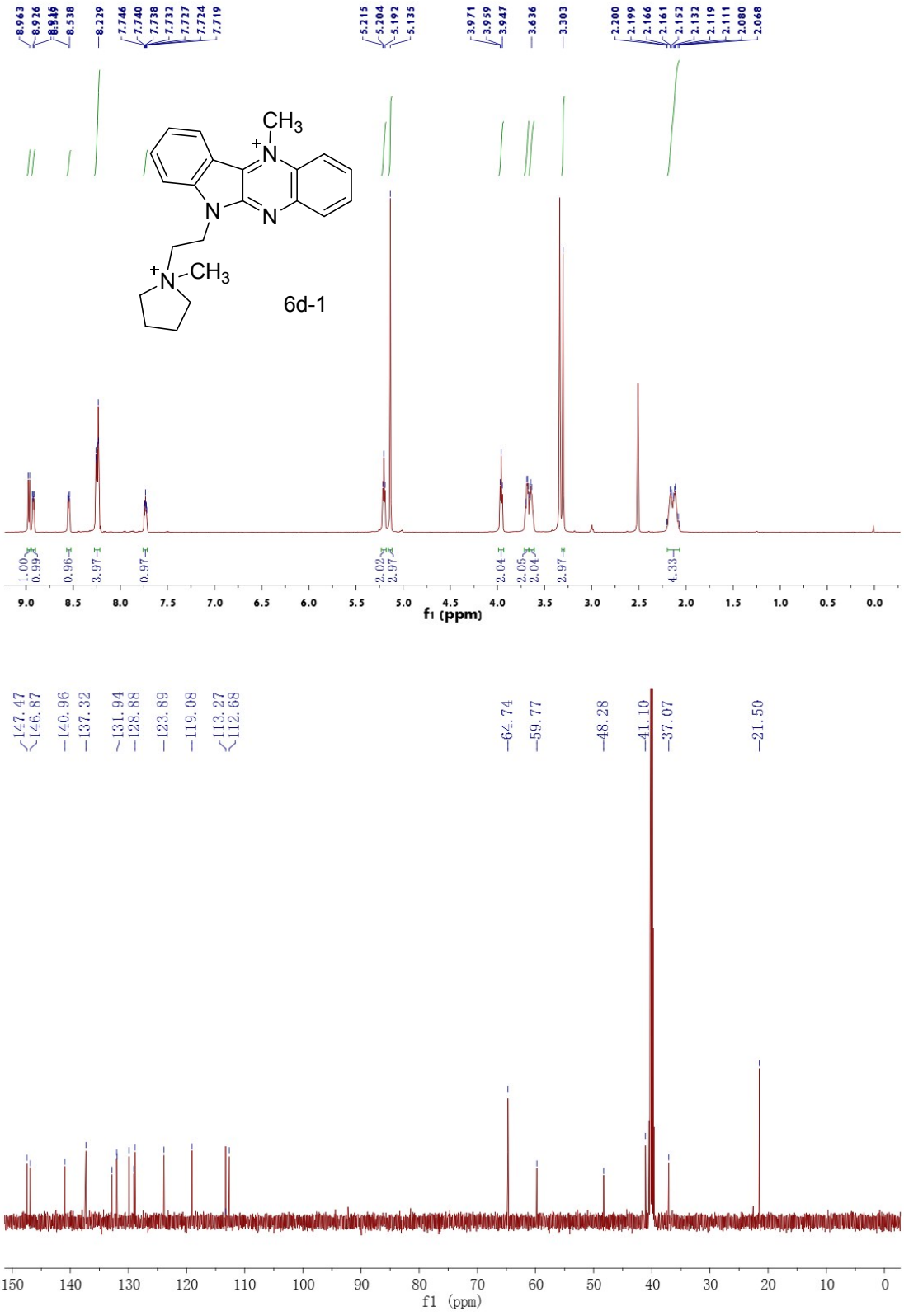


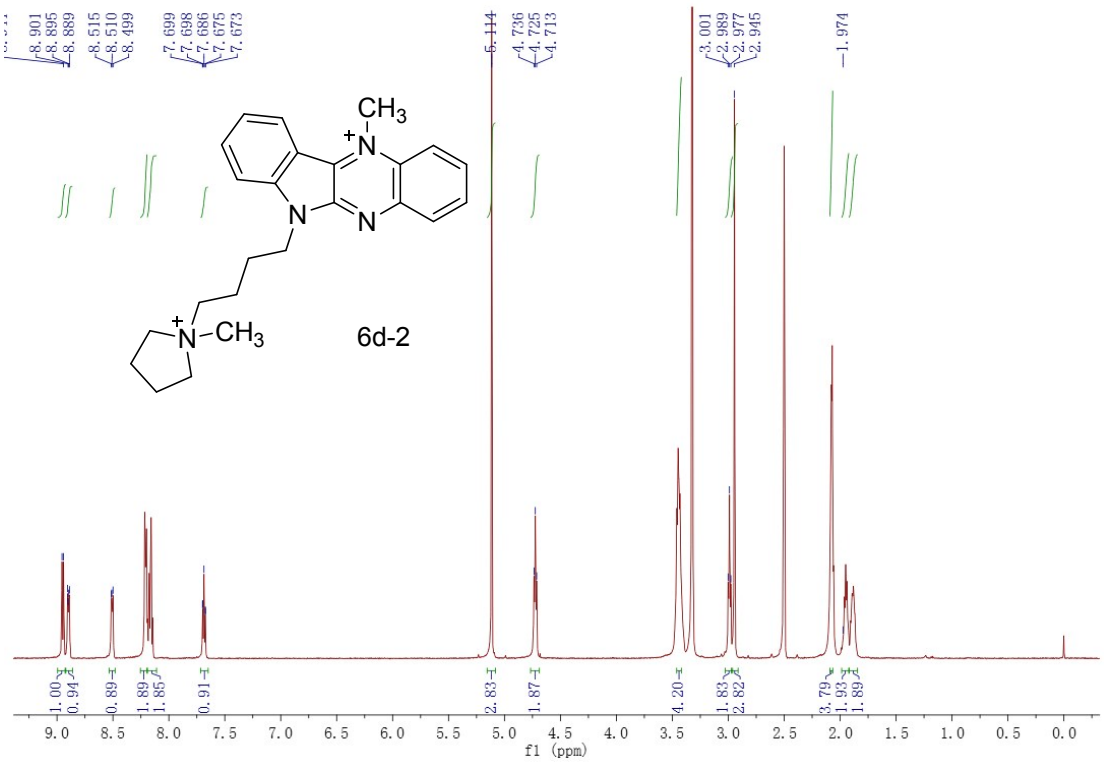

$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6c-2** in DMSO-$d_6$

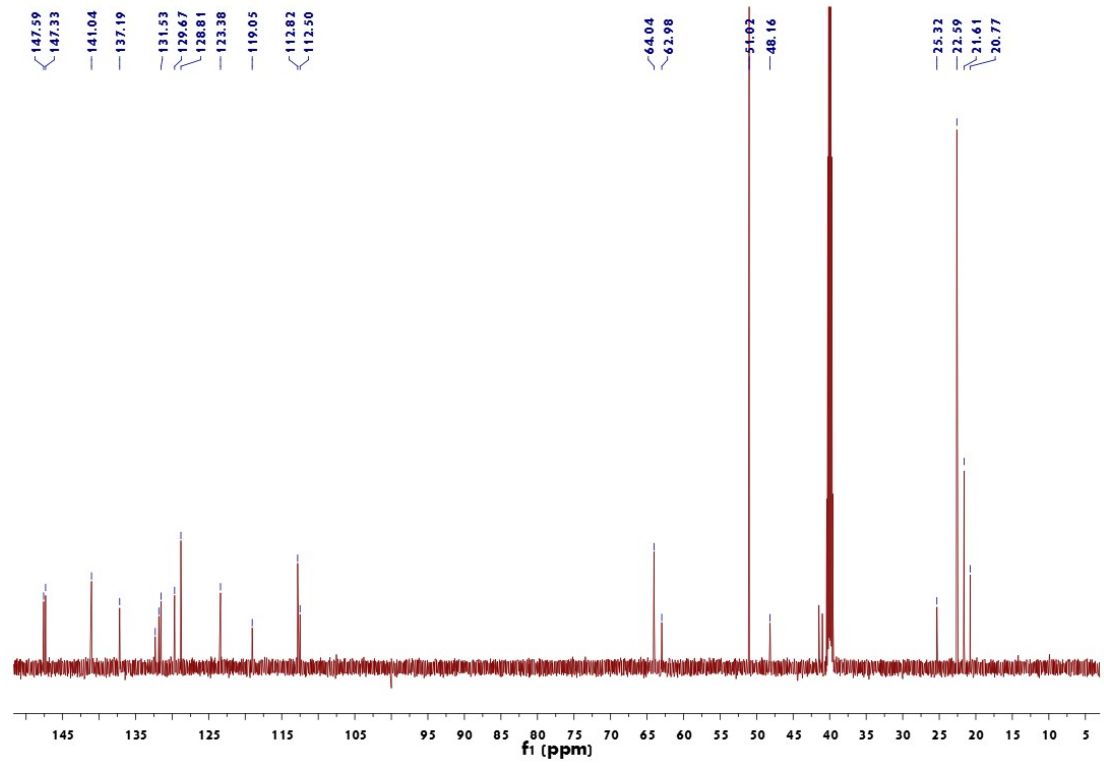



$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6c-3** in DMSO-$d_6$

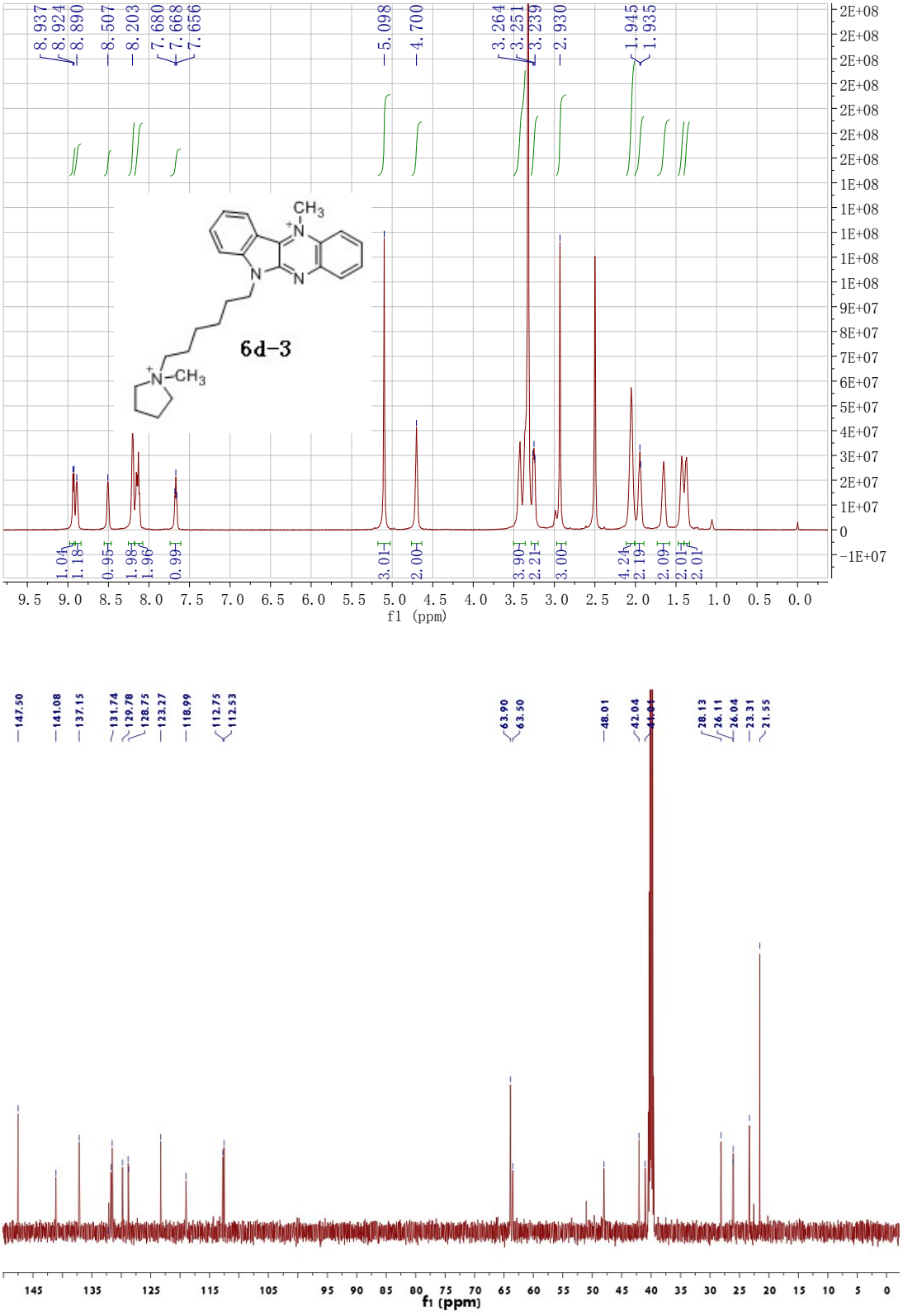



$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6d-1** in DMSO-$d_6$



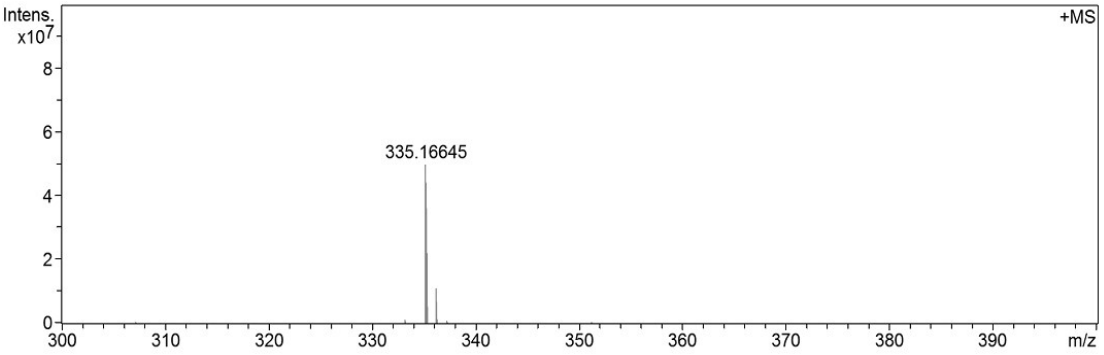




$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6d-2** in DMSO-$d_6$

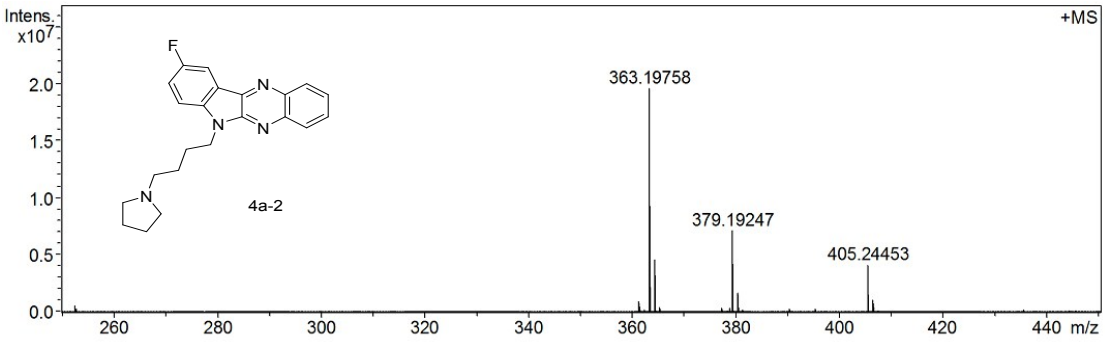



$^{1}$H（600 MHz）and $^{13}$C(150 MHz) NMR spectra of **6d-3** in DMSO-$d_6$

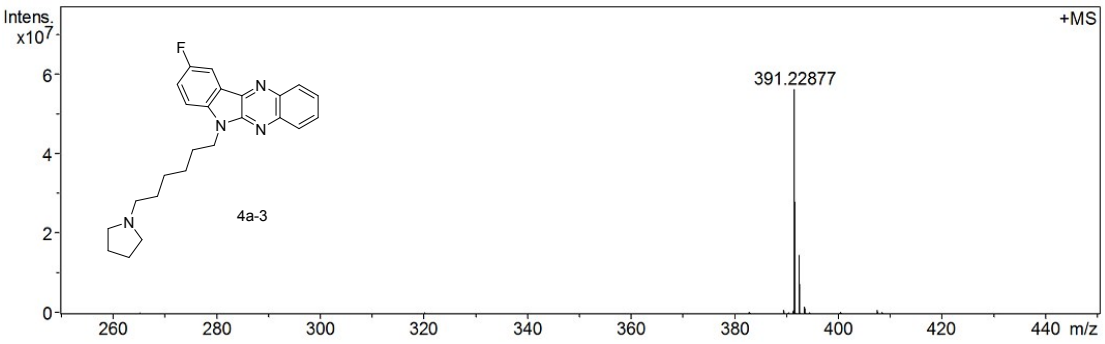
3. ESI-MS spectra of compounds



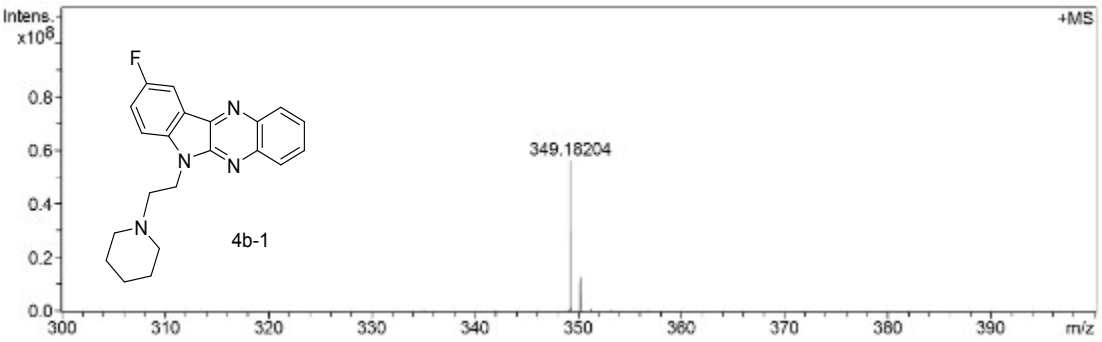

ESI-MS spectra of **4a-1**



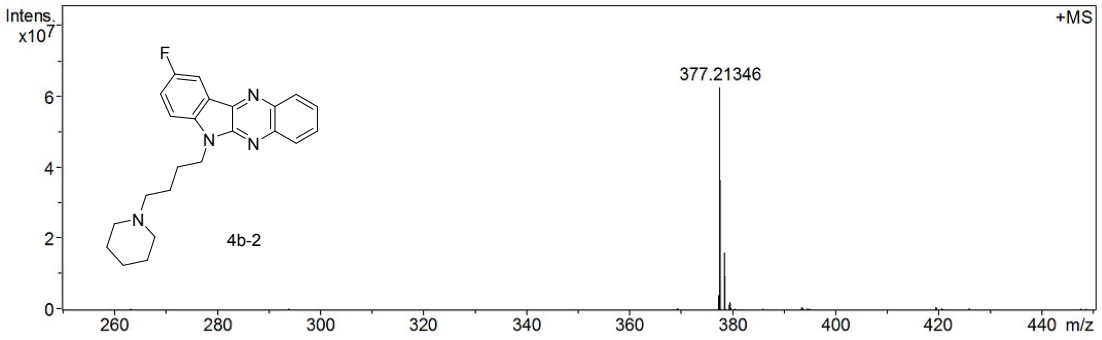

ESI-MS spectra of **4a-2**



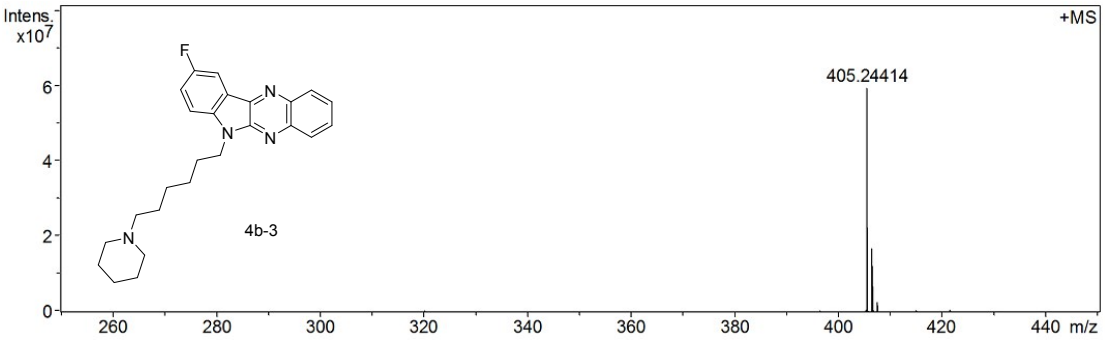

ESI-MS spectra of **4a-3**



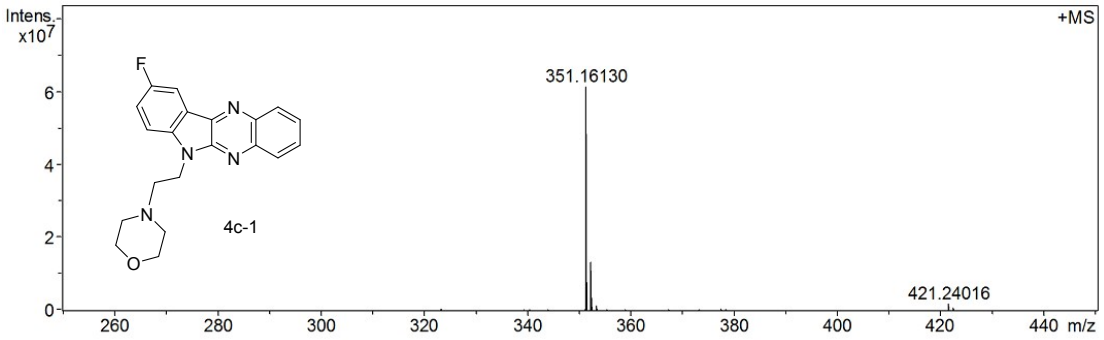

ESI-MS spectra of **4b-1**



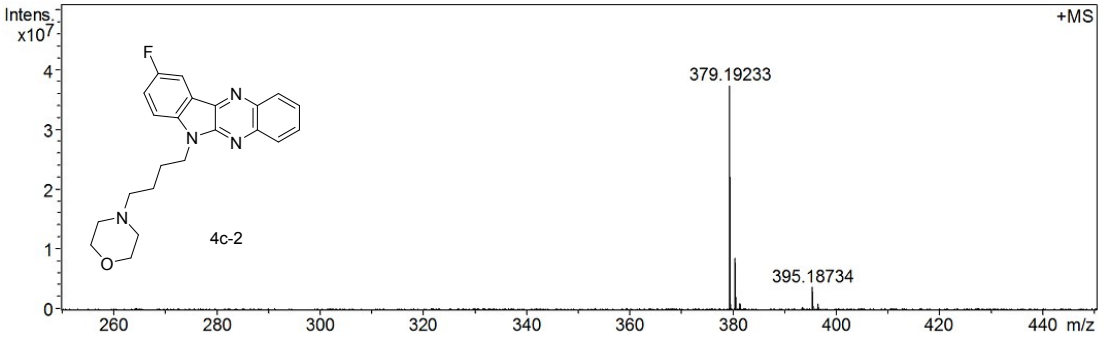

ESI-MS spectra of **4b-2**



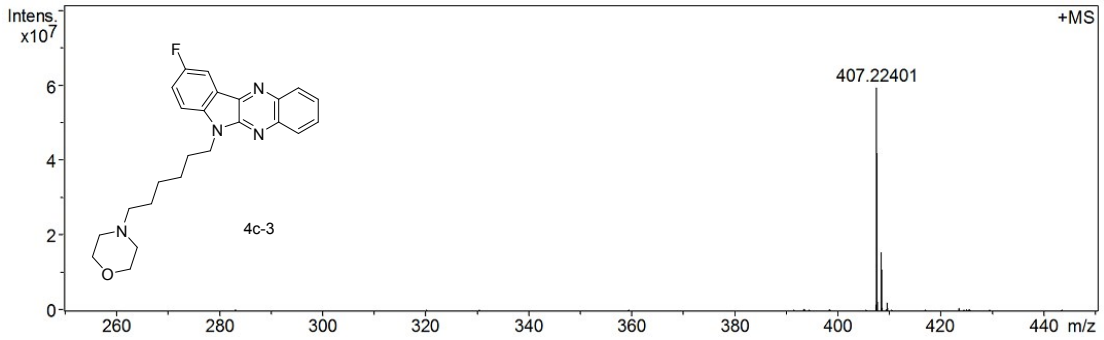

ESI-MS spectra of **4b-3**



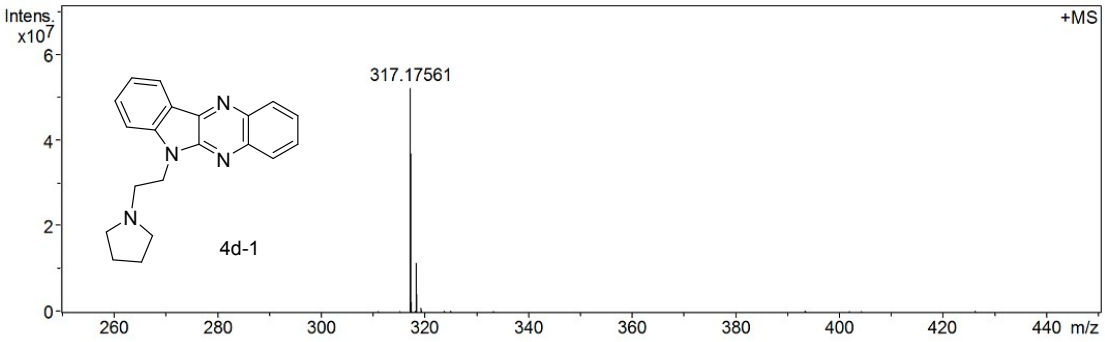

ESI-MS spectra of **4c-1**



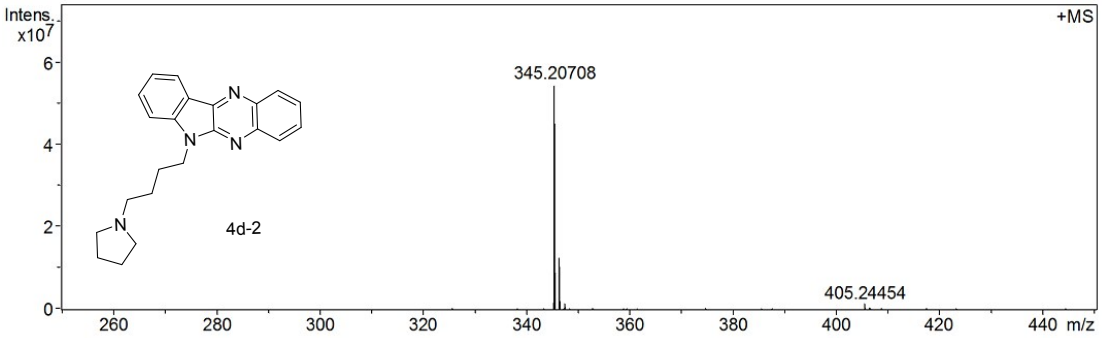

ESI-MS spectra of **4c-2**



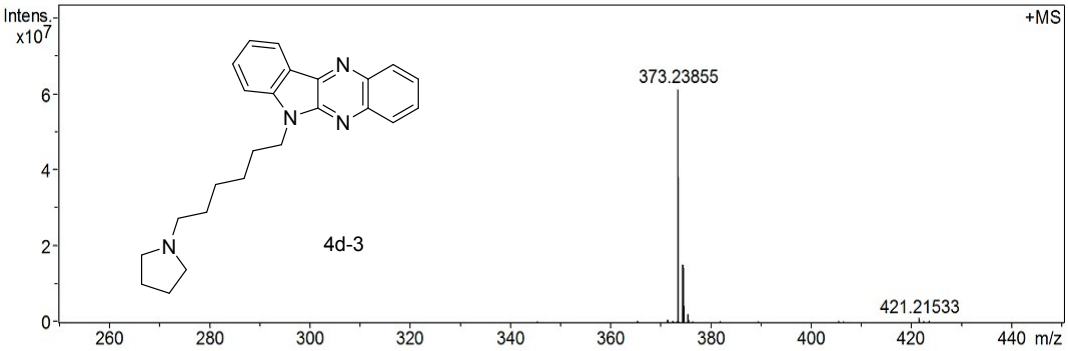

ESI-MS spectra of **4c-3**



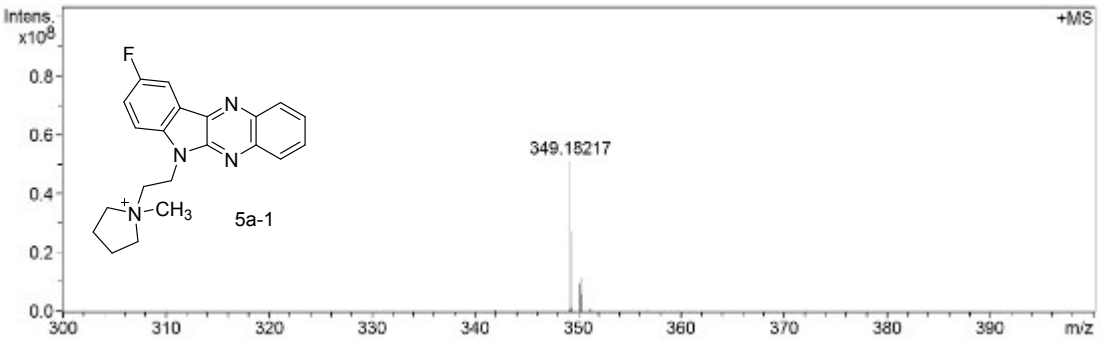

ESI-MS spectra of **4d-1**



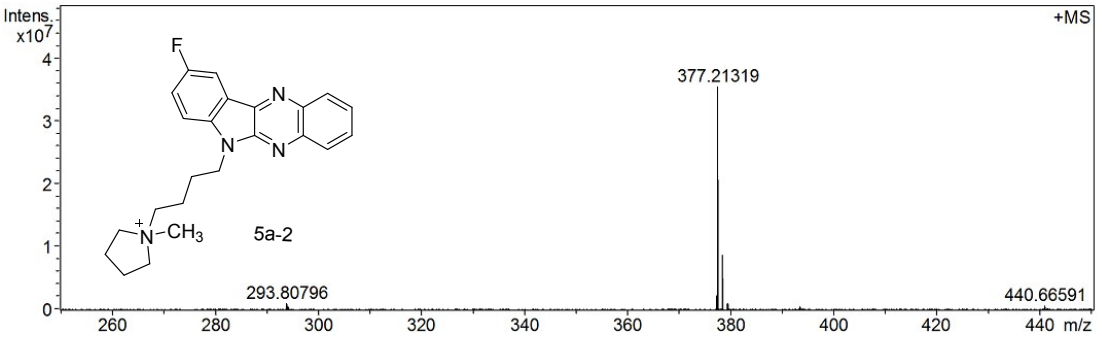

ESI-MS spectra of **4d-2**



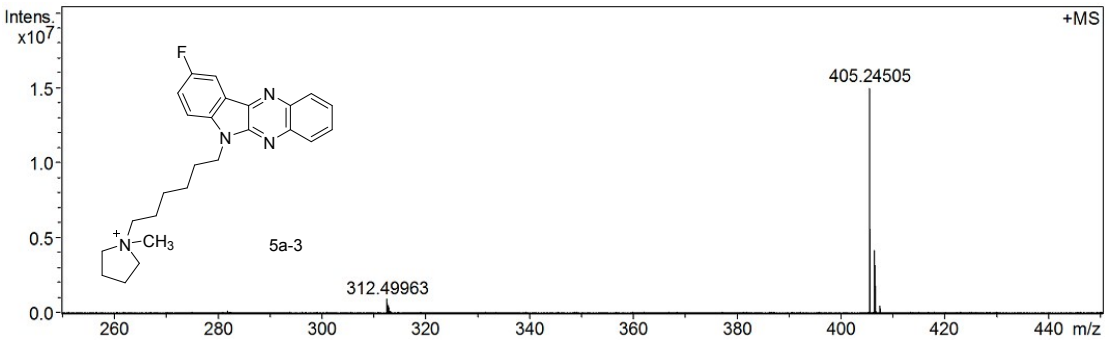

ESI-MS spectra of **4d-3**



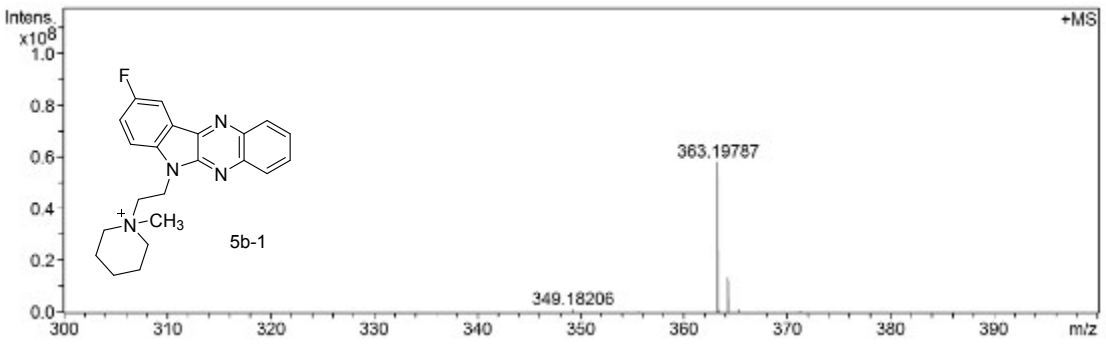

ESI-MS spectra of **5a-1**



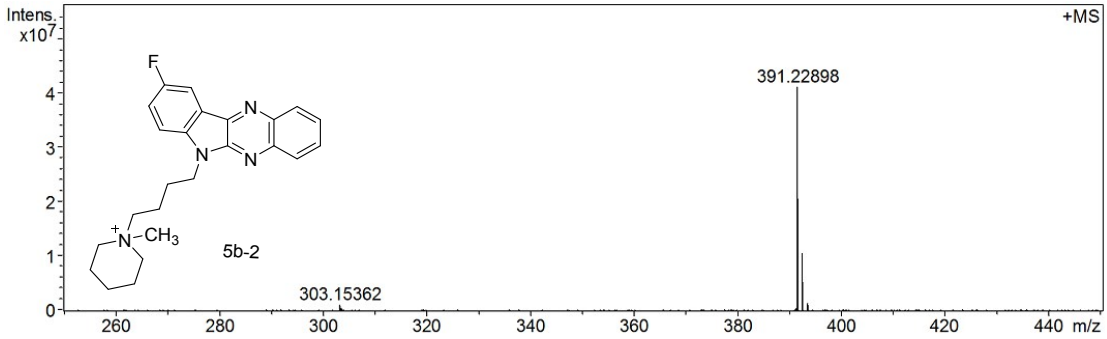

ESI-MS spectra of **5a-2**



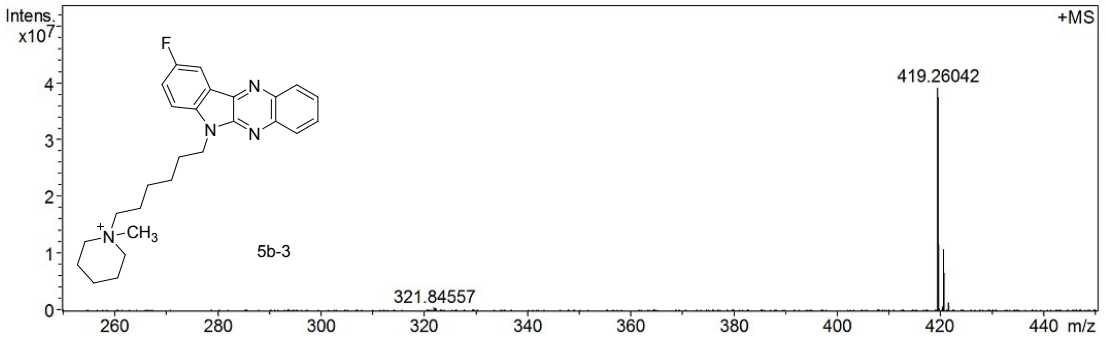

ESI-MS spectra of **5a-3**



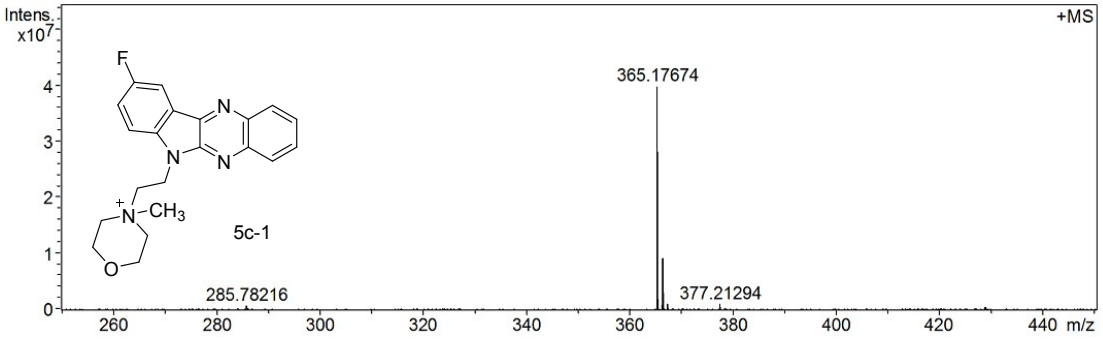

ESI-MS spectra of **5b-1**



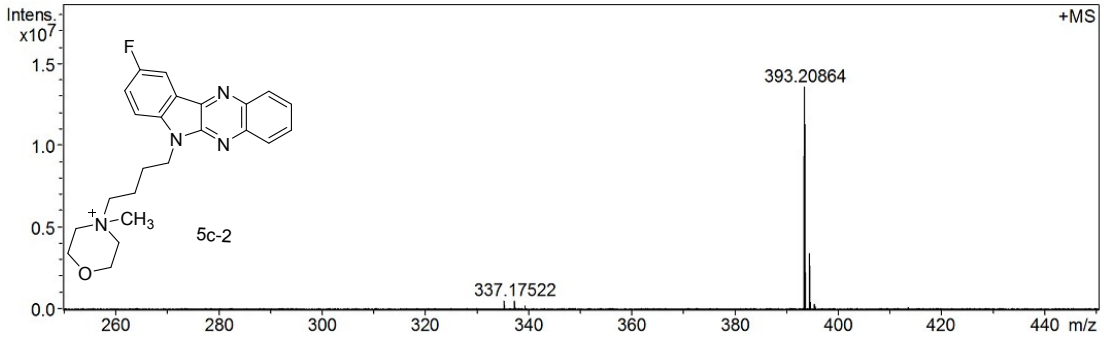

ESI-MS spectra of **5b-2**



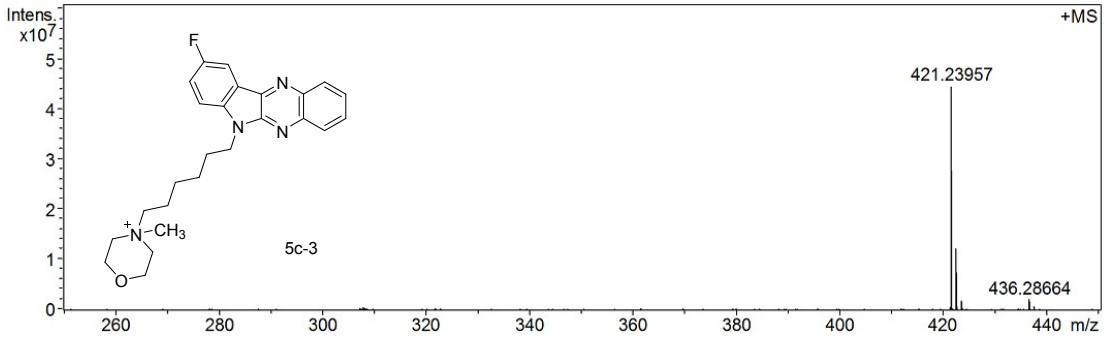

ESI-MS spectra of **5b-3**



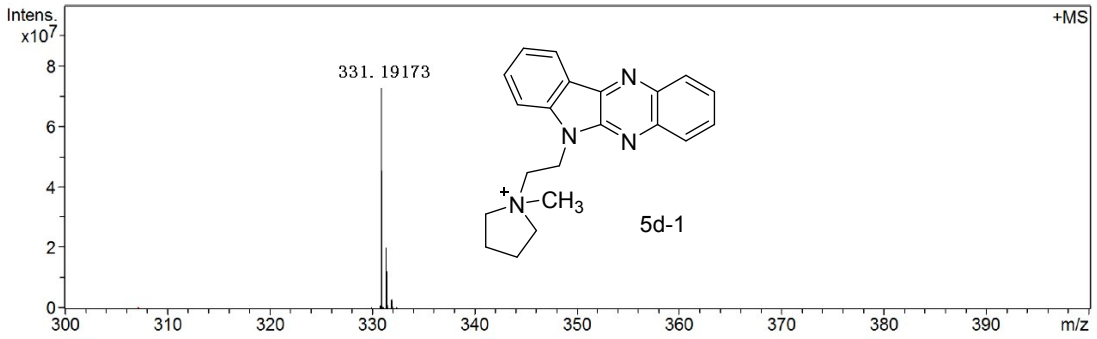

ESI-MS spectra of **5c-1**



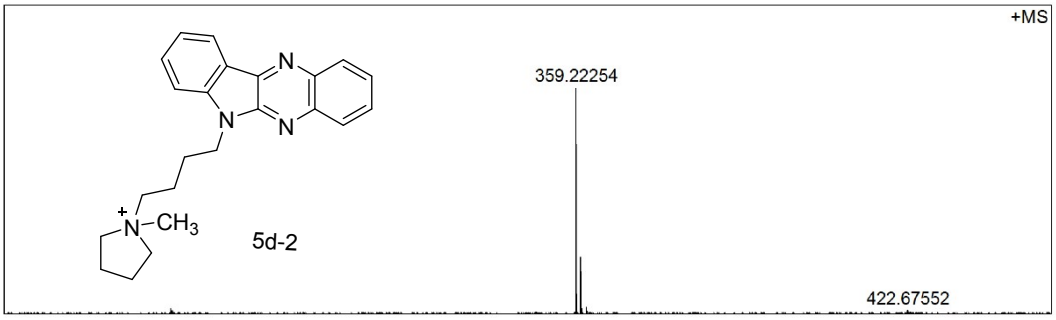

ESI-MS spectra of **5c-2**




ESI-MS spectra of **5c-3**




ESI-MS spectra of **5d-1**

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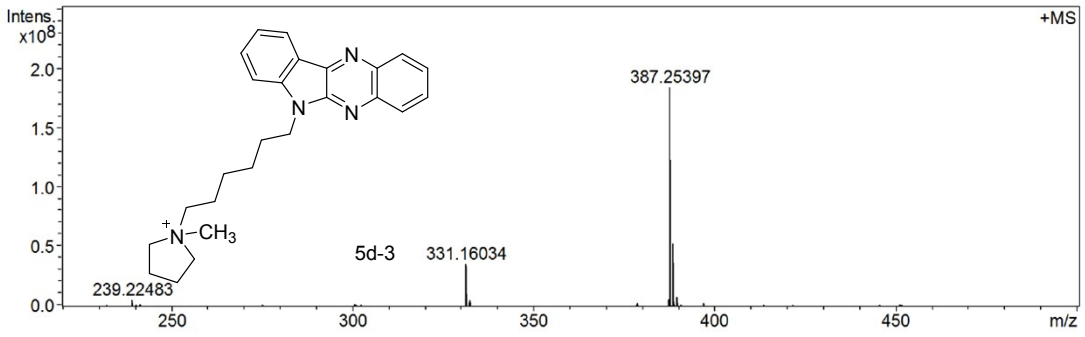
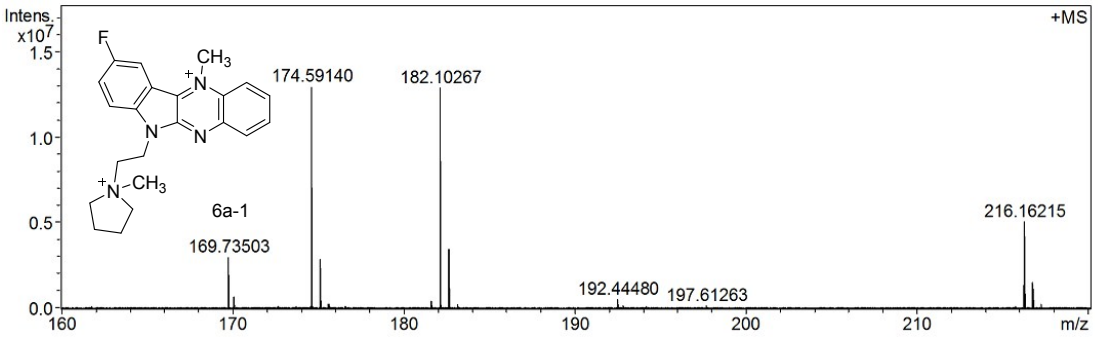
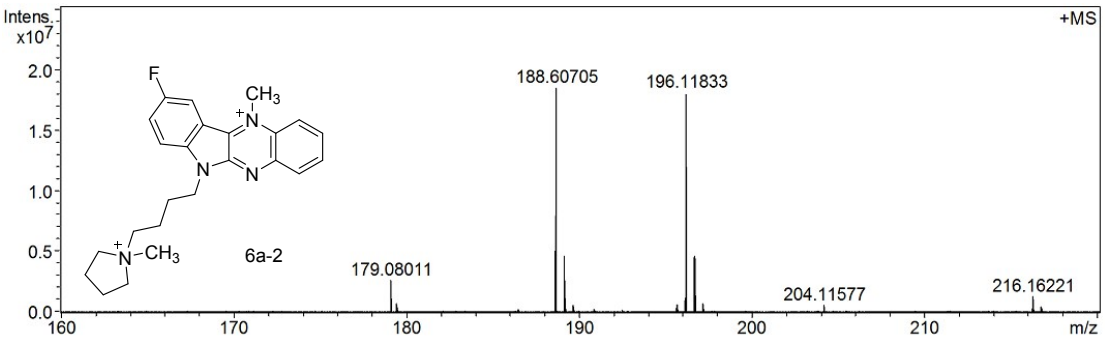


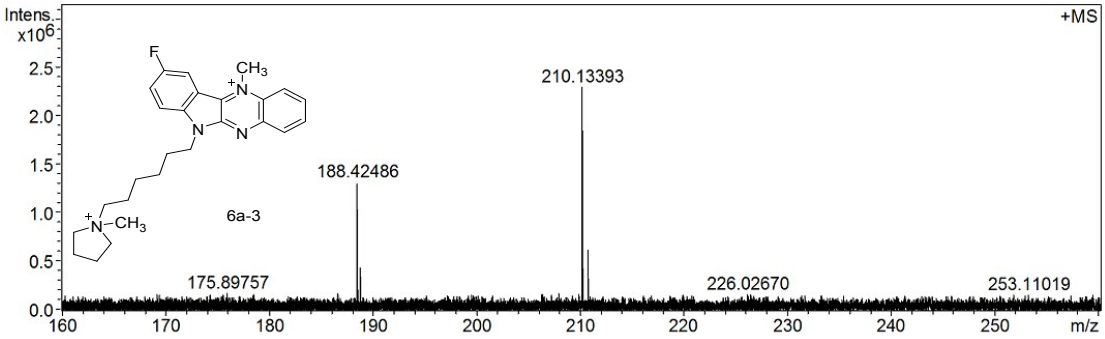

ESI-MS spectra of **5d-3**



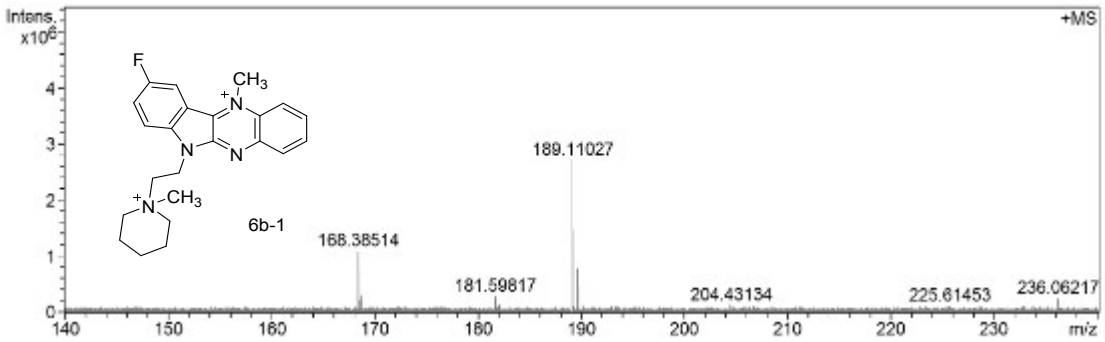

ESI-MS spectra of **6a-1**



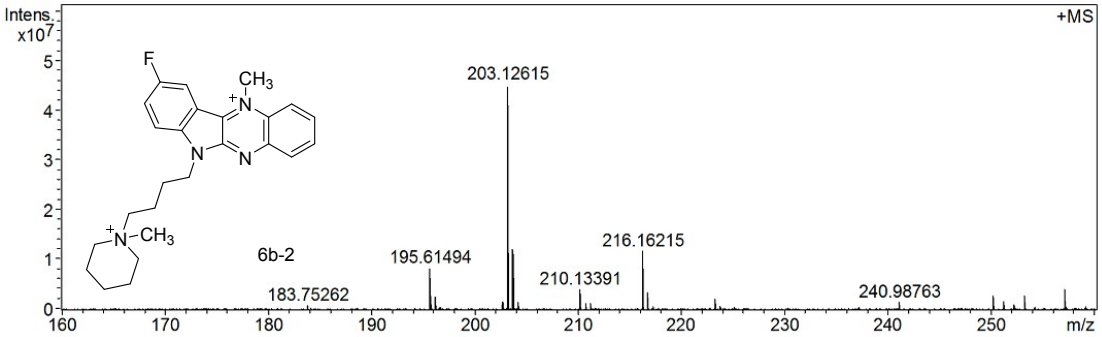

ESI-MS spectra of **6a-2**




ESI-MS spectra of **6a-3**




ESI-MS spectra of **6b-1**

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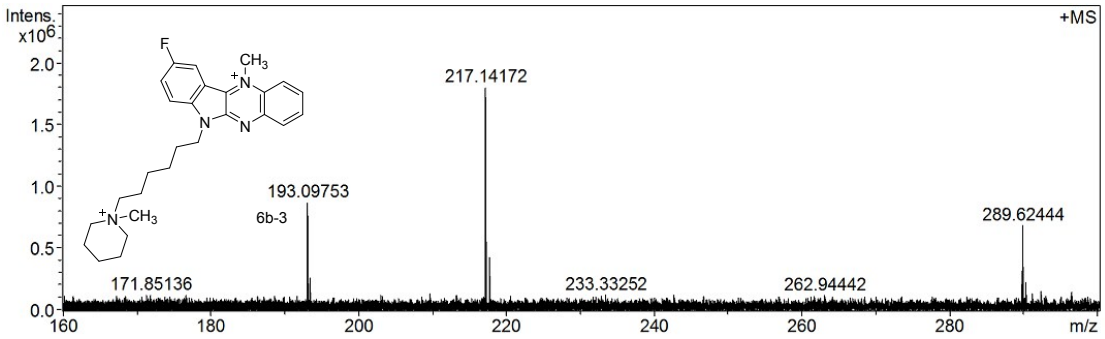
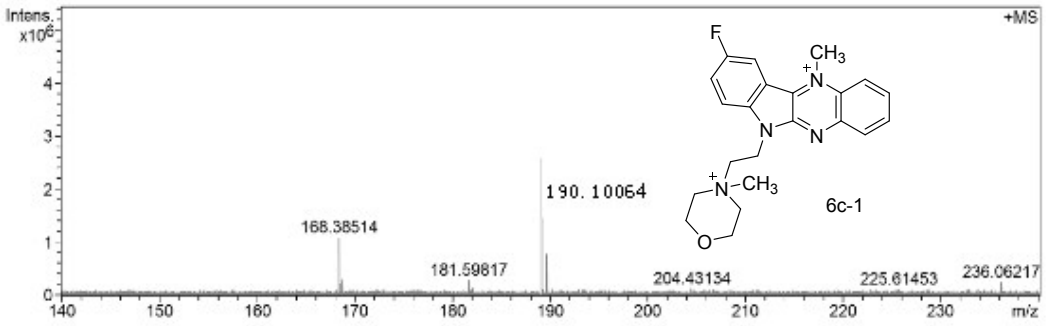
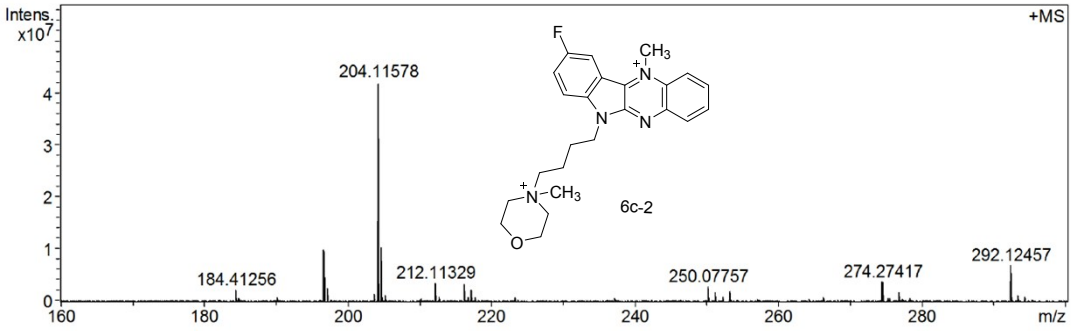



ESI-MS spectra of **6b-3**




ESI-MS spectra of **6c-1**

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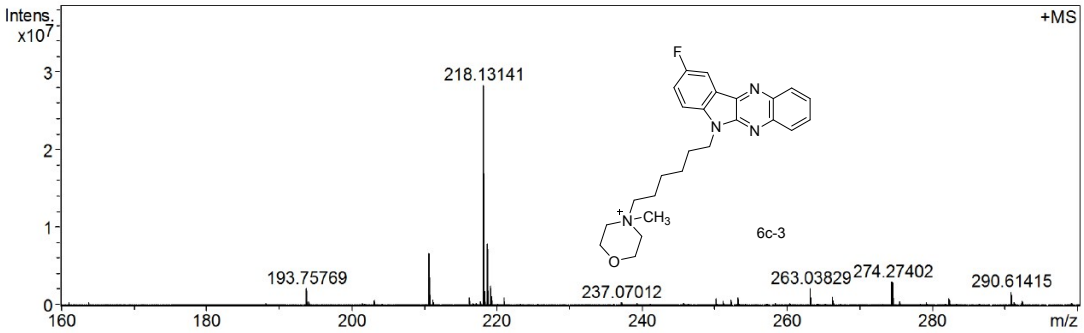
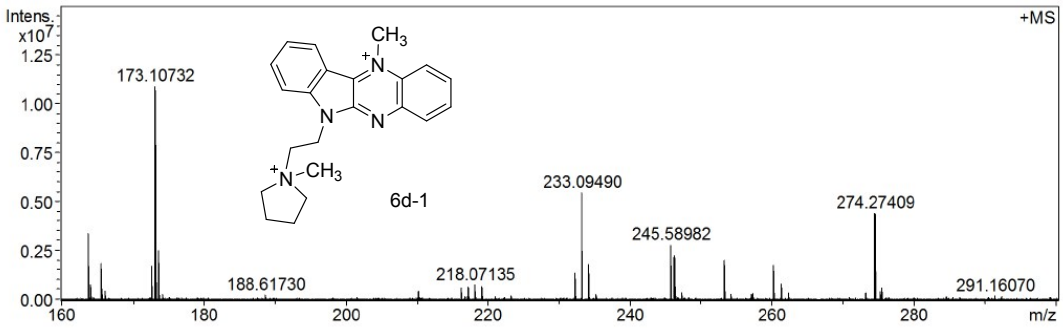
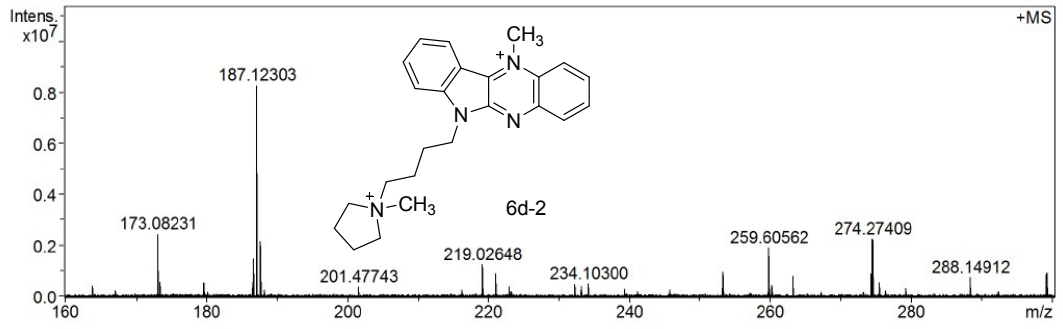


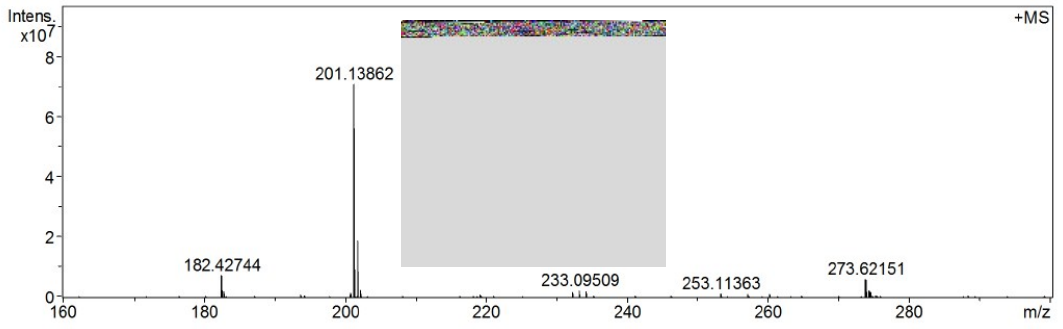

ESI-MS spectra of **6c-3**




ESI-MS spectra of **6d-1**




ESI-MS spectra of **6d-2**




ESI-MS spectra of **6d-3**