Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry

Supplementary Information

Synthesis and Biological Evaluation of Novel Isoellipticine Derivatives and Salts

Charlotte M. Miller,[a] Elaine C. O'Sullivan,[a] Ken J. Devine[b] and Florence O. McCarthy.[a]

[a]*Department of Chemistry, Analytical and Biological Chemistry Research Facility, University College Cork, Western Road, Cork, Ireland.* [b]*School of Pharmacy, University College Cork, Western Road, Cork, Ireland.*

Contents

1. Experimental – Isoellipticinium salts

2-(3'-Cyanopropyl)isoellipticinium chloride 17

5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazole **5** (198 mg, 0.80 mmol) and 4-chlorobutryonitrile (0.091 mL, 0.96 mmol) in dimethylformamide (5 mL) were heated to 120 ºC for 48 hours. The dark pink solution was cooled to 0 ºC and excess cold ether added. The resulting dark pink precipitate was filtered and washed with cold ether to yield product as a red powder (222 mg, 79%). mp 236 – 240 ºC; ν_{max}/cm^{-1} (KBr): 3384 (NH), 3153 (CH, aromatic), 3091 (CH_3), 2246 (CN, nitrile), 1634 (C=C, aromatic), 1619 (C=C, aromatic), 1417, 1321; δ_H (300 MHz, DMSO-d_6): 2.28 – 2.41 [2H, m, C(2′)H_2], 2.69 [2H, t, *J* 7.3, C(3′)C$\underline{H}_2$], 2.91 [3H, s, C(11)CH_3], 2.98 [3H, s, C(5)CH_3]. 4.80 [2H, t, *J* 7.0, C(1′)H_2], 7.18 – 7.25 [1H, m, C(7)H], 7.53 – 7.59 [2H, m, C(8)H, C(9)H], 8.25 [1H, d, *J* 8.1, C(6)H], 8.44 [1H, d, *J* 7.1, C(3)H], 8.57 [1H, d, *J* 7.1, C(4)H], 9.97 [1H, s, C(1)H], 12.13 (1H, s, N$\underline{H}$); δ_C (75.5 MHz; DMSO-d_6): 12.6 [CH_3, C(11) $\underline{C}H_3$], 13.6 (CH_2), 14.6 [CH_3, C(5)$\underline{C}H_3$], 26.4 (CH_2), 58.6 [CH_2, C(1′)H_2], 111.4 (CH, aromatic), 115.6 (C, aromatic C), 119.7 (C, aromatic C), 119.8 (CH, aromatic), 121.4 (C, $\underline{C}$N), 122.3 (CH, aromatic), 123.6 (C, aromatic C), 124.8 (CH, aromatic), 126.1 (C, aromatic C), 128.0 (C, aromatic C), 128.5 (CH, aromatic), 129.5 (CH, aromatic), 129.9 (C, aromatic C), 139.7 (C, aromatic C), 143.7 (C, aromatic C), 146.2 (CH, aromatic); m/z (ESI^+): 314 [(M^+), 100%]; HRMS (ESI): Exact mass calculated for $C_{21}H_{20}N_3^+$: 314.1657. Found: 314.1664

2-(4'-Cyanobutyl)isoellipticinium chloride 18

This was synthesised following the procedure described for **17** from 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazole **5** (204 mg, 0.827 mmol) and 5-chlorovaleronitrile (0.11 ml, 0.986 mmol) in dimethylformamide (5 ml). The product was isolated as a pink solid (265 mg, 88%). mp 225 – 228; ν_{max}/cm^{-1} (KBr): 3370 (NH), 3147 (CH, aromatic), 3087 (CH_3), 2868 (CH_2), 2243 (CN, nitrile), 1635 (C=C, aromatic), 1620 (C=C, aromatic), 1498, 1418, 1321; δ_H (300 MHz; DMSO-d_6): 1.60 – 1.75 [2H, m, C(2′)H or C(3′)H], 2.10 – 2.22 [2H, m, C(2′)H or C(3′)H], 2.64 [2H, t, *J* 7.0, C(4′)H_2], 2.96 [3H, s, C(11)C$\underline{H}_3$], 3.04 [3H, s, C(5)C$\underline{H}_3$], 4.83 [2H, t, *J* 7.2, C(1′)H_2], 7.23 – 7.31 [1H, m, C(7)H], 7.58 – 7.64 [2H, m, C(8)H, C(9)H], 8.3 [1H, d, *J* 8.1, C(6)H], 8.49 [1H, d, *J* 7.1, C(3)H], 8.63 [1H, d, *J* 7.1, C(4)H], 10.01 [1H, s, C(1)H], 12.18 (1H, s, N$\underline{H}$); δ_C (75.5 MHz; DMSO-d_6): 12.6 [CH_3, C(11)$\underline{C}H_3$], 14.7 [CH_3, C(5)$\underline{C}H_3$], 15.8 (CH_2), 21.7 (CH_2), 29.9 (CH_2), 58.9 [CH_2, C(1′)H_2], 111.4 (CH, aromatic), 115.5 (C, aromatic C), 119.8 (CH, aromatic), 120.4 (C, aromatic C), 121.4 ($\underline{C}$N), 122.4 (CH, aromatic), 123.6 (C, aromatic C), 124.8 (CH, aromatic), 126.1 (C, aromatic C), 128.0 (C, aromatic C), 128.5 (CH, aromatic), 129.4 (CH, aromatic), 129.8 (C, aromatic C), 139.7 (C, aromatic C), 143.7 (C, aromatic C), 145.8 (CH, aromatic); m/z (ESI^+): 328 [(M^+), 100%]; HRMS (ESI): Exact mass calculated for $C_{22}H_{22}N_3^+$: 328.1814 . Found: 328.1811.

2-(5'-Cyanopentyl)isoellipticinium bromide 19

To a stirred suspension of 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazole **5** (194 mg, 0.788 mmol) in dimethylformamide (5 mL), was added 6-bromohexanenitrile (153 mg, 0.11 mL, 0.867 mmol). The reaction mixture was heated to 120 °C for 4 hours and subsequently stirred at room temperature overnight. The mixture was cooled to 0 °C and cold diethyl ether (3 mL) was added. The resulting precipitate was collected by vacuum filtration and washed with hexane (3 mL) and cold diethyl ether (5 mL) to give the product as a bright

orange solid (272 mg, 81.7%). mp: 274 – 275 °C; ν_{max}/cm^{-1}(KBr): 3434 (NH), 3137 (CH), 3098 (CH), 2971 (asymm. CH_3 stretch), 2927 (asymm. CH_2 stretch), 2861 (symm. CH_2 stretch), 2239 (CN nitrile), 1634 (C=C arom.), 1624 (C=C arom.), 1419, 1320, 1217; δ_H (300 MHz, DMSO-d_6): 1.42 – 1.52 [2H, m, C(3′)H_2], 1.62 – 1.72 [2H, m, C(4′)H_2], 2.04 – 2.14 [2H, m, C(2′)H_2], 2.55 [2H, t, *J* 7.0, C(5′)H_2], 3.05 [3H, s, C(11)C$\underline{H}_3$], 3.21 [3H, s, C(5)C$\underline{H}_3$], 4.81 [2H, t, *J* 7.4, C(1′)H_2], 7.36 [1H, overlapping ddd, *J* 8.1, 5.2, 3.0, C(7)H], 7.69 – 7.70 [2H, m, C(8)H, C(9)H], 8.48 [1H, d, *J* 8.1, C(6)H], 8.59 [1H, dd, *J* 7.2, 1.1, C(3)H], 8.81 [1H, d, *J* 7.1, C(4)H], 10.08 [1H, s, C(1)H], 12.00 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.5 [CH_3, C(11)$\underline{C}H_3$], 14.8 [CH_3, C(5)$\underline{C}H_3$], 16.0 [CH_2, C(5′)H_2], 24.2 [CH_2, C(4′)H_2], 24.7 [CH_2, C(3′)H_2], 30.1 [CH_2, C(2′)H_2], 59.6 [CH_2, C(1′)H_2], 111.4 [CH, C(8)H or C(9)H], 115.5 (C, aromatic C), 120.0 [CH, C(7)H], 120.6 (C, $\underline{C}$N), 121.6 (C, aromatic C), 122.5 [CH, C(4)H], 123.8 (C, aromatic C), 125.0 [CH, C(6)H], 126.4 (C, aromatic C), 128.2 (C, aromatic C), 128.8 [CH, C(3)H], 129.7 [CH, C(8)H or C(9)H], 130.1 (C, aromatic C), 139.9 (C, aromatic C), 143.8 (C, aromatic C), 145.8 [CH, C(1)H]; m/z (ESI^+): 342 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{23}H_{24}N_3^+$ 342.1970. Found 342.1967. Anal. calculated for $C_{23}H_{24}N_3Br.(0.25\ H_2O)$: C, 64.72; H, 5.79; N, 9.84. Found: C, 64.87; H, 5.73; N, 10.00.

2-(5'-Carboxypentyl)isoellipticinium bromide 20

This was synthesised following the procedure described for **19** from 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazole **5** (211 mg, 0.857 mmol) and 6-bromohexanoic acid (184 mg, 0.943 mmol, 1.1 eq) in dimethylformamide (5 mL) to give the product as a bright orange solid (290 mg, 76.7%). mp: 302 – 304 °C; ν_{max}/cm^{-1} (KBr): 3419 (NH), 3147 (OH, broad), 3097 (CH), 3025 (CH), 2932 (asymm. CH_2 stretch), 2860 (symm. CH_2 stretch), 1721 (C=O), 1634 (C=C arom.), 1621(C=C arom.), 1418, 1157 (C-O); δ_H (300 MHz, DMSO-d_6): 1.33 – 1.43 [2H, m, C(3′)H_2], 1.55 – 1.65 [2H, m, C(4′)H_2], 2.02 – 2.11 [2H, m, C(2′)H_2], 2.25 [2H, t, *J* 7.2, C(5′)H_2], 3.05 [3H, s, C(11)C$\underline{H}_3$], 3.22 [3H, s, C(5)C$\underline{H}_3$], 4.79 [2H, t, *J* 7.4, C(1′)H_2], 7.37 [1H, overlapping ddd, *J* 8.1, 5.0, 3.1, C(7)H], 7.69 – 7.71 [2H, m, C(8)H, C(9)H], 8.50 [1H, d, *J* 8.0, C(6)H], 8.58 [1H, dd, *J* 7.2, 1.2, C(3)H], 8.81 [1H, d, *J* 7.1, C(4)H], 10.08 [1H, s, C(1)H], 12.00 – 12.05 [2H, s & overlapping br s, N(10)H, COO$\underline{H}$]; δ_C(75.5 MHz, DMSO-d_6): 12.5 [CH_3, C(11)$\underline{C}H_3$], 14.7 [CH_3, C(5)$\underline{C}H_3$], 23.9 [CH_2, C(4′)H_2], 25.2 [CH_2, C(3′)H_2], 30.7 [CH_2, C(2′)H_2], 33.4 [CH_2, C(5′)H_2], 59.7 [CH_2, C(1′)H_2], 111.3 [CH, C(8)H or C(9)H], 115.4 (C, aromatic C), 119.9 [CH, C(7)H], 121.5 (C, aromatic C), 122.3 [CH, C(4)H], 123.6 (C, aromatic C), 124.9 [CH, C(6)H] 126.2 (C, aromatic C), 128.1 (C, aromatic C), 128.7 [CH, C(3)H], 129.5 [CH, C(8)H or C(9)H], 129.8 (C, aromatic C), 139.7 (C, aromatic C), 143.6 (C, aromatic C), 145.6 [CH, C(1)H], 174.3 (C, $\underline{C}$OOH); m/z (ESI^+): 361 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{23}H_{25}N_2O_2^+$ 361.1916. Found 361.1911. Anal. calculated for $C_{23}H_{25}N_2O_2Br$: C, 62.59; H, 5.71; N, 6.35. Found: C, 62.34; H, 5.72; N, 6.35.

2-(6'-Carboxamidohexyl)isoellipticinium bromide 21

This was synthesised following the procedure described for **19** from 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazole **5** (200 mg, 0.812 mmol) and 6-bromohexanamide (173 mg, 0.893 mmol, 1.1 eq) in dimethylformamide (5 mL) to give the amide as a bright orange solid (301 mg, 84.2%). mp: 284 – 285 °C; ν_{max}/cm^{-1} (KBr): 3294 (NH), 3150 (NH), 3097 (CH), 2943 (asymm. CH_2 stretch), 2856 (symm. CH_2 stretch), 1683 (C=O), 1622 (N-H bend), 1498 (C=C arom.) 1417 (C-N stretch, amide), 1321; δ_H (300 MHz, DMSO-d_6): 1.31 – 1.41 [2H, m, C(3′)H_2], 1.54 – 1.64 [2H, m, C(4′)H_2], 2.00 – 2.10 [4H, m, C(2′)H_2, C(5′)H_2], 3.02 [3H, s, C(11)C$\underline{H}_3$], 3.17 [3H, s, C(5)C$\underline{H}_3$], 4.79 [2H, t, *J* 7.4, C(1′)H_2], 6.71 (1H, br s, one of

CONH$_2$), 7.26 (1H, br s, one of CONH$_2$), 7.26 [1H, ddd, *J* 8.2, 5.7, 2.5, C(7)H], 7.66 – 7.68 [2H, m, C(8)H, C(9)H], 8.44 [1H, d, *J* 8.1, C(6)H], 8.56 [1H, dd, *J* 7.2, 1.2, C(3)H], 8.76 [1H, d, *J* 6.9, C(4)H], 10.04 [1H, s, C(1)H], 11.96 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.4 [CH$_3$, C(11)CH$_3$], 14.8 [CH$_3$, C(5)CH$_3$], 24.4 [CH$_2$, C(4′)H$_2$], 25.3 [CH$_2$, C(3′)H$_2$], 30.8 [CH$_2$, C(2′)H$_2$], 34.7 [CH$_2$, C(5′)H$_2$], 59.8 [CH$_2$, C(1′)H$_2$], 111.4 [CH, C(8)H or C(9)H], 115.5 (C, aromatic C), 120.0 [CH, C(7)H], 121.6 (C, aromatic C), 122.4 [CH, C(4)H], 123.7 (C, aromatic C), 125.0 [CH, C(6)H], 126.4 (C, aromatic C), 128.2 (C, aromatic C), 128.7 [CH, C(3)H], 129.6 [CH, C(8)H or C(9)H], 130.0 (C, aromatic C), 139.8 (C, aromatic C), 143.7 (C, aromatic C), 145.8 [CH, C(1)H], 174.0 (C, CONH$_2$); m/z (ESI$^+$): 360 [(M)$^+$ 100%]; HRMS (ESI$^+$): Exact mass calculated for $C_{23}H_{26}N_3O^+$ 360.2076. Found 360.2074. Anal. calculated for $C_{23}H_{26}N_3OBr(0.2\ H_2O)$: C, 62.22; H, 5.99; N, 9.46. Found: C, 62.30; H, 5.89; N, 9.40.

N^2-(6'-Methylsulfonamido-6'-oxohexyl)isoellipticinium bromide 22

This was synthesised following the procedure described for **19** from 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazole **5** (212 mg, 0.861 mmol) and 6-bromo-*N*-(methylsulfonyl)hexanamide (258 mg, 0.947 mmol, 1.1 eq) in dimethylformamide (5 mL). The product was isolated as a bright orange solid (337 mg, 75.5%). mp: 285 - 287°C; ν_{max}/cm^{-1} (KBr): 3399 (NH), 3164 (NH), 3052 (CH), 2935 (asymm. CH$_2$ stretch), 2865 (symm. CH$_2$ stretch), 1705 (C=O), 1633 (C=C arom.), 1620 (C=C arom.), 1437, 1415 (C-N stretch, amide), 1336 (asymm. SO$_2$ stretch), 1122 (symm. SO$_2$ stretch); δ_H (300 MHz, DMSO-d_6): 1.33 – 1.43 [2H, m, C(3′)H$_2$], 1.58 – 1.68 [2H, m, C(4′)H$_2$], 2.00 – 2.10 [2H, m, C(2′)H$_2$], 2.33 [2H, t, *J* 7.2, C(5′)H$_2$], 2.96 [3H, s, C(11)CH$_3$], 3.07 [3H, s, C(5)CH$_3$], 3.21 (3H, s, SO$_2$CH$_3$), 4.78 [2H, t, *J* 7.4, C(1′)H$_2$], 7.29 [1H, overlapping ddd, *J* 8.1, 6.3, 1.9, C(7)H], 7.59 – 7.66 [2H, m, C(8)H, C(9)H], 8.32 [1H, d, *J* 8.1, C(6)H], 8.51 [1H, dd, *J* 7.1, 1.0, C(3)H], 8.66 [1H, d, *J* 7.1, C(4)H], 9.98 [1H, s, C(1)H], 11.66 (1H, br s, CONH), 11.87 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.5 [CH$_3$, C(11)CH$_3$], 14.7 [CH$_3$, C(5)CH$_3$], 23.5 [CH$_2$, C(4′)H$_2$], 25.0 [CH$_2$, C(3′)H$_2$], 30.7 [CH$_2$, C(2′)H$_2$], 35.1 [CH$_2$, C(5′)H$_2$], 40.99 (CH$_3$, SO$_2$CH$_3$), 59.7 [CH$_2$, C(1′)H$_2$], 111.3 [CH, C(8)H or C(9)H], 115.4 (C, aromatic C), 119.9 [CH, C(7)H], 121.4 (C, aromatic C), 122.3 [CH, C(4)H], 123.6 (C, aromatic C), 124.8 [CH, C(6)H], 126.2 (C, aromatic C), 128.0 (C, aromatic C), 128.6 [CH, C(3)H], 129.5 [CH, C(8)H or C(9)H], 129.8 (C, aromatic C), 139.7 (C, aromatic C), 143.6 (C, aromatic C), 145.6 [CH, C(1)H], 172.5 (C, CONH$_2$); m/z (ESI$^+$): 438 [(M)$^+$ 100%]; HRMS (ESI$^+$): Exact mass calculated for $C_{24}H_{28}N_3O_3S^+$ 438.1851. Found 438.1833. Anal. calculated for $C_{24}H_{28}N_3O_3SBr$: C, 55.60; H, 5.44; N, 8.10. Found: C, 55.65; H, 5.41; N, 8.10.

2-(5'-Carboxypentyl)-7-formylisoellipticinium bromide 23

This was synthesised following the procedure described for **19** from 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6** (146 mg, 0.532 mmol) and 6-bromohexanoic acid (114 mg, 0.585 mmol) in dimethylformamide (5 mL). The product was isolated as a bright orange solid (123 mg, 49.3%). mp: 267 - 269°C; ν_{max}/cm^{-1} (KBr): 3348 (NH), 3109 (OH broad), 2944 (CH), 2862 (CH), 1716 (C=O acid), 1684 (C=O aldehyde), 1622 (C=C arom.), 1600 (C=C arom.), 1411, 1199; δ_H (300 MHz, DMSO-d_6): 1.38 – 1.46 [2H, m, C(3′)H$_2$], 1.58 – 1.67 [2H, m, C(4′)H$_2$], 2.02 – 2.12 [2H, m, C(2′)H$_2$], 2.28 [2H, t, *J* 7.2, C(5′)H$_2$], 2.93 [3H, s, C(11)CH$_3$], 3.05 [3H, s, C(5)CH$_3$], 4.78 [2H, t, *J* 7.5, C(1′)H$_2$], 7.56 [1H, d, *J* 8.5, C(9)H], 7.95 [1H, dd, *J* 8.5, 1.3, C(8)H], 8.57 [1H, dd, *J* 7.1, 0.6 C(3)H], 8.65 – 8.68 [2H, overlapping s and d, C(6)H, C(4)H respectively], 10.00 [1H, s, C(1)H], 10.03 [1H, s, C(7)CHO], 12.04

(1H, br s, COOH), 12.28 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.5 [CH_3, C(11)CH_3], 14.7 [CH_3, C(5)CH_3], 23.9 (CH_2), 25.2 (CH_2), 30.7 (CH_2), 33.4 (CH_2), 59.9 [CH_2, C(1′)H_2], 111.6 (CH, aromatic CH), 116.5 (C, aromatic C), 121.2 (C, aromatic C), 122.5 (CH, aromatic CH), 122.6 (C, aromatic C), 124.0 (C, aromatic C), 126.9 (C, aromatic C), 128.7 (CH, aromatic CH), 128.8 (C, aromatic C), 129.1 (CH, aromatic CH), 129.3 (C, aromatic C), 129.4 (CH, aromatic CH), 139.9 (C, aromatic C), 146.0 (CH, aromatic CH), 147.0 (C, aromatic C), 174.3 (C, COOH), 191.8 (CH, CHO); m/z (ESI^+): 389 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{24}H_{25}N_2O_3^+$ 389.1865. Found 389.1853.

2-(5'-Cyanopentyl)-7-formylisoellipticinium bromide 24

This was synthesised following the procedure described for **19** from 5,11 dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6** (149 mg, 0.543 mmol) and 6-bromohexanenitrile (105 mg, 0.597 mmol) in dimethylformamide (5 mL) to give the product as a bright orange solid (154 mg, 62.9%). mp: 300 - 302°C; ν_{max}/cm^{-1} (KBr): 3418 (NH), 3029 (CH), 2933 (CH), 2868 (CH), 2243 (CN), 1678 (C=O), 1626 (C=C arom.), 1606 (C=C arom.), 1412, 1202, 1113; δ_H (300 MHz, DMSO-d_6): 1.45 – 1.55 [2H, m, C(3′)H_2], 1.65 – 1.75 [2H, m, C(4′)H_2], 2.05 – 2.15 [2H, m, C(2′)H_2], 2.58 [2H, t, *J* 7.0, C(5′)H_2], 2.90 [3H, s, C(11)CH_3], 3.00 [3H, s, C(5)CH_3], 4.79 [2H, t, *J* 7.5, C(1′)H_2], 7.52 [1H, d, *J* 8.5, C(9)H], 7.91 [1H, dd, *J* 8.5, 1.3, C(8)H], 8.56 [1H, dd, *J* 7.2, 0.9, C(3)H], 8.61 [1H, s, C(6)H], 8.63 [1H, d, *J* 7.2, C(4)H], 9.99 [1H, s, C(1)], 10.01 [1H, s, C(7)CHO], 12.22 [1H, s, N(10)H]; δ_C (150.9 MHz, DMSO-d_6): 12.3 [CH_3, C(11)CH_3], 14.5 [CH_3, C(5)CH_3], 16.0 (CH_2), 24.1 (CH_2), 24.7 (CH_2), 30.1 (CH_2), 59.8 [CH_2, N(2)CH_2], 111.3 (CH, aromatic CH), 116.2 (C, aromatic C), 120.7 (C, C≡N), 120.9 (C, aromatic C), 122.4 (CH, aromatic CH), 123.8 (C, aromatic C), 126.7 (C, aromatic C), 128.3 (CH, aromatic CH), 128.5 (C, aromatic C), 128.6 (C, aromatic C), 128.9 (CH, aromatic CH), 129.0 (C, aromatic C), 129.2 (CH, aromatic CH), 139.8 (C, aromatic C), 145.5 (CH, aromatic CH), 146.7 (C, aromatic C), 191.8 (CH, CHO); m/z (ESI^+): 370 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{24}H_{24}N_3O^+$ 370.1919. Found 370.1917.

2-(6'-Carboxamidohexyl)-7-formylisoellipticinium bromide 25

This was synthesised following the procedure described for **19** from 5,11 dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6** (148 mg, 0.540 mmol) and 6-bromohexanamide (114 mg, 0.587 mmol) in dimethylformamide (5 mL). The product was isolated as a bright orange solid (151 mg, 59.7%). mp: >300 °C without melting; ν_{max}/cm^{-1} (KBr): 3105 (NH), 2929 (asymm. CH_2 stretch), 2860 (symm. CH_2 stretch), 1664 (broad, 2 × C=O) 1600 (C=C arom.), 1409 (C=C arom.), 1319, 1273, 1199, 1112; δ_H (300 MHz, DMSO-d_6): 1.32 – 1.42 [2H, m, C(3′)H_2], 1.56 – 1.65 [2H, m, C(4′)H_2], 2.00 – 2.10 [2H, m, C(2′)H], 2.11 [2H, t, *J* 7.2, C(5′)H_2], 2.88 [3H, s, C(11)CH_3], 2.99 [3H, s, C(5)CH_3], 4.75 [2H, t, *J* 7.4, C(1′)H_2], 6.73 (1H, br s, one of CONH$_2$), 7.32 (1H, br s, one of CONH$_2$), 7.52 [1H, d, *J* 8.5, C(9)H], 7.92 [1H, d, *J* 8.5, C(8)H], 8.52 [1H, d, *J* 7.1, C(3)H], 8.60 [1H, d, *J* 6.8, C(4)H], 8.61 [1H, s, C(6)H], 9.94 [1H, s, C(1)H], 9.98 [1H, s, C(7)CHO], 12.23 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.4 [CH_3, C(11)CH_3], 14.6 [CH_3, C(5)CH_3], 24.4 (CH_2), 25.3 (CH_2), 30.8 (CH_2), 34.7 (CH_2), 60.0 [CH_2, C(1′)H_2], 111.5 (CH, aromatic CH), 116.4 (C, aromatic C), 121.1 (C, aromatic C), 122.5 (CH, aromatic CH), 124.0 (C, aromatic C), 126.8 (C, aromatic C), 128.71 (CH, aromatic CH), 128.73 (C, aromatic C), 129.1 (CH, aromatic CH), 129.2 (C, aromatic C), 129.4 (CH, aromatic CH), 130.4 (C, aromatic C), 139.8 (C, aromatic C), 145.8 (CH, aromatic CH), 146.9 (C, aromatic C), 174.4 (C, CONH$_2$), 191.8 (CH, CHO); m/z (ESI^+): 388 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{24}H_{26}N_3O_2^+$ 388.2025. Found 388.2021.

7-Formyl-N^2-(6'-methylsulfonamido-6'-oxohexyl) isoellipticinium bromide 26

This was synthesised following the procedure described for **19** from 5,11 dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6** (103 mg, 0.375 mmol) and 6-bromo-*N*-(methylsulfonyl) hexanamide (112 mg, 0.412 mmol) in dimethylformamide (5 mL) to give the product as a bright orange solid (110 mg, 53.7%). mp: 270 – 271°C; ν_{max}/cm^{-1} (KBr): 3108 (NH), 3000 (CH), 2861 (CH), 1704 (C=O amide), 1683 (C=O aldehyde), 1622 (C=C arom.), 1604 (C=C arom.), 1411, 1321 (asymm. SO_2 stretch), 1157 (symm. SO_2 stretch); δ_H (300 MHz, DMSO-d_6): 1.28 – 1.38 [2H, m, C(3′)H_2], 1.53 – 1.63 [2H, m, C(4′)H_2], 1.96 – 2.06 [2H, m, C(2′)H_2], 2.27 [2H, t, *J* 7.2, C(5′)H_2], 2.90 [3H, s, C(11)C$\underline{H}_3$], 3.02 [3H, s, C(5)C$\underline{H}_3$], 3.15 (3H, s, $SO_2C\underline{H}_3$), 4.73 [2H, t, *J* 7.2, C(1′)H_2], 7.54 [1H, d, *J* 8.5, C(9)H], 7.93 [1H, dd, *J* 8.7, 1.2, C(8)H], 8.52 [1H, dd, *J* 7.0, 0.7, C(3)H], 8.64 [1H, d, *J* 7.2, C(4)H], 8.67 [1H, d, *J* 0.6, C(6)H], 9.97 – 9.98 [2H, s, C(1)H, C(7)C$\underline{H}$O], 11.61 (1H, br s, CON$\underline{H}SO_2$), 12.26 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.5 [CH_3, C(11)$\underline{C}H_3$], 14.7 [CH_3, C(5)$\underline{C}H_3$], 23.5 (CH_2), 25.0 (CH_2), 30.7 (CH_2), 35.1 (CH_2), 41.0 (CH_3, $SO_2\underline{C}H_3$), 59.8 [CH_2, C(1′)H_2], 111.7 (CH, aromatic CH), 116.5 (C, aromatic C), 121.3 (C, aromatic C), 122.6 (CH, aromatic CH), 124.1 (C, aromatic C), 127.0 (C, aromatic C), 128.8 (CH, aromatic CH), 128.9 (C, aromatic C), 129.2 (CH, aromatic CH), 129.3 (C, aromatic C), 129.5 (CH, aromatic CH), 129.6 (C, aromatic C), 140.0 (C, aromatic C), 146.1 (CH, aromatic CH), 147.1 (C, aromatic C), 172.5 (C, $\underline{C}$ONH), 191.8 (CH, $\underline{C}$HO); m/z (ESI^+): 466 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{25}H_{28}N_3O_4S^+$ 466.1801. Found 466.1787.

2-(5'-Carboxypentyl)-7-hydroxyisoellipticinium bromide 27

A stirred suspension of 5,11-dimethyl-10H-pyrido[3,4-*b*]carbazol-7-ol **7** (85 mg, 0.324 mmol) in dimethylformamide (5 mL) was treated with 6-bromohexanoic acid (69 mg, 0.354 mmol) and heated to 120 °C for 4 hours followed by stirring at room temperature overnight. The mixture was cooled to 0 °C and cold diethyl ether (3 mL) was added. The resulting precipitate was collected by vacuum filtration under nitrogen as the product was highly hygroscopic. The solid was quickly washed with hexane (3 mL) and cold diethyl ether (5 mL) to give the product as a red solid which was dried at 0.1 mmHg for 7 days (47 mg, 31.7%). mp: 291 - 293°C; ν_{max}/cm^{-1} (KBr): 3166 (OH), 3050 (NH), 2927 (asymm. CH_2 stretch) 2860 (symm. CH_2 stretch), 1719 (C=O), 1635 (C=C arom.), 1492 (C=C arom.), 1413, 1380, 1220 (C-O), 1152; δ_H (300 MHz, DMSO-d_6): 1.32 – 1.42 [2H, m, C(3′)H_2], 1.55 – 1.64 [2H, m, C(4′)H_2], 2.01 – 2.09 [2H, m, C(2′)H_2], 2.25 [2H, t, *J* 7.2, C(5′)H_2], 2.99 [3H, s, C(11)C$\underline{H}_3$], 3.13 [3H, s, C(5)C$\underline{H}_3$], 4.77 [2H, t, *J* 7.2, C(1′)H_2], 7.21 [1H, dd, *J* 8.7, 2.3, C(8)H], 7.51 [1H, d, *J* 8.8, C(9)H], 7.78 [1H, d, *J* 1.5, C(6)H], 8.51 [1H, d, *J* 7.2, C(3)H], 8.72 [1H, d, *J* 7.0, C(4)H], 9.34 [1H, s, C(7)O$\underline{H}$], 10.00 [1H, s, C(1)H], 11.68 [1H, s, N(10)H], 12.02 (1H, br s, COO$\underline{H}$); δ_C (75.5 MHz, DMSO-d_6): 12.3 [CH_3, C(11)$\underline{C}H_3$] 14.6 [CH_3, C(5)$\underline{C}H_3$], 23.9 (CH_2), 25.1 (CH_2), 30.6 (CH_2), 33.4 (CH_2), 59.7 [CH_2, C(1′)H_2], 109.4 (CH, aromatic CH), 111.9 (CH, aromatic CH), 115.3 (C, aromatic C), 119.2 (CH, aromatic CH), 122.2 (C, aromatic C), 122.4 (CH, aromatic CH), 123.5 (C, aromatic C), 126.2 (C, aromatic C), 127.5 (C, aromatic C), 128.3 (CH, aromatic CH), 129.9 (C, aromatic C), 137.6 (C, aromatic C), 140.4 (C, aromatic C), 145.7 (CH, aromatic CH), 151.3 (C, aromatic C), 174.3 (C, $\underline{C}$OOH); m/z (ESI^+): 377 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{23}H_{25}N_2O_3^+$ 377.1865. Found 377.1859.

2-(5'-Cyanopentyl)-7-hydroxyisoellipticinium bromide 28

This was synthesised following the procedure described for **27** from 5,11-dimethyl-10*H*-

pyrido[3,4-*b*]carbazol-7-ol **7** (79 mg, 0.301 mmol) and 6-bromohexanenitrile (0.04 mL, 0.331 mmol) in dimethylformamide (5 mL) to give the product as a red solid (41 mg, 31.1%). mp: 245 – 248 °C; ν_{max}/cm^{-1} (KBr): 3169 (broad, OH & NH), 2932 (asymm. CH_2 stretch), 2861 (symm. CH_2 stretch), 2242 (CN), 1633 (C=C arom.), 1492 (C=C arom.), 1468, 1413, 1221 (C-O), 1147; δ_H (400 MHz, DMSO-d_6): 1.41 – 1.48 [2H, m, C(3′)H_2], 1.62 – 1.69 [2H, m, C(4′)H_2], 2.03 – 2.11 [2H, m, C(2′)H_2], 2.54 [2H, t, *J* 7.0, C(5′)H_2], 3.03 [3H, s, C(11)C$\underline{H}_3$], 3.16 [3H, s, C(5)C$\underline{H}_3$], 4.79 [2H, t, *J* 7.6, C(1′)H_2], 7.22 [1H, dd, *J* 8.8, 2.2, C(8)H], 7.52 [1H, d, *J* 8.7, C(9)H], 7.81 [1H, d, *J* 2.2, C(6)H], 8.54 [1H, d, *J* 7.1, C(3)H], 8.77 [1H, d, *J* 7.0, C(4)H], 9.37 [1H, s, C(7)O$\underline{H}$], 10.04 [1H, s, C(1)H], 11.67 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.4 [CH_3, C(11)$\underline{C}H_3$], 14.6 [CH_3, C(5)$\underline{C}H_3$], 16.0 (CH_2), 24.2 (CH_2), 24.7 (CH_2), 30.1 (CH_2), 59.5 [CH_2, C(1′)H_2], 109.4 (CH, aromatic CH), 111.9 (CH, aromatic CH), 115.3 (C, aromatic C), 119.2 (CH, aromatic CH), 120.6 (C, C≡N), 122.2 (C, aromatic C), 122.4 (CH, aromatic CH), 123.5 (C, aromatic C), 126.2 (C, aromatic C), 127.5 (C, aromatic C), 128.3 (CH, aromatic CH), 130.0 (C, aromatic C), 137.6 (C, aromatic C), 140.4 (C, aromatic C), 145.7 (CH, aromatic CH), 151.3 (C, aromatic C); m/z (ESI^+): 358 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{23}H_{24}N_3O^+$ 358.1919. Found 358.1929.

2-(6'-Carboxamidohexyl)-7-hydroxyisoellipticinium bromide 29

This was synthesised following the procedure described for **27** from 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol **7** (233 mg, 0.888 mmol) and 6-bromohexanamide (190 mg, 0.979 mmol) in dimethylformamide (5 mL) to give the product as a red solid (186 mg, 45.9%). mp: 278 – 279 °C; ν_{max}/cm^{-1} (KBr): 3177 (broad, NH & OH), 2928 (asymm. CH_2 stretch), 2858 (symm. CH_2 stretch), 1654 (C=O), 1635 (C=C arom.), 1493 (C=C arom.), 1466, 1413, 1381, 1218 (C-O), 1151; δ_H (400 MHz, DMSO-d_6): 1.30 – 1.37 [2H, m, C(3′)H_2], 1.54 – 1.61 [2H, m, C(4′)H_2], 1.99 – 2.09 (4H, m, C(2′)H_2, C(5′)CH_2], 2.95 [3H, s, C(11)C$\underline{H}_3$], 3.08 [3H, s, C(5)C$\underline{H}_3$], 4.75 [2H, t, *J* 7.1, C(1′)H_2], 6.73 (1H, br s, one of CON$\underline{H}_2$), 7.18 [1H, dd, *J* 8.7, 2.2, C(8)H], 7.28 (1H, br s, one of CON$\underline{H}_2$) 7.47 [1H, d, *J* 8.6, C(9)H], 7.72 [1H, d, *J* 1.8, C(6)H], 8.49 [1H, d, *J* 7.1, C(3)H], 8.68 [1H, d, *J* 7.1, C(4)H], 9.35 [1H, s, C(7)O$\underline{H}$], 9.96 [1H, s, C(1)H], 11.66 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.4 [CH_3, C(11)$\underline{C}H_3$], 14.5 [CH_3, C(5)$\underline{C}H_3$], 24.4 (CH_2), 25.3 (CH_2), 30.7 (CH_2), 34.8 (CH_2), 59.7 [CH_2, C(1′v)H_2], 109.3 (CH, aromatic CH), 111.9 (CH, aromatic CH), 115.3 (C, aromatic C), 119.1 (CH, aromatic CH), 122.1 (C, aromatic C), 122.3 (CH, aromatic CH), 123.4 (C, aromatic C), 126.1 (C, aromatic C), 127.4 (C, aromatic C), 128.3 (CH, aromatic CH), 129.8 (C, aromatic C), 137.6 (C, aromatic C), 140.3 (C, aromatic C), 145.6 (CH, aromatic CH), 151.2 (C, aromatic C), 174.1 (C, $\underline{C}ONH_2$); m/z (ESI^+): 376 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{23}H_{26}N_3O_2^+$ 376.2025. Found 376.2018.

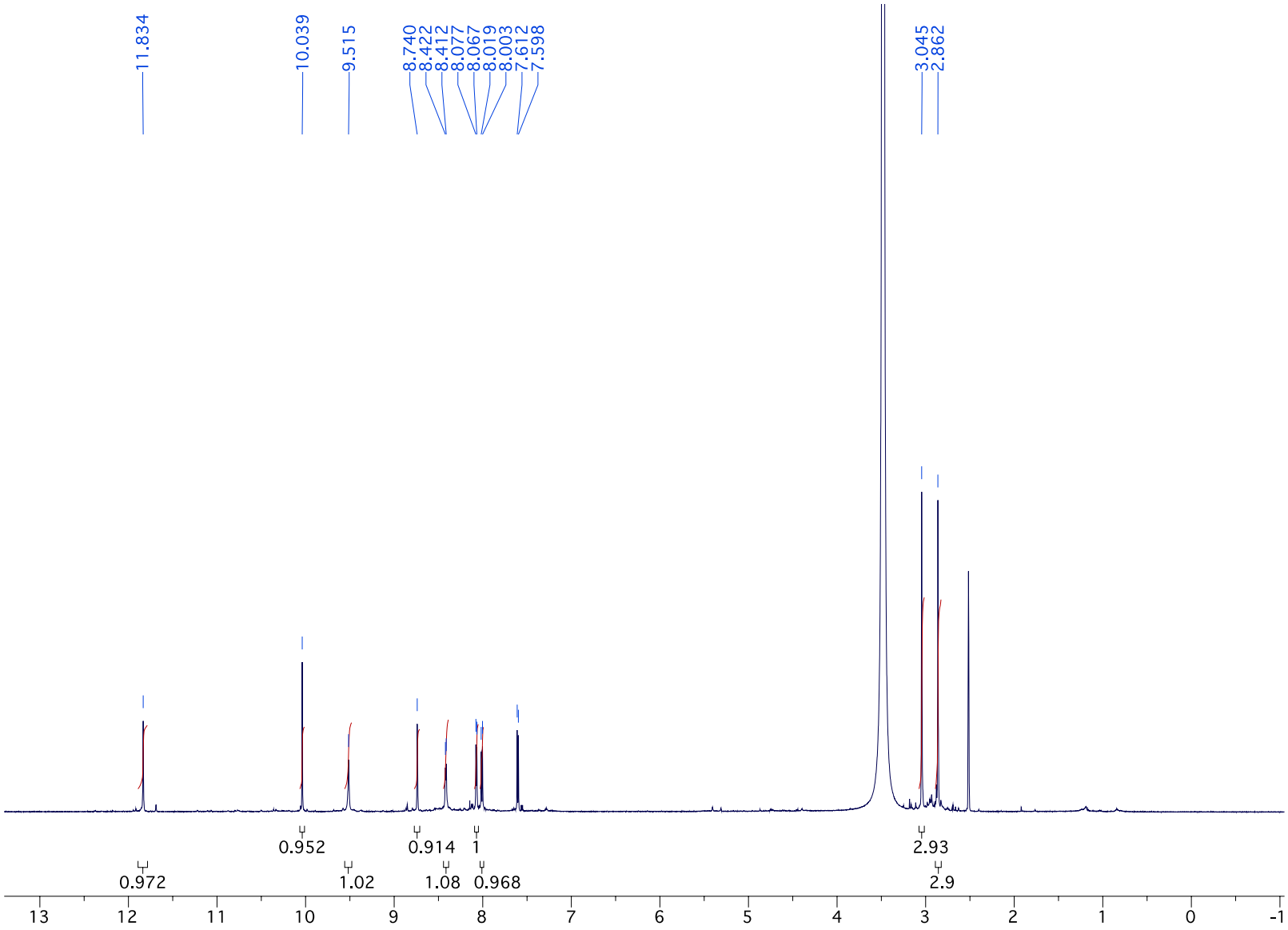
7-Hydroxy-N^2-(6'-methylsulfonamido-6-oxohexyl) isoellipticinium bromide 30

This was synthesised following the procedure described for **27** from 5,11-dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol **7** (137 mg, 0.522 mmol) and 6-bromo-*N*-(methylsulfonyl) hexanamide (157 mg, 0.577 mmol) in dimethylformamide (5 mL) to give the product as a red solid (145 mg, 52.1%). mp: 238 – 240 °C; ν_{max}/cm^{-1} (KBr): 3177 (broad, OH & NH), 2931 (asymm. CH_2 stretch), 2862 (symm. CH_2 stretch), 1708 (C=O), 1651 (C=C arom.), 1593 (C=C arom.), 1493, 1439, 1415, 1382, 1325 (asymm. SO_2 stretch), 1222 (C-O), 1156, 1113 (symm. SO_2 stretch); δ_H (400 MHz, DMSO-d_6): 1.31 – 1.39 [2H, m, C(3′)H_2], 1.58 – 1.65 [2H, m, C(4′)H_2], 2.01 – 2.09 [2H, m, C(2′)H_2], 2.31 [2H, t, *J* 7.2, C(5′)H_2], 3.01 [3H, s,

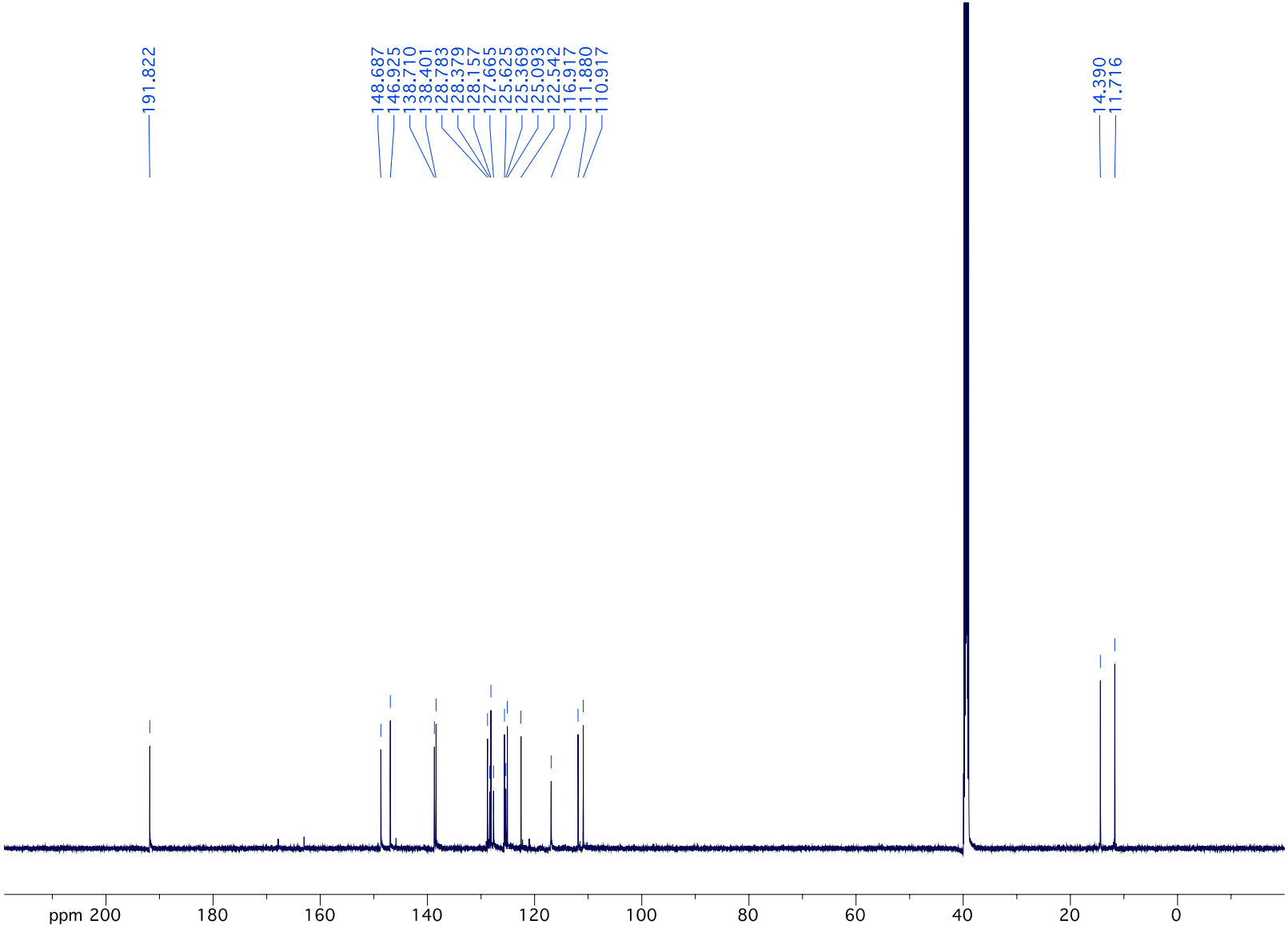
C(11)C<u>H</u>$_3$], 3.16 [3H, s, C(5)C<u>H</u>$_3$], 3.21 (3H, s, $SO_2C\underline{H}_3$), 4.78 [2H, t, *J* 7.4, C(1′)H_2], 7.23 [1H, dd, *J* 8.7, 2.2, C(8)H], 7.53 [1H, d, *J* 8.7, C(9)H], 7.82 [1H, d, *J* 2.1, C(6)H], 8.53 [1H, dd, *J* 7.3, 0.4, C(3)H], 8.77 [1H, d, *J* 7.1, C(4)H], 9.38 [1H, s, C(7)O<u>H</u>], 10.04 [1H, s, C(1)H], 11.69 (1H, br s, CON<u>H</u>SO_2), 11.73 [1H, s, N(10)H]; δ_C (75.5 MHz, DMSO-d_6): 12.4 [CH_3, C(11)<u>C</u>H_3], 14.6 [CH_3, C(5)<u>C</u>H_3], 23.5 (CH_2), 25.0 (CH_2), 30.6 (CH_2), 35.1 (CH_2), 41.0 (CH_3, $SO_2\underline{C}H_3$) 59.6 [CH_2, C(1′)H_2], 109.5 (CH, aromatic CH), 112.0 (CH, aromatic CH), 115.4 (C, aromatic C), 119.2 (CH, aromatic CH), 122.2 (C, aromatic C), 122.4 (CH, aromatic CH), 123.5 (C, aromatic C), 126.3 (C, aromatic C), 127.5 (C, aromatic C), 128.3 (CH, aromatic CH), 130.0 (C, aromatic C), 137.7 (C, aromatic C), 140.4 (C, aromatic C), 145.8 (CH, aromatic CH), 151.3 (C, aromatic C), 172.4 (C, <u>C</u>ONH); m/z (ESI^+): 454 [$(M)^+$ 100%]; HRMS (ESI^+): Exact mass calculated for $C_{24}H_{29}N_3O_4S^+$ 454.1801. Found 454.1783.

Note: Despite through drying at 0.1 mmHg (min. 48 h, max. 7 days), several of the 7-formyl and 7-hydroxy isoellipticinium salts contain traces of dimethylformamide. DMF signals in ^1H & ^{13}C NMR spectra: ^1H: 2.73 (s), 2.89 (s), 7.95 (s); ^{13}C: 30.7, 35.7, 162.3 ppm.

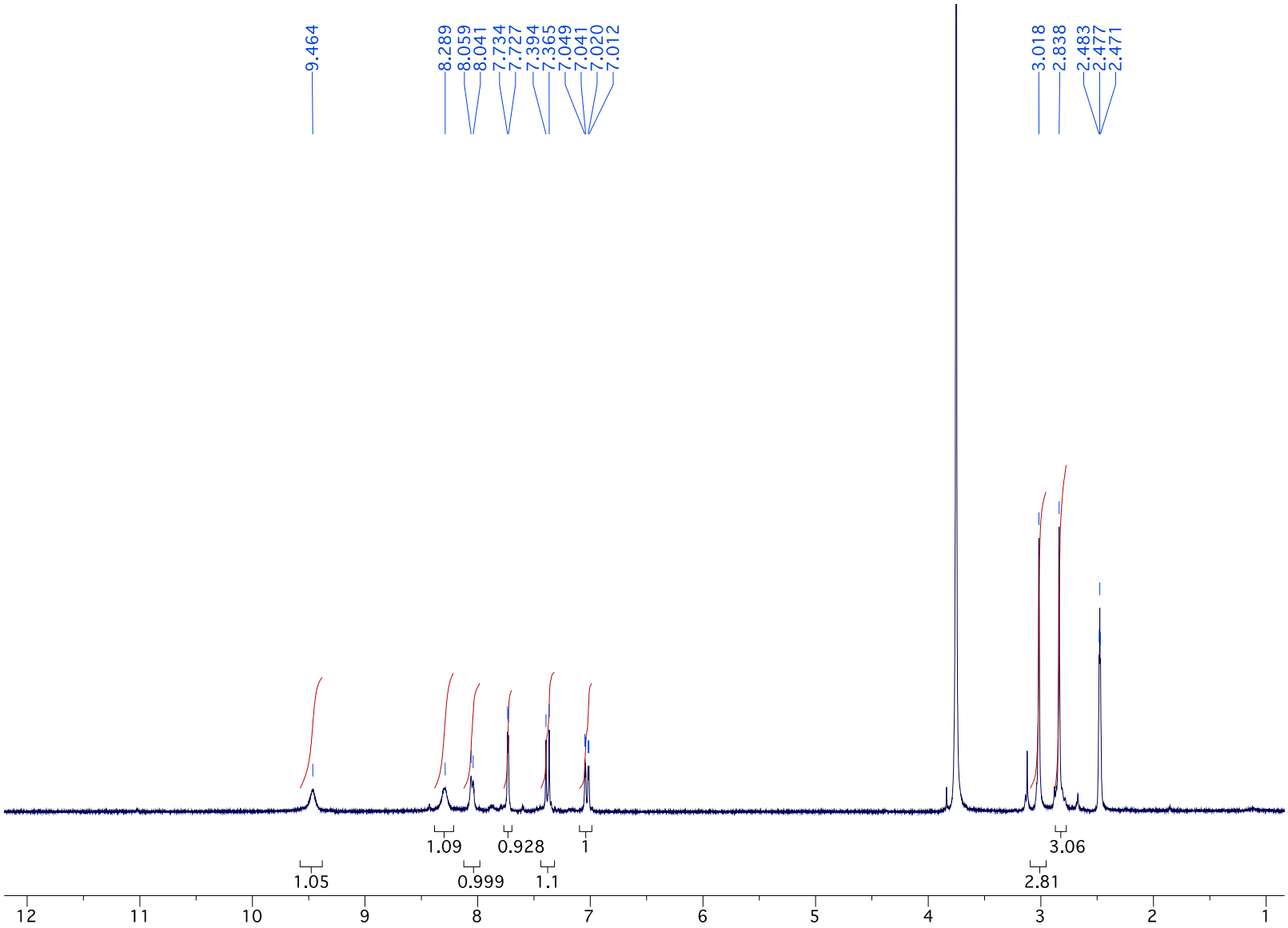
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6** (^{1}H NMR spectrum in DMSO-d_6 at 600 MHz)



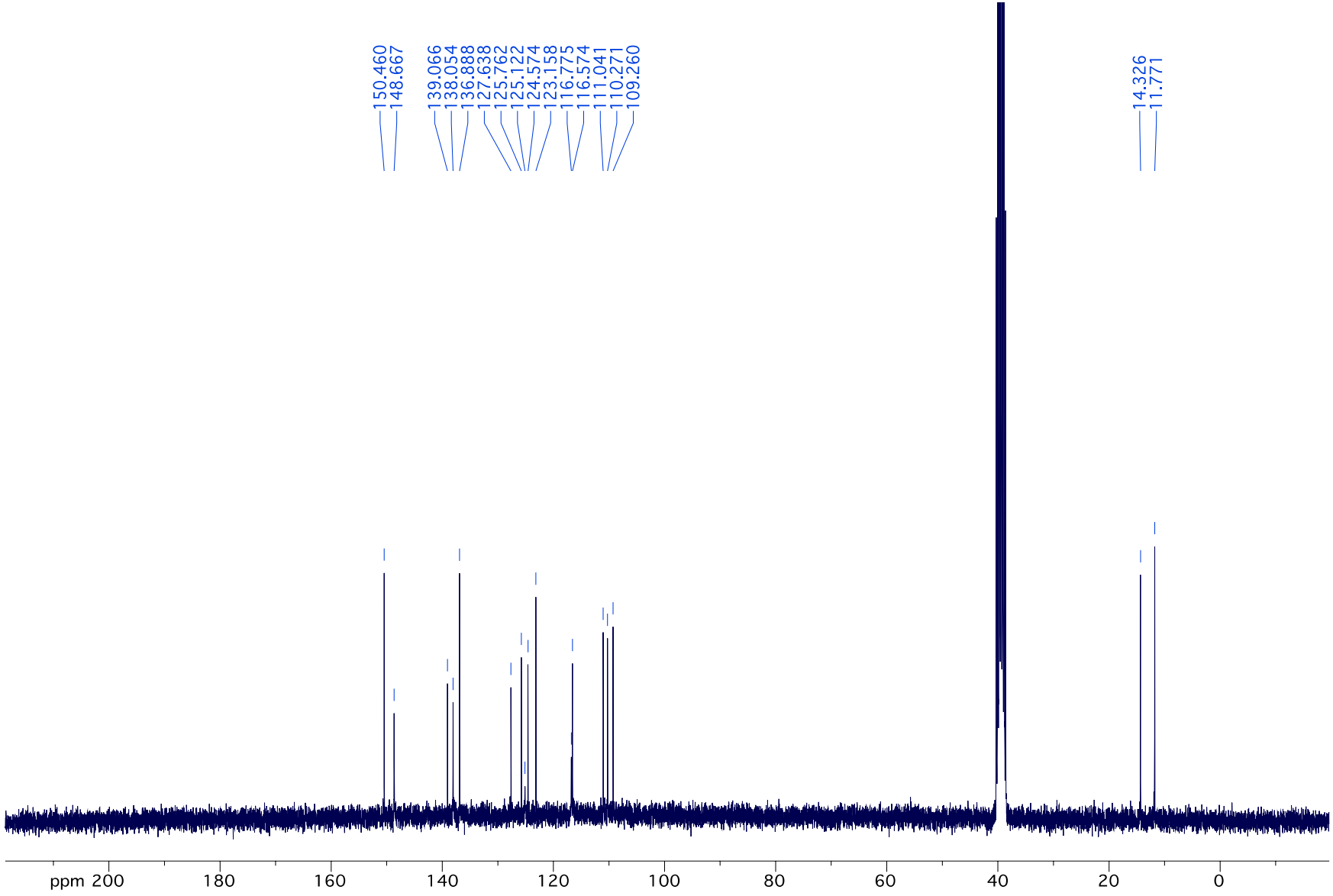
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6** (^{13}C NMR spectrum in DMSO-d_6 at 150.9 MHz)



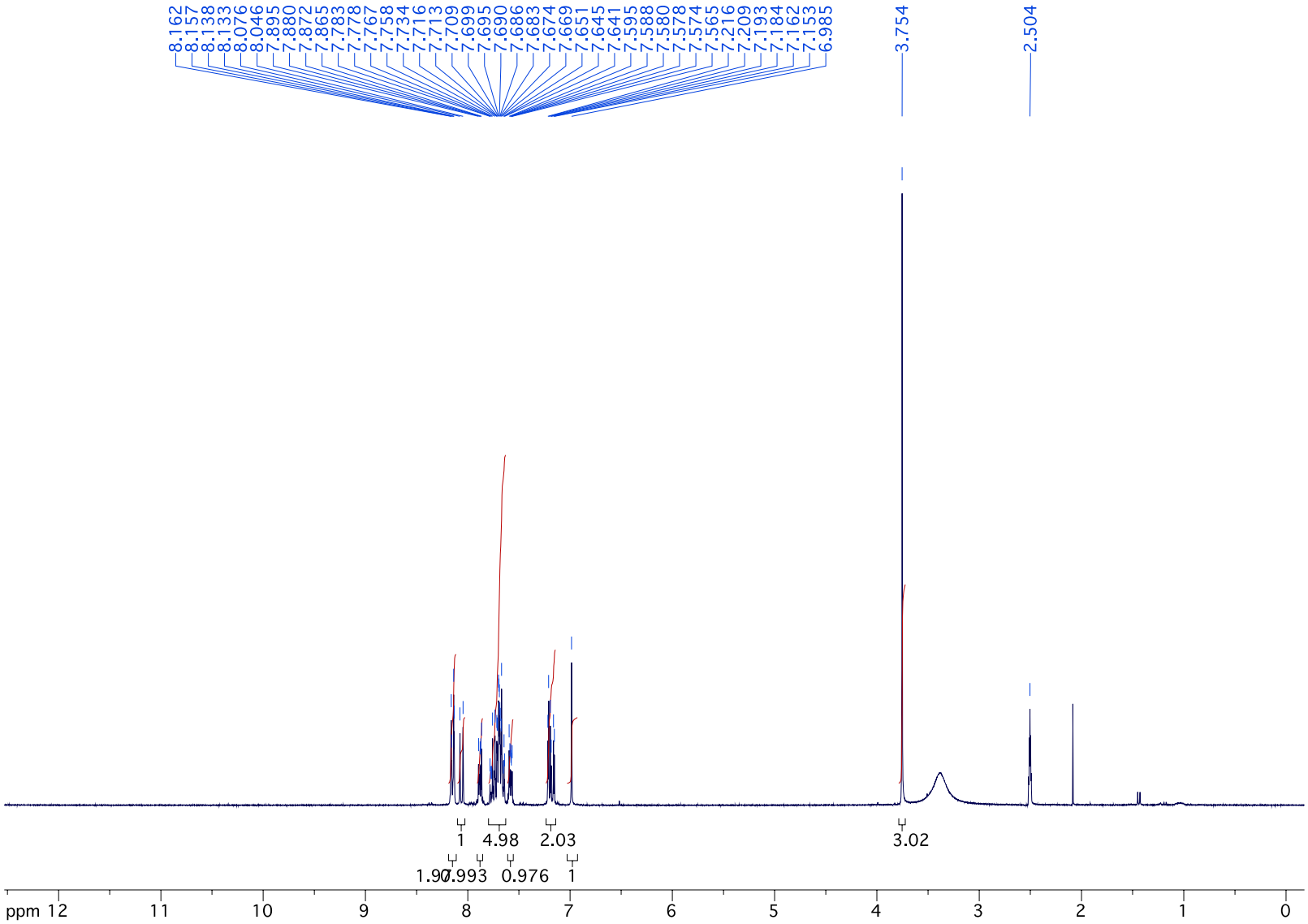
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol **7** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



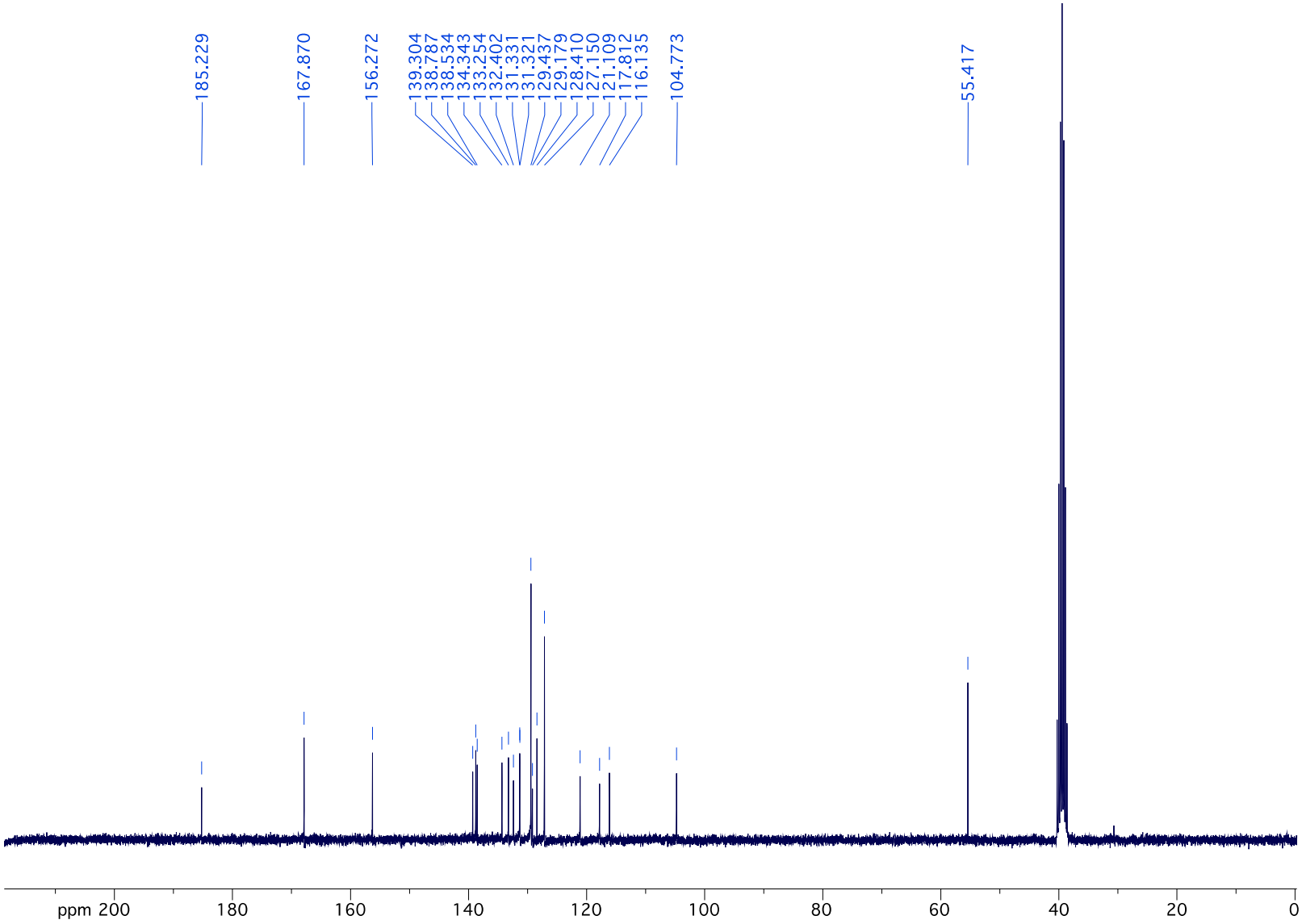
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol **7** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



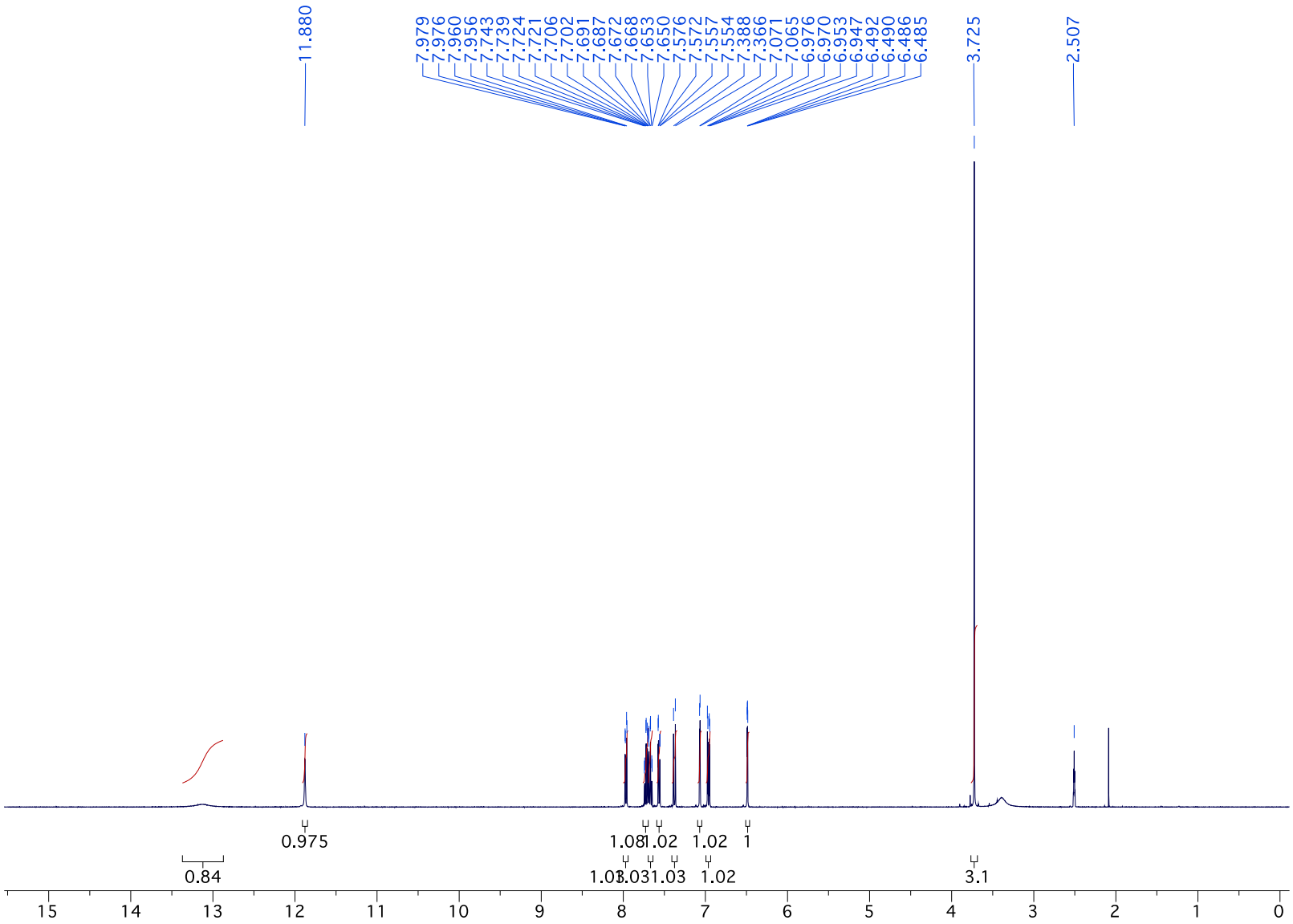
2-(5-Methoxy-1-(phenylsulfonyl)-1H-indole-2-carbonyl)benzoic acid **11** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



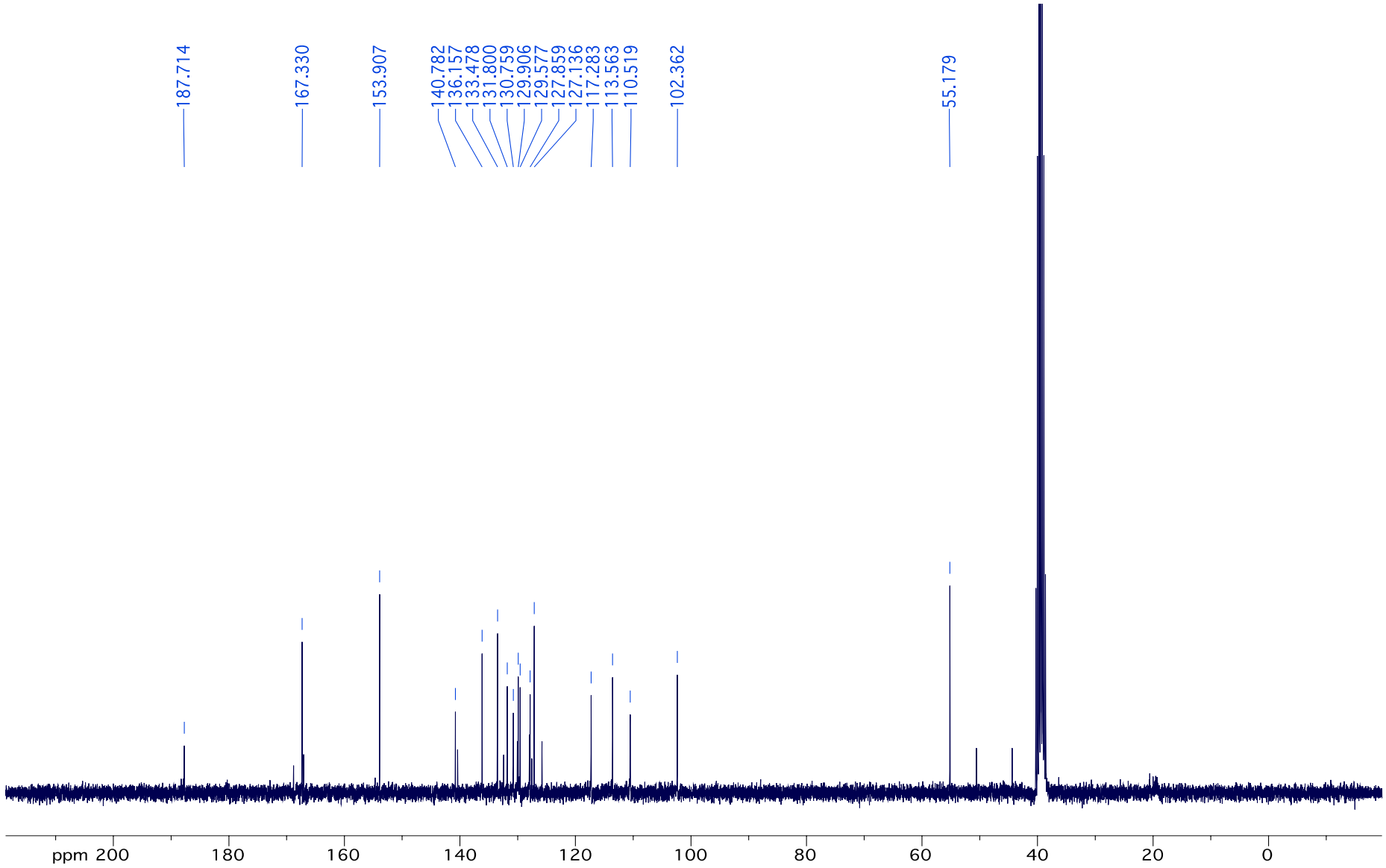
2-(5-Methoxy-1-(phenylsulfonyl)-1H-indole-2-carbonyl)benzoic acid **11** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



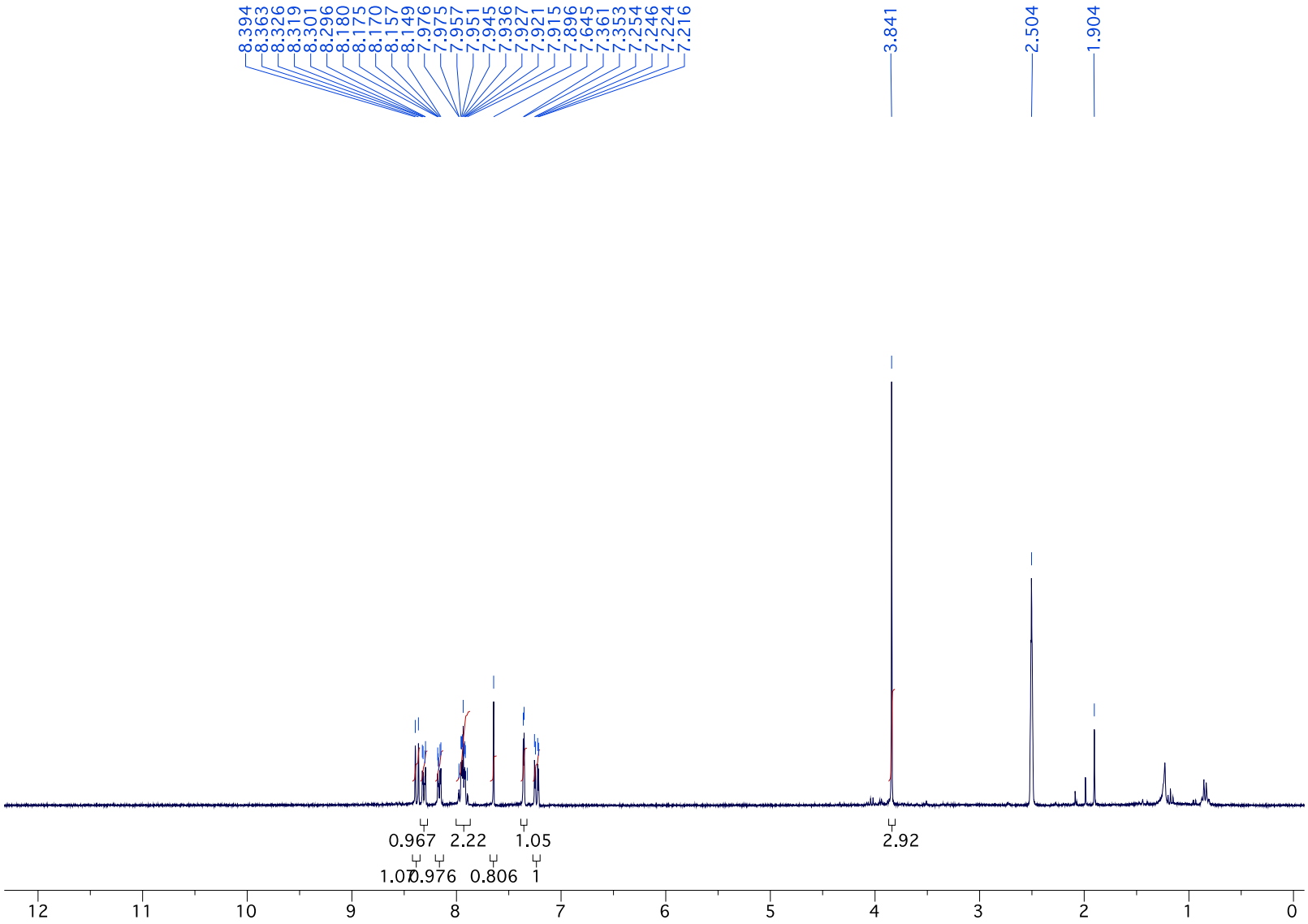
2-(5-Methoxy-1*H*-indole-2-carbonyl)benzoic acid **12** (^{1}H NMR spectrum in DMSO-d_6 at 400 MHz)



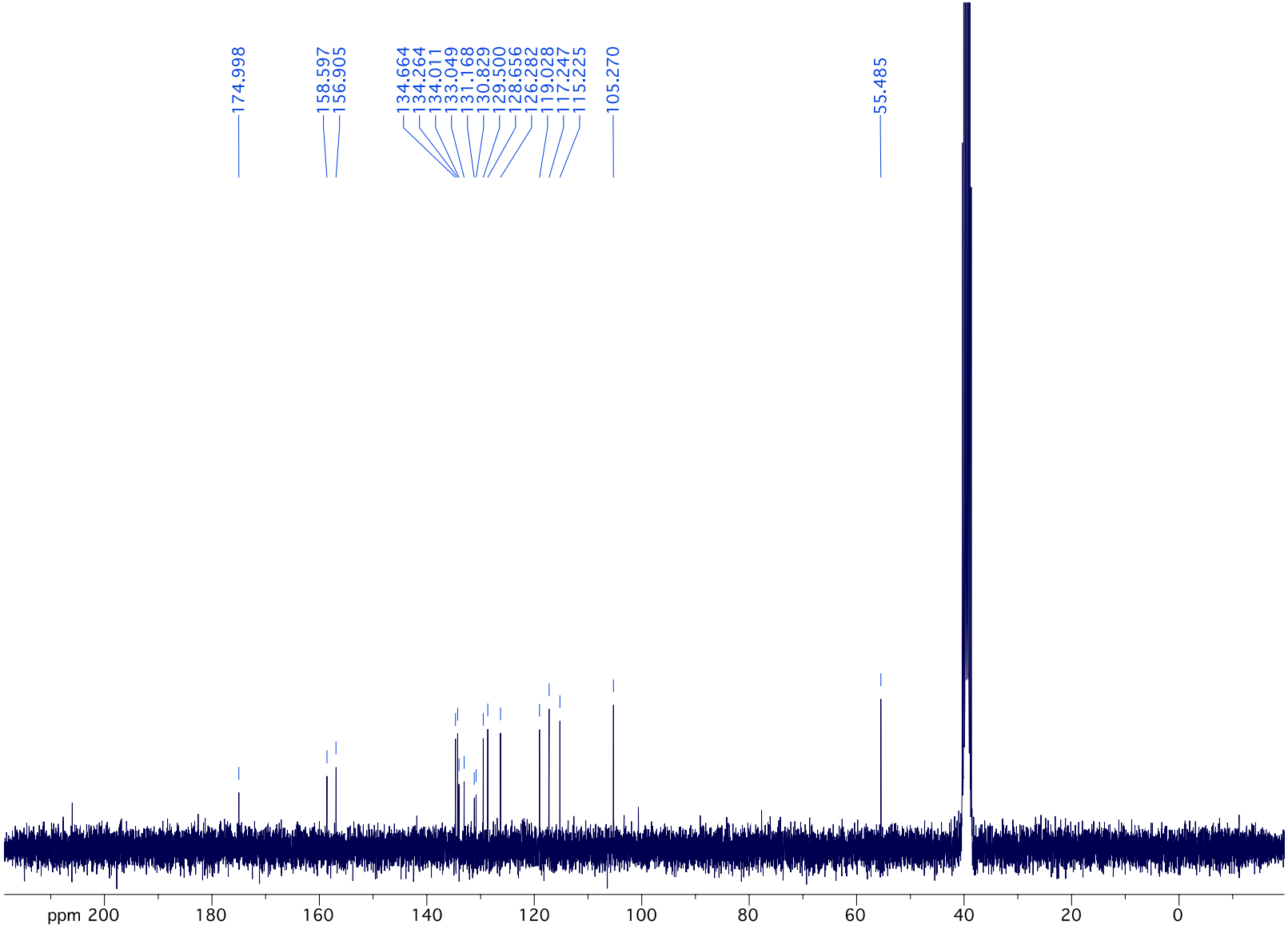
2-(5-Methoxy-1*H*-indole-2-carbonyl)benzoic acid **12** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



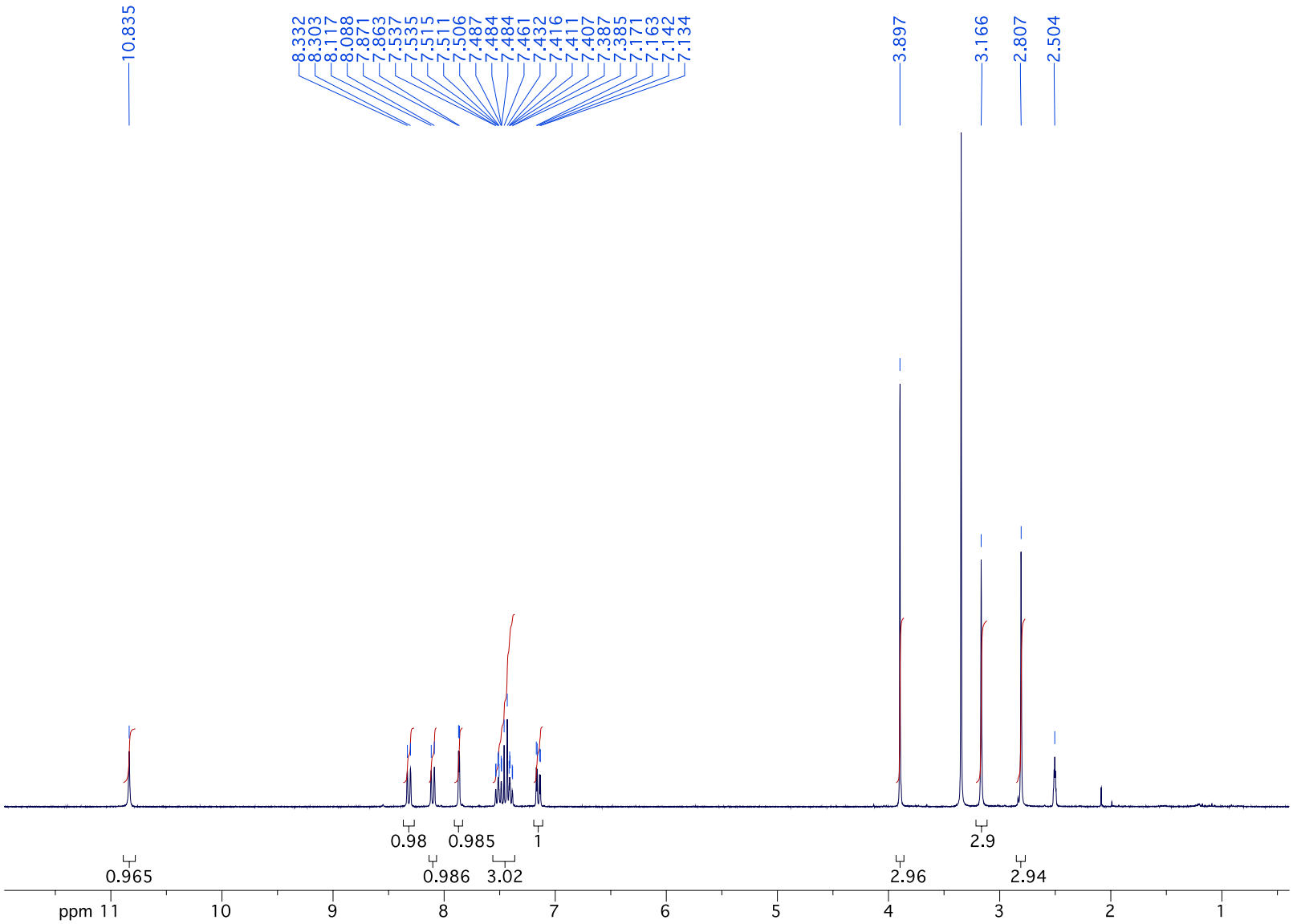
2-Methoxyindolo[1,2-*b*]isoquinoline-6,11-dione **13** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



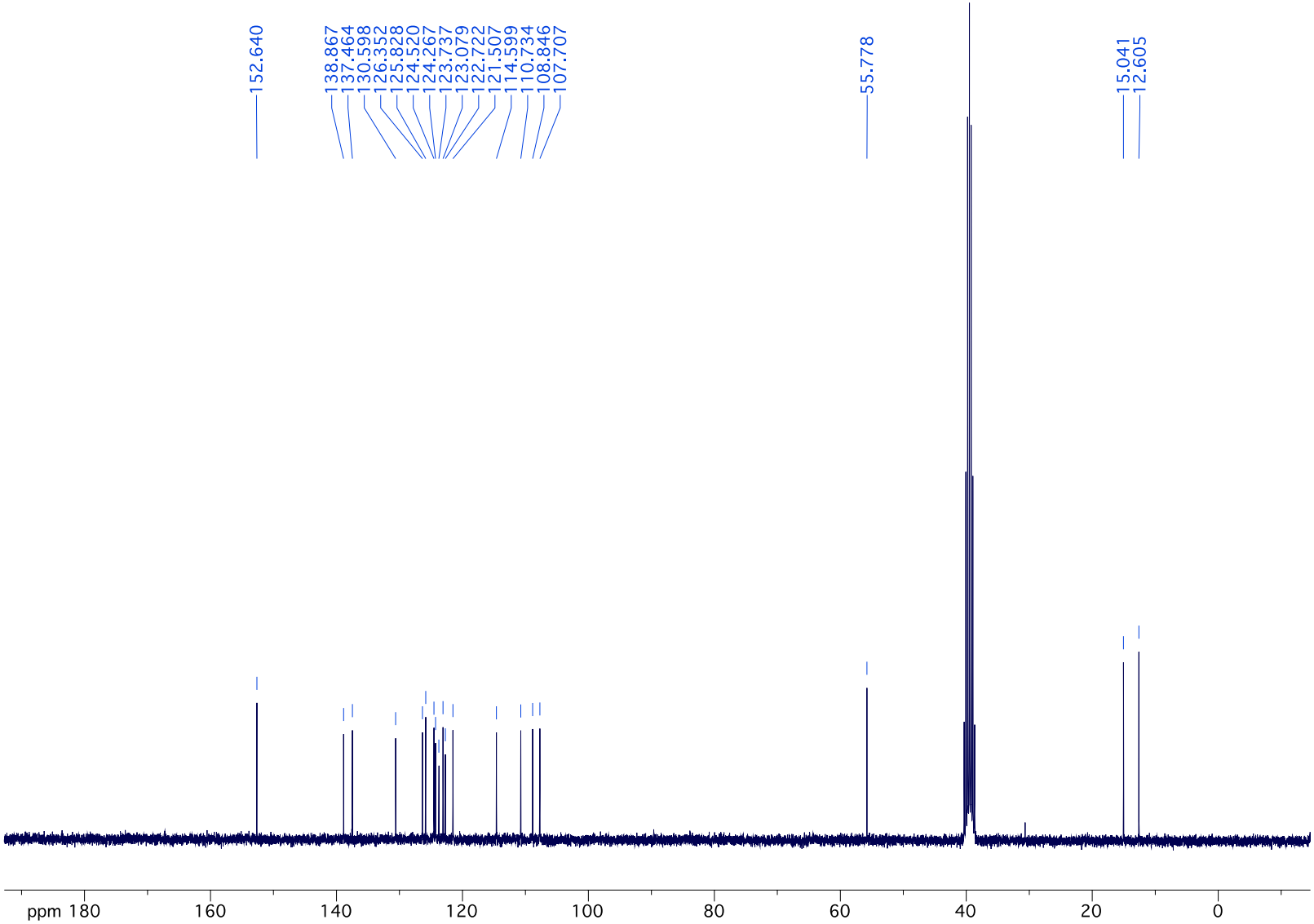
2-Methoxyindolo[1,2-*b*]isoquinoline-6,11-dione **13** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



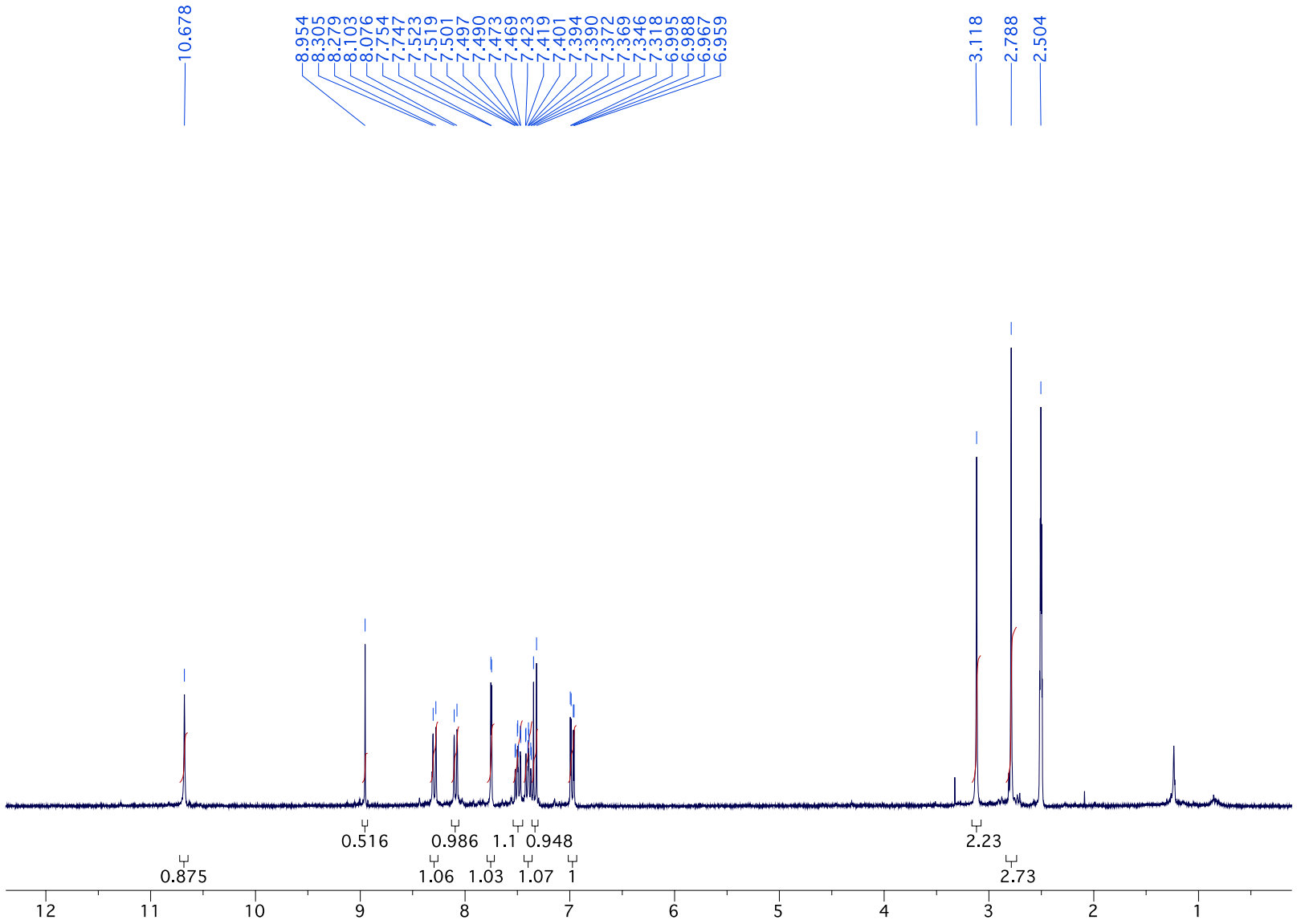
2-Methoxy-6,11-dimethyl-5*H*-benzo[*b*]carbazole **14** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



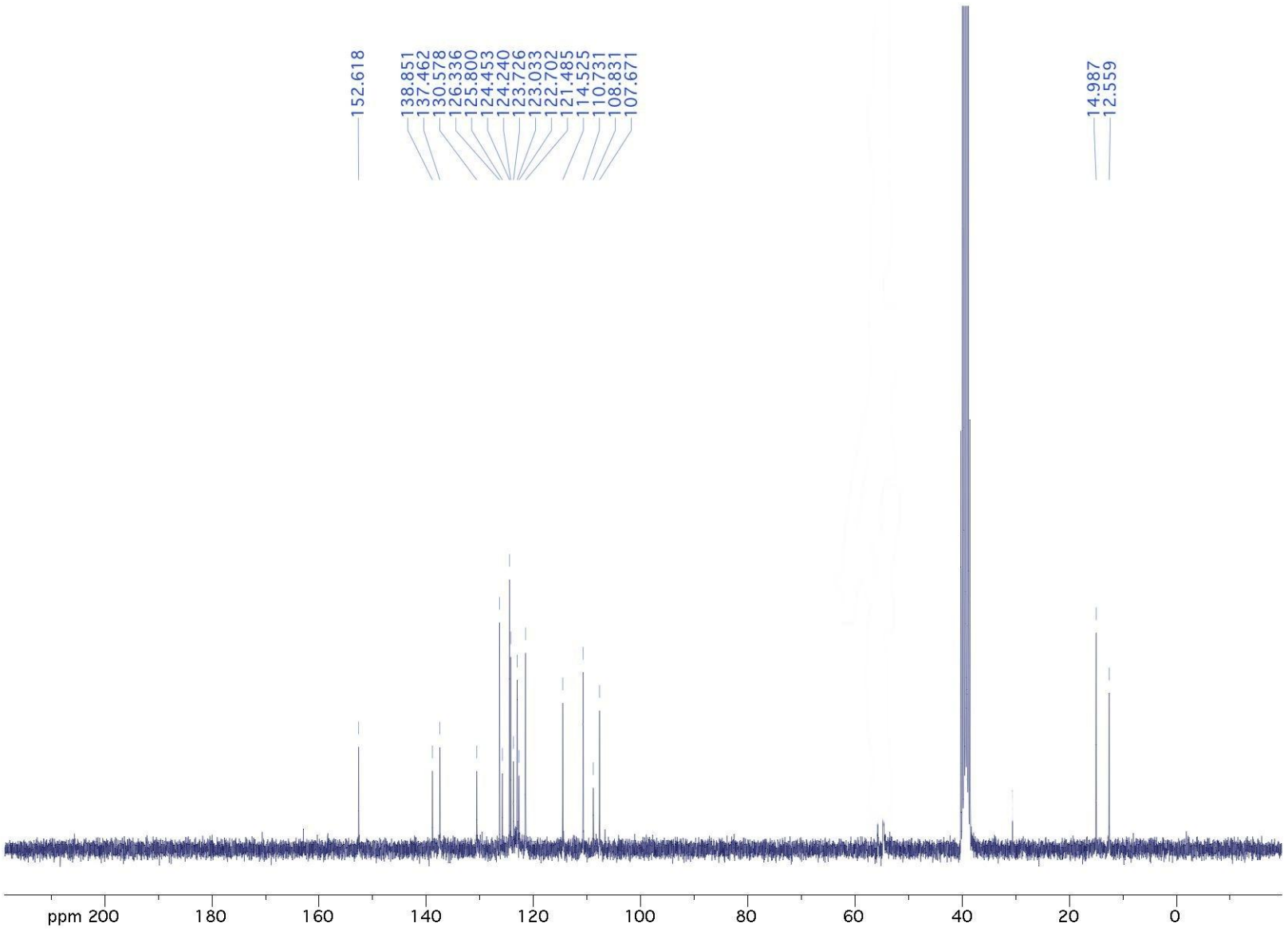
2-Methoxy-6,11-dimethyl-5*H*-benzo[*b*]carbazole **14** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



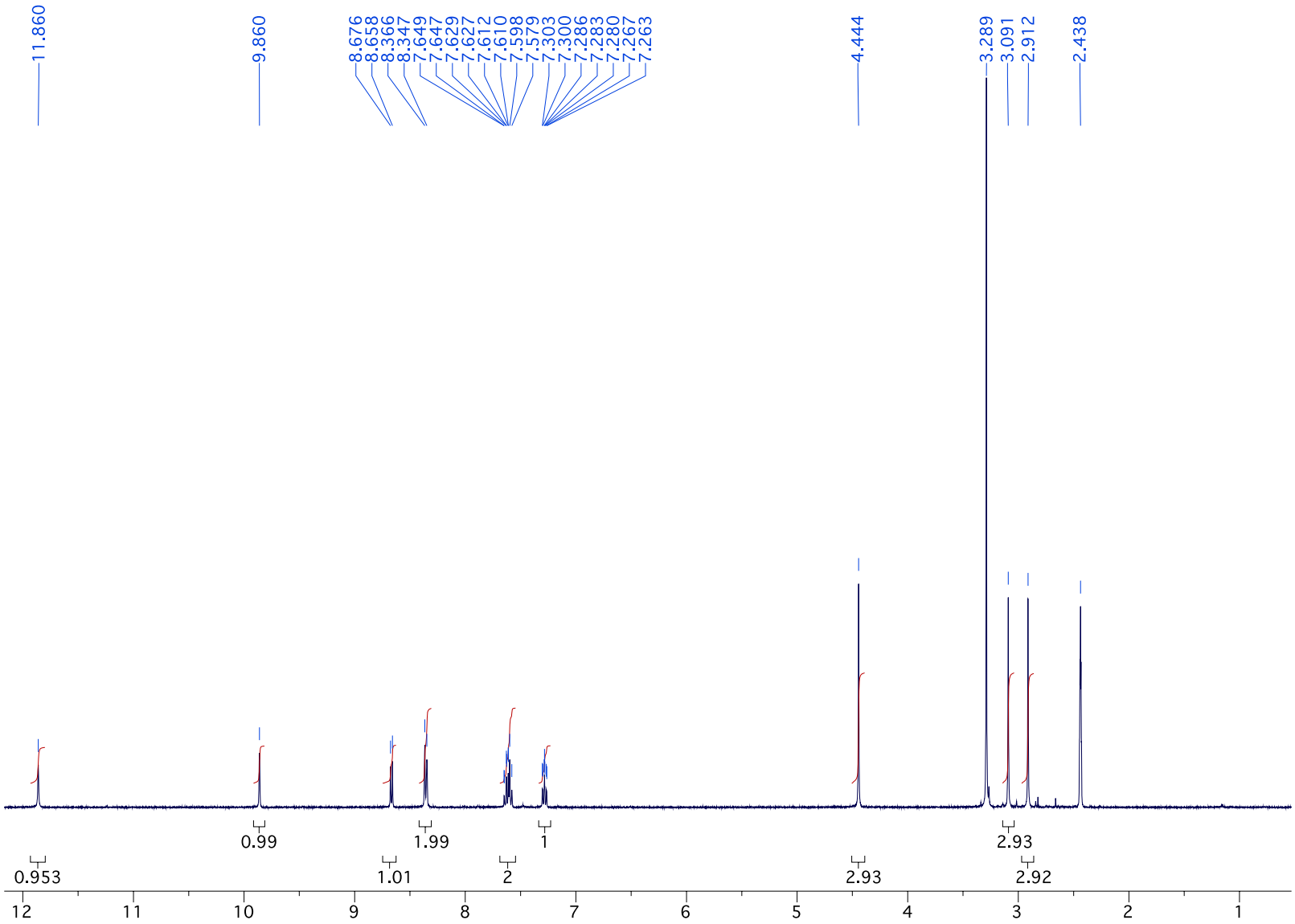
6,11-Dimethyl-5*H*-benzo[*b*]carbazol-2-ol **9** (^{1}H NMR water suppression in DMSO-d_6 at 300 MHz)



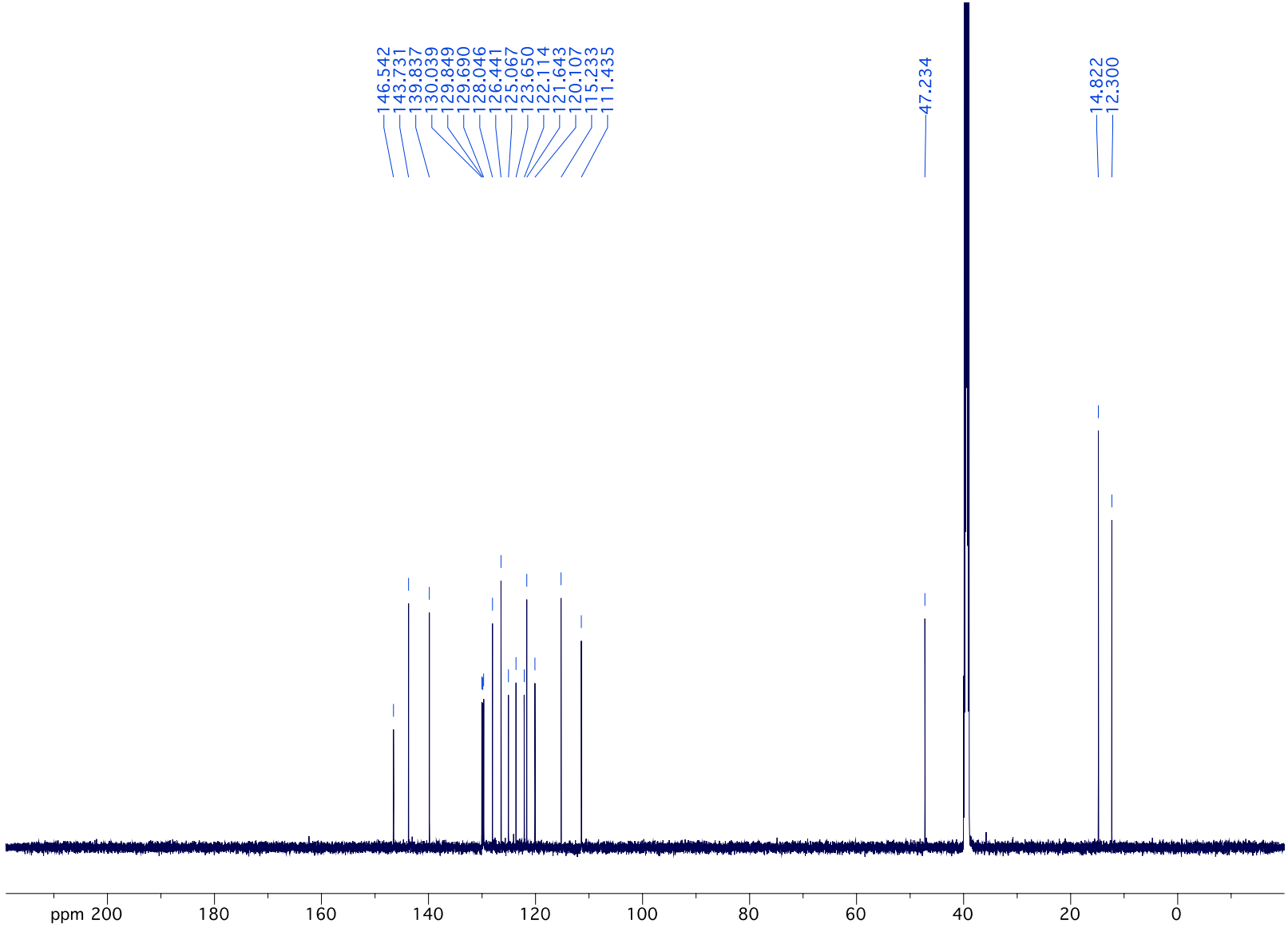
6,11-Dimethyl-5*H*-benzo[*b*]carbazol-2-ol **9** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



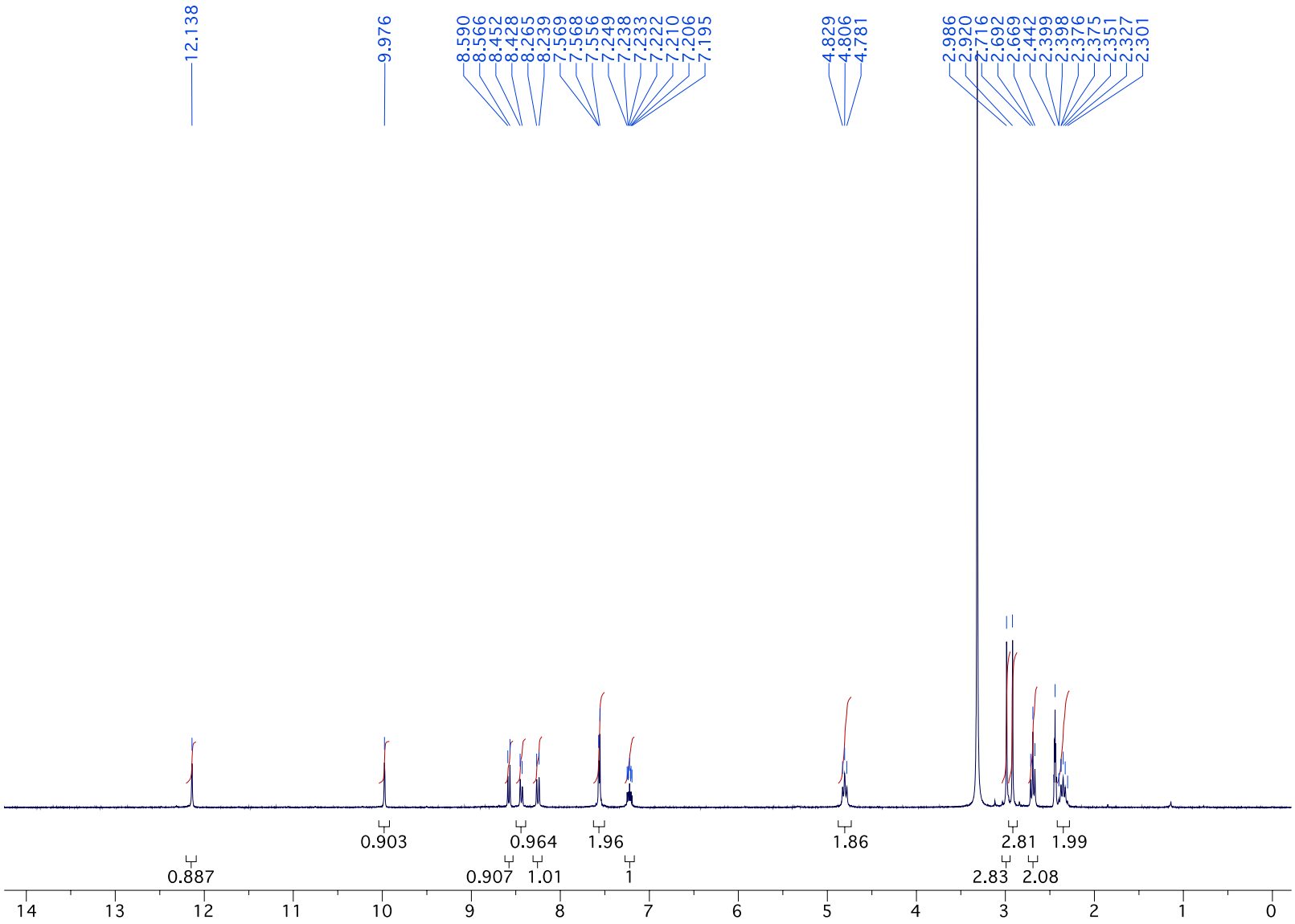
2-Methylisoellpticinium iodide **16** (^{1}H NMR spectrum in DMSO-d_6 at 400 MHz)



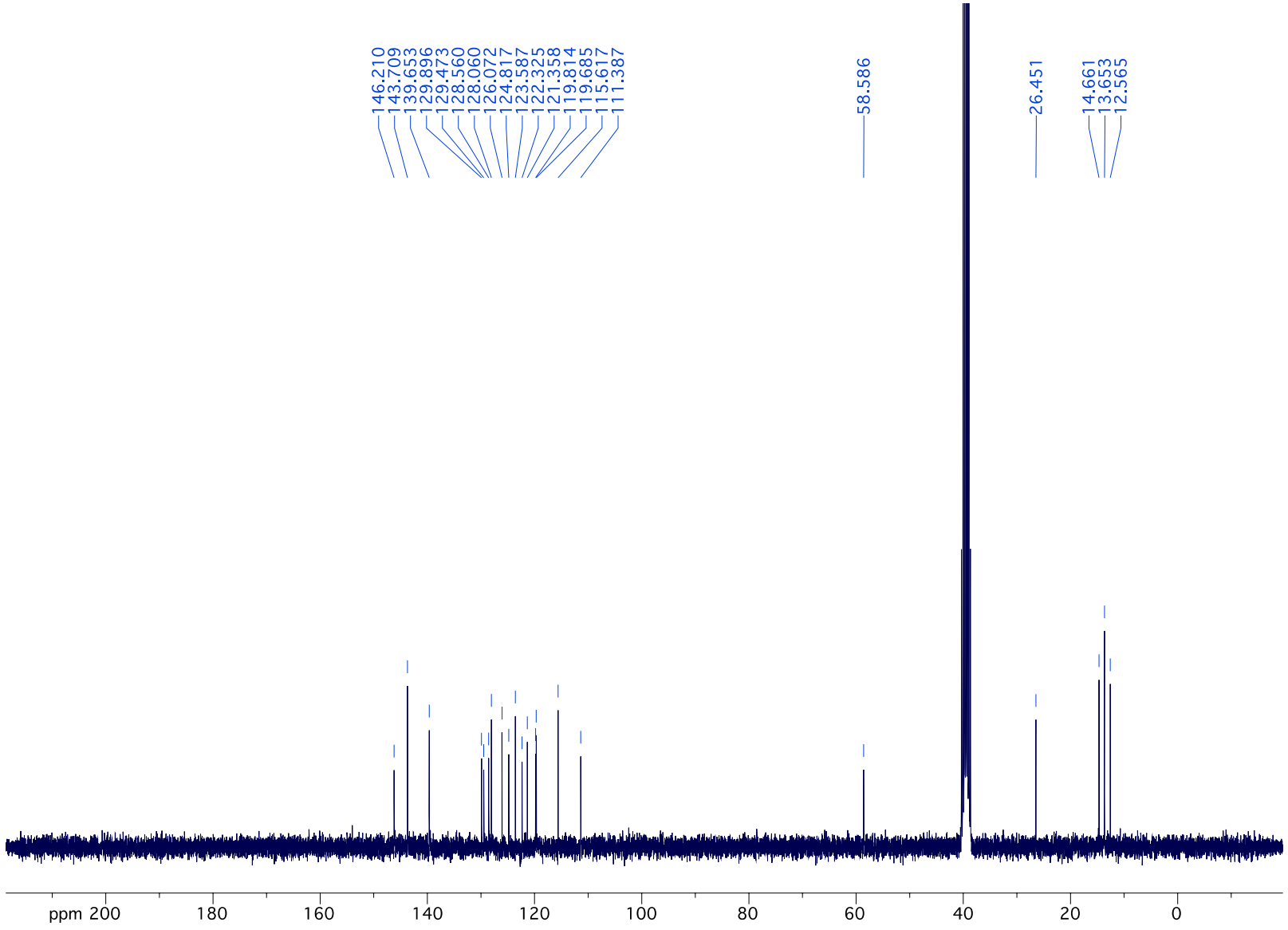
2-Methylisoellpticinium iodide **16** (^{13}C NMR spectrum in DMSO-d_6 at 150.9 MHz)



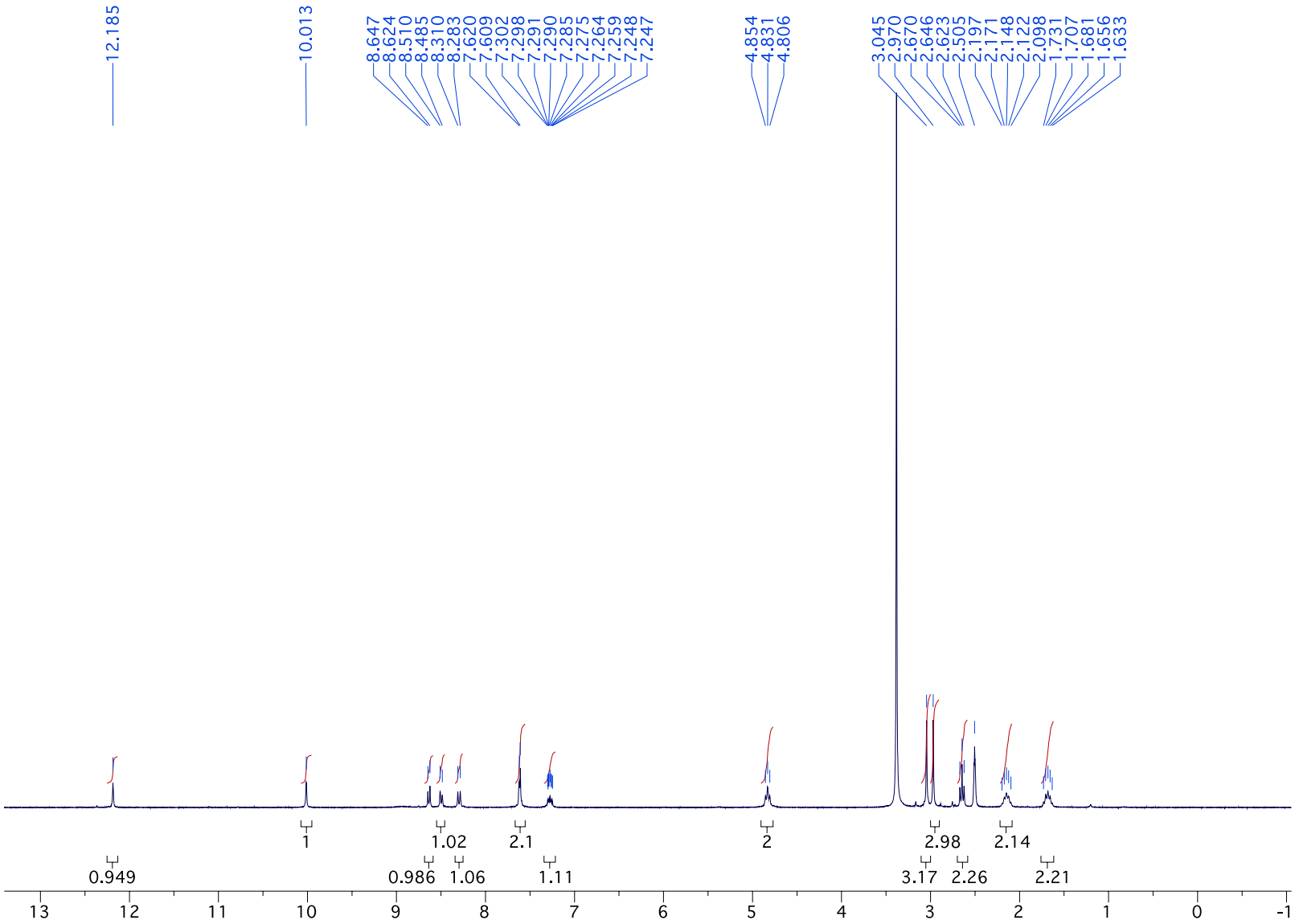
2-(3'-Cyanopropyl)isoellipticinium chloride **17** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



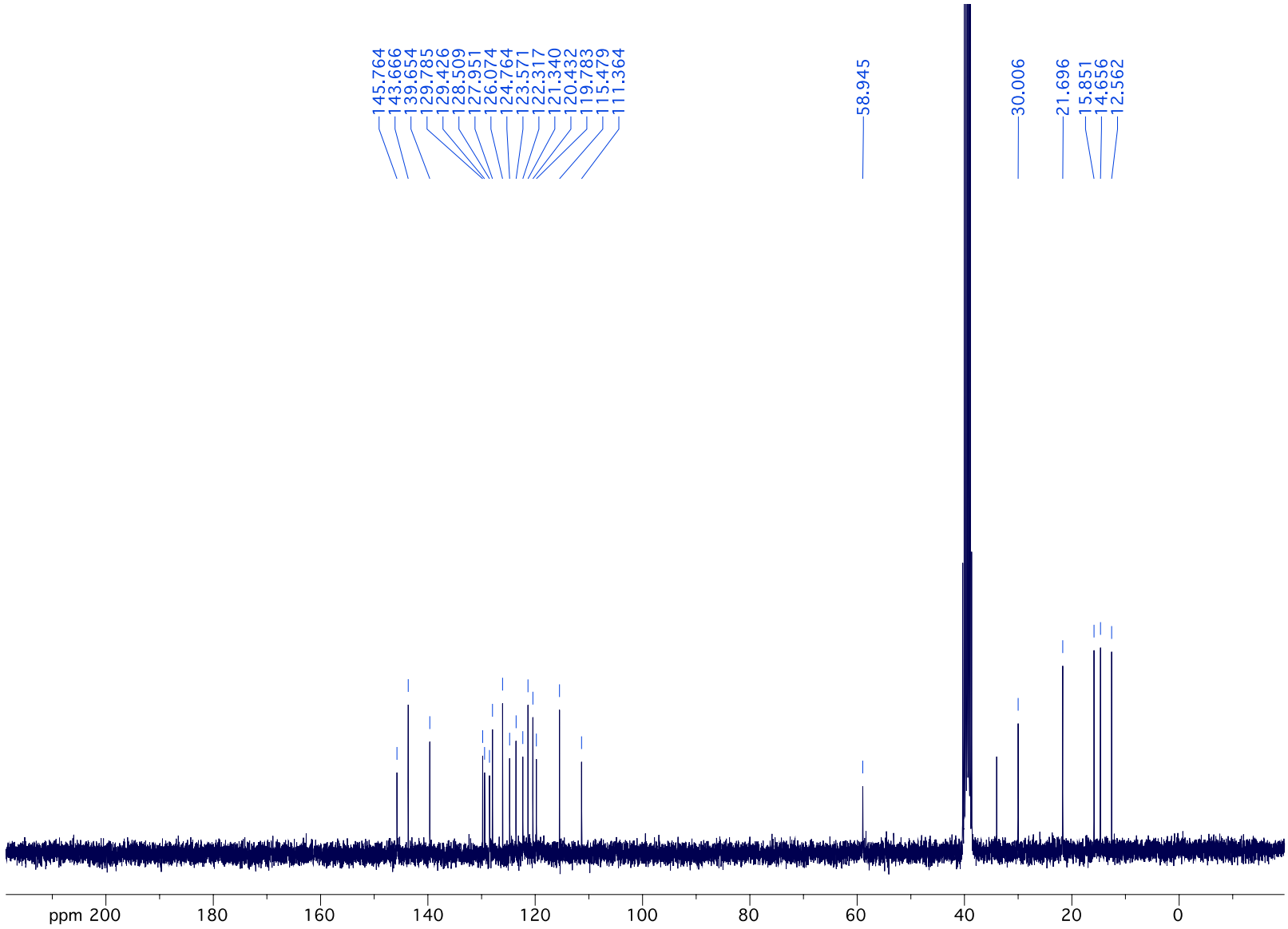
2-(3'-Cyanopropyl)isoellipticinium chloride **17** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



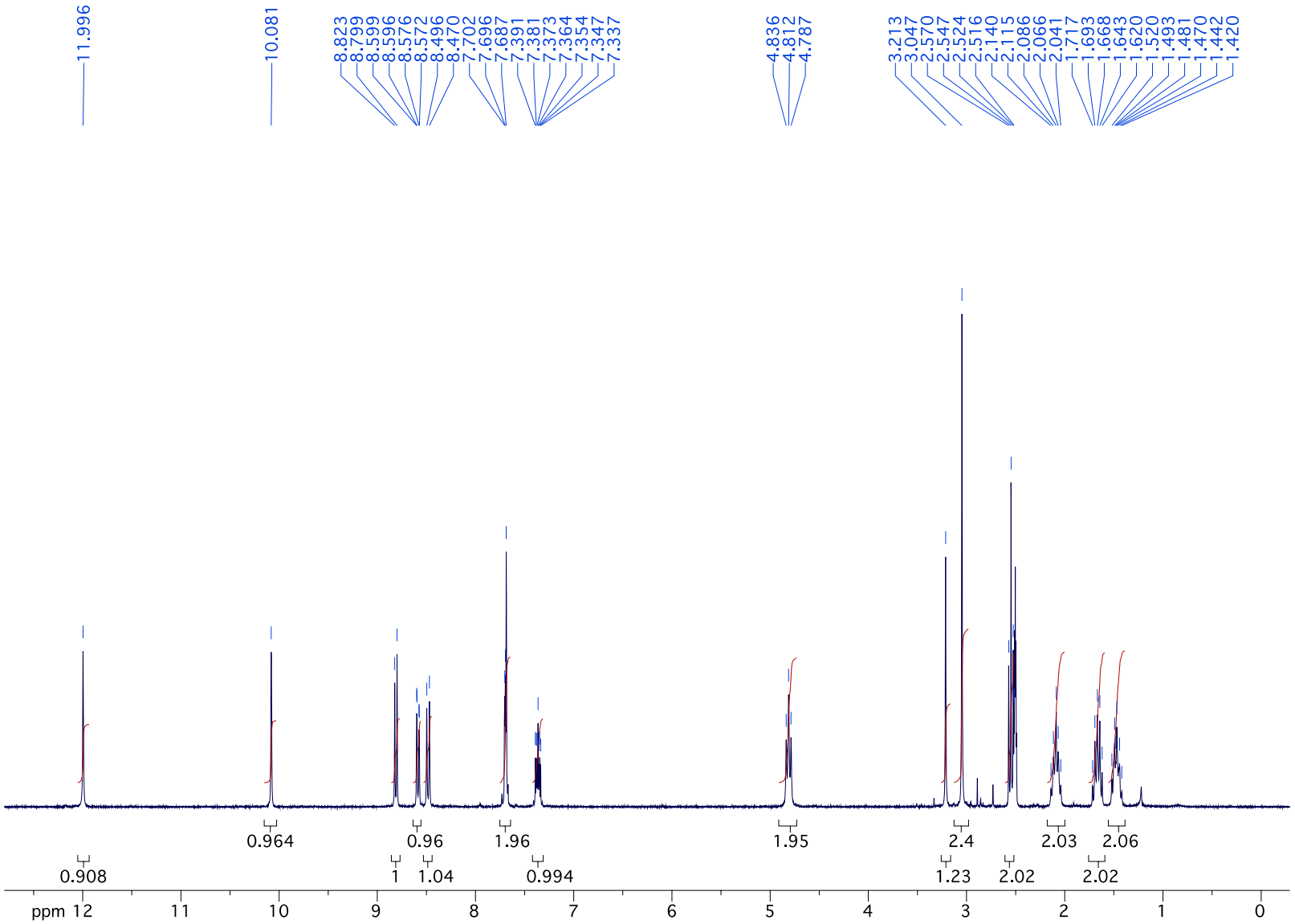
2-(4'-Cyanobutyl)isoellipticinium chloride **18** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



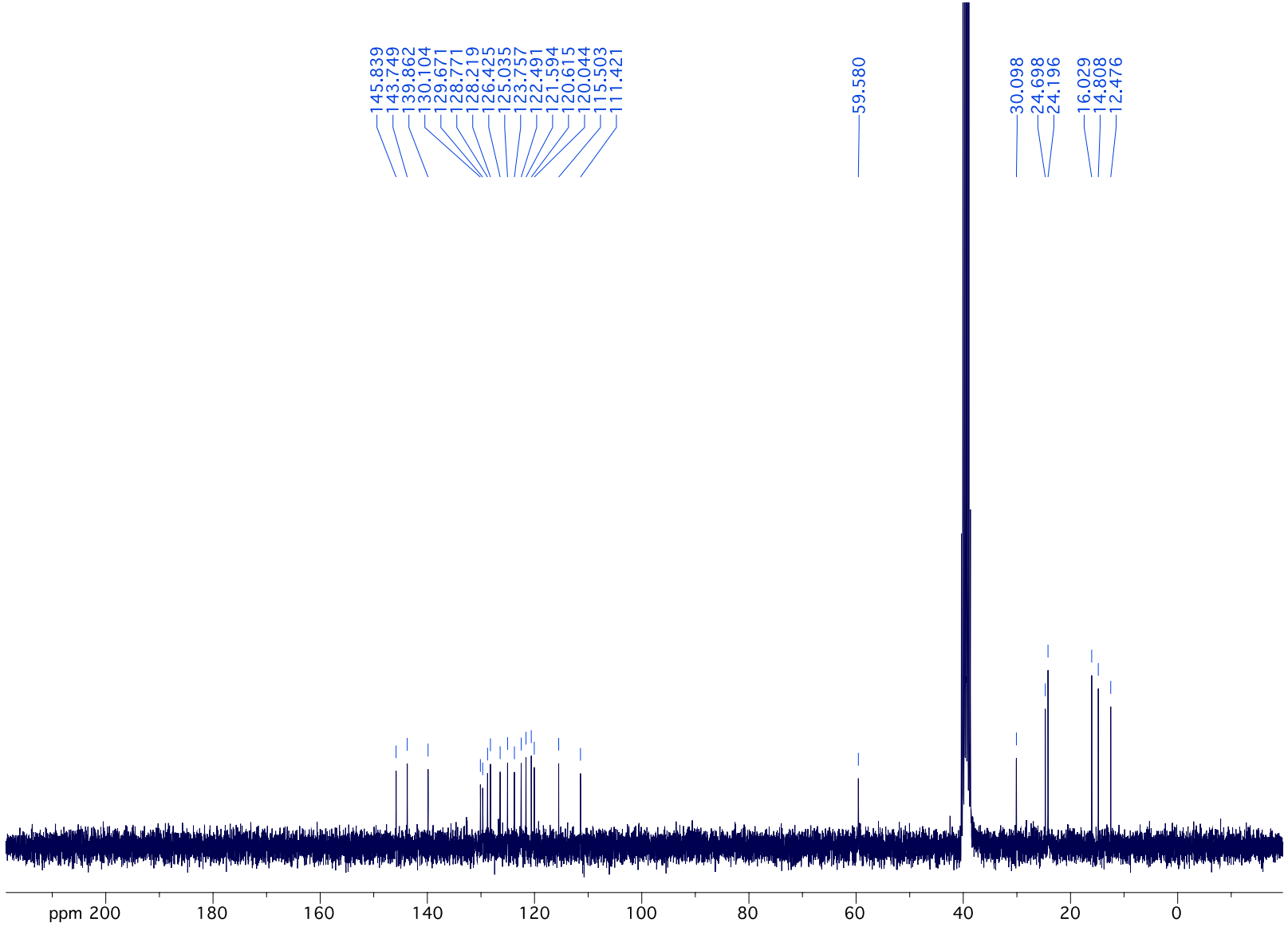
2-(4'-Cyanobutyl)isoellipticinium chloride **18** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



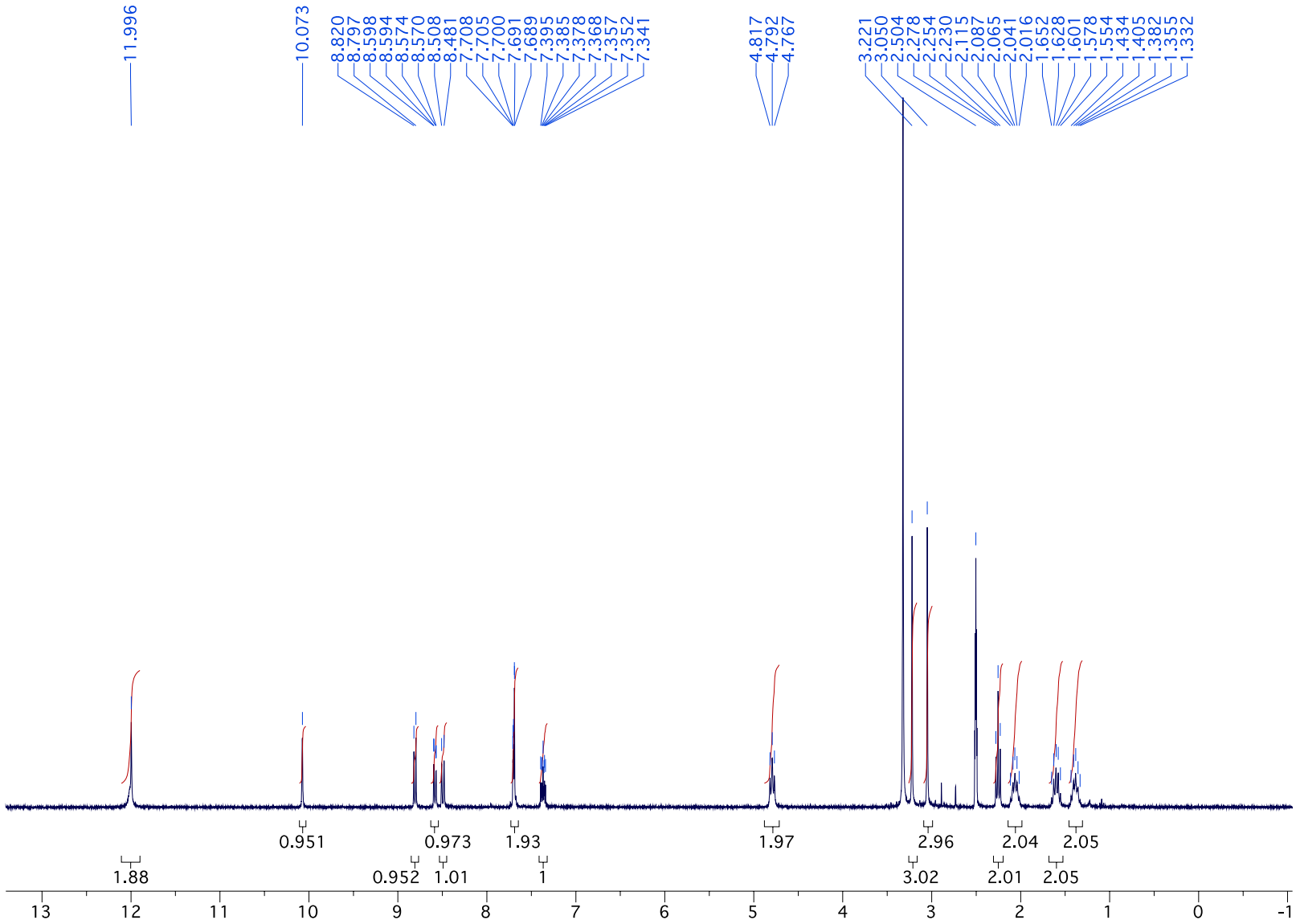
2-(5'-Cyanopentyl)isoellipticinium bromide **19** (water suppression in DMSO-d_6 at 300 MHz)



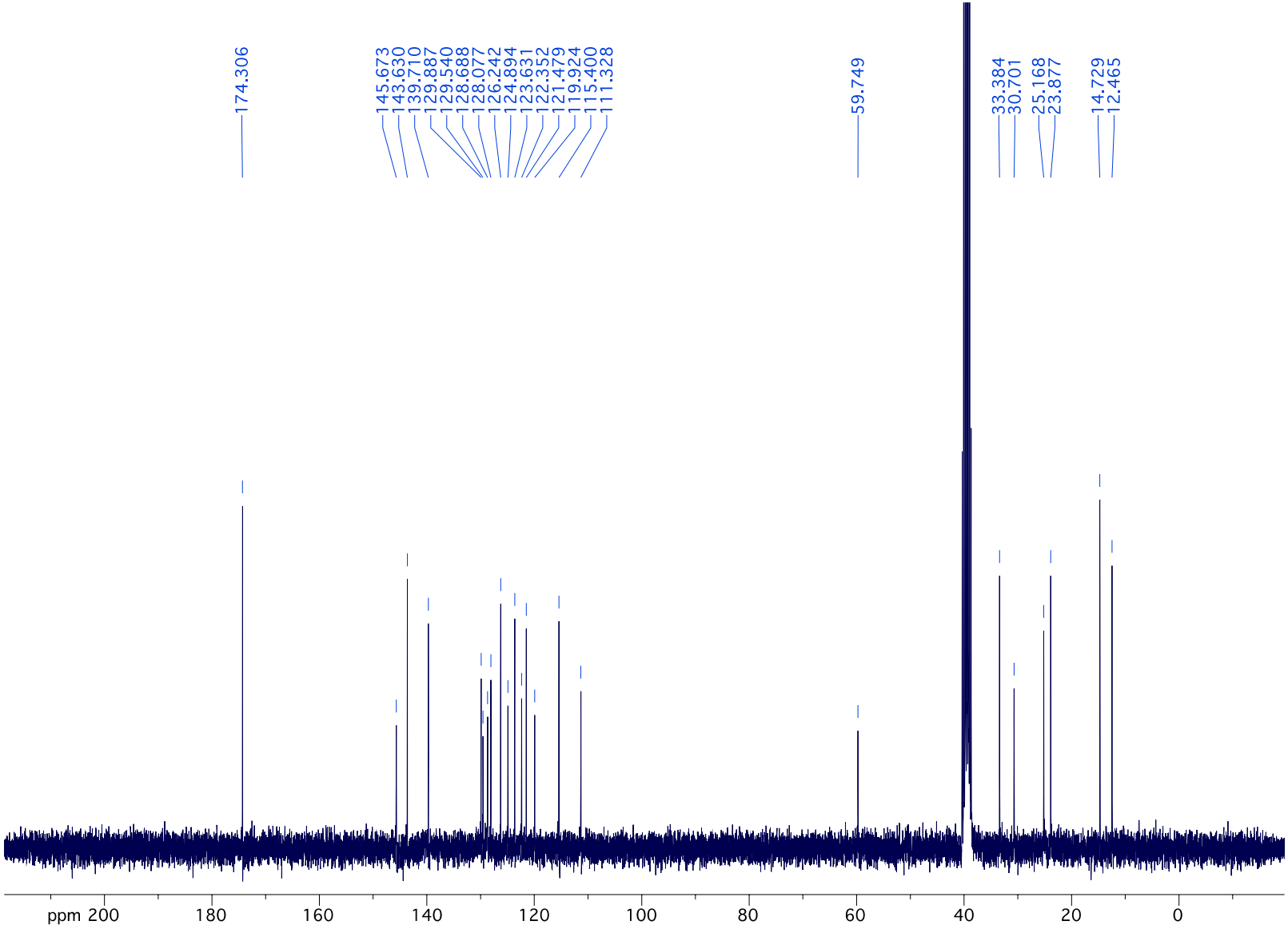
2-(5'-Cyanopentyl)isoellipticinium bromide **19** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



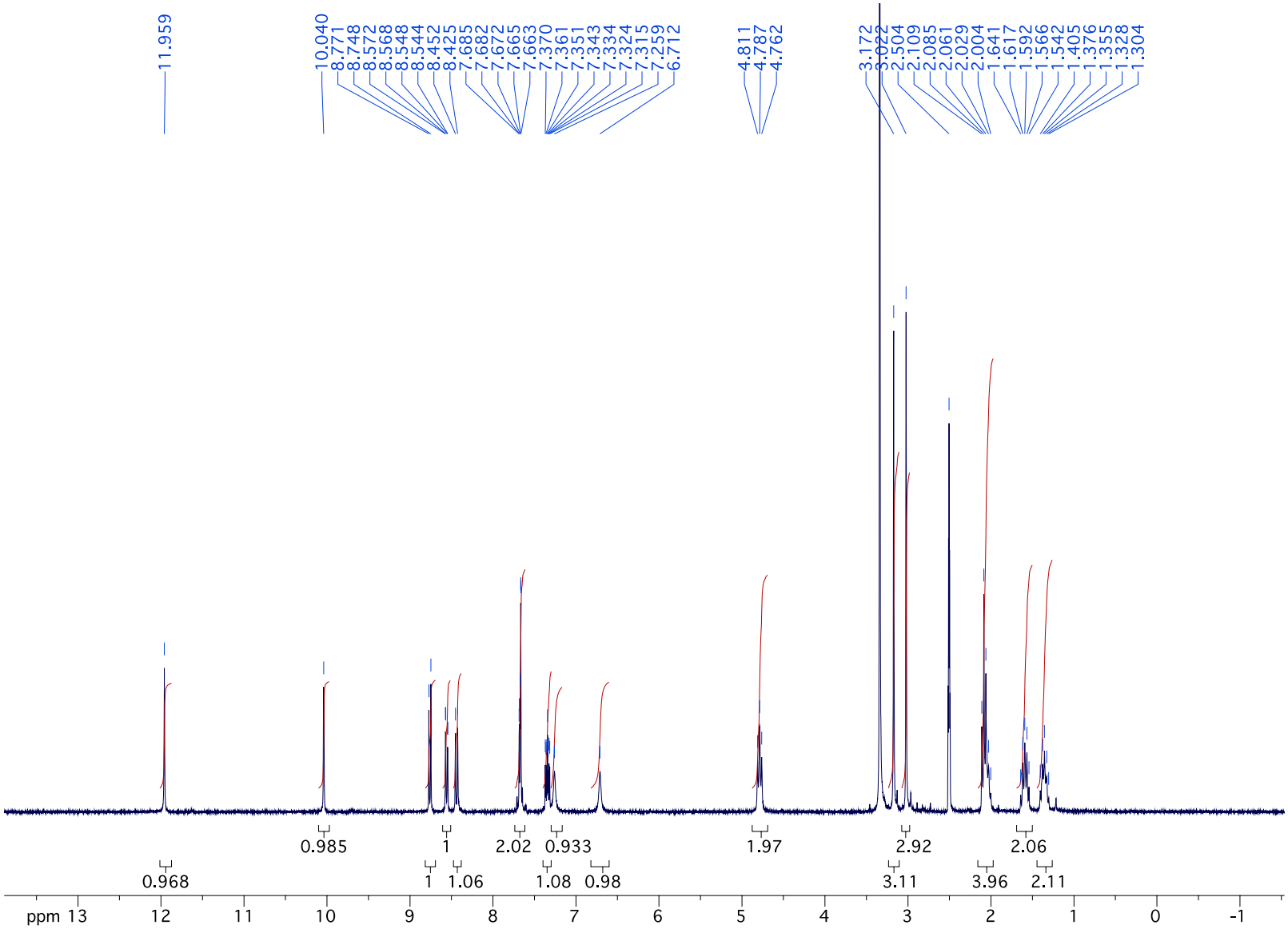
2-(5'-Carboxypentyl)isoellipticinium bromide **20** (1H NMR spectrum in DMSO-d_6 at 300 MHz)



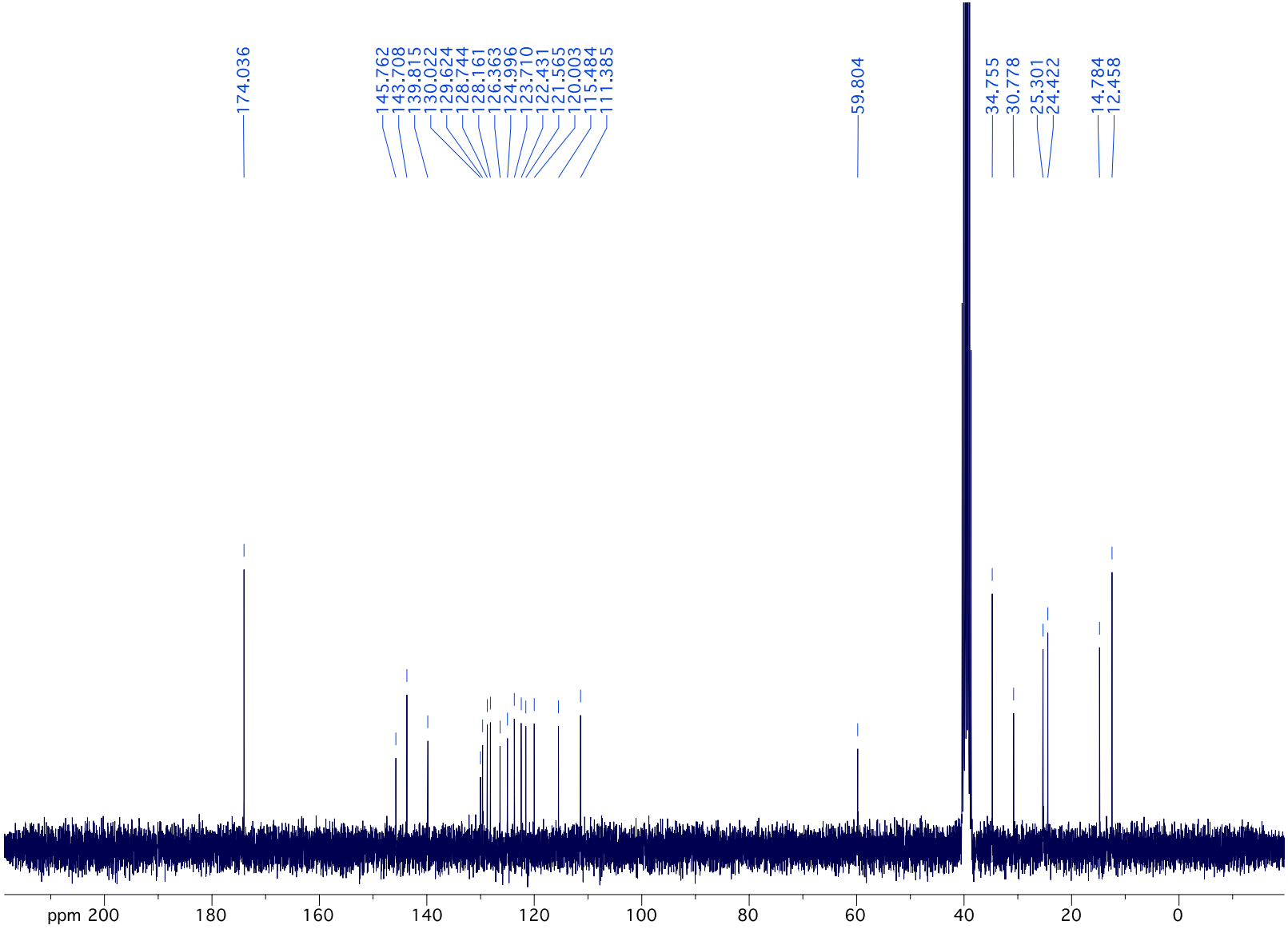
2-(5'-Carboxypentyl)isoellipticinium bromide **20** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



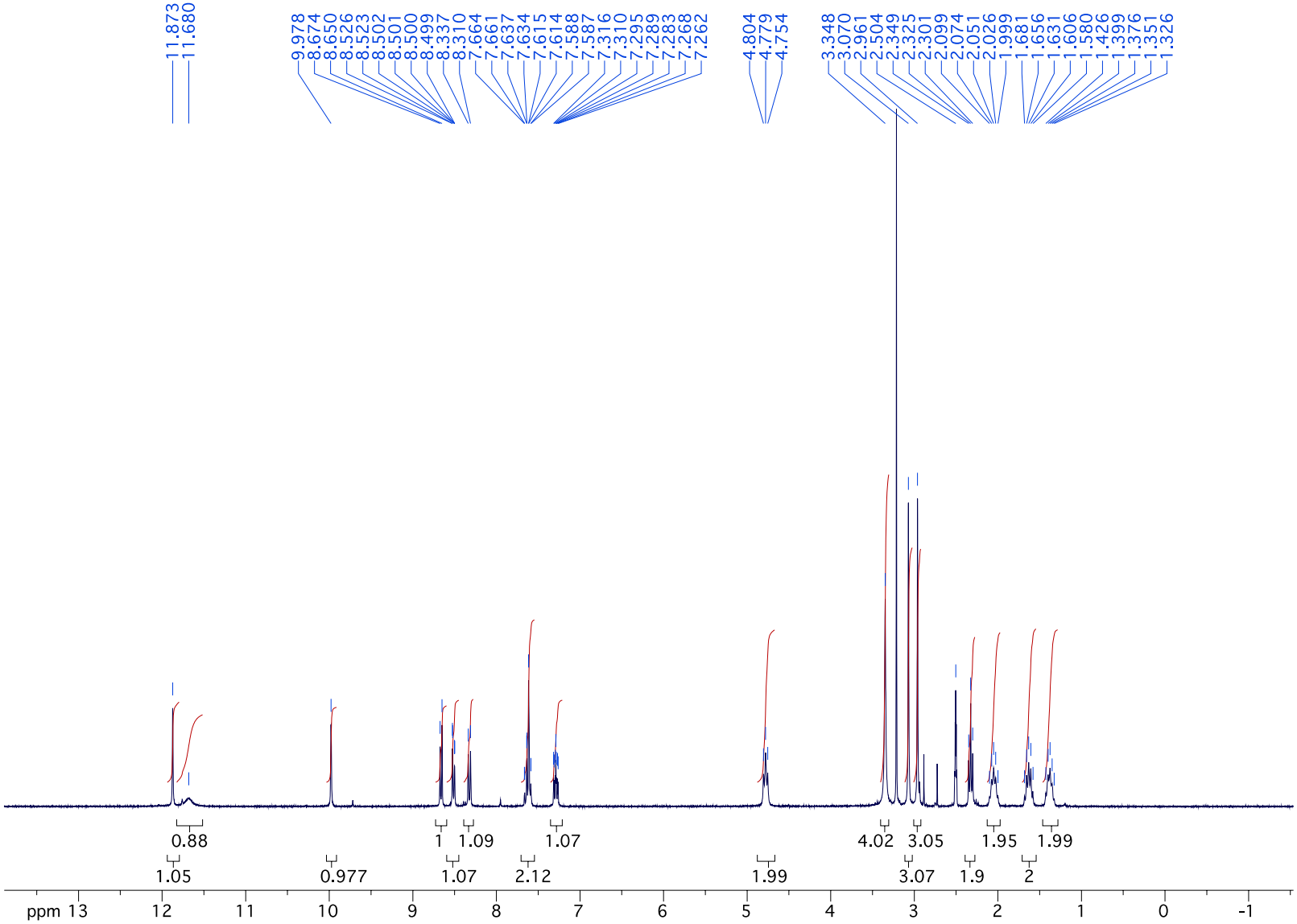
2-(6'-Carboxamidohexyl)isoellipticinium bromide **21** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



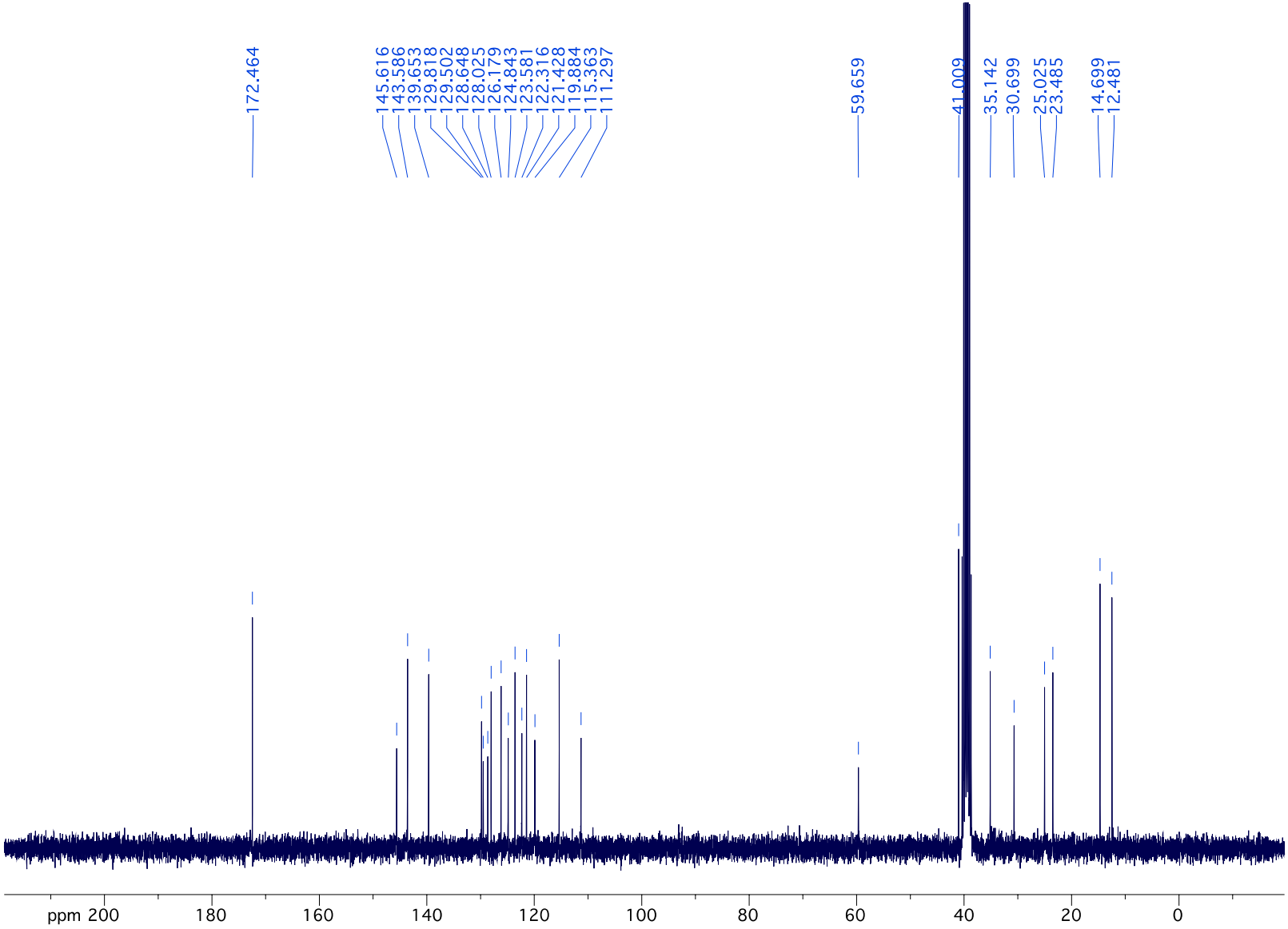
2-(6'-Carboxamidohexyl)isoellipticinium bromide **21** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



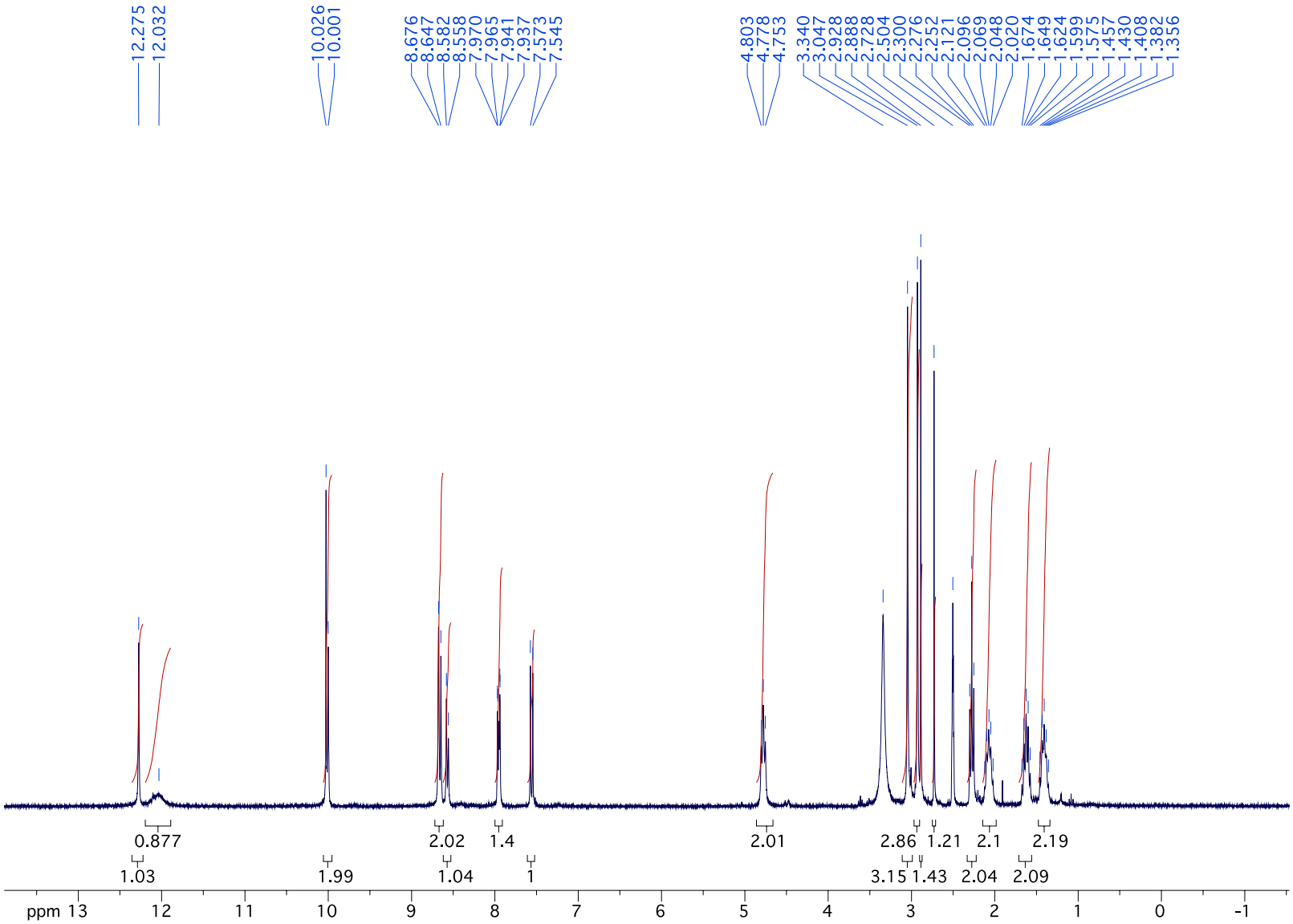
N^2-(6'-Methylsulfonamido-6'-oxohexyl)isoellipticinium bromide **22** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



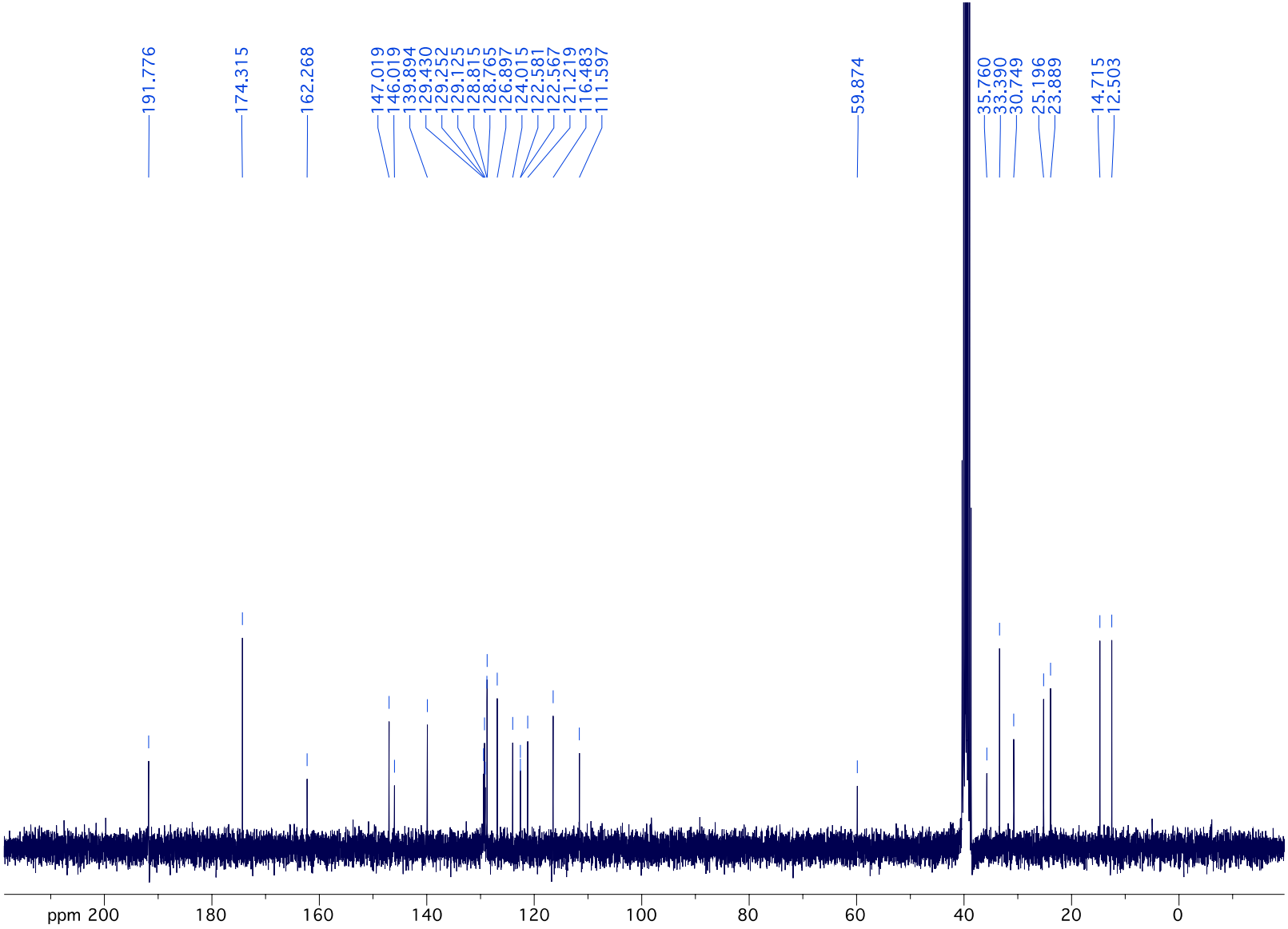
N^2-(6'-Methylsulfonamido-6'-oxohexyl)isoellipticinium bromide **22** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



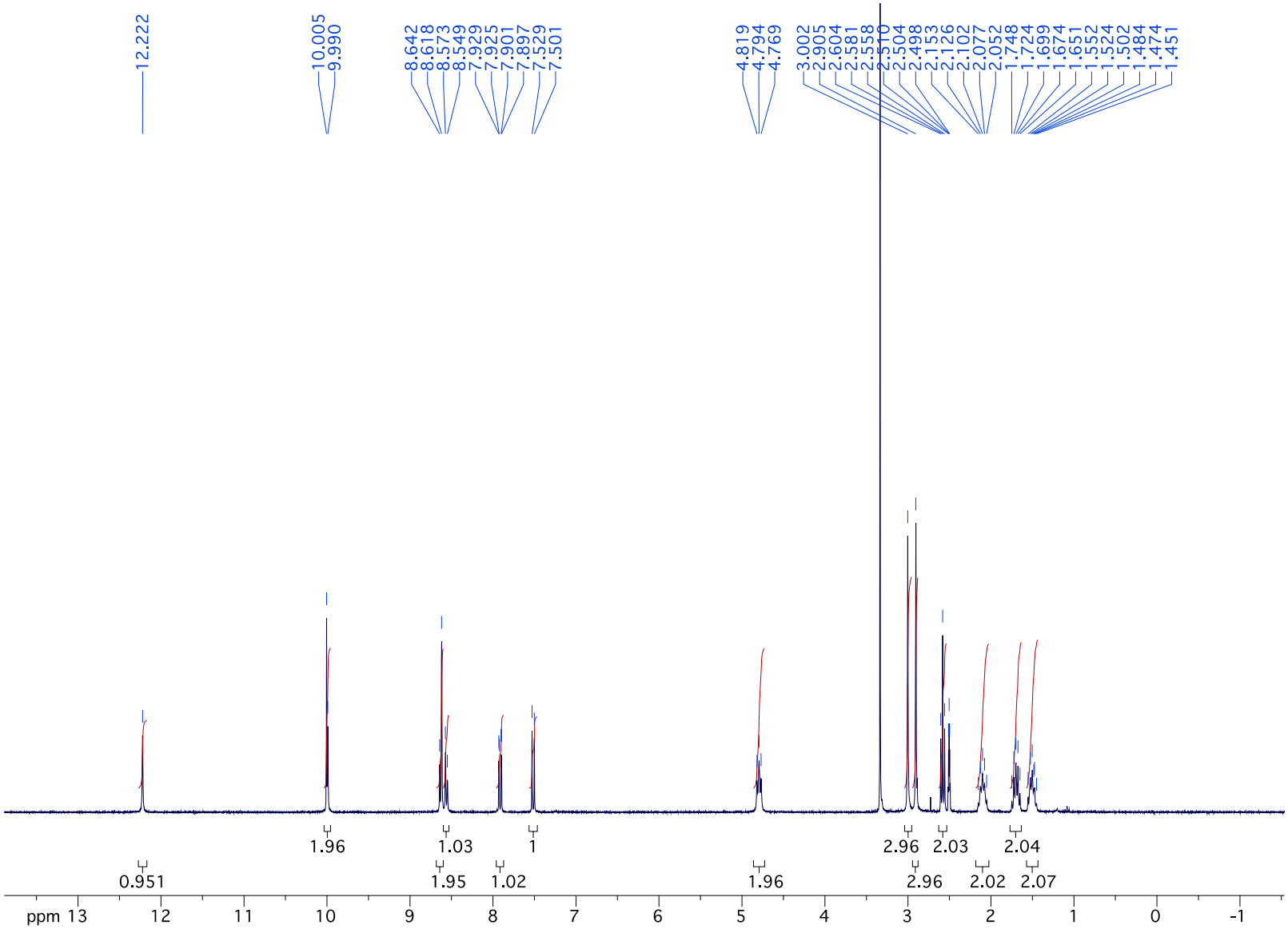
2-(5'-Carboxypentyl)-7-formylisoellipticinium bromide **23** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz, with trace DMF)



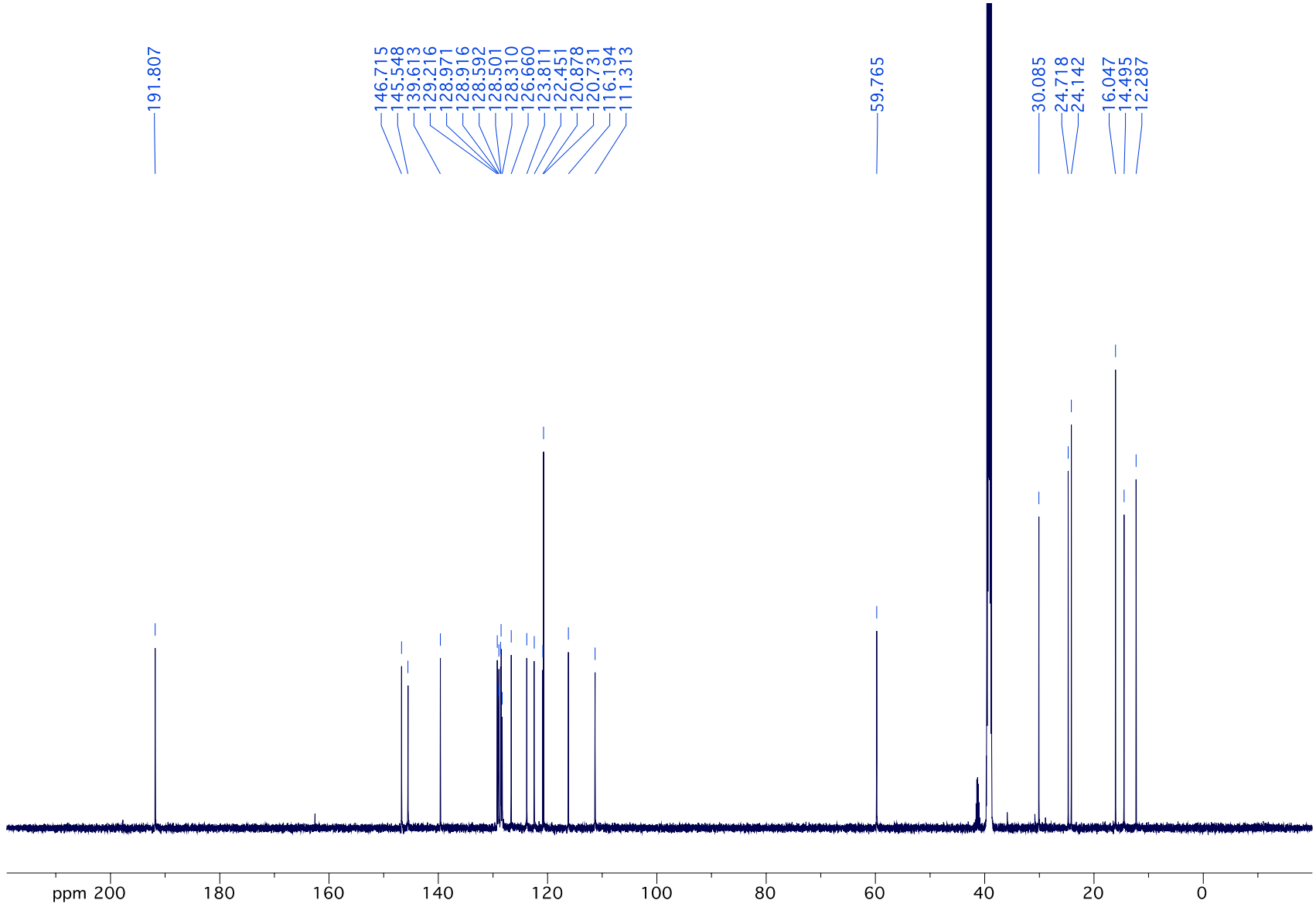
2-(5'-Carboxypentyl)-7-formylisoellipticinium bromide **23** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz, with trace DMF)



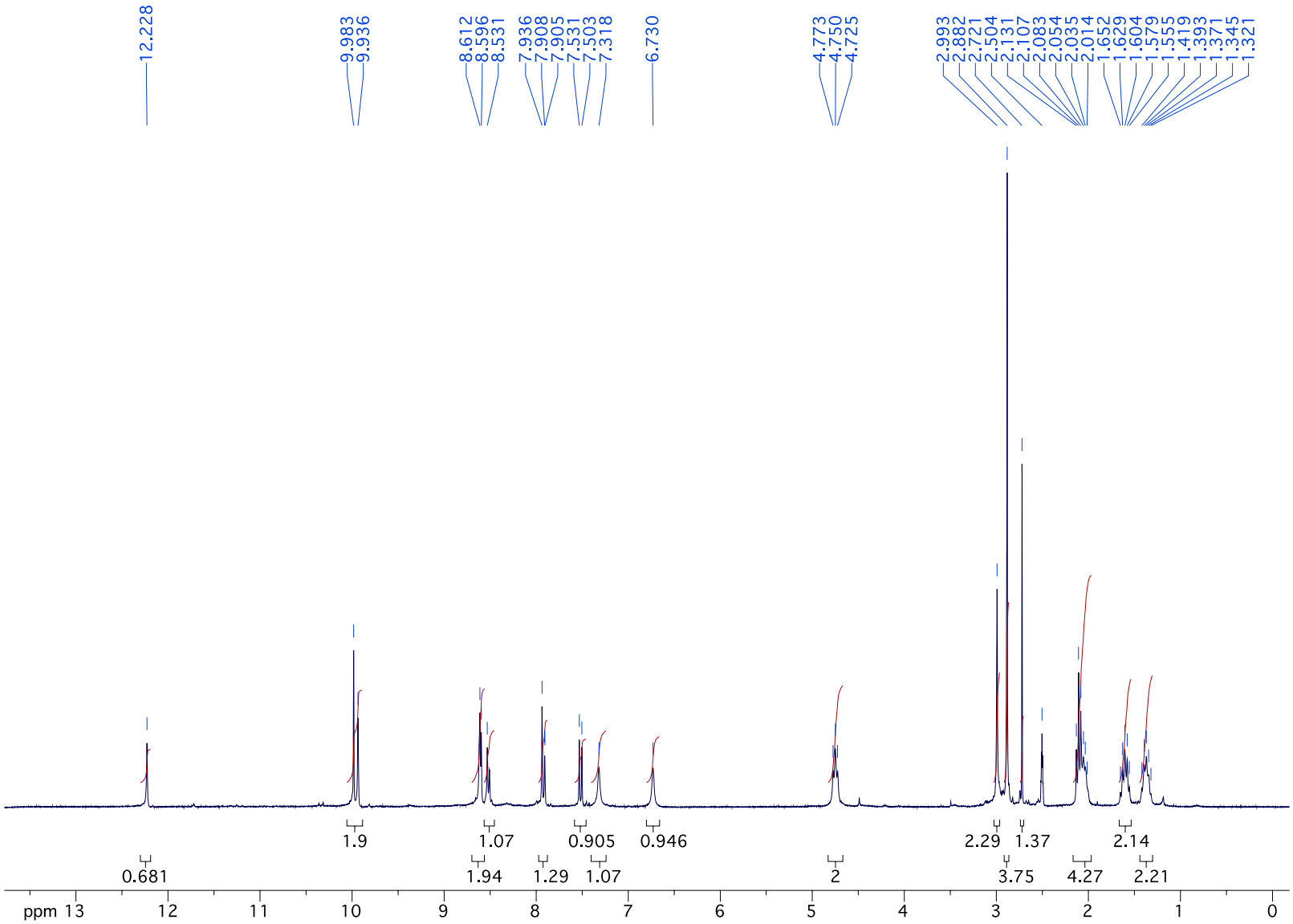
2-(5'-Cyanopentyl)-7-formylisoellipticinium bromide **24** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



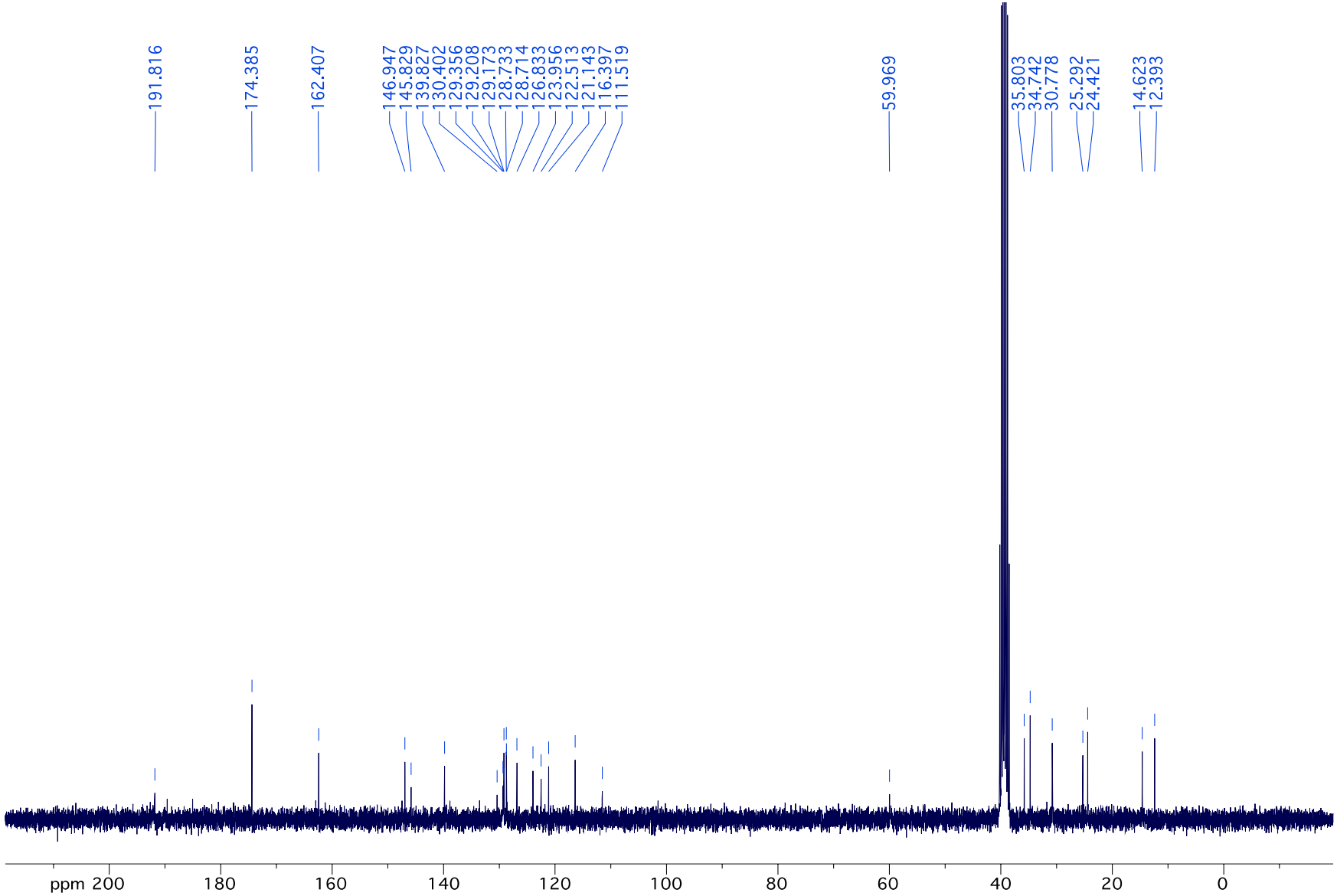
2-(5'-Cyanopentyl)-7-formylisoellipticinium bromide **24** [^{13}C NMR spectrum in DMSO-d_6 at 150.9 MHz, with trace dimethyl sulfoxide (undeuterated) at 40.5 ppm]



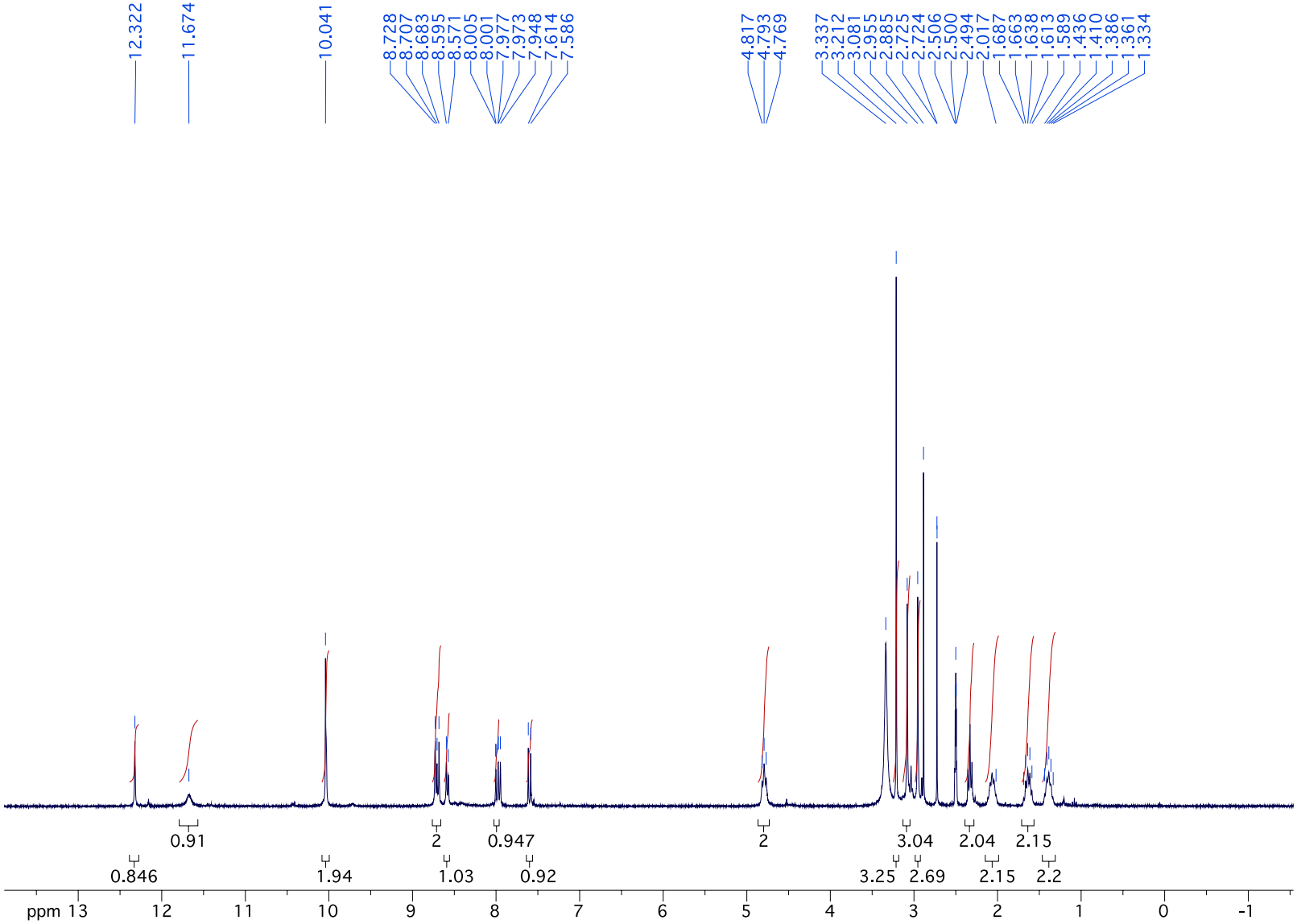
2-(6'-Carboxamidohexyl)-7-formylisoellipticinium bromide **25** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



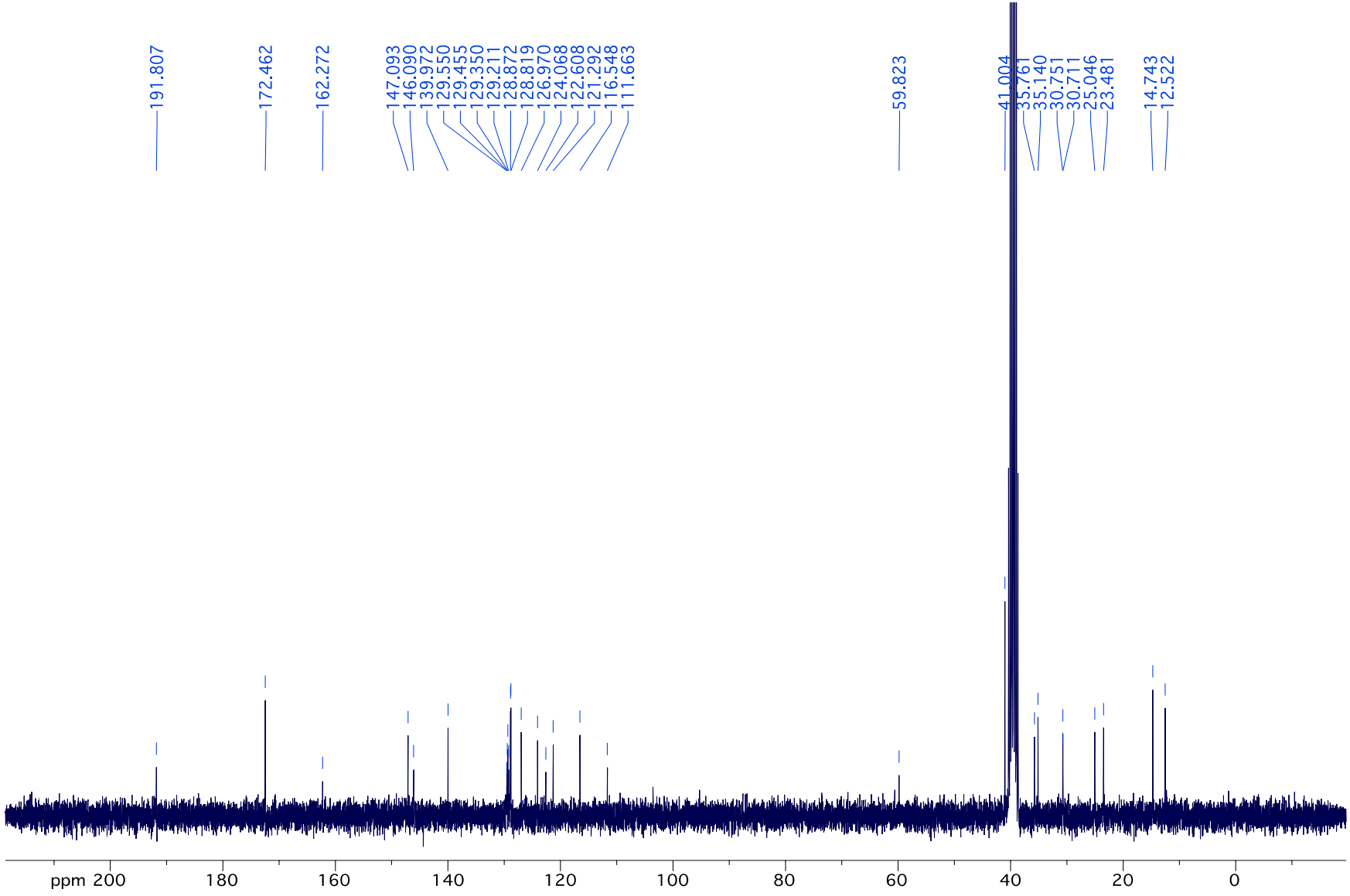
2-(6'-Carboxamidohexyl)-7-formylisoellipticinium bromide **25** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



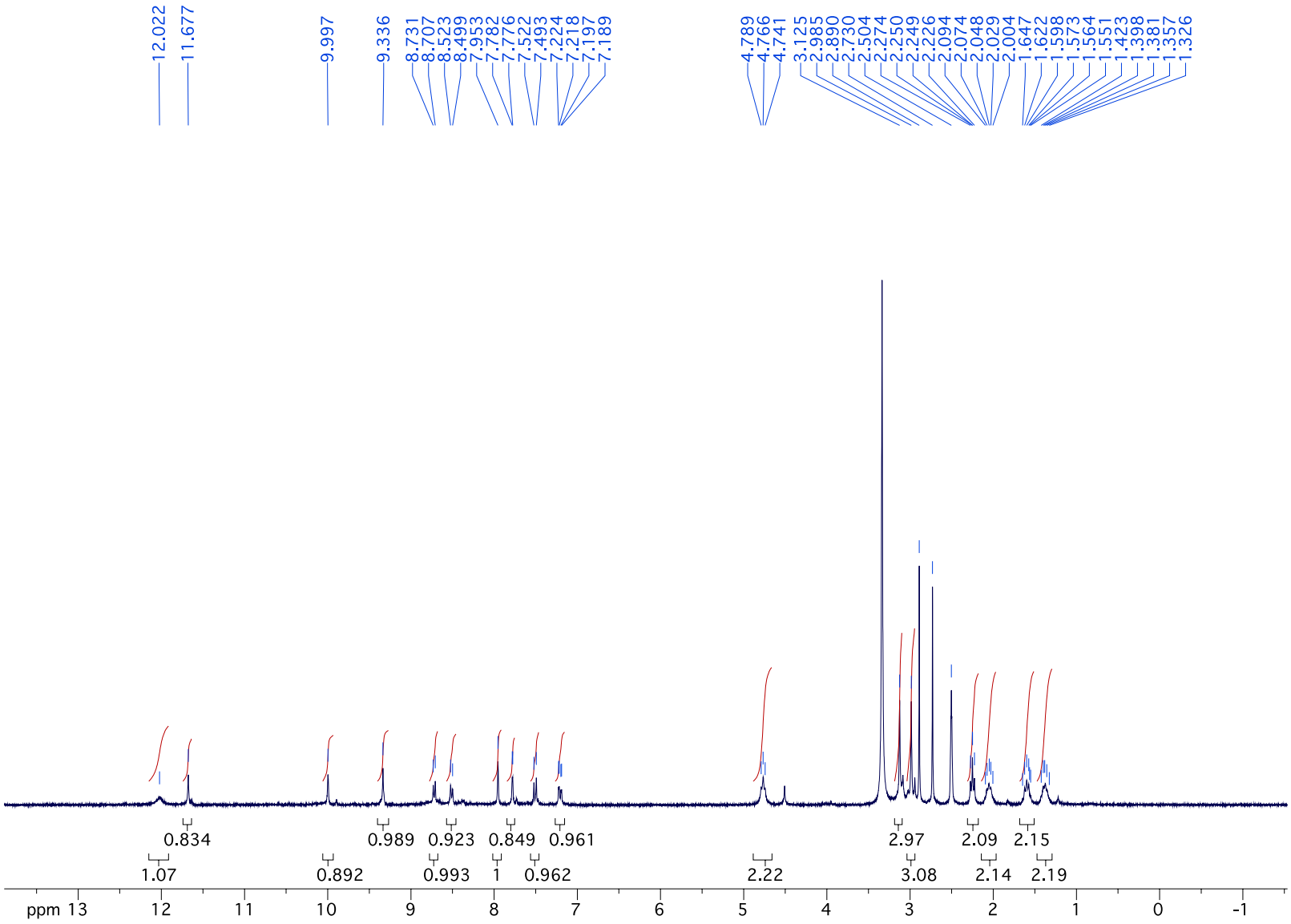
7-Formyl-N^2-(6'-methylsulfonamido-6'-oxohexyl)isoellipticinium bromide **26** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



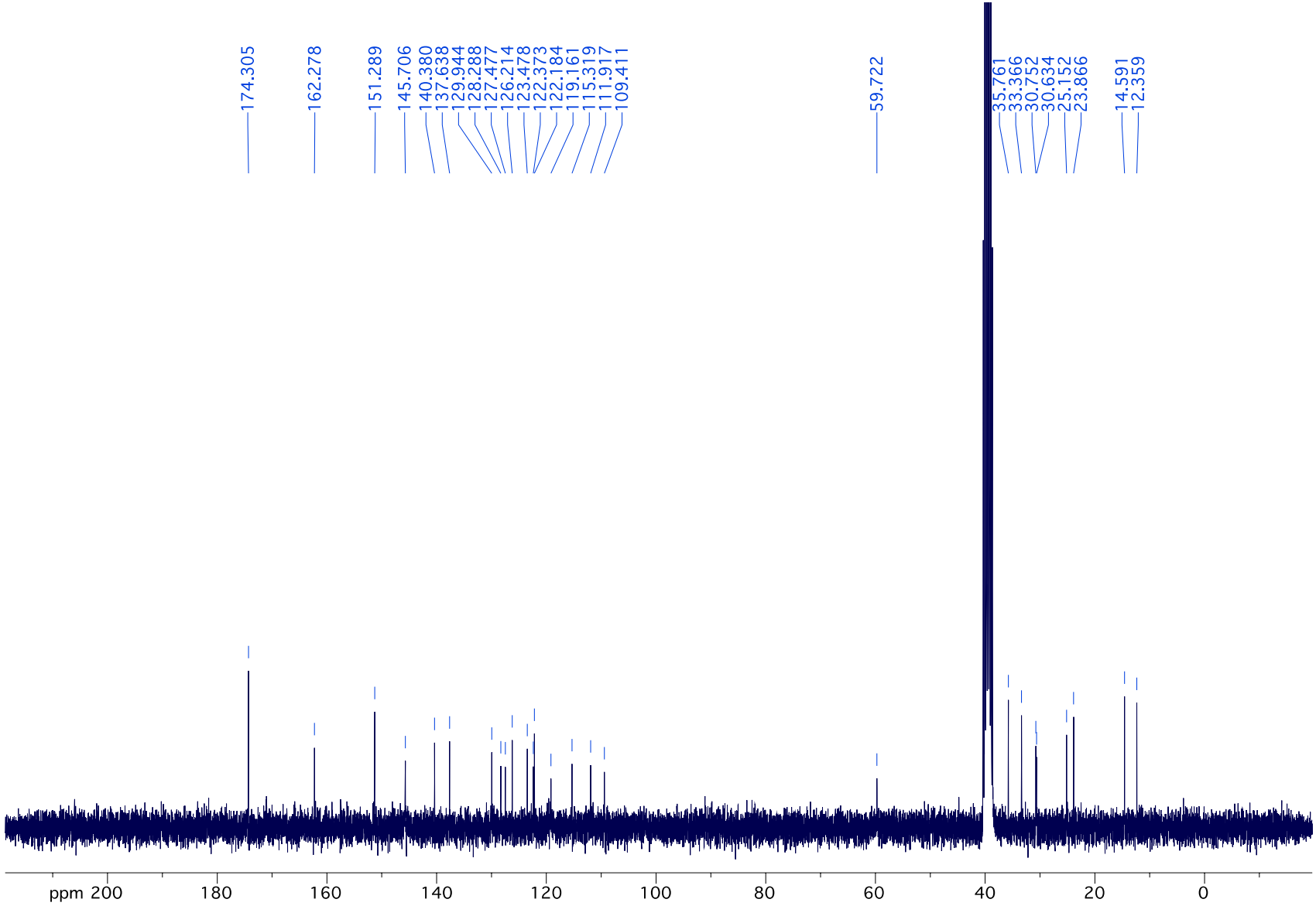
7-Formyl-N^2-(6'-methylsulfonamido-6'-oxohexyl)isoellipticinium bromide **26** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



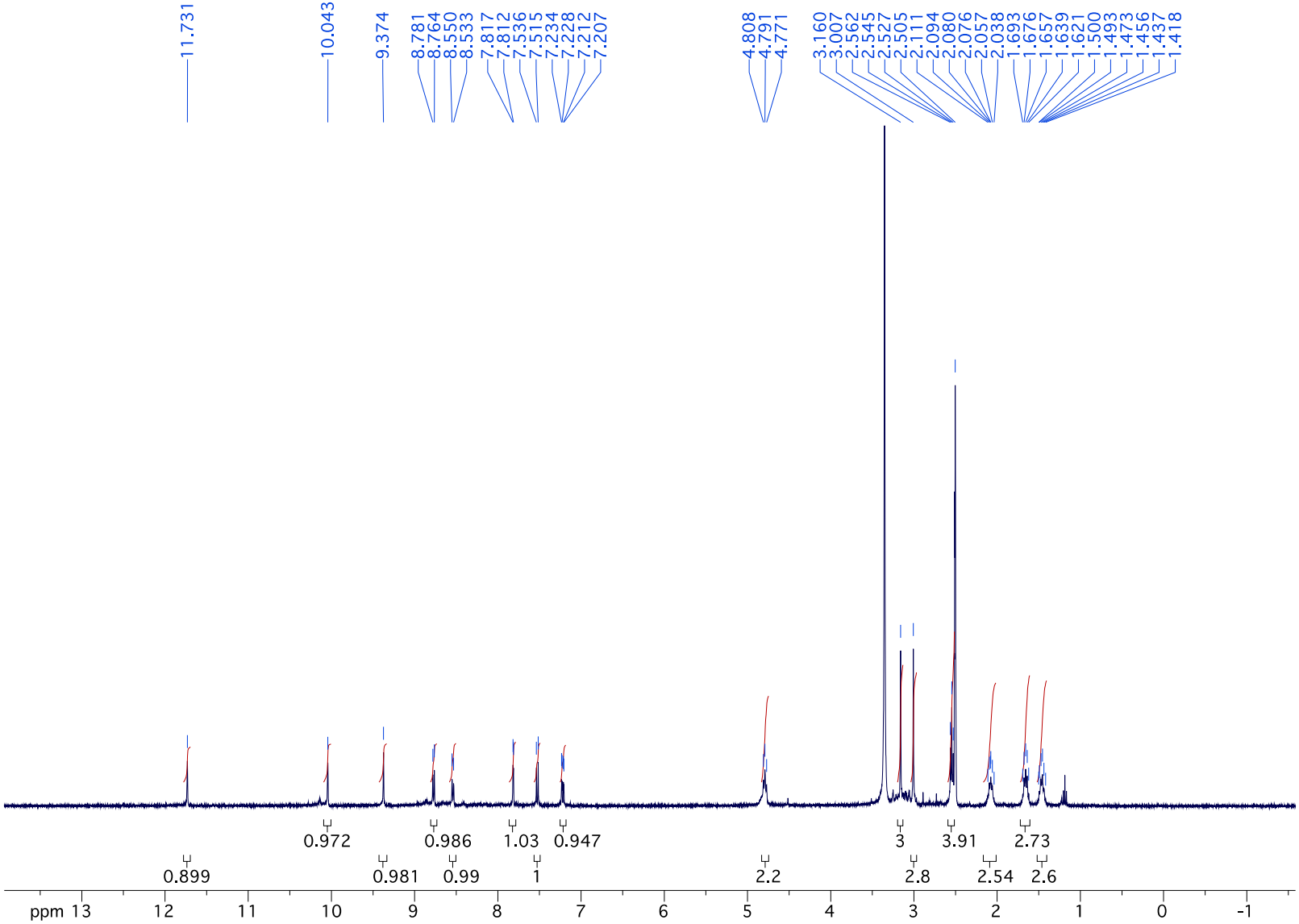
2-(5'-Carboxypentyl)-7-hydroxyisoellipticinium bromide **27** (^{1}H NMR spectrum in DMSO-d_6 at 300 MHz)



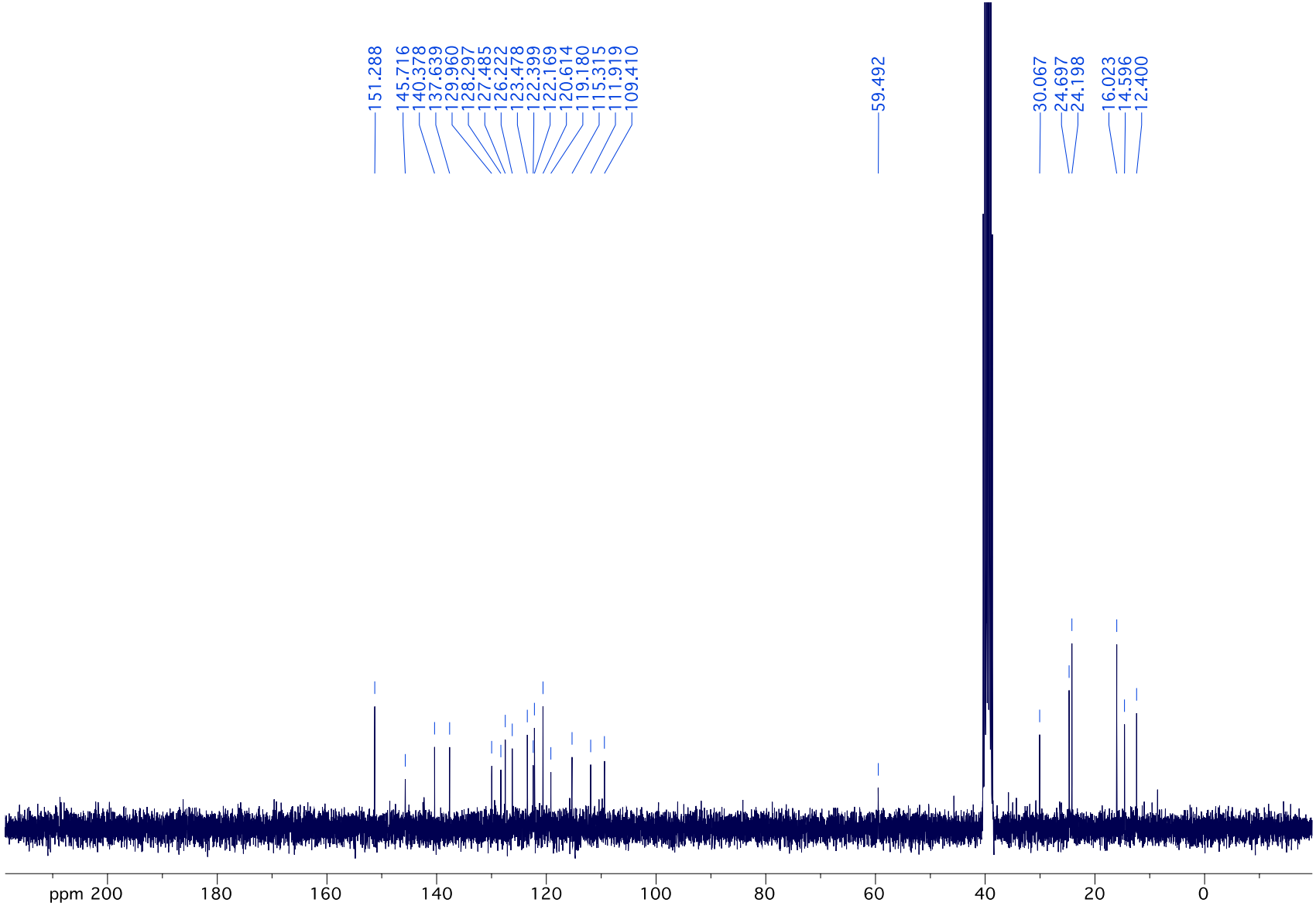
2-(5'-Carboxypentyl)-7-hydroxyisoellipticinium bromide **27** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



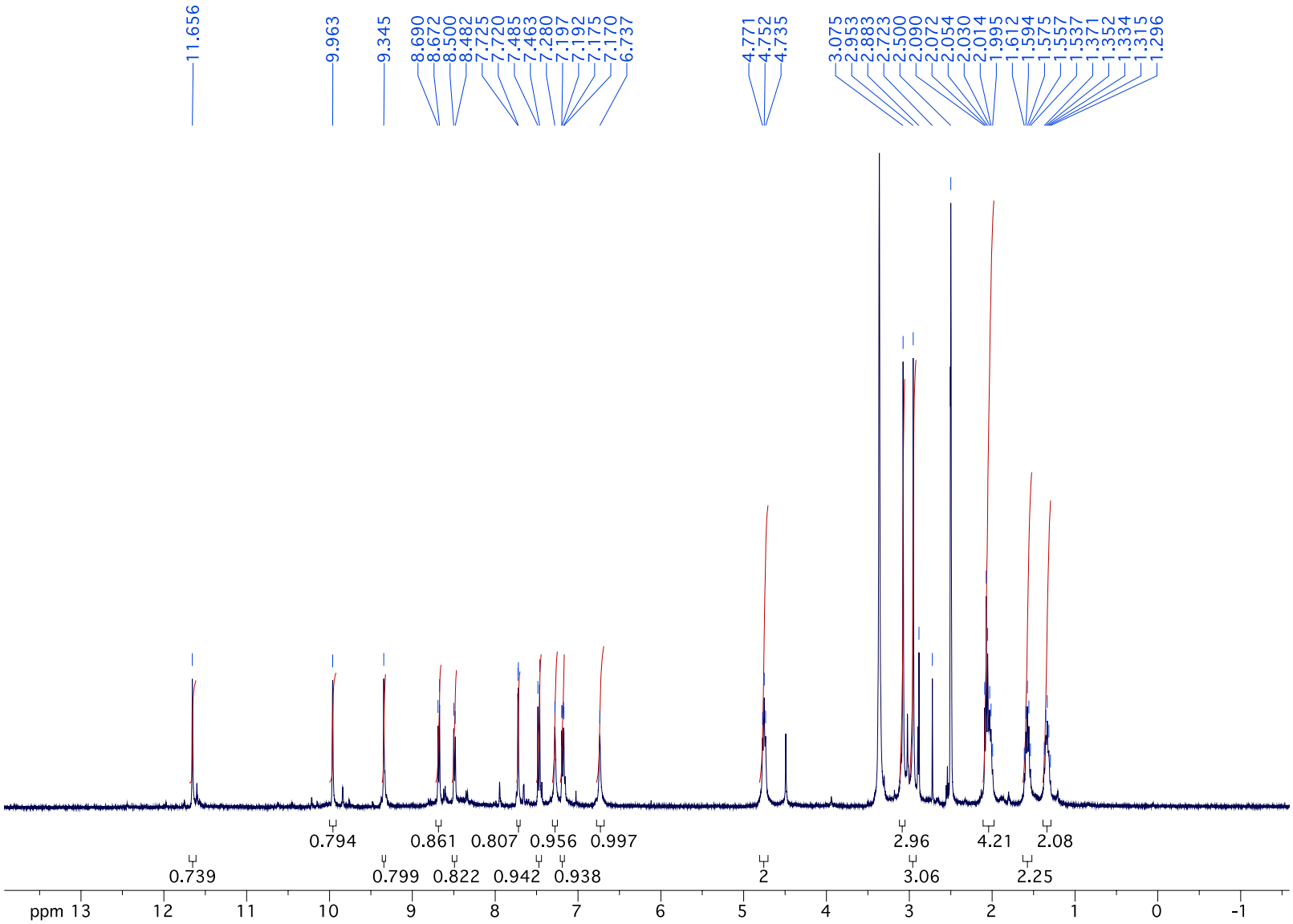
2-(5'-Cyanopentyl)-7-hydroxyisoellipticinium bromide **28** (^{1}H NMR spectrum in DMSO-d_6 at 400 MHz)



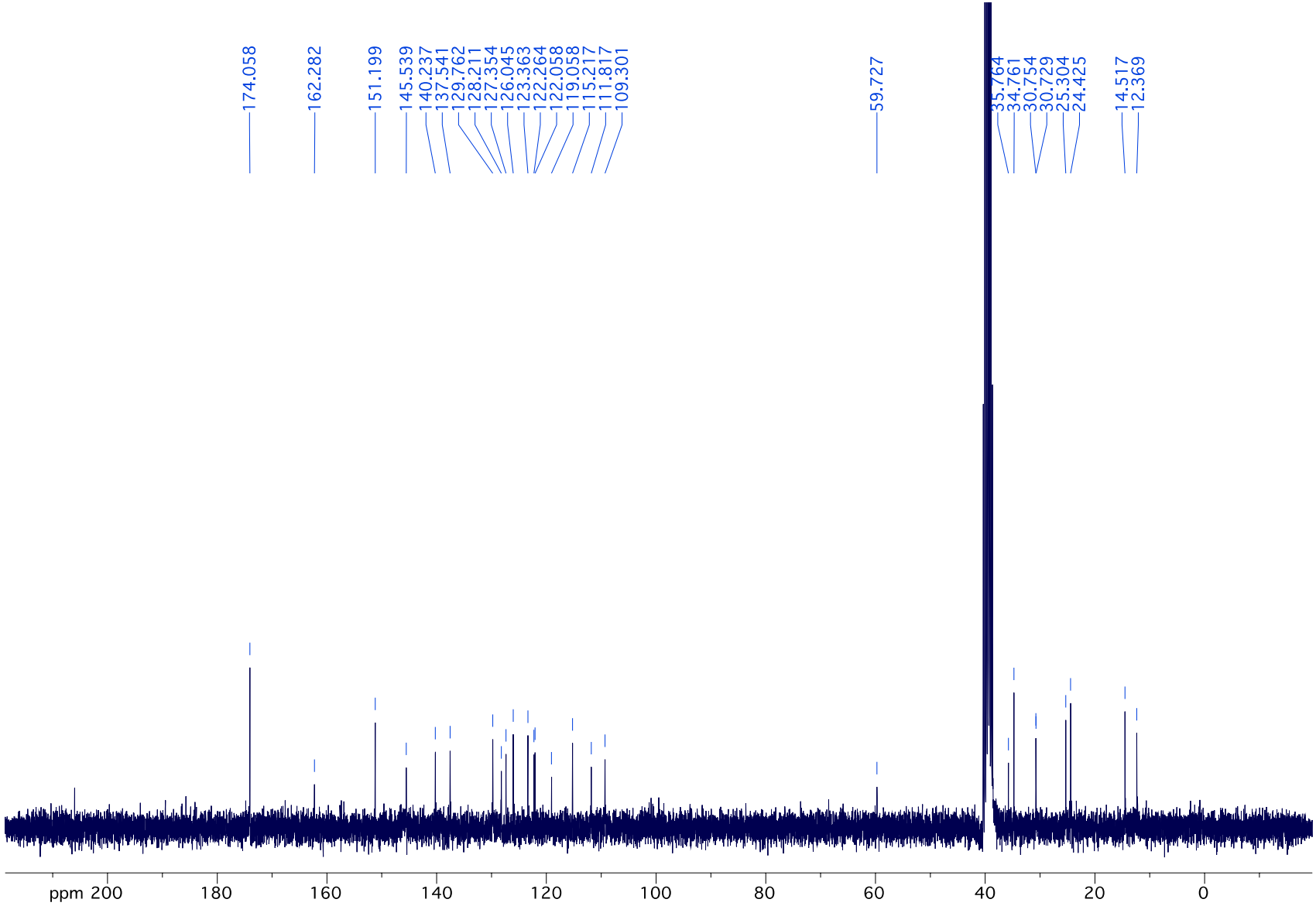
2-(5'-Cyanopentyl)-7-hydroxyisoellipticinium bromide **28** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



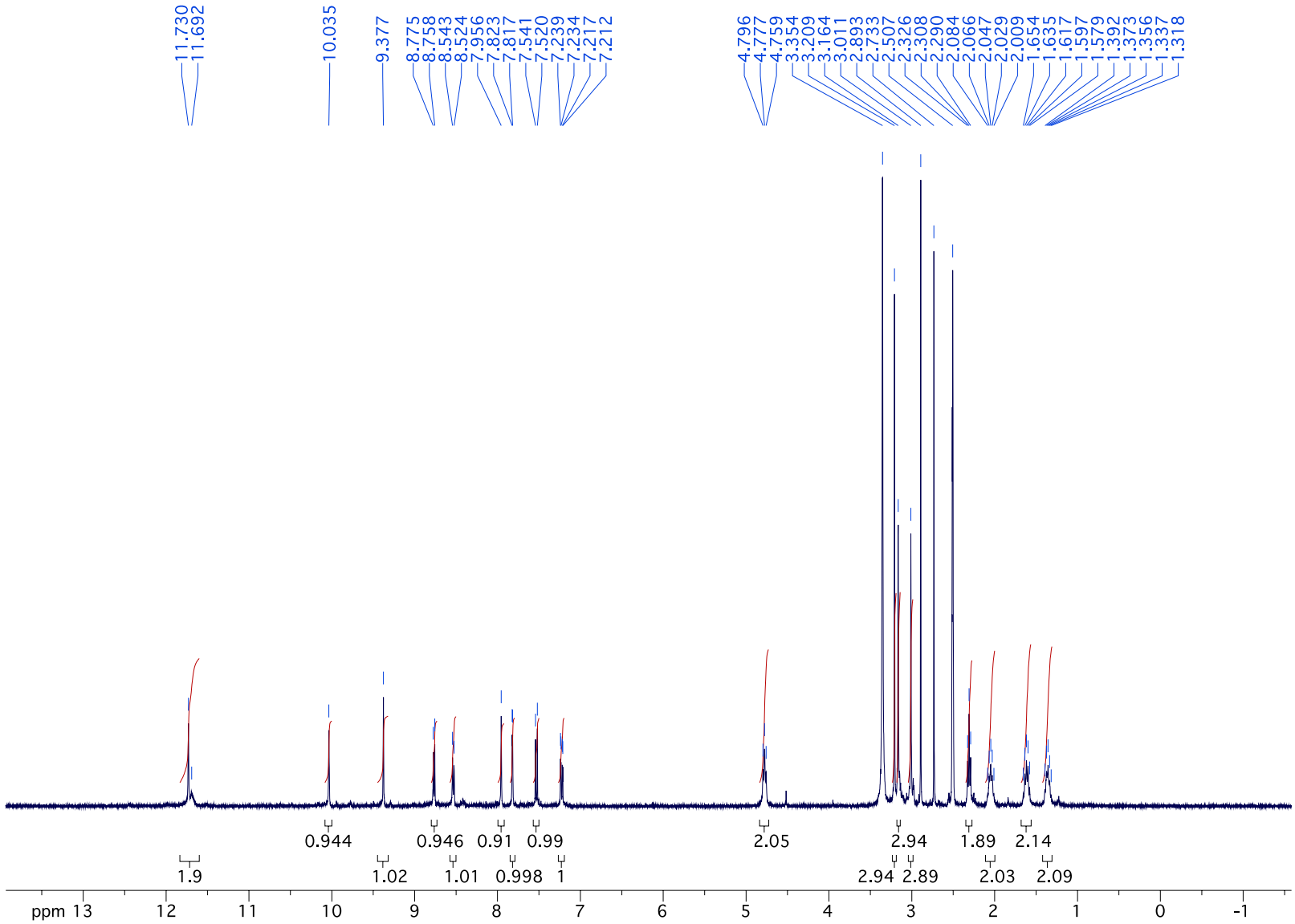
2-(6'-Carboxamidohexyl)-7-hydroxyisoellipticinium bromide **29** (^{1}H NMR spectrum in DMSO-d_6 at 400 MHz)



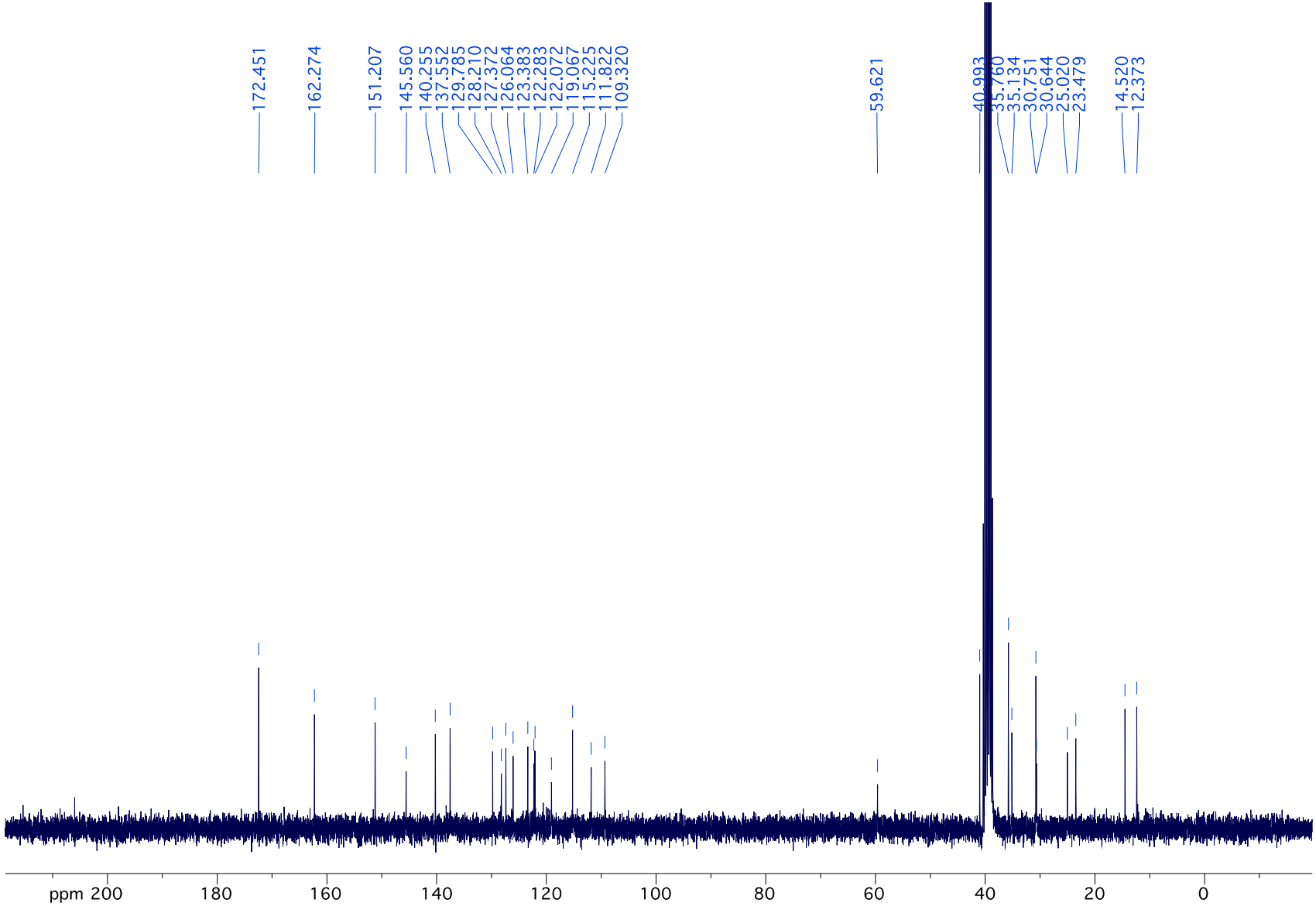
2-(6'-Carboxamidohexyl)-7-hydroxyisoellipticinium bromide **29** (^{13}C NMR spectrum in DMSO-d_6 at 75.5 MHz)



7-Hydroxy-N^2-(6'-methylsulfonamido-6-oxohexyl)isoellipticinium bromide **30** (^{1}H NMR in DMSO-d_6 at 400 MHz)

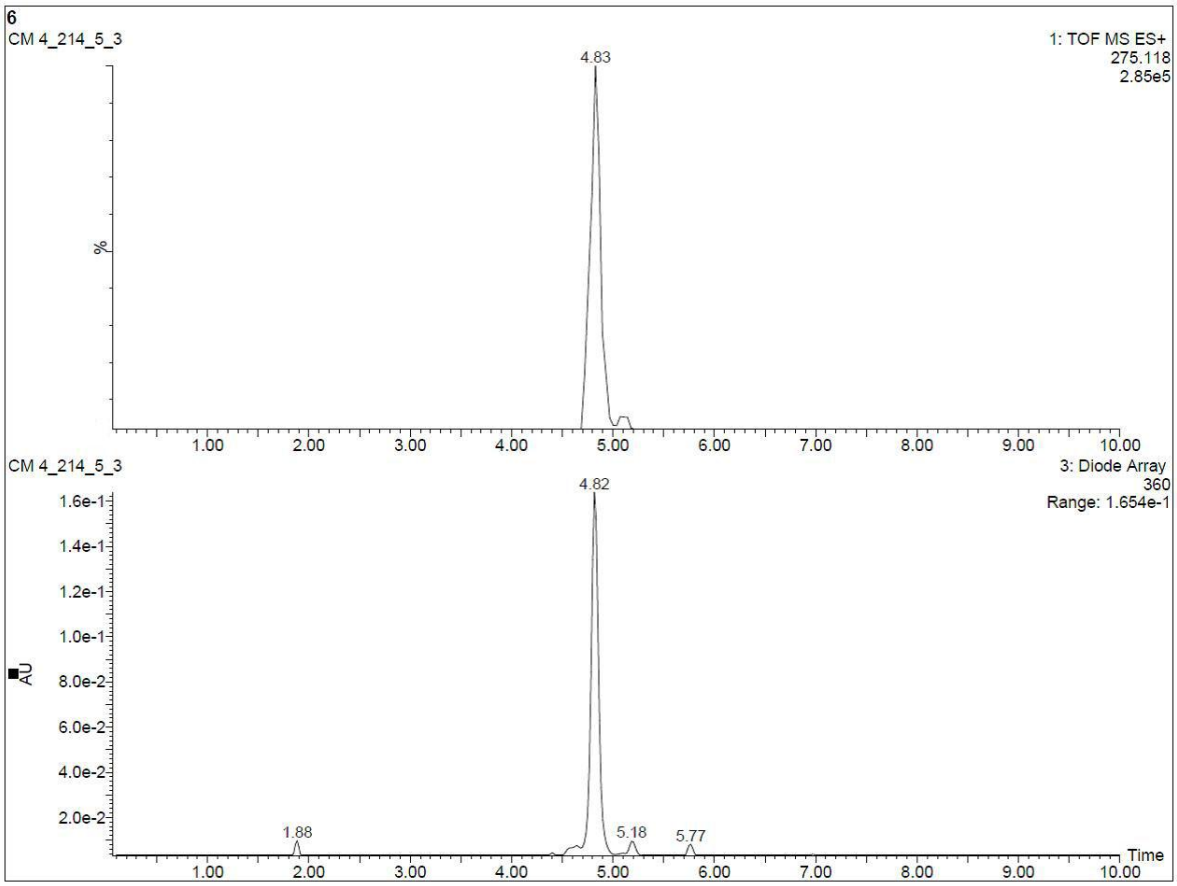


7-Hydroxy-N^2-(6'-methylsulfonamido-6-oxohexyl)isoellipticinium bromide **30** (^{13}C NMR in DMSO-d_6 at 75.5 MHz)

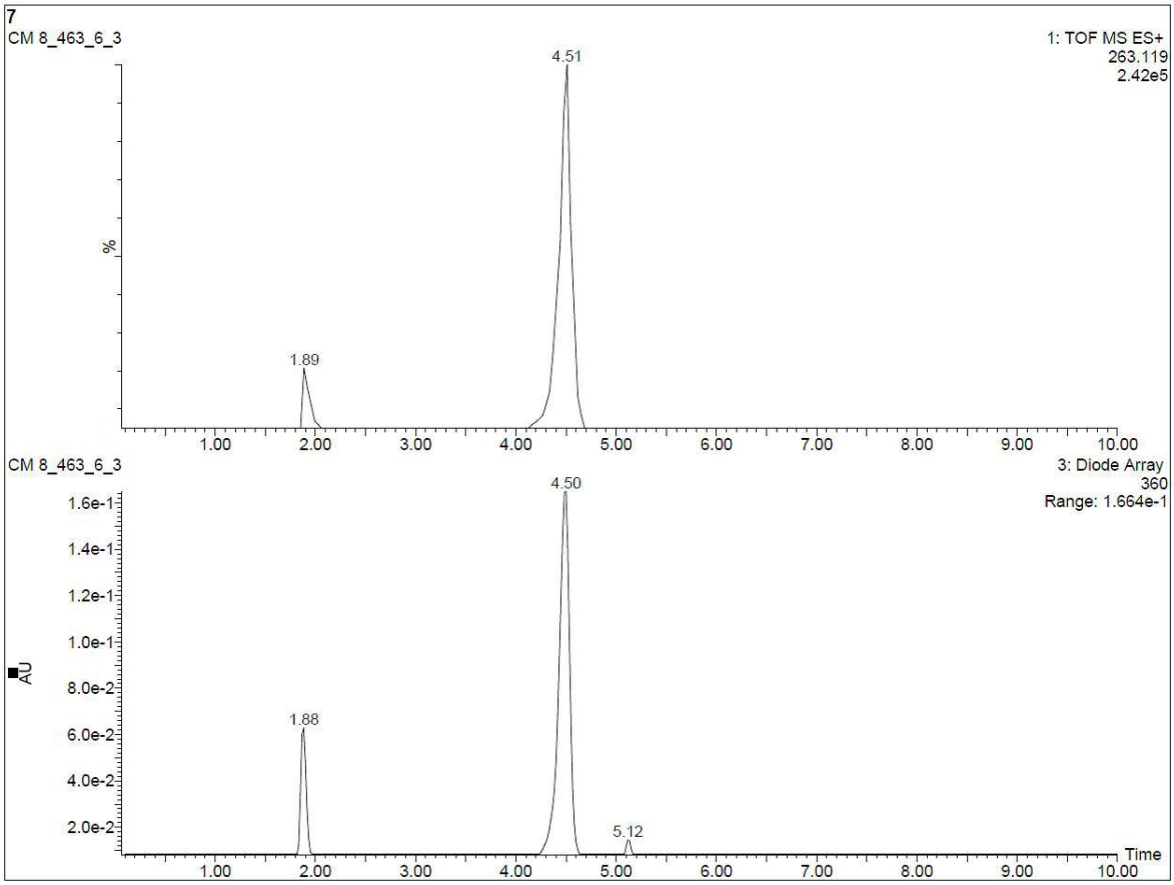


3. HPLC

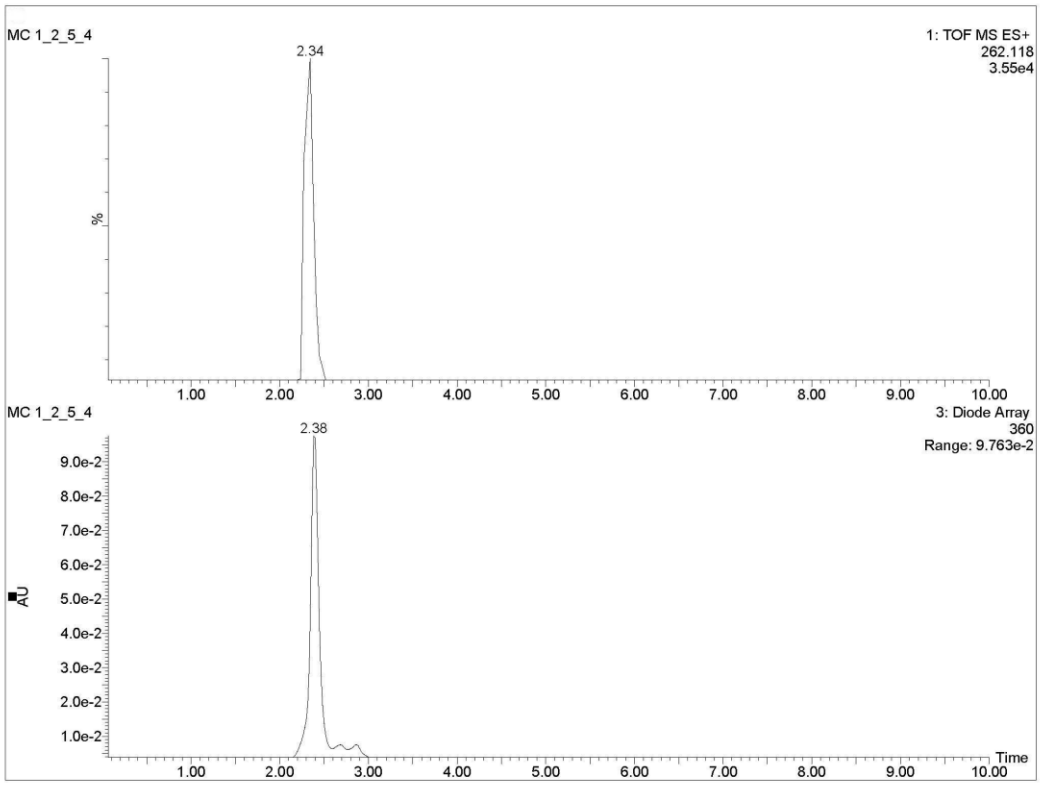
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde 6



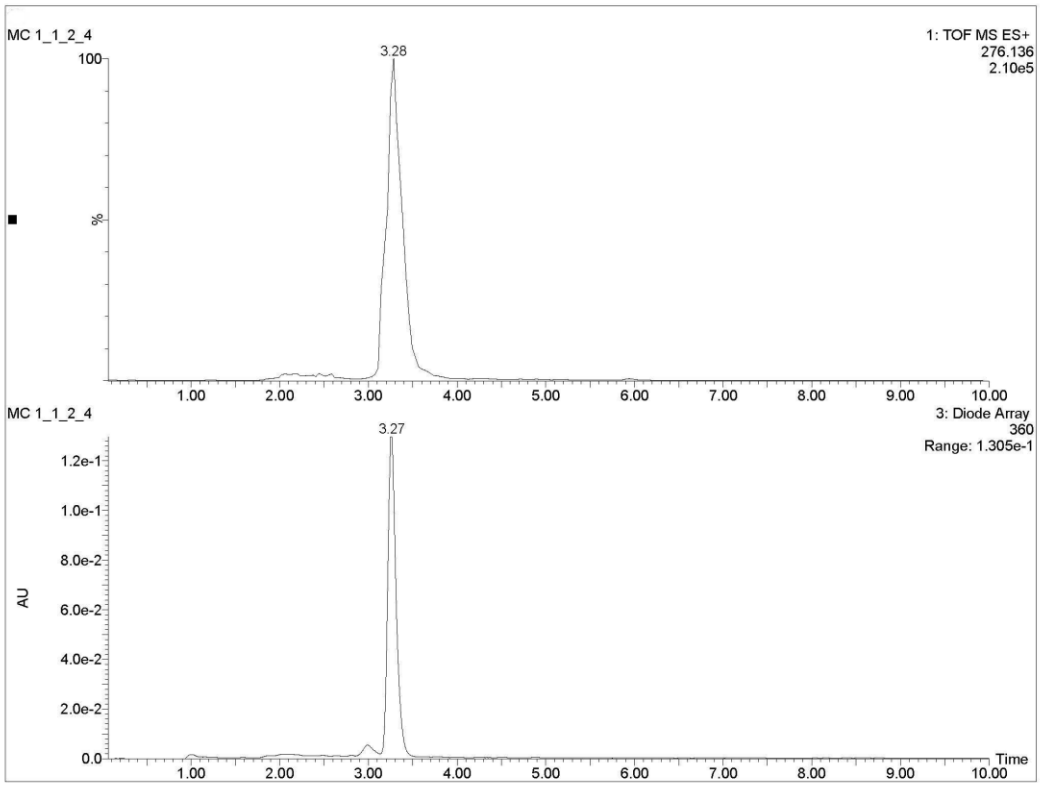
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol 7



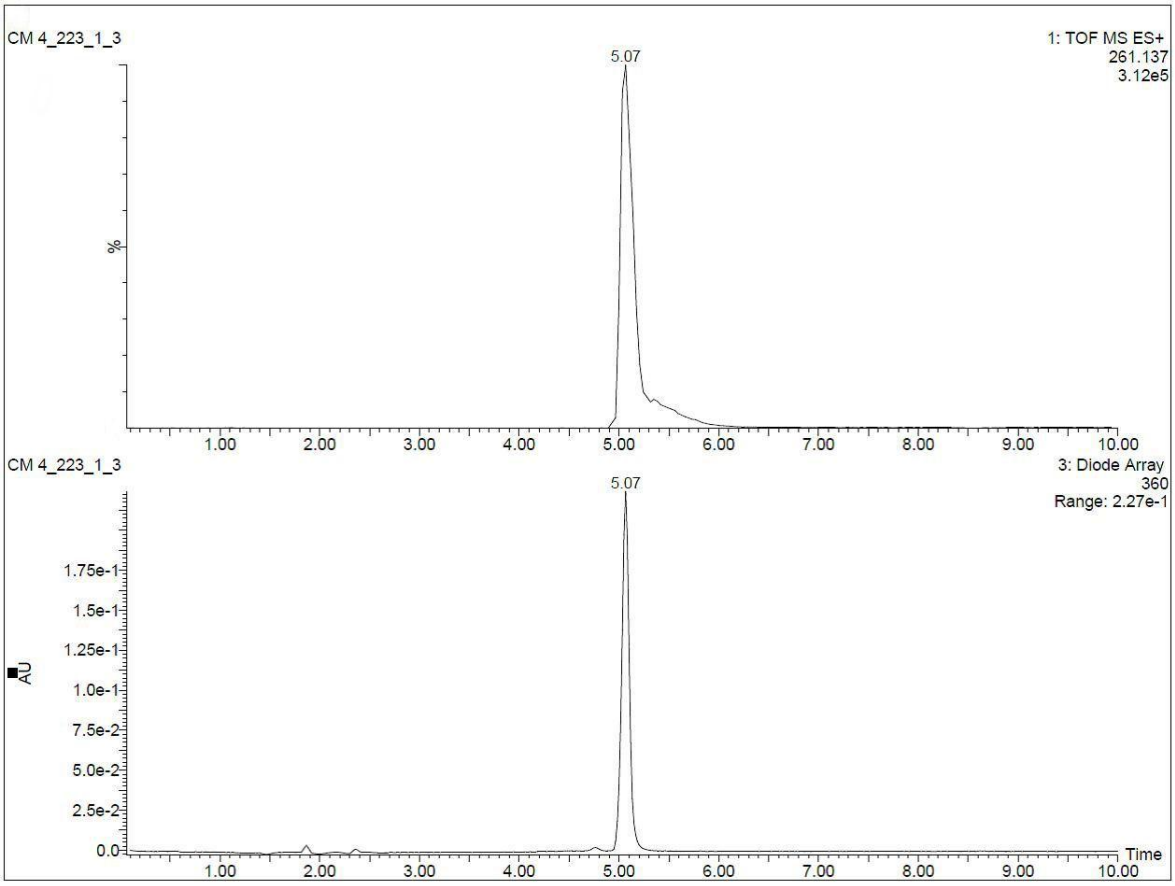
6,11-Dimethyl-5*H*-benzo[*b*]carbazol-2-ol 9



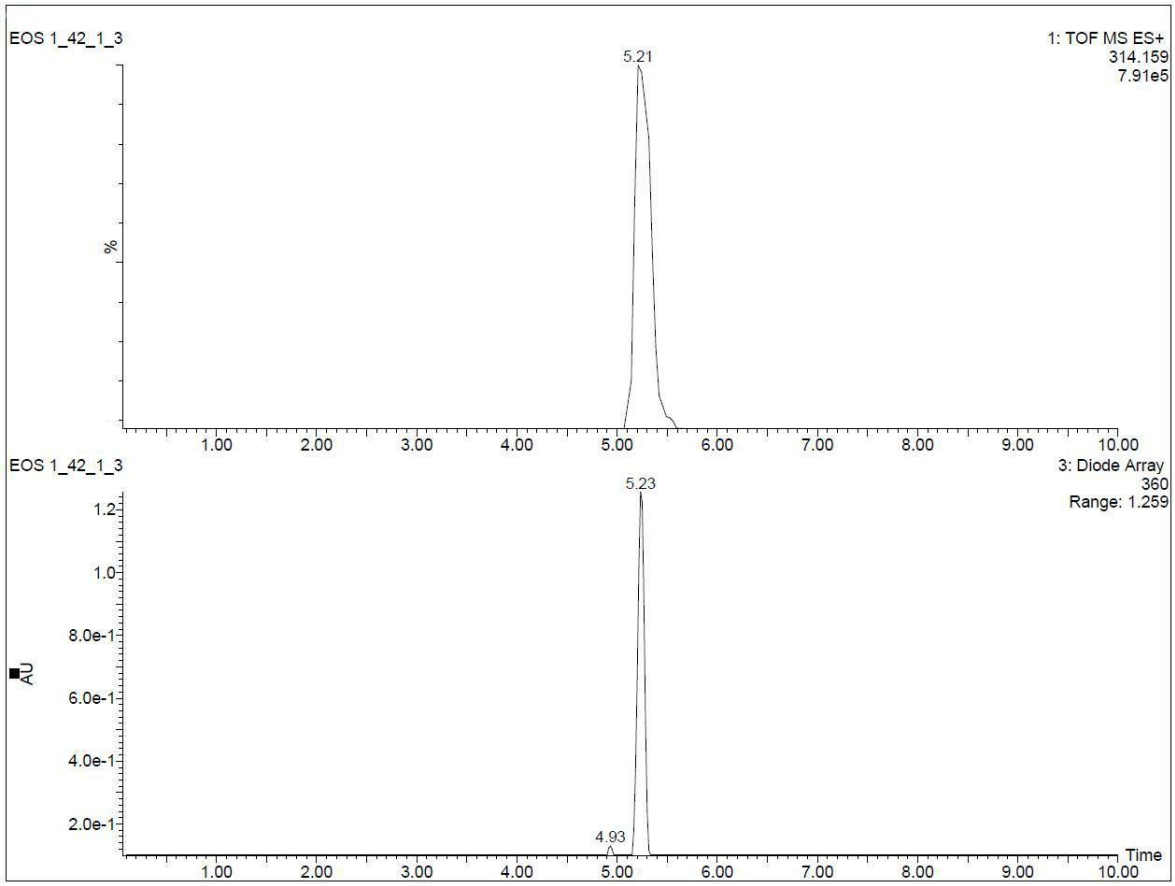
2-Methoxy-6,11-dimethyl-5*H*-benzo[*b*]carbazole 14



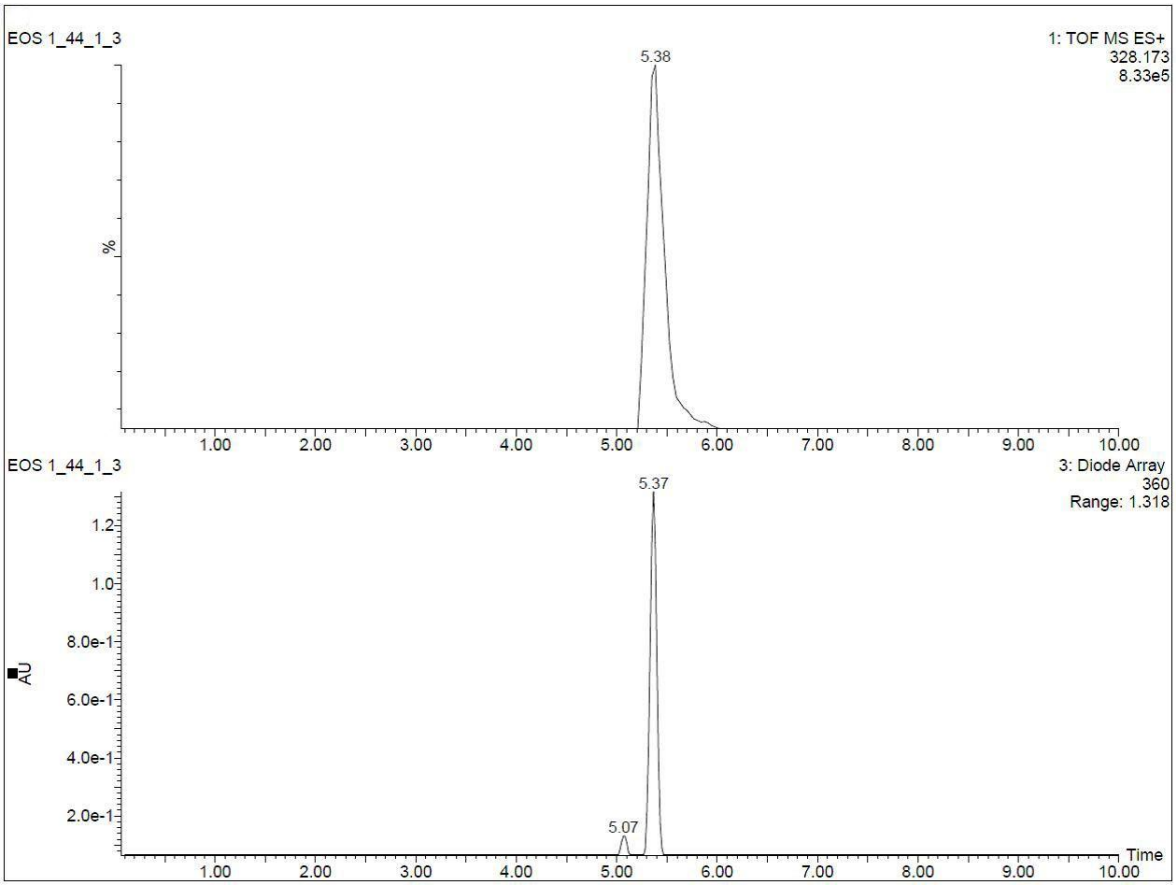
2-Methylisoellipticinium iodide 16



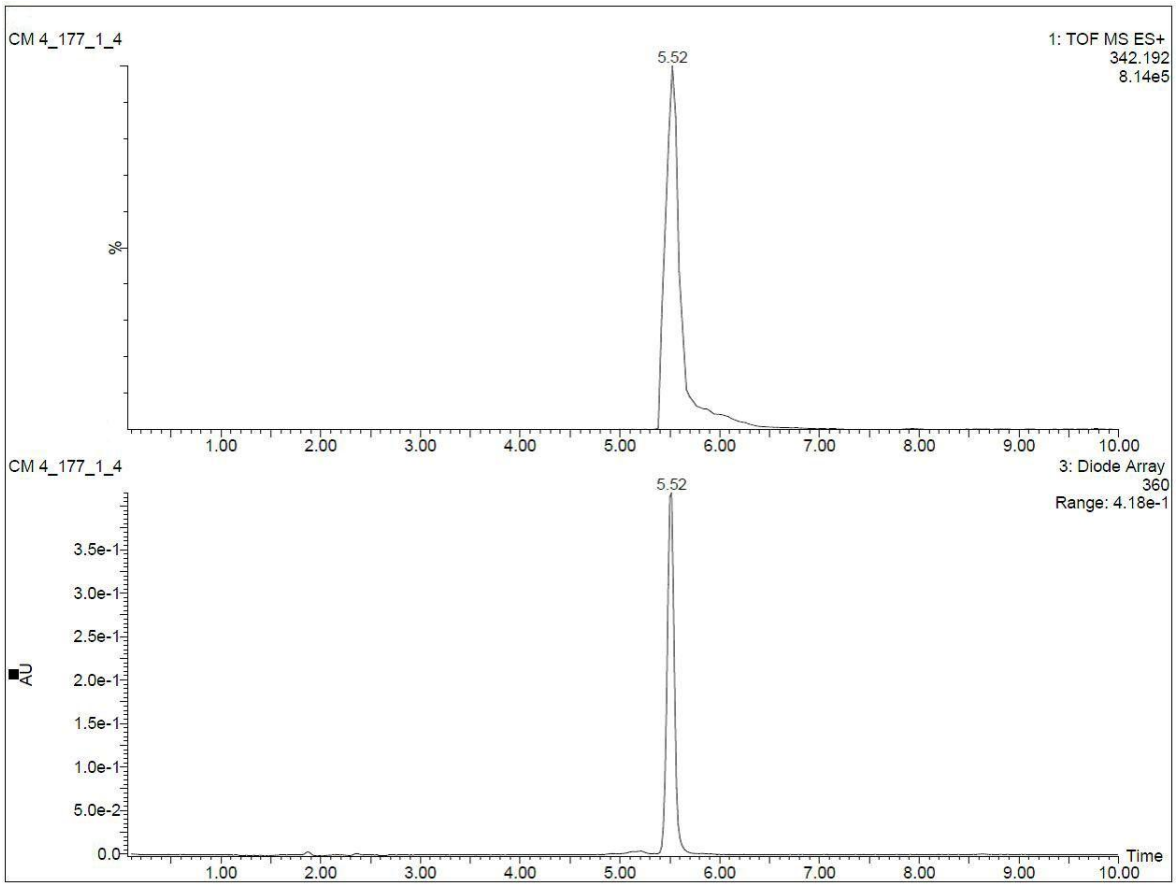
2-(3'-Cyanopropyl)isoellipticinium chloride 17



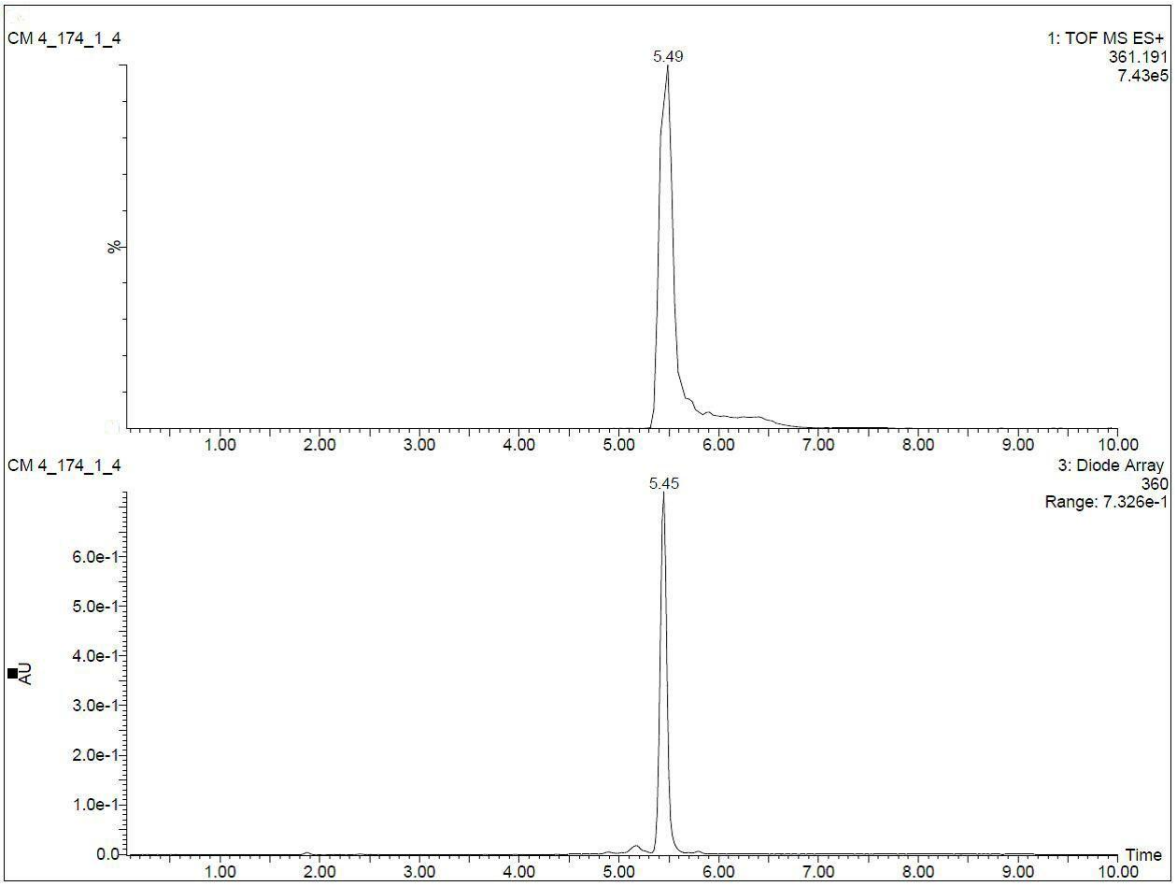
2-(4'-Cyanobutyl)isoellipticinium chloride 18



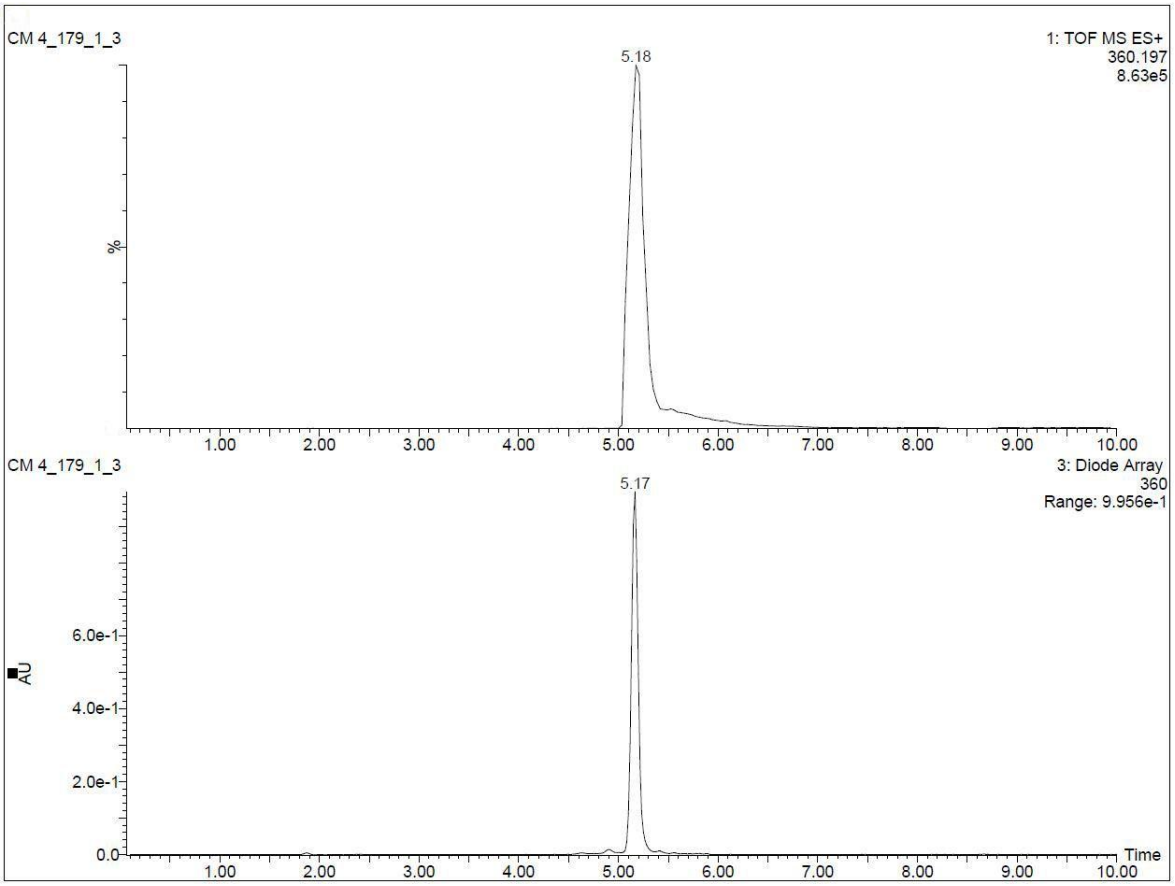
2-(5'-Cyanopentyl)isoellipticinium bromide 19



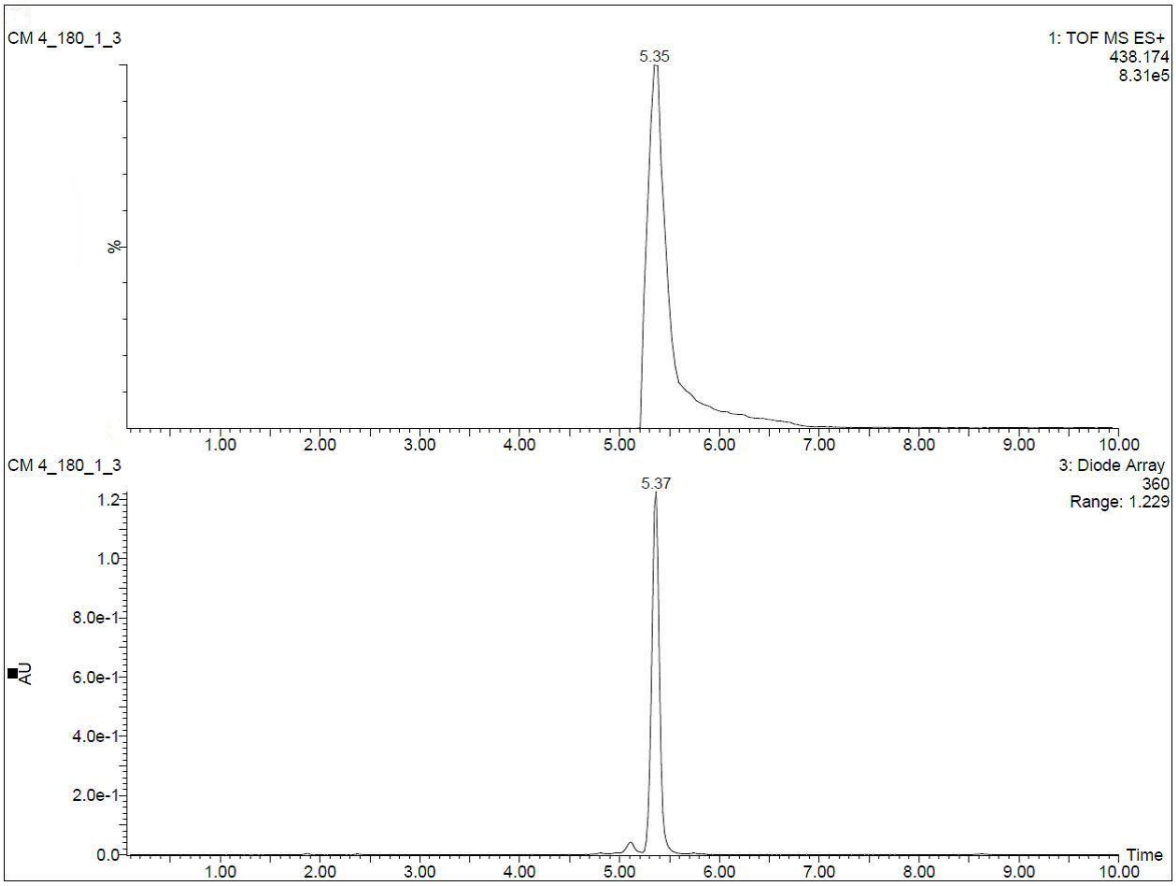
2-(5'-Carboxypentyl)isoellipticinium bromide 20



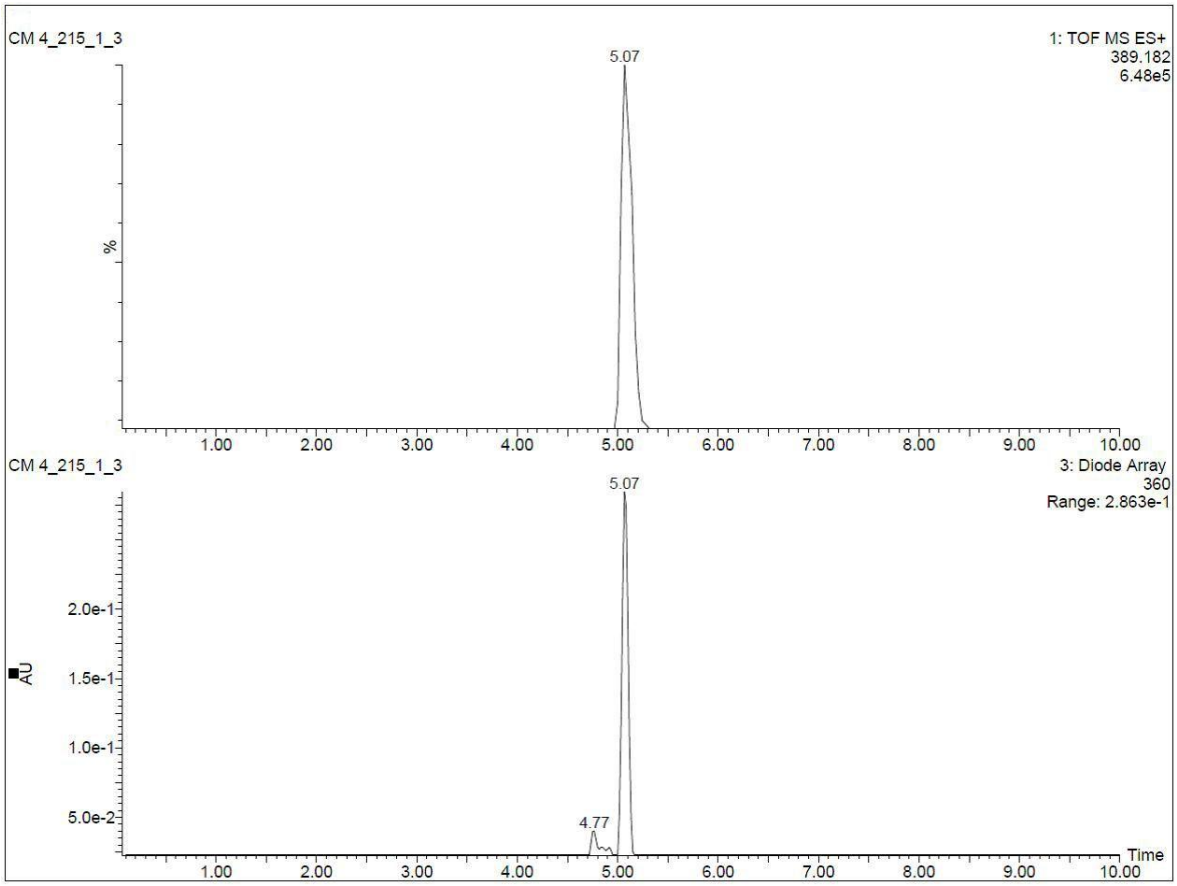
2-(6'-Carboxamidohexyl)isoellipticinium bromide 21



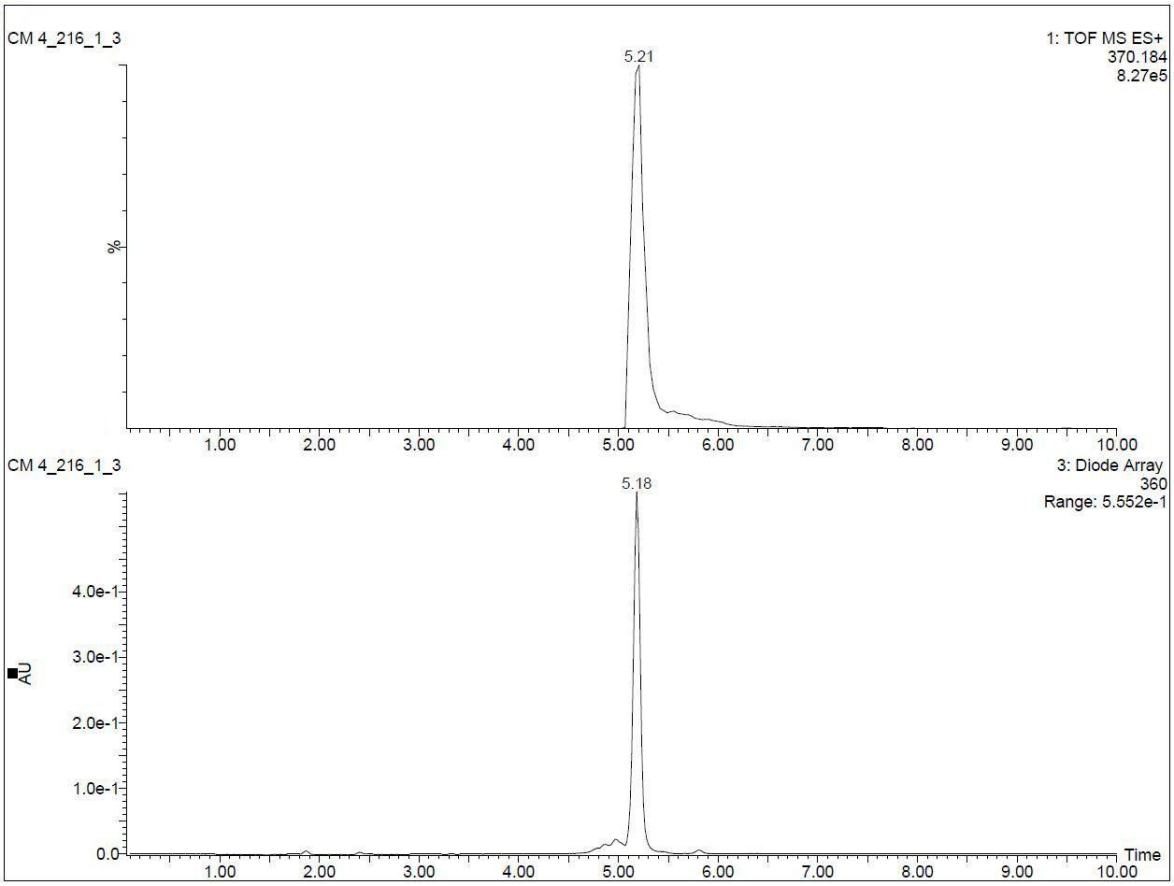
N^2-(6'-Methylsulfonamido-6'-oxohexyl)isoellipticinium bromide 22



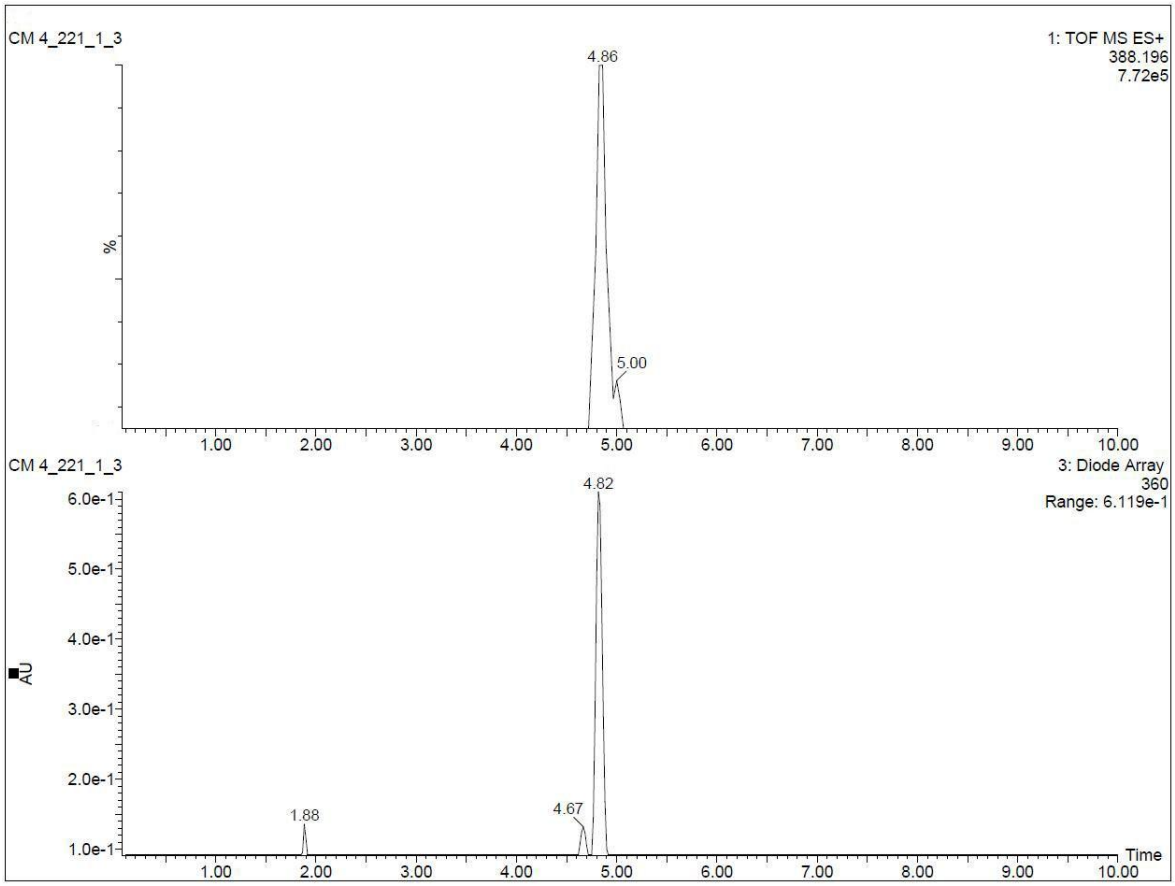
2-(5'-Carboxypentyl)-7-formylisoellipticinium bromide 23



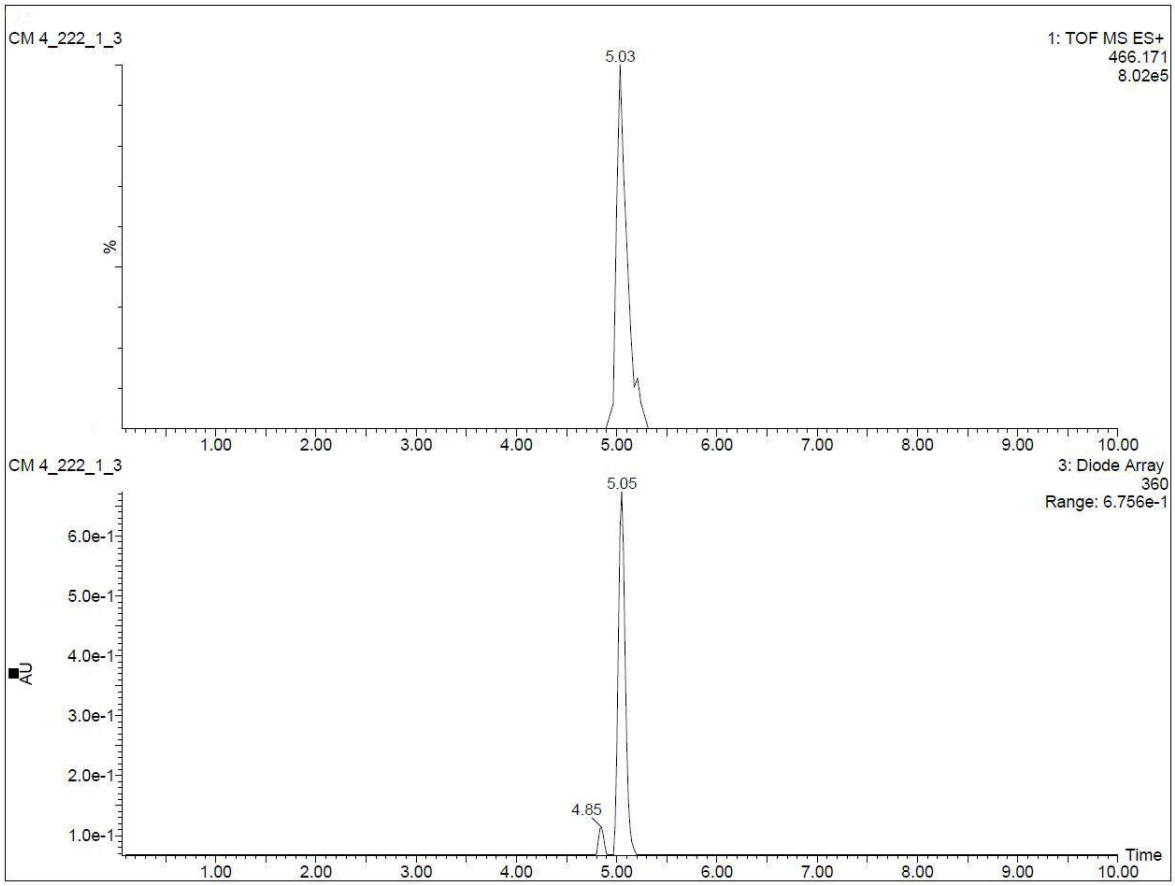
2-(5'-Cyanopentyl)-7-formylisoellipticinium bromide 24



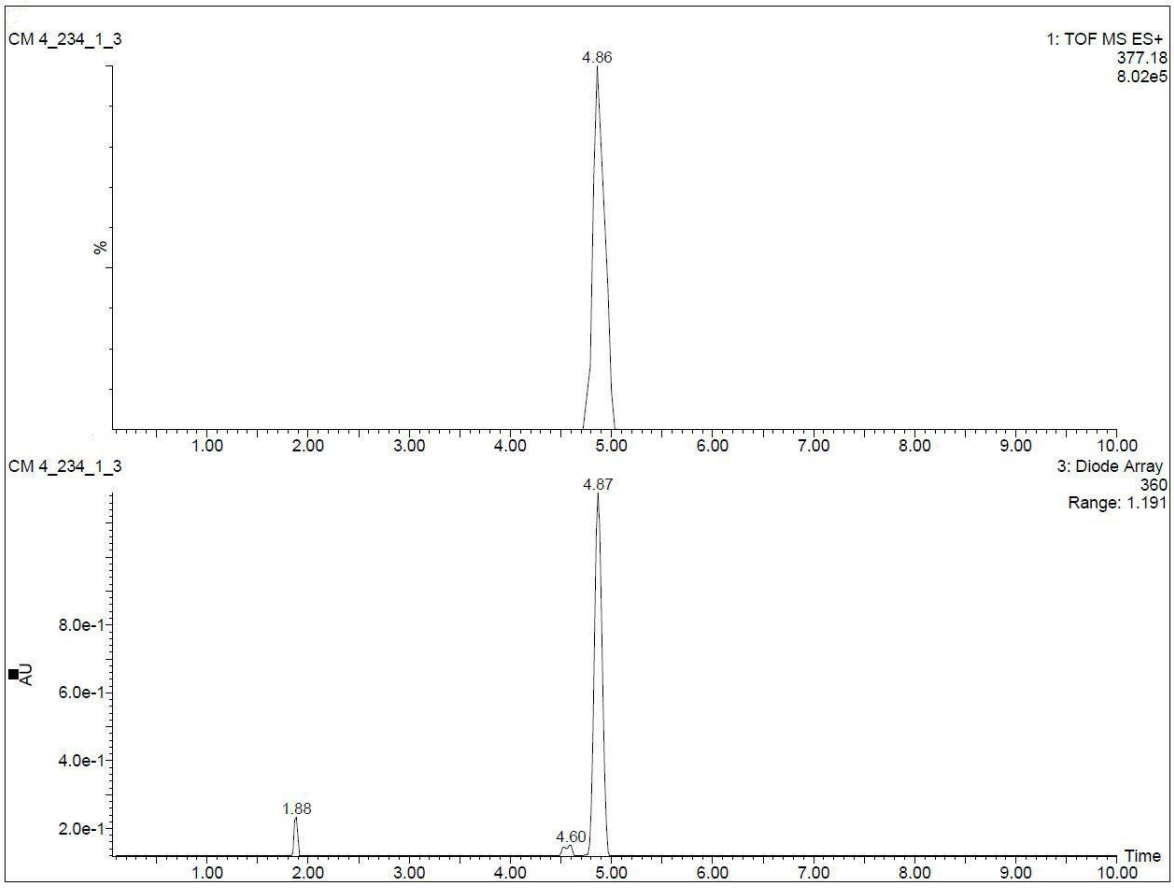
2-(6'-Carboxamidohexyl)-7-formylisoellipticinium bromide 25



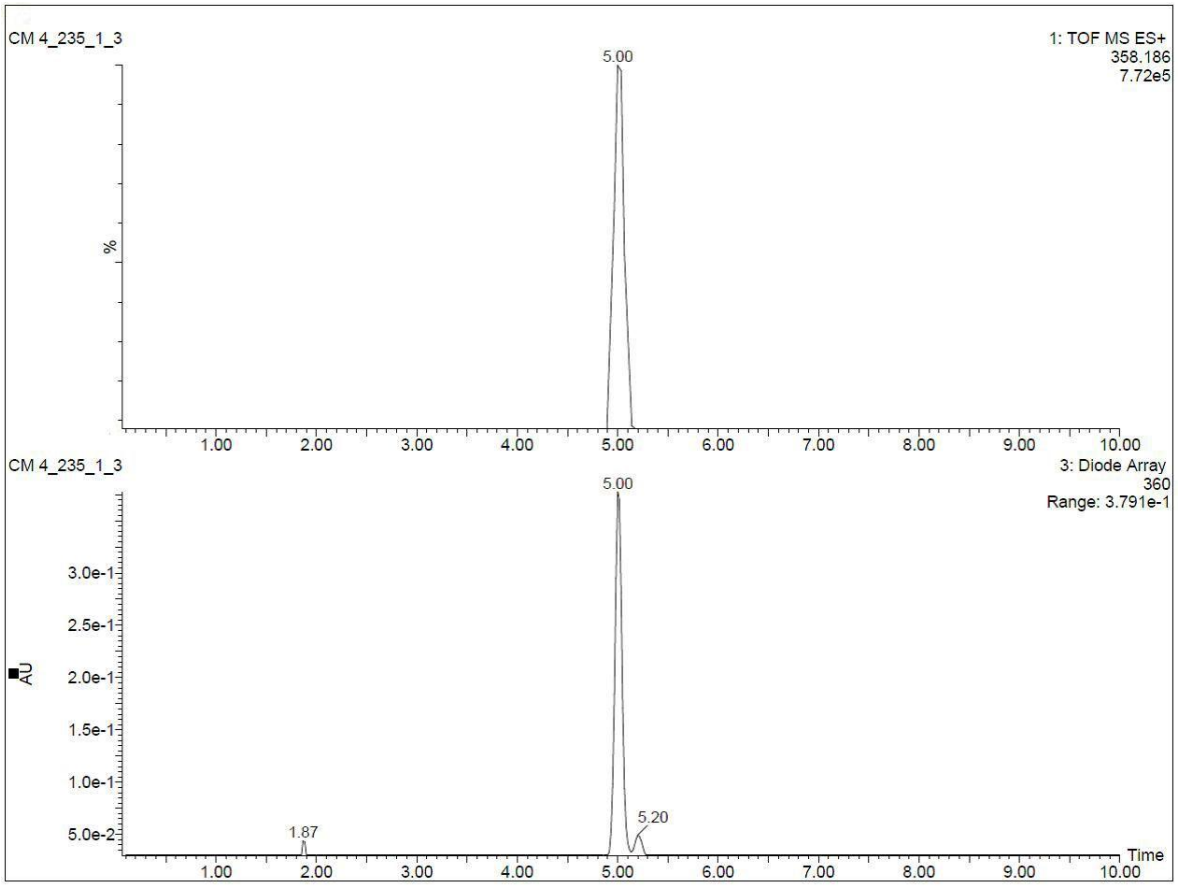
7-Formyl-N^2-(6'-methylsulfonamido-6'-oxohexyl) isoellipticinium bromide 26



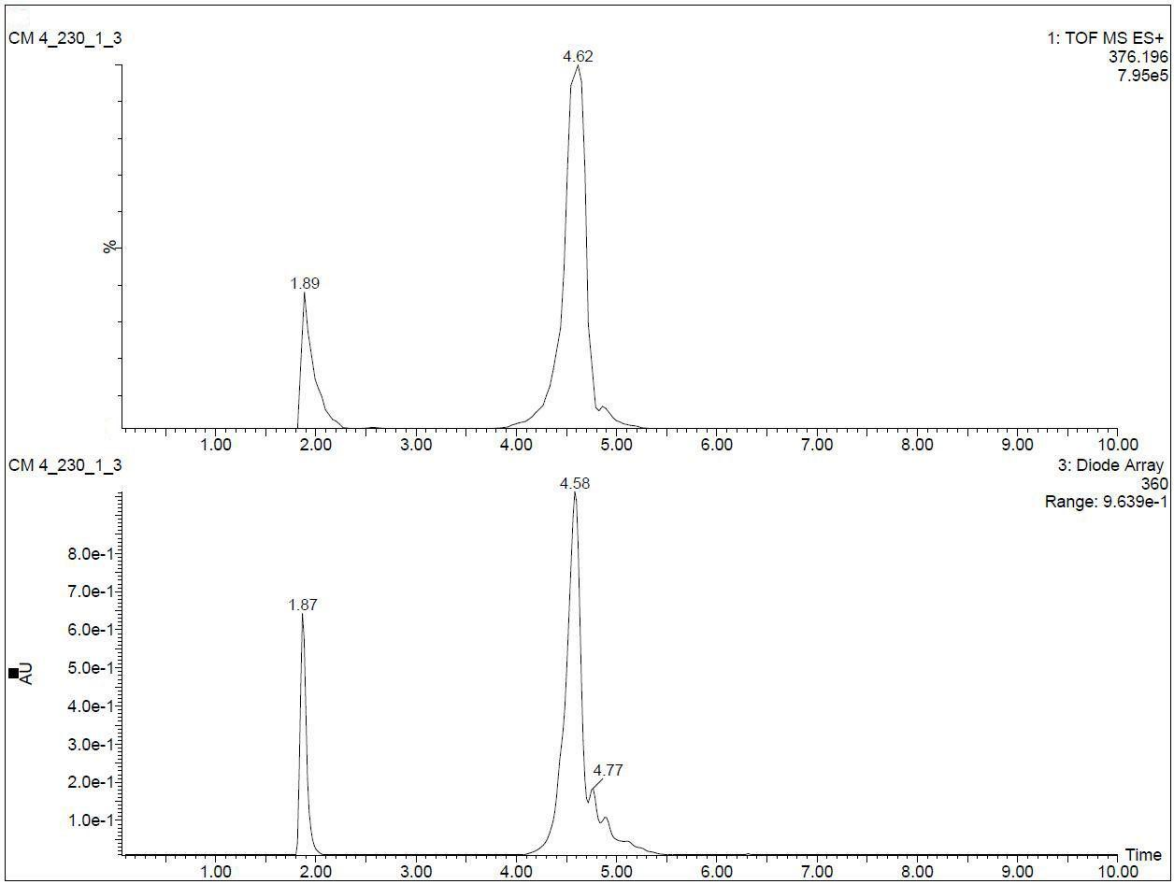
2-(5'-Carboxypentyl)-7-hydroxyisoellipticinium bromide 27



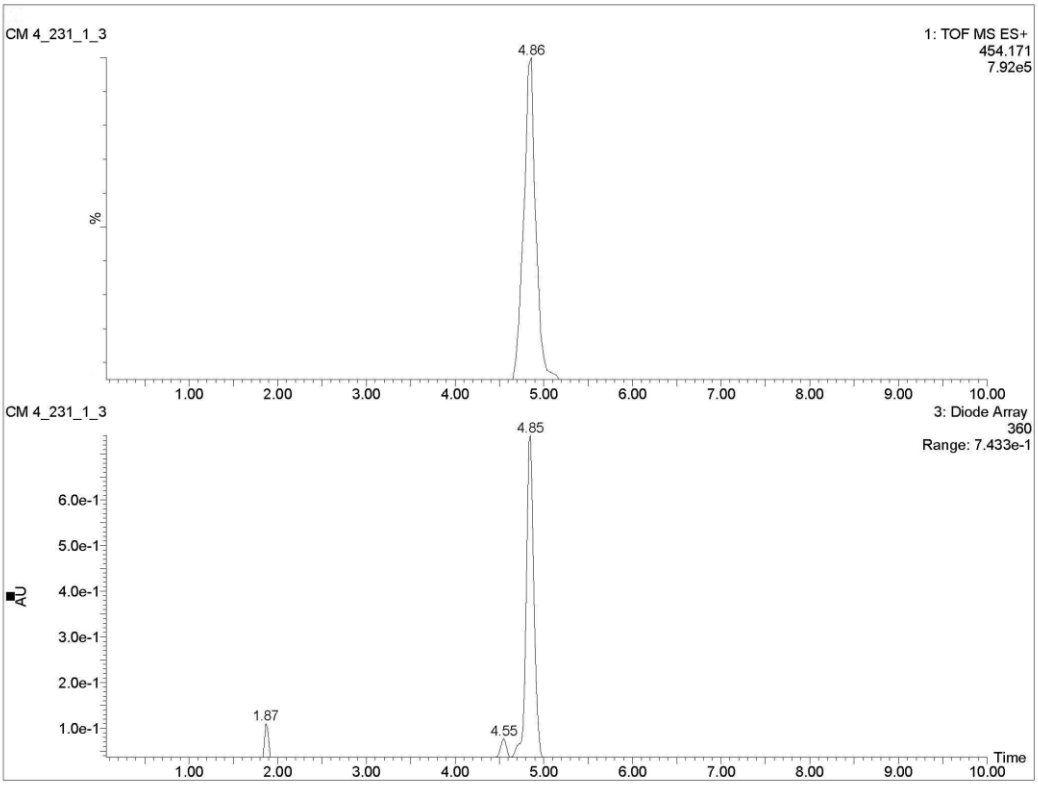
2-(5'-Cyanopentyl)-7-hydroxyisoellipticinium bromide 28



2-(6'-Carboxamidohexyl)-7-hydroxyisoellipticinium bromide 29

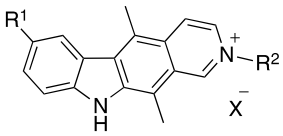


7-Hydroxy-N^2-(6'-methylsulfonamido-6-oxohexyl) isoellipticinium bromide 30



LCMS conditions: Samples were analysed for purity via LCMS using a Waters Alliance 2695 HPLC, Waters 996 photodiode array detector and a Waters LCT Premier TOF mass spectrometer. The samples were injected onto a Waters Atlantis T3 column (150 x 4.6mm, 5um particle size) using acetonitrile (+0.1% HCOOH) and water (+0.1% HCOOH) as mobile phase over a 10 minute run time at a flow rate of 1 mL/min. The HPLC conditions are as follows: Method A (gradient method) 0mins 10% ACN, 7mins 90% ACN, 9mins 90% ACN, 10mins 10% ACN ; Method B (isocratic method) 100% ACN. Method B was used for samples **9** and **14** with method A used for the others.

4. NCI 60-cell line screen: single-dose data



Compound number	R^1	R^2	X	NSC No.†
5	H	-	-	
6	CHO	-	-	754620
7	OH	-	-	754619
8	OMe	-	-	
16	H	Me	I	754621
17	H	C_3H_6CN	Cl	
18	H	C_4H_8CN	Cl	
19	H	$C_5H_{10}CN$	Br	754623
20	H	$C_5H_{10}COOH$	Br	754622
21	H	$C_5H_{10}CONH_2$	Br	754624
22	H	$C_5H_{10}CONHSO_2CH_3$	Br	
23	CHO	$C_5H_{10}COOH$	Br	762135
24	CHO	$C_5H_{10}CN$	Br	762136
25	CHO	$C_5H_{10}CONH_2$	Br	762137
26	CHO	$C_5H_{10}CONHSO_2CH_3$	Br	762138
27	OH	$C_5H_{10}COOH$	Br	
28	OH	$C_5H_{10}CN$	Br	762117
29	OH	$C_5H_{10}CONH_2$	Br	762118
30	OH	$C_5H_{10}CONHSO_2CH_3$	Br	762119

†NCI number in green = single dose and five dose data available, NCI no. in blue = single dose only.

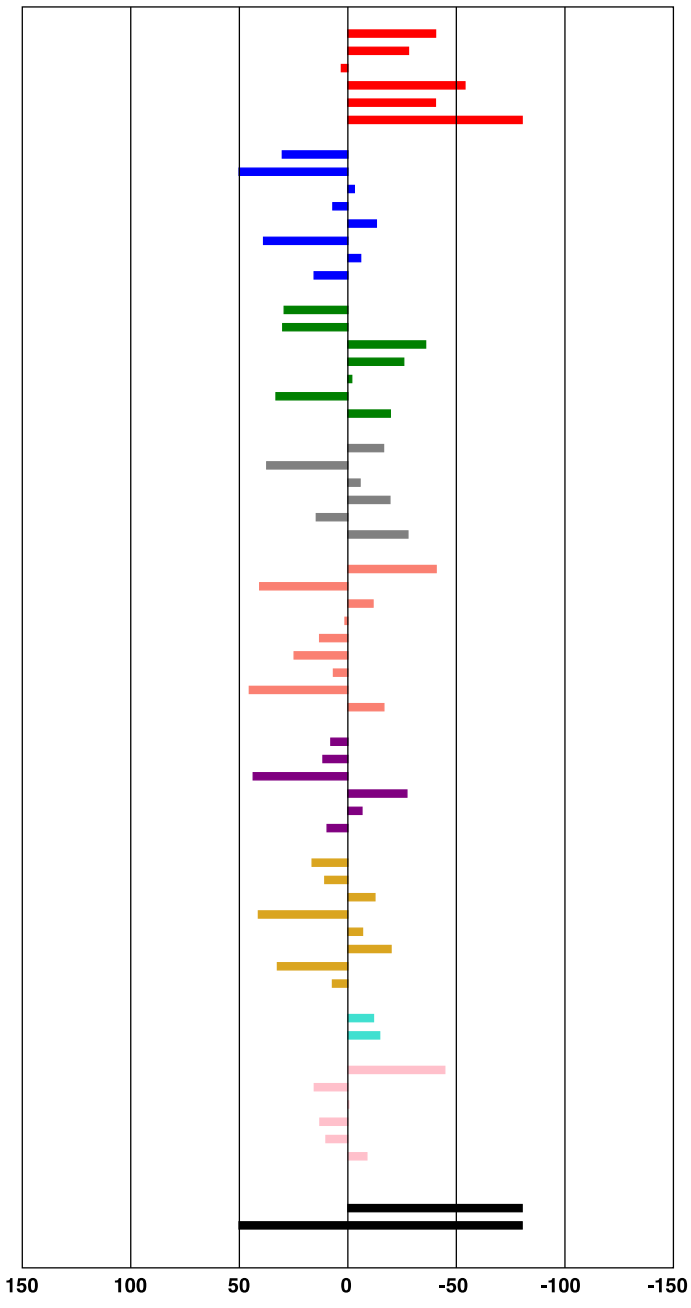
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6**

Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-754620 / 1	Conc: 1.00E-5 Molar	Test Date: Oct 18, 2010
Experiment ID: 1010OS37		Report Date: Nov 17, 2010

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	11.07
HL-60(TB)	23.54
K-562	54.44
MOLT-4	-2.46
RPMI-8226	11.10
SR	-28.84
Non-Small Cell Lung Cancer	
A549/ATCC	81.69
EKVX	101.55
HOP-62	48.47
NCI-H226	58.38
NCI-H23	38.33
NCI-H322M	90.32
NCI-H460	45.56
NCI-H522	66.97
Colon Cancer	
COLO 205	80.78
HCC-2998	81.45
HCT-116	15.62
HCT-15	25.75
HT29	49.71
KM12	84.56
SW-620	31.91
CNS Cancer	
SF-268	35.01
SF-295	88.82
SF-539	45.83
SNB-19	32.07
SNB-75	66.00
U251	23.79
Melanoma	
LOX IMVI	10.80
MALME-3M	92.11
M14	39.85
MDA-MB-435	52.83
SK-MEL-2	64.50
SK-MEL-28	76.22
SK-MEL-5	58.08
UACC-257	96.84
UACC-62	34.89
Ovarian Cancer	
IGROV1	59.31
OVCAR-3	62.98
OVCAR-5	95.08
OVCAR-8	24.23
NCI/ADR-RES	44.95
SK-OV-3	61.00
Renal Cancer	
786-0	67.90
A498	62.12
ACHN	39.00
CAKI-1	92.70
RXF 393	44.71
SN12C	31.53
TK-10	83.95
UO-31	58.59
Prostate Cancer	
PC-3	39.66
DU-145	36.83
Breast Cancer	
MCF7	6.80
MDA-MB-231/ATCC	66.95
HS 578T	51.05
BT-549	64.37
T-47D	61.58
MDA-MB-468	42.73
Mean	51.47
Delta	80.31
Range	130.39



5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol **7**

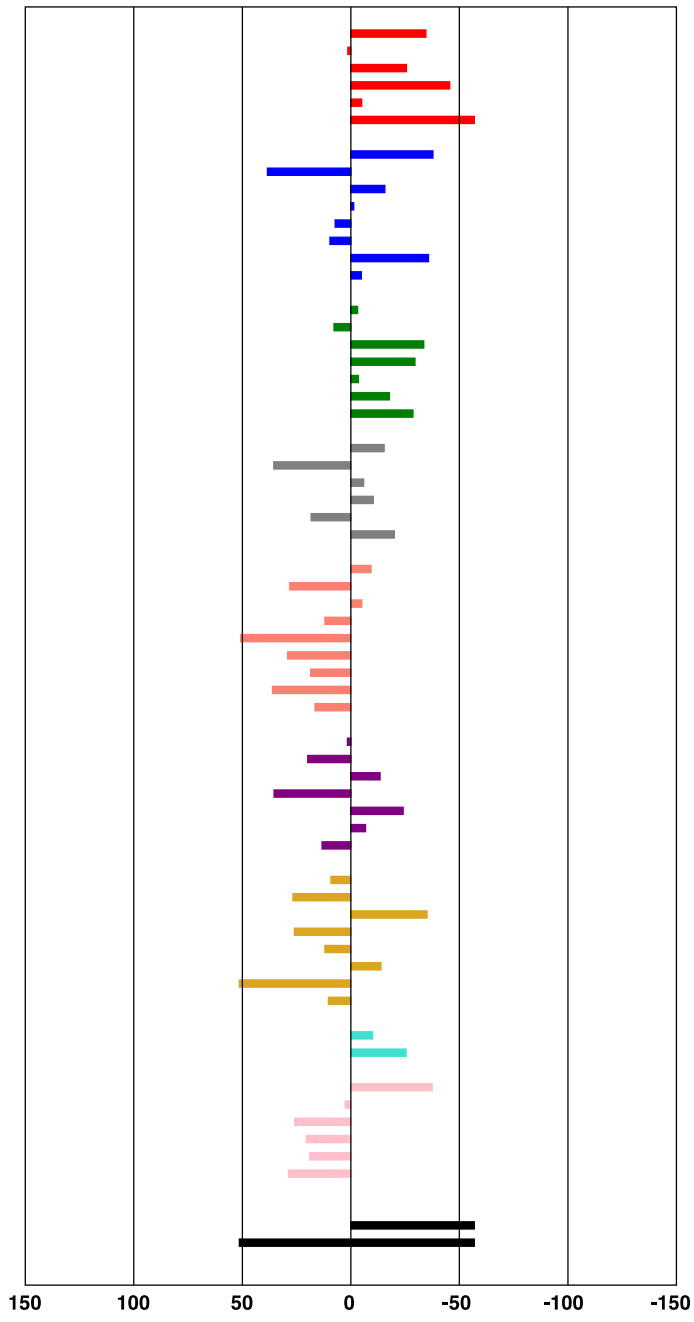
Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-754619 / 1 **Conc:** 1.00E-5 Molar **Test Date:** Oct 18, 2010

Experiment ID: 1010OS37 **Report Date:** Nov 17, 2010

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	18.93
HL-60(TB)	54.87
K-562	27.90
MOLT-4	7.97
RPMI-8226	48.53
SR	-3.37
Non-Small Cell Lung Cancer	
A549/ATCC	15.67
EKVX	91.95
HOP-62	37.85
NCI-H226	52.20
NCI-H23	60.75
NCI-H322M	63.12
NCI-H460	17.71
NCI-H522	48.64
Colon Cancer	
COLO 205	50.35
HCC-2998	61.27
HCT-116	19.94
HCT-15	23.96
HT29	50.03
KM12	35.74
SW-620	24.87
CNS Cancer	
SF-268	38.16
SF-295	88.98
SF-539	47.59
SNB-19	43.11
SNB-75	71.80
U251	33.42
Melanoma	
LOX IMVI	44.21
MALME-3M	81.65
M14	48.46
MDA-MB-435	65.42
SK-MEL-2	104.21
SK-MEL-28	82.64
SK-MEL-5	71.98
UACC-257	89.58
UACC-62	69.99
Ovarian Cancer	
IGROV1	55.12
OVCAR-3	73.34
OVCAR-4	39.99
OVCAR-5	88.87
OVCAR-8	29.40
NCI/ADR-RES	46.72
SK-OV-3	66.75
Renal Cancer	
786-0	62.67
A498	80.16
ACHN	18.37
CAKI-1	79.49
RXF 393	65.42
SN12C	39.60
TK-10	104.84
UO-31	63.83
Prostate Cancer	
PC-3	43.54
DU-145	28.07
Breast Cancer	
MCF7	15.98
MDA-MB-231/ATCC	56.06
HS 578T	79.41
BT-549	73.99
T-47D	72.39
MDA-MB-468	82.24
Mean	53.50
Delta	56.87
Range	108.21



2-Methylisoellpticinium iodide **16**

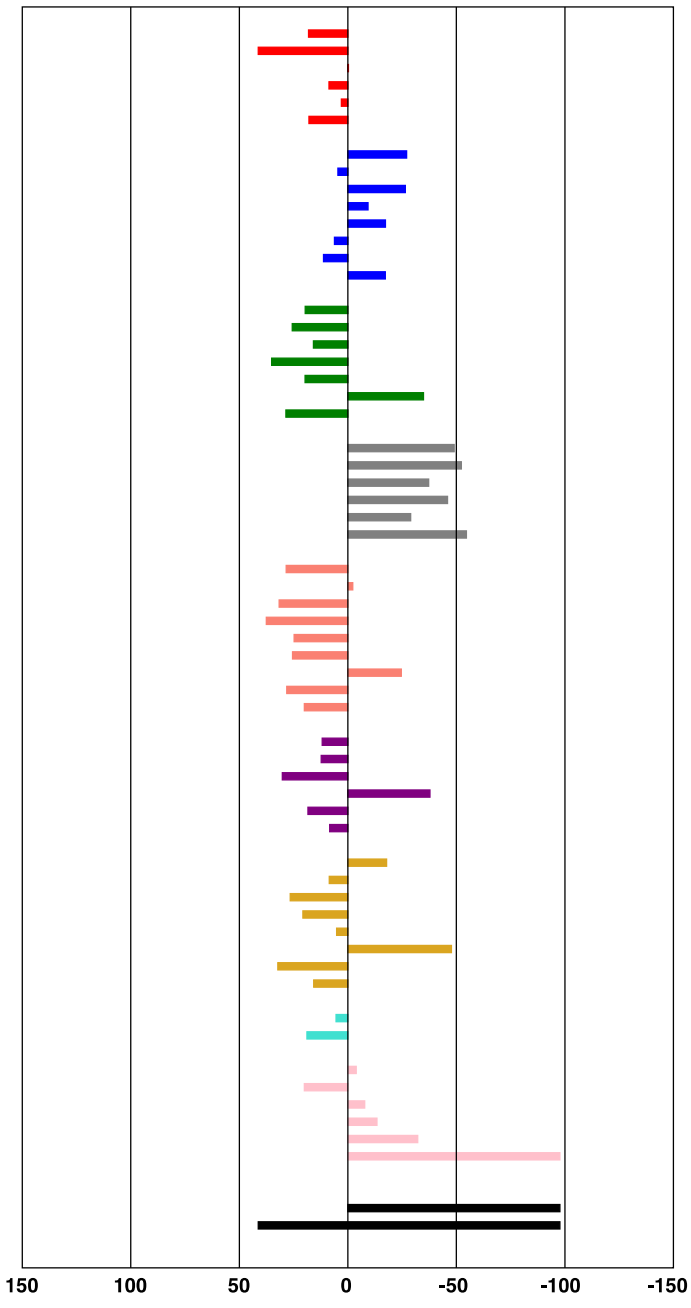
Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-754621 / 1 **Conc:** 1.00E-5 Molar **Test Date:** Oct 18, 2010

Experiment ID: 1010OS37 **Report Date:** Nov 17, 2010

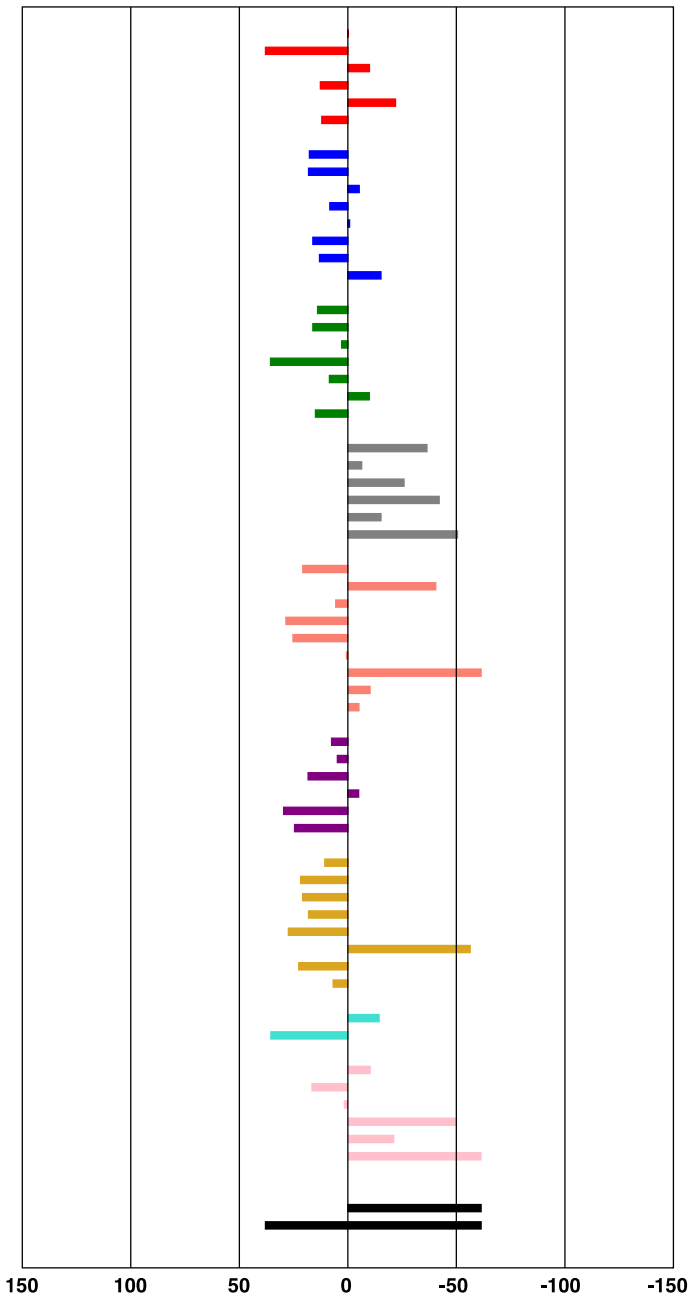
Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	83.86
HL-60(TB)	107.04
K-562	65.48
MOLT-4	74.45
RPMI-8226	68.71
SR	83.67
Non-Small Cell Lung Cancer	
A549/ATCC	38.70
EKVX	70.36
HOP-62	39.29
NCI-H226	56.47
NCI-H23	48.40
NCI-H322M	71.92
NCI-H460	76.95
NCI-H522	48.47
Colon Cancer	
COLO 205	85.42
HCC-2998	91.35
HCT-116	81.64
HCT-15	100.88
HT29	85.46
KM12	30.90
SW-620	94.26
CNS Cancer	
SF-268	16.79
SF-295	13.44
SF-539	28.51
SNB-19	19.85
SNB-75	36.84
U251	11.15
Melanoma	
LOX IMVI	94.13
MALME-3M	63.47
M14	97.39
MDA-MB-435	103.30
SK-MEL-2	90.49
SK-MEL-28	91.22
SK-MEL-5	41.11
UACC-257	93.91
UACC-62	85.79
Ovarian Cancer	
IGROV1	77.57
OVCAR-3	78.05
OVCAR-5	95.92
OVCAR-8	27.89
NCI/ADR-RES	84.10
SK-OV-3	74.10
Renal Cancer	
786-0	47.89
A498	74.30
ACHN	92.27
CAKI-1	86.43
RXF 393	70.93
SN12C	18.03
TK-10	98.01
UO-31	81.47
Prostate Cancer	
PC-3	71.21
DU-145	84.61
Breast Cancer	
MCF7	61.88
MDA-MB-231/ATCC	85.82
HS 578T	57.99
BT-549	52.33
T-47D	33.59
MDA-MB-468	-31.95
Mean	65.75
Delta	97.70
Range	138.99



2-(5'-Cyanopentyl)isoellipticinium bromide **19**

Developmental Therapeutics Program One Dose Mean Graph	NSC: D-754623 / 1	Conc: 1.00E-5 Molar	Test Date: Oct 18, 2010
	Experiment ID: 1010OS37		Report Date: Nov 17, 2010

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	75.57
HL-60(TB)	113.63
K-562	65.72
MOLT-4	88.33
RPMI-8226	53.70
SR	87.67
Non-Small Cell Lung Cancer	
A549/ATCC	93.37
EKVX	93.81
HOP-62	70.45
NCI-H226	83.95
NCI-H23	74.87
NCI-H322M	91.79
NCI-H460	88.76
NCI-H522	60.43
Colon Cancer	
COLO 205	89.61
HCC-2998	91.84
HCT-116	78.51
HCT-15	111.30
HT29	84.15
KM12	65.81
SW-620	90.60
CNS Cancer	
SF-268	39.23
SF-295	69.30
SF-539	49.81
SNB-19	33.62
SNB-75	60.43
U251	25.19
Melanoma	
LOX IMVI	96.43
MALME-3M	35.17
M14	81.25
MDA-MB-435	104.20
SK-MEL-2	101.00
SK-MEL-28	76.26
SK-MEL-5	14.31
UACC-257	65.46
UACC-62	70.59
Ovarian Cancer	
IGROV1	83.19
OVCAR-3	80.52
OVCAR-5	94.03
OVCAR-8	70.70
NCI/ADR-RES	105.28
SK-OV-3	100.25
Renal Cancer	
786-0	86.28
A498	97.43
ACHN	96.51
CAKI-1	93.82
RXF 393	103.12
SN12C	19.33
TK-10	98.29
UO-31	82.46
Prostate Cancer	
PC-3	61.28
DU-145	111.09
Breast Cancer	
MCF7	65.40
MDA-MB-231/ATCC	92.23
HS 578T	77.29
BT-549	26.11
T-47D	54.57
MDA-MB-468	14.33
Mean	75.68
Delta	61.37
Range	99.32



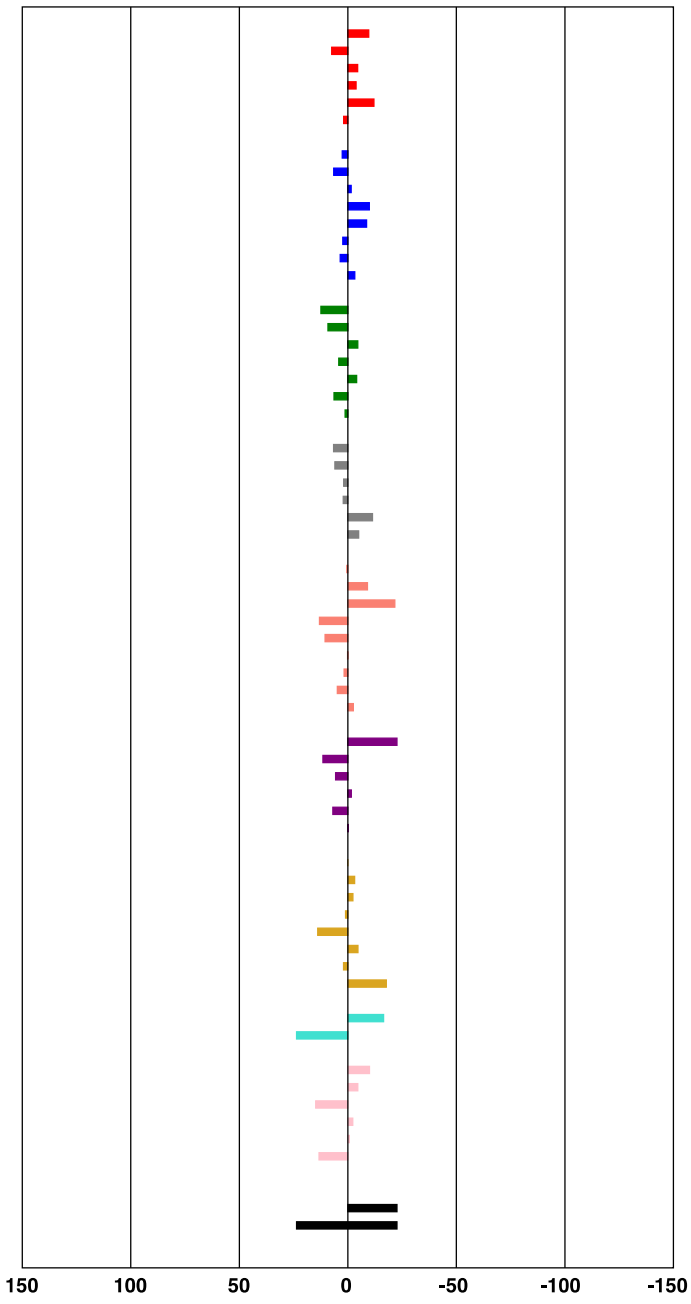
2-(5'-Carboxypentyl)isoellipticinium bromide **20**

Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-754622 / 1	Conc: 1.00E-5 Molar	Test Date: Oct 18, 2010
Experiment ID: 1010OS37		Report Date: Nov 17, 2010

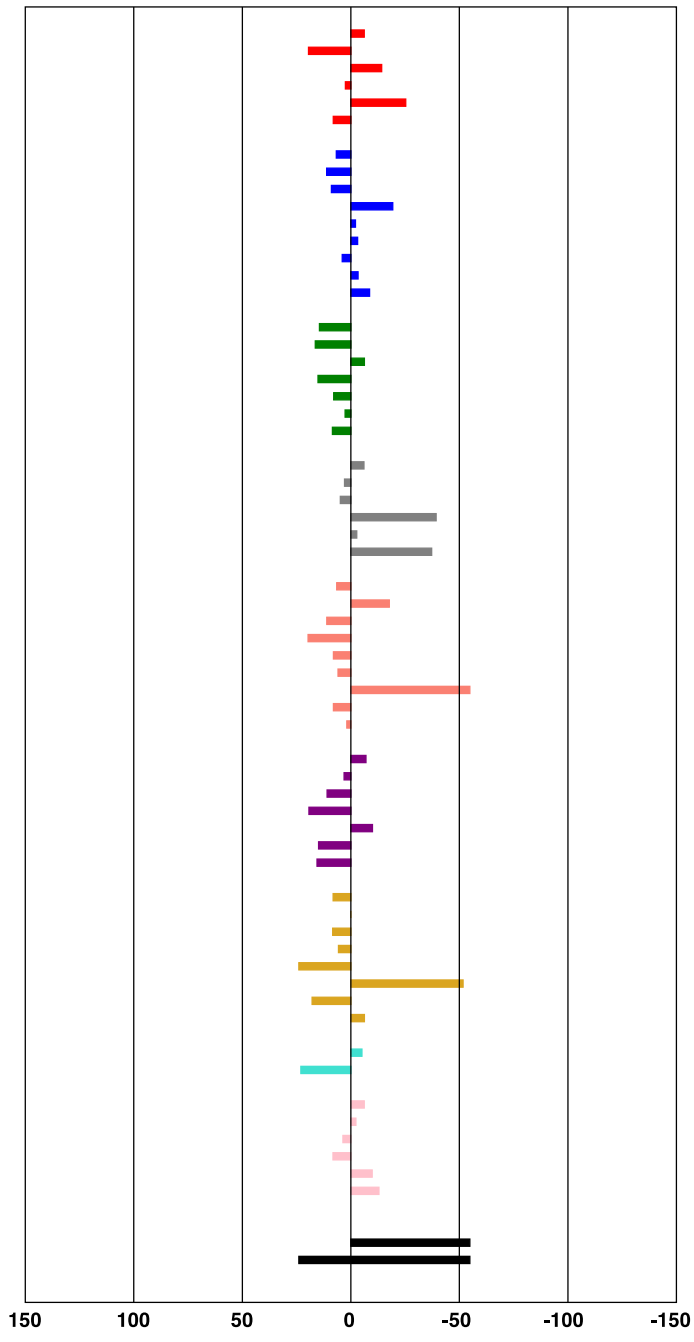
Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	90.15
HL-60(TB)	107.20
K-562	95.28
MOLT-4	95.98
RPMI-8226	87.76
SR	101.72
Non-Small Cell Lung Cancer	
A549/ATCC	102.38
EKVX	106.30
HOP-62	98.26
NCI-H226	89.86
NCI-H23	91.14
NCI-H322M	102.08
NCI-H460	103.29
NCI-H522	96.59
Colon Cancer	
COLO 205	112.17
HCC-2998	108.93
HCT-116	95.18
HCT-15	103.96
HT29	95.73
KM12	106.12
SW-620	101.01
CNS Cancer	
SF-268	106.32
SF-295	105.75
SF-539	101.73
SNB-19	101.89
SNB-75	88.45
U251	94.79
Melanoma	
LOX IMVI	100.21
MALME-3M	90.74
M14	78.15
MDA-MB-435	112.88
SK-MEL-2	110.28
SK-MEL-28	99.94
SK-MEL-5	101.50
UACC-257	104.61
UACC-62	97.26
Ovarian Cancer	
IGROV1	77.15
OVCAR-3	111.24
OVCAR-5	105.43
OVCAR-8	98.19
NCI/ADR-RES	106.71
SK-OV-3	99.61
Renal Cancer	
786-0	99.81
A498	96.69
ACHN	97.47
CAKI-1	100.84
RXF 393	113.66
SN12C	95.12
TK-10	101.77
UO-31	82.03
Prostate Cancer	
PC-3	83.33
DU-145	123.41
Breast Cancer	
MCF7	89.79
MDA-MB-231/ATCC	95.19
HS 578T	114.57
BT-549	97.49
T-47D	99.10
MDA-MB-468	113.02
Mean	99.78
Delta	22.63
Range	46.26



2-(6'-Carboxamidohexyl)isoellipticinium bromide **21**

Developmental Therapeutics Program	NSC: D-754624 / 1	Conc: 1.00E-5 Molar	Test Date: Oct 18, 2010
One Dose Mean Graph	Experiment ID: 1010OS37		Report Date: Nov 17, 2010

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	85.51
HL-60(TB)	111.22
K-562	77.44
MOLT-4	94.20
RPMI-8226	66.41
SR	99.78
Non-Small Cell Lung Cancer	
A549/ATCC	98.38
EKVX	102.85
HOP-62	100.61
HOP-92	72.39
NCI-H226	89.54
NCI-H23	88.54
NCI-H322M	95.67
NCI-H460	88.34
NCI-H522	83.02
Colon Cancer	
COLO 205	106.14
HCC-2998	108.09
HCT-116	85.41
HCT-15	106.80
HT29	99.57
KM12	94.31
SW-620	100.18
CNS Cancer	
SF-268	85.66
SF-295	94.57
SF-539	96.54
SNB-19	52.38
SNB-75	88.96
U251	54.43
Melanoma	
LOX IMVI	98.21
MALME-3M	73.97
M14	102.75
MDA-MB-435	111.41
SK-MEL-2	99.69
SK-MEL-28	97.55
SK-MEL-5	36.83
UACC-257	99.70
UACC-62	93.51
Ovarian Cancer	
IGROV1	84.72
OVCAR-3	94.81
OVCAR-4	102.65
OVCAR-5	110.97
OVCAR-8	81.69
NCI/ADR-RES	106.52
SK-OV-3	107.29
Renal Cancer	
786-0	99.85
A498	91.68
ACHN	100.01
CAKI-1	97.39
RXF 393	115.66
SN12C	40.00
TK-10	109.52
UO-31	85.42
Prostate Cancer	
PC-3	86.58
DU-145	114.72
Breast Cancer	
MCF7	85.49
MDA-MB-231/ATCC	89.35
HS 578T	95.30
BT-549	99.89
T-47D	81.86
MDA-MB-468	78.71
Mean	91.68
Delta	54.85
Range	78.83



2-(5'-Carboxypentyl)-7-formylisoellipticinium bromide **23**

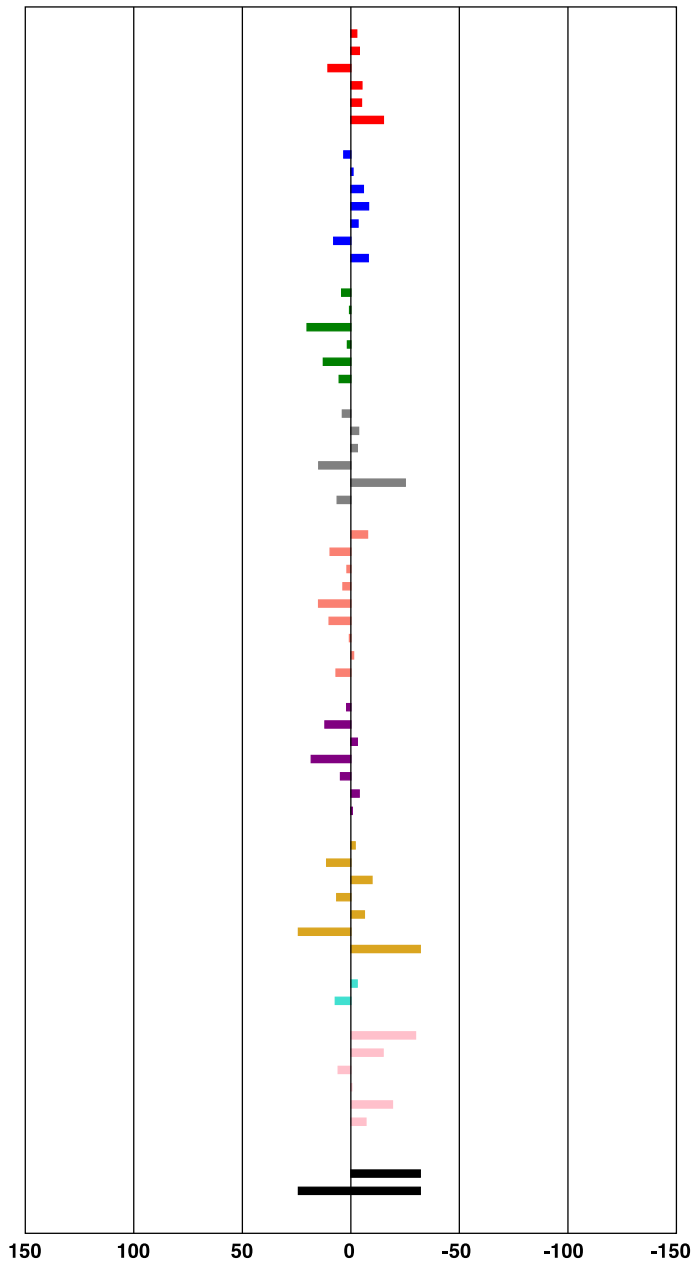
Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-762135 / 1 **Conc:** 1.00E-5 Molar **Test Date:** Nov 07, 2011

Experiment ID: 1111OS59 **Report Date:** Dec 01, 2011

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	93.17
HL-60(TB)	91.92
K-562	106.40
MOLT-4	90.74
RPMI-8226	90.97
SR	80.86
Non-Small Cell Lung Cancer	
A549/ATCC	99.09
EKVX	94.87
HOP-62	90.08
NCI-H226	87.71
NCI-H23	92.58
NCI-H460	103.76
NCI-H522	87.83
Colon Cancer	
HCC-2998	100.10
HCT-116	96.46
HCT-15	116.06
HT29	97.43
KM12	108.54
SW-620	101.21
CNS Cancer	
SF-268	99.81
SF-295	92.31
SF-539	92.85
SNB-19	110.64
SNB-75	70.76
U251	102.15
Melanoma	
LOX IMVI	88.16
MALME-3M	105.43
M14	97.65
MDA-MB-435	99.50
SK-MEL-2	110.71
SK-MEL-28	105.92
SK-MEL-5	96.55
UACC-257	94.61
UACC-62	102.68
Ovarian Cancer	
IGROV1	97.81
OVCAR-3	107.81
OVCAR-4	92.89
OVCAR-5	114.09
OVCAR-8	100.63
NCI/ADR-RES	92.00
SK-OV-3	95.18
Renal Cancer	
A498	93.90
ACHN	107.00
CAKI-1	86.09
RXF 393	102.37
SN12C	89.64
TK-10	120.02
UO-31	63.90
Prostate Cancer	
PC-3	92.96
DU-145	103.01
Breast Cancer	
MCF7	66.07
MDA-MB-231/ATCC	80.97
HS 578T	101.69
BT-549	95.46
T-47D	76.69
MDA-MB-468	88.92
Mean	95.87
Delta	31.97
Range	56.12



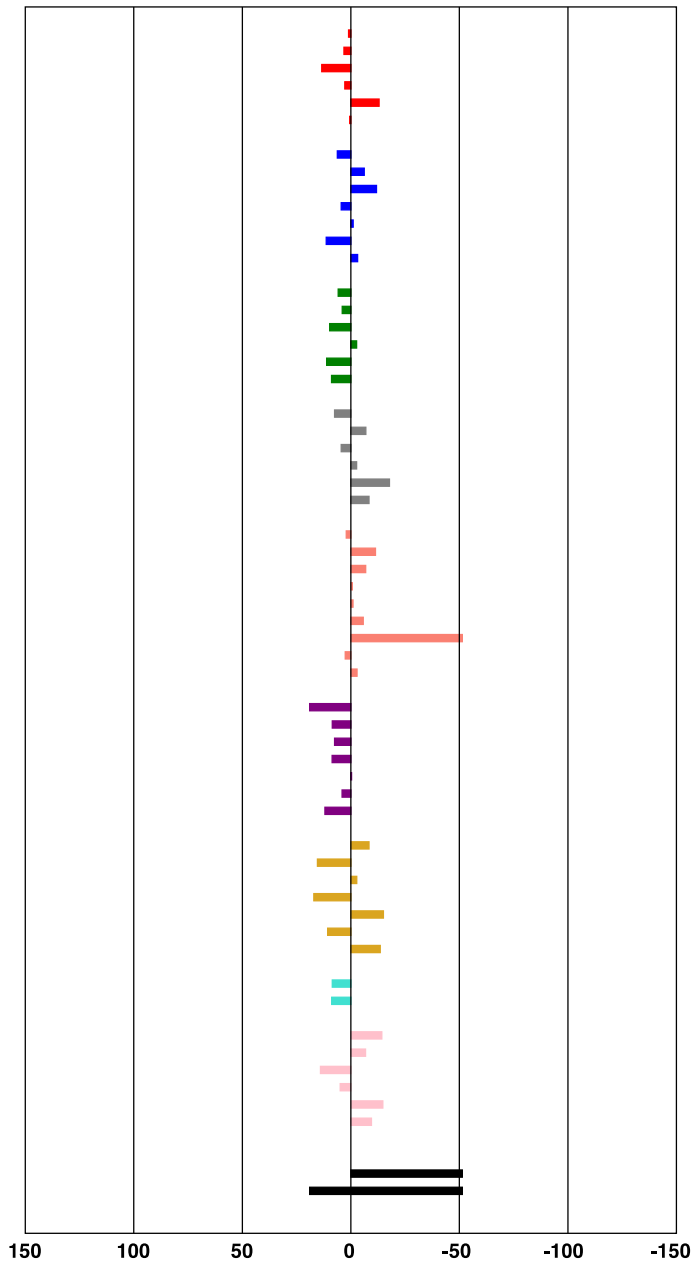
2-(5'-Cyanopentyl)-7-formylisoellipticinium bromide **24**

Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-762136 / 1	Conc: 1.00E-5 Molar	Test Date: Nov 07, 2011
Experiment ID: 1111OS59		Report Date: Dec 01, 2011

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	93.37
HL-60(TB)	95.55
K-562	105.73
MOLT-4	95.09
RPMI-8226	79.34
SR	92.89
Non-Small Cell Lung Cancer	
A549/ATCC	98.59
EKVX	86.19
HOP-62	80.52
NCI-H226	96.78
NCI-H23	91.26
NCI-H460	103.69
NCI-H522	89.23
Colon Cancer	
HCC-2998	98.16
HCT-116	96.32
HCT-15	102.12
HT29	89.71
KM12	103.47
SW-620	101.22
CNS Cancer	
SF-268	99.83
SF-295	85.41
SF-539	96.75
SNB-19	89.69
SNB-75	74.55
U251	83.95
Melanoma	
LOX IMVI	94.45
MALME-3M	81.01
M14	85.52
MDA-MB-435	91.67
SK-MEL-2	91.36
SK-MEL-28	86.61
SK-MEL-5	40.94
UACC-257	94.92
UACC-62	89.51
Ovarian Cancer	
IGROV1	111.29
OVCAR-3	100.87
OVCAR-4	99.85
OVCAR-5	100.98
OVCAR-8	92.00
NCI/ADR-RES	96.35
SK-OV-3	104.28
Renal Cancer	
A498	83.98
ACHN	107.71
CAKI-1	89.64
RXF 393	109.40
SN12C	77.33
TK-10	103.03
UO-31	78.76
Prostate Cancer	
PC-3	100.91
DU-145	101.18
Breast Cancer	
MCF7	78.05
MDA-MB-231/ATCC	85.56
HS 578T	106.36
BT-549	97.26
T-47D	77.62
MDA-MB-468	82.86
Mean	92.33
Delta	51.39
Range	70.35



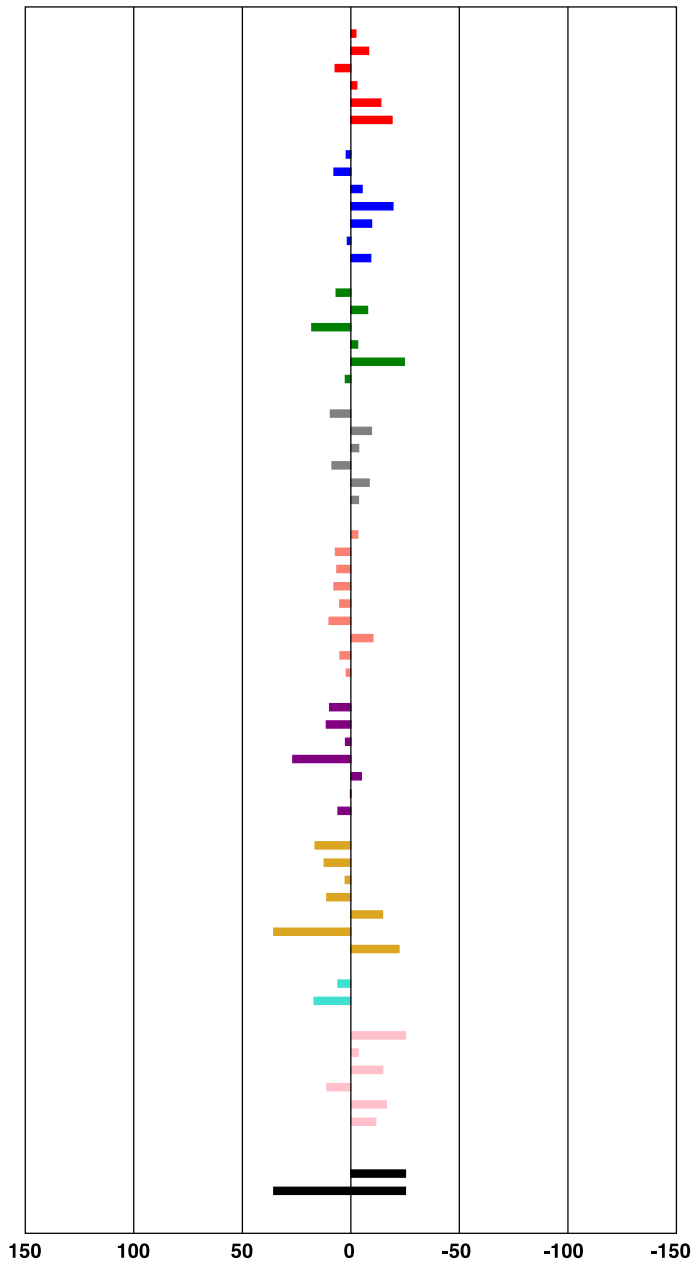
2-(6'-Carboxamidohexyl)-7-formylisoellipticinium bromide **25**

Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-762137 / 1	Conc: 1.00E-5 Molar	Test Date: Nov 07, 2011
Experiment ID: 1111OS59		Report Date: Dec 01, 2011

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	90.64
HL-60(TB)	84.82
K-562	100.19
MOLT-4	90.27
RPMI-8226	79.16
SR	74.00
Non-Small Cell Lung Cancer	
A549/ATCC	95.09
EKVX	100.78
HOP-62	87.81
NCI-H226	73.59
NCI-H23	83.45
NCI-H460	94.59
NCI-H522	83.83
Colon Cancer	
HCC-2998	99.74
HCT-116	85.26
HCT-15	110.99
HT29	89.89
KM12	68.33
SW-620	95.53
CNS Cancer	
SF-268	102.44
SF-295	83.49
SF-539	89.42
SNB-19	101.69
SNB-75	84.53
U251	89.44
Melanoma	
LOX IMVI	89.79
MALME-3M	100.10
M14	99.42
MDA-MB-435	100.76
SK-MEL-2	98.07
SK-MEL-28	103.02
SK-MEL-5	82.80
UACC-257	97.99
UACC-62	95.10
Ovarian Cancer	
IGROV1	102.76
OVCAR-3	104.26
OVCAR-4	95.47
OVCAR-5	119.73
OVCAR-8	88.12
NCI/ADR-RES	93.17
SK-OV-3	98.87
Renal Cancer	
A498	109.44
ACHN	105.27
CAKI-1	95.58
RXF 393	104.10
SN12C	78.36
TK-10	128.46
UO-31	70.81
Prostate Cancer	
PC-3	98.93
DU-145	109.93
Breast Cancer	
MCF7	67.80
MDA-MB-231/ATCC	89.65
HS 578T	78.32
BT-549	104.01
T-47D	76.69
MDA-MB-468	81.51
Mean	92.99
Delta	25.19
Range	60.66



7-Formyl-N^2-(6'-methylsulfonamido-6'-oxohexyl)isoellipticinium bromide **26**

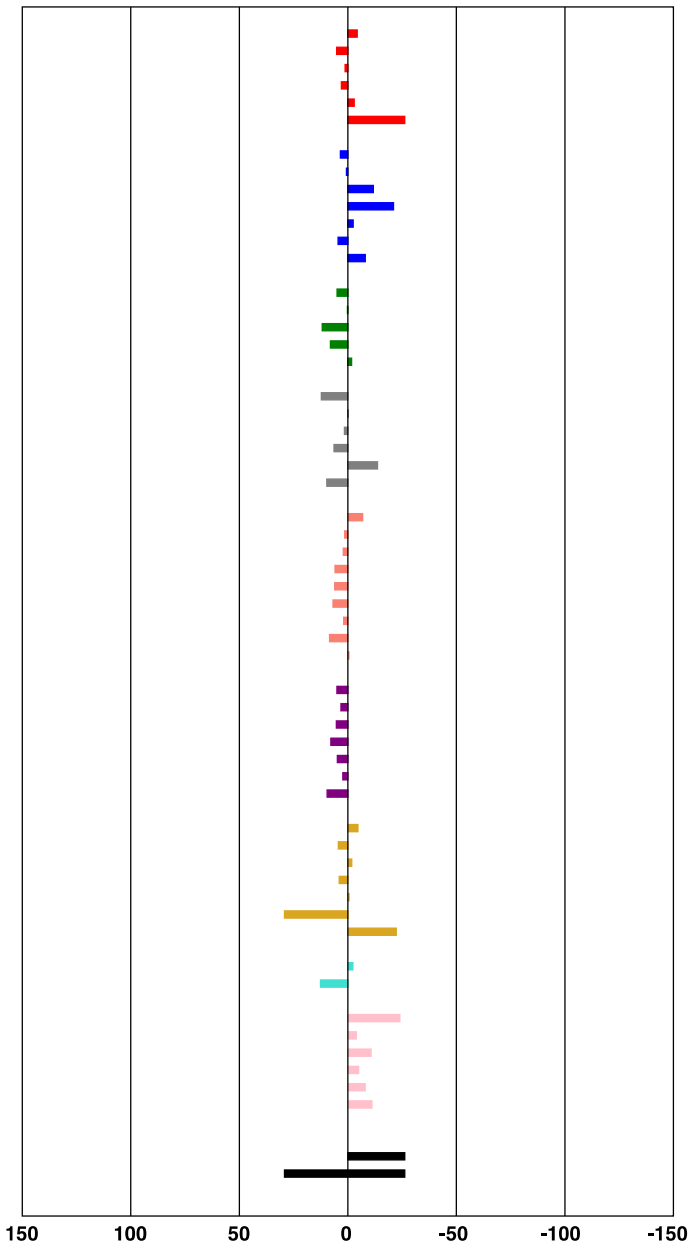
Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-762138 / 1	Conc: 1.00E-5 Molar	Test Date: Nov 07, 2011
Experiment ID: 1111OS59		Report Date: Dec 01, 2011

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	91.12
HL-60(TB)	100.57
K-562	96.68
MOLT-4	98.38
RPMI-8226	92.52
SR	69.21
Non-Small Cell Lung Cancer	
A549/ATCC	98.91
EKVX	96.10
HOP-62	83.69
NCI-H226	74.37
NCI-H23	92.99
NCI-H460	99.95
NCI-H522	87.38
Colon Cancer	
HCC-2998	100.43
HCT-116	95.64
HCT-15	107.21
HT29	103.45
SW-620	93.71
CNS Cancer	
SF-268	107.63
SF-295	95.20
SF-539	97.02
SNB-19	101.83
SNB-75	81.73
U251	105.13
Melanoma	
LOX IMVI	88.59
MALME-3M	96.90
M14	97.52
MDA-MB-435	101.33
SK-MEL-2	101.44
SK-MEL-28	102.24
SK-MEL-5	97.34
UACC-257	103.87
UACC-62	94.94
Ovarian Cancer	
IGROV1	100.49
OVCAR-3	98.61
OVCAR-4	100.73
OVCAR-5	103.28
OVCAR-8	100.28
NCI/ADR-RES	97.72
SK-OV-3	104.98
Renal Cancer	
A498	90.79
ACHN	99.80
CAKI-1	93.66
RXF 393	99.41
SN12C	94.89
TK-10	124.63
UO-31	73.13
Prostate Cancer	
PC-3	93.09
DU-145	108.06
Breast Cancer	
MCF7	71.44
MDA-MB-231/ATCC	91.51
HS 578T	84.73
BT-549	90.44
T-47D	87.47
MDA-MB-468	84.35
Mean	95.43
Delta	26.22
Range	55.42

Mean Growth Percent - Growth Percent



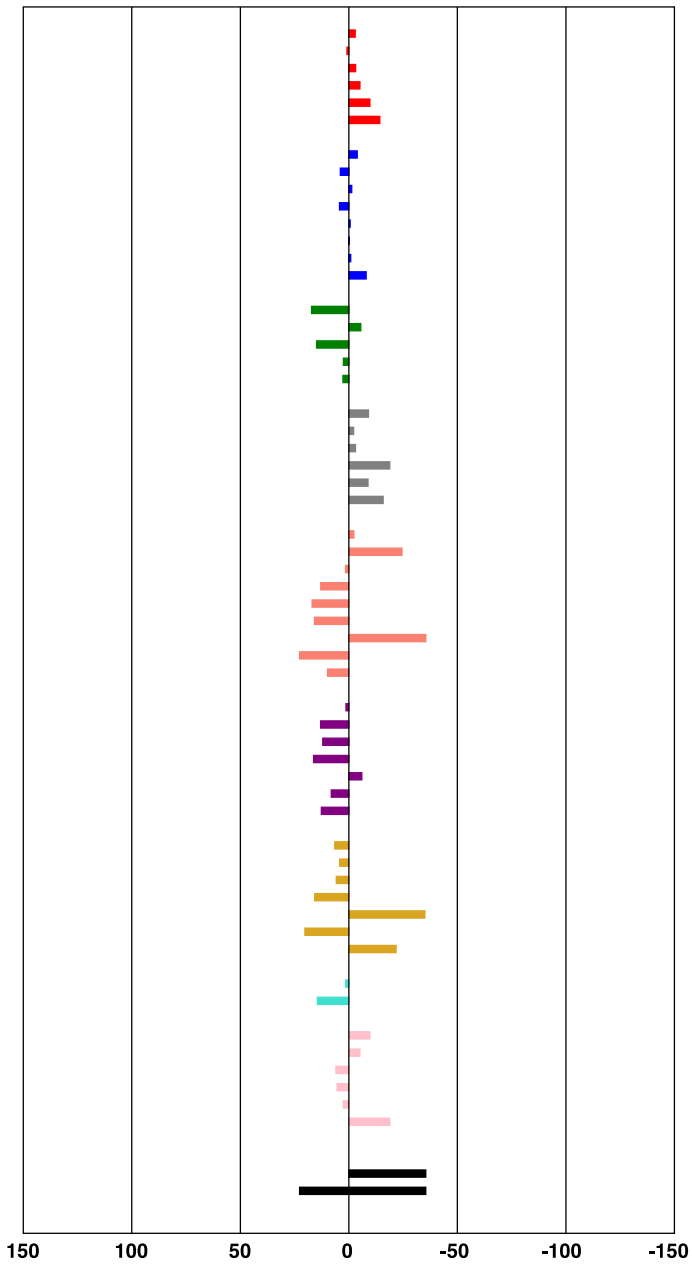
2-(5'-Cyanopentyl)-7-hydroxyisoellipticinium bromide **28**

Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-762117 / 1	Conc: 1.00E-5 Molar	Test Date: Nov 07, 2011
Experiment ID: 1111OS59		Report Date: Dec 01, 2011

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	86.63
HL-60(TB)	90.36
K-562	86.39
MOLT-4	84.43
RPMI-8226	79.80
SR	75.26
Non-Small Cell Lung Cancer	
A549/ATCC	85.65
EKVX	93.43
HOP-62	88.19
HOP-92	93.86
NCI-H226	88.93
NCI-H23	89.35
NCI-H460	88.63
NCI-H522	81.57
Colon Cancer	
HCC-2998	106.73
HCT-116	84.04
HCT-15	104.40
HT29	92.05
SW-620	92.23
CNS Cancer	
SF-268	80.50
SF-295	87.30
SF-539	86.45
SNB-19	70.69
SNB-75	80.67
U251	73.73
Melanoma	
LOX IMVI	87.21
MALME-3M	65.06
M14	91.08
MDA-MB-435	102.49
SK-MEL-2	106.44
SK-MEL-28	105.38
SK-MEL-5	54.09
UACC-257	112.24
UACC-62	99.33
Ovarian Cancer	
IGROV1	90.84
OVCAR-3	102.53
OVCAR-4	101.52
OVCAR-5	105.76
OVCAR-8	83.57
NCI/ADR-RES	97.65
SK-OV-3	102.22
Renal Cancer	
A498	96.03
ACHN	93.80
CAKI-1	95.29
RXF 393	105.26
SN12C	54.51
TK-10	109.73
UO-31	67.73
Prostate Cancer	
PC-3	90.89
DU-145	103.98
Breast Cancer	
MCF7	79.81
MDA-MB-231/ATCC	84.38
HS 578T	95.48
BT-549	94.96
T-47D	92.04
MDA-MB-468	70.69
Mean	89.52
Delta	35.43
Range	58.15



2-(6'-Carboxamidohexyl)-7-hydroxyisoellipticinium bromide **29**

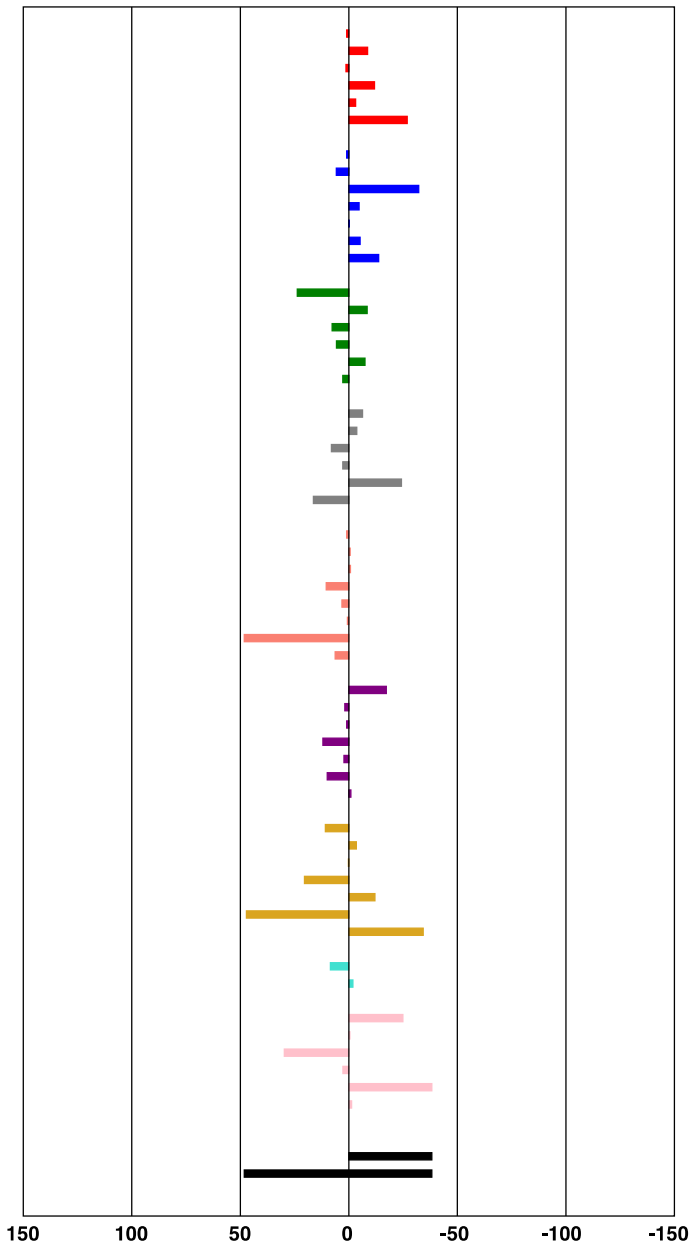
Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-762118 / 1	Conc: 1.00E-5 Molar	Test Date: Nov 07, 2011
Experiment ID: 1111OS59		Report Date: Dec 01, 2011

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	96.77
HL-60(TB)	87.15
K-562	97.11
MOLT-4	83.94
RPMI-8226	92.66
SR	68.87
Non-Small Cell Lung Cancer	
A549/ATCC	96.76
EKVX	101.53
HOP-62	63.59
NCI-H226	91.08
NCI-H23	95.73
NCI-H460	90.62
NCI-H522	82.03
Colon Cancer	
HCC-2998	119.54
HCT-116	87.38
HCT-15	103.48
HT29	101.47
KM12	88.33
SW-620	98.57
CNS Cancer	
SF-268	89.48
SF-295	92.10
SF-539	103.81
SNB-19	98.55
SNB-75	71.56
U251	112.09
Melanoma	
LOX IMVI	96.79
MALME-3M	95.16
M14	95.03
MDA-MB-435	106.19
SK-MEL-28	98.96
SK-MEL-5	96.43
UACC-257	143.96
UACC-62	102.09
Ovarian Cancer	
IGROV1	78.50
OVCAR-3	97.61
OVCAR-4	96.76
OVCAR-5	107.72
OVCAR-8	98.02
NCI/ADR-RES	105.75
SK-OV-3	94.86
Renal Cancer	
A498	106.59
ACHN	92.31
CAKI-1	95.99
RXF 393	116.20
SN12C	83.75
TK-10	142.94
UO-31	61.51
Prostate Cancer	
PC-3	104.27
DU-145	93.89
Breast Cancer	
MCF7	70.89
MDA-MB-231/ATCC	95.32
HS 578T	125.53
BT-549	98.47
T-47D	57.56
MDA-MB-468	94.50
Mean	95.78
Delta	38.22
Range	86.40

Mean Growth Percent - Growth Percent



7-Hydroxy-N^2-(6'-methylsulfonamido-6-oxohexyl)isoellipticinium bromide **30**

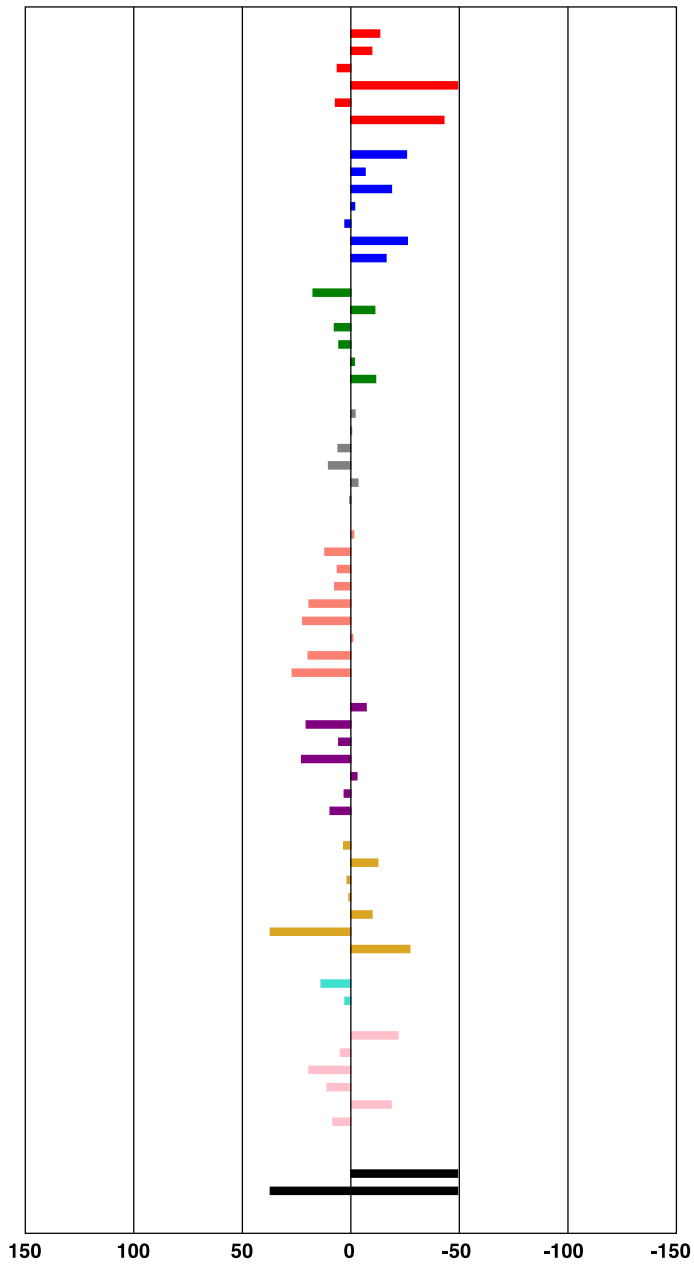
Developmental Therapeutics Program

One Dose Mean Graph

NSC: D-762119 / 1 | **Conc:** 1.00E-5 Molar | **Test Date:** Nov 07, 2011

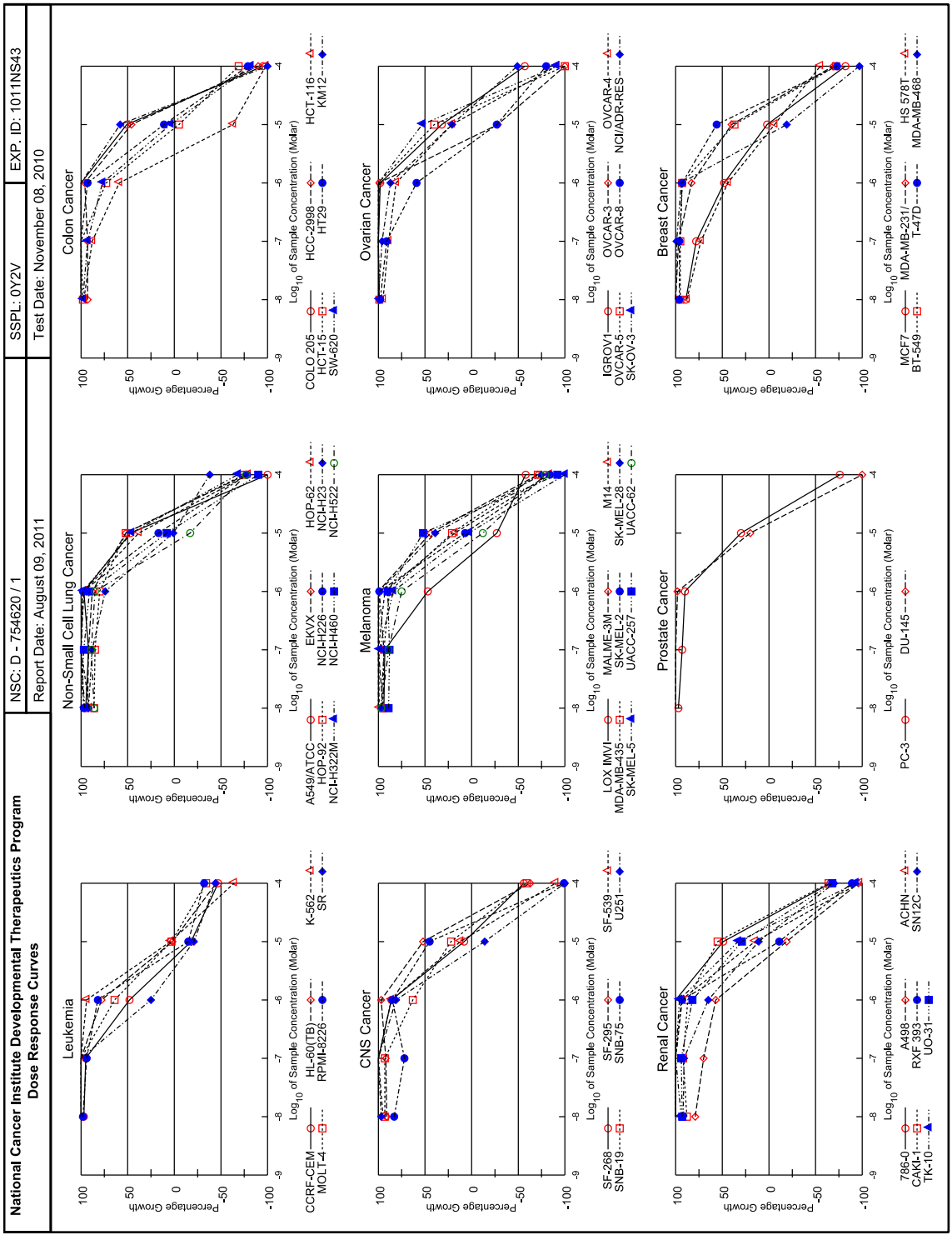
Experiment ID: 1111OS59 | **Report Date:** Dec 01, 2011

Panel/Cell Line	Growth Percent
Leukemia	
CCRF-CEM	71.32
HL-60(TB)	74.98
K-562	90.84
MOLT-4	35.39
RPMI-8226	91.66
SR	41.69
Non-Small Cell Lung Cancer	
A549/ATCC	58.99
EKVX	77.99
HOP-62	65.86
NCI-H226	82.87
NCI-H23	87.30
NCI-H460	58.59
NCI-H522	68.40
Colon Cancer	
HCC-2998	101.98
HCT-116	73.59
HCT-15	92.11
HT29	90.06
KM12	82.95
SW-620	73.13
CNS Cancer	
SF-268	82.63
SF-295	84.23
SF-539	90.46
SNB-19	94.89
SNB-75	81.32
U251	85.01
Melanoma	
LOX IMVI	83.26
MALME-3M	96.50
M14	90.80
MDA-MB-435	91.99
SK-MEL-2	103.80
SK-MEL-28	106.76
SK-MEL-5	83.70
UACC-257	104.19
UACC-62	111.57
Ovarian Cancer	
IGROV1	77.56
OVCAR-3	105.14
OVCAR-4	90.14
OVCAR-5	107.29
OVCAR-8	81.80
NCI/ADR-RES	87.65
SK-OV-3	94.14
Renal Cancer	
A498	87.87
ACHN	72.15
CAKI-1	86.28
RXF 393	85.43
SN12C	74.82
TK-10	121.66
UO-31	57.42
Prostate Cancer	
PC-3	98.31
DU-145	87.28
Breast Cancer	
MCF7	62.88
MDA-MB-231/ATCC	89.43
HS 578T	103.88
BT-549	95.53
T-47D	65.97
MDA-MB-468	92.87
Mean	84.58
Delta	49.19
Range	86.27



5. NCI 60- cell line screen: five-dose data

5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6**



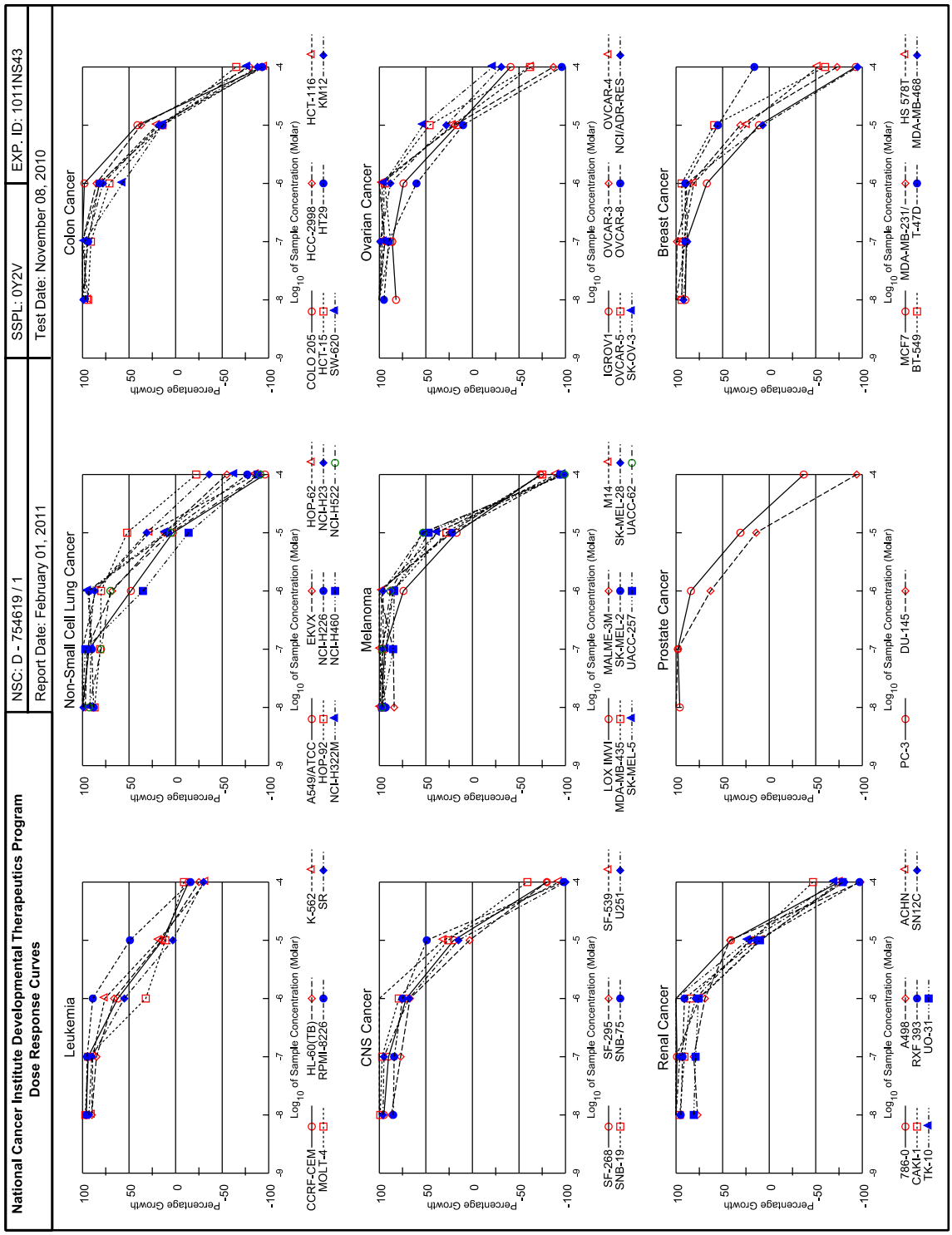
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazole-7-carbaldehyde **6**

National Cancer Institute Developmental Therapeutics Program
In-Vitro Testing Results

NSC : D - 754620 / 1	Experiment ID : 1011NS43	Test Type : 08	Units : Molar
Report Date : August 09, 2011	Test Date : November 08, 2010	QNS :	MC :
COMI : CM-3-214-5 (98578)	Stain Reagent : SRB Dual-Pass Related	SSPL : 0Y2V	

			Log10 Concentration												
	Time		Mean Optical Densities					Percent Growth							
Panel/Cell Line	Zero	Ctrl	-8.0	-7.0	-6.0	-5.0	-4.0	-8.0	-7.0	-6.0	-5.0	-4.0	GI50	TGI	LC50
Leukemia															
CCRF-CEM	0.564	2.353	2.305	2.267	1.417	0.465	0.298	97	95	48	-18	-47	8.94E-7	5.38E-6	> 1.00E-4
HL-60(TB)	0.664	2.187	2.403	2.475	1.846	0.696	0.367	114	119	78	2	-45	2.32E-6	1.11E-5	> 1.00E-4
K-562	0.166	1.173	1.190	1.173	1.116	0.203	0.060	102	100	94	4	-64	3.08E-6	1.13E-5	6.23E-5
MOLT-4	0.546	1.978	2.047	2.131	1.460	0.591	0.359	105	111	64	3	-34	1.69E-6	1.21E-5	> 1.00E-4
RPMI-8226	1.152	2.873	2.842	2.779	2.556	0.980	0.782	98	94	82	-15	-32	2.12E-6	7.00E-6	> 1.00E-4
SR	0.382	1.759	1.772	1.830	0.725	0.302	0.215	101	105	25	-21	-44	4.87E-7	3.49E-6	> 1.00E-4
Non-Small Cell Lung Cancer															
A549/ATCC	0.317	1.376	1.322	1.294	1.349	0.816	-0.022	95	92	97	47	-100	8.76E-6	2.09E-5	4.57E-5
EKVX	0.655	1.604	1.540	1.528	1.487	1.151	0.152	93	92	88	52	-77	1.04E-5	2.54E-5	6.20E-5
HOP-62	0.492	1.553	1.453	1.610	1.517	0.891	0.102	91	105	97	38	-79	6.17E-6	2.10E-5	5.61E-5
HOP-92	0.992	1.420	1.360	1.356	1.336	1.215	0.249	86	85	80	52	-75	1.04E-5	2.57E-5	6.36E-5
NCI-H226	0.666	1.352	1.330	1.361	1.339	0.782	0.146	97	101	98	17	-78	3.91E-6	1.51E-5	5.06E-5
NCI-H23	0.636	1.907	1.802	1.758	1.572	0.650	0.393	92	88	74	1	-38	2.12E-6	1.07E-5	> 1.00E-4
NCI-H322M	0.668	1.386	1.356	1.434	1.370	0.998	0.214	96	107	98	46	-68	8.35E-6	2.53E-5	6.95E-5
NCI-H460	0.257	2.051	2.097	1.993	1.888	0.395	0.026	103	97	91	8	-90	3.10E-6	1.20E-5	3.90E-5
NCI-H522	0.577	1.287	1.186	1.208	1.181	0.477	0.132	86	89	85	-17	-77	2.20E-6	6.76E-6	3.51E-5
Colon Cancer															
COLO 205	0.282	1.111	1.138	1.196	1.152	0.703	0.016	103	110	105	51	-95	1.01E-5	2.24E-5	4.94E-5
HCC-2998	0.511	2.128	2.021	2.022	2.058	1.256	0.053	93	93	96	46	-90	8.33E-6	2.19E-5	5.10E-5
HCT-116	0.244	1.817	1.767	1.629	1.175	0.092	0.005	97	88	59	-63	-98	1.19E-6	3.06E-6	7.89E-6
HCT-15	0.247	1.416	1.390	1.421	1.102	0.234	0.076	98	100	73	-5	-69	1.97E-6	8.52E-6	4.99E-5
HT29	0.205	1.040	1.048	1.071	0.983	0.295	0.044	101	104	93	11	-79	3.34E-6	1.32E-5	4.77E-5
KM12	0.440	1.802	1.885	1.890	1.919	1.225	-0.033	106	106	109	58	-100	1.12E-5	2.32E-5	4.82E-5
SW-620	0.242	1.191	1.169	1.122	0.969	0.284	0.044	98	93	77	4	-82	2.34E-6	1.12E-5	4.26E-5
CNS Cancer															
SF-268	0.360	1.066	1.114	1.081	0.967	0.417	0.159	107	102	86	8	-56	2.90E-6	1.34E-5	8.10E-5
SF-295	0.799	2.626	2.461	2.487	2.568	1.758	0.294	91	92	97	52	-63	1.05E-5	2.84E-5	7.69E-5
SF-539	0.654	1.593	1.544	1.657	1.457	0.766	0.065	95	107	86	12	-90	3.04E-6	1.31E-5	4.05E-5
SNB-19	0.484	1.472	1.401	1.403	1.109	0.703	0.199	93	93	63	22	-59	2.10E-6	1.88E-5	7.77E-5
SNB-75	0.760	1.428	1.317	1.238	1.328	1.061	0.006	83	72	85	45	-99	7.51E-6	2.05E-5	4.56E-5
U251	0.337	1.189	1.166	1.192	1.028	0.290	-0.013	97	100	81	-14	-100	2.12E-6	7.13E-6	2.62E-5
Melanoma															
LOX IMVI	0.268	2.081	1.980	1.945	1.121	0.195	0.114	94	93	47	-27	-58	8.61E-7	4.30E-6	5.60E-5
MALME-3M	0.759	1.388	1.354	1.423	1.437	1.038	0.223	95	105	108	44	-71	8.12E-6	2.43E-5	6.61E-5
M14	0.350	1.272	1.266	1.280	1.210	0.517	0.059	99	101	93	18	-83	3.76E-6	1.51E-5	4.70E-5
MDA-MB-435	0.538	2.009	1.932	1.914	1.831	0.852	0.156	95	94	88	21	-71	3.71E-6	1.70E-5	5.92E-5
SK-MEL-2	0.749	1.343	1.351	1.386	1.335	0.788	0.122	101	107	99	7	-84	3.38E-6	1.18E-5	4.23E-5
SK-MEL-28	0.415	1.106	1.085	1.065	1.099	0.688	0.103	97	94	99	39	-75	6.65E-6	2.21E-5	6.02E-5
SK-MEL-5	0.562	1.927	1.950	1.919	1.710	0.601	-0.046	102	99	84	3	-100	2.63E-6	1.07E-5	3.26E-5
UACC-257	0.792	1.573	1.489	1.479	1.495	1.202	0.065	89	88	90	52	-92	1.04E-5	2.31E-5	5.13E-5
UACC-62	0.729	2.303	2.256	2.133	1.916	0.641	0.154	97	89	75	-12	-79	1.95E-6	7.27E-6	3.69E-5
Ovarian Cancer															
IGROV1	0.429	1.626	1.720	1.645	1.599	0.816	0.184	108	102	98	32	-57	5.36E-6	2.30E-5	8.33E-5
OVCAR-3	0.335	0.763	0.757	0.766	0.760	0.242	-0.028	99	101	99	-28	-100	2.44E-6	6.03E-6	2.02E-5
OVCAR-4	0.592	1.418	1.380	1.324	1.261	0.762	0.053	95	89	81	21	-91	3.25E-6	1.53E-5	4.29E-5
OVCAR-5	0.463	0.951	0.947	0.967	0.983	0.656	-0.005	99	103	107	40	-100	6.99E-6	1.92E-5	4.38E-5
OVCAR-8	0.399	1.383	1.365	1.291	0.982	0.293	0.079	98	91	59	-27	-80	1.28E-6	4.90E-6	2.73E-5
NCI/ADR-RES	0.525	1.857	1.869	1.800	1.688	0.799	0.268	101	96	87	21	-49	3.62E-6	1.97E-5	> 1.00E-4
SK-OV-3	0.714	1.710	1.695	1.735	1.781	1.240	0.067	99	103	107	53	-91	1.05E-5	2.33E-5	5.21E-5
Renal Cancer															
786-0	0.700	2.354	2.424	2.428	2.362	1.507	0.235	104	105	100	49	-66	9.47E-6	2.65E-5	7.20E-5
A498	1.273	1.890	1.764	1.705	1.628	1.035	0.049	79	70	57	-19	-96	1.25E-6	5.68E-6	2.53E-5
ACHN	0.366	1.345	1.388	1.374	1.287	0.512	0.013	104	103	94	15	-97	3.60E-6	1.36E-5	3.82E-5
CAKI-1	0.584	2.216	2.027	2.084	2.003	1.479	0.213	88	92	87	55	-64	1.10E-5	2.90E-5	7.67E-5
RXF 393	0.656	1.036	1.050	1.053	1.010	0.582	0.073	104	105	93	-11	-89	2.59E-6	7.79E-6	3.15E-5
SN12C	0.524	1.760	1.658	1.652	1.333	0.663	0.160	92	91	65	11	-70	1.93E-6	1.38E-5	5.73E-5
TK-10	0.588	1.078	1.050	1.102	1.061	0.748	0.040	94	105	96	33	-93	5.35E-6	1.82E-5	4.53E-5
UO-31	0.580	1.559	1.493	1.502	1.381	0.867	0.185	93	94	82	29	-68	4.04E-6	2.00E-5	6.51E-5
Prostate Cancer															
PC-3	0.561	2.009	1.970	1.907	1.858	1.001	0.135	97	93	90	30	-76	4.66E-6	1.93E-5	5.69E-5
DU-145	0.276	0.963	1.027	1.031	0.952	0.416	-0.060	109	110	98	20	-100	4.17E-6	1.48E-5	3.84E-5
Breast Cancer															
MCF7	0.402	1.696	1.553	1.414	1.027	0.428	0.071	89	78	48	2	-82	8.79E-7	1.06E-5	4.13E-5
MDA-MB-231/ATCC	0.461	1.013	1.050	0.999	0.917	0.682	0.144	107	97	83	40	-69	5.83E-6	2.33E-5	6.72E-5
HS 578T	0.967	1.462	1.401	1.327	1.185	0.909	0.433	88	73	44	-6	-55	6.20E-7	7.59E-6	7.82E-5
BT-549	0.632	1.356	1.318	1.320	1.303	0.900	0.177	95	95	93	37	-72	5.84E-6	2.18E-5	6.27E-5
T-47D	0.711	1.775	1.735	1.732	1.702	1.311	0.193	96	96	93	56	-73	1.12E-5	2.73E-5	6.66E-5
MDA-MB-468	0.501	0.811	0.816	0.808	0.791	0.406	0.014	102	99	94	-19	-97	2.44E-6	6.77E-6	2.49E-5

5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol **7**



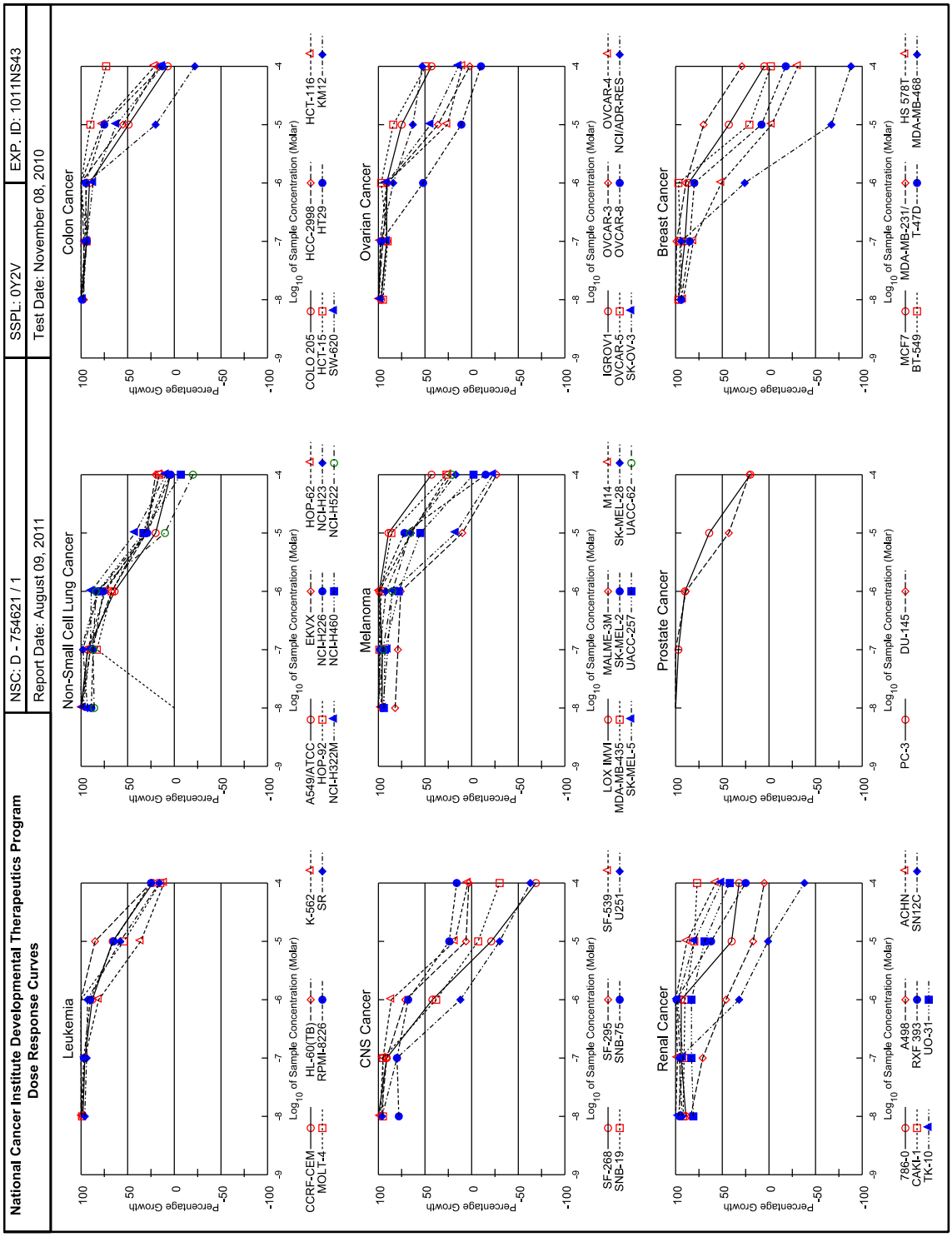
5,11-Dimethyl-10*H*-pyrido[3,4-*b*]carbazol-7-ol **7**

National Cancer Institute Developmental Therapeutics Program
In-Vitro Testing Results

NSC : D - 754619 / 1	Experiment ID : 1011NS43	Test Type : 08	Units : Molar
Report Date : February 01, 2011	Test Date : November 08, 2010	QNS :	MC :
COMI : CM-7-387-1 (98577)	Stain Reagent : SRB Dual-Pass Related	SSPL : 0Y2V	

		Log10 Concentration												
	Time	Mean Optical Densities						Percent Growth						
Panel/Cell Line	Zero	Ctrl	-8.0	-7.0	-6.0	-5.0	-4.0	-8.0	-7.0	-6.0	-5.0	-4.0	GI50	TGI	LC50
Leukemia															
CCRF-CEM	0.564	2.455	2.385	2.347	1.737	0.820	0.483	96	94	62	14	-14	1.77E-6	3.04E-5	> 1.00E-4
HL-60(TB)	0.664	2.487	2.301	2.214	1.874	0.947	0.495	90	85	66	15	-25	2.10E-6	2.39E-5	> 1.00E-4
K-562	0.166	1.187	1.087	1.074	0.945	0.350	0.113	90	89	76	18	-32	2.83E-6	2.28E-5	> 1.00E-4
MOLT-4	0.546	2.041	2.000	1.956	1.027	0.714	0.498	97	94	32	11	-9	5.17E-7	3.62E-5	> 1.00E-4
RPMI-8226	1.152	2.976	2.896	2.888	2.771	2.037	0.966	96	95	89	49	-16	9.19E-6	5.63E-5	> 1.00E-4
SR	0.382	1.808	1.714	1.667	1.170	0.423	0.266	93	90	55	3	-30	1.26E-6	1.22E-5	> 1.00E-4
Non-Small Cell Lung Cancer															
A549/ATCC	0.317	1.370	1.407	1.299	0.819	0.349	0.013	104	93	48	3	-96	8.88E-7	1.07E-5	3.43E-5
EKVX	0.655	1.496	1.474	1.451	1.228	0.755	0.292	97	95	68	12	-55	2.10E-6	1.50E-5	8.29E-5
HOP-62	0.492	1.439	1.453	1.493	1.303	0.758	0.070	101	106	86	28	-86	4.15E-6	1.76E-5	4.85E-5
HOP-92	0.992	1.436	1.379	1.350	1.349	1.225	0.771	87	81	80	52	-22	1.08E-5	5.03E-5	> 1.00E-4
NCI-H226	0.666	1.373	1.286	1.305	1.323	0.723	0.154	88	90	93	8	-77	3.20E-6	1.24E-5	4.82E-5
NCI-H23	0.636	1.877	1.868	1.798	1.714	1.020	0.407	99	94	87	31	-36	4.57E-6	2.90E-5	> 1.00E-4
NCI-H322M	0.668	1.399	1.339	1.334	1.357	0.750	0.245	92	91	94	11	-63	3.41E-6	1.41E-5	6.61E-5
NCI-H460	0.257	1.970	2.010	1.920	0.852	0.220	0.032	102	97	35	-14	-88	5.69E-7	5.09E-6	3.06E-5
NCI-H522	0.577	1.238	1.189	1.103	1.041	0.610	0.053	93	80	70	5	-91	2.04E-6	1.13E-5	3.75E-5
Colon Cancer															
COLO 205	0.282	1.066	1.085	1.074	1.050	0.606	0.021	102	101	98	41	-93	7.03E-6	2.03E-5	4.80E-5
HCC-2998	0.511	1.999	2.086	2.052	1.769	1.056	0.102	106	104	85	37	-80	5.25E-6	2.06E-5	5.53E-5
HCT-116	0.244	1.814	1.725	1.843	1.518	0.565	0.012	94	102	81	20	-95	3.26E-6	1.50E-5	4.06E-5
HCT-15	0.247	1.432	1.363	1.325	1.093	0.411	0.088	94	91	71	14	-65	2.35E-6	1.50E-5	6.52E-5
HT29	0.205	1.031	1.049	0.980	0.883	0.317	0.015	102	94	82	14	-93	2.93E-6	1.34E-5	3.95E-5
KM12	0.440	1.866	1.859	1.788	1.558	0.695	0.053	99	95	78	18	-88	2.94E-6	1.47E-5	4.37E-5
SW-620	0.242	1.187	1.155	1.169	0.779	0.372	0.055	97	98	57	14	-77	1.44E-6	1.42E-5	5.02E-5
CNS Cancer															
SF-268	0.360	1.154	1.112	1.074	0.926	0.520	0.074	95	90	71	20	-80	2.60E-6	1.59E-5	5.05E-5
SF-295	0.799	2.465	2.254	2.084	1.909	0.841	0.163	87	77	67	3	-80	1.82E-6	1.07E-5	4.36E-5
SF-539	0.654	1.576	1.586	1.605	1.588	0.942	0.049	101	103	101	31	-93	5.39E-6	1.79E-5	4.53E-5
SNB-19	0.484	1.460	1.451	1.431	1.252	0.735	0.199	99	97	79	26	-59	3.47E-6	2.01E-5	7.85E-5
SNB-75	0.760	1.429	1.328	1.320	1.263	1.089	0.015	85	84	75	49	-98	9.33E-6	2.16E-5	4.72E-5
U251	0.337	1.185	1.153	1.142	0.916	0.465	-0.018	96	95	68	15	-100	2.20E-6	1.35E-5	3.68E-5
Melanoma															
LOX IMVI	0.268	1.931	1.892	1.827	1.507	0.559	0.072	98	94	74	17	-73	2.69E-6	1.56E-5	5.55E-5
MALME-3M	0.759	1.429	1.323	1.327	1.434	0.922	0.201	84	85	101	24	-74	4.61E-6	1.77E-5	5.75E-5
M14	0.350	1.281	1.270	1.276	1.258	0.701	0.037	99	99	97	38	-90	6.21E-6	1.98E-5	4.89E-5
MDA-MB-435	0.538	1.940	1.882	1.901	1.728	0.934	0.137	96	97	85	28	-75	4.13E-6	1.88E-5	5.77E-5
SK-MEL-2	0.749	1.342	1.302	1.339	1.365	0.877	0.044	93	100	104	22	-94	4.51E-6	1.53E-5	4.15E-5
SK-MEL-28	0.415	1.105	1.142	1.078	1.075	0.784	0.004	105	96	96	53	-99	1.05E-5	2.24E-5	4.77E-5
SK-MEL-5	0.562	1.994	1.934	1.890	1.773	1.105	0.016	96	93	85	38	-97	5.51E-6	1.91E-5	4.48E-5
UACC-257	0.792	1.538	1.519	1.425	1.417	1.142	0.044	97	85	84	47	-95	8.23E-6	2.15E-5	4.84E-5
UACC-62	0.729	2.360	2.307	2.313	2.158	1.600	0.006	97	97	88	53	-99	1.05E-5	2.24E-5	4.76E-5
Ovarian Cancer															
IGROV1	0.429	1.456	1.276	1.315	1.192	0.596	0.255	82	86	74	16	-41	2.62E-6	1.93E-5	> 1.00E-4
OVCAR-3	0.335	0.786	0.786	0.758	0.804	0.421	0.045	100	94	104	19	-87	4.33E-6	1.51E-5	4.50E-5
OVCAR-4	0.592	1.394	1.416	1.366	1.372	0.760	0.221	103	97	97	21	-63	4.16E-6	1.78E-5	7.05E-5
OVCAR-5	0.463	0.984	1.004	0.921	0.952	0.701	0.176	104	88	94	46	-62	8.12E-6	2.66E-5	7.74E-5
OVCAR-8	0.399	1.443	1.387	1.337	1.022	0.503	0.017	95	90	60	10	-96	1.57E-6	1.24E-5	3.69E-5
NCI/ADR-RES	0.525	1.755	1.793	1.746	1.610	0.875	0.362	103	99	88	28	-31	4.36E-6	3.01E-5	> 1.00E-4
SK-OV-3	0.714	1.666	1.705	1.619	1.615	1.217	0.558	104	95	95	53	-22	1.09E-5	5.10E-5	> 1.00E-4
Renal Cancer															
786-0	0.700	2.306	2.321	2.290	2.357	1.354	0.175	101	99	103	41	-75	7.10E-6	2.25E-5	6.07E-5
A498	1.273	2.081	1.896	1.925	1.831	1.609	0.029	77	81	69	42	-98	4.95E-6	1.99E-5	4.54E-5
ACHN	0.366	1.337	1.370	1.341	1.093	0.457	0.088	103	100	75	9	-76	2.40E-6	1.29E-5	4.95E-5
CAKI-1	0.584	2.057	2.001	1.929	1.842	0.866	0.307	96	91	85	19	-47	3.42E-6	1.94E-5	> 1.00E-4
RXF 393	0.656	1.053	1.034	1.025	1.018	0.707	0.023	95	93	91	13	-97	3.34E-6	1.31E-5	3.75E-5
SN12C	0.524	1.730	1.771	1.676	1.478	0.774	0.101	103	96	79	21	-81	3.15E-6	1.60E-5	4.98E-5
TK-10	0.588	1.007	1.006	1.015	1.031	0.686	0.178	100	102	106	23	-70	4.75E-6	1.78E-5	6.13E-5
UO-31	0.580	1.457	1.292	1.276	1.249	0.670	0.122	81	79	76	10	-79	2.50E-6	1.30E-5	4.73E-5
Prostate Cancer															
PC-3	0.561	1.970	1.920	1.937	1.738	0.993	0.356	96	98	84	31	-37	4.31E-6	2.86E-5	> 1.00E-4
DU-145	0.276	1.034	1.036	1.020	0.753	0.381	0.018	100	98	63	14	-94	1.83E-6	1.34E-5	3.92E-5
Breast Cancer															
MCF7	0.402	1.756	1.627	1.601	1.305	0.548	0.029	90	89	67	11	-93	1.99E-6	1.27E-5	3.86E-5
MDA-MB-231/ATCC	0.461	1.004	1.051	1.000	0.918	0.627	0.126	109	99	84	31	-73	4.34E-6	1.97E-5	6.02E-5
HS 578T	0.967	1.647	1.605	1.595	1.518	1.131	0.469	94	92	81	24	-52	3.50E-6	2.08E-5	9.54E-5
BT-549	0.632	1.338	1.297	1.289	1.295	1.048	0.250	94	93	94	59	-60	1.19E-5	3.12E-5	8.18E-5
T-47D	0.711	1.678	1.710	1.579	1.577	1.246	0.870	103	90	90	55	16	1.37E-5	> 1.00E-4	> 1.00E-4
MDA-MB-468	0.501	0.838	0.812	0.799	0.802	0.525	0.026	92	88	89	7	-95	3.01E-6	1.17E-5	3.63E-5

2-Methylisoellpticinium iodide **16**



Methylisoellpticinium iodide **16**

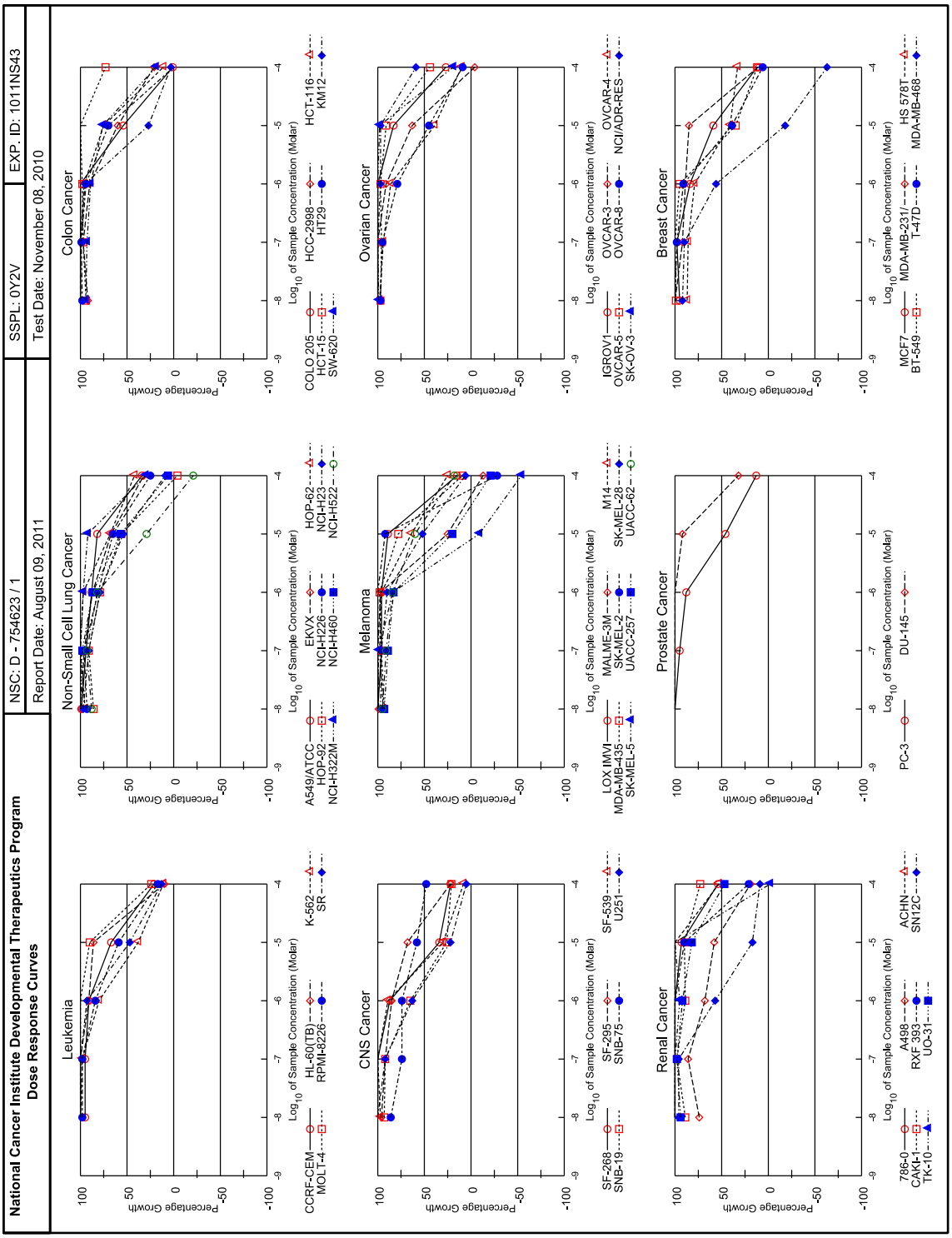
National Cancer Institute Developmental Therapeutics Program
In-Vitro Testing Results

NSC : D - 754621 / 1	Experiment ID : 1011NS43	Test Type : 08	Units : Molar
Report Date : August 09, 2011	Test Date : November 08, 2010	QNS :	MC :
COMI : CM-4-223-1 (98579)	Stain Reagent : SRB Dual-Pass Related	SSPL : 0Y2V	

Log10 Concentration

	Time	Mean Optical Densities						Percent Growth							
Panel/Cell Line	Zero	Ctrl	-8.0	-7.0	-6.0	-5.0	-4.0	-8.0	-7.0	-6.0	-5.0	-4.0	GI50	TGI	LC50
Leukemia															
CCRF-CEM	0.564	2.509	2.461	2.437	2.285	1.849	1.009	98	96	88	66	23	2.35E-5	> 1.00E-4	> 1.00E-4
HL-60(TB)	0.664	2.158	2.173	2.243	2.351	1.931	1.036	101	106	113	85	25	3.81E-5	> 1.00E-4	> 1.00E-4
K-562	0.166	1.170	1.157	1.133	0.977	0.527	0.276	99	96	81	36	11	4.87E-6	> 1.00E-4	> 1.00E-4
MOLT-4	0.546	2.028	2.010	2.027	2.040	1.346	0.764	99	100	101	54	15	1.26E-5	> 1.00E-4	> 1.00E-4
RPMI-8226	1.152	2.925	2.931	2.869	2.751	2.307	1.590	100	97	90	65	25	2.37E-5	> 1.00E-4	> 1.00E-4
SR	0.382	1.828	1.766	1.747	1.724	1.228	0.609	96	94	93	58	16	1.58E-5	> 1.00E-4	> 1.00E-4
Non-Small Cell Lung Cancer															
A549/ATCC	0.317	1.410	1.420	1.332	1.022	0.532	0.361	101	93	64	20	4	2.10E-6	> 1.00E-4	> 1.00E-4
EKVX	0.655	1.692	1.700	1.591	1.347	0.963	0.866	101	90	67	30	20	2.83E-6	> 1.00E-4	> 1.00E-4
HOP-62	0.492	1.804	1.792	1.713	1.468	0.903	0.704	99	93	74	31	16	3.68E-6	> 1.00E-4	> 1.00E-4
HOP-92	0.992	1.431	.	1.358	1.284	1.139	1.062	.	83	67	33	16	3.16E-6	> 1.00E-4	> 1.00E-4
NCI-H226	0.666	1.436	1.354	1.337	1.254	0.888	0.696	89	87	76	29	4	3.58E-6	> 1.00E-4	> 1.00E-4
NCI-H23	0.636	1.892	1.809	1.865	1.659	1.011	0.730	93	98	81	30	7	4.07E-6	> 1.00E-4	> 1.00E-4
NCI-H322M	0.668	1.470	1.451	1.393	1.384	1.002	0.739	98	90	89	42	9	6.68E-6	> 1.00E-4	> 1.00E-4
NCI-H460	0.257	2.065	2.113	2.056	1.731	0.857	0.240	103	100	82	33	-7	4.49E-6	6.82E-5	> 1.00E-4
NCI-H522	0.577	1.262	1.169	1.174	1.154	0.648	0.460	86	87	84	10	-20	2.91E-6	2.18E-5	> 1.00E-4
Colon Cancer															
COLO 205	0.282	1.164	1.184	1.113	1.082	0.712	0.348	102	94	91	49	7	9.32E-6	> 1.00E-4	> 1.00E-4
HCC-2998	0.511	2.129	2.084	2.073	2.138	1.409	0.793	97	97	101	55	17	1.39E-5	> 1.00E-4	> 1.00E-4
HCT-116	0.244	1.937	1.948	1.970	1.950	1.540	0.592	101	102	101	77	21	2.98E-5	> 1.00E-4	> 1.00E-4
HCT-15	0.247	1.561	1.558	1.482	1.573	1.430	1.205	100	94	101	90	73	> 1.00E-4	> 1.00E-4	> 1.00E-4
HT29	0.205	1.040	1.033	0.994	0.997	0.832	0.311	99	94	95	75	13	2.52E-5	> 1.00E-4	> 1.00E-4
KM12	0.440	1.945	1.943	1.881	1.856	0.749	0.343	100	96	94	20	-22	3.97E-6	3.03E-5	> 1.00E-4
SW-620	0.242	1.316	1.295	1.254	1.180	0.905	0.382	98	94	87	62	13	1.74E-5	> 1.00E-4	> 1.00E-4
CNS Cancer															
SF-268	0.360	1.180	1.179	1.106	0.701	0.284	0.112	100	91	42	-21	-69	6.76E-7	4.61E-6	4.02E-5
SF-295	0.799	2.734	2.684	2.556	2.175	0.920	0.864	97	91	71	6	3	2.11E-6	> 1.00E-4	> 1.00E-4
SF-539	0.654	1.781	1.754	1.720	1.621	0.856	0.699	98	95	86	18	4	3.37E-6	> 1.00E-4	> 1.00E-4
SNB-19	0.484	1.599	1.541	1.539	0.904	0.453	0.340	95	95	38	-7	-30	6.07E-7	7.12E-6	> 1.00E-4
SNB-75	0.760	1.461	1.307	1.319	1.237	0.929	0.869	78	80	68	24	16	2.58E-6	> 1.00E-4	> 1.00E-4
U251	0.337	1.281	1.242	1.093	0.449	0.237	0.124	96	80	12	-30	-63	2.76E-7	1.93E-6	4.02E-5
Melanoma															
LOX IMVI	0.268	2.004	1.943	1.932	1.992	1.808	1.007	96	96	99	89	43	6.89E-5	> 1.00E-4	> 1.00E-4
MALME-3M	0.759	1.452	1.330	1.309	1.287	0.828	0.552	82	79	76	10	-27	2.49E-6	1.85E-5	> 1.00E-4
M14	0.350	1.357	1.325	1.317	1.347	1.007	0.602	97	96	99	65	25	2.39E-5	> 1.00E-4	> 1.00E-4
MDA-MB-435	0.538	1.942	1.948	1.927	1.899	1.747	0.915	100	99	97	86	27	4.06E-5	> 1.00E-4	> 1.00E-4
SK-MEL-2	0.749	1.411	1.417	1.397	1.422	1.227	0.639	101	98	102	72	-15	1.80E-5	6.76E-5	> 1.00E-4
SK-MEL-28	0.415	1.139	1.163	1.123	1.081	0.889	0.537	103	98	92	65	17	2.08E-5	> 1.00E-4	> 1.00E-4
SK-MEL-5	0.562	2.031	1.960	1.885	1.811	0.805	0.431	95	90	85	17	-23	3.24E-6	2.60E-5	> 1.00E-4
UACC-257	0.792	1.517	1.471	1.469	1.356	1.191	0.774	94	93	78	55	-2	1.22E-5	9.11E-5	> 1.00E-4
UACC-62	0.729	2.494	2.525	2.406	2.225	1.894	1.101	102	95	85	66	21	2.27E-5	> 1.00E-4	> 1.00E-4
Ovarian Cancer															
IGROV1	0.429	1.621	1.590	1.514	1.518	1.327	0.940	97	91	91	75	43	6.02E-5	> 1.00E-4	> 1.00E-4
OVCAR-3	0.335	0.882	0.902	0.858	0.830	0.531	0.348	104	95	90	36	2	5.48E-6	> 1.00E-4	> 1.00E-4
OVCAR-4	0.592	1.402	1.390	1.389	1.328	0.802	0.671	99	98	91	26	10	4.25E-6	> 1.00E-4	> 1.00E-4
OVCAR-5	0.463	1.038	1.011	0.983	1.023	0.947	0.742	95	90	97	84	49	9.07E-5	> 1.00E-4	> 1.00E-4
OVCAR-8	0.399	1.407	1.483	1.382	0.924	0.509	0.361	108	97	52	11	-10	1.12E-6	3.39E-5	> 1.00E-4
NCI/ADR-RES	0.525	1.769	1.799	1.736	1.574	1.315	1.185	102	97	84	63	53	> 1.00E-4	> 1.00E-4	> 1.00E-4
SK-OV-3	0.714	1.709	1.685	1.622	1.615	1.149	0.849	98	91	91	44	14	7.32E-6	> 1.00E-4	> 1.00E-4
Renal Cancer															
786-0	0.700	2.362	2.181	2.270	2.263	1.368	1.234	89	94	94	40	32	6.57E-6	> 1.00E-4	> 1.00E-4
A498	1.273	1.924	1.822	1.738	1.571	1.387	1.304	84	71	46	17	5	6.83E-7	> 1.00E-4	> 1.00E-4
ACHN	0.366	1.437	1.467	1.419	1.468	1.304	0.977	103	98	103	88	57	> 1.00E-4	> 1.00E-4	> 1.00E-4
CAKI-1	0.584	2.095	1.978	1.953	1.939	1.789	1.742	92	91	90	80	77	> 1.00E-4	> 1.00E-4	> 1.00E-4
RXF 393	0.656	1.076	1.060	1.056	1.073	0.915	0.762	96	95	99	62	25	2.09E-5	> 1.00E-4	> 1.00E-4
SN12C	0.524	1.857	1.763	1.798	0.956	0.532	0.327	93	96	32	1	-38	5.26E-7	1.03E-5	> 1.00E-4
TK-10	0.588	1.085	1.071	1.045	1.075	0.985	0.844	97	92	98	80	51	> 1.00E-4	> 1.00E-4	> 1.00E-4
UO-31	0.580	1.623	1.430	1.446	1.444	1.299	1.019	81	83	83	69	42	5.07E-5	> 1.00E-4	> 1.00E-4
Prostate Cancer															
PC-3	0.561	2.032	2.033	1.986	1.892	1.503	0.859	100	97	90	64	20	2.09E-5	> 1.00E-4	> 1.00E-4
DU-145	0.276	1.022	1.049	1.069	0.943	0.598	0.433	104	106	89	43	21	7.09E-6	> 1.00E-4	> 1.00E-4
Breast Cancer															
MCF7	0.402	1.730	1.689	1.602	1.547	0.971	0.470	97	90	86	43	5	6.84E-6	> 1.00E-4	> 1.00E-4
MDA-MB-231/ATCC	0.461	1.119	1.153	1.112	1.048	0.924	0.651	105	99	89	70	29	3.09E-5	> 1.00E-4	> 1.00E-4
HS 578T	0.967	1.628	1.578	1.501	1.303	0.936	0.668	92	81	51	-3	-31	1.03E-6	8.70E-6	> 1.00E-4
BT-549	0.632	1.397	1.373	1.362	1.371	0.796	0.622	97	95	97	21	-2	4.16E-6	8.54E-5	> 1.00E-4
T-47D	0.711	1.737	1.675	1.587	1.532	0.792	0.582	94	85	80	8	-18	2.61E-6	2.00E-5	> 1.00E-4
MDA-MB-468	0.501	0.837	0.815	0.816	0.588	0.164	0.059	94	94	26	-67	-88	4.42E-7	1.90E-6	6.51E-6

2-(5'-Cyanopentyl)isoellipticinium bromide **19**



2-(5'-Cyanopentyl)isoellipticinium bromide **19**

National Cancer Institute Developmental Therapeutics Program
In-Vitro Testing Results

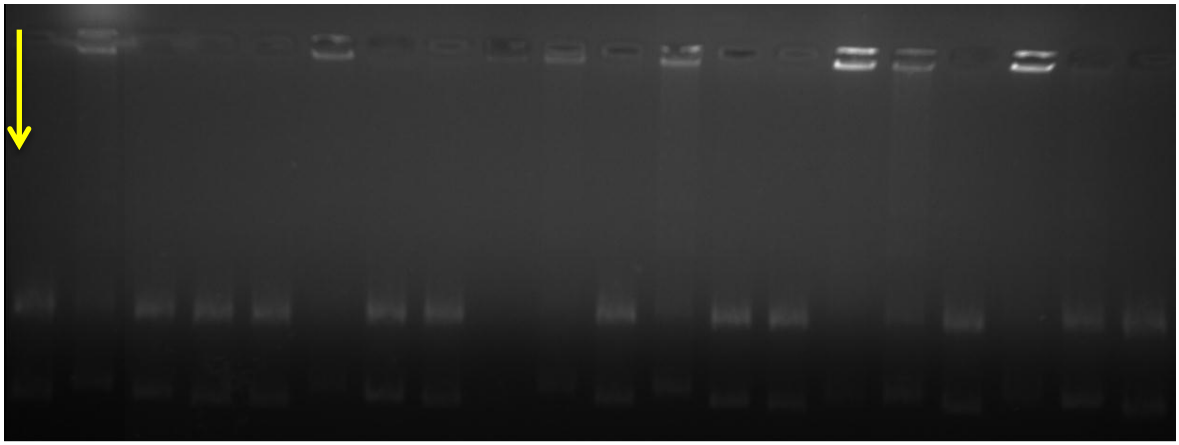
NSC : D - 754623 / 1	Experiment ID : 1011NS43	Test Type : 08	Units : Molar
Report Date : August 09, 2011	Test Date : November 08, 2010	QNS :	MC :
COMI : CM-4-177-1 (98581)	Stain Reagent : SRB Dual-Pass Related	SSPL : 0Y2V	

		Log10 Concentration												
	Time	Mean Optical Densities					Percent Growth							
Panel/Cell Line	Zero	Ctrl	-8.0	-7.0	-6.0	-5.0	-4.0	-8.0	-7.0	-6.0	-5.0	-4.0	GI50	TGI	LC50
Leukemia															
CCRF-CEM	0.564	2.509	2.404	2.418	2.336	1.864	0.981	95	95	91	67	21	2.35E-5	> 1.00E-4	> 1.00E-4
HL-60(TB)	0.664	2.158	2.355	2.204	2.030	1.951	0.816	113	103	91	86	10	2.99E-5	> 1.00E-4	> 1.00E-4
K-562	0.166	1.170	1.177	1.145	0.972	0.544	0.276	101	98	80	38	11	5.14E-6	> 1.00E-4	> 1.00E-4
MOLT-4	0.546	2.028	2.031	2.077	2.154	1.879	0.909	100	103	109	90	24	4.08E-5	> 1.00E-4	> 1.00E-4
RPMI-8226	1.152	2.925	2.891	2.896	2.643	2.193	1.461	98	98	84	59	17	1.62E-5	> 1.00E-4	> 1.00E-4
SR	0.382	1.828	1.847	1.827	1.727	1.058	0.564	101	100	93	47	13	8.49E-6	> 1.00E-4	> 1.00E-4
Non-Small Cell Lung Cancer															
A549/ATCC	0.317	1.410	1.399	1.345	1.284	1.209	0.688	99	94	88	82	34	4.60E-5	> 1.00E-4	> 1.00E-4
EKVX	0.655	1.692	1.679	1.650	1.560	1.355	0.989	99	96	87	67	32	3.13E-5	> 1.00E-4	> 1.00E-4
HOP-62	0.492	1.804	1.743	1.845	1.764	1.386	1.046	95	103	97	68	42	5.00E-5	> 1.00E-4	> 1.00E-4
HOP-92	0.992	1.431	1.368	1.392	1.340	1.239	0.953	86	91	79	56	-4	1.27E-5	8.60E-5	> 1.00E-4
NCI-H226	0.666	1.436	1.381	1.403	1.293	1.165	0.856	93	96	81	65	25	2.33E-5	> 1.00E-4	> 1.00E-4
NCI-H23	0.636	1.892	1.852	1.781	1.632	1.319	0.749	97	91	79	54	9	1.25E-5	> 1.00E-4	> 1.00E-4
NCI-H322M	0.668	1.470	1.476	1.510	1.443	1.402	0.911	101	105	97	92	30	4.76E-5	> 1.00E-4	> 1.00E-4
NCI-H460	0.257	2.065	2.154	2.023	1.832	1.280	0.368	105	98	87	57	6	1.35E-5	> 1.00E-4	> 1.00E-4
NCI-H522	0.577	1.262	1.180	1.213	1.140	0.773	0.454	88	93	82	29	-21	3.99E-6	3.73E-5	> 1.00E-4
Colon Cancer															
COLO 205	0.282	1.164	1.202	1.269	1.174	0.760	0.291	104	112	101	54	1	1.20E-5	> 1.00E-4	> 1.00E-4
HCC-2998	0.511	2.129	2.000	2.079	1.959	1.477	0.845	92	97	90	60	21	1.77E-5	> 1.00E-4	> 1.00E-4
HCT-116	0.244	1.937	1.929	1.949	1.875	1.511	0.427	100	101	96	75	11	2.44E-5	> 1.00E-4	> 1.00E-4
HCT-15	0.247	1.561	1.485	1.526	1.535	1.610	1.206	94	97	98	104	73	> 1.00E-4	> 1.00E-4	> 1.00E-4
HT29	0.205	1.040	1.027	1.036	0.993	0.787	0.205	98	99	94	70	.	1.91E-5	9.92E-5	> 1.00E-4
KM12	0.440	1.945	1.972	1.993	1.865	0.848	0.490	102	103	95	27	3	4.58E-6	> 1.00E-4	> 1.00E-4
SW-620	0.242	1.316	1.253	1.236	1.196	1.055	0.448	94	93	89	76	19	2.85E-5	> 1.00E-4	> 1.00E-4
CNS Cancer															
SF-268	0.360	1.180	1.215	1.223	1.074	0.637	0.542	104	105	87	34	22	4.95E-6	> 1.00E-4	> 1.00E-4
SF-295	0.799	2.734	2.648	2.570	2.448	2.120	1.222	96	92	85	68	22	2.47E-5	> 1.00E-4	> 1.00E-4
SF-539	0.654	1.781	1.749	1.798	1.657	0.998	0.750	97	101	89	30	8	4.64E-6	> 1.00E-4	> 1.00E-4
SNB-19	0.484	1.599	1.521	1.513	1.208	0.771	0.715	93	92	65	26	21	2.40E-6	> 1.00E-4	> 1.00E-4
SNB-75	0.760	1.461	1.361	1.280	1.280	1.166	1.095	86	74	74	58	48	5.98E-5	> 1.00E-4	> 1.00E-4
U251	0.337	1.281	1.288	1.201	0.930	0.543	0.386	101	92	63	22	5	2.05E-6	> 1.00E-4	> 1.00E-4
Melanoma															
LOX IMVI	0.268	2.004	2.010	1.943	1.932	1.821	0.520	100	96	96	89	15	3.36E-5	> 1.00E-4	> 1.00E-4
MALME-3M	0.759	1.452	1.442	1.535	1.430	0.930	0.662	99	112	97	25	-13	4.45E-6	4.55E-5	> 1.00E-4
M14	0.350	1.357	1.300	1.333	1.317	0.999	0.599	94	98	96	64	25	2.31E-5	> 1.00E-4	> 1.00E-4
MDA-MB-435	0.538	1.942	1.843	1.883	1.910	1.638	0.665	93	96	98	78	9	2.56E-5	> 1.00E-4	> 1.00E-4
SK-MEL-2	0.749	1.411	1.443	1.459	1.439	1.359	0.543	105	107	104	92	-28	2.25E-5	5.89E-5	> 1.00E-4
SK-MEL-28	0.415	1.139	1.117	1.114	1.067	0.795	0.460	97	96	90	52	6	1.13E-5	> 1.00E-4	> 1.00E-4
SK-MEL-5	0.562	2.031	2.025	2.014	1.792	0.512	0.260	100	99	84	-9	-54	2.31E-6	8.00E-6	8.25E-5
UACC-257	0.792	1.517	1.464	1.436	1.394	0.936	0.628	93	89	83	20	-21	3.34E-6	3.09E-5	> 1.00E-4
UACC-62	0.729	2.494	2.409	2.341	2.218	1.783	1.039	95	91	84	60	18	1.70E-5	> 1.00E-4	> 1.00E-4
Ovarian Cancer															
IGROV1	0.429	1.621	1.723	1.765	1.643	1.417	0.746	109	112	102	83	27	3.84E-5	> 1.00E-4	> 1.00E-4
OVCAR-3	0.335	0.882	0.892	0.904	0.834	0.681	0.322	102	104	91	63	-4	1.57E-5	8.75E-5	> 1.00E-4
OVCAR-4	0.592	1.402	1.385	1.356	1.289	0.908	0.670	98	94	86	39	10	5.83E-6	> 1.00E-4	> 1.00E-4
OVCAR-5	0.463	1.038	1.020	1.014	1.021	0.984	0.717	97	96	97	91	44	7.45E-5	> 1.00E-4	> 1.00E-4
OVCAR-8	0.399	1.407	1.381	1.356	1.197	0.851	0.485	97	95	79	45	9	7.05E-6	> 1.00E-4	> 1.00E-4
NCI/ADR-RES	0.525	1.769	1.829	1.766	1.727	1.730	1.262	105	100	97	97	59	> 1.00E-4	> 1.00E-4	> 1.00E-4
SK-OV-3	0.714	1.709	1.700	1.741	1.733	1.693	0.907	99	103	102	98	19	4.10E-5	> 1.00E-4	> 1.00E-4
Renal Cancer															
786-0	0.700	2.362	2.390	2.422	2.368	2.239	1.600	102	104	100	93	54	> 1.00E-4	> 1.00E-4	> 1.00E-4
A498	1.273	1.924	1.753	1.832	1.717	1.654	1.395	74	86	68	58	19	1.64E-5	> 1.00E-4	> 1.00E-4
ACHN	0.366	1.437	1.446	1.446	1.457	1.440	0.935	101	101	102	100	53	> 1.00E-4	> 1.00E-4	> 1.00E-4
CAKI-1	0.584	2.095	1.933	2.061	1.932	1.947	1.686	89	98	89	90	73	> 1.00E-4	> 1.00E-4	> 1.00E-4
RXF 393	0.656	1.076	1.098	1.102	1.098	1.032	0.744	105	106	105	90	21	3.77E-5	> 1.00E-4	> 1.00E-4
SN12C	0.524	1.857	1.799	1.798	1.285	0.747	0.649	96	96	57	17	9	1.50E-6	> 1.00E-4	> 1.00E-4
TK-10	0.588	1.085	1.088	1.084	1.059	1.084	0.575	100	100	95	100	-2	3.07E-5	9.49E-5	> 1.00E-4
UO-31	0.580	1.623	1.559	1.603	1.538	1.436	1.075	94	98	92	82	47	8.44E-5	> 1.00E-4	> 1.00E-4
Prostate Cancer															
PC-3	0.561	2.032	2.034	1.965	1.858	1.238	0.757	100	95	88	46	13	8.03E-6	> 1.00E-4	> 1.00E-4
DU-145	0.276	1.022	1.060	1.070	1.069	0.964	0.515	105	106	106	92	32	5.01E-5	> 1.00E-4	> 1.00E-4
Breast Cancer															
MCF7	0.402	1.730	1.658	1.706	1.524	1.186	0.557	95	98	84	59	12	1.55E-5	> 1.00E-4	> 1.00E-4
MDA-MB-231/ATCC	0.461	1.119	1.130	1.064	1.050	1.019	0.536	102	92	89	85	11	2.97E-5	> 1.00E-4	> 1.00E-4
HS 578T	0.967	1.628	1.543	1.535	1.489	1.241	1.188	87	86	79	41	33	5.90E-6	> 1.00E-4	> 1.00E-4
BT-549	0.632	1.397	1.389	1.396	1.363	0.899	0.726	99	100	95	35	12	5.63E-6	> 1.00E-4	> 1.00E-4
T-47D	0.711	1.737	1.743	1.718	1.649	1.106	0.774	101	98	91	39	6	6.07E-6	> 1.00E-4	> 1.00E-4
MDA-MB-468	0.501	0.837	0.809	0.803	0.691	0.412	0.186	92	90	56	-18	-63	1.22E-6	5.75E-6	5.16E-5

6. Topoisomerase II assay gels

A-ring substituted ellipticines and analogues

µM:		100	10	1	100	10	1	100	10	1	100	10	1	100	10	1	100	10	1
A	B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18



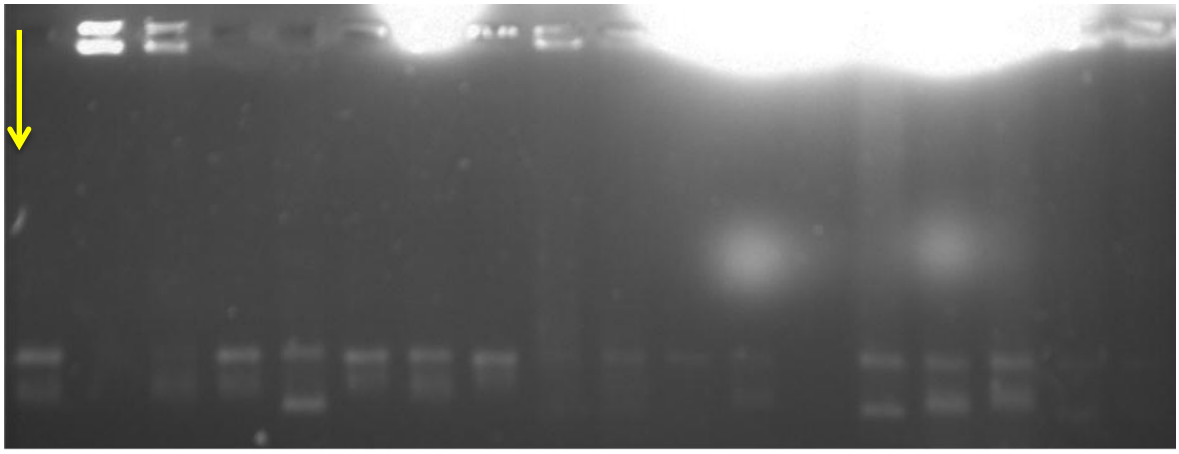
Lane	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
No.	**9**	**9**	**9**	**7**	**7**	**7**	**4**	**4**	**4**				**6**	**6**	**6**	**15**	**15**	**15**
Activity	–	–	–	+	–	–	+	+	–				+	+	–	+	–	–

Figure 1

A, positive control = kDNA +ATP + Topo II; B, negative control = kDNA +ATP + Topo II + 100 µM ellipticine
C = dilution solvent / blank. Inhibitory activity: (-) = not active against topo II; (+) = topo II inhibition.

Isollipticinium salts – 100 µM

A	B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16



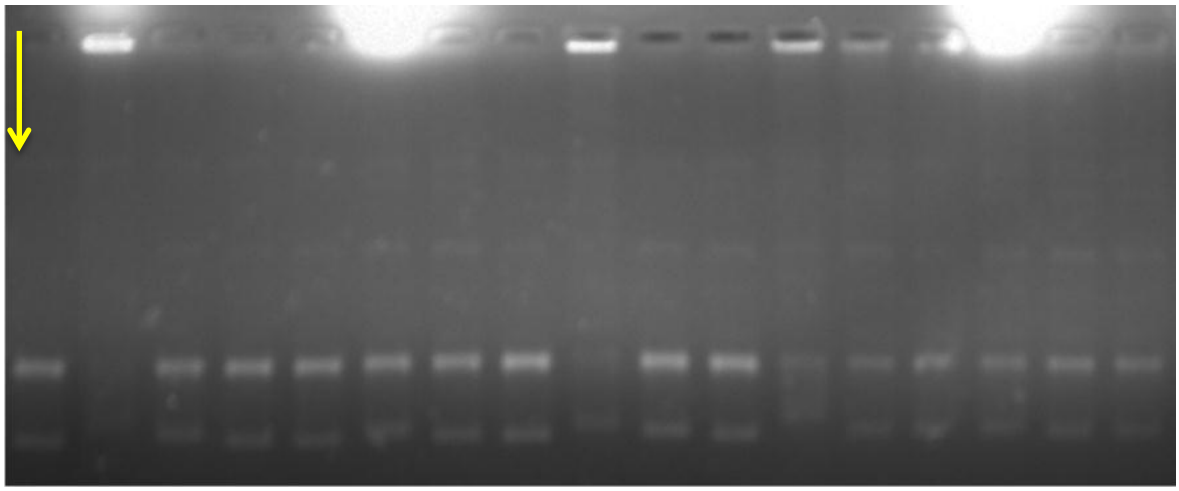
Lane	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
No.	**6**	**C**	**16**	**C**	**20**	**C**	**19**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**
Activity	+	–	–	–	–	–	+	+	+	–	+	–	–	–	+	+

Figure 2

Note: 7-Hydroxy-N^2-(6'-methylsulfonamido-6-oxohexyl)isoellipticinium bromide **30** was tested in a separate gel with unrelated compounds and displayed no inhibition of topo II.

Isoellipticinium salts – 3-fold dilution

µM:		100	10	1	100	10	1	100	10	1	100	10	1	100	10	1
A	B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

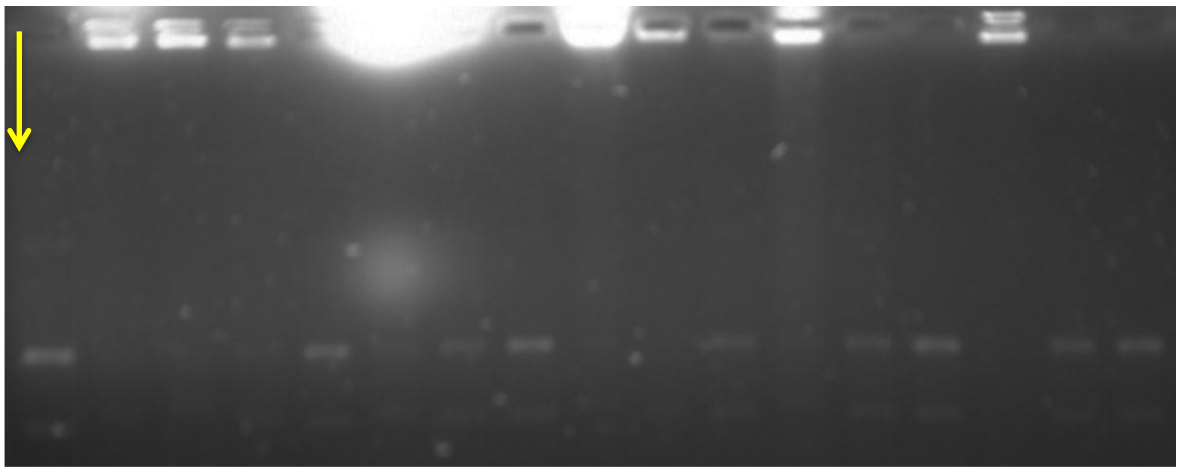


Lane	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No.	**5**	**5**	**5**	**20**	**20**	**20**	**19**	**19**	**19**	**21**	**21**	**21**	**22**	**22**	**22**
Activity	–	–	–	–	–	–	+	–	–	+	+	–	–	–	–

Figure 3

7-Formyl and 7-Hydroxy Isoellipticinium salts – 3-fold dilution

µM:		100	10	1	100	10	1	100	10	1	100	10	1	100	10	1
A	B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15



Lane	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No.	**6**	**6**	**6**	**23**	**23**	**23**	**24**	**24**	**24**	**28**	**28**	**28**	**29**	**29**	**29**
Activity	+	+	–	+	–	–	+	+	–	+	–	–	+	–	–

Figure 4