Electronic Supplementary Information

Rigid amphipathic nucleosides suppressing reproduction of tick-borne encephalitis virus

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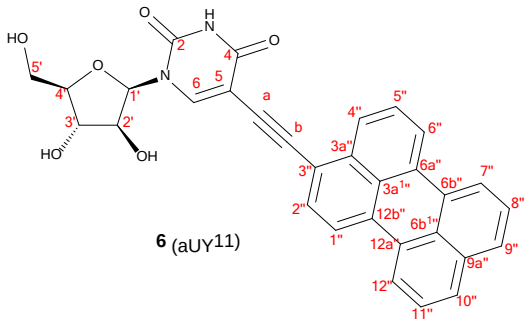
1D (^{1}H, ^{13}C) and 2D (COSY, HMQC, HMBC) NMR spectra of compounds **6**, **7**, and **9** were registered in DMSO-d_6.

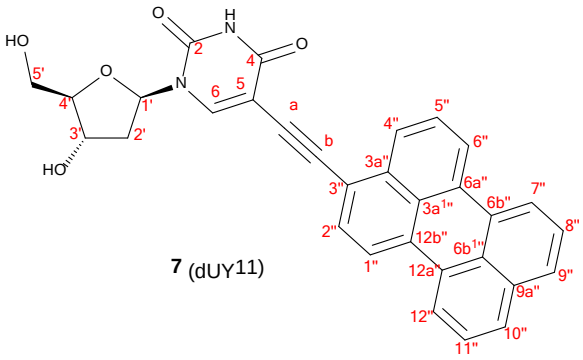
5-(Perylen-3-yl)ethynyl-*arabino*-uridine **6** (aUY11):



^{1}H NMR (600 MHz) δ 11.83 (s, 1H, N*H*), 8.44 (d, *J* = 7.6 Hz, 1H, H4″), 8.40 (d, *J* = 7.6 Hz, 1H, H12″), 8.38 (d, *J* = 7.5 Hz, 1H, H7″), 8.35 (d, *J* = 7.9 Hz, 1H, H1″), 8.29 (d, *J* = 8.3 Hz, 1H, H6″), 8.26 (s, 1H, H6), 7.83 (d, *J* = 5.1 Hz, 1H, H10″), 7.82 (d, *J* = 5.1 Hz, 1H, H9″), 7.71 (d, *J* = 7.8 Hz, 1H, H2″), 7.68 (t, *J* = 7.8 Hz, 1H, H5″), 7.58 – 7.54 (m, 2H, H8″, H11″), 6.06 (d, *J* = 4.6 Hz, 1H, H1′), 5.73 (d, *J* = 5.2 Hz, 1H, 2′-O*H*), 5.55 (d, *J* = 4.5 Hz, 1H, 3′-O*H*), 5.28 (t, *J* = 5.4 Hz, 1H, 5′-O*H*), 4.10 (q, *J* = 4.5 Hz, 1H, H2′), 3.99 (q, *J* = 4.1 Hz, 1H, H3′), 3.81 (q, *J* = 4.5 Hz, 1H, H4′), 3.70 (ddt, *J* = 14.9, 11.8, 5.5 Hz, 2H, H5′).

^{13}C NMR (151 MHz) δ 161.71 (C4), 149.44 (C2), 145.05 (C6), 134.22 (C9a″), 133.78 (C3a″), 131.12 (C12b″), 131.00 (C6a″), 130.46 (C2″), 130.14 (C6b″), 129.86 (C12a″), 128.65 (C10″), 128.37 (C9″), 127.93 (C5″), 127.80 (C3a^{1}″), 127.64 (C6b^{1}″), 127.05 (C8″), 127.01 (C11″), 125.81 (C6″), 121.63 (C12″), 121.45 (C7″), 121.31 (C4″), 120.34 (C1″), 119.55 (C3″), 97.04 (C5), 90.55 (Ca), 88.99 (Cb), 85.62 (C1′), 84.82 (C4′), 75.37 (C2′), 74.92 (C3′), 60.34 (C5′).

5-(Perylen-3-yl)ethynyl-2′-*deoxy*-uridine **7** (dUY11):

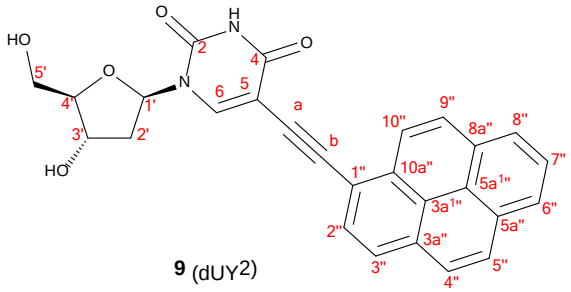


^{1}H NMR (500 MHz) δ 11.76 (s, 1H, N*H*), 8.54 (s, 1H, H6), 8.45 (d, *J* = 7.6 Hz, 1H, H4″), 8.40 (dd, *J* = 9.9, 7.6 Hz, 2H, H12″, H7″), 8.36 (d, *J* = 7.9 Hz, 1H, H1″), 8.29 (d, *J* = 8.3 Hz, 1H, H6″), 7.83 (dd, *J* = 8.1, 4.7 Hz, 2H, H10″, H9″), 7.73–7.65 (m, 2H, H2″, H5″), 7.57 (t, *J* = 7.8 Hz, 2H, H8″, H11″), 6.18

(t, J = 6.5 Hz, 1H, H1′), 5.31–5.21 (m, 2H, 3′-O*H*, 5″-O*H*), 4.32 (d, J = 5.6 Hz, 1H, H3′), 3.85 (q, J = 3.4 Hz, 1H, H4′), 3.70 (dd, J = 25.1, 11.9 Hz, 2H, H5′), 2.31–2.16 (m, 2H, H2′).

^{13}C NMR (126 MHz) δ 161.57 (C4), 149.47 (C2), 143.75 (C6), 134.19 (C9a″), 133.77 (C3a″), 131.14 (C12b″), 130.97 (C6a″), 130.45 (C2″), 130.11 (C6b″), 129.83 (C12a″), 128.62 (C10″), 128.33 (C9″), 127.89 (C5″), 127.78 (C3a^{1}″), 127.61 (C6b^{1}″), 127.01 (C8″), 126.96 (C11″), 125.82 (C6″), 121.58 (C12″), 121.40 (C7″), 121.26 (C4″), 120.28 (C1″), 119.50 (C3″), 98.38 (C5), 88.87 (Ca), 87.70 (Cb), 85.04 (C4′), 84.82 (C1′), 75.37 (C3′), 74.92 (C5′), 40.31 (C2′).

5-(Pyren-1-yl)ethynyl-*2′-deoxy*-uridine **9** (dUY2):

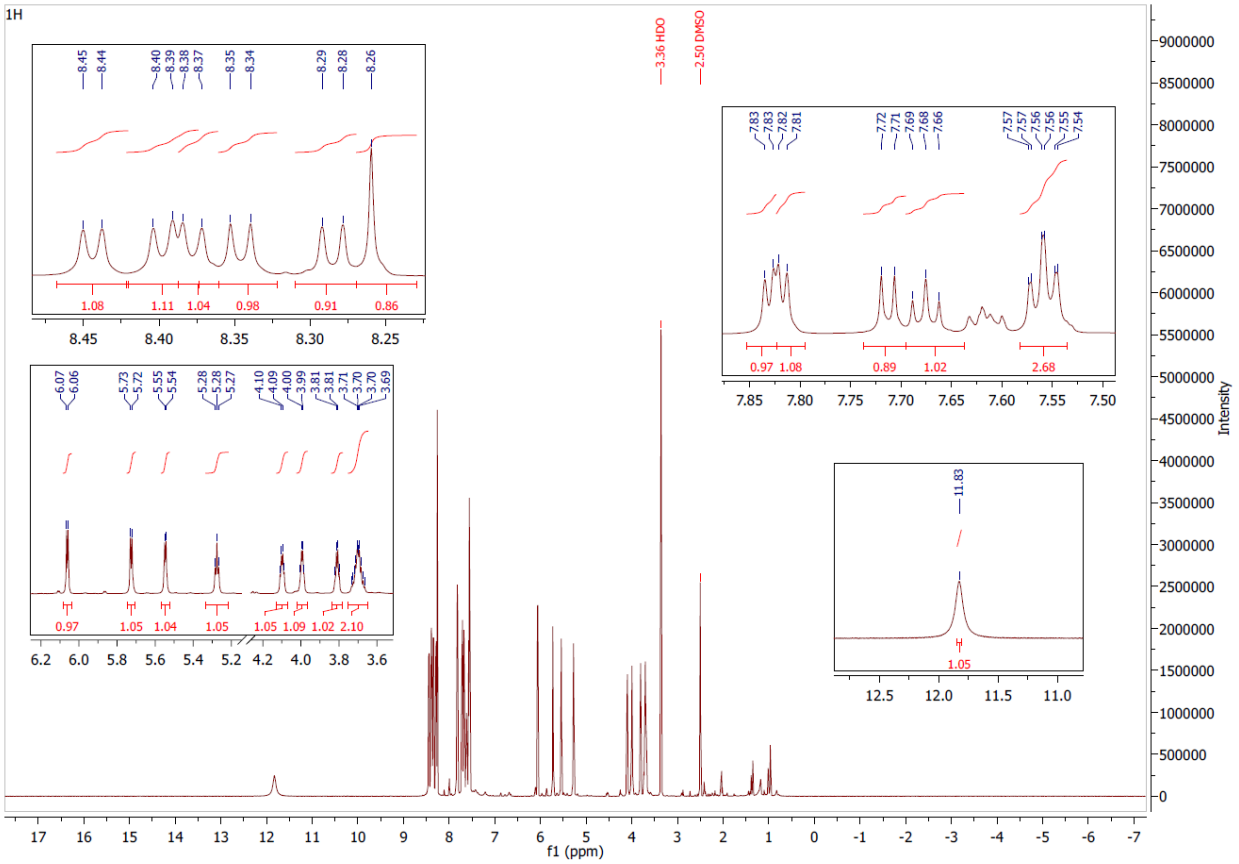


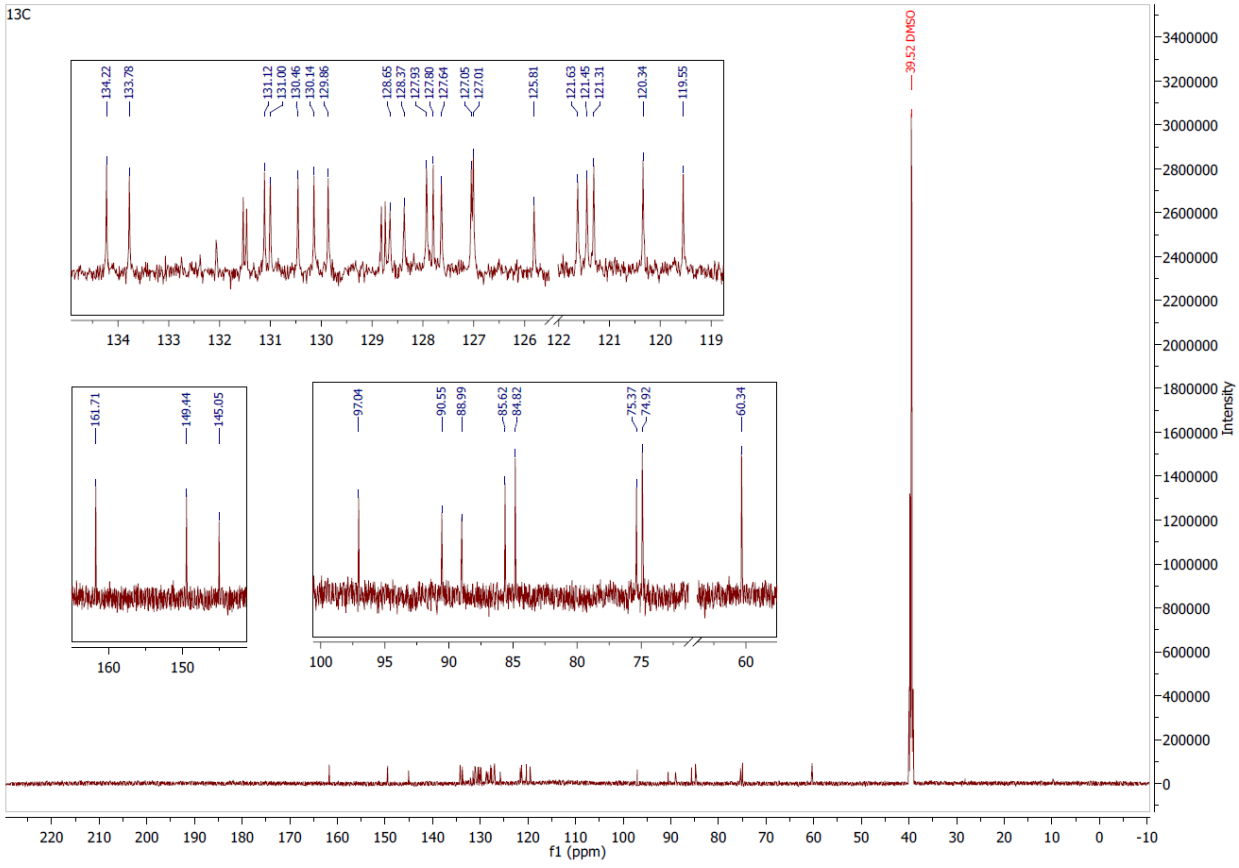
9 (dUY2)

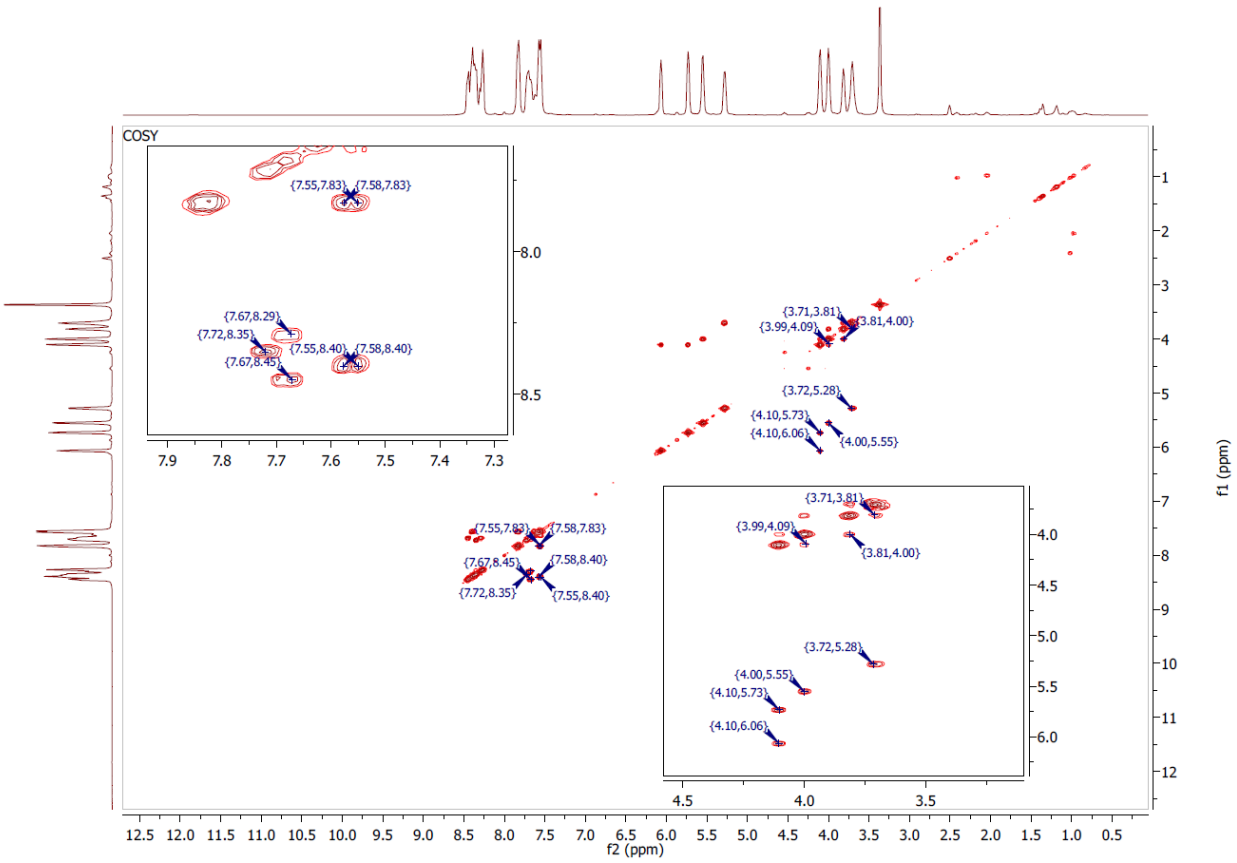
^{1}H NMR (500 MHz) δ 11.81 (s, 1H, N*H*), 8.65 (d, J = 9.1 Hz, 1H, H2″), 8.63 (s, 1H, H6), 8.35 (t, J = 6.8 Hz, 2H, H6″, H8″), 8.33 (d, J = 3.3 Hz, 1H, H3″), 8.29 (d, J = 8.0 Hz, 1H, H10″), 8.23 (d, J = 9.0 Hz, 1H, H4″), 8.21–8.15 (m, 2H, H5″, H9″), 8.11 (t, J = 7.6 Hz, 1H, H7″), 6.23 (t, J = 6.4 Hz, 1H, H1′), 5.32 (s, 2H, 3′-O*H*, 5″-O*H*), 4.36 (dt, J = 6.6, 3.8 Hz, 1H, H3′), 3.89 (q, J = 3.4 Hz, 1H, H4′), 3.73 (dd, J = 11.9, 3.5 Hz, 2H, H5′), 2.35–2.20 (m, 2H, H2′).

^{13}C NMR (126 MHz) δ 161.69 (C4), 149.55 (C2), 143.85 (C6), 130.96 (C10a″), 130.79 (2C, C5a″, C8a″), 130.54 (C3a″), 129.00 (C9″), 128.74 (C3″), 128.27 (C4″), 127.23 (C5″), 126.75 (C7″), 125.94 (C6″), 125.89 (C8″), 125.02 (C2″), 124.92 (C10″), 123.68 (C5a^{1}″), 123.41 (C3a^{1}″), 117.00 (C1″), 98.50 (C5), 91.20 (Ca), 88.56 (Cb), 87.74 (C4′), 85.06 (C1′), 69.89 (C3′), 60.87 (C5′), 40.35 (C2′).

5-(Perylen-3-yl)ethynyl-*arabino*-uridine **6** (aUY11):



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{3.71,3.81}
{3.99,4.09}
{3.81,4.00}
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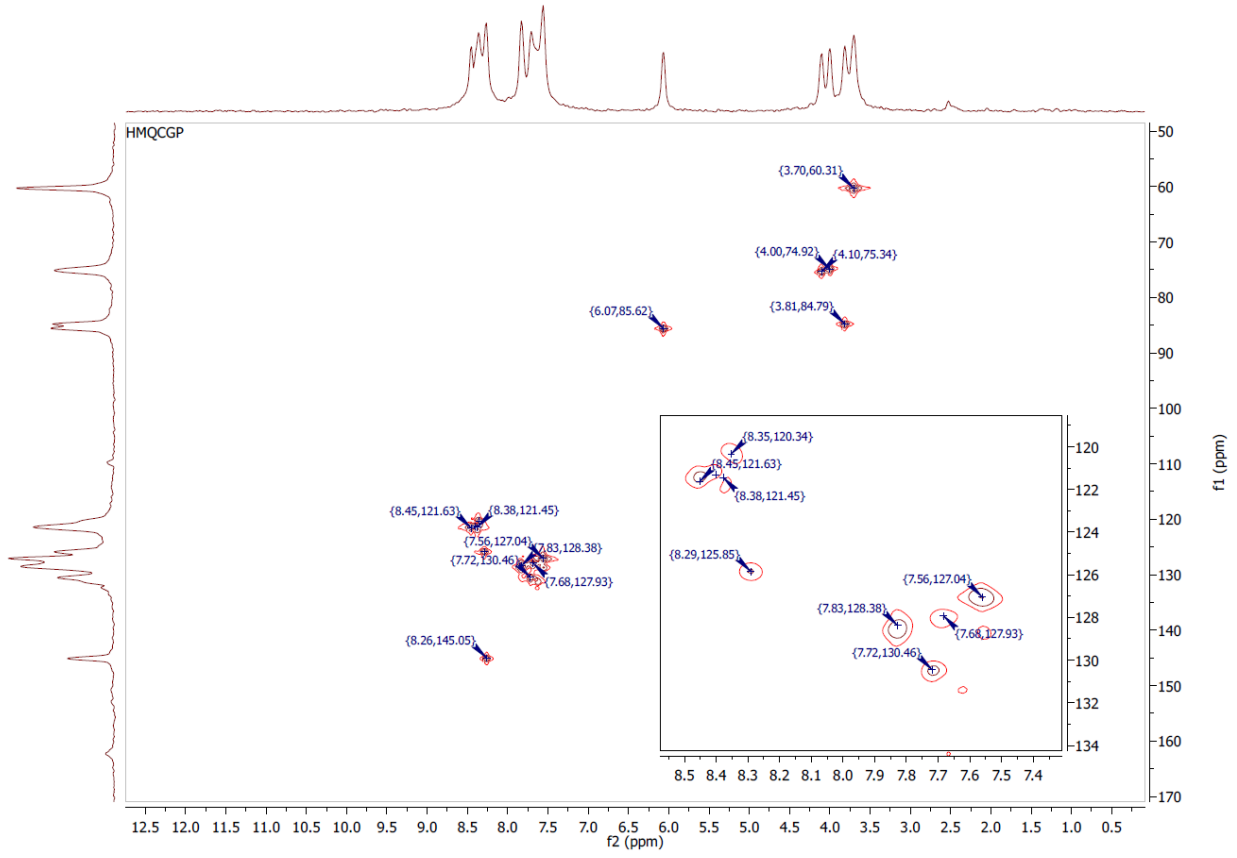
{4.00,5.55}
f2 (ppm)
f1 (ppm)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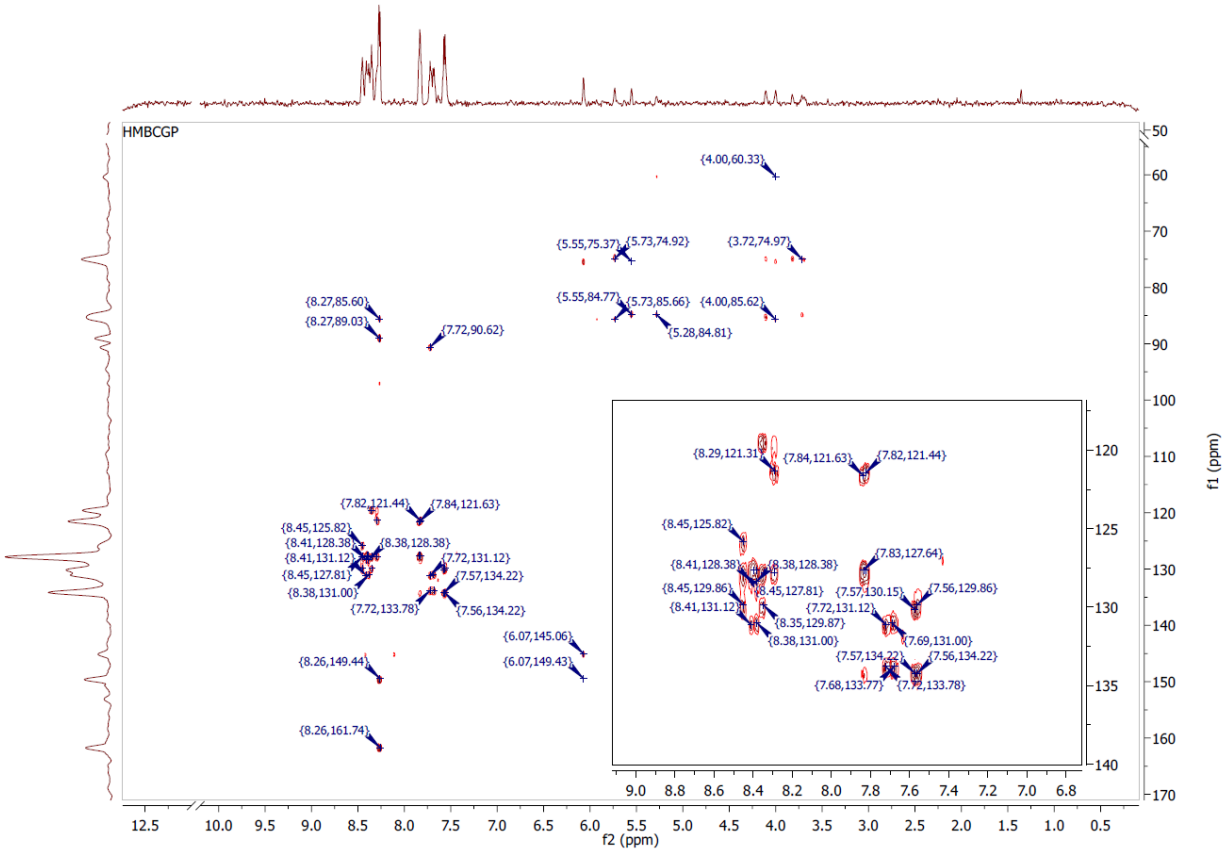
f2 (ppm)
f1 (ppm)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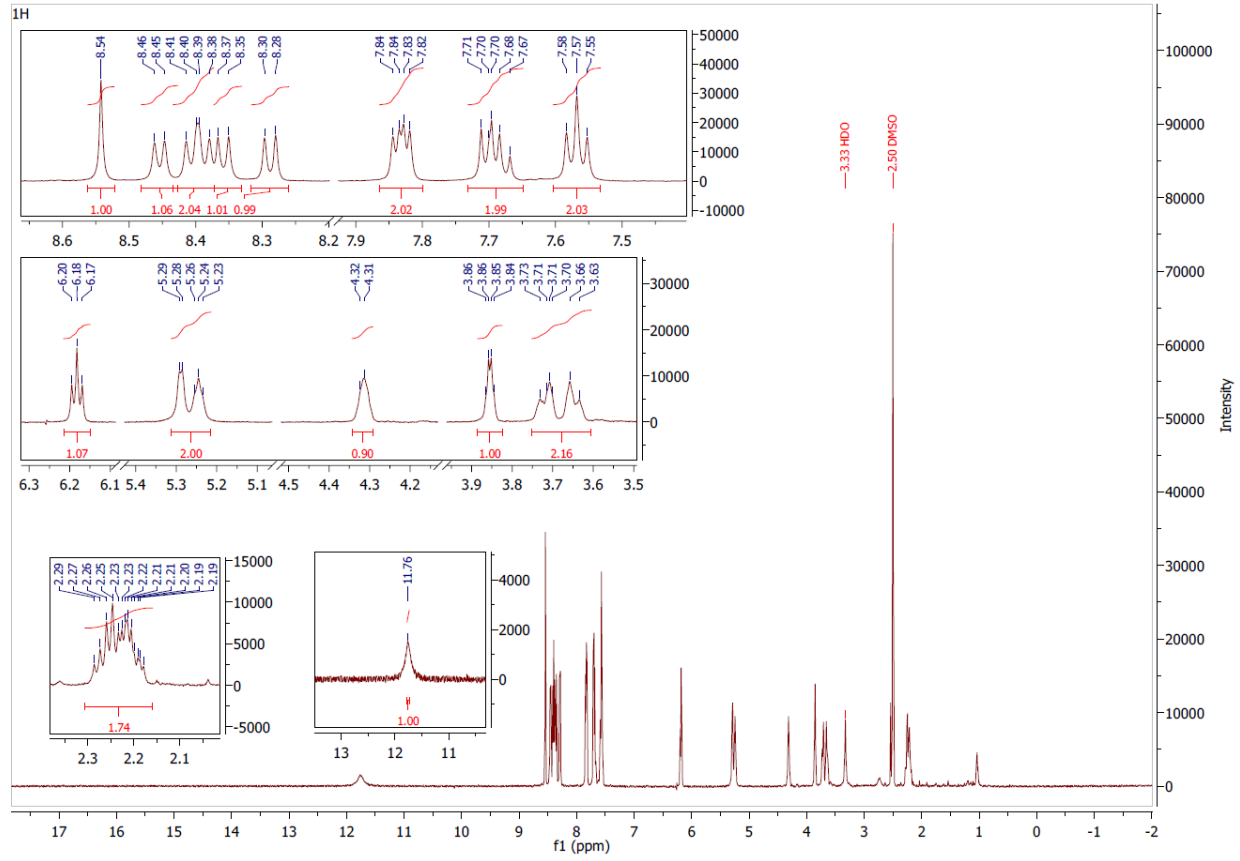
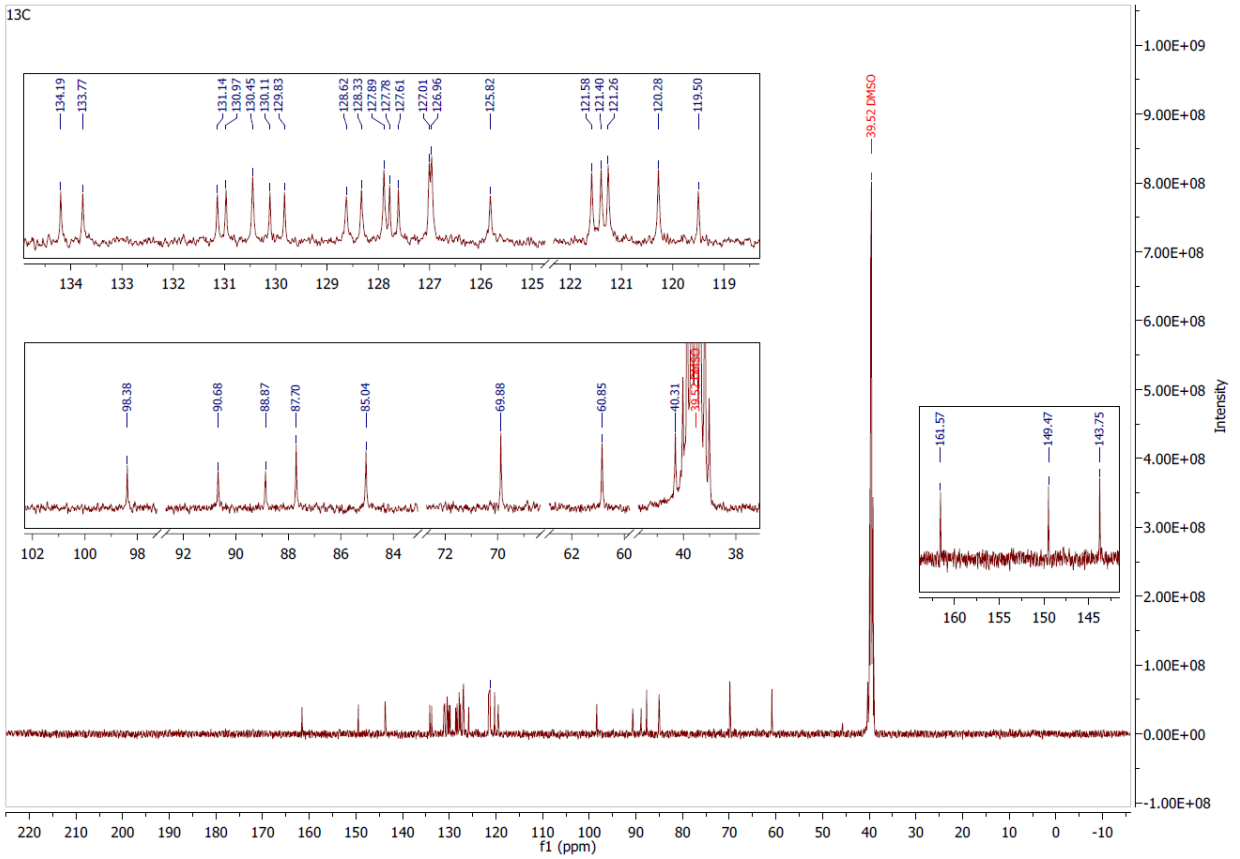
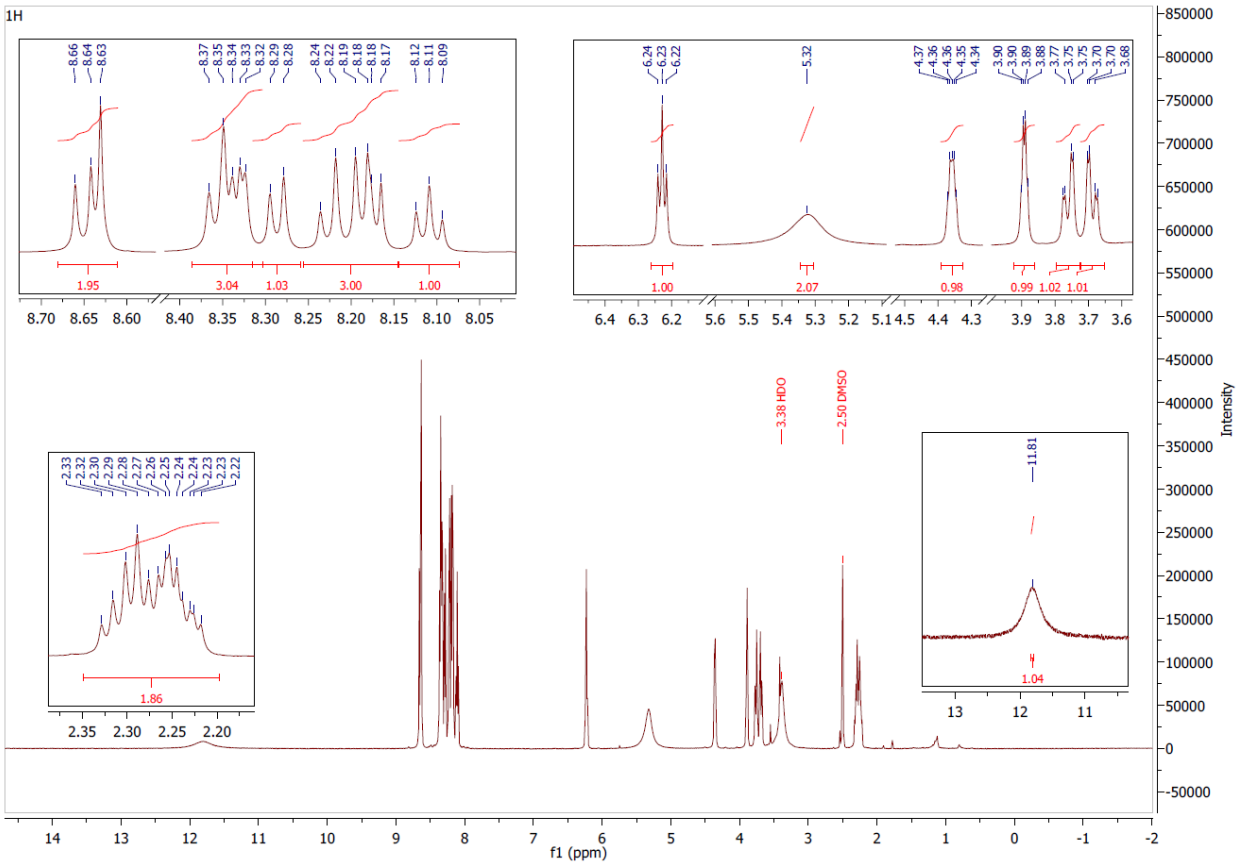
{7.56,134.22}
{7.68,133.77}
{7.72,133.78}
f2 (ppm)
f1 (ppm)

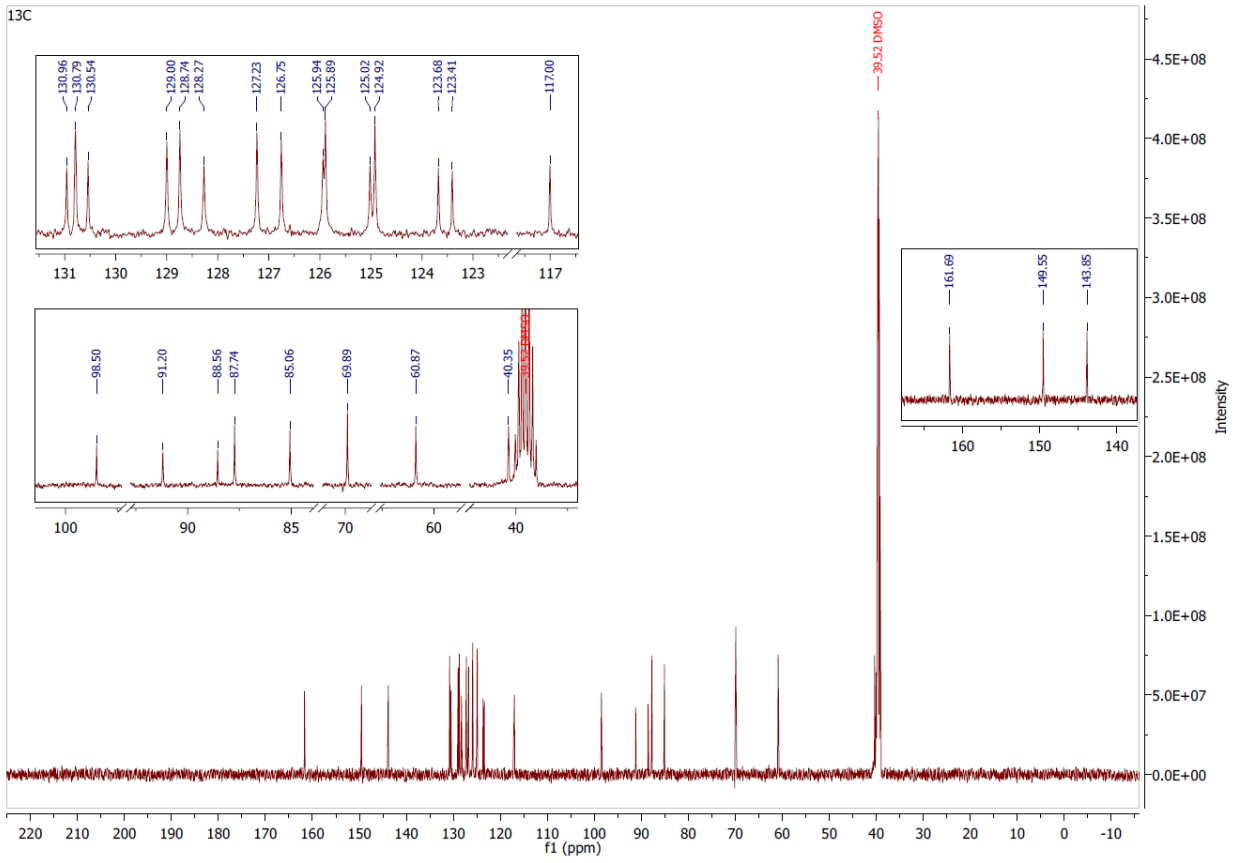
5-(Perylen-3-yl)ethynyl-2′-*deoxy*-uridine **7** (dUY11):

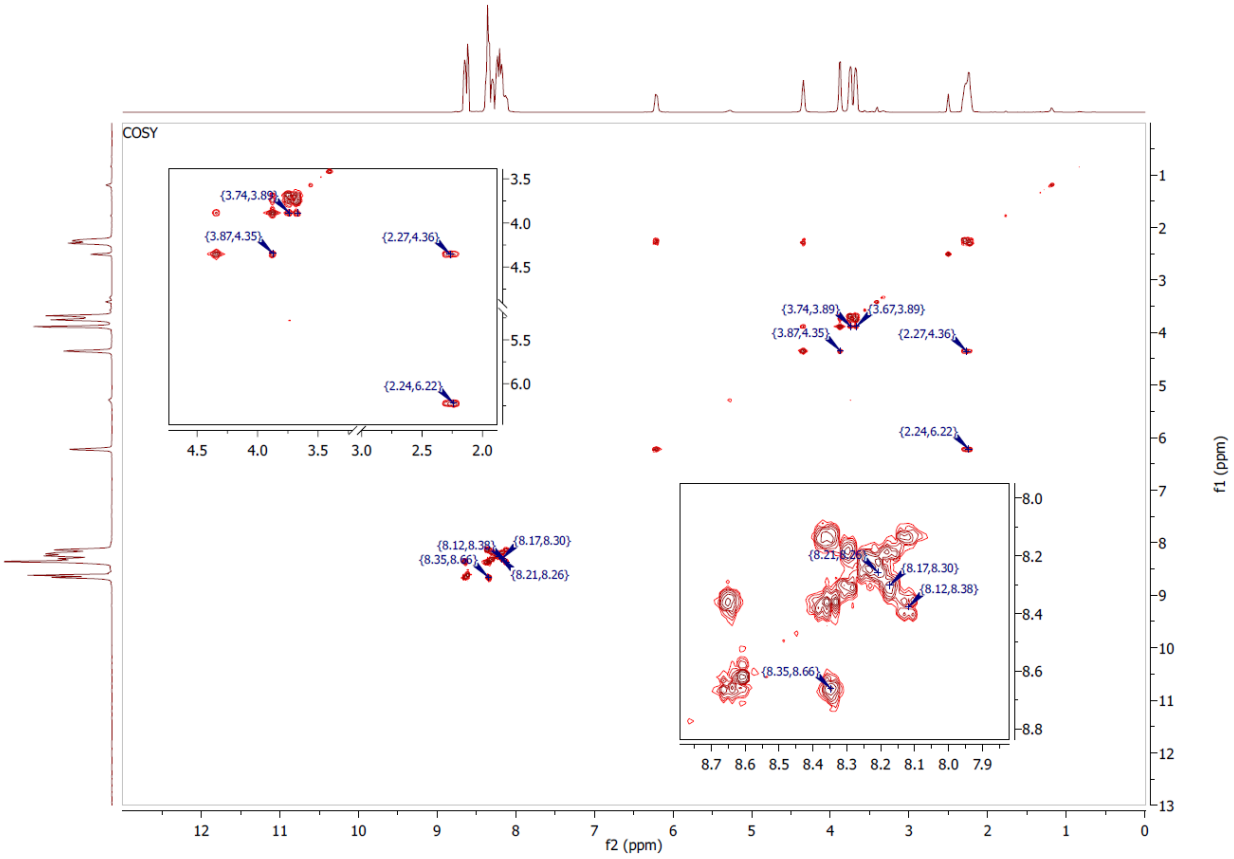




5-(Pyren-1-yl)ethynyl-2′-*deoxy*-uridine **9** (dUY2):






COSY
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{3.87,4.35}
{2.27,4.36}
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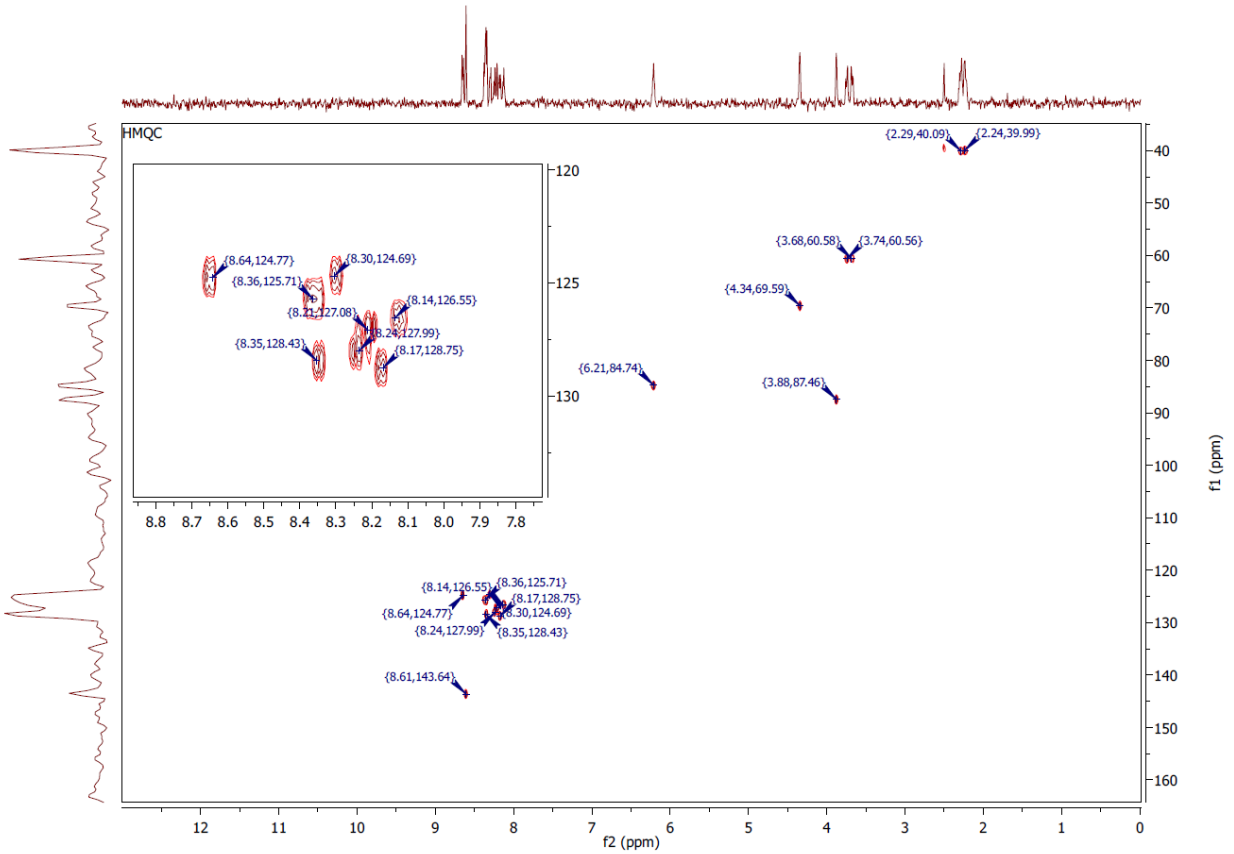
{8.17,8.30}
{8.35,8.66}
{8.21,8.26}
f2 (ppm)
f1 (ppm)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{3.74,60.56}
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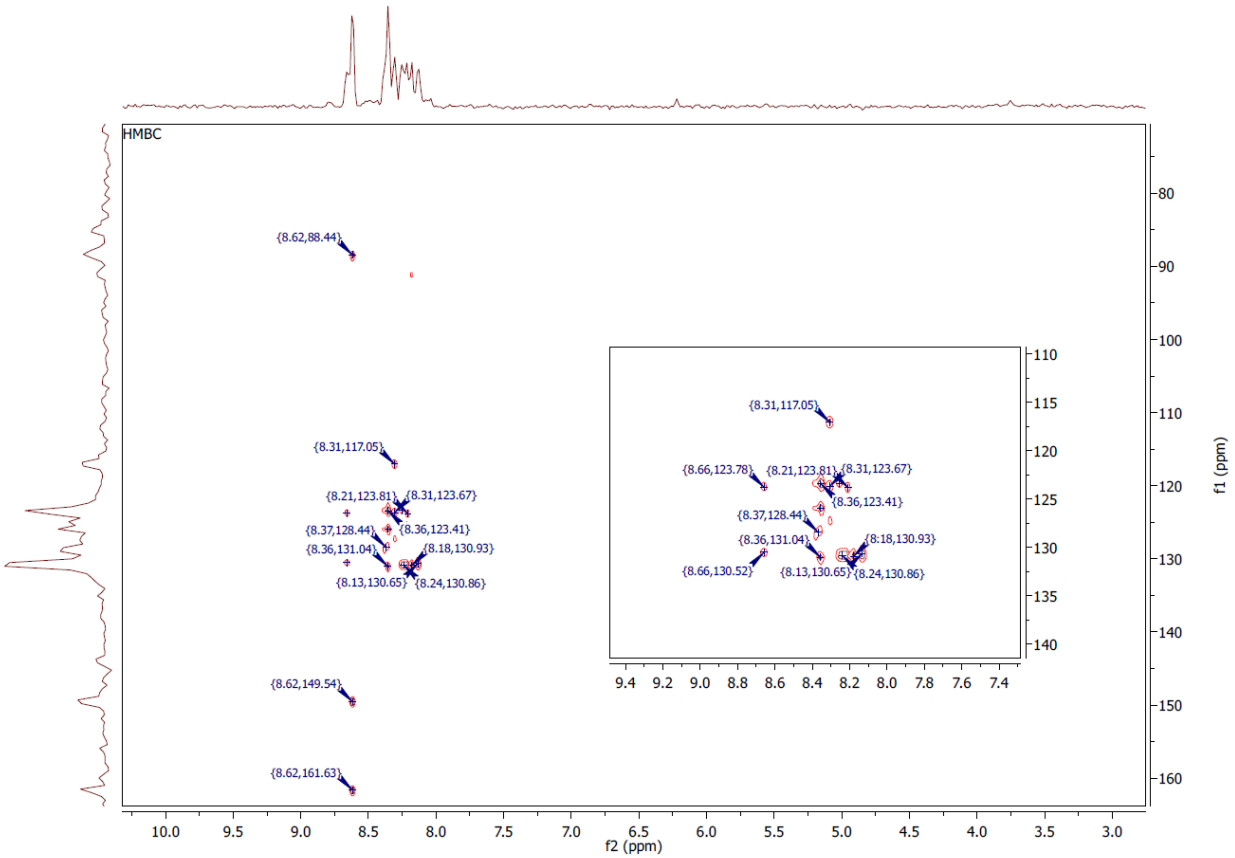
{8.61,143.64}
f2 (ppm)
f1 (ppm)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{8.13,130.65}
{8.24,130.86}
{8.62,149.54}
{8.62,161.63}
{8.66,123.78}
{8.66,130.52}
f2 (ppm)
f1 (ppm)