

Electronic Supporting Information

Synthesis and Evaluation of Porphyrin Glycoconjugates Varying in Linker Length: Preliminary Effects on the Photodynamic Inactivation of *Mycobacterium smegmatis*.

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Authors made equal contributions

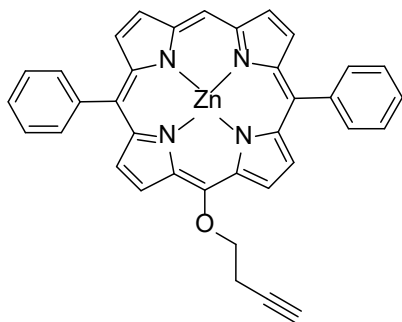
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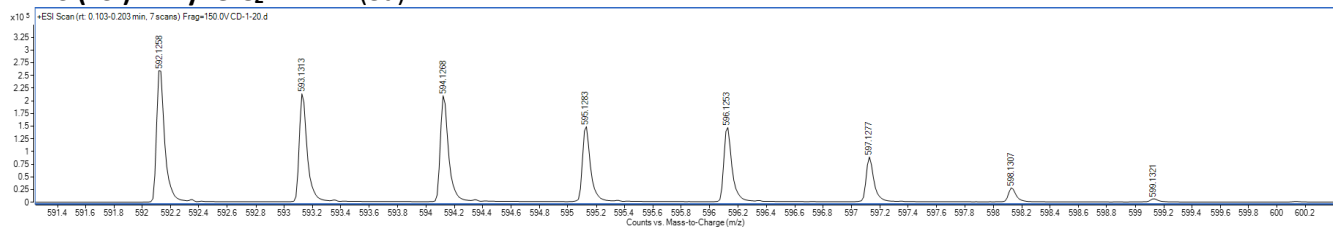
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Alkyne-C₂-ZnDPP (3a)

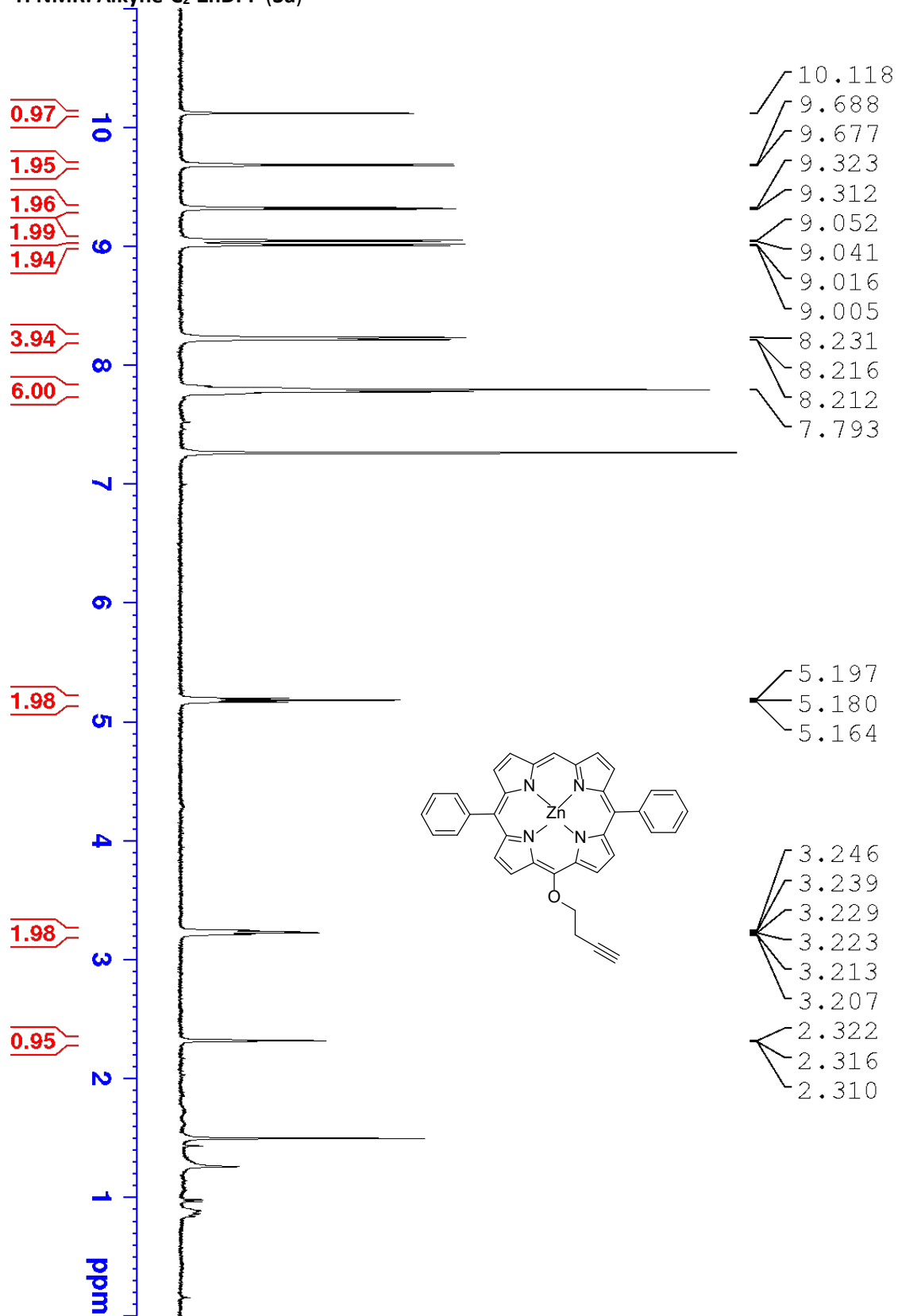


Alkyne-C₂-ZnDPP (3a) Was obtained using the general procedure as a red solid (154.2 mg, 41.2% yield). TLC analysis $R_f = 0.51$ (Hexanes:DCM 20:80 [v:v]). ¹HNMR (400 MHz, CDCl₃): δ 10.12 (s, 1H), 9.68 (d, $J = 4.6$ Hz, 2 H), 9.32 (d, $J = 4.5$ Hz, 2H), 9.05 (d, $J = 4.5$ Hz, 2H), 9.01 (d, $J = 4.6$ Hz, 2H), 8.25 – 8.18 (m, 4H), 7.84 – 7.73 (m, 6H), 5.18 (t, $J = 6.5$ Hz, 2H), 3.27 – 3.18 (m, 2H), 2.35 – 2.27 (m, 1H). ¹³C NMR (100 MHz, CDCl₃): δ 150.46, 149.91, 149.72, 145.88, 142.50, 134.50, 132.90, 131.79, 131.62, 127.52, 127.38, 126.65, 120.52, 105.04, 81.28, 81.20, 70.41, 21.06. HRMS (ESI) m/z : Calcd for C₃₆H₂₄N₄OZn [M]⁺ 592.1242; Found [M]⁺ 592.1258.

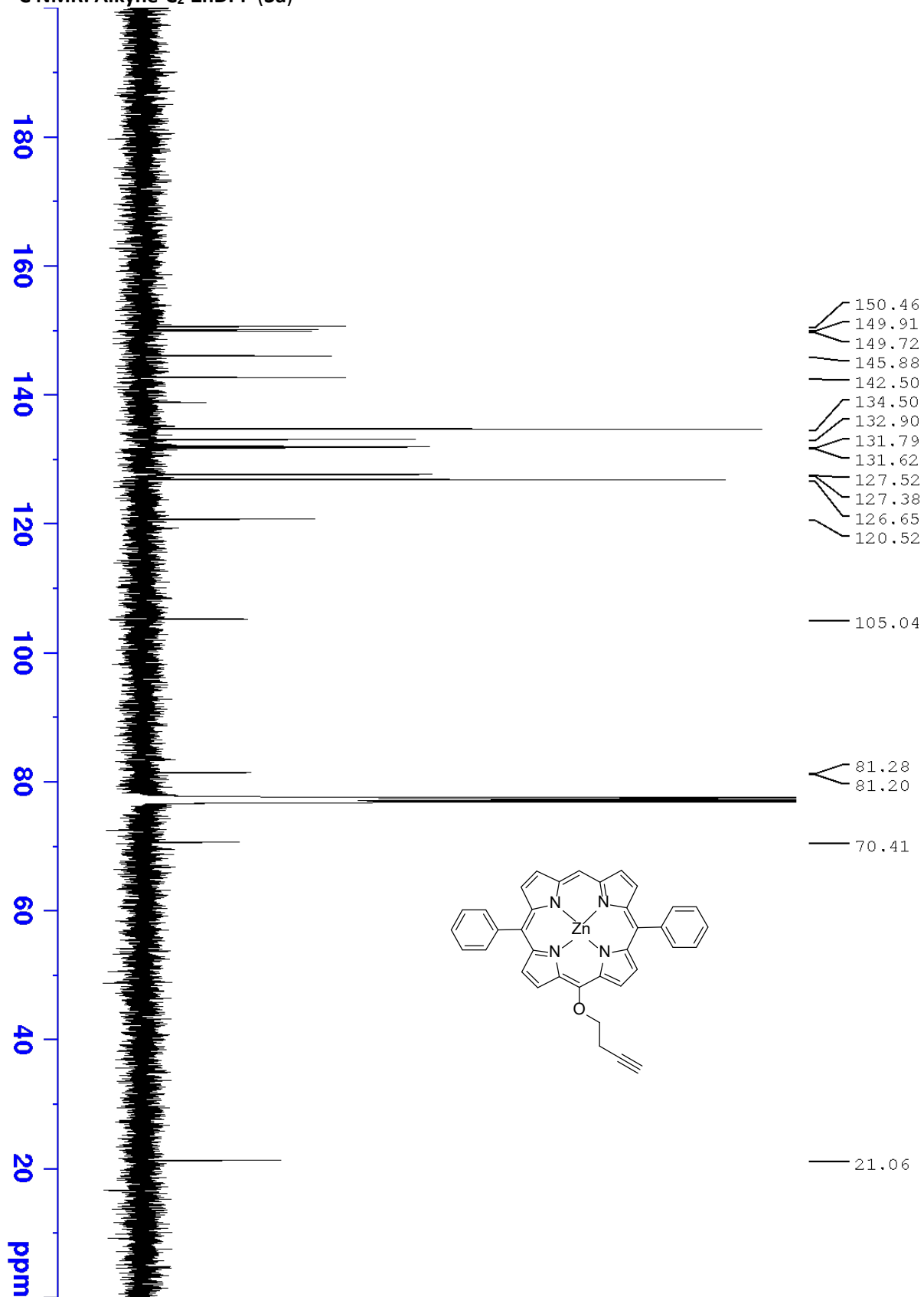
HRMS (ESI): Alkyne-C₂-ZnDPP (3a)



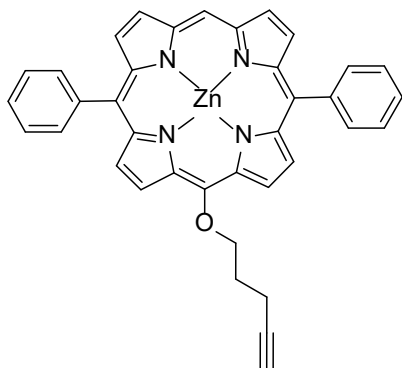
¹H NMR: Alkyne-C₂-ZnDPP (3a)



¹³C NMR: Alkyne-C₂-ZnDPP (3a)

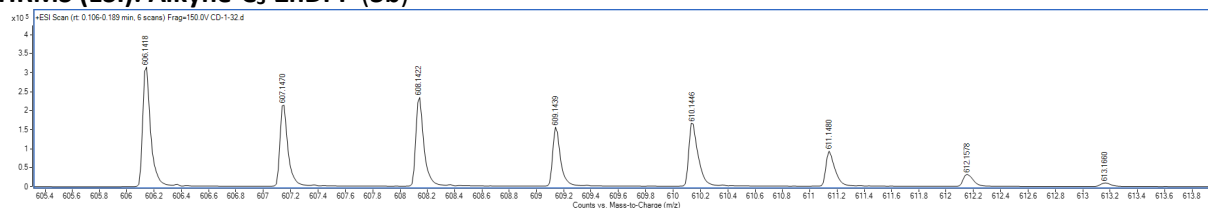


Alkyne-C₃-ZnDPP (3b)

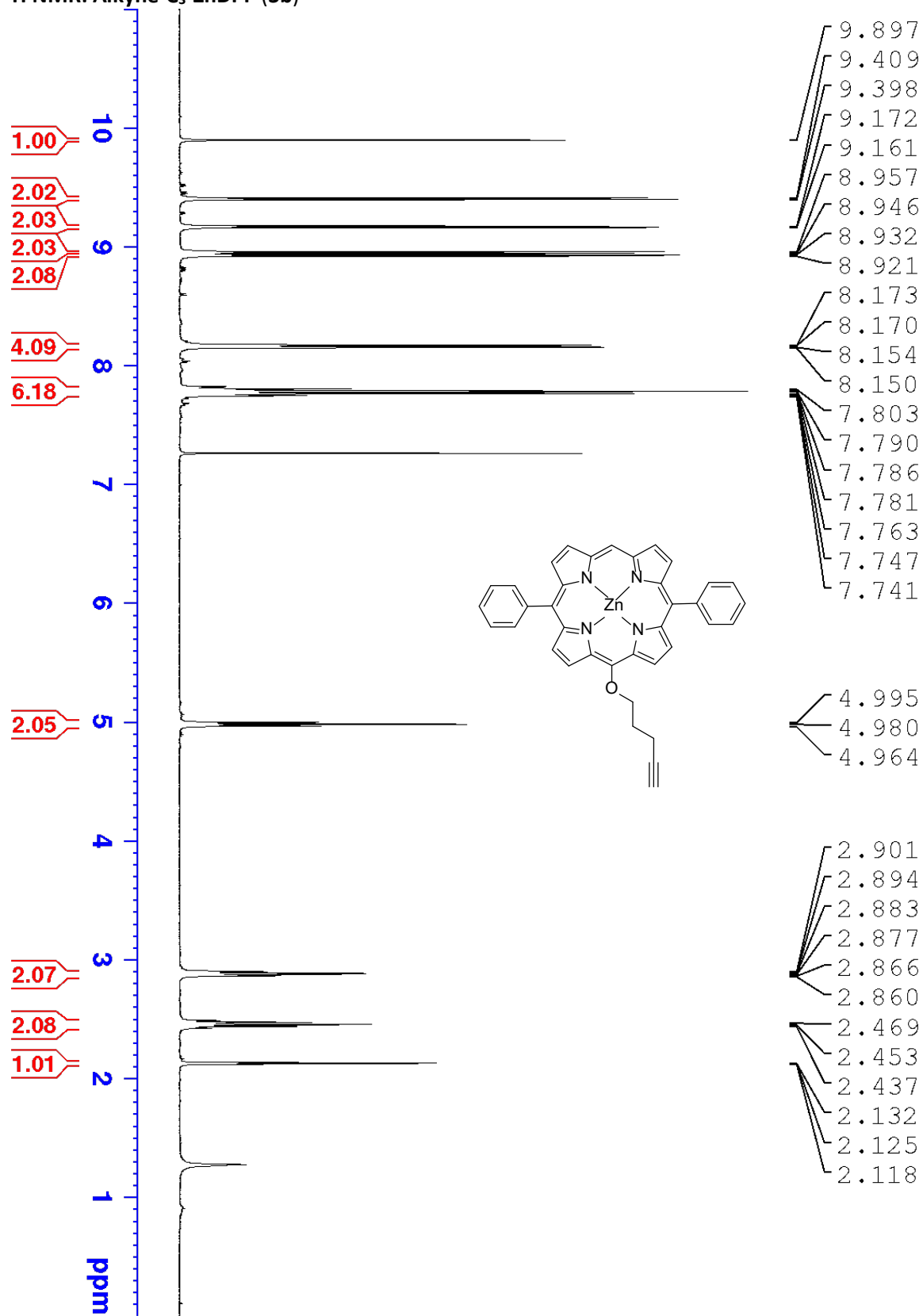


Alkyne-C₃-ZnDPP (3b). Was obtained using the general procedure as a red solid (243.1 mg, 63.0% yield). TLC analysis $R_f = 0.54$ (Hexanes:DCM 20:80 [v:v]). ¹H NMR (400MHz, CDCl₃): δ 9.90 (s, 1H), 9.40 (d, $J = 4.6$ Hz, 2H), 9.17 (d, $J = 4.5$ Hz, 2H), 8.95 (d, $J = 4.5$ Hz, 2H), 8.93 (d, $J = 4.6$ Hz, 2H), 8.18 – 8.13 (m, 4H), 7.81 – 7.74 (m, 6H), 4.98 (t, $J = 6.1$ Hz, 2H), 2.91 – 2.84 (m, 2H), 2.49 – 2.41 (m, 2H), 2.12 (t, $J = 2.6$ Hz, 3H). ¹³C NMR (100 MHz, CDCl₃): δ 150.10, 149.62, 149.42, 145.65, 142.63, 138.84, 134.64, 132.63, 131.47, 131.35, 127.51, 127.11, 126.70, 120.21, 104.54, 83.71, 82.27, 69.58, 29.59, 15.61. HRMS (ESI) m/z : Calcd for C₃₇H₂₆N₄OZn [M]⁺ 606.1398; Found [M]⁺ 606.1418.

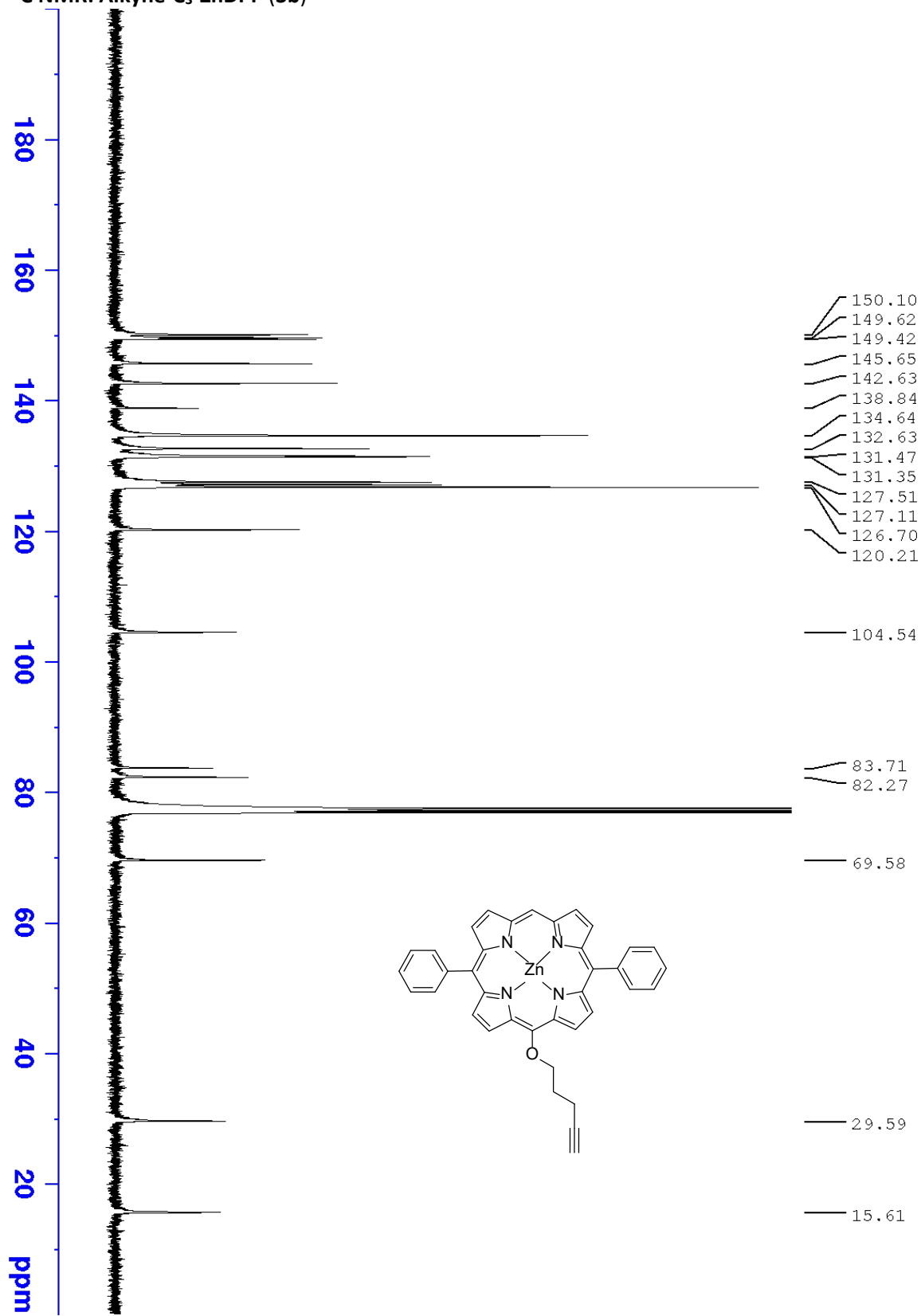
HRMS (ESI): Alkyne-C₃-ZnDPP (3b)



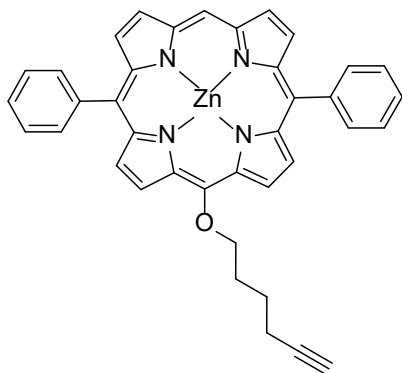
¹H NMR: Alkyne-C₃-ZnDPP (3b)



¹³C NMR: Alkyne-C₃-ZnDPP (3b)

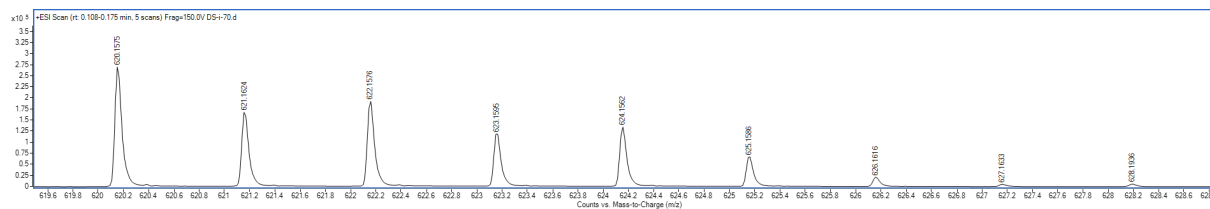


Alkyne-C₄-ZnDPP (3c)

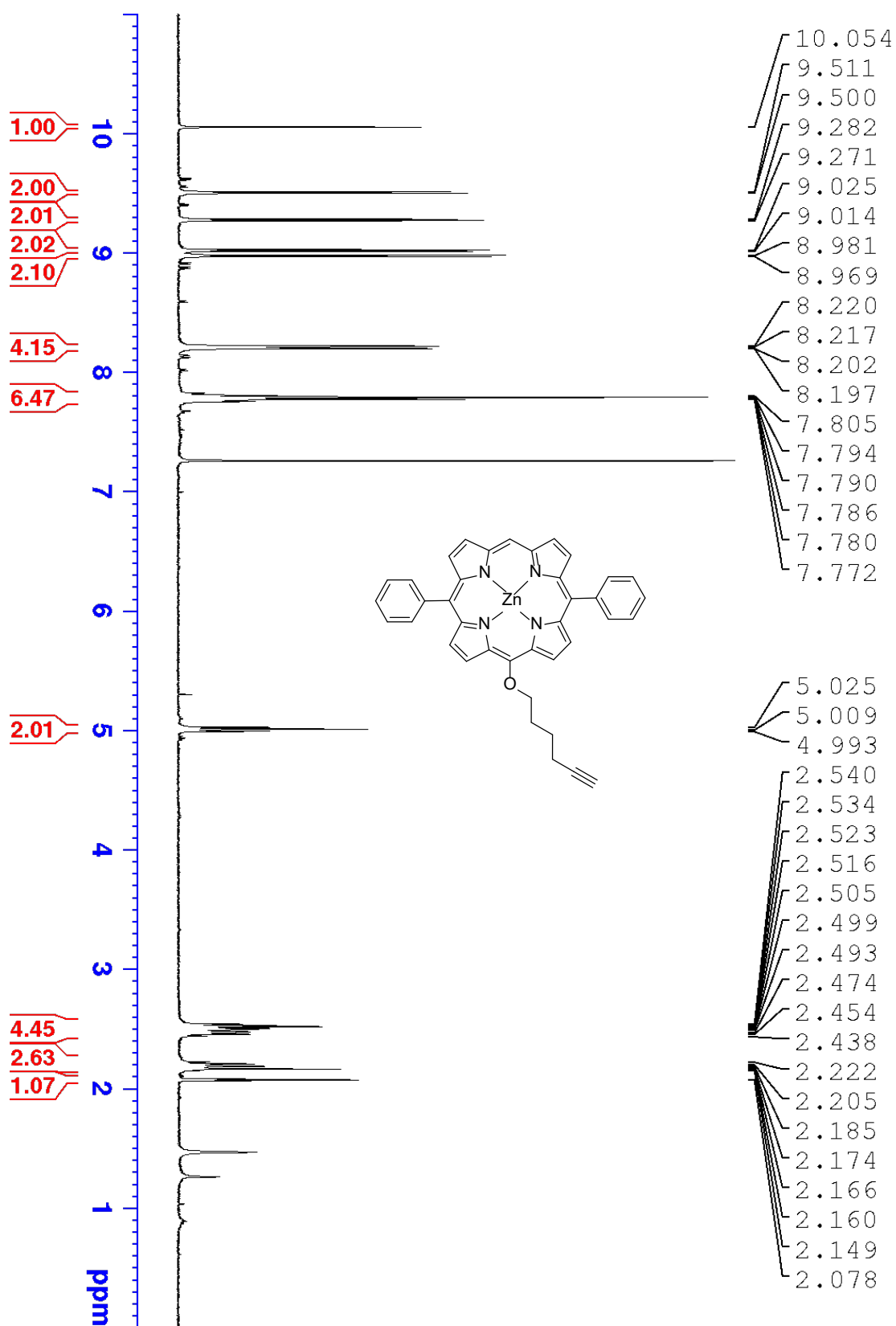


Alkyne-C₄-ZnDPP (3c). Was obtained using the general procedure as a red solid (236 mg, 74.7% yield). TLC analysis $R_f = 0.62$ (Hexanes:DCM 20:80 [v:v]). ¹H NMR (400 MHz, CDCl₃): δ 10.05 (s, 1H), 9.50 (d, $J = 4.6$ Hz, 2H), 9.28 (d, $J = 4.6$ Hz, 2H), 9.02 (d, $J = 4.5$ Hz, 2H), 8.97 (d, $J = 4.6$ Hz, 2H), 8.23 – 8.19 (m, 4H), 7.81 – 7.75 (m, 6H), 5.01 (t, $J = 6.4$ Hz, 2H), 2.53 – 2.43 (m, 4H), 2.23 – 2.16 (m, 2H), 2.07 (t, $J = 2.6$ Hz, 1H). ¹³C NMR (100 MHz, CDCl₃): δ 150.57, 149.91, 149.71, 146.04, 142.70, 139.71, 134.66, 132.97, 131.69, 131.65, 127.63, 127.38, 126.79, 120.52, 104.89, 84.29, 69.06, 30.34, 25.72, 18.72. HRMS (ESI) m/z : Calcd for C₃₈H₂₈N₄OZn [M]⁺ 620.1555; Found [M]⁺ 620.1575.

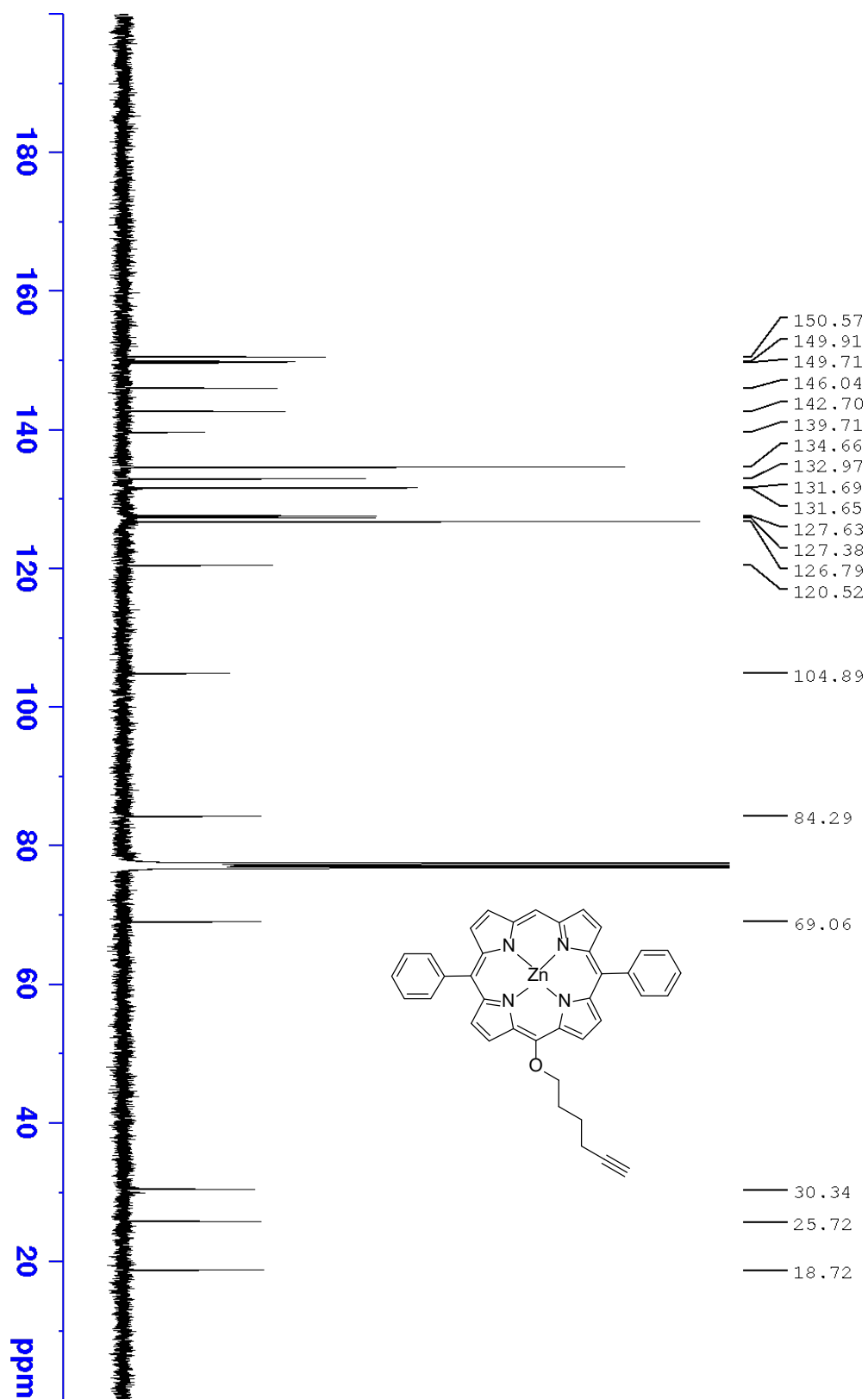
HRMS (ESI): Alkyne-C₄-ZnDPP (3c)



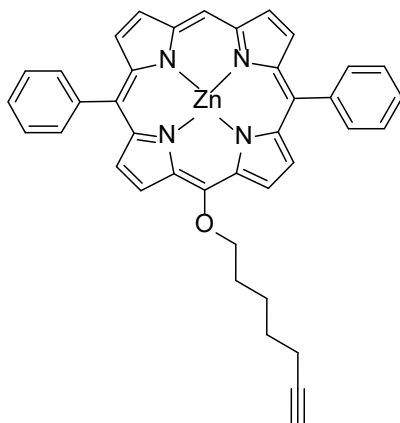
¹H NMR: Alkyne-C₄-ZnDPP (3c)



¹³C NMR: Alkyne-C₄-ZnDPP (3c)

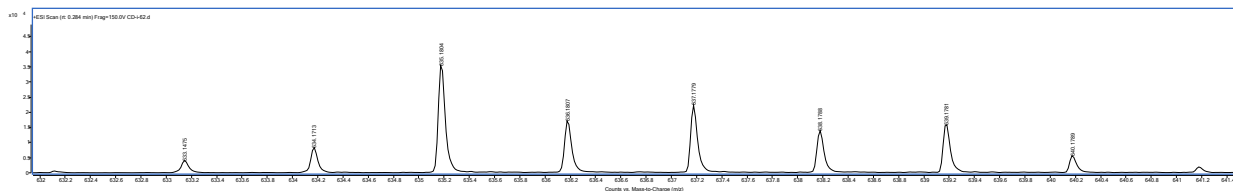


Alkyne-C₅-ZnDPP (3d)

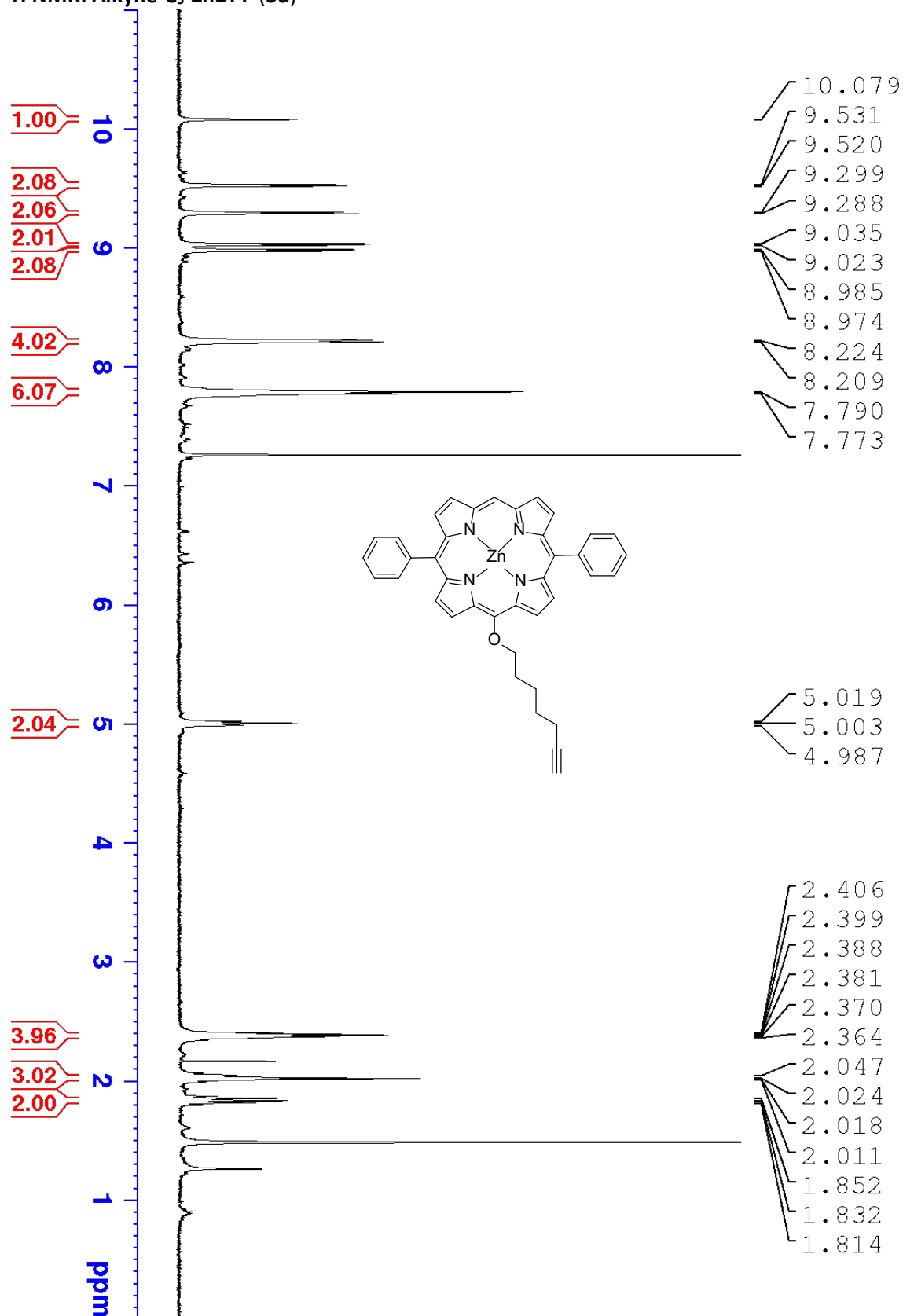


Alkyne-C₅-ZnDPP (3d). Was obtained using the general procedure as a red solid (130.8 mg, 64.7% yield). TLC analysis $R_f = 0.52$ (Hexanes:DCM 20:80 [v:v]). ^1H NMR (400MHz, CDCl_3): δ 10.08 (s, 1H), 9.52 (d, $J = 4.5$ Hz, 2H), 9.29 (d, $J = 4.4$ Hz, 2H), 9.03 (d, $J = 4.5$ Hz, 2H), 8.98 (d, $J = 4.5$ Hz, 2H), 8.24 – 8.19 (m, 4H), 7.82 – 7.76 (m, 6H), 5.00 (t, $J = 6.5$ Hz, 2H), 2.41 – 2.36 (m, 4H), 2.05 – 2.00 (m, 3H), 1.86 – 1.81 (m, 2H). ^{13}C NMR (100 MHz, CDCl_3): δ 150.49, 149.84, 149.64, 146.00, 142.69, 139.60, 134.66, 132.90, 131.59, 127.61, 127.37, 126.77, 120.45, 104.81, 84.57, 68.74, 30.65, 28.63, 25.73, 18.67. HRMS (ESI) m/z : Calcd for $\text{C}_{39}\text{H}_{30}\text{N}_4\text{OZn}$ $[\text{M}]^+$ 634.1711; Found $[\text{M}]^+$ 634.1713.

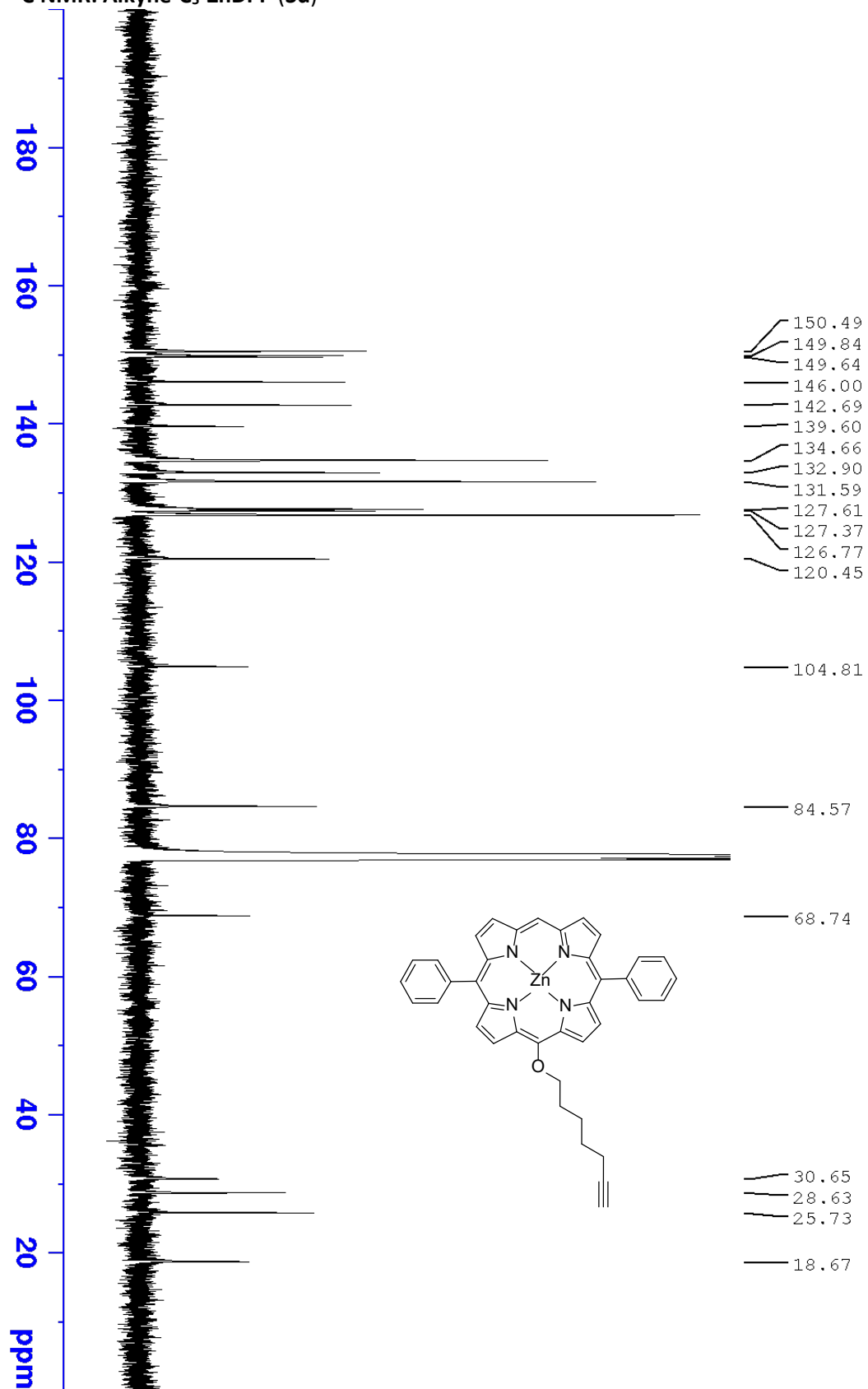
HRMS (ESI): Alkyne-C₅-ZnDPP (3d)



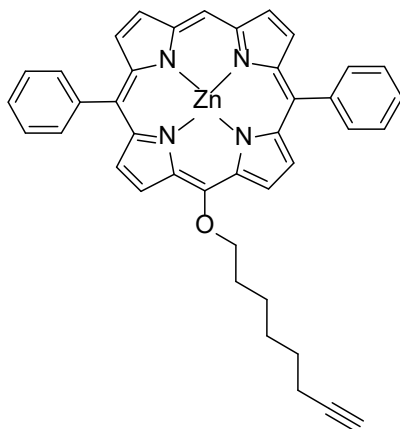
¹H NMR: Alkyne-C₅-ZnDPP (3d)



¹³C NMR: Alkyne-C₅-ZnDPP (3d)

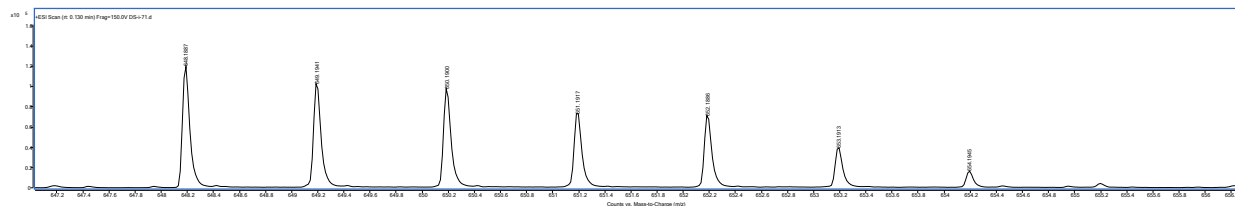


Alkyne-C₆-ZnDPP (3e)

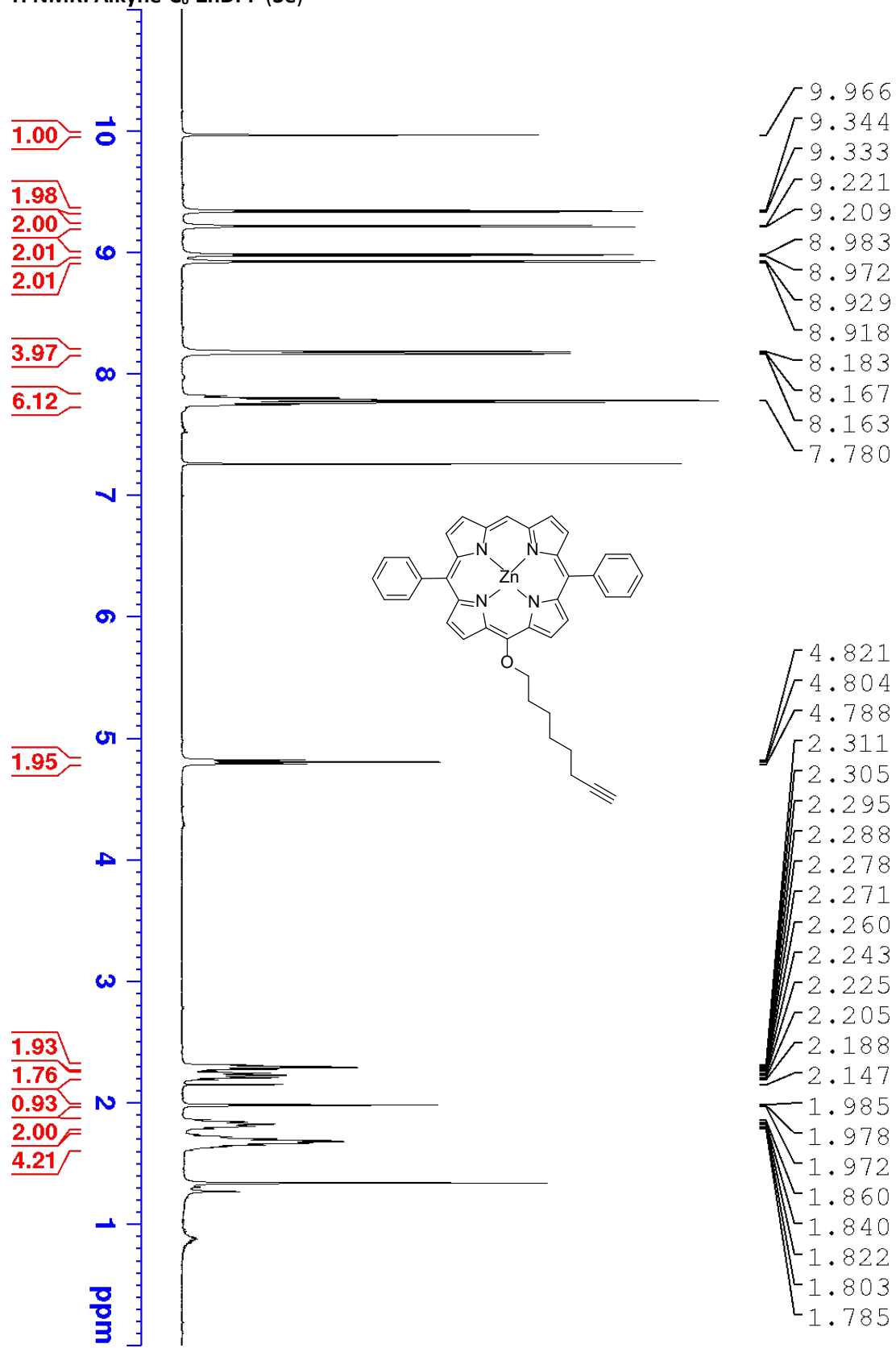


Alkyne-C₆-ZnDPP (3e). Was obtained using the general procedure as a red solid (186.1mg, 59.0% yield). TLC analysis $R_f = 0.58$ (Hexanes:DCM 20:80 [v:v]). ¹H NMR (400MHz, CDCl₃): δ 9.96 (s, 1H), 9.34 (d, $J = 4.5$ Hz, 2H), 9.21 (d, $J = 4.4$ Hz, 2H), 8.98 (d, $J = 4.45$ Hz, 2H), 8.92 (d, $J = 4.5$ Hz, 2H), 8.16 – 8.19 (m, 4H), 7.81 – 7.75 (m, 6H), 4.82 – 4.78 (m, 2H), 2.32 – 2.27 (m, 2H), 2.24 – 2.20 (m, 2H), 1.98 (t, $J = 2.6$ Hz, 1H), 1.85 – 1.78 (m, 2H), 1.71 – 1.62 (m, 2H). ¹³C NMR (100 MHz, CDCl₃): δ 150.49, 149.84, 149.63, 146.02, 142.71, 139.66, 134.64, 132.89, 131.57, 127.60, 127.37, 126.76, 120.44, 104.77, 84.77, 84.73, 68.49, 31.01, 28.89, 28.66, 26.10, 18.59. HRMS (ESI) m/z : Calcd for C₄₀H₃₂N₄OZn [M]⁺ 648.1868; Found [M]⁺ 648.1887.

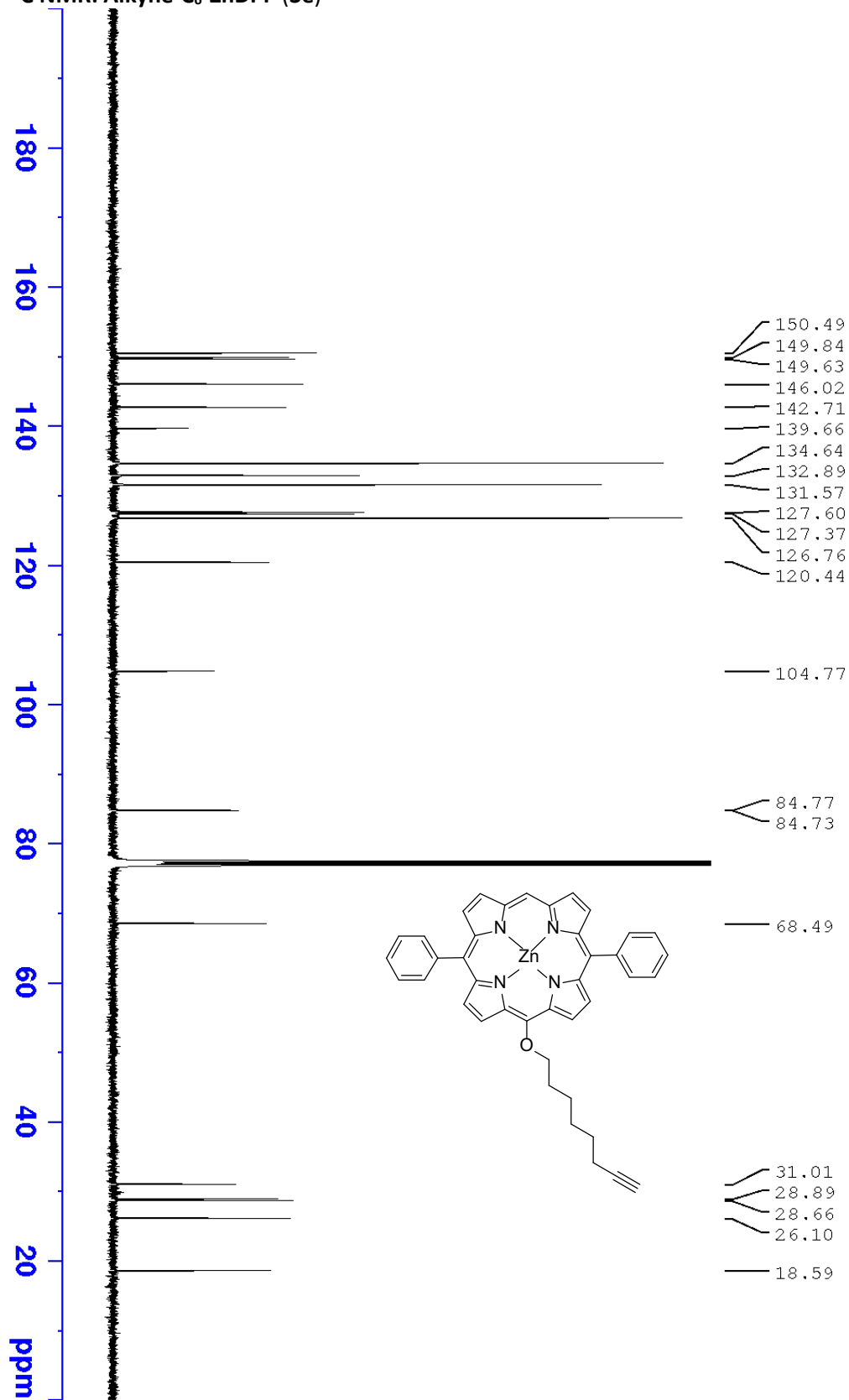
HRMS (ESI): Alkyne-C₆-ZnDPP (3e)



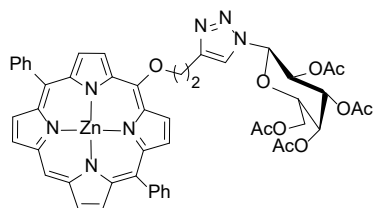
¹H NMR: Alkyne-C₆-ZnDPP (3e)



¹³C NMR: Alkyne-C₆-ZnDPP (3e)

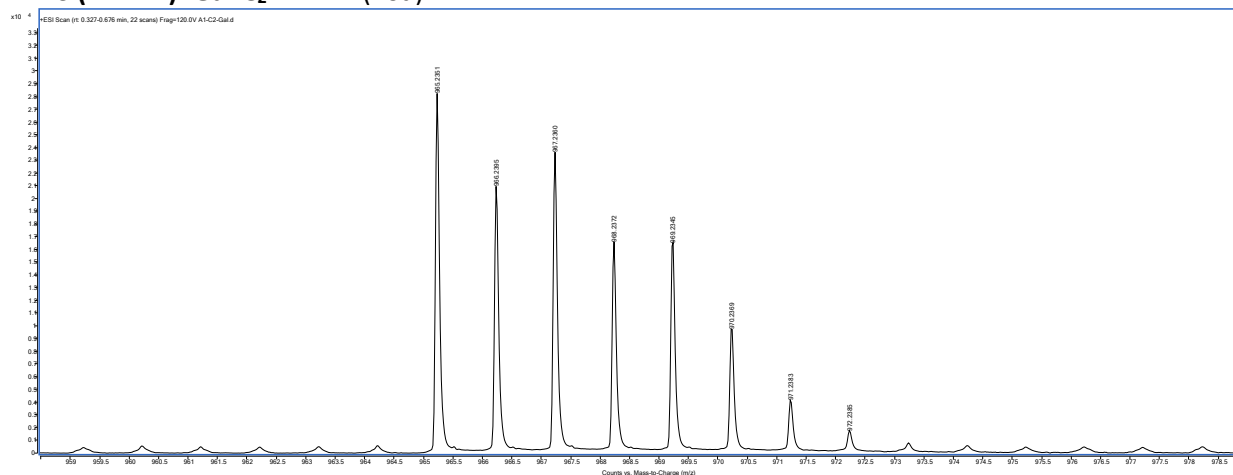


Gal-C₂-ZnDPP (10a)

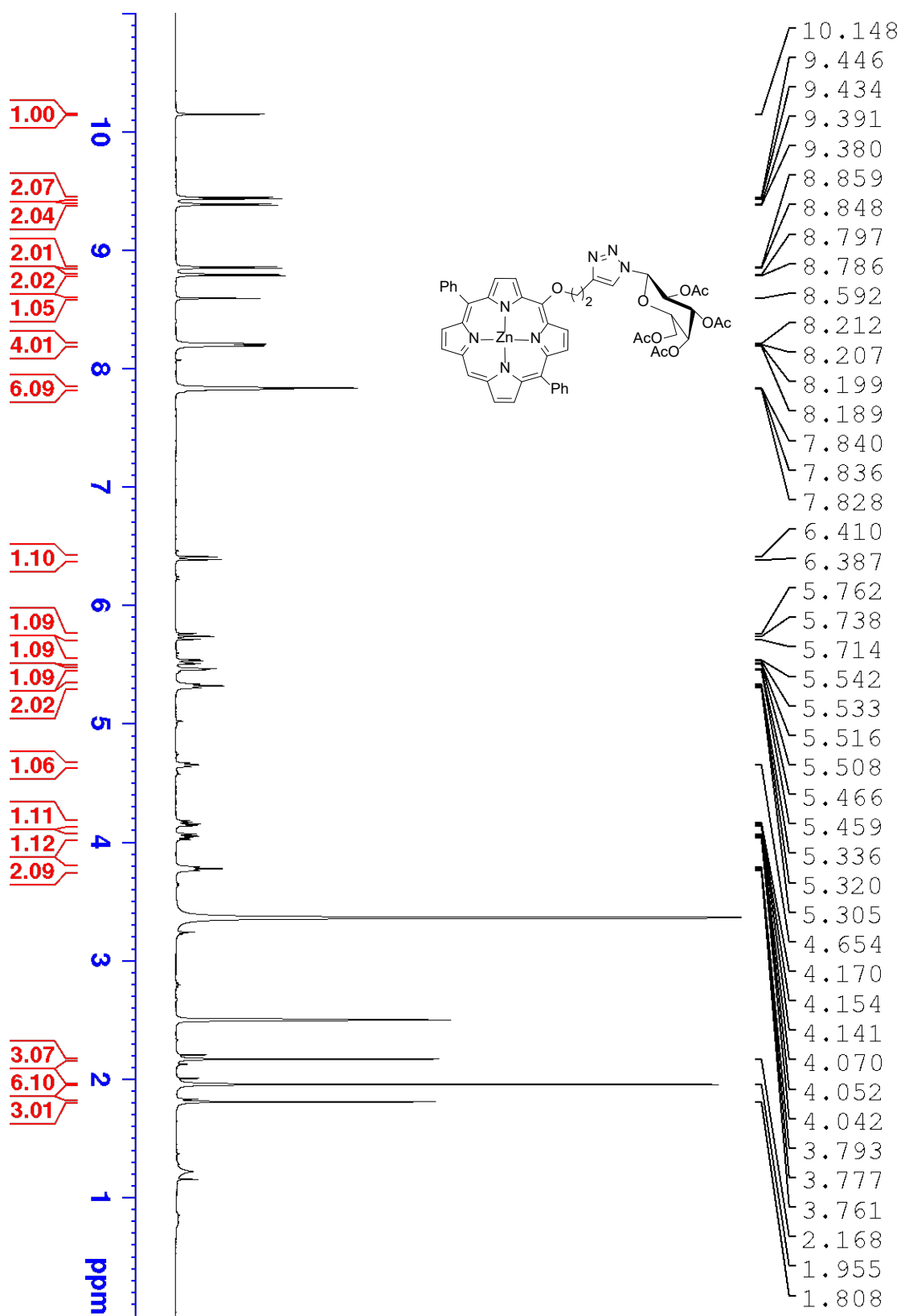


Gal-C₂-ZnDPP (10a). was obtained using the general procedure as a purple solid (21.9 mg, 91.0% yield). TLC analysis $R_f = 0.35$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400 MHz, DMSO): δ 10.15 (s, 1H), 9.44 (d, $J = 4.6$ Hz, 2H), 9.39 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.79 (d, $J = 4.5$ Hz, 2H), 8.59 (s, 1H), 8.22 - 8.18 (m, 4H), 7.85 - 7.82 (m, 6H), 6.40 (d, $J = 9.2$ Hz, 1H), 5.77 - 5.70 (m, 1H), 5.52 (dd, $J = 10.1, 3.4$ Hz, 1H), 5.48 - 5.45 (m, 1H), 5.32 (t, $J = 6.3$ Hz, 2H), 4.68 - 4.63 (m, 1H), 4.16 (dd, $J = 11.6, 5.2$ Hz, 1H), 4.05 (dd, $J = 11.5, 7.3$ Hz, 1H), 3.78 (t, $J = 6.3$ Hz, 2H), 2.17 (s, 3H), 1.96 (s, 6H), 1.81 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.02, 169.92, 169.53, 168.61, 150.00, 149.03, 148.68, 145.20, 144.78, 142.54, 138.82, 134.33, 132.07, 132.01, 130.92, 127.47, 127.38, 126.71, 122.74, 119.42, 104.69, 84.39, 82.98, 72.91, 70.52, 67.85, 67.38, 61.60, 27.10, 20.49, 20.37, 20.09. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.63), 554 (4.15), 597 (3.91). HRMS (MALDI) m/z : Calcd for C₅₀H₄₃N₇O₁₀Zn [M]⁺ 965.2357; Found [M]⁺ 965.2351.

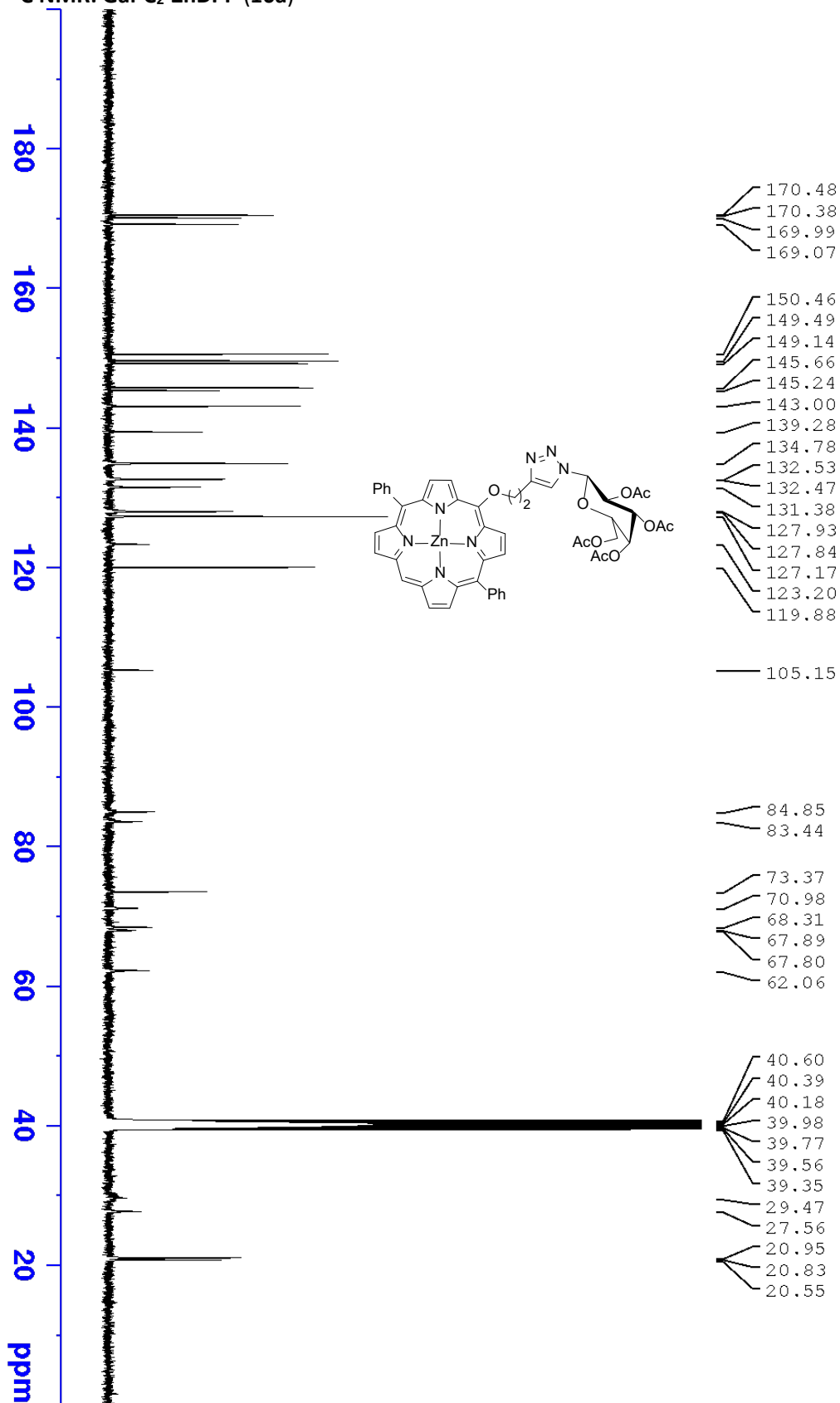
HRMS (MALDI): Gal-C₂-ZnDPP (10a)



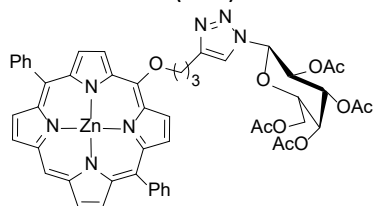
¹H NMR: Gal-C₂-ZnDPP (10a)



¹³C NMR: Gal-C₂-ZnDPP (10a)

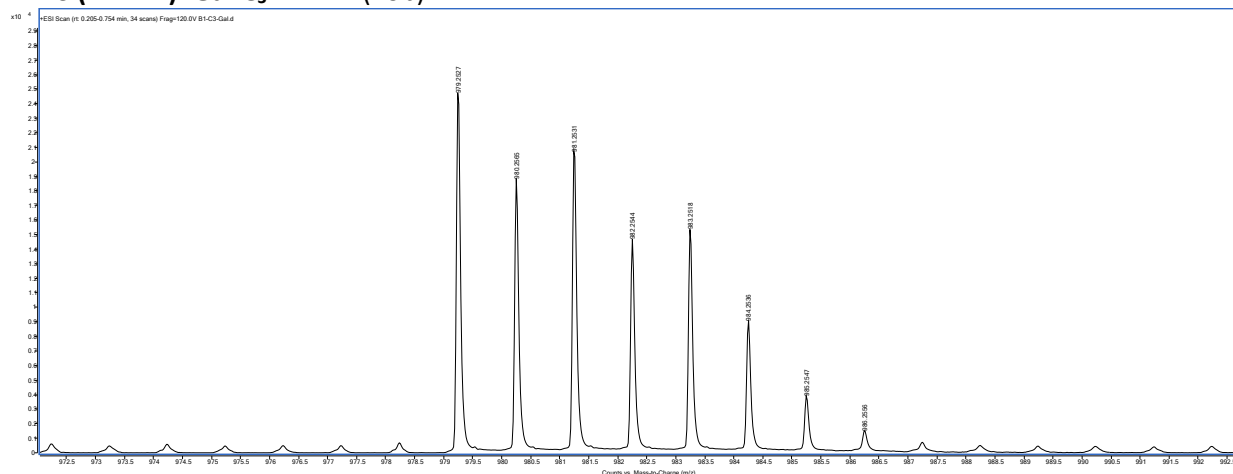


Gal-C₃-ZnDPP (10b)

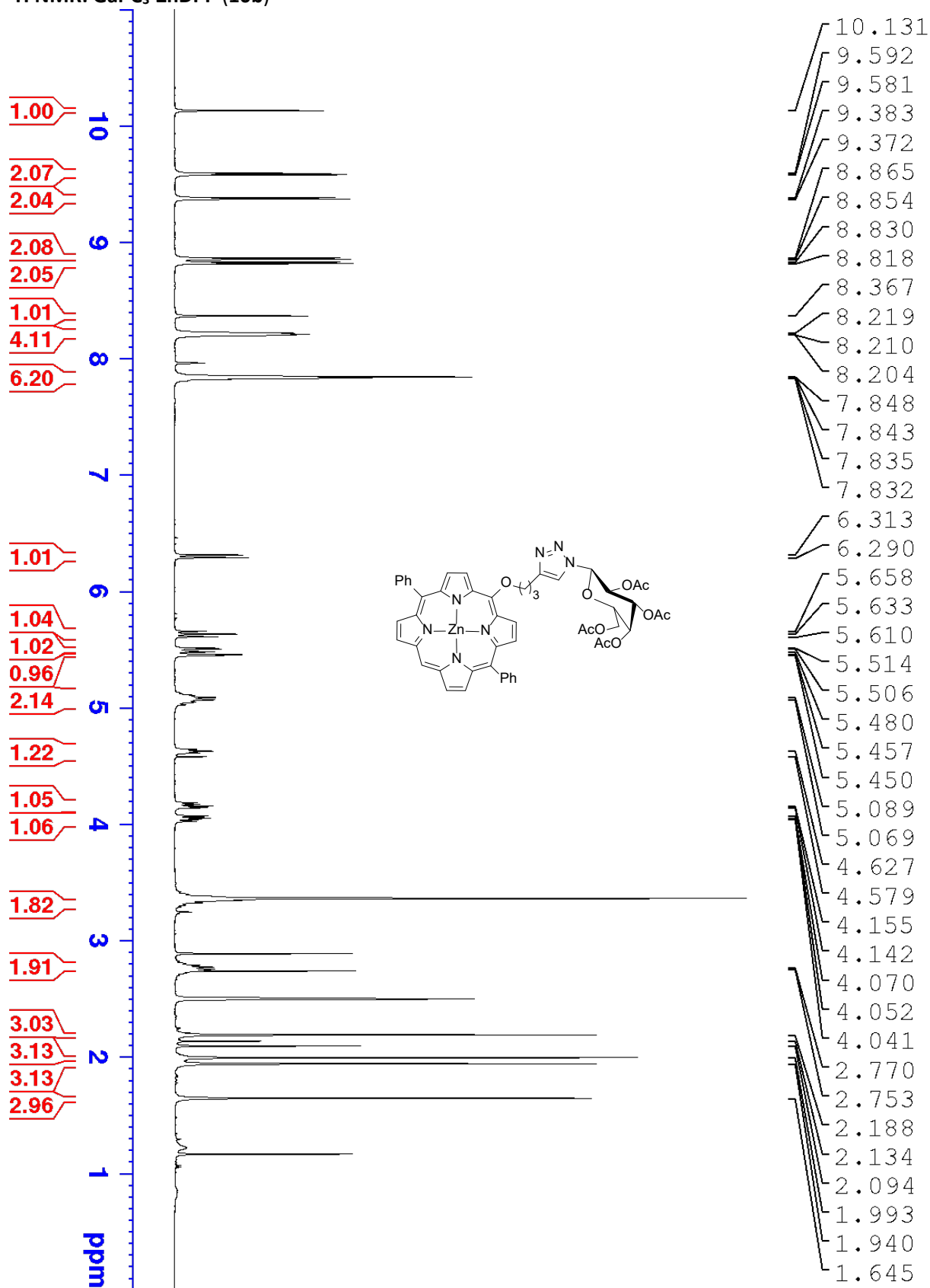


Gal-C₃-ZnDPP (10b). was obtained using the general procedure as a purple solid (28.4 mg, 95.0% yield). TLC analysis $R_f = 0.34$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.59 (d, $J = 4.6$ Hz, 2H), 9.38 (d, $J = 4.5$ Hz, 2H), 8.86 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.37 (s, 1H), 8.25 - 8.18 (m, 4H), 7.87 - 7.80 (m, 6H), 6.30 (d, $J = 9.2$ Hz, 1H), 5.67 - 5.60 (m, 1H), 5.50 (dd, $J = 10.0, 3.4$ Hz, 1H), 5.47 - 5.44 (m, 1H), 5.14 - 5.02 (m, 2H), 4.63 (t, $J = 6.2$ Hz, 1H), 4.16 (dd, $J = 11.6, 5.2$ Hz, 1H), 4.05 (dd, $J = 11.5, 7.3$ Hz, 1H), 3.46 - 3.26 (m, 2H), 2.83 - 2.69 (m, 2H), 2.19 (s, 3H), 1.99 (s, 3H), 1.94 (s, 3H), 1.64 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.02, 169.96, 169.51, 168.51, 150.02, 149.01, 148.65, 147.23, 145.24, 142.58, 139.34, 134.32, 132.08, 131.98, 130.93, 127.47, 127.42, 126.72, 121.56, 119.40, 104.58, 84.31, 83.66, 72.88, 70.43, 67.85, 67.34, 61.58, 30.24, 22.00, 20.51, 20.44, 20.34, 19.81. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.64), 554 (4.17), 597 (3.94). HRMS (MALDI) m/z : Calcd for C₅₁H₄₅N₇O₁₀Zn [M]⁺ 979.2514; Found [M]⁺ 979.2527.

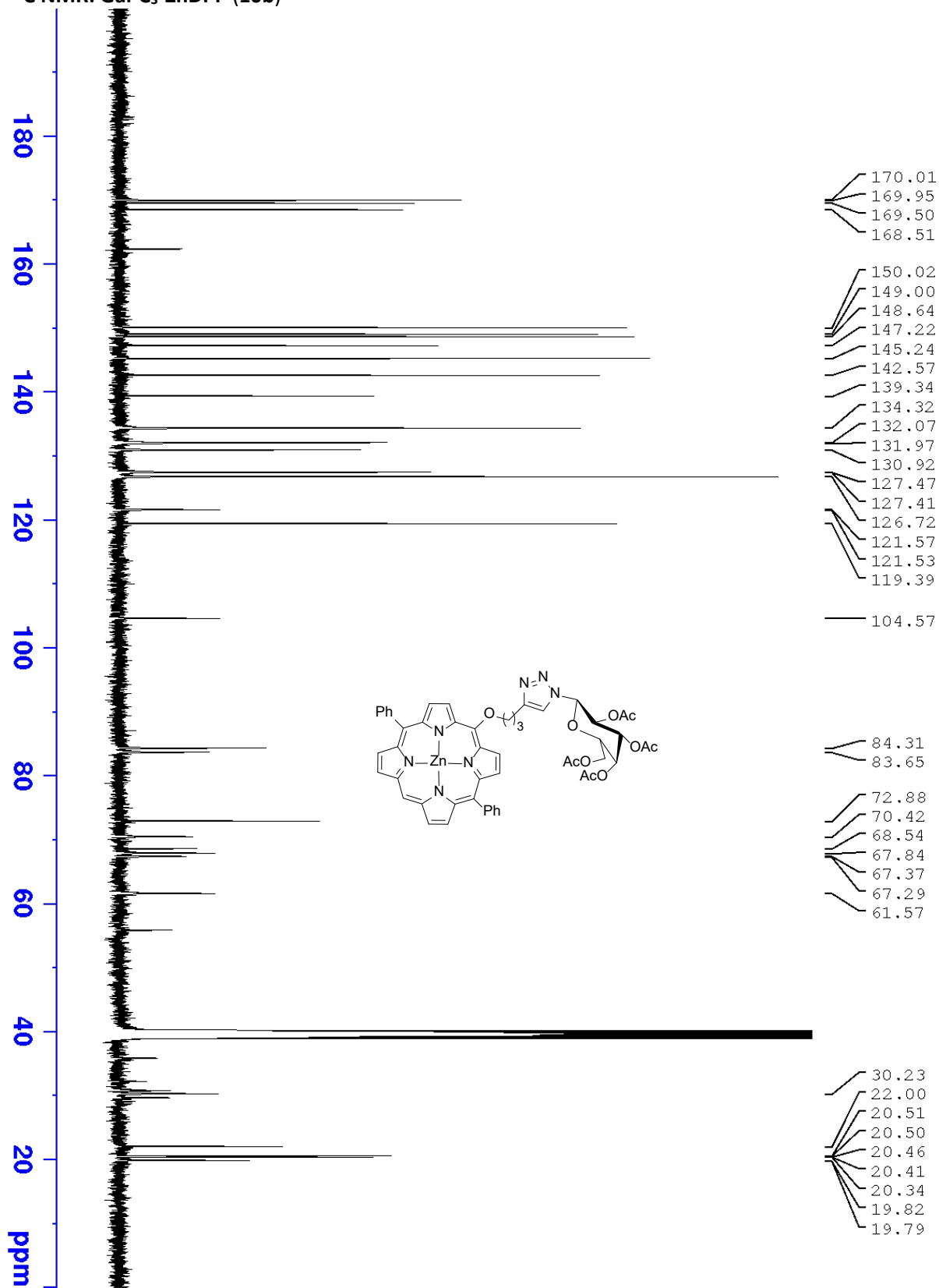
HRMS (MALDI): Gal-C₃-ZnDPP (10b)



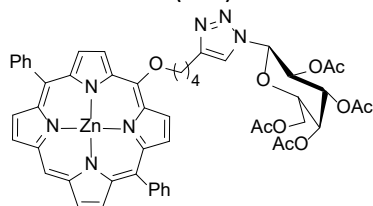
¹H NMR: Gal-C₃-ZnDPP (10b)



¹³C NMR: Gal-C₃-ZnDPP (10b)

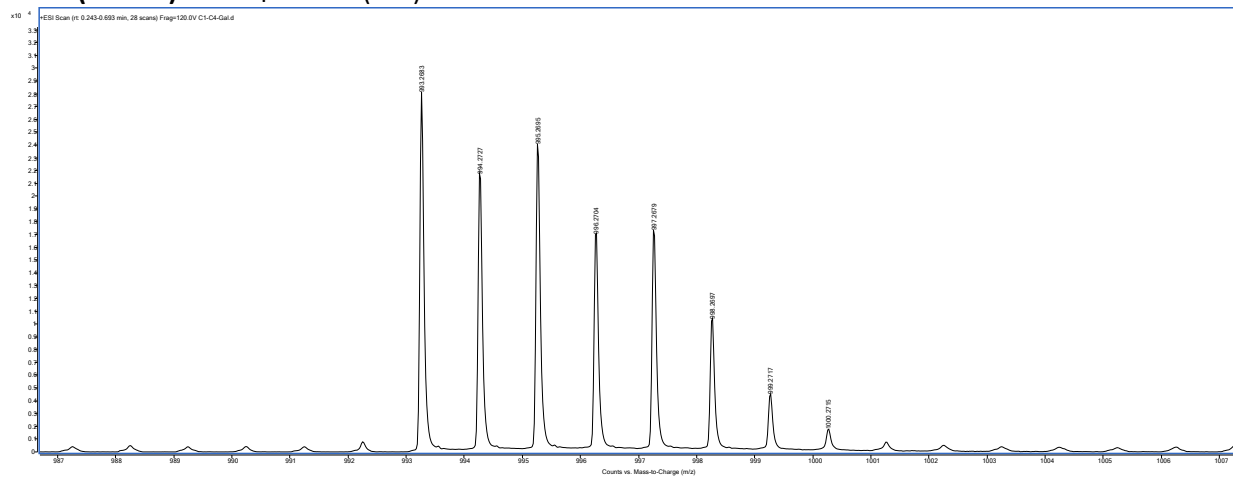


Gal-C₄-ZnDPP (10c)

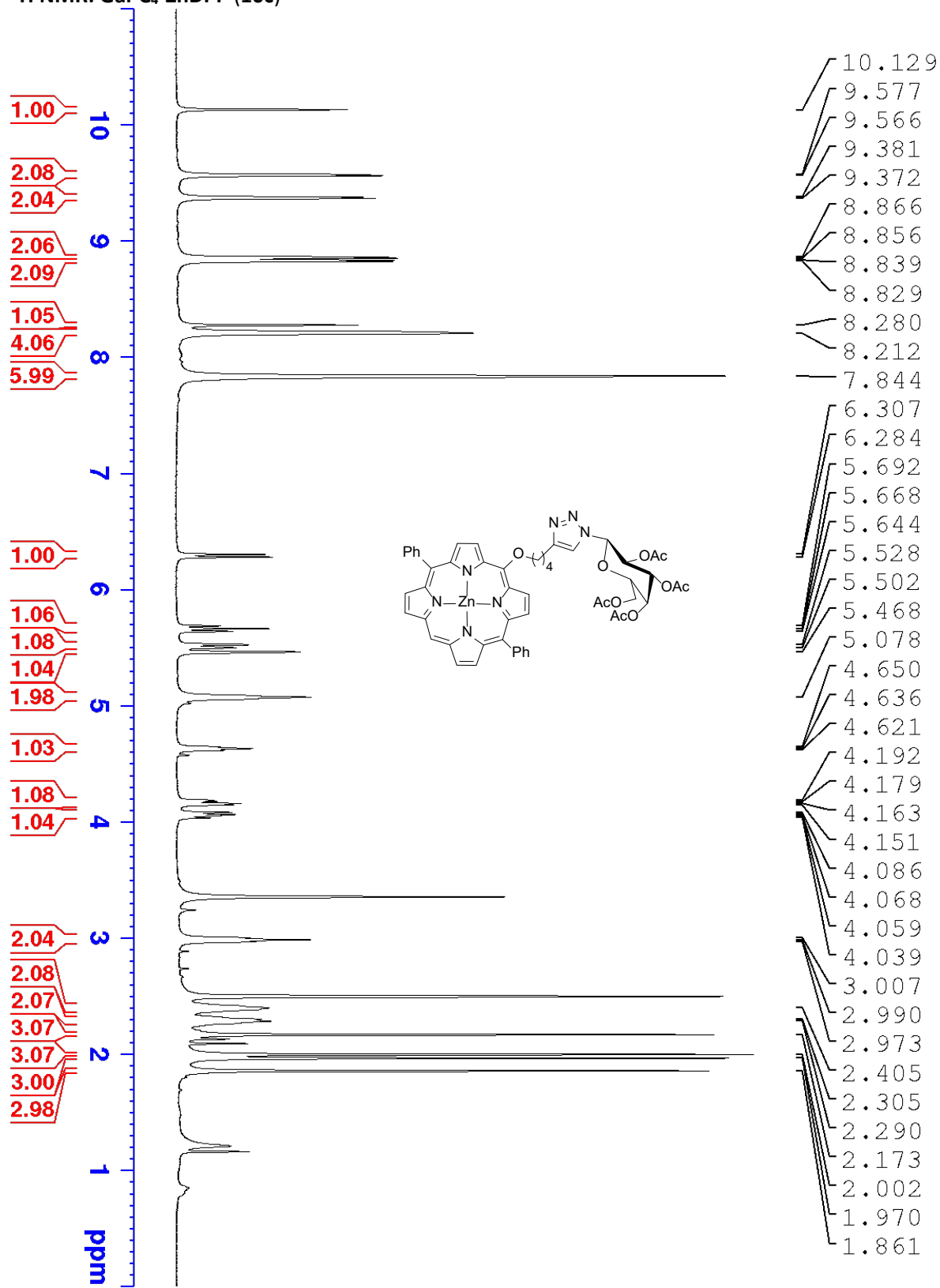


Gal-C₄-ZnDPP (10c). was obtained using the general procedure as a purple solid (23.0 mg, 91.0% yield). TLC analysis $R_f = 0.25$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.57 (d, $J = 4.1$ Hz, 2H), 9.38 (d, $J = 3.9$ Hz, 2H), 8.86 (d, $J = 3.9$ Hz, 2H), 8.83 (d, $J = 4.1$ Hz, 2H), 8.28 (s, 1H), 8.24 - 8.19 (m, 4H), 7.87 - 7.81 (m, 6H), 6.30 (d, $J = 9.2$ Hz, 1H), 5.67 (t, $J = 9.6$ Hz, 1H), 5.55 - 5.49 (m, 1H), 5.49 - 5.45 (m, 1H), 5.12 - 5.04 (m, 2H), 4.67 - 4.60 (m, 1H), 4.21 - 4.13 (m, 1H), 4.10 - 4.03 (m, 1H), 2.99 (t, $J = 6.8$ Hz, 2H), 2.44 - 2.37 (m, 2H), 2.33 - 2.26 (m, 2H), 2.17 (s, 3H), 2.00 (s, 3H), 1.97 (s, 3H), 1.86 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.03, 169.96, 169.52, 168.60, 150.03, 149.00, 148.63, 147.56, 145.23, 142.57, 139.49, 134.33, 132.08, 131.96, 130.94, 127.46, 127.33, 126.72, 121.34, 119.40, 104.54, 84.55, 84.31, 72.91, 70.43, 67.91, 67.36, 61.62, 30.00, 26.00, 24.88, 20.51, 20.44, 20.37, 20.04. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.67), 554 (4.18), 597 (3.94). HRMS (MALDI) m/z : Calcd for C₅₂H₄₇N₇O₁₀Zn [M]⁺ 993.2676; Found [M]⁺ 993.2683.

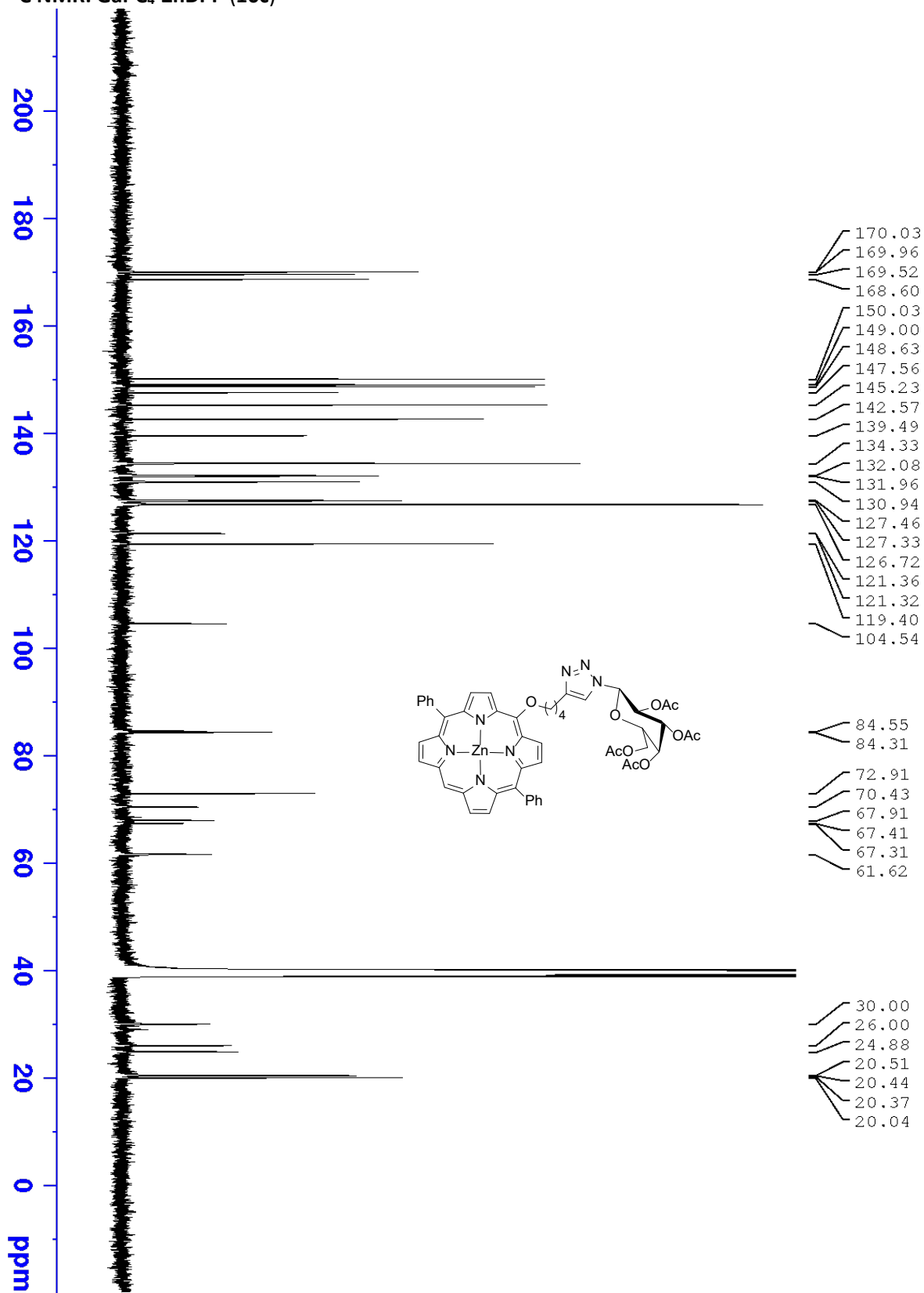
HRMS (MALDI): Gal-C₄-ZnDPP (10c)



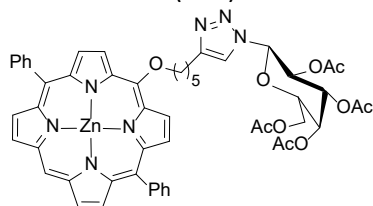
¹H NMR: Gal-C₄-ZnDPP (10c)



¹³C NMR: Gal-C₄-ZnDPP (10c)

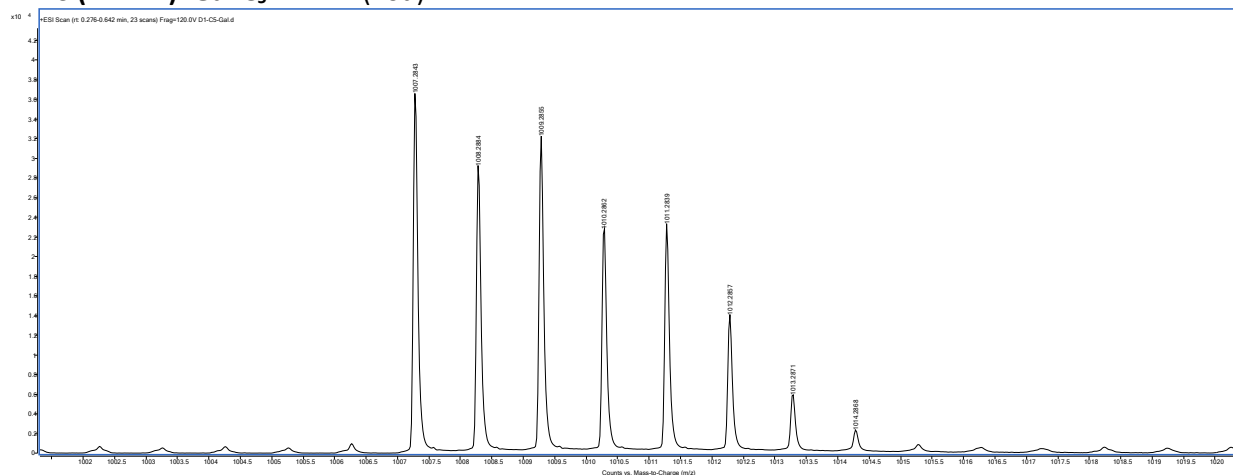


Gal-C₅-ZnDPP (10d)

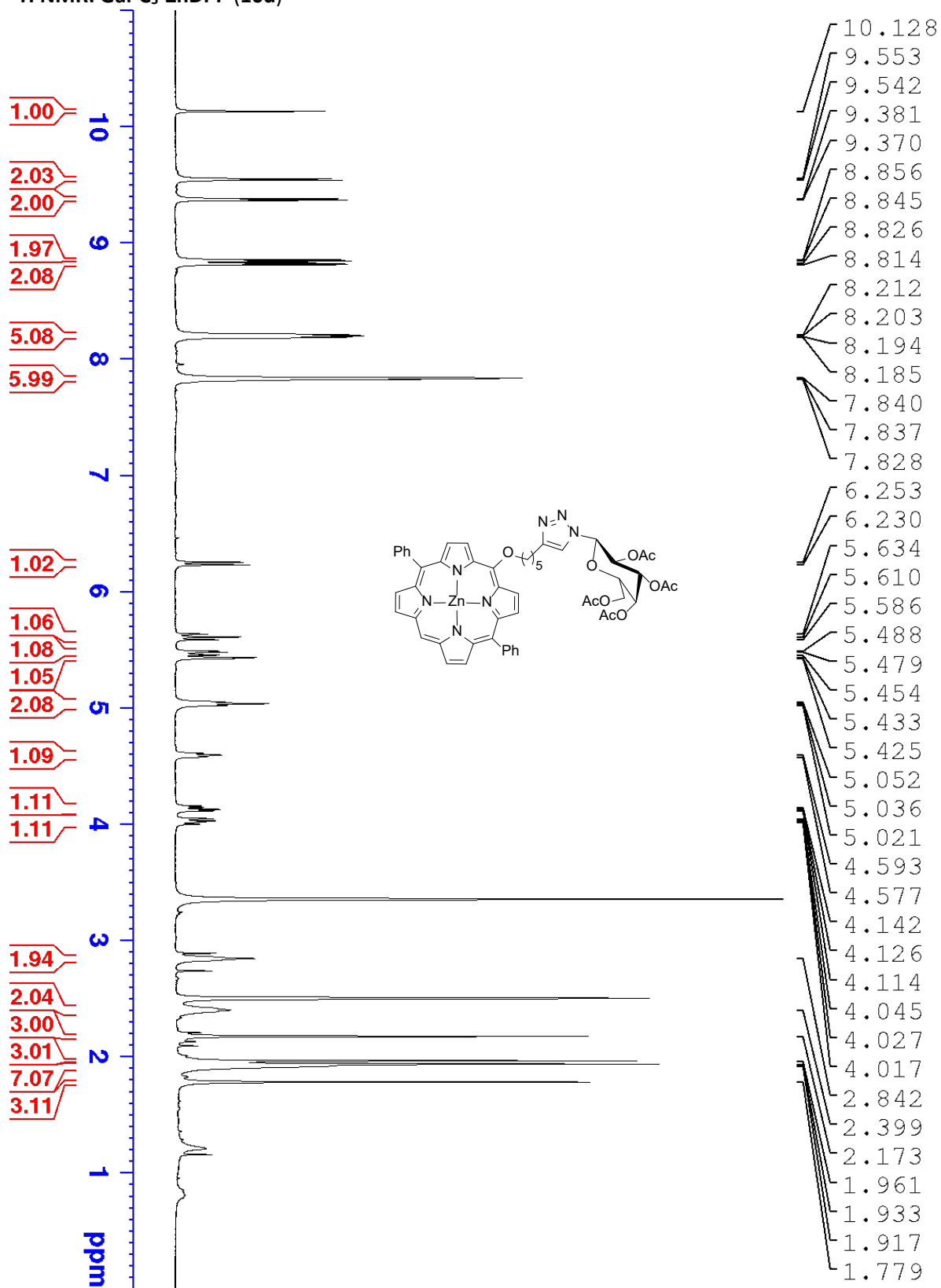


Gal-C₅-ZnDPP (10d). was obtained using the general procedure as a purple solid (23.5 mg, 94.0% yield). TLC analysis $R_f = 0.40$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.55 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.23 - 8.17 (m, 5H), 7.86 - 7.81 (m, 6H), 6.24 (d, $J = 9.2$ Hz, 1H), 5.66 - 5.57 (m, 1H), 5.47 (dd, $J = 10.1, 3.3$ Hz, 1H), 5.45 - 5.41 (m, 1H), 5.04 (t, $J = 6.2$ Hz, 2H), 4.63 - 4.55 (m, 1H), 4.13 (dd, $J = 11.5, 5.0$ Hz, 1H), 4.02 (dd, $J = 11.5, 7.2$ Hz, 1H), 2.88 - 2.81 (m, 2H), 2.44 - 2.36 (m, 2H), 2.17 (s, 3H), 1.96 (s, 3H), 1.93 (s, 3H), 1.95 - 1.88 (m, 7H), 1.78 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.01, 169.93, 169.49, 168.52, 150.02, 148.98, 148.61, 147.59, 145.25, 142.57, 139.50, 134.33, 132.07, 131.96, 130.92, 127.46, 127.35, 126.71, 121.19, 119.38, 104.53, 84.75, 84.24, 72.86, 70.45, 67.81, 67.33, 61.58, 30.38, 28.86, 25.42, 24.92, 20.48, 20.40, 20.33, 19.97. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.53), 554 (4.08), 597 (3.87). HRMS (MALDI) m/z : Calcd for C₅₃H₄₉N₇O₁₀Zn [M]⁺ 1007.2827; Found [M]⁺ 1007.2843.

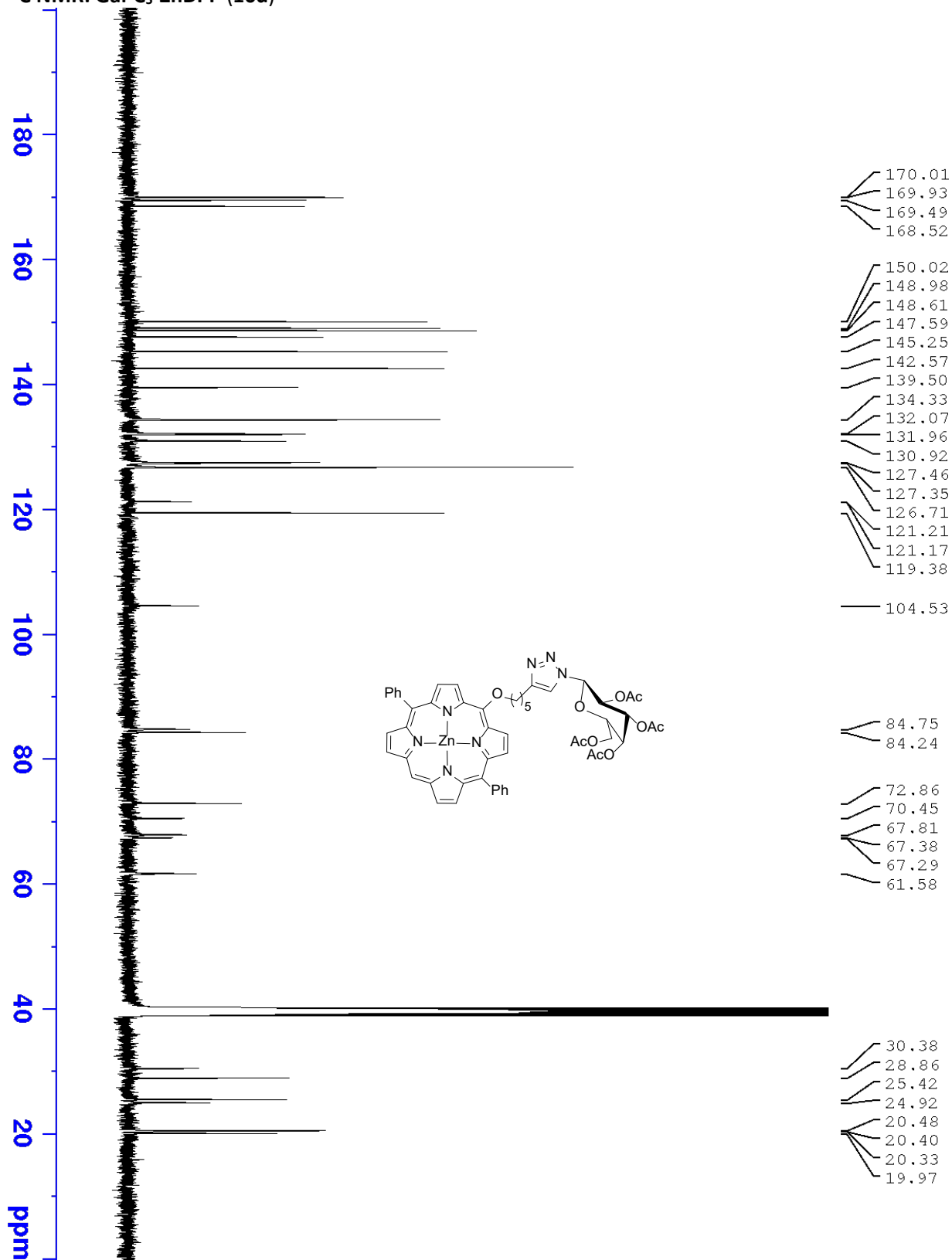
HRMS (MALDI): Gal-C₅-ZnDPP (10d)



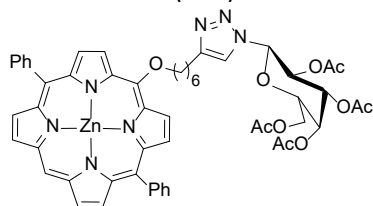
¹H NMR: Gal-C₅-ZnDPP (10d)



¹³C NMR: Gal-C₅-ZnDPP (10d)

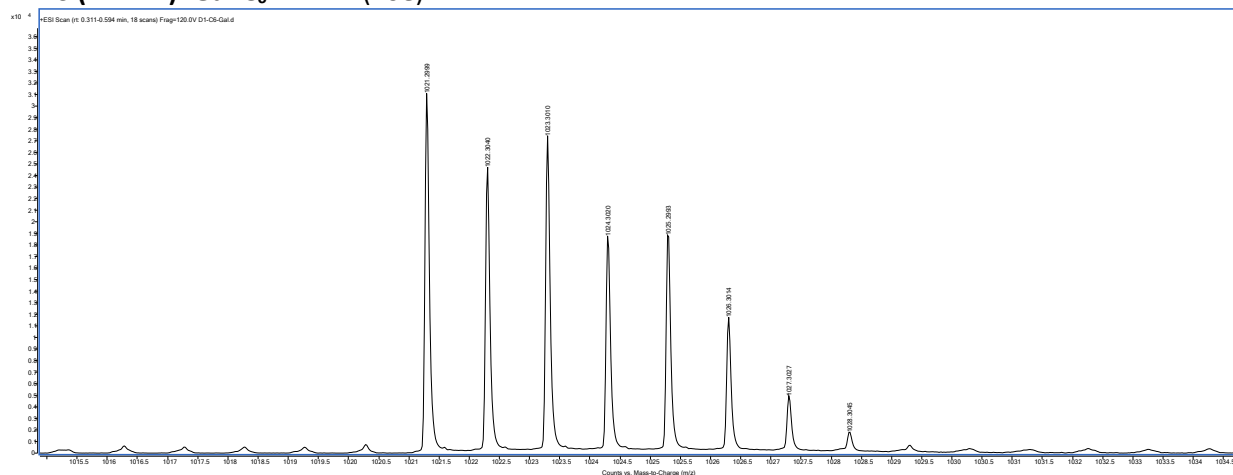


Gal-C₆-ZnDPP (10e)

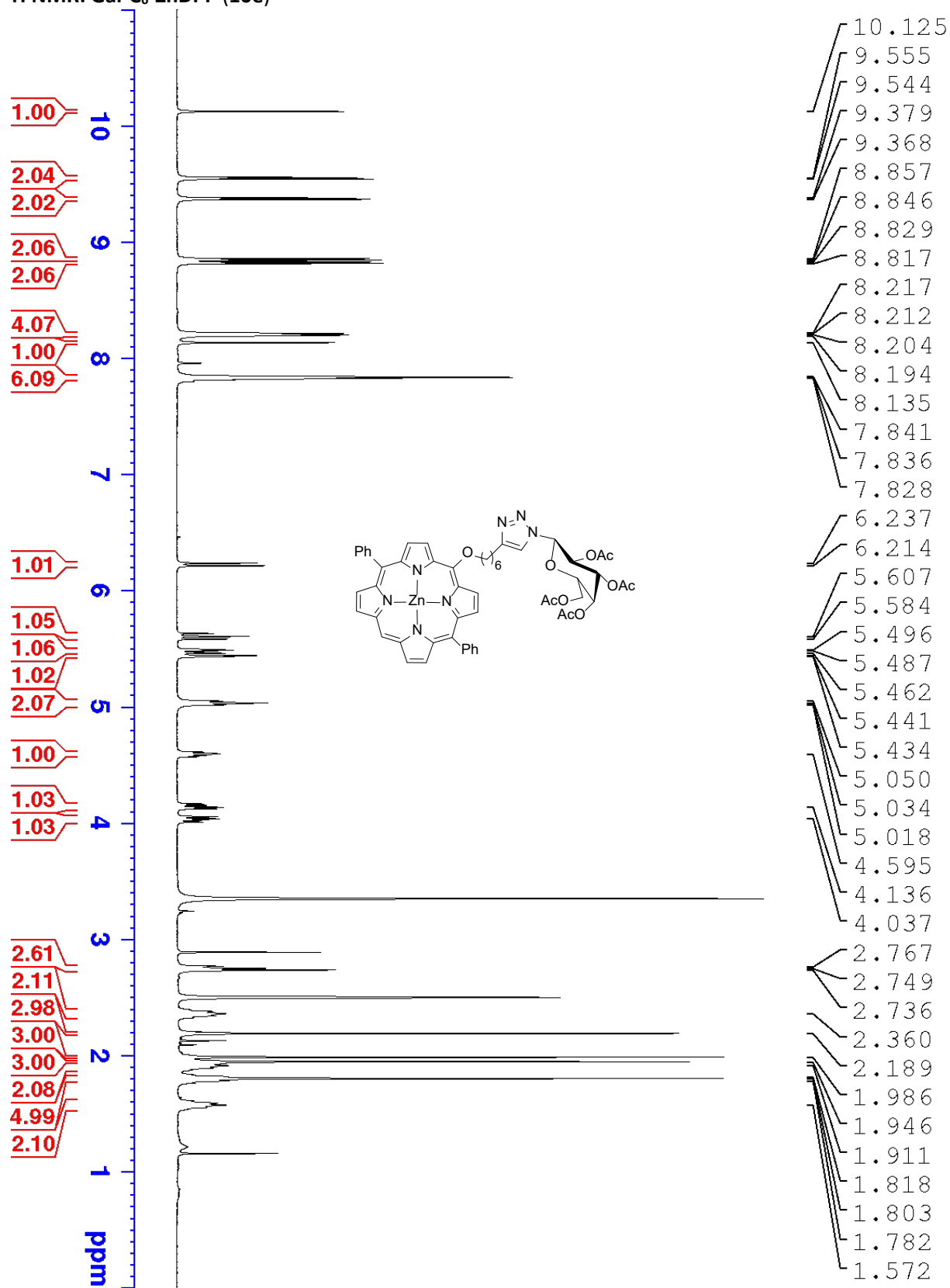


Gal-C₆-ZnDPP (10e). was obtained using the general procedure as a purple solid (24.9 mg, 93.0% yield). TLC analysis $R_f = 0.29$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.12 (s, 1H), 9.55 (d, $J = 4.6$ Hz, 2H), 9.37 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.23 - 8.18 (m, 4H), 8.13 (s, 1H), 7.86 - 7.81 (m, 6H), 6.22 (d, $J = 9.2$ Hz, 1H), 5.64 - 5.57 (m, 1H), 5.48 (dd, $J = 10.0$, 3.4 Hz, 1H), 5.45 - 5.42 (m, 1H), 5.03 (t, $J = 6.3$ Hz, 2H), 4.62 - 4.57 (m, 1H), 4.17 - 4.11 (m, 1H), 4.03 (dd, $J = 11.5$, 7.3 Hz, 1H), 2.78 - 2.72 (m, 2H), 2.40 - 2.32 (m, 2H), 2.19 (s, 3H), 1.99 (s, 3H), 1.95 (s, 3H), 1.94 - 1.87 (m, 2H) 1.83 - 1.76 (m, 5H), 1.62 - 1.53 (m, 2H). ¹³C NMR (100 MHz, DMSO): δ 170.02, 169.94, 169.49, 168.51, 150.02, 148.97, 148.61, 147.64, 145.25, 142.56, 139.52, 134.33, 132.06, 131.95, 130.92, 127.45, 127.32, 126.71, 121.08, 119.38, 104.51, 84.82, 84.23, 72.86, 70.43, 67.81, 67.38, 61.59, 30.62, 28.90, 28.54, 25.79, 24.86, 20.48, 20.41, 20.34, 19.98. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.53), 554 (4.15), 597 (3.93). HRMS (MALDI) m/z : Calcd for C₅₄H₅₁N₇O₁₀Zn [M]⁺ 1021.2983; Found [M]⁺ 1021.2999.

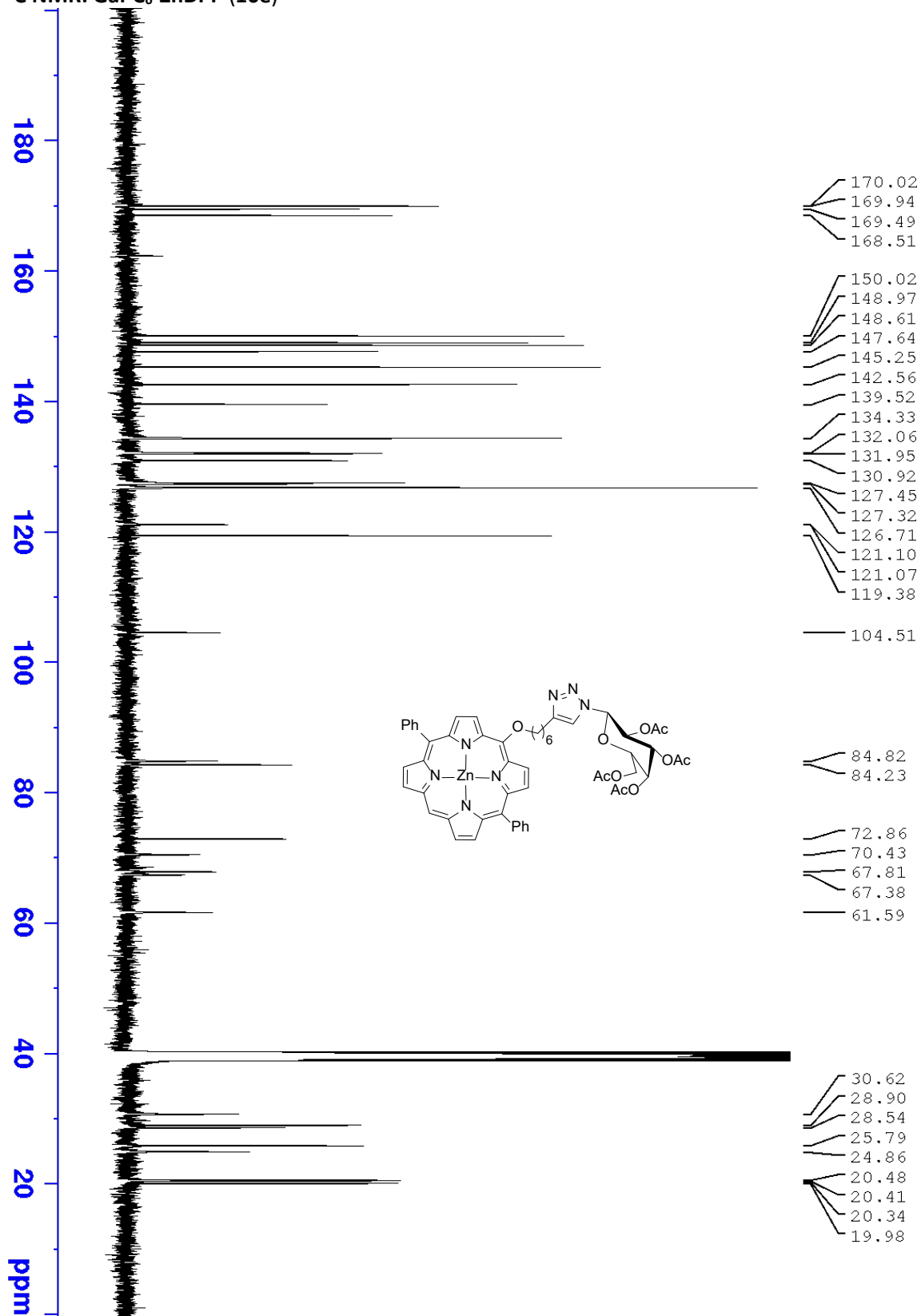
HRMS (MALDI): Gal-C₆-ZnDPP (10e)



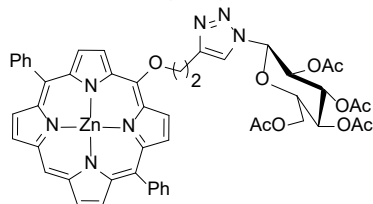
¹H NMR: Gal-C₆-ZnDPP (10e)



¹³C NMR: Gal-C₆-ZnDPP (10e)

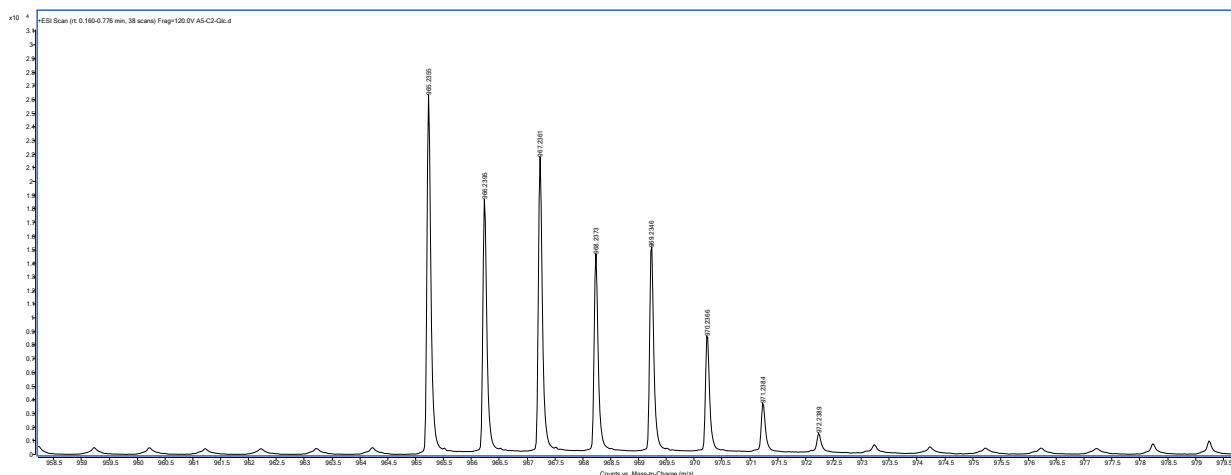


Glc-C₂-ZnDPP(11a)

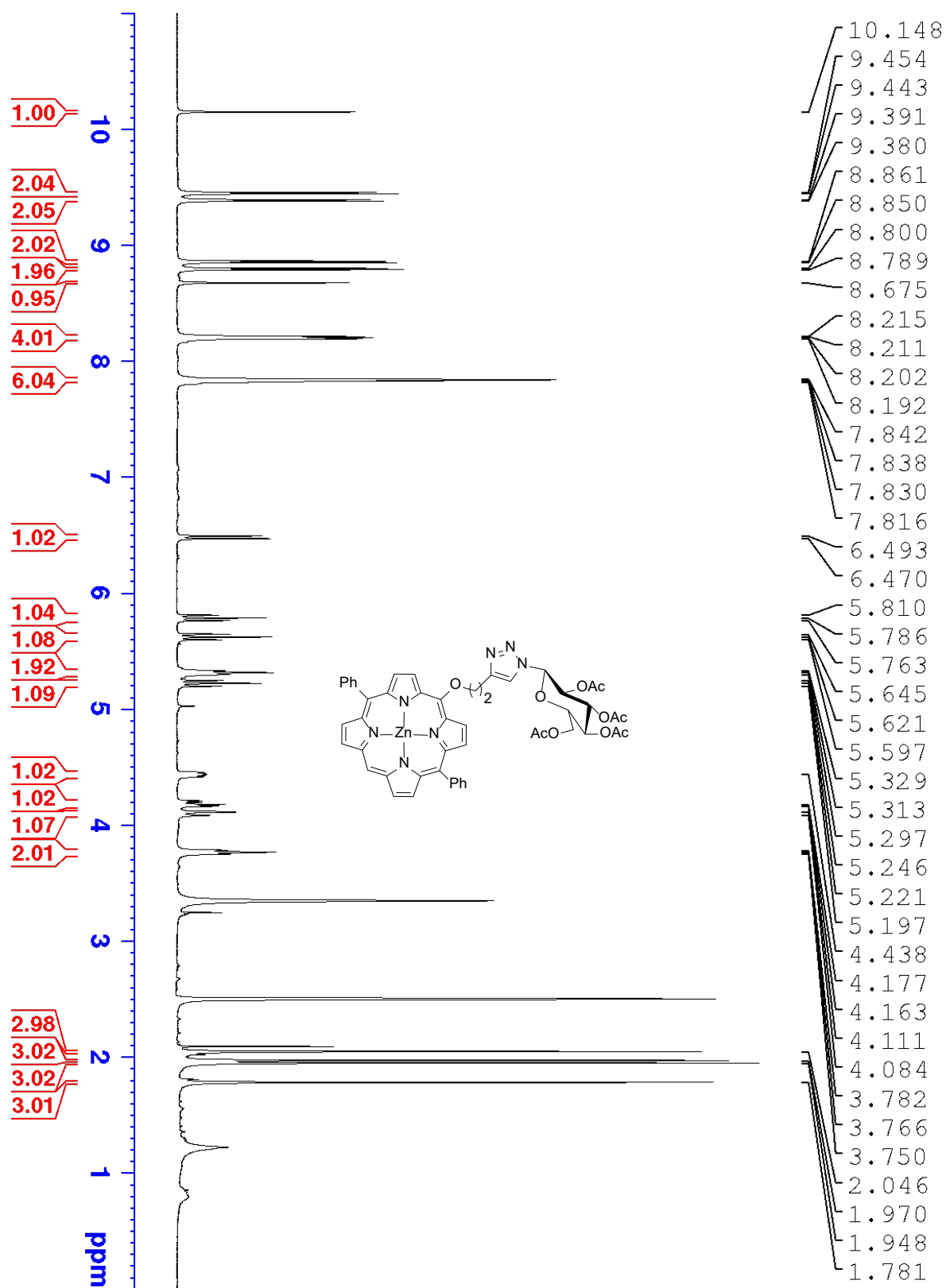


Glc-C₂-ZnDPP(11a). was obtained using the general procedure as a purple solid (23.6 mg, 95.0% yield). TLC analysis $R_f = 0.32$ (hexanes: acetone 60:40 [v:v]). ¹HNMR (400 MHz, DMSO): δ 10.15 (s, 1H), 9.45 (d, $J = 4.6$ Hz, 2H), 9.39 (d, $J = 4.5$ Hz, 2H), 8.86 (d, $J = 4.5$ Hz, 2H), 8.79 (d, $J = 4.5$ Hz, 2H), 8.68 (s, 1H), 8.22 - 8.18 (m, 4H), 7.86 - 7.81 (m, 6H), 6.48 (d, $J = 9.2$ Hz, 1H), 5.79 (t, $J = 9.4$ Hz, 1H), 5.62 (t, $J = 9.5$ Hz, 1H), 5.31 (t, $J = 6.4$ Hz, 2H), 5.22 (t, $J = 9.8$ Hz, 1H), 4.47 - 4.40 (m, 1H), 4.22 - 4.15 (m, 1H), 4.13 - 4.08 (m, 1H), 3.77 (t, $J = 6.3$ Hz, 2H), 2.05 (s, 3H), 1.97 (s, 3H), 1.95 (s, 3H), 1.78 (s, 3H) ¹³C NMR (100 MHz, DMSO): δ 170.00, 169.61, 169.41, 168.56, 149.99, 149.02, 148.68, 145.20, 144.81, 142.54, 138.83, 134.33, 132.07, 132.01, 130.93, 127.47, 127.40, 126.71, 122.46, 119.42, 104.69, 83.95, 82.97, 73.29, 72.28, 70.25, 67.64, 61.87, 27.13, 20.51, 20.42, 20.28, 19.99. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.65), 554 (4.16), 597 (3.91). HRMS (MALDI) m/z : Calcd for C₅₀H₄₃N₇O₁₀Zn [M]⁺ 965.2357; Found [M]⁺ 965.2355.

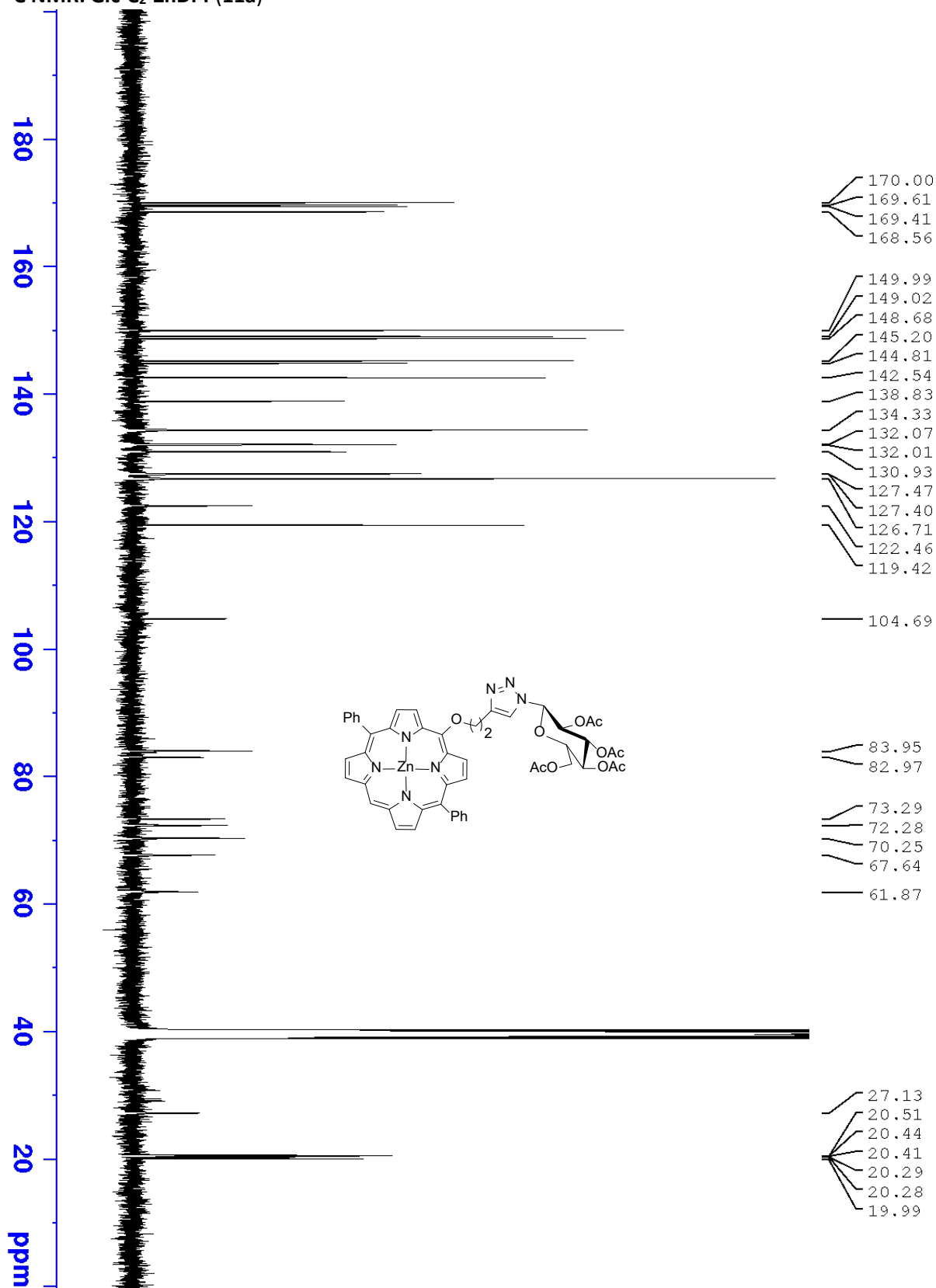
HRMS (MALDI): Glc-C₂-ZnDPP(11a)



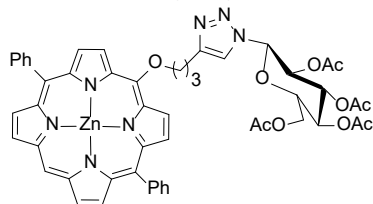
¹H NMR: Glc-C₂-ZnDPP(11a)



¹³C NMR: Glc-C₂-ZnDPP(11a)

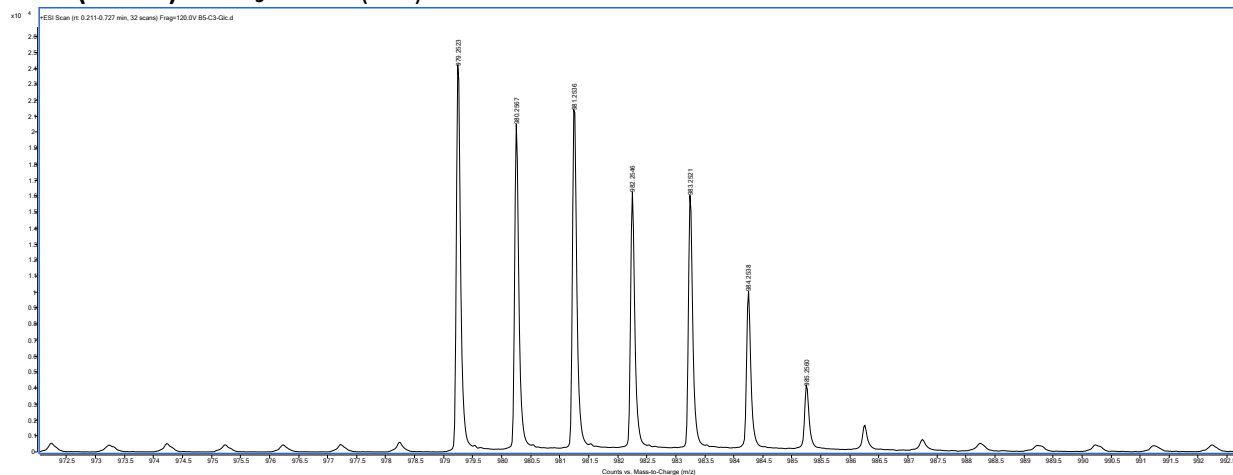


Glc-C₃-ZnDPP (11b)

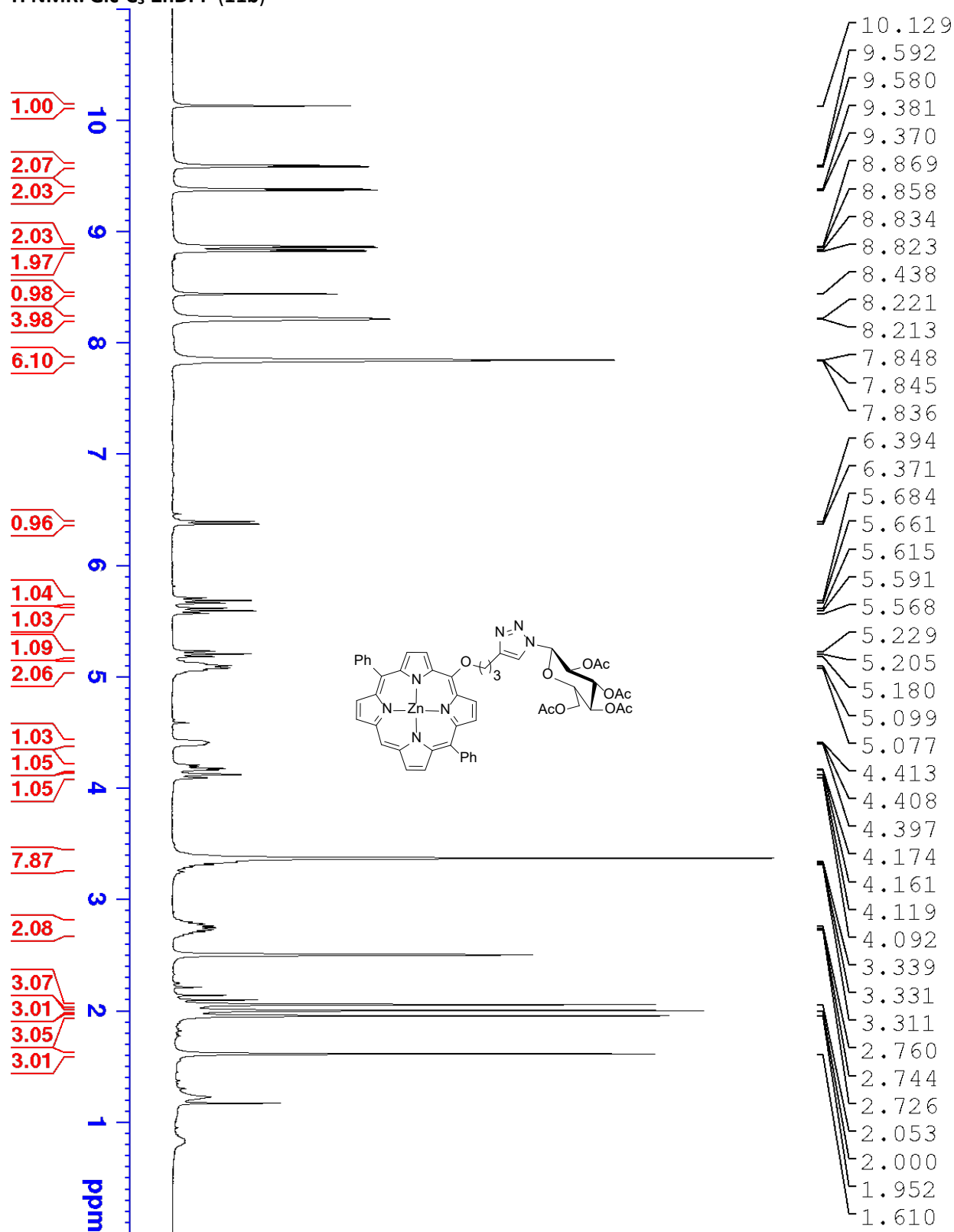


Glc-C₃-ZnDPP (11b). was obtained using the general procedure as a purple solid (27.1 mg, 95.0% yield). TLC analysis $R_f = 0.35$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.59 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.4$ Hz, 2H), 8.86 (d, $J = 4.4$ Hz, 2H), 8.83 (d, $J = 4.4$ Hz, 2H), 8.44 (s, 1H), 8.24 - 8.19 (m, 4H), 7.87 - 7.82 (m, 6H), 6.38 (d, $J = 9.1$ Hz, 1H), 5.72 - 5.65 (m, 1H), 5.59 (t, $J = 9.4$ Hz, 1H), 5.24 - 5.17 (m, 1H), 5.14 - 5.03 (m, 2H), 4.44 - 4.37 (m, 1H), 4.22 - 4.15 (m, 1H), 4.14 - 4.08 (m, 1H), 3.45 - 3.26 (m, 2H), 2.82 - 2.67 (m, 2H), 2.05 (s, 3H), 2.00 (s, 3H), 1.95 (s, 3H), 1.61 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.06, 169.58, 169.42, 168.46, 150.03, 149.01, 148.66, 147.24, 145.25, 142.59, 139.34, 134.33, 132.08, 131.98, 130.96, 127.48, 126.73, 121.31, 119.41, 104.58, 83.85, 83.62, 73.25, 72.20, 70.25, 67.65, 61.82, 30.22, 22.05, 20.54, 20.43, 20.26, 19.71. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.63), 554 (4.16), 597 (3.93). HRMS (MALDI) m/z : Calcd for C₅₁H₄₅N₇O₁₀Zn [M]⁺ 979.2514; Found [M]⁺ 979.2523.

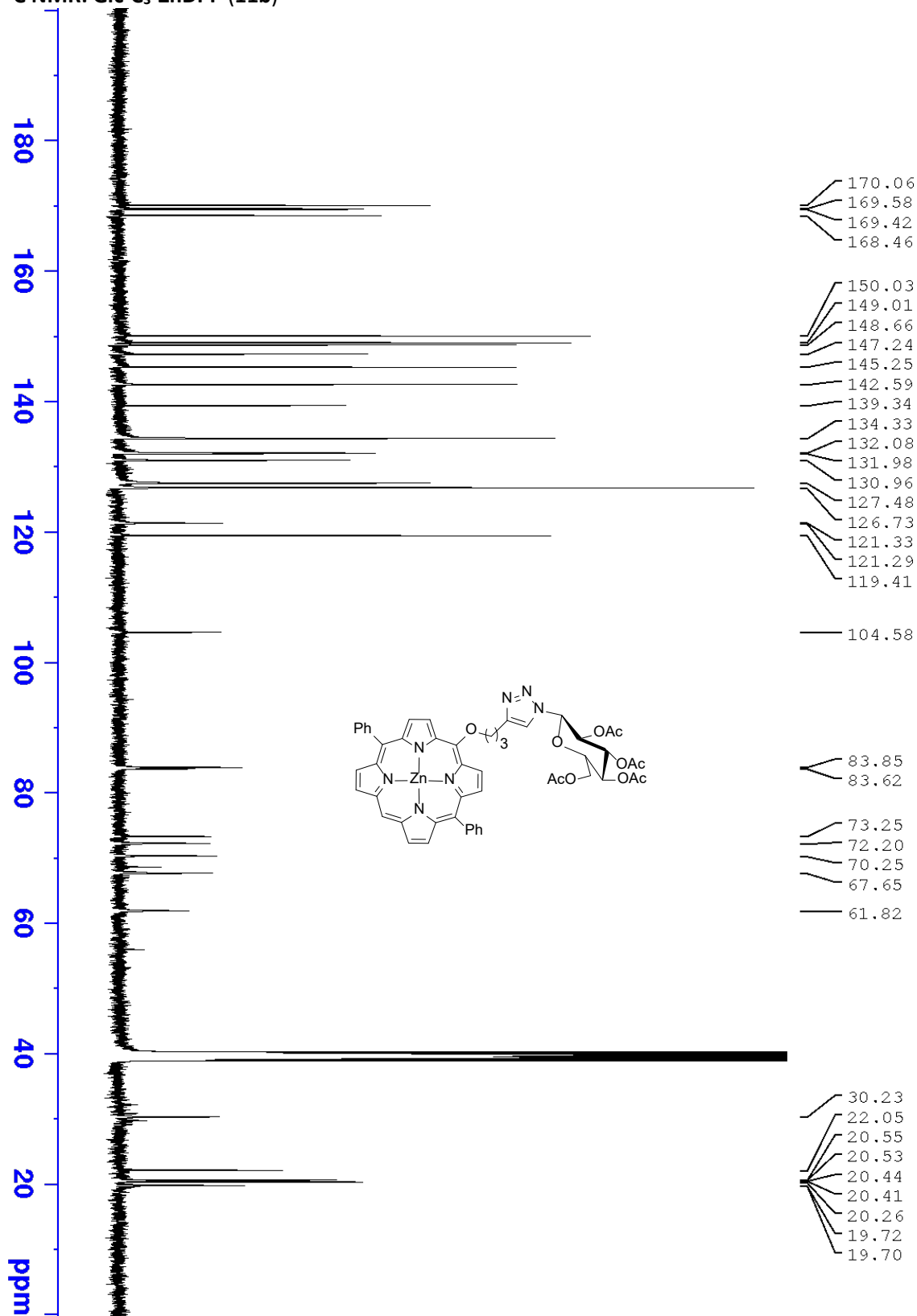
HRMS (MALDI): Glc-C₃-ZnDPP (11b)



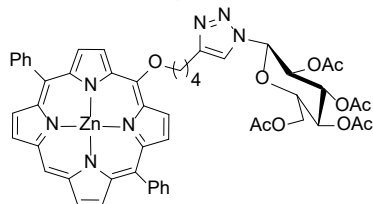
¹H NMR: Glc-C₃-ZnDPP (11b)



¹³C NMR: Glc-C₃-ZnDPP (11b)

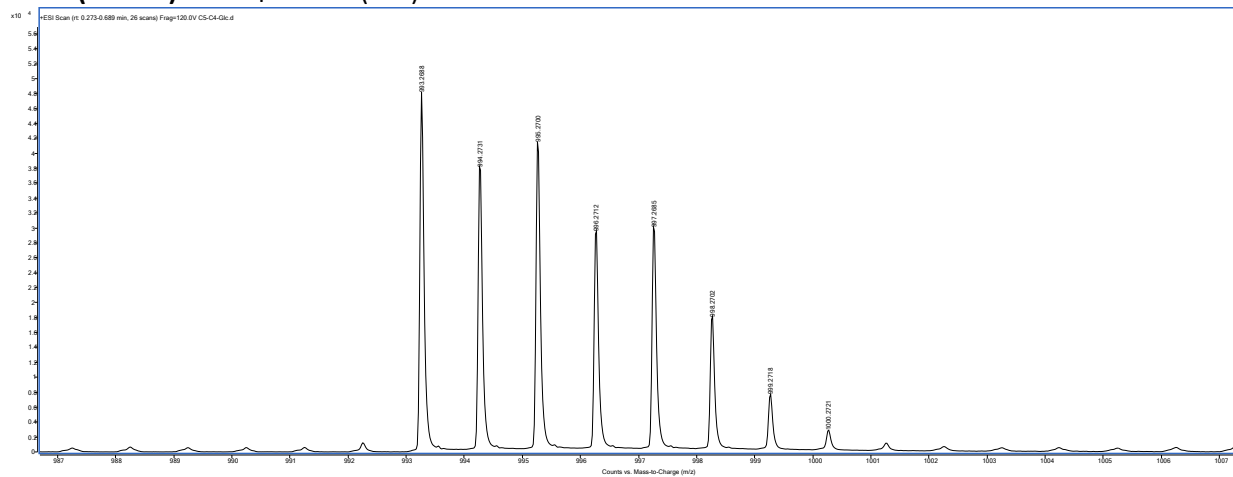


Glc-C₄-ZnDPP (11c)

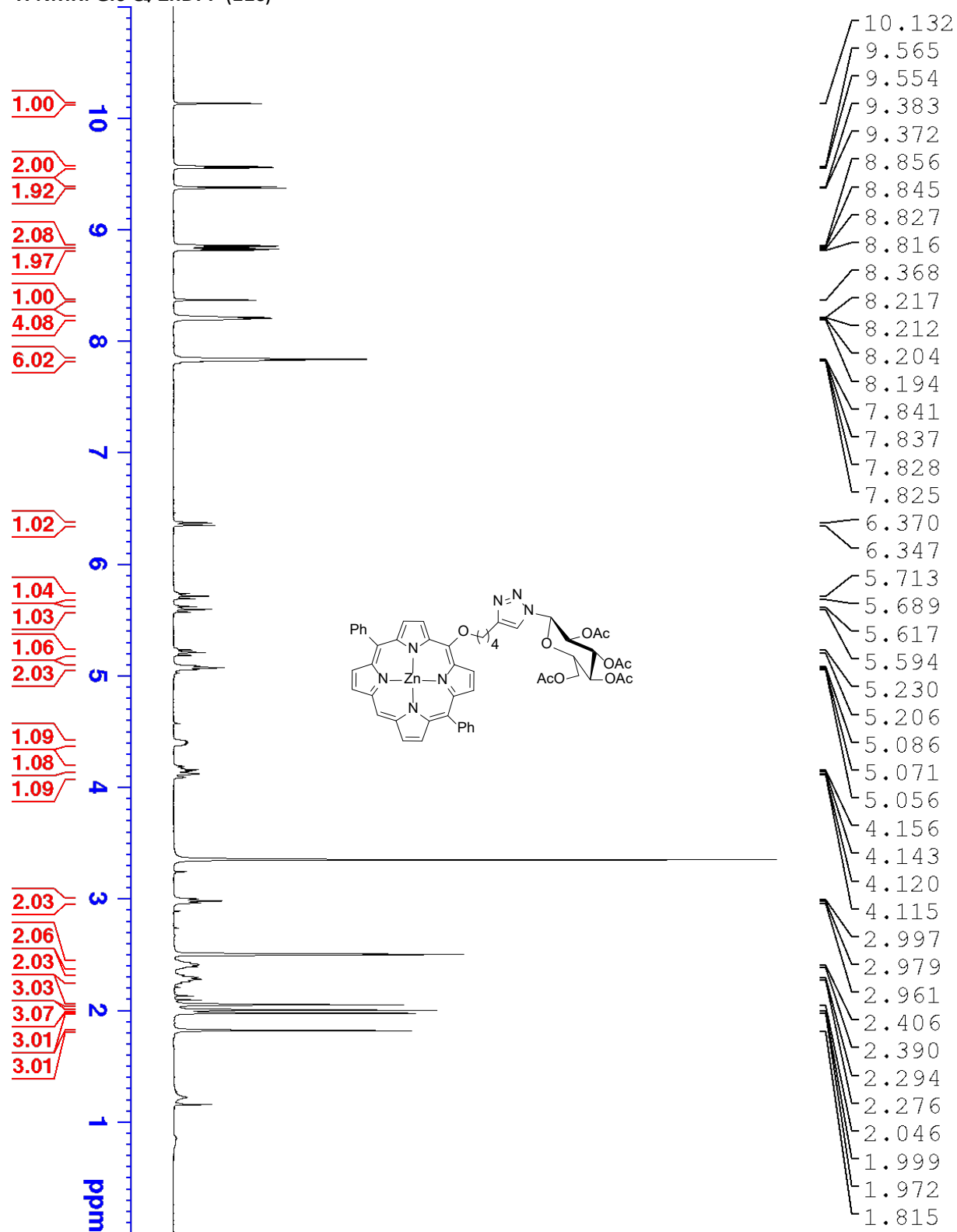


Glc-C₄-ZnDPP (11c). was obtained using the general procedure as a purple solid (25.5 mg, 95.0% yield). TLC analysis $R_f = 0.35$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.56 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.37 (s, 1H), 8.23 - 8.19 (m, 4H), 7.85 - 7.82 (m, 6H), 6.36 (d, $J = 9.2$ Hz, 1H), 5.71 (t, $J = 9.4$ Hz, 1H), 5.59 (t, $J = 9.5$ Hz, 1H), 5.21 (t, $J = 9.8$ Hz, 1H), 5.07 (t, $J = 6.0$ Hz, 2H), 4.43 - 4.37 (m, 1H), 4.20 - 4.14 (m, 1H), 4.13 - 4.07 (m, 1H), 2.98 (t, $J = 7.3$ Hz, 2H), 2.45 - 2.37 (m, 2H), 2.31 - 2.24 (m, 2H), 2.05 (s, 3H), 2.00 (s, 3H), 1.97 (s, 3H), 1.82 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.06, 169.58, 169.42, 168.53, 150.02, 148.98, 148.62, 147.56, 145.23, 142.56, 139.47, 134.33, 132.07, 131.96, 130.95, 127.46, 127.32, 126.71, 121.15, 121.11, 119.39, 104.54, 84.54, 83.83, 73.22, 72.20, 70.29, 67.65, 61.84, 30.03, 25.97, 24.95, 20.53, 20.43, 20.29, 19.94. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.61), 554 (4.14), 597 (3.91). HRMS (MALDI) m/z : Calcd for C₅₂H₄₇N₇O₁₀Zn [M]⁺ 993.2676; Found [M]⁺ 993.2688.

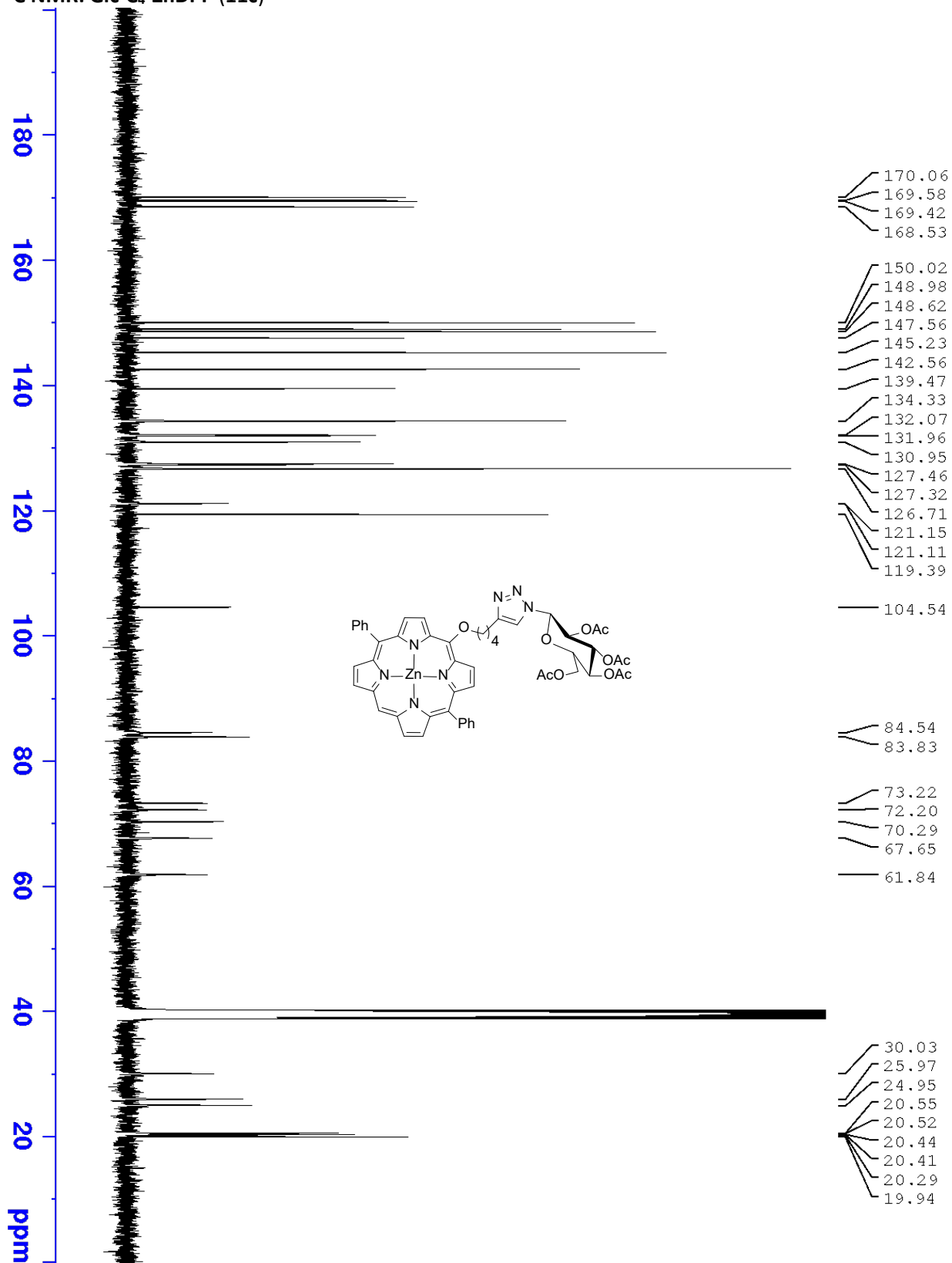
HRMS (MALDI): Glc-C₄-ZnDPP (11c)



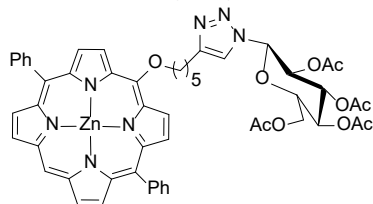
¹H NMR: Glc-C₄-ZnDPP (11c)



¹³C NMR: Glc-C₄-ZnDPP (11c)

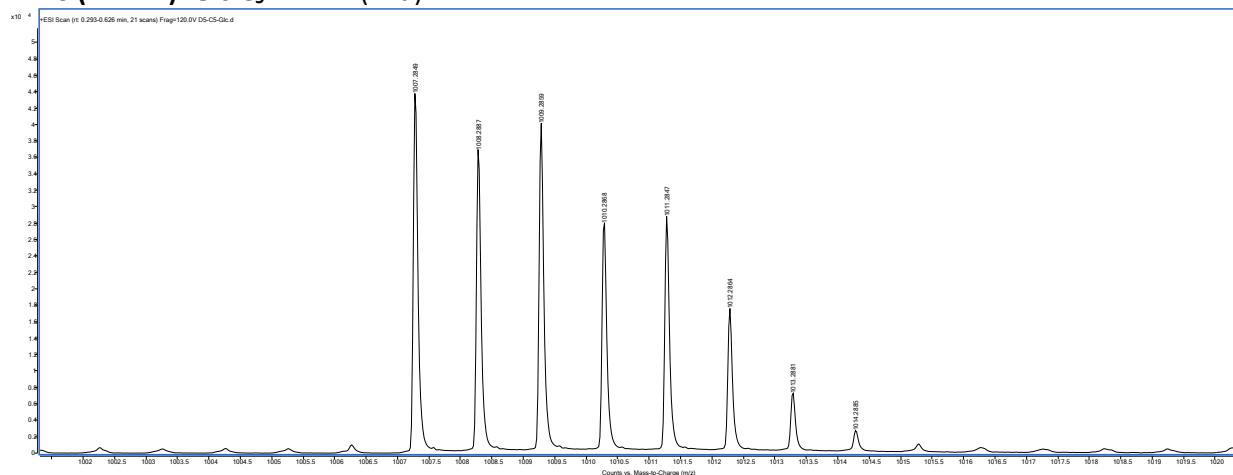


Glc-C₅-ZnDPP (11d)

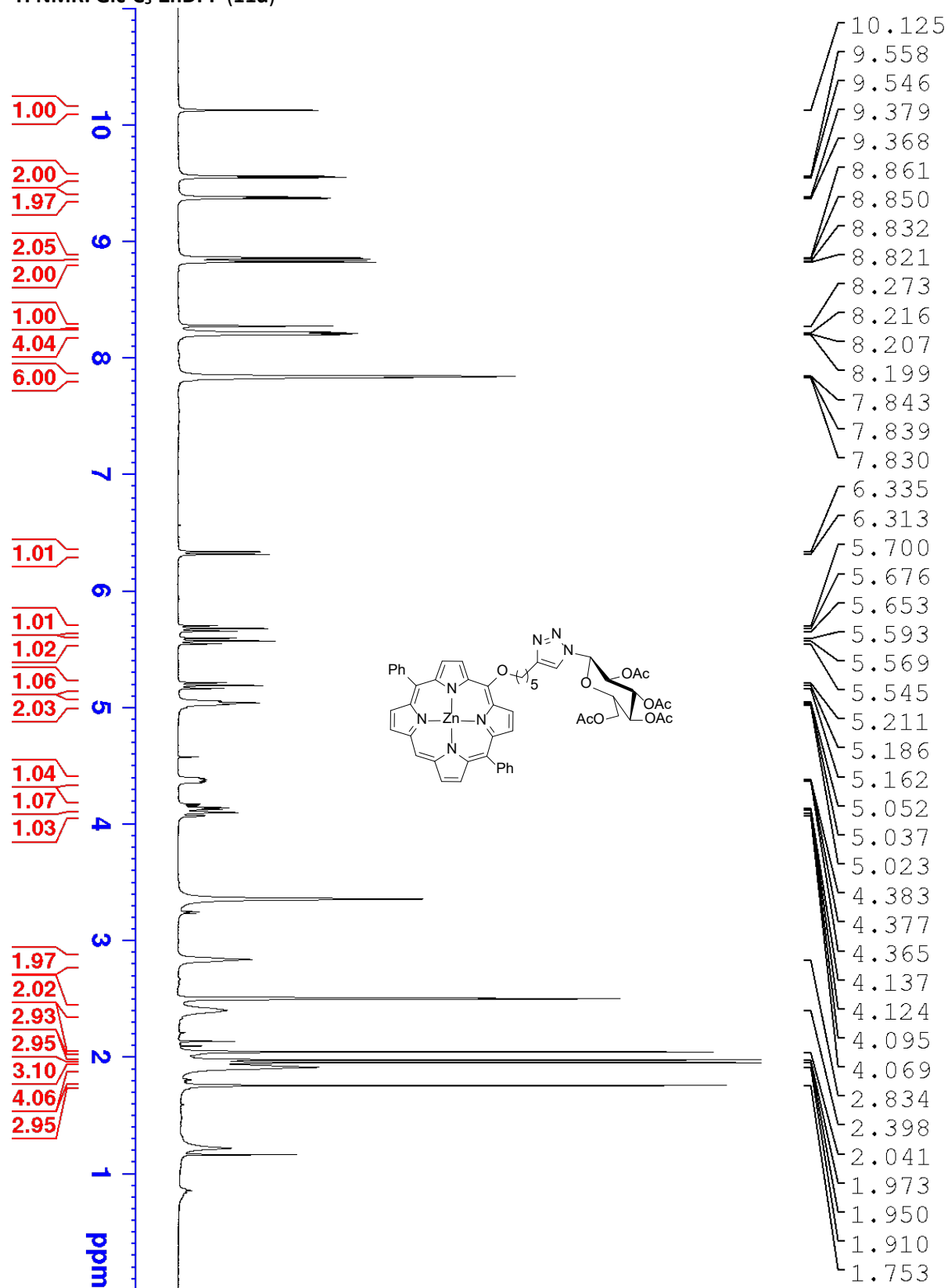


Glc-C₅-ZnDPP (11d). was obtained using the general procedure as a purple solid (24.6 mg, 95.0% yield). TLC analysis $R_f = 0.45$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400 MHz, DMSO): δ 10.12 (s, 1H), 9.55 (d, $J = 4.5$ Hz, 2H), 9.37 (d, $J = 4.4$ Hz, 2H), 8.86 (d, $J = 4.4$ Hz, 2H), 8.83 (d, $J = 4.5$ Hz, 2H), 8.25 (s, 1H), 8.24 - 8.17 (m, 4H), 7.87 - 7.80 (m, 6H), 6.32 (d, $J = 9.2$ Hz, 1H), 5.68 (t, $J = 9.4$ Hz, 1H), 5.57 (t, $J = 9.4$ Hz, 1H), 5.23 - 5.14 (m, 1H), 5.07 - 4.99 (m, 2H), 4.41 - 4.33 (m, 1H), 4.18 - 4.11 (m, 1H), 4.11 - 4.05 (m, 1H), 2.88 - 2.77 (m, 2H), 2.45 - 2.34 (m, 2H), 2.04 (s, 3H), 1.97 (s, 3H), 1.95 (s, 3H), 1.94 - 1.88 (m, 4H), 1.75 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.03, 169.55, 169.40, 168.47, 150.12, 148.98, 148.62, 147.59, 145.26, 142.57, 139.49, 134.33, 132.06, 131.95, 130.93, 127.46, 127.36, 126.71, 121.01, 120.96, 119.38, 104.52, 84.73, 83.77, 73.19, 72.18, 70.22, 67.64, 61.84, 30.40, 28.79, 25.38, 24.97, 20.49, 20.41, 20.25, 19.87. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.51), 554 (4.15), 597 (3.94). HRMS (MALDI) m/z : Calcd for C₅₃H₄₉N₇O₁₀Zn [M]⁺ 1007.2827; Found [M]⁺ 1007.2849.

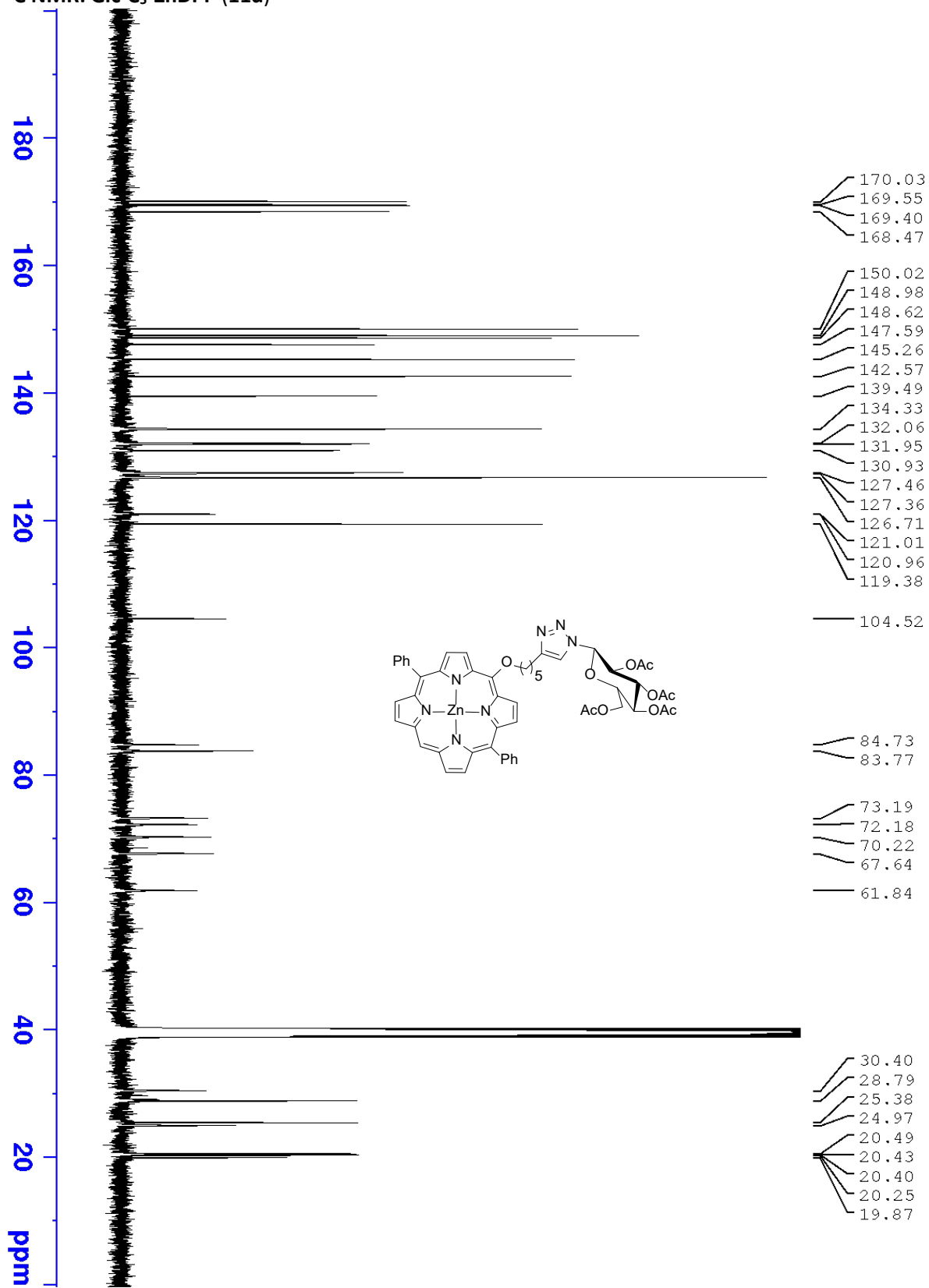
HRMS (MALDI): Glc-C₅-ZnDPP (11d)



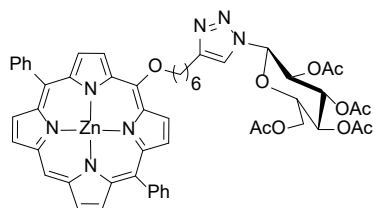
¹H NMR: Glc-C₅-ZnDPP (11d)



¹³C NMR: Glc-C₅-ZnDPP (11d)

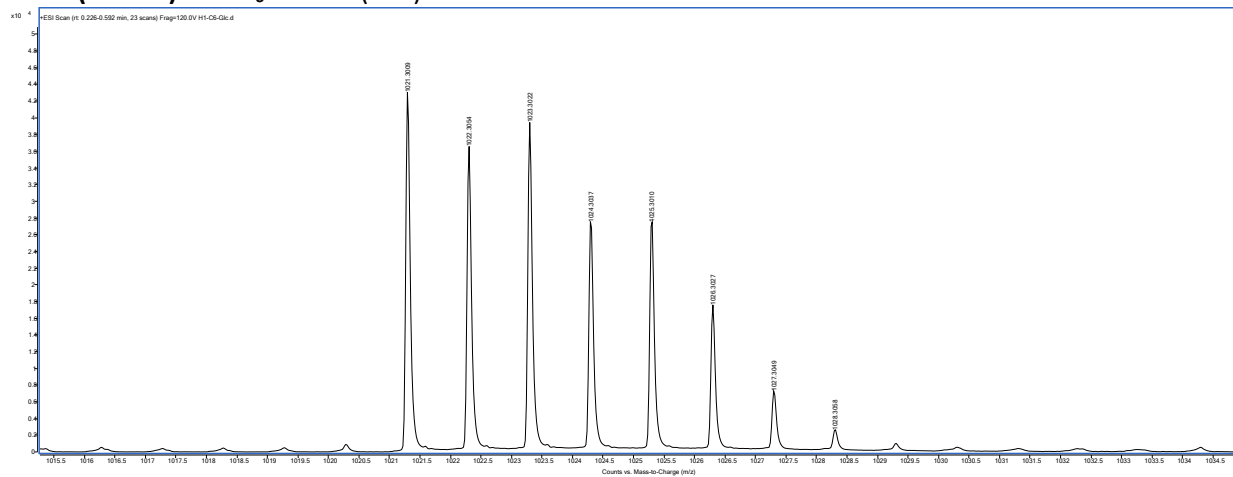


Glc-C₆-ZnDPP (11e)

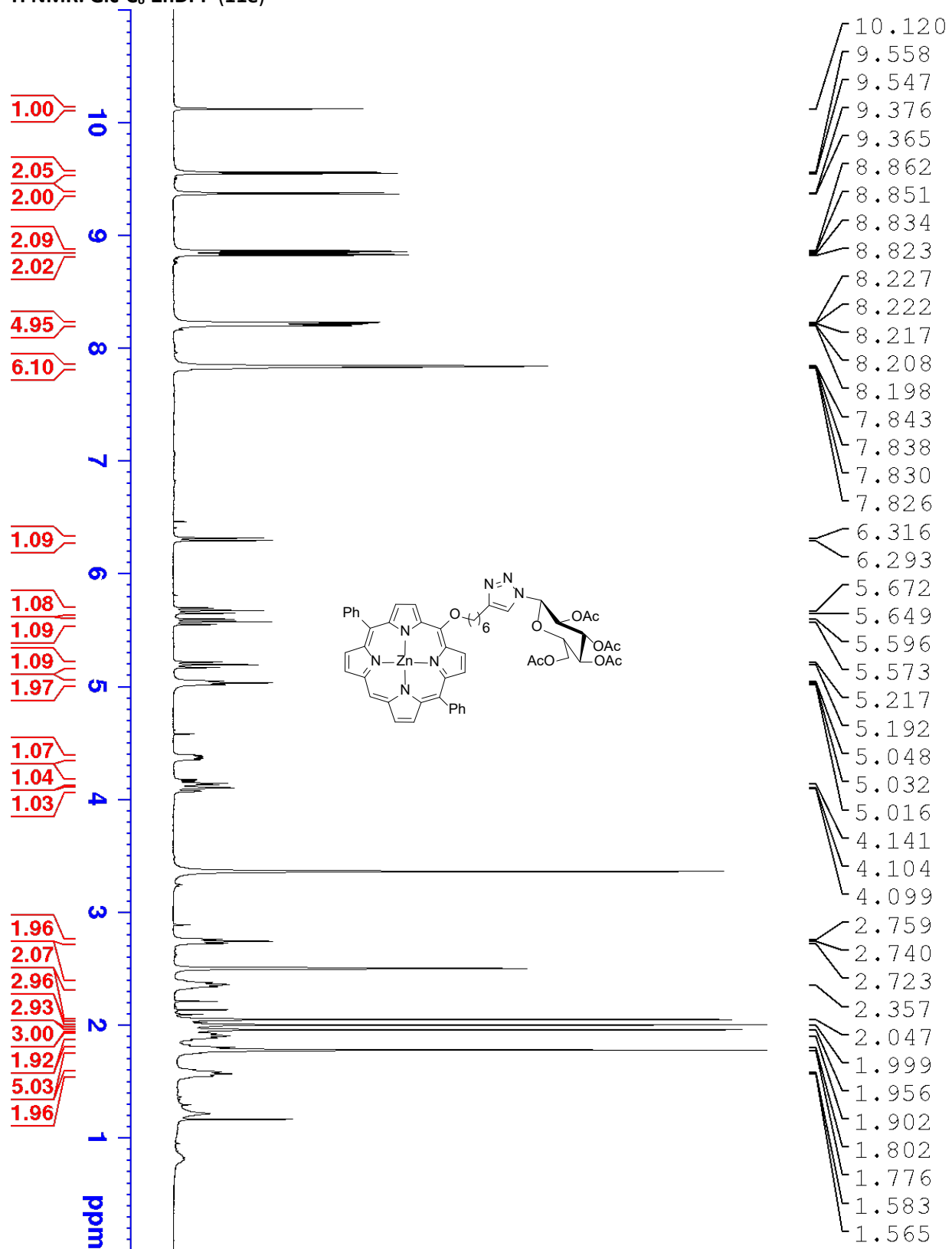


Glc-C₆-ZnDPP (11e). was obtained using the general procedure as a purple solid (32.3 mg, 95.0% yield). TLC analysis $R_f = 0.29$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.12 (s, 1H), 9.55 (d, $J = 4.6$ Hz, 2H), 9.37 (d, $J = 4.5$ Hz, 2H), 8.86 (d, $J = 4.4$ Hz, 2H), 8.83 (d, $J = 4.5$ Hz, 2H), 8.23 - 8.19 (m, 5H), 7.86 - 7.81 (m, 6H), 6.30 (d, $J = 9.1$ Hz, 1H), 5.71 - 5.64 (m, 1H), 5.57 (t, $J = 9.4$ Hz, 1H), 5.22 - 5.16 (m, 1H), 5.03 (t, $J = 6.4$ Hz, 2H), 4.40 - 4.34 (m, 1H), 4.18 - 4.12 (m, 1H), 4.11 - 4.06 (m, 1H), 2.77 - 2.72 (m, 2H), 2.40 - 2.31 (m, 2H), 2.05 (s, 3H), 2.00 (s, 3H), 1.96 (s, 3H), 1.93 - 1.87 (m, 2H), 1.81 - 1.75 (m, 5H), 1.60 - 1.54 (m, 2H). ¹³C NMR (100 MHz, DMSO): δ 170.06, 169.57, 169.42, 168.48, 150.03, 148.99, 148.62, 147.64, 145.27, 142.58, 139.53, 134.54, 132.08, 131.95, 130.93, 127.46, 127.34, 126.72, 120.91, 120.87, 119.39, 104.52, 84.81, 83.77, 73.20, 72.19, 70.22, 67.64, 61.84, 30.62, 28.82, 28.48, 25.81, 24.89, 20.53, 20.42, 20.26, 19.90. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.53), 554 (4.11), 597 (3.89). HRMS (MALDI) m/z : Calcd for C₅₄H₅₁N₇O₁₀Zn [M]⁺ 1021.2983; Found [M]⁺ 1021.3009.

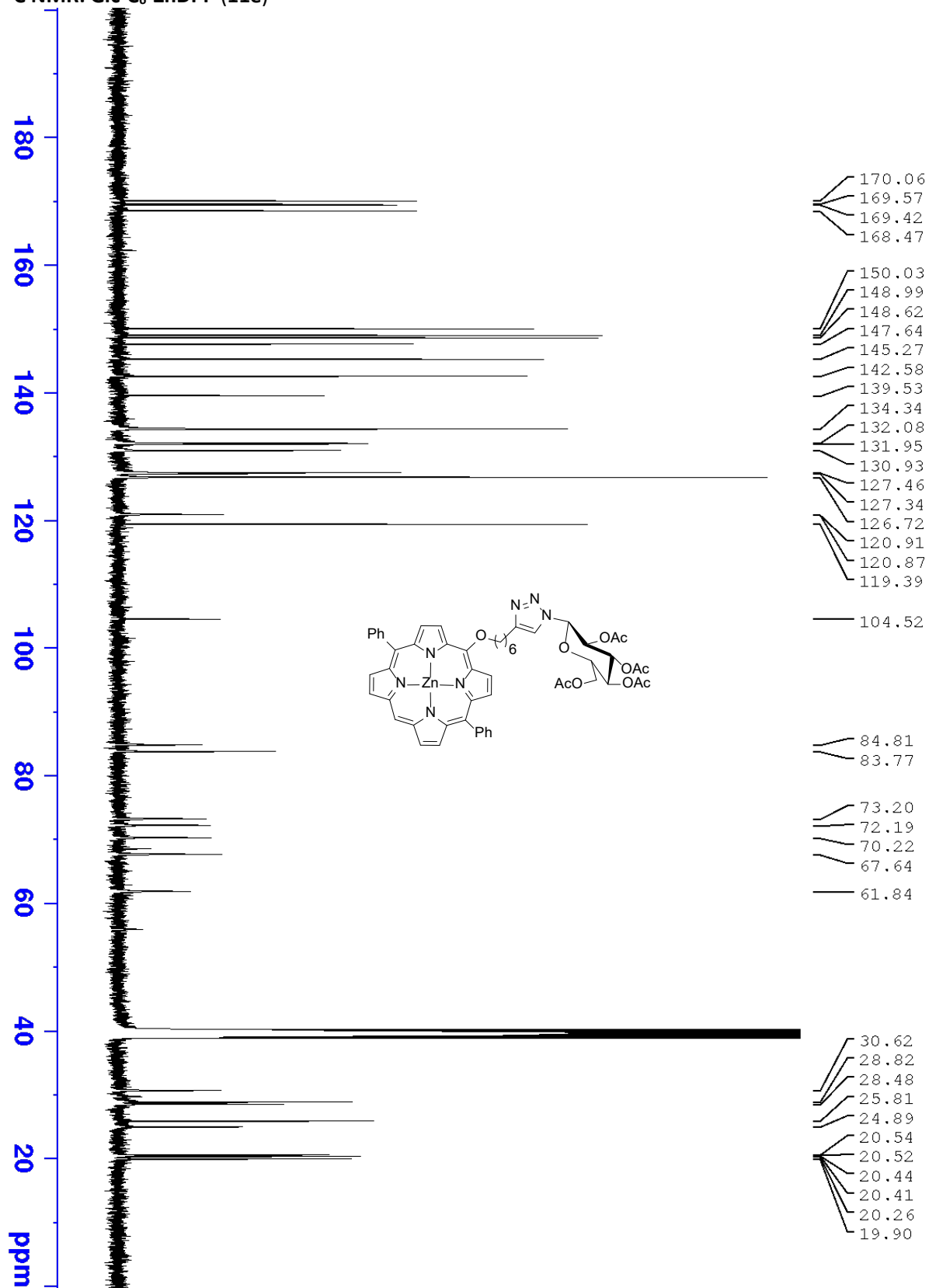
HRMS (MALDI): Glc-C₆-ZnDPP (11e)



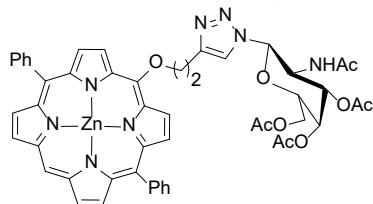
¹H NMR: Glc-C₆-ZnDPP (11e)



¹³C NMR: Glc-C₆-ZnDPP (11e)

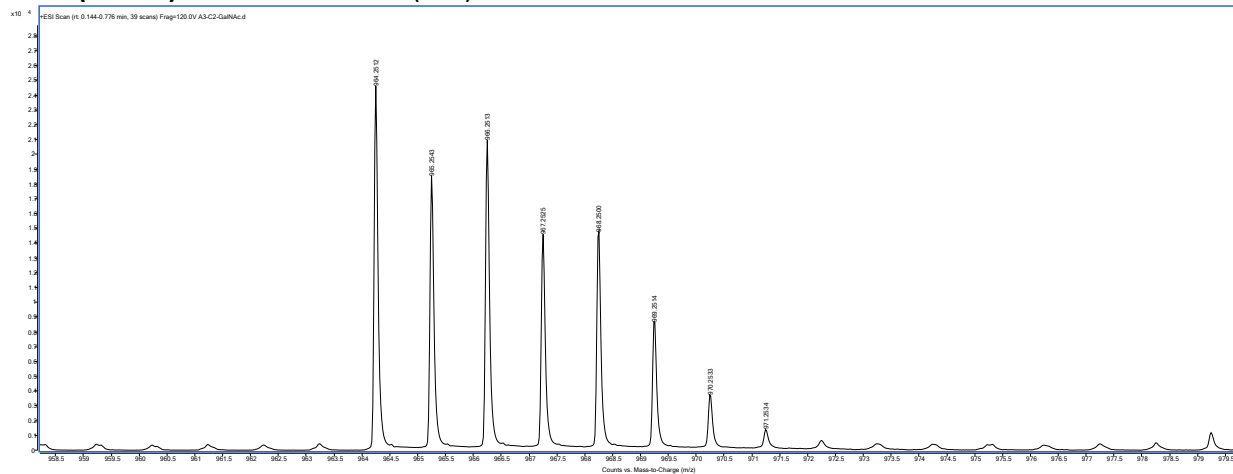


GalNAc-C₂-ZnDPP (12a)

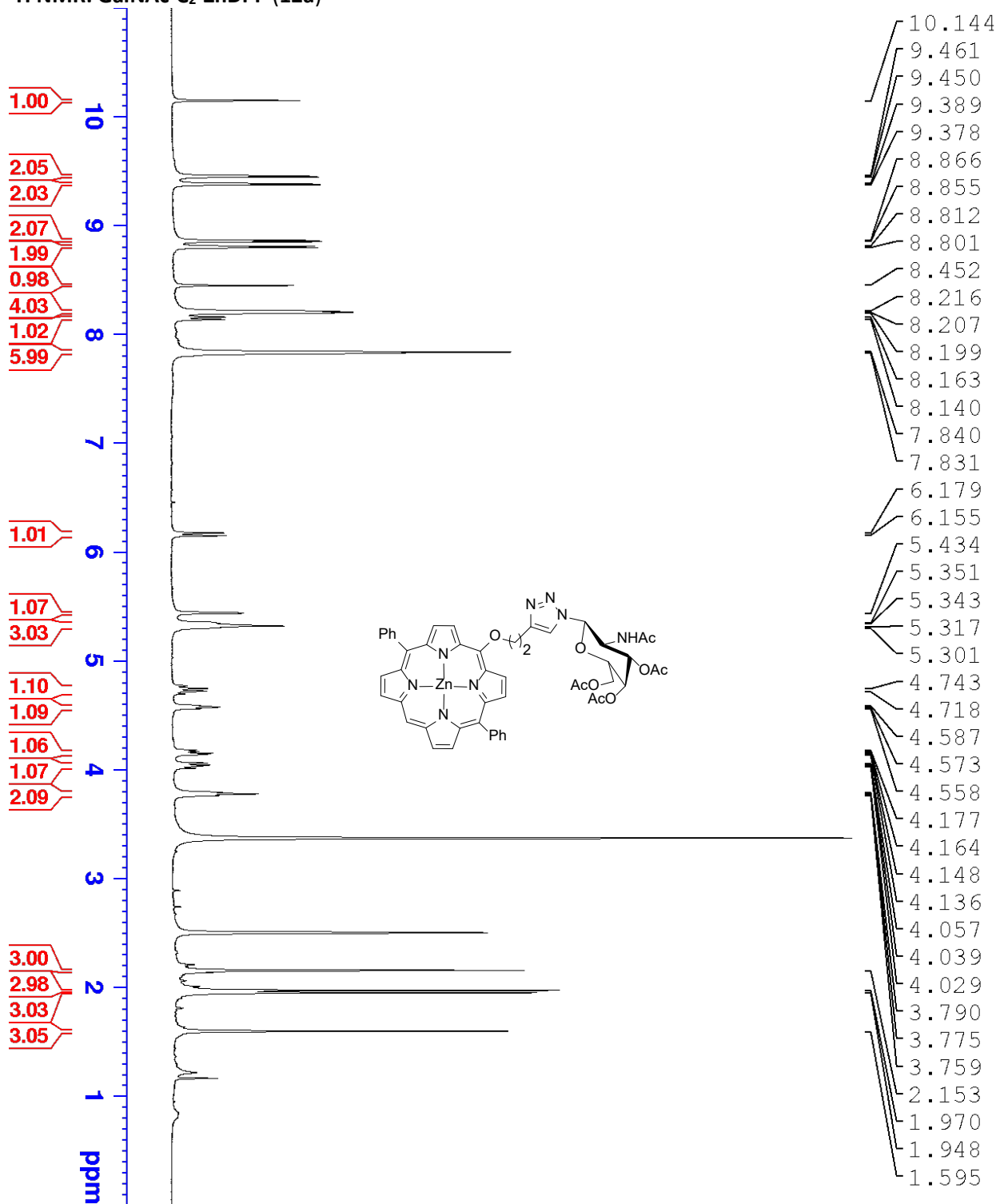


GalNAc-C₂-ZnDPP (12a). was obtained using the general procedure as a purple solid (21.9 mg, 88.0% yield). TLC analysis $R_f = 0.18$ (hexanes: acetone 60:40 [v:v]). ¹HNMR (400 MHz, DMSO): δ 10.14 (s, 1H), 9.46 (d, $J = 4.4$ Hz, 2H), 9.38 (d, $J = 4.4$ Hz, 2H), 8.86 (d, $J = 4.3$ Hz, 2H), 8.81 (d, $J = 4.4$ Hz, 2H), 8.45 (s, 1H), 8.23 - 8.19 (m, 4H), 8.15 (d, $J = 9.1$ Hz, 1H), 7.86 - 7.82 (m, 6H), 6.17 (d, $J = 9.9$ Hz, 1H), 5.45 - 5.42 (m, 1H), 5.36 - 5.29 (m, 3H), 4.77 - 4.69 (m, 1H), 4.60 - 4.55 (m, 1H), 4.16 (dd, $J = 11.3, 5.0$ Hz, 1H), 4.03 (dd, $J = 11.3, 7.0$ Hz, 1H), 3.81 - 3.75 (m, 2H), 2.15 (s, 3H), 1.97 (s, 3H), 1.95 (s, 3H), 1.59 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.07, 169.93, 169.59, 149.99, 149.03, 148.69, 145.24, 144.29, 142.56, 138.86, 134.33, 132.06, 132.00, 130.97, 127.47, 126.72, 122.20, 119.42, 104.68, 85.65, 83.10, 72.82, 70.45, 66.70, 61.67, 48.45, 27.15, 22.49, 20.53, 20.45. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.56), 554 (4.11), 597 (3.86). HRMS (MALDI) m/z : Calcd for C₅₀H₄₄N₈O₉Zn [M]⁺ 964.2517; Found [M]⁺ 964.2512.

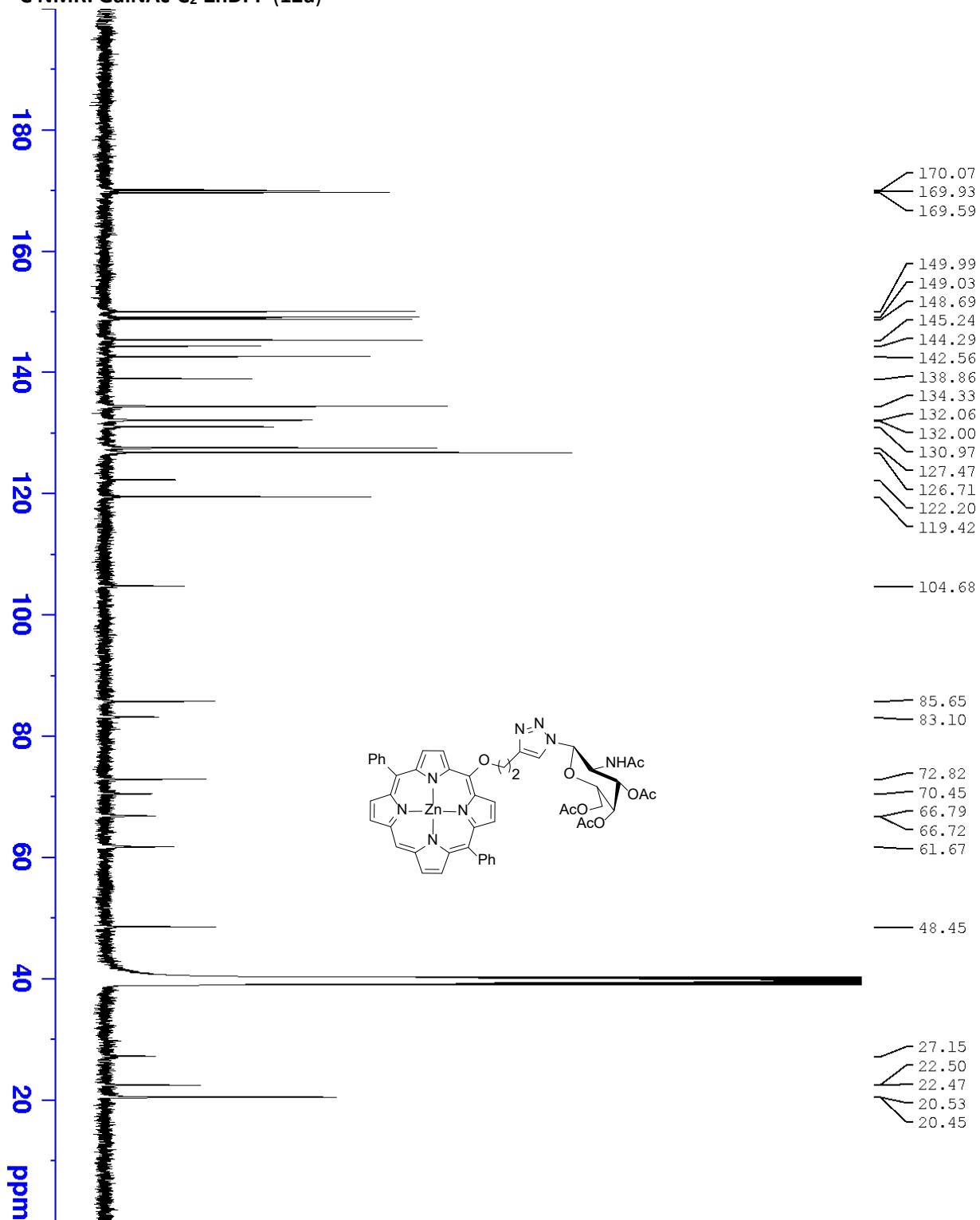
HRMS (MALDI): GalNAc-C₂-ZnDPP (12a)



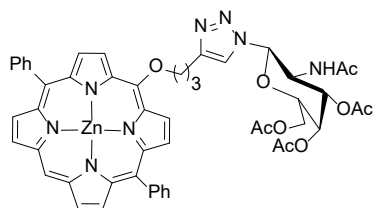
¹H NMR: GalNAc-C₂-ZnDPP (12a)



¹³C NMR: GalNAc-C₂-ZnDPP (12a)

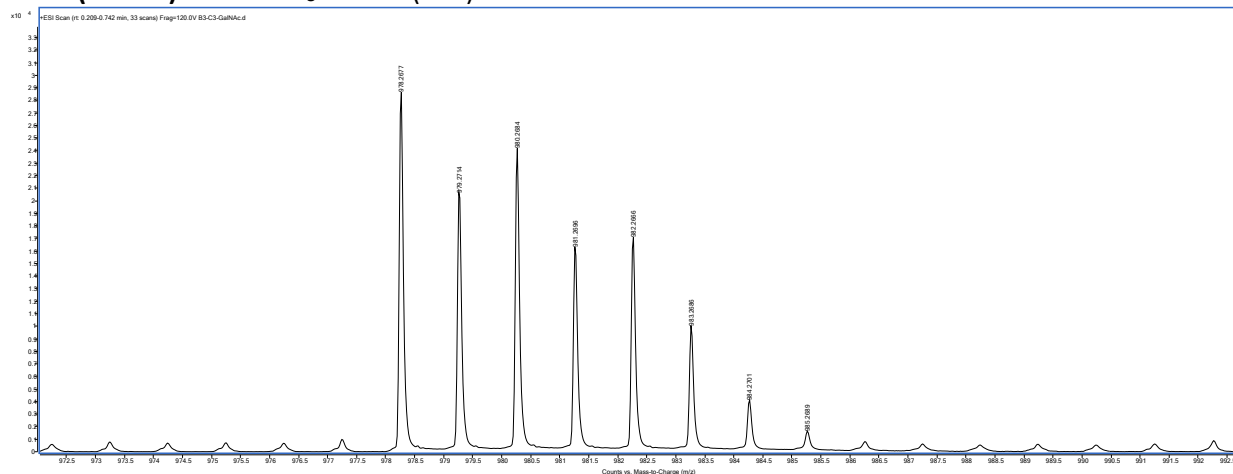


GalNAc-C₃-ZnDPP (12b)

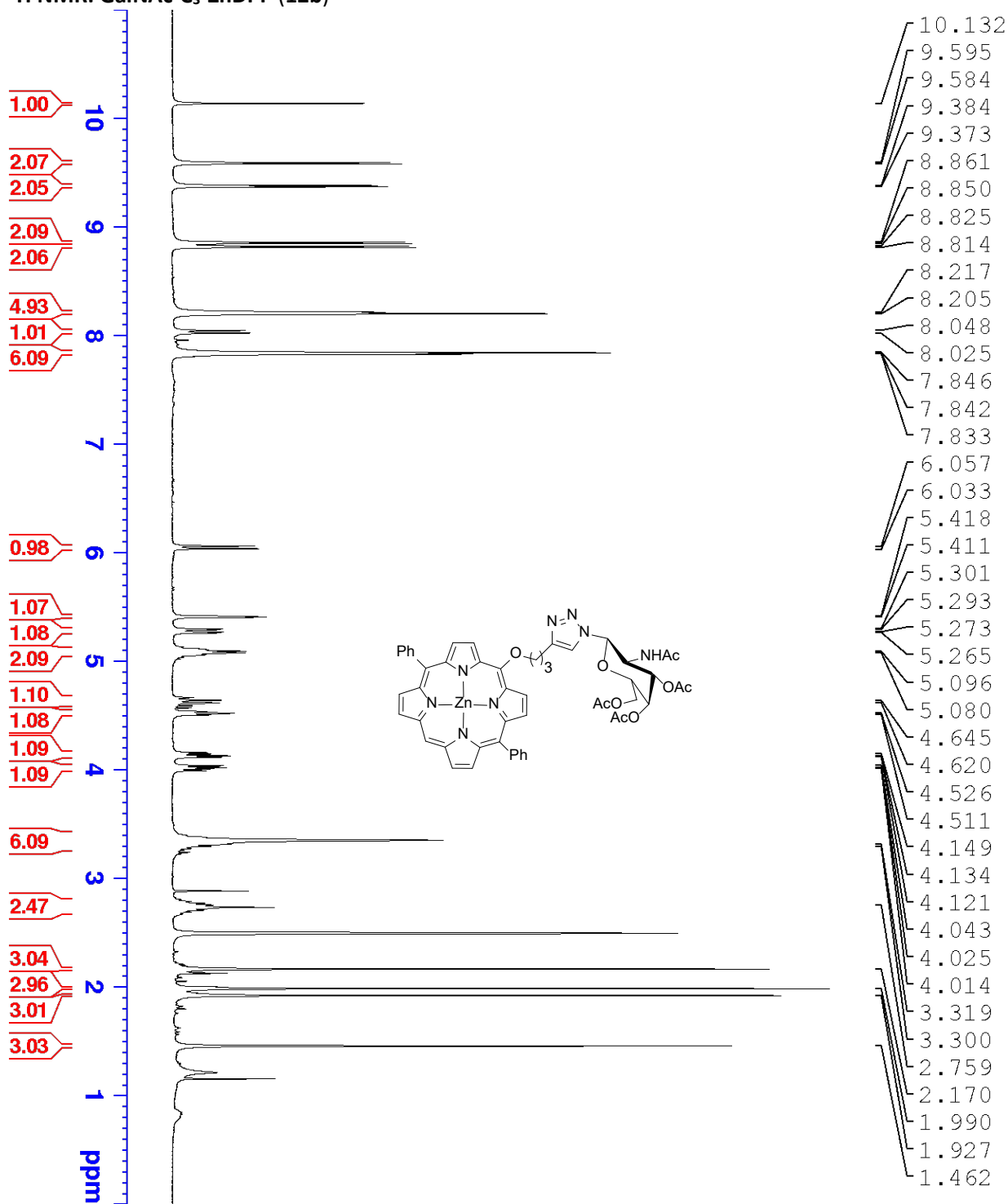


GalNAc-C₃-ZnDPP (12b). was obtained using the general procedure as a purple solid (21.1 mg, 93.0% yield). TLC analysis $R_f = 0.31$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.59 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.4$ Hz, 2H), 8.86 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.23 - 8.19 (m, 5H), 8.03 (d, $J = 9.2$ Hz, 1H), 7.86 - 7.82 (m, 6H), 6.05 (d, $J = 9.9$ Hz, 1H), 5.44 - 5.40 (m, 1H), 5.28 (dd, $J = 11.0, 3.2$ Hz, 1H), 5.13 - 5.04 (m, 2H), 4.68 - 4.58 (m, 1H), 4.53 (t, $J = 6.2$ Hz, 1H), 4.14 (dd, $J = 11.6, 5.3$ Hz, 1H), 4.02 (dd, $J = 11.4, 7.1$ Hz, 1H), 3.43 - 3.25 (m, 2H), 2.82 - 2.67 (m, 2H), 2.17 (s, 3H), 1.99 (s, 3H), 1.93 (s, 3H), 1.46 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.07, 169.95, 169.56, 169.46, 150.01, 148.99, 148.63, 146.68, 145.26, 142.58, 139.38, 134.32, 132.06, 131.96, 130.92, 127.46, 126.71, 121.07, 119.38, 104.56, 85.60, 83.64, 72.78, 70.34, 66.69, 61.65, 48.41, 30.28, 22.26, 22.00, 20.55, 20.54, 20.42. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.65), 554 (4.16), 597 (3.94). HRMS (MALDI) m/z : Calcd for C₅₁H₄₆N₈O₉Zn [M]⁺ 978.2674; Found [M]⁺ 978.2677.

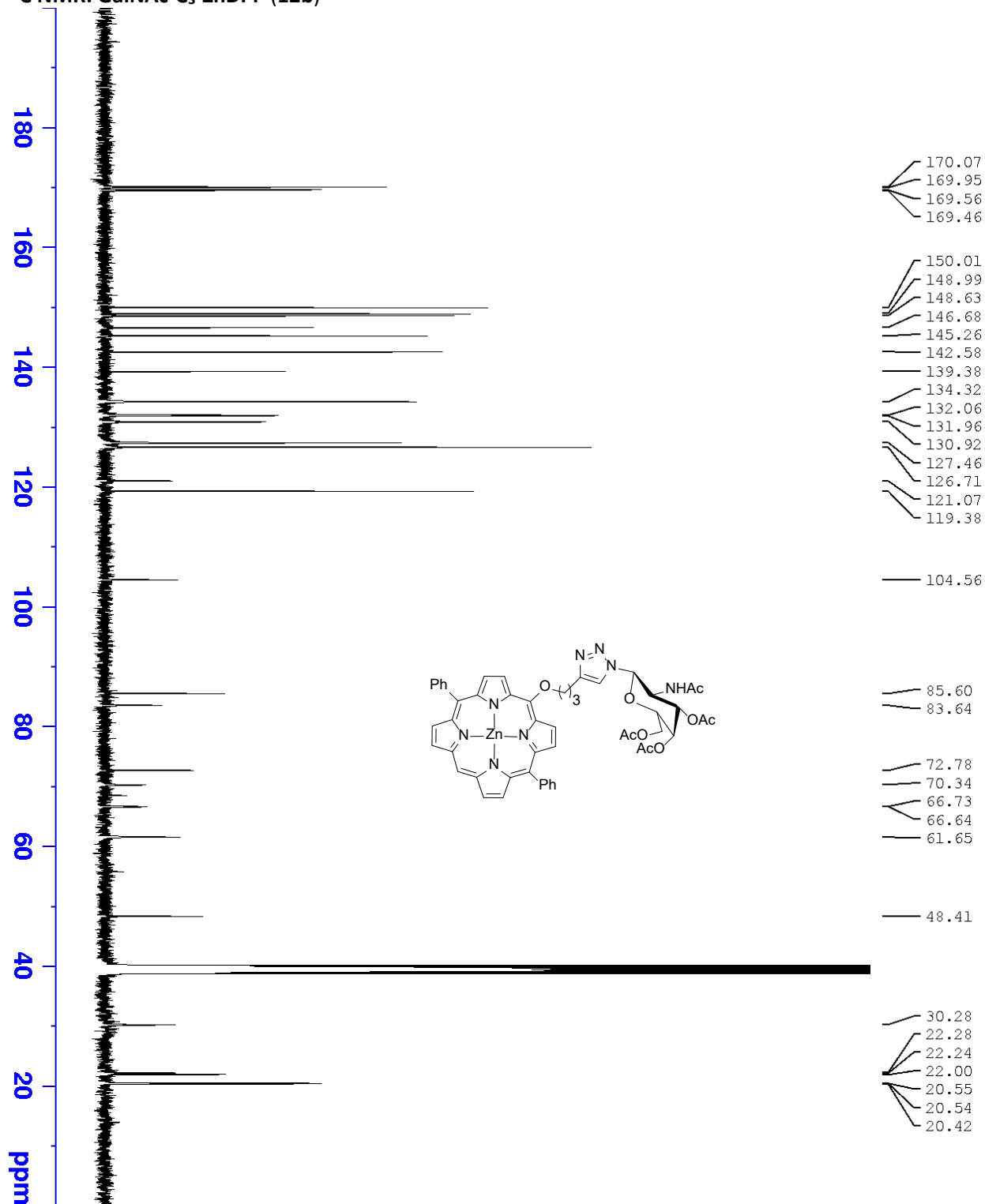
HRMS (MALDI): GalNAc-C₃-ZnDPP (12b)



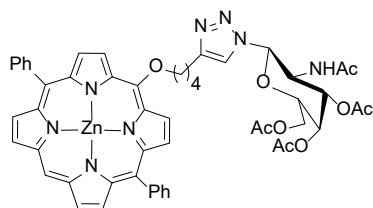
¹H NMR: GalNAc-C₃-ZnDPP (12b)



¹³C NMR: GalNAc-C₃-ZnDPP (12b)

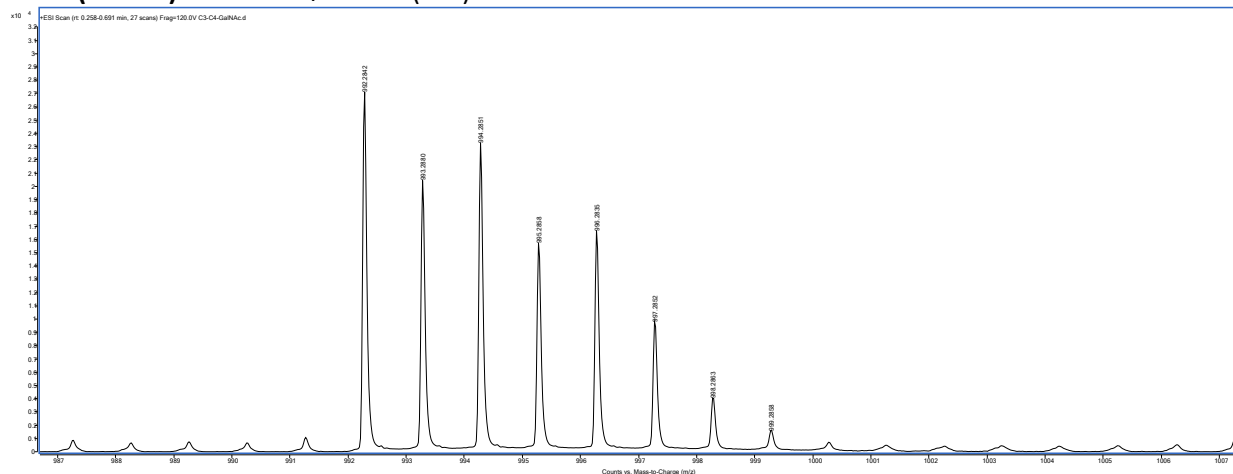


GalNAc-C₄-ZnDPP (12c)

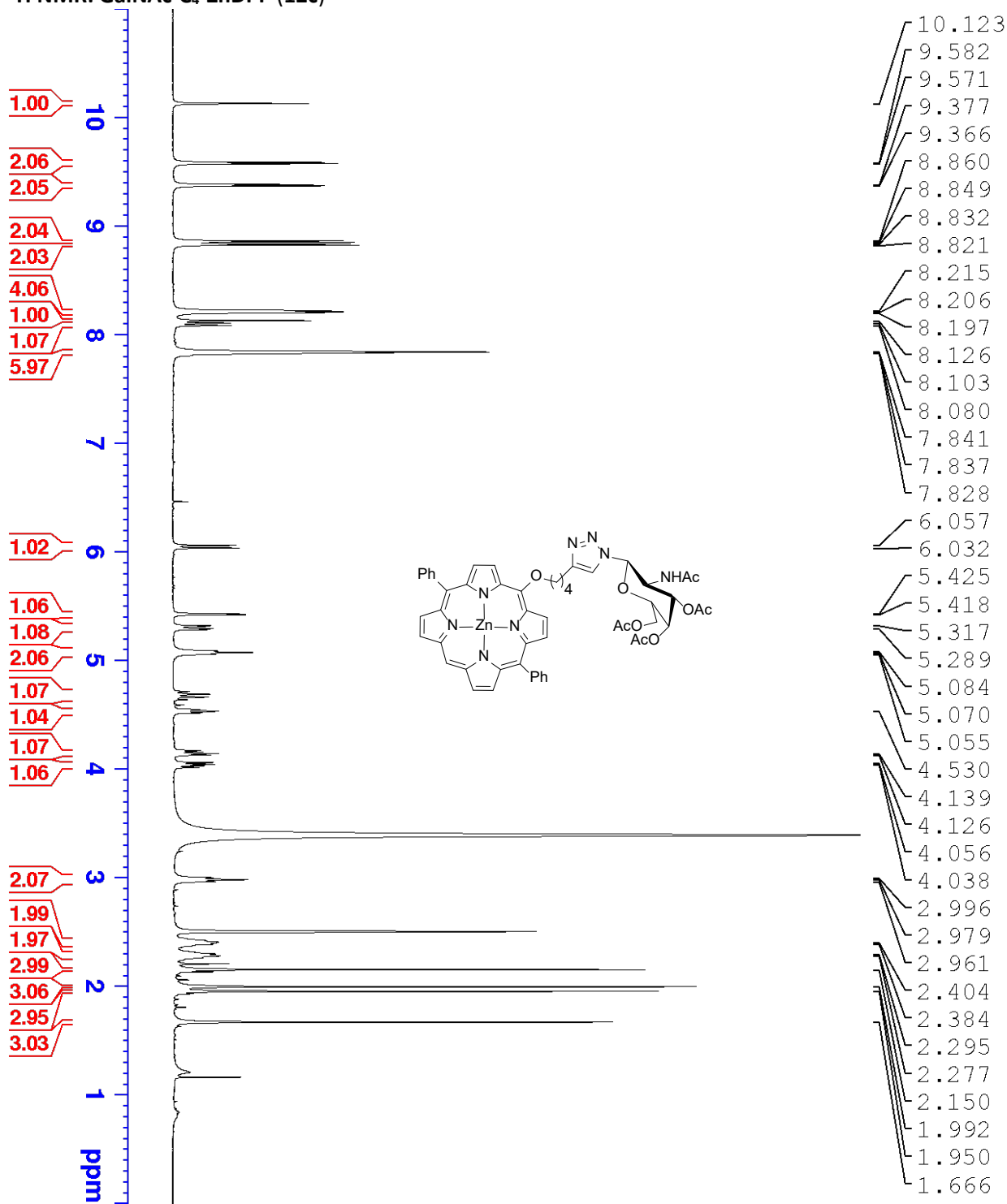


GalNAc-C₄-ZnDPP (12c). was obtained using the general procedure as a purple solid (23.8 mg, 96.0% yield). TLC analysis R_f = 0.16 (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.12 (s, 1H), 9.58 (d, J = 4.5 Hz, 2H), 9.37 (d, J = 4.5 Hz, 2H), 8.85 (d, J = 4.4 Hz, 2H), 8.83 (d, J = 4.5 Hz, 2H), 8.23 - 8.18 (m, 4H), 8.13 (s, 1H), 8.09 (d, J = 9.2 Hz, 1H), 7.86 - 7.81 (m, 6H), 6.04 (d, J = 9.9 Hz, 1H), 5.45 - 5.39 (m, 1H), 5.30 (dd, J = 11.0, 3.2 Hz, 1H), 5.12 - 5.03 (m, 2H), 4.73 - 4.62 (m, 1H), 4.53 (t, J = 6.2 Hz, 1H), 4.14 (dd, J = 11.6, 5.3 Hz, 1H), 4.03 (dd, J = 11.4, 7.1 Hz, 1H), 2.98 (t, J = 7.0 Hz, 2H), 2.44 - 2.36 (m, 2H), 2.32 - 2.25 (m, 2H), 2.15 (s, 3H), 1.99 (s, 3H), 1.95 (s, 3H), 1.67 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.11, 169.99, 169.62, 169.56, 150.05, 149.01, 148.65, 147.06, 145.27, 142.59, 139.52, 134.35, 132.10, 131.99, 130.96, 127.49, 127.39, 126.74, 120.95, 119.41, 104.56, 85.61, 84.64, 72.86, 70.40, 66.74, 61.71, 48.44, 29.99, 26.08, 24.92, 22.48, 20.57, 20.51, 20.47. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.70), 554 (4.10), 597 (3.87). HRMS (MALDI) m/z : Calcd for C₅₂H₄₈N₈O₉Zn [M]⁺ 992.2836; Found [M]⁺ 992.2842.

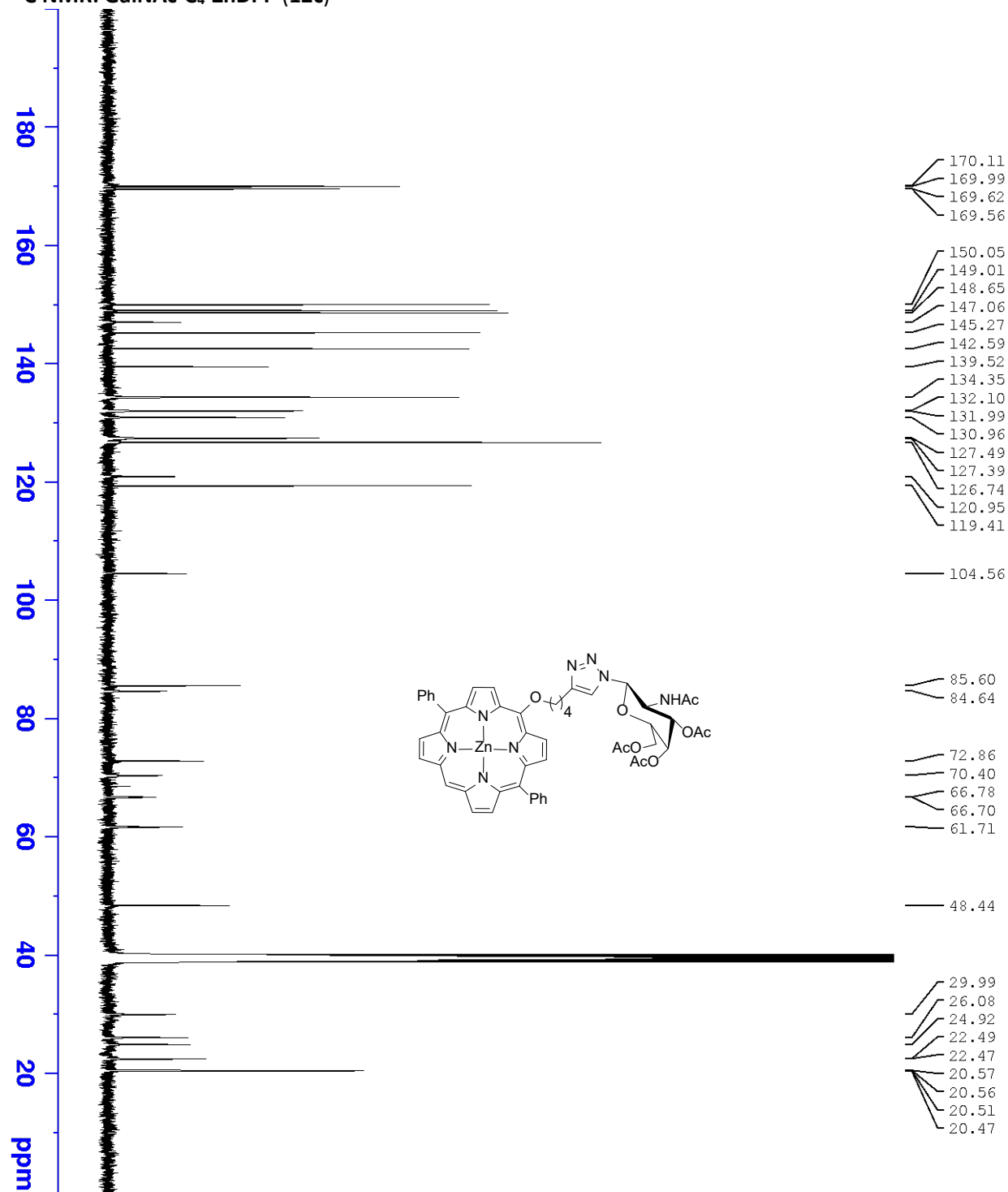
HRMS (MALDI): GalNAc-C₄-ZnDPP (12c)



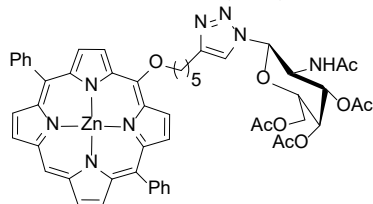
¹H NMR: GalNAc-C₄-ZnDPP (12c)



¹³C NMR: GalNAc-C₄-ZnDPP (12c)

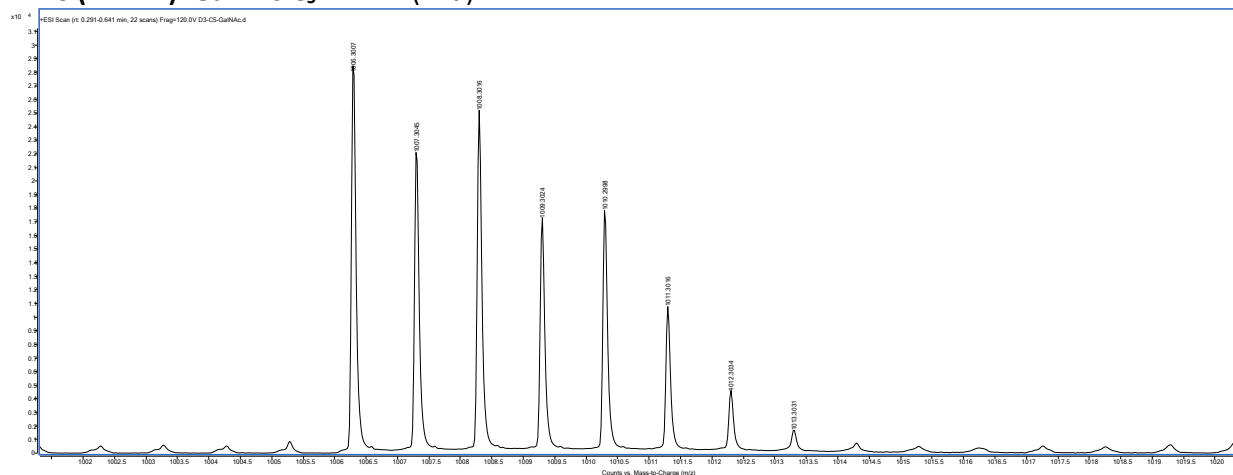


GalNAc-C₅-ZnDPP (12d)

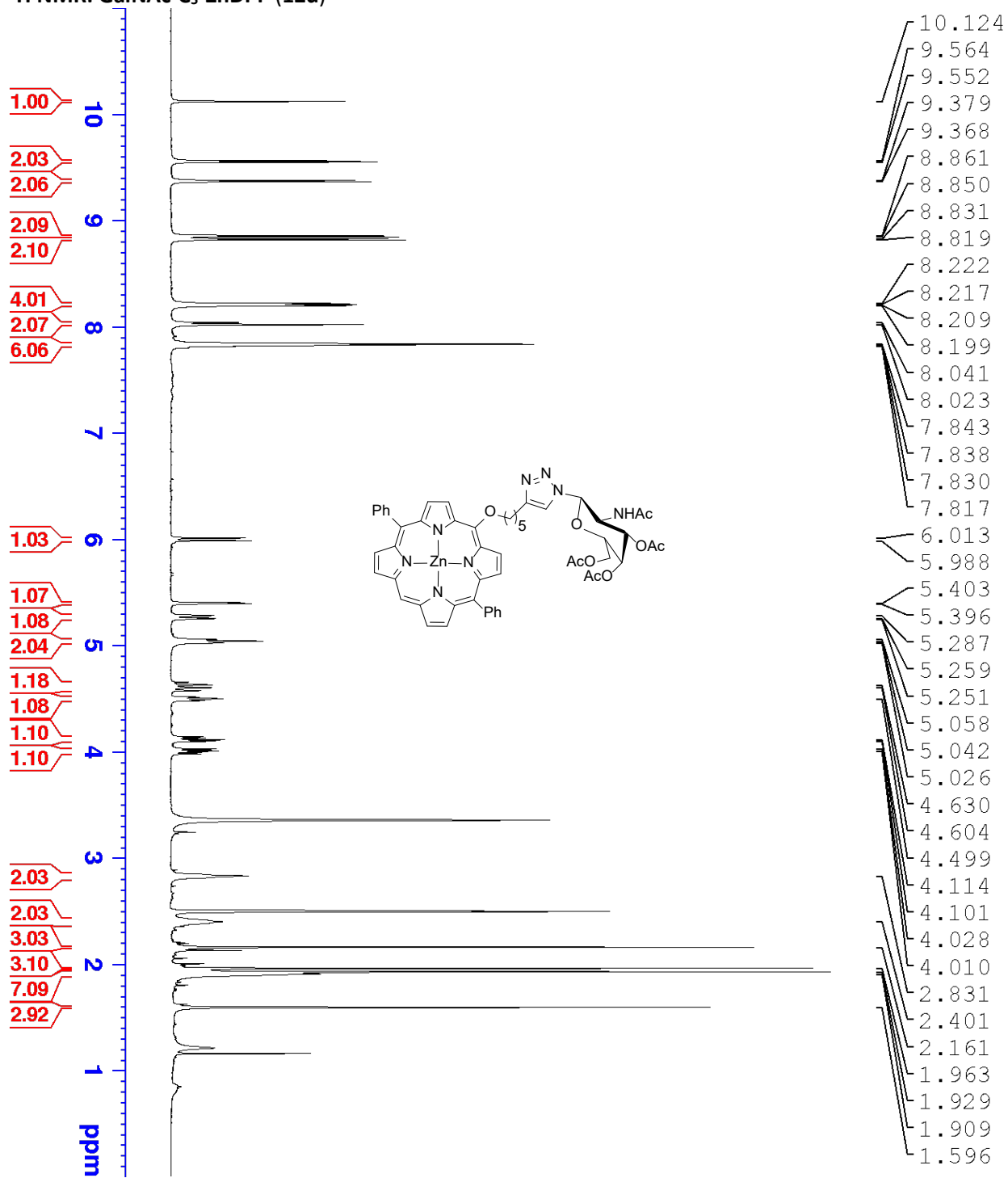


GalNAc-C₅-ZnDPP (12d). was obtained using the general procedure as a purple solid (26.0 mg, 92.0% yield). TLC analysis $R_f = 0.15$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.12 (s, 1H), 9.56 (d, $J = 4.6$ Hz, 2H), 9.37 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.83 (d, $J = 4.6$ Hz, 2H), 8.23 - 8.19 (m, 4H), 8.05 - 8.01 (m, 2H), 7.85 - 7.81 (m, 6H), 6.00 (d, $J = 9.9$ Hz, 1H), 5.41 - 5.39 (m, 1H), 5.27 (dd, $J = 11.0, 3.2$ Hz, 1H), 5.07 - 5.01 (m, 2H), 4.66 - 4.57 (m, 1H), 4.52 - 4.48 (m, 1H), 4.12 (dd, $J = 11.5, 5.2$ Hz, 1H), 4.00 (dd, $J = 11.4, 7.1$ Hz, 1H), 3.86 - 3.79 (m, 2H), 3.44 - 3.36 (m, 2H), 2.16 (s, 3H), 1.96 (s, 3H), 1.94 - 1.89 (m, 7H), 1.60 (s, 3H). ¹³C NMR (100 MHz, DMSO) δ 170.06, 169.93, 169.55, 169.44, 150.02, 148.98, 148.62, 147.05, 145.26, 142.58, 139.52, 134.34, 132.06, 131.95, 130.92, 127.46, 127.37, 126.71, 120.74, 119.38, 104.51, 85.51, 84.76, 72.77, 70.37, 66.70, 61.66, 48.35, 30.41, 28.92, 25.38, 24.95, 22.40, 20.51, 20.42. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.48), 554 (4.14), 597 (3.93). HRMS (MALDI) m/z : Calcd for C₅₃H₅₀N₈O₉Zn [M]⁺ 1006.2987; Found [M]⁺ 1006.3007.

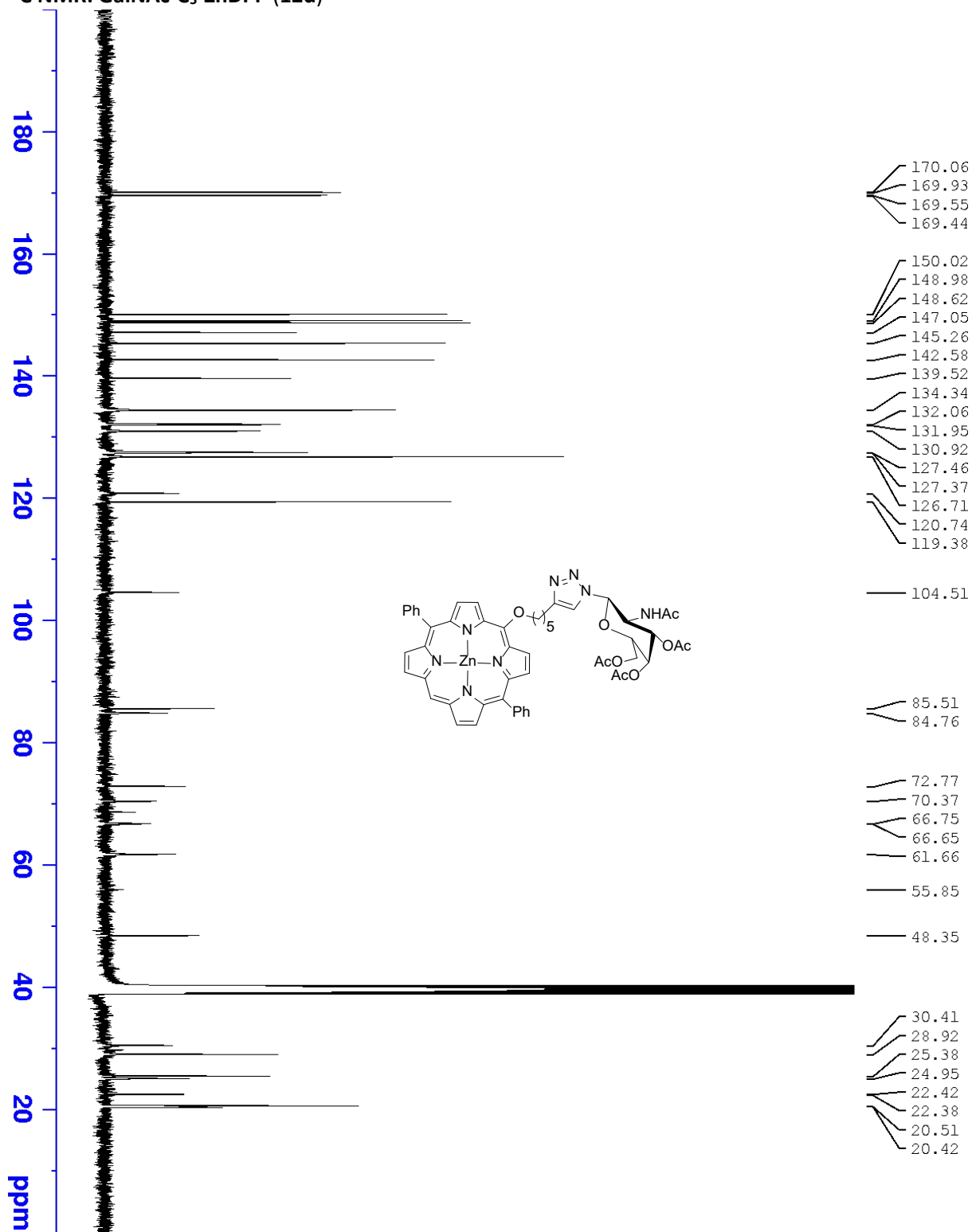
HRMS (MALDI): GalNAc-C₅-ZnDPP (12d)



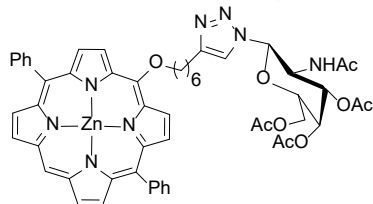
¹H NMR: GalNAc-C₅-ZnDPP (12d)



¹³C NMR: GalNAc-C₅-ZnDPP (12d)

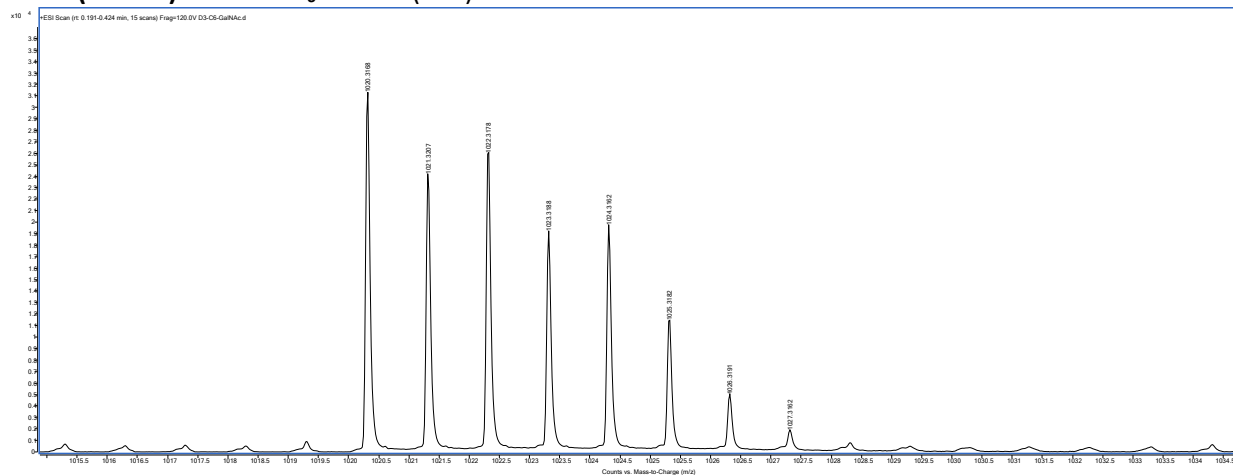


GalNAc-C₆-ZnDPP (12e)

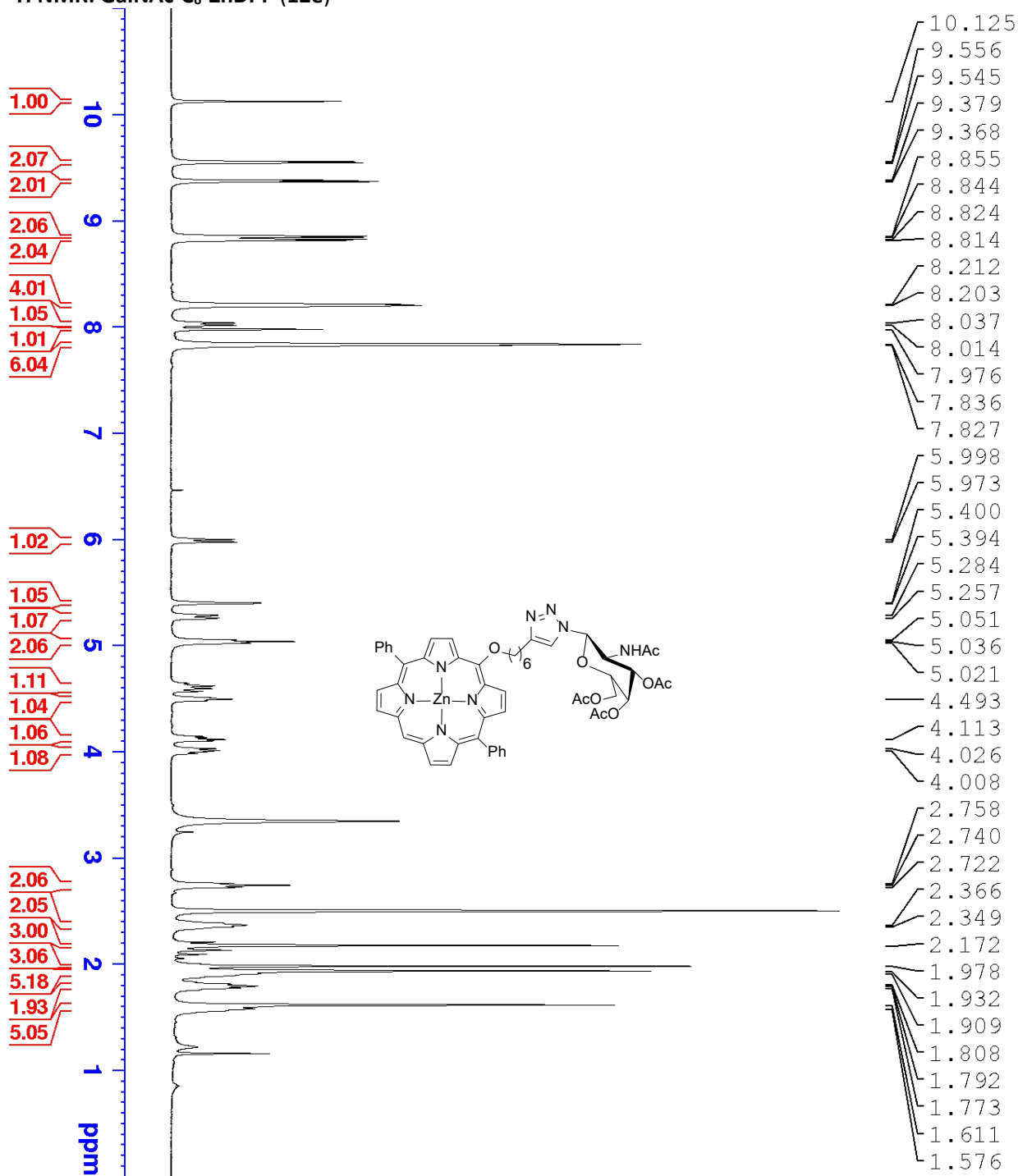


GalNAc-C₆-ZnDPP (12e). was obtained using the general procedure as a purple solid (24.4 mg, 90.0% yield). TLC analysis $R_f = 0.39$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.55 (d, $J = 4.4$ Hz, 2H), 9.37 (d, $J = 4.4$ Hz, 2H), 8.85 (d, $J = 4.2$ Hz, 2H), 8.82 (d, $J = 4.3$ Hz, 2H), 8.23 - 8.18 (m, 4H), 8.03 (d, $J = 9.2$ Hz, 1H), 7.98 (s, 1H), 7.86 - 7.81 (m, 6H), 5.99 (d, $J = 9.9$ Hz, 1H), 5.42 - 5.38 (m, 1H), 5.31 - 5.24 (m, 1H), 5.04 (t, $J = 6.1$ Hz, 2H), 4.65 - 4.56 (m, 1H), 4.49 (t, $J = 5.7$ Hz, 1H), 4.16 - 4.09 (m, 1H), 4.04 - 3.97 (m, 1H), 2.78 - 2.70 (m, 2H), 2.40 - 2.33 (m, 2H), 2.17 (s, 3H), 1.98 (s, 3H), 1.95 - 1.88 (m, 5H), 1.82 - 1.76 (m, 2H), 1.63 - 1.56 (m, 5H). ¹³C NMR (100 MHz, DMSO): δ 170.07, 169.94, 169.55, 169.43, 150.02, 148.97, 148.61, 147.11, 145.25, 142.57, 139.53, 134.33, 132.06, 131.94, 130.92, 127.45, 127.34, 126.71, 120.63, 119.38, 104.50, 85.48, 84.84, 72.77, 70.37, 66.75, 66.65, 61.66, 48.33, 30.62, 28.95, 28.53, 25.82, 24.90, 22.41, 20.52, 20.47, 20.42. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.52), 554 (4.16), 597 (3.95). HRMS (MALDI) m/z: Calcd for C₅₄H₅₂N₈O₉Zn [M]⁺ 1020.3143; Found [M]⁺ 1020.3168.

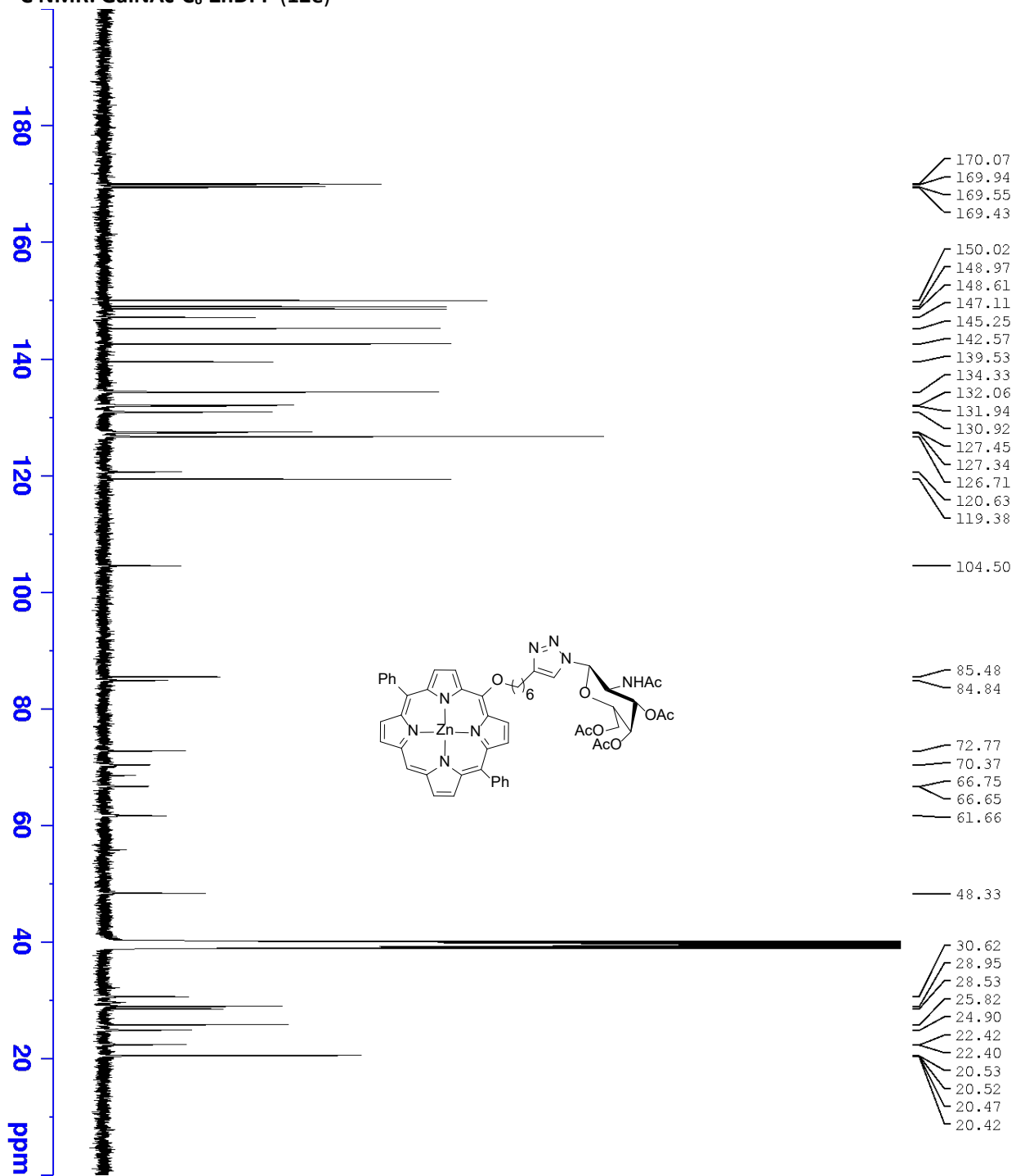
HRMS (MALDI): GalNAc-C₆-ZnDPP (12e)



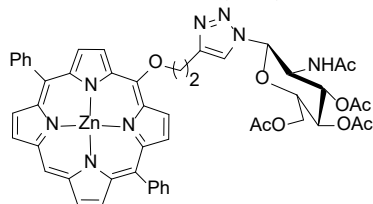
¹H NMR: GalNAc-C₆-ZnDPP (12e)



¹³C NMR: GalNAc-C₆-ZnDPP (12e)

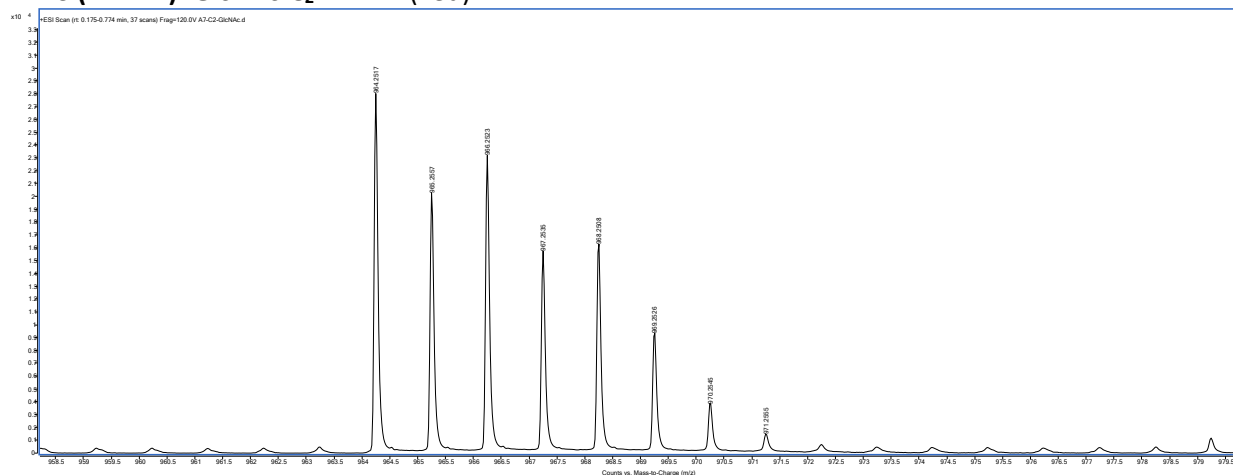


GlcNAc-C₂-ZnDPP (13a)

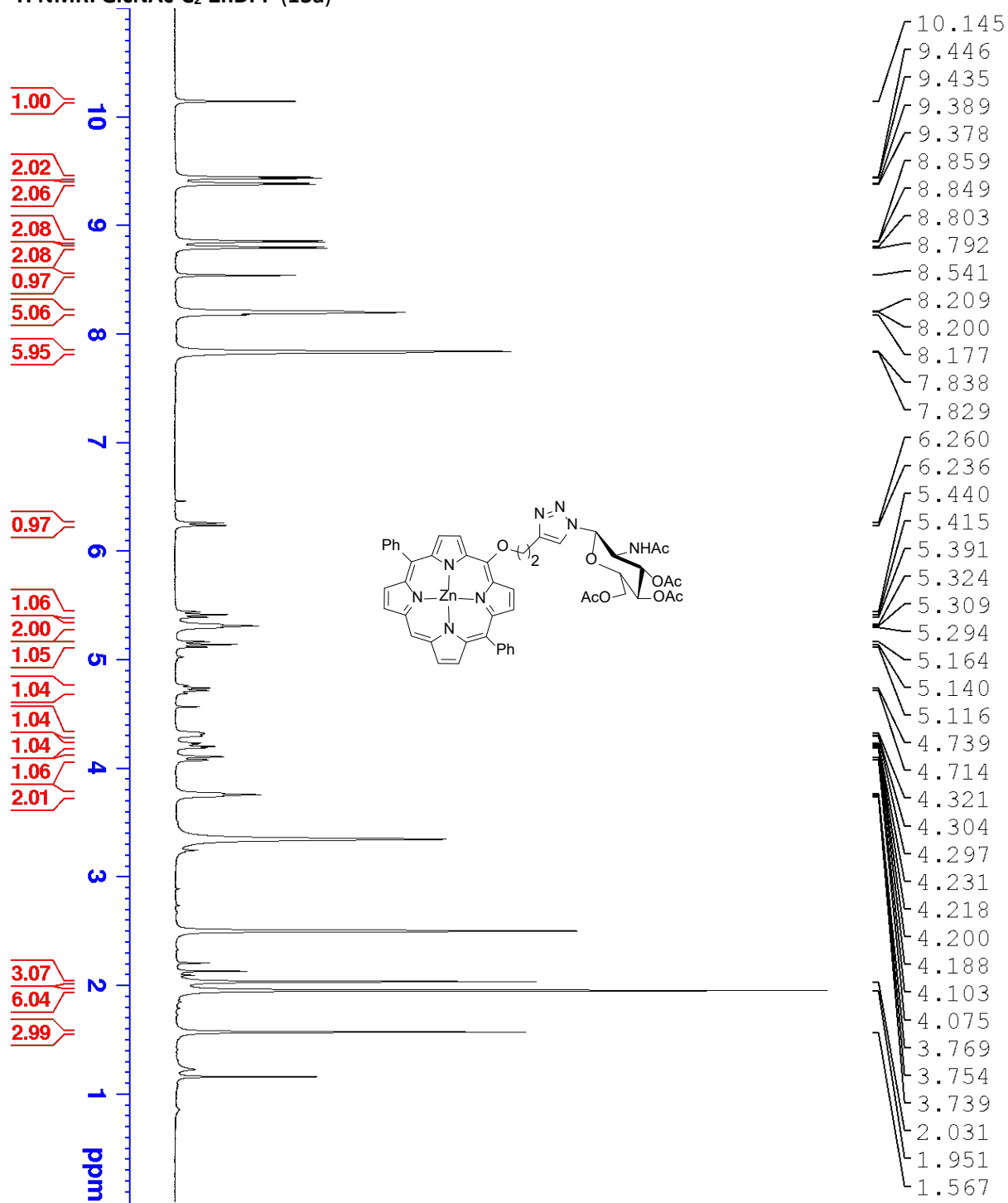


GlcNAc-C₂-ZnDPP (13a). was obtained using the general procedure as a purple solid (24.9 mg, 96.0% yield). TLC analysis $R_f = 0.18$ (hexanes: acetone 60:40 [v:v]). ¹HNMR (400 MHz, DMSO): δ 10.15 (s, 1H), 9.44 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.3$ Hz, 2H), 8.85 (d, $J = 4.3$ Hz, 2H), 8.80 (d, $J = 4.4$ Hz, 2H), 8.54 (s, 1H), 8.22 - 8.17 (m, 5H), 7.86 - 7.81 (m, 6H), 6.25 (d, $J = 9.9$ Hz, 1H), 5.42 (t, $J = 9.9$ Hz, 1H), 5.34 - 5.28 (m, 2H), 5.14 (t, $J = 9.8$ Hz, 1H), 4.77 - 4.68 (m, 1H), 4.34 - 4.28 (m, 1H), 4.24 - 4.18 (m, 1H), 4.12 - 4.06 (m, 1H), 3.78 - 3.72 (m, 2H), 2.03 (s, 3H), 1.95 (s, 6H), 1.57 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.02, 169.65, 169.47, 169.39, 149.98, 149.02, 148.68, 145.22, 144.33, 142.55, 138.85, 134.33, 132.06, 131.99, 130.98, 127.46, 126.71, 122.21, 119.41, 104.67, 84.87, 83.04, 73.45, 72.51, 68.13, 61.86, 52.19, 29.60, 27.14, 22.41, 20.53, 20.46, 20.32. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.50), 554 (4.03), 597 (3.77). HRMS (MALDI) m/z : Calcd for C₅₀H₄₄N₈O₉Zn [M]⁺ 964.2517; Found [M]⁺ 964.2517.

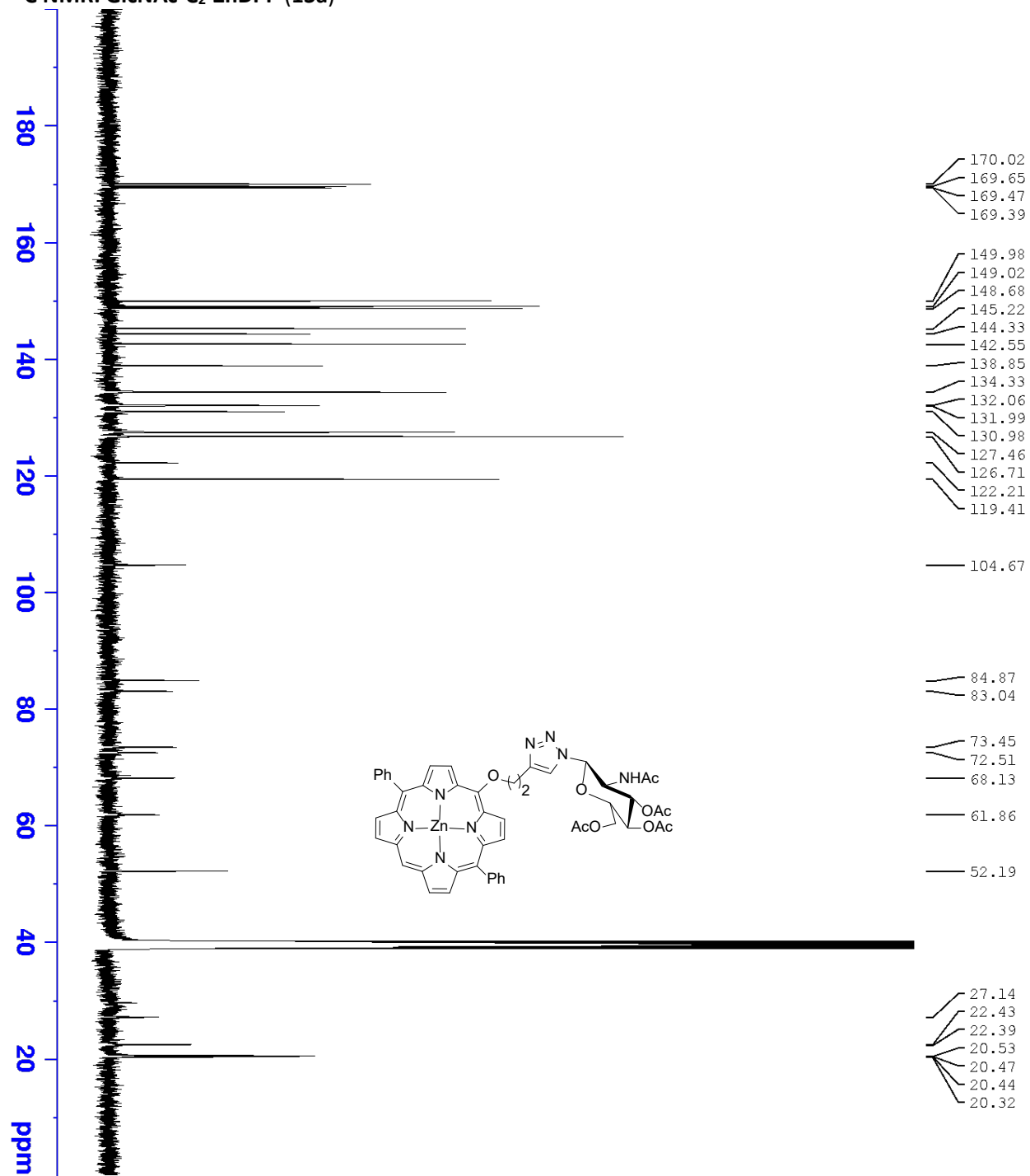
HRMS (MALDI): GlcNAc-C₂-ZnDPP (13a)



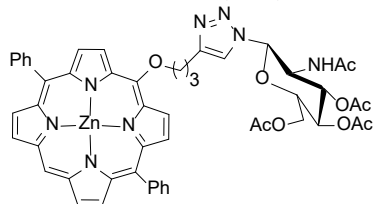
¹H NMR: GlcNAc-C₂-ZnDPP (13a)



¹³C NMR: GlcNAc-C₂-ZnDPP (13a)

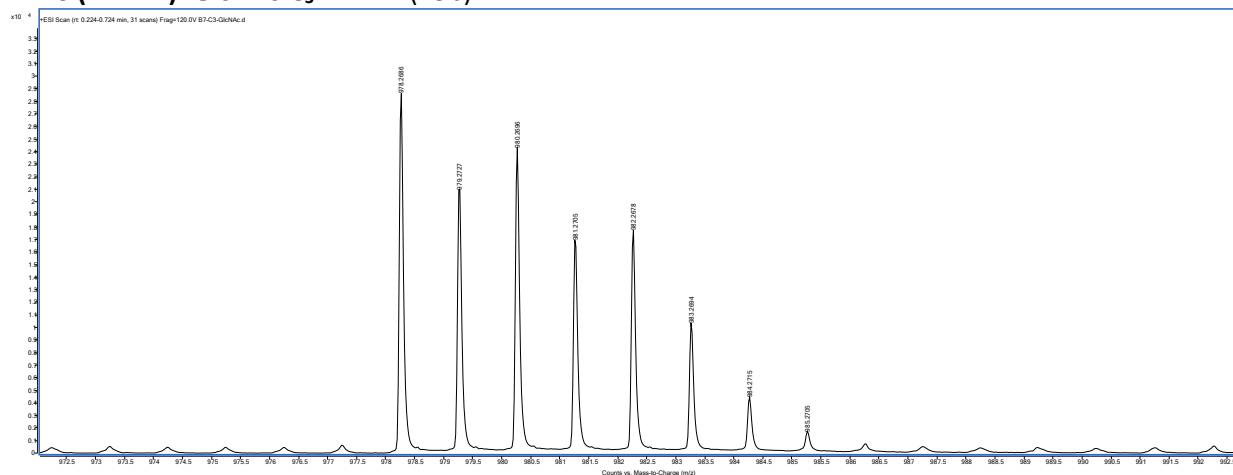


GlcNAc-C₃-ZnDPP (13b)

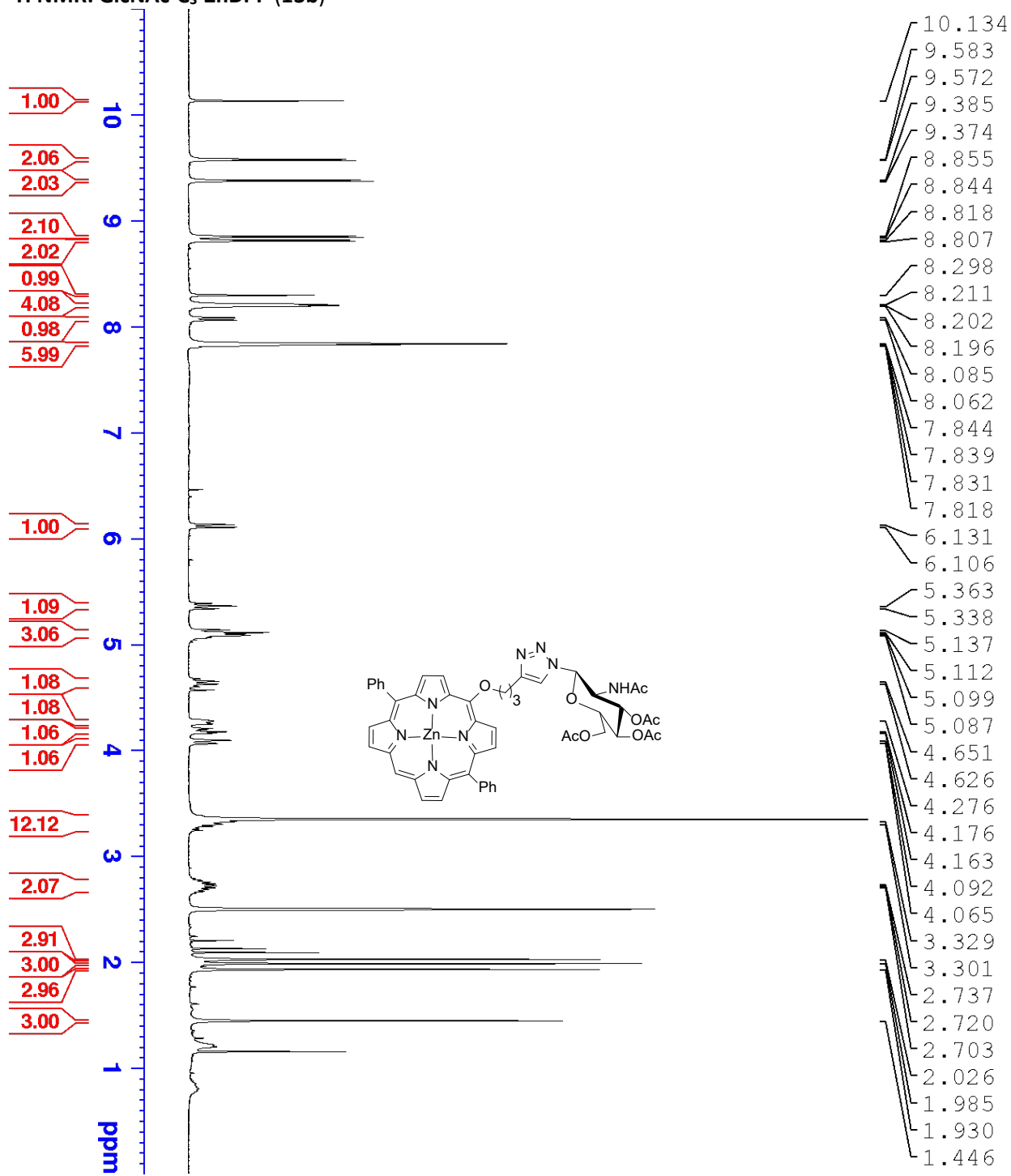


GlcNAc-C₃-ZnDPP (13b). was obtained using the general procedure as a purple solid (23.1 mg, 91.0% yield). TLC analysis $R_f = 0.20$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.58 (d, $J = 4.6$ Hz, 2H), 9.38 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.81 (d, $J = 4.6$ Hz, 2H), 8.30 (s, 1H), 8.22 - 8.18 (m, 4H), 8.07 (d, $J = 9.2$ Hz, 1H), 7.84 - 7.82 (m, 6H), 6.12 (d, $J = 9.9$ Hz, 1H), 5.36 (t, $J = 9.8$ Hz, 1H), 5.14 - 5.06 (m, 3H), 4.69 - 4.59 (m, 1H), 4.29 - 4.24 (m, 1H), 4.22 - 4.15 (m, 1H), 4.11 - 4.05 (m, 1H) 3.39 - 3.23 (m, 2H) 2.78 - 2.66 (m, 2H) 2.03 (s, 3H), 1.99 (s, 3H), 1.93 (s, 3H), 1.45 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.07, 169.62, 169.40, 169.37, 150.02, 149.00, 148.65, 146.75, 145.26, 142.59, 139.36, 134.33, 132.07, 131.98, 130.96, 127.48, 126.73, 121.04, 119.40, 104.57, 84.81, 83.66, 73.40, 72.47, 68.12, 61.83, 52.16, 30.29, 22.19, 22.06, 20.57, 20.47, 20.31. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.66), 554 (4.15), 597 (3.92). HRMS (MALDI) m/z : Calcd for C₅₁H₄₆N₈O₉Zn [M]⁺ 978.2674; Found [M]⁺ 978.2686.

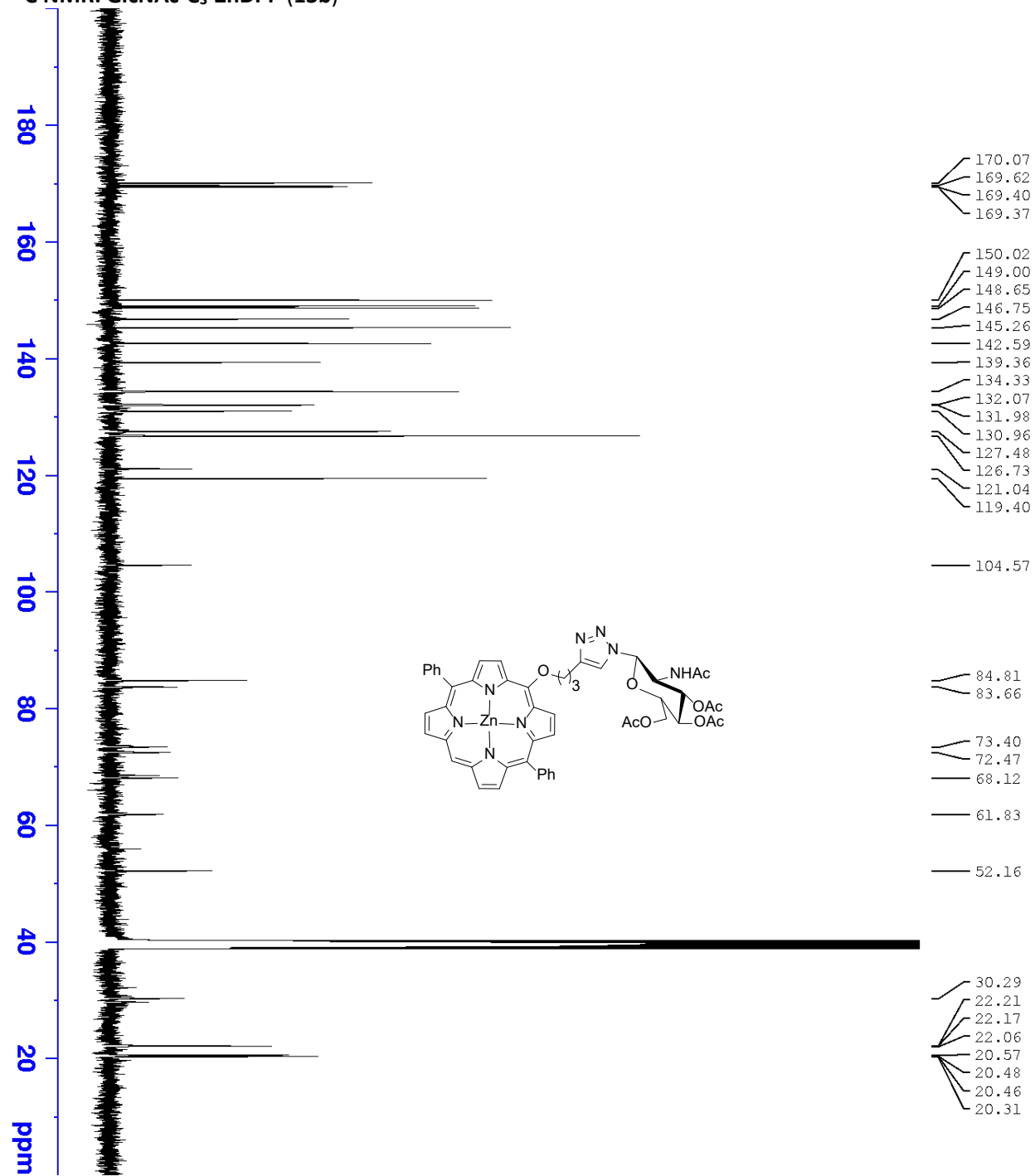
HRMS (MALDI): GlcNAc-C₃-ZnDPP (13b)



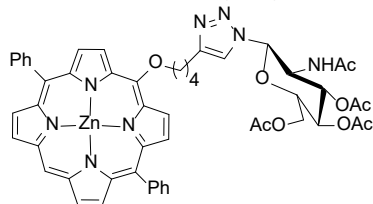
¹H NMR: GlcNAc-C₃-ZnDPP (13b)



¹³C NMR: GlcNAc-C₃-ZnDPP (13b)

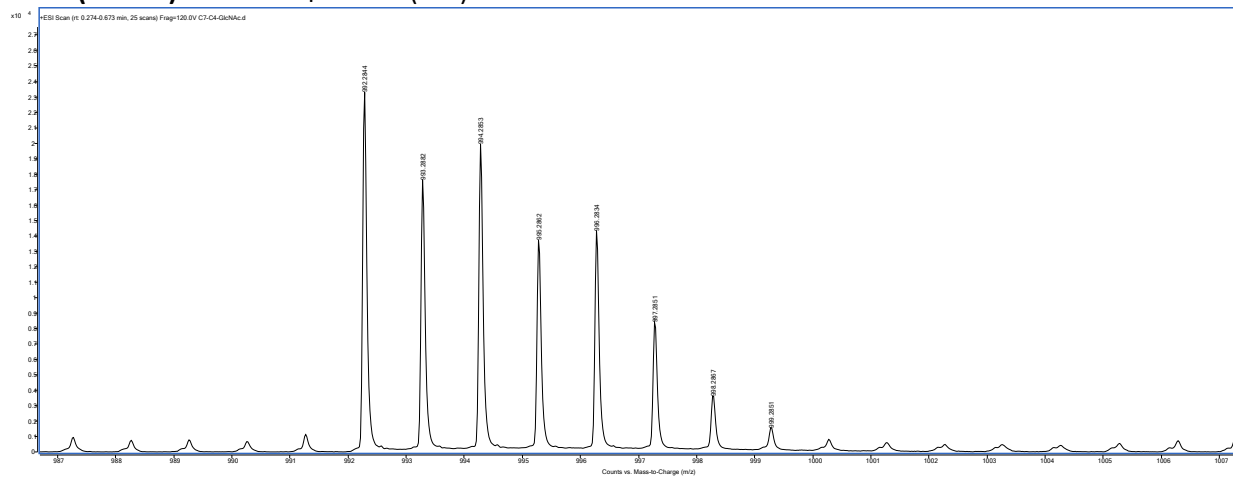


GlcNAc-C₄-ZnDPP (13c)

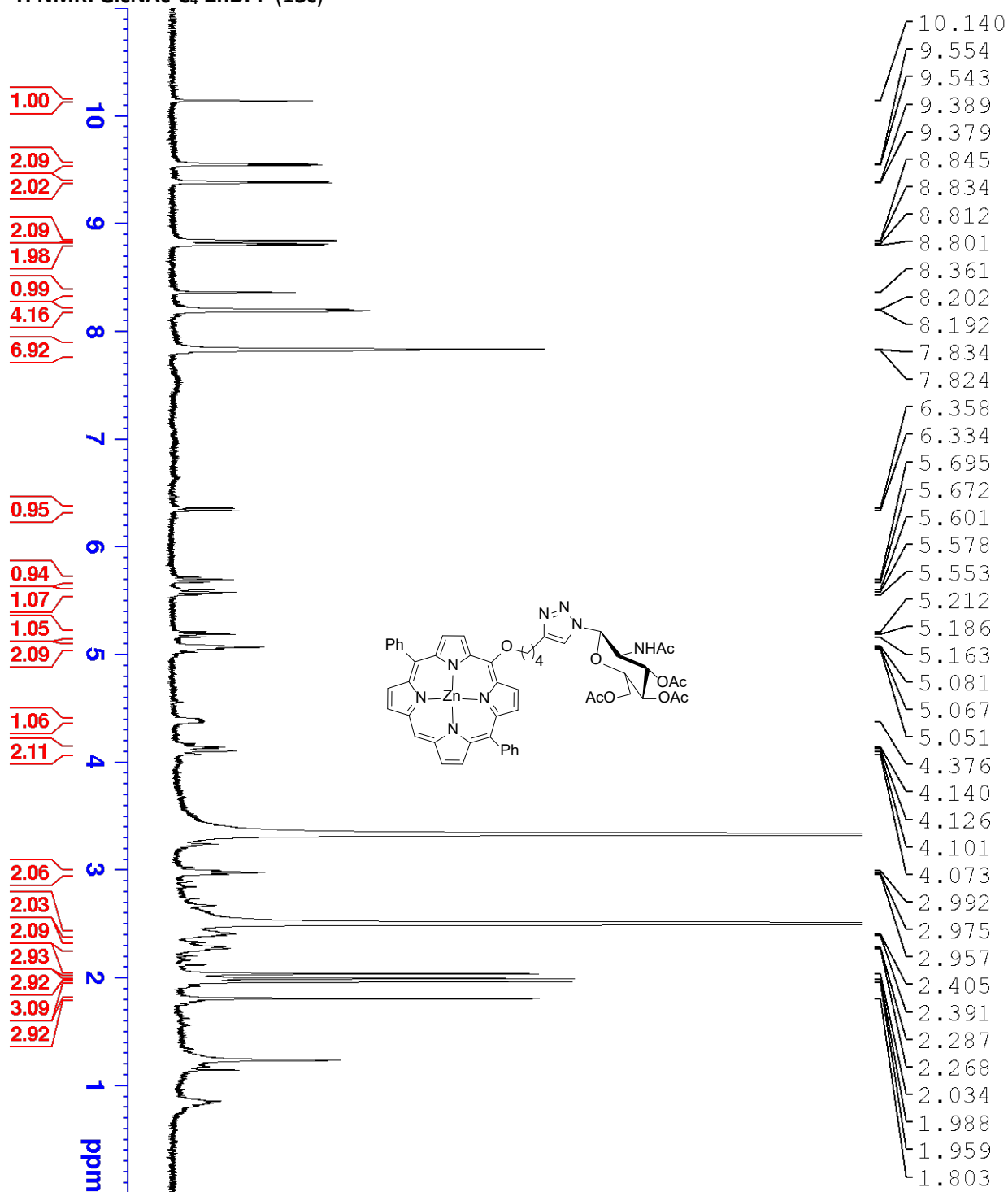


GlcNAc-C₄-ZnDPP (13c). was obtained using the general procedure as a purple solid (24.6 mg, 95.0% yield). TLC analysis $R_f = 0.29$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.14 (s, 1H), 9.55 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.0$ Hz, 2H), 8.84 (d, $J = 4.3$ Hz, 2H), 8.81 (d, $J = 4.2$ Hz, 2H), 8.36 (s, 1H), 8.21 - 8.18 (m, 4H), 7.90 - 7.76 (m, 7H), 6.35 (d, $J = 9.4$ Hz, 1H), 5.72 - 5.66 (m, 1H), 5.61 - 5.54 (m, 1H), 5.22 - 5.15 (m, 1H), 5.10 - 5.03 (m, 2H), 4.41 - 4.36 (m, 1H), 4.15 - 4.06 (m, 2H), 3.00 - 2.95 (m, 2H), 2.43 - 2.38 (m, 1H), 2.32 - 2.24 (m, 2H), 2.03 (s, 3H), 1.99 (s, 3H), 1.96 (s, 3H), 1.80 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.07, 169.64, 169.40, 150.02, 148.99, 148.62, 147.05, 145.23, 142.57, 139.48, 134.33, 132.07, 131.96, 130.96, 127.46, 127.35, 126.72, 120.89, 119.39, 104.54, 84.78, 84.59, 73.38, 72.47, 68.13, 61.85, 52.14, 30.05, 26.03, 24.98, 22.38, 20.55, 20.46, 20.32. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.65), 554 (4.16), 597 (3.95). HRMS (MALDI) m/z : Calcd for C₅₂H₄₈N₈O₉Zn [M]⁺ 992.2836; Found [M]⁺ 992.2844.

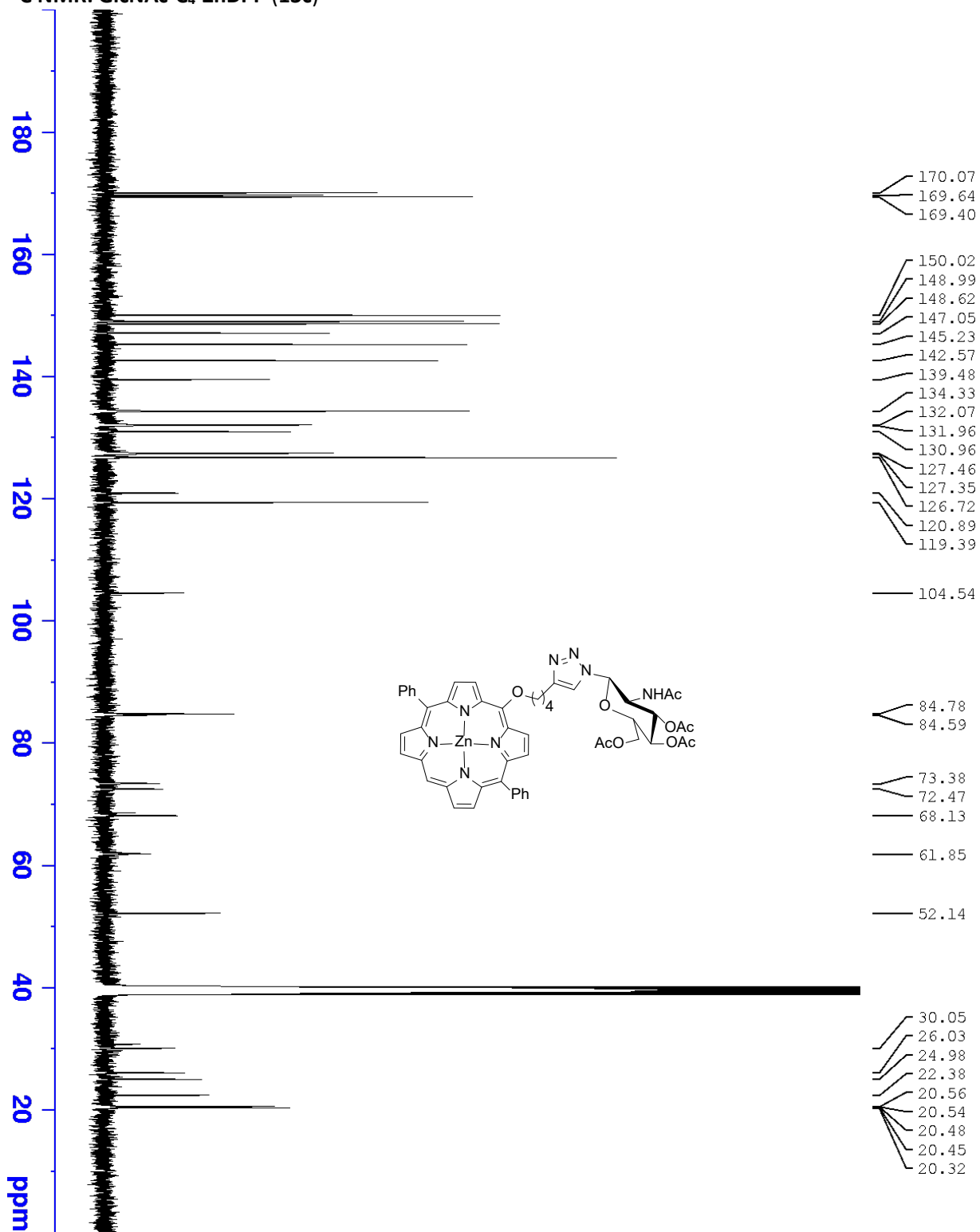
HRMS (MALDI): GlcNAc-C₄-ZnDPP (13c)



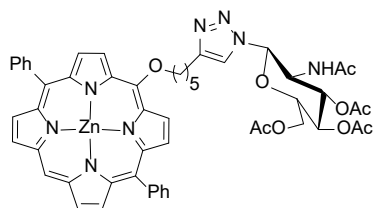
¹H NMR: GlcNAc-C₄-ZnDPP (13c)



¹³C NMR: GlcNAc-C₄-ZnDPP (13c)

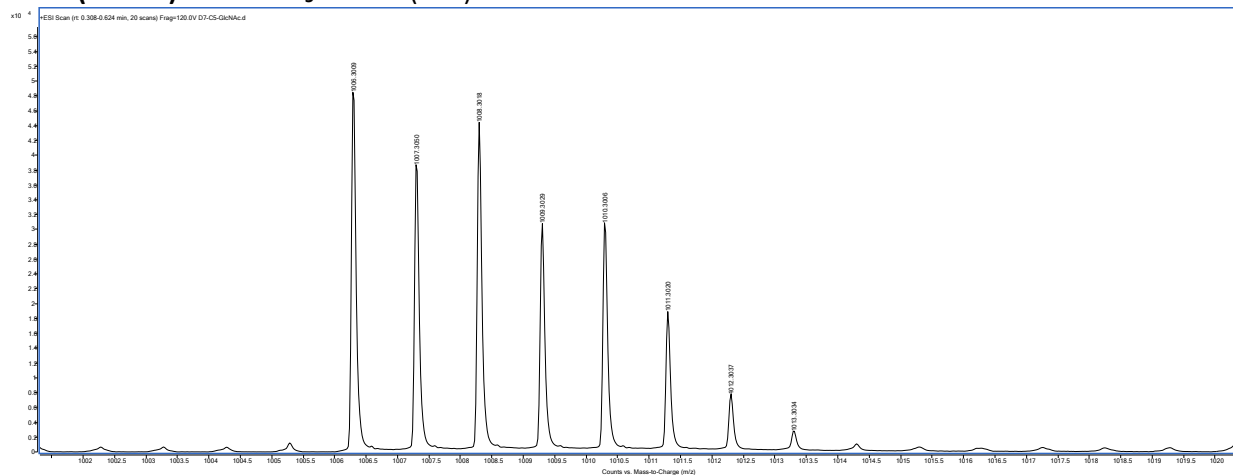


GlcNAc-C₅-ZnDPP (13d)

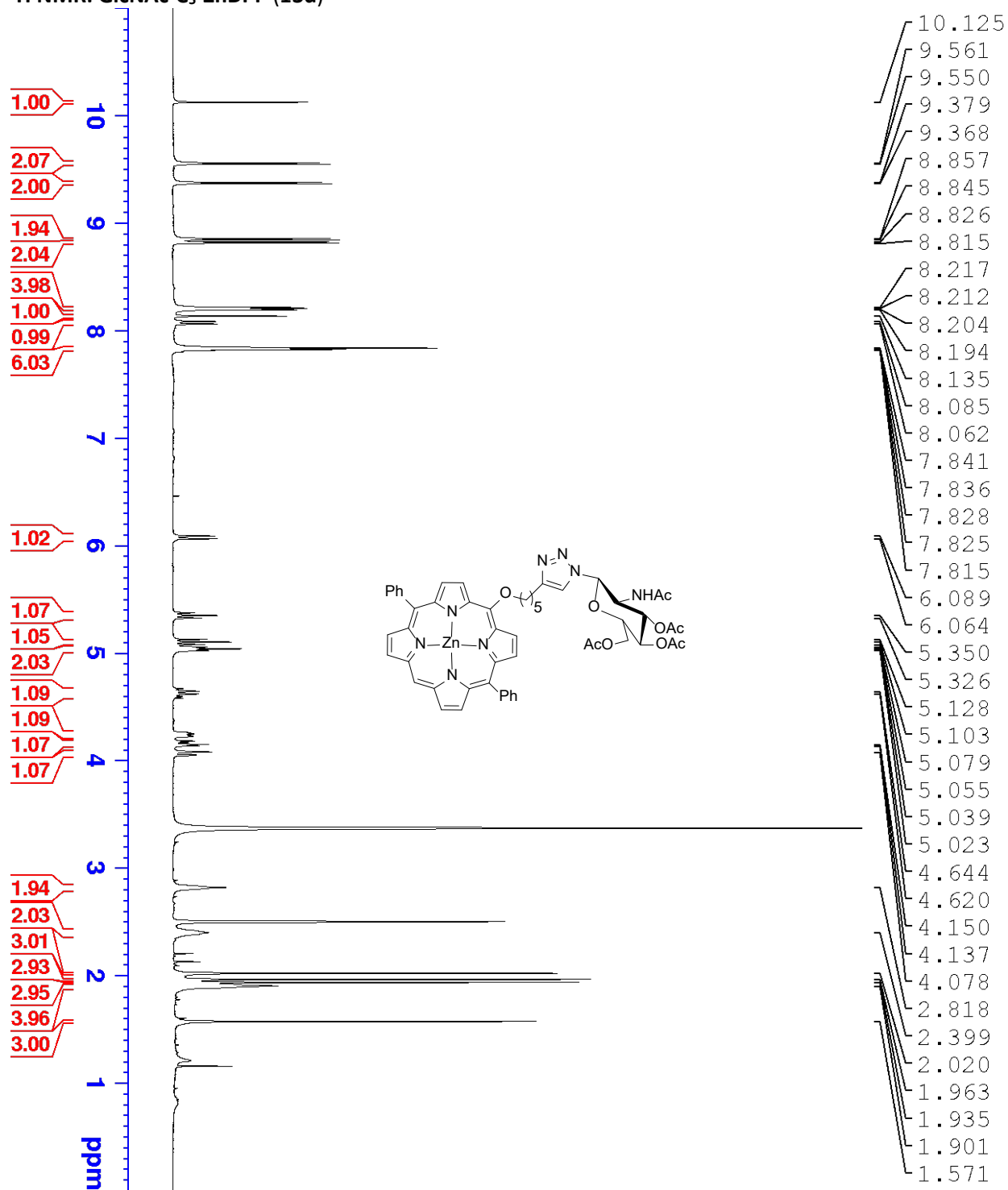


GlcNAc-C₅-ZnDPP (13d). was obtained using the general procedure as a purple solid (26.0 mg, 97.0% yield). TLC analysis $R_f = 0.15$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.56 (d, $J = 4.6$ Hz, 2H), 9.37 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.5$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.23 - 8.19 (m, 4H), 8.14 (s, 1H), 8.07 (d, $J = 9.2$ Hz, 1H), 7.86 - 7.81 (m, 6H), 6.08 (d, $J = 10.0$ Hz, 1H), 5.35 (t, $J = 9.8$ Hz, 1H), 5.10 (t, $J = 9.8$ Hz, 1H), 5.04 (t, $J = 6.4$ Hz, 2H), 4.68 - 4.57 (m, 1H), 4.28 - 4.21 (m, 1H), 4.19 - 4.12 (m, 1H), 4.10 - 4.03 (m, 1H), 2.85 - 2.78 (m, 2H), 2.44 - 2.35 (m, 2H), 2.02 (s, 3H), 1.96 (s, 3H), 1.94 (s, 3H), 1.92 - 1.87 (m, 4H), 1.57 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.06, 169.62, 169.40, 169.36, 150.03, 148.99, 148.63, 147.11, 145.27, 142.58, 139.52, 134.34, 132.07, 131.96, 130.94, 127.47, 127.39, 126.73, 120.77, 119.39, 104.53, 84.73, 73.35, 72.46, 68.12, 61.86, 52.09, 30.43, 28.86, 25.40, 25.00, 22.31, 20.52, 20.46, 20.31. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.56), 554 (4.11), 597 (3.89). HRMS (MALDI) m/z : Calcd for C₅₃H₅₀N₈O₉Zn [M]⁺ 1006.3007; Found [M]⁺ 1006.3009.

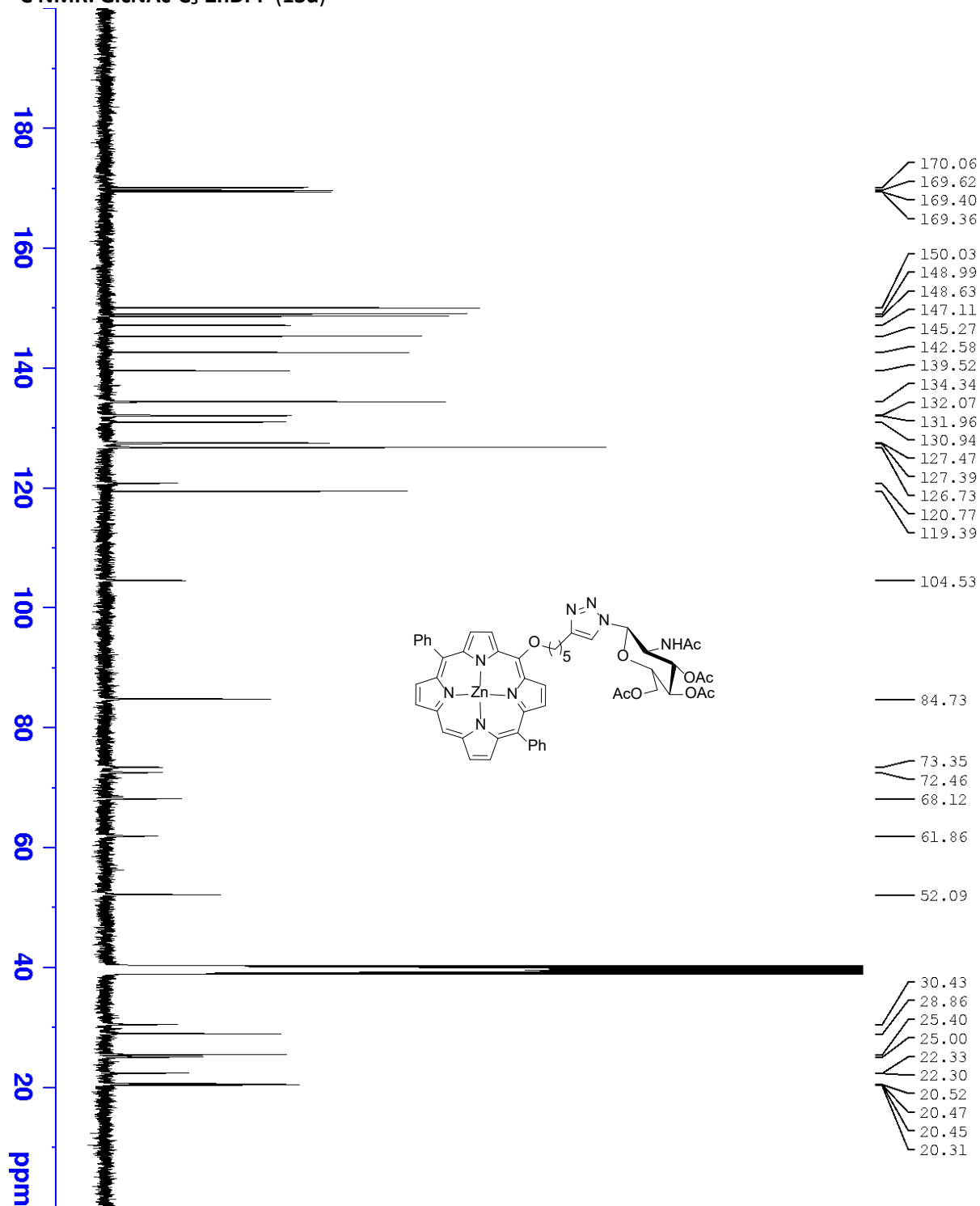
HRMS (MALDI): GlcNAc-C₅-ZnDPP (13d)



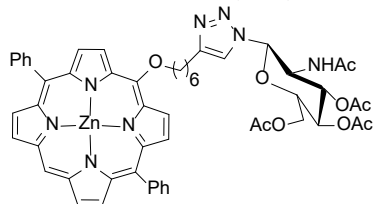
¹H NMR: GlcNAc-C₅-ZnDPP (13d)



¹³C NMR: GlcNAc-C₅-ZnDPP (13d)

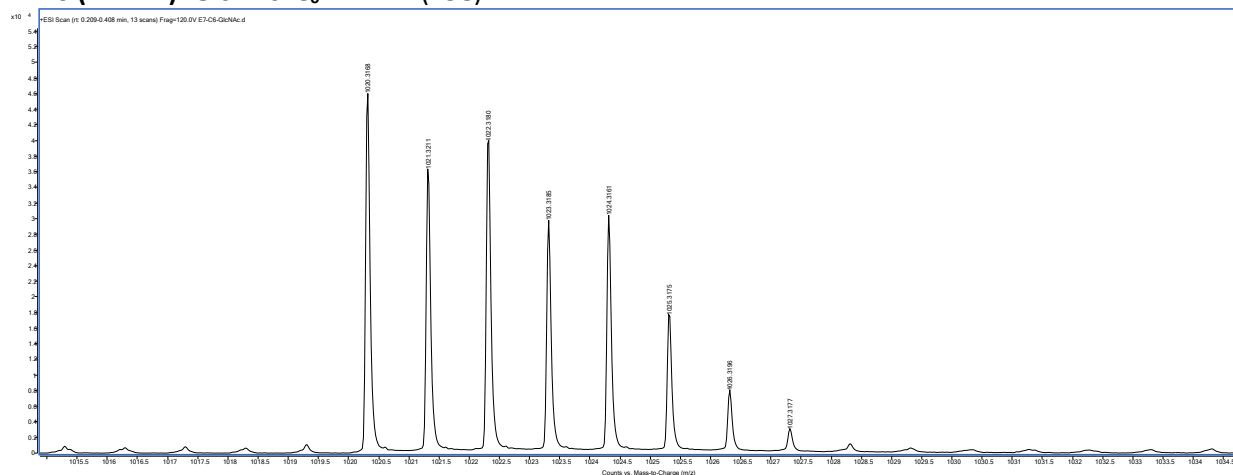


GlcNAc-C₆-ZnDPP (13e)

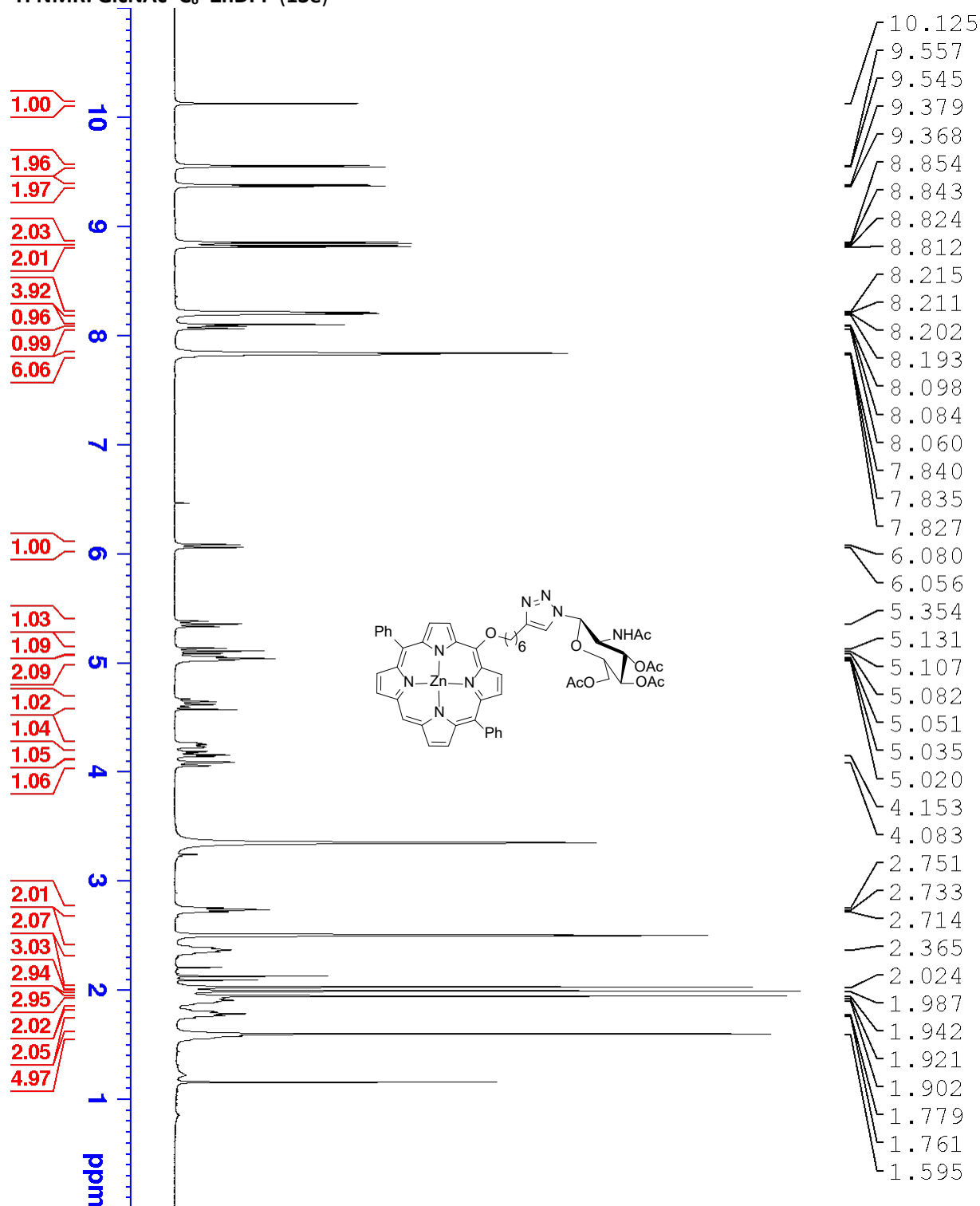


GlcNAc-C₆-ZnDPP (13e). was obtained using the general procedure as a purple solid (24.0 mg, 90.0% yield). TLC analysis $R_f = 0.24$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.12 (s, 1H), 9.55 (d, $J = 4.5$ Hz, 2H), 9.37 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.22 - 8.18 (m, 4H), 8.10 (s, 1H), 8.07 (d, $J = 9.3$ Hz, 1H), 7.86 - 7.80 (m, 6H), 6.07 (d, $J = 10.0$ Hz, 1H), 5.35 (t, $J = 9.8$ Hz, 1H), 5.11 (t, $J = 9.8$ Hz, 1H), 5.04 (t, $J = 6.2$ Hz, 2H), 4.69 - 4.58 (m, 1H), 4.28 - 4.20 (m, 1H), 4.20 - 4.12 (m, 1H), 4.11 - 4.03 (m, 1H), 2.78 - 2.68 (m, 2H), 2.42 - 2.32 (m, 2H), 2.02 (s, 3H), 1.99 (s, 3H), 1.94 (s, 3H), 1.93 - 1.86 (m, 2H), 1.82 - 1.74 (m, 2H), 1.62 - 1.55 (m, 5H). ¹³C NMR (100 MHz, DMSO): δ 170.04, 169.60, 169.37, 169.31, 150.01, 148.96, 148.59, 145.24, 142.56, 139.51, 134.32, 132.05, 131.93, 130.90, 127.44, 127.33, 126.70, 119.36, 104.49, 84.83, 84.68, 73.33, 72.47, 68.08, 61.83, 52.05, 30.60, 28.86, 28.50, 25.81, 24.92, 22.23, 20.53, 20.44, 20.29. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.56), 554 (4.11), 597 (3.89). HRMS (MALDI) m/z : Calcd for C₅₄H₅₂N₈O₉Zn [M]⁺ 1020.3143; Found [M]⁺ 1020.3168.

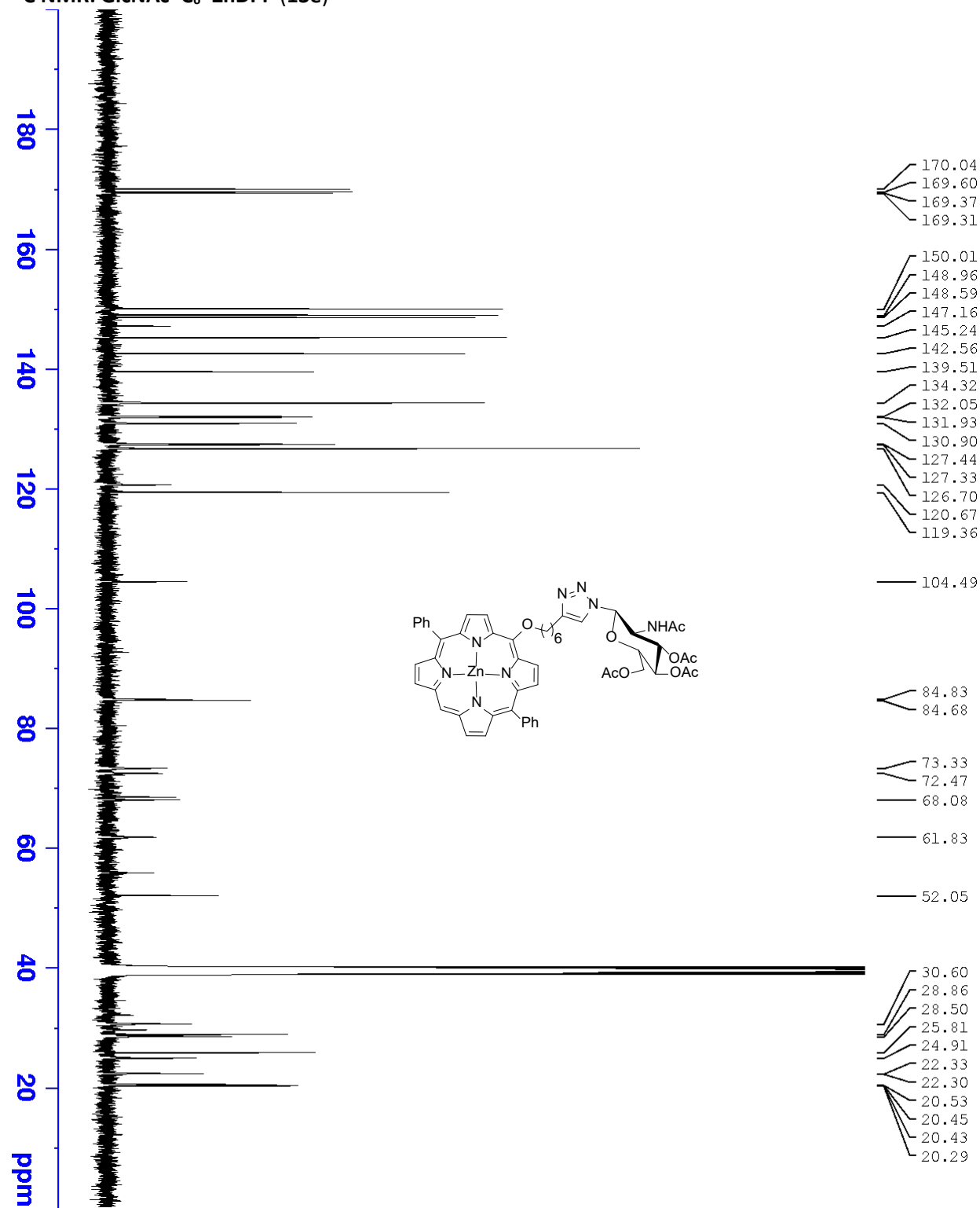
HRMS (MALDI): GlcNAc-C₆-ZnDPP (13e)



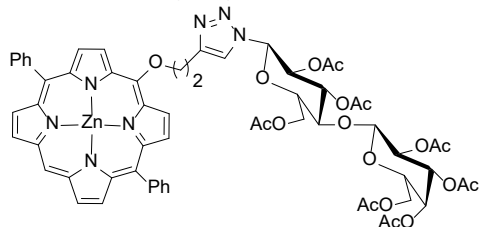
¹H NMR: GlcNAc-C₆-ZnDPP (13e)



¹³C NMR: GlcNAc-C₆-ZnDPP (13e)

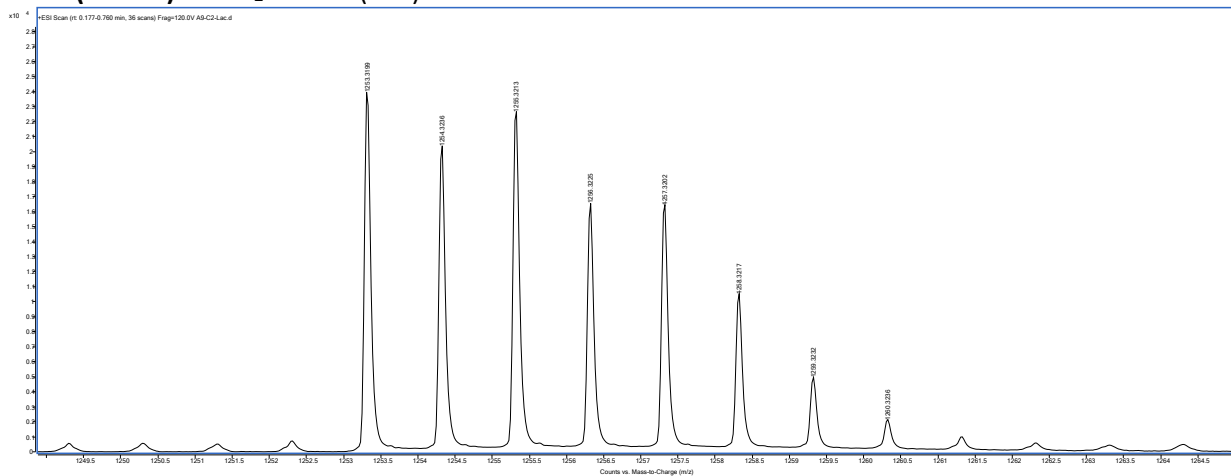


Lac-C₂-ZnDPP (14a)

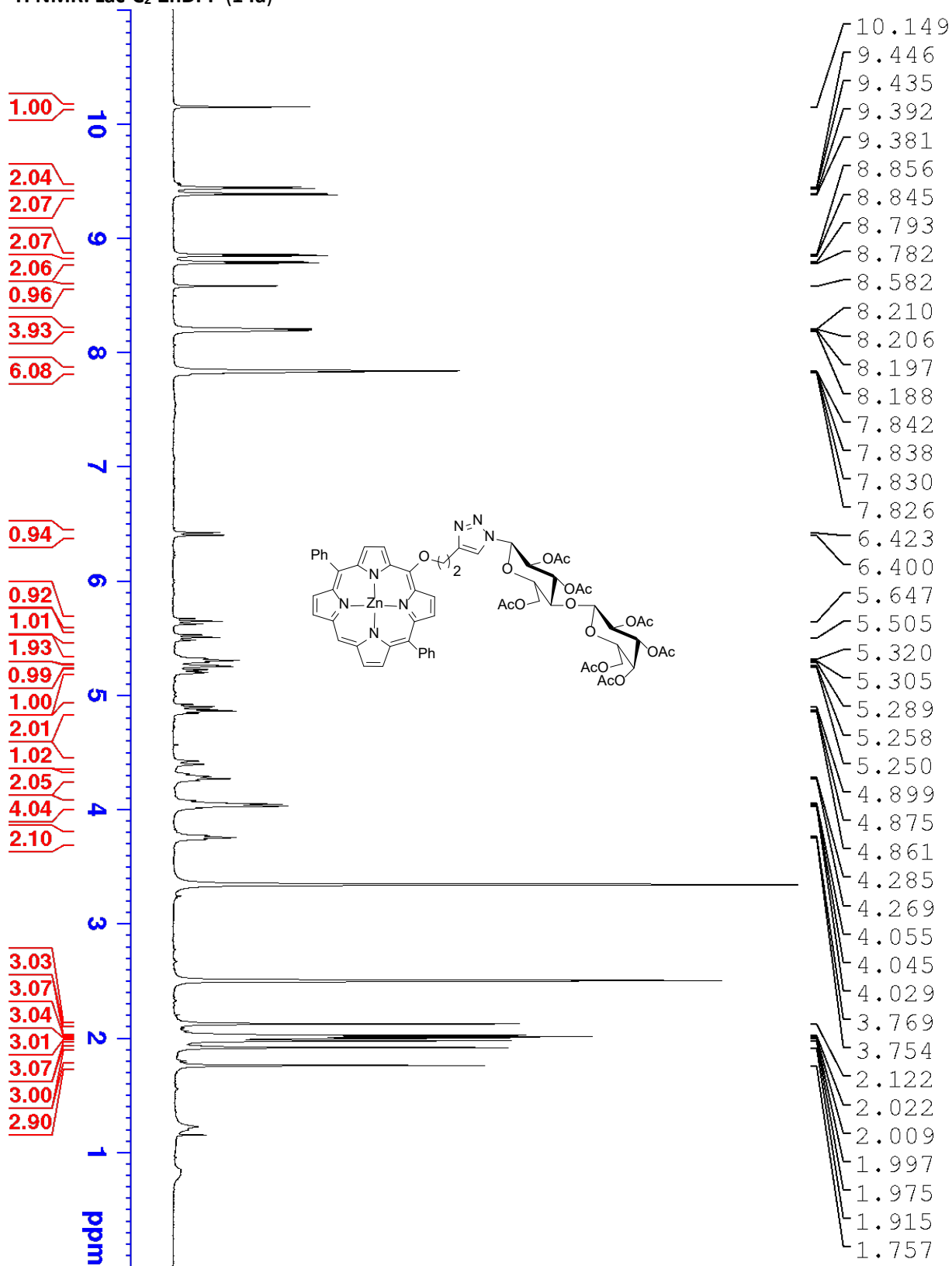


Lac-C₂-ZnDPP (14a). was obtained using the general procedure as a purple solid (28.7 mg, 90.0% yield). TLC analysis $R_f = 0.21$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.15 (s, 1H), 9.45 (d, $J = 4.5$ Hz, 2H), 9.39 (d, $J = 4.5$ Hz, 2H), 8.86 (d, $J = 4.4$ Hz, 2H), 8.79 (d, $J = 4.5$ Hz, 2H), 8.58 (s, 1H), 8.22 – 8.18 (m, 4H), 7.87 – 7.81 (m, 6H), 6.42 (d, $J = 9.2$ Hz, 2H), 5.65 (t, $J = 9.4$ Hz, 1H), 5.55 – 5.46 (m, 1H), 5.30 (t, $J = 6.2$ Hz, 2H), 5.27 – 5.24 (m, 1H), 5.23 – 5.18 (m, 1H), 4.93 – 4.83 (m, 1H), 4.41 (d, $J = 11.2$ Hz, 1H), 4.33 – 4.24 (m, 2H), 4.08 – 4.00 (m, 4H), 3.81 – 3.69 (m, 2H), 2.12 (s, 3H), 2.02 (s, 3H), 2.01 (s, 3H), 2.00 (s, 3H), 1.97 (s, 3H), 1.91 (s, 3H), 1.76 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.21, 169.93, 169.56, 169.43, 169.12, 168.65, 150.00, 149.03, 148.68, 145.20, 144.71, 142.54, 138.83, 134.34, 132.08, 132.02, 130.94, 127.48, 127.38, 126.72, 122.47, 119.42, 104.69, 100.08, 83.75, 82.96, 75.99, 74.41, 72.47, 70.50, 70.32, 69.78, 68.93, 67.17, 62.37, 60.93, 27.10, 20.57, 20.50, 20.43, 20.40, 20.34, 20.30, 20.04. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.62), 554 (4.16), 597 (3.92). HRMS (MALDI) m/z : Calcd for C₆₂H₅₉N₇O₁₈Zn [M]⁺ 1253.3203; Found [M]⁺ 1253.3199.

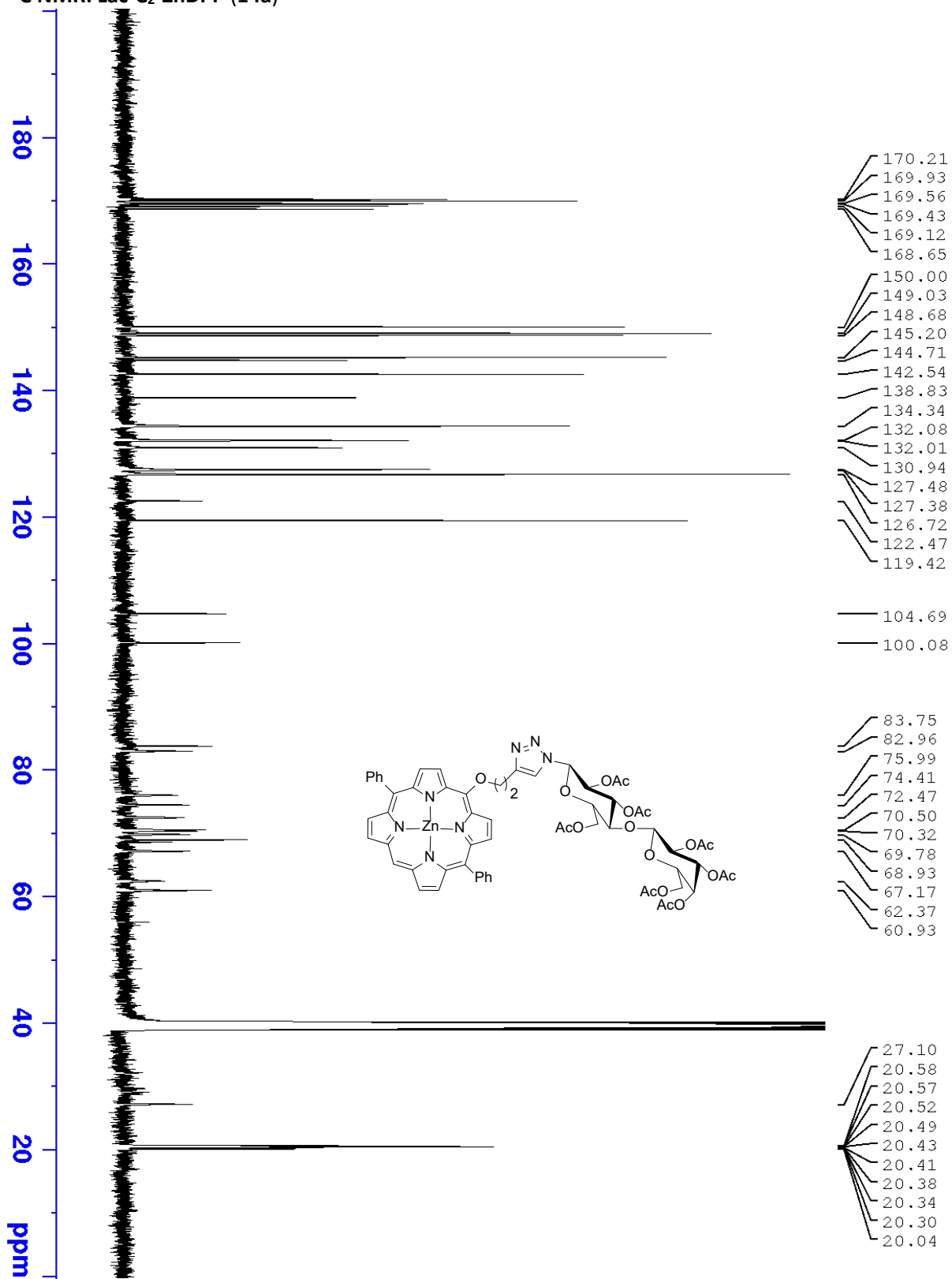
HRMS (MALDI): Lac-C₂-ZnDPP (14a)



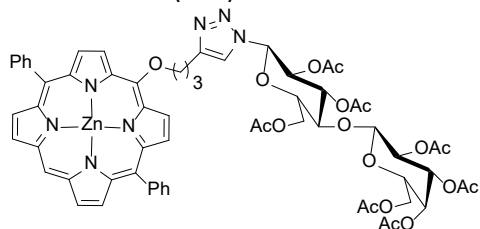
¹H NMR: Lac-C₂-ZnDPP (14a)



¹³C NMR: Lac-C₂-ZnDPP (14a)

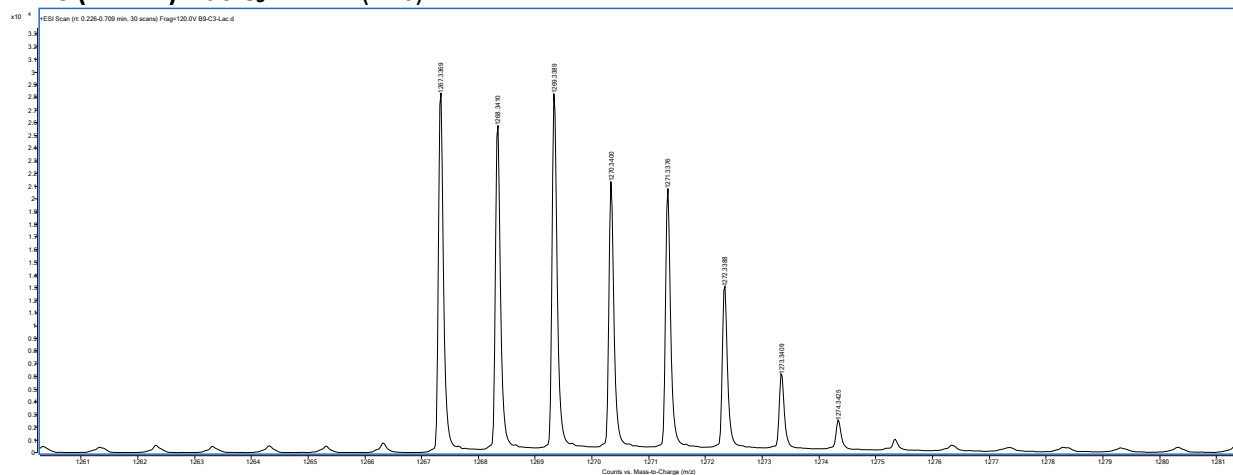


Lac-C₃-ZnDPP (14b)

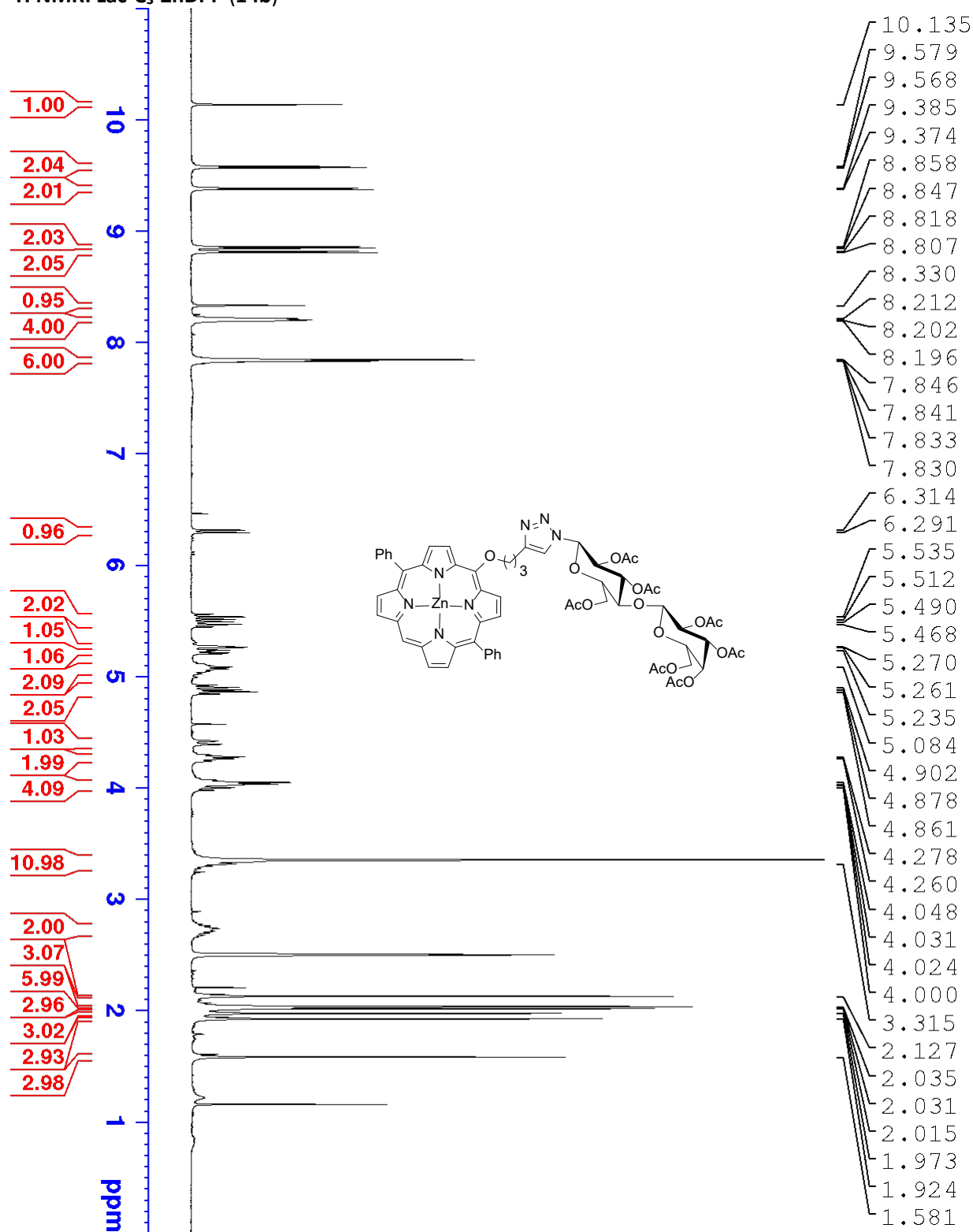


Lac-C₃-ZnDPP (14b). was obtained using the general procedure as a purple solid (10.8 mg, 93.0% yield). TLC analysis $R_f = 0.27$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.14 (s, 1H), 9.57 (d, $J = 4.6$ Hz, 2H), 9.39 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.5$ Hz, 2H), 8.80 (d, $J = 4.6$ Hz, 2H), 8.33 (s, 1H), 8.23 – 8.18 (m, 4H), 7.86 – 7.81 (m, 6H), 6.30 (d, $J = 9.0$ Hz, 2H), 5.57 – 5.44 (m, 2H), 5.29 – 5.25 (m, 1H), 5.24 – 5.19 (m, 1H), 5.12 – 5.01 (m, 2H), 4.94 – 4.81 (m, 2H), 4.42 (t, $J = 11.12$ Hz, 1H), 4.30 – 4.23 (m, 2H), 4.07 – 3.97 (m, 4H), 3.40 – 3.25 (m, 2H), 2.78 – 2.67 (m, 2H), 2.13 (s, 3H), 2.03 (s, 6H), 2.01 (s, 3H), 1.97 (s, 3H), 1.92 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.26, 169.93, 169.56, 169.36, 169.11, 168.53, 150.01, 148.99, 148.63, 147.15, 145.22, 142.57, 139.32, 134.32, 132.07, 131.98, 130.94, 127.47, 127.40, 126.72, 121.30, 119.39, 104.58, 100.07, 83.61, 75.93, 74.35, 72.32, 70.35, 69.71, 68.92, 67.16, 62.31, 60.92, 30.25, 29.65, 22.04, 20.60, 20.50, 20.42, 20.35, 20.30, 19.73. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.65), 554 (4.19), 597 (3.97). HRMS (MALDI) m/z : Calcd for C₆₃H₆₁N₇O₁₈Zn [M]⁺ 1267.3359; Found [M]⁺ 1267.3369.

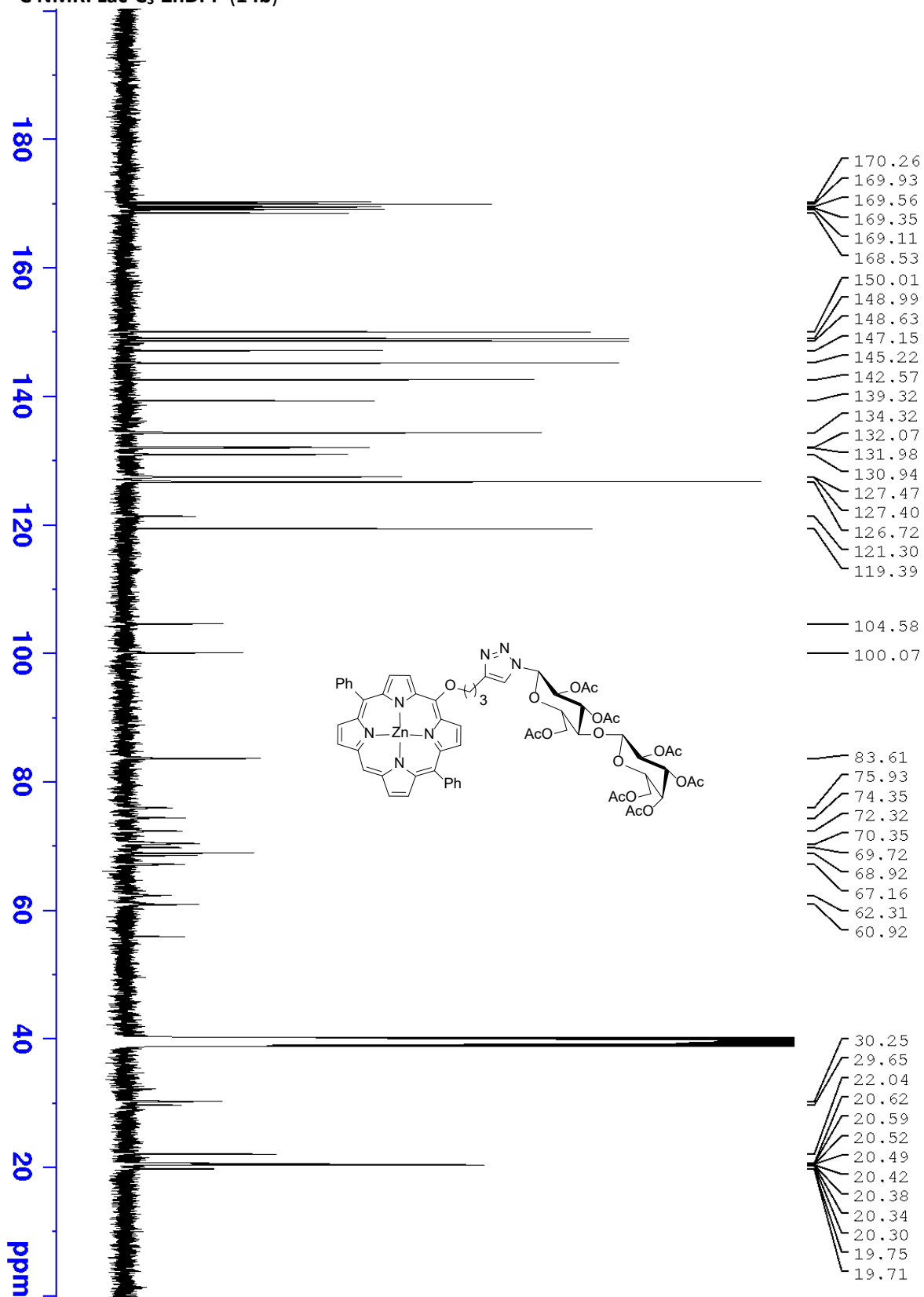
HRMS (MALDI): Lac-C₃-ZnDPP (14b)



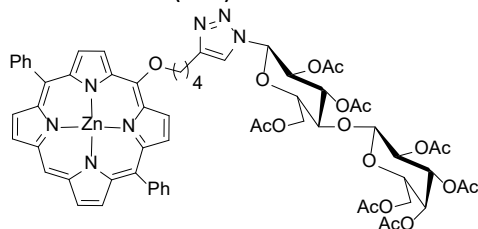
¹H NMR: Lac-C₃-ZnDPP (14b)



¹³C NMR: Lac-C₃-ZnDPP (14b)

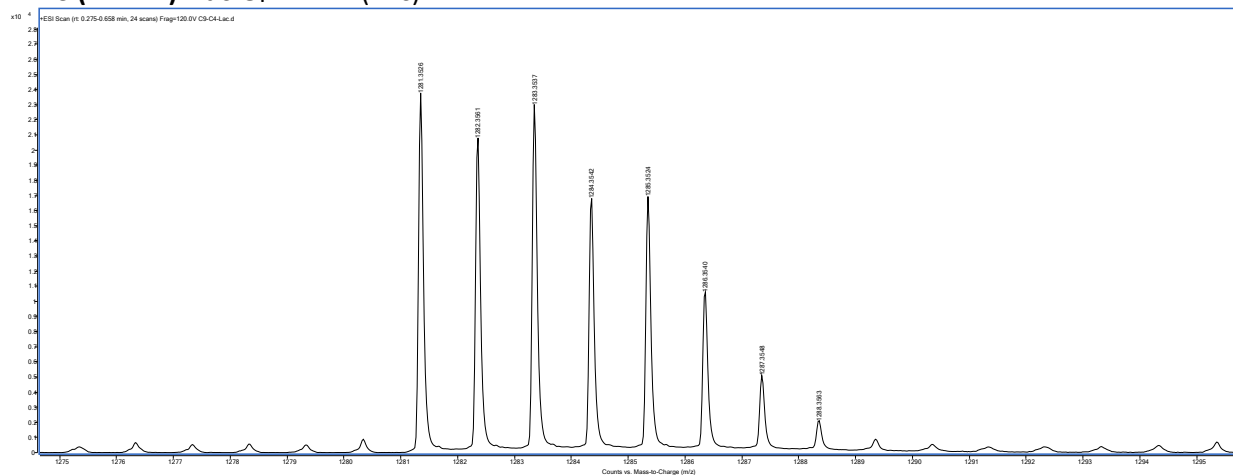


Lac-C₄-ZnDPP (14c)

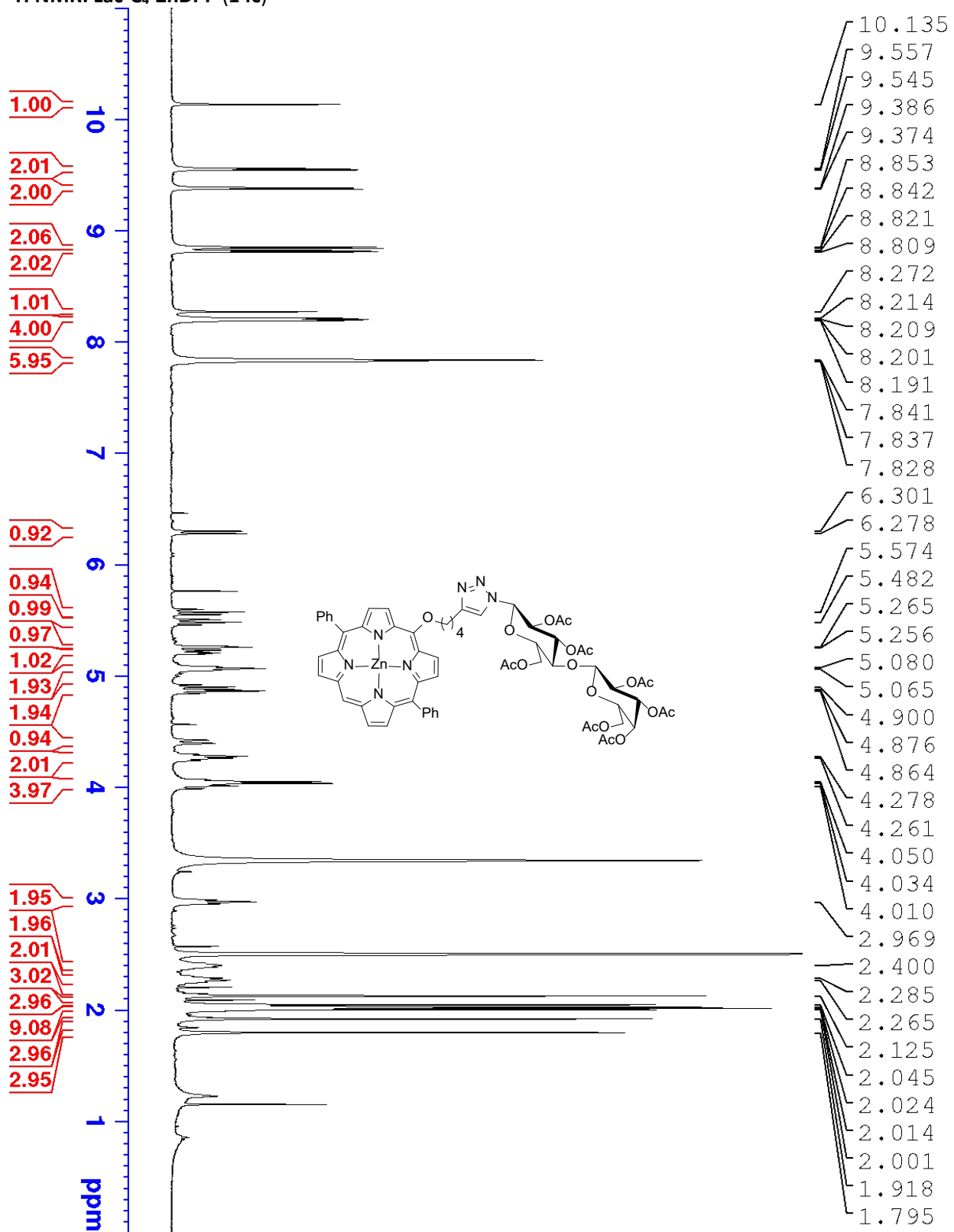


Lac-C₄-ZnDPP (14c). was obtained using the general procedure as a purple solid (29.9 mg, 91.0% yield). TLC analysis $R_f = 0.17$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.55 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.5$ Hz, 2H), 8.81 (d, $J = 4.5$ Hz, 2H), 8.27 (s, 1H), 8.23 – 8.18 (m, 4H), 7.86 – 7.81 (m, 6H), 6.29 (d, $J = 9.1$ Hz, 1H), 5.57 (t, $J = 9.4$ Hz, 1H), 5.48 (t, $J = 9.1$ Hz, 1H), 5.28 – 5.25 (m, 1H), 5.24 – 5.18 (m, 1H), 5.06 (t, $J = 5.8$ Hz, 2H), 4.93 – 4.83 (m, 2H), 4.41 (d, $J = 11.3$ Hz, 1H), 4.31 – 4.22 (m, 2H), 4.08 – 3.98 (m, 4H), 2.96 (t, $J = 7.2$ Hz, 2H), 2.44 – 2.36 (m, 2H), 2.31 – 2.23 (m, 2H), 2.12 (s, 3H), 2.04 (s, 3H), 2.02 (s, 3H), 2.01 (s, 3H), 2.00 (s, 3H), 1.91 (s, 2H), 1.80 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.27, 169.93, 169.55, 169.37, 169.11, 168.61, 150.02, 148.99, 148.62, 147.47, 145.22, 142.56, 139.46, 134.33, 132.07, 131.97, 130.94, 127.46, 127.32, 126.71, 121.14, 119.39, 104.54, 100.08, 84.53, 83.62, 75.98, 74.33, 72.33, 70.43, 69.72, 68.92, 67.07, 62.33, 60.93, 30.05, 25.98, 24.93, 20.61, 20.51, 20.42, 20.39, 20.34, 20.29, 19.97. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.67), 554 (4.08), 597 (3.86). HRMS (MALDI) m/z : Calcd for C₆₄H₆₃N₇O₁₈Zn [M]⁺ 1281.3516; Found [M]⁺ 1281.3526.

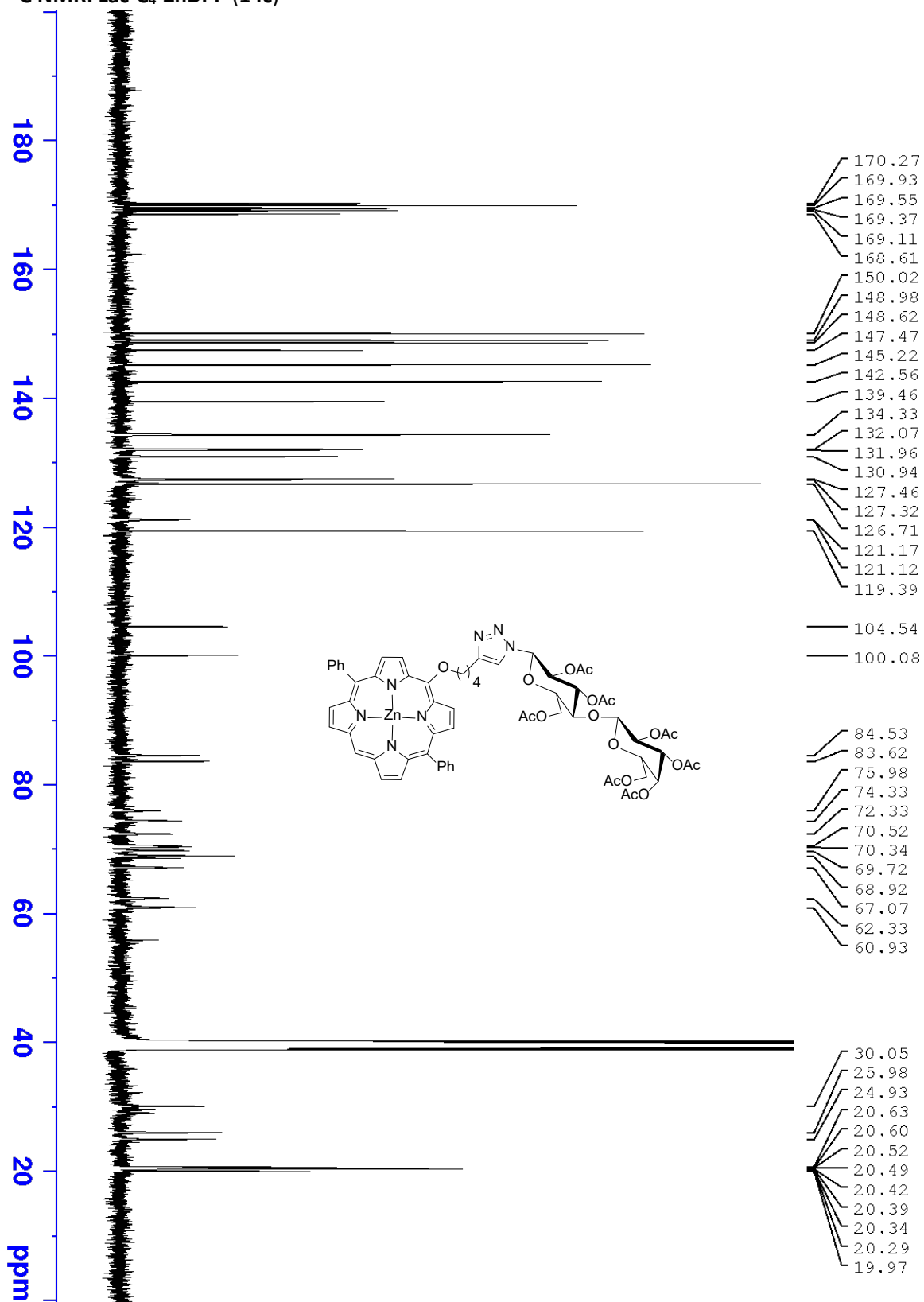
HRMS (MALDI): Lac-C₄-ZnDPP (14c)



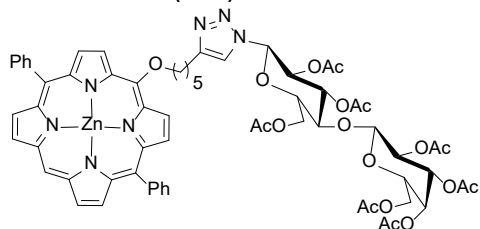
¹H NMR: Lac-C₄-ZnDPP (14c)



¹³C NMR: Lac-C₄-ZnDPP (14c)

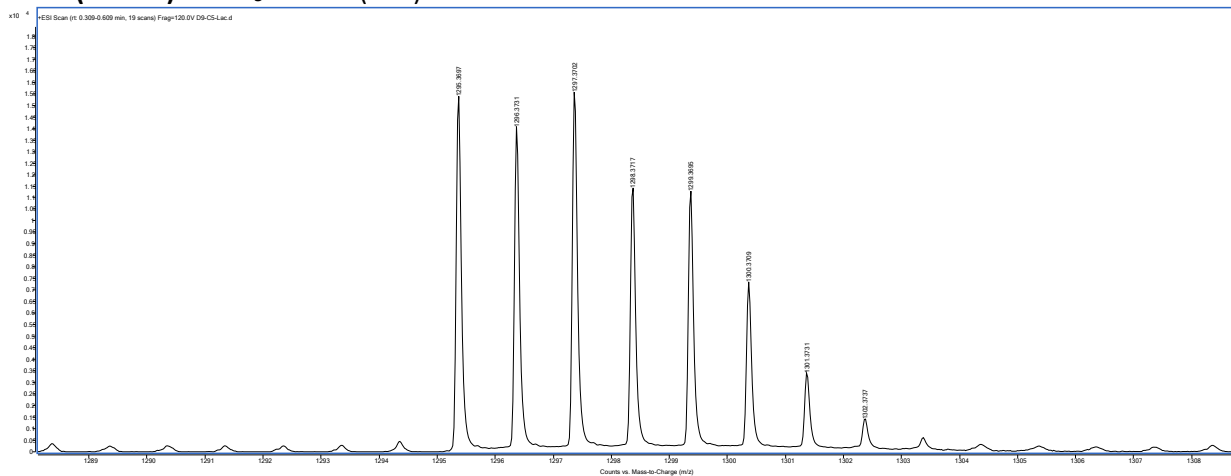


Lac-C₅-ZnDPP (14d)

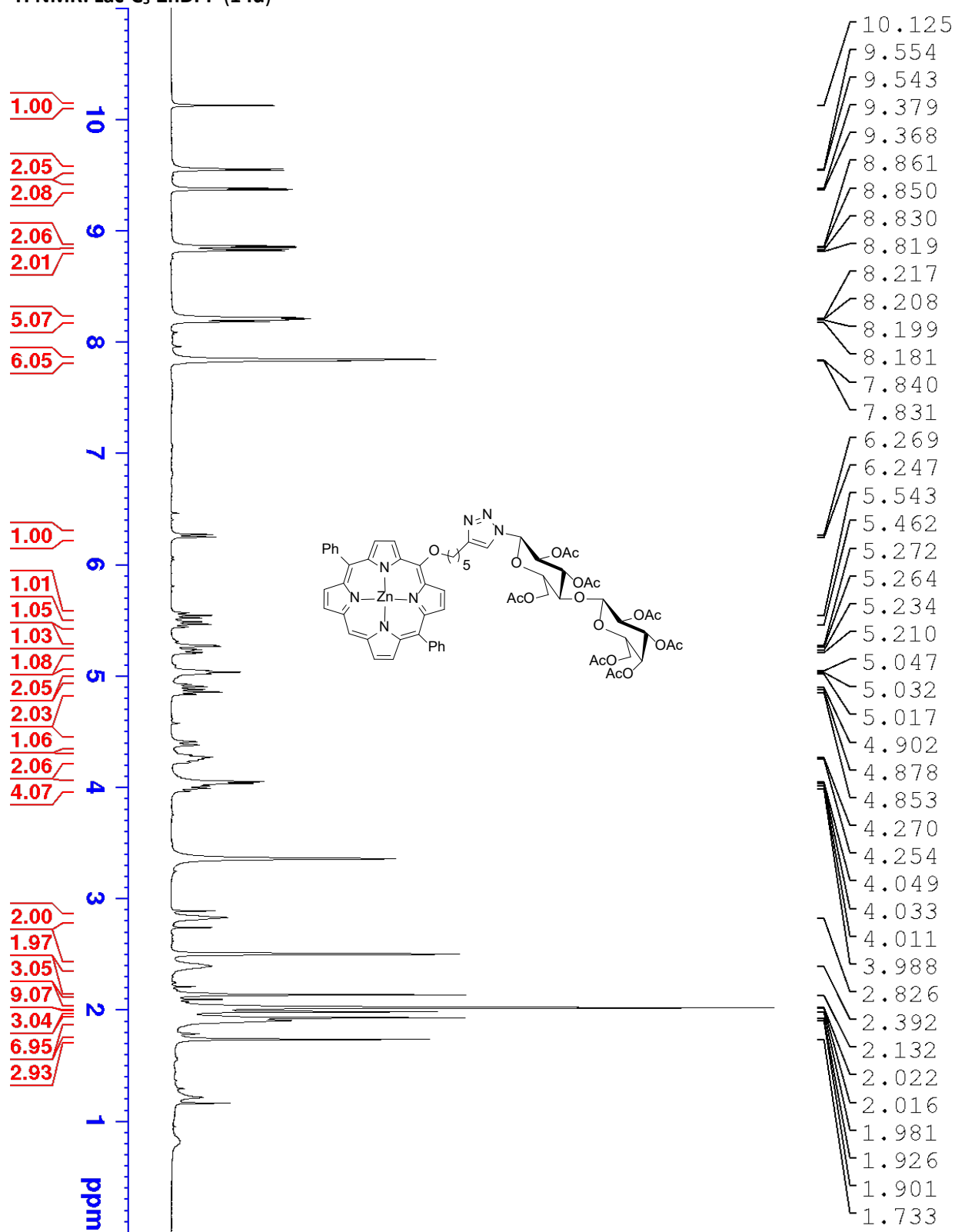


Lac-C₅-ZnDPP (14d). was obtained using the general procedure as a purple solid (34.4 mg, 95.0% yield). TLC analysis $R_f = 0.27$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.55 (d, $J = 4.5$ Hz, 2H), 9.37 (d, $J = 4.4$ Hz, 2H), 8.86 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.24 – 8.17 (m, 5H), 7.86 – 7.81 (m, 6H), 6.25 (d, $J = 9.0$ Hz, 1H), 5.58 – 5.51 (m, 1H), 5.51 – 5.42 (m, 1H), 5.29 – 5.25 (m, 1H), 5.25 – 5.18 (m, 1H), 5.06 – 5.00 (m, 2H), 4.93 – 4.82 (m, 2H), 4.39 (d, $J = 11.6$ Hz, 1H), 4.30 – 4.21 (m, 2H), 4.06 – 3.96 (m, 4H), 2.87 – 2.78 (m, 2H), 2.43 – 2.35 (m, 2H), 2.13 (s, 3H), 2.02 (s, 9H), 1.98 (s, 3H), 1.94 – 1.87 (m, 7H), 1.73 (s, 3H). ¹³C NMR (100 MHz, DMSO): δ 170.25, 169.93, 169.56, 169.35, 169.11, 168.56, 150.03, 148.99, 148.62, 147.50, 145.26, 142.58, 139.50, 134.34, 132.07, 131.96, 130.93, 127.46, 127.36, 126.72, 121.03, 119.39, 104.53, 100.07, 84.73, 83.56, 75.94, 74.32, 72.36, 70.45, 70.33, 69.73, 68.92, 67.16, 62.36, 60.92, 30.40, 28.81, 25.39, 24.95, 20.57, 20.51, 20.43, 20.36, 20.29, 19.91. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.51), 554 (4.15), 597 (3.94). HRMS (MALDI) m/z : Calcd for C₆₅H₆₅N₇O₁₈Zn [M]⁺ 1295.3672; Found [M]⁺ 1295.3697.

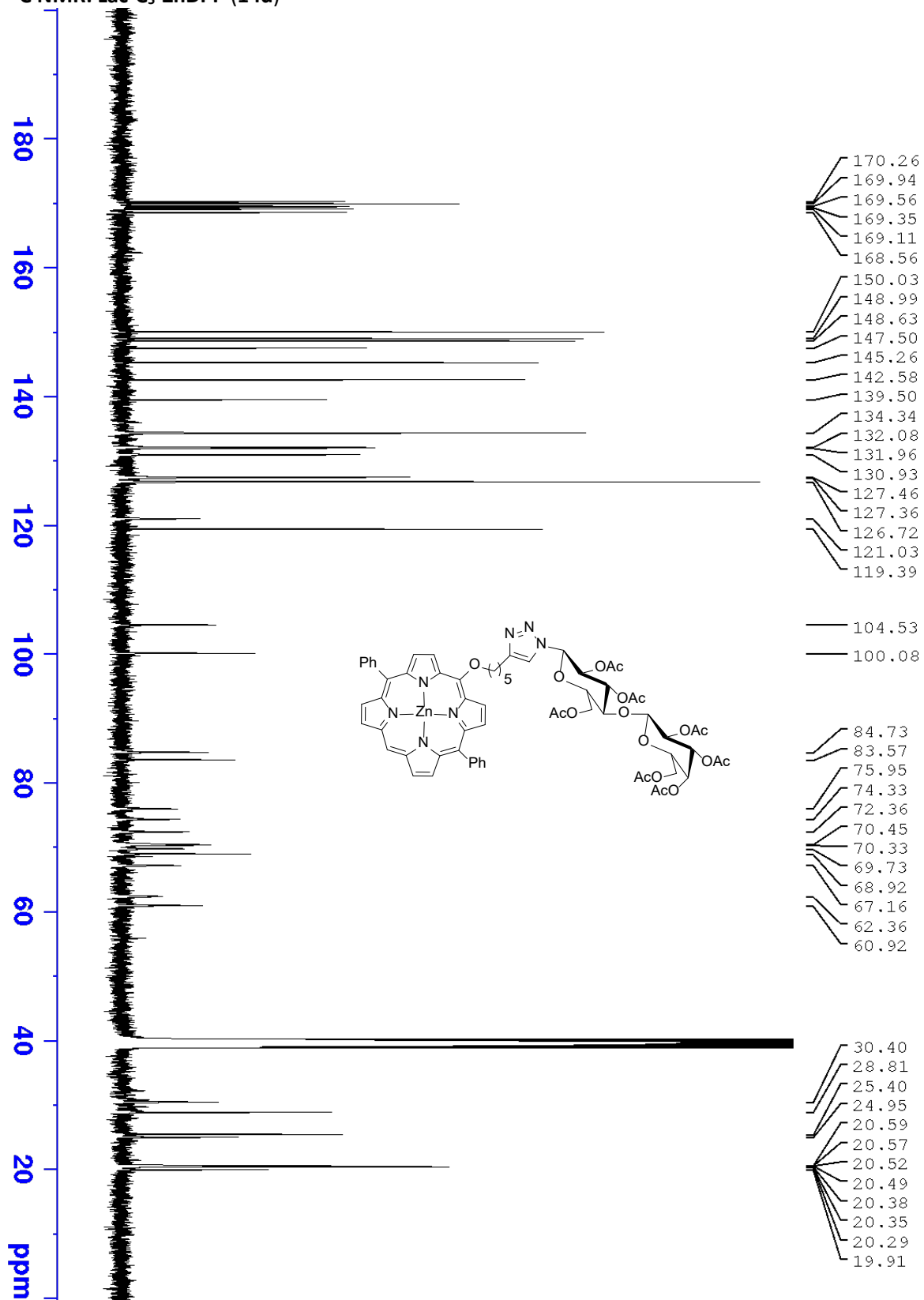
HRMS (MALDI): Lac-C₅-ZnDPP (14d)



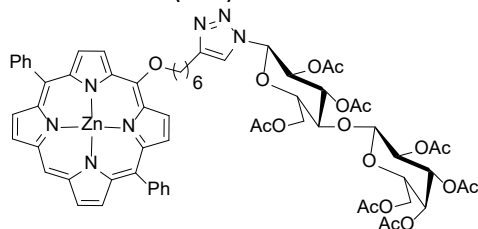
¹H NMR: Lac-C₅-ZnDPP (14d)



¹³C NMR: Lac-C₅-ZnDPP (14d)

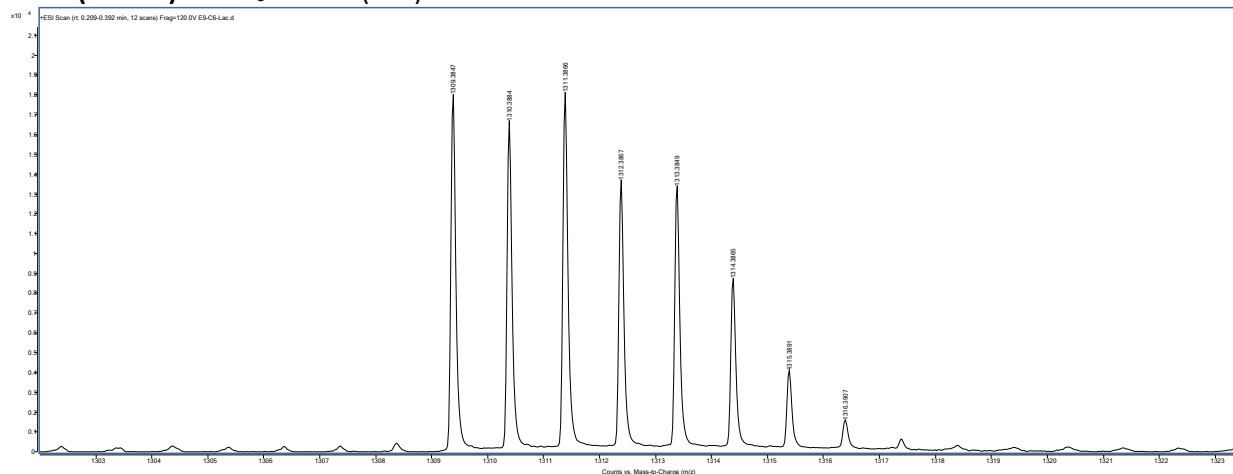


Lac-C₆-ZnDPP (14e)

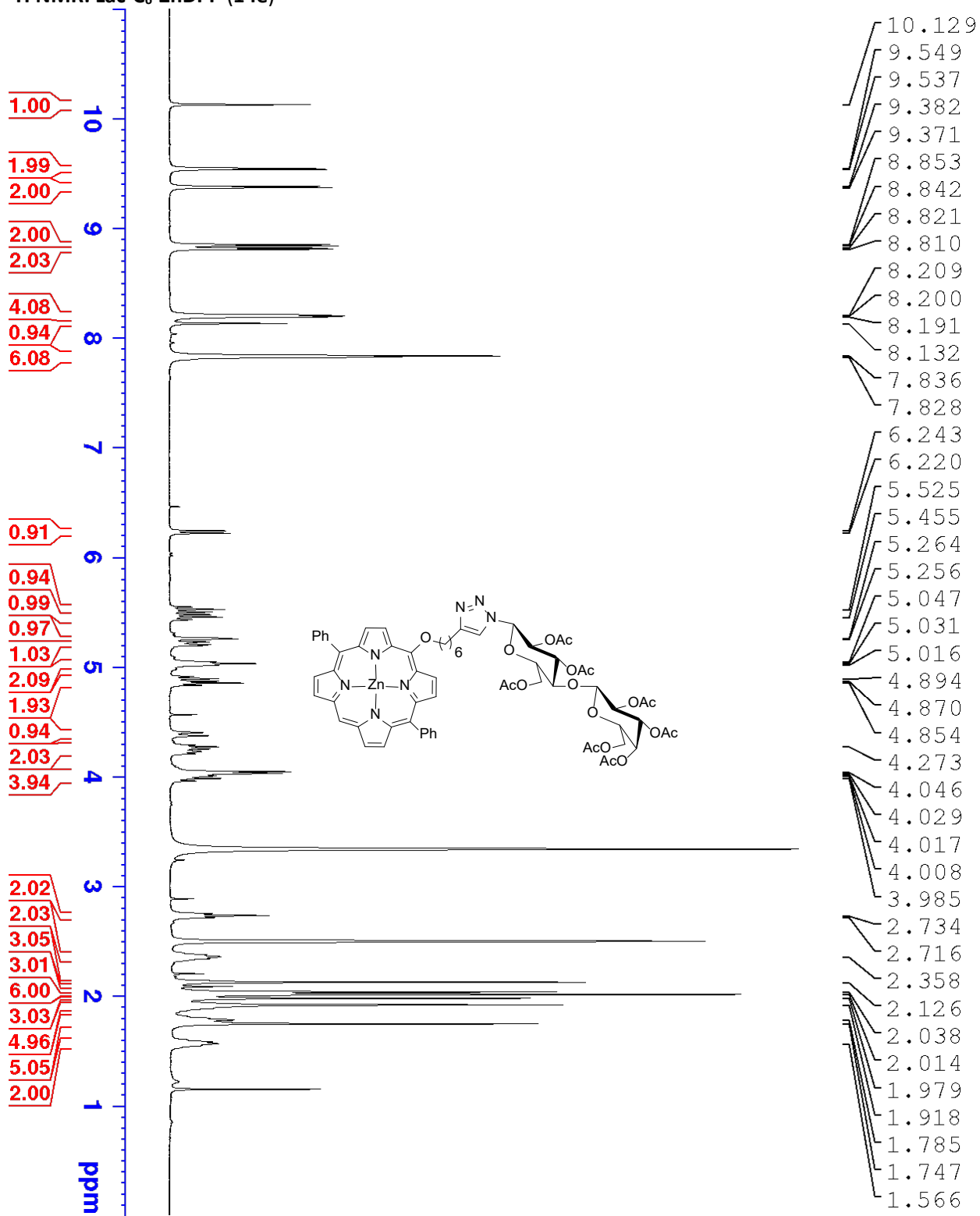


Lac-C₆-ZnDPP (14e). was obtained using the general procedure as a purple solid (34.6 mg, 96.0% yield). TLC analysis $R_f = 0.36$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO) δ 10.13 (s, 1H), 9.54 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.4$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.81 (d, $J = 4.4$ Hz, 2H), 8.24 – 8.15 (m, 4H), 8.13 (s, 1H), 7.88 – 7.73 (m, 6H), 6.22 (d, $J = 9.0$ Hz, 1H), 5.57 – 5.49 (m, 1H), 5.49 – 5.41 (m, 1H), 5.28 – 5.24 (m, 1H), 5.24 – 5.18 (m, 1H), 5.07 – 4.98 (m, 2H), 4.93 – 4.81 (m, 2H), 4.39 (d, $J = 9.6$ Hz, 1H), 4.31 – 4.19 (m, 2H), 4.07 – 3.94 (m, 4H), 2.77 – 2.70 (m, 2H), 2.41 – 2.31 (m, 2H), 2.13 (s, 1H), 2.04 (s, 3H), 2.01 (s, 6H), 1.97 (s, 3H), 1.95 – 1.87 (m, 5H), 1.83 – 1.72 (m, 5H), 1.62 – 1.52 (m, 2H). ¹³C NMR (100 MHz, DMSO): δ 170.25, 169.92, 169.54, 169.34, 169.09, 168.54, 150.01, 148.96, 148.59, 147.55, 145.23, 142.55, 139.50, 134.32, 132.06, 131.95, 130.90, 127.56, 127.31, 126.70, 120.92, 119.37, 104.51, 100.05, 84.80, 83.54, 75.94, 74.31, 72.33, 70.37, 69.76, 68.90, 67.13, 60.90, 30.61, 28.83, 28.48, 25.79, 24.56, 20.59, 20.49, 20.41, 20.37, 20.33, 20.28, 19.92. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.54), 554 (4.18), 597 (3.97). HRMS (MALDI) m/z : Calcd for C₆₆H₆₇N₇O₁₈Zn [M]⁺ 1309.3829; Found [M]⁺ 1309.3847.

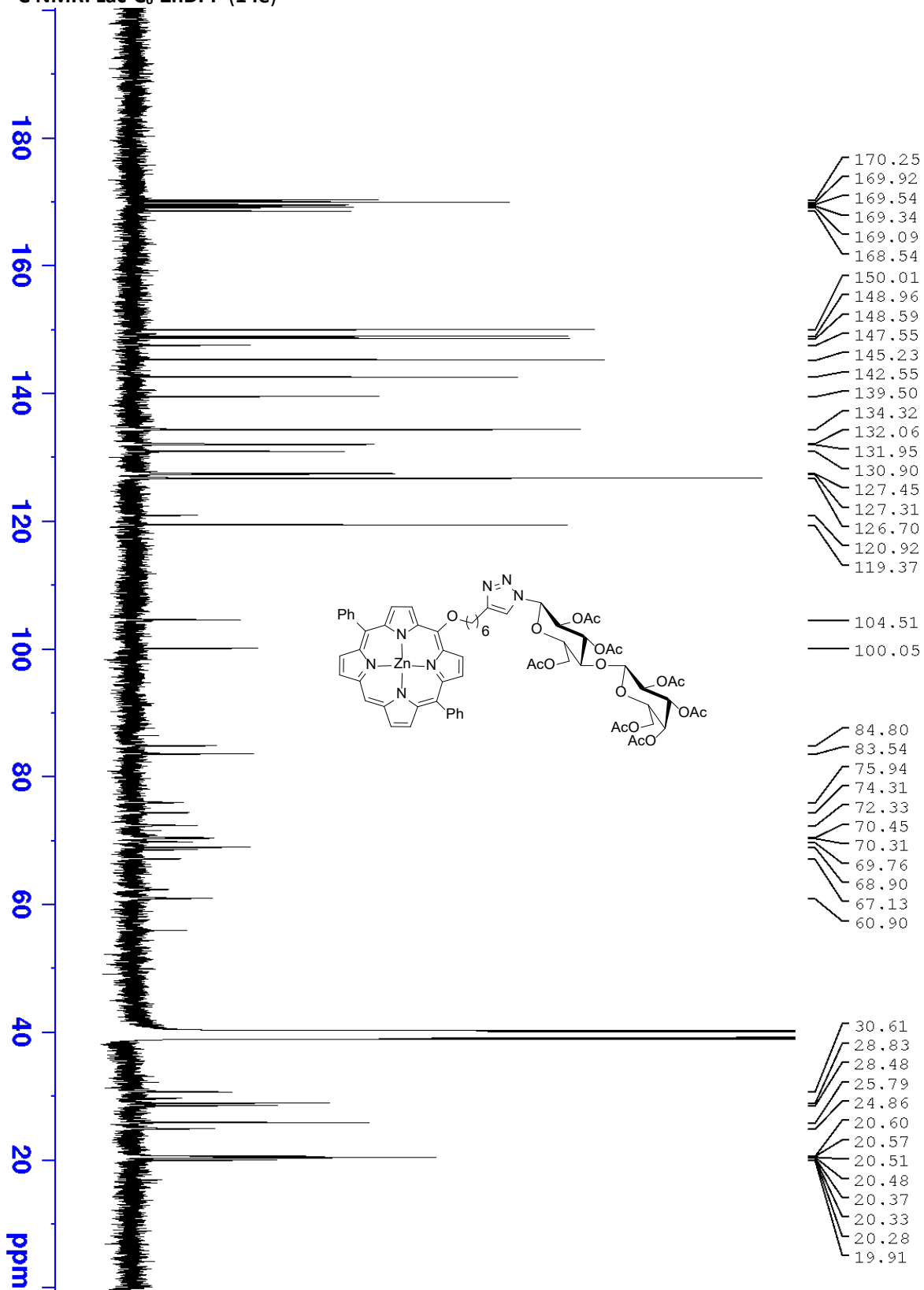
HRMS (MALDI): Lac-C₆-ZnDPP (14e)



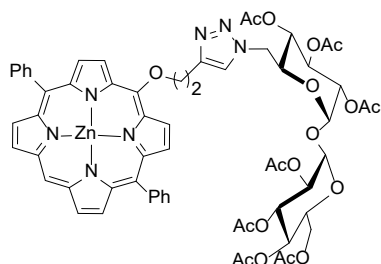
¹H NMR: Lac-C₆-ZnDPP (14e)



¹³C NMR: Lac-C₆-ZnDPP (14e)

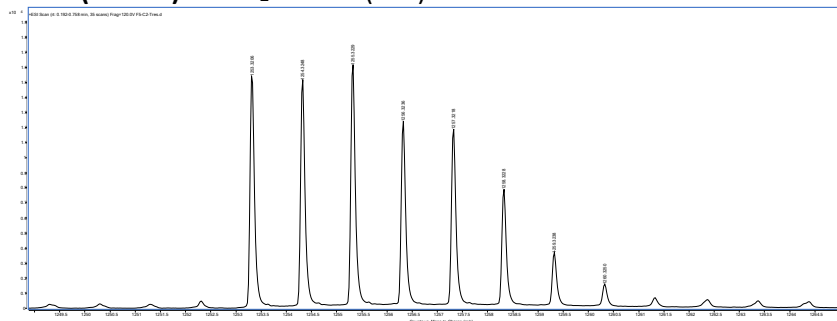


Tre-C₂-ZnDPP (15a/16a)

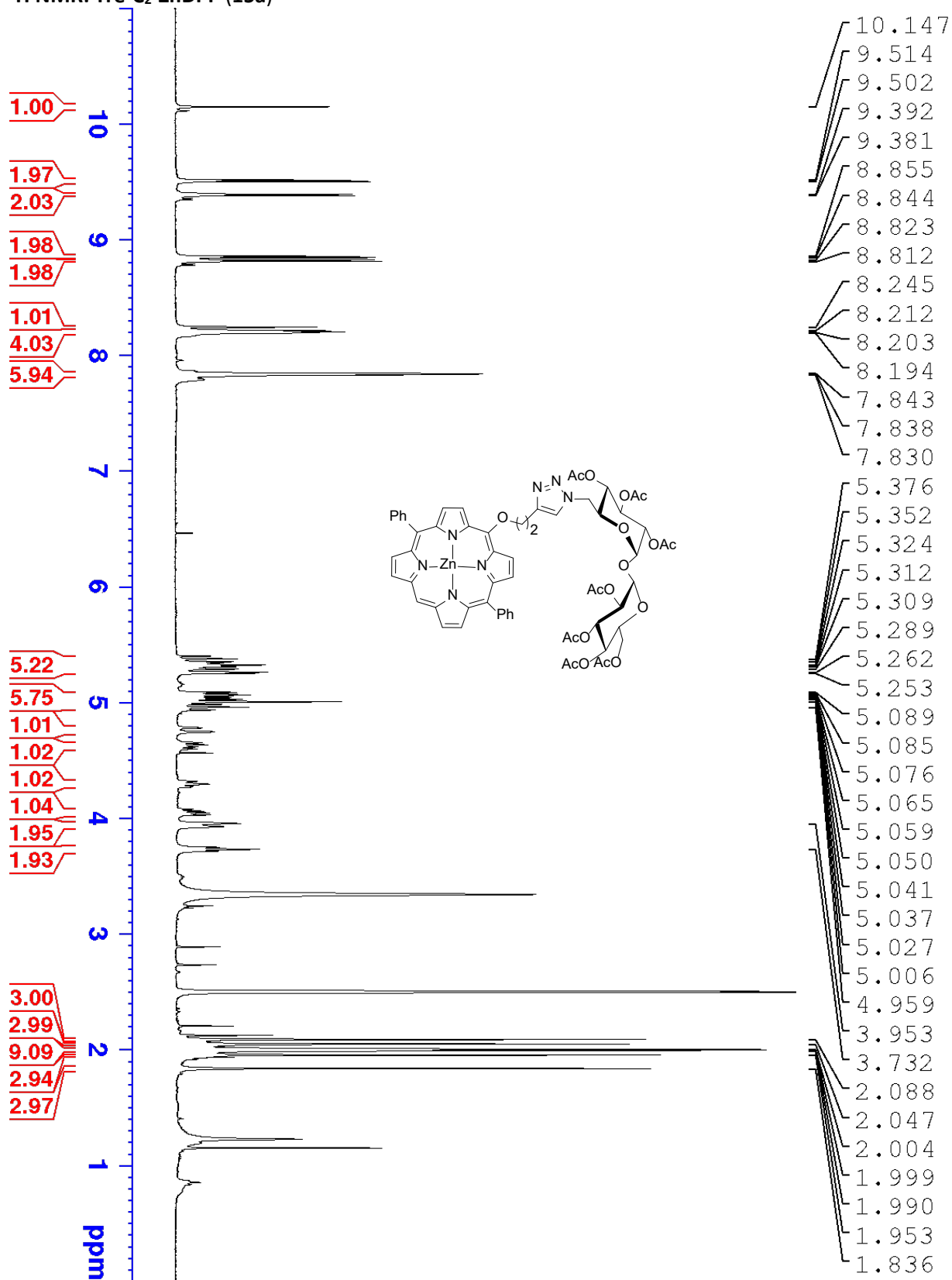


Tre-C₂-ZnDPP (15a). was obtained using the general procedure as a purple solid (20.9 mg, 86.0% yield). TLC analysis $R_f = 0.16$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO): δ 10.15 (s, 1H), 9.51 (d, $J = 4.5$ Hz, 2H), 9.39 d, $J = 4.4$ Hz, 2H), 8.85 (d, $J = 4.5$ Hz, 2H), 8.82 (d, $J = 4.5$ Hz, 2H), 8.24 (s, 1H), 8.23 - 8.18 (m, 4H), 7.86 - 7.81 (m, 6H), 5.40 - 5.25 (m, 5H), 5.10 - 4.93 (m, 5H), 4.80 - 4.72 (m, 1H), 4.63 (dd, $J = 14.5$, 8.0 Hz, 1H), 4.33 - 4.26 (m, 1H), 4.09 - 4.02 (m, 1H), 3.97 - 3.91 (m, 2H), 3.73 (t, $J = 6.6$ Hz, 2H), 2.09 (s, 3H), 2.05 (s, 3H), 2.01 - 1.98 (m, 9H), 1.95 (s, 3H), 1.84 (s, 3H). ¹³C NMR (400MHz, DMSO): δ 169.90, 169.81, 169.69, 169.48, 169.43, 169.34, 169.12, 149.98, 149.00, 148.66, 145.24, 143.99, 142.55, 138.93, 134.32, 132.05, 131.98, 130.96, 127.45, 126.71, 124.34, 119.41, 104.64, 91.45, 91.07, 82.98, 69.21, 68.97, 68.78, 68.52, 68.32, 68.00, 61.67, 49.69, 27.12, 20.57, 20.53, 20.39, 20.36, 20.29, 20.18. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.79), 554 (4.22), 597 (3.98). HRMS (MALDI) m/z : Calcd for C₆₂H₅₉N₇O₁₈Zn [M]⁺ 1253.3203; Found [M]⁺ 1253.3206. **HO-Tre-C₂-ZnDPP (16a)**. HRMS (MALDI) m/z : Calcd for C₄₈H₄₅N₇O₁₁Zn [M]⁺ 959.2463; Found [M]⁺ 959.2486.

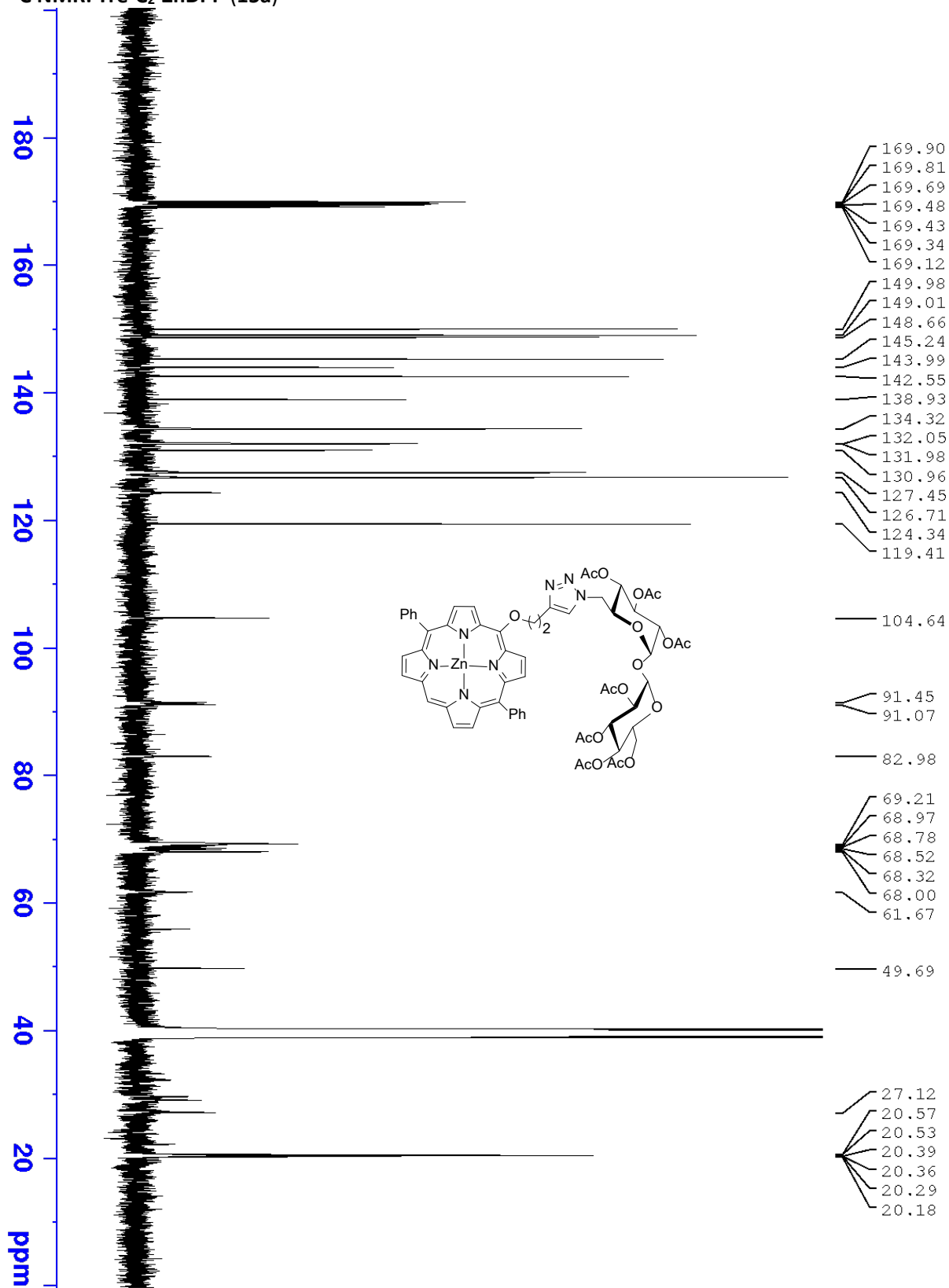
HRMS (MALDI): Tre-C₂-ZnDPP (15a)



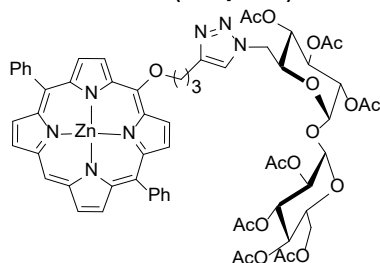
¹H NMR: Tre-C₂-ZnDPP (15a)



¹³C NMR: Tre-C₂-ZnDPP (15a)

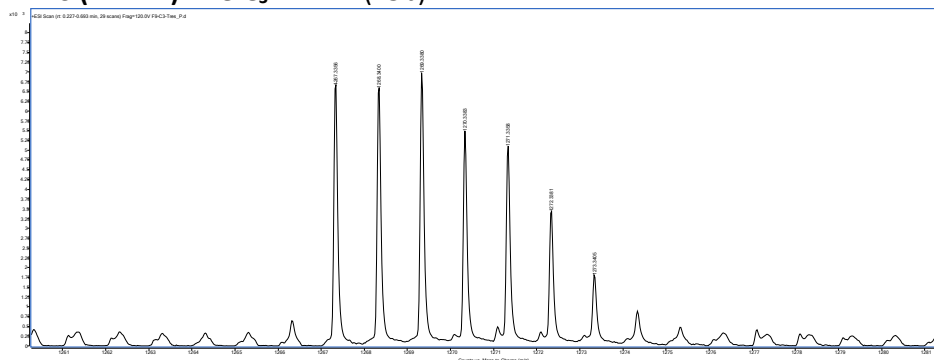


Tre-C₃-ZnDPP (15b/16b)

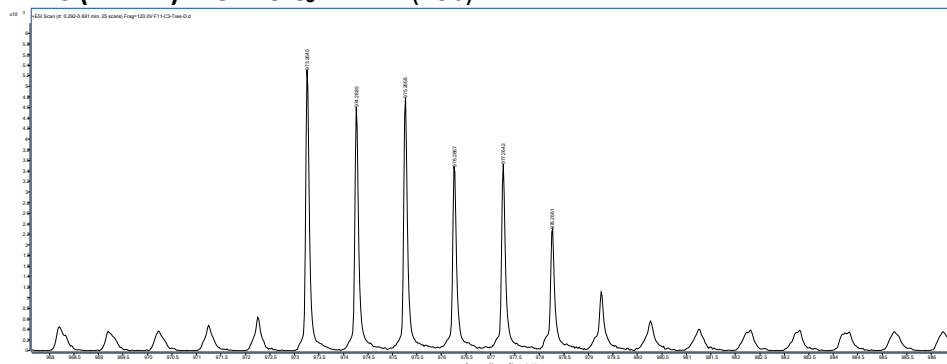


Tre-C₃-ZnDPP (15b). was obtained using the general procedure as a purple solid (26.2 mg, 84.0% yield). TLC analysis $R_f = 0.18$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO): δ 10.14 (s, 1H), 9.61 (d, $J = 4.6$ Hz, 2H), 9.38 d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.83 (d, $J = 4.6$ Hz, 2H), 8.23 - 8.19 (m, 4H), 8.06 (s, 1H), 7.86 - 7.82 (m, 6H), 5.41 - 5.35 (m, 1H), 5.32 - 5.27 (m, 2H), 5.13 - 5.02 (m, 7H), 4.73 - 4.66 (m, 1H), 4.57 - 4.50 (m, 1H), 4.27 - 4.21 (m, 1H), 4.14 (dd, $J = 12.3, 6.4$ Hz, 1H), 4.04 - 3.96 (m, 2H), 3.37 - 3.26 (m, 2H), 2.75 - 2.67 (m, 2H), 2.09 - 2.07 (m, 6H), 2.02 (s, 6H) 1.98 - 1.95 (m, 9H). ¹³C NMR (100MHz, DMSO): δ 169.99, 169.82, 169.71, 169.55, 169.44, 169.36, 169.12, 150.02, 148.99, 148.64, 146.88, 145.25, 142.57, 139.39, 134.33, 132.07, 131.97, 130.94, 127.46, 126.72, 123.20, 119.40, 104.56, 91.43, 91.21, 91.11, 84.02, 69.22, 68.96, 68.53, 68.35, 68.00, 61.74, 49.71, 30.50, 22.20, 20.56, 20.52, 20.43, 20.39, 20.30, 20.27. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.90), 554 (4.37), 597 (4.15). HRMS (MALDI) m/z: Calcd for C₆₃H₆₁N₇O₁₈Zn [M]⁺ 1267.3359; Found [M]⁺ 1267.3356. **HO-Tre-C₃-ZnDPP (16b)**. HRMS (MALDI) m/z: Calcd for C₄₉H₄₇N₇O₁₁Zn [M]⁺ 973.2625; Found [M]⁺ 973.2640.

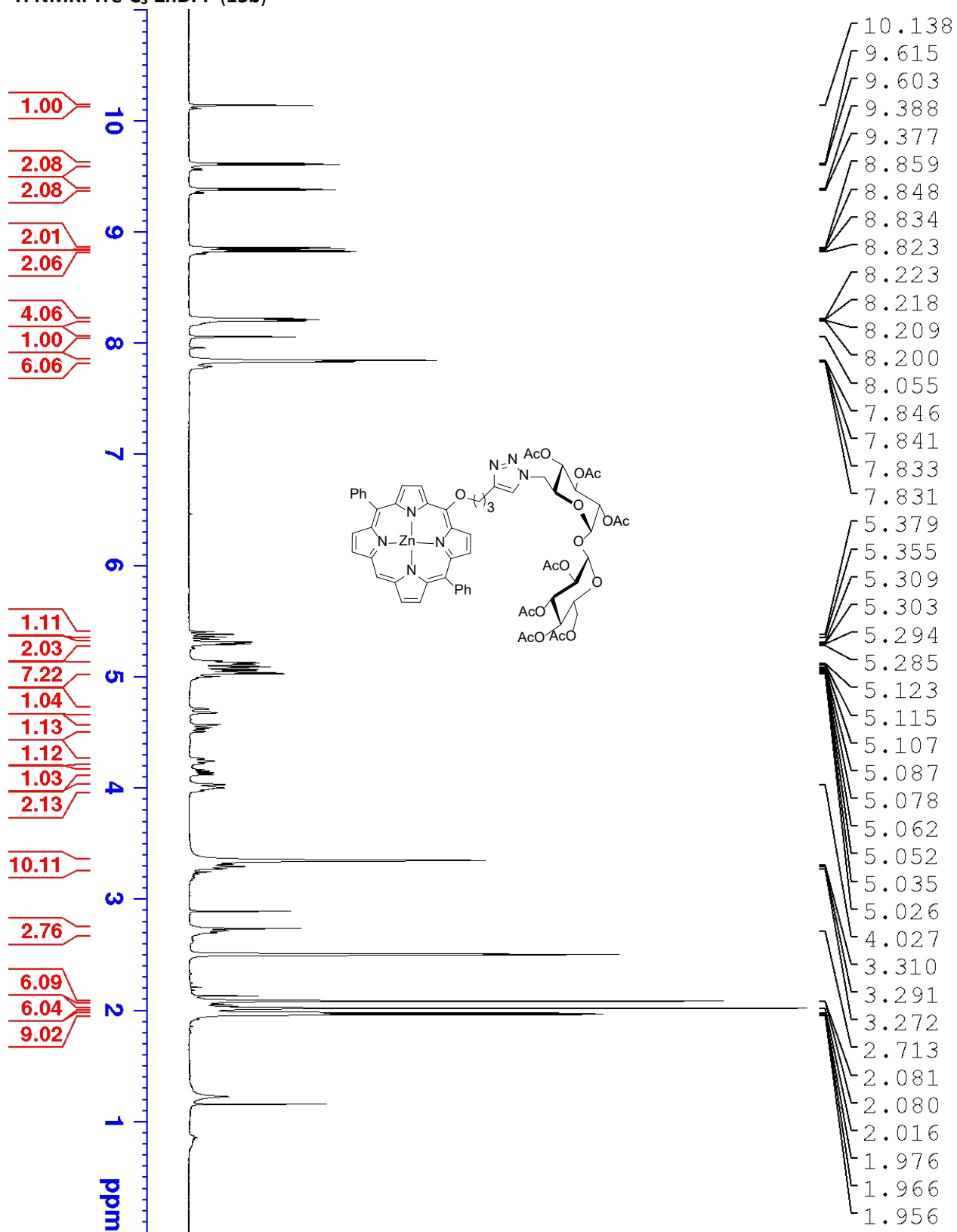
HRMS (MALDI): Tre-C₃-ZnDPP (15b)



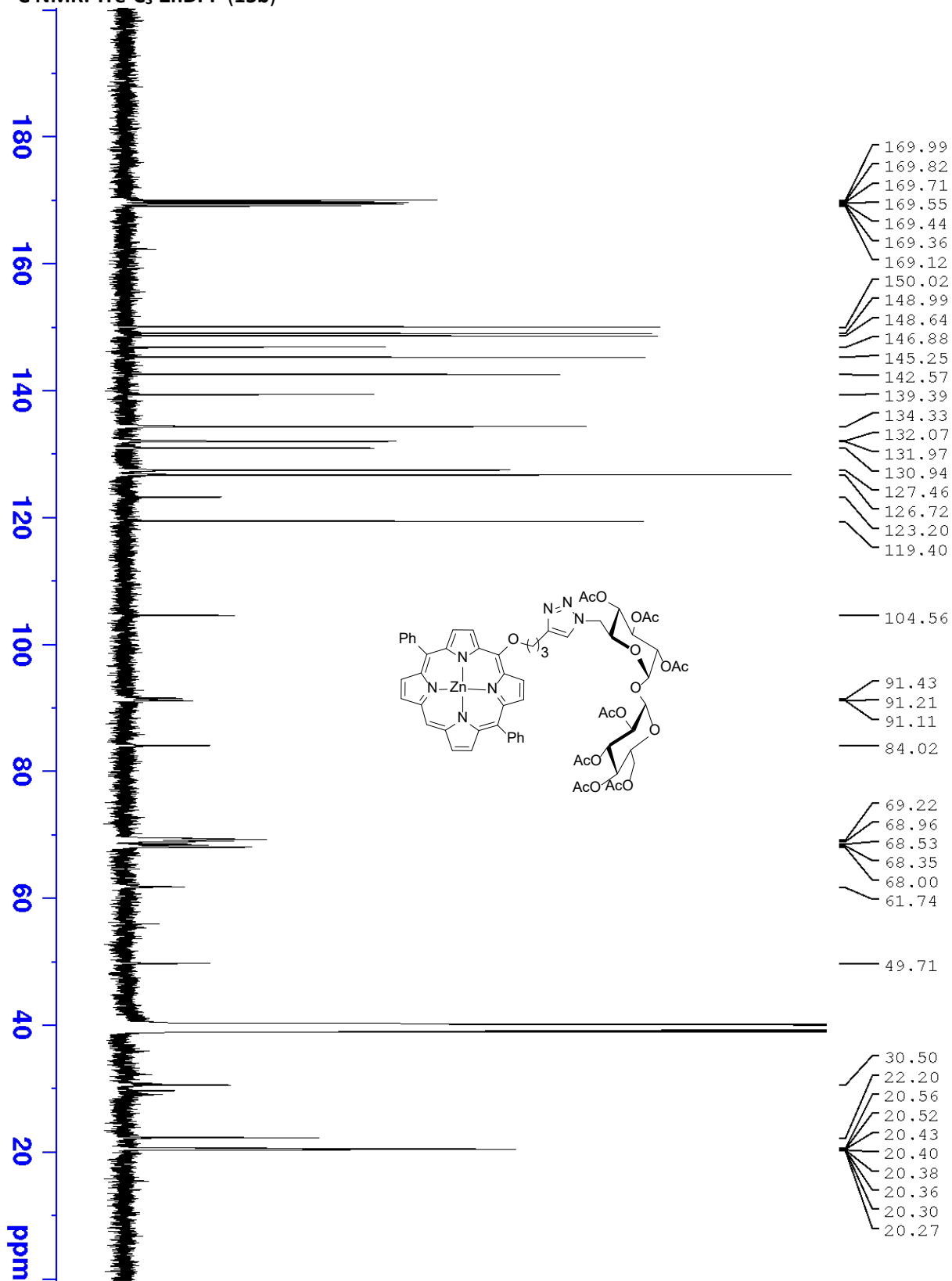
HRMS (MALDI): HO-Tre-C₃-ZnDPP (16b)



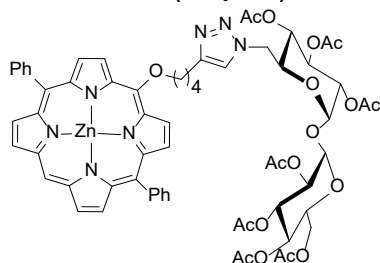
¹H NMR: Tre-C₃-ZnDPP (15b)



¹³C NMR: Tre-C₃-ZnDPP (15b)

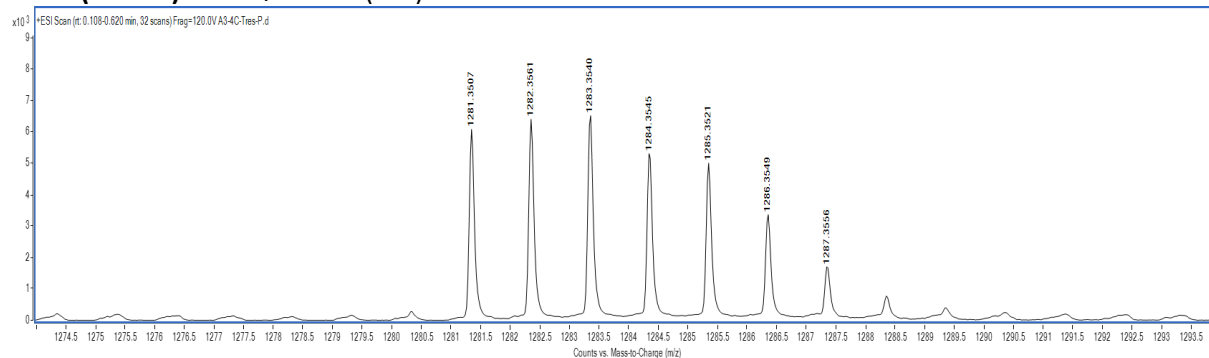


Tre-C₄-ZnDPP (15c/16c)

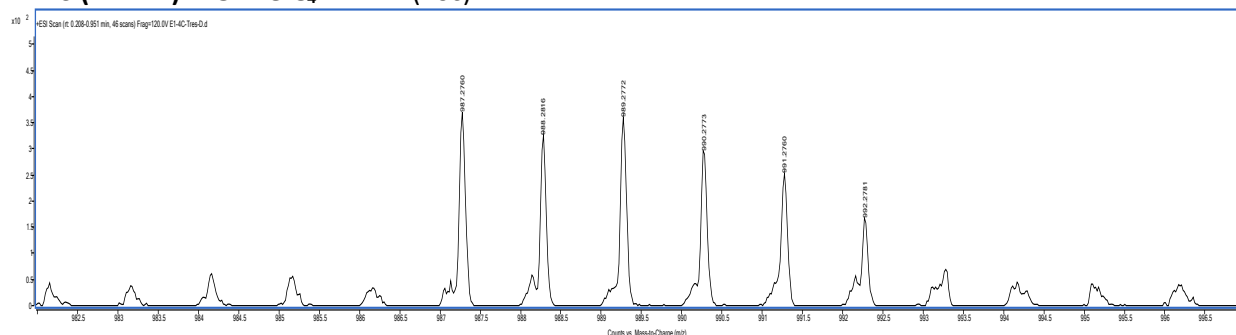


Tre-C₄-ZnDPP (15c). was obtained using the general procedure as a purple solid (27.1 mg, 84.0% yield). TLC analysis $R_f = 0.22$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO): δ 10.13 (s, 1H), 9.58 (d, $J = 4.6$ Hz, 2H), 9.38 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.5$ Hz, 2H), 8.83 (d, $J = 4.5$ Hz, 2H), 8.23 - 8.18 (m, 4H), 7.97 (s, 1H), 7.86 - 7.81 (m, 6H), 5.40 - 5.34 (m, 1H), 5.32 - 5.26 (m, 2H), 5.11 - 5.02 (m, 5H), 5.00 - 4.94 (m, 2H), 4.72 - 4.64 (m, 1H), 4.52 (dd, $J = 14.5, 8.2$ Hz, 1H), 4.26 - 4.19 (m, 1H), 4.09 (dd, $J = 12.2, 6.4$ Hz, 1H), 4.01 - 3.94 (m, 2H), 2.97 - 2.90 (m, 2H), 2.47 - 2.39 (m, 2H), 2.30 - 2.22 (m, 2H), 2.08 (s, 3H), 2.06 (s, 3H), 2.02 - 1.99 (m, 6H), 1.98 (s, 3H), 1.94 (s, 3H), 1.87 (m, 3H). ¹³C NMR (100MHz, DMSO): δ 169.94, 169.81, 169.69, 169.53, 169.44, 169.32, 169.08, 150.01, 148.98, 148.63, 147.13, 145.25, 142.57, 139.49, 134.33, 132.06, 131.95, 130.94, 127.45, 127.35, 126.70, 123.09, 119.39, 104.52, 91.42, 91.16, 84.61, 69.26, 68.95, 68.53, 68.33, 68.02, 61.71, 49.67, 30.29, 26.13, 25.06, 20.56, 20.52, 20.41, 20.39, 20.34, 20.25, 20.21. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.84), 554 (4.28), 597 (4.06). HRMS (MALDI) m/z: Calcd for C₆₄H₆₃N₇O₁₈Zn [M]⁺ 1281.3516; Found [M]⁺ 1281.3507. **HO-Tre-C₄-ZnDPP (16c).** HRMS (MALDI) m/z: Calcd for C₅₀H₄₉N₇O₁₁Zn [M]⁺ 987.2776; Found [M]⁺ 987.2760.

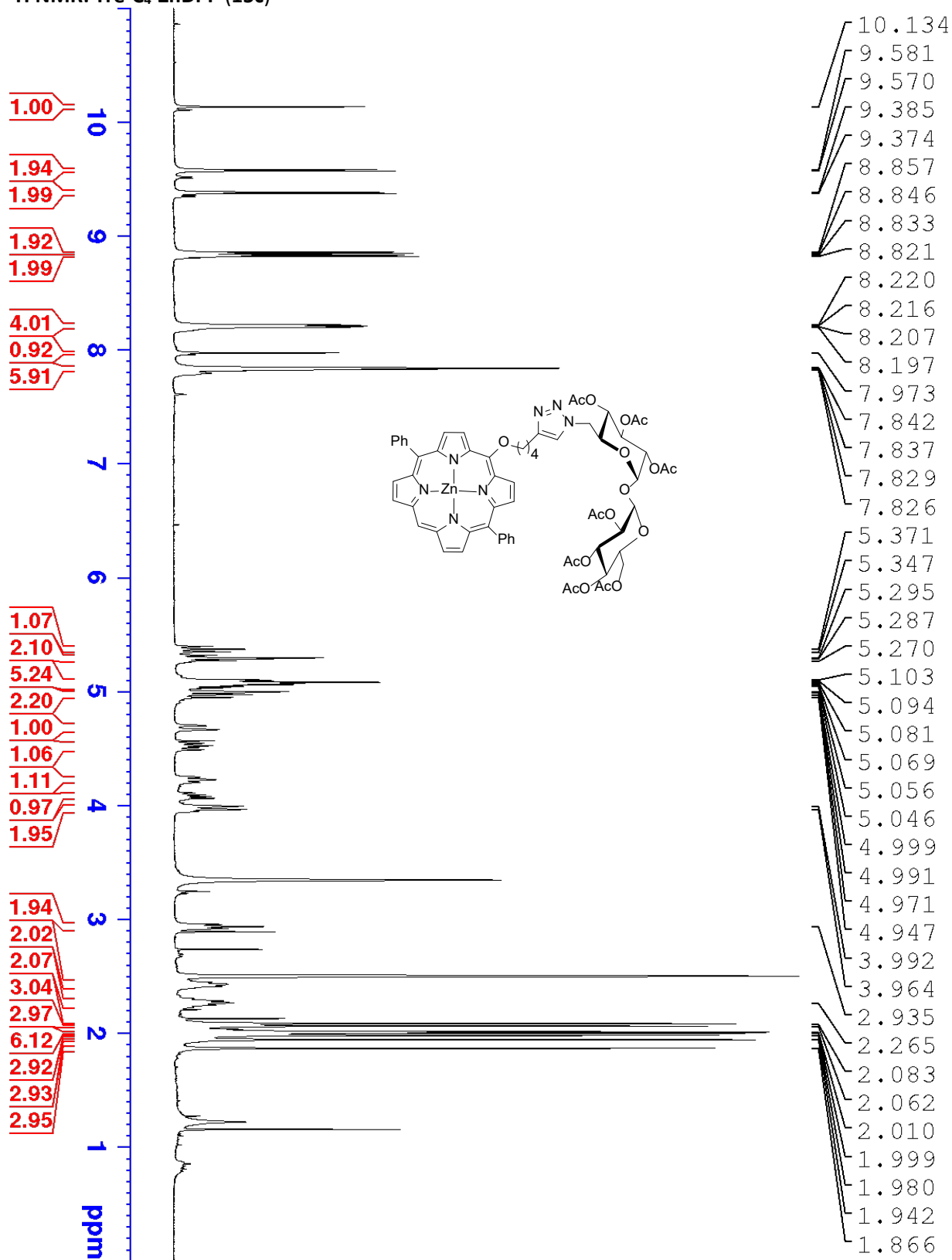
HRMS (MALDI): Tre-C₄-ZnDPP (15c)



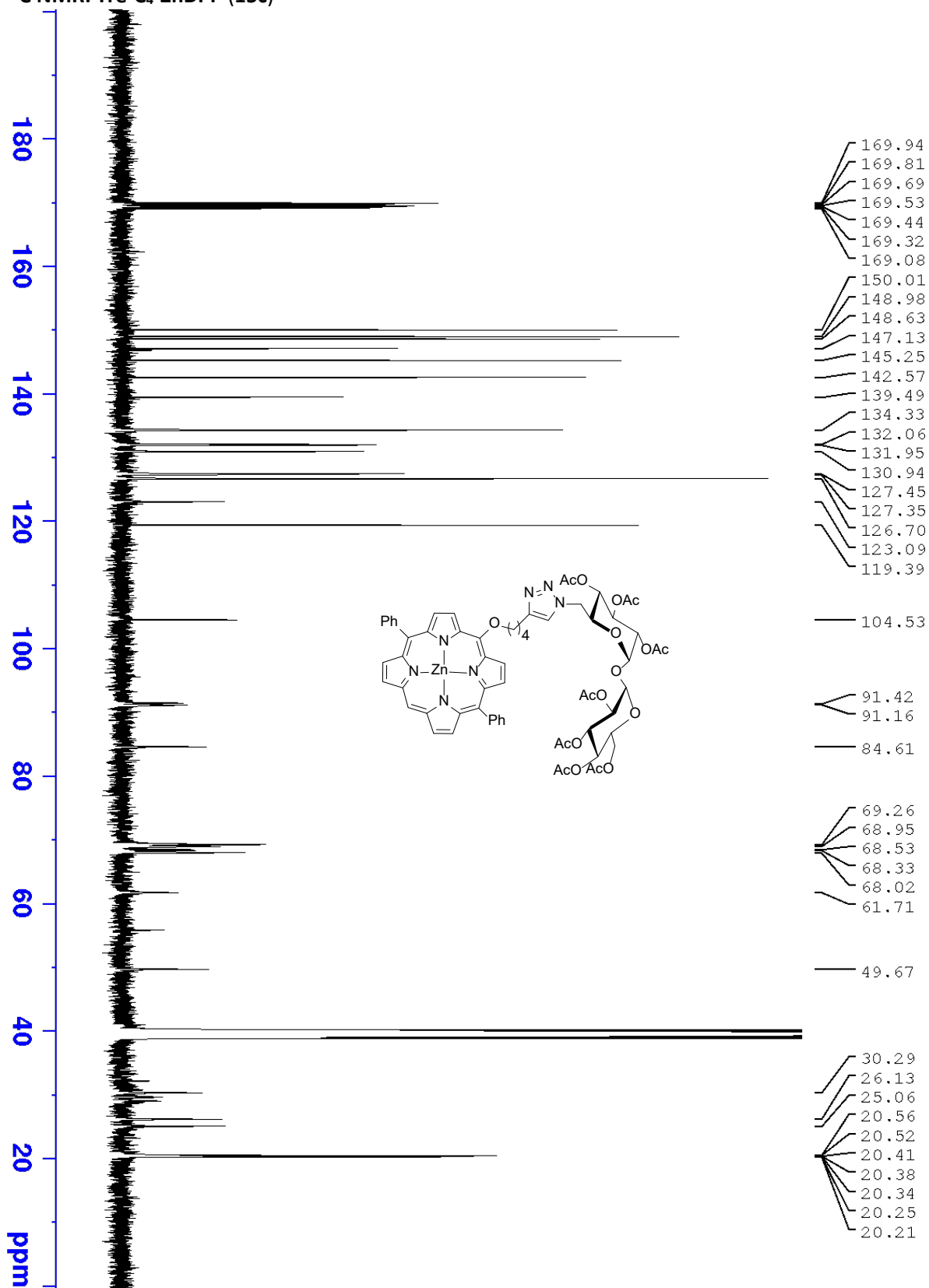
HRMS (MALDI): HO-Tre-C₄-ZnDPP (16c)



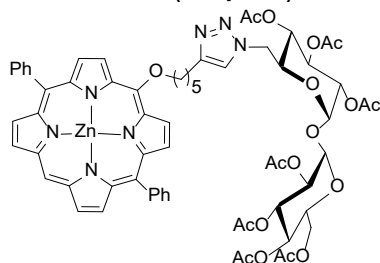
¹H NMR: Tre-C₄-ZnDPP (15c)



¹³C NMR: Tre-C₄-ZnDPP (15c)

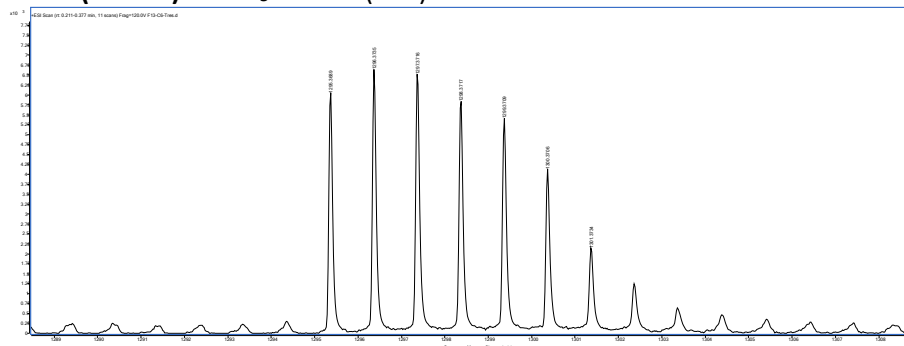


Tre-C₅-ZnDPP (15d/16d)

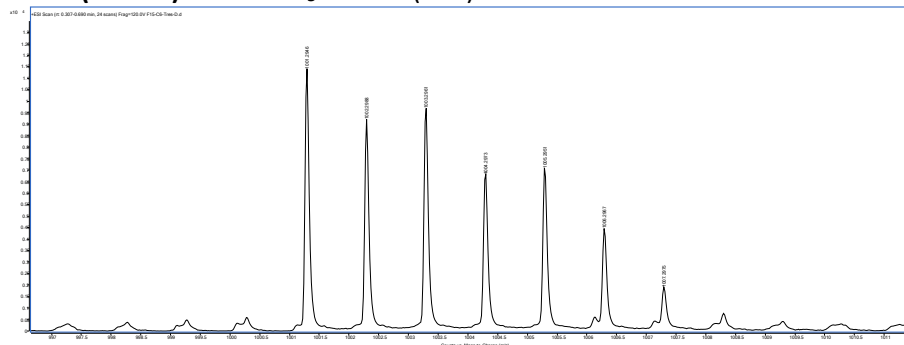


Tre-C₅-ZnDPP (15d). was obtained using the general procedure as a purple solid (29.1 mg, 88.0% yield). TLC analysis $R_f = 0.20$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO): δ 10.13 (s, 1H), 9.55 (d, $J = 4.5$ Hz, 2H), 9.38 (d, $J = 4.5$ Hz, 2H), 8.85 (d, $J = 4.4$ Hz, 2H), 8.82 (d, $J = 4.6$ Hz, 2H), 8.23 - 8.18 (m, 4H), 7.89 (s, 1H), 7.87 - 7.81 (m, 6H), 5.39 - 5.33 (m, 1H), 5.30 - 5.24 (m, 2H), 5.09 - 5.01 (m, 6H), 4.97 - 4.95 (m, 1H), 4.68 - 4.61 (m, 1H), 4.52 (dd, $J = 14.5, 8.1$ Hz, 1H), 4.23 - 4.17 (m, 1H), 4.15 - 4.10 (m, 1H), 4.04 - 3.94 (m, 2H), 2.84 - 2.75 (m, 2H), 2.46 - 2.37 (m, 2H), 2.08 - 2.04 (m, 6H), 2.02 - 2.00 (m, 5H), 1.99 (s, 3H), 1.96 - 1.94 (m, 6H), 1.94 - 1.91 (m, 5H). ¹³C NMR (400MHz, DMSO): δ 170.00, 169.77, 169.68, 169.52, 169.39, 169.33, 169.04, 150.01, 148.96, 148.60, 147.21, 145.25, 142.56, 139.51, 134.32, 132.05, 131.90, 130.91, 127.44, 127.33, 126.70, 122.90, 119.37, 104.50, 91.41, 91.13, 91.04, 84.73, 69.22, 68.94, 68.52, 68.28, 67.99, 61.72, 49.60, 30.42, 29.00, 25.67, 25.06, 20.52, 20.49, 20.37, 20.33, 20.26, 20.23. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.77), 554 (4.20), 597 (3.98). HRMS (MALDI) m/z: Calcd for C₆₅H₆₅N₇O₁₈Zn [M]⁺ 1295.3672; Found [M]⁺ 1295.3689. **HO-Tre-C₅-ZnDPP (16d)**. HRMS (MALDI) m/z: Calcd for C₅₁H₅₁N₇O₁₁Zn [M]⁺ 1001.2933; Found [M]⁺ 1001.2946.

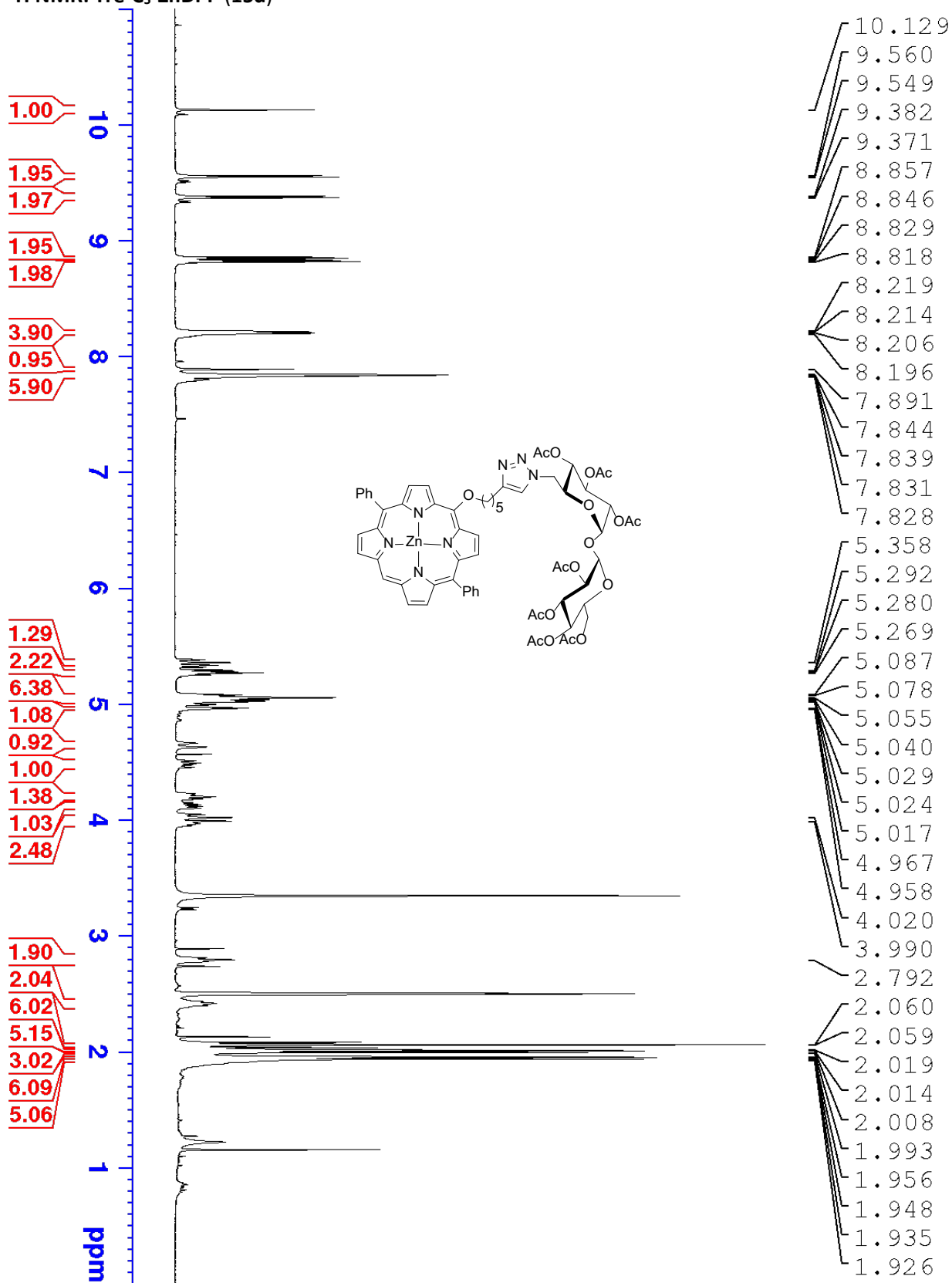
HRMS (MALDI): Tre-C₅-ZnDPP (15d)



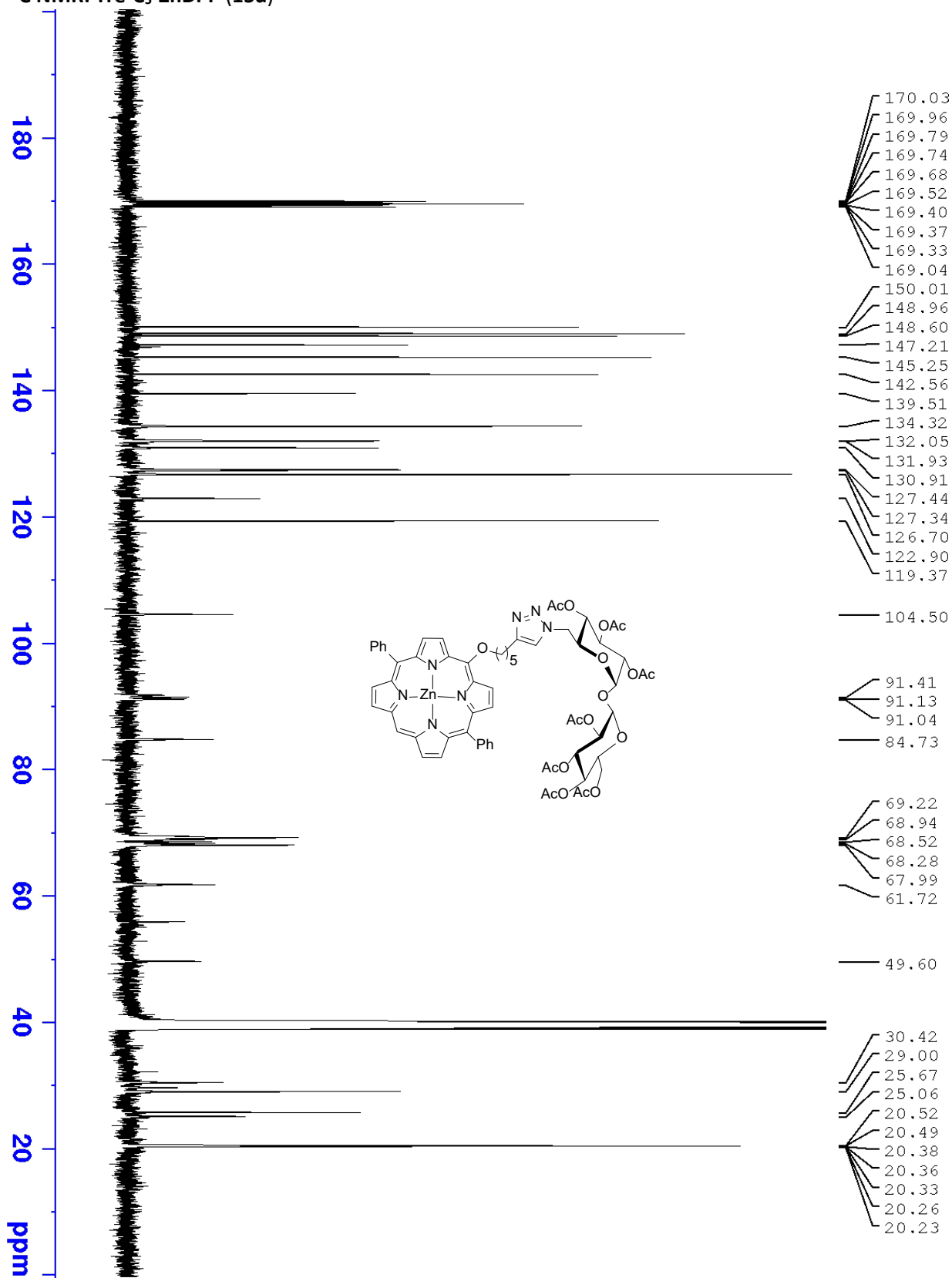
HRMS (MALDI): HO-Tre-C₅-ZnDPP (16d)



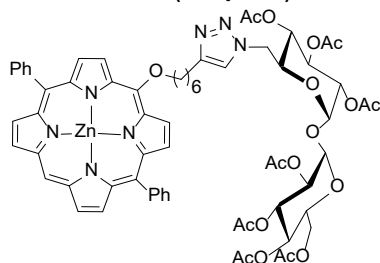
¹H NMR: Tre-C₅-ZnDPP (15d)



¹³C NMR: Tre-C₅-ZnDPP (15d)

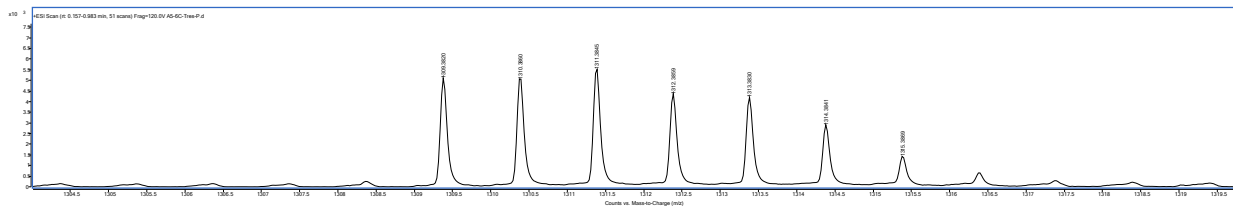


Tre-C₆-ZnDPP (15e/16e)

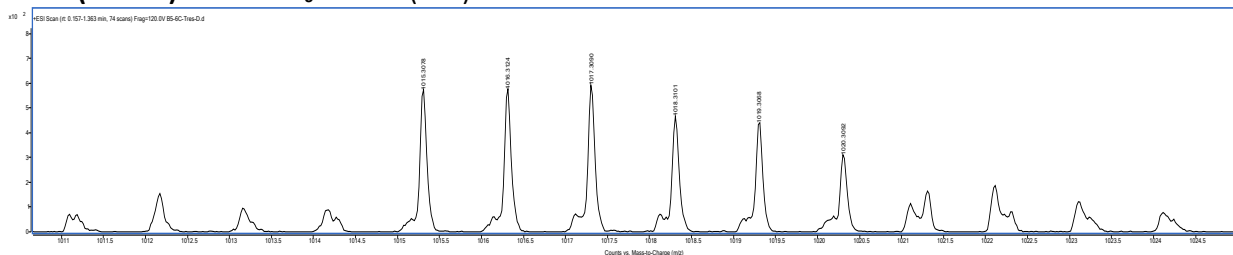


Tre-C₆-ZnDPP (15e). was obtained using the general procedure as a purple solid (26.4 mg, 79.0% yield). TLC analysis $R_f = 0.17$ (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO): δ 10.13 (s, 1H), 9.58 - 9.53 (m, 2H), 9.41 - 9.35 (m, 2H), 8.87 - 8.81 (m, 4H), 8.27 - 8.14 (m, 5H), 7.86 - 7.82 (m, 6H), 5.39 - 5.26 (m, 3H), 5.08 - 4.99 (m, 6H), 4.96 - 4.93 (m, 1H), 4.67 - 4.60 (m, 1H), 4.51 - 4.43 (m, 1H), 4.22 - 4.12 (m, 2H), 4.05 - 3.95 (m, 2H), 2.75 - 2.67 (m, 2H), 2.41 - 2.35 (m, 2H), 2.07 (s, 6H), 2.00 (s, 6H), 1.97 - 1.92 (m, 11H), 1.81 - 1.76 (m, 2H), 1.64 - 1.58 (m, 2H). ¹³C NMR (100MHz, DMSO): δ 169.97, 169.80, 169.68, 169.53, 169.40, 169.32, 169.03, 150.01, 148.96, 147.23, 145.24, 142.56, 139.52, 134.32, 132.05, 131.94, 130.91, 127.44, 127.31, 126.70, 122.82, 119.37, 104.51, 91.40, 91.11, 91.02, 84.84, 69.39, 69.22, 68.94, 68.52, 68.28, 67.98, 61.43, 49.59, 30.60, 28.98, 28.75, 25.82, 24.99, 20.53, 20.49, 20.38, 20.33, 20.28, 20.23. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.80), 554 (4.27), 597 (4.05). HRMS (MALDI) m/z: Calcd for C₆₆H₆₇N₇O₁₈Zn [M]⁺ 1309.3829; Found [M]⁺ 1309.3820. **HO-Tre-C₆-ZnDPP (16e)**. HRMS (MALDI) m/z: Calcd for C₅₂H₅₃N₇O₁₁Zn [M]⁺ 1015.3089; Found [M]⁺ 1015.3078.

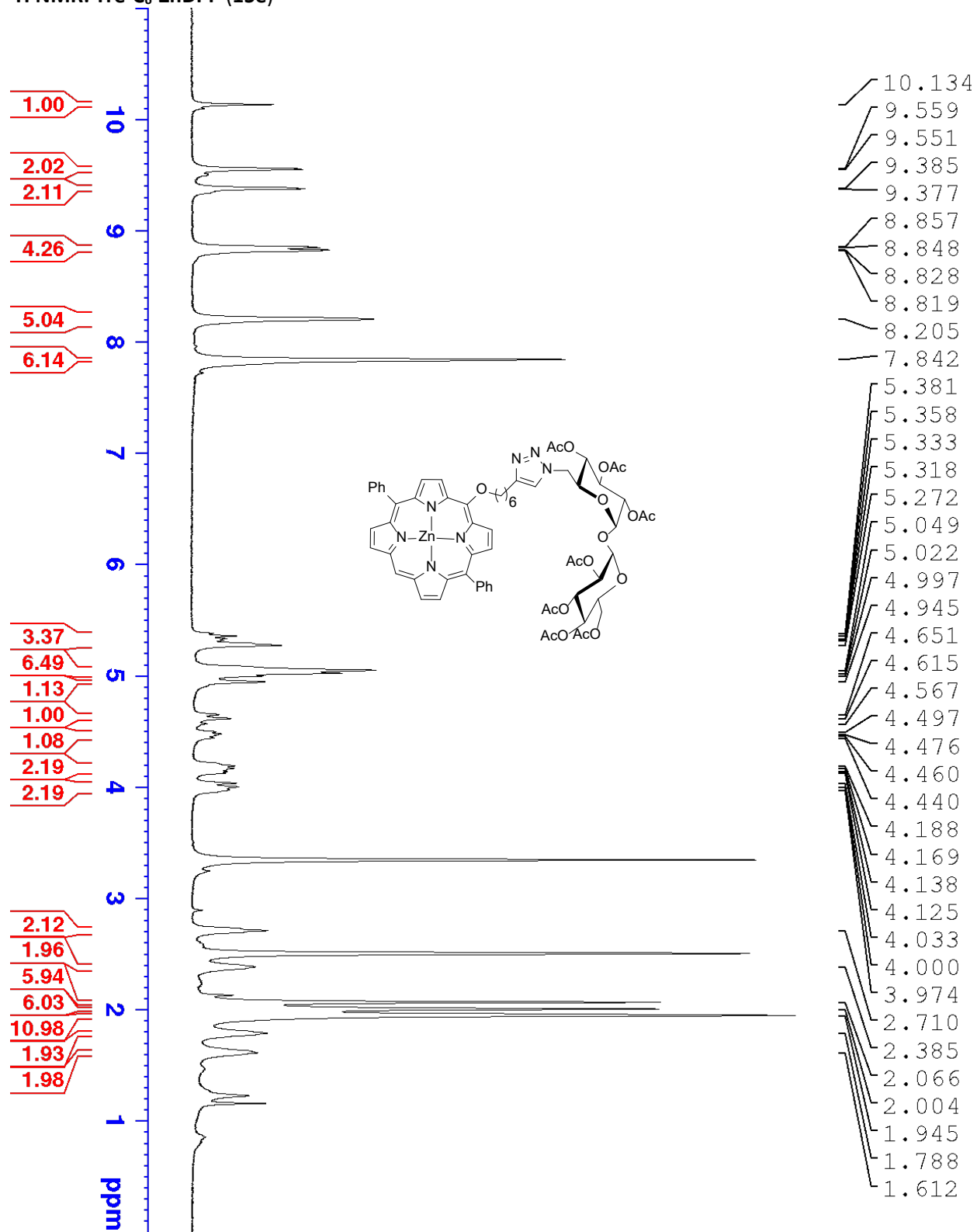
HRMS (MALDI): Tre-C₆-ZnDPP (15e)



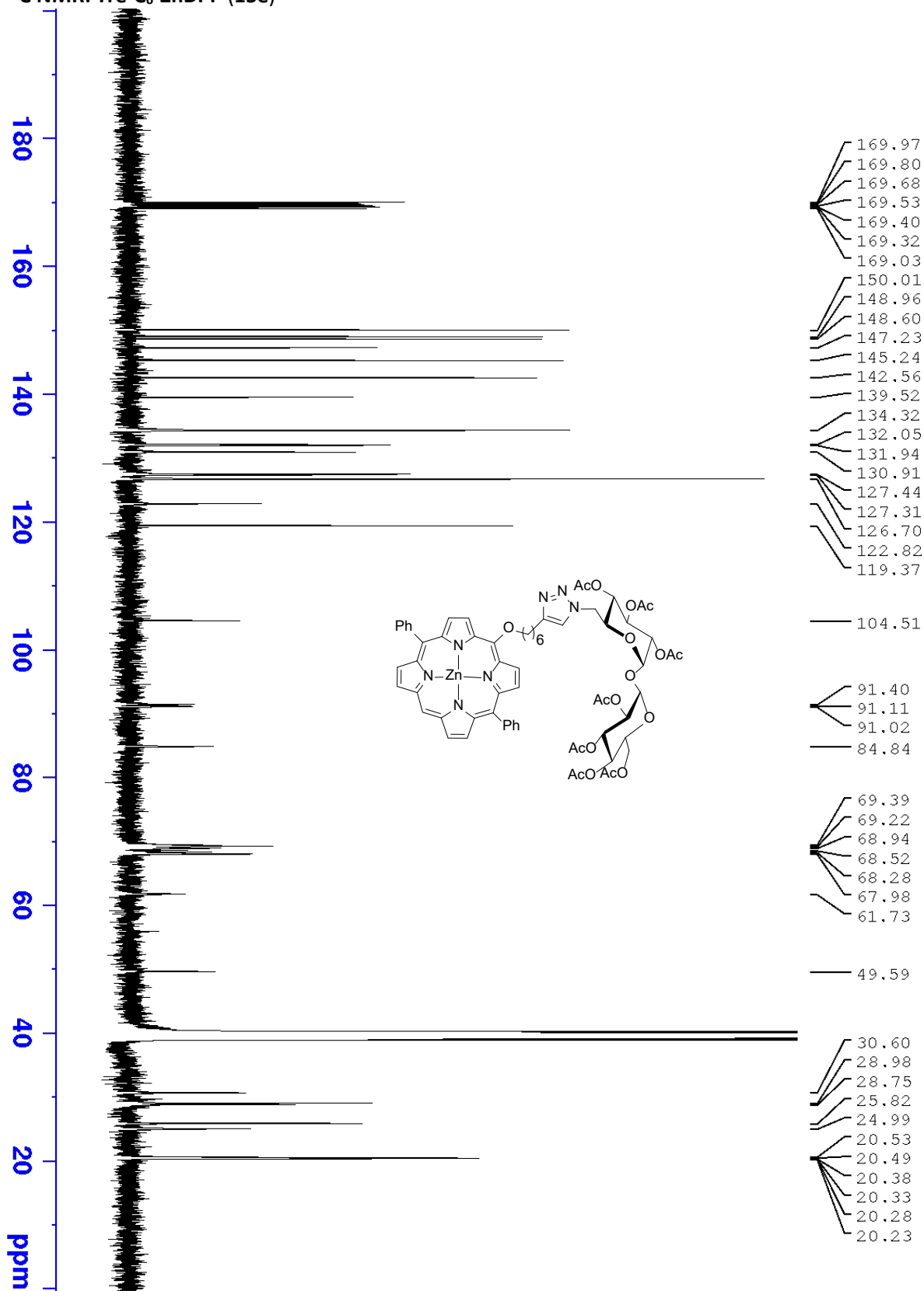
HRMS (MALDI): HO-Tre-C₆-ZnDPP (16e)



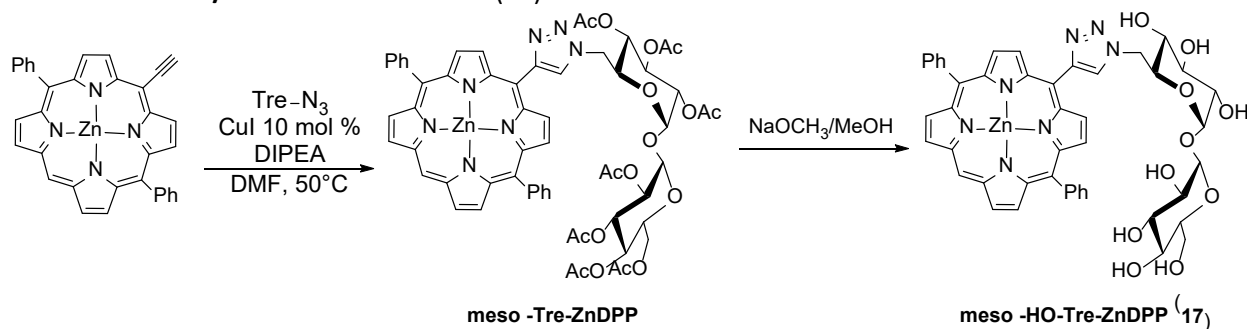
¹H NMR: Tre-C₆-ZnDPP (15e)



¹³C NMR: Tre-C₆-ZnDPP (15e)

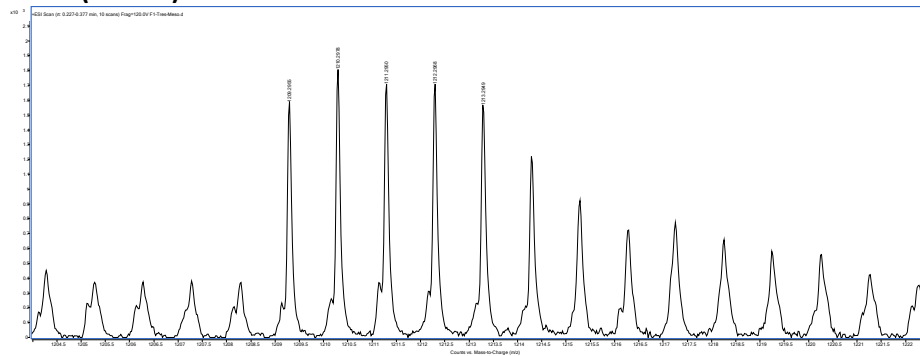


meso-Tre-ZnDPP / meso -HO-Tre-ZnDPP (17)

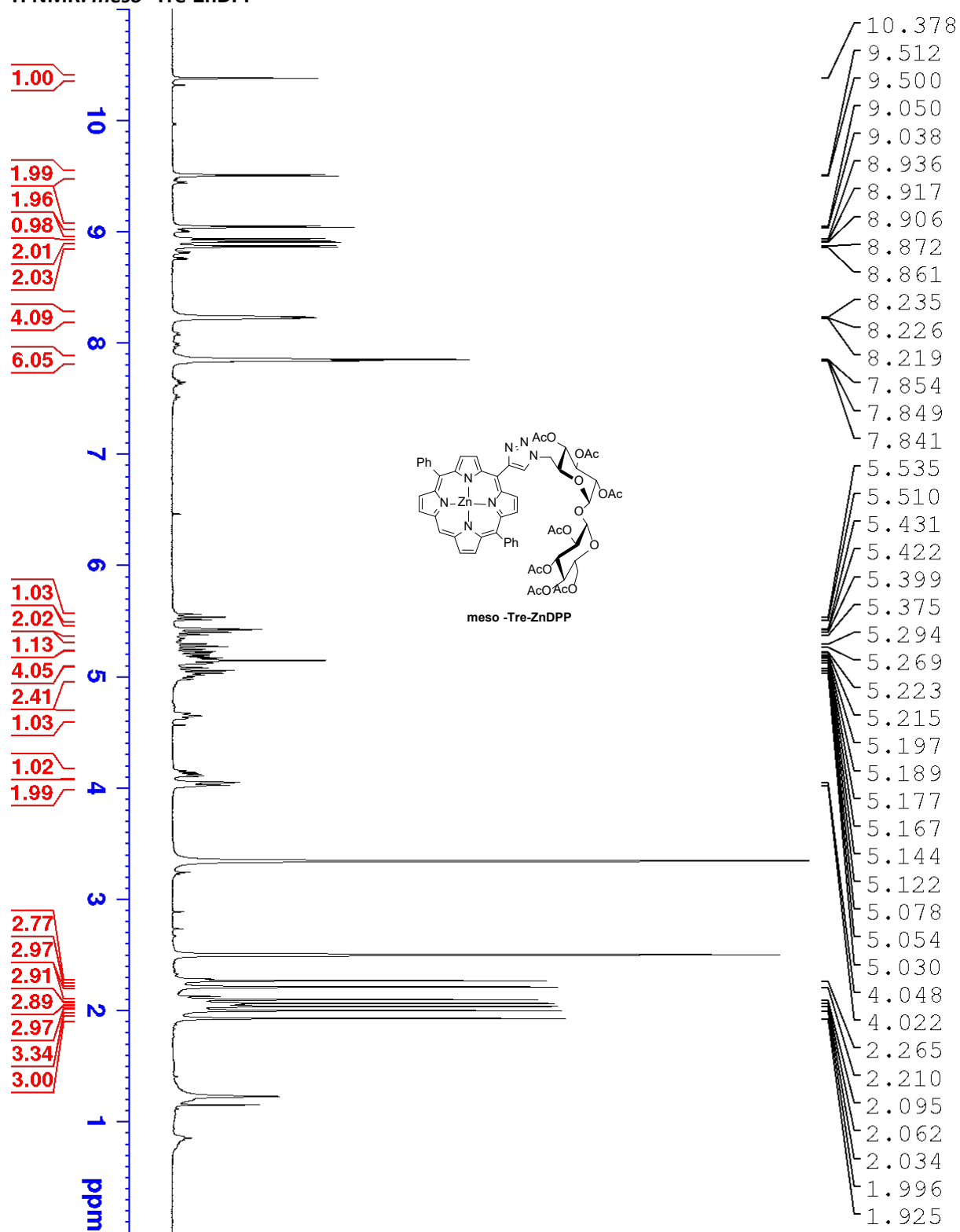


meso -Tre-ZnDPP . was obtained using the general procedure as a purple solid (21.3 mg, 93 % yield). TLC analysis R_f = 0.18 (hexanes: acetone 60:40 [v:v]). ¹H NMR (400MHz, DMSO): δ 10.38 (1H, s), 9.51 (2H, d, J = 4.4 Hz), 9.04 (2H, d, J = 4.6 Hz), 8.94 (1H, s), 8.91 (2H, d, J = 4.4 Hz), 8.86 (2H, d, J = 4.6 Hz) 8.24 – 8.20 (4H, m), 7.86 – 7.84 (6H, m), 5.56 – 5.51 (1H, t, J = 9.7 Hz), 5.43 – 5.37 (2H, m), 5.29 – 5.24 (1H, t, J = 9.7 Hz), 5.22 – 5.10 (4H, m), 5.08 – 4.98 (2H, m), 4.67 – 4.62 (1H, m), 4.15 – 4.10 (1H, m), 4.04 – 4.02 (2H, m), 2.27 (3H, s), 2.21 (3H, s), 2.09 (3H, s), 2.06 (3H, s), 2.03 (3H, s), 1.99 (3H, s), 1.93 (3H, s). ¹³C NMR (100MHz, DMSO): δ 168.95, 168.88, 168.75, 168.56, 168.36, 148.53, 148.48, 148.29, 148.16, 146.76, 141.61, 133.35, 131.36, 130.78, 130.65, 130.39, 128.87, 126.53, 125.71, 118.80, 106.93, 105.65, 90.56, 68.40, 67.80, 67.00, 60.70, 49.09, 28.00, 19.71, 19.66, 19.59, 19.49, 19.45, 19.39, 19.30. UV-Vis, DMSO, λ_{max} (nm), (Log ϵ): 421 (5.79), 554 (4.29), 597 (3.90). HRMS (MALDI) m/z : Calcd for C₆₀H₅₅N₇O₁₇Zn [M]⁺ 1209.2946; Found [M]⁺ 1209.2955. **meso -HO-Tre-ZnDPP (17)**. HRMS (MALDI) m/z : Calcd for C₄₆H₄₁N₇O₁₀Zn [M]⁺ 915.2201; Found [M]⁺ 915.2200.

HRMS (MALDI): meso -Tre-ZnDPP



¹H NMR: *meso*-Tre-ZnDPP



¹³C NMR: *meso*-Tre-ZnDPP

