

# Supplementary Information

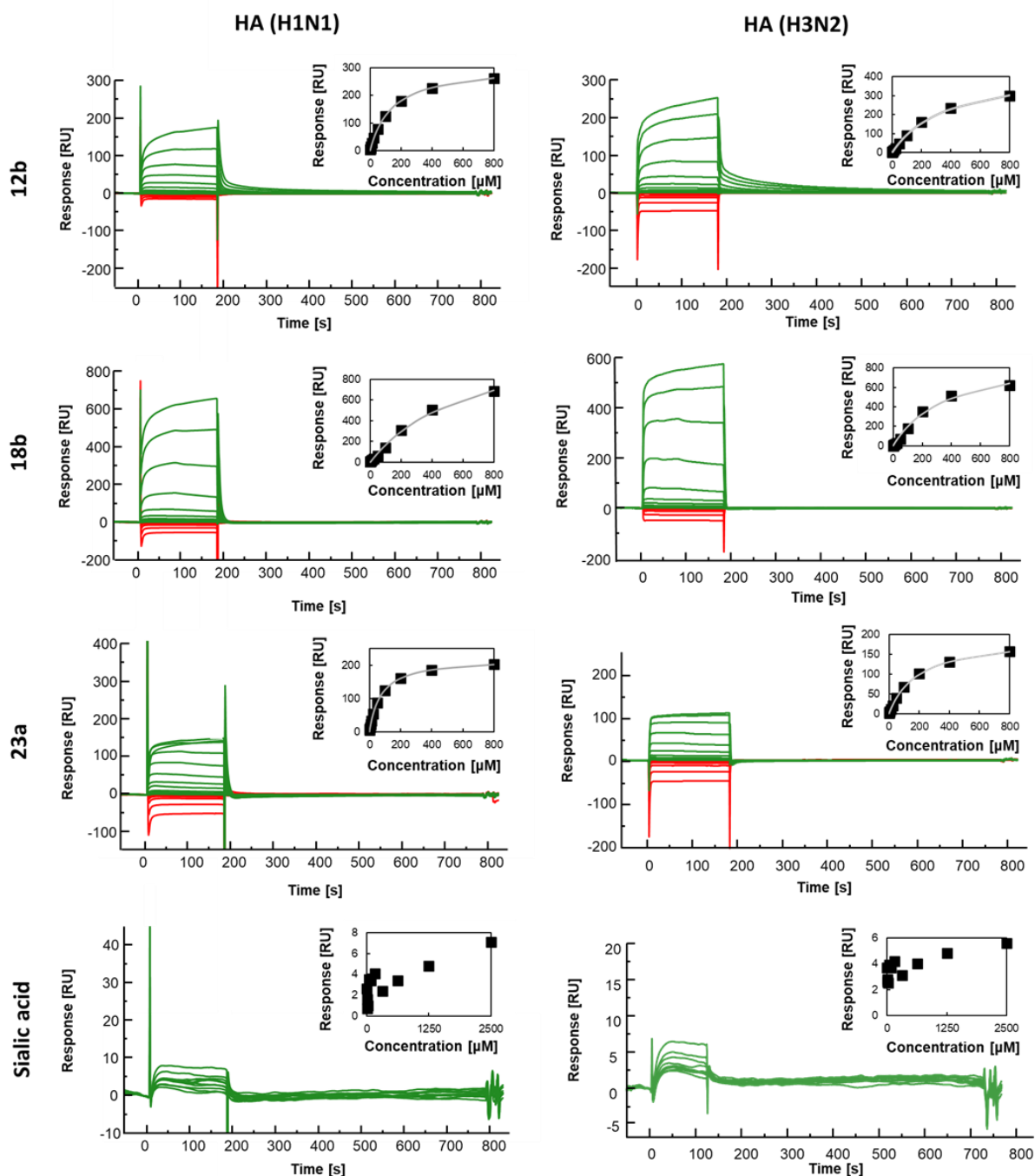
## **Amphiphilic sialic acid derivatives as potential dual-specific inhibitors of influenza hemagglutinin and neuraminidase**

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Ilona Bereczki

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## Surface plasmon resonance measurements in the absence of DMSO

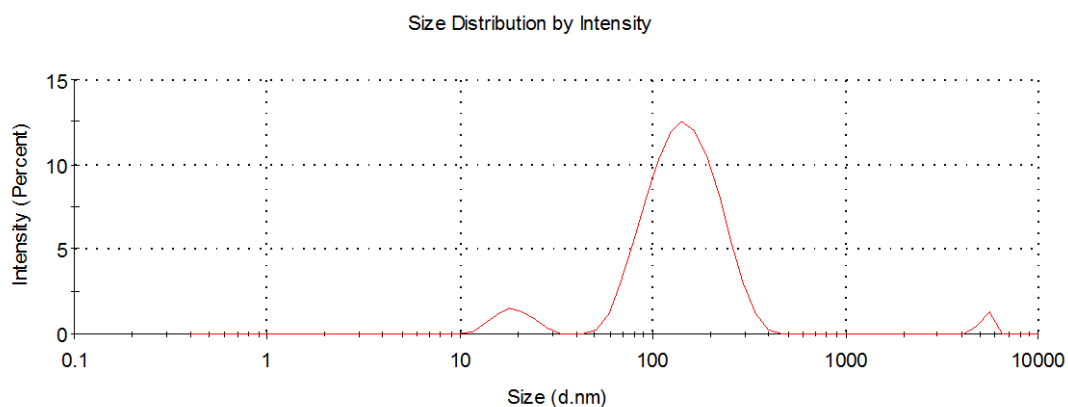


**Figure S1.** SPR sensorgrams. Example of a single replicate of compounds binding to immobilized hemagglutinin from H1N1 and H3N2 influenza strain. Green: Sensorgrams of two-fold dilution row of each compound. Red: Sensorgrams of corresponding DMSO injections (not applicable for sialic acid). Inset: Steady-state response after DMSO-correction as black squares, one-site binding model fit in grey (fit not shown for sialic acid).

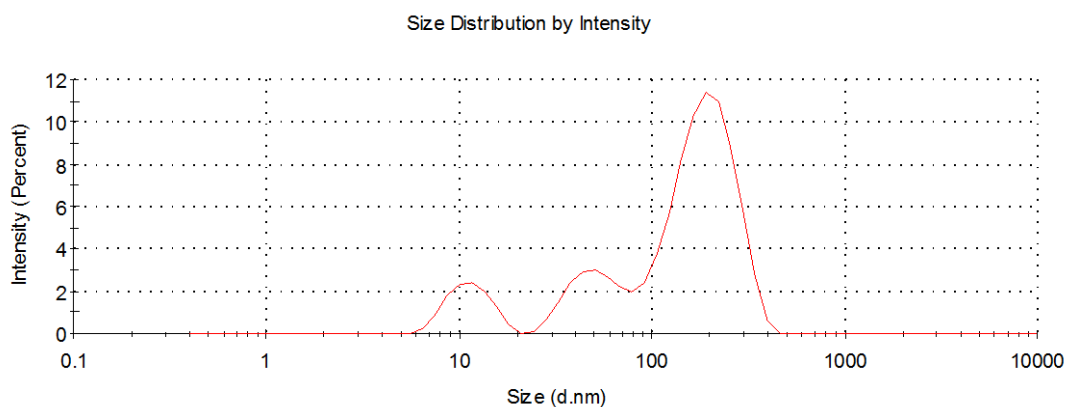
**Table S1.** Affinity of tested compounds towards hemagglutinins determined by SPR in the absence of DMSO.

Compound	H1N1 hemagglutinin		H3N2 hemagglutinin	
	$K_D(\text{app})$ [ $\mu\text{M}$ ]	$R_{\text{max}}$ [RU]	$K_D(\text{app})$ [ $\mu\text{M}$ ]	$R_{\text{max}}$ [RU]
<b>12b</b>	$187 \pm 41$	$305 \pm 30$	$279 \pm 98$	$454 \pm 39$
<b>18b</b>	$286 \pm 19$	$783 \pm 8$	$357 \pm 23$	$925 \pm 23$
<b>23a</b>	$106 \pm 36$	$197 \pm 24$	$134 \pm 48$	$200 \pm 23$

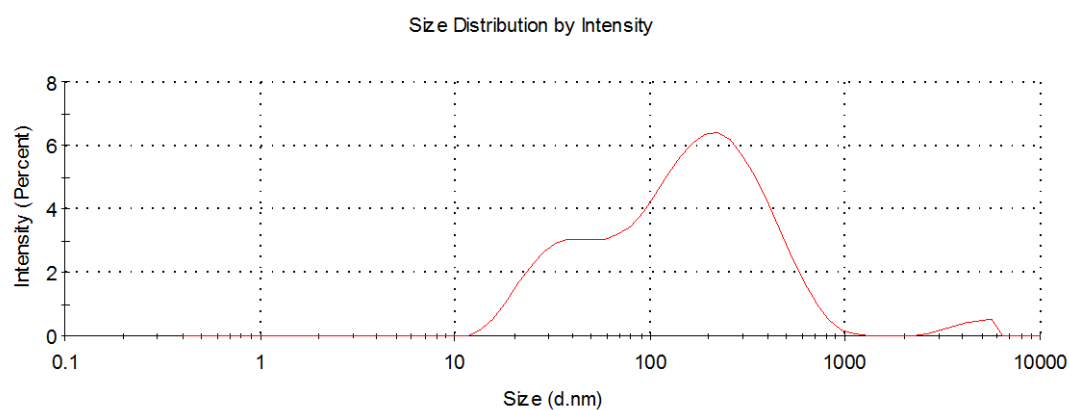
## Dynamic light scattering measurements



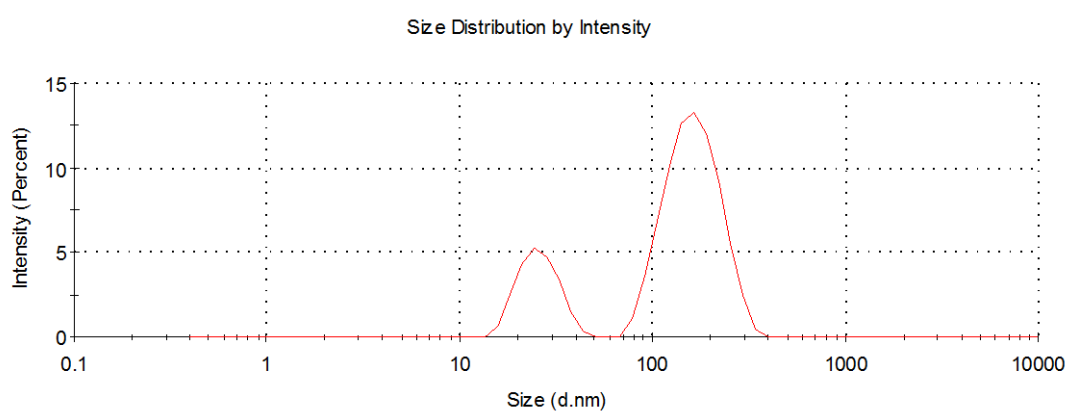
**Figure S2.** Size distribution of **12a** in the concentration of 1 mg/ml



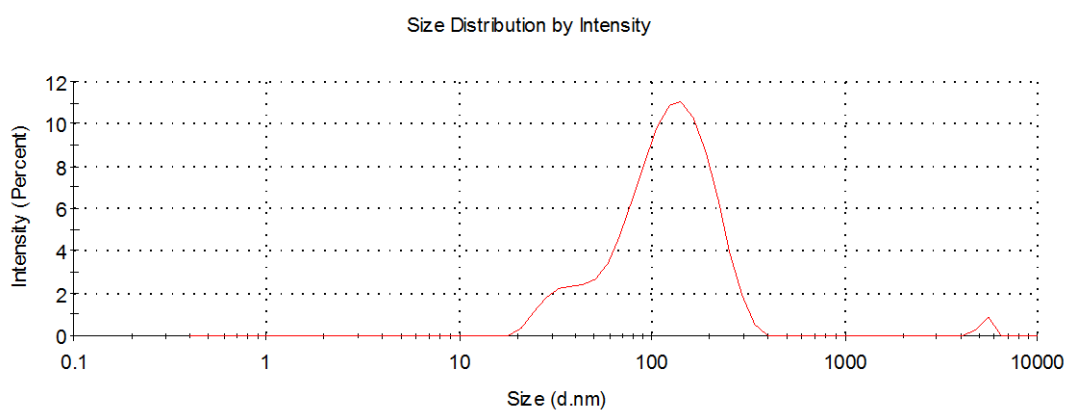
**Figure S3.** Size distribution of **12a** in the concentration of 0.1 mg/ml



**Figure S4.** Size distribution of **12b** in the concentration of 1 mg/ml

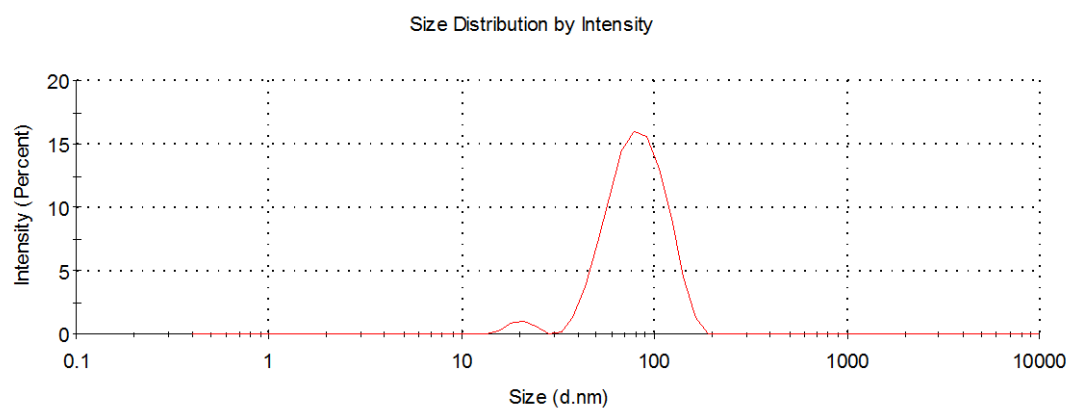


**Figure S5.** Size distribution of **12b** in the concentration of 0.1 mg/ml



**Figure S6.** Size distribution of **12c** in the concentration of 1 mg/ml

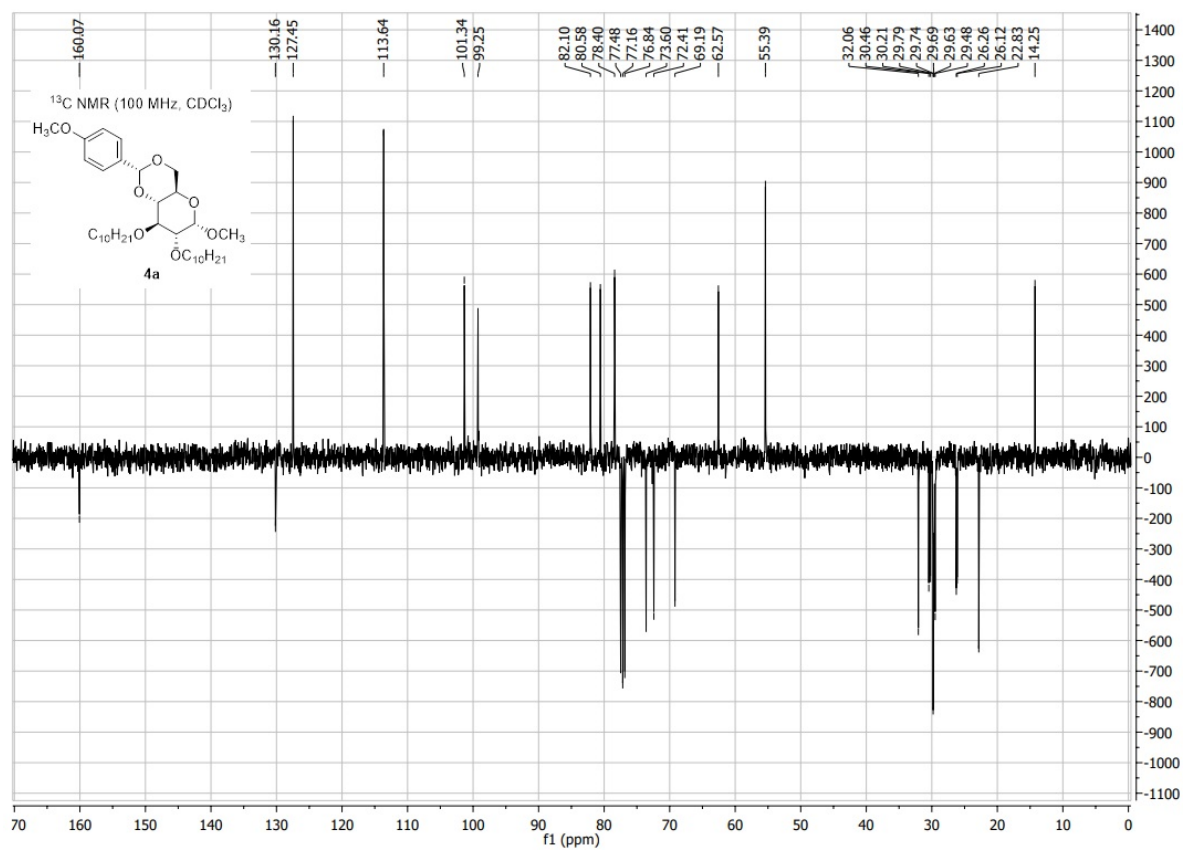
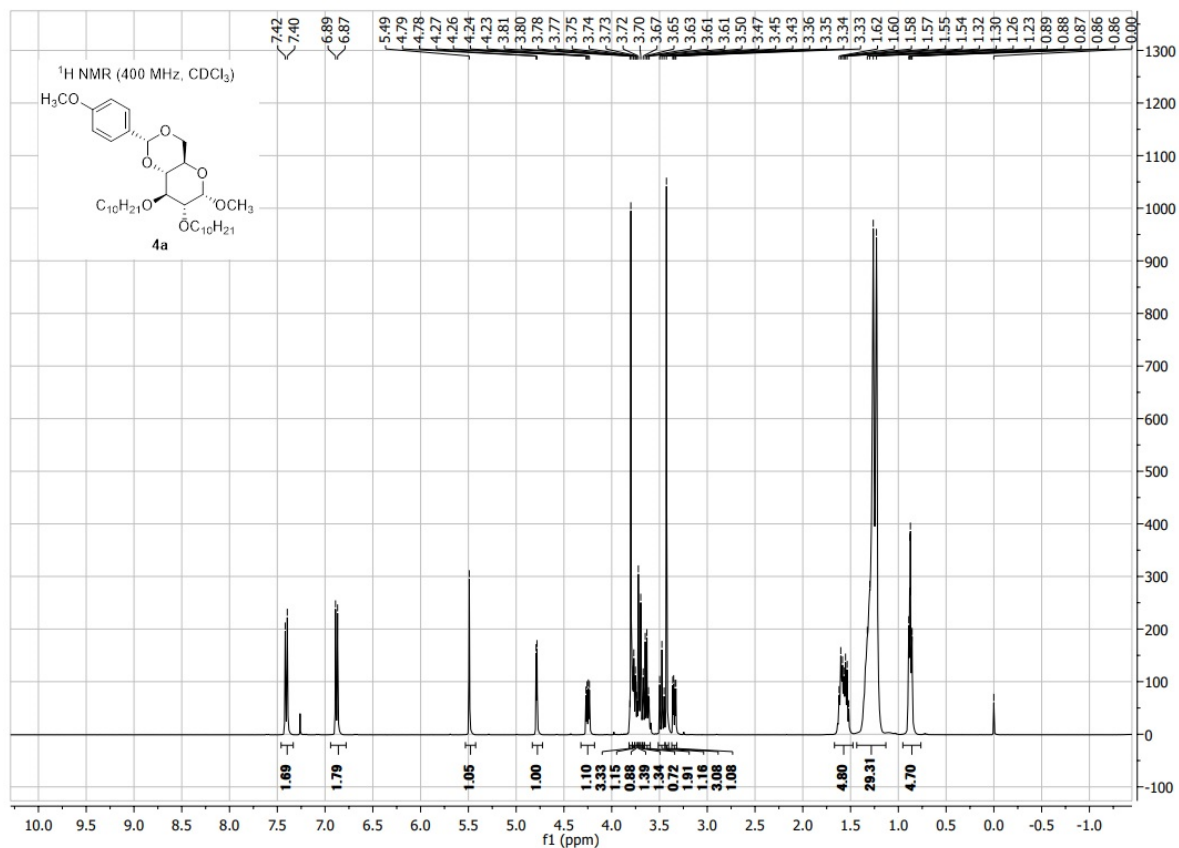




**Figure S7.** Size distribution of **12c** in the concentration of 0.1 mg/ml

# NMR spectra

NMR spectra of compound **4a**



The figure displays two NMR spectra for compound 5a, which is a substituted tetrahydropyran derivative. The chemical structure of 5a is shown in the top left of both spectra.

**<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)**

The <sup>1</sup>H NMR spectrum (top) shows peaks in the aromatic region (7.28-7.26 ppm, integration 1.79), the methoxy singlet (3.84 ppm, integration 1.56), and the aliphatic region (3.60-3.26 ppm, integrations 1.11, 1.00, 1.10, 1.23, 2.62, 2.16, 2.74, 2.82, 1.37, 2.79, 1.02). A large solvent peak for CDCl<sub>3</sub> is visible at 7.26 ppm. The x-axis ranges from 10.0 to -1.0 ppm.

**<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)**

The <sup>13</sup>C NMR spectrum (bottom) shows peaks for the PMBO group (159.49 ppm), the tetrahydropyran ring carbons (130.57, 129.88, 114.03 ppm), and the aliphatic carbons (98.20, 81.80, 81.03, 77.48, 77.29, 77.16, 77.16, 76.84, 74.72, 73.88, 71.93, 70.74, 62.21, 55.41, 55.22 ppm). The x-axis ranges from 210 to -10 ppm.

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)

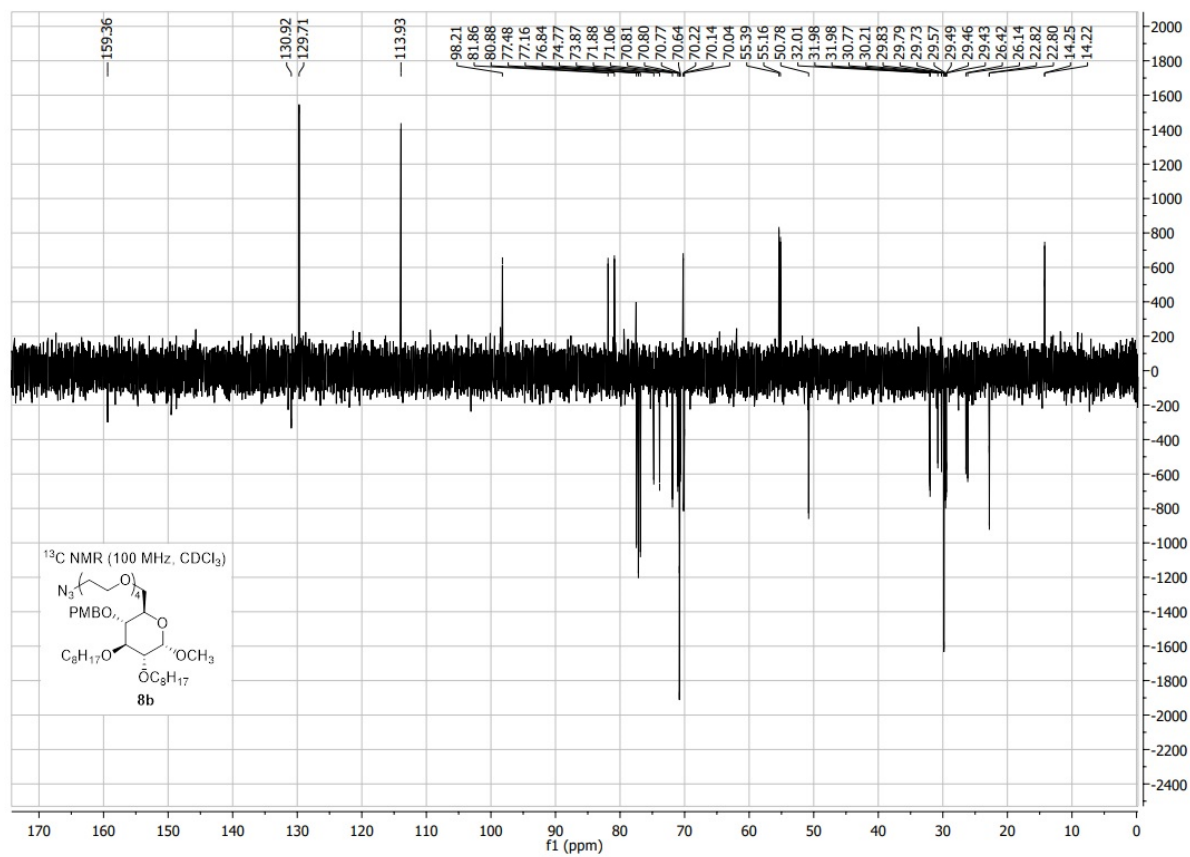
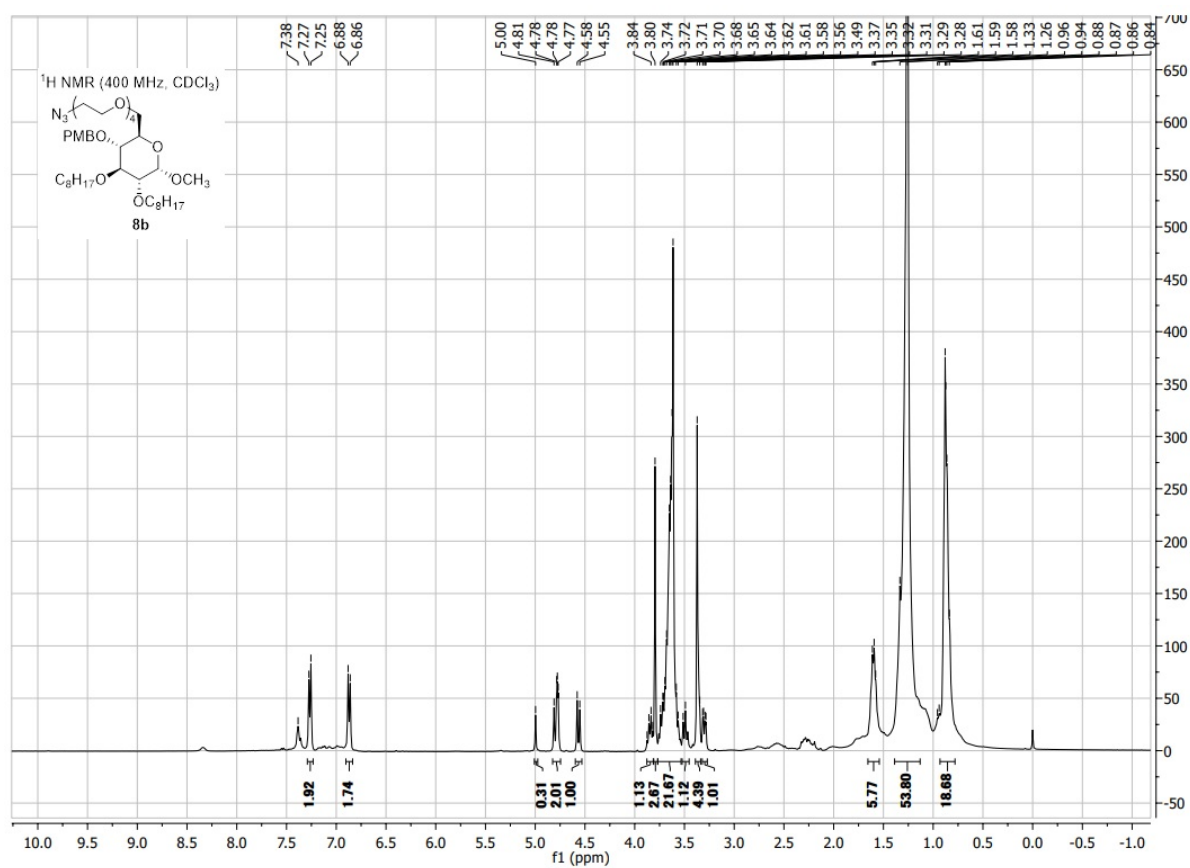
Chemical structure of **8a** is shown as an inset. It is a substituted tetrahydropyran with a PMBO group, a C<sub>10</sub>H<sub>21</sub>O group, a methoxy group, and a C<sub>10</sub>H<sub>21</sub> group.

The <sup>1</sup>H NMR spectrum (400 MHz, CDCl<sub>3</sub>) shows the following peaks (ppm) and integrations:

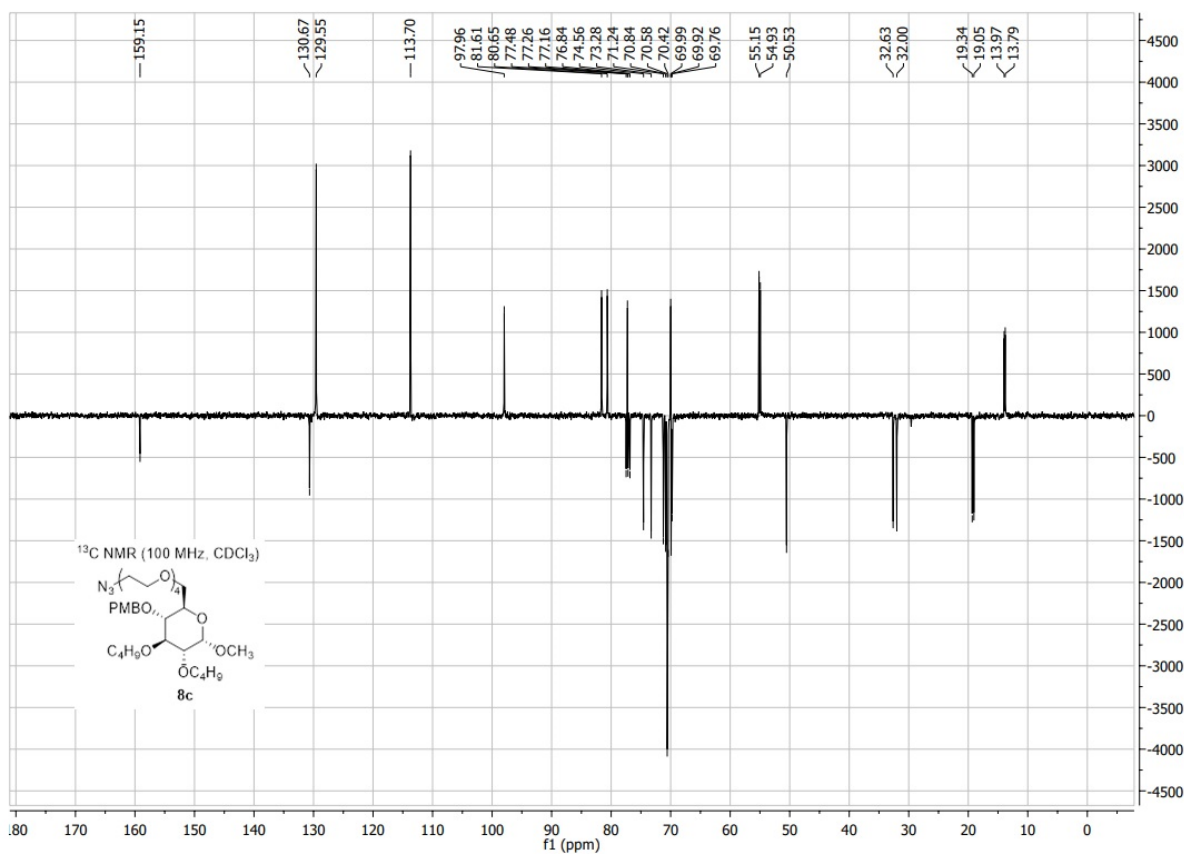
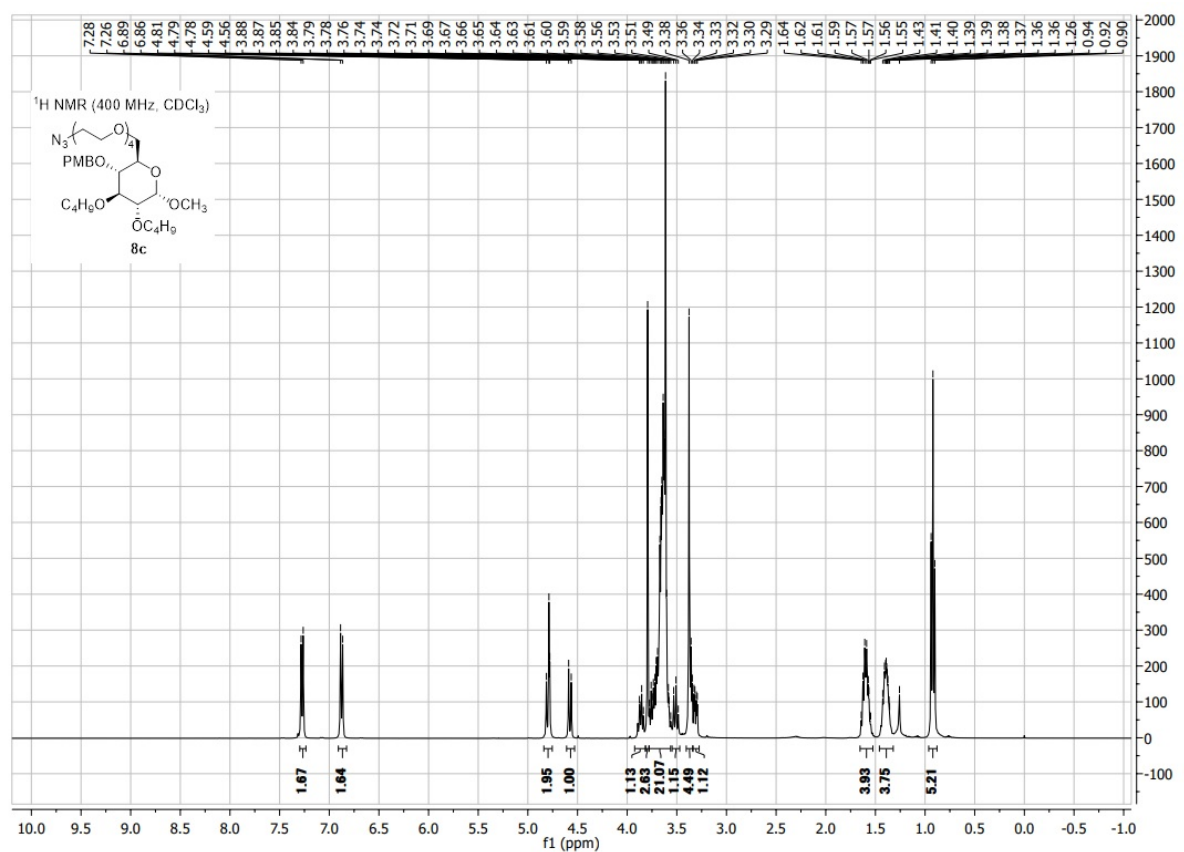
- 7.28, 7.27, 7.25, 6.88, 6.86, 4.81, 4.78, 4.78, 4.77, 4.58, 4.55, 3.86, 3.85, 3.84, 3.82, 3.81, 3.80, 3.74, 3.72, 3.72, 3.71, 3.70, 3.69, 3.68, 3.67, 3.65, 3.64, 3.64, 3.63, 3.63, 3.62, 3.61, 3.60, 3.59, 3.58, 3.56, 3.56, 3.52, 3.49, 3.47, 3.37, 3.37, 3.37, 3.35, 3.32, 3.31, 3.29, 3.28, 1.85, 1.63, 1.61, 1.59, 1.58, 1.34, 1.26, 1.25, 0.89, 0.88, 0.88, 0.86, 0.86, -0.00
- Integration values: 1.70, 1.58, 2.00, 1.03, 1.10, 2.53, 2.13, 1.16, 4.52, 1.12, 4.26, 27.85, 4.42

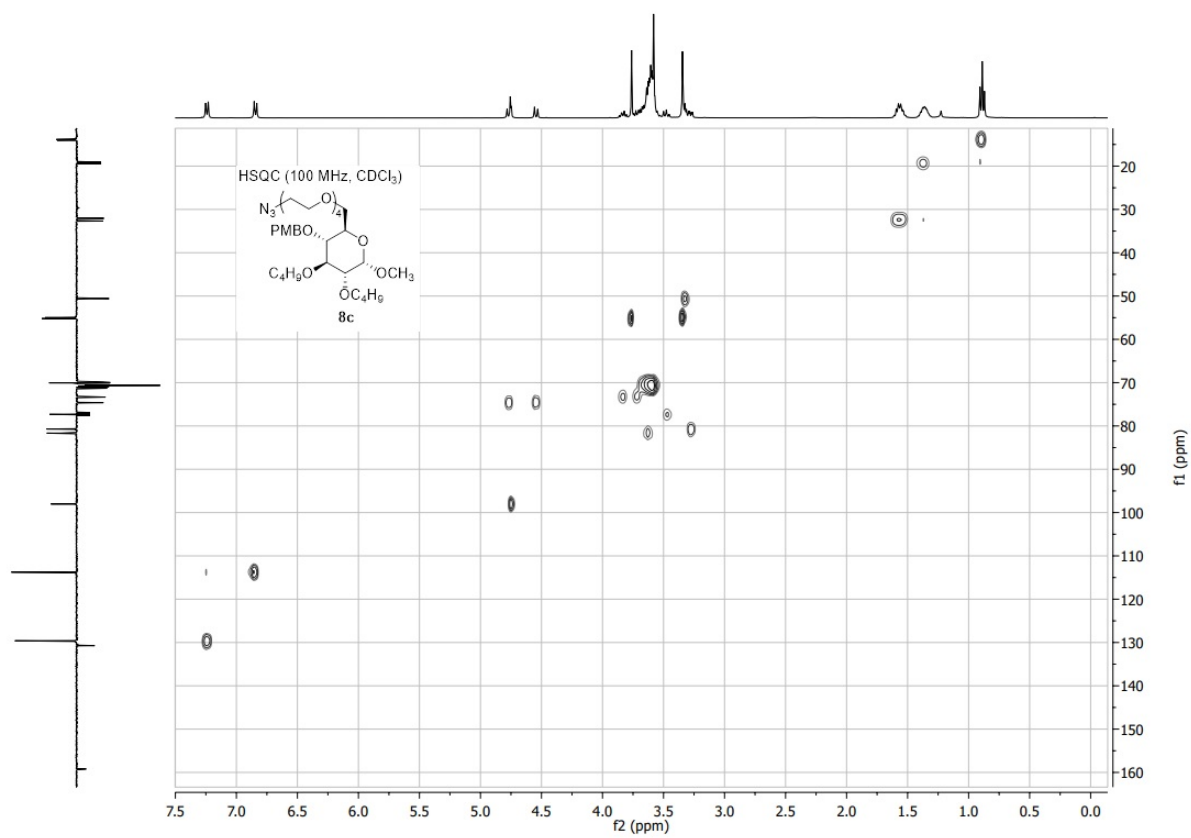
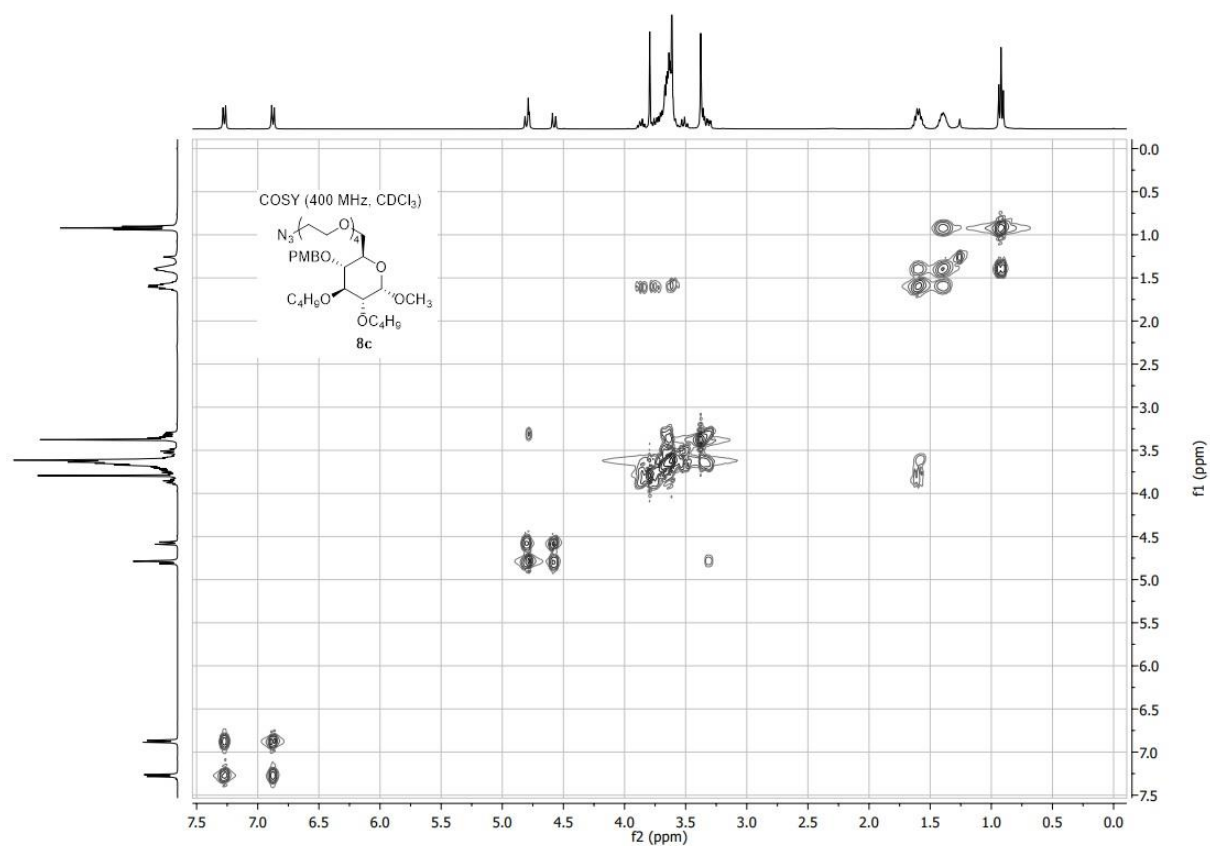


### NMR spectra of compound **8b**



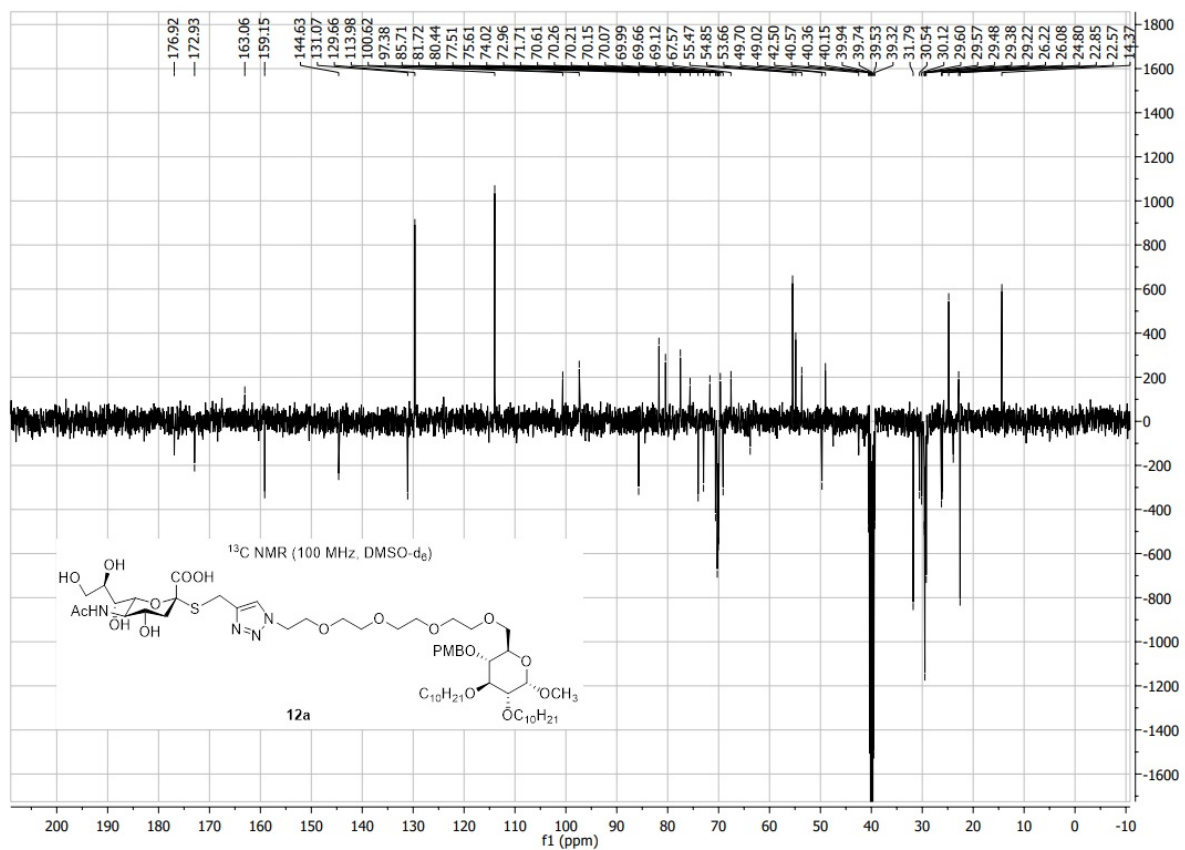
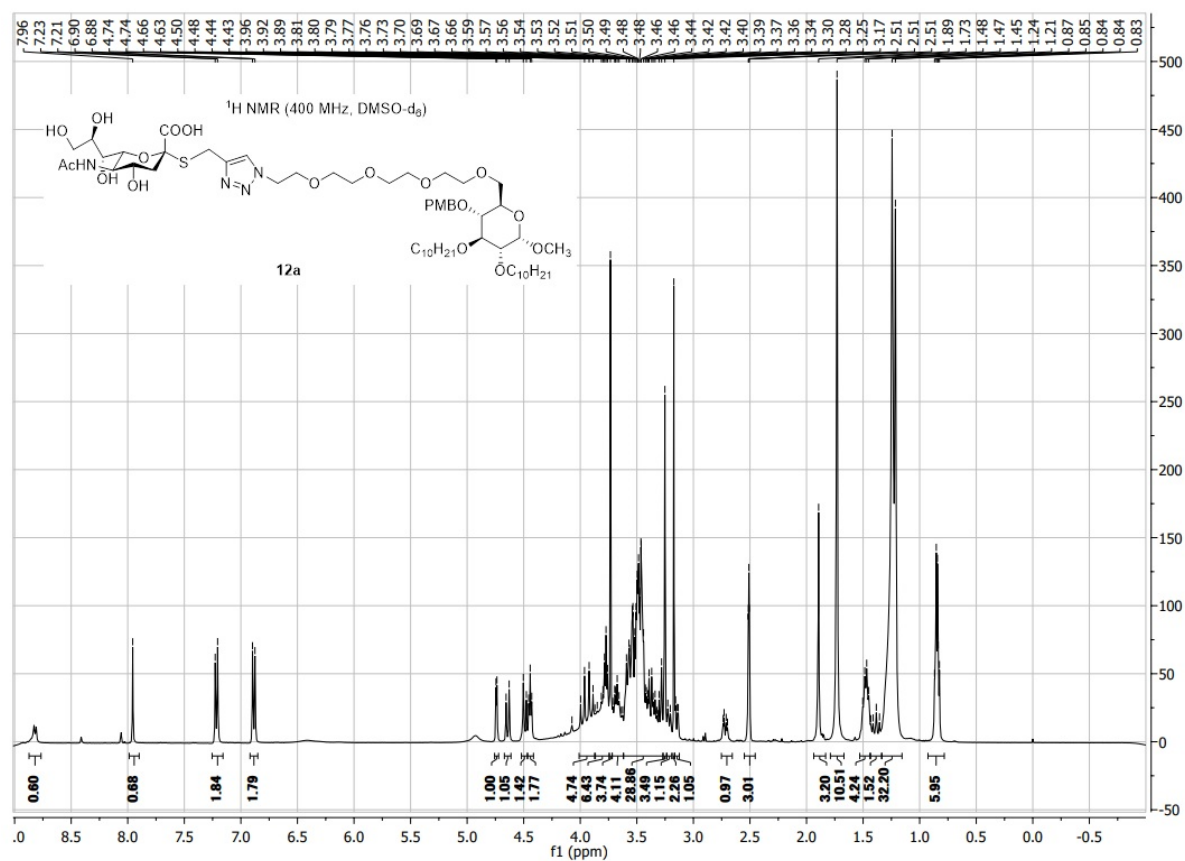
# NMR spectra of compound **8c**



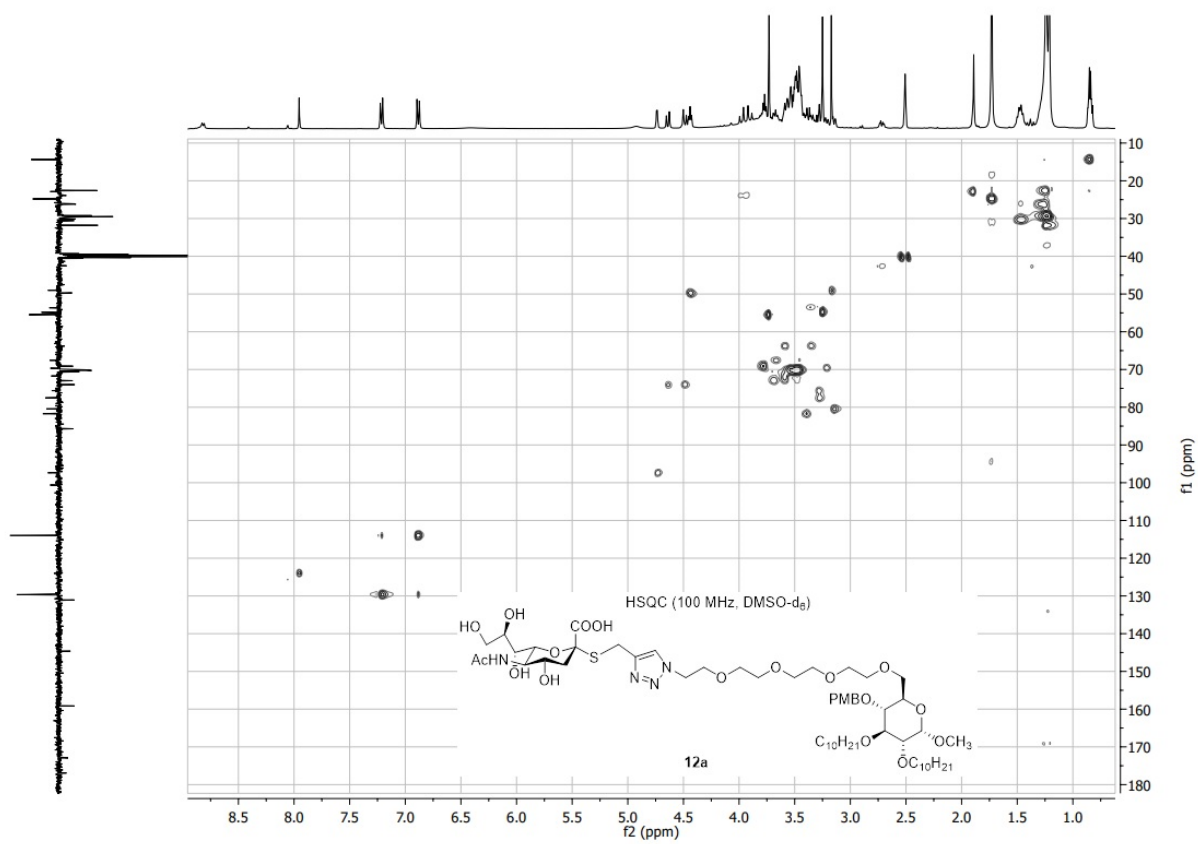
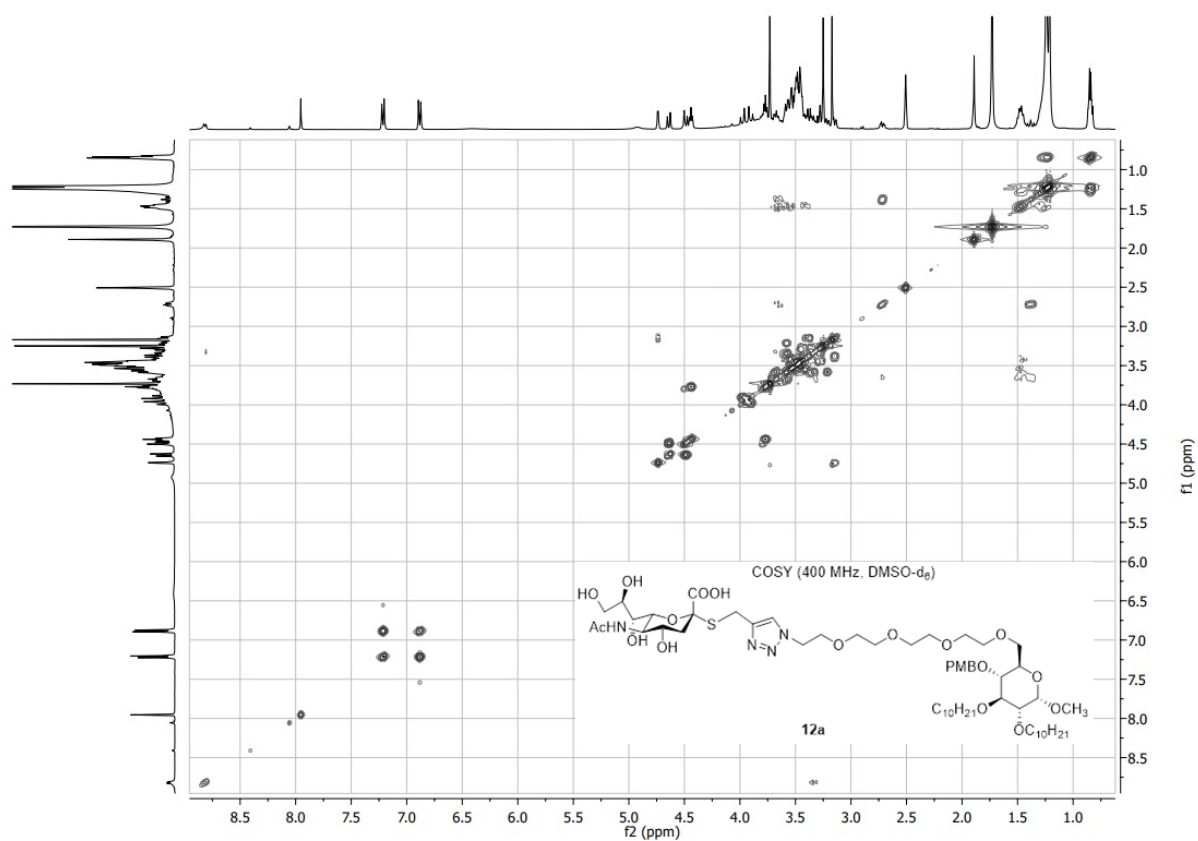




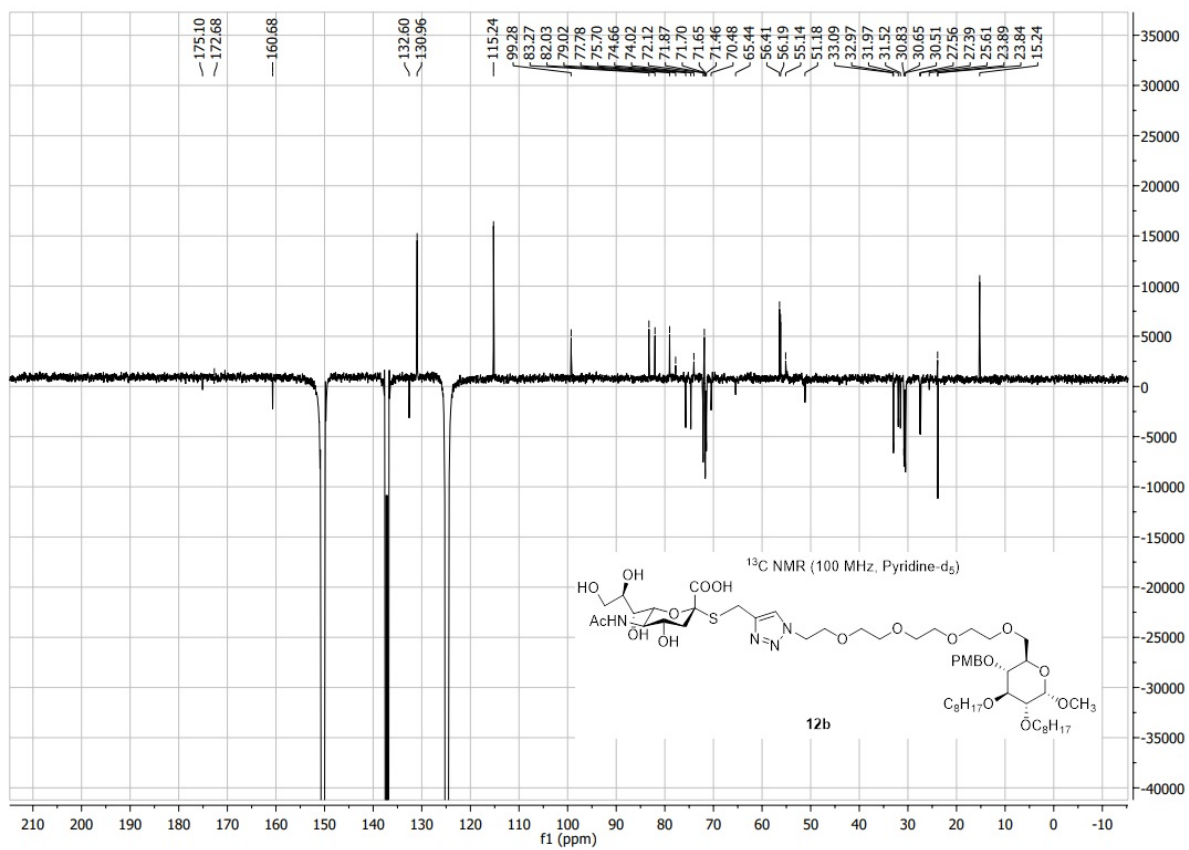
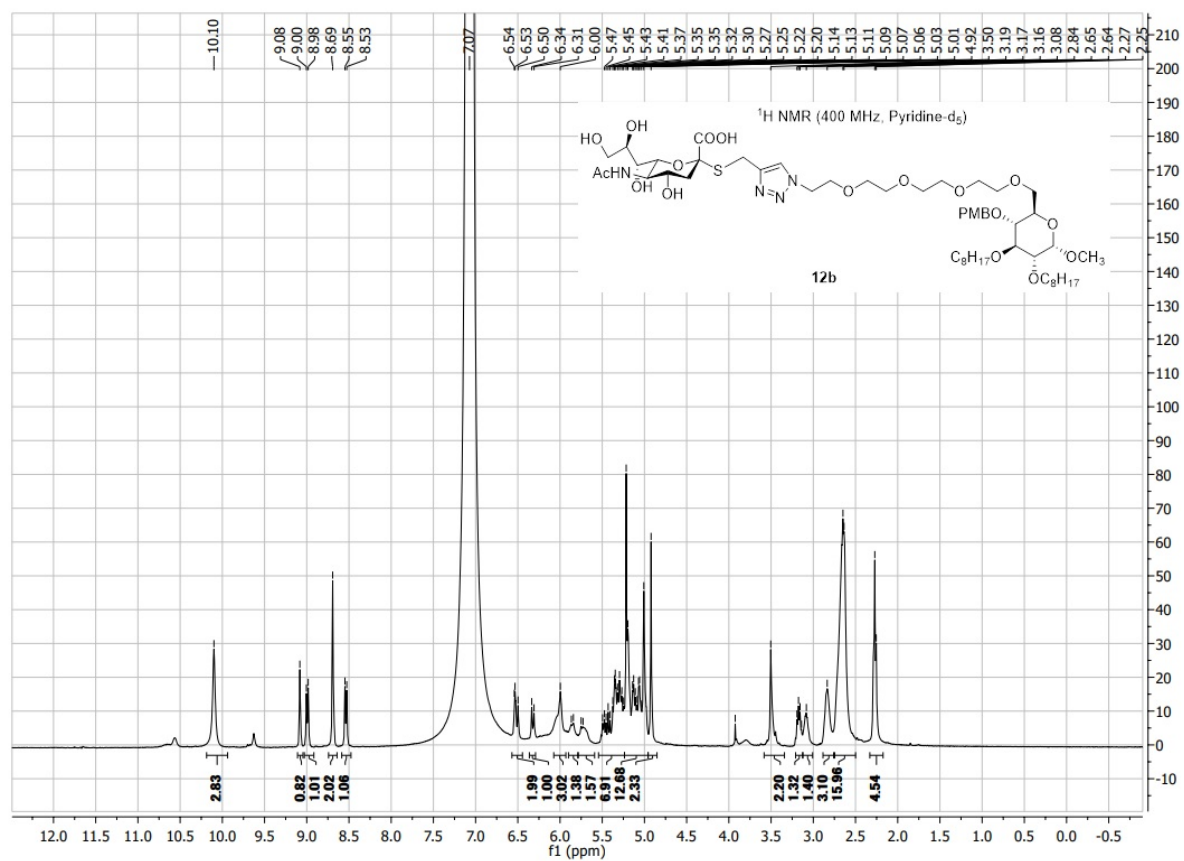
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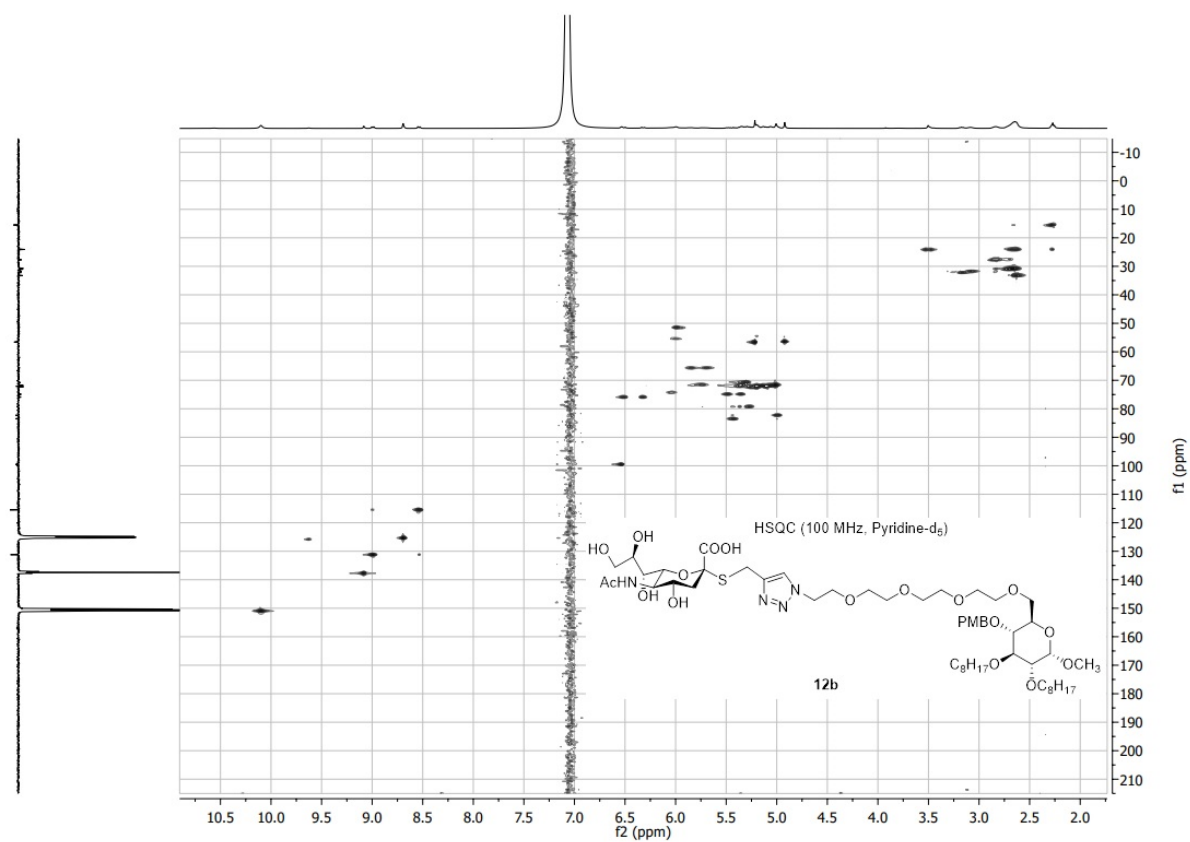
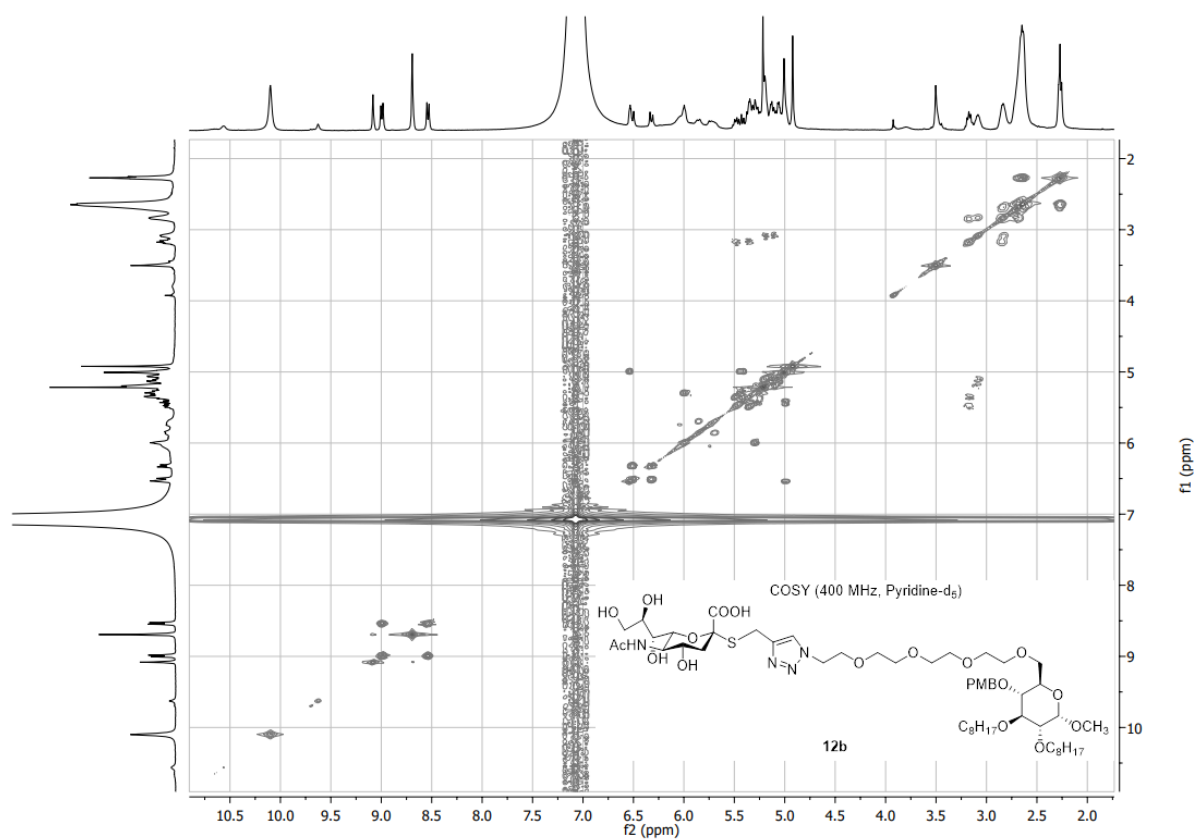




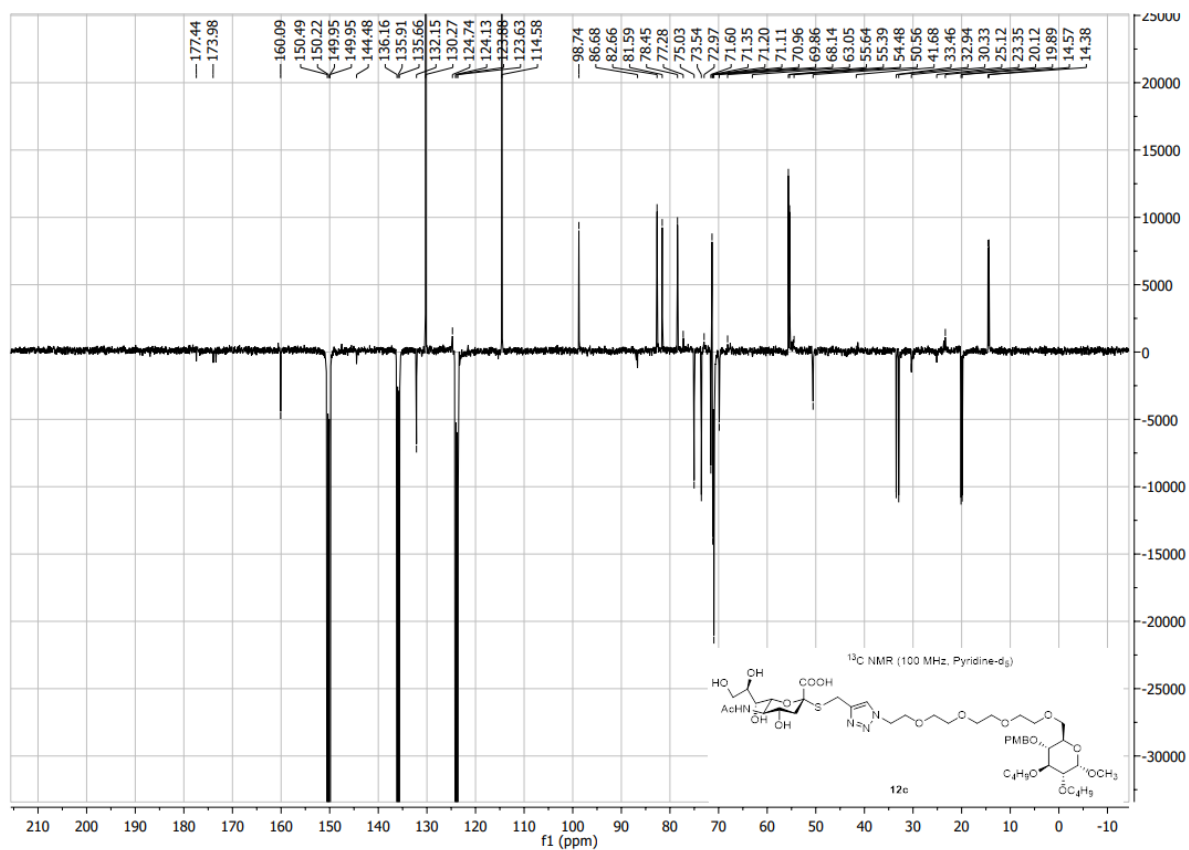
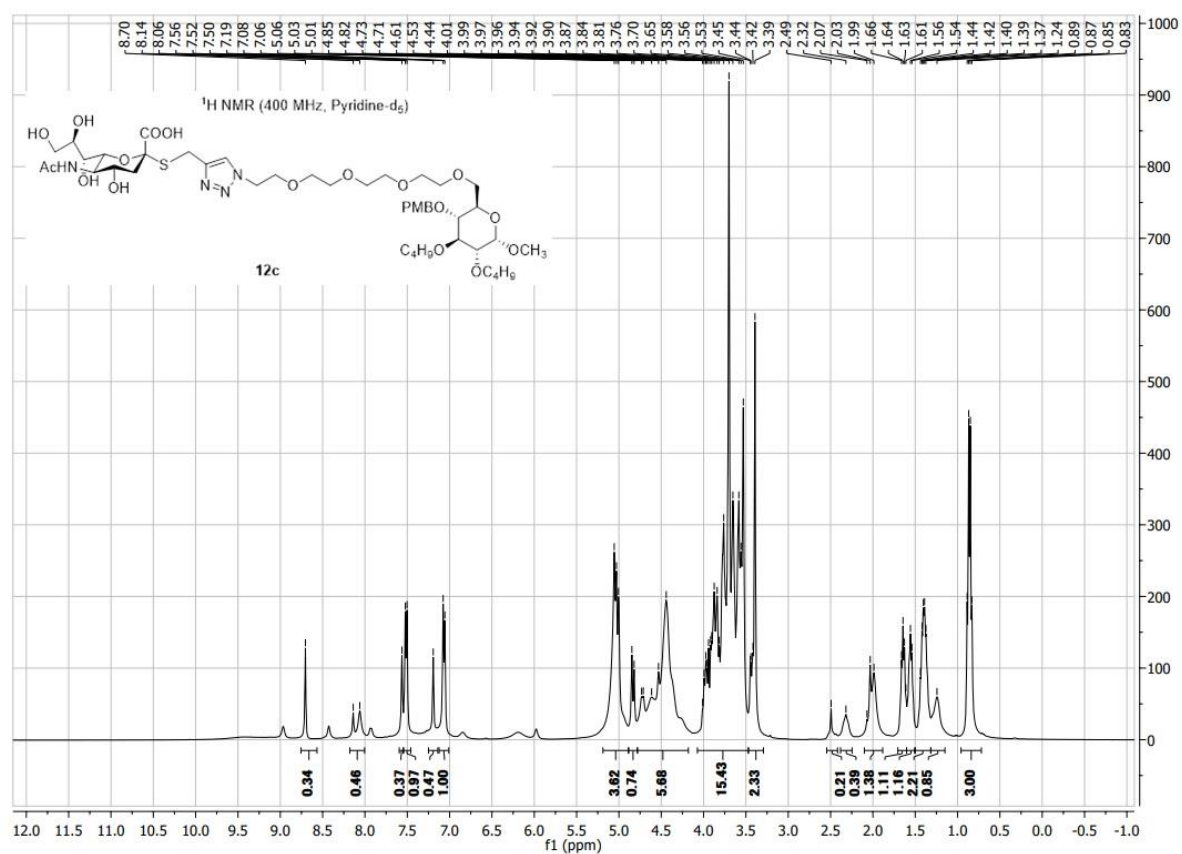


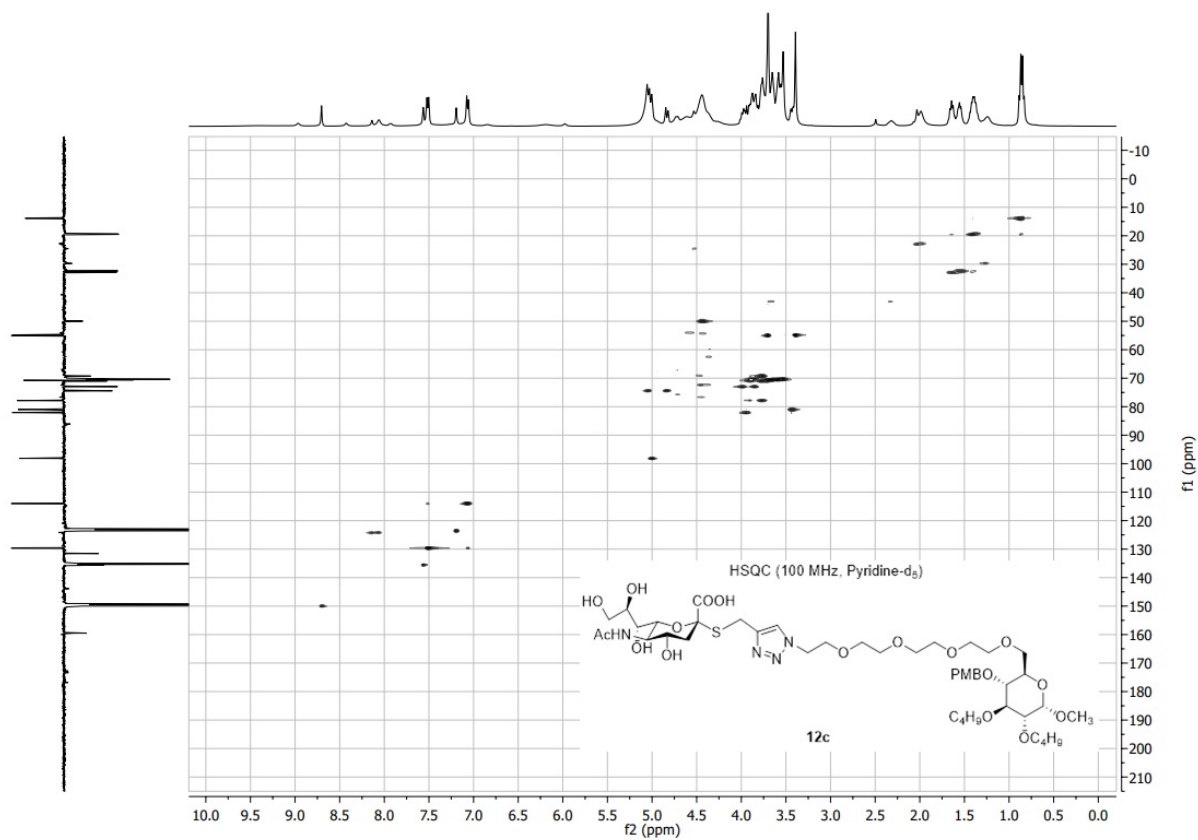
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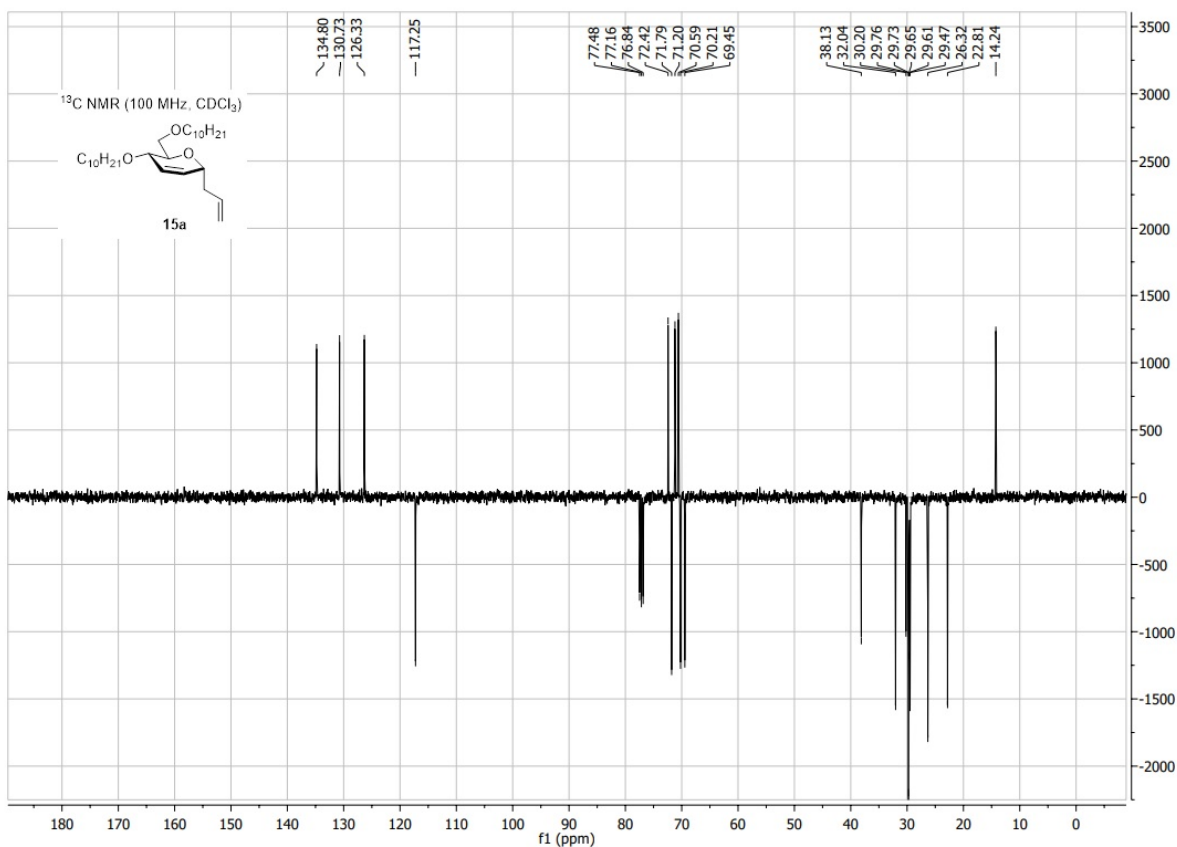
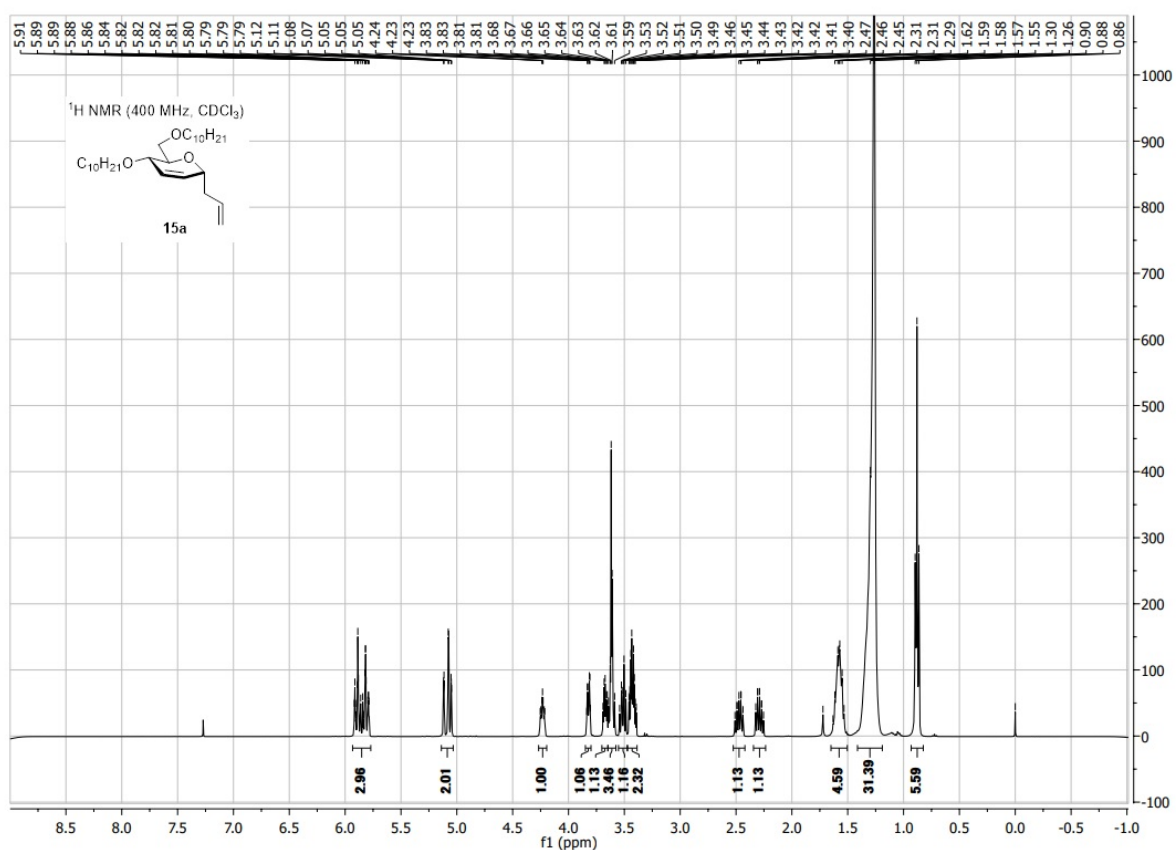


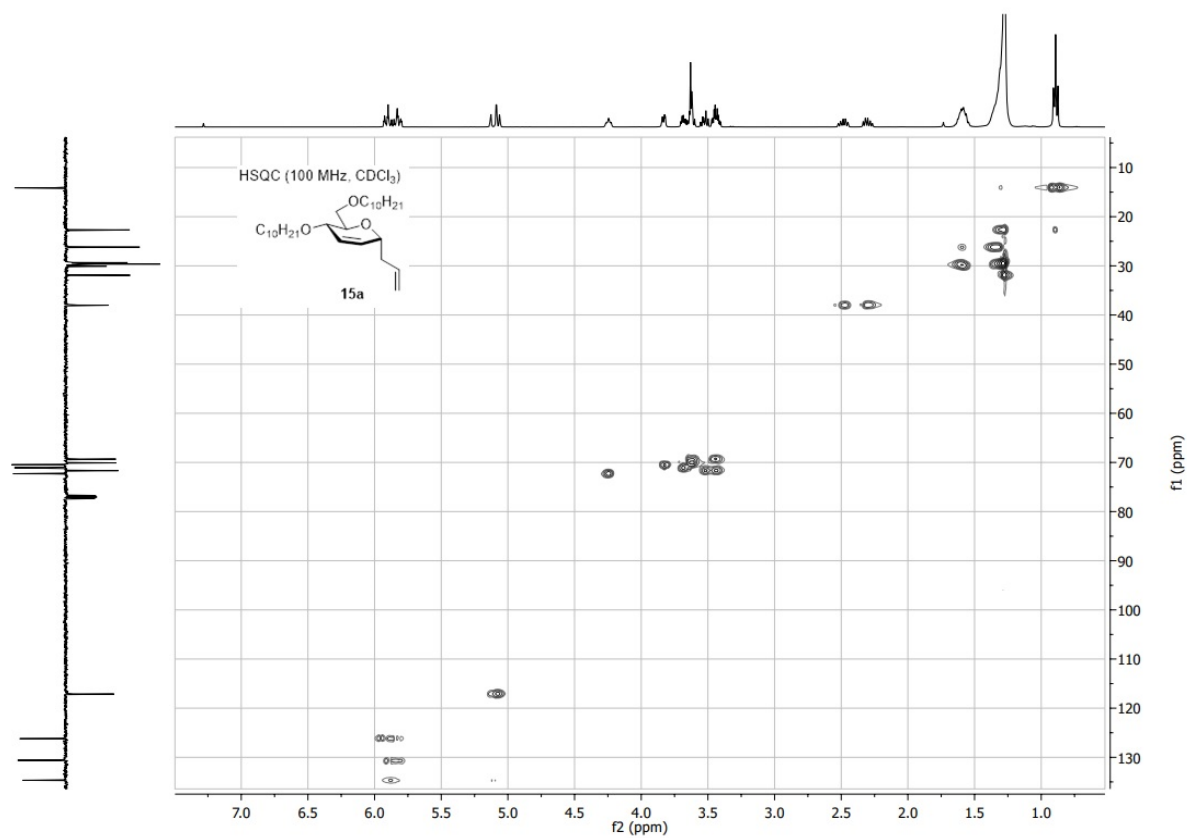
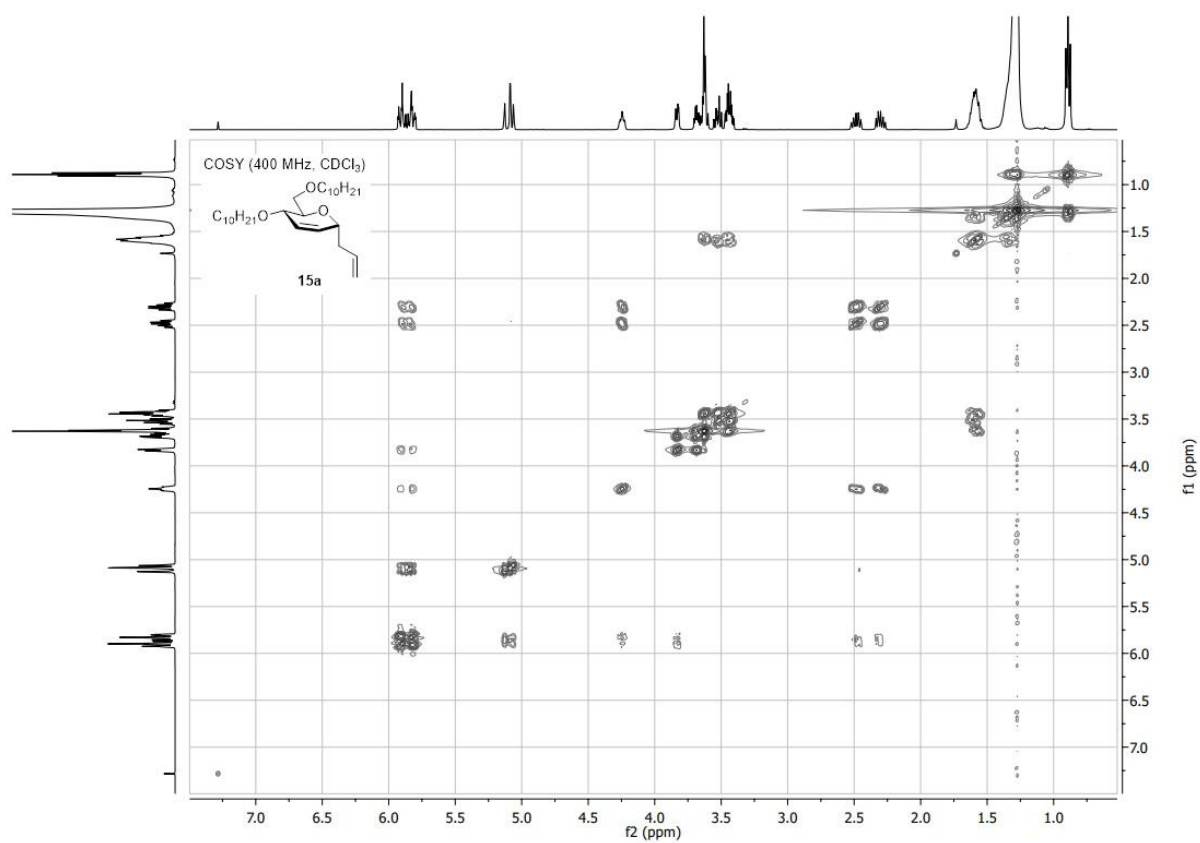
# NMR spectra of compound **12c**





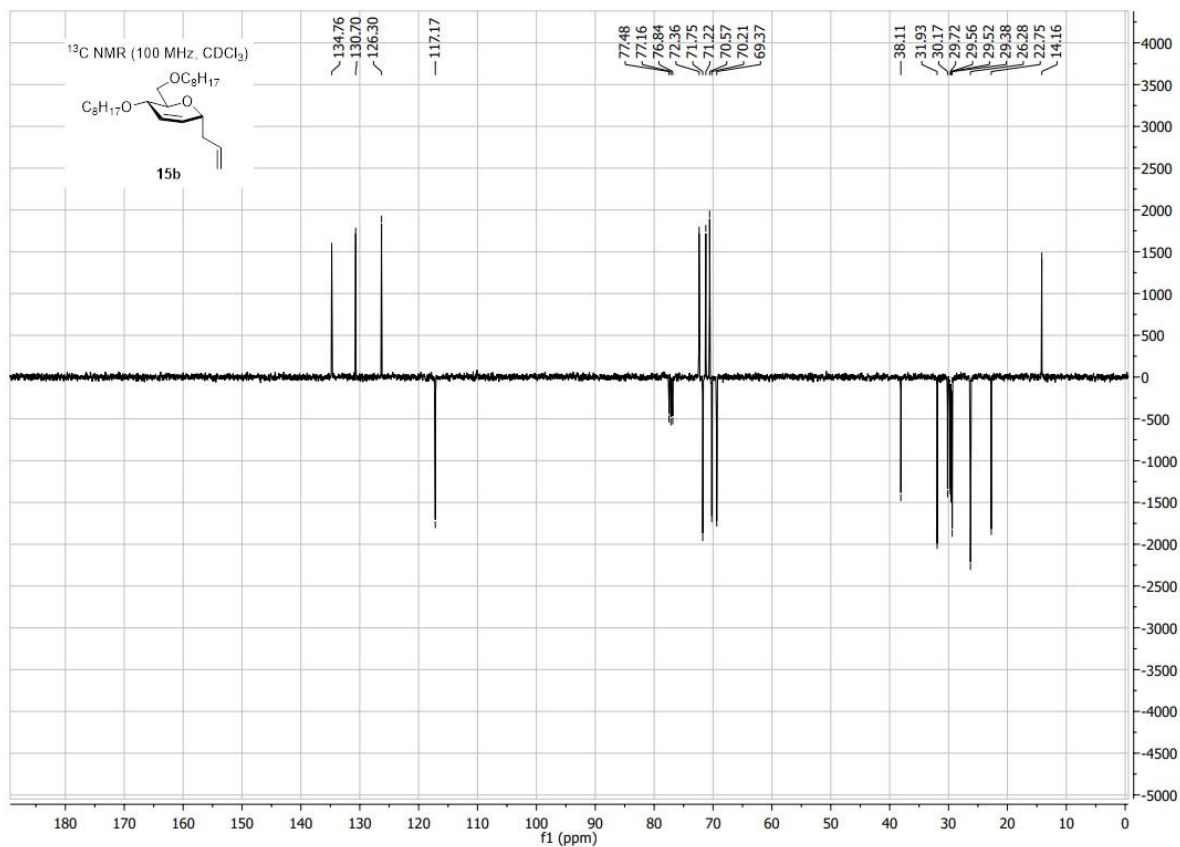
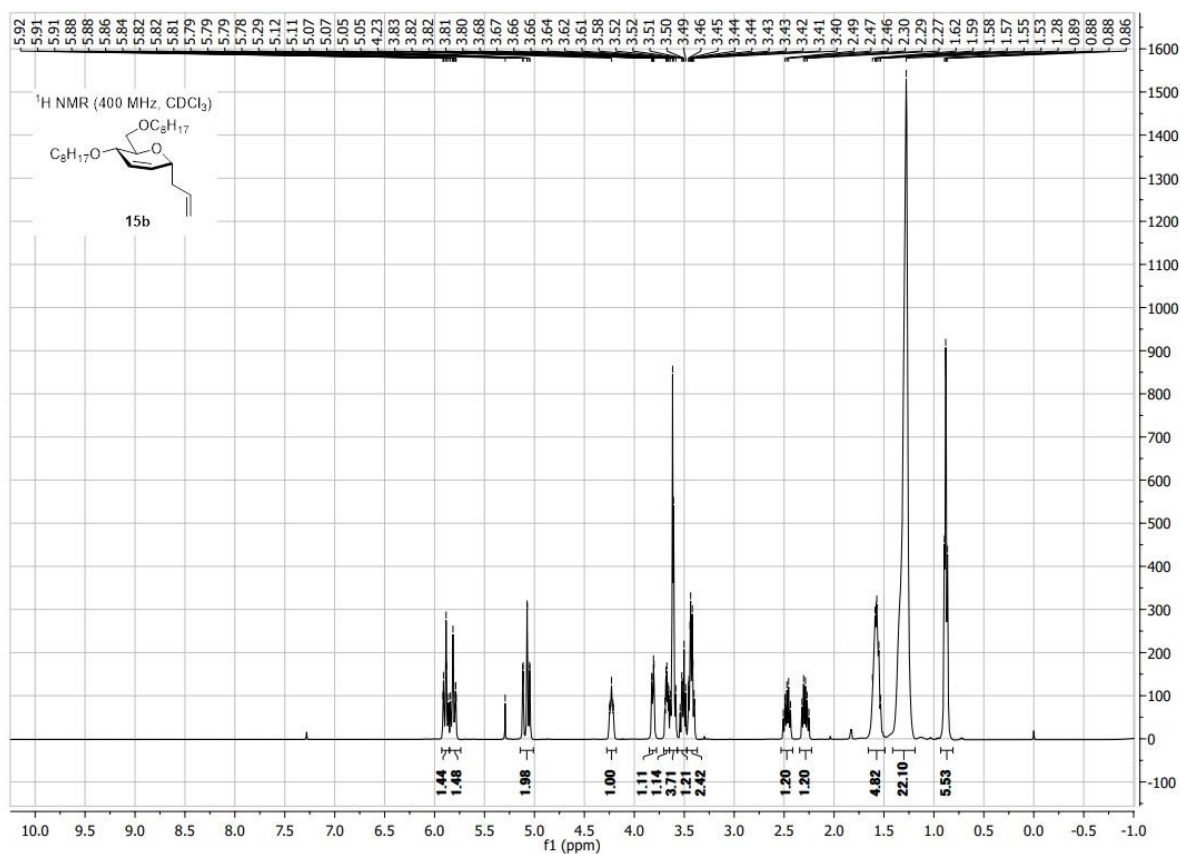
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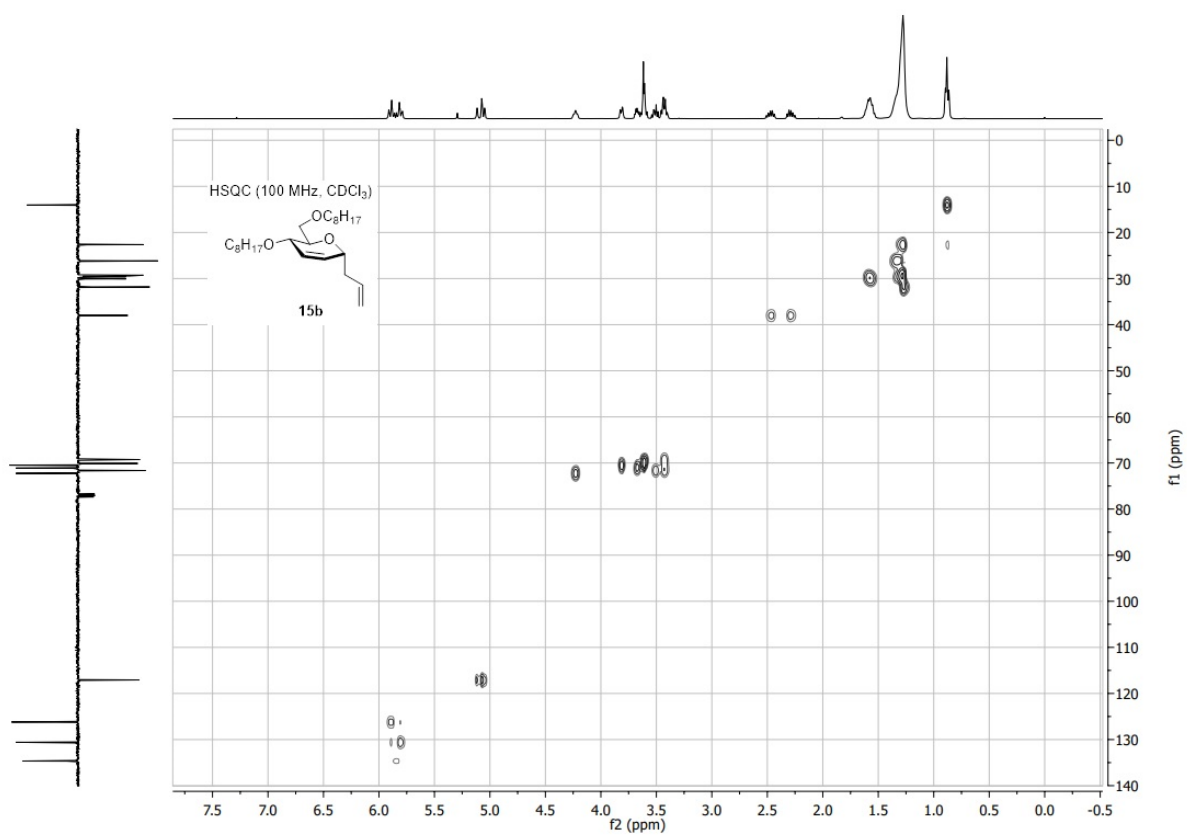
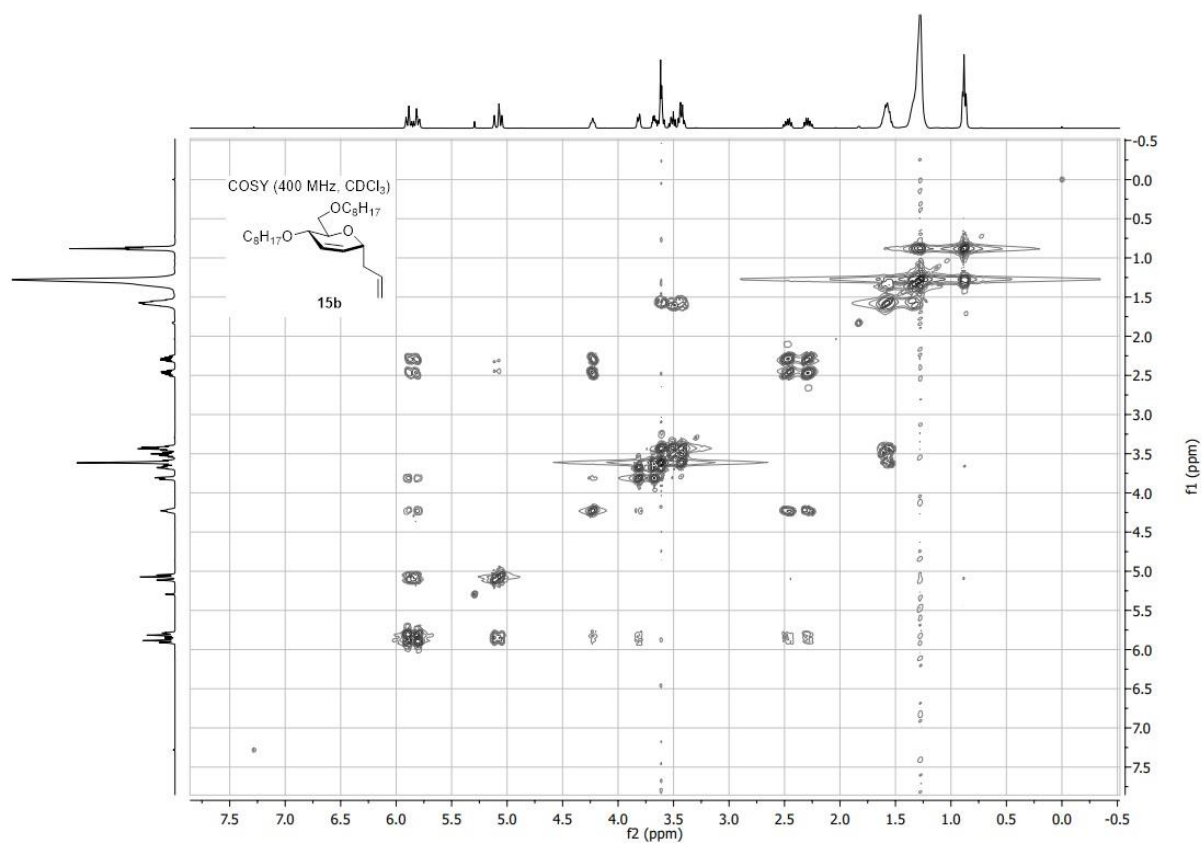




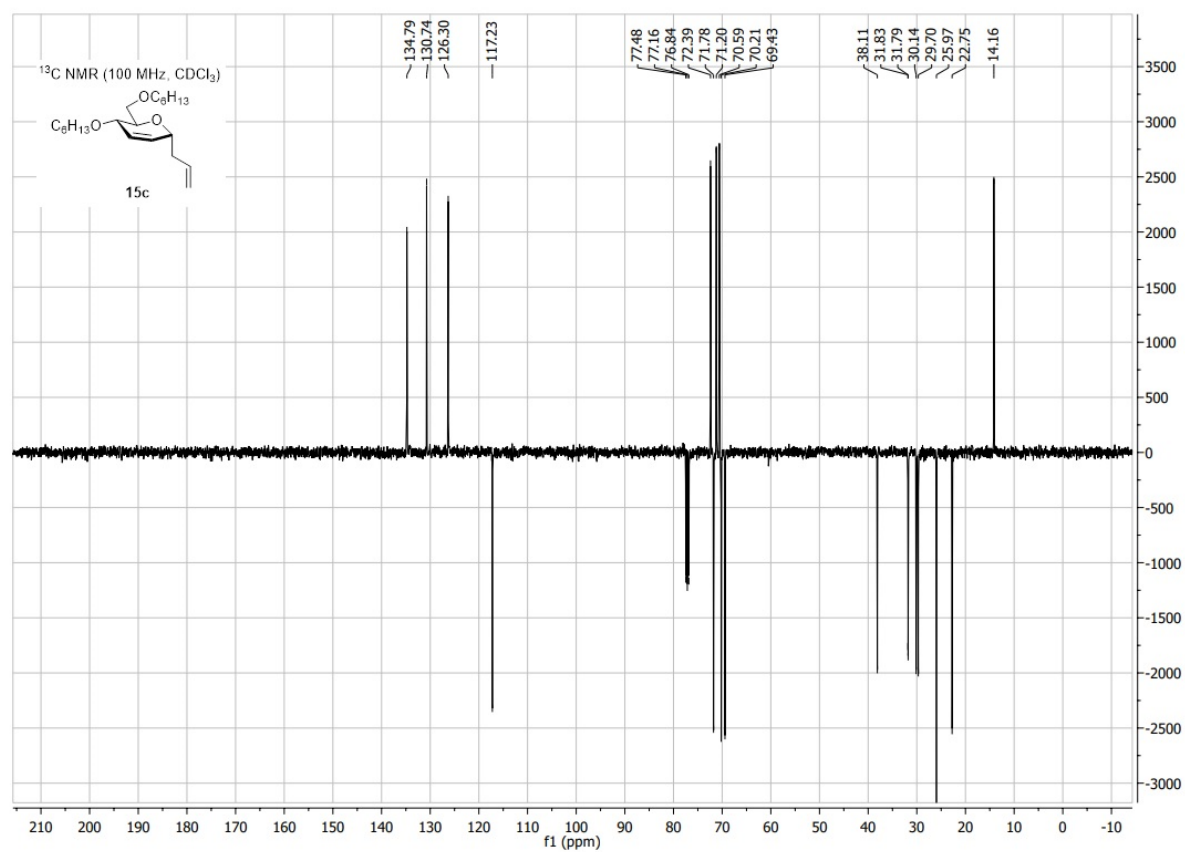
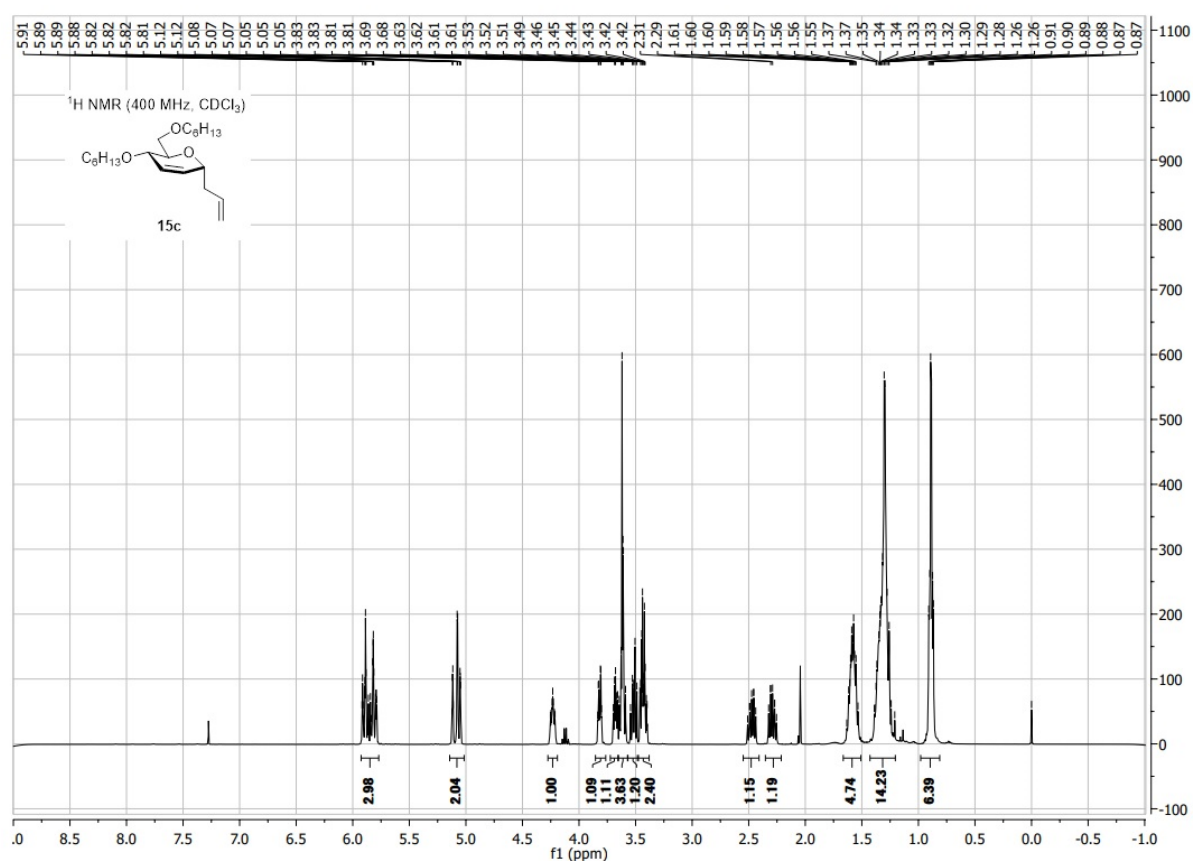
# NMR spectra of compound **15b**

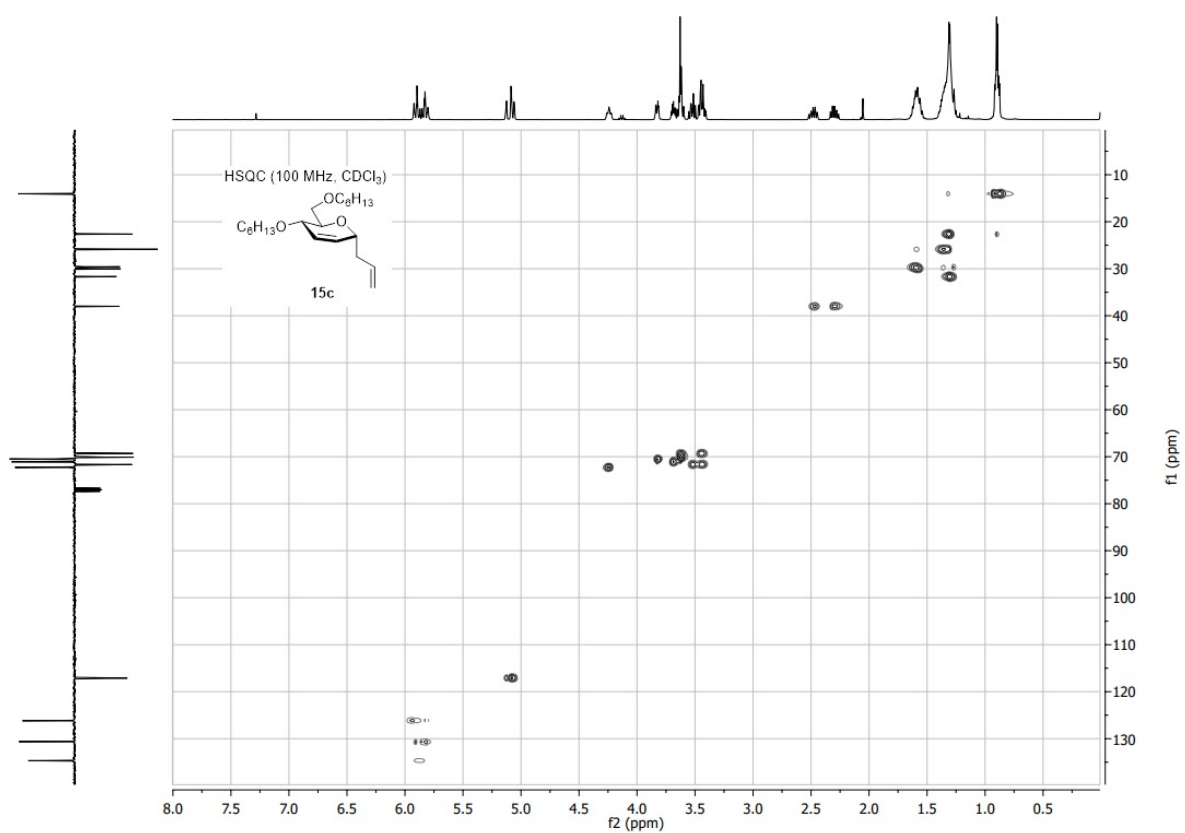
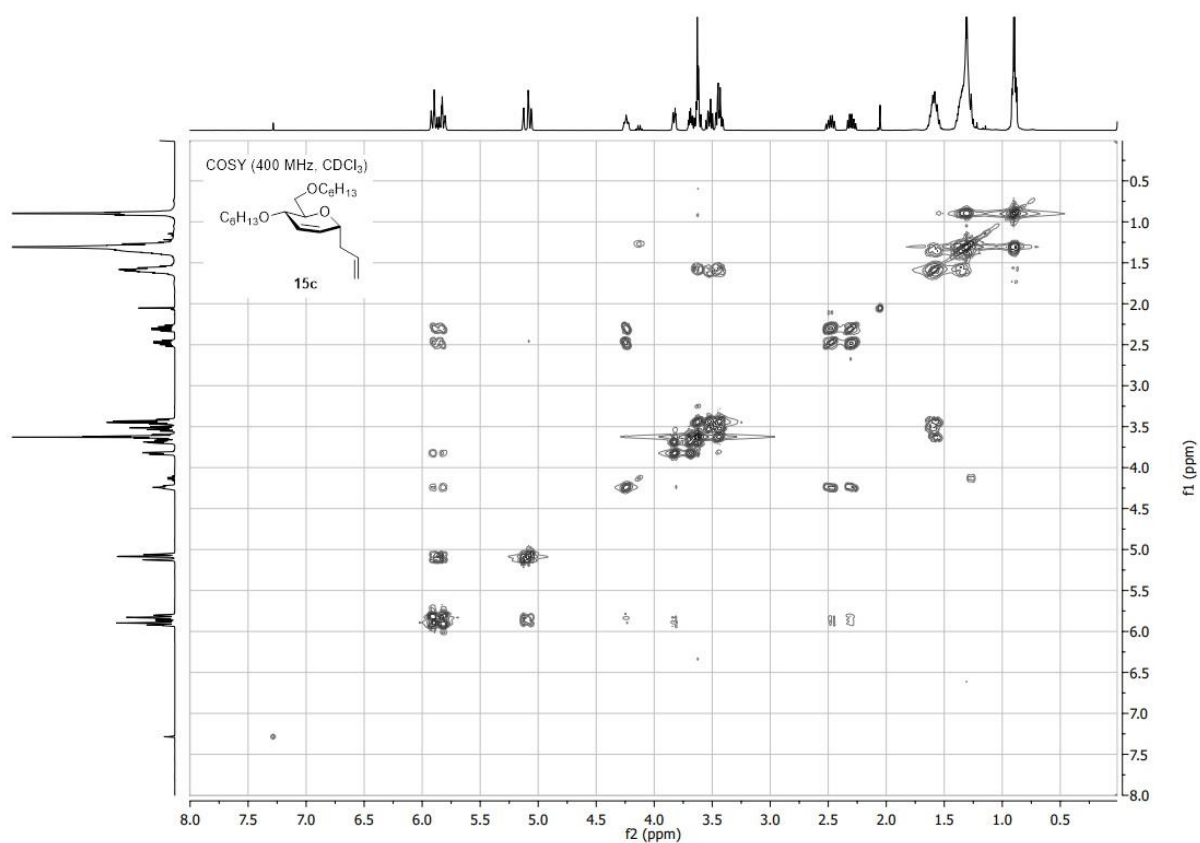




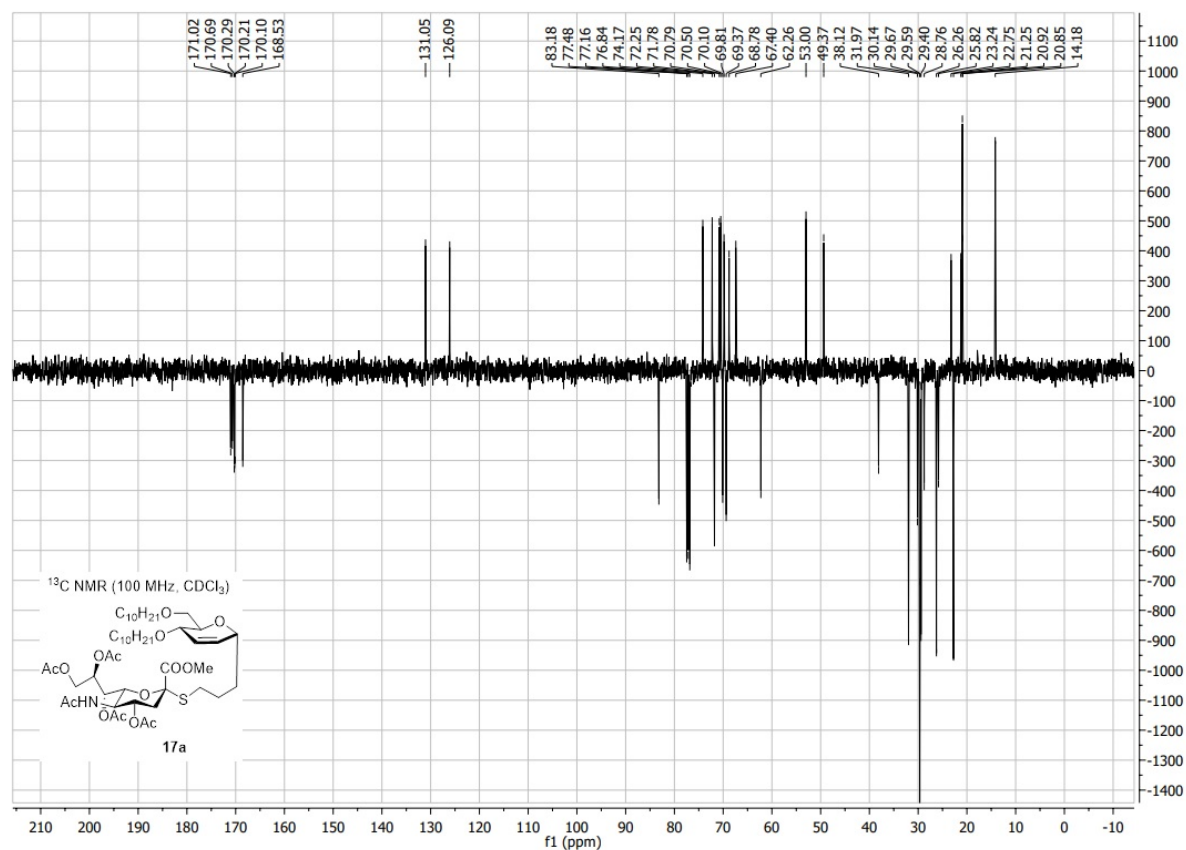
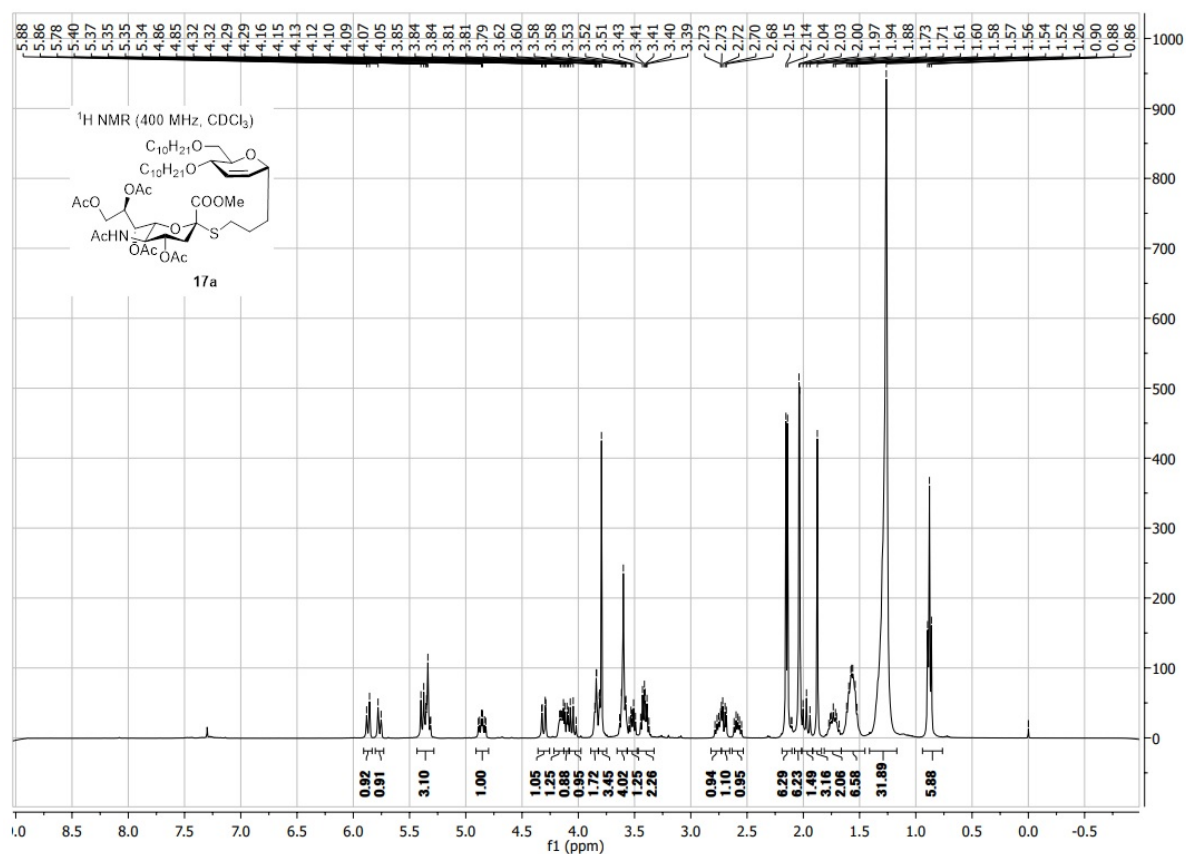


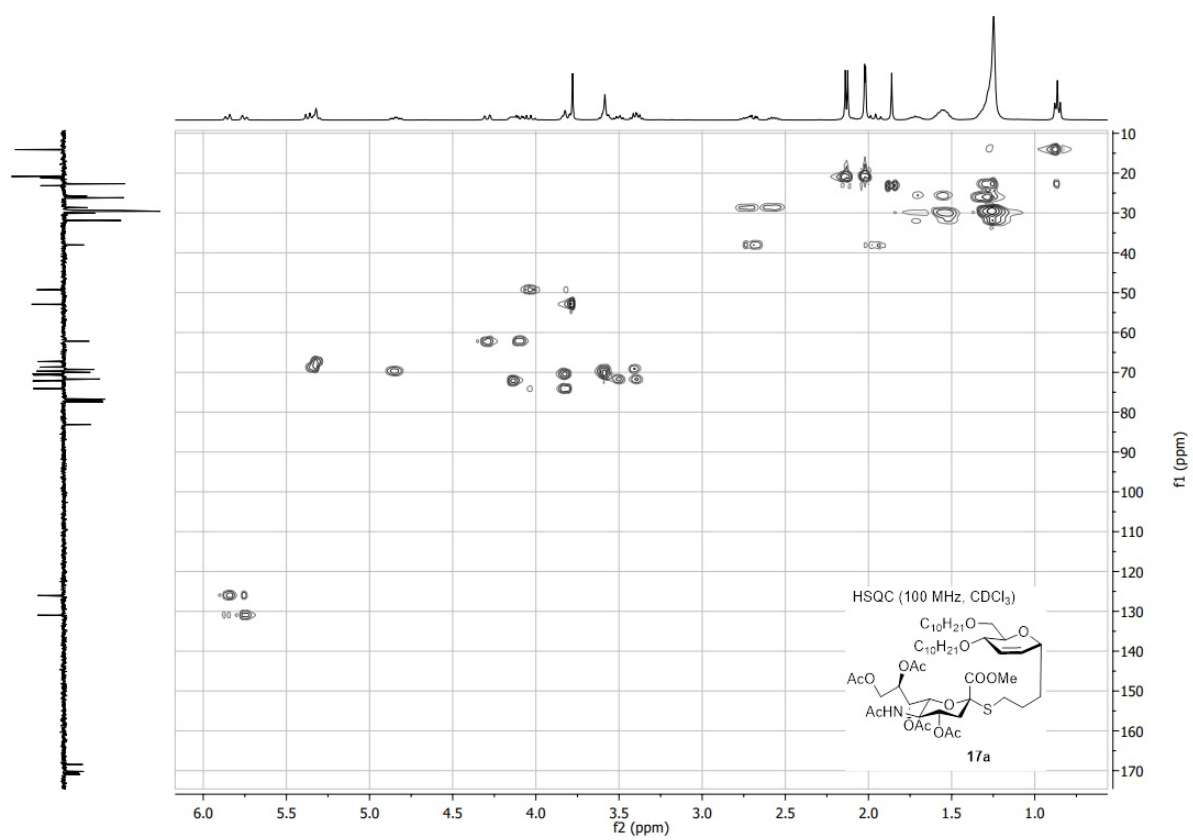
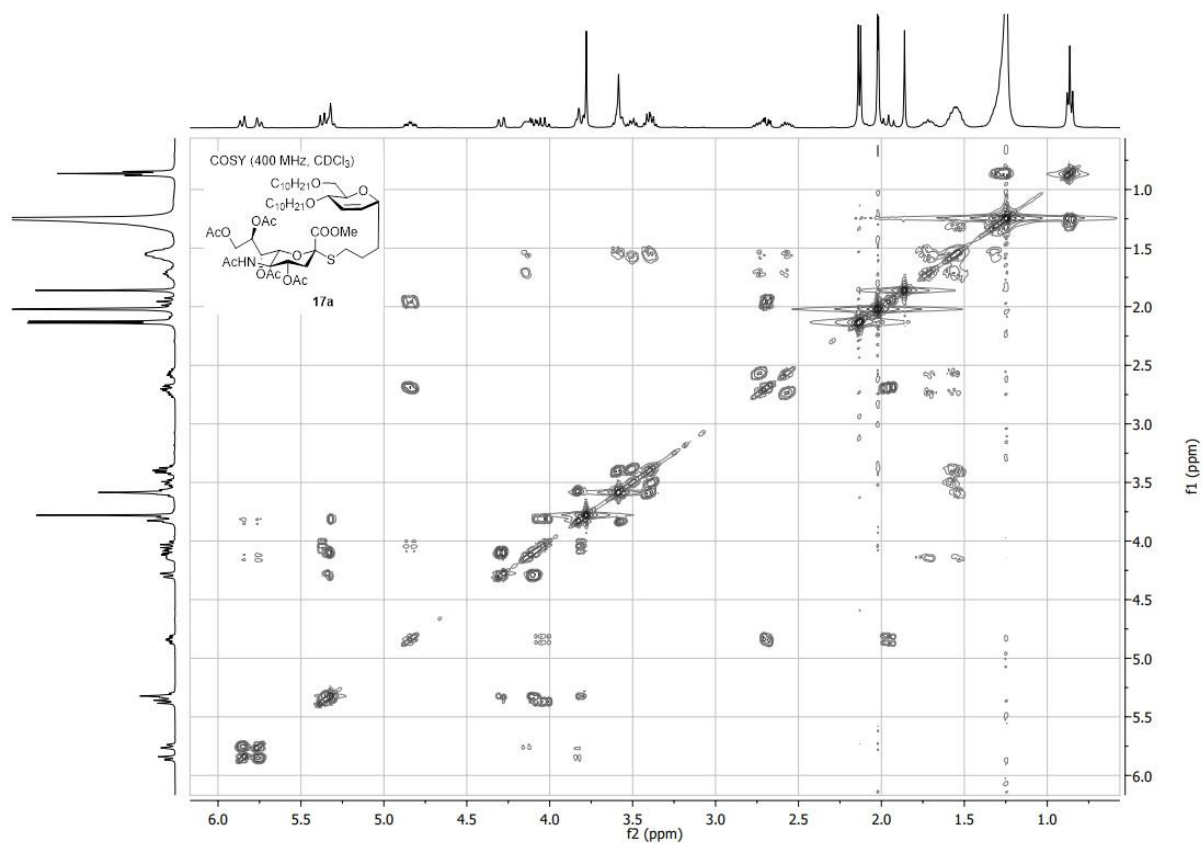
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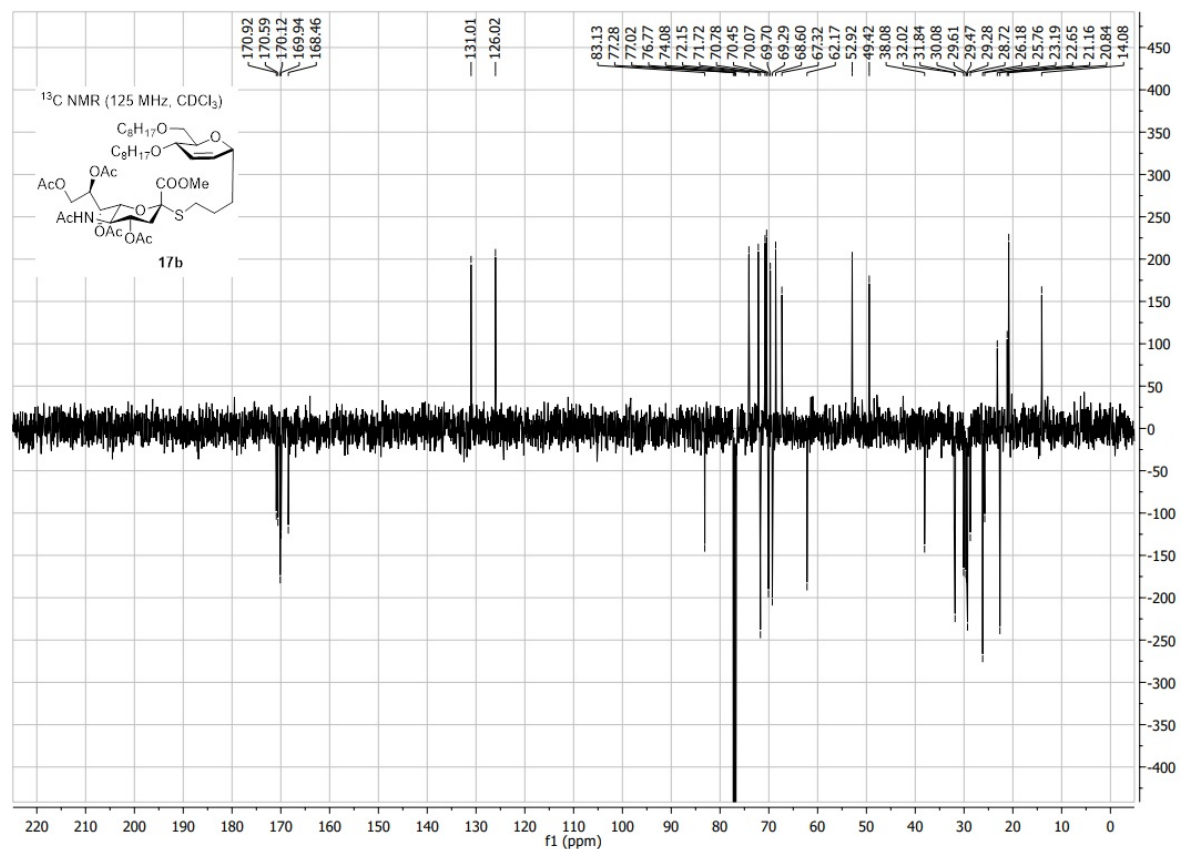
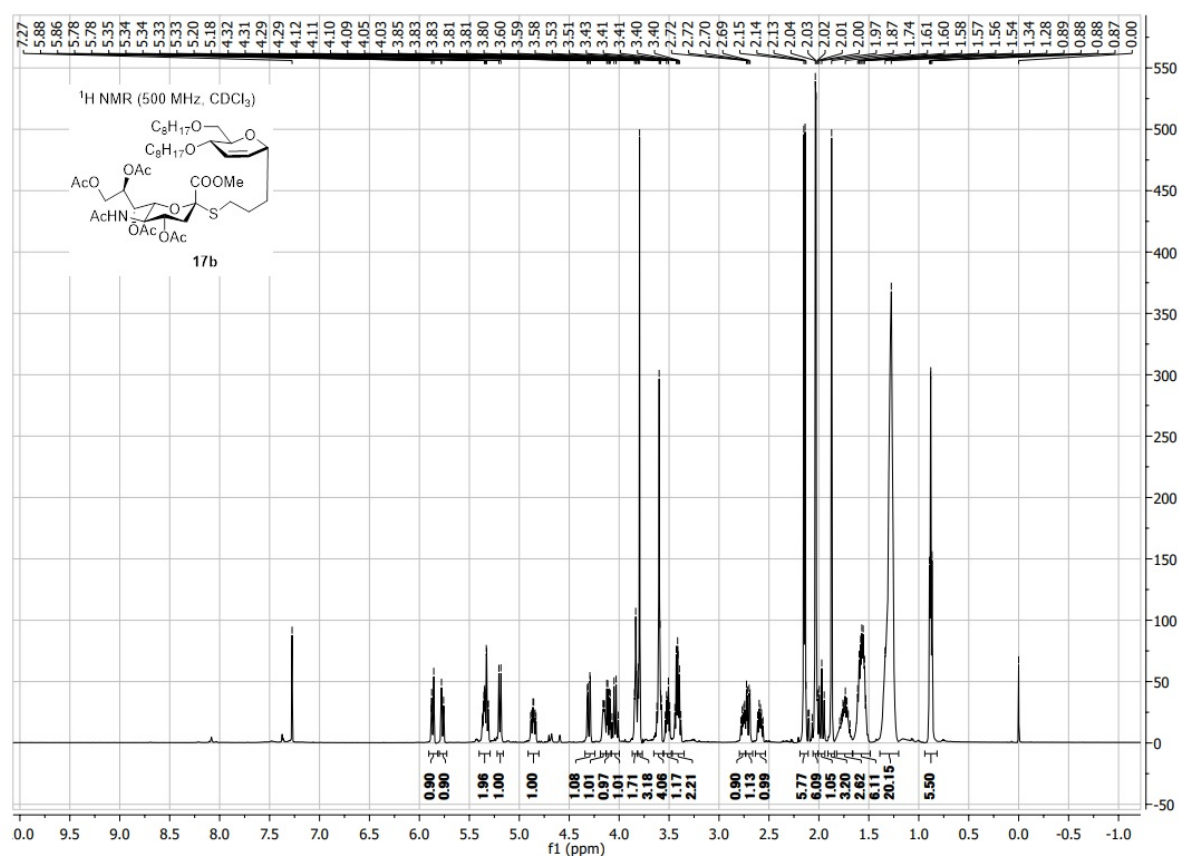


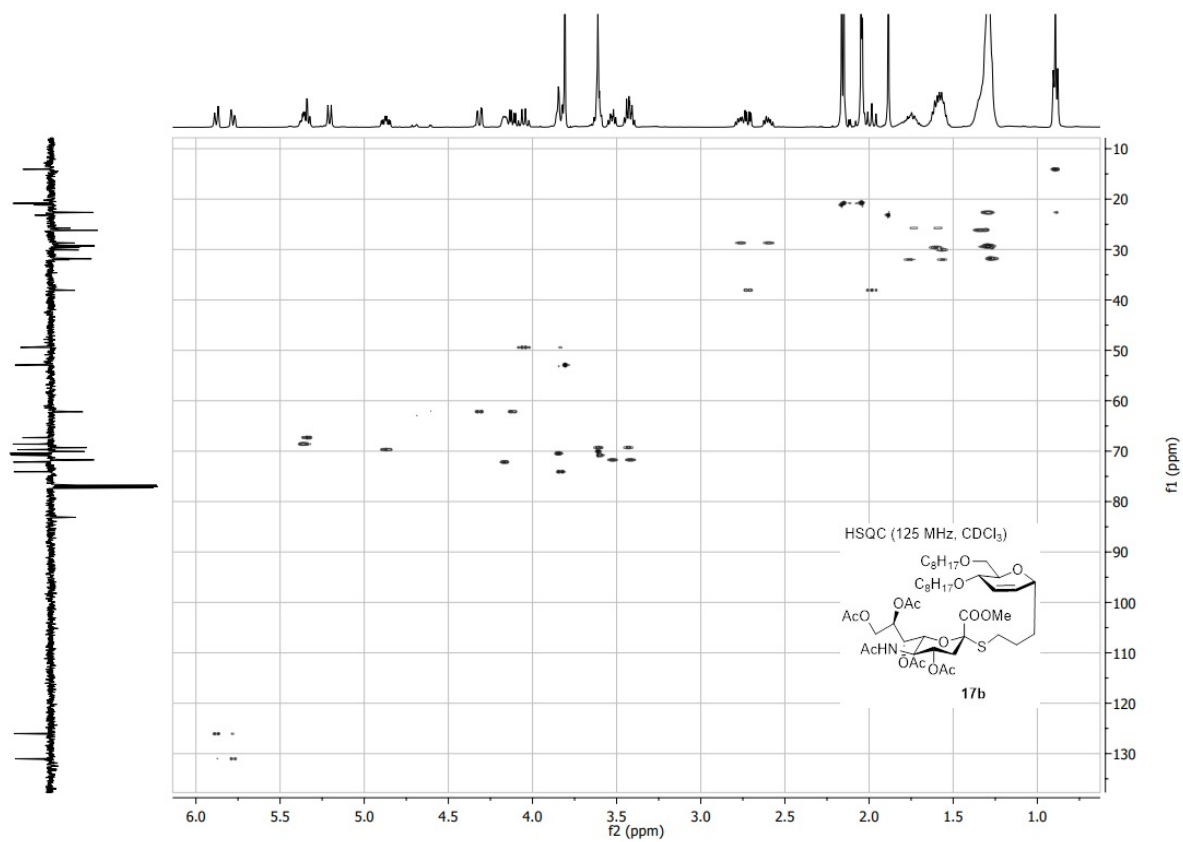
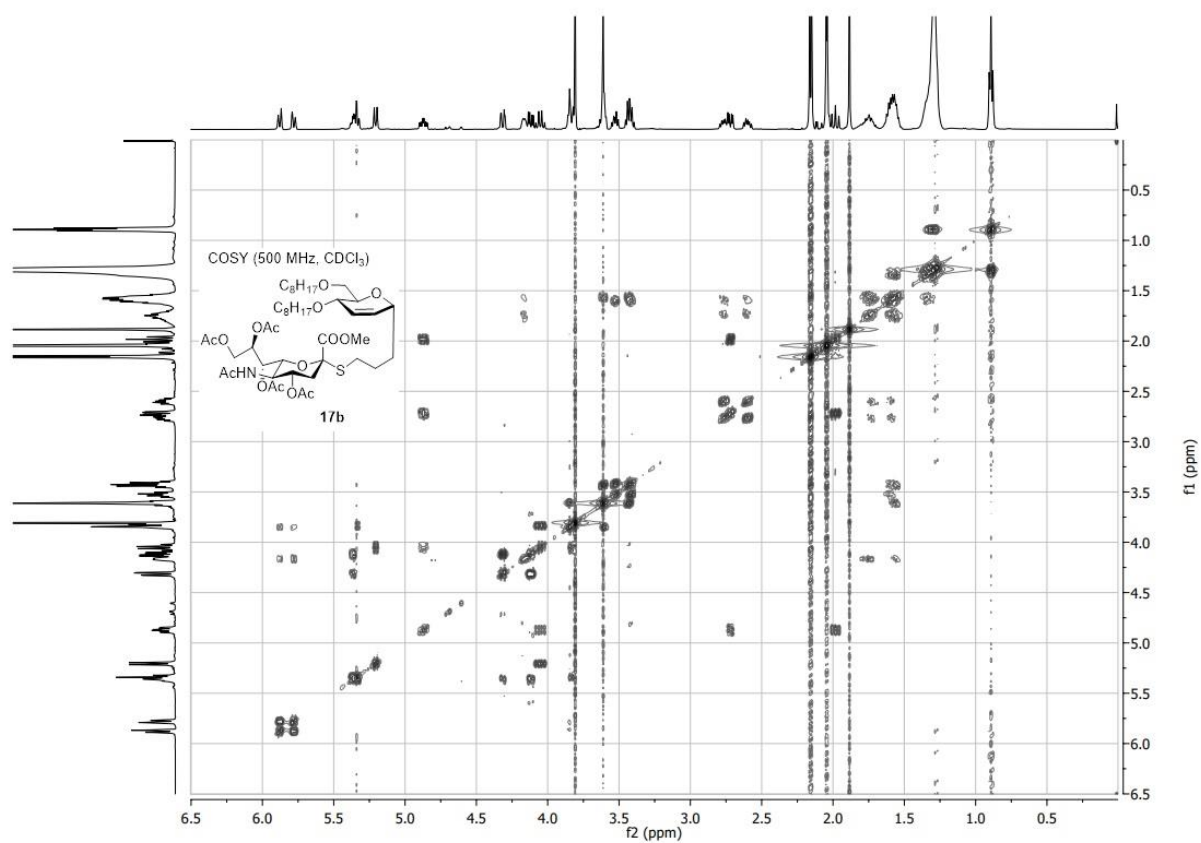
# NMR spectra of compound **17a**





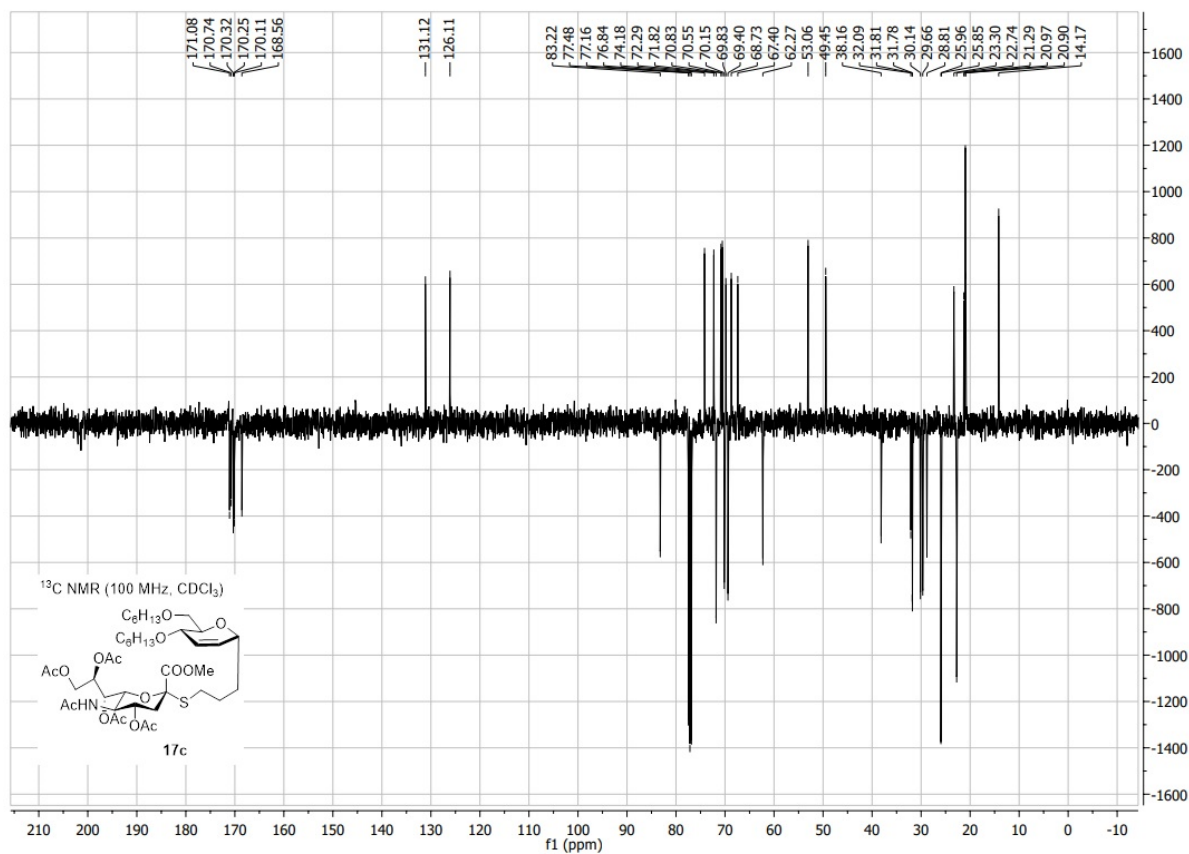
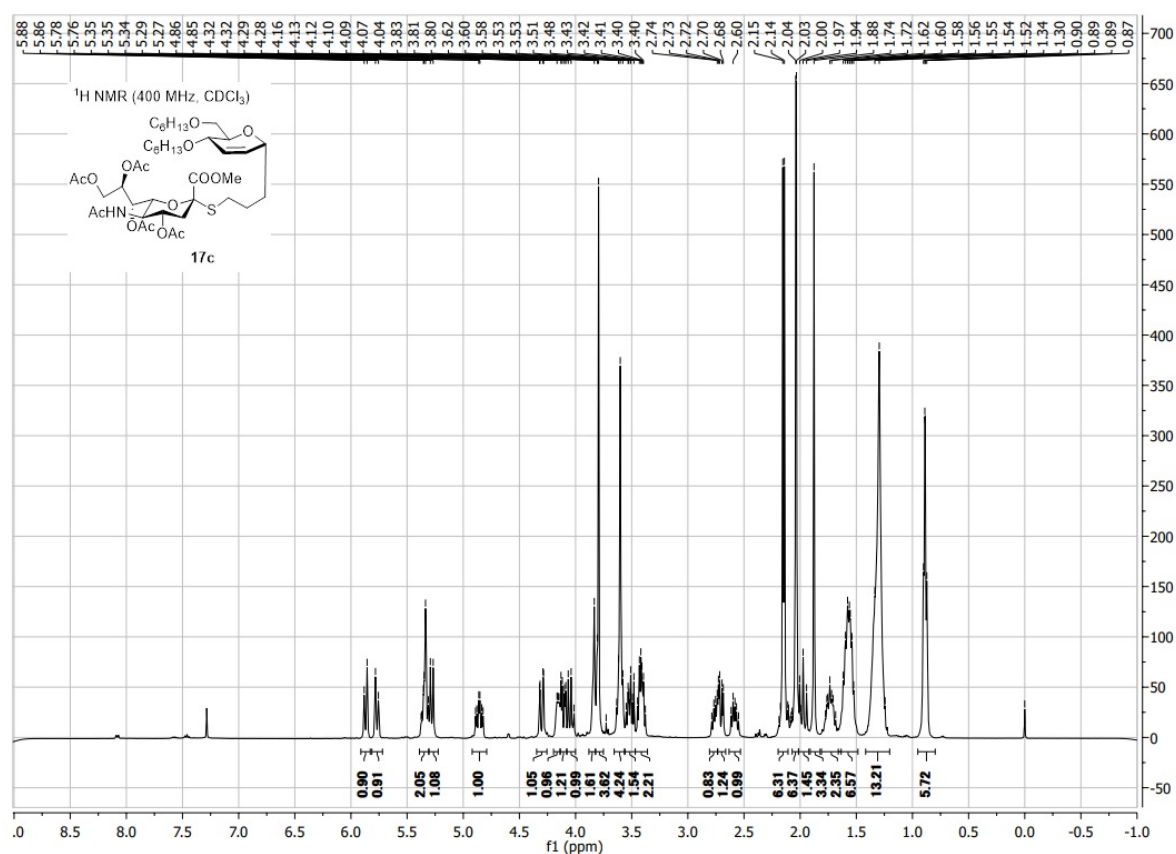
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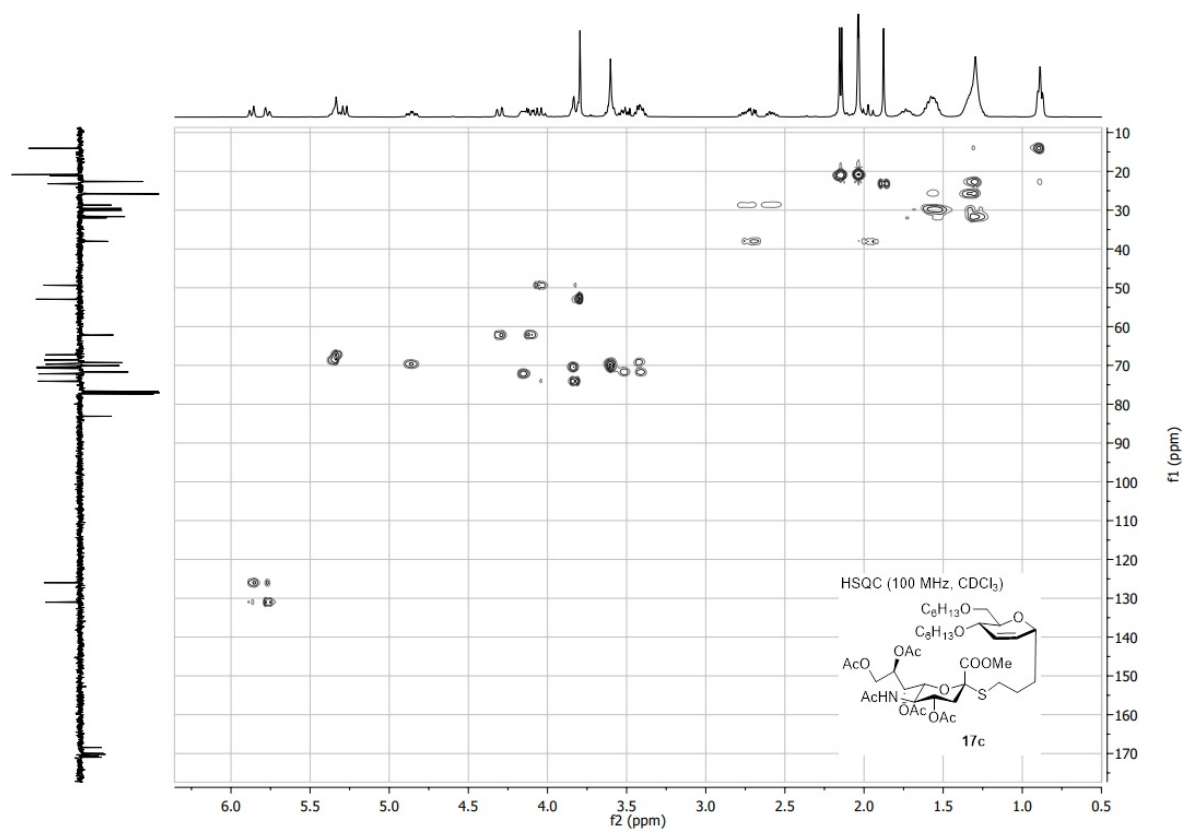
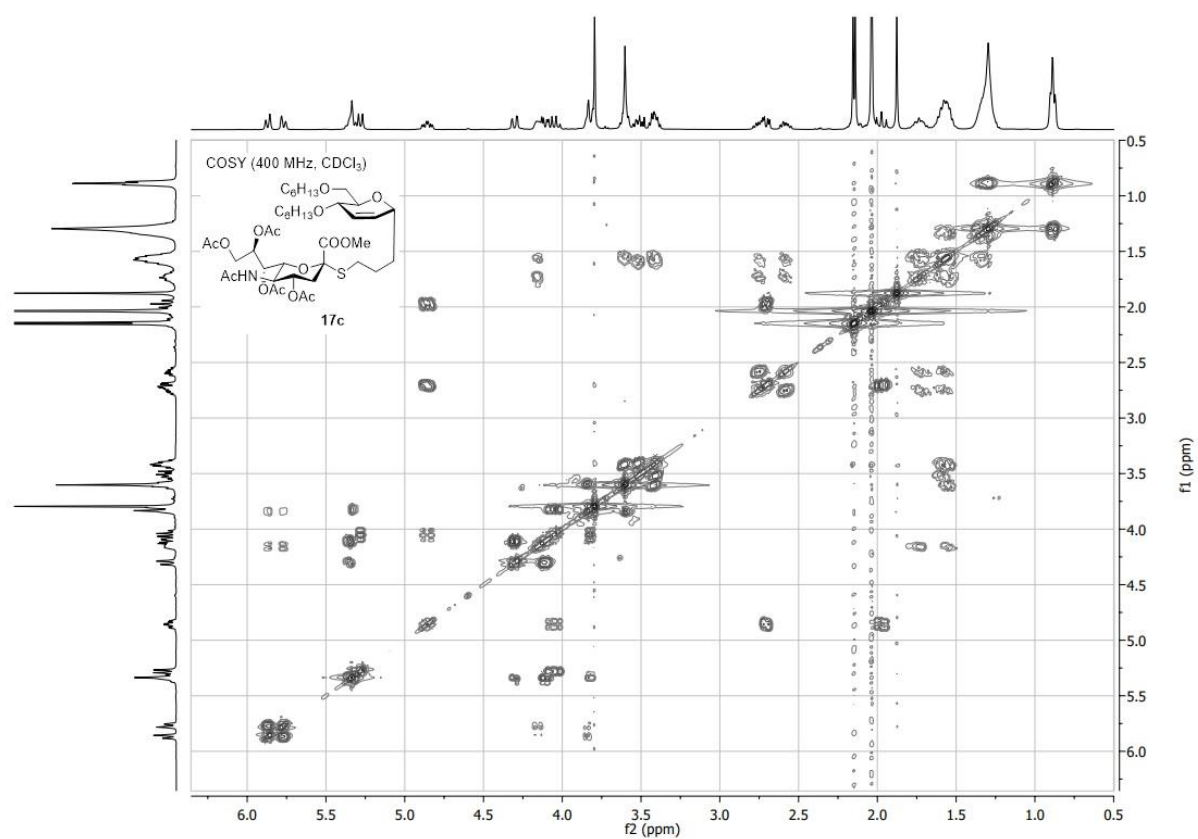




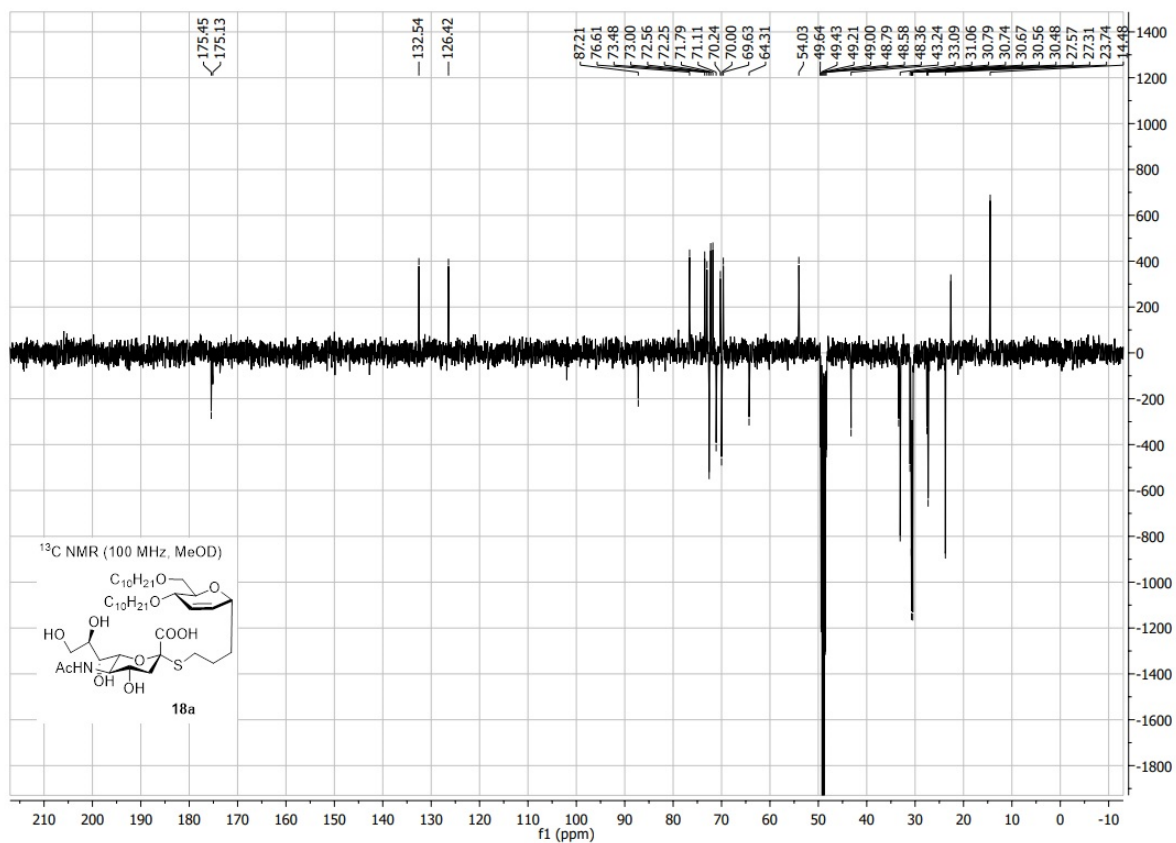
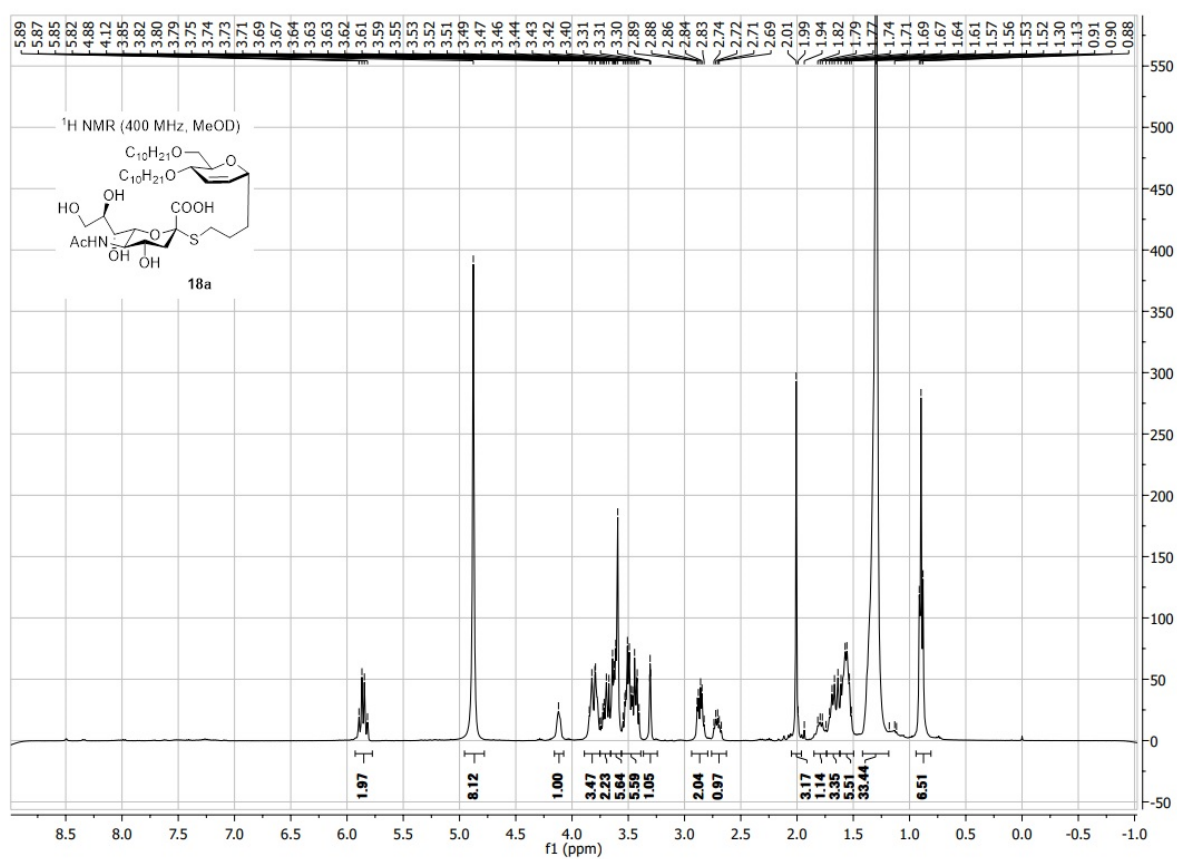
# NMR spectra of compound **17c**

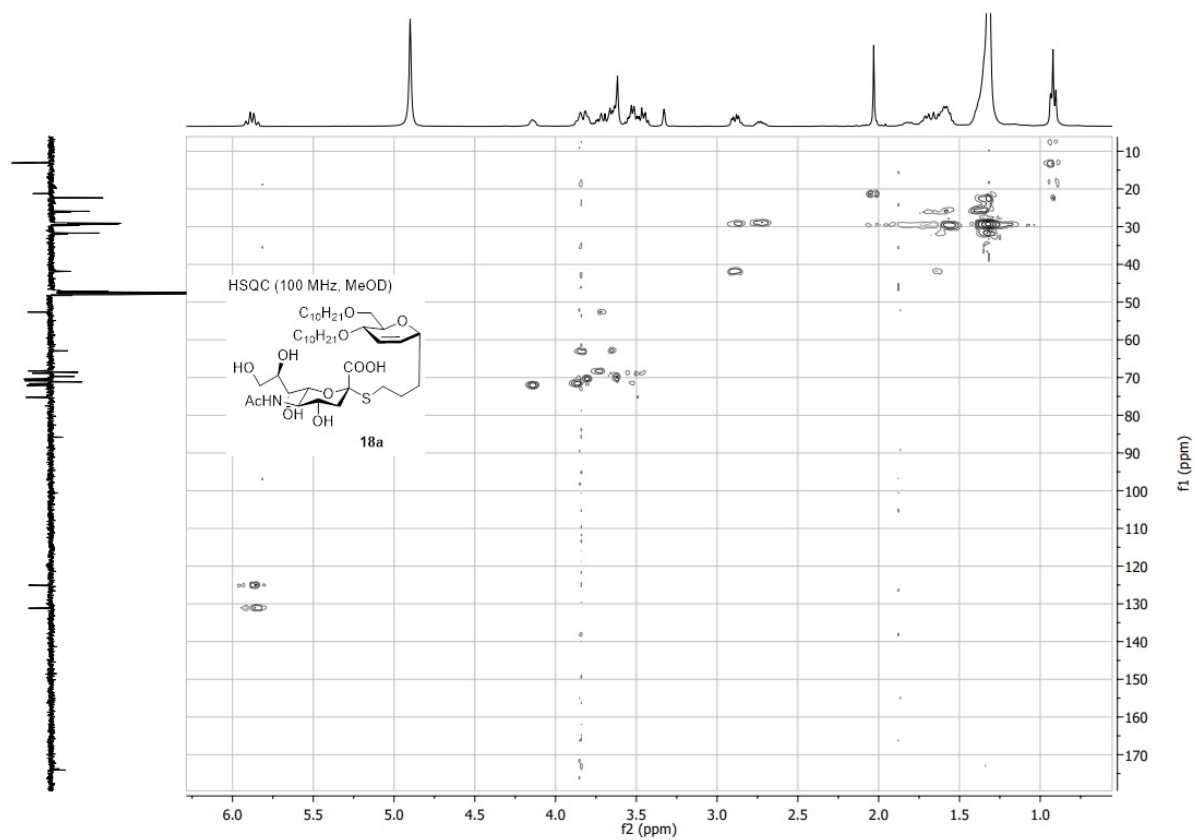
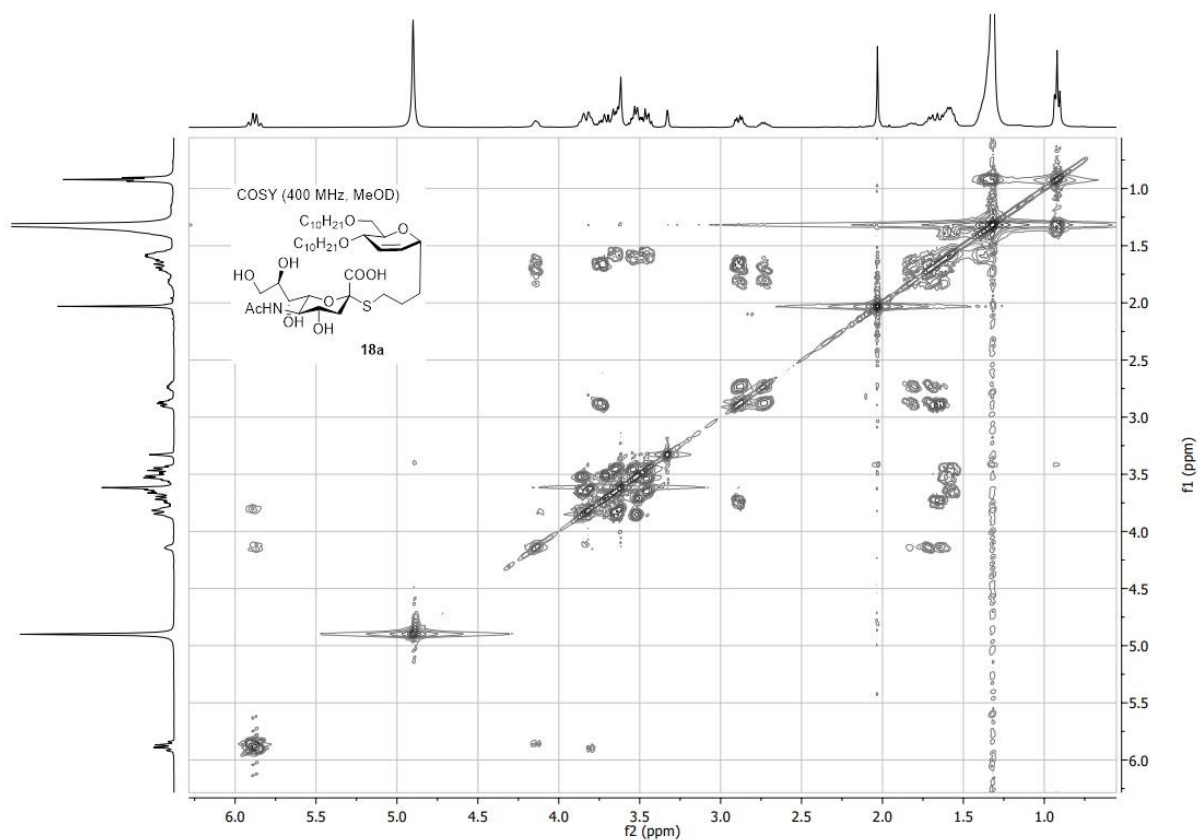




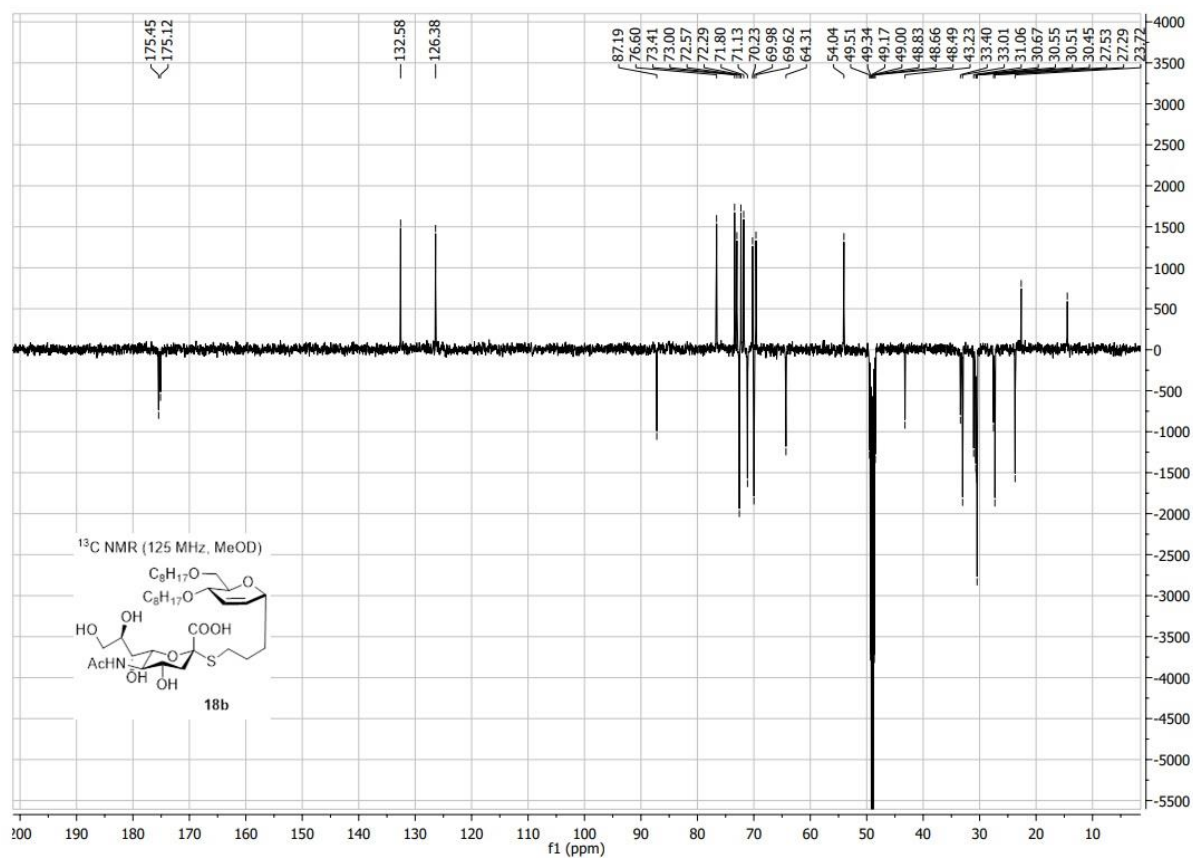
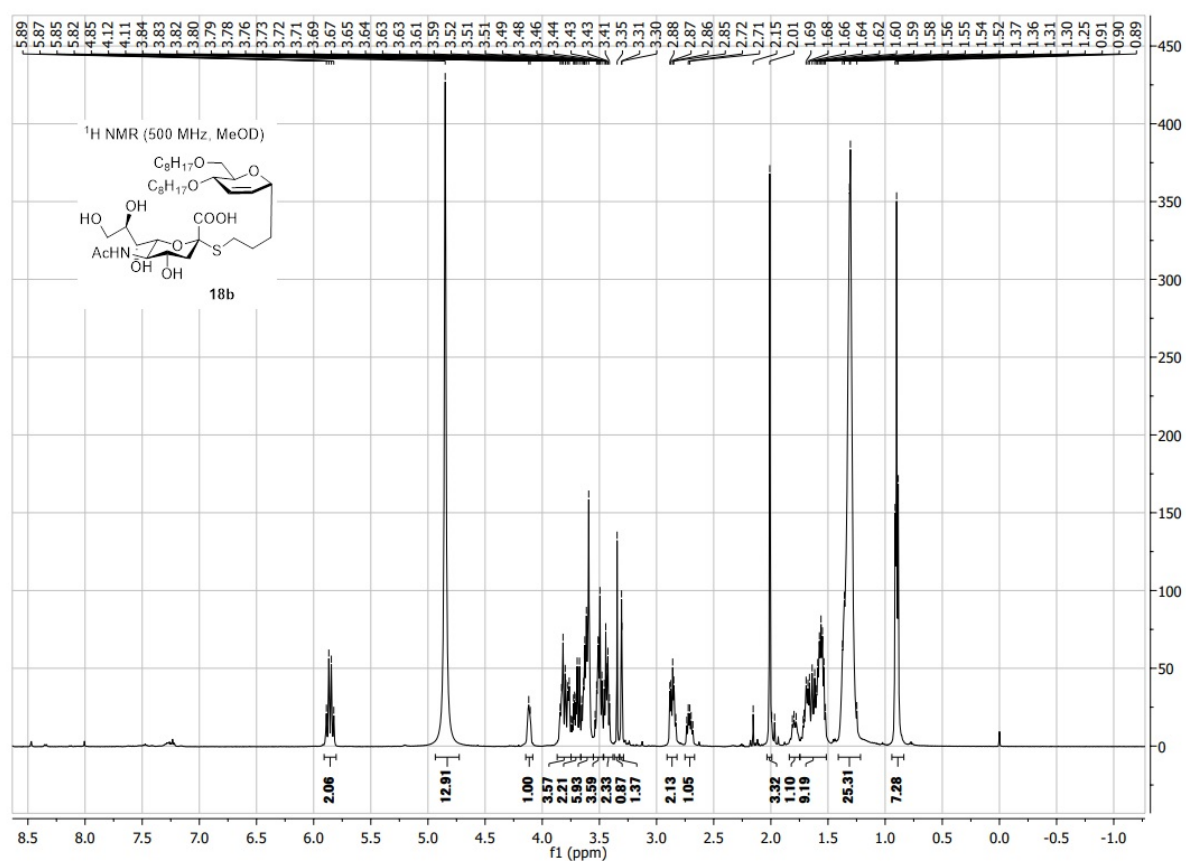


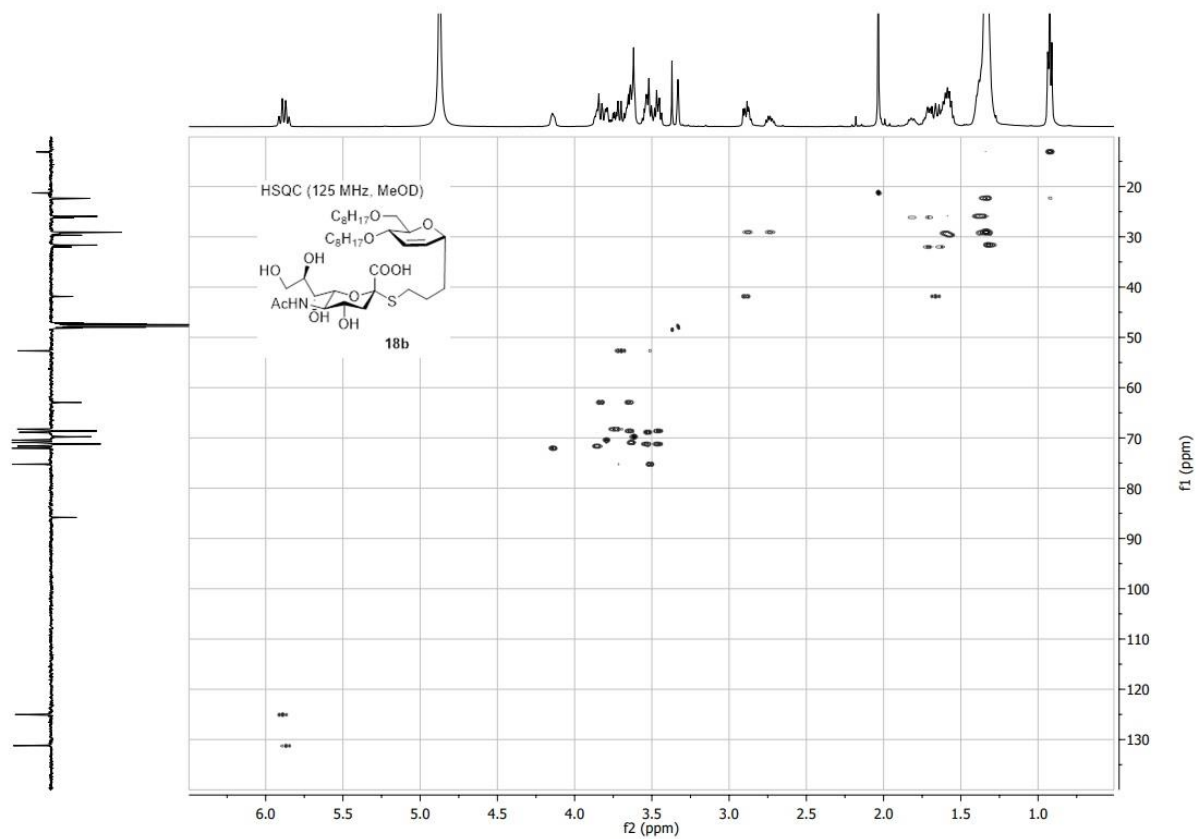
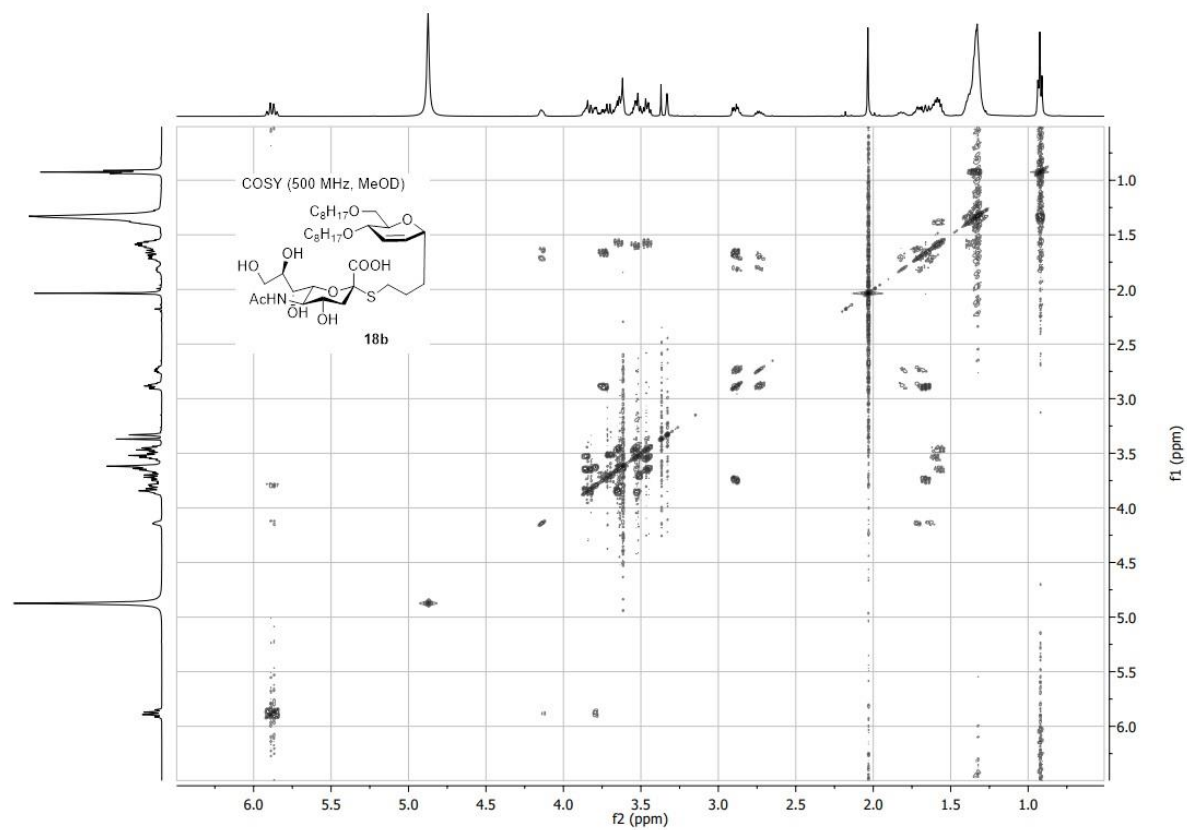
# NMR spectra of compound **18a**

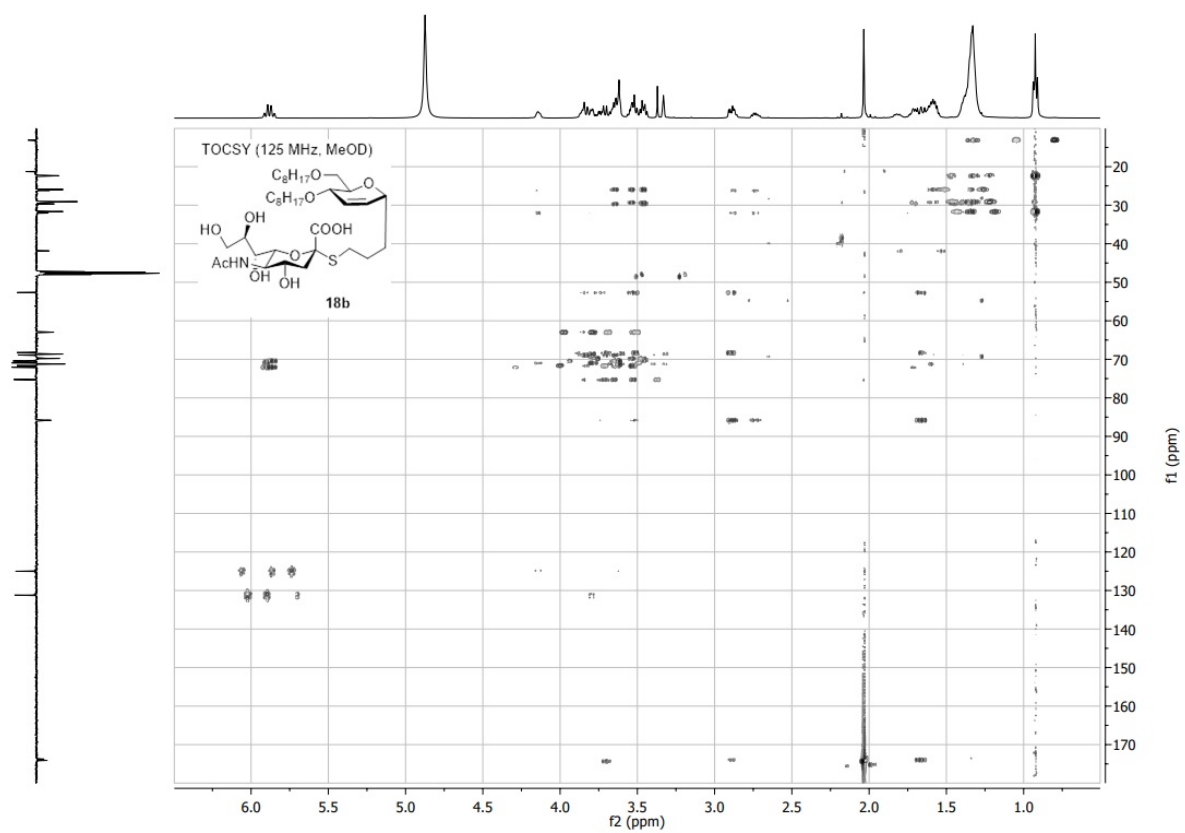
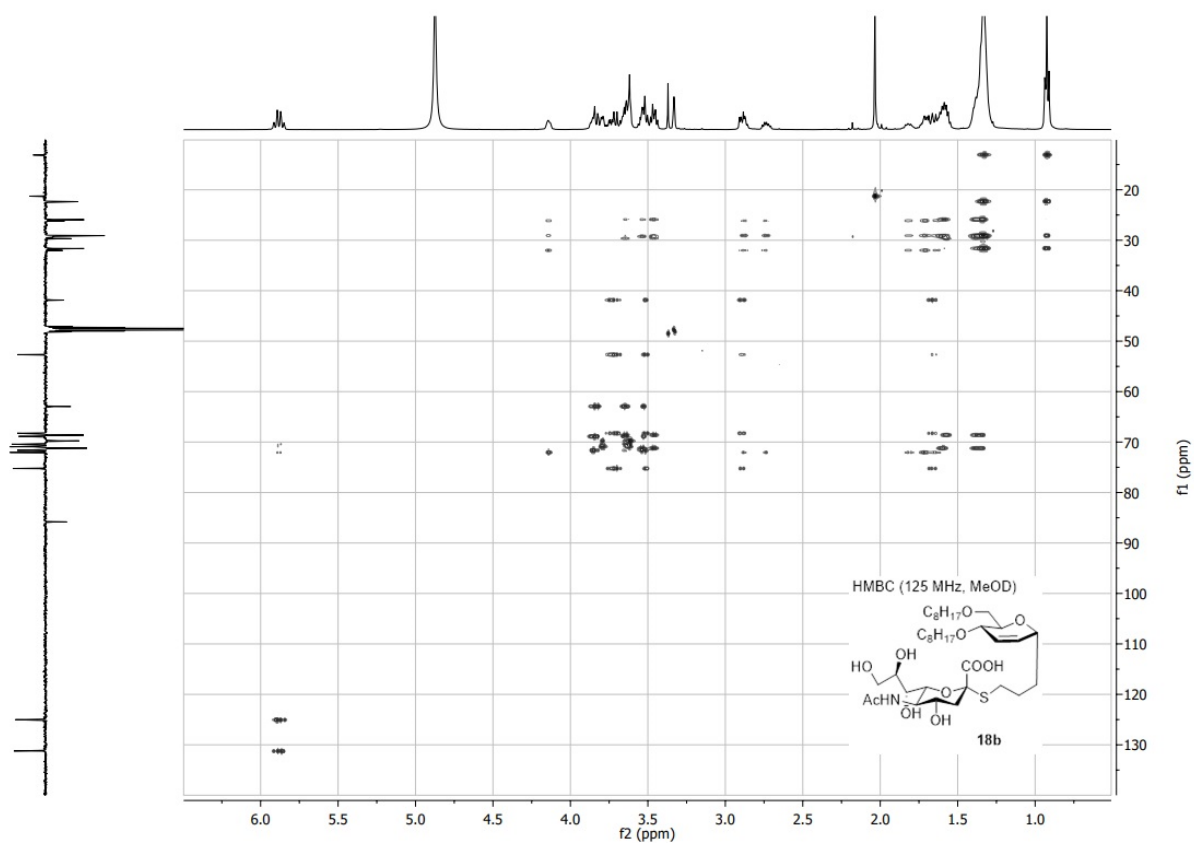




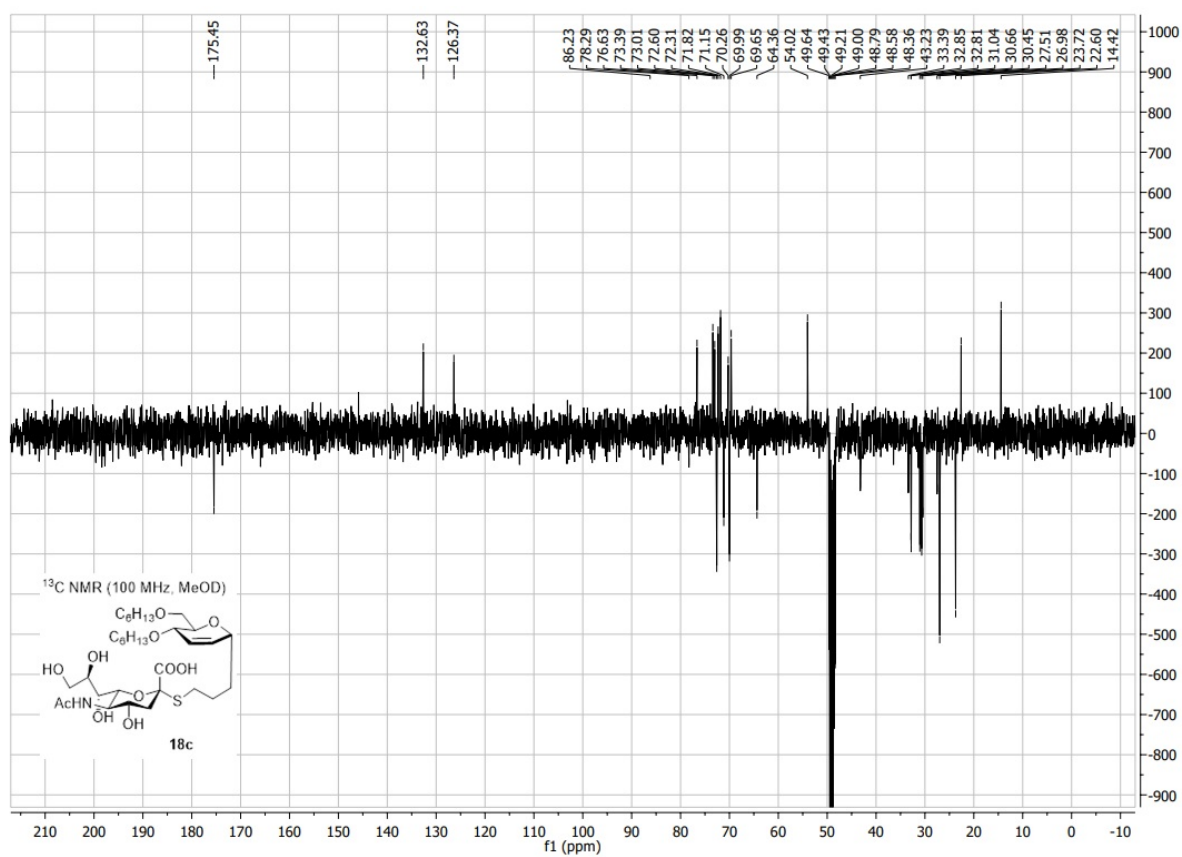
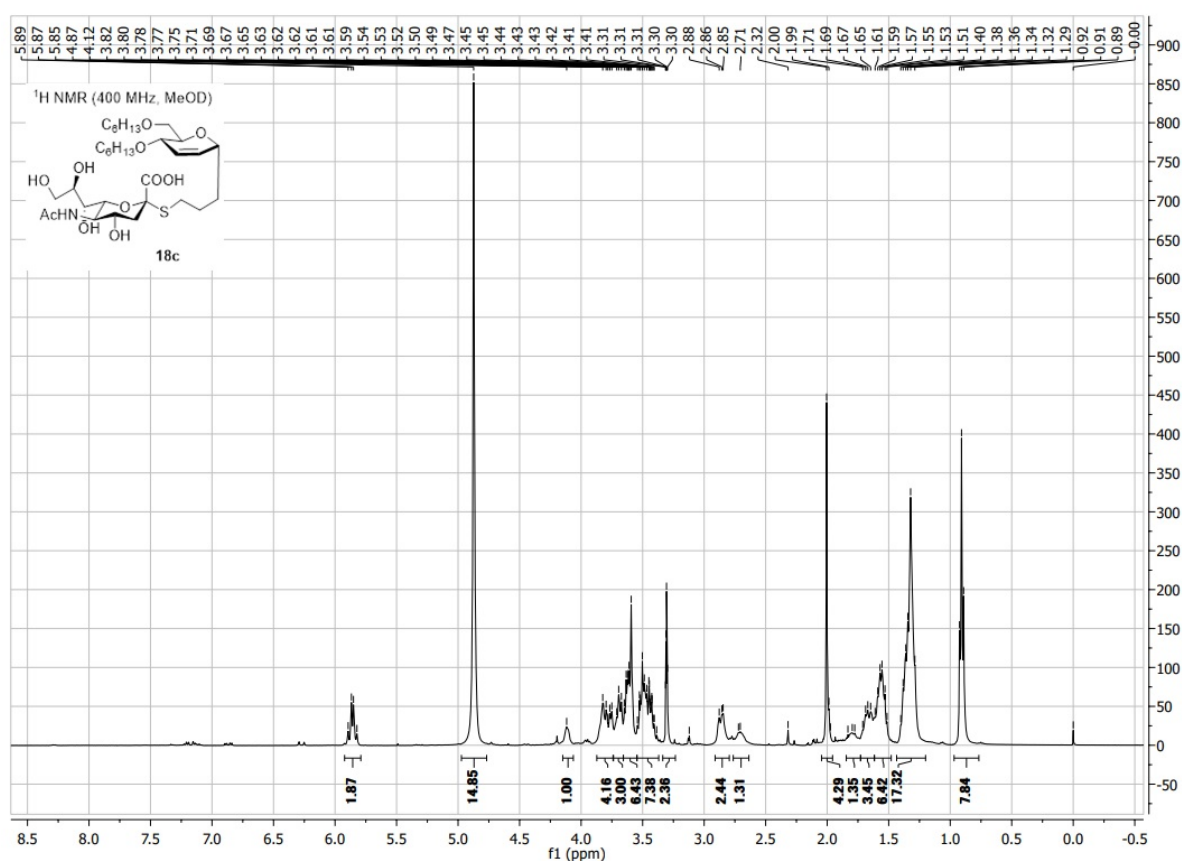
# NMR spectra of compound **18b**



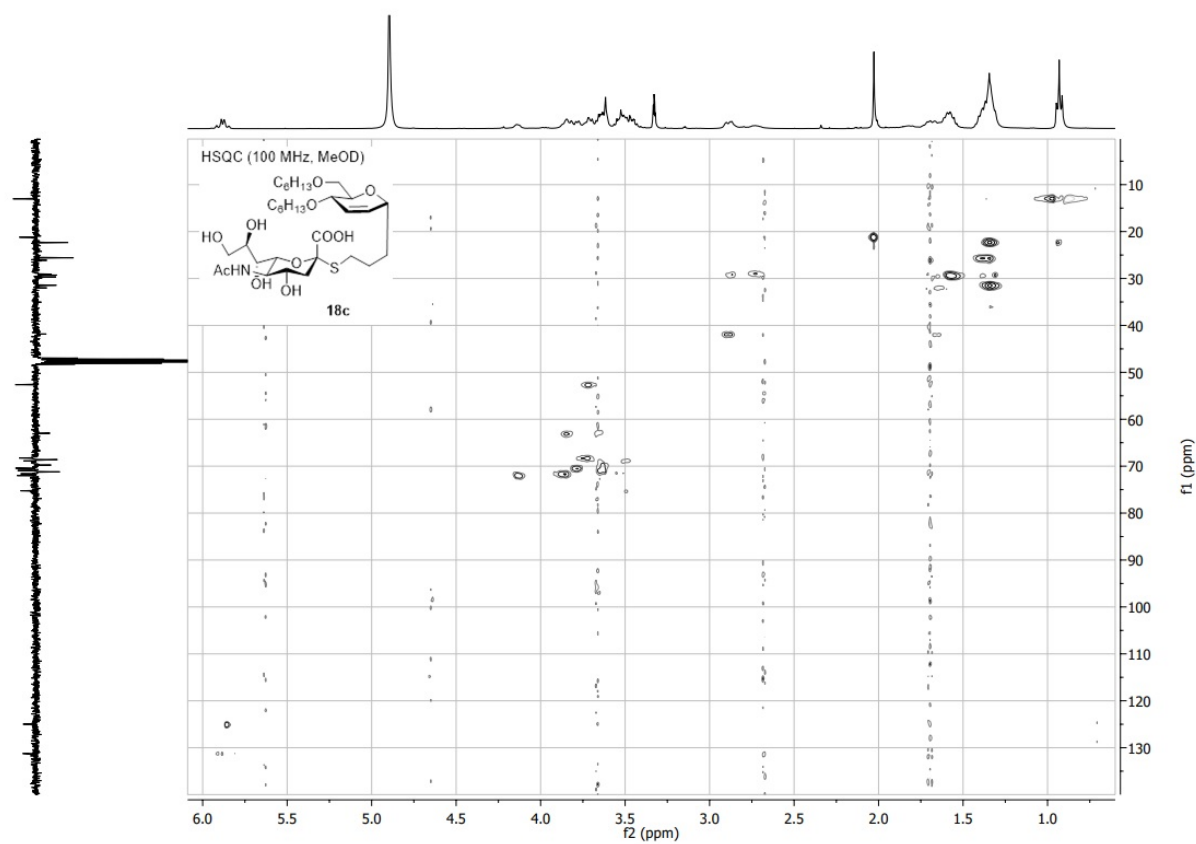
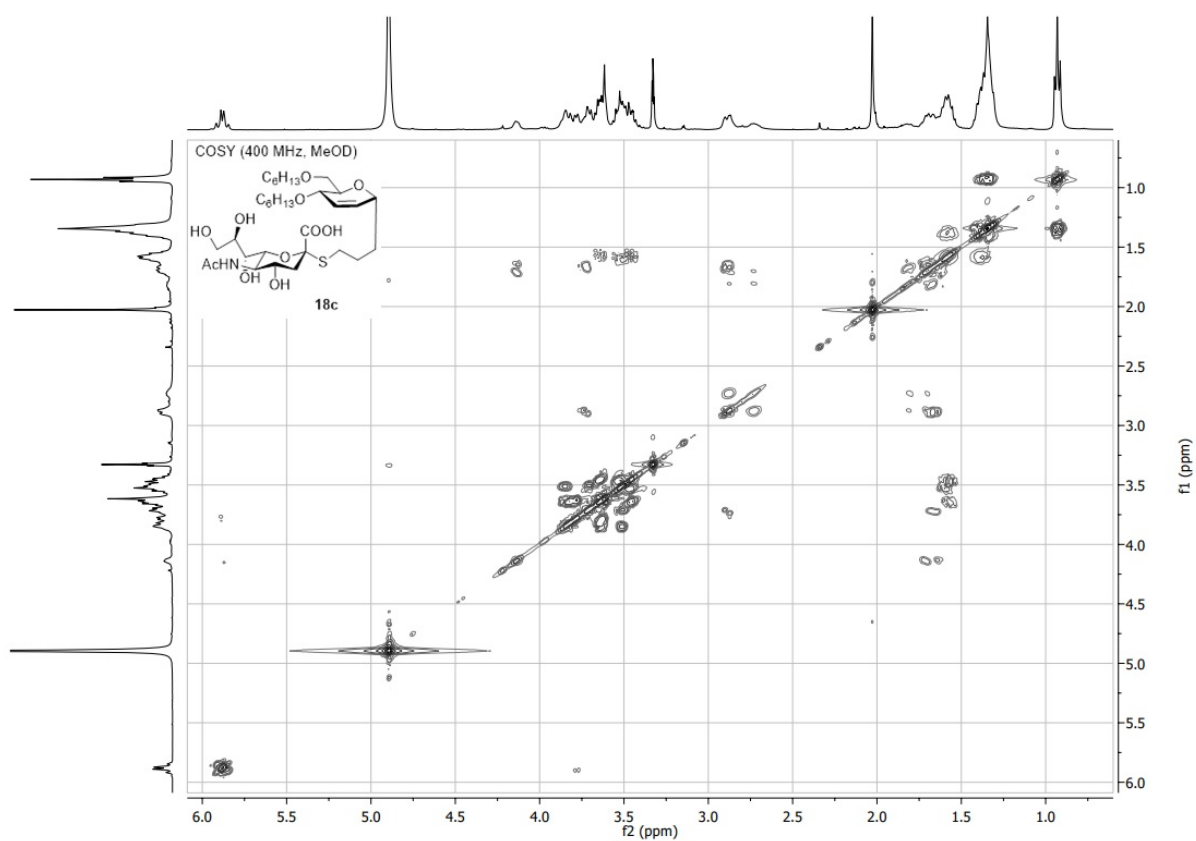




# NMR spectra of compound **18c**

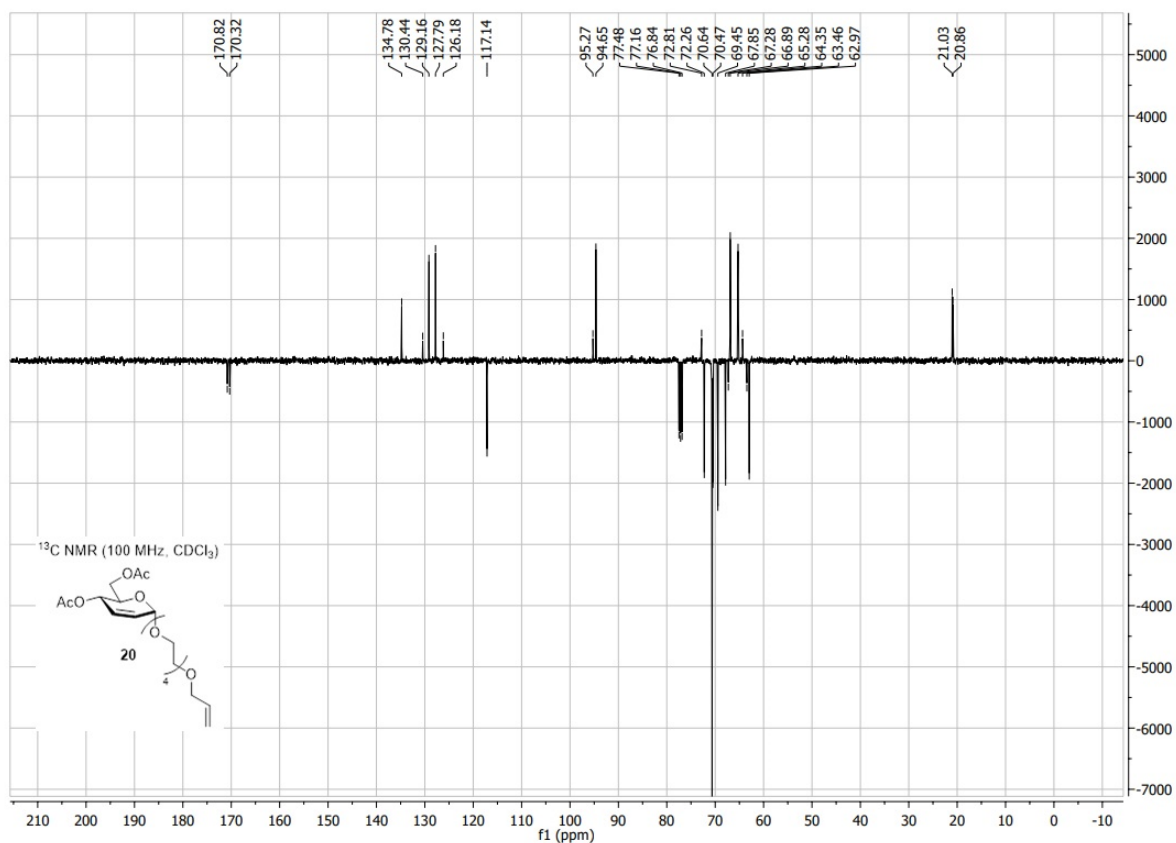
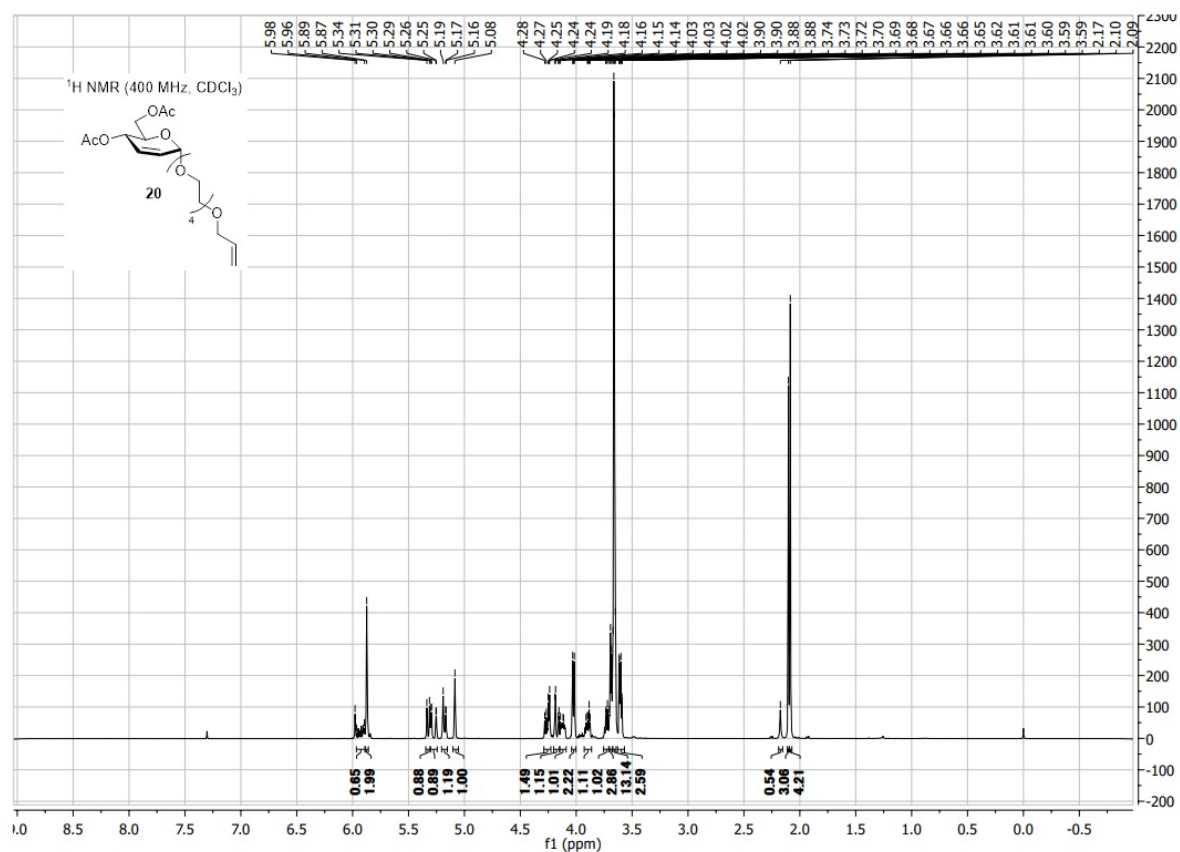


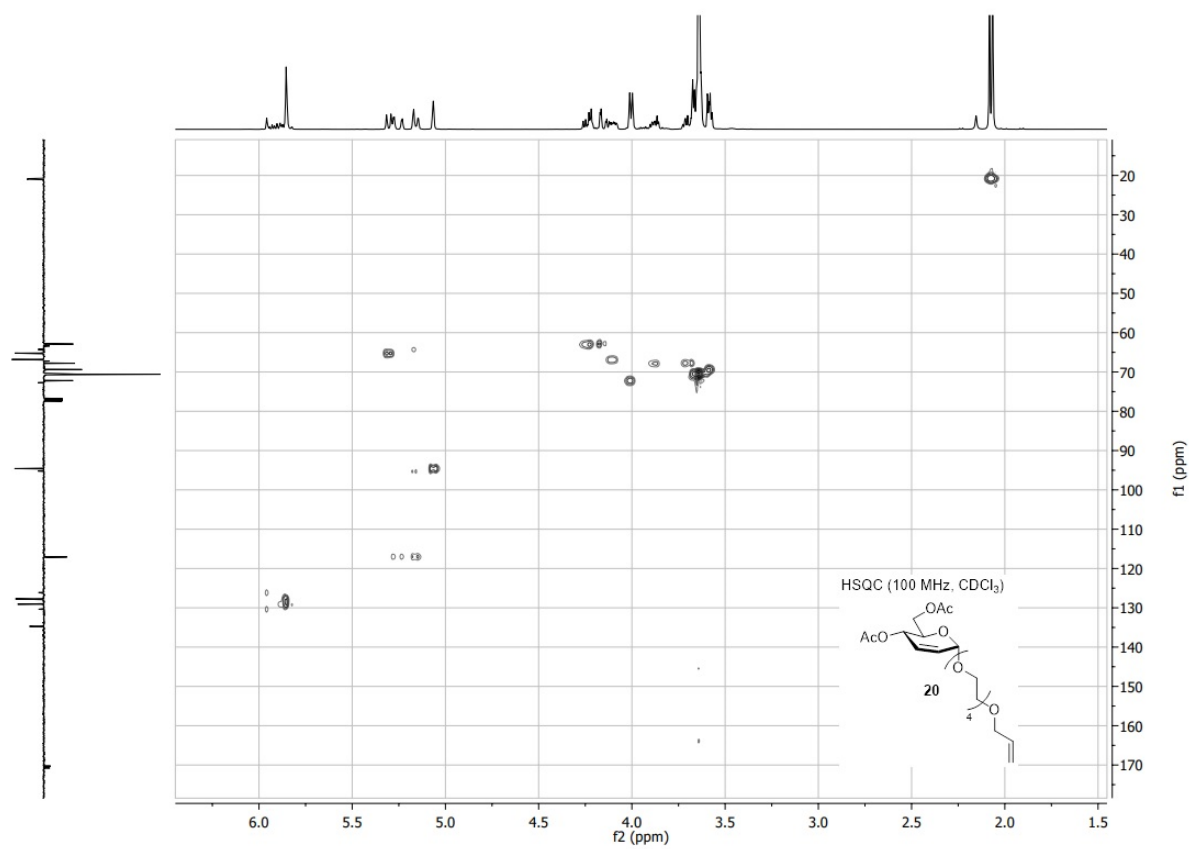
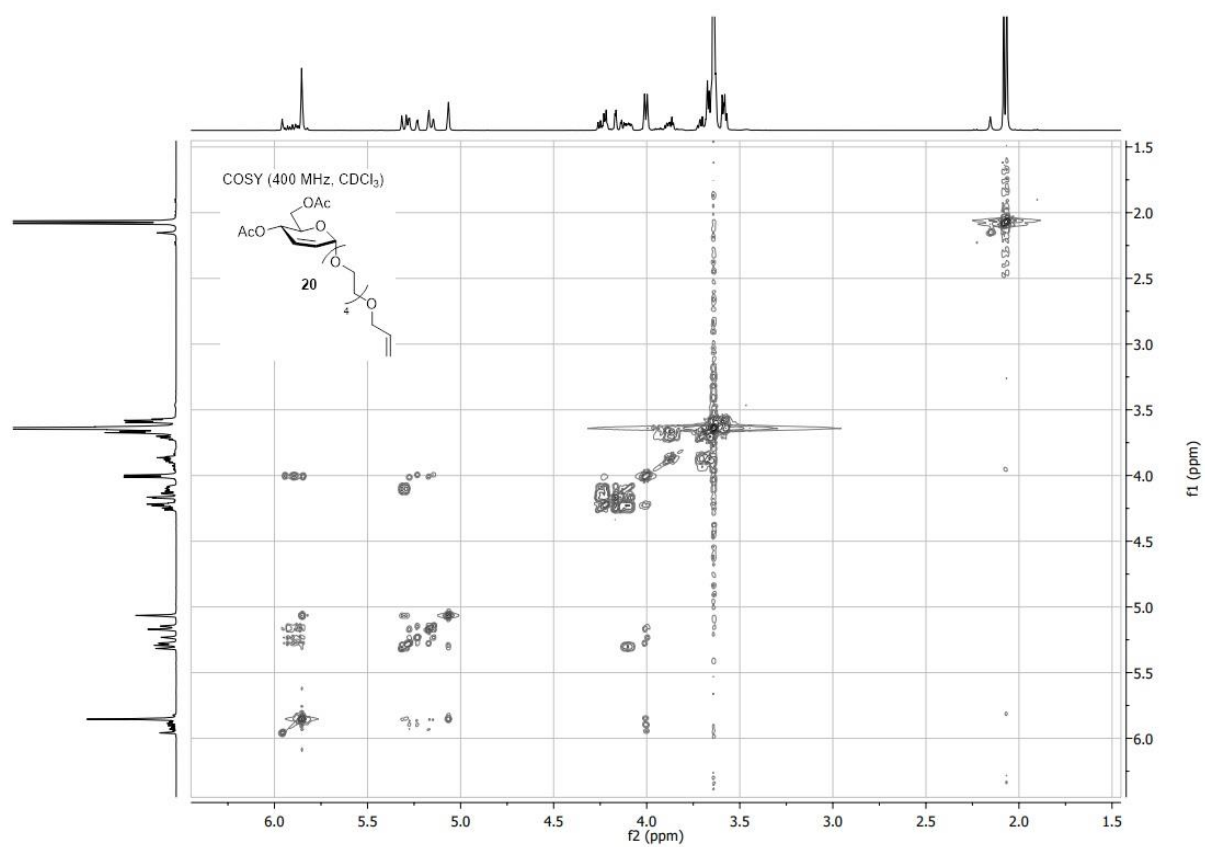




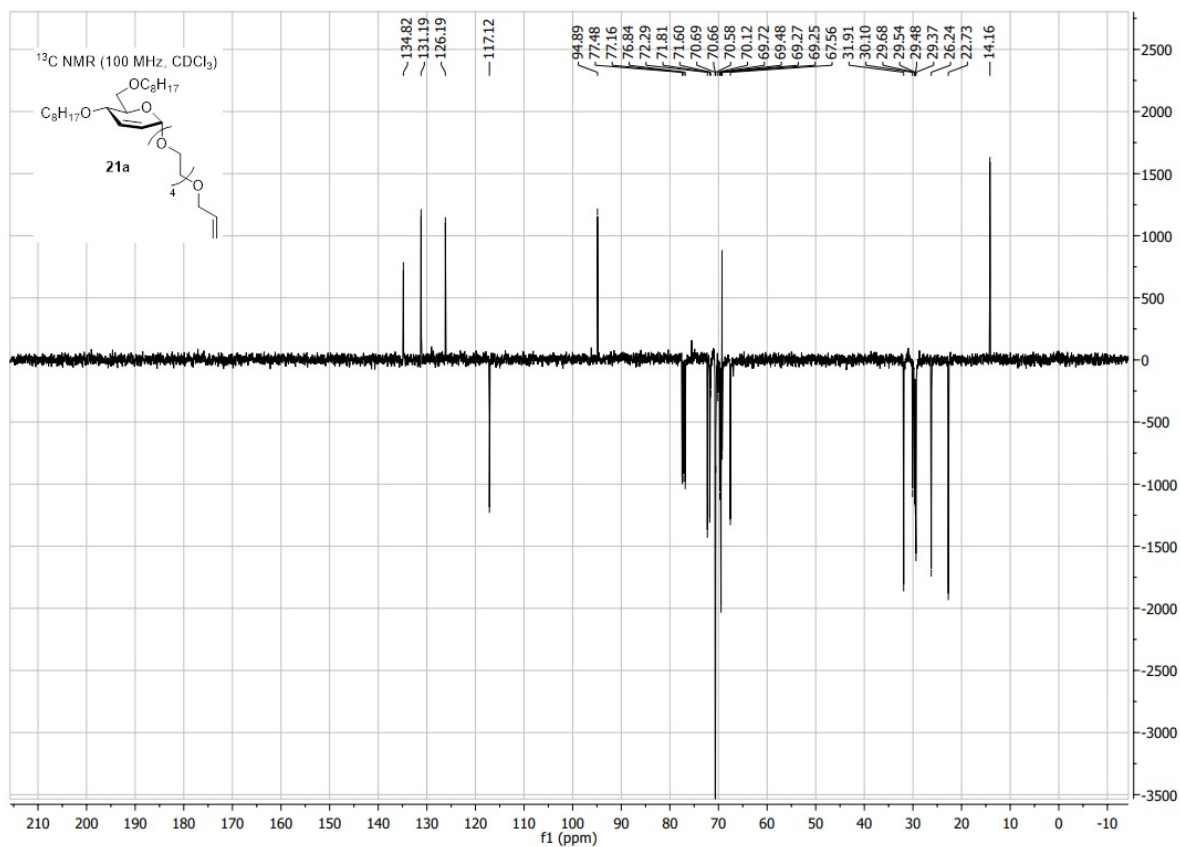
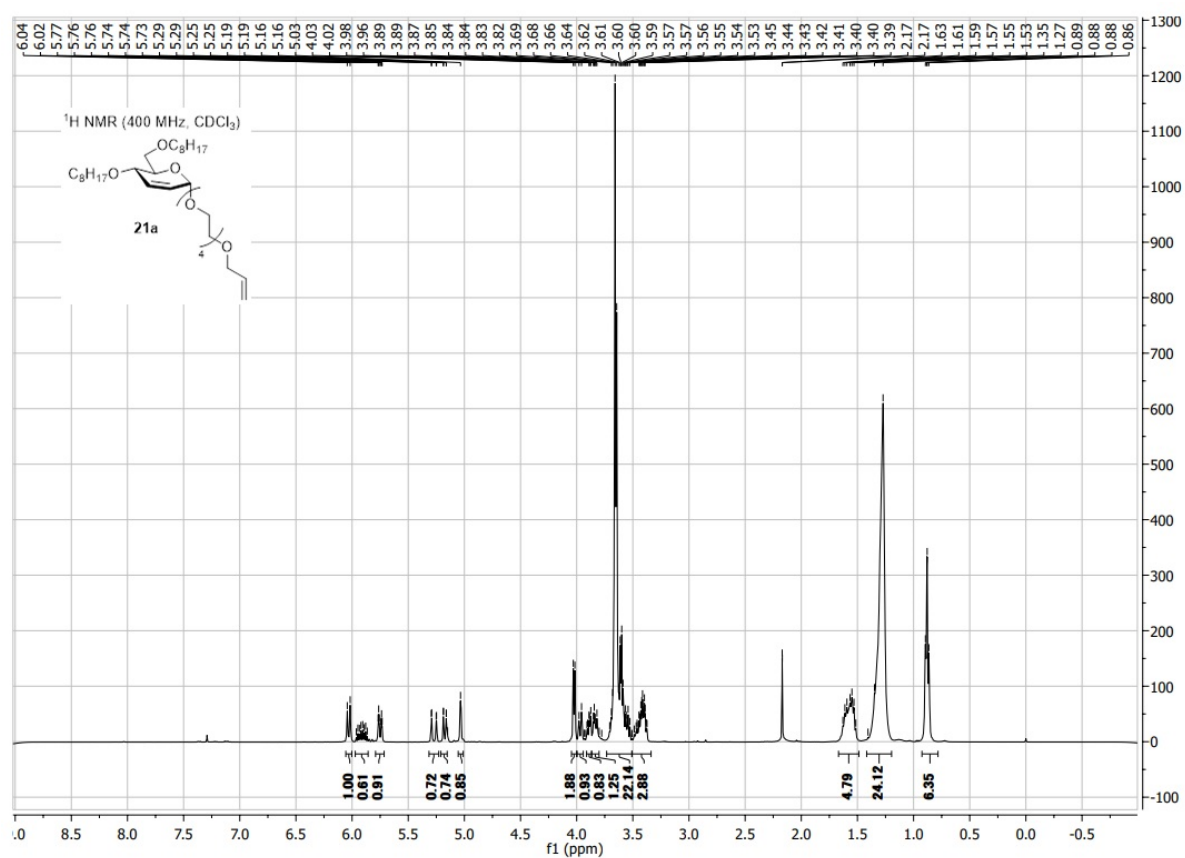


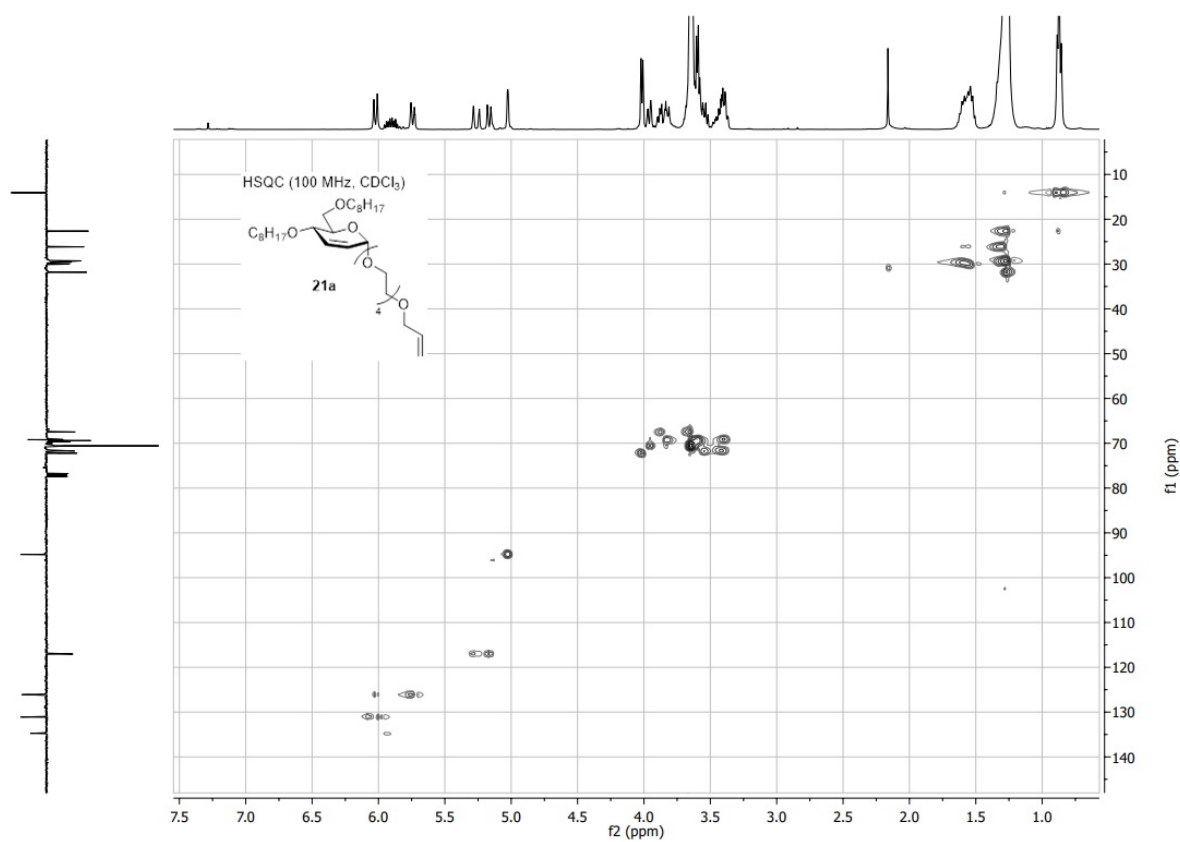
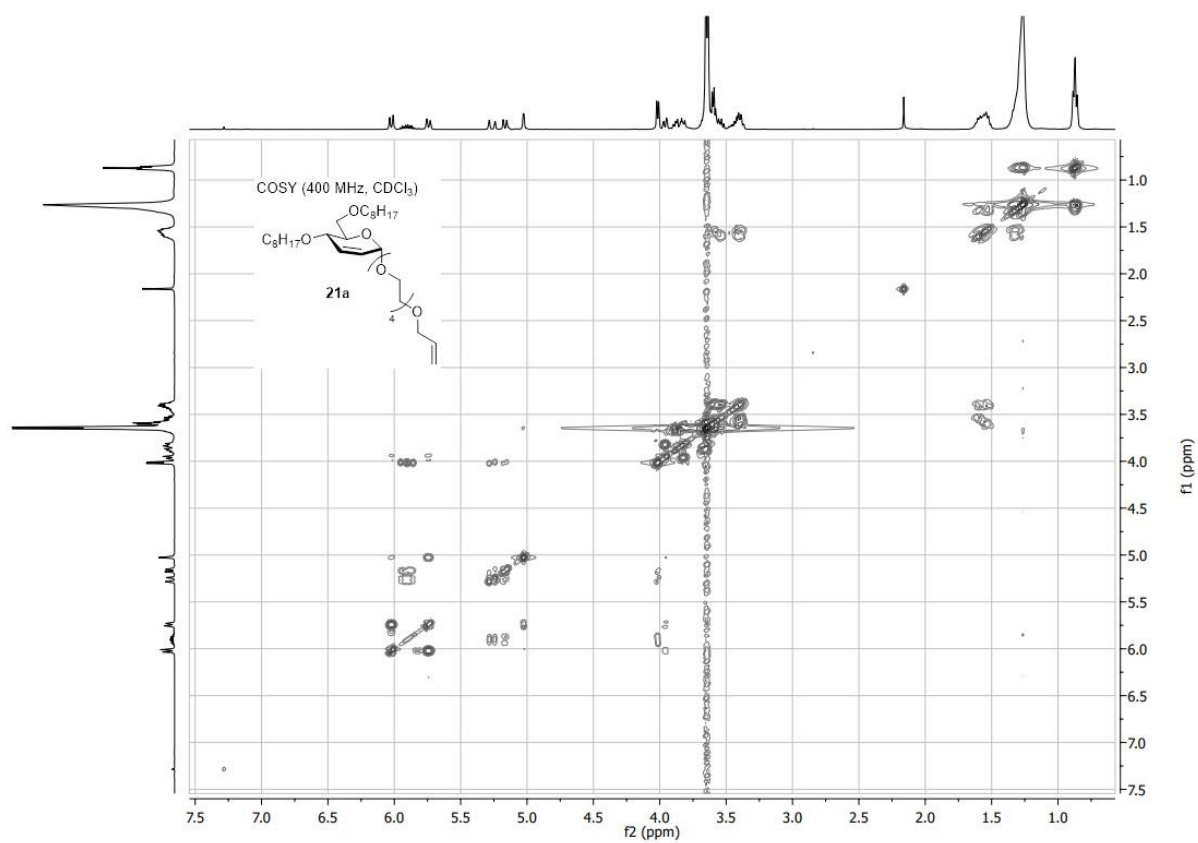
# NMR spectra of compound **20**



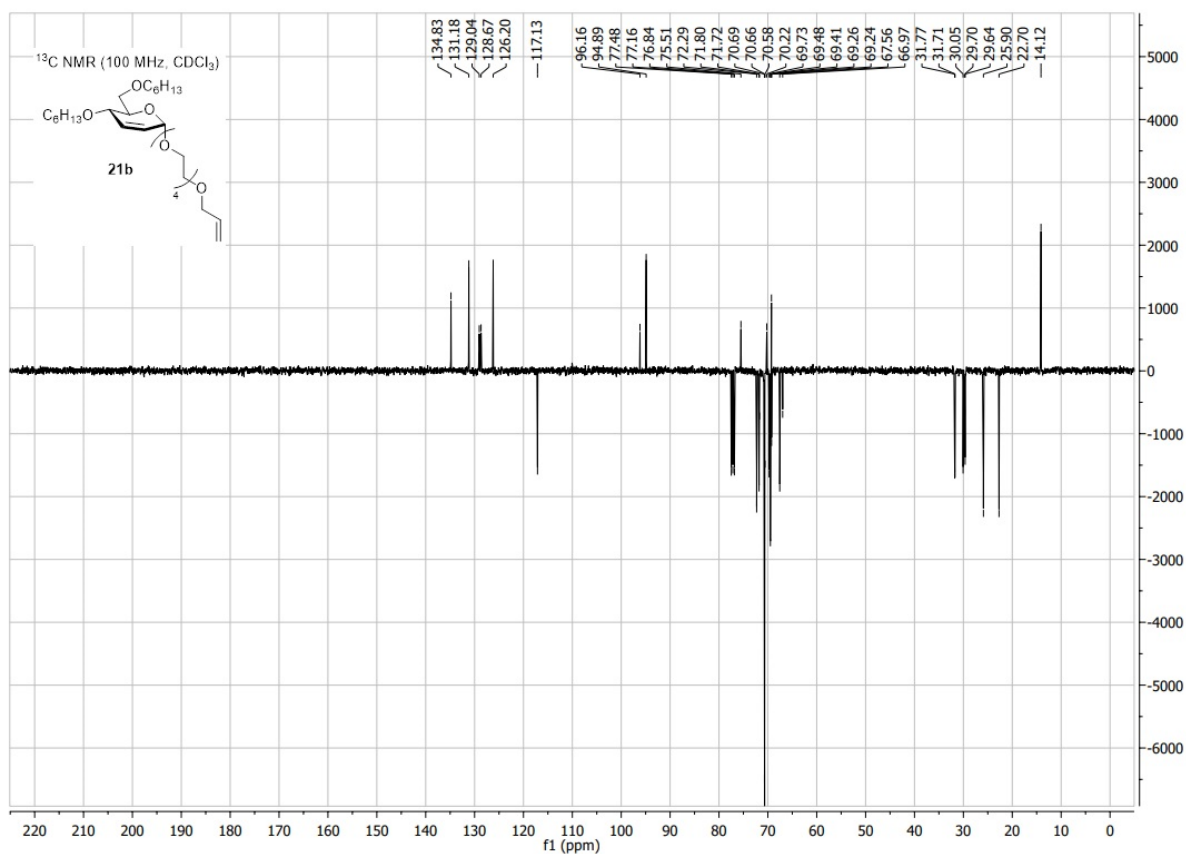
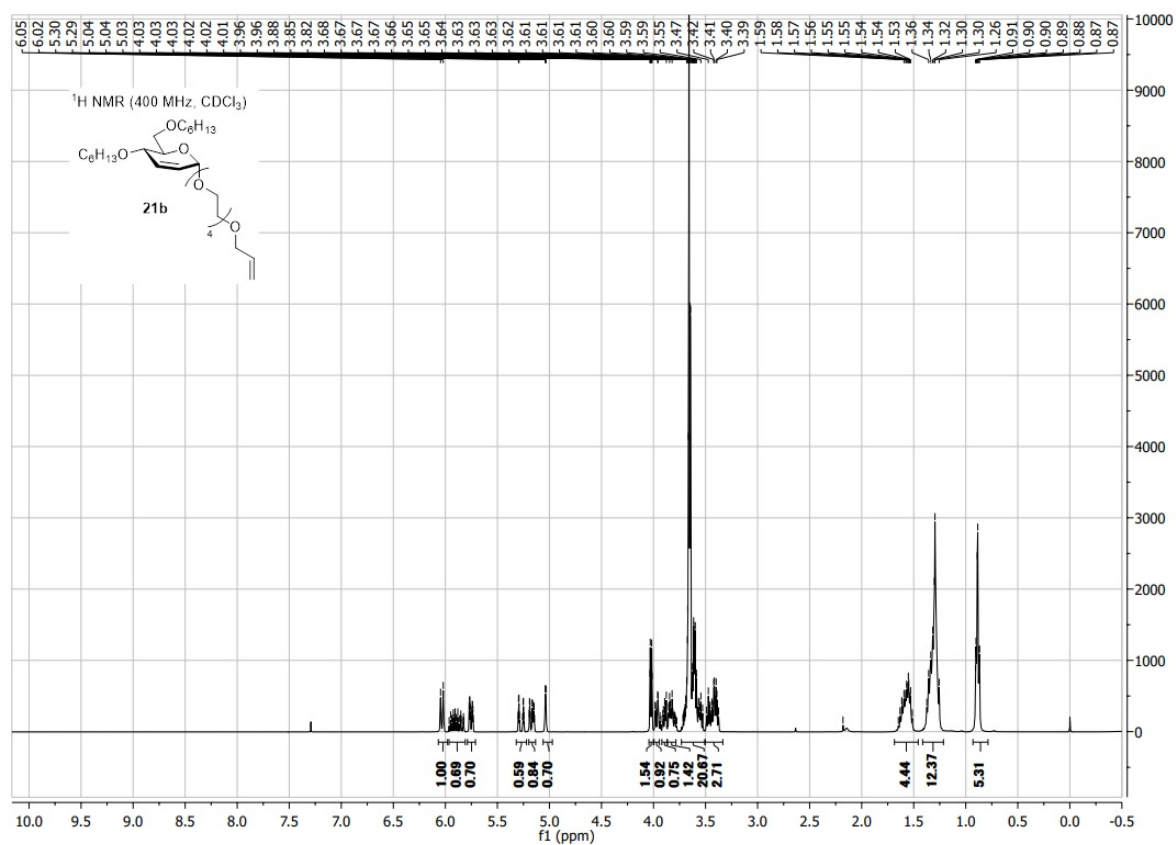


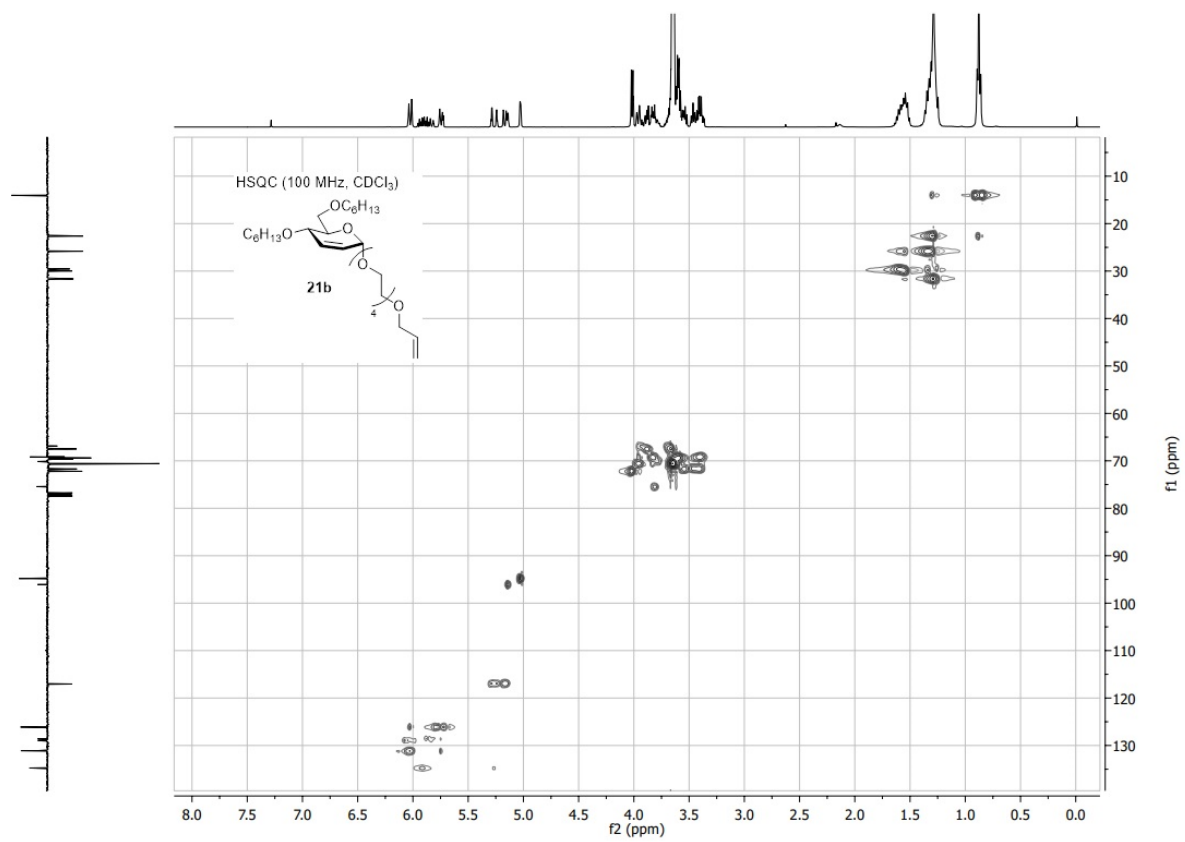
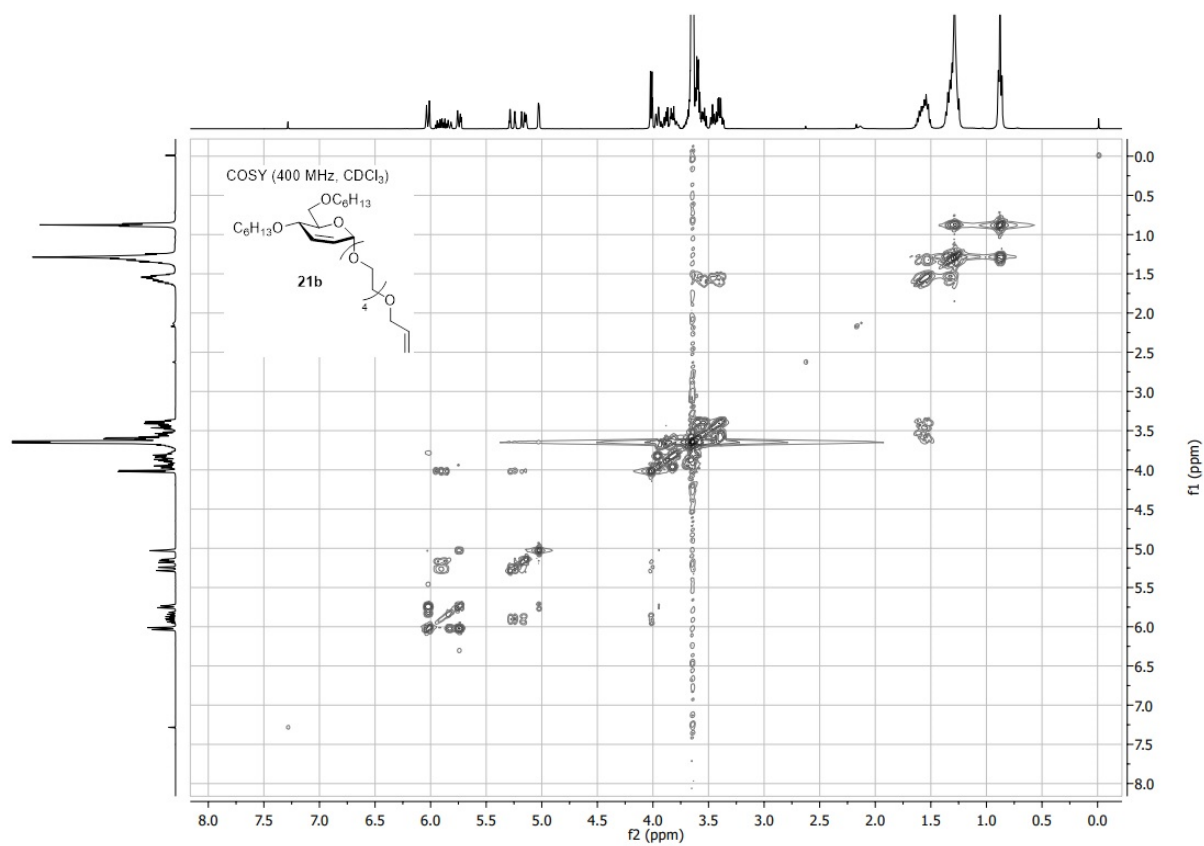
# NMR spectra of compound **21a**



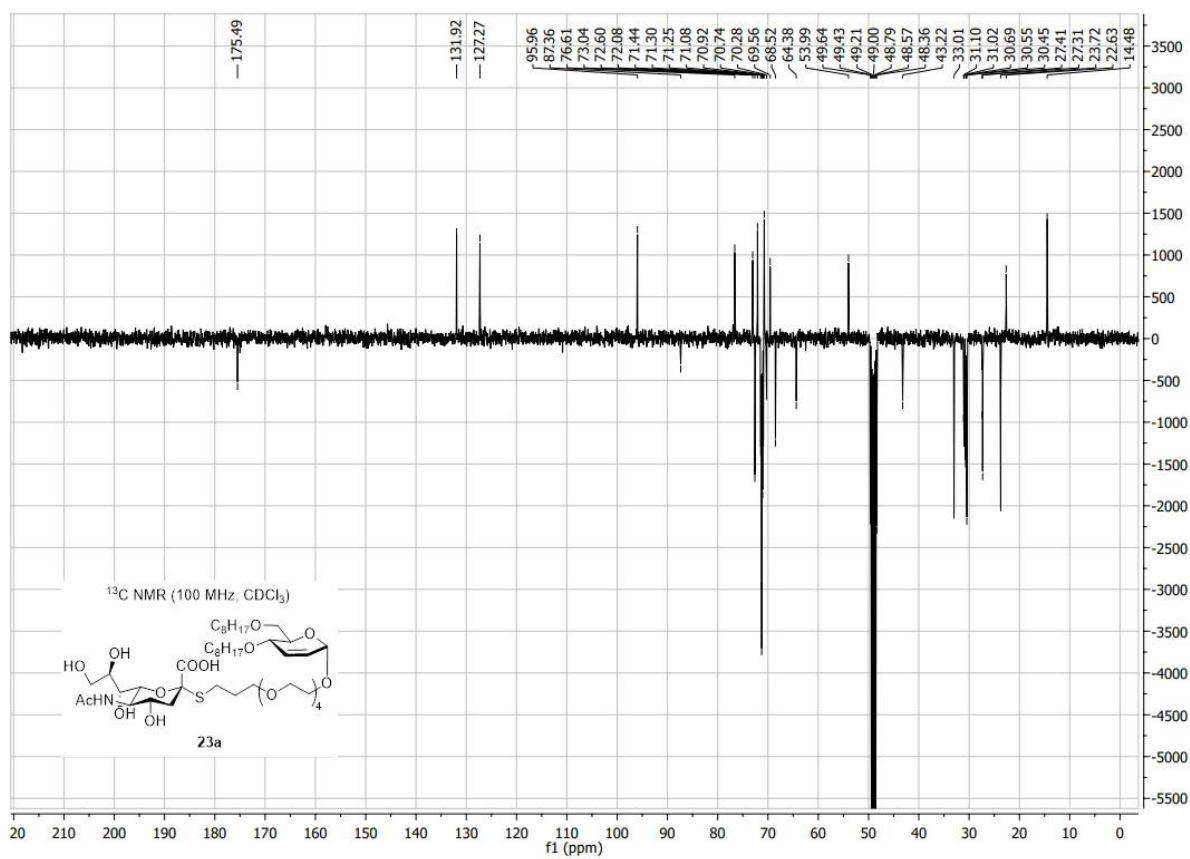
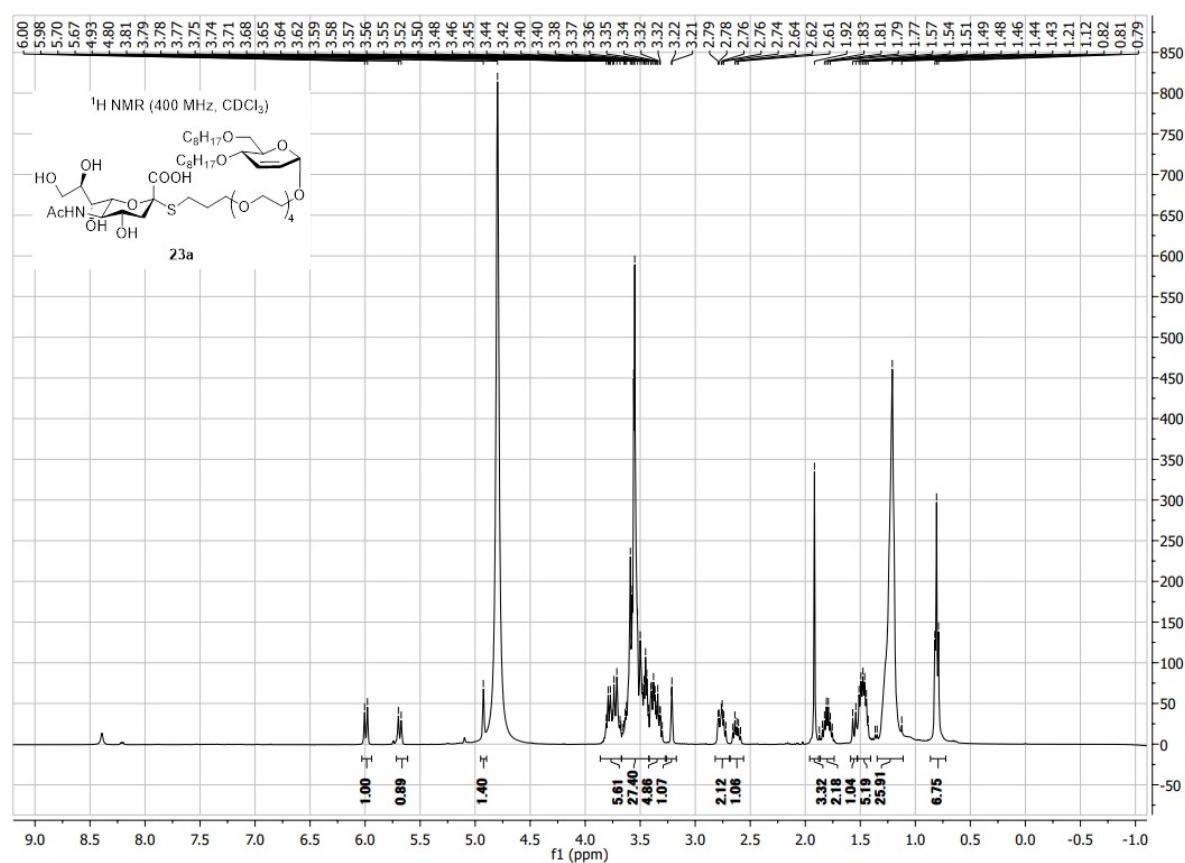


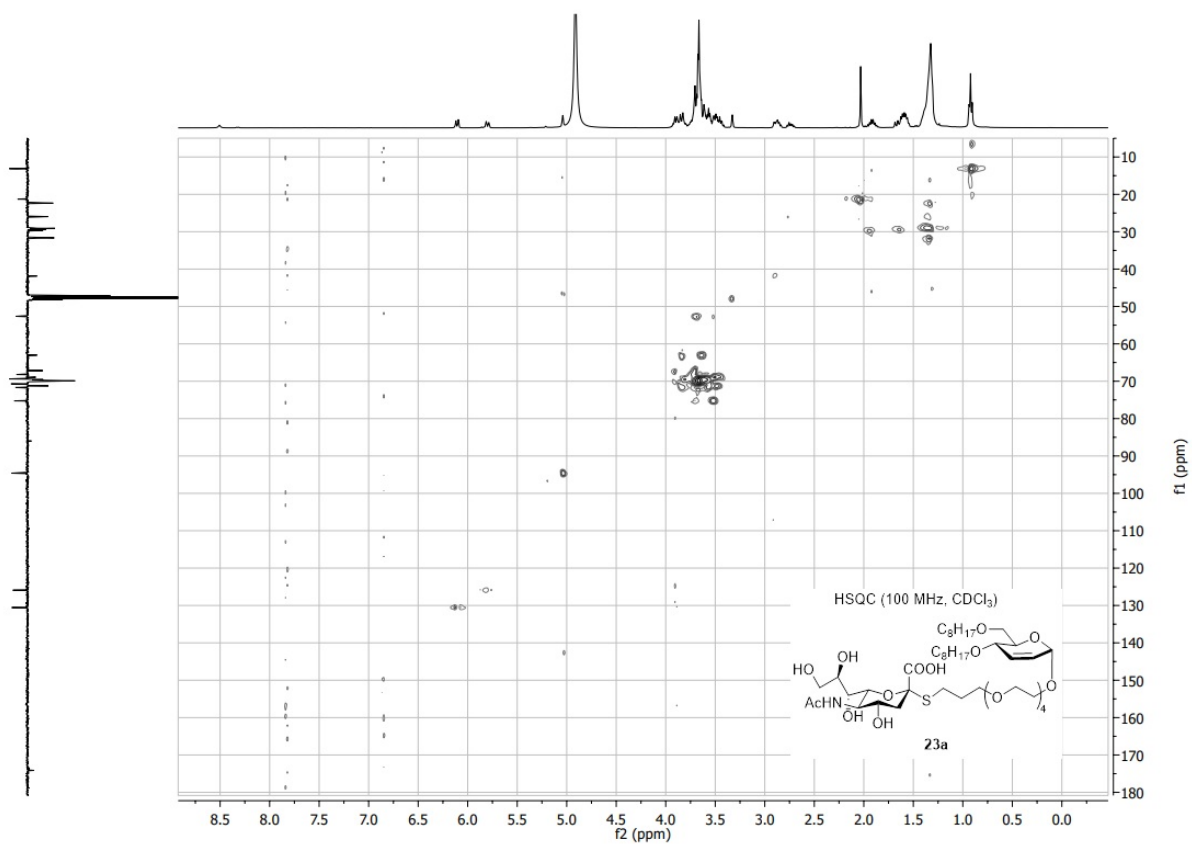
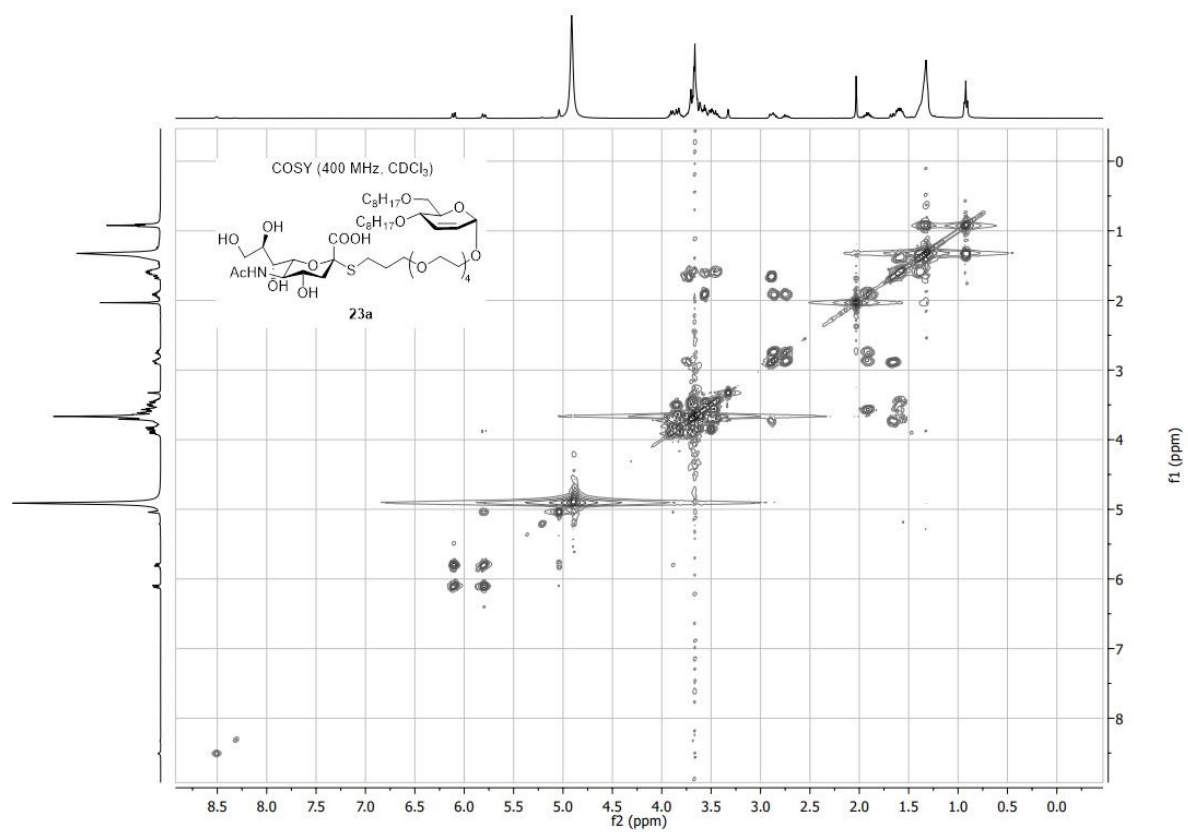
# NMR spectra of compound **21b**





# NMR spectra of compound **23a**







# NMR spectra of compound **23b**

