

## Supporting Information

### Exploring a glycosylation methodology for the synthesis of hydroxamate-modified alginate building blocks

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The following pages contain representative supporting information and data.

**S1.** Attempted glycosylation conditions for synthesis of disaccharide **18** using donor **5** and acceptor **9**

**S2.** Spectral Data:  $^1\text{H}$ ,  $^{13}\text{C}$ , HSQC and nOe NMR for compounds **4-26**

**S1.** Attempted glycosylation conditions for synthesis of disaccharide **18** using donor **5** and acceptor **9**

Pre-activation using $\text{Ph}_2\text{SO}/\text{Tf}_2\text{O}^a$				
Entry	Acceptor <b>9</b> (equiv.)	Reaction concentration (M)	Reaction duration and temperature <sup>b</sup> (°C)	Observations (TLC and NMR <sup>c</sup> )
1	1	0.05	30 min / -10 °C	Baseline material only by TLC analysis
2	1	0.06	20 min / -20 °C	Complicated mixture by TLC with baseline material. NMR showed hydrolysed donor (28%) and unreacted acceptor (60%)
3	1.1	0.05	15 min / -40 °C	As per entry 2
4 <sup>d</sup>	1.1	0.05	15 min / -40 °C	As per entry 2
Pre-activation using $\text{BSP}/\text{Tf}_2\text{O}^e$				
5	1.1	0.05	45 min / -40 °C	TLC baseline spot, NMR showed donor (77%)
Pre-mixing glycosylation using $\text{Me}_2\text{S}_2/\text{Tf}_2\text{O}^f$				
6	1.1	0.07	20 min / -55 °C	TLC baseline spot, NMR showed donor (23%) and acceptor (12%)
Inverse glycosylation using $\text{NIS}/\text{TMSOTf}$				
7	1.1	0.05	3.5 h / -20 °C	Complicated mixture by TLC and NMR showed unreacted acceptor (49%), no donor

<sup>a</sup> 1.3 equiv. of  $\text{Ph}_2\text{SO}$ , 1.3 equiv. of  $\text{Tf}_2\text{O}$  and 2.5 equiv. of TTBP.

<sup>b</sup> The initial reaction temperature in all entries was -80°C (donor and promoter stirred for 5-10 min), except for entry 7 where the reaction was started at -40°C.

<sup>c</sup> HRMS of the reaction mixtures also showed no trace of the desired product.

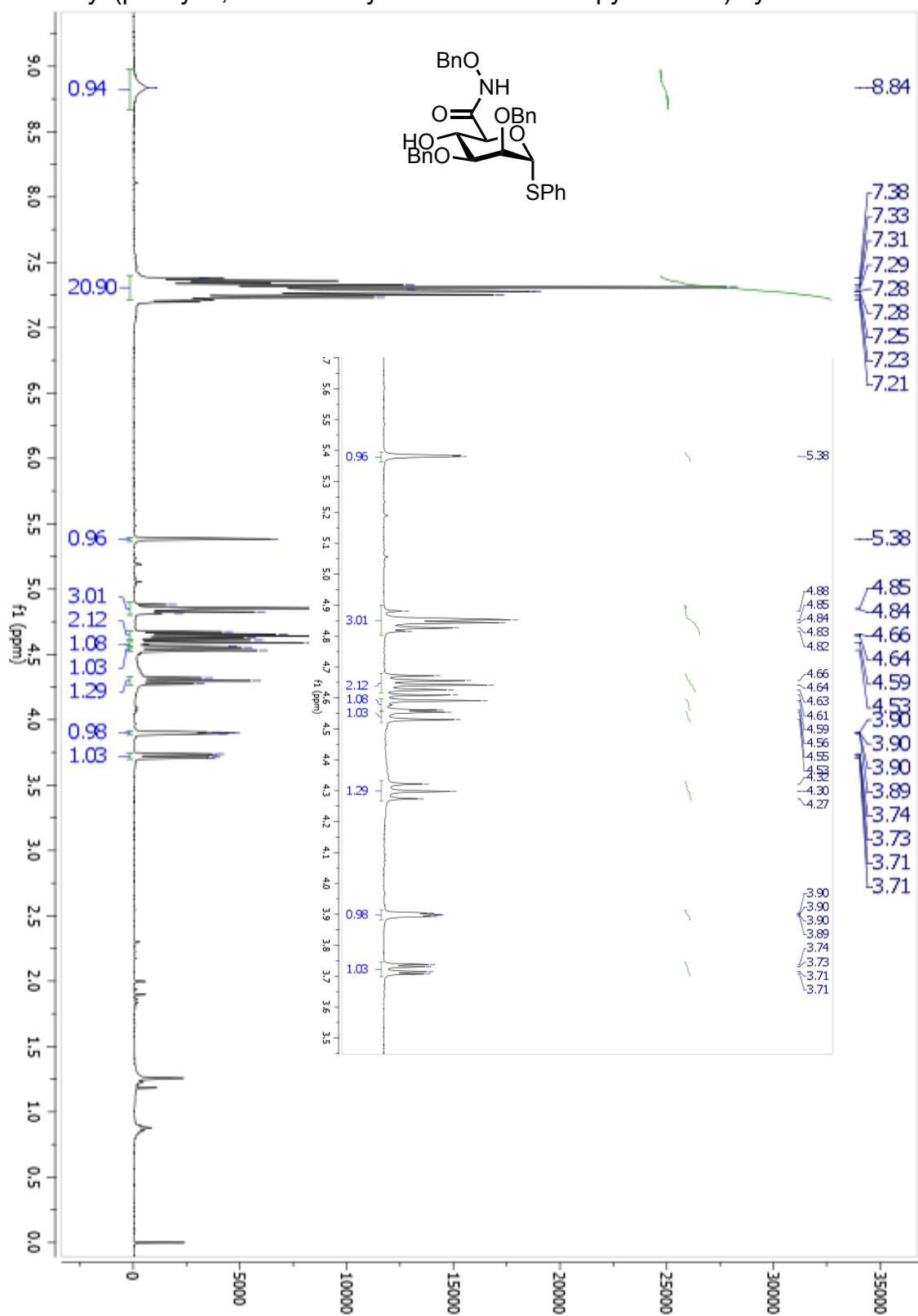
<sup>d</sup> Donor **6** was used.

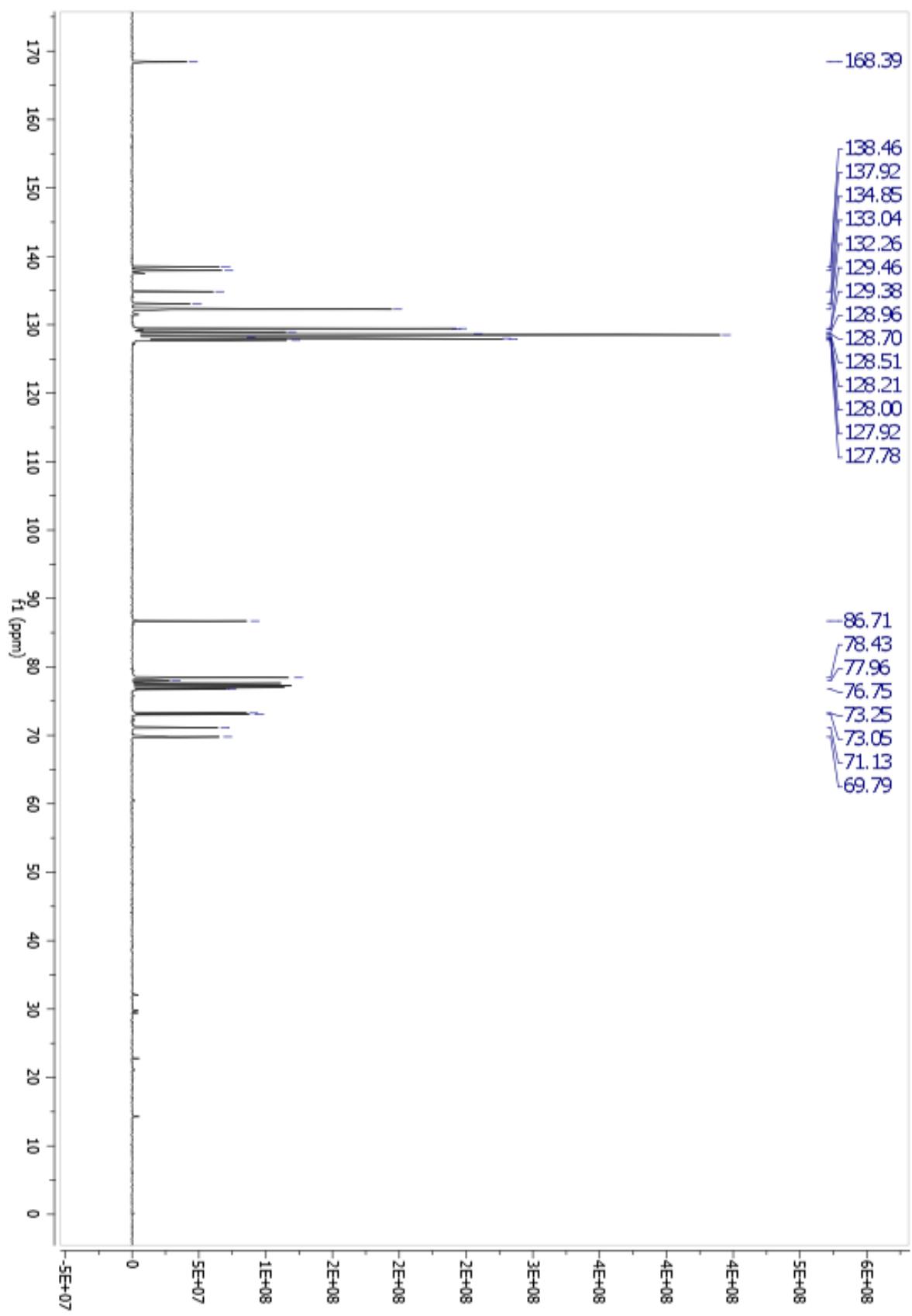
<sup>e</sup> 1.3 equiv. of BSP, 1.3 equiv. of  $\text{Tf}_2\text{O}$  and 2.5 equiv. of TTBP.

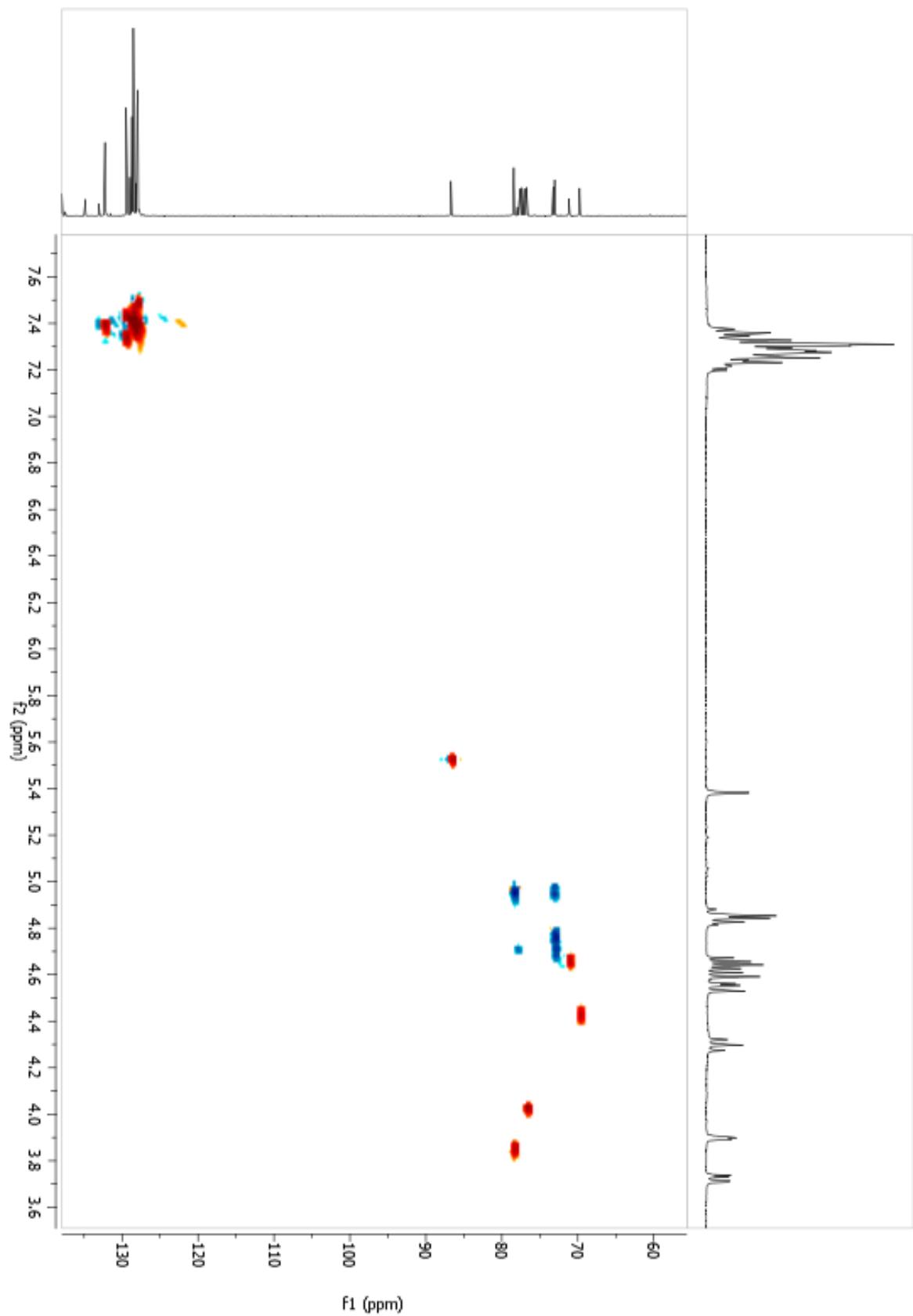
<sup>f</sup> Preparation: A 1 M solution of the reagent was made by adding  $\text{Tf}_2\text{O}$  (0.168 mL, 1 mmol) to a solution of  $\text{Me}_2\text{S}_2$  (0.10 mL, 1.1 mmol) in dry  $\text{CH}_2\text{Cl}_2$  (0.75 mL) at 0 °C and stirring continued for 30 min this temperature before use. 1.5 equiv. of this promoter was added to the reaction along with 0.8 equiv. of 2,6-di-tert-butyl-4methylpyridine (DTBMP).

S2. Spectral Data:  $^1\text{H}$ ,  $^{13}\text{C}$  and HSQC NMR for compounds 4-25

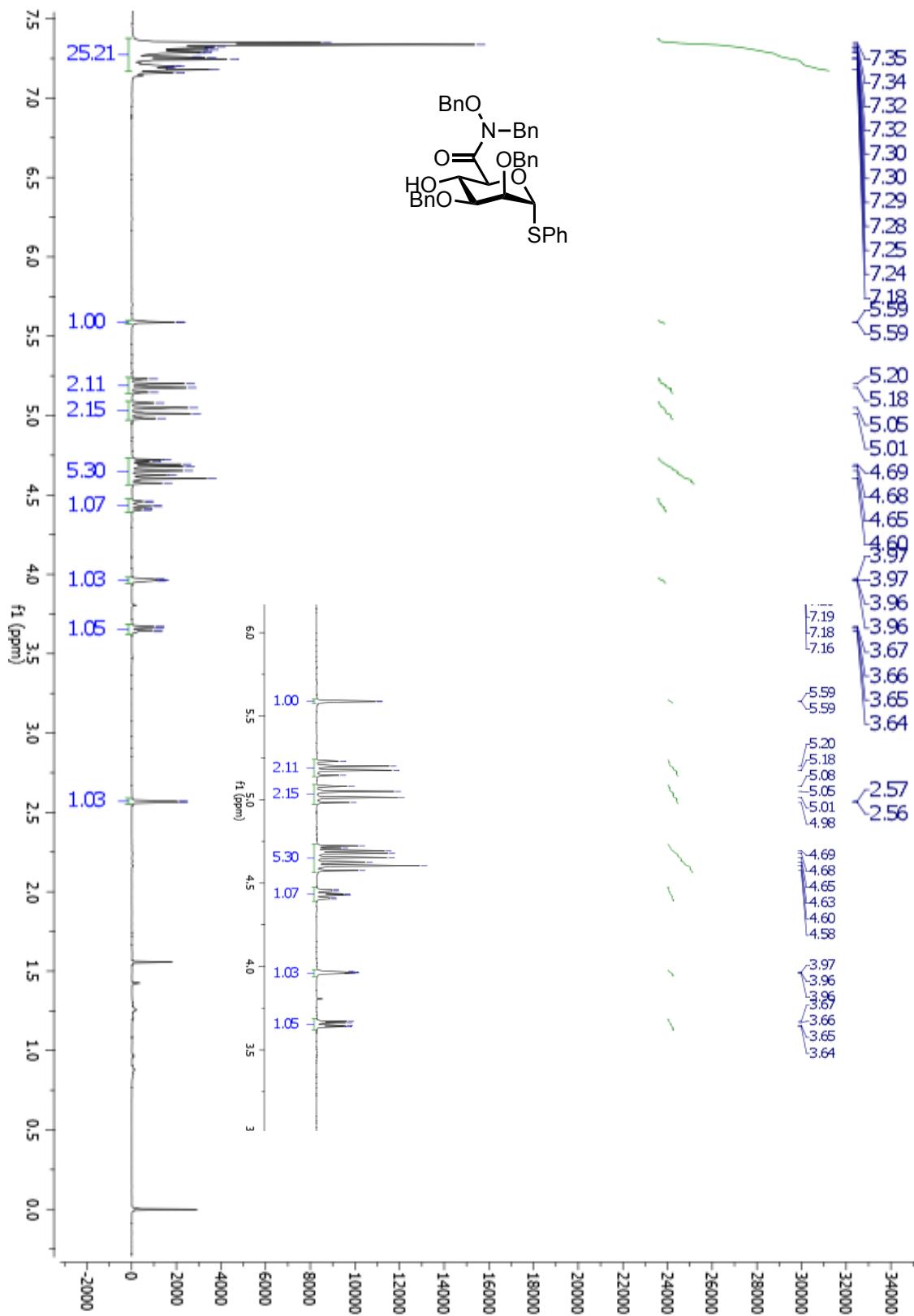
O-benzyl (phenyl 2,3-di-O-benzyl-1-thio- $\alpha$ -D-mannopyranoside) hydroxamate

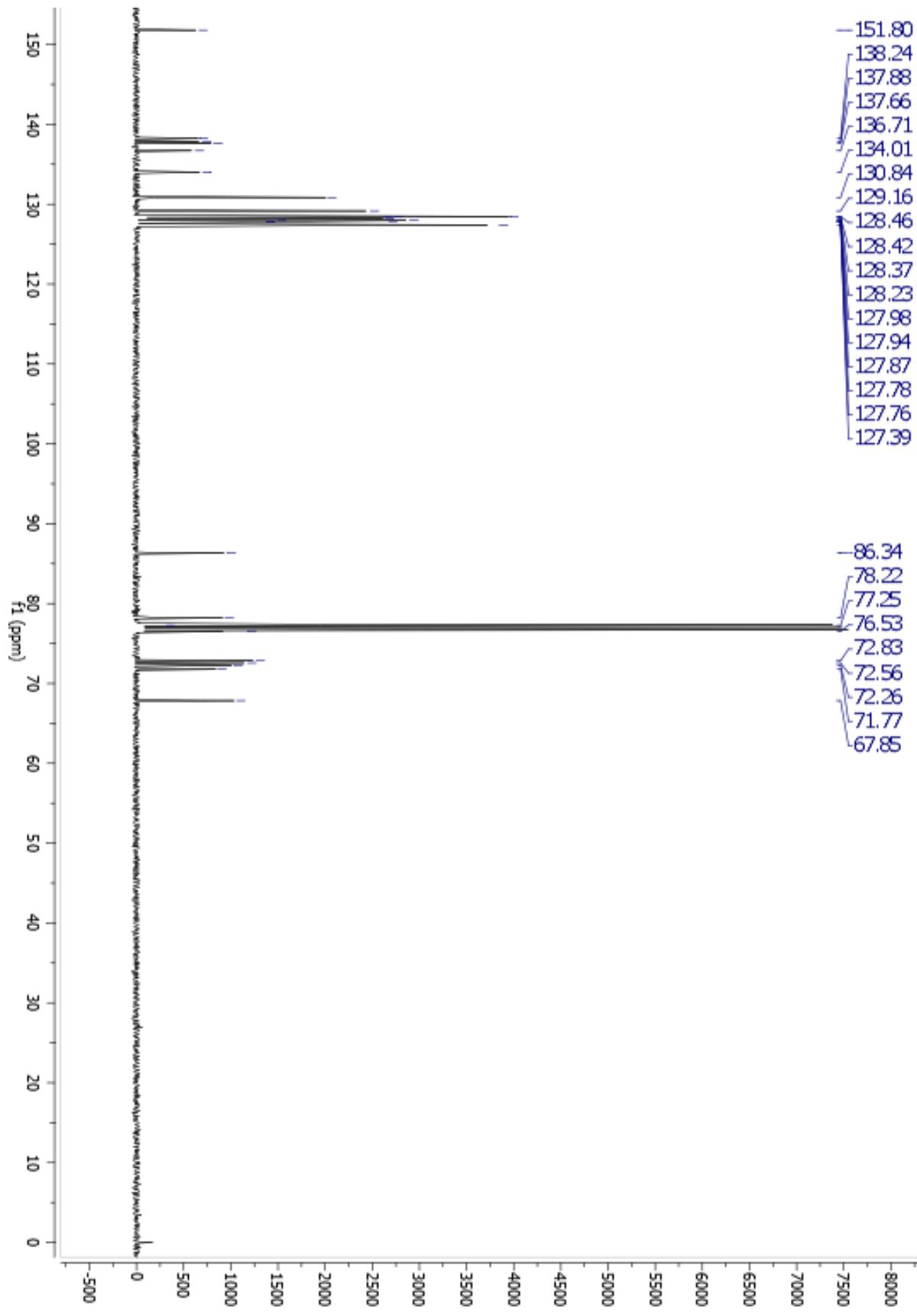


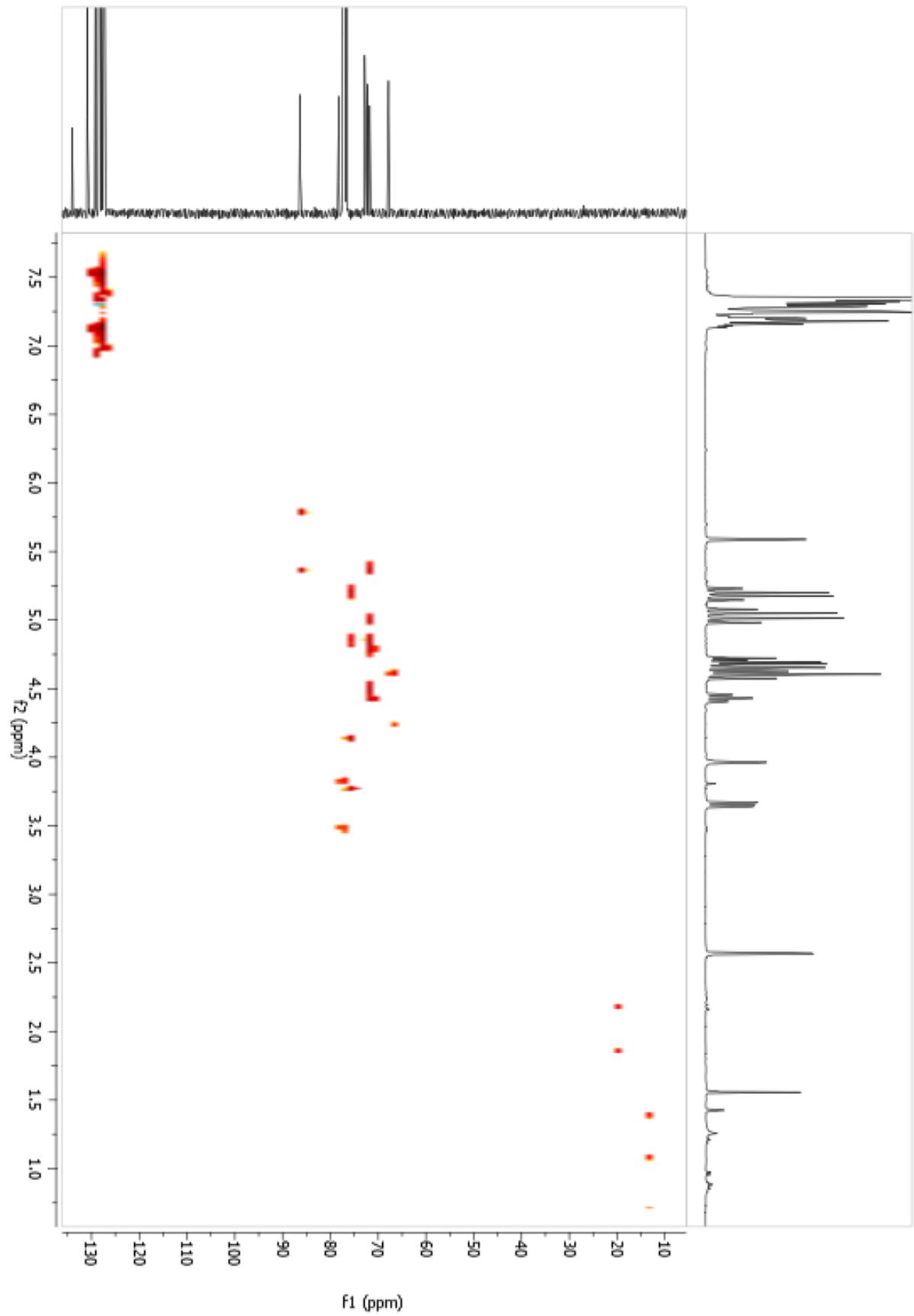




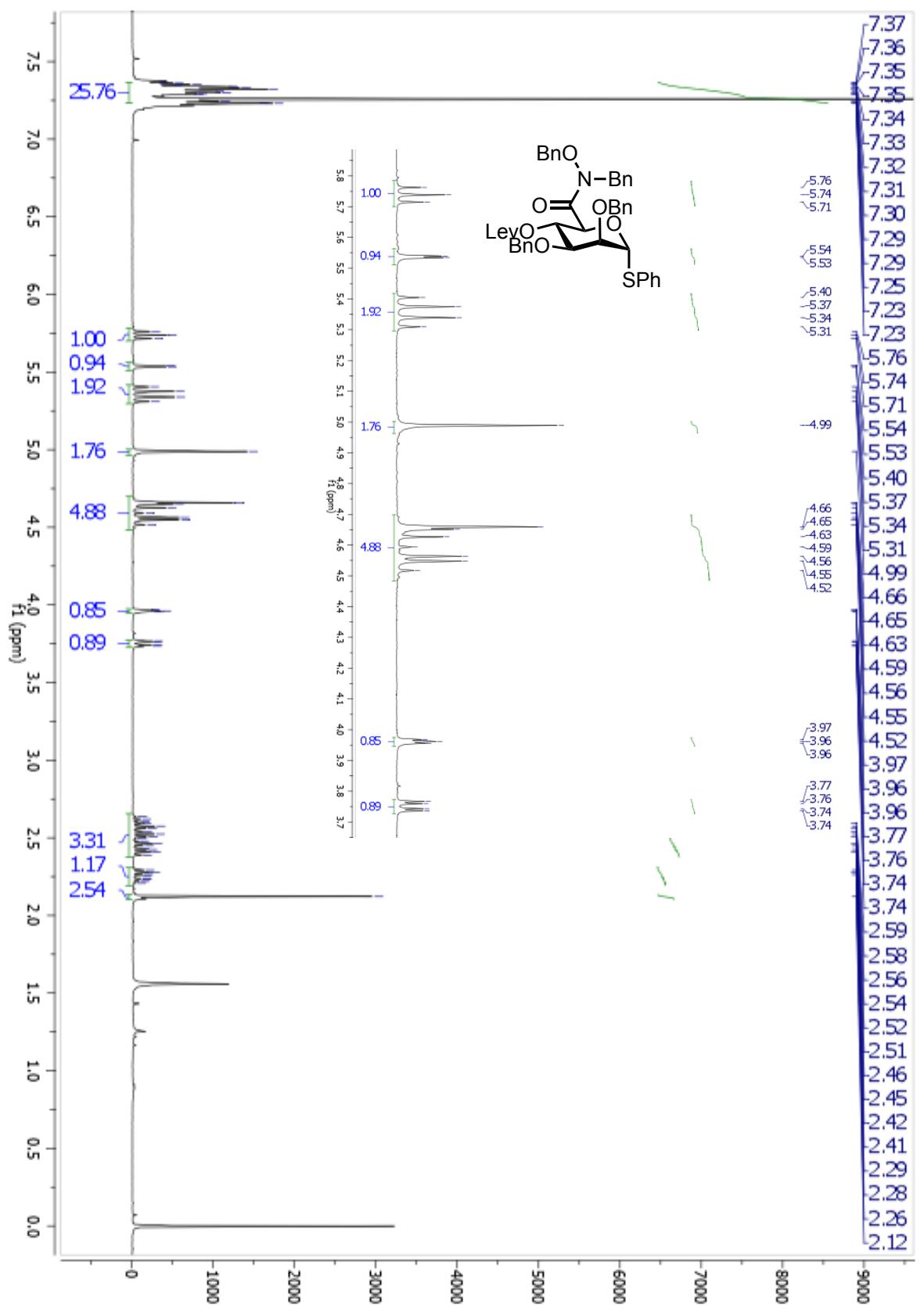
O-benzyl, N-benzyl  
hydroxamate **4** (phenyl-2,3-di-O-benzyl-1-thio- $\alpha$ -D-mannopyranoside)

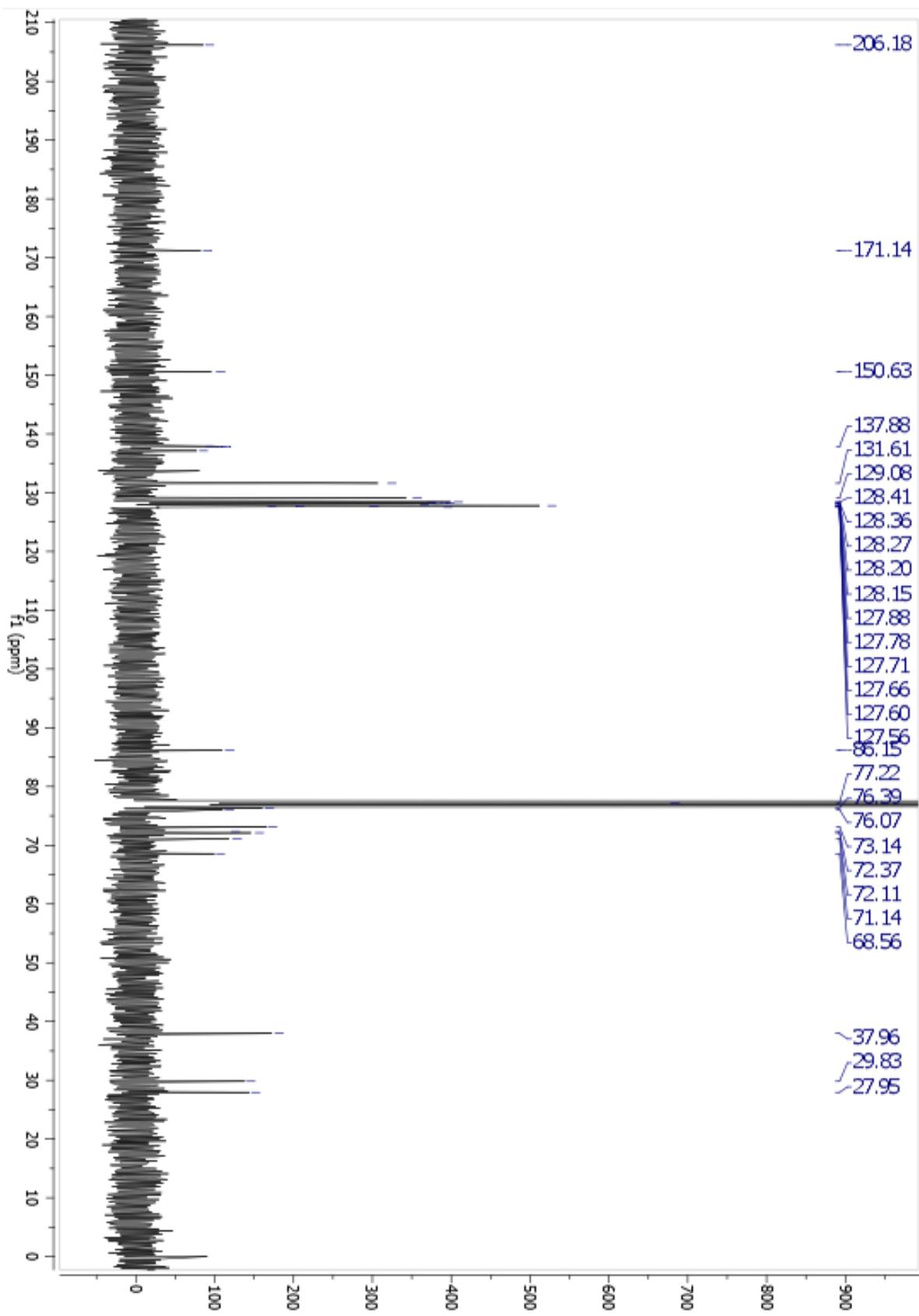


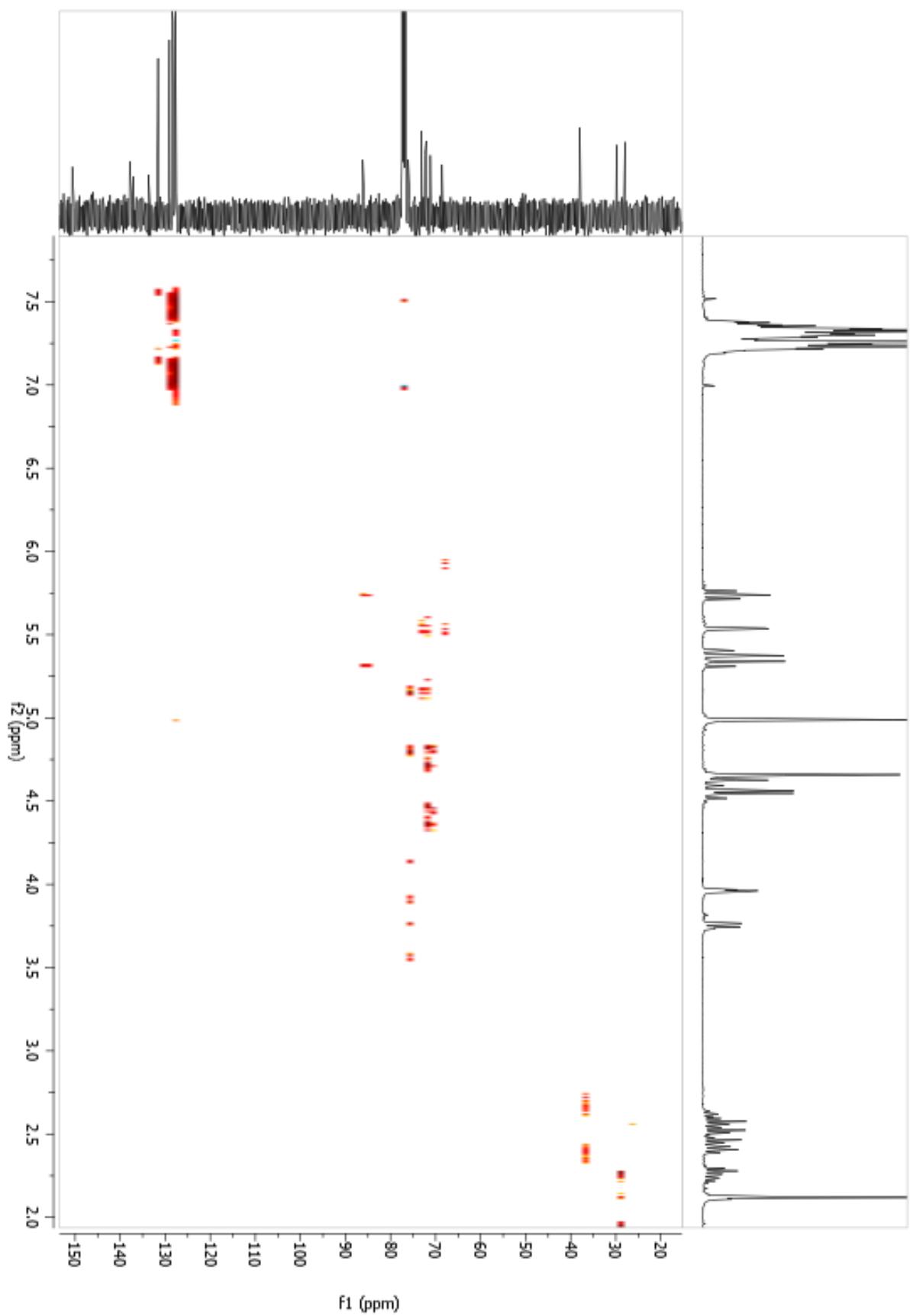




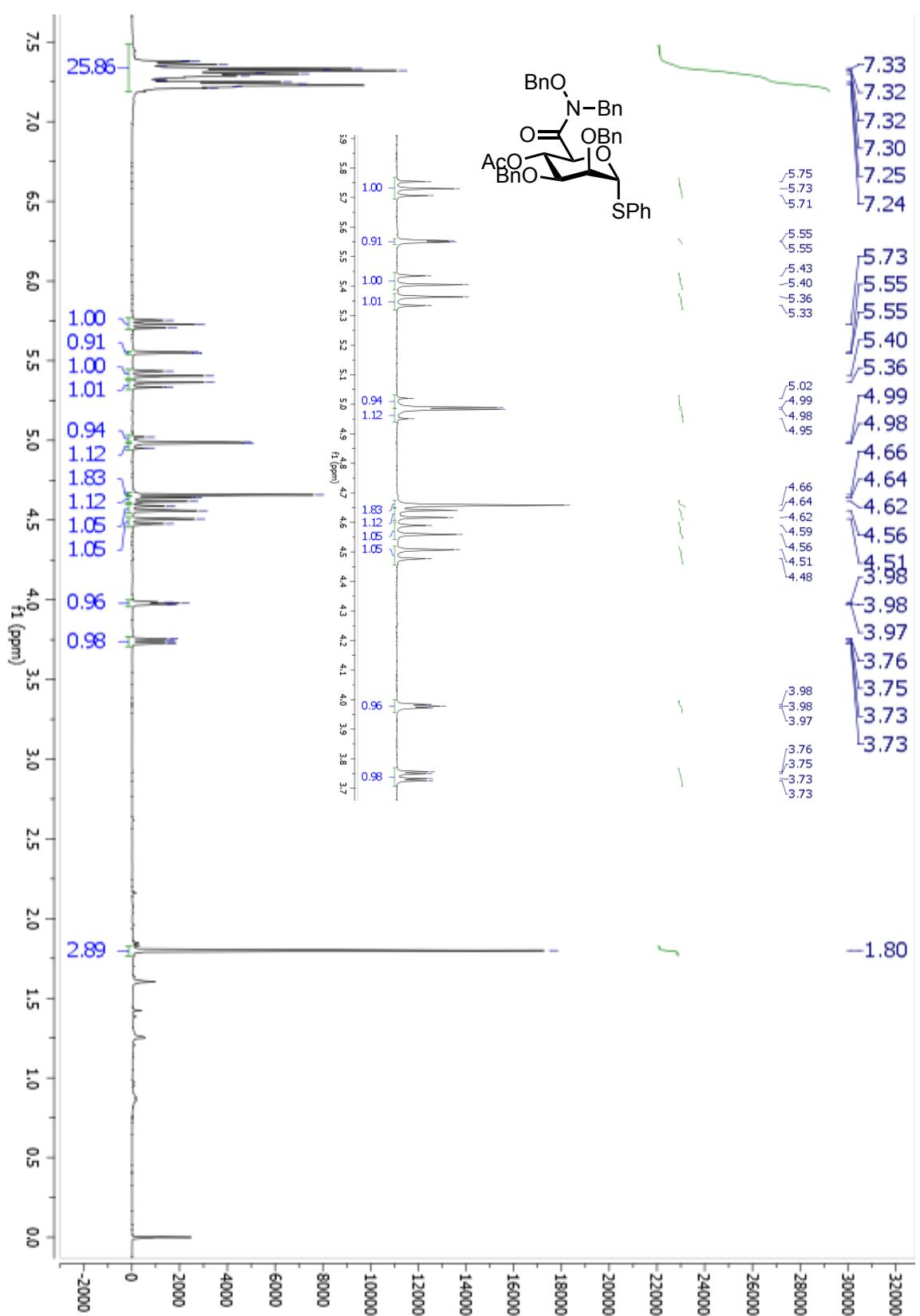
O-benzyl, N-benzyl (phenyl mannopyranoside) hydroxamate 5

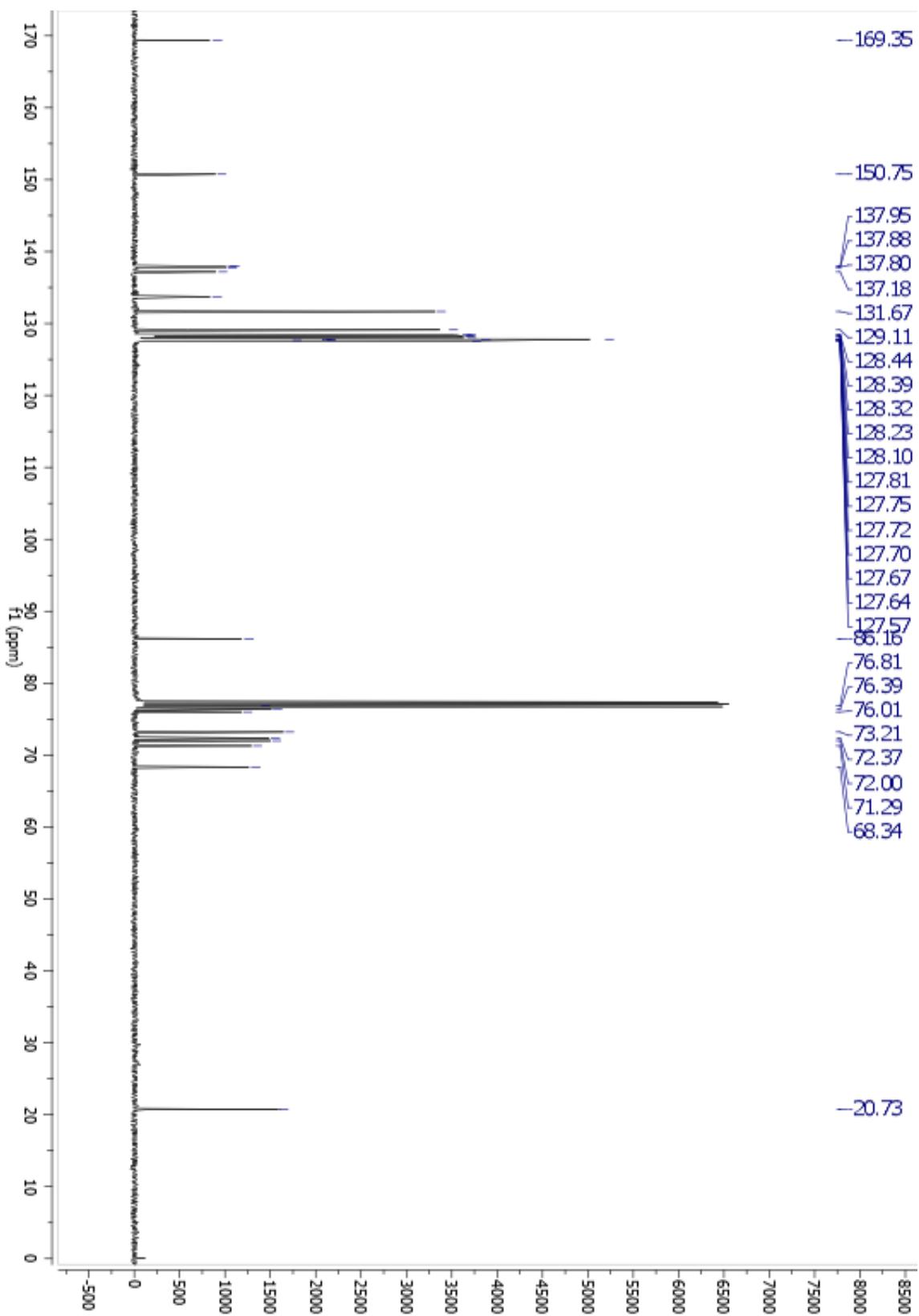


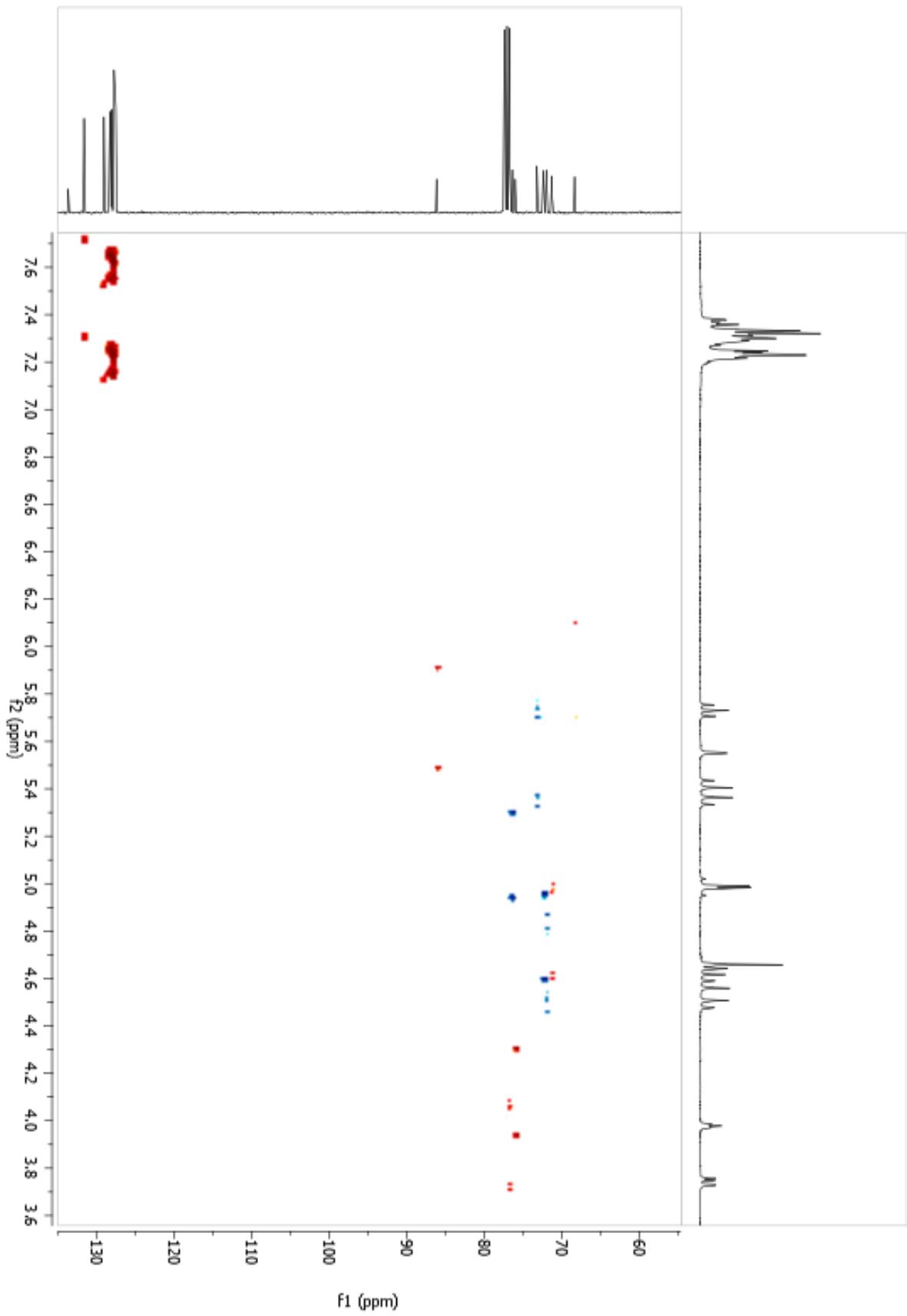




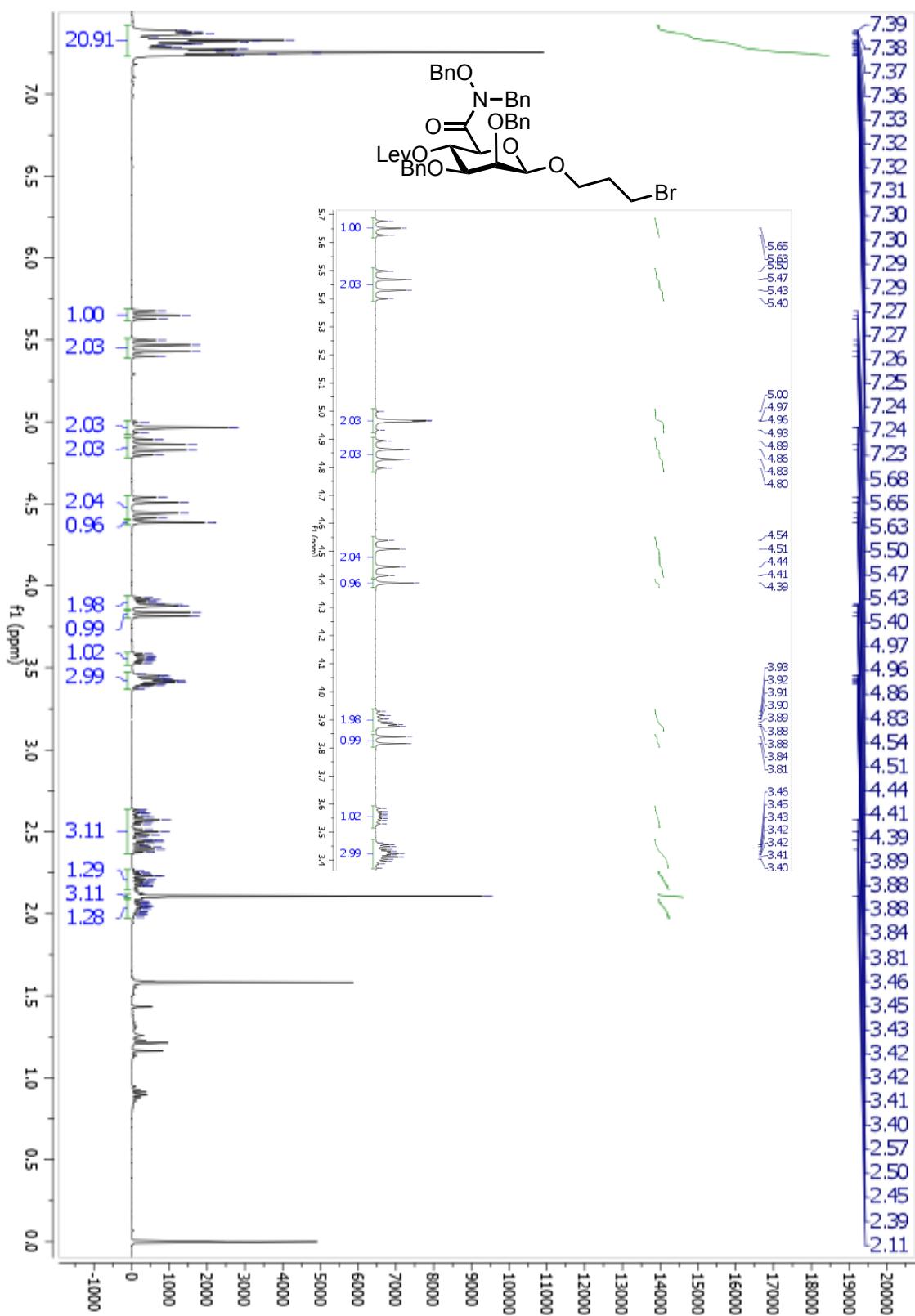
O-benzyl, N-benzyl (phenyl 4-O-acetyl-2,3-di-O-benzyl-1-thio- $\alpha$ -D-mannopyranoside) hydroxamate **6**

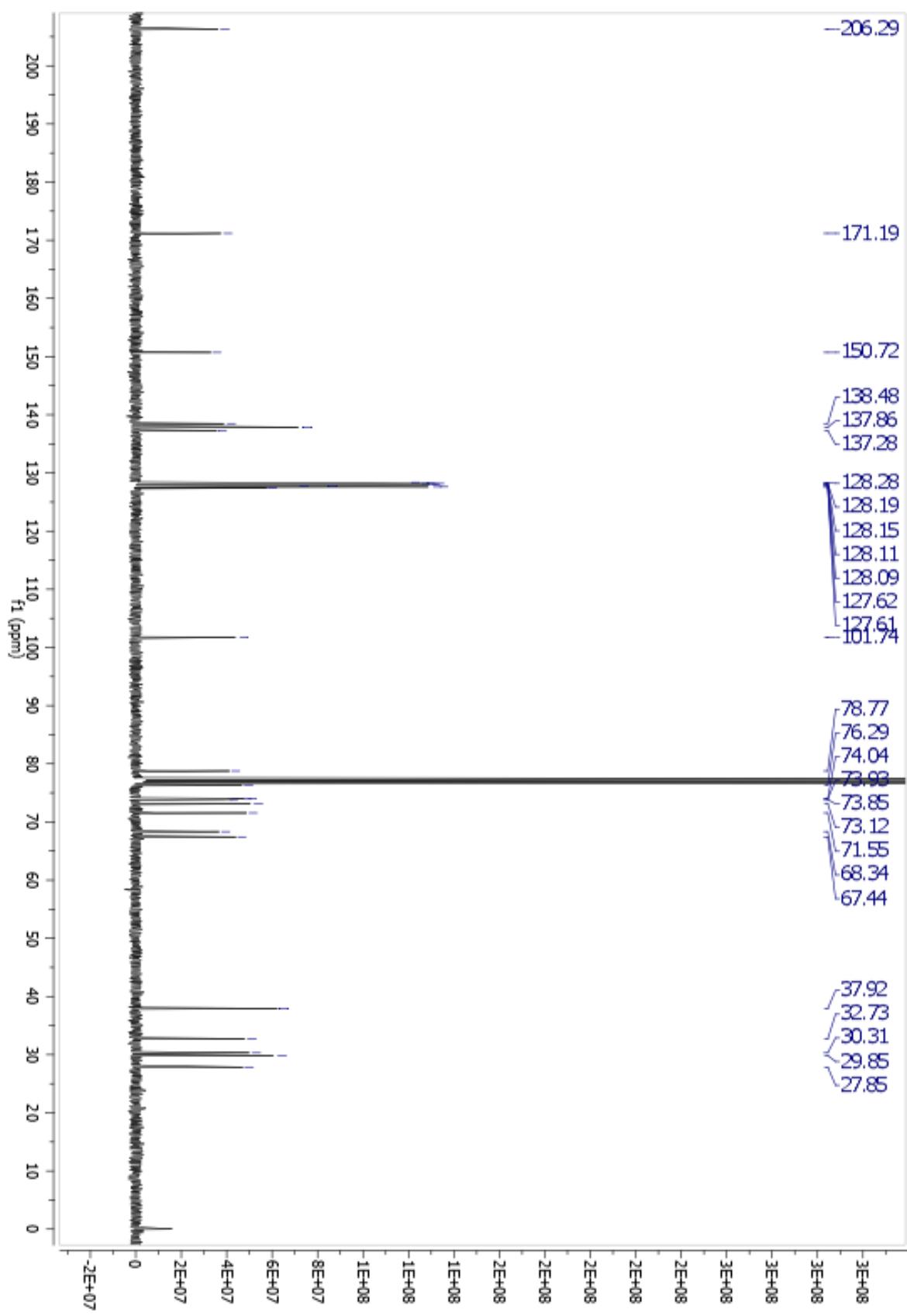


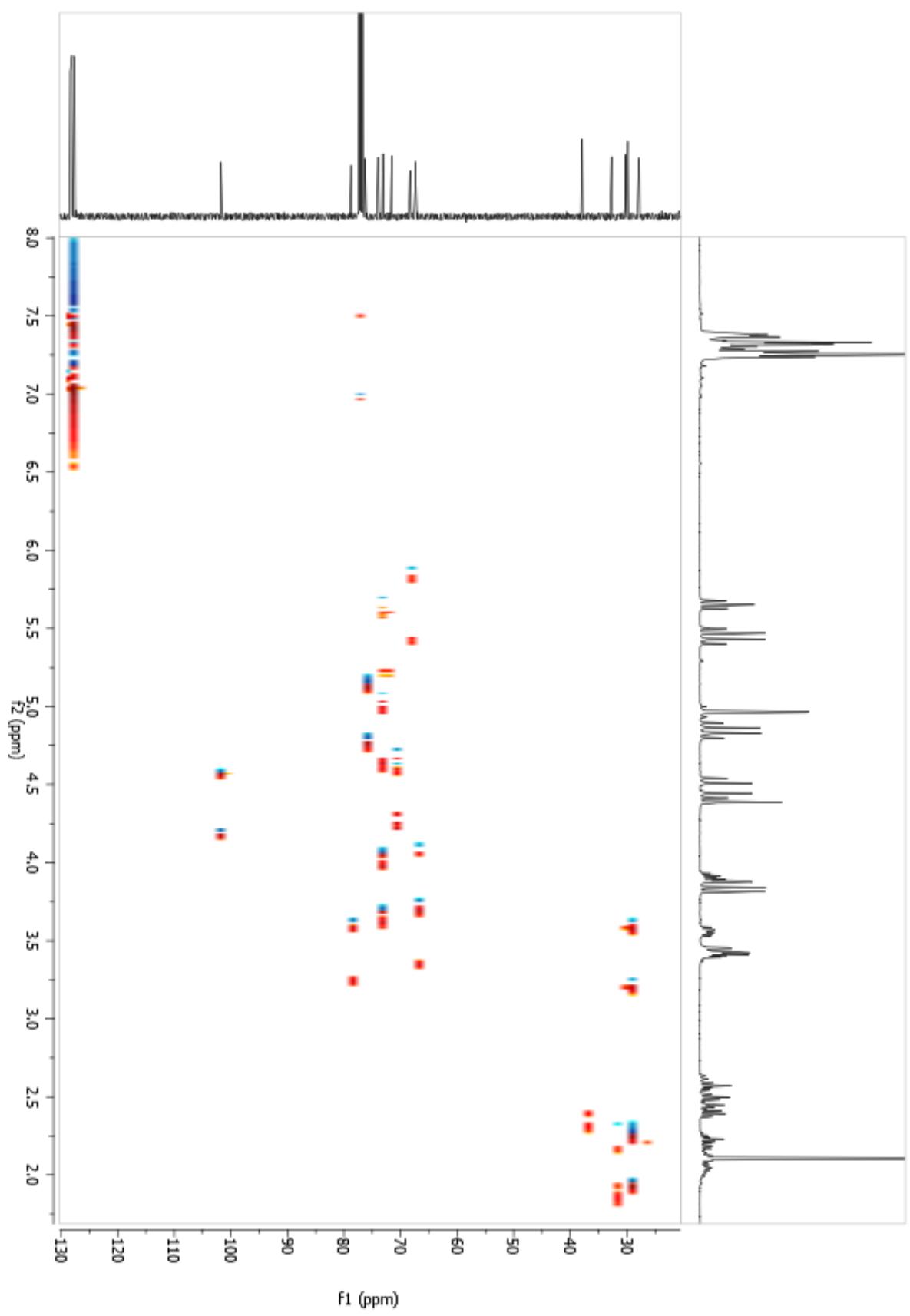




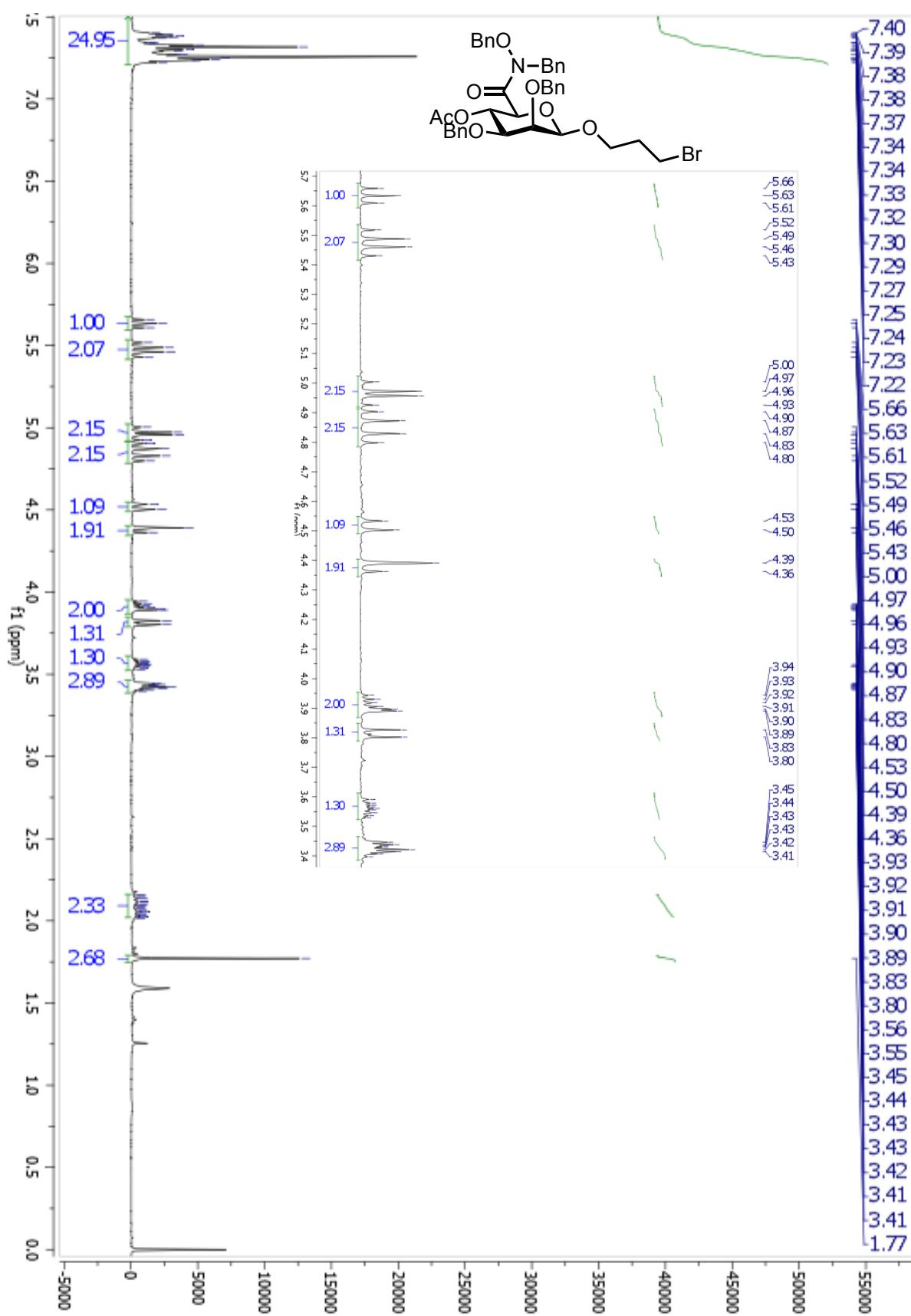
3-bromopropyl (O-benzyl, N-benzyl (phenyl 4-O- levulinoyl-2,3-di-O-benzyl-1-thio- $\alpha$ -D-mannopyranoside) hydroxamate) **7**

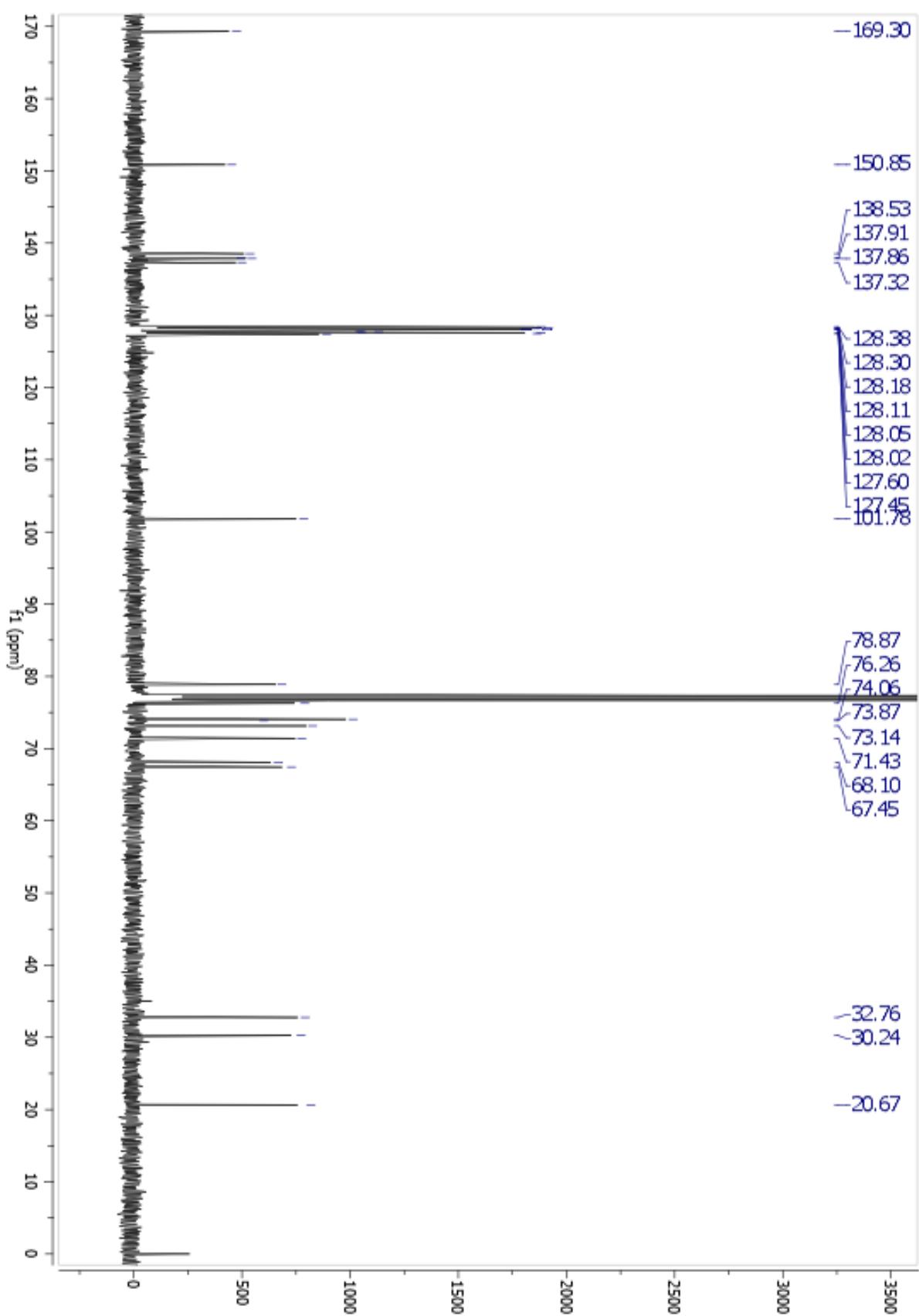


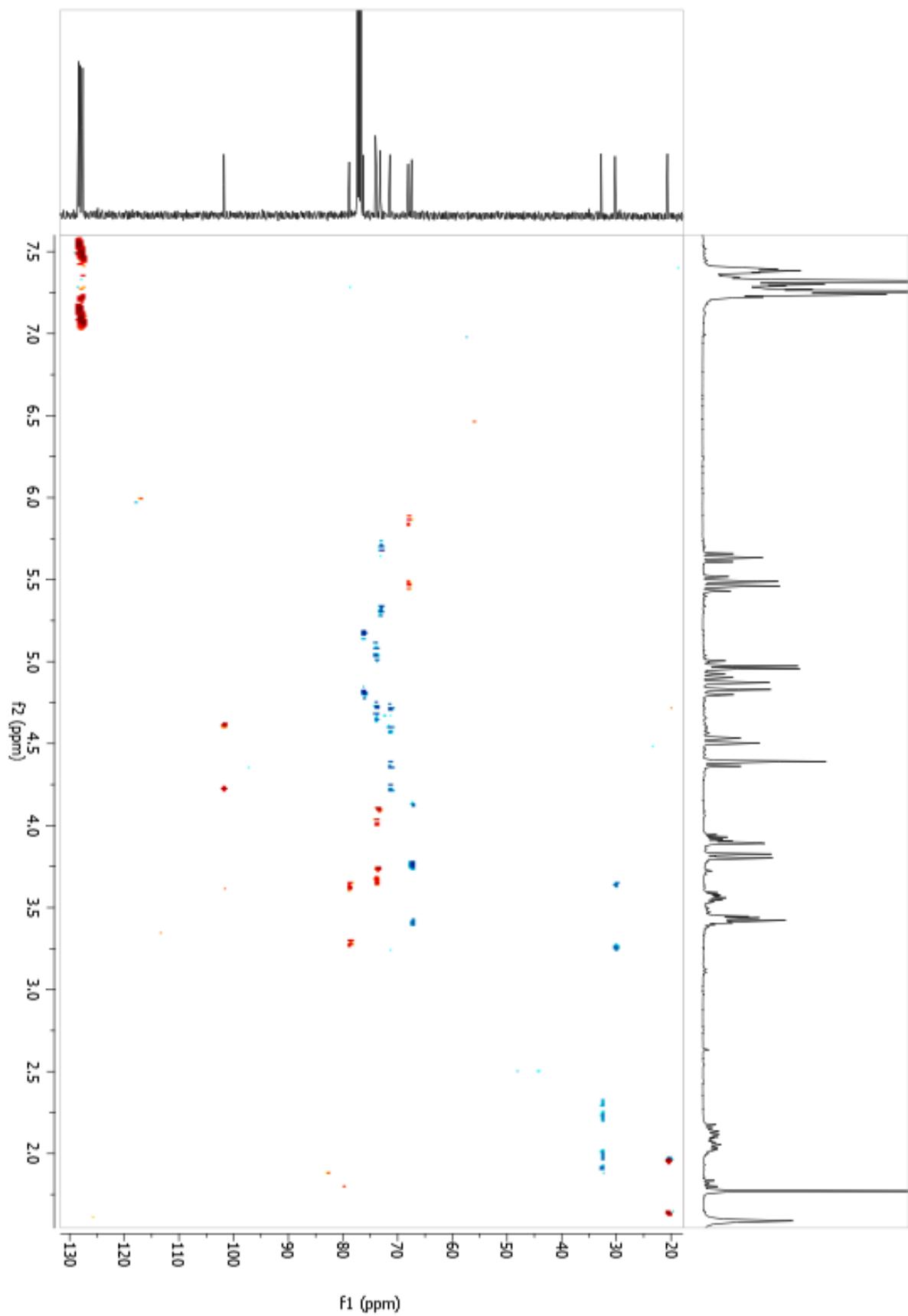




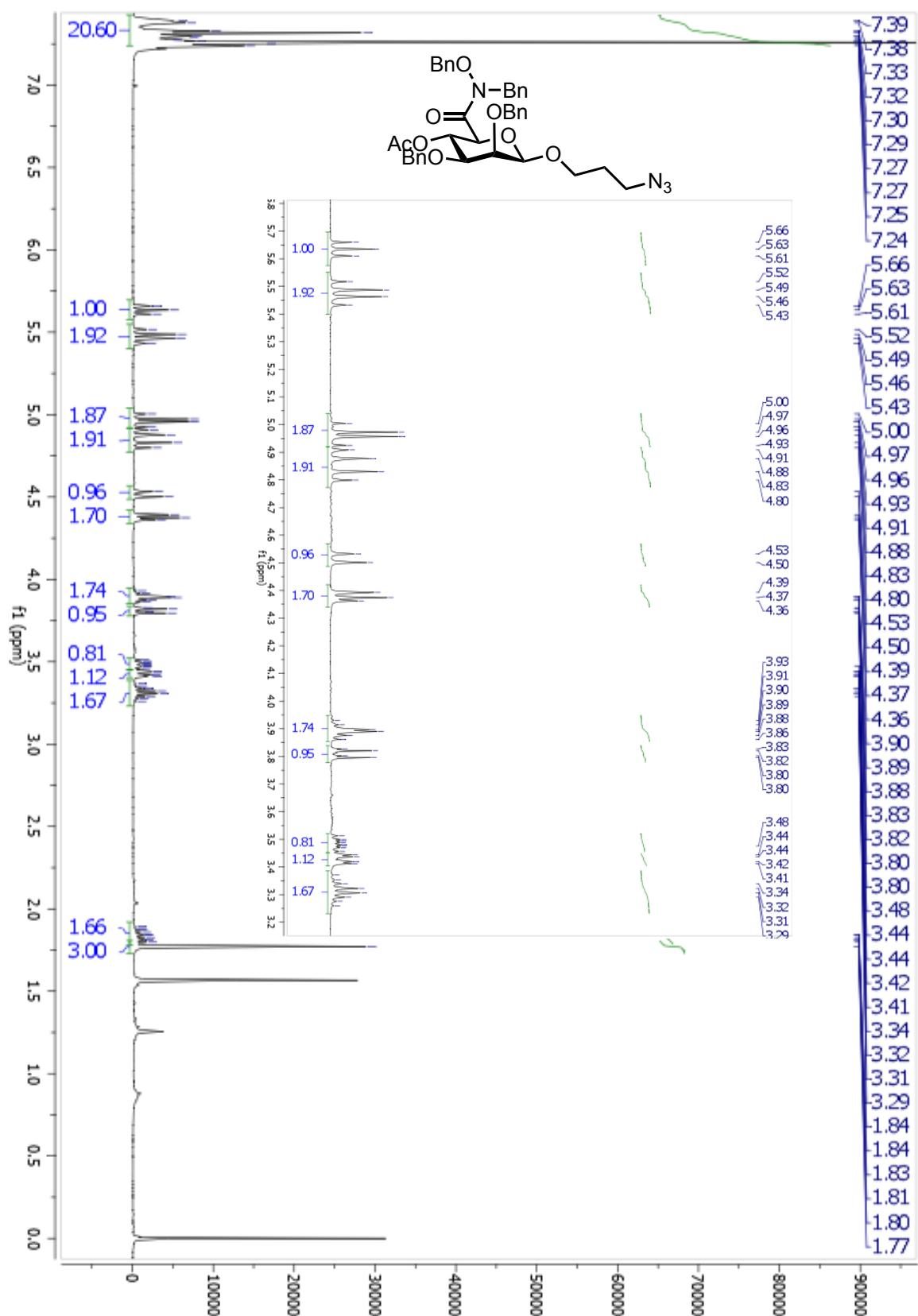
3-bromopropyl (O-benzyl, N-benzyl (phenyl 4-O-acetyl-2,3-di-O-benzyl-1-thio- $\alpha$ -D-mannopyranoside) hydroxamate) **8**

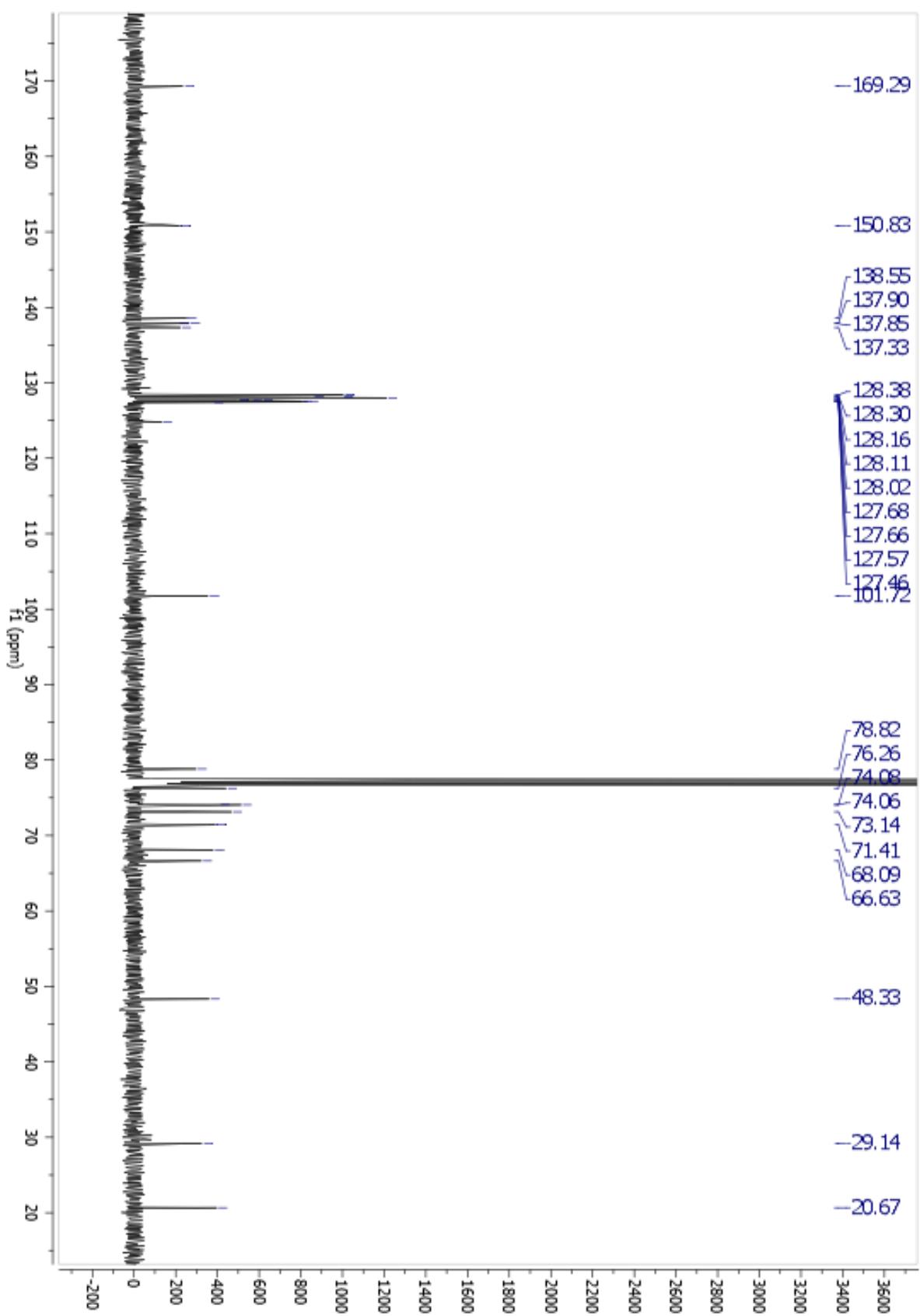


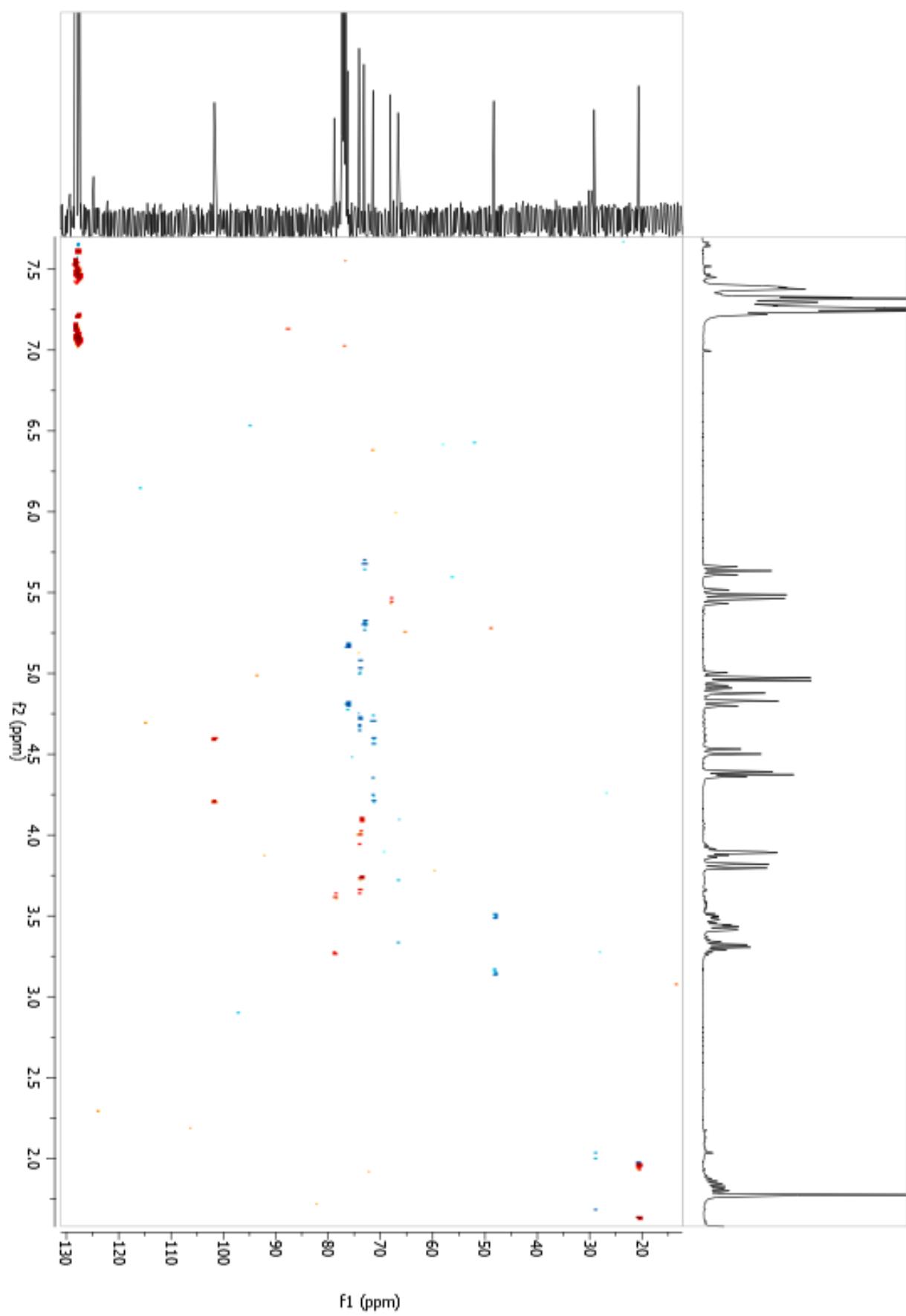




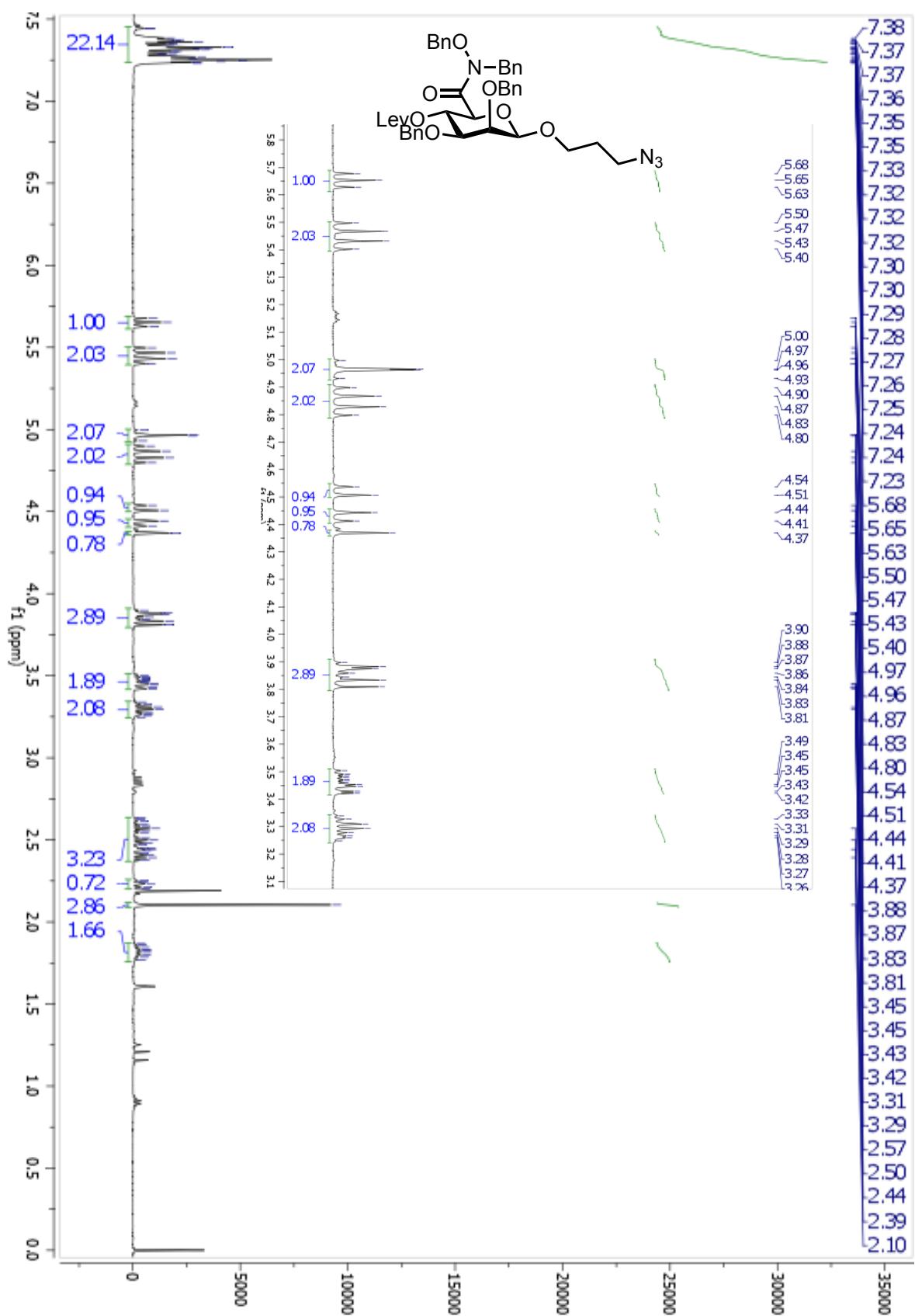
3-azidopropyl (O-benzyl, N-benzyl (phenyl 4-O-acetyl-2,3-di-O-benzyl-1-thio- $\alpha$ -D-mannopyranoside) hydroxamate

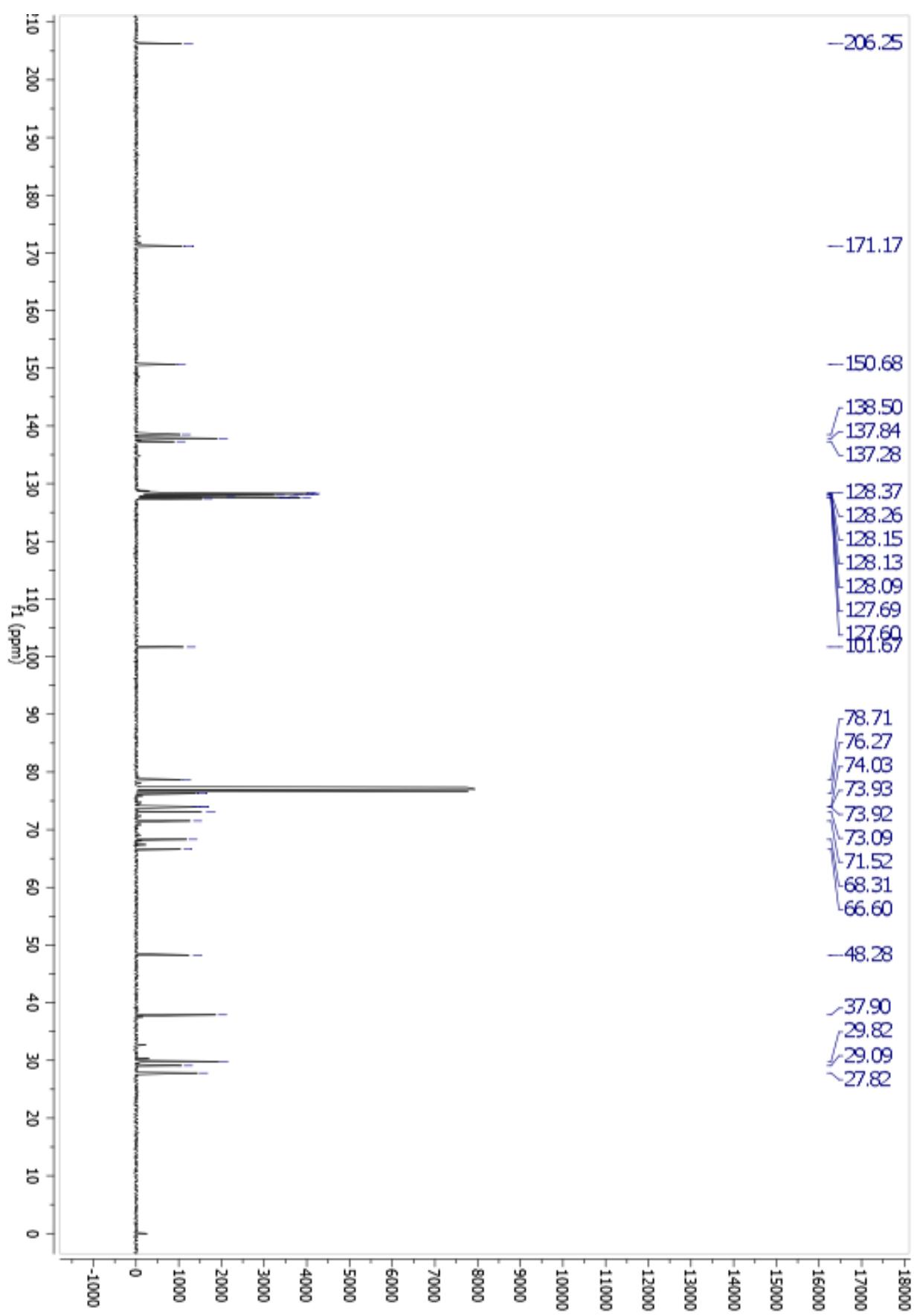


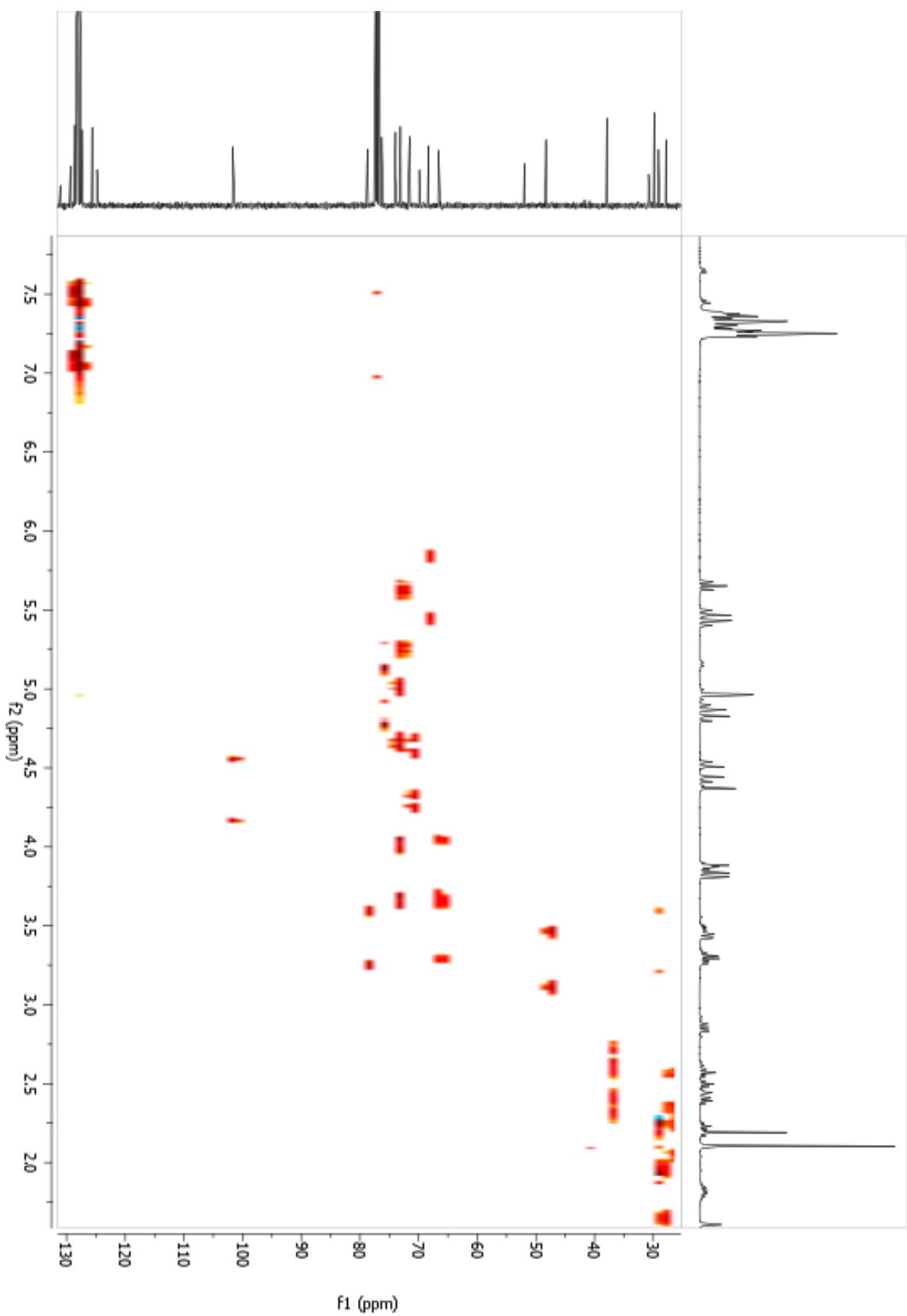




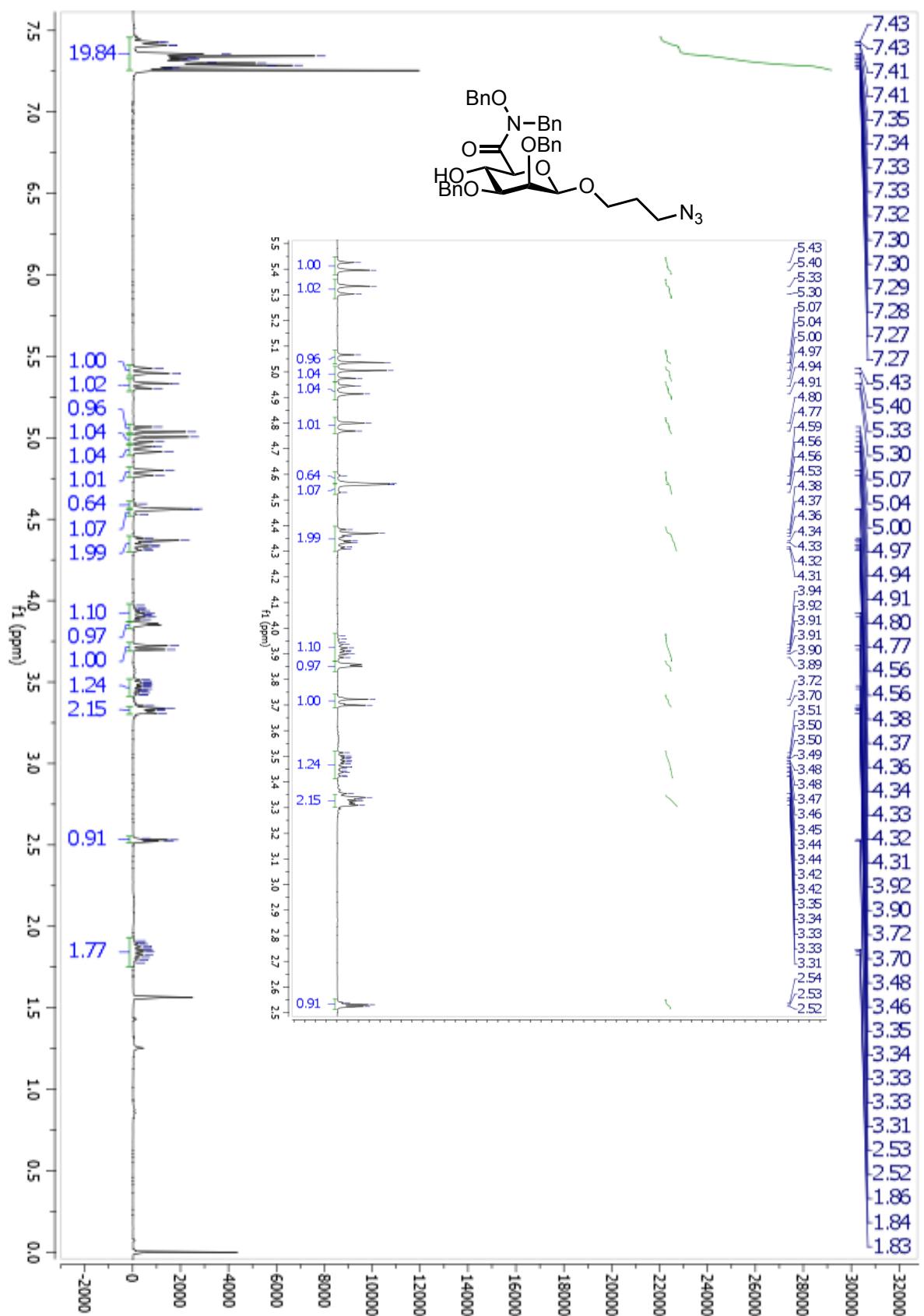
3-azidopropyl (O-benzyl, N-benzyl (phenyl 4-O- levulinoyl-2,3-di-O-benzyl-1-thio- $\alpha$ -D-mannopyranoside) hydroxamate)

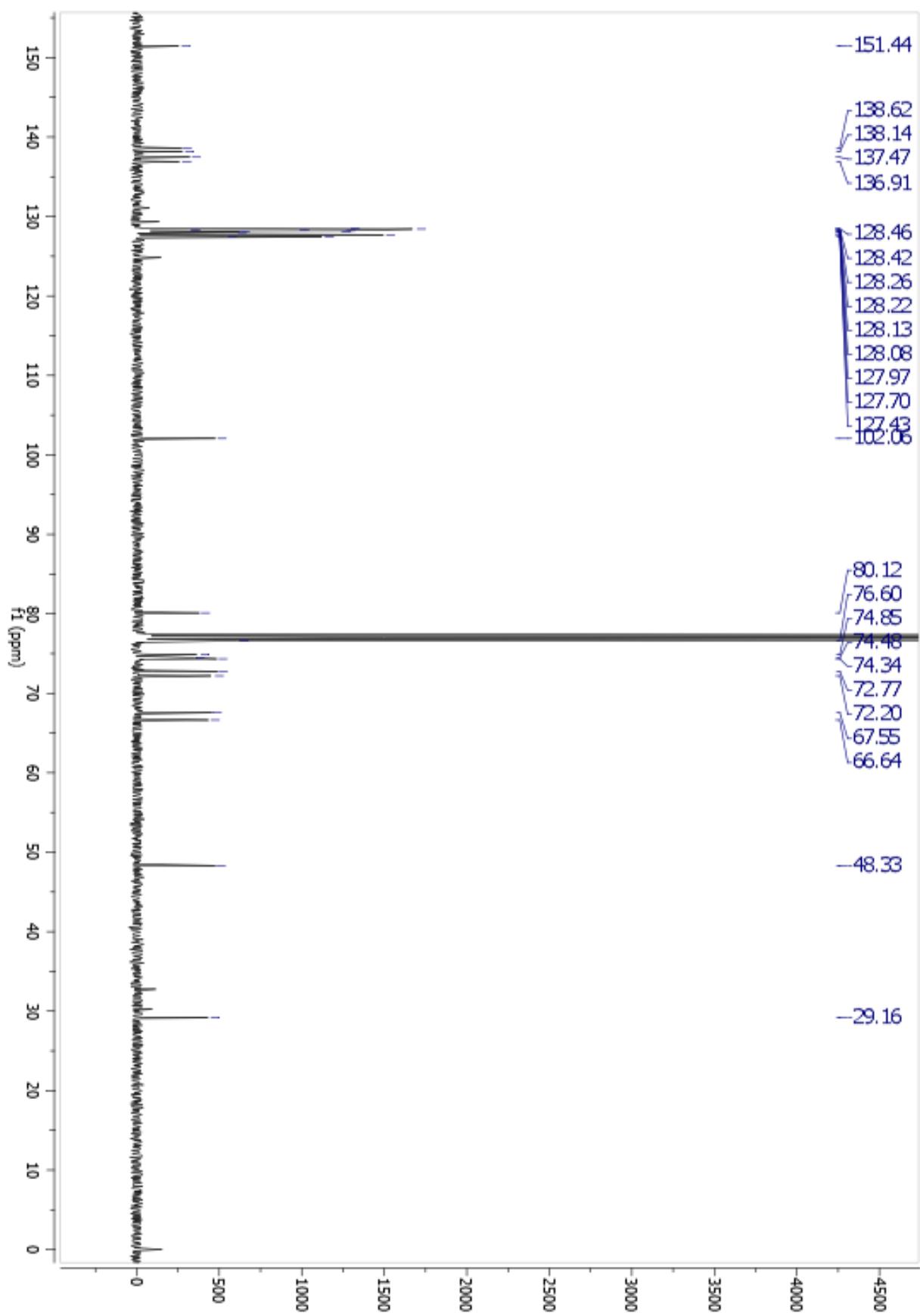


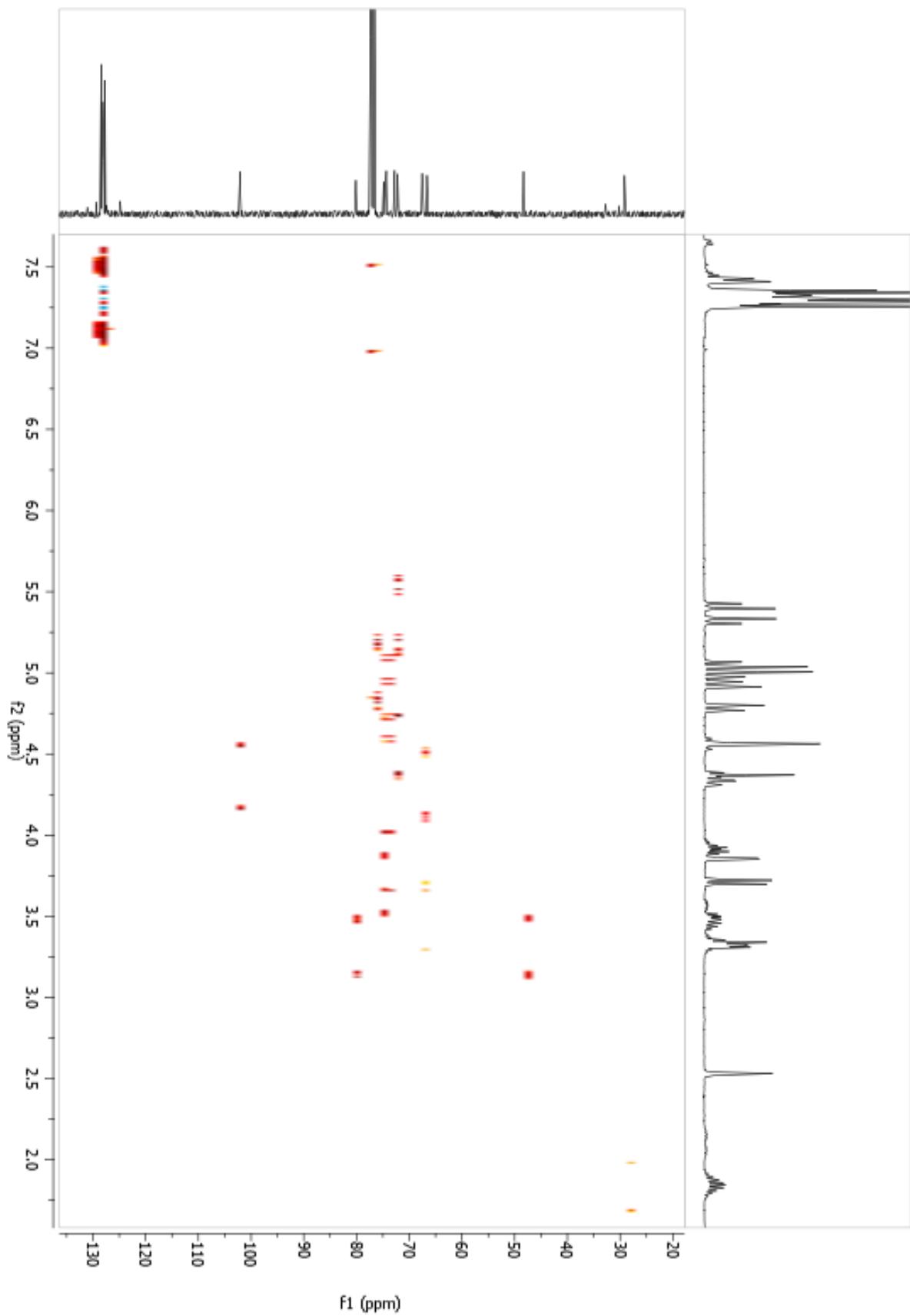




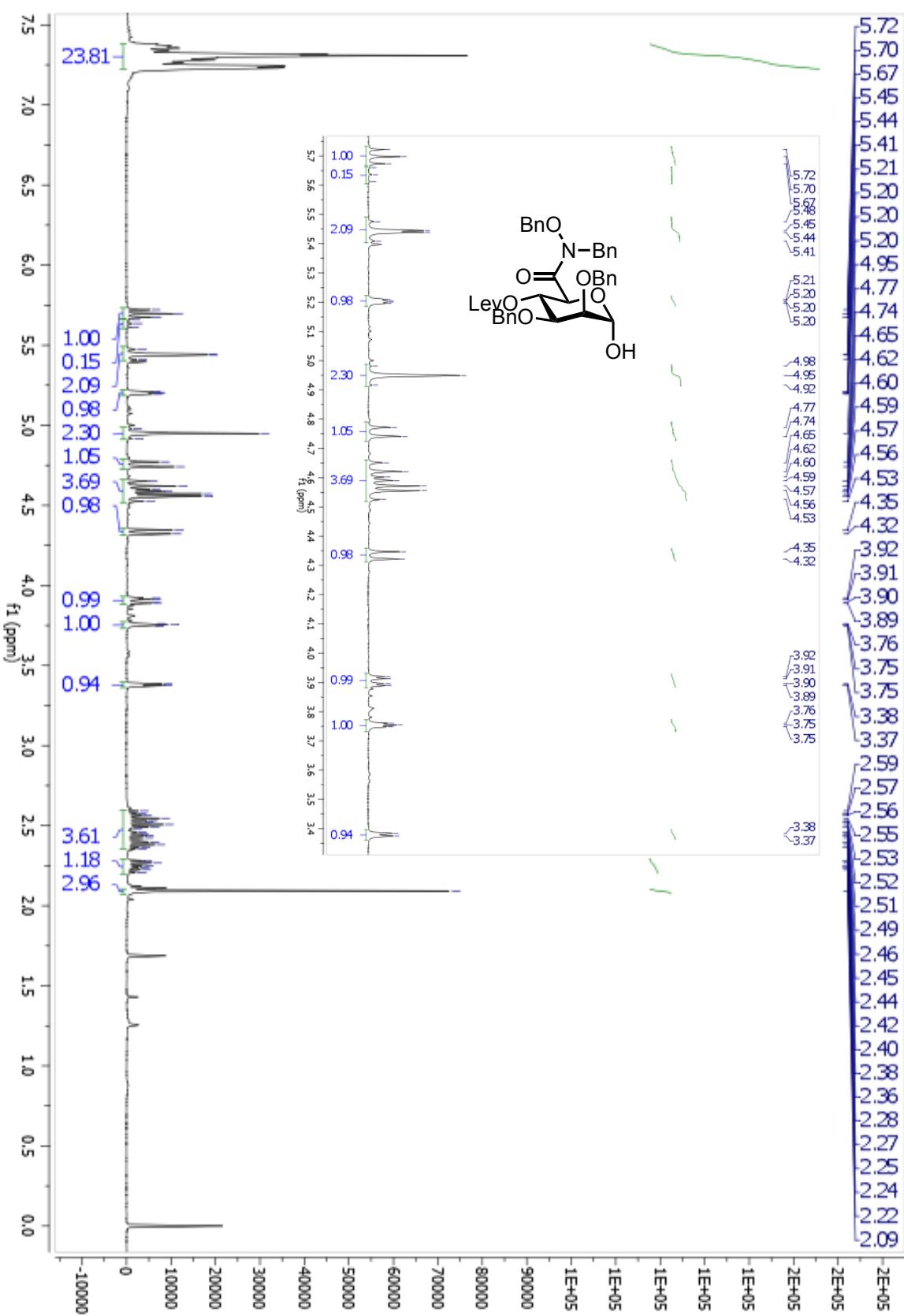
3-azidopropyl (O-benzyl, N-benzyl (phenyl mannopyranoside) hydroxamate) **9**

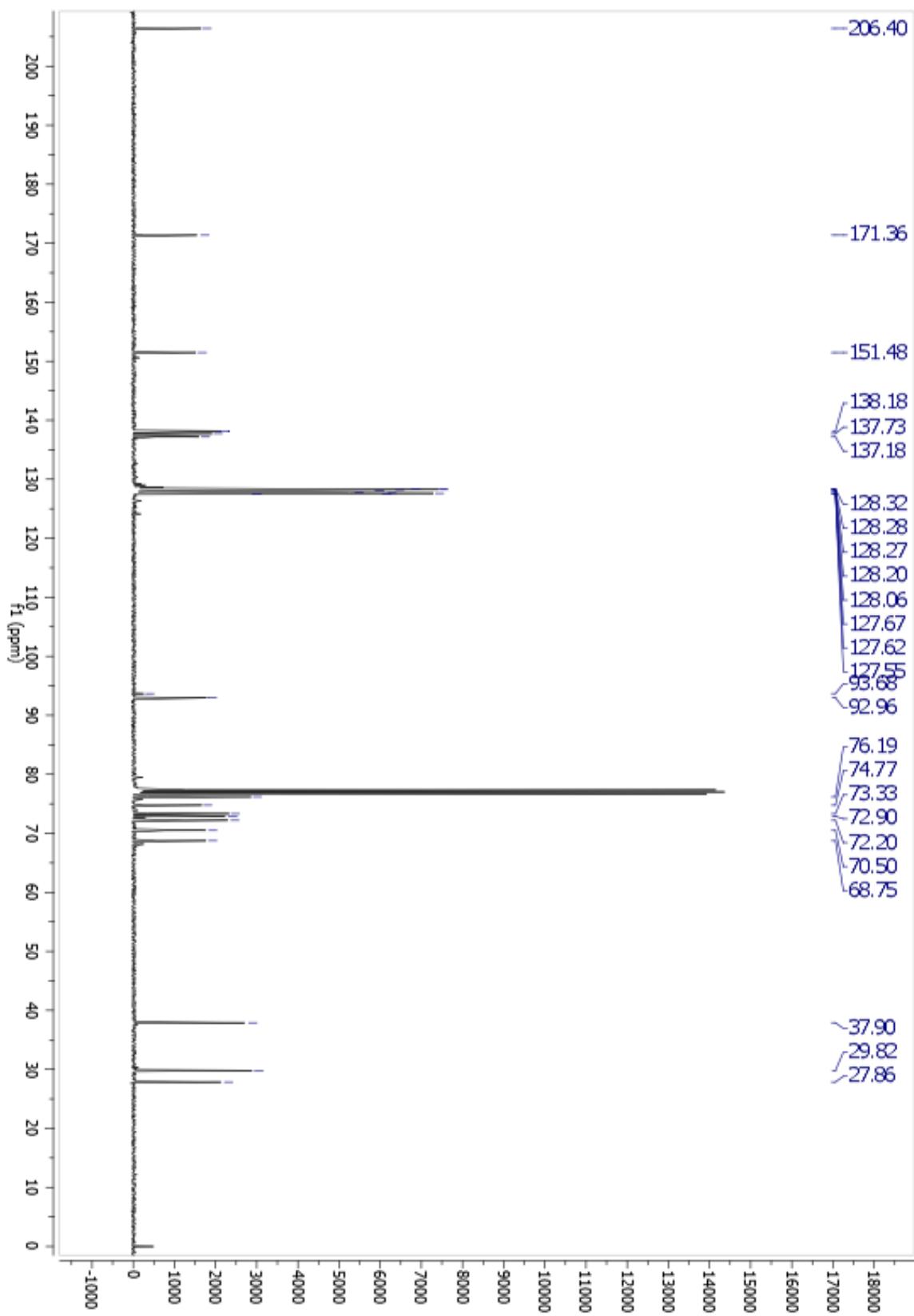


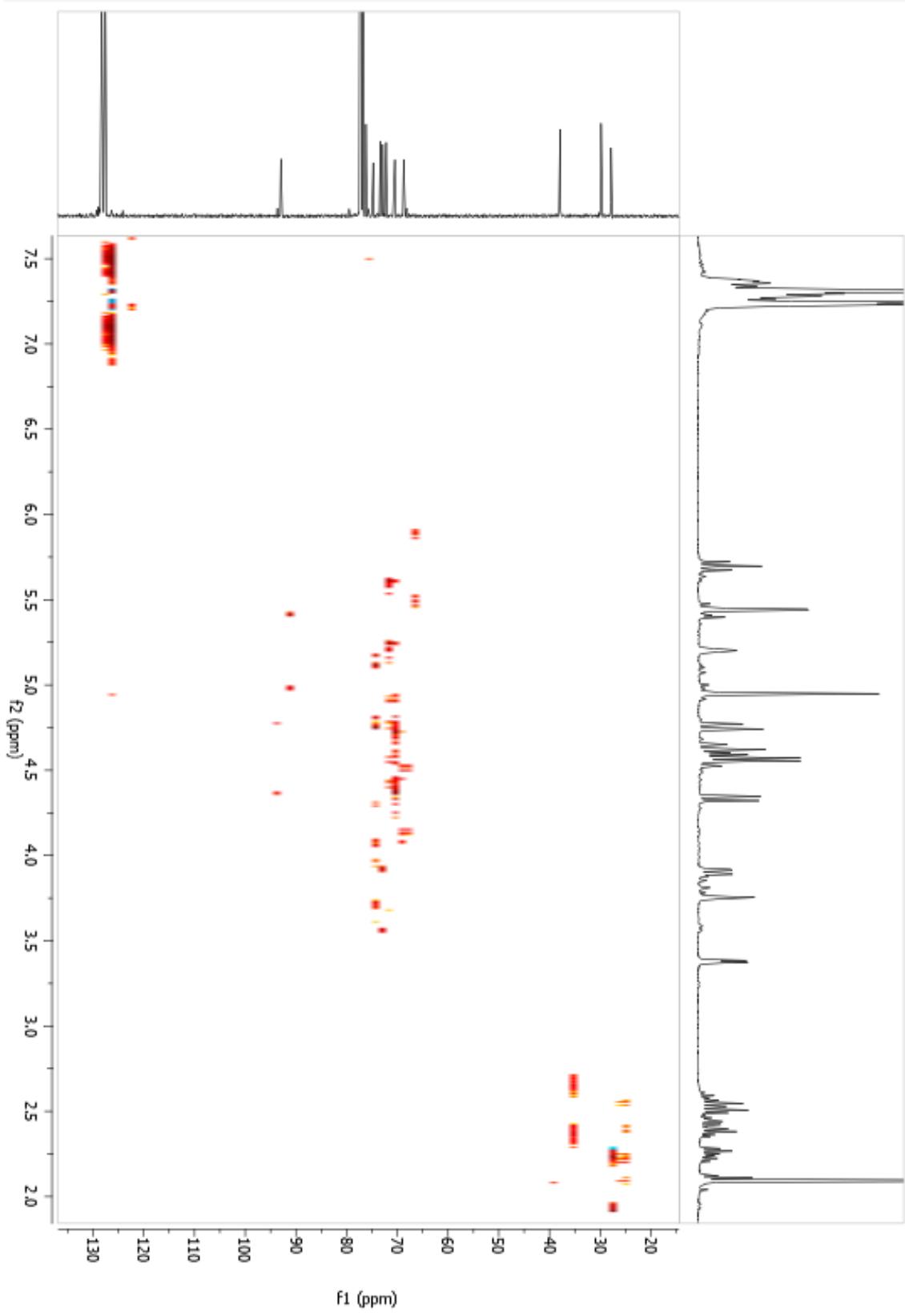




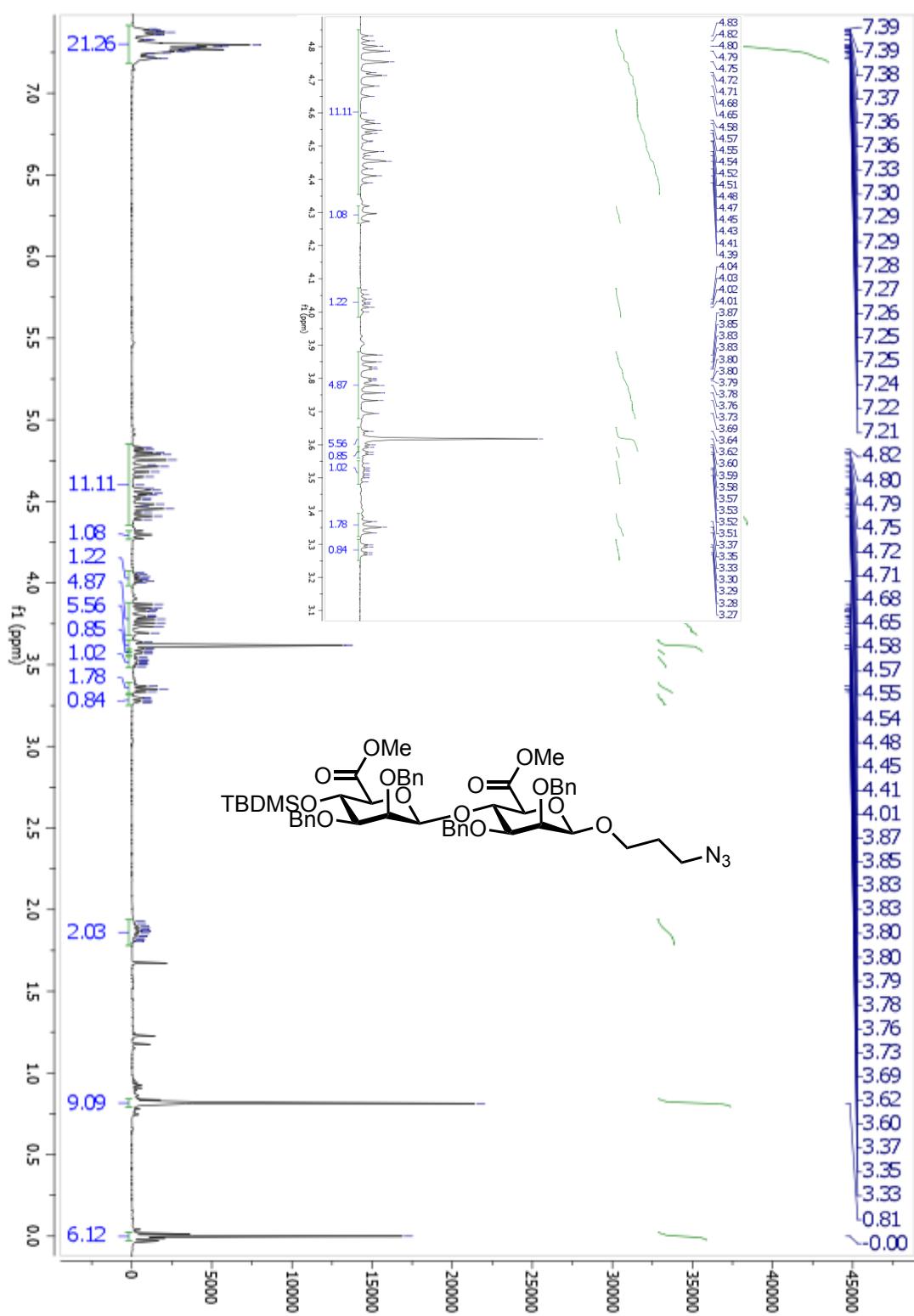
O-benzyl, N-benzyl (phenyl mannopyranoside) hydroxamate

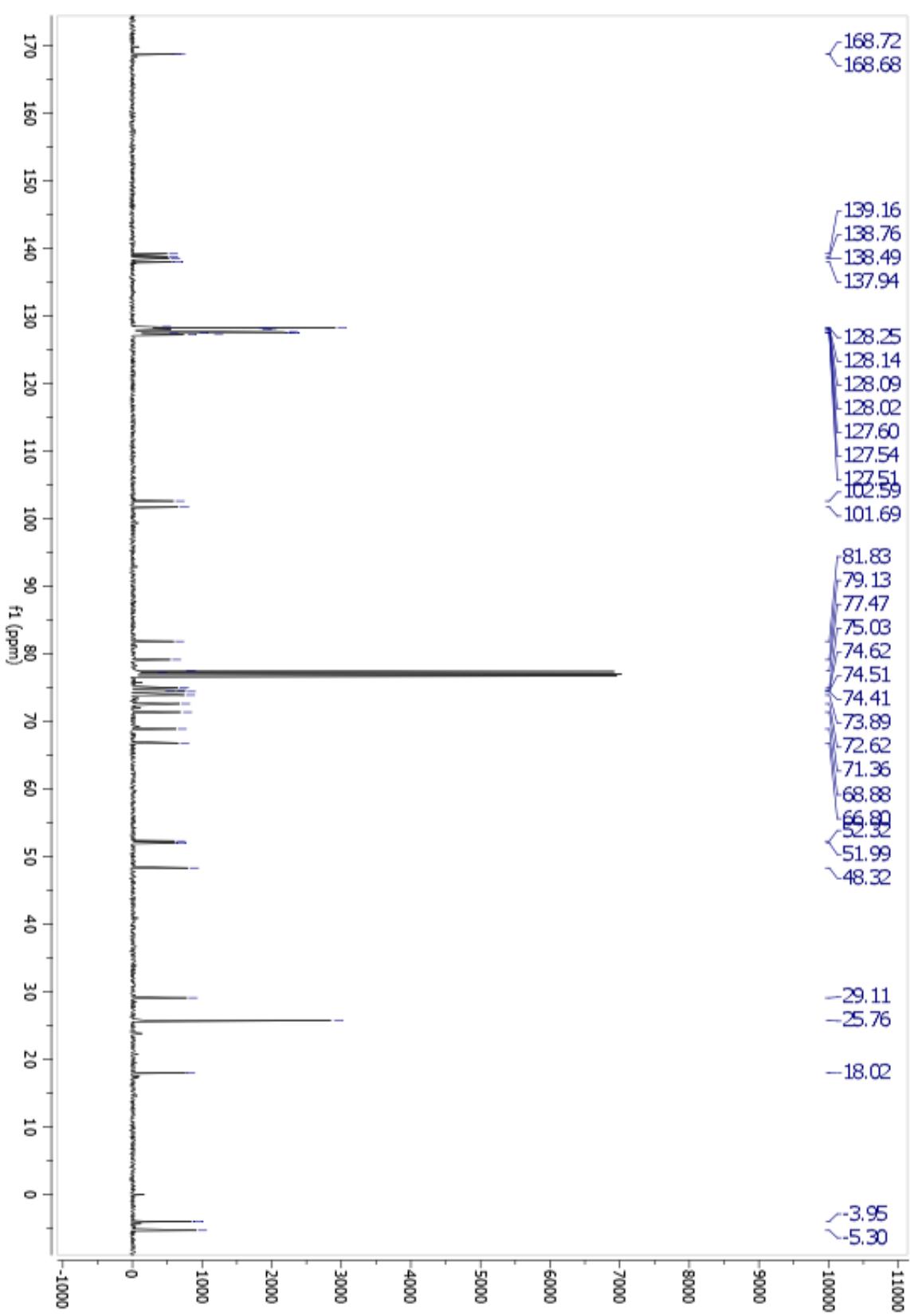




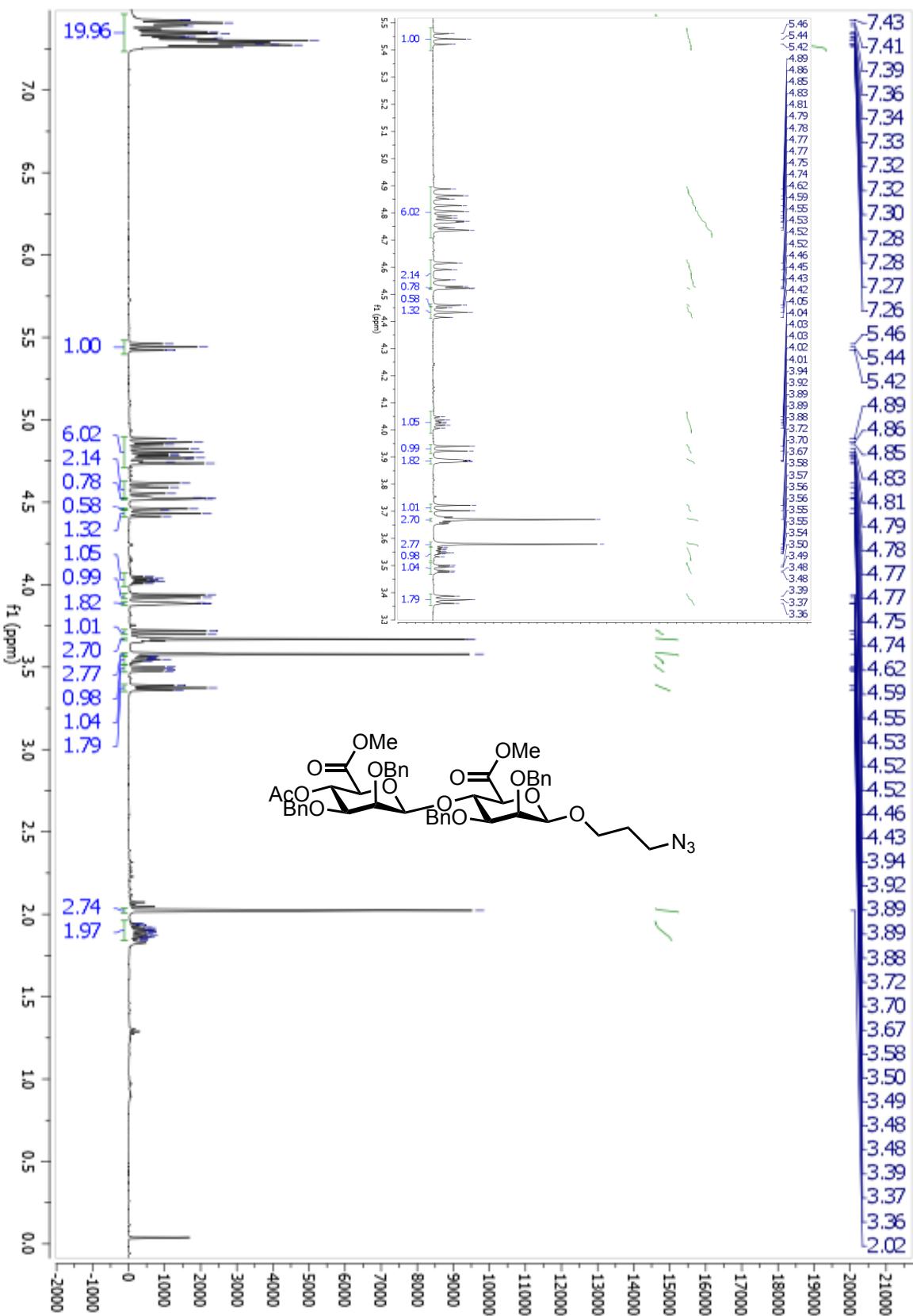


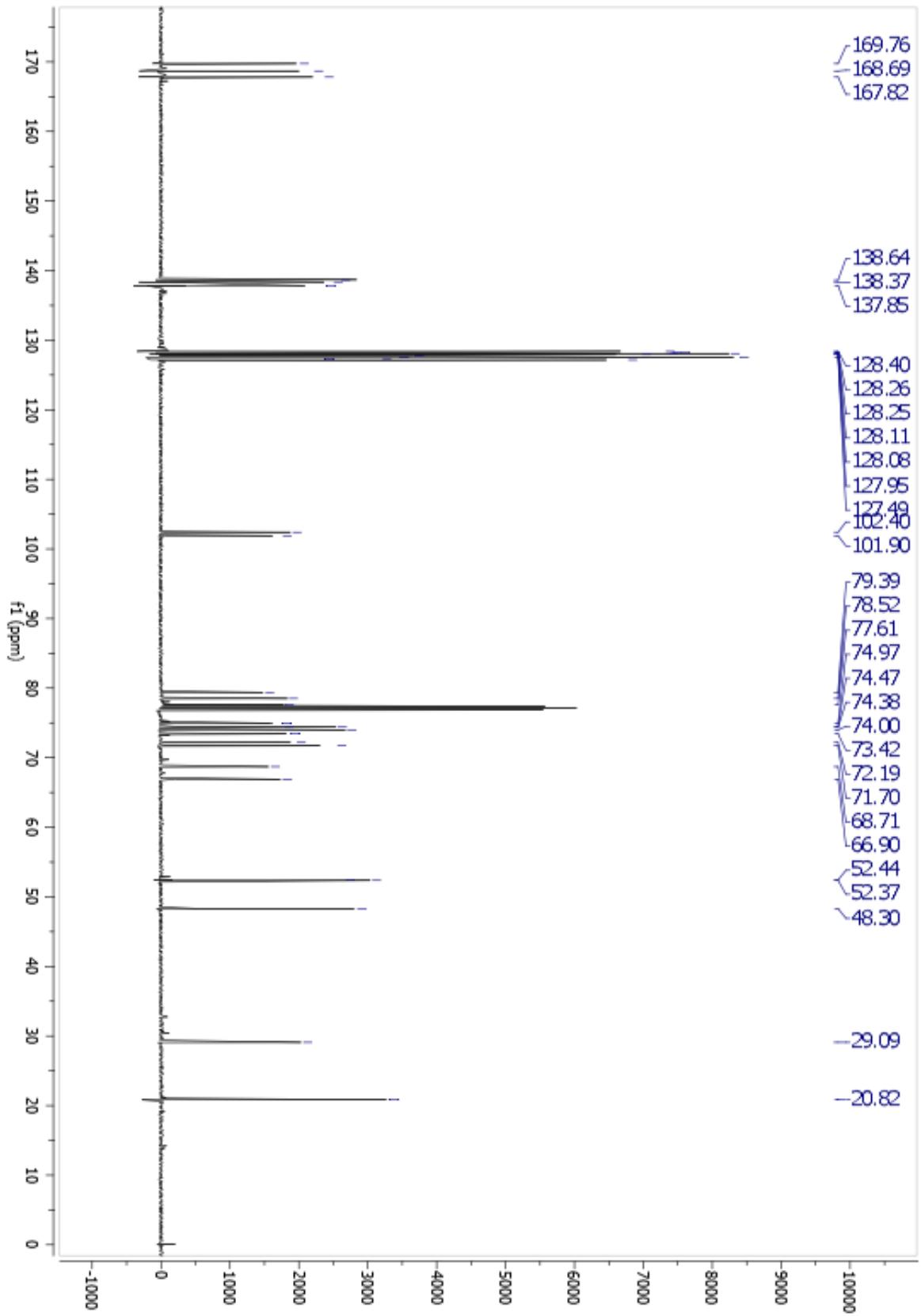
3-azidopropyl (methyl 2,3-di-O-benzyl-4-O-(methyl (4-O-*tert*-butyl dimethylsilyl)-2,3-di-O-benzyl- $\beta$ -D-mannopyranosyl) uronate)- $\beta$ -D-mannopyranoside **14**

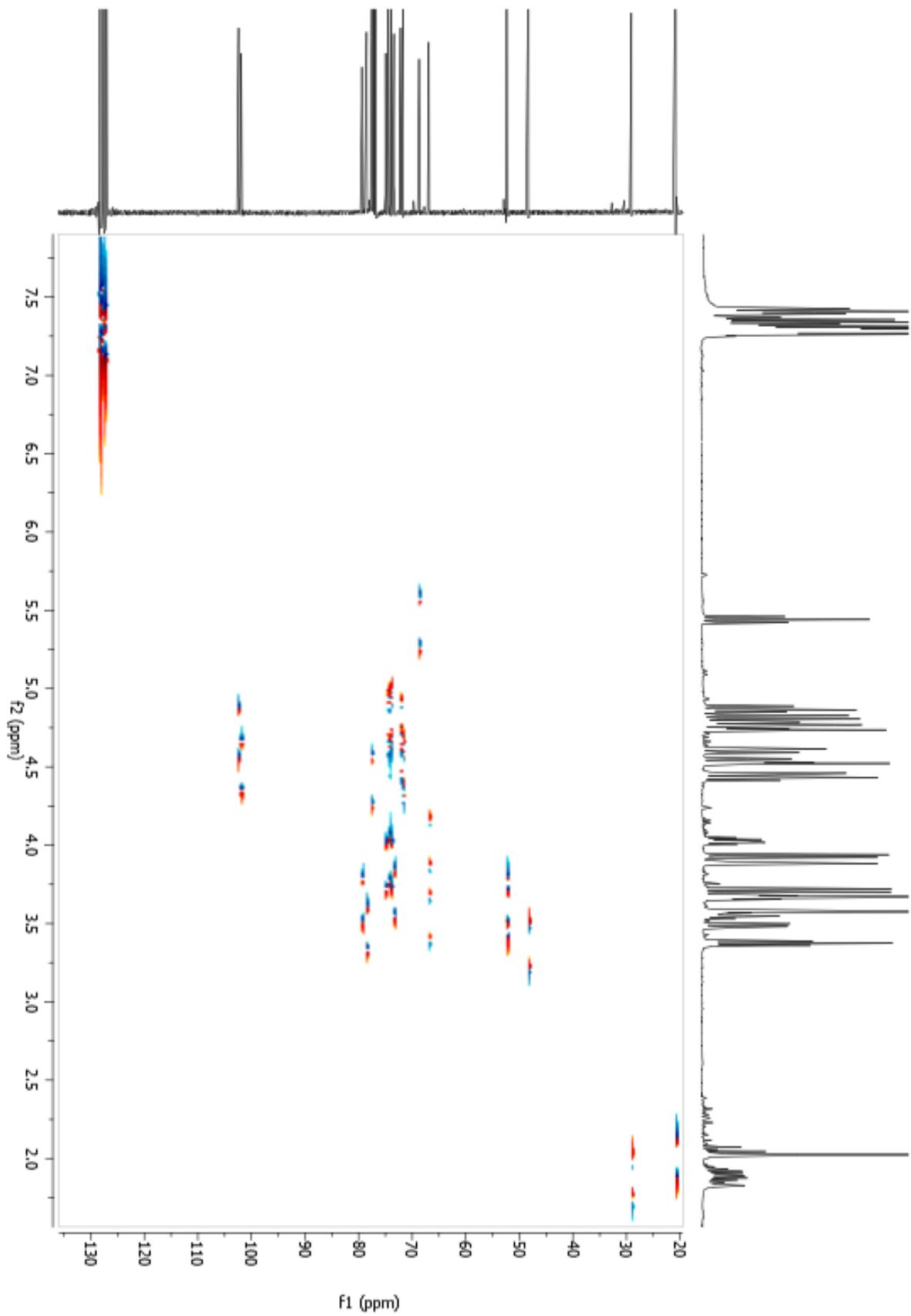




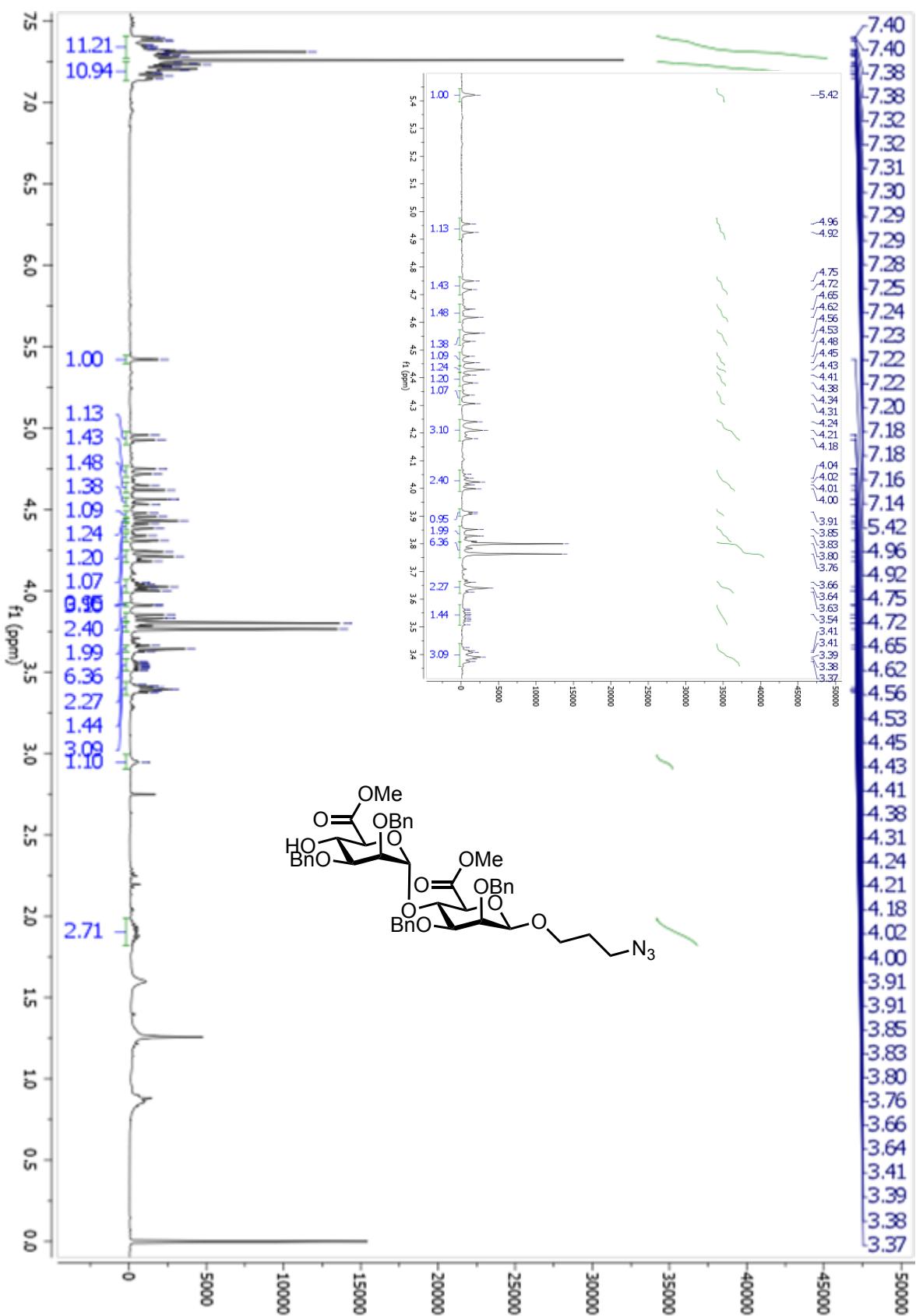
3-azidopropyl (methyl 2,3-di-O-benzyl-4-O-(methyl (4-O-acetyl-2,3-di-O-benzyl- $\beta$ -D-mannopyranosyl) uronate)- $\alpha$ -D-mannopyranoside) uronate **15**

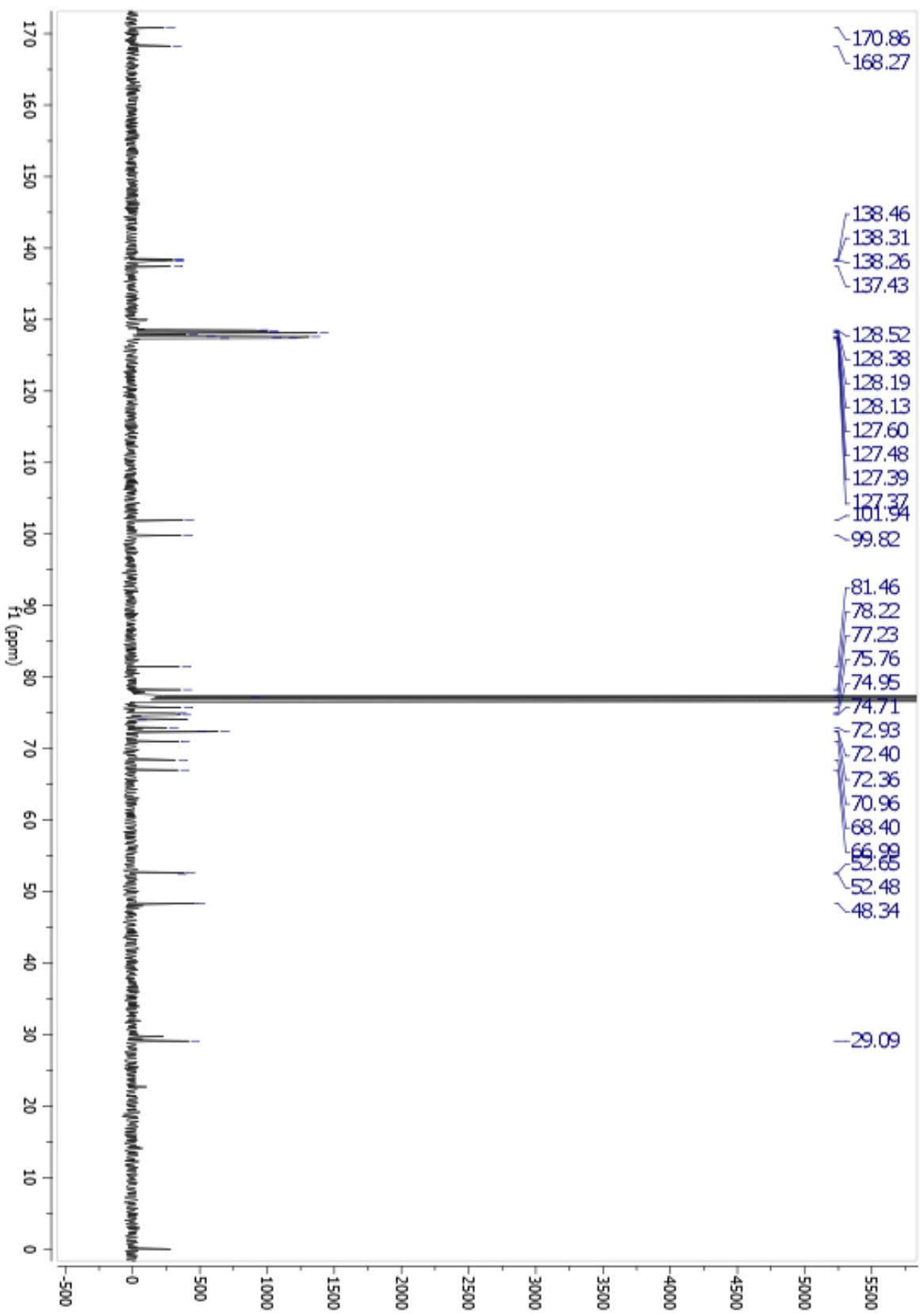


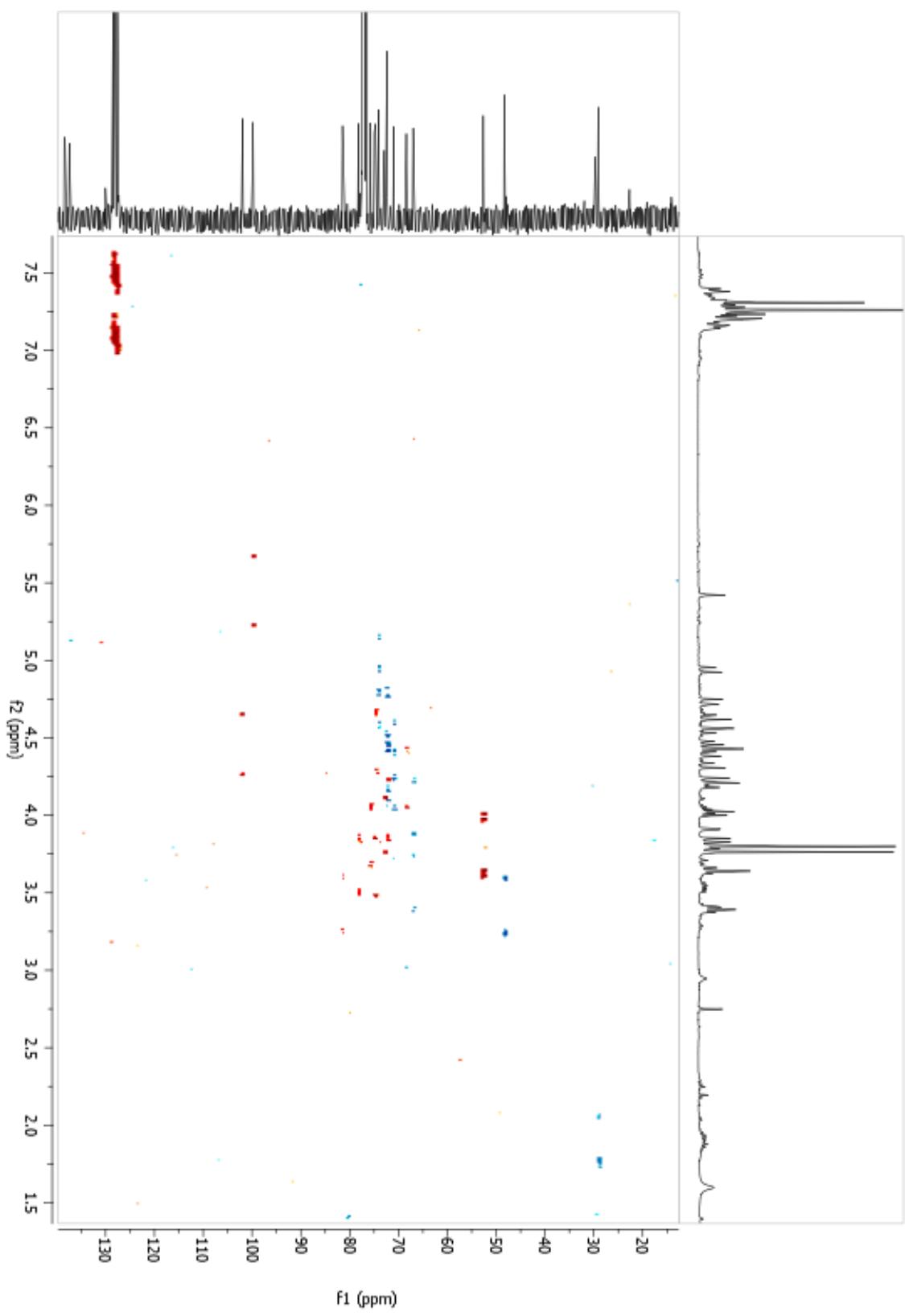


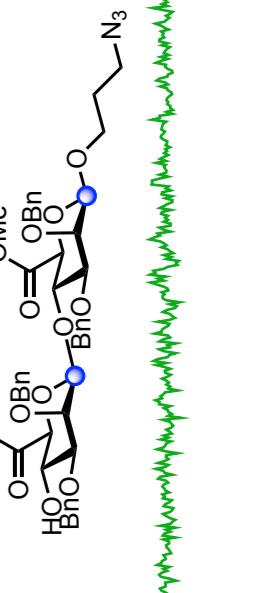
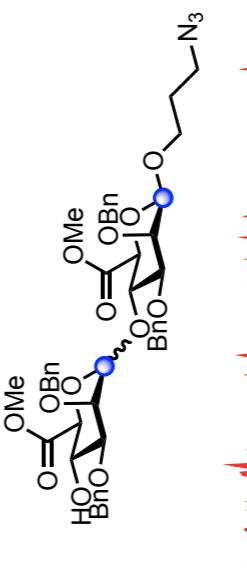
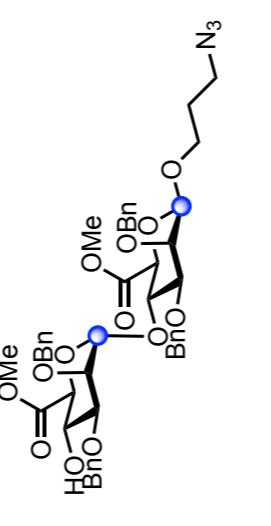
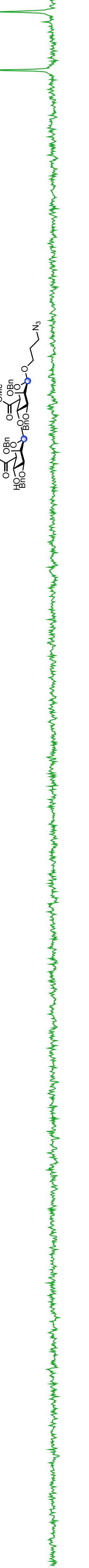


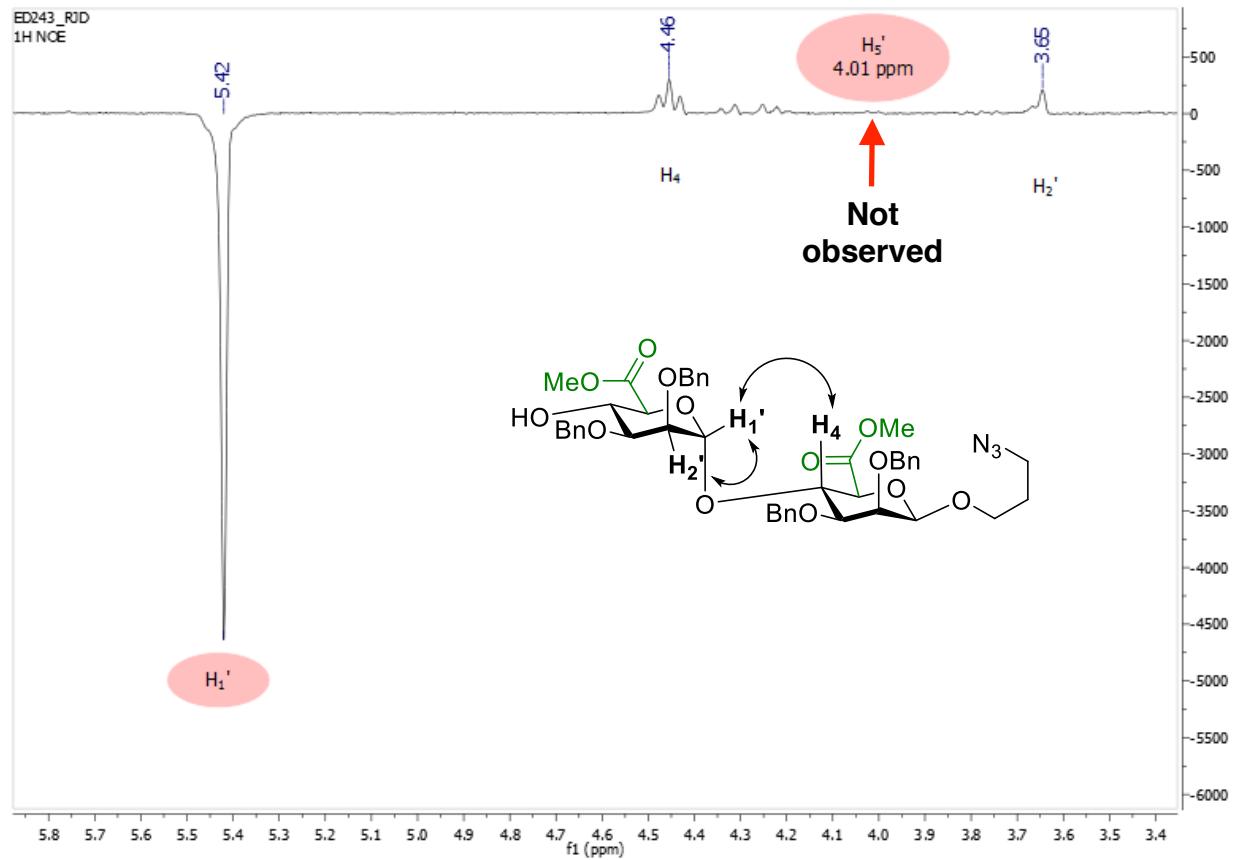
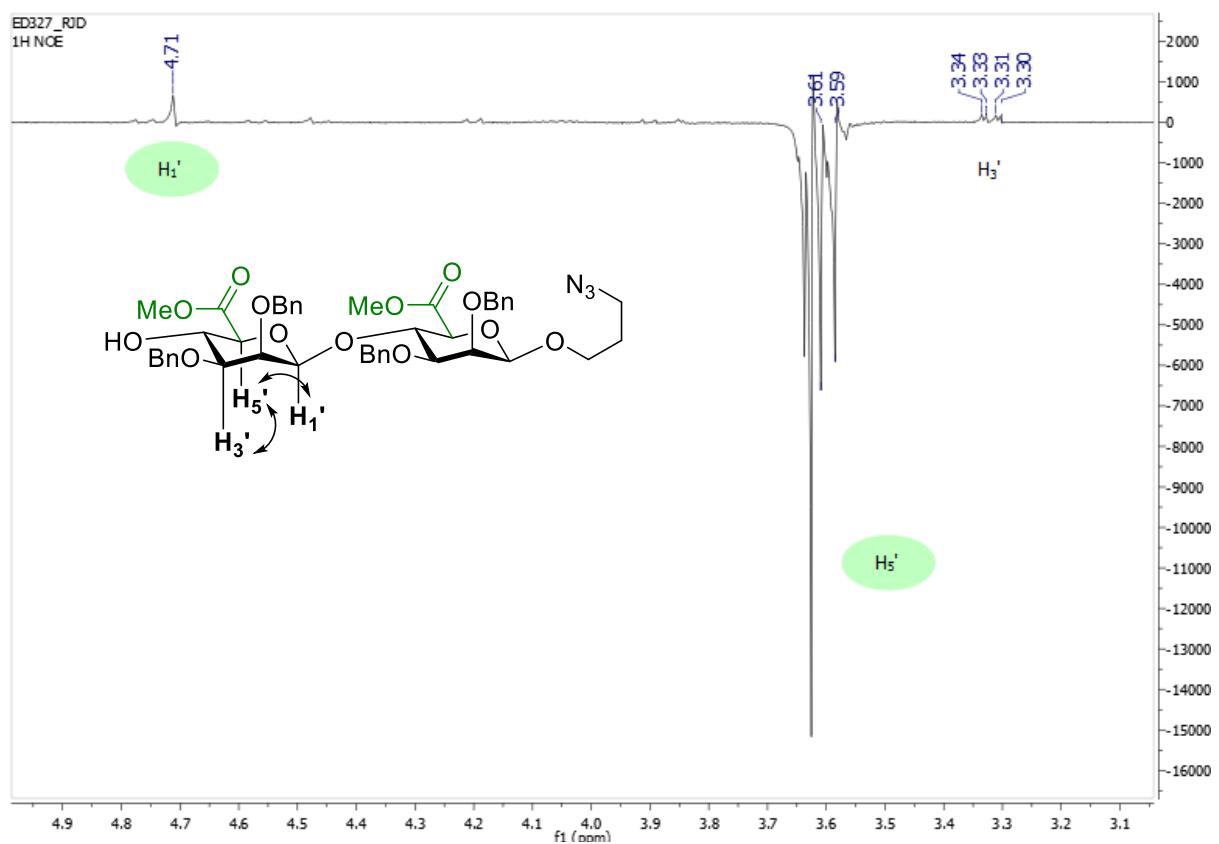
3-azidopropyl (methyl 2,3-di-O-benzyl-4-O-(methylmannopyranosyl) uronate)- $\alpha$ -D-mannopyranoside) uronate **17**



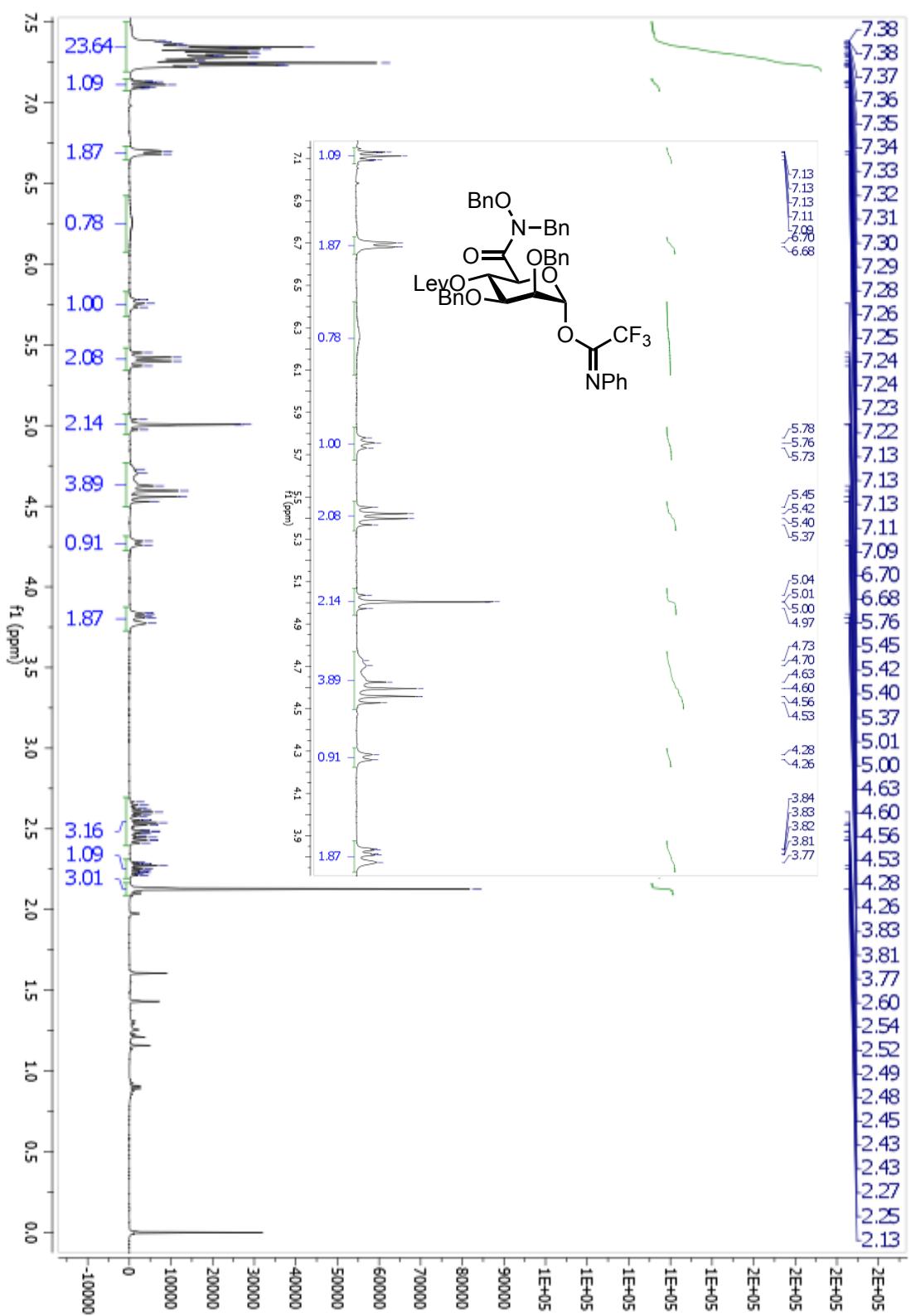


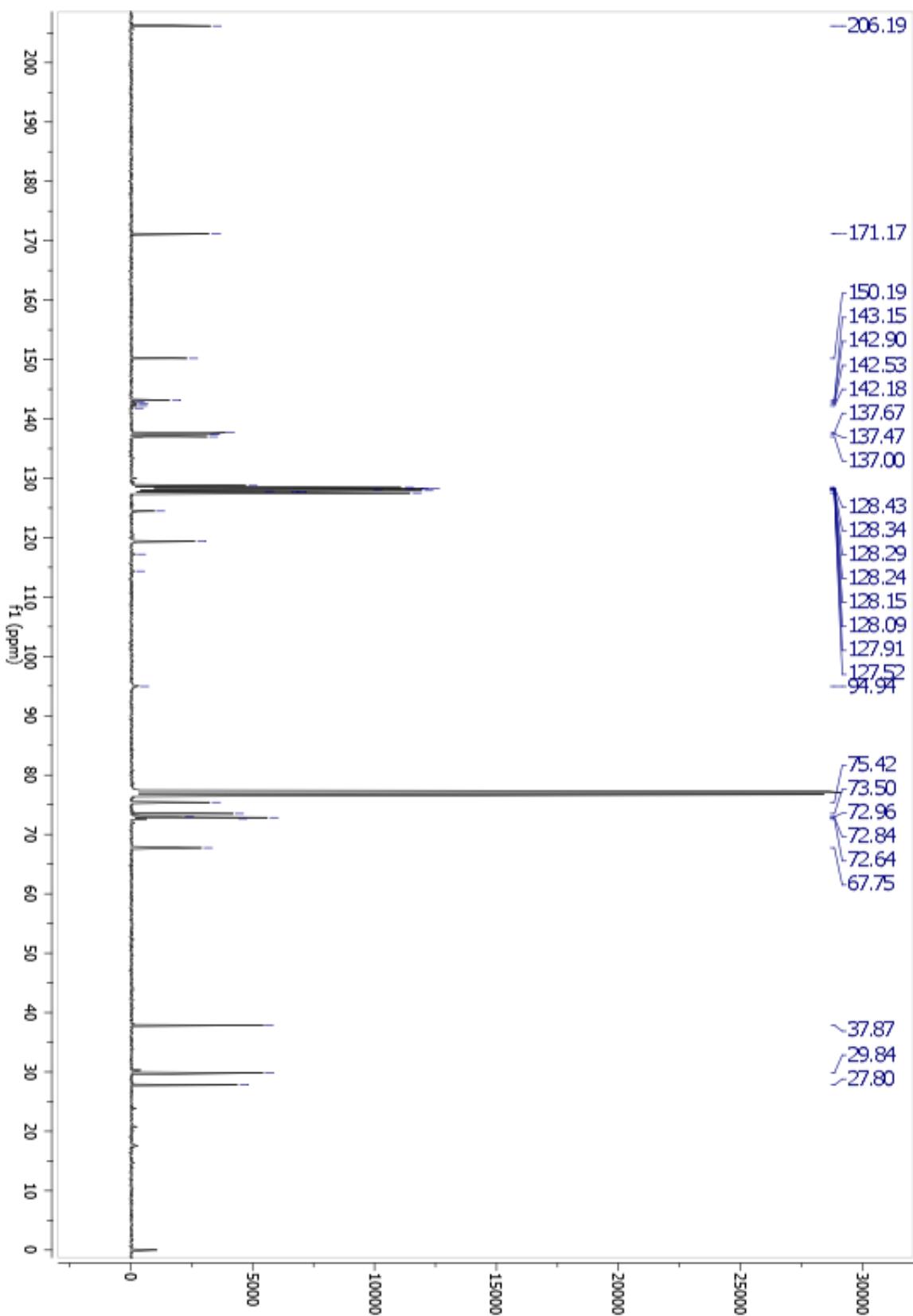


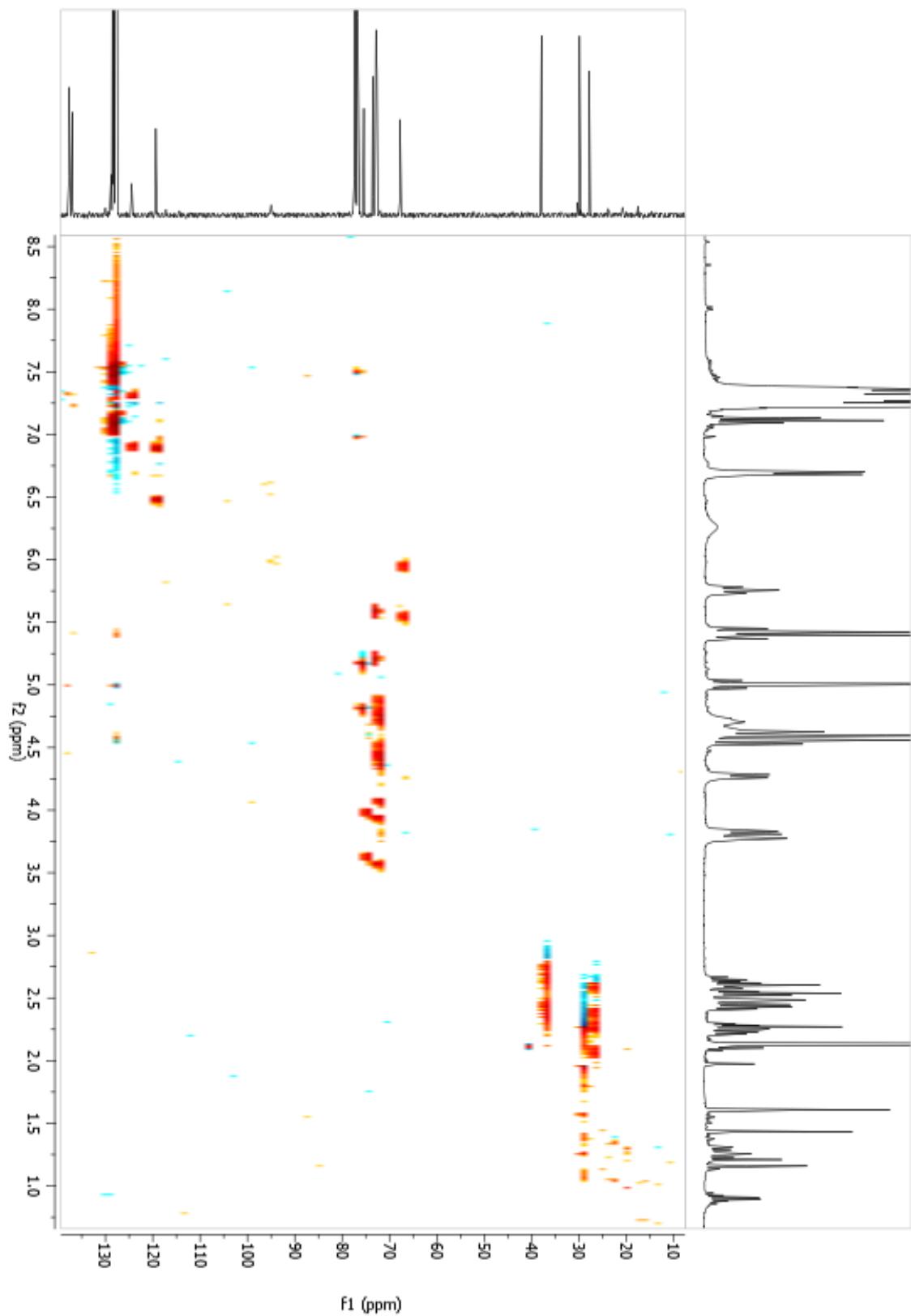




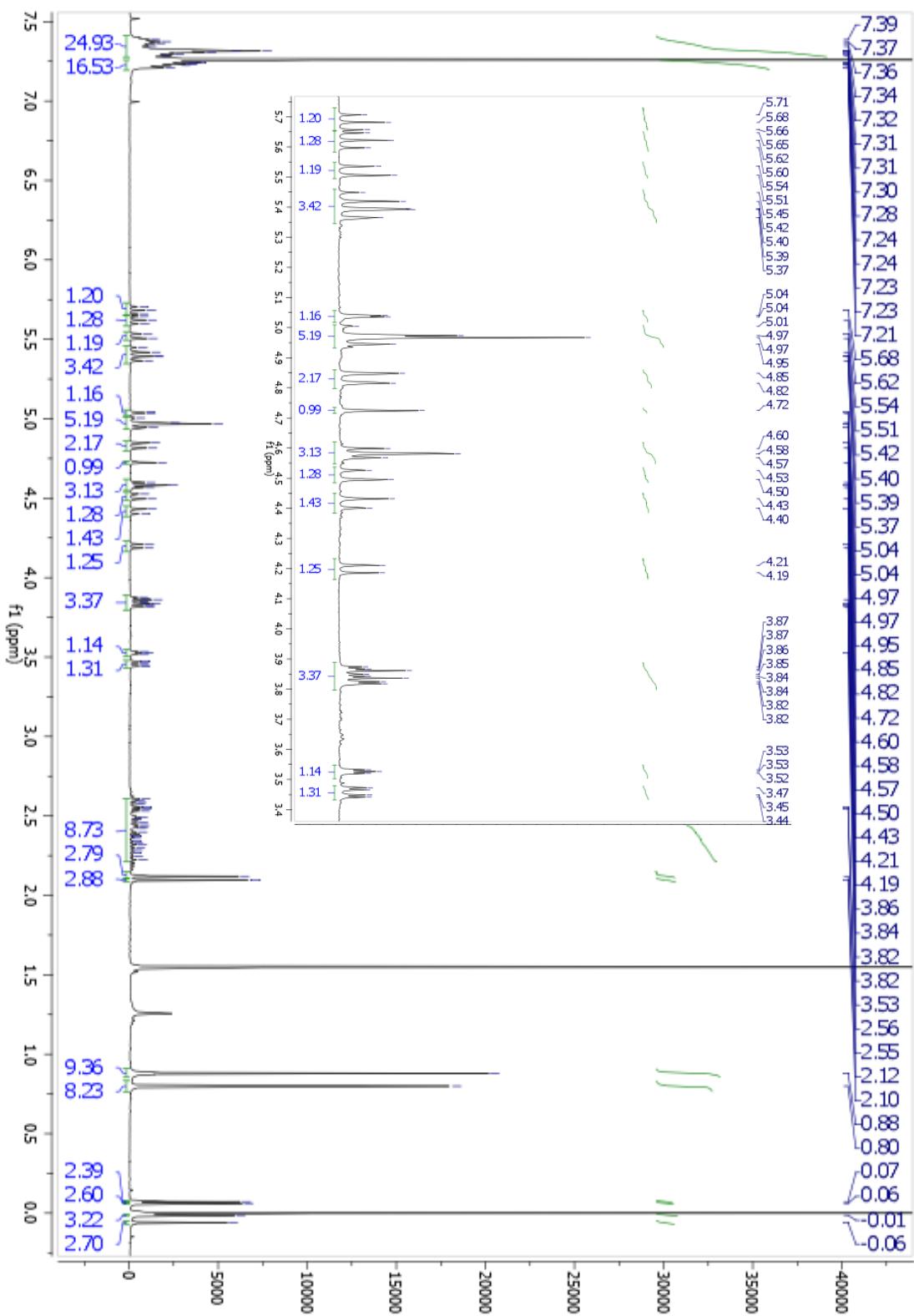
O-benzyl, N-benzyl (phenyl 4-O-levulinoyl-2,3-di-O-benzyl-1-O-Phenyl-N-trifluoroacetimidate- $\alpha$ -D-mannopyranoside) hydroxamate **19**

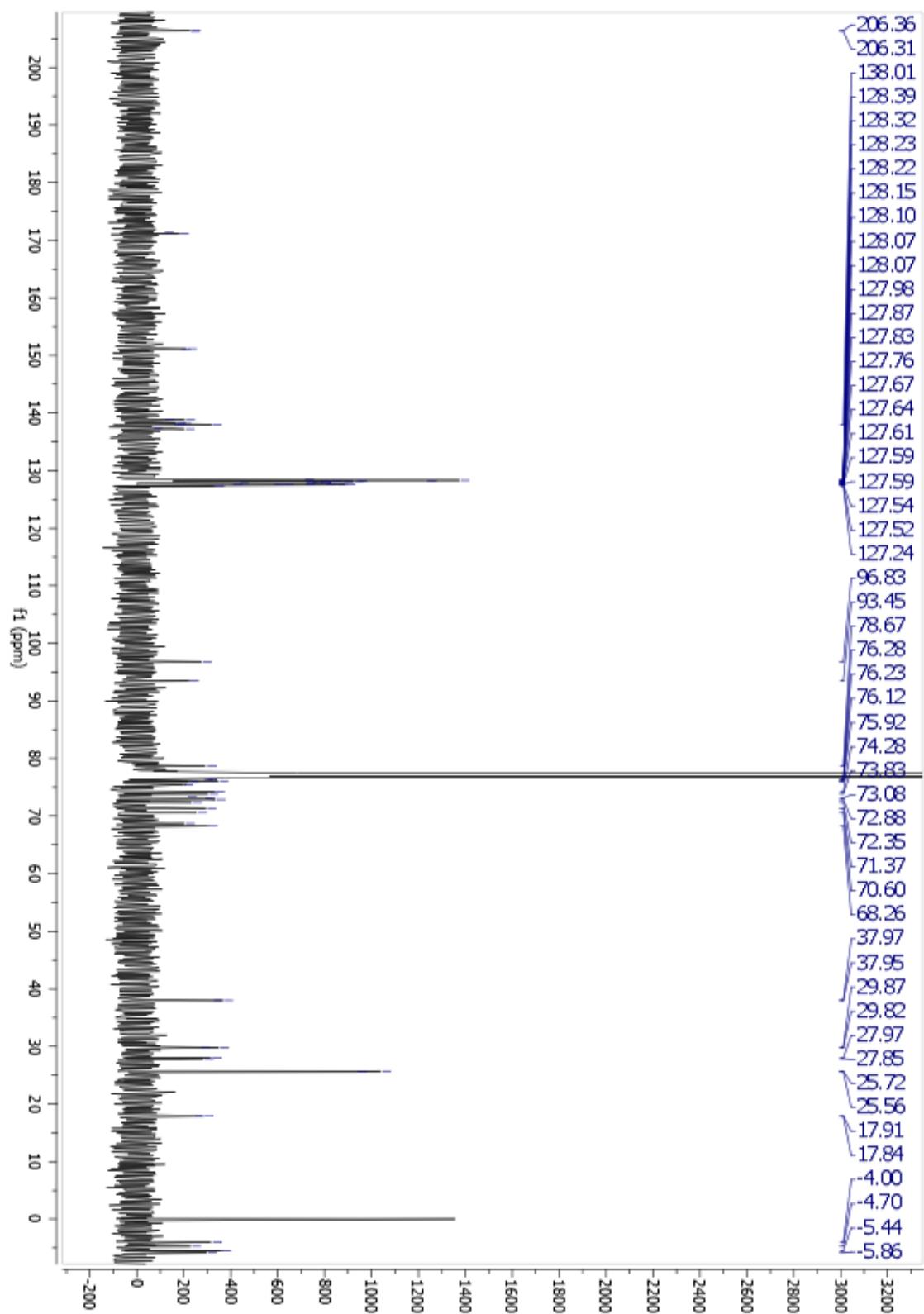


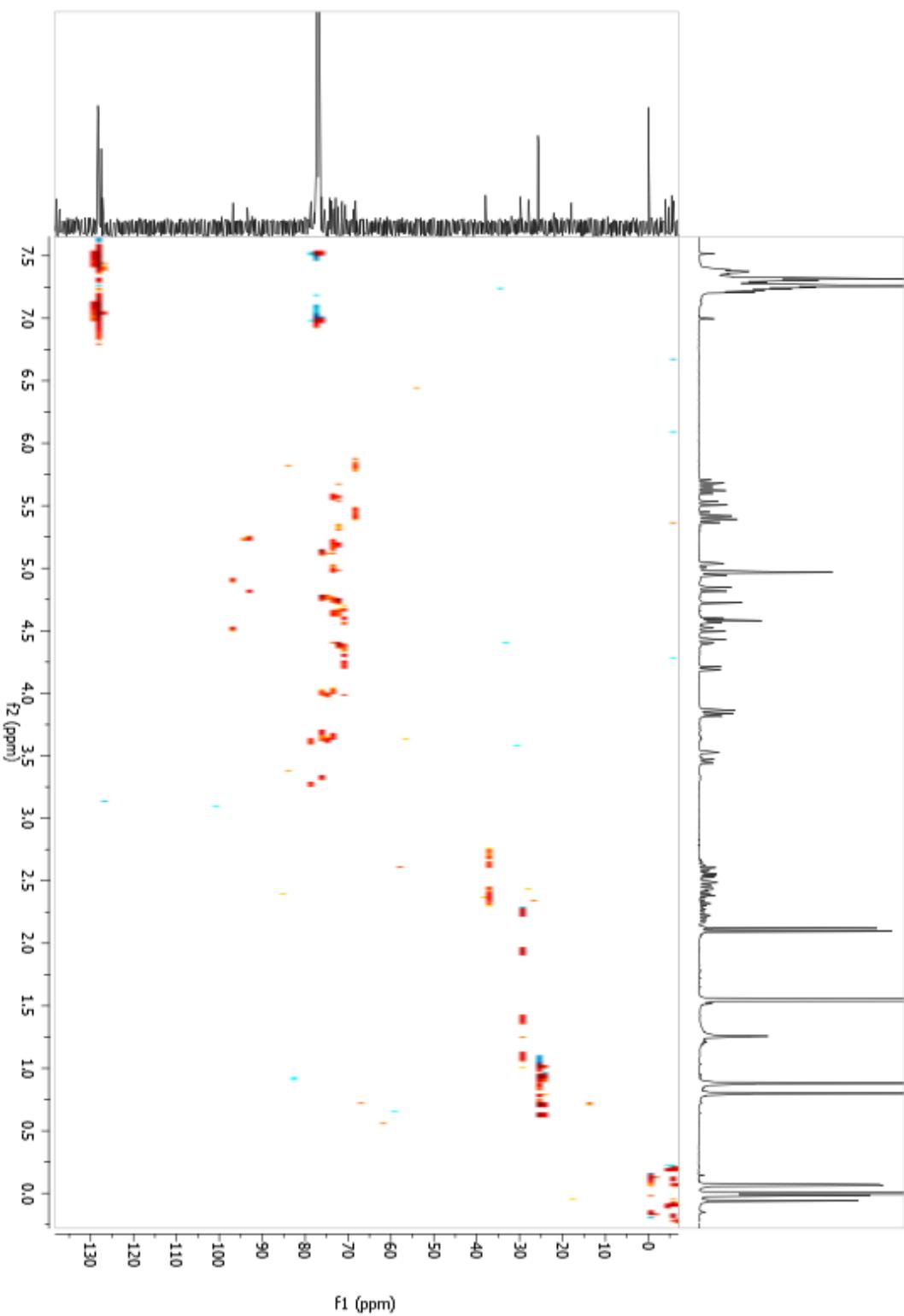




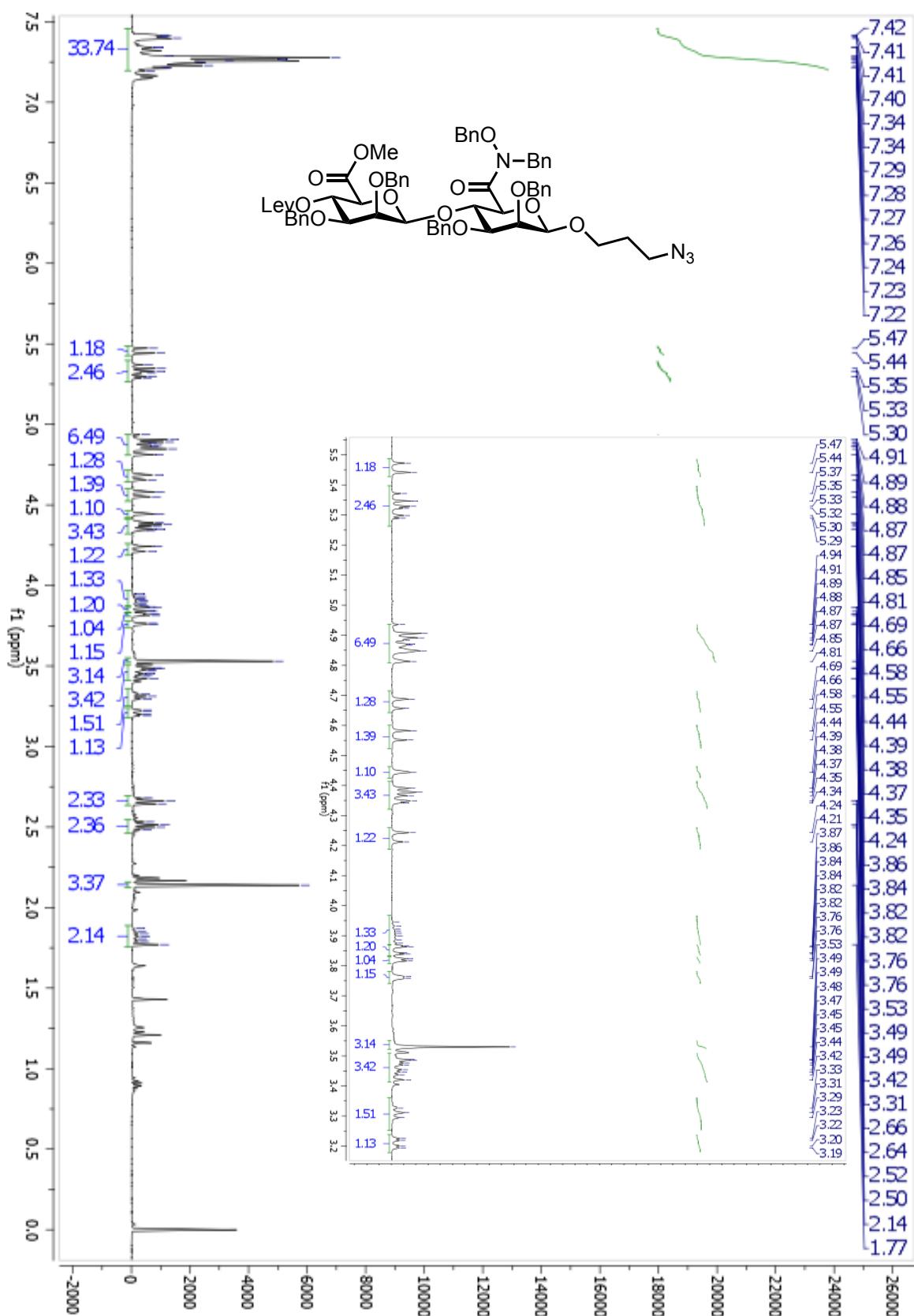
O-benzyl, N-benzyl (phenyl dimethylsilyl- $\alpha$ / $\beta$ -D-mannopyranoside) hydroxamate

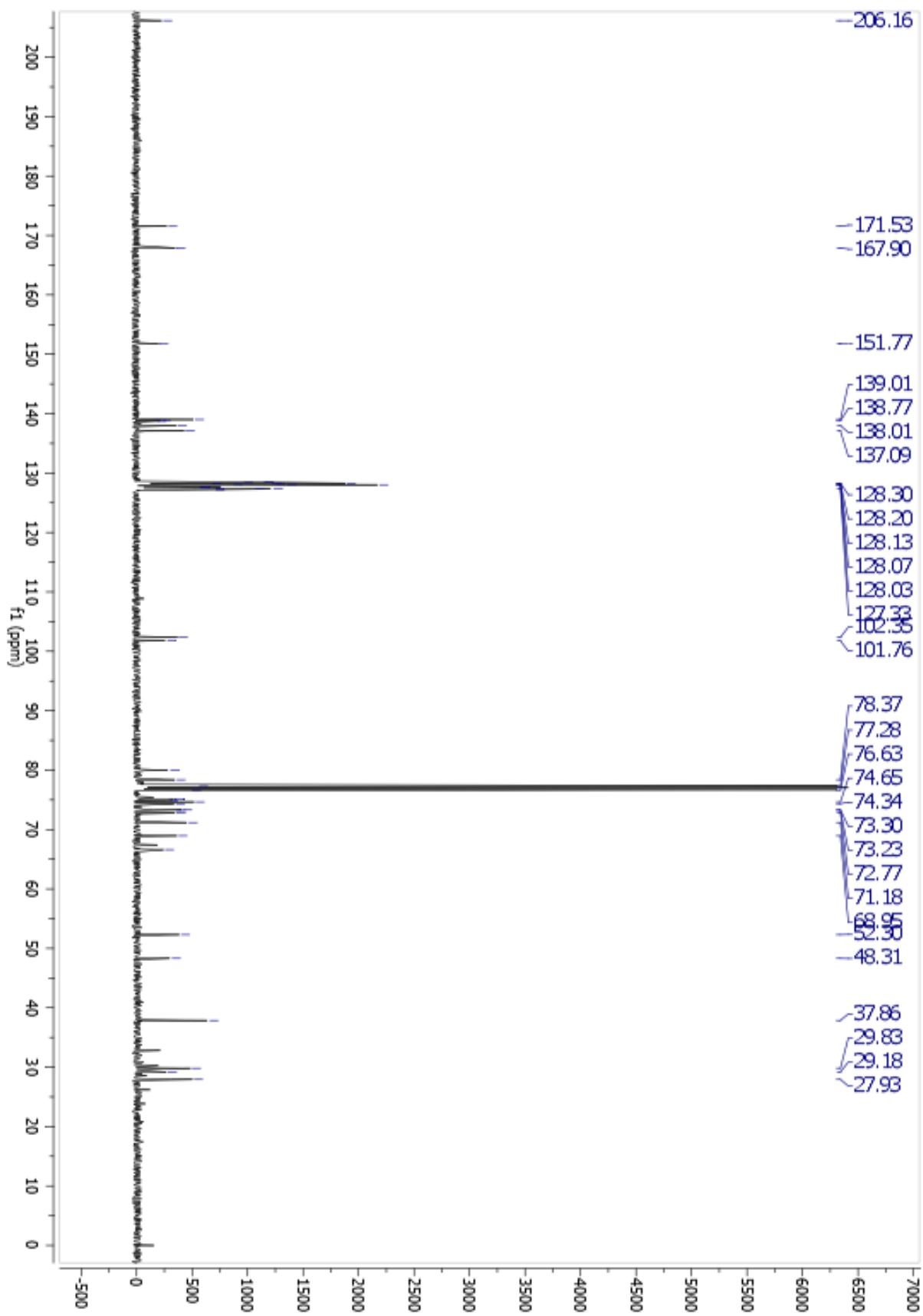


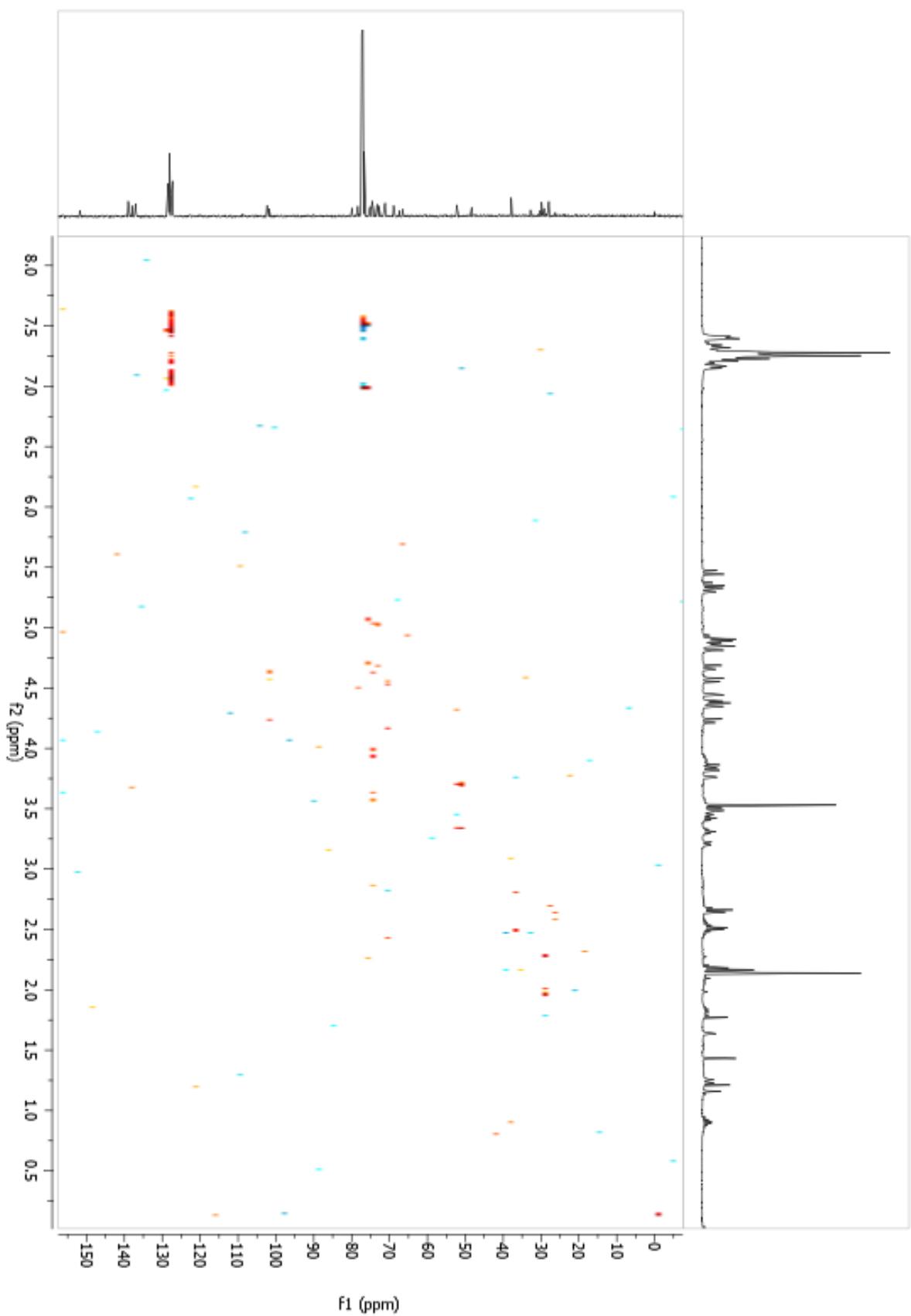




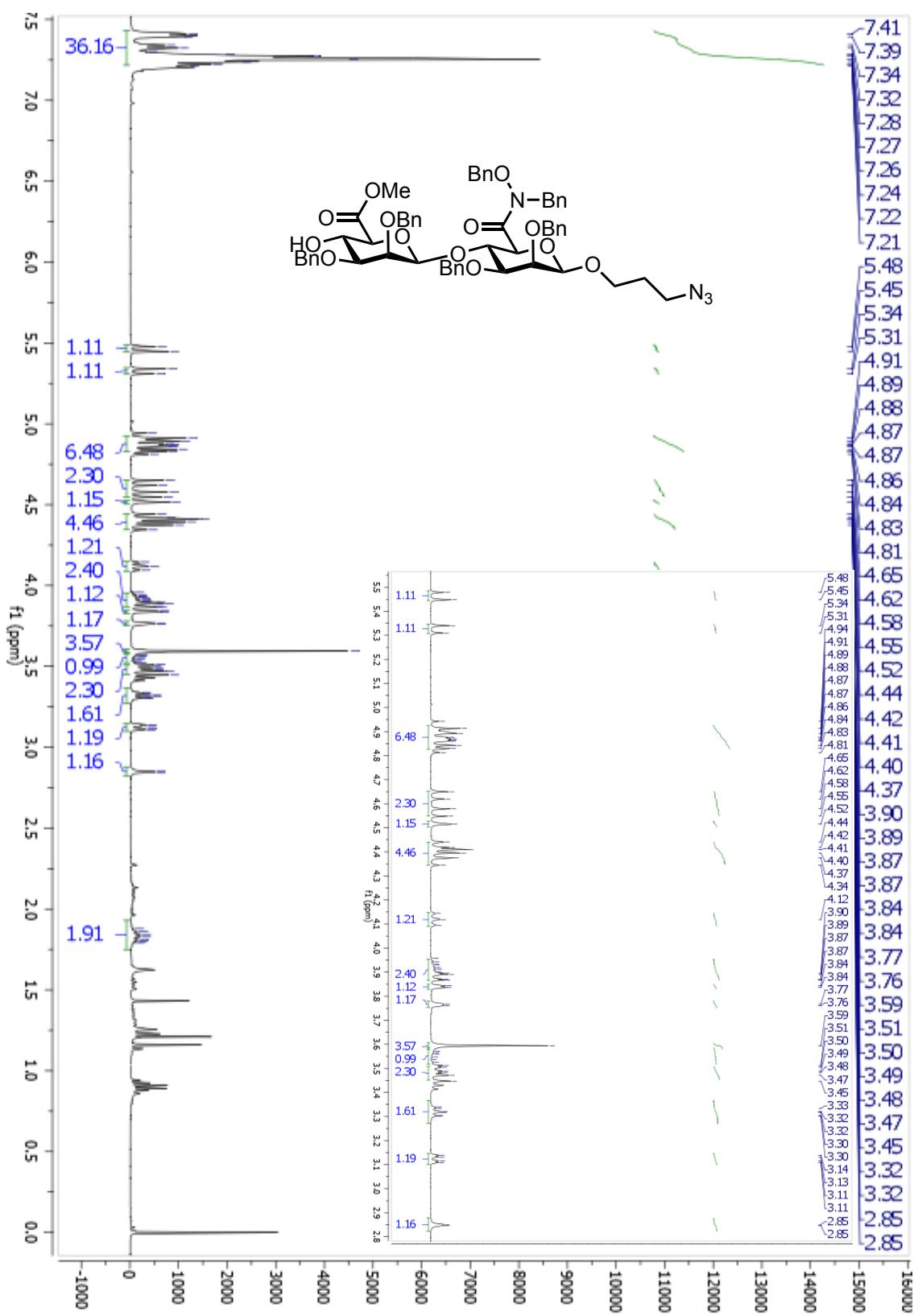
3-azidopropyl (O-benzyl-N-benzyl-(methyl 2,3-di-O-benzyl (4-O-levulinoyl-2,3-di-O-benzyl- $\alpha$ -D-mannopyranosyl) uronate)-D-mannopyranoside) hydroxamate **20**

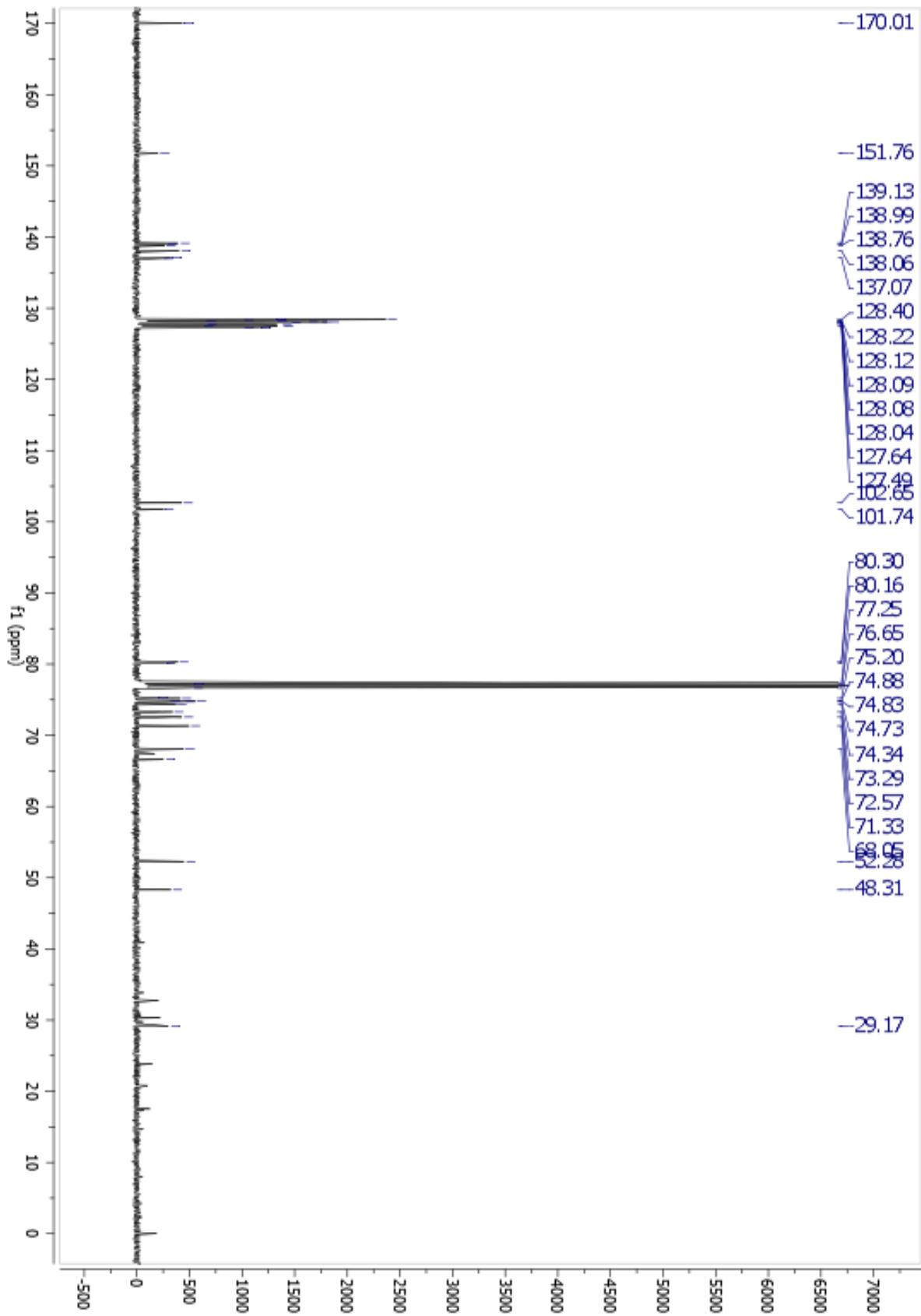


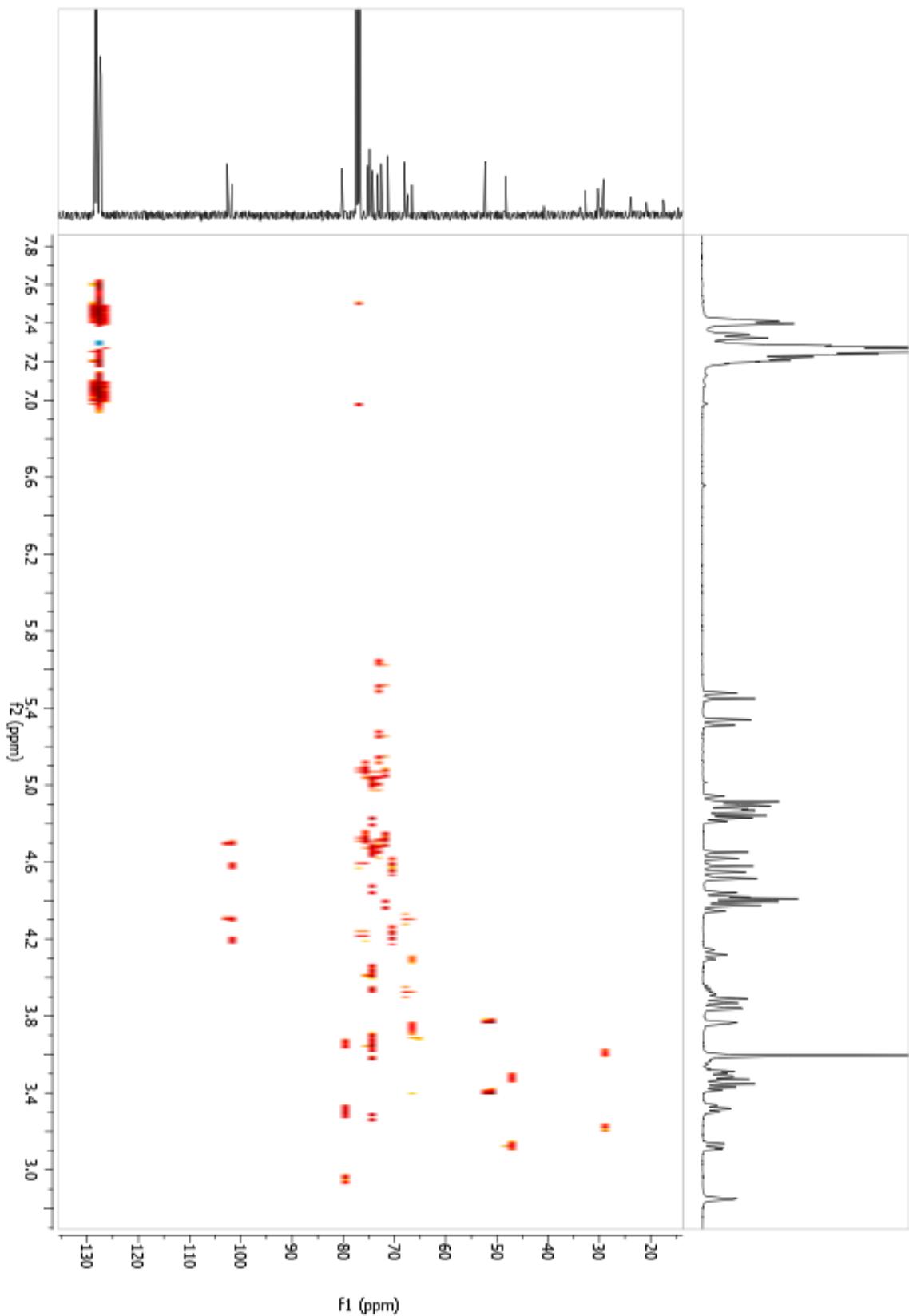




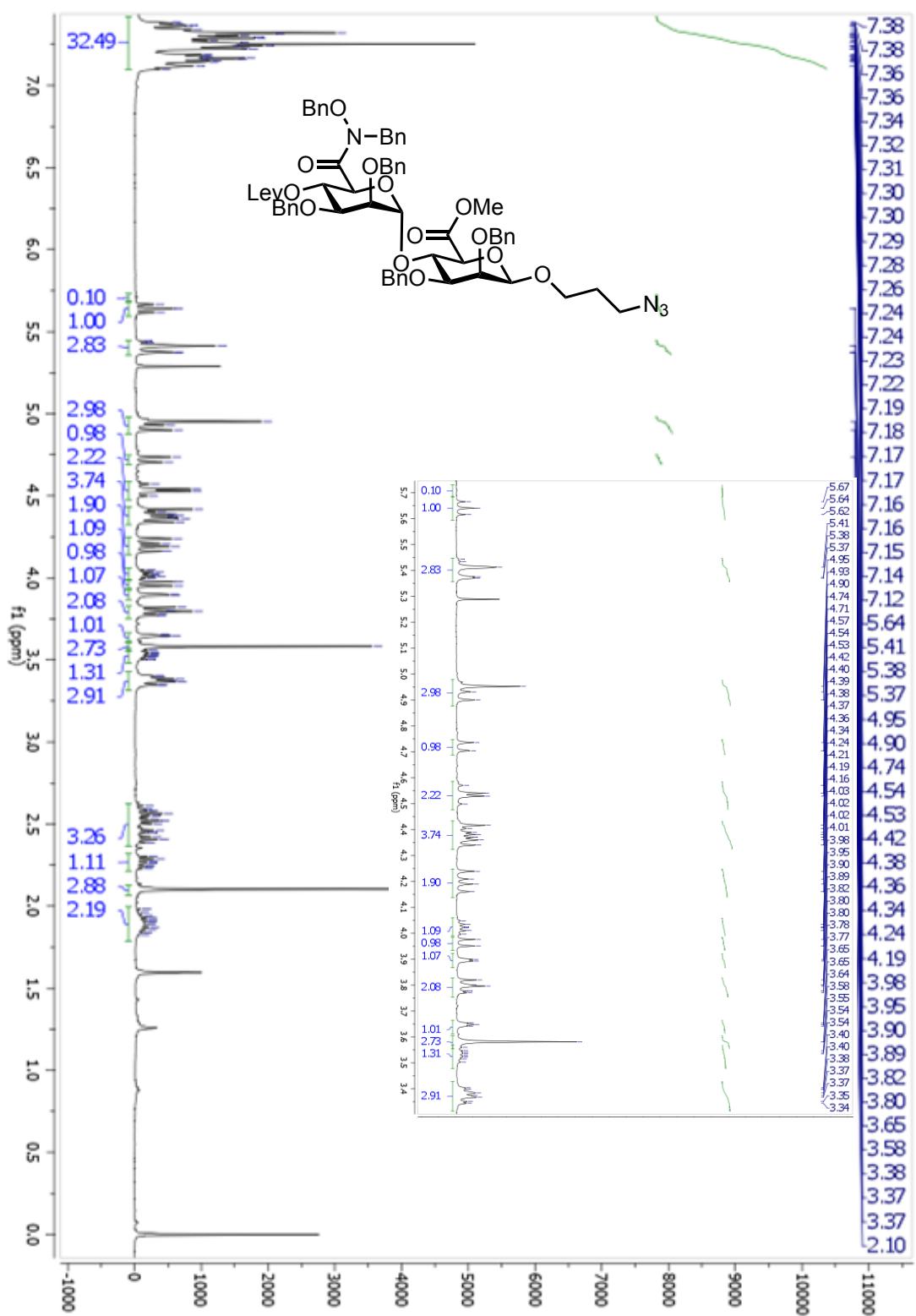
3-azidopropyl (O-benzyl-*N*-benzyl-(methyl 2,3-di-O-benzyl (2,3-di-O-benzyl- $\alpha$ -D-mannopyranosyl) uronate)-D-mannopyranoside) hydroxamate **21**

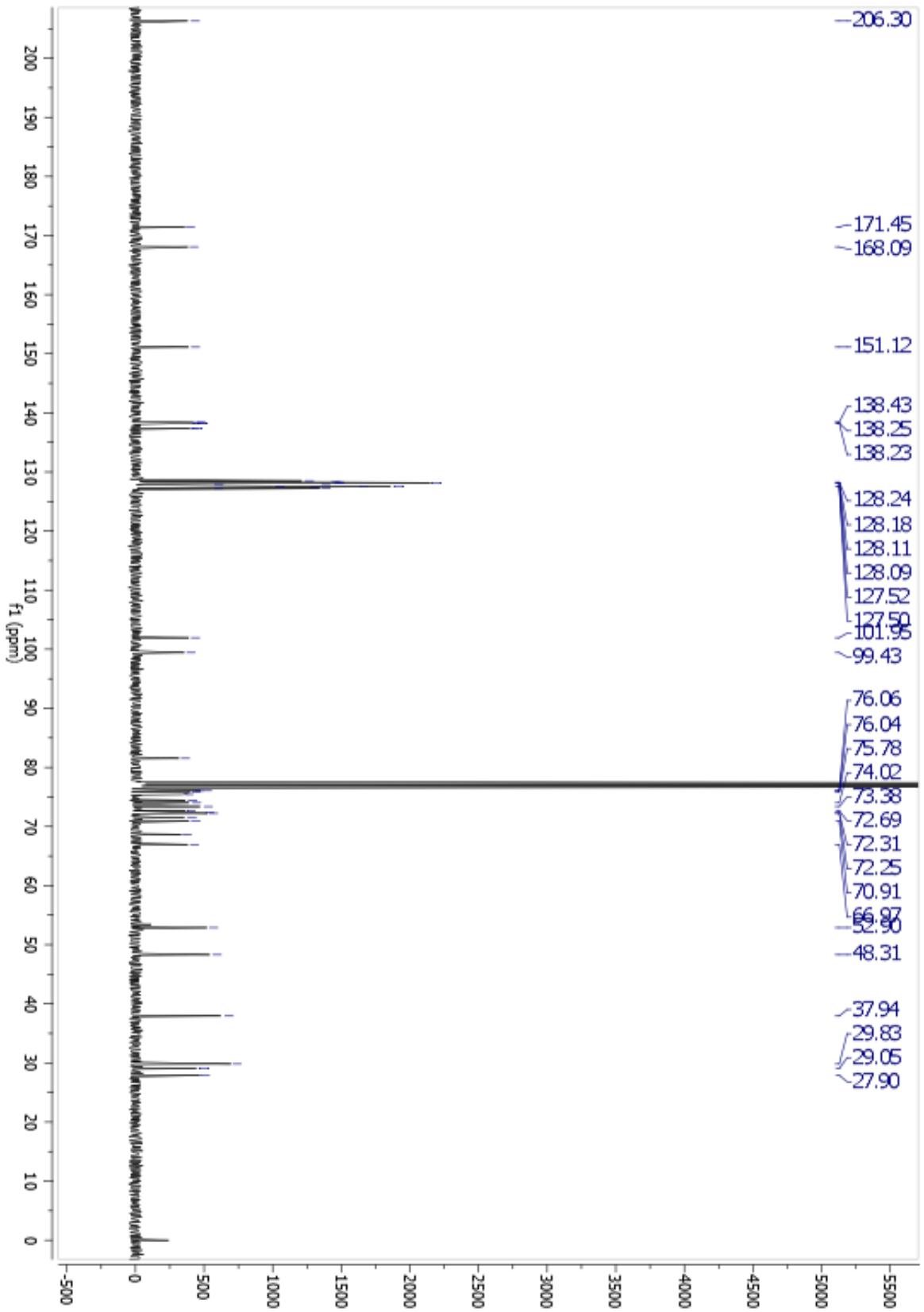


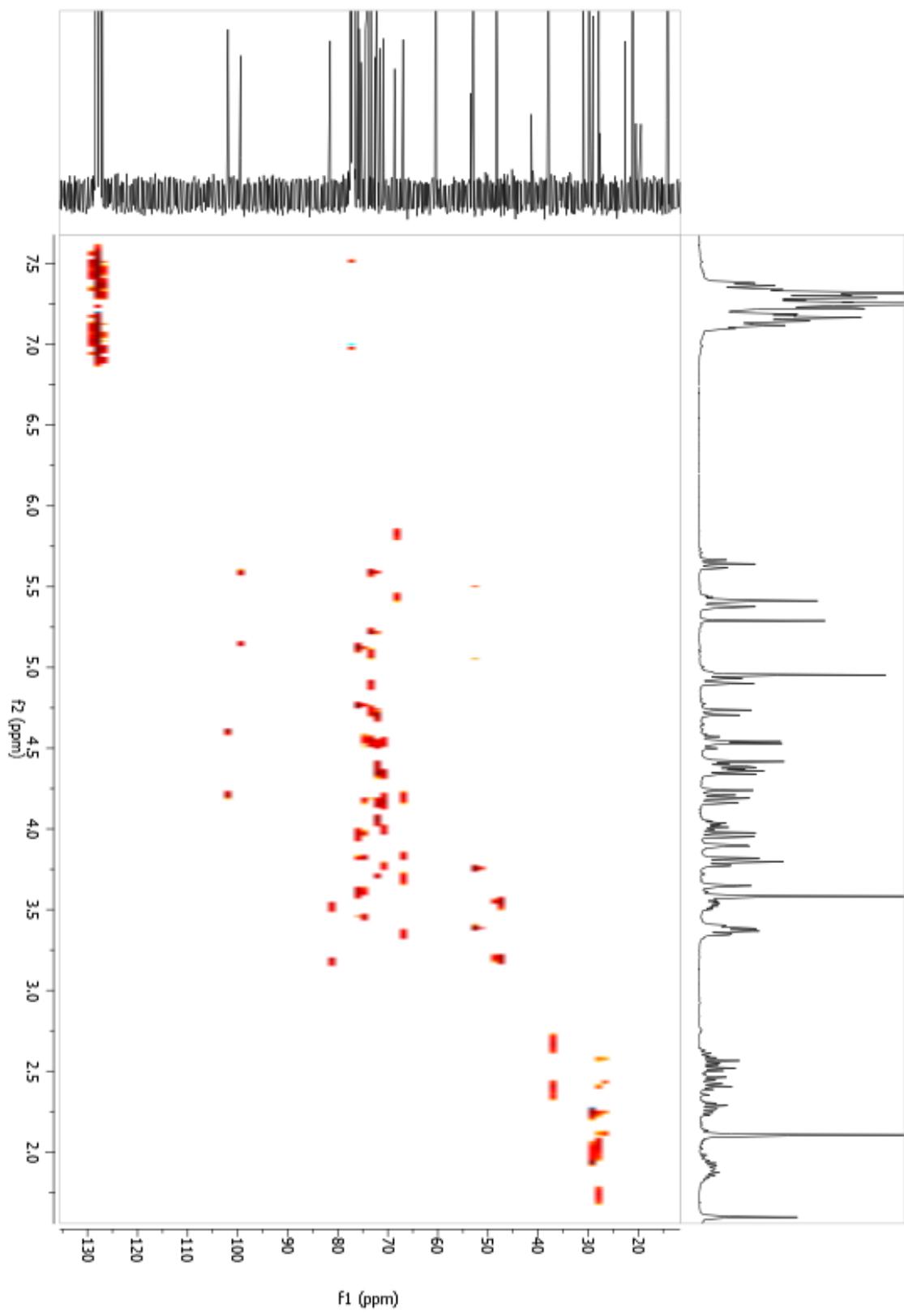




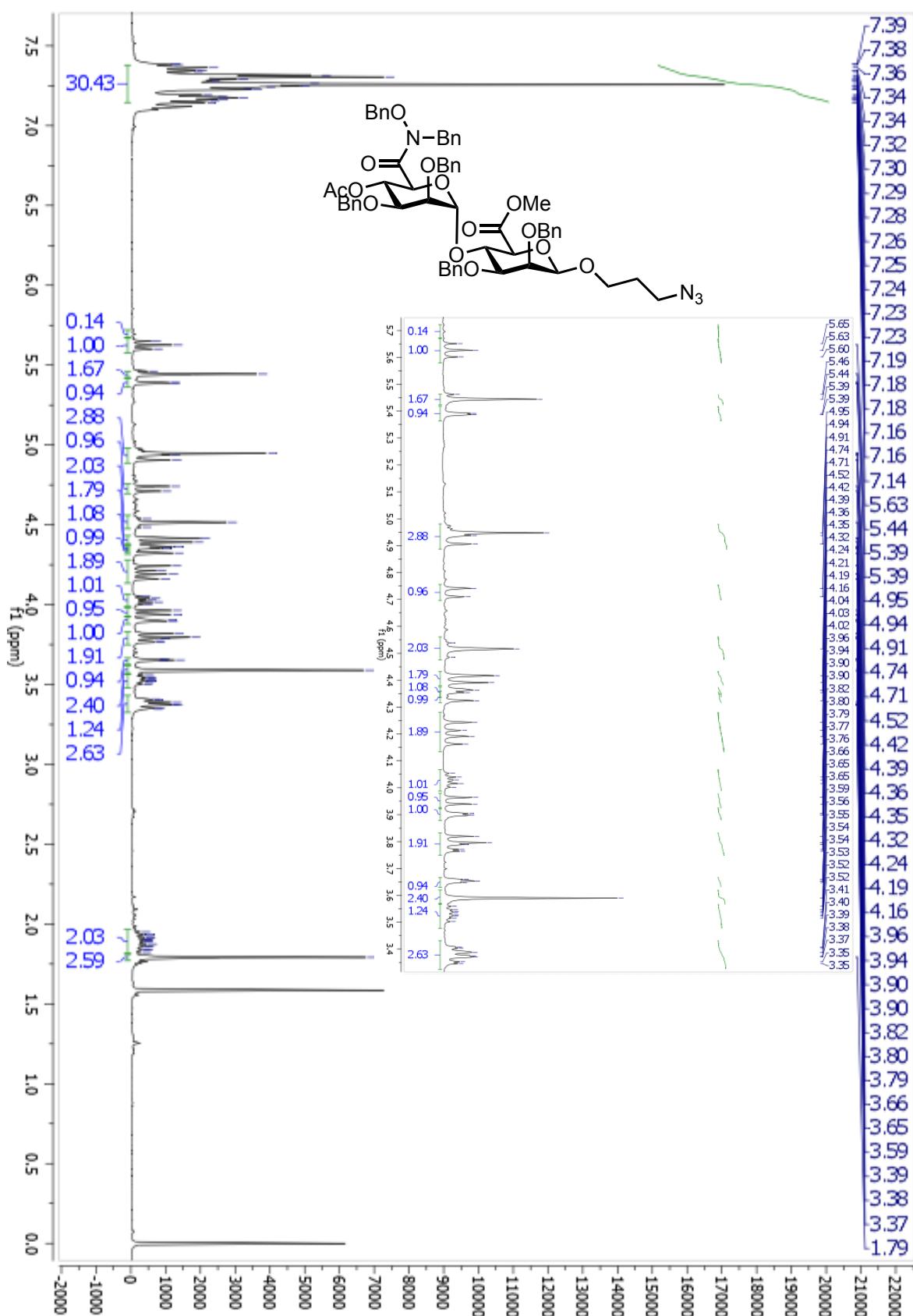
3-azidopropyl (methyl 2,3-di-O-benzyl-4-O-(O-benzyl-N-benzyl-(4-O-levulinoyl-2,3-di-O-benzyl- $\alpha$ -D-mannopyranosyl) hydroxamate)-D-mannopyranoside) uronate **22**

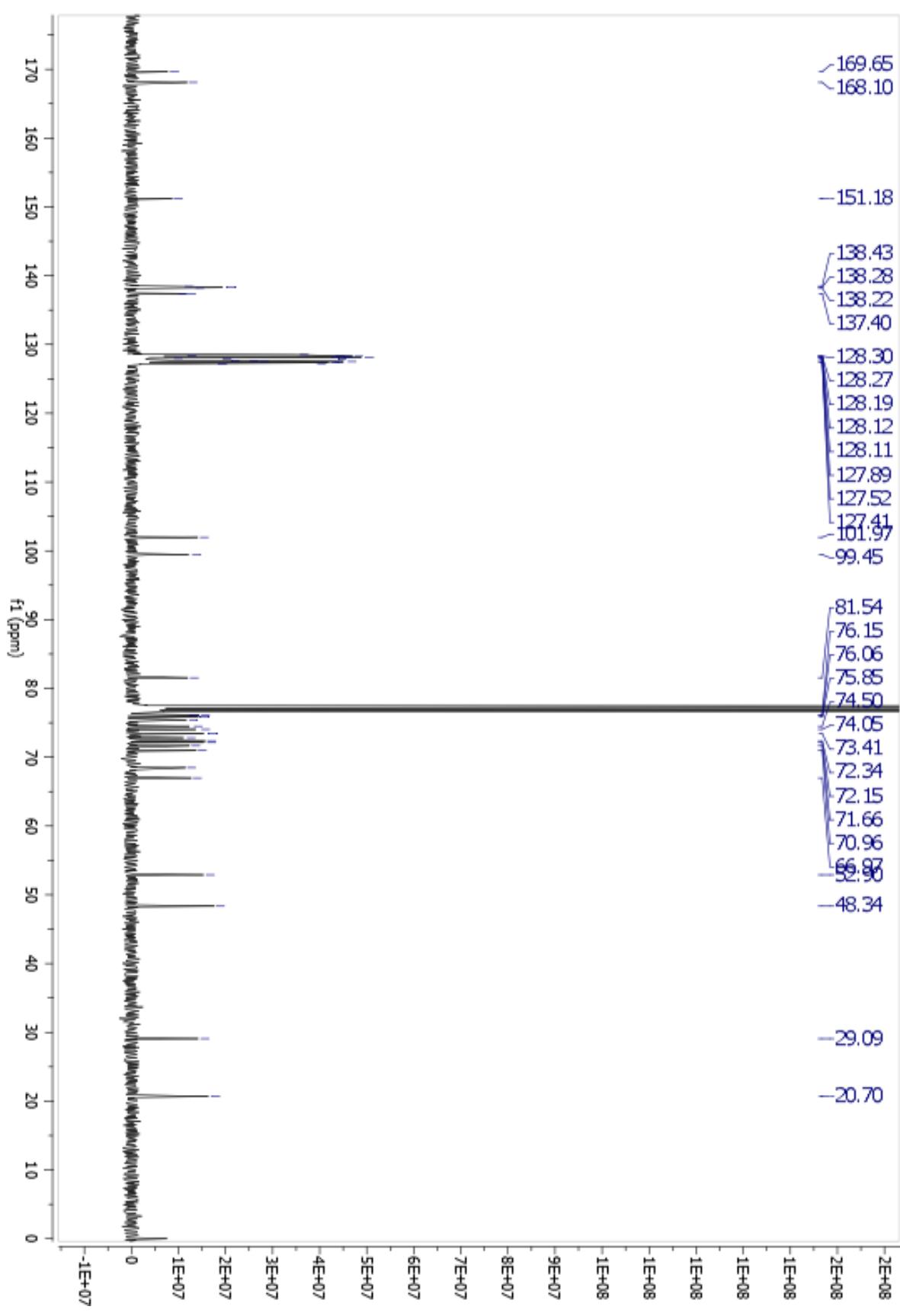


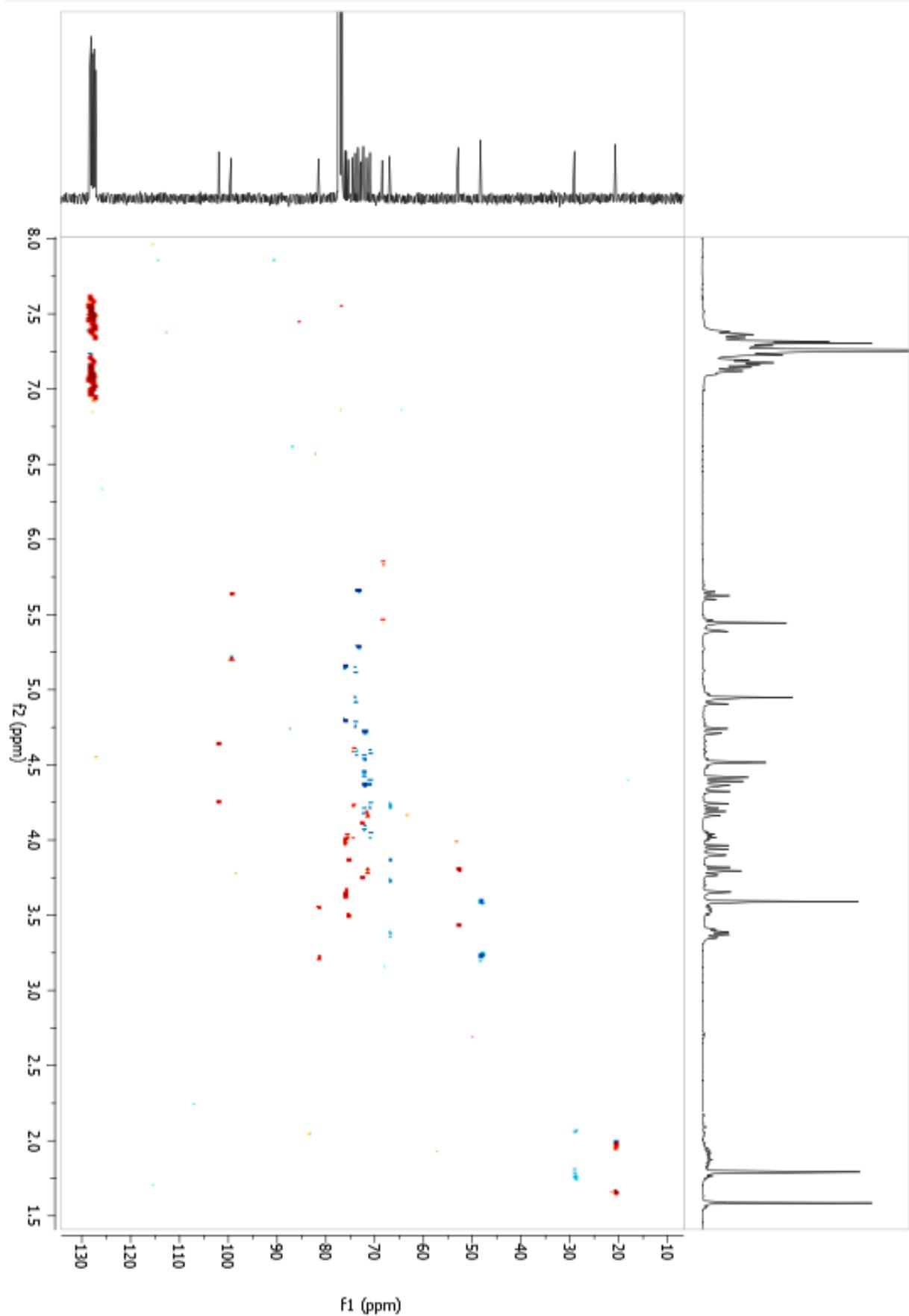




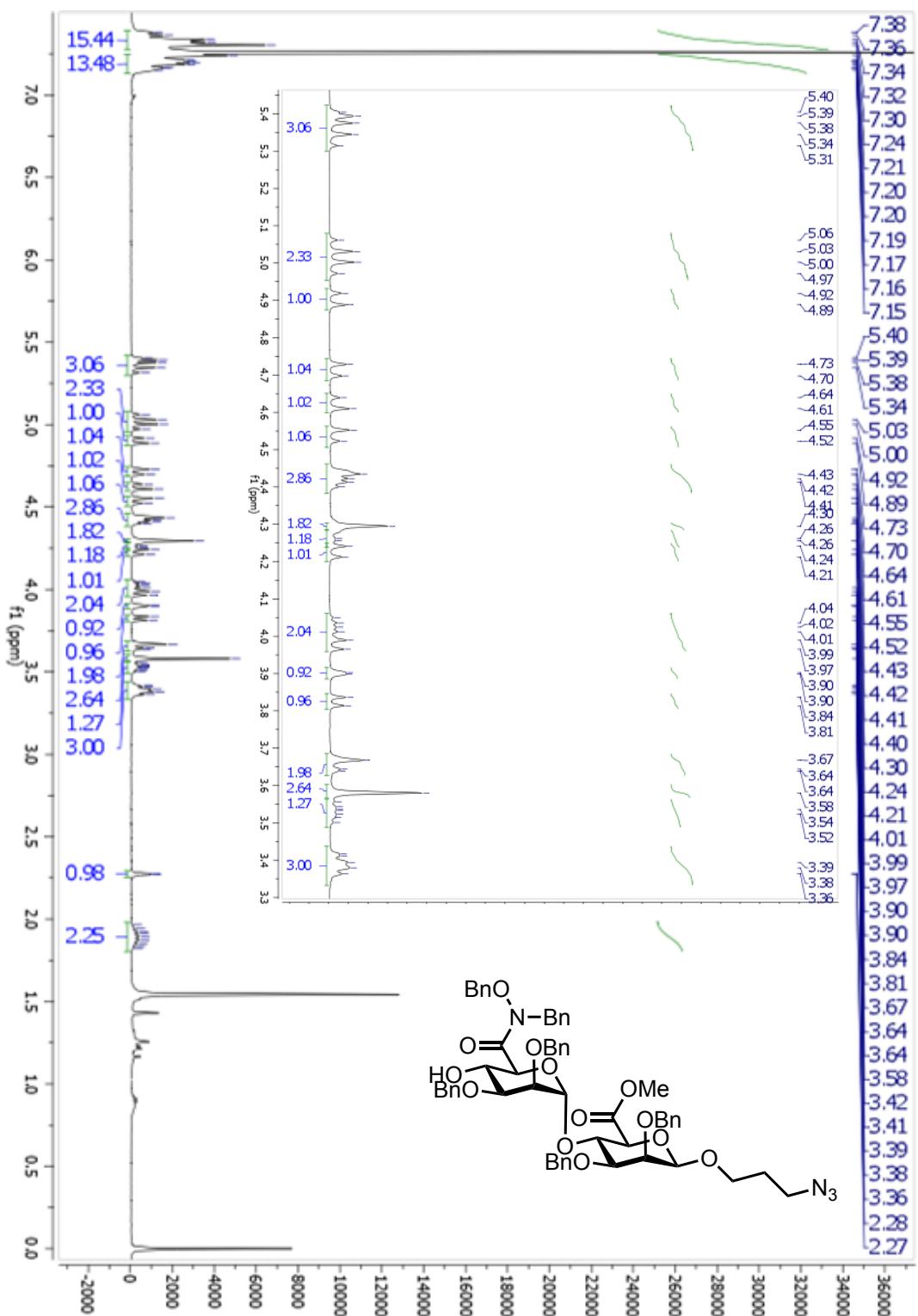
3-azidopropyl (methyl 2,3-di-O-benzyl-4-O-(O-benzyl-N-benzyl-(4-O-acetyl-2,3-di-O-benzyl- $\alpha$ -D-mannopyranosyl) hydroxamate)-D-mannopyranoside) uronate **23**

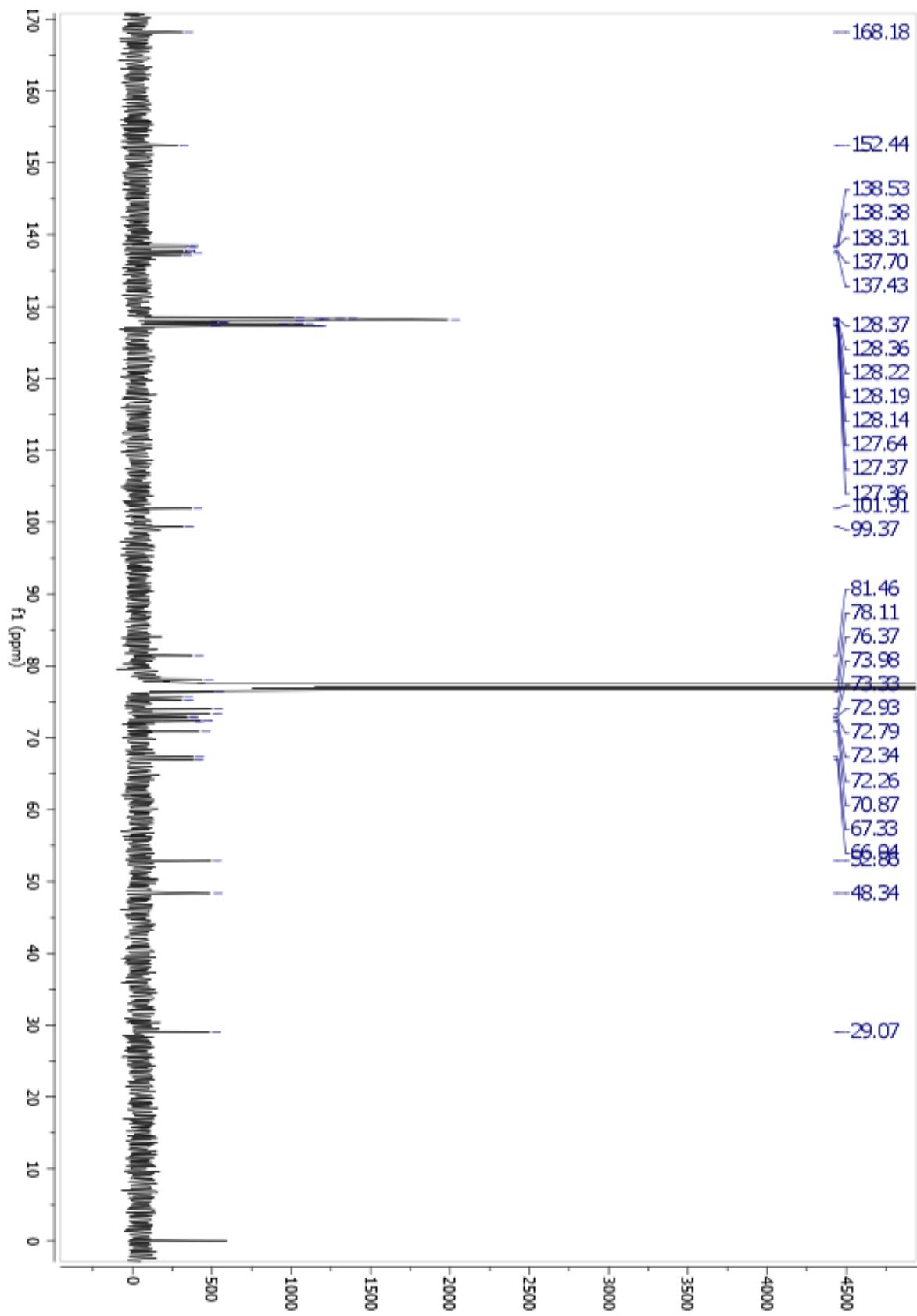






3-azidopropyl (methyl 2,3-di-O-benzyl-4-O-(O-benzyl-N-benzyl-(4-O-acetyl-2,3-di-O-benzyl- $\alpha$ -D-mannopyranosyl) hydroxamate)-D-mannopyranoside) uronate **24**





O-benzyl (4-O-acetyl-2,3-di-O-benzyl-1-N-D-mannopyranoside) hydroxamate **26**

