Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Supporting Information

Bismuth(III) triflate as a novel and efficient activator for glycosyl halides

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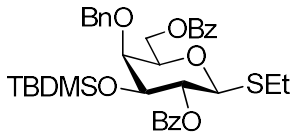
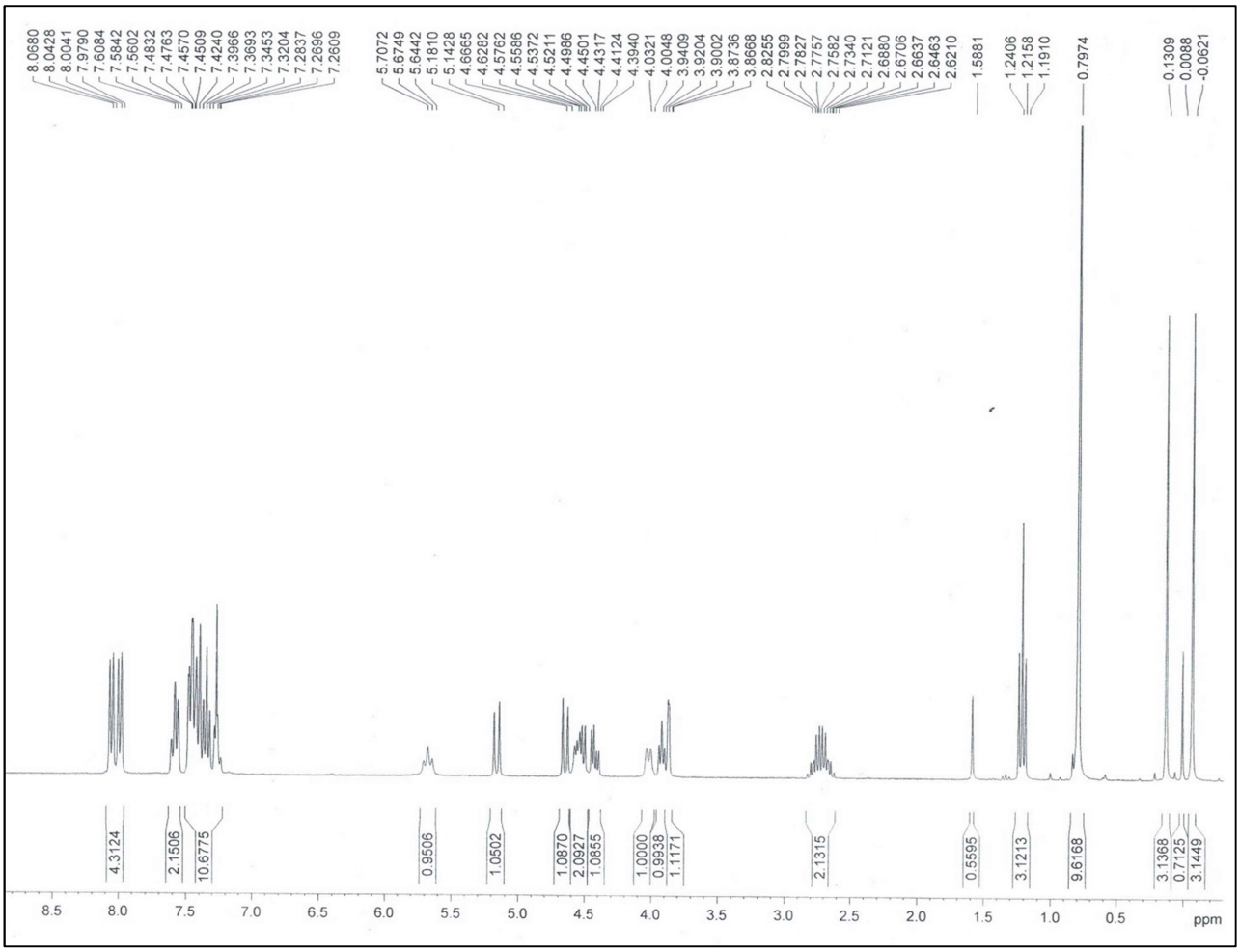
NMR Spectra for New Compounds

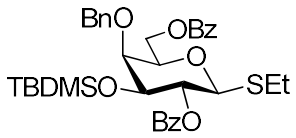
Ethyl 2,6-di-*O*-benzoyl-4-*O*-benzyl-3-*O*-*tert*-butyldimethylsilyl-1-thio-β-D-galactopyranoside (33)

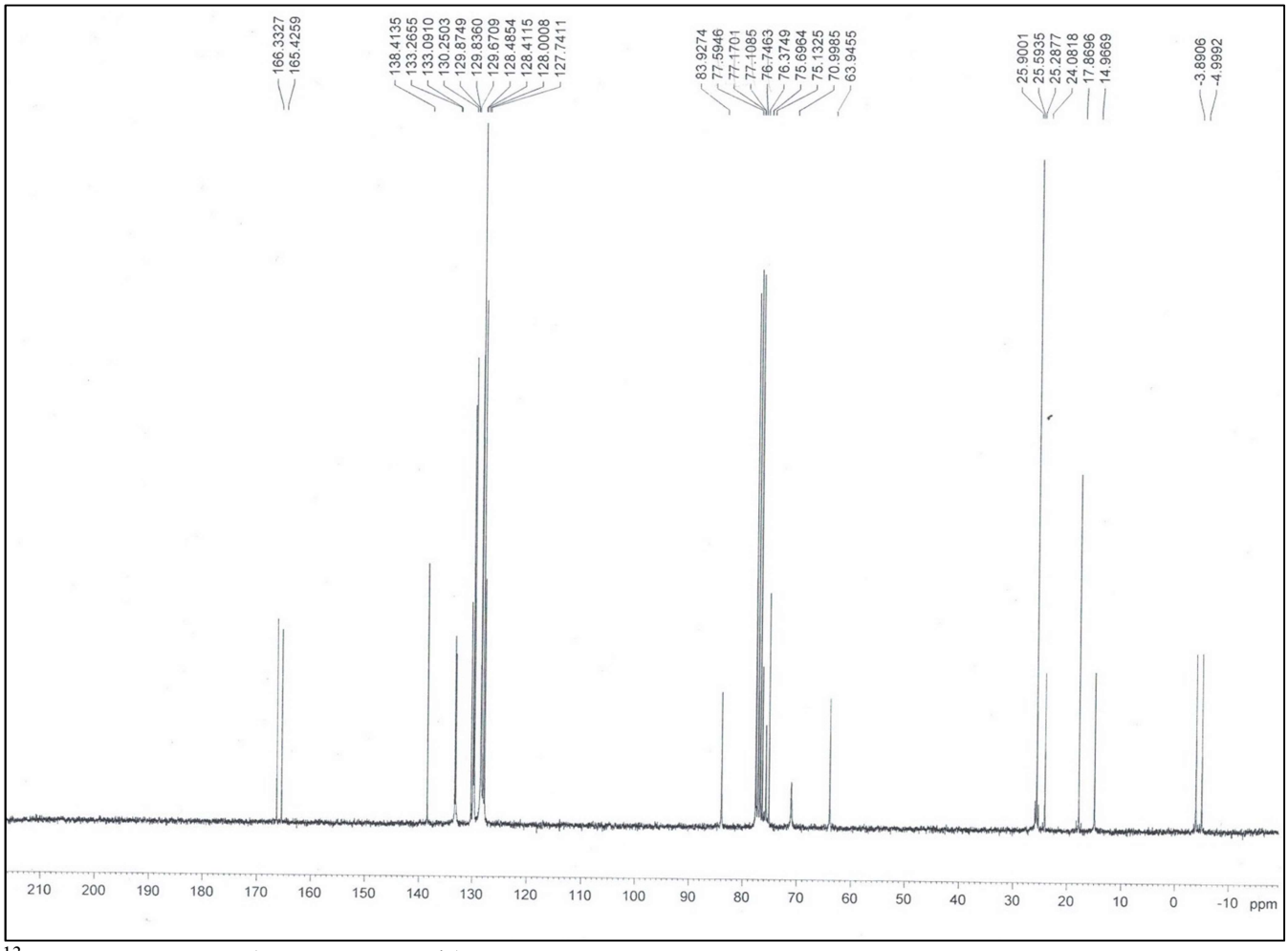




^{1}H NMR spectrum ($CDCl_3$, 300 MHz)

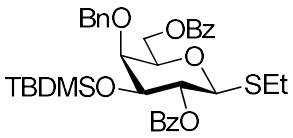
Ethyl 2,6-di-*O*-benzoyl-4-*O*-benzyl-3-*O*-*tert*-butyldimethylsilyl-1-thio-β-D-galactopyranoside (33)

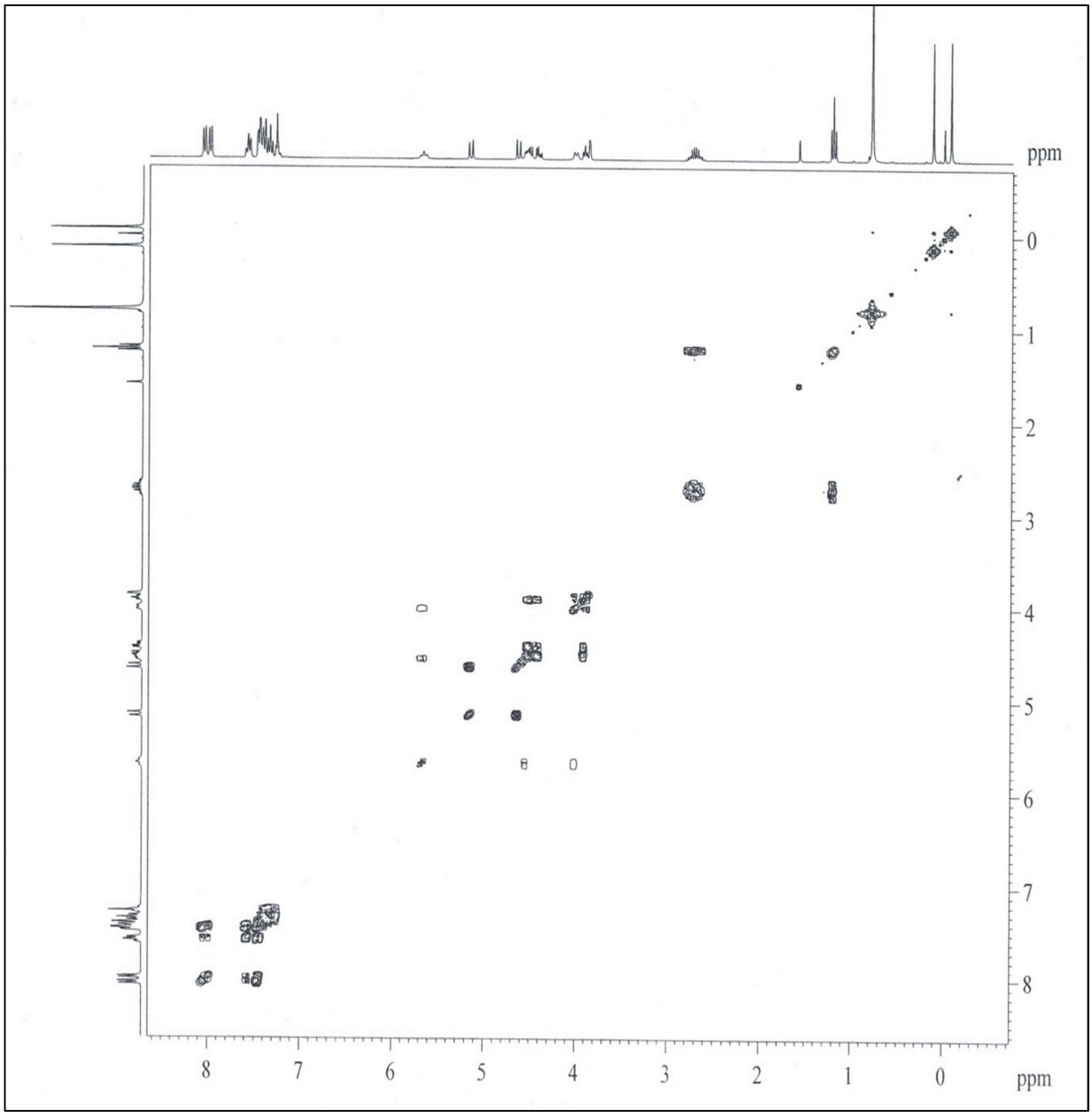




^{13}C NMR spectrum (75 MHz, $CDCl_3$)

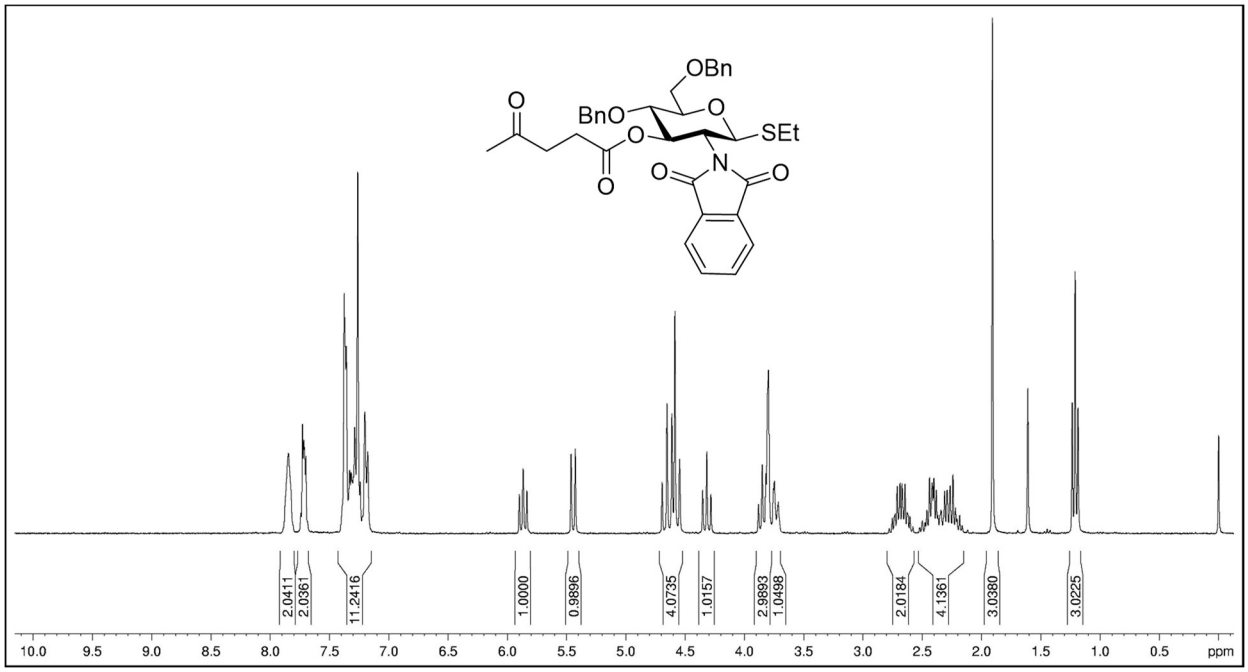
Ethyl 2,6-di-*O*-benzoyl-4-*O*-benzyl-3-*O*-*tert*-butyldimethylsilyl-1-thio-β-D-galactopyranoside (33)



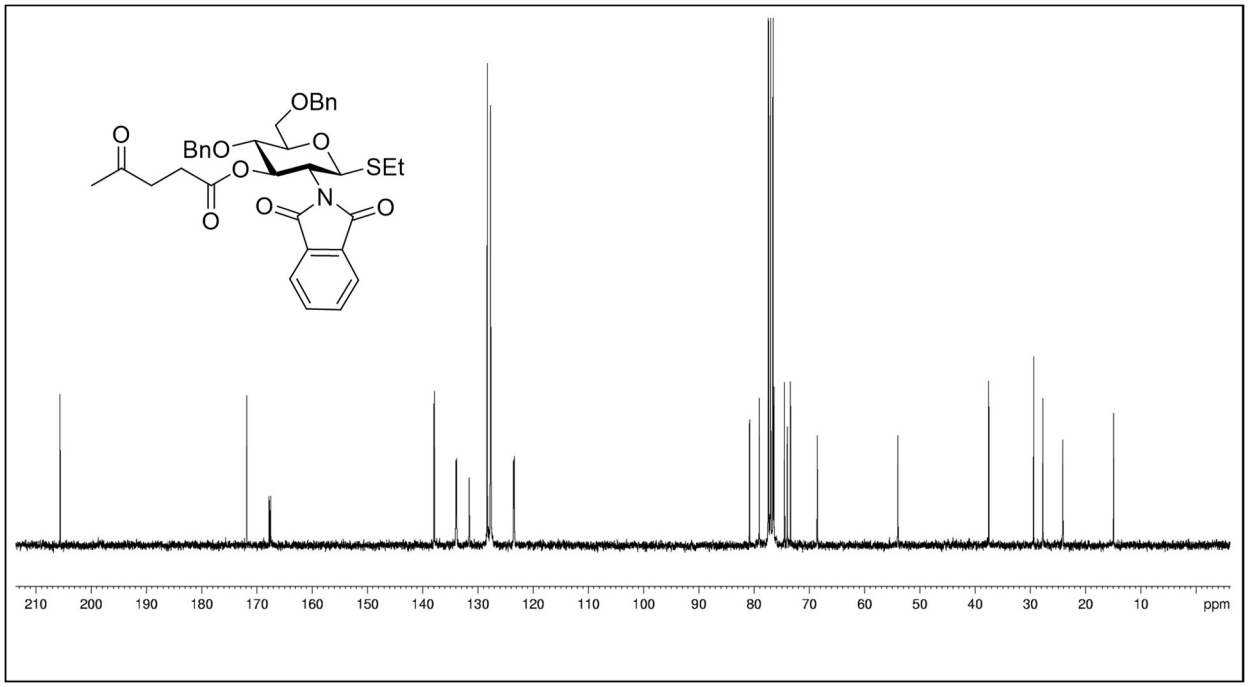


2D NMR (300 MHz, $CDCl_3$)

Ethyl 4, 6-di-*O*-benzyl-2-deoxy-3-*O*-levulinoyl-2-phthalimido-1-thio-β-D-glucopyranoside (34)

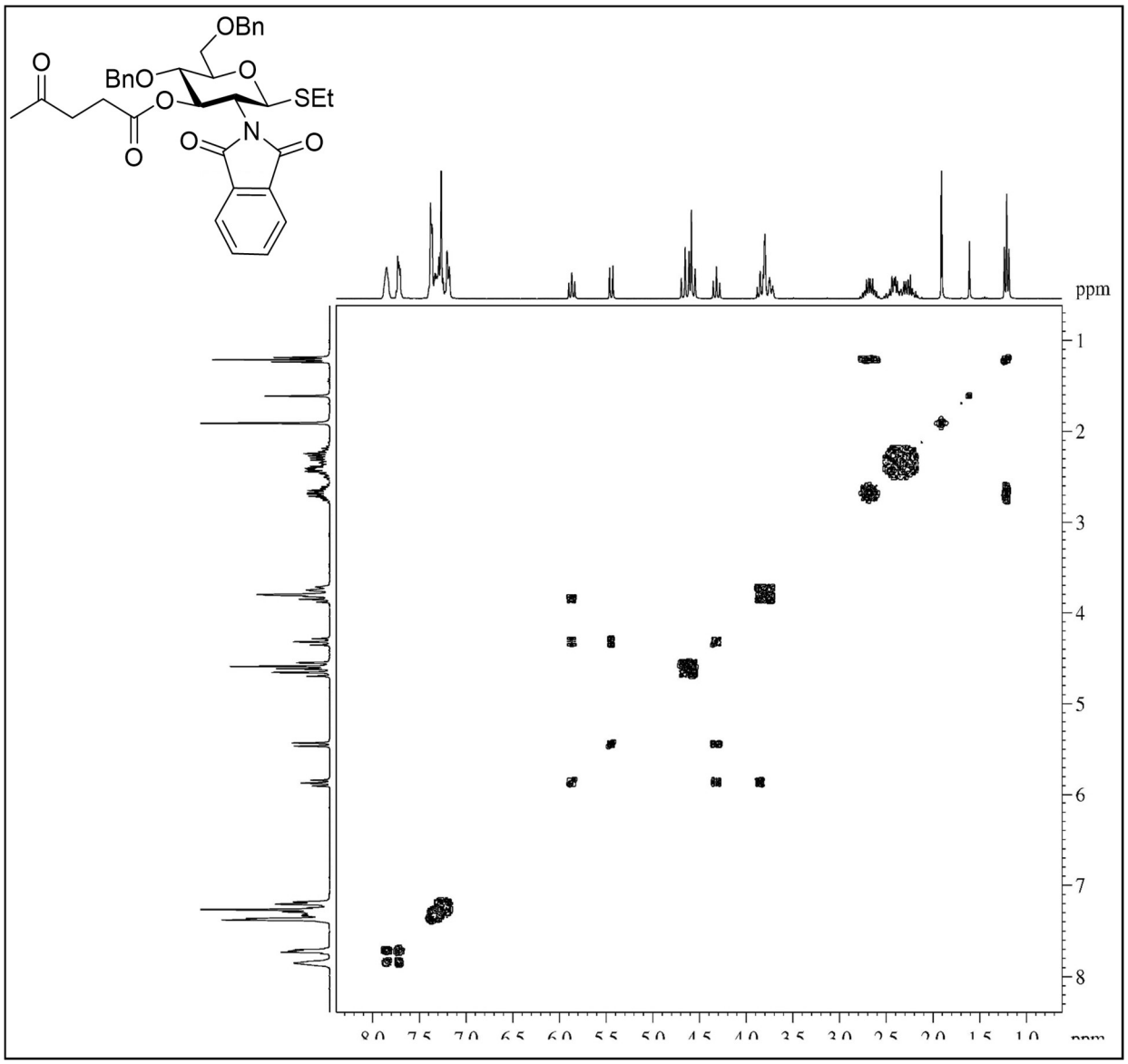


^{1}H NMR spectrum ($CDCl_3$, 300 MHz)



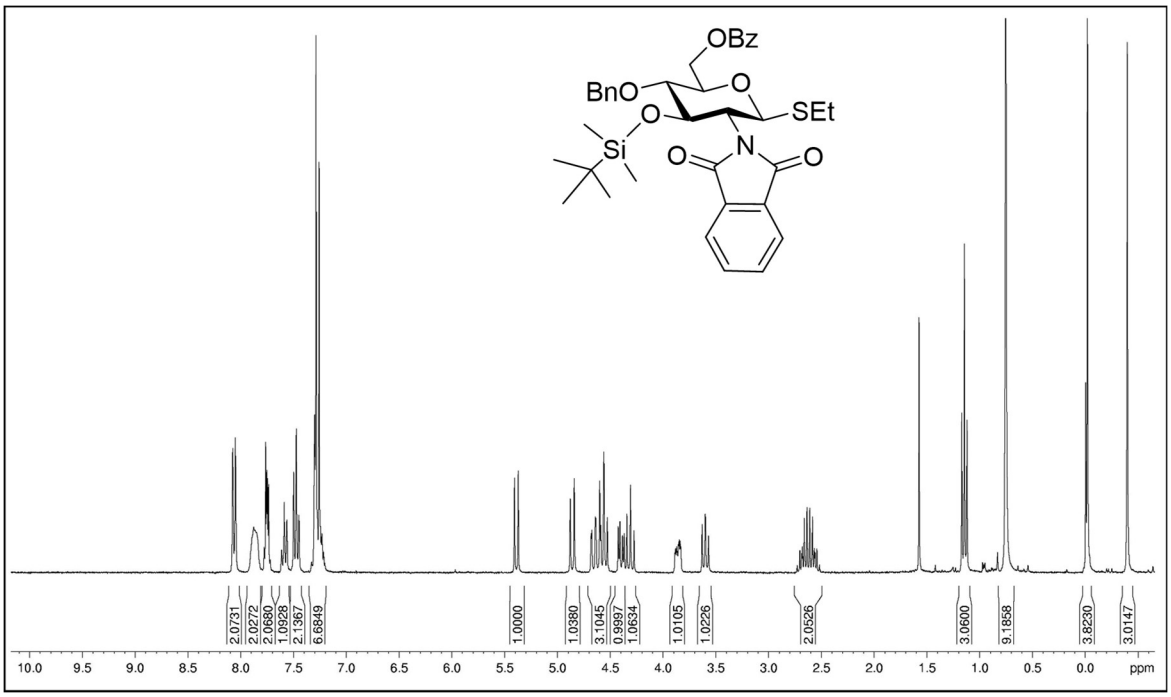
^{13}C NMR spectrum (75 MHz, $CDCl_3$)

Ethyl 4, 6-di-*O*-benzyl-2-deoxy-3-*O*-levulinoyl-2-phthalimido-1-thio-β-D-glucopyranoside (34)

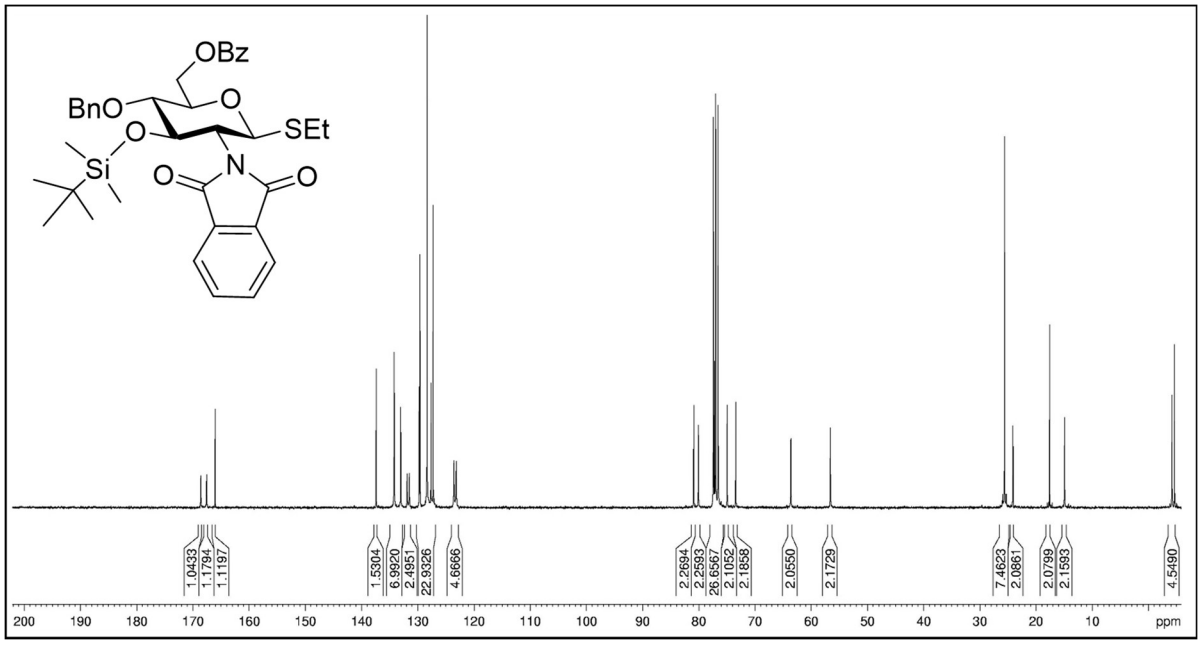


2D NMR (300 MHz, $CDCl_3$)

Ethyl 6-O-benzoyl-4-O-benzyl-2-deoxy-2-phthalimido-3-O-tert-butyldimethylsilyl-1-thio-β-D-glucopyranoside (49)

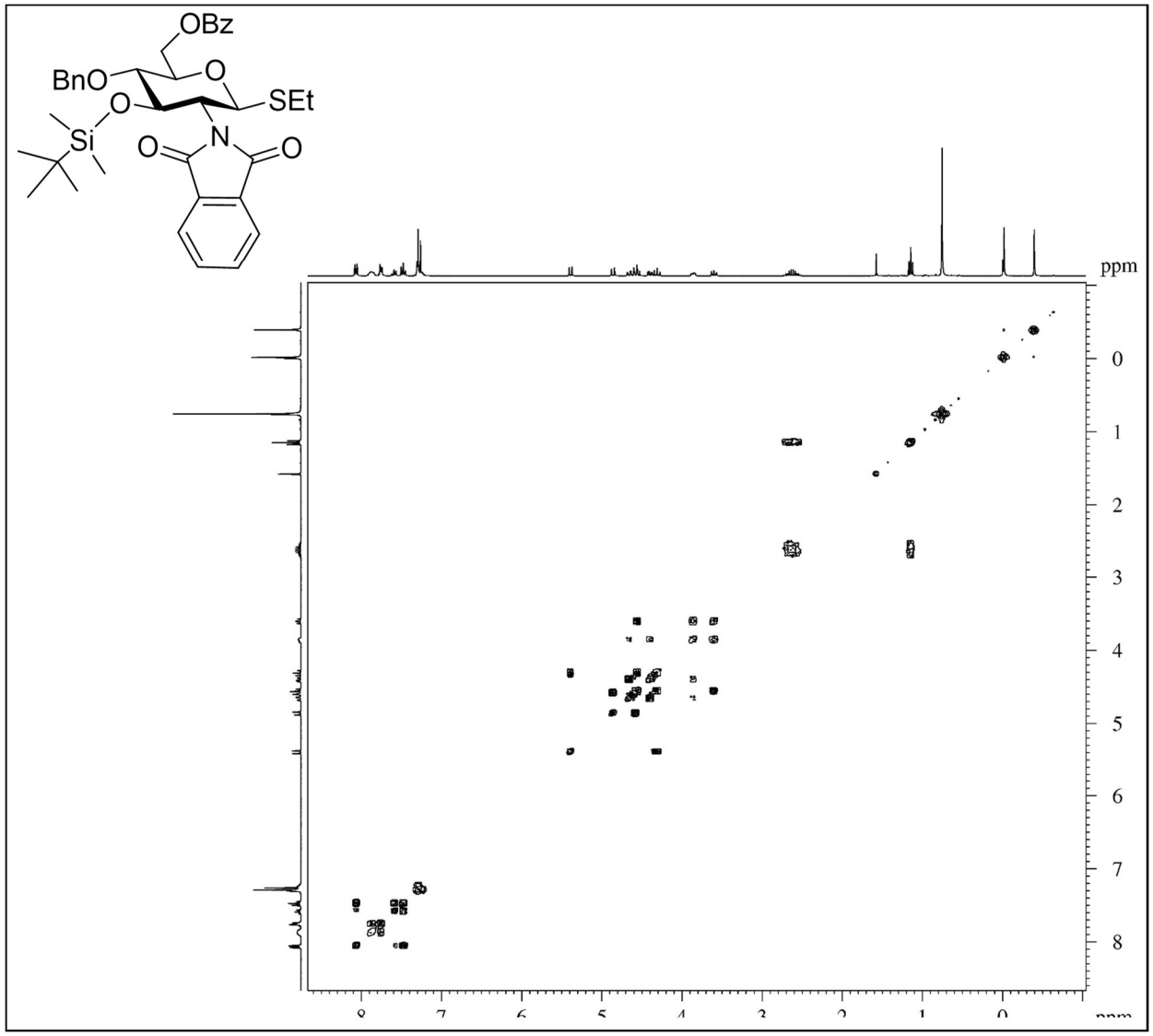


^{1}H NMR spectrum ($CDCl_3$, 300 MHz)



^{13}C NMR spectrum (75 MHz, $CDCl_3$).

Ethyl 6-O-benzoyl-4-O-benzyl-2-deoxy-2-phthalimido-3-O-tert-butyldimethylsilyl-1-thio-β-D-glucopyranoside (49)



2D NMR (300 MHz, $CDCl_3$)

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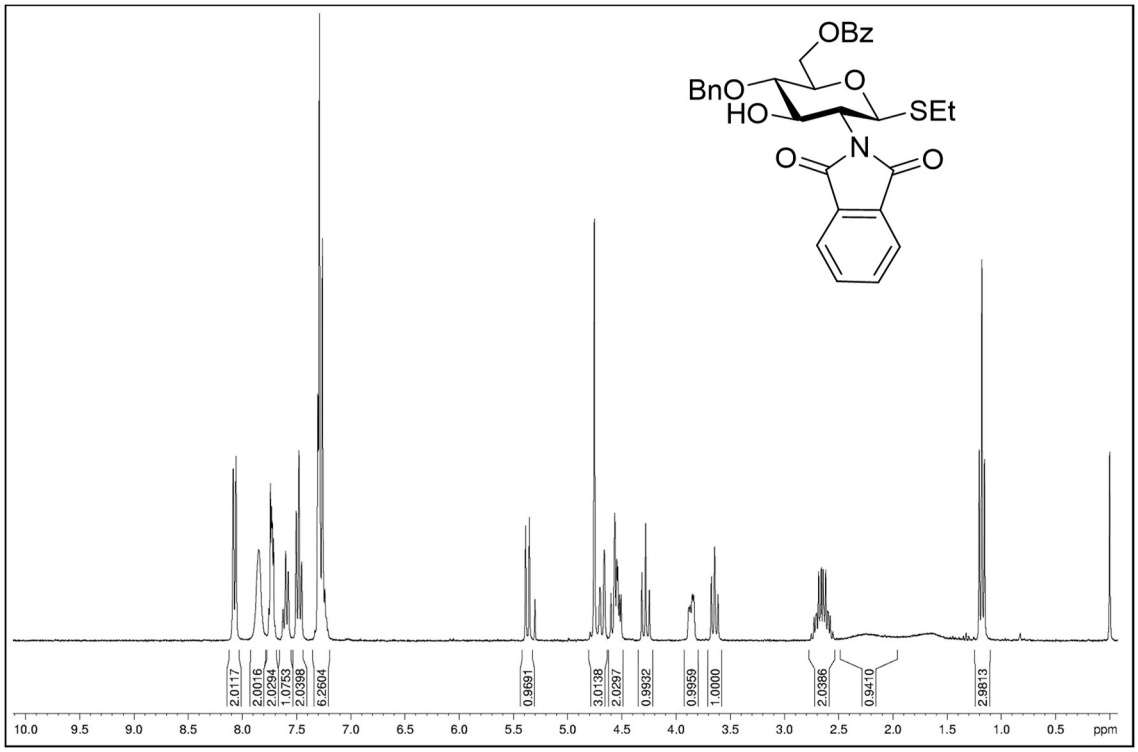
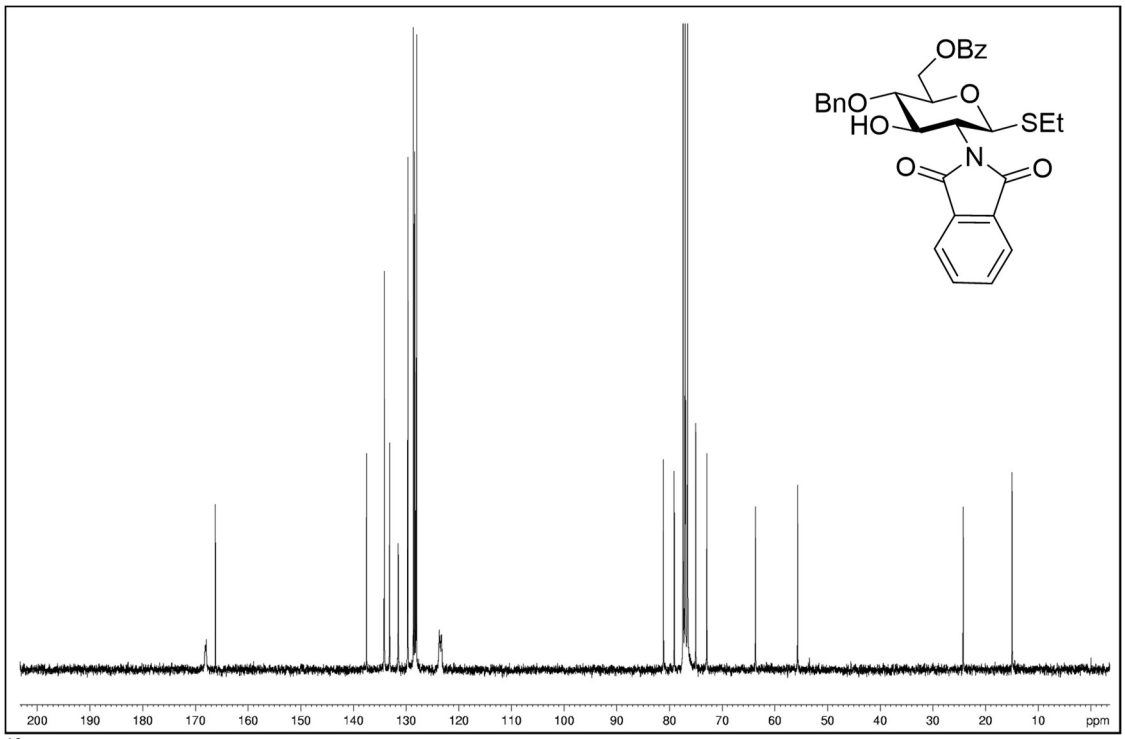
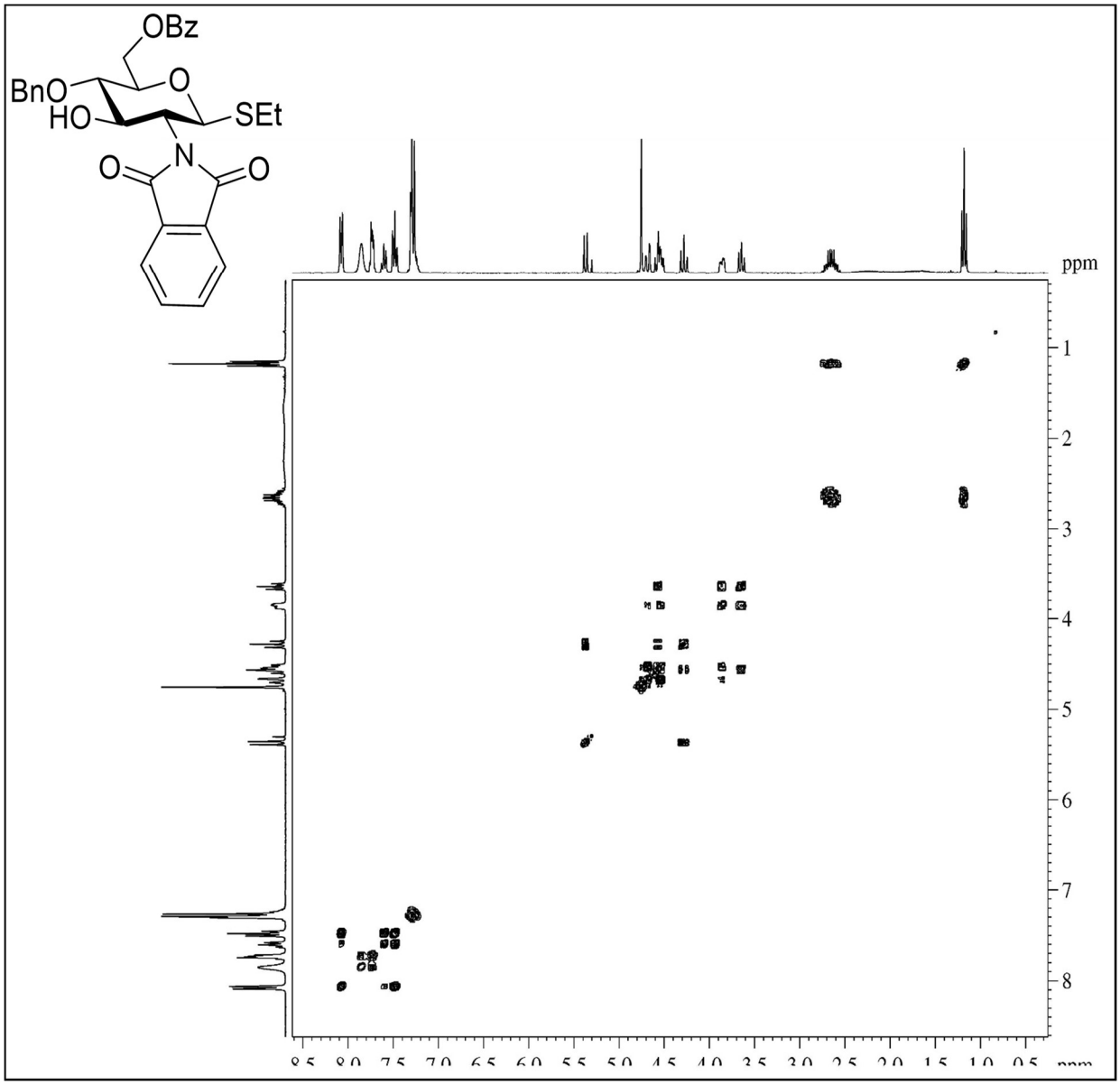


^{1}H NMR spectrum ($CDCl_3$, 300 MHz)



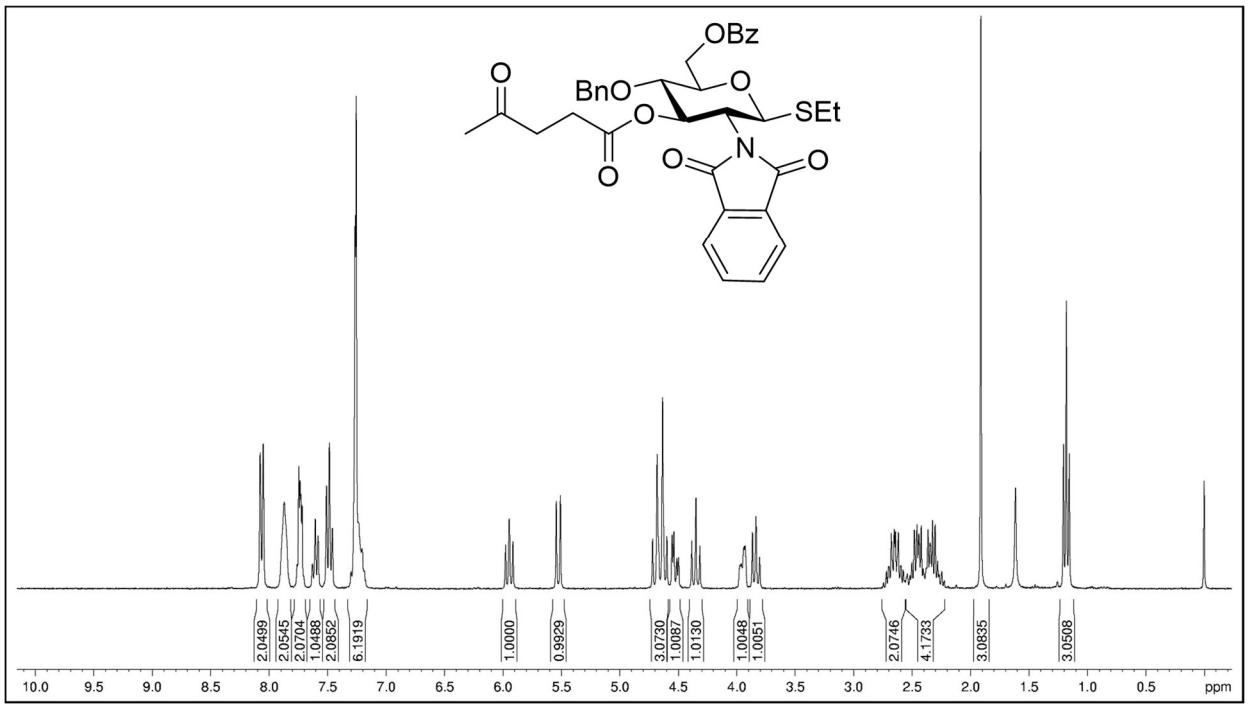
^{13}C NMR spectrum (75 MHz, $CDCl_3$)

Ethyl 6-*O*-benzoyl-4-*O*-benzyl-2-deoxy-2-phthalimido-1-thio-β-D-glucopyranoside (50)

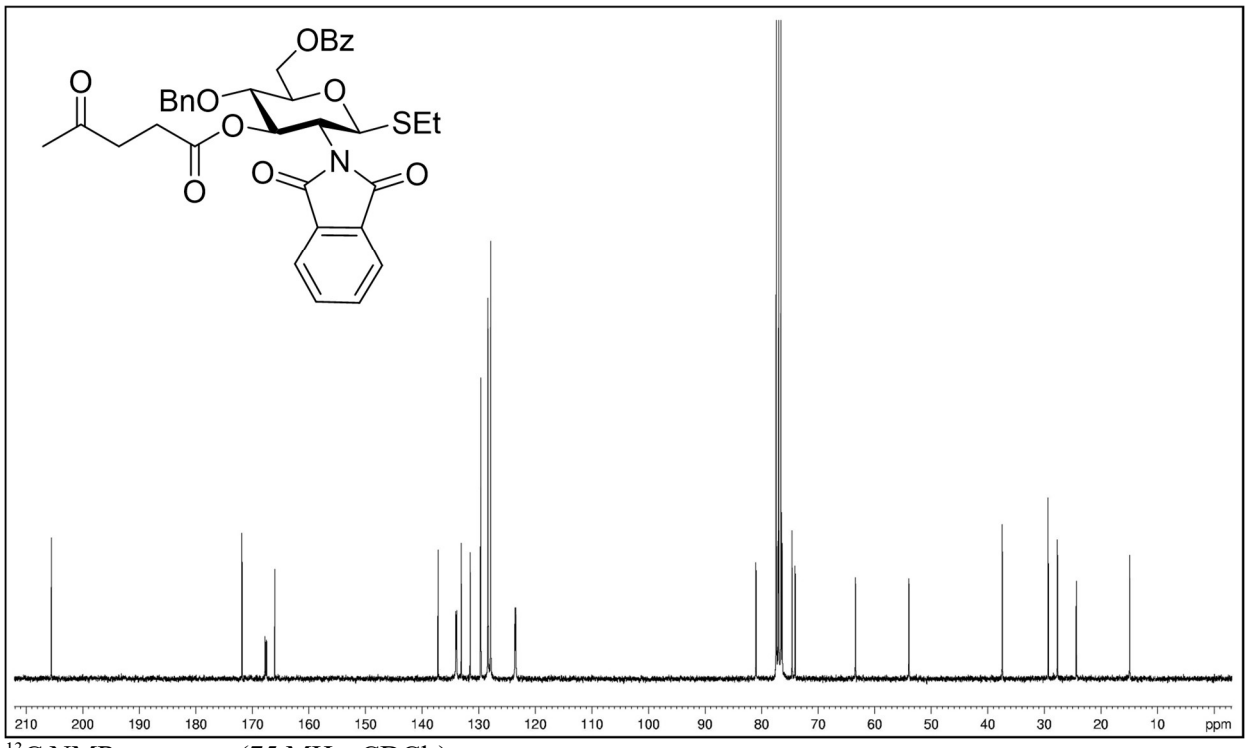


2D NMR (300 MHz, $CDCl_3$)

Ethyl 6-*O*-benzoyl-4-*O*-benzyl-2-deoxy-3-*O*-levulinoyl-2-phthalimido-1-thio-β-D-glucopyranoside (35)

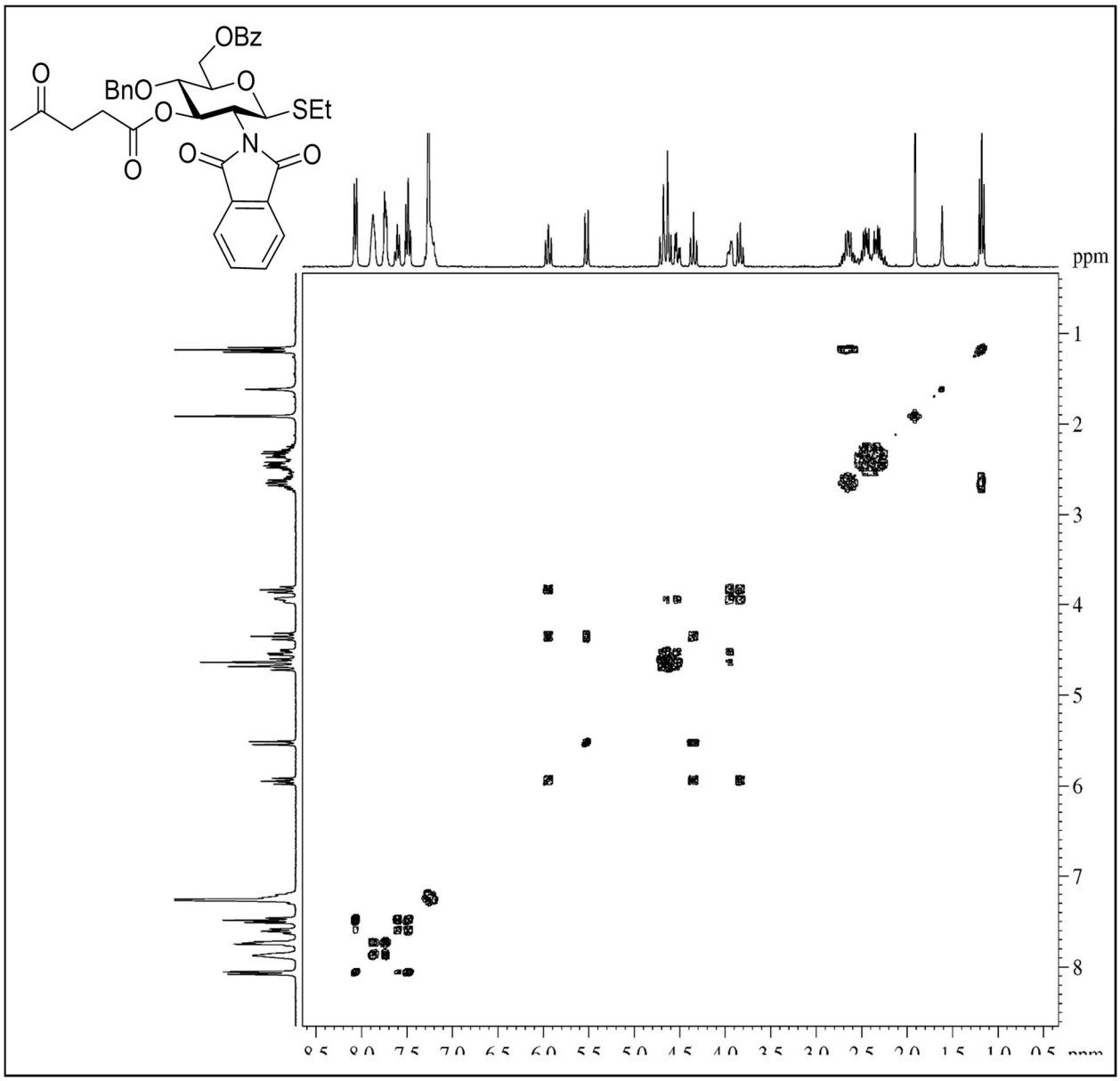


^{1}H NMR spectrum ($CDCl_3$, 300 MHz)



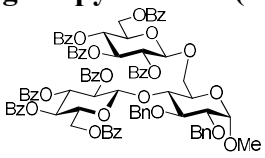
^{13}C NMR spectrum (75 MHz, $CDCl_3$)

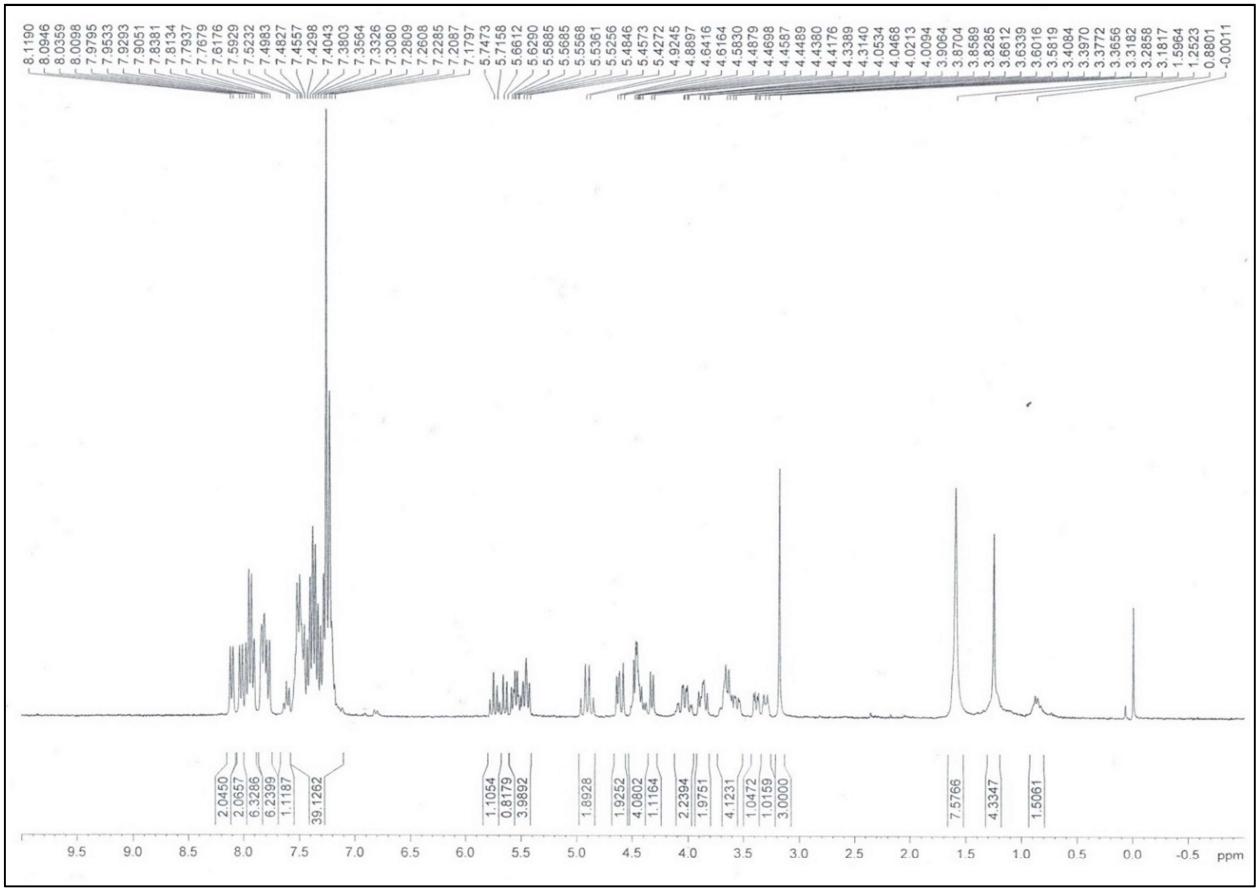
Ethyl 6-*O*-benzoyl-4-*O*-benzyl-2-deoxy-3-*O*-levulinoyl-2-phthalimido-1-thio-β-D-glucopyranoside (35)



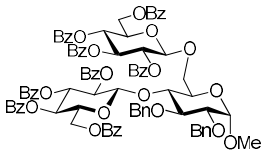
2D NMR (300 MHz, $CDCl_3$)

Methyl 4,6-di-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-2,3-di-O-benzyl-α-D-glucopyranoside (25)





^{1}H NMR (300 MHz, $CDCl_3$)



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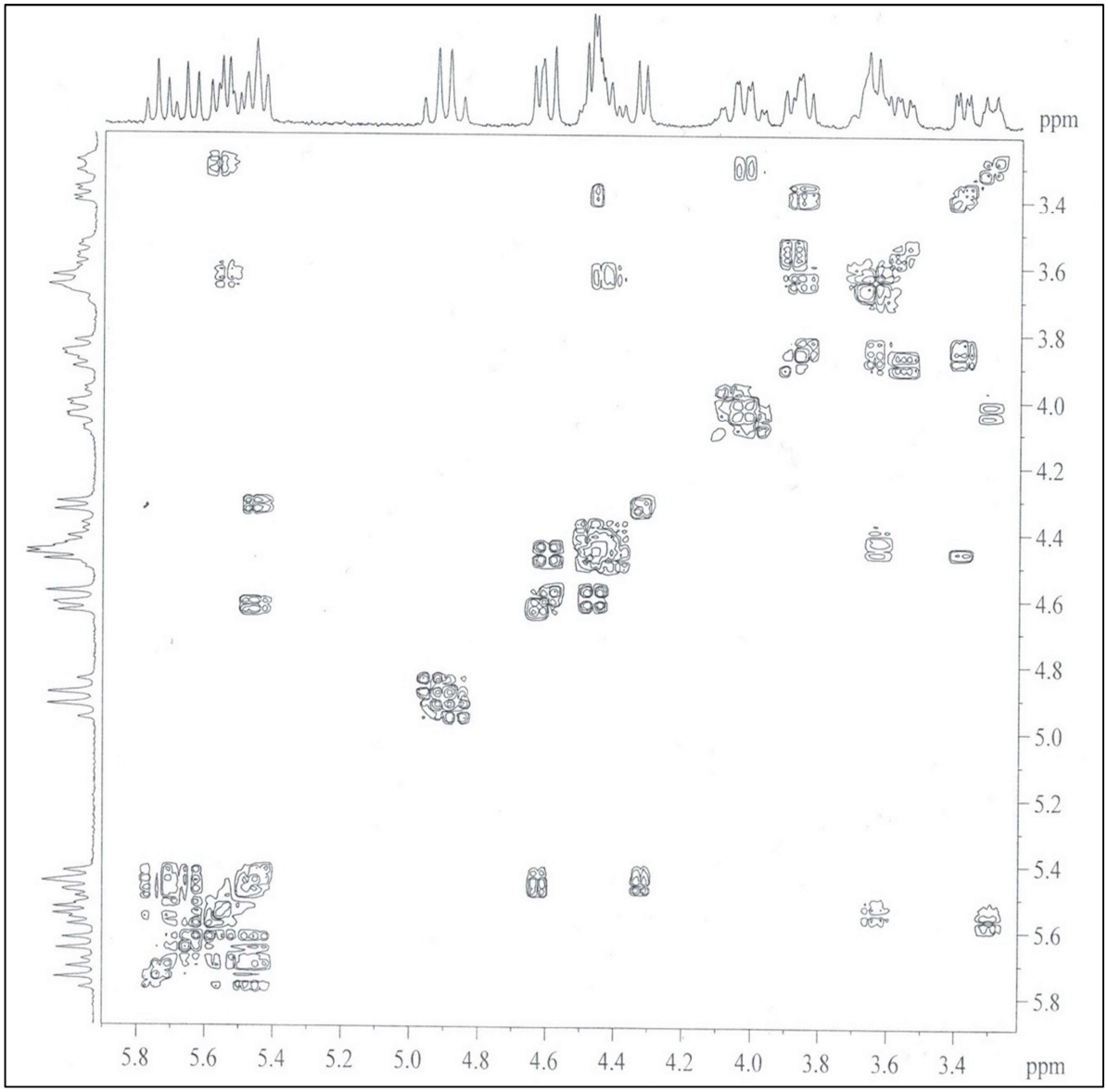
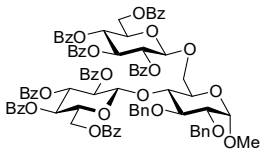


2D NMR (300 MHz, $CDCl_3$)



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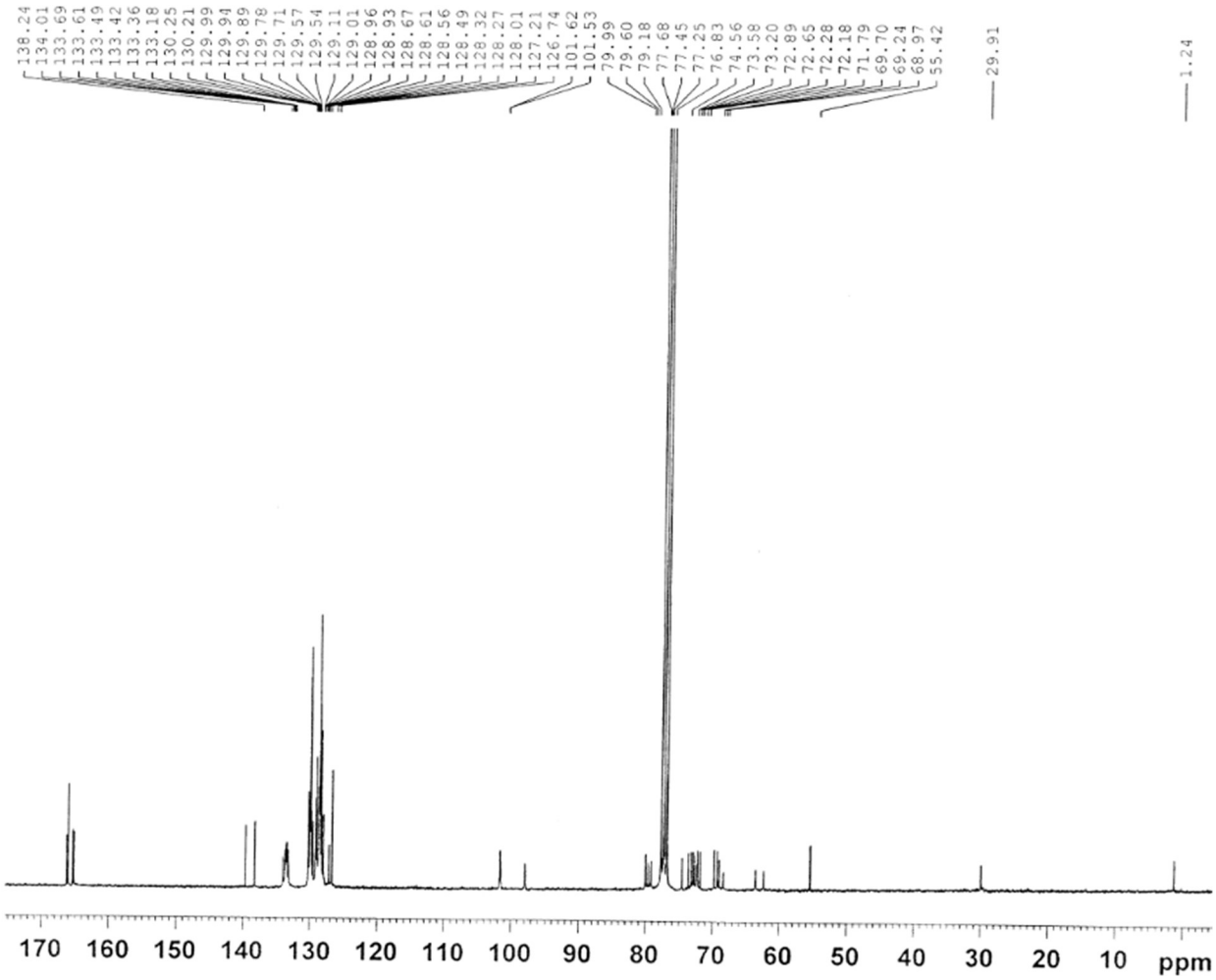
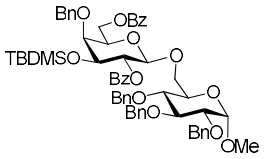
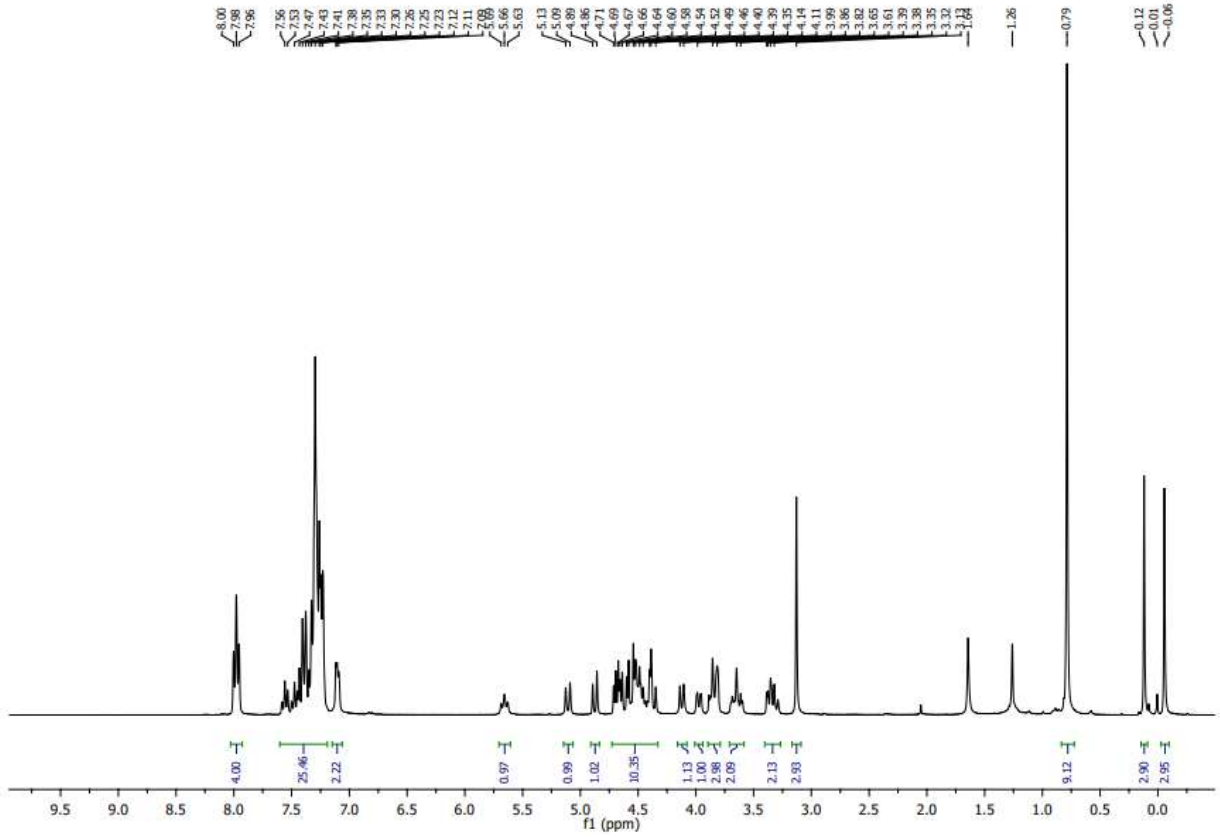


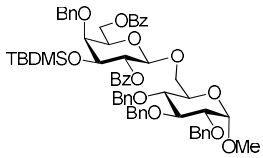
^{13}C NMR spectrum (75 MHz, $CDCl_3$)

Methyl 6-*O*-(2,6-di-*O*-benzoyl-4-*O*-benzyl-3-*O*-*tert*-butyldimethylsilyl-β-D-galactopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (42)





^{1}H NMR (300 MHz, $CDCl_3$)



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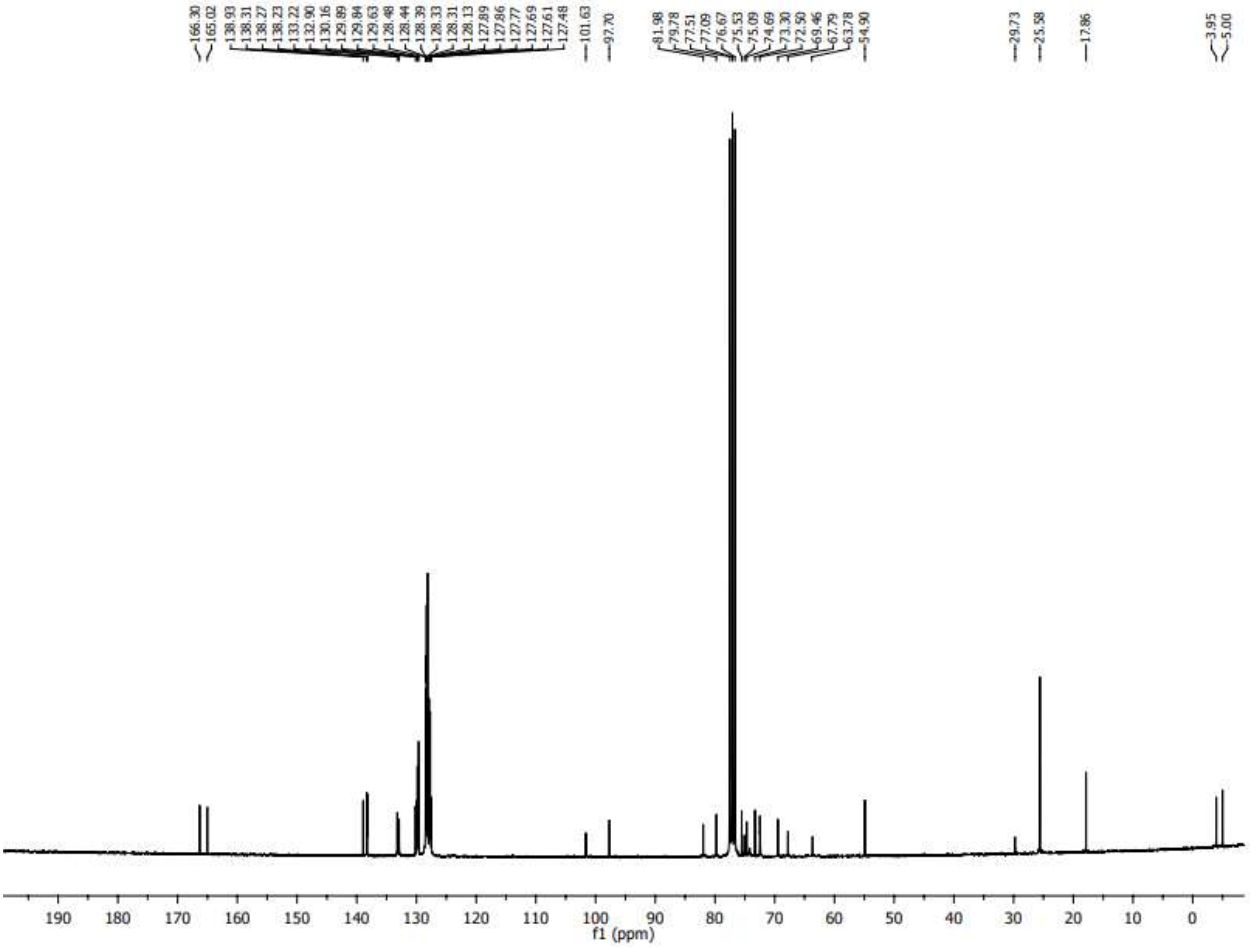
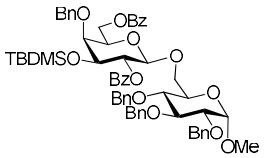


^{13}C NMR (75 MHz, $CDCl_3$)



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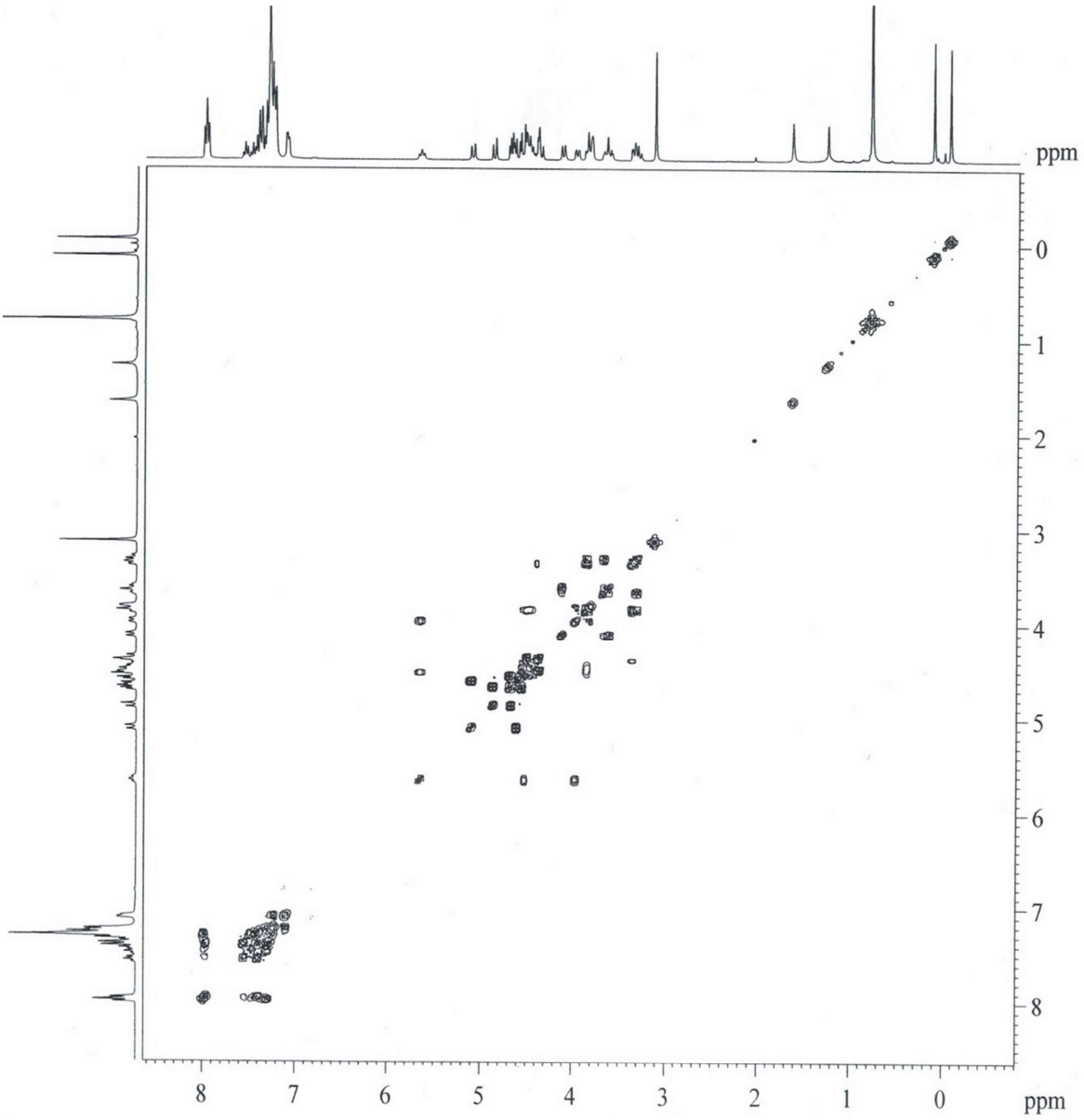
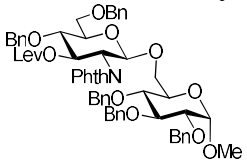
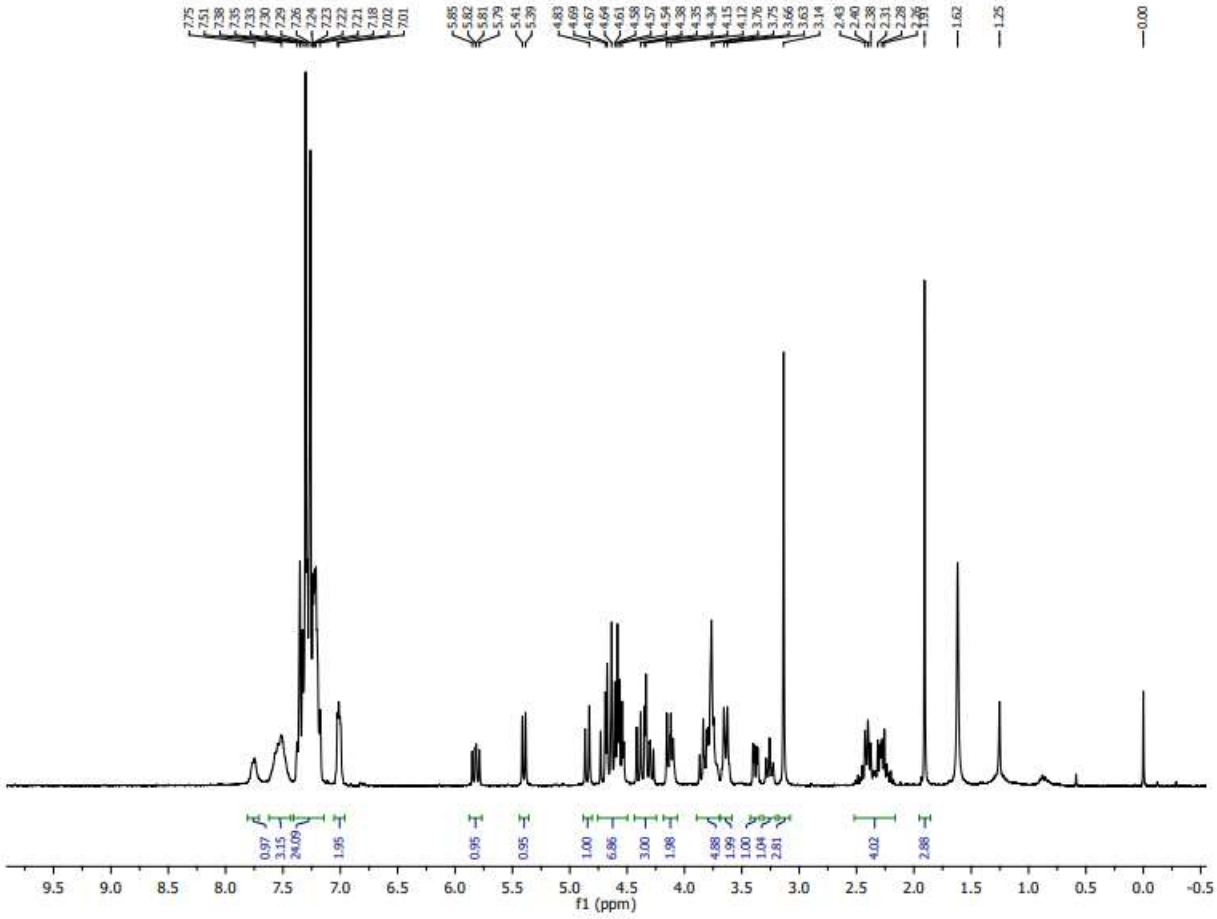


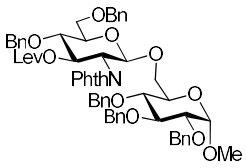
2D NMR (300 MHz, $CDCl_3$)

Methyl 6-*O*-(4,6-di-*O*-benzyl-2-deoxy-3-*O*-levulinoyl-2-phthalimido-β-D-glucopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (43)





^{1}H NMR (300 MHz, $CDCl_3$)



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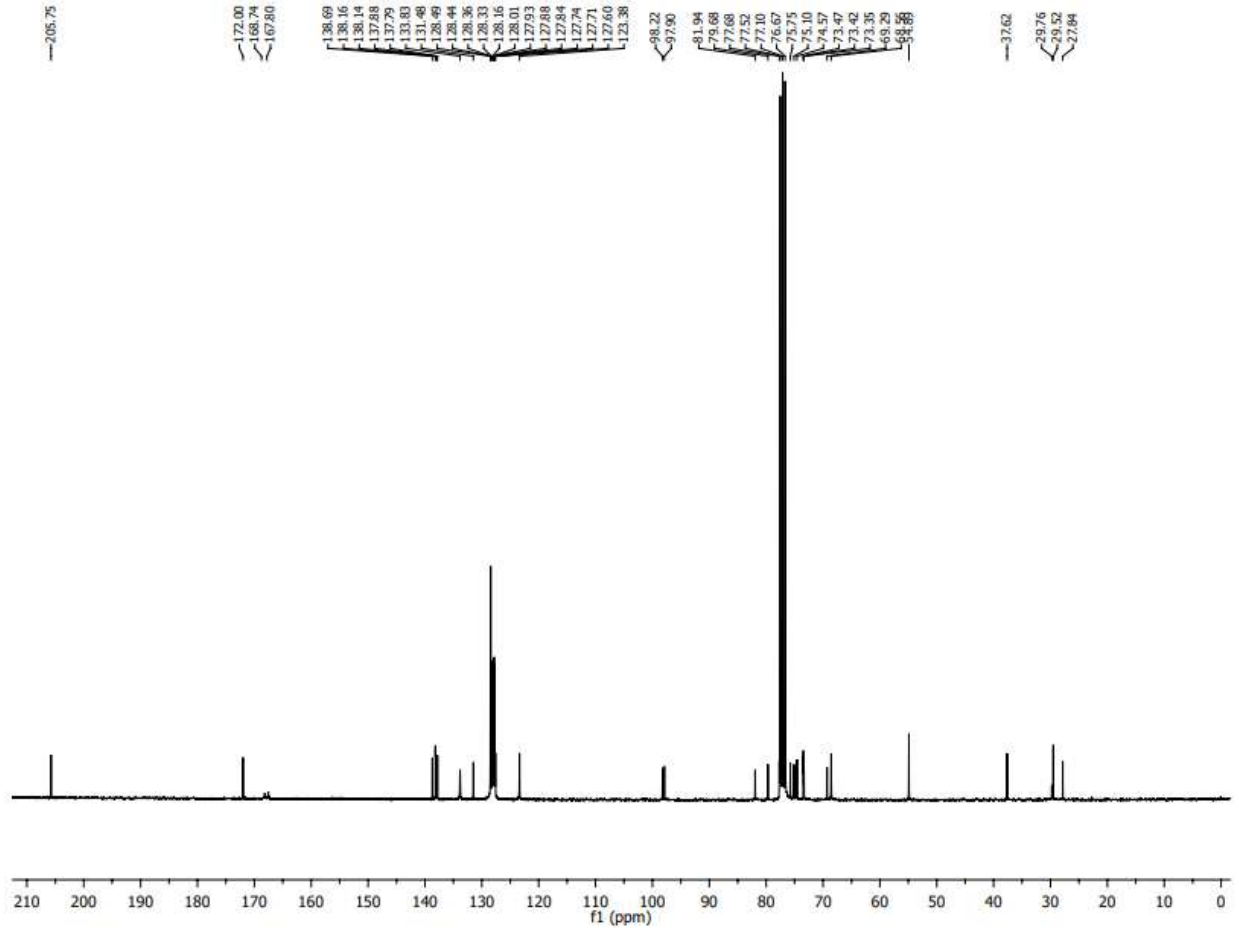
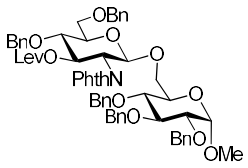


^{13}C NMR (75 MHz, $CDCl_3$)



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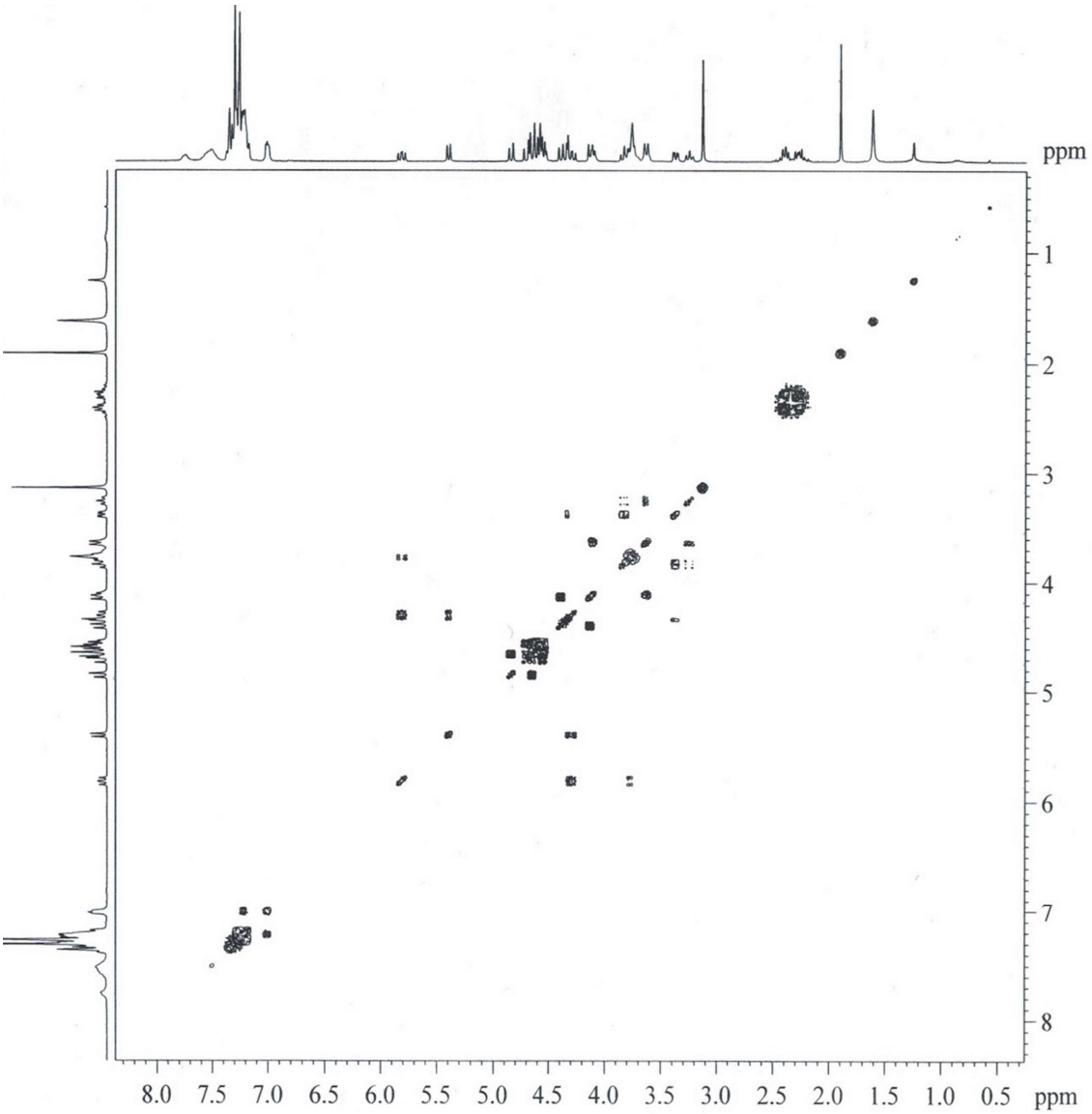
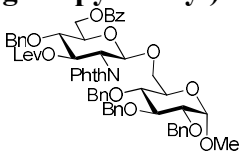
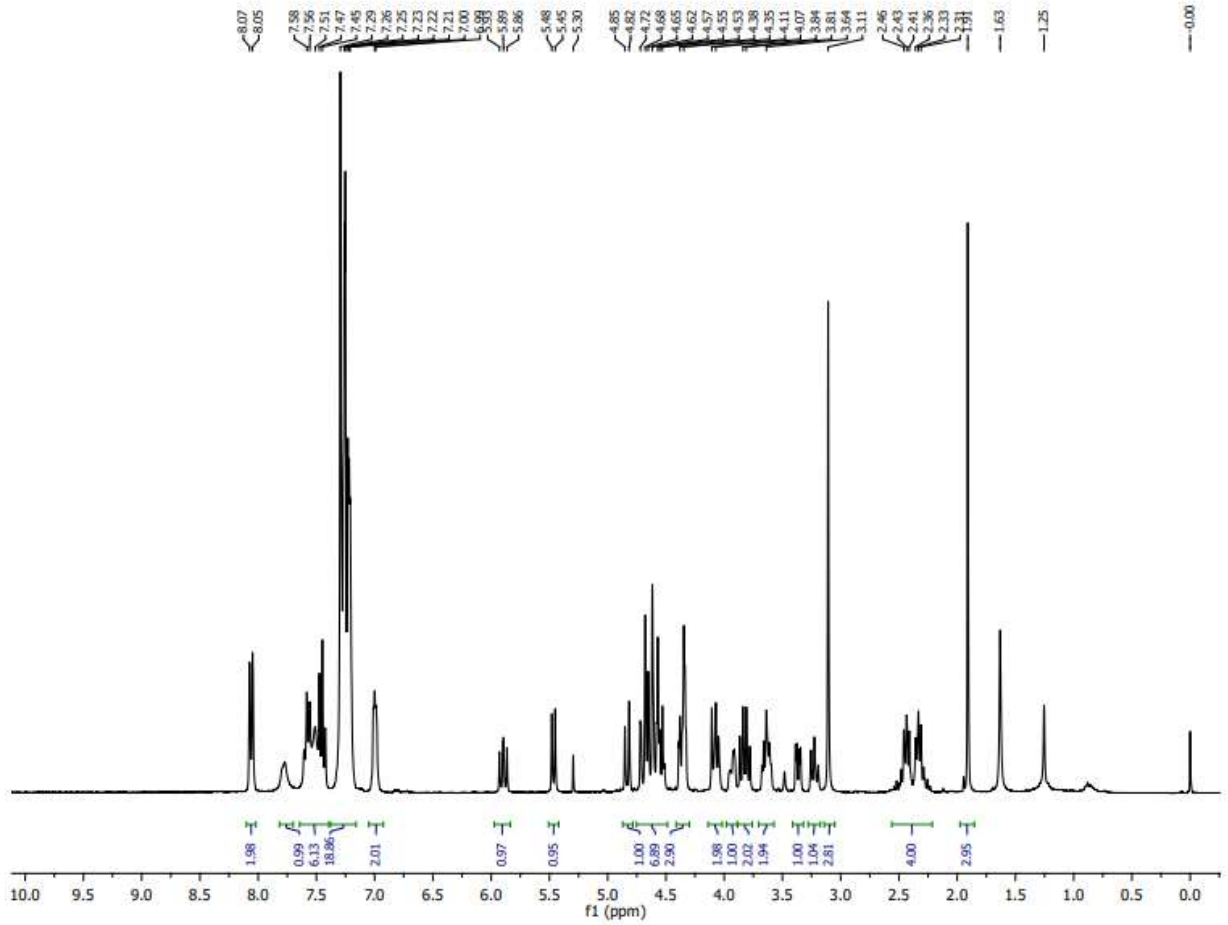


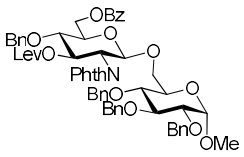
2D NMR (300 MHz, $CDCl_3$)

Methyl 6-*O*-(6-*O*-benzoyl-4-*O*-benzyl-2-deoxy-3-*O*-levulinoyl-2-phthalimido-β-D-glucopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (44)





^{1}H NMR (300 MHz, $CDCl_3$)



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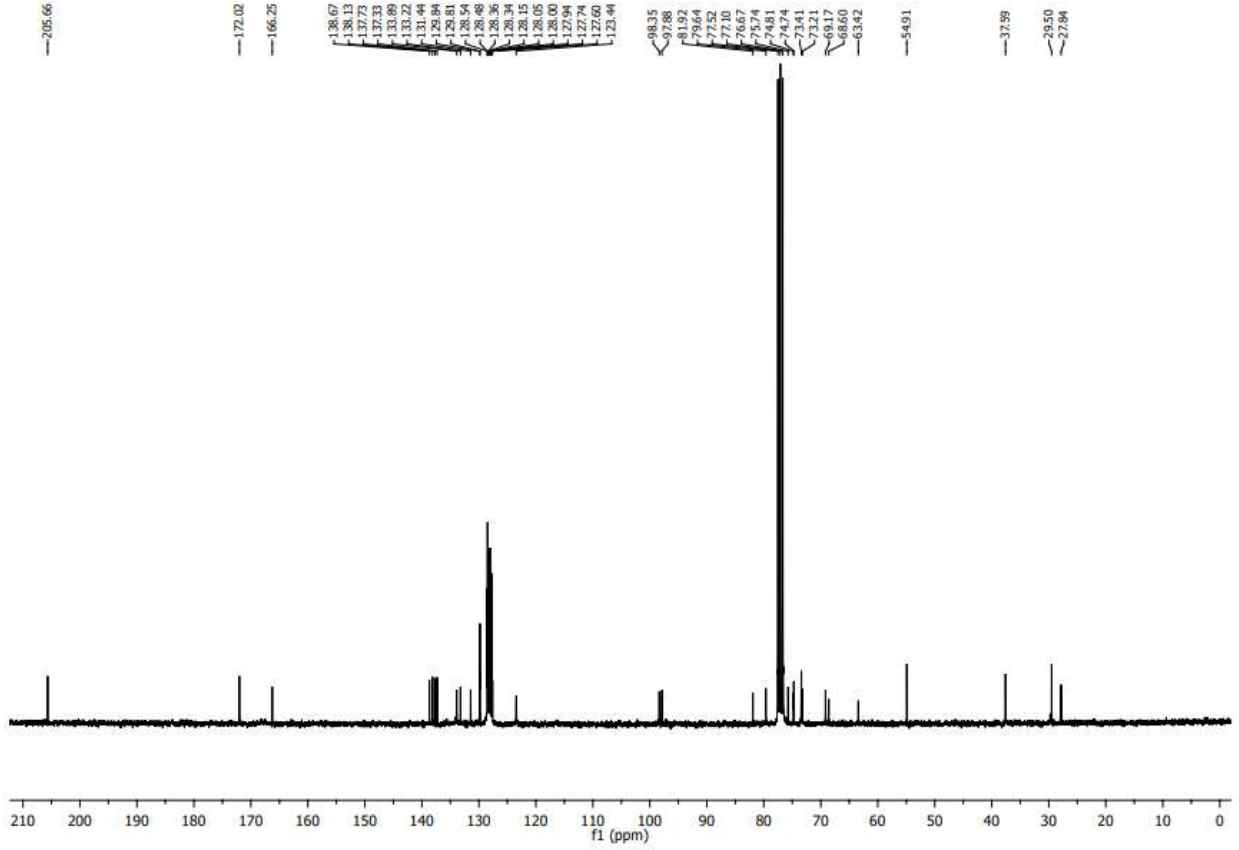
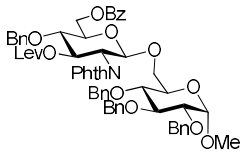


^{13}C NMR (75 MHz, $CDCl_3$)



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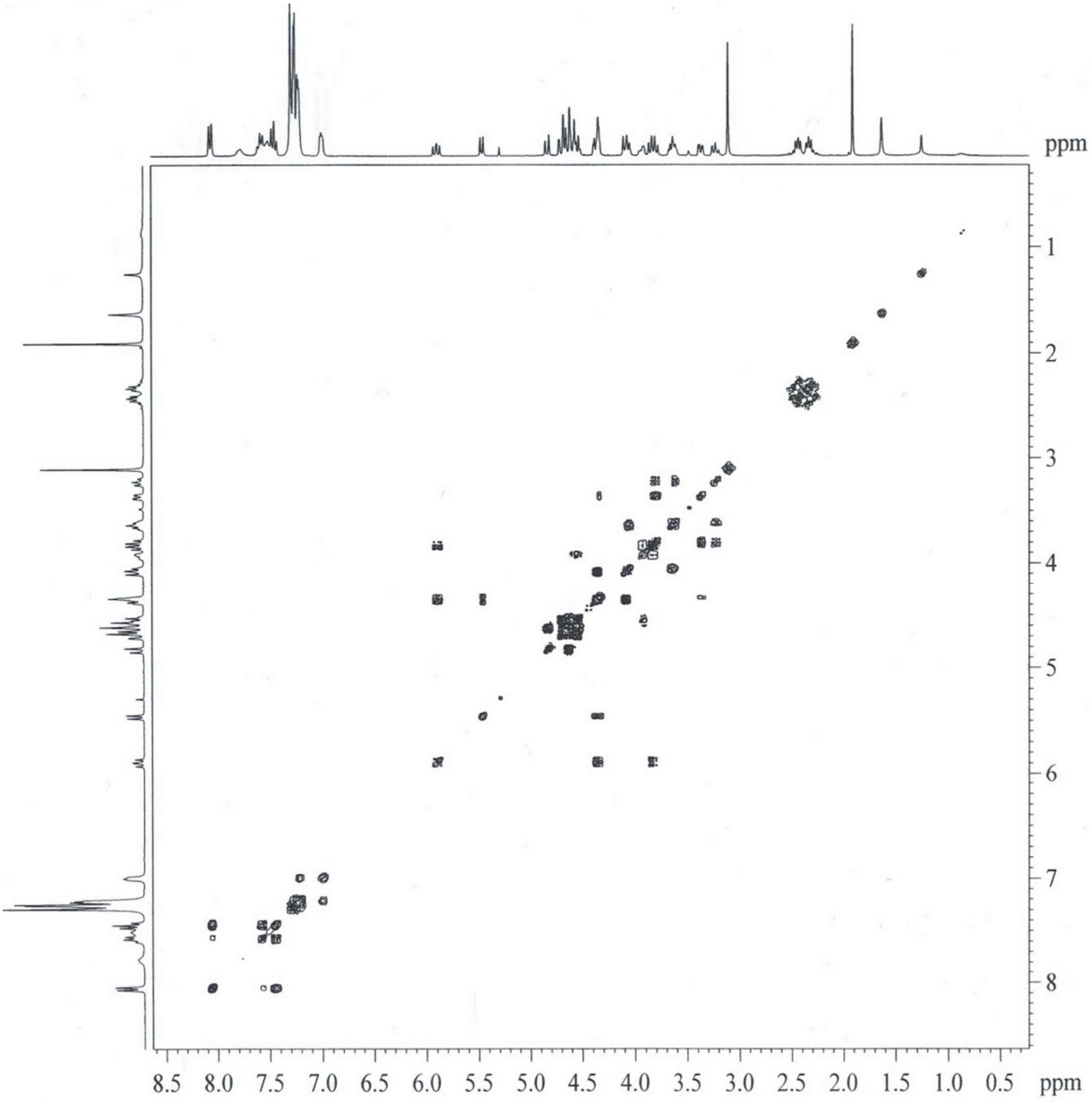
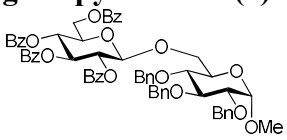
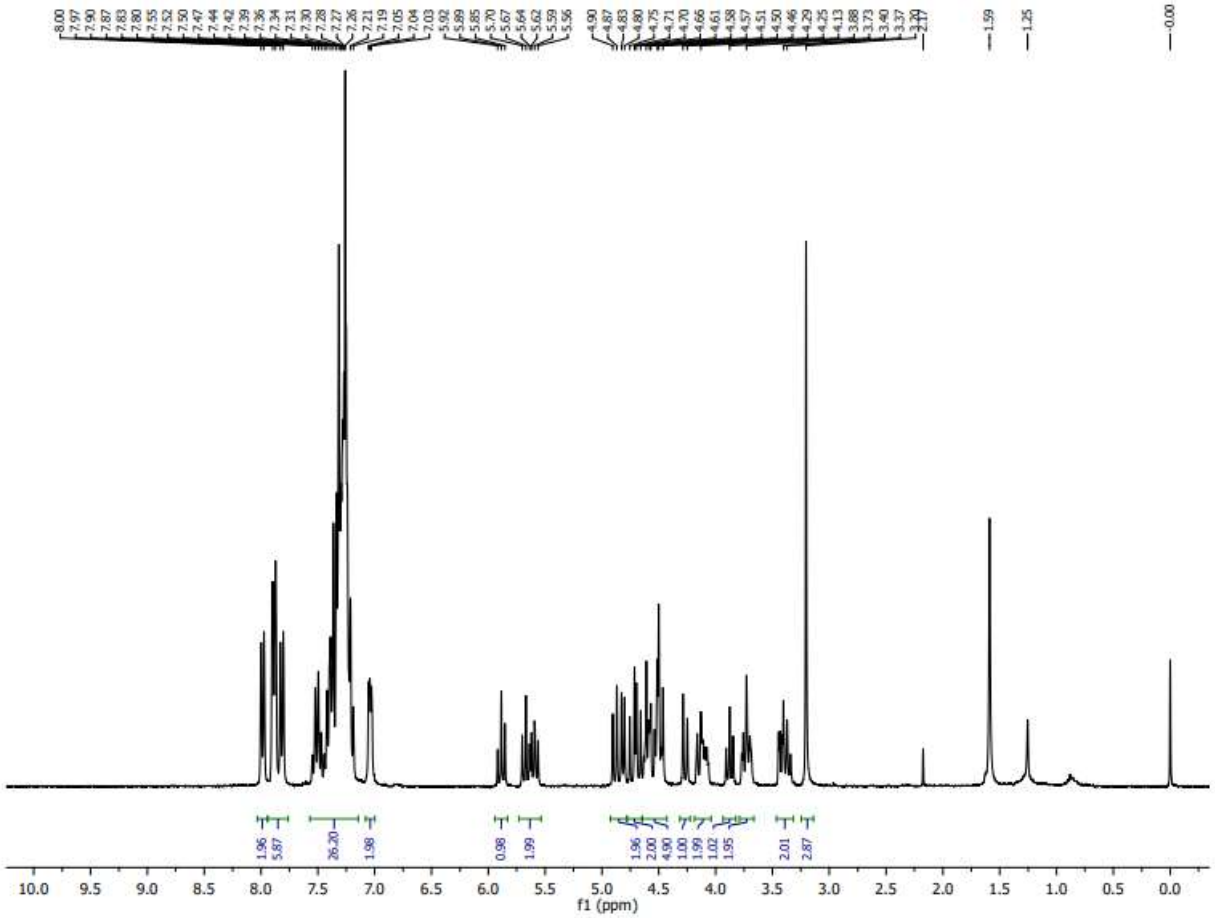


2D NMR (300 MHz, $CDCl_3$)

^{1}H NMR Spectra of Known Oligosaccharides

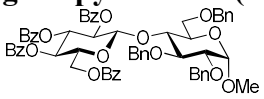
Methyl 6-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (3)

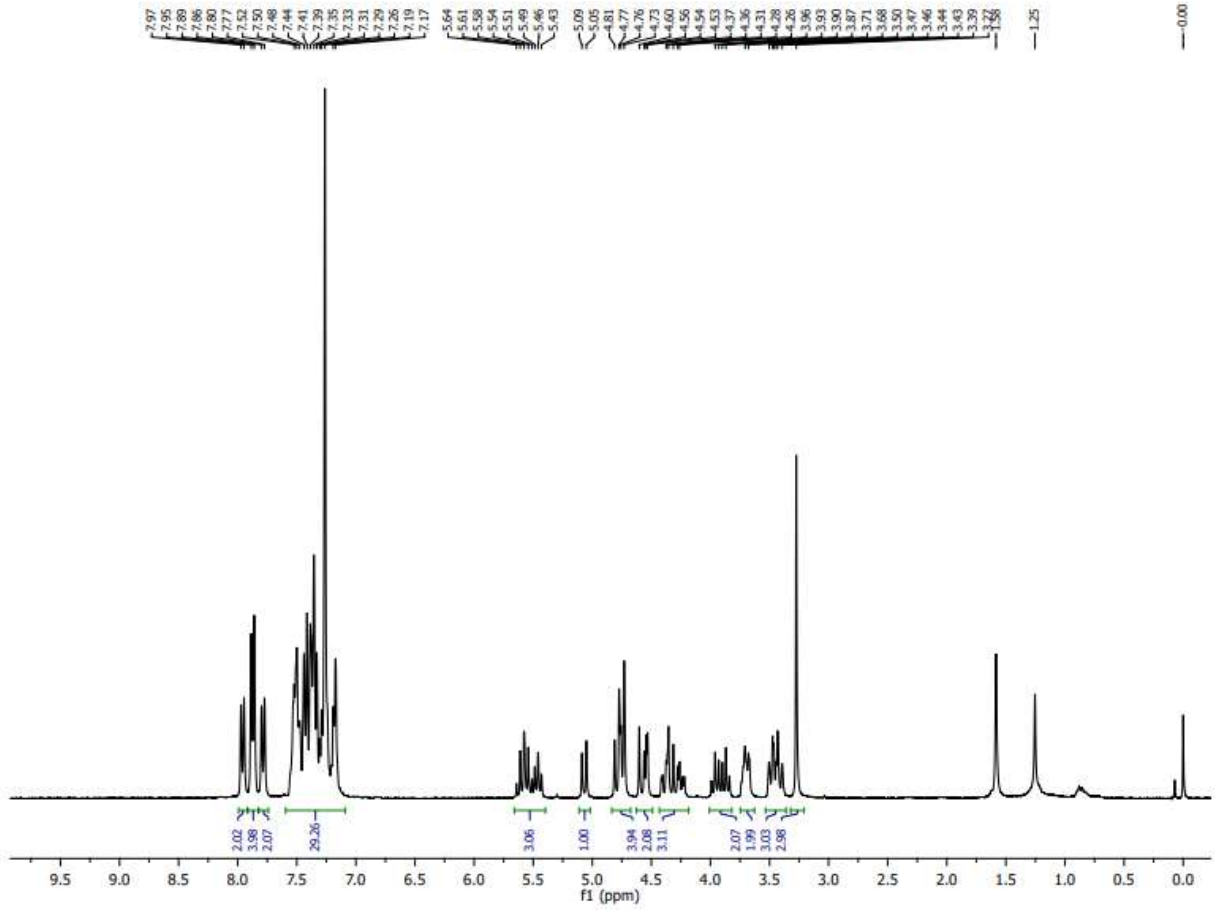




^{1}H NMR (300 MHz, $CDCl_3$)

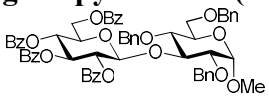
Methyl 4-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-2,3,6-tri-O-benzyl-α-D-glucopyranoside (15)

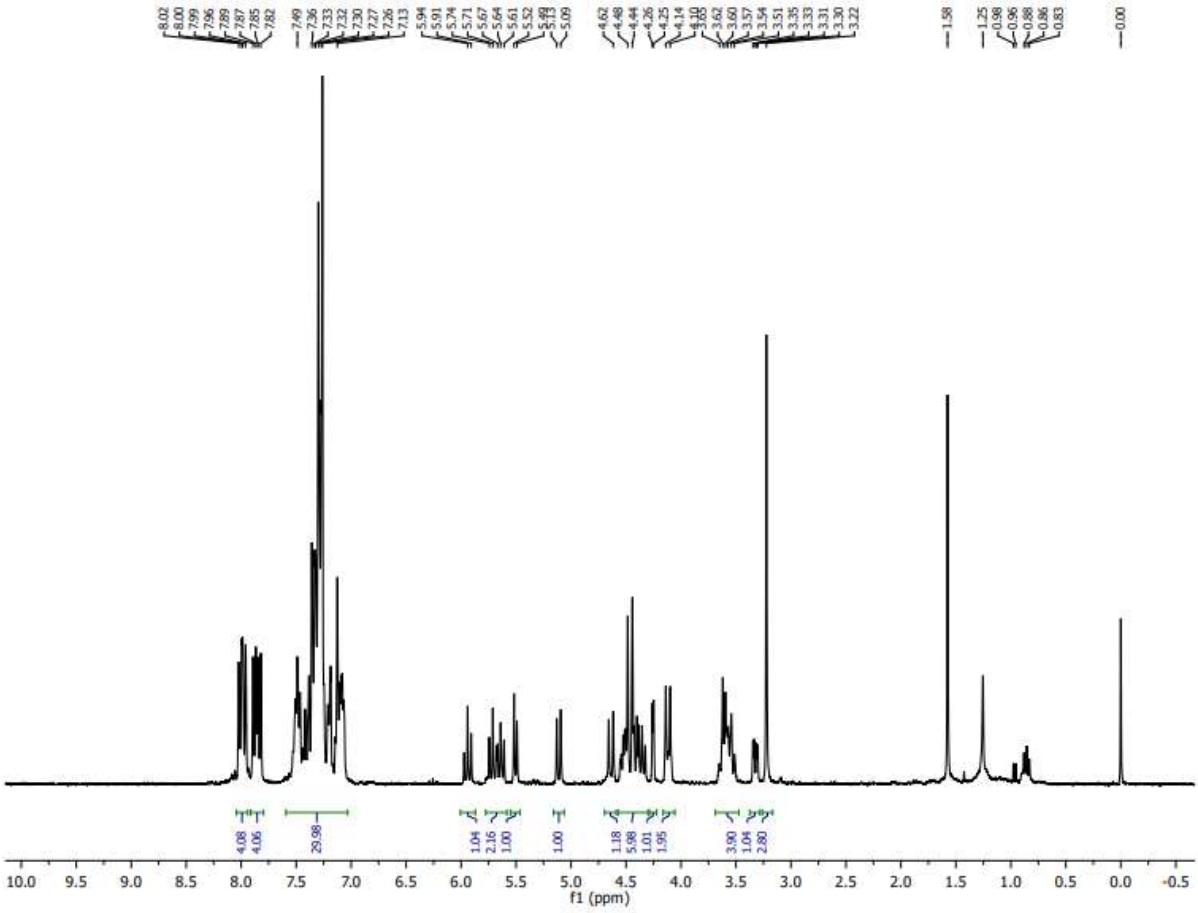




^{1}H NMR (300 MHz, $CDCl_3$)

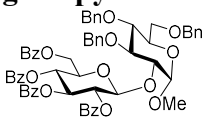
Methyl 3-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-2,4,6-tri-O-benzyl-α-D-glucopyranoside (16)

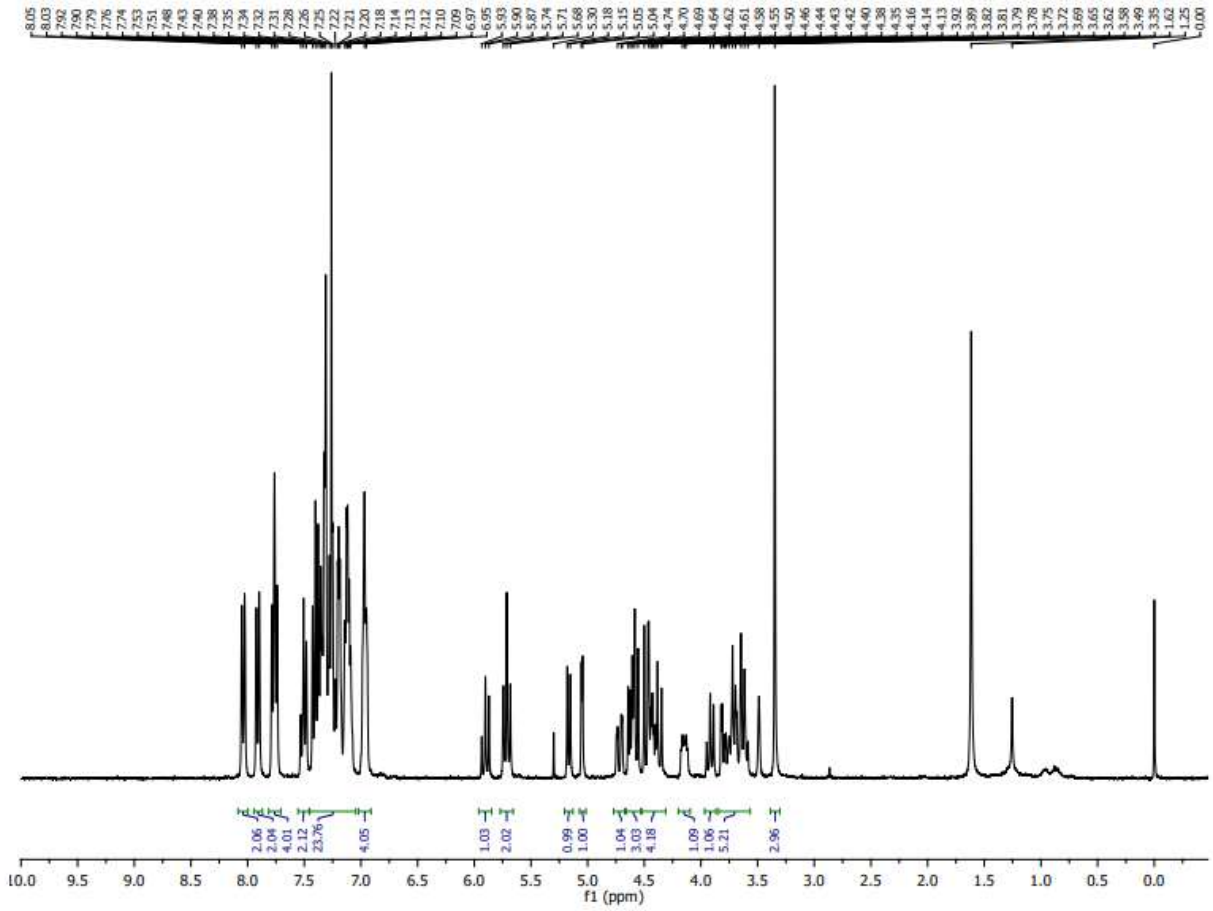




^{1}H NMR (300 MHz, $CDCl_3$)

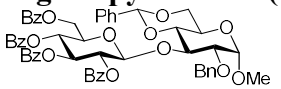
Methyl 2-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-3,4,6-tri-O-benzyl-α-D-glucopyranoside (17)

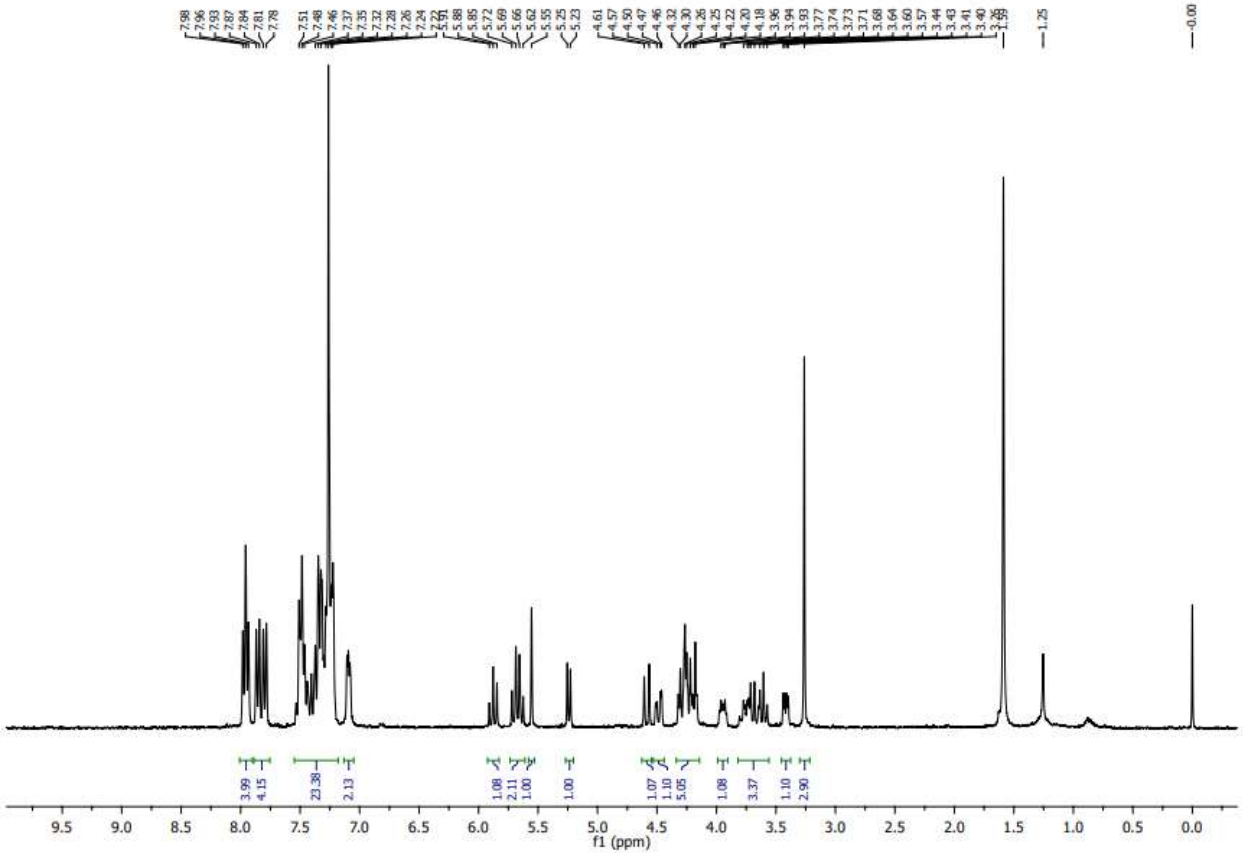




^{1}H NMR (300 MHz, $CDCl_3$)

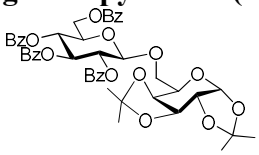
Methyl 3-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-2-*O*-benzyl-4,6-*O*-benzylidene-α-D-glucopyranoside (18)

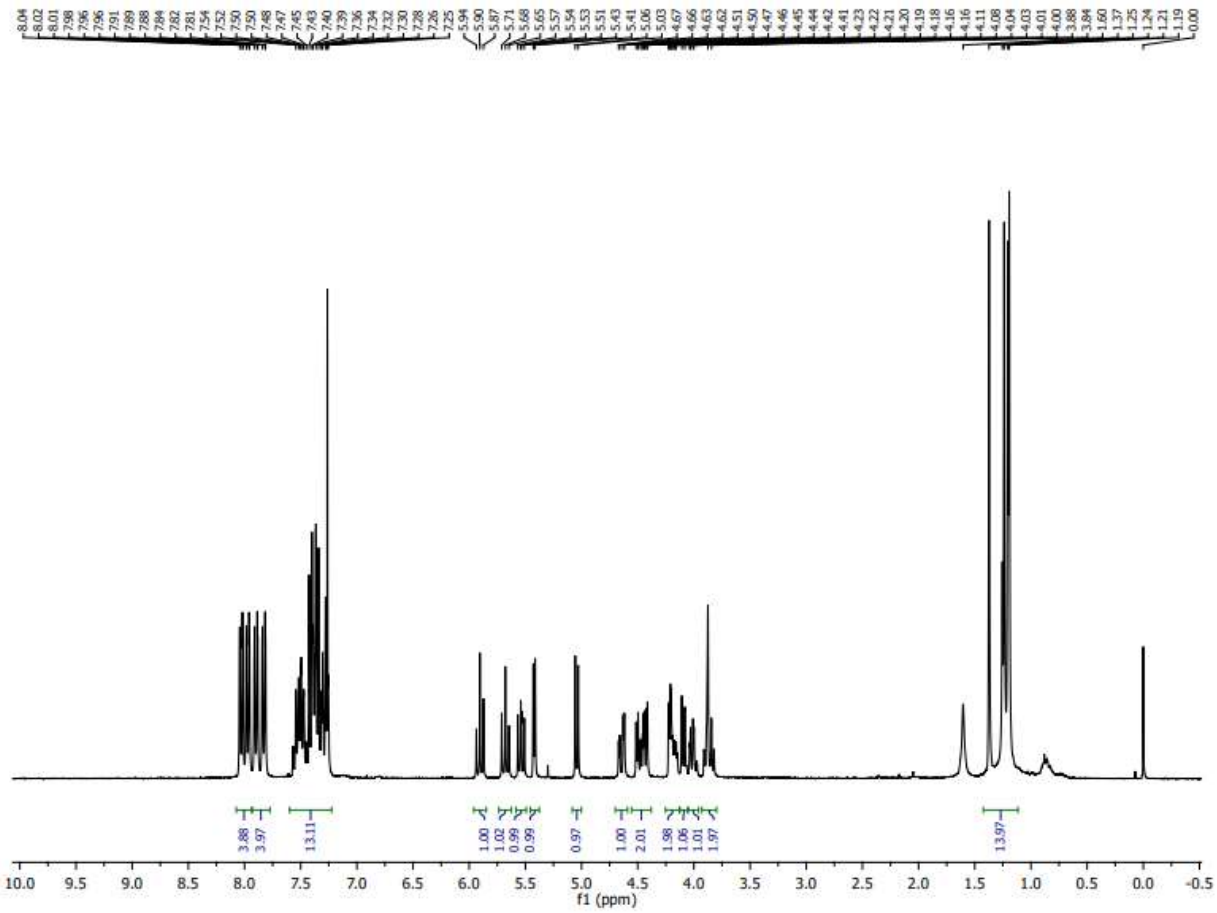




^{1}H NMR (300 MHz, $CDCl_3$)

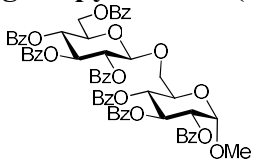
6-*O*-(2,3,4,6-Tetra-*O*-benzoyl-β-D-glucopyranosyl)-1,2:3,4-di-*O*-isopropylidene-α-D-galactopyranose (19)

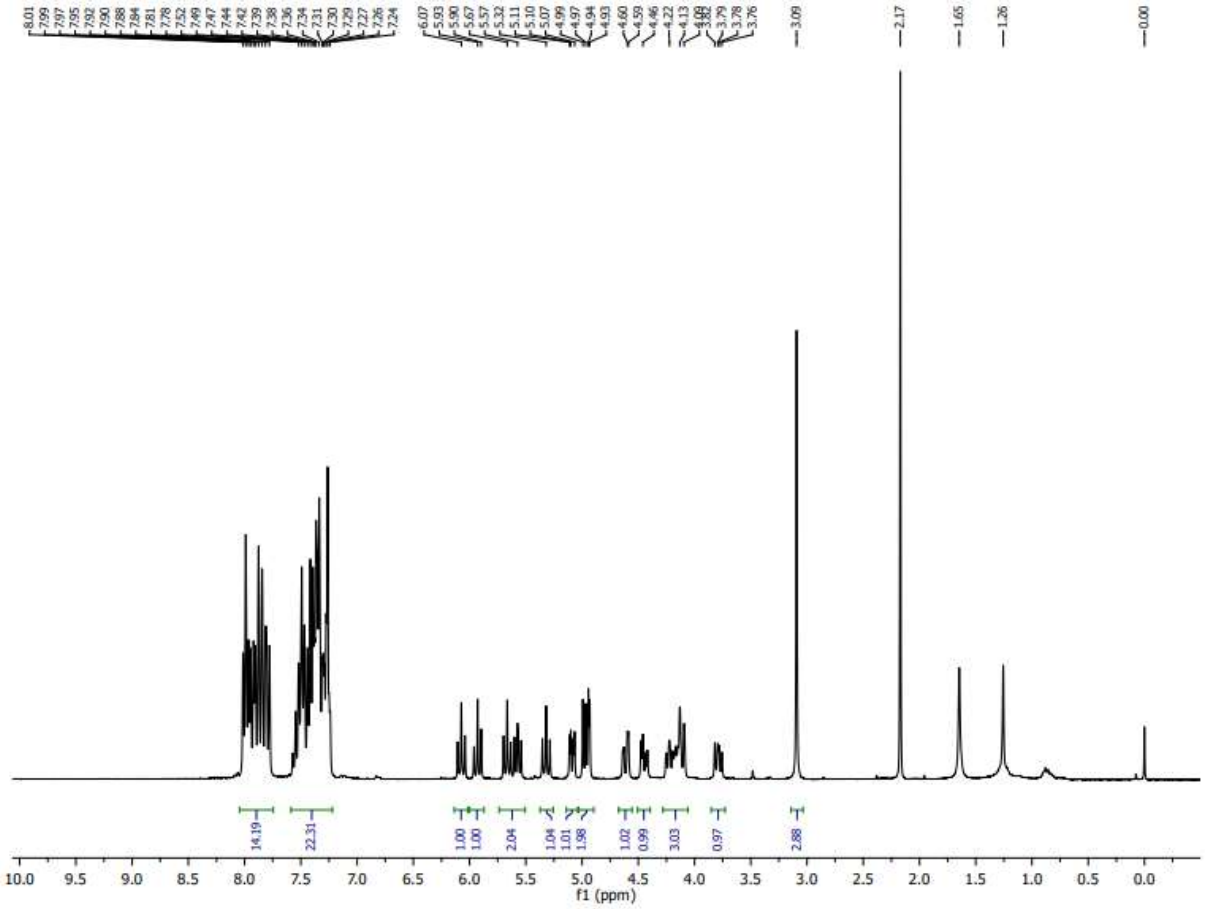




^{1}H NMR (300 MHz, $CDCl_3$)

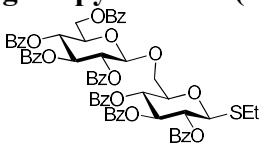
Methyl 2,3,4-tri-*O*-benzoyl-6-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-α-D-glucopyranoside (20)

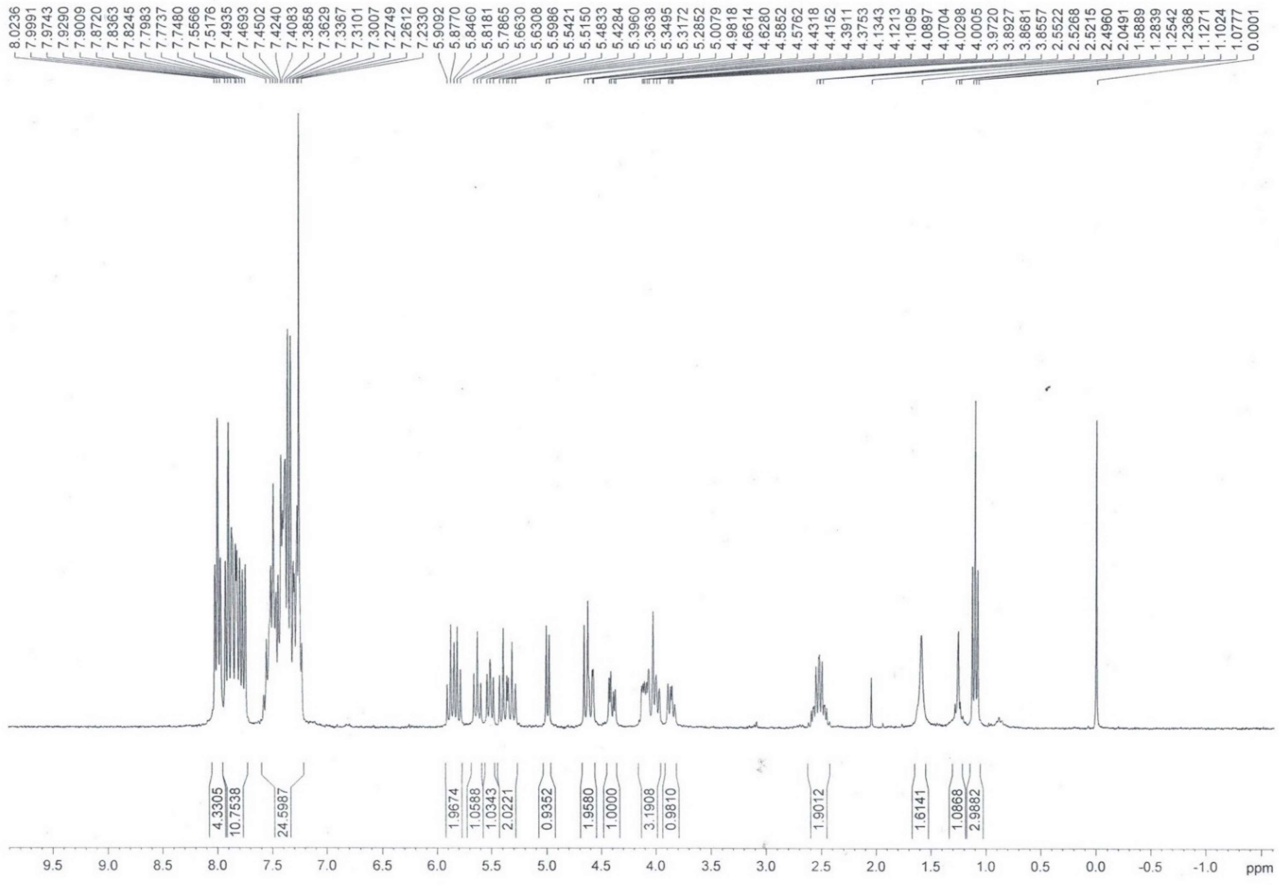




^{1}H NMR (300 MHz, $CDCl_3$)

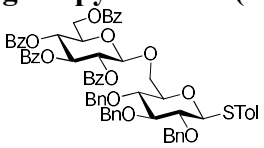
Ethyl 2,3,4-tri-O-benzoyl-6-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-1-thio-β-D-glucopyranoside (21)

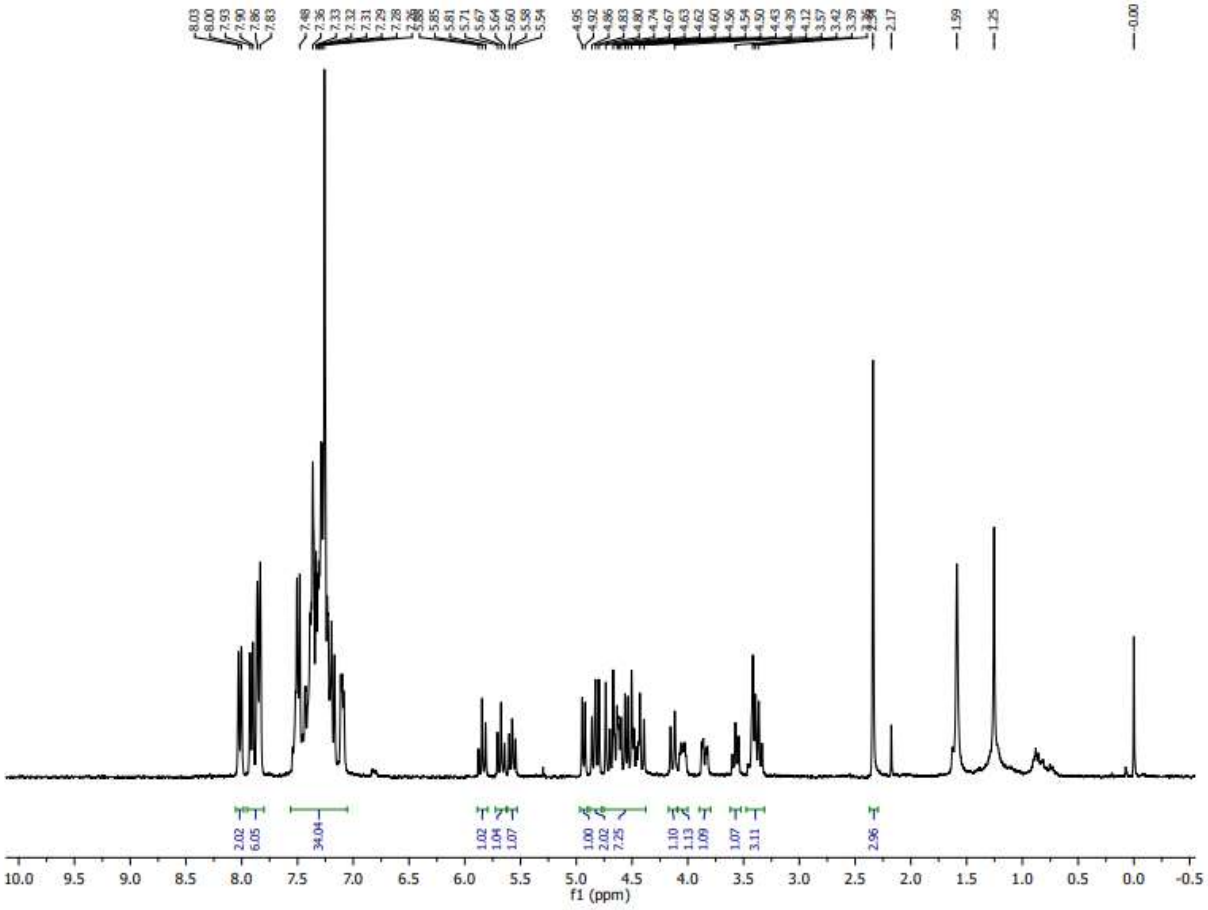




^{1}H NMR (300 MHz, $CDCl_3$)

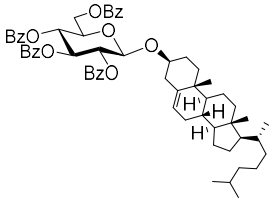
***p*-Tolyl 2,3,4-tri-*O*-benzyl-6-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranosyl)-1-thio-β-D-glucopyranoside (22)**

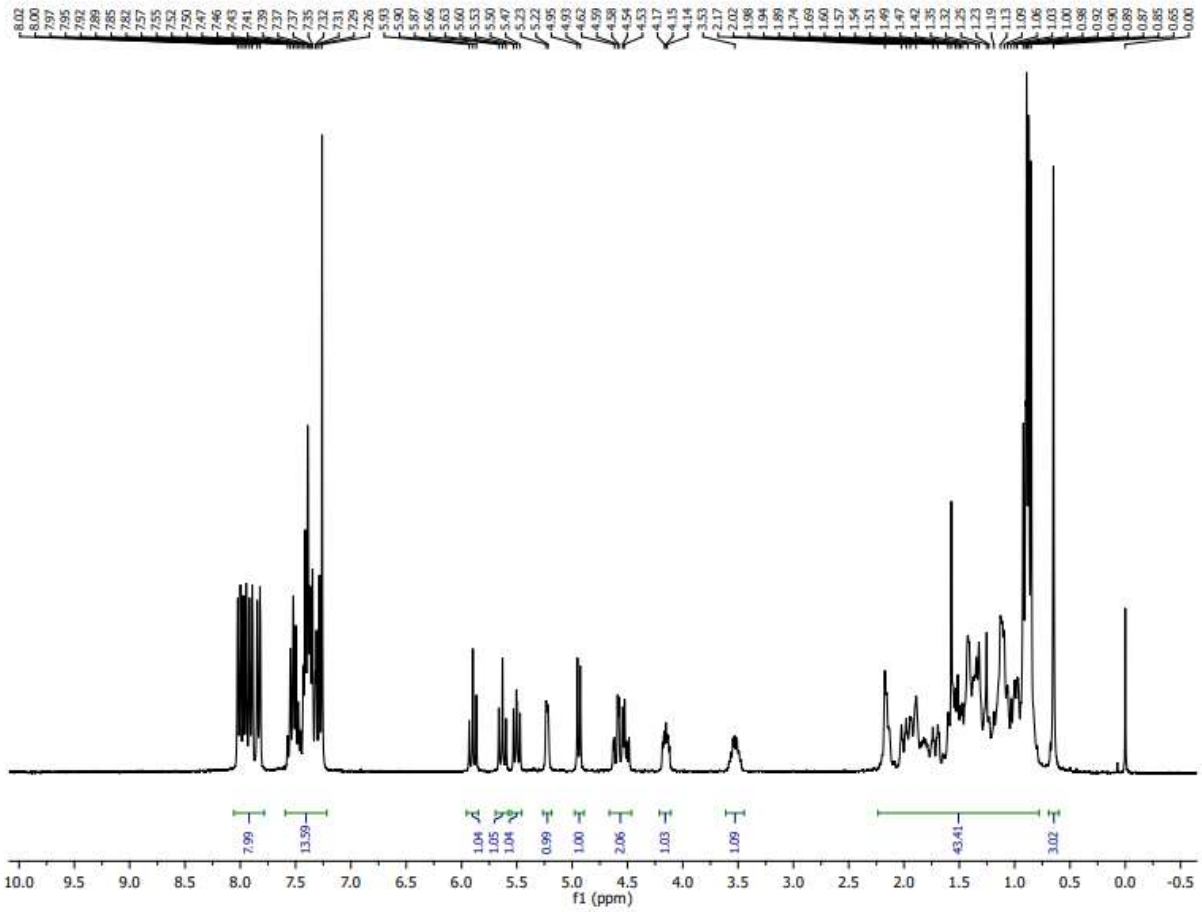




^{1}H NMR (300 MHz, $CDCl_3$)

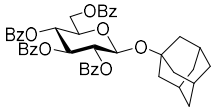
Cholesteryl 2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranoside (23)

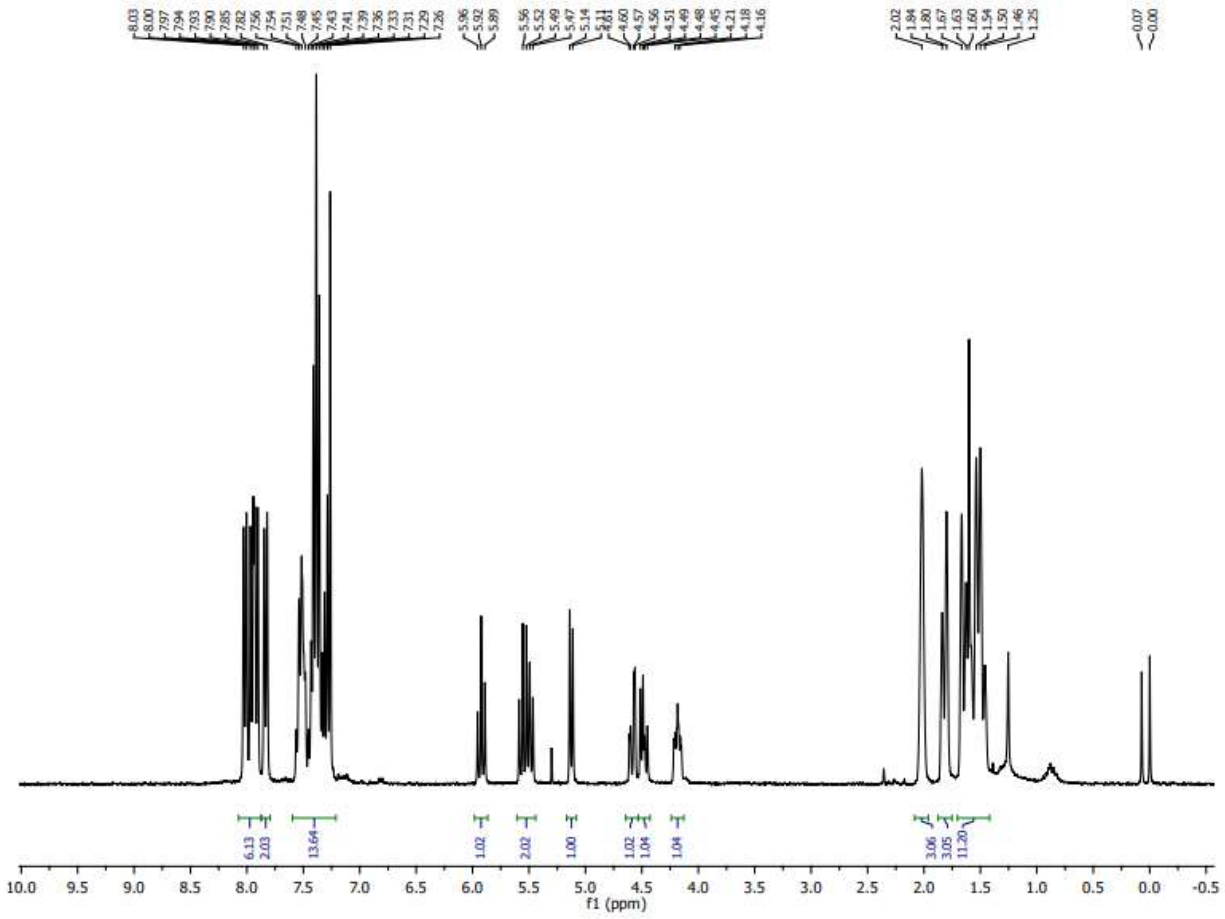




^{1}H NMR (300 MHz, $CDCl_3$)

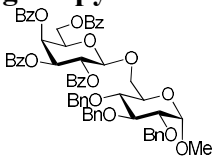
1-Adamantyl 2,3,4,6-tetra-*O*-benzoyl-β-D-glucopyranoside (24)

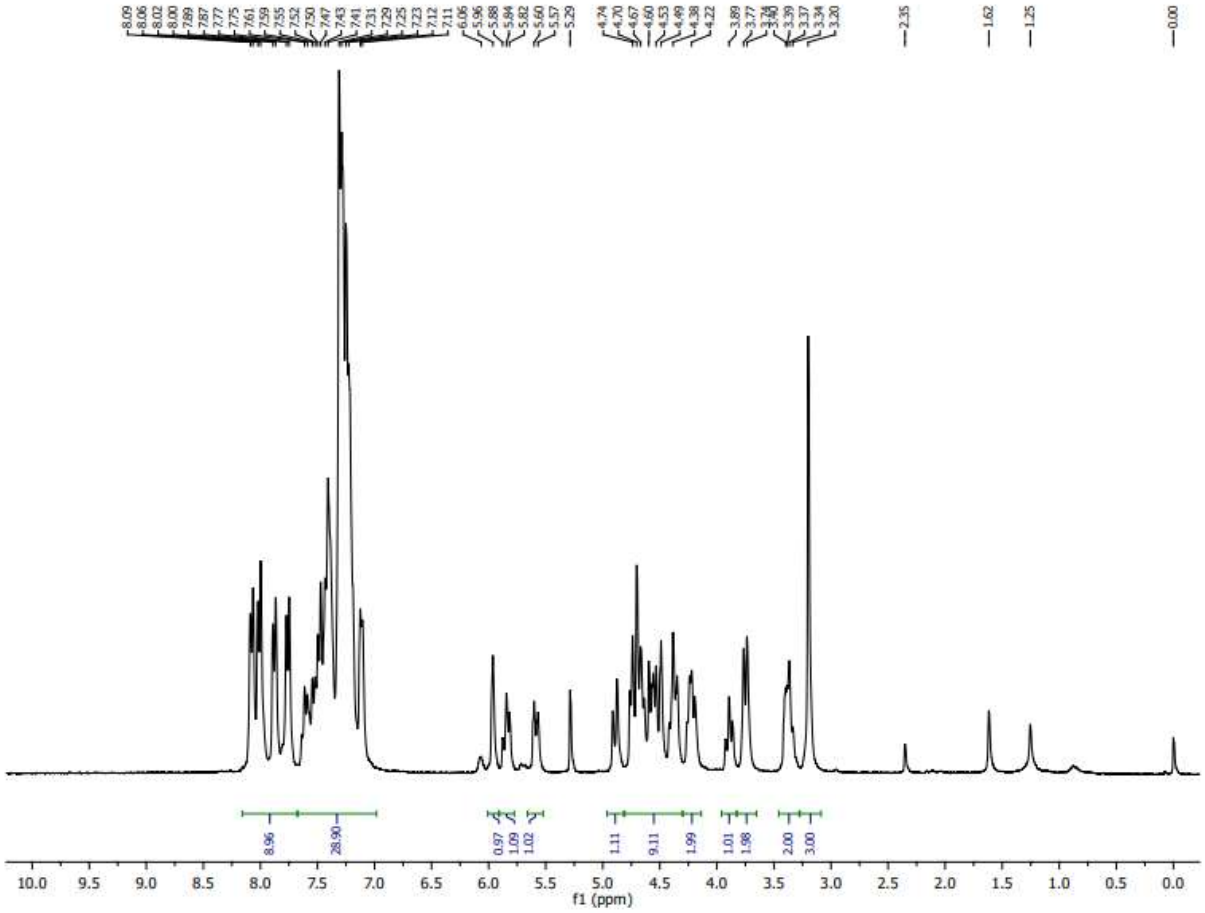




^{1}H NMR (300 MHz, $CDCl_3$)

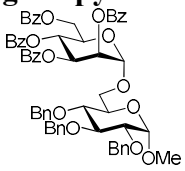
Methyl 6-*O*-(2,3,4,6-tetra-*O*-benzoyl-β-D-galactopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (37)

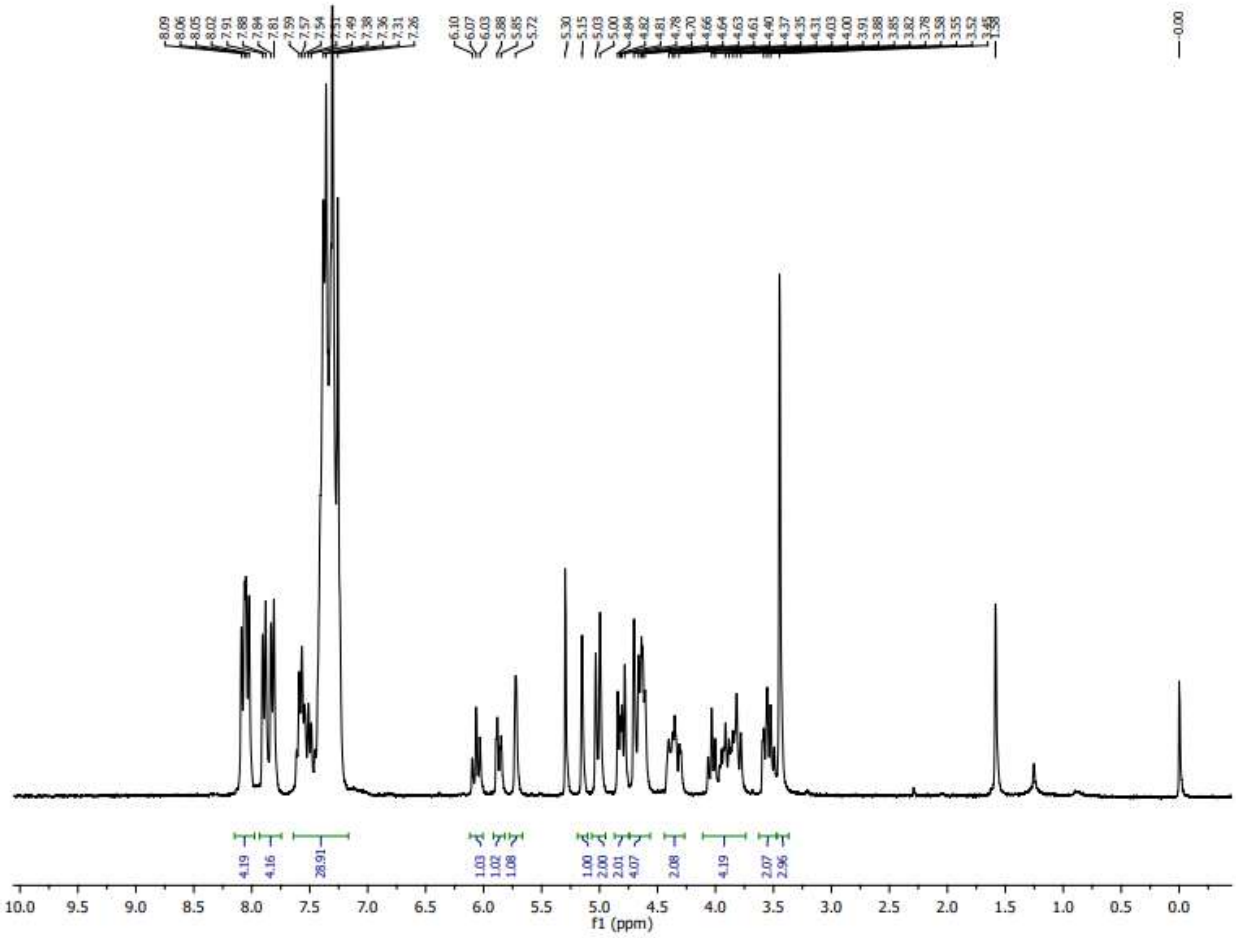




^{1}H NMR (300 MHz, $CDCl_3$)

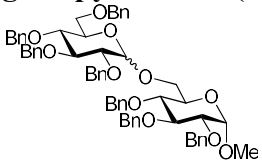
Methyl 6-*O*-(2,3,4,6-tetra-*O*-benzoyl-α-D-mannopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (38)

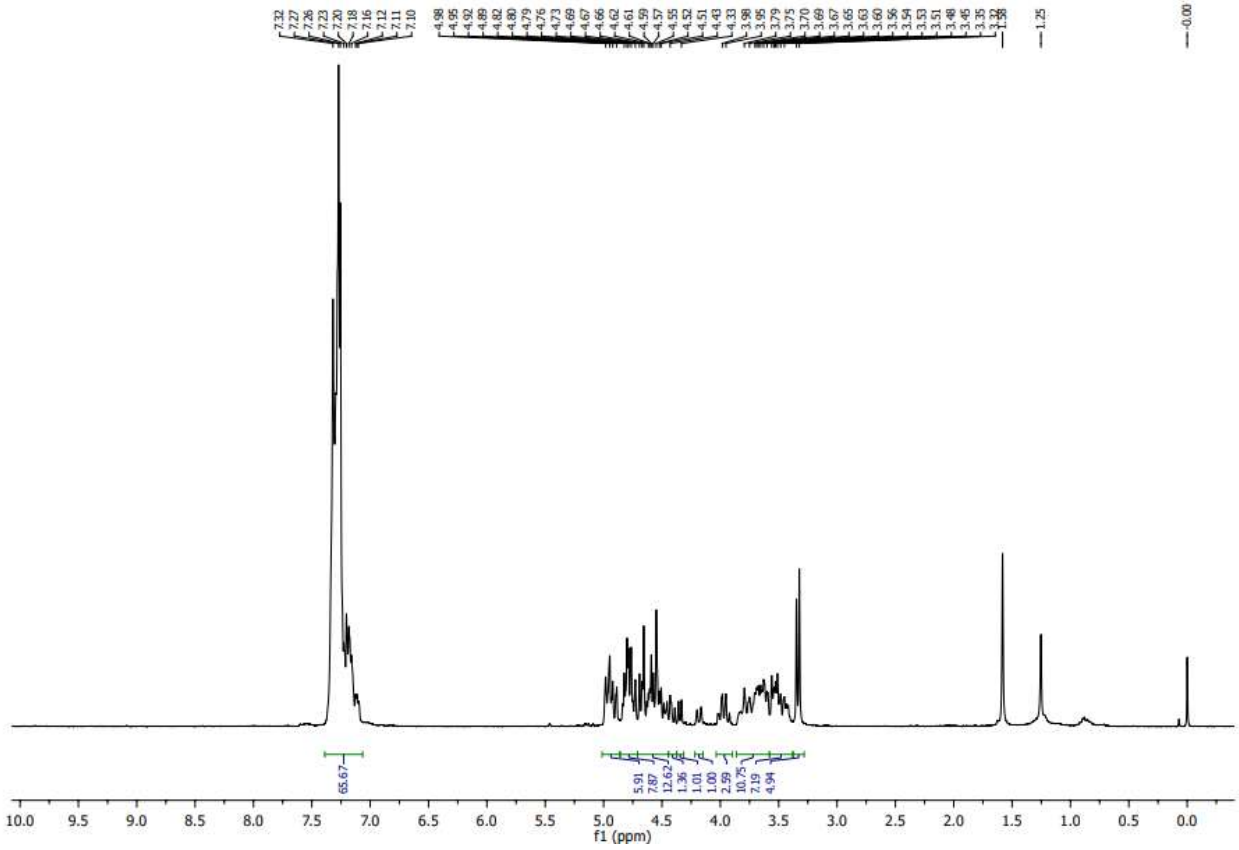




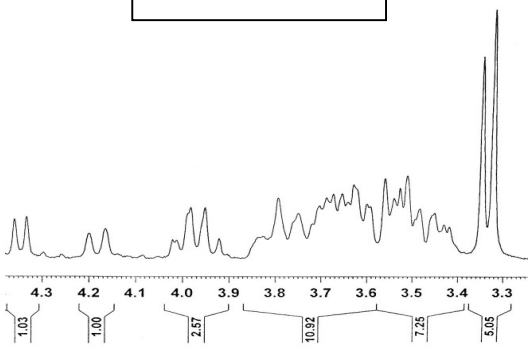
^{1}H NMR (300 MHz, $CDCl_3$)

Methyl 6-*O*-(2,3,4,6-tetra-*O*-benzyl-D-glucopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (39) (α/β = 1/1.5)



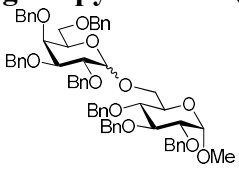


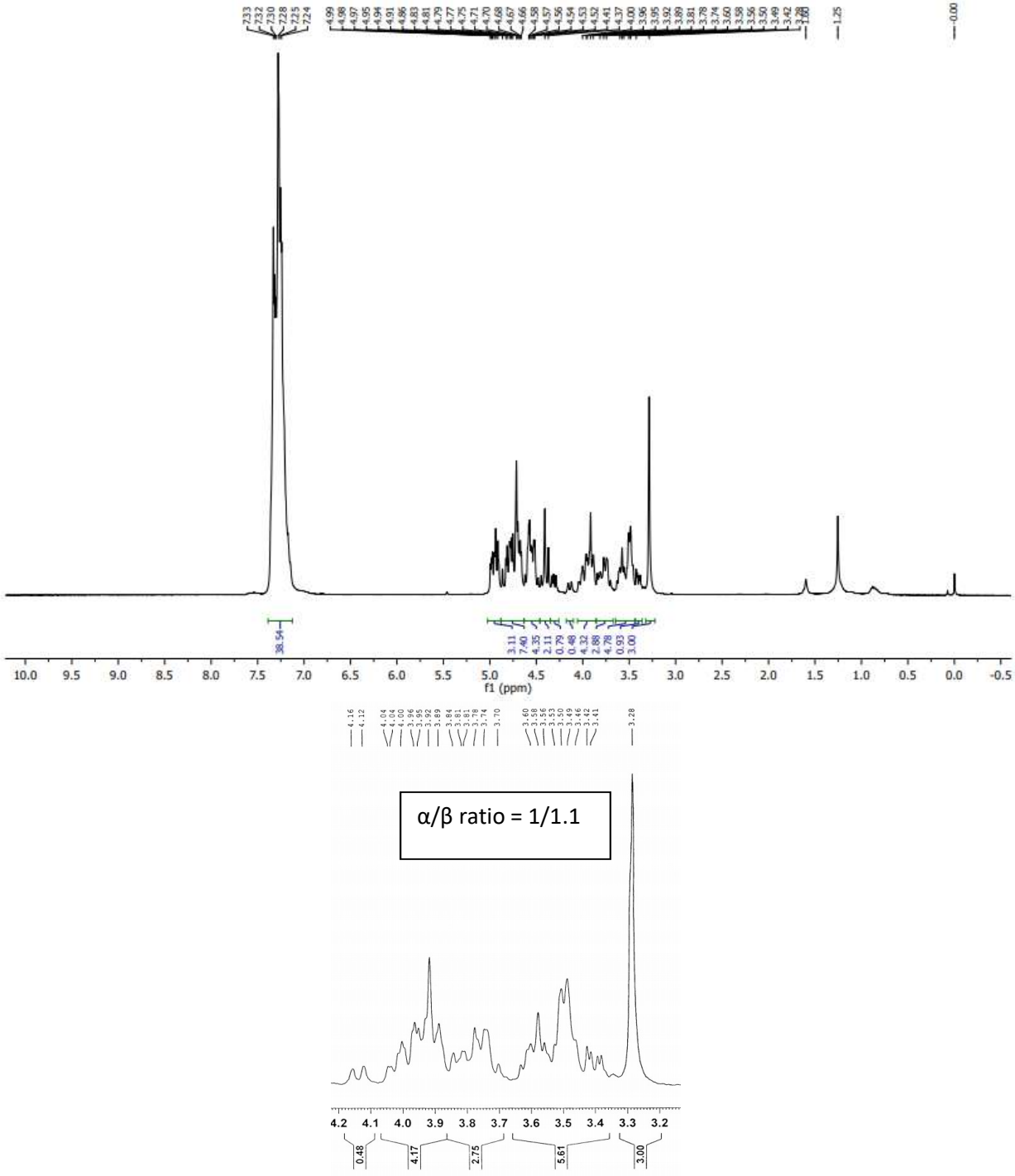
α/β ratio = 1/1.5



^{1}H NMR (300 MHz, $CDCl_3$)

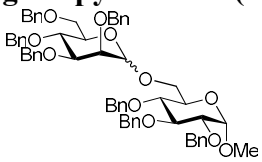
Methyl 6-*O*-(2,3,4,6-tetra-*O*-benzyl-D-galactopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (40) (α/β = 1/1.1)

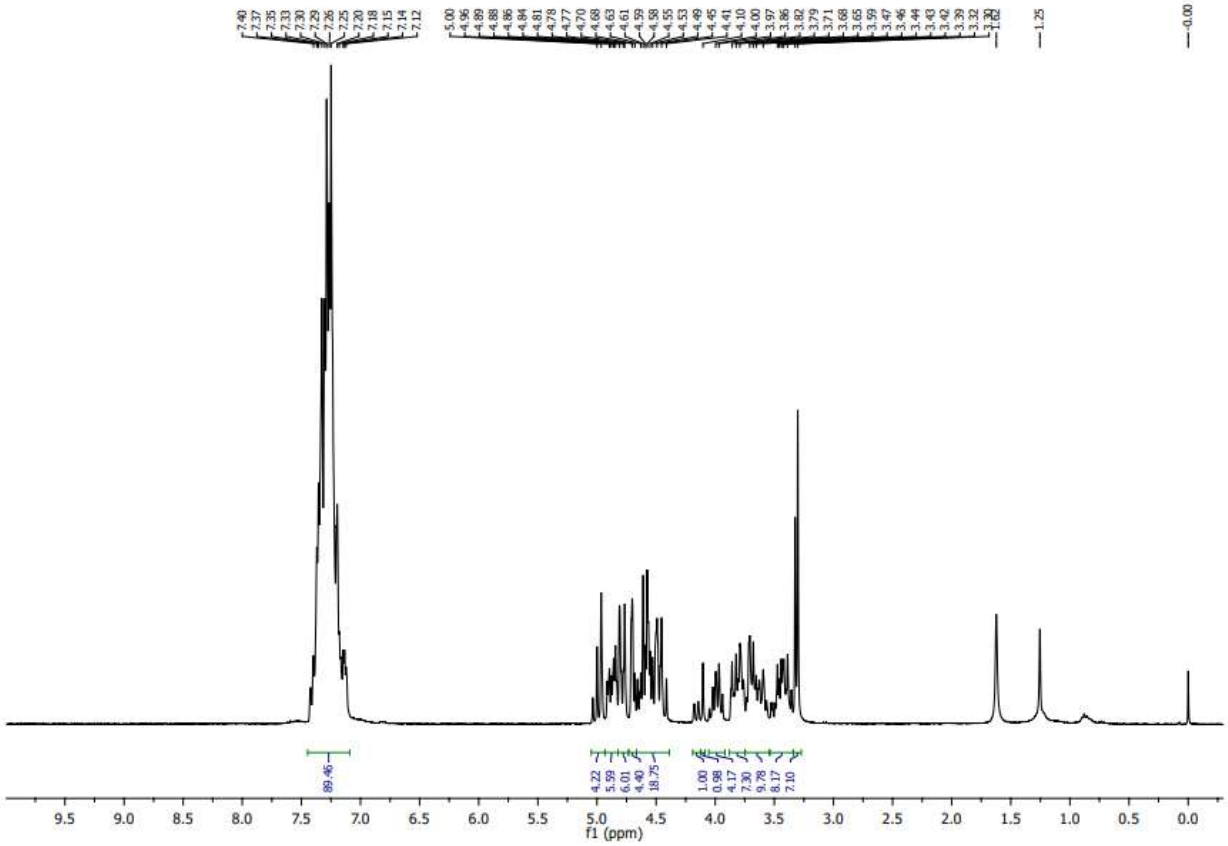


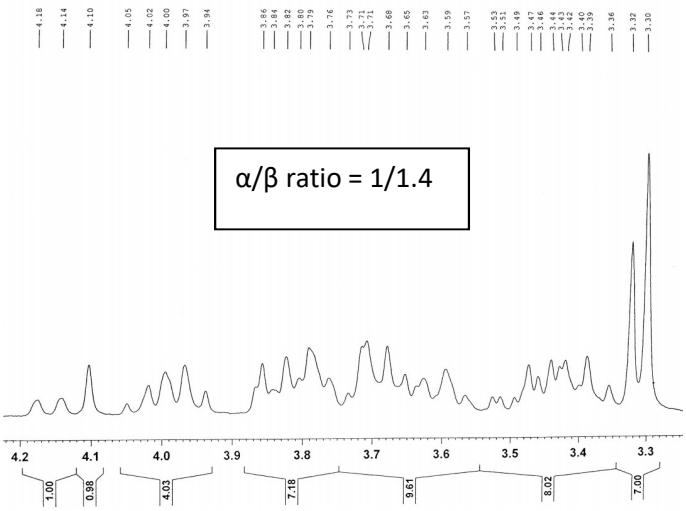


^{1}H NMR (300 MHz, $CDCl_3$)

Methyl 6-*O*-(2,3,4,6-tetra-*O*-benzyl-D-mannopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (41) (α/β = 1/1.4)

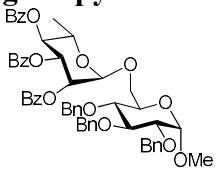


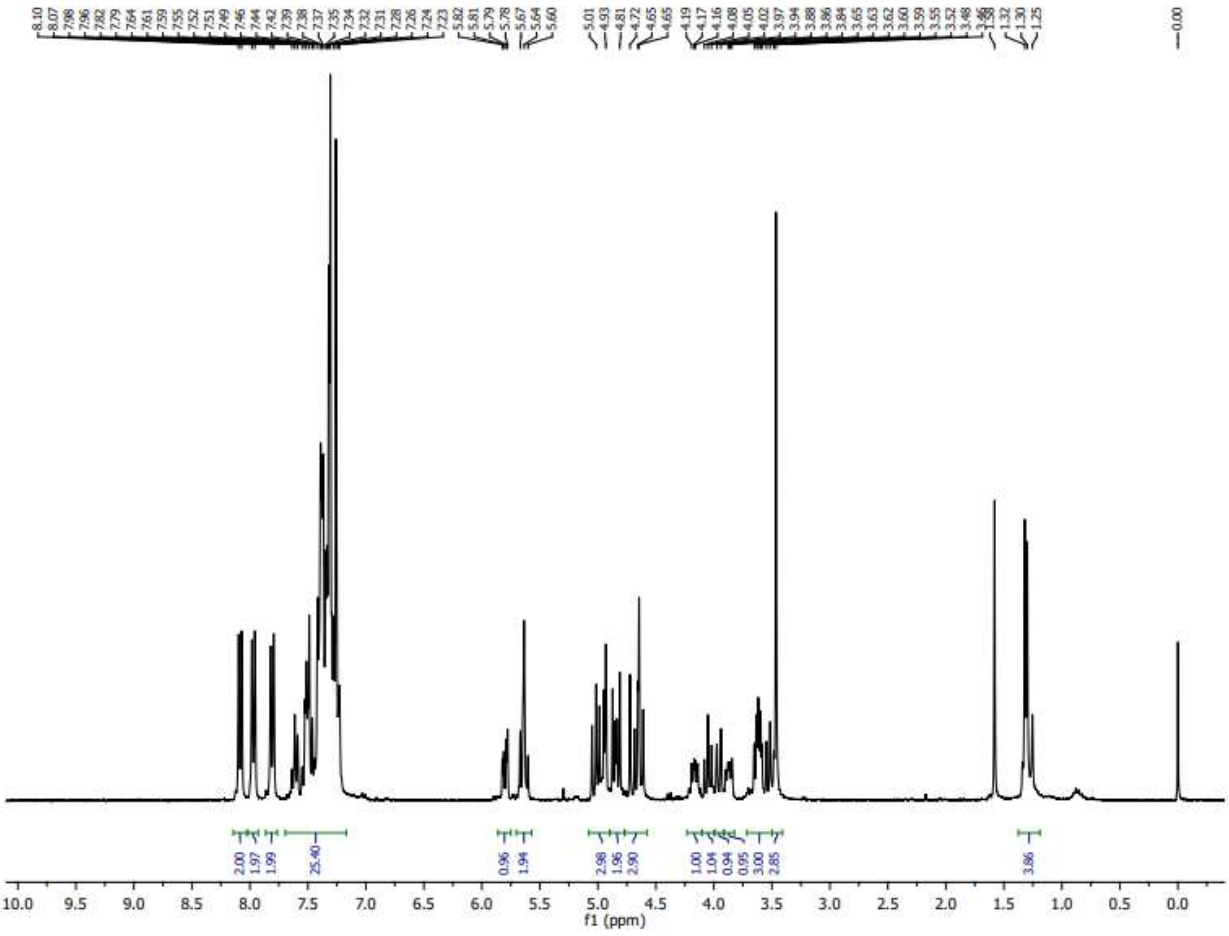




^{1}H NMR (300 MHz, $CDCl_3$)

Methyl 6-*O*-(2,3,4-tri-*O*-benzoyl-α-L-rhamnopyranosyl)-2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (45)





^{1}H NMR (300 MHz, $CDCl_3$)