Supporting Information

3, 5-Di(trifluoromethyl)phenyl(cyano)iodonium Triflate as a Novel and Potential Activator for *p*-Tolyl Thioglycoside Donors

Xiaowei Tong, Zuowa Li, Boting Xi, Zhaoyan Wang, Yuan Li, Weihua Xue*

School of Pharmacy, Lanzhou University

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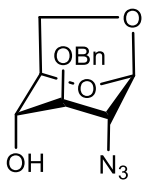
General information

All reagents used were purchased from commercial sources and were used without further purification unless noted. All glassware was oven-dried before use. ^{1}H and ^{13}C NMR spectra were recorded in $CDCl_3$ on a Bruker 400 spectrometer. Chemical shifts (δ) are reported in ppm relative to the residual undeuterated chloroform in $CDCl_3$ (δ = 7.26 for ^{1}H and 77.16 for ^{13}C NMR). The following abbreviations were used to express multiplicities: s = singlet, d = doublet, t = triplet, m = multiplet, br = broad. High-resolution mass spectra (HRMS) were recorded using electron spray ionization (ESI) methods on a Waters mass spectrometer. Column chromatography was carried out on silica gel (200-300 mesh). Analytical thin-layer chromatography was performed on glass plates coated with silica gel 60-F254. Visualization on the developed plates were achieved by UV irradiation or spraying with 10% ethanolic sulfuric acid solution followed by heating. Crude anomeric ratios were collected by integration of quantitative ^{1} H NMR spectra of the reaction mixtures prior to purification. Stereochemistry of the newly formed glycosidic bonds was determined by the observation of the coupling constants $^{3}J_{H1,\,H2}$ through ^{1}HNMR or $^{1}J_{C1,H1}$ through HSQC. Smaller coupling constants of $^{3}J_{H1,\,H2}$ (around 3 Hz) indicate α-anomers while larger coupling constants $^{3}J_{H1,H1}$ (above 7.0 Hz) indicate β- linkages. $^{1}J_{C1,H1}$ around 170 Hz indicates α linkages and 160 Hz suggests β linkages. The melting points were measured with

The following alcoholic acceptors including **A1**[1]，**A2**[2], **A3**[3], **A4**[4], **A5**[5], **A6**[6], **A7**[7], **A8**[8], **A9**[9], **A10**[10], **A11**[11], **A12**[12], **A13**[13], **A14**[14], **A15**[15], **A16**[16], and **A17**[17] are known compounds.



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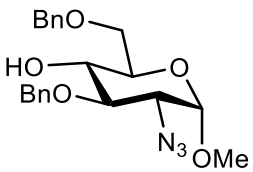

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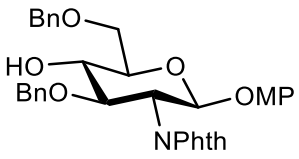

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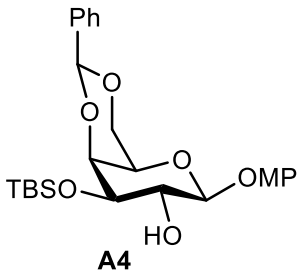

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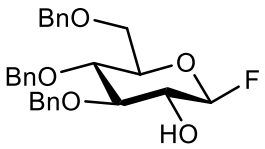

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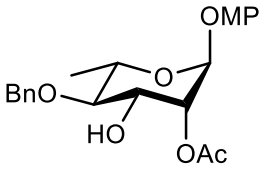

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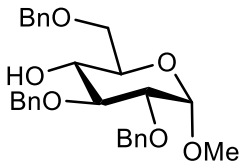

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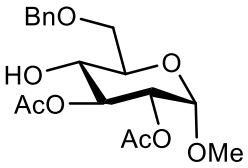

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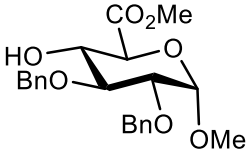

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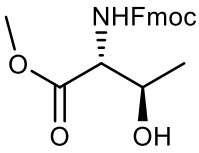

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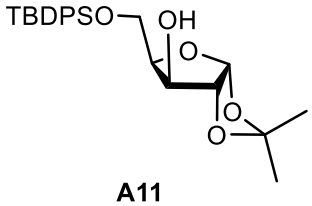

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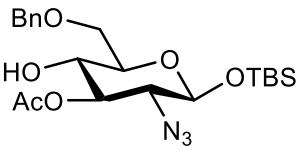

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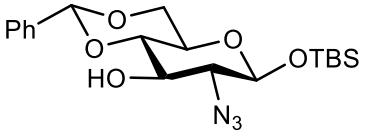

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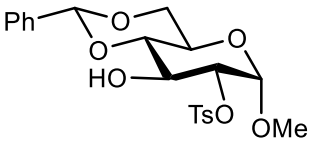

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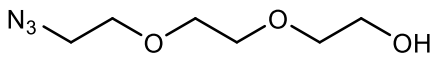

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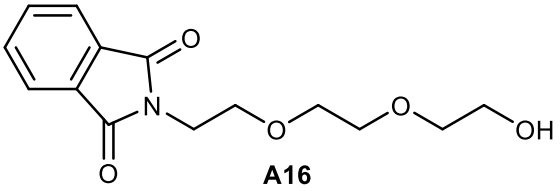

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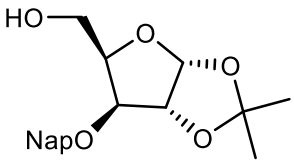
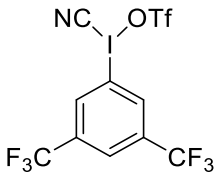


A17

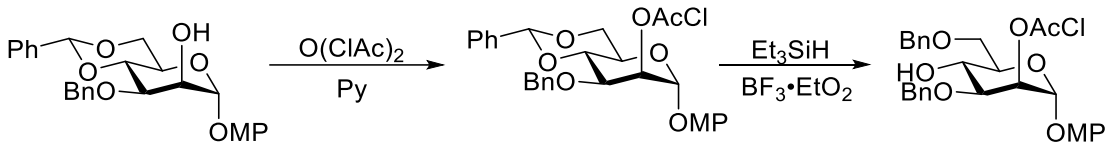
Multigram-scale synthesis of 3, 5-di(trifluoromethyl)phenyl(cyano)iodonium triflates (DFCT)



A 30 wt% aqueous solution of H_2O_2 (16 mL) was added dropwise to a solution of trifluoroacetic anhydride (80 mL) in CH_2Cl_2 (100 mL) with mechanical stirring and cooling (-50℃) in a nitrogen atmosphere within 0.5 h. Then, a solution of 1-iodo-3, 5-bis(trifluoromethyl)benzene (12.0 mmol) in CH_2Cl_2 (20 mL) was added dropwise. The reaction mixture was gradually equilibrated to room temperature and then was concentrated in the reduced pressure to furnish a white solid which was directed used for the next step without further purification. Its solution in dried CH_2Cl_2 (40 ml) was reacted with trimethylsilyl cyanide (12 mmol) in the presence of TMSOTf (12 mmol) at room temperature. The resulting white precipitation was collected through the suction filtration and washed with petroleum ether to afford the title compound (5.4 g, 88%). White solid (from chloroform), mp 171℃. ^{1}H NMR (CD_3CN,400 MHz): δ 8.98 (s, 2 H, Ar*H*), 8.47 (s, 1 H, Ar*H*). The spectroscopic data correspond with those previously reported. [18]

Preparation and characterization of new alcoholic acceptors(A18-21)

p-Methoxyphenyl 3, 6-di-*O*-benzyl- 2-*O*-chloroacetyl-α-D-mannopyranoside (A18)

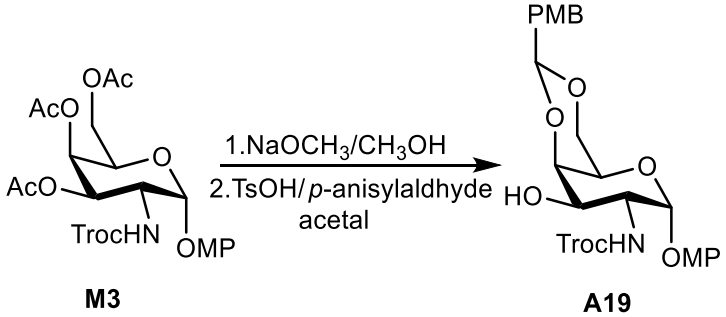


An ice-cooled solution of alcohol **M1**[19] (1.16 g, 2.5 mmol) in dry pyridine (25 mL) was treated with chloroacetic anhydride (0.51 g, 3.0 mmol) for 3 h. The reaction mixture was diluted with DCM, then washed with saturated aqueous $CuSO_4$ solution and brine. The combined organic phases were dried over Na_2SO_4, filtered and the filtrate was concentrated *in vacuo*. The resulting residue was purified by flash column chromatography on silica gel to give **M2** (1.25 g, 92.6%) as a colorless oil. R_f 0.55 (PE/EA, 4:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 - 7.49 (m, 2H), 7.42 - 7.37 (m, 5H),

7.36 - 7.27 (m, 3H), 6.99 - 6.94 (m, 2H), 6.86 - 6.81 (m, 2H), 5.65 (s, 1H), 5.64 (dd, *J* = 3.6, 2.0 Hz, 1H), 5.43 (d, *J* = 2.0 Hz, 1H), 4.80 - 4.72 (m, 2H), 4.27 - 4.22 (m, 2H), 4.21 (s, 2H), 4.11 (t, *J* = 9.6 Hz, 1H), 4.05 (td, *J* = 9.6, 4.4 Hz, 1H), 3.84 (t, *J* = 9.6 Hz, 1H), 3.78 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.9, 155.6, 149.6, 137.9, 137.4, 129.1, 128.6, 128.3, 127.9, 127.9, 126.2, 118.1, 114.9, 101.8, 97.6, 78.3, 73.8, 72.7, 71.7, 68.6, 64.5, 55.8, 40.9; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{29}H_{29}ClO_8$ 563.1449; Found: 563.1437.

Triethylsilane (0.5 mL, 3.2 mmol) and boron trifluoride etherate (0.4 mL, 3.2 mmol) sequentially added to an iced-cooled solution of compound **M2** (0.9 g, 1.6 mmol) in DCM (20 mL). The reaction mixture was allowed to warm up to room temperature with stirring for 1 h and then quenched with Et_3N (2 mL). The resulting mixture was washed with saturated brine. The organic phase was dried over Na_2SO_4 and filtered. Removal of solvent on a rotary evaporator left a dark residue, which was subjected to flash chromatography (PE/EA, 3:1) over silica gel to afford **A18** as a colorless oil (0.78 g, 87%). R_f 0.45 (PE/EA, 3:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 - 7.27 (m, 10H), 7.05 - 7.00 (m, 2H), 6.83 - 6.79 (m, 2H), 5.58 (dd,, *J* = 3.6, 1.6 Hz, 1H), 5.46 (d, *J* = 1.6 Hz, 1H), 4.79 (dd, *J* = 11.2 Hz, 1H), 4.61 (d, *J* = 12.0 Hz, 1H), 4.57 (d, *J* = 11.2 Hz, 1H), 4.52 (d, *J* = 12.0 Hz, 1H), 4.14 (s, 2H), 4.07 - 3.94 (m, 3H), 3.81 - 3.72 (m, 5H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.97, 155.47, 149.97, 138.15, 137.51, 128.73, 128.43, 128.30, 128.27, 127.72, 127.64, 118.19, 114.76, 97.05, 77.34, 73.56, 72.20, 71.82, 69.92, 69.56, 67.22, 55.71, 40.86; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{29}H_{31}ClO_8$ 565.1605; Found: 565.1585.

***p*-Methoxyphenyl 4, 6-*O*-*p*-methoxybenzylidene-2-deoxy-2-(2′, 2′, 2′-trichloroethoxycarbonylamino)- α-D-galactopyranoside (A19)**

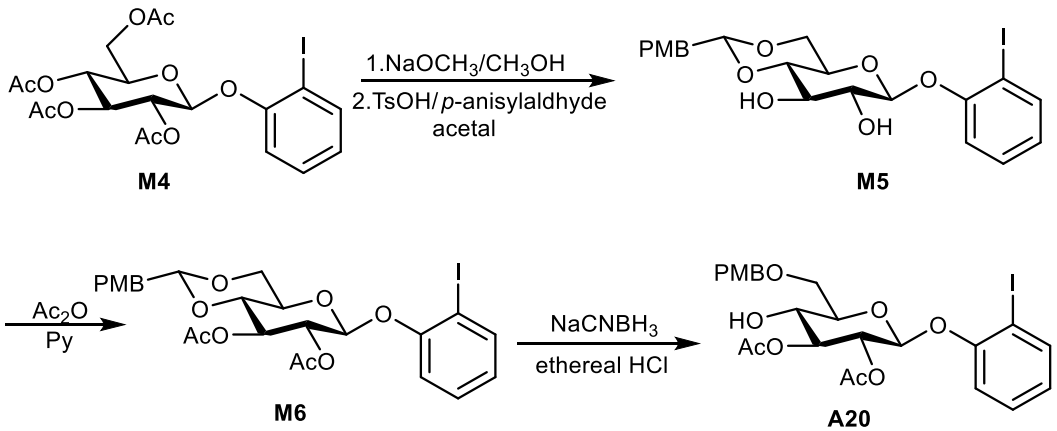


M3 **A19**

To a methanolic solution (30 mL) of protected galactosamine **M3** [20] (3.5 g, 6.0 mmol),

methanolic NaOMe (0.2 mL, 5.4 mol/L) was added dropwise at 0°C until pH was 9. The mixture was stirred for 6 h at 0°C, when TLC (1:1 CH_2Cl_2-acetone) showed the deacetylation was finished. Strong acidic cationic exchange resin Amberlist-15 was added to neutralize, then the mixture was filtered, and the filtrate was concentrated. The resultant residue was dissolved in acetonitrile (30 mL), to which *p*-TsOH (207 mg, 1.2 mmol) followed by *p*-anisylaldehyde dimethyl acetal (1.8 mL, 12.0 mmol) was added. The mixture was stirred for 6 h under reflux at 80℃, monitoring by TLC (PE/EA, 1:1). When the reaction was complete, triethylamine (1 mL) was added to neutralize. The mixture was concentrated and the residue was purified on silica gel (PE/EA, 2:1) to afford a syrupy product **A19** (3.1 g, 88.6%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 - 7.42 (m, 2H), 7.05 - 6.99 (m, 2H), 6.94 - 6.88 (m, 2H), 6.86 - 6.81 (m, 2H), 5.66 (d, *J* = 3.2 Hz, 1H), 5.55 (s, 1H), 5.40 (d, *J* = 9.6 Hz, 1H), 4.79 - 4.71 (m, 2H), 4.37 - 4.27 (m, 2H), 4.24 (dd, *J* = 12.8, 2.0 Hz, 1H), 4.12 - 4.00 (m, 2H), 3.84 - 3.80 (m, 4H), 3.78 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 160.5, 155.4, 155.2, 150.3, 132.1, 130.0, 127.8, 117.5, 114.9, 113.8, 101.4, 97.6, 95.5, 75.3, 74.9, 69.3, 68.5, 63.6, 55.8, 55.5, 52.8; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{24}H_{26}Cl_3NO_9$ 600.0571; Found: 600.0568.

***o*-Iodophenyl 2, 3-di-*O*-acetyl-6-*O*-*p*-methoxyphenzyl- β-D-glucopyranoside (A20)**



To a methanolic solution (30 mL) of peracetylated iodophenyl glucoside **M4** [21] (3.3 g, 6.0 mmol), methanolic NaOMe (0.2 mL, 5.4 mol/L) was added dropwise at 0°C until pH was 9. The mixture was stirred for 6 h at 0°C, when TLC (CH_2Cl_2-acetone, 1:1) showed the deacetylation was finished. Strong acidic cationic exchange resin Amberlist-15 was added to neutralize, then the mixture was filtered, and the filtrate was

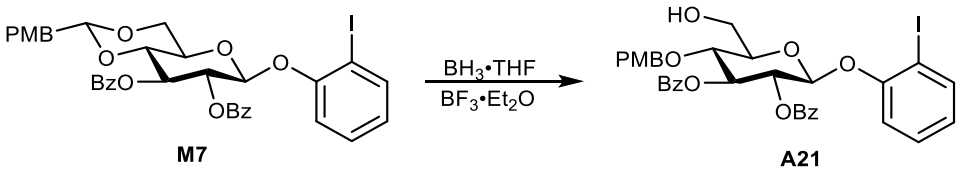
concentrated. The resultant residue was dissolved in acetonitrile (30 mL), to which *p*-TsOH (207 mg, 1.2 mmol) followed by *p*-anisylaldehyde dimethyl acetal (1.8 mL, 12.0 mmol) was added. The mixture was stirred for 5 h under reflux at 80℃ and neutralized with triethylamine. The slurry was then concentrated and crystallized from hexane-ethyl acetate to give the white solid **M5** (2.8 g, about 92%); mp 205℃.^{1}H NMR (400 MHz, DMSO-d_6) δ 7.75 (dd, J = 7.8, 1.6 Hz, 1H), 7.36 - 7.29 (m, 3H), 7.14 (dd, J = 8.4, 1.6 Hz, 1H), 6.92 - 6.86 (m, 2H), 6.77 (td, J = 7.5, 1.3 Hz, 1H), 5.52 - 5.49 (m, 2H), 5.41 (d, J = 5.2 Hz, 1H), 5.21 (d, J = 7.2 Hz, 1H), 4.17- 4.11 (m, 1H), 3.72 (s, 3H), 3.68 - 3.50 (m, 3H), 3.48 - 3.38 (m, 2H); ^{13}C NMR (101 MHz, DMSO-D_6) δ 159.6, 155.7, 139.1, 130.1, 129.6, 127.7, 123.9, 115.0, 113.3, 100.6, 100.4, 87.0, 80.1, 74.1, 73.1, 67.7, 65.9, 55.1; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{20}H_{21}IO_7$ 523.0230; Found: 523.0247.

To a stirred solution **M5** (2.0 g, 3.9 mmol) in pyridine (10 mL), Ac_2O (5 mL, 53 mmol) was added. After 1 hour, the reaction was concentrated under reduced pressure, diluted in CH_2Cl_2, washed with aqueous hydrogen chloride and brine, and dried with Na_2SO_4. The organic phase was concentrated to give an inseparable crude white solid **M6 (**1.8 g, 80.8%) which was used to next step. R_f0.6 (PE: EA, 3:1).

Sodium cyanoborohydride (1.85 g, 30 mmol) was added to a solution of **M6** (1.2 g, 2.0 mmol) in THF (20mL) containing 3 Å molecular sieves at ambient temperature. Under vigorous stirring the mixture was treated with ethereal hydrogen chloride until the evolution of gas ceased. After the complete conversion indicated by TLC the reaction mixture was filtered through a pad of Celite and the filtrate was then partitioned between saturated aqueous $NaHCO_3$ and CH_2Cl_2. The water phase was extracted with CH_2Cl_2. The combined organic fraction was washed with brine, dried, and concentrated. The residue was purified by silica gel column chromatography (PE/EA, 3:1) to give compound **A20** (0.87 g, 73%) as a colorless oil. R_f 0.5 (PE/EA, 2:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (dd, J = 7.6, 1.6 Hz, 1H), 7.24 - 7.20 (m, 3H), 7.06 (dd, J = 8.4, 1.6 Hz, 1H), 6.88 - 6.82 (m, 2H), 6.79 (td, J = 8.0, 1.6 Hz, 1H), 5.30 (dd, J = 9.6, 8.0 Hz, 1H), 5.10 (t, J = 9.6 Hz, 1H), 5.01 (d, J = 8.0 Hz, 1H), 4.53 (d, J = 11.6 Hz, 1H),

4.48 (d, J = 11.6 Hz, 1H), 3.84 - 3.74 (m, 6H), 3.71 - 3.65 (m, 1H), 2.10 (s, 3H), 2.09 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 171.5, 169.6, 159.5, 156.2, 139.6, 129.7, 129.7, 129.5, 124.8, 115.9, 114.0, 99.8, 86.9, 75.7, 74.8, 73.6, 70.8, 70.5, 69.6, 55.4, 21.3, 21.0; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{24}H_{27}IO_9$ 609.0598; Found: 609.1120.

***o*-Iodophenyl 2, 3-di-*O*-benzoyl-4-*O*-*p*-methoxyphenzyl- β-D-glucopyranoside (A21)**



To a stirred solution (20 mL) of borane/tetrahydrofuran complex (1 mol/L) was added benzylidene **M7** (1.4 g, 2 mmol) in a nitrogen atmosphere at room temperature. Then boron trifluoride diethyl etherate (0.32 mL 2.5 mmol) was added dropwise under ice bath. The stirring was continued for another1 h and subsequently neutralized with Et_3N. The solvent was evaporated in vacuo and further purified with chromatograph on silica gel (PE/EA, 2:1) to give **A21 (**0.89 g, 62%) as a colorless oil. R_f 0.35 (PE/EA, 2:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 - 7.91 (m, 4H), 7.72 - 7.68 (m, 1H), 7.55 - 7.50 (m, 1H), 7.50 - 7.44 (m, 1H), 7.41 - 7.36 (m, 2H), 7.35 - 7.27 (m, 3H), 7.13 - 7.05 (m, 3H), 6.81 -6.75 (m, 1H), 6.72 - 6.67 (m, 2H), 5.83 - 5.72 (m, 2H), 5.32 (d, J = 7.2 Hz, 1H), 4.61 - 4.53 (m, 2H), 4.06 (t, J = 9.2 Hz, 1H), 4.00 (dd, J = 12.0, 3.2 Hz, 1H), 3.86 (dd, J = 12.0, 4.0 Hz, 1H), 3.79 - 3.74 (m, 1H), 3.71 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.8, 165.3, 159.5, 156.0, 139.8, 133.4, 133.2, 130.1, 130.0, 129.9, 129.7, 129.6, 129.4, 129.3, 128.5, 128.4, 125.0, 115.8, 113.9, 99.9, 87.2, 76.0, 74.9, 74.9, 74.6, 71.5, 61.6, 55.2; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{34}H_{31}IO_9$ 733.0911; Found: 733.0911.

The general procedures for *tert*-butyldimethylsilylation of secondary carbohydrate alcohols

A solution of secondary alcohol (1 mmol) in dried CH_2Cl_2 (20 mL) was cooled down to -20 ℃, then 2, 6-lutidine (1.2 mmol) and TBSOTf (1.2 mmol) were added

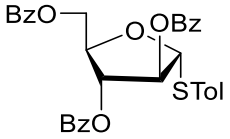
sequentially. The resulting solution was warmed up to room temperature with stirring. Upon complete consumption of alcohol as evidenced by TLC, the reaction mixture was diluted with CH_2Cl_2 (20 mL) and washed with saturated aqueous $CuSO_4$ and brine. The organic phase was dried with Na_2SO_4, filtered, and evaporated. The resulting syrup was chromatographed on silica gel using petroleum-ethyl acetate as an eluant to afford the goal silyl ether.

The general procedures for 4, 6-*O*-di-*tert*-butylsilylenation of thioglycosides

To a stirred solution of diol (2.0 mmol) and 2, 6-lutidine (2.4 mmol) in dried CH_2Cl_2 (40 mL) was added $^tBu_2Si(OTf)_2$ (2.4 mmol) at -20 °C under argon. Then at room temperature stirring was continued until TLC indicated the thorough consumption of diol. The mixture was diluted with CH_2Cl_2 and washed with saturated aqueous $CuSO_4$ and brine. The combined organic fraction was dried with anhydrous Na_2SO_4, filtered and evaporated. The subsequent purification of the resulting residue through chromatography over silica gel to give the goal products.

Preparation and characterization of thioglycoside donors (D1-16)

***p*-Methylphenyl 2, 3, 5- tri-*O*-benzoyl-α-D-arabofuranoside (D1)**

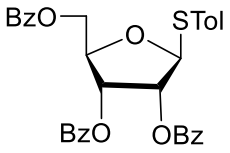


D1

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.15 - 8.11 (m, 2H), 8.07 - 7.97 (m, 4H), 7.65 - 7.56 (m, 2H), 7.55 - 7.45 (m, 5H), 7.40 (t, *J* = 8.0 Hz, 2H), 7.31 (t, *J* = 8.0 Hz, 2H), 7.13 (d, *J* = 8.0 Hz, 2H), 5.77 (s, 1H), 5.71 (t, *J* = 1.6 Hz, 1H), 5.58 (dt, J = 4.8, 1.2 Hz, 1H), 4.89 (t, *J* = 4.8 Hz, 1H), 4.81 (dd, *J* = 12.0, 3.6 Hz, 1H), 4.74 (dd, *J* = 12.0, 5.2 Hz, 1H), 2.33 (s, 3H).

^{1}H NMR spectroscopic data for **D1** are consistent with those previously reported. [22]

***p*-Methylphenyl 2, 3, 5- tri-*O*-benzoyl-β-D-ribofuranoside (D2)**

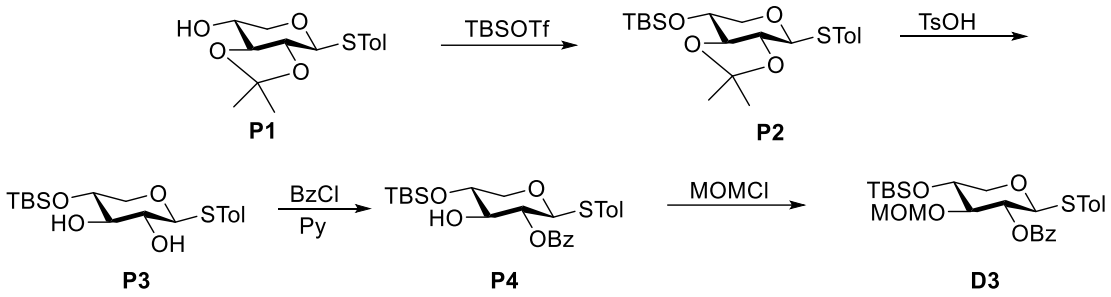


D2

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 - 8.03 (m, 2H), 8.02 - 7.97 (m, 2H), 7.93 - 7.88 (m, 2H), 7.59 - 7.50 (m, 3H), 7.48 - 7.38 (m, 6H), 7.37 - 7.32 (m, 2H), 7.06 (d, *J* = 8.0 Hz, 2H), 5.72 (t, *J* = 5.2 Hz, 1H), 5.64 (t, *J* = 5.2 Hz, 1H), 5.56 (d, *J* = 5.2 Hz, 1H), 4.67 - 4.59 (m, 2H), 4.52 - 4.46 (m, 1H), 2.22 (s, 3H).

^{1}H NMR spectroscopic data for **D2** were in agreement with those previously reported. [23]

***p*-Methylphenyl 2-*O*-benzoyl-4-*O*-*tert*-butyldimethylsilyl- 3-*O*-methoxymethoxyl-1-thio-β-D- xylopyranoside(D3)**



According to the general procedures for *tert*-butyldimethylsilylation. The treatment of the known compound **P1** [24] (1.48 g, 5 mmol) with TBSOTf (1.38 mL, 6 mmol) afforded 4-*O*- silyl ether **P2** (1.96 g, 93%) as a pale yellow oil. R_f 0.35 (PE/EA, 30:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 - 7.44 (m, 2H), 7.15 - 7.10 (m, 2H), 4.69 (d, *J* = 9.2 Hz, 1H), 3.96 (dd, *J* = 11.6, 5.2 Hz, 1H), 3.86 (td, *J* = 8.8, 5.2 Hz, 1H), 3.45 (t, *J* = 8.8 Hz, 1H), 3.20 - 3.12 (m, 2H), 2.34 (s, 3H), 1.45 (s, 3H), 1.41 (s, 3H), 0.87 (s, 9H), 0.09 (s, 3H), 0.07 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 138.4, 133.5, 129.7, 128.2, 110.6, 85.6, 83.2, 75.2, 70.9, 69.9, 26.9, 26.6, 25.8, 21.3, 18.3, 18.1, -4.5, -4.9; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{21}H_{34}O_4SSi$ 433.1845; Found: 433.1843.

To a stirred solution of **P2** (1.5 g, 3.6 mmol) in a mixed solvent of MeOH (10 mL) and CH_2Cl_2 (10 mL), TsOH (62 mg, 0.36 mmol) was added at room temperature and stirring was continued for 3 h before TLC indicated the disappearance of the starting material.

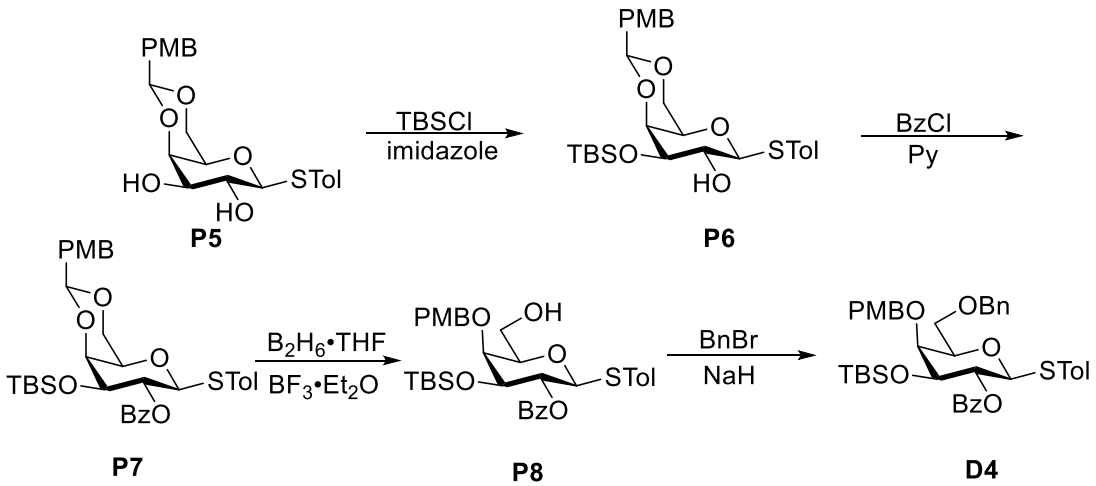
Et_3N was added to the reaction mixture and subsequently the solvent was removed under reduced pressure to yield the crude product, which was further purified by silica gel column chromatography (PE/EA, 6:1) to afford diol **P3** (1.1 g, 85%). R_f 0.53 (PE/EA, 4:1); White solid (from hot isopropanol), mp 121°C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 -7.40 (m, 2H), 7.14 - 7.09 (m, 2H), 4.51 (d, *J* = 8.8 Hz, 1H), 3.96 (dd, *J* = 11.6, 4.8 Hz, 1H), 3.61 (ddd, J = 9.6, 8.4, 4.8 Hz, 1H), 3.51 (t, *J* = 8.4 Hz, 1H), 3.37 (t, *J* = 8.4 Hz, 1H), 3.23 (dd, *J* = 11.6, 9.6 Hz, 1H), 2.33 (s, 3H), 0.87 (s, 9H), 0.10 (s, 3H), 0.07 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 138.5, 133.3, 129.9, 128.3, 89.1, 77.6, 71.8, 70.7, 69.4, 25.8, 21.3, 18.1, -4.5, -4.6; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{18}H_{30}O_4SSi$ 393.1532; Found: 393.1510.

BzCl (0.26 mL, 2.2 mmol) was added to a solution of **P3** (0.74 g, 2 mmol**)**, Et_3N (0.3 mL, 2.2 mmol), and DMAP (27 mg, 0.22 mmol) in CH_2Cl_2 (15 mL) at 0°C. The resulting mixture was warmed to room temperature and stirred for 2h. The mixture was quenched by the addition of methanol, diluted with CH_2Cl_2 and washed with saturated aqueous $NaHCO_3$ and brine. The organic layer was dried and the solvents were removed under reduced pressure. The resultant residue was purified by flash chromatography (PE/EA,10:1) to afford **P4** (0.92 g, 97%). R_f 0.65 (PE/EA, 5:1); white solid (from PE-CH_2Cl_2), mp 62°C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.12 - 8.07 (m, 2H), 7.63 - 7.56 (m, 1H), 7.50 - 7.44 (m, 2H), 7.37 - 7.32 (m, 2H), 7.12- 7.07 (m, 2H), 5.01 (dd, *J* = 10.0, 8.8 Hz, 1H), 4.72 (d, *J* = 8.8 Hz, 1H), 3.99 (dd, *J* = 11.2, 4.8 Hz, 1H), 3.78 -3.67 (m, 2H), 3.28 (dd, *J* = 11.2, 10.0 Hz, 1H), 2.33 (s, 3H), 0.87 (s, 9H), 0.11 (s, 3H), 0.09 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.2, 138.5, 133.5, 130.1, 129.9, 128.7, 128.6, 87.1, 77.6, 72.9, 71.5, 70.1, 25.8, 21.3, 18.1, -4.5, -4.5; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{25}H_{34}O_5SSi$ 497.1794; Found: 497.1820.

To a solution of **P4** (0.8 g, 1.7 mmol) in dried CH_2Cl_2 (15 mL) containing diisopropylethylamine (0.35 mg, 2 mmol) (3.0 ml) was added MOMCl (16 mg, 2 mmol). The mixture was stirred at room temperature for 10 h, at which time TLC show the completion of the reaction. Then the solution was poured into saturated aqueous NH_4Cl and extracted with CH_2Cl_2. The combined organic fraction was dried over anhydrous

Na_2SO_4, and concentrated. The resultant residue was purified by silica gel chromatography (EtOAc/hexane, 1:15) to give xyloside donor **D3** (710 mg, 81%). R_f 0.54 (PE/EA 10:1); white solid (from PE-CH_2Cl_2), mp 115℃.^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14 - 8.08 (m, 2H), 7.61 - 7.55 (m, 1H), 7.49 - 7.43 (m, 2H), 7.36 - 7.31 (m, 2H), 7.11 - 7.04 (m, 2H), 5.13 (t, *J* = 8.8 Hz, 1H), 4.86 (d, *J* = 6.8 Hz, 1H), 4.76 (d, *J* = 8.8 Hz, 1H), 4.58 (d, *J* = 6.8 Hz, 1H), 4.01 (dd, *J* = 11.6, 5.2 Hz, 1H), 3.82 (ddd, *J* = 9.6, 8.4, 5.2 Hz, 1H), 3.74 (t, *J* = 8.4 Hz, 1H), 3.29 (dd, *J* = 11.6, 9.6 Hz, 1H), 3.02 (s, 3H), 2.31 (s, 3H), 0.86 (s, 9H), 0.08 (s, 3H), 0.08 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.6, 138.2, 133.3, 133.0, 130.2, 130.0, 129.8, 129.5, 128.5, 98.2, 87.8, 82.1, 71.5, 71.2, 69.8, 56.0, 25.8, 21.3, 18.0, -4.6, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{27}H_{38}O_6SSi$ 541.2056; Found: 541.2051.

***p*-Methylphenyl 2-*O*-benzoyl- 6-*O*-benzyl-4-*O*-*tert*-butyldimethylsilyl-5-*O*-*p*-methoxylbenzyl- 1-thio - β-D-galacopyranoside (D4)**



To a stirring solution of compound **P5** [25] (2.02 g, 5 mmol) and imidazole (0.4 g, 6 mmol) in absolute DMF (50 mL) was added *tert*-butyldimethylchlorosilane (0.9 g, 6 mmol) at 0℃. The mixture was stirred at room temperature overnight and then was partitioned between water and CH_2Cl_2. The aqueous phase was extracted with CH_2Cl_2. The combined organic phases were dried and concentrated. Then crystallization from PE-EA gave **P6** as an unpurified white crude solid (2.2 g, 85%), which was used for the next step without further purification.

To a stirring solution of compound **P6** (2.0 g, 3.76 mmol) in dried pyridine (40 mL) was added benzoyl chloride (0.52 mL, 5.31 mmol) at room temperature. The mixture

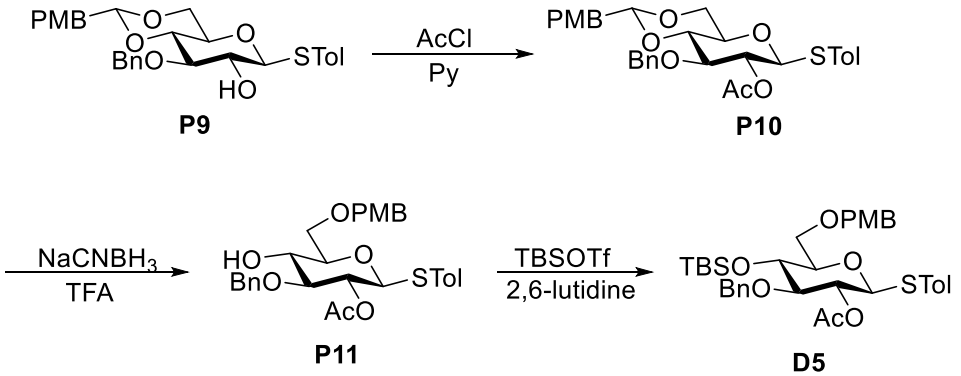
was warmed to room temperature and continuously stirred overnight. Most of pyridine was removed under reduced pressure and the residue was taken up in CH_2Cl_2. The resulting solution was washed with saturated aqueous $CuSO_4$, dried over Na_2SO_4, filtered, and concentrated *in vacuo*. The resulting crude solid **P7** was used to the next step without further purification.

To an ice-cooled solution of **P7** (1.9 g, 3 mmol) in CH_2Cl_2 (20 mL) borane tetrahydrofuran (30 mL, 1 moL/L solution in THF) was added. Then boron trifluoride diethyl etherate was added dropwise. The reaction mixture was allowed to stirred in the ice bath for another1 h and subsequently neutralized with Et_3N. The solvent was evaporated in vacuo and further purified with chromatograph on silica gel (PE/EA, 3:1) to give **P8** (1.5 g, 82%) as a colorless oil. R_f 0.50 (PE/EA, 2:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 - 7.95 (m, 2H), 7.54 - 7.47 (m, 1H), 7.38 (td, *J* = 8.0, 2.0 Hz, 2H), 7.25 - 7.18 (m, 4H), 6.97 - 6.92 (m, 2H), 6.85 - 6.79 (m, 2H), 5.55 (t, *J* = 9.6 Hz, 1H), 4.93 (d, *J* = 11.2 Hz, 1H), 4.65 (d, *J* = 9.6 Hz, 1H), 4.44 (d, *J* = 11.2 Hz, 1H), 3.92 - 3.85 (m, 1H), 3.81 - 3.73 (m, 4H), 3.68 (t, *J* = 2.0 Hz, 1H), 3.54 - 3.45 (m, 2H), 2.21 (s, 3H), 0.71 (s, 9H), 0.03 (s, 3H), -0.17 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.4, 159.4, 137.8, 133.1, 132.6, 130.7, 130.5, 130.0, 129.8, 129.7, 128.5, 113.9, 87.5, 79.0, 76.5, 76.0, 74.4, 71.4, 62.4, 55.4, 25.7, 21.2, 17.9, -3.9, -4.9; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{34}H_{44}O_7SSi$ 647.2475 Found: 647.2473 .

NaH (60% dispersion in mineral oil, 160 mg, 4 mmol) were added to a solution of **P8** (1.22g, 2.0 mmol) in anhydrous DMF (20 mL) under argon atmosphere. Then to the resulting suspension benzyl bromide (2.50 mmol) were added dropwise at 0 °C. The reaction mixture was stirred at room temperature overnight and poured into saturated aqueous NH_4Cl. After the extraction with CH_2Cl_2, the combined organic fraction was washed with brine, dried over Na_2SO_4, and concentrated in vacuo. The resultant residue underwent the purification through chromatography on silica gel (PE/EA, 10:1) to afford **D4** (1.1 g, 79%). R_f 0.57 (PE/EA, 5:1); white solid (from PE-CH_2Cl_2), mp 104℃.^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 - 8.02 (m, 2H), 7.59 - 7.53 (m, 1H), 7.47 - 7.41 (m, 2H), 7.37 - 7.24 (m, 9H), 6.97 (d, *J* = 8.0 Hz, 2H), 6.89 - 6.83 (m, 2H), 5.61

(t, J = 9.6 Hz, 1H), 4.99 (d, J = 10.6 Hz, 1H), 4.70 (d, J = 9.6 Hz, 1H), 4.52 - 4.41 (m, 3H), 3.99 - 3.91 (m, 1H), 3.83 - 3.79 (m, 4H), 3.74 - 3.69 (m, 1H), 3.68 - 3.59 (m, 2H), 2.27 (s, 3H), 0.77 (s, 9H), 0.09 (s, 3H), -0.11 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.4, 159.2, 138.2, 137.6, 133.0, 132.5, 131.1, 130.6, 130.2, 129.9, 129.6, 129.5, 128.5, 128.4, 128.0, 127.9, 113.7, 87.6, 77.9, 77.4, 76.9, 75.9, 74.8, 73.7, 69.2, 55.4, 25.7, 21.2, 17.9, -3.9, -4.9; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{41}H_{50}O_7SSi$ 737.2945; Found: 737.2943.

***p*-Methylphenyl 2-*O*-acetyl-3-*O*-benzyl-4-*O*-*tert*-butyldimethylsilyl- 6-*O*-*p*-methoxylbenzyl- 1-thio-β-D-glucopyranoside (D5)**



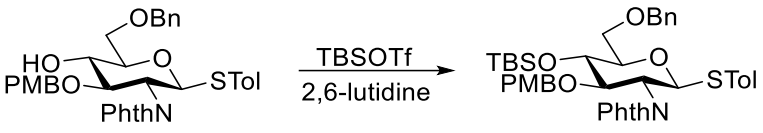
P9 [26] (2.0 g, 4 mmol) was dissolved in a mixture of pyridine (20 mL) and Ac_2O (4 mL). After the reaction mixture was stirred for 1 h at room temperature, TLC showed complete conversion. Then the mixture was concentrated under reduced pressure. Crystallization of the resulting residue from PE-EA to give **P10** (2.12 g, 96%) as a colorless needle. mp 128 ℃, R_f 0.50 (PE/EA, 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 - 7.38 (m, 2H), 7.36 (d, J = 7.9 Hz, 2H), 7.33 - 7.24 (m, 5H), 7.11 (d, J = 7.9 Hz, 2H), 6.92 - 6.87 (m, 2H), 5.51 (s, 1H), 5.02 - 4.95 (m, 1H), 4.84 (d, J = 12.0 Hz, 1H), 4.67 - 4.59 (m, 2H), 4.35 (dd, J = 10.8, 5.2 Hz, 1H), 3.80 (s, 3H), 3.78 - 3.74 (m, 1H), 3.73 - 3.66 (m, 2H), 3.46 (td, J = 8.8, 4.8 Hz, 1H), 2.33 (s, 3H), 2.03 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.4, 160.2, 138.6, 138.2, 133.5, 129.8, 128.4, 128.0, 127.8, 127.4, 113.7, 101.3, 87.1, 81.4, 79.9, 74.4, 71.4, 70.6, 68.6, 55.4, 21.3, 21.1; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{30}H_{32}O_7S$ 559.1767; Found: 559.1754.

Sodium cyanoborohydride (943 mg, 15 mmol) was added at room temperature to a solution of **P10** (1.65 g, 3 mmol) containing 3 Å molecular sieves in dried DMF (30

mL). Under vigorous stirring the mixture was treated with trifluoroacetic acid (30 mmol). After no starting material was detected as evidenced by TLC, the reaction mixture was filtered through a pad of Celite and the filtrate was then partitioned between saturated aqueous $NaHCO_3$ and CH_2Cl_2. The water phase was extracted with CH_2Cl_2. The combined organic fraction was washed with brine, dried over Na_2SO_4, and concentrated. The resultant residue was chromatographically purified over silica gel (PE/EA 5:1) to provide **P11** (1.2 g, 72.7%). R_f 0.50 (PE/EA, 3:1); white solid (from PE-CH_2Cl_2), mp 72 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 - 7.37 (m, 2H), 7.36 - 7.32 (m, 2H), 7.31 - 7.27 (m, 3H), 7.26 - 7.22 (m, 2H), 7.08 - 7.04 (m, 2H), 6.91 - 6.86 (m, 2H), 4.97 (dd, *J* = 10.0, 9.2 Hz, 1H), 4.77 - 4.69 (m, 2H), 4.57 (d, *J* = 10.0 Hz, 1H), 4.54 - 4.45 (m, 2H), 3.81 (s, 3H), 3.77 - 3.73 (m, 2H), 3.69 (t, *J* = 9.2 Hz, 1H), 3.53 (t, *J* = 9.2 Hz, 1H), 3.51 - 3.46 (m, 1H), 2.31 (s, 3H), 2.05 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.6, 159.4, 138.3, 138.2, 133.1, 130.0, 129.7, 129.5, 129.1, 128.6, 127.9, 113.9, 86.6, 83.9, 78.2, 74.7, 73.5, 72.1, 71.5, 70.2, 55.4, 21.2, 21.2; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{30}H_{34}O_7S$ 561.1923; Found: 561.1910.

The treatment of alcohol **P11** (1 g, 1.9 mmol) with TBSOTf furnished the product **D5 (**1.1 g, 89%**)** according to the general procedure for *tert*-butyldimethylsilylation. White powder (from PE-CH_2Cl_2), mp 100 ℃, R_f 0.50 (PE/EA 10:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 - 7.41 (m, 2H), 7.35 - 7.30 (m, 2H), 7.28 - 7.24 (m, 5H), 7.05 - 7.00 (m, 2H), 6.92 - 6.87 (m, 2H), 5.02 (dd, *J* = 10.0, 8.8 Hz, 1H), 4.74 (d, *J* = 11.6 Hz, 1H), 4.65 (d, *J* = 11.6 Hz, 1H), 4.61 (d, *J* = 10.0 Hz, 1H), 4.56 (d, *J* = 11.6 Hz, 1H), 4.45 (d, *J* = 11.6 Hz, 1H), 3.82 (s, 3H), 3.78 (dd, *J* = 10.8, 2.0 Hz, 1H), 3.65 (dd, *J* = 9.6, 8.8 Hz, 1H), 3.59 (dd, *J* = 10.8, 6.4 Hz, 1H), 3.53 - 3.46 (m, 2H), 2.31 (s, 3H), 1.93 (s, 3H), 0.87 (s, 9H), 0.02 (s, 3H), -0.02 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.7, 159.2, 138.3, 137.8, 132.6, 130.6, 129.7, 129.6, 129.3, 128.4, 127.5, 127.4, 113.8, 86.4, 85.1, 80.9, 75.3, 73.2, 72.3, 71.1, 69.2, 55.4, 26.0, 21.2, 21.1, 18.1, -3.7, -4.7; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{36}H_{48}O_7SSi$ 675.2788; Found: 675.2784.

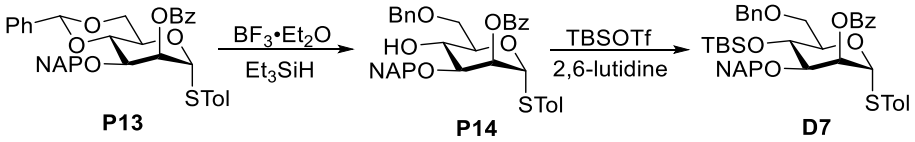
***p*-Methylphenyl 6-*O*-benzyl-4-*O*-*tert*-butyldimethylsilyl- 2-deoxy- 3-*O*-*p*-methoxybenzyl-2-phthalimido- 1-thio-β-D-glucopyranoside (D6)**



P12 **D6**

According to the general procedures for *tert*-butyldimethylsilylation. The treatment of alcohol **P12**[27] (1.25 g, 2 mmol) with TBSOTf furnished the product **D6** (1.33 g, 90%). White solid (from PE-EA), mp 66 ℃; R_f 0.62 (PE/EA, 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 - 7.56 (m, 4H), 7.37 - 7.32 (m, 4H), 7.32 - 7.28 (m, 1H), 7.28 - 7.25 (m, 2H), 6.92 (d, *J* = 7.9 Hz, 2H), 6.89 - 6.85 (m, 2H), 6.38 - 6.34 (m, 2H), 5.53 - 5.45 (m, 1H), 4.68 (d, *J* = 12.2 Hz, 1H), 4.62 (d, *J* = 12.0 Hz, 1H), 4.51 (d, *J* = 12.0 Hz, 1H), 4.23 - 4.14 (m, 3H), 3.81 (d, *J* = 9.6 Hz, 1H), 3.71 - 3.60 (m, 3H), 3.56 (s, 3H), 2.23 (s, 3H), 0.88 (s, 9H), 0.10 (s, 3H), 0.05 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.3, 167.4, 158.6, 138.6, 137.8, 133.7, 132.9, 131.7, 131.7, 130.5, 129.6, 129.2, 128.6, 128.4, 127.7, 127.6, 123.4, 123.1, 113.4, 83.5, 81.9, 80.7, 75.4, 73.4, 72.8, 69.4, 55.1, 54.9, 26.0, 21.2, 18.1, -3.6, -4.3; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{42}H_{49}NO_7SSi$ 762.2897; Found: 762.2890.

***p*-Methylphenyl 2-*O*-benzoyl-6-*O*-benzyl-4-*O*-*tert*-butyldimethylsilyl- 3-*O*-naphthylmethyl- 1-thio-α-D-mannopyranoside(D7)**



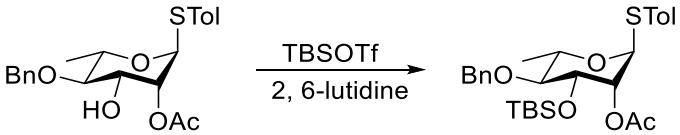
P13 **P14** **D7**

Triethylsilane (1.3 mL, 8 mmol) and borate trifluoride etherate (0.99 mL, 8.0 mmol) were sequentially added to an iced-cooled solution of compound **P13**[28] (2.5 g, 4.0 mmol) in DCM (50 mL). The reaction mixture was allowed to warm up to room temperature stirred for 1 h and then quenched with Et_3N (1 mL). The resulting mixture was washed with saturated brine. The organic phase was dried over Na_2SO_4, filtered and the filtrate was concentrated in vacuo. The resulting residue was purified by silica gel column chromatography (PE/EA 6:1) to give **P14** (1.93 g, 77%) as a colorless oil. R_f 0.49 (PE/EA 4:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.12 -8.06 (m, 2H), 7.84 -7.74 (m, 4H), 7.60 - 7.55 (m, 1H),7.49 - 7.31 (m, 12H), 7.08 (d, *J* = 8.0 Hz, 2H), 5.94 (dd, *J* =

2.8, 1.6 Hz, 1H), 5.64 (d, *J* = 1.6 Hz, 1H), 4.99 (d, *J* = 11.6 Hz, 1H), 4.74 (d, *J* = 11.6 Hz, 1H), 4.69 (d, *J* = 12.0 Hz, 1H), 4.59 (d, *J* = 12.0 Hz, 1H), 4.46 (ddd, *J* = 10.0, 4.8, 2.8 Hz, 1H), 4.28 (t, *J* = 9.6 Hz, 1H), 4.00 - 3.92 (m, 2H), 3.89 (dd, *J* = 10.8, 2.8 Hz, 1H), 2.32 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.4, 138.1, 137.8, 134.6, 133.1, 133.0, 132.9, 132.4, 129.7, 129.7, 129.5, 128.2, 128.2, 128.1, 127.7, 127.5, 127.3, 126.9, 125.9, 125.8, 125.7, 86.6, 77.8, 73.3, 72.2, 71.4, 69.8, 69.6, 67.4, 20.9; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{38}H_{36}O_6S$ 643.2131; Found: 643.2129.

According to the general procedures for *tert*-butyldimethylsilylation, the treatment of diol **P14** (1.24 g, 2.0 mmol） with TBSOTf (0.55 mL, 2.4 mmol) furnished the product **D7**（1.41 g, 96%）. White solid (from PE-CH_2Cl_2), mp 73°C; R_f 0.65 (PE/EA 6:1).^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 - 8.02 (m, 2H), 7.81 - 7.76 (m, 1H), 7.73 - 7.68 (m, 2H), 7.65 - 7.61 (m, 1H), 7.61 - 7.55 (m, 1H), 7.45 - 7.30 (m, 12H), 7.07 (d, *J* = 8.0 Hz, 2H), 5.91 (dd, *J* = 2.8, 1.6 Hz, 1H), 5.60 (d, *J* = 1.6 Hz, 1H), 4.95 (d, *J* = 11.6 Hz, 1H), 4.70 - 4.64 (m, 2H), 4.60 (d, *J* = 12.0 Hz, 1H), 4.48 (ddd, *J* = 10.0, 4.8, 2.8 Hz, 1H), 4.30 (t, *J* = 9.2 Hz, 1H), 3.94 (dd, *J* = 10.8, 4.8 Hz, 1H), 3.90 (dd, *J* = 9.2, 2.8 Hz, 1H), 3.85 (dd, *J* = 10.8, 2.8 Hz, 1H), 2.32 (s, 3H), 0.87 (s, 9H), 0.05 (s, 3H), 0.00 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.7, 138.8, 138.1, 135.2, 133.3, 133.0, 132.7, 130.0, 130.0, 130.0, 129.9, 128.6, 128.3, 128.0, 127.9, 127.7, 127.4, 127.4, 126.8, 126.0, 125.9, 125.8, 86.8, 78.9, 74.1, 73.3, 71.2, 70.3, 69.6, 68.3, 26.1, 21.2, 18.3, -3.7, -5.0; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{44}H_{50}O_6SSi$ 757.2995; Found: 757.2984.

_p_-Methylphenyl 2-_O_-acetyl-4-_O_-benzyl-3-_O_- _tert_-butyldimethylsilyl -1-thio-α-L-rhamnopyranoside (D8)

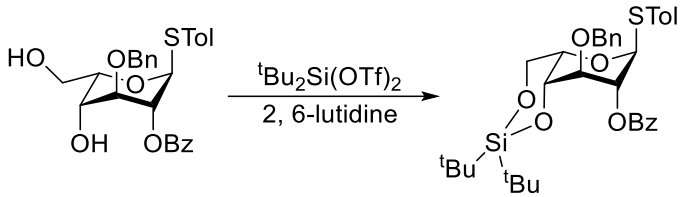


P15 **D8**

According to the general procedures for *tert*-butyldimethylsilylation, the treatment of diol **P15** [29] (804 mg, 2 mmol) with $DTB(OTf)_2$ (0.55 mL, 2.4 mmol) furnished the product **D8** (902 mg, 87.4%) as a colorless oil. R_f 0.73 (PE/EA, 6:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 - 7.33 (m, 6H), 7.33 - 7.28 (m, 1H), 7.13 - 7.09 (m, 2H), 5.32 -

5.28 (m, 2H), 4.92 (d, J = 11.2 Hz, 1H), 4.63 (d, J = 11.2 Hz, 1H), 4.26 - 4.17 (m, 1H), 4.09 (dd, J = 9.2, 3.2 Hz, 1H), 3.45 (t, J = 9.2 Hz, 1H), 2.32 (s, 3H), 2.14 (s, 3H), 1.31 (d, J = 6.4 Hz, 3H), 0.91 (s, 9H), 0.14 (s, 3H), 0.12 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.4, 138.4, 137.9, 132.3, 130.4, 130.0, 128.5, 127.9, 127.8, 86.6, 81.6, 75.6, 74.6, 71.6, 69.2, 25.9, 21.2, 21.2, 17.9, 17.9, -4.6; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{28}H_{40}O_5SSi$ 539.2264; Found: 539.2261.

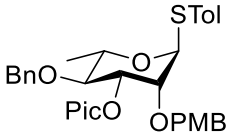
***p*-Methylphenyl 2-*O*-benzoyl-3-*O*-benzyl-4, 6-*O*-di-*tert*-butylsilylene-1-thio-α-L-idopyranoside (D9)**



P16 **D9**

According to the general procedures for *tert*-butyldimethylsilylation, the treatment of diol **P16**[30] (960 mg, 2.0 mmol) with $DTB(OTf)_2$ (0.55 mL, 2.4 mmol) furnished the product **D9** (1.18 g, 95.2%). White solid (from PE-ethyl ether), mp 147 ℃, R_f 0.4 (PE:EA, 25:1).^{1}H NMR (400 MHz, $CDCl_3$) δ 8.11 - 8.06 (m, 2H), 7.59 - 7.53 (m, 1H), 7.48 - 7.40 (m, 6H), 7.40 - 7.34 (m, 2H), 7.33 - 7.28 (m, 1H), 7.16 - 7.10 (m, 2H), 5.66 (s, 1H), 5.40 - 5.36 (m, 1H), 5.00 (d, J = 11.8 Hz, 1H), 4.73 (d, J = 11.8 Hz, 1H), 4.55 - 4.50 (m, 1H), 4.36 (dd, J = 12.8, 2.4 Hz, 1H), 4.31 - 4.27 (m, 1H), 4.20 (dd, J = 12.4, 2.4 Hz, 1H), 3.95 - 3.90 (m, 1H), 2.34 (s, 3H), 1.02 (s, 9H), 0.96 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.4, 137.9, 137.6, 133.4, 132.3, 132.2, 130.4, 129.9, 129.7, 128.6, 128.3, 128.0, 127.9, 87.4, 76.1, 72.6, 70.8, 70.0, 67.5, 65.4, 28.0, 27.1, 23.4, 21.3, 20.7; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{35}H_{44}O_6SSi$ 643.2526; Found: 643.2502.

***p*-Methylphenyl 4-*O*-benzyl-2-*O*-*p*-methoxybenzyl- 3-*O*-picolinoyl -1-thio-α-L-rhamnopyranoside (D10)**

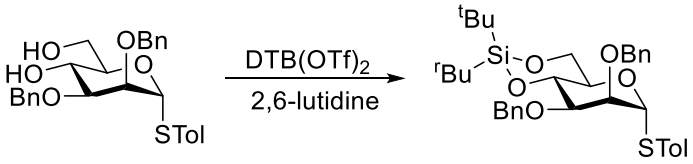


D10

It was prepared as described in the literature. [31] ^{1}H NMR spectroscopic data for **D10**

corresponded to those previously reported. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.82 (d, *J* = 4.4 Hz, 1H), 8.01 (d, *J* = 8.0 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.55 - 7.49 (m, 1H), 7.36 (d, *J* = 8.0 Hz, 2H), 7.26 - 7.17 (m, 5H), 7.16 - 7.10 (m, 4H), 6.63 - 6.56 (m, 2H), 5.47 (dd, *J* = 9.2, 3.2 Hz, 1H), 5.41 (d, *J* = 1.6 Hz, 1H), 4.88 (d, *J* = 11.0 Hz, 1H), 4.70 (d, *J* = 11.0 Hz, 1H), 4.61 (d, *J* = 12.0 Hz, 1H), 4.42 (d, *J* = 12.0 Hz, 1H), 4.33 - 4.25 (m, 1H), 4.24 - 4.21 (m, 1H), 3.91 (t, *J* = 9.6 Hz, 1H), 3.70 (s, 3H), 2.34 (s, 3H), 1.39 (d, *J* = 6.1 Hz, 3H).

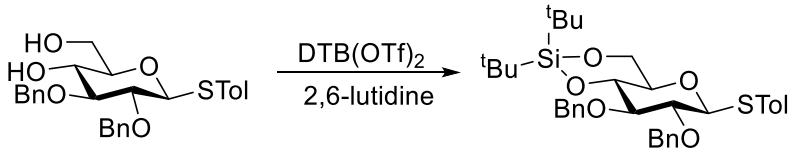
***p*-Methylphenyl 2, 3-di-*O*-benzyl-4, 6-*O*-di-*tert*-butylsilylene-1-thio-α-D-mannopyranoside (D11)**



P17 **D11**

According to the general procedures for 4, 6-*O*-di-*tert*-butylsilylenation, the treatment of diol **P17** [32] (932 mg, 2 mmol) with $DTB(OTf)_2$ (0.55 mL, 2.4 mmol) furnished the product **D11** (1.08 g, 89.0%) as a colorless oil. R_f 0.55 (PE/EA, 20:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 - 7.27 (m, 10H), 7.25 - 7.20 (m, 2H), 7.11 - 7.07 (m, 2H), 5.35 (d, *J* = 1.6 Hz, 1H), 4.90 (d, *J* = 12.4 Hz, 1H), 4.77 - 4.67 (m, 3H), 4.44 (t, *J* = 9.6 Hz, 1H), 4.19 (td, *J* = 9.6, 5.2 Hz, 1H), 4.07 - 3.97 (m, 2H), 3.96 (dd, *J* = 3.2, 1.6 Hz, 1H), 3.69 (dd, *J* = 9.6, 3.2 Hz, 1H), 2.33 (s, 3H), 1.09 (s, 9H), 1.05 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 139.1, 138.1, 137.9, 132.1, 130.4, 130.0, 128.5, 128.5, 128.2, 127.8, 127.7, 127.6, 87.4, 79.0, 78.0, 75.6, 73.6, 72.9, 69.2, 66.6, 27.6, 27.3, 22.8, 21.2, 20.2; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{35}H_{46}O_5SSi$ 629.2733; Found: 629.2724.

***p*-Methylphenyl 2, 3-di -*O*-benzyl 4, 6-*O*-di-*tert*-butylsilylene- 1-thio-β-D-glucopyranoside (D12)**

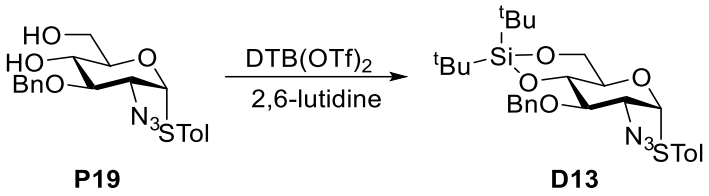


P18 **D12**

According to the general procedures for 4, 6-*O*-di-*tert*-butylsilylenation, the treatment

of diol **P18**[33] (932 mg, 2 mmol) with DTB(OTf)$_2$ (0.55 mL, 2.4 mmol) furnished the product **D12** (1.13 g, 93.4%) as a colorless oil. R_f 0.60 (PE/EA, 20:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 - 7.41 (m, 4H), 7.41 - 7.34 (m, 5H), 7.34 - 7.27 (m, 3H), 7.14 - 7.10 (m, 2H), 5.03 (d, *J* = 10.8 Hz, 1H), 4.85 (d, *J* = 10.0 Hz, 1H), 4.83 – 4.78 (m, 2H), 4.65 (d, *J* = 10.0 Hz, 1H), 4.22 (dd, *J* = 10.0, 4.8 Hz, 1H), 3.99 - 3.91 (m, 2H), 3.63 (t, *J* = 8.8 Hz, 1H), 3.46 – 3.38 (m, 2H), 2.35 (s, 3H), 1.11 (s, 9H), 1.00 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 138.7, 138.4, 138.2, 133.2, 129.9, 129.4, 128.5, 128.4, 128.3, 127.9, 127.9, 88.6, 86.4, 80.0, 78.0, 75.9, 75.8, 74.5, 66.4, 27.6, 27.1, 22.8, 21.3, 20.1; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{35}H_{46}O_5SSi$ 629.2733; Found: 629.2720.

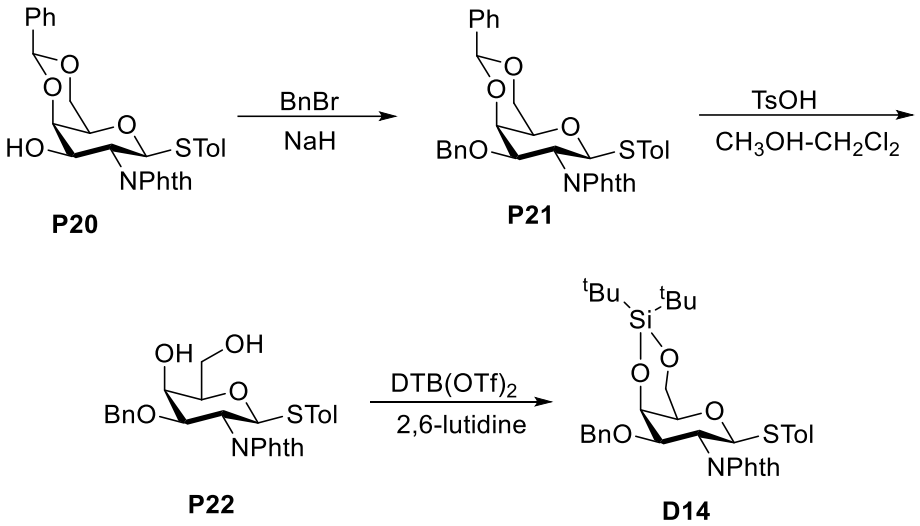
***p*-Methylphenyl 2-azido-3-*O*-benzyl-4, 6-*O*-di-*tert*-butylsilylene-2-deoxy-1-thio -α-D-glucopyranoside (D13)**



P19 **D13**

According to the general procedures for 4, 6-*O*-di-*tert*-butylsilylenation, the treatment of diol **P19**[34] (802 mg，2 mmol) with DTB(OTf)$_2$ furnished the product **D13** (981 mg，90.7%) as a colorless oil. R_f 0.48 (PE/EA, 2:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 - 7.42 (m, 2H), 7.39 - 7.29 (m, 5H), 7.16 - 7.11 (m, 2H), 5.40 (d, *J* = 5.6 Hz, 1H), 5.07 (d, *J* = 10.5 Hz, 1H), 4.84 (d, *J* = 10.5 Hz, 1H), 4.38 (td, *J* = 10.1, 5.6 Hz, 1H), 4.03 (dd, *J* = 10.1, 4.8 Hz, 1H), 3.98 (dd, *J* = 9.6, 8.4 Hz, 1H), 3.91 - 3.82 (m, 2H), 3.75 (dd, *J* = 10.0, 8.4 Hz, 1H), 2.33 (s, 3H), 1.09 (s, 9H), 1.08 (s, 9H); ^{13}C NMR (101 MHz, $CDCl^3$) δ 138.3, 138.0, 132.9, 130.1, 129.4, 128.6, 128.6, 128.1, 87.9, 80.9, 79.0, 75.7, 67.6, 66.5, 63.0, 27.5, 27.2, 22.8, 21.3, 20.2; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{28}H_{39}N_3O_4SSi$ 564.2329; Found: 564.2303.

***p*-Methylphenyl 3-*O*-benzyl- 4, 6-*O*-di-*tert*-butylsilylene- 2-deoxy -2-phthalimido-1-thio-β-D-galactopyranoside (D14)**



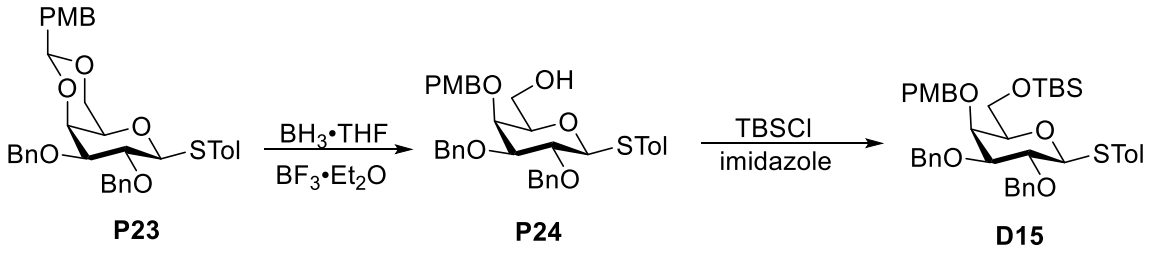
To a solution of **P20**[35] (2.52 g, 5.0 mmol) in DMF (100 mL) was added NaH (60% in mineral oil, 800 mg, 20 mmol) at 0 °C. The resulting slurry was stirred for 30 min, then benzyl bromide (0.72 mL, 6 mmol) was added. The reaction mixture was warmed to room temperature and stirred for 2h. After saturated aqueous NH_4Cl solution was added to quench reaction, the mixture was extracted with ethyl acetate. The combined organic fractions were dried over Na_2SO_4, filtered, and dried under reduced pressure. The residue is subjected to chromatographical purification over silica gel (ethyl acetate in petroleum ether, 4:1) to give **P21** (2.28 g, 76.8%**)**. White solid (from PE-EA), mp: 229 ℃; R_f 0.51 (PE/EA, 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89 - 7.85 (m, 1H), 7.76 - 7.70 (m, 3H), 7.52 - 7.47 (m, 2H), 7.43 - 7.37 (m, 5H), 7.09 - 7.00 (m, 7H), 5.54 (d, J = 10.4 Hz, 1H), 5.50 (s, 1H), 4.71 (t, J = 10.4 Hz, 1H), 4.59 (d, J = 12.8 Hz, 1H), 4.42 - 4.36 (m, 3H), 4.28 - 4.24 (m, 1H), 4.03 (dd, J = 12.4, 2.0 Hz, 1H), 3.60 - 3.56 (m, 1H), 2.31 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.6, 167.2, 138.2, 137.9, 137.8, 134.1, 134.1, 133.9, 131.9, 131.8, 129.6, 129.1, 128.3, 128.2, 127.8, 127.7, 127.6, 126.8, 123.7, 123.2, 101.4, 83.1, 74.8, 72.7, 71.0, 70.2, 69.6, 50.9, 21.3; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{35}H_{31}NO_6S$ 616.1770; Found: 616.1769.

TsOH (52 mg, 0.3 mmol) and **P21** (1.78 g, 3 mmol) was added to in the mixed solvent of MeOH (8 mL) and CH_2Cl_2 (52 mL). After stirring at room temperature for 2 h, the reaction mixture was quenched with Et_3N and concentrated. The further purification through chromatography (petroleum ether: EtOAc, 2:1) over silica gel to give diol **P22** (1.41 g, 93%). White solid (from hot isopropyl alcohol), mp 201℃;. R_f 0.2 (PE/EA,

1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 - 7.81 (m, 1H), 7.75 - 7.62 (m, 3H), 7.26 - 7.23 (m, 2H), 7.03 - 6.97 (m, 5H), 6.97 - 6.92 (m, 2H), 5.46 (d, *J* = 10.4 Hz, 1H), 4.60 (d, *J* = 12.4 Hz, 1H), 4.53 (t, *J* = 10.4 Hz, 1H), 4.30 (d, *J* = 12.4 Hz), 4.26 (dd, *J* = 10.4, 2.8 Hz, 1H), 4.19 - 4.15 (m, 1H), 4.00 (dd, *J* = 11.6, 6.8 Hz, 1H), 3.84 (dd, *J* = 11.6, 4.4 Hz, 1H), 3.71 - 3.65 (m, 1H), 2.25 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.3, 167.6, 138.1, 137.1, 134.2, 134.0, 132.9, 131.7, 129.7, 128.5, 128.4, 128.1, 128.0, 123.7, 123.3, 84.1, 78.4, 75.6, 71.4, 66.3, 62.8, 51.2, 21.2; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{28}H_{27}NO_6S$ 528.1457; Found: 528.1463.

According to the general procedures for 4, 6-*O*-di-*tert*-butylsilylenation, the treatment of diol **P22** (1.01 g, 2 mmol) with $DTB(OTf)_2$ (0.55 mL, 2.4 mmol) furnished the donor **D14** (1.13 g, 87.6%). White solid (from PE-CH_2Cl_2), mp 160 ℃; R_f 0.49 (PE/EA, 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 - 7.85 (m, 1H), 7.76 - 7.69 (m, 3H), 7.26 - 7.23 (m, 2H), 7.16 - 7.08 (m, 5H), 7.00 - 6.95 (m, 2H), 5.47 (d, *J* = 10.4 Hz, 1H), 4.86 (t, *J* = 10.4 Hz, 1H), 4.64 (d, *J* = 12.4 Hz, 1H), 4.61 - 4.58 (m, 1H), 4.45 (d, *J* = 12.4 Hz, 1H), 4.30 -4.21 (m, 3H), 3.51 - 3.44 (m, 1H), 2.24 (s, 3H), 1.20 (s, 9H), 1.08 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.3, 167.6, 138.1, 137.1, 134.2, 134.0, 132.9, 131.7, 129.7, 128.5, 128.4, 128.1, 128.0, 123.7, 123.3, 84.1, 78.4, 75.6, 71.4, 66.3, 62.8, 51.2, 21.2; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{36}H_{43}NO_6SSi$ 668.2478; Found: 668.2473.

***p*-Methyphenyl 2, 3-di -*O*-benzyl-4-*O*- *tert*-butyldimethylsilyl-6-*O*-(*p*-methoxyphenyl)- 1-thio-β-D-galactopyranoside (D15)**

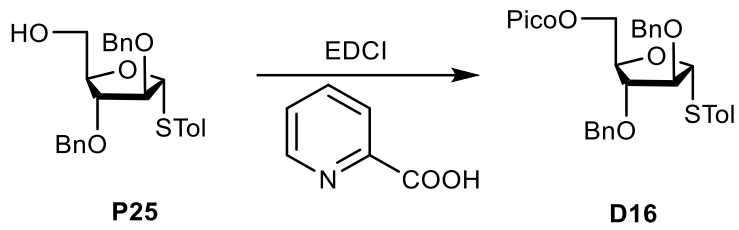


Compound **P23** [36] (1.5 g, 2.5 mmol) was dissolved in a solution of BH_3 in THF (1mol/L, 25 mL, 25 mmol), then treated with boron trifluoride diethyl etherate (0.3 mL, 2.5 mmol) at 0℃. The reaction mixture was stirred at 0℃ until TLC analysis confirmed total consumption of the starting material. Et_3N was added to quench the reaction and then methanol was dropped until effervescence ceased. The solution was concentrated under

reduced pressure to provide the syrup, which was subjected to chromatographic purification (PE: EA, 2:1) to give **P24** (1.23 g, 82%). White solid (from PE-EA), mp 77°C; R_f = 0.5 (PE/EA, 2:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 8.0 Hz, 2H), 7.41 (d, *J* = 7.3 Hz, 2H), 7.38 - 7.29 (m, 8H), 7.26 - 7.23 (m, 2H), 7.03 (d, *J* = 8.0 Hz, 2H), 6.91 - 6.85 (m, 2H), 4.91 - 4.82 (m, 2H), 4.80 - 4.73 (m, 3H), 4.61 - 4.56 (m, 2H), 3.92 (dd, *J* = 10.0, 8.8 Hz, 1H), 3.84 - 3.76 (m, 5H), 3.59 (dd, *J* = 9.2, 2.4 Hz, 1H), 3.52 - 3.45 (m, 1H), 3.43 – 3.36 (m, 1H), 2.30 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.5, 138.4, 138.3, 137.5, 132.3, 130.5, 130.3, 130.0, 129.7, 128.6, 128.5, 128.4, 127.9, 127.9, 127.8, 113.9, 88.3, 84.4, 78.8, 77.8, 75.8, 73.8, 73.2, 72.8, 62.4, 55.4, 21.2; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{35}H_{38}O_6S$ 609.2287; Found: 609.2286.

To a solution of **P24** (587 mg, 1 mmol) in dried CH_2Cl_2 (20 mL) was added imidazole (82 mg, 1.2 mmol). After stirring at room temperature for 10 min, *t*-butyldimethylchlorosilane (181 mg, 1.2 mmol) was added, and the mixture was stirred at room temperature for another 3 h. The mixture was concentrated under vacuum, and the residue was purified by silica gel column chromatography (EtOAc/hexane 1:15) to give **D15** (616 mg, 88%) as a colorless oil. R_f 0.5 (PE/EA, 15:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (d, *J* = 8.0 Hz, 2H), 7.42 - 7.38 (m, 2H), 7.37 - 7.25 (m, 10H), 7.03 - 6.96 (m, 2H), 6.89 - 6.84 (m, 2H), 4.90 (d, *J* = 10.8 Hz, 1H), 4.80 (d, *J* = 10.0 Hz, 1H), 4.77 - 4.69 (m, 3H), 4.60 - 4.54 (m, 2H), 3.95 - 3.87 (m, 2H), 3.82 (s, 3H), 3.78 - 3.66 (m, 2H), 3.58 (dd, *J* = 9.2, 2.8 Hz, 1H), 3.41 (t, *J* = 6.8 Hz, 1H), 2.30 (s, 3H), 0.89 (s, 9H), 0.05 (s, 3H), 0.04 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.2, 138.7, 138.6, 137.1, 132.1, 131.3, 130.7, 129.7, 129.5, 128.5, 128.5, 128.4, 127.8, 127.7, 113.7, 88.2, 84.4, 79.1, 77.6, 75.7, 74.2, 73.2, 72.9, 61.8, 55.4, 26.1, 21.2, 18.3, -5.2, -5.3; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{41}H_{52}O_6SSi$ 723.3152; Found: 723.3157.

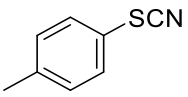
***p*-Methylphenyl 2, 3-di-*O*-benzyl -6-*O*-picolinoyl -1-thio-α-D-arabinofuranoside (D16)**



P25 **D16**

2-Picolinic acid (246 mg, 2.0 mmol), 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDCI, 403 mg, 2.1 mmol), and 4-dimethylaminopyridine (24 mg, 0.2 mmol) were added to a solution of **P25**[37] (872 mg, 2.0 mmol) in CH_2Cl_2 (10 mL) and the resulting mixture was stirred under nitrogen for 1 h at room temperature. The reaction mixture was diluted with CH_2Cl_2 and washed with brine. The organic phase was separated, dried with anhydrous Na_2SO_4, and concentrated in vacuo. The residue was purified by column chromatography (3:1, PE/EA) to afford compound as a brown oil (920 mg, 85%). R_f 0.40 (CH_2Cl_2/CH_3OH, 20:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.75 (d, J = 4.0 Hz, 1H), 8.01 (d, J = 7.6 Hz, 1H), 7.69 (td, J = 7.6, 2.0 Hz, 1H), 7.44 (ddd, J = 8.0, 4.8, 1.2 Hz, 1H), 7.42 - 7.38 (m, 2H), 7.38 - 7.25 (m, 10H), 7.13 - 7.05 (m, 2H), 5.55 (d, J = 2.8 Hz, 1H), 4.66 - 4.54 (m, 6H), 4.51 (d, J = 11.6 Hz, 1H), 4.15 (t, J = 2.8 Hz, 1H), 4.09 - 4.03 (m, 1H), 2.31 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 164.7, 150.0, 147.7, 137.7, 137.5, 137.3, 137.1, 132.4, 130.7, 129.8, 128.6, 128.5, 128.1, 128.0, 128.0, 127.0, 125.5, 90.9, 88.4, 83.9, 79.2, 72.5, 72.3, 64.6, 21.2. HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{32}H_{31}NO_5S$ 564.1821; found 564.1828.

Characterization of *p*-tolyl thiocyanate as a byproduct driving from glycosylation



The byproduct was isolated as a colorless oil from the reaction mixture through column chromatography (PE: EA, 70:1) over silica gel.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 - 7.40 (m, 2H), 7.25 - 7.22 (m, 2H), 2.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 140.4, 131.1, 130.9, 120.7, 111.3(SCN), 21.3. These spectroscopic data are identical with those previously reported. [38]

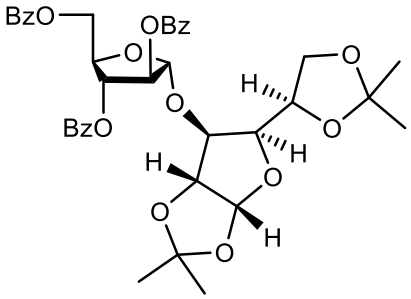
General procedures for glycosidation products

To a solution of alcohol (0.12 mmol) and thioglycoside (0.1 mmol) in anhydrous DCM

(2 mL) containing freshly activated 4 Å molecular sieves and 2, 4, 6-tri-*tert*-butylpyrimidine (TTBP, 0.1 mmol) DFCT(0.12 mmol for thiofuranosyl donors and 0.2 mmol for thiopyransoyl donors) was added and stirred at room temperature until TLC analysis shows the thorough consumption of thioglycoside. The reaction mixture was then filtered and concentrated under reduced pressure. The resultant residue was purified by flash chromatography to provide the goal glycoside. All the solid products were subjected to crystallization or recrystallization before their melting points were measured.

Characterization of glycosylation products (G1-44)

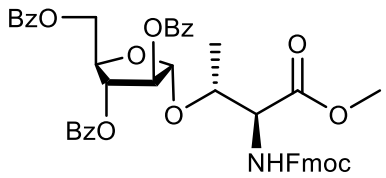
(2', 3', 5'-Tri-*O*-benzoyl- α-D-arabinofuranosyl)-(1→3)-1, 2, 5, 6-di-*O*-isopropylidene-α-D-glucofuranoside (G1)



Yield: 69 mg (98%); colorless oil. R_f = 0.38 (PE/EA 6:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 - 8.04 (m, 4H), 8.02 - 7.97 (m, 2H), 7.64 - 7.55 (m, 2H), 7.55 - 7.50 (m, 1H), 7.49 - 7.44 (m, 2H), 7.43 - 7.37 (m, 2H), 7.36 - 7.30 (m, 2H), 5.92 (d, *J* = 3.2 Hz, 1H), 5.62 - 5.58 (m, 2H), 5.57 (s, 1H), 4.83 (dd, *J* = 12.0, 3.6 Hz, 1H), 4.70 (dd, *J* = 12.0, 5.2 Hz, 1H), 4.66 - 4.61 (m, 2H), 4.44 - 4.37 (m, 2H), 4.15 (dd, *J* = 8.4, 6.0 Hz, 1H), 4.11 (dd, *J* = 8.8, 2.4 Hz, 1H), 4.01 (dd, *J* = 8.8, 5.2 Hz, 1H), 1.51 (s, 3H), 1.37 (s, 3H), 1.30 (s, 3H), 1.20 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.3, 165.8, 165.3, 133.8, 133.7, 133.3, 130.0, 129.9, 129.7, 129.1, 129.0, 128.7, 128.7, 128.5, 112.3, 109.4, 106.5, 105.5, 84.3, 81.8, 81.7, 81.5, 79.7, 77.8, 72.3, 67.8, 63.9, 27.0, 26.9, 26.4, 25.1; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{38}H_{40}O_{13}$ 727.2367; Found: 727.2364.

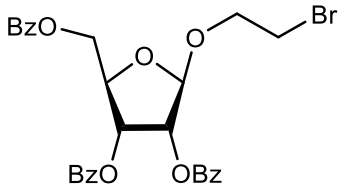
***O*-(2, 3, 5-tri-*O*-benzoyl-α-D-arabinofuranosyl)-*N*-9-fluorenylmethyloxycarbonyl -L-threonine methyl ester (G2)**



Yield: 77 mg (96%); colorless oil. R_f = 0.55 (PE/EA, 3:1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.12 - 8.08 (m, 2H), 8.08 - 8.04 (m, 2H), 8.01 (dd, *J* = 8.0, 1.5 Hz, 2H), 7.76 (d, *J* = 7.6 Hz, 2H), 7.64 - 7.61 (m, 2H), 7.59 - 7.54 (m, 2H), 7.53 - 7.50 (m, 1H), 7.47 - 7.37 (m, 6H), 7.36 - 7.31 (m, 2H), 7.31 - 7.26 (m, 2H), 5.68 (d, *J* = 9.2 Hz, 1H), 5.60 (dd, *J* = 5.2, 1.8 Hz, 1H), 5.42 (d, *J* = 1.8 Hz, 1H), 5.31 (s, 1H), 4.81 (dd, *J* = 11.6, 3.6 Hz, 1H), 4.72 - 4.62 (m, 2H), 4.55 - 4.43 (m, 3H), 4.37 (dd, *J* = 10.4, 7.6 Hz, 1H), 4.25 (t, *J* = 7.6 Hz, 1H), 3.79 (s, 3H), 1.39 (d, *J* = 6.3 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.9, 166.3, 165.8, 165.6, 156.8, 144.0, 143.8, 141.4, 133.8, 133.7, 133.3, 130.0, 130.0, 129.9, 129.7, 129.1, 129.0, 128.7, 128.7, 128.5, 127.8, 127.2, 125.3, 125.2, 120.1, 106.5, 82.5, 81.0, 77.6, 75.5, 67.4, 63.8, 58.9, 52.9, 47.2, 18.6; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{46}H_{41}NO_{12}$ 822.2527; Found: 822.2515.

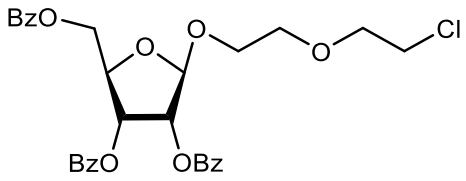
2-Bromoethyl 2, 3, 5-tri-*O*-benzoyl-β-D-ribofuranoside (G3)



Yield: 51 mg (89%); colorless oil. R_f = 0.47 (PE/EA, 4:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 - 8.05 (m, 2H), 8.05 - 8.00 (m, 2H), 7.92 - 7.87 (m, 2H), 7.61 - 7.49 (m, 3H), 7.46 - 7.37 (m, 4H), 7.32 (t, *J* = 7.6 Hz, 2H), 5.89 (dd, *J* = 6.4, 4.8 Hz, 1H), 5.74 (d, *J* = 4.8 Hz, 1H), 5.32 (s, 1H), 4.79 - 4.72 (m, 2H), 4.62 - 4.53 (m, 1H), 4.07 (dt, *J* = 10.8, 6.4 Hz, 1H), 3.82 (dt, *J* = 10.8, 6.4 Hz, 1H), 3.43 - 3.38 (m, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.2, 165.5, 165.3, 133.6, 133.5, 133.3, 129.9, 129.8, 129.8, 129.3, 129.0, 128.6, 128.5, 105.7, 79.4, 75.6, 72.4, 68.4, 64.9, 29.8; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{28}H_{25}BrO_8$ 591.0631; Found: 591.0636.

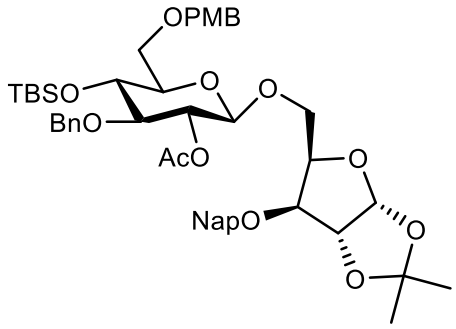
2-(2-Chloroethoxy)ethyl 2, 3, 5-tri-*O*-benzoyl-β-D-ribofuranoside (G4)



Yield: 53 mg (94%); colorless oil. R_f = 0.40 (PE/EA, 5:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 -8.04 (m, 2H), 8.04 - 8.00 (m, 2H), 7.91 - 7.85 (m, 2H), 7.60 - 7.47 (m, 3H), 7.45 - 7.36 (m, 4H), 7.34 - 7.28 (m, 2H), 5.89 (dd, *J* = 6.4, 4.8 Hz, 1H), 5.73 (d, *J* = 4.8 Hz, 1H), 5.34 (s, 1H), 4.77 - 4.70 (m, 2H), 4.59 - 4.51 (m, 1H), 3.93 - 3.86 (m, 1H), 3.77 - 3.66 (m, 3H), 3.65 - 3.57 (m, 4H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.2, 165.5, 165.3, 133.6, 133.5, 133.2, 129.9, 129.8, 129.3, 129.1, 128.6, 128.5, 128.4, 105.7, 79.2, 75.6, 72.7, 71.5, 70.3, 67.4, 65.1, 42.8; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{30}H_{29}ClO_9$ 591.1398; Found: 591.1397.

(2'-*O*-acetyl-3'-*O*-benzyl- 4'-*O*-*tert*-butyldimethylsilyl- 6'-*O*-*p*-methoxybenzyl- β-D-glucopyranosyl)-(1→5)- 1, 2-*O*-isopropylidene-3-*O*-naphthylmethyl-α-D-xylofuranoside (G5)

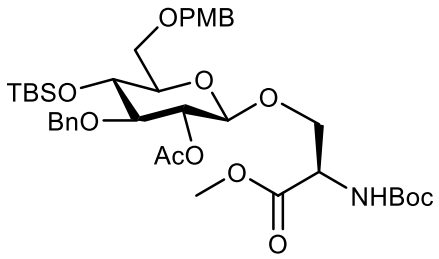


Yield: 66 mg (77%); colorless oil. R_f = 0.40 (PE/EA, 3:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 -7.77 (m, 3H), 7.74 (s, 1H), 7.49 - 7.44 (m, 2H), 7.42 (dd, *J* = 8.4, 1.7 Hz, 1H), 7.32 - 7.27 (m, 2H), 7.26 - 7.23 (m, 3H), 7.21 (d, *J* = 8.4 Hz, 2H), 6.82 - 6.77 (m, 2H), 5.93 (d, *J* = 3.6 Hz, 1H), 4.99 (dd, *J* = 9.2, 8.0 Hz, 1H), 4.75 (d, *J* = 12.4 Hz, 1H), 4.72 - 4.66 (m, 2H), 4.63 (d, *J* = 11.6 Hz, 1H), 4.58 (d, *J* = 4.0 Hz, 1H), 4.55 - 4.49 (m, 2H), 4.38 (d, *J* = 11.6 Hz, 1H), 4.30 (td, *J* = 6.4, 2.8 Hz, 1H), 4.15 (dd, *J* = 11.2, 5.6 Hz, 1H), 3.99 (d, *J* = 3.2 Hz, 1H), 3.86 (dd, *J* = 11.2, 6.4 Hz, 1H), 3.73 (s, 3H), 3.70 (dd, *J* = 10.7, 2.0 Hz, 1H), 3.64 (t, *J* = 8.8 Hz, 1H), 3.52 (dd, *J* = 10.7, 6.0 Hz, 1H), 3.46 (t, *J* = 8.9 Hz, 1H), 3.41 (ddd, *J* = 8.3, 6.0, 1.9 Hz, 1H), 1.89 (s, 3H), 1.45 (s, 3H), 1.29 (s, 3H), 0.83 (s, 9H), -0.03 (s, 3H), -0.04 (s, 3H); ^{13}C NMR

(101 MHz, $CDCl_3$) δ 169.8, 159.2, 138.5, 135.2, 133.3, 133.2, 130.5, 129.3, 128.5, 128.4, 128.1, 127.8, 127.5, 127.4, 126.7, 126.3, 126.1, 125.8, 113.8, 111.8, 105.3, 101.6, 83.4, 82.7, 81.8, 79.9, 76.8, 74.9, 73.8, 73.2, 72.5, 71.1, 69.1, 67.3, 55.3, 27.0, 26.5, 26.0, 21.0, 18.1, -3.7, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{48}H_{62}O_{12}Si$ 881.3909; Found: 881.3910.

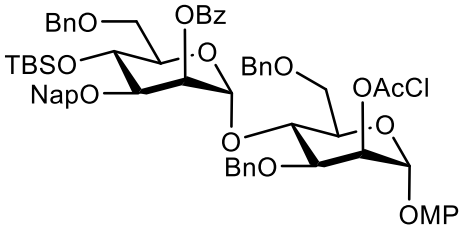
_O_-(2-_O_-acetyl-3-_O_-benzyl-4-_O_-_tert_-butyldimethylsilyl-6-_O_-_p_-methoxybenzyl- β-D-glucopyranosyl)-_N_-(_tert_-butyloxycarbonyl)-_L_-serine methyl ester (G6)



Yield: 63 mg (84%); colorless oil. R_f = 0.70 (PE/EA, 3:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.32 - 7.22 (m, 7H), 6.89 - 6.84 (m, 2H), 5.35 (d, J = 8.4 Hz, 1H), 4.94 (dd, J = 9.0, 8.8 Hz, 1H), 4.69 (d, J = 12.0 Hz, 1H), 4.61 (d, J = 12.0 Hz, 1H), 4.56 (d, J = 11.6 Hz, 1H), 4.46 - 4.35 (m, 3H), 4.21 (dd, J = 10.4, 3.6 Hz, 1H), 3.81 - 3.74 (m, 4H), 3.70 (s, 3H), 3.70 - 3.61 (m, 2H), 3.53 (dd, J = 10.7, 5.8 Hz, 1H), 3.47 - 3.38 (m, 2H), 1.90 (s, 3H), 1.43 (s, 9H), 0.82 (s, 9H), -0.03 (s, 3H), -0.05 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.7, 169.6, 159.3, 155.6, 138.4, 130.4, 129.4, 128.4, 127.5, 127.4, 113.9, 101.1, 83.3, 80.1, 74.8, 73.3, 73.2, 70.9, 69.0, 68.8, 55.4, 54.0, 52.7, 28.5, 26.0, 20.9, 18.1, -3.7, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{38}H_{57}NO_{12}Si$ 770.3548; Found: 770.3555.

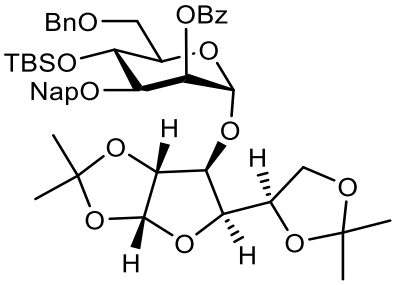
***p*- Methoxyphenyl (2'-_O_-benzoyl-6'-_O_-benzyl-4'-_O_-_tert_-butyldimethylsilyl-3'-_O_-naphthylmethyl -α-D-mannopyranosyl)-(1→4)-3, 6-di-_O_-benzyl-2-_O_-chloroacetyl-α-D-mannopyranoside (G7)**



Yield: 105 mg (91%); colorless oil. R_f = 0.46 (Toluene/EA, 25:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 - 8.02 (m, 2H), 7.80 - 7.75 (m, 1H), 7.71 (d, *J* = 8.4 Hz, 1H), 7.67 - 7.56 (m, 3H), 7.44 - 7.27 (m, 17H), 7.24 - 7.16 (m, 3H), 7.11 - 7.06 (m, 2H), 6.89 - 6.82 (m, 2H), 5.77 (t, *J* = 2.8 Hz, 1H), 5.59 - 5.56 (m, 2H), 5.47 (d, *J* = 2.0 Hz, 1H), 4.96 (d, *J* = 11.2 Hz, 1H), 4.66 (d, *J* = 10.8 Hz, 1H), 4.64 - 4.53 (m, 6H), 4.27 - 4.18 (m, 3H), 4.09 (s, 2H), 4.07 - 4.02 (m, 1H), 3.86 - 3.75 (m, 8H), 3.64 (dd, *J* = 10.8, 2.0 Hz, 1H), 0.82 (s, 9H), -0.02 (s, 3H), -0.07 (s, 3H); ^{13}C NMR (101 MHz,$CDCl_3$) δ 167.0, 165.5, 155.5, 150.1, 138.8, 138.5, 137.0, 135.5, 133.3, 133.2, 133.0, 130.2, 130.0, 128.8, 128.6, 128.4, 128.1, 128.0, 127.8, 127.7, 127.4, 126.7, 126.1, 125.9, 125.7, 118.4, 114.8, 99.4, 96.7, 78.3, 77.7, 74.4, 73.4, 73.3, 72.3, 71.9, 71.7, 71.1, 69.9, 69.7, 69.4, 68.6, 67.6, 55.8, 40.8, 26.1, 18.3, -3.8, -5.1; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{66}H_{73}ClO_{14}Si$ 1175.4356; Found: 1175.4353.

(2'-*O*-benzoyl- 6'-*O*-benzyl-4'-*O*-*tert*-butyldimethylsilyl-3'-*O*-naphthylmethyl- α-D-mannopyranosyl)- (1→3)-1, 2:5, 6-di-*O*-isopropylidene-α-D-glucofuranoside (G8)

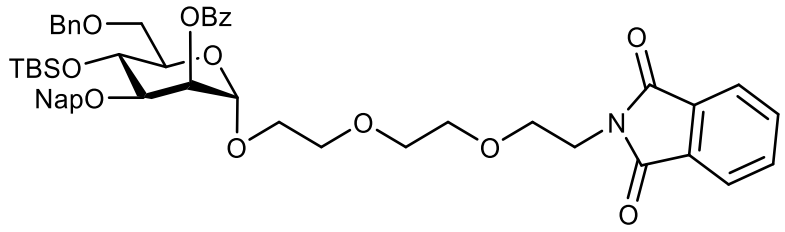


Yield: 75 mg (86%); colorless oil. R_f = 0.29 (PE/EA, 10:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 - 8.00 (m, 2H), 7.77 -7.72 (m, 1H), 7.67 (d, *J* = 8.4 Hz, 1H), 7.63 - 7.55 (m, 3H), 7.42 - 7.28 (m, 10H), 5.93 (d, *J* = 3.6 Hz, 1H), 5.68 - 5.64 (m, 1H), 5.28 - 5.23 (m, 1H), 4.90 (d, *J* = 11.2 Hz, 1H), 4.81 (d, *J* = 3.6 Hz, 1H), 4.64 (s, 2H), 4.60 (d, *J* = 11.2 Hz, 1H), 4.34 - 4.31 (m, 1H), 4.26 -4.21 (m, 1H), 4.18 (t, *J* = 9.2 Hz, 1H), 4.13 - 4.08 (m, 2H), 3.98 (dd, *J* = 8.4, 5.6 Hz, 1H), 3.89 - 3.80 (m, 4H), 1.50 (s, 3H), 1.38 (s, 3H), 1.31 - 1.28 (m, 3H), 1.26 (s, 3H), 0.81 (s, 9H), -0.01 (s, 3H), -0.06 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.5, 138.6, 135.3, 133.3, 133.3, 133.0, 130.1, 130.0, 128.6, 128.5, 128.0, 127.9, 127.7, 127.6, 127.5, 126.7, 126.0, 126.0, 125.8, 112.1, 109.5, 105.5, 99.2, 83.6, 81.5, 78.2, 77.4, 74.1, 73.5, 72.5, 71.2, 69.8, 68.3, 68.1,

67.8, 27.0, 26.9, 26.3, 26.1, 25.2, 18.4, -3.7, -5.0; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{49}H_{62}O_{12}Si$ 893.3909; Found: 893.3906.

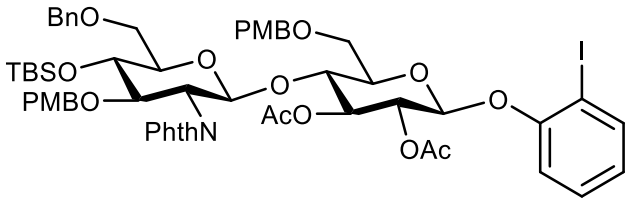
2-(2-(2-Phthalimidoethoxy)ethoxy)ethoxyl 2-*O*-benzoyl-6-*O*-benzyl-4-*O*-*tert*-butyldimethylsilyl-3-*O*-naphthylmethyl-α-D-mannopyranoside (G9)



Yield: 78 mg (88%); colorless oil. R_f = 0.60 (PE/EA, 3:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 - 8.00 (m, 2H), 7.85 - 7.80 (m, 2H), 7.76 - 7.71 (m, 1H), 7.69 - 7.61 (m, 4H), 7.59 - 7.53 (m, 2H), 7.40 - 7.27 (m, 10H), 5.68 - 5.65 (m, 1H), 5.01 - 4.97 (m, 1H), 4.92 (d, *J* = 11.2 Hz, 1H), 4.69 - 4.57 (m, 3H), 4.20 (t, *J* = 8.4 Hz, 1H), 3.93 - 3.88 (m, 3H), 3.87 - 3.72 (m, 6H), 3.65 - 3.57 (m, 7H), 0.80 (s, 9H), -0.02 (s, 3H), -0.08 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.4, 165.8, 138.8, 135.7, 134.0, 133.3, 133.2, 132.9, 132.3, 130.2, 130.0, 128.6, 128.4, 127.9, 127.8, 127.7, 127.4, 127.4, 126.5, 125.9, 125.8, 125.7, 123.3, 98.0, 78.4, 77.4, 73.4, 73.1, 70.9, 70.7, 70.3, 69.6, 68.6, 68.1, 68.0, 67.1, 37.4, 26.1, 18.3, -3.7, -5.1; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{51}H_{59}NO_{11}Si$ 912.3755; Found: 912.3761.

***O*-idophenyl (6'-*O*-benzyl-4'-*O*-*tert*-butyldimethylsilyl- 2'-deoxy-3'-*O*-*p*-methoxybenzyl- 2-phthalimido-β-D-glucopyranosyl)-(1→4)- 2, 3-di-*O*-acetyl- 6-*O*-*p*-methoxybenzyl-β-D-glucopyranoside (G10)**

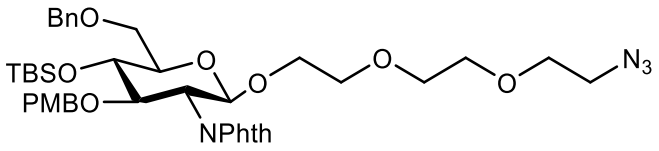


Yield: 108 mg (90%); colorless oil. R_f = 0.25 (PE/EA, 3:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.69 - 7.59 (m, 4H), 7.38 - 7.30 (m, 4H), 7.22 (tt, *J* = 7.2, 2.0 Hz, 1H), 7.14 - 7.08 (m, 3H), 6.92 (dd, *J* = 8.3, 1.4 Hz, 1H), 6.90 - 6.85 (m, 2H), 6.82 - 6.77 (m, 2H), 6.73 (td, *J* = 7.6, 1.4 Hz, 1H), 6.41 - 6.36 (m, 2H), 5.26 - 5.19 (m, 3H), 4.85 - 4.77 (m, 1H), 4.69 (d, *J* = 12.2 Hz, 1H), 4.61

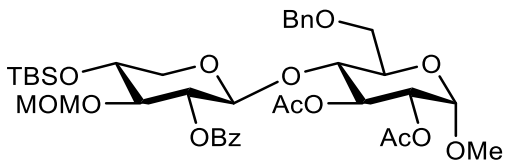
(d, *J* = 12.2 Hz, 1H), 4.53 (d, *J* = 12.2 Hz, 1H), 4.29 (d, *J* = 11.2 Hz, 1H), 4.24 - 4.16 (m, 2H), 4.13 (dd, *J* = 10.8, 8.0 Hz, 1H), 4.04 (dd, *J* = 10.8, 8.0 Hz, 1H), 3.98 (ddd, *J* = 9.6, 6.4, 3.2 Hz, 1H), 3.78 (s, 3H), 3.74 - 3.68 (m, 2H), 3.58 (s, 3H), 3.58 - 3.46 (m, 4H), 3.35 (dd, *J* = 11.0, 5.3 Hz, 1H), 2.06 (s, 3H), 2.00 (s, 3H), 0.88 (s, 9H), 0.10 (s, 3H), 0.05 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.3, 169.6, 159.2, 158.6, 156.3, 139.5, 138.3, 133.8, 131.7, 130.6, 130.3, 129.6, 129.2, 129.0, 128.5, 127.6, 127.4, 124.6, 123.2, 116.1, 113.8, 113.4, 99.7, 96.9, 87.0, 80.9, 76.1, 75.2, 75.1, 73.6, 73.1, 72.7, 72.5, 71.5, 69.1, 67.9, 56.4, 55.4, 54.9, 26.1, 21.3, 21.0, 18.1, -3.6, -4.3; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{59}H_{68}INO_{16}Si$ 1224.3250; Found: 1224.3229.

2-[2-(2-Azidoethoxy)ethoxy]ethyl 6-*O*-benzyl-4-*O*-*tert*-butyldimethylsilyl-2-deoxy 3-*O*-*p*-methoxybenzyl-2-phthalimido-β-D-glucopyranoside (G11)



Yield: 65 mg (82%); white solid (from PE-EA), mp 51 ℃. R_f = 0.30 (PE/EA, 2:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 - 7.60 (m, 4H), 7.38 - 7.31 (m, 4H), 7.30 - 7.26 (m, 11H), 6.92 - 6.87 (m, 2H), 6.40 - 6.34 (m, 2H), 5.17 (d, *J* = 8.2 Hz, 1H), 4.73 - 4.66 (m, 2H), 4.54 (d, *J* = 12.4 Hz, 1H), 4.21 (d, *J* = 12.4 Hz, 1H), 4.18 - 4.08 (m, 2H), 3.90 - 3.83 (m, 1H), 3.80 - 3.76 (m, 1H), 3.70 - 3.57 (m, 4H), 3.56 (s, 3H), 3.50 - 3.43 (m, 4H), 3.36 - 3.23 (m, 6H), 0.87 (s, 9H), 0.11 (s, 3H), 0.04 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.6, 138.5, 133.6, 131.8, 130.7, 129.1, 128.5, 127.7, 127.7, 123.1, 113.3, 98.2, 80.8, 76.3, 75.2, 73.4, 73.1, 70.6, 70.5, 70.1, 70.0, 69.4, 68.8, 56.1, 54.9, 50.7, 26.0, 18.1, -3.6, -4.4; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{41}H_{54}N_4O_{10}Si$ 813.3507; Found: 813.3498.

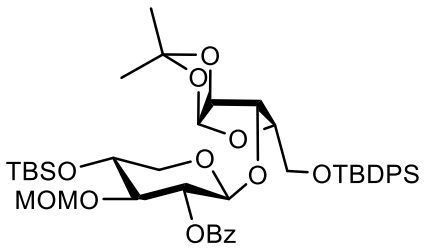
Methyl (2'-*O*-benzoyl-4'-*O*-*tert*-butyldimethylsilyl-3'-*O*-methoxymethyl-β-D-xylopyranosyl)-(1→4)- 2, 3-di-*O*-acetyl- 6-*O*-benzyl- α-D-glucopyranoside (G12)



Yield: 74 mg (97%); colorless oil. R_f = 0.30 (PE/EA, 4:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 - 8.01 (m, 2H), 7.59 - 7.53 (m, 1H), 7.46 - 7.37 (m, 4H), 7.35 - 7.28 (m, 3H), 5.40 (t, *J* = 9.2 Hz, 1H), 5.02 (dd, *J* = 9.6, 7.6 Hz, 1H), 4.85 - 4.79 (m, 3H), 4.55 -4.50 (m, 2H), 4.42 (d, *J* = 7.6 Hz, 1H), 4.28 (d, *J* = 12.0 Hz, 1H), 3.86 (t, *J* = 9.2 Hz, 1H), 3.80 - 3.70 (m, 2H), 3.63 - 3.57 (m, 2H), 3.53 (dd, *J* = 9.6, 8.0 Hz, 1H), 3.39 - 3.33 (m, 1H), 3.28 (s, 3H), 3.19 - 3.07 (m, 1H), 2.95 (s, 3H), 2.04 (s, 3H), 2.01 (s, 3H), 0.89 (s, 9H), 0.08 (s, 6H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.5, 169.9, 165.0, 138.2, 133.2, 130.2, 130.0, 128.6, 128.5, 128.0, 127.9, 101.9, 98.2, 96.9, 81.4, 76.2, 73.5, 72.8, 71.5, 71.3, 70.5, 69.6, 67.6, 66.2, 56.0, 55.3, 25.8, 21.1, 20.9, 18.0, -4.6, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{38}H_{54}O_{14}Si$ 785.3181; Found: 785.3080.

(2'-*O*-benzoyl- 4'-*O*-*tert*-butyldimethylsilyl-3'-*O*-methoxymethyl-β-D-xylopyranosyl)-(1→3)-5-*O*-*tert*-butyldiphenylsilyl-1, 2-*O*-isopropylidene-α-xylofuranoside (G13)

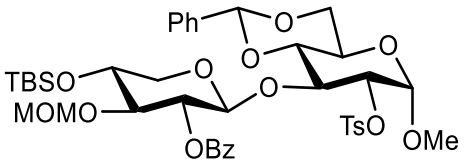


Yield: 78 mg (95%); White solid (from PE-ethyl ether), mp 79℃; R_f = 0.35 (PE/EA, 8:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14 - 8.06 (m, 2H), 7.74 - 7.66 (m, 4H), 7.59 - 7.54 (m, 1H), 7.46 - 7.35 (m, 8H), 5.34 (d, *J* = 4.0 Hz, 1H), 5.03 (dd, *J* = 8.4, 7.2 Hz, 1H), 4.84 (d, *J* = 6.8 Hz, 1H), 4.65 - 4.55 (m, 2H), 4.32 -4.21 (m, 3H), 3.97 (dd, *J* = 10.0, 6.8 Hz, 1H), 3.85 - 3.68 (m, 4H), 3.23 - 3.15 (m, 1H), 3.06 (s, 3H), 1.41 (s, 3H), 1.11 (s, 3H), 1.04 (s, 9H), 0.88 (s, 9H), 0.08 (s, 3H), 0.07 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.1, 135.8, 133.9, 133.7, 133.4, 130.1, 129.7, 129.7, 128.6, 127.8, 127.7, 111.9, 104.9, 100.4, 97.9, 82.9, 80.6, 80.4, 80.3, 72.5, 71.3, 66.0, 61.0, 55.9, 26.9, 26.1, 25.8, 19.4, 18.1, -4.6, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{44}H_{62}O_{11}Si_2$ 845.3729; Found: 845.3730.

Methyl (2'-*O*-benzoyl -4'-*O*-*tert*-butyldimethylsilyl-3'-*O*-methoxymethyl- β-D-

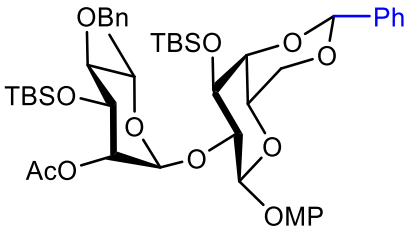
xylopyranosyl)-(1→3)-4, 6-*O*-benzylidene-2-*O*-*p*-toluenesulphonyl-α-D-glucopyranoside (G14)



Yield: 69 mg (83%); White solid (from PE-CH_2Cl_2), mp 61 ℃. R_f = 0.50 (PE/EA, 4:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13 - 8.08 (m, 2H), 7.77 - 7.72 (m, 2H), 7.58 - 7.52 (m, 1H), 7.50 - 7.46 (m, 2H), 7.45 - 7.40 (m, 2H), 7.37 - 7.32 (m, 3H), 7.29 - 7.26 (m, 2H), 5.49 (s, 1H), 4.90 (dd, *J* = 8.0, 6.4 Hz, 1H), 4.83 - 4.75 (m, 3H), 4.59 (d, *J* = 6.8 Hz, 1H), 4.35 (dd, *J* = 9.6, 3.6 Hz, 1H), 4.29 - 4.21 (m, 2H), 3.87 - 3.76 (m, 2H), 3.72 - 3.65 (m, 2H), 3.62 (t, *J* = 7.6 Hz, 1H), 3.55 (t, *J* = 9.2 Hz, 1H), 3.23 (s, 3H), 3.04 (s, 3H), 3.03 - 2.96 (m, 1H), 2.40 (s, 3H), 0.81 (s, 9H), 0.07 (d, *J* = 0.98 Hz, 6H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.7, 145.1, 137.3, 133.5, 133.0, 130.6, 130.3, 130.3, 129.9, 129.2, 129.2, 128.3, 128.3, 128.2, 128.0, 126.3, 101.8, 100.3, 98.1, 97.8, 80.3, 79.5, 78.8, 73.3, 72.2, 70.8, 69.0, 65.2, 62.3, 55.9, 55.7, 25.8, 25.8, 21.8, 18.0, -4.7, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{41}H_{54}O_{14}SSi$ 853.2902; Found: 853.2893.

***p*-Methoxyphenyl (2'-*O*-acetyl -4'-*O*-benzyl-3'-*O*-*tert*-butyldimethylsilyl-α-L-rhamnopyranosyl)-(1→2)-4, 6-*O*-benzylidene-3-*O*-*tert*-butyldimethylsilyl-β-D-galactopyranoside (G15)**

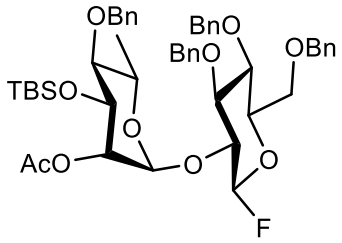


Yield: 81 mg (92%); White solid (from PE-ethyl ether), mp 101℃. R_f = 0.60 (PE/EA, 5:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 - 7.51 (m, 2H), 7.39 - 7.26 (m, 8H), 7.09 - 7.04 (m, 2H), 6.80 - 6.74 (m, 2H), 5.51 (s, 1H), 5.24 (dd, *J* = 3.6, 2.0 Hz, 1H), 5.18 (d, *J* = 2.0 Hz, 1H), 4.87 - 4.82 (m, 2H), 4.61 (d, *J* = 11.6 Hz, 1H), 4.42 - 4.33 (m, 2H), 4.24 (dd, *J* = 9.2, 8.0 Hz, 1H), 4.12 - 4.06 (m, 2H), 4.02 (dd, *J* = 9.2, 3.2 Hz, 1H), 3.95 - 3.91 (m,

1H), 3.76 (d, *J* = 1.1 Hz, 3H), 3.50 (s, 1H), 3.32 (t, *J* = 9.2 Hz, 1H), 2.10 (d, *J* = 0.8 Hz, 3H), 1.28 (d, *J* = 6.2 Hz, 3H), 0.91 -0.87 (m, 9H), 0.85 (s, 9H), 0.15 (s, 3H), 0.12 (s, 3H), 0.07 (s, 3H), -0.03 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.9, 155.3, 152.0, 139.1, 137.8, 128.9, 128.2, 128.2, 127.3, 127.1, 126.3, 118.7, 114.5, 101.3, 100.8, 98.4, 81.5, 76.6, 75.3, 74.8, 73.3, 72.4, 71.1, 69.3, 67.9, 66.7, 55.7, 25.9, 25.8, 21.1, 18.2, 18.0, 17.9, -4.0, -4.6, -4.7, -4.8; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{47}H_{68}O_{12}Si_2$ 903.4147; Found: 903.4122.

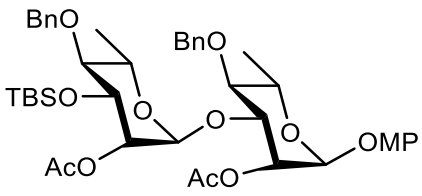
(2'-*O*-acetyl- 4'-*O*-benzyl-3'-*O*-*tert*-butyldimethylsilyl- α-L-rhamnopyranosyl)-(1→2)-3, 4, 6-tri-*O*-benzyl-β-D-galactopyranosyl fluoride (G16)



Yield: 74 mg (88%); White powder (from PE-ethyl ether), mp 86°C. R_f = 0.50 (PE/EA, 5:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 - 7.27 (m, 18H), 7.17 - 7.13 (m, 2H), 5.30 - 5.14 (m, 2H), 5.04 - 5.02 (m, 1H), 4.89 (d, *J* = 11.2 Hz, 1H), 4.86 - 4.75 (m, 3H), 4.66 - 4.59 (m, 2H), 4.58 - 4.52 (m, 2H), 4.06 (dd, *J* = 8.8, 3.6 Hz, 1H), 3.95 - 3.86 (m, 1H), 3.83 - 3.66 (m, 5H), 3.63 (dd, *J* = 9.6, 3.2 Hz, 1H), 3.38 (t, *J* = 9.6 Hz, 1H), 2.11 (s, 3H), 1.28 (d, *J* = 6.3 Hz, 3H), 0.91 (s, 9H), 0.12 (s, 3H), 0.10 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.1, 138.4, 137.9, 137.8, 137.8, 128.5, 128.5, 128.5, 128.1, 128.0, 128.0, 127.9, 127.8, 108.9, 106.8, 98.9, 83.9, 83.8, 81.2, 78.2, 78.0, 75.6, 75.3, 75.0, 74.9, 73.7, 72.7, 70.9, 68.4, 68.4, 25.9, 21.1, 17.9, 17.7, -4.6, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{48}H_{61}FO_{10}Si$ 867.3916; Found: 867.3906.

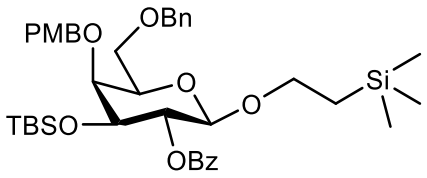
***p*-Methoxyphenyl (2'-*O*-acetyl- 4'-*O*-benzyl-3'-*O*-*tert*-butyldimethylsilyl- α-L-rhamnopyranosyl)-(1→3)- 2-*O*-acetyl-4-*O*-benzyl-α-D-rhmnopyranoside (G17)**



Yield: 76 mg (96%); colorless oil. R_f = 0.45 (PE/EA, 8:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 - 7.32 (m, 8H), 7.32 - 7.27 (m, 2H), 6.97 -6.91 (m, 2H), 6.83 -6.78 (m, 2H), 5.35 (d, *J* = 2.0 Hz, 1H), 5.31 (dd, *J* = 3.6, 2.0 Hz, 1H), 5.22 (dd, *J* = 3.6, 2.0 Hz, 1H), 5.05 (d, *J* = 2.0 Hz, 1H), 4.94 -4.87 (m, 2H), 4.62 (d, *J* = 11.2 Hz, 2H), 4.32 (dd, *J* = 9.6, 3.6 Hz, 1H), 4.10 (dd, *J* = 9.2, 3.6 Hz, 1H), 3.95 -3.84 (m, 1H), 3.81 -3.72 (m, 4H), 3.55 (t, *J* = 9.6 Hz, 1H), 3.37 (t, *J* = 9.2 Hz, 1H), 2.19 (s, 3H), 2.12 (s, 3H), 1.28 (d, *J* = 6.4 Hz, 3H), 1.26 (d, *J* = 6.4 Hz, 3H), 0.88 (s, 9H), 0.07 (s, 3H), 0.06 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.4, 170.3, 155.2, 150.2, 138.7, 138.0, 128.6, 128.4, 128.2, 128.0, 127.8, 127.7, 117.8, 114.7, 99.9, 96.2, 81.2, 80.3, 77.4, 75.6, 75.3, 73.1, 72.4, 70.9, 69.0, 68.5, 55.8, 25.9, 21.2, 21.1, 18.1, 18.0, -4.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{43}H_{58}O_{12}Si$ 817.3596; Found: 817.3594.

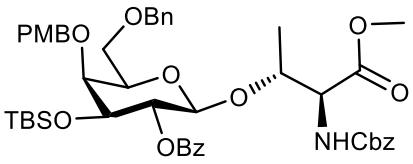
2'-Trimethylsilylethyl 2-*O*-benzoyl-6-*O*-benzyl -3-*O*-*tert*-butyldimethylsilyl- 4-*O*-*p*-methoxybenzyl-β-D-galactopyranoside (G18)



Yield: 64 mg (90%); White solid (PE-ethyl ether), mp 57°C. R_f = 0.50 (PE/EA, 10:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 - 8.02 (m, 2H), 7.58 - 7.51 (m, 1H), 7.48 - 7.39 (m, 2H), 7.37 - 7.26 (m, 7H), 6.88 - 6.82 (m, 2H), 5.56 (dd, *J* = 10.0, 8.0 Hz, 1H), 5.00 (d, *J* = 10.8 Hz, 1H), 4.52 - 4.40 (m, 4H), 3.98 - 3.89 (m, 2H), 3.81 - 3.76 (m, 4H), 3.71 - 3.59 (m, 3H), 3.52 - 3.43 (m, 1H), 0.90 - 0.75 (m, 11H), 0.11 (s, 3H), -0.08 (s, 3H), -0.13 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.3, 159.2, 138.1, 132.9, 131.1, 130.7, 129.9, 129.8, 128.6, 128.3, 128.0, 127.9, 113.7, 101.1, 76.7, 74.8, 74.7, 73.8, 73.7, 73.0, 69.1, 67.0, 55.4, 25.7, 18.0, 17.9, -1.4, -3.9, -4.9; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{39}H_{56}O_8Si_2$ 731.3412; Found: 731.3413.

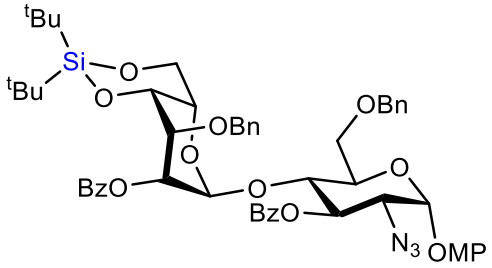
***O*-(2-*O*-benzoyl- 6-*O*-benzyl-3-*O*-*tert*-butyldimethylsilyl-4-*O*-*p*-methoxybenzyl- β-D-galactopyranosyl)-*N*-benzyoxycarbonyl-L-threonine methyl ester (G19)**



Yield: 74 mg (86%); colorless oil. R_f = 0.55 (PE/EA, 3:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 - 8.00 (m, 2H), 7.57 - 7.51 (m, 1H), 7.40 (t, *J* = 7.7 Hz, 2H), 7.35 - 7.31 (m, 5H), 7.31 - 7.28 (m, 2H), 7.28 - 7.25 (m, 4H), 7.19 - 7.15 (m, 1H), 6.86 (d, *J* = 8.7 Hz, 2H), 5.71 (d, *J* = 8.8 Hz, 1H), 5.45 (dd, *J* = 10.0, 8.0 Hz, 1H), 5.10 - 5.02 (m, 2H), 4.98 (d, *J* = 11.2 Hz, 1H), 4.47 - 4.42 (m, 2H), 4.37 (s, 2H), 4.34 - 4.26 (m, 1H), 4.21 - 4.16 (m, 1H), 3.93 - 3.87 (m, 1H), 3.79 (s, 3H), 3.76 (d, *J* = 2.7 Hz, 1H), 3.59 (s, 3H), 3.59 - 3.54 (m, 2H), 3.51 - 3.45 (m, 1H), 1.00 (d, *J* = 6.4 Hz, 3H), 0.78 (s, 9H), 0.10 (s, 3H), -0.08 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 171.0, 165.3, 159.2, 156.9, 138.0, 136.5, 133.0, 130.9, 130.3, 129.7, 129.1, 128.6, 128.5, 128.5, 128.3, 128.0, 128.0, 128.0, 127.9, 125.4, 113.7, 100.8, 76.6, 75.5, 75.0, 74.3, 73.6, 73.6, 72.9, 68.4, 66.9, 58.7, 55.4, 52.5, 25.6, 21.6, 17.9, 17.8, -4.0, -4.9; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{47}H_{59}NO_{12}Si$ 880.3705; Found: 880.3706.

_p_-Methoxyphenyl (2'-*O*-benzoyl- 3'-*O*-benzyl-4', 6'-*O*-di-*tert*-butylsilylene-α-D-idopyranosyl)- (1 → 4)-3-*O*-benzoyl-6-*O*-benzyl-2-azido-2-deoxy-α-D-glucopyranoside (G20)

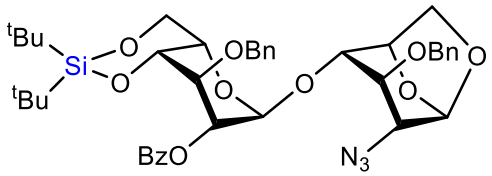


Yield: 93 mg (93%); White solid (from PE-ethyl ether), mp 63℃. R_f = 0.55 (PE/EA, 5:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.12 - 8.06 (m, 2H), 7.99 - 7.93 (m, 2H), 7.62 - 7.51 (m, 2H), 7.47 (t, *J* = 7.6 Hz, 2H), 7.36 (t, *J* = 7.6 Hz, 2H), 7.29 (d, *J* = 4.4 Hz, 4H), 7.24 - 7.18 (m, 6H), 7.12 - 7.07 (m, 2H), 6.85 - 6.80 (m, 2H), 5.98 (dd, *J* = 10.4, 8.8 Hz, 1H), 5.54 (d, *J* = 3.6 Hz, 1H), 5.16 - 5.10 (m, 2H), 4.78 (d, *J* = 12.0 Hz, 1H), 4.66 (d, *J* = 12.0 Hz, 1H), 4.46 (d, *J* = 11.6 Hz, 1H), 4.39 (d, *J* = 11.6 Hz, 1H), 4.30 (t, *J* = 9.6 Hz,

1H), 4.09 - 4.03 (m, 2H), 3.85 (d, *J* = 2.4 Hz, 1H), 3.82 - 3.75 (m, 5H), 3.70 (t, *J* = 4.0 Hz, 1H), 3.62 (dd, *J* = 11.2, 2.0 Hz, 1H), 3.55 (dd, *J* = 12.4, 2.4 Hz, 1H), 3.38 (dd, *J* = 10.4, 3.6 Hz, 1H), 0.91 (s, 9H), 0.83 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.0, 165.7, 155.6, 150.5, 138.2, 137.7, 133.4, 130.2, 130.0, 129.9, 129.5, 128.6, 128.4, 128.4, 128.3, 127.8, 127.7, 127.7, 127.6, 118.1, 114.8, 99.9, 98.1, 77.3, 74.3, 73.5, 72.0, 71.6, 71.4, 71.0, 69.6, 68.3, 66.4, 65.6, 61.7, 55.8, 27.8, 27.0, 23.1, 20.5; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{55}H_{63}N_3O_{13}Si$ 1024.4028; Found: 1024.4036.

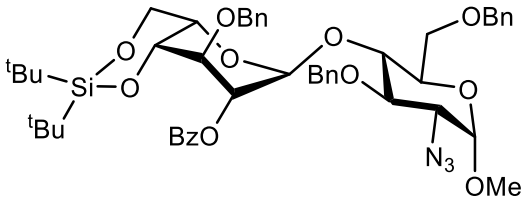
(2'-*O*-benzoyl- 3'-*O*-benzyl -4', 6'-*O*-di-*tert*-butylsilylene-α-D-idopyranosyl)-(1→4)- 1, 6-anhydro-2-azido- 3-*O*-benzyl-2-deoxy- β-D-glucopyranoside (G21)



Yield: 67 mg (87%); colorless oil. R_f = 0.32 (PE/EA, 8:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.11 - 8.05 (m, 2H), 7.60 - 7.54 (m, 1H), 7.46 - 7.40 (m, 2H), 7.39 -7.34 (m, 2H), 7.34 - 7.26 (m, 6H), 7.24 - 7.21 (m, 2H), 5.49 (s, 1H), 5.25 - 5.19 (m, 2H), 4.93 (d, *J* = 11.6 Hz, 1H), 4.73 - 4.67 (m, 2H), 4.59 (d, *J* = 11.6 Hz, 1H), 4.52 (d, *J* = 11.6 Hz, 1H), 4.24 - 4.21 (m, 1H), 4.10 - 3.99 (m, 3H), 3.95 - 3.92 (m, 1H), 3.87 - 3.82 (m, 1H), 3.76 (dd, *J* = 7.2, 6.0 Hz, 1H), 3.74 - 3.71 (m, 1H), 3.69 -3.65 (m, 1H), 3.21 (d, *J* = 2.0 Hz, 1H), 1.02 (s, 9H), 1.00 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.1, 138.1, 137.5, 133.4, 130.3, 129.7, 128.6, 128.5, 128.4, 128.1, 128.0, 127.9, 127.9, 101.2, 97.4, 78.2, 76.7, 74.2, 73.4, 73.2, 72.1, 71.1, 68.4, 67.0, 65.9, 65.1, 61.2, 27.9, 27.2, 23.4, 20.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{41}H_{51}N_3O_{10}Si$ 796.3242; Found: 796.3238.

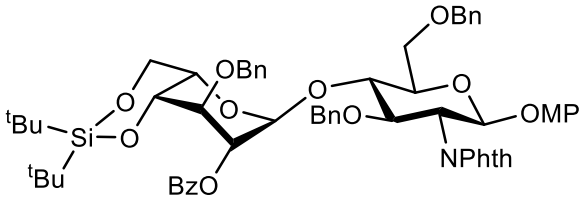
Methyl (2'-*O*-benzoyl- 3'-*O*-benzyl- 4', 6'-*O*-di-*tert*-butylsilylene- α-D-idopyranosyl)-(1→4)- 2-azido- 3, 6-di-*O*-benzyl-2-deoxy- α-D-glucopyranoside (G22)



Yield: 84 mg (94%); White powder (from PE-ethyl ether), mp 108℃. R_f = 0.70 (Toluene/EA, 15:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 - 7.95 (m, 2H), 7.55 (td, *J* = 7.6, 1.4 Hz, 1H), 7.41 - 7.36 (m, 4H), 7.36 - 7.26 (m, 5H), 7.24 - 7.13 (m, 8H), 5.18 - 5.11 (m, 2H), 4.87 - 4.77 (m, 3H), 4.70 (d, *J* = 11.6 Hz, 1H), 4.59 (d, *J* = 10.8 Hz, 1H), 4.52 (d, *J* = 11.6 Hz, 1H), 4.41 (d, *J* = 11.6 Hz, 1H), 4.12 - 4.02 (m, 2H), 3.93 (s, 1H), 3.84 - 3.74 (m, 4H), 3.69 - 3.62 (m, 2H), 3.51 - 3.45 (m, 1H), 3.42 (s, 3H), 3.05 (d, *J* = 12.4 Hz, 1H), 0.95 (s, 18H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.17, 138.12, 137.99, 137.69, 133.36, 130.18, 129.60, 128.56, 128.46, 128.37, 128.34, 128.29, 128.23, 127.99, 127.89, 127.71, 127.65, 98.74, 98.17, 79.47, 77.76, 77.32, 75.41, 73.58, 72.56, 72.26, 71.38, 70.96, 69.13, 68.47, 66.28, 64.77, 64.40, 55.33, 27.85, 27.09, 23.14, 20.54; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{49}H_{61}N_3O_{11}Si$ 918.3973; Found: 918.3976.

_p_-Methoxyphenyl (2'-*O*-benzoyl-3'-*O*-benzyl- 4', 6'-*O*-di-*tert*-butylsilylene- α-D-idopyranosyl)-(1 → 4)-3, 6-di-*O*-benzyl-2-deoxy-2-phthalimido-β-D-glucopyranoside (G23)

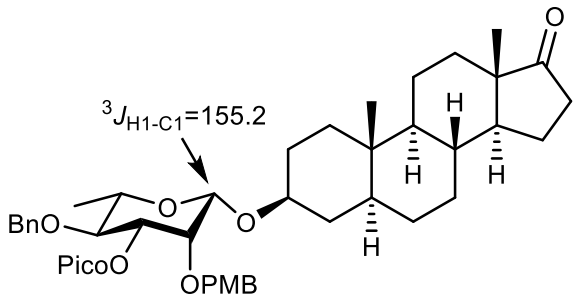


Yield: 98 mg (90%); White solid (from PE-ethyl ether), mp 74℃. R_f = 0.31 (PE/EA, 5:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.03 - 7.99 (m, 2H), 7.80 - 7.69 (m, 2H), 7.68 - 7.62 (m, 2H), 7.60 - 7.54 (m, 1H), 7.44 - 7.38 (m, 2H), 7.38 - 7.29 (m, 4H), 7.28 - 7.26 (m, 1H), 7.24 - 7.18 (m, 5H), 7.01 - 6.90 (m, 5H), 6.84 - 6.78 (m, 2H), 6.70 - 6.64 (m, 2H), 5.62 (dd, *J* = 8.4, 1.2 Hz, 1H), 5.26 - 5.21 (m, 2H), 4.84 (d, *J* = 12.0 Hz, 1H), 4.72 (d, *J* = 12.0 Hz, 1H), 4.57 (dd, *J* = 11.6, 5.2 Hz, 2H), 4.51 - 4.43 (m, 2H), 4.38 - 4.32 (m, 1H),

4.28 (d, *J* = 11.6 Hz, 1H), 4.20 (t, *J* = 9.2 Hz, 1H),4.15 - 4.12 (m, 1H), 4.02 (s, 1H), 3.90 (d, *J* = 12.8 Hz, 1H), 3.85 - 3.72 (m, 3H), 3.71 - 3.66 (m, 4H), 3.45 (d, *J* = 12.0 Hz, 1H), 0.98 (s, 9H), 0.96 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.1, 155.5, 151.1, 138.2, 138.1, 138.1, 134.1, 133.4, 131.7, 130.3, 129.7, 128.5, 128.4, 128.4, 128.2, 128.2, 127.9, 127.7, 127.6, 127.4, 123.5, 118.9, 114.5, 98.6, 97.9, 78.7, 78.1, 75.7, 75.3, 74.4, 73.5, 72.3, 72.1, 69.5, 68.6, 66.4, 65.4, 56.3, 55.7, 27.9, 27.2, 23.2, 20.7; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{63}H_{69}NO_{14}Si$ 1114.4385; Found: 1114.4376.

Epiandrosteronyl 4-*O*-benzyl-2-*O*-*p*-methoxybenzyl-3-*O*-picolinoyl-β-L-rhamnopyranoside (G24)

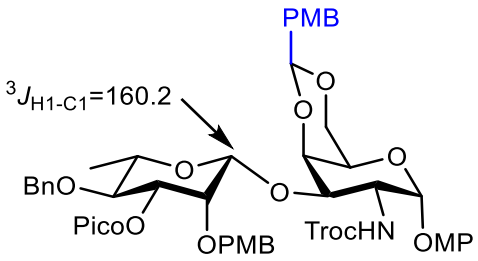


Yield: 61 mg (81%); colorless oil. R_f = 0.50 (toluene/EA, 4:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.78 (d, *J* = 4.4 Hz, 1H), 7.90 (d, *J* = 8.0 Hz, 1H), 7.78 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 (dd, *J* = 8.0, 4.8 Hz, 1H), 7.22 - 7.15 (m, 7H), 6.53 - 6.47 (m, 2H), 5.05 (dd, *J* = 9.6, 3.2 Hz, 1H), 4.87 - 4.79 (m, 2H), 4.72 - 4.64 (m, 2H), 4.61 (d, *J* = 12.4 Hz, 1H), 4.05 (d, *J* = 3.2 Hz, 1H), 3.83 (t, *J* = 9.6 Hz, 1H), 3.72 - 3.61 (m, 4H), 3.48 - 3.40 (m, 1H), 2.43 (dd, *J* = 19.2, 8.8 Hz, 1H), 2.12 - 1.99 (m, 1H), 1.98 - 1.85 (m, 2H), 1.84 - 1.72 (m, 4H), 1.70 - 1.62 (m, 1H), 1.60 - 1.48 (m, 2H), 1.48 - 1.42 (m, 2H), 1.41 (d, *J* = 6.0 Hz, 3H), 1.40 - 1.19 (m, 5H), 1.18 - 1.09 (m, 1H), 1.04 - 0.92 (m, 2H), 0.86 (s, 6H), 0.75 - 0.65 (m, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 221.2, 164.1, 158.9, 149.9, 147.8, 138.2, 136.8, 130.6, 130.2, 128.3, 127.9, 127.6, 126.8, 125.2, 113.3, 98.9, 78.5, 77.9, 75.2, 74.1, 71.7, 55.0, 54.5, 51.5, 47.8, 44.9, 36.9, 36.0, 35.9, 35.8, 35.1, 31.6, 30.9, 28.5, 27.9, 21.8, 20.5, 18.1, 13.9, 12.3; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{46}H_{57}NO_8$ 774.3982; Found: 774.3988.

***p*-Methoxyphenyl (4'-*O*-benzyl-2'-*O*-*p*-methoxylbenzyl-3'-*O*-picolinoyl-β-L-rhamnopyranosyl)- (1 → 3)-4, 6-*O*-*p*-methoxybenzylidene-2-deoxy-(2, 2, 2-**

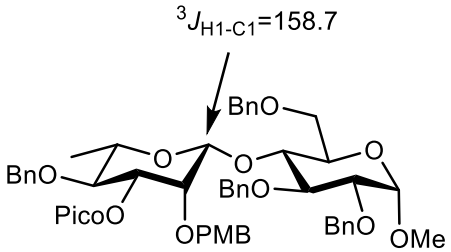
trichloroethoxylcarbamoyl)-α-D-galactopyranoside (G25)



Yield: 90 mg (87%); White solid (from isopropanol), mp151℃. R_f = 0.50 (toluene/EA, 2:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.80 (d, *J* = 4.4 Hz, 1H), 7.99 - 7.91 (m, 1H), 7.80 (t, *J* = 7.6 Hz, 1H), 77.53 - 7.47 (m, 3H), 7.24 - 7.18 (m, 5H), 7.07 - 7.02 (m, 4H), 6.91 - 6.86 (m, 2H), 6.85 - 6.80 (m, 2H), 6.34 - 6.30 (m, 2H), 6.25 - 6.20 (m, 1H), 5.96 (d, *J* = 3.2 Hz, 1H), 5.61 (s, 1H), 5.10 - 5.02 (m, 1H), 4.85 (d, *J* = 11.2 Hz, 1H), 4.81 (s, 1H), 4.78 - 4.72 (m, 2H), 4.69 (d, *J* = 10.8 Hz, 1H), 4.64 - 4.58 (m, 2H), 4.48 (ddd, *J* = 10.8, 6.0, 3.2 Hz, 1H), 4.40 - 4.31 (m, 2H), 4.27 (d, *J* = 12.4 Hz, 1H), 4.13 - 4.06 (m, 2H), 3.90 (t, *J* = 9.4 Hz, 1H), 3.85 (s, 1H), 3.75 (s, 6H), 3.60 (s, 3H), 3.58 - 3.52 (m, 1H), 1.52 (d, *J* = 6.0 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 164.0, 160.1, 158.9, 155.2, 154.7, 150.8, 149.9, 147.6, 138.0, 136.8, 130.3, 130.2, 129.9, 128.3, 127.9, 127.7, 127.6, 127.0, 125.2, 117.9, 114.7, 113.6, 113.2, 100.9, 99.0, 97.6, 95.7, 78.1, 76.7, 75.3, 74.4, 73.5, 73.2, 73.1, 73.1, 72.2, 69.3, 63.4, 55.6, 55.2, 55.0, 50.5, 18.0; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{51}H_{53}Cl_3N_2O_{15}$ 1061.2410; Found: 1061.2401.

Methyl (4'-*O*-benzyl-2'-*O*-*p*-methoxybenzyl 3'-*O*-picolinoyl-β-L-rhamnopyranosyl)-(1→4)- 2, 3, 6-tri-*O*-benzyl-α-D-glucopyranoside (G26)

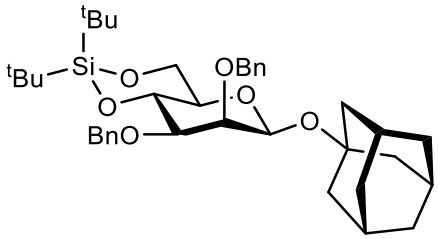


Yield: 71 mg (77%); colorless oil. R_f = 0.46 (PE/EA, 2:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.80 (d, *J* = 4.2 Hz, 1H), 7.95 (dd, *J* = 7.6, 1.2 Hz, 1H), 7.78 (t, *J* = 8.0 Hz, 1H), 7.48 - 7.37 (m,5H), 7.36 - 7.17 (m, 18H), 6.61 - 6.55 (m, 2H),

5.01 - 4.94 (m, 2H), 4.90 (s, 1H), 4.82 - 4.52 (m, 10H), 4.02 (d, *J* = 3.2 Hz, 1H), 3.98 - 3.90 (m, 2H), 3.81 - 3.66 (m, 4H), 3.64 (s, 3H), 3.56 (dd, *J* = 10.0, 3.2 Hz, 1H), 3.43 (s, 3H), 3.34 - 3.25 (m, 1H), 1.28 (d, *J* = 6.0 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 164.1, 159.2, 150.2, 148.1, 138.9, 138.3, 138.2, 136.9, 130.7, 130.0, 129.1, 128.8, 128.7, 128.5, 128.4, 128.3, 128.3, 128.2, 128.1, 127.8, 127.6, 127.5, 127.0, 125.3, 113.6, 101.3, 98.0, 81.9, 80.4, 78.8, 77.5, 77.2, 76.4, 75.6, 75.4, 74.5, 73.5, 73.4, 71.7, 70.1, 69.6, 55.5, 55.2, 18.0; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{55}H_{59}NO_{12}$ 948.3935; Found: 948.3946.

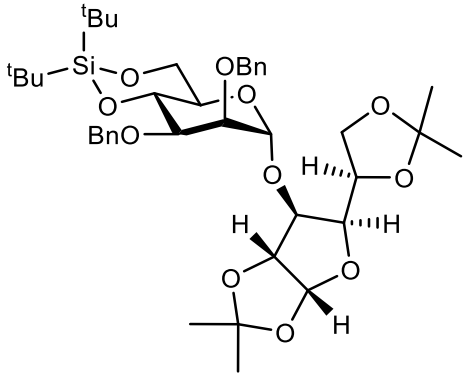
Adamantanyl 2, 3-di-*O*-benzyl-4, 6-*O*-di-*tert*-butylsilylene-β-D-mannopyranoside (G27) [39]



Yield: 58 mg (92%); colorless oil. R_f = 0.30 (toluene).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51 - 7.47 (m, 2H), 7.34 - 7.26 (m, 8H), 5.01 - 4.92 (m, 2H), 4.77 (d, *J* = 12.6 Hz, 1H), 4.71 - 4.64 (m, 2H), 4.37 (t, *J* = 9.4 Hz, 1H), 4.07 (d, *J* = 7.2 Hz, 2H), 3.70 -3.65 (m, 1H), 3.34 - 3.29 (m, 1H), 3.27 - 3.18 (m, 1H), 2.17 - 2.11 (m, 3H), 1.86 - 1.79 (m, 3H), 1.75 - 1.69 (m, 3H), 1.66 - 1.56 (m, 6H), 1.09 (s, 9H), 1.01 (s, 9H).

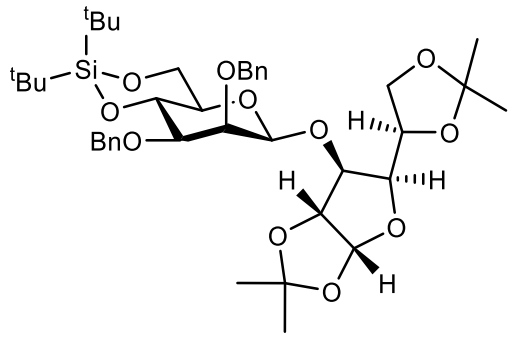
(2', 3'-Di-*O*-benzyl-4',6'-*O*-di-*tert*-butylsilylene- α-D-mannopyranosyl)- (1→3)-1, 2: 5, 6-di-*O*-isopropylidene-α-D-glucofuranoside (G28-α) [39]



Yield: 10 mg (13%); colorless oil. R_f = 0.48 (PE/EA, 8:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 - 7.27 (m, 10H), 5.81 (d, *J* = 3.6 Hz, 1H), 5.09 (d, *J* = 1.6 Hz, 1H), 4.89 (d, *J* = 12.4 Hz, 1H), 4.74 (s, 2H), 4.66 (d, *J* = 12.4 Hz, 1H), 4.44 (d, *J* = 3.6 Hz, 1H), 4.39 (t, *J* = 9.2 Hz, 1H), 4.22 (d, *J* = 2.4 Hz, 1H), 4.12 (dd, *J* = 10.4, 4.8 Hz, 1H), 4.08 - 3.96 (m, 5H), 3.75 (dd, *J* = 3.2, 1.6 Hz, 1H), 3.71 (td, *J* = 10.0, 4.8 Hz, 1H), 3.62 (dd, *J* = 9.6, 3.2 Hz, 1H), 1.49 (s, 3H), 1.39 (s, 3H), 1.30 (d, *J* = 2.0 Hz, 6H), 1.09 (s, 9H), 1.02 (s, 9H).

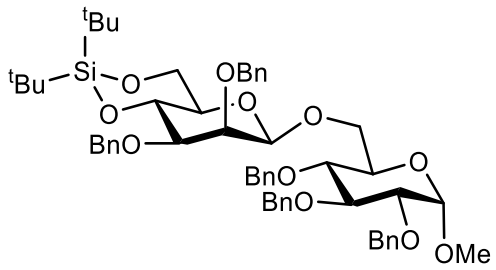
(2', 3'-Di-*O*-benzyl-4',6'-*O*-di-*tert*-butylsilylene-β-D-mannopyranosyl)- (1→3)-1, 2: 5, 6-di-*O*-isopropylidene-α-D-glucofuranoside (G28-β) [39]



Yield: 57 mg (77%); colorless oil. R_f = 0.40 (PE/EA 8:1).

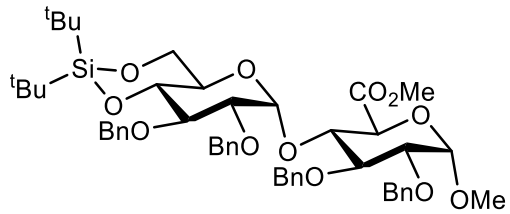
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 - 7.39 (m, 2H), 7.33 (d, *J* = 4.4 Hz, 4H), 7.32 - 7.26 (m, 4H), 5.86 (d, *J* = 3.6 Hz, 1H), 4.87 -4.81 (m, 3H), 4.70 (d, *J* = 12.4 Hz, 1H), 4.48 (s, 1H), 4.41 - 4.31 (m, 3H), 4.28 (dd, *J* = 5.2, 3.2 Hz, 1H), 4.22 (d, *J* = 3.2 Hz, 1H), 4.15 - 4.00 (m, 4H), 3.77 (d, *J* = 2.7 Hz, 1H), 3.34 (dd, *J* = 9.3, 3.2 Hz, 1H), 3.27 (td, *J* = 9.6, 5.2 Hz, 1H), 1.48 (s, 3H), 1.42 (s, 3H), 1.31 (s, 3H), 1.29 (s, 3H), 1.09 (s, 9H), 1.00 (s, 9H).

Methyl (2', 3'-di-*O*-benzyl-4',6'-*O*-di-*tert*-butylsilylene-β-D-mannopyranosyl)- (1→6)-2, 3, 4-tri-*O*-benzyl-α-glucopyranoside (G29) [39]



Yield: 90 mg (95%); White solid (from PE-CH_2Cl_2), mp 107°C . R_f = 0.33 (PE/EA, 6:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 - 7.27 (m, 19H), 7.25 - 7.14 (m, 6H), 5.02 (d, *J* = 11.8 Hz, 1H), 4.90 (d, *J* = 12.4 Hz, 1H), 4.85 - 4.75 (m, 5H), 4.72 - 4.64 (m, 2H), 4.58 (d, *J* = 3.6 Hz, 1H), 4.46 (d, *J* = 11.6 Hz, 1H), 4.35 (t, *J* = 9.6 Hz, 1H), 4.13 - 3.97 (m, 5H), 3.77 - 3.71 (m, 1H), 3.66 - 3.63 (m, 1H), 3.50 (dd, *J* = 9.6, 3.2 Hz, 1H), 3.46 - 3.39 (m, 2H), 3.31 (s, 3H), 3.26 - 3.14 (m, 2H), 1.08 (s, 9H), 1.01 (s, 9H).

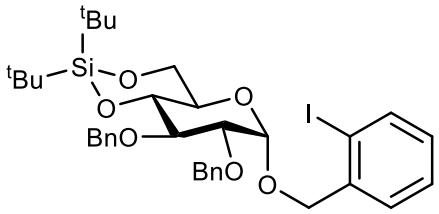
Methyl (2', 3'-di-*O*-benzyl -4', 6'-*O*-di-*tert*-butylsilylene- α-D- glucopyranosyl)-(1→4)-2, 3-di-*O*-benzyl-α-D-glucuronide methyl ester (G30)



Yield: 79 mg (89%); colorless oil. R_f = 0.25 (PE/EA, 10:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 - 7.32 (m, 2H), 7.28 - 7.26 (m, 5H), 7.25 - 7.20 (m, 11H), 7.17 (dd, *J* = 7.3, 2.3 Hz, 2H), 5.34 (d, *J* = 4.0 Hz, 1H,), 4.98 (d, *J* = 10.8 Hz, 1H), 4.90 (d, *J* = 11.2 Hz, 1H),4.83 - 4.76 (m, 2H), 4.75 - 4.70 (m, 2H), 4.57 - 4.53 (m, 2H), 4.49 (d, *J* = 12.0 Hz, 1H), 4.17 (d, *J* = 9.6 Hz, 1H), 4.15 - 4.07 (m, 2H), 4.01 (dd, *J* = 9.6, 8.0 Hz, 1H), 3.83 - 3.76 (m, 3H), 3.75 (s, 3H), 3.68 (td, *J* = 9.6, 4.4 Hz, 1H), 3.55 (dd, *J* = 9.6, 3.6 Hz, 1H), 3.43 - 3.37 (m, 4H), 1.07 (s, 9H), 1.03 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.4, 139.1, 139.0, 138.4, 137.9, 128.6, 128.4, 128.3, 128.3, 128.2, 127.7, 127.7, 127.6, 127.3, 127.2, 98.6, 98.4, 81.4, 80.7, 79.1, 78.5, 78.4, 77.4, 75.7, 75.1, 73.9, 73.8, 70.5, 67.1, 66.5, 55.8, 52.8, 27.7, 27.2, 22.9, 20.0; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{50}H_{64}O_{12}Si$ 907.4065; Found: 907.4069.

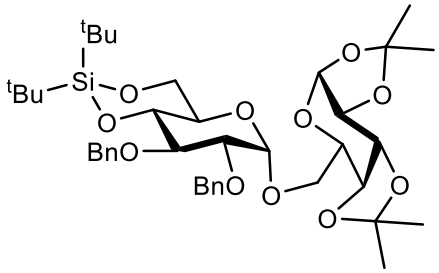
***o*-Iodobenzyl 2, 3-di-*O*-benzyl-4, 6-*O*-di-*tert*-butylsilylene-α-D-glucopyranoside (G31)**



Yield: 57 mg (79%); colorless oil. R_f = 0.23 (PE/EA, 20:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (dt, *J* = 7.9, 0.9 Hz, 1H), 7.57 (dd, *J* = 7.7, 1.7 Hz, 1H), 7.48 - 7.43 (m, 2H), 7.39 - 7.28 (m, 9H), 7.01 (td, *J* = 7.6, 1.7 Hz, 1H), 5.04 (d, *J* = 10.8 Hz, 1H), 4.89 (d, *J* = 5.2 Hz, 1H), 4.87 - 4.84 (m, 2H), 4.72 - 4.65 (m, 2H), 4.62 (d, *J* = 13.6 Hz, 1H), 4.00 - 3.96 (m, 1H), 3.95 - 3.79 (m, 4H), 3.53 (dd, *J* = 8.8, 3.6 Hz, 1H), 1.09 (s, 9H), 1.02 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 140.0, 139.3, 139.2, 138.5, 129.5, 129.4, 128.5, 128.4, 128.2, 128.1, 127.9, 127.7, 98.0, 97.8, 81.9, 78.9, 78.5, 75.9, 74.0, 73.8, 66.8, 27.6, 27.2, 22.8, 20.1; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{35}H_{45}IO_6Si$ 739.1928; Found: 739.1927.

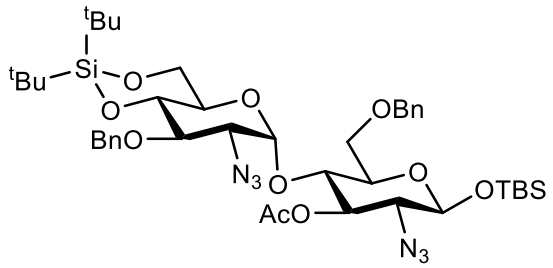
(2', 3'-Di-*O*-benzyl- 4', 6'-*O*-di-*tert*-butylsilylene -α-D-glucopyranosyl)-(1→6)-1, 2:3, 4-di-*O*-isopropylidene-α-D-galactopyranoside (G32)



Yield: 70 mg (94%); White solid (from PE-CH_2Cl_2), mp 98°C. R_f = 0.32 (PE/EA, 10:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 - 7.41 (m, 2H), 7.39 - 7.35 (m, 2H), 7.35 - 7.27 (m, 6H), 5.53 (d, *J* = 5.0 Hz, 1H), 4.99 (d, *J* = 11.1 Hz, 1H), 4.87 - 4.81 (m, 2H), 4.78 (d, *J* = 12.0 Hz, 1H), 4.71 (d, *J* = 12.0 Hz, 1H), 4.60 (dd, *J* = 7.6, 2.0 Hz, 1H), 4.36 (dd, *J* = 7.6, 1.9 Hz, 1H), 4.32 (dd, *J* = 4.8, 2.4 Hz, 1H), 4.12 - 4.03 (m, 2H), 3.89 - 3.81 (m, 4H), 3.79 - 3.72 (m, 2H), 3.48 (dd, *J* = 8.8, 4.0 Hz, 1H), 1.53 (s, 3H), 1.46 (s, 3H), 1.32 (s, 6H), 1.08 (s, 9H), 1.01 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 139.3, 138.6, 128.5, 128.4, 128.2, 127.9, 127.8, 127.6, 109.3, 108.7, 98.0, 96.4, 81.9, 78.8, 78.5, 77.4, 75.8, 73.1, 70.9, 70.8, 70.7, 66.9, 66.7, 66.3, 65.8, 27.6, 27.2, 26.2, 26.2, 25.0, 24.7, 22.8, 20.1; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{40}H_{58}O_{11}Si$ 765.3646; Found: 765.3648.

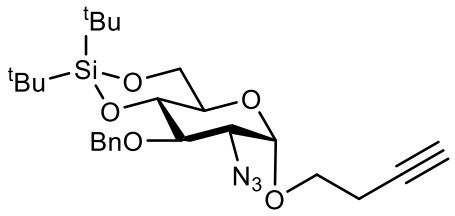
***Tert*-butyldimethysilyl (2'-azido-3'-*O*-benzy- 4', 6'-*O*-di-*tert*-butylsilylene-2-deoxy-α-D- glucopyranosyl)-(1→4)-6-*O*-benzyl-3-*O*-acetyl-2-azido-2-deoxy-β-D-glucopyranoside (G33)**



Yield: 78 mg (90%); colorless oil. R_f = 0.53 (PE/EA, 10:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 - 7.39 (m, 2H), 7.38 - 7.33 (m, 6H), 7.32 - 7.27 (m, 2H), 5.12 - 5.02 (m, 3H), 4.77 (d, *J* = 10.5 Hz, 1H), 4.65 (d, *J* = 7.7 Hz, 1H), 4.62 (s, 2H), 4.09 - 4.01 (m, 1H), 3.96 - 3.88 (m, 2H), 3.86 - 3.68 (m, 5H), 3.56 - 3.51 (m, 1H), 3.33 - 3.24 (m, 2H), 2.16 (s, 3H), 1.09 (s, 9H), 1.05 (s, 9H), 0.95 (s, 9H), 0.18 (s, 3H), 0.17 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.8, 138.1, 138.0, 128.6, 128.5, 128.5, 128.1, 127.8, 127.6, 99.5, 97.1, 78.9, 78.7, 75.7, 75.1, 74.8, 73.8, 73.7, 68.6, 67.8, 66.7, 66.5, 62.5, 27.6, 27.2, 25.7, 22.8, 21.2, 20.1, 18.1, -4.3, -5.1; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{42}H_{64}N_6O_{10}Si$ 891.4120; Found: 891.4109.

1'-Butynyl 2-azido- 3-*O*-benzyl-4, 6-*O*-di-*tert*-butylsilylene- 2-deoxy- α-D-glucopyranoside (G34)

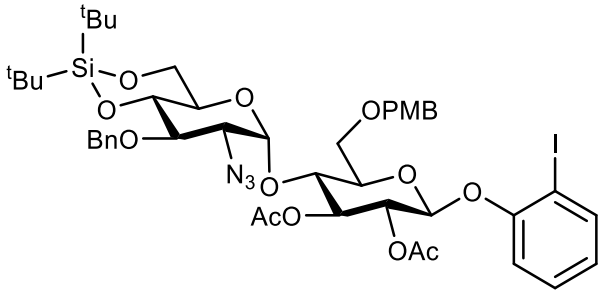


Yield: 43 mg (88%); colorless oil. R_f = 0.55 (PE/EA, 10:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 - 7.41 (m, 2H), 7.38 - 7.33 (m, 2H), 7.32 - 7.27 (m, 1H), 5.06 (d, *J* = 10.8 Hz, 1H), 4.86 - 4.80 (m, 2H), 4.12 (dd, *J* = 9.6, 3.6 Hz, 1H), 3.98 - 3.91 (m, 2H), 3.91 - 3.84 (m, 2H), 3.80 (dt, *J* = 9.7, 6.8 Hz, 1H), 3.66 (dt, *J* = 9.6, 6.4 Hz, 1H), 3.30 (dd, *J* = 9.8, 3.6 Hz, 1H), 2.55 (td, *J* = 6.4, 2.4 Hz, 2H), 1.99 (t, *J* = 2.6 Hz, 1H), 1.09 (s, 9H), 1.04 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 138.2, 128.6, 128.5,

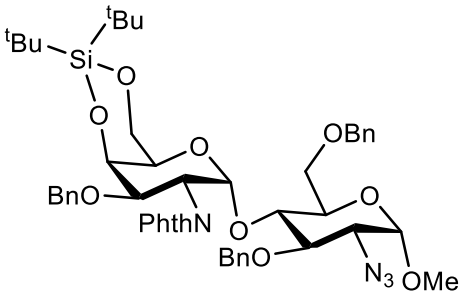
128.0, 98.3, 80.9, 79.2, 79.1, 75.6, 69.8, 66.9, 66.8, 66.7, 62.4, 27.6, 27.2, 22.8, 20.1, 20.0; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{25}H_{37}N_3O_5Si$ 510.2400; Found: 510.2411.

_o_-Idophenyl (2'-azido- 3'-_O_-benzyl -4', 6'-_O_-di-_tert_-butylsilylene- 2'-deoxy-α-D-glucopyranosyl)-(1 → 4)-2, 3-di-_O_-acetyl-6-_O_-_p_-methoxybenzyl-β-D-glucopyranoside (G35)



Yield: 92 mg (92%); White solid (from PE-CH_2Cl_2), mp 49°C. R_f = 0.50 (PE/EA, 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.42 - 7.38 (m, 2H), 7.37 - 7.32 (m, 2H), 7.32 - 7.27 (m, 1H), 7.25 - 7.21 (m, 3H), 7.11 (dd, *J* = 8.4, 1.4 Hz, 1H), 6.87 - 6.84 (m, 2H), 6.83 - 6.78 (m, 1H),5.37 (t, *J* = 9.2 Hz, 1H), 5.24 (dd, *J* = 9.6, 7.6 Hz, 1H), 5.08 (d, *J* = 4.0 Hz, 1H), 5.07 - 5.03 (m, 2H), 4.78 (d, *J* = 10.8 Hz, 1H), 4.53 (s, 2H), 4.04 (d, *J* = 5.6 Hz, 1H), 4.00 (d, *J* = 8.8 Hz, 1H), 3.97 - 3.92 (m, 1H), 3.83 (d, *J* = 7.2 Hz, 2H), 3.81 - 3.74 (m, 7H), 3.30 (dd, *J* = 10.4, 4.0 Hz, 1H), 2.10 (s, 3H), 2.09 (s, 3H), 1.09 (s, 9H), 1.06 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.1, 169.9, 159.4, 156.3, 139.6, 138.0, 130.1, 129.8, 129.3, 128.6, 128.5, 128.1, 124.9, 116.3, 113.9, 99.7, 99.6, 87.1, 78.8, 75.6, 75.2, 75.0, 73.5, 71.7, 68.5, 67.8, 66.5, 62.4, 55.4, 27.5, 27.2, 22.8, 21.3, 21.0, 20.2, 1.2; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{45}H_{58}IN_3O_{13}Si$ 1026.2682; Found: 1026.2684.

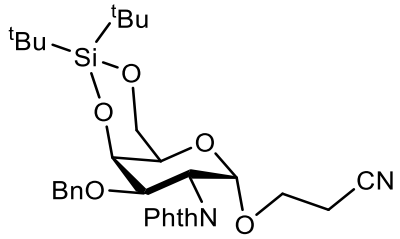
Methyl (3'-_O_-benzyl 4',6'-_O_-di-_tert_-butylsilylene- 2'-deoxy-2'-phthalimido-α-D-galactopyranosyl)-(1→4)- 2-azido-6-_O_-benzyl-2-deoxy-α-D-glucopyranoside (G36)



Yield: 79 mg (86%); colorless oil. R_f = 0.39 (toluene/EA, 25:1).

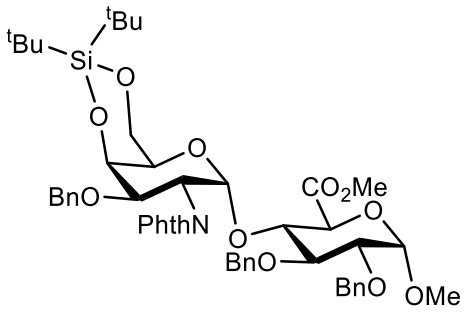
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, *J* = 7.2 Hz, 1H), 7.76 - 7.64 (m, 3H), 7.36 - 7.26 (m, 12H), 7.26 - 7.22 (m, 3H), 5.74 (d, *J* = 3.6 Hz, 1H), 4.97 (dd, *J* = 11.6, 3.6 Hz, 1H), 4.86 (dd, *J* = 11.6, 2.4 Hz, 1H), 4.80 (d, *J* = 3.6 Hz, 1H), 4.65 - 4.59 (m, 2H), 4.59 - 4.53 (m, 2H), 4.46 (d, *J* = 12.0 Hz, 1H), 4.40 (d, *J* = 2.8 Hz, 1H), 4.22 (d, *J* = 10.0 Hz, 1H), 4.01 (dd, *J* = 10.0, 8.8 Hz, 1H), 3.96 - 3.87 (m, 2H), 3.77 - 3.60 (m, 5H), 3.42 (s, 3H), 3.39 (dd, *J* = 10.4, 3.6 Hz, 1H), 1.10 (s, 9H), 1.03 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.0, 168.3, 138.6, 138.0, 136.8, 134.1, 133.9, 132.6, 131.3, 128.6, 128.4, 128.3, 128.0, 127.9, 127.9, 127.7, 123.3, 123.2, 98.8, 96.9, 80.6, 73.8, 73.0, 72.1, 70.5, 70.3, 69.9, 69.7, 69.1, 68.4, 67.0, 63.2, 55.6, 50.8, 27.7, 27.5, 23.5, 20.9; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{50}H_{60}N_4O_{11}Si$ 943.3926; Found: 943.3911.

2'-Cyanoethyl 3-*O*-benzyl-4,6-*O*-di-*tert*-butylsilylene- 2-deoxy-2-phthalimido-α-D-galactopyranoside (G37)



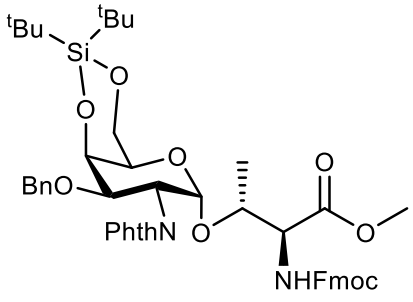
Yield: 48 mg (81%); White solid (from PE-CH_2Cl_2), mp 91°C. R_f = 0.50 (PE/EA, 20:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82 (dd, *J* = 18.4, 6.8 Hz, 2H), 7.74 - 7.66 (m, 2H), 7.34 - 7.29 (m, 2H), 7.26 - 7.17 (m, 3H), 5.10 (dd, *J* = 11.6, 2.8 Hz, 1H), 5.03 (d, *J* = 3.2 Hz, 1H), 4.95 (dd, *J* = 11.6, 3.6 Hz, 1H), 4.69 - 4.63 (m, 2H), 4.59 (d, *J* = 11.6 Hz, 1H), 4.29 (dd, *J* = 12.8, 2.0 Hz, 1H), 4.20 (dd, *J* = 12.8, 2.0 Hz, 1H), 3.92 - 3.83 (m, 2H), 3.62 -3.55 (m, 1H), 2.58 - 2.51 (m, 2H), 1.14 (s, 9H), 1.06 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.3, 168.0, 138.5, 134.2, 133.9, 132.7, 131.4, 128.4, 128.1, 127.7, 123.3, 123.2, 117.5, 98.8, 72.1, 70.7, 69.9, 68.5, 67.4, 63.1, 50.8, 27.7, 27.5, 23.6, 20.9, 19.0; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{32}H_{40}N_2O_7Si$ 615.2503; Found: 615.2502.

Methyl (3'-*O*-benzyl- 4',6'-*O*-di-*tert*-butylsilylene -2'-deoxy-2'-phthalimido-α-D-galactopyranosyl)-(1→4)-2, 3-di-*O*-benzyl-α-D-glucuronide methyl ester (G38)



Yield: 83 mg (90%); White needle (from PE-EA), mp 172℃. R_f = 0.60 (PE/EA, 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 - 7.72 (m, 1H), 7.65 -7.60 (m, 1H), 7.60 - 7.56 (m, 2H), 7.30 - 7.26 (m, 2H), 7.24 - 7.16 (m, 11H), 7.06 - 7.02 (m, 2H), 5.65 (d, *J* = 3.6 Hz, 1H), 4.96 (dd, *J* = 11.6, 3.2 Hz, 1H), 4.91 (dd, *J* = 11.6, 2.4 Hz, 1H), 4.67 (d, *J* = 11.2 Hz, 1H), 4.62 (d, *J* = 11.6 Hz, 1H), 4.58 - 4.54 (m, 2H), 4.52 (d, *J* = 1.6 Hz, 1H), 4.49 (d, *J* = 3.6 Hz, 1H), 4.40 (d, *J* = 12.0 Hz, 1H), 4.19 - 4.13 (m, 4H), 4.05 (dd, *J* = 10.0, 8.4 Hz, 1H), 3.72 (s, 4H), 3.59 (s, 1H), 3.49 (dd, *J* = 9.6, 3.6 Hz, 1H), 3.34 (s, 3H), 1.13 (s, 9H), 1.04 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.9, 168.9, 167.9, 138.6, 138.1, 137.7, 134.0, 133.7, 132.4, 131.2, 128.6, 128.4, 128.3, 128.2, 128.0, 127.6, 127.4, 127.1, 123.2, 123.1, 98.3, 98.2, 80.7, 80.0, 74.3, 74.2, 73.5, 72.0, 70.6, 70.5, 70.2, 68.4, 67.4, 56.0, 52.5, 50.7, 27.7, 27.5, 23.6, 21.0; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{51}H_{61}NO_{13}Si$ 946.3810; Found: 946.3804.

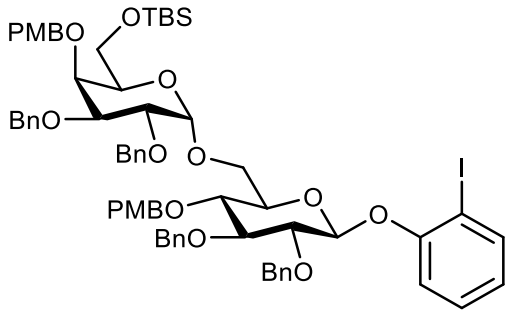
_O_-(3-_O_-benzyl-4, 6-_O_-di-_tert_-butylsilylene- 2-deoxy-2-phthalimido-α-D-galactopyranosyl)-_N_- 9-fluorenylmethyloxycarbonyl -L-threonine methyl ester (G39)



Yield: 73 mg (83%); White solid (from hot ethanol), mp 92℃. R_f = 0.40 (PE/EA, 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89 - 7.79 (m, 6H), 7.68 (dd, *J* = 5.5, 3.0 Hz, 2H), 7.47 - 7.41 (m, 2H), 7.39 (dd, *J* = 7.4, 1.3 Hz, 1H), 7.37 - 7.33 (m, 1H), 7.33 - 7.29 (m, 2H), 7.24 - 7.16 (m, 3H), 5.86 (d, *J* = 10.4 Hz, 1H), 5.05 (dd, *J* = 11.6, 2.8 Hz, 1H), 4.99 (d,

J = 3.2 Hz, 1H), 4.92 (dd, *J* = 11.6, 3.6 Hz, 1H), 4.68 (d, *J* = 11.6 Hz, 1H), 4.65 (d, *J* = 2.8 Hz, 1H), 4.60 (d, *J* = 11.6 Hz, 1H), 4.47 - 4.28 (m, 5H), 4.24 - 4.16 (m, 2H), 3.88 (s, 1H), 3.13 (s, 3H), 1.32 (d, *J* = 6.4 Hz, 3H), 1.15 (s, 9H), 1.07 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 171.0, 169.5, 169.1, 157.1, 144.2, 144.1, 141.5, 141.5, 138.6, 134.3, 133.9, 133.3, 131.4, 128.4, 127.9, 127.7, 127.3, 125.8, 125.7, 123.3, 123.1, 120.2, 120.1, 100.4, 77.3, 75.9, 72.2, 70.7, 70.2, 68.4, 67.4, 58.8, 52.0, 50.9, 47.4, 27.8, 27.5, 23.6, 20.9, 19.6; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{49}H_{56}N_2O_{11}Si$ 899.3551; Found: 899.3548.

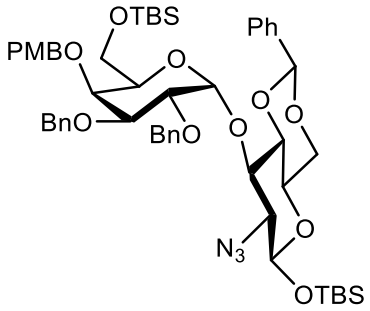
Iodophenyl (2', 3'-di-*O*-benzyl- 6'-*O*-*tert*-butyldimethylsilyl-4'-*O*-*p*-methoxybenzyl- α-D-galactopyranosyl)-(1→6)- 2, 3-di-*O*-benzyl-4-*O*-*p*-methoxylbenzyl-β-D-glucopyranside (G40)



Yield: 107 mg (85%); White solid (from PE-EA), mp 81℃. R_f = 0.45 (PE/EA, 6:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.45 -7.41 (m, 2H), 7.40 - 7.37 (m, 2H), 7.37 - 7.31 (m, 8H), 7.31 - 7.25 (m, 7H), 7.24 - 7.20 (m, 3H), 7.20 - 7.16 (m, 2H), 7.13 - 7.06 (m, 1H), 7.02 (dd, *J* = 8.4, 1.6 Hz, 1H), 6.86 - 6.79 (m, 4H), 6.69 (td, *J* = 7.2, 1.2 Hz, 1H), 5.26 (d, *J* = 10.4 Hz, 1H), 5.01 (d, *J* = 7.2 Hz, 1H), 4.97 - 4.92 (m, 2H), 4.87 - 4.70 (m, 8H), 4.55 (d, *J* = 10.8 Hz, 1H), 4.51 (d, *J* = 10.8 Hz, 1H), 4.02 (dd, *J* = 10.0, 3.6 Hz, 1H), 3.87 (dd, *J* = 10.0, 2.8 Hz, 1H), 3.81 - 3.74 (m, 9H), 3.73 - 3.61 (m, 5H), 3.55 (dd, *J* = 10.0, 6.4 Hz, 1H), 3.47 (dd, *J* = 10.0, 6.4 Hz, 1H), 0.85 (s, 9H), -0.01 (s, 3H), -0.04 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.5, 159.3, 156.4, 139.8, 139.2, 139.0, 138.8, 138.5, 131.2, 130.4, 129.9, 129.8, 129.5, 129.0, 128.5, 128.5, 127.9, 127.8, 127.7, 127.6, 127.5, 124.0, 115.3, 114.0, 113.7, 100.9, 98.0, 86.3, 84.9, 82.0, 78.7, 77.7, 77.0, 75.8, 75.7, 75.3, 74.9, 74.8, 74.5, 73.2, 72.9, 71.3, 66.2, 62.1, 55.4, 55.4, 26.1, 18.3, -5.2, -5.3; HRMS (ESI): m/z [M + Na]$^+$ calcd for

$C_{68}H_{79}IO_{13}Si$ 1281.4233; Found: 1281.4235.

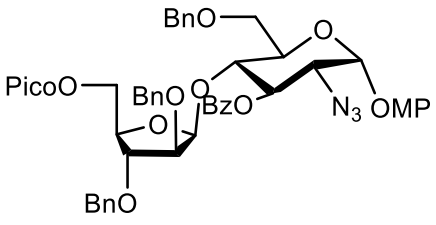
***Tert*-butyldimethylsilyl (2', 3'-di-*O*-benzyl-6'-*O*-*tert*-butyldimethylsilyl-4'-*O*-*p*-methoxybenzyl- α-D-galactopyranosyl)- (1→3)- 2-azido-4, 6-*O*-benzylidene-2-deoxy -β-D-glucopyranoside (G41)**



Yield: 77 mg (78%); White solid (from PE-ethyl ether). R_f = 0.15 (PE/EA, 20:1). mp 63 ℃.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 - 7.37 (m, 2H), 7.36 - 7.30 (m, 7H), 7.30 - 7.27 (m, 1H), 7.24 -7.19 (m, 2H), 7.18 -7.09 (m, 3H), 7.08 -7.03 (m, 2H), 6.82 -6.77 (m, 2H), 5.58 (d, *J* = 2.4 Hz, 1H), 5.40 (s, 1H), 4.88 (d, *J* = 11.6 Hz, 1H), 4.83 (d, *J* = 10.8 Hz, 1H), 4.72 (d, *J* = 11.6 Hz, 1H), 4.66 (d, *J* = 7.6 Hz, 1H), 4.59 -4.50 (m, 2H), 4.47 (d, *J* = 12.0 Hz, 1H), 4.25 (dd, *J* = 10.8, 5.2 Hz, 1H), 4.13 (t, *J* = 6.8 Hz, 1H), 4.01 -3.95 (m, 3H), 3.86 (t, *J* = 9.6 Hz, 1H), 3.80 (d, *J* = 9.2 Hz, 1H),3.78 (s, 3H), 3.75 (d, *J* = 10.4 Hz, 1H), 3.70 -3.59 (m, 2H), 3.48 -3.38 (m, 2H), 0.95 (s, 9H), 0.91 (s, 9H), 0.17 (s, 3H), 0.16 (s, 3H), 0.07 (s, 3H), 0.07 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.3, 139.2, 138.5, 137.0, 131.2, 130.0, 129.5, 128.5, 128.4, 128.2, 127.6, 127.5, 127.5, 127.4, 126.3, 113.7, 101.9, 98.0, 96.9, 82.4, 78.6, 75.9, 74.7, 74.7, 73.4, 73.2, 72.0, 71.3, 68.9, 67.8, 66.3, 61.6, 55.4, 26.0, 25.7, 18.4, 18.1, -4.2, -5.0, -5.3, -5.4; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{53}H_{73}N_3O_{11}Si_2$ 1006.4682; Found: 1006.4685.

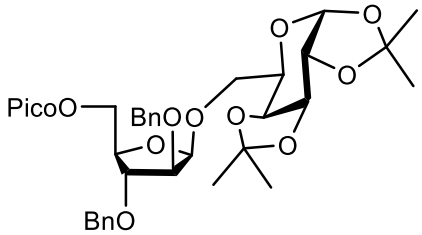
***p*-Methoxyphenyl (2, 3-di-*O*-benzyl-5-*O*-picolinoyl-β-D-arabinofuranosyl)-(1→4)- 2-azido-3-*O*-benzoyl- 6-*O*-benzyl-2-deoxy-α-D-glucopyranoside (G42)**



Yield: 74 mg (80%); colorless oil. R_f = 0.23 (toluene/EA, 5:1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.71 (d, *J* = 4.0 Hz, 1H), 8.10 - 8.02 (m, 3H), 7.71 (td, *J* = 7.6, 2.0 Hz, 1H), 7.51 - 7.45 (m, 1H), 7.41 - 7.25 (m, 12H), 7.24 - 7.15 (m, 6H), 7.13 - 7.08 (m, 2H), 6.86 - 6.80 (m, 2H), 5.90 (dd, *J* = 10.4, 8.4 Hz, 1H), 5.49 (d, *J* = 3.6 Hz, 1H), 5.08 (d, *J* = 4.4 Hz, 1H), 4.57 (s, 4H), 4.41 (d, *J* = 12.0 Hz, 1H), 4.33 - 4.26 (m, 3H), 4.19 (dd, *J* = 7.2, 6.0 Hz, 1H), 4.17 - 4.12 (m, 1H), 4.06 (dd, *J* = 10.4, 8.8 Hz, 1H), 3.97 - 3.90 (m, 3H), 3.78 (s, 3H), 3.70 (dd, *J* = 10.8, 1.6 Hz, 1H), 3.25 (dd, *J* = 10.8, 3.6 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.6, 164.6, 155.7, 150.7, 149.9, 148.0, 138.3, 137.9, 137.8, 137.0, 133.0, 130.3, 129.9, 128.5, 128.5, 128.4, 128.4, 127.9, 127.8, 127.8, 127.7, 127.7, 126.8, 125.5, 118.6, 114.8, 103.3, 98.6, 83.4, 82.2, 78.6, 77.8, 73.4, 72.7, 72.6, 71.8, 70.8, 68.3, 66.0, 61.5, 55.8; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{52}H_{50}N_4O_{12}$ 945.3323; Found: 945.3323.

(2, 3-Di-*O*-benzyl-5-*O*-picolinoyl-β-D-arabinofuranosyl)-(1→6)-1, 2:3, 4-di-*O*-isopropylidene-α-D-galactopyranoside (G43)

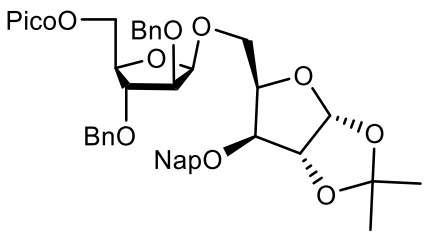


Yield: 60 mg (88%); colorless oil. R_f = 0.27 (toluene/EA, 2:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.76 (d, *J* = 4.0 Hz, 1H), 8.09 (d, *J* = 7.6 Hz, 1H), 7.79 (td, *J* = 7.6, 2.0 Hz, 1H), 7.48 - 7.44 (m, 1H), 7.43 - 7.40 (m, 2H), 7.37 - 7.31 (m, 3H), 7.30 - 7.24 (m, 5H), 5.54 (d, *J* = 4.8 Hz, 1H), 5.20 (d, *J* = 4.4 Hz, 1H), 4.79 - 4.73 (m, 2H), 4.65 (d, *J* = 11.6 Hz, 1H), 4.62 - 4.50 (m, 4H), 4.33 - 4.25 (m, 3H), 4.22 (dd, *J* = 8.0, 2.0 Hz, 1H), 4.10 (dd, *J* = 6.8, 4.4 Hz, 1H), 4.07- 4.02 (m, 1H), 3.88 (dd, *J* = 11.2, 4.4 Hz, 1H), 3.71 (dd, *J* = 11.6, 7.6 Hz, 1H), 1.45 (s, 3H), 1.41 (s, 3H), 1.31 (s, 3H), 1.31 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 164.7, 150.1, 147.9, 138.1, 138.0, 137.1, 128.5, 128.1, 127.9, 127.8, 127.8, 127.0, 125.4, 109.4, 108.6, 101.3, 96.4, 83.9, 83.1, 78.9, 72.5, 72.1, 71.1, 70.7, 70.6, 68.1, 67.6, 66.3, 26.1, 26.0, 25.0, 24.4; HRMS (ESI): m/z [M + Na]$^+$ calcd for $C_{37}H_{43}NO_{11}$ 700.2734; Found: 700.2731.

(2, 3-Di-*O*-benzyl-5-*O*-picolinoyl-β-D-arabinofuranosyl)-(1→5)-1, 2 -*O*-

isopropylidene-3-*O*-naphthylmethyl-α-D-xylofuranoside (G44)



Yield: 56 mg (75%); colorless oil. R_f = 0.28 (CH_2Cl_2/CH_3OH, 200:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.71 (d, *J* = 4.4 Hz, 1H), 7.98 (d, *J* = 7.6 Hz, 1H), 7.82 - 7.75 (m, 3H), 7.72 (s, 1H), 7.65 (t, *J* = 8.0 Hz, 1H), 7.47 - 7.43 (m, 2H), 7.42 - 7.37 (m, 4H), 7.35 - 7.25 (m, 8H), 5.98 (d, *J* = 4.0 Hz, 1H), 5.17 (d, *J* = 4.0 Hz, 1H), 4.81 - 4.74 (m, 2H), 4.72 (d, *J* = 11.6 Hz, 1H), 4.68 - 4.61 (m, 3H), 4.57 (d, *J* = 11.6 Hz, 1H), 4.52 (dd, *J* = 11.2, 6.4 Hz, 1H), 4.48 - 4.41 (m, 2H), 4.32 - 4.24 (m, 2H), 4.10 (dd, *J* = 6.4, 4.0 Hz, 1H), 4.03 - 3.97 (m, 2H), 3.88 (dd, *J* = 11.6, 7.2 Hz, 1H), 1.45 (s, 3H), 1.30 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 164.7, 149.9, 147.7, 138.1, 137.8, 137.1, 135.0, 133.3, 133.2, 128.5, 128.5, 128.4, 128.0, 128.0, 127.8, 127.8, 127.0, 126.6, 126.3, 126.1, 125.6, 125.4, 111.8, 105.4, 101.7, 84.0, 82.6, 82.3, 82.2, 80.2, 78.9, 72.6, 72.3, 72.1, 67.2, 66.6, 26.9, 26.4; HRMS (ESI): m/z $[M + Na]^+$ calcd for $C_{44}H_{45}NO_{10}$ 770.2941; Found: 770.2933.

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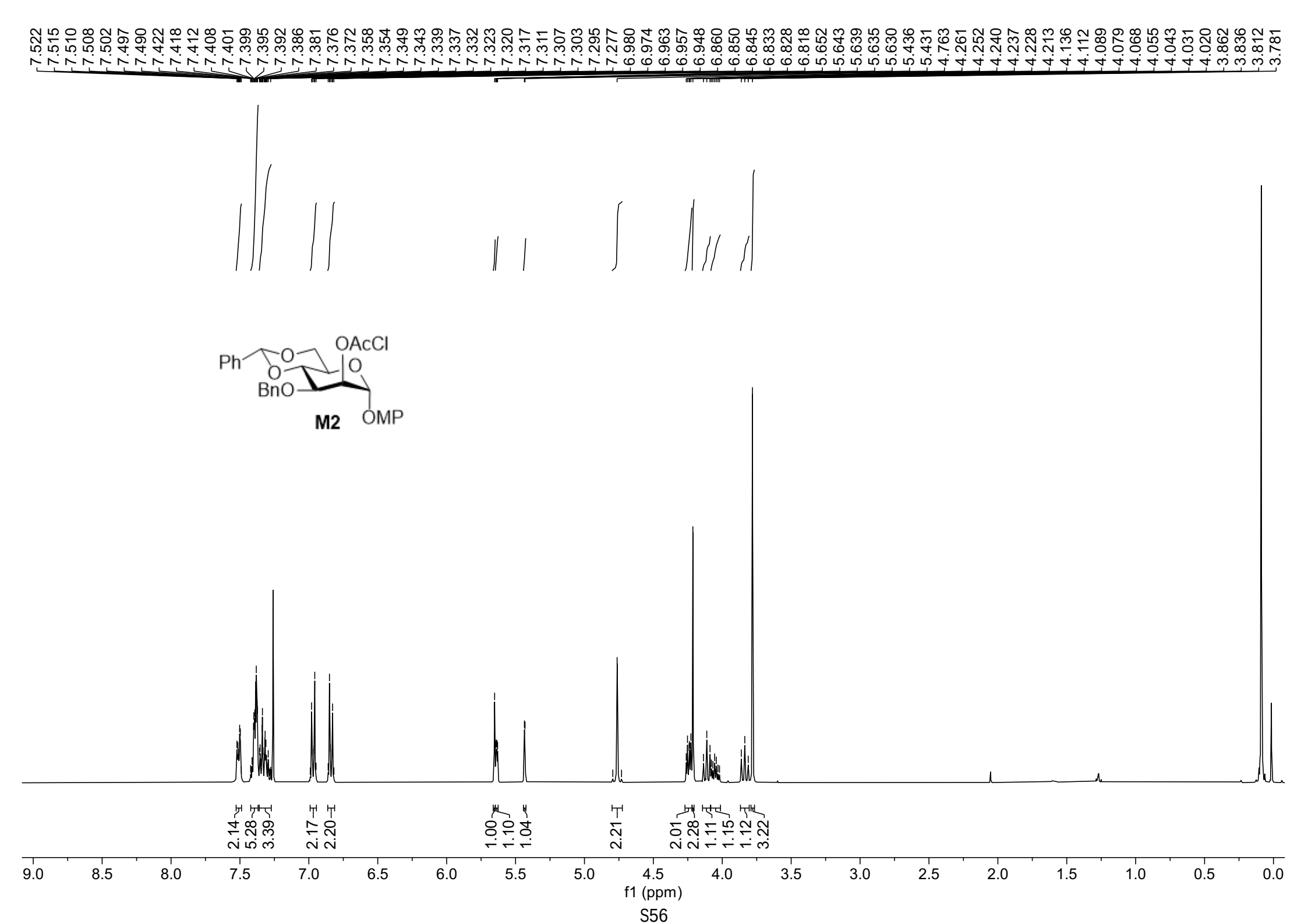
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OAcCl
Ph
O
O
O
BnO
OMP
M2
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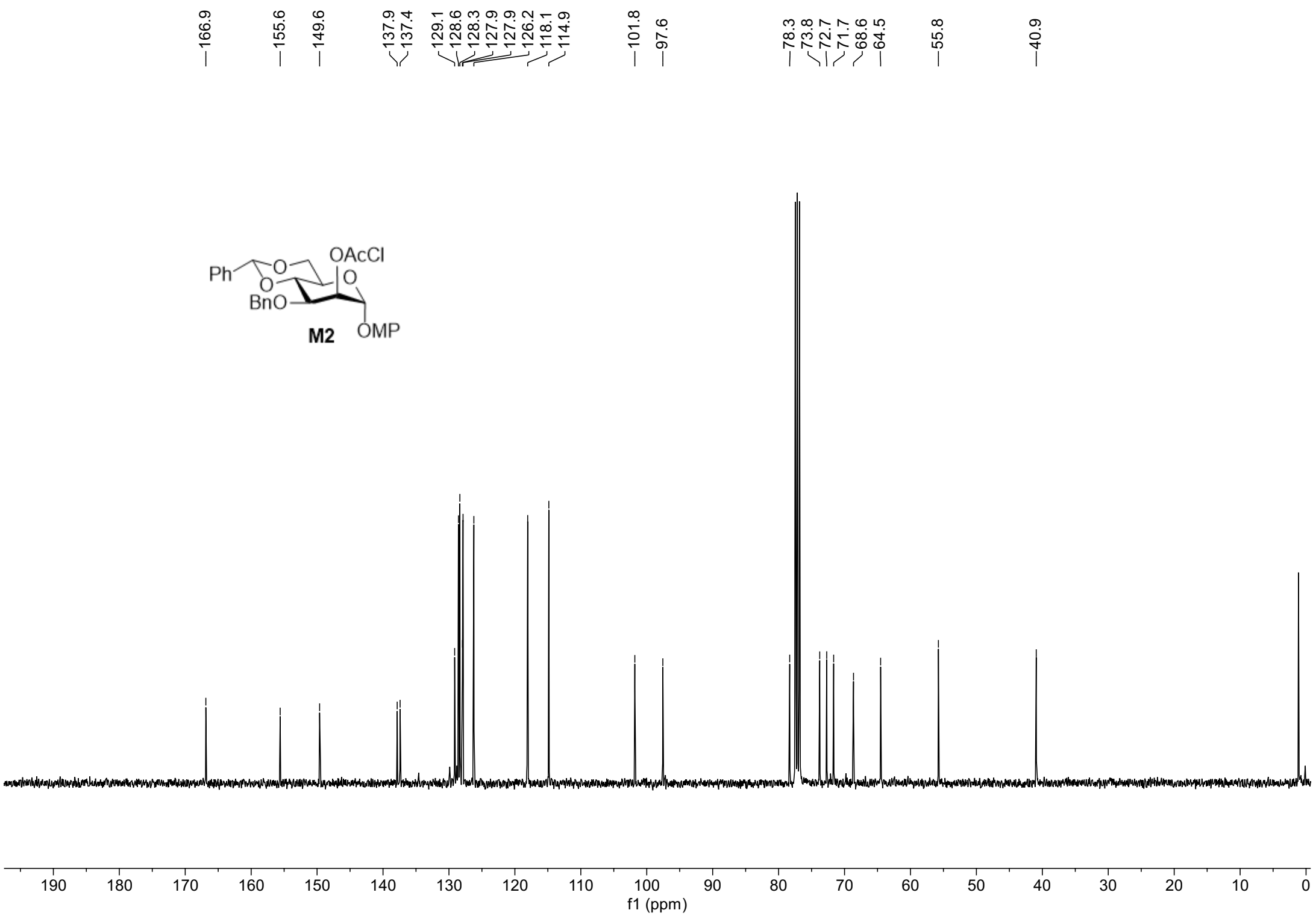
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55.8
40.9
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Ph
O
O
O
BnO
OMP
M2
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180
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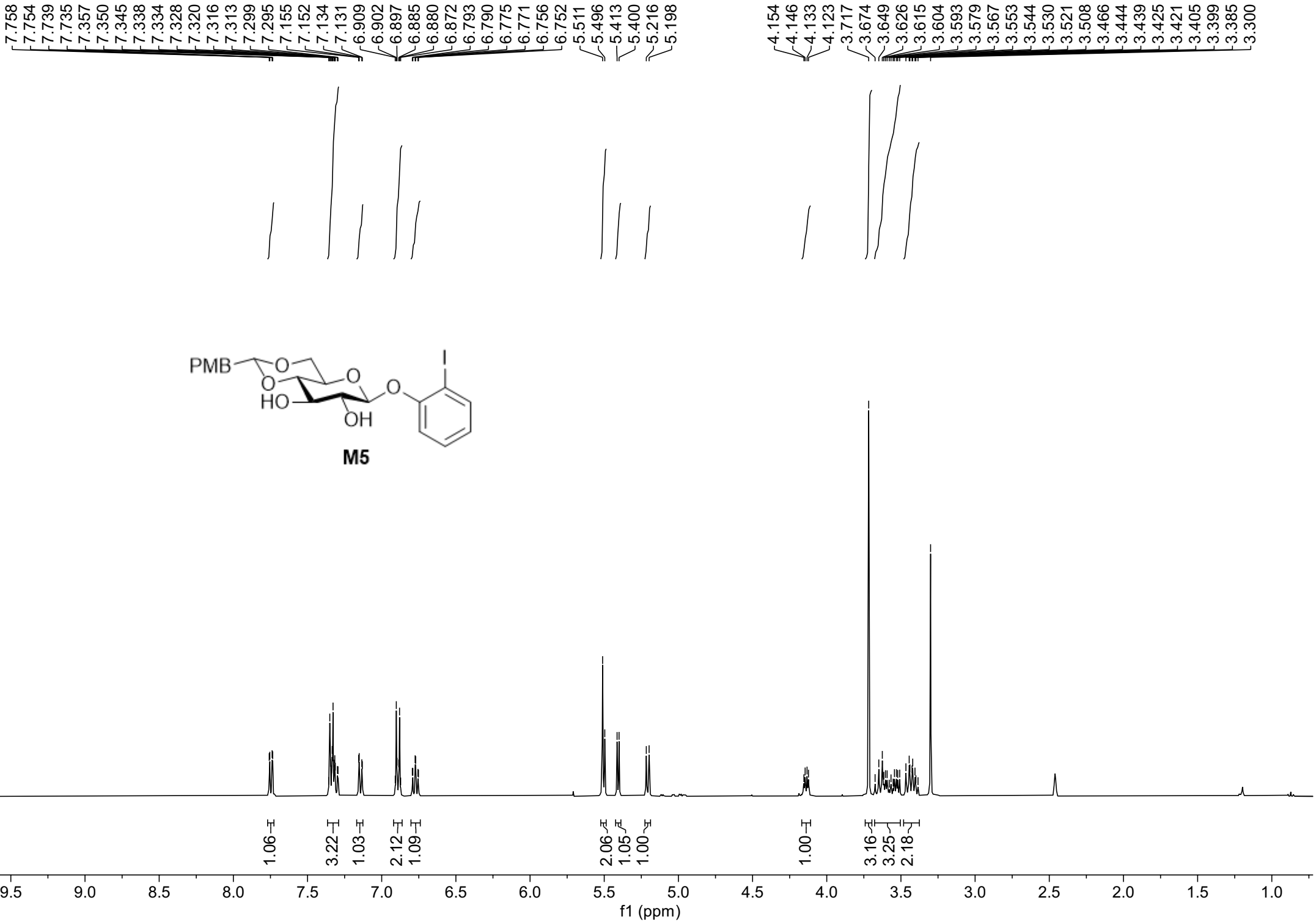
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3.385
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PMB
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O
O
HO
OH
O
I
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3.22
1.03
2.12
1.09
2.06
1.05
1.00
1.00
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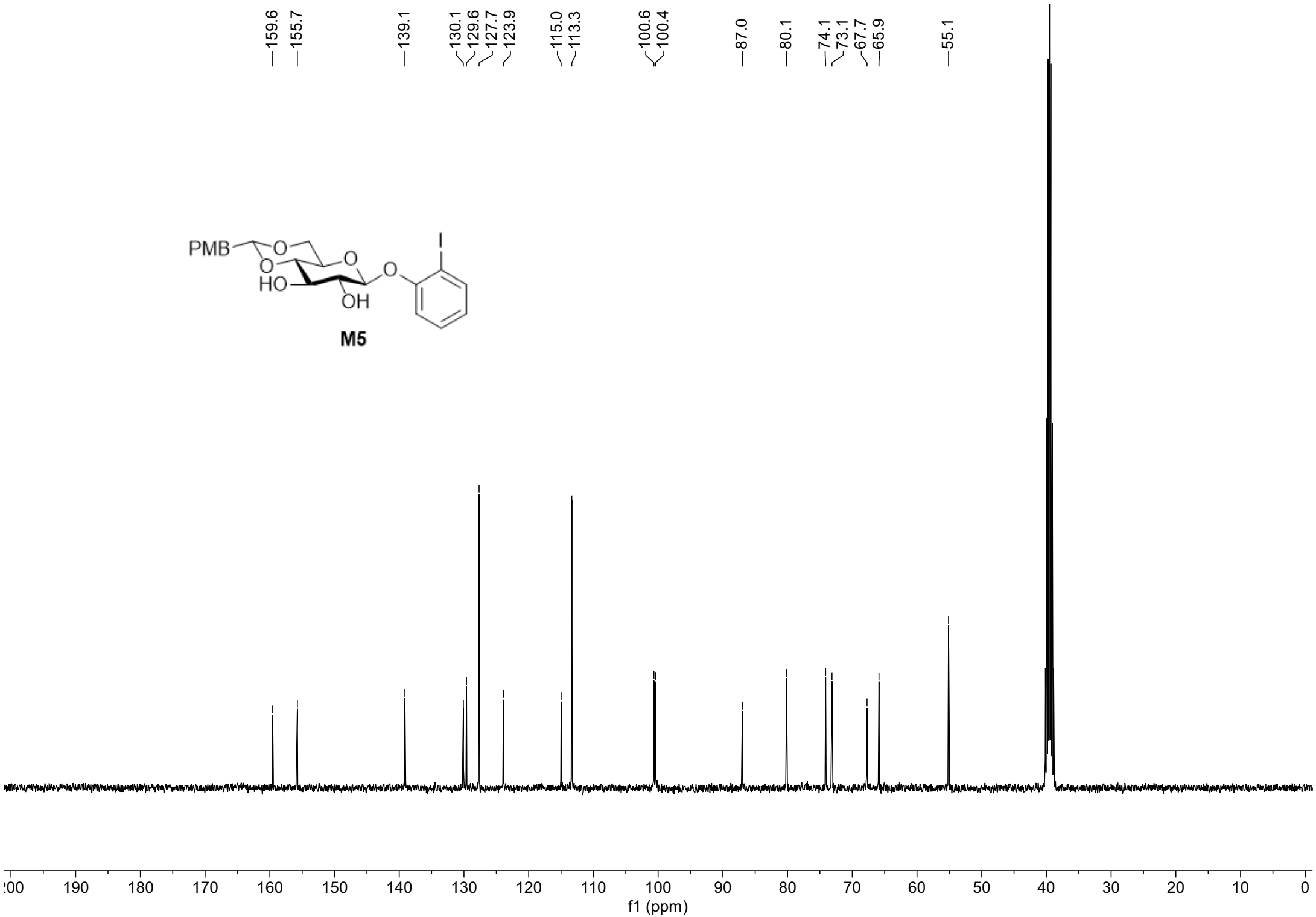
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O
HO
OH
O
I
M5
200
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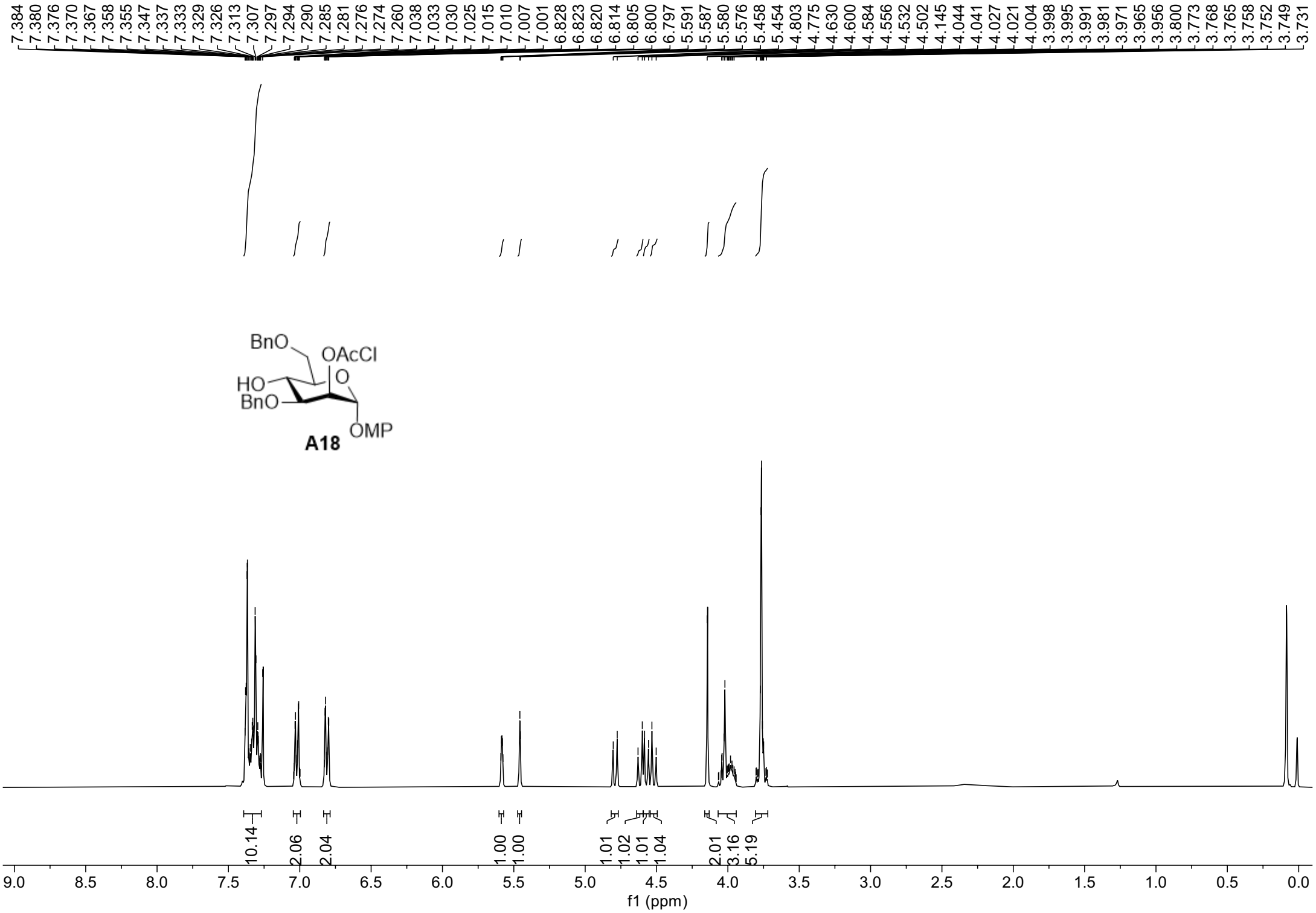
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BnO
OAcCl
HO
O
BnO
OMP
A18
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2.04
1.00
1.00
1.01
1.02
1.01
1.04
2.01
3.16
5.19
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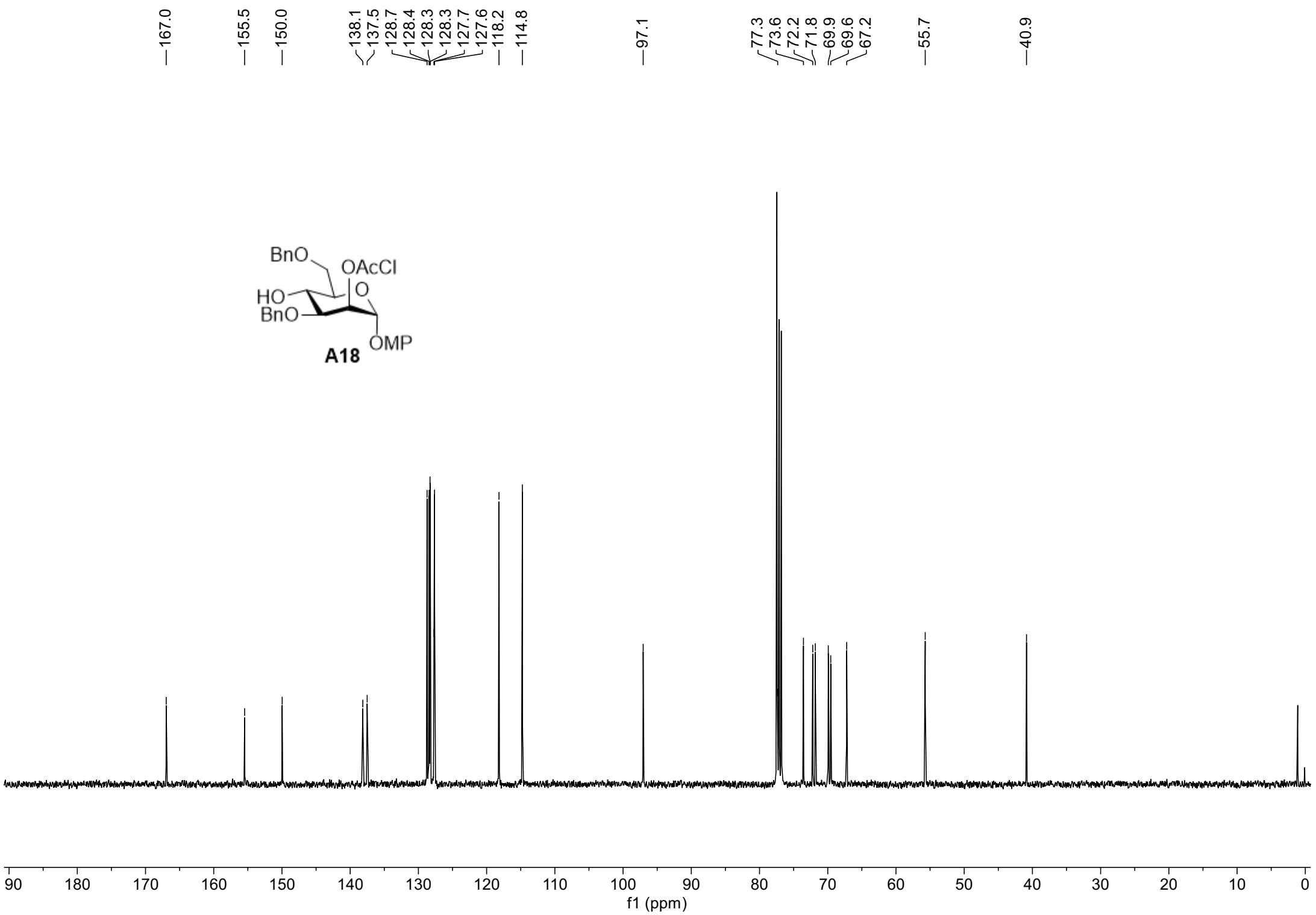
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67.2
55.7
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BnO
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HO
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BnO
OMP
A18
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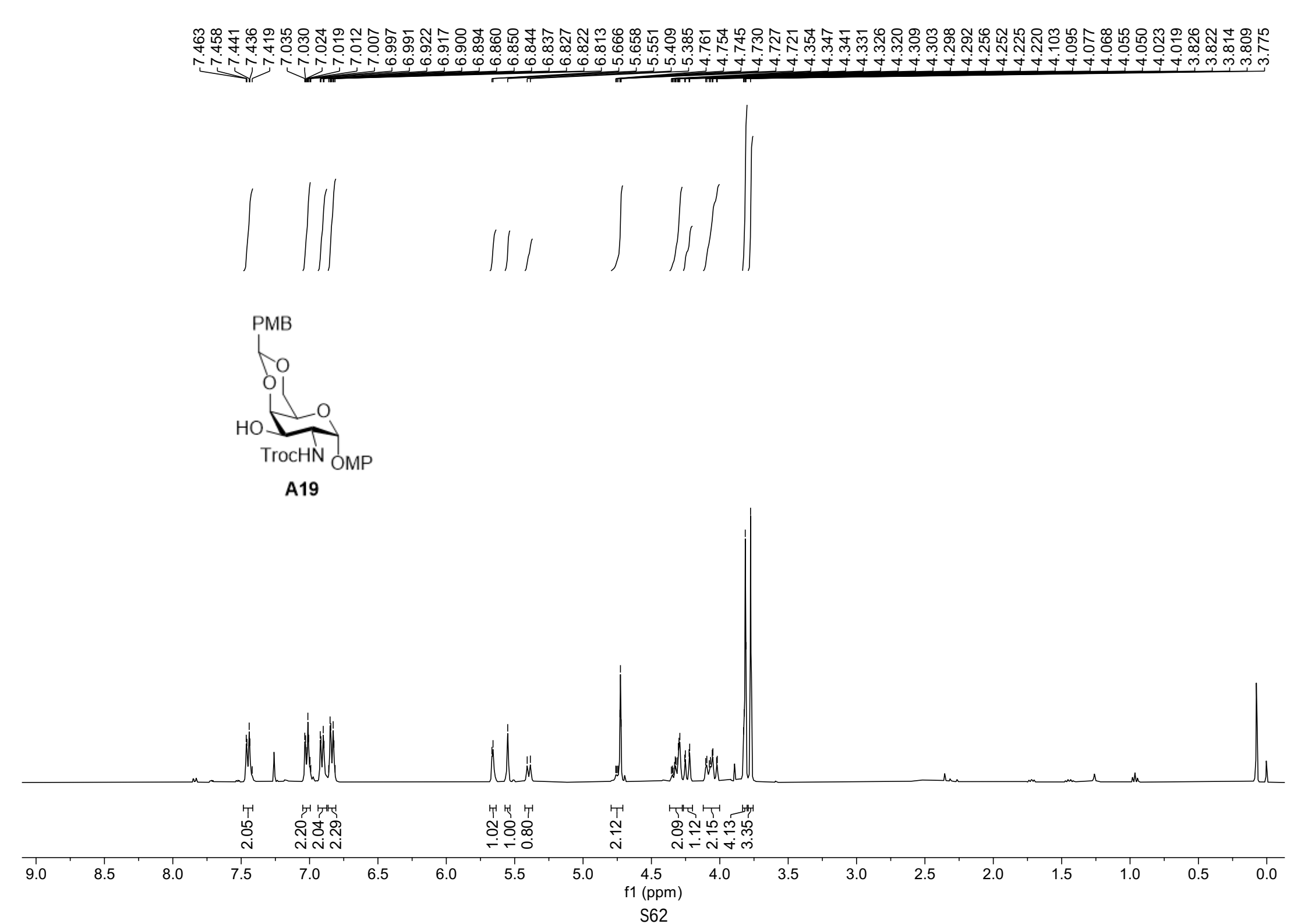
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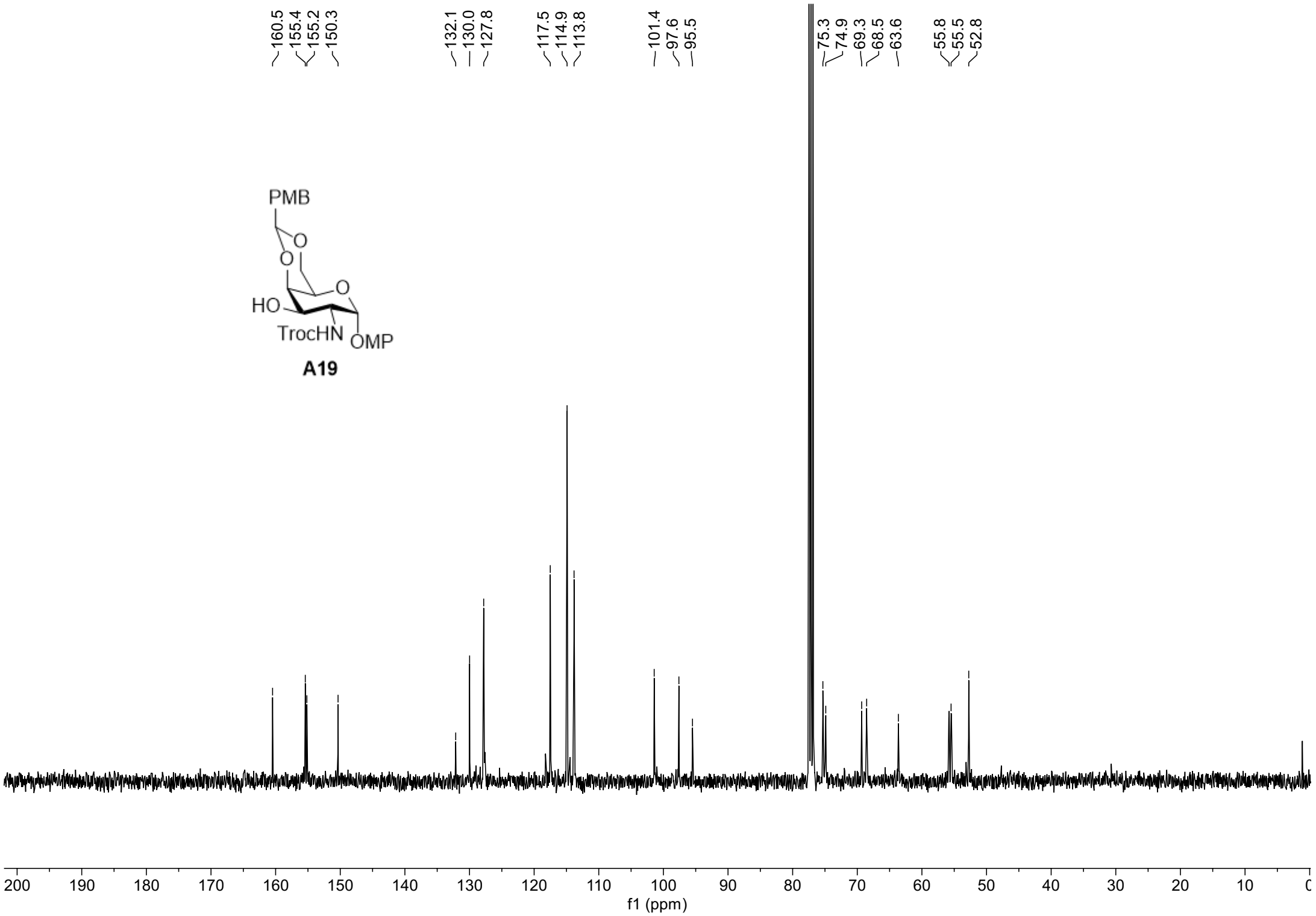
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55.8
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52.8
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HO
TrocHN
OMP
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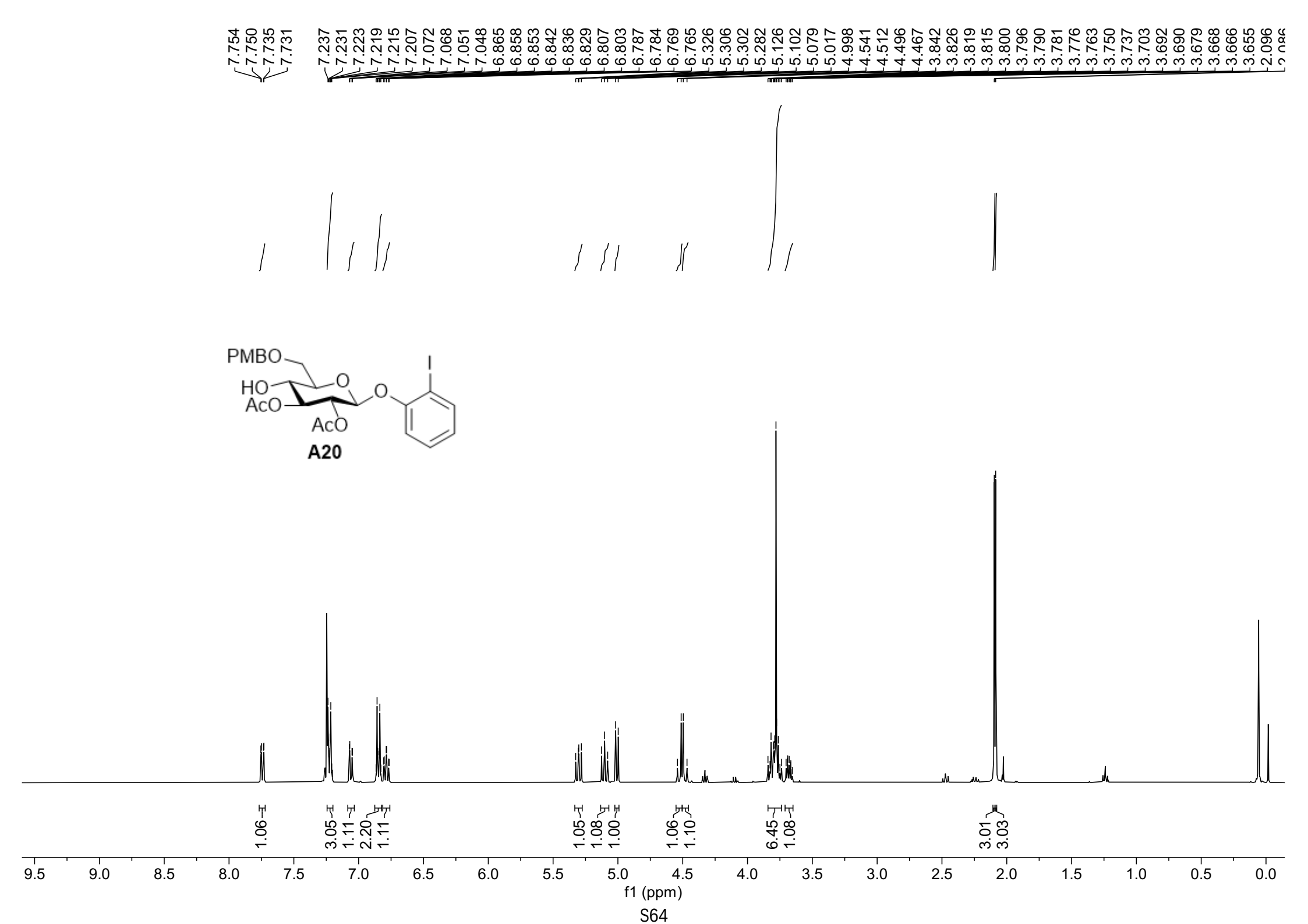
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AcO
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O
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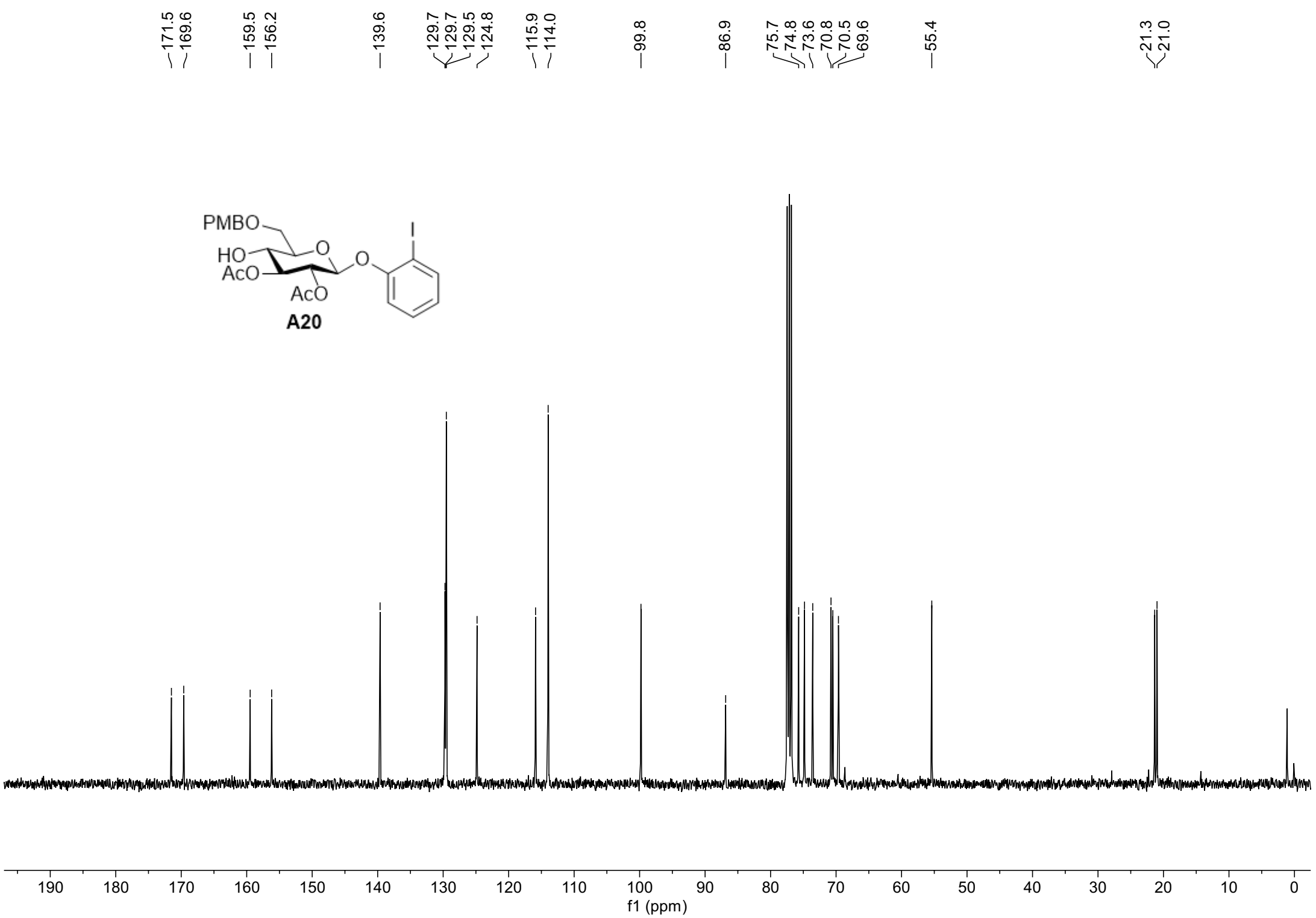
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AcO
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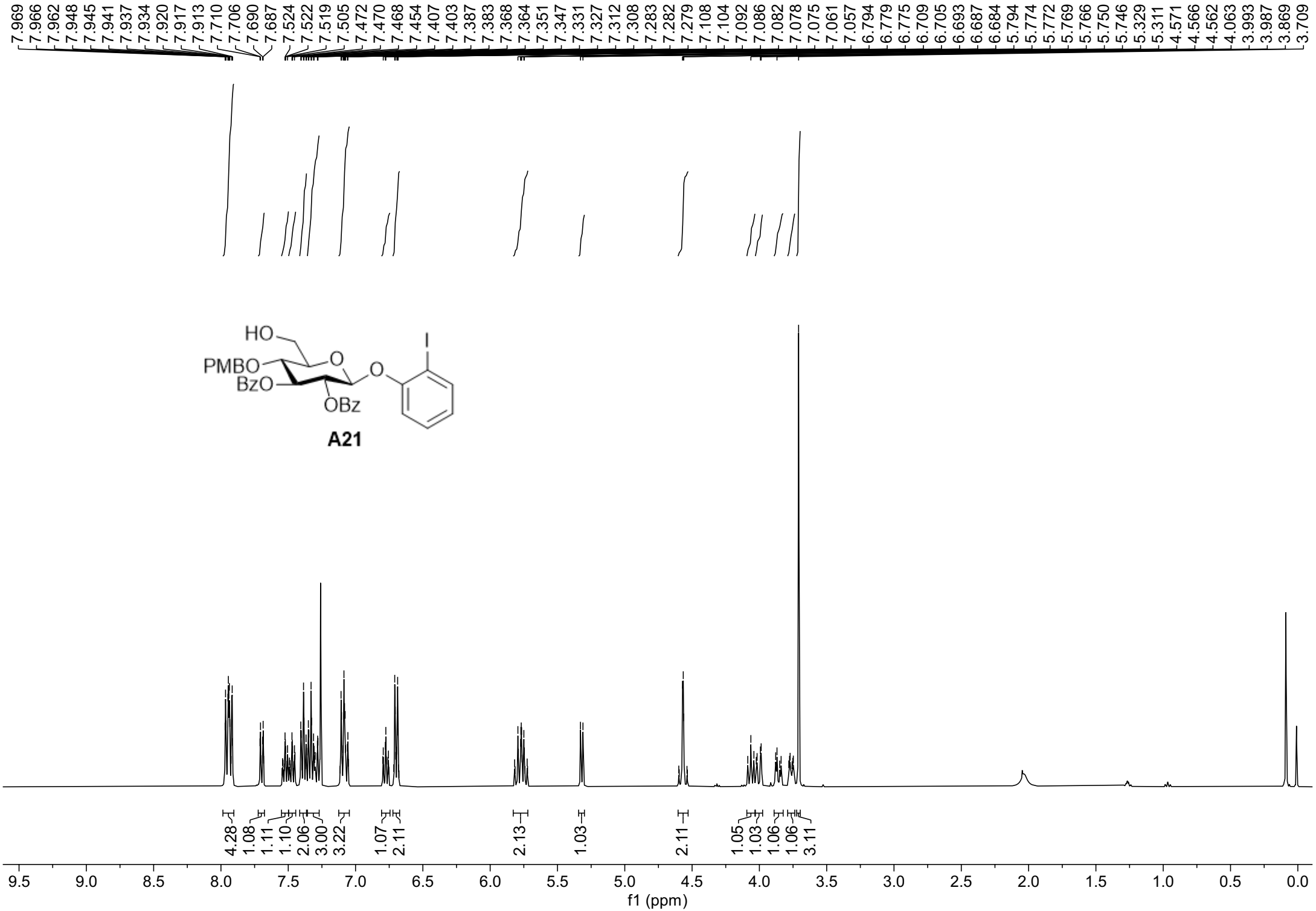
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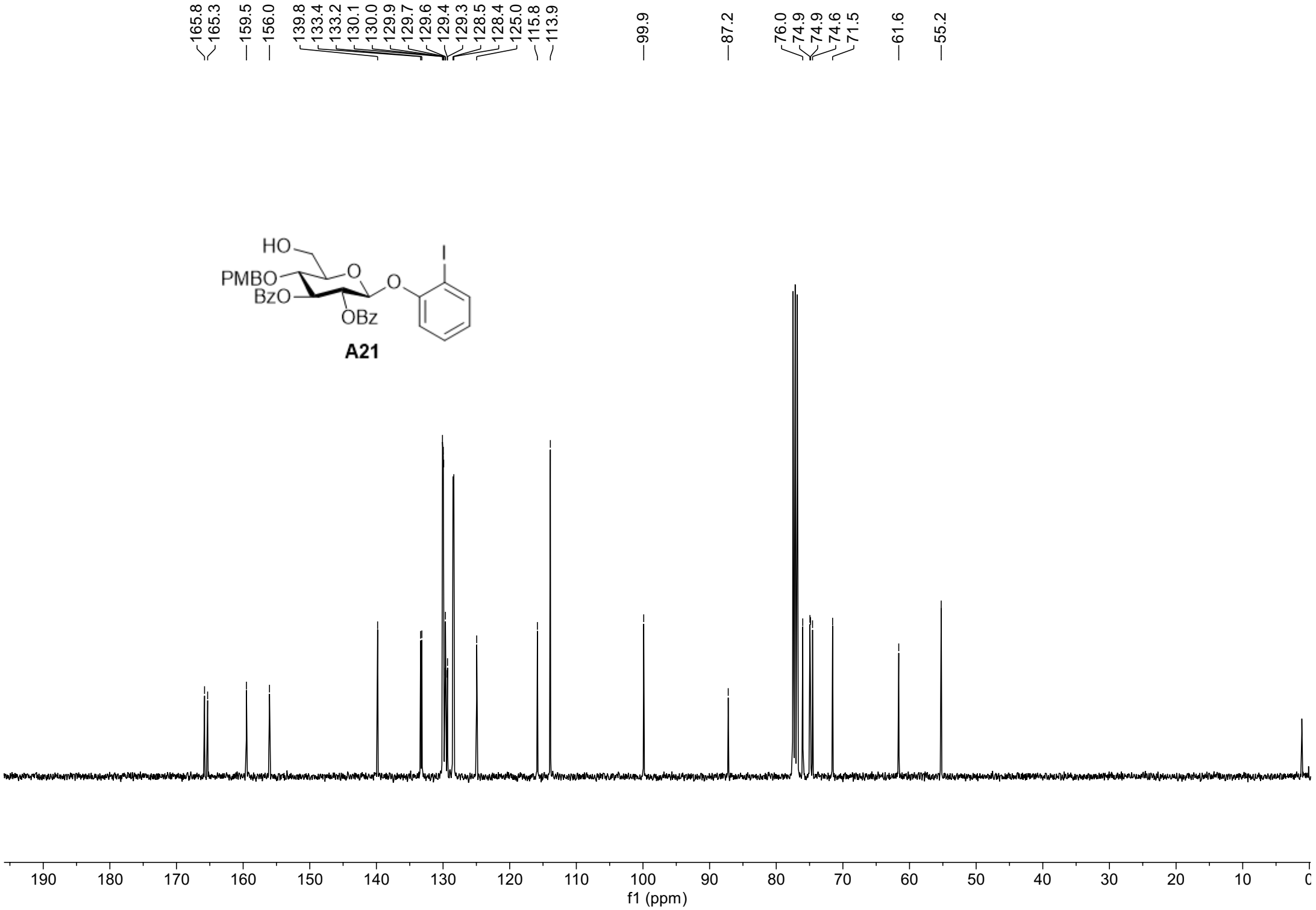
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55.2
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OBz
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A21
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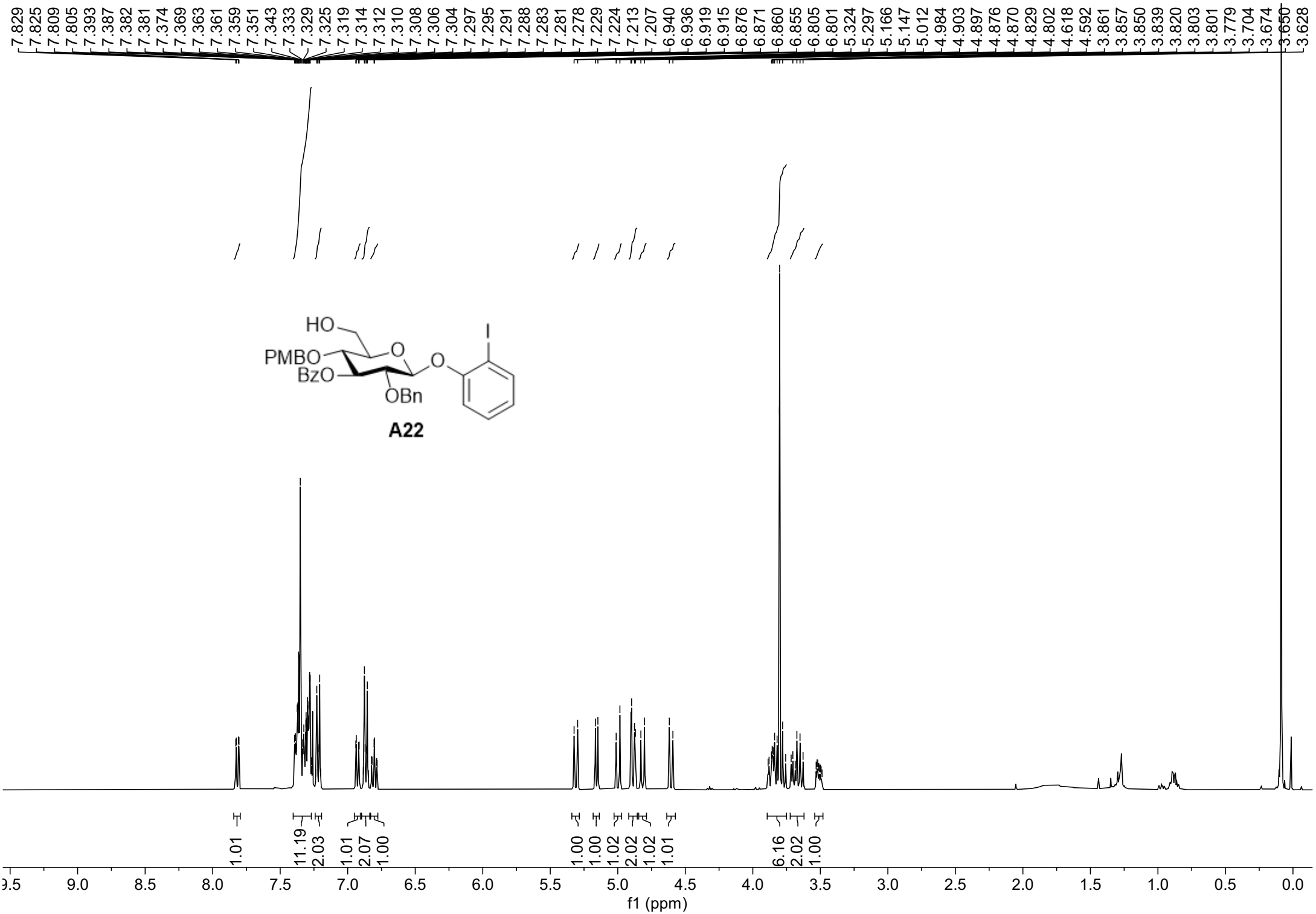
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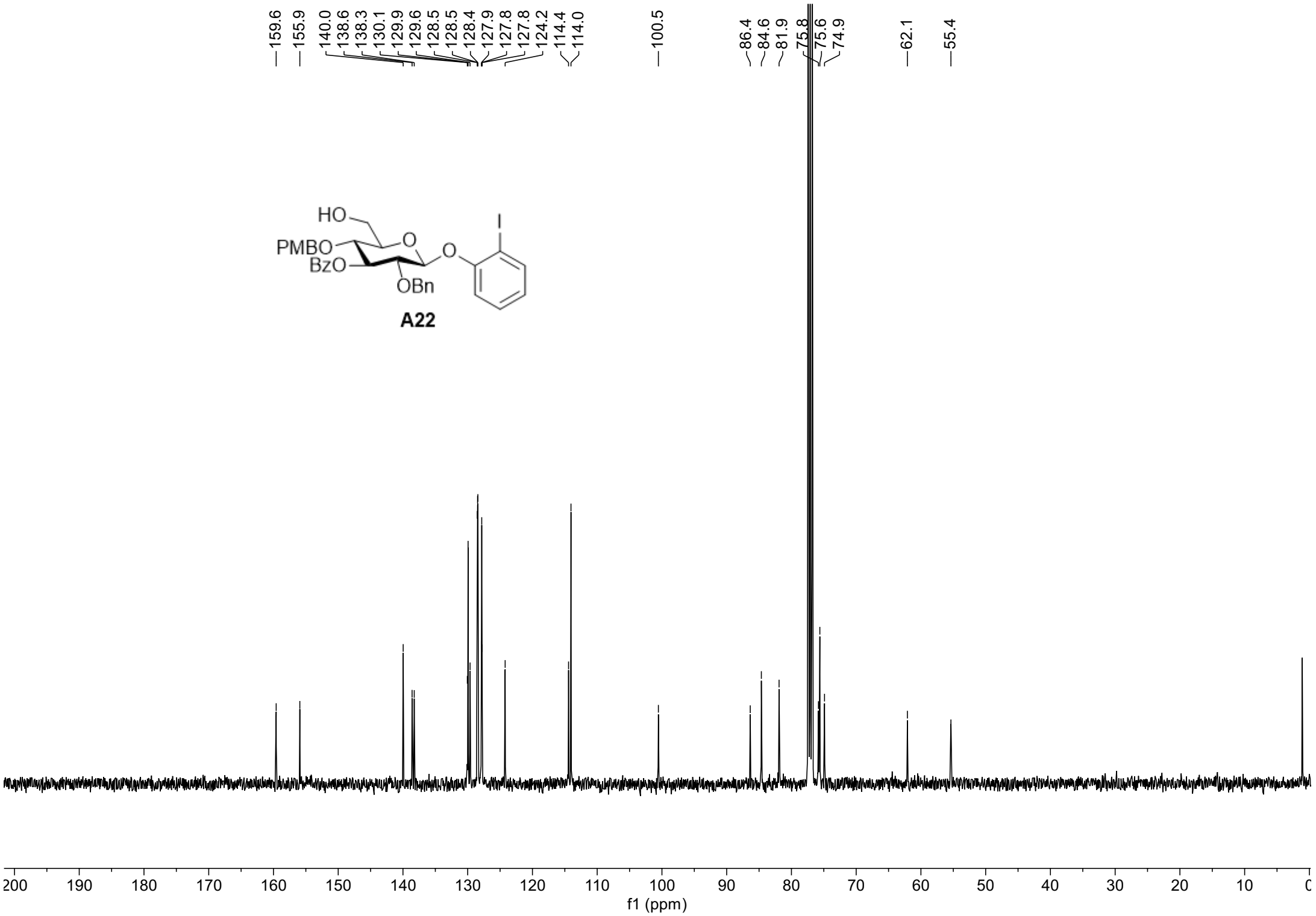
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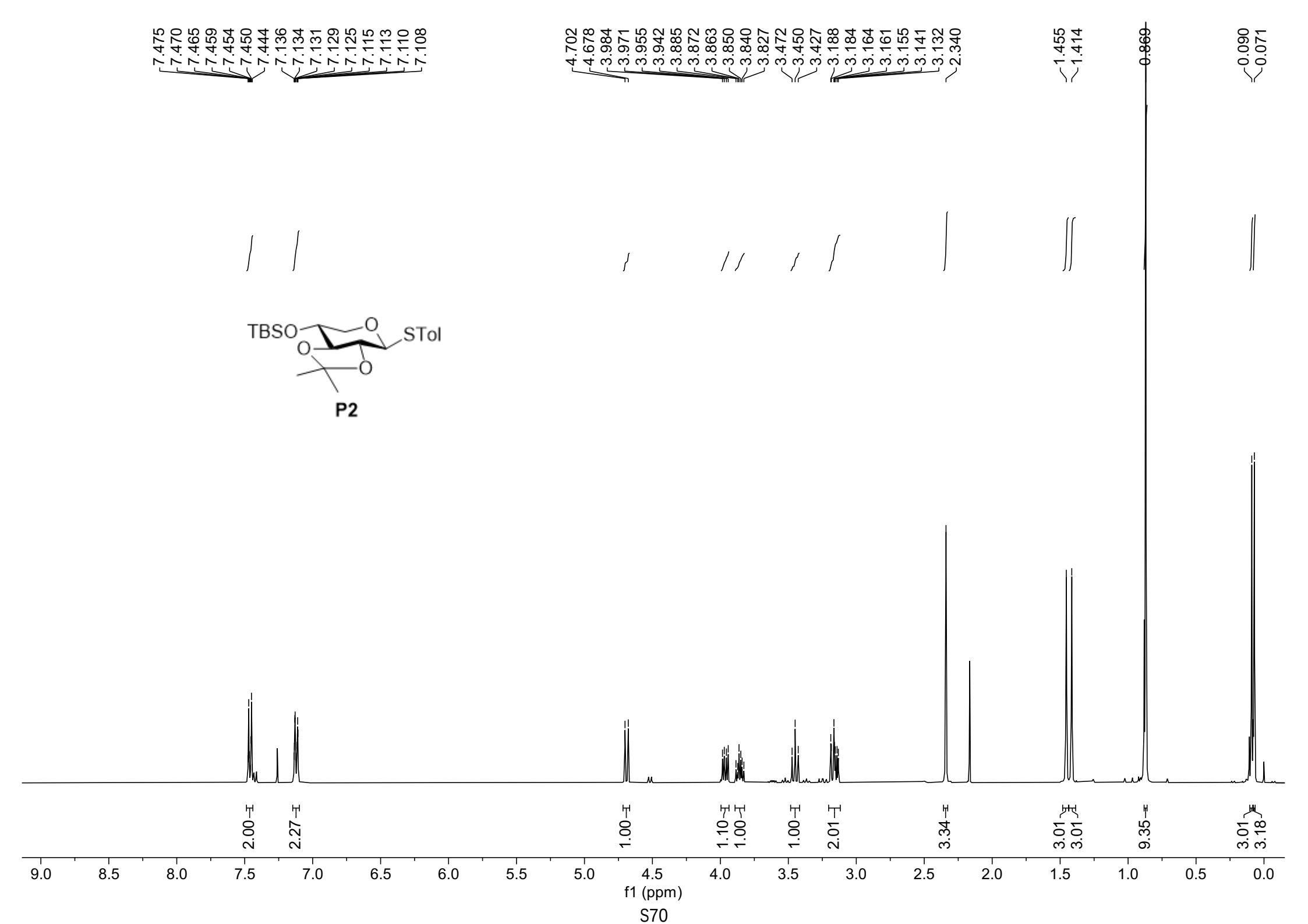
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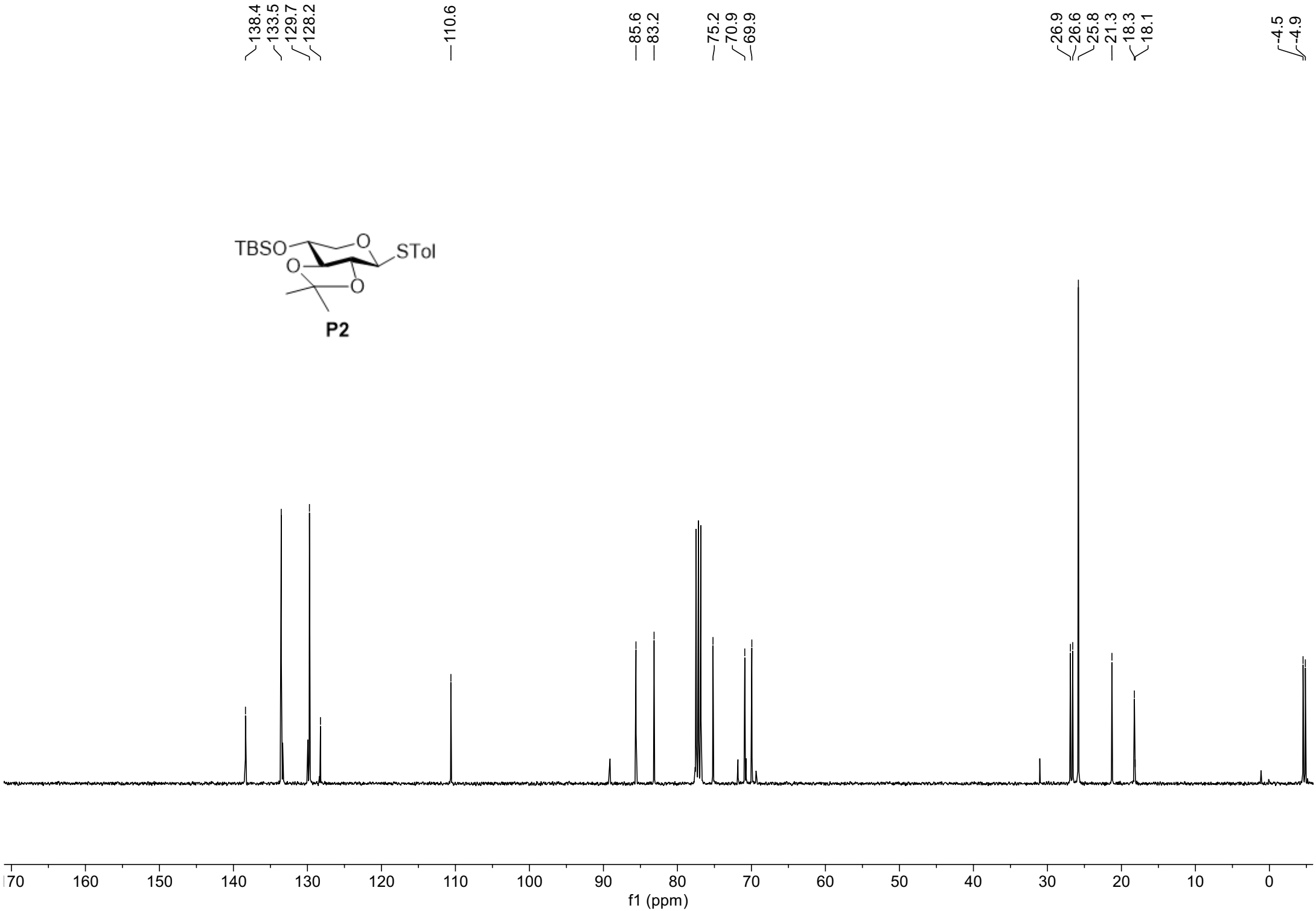
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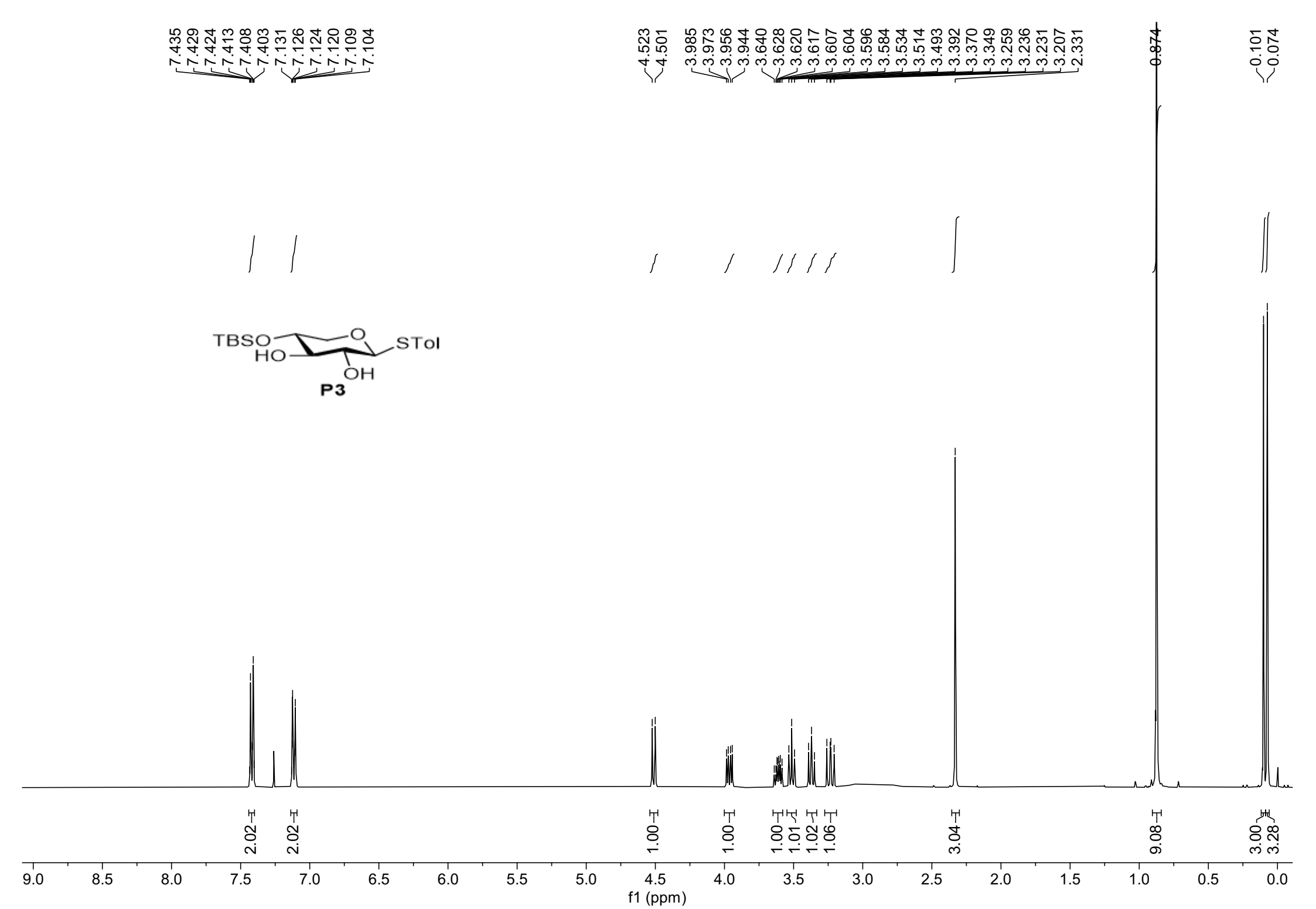
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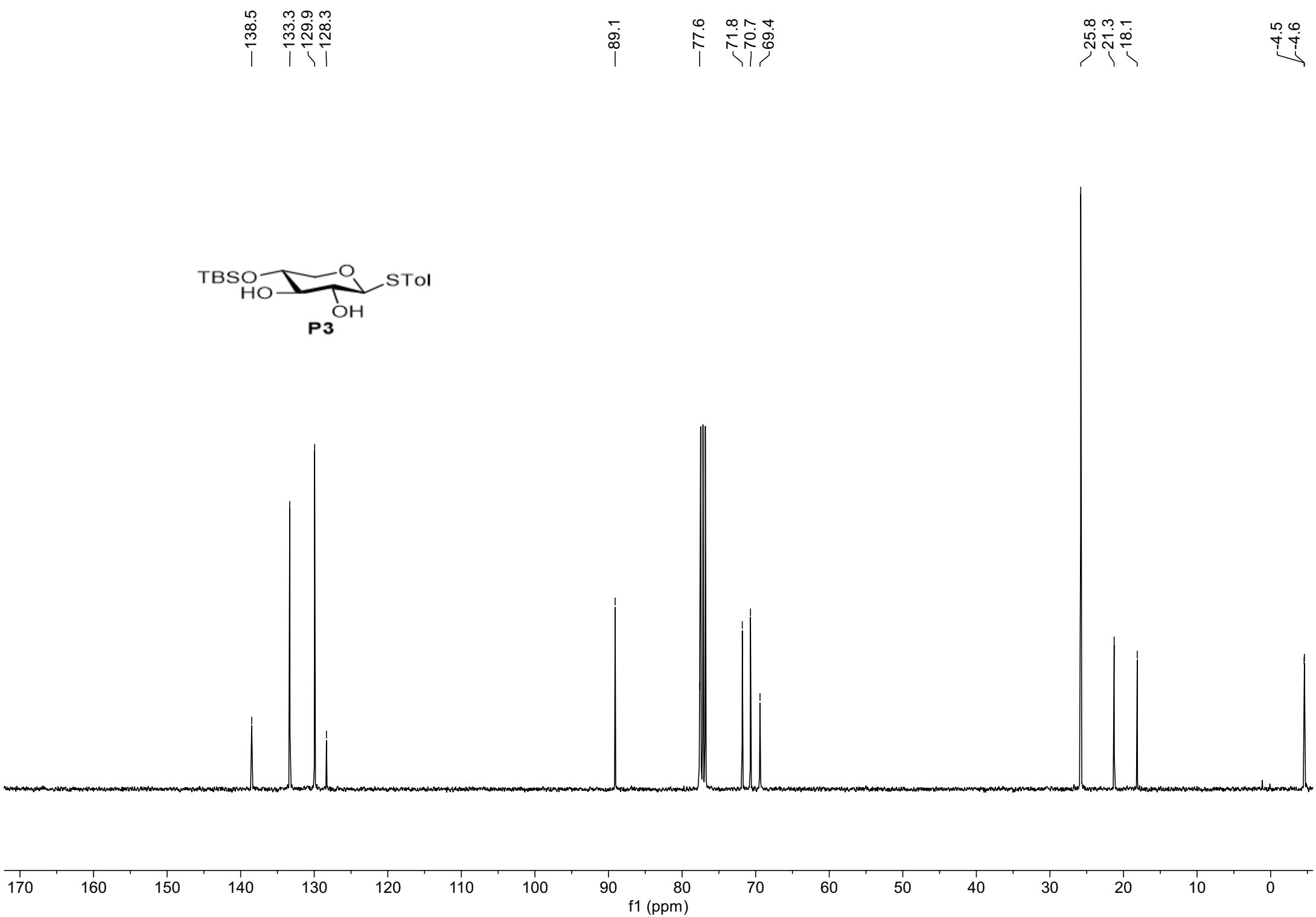
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129.9
128.3
89.1
77.6
71.8
70.7
69.4
25.8
21.3
18.1
-4.5
-4.6
TBSO
HO
OH
O
STol
P3
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90
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50
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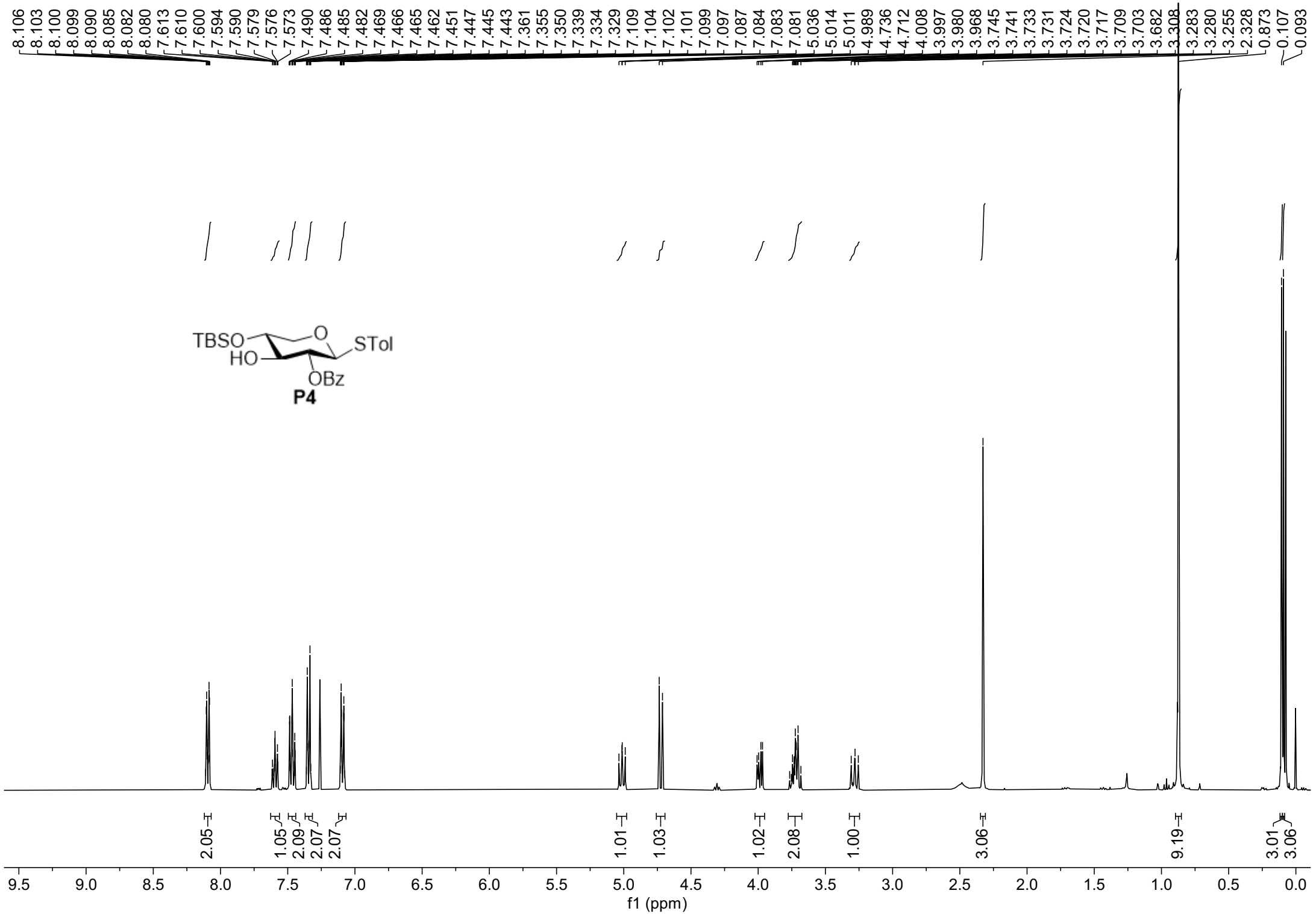
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7.590
7.579
7.576
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7.485
7.482
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7.466
7.465
7.462
7.451
7.447
7.445
7.443
7.361
7.355
7.350
7.339
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7.329
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7.104
7.102
7.101
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7.097
7.087
7.084
7.083
7.081
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5.014
5.011
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4.008
3.997
3.980
3.968
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3.741
3.733
3.731
3.724
3.720
3.717
3.709
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3.283
3.280
3.255
2.328
0.873
0.107
0.093
TBSO
HO
O
STol
OBz
P4
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1.05
2.09
2.07
2.07
1.01
1.03
1.02
2.08
1.00
3.06
9.19
3.01
3.06
9.5
9.0
8.5
8.0
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7.0
6.5
6.0
5.5
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2.5
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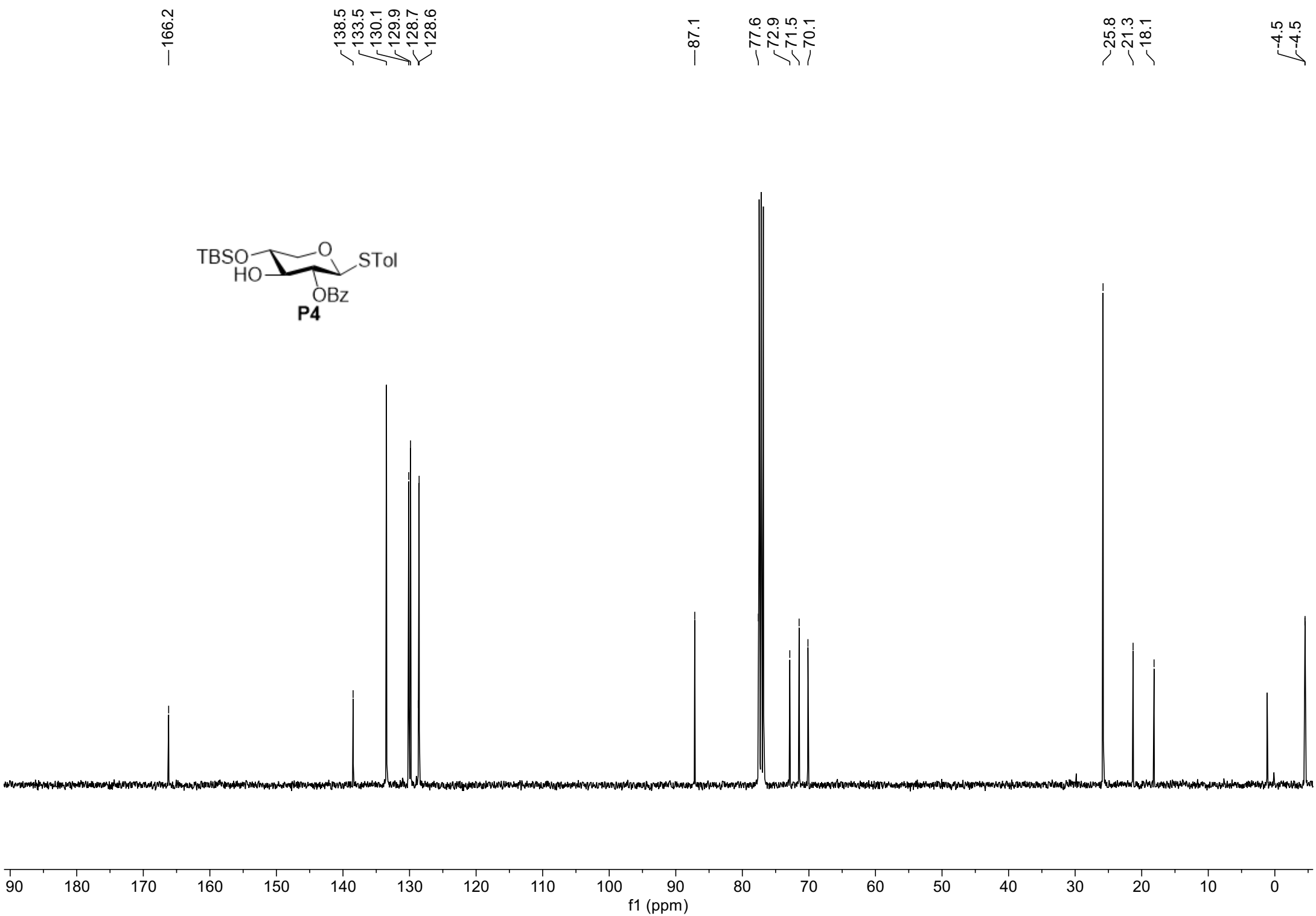
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72.9
71.5
70.1
25.8
21.3
18.1
-4.5
-4.5
TBSO
HO
O
STol
OBz
P4
90
180
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130
120
110
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90
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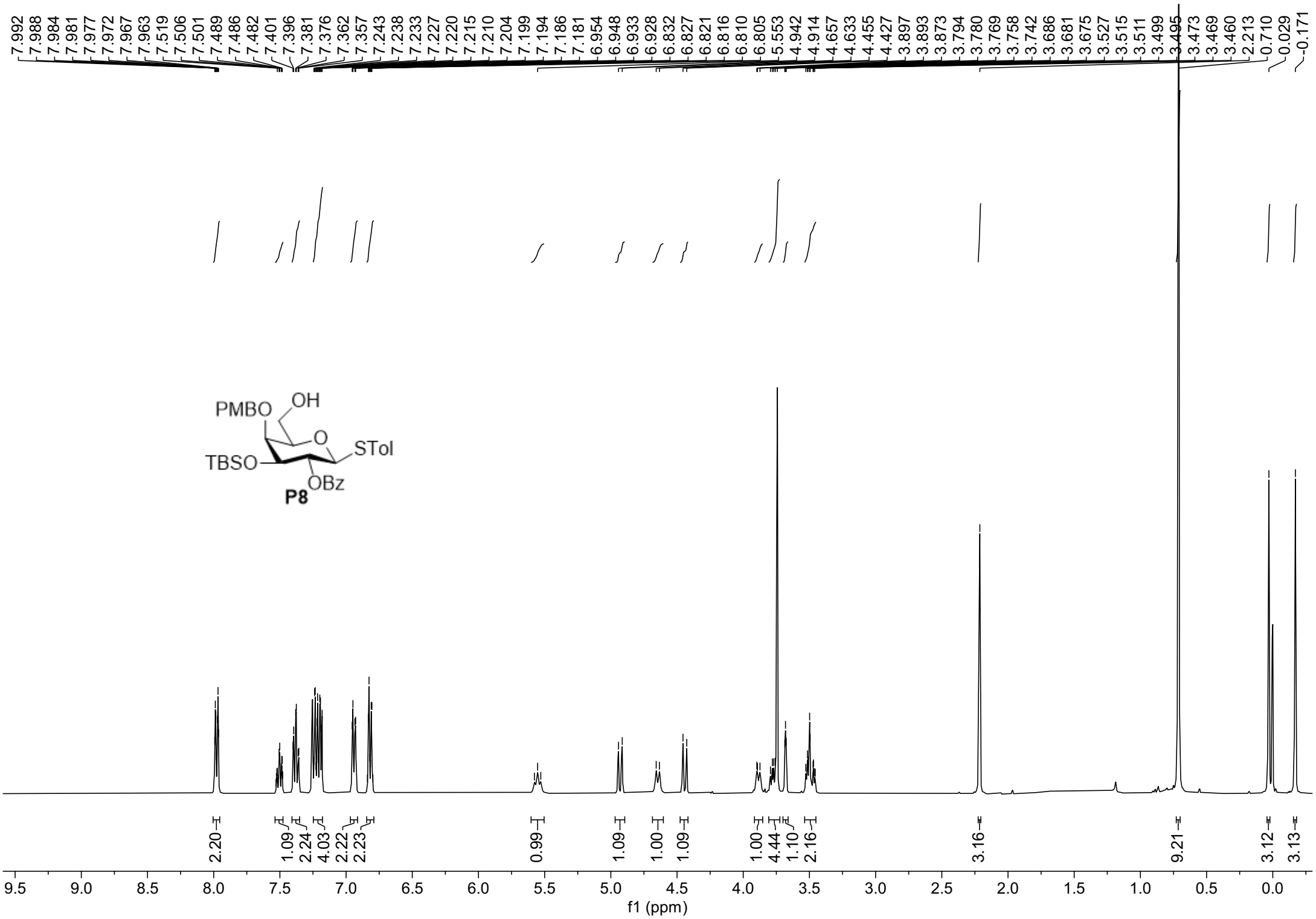
f1 (ppm)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7.482
7.401
7.396
7.381
7.376
7.362
7.357
7.243
7.238
7.233
7.227
7.220
7.215
7.210
7.204
7.199
7.194
7.186
7.181
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6.933
6.928
6.832
6.827
6.821
6.816
6.810
6.805
5.553
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4.914
4.657
4.633
4.455
4.427
3.897
3.893
3.873
3.794
3.780
3.769
3.758
3.742
3.686
3.681
3.675
3.527
3.515
3.511
3.499
3.495
3.473
3.469
3.460
2.213
0.710
0.029
-0.171
PMBO
OH
O
STol
TBSO
OBz
P8
2.20
1.09
2.24
4.03
2.22
2.23
0.99
1.09
1.00
1.09
1.00
4.44
1.10
2.16
3.16
9.21
3.12
3.13
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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3.5
3.0
2.5
2.0
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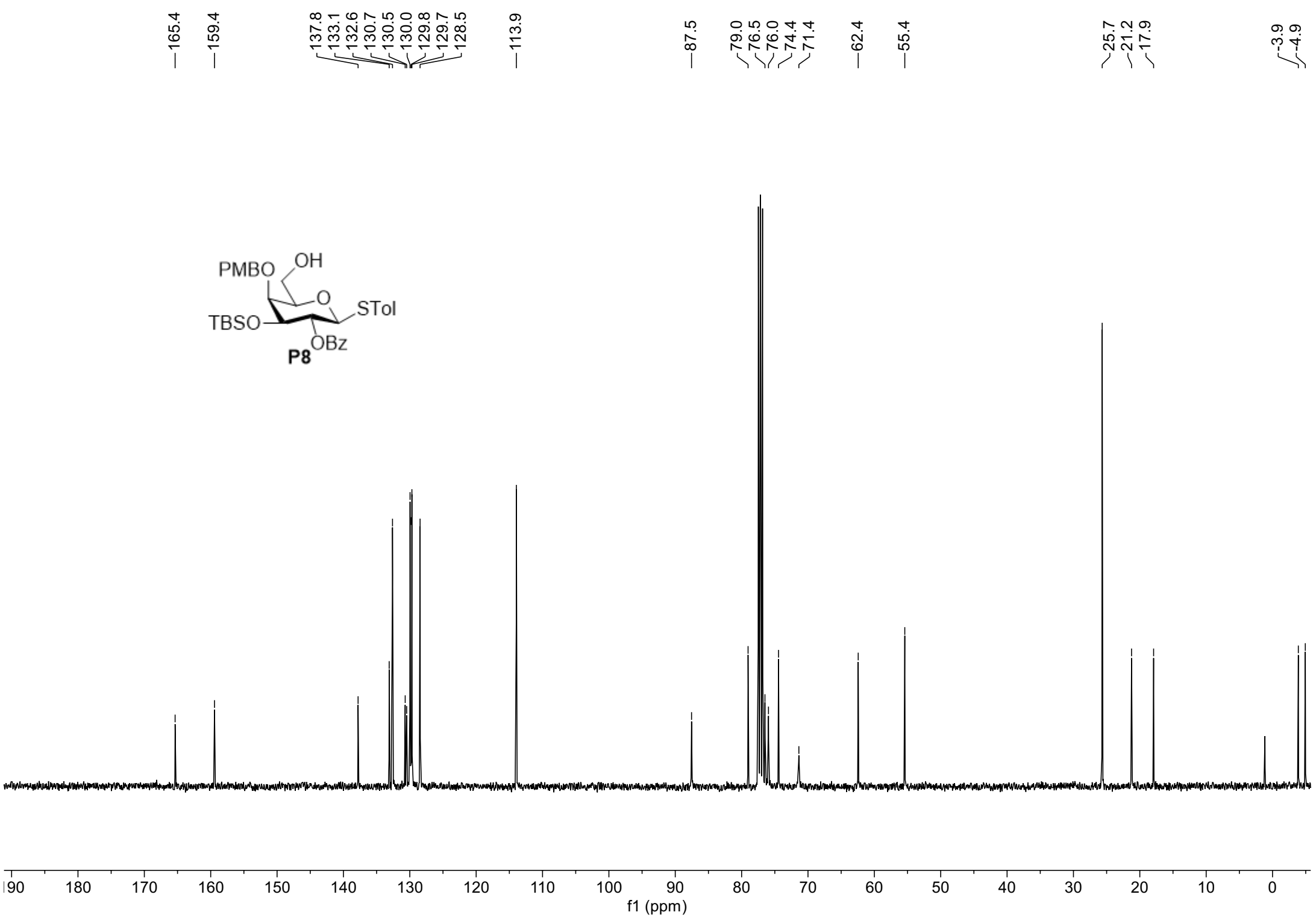
0.0
f1 (ppm)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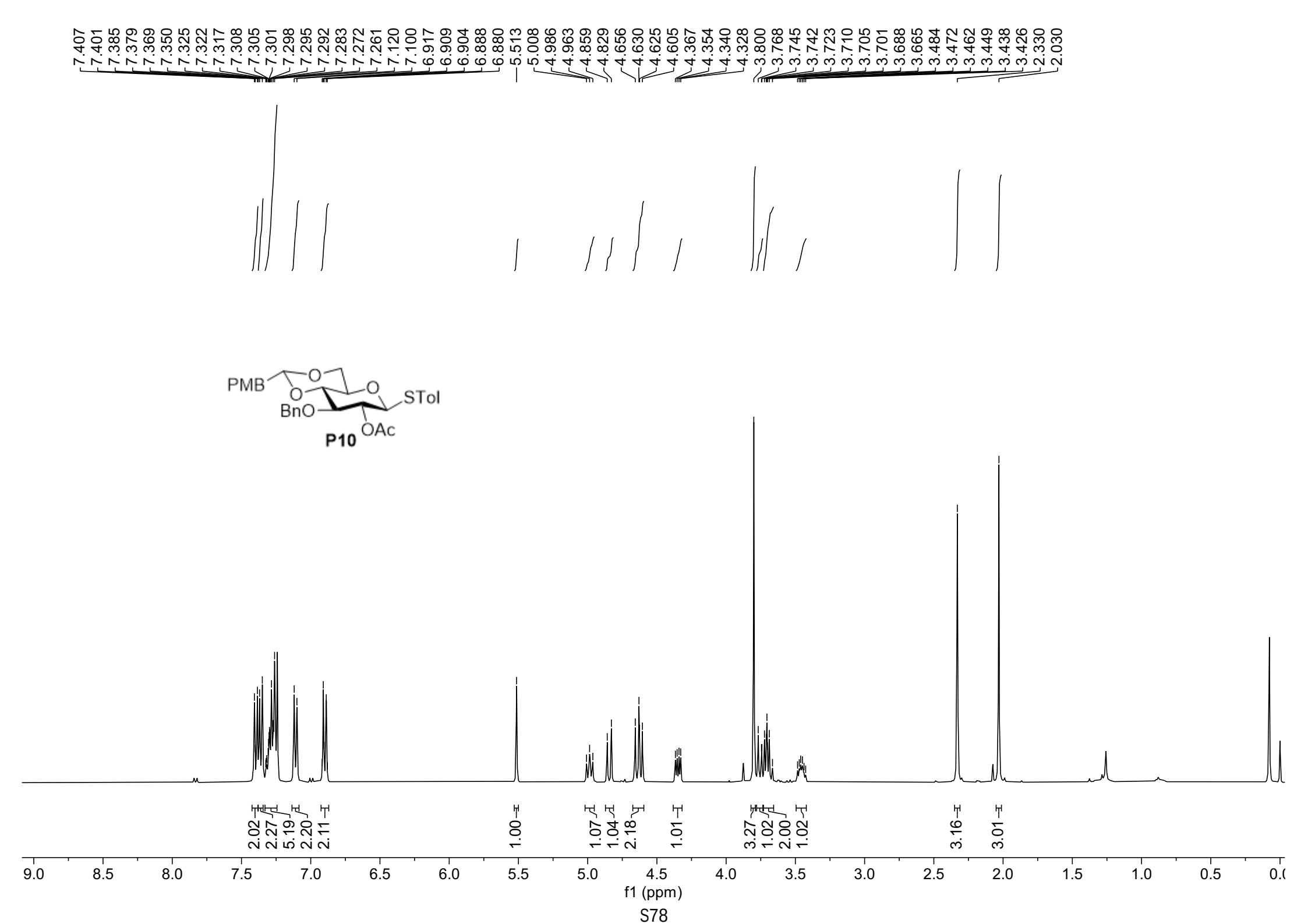
129.7
128.5
113.9
87.5
79.0
76.5
76.0
74.4
71.4
62.4
55.4
25.7
21.2
17.9
-3.9
-4.9
PMBO
OH
O
STol
TBSO
OBz
P8
f1 (ppm)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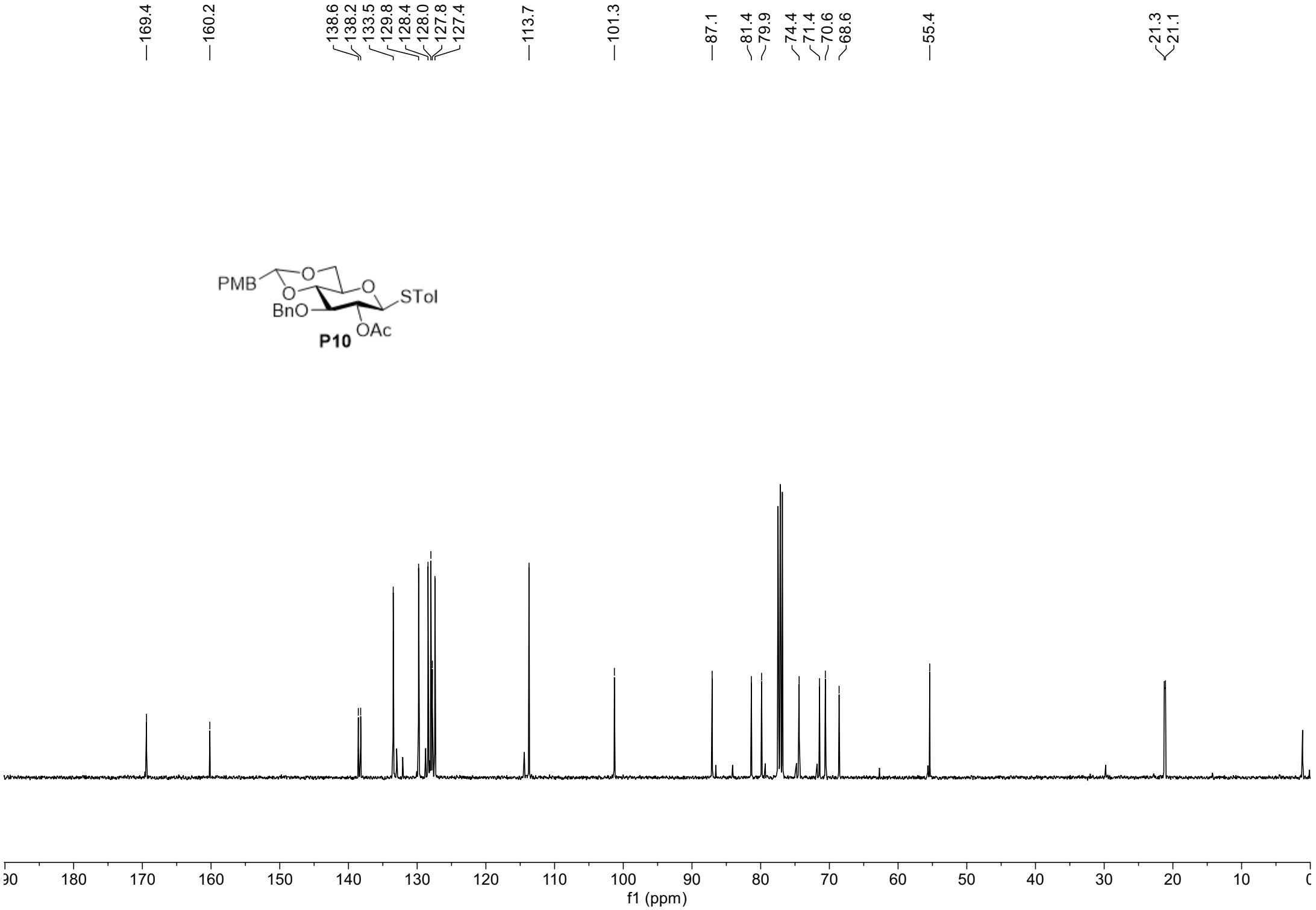
7.317
7.308
7.305
7.301
7.298
7.295
7.292
7.283
7.272
7.261
7.120
7.100
6.917
6.909
6.904
6.888
6.880
5.513
5.008
4.986
4.963
4.859
4.829
4.656
4.630
4.625
4.605
4.367
4.354
4.340
4.328
3.800
3.768
3.745
3.742
3.723
3.710
3.705
3.701
3.688
3.665
3.484
3.472
3.462
3.449
3.438
3.426
2.330
2.030
PMB
O
O
O
STol
BnO
OAc
P10
2.02
2.27
5.19
2.20
2.11
1.00
1.07
1.04
2.18
1.01
3.27
1.02
2.00
1.02
3.16
3.01
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)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138.2
133.5
129.8
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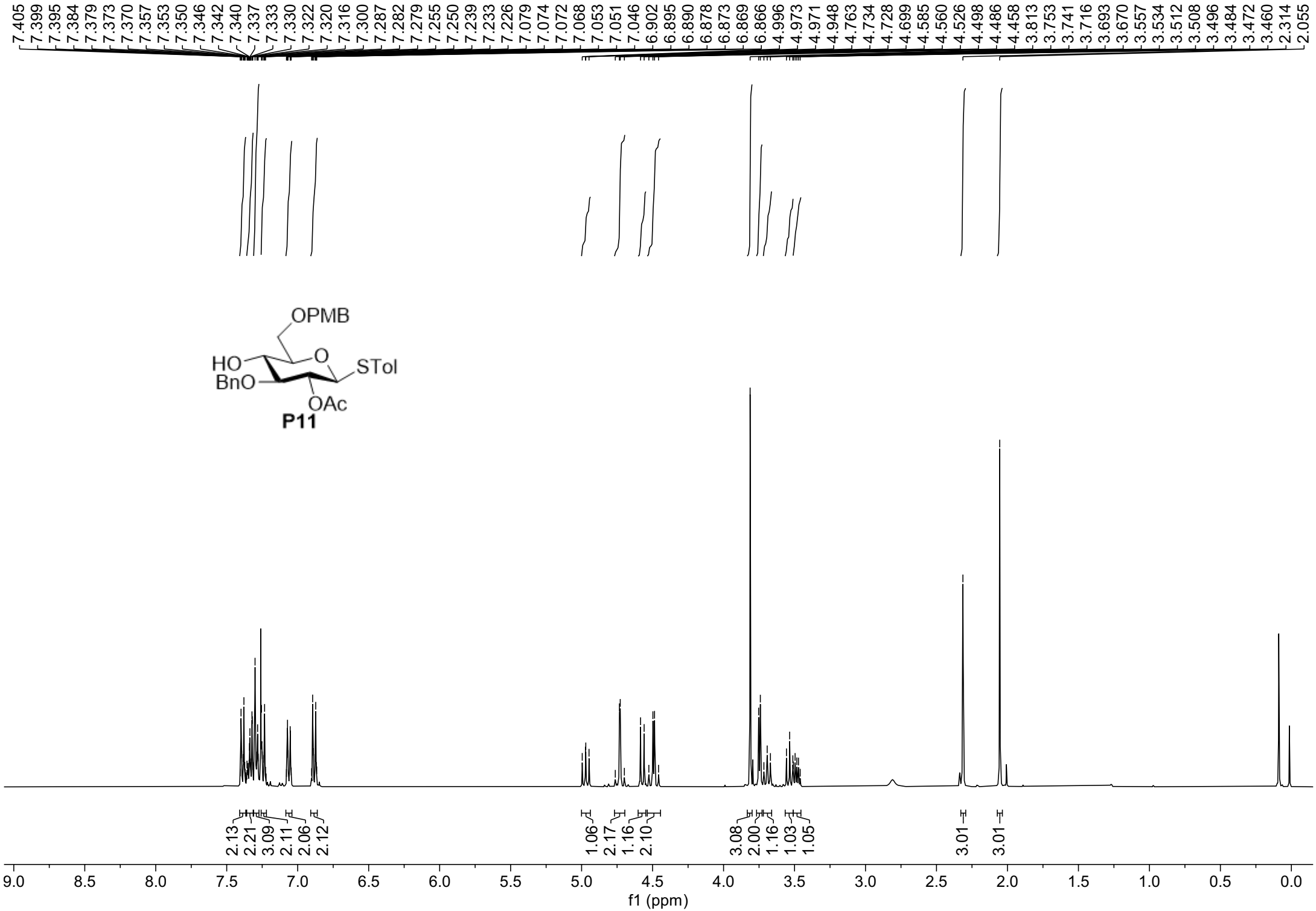
128.0
127.8
127.4
113.7
101.3
87.1
81.4
79.9
74.4
71.4
70.6
68.6
55.4
21.3
21.1
PMB
O
O
O
STol
BnO
OAc
P10
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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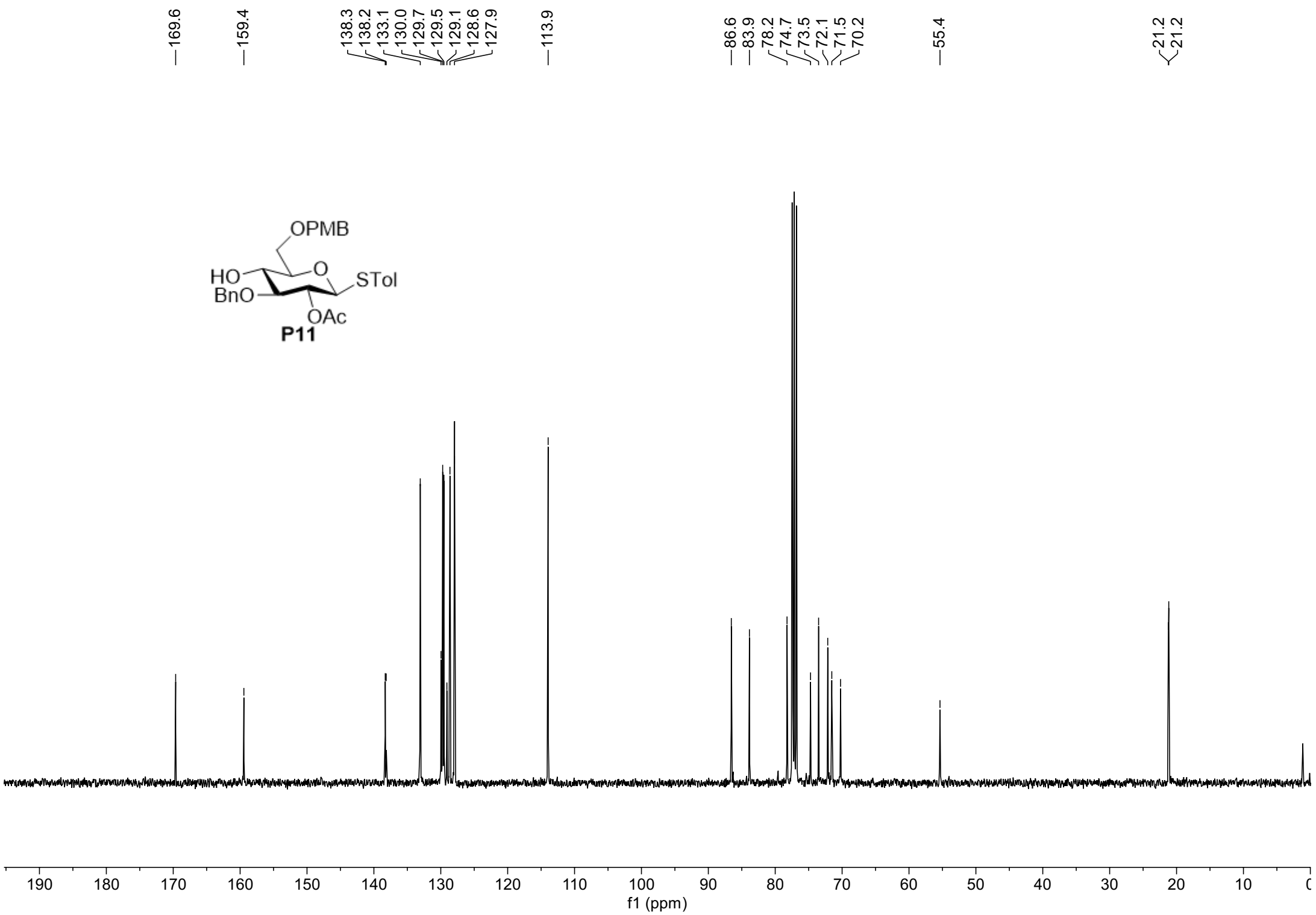
OPMB
HO
BnO
O
STol
OAc
P11
2.13 2.21 3.09 2.11 2.06 2.12
1.06 2.17 1.16 2.10
3.08 2.00 1.16 1.03 1.05
3.01 3.01
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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133.1
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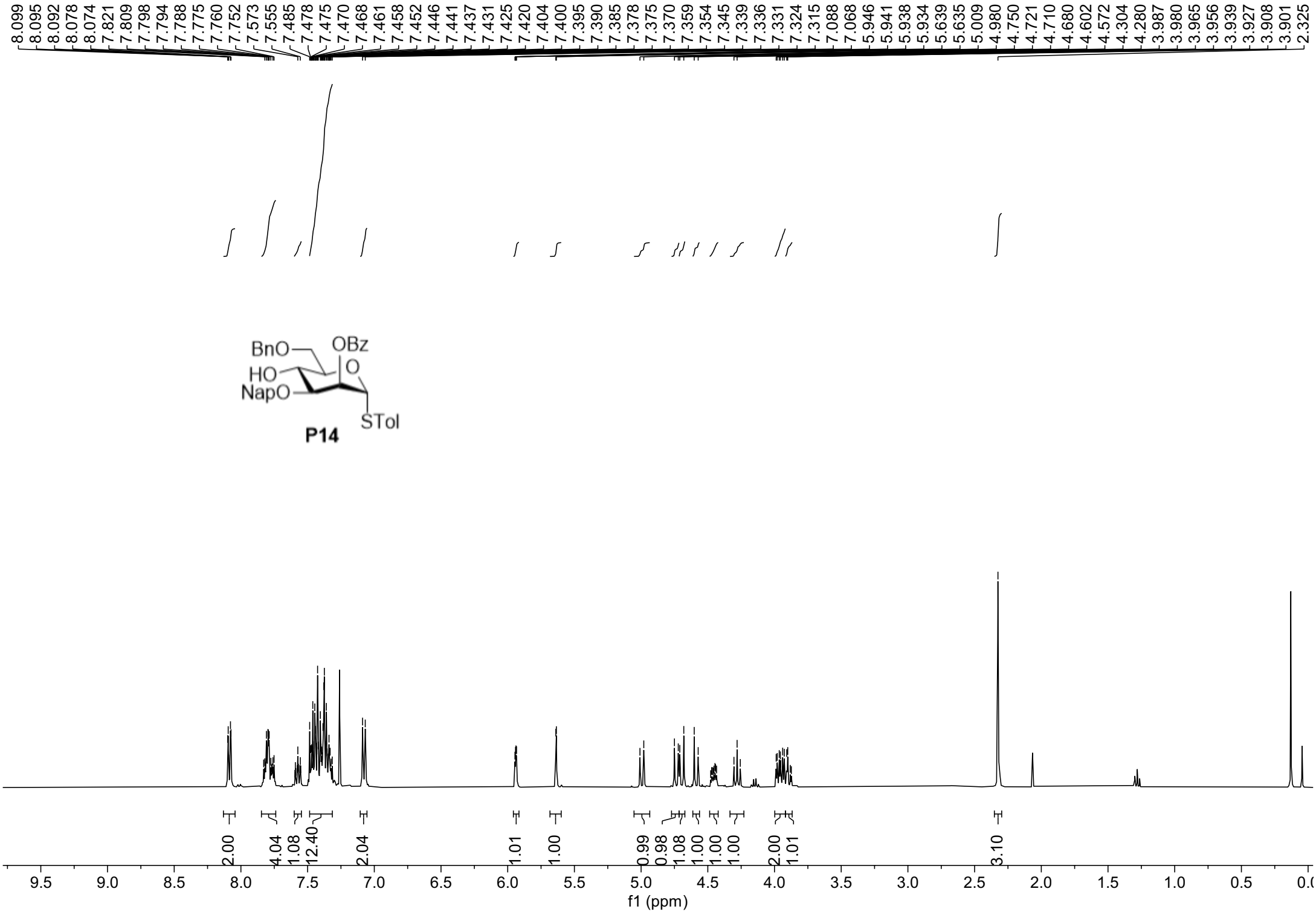
128.6
127.9
113.9
86.6
83.9
78.2
74.7
73.5
72.1
71.5
70.2
55.4
21.2
21.2
OPMB
HO
O
STol
BnO
OAc
P11
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.794
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7.760
7.752
7.573
7.555
7.485
7.478
7.475
7.470
7.468
7.461
7.458
7.452
7.446
7.441
7.437
7.431
7.425
7.420
7.404
7.400
7.395
7.390
7.385
7.378
7.375
7.370
7.359
7.354
7.345
7.339
7.336
7.331
7.324
7.315
7.088
7.068
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5.941
5.938
5.934
5.639
5.635
5.009
4.980
4.750
4.721
4.710
4.680
4.602
4.572
4.304
4.280
3.987
3.980
3.965
3.956
3.939
3.927
3.908
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BnO
OBz
HO
O
NapO
STol
P14
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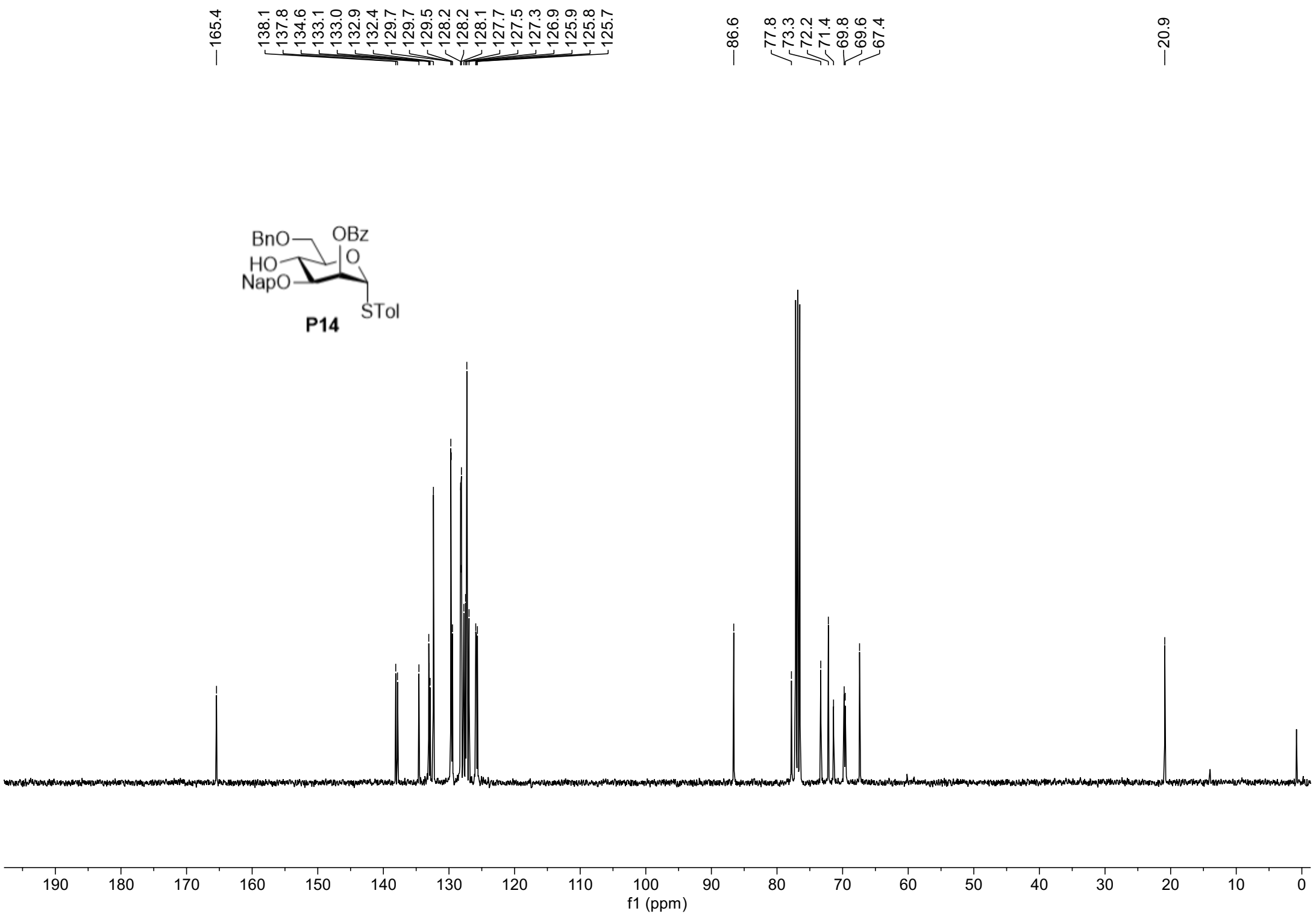
4.04
1.08
12.40
2.04
1.01
1.00
0.99
0.98
1.08
1.00
1.00
2.00
1.01
3.10
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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134.6
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129.7
129.5
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128.2
128.1
127.7
127.5
127.3
126.9
125.9
125.8
125.7
86.6
77.8
73.3
72.2
71.4
69.8
69.6
67.4
20.9
BnO
OBz
HO
O
NapO
STol
P14
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
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10
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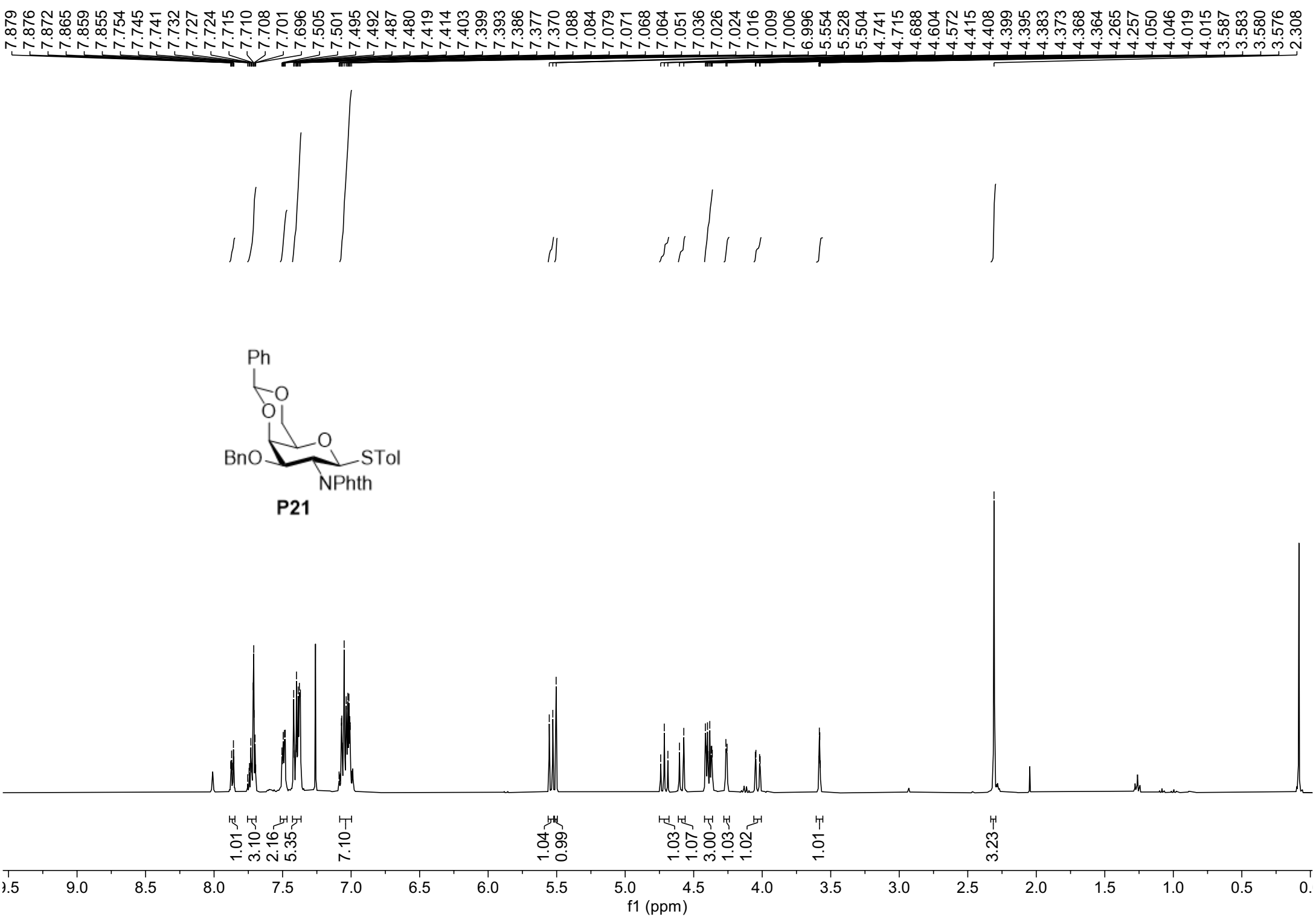
f1 (ppm)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7.715
7.710
7.708
7.701
7.696
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7.501
7.495
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7.487
7.480
7.419
7.414
7.403
7.399
7.393
7.386
7.377
7.370
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7.084
7.079
7.071
7.068
7.064
7.051
7.036
7.026
7.024
7.016
7.009
7.006
6.996
5.554
5.528
5.504
4.741
4.715
4.688
4.604
4.572
4.415
4.408
4.399
4.395
4.383
4.373
4.368
4.364
4.265
4.257
4.050
4.046
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3.587
3.583
3.580
3.576
2.308
Ph
O
O
O
BnO
STol
NPhth
P21
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3.10
2.16
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7.10
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1.03
1.07
3.00
1.03
1.02
1.01
3.23
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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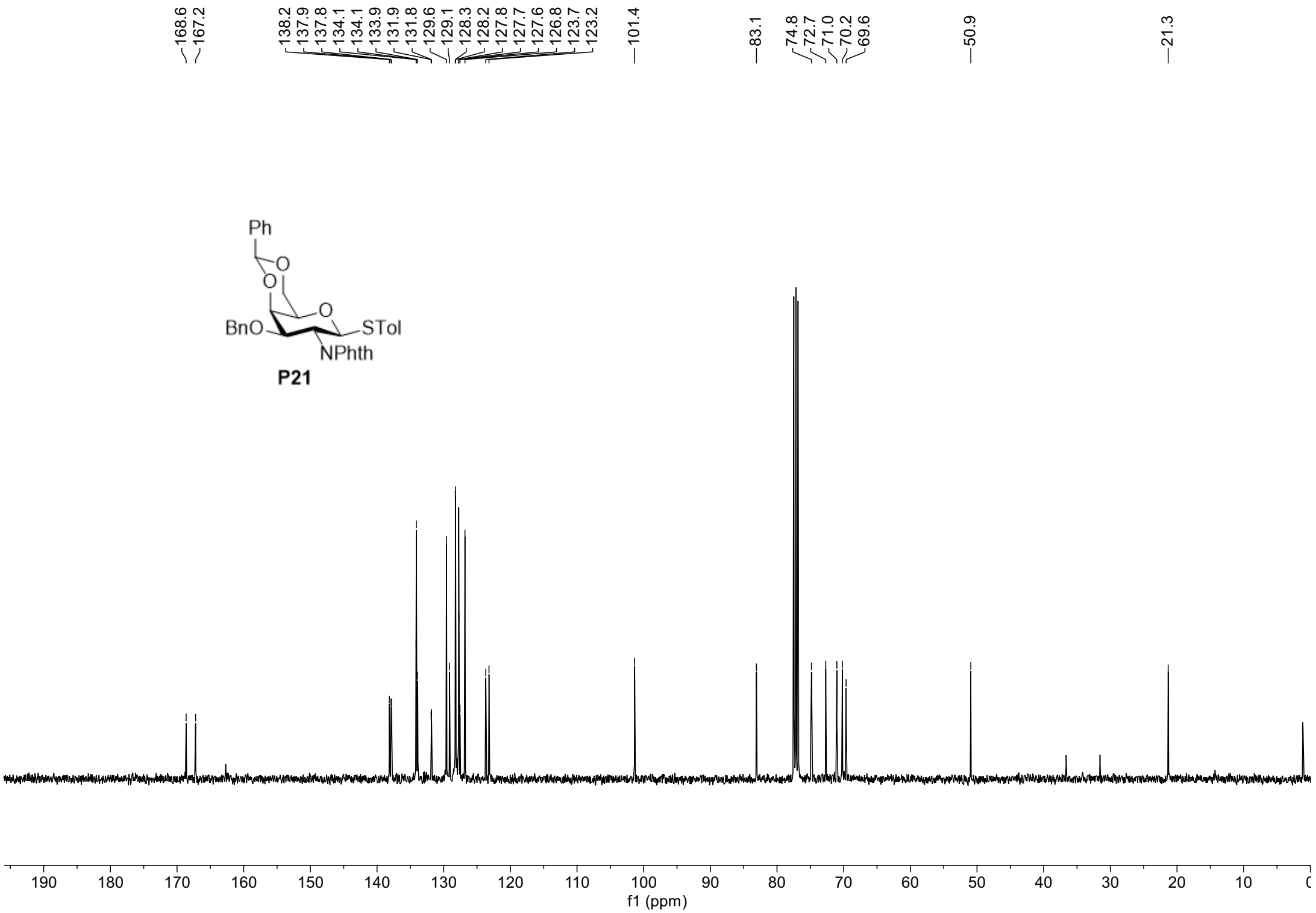
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.
f1 (ppm)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134.1
133.9
131.9
131.8
129.6
129.1
128.3
128.2
127.8
127.7
127.6
126.8
123.7
123.2
101.4
83.1
74.8
72.7
71.0
70.2
69.6
50.9
21.3
Ph
O
O
O
BnO
STol
NPhth
P21
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
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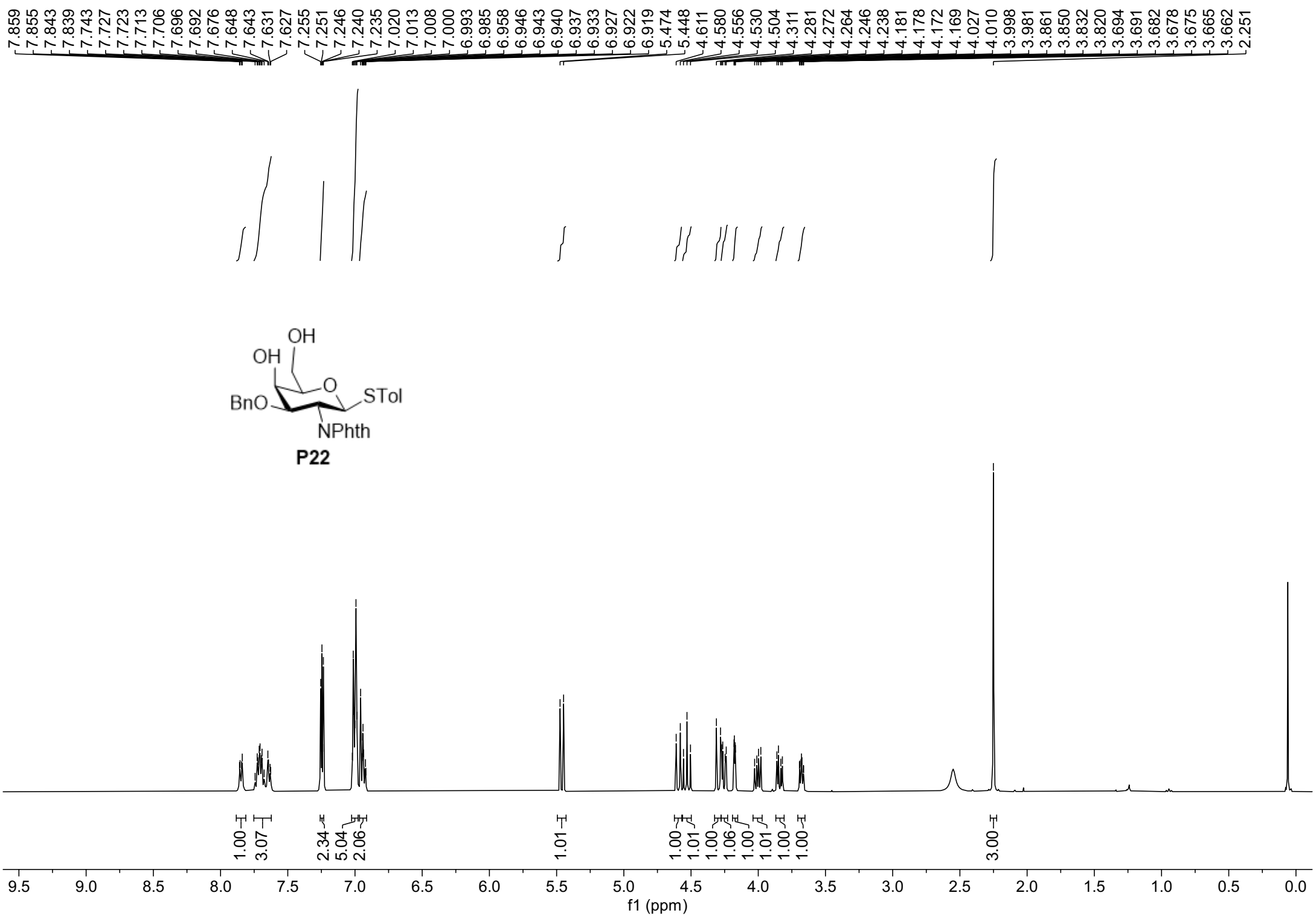
0
f1 (ppm)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7.648
7.643
7.631
7.627
7.255
7.251
7.246
7.240
7.235
7.020
7.013
7.008
7.000
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6.985
6.958
6.946
6.943
6.940
6.937
6.933
6.927
6.922
6.919
5.474
5.448
4.611
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4.556
4.530
4.504
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4.281
4.272
4.264
4.246
4.238
4.181
4.178
4.172
4.169
4.027
4.010
3.998
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3.861
3.850
3.832
3.820
3.694
3.691
3.682
3.678
3.675
3.665
3.662
2.251
OH
OH
O
STol
BnO
NPhth
P22
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3.07
2.34
5.04
2.06
1.01
1.00
1.01
1.00
1.06
1.00
1.01
1.00
1.00
3.00
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
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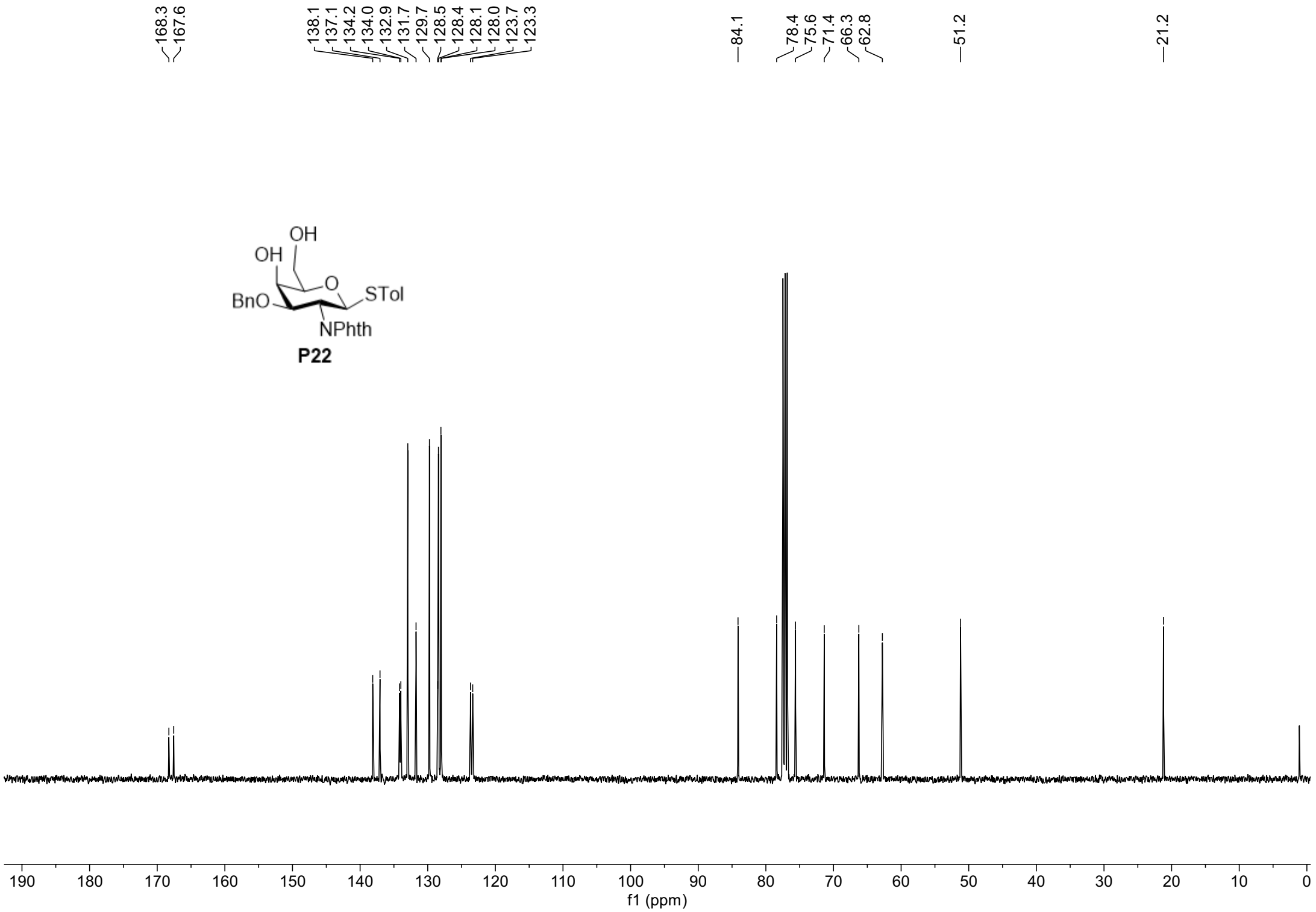
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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137.1
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132.9
131.7
129.7
128.5
128.4
128.1
128.0
123.7
123.3
84.1
78.4
75.6
71.4
66.3
62.8
51.2
21.2
OH
OH
O
STol
BnO
NPhth
P22
190
180
170
160
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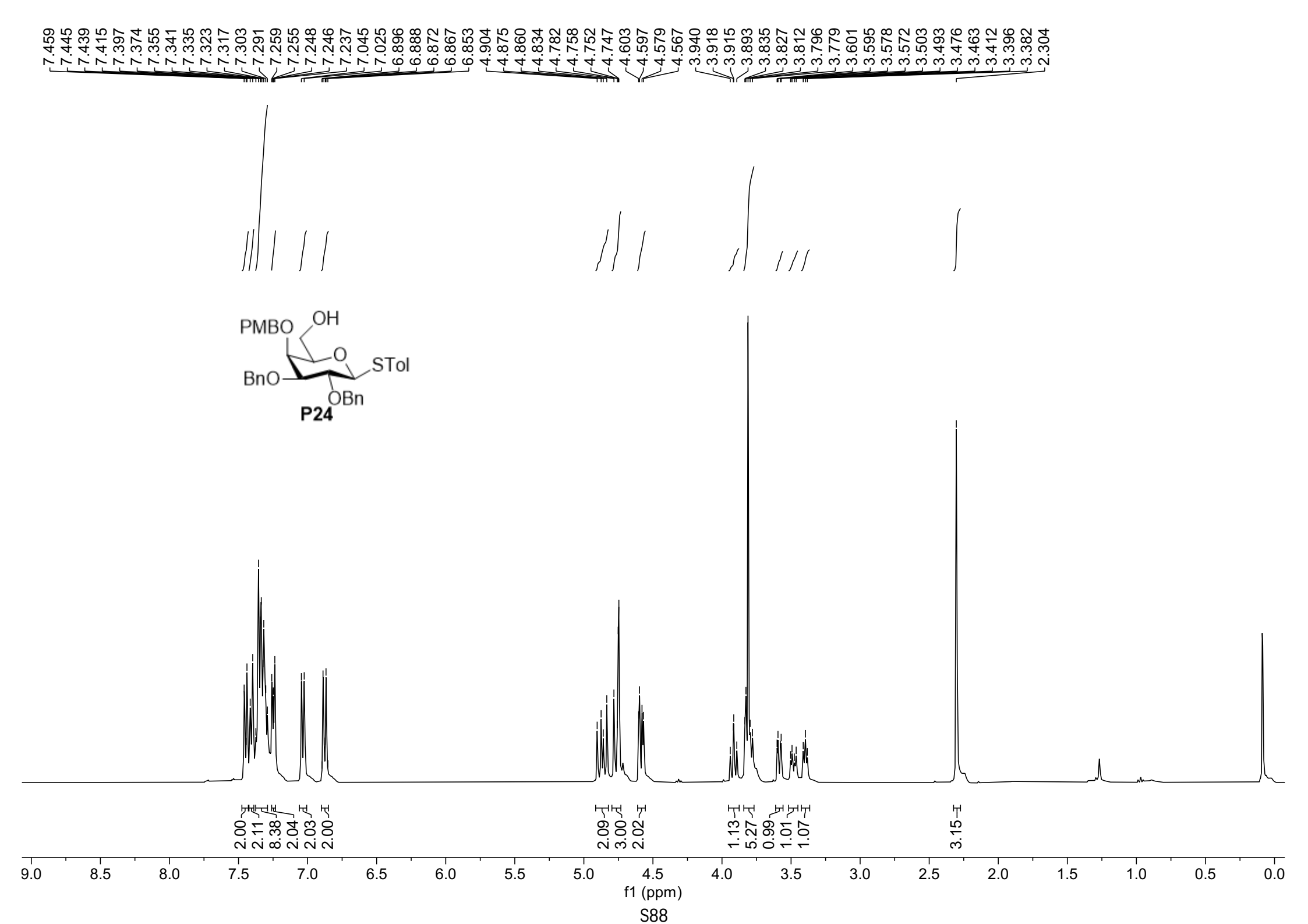
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.335
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7.317
7.303
7.291
7.259
7.255
7.248
7.246
7.237
7.045
7.025
6.896
6.888
6.872
6.867
6.853
4.904
4.875
4.860
4.834
4.782
4.758
4.752
4.747
4.603
4.597
4.579
4.567
3.940
3.918
3.915
3.893
3.835
3.827
3.812
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3.779
3.601
3.595
3.578
3.572
3.503
3.493
3.476
3.463
3.412
3.396
3.382
2.304
PMBO
OH
O
STol
BnO
OBn
P24
2.00
2.11
8.38
2.04
2.03
2.00
2.09
3.00
2.02
1.13
5.27
0.99
1.01
1.07
3.15
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
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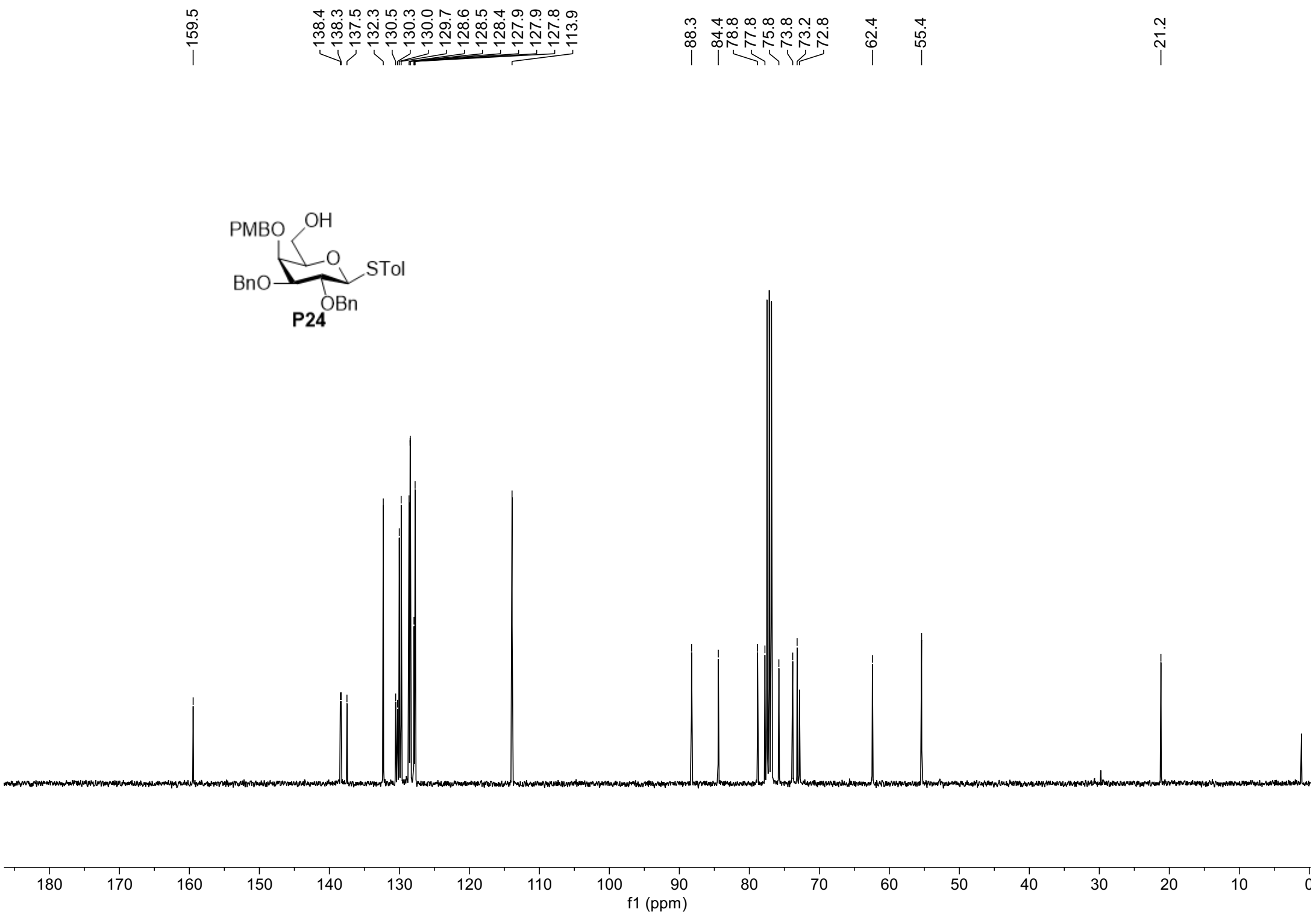
0.0
f1 (ppm)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138.3
137.5
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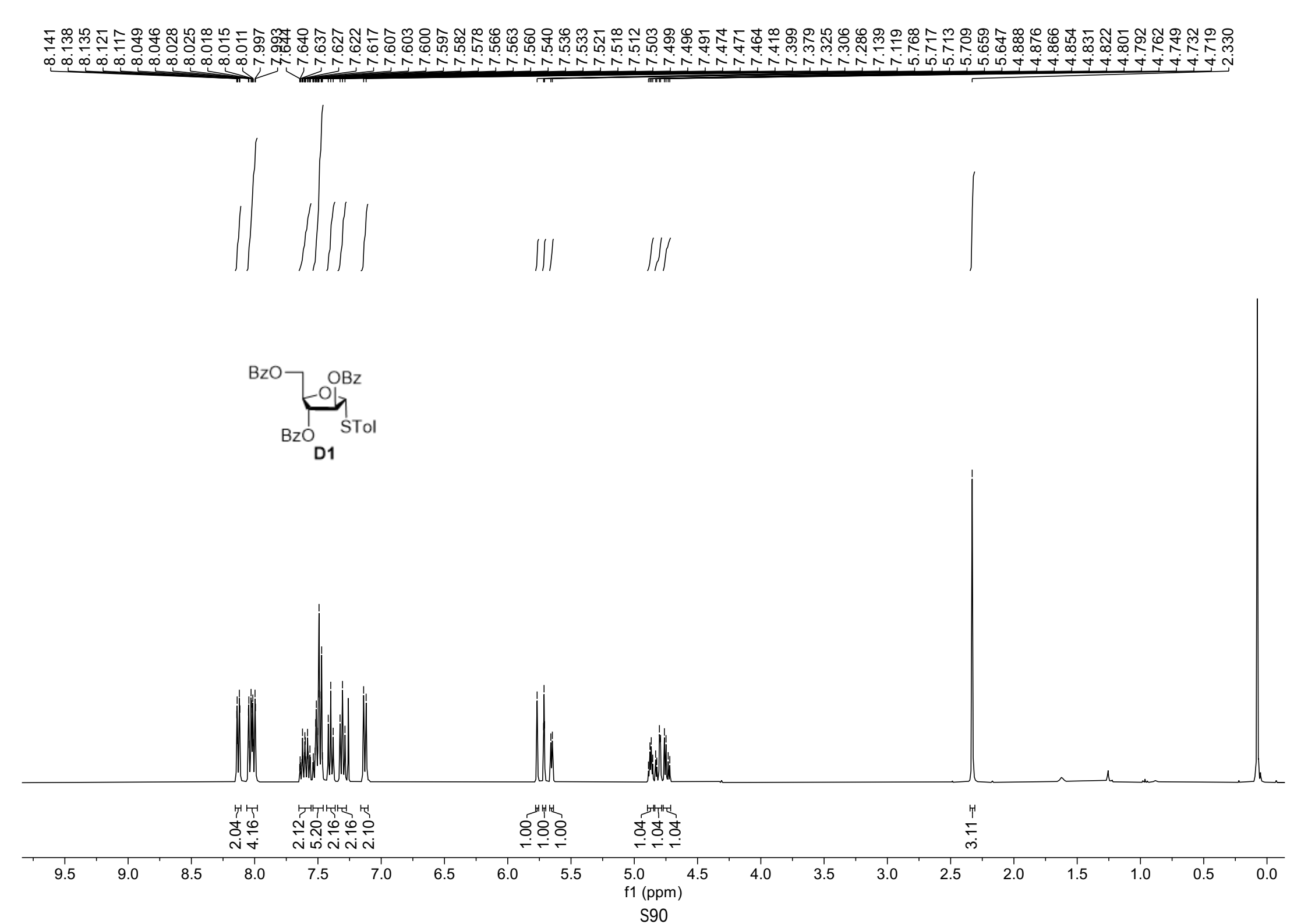
129.7
128.6
128.5
128.4
127.9
127.9
127.8
113.9
88.3
84.4
78.8
77.8
75.8
73.8
73.2
72.8
62.4
55.4
21.2
PMBO
OH
O
STol
BnO
OBn
P24
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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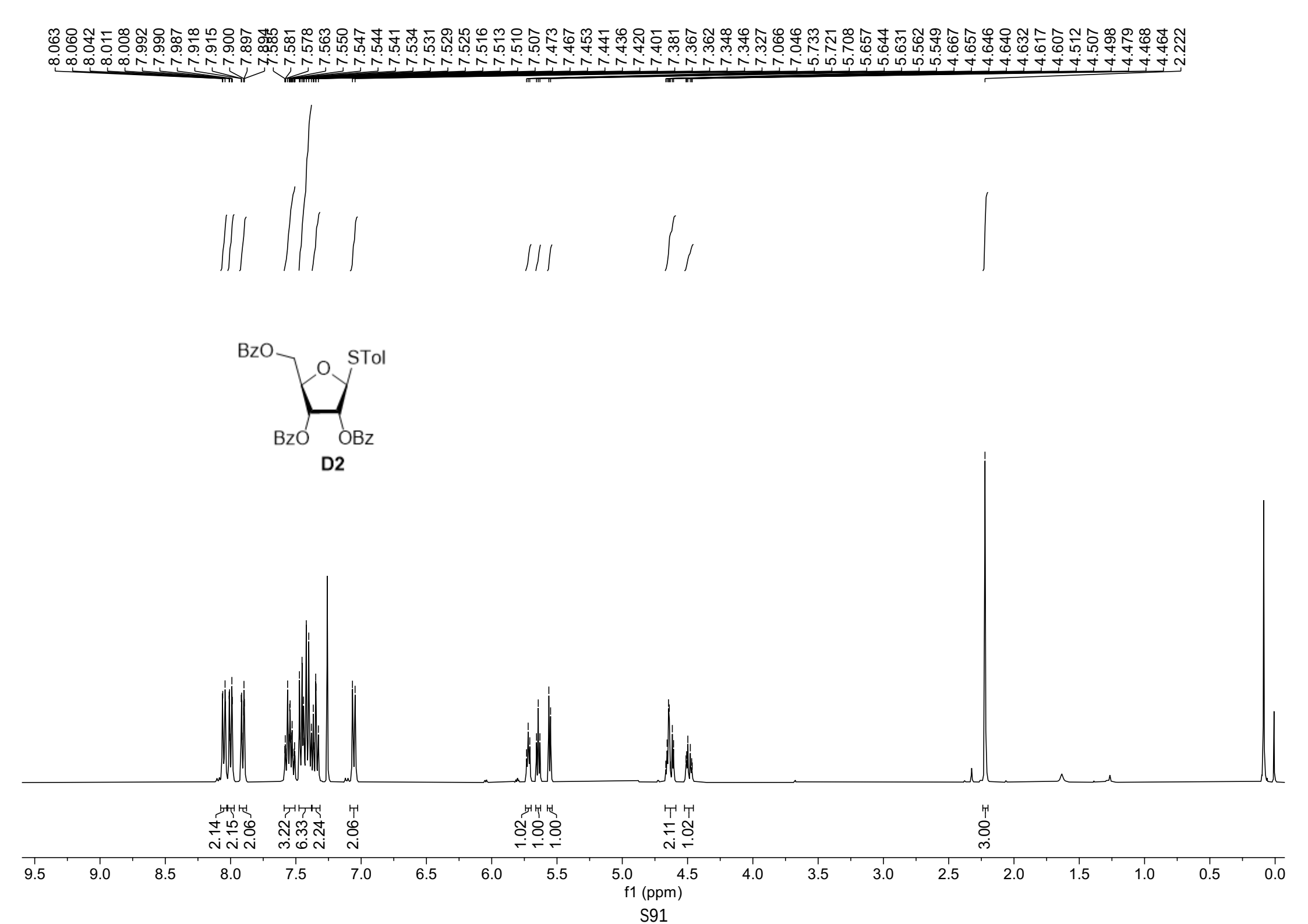
8.135
8.121
8.117
8.049
8.046
8.028
8.025
8.018
8.015
8.011
7.997
7.993
7.644
7.640
7.637
7.627
7.622
7.617
7.607
7.603
7.600
7.597
7.582
7.578
7.566
7.563
7.560
7.540
7.536
7.533
7.521
7.518
7.512
7.503
7.499
7.496
7.491
7.474
7.471
7.464
7.418
7.399
7.379
7.325
7.306
7.286
7.139
7.119
5.768
5.717
5.713
5.709
5.659
5.647
4.888
4.876
4.866
4.854
4.831
4.822
4.801
4.792
4.762
4.749
4.732
4.719
2.330
BzO
OBz
O
BzO
STol
D1
2.04
4.16
2.12
5.20
2.16
2.16
2.10
1.00
1.00
1.00
1.04
1.04
1.04
3.11
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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8.042
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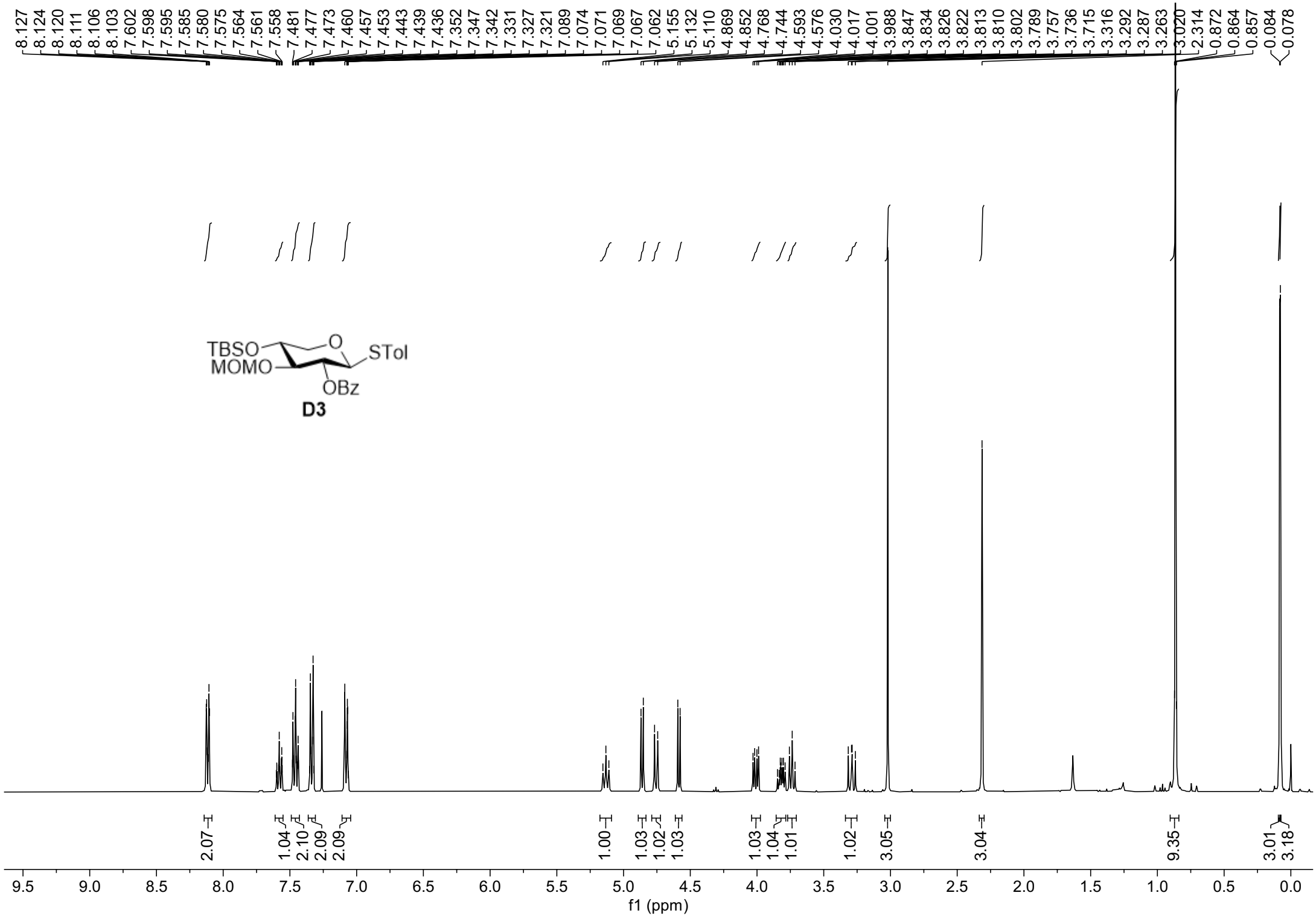
7.987
7.918
7.915
7.900
7.897
7.894
7.885
7.581
7.578
7.563
7.550
7.547
7.544
7.541
7.534
7.531
7.529
7.525
7.516
7.513
7.510
7.507
7.473
7.467
7.453
7.441
7.436
7.420
7.401
7.381
7.367
7.362
7.348
7.346
7.327
7.066
7.046
5.733
5.721
5.708
5.657
5.644
5.631
5.562
5.549
4.667
4.657
4.646
4.640
4.632
4.617
4.607
4.512
4.507
4.498
4.479
4.468
4.464
2.222
BzO
O
STol
BzO
OBz
D2
2.14
2.15
2.06
3.22
6.33
2.24
2.06
1.02
1.00
1.00
2.11
1.02
3.00
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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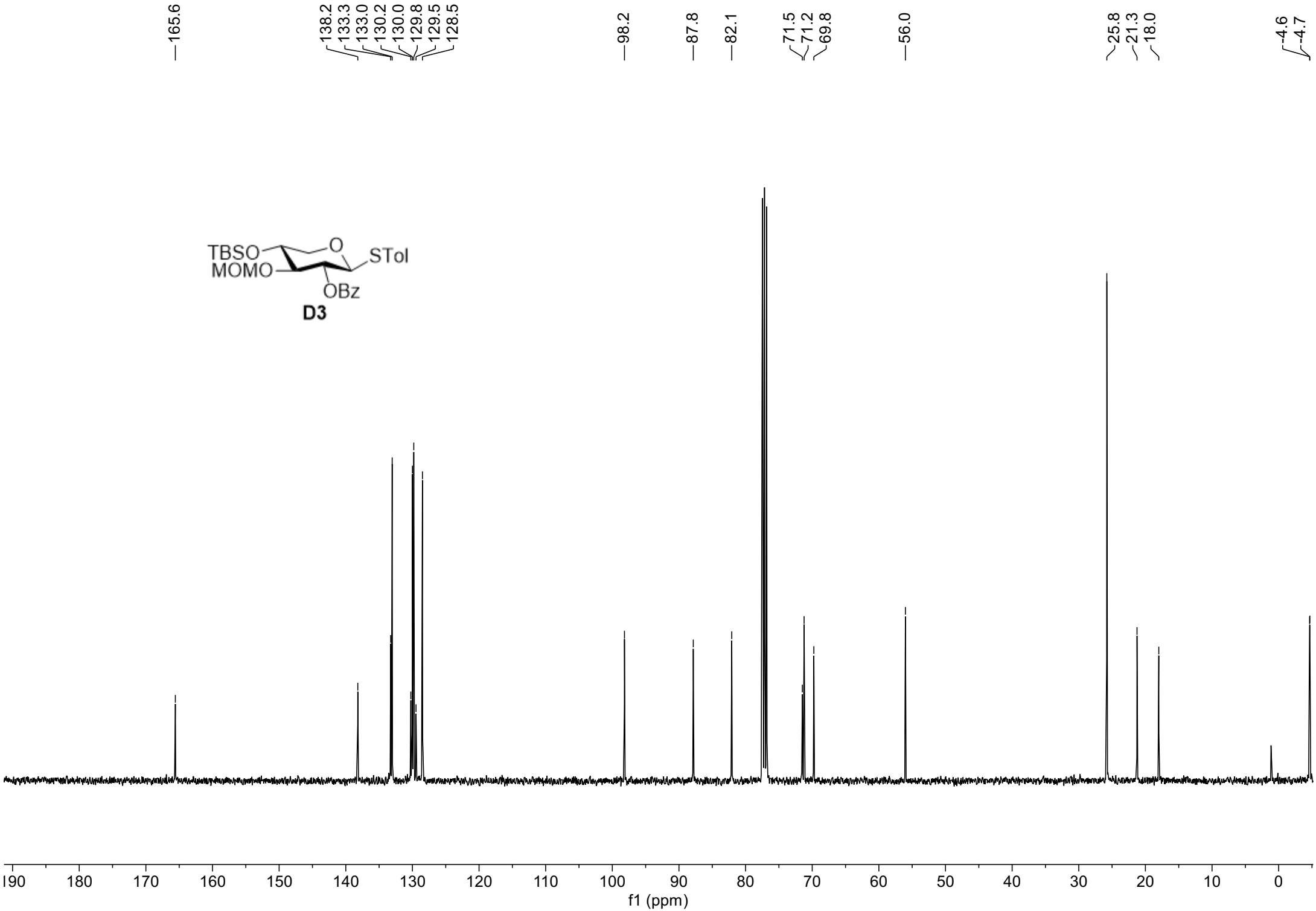
TBSO
MOMO
O
STol
OBz
D3
2.07 1.04 2.10 2.09 2.09 1.00 1.03 1.02 1.03 1.03 1.04 1.01 1.02 3.05 3.04 9.35 3.01 3.18
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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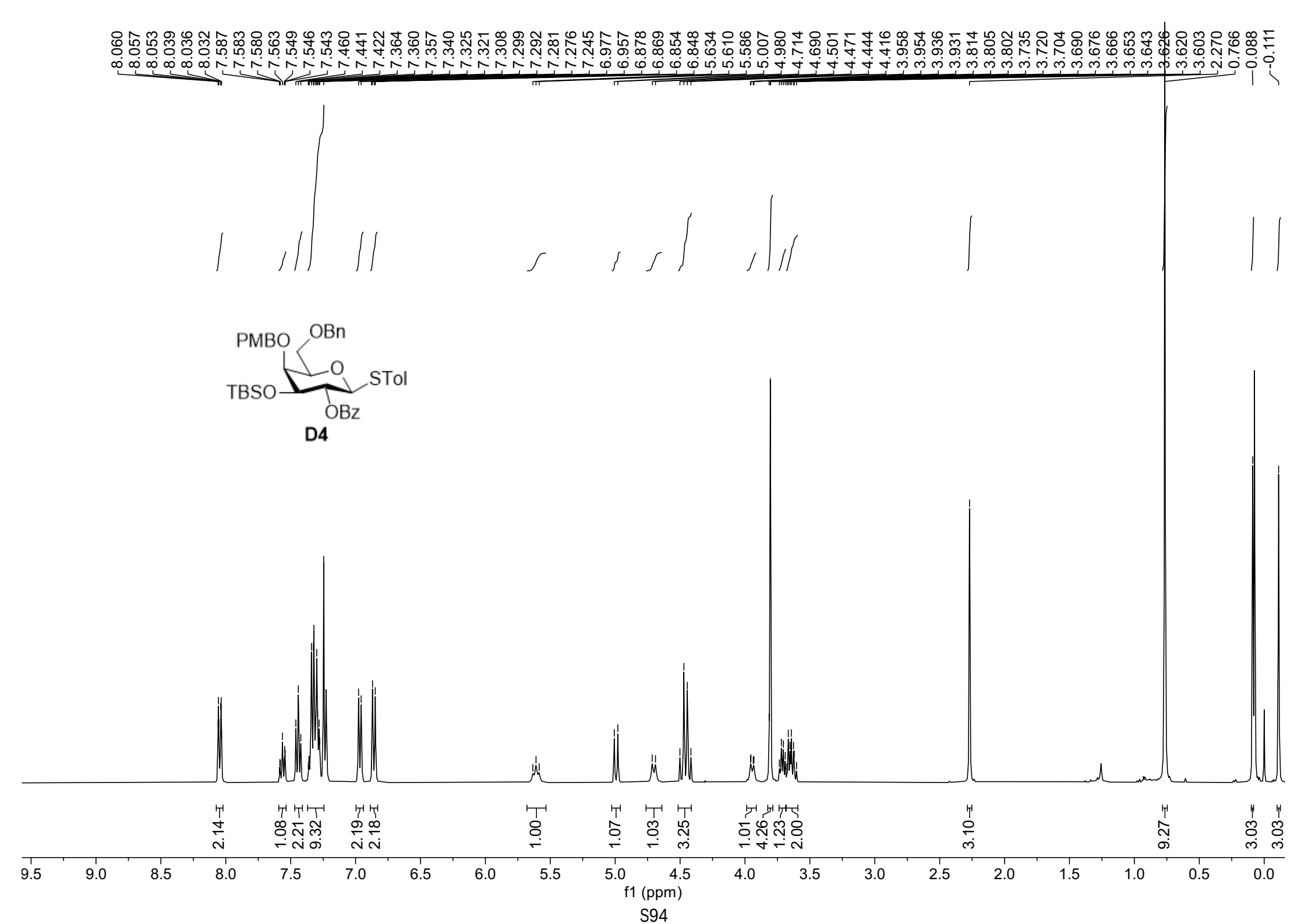
133.3
133.0
130.2
130.0
129.8
129.5
128.5
98.2
87.8
82.1
71.5
71.2
69.8
56.0
25.8
21.3
18.0
-4.6
-4.7
TBSO
MOMO
O
STol
OBz
D3
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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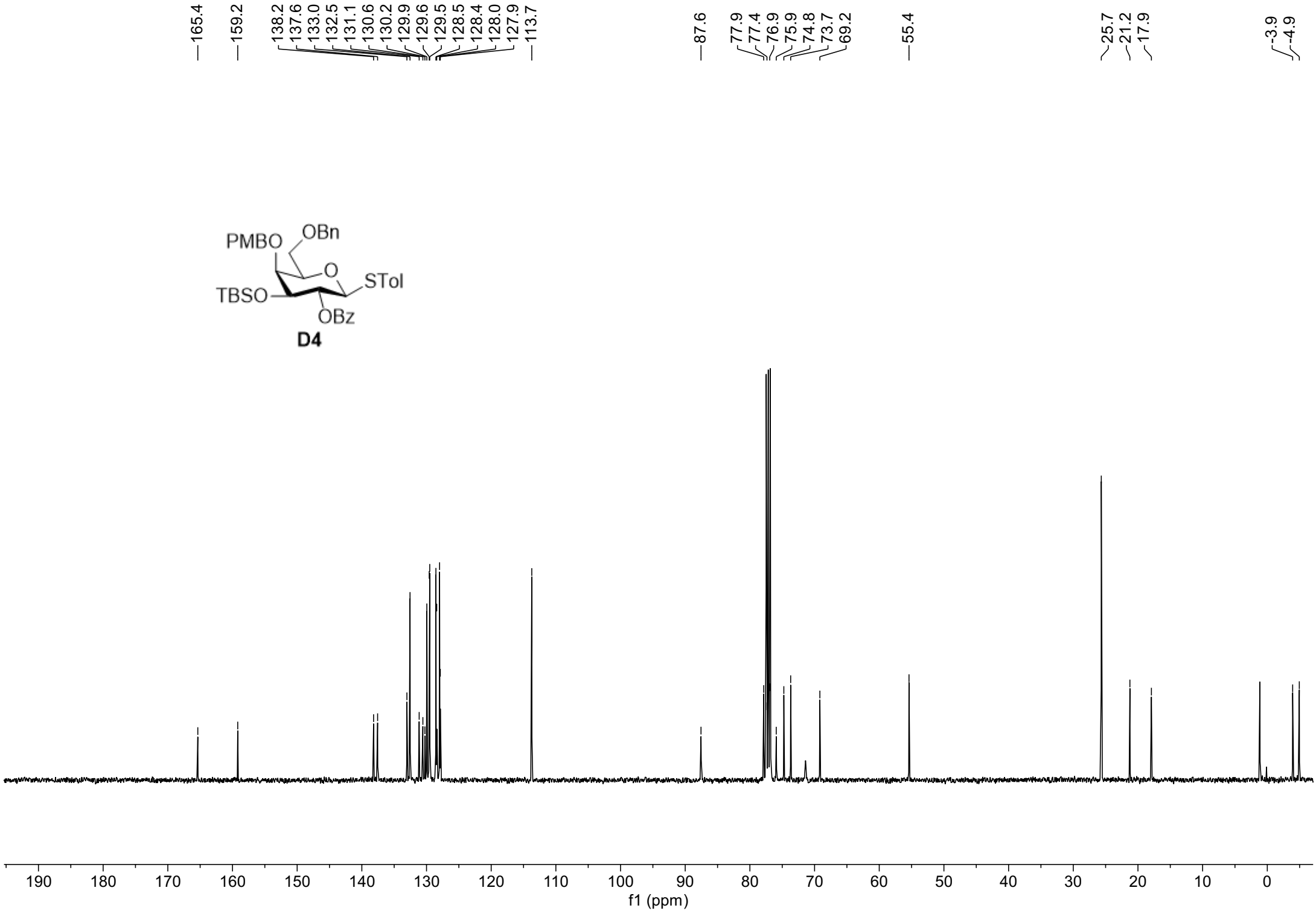
8.057
8.053
8.039
8.036
8.032
7.587
7.583
7.580
7.563
7.549
7.546
7.543
7.460
7.441
7.422
7.364
7.360
7.357
7.340
7.325
7.321
7.308
7.299
7.292
7.281
7.276
7.245
6.977
6.957
6.878
6.869
6.854
6.848
5.634
5.610
5.586
5.007
4.980
4.714
4.690
4.501
4.471
4.444
4.416
3.958
3.954
3.936
3.931
3.814
3.805
3.802
3.735
3.720
3.704
3.690
3.676
3.666
3.653
3.643
3.626
3.620
3.603
2.270
0.766
0.088
-0.111
PMBO
OBn
O
STol
TBSO
OBz
D4
2.14
1.08
2.21
9.32
2.19
2.18
1.00
1.07
1.03
3.25
1.01
4.26
1.23
2.00
3.10
9.27
3.03
3.03
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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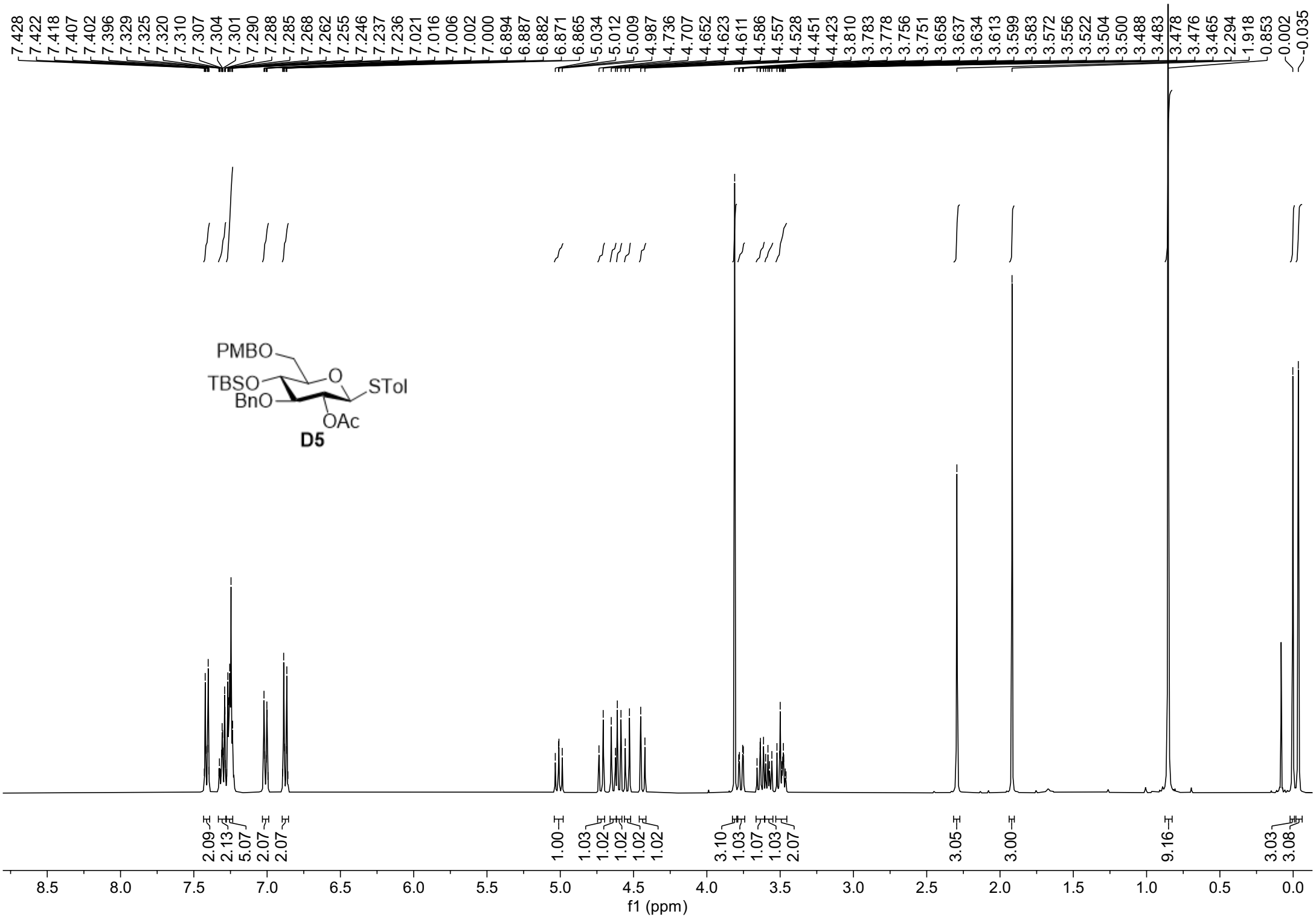
159.2
138.2
137.6
133.0
132.5
131.1
130.6
130.2
129.9
129.6
129.5
128.5
128.4
128.0
127.9
113.7
87.6
77.9
77.4
76.9
75.9
74.8
73.7
69.2
55.4
25.7
21.2
17.9
-3.9
-4.9
PMBO
OBn
O
STol
TBSO
OBz
D4
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.418
7.407
7.402
7.396
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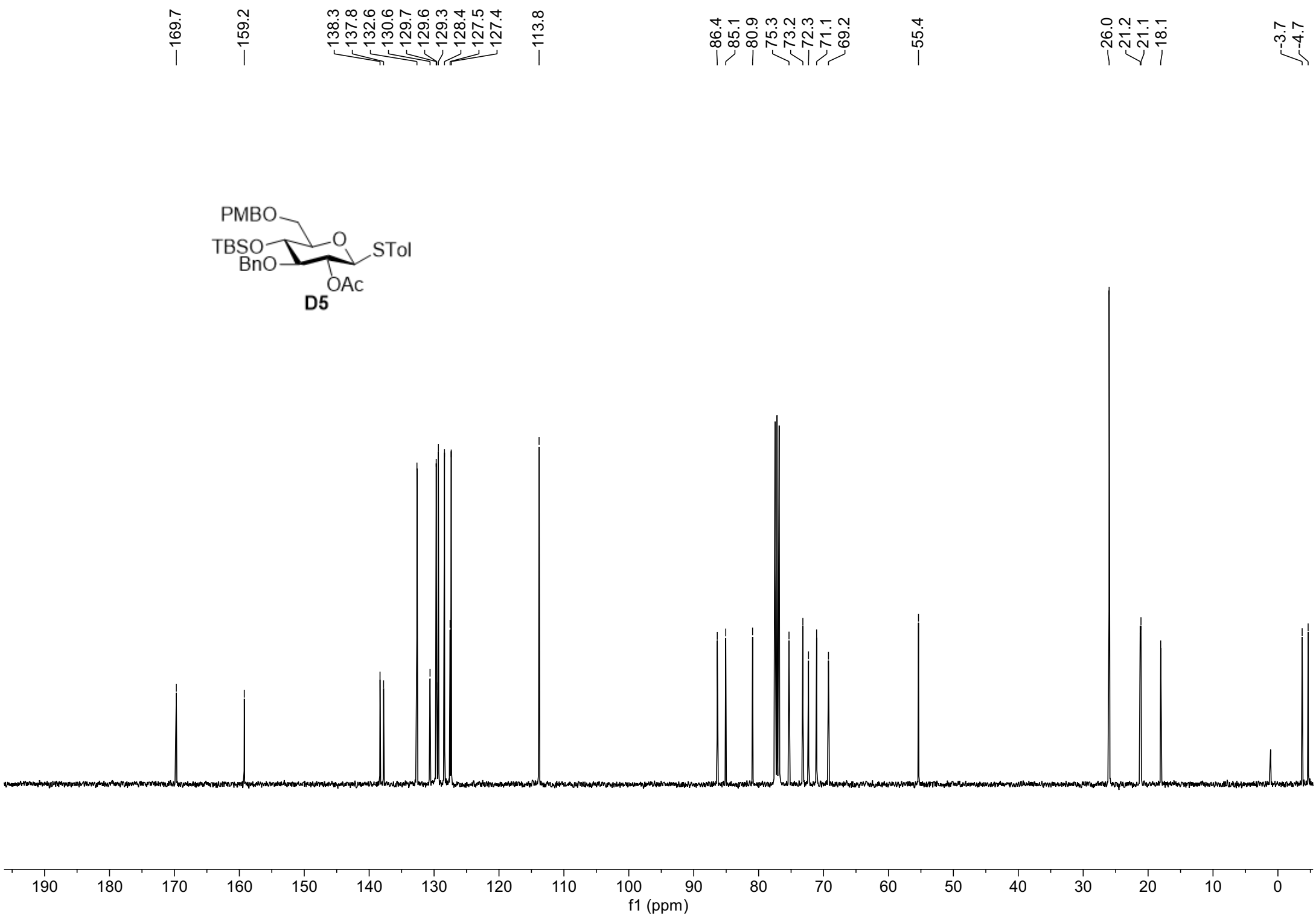
7.325
7.320
7.310
7.307
7.304
7.301
7.290
7.288
7.285
7.268
7.262
7.255
7.246
7.237
7.236
7.021
7.016
7.006
7.002
7.000
6.894
6.887
6.882
6.871
6.865
5.034
5.012
5.009
4.987
4.736
4.707
4.652
4.623
4.611
4.586
4.557
4.528
4.451
4.423
3.810
3.783
3.778
3.756
3.751
3.658
3.637
3.634
3.613
3.599
3.583
3.572
3.556
3.522
3.504
3.500
3.488
3.483
3.478
3.476
3.465
2.294
1.918
0.853
0.002
-0.035
PMBO
TBSO
BnO
O
STol
OAc
D5
2.09
2.13
5.07
2.07
2.07
1.00
1.03
1.02
1.02
1.02
1.02
3.10
1.03
1.07
1.03
2.07
3.05
3.00
9.16
3.03
3.08
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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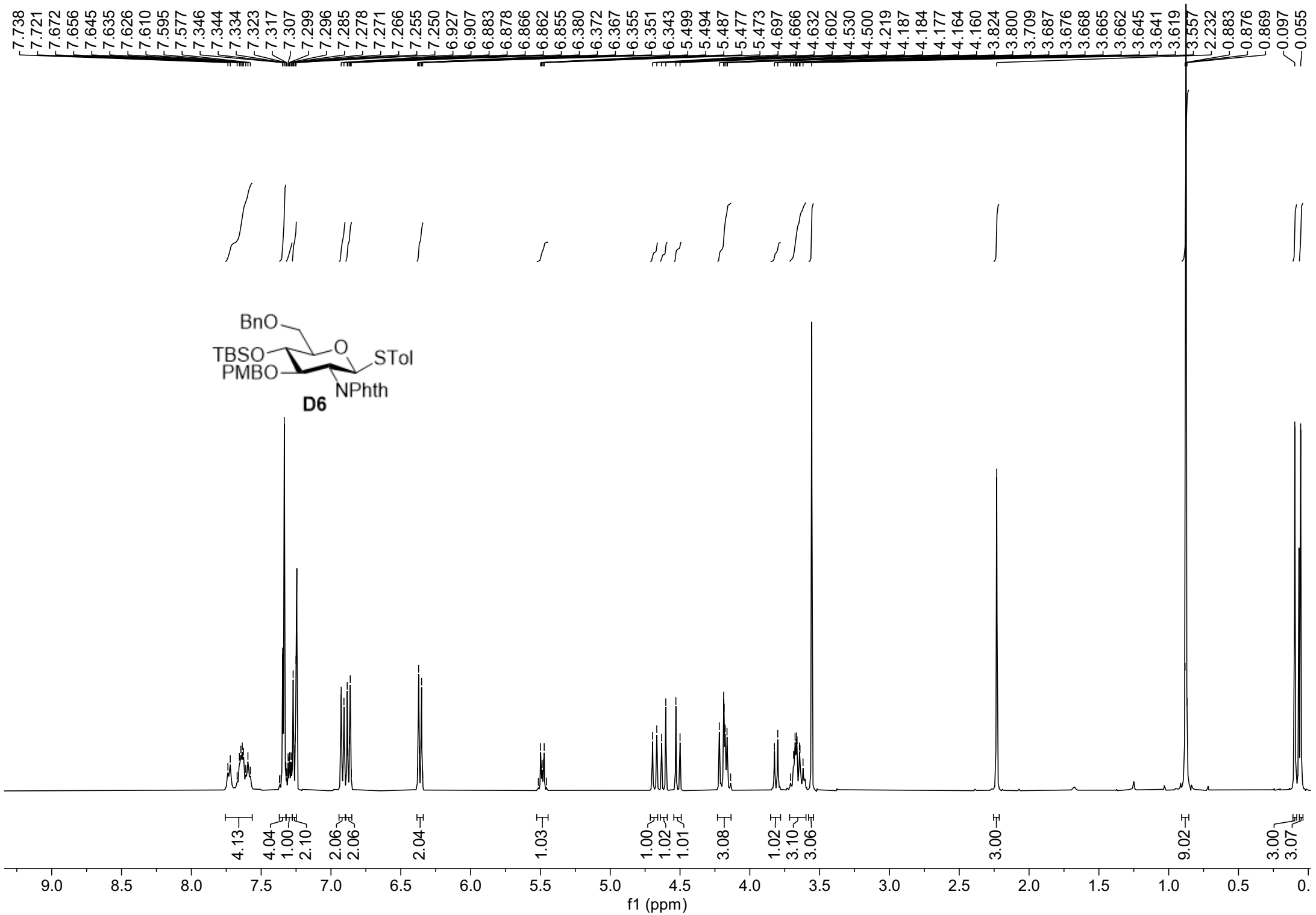
159.2
138.3
137.8
132.6
130.6
129.7
129.6
129.3
128.4
127.5
127.4
113.8
86.4
85.1
80.9
75.3
73.2
72.3
71.1
69.2
55.4
26.0
21.2
21.1
18.1
-3.7
-4.7
PMBO
TBSO
BnO
O
STol
OAc
D5
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.610
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7.577
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7.344
7.334
7.323
7.317
7.307
7.299
7.296
7.285
7.278
7.271
7.266
7.255
7.250
6.927
6.907
6.883
6.878
6.866
6.862
6.855
6.380
6.372
6.367
6.355
6.351
6.343
5.499
5.494
5.487
5.477
5.473
4.697
4.666
4.632
4.602
4.530
4.500
4.219
4.187
4.184
4.177
4.164
4.160
3.824
3.800
3.709
3.687
3.676
3.668
3.665
3.662
3.645
3.641
3.619
3.557
2.232
0.883
0.876
0.869
0.097
0.055
BnO
TBSO
PMBO
O
STol
NPhth
D6
4.13
4.04
1.00
2.10
2.06
2.06
2.04
1.03
1.00
1.02
1.01
3.08
1.02
3.10
3.06
3.00
9.02
3.00
3.07
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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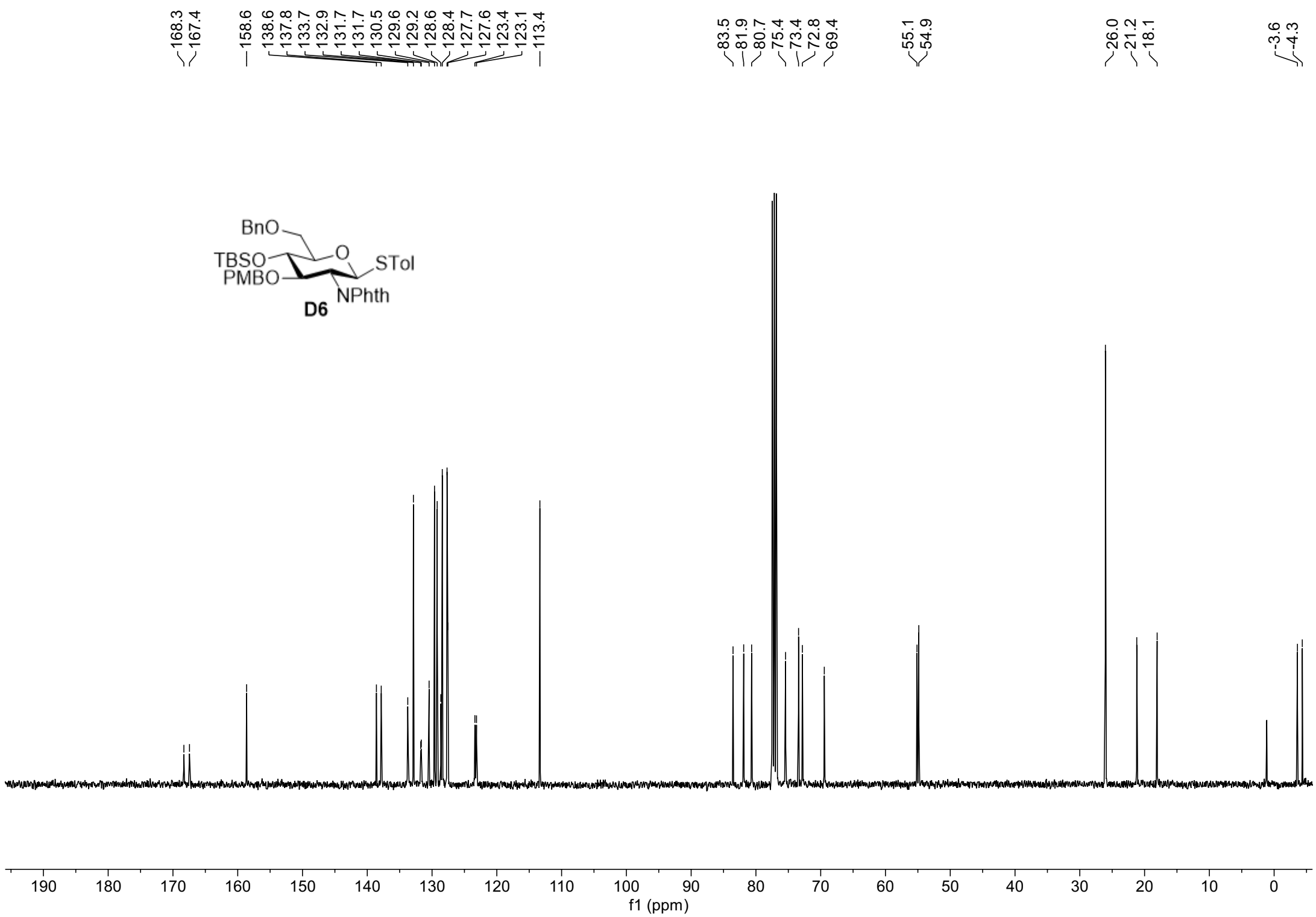
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)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167.4
158.6
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133.7
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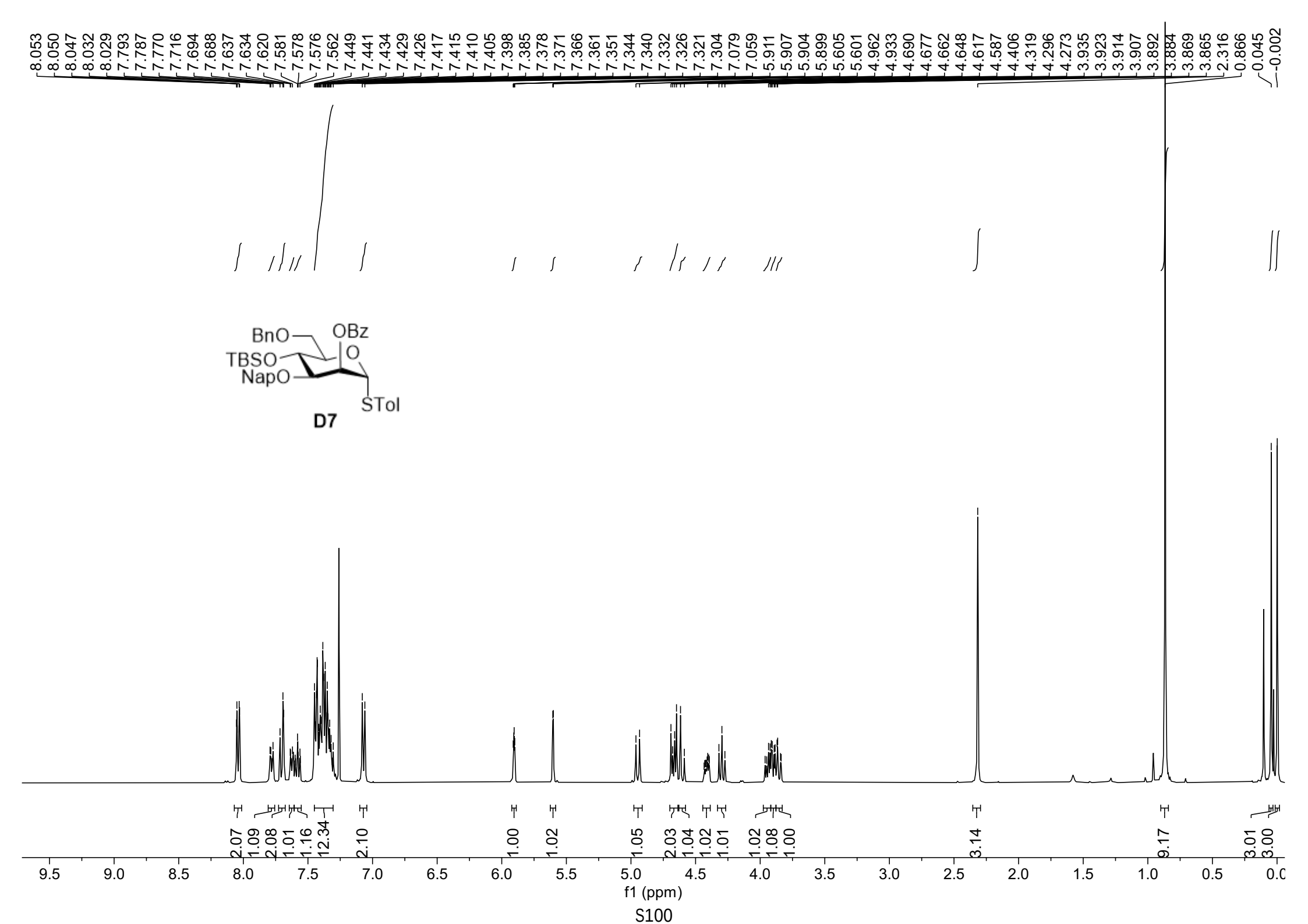
131.7
131.7
130.5
129.6
129.2
128.6
128.4
127.7
127.6
123.4
123.1
113.4
83.5
81.9
80.7
75.4
73.4
72.8
69.4
55.1
54.9
26.0
21.2
18.1
-3.6
-4.3
BnO
TBSO
PMBO
O
STol
NPhth
D6
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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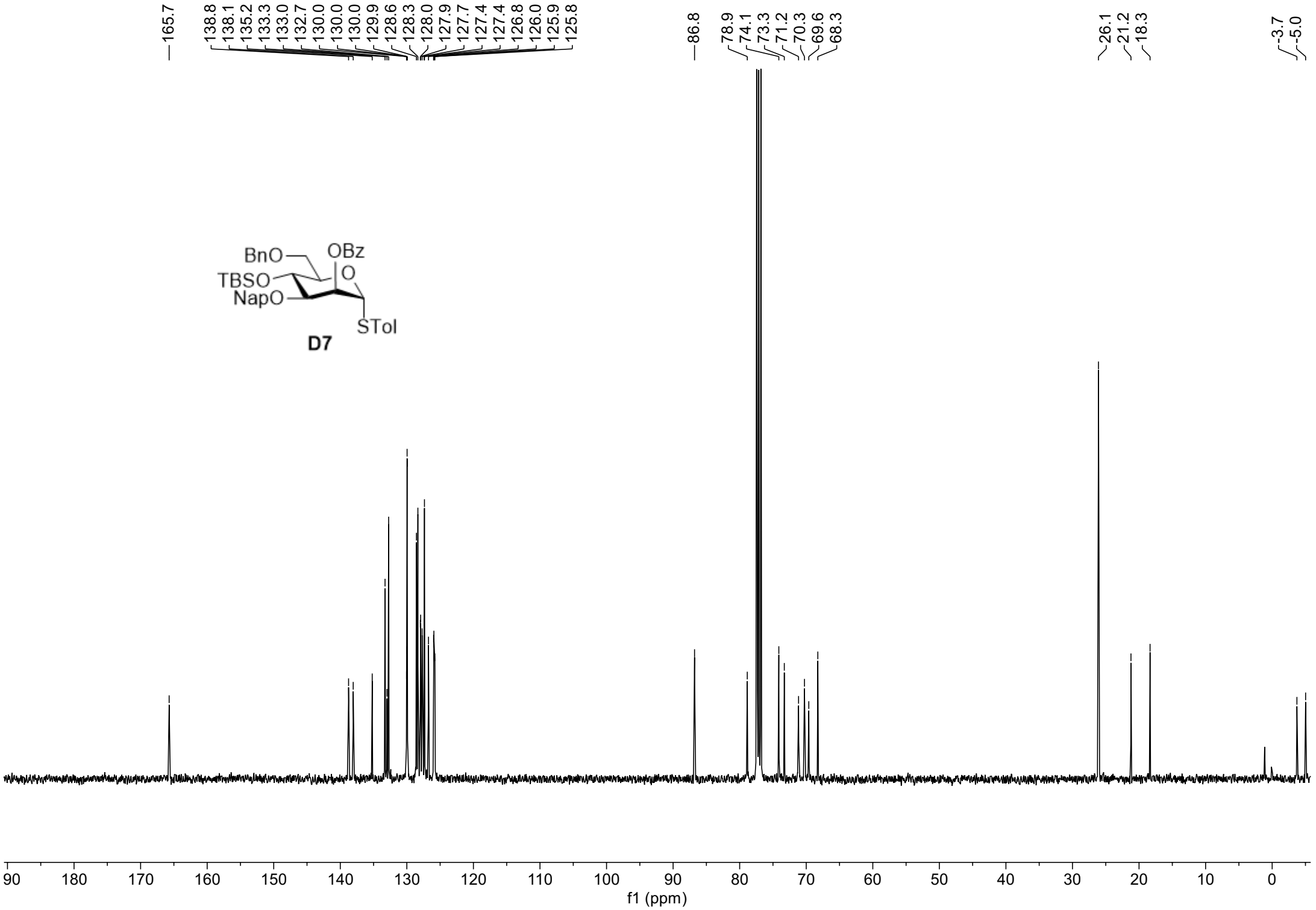
8.047
8.032
8.029
7.793
7.787
7.770
7.716
7.694
7.688
7.637
7.634
7.620
7.581
7.578
7.576
7.562
7.449
7.441
7.434
7.429
7.426
7.417
7.415
7.410
7.405
7.398
7.385
7.378
7.371
7.366
7.361
7.351
7.344
7.340
7.332
7.326
7.321
7.304
7.079
7.059
5.911
5.907
5.904
5.899
5.605
5.601
4.962
4.933
4.690
4.677
4.662
4.648
4.617
4.587
4.406
4.319
4.296
4.273
3.935
3.923
3.914
3.907
3.892
3.884
3.869
3.865
2.316
0.866
0.045
-0.002
BnO
OBz
O
TBSO
NapO
STol
D7
2.07
1.09
2.08
1.01
1.16
12.34
2.10
1.00
1.02
1.05
2.03
1.04
1.02
1.01
1.02
1.08
1.00
3.14
9.17
3.01
3.00
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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135.2
133.3
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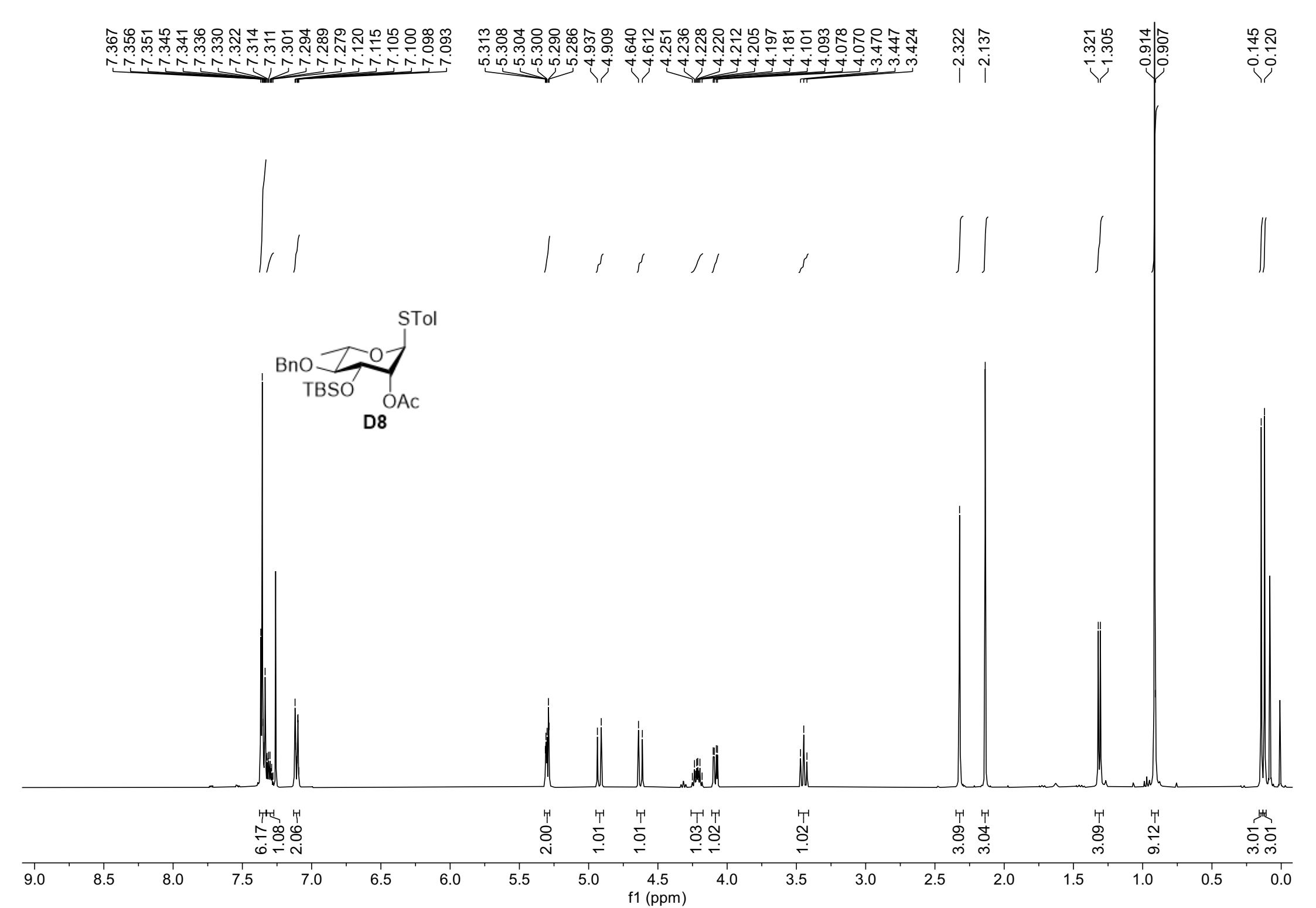
132.7
130.0
130.0
130.0
129.9
128.6
128.3
128.0
127.9
127.7
127.4
127.4
126.8
126.0
125.9
125.8
86.8
78.9
74.1
73.3
71.2
70.3
69.6
68.3
26.1
21.2
18.3
-3.7
-5.0
BnO
OBz
O
TBSO
NapO
STol
D7
90
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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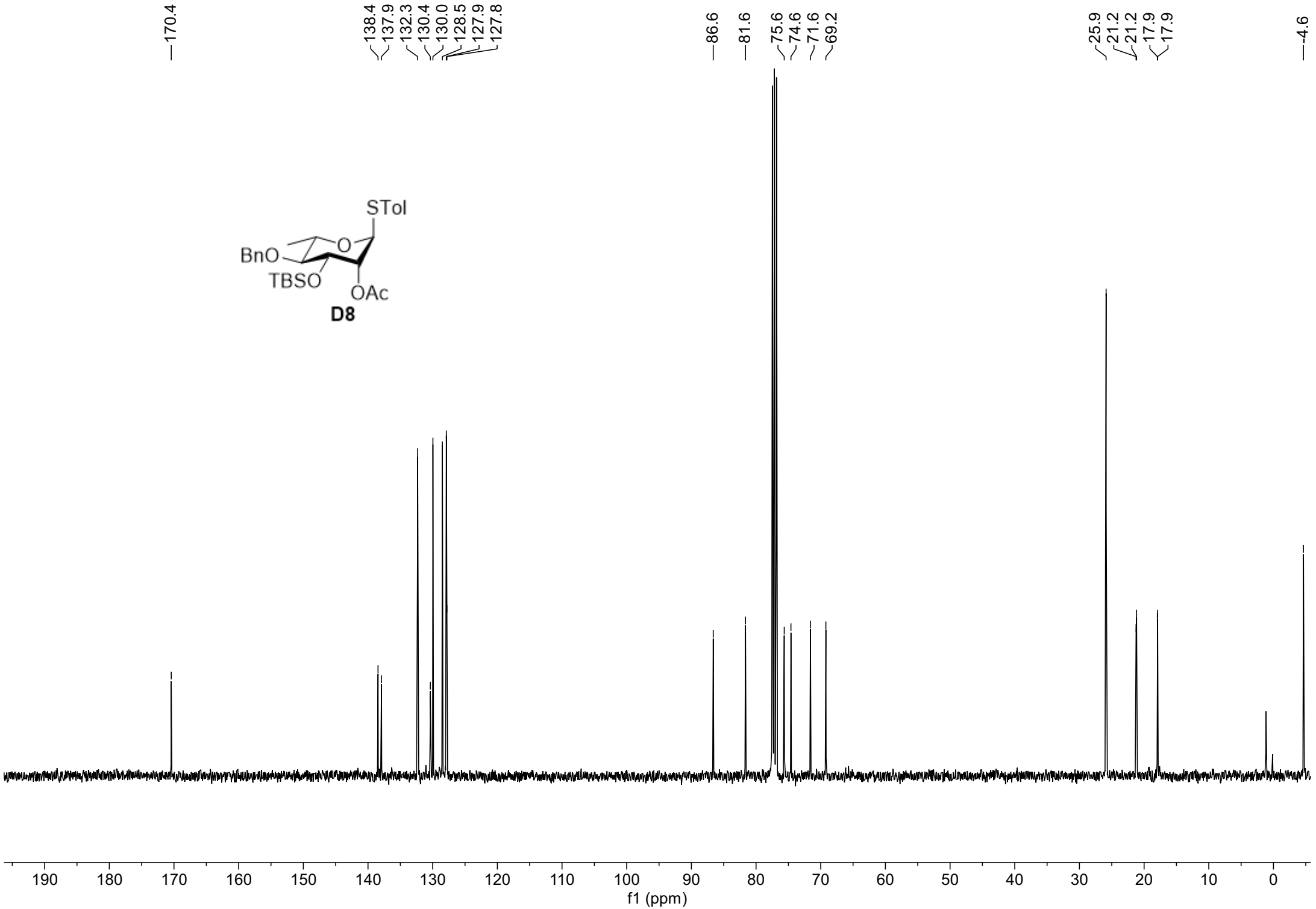
7.330
7.322
7.314
7.311
7.301
7.294
7.289
7.279
7.120
7.115
7.105
7.100
7.098
7.093
5.313
5.308
5.304
5.300
5.290
5.286
4.937
4.909
4.640
4.612
4.251
4.236
4.228
4.220
4.212
4.205
4.197
4.181
4.101
4.093
4.078
4.070
3.470
3.447
3.424
2.322
2.137
1.321
1.305
0.914
0.907
0.145
0.120
STol
BnO
O
TBSO
OAc
D8
6.17
1.08
2.06
2.00
1.01
1.01
1.03
1.02
1.02
3.09
3.04
3.09
9.12
3.01
3.01
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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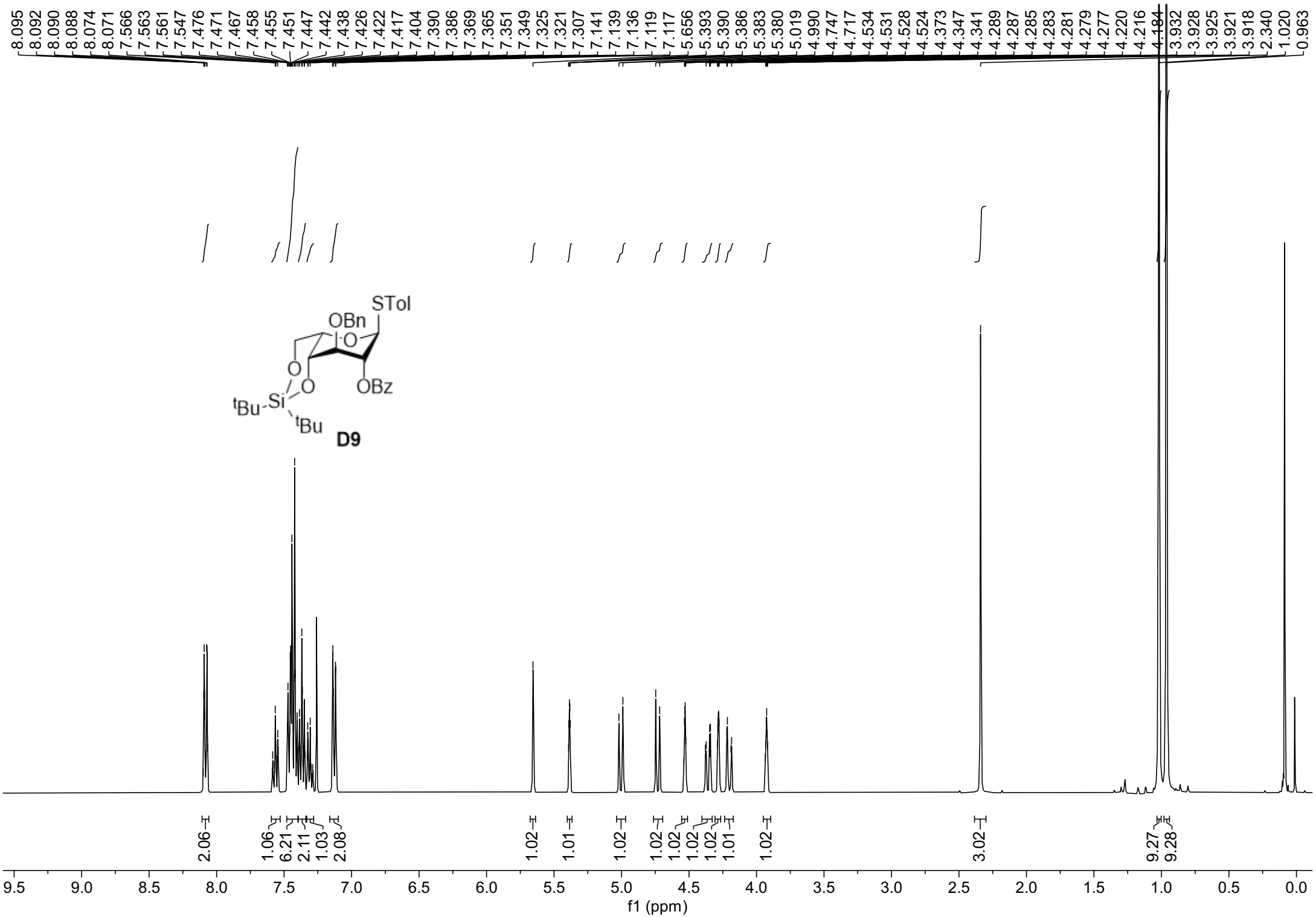
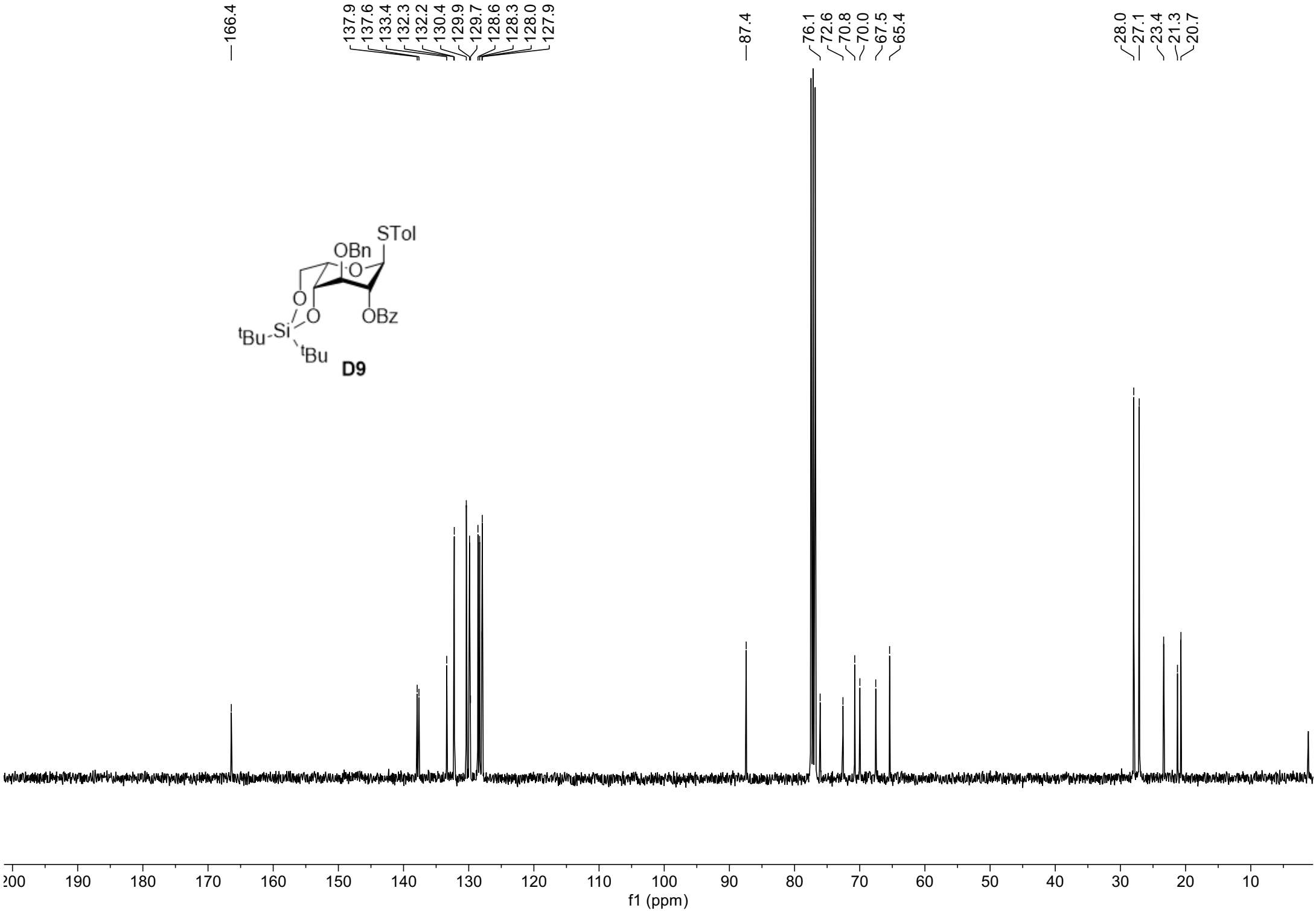
137.9
132.3
130.4
130.0
128.5
127.9
127.8
86.6
81.6
75.6
74.6
71.6
69.2
25.9
21.2
21.2
17.9
17.9
-4.6
STol
BnO
O
TBSO
OAc
D8
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.095 8.092 8.090 8.088 8.074 8.071 7.566 7.563 7.561 7.547 7.476 7.471 7.467 7.458 7.455 7.451 7.447 7.442 7.438 7.426 7.422 7.417 7.404 7.390 7.386 7.369 7.365 7.351 7.349 7.325 7.321 7.307 7.141 7.139 7.136 7.119 7.117 5.656 5.393 5.390 5.386 5.383 5.380 5.019 4.990 4.747 4.717 4.534 4.531 4.528 4.524 4.373 4.347 4.341 4.289 4.287 4.285 4.283 4.281 4.279 4.277 4.220 4.216 4.184 3.932 3.928 3.925 3.921 3.918 2.340 1.020 0.963
STol
OBn
O
O
O
OBz
tBu-Si
tBu
D9
2.06 1.06 6.21 2.11 1.03 2.08 1.02 1.01 1.02 1.02 1.02 1.02 1.01 1.02 3.02 9.27 9.28
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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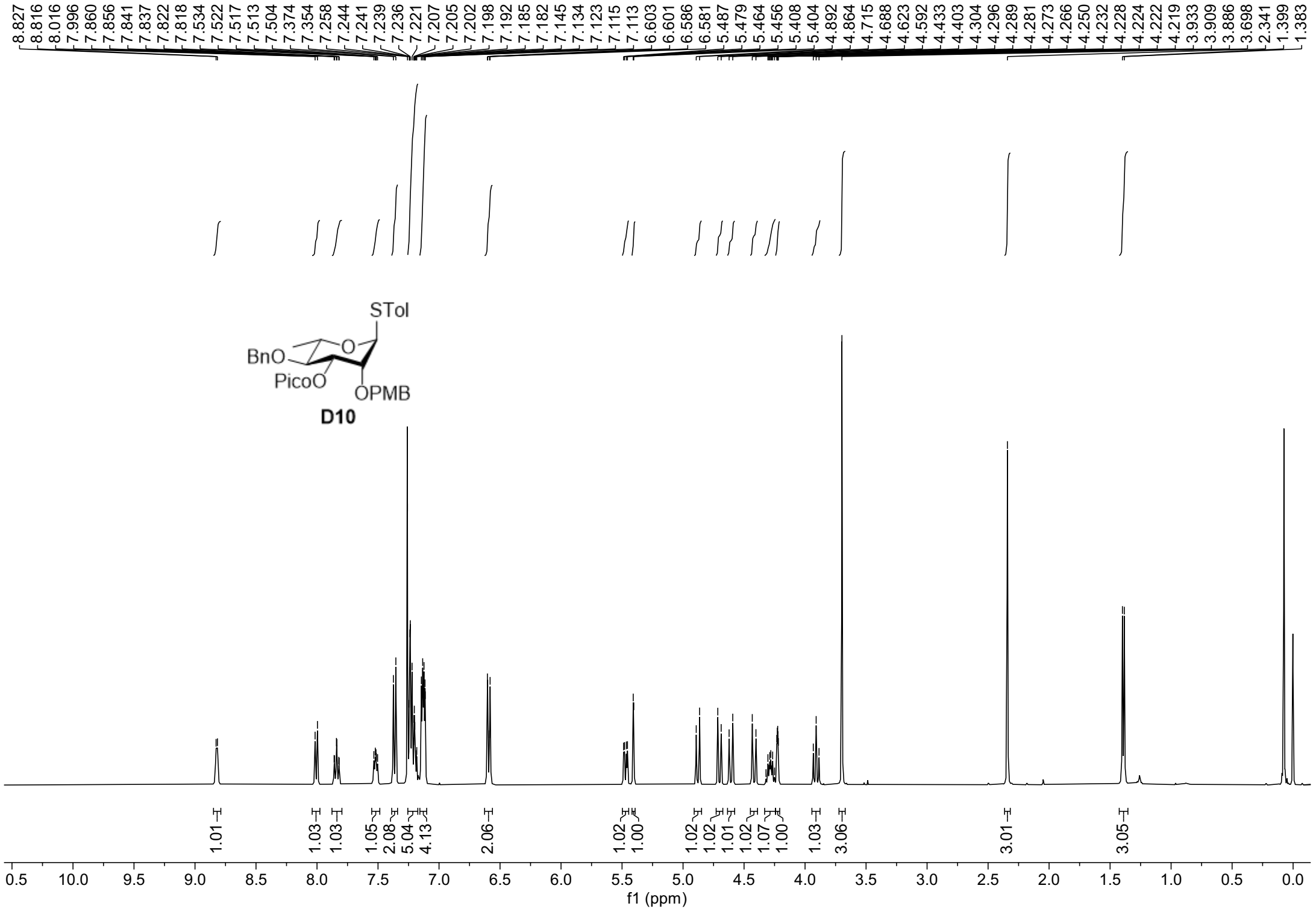
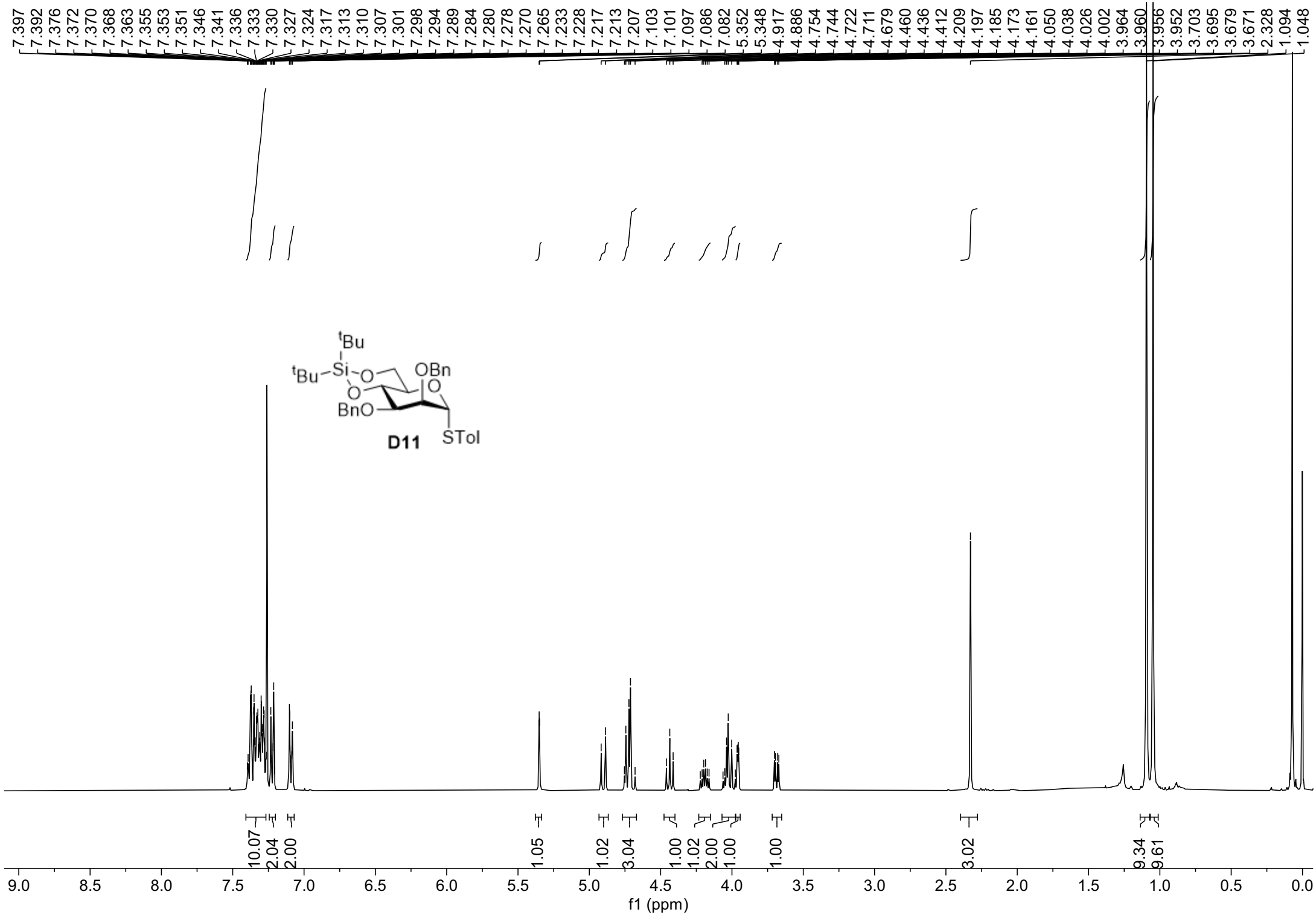
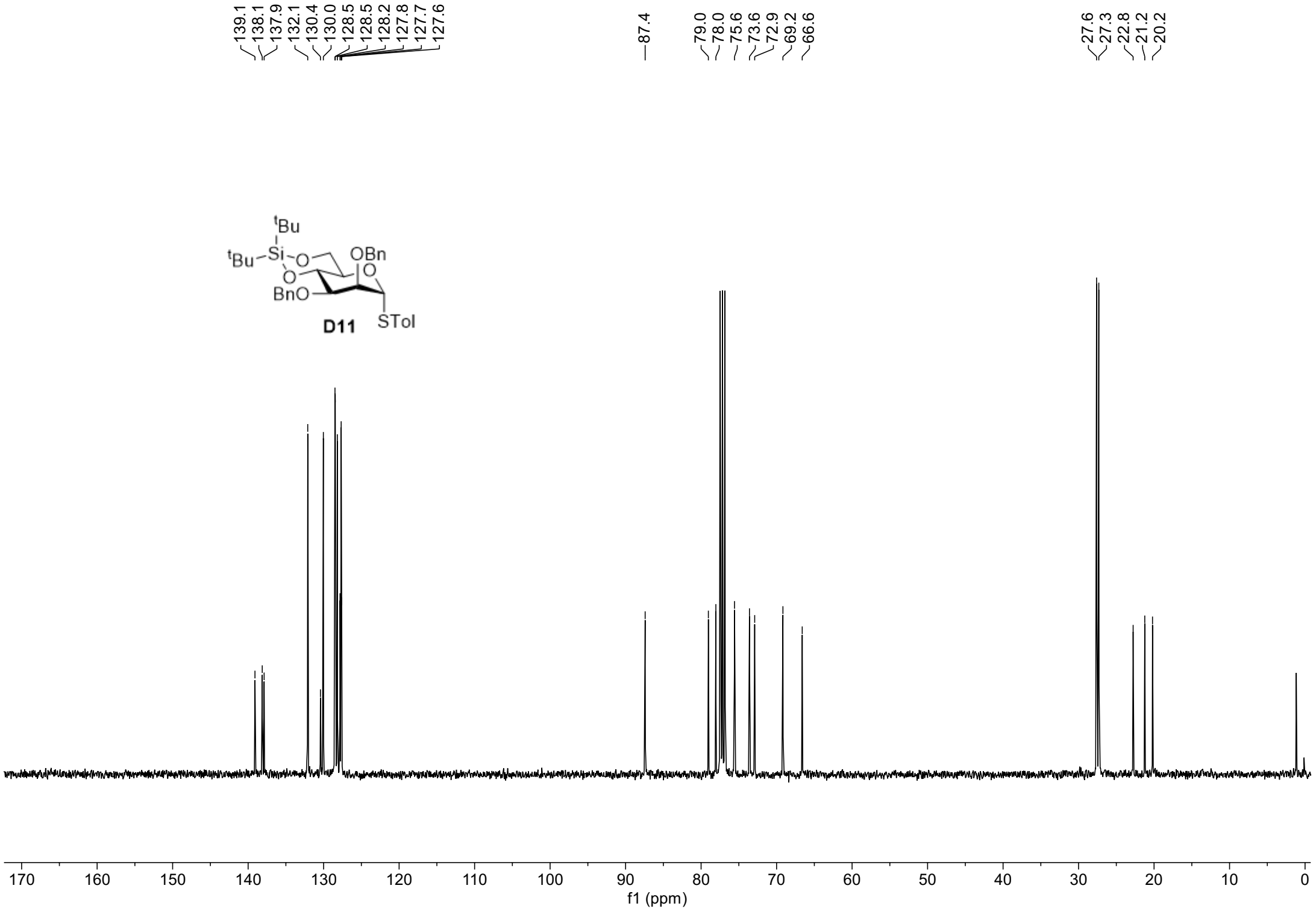
137.9
137.6
133.4
132.3
132.2
130.4
129.9
129.7
128.6
128.3
128.0
127.9
87.4
76.1
72.6
70.8
70.0
67.5
65.4
28.0
27.1
23.4
21.3
20.7
STol
OBn
O
O
O
OBz
tBu-Si
tBu
D9
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


8.827 8.816 8.016 7.996 7.860 7.856 7.841 7.837 7.822 7.818 7.534 7.522 7.517 7.513 7.504 7.374 7.354 7.258 7.244 7.241 7.239 7.236 7.221 7.207 7.205 7.202 7.198 7.192 7.185 7.182 7.145 7.134 7.123 7.115 7.113 6.603 6.601 6.586 6.581 5.487 5.479 5.464 5.456 5.408 5.404 4.892 4.864 4.715 4.688 4.623 4.592 4.433 4.403 4.304 4.296 4.289 4.281 4.273 4.266 4.250 4.232 4.228 4.224 4.222 4.219 3.933 3.909 3.886 3.698 2.341 1.399 1.383
STol
BnO
O
PicoO
OPMB
D10
1.01 1.03 1.03 1.05 2.08 5.04 4.13 2.06 1.02 1.00 1.02 1.02 1.01 1.02 1.07 1.00 1.03 3.06 3.01 3.05
0.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


7.397 7.392 7.376 7.372 7.370 7.368 7.363 7.355 7.353 7.351 7.346 7.341 7.336 7.333 7.330 7.327 7.324 7.317 7.313 7.310 7.307 7.301 7.298 7.294 7.289 7.284 7.280 7.278 7.270 7.265 7.233 7.228 7.217 7.213 7.207 7.103 7.101 7.097 7.086 7.082 5.352 5.348 4.917 4.886 4.754 4.744 4.722 4.711 4.679 4.460 4.436 4.412 4.209 4.197 4.185 4.173 4.161 4.050 4.038 4.026 4.002 3.964 3.960 3.956 3.952 3.703 3.695 3.679 3.671 2.328 1.094 1.048
tBu
tBu
Si
O
OBn
O
O
BnO
STol
D11
10.07
2.04
2.00
1.05
1.02
3.04
1.00
1.02
2.00
1.00
1.00
3.02
9.34
9.61
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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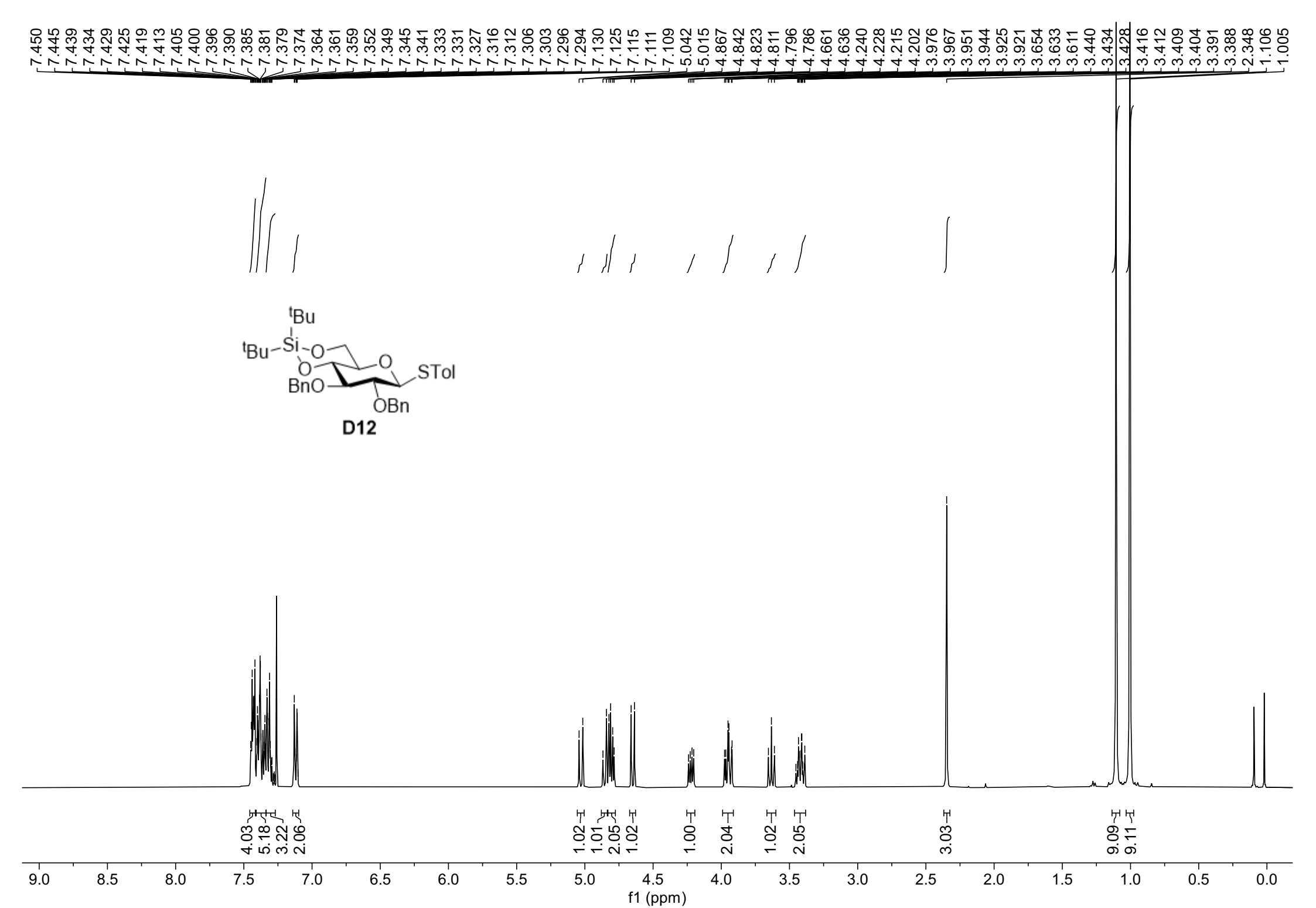
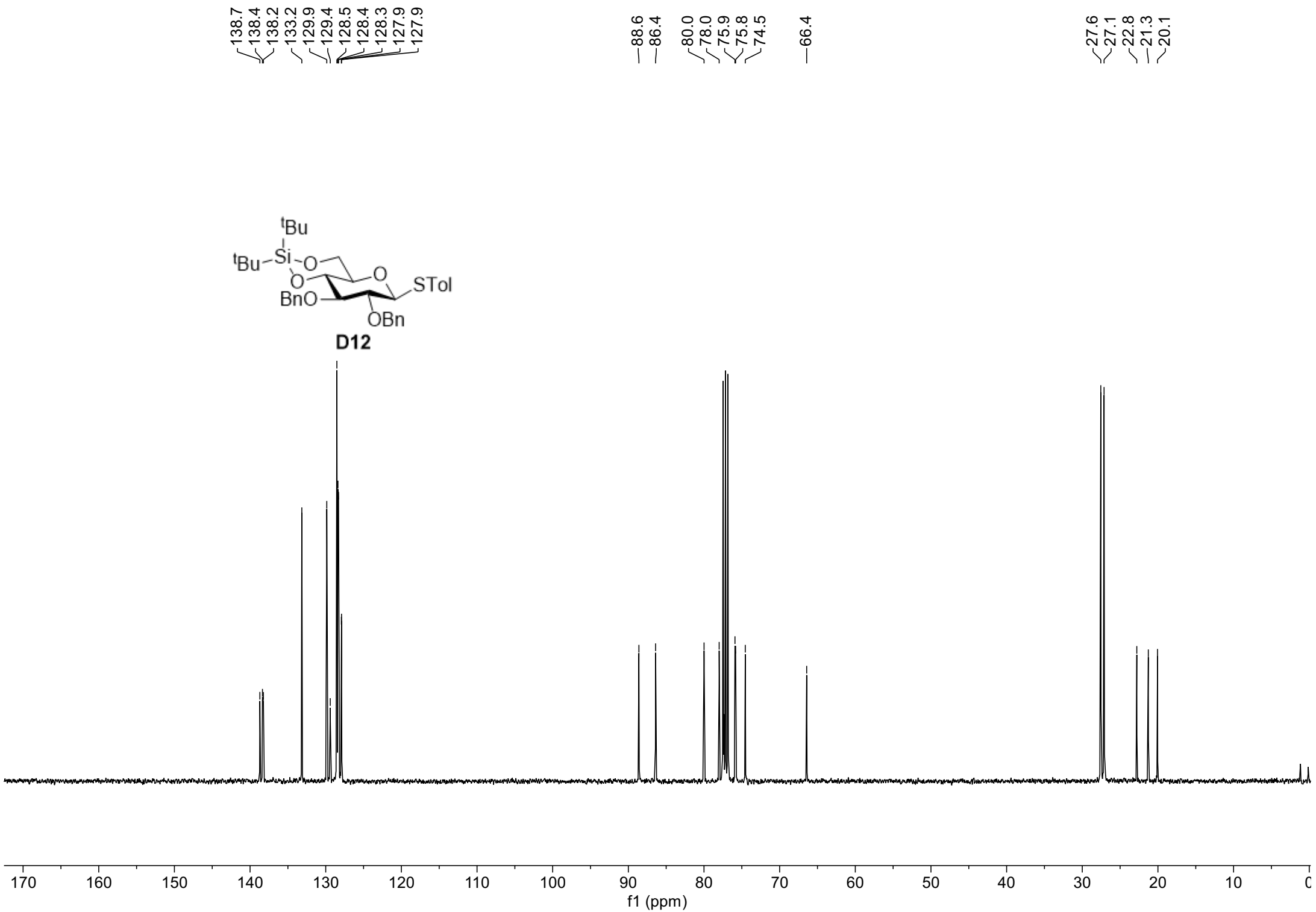
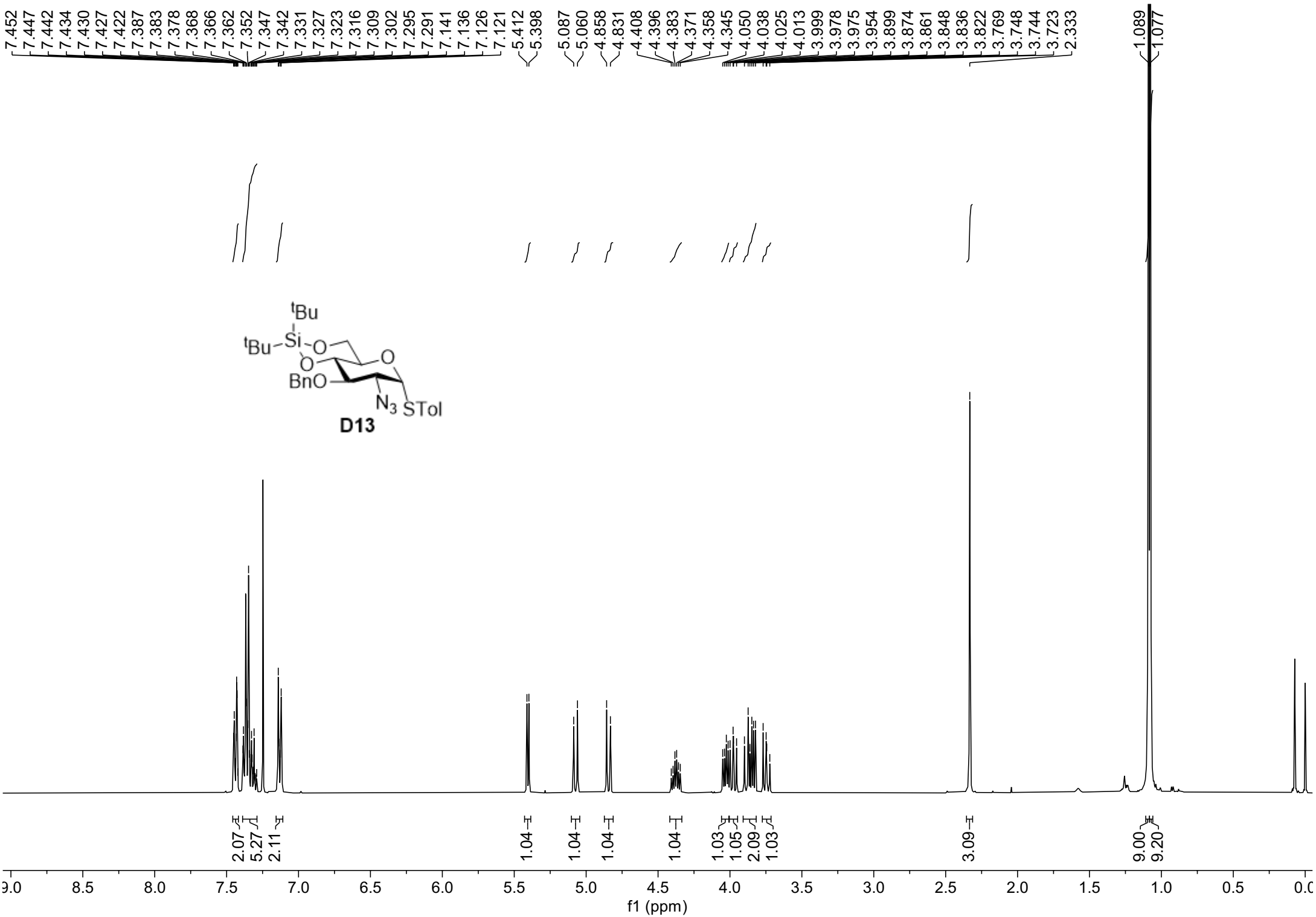
138.1
137.9
132.1
130.4
130.0
128.5
128.5
128.2
127.8
127.7
127.6
87.4
79.0
78.0
75.6
73.6
72.9
69.2
66.6
27.6
27.3
22.8
21.2
20.2
tBu
tBu
Si
O
O
OBn
O
BnO
STol
D11
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.450
7.445
7.439
7.434
7.429
7.425
7.419
7.413
7.405
7.400
7.396
7.390
7.385
7.381
7.379
7.374
7.364
7.361
7.359
7.352
7.349
7.345
7.341
7.333
7.331
7.327
7.316
7.312
7.306
7.303
7.296
7.294
7.130
7.125
7.115
7.111
7.109
5.042
5.015
4.867
4.842
4.823
4.811
4.796
4.786
4.661
4.636
4.240
4.228
4.215
4.202
3.976
3.967
3.951
3.944
3.925
3.921
3.654
3.633
3.611
3.440
3.434
3.428
3.416
3.412
3.409
3.404
3.391
3.388
2.348
1.106
1.005
tBu
tBu
Si
O
O
O
BnO
OBn
STol
D12
4.03
5.18
3.22
2.06
1.02
1.01
2.05
1.02
1.00
2.04
1.02
2.05
3.03
9.09
9.11
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


138.7
138.4
138.2
133.2
129.9
129.4
128.5
128.4
128.3
127.9
127.9
88.6
86.4
80.0
78.0
75.9
75.8
74.5
66.4
27.6
27.1
22.8
21.3
20.1
tBu
tBu
Si
O
O
O
STol
BnO
OBn
D12
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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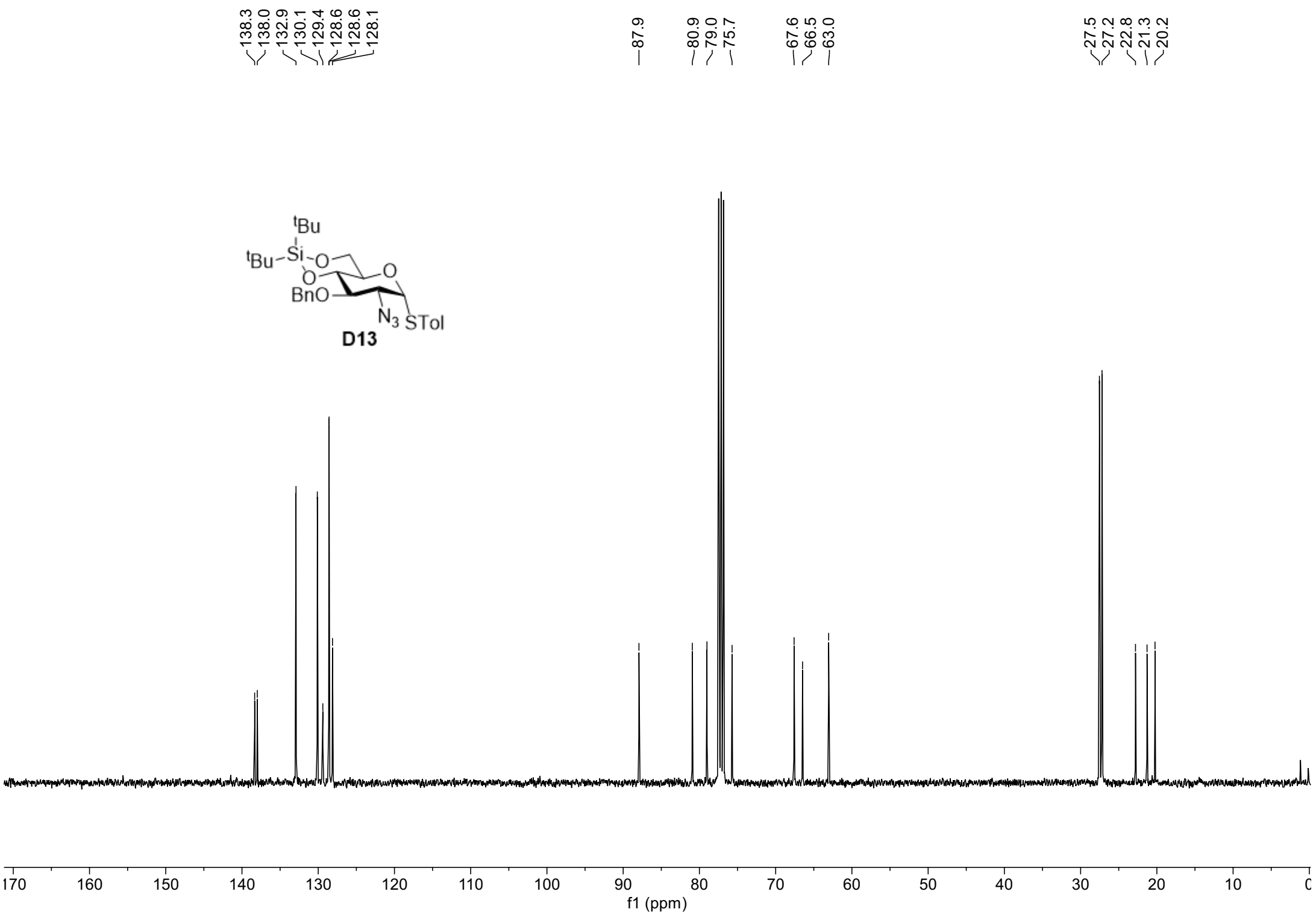
7.447
7.442
7.434
7.430
7.427
7.422
7.387
7.383
7.378
7.368
7.366
7.362
7.352
7.347
7.342
7.331
7.327
7.323
7.316
7.309
7.302
7.295
7.291
7.141
7.136
7.126
7.121
5.412
5.398
5.087
5.060
4.858
4.831
4.408
4.396
4.383
4.371
4.358
4.345
4.050
4.038
4.025
4.013
3.999
3.978
3.975
3.954
3.899
3.874
3.861
3.848
3.836
3.822
3.769
3.748
3.744
3.723
2.333
1.089
1.077
tBu
tBu
Si
O
O
O
BnO
N3
STol
D13
2.07
5.27
2.11
1.04
1.04
1.04
1.04
1.03
1.05
2.09
1.03
3.09
9.00
9.20
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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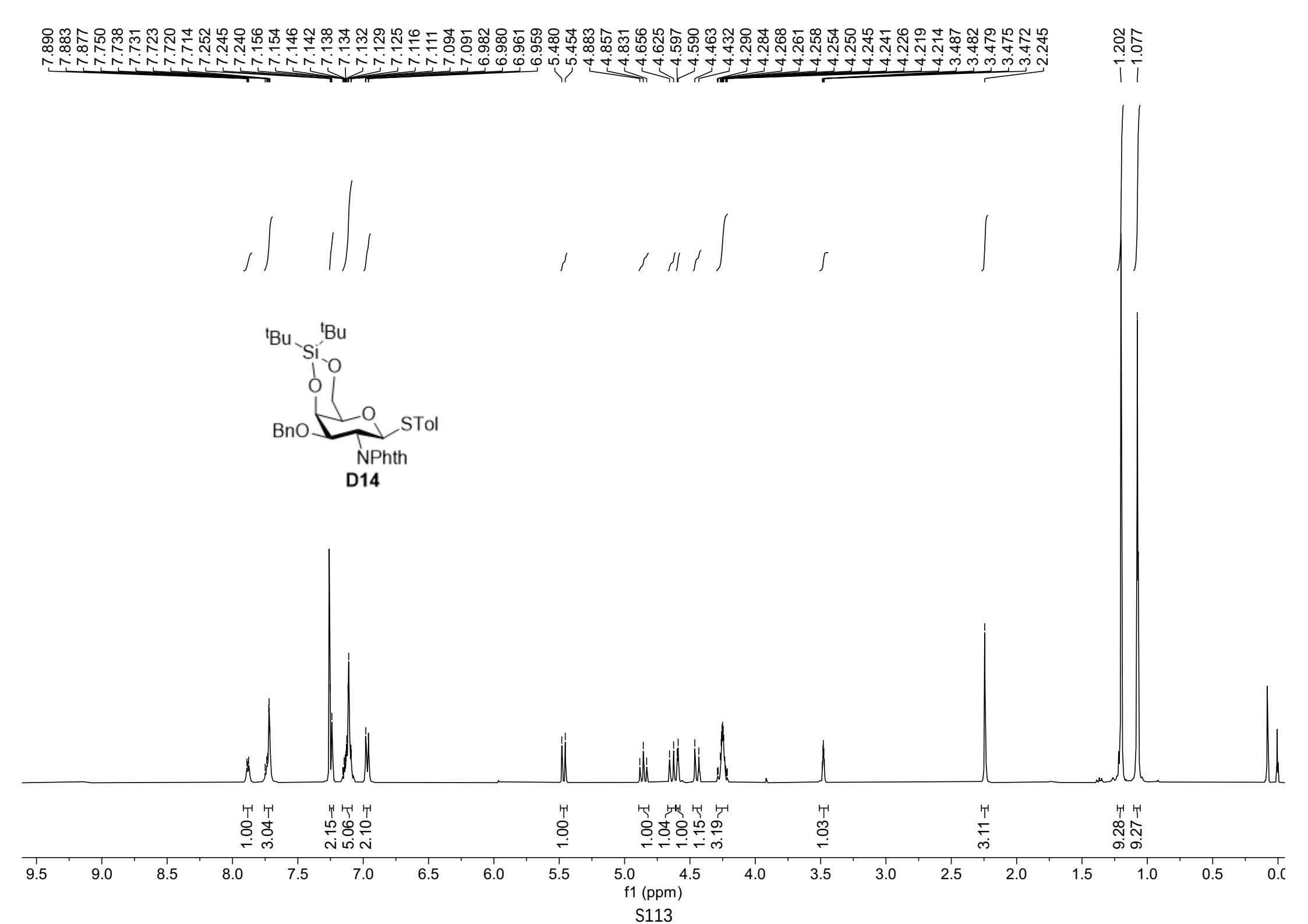
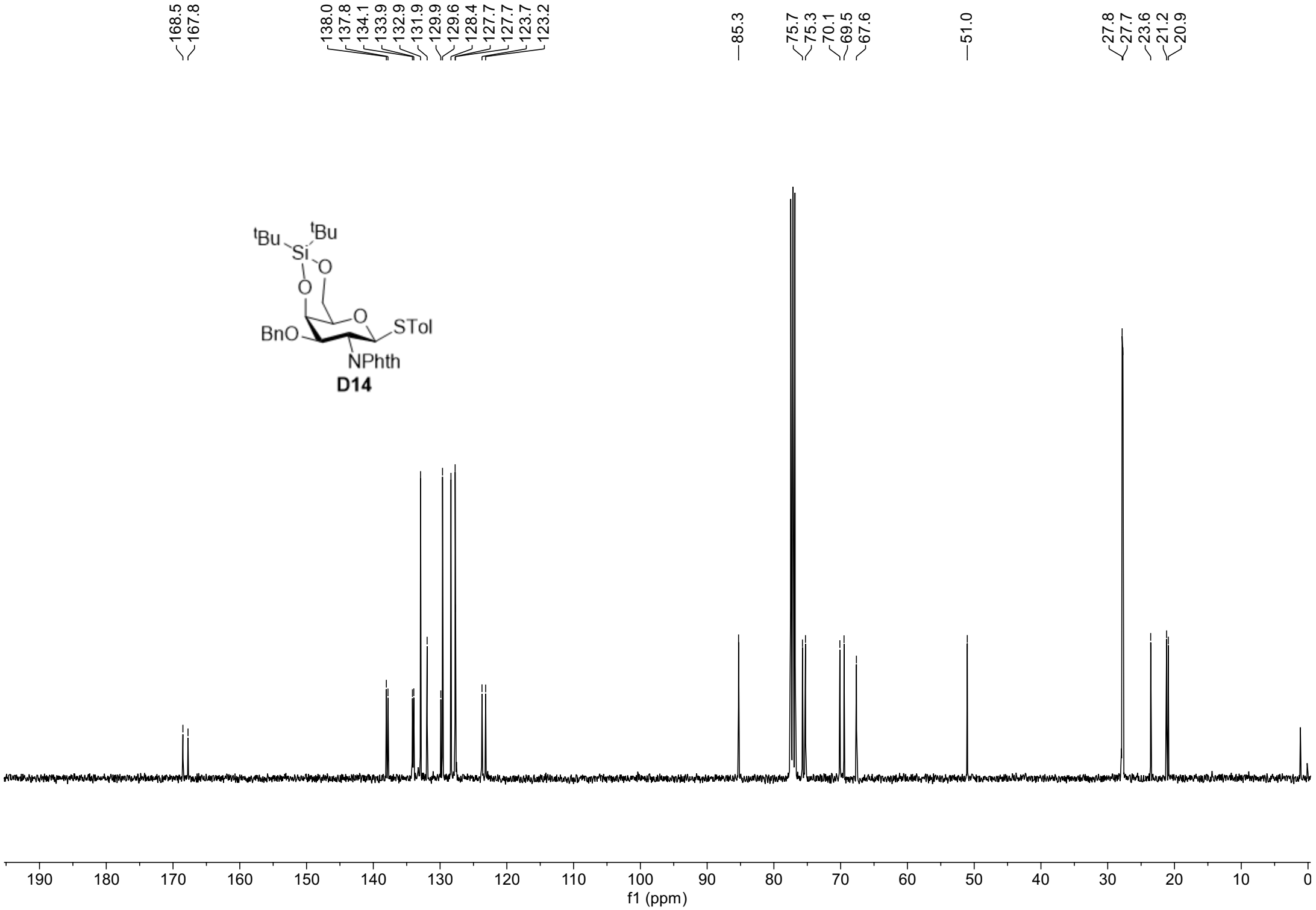
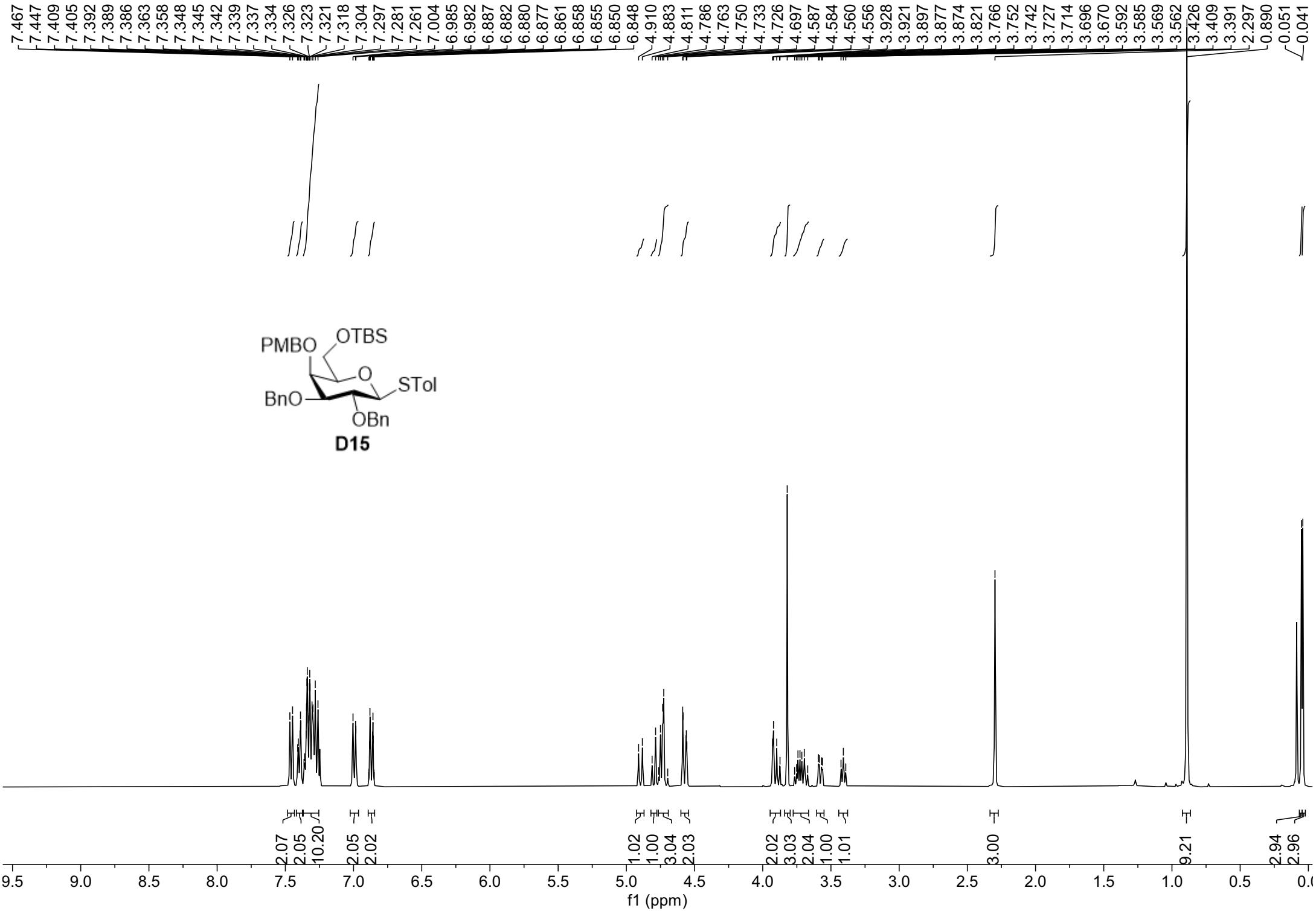
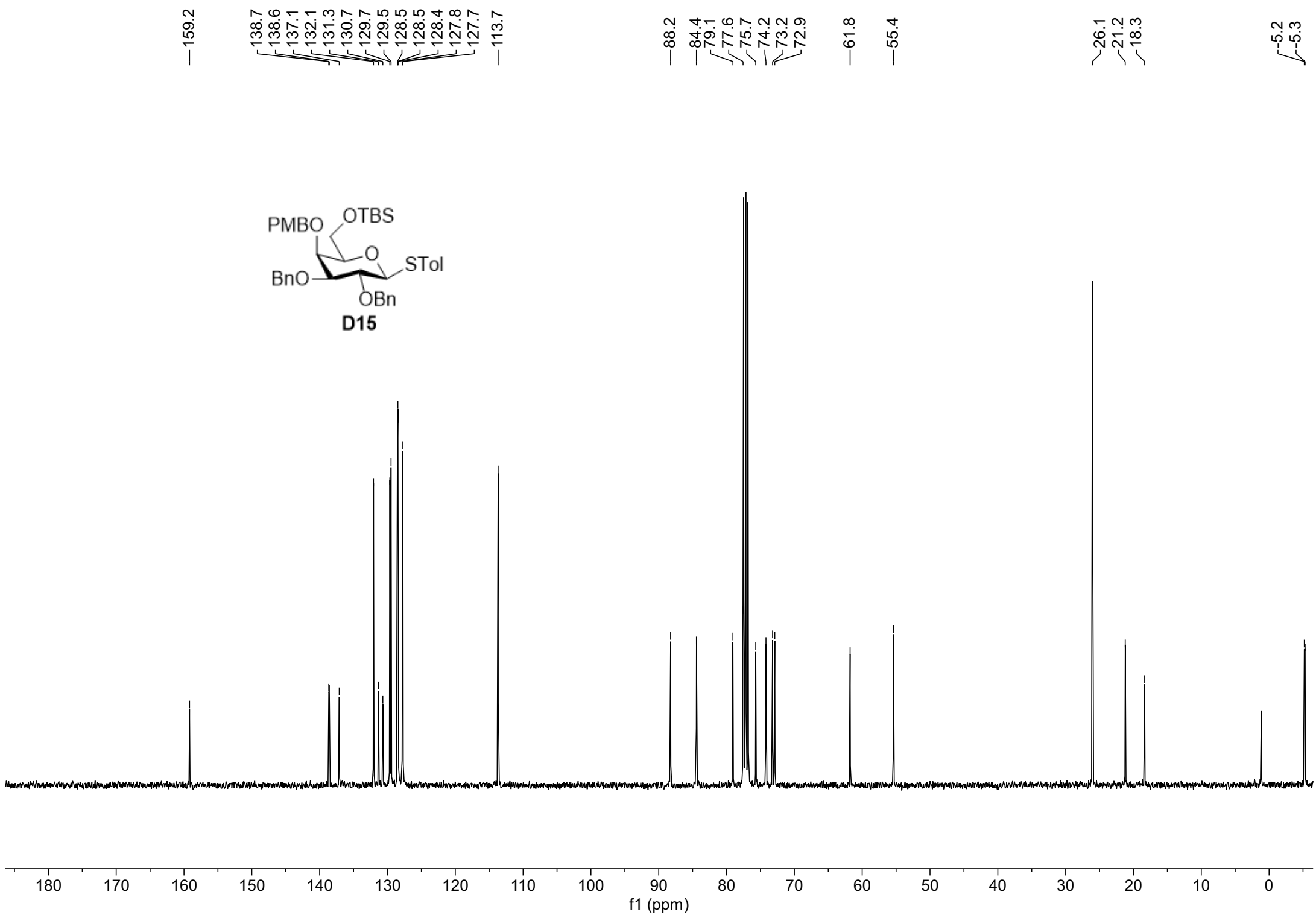
138.0
132.9
130.1
129.4
128.6
128.6
128.1
87.9
80.9
79.0
75.7
67.6
66.5
63.0
27.5
27.2
22.8
21.3
20.2
tBu
tBu
Si
O
O
O
BnO
N3
STol
D13
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.890
7.883
7.877
7.750
7.738
7.731
7.723
7.720
7.714
7.252
7.245
7.240
7.156
7.154
7.146
7.142
7.138
7.134
7.132
7.129
7.125
7.116
7.111
7.094
7.091
6.982
6.980
6.961
6.959
5.480
5.454
4.883
4.857
4.831
4.656
4.625
4.597
4.590
4.463
4.432
4.290
4.284
4.268
4.261
4.258
4.254
4.250
4.245
4.241
4.226
4.219
4.214
3.487
3.482
3.479
3.475
3.472
2.245
1.202
1.077
tBu
tBu
Si
O
O
O
BnO
STol
NPhth
D14
1.00
3.04
2.15
5.06
2.10
1.00
1.00
1.04
1.00
1.15
3.19
1.03
3.11
9.28
9.27
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


168.5
167.8
138.0
137.8
134.1
133.9
132.9
131.9
129.9
129.6
128.4
127.7
127.7
123.7
123.2
85.3
75.7
75.3
70.1
69.5
67.6
51.0
27.8
27.7
23.6
21.2
20.9
tBu
tBu
Si
O
O
O
BnO
STol
NPhth
D14
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.467 7.447 7.409 7.405 7.392 7.389 7.386 7.363 7.358 7.348 7.345 7.342 7.339 7.337 7.334 7.326 7.323 7.321 7.318 7.304 7.297 7.281 7.261 7.004 6.985 6.982 6.887 6.882 6.880 6.877 6.861 6.858 6.855 6.850 6.848 4.910 4.883 4.811 4.786 4.763 4.750 4.733 4.726 4.697 4.587 4.584 4.560 4.556 3.928 3.921 3.897 3.877 3.874 3.821 3.766 3.752 3.742 3.727 3.714 3.696 3.670 3.592 3.585 3.569 3.562 3.426 3.409 3.391 2.297 0.890 0.051 0.041
PMBO
OTBS
O
STol
BnO
OBn
D15
2.07 2.05 10.20 2.05 2.02 1.02 1.00 3.04 2.03 2.02 3.03 2.04 1.00 1.01 3.00 9.21 2.94 2.96
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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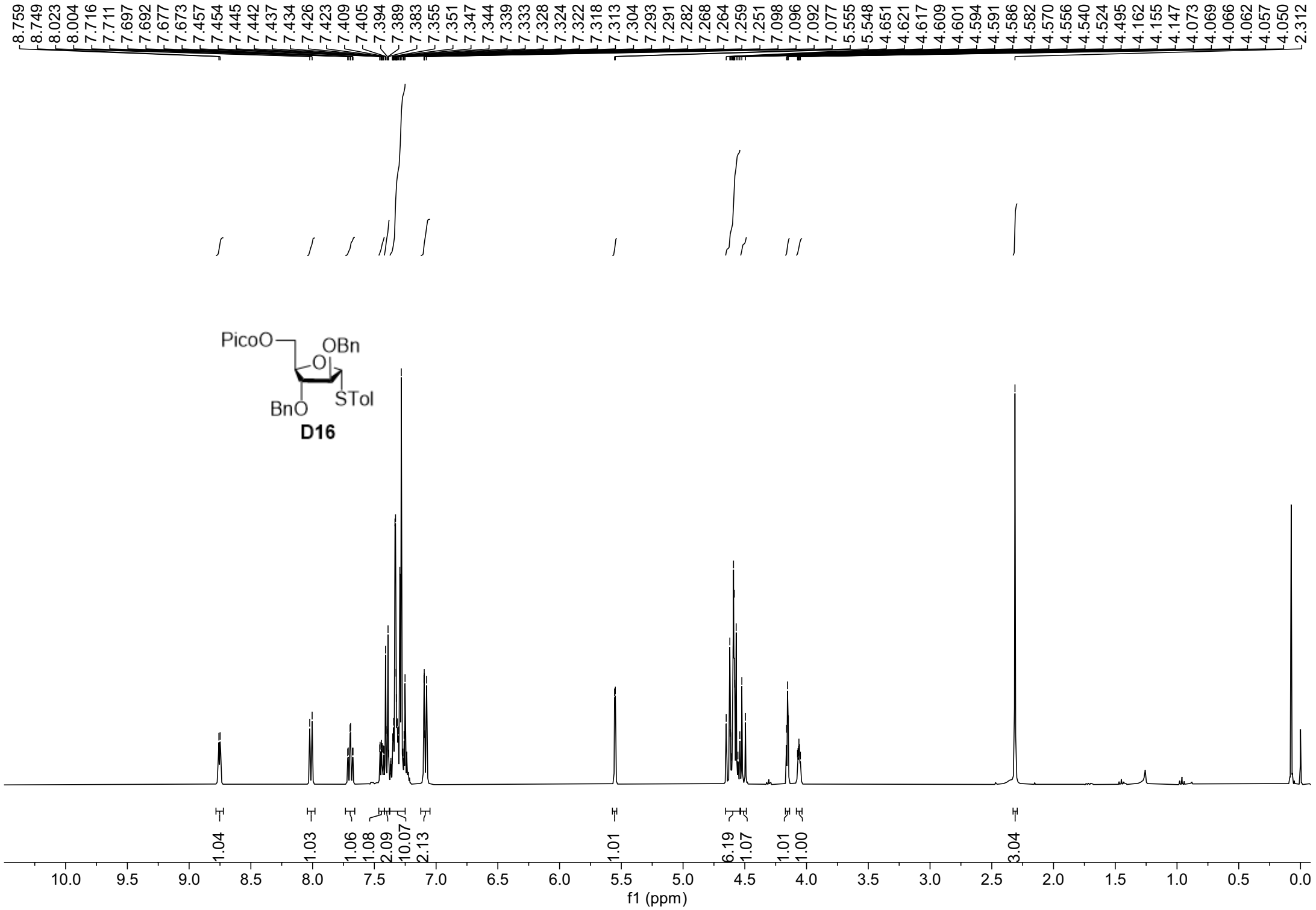
138.7
138.6
137.1
132.1
131.3
130.7
129.7
129.5
128.5
128.5
128.4
127.8
127.7
113.7
88.2
84.4
79.1
77.6
75.7
74.2
73.2
72.9
61.8
55.4
26.1
21.2
18.3
-5.2
-5.3
PMBO
OTBS
O
STol
BnO
OBn
D15
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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8.749
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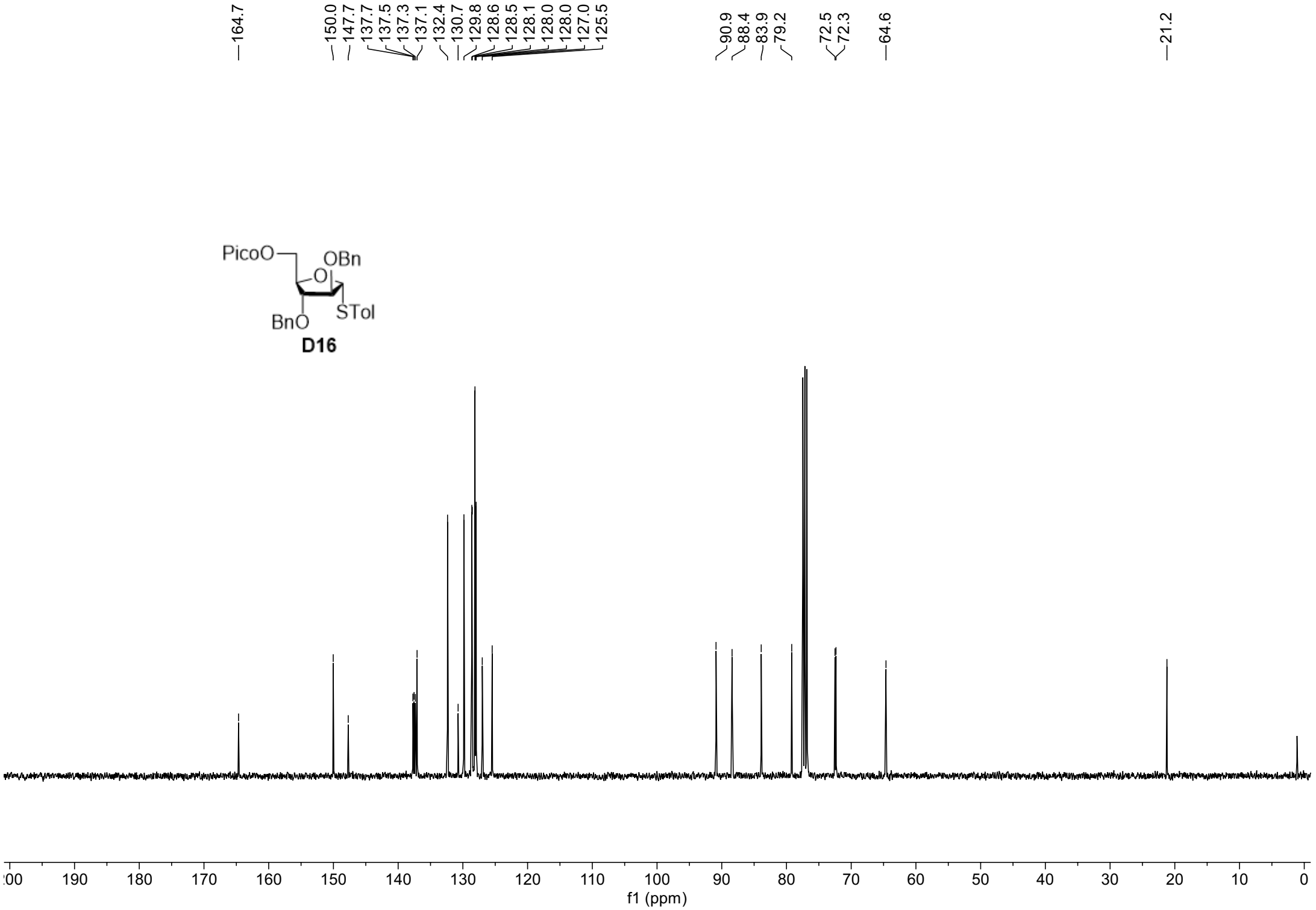
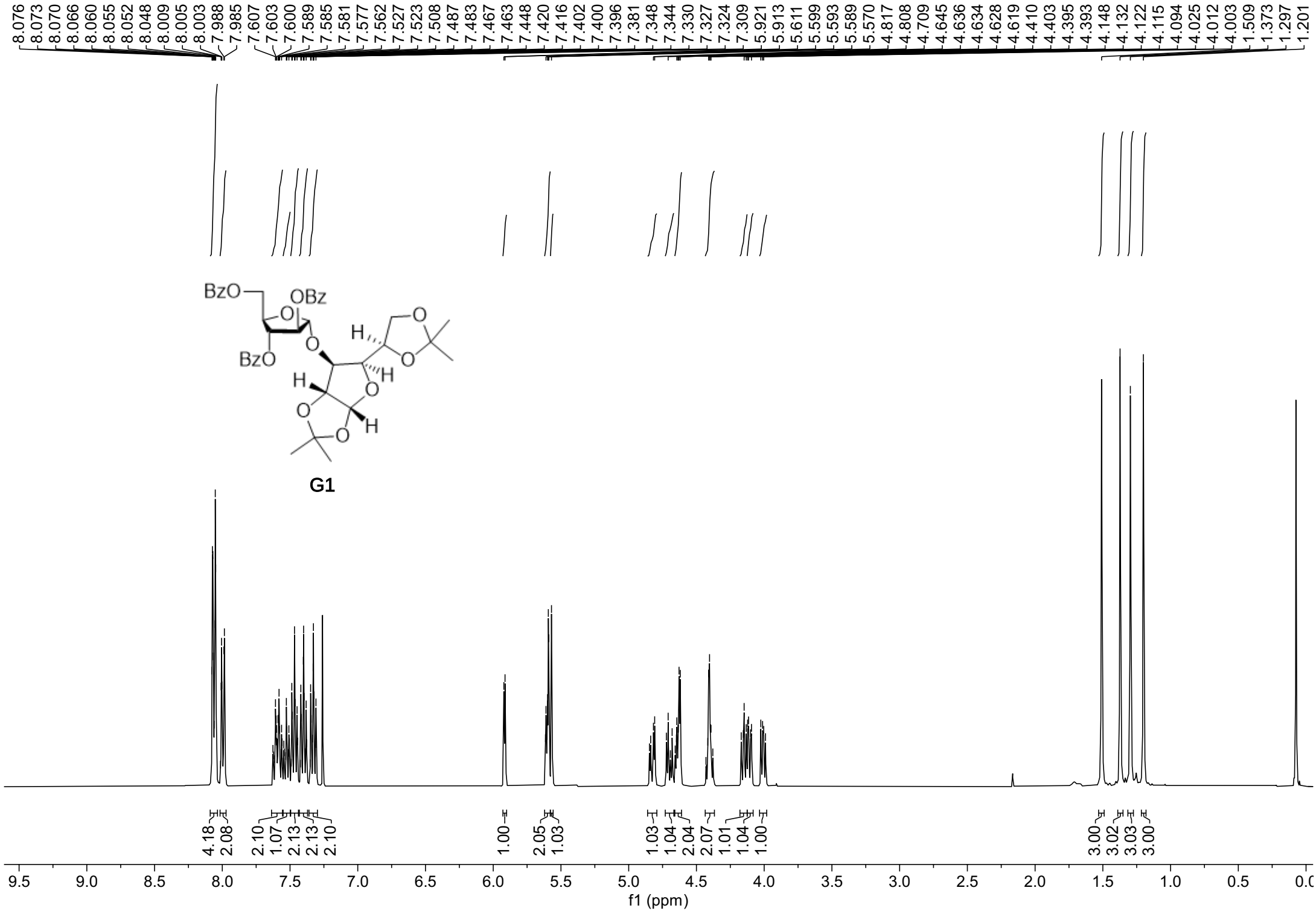
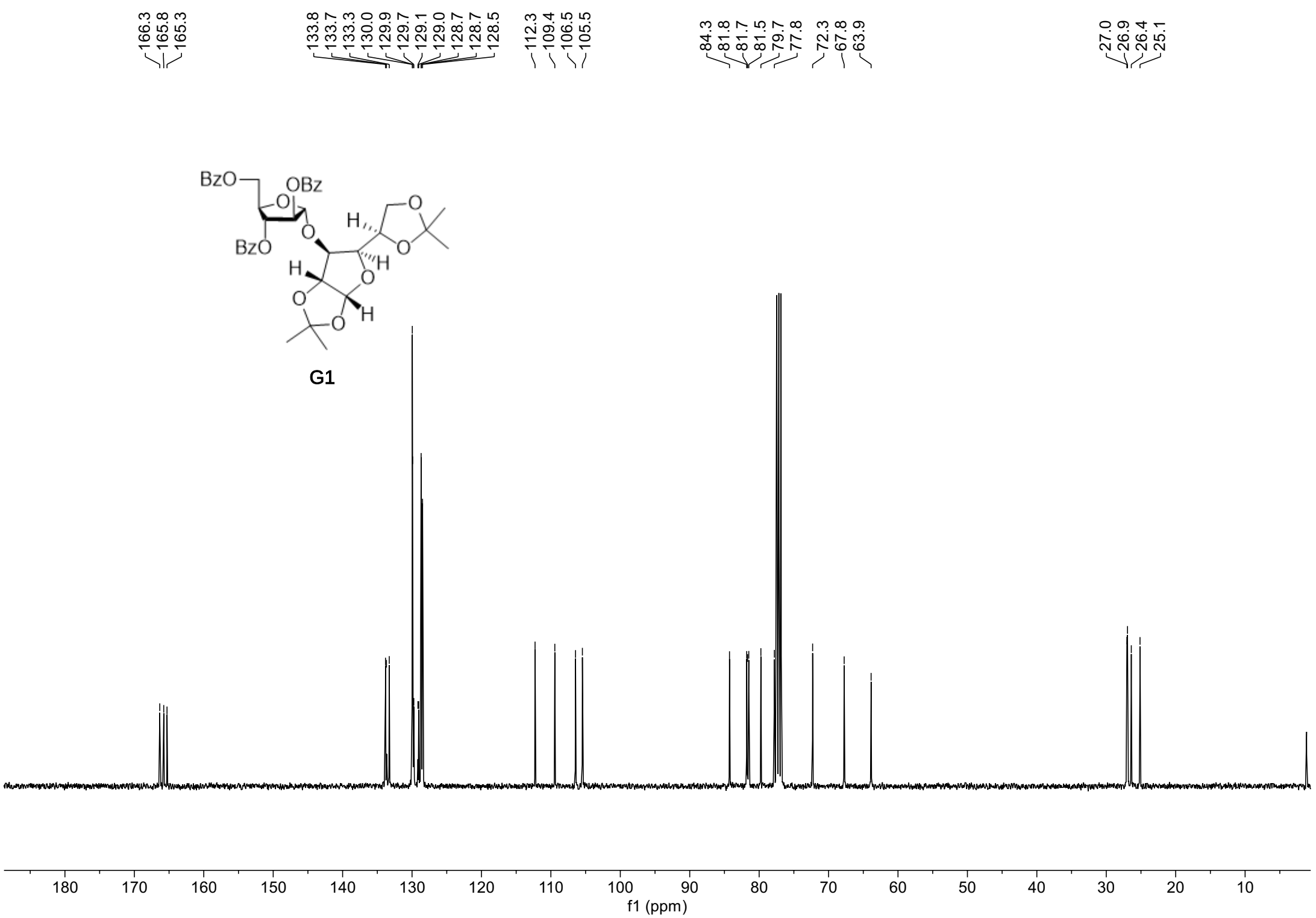
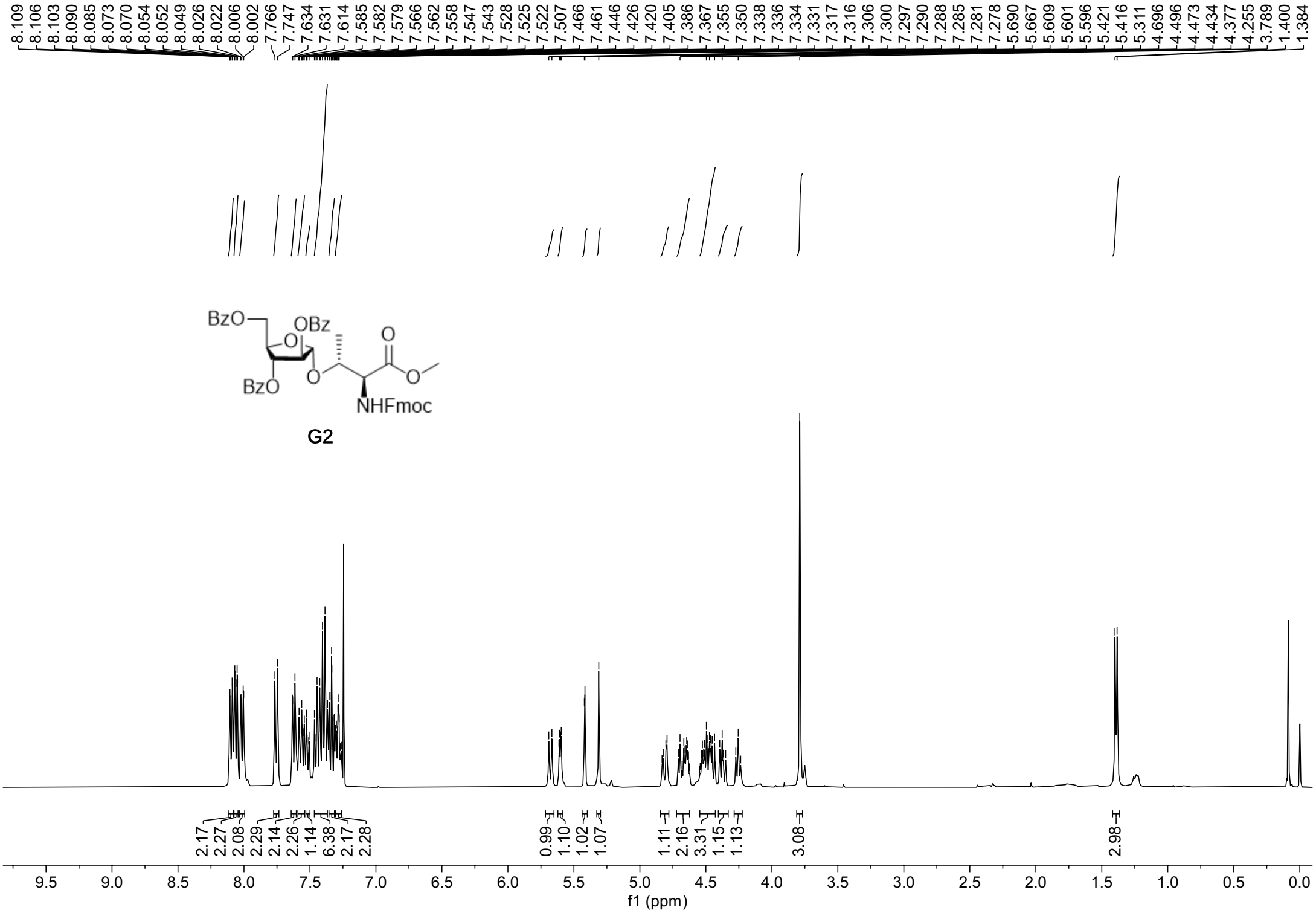
8.004
7.716
7.711
7.697
7.692
7.677
7.673
7.457
7.454
7.445
7.442
7.437
7.434
7.426
7.423
7.409
7.405
7.394
7.389
7.383
7.355
7.351
7.347
7.344
7.339
7.333
7.328
7.324
7.322
7.318
7.313
7.304
7.293
7.291
7.282
7.268
7.264
7.259
7.251
7.098
7.096
7.092
7.077
5.555
5.548
4.651
4.621
4.617
4.609
4.601
4.594
4.591
4.586
4.582
4.570
4.556
4.540
4.524
4.495
4.162
4.155
4.147
4.073
4.069
4.066
4.062
4.057
4.050
2.312
PicoO
OBn
O
BnO
STol
D16
1.04
1.03
1.06
1.08
2.09
10.07
2.13
1.01
6.19
1.07
1.01
1.00
3.04
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


164.7
150.0
147.7
137.7
137.5
137.3
137.1
132.4
130.7
129.8
128.6
128.5
128.1
128.0
128.0
127.0
125.5
90.9
88.4
83.9
79.2
72.5
72.3
64.6
21.2
PicoO
OBn
O
BnO
STol
D16
f1 (ppm)

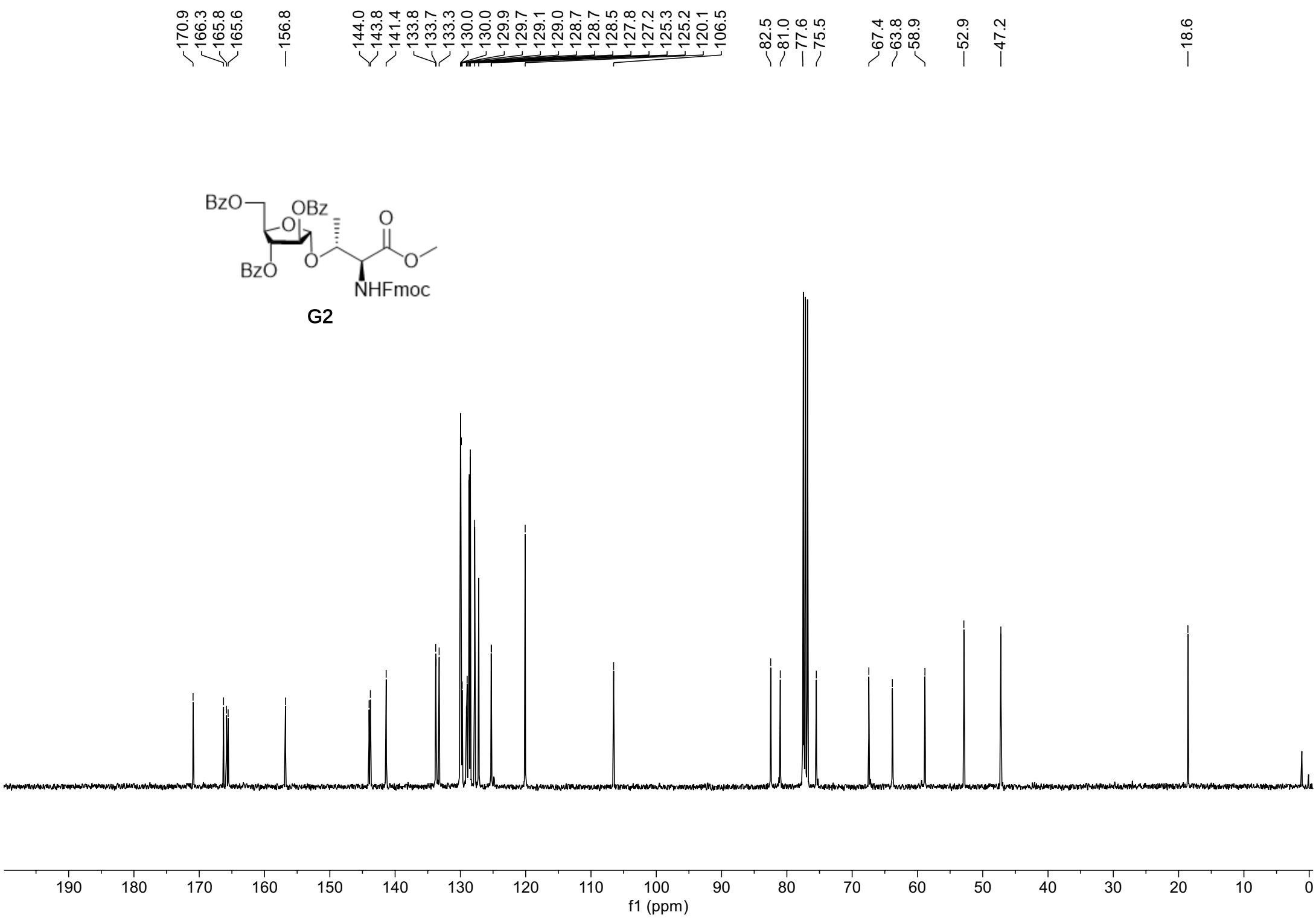

8.076 8.073 8.070 8.066 8.060 8.055 8.052 8.048 8.009 8.005 8.003 7.988 7.985 7.607 7.603 7.600 7.589 7.585 7.581 7.577 7.562 7.527 7.523 7.508 7.487 7.483 7.467 7.463 7.448 7.420 7.416 7.402 7.400 7.396 7.381 7.348 7.344 7.330 7.327 7.324 7.309 5.921 5.913 5.611 5.599 5.593 5.589 5.570 4.817 4.808 4.709 4.645 4.636 4.634 4.628 4.619 4.410 4.403 4.395 4.393 4.148 4.132 4.122 4.115 4.094 4.025 4.012 4.003 1.509 1.373 1.297 1.201
BzO
OBz
BzO
G1
4.18 2.08 2.10 1.07 2.13 2.13 2.10 1.00 2.05 1.03 1.03 1.04 2.04 2.07 1.01 1.04 1.00 3.00 3.02 3.03 3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

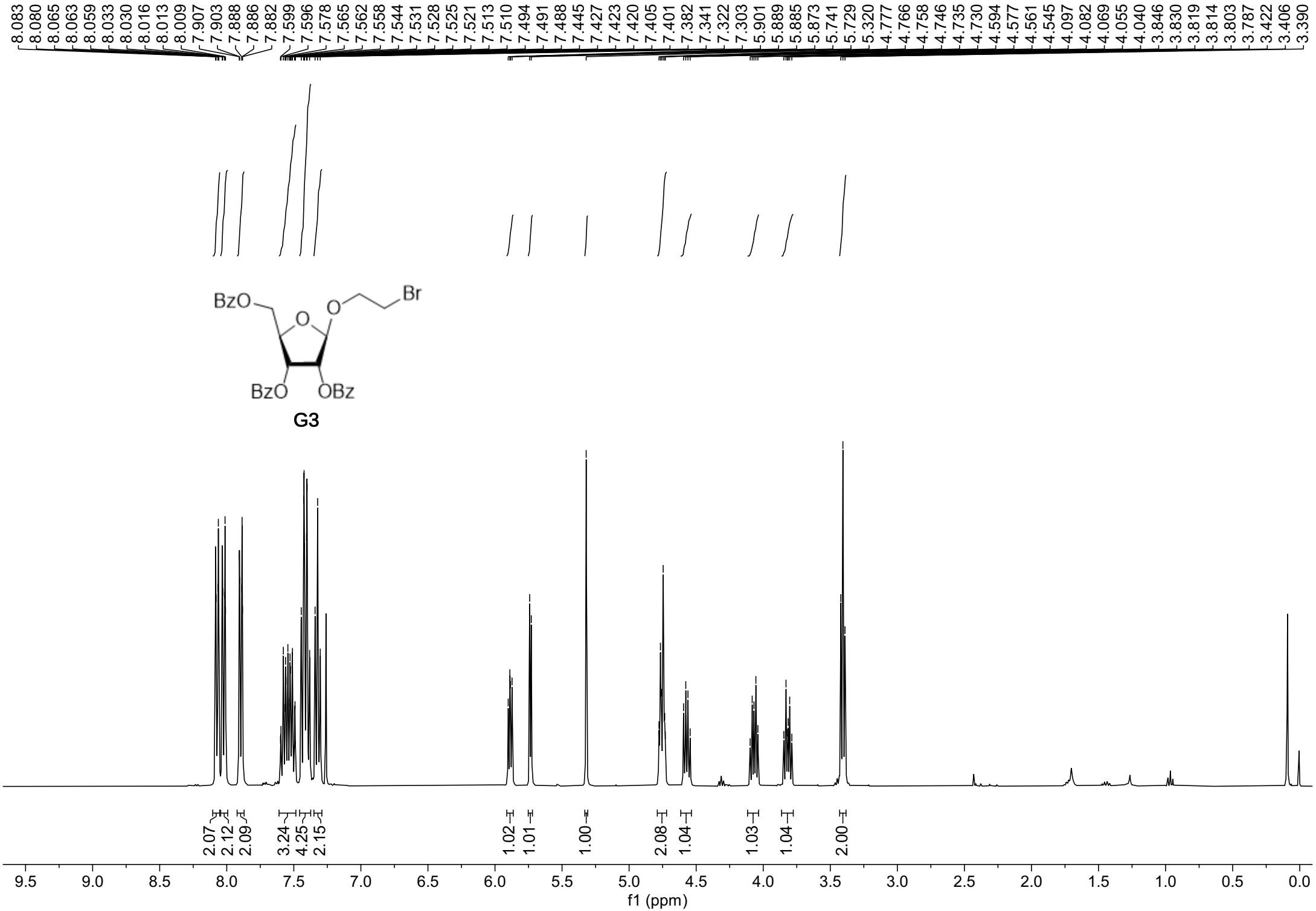

166.3
165.8
165.3
133.8
133.7
133.3
130.0
129.9
129.7
129.1
129.0
128.7
128.7
128.5
112.3
109.4
106.5
105.5
84.3
81.8
81.7
81.5
79.7
77.8
72.3
67.8
63.9
27.0
26.9
26.4
25.1
BzO
OBz
BzO
O
O
O
O
O
O
O
H
H
H
H
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

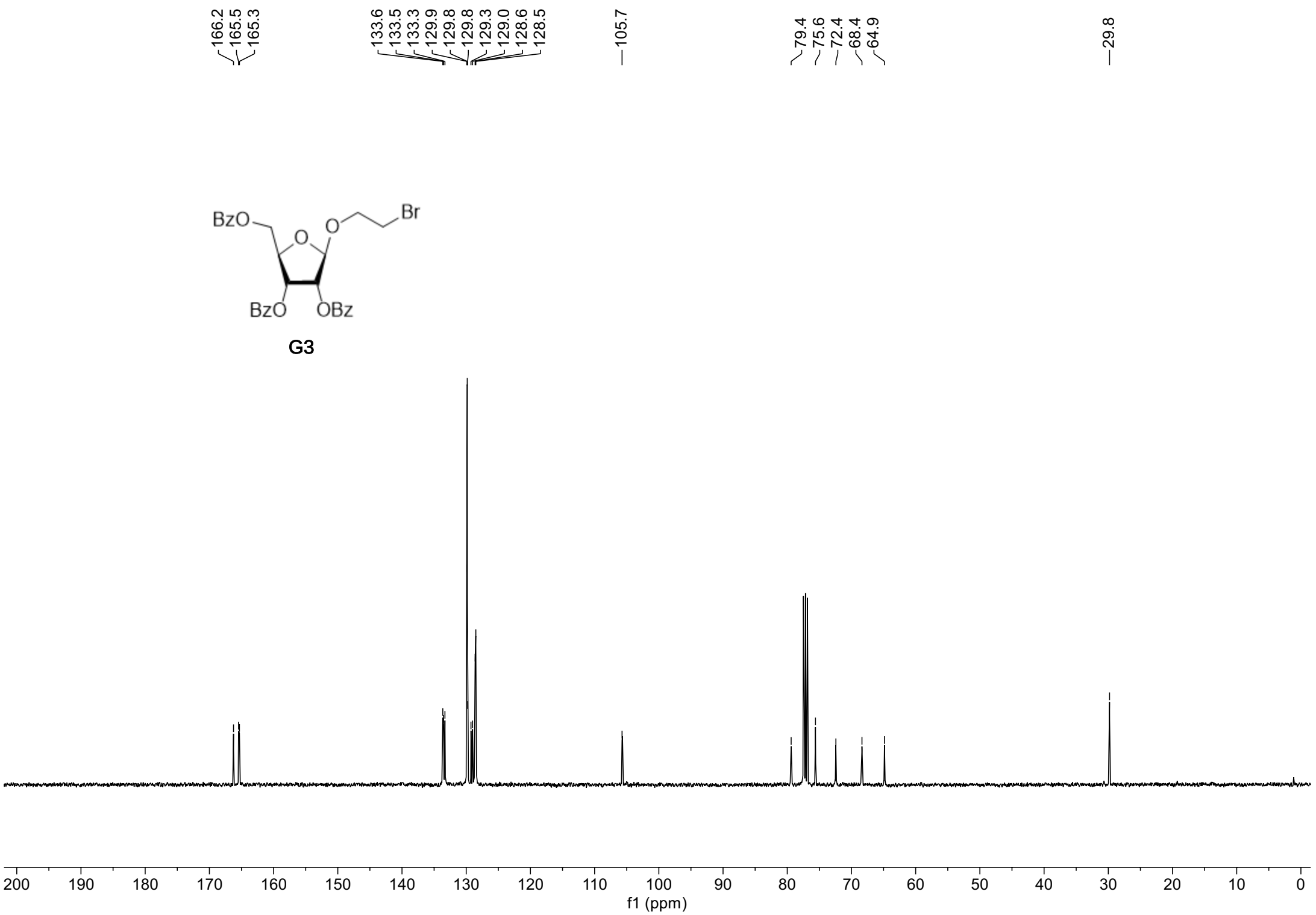
G1


8.109 8.106 8.103 8.090 8.085 8.073 8.070 8.054 8.052 8.049 8.026 8.022 8.006 8.002 7.766 7.747 7.634 7.631 7.614 7.585 7.582 7.579 7.566 7.562 7.558 7.547 7.543 7.528 7.525 7.522 7.507 7.466 7.461 7.446 7.426 7.420 7.405 7.386 7.367 7.355 7.350 7.338 7.336 7.334 7.331 7.317 7.316 7.306 7.300 7.297 7.290 7.288 7.285 7.281 7.278 5.690 5.667 5.609 5.601 5.596 5.421 5.416 5.311 4.696 4.496 4.473 4.434 4.377 4.255 3.789 1.400 1.384
BzO
OBz
O
O
BzO
O
O
NHFmoc
2.17 2.27 2.08 2.29 2.14 2.26 1.14 6.38 2.17 2.28
0.99 1.10 1.02 1.07
1.11 2.16 3.31 1.15 1.13
3.08
2.98
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

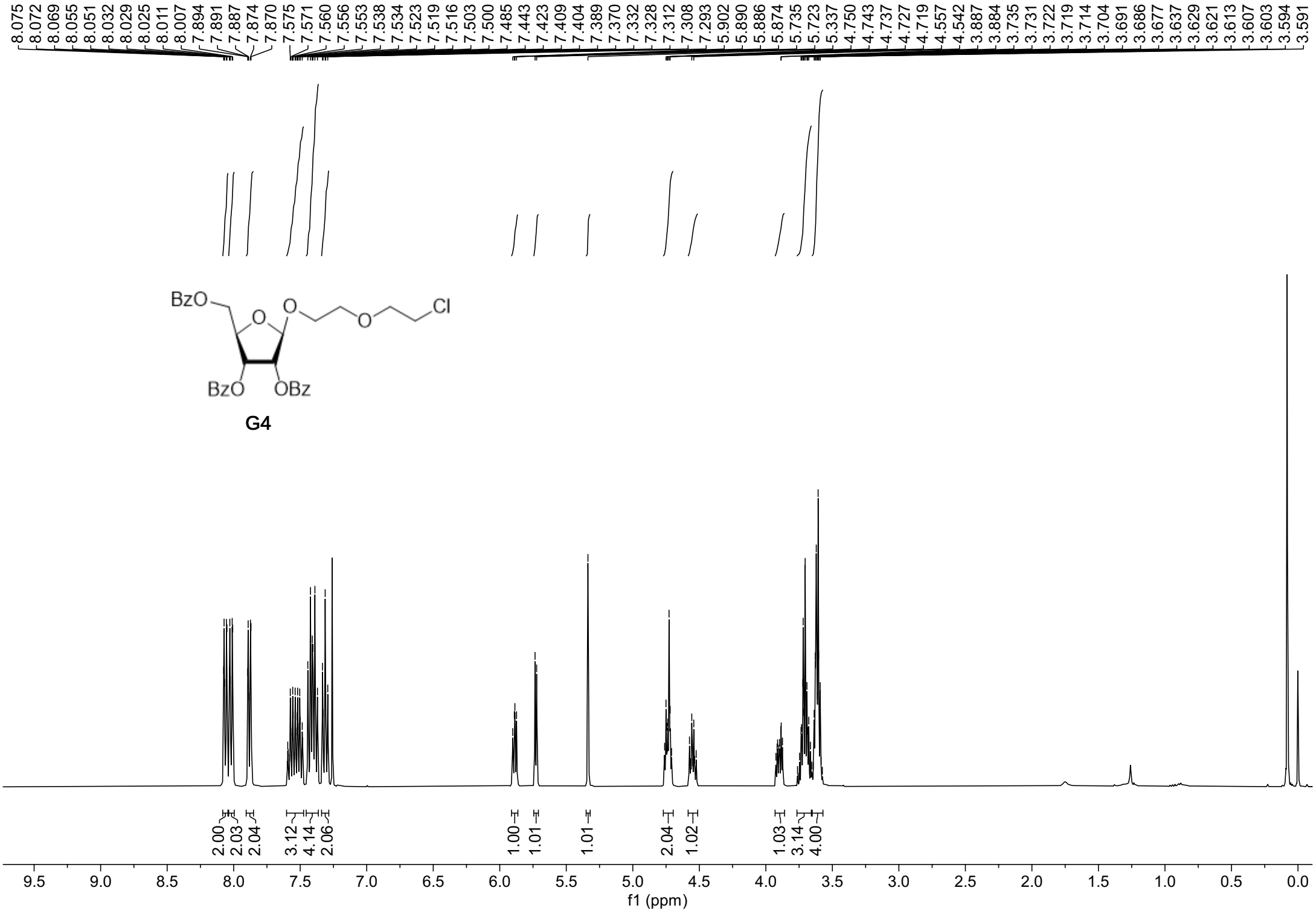
G2


170.9
166.3
165.8
165.6
156.8
144.0
143.8
141.4
133.8
133.7
133.3
130.0
130.0
129.9
129.7
129.1
129.0
128.7
128.7
128.5
127.8
127.2
125.3
125.2
120.1
106.5
82.5
81.0
77.6
75.5
67.4
63.8
58.9
52.9
47.2
18.6
BzO
OBz
O
O
BzO
O
O
NHFmoc
G2
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

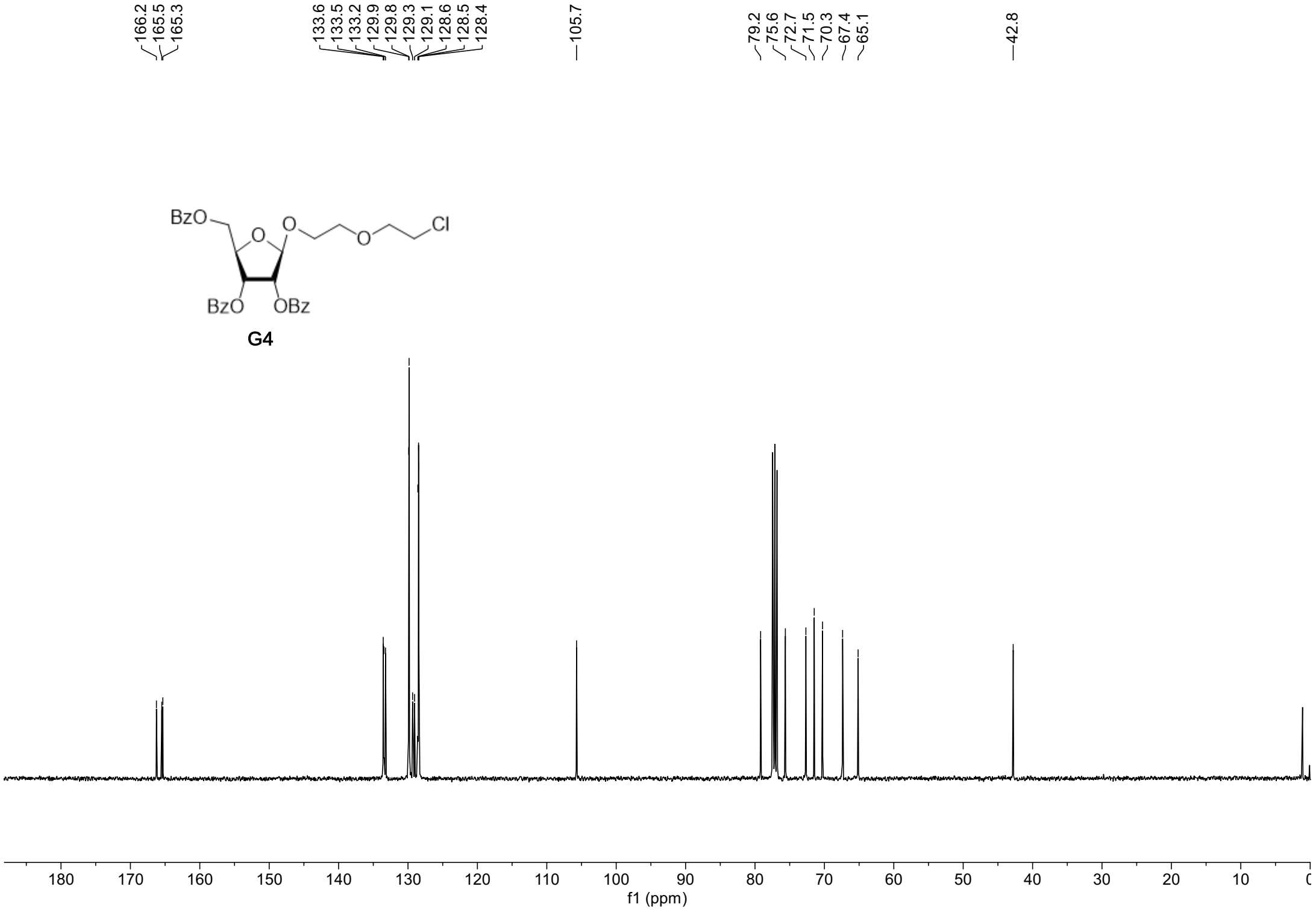

8.083 8.080 8.065 8.063 8.059 8.033 8.030 8.016 8.013 8.009 7.907 7.903 7.888 7.886 7.882 7.599 7.596 7.578 7.565 7.562 7.558 7.544 7.531 7.528 7.525 7.521 7.513 7.510 7.494 7.491 7.488 7.445 7.427 7.423 7.420 7.405 7.401 7.382 7.341 7.322 7.303 5.901 5.889 5.885 5.873 5.741 5.729 5.320 4.777 4.766 4.758 4.746 4.735 4.730 4.594 4.577 4.561 4.545 4.097 4.082 4.069 4.055 4.040 3.846 3.830 3.819 3.814 3.803 3.787 3.422 3.406 3.390
BzO
O
O
Br
BzO
OBz
G3
2.07 2.12 2.09 3.24 4.25 2.15 1.02 1.01 1.00 2.08 1.04 1.03 1.04 2.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


166.2
165.5
165.3
133.6
133.5
133.3
129.9
129.8
129.8
129.3
129.0
128.6
128.5
105.7
79.4
75.6
72.4
68.4
64.9
29.8
BzO
O
O
Br
BzO
OBz
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

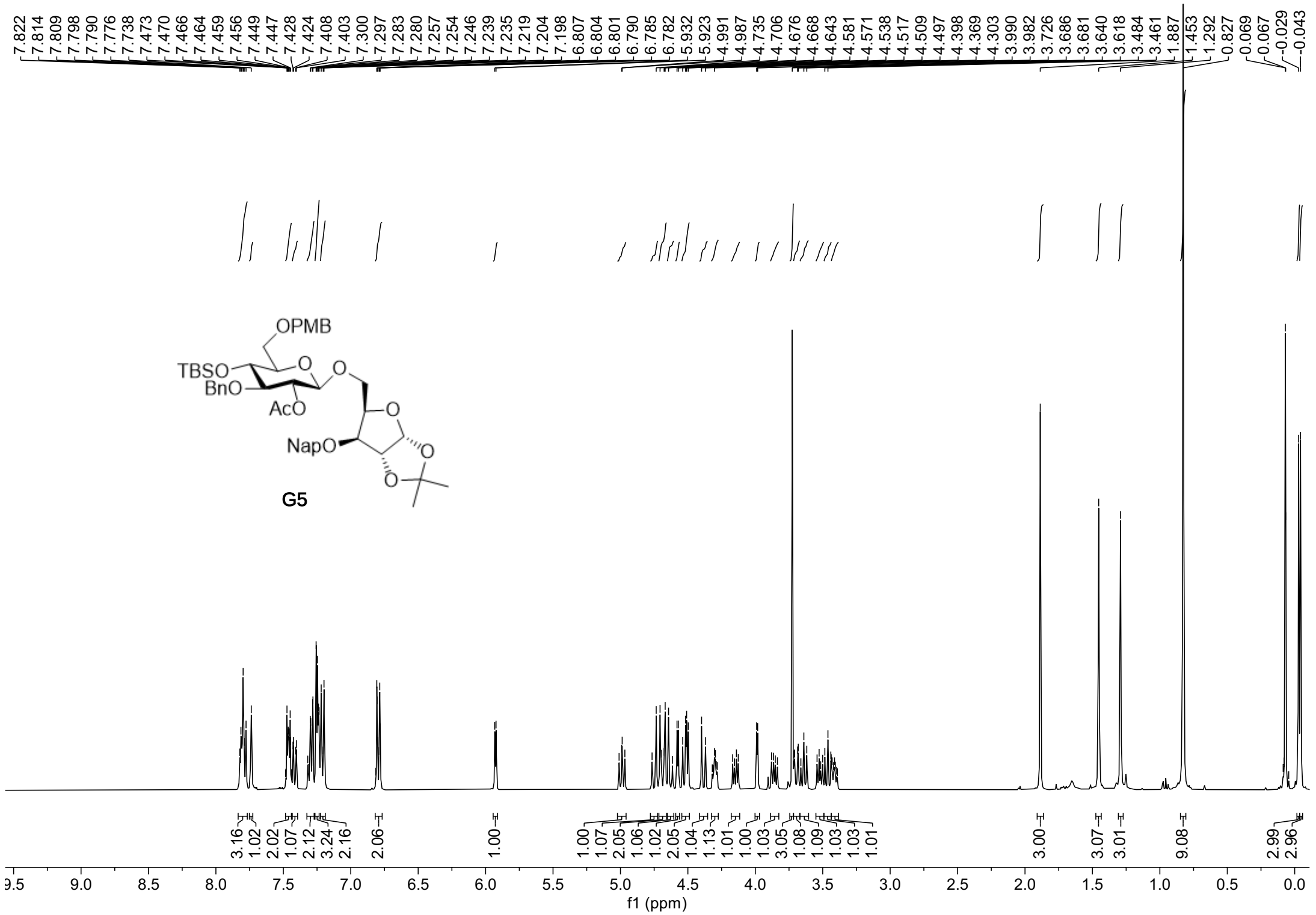
G3

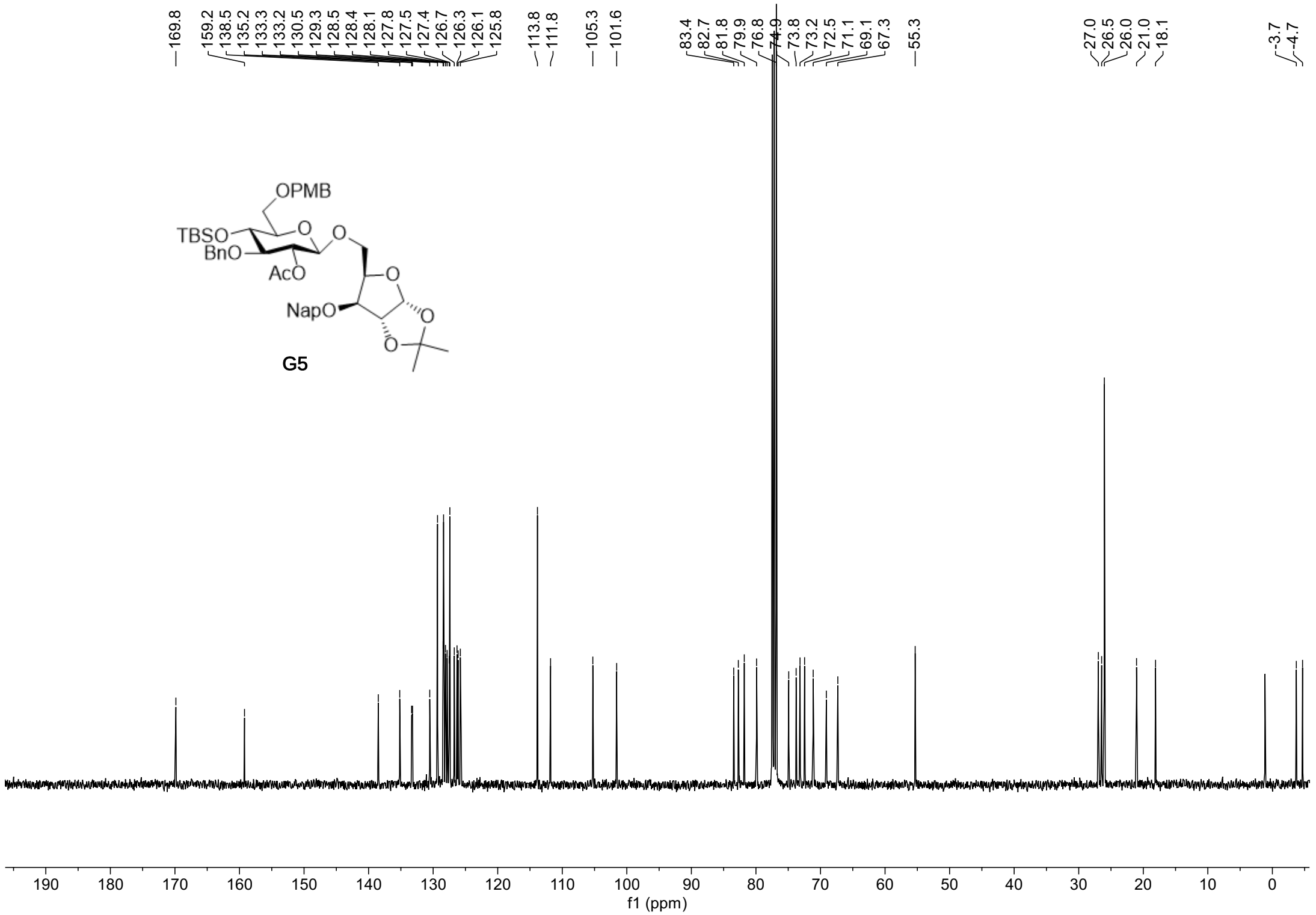

8.075 8.072 8.069 8.055 8.051 8.032 8.029 8.025 8.011 8.007 7.894 7.891 7.887 7.874 7.870
7.575 7.571 7.560 7.556 7.553 7.538 7.534 7.523 7.519 7.516 7.503 7.500 7.485 7.443 7.423 7.409 7.404 7.389 7.370 7.332 7.328 7.312 7.308 7.293
5.902 5.890 5.886 5.874 5.735 5.723 5.337 4.750 4.743 4.737 4.727 4.719 4.557 4.542 3.887 3.884 3.735 3.731 3.722 3.719 3.714 3.704 3.691 3.686 3.677 3.637 3.629 3.621 3.613 3.607 3.603 3.594 3.591
BzO
O
O
O
Cl
BzO
OBz
2.00 2.03 2.04 3.12 4.14 2.06 1.00 1.01 1.01 2.04 1.02 1.03 3.14 4.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

G4


166.2
165.5
165.3
133.6
133.5
133.2
129.9
129.8
129.3
129.1
128.6
128.5
128.4
105.7
79.2
75.6
72.7
71.5
70.3
67.4
65.1
42.8
BzO
O
O
O
Cl
BzO
OBz
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

G4


7.822
7.814
7.809
7.798
7.790
7.776
7.738
7.473
7.470
7.466
7.464
7.459
7.456
7.449
7.447
7.428
7.424
7.408
7.403
7.300
7.297
7.283
7.280
7.257
7.254
7.246
7.239
7.235
7.219
7.204
7.198
6.807
6.804
6.801
6.790
6.785
6.782
5.932
5.923
4.991
4.987
4.735
4.706
4.676
4.668
4.643
4.581
4.571
4.538
4.517
4.509
4.497
4.398
4.369
4.303
3.990
3.982
3.726
3.686
3.681
3.640
3.618
3.484
3.461
1.887
1.453
1.292
0.827
0.069
0.067
-0.029
-0.043
OPMB
TBSO
BnO
AcO
NapO
O
O
O
O
O
O
G5
3.16
1.02
2.02
1.07
2.12
3.24
2.16
2.06
1.00
1.00
1.07
2.05
1.06
1.02
2.05
1.04
1.13
1.01
1.00
1.03
3.05
1.08
1.09
1.03
1.03
1.01
3.00
3.07
3.01
9.08
2.99
2.96
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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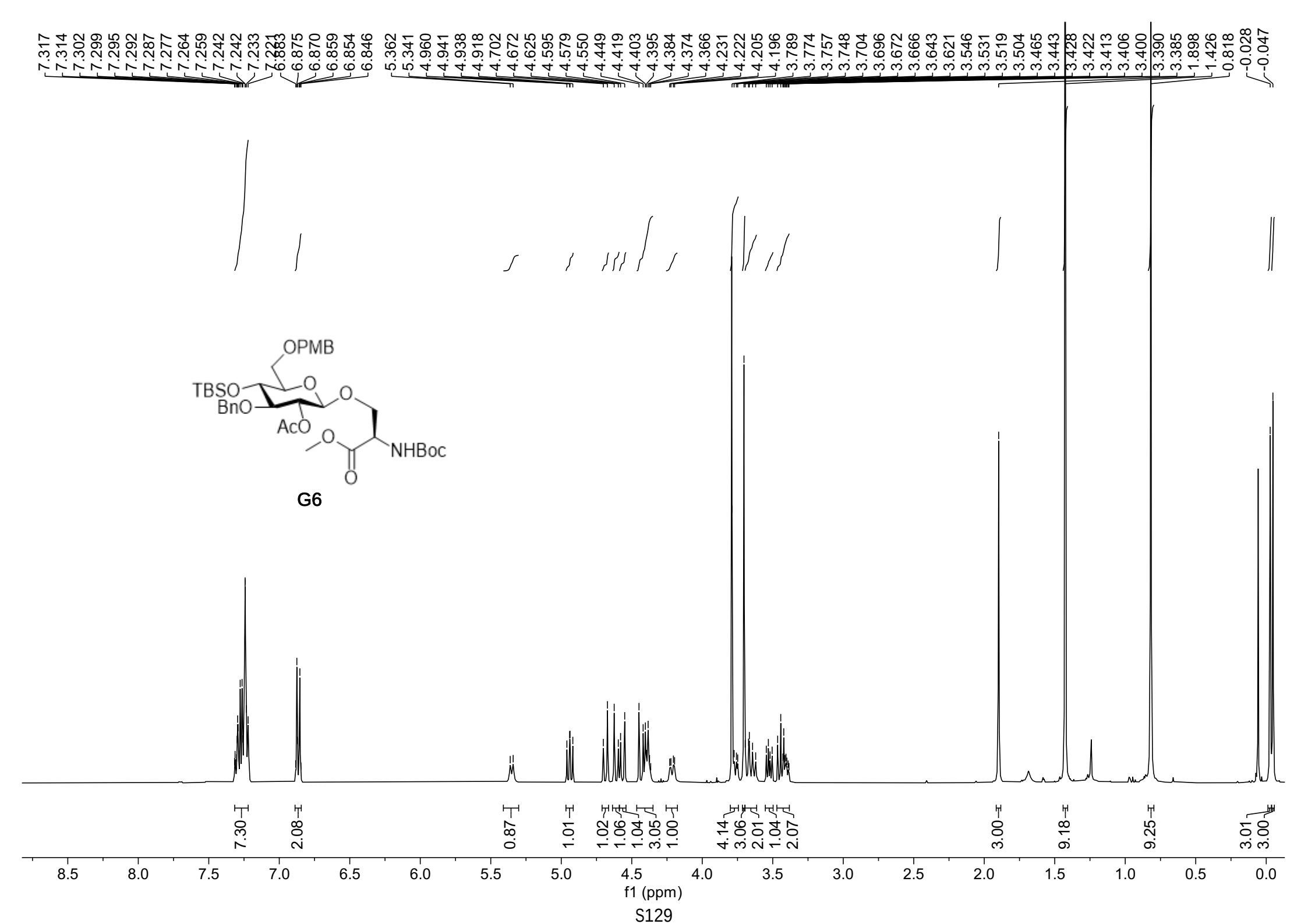
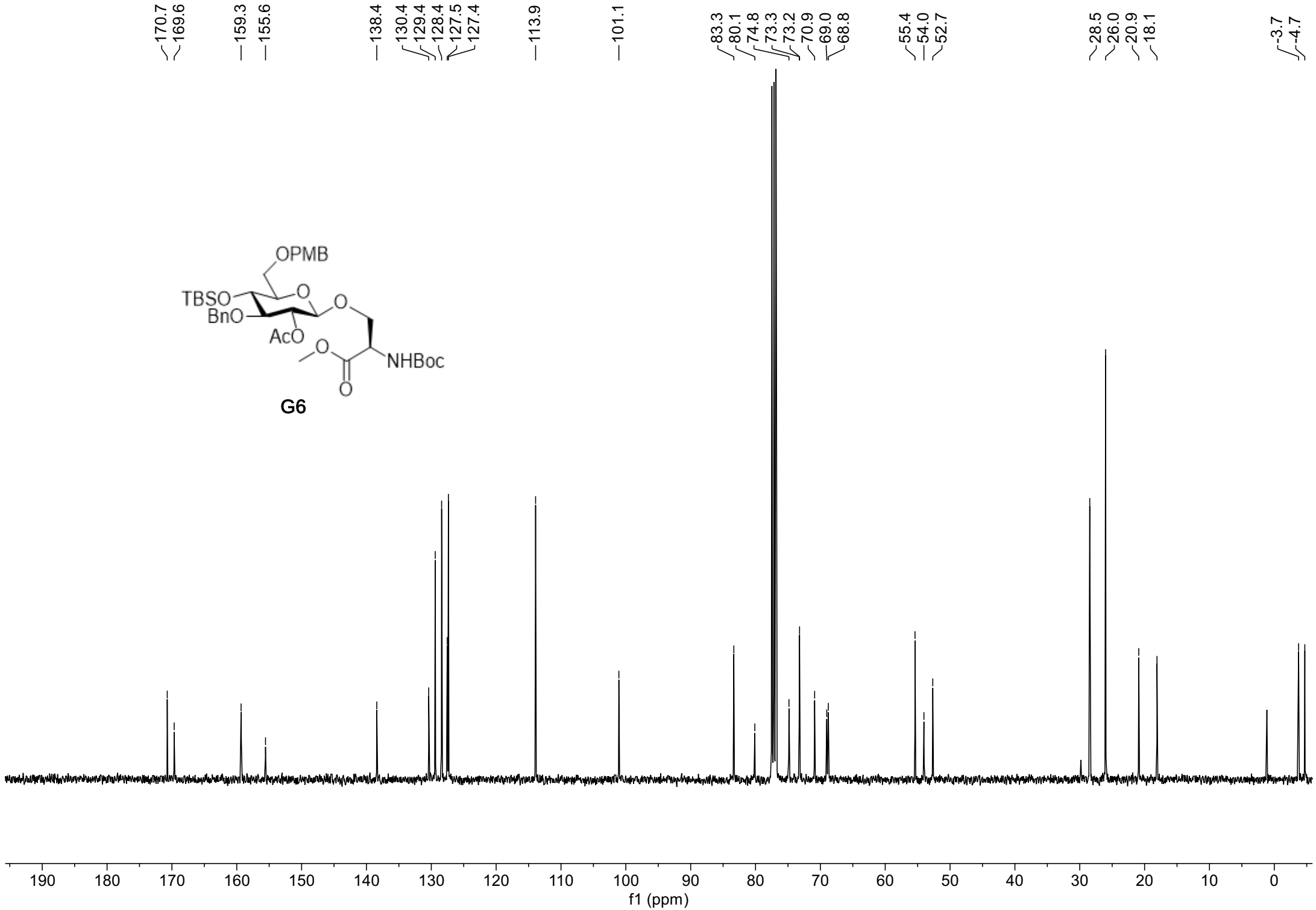
159.2
138.5
135.2
133.3
133.2
130.5
129.3
128.5
128.4
128.1
127.8
127.5
127.4
126.7
126.3
126.1
125.8
113.8
111.8
105.3
101.6
83.4
82.7
81.8
79.9
76.8
74.9
73.8
73.2
72.5
71.1
69.1
67.3
55.3
27.0
26.5
26.0
21.0
18.1
-3.7
-4.7
OPMB
TBSO
BnO
AcO
NapO
O
O
O
O
O
O
G5
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


OPMB
TBSO
BnO
AcO
NHBoc
G6
f1 (ppm)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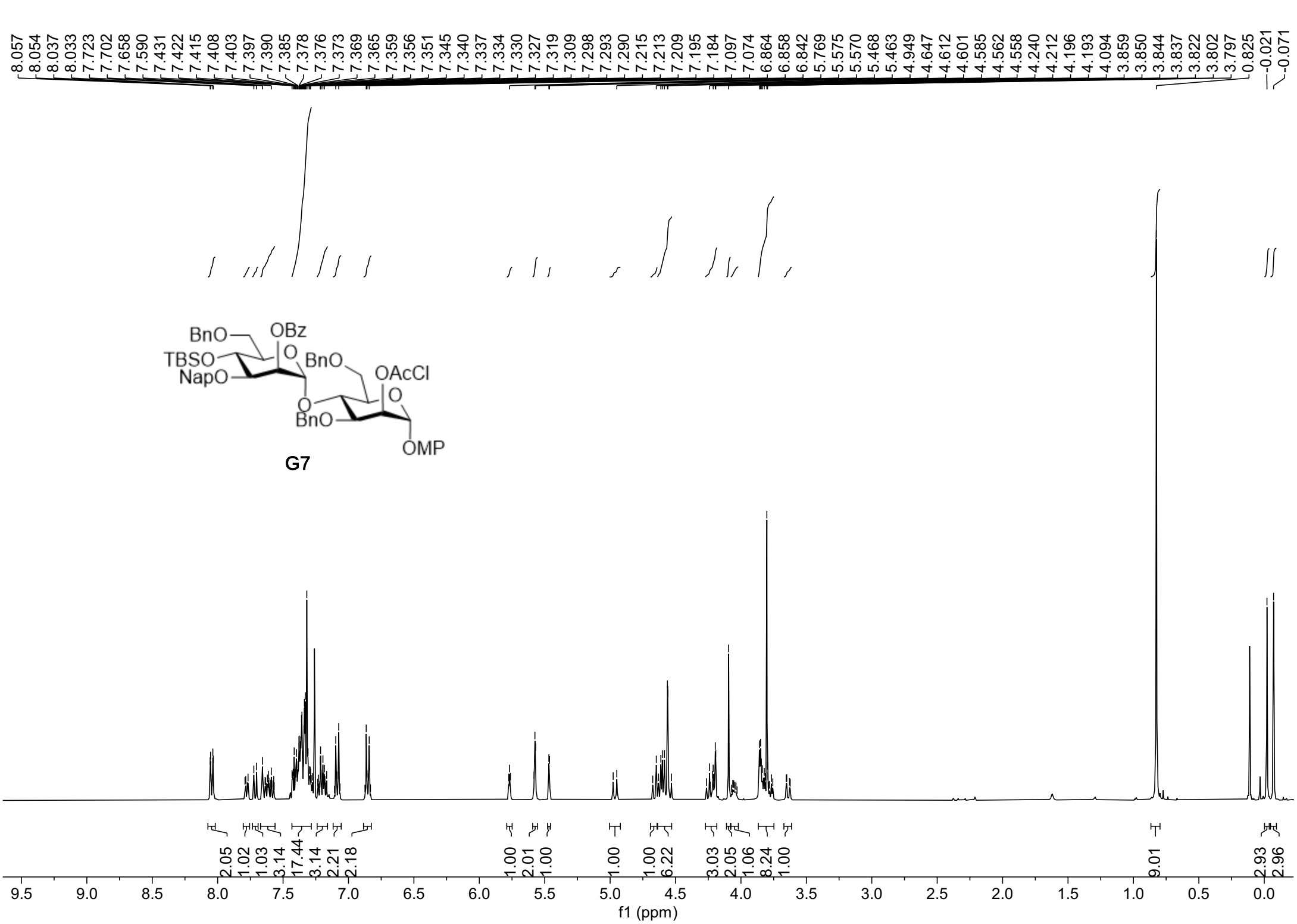
169.6
159.3
155.6
138.4
130.4
129.4
128.4
127.5
127.4
113.9
101.1
83.3
80.1
74.8
73.3
73.2
70.9
69.0
68.8
55.4
54.0
52.7
28.5
26.0
20.9
18.1
-3.7
-4.7
OPMB
TBSO
BnO
AcO
NHBoc
G6
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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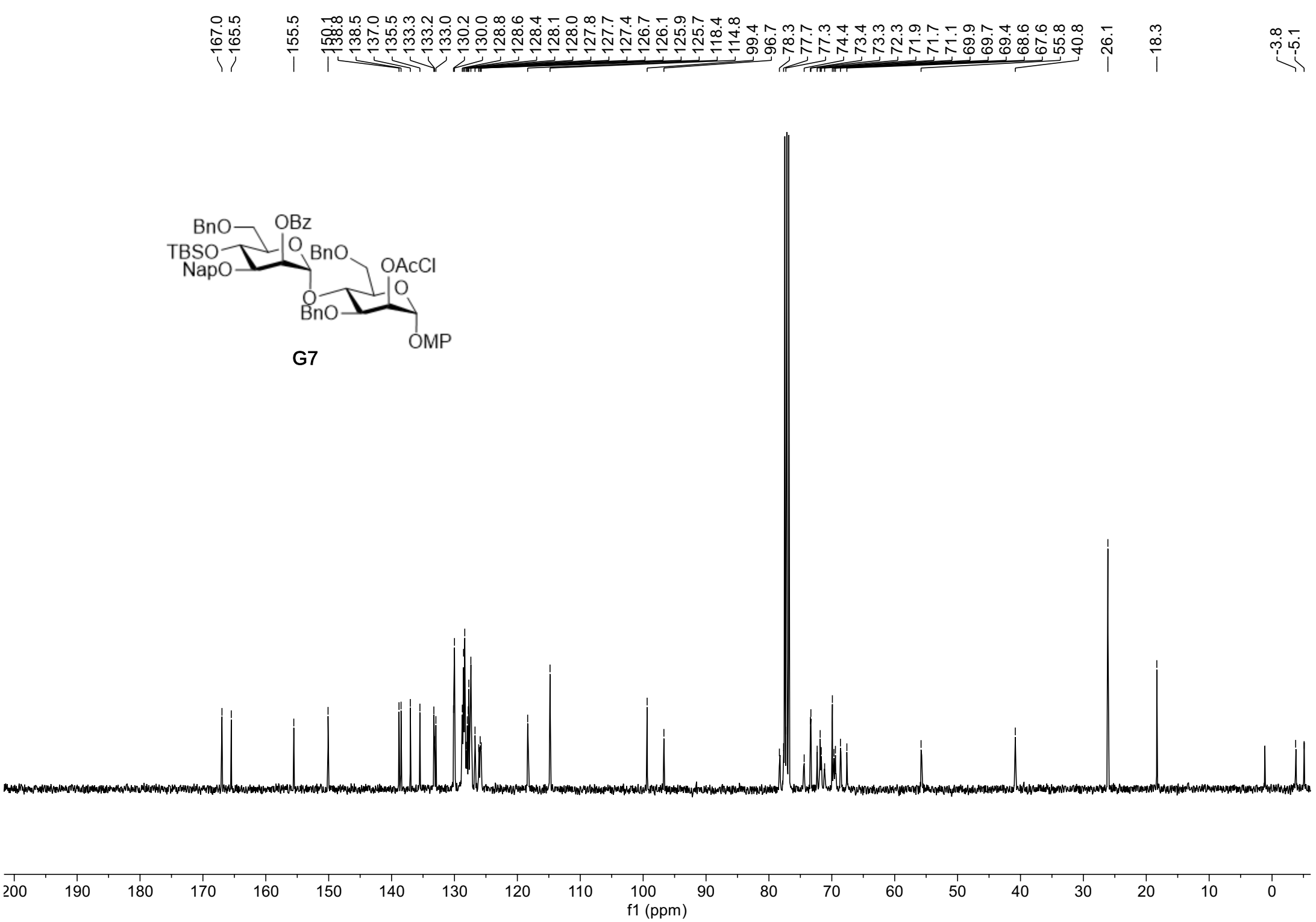
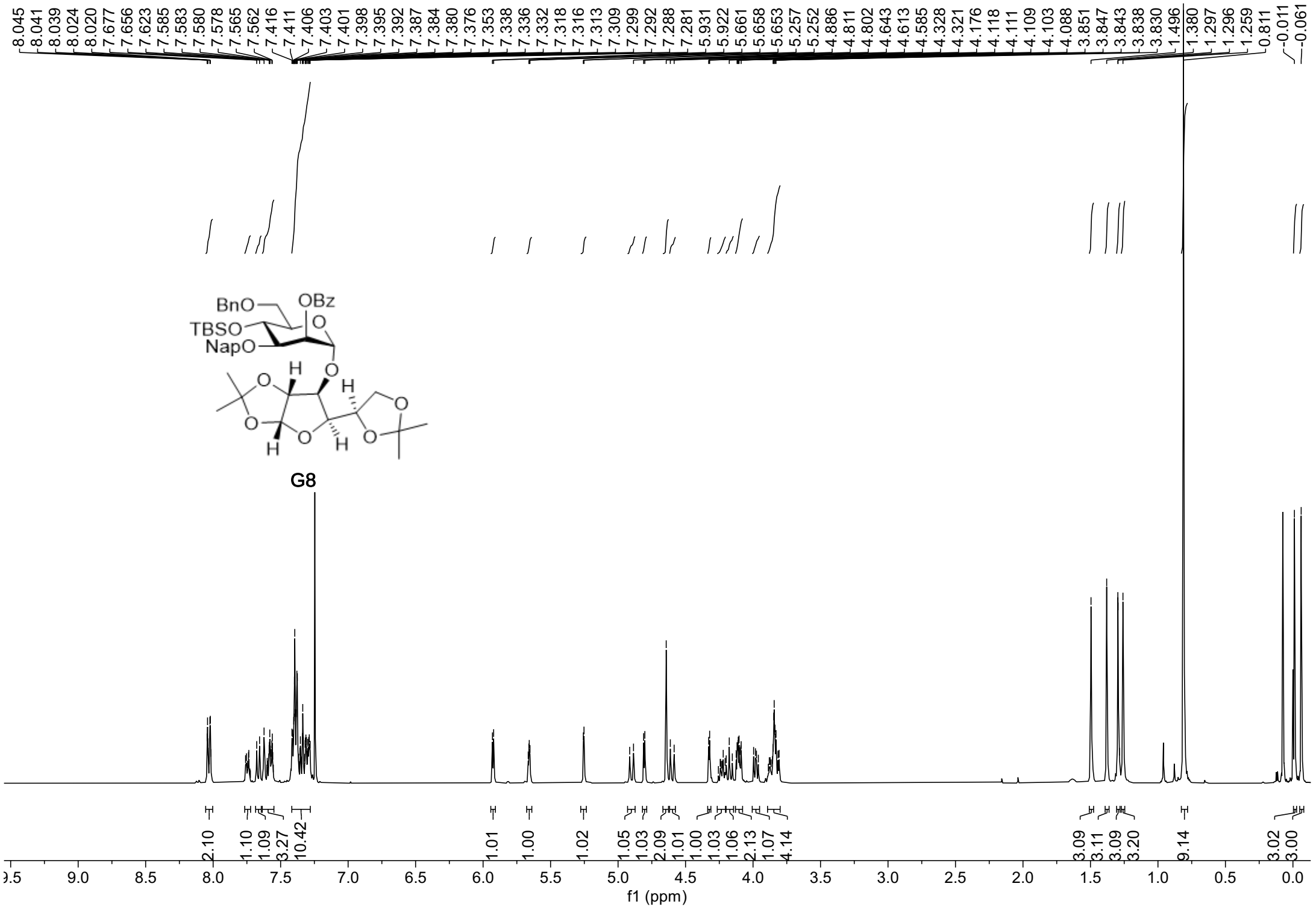
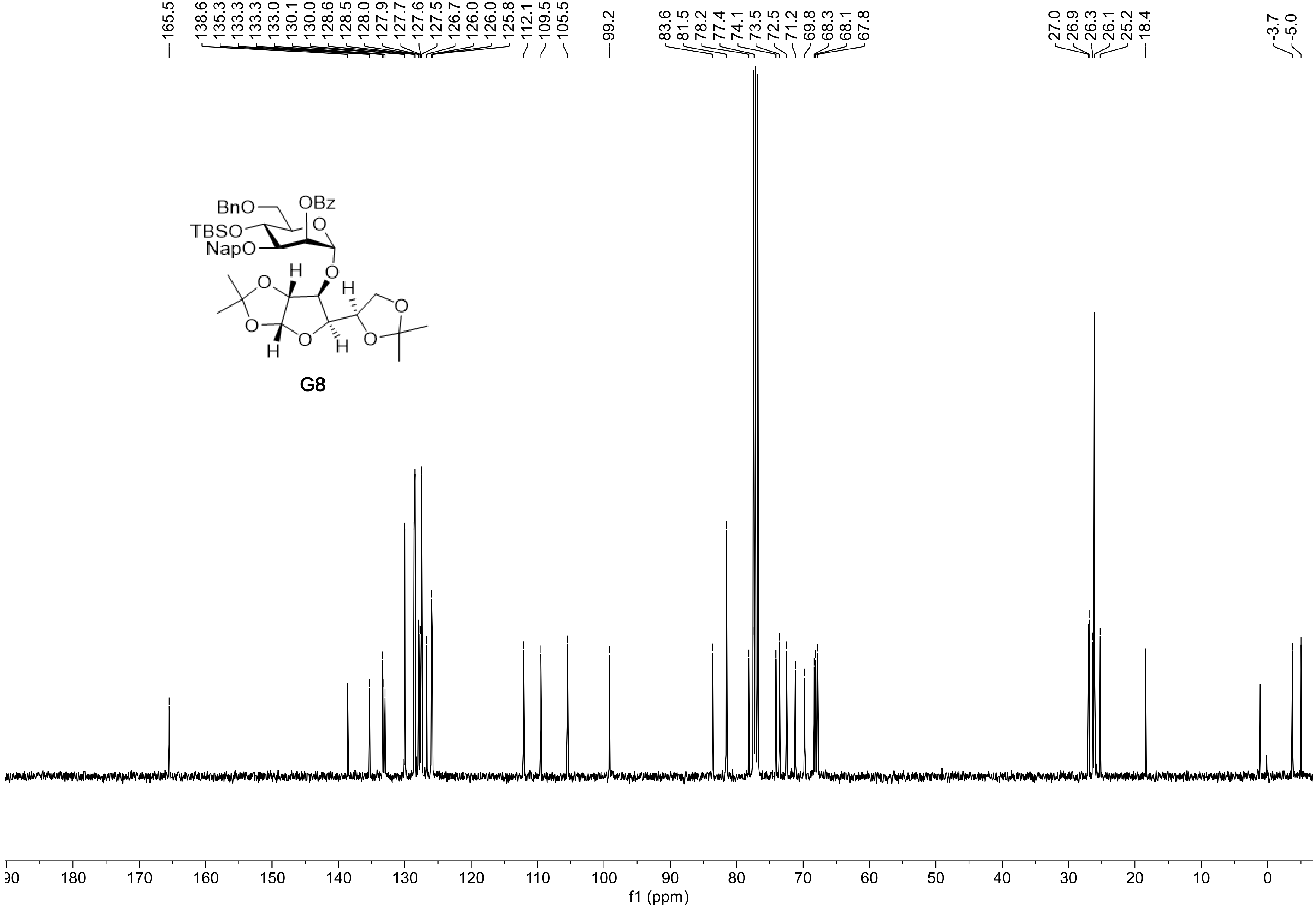
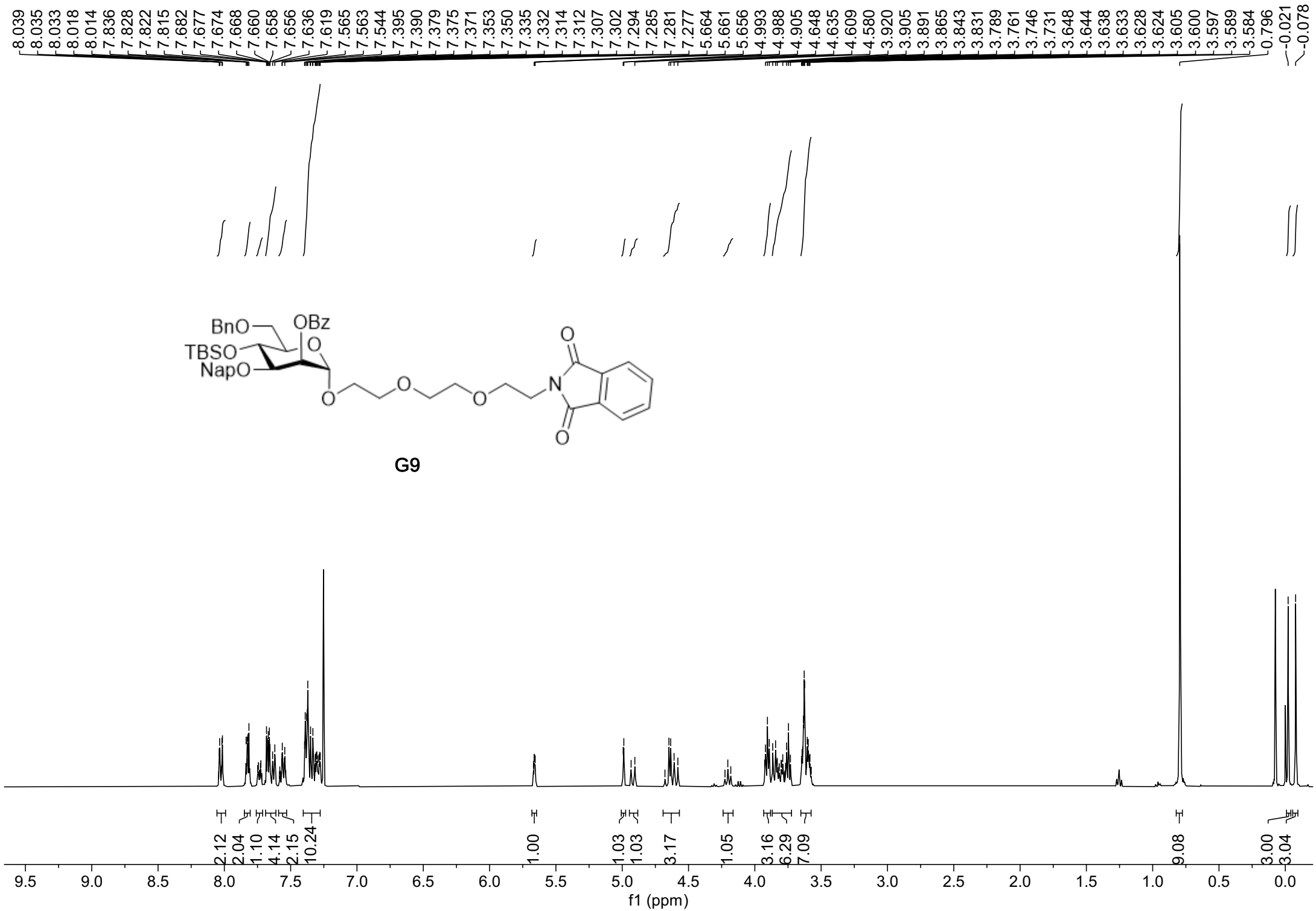
8.054
8.037
8.033
7.723
7.702
7.658
7.590
7.431
7.422
7.415
7.408
7.403
7.397
7.390
7.385
7.378
7.376
7.373
7.369
7.365
7.359
7.356
7.351
7.345
7.340
7.337
7.334
7.330
7.327
7.319
7.309
7.298
7.293
7.290
7.215
7.213
7.209
7.195
7.184
7.097
7.074
6.864
6.858
6.842
5.769
5.575
5.570
5.468
5.463
4.949
4.647
4.612
4.601
4.585
4.562
4.558
4.240
4.212
4.196
4.193
4.094
3.859
3.850
3.844
3.837
3.822
3.802
3.797
0.825
-0.021
-0.071
BnO
OBz
O
TBSO
BnO
NapO
OAcCl
O
O
BnO
OMP
G7
2.05
1.02
1.03
3.14
17.44
3.14
2.21
2.18
1.00
2.01
1.00
1.00
1.00
6.22
3.03
2.05
1.06
8.24
1.00
9.01
2.93
2.96
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


167.0
165.5
155.5
150.1
138.8
138.5
137.0
135.5
133.3
133.2
133.0
130.2
130.0
128.8
128.6
128.4
128.1
128.0
127.8
127.7
127.4
126.7
126.1
125.9
125.7
118.4
114.8
99.4
96.7
78.3
77.7
77.3
74.4
73.4
73.3
72.3
71.9
71.7
71.1
69.9
69.7
69.4
68.6
67.6
55.8
40.8
26.1
18.3
-3.8
-5.1
BnO
OBz
TBSO
NapO
O
BnO
OAcCl
O
O
BnO
OMP
G7
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.045 8.041 8.039 8.024 8.020 7.677 7.656 7.623 7.585 7.583 7.580 7.578 7.565 7.562 7.416 7.411 7.406 7.403 7.401 7.398 7.395 7.392 7.387 7.384 7.380 7.376 7.353 7.338 7.336 7.332 7.318 7.316 7.313 7.309 7.299 7.292 7.288 7.281 5.931 5.922 5.661 5.658 5.653 5.257 5.252 4.886 4.811 4.802 4.643 4.613 4.585 4.328 4.321 4.176 4.118 4.111 4.109 4.103 4.088 3.851 3.847 3.843 3.838 3.830 1.496 1.380 1.297 1.296 1.259 0.811 -0.011 -0.061
BnO
OBz
TBSO
NapO
G8
2.10 1.10 1.09 3.27 10.42 1.01 1.00 1.02 1.05 1.03 2.09 1.01 1.00 1.03 1.06 2.13 1.07 4.14 3.09 3.11 3.09 3.20 9.14 3.02 3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


165.5
138.6 135.3 133.3 133.3 133.0 130.1 130.0 128.6 128.5 128.0 127.9 127.7 127.6 127.5 126.7 126.0 126.0 125.8
112.1 109.5 105.5
99.2
83.6 81.5 78.2 77.4 74.1 73.5 72.5 71.2 69.8 68.3 68.1 67.8
27.0 26.9 26.3 26.1 25.2 18.4
-3.7 -5.0
BnO
OBz
TBSO
NapO
O
H
G8
90 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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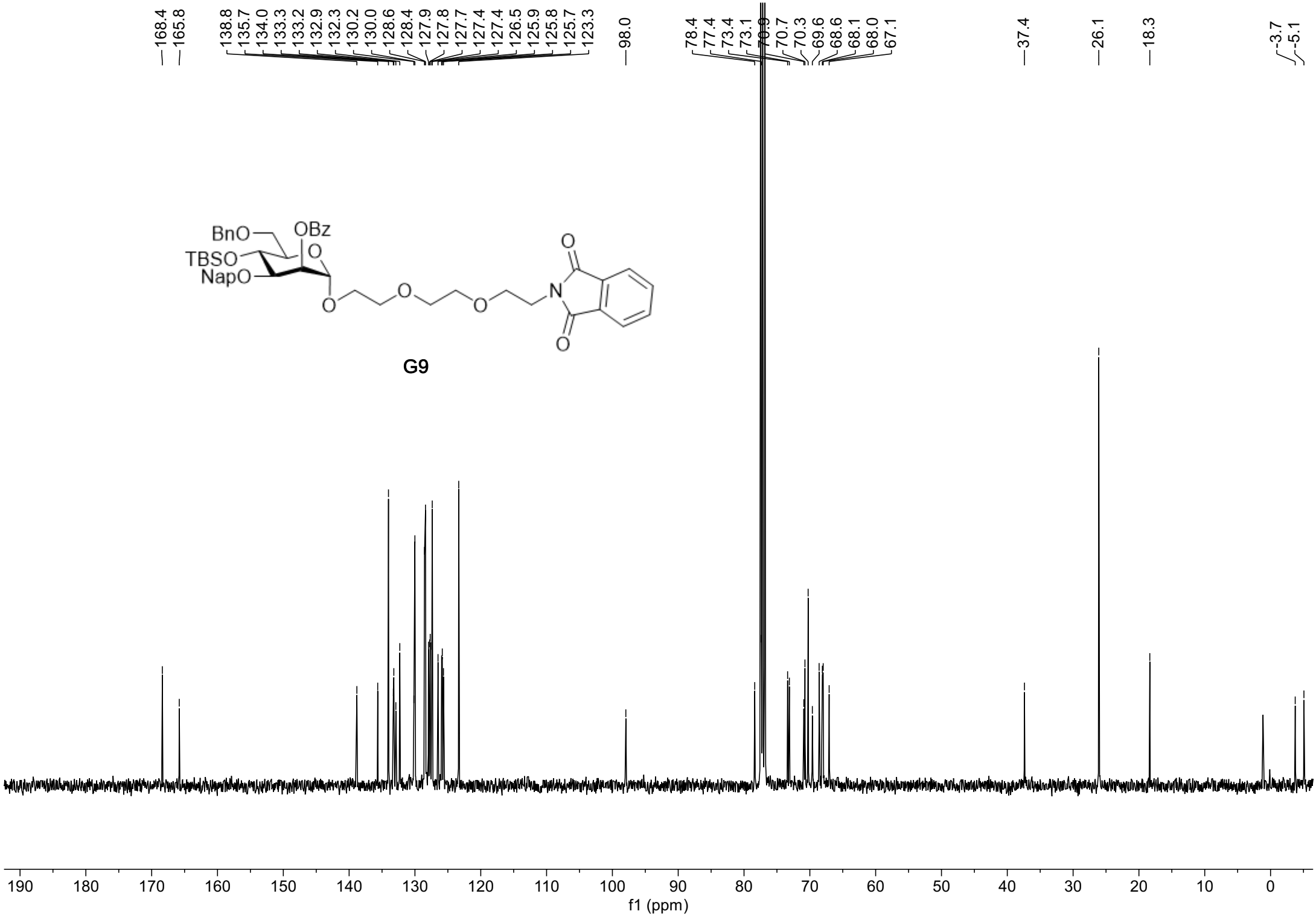
8.014
7.836
7.828
7.822
7.815
7.682
7.677
7.674
7.668
7.660
7.658
7.656
7.636
7.619
7.565
7.563
7.544
7.395
7.390
7.379
7.375
7.371
7.353
7.350
7.335
7.332
7.314
7.312
7.307
7.302
7.294
7.285
7.281
7.277
5.664
5.661
5.656
4.993
4.988
4.905
4.648
4.635
4.609
4.580
3.920
3.905
3.891
3.865
3.843
3.831
3.789
3.761
3.746
3.731
3.648
3.644
3.638
3.633
3.628
3.624
3.605
3.600
3.597
3.589
3.584
0.796
-0.021
-0.078
BnO
OBz
TBSO
NapO
O
N
G9
2.12
2.04
1.10
4.14
2.15
10.24
1.00
1.03
1.03
3.17
1.05
3.16
6.29
7.09
9.08
3.00
3.04
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


168.4
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133.3
133.2
132.9
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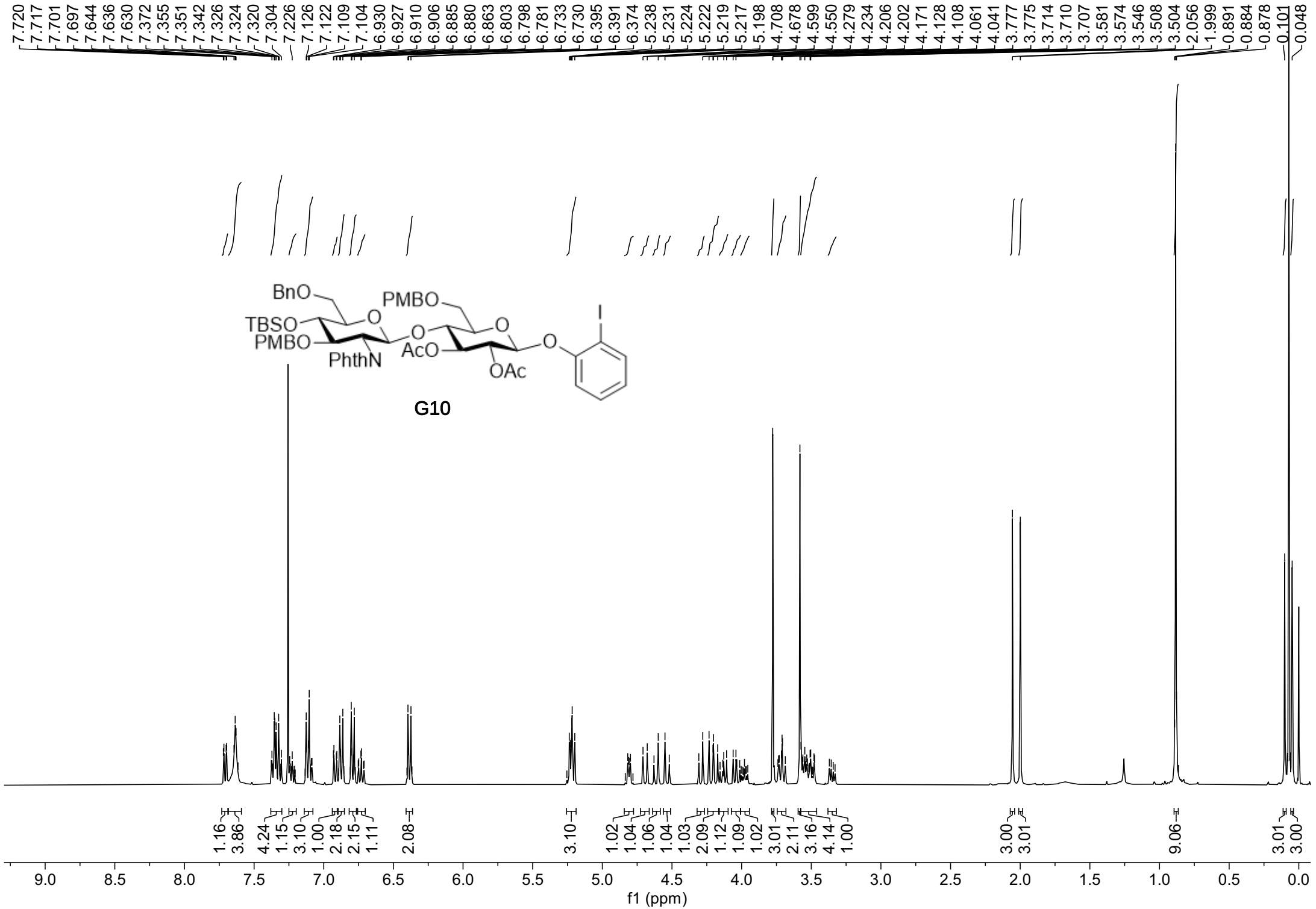
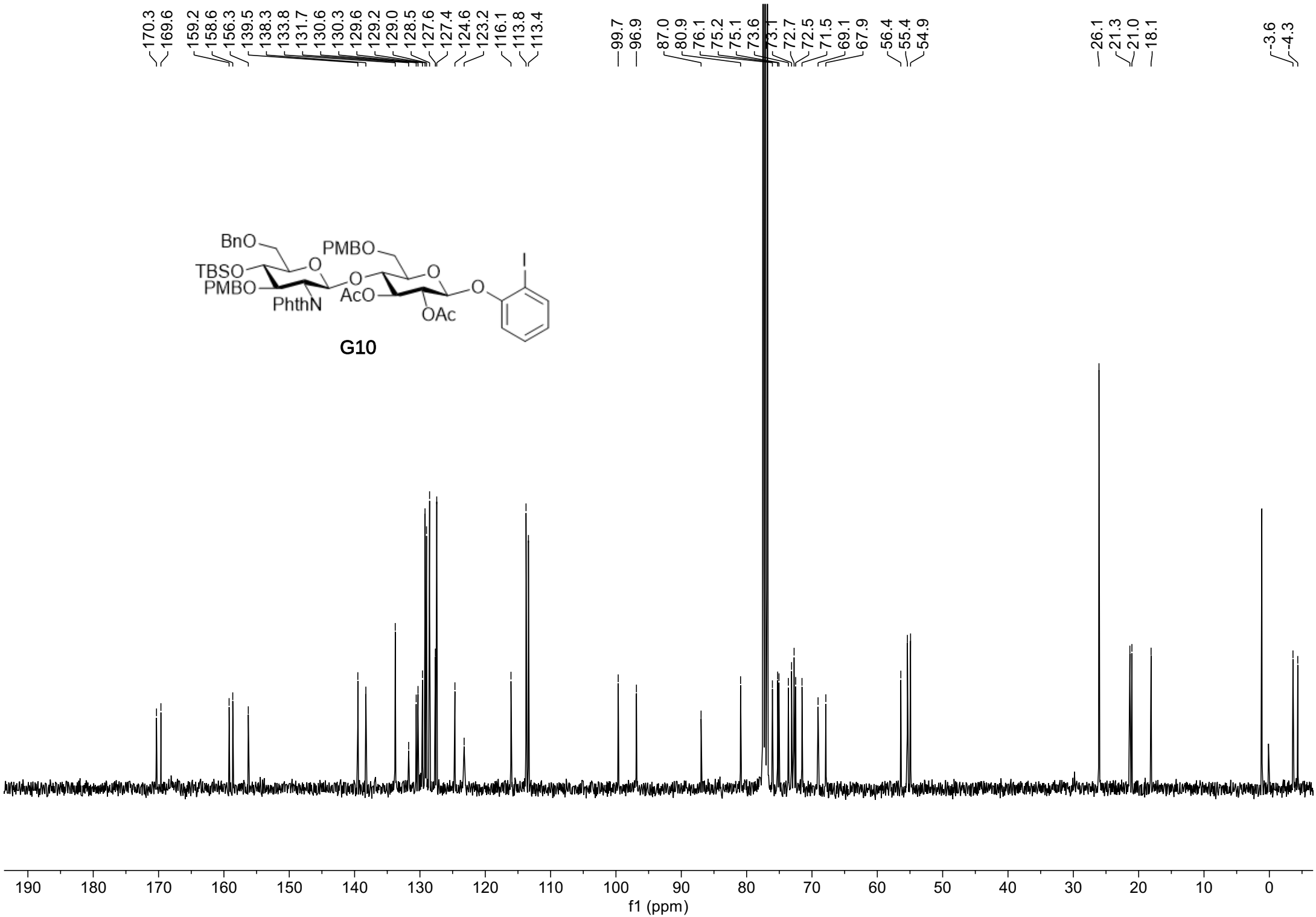
130.2
130.0
128.6
128.4
127.9
127.8
127.7
127.4
127.4
126.5
125.9
125.8
125.7
123.3
98.0
78.4
77.4
73.4
73.1
70.9
70.7
70.3
69.6
68.6
68.1
68.0
67.1
37.4
26.1
18.3
-3.7
-5.1
BnO
OBz
TBSO
NapO
O
O
O
O
N
O
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

G9


BnO
PMBO
TBSO
PMBO
PhthN
AcO
OAc
I
G10
f1 (ppm)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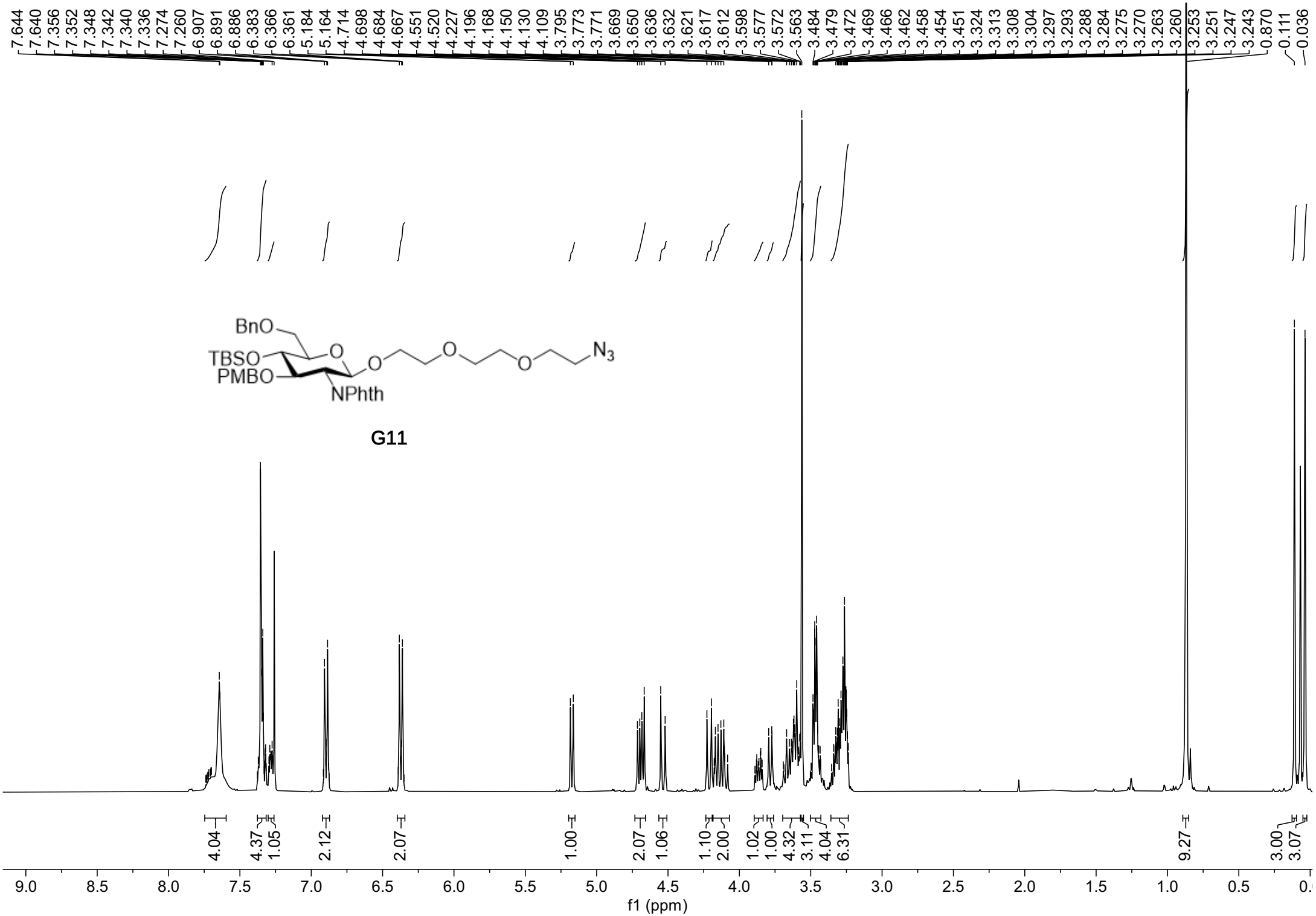
169.6
159.2
158.6
156.3
139.5
138.3
133.8
131.7
130.6
130.3
129.6
129.2
129.0
128.5
127.6
127.4
124.6
123.2
116.1
113.8
113.4
99.7
96.9
87.0
80.9
76.1
75.2
75.1
73.6
73.1
72.7
72.5
71.5
69.1
67.9
56.4
55.4
54.9
26.1
21.3
21.0
18.1
-3.6
-4.3
BnO
PMBO
TBSO
PMBO
PhthN
AcO
OAc
I
G10
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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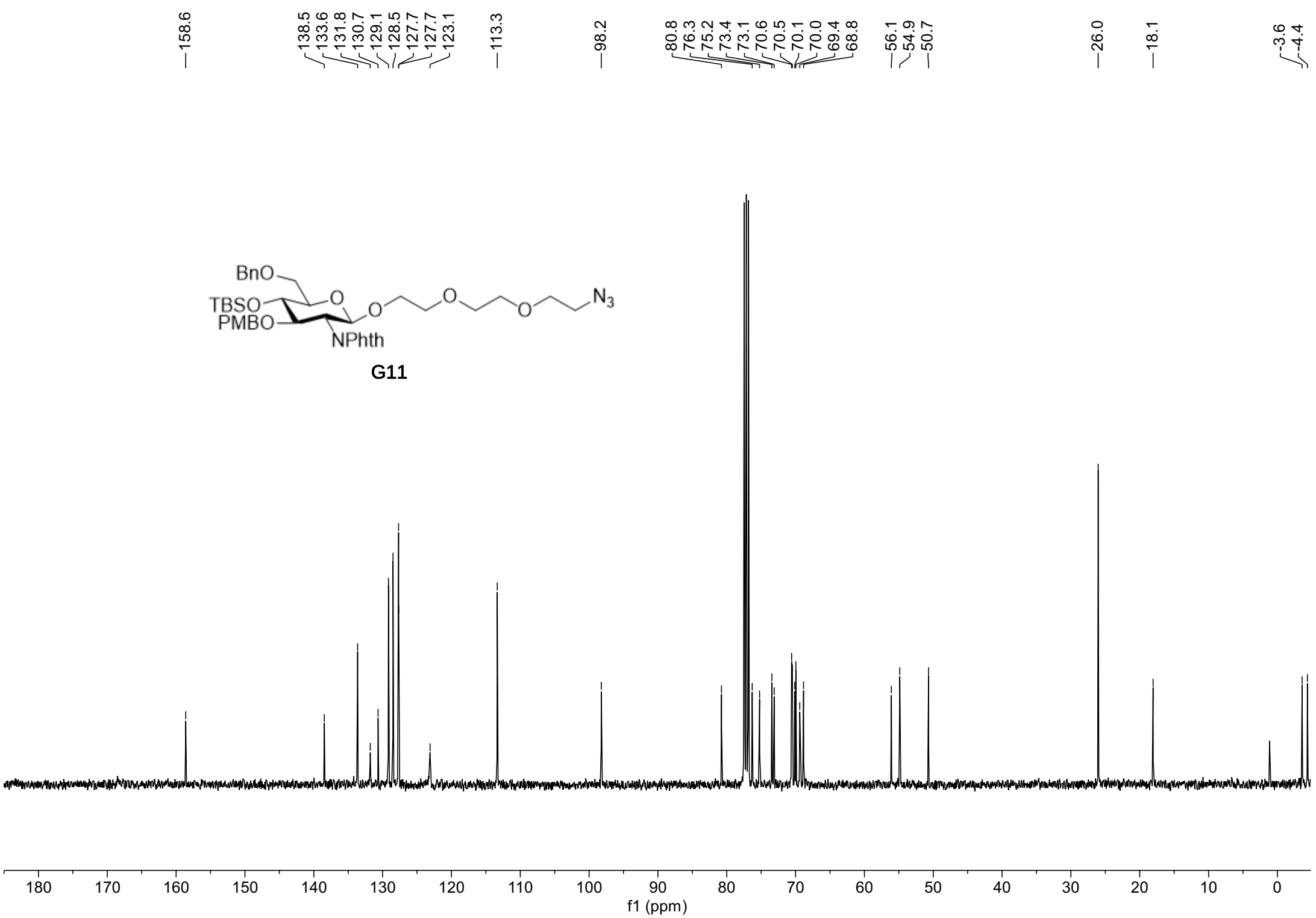
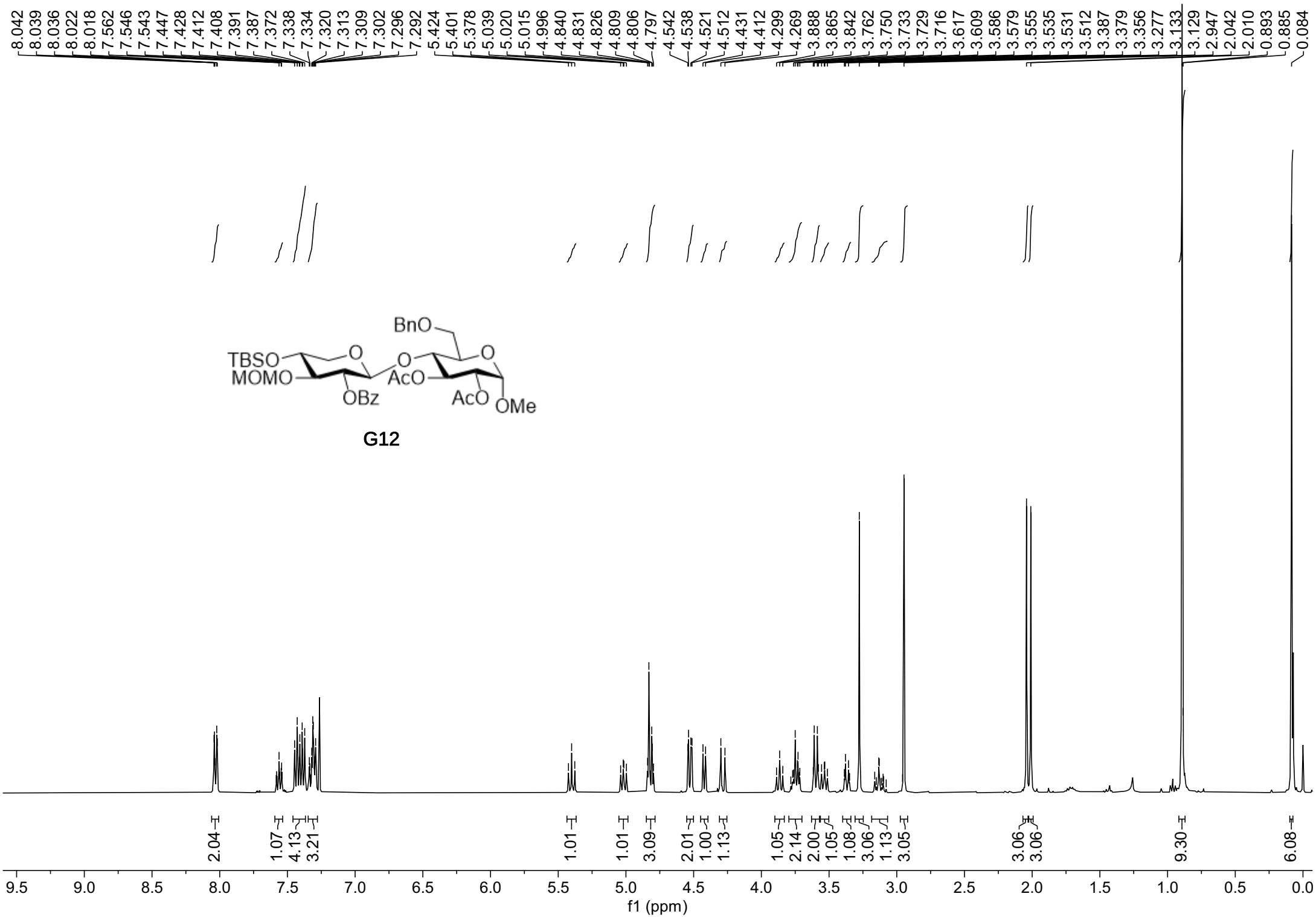
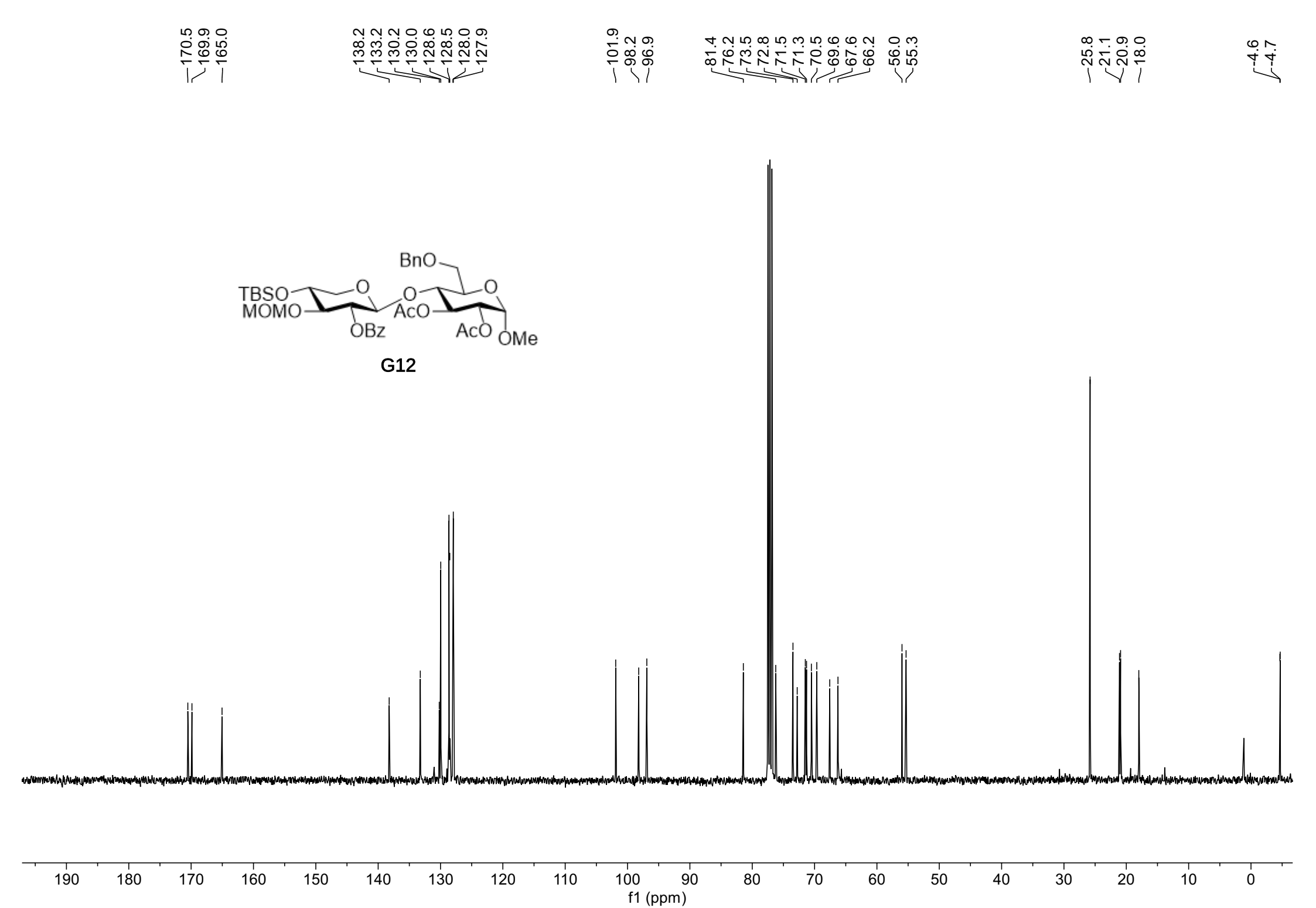
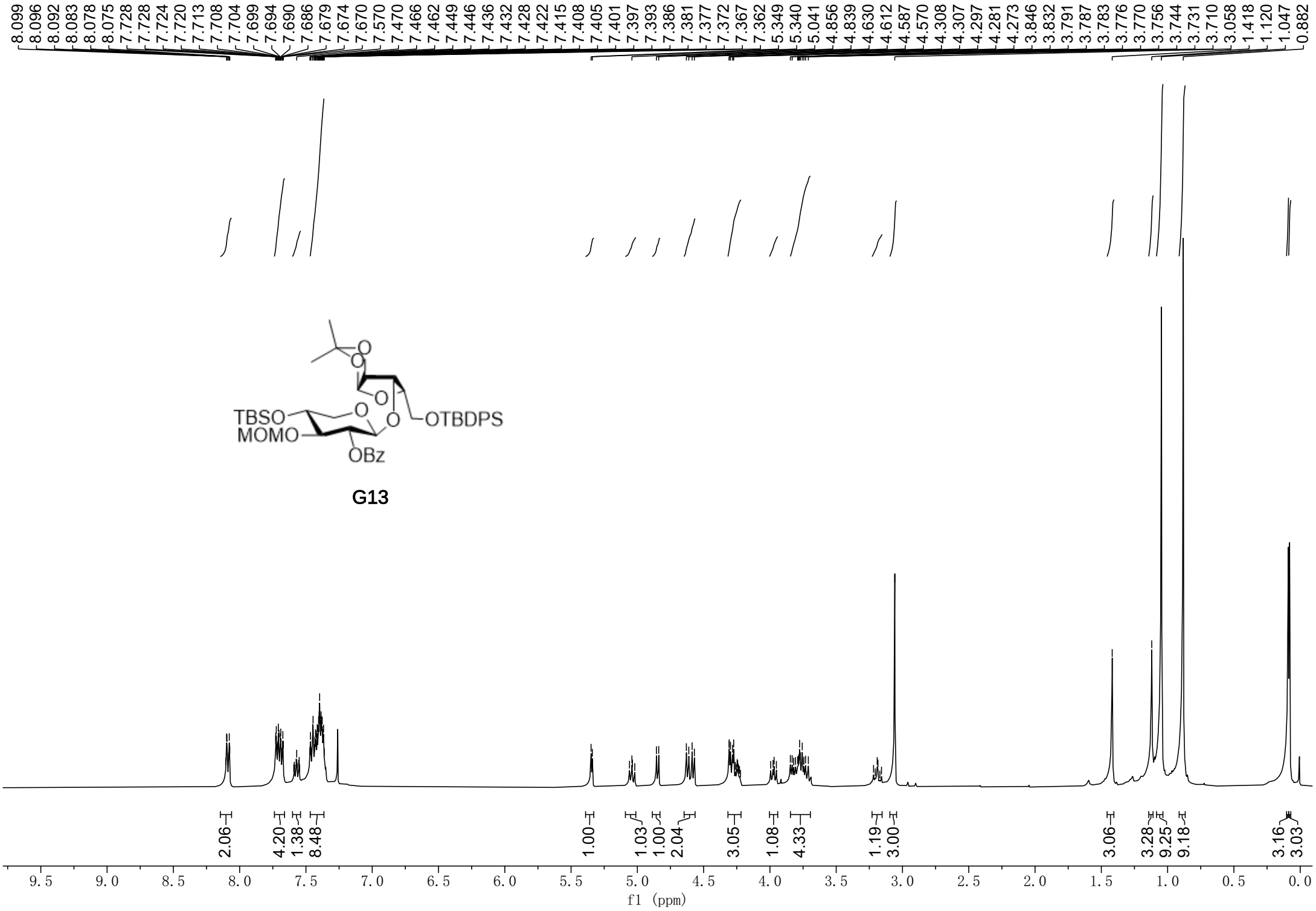
7.342
7.340
7.336
7.274
7.260
6.907
6.891
6.886
6.383
6.366
6.361
5.184
5.164
4.714
4.698
4.684
4.667
4.551
4.520
4.227
4.196
4.168
4.150
4.130
4.109
3.795
3.773
3.771
3.669
3.650
3.636
3.632
3.621
3.617
3.612
3.598
3.577
3.572
3.563
3.484
3.479
3.472
3.469
3.466
3.462
3.458
3.454
3.451
3.324
3.313
3.308
3.304
3.297
3.293
3.288
3.284
3.275
3.270
3.263
3.260
3.253
3.251
3.247
3.243
0.870
0.111
0.036
BnO
TBSO
PMBO
NPhth
O
O
O
O
N3
G11
4.04
4.37
1.05
2.12
2.07
1.00
2.07
1.06
1.10
2.00
1.02
1.00
4.32
3.11
4.04
6.31
9.27
3.00
3.07
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)


158.6
138.5
133.6
131.8
130.7
129.1
128.5
127.7
127.7
123.1
113.3
98.2
80.8
76.3
75.2
73.4
73.1
70.6
70.5
70.1
70.0
69.4
68.8
56.1
54.9
50.7
26.0
18.1
-3.6
-4.4
BnO
TBSO
PMBO
O
O
O
O
O
N3
NPhth
G11
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

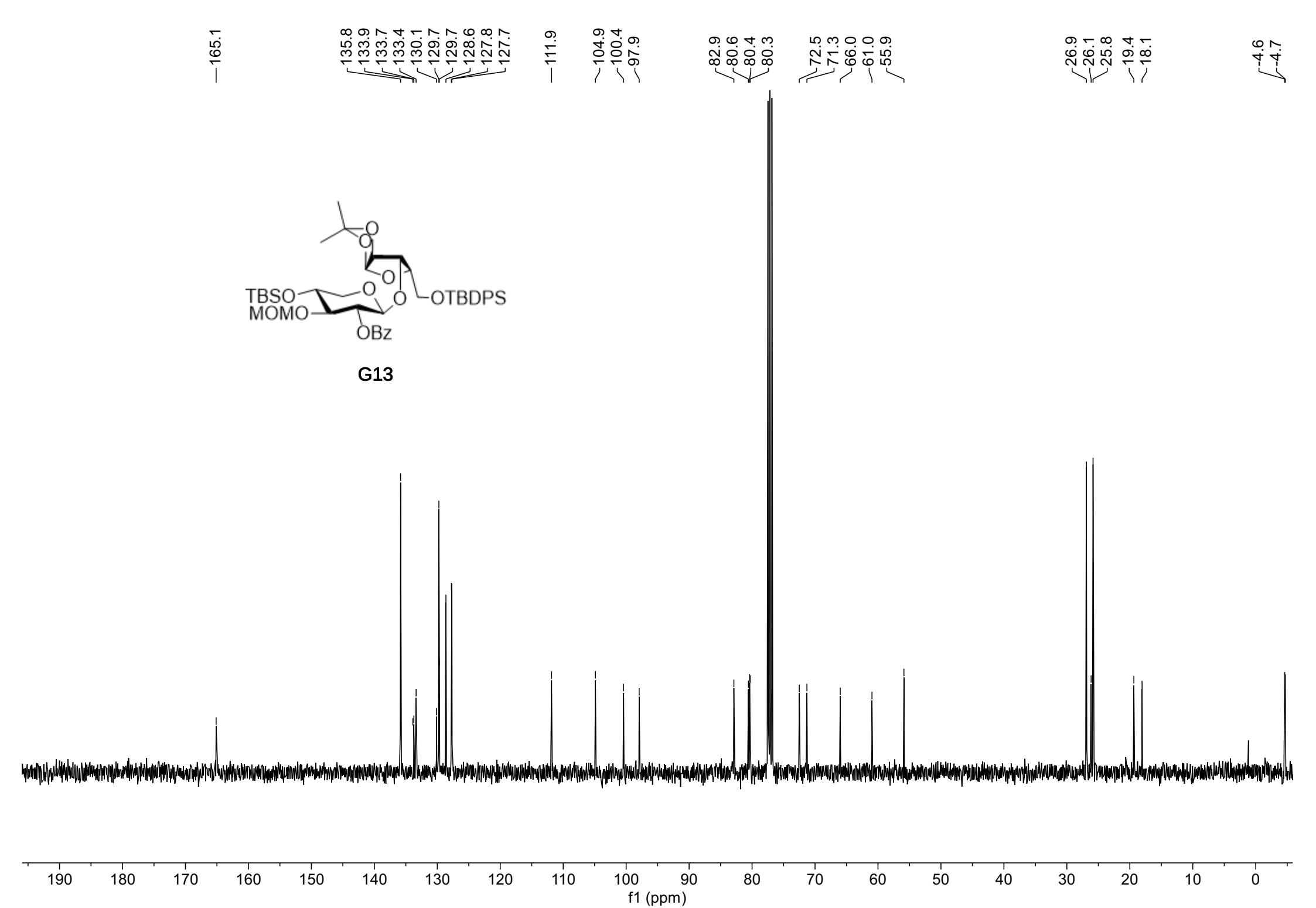

8.042
8.039
8.036
8.022
8.018
7.562
7.546
7.543
7.447
7.428
7.412
7.408
7.391
7.387
7.372
7.338
7.334
7.320
7.313
7.309
7.302
7.296
7.292
5.424
5.401
5.378
5.039
5.020
5.015
4.996
4.840
4.831
4.826
4.809
4.806
4.797
4.542
4.538
4.521
4.512
4.431
4.412
4.299
4.269
3.888
3.865
3.842
3.762
3.750
3.733
3.729
3.716
3.617
3.609
3.586
3.579
3.555
3.535
3.531
3.512
3.387
3.379
3.356
3.277
3.133
3.129
2.947
2.042
2.010
0.893
0.885
0.084
BnO
TBSO
MOMO
OBz
AcO
AcO
OMe
2.04
1.07
4.13
3.21
1.01
1.01
3.09
2.01
1.00
1.13
1.05
2.14
2.00
1.05
1.08
3.06
1.13
3.05
3.06
3.06
9.30
6.08
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

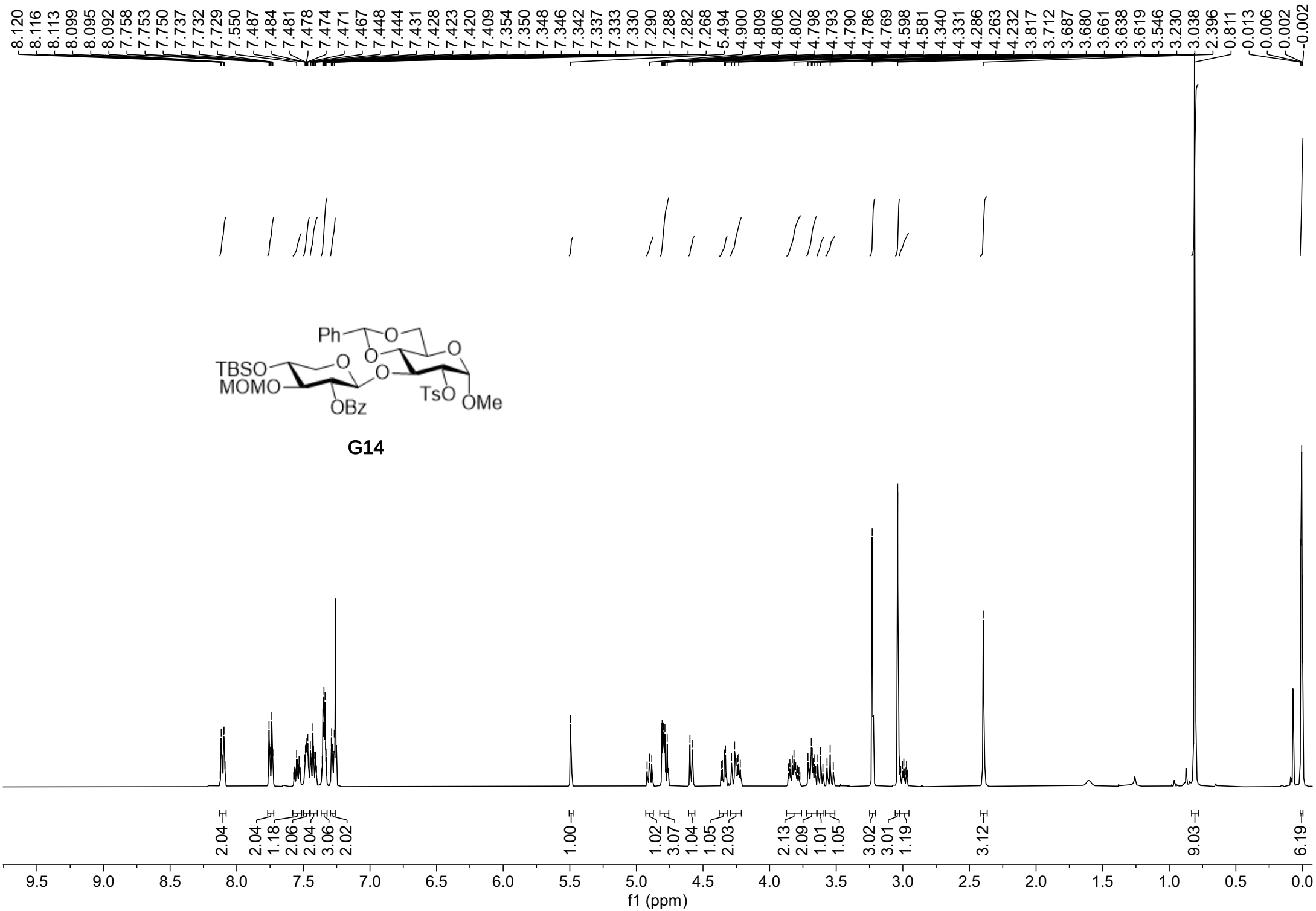
G12


170.5
169.9
165.0
138.2
133.2
130.2
130.0
128.6
128.5
128.0
127.9
101.9
98.2
96.9
81.4
76.2
73.5
72.8
71.5
71.3
70.5
69.6
67.6
66.2
56.0
55.3
25.8
21.1
20.9
18.0
-4.6
-4.7
BnO
TBSO
MOMO
OBz
AcO
AcO
OMe
G12
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

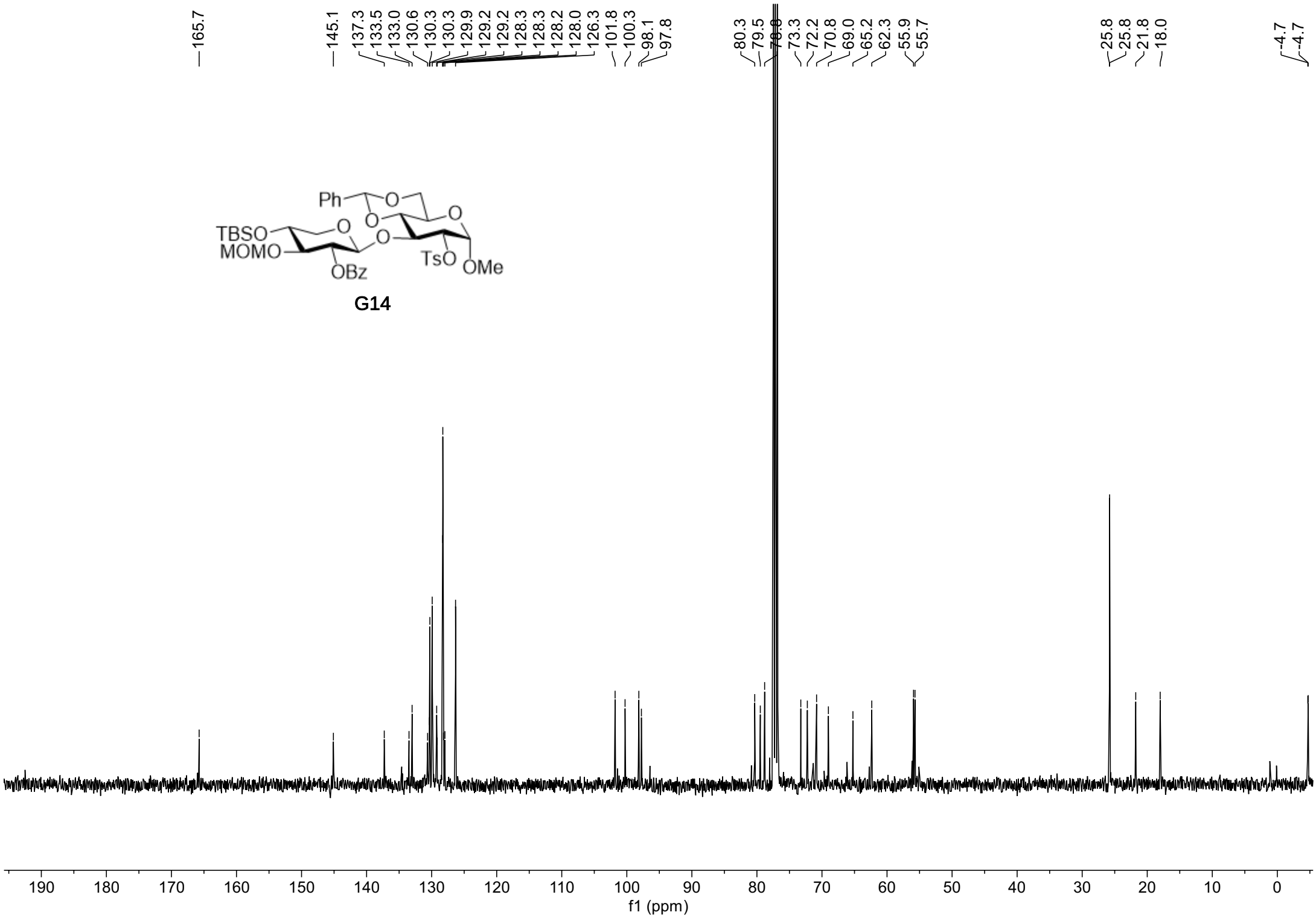

8.099 8.096 8.092 8.083 8.078 8.075 7.728 7.728 7.724 7.720 7.713 7.708 7.704 7.699 7.694 7.690 7.686 7.679 7.674 7.670 7.570 7.470 7.466 7.462 7.449 7.446 7.436 7.432 7.428 7.422 7.415 7.408 7.405 7.401 7.397 7.393 7.386 7.381 7.377 7.372 7.367 7.362 5.349 5.340 5.041 4.856 4.839 4.630 4.612 4.587 4.570 4.308 4.307 4.297 4.281 4.273 3.846 3.832 3.791 3.787 3.783 3.776 3.770 3.756 3.744 3.731 3.710 3.058 1.418 1.120 1.047 0.882
TBSO
MOMO
OBz
OTBDPS
2.06 4.20 1.38 8.48 1.00 1.03 1.00 2.04 3.05 1.08 4.33 1.19 3.00 3.06 3.28 9.25 9.18 3.16 3.03
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

G13

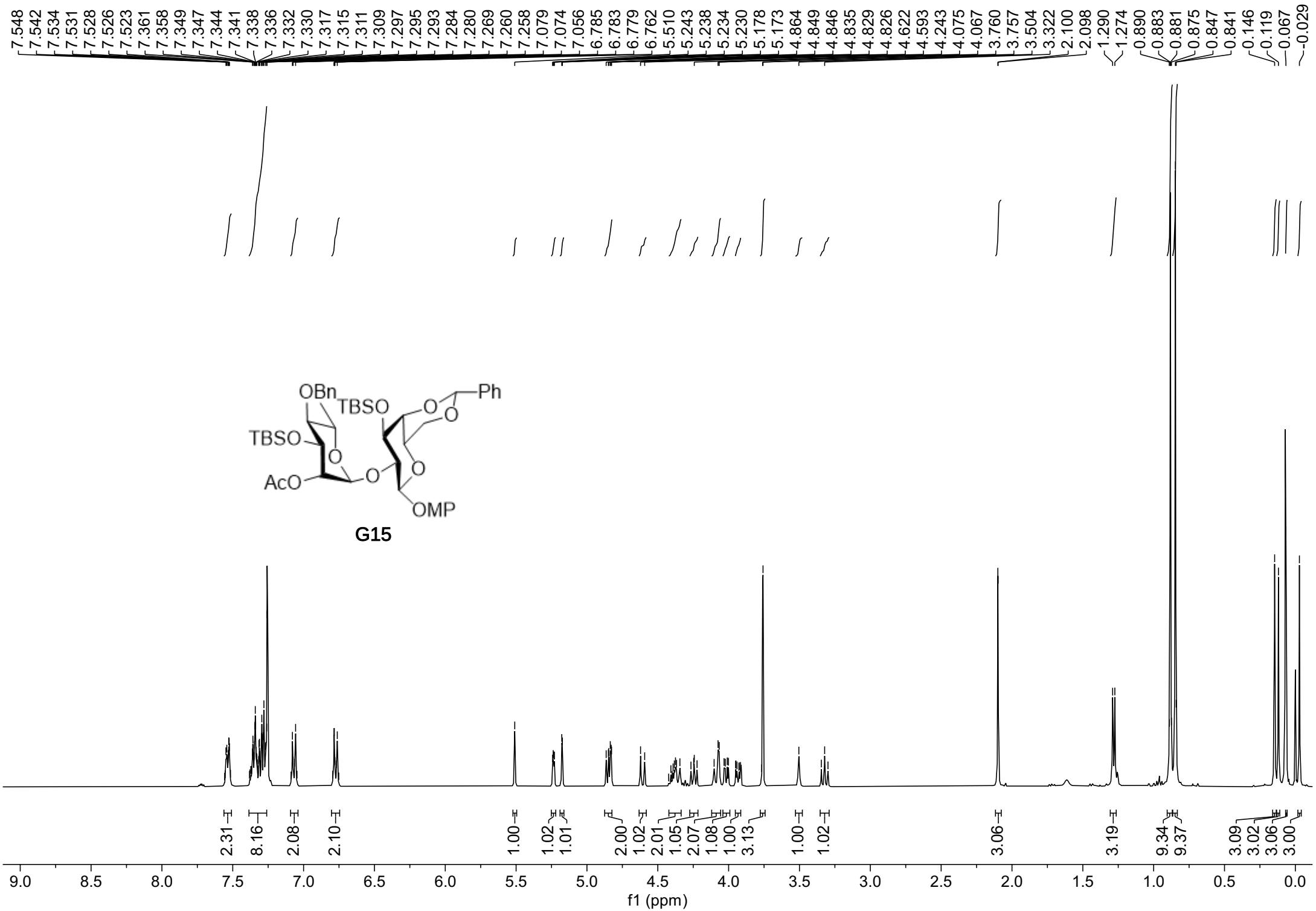

165.1
135.8
133.9
133.7
133.4
130.1
129.7
129.7
128.6
127.8
127.7
111.9
104.9
100.4
97.9
82.9
80.6
80.4
80.3
72.5
71.3
66.0
61.0
55.9
26.9
26.1
25.8
19.4
18.1
-4.6
-4.7
TBSO
MOMO
OBz
OTBDPS
G13
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

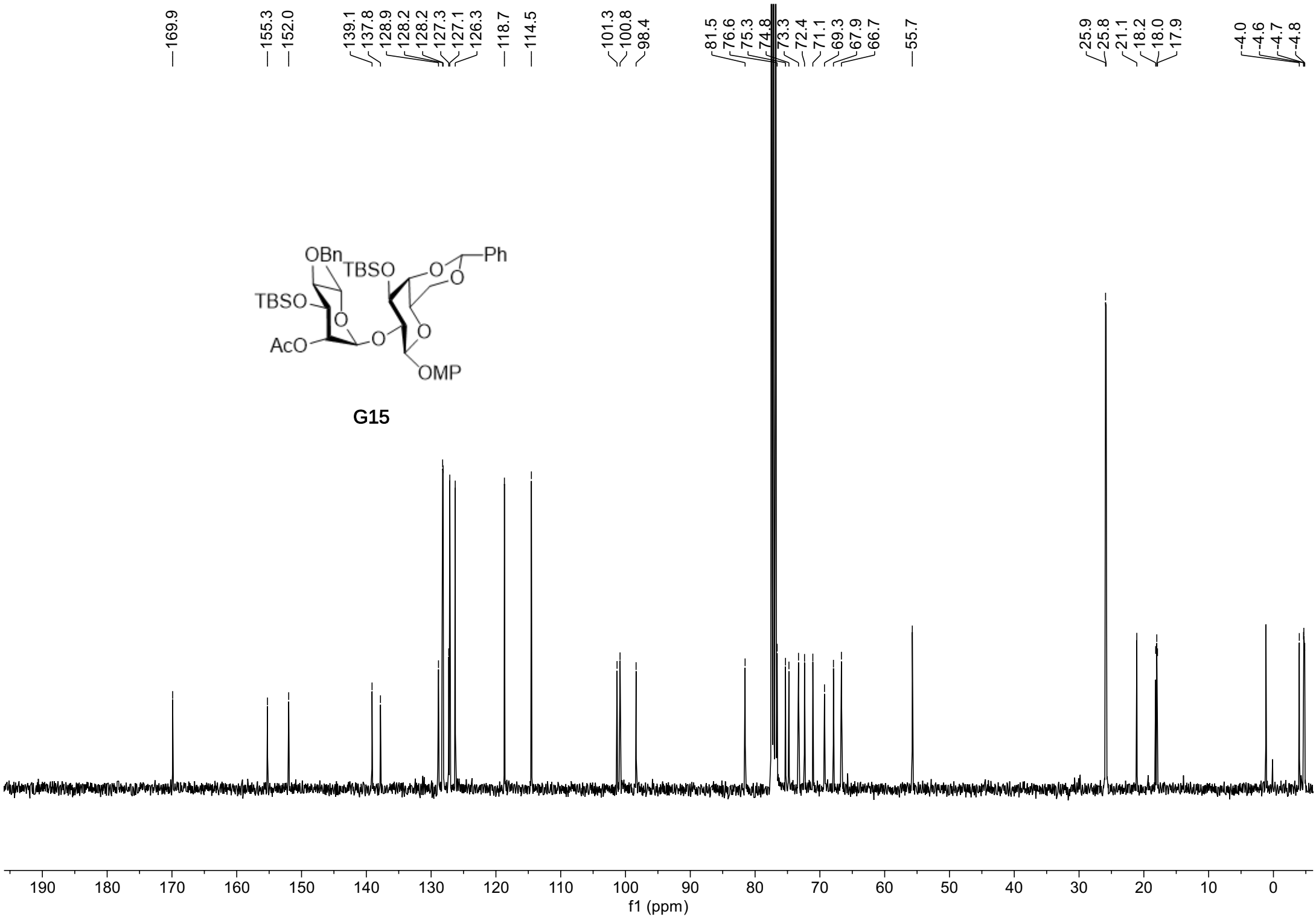

8.120
8.116
8.113
8.099
8.095
8.092
7.758
7.753
7.750
7.737
7.732
7.729
7.550
7.487
7.484
7.481
7.478
7.474
7.471
7.467
7.448
7.444
7.431
7.428
7.423
7.420
7.409
7.354
7.350
7.348
7.346
7.342
7.337
7.333
7.330
7.290
7.288
7.282
7.268
5.494
4.900
4.809
4.806
4.802
4.798
4.793
4.790
4.786
4.769
4.598
4.581
4.340
4.331
4.286
4.263
4.232
3.817
3.712
3.687
3.680
3.661
3.638
3.619
3.546
3.230
3.038
2.396
0.811
0.013
0.006
0.002
-0.002
Ph
TBSO
MOMO
OBz
TsO
OMe
2.04
2.04
1.18
2.06
2.04
3.06
2.02
1.00
1.02
3.07
1.04
1.05
2.03
2.13
2.09
1.01
1.05
3.02
3.01
1.19
3.12
9.03
6.19
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

G14

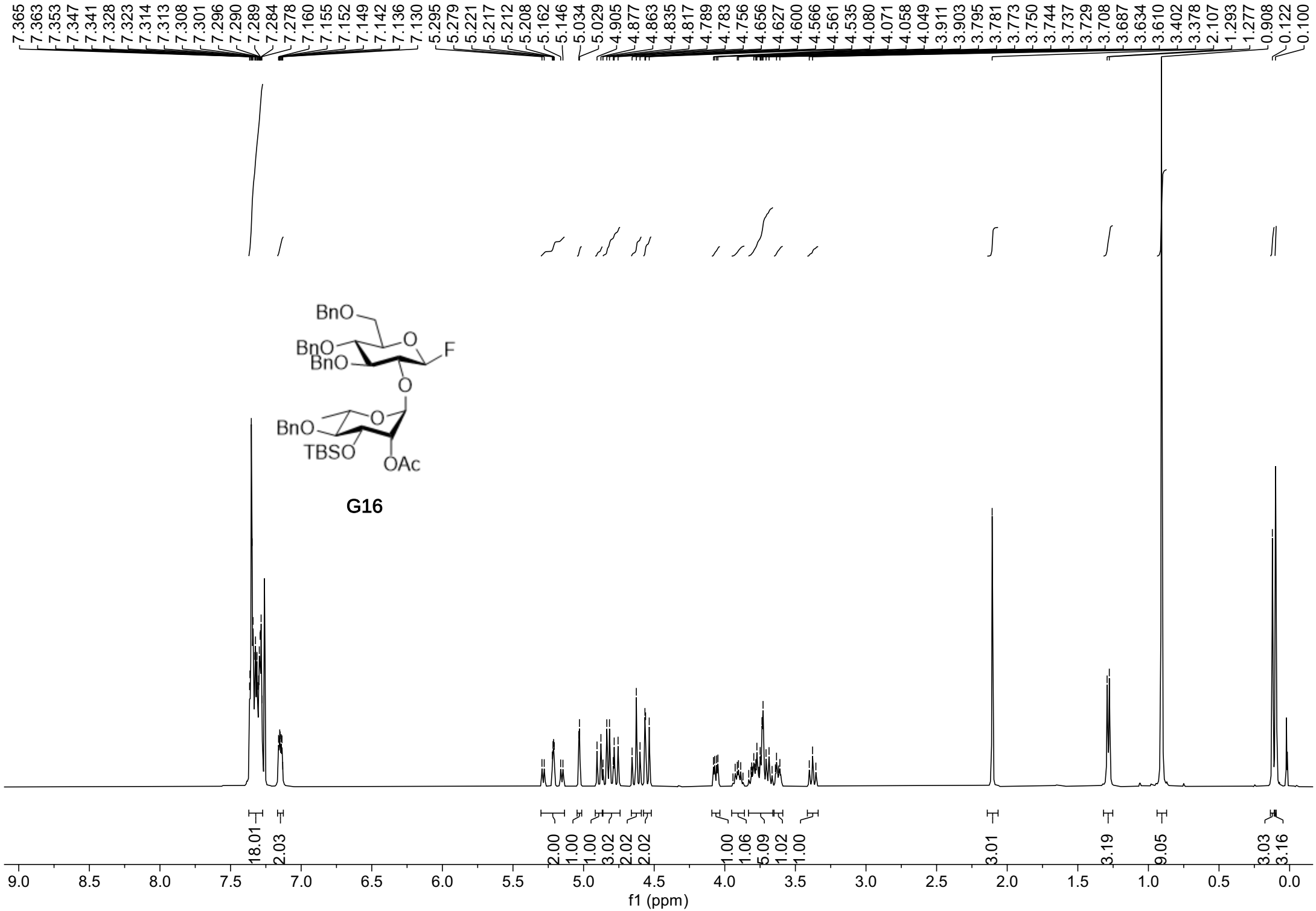

165.7
145.1
137.3
133.5
133.0
130.6
130.3
130.3
129.9
129.2
129.2
128.3
128.3
128.2
128.0
126.3
101.8
100.3
98.1
97.8
80.3
79.5
78.8
73.3
72.2
70.8
69.0
65.2
62.3
55.9
55.7
25.8
25.8
21.8
18.0
-4.7
-4.7
Ph
O
O
O
O
O
TBSO
MOMO
OBz
TsO
OMe
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

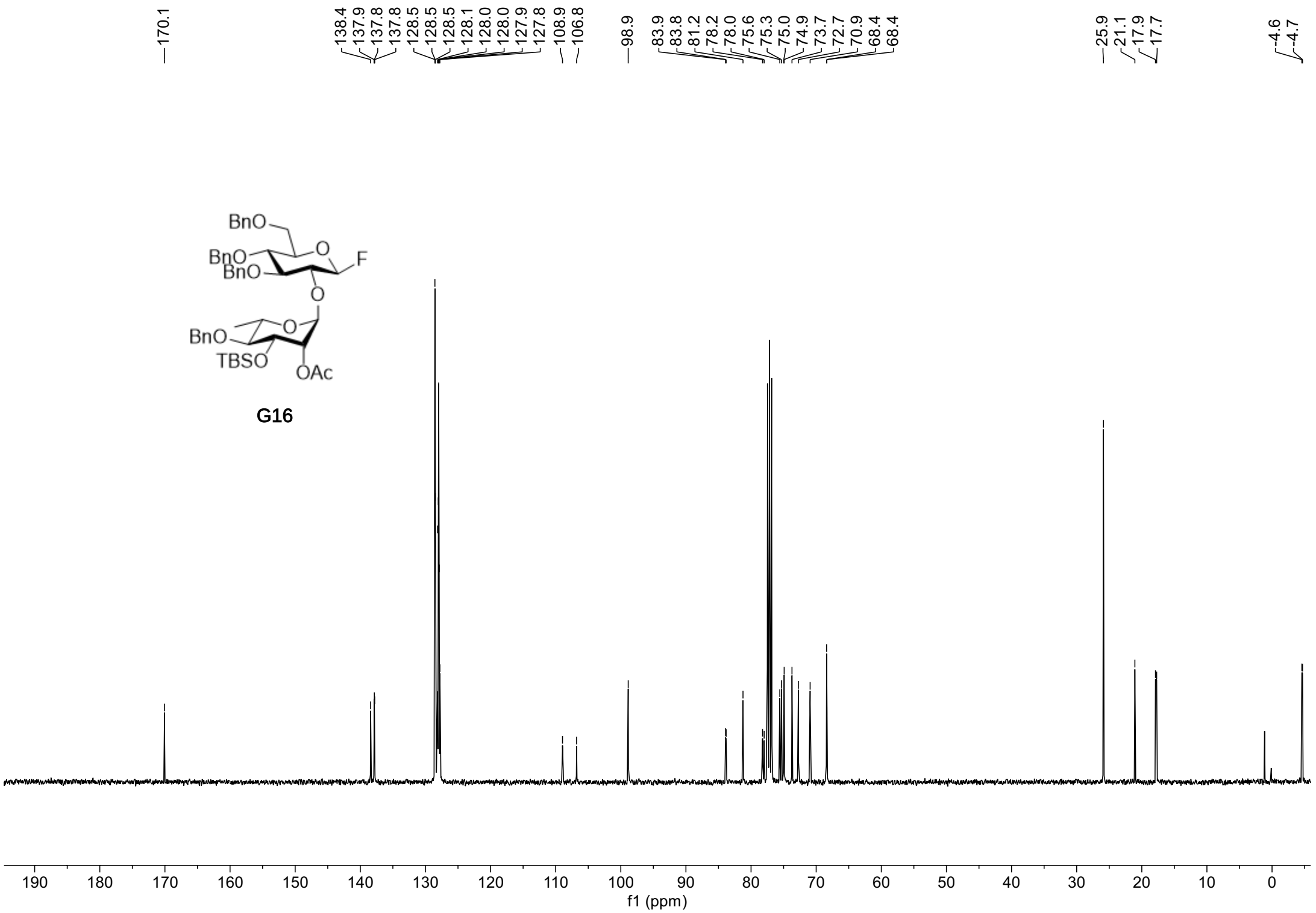
G14

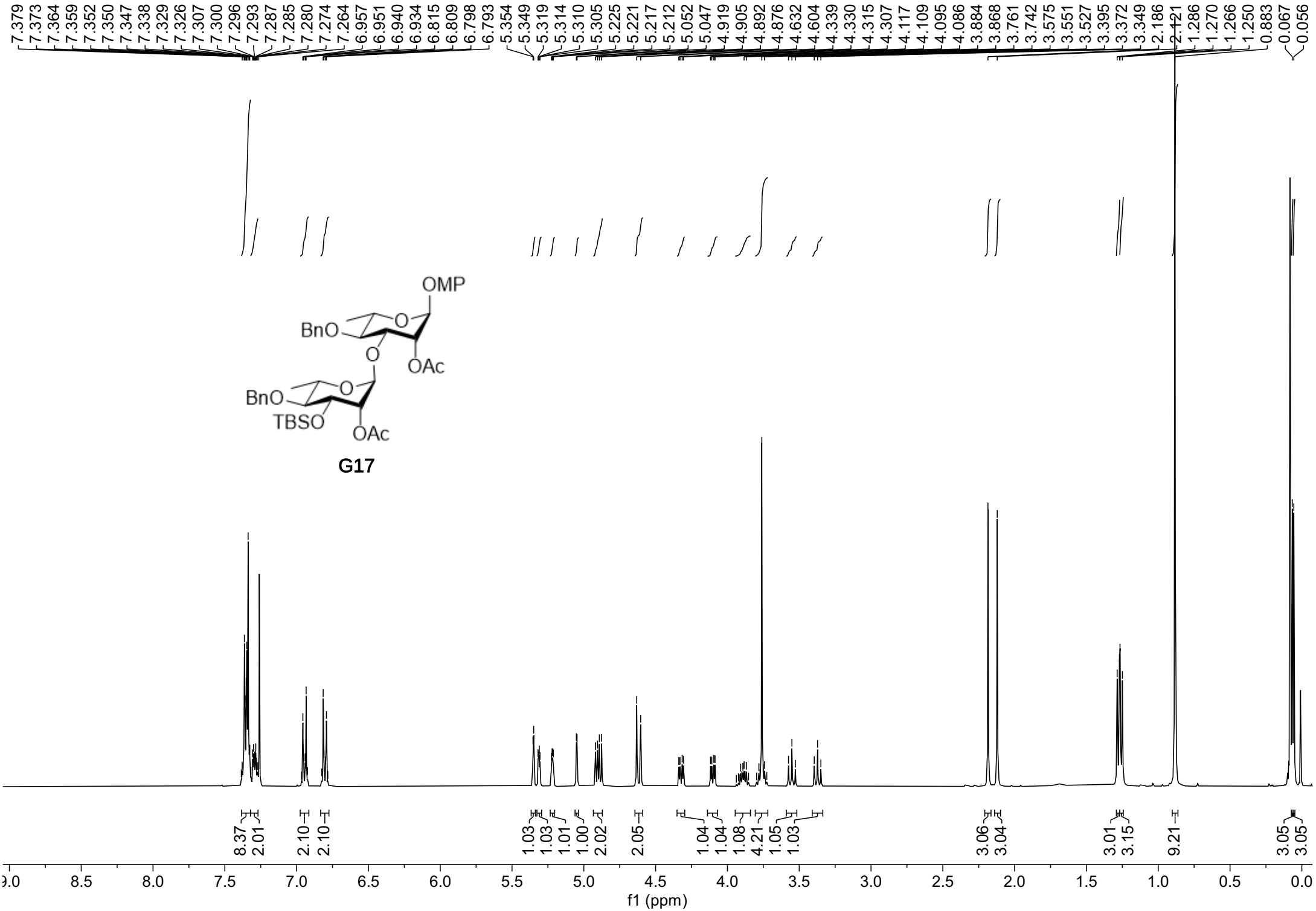

7.548
7.542
7.534
7.531
7.528
7.526
7.523
7.361
7.358
7.349
7.347
7.344
7.341
7.338
7.336
7.332
7.330
7.317
7.315
7.311
7.309
7.297
7.295
7.293
7.284
7.280
7.269
7.260
7.258
7.079
7.074
7.056
6.785
6.783
6.779
6.762
5.510
5.243
5.238
5.234
5.230
5.178
5.173
4.864
4.849
4.846
4.835
4.829
4.826
4.622
4.593
4.243
4.075
4.067
3.760
3.757
3.504
3.322
2.100
2.098
1.290
1.274
0.890
0.883
0.881
0.875
0.847
0.841
0.146
0.119
0.067
-0.029
OBn
TBSO
Ph
TBSO
AcO
OMP
G15
2.31
8.16
2.08
2.10
1.00
1.02
1.01
2.00
1.02
2.01
1.05
2.07
1.08
1.00
3.13
1.00
1.02
3.06
3.19
9.34
9.37
3.09
3.02
3.06
3.00
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


169.9
155.3
152.0
139.1
137.8
128.9
128.2
128.2
127.3
127.1
126.3
118.7
114.5
101.3
100.8
98.4
81.5
76.6
75.3
74.8
73.3
72.4
71.1
69.3
67.9
66.7
55.7
25.9
25.8
21.1
18.2
18.0
17.9
-4.0
-4.6
-4.7
-4.8
OBn
TBSO
Ph
O
O
TBSO
O
AcO
O
O
OMP
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

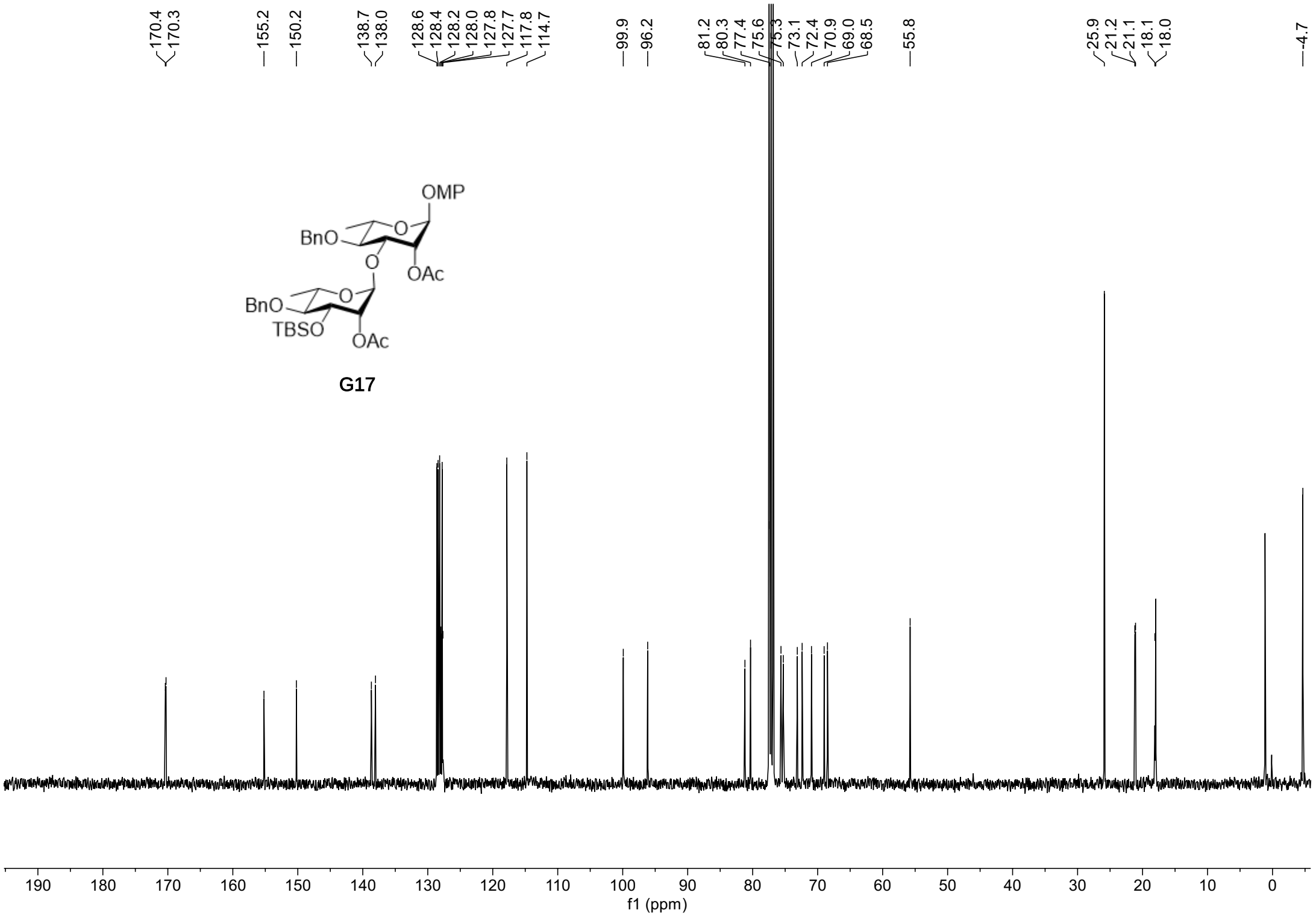
G15


BnO
BnO
BnO
O
F
O
BnO
O
TBSO
OAc
G16
f1 (ppm)

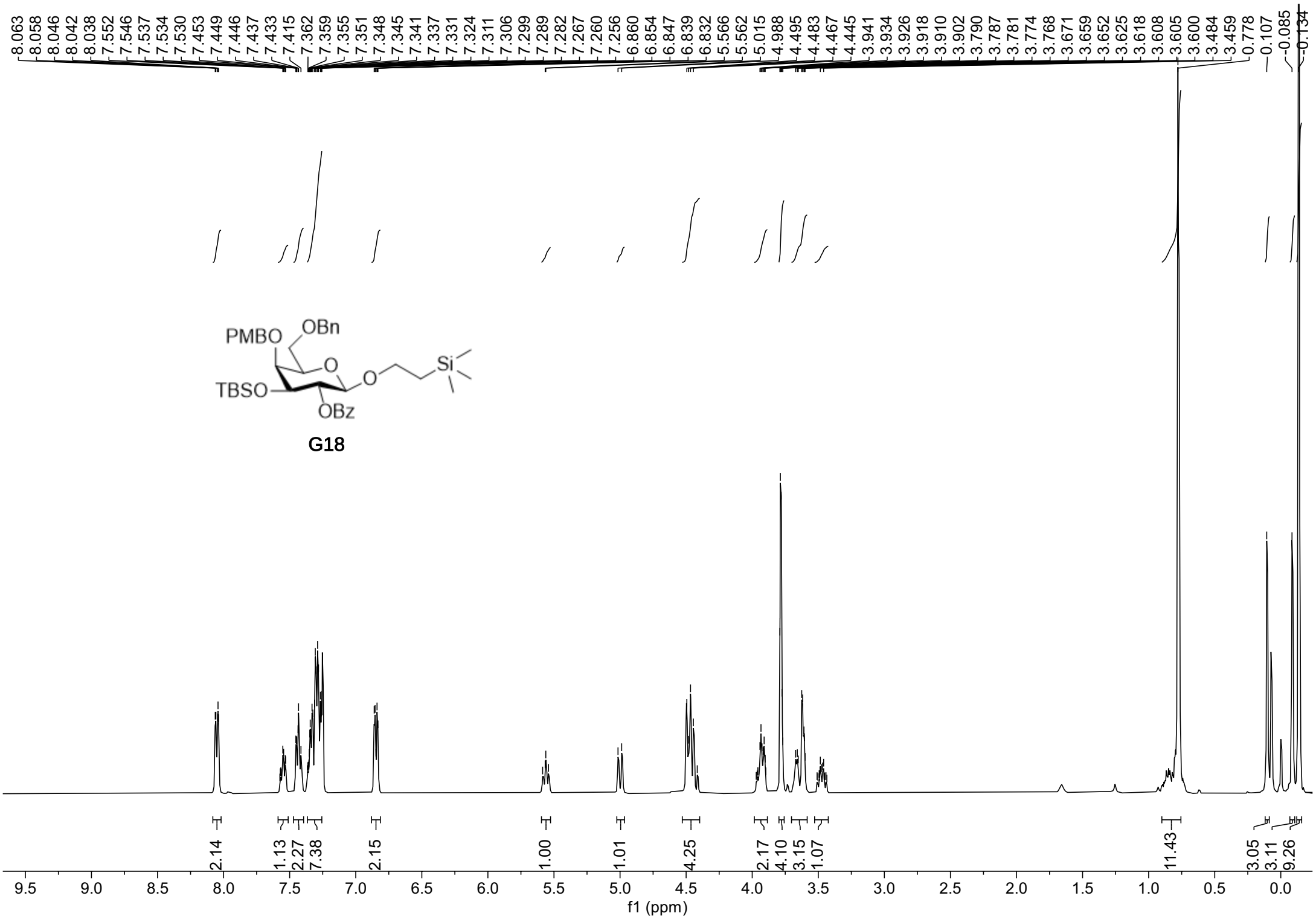

170.1
138.4
137.9
137.8
137.8
128.5
128.5
128.5
128.1
128.0
128.0
127.9
127.8
108.9
106.8
98.9
83.9
83.8
81.2
78.2
78.0
75.6
75.3
75.0
74.9
73.7
72.7
70.9
68.4
68.4
25.9
21.1
17.9
17.7
-4.6
-4.7
BnO
BnO
BnO
O
F
O
BnO
O
TBSO
OAc
G16
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



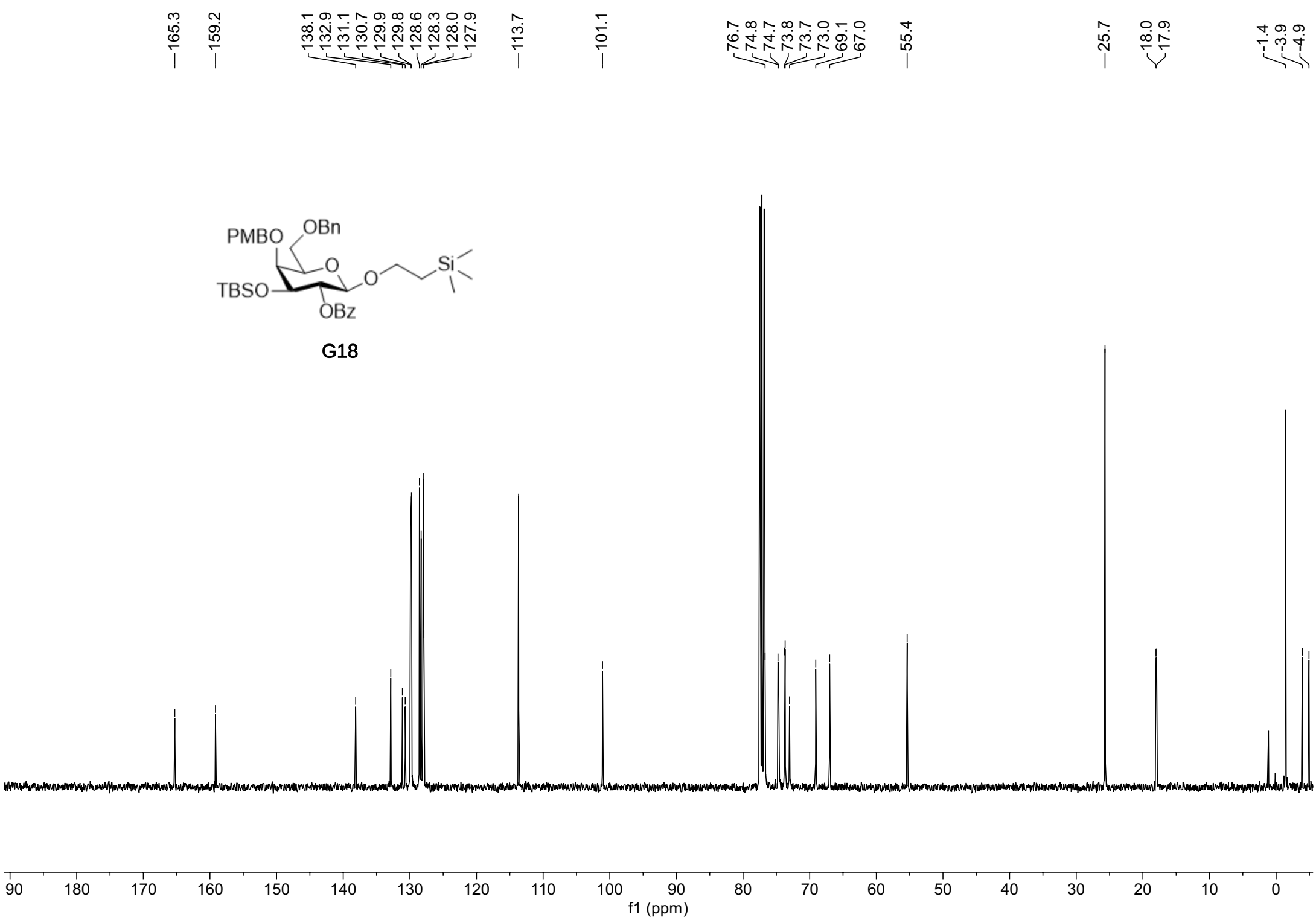
G17

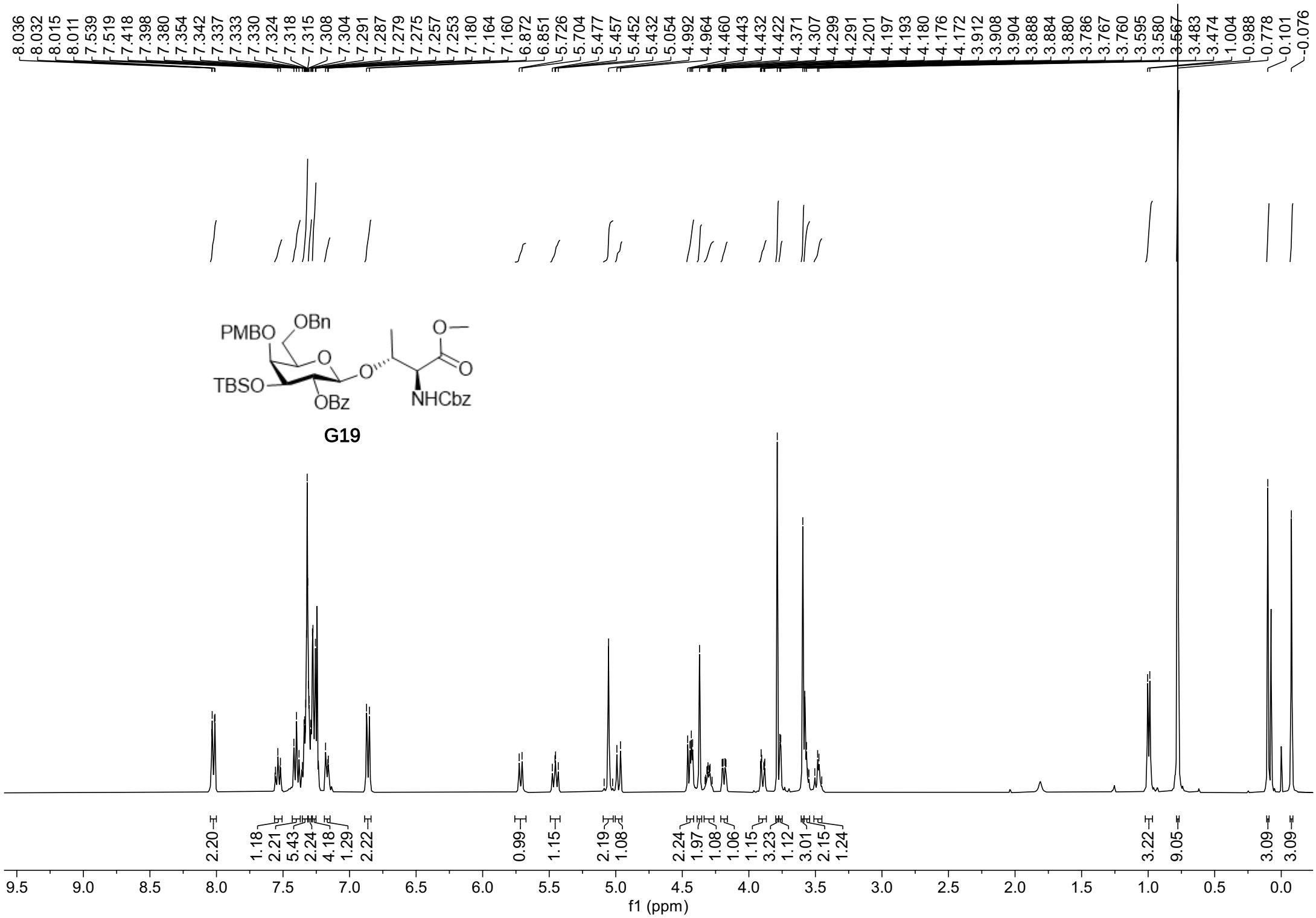

170.4
170.3
155.2
150.2
138.7
138.0
128.6
128.4
128.2
128.0
127.8
127.7
117.8
114.7
99.9
96.2
81.2
80.3
77.4
75.6
75.3
73.1
72.4
70.9
69.0
68.5
55.8
25.9
21.2
21.1
18.1
18.0
-4.7
OMP
BnO
O
OAc
BnO
O
TBSO
OAc
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

G17

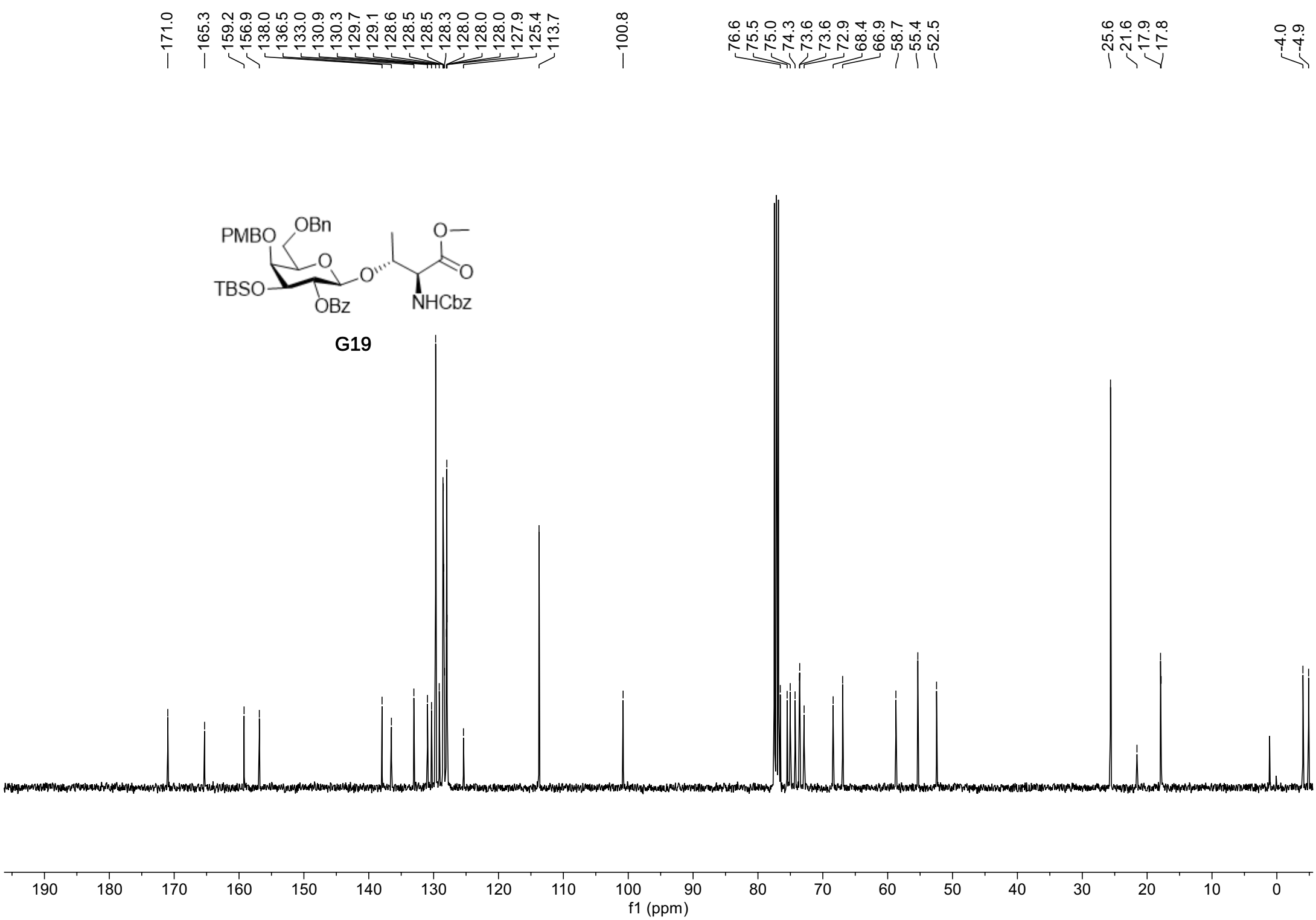

8.063
8.058
8.046
8.042
8.038
7.552
7.546
7.537
7.534
7.530
7.453
7.449
7.446
7.437
7.433
7.415
7.362
7.359
7.355
7.351
7.348
7.345
7.341
7.337
7.331
7.324
7.311
7.306
7.299
7.289
7.282
7.267
7.260
7.256
6.860
6.854
6.847
6.839
6.832
5.566
5.562
5.015
4.988
4.495
4.483
4.467
4.445
3.941
3.934
3.926
3.918
3.910
3.902
3.790
3.787
3.781
3.774
3.768
3.671
3.659
3.652
3.625
3.618
3.608
3.605
3.600
3.484
3.459
0.778
0.107
-0.085
-0.134
PMBO
OBn
O
O
Si
TBSO
OBz
2.14
1.13
2.27
7.38
2.15
1.00
1.01
4.25
2.17
4.10
3.15
1.07
11.43
3.05
3.11
9.26
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

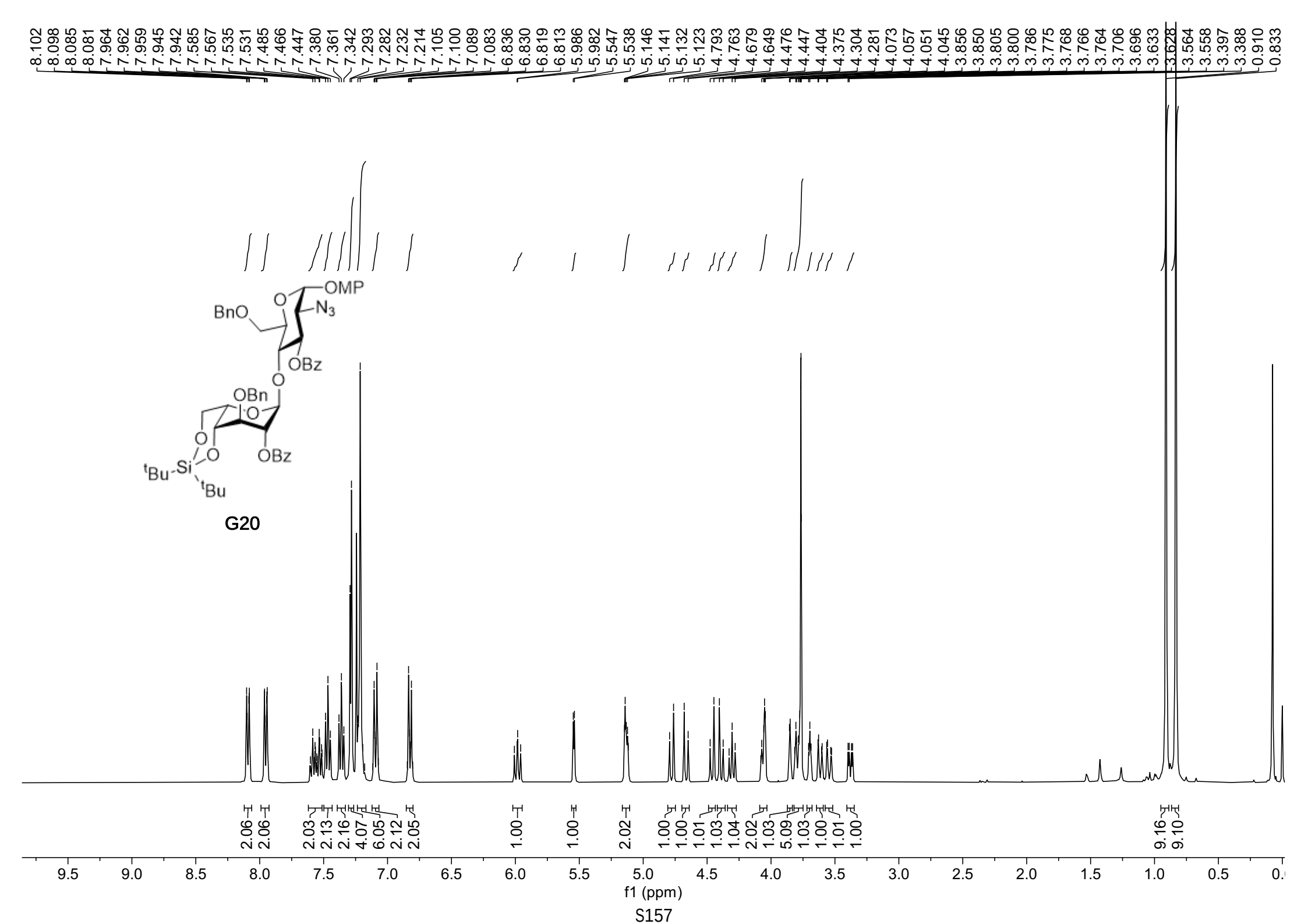
G18

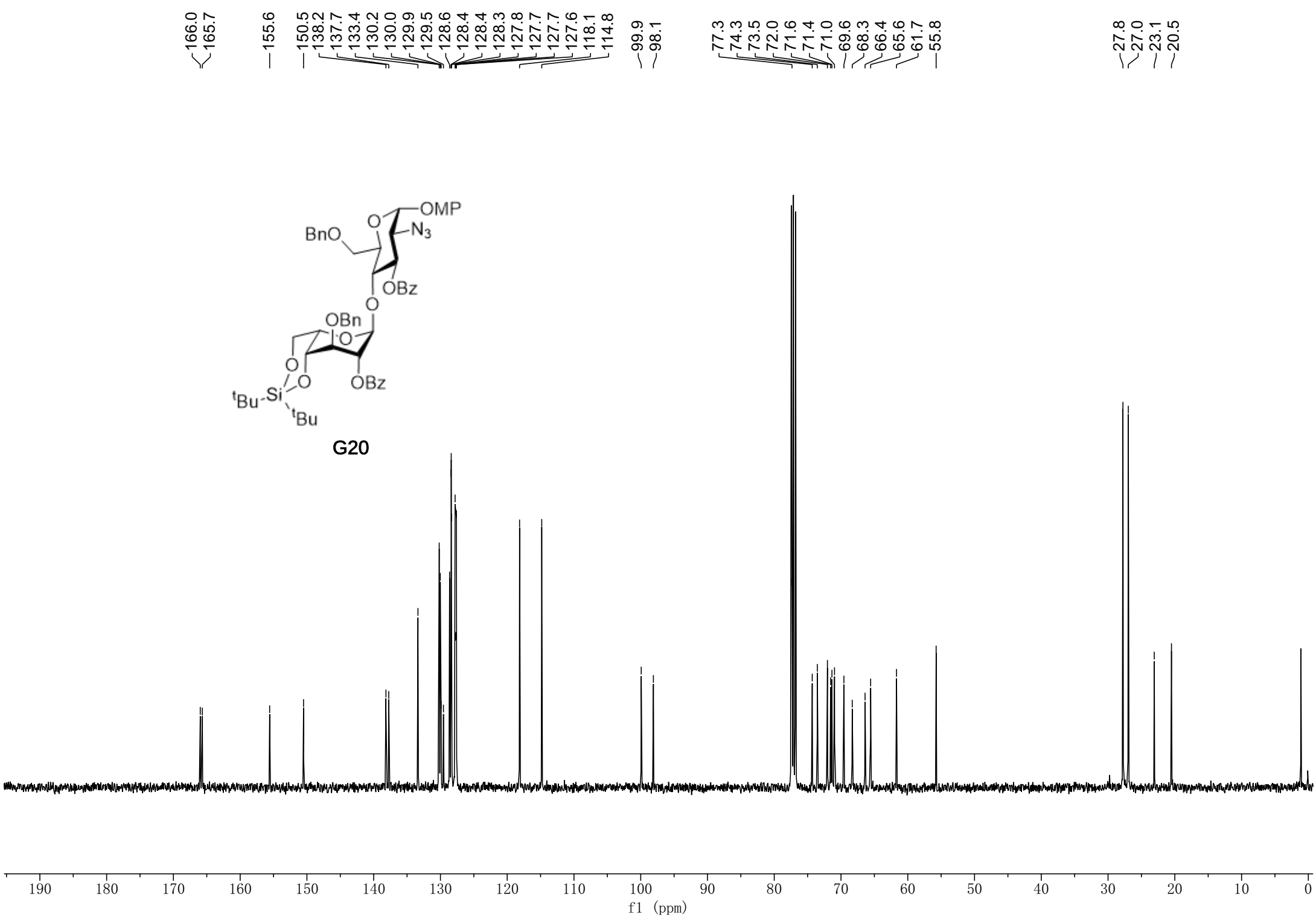

165.3
159.2
138.1
132.9
131.1
130.7
129.9
129.8
128.6
128.3
128.0
127.9
113.7
101.1
76.7
74.8
74.7
73.8
73.7
73.0
69.1
67.0
55.4
25.7
18.0
17.9
-1.4
-3.9
-4.9
PMBO
OBn
O
O
Si
TBSO
OBz
G18
90
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.036
8.032
8.015
8.011
7.539
7.519
7.418
7.398
7.380
7.354
7.342
7.337
7.333
7.330
7.324
7.318
7.315
7.308
7.304
7.291
7.287
7.279
7.275
7.257
7.253
7.180
7.164
7.160
6.872
6.851
5.726
5.704
5.477
5.457
5.452
5.432
5.054
4.992
4.964
4.460
4.443
4.432
4.422
4.371
4.307
4.299
4.291
4.201
4.197
4.193
4.180
4.176
4.172
3.912
3.908
3.904
3.888
3.884
3.880
3.786
3.767
3.760
3.595
3.580
3.567
3.483
3.474
1.004
0.988
0.778
0.101
-0.076
PMBO
OBn
O
TBSO
OBz
O
O
O
NHCbz
2.20
1.18
2.21
5.43
2.24
4.18
1.29
2.22
0.99
1.15
2.19
1.08
2.24
1.97
1.08
1.06
1.15
3.23
1.12
3.01
2.15
1.24
3.22
9.05
3.09
3.09
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

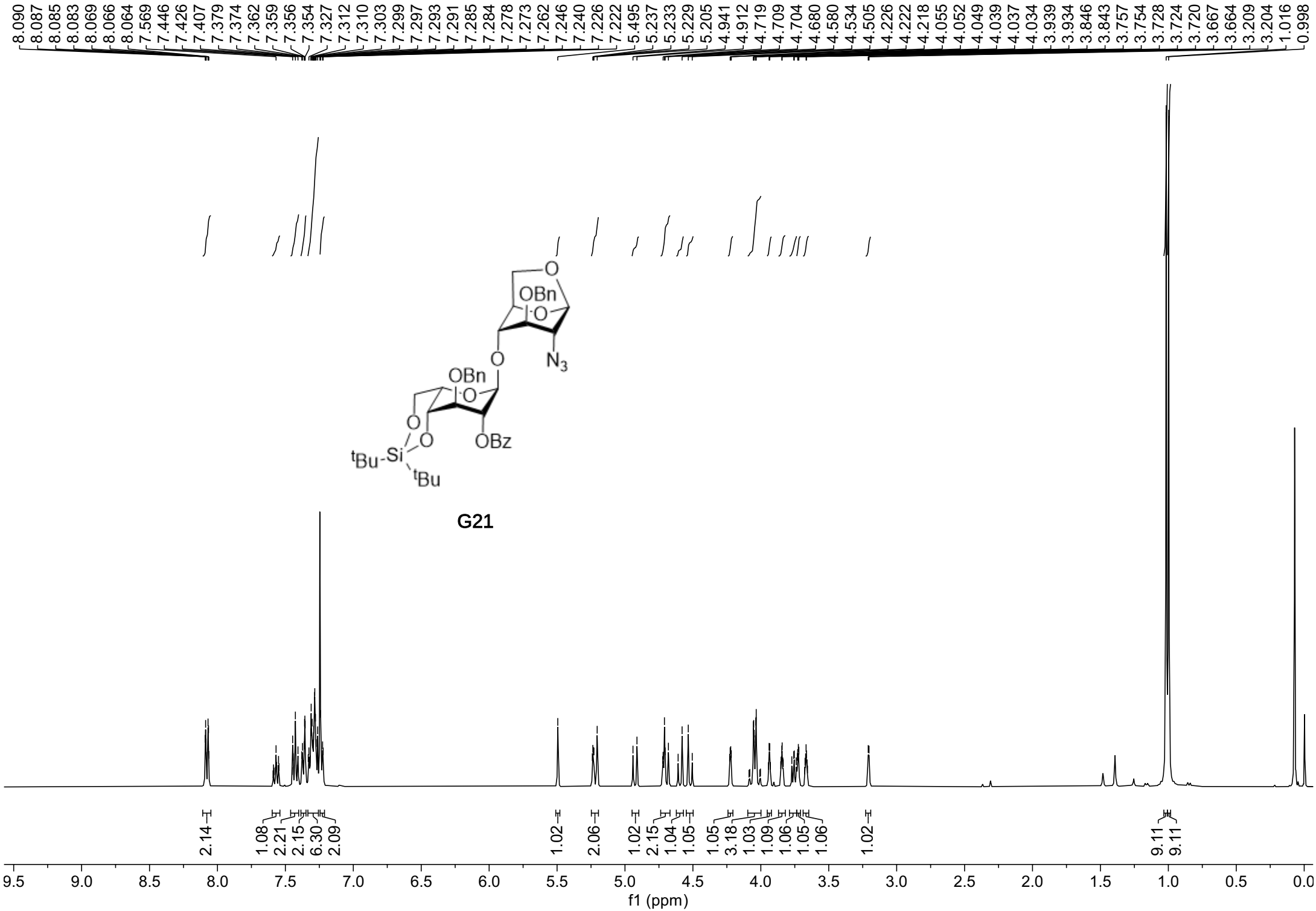
G19


171.0
165.3
159.2
156.9
138.0
136.5
133.0
130.9
130.3
129.7
129.1
128.6
128.5
128.5
128.3
128.0
128.0
128.0
127.9
125.4
113.7
100.8
76.6
75.5
75.0
74.3
73.6
73.6
72.9
68.4
66.9
58.7
55.4
52.5
25.6
21.6
17.9
17.8
-4.0
-4.9
PMBO
OBn
O
O
TBSO
OBz
O
O
NHCbz
G19
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

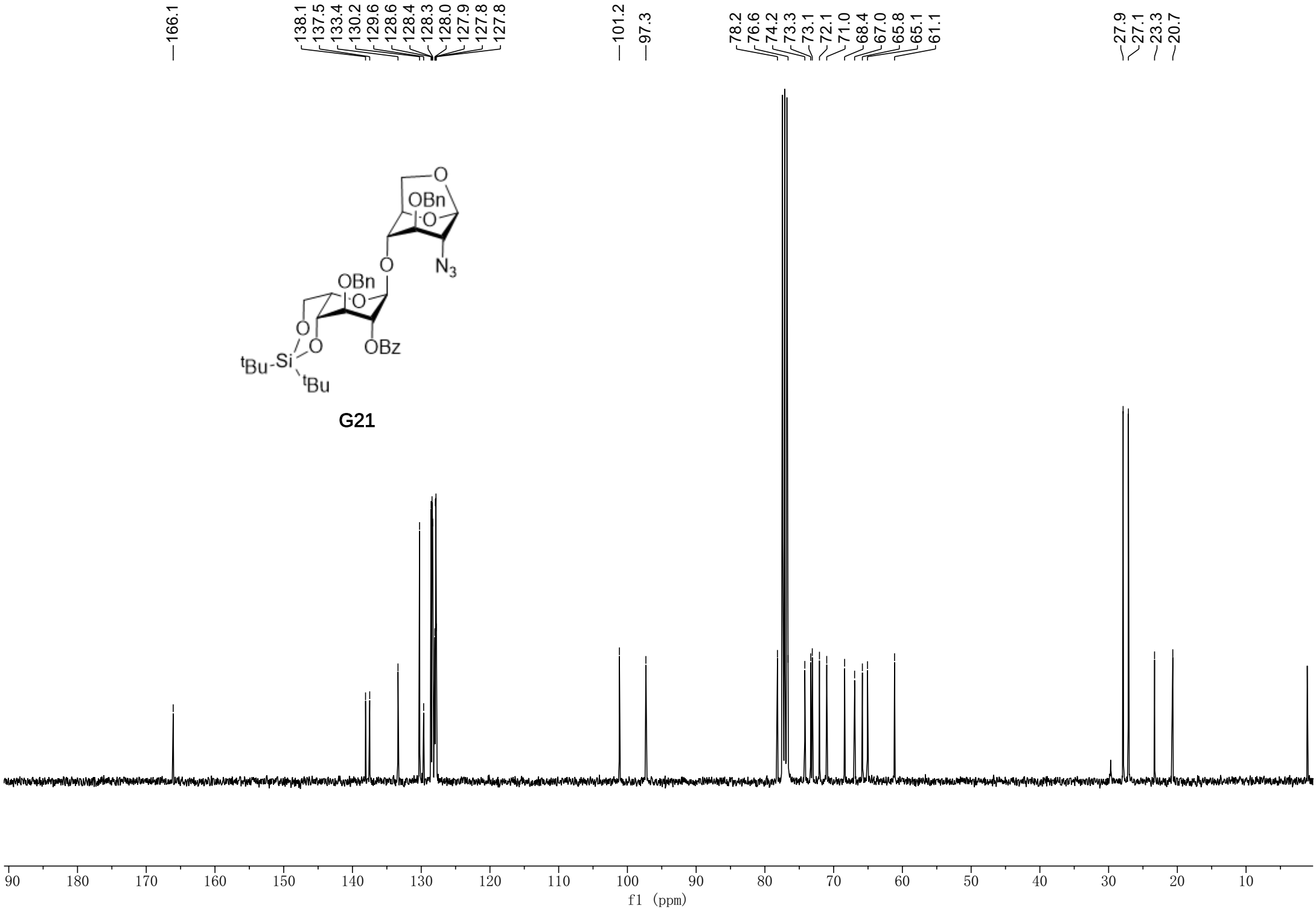

8.102
8.098
8.085
8.081
7.964
7.962
7.959
7.945
7.942
7.585
7.567
7.535
7.531
7.485
7.466
7.447
7.380
7.361
7.342
7.293
7.282
7.232
7.214
7.105
7.100
7.089
7.083
6.836
6.830
6.819
6.813
5.986
5.982
5.547
5.538
5.146
5.141
5.132
5.123
4.793
4.763
4.679
4.649
4.476
4.447
4.404
4.375
4.304
4.281
4.073
4.057
4.051
4.045
3.856
3.850
3.805
3.800
3.786
3.775
3.768
3.766
3.764
3.706
3.696
3.633
3.628
3.564
3.558
3.397
3.388
0.910
0.833
OMP
N3
BnO
OBz
OBn
OBz
tBu-Si-tBu
G20
2.06
2.06
2.03
2.13
2.16
4.07
6.05
2.12
2.05
1.00
1.00
2.02
1.00
1.00
1.01
1.03
1.04
2.02
1.03
5.09
1.03
1.00
1.01
1.00
9.16
9.10
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)


166.0
165.7
155.6
150.5
138.2
137.7
133.4
130.2
130.0
129.9
129.5
128.6
128.4
128.4
128.3
127.8
127.7
127.7
127.6
118.1
114.8
99.9
98.1
77.3
74.3
73.5
72.0
71.6
71.4
71.0
69.6
68.3
66.4
65.6
61.7
55.8
27.8
27.0
23.1
20.5
OMP
BnO
O
N3
OBz
O
OBn
O
O
O
OBz
tBu-Si
O
tBu
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

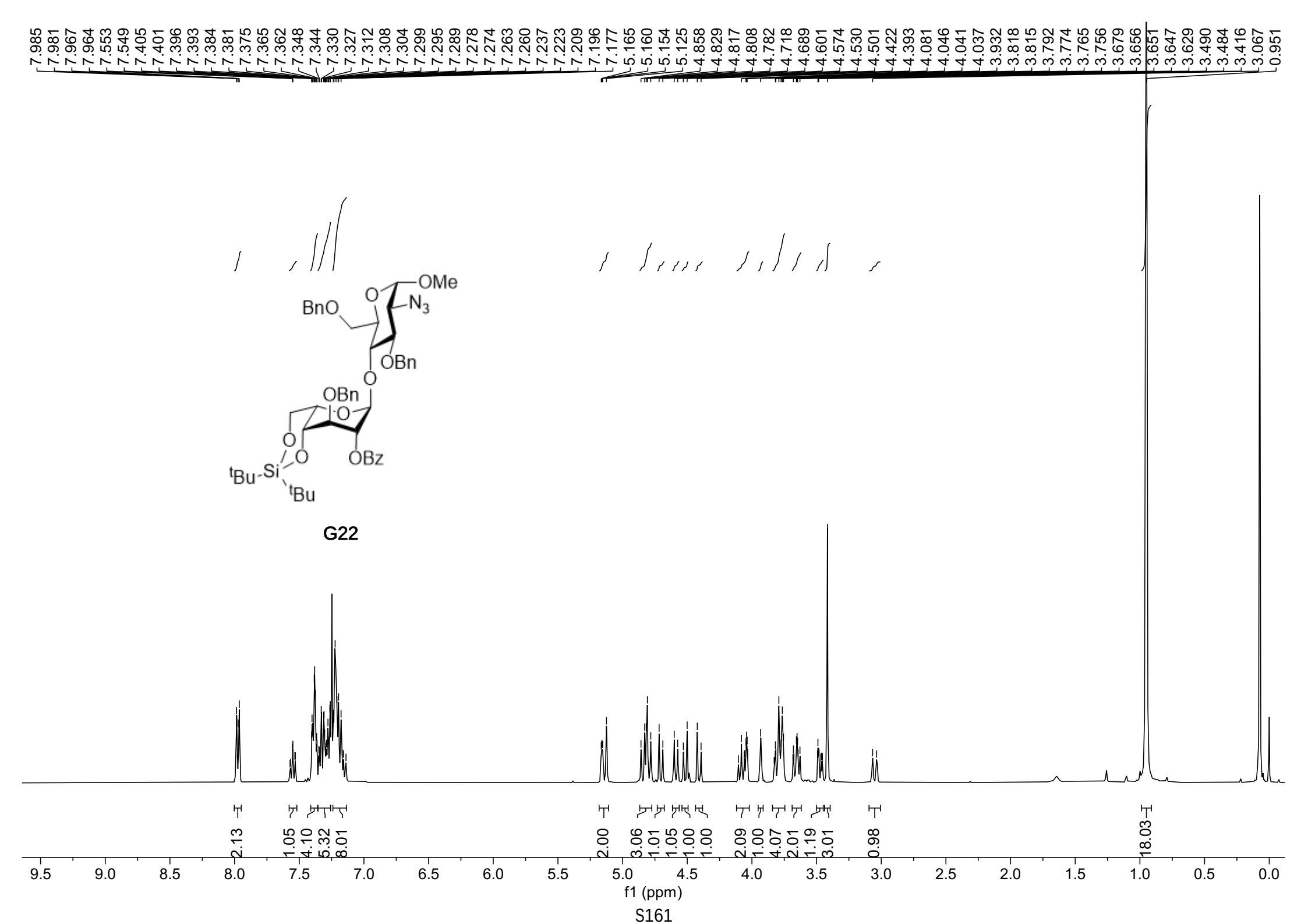
G20

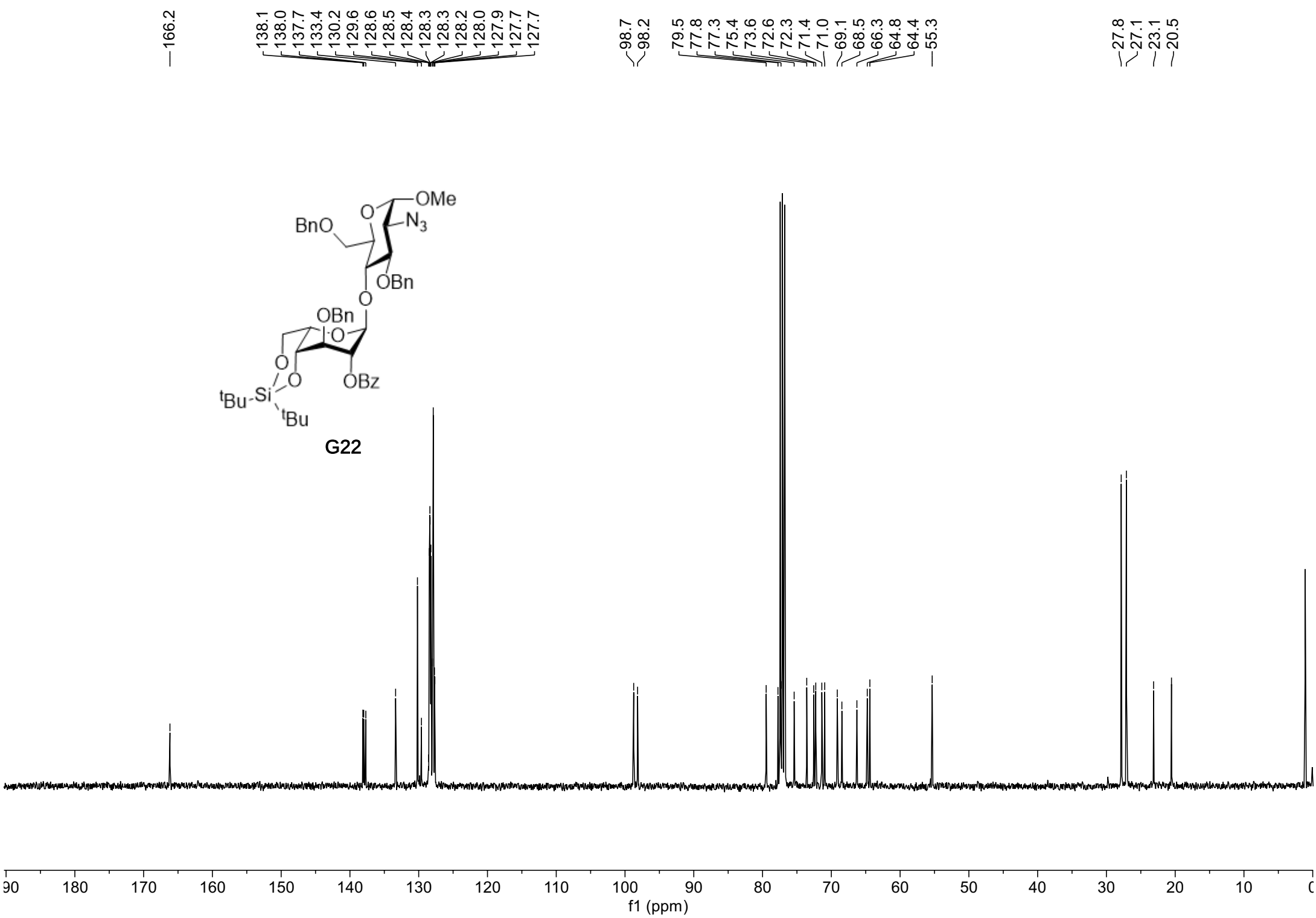

8.090 8.087 8.085 8.083 8.069 8.066 8.064 7.569 7.446 7.426 7.407 7.379 7.374 7.362 7.359 7.356 7.354 7.327 7.312 7.310 7.303 7.299 7.297 7.293 7.291 7.285 7.284 7.278 7.273 7.262 7.246 7.240 7.226 7.222 5.495 5.237 5.233 5.229 5.205 4.941 4.912 4.719 4.709 4.704 4.680 4.580 4.534 4.505 4.226 4.222 4.218 4.055 4.052 4.049 4.039 4.037 4.034 3.939 3.934 3.846 3.843 3.757 3.754 3.728 3.724 3.720 3.667 3.664 3.209 3.204 1.016 0.998
OBn
O
O
N3
OBn
O
O
O
OBz
tBu-Si
tBu
2.14 1.08 2.21 2.15 6.30 2.09 1.02 2.06 1.02 2.15 1.04 1.05 1.05 3.18 1.03 1.09 1.06 1.05 1.06 1.02 9.11 9.11
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

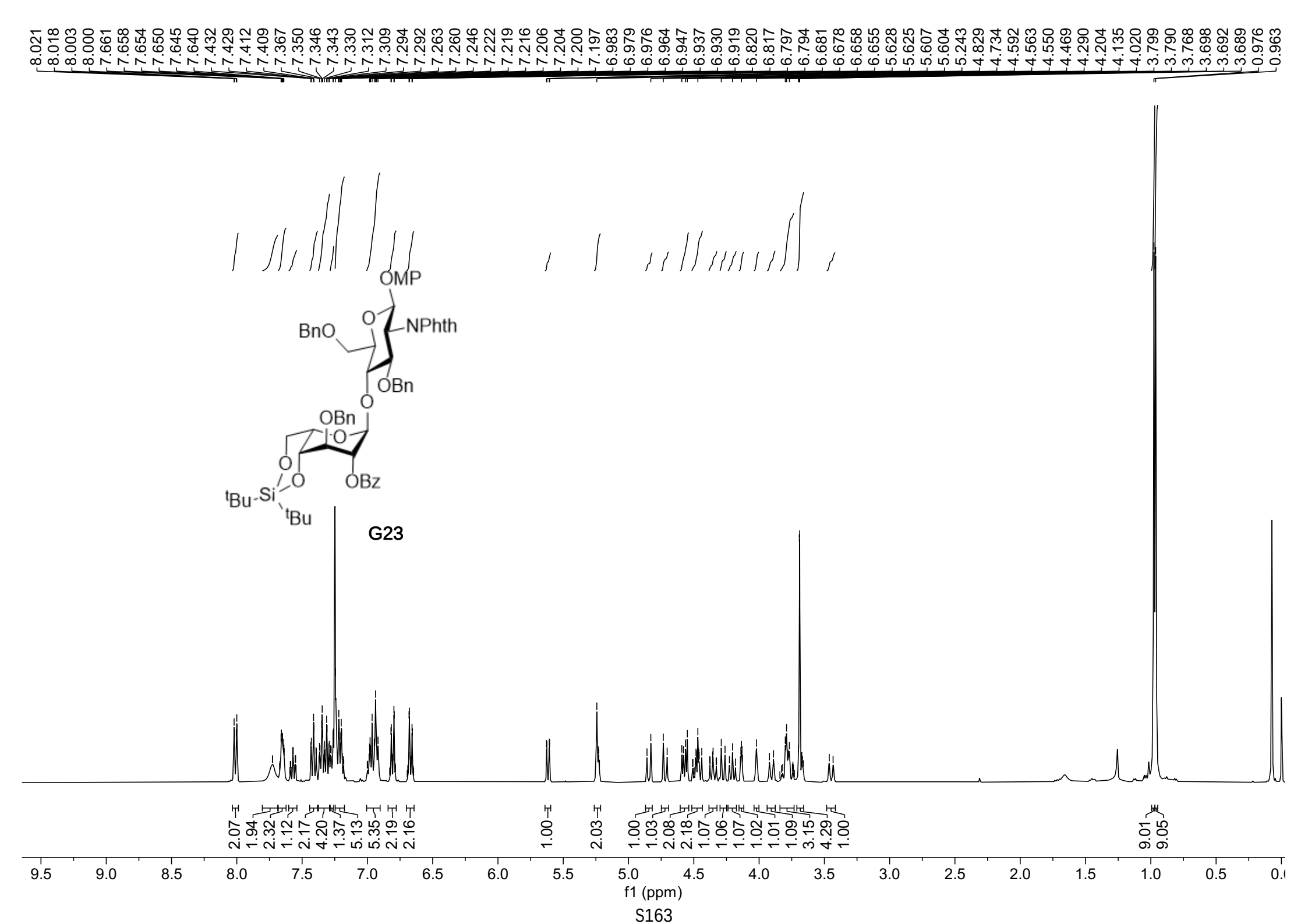
G21

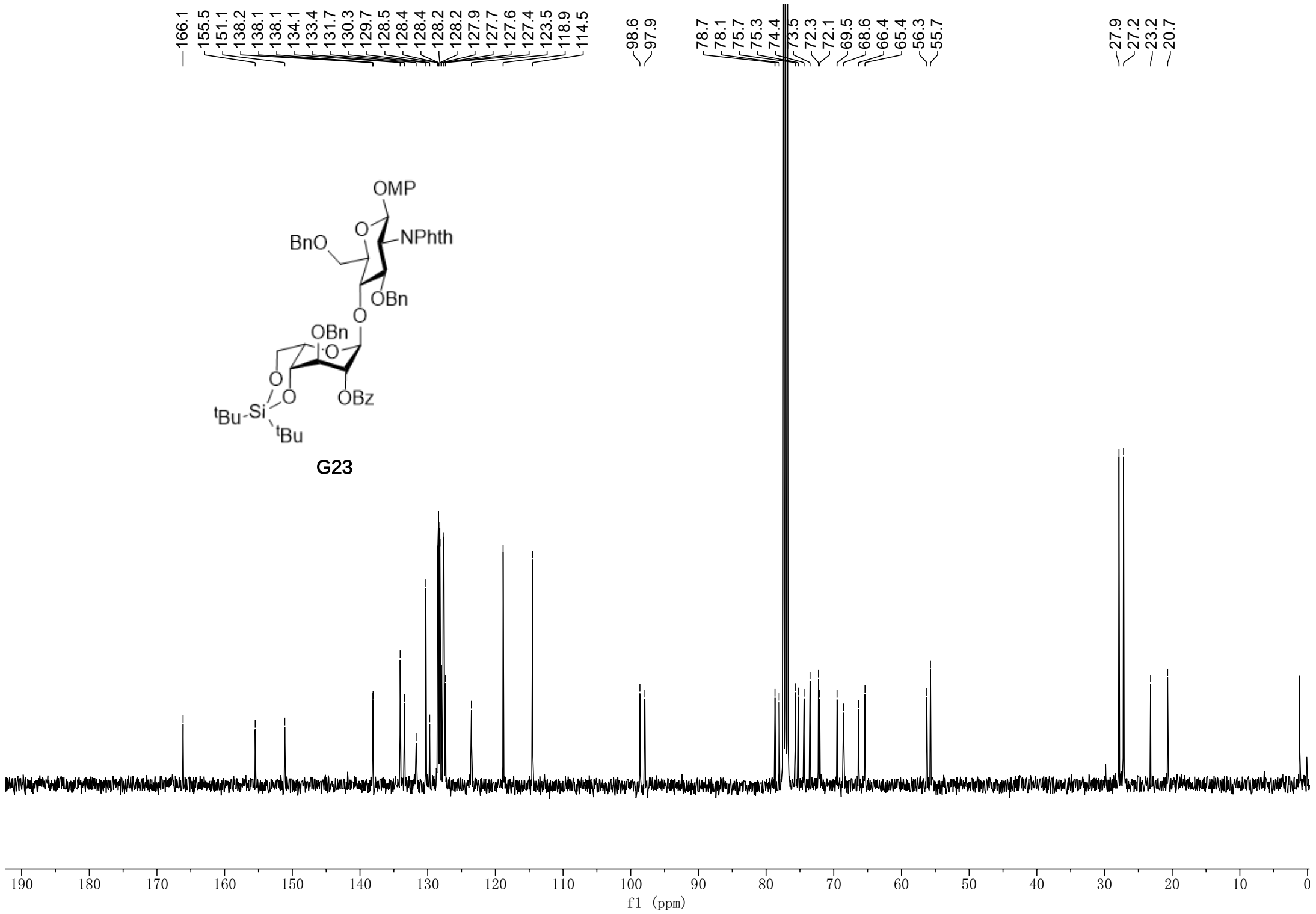

166.1
138.1
137.5
133.4
130.2
129.6
128.6
128.4
128.3
128.0
127.9
127.8
127.8
101.2
97.3
78.2
76.6
74.2
73.3
73.1
72.1
71.0
68.4
67.0
65.8
65.1
61.1
27.9
27.1
23.3
20.7
OBn
O
N3
OBn
OBz
tBu-Si
tBu
f1 (ppm)

G21

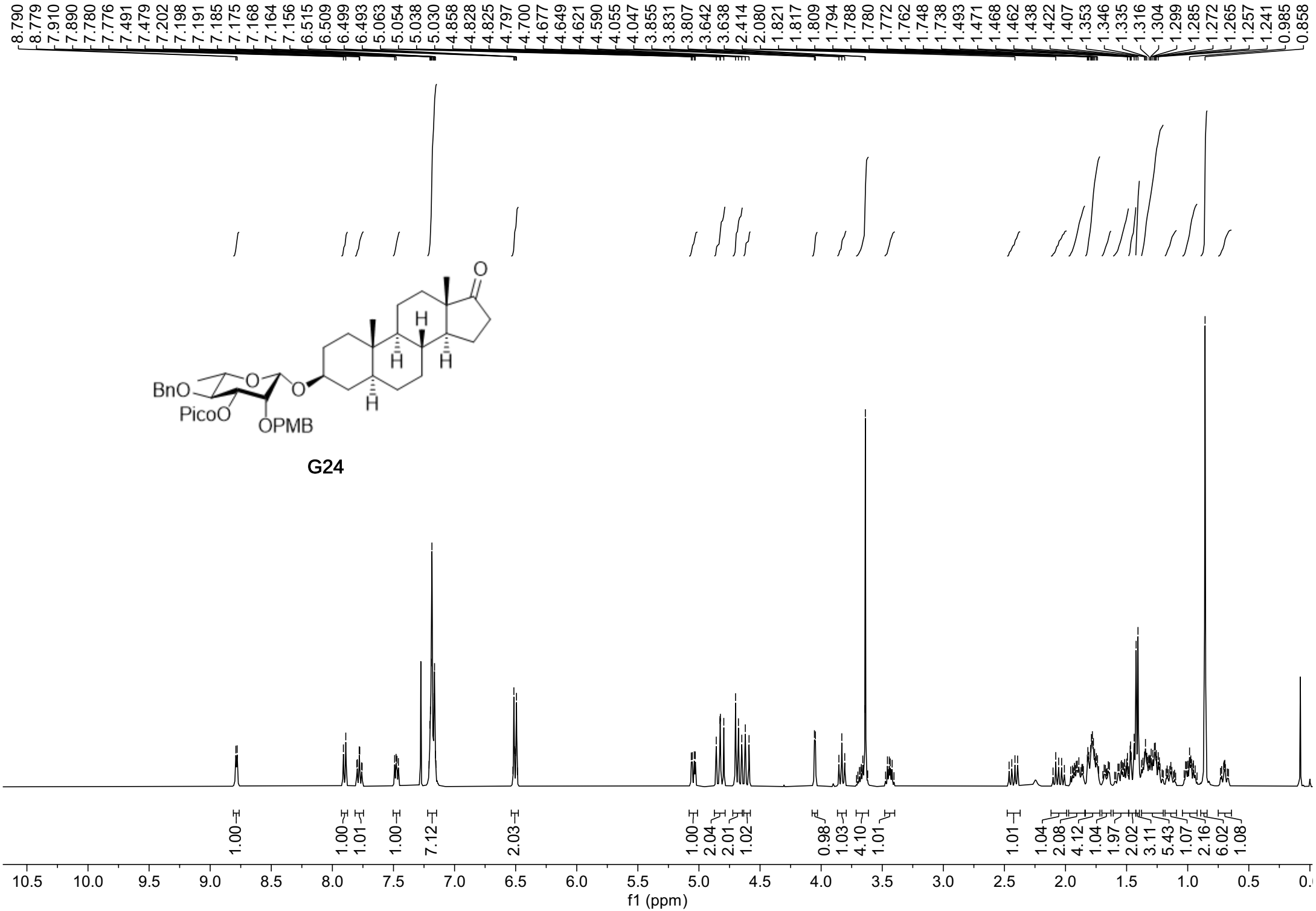

7.985 7.981 7.967 7.964 7.553 7.549 7.405 7.401 7.396 7.393 7.384 7.381 7.375 7.365 7.362 7.348 7.344 7.330 7.327 7.312 7.308 7.304 7.299 7.295 7.289 7.278 7.274 7.263 7.260 7.237 7.223 7.209 7.196 7.177 5.165 5.160 5.154 5.125 4.858 4.829 4.817 4.808 4.782 4.718 4.689 4.601 4.574 4.530 4.501 4.422 4.393 4.081 4.046 4.041 4.037 3.932 3.818 3.815 3.792 3.774 3.765 3.756 3.679 3.656 3.651 3.647 3.629 3.490 3.484 3.416 3.067 0.951
OMe
N3
BnO
OBn
OBn
OBz
tBu-Si
tBu
G22
2.13 1.05 4.10 5.32 8.01 2.00 3.06 1.01 1.05 1.00 1.00 2.09 1.00 4.07 2.01 1.19 3.01 0.98 18.03
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


166.2
138.1
138.0
137.7
133.4
130.2
129.6
128.6
128.5
128.4
128.3
128.3
128.2
128.0
127.9
127.7
127.7
98.7
98.2
79.5
77.8
77.3
75.4
73.6
72.6
72.3
71.4
71.0
69.1
68.5
66.3
64.8
64.4
55.3
27.8
27.1
23.1
20.5
OMe
BnO
O
N3
OBn
O
OBn
O
O
O
OBz
tBu-Si
tBu
G22
90
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

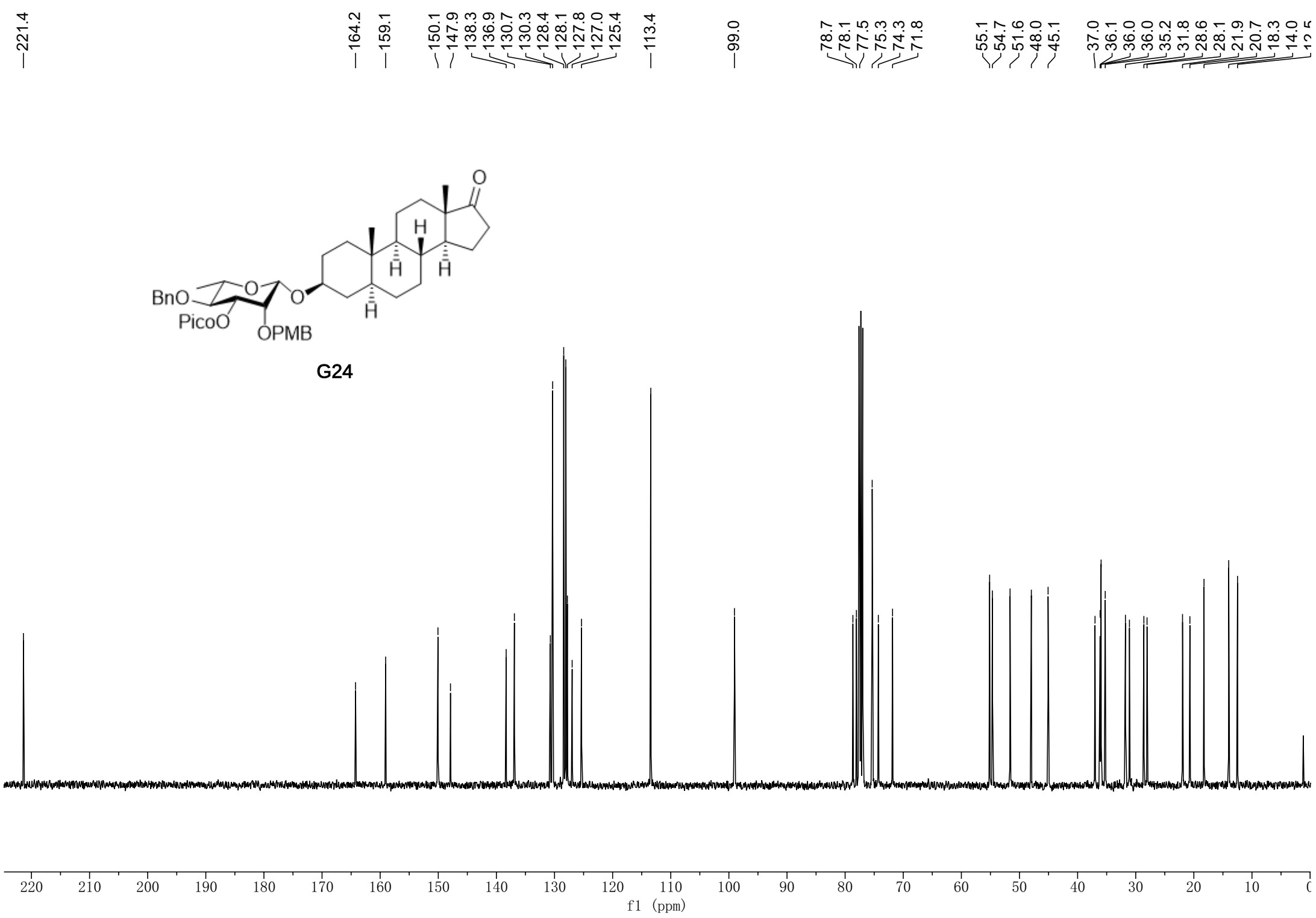

OMP
O
NPhth
BnO
OBn
O
OBn
O
O
O
OBz
tBu-Si
tBu
G23
f1 (ppm)

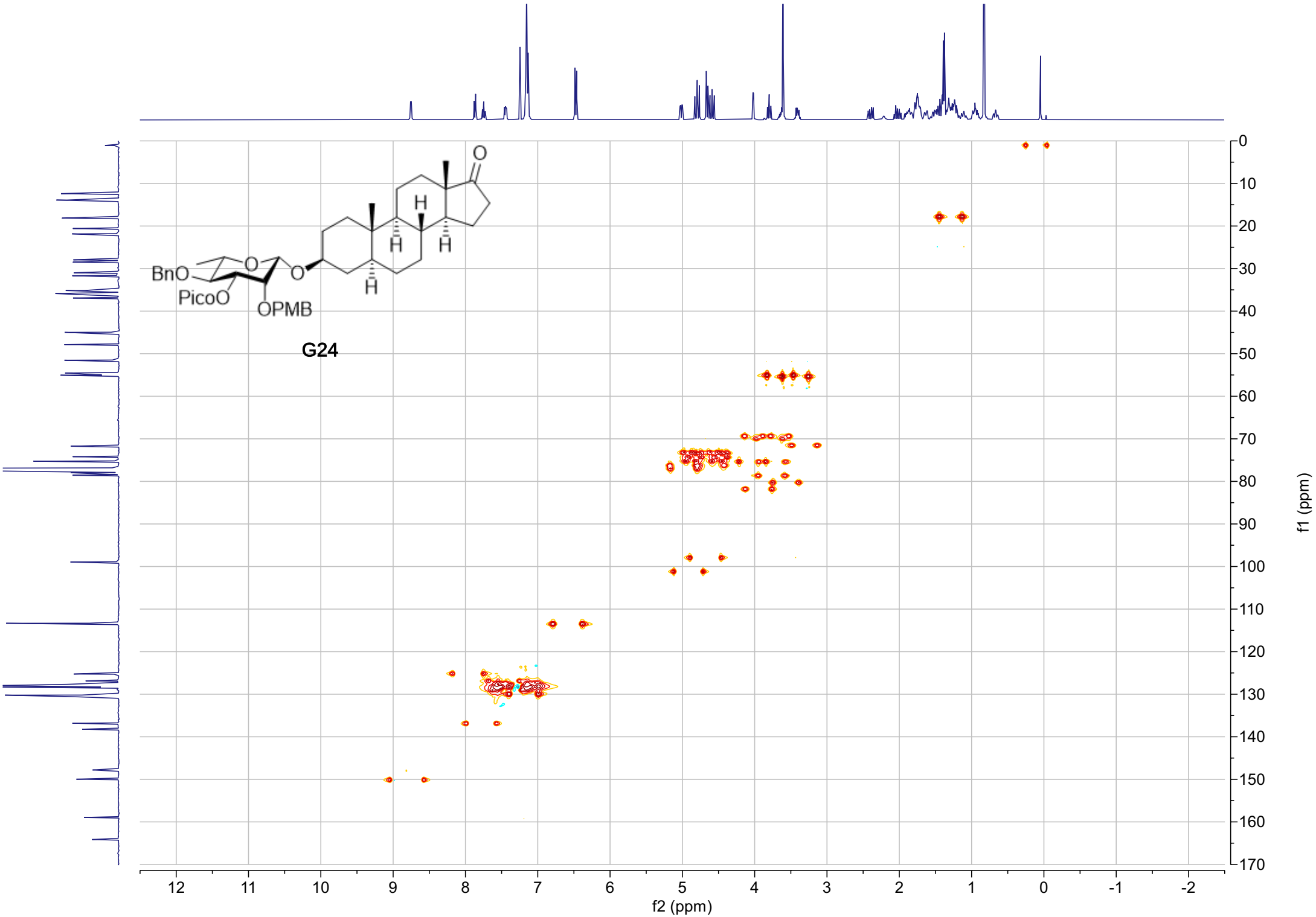

166.1
155.5
151.1
138.2
138.1
138.1
134.1
133.4
131.7
130.3
129.7
128.5
128.4
128.4
128.2
128.2
127.9
127.7
127.6
127.4
123.5
118.9
114.5
98.6
97.9
78.7
78.1
75.7
75.3
74.4
73.5
72.3
72.1
69.5
68.6
66.4
65.4
56.3
55.7
27.9
27.2
23.2
20.7
OMP
O
NPhth
BnO
OBn
O
OBn
O
O
O
OBz
tBu-Si
tBu
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

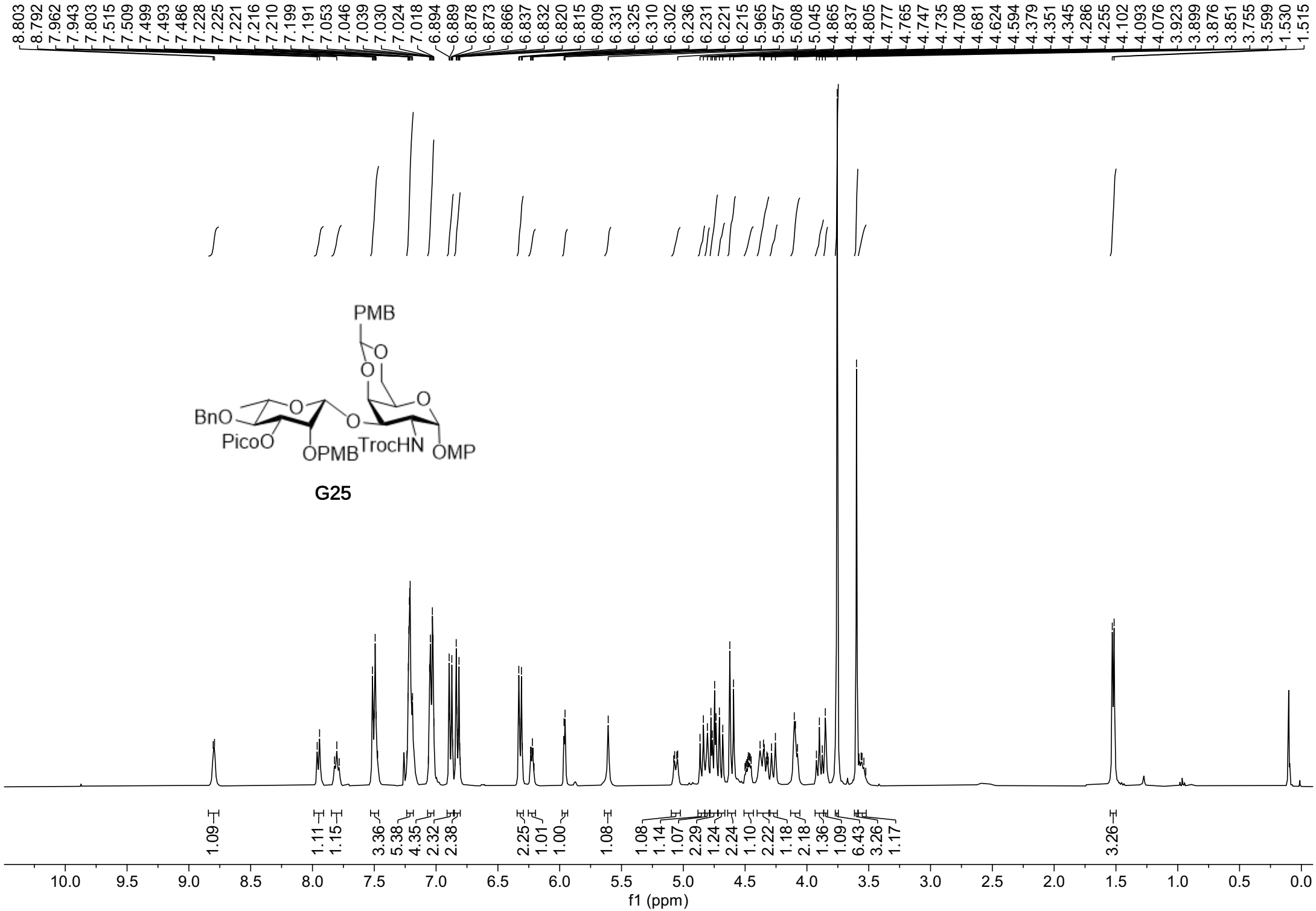
G23

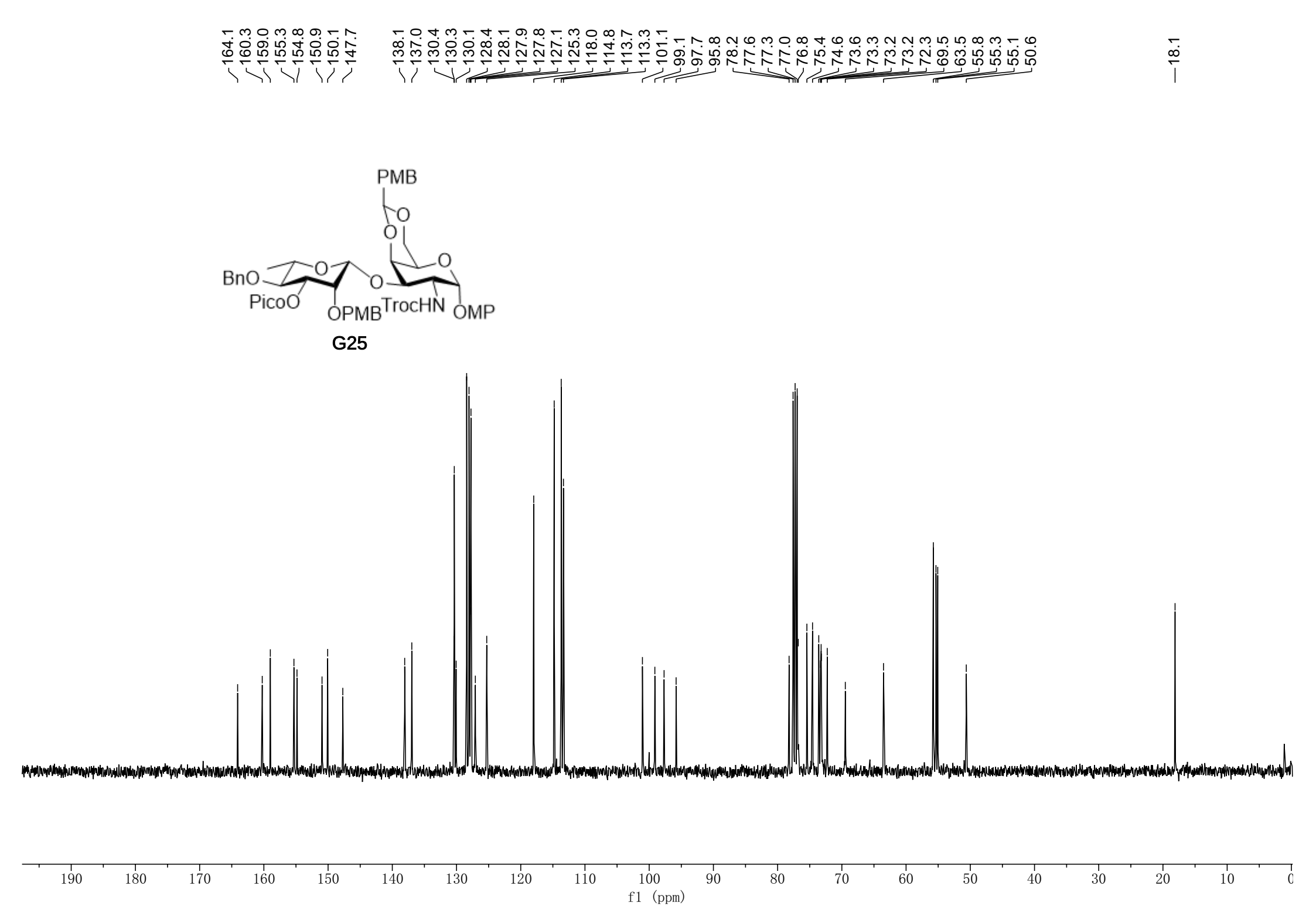

8.790
8.779
7.910
7.890
7.780
7.776
7.491
7.479
7.202
7.198
7.191
7.185
7.175
7.168
7.164
7.156
6.515
6.509
6.499
6.493
5.063
5.054
5.038
5.030
4.858
4.828
4.825
4.797
4.700
4.677
4.649
4.621
4.590
4.055
4.047
3.855
3.831
3.807
3.642
3.638
2.414
2.080
1.821
1.817
1.809
1.794
1.788
1.780
1.772
1.762
1.748
1.738
1.493
1.471
1.468
1.462
1.438
1.422
1.407
1.353
1.346
1.335
1.316
1.304
1.299
1.285
1.272
1.265
1.257
1.241
0.985
0.858
BnO
PicoO
OPMB
O
H
H
H
H
1.00
1.00
1.01
1.00
7.12
2.03
1.00
2.04
2.01
1.02
0.98
1.03
4.10
1.01
1.01
1.04
2.08
4.12
1.04
1.97
2.02
3.11
5.43
1.07
2.16
6.02
1.08
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

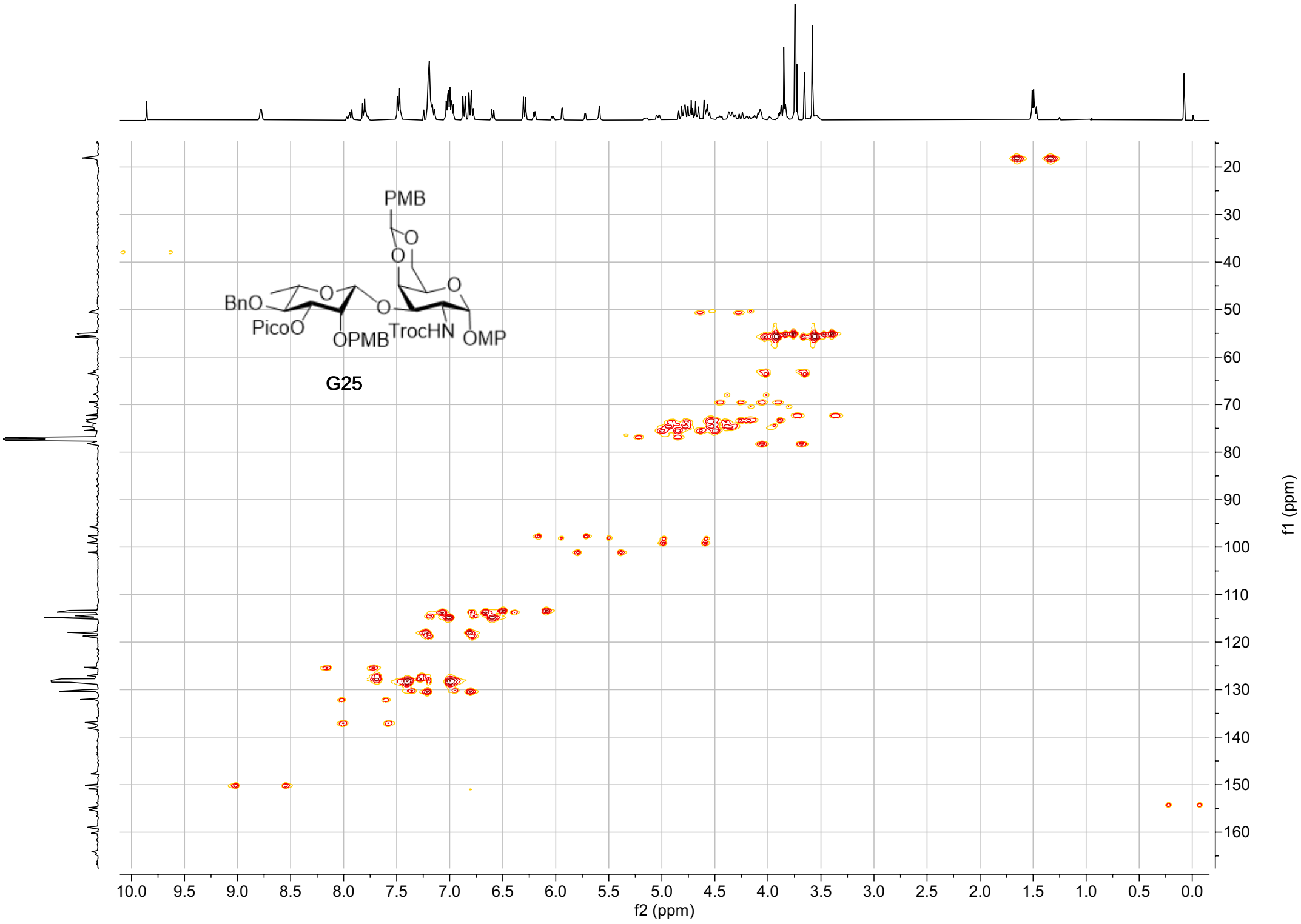
G24

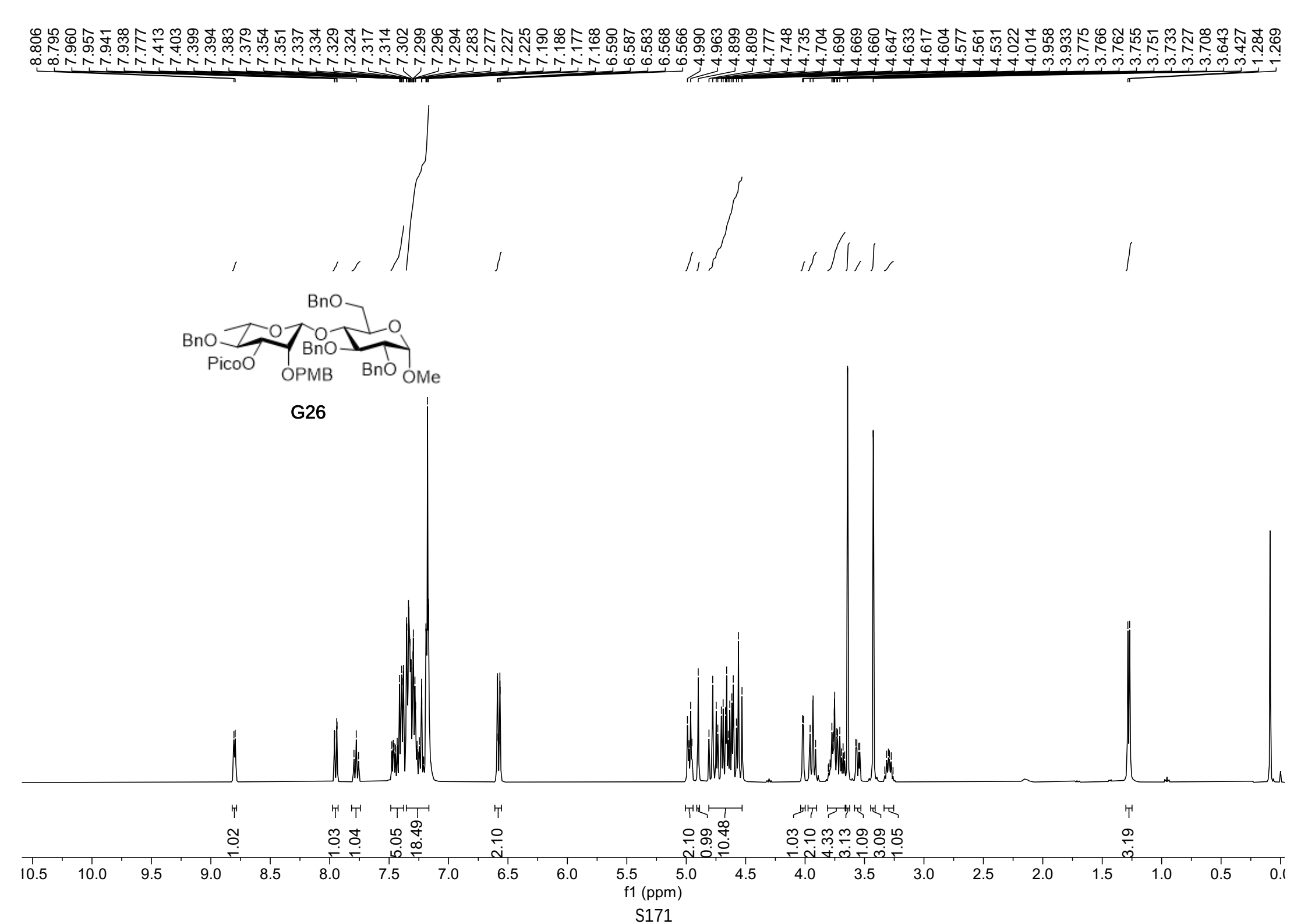

221.4
164.2
159.1
150.1
147.9
138.3
136.9
130.7
130.3
128.4
128.1
127.8
127.0
125.4
113.4
99.0
78.7
78.1
77.5
75.3
74.3
71.8
55.1
54.7
51.6
48.0
45.1
37.0
36.1
36.0
36.0
35.2
31.8
28.6
28.1
21.9
20.7
18.3
14.0
BnO
PicoO
OPMB
O
H
H
H
H
G24
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

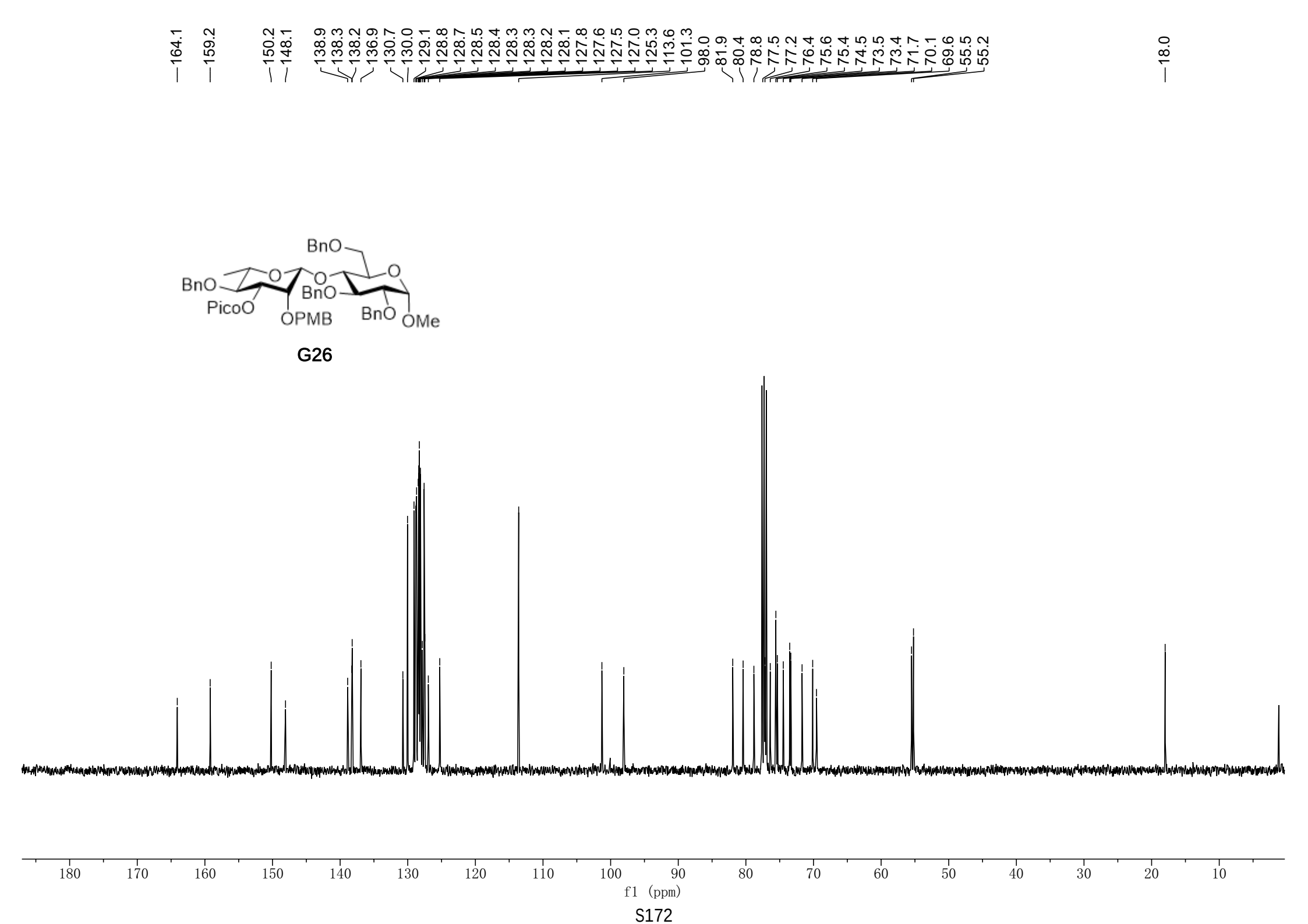

BnO
PicoO
OPMB
O
O
H
H
H
G24
f2 (ppm)
f1 (ppm)
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170

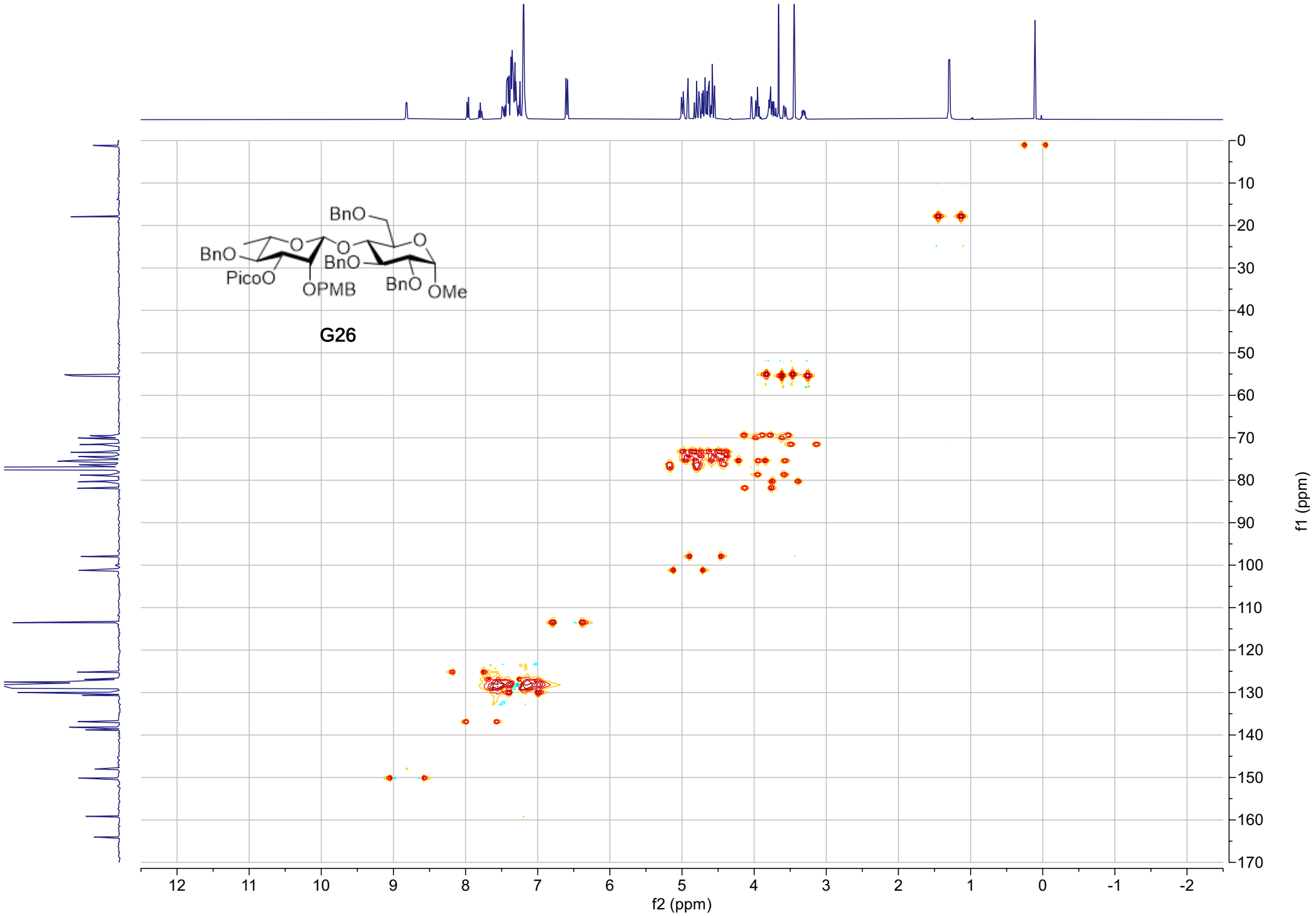

8.803 8.792 7.962 7.943 7.803 7.515 7.509 7.499 7.493 7.486 7.228 7.225 7.221 7.216 7.210 7.199 7.191 7.053 7.046 7.039 7.030 7.024 7.018 6.894 6.889 6.878 6.873 6.866 6.837 6.832 6.820 6.815 6.809 6.331 6.325 6.310 6.302 6.236 6.231 6.221 6.215 5.965 5.957 5.608 5.045 4.865 4.837 4.805 4.777 4.765 4.747 4.735 4.708 4.681 4.624 4.594 4.379 4.351 4.345 4.286 4.255 4.102 4.093 4.076 3.923 3.899 3.876 3.851 3.755 3.599 1.530 1.515
PMB
BnO
PicoO
OPMB
TrocHN
OMP
G25
1.09 1.11 1.15 3.36 5.38 4.35 2.32 2.38 2.25 1.01 1.00 1.08 1.08 1.14 1.07 2.29 1.24 2.24 1.10 2.22 1.18 2.18 1.36 1.09 6.43 3.26 1.17 3.26
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

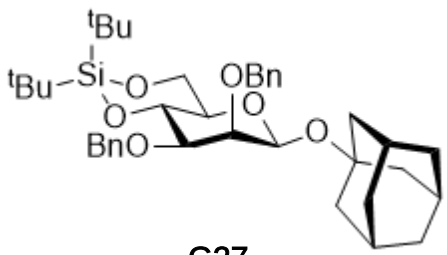

164.1
160.3
159.0
155.3
154.8
150.9
150.1
147.7
138.1
137.0
130.4
130.3
130.1
128.4
128.1
127.9
127.8
127.1
125.3
118.0
114.8
113.7
113.3
101.1
99.1
97.7
95.8
78.2
77.6
77.3
77.0
76.8
75.4
74.6
73.6
73.3
73.2
73.2
72.3
69.5
63.5
55.8
55.3
55.1
50.6
18.1
PMB
O
O
O
BnO
O
O
PicoO
OPMB
TrocHN
OMP
G25
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


PMB
O
O
O
BnO
PicoO
OPMB
TrocHN
OMP
G25
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
f1 (ppm)

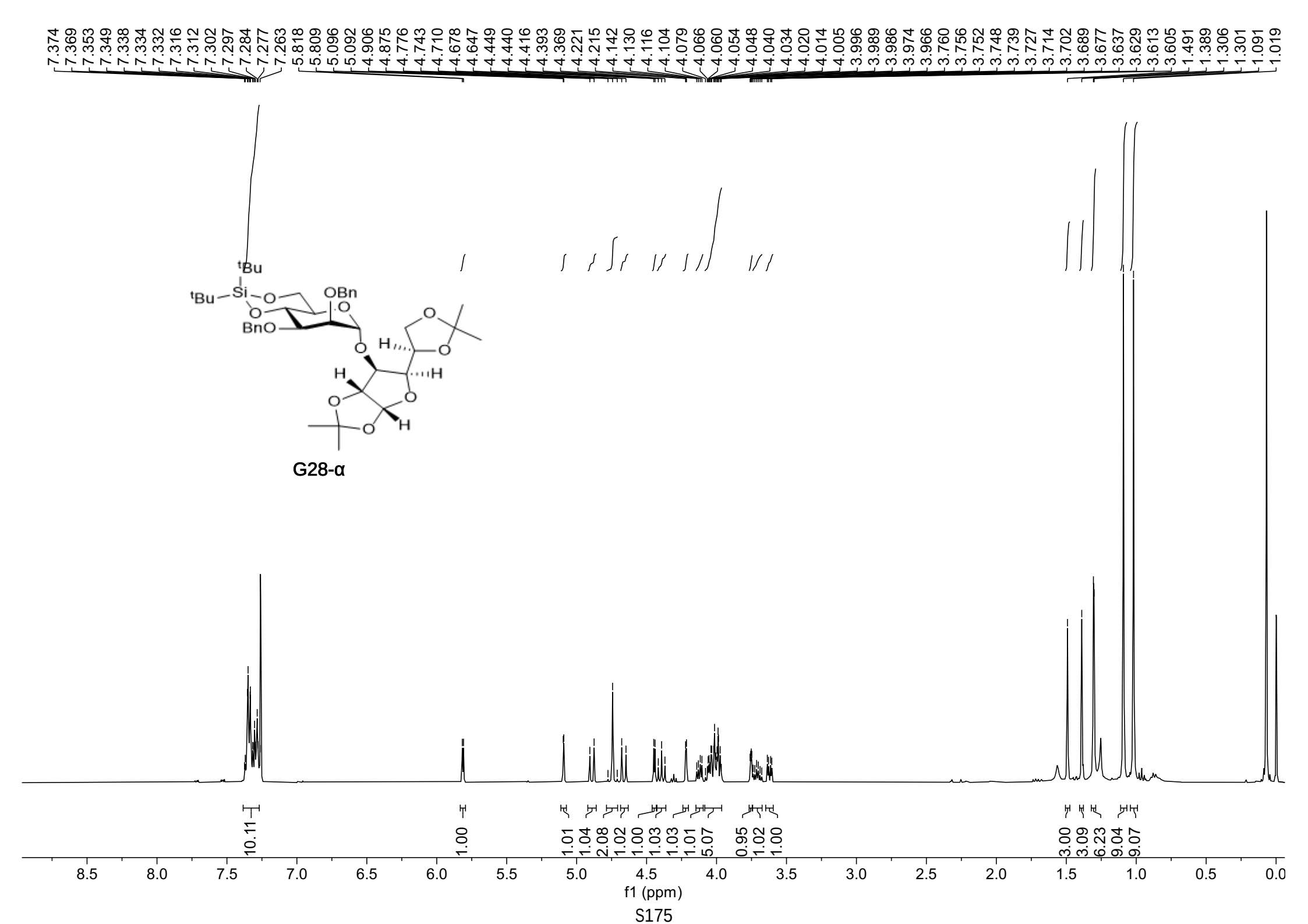

8.806
8.795
7.960
7.957
7.941
7.938
7.777
7.413
7.403
7.399
7.394
7.383
7.379
7.354
7.351
7.337
7.334
7.329
7.324
7.317
7.314
7.302
7.299
7.296
7.294
7.283
7.277
7.227
7.225
7.190
7.186
7.177
7.168
6.590
6.587
6.583
6.568
6.566
4.990
4.963
4.899
4.809
4.777
4.748
4.735
4.704
4.690
4.669
4.660
4.647
4.633
4.617
4.604
4.577
4.561
4.531
4.022
4.014
3.958
3.933
3.775
3.766
3.762
3.755
3.751
3.733
3.727
3.708
3.643
3.427
1.284
1.269
BnO
BnO
PicoO
OPMB
BnO
BnO
OMe
G26
1.02
1.03
1.04
5.05
18.49
2.10
2.10
0.99
10.48
1.03
2.10
4.33
3.13
1.09
3.09
1.05
3.19
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)


164.1
159.2
150.2
148.1
138.9
138.3
138.2
136.9
130.7
130.0
129.1
128.8
128.7
128.5
128.4
128.3
128.3
128.2
128.1
127.8
127.6
127.5
127.0
125.3
113.6
101.3
98.0
81.9
80.4
78.8
77.5
77.2
76.4
75.6
75.4
74.5
73.5
73.4
71.7
70.1
69.6
55.5
55.2
18.0
BnO
BnO
PicoO
OPMB
BnO
BnO
OMe
G26
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

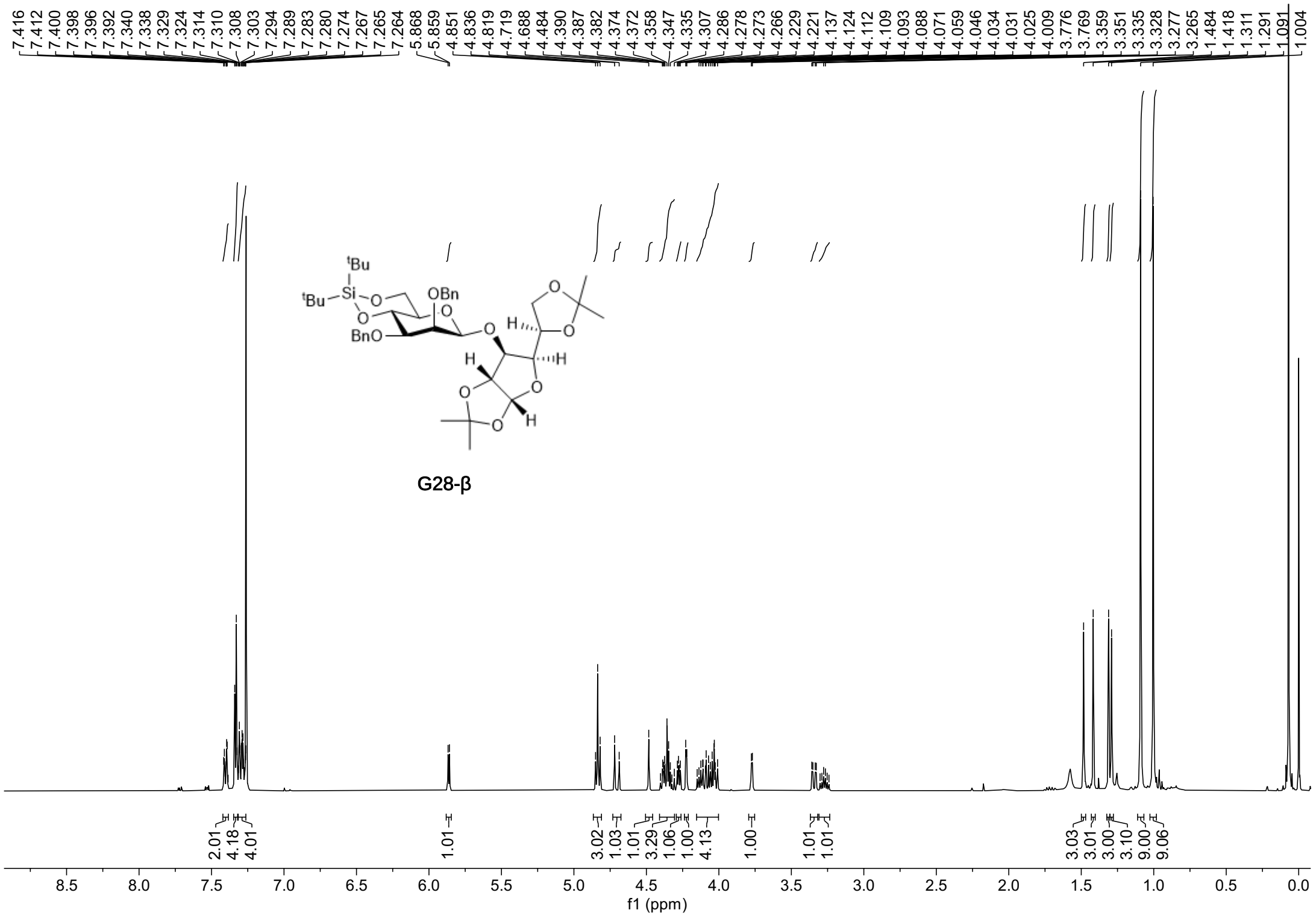

BnO
BnO
PicoO
O
O
O
BnO
OPMB
BnO
OMe
G26
f2 (ppm)
f1 (ppm)



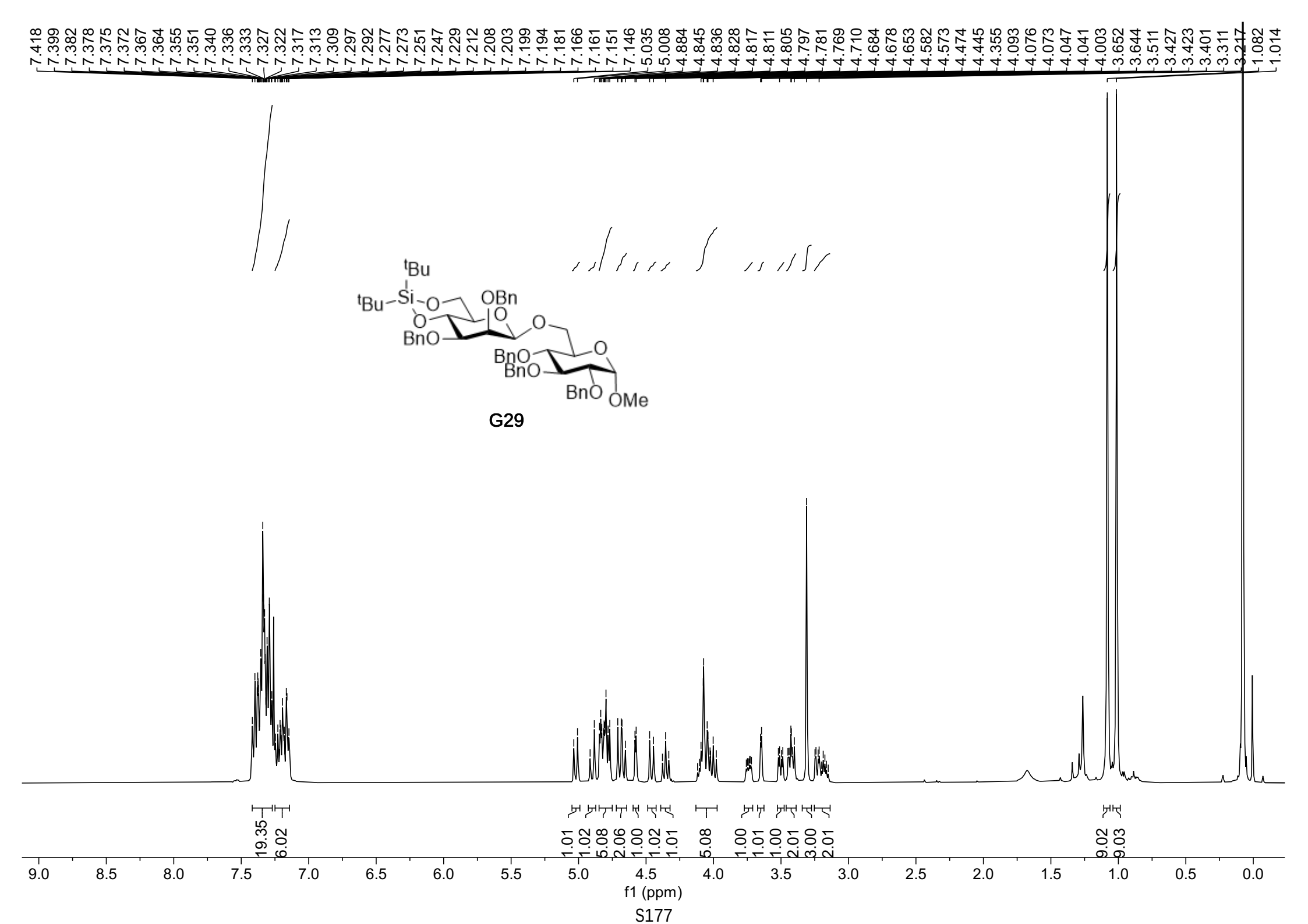
G27


7.374 7.369 7.353 7.349 7.338 7.334 7.332 7.316 7.312 7.302 7.297 7.284 7.277 7.263
5.818 5.809 5.096 5.092 4.906 4.875 4.776 4.743 4.710 4.678 4.647 4.449 4.440 4.416 4.393 4.369 4.221 4.215 4.142 4.130 4.116 4.104 4.079 4.066 4.060 4.054 4.048 4.040 4.034 4.020 4.014 4.005 3.996 3.989 3.986 3.974 3.966 3.760 3.756 3.752 3.748 3.739 3.727 3.714 3.702 3.689 3.677 3.637 3.629 3.613 3.605 1.491 1.389 1.306 1.301 1.091 1.019
tBu
tBu
Si
O
OBn
O
O
BnO
O
H
O
O
H
H
O
O
H
O
10.11
1.00
1.01
1.04
2.08
1.02
1.00
1.03
1.03
1.01
5.07
0.95
1.02
1.00
3.00
3.09
6.23
9.04
9.07
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

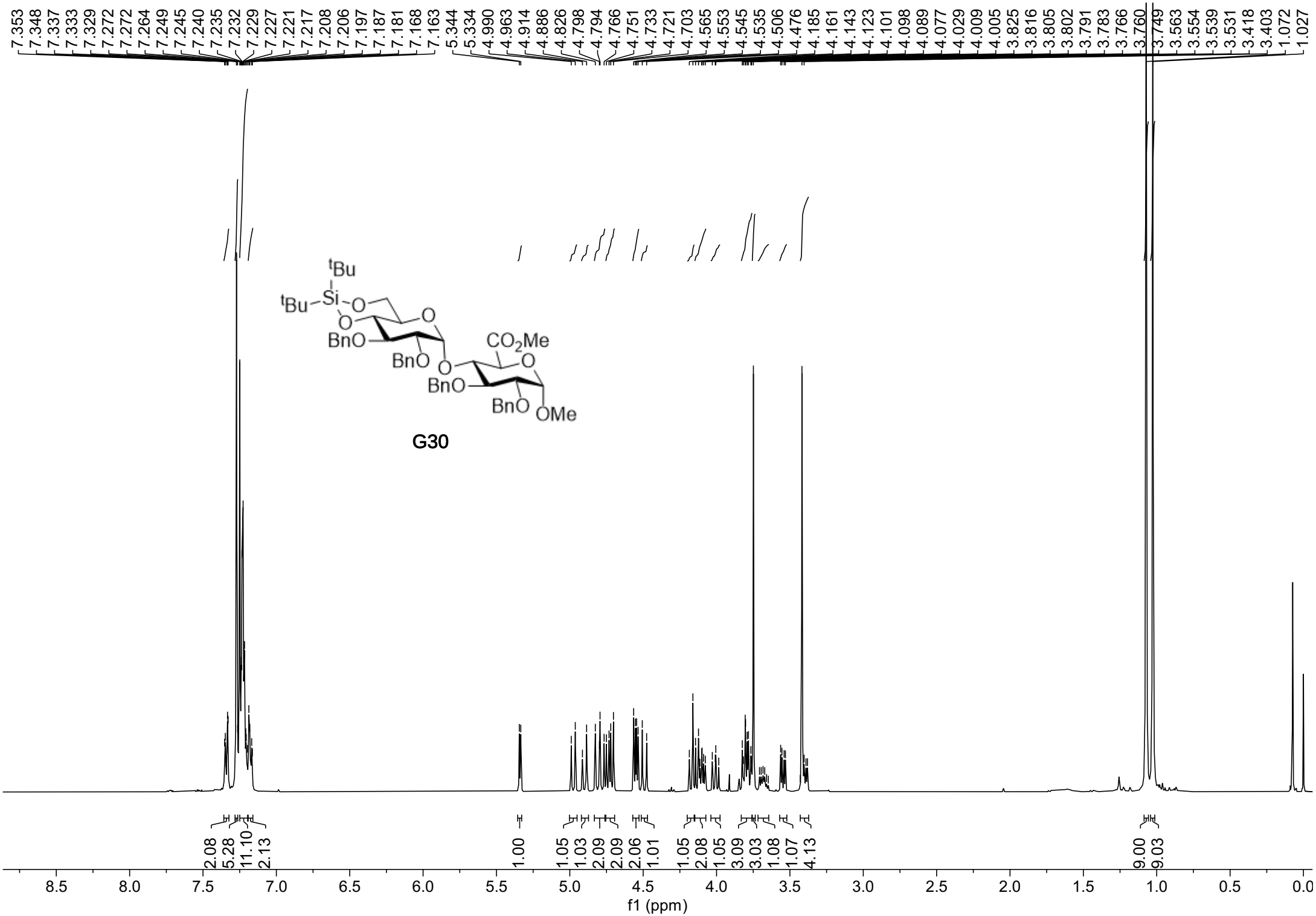
G28-α


7.416 7.412 7.400 7.398 7.396 7.392 7.340 7.338 7.329 7.324 7.314 7.310 7.308 7.303 7.294 7.289 7.283 7.280 7.274 7.267 7.265 7.264
5.868 5.859 4.851 4.836 4.819 4.719 4.688 4.484 4.390 4.387 4.382 4.374 4.372 4.358 4.347 4.335 4.307 4.286 4.278 4.273 4.266 4.229 4.221 4.137 4.124 4.112 4.109 4.093 4.088 4.071 4.059 4.046 4.034 4.031 4.025 4.009 3.776 3.769 3.359 3.351 3.335 3.328 3.277 3.265 1.484 1.418 1.311 1.291 1.091 1.004
tBu
tBu
Si
O
OBn
BnO
H
H
H
2.01 4.18 4.01 1.01 3.02 1.03 1.01 3.29 1.06 1.00 4.13 1.00 1.01 1.01 3.03 3.01 3.00 3.10 9.00 9.06
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

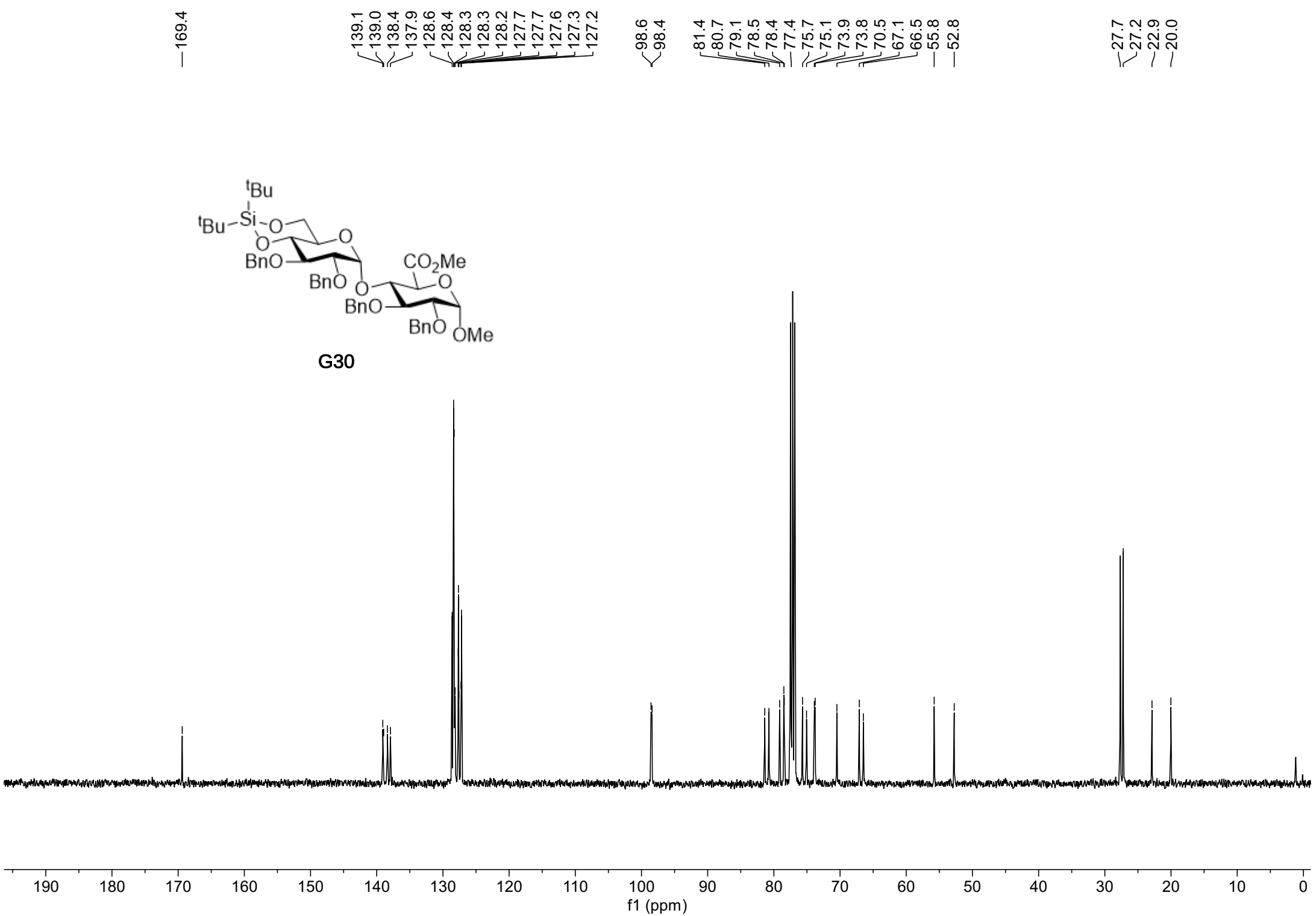
G28-β


7.418 7.399 7.382 7.378 7.375 7.372 7.367 7.364 7.355 7.351 7.340 7.336 7.333 7.327 7.322 7.317 7.313 7.309 7.297 7.292 7.277 7.273 7.251 7.247 7.229 7.212 7.208 7.203 7.199 7.194 7.181 7.166 7.161 7.151 7.146 5.035 5.008 4.884 4.845 4.836 4.828 4.817 4.811 4.805 4.797 4.781 4.769 4.710 4.684 4.678 4.653 4.582 4.573 4.474 4.445 4.355 4.093 4.076 4.073 4.047 4.041 4.003 3.652 3.644 3.511 3.427 3.423 3.401 3.311 3.217 1.082 1.014
tBu
tBu
Si
O
OBn
O
O
O
BnO
BnO
BnO
O
BnO
OMe
19.35
6.02
1.01
1.02
5.08
2.06
1.00
1.02
1.01
5.08
1.00
1.01
1.00
2.01
3.00
2.01
9.02
9.03
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

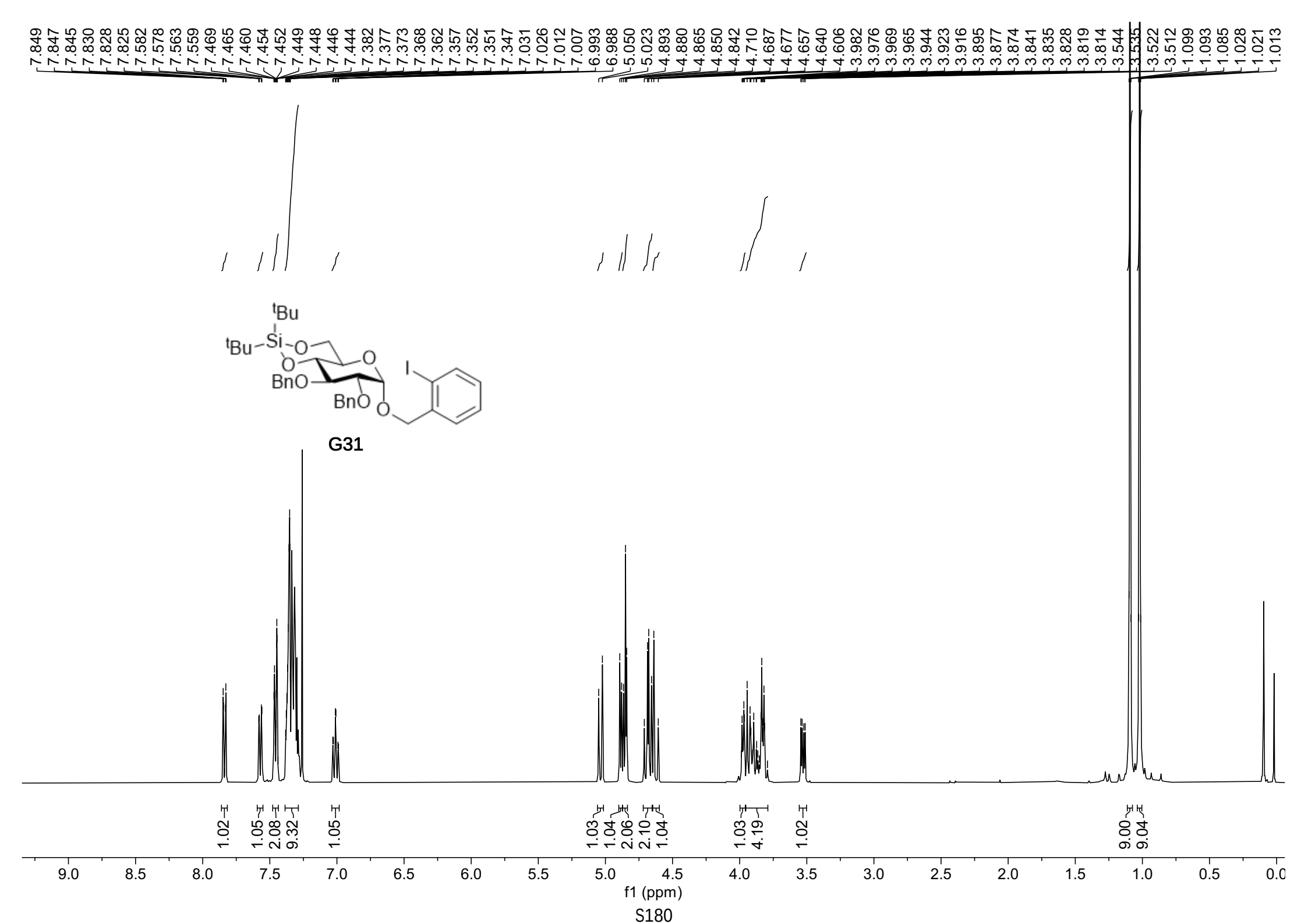
G29

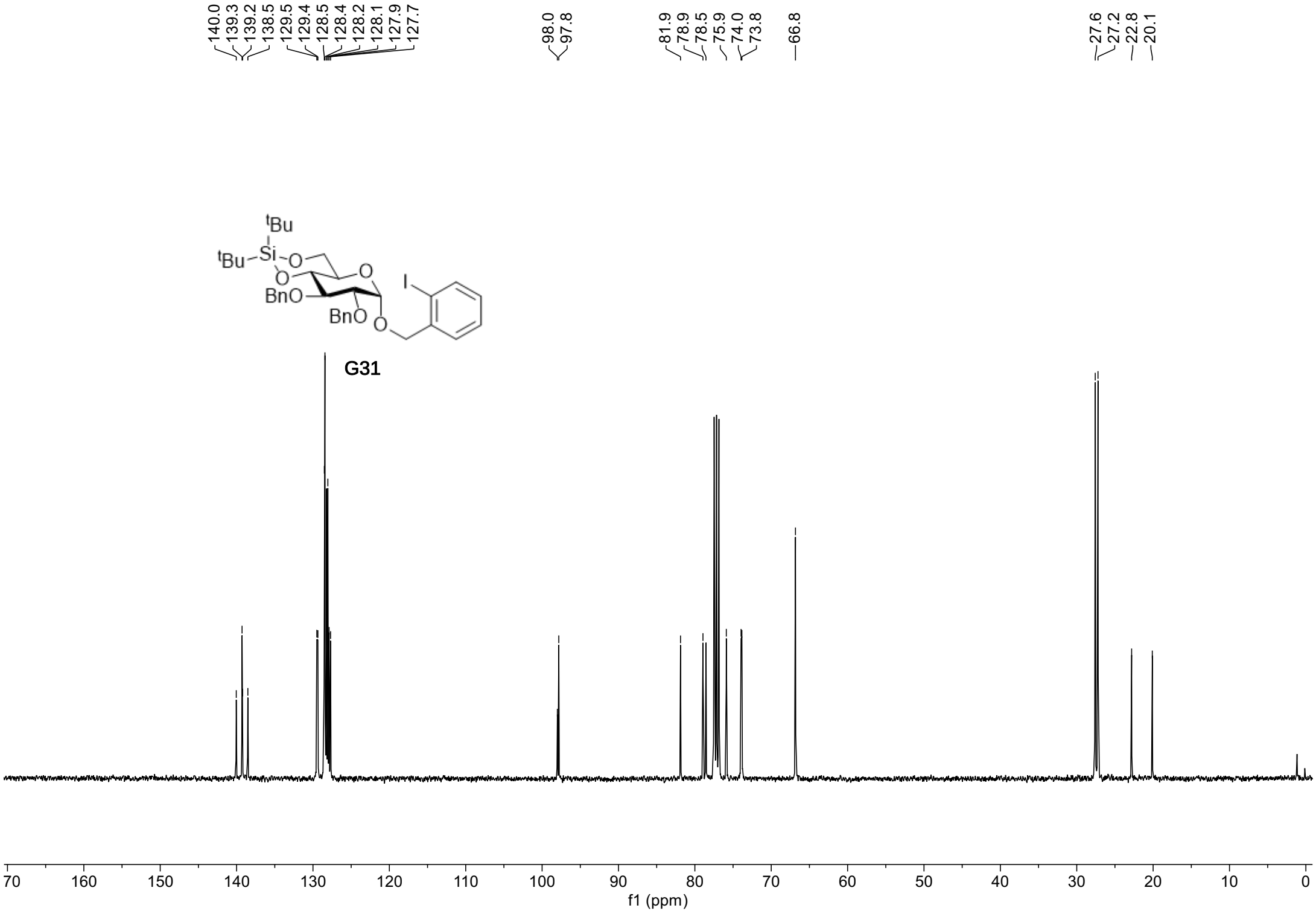

7.353 7.348 7.337 7.333 7.329 7.272 7.272 7.264 7.249 7.245 7.240 7.235 7.232 7.229 7.227 7.221 7.217 7.208 7.206 7.197 7.187 7.181 7.168 7.163
5.344 5.334 4.990 4.963 4.914 4.886 4.826 4.798 4.794 4.766 4.751 4.733 4.721 4.703 4.565 4.553 4.545 4.535 4.506 4.476 4.185 4.161 4.143 4.123 4.101 4.098 4.089 4.077 4.029 4.009 4.005 3.825 3.816 3.805 3.802 3.791 3.783 3.766 3.760 3.749 3.563 3.554 3.539 3.531 3.418 3.403 1.072 1.027
tBu
tBu
Si
O
BnO
BnO
BnO
BnO
CO2Me
OMe
2.08 5.28 11.10 2.13 1.00 1.05 1.03 2.09 2.09 2.06 1.01 1.05 2.08 1.05 3.09 3.03 1.08 1.07 4.13 9.00 9.03
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

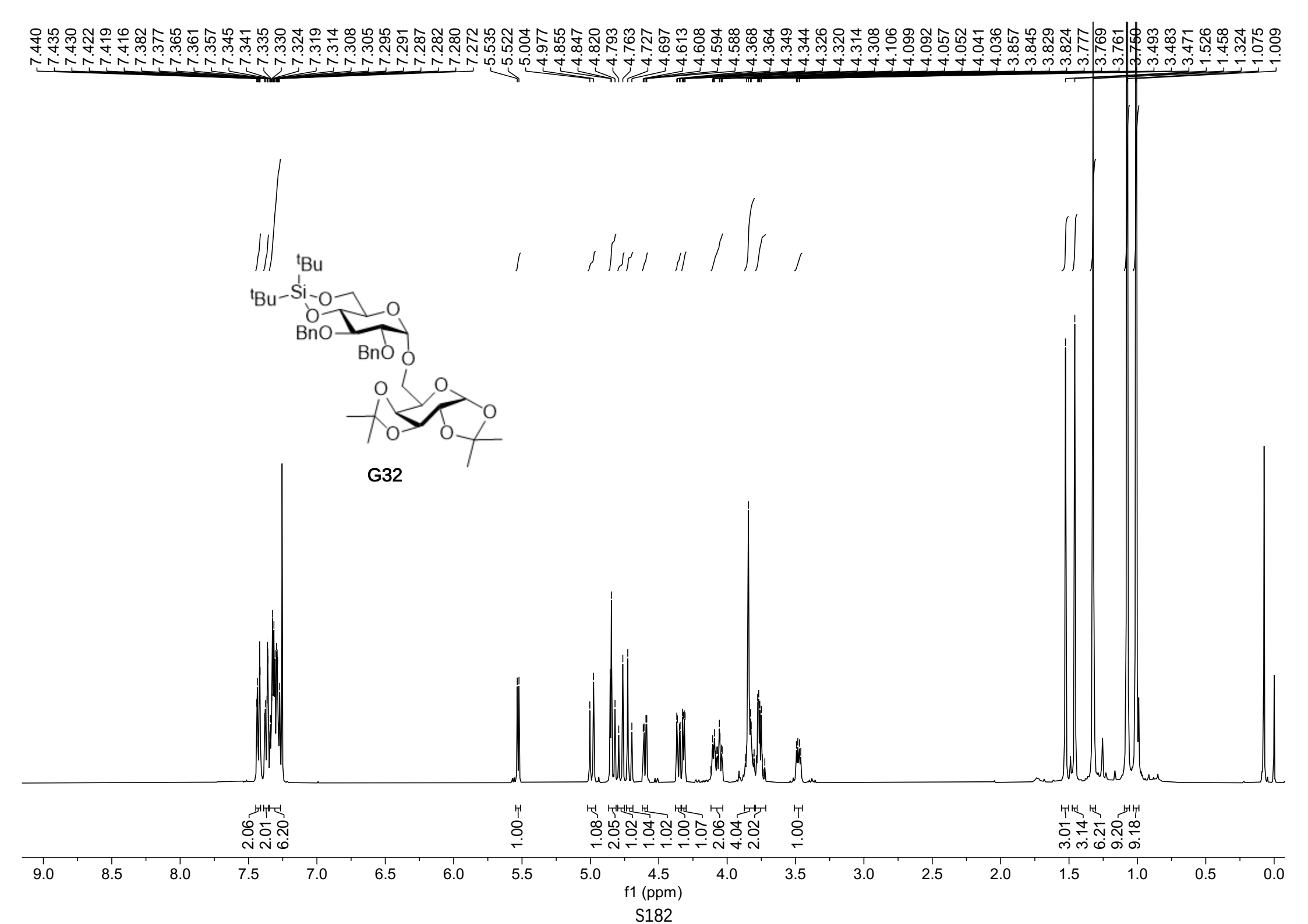
G30

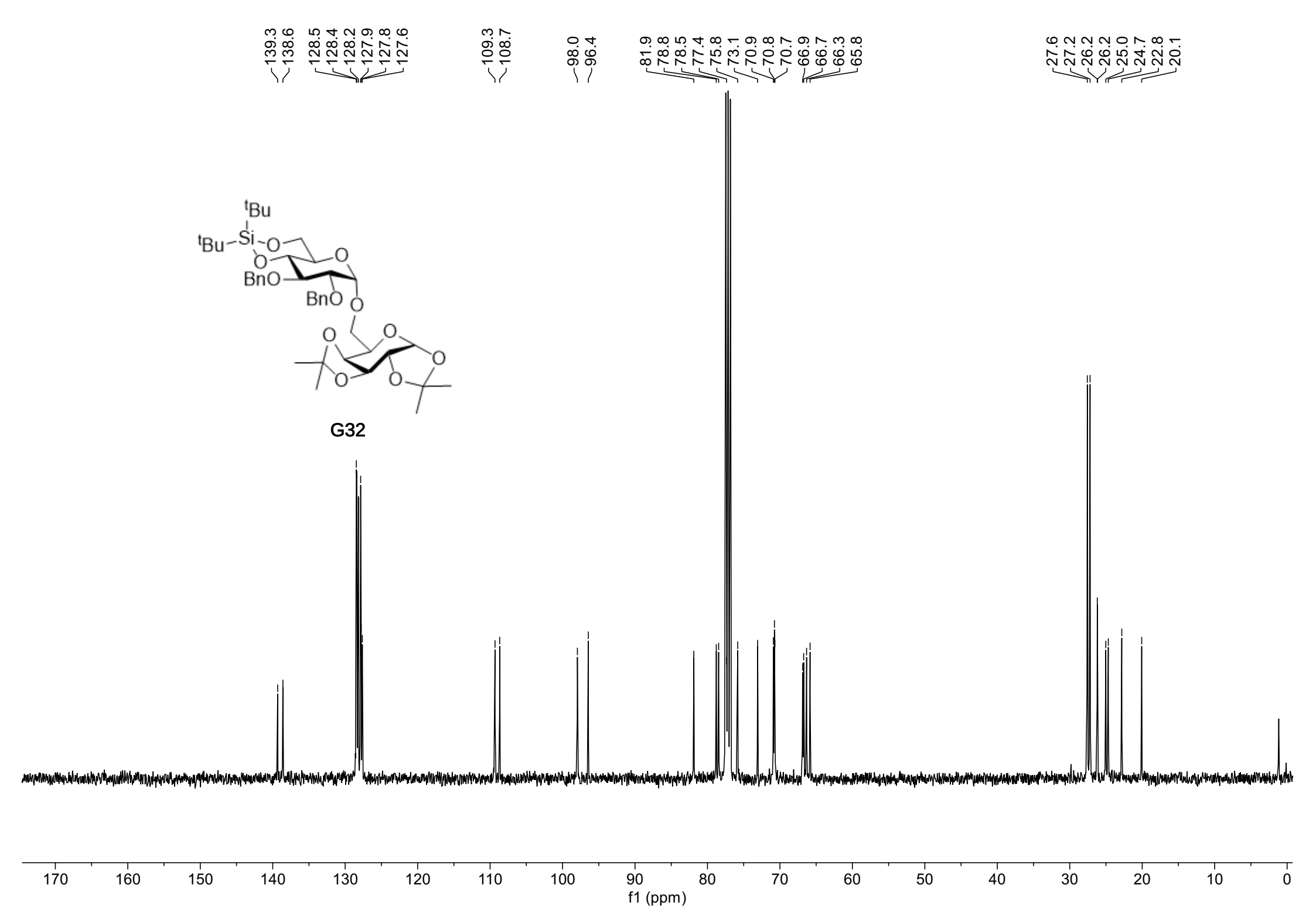

169.4
139.1
139.0
138.4
137.9
128.6
128.4
128.3
128.3
128.2
127.7
127.7
127.6
127.3
127.2
98.6
98.4
81.4
80.7
79.1
78.5
78.4
77.4
75.7
75.1
73.9
73.8
70.5
67.1
66.5
55.8
52.8
27.7
27.2
22.9
20.0
tBu
tBu
Si
O
O
O
O
BnO
BnO
O
BnO
BnO
CO2Me
O
OMe
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

G30

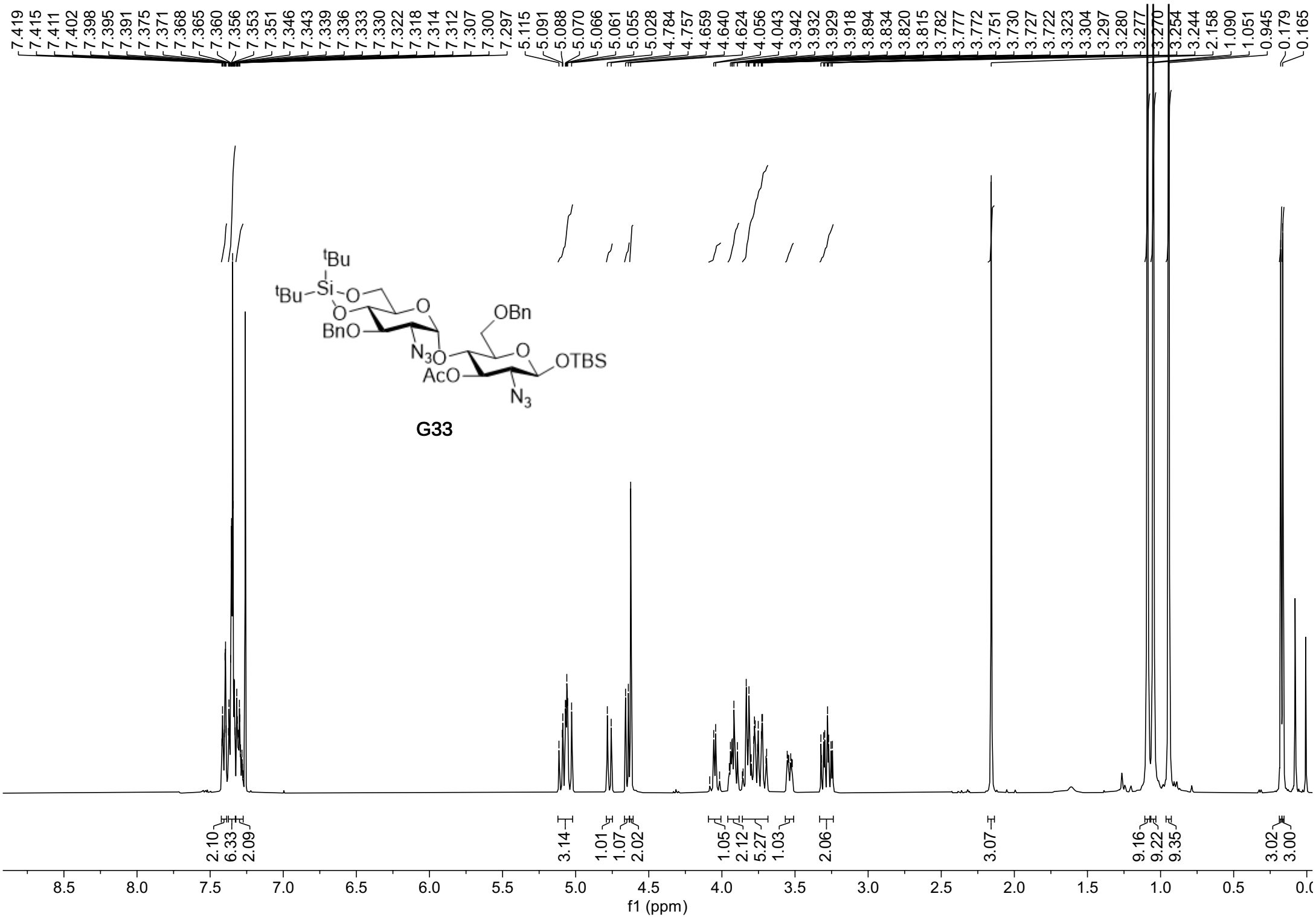

7.849 7.847 7.845 7.830 7.828 7.825 7.582 7.578 7.563 7.559 7.469 7.465 7.460 7.454 7.452 7.449 7.448 7.446 7.444 7.382 7.377 7.373 7.368 7.362 7.357 7.352 7.351 7.347 7.031 7.026 7.012 7.007 6.993 6.988 5.050 5.023 4.893 4.880 4.865 4.850 4.842 4.710 4.687 4.677 4.657 4.640 4.606 3.982 3.976 3.969 3.965 3.944 3.923 3.916 3.895 3.877 3.874 3.841 3.835 3.828 3.819 3.814 3.544 3.535 3.522 3.512 1.099 1.093 1.085 1.028 1.021 1.013
tBu
tBu
Si
O
O
O
BnO
BnO
O
I
G31
1.02 1.05 2.08 9.32 1.05 1.03 1.04 2.06 2.10 1.04 1.03 4.19 1.02 9.00 9.04
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


140.0
139.3
139.2
138.5
129.5
129.4
128.5
128.4
128.2
128.1
127.9
127.7
98.0
97.8
81.9
78.9
78.5
75.9
74.0
73.8
66.8
27.6
27.2
22.8
20.1
tBu
tBu
Si
O
O
O
BnO
BnO
O
I
G31
70
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

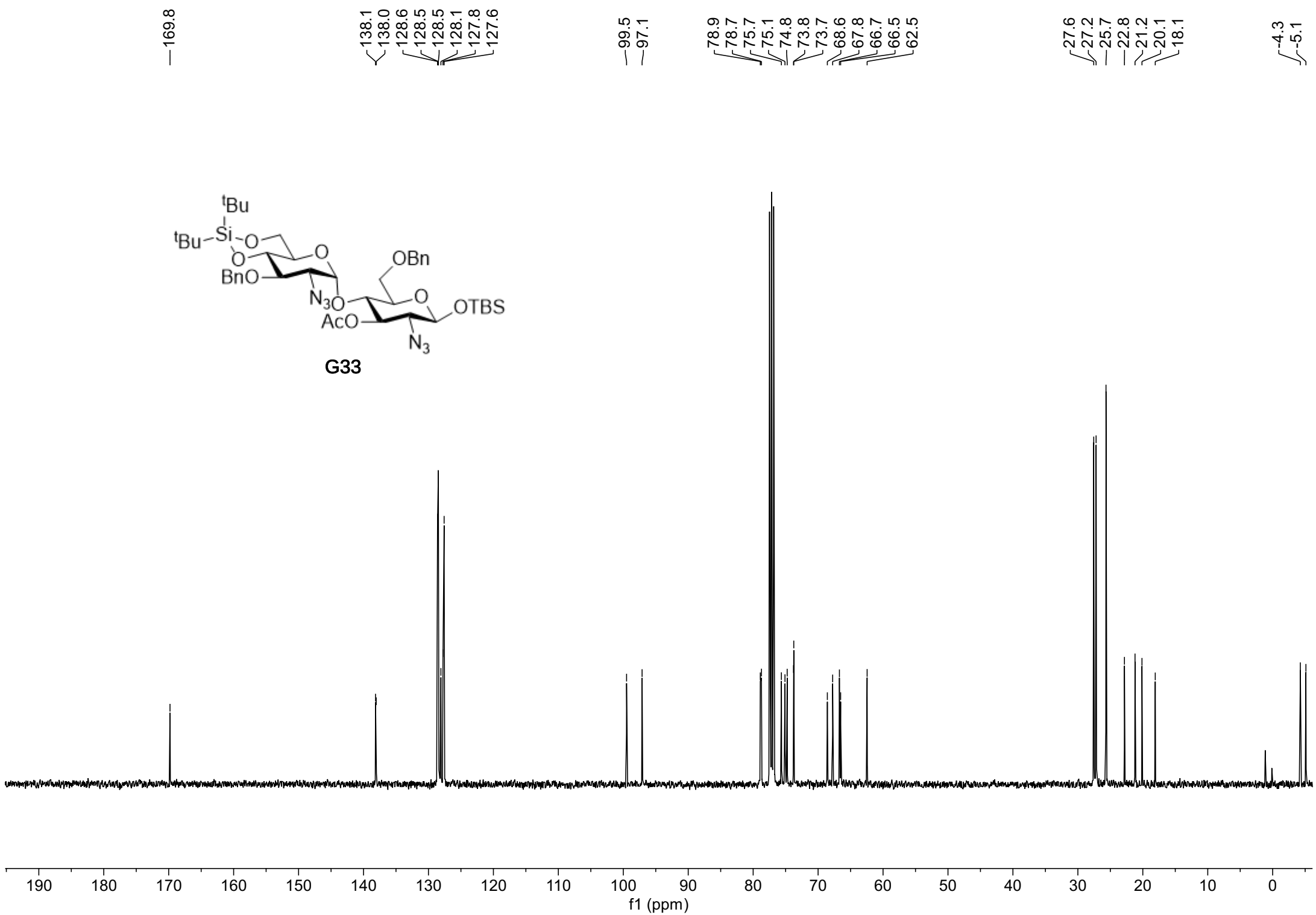

7.440 7.435 7.430 7.422 7.419 7.416 7.382 7.377 7.365 7.361 7.357 7.345 7.341 7.335 7.330 7.324 7.319 7.314 7.308 7.305 7.295 7.291 7.287 7.282 7.280 7.272 5.535 5.522 5.004 4.977 4.855 4.847 4.820 4.793 4.763 4.727 4.697 4.613 4.608 4.594 4.588 4.368 4.364 4.349 4.344 4.326 4.320 4.314 4.308 4.106 4.099 4.092 4.057 4.052 4.041 4.036 3.857 3.845 3.829 3.824 3.777 3.769 3.761 3.750 3.493 3.483 3.471 1.526 1.458 1.324 1.075 1.009
tBu
tBu
Si
O
O
O
O
BnO
BnO
O
O
O
O
O
O
G32
2.06 2.01 6.20 1.00 1.08 2.05 1.02 1.04 1.02 1.00 1.07 2.06 4.04 2.02 1.00 3.01 3.14 6.21 9.20 9.18
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


139.3
138.6
128.5
128.4
128.2
127.9
127.8
127.6
109.3
108.7
98.0
96.4
81.9
78.8
78.5
77.4
75.8
73.1
70.9
70.8
70.7
66.9
66.7
66.3
65.8
27.6
27.2
26.2
26.2
25.0
24.7
22.8
20.1
tBu
tBu
Si
O
O
BnO
BnO
O
O
O
O
O
O
O
O
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

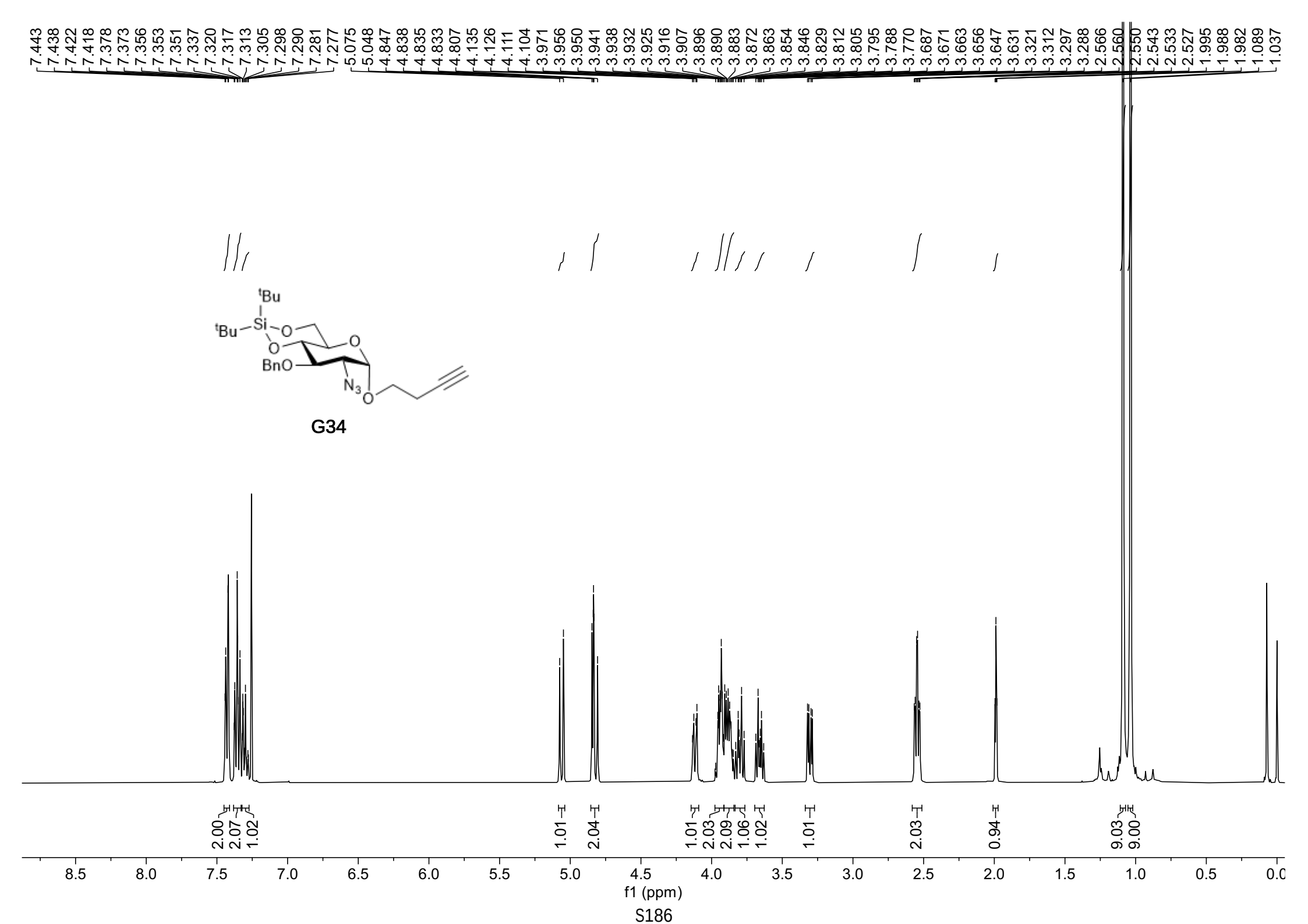
G32


7.419 7.415 7.411 7.402 7.398 7.395 7.391 7.375 7.371 7.368 7.365 7.360 7.356 7.353 7.351 7.346 7.343 7.339 7.336 7.333 7.330 7.322 7.318 7.314 7.312 7.307 7.300 7.297
5.115 5.091 5.088 5.070 5.066 5.061 5.055 5.028 4.784 4.757 4.659 4.640 4.624 4.056 4.043 3.942 3.932 3.929 3.918 3.894 3.834 3.820 3.815 3.782 3.777 3.772 3.751 3.730 3.727 3.722 3.323 3.304 3.297 3.280 3.277 3.270 3.254 3.244 2.158 1.090 1.051 0.945 0.179 0.165
tBu
tBu
Si
O
O
O
BnO
N3
O
OBn
O
OTBS
AcO
N3
2.10 6.33 2.09 3.14 1.01 1.07 2.02 1.05 2.12 5.27 1.03 2.06 3.07 9.16 9.22 9.35 3.02 3.00
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

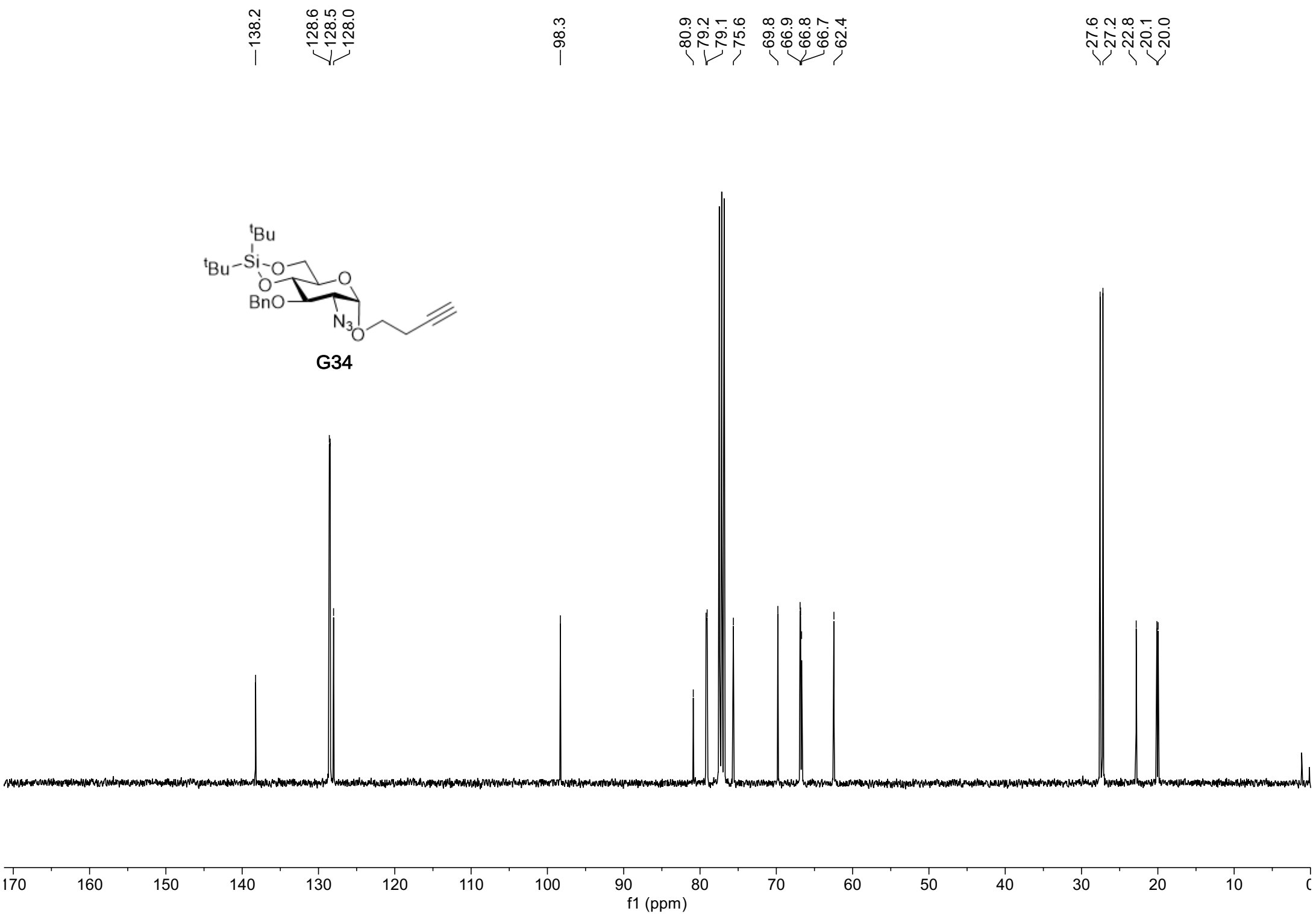
G33


169.8
138.1
138.0
128.6
128.5
128.5
128.1
127.8
127.6
99.5
97.1
78.9
78.7
75.7
75.1
74.8
73.8
73.7
68.6
67.8
66.7
66.5
62.5
27.6
27.2
25.7
22.8
21.2
20.1
18.1
-4.3
-5.1
tBu
tBu
Si
O
O
O
BnO
N3
O
OBn
O
AcO
OTBS
N3
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

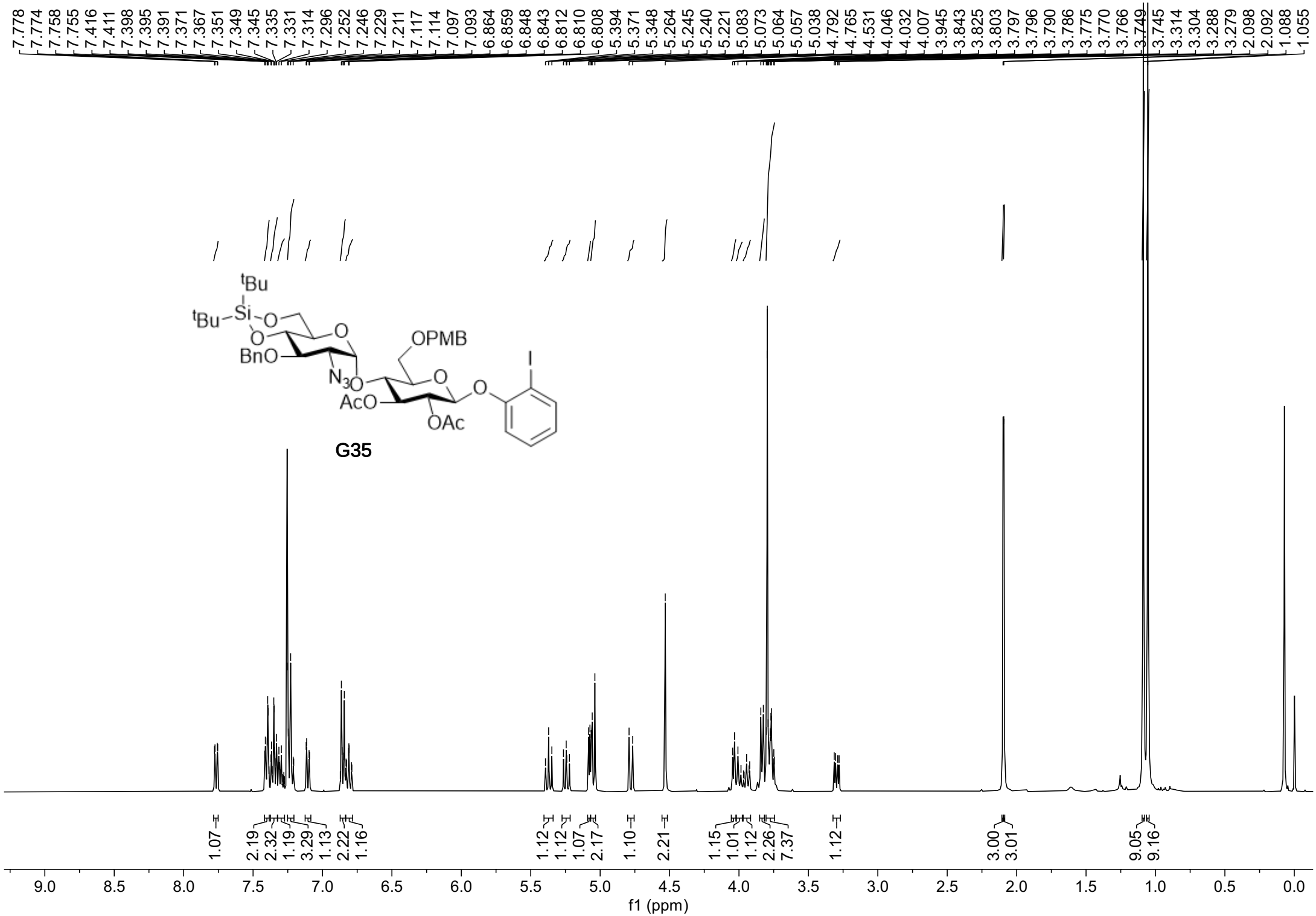
G33


7.443 7.438 7.422 7.418 7.378 7.373 7.356 7.353 7.351 7.337 7.320 7.317 7.313 7.305 7.298 7.290 7.281 7.277
5.075 5.048 4.847 4.838 4.835 4.833 4.807 4.135 4.126 4.111 4.104 3.971 3.956 3.950 3.941 3.938 3.932 3.925 3.916 3.907 3.896 3.890 3.883 3.872 3.863 3.854 3.846 3.829 3.812 3.805 3.795 3.788 3.770 3.687 3.671 3.663 3.656 3.647 3.631 3.321 3.312 3.297 3.288 2.566 2.560 2.550 2.543 2.533 2.527 1.995 1.988 1.982 1.089 1.037
tBu
tBu
Si
O
O
O
BnO
N3
O
2.00 2.07 1.02 1.01 2.04 1.01 2.03 2.09 1.06 1.02 1.01 2.03 0.94 9.03 9.00
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

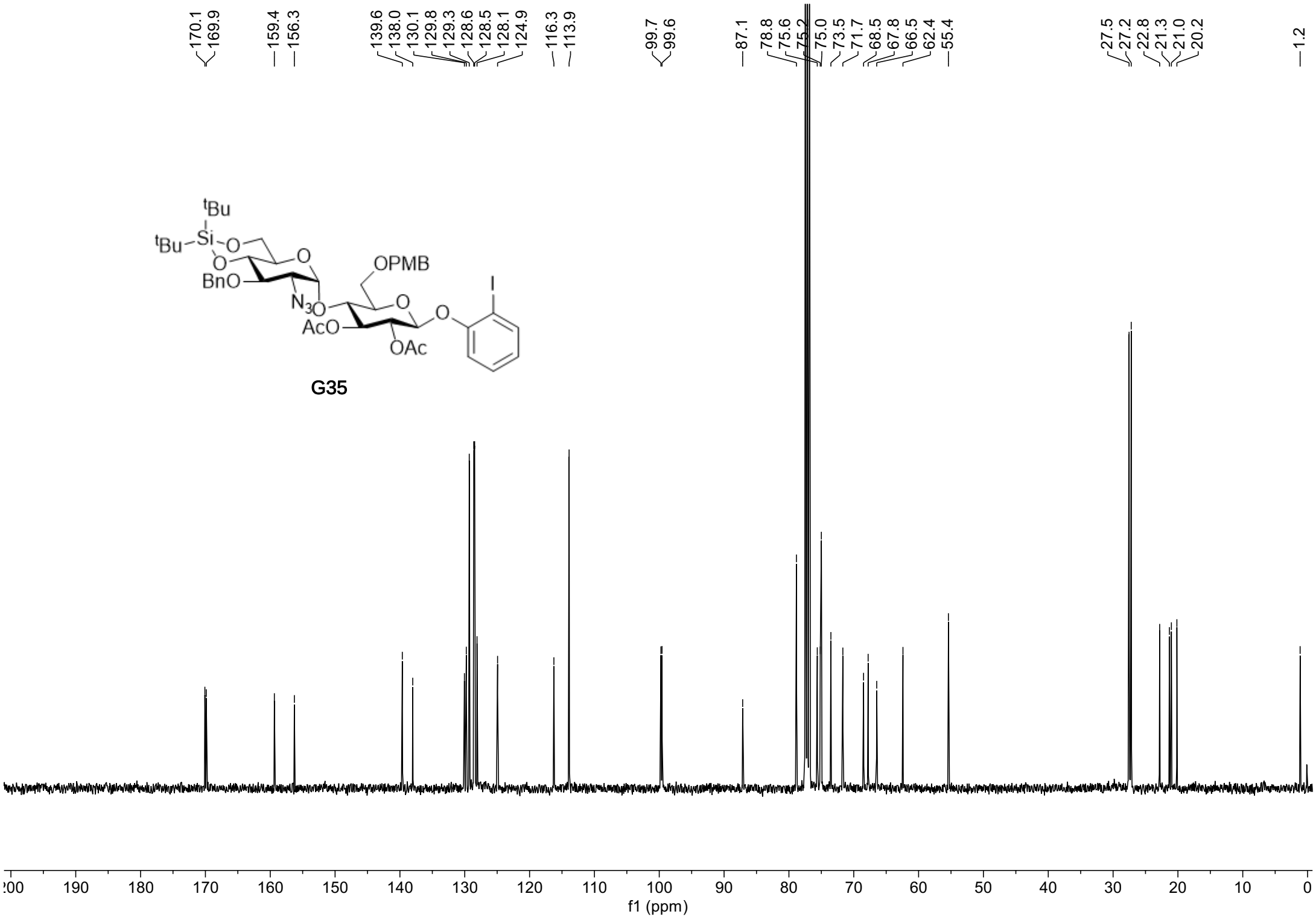
G34


138.2
128.6
128.5
128.0
98.3
80.9
79.2
79.1
75.6
69.8
66.9
66.8
66.7
62.4
27.6
27.2
22.8
20.1
20.0
tBu
tBu
Si
O
O
O
BnO
N3
O
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

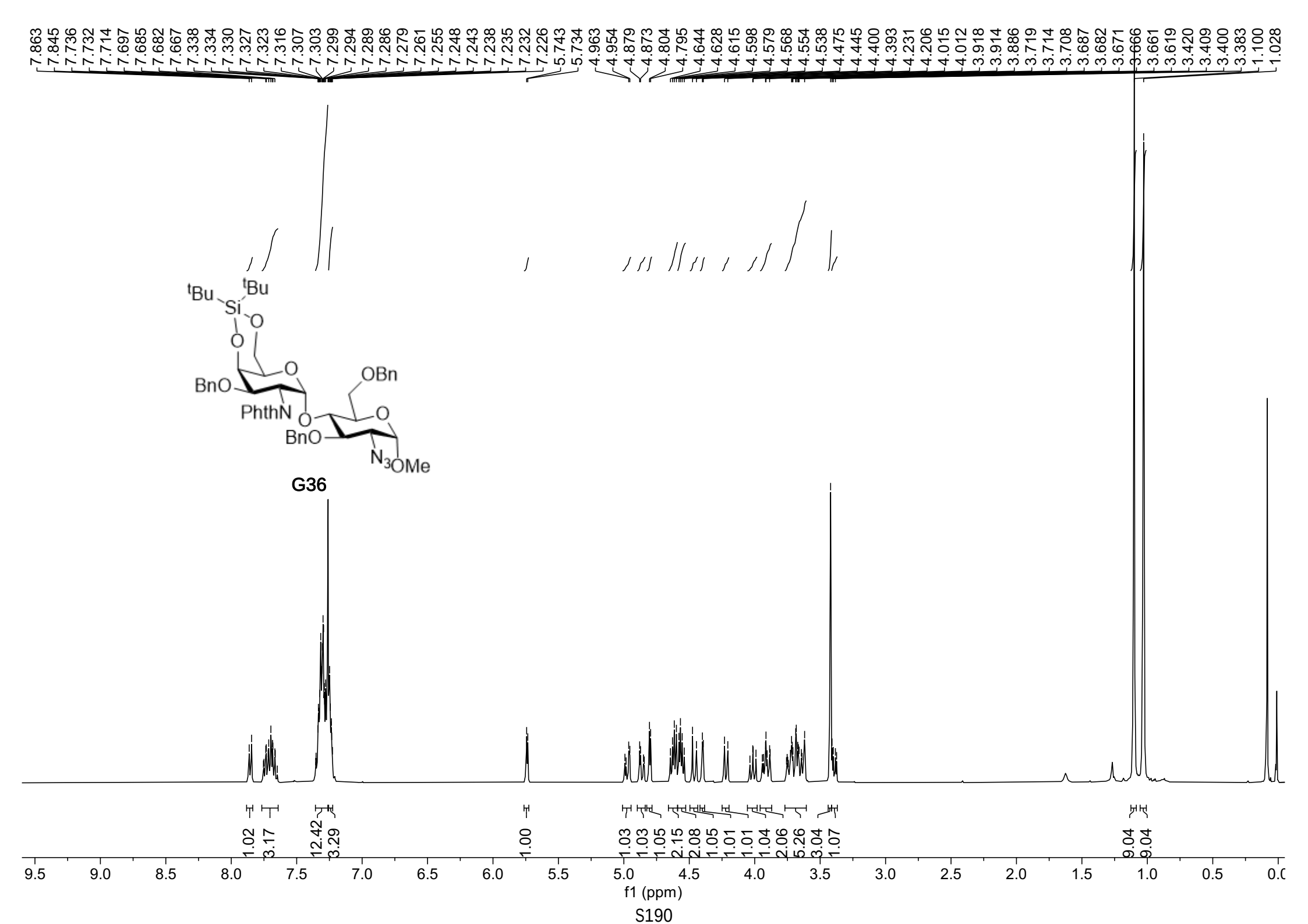
G34

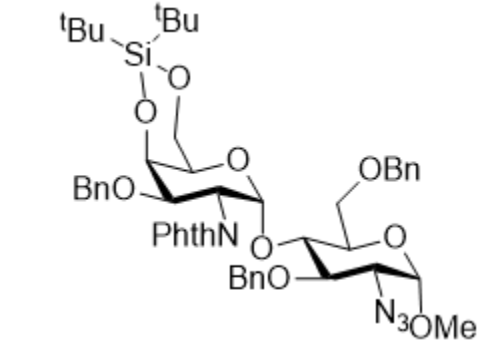

7.778 7.774 7.758 7.755 7.416 7.411 7.398 7.395 7.391 7.371 7.367 7.351 7.349 7.345 7.335 7.331 7.314 7.296 7.252 7.246 7.229 7.211 7.117 7.114 7.097 7.093 6.864 6.859 6.848 6.843 6.812 6.810 6.808 5.394 5.371 5.348 5.264 5.245 5.240 5.221 5.083 5.073 5.064 5.057 5.038 4.792 4.765 4.531 4.046 4.032 4.007 3.945 3.843 3.825 3.803 3.797 3.796 3.790 3.786 3.775 3.770 3.766 3.749 3.745 3.314 3.304 3.288 3.279 2.098 2.092 1.088 1.055
tBu
tBu
Si
O
O
O
BnO
N3
O
OPMB
O
I
O
AcO
OAc
1.07 2.19 2.32 1.19 3.29 1.13 2.22 1.16 1.12 1.12 1.07 2.17 1.10 2.21 1.15 1.01 1.12 2.26 7.37 1.12 3.00 3.01 9.05 9.16
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

G35


170.1
169.9
159.4
156.3
139.6
138.0
130.1
129.8
129.3
128.6
128.5
128.1
124.9
116.3
113.9
99.7
99.6
87.1
78.8
75.6
75.2
75.0
73.5
71.7
68.5
67.8
66.5
62.4
55.4
27.5
27.2
22.8
21.3
21.0
20.2
1.2
tBu
tBu
Si
O
O
O
BnO
N3
O
AcO
OPMB
O
O
I
OAc
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

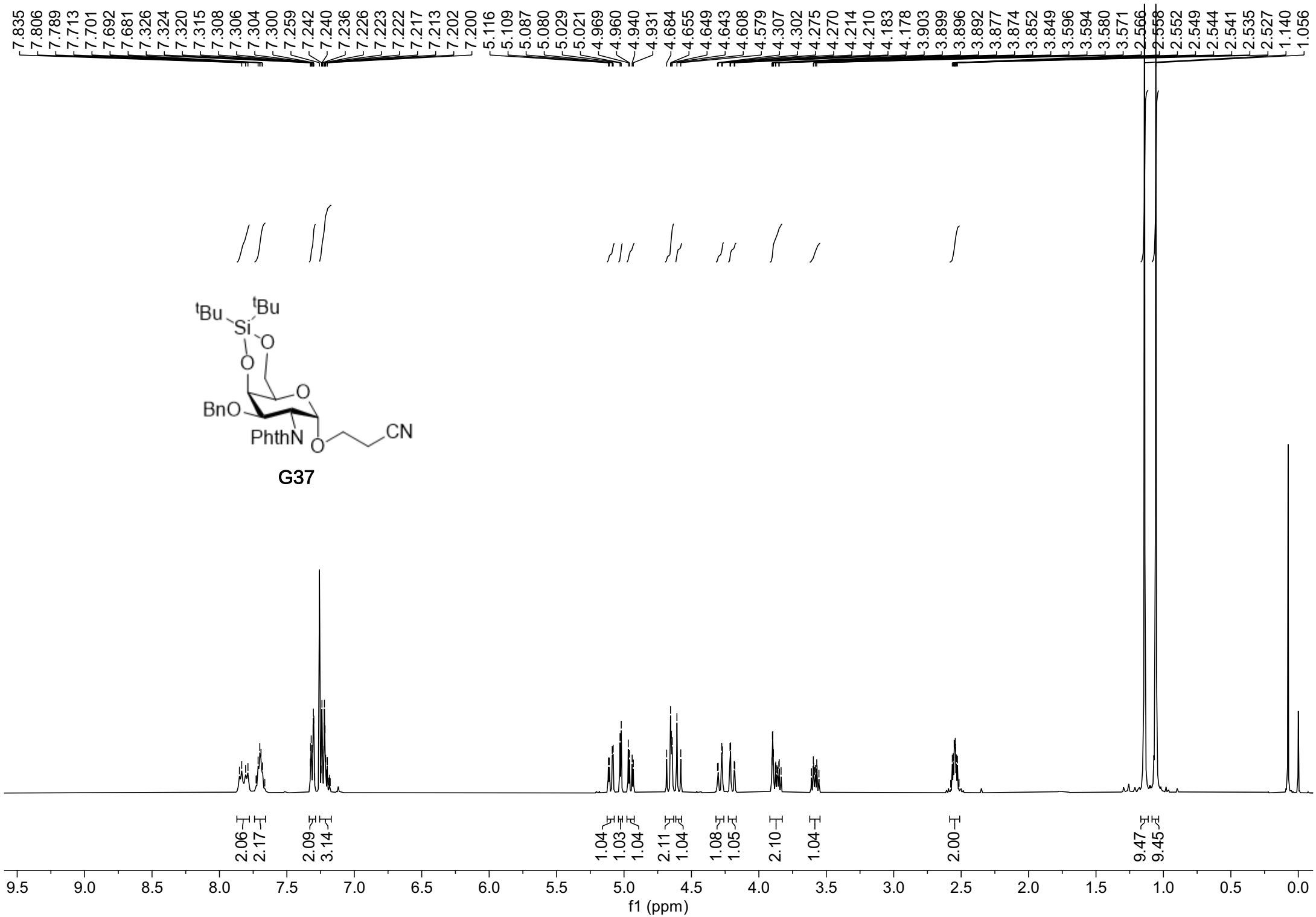
G35

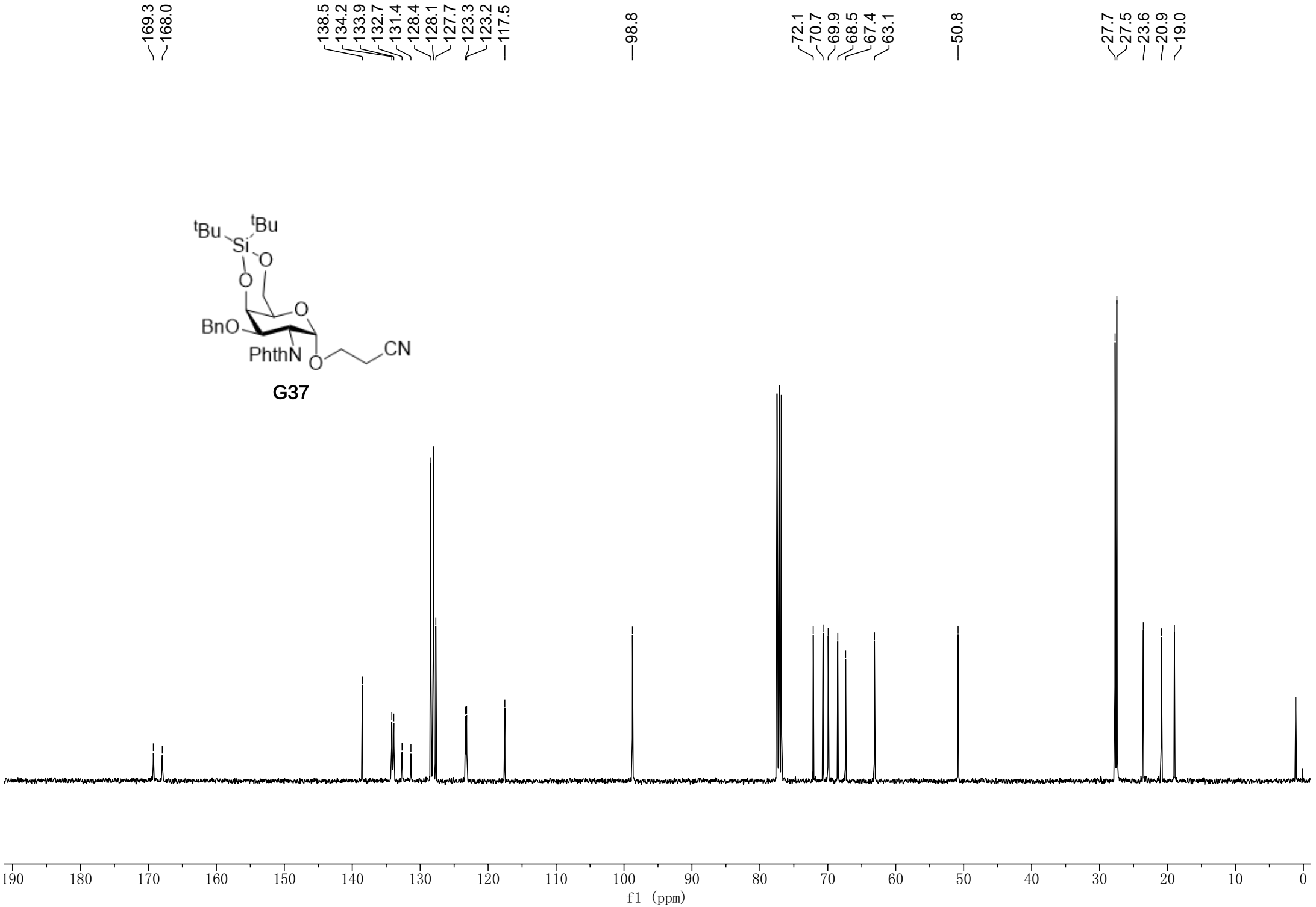

7.863 7.845 7.736 7.732 7.714 7.697 7.685 7.682 7.667 7.338 7.334 7.330 7.327 7.323 7.316 7.307 7.303 7.299 7.294 7.289 7.286 7.279 7.261 7.255 7.248 7.243 7.238 7.235 7.232 7.226 5.743 5.734 4.963 4.954 4.879 4.873 4.804 4.795 4.644 4.628 4.615 4.598 4.579 4.568 4.554 4.538 4.475 4.445 4.400 4.393 4.231 4.206 4.015 4.012 3.918 3.914 3.886 3.719 3.714 3.708 3.687 3.682 3.671 3.666 3.661 3.619 3.420 3.409 3.400 3.383 1.100 1.028
tBu
tBu
Si
O
O
O
BnO
PhthN
O
OBn
O
BnO
N3
OMe
G36
1.02 3.17 12.42 3.29 1.00 1.03 1.03 1.05 2.15 2.08 1.05 1.01 1.01 1.04 2.06 5.26 3.04 1.07 9.04 9.04
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


tBu
tBu
Si
O
O
O
BnO
PhthN
O
OBn
O
BnO
N3
OMe

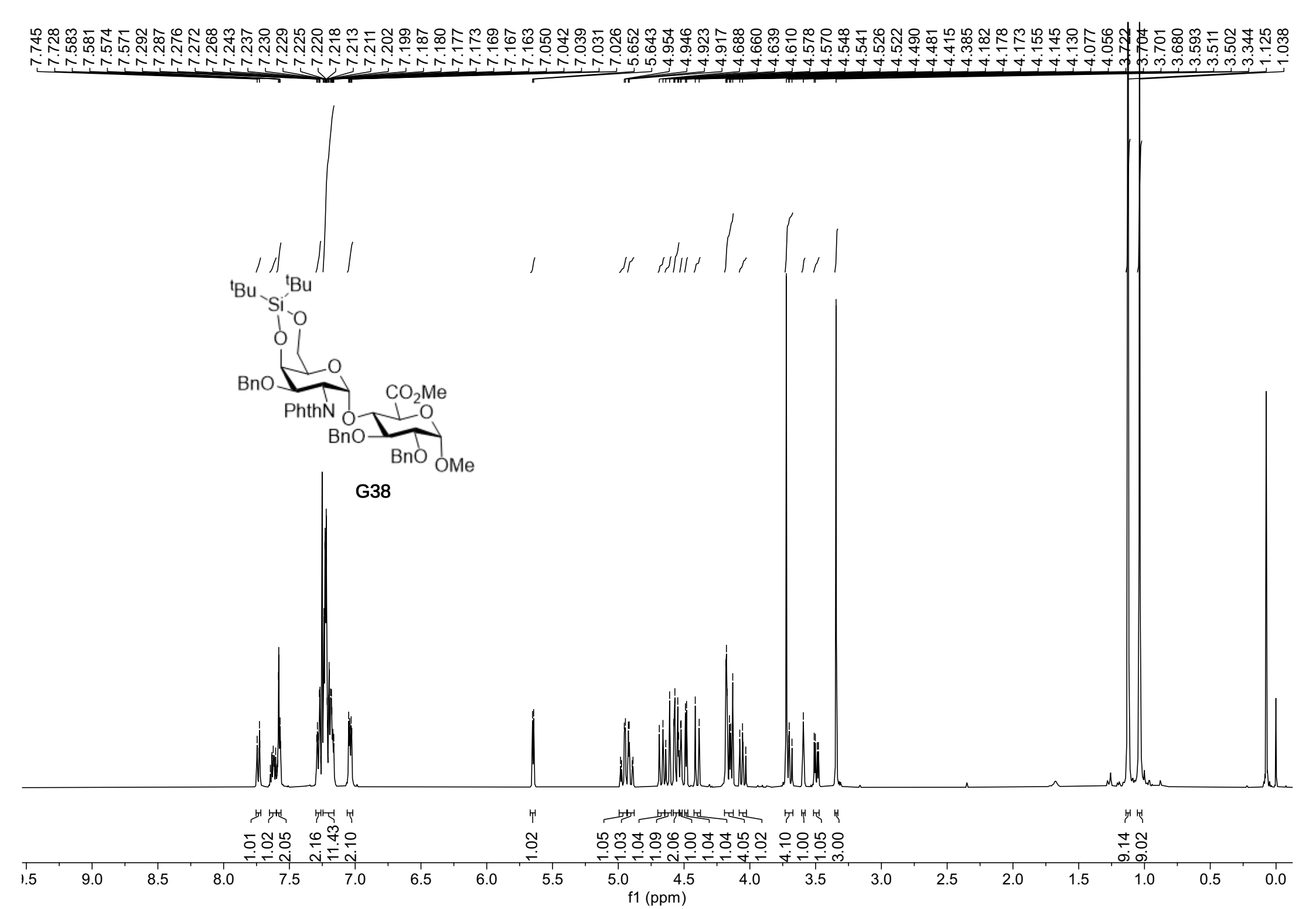
G36

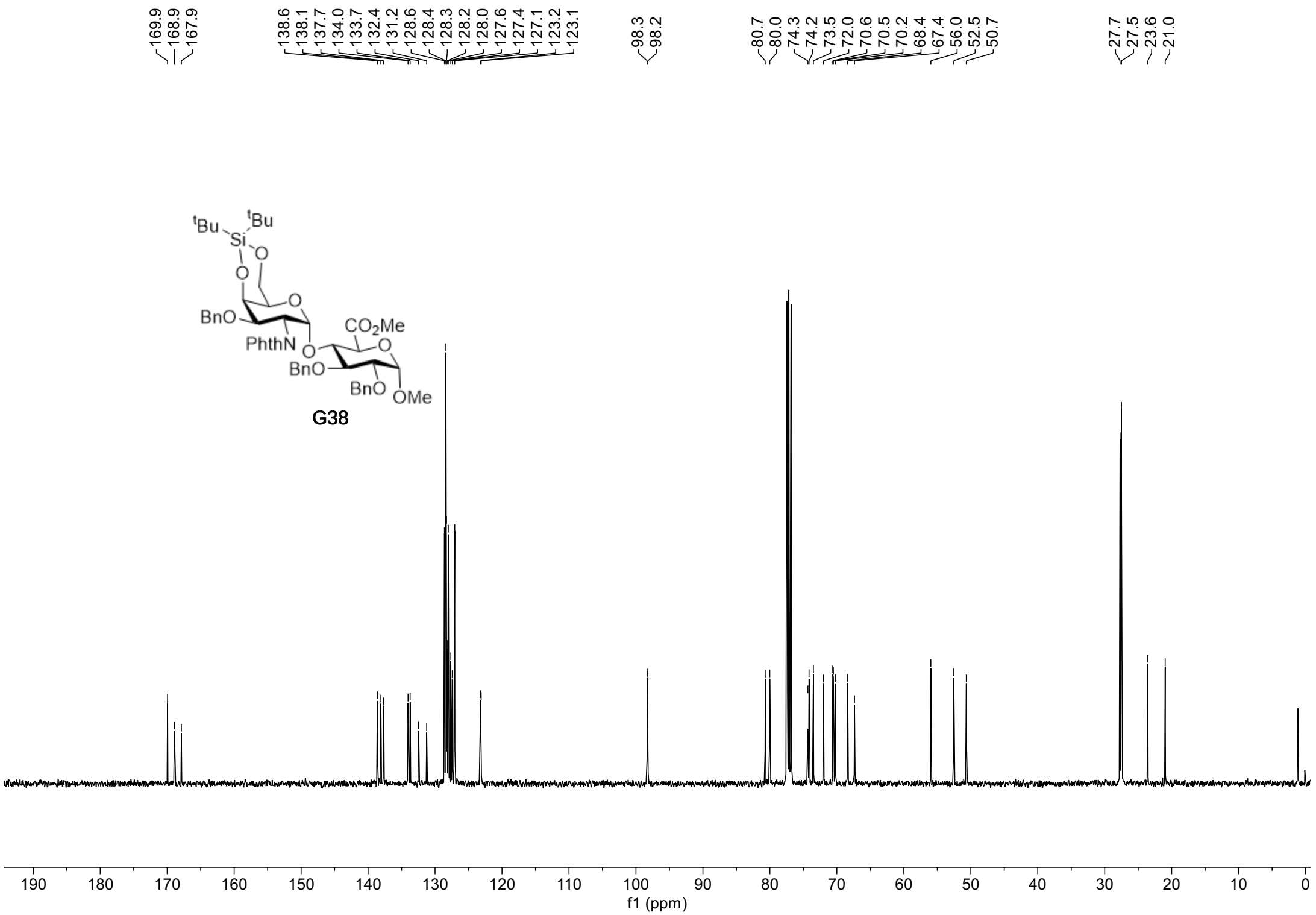
169.0
168.3
138.6
138.0
136.8
134.1
133.9
132.6
131.3
128.6
128.4
128.3
128.0
127.9
127.9
127.7
123.3
123.2
98.8
96.9
80.6
73.8
73.0
72.1
70.5
70.3
69.9
69.7
69.1
68.4
67.0
63.2
55.6
50.8
27.7
27.5
23.5
20.9
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.835
7.806
7.789
7.713
7.701
7.692
7.681
7.326
7.324
7.320
7.315
7.308
7.306
7.304
7.300
7.259
7.242
7.240
7.236
7.226
7.223
7.222
7.217
7.213
7.202
7.200
5.116
5.109
5.087
5.080
5.029
5.021
4.969
4.960
4.940
4.931
4.684
4.655
4.649
4.643
4.608
4.579
4.307
4.302
4.275
4.270
4.214
4.210
4.183
4.178
3.903
3.899
3.896
3.892
3.877
3.874
3.852
3.849
3.596
3.594
3.580
3.571
2.566
2.558
2.552
2.549
2.544
2.541
2.535
2.527
1.140
1.056
tBu
tBu
Si
O
O
O
BnO
PhthN
O
CN
G37
2.06
2.17
2.09
3.14
1.04
1.03
1.04
2.11
1.04
1.08
1.05
2.10
1.04
2.00
9.47
9.45
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

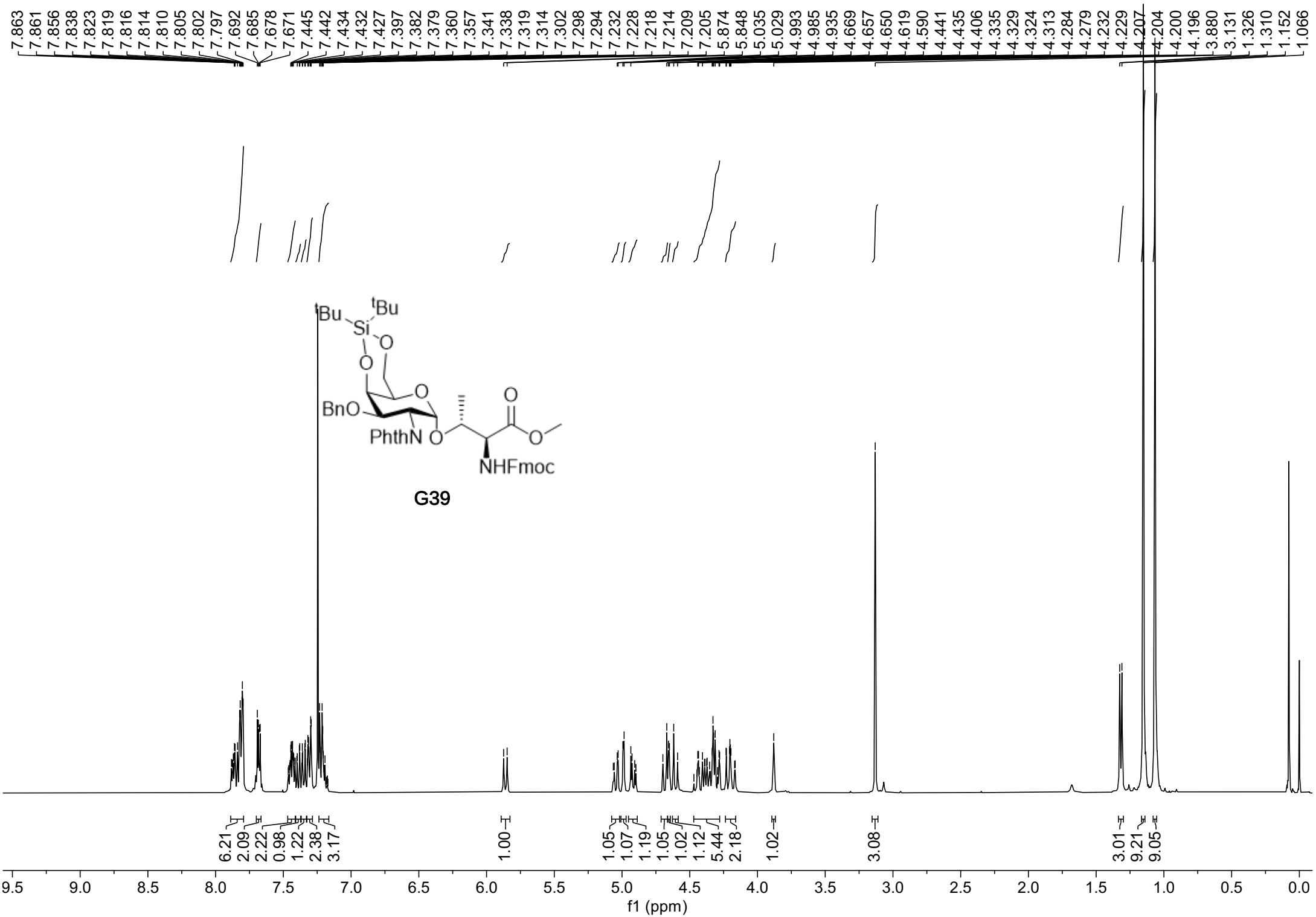

169.3
168.0
138.5
134.2
133.9
132.7
131.4
128.4
128.1
127.7
123.3
123.2
117.5
98.8
72.1
70.7
69.9
68.5
67.4
63.1
50.8
27.7
27.5
23.6
20.9
19.0
tBu
tBu
Si
O
O
O
BnO
PhthN
O
CN
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

G37

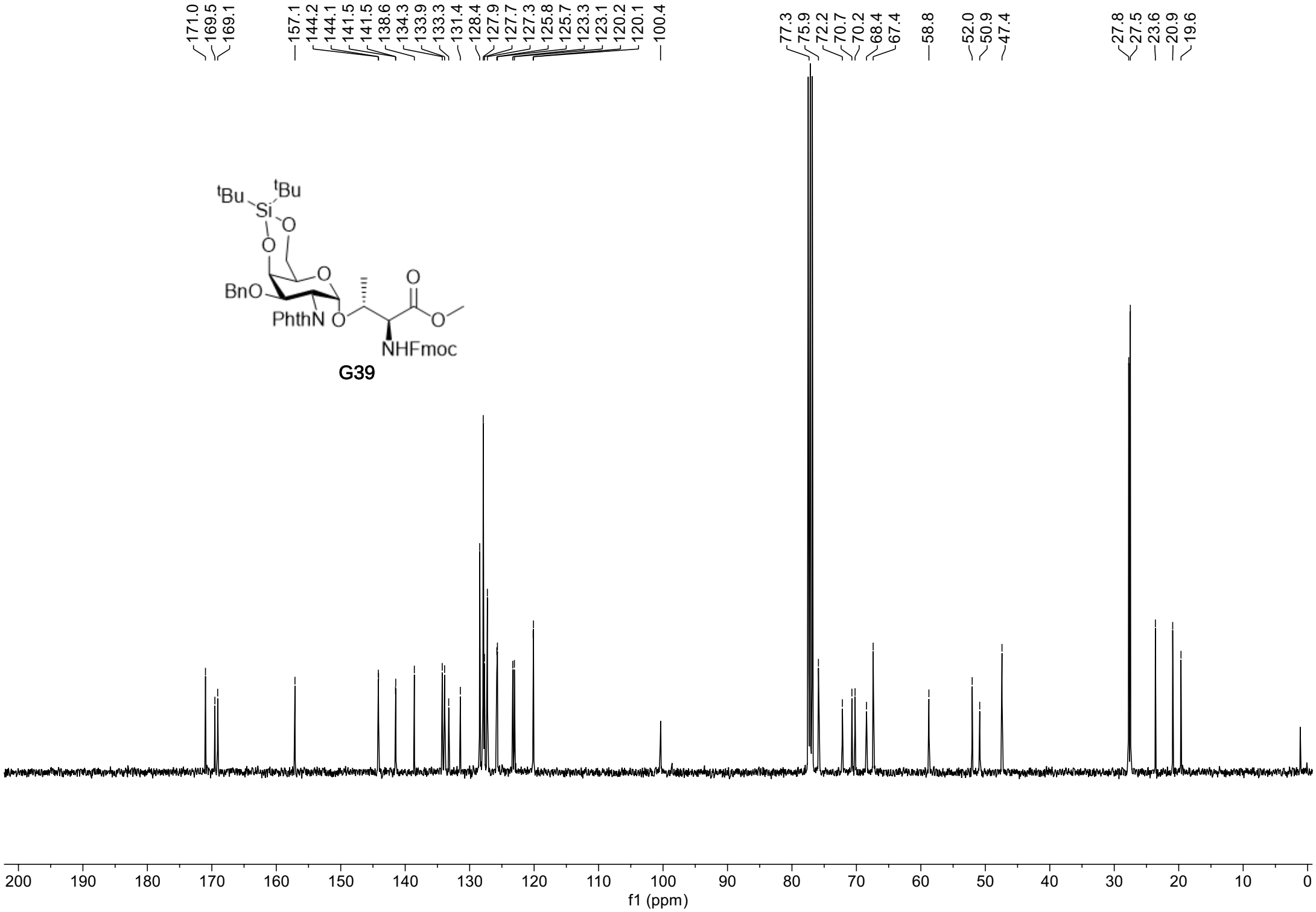

7.745 7.728 7.583 7.581 7.574 7.571 7.292 7.287 7.276 7.272 7.268 7.243 7.237 7.230 7.229 7.225 7.220 7.218 7.213 7.211 7.202 7.199 7.187 7.180 7.177 7.173 7.169 7.167 7.163 7.050 7.042 7.039 7.031 7.026 5.652 5.643 4.954 4.946 4.923 4.917 4.688 4.660 4.639 4.610 4.578 4.570 4.548 4.541 4.526 4.522 4.490 4.481 4.415 4.385 4.182 4.178 4.173 4.155 4.145 4.130 4.077 4.056 3.722 3.704 3.701 3.680 3.593 3.511 3.502 3.344 1.125 1.038
tBu
tBu
Si
O
O
O
BnO
PhthN
O
CO2Me
O
BnO
BnO
OMe
G38
1.01 1.02 2.05 2.16 11.43 2.10 1.02 1.05 1.03 1.04 1.09 2.06 1.00 1.04 1.04 4.05 1.02 4.10 1.00 1.05 3.00 9.14 9.02
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

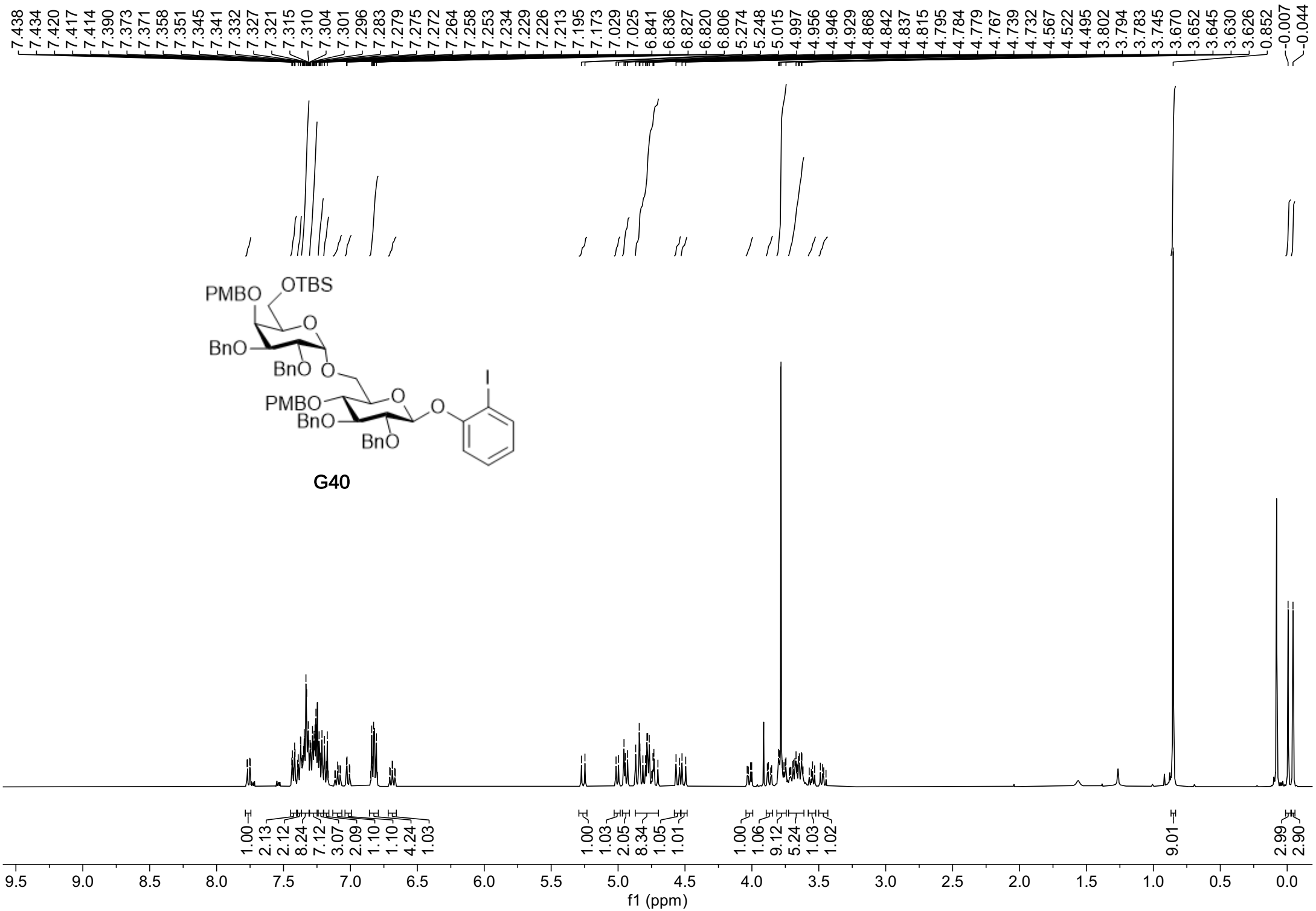

169.9
168.9
167.9
138.6
138.1
137.7
134.0
133.7
132.4
131.2
128.6
128.4
128.3
128.2
128.0
127.6
127.4
127.1
123.2
123.1
98.3
98.2
80.7
80.0
74.3
74.2
73.5
72.0
70.6
70.5
70.2
68.4
67.4
56.0
52.5
50.7
27.7
27.5
23.6
21.0
tBu
tBu
Si
O
O
O
BnO
PhthN
O
CO2Me
O
BnO
BnO
OMe
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

G38

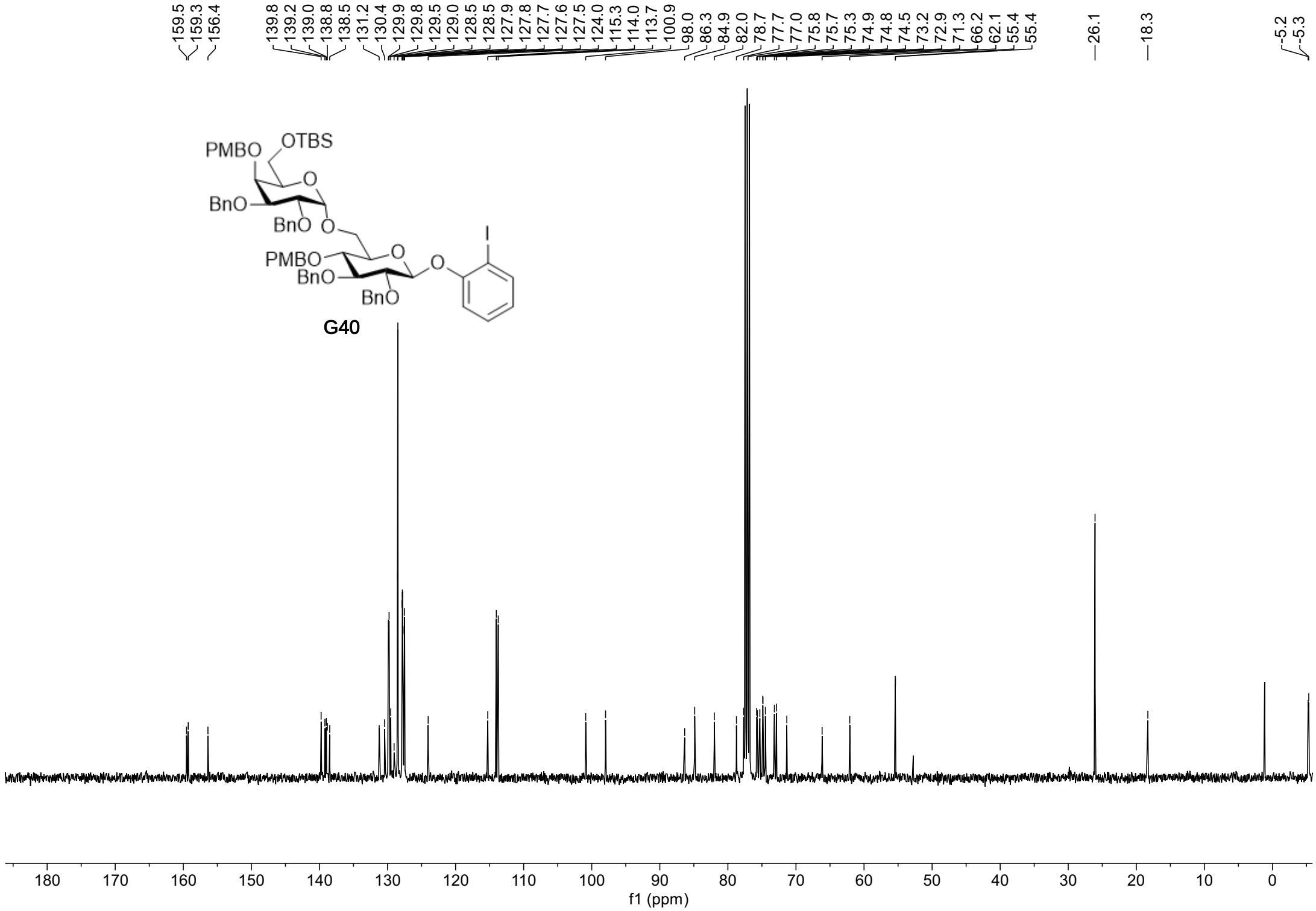

7.863 7.861 7.856 7.838 7.823 7.819 7.816 7.814 7.810 7.805 7.802 7.797 7.692 7.685 7.678 7.671 7.445 7.442 7.434 7.432 7.427 7.397 7.382 7.379 7.360 7.357 7.341 7.338 7.319 7.314 7.302 7.298 7.294 7.232 7.228 7.218 7.214 7.209 7.205 5.874 5.848 5.035 5.029 4.993 4.985 4.935 4.669 4.657 4.650 4.619 4.590 4.441 4.435 4.406 4.335 4.329 4.324 4.313 4.284 4.279 4.232 4.229 4.207 4.204 4.200 4.196 3.880 3.131 1.326 1.310 1.152 1.066
tBu
tBu
Si
O
O
O
BnO
PhthN
O
O
O
NHFmoc
6.21 2.09 2.22 0.98 1.22 2.38 3.17 1.00 1.05 1.07 1.19 1.05 1.02 1.12 5.44 2.18 1.02 3.08 3.01 9.21 9.05
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

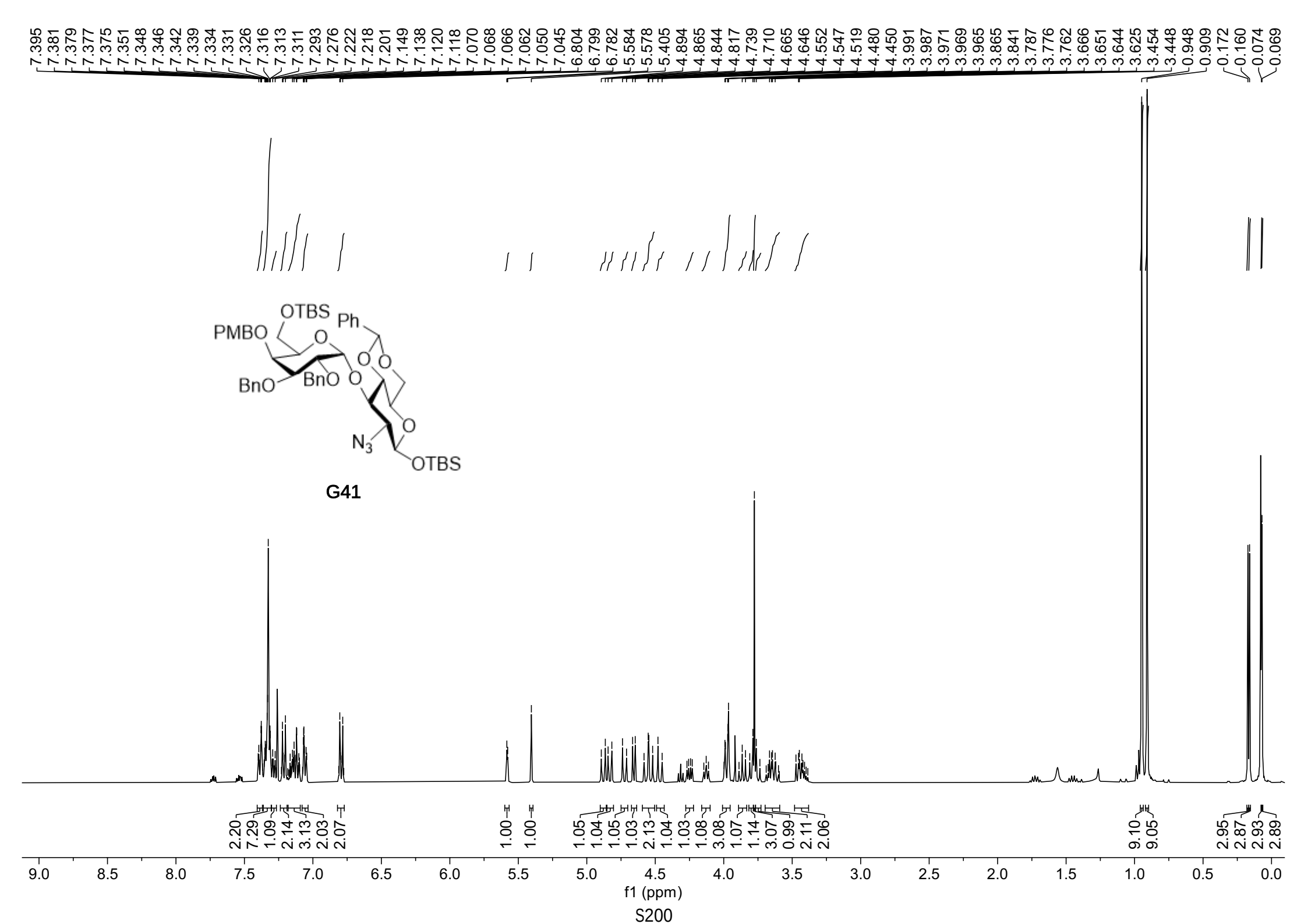
G39

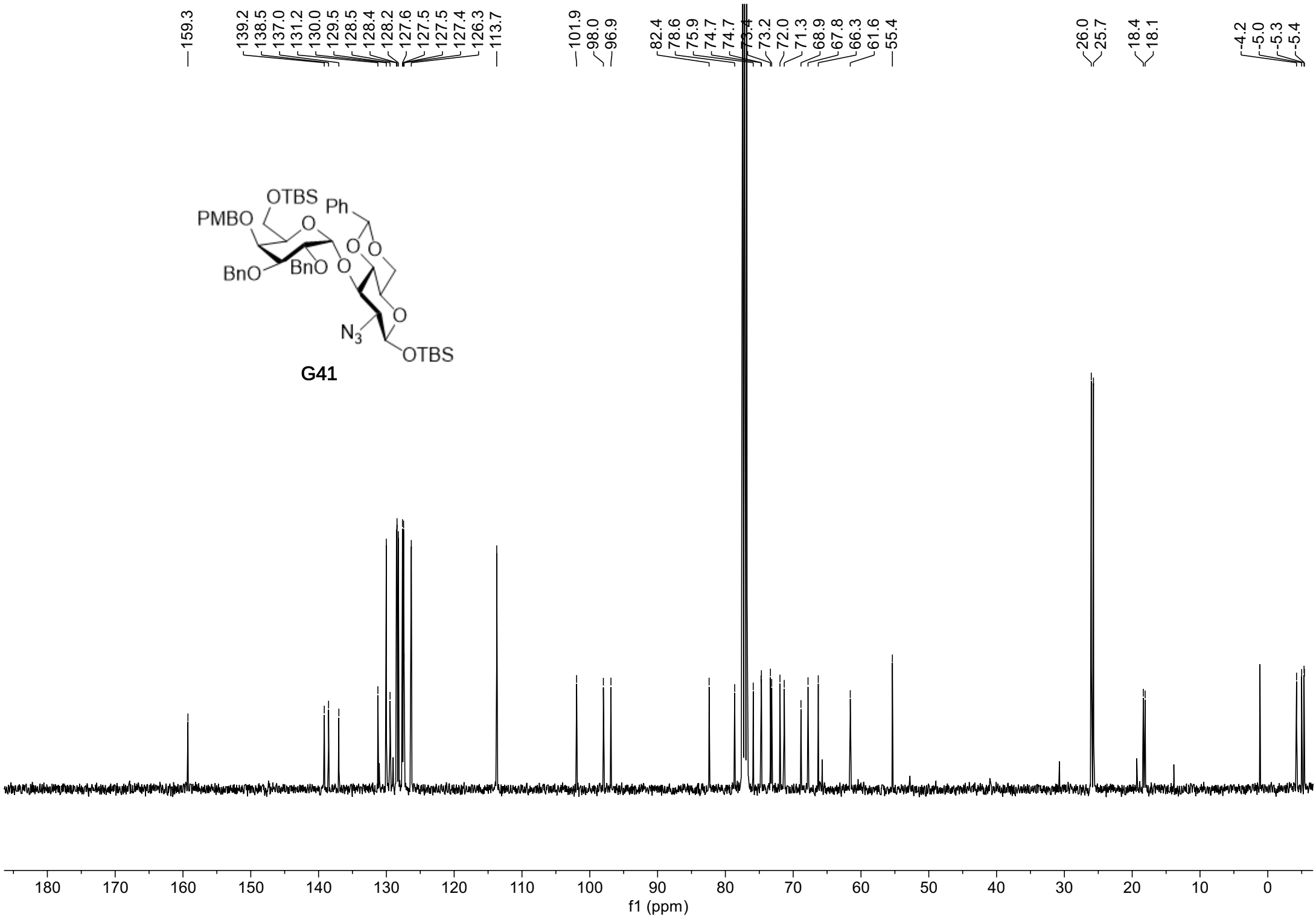

171.0
169.5
169.1
157.1
144.2
144.1
141.5
141.5
138.6
134.3
133.9
133.3
131.4
128.4
127.9
127.7
127.3
125.8
125.7
123.3
123.1
120.2
120.1
100.4
77.3
75.9
72.2
70.7
70.2
68.4
67.4
58.8
52.0
50.9
47.4
27.8
27.5
23.6
20.9
19.6
tBu
tBu
Si
O
O
O
BnO
PhthN
O
O
O
O
NHFmoc
G39
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

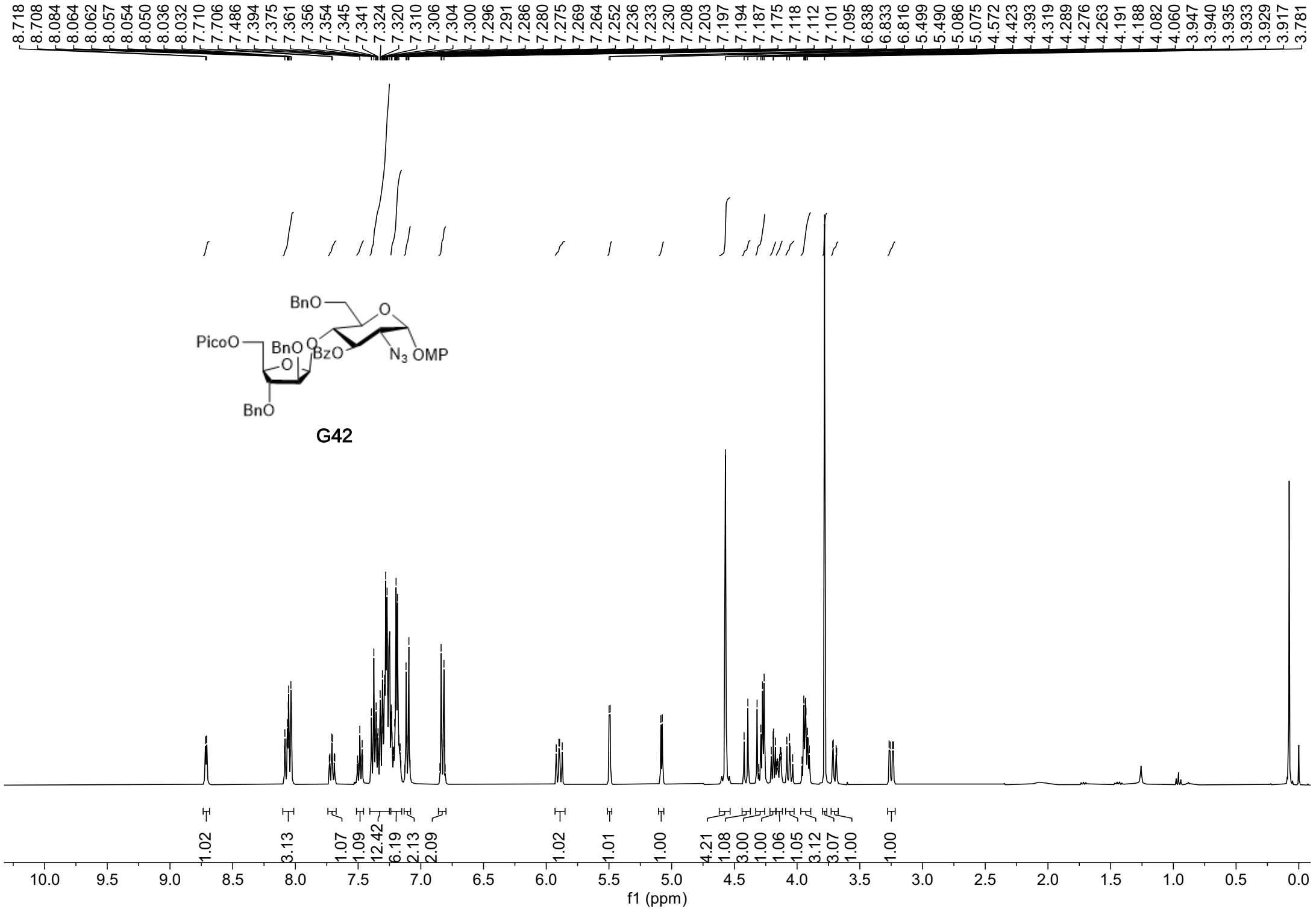

7.438 7.434 7.420 7.417 7.414 7.390 7.373 7.371 7.358 7.351 7.345 7.341 7.332 7.327 7.321 7.315 7.310 7.304 7.301 7.296 7.283 7.279 7.275 7.272 7.264 7.258 7.253 7.234 7.229 7.226 7.213 7.195 7.173 7.029 7.025 6.841 6.836 6.827 6.820 6.806 5.274 5.248 5.015 4.997 4.956 4.946 4.929 4.868 4.842 4.837 4.815 4.795 4.784 4.779 4.767 4.739 4.732 4.567 4.522 4.495 3.802 3.794 3.783 3.745 3.670 3.652 3.645 3.630 3.626 0.852 -0.007 -0.044
PMBO
OTBS
O
BnO
BnO
O
PMBO
O
BnO
O
BnO
I
1.00 2.13 2.12 8.24 7.12 3.07 2.09 1.10 1.10 4.24 1.03
1.00 1.03 2.05 8.34 1.05 1.01
1.00 1.06 9.12 5.24 1.03 1.02
9.01
2.99 2.90
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

G40

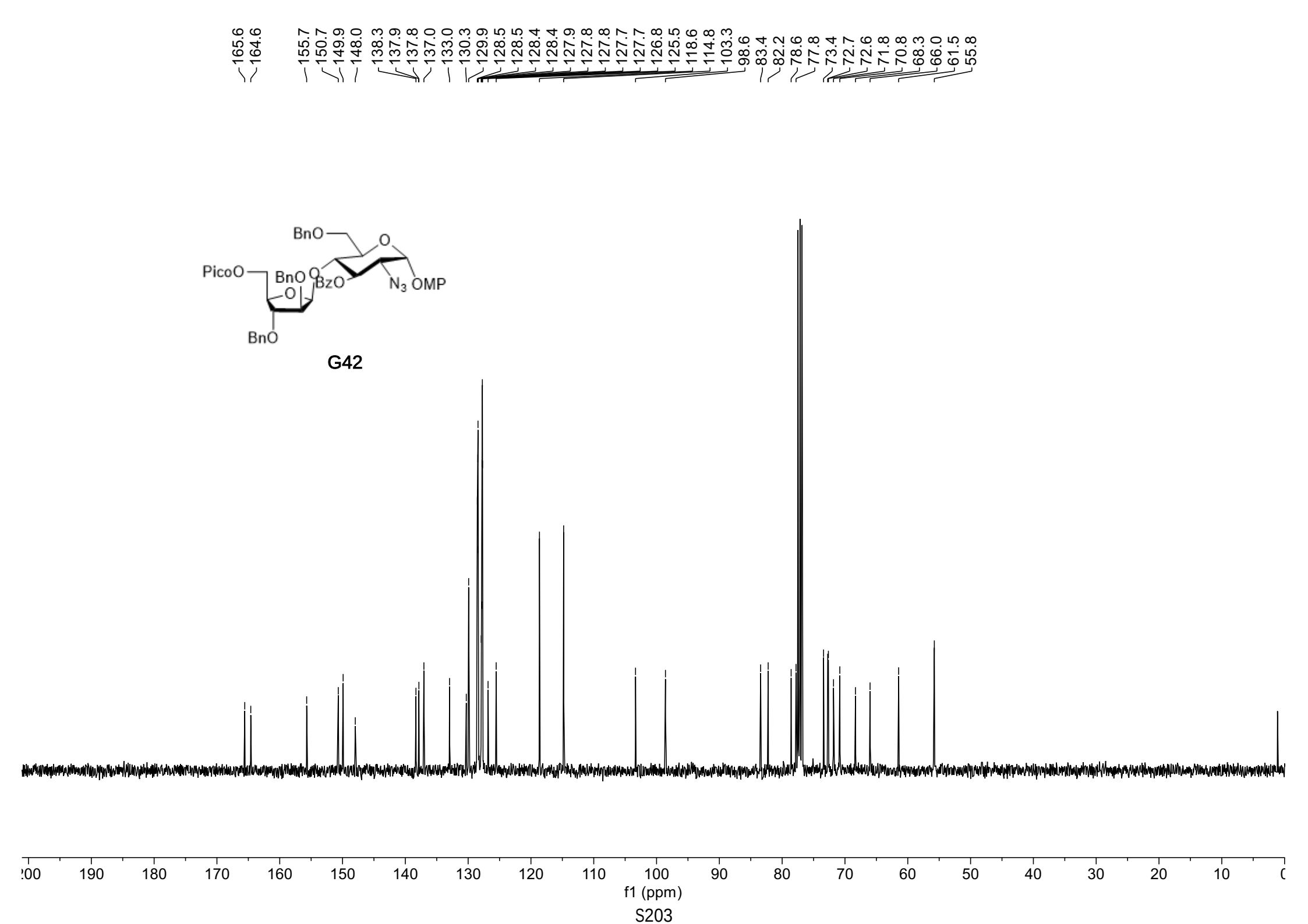

159.5
159.3
156.4
139.8
139.2
139.0
138.8
138.5
131.2
130.4
129.9
129.8
129.5
129.0
128.5
128.5
127.9
127.8
127.7
127.6
127.5
124.0
115.3
114.0
113.7
100.9
98.0
86.3
84.9
82.0
78.7
77.7
77.0
75.8
75.7
75.3
74.9
74.8
74.5
73.2
72.9
71.3
66.2
62.1
55.4
55.4
26.1
18.3
-5.2
-5.3
PMBO
OTBS
O
BnO
BnO
O
O
PMBO
BnO
BnO
O
I
G40
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

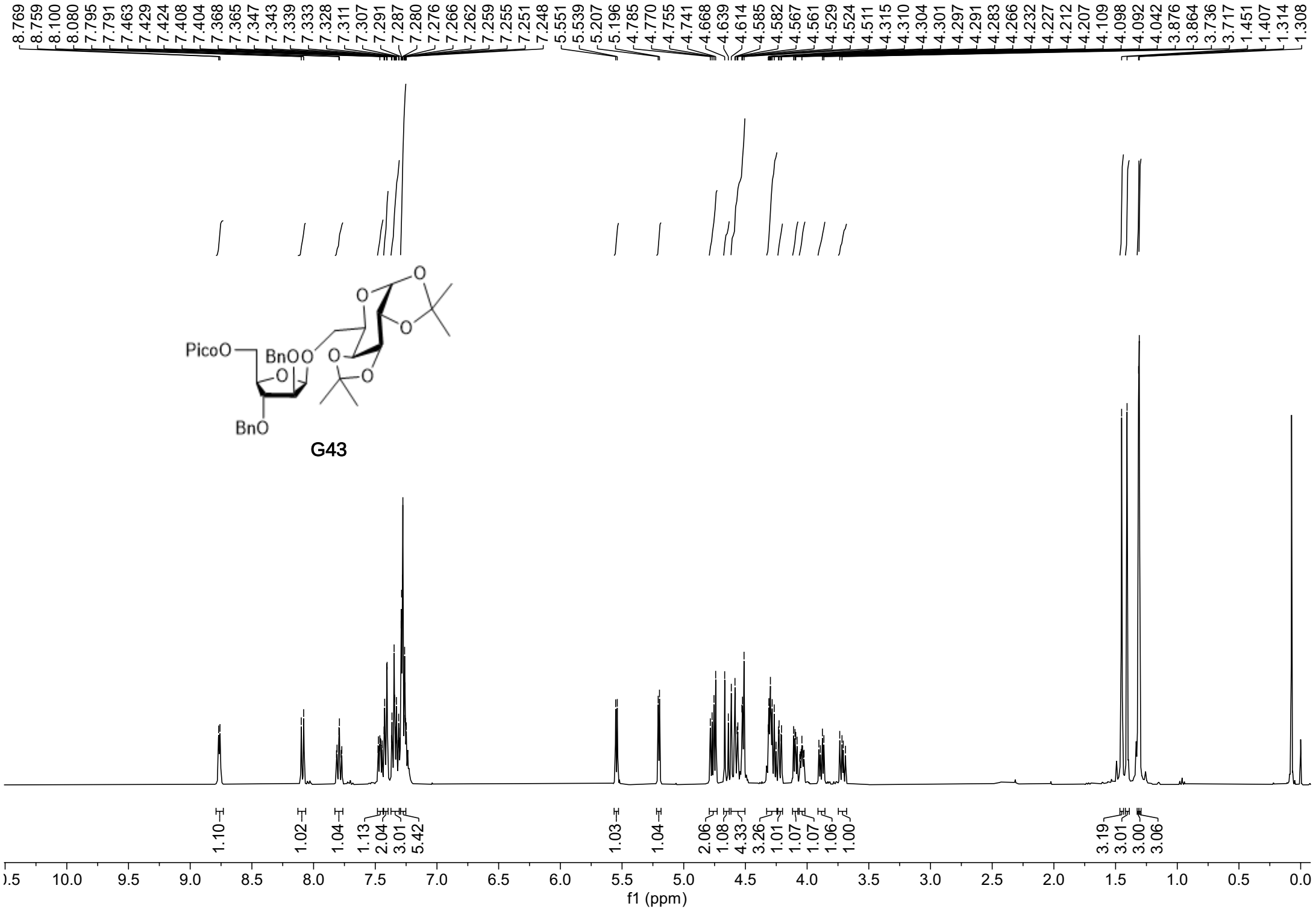

7.395 7.381 7.379 7.377 7.375 7.351 7.348 7.346 7.342 7.339 7.334 7.331 7.326 7.316 7.313 7.311 7.293 7.276 7.222 7.218 7.201 7.149 7.138 7.120 7.118 7.070 7.068 7.066 7.062 7.050 7.045 6.804 6.799 6.782 5.584 5.578 5.405 4.894 4.865 4.844 4.817 4.739 4.710 4.665 4.646 4.552 4.547 4.519 4.480 4.450 3.991 3.987 3.971 3.969 3.965 3.865 3.841 3.787 3.776 3.762 3.666 3.651 3.644 3.625 3.454 3.448 0.948 0.909 0.172 0.160 0.074 0.069
OTBS
Ph
PMBO
O
O
O
BnO
BnO
O
O
N3
OTBS
G41
2.20 7.29 1.09 2.14 3.13 2.03 2.07
1.00 1.00
1.05 1.04 1.05 1.03 2.13 1.04 1.03 1.08 3.08 1.07 1.14 3.07 0.99 2.11 2.06
9.10 9.05
2.95 2.87 2.93 2.89
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

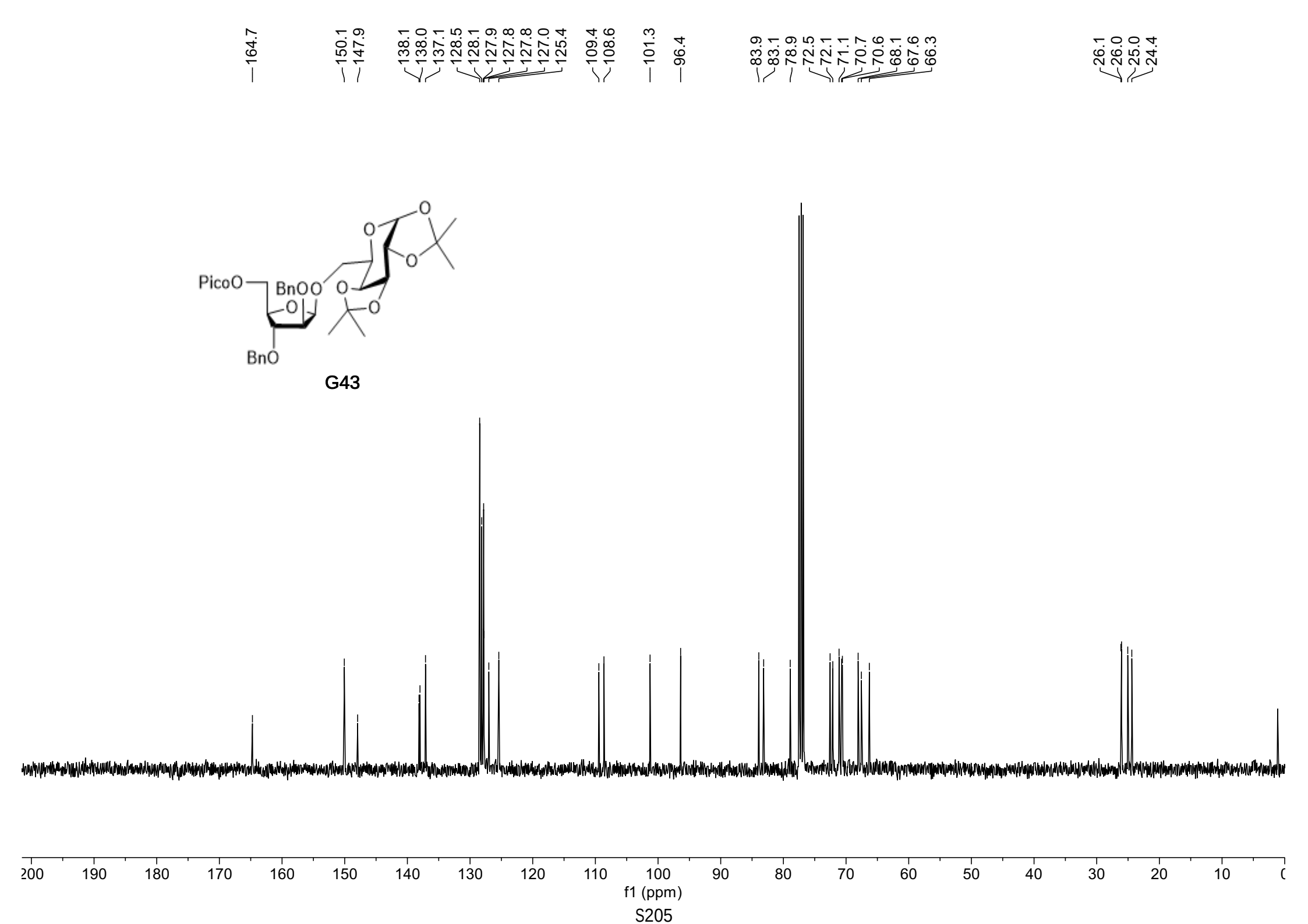

159.3
139.2
138.5
137.0
131.2
130.0
129.5
128.5
128.4
128.2
127.6
127.5
127.5
127.4
126.3
113.7
101.9
98.0
96.9
82.4
78.6
75.9
74.7
74.7
73.4
73.2
72.0
71.3
68.9
67.8
66.3
61.6
55.4
26.0
25.7
18.4
18.1
-4.2
-5.0
-5.3
-5.4
OTBS
Ph
PMBO
O
O
O
BnO
BnO
O
O
N_3
OTBS
G41
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.718 8.708 8.084 8.064 8.062 8.057 8.054 8.050 8.036 8.032 7.710 7.706 7.486 7.394 7.375 7.361 7.356 7.354 7.345 7.341 7.324 7.320 7.310 7.306 7.304 7.300 7.296 7.291 7.286 7.280 7.275 7.269 7.264 7.252 7.236 7.233 7.230 7.208 7.203 7.197 7.194 7.187 7.175 7.118 7.112 7.101 7.095 6.838 6.833 6.816 5.499 5.490 5.086 5.075 4.572 4.423 4.393 4.319 4.289 4.276 4.263 4.191 4.188 4.082 4.060 3.947 3.940 3.935 3.933 3.929 3.917 3.781
BnO
O
PicoO
BnO
O
BzO
N3
OMP
O
BnO
1.02 3.13 1.07 1.09 12.42 6.19 2.13 2.09 1.02 1.01 1.00 4.21 1.08 3.00 1.00 1.06 1.05 3.12 3.07 1.00 1.00
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

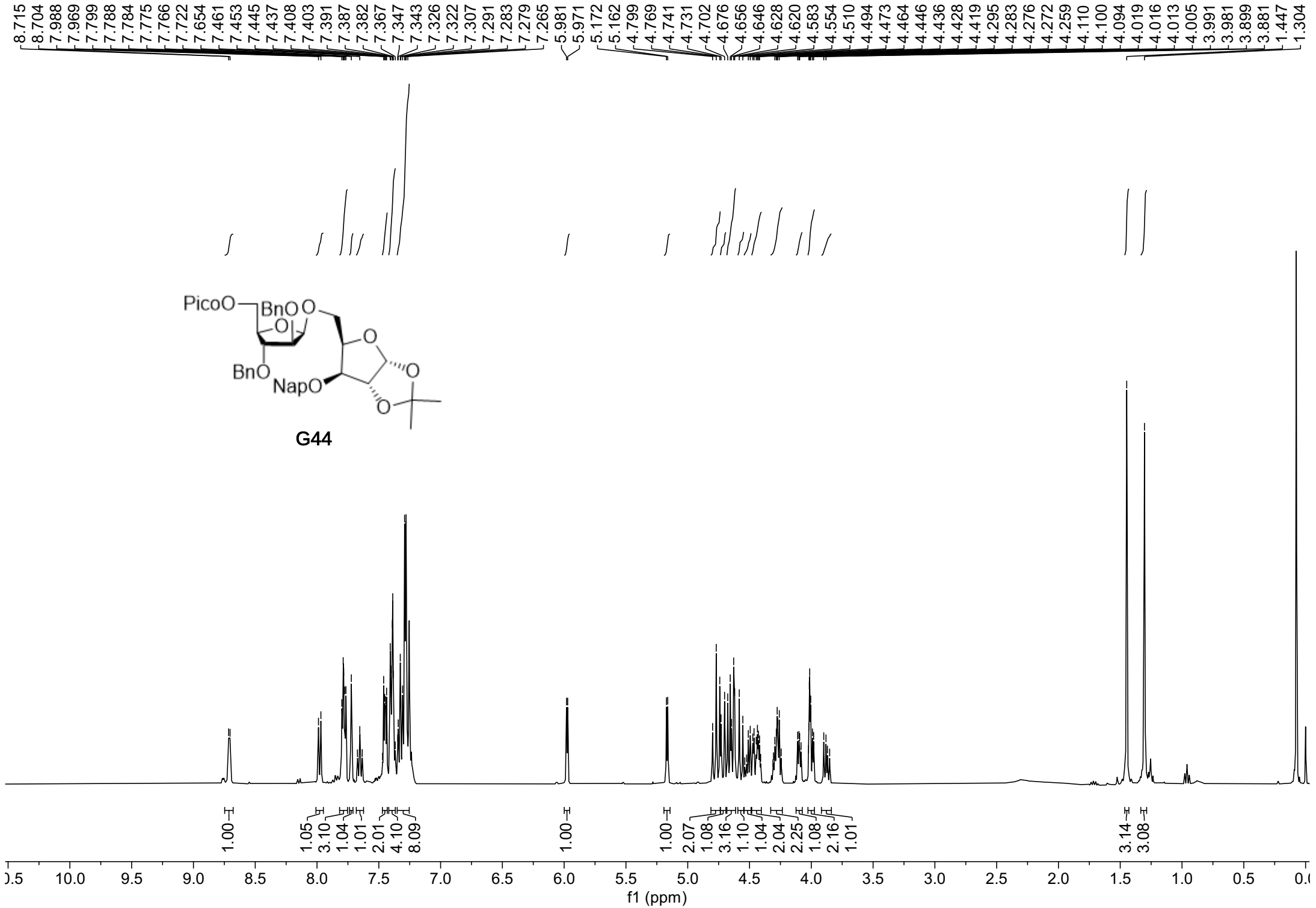
G42


165.6
164.6
155.7
150.7
149.9
148.0
138.3
137.9
137.8
137.0
133.0
130.3
129.9
128.5
128.5
128.4
128.4
127.9
127.8
127.8
127.7
127.7
126.8
125.5
118.6
114.8
103.3
98.6
83.4
82.2
78.6
77.8
73.4
72.7
72.6
71.8
70.8
68.3
66.0
61.5
55.8
BnO
O
PicoO
BnO
O
BzO
N3
OMP
O
BnO
G42
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

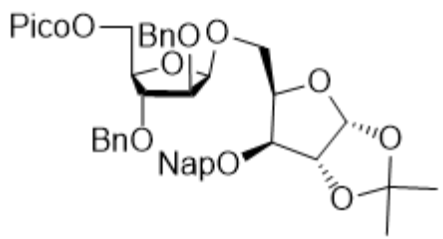

8.769 8.759 8.100 8.080 7.795 7.791 7.463 7.429 7.424 7.408 7.404 7.368 7.365 7.347 7.343 7.339 7.333 7.328 7.311 7.307 7.291 7.287 7.280 7.276 7.266 7.262 7.259 7.255 7.251 7.248
5.551 5.539 5.207 5.196 4.785 4.770 4.755 4.741 4.668 4.639 4.614 4.585 4.582 4.567 4.561 4.529 4.524 4.511 4.315 4.310 4.304 4.301 4.297 4.291 4.283 4.266 4.232 4.227 4.212 4.207 4.109 4.098 4.092 4.042 3.876 3.864 3.736 3.717 1.451 1.407 1.314 1.308
PicoO
BnO
BnO
G43
1.10 1.02 1.04 1.13 2.04 3.01 5.42 1.03 1.04 2.06 1.08 4.33 3.26 1.01 1.07 1.07 1.06 1.00 3.19 3.01 3.00 3.06
f1 (ppm)


164.7
150.1
147.9
138.1
138.0
137.1
128.5
128.1
127.9
127.8
127.8
127.0
125.4
109.4
108.6
101.3
96.4
83.9
83.1
78.9
72.5
72.1
71.1
70.7
70.6
68.1
67.6
66.3
26.1
26.0
25.0
24.4
PicoO
BnO
BnO
O
O
O
O
O
O
O
O
f1 (ppm)

G43


8.715 8.704 7.988 7.969 7.799 7.788 7.784 7.775 7.766 7.722 7.654 7.461 7.453 7.445 7.437 7.408 7.403 7.391 7.387 7.382 7.367 7.347 7.343 7.326 7.322 7.307 7.291 7.283 7.279 7.265 5.981 5.971 5.172 5.162 4.799 4.769 4.741 4.731 4.702 4.676 4.656 4.646 4.628 4.620 4.583 4.554 4.510 4.494 4.473 4.464 4.446 4.436 4.428 4.419 4.295 4.283 4.276 4.272 4.259 4.110 4.100 4.094 4.019 4.016 4.013 4.005 3.991 3.981 3.899 3.881 1.447 1.304
PicoO
BnO
O
O
BnO
NapO
O
O
1.00 1.05 3.10 1.04 1.01 2.01 4.10 8.09 1.00 1.00 2.07 1.08 3.16 1.10 1.04 2.04 2.25 1.08 2.16 1.01 3.14 3.08
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)

G44

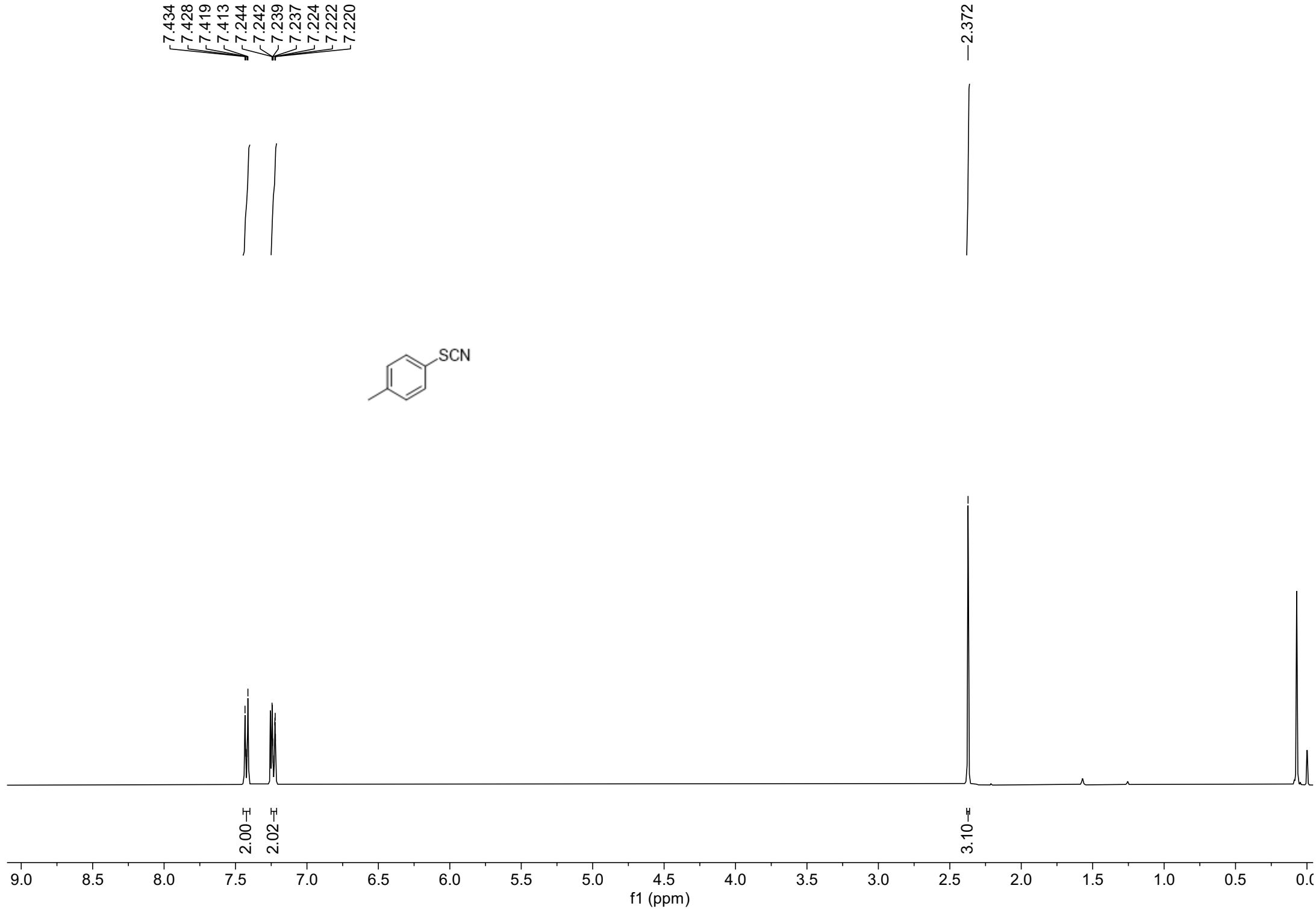


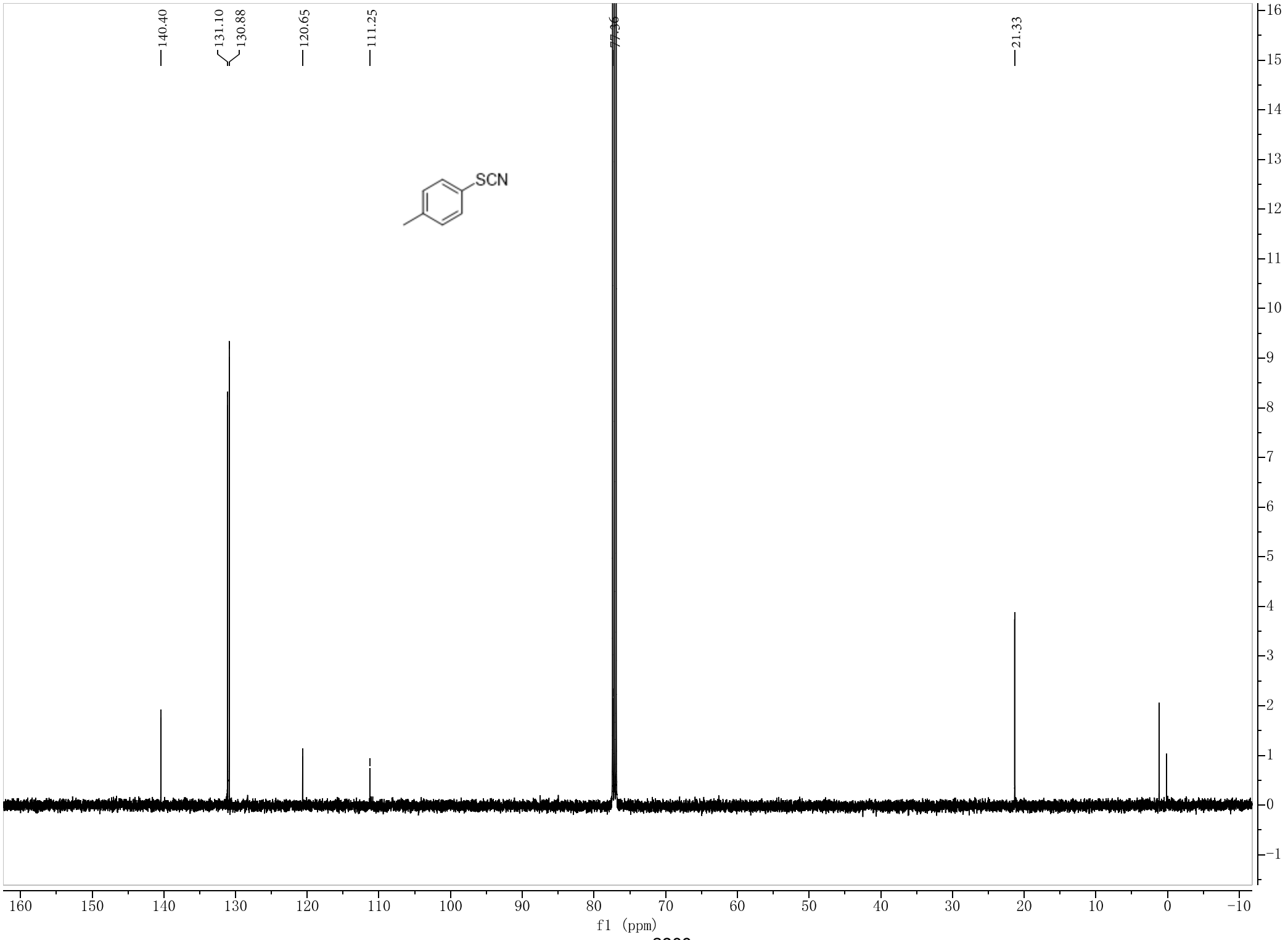
G44

164.7
149.9
147.7
138.1
137.8
137.1
135.0
133.3
133.2
128.5
128.5
128.4
128.0
128.0
127.8
127.8
127.0
126.6
126.3
126.1
125.6
125.4
111.8
105.4
101.7
84.0
82.6
82.3
82.2
80.2
78.9
72.6
72.3
72.1
67.2
66.6
26.9
26.4

00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0

f1 (ppm)


7.434
7.428
7.419
7.413
7.244
7.242
7.239
7.237
7.224
7.222
7.220
2.372
SCN
2.00
2.02
3.10
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)


140.40
131.10
130.88
120.65
111.25
77.36
21.33
SCN
f1 (ppm)