A Strategy for Minimizing Background Signal in Autoinductive Signal Amplification Reactions for Point-of-Need Assays

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Supporting Information

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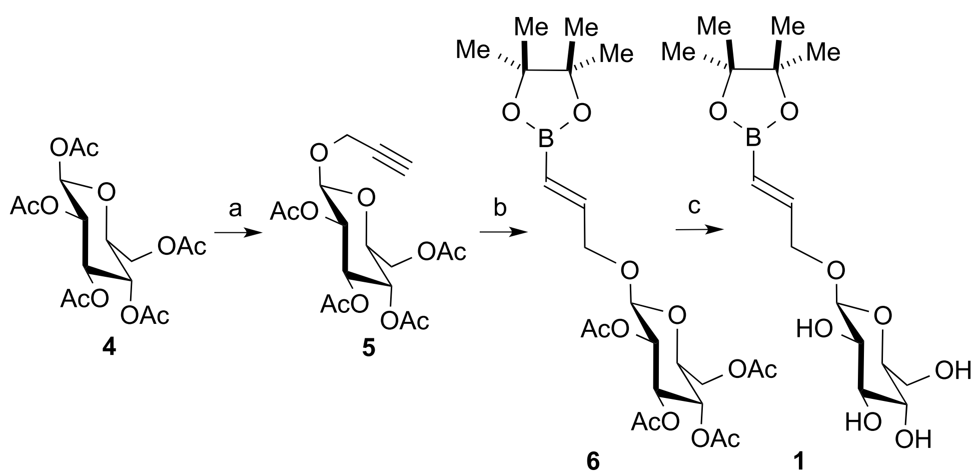
General Experimental Procedures. All reactions that required anhydrous conditions were performed in flame-dried glassware under a positive pressure of argon. Air- and moisture-sensitive liquids were transferred by syringe or stainless steel cannula. Organic solutions were concentrated by rotary evaporation (25–40 mmHg) at ambient temperature, unless otherwise noted. Flash-column chromatography was performed as described by Still et al.,[1] employing silica gel (60-Å pore size, 32–63 µm, standard grade, Dynamic Adsorbents). Thin layer chromatography was carried out on Dynamic Adsorbants silica gel TLC (20Å~20 cm w/h, F-254, 250 µm). Deionized water was purified using a millipore-purification system (Barnstead EASYpure® II UV/UF).

Synthesis of Reagent 1

Figure S1: Synthesis of Reagent **1**



(a) propargyl alcohol, $BF_3 \cdot Et_2O$, CH_2Cl_2, 89%; (b) pinacolborane, 100 ˚C, 37%; (c) (i) NaOMe, MeOH, CH_2Cl_2, (ii) Dowex H^+, 80%

1-propargyl-2,3,4,6-tetraacetate β-D-Glucopyranoside (5). This compound was prepared according to literature precedent.[2, 3] ^{1}H-NMR (300 MHz, $CDCl_3$): δ 5.24 (t, 1 H, *J* = 9.4), 5.10 (t, 1 H, *J* = 9.7), 5.02 (dd, 1 H, *J* = 7.9, 9,5), 4.78 (d, 1 H, *J* = 7.9), 4.37 (d, 2 H, *J* = 2.4), 4.27 (dd, 1 H, *J* = 4.6, 12.4), 4.14 (dd, 1 H, *J* = 2.3, 12.4), 3.73 (ddd, 1 H, *J* = 2.4, 4.6, 7.0), 2.47 (t, 1 H, *J* = 2.4), 2.09 (s, 3 H), 2.06 (s, 3 H), 2.02 (s, 3 H), 2.01 (s, 3 H). The spectral data is consistent with data for the known compound.[2, 3]

(2*E*)-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-2-propen-1-yl-2,3,4,6-tetraacetate β-D-Glucopyranoside (6). Compound **5** (0.75 g, 2 mmol) and pinacolborane (581 μL, 4 mmol, 2.0 equiv) were added to a sealed tube and purged with argon. The reaction mixture was heated to 100 °C with stirring for 48 h. The resulting residue was placed under high vacuum (~1 mmHg) at 100 °C for 17 h to remove excess pinacolborane. After cooling the reaction mixture to room temperature, the crude product was diluted with dichloromethane and purified by column chromatography (30% ethyl acetate in petroleum ether) to obtain the product as a white solid. The solid was recrystallized by dissolving it in dichloromethane and adding petroleum ether to the solution to afford compound **6** as a white crystalline solid (0.37 g, 0.73 mmol, 37%). ^{1}H-NMR (300 MHz, $CDCl_3$): δ 6.55 (dt 1 H, *J* = 3.0, 9.0, 18.0), 5.66 (d, 1 H, *J* = 18), 5.12 (m, 3 H), 4.54 (d, 1 H, *J* = 9.0), 4.24 (dd, 1 H, *J* = 3.0, 6.0), 4.28 (m, 3 H), 3.67 (m, 1 H), 2.08 (s, 3 H), 2.06 (s, 3 H), 2.01 (s, 3 H), 2.00 (s, 3 H), 1.26 (s, 12 H). The spectral data is consistent with data for the known compound.[2, 3]

(2*E*)-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-2-propen-1-yl β-D-Glucopyranoside (1). Compound **6** (68 mg, 0.14 mmol, 1 equiv) was dissolved in dry dichloromethane (0.3 mL) and anhydrous methanol (2.5 mL), and the resulting solution was stirred at room temperature. Sodium methoxide (0.20 mmol, 1.5 equiv) was added in one portion to the solution. After 1 h, an additional portion of sodium methoxide (15 mg, 0.28 mmol) was added to the reaction mixture, followed by another portion of sodium methoxide (11 mg, 0.20 mmol) after 2 h. The reaction mixture was stirred for 18 h and the resulting mixture was treated with small portions of DOWEX C-211 H^+ resin until the pH of the mixture was neutral (the acidic resin was pre-washed with methanol, acetone, and 2 M HCl and rinsed with deionized water to adjust the pH of the resin to 4 – 5). After the addition of the resin, the mixture was stirred for 1 h, after which the resin was removed by filtration and washed with methanol. The methanol washes were combined with the organic solutions, and the combined organics were concentrated under reduced pressure to afford compound **1** as a clear liquid (36 mg, 0.10 mmol, 74%). ^{1}H-NMR (360 MHz, MeOD): δ 6.55 (dt, 1 H, *J* = 7.20, 10.8, 18.0), 5.62 (d, 1 H, *J* = 3.60), 4.36 (dd, 1 H, *J* = 3.60, 7.20), 4.24 (dd, 1 H, *J* = 3.60, 7.20), 4.15 (dd, 1 H, *J* = 7.20, 10.8), 3.78 (d, 1 H, *J* = 10.8), 3.57 (dd, 1 H, *J* = 3.60, 10.8), 3.20 (m, 4 H), 1.16 (s, 12 H). The spectral data is consistent with data for the known compound.[2, 3]

References:

1. W. C. Still, M. Kahn and A. Mitra, *J. Org. Chem.*, 1978, 43, 2923-2925.
2. J. M. Chalker, C. S. C. Wood and B. G. Davis, *J. Am. Chem. Soc.*, 2009, 131, 16346-16347.
3. C. D. Spicer and B. G. Davis, *Chem. Commun.*, 2013, 49, 2747-2749.

Figure S2: ^{1}H NMR of Compound **5**

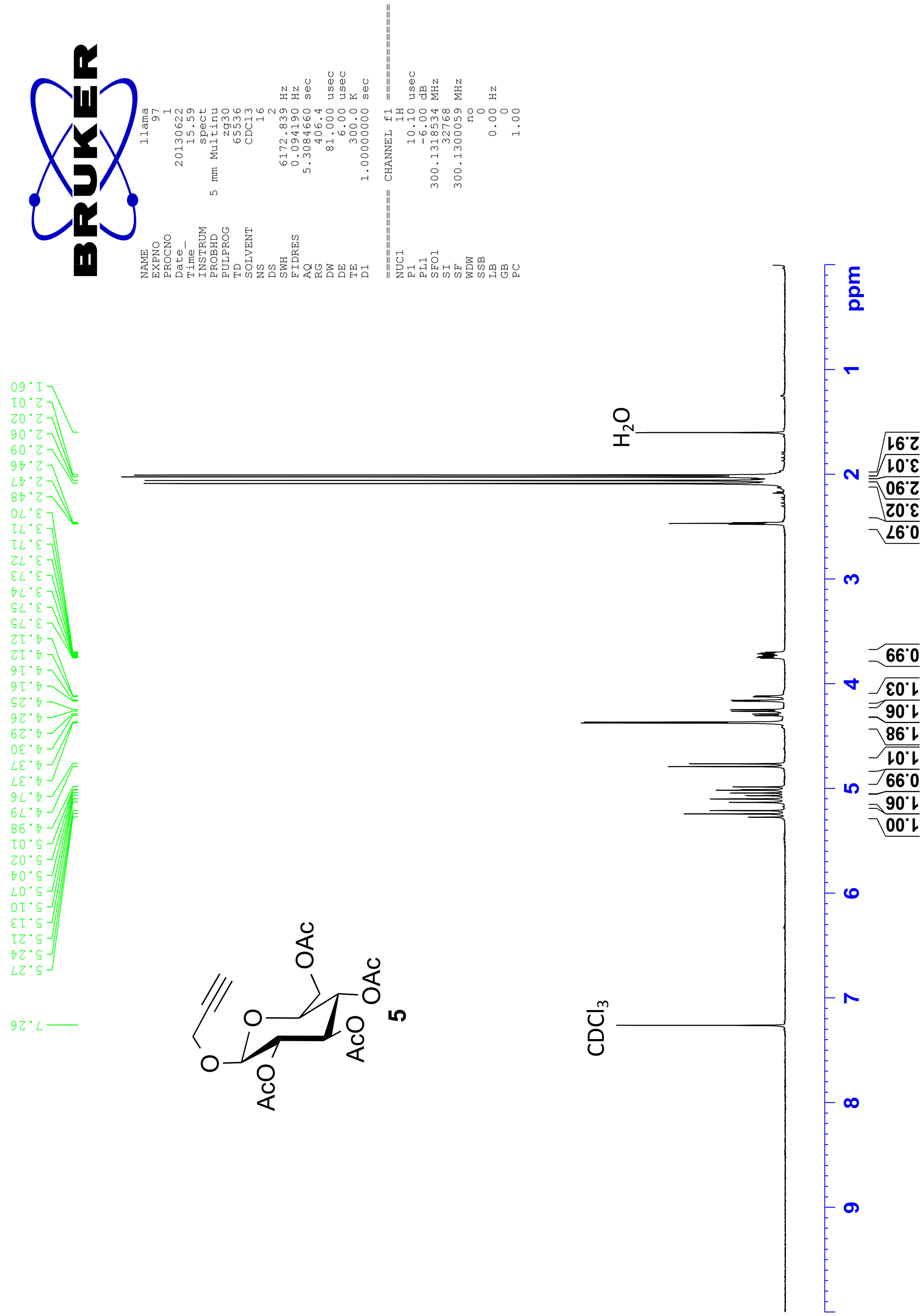


Figure S3: ^{1}H NMR of Compound **6**

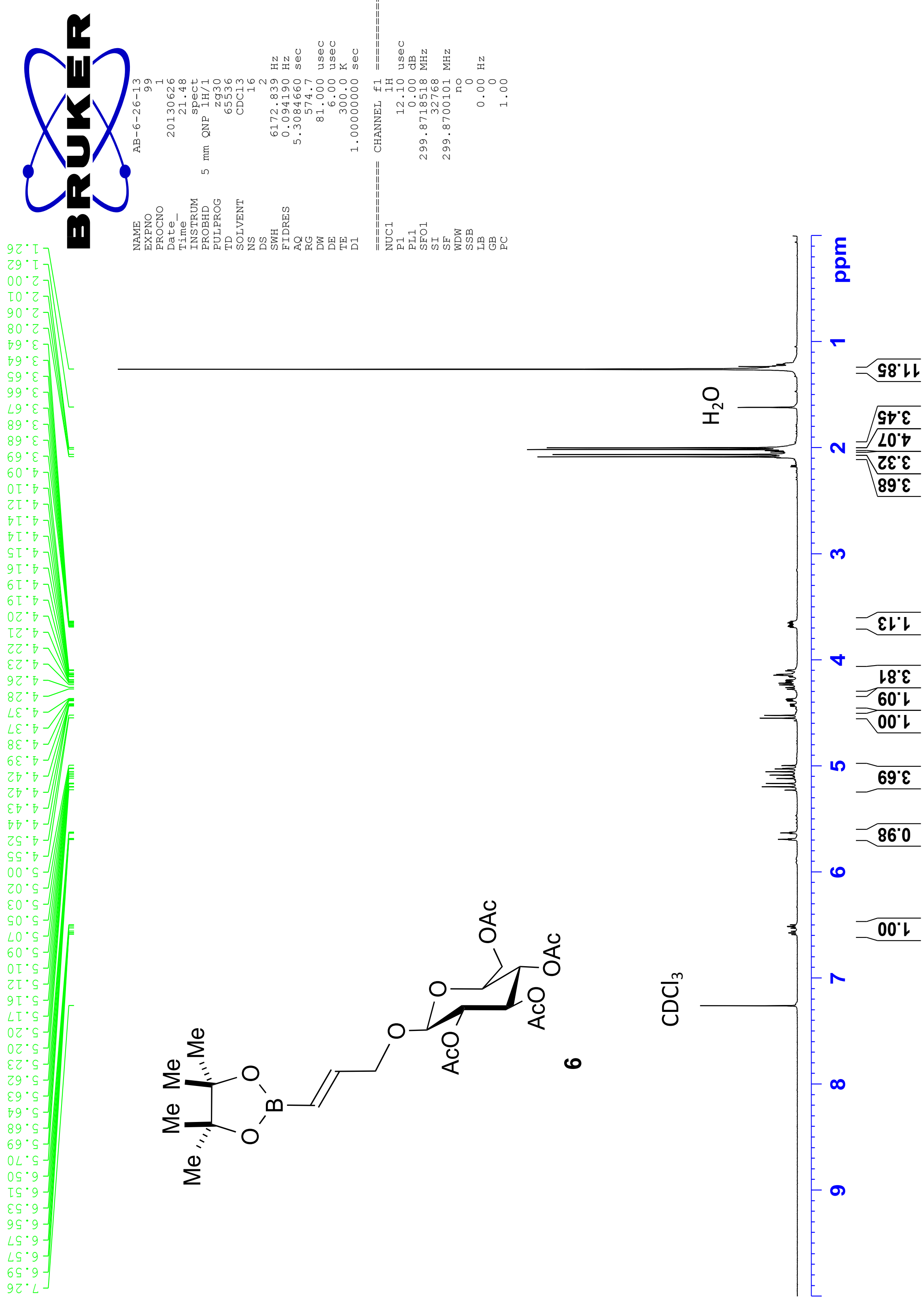


Figure S4: ^{1}H NMR of Reagent **1**