Supplementary Information for

Convergent Synthesis of Bicyclic Boronates via a Cascade Regioselective Suzuki-Miyaura/Cyclisation Protocol

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Table of contents

General Information

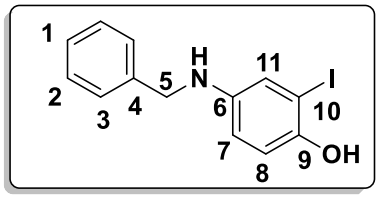
All chemicals were purchased as reagent grade and used without further purification unless stated otherwise. Microwave reaction vials were purchased from VWR (# 89079-404 (5 mL) and # 89079-402 (20 mL)). Anhydrous solvents were obtained by passing solvents through activated alumina columns and storing them over activated 4 Å molecular sieves for 24 h. Degassed solvent refers to bubbling argon through the solvent for a minimum of 15 min. Solvents for purification (extraction and chromatography) were purchased as technical grade and distilled on the rotary evaporator prior to use. For column chromatography SiO_2 (40-63 µm for flash chromatography, Macherey Nagel or VWR), $B(OH)_3$-SiO_2 (prepared according to the procedure of Snaddon)[1] and C18 (50 µm Büchi FlashPure EcoFlex 4g) were used as stationary phase. Analytical thin layer chromatography (TLC) was performed on pre-coated TLC sheets ALUGRAM® XtraSIL G/UV_{254} (Macherey Nagel). UV light (254 nm), potassium permanganate ($KMnO_4$), vanillin and *p*-anisaldehyde stain solutions were used for visualization. Concentration under reduced pressure was performed at ~10 mbar and 40 °C, anhydrousing at ~10^{-2} mbar and ambient temperature. NMR spectra were measured on either a Varian 400 MHz, Bruker Ascend 400 or Varian 600 at ambient temperature. The chemical shifts are referenced to the residual solvent peak as internal standard and are reported in ppm. The resonance multiplicity is abbreviated as: s (singlet), d (doublet), t (triplet), q (quadruplet), quint (quintet), m (multiplet) and b (broad). Assignments of unknown compounds are based on COSY(HH), HMBC and HSQC spectra. Carbon atoms bearing boron were not observed by ^{13}C NMR and are not reported. Both benzoxaborines and benzazaborines can undergo boron speciation in solution resulting in dimer formation.[2] To reduce dimer formation and aid characterization, 40 µL of D_2O were added when preparing NMR samples. High-resolution mass spectra were measured by the MS service of Freie Universität Berlin. IR spectra were recorded on a Perkin-Elmer Spectrum 100 FT-IR spectrometer and on a IRSpirit FT-IR spectrometer, selected adsorption bands are reported in wavenumbers (cm^{-1}). Optical rotations were measured on a Schimdt-Hänsch Unipol 1000. UV/Vis spectra were recorded using a Shimadzu UV-1900 I spectrophotometer. The samples were prepared and recorded in UV-grade cuvettes (PlastiBrand) or quartz cuvettes with a pathlength of 1 cm.

Synthesis of Starting Materials

General procedure A: Diborylation of alkynes

The reaction was performed according to a modified procedure of Suzuki *et al.*[3] To an oven-dried microwave vial were added bis(pinacolato)diboron (1 equiv.) and $Pt(PPh_3)_4$ (5 mol%). The vial was sealed and purged with nitrogen, before the addition of anhydrous DMF (0.17 M). The reaction was stirred and, upon complete dissolution, the alkyne (1.1 or 1.2 equiv.) was added via syringe. The reaction mixture was then stirred at 80 °C for 24 h. After completion, the reaction was allowed to cool to ambient temperature and transferred to a separation funnel with toluene (5 times the volume of DMF used). The organic layer was washed with cold H_2O (5 x 5 times the volume of DMF used), dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified either by distillation or flash column chromatography ($B(OH)_3$-SiO_2, specified mixture of solvents).

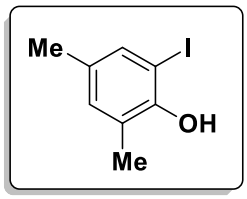
4-(Benzylamino)-2-iodophenol (S1)



To a solution of 3-amino-2-iodophenol (500 mg, 2.13 mmol, 1 equiv.) in anhydrous MeOH (15 mL, 0.14 M) were added benzaldehyde (220 µL, 2.13 mmol, 1 equiv.) and glacial acetic acid (120 µL, 2.13 mmol, 1 equiv.). The mixture was stirred at ambient temperature for 3 h, before the portionwise addition of sodium cyanoborohydride (268 mg, 4.26 mmol, 2 equiv.). The reaction mixture was stirred at ambient temperature for 3 h. The solvent was removed under reduced pressure and the residue dissolved in EtOAc (20 mL). The solution was washed with H_2O (20 mL) and brine (20 mL), dried with Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified via flash column chromatography (C18, MeCN/H_2O 20%→100%) yielding **S1** as a brown solid (456 mg, 66%).

***R**f* (DCM) = 0.59; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.35 (d, *J* = 4.4 Hz, 4H, H2 and H3), 7.32 – 7.27 (m, 1H, H1), 6.96 (d, *J* = 2.7 Hz, 1H, H11), 6.82 (d, *J* = 8.7 Hz, 1H, H8), 6.57 (dd, *J* = 8.7, 2.8 Hz, 1H, H7), 4.24 (s, 2H, H5) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 147.4 (C9), 143.5 (C6), 139.2 (C4), 128.8 (C3), 127.7 (C2), 127.5 (C1), 121.8 (C11), 115.7 (C7), 115.6 (C8), 86.3 (C10), 49.2 (C5) ppm; **IR** (ATR) $\tilde{\nu}$ = 3734, 3588, 3568, 3285, 2376, 1509, 1490, 1339, 1276, 1216, 1197, 1067, 1027, 808, 755, 696, 607 cm^{-1}; **HRMS** (ESI) calcd. for $C_{13}H_{13}INO$ $[M + H]^+$ 326.0036, found 326.0058.

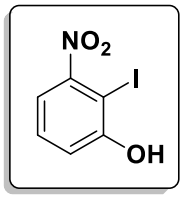
2-Iodo-4,6-dimethylphenol (S2)



The reaction was performed according to a modified procedure of Ball *et al.*[4] To a solution of 2,4-dimethylphenol (1.2 mL, 10 mmol, 1 equiv.) in anhydrous DCM (25 mL, 0.4 M) was added a solution of iodine monochloride (1.79 g, 11 mmol, 1.1 equiv.) in acetic acid (1.2 mL, 20 mmol, 2 equiv.). The mixture was stirred at ambient temperature for 64 h, before quenching with saturated aqueous solution of $Na_2S_2O_5$ (10 mL). After 30 minutes the mixture was transferred to a separation funnel and extracted with DCM (3 × 10 mL). The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by flash column chromatography (SiO_2, AcOH/DCM 2%), yielding **S4** as a colorless oil (1.290 g, 52%).

^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.31 (dq, *J* = 2.1, 0.7 Hz, 1H), 6.90 (dq, *J* = 2.1, 0.7 Hz, 1H), 5.13 (s, 1H), 2.27 (s, 3H), 2.22 (s, 3H) ppm; analytic data in agreement with literature.[4]

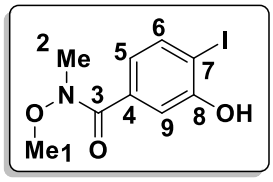
2-Iodo-3-nitrophenol (S3)



The reaction was performed according to a modified procedure of Zhang *et al*.[5] To a solution of 2-amino-3-nitrophenol (1.0 g, 6.49 mmol, 1.0 equiv.) in DMSO (16.9 mL, 0.38 M), was added 30% aqueous H_2SO_4 (33.8 mL) via syringe. The mixture was stirred for 1 h, then cooled to 0 °C. A solution of $NaNO_2$ (671 mg, 9.73 mmol, 1.5 equiv.) in H_2O (3.3 mL) was added via syringe and the reaction mixture was allowed to react for 1 h at 0 °C. Subsequently a solution of KI (1.62 g, 9.73 mmol, 1.5 equiv.) and iodine (1.24 g, 4.87 mmol, 0.75 equiv.) in H_2O (8.3 mL) was added via syringe. After 1 h of stirring at ambient temperature, more solution of KI (538 mg, 3.24 mmol, 0.5 equiv.) and iodine (616 mg, 2.42 mmol, 0.37 equiv.) in H_2O (8.3 mL) was added via syringe. The reaction mixture was stirred for 1 h at ambient temperature and for 2 h at 80 °C. Upon completion, EtOAc (50 mL) was added and the mixture was washed with brine (50 mL), 10% $NaHSO_3$ (50 mL) and H_2O (50 mL). The organic phase was dried over Na_2SO_4 and concentrated under reduces pressure. The crude residue was purified by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0%→10%) yielding **S3** as a yellow solid (1.56 g, 90%).

^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.42 – 7.36 (m, 2H), 7.07 – 7.02 (m, 1H) ppm; analytic data in agreement with literature.[5]

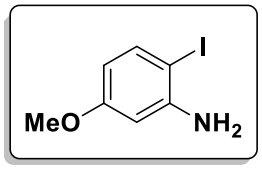
3-Hydroxy-4-iodo-*N*-methoxy-*N*-methylbenzamide (S4)



To an oven-dried microwave vial was added 3-hydroxy-4-iodobenzoic acid (264 mg, 1 mmol, 1 equiv.) The vial was sealed and purged with nitrogen. Thionyl chloride (1.1 mL, 15 mmol, 15 equiv.) was added together with a drop of anhydrous DMF. The mixture was stirred at 60 °C for 3 h. The volatiles were then removed under reduced pressure and the residue dissolved in DCM (2 mL) and added dropwise to a stirred solution of *N*,*O*-dimethylhydroxylamine hydrochloride salt (390 mg, 4 mmol, 4 equiv.) and NEt_3 (560 µL, 4 mmol, 4 equiv.) in DCM (2 mL). The mixture was stirred at ambient temperature for 16 h before quenching with saturated aqueous solution of NH_4Cl (5 mL). The mixture was transferred to a separation funnel and extracted with DCM (3 x 5 mL) The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by flash column chromatography (SiO_2, AcOH/DCM 5%), yielding **S4** as a white solid (79 mg, 26%).

***R*$_f$** (DCM) = 0.55; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.70 (d, *J* = 8.2 Hz, 1H, H6), 7.36 (d, *J* = 2.0 Hz, 1H, H9), 6.99 (dd, *J* = 8.2, 2.0 Hz, 1H, H5), 3.56 (s, 3H, H1), 3.36 (s, 3H, H2) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 168.8 (C3), 155.3 (C8), 138.4 (C6), 135.7 (C4), 121.8 (C5), 115.3 (C9), 88.5 (C7), 61.5 (C1) ppm, C2 not observed due to quadrupolar relaxation of nitrogen; **IR** (ATR) $\tilde{\nu}$ = 2979, 2930, 2851, 1734, 1629, 1579, 1476, 1401, 1383, 1294, 1268, 1220, 1199, 1164, 1126, 1071, 1012, 942, 900, 876, 849, 815, 741, 699, 656, 615 cm^{-1}; **HRMS** (ESI) calcd. for $C_9H_{10}INO_3Na$ $[M + Na]^+$ 329.9598, found 329.9581.

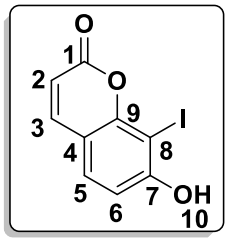
2-Iodo-5-methoxyaniline (S5)



The reaction was performed according to a modified procedure of Sokolov *et al.*[6] To a suspension of 1-iodo-4-methoxy-2-nitrobenzene (1.40 g, 5 mmol, 1 equiv.) and NH_4Cl (1.34 g, 25 mmol, 5 equiv.) in EtOH (15 mL) and H_2O (7.5 mL), was added iron powder (838 mg, 15 mmol, 3 equiv.). The reaction mixture was refluxed for 2 h, subsequently filtered and the filter cake was washed with H_2O (70 mL) and DCM (15 mL). The phases were separated and the aqueous phase was extracted with DCM (3 x 20 mL). The combined organic phases were washed with H_2O (20 mL), dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0%→10%) yielding **S5** as a yellow solid (1.09 g, 88%).

^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.48 (d, J = 8.7 Hz, 1H), 6.33 (d, J = 2.8 Hz, 1H), 6.14 (dd, J = 8.7, 2.8 Hz, 1H), 4.09 (br, 2H), 3.75 (s, 3H) ppm; analytic data in agreement with literature.[7]

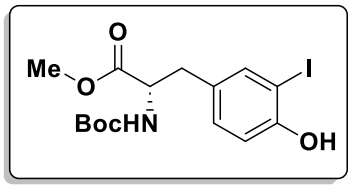
7-Hydroxy-8-iodo-2*H*-chromen-2-one (S6)



To a round-bottom-flask were added 7-hydroxy-2*H*-chromen-2-one (200 mg, 1.23 mmol, 1 equiv.) and 20% aqueous solution of NH_3 (5 mL). To the solution were added 5% aqueous solution of KI (10 mL) and iodine (313 mg, 1.23 mmol, 1 equiv.) and the reaction stirred for 16 h, before quenching with 1.25 M aqueous solution of H_2SO_4 (30 mL). The formed precipitate was collected and dried. The crude residue was purified by flash column chromatography (C18, MeCN/H_2O 20%→100%), yielding **S6** as a white solid (223 mg, 63%).

***R*$_f$** (Acetone) = 0.75; **^{1}H NMR** (400 MHz, Acetone d_6) δ = 10.12 (br, 1H, H10), 7.85 (dd, *J* = 9.4, 1.4 Hz, 1H, H5), 7.54 (dd, *J* = 8.4, 1.9 Hz, 1H, H3), 6.98 (d, *J* = 8.4 Hz, 1H, H2), 6.21 (d, *J* = 9.4 Hz, 1H, H6) ppm; **^{13}C NMR** (151 MHz, Acetone d_6) δ = 161.7 (C1), 160.7 (C7), 156.5 (C9), 144.7 (C5), 130.4 (C3), 113.7 (C4), 113.4 (C6), 112.6 (C2), 74.1 (C8) ppm; **IR** (ATR) $\tilde{\nu}$ = 3321, 2347, 1697, 1648, 1638, 1596, 1561, 1545, 1535, 1509, 1459, 1424, 1404, 1362, 1339, 1305, 1265, 1232, 1166, 1140, 1104, 1027, 927, 837, 804, 791, 755, 713, 701, 669, 648, 630 cm^{-1}; **HRMS** (EI) calcd. for $C_9H_5IO_3$ $[M]^+$ 287.9278, found 287.9265.

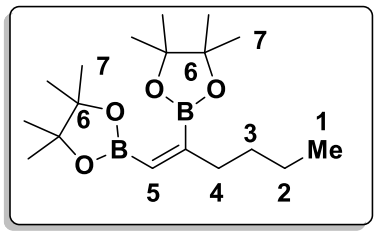
Methyl (*S*)-2-((tert-butoxycarbonyl)amino)-3-(4-hydroxy-3-iodophenyl)propanoate (S7)



The reaction was performed according to a modified procedure of Schindler *et al.*[8] To a suspension of (*S*)-2-amino-3-(4-hydroxy-3-iodophenyl)propanoic acid (460.6 mg, 1.5 mmol, 1 equiv.) in MeOH (2 mL) at 0 °C was added $SOCl_2$ dropwise (163 µL, 2.25 mmol, 1.5 equiv.). The reaction was stirred at ambient temperature for 16 h. After completion, the solvent was removed under reduced pressure and the residue redissolved in dioxane:H_2O (4:1) (3 mL). To the stirred mixture was added Et_3N (625 µL, 4.5 mmol, 3 equiv.) and Boc_2O (370 µL, 1.6 mmol, 1.07 equiv.). The mixture was stirred for 4 h at ambient temperature. Then dioxane was removed under reduced pressure and the residue transferred to a separation funnel with EtOAc (3 mL). The mixture was washed with 1 M HCl (5 mL) and the aqueous phase extracted with EtOAc (3 x 3 mL). The combined organic phases were dried over Na_2SO_4, concentrated under reduced pressure to afford **S7** as a white solid (524 mg, 83%).

^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.42 (d, *J* = 2.1 Hz, 1H), 6.98 (dd, *J* = 8.2, 2.1 Hz, 1H), 6.87 (d, *J* = 8.3 Hz, 1H), 5.66 (s, 1H), 5.02 (d, *J* = 8.3 Hz, 1H), 4.60 – 4.46 (m, 1H), 3.72 (s, 3H), 3.09 – 2.86 (m, 2H), 1.42 (s, 9H) ppm; analytic data in agreement with literature.[8]

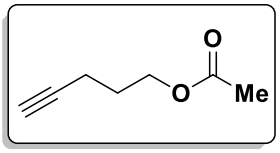
(*E*)-2,2'-(Hex-1-ene-1,2-diyl)bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolane) (2)



Prepared according to General Procedure **A**, hex-1-yne (130 µL, 1.1 mmol, 1.1 equiv.) was converted to **2** yielding a pale-yellow oil (219 mg, 65%), after distillation.

***R**$_f$* (EtOAc/*n*-hexane 20%) = 0.70; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 55.86 – 5.82 (m, 1H, H5), 2.26 – 2.15 (m, 2H, H4), 1.44 – 1.34 (m, 2H, H3), 1.32-1.28 (m, 2H, H2), 1.31 (d, *J* = 1.9 Hz, 12H, H7), 1.26 (d, *J* = 1.9 Hz, 12H, H7), 0.86 (t, *J* = 7.3 Hz, 3H, H1) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 83.7 (C6), 83.4 (C6), 39.7 (C4), 30.9 (C3), 25.0 (C7), 25.0 (C7), 22.6 (C2), 14.1 (C1) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 29.64 ppm; **IR** (ATR) $\tilde{\nu}$ = 3747, 2978, 2930, 1618, 1400, 1390, 1378, 1371, 1332, 1305, 1272, 1220, 1139, 1005, 969, 894, 860, 850, 836, 719, 702, 669 cm^{-1}; **HRMS** (EI) calcd. for $C_{18}H_{34}B_2O_4$ $[M]^+$ 336.2638, found 336.2645.

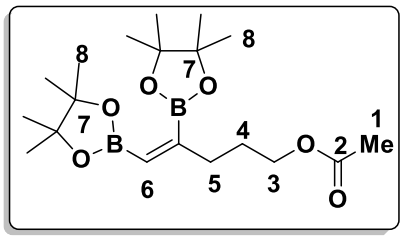
Pent-4-yn-1-yl acetate (S8)



To a solution of pent-4-yn-1-ol (2 mL, 21.4 mmol, 1 equiv.) in anhydrous pyridine (6 mL, 3.6 M) was added Ac_2O (2.4 mL, 25.4 mmol, 1.2 equiv.) at 0 °C. The mixture was stirred at ambient temperature for 16 h. The reaction mixture was diluted with saturated aqueous solution of NH_4Cl (20 mL), transferred to a separating funnel and exrtacted with DCM (3 x 10 mL). The combined organic layers were washed with brine (20 mL), dried over Na_2SO_4 and concentrated under reduced pressure, yielding **S8** as a colorless oil (2.619 g, 97%).

^{1}H NMR (400 MHz, $CDCl_3$) δ = 4.17 (t, *J* = 6.4 Hz, 2H), 2.29 (td, *J* = 7.0, 2.7 Hz, 2H), 2.06 (s, 3H), 1.97 (t, *J* = 2.7 Hz, 1H), 1.90 – 1.80 (m, 2H) ppm; analytic data in agreement with literature.[9]

(*E*)-4,5-bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)pent-4-en-1-yl acetate (S9)

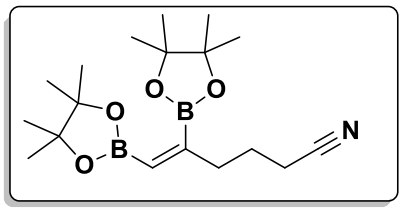


Prepared according to General Procedure **A**, **S8** (139 mg, 1.1 mmol, 1.1 equiv.) was converted to **S9** yielding a pale-yellow oil (175 mg, 46%), after purification by flash column chromatography ($B(OH)_3$-SiO_2, EtOAc/ *n*-hexane 0→9%).

***R**$_f$* (EtOAc/*n*-hexane 20%) = 0.45; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 5.89 (s, 1H, H6), 4.05 (t, J = 6.6 Hz, 2H, H3), 2.28 (t, J = 7.7 Hz, 2H, H5), 2.03 (s, 3H, H1), 1.81 – 1.71 (m, 2H, H4), 1.30 (s, 12H, H8), 1.27 (s, 12H, H8) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ =171.3 (C2), 83.9 (C7), 83.5 (C7), 64.3 (C3), 35.9 (C5), 27.7 (C4), 25.0 (C8), 21.2 (C1) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 29.65 ppm; **IR** (ATR) $\tilde{\nu}$ = 3568,

2982, 2939, 1726, 1614, 1509, 1459, 1420, 1391, 1381, 1370, 1328, 1305, 1272, 1246, 1220, 1167, 1139, 1103, 1072, 1037, 966, 952, 943, 906, 879, 860, 849, 828, 765, 738, 729, 704, 669, 637, 609 cm^{-1}; **HRMS** (EI) calcd. for $C_{19}H_{34}B_2O_6$ $[M]^+$ 380.2536, found 380.2544.

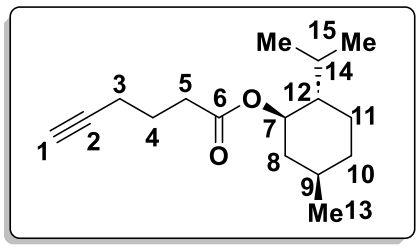
(*E*)-5,6-bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)hex-5-enenitrile (S10)



Prepared according to General Procedure **A**, hex-5-ynenitrile (1.3 mL, 12 mmol, 1.2 equiv.) was converted to **S10** yielding a pale-yellow oil (2.464 g, 71%), after distillation.

^{1}H NMR (400 MHz, $CDCl_3$) δ = 5.93 (s, 1H), 2.37-2.30 (m, 4H), 1.81 (p, *J* = 7.3 Hz, 2H), 1.30 (s, 12H), 1.27 (s, 12H) ppm; analytic data in agreement with literature.[10]

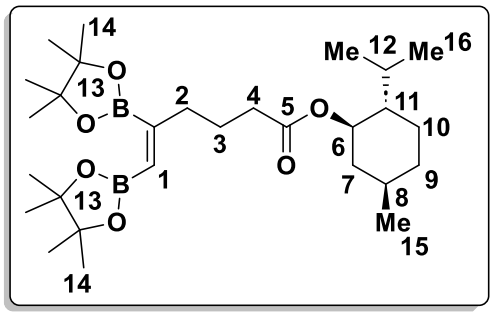
(1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl hex-5-ynoate (S11)



To a suspension of 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide monohydrochloride (2.02 g, 10.5 mmol, 1.05 equiv.) in anhydrous DCM (30 mL, 0.3 M) at 0 °C were added hexynoic acid (1.1 mL, 10 mmol, 1 equiv.) and Et_3N (3.5 mL, 25 mmol, 2.5 equiv.). The mixture was stirred for 5 minutes before the addition of a solution of (1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexan-1-ol (1.05 g, 6.7 mmol, 0.7 equiv.) and 4-dimethylaminopyridine (78 mg, 0.6 mmol) in anhydrous DCM (40 mL). The reaction mixture was stirred at ambient temperature for 4 h. The reaction was quenched by the addition of saturated aqueous solution of NH_4Cl (60 mL). The mixture was transferred to a separation funnel and washed with DCM (3 x 50 mL). The combined organic phases were washed with brine (60 mL), dried over Na_2SO_4 and concentrated under reduced pressure. The residue was purified by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→6%) yielding **S11** as a colorless oil (1.493 g, 89%).

R_f (EtOAc/*n*-hexane 20%) = 0.69; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 4.68 (td, *J* = 10.9, 4.4 Hz, 1H, H7), 2.46 – 2.39 (m, 2H, H5), 2.26 (td, *J* = 7.0, 2.6 Hz, 2H, H3), 2.01 – 1.93 (m, 2H, H1 and H8), 1.90 – 1.79 (m, 3H, H4 and H14), 1.71 – 1.63 (m, 2H, H10 and H11), 1.54 – 1.43 (m, 1H, H9), 1.40 – 1.31 (m, 1H, H12), 1.11 – 0.91 (m, 3H, H8, H10 and H14), 0.90 (d, *J* = 3.1 Hz, 3H, H13), 0.88 (d, *J* = 3.5 Hz, 3H, H15), 0.86-0.80 (m, 1H, H11), 0.75 (d, *J* = 7.0 Hz, 3H, H15) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 172.8 (C6), 83.5 (C2), 74.3 (C7), 69.2 (C1), 47.1 (C12), 41.1 (C8), 34.4 (C11), 33.5 (C5), 31.5 (C9), 26.4 (C14), 23.9 (C4), 23.5 (C10), 22.2 (C13), 20.9 (C15), 18.0 (C3), 16.4 (C15) ppm; **IR** (ATR) $\tilde{\nu}$ = 3736, 3588, 3568, 3285, 2376, 1509, 1490, 1339, 1276, 1216, 1197, 1067, 1027, 808, 755, 696, 607 cm^{-1}; **HRMS** (EI) calcd. for $C_{16}H_{26}O_2$ $[M]^+$ 250.1927, found 250.1995.

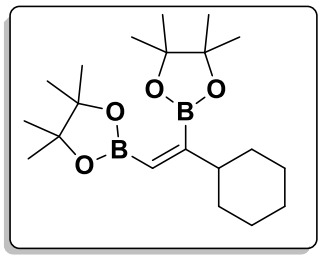
(1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl (E)-5,6-bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)hex-5-enoate (S12)



Prepared according to General Procedure **A**, **S11** (300.5 mg, 1.2 mmol, 1.2 equiv.) was converted to **S12** yielding a pale-yellow oil (211.8 mg, 42%), after purification by flash column chromatography ($B(OH)_3$-SiO_2, EtOAc/*n*-hexane 0→10%).

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.55; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 5.87 (s, 1H, H1), 4.66 (td, *J* = 10.9, 4.4 Hz, 1H, H6), 2.33 – 2.22 (m, 4H, H2 and H4), 1.96 (d, *J* = 11.3 Hz, 1H, H7), 1.92 – 1.81 (m, 1H, H12), 1.76 (td, *J* = 7.7, 1.8 Hz, 2H, H3), 1.70 – 1.61 (m, 2H, H10 and H9), 1.51 – 1.43 (m, 1H, H8), 1.31-1.35 (m, 14H, H9 and H11 and H14), 1.27 (s, 12H, H14), 0.96 – 0.91 (m, 1H, H7), 0.90 – 0.86 (m, 6H, H15 and H16), 0.84 (dt, *J* = 4.5, 2.7 Hz, 1H, H10), 0.74 (d, *J* = 7.0 Hz, 3H, H16) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 173.4 (C5), 83.9 (C13), 83.5 (C13), 74.0 (C6), 47.1 (C11), 41.1 (C7), 39.3 (C2), 34.6 (C4), 34.4 (C10), 31.5 (C8), 26.3 (C12), 25.1 (C14), 25.0 (C14), 24.3 (C3), 23.5 (C9), 22.2 (C15), 20.9 (C16), 16.4 (C16) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 29.40 ppm; **IR** (ATR) $\tilde{\nu}$ =3736, 3588, 3568, 2956, 2932, 2870, 2376, 2321, 1730, 1697, 1619, 1614, 1551, 1545, 1509, 1502, 1459, 1340, 1388, 1378, 1370, 1334, 1306, 1271, 1219, 1139, 1111, 1039, 1011, 985, 969, 900, 850, 702, 669 cm^{-1}; **HRMS** (EI) calcd. for $C_{28}H_{50}B_2O_6$ $[M]^+$ 504.3793, found 504.3784.

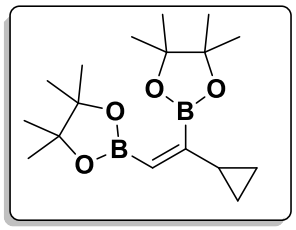
(*E*)-2,2'-(1-cyclohexylethene-1,2-diyl)bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolane) (S13)



Prepared according to General Procedure **A**, ethynylcyclohexane (143 µL, 1.1 mmol, 1.1 equiv.) was converted to **S13** yielding a pale-yellow oil (282.5 mg, 78%), after distillation.

^{1}H NMR (400 MHz, $CDCl_3$) δ = 5.81 (s, 1H), 1.62 – 1.56 (m, 1H), 1.32 (s, 12H), 1.25 (s, 12H), 0.77 – 0.70 (m, 2H), 0.69 – 0.62 (m, 2H) ppm; analytic data in agreement with literature.[10]

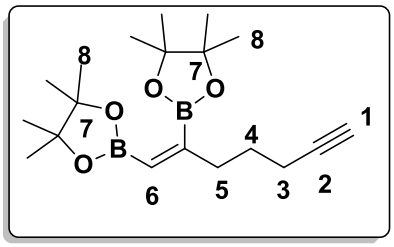
(*E*)-2,2'-(1-cyclopropylethene-1,2-diyl)bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolane) (S14)



Prepared according to General Procedure **A**, ethynylcyclopropane (93 µL, 1.1 mmol, 1.1 equiv.) was converted to **S14** yielding a pale-yellow oil (163 mg, 51%), after distillation.

^{1}H NMR (400 MHz, $CDCl_3$) δ = 5.81 (s, 1H), 1.62 – 1.56 (m, 1H), 1.32 (s, 12H), 1.25 (s, 12H), 0.77 – 0.70 (m, 2H), 0.69 – 0.62 (m, 2H) ppm; analytic data in agreement with literature.[10]

(*E*)-2,2'-(hept-1-en-6-yne-1,2-diyl)bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolane) (S15)

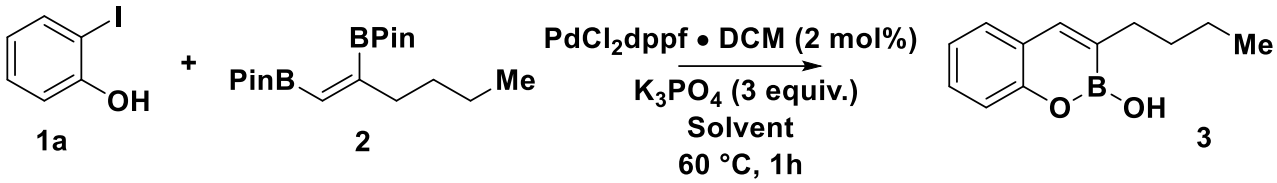


Prepared according to General Procedure **A**, hepta-1,6-diyne (580 µL, 5.04 mmol, 1.2 equiv.) was converted to **S15** yielding a pale-yellow oil (1.061 g, 73%), after purification by flash column chromatography ($B(OH)_3$-SiO_2, EtOAc/*n*-hexane 0→4%).

***R*$_f$** (DCM) = 0.67; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 5.88 (s, 1H, H6), 2.35 – 2.26 (m, 2H, H5), 2.16 (ddq, *J* = 6.9, 4.2, 2.5 Hz, 2H, H3), 1.90 (tq, *J* = 3.8, 1.8 Hz, 1H, H1), 1.65 (p, *J* = 7.3 Hz, 2H, H4), 1.30 (s, 12H, H8), 1.25 (s, 12H, H8) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 84.6 (C2), 83.8 (C7), 83.4 (C7), 68.4 (C1), 38.6 (C5), 27.5 (C4), 25.0 (C8), 25.0 (C8), 18.1 (C3) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 30.12 ppm; **IR** (ATR) $\tilde{\nu}$ = 2978, 2934, 1617, 1401, 1390, 1380, 1371, 1332, 1305, 1272, 1219, 1166, 1137, 1111, 1025, 968, 860, 851, 834, 702 cm^{-1}; **HRMS** (EI) calcd. for $C_{19}H_{32}B_2O_4$ $[M]^+$ 346.2481, found 346.2435.

Reaction Optimization

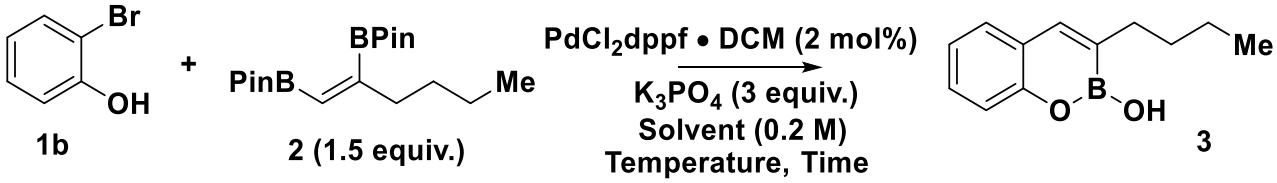
Table S1 Optimization of 2-iodophenol coupling



Entry	Solvent	Equiv. 2	Concentration	Yield[a]
1	THF/H_2O 50:1	1.5	0.1 M	16%
2	THF/H_2O 9:1	1.5	0.1 M	53%
3	THF/H_2O 4:1	1.5	0.1 M	68%
4	THF/H_2O 1:1	1.5	0.1 M	91%
5	MeCN/H_2O 1:1	1.5	0.1 M	92%
6	**MeCN/H_2O 1:1**	**1.5**	**0.2 M**	**quantitative**
7	MeCN/H_2O 1:1	1.1	0.2 M	74%
8	MeCN/H_2O 1:1	1.5	0.05 M	85%
9[b]	MeCN/H_2O 1:1	1.5	0.2 M	0%

[a] Determined by ^{1}H-NMR spectroscopy against a known internal standard (1,3,5-trimethoxybenzene). [b] $Pd(OAc)_2$ (5 mol%) and SPhos (10 mol%) used in place of $PdCl_2$dppf ● DCM (2 mol%).

Table S2 Optimization of 2-bromophenol coupling



Entry	Solvent	Temperature	Time	Yield[a]
1	MeCN/H_2O 1:1	60 ˚C	1 h	traces
2	MeCN/H_2O 1:1	80 ˚C	16 h	27%
3	THF/H_2O 1:1	80 ˚C	16 h	73%
4	**THF/H_2O 1:1**	**100 ˚C**	**16 h**	**83%**

[a] Determined by ^{1}H-NMR spectroscopy against a known internal standard (1,3,5-trimethoxybenzene).

Substrate Scope

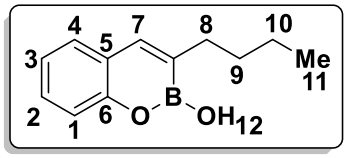
General Procedure B: Suzuki-Miyaura cross-coupling and cyclization of iodo species

To a 5 mL oven-dried microwave vial were added the respective 2-iodophenol/iodoaniline (0.1 mmol, 1 equiv.), $PdCl_2$dppf▪DCM (1.6 mg, 2 mol%), K_3PO_4 (63.7 mg, 0.3 mmol, 3 equiv.) and the respective vicinal diboron alkene (0.15 mmol, 1.5 equiv.). The vial was sealed and purged with nitrogen before the sequential addition via syringe of degassed MeCN (250 µL) and degassed H_2O (250 µL). The reaction mixture was stirred vigorously at 60 °C for 1 h, unless specified otherwise. After completion, the reaction was allowed to cool to ambient temperature and opened to air. 4 M aqueous HCl (4 mL) was added to the reaction, that was stirred for 5 minutes. The mixture was then transferred to a separating funnel and extracted with DCM (3 x 5 mL). The combined organic phases were dried over Na_2SO_4, filtered and concentrated under reduced pressure. The crude residue was purified by flash column chromatography.

General Procedure C: Suzuki-Miyaura cross-coupling and cyclization of bromo species

To a 5 mL oven-dried microwave vial were added the respective 2-bromophenol (0.1 mmol, 1 equiv.), $PdCl_2$dppf▪DCM (1.6 mg, 2 mol%), K_3PO_4 (63.7 mg, 0.3 mmol, 3 equiv.) and the respective vicinal diboron alkene (0.15 mmol, 1.5 equiv.). The vial was sealed and purged with nitrogen before the sequential addition of degassed THF (250 µL) and degassed H_2O (250 µL). The reaction mixture was stirred vigorously for 16 h at 100 °C. After completion, the reaction was allowed to cool to ambient temperature and opened to air. 4 M aqueous HCl (4 mL) was added to the reaction, that was stirred for 5 minutes. The mixture was then transferred to a separating funnel and extracted with DCM (3 x 5 mL). The combined organic phases were dried over Na_2SO_4, filtered and concentrated under reduced pressure. The crude residue was purified by flash column chromatography.

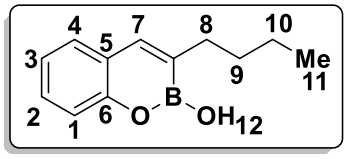
3-Butyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (3)



Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **3**, yielding a white solid (quantitative NMR yield, 17.4 mg, 86%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→4%).

R_f (EtOAc/*n*-hexane 17%) = 0.65; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.43 (s, 1H, H7), 7.36 (dd, *J* = 7.5, 1.7 Hz, 1H, H4), 7.30 (ddd, *J* = 8.5, 7.5, 1.7 Hz, 1H, H2), 7.20 (dt, *J* = 8.5, 1.0 Hz, 1H, H1), 7.12 (td, *J* = 7.5, 1.0 Hz, 1H, H3), 4.43 (d, *J* = 5.7 Hz, 1H, H12), 2.44 (td, *J* = 7.0, 1.2 Hz, 2H, H8), 1.57 (tt, *J* = 8.9, 7.0 Hz, 2H, H9), 1.42-1.26 (m, 2H, H10), 0.94 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 151.6 (C6), 143.5 (C7), 128.3 (C2), 128.1 (C4), 125.1 (C5), 122.4 (C3), 118.1 (C1), 33.0 (C8), 31.9 (C9), 22.7 (C10), 14.2 (C11) ppm; **^{11}B NMR** (192 MHz, $CDCl_3$) δ = 27.67 ppm; **IR** (ATR) $\tilde{\nu}$ = 2956, 2927, 2857, 1609, 1562, 1486, 1460, 1413, 1328, 1284, 1258, 1213, 1133, 1111, 1075, 1029, 943, 890, 853, 821, 754, 704, 668 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{15}BO_2$ $[M]^+$ 202.1160, found 202.1173.

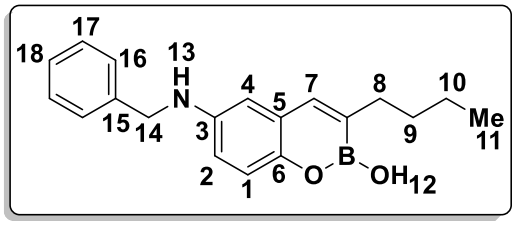
3-Butyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (3)



Prepared according to General Procedure **C**, **1b** (12 µL, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **3** yielding a white solid (83% NMR yield, 14.3 mg, 71%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→4%).

Analytic data in agreement with those reported above.

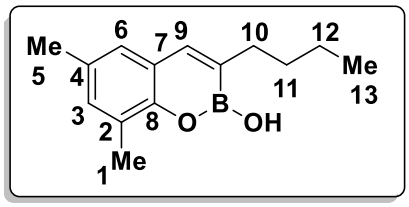
6-(Benzylamino)-3-butyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (4)



Prepared according to General Procedure **B**, **S1** (32.5 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **4** yielding an off-white solid (63% NMR yield, 16.9 mg, 55%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→5%).

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.36; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.41 – 7.27 (m, 6H, H7 and H16 and H17 and H18), 7.03 (d, *J* = 8.7 Hz, 1H, H1), 6.66 (dd, *J* = 8.7, 2.9 Hz, 1H, H2), 6.61 (d, *J* = 2.9 Hz, 1H, H4), 4.33 (s, 2H, H14), 2.40 (td, *J* = 7.8, 1.3 Hz, 2H, H8), 1.58 – 1.49 (m, 2H, H9), 1.42 – 1.32 (m, 2H, H10), 0.93 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 144.6 (Cq Ar), 143.5 (C7), 143.3 (Cq Ar), 139.5 (C15), 128.8 (CH Ar), 127.7 (CH Ar), 127.4 (CH Ar), 125.4 (Cq Ar), 118.5 (C1), 114.7 (C2), 110.7 (C4), 49.2 (C14), 33.0 (C8), 31.9 (C9), 22.7 (C10), 14.2 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.31 ppm; **IR** (ATR) $\tilde{\nu}$ = 2950, 2927, 2851, 1608, 1569, 1493, 1453, 1397, 1362, 1337, 1314, 1299, 1279, 1253, 1187, 1133, 1071, 1029, 966, 936, 853, 805,737, 695 cm^{-1}; **HRMS** (EI) calcd. for $C_{19}H_{22}BNO_2$ $[M]^+$ 307.1738, found 307.1709.

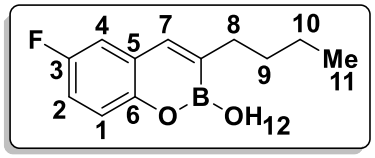
3-Butyl-6,8-dimethyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (5)



Prepared according to General Procedure **B**, **S2** (24.8 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **5** yielding a white solid (65% NMR yield, 13.6 mg, 59%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→4%).

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.50; **^{1}H NMR** (400 MHz, $CDCl_3$) δ =7.36 (s, 1H, H9), 6.99 (s, 2H, H3 and H6), 2.45 – 2.40 (m, 2H, H10), 2.36 (s, 3H), 2.33 (s, 3H), 1.60 – 1.51 (m, 2H, H11), 1.39 (dt, *J* = 15.0, 7.3 Hz, 2H, H12), 0.94 (t, *J* = 7.3 Hz, 3H, H13) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 148.0 (Cq Ar), 143.9 (C9), 131.0 (Cq Ar), 130.6 (CH Ar), 126.5 (Cq Ar), 126.0 (CH Ar), 124.3 (Cq Ar), 32.9 (C10), 32.0 (C11), 22.7 (C12), 20.8 (CH_3), 15.9 (CH_3), 14.2 (C13) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.71 ppm; **IR** (ATR) $\tilde{\nu}$ = 3736, 3588, 3568, 2956, 2926, 2858, 1607, 1579, 1509, 1424, 1340, 1380, 1256, 1239, 1167, 1139, 936, 919, 850, 803, 755, 689, 669 cm^{-1}; **HRMS** (EI) calcd. for $C_{14}H_{19}BO_2$ $[M]^+$ 230.1473, found 230.1489.

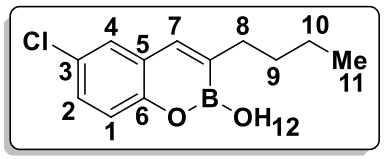
3-Butyl-6-fluoro-2*H*-benzo[e][1,2]oxaborinin-2-ol (6)



Prepared according to General Procedure **B**, 4-fluoro-2-iodophenol (23.8 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **6** yielding a white solid (78% NMR yield, 14.7 mg, 67%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→5%).

***R**f* (EtOAc/*n*-hexane 20%) = 0.47; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.35 (s, 1H, H7), 7.14 (dd, *J* = 8.8, 4.7 Hz, 1H, H4), 7.06 – 6.95 (m, 2H, H1 and H2), 2.44 (t, *J* = 7.0 Hz, 2H, H8), 1.56 (tt, *J* = 8.9, 6.9 Hz, 2H, H9), 1.41-1.34 (m, 2H, H10), 0.94 (t, *J* = 7.3 Hz, 3H, H11); **^{13}C NMR** (151 MHz, $CDCl_3$) δ = 157.9 (d, *J* = 239.4 Hz, C3), 147.7 (d, *J* = 1.8 Hz, C6), 142.5 (d, *J* = 2.5 Hz, C7), 125.7 (d, *J* = 8.4 Hz, C5), 119.0 (d, *J* = 8.7 Hz, C4), 115.1 (d, *J* = 24.0 Hz, C2), 113.3 (d, *J* = 23.3 Hz, C1), 32.9 (C8), 31.8 (C9), 22.7 (C10), 14.1 (C11) ppm; **^{11}B NMR** (192 MHz, $CDCl_3$) δ = 27.67 ppm; **^{19}F NMR** (376 MHz, $CDCl_3$) δ = -121.63 (td, *J* = 8.4, 4.5 Hz); **IR** (ATR) $\tilde{\nu}$ = 3568, 2960, 2952, 2926, 2871, 2858, 2472, 1843, 1621, 1571, 1507, 1489, 1469, 1451, 1441, 1401, 1377, 1367, 1337, 1308, 1263, 1250, 1239, 1230, 1225, 1149, 1114, 1103, 965, 945, 922, 902, 857, 843, 804, 777, 732, 724, 681, 659, 645 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{14}BFO_2$ $[M]^+$ 220.1065, found 220.1053.

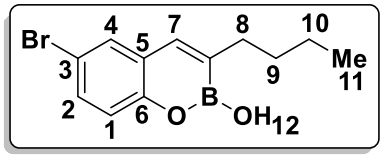
3-Butyl-6-chloro-2*H*-benzo[e][1,2]oxaborinin-2-ol (7)



Prepared according to General Procedure **B**, 4-chloro-2-iodophenol (25.4 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **7** yielding a white solid (78% NMR yield, 17.0 mg, 72%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→3%).

***R**f* (EtOAc/*n*-hexane 20%) = 0.52; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.33-7.32 (m, 2H, H4 and H7), 7.24 (dd, *J* = 8.7, 2.4 Hz, 1H, H2), 7.12 (d, *J* = 8.7 Hz, 1H, H1), 4.59 – 4.49 (m, 1H, H12), 2.49 – 2.40 (m, 2H, H8), 1.55 (tdd, *J* = 10.4, 7.6, 4.4 Hz, 2H, H9), 1.43 – 1.31 (m, 2H, H10), 0.94 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 150.0 (C6), 142.2 (C7), 128.0 (C2), 127.4 (C4), 127.3 (C3), 126.2 (C5), 119.3 (C1), 32.9 (C8), 31.7 (C9), 22.7 (C10), 14.1 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ 27.69 ppm; **IR** (ATR) $\tilde{\nu}$ = 2923, 1605, 1556, 1482, 1464, 1427, 1394, 1375, 1357, 1334, 1321, 1302, 1272, 1262, 1236, 1213, 1126, 1083, 946, 925, 902, 854, 814, 739, 722, 678, 660, 622 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{14}BClO_2$ $[M]^+$ 236.0770, found 236.0767.

6-Bromo-3-butyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (8)

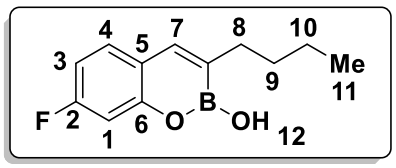


Prepared according to General Procedure **B**, 4-bromo-2-iodophenol (29.9 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **8** yielding a white solid (75% NMR yield, 18.0 mg, 64%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0%→5%).

***R**f* (EtOAc/*n*-hexane 10%) = 0.29; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.47 (d, *J* = 2.4 Hz, 1H, H4), 7.37 (dd, *J* = 8.7, 2.4 Hz, 1H, H2), 7.32 (s, 1H, H7), 7.07 (d, *J* = 8.7 Hz, 1H, H1), 2.43 (td, *J* = 7.7, 1.3 Hz, 2H, H8), 1.63 – 1.49 (m, 2H, H9), 1.38 (dq, *J* = 14.5, 7.3 Hz, 2H, H10), 0.94 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 150.5 (CqAr), 142.1 (C7), 130.9 (C2), 130.4 (C4), 126.8 (CqAr), 119.8 (C1), 114.7

(C3), 32.9 (C8), 31.7 (C9), 22.7 (C10), 14.1 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.66 ppm; **IR** (ATR) $\tilde{\nu}$ = 3401, 2956, 2927, 2858, 1707, 1601, 1553, 1477, 1427, 1378, 1328, 1271, 1256, 1137, 1101, 1071, 1037, 942, 917, 902, 863, 814, 738, 702, 681 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{14}BBrO_2$ $[M]^+$ 280.0265, found 280.0254.

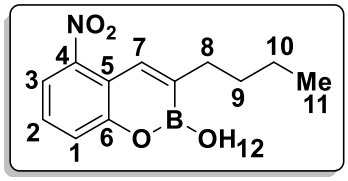
3-Butyl-7-fluoro-2*H*-benzo[e][1,2]oxaborinin-2-ol (9)



Prepared according to General Procedure **C**, 2-bromo-5-fluorophenol (19.1 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **9** yielding an off-white solid (67% NMR yield, 11.7 mg, 53%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→5%).

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.40; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.39 (s, 1H, H7), 7.30 (dd, *J* = 8.6, 6.4 Hz, 1H, H4), 6.92 (dd, *J* = 9.8, 2.6 Hz, 1H, H1), 6.85 (td, *J* = 8.6, 2.6 Hz, 1H, H3), 2.46 – 2.35 (m, 2H, H8), 1.61 – 1.49 (m, 2H, H9), 1.43 – 1.32 (m, 2H, H10), 0.94 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ =162.53 (d, *J* = 246.3 Hz, C2), 152.49 (d, *J* = 12.7 Hz, C6), 142.8 (C7), 129.0 (d, *J* = 10.2 Hz, C4), 121.6 (C5), 110.0 (d, *J* = 22.2 Hz, C3), 105.4 (d, *J* = 24.3 Hz, C1), 32.8 (C8), 31.9 (C9), 22.7 (C10), 14.1 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.85 ppm; **^{19}F NMR** (376 MHz, $CDCl_3$) δ = -112.39 (td, *J* = 9.4, 6.2 Hz) ppm; **IR** (ATR) $\tilde{\nu}$ = 3568, 3476, 2955, 2927, 2871, 2853, 1615, 1574, 1502, 1467, 1459, 1420, 1370, 1347, 1314, 1272, 1215, 1159, 1105, 1088, 1058, 1045, 999, 955, 949, 907, 894, 850, 810, 778, 734, 718, 633 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{14}BFO_2$ $[M]^+$ 220.1065, found 220.1084.

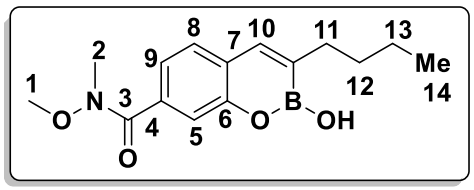
3-Butyl-5-nitro-2*H*-benzo[e][1,2]oxaborinin-2-ol (10)



Prepared according to a modified version of General Procedure **B** in which the reaction mixture was stirred for 16 h, **S3** (26.5 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **10** yielding a yellow solid (75% NMR yield, 16.8 mg, 68%), after purification by flash column chromatography (SiO_2, DCM).

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.33; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.98 (s, 1H, H7), 7.71 (dd, *J* = 8.0, 1.6 Hz, 1H, H3), 7.45 (dd, *J* = 8.0, 1.6 Hz, 1H, H1), 7.38 (t, *J* = 8.0 Hz, 1H, H2), 4.66 (br, 1H, H12), 2.50 (td, *J* = 7.8, 1.3 Hz, 2H, H8), 1.62 – 1.53 (m, 2H, H9), 1.42-1.36 (m, 2H, H10), 0.94 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 152.2 (Cq Ar), 147.4 (Cq Ar), 137.1 (C7), 127.2 (C2), 123.3 (C1), 118.9 (C3), 118.7 (Cq Ar), 33.6 (C8), 31.7 (C9), 22.8 (C10), 14.1 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ 27.26 ppm; **IR** (ATR) $\tilde{\nu}$ = 3525, 2956, 2930, 2860, 1599, 1555, 1460, 1411, 857, 807, 737, 693, 669 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{14}BNO_4$ $[M]^+$ 247.1010, found 247.1013.

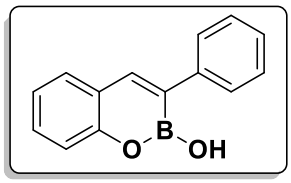
3-Butyl-2-hydroxy-*N*-methoxy-*N*-methyl-2*H*-benzo[e][1,2]oxaborinine-7-carboxamide (11)



Prepared according to General Procedure **B**, **S4** (30.7 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **11** yielding a white solid (63% NMR yield, 15.0 mg, 52%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→5%).

***R**f* (EtOAc/*n*-hexane 20%) = 0.40; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.70 (s, 1H, H5), 7.44 (dd, *J* = 7.9, 1.7 Hz, 1H, H9), 7.39 (s, 1H, H10), 7.35 (d, *J* = 7.9 Hz, 1H, H8), 3.56 (s, 3H, H2), 3.39 (s, 3H, H1), 2.50 – 2.39 (m, 2H, H11), 1.62 – 1.51 (m, 2H, H12), 1.41 – 1.32 (m, 2H, H13), 0.92 (t, *J* = 7.3 Hz, 3H, H14) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 169.6 (C3), 151.2 (C6), 142.2 (C10), 133.0 (C7), 127.5 (C8), 127.1 (C4), 122.1 (C9), 118.6 (C5), 61.3 (C1), 34.0 (C2), 33.1 (C11), 31.7 (C12), 22.7 (C13), 14.1 (C14) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 31.12 ppm; **IR** (ATR) $\tilde{\nu}$ = 3568, 2959, 2932, 2403, 2379, 1604, 1401, 1387, 1345, 1261, 1195, 1130, 1067, 982, 962, 916, 890, 830, 804, 757, 729, 695, 669, 625 cm^{-1}; **HRMS** (EI) calcd. for $C_{15}H_{20}BNO_4$ $[M]^+$ 289.1480, found 289.1490.

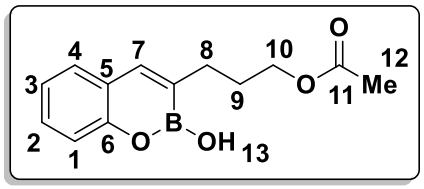
3-Phenyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (12)



Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and (*E*) 2,2'-(1-phenylethene-1,2-diyl)bis(4,4,5,5-tetramethyl-1,3,2-dioxaborolane) (53.4 mg, 0.15 mmol) were converted to **12** yielding a white solid (68% NMR yield, 14.0 mg, 63%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→5%).

^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.81 (s, 1H), 7.65 – 7.58 (m, 2H), 7.50 (dd, J = 7.7, 1.8 Hz, 1H), 7.44 (tt, J = 7.7, 1.7 Hz, 2H), 7.38 (dd, J = 7.1, 1.7 Hz, 1H), 7.34 (dt, J = 8.0, 1.7 Hz, 1H), 7.29 (d, J = 7.2 Hz, 1H), 7.19 (td, J = 7.4, 1.4 Hz, 1H) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 151.9, 144.4, 140.5, 129.5, 129.1, 129.0, 127.5, 127.4, 124.8, 122.7, 118.3 ppm; analytic data in agreement with literature.[11]

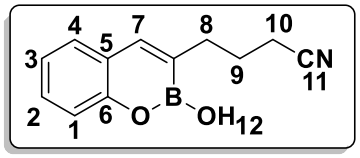
3-(2-Hydroxy-2*H*-benzo[e][1,2]oxaborinin-3-yl)propyl acetate (13)



Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and **S9** (57.0 mg, 0.15 mmol) were converted to **13** yielding a light brown solid (67% NMR yield, 14.4 mg, 59%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→4%).

***R**f* (EtOAc/*n*-hexane 30%) = 0.32; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.45 (s, 1H, H7), 7.40 – 7.28 (m, 2H, H2 and H4), 7.20 (d, J = 8.2 Hz, 1H, H1), 7.12 (td, J = 7.5, 1.3 Hz, 1H, H3), 4.70 (br, 1H, H13), 4.14 (t, J = 6.6 Hz, 2H, H10), 2.52 (t, J = 7.6 Hz, 2H, H8), 2.06 (s, 3H, H12), 2.00 – 1.84 (m, 2H, H9) ppm; **^{13}C NMR** (100 MHz, $CDCl_3$) δ = 171.5 (C11), 151.7 (C6), 144.1 (C7), 128.6 (C2), 128.3 (C4), 124.8 (C5), 122.5 (C3), 118.1 (C1), 64.4 (C10), 29.6 (C8), 28.6 (C9), 21.2 (C12) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.69 ppm; **IR** (ATR) $\tilde{\nu}$ = 3358, 2968, 2934, 2851, 1711, 1608, 1565, 1486, 1473, 1459, 1431, 1408, 1395, 1367, 1358, 1334, 1285, 1272, 1263, 1216, 1150, 1130, 1088, 1051, 1035, 1012, 975, 955, 915, 896, 863, 843, 767, 738, 706, 683, 666, 641, 610 cm^{-1}; **HRMS** (EI) calcd. for $C_{13}H_{15}BO_4$ $[M]^+$ 246.1058, found 246.1046.

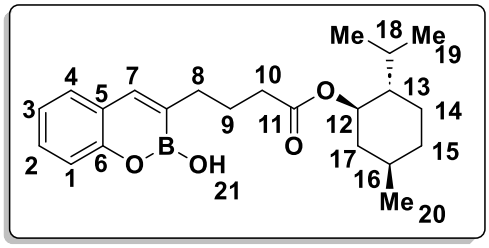
4-(2-Hydroxy-2*H*-benzo[e][1,2]oxaborinin-3-yl)butanenitrile (14)



Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and **S10** (52.1 mg, 0.15 mmol) were converted to **14** yielding a white solid (80% NMR yield, 15.6 mg, 73%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→8%).

***R**f* (EtOAc/*n*-hexane 20%) = 0.13; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.49 (s, 1H, H7), 7.38 (dd, *J* = 7.5, 1.7 Hz, 1H, H4), 7.33 (ddd, *J* = 8.5, 7.4, 1.7 Hz, 1H, H2), 7.20 (dd, *J* = 8.5, 1.3 Hz, 1H, H1), 7.14 (td, *J* = 7.5, 1.3 Hz, 1H, H3), 2.64 – 2.58 (m, 2H, H8), 2.38 (t, *J* = 7.1 Hz, 2H, H10), 2.03 – 1.93 (m, 2H, H9) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 151.8 (C6), 145.1 (C7), 128.9 (C2), 128.4 (C4), 124.5 (C5), 122.6 (C3), 119.9 (C11), 118.1 (C1), 32.3 (C8), 25.2 (C9), 16.8 (C10) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.45 ppm; **IR** (ATR) $\tilde{\nu}$ = 2946, 2540, 2261, 1609, 1563, 1483, 1459, 1429, 1362, 1335, 1284, 1263, 1207, 1157, 1124, 1032, 938, 900, 850, 824, 788, 749, 732, 719, 705, 682, 669, 656 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{12}BNO_2$ $[M]^+$ 213.0956, found 213.1005.

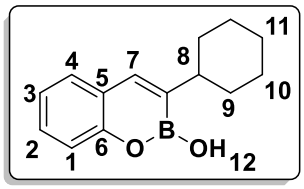
(1*S*,2*R*,5*R*)-2-Isopropyl-5-methylcyclohexyl-4-(2-hydroxy-2*H*-benzo[e][1,2]oxaborinin-3-yl)butanoate (15)



Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and **S12** (75.6 mg, 0.15 mmol) were converted to **15** yielding a white solid (86% NMR yield, 26.3 mg, 71%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→6%)

***R**f* (Acetone/*n*-hexane 10%) = 0.24; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.41 (s, 1H, H7), 7.35-7.29 (m, 2H, H2 and H4), 7.24 (dd, *J* = 8.3, 1.4 Hz, 1H, H1), 7.10 (td, *J* = 7.3, 1.4 Hz, 1H, H3), 6.29 (br, 1H, H21), 4.76 (td, *J* = 10.9, 4.4 Hz, 1H, H12), 2.44 (ddd, *J* = 8.8, 6.1, 0.9 Hz, 2H, H8), 2.42 – 2.37 (m, 2H, C10), 2.04 – 1.96 (m, 1H, H17), 1.91 – 1.79 (m, 3H, H9 and H18), 1.74 – 1.63 (m, 2H, H14 and H15), 1.50 (dddd, *J* = 15.3, 11.9, 6.7, 3.4 Hz, 1H, H16), 1.38 (ddt, *J* = 12.3, 10.8, 3.2 Hz, 1H, H13), 1.13 – 1.01 (m, 1H, H15), 0.98 (dd, *J* = 12.2, 1.2 Hz, 1H, H17), 0.90 (dd, *J* = 6.8, 2.9 Hz, 6H, H19 and H20), 0.87-0.81 (m, 1H, H14) 0.77 (d, *J* = 7.0 Hz, 3H, H19) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 174.6 (C11), 152.1 (C6), 143.9 (C7), 128.5 (C2), 128.1 (C4), 124.7 (C5), 122.2 (C3), 118.3 (C1), 74.9 (C12), 47.1 (C13), 41.0 (C17), 34.3 (C14), 33.7 (C10), 32.8 (C8), 31.5 (C16), 26.5 (C18), 25.2 (C9), 23.5 (C15), 22.1 (C20), 20.9 (C19), 16.4 (C19) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.47 ppm; **IR** (ATR) $\tilde{\nu}$ = 3568, 2955, 2927, 2868, 1729, 1611, 1563, 1509, 1486, 1413, 1387, 1370, 1339, 1282, 1215, 1179, 1149, 1098, 1039, 1011, 983, 963, 942, 913, 892, 755, 711, 669 cm^{-1}; **HRMS** (EI) calcd. for $C_{22}H_{31}BO_4$ $[M]^+$ 370.2310, found 370.2378.

3-Cyclohexyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (16)

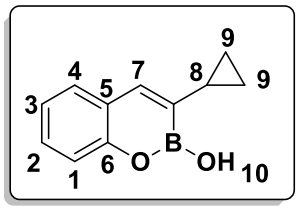


Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and **S13** (54.3 mg, 0.15 mmol) were converted to **16** yielding a white solid (quantitative NMR yield, 18.5 mg, 81%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→4%).

***R**f* (EtOAc/*n*-hexane 20%) = 0.52; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.43 (s, 1H, H7), 7.37 (dd, *J* = 7.6, 1.8 Hz, 1H, H4), 7.30 (ddd, *J* = 8.5, 7.6, 1.8 Hz, 1H, H2), 7.19 (d, *J* = 8.5 Hz, 1H, H1), 7.12 (td, *J* = 7.6, 1.8 Hz, 1H, H3), 2.41 (tq, *J* = 6.8, 3.6 Hz, 1H, H8), 1.85 (tdd, *J* = 10.0, 6.8, 4.2 Hz, 4H, H9 and H10), 1.78 – 1.72 (m, 1H, H11), 1.40 (td, *J* = 10.0, 2.9 Hz, 4H, H9 and H10), 1.31 – 1.21 (m, 1H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 151.4 (C6), 141.1 (C7), 128.3 (C4), 128.2 (C2), 125.1 (C5), 122.3 (C3), 117.9 (C1), 41.6 (C8), 32.9 (C9), 27.0 (C10), 26.4 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.73 ppm; **IR** (ATR) $\tilde{\nu}$ = 3747, 3461, 2923, 2848, 1608, 1563, 1507, 1490, 1459, 1446, 1417, 1404, 1367, 1332, 1292, 1278,

1261, 1240, 1216, 1141, 1100, 1054, 1027, 985, 940, 916, 896, 889, 861, 854, 836, 801, 752, 722, 695, 670 cm^{-1}; **HRMS** (EI) calcd. for $C_{14}H_{17}BO_2$ $[M]^+$ 228.1316, found 228.1308.

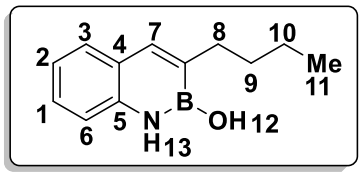
3-Cyclopropyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (17)



Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and **S14** (48.0 mg, 0.15 mmol) were converted to **17** yielding a white solid (quantitative NMR yield, 16.9 mg, 91%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→10%).

***R**f* (EtOAc/*n*-hexane 10%) = 0.21; **^{1}H NMR** (400 MHz, CDCl3) δ = 7.33 (dd, *J* = 7.5, 1.7 Hz, 1H, H4), 7.30 (s, 1H, H7), 7.29 – 7.26 (m, 1H, H2), 7.19 (d, *J* = 7.0, 1H, H1), 7.11 (td, *J* = 7.5, 1.3 Hz, 1H, H3), 4.80 (br, 1H, H10), 1.80 – 1.70 (m, 1H, H8), 0.91 – 0.84 (m, 2H, H9), 0.84 – 0.76 (m, 2H, H9) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 151.2 (C6), 140.2 (C7), 128.1 (C4), 128.0 (C2), 124.9 (C5), 122.4 (C3), 118.0 (C1), 13.8 (C8), 7.8 (C9) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.56 ppm; **IR** (ATR) $\tilde{\nu}$ = 3464, 3077, 3029, 2997, 2561, 2376, 1942, 1911, 1604, 1562, 1551, 1509, 1490, 1443, 1420, 1387, 1364, 1334, 1312, 1275, 1240, 1219, 1197, 1182, 1154, 1121, 1108, 1068, 1032, 1018, 1009, 940, 919, 894, 873, 856, 807, 787, 755, 742, 708, 689, 652 cm^{-1}; **HRMS** (EI) calcd. for $C_{11}H_{11}BO_2$ $[M]^+$ 186.0847, found 186.0861.

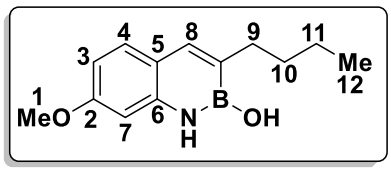
3-Butylbenzo[e][1,2]azaborinin-2(1*H*)-ol (18)



Prepared according to General Procedure **B**, 2-iodoaniline (21.9 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **18** yielding a light brown solid (quantitative NMR yield, 15.3 mg, 76%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→10%). In solution the compound is present in both the monomeric and dimeric form.

***R**f* (EtOAc/*n*-hexane 20%) = 0.29; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.66 (s, 0.6H, H7), 7.56 (s, 0.4H, H7´), 7.50 (d, *J* = 7.7 Hz, 0.6H, H3), 7.44 (d, *J* = 7.8 Hz, 0.4H, H3), 7.28 (q, *J* = 8.0 Hz, 1H, H2 and H2´), 7.12 – 6.98 (m, 2H, H1 and H6 and H1´ and H6´), 6.84 (br, 0.6H, H13), 6.74 (br, 0.4H, H13), 2.47 (t, *J* = 7.7 Hz, 2H, H8), 1.62 – 1.49 (m, 2H, H9), 1.42 (p, *J* = 7.2 Hz, 0.8H, H10´), 1.32 (dd, *J* = 8.3, 6.6 Hz, 1.2H, H10), 0.95 (t, *J* = 7.3 Hz, 1.2H, H11´), 0.86 (t, *J* = 7.4 Hz, 1.8H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 142.5 (C7), 139.9 (C5), 128.7 (C3), 127.4 (C2), 123.9 (C4), 119.8 (CH Ar), 116.8 (CH Ar), 33.2 (C8), 32.7 (C9), 22.8 (C10), 14.2 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 28.69 ppm; **IR** (ATR) $\tilde{\nu}$ = 3378, 2956, 2927, 2856, 1614, 1572, 1463, 1335, 942, 757, 745, 669 cm^{-1}; **HRMS** (EI) calcd. for $C_{12}H_{16}BNO$ $[M^+]^+$ 201.1319, found 201.1315.

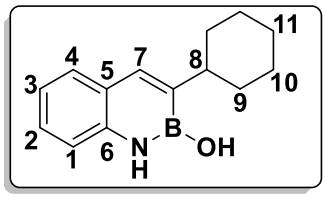
3-Butyl-7-methoxybenzo[e][1,2]azaborinin-2(1*H*)-ol (19)



Prepared according to General Procedure **B**, **S5** (24.9 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **19** yielding a brown solid (quantitative NMR yield, 19.4 mg, 84%), after purification by flash column chromatography (SiO_2, DCM). In solution the compound is present in both the monomeric and dimeric form.

***R**f* (DCM) = 0.4; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.58 (s, 0.6H, H8), 7.49 (s, 0.4H, H8´), 7.39 (d, *J* = 8.6 Hz, 0.6H, H4), 7.33 (d, *J* = 8.5 Hz, 0.4H, H4´), 6.78 (s, 1H, NH), 6.68 (dd, *J* = 8.6, 2.5 Hz, 0.6H), 6.63 (dd, *J* = 8.6, 2.5 Hz, 0.4H), , 6.55 (d, *J* = 2.5 Hz, 0.6H, H7), 6.51 (d, *J* = 2.5 Hz, 0.4H, H7´)3.83 (s, 3H, H1), 2.42 (t, *J* = 8Hz, 2H, H8), 1.57 – 1.46 (m, 2H, H9), 1.44 – 1.35 (m, 1H, H9´), 1.34 – 1.25 (m, 3H, H11 and H11´), 0.94 (t, *J* = 7.3 Hz, 1.2H, H12´), 0.85 (t, *J* = 7.3 Hz, 1.8H, H12) ppm; **^{13}C NMR** (151 MHz, Acetone d_6) δ = 159.8 (C2), 142.7 (C6), 141.8 (C8), 129.7 (C4), 118.4 (C5), 107.7 (C3), 100.9 (C7), 55.4 (C1), 33.7 (C9), 33.3 (C10), 22.9 (C11), 14.2 (C12) ppm; **^{11}B NMR** (192 MHz, Acetone d_6) δ = 28.56 ppm; **IR** (ATR) $\tilde{\nu}$ = 3405, 2959, 2923, 2857, 2563, 2527, 2377, 1621, 1604, 1559, 1507, 1490, 1464, 1453, 1429, 1406, 1370, 1350, 1291, 1258, 1243, 1217, 1196, 1174, 1141, 1128, 1085, 1025, 988, 969, 952, 939, 894, 823, 804, 741, 692, 678, 660, 626 cm^{-1}; **HRMS** (EI) calcd. for $C_{13}H_{18}BNO_2$ $[M]^+$ 231.1425, found 231.1476.

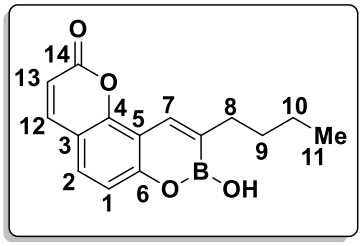
3-Cyclohexylbenzo[e][1,2]azaborinin-2(1*H*)-ol (20)



Prepared according to General Procedure **B**, 2-iodoaniline (21.9 mg, 0.1 mmol) and **S13** (54.3 mg, 0.15 mmol) were converted to **20** yielding a pale yellow solid (96% NMR yield, 19.8 mg, 87%), after purification by flash column chromatography (SiO_2, DCM). In solution the compound is present in both the monomeric and dimeric form (alkyl region coalesces).

***R**f* (EtOAc/*n*-hexane 20%) = 0.27; **^{1}H NMR** (400 MHz, Acetone d_6) δ = 7.68 (s, 1H, H7), 7.53 (dd, *J* = 7.8, 1.6 Hz, 1H, H4), 7.43 (dd, *J* = 7.8, 1.6 Hz, 0.2H, H4´), 7.33 (dd, *J* = 8.1, 1.3 Hz, 1H, H1), 7.26 (ddd, *J* = 8.2, 7.0, 1.6 Hz, 1H, H2), 7.21 – 7.14 (m, 0.4H, H1´ and H2´), 7.03 (ddd, *J* = 8.2, 7.0, 1.3 Hz, 1H, H3), 6.93 (ddd, *J* = 7.8, 6.7, 1.7 Hz, 0.2H, H3´), 2.57 (tdt, *J* = 11.7, 3.3, 1.7 Hz, 1H, H8), 1.94 – 1.86 (m, 2H, H9), 1.85 – 1.77 (m, 2H, H10), 1.74 – 1.66 (m, 1H, H11), 1.55 (qd, *J* = 12.2, 2.9 Hz, 2H, H9), 1.49 – 1.37 (m, 1H, H10), 1.35-1.25 (m, 2H, H10 and H11) ppm; **^{13}C NMR** (101 MHz, Acetone d_6) δ = 141.3 (C6), 140.5 (C7), 129.3 (C4), 127.8 (C2), 125.1 (C5), 120.3 (C3), 118.0 (C1), 43.1 (C8), 34.0 (C9), 27.8 (C10), 27.1 (C11) ppm; **^{11}B NMR** (128 MHz, Acetone d_6) δ = 28.28 ppm; **IR** (ATR) $\tilde{\nu}$ = 3369, 2922, 2847, 2502, 1612, 1490, 1449, 1397, 1367, 1309, 1281, 1212, 1179, 978, 942, 909, 884, 853, 757, 748, 693, 650 cm^{-1}; **HRMS** (EI) calcd. for $C_{14}H_{18}BNO$ $[M]^+$ 227.1476, found 227.1453.

9-Butyl-8-hydroxy-2*H*,8*H*-[1,2]oxaborinino[6,5-h]chromen-2-one (21)

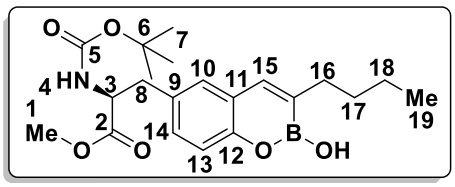


Prepared according to General Procedure **B**, **S6** (28.8 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **21** yielding a white solid (50% NMR yield, 7.6 mg, 28%), after purification by flash column chromatography (SiO_2, DCM/*n*-hexane/EtOAc 50%/50%/0%→DCM/*n*-hexane/EtOAc 45%/45%/10%).

***R**f* (Acetone/*n*-hexane 10%) = 0.09; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 8.06 (s, 1H, H7), 7.72 (d, *J* = 9.6 Hz, 1H, Hz, H12), 7.37 (d, *J* = 8.5 Hz, 1H, H2), 7.12 (d, *J* = 8.5 Hz, 1H, H1), 6.36 (d, *J* = 9.6 Hz, 1H, H13), 2.49 (t, *J* = 7.6 Hz, 2H, H8), 1.58 (tt, *J* = 7.6, 6.4 Hz, 2H, H9), 1.43 – 1.31 (m, 2H, H10), 0.94 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 161.1 (C14), 154.1 (C6), 150.7 (C4), 144.20 (C12), 135.6 (C7), 126.6 (C2), 115.3 (C1), 114.1 (C13), 113.9 (C5), 113.4 (C3), 33.2 (C8), 31.9 (C9), 22.8 (C10), 14.1 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.98 ppm; **IR** (ATR) $\tilde{\nu}$ = 3882, 3767, 3747, 3736, 3588, 3568, 3546, 3321, 2956, 2929, 2448, 2376, 1706, 1608, 1586, 1559, 1545, 1518, 1509, 1502, 1490, 1437,

1339, 1262, 1167, 1136, 1081, 1008, 939, 896, 826, 772, 692, 624 cm^{-1}; **HRMS** (EI) calcd. for $C_{15}H_{15}BO_4$ $[M]^+$ 270.1058, found 270.1049.

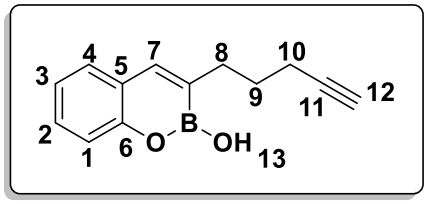
Methyl-(2*S*)-2-((tert-butoxycarbonyl)amino)-3-(3-butyl-2-hydroxy-2*H*-chromen-6-yl)propanoate (22)



Prepared according to a modified version of General Procedure **B** in which the quench was effected with 1 M HCl, **S7** (42.1 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **22** yielding a white solid (23.0 mg, 57%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→10%).

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.16; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.33 (s, 1H, H15), 7.10 – 7.00 (m, 3H, ArH), 4.58 (t, *J* = 6.0 Hz, 1H, H3), 3.72 (s, 3H, H1), 3.17 – 3.00 (m, 2H, H8), 2.40 (t, *J* = 7.5 Hz, 2H, H16), 1.60 – 1.48 (m, 2H, H17), 1.41-1.32 (m, 11H, H7 and H18), 0.93 (t, *J* = 7.3 Hz, 3H, H19) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 172.6 (C2), 155.3 (C5), 150.8 (C12), 143.0 (C15), 129.8 (C9), 129.0 (CH Ar), 128.7 (CH Ar), 125.0 (C11), 118.1 (CH Ar), 80.2 (C6), 54.6 (C3), 52.4 (C1), 37.8 (C8), 32.9 (C16), 31.8 (C17), 28.4 (C7), 22.7 (C18), 14.1 (C19) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 26.78 ppm; **IR** (ATR) $\tilde{\nu}$ = 3481, 2959, 2929, 2574., 2501, 1743, 1684, 1608, 1526, 1489, 1460, 1426, 1401, 1343, 1265, 1216, 1159, 1130, 1057, 996, 959, 940, 929, 876, 857, 821, 698, 669, 646, 609 cm^{-1}; **HRMS** (EI) calcd. for $C_{21}H_{30}BNO_6$ $[M]^+$ 403.2161, found 403.2151, **ORD** (MeCN, c 1.00): $[\alpha]_D^{23}$ = -3.533.

3-(Pent-4-yn-1-yl)-2*H*-benzo[e][1,2]oxaborinin-2-ol (23)

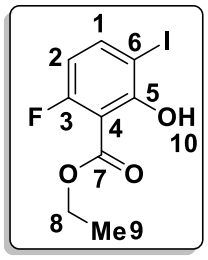


Prepared according to General Procedure **B**, **1a** (22.0 mg, 0.1 mmol) and **S15** (51.9 mg, 0.15 mmol) were converted to **23** yielding a pale-yellow solid (82% NMR yield, 15.7 mg, 74%), after purification by flash column chromatography (SiO_2, Acetone/*n*-hexane 0→5%).

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.42; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.47 (s, 1H, H7), 7.36 (d, *J* = 7.6 Hz, 1H, H4), 7.31 (t, *J* = 7.6 Hz, 1H, H2), 7.21 (d, *J* = 7.6 Hz, 1H, H1), 7.13 (t, *J* = 7.6 Hz, 1H, H3), 4.76 (br, 1H, H13), 2.57 (t, *J* = 7.5 Hz, 2H, H8), 2.25 (q, *J* = 4.4 Hz, 2H, H10), 2.02 – 1.98 (m, 1H, H12), 1.83 (p, *J* = 7.2 Hz, 2H, H9) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ = 151.7 (C6), 144.3 (C7), 128.5 (C2), 128.2 (C4), 124.8 (C5), 122.4 (C3), 118.1 (C1), 84.6 (C11), 68.9 (C12), 32.0 (C8), 28.4 (C9), 18.1 (C10) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.75 ppm; **IR** (ATR) $\tilde{\nu}$ = 2926, 2854, 1608, 1562, 1484, 1454, 1433, 1414, 1371, 1328, 1284, 1252, 1210, 1177, 1141, 1121, 1104, 1029, 1009, 942, 883, 851, 795, 751, 741, 669, 612 cm^{-1}; **HRMS** (EI) calcd. for $C_{13}H_{13}BO_2$ $[M]^+$ 212.1003, found 212.1050.

Synthesis of Xeruborbactam Derivative

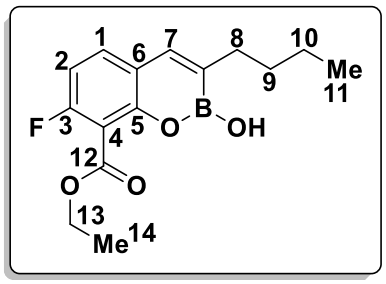
Ethyl 6-fluoro-2-hydroxy-3-iodobenzoate (25)



The reaction was performed according to a modified procedure of Porco *et al.*[12] To a solution of ethyl 2-fluoro-6-hydroxybenzoate (1.84 g, 10 mmol, 1 equiv.) and TlOAc (2.77 g, 10.5 mmol, 1.05 equiv.) in anhydrous DCM (100 mL, 0.1 M) was added a solution of iodine (2.67 g, 10.5 mmol, 1.05 equiv.) in anhydrous DCM (40 mL) over 2 h via syringe pump. The reaction was stirred at ambient temperature for 16 h. The mixture was filtered through a Celite plug and the solvent was evaporated under reduced pressure. The crude residue was purified by flash column chromatography (SiO_2, *n*-pentane), yielding **25** as a white solid (1.41 g, 46%).

***R*$_f$** (Toluene) = 0.8; **^{1}H NMR** (600 MHz, $CDCl_3$) δ 12.27 (s, 1H, H10), 7.85 (dd, *J* = 8.8, 5.7 Hz, 1H, H1), 6.49 (dd, *J* = 10.5, 8.7 Hz, 1H, H2), 4.47 (q, *J* = 7.1 Hz, 2H, H8), 1.43 (t, *J* = 7.1 Hz, 3H, H9) ppm; **^{13}C NMR** (151 MHz, $CDCl_3$) δ = 169.19 (d, J_{CF} = 4.4 Hz, C7), 162.92 (d, J_{CF} = 263.0 Hz, C3), 161.54 (d, *J* = 3.7 Hz, C5), 144.28 (d, J_{CF} = 11.2 Hz, C1), 109.29 (d, J_{CF} = 24.3 Hz, C2), 103.37 (d, J_{CF} = 13.1 Hz, C4), 78.74 (d, J_{CF} = 3.9 Hz, C6), 62.83 (C8), 14.21 (C9) ppm; **^{19}F NMR** (376 MHz, $CDCl_3$) δ = -103.76 (dd, *J* = 10.8, 5.9 Hz) ppm; **IR** (ATR) $\tilde{\nu}$ = 2982, 1663, 1609, 1563, 1460, 1417, 1400, 1374, 1332, 1306, 1250, 1199, 1159, 1131, 1114, 1091, 1061, 1034, 1009, 884, 863, 805, 784, 757, 696, 681, 640, 619, 612 cm^{-1}; **HRMS** (EI) calcd. for $C_9H_8IO_3F$ $[M]^+$ 309.9497, found 309.9512.

Ethyl 3-butyl-7-fluoro-2-hydroxy-2H-benzo[e][1,2]oxaborinine-8-carboxylate (26)

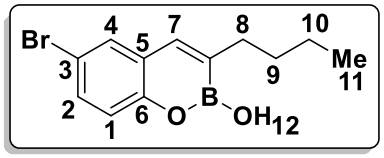


Prepared according to General Procedure **B**, **25** (31.0 mg, 0.1 mmol) and **2** (50.4 mg, 0.15 mmol) were converted to **26** yielding a white solid (65% NMR yield, 16.9 mg, 58%), after purification by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0→8%)

***R*$_f$** (EtOAc/*n*-hexane 20%) = 0.49; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.38 (dd, *J* = 8.9, 6.2 Hz, 1H, H1), 7.34 (s, 1H, H7), 6.89 (t, *J* = 8.9 Hz, 1H, H2), 4.45 (q, *J* = 7.2 Hz, 2H, H13), 2.43 – 2.38 (m, 2H, H8), 1.58 – 1.48 (m, 2H, H9), 1.41 (t, *J* = 7.2 Hz, 3H, H14), 1.39 – 1.31 (m, 2H, H10), 0.92 (t, *J* = 7.3 Hz, 3H, H11) ppm; **^{13}C NMR** (101 MHz, Acetone d_6) δ = 164.0 (C12), 159.2 (d, *J* = 248.7 Hz, C3), 150.2 (d, *J* = 7.7 Hz, C5), 142.3 (d, *J* = 1.5 Hz, C7), 131.2 (d, *J* = 10.3 Hz, C1), 122.5 (d, *J* = 3.3 Hz, C6), 113.2 (d, *J* = 20.2 Hz, C4), 110.1 (d, *J* = 22.4 Hz, C2), 62.4 (C13), 33.3 (C8), 32.3 (C9), 22.9 (C10), 14.3 (C14), 14.1 (C11) ppm; **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 27.23 ppm; **^{19}F NMR** (376 MHz, Acetone d_6) δ = -116.62 (dd, *J* = 9, 6.2 Hz) ppm; **IR** (ATR) $\tilde{\nu}$ = 3444, 3204, 2957, 2930, 1717, 1665, 1619, 1605, 1578, 1484, 1421, 1370, 1332, 1305, 1252, 1206, 1121, 1075, 1037, 948, 912, 810, 696, 673 cm^{-1}; **HRMS** (EI) calcd. for $C_{15}H_{18}BFO_4$ $[M]^+$ 292.1277, found 292.1282.

Product Derivatization

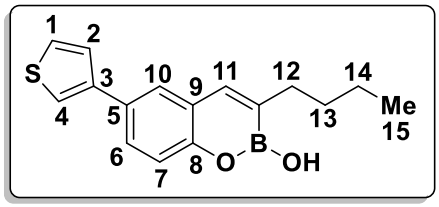
6-Bromo-3-butyl-2*H*-benzo[e][1,2]oxaborinin-2-ol (8)



To an oven-dried 20 mL microwave vial were added $PdCl_2$dppf▪DCM (16.3 mg, 20 µmol, 2 mol%), 4-bromo-2-iodophenol (299 mg, 1 mmol, 1 equiv.), K_3PO_4 (636.8 mg, 3 mmol, 3 equiv.) and **2** (504 mg, 1.5 mmol). The vial was sealed and purged with nitrogen before the sequential addition via syringe of degassed MeCN (2.5 mL) and degassed H_2O (2.5 mL). The reaction mixture was stirred vigorously for 1 h at 60 ˚C. After completion, the reaction mixture was allowed to cool down to ambient temperature and opened to air. 12 mL of 4 M aqueous HCl was added to the mixture, that was stirred for 10 minutes, before being extracted with DCM (3 x 10 mL). The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by flash column chromatography (SiO_2, EtOAc/*n*-hexane 0%→5%) yielding **8** as a white solid (177.0 mg, 63%).

Analytic data in agreement with those reported above.

3-Butyl-6-(thiophen-3-yl)-2*H*-benzo[e][1,2]oxaborinin-2-ol (27)

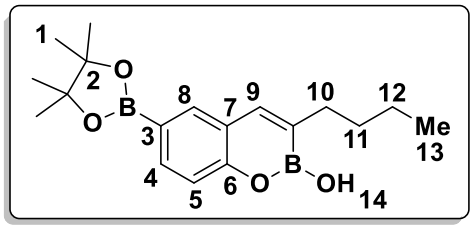


To a 5 mL oven-dried microwave vial **8** (28.1 mg, 0.1 mmol, 1 equiv.), thiophen-3-ylboronic acid (25.6 mg, 0.2 mmol, 2 equiv.), $PdCl_2$dppf▪DCM (1.6 mg, 2 mol%) and K_3PO_4 (63.7 mg). The vial was sealed and purged with nitrogen, before the sequential addition via syringe of degassed THF (500 µL, 0.2 M) and degassed H_2O (90 µL, 5 mmol, 50 equiv.). The reaction mixture was stirred at 50 °C for 8 h. After completion, the reaction was allowed to cool down to ambient temperature and opened to air. 4 M aqueous HCl (2 mL) was added and the reaction mixture was stirred for 5 minutes. It was then transferred to a separation funnel and extracted with DCM (3 x 4 mL). The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. To the residue were added $PdCl_2$dppf▪DCM (1.6 mg, 2 mol%), thiophen-3-ylboronic acid (38.4 mg, 0.3 mmol, 3 equiv.) and K_3PO_4 (63.7 mg, 0.3 mmol, 3 equiv.) and a stirring bar. The container was sealed and purged with nitrogen, before the sequential addition via syringe of degassed THF (500 µL) and H_2O (90 µL, 5 mmol, 50 equiv.). The reaction mixture was stirred at 50 °C for 16 h. After completion, the reaction was allowed to cool down to ambient temperature and opened to air. 4 M aqueous HCl (2 mL) was added and the reaction mixture was stirred for 5 minutes. It was then transferred to a separation funnel and extracted with DCM (3 x 4 mL). The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by flash column chromatography (C18, MeCN/H_2O 20%→100%), yielding **27** as a white solid (14.4 mg, 51%).

R_f (EtOAc/*n*-hexane 20%) = 0.36; **^{1}H NMR** (400 MHz, Acetone d_6) δ = 7.77 (d, *J* = 2.3 Hz, 1H, H10), 7.69 (dd, *J* = 2.9, 1.5 Hz, 1H, H2), 7.65 (dd, *J* = 8.4, 2.3 Hz, 1H, H6), 7.56 – 7.51 (m, 3H, H1 and H4 and H11), 7.19 (d, *J* = 8.4 Hz, 1H, H7), 2.44 (ddd, *J* = 9.0, 6.5, 1.3 Hz, 2H, H12), 1.62 – 1.52 (m, 2H, H13), 1.44 – 1.32 (m, 2H, H14), 0.92 (t, *J* = 7.3 Hz, 3H, H15) ppm; **^{13}C NMR** (101 MHz, Acetone d_6) δ = 152.0 (C8), 143.5 (C11), 142.5 (C3), 130.7 (C5), 127.3 (ThioCH), 127.0 (ThioCH), 126.9 (C6), 126.4 (C10), 126.0 (C9), 120.4 (C2), 118.9 (C7), 33.7 (C12), 32.6 (C13), 23.2 (C14), 14.3 (C15) ppm; **^{11}B NMR** (128 MHz, Acetone d_6) δ = 27.39 ppm; **IR** (ATR) $\tilde{\nu}$ = 3332, 2956, 2917, 2850, 1599, 1561, 1466, 1439, 1421, 1395,

1380, 1339, 1301, 1285, 1258, 1202, 1166, 1085, 939, 919, 854, 847, 831, 794, 777, 760, 732, 665, 617 cm^{-1}; **HRMS** (EI) calcd. for $C_{16}H_{17}BO_2S$ $[M]^+$ 284.1037, found 284.1046.

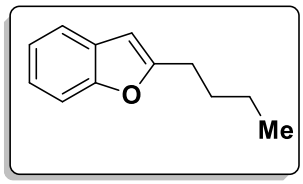
3-Butyl-6-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-2*H*-benzo[e][1,2]oxaborinin-2-ol (28)



To an oven dried microwave vial, **8** (28.1 mg, 0.1 mmol, 1 equiv.), bis(pinacolato)diboron (38.1 mg, 0.15 mmol, 1.5 equiv.), dried KOAc (29.4 mg, 0.3 mmol, 3 equiv.), and $PdCl_2$(dppf)▪DCM (0.8 mg, 1 mol%) were added. The vial was sealed and purged with nitrogen before the addition via syringe of anhydrous 1,4-dioxane (1 mL, 0.1 M). The reaction mixture was stirred for 22 h at 80 °C. After completion, the reaction was allowed to cool down to ambient temperature, opened to air and concentrated under reduced pressure and the crude residue was purified by flash column chromatography (SiO_2, Acetone/*n*-hexane 0%→1%), yielding **28** as a white solid (28.3 mg, 86%).

***R*$_f$** (Acetone/*n*-hexane 10%) = 0.23; **^{1}H NMR** (400 MHz, $CDCl_3$) δ = 7.85 (d, *J* = 1.6 Hz, 1H, H8), 7.74 (dd, *J* = 8.1, 1.6 Hz, 1H, H4), 7.44 (s, 1H, H9), 7.18 (d, *J* = 8.1 Hz, 1H, H5), 4.53 (br, 1H, H14), 2.42 (t, *J* = 7.0 Hz, 2H, H10), 1.55 (tt, *J* = 8.5, 7.0 Hz, 2H, H11), 1.36 (m, 14H, H1 and H12), 0.93 (t, *J* = 7.3 Hz, 3H, H13). **^{13}C NMR** (100 MHz, $CDCl_3$) δ = 154.1 (C6), 143.6 (C9), 135.5 (C8), 134.8 (C4), 124.6 (C7), 117.6 (C5), 84.0 (C2), 32.8 (C10), 31.8 (C11), 25.0 (C1), 22.6 (C12), 14.1 (C13). **^{11}B NMR** (128 MHz, $CDCl_3$) δ = 30.39, 27.62 ppm; **IR** (ATR) $\tilde{\nu}$ = 3410, 2978, 2956, 2927, 2857, 1612, 1569, 1428, 1361, 1325, 1275, 1258, 1206, 1166, 1143, 1085, 1037, 965, 930, 857, 830, 757, 673 cm^{-1}; **HRMS** (ESI) calcd. for $C_{20}H_{30}B_2NO_4$ $[M + MeCN + H]^+$ 370.2355, found 370.2362.

2-Butylbenzofuran (29)

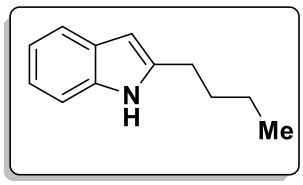


To a solution of **3** (20.2 mg, 0.1 mmol, 1 equiv.) in THF (1 mL) and EtOH (250 µL) in air was added 3 M aqueous NaOH (0.5 mL). The vigorously stirred mixture was placed in an ice bath and 30% (w/w) aqueous solution of H_2O_2 (0.5 mL) was added dropwise. The reaction mixture was stirred vigorously at 0 °C for 5 minutes and then at ambient temperature for 20 minutes. After completion, the reaction mixture was concentrated under reduced pressure. The residue was transferred to a separation funnel with DCM (4 mL) and saturated aqueous $Na_2S_2O_3$ (5 mL) was added. The aqueous phase was extracted with DCM (3 x 4 mL). The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. The residue was transferred to a 5 mL round bottom flask. Activated 4 Å molecular sieves (71 mg) and a stirring bar were added. The flask was sealed and purged with nitrogen and the residue dissolved in anhydrous DCM (2.5 mL). TFA (1 mL) was added via syringe and the mixture stirred at ambient temperature for 20 minutes. The mixture was then transferred to a separation funnel containing H_2O (5 mL). The aqueous phase was extracted with DCM (3 x 5 mL). The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by flash column chromatography (SiO_2, DCM), yielding **29** as a colorless oil (15.9 mg, 91%).

^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.50 – 7.46 (m, 1H), 7.44 – 7.39 (m, 1H), 7.23 – 7.15 (m, 2H), 6.38 (s, 1H), 2.78 (t, *J* = 7.6 Hz, 2H), 1.80 – 1.67 (m, 2H), 1.48 – 1.38 (m, 2H), 0.97 (t, *J* = 7.3 Hz, 3H) ppm; **^{13}C**

NMR (101 MHz, $CDCl_3$) δ =159.9, 154.8, 129.2, 123.2, 122.5, 120.3, 110.8, 101.9, 29.9, 28.3, 22.4, 14.0 ppm; analytic data in agreement with literature.[13]

2-Butyl-1*H*-indole (30)



To a solution of **18** (40.2 mg, 0.2 mmol, 1 equiv.) in THF (2 mL) and EtOH (0.5 mL) in air was added 3 M aqueous NaOH (1 mL). The vigorously stirred mixture was placed in an ice bath and 30% (w/w) aqueous solution of H_2O_2 (1 mL) was added dropwise. The reaction mixture was stirred vigorously at 0 °C for 5 minutes and then at ambient temperature for 20 minutes. After completion, the reaction mixture was concentrated under reduced pressure. The residue was transferred to a separation funnel with DCM (4 mL) and saturated aqueous $Na_2S_2O_3$ (5 mL) was added. The aqueous phase was extracted with DCM (3 x 4 mL). The combined organic phases were dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by flash column chromatography (SiO_2, DCM), yielding **30** as a pale-yellow oil (32.9 mg, 95%).

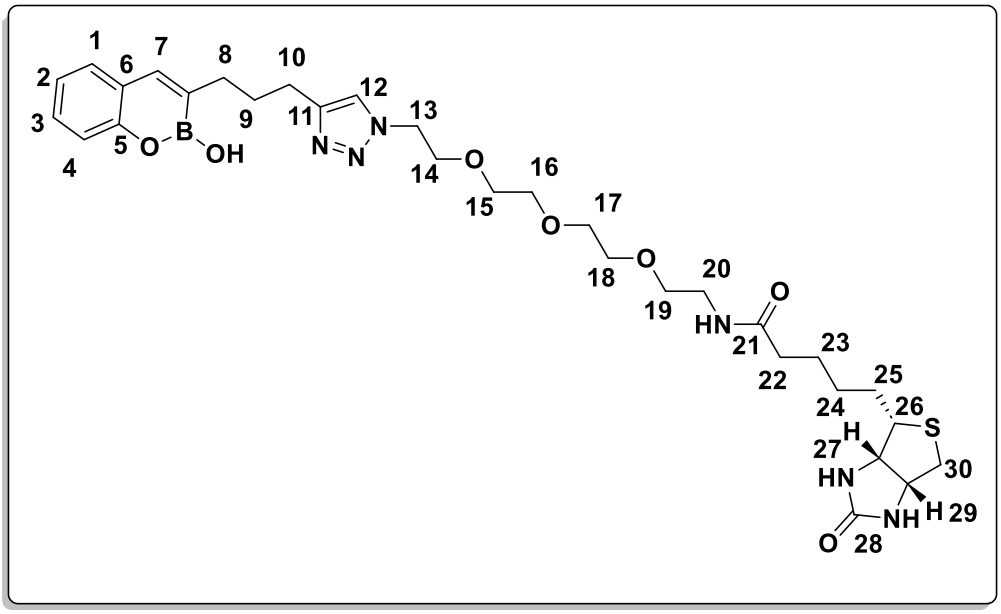
^{1}H NMR (400 MHz, $CDCl_3$) δ =7.85 – 7.70 (m, 1H), 7.59 (dd, *J* = 7.6, 1.3 Hz, 1H), 7.31 (d, *J* = 7.7 Hz, 1H), 7.15 (dtd, *J* = 16.1, 7.2, 1.4 Hz, 2H), 6.29 (d, *J* = 2.0 Hz, 1H), 2.77 (t, *J* = 7.7 Hz, 2H), 1.81 – 1.68 (m, 2H), 1.47 (h, *J* = 7.3 Hz, 2H), 1.01 (t, *J* = 7.4 Hz, 3H) ppm; **^{13}C NMR** (101 MHz, $CDCl_3$) δ =140.1, 136.0, 129.0, 121.0, 119.9, 119.7, 110.4, 99.5, 31.4, 28.1, 22.5, 14.0 ppm; analytic data in agreement with literature.[14]

Click Synthesis of Appended Biomolecular Probes

General procedure D: CuAAC of 23

23 (19 µmol, 1 equiv.) and the respective azide (19 µmol, 1 equiv.) were dissolved in degassed DCM (1.5 mL). To the stirred solution was added $Cu(MeCN)_4BF_4$ (1.8 mg, 30 mol%). The resulting mixture was stirred at ambient temperature for 16 h. The mixture was then concentrated under reduced pressure and the crude residue purified by flash column chromatography.

***N*-(2-(2-(2-(2-(4-(3-(2-hydroxy-2*H*-benzo[e][1,2]oxaborinin-3-yl)propyl)-1*H*-1,2,3-triazol-1-yl)ethoxy)ethoxy)ethoxy)ethyl)-5-((3a*S*,4*S*,6a*R*)-2-oxohexahydro-1*H*-thieno[3,4-d]imidazol-4-yl)pentanamide (31)**

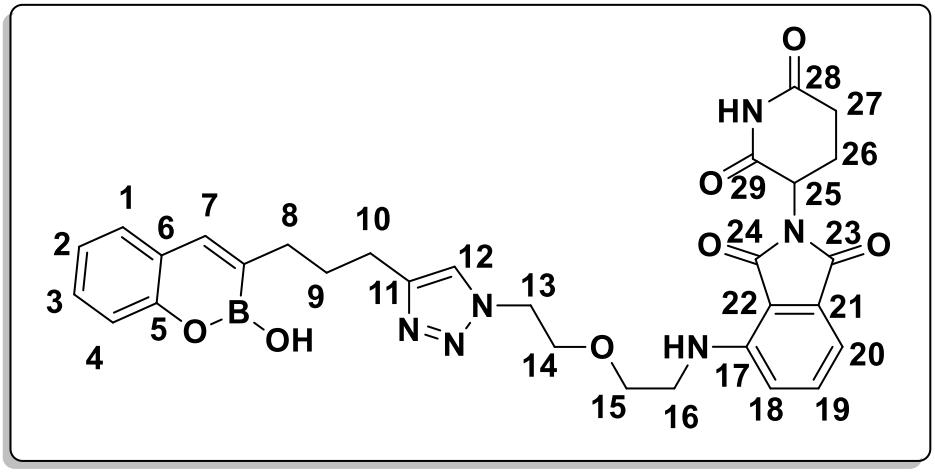


Prepared according to General Procedure **D**, **23** (4 mg, 19 µmol) and *N*-[2-[2-[2-(2-Azidoethoxy)ethoxy]ethoxy]ethyl]hexahydro-2-oxo-(3*aS*,4*S*,6*aR*)-1*H*-thieno[3,4-*d*]imidazole-4-pentanamide (8.4 mg, 19 µmol) were converted to **31**, yielding a white solid (8.3 mg, 67%), after purification by flash column chromatography (SiO_2, Acetone/MeOH 0%→5%).

***R*$_f$** ($CHCl_3$/MeOH 5%) = 0.2; **^{1}H NMR** (600 MHz, Acetone d_6) δ = 7.82 (s, 1H, H12), 7.48 (s, 1H, H7), 7.40 (dd, *J* = 7.5, 1.6 Hz, 1H, H1), 7.31 – 7.25 (m, 1H, H3), 7.15 (d, *J* = 8.2 Hz, 1H, H4), 7.08 (td, *J* = 7.5, 1.1 Hz, 1H, H2), 4.53 (t, *J* = 5.2 Hz, 2H, H13), 4.49 (dd, *J* = 8.3, 4.6 Hz, 1H, H29), 4.31 (dd, *J* = 7.9, 4.6 Hz, 1H, H27), 3.87 (t, *J* = 5.2 Hz, 2H, H14), 3.60 – 3.57 (m, 2H, H15 or H16 or H17 or H18), 3.55 (td, *J* = 4.5, 2.0 Hz, 2H, H15 or H16 or H17 or H18), 3.52 (s, 4H, H15 or/and H16 or/and H17 or/and H18), 3.47 (t, *J* = 5.6 Hz, 2H, H19), 3.30 (t, *J* = 5.6 Hz, 2H, H20), 3.17 (ddd, *J* = 7.9, 6.4, 4.5 Hz, 1H, H26), 2.88 (ddd, *J* = 12.6, 5.0, 1.0 Hz, 1H, H30), 2.72 (t, *J* = 7.5 Hz, 2H, H10), 2.68 (d, *J* = 12.6 Hz, 1H, H30), 2.48 (t, *J* = 7.7 Hz, 2H, H8), 2.17 (t, *J* = 7.5 Hz, 2H, H22), 1.90 (p, *J* = 7.6 Hz, 2H, H9), 1.75 – 1.68 (m, 1H, H25), 1.63 – 1.49 (m, 3H, H25 and H23), 1.43 – 1.31 (m, 2H, H24) ppm; **^{13}C NMR** (151 MHz, Acetone d_6) δ = 174.7 (C21), 164.6 (C28), 152.6 (C5), 148.0 (C11), 143.9 (C7), 128.9 (C3), 128.8 (C1), 125.4 (C6), 123.3 (C12), 122.7 (C2), 118.5 (C4), 70.8 (C15 or C16 or C17 or C18), 70.7 (C15 or C16 or C17 or C18), 70.7 (C15 or C16 or C17 or C18), 70.5 (C15 or C16 or C17 or C18), 70.0 (C19), 69.9 (C14), 62.3 (C27), 60.7 (C29), 56.2 (C26), 50.50 (C13), 40.6 (C30), 39.5 (C20), 36.1 (C22), 33.2 (C8), 30.0 (C9), 29.0 (C24), 28.8 (C25),

26.1 (C23), 25.5 (C10) ppm; **^{11}B NMR** (128 MHz, Acetone d_6) δ = 26.87 ppm; **IR** (ATR) $\tilde{\nu}$ = 3568, 3309, 3220, 2927, 2864, 2376, 2102, 1690, 1638, 1612, 1551, 1536, 1509, 1460, 1424, 1362, 1339, 1261, 1101, 856, 800, 758, 721, 683, 669 cm^{-1}; **HRMS** (ESI) calcd. for $C_{31}H_{46}BN_6O_7S$ $[M + H]^+$ 657.3236, found 657.3258.

2-(2,6-Dioxopiperidin-3-yl)-4-((2-(2-(4-(3-(2-hydroxy-2*H*-benzo[e][1,2]oxaborinin-3-yl)propyl)-1*H*-1,2,3-triazol-1-yl)ethoxy)ethyl)amino)isoindoline-1,3-dione (32)



Prepared according to General Procedure **D**, **23** (4 mg, 19 µmol) and 4-[[2-(2-Azidoethoxy)ethyl]amino]-2-(2,6-dioxo-3-piperidinyl)-1*H*-isoindole-1,3(2*H*)-dione (7.3 mg, 19 µmol) were converted to **32** yielding a yellow solid (5.9 mg, 52%), after purification by flash column chromatography (SiO_2, EtOAc/THF 100%→0%).

***R*$_f$** (THF) = 0.70; **^{1}H NMR** (600 MHz, Acetone d_6) δ = 7.74 (s, 1H, H12), 7.54 (ddd, *J* = 8.3, 7.1, 0.8 Hz, 1H, H19), 7.46 (s, 1H, H7), 7.39 (d, *J* = 7.6 Hz, 1H, H1), 7.30 – 7.26 (m, 1H, H3), 7.14 (d, *J* = 8.1 Hz, 1H, H4), 7.11 – 7.06 (m, 2H, H2 and H18), 7.01 (d, *J* = 7.1 Hz, 1H, H20), 5.06 (dd, *J* = 12.9, 5.5 Hz, 1H, H25), 4.56 (t, *J* = 5.0 Hz, 2H, H13), 3.92 (t, *J* = 5.0 Hz, 2H, H14), 3.72 (t, *J* = 5.3 Hz, 2H, H15), 3.52 (t, *J* = 5.3 Hz, 2H, H16), 2.93 (ddd, *J* = 18.1, 14.4, 5.3 Hz, 1H, H27), 2.78 – 2.72 (m, 2H, H26 and H27), 2.69 (t, *J* = 7.3 Hz, 2H, H10), 2.45 (t, *J* = 7.3 Hz, 2H, H8), 2.21 – 2.14 (m, 1H, H26), 1.89 (p, *J* = 7.3 Hz, 2H, H9) ppm; **^{13}C NMR** (151 MHz, Acetone d_6) δ = 173.0 (C28), 170.3 (C29), 170.2 (C24), 168.3 (C23), 152.8 (C5), 148.0 (C11), 147.6 (C17), 144.0 (C7), 136.9 (C19), 133.4 (C21), 128.9 (C3), 128.9 (C1), 125.6 (C6), 123.2 (C12), 122.7 (C2), 118.6 (C4), 117.9 (C18), 111.6 (C20), 110.9 (C22), 70.3 (C15), 70.1 (C14), 50.6 (C13), 49.8 (C25), 42.7 (C16), 33.2 (C8), 31.9 (C27), 30.3 (C9), 25.4 (C10), 23.3 (C26) ppm; **^{11}B NMR** (128 MHz, Acetone d_6) δ = 27.87 ppm; **IR** (ATR) $\tilde{\nu}$ = 3387, 2912, 1697, 1624, 1559, 1507, 1408, 1362, 1261, 1199, 1114, 748, 669 cm^{-1}; **HRMS** (ESI) calcd. for $C_{30}H_{31}BN_6O_7Na$ $[M + Na]^+$ 621.2239, found 621.2248.

UV-Vis analysis of 21

The absorption spectrum was recorded on a Shimadzu UV-1900 I UV/Vis Spectrophotometer, at medium speed with 2 nm steps in the 220-600 nm range using a 1 cm path quartz cuvette.

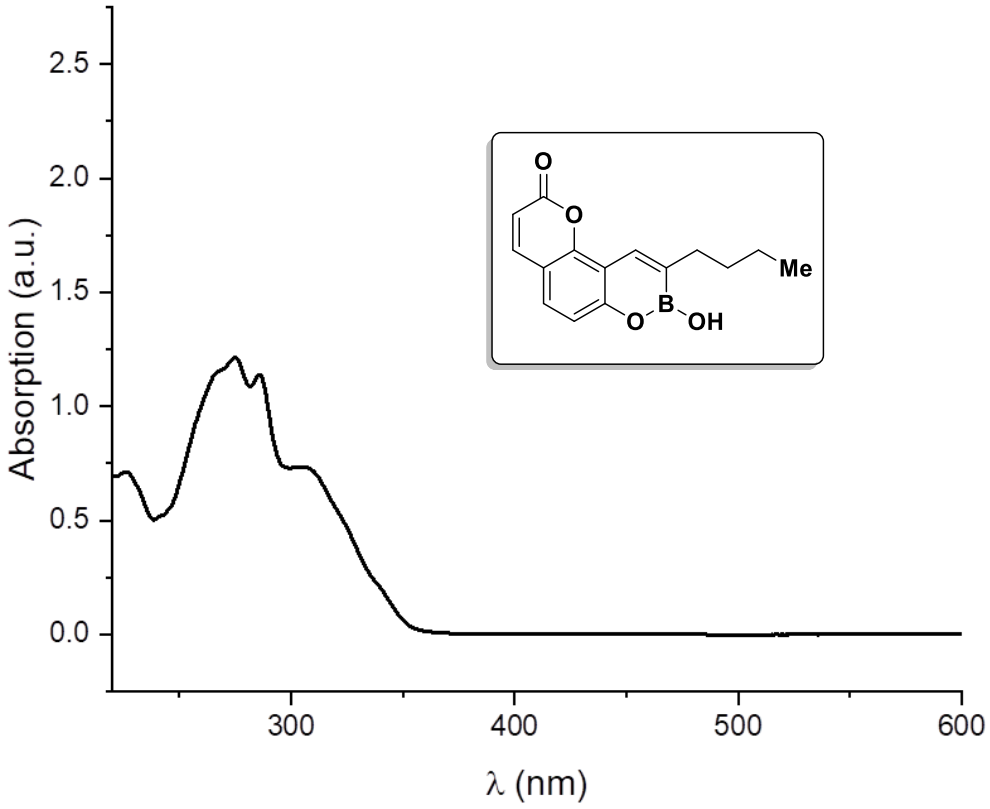


Figure S1 Absorption spectrum of **21** in MeCN (0.05 mM).

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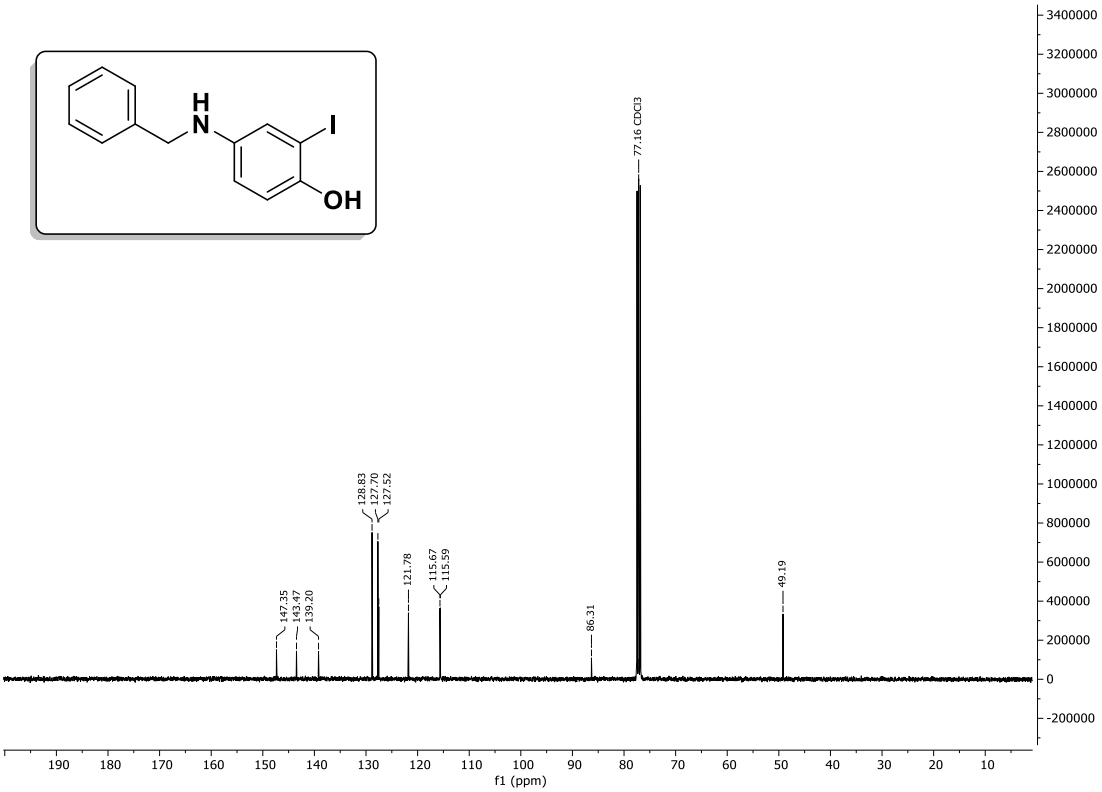
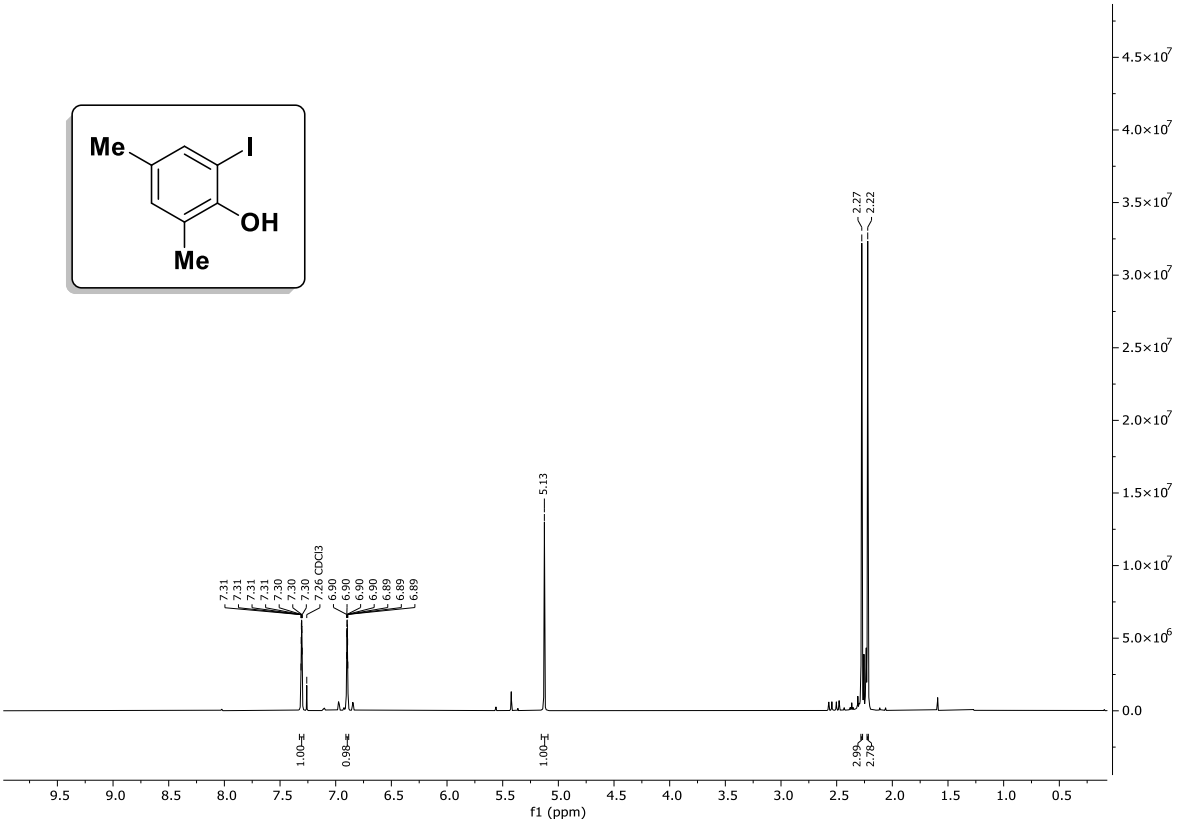
NMR Spectra

^{1}H NMR of S1 (400 MHz, $CDCl_3$)

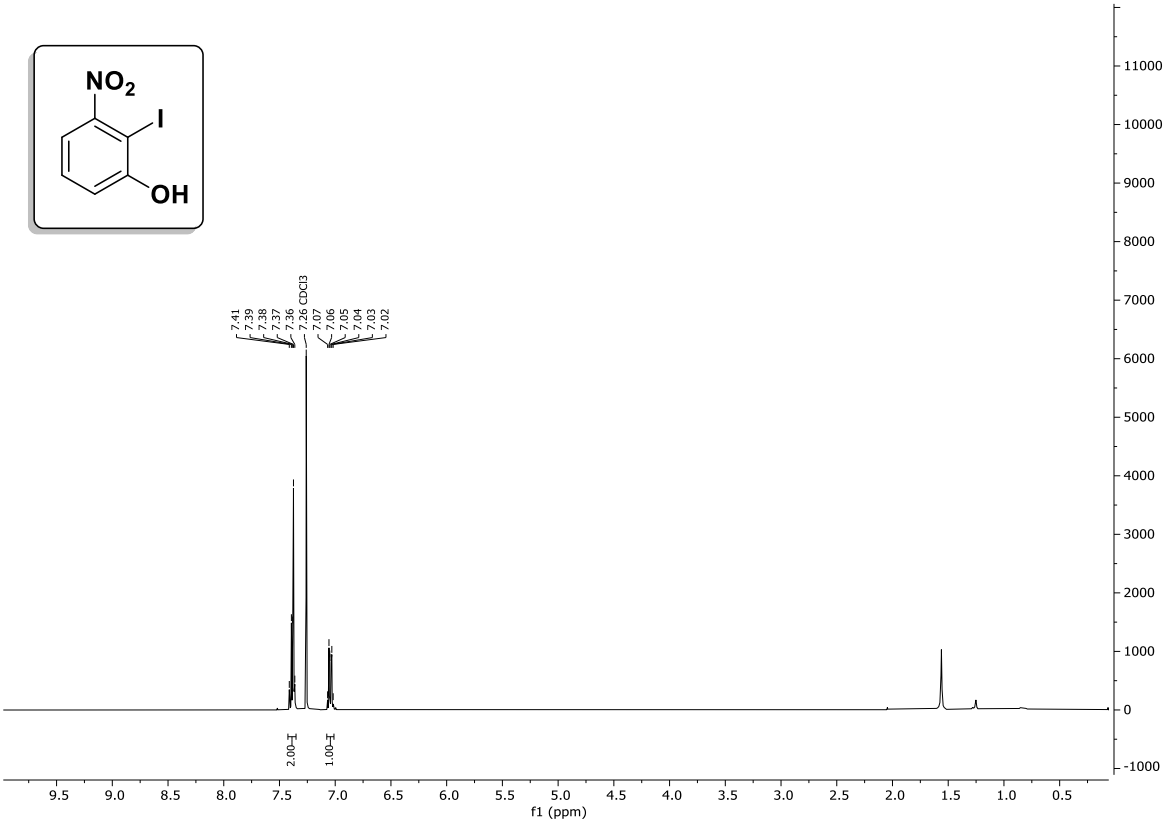
^{13}C NMR of S1 (101 MHz, $CDCl_3$)



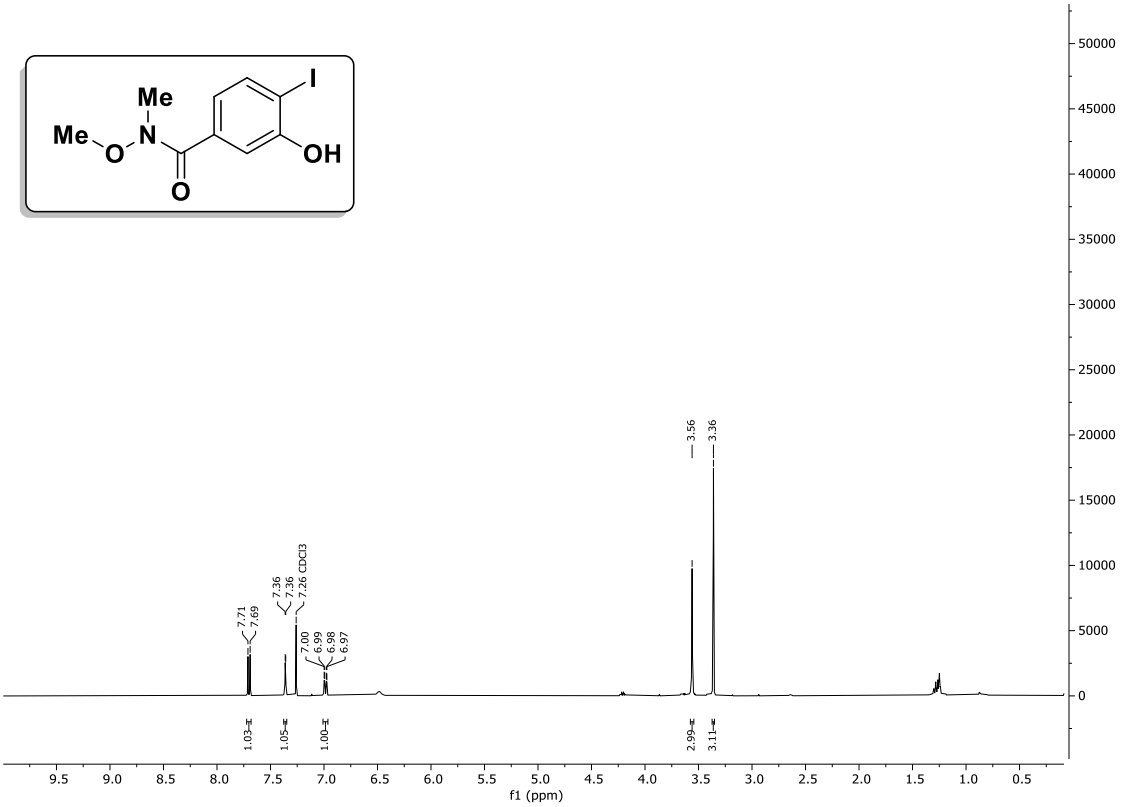
^{1}H NMR of S2 (400 MHz, $CDCl_3$)



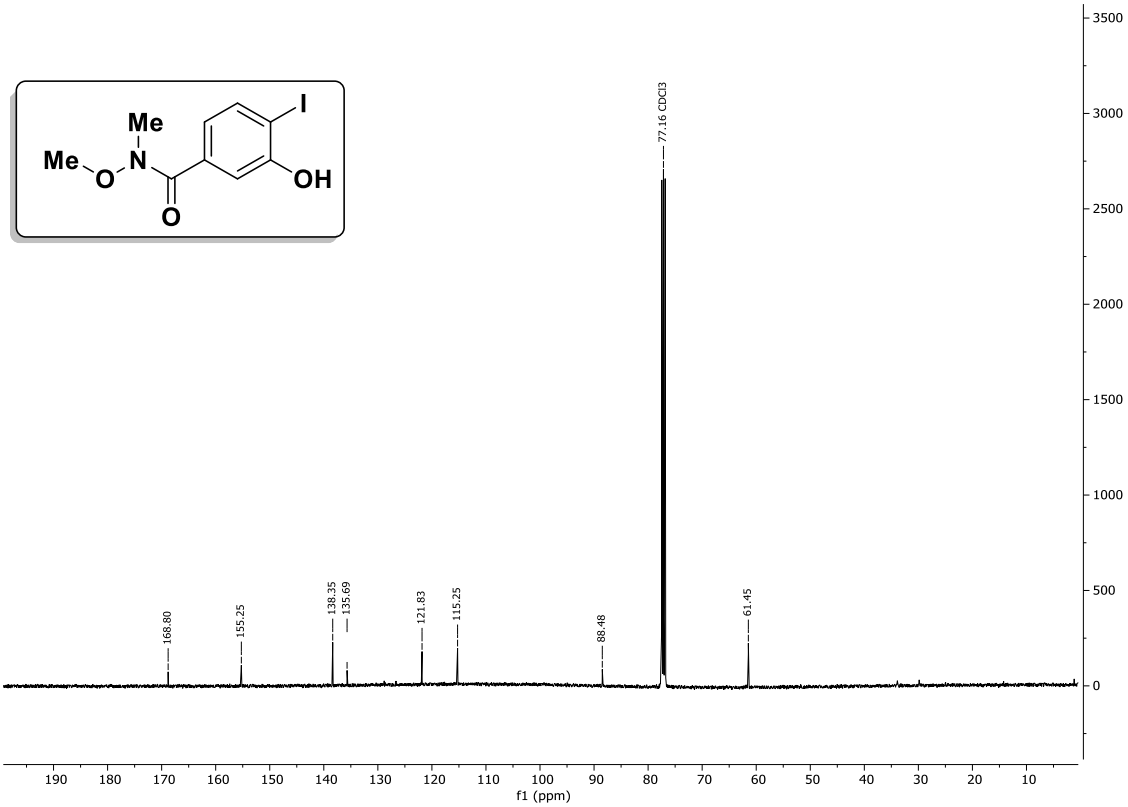
^{1}H NMR of S3 (400 MHz, $CDCl_3$)



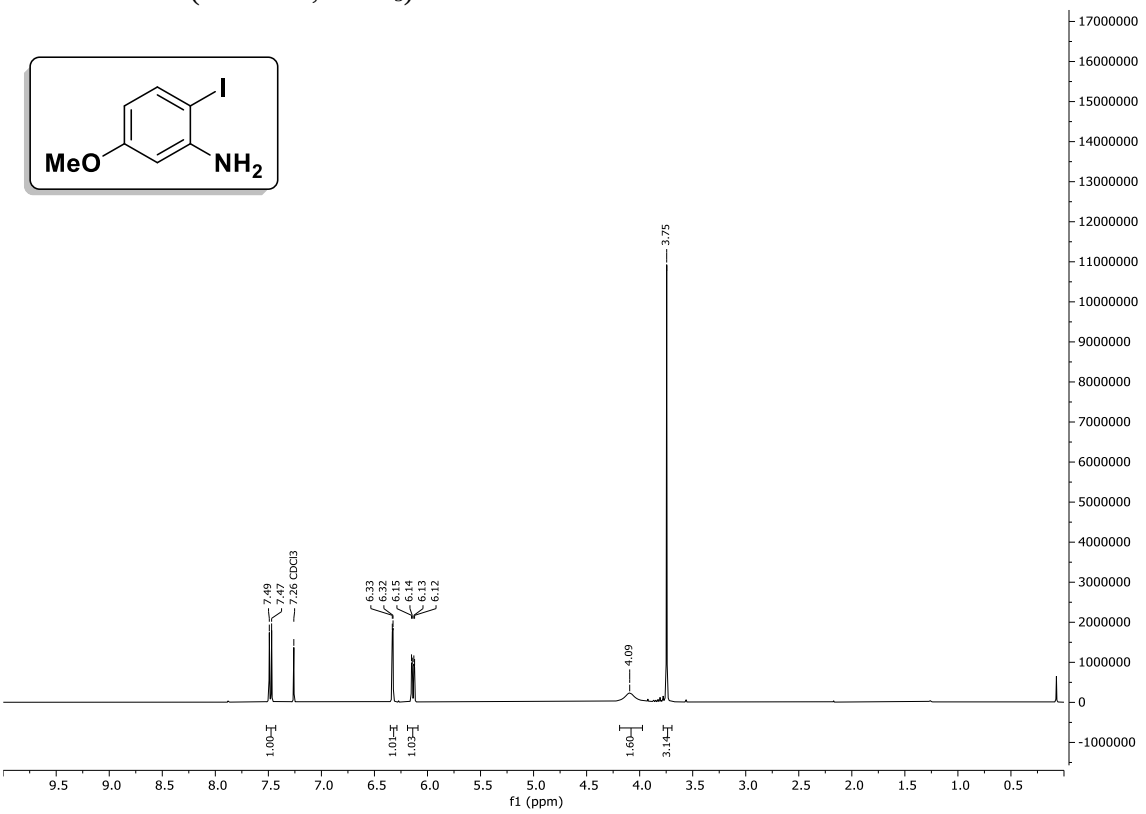
^{1}H NMR of S4 (400 MHz, $CDCl_3$)



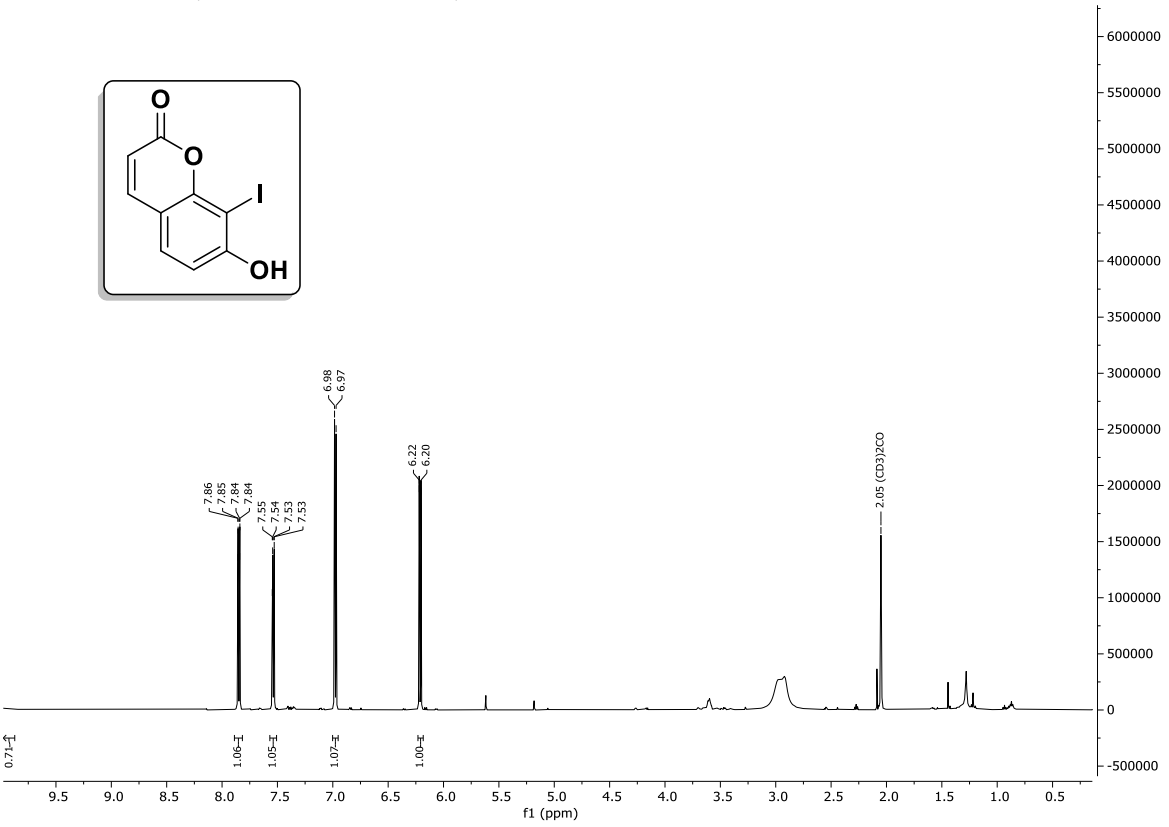
^{13}C NMR of S4 (101 MHz, $CDCl_3$)



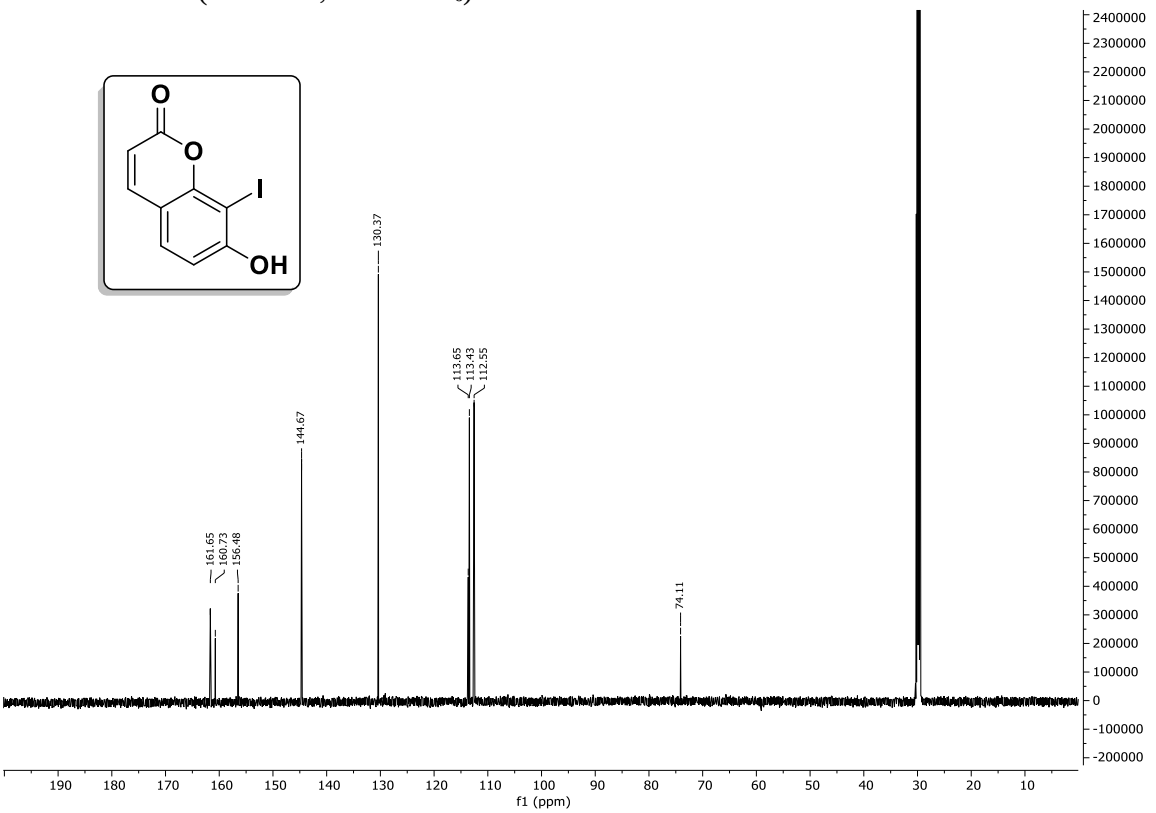
^{1}H NMR of S5 (400 MHz, $CDCl_3$)



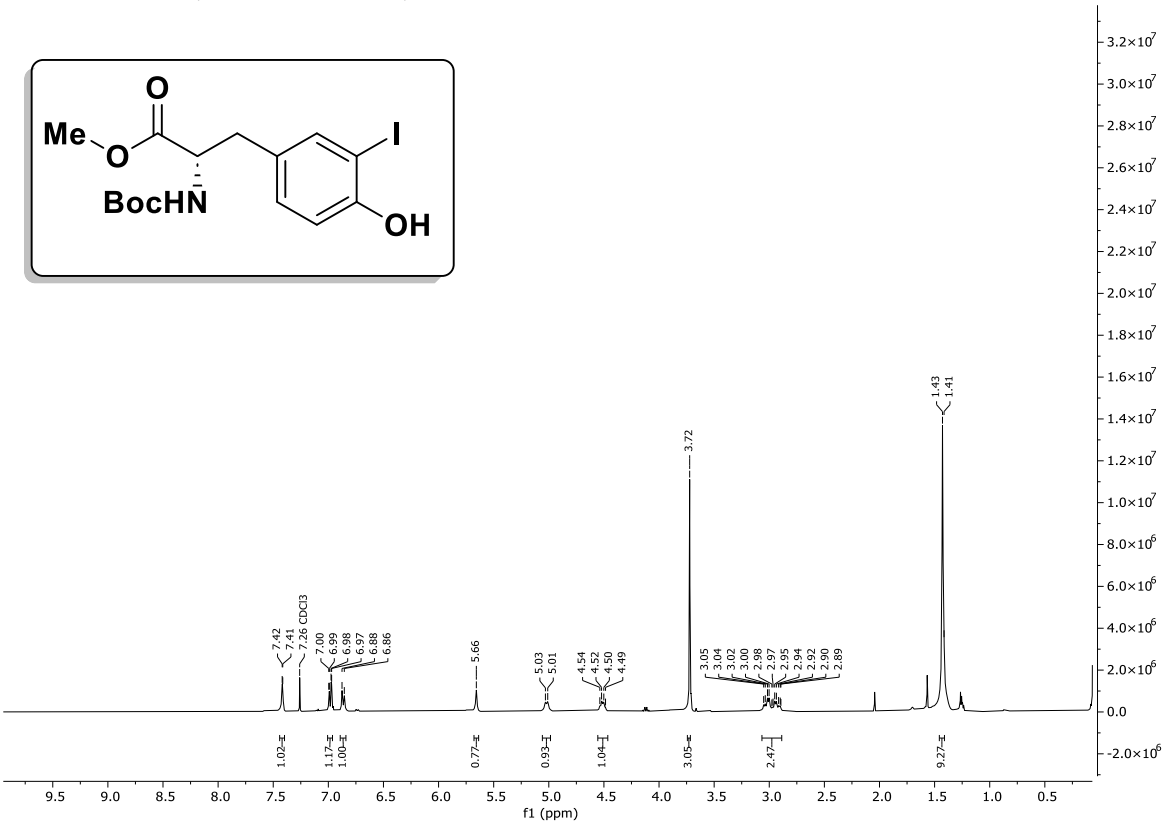
^{1}H NMR of S6 (400 MHz, Acetone d_6)



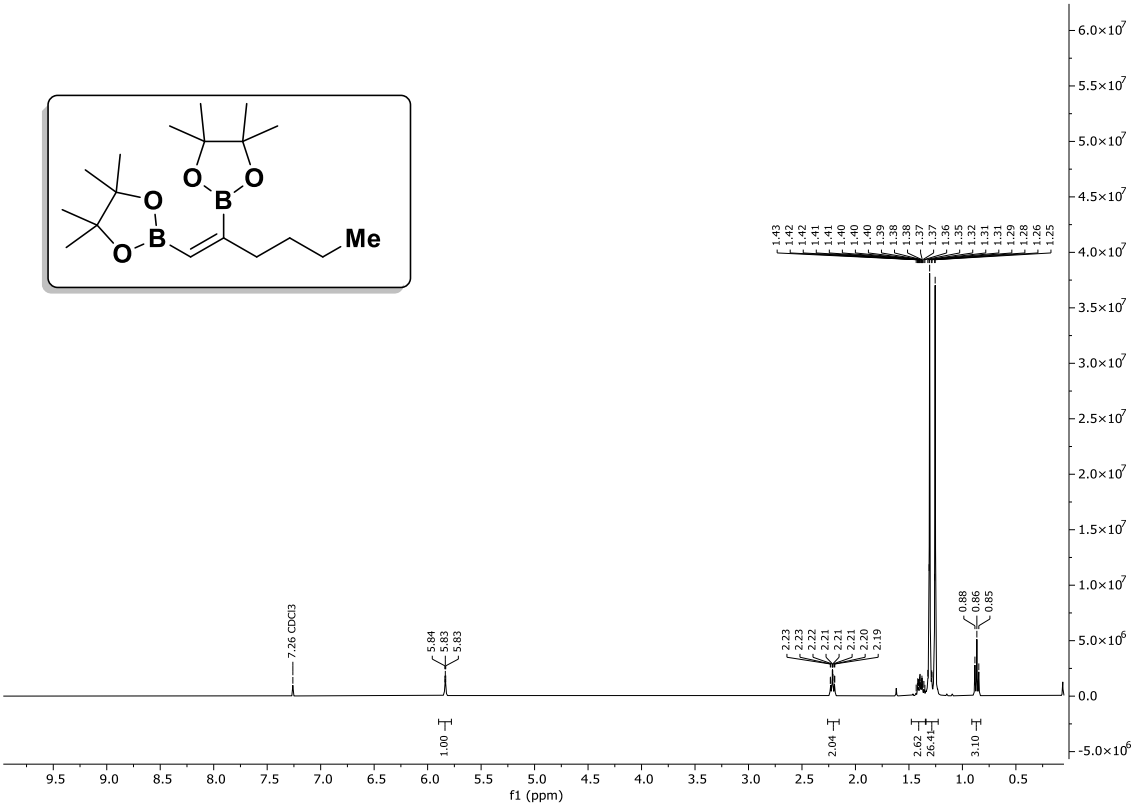
^{13}C NMR of S6 (151 MHz, Acetone d_6)



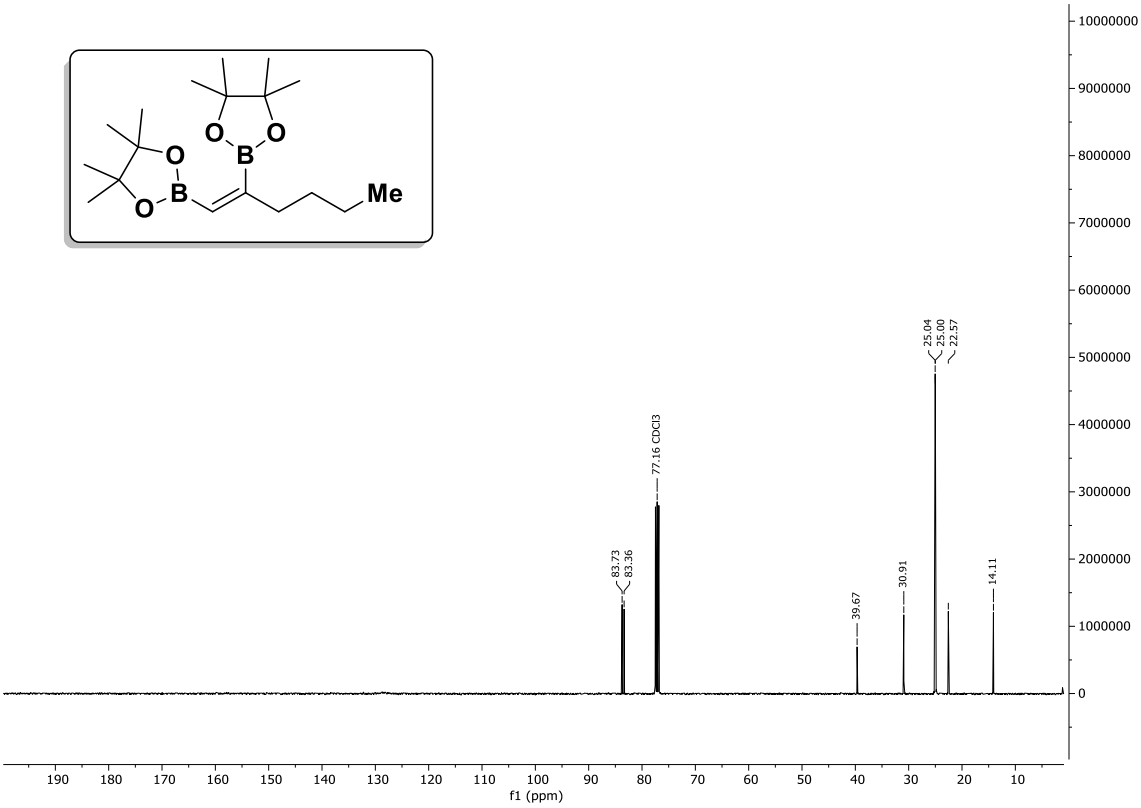
^{1}H NMR of S7 (400 MHz, $CDCl_3$)



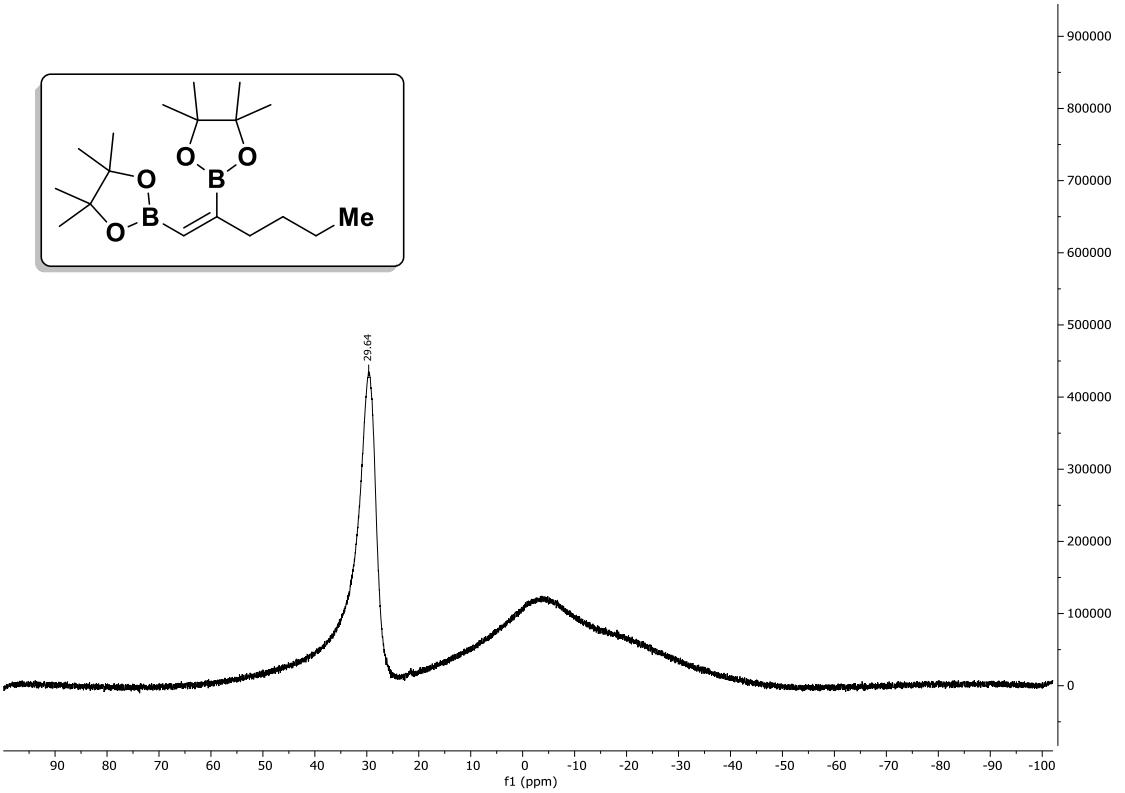
^{1}H NMR of 2 (400 MHz, $CDCl_3$)



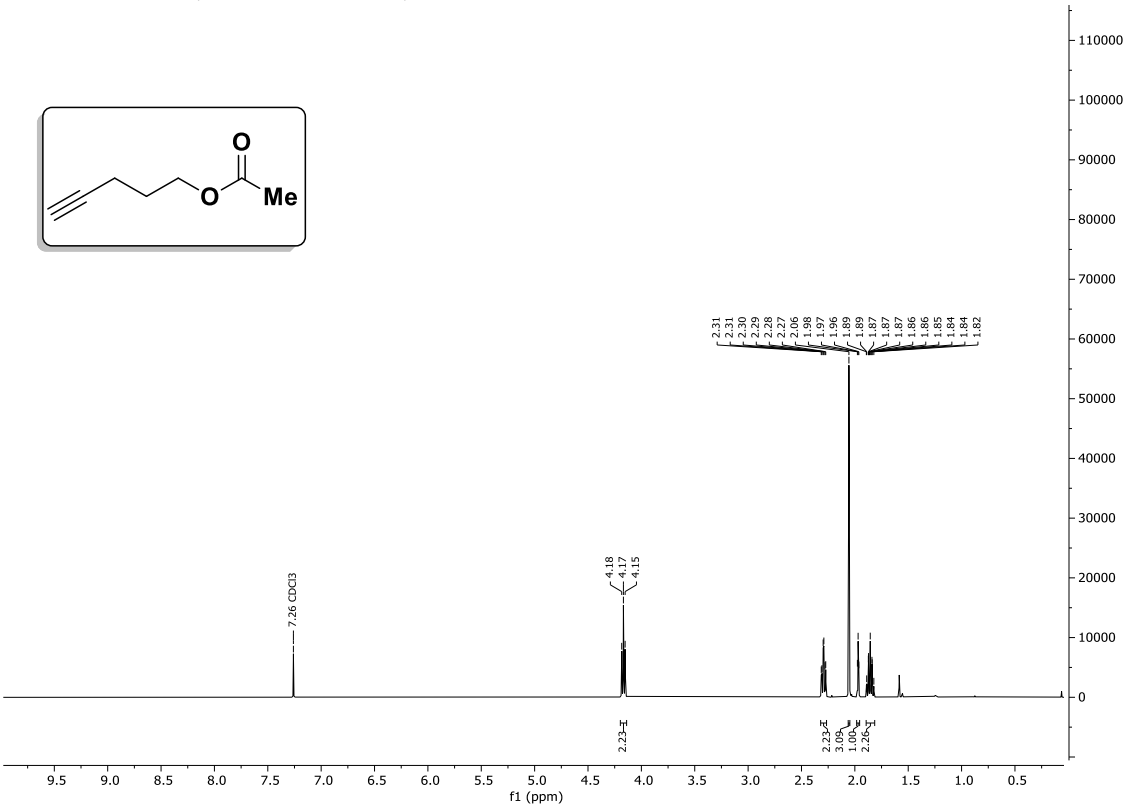
^{13}C NMR of 2 (101 MHz, $CDCl_3$)



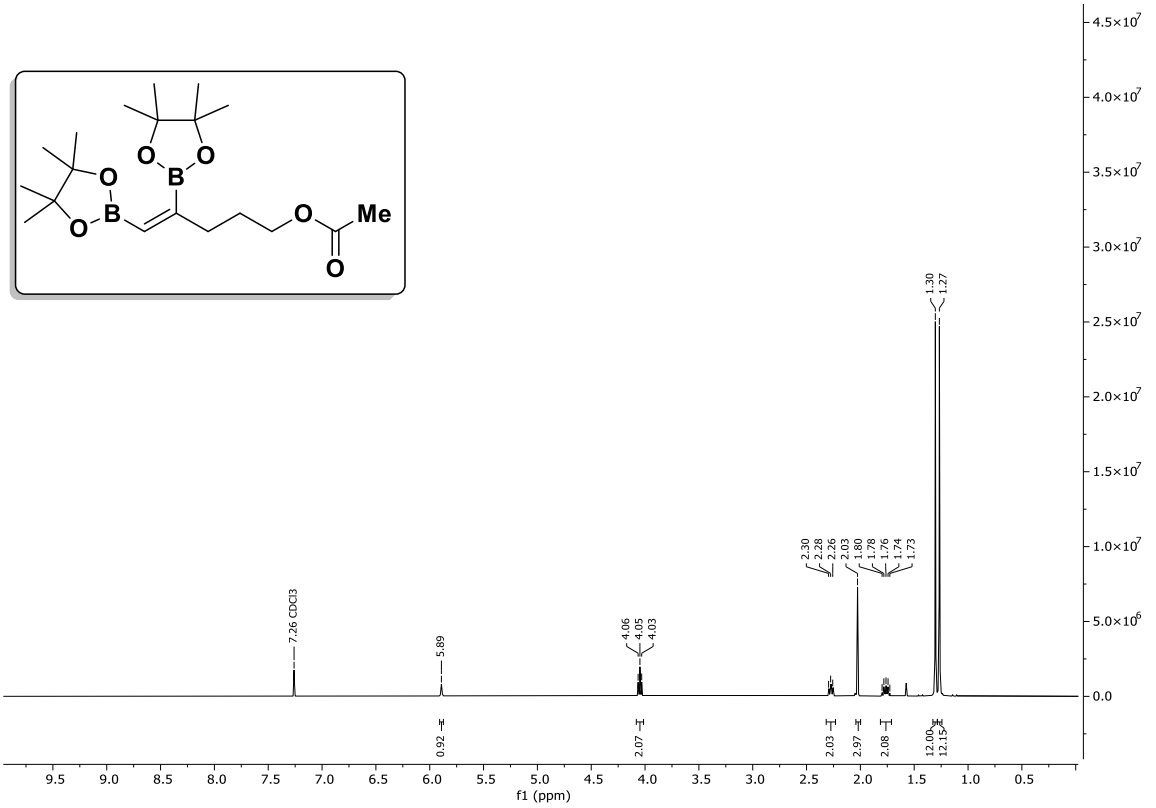
^{11}B NMR of 2 (128 MHz, $CDCl_3$)



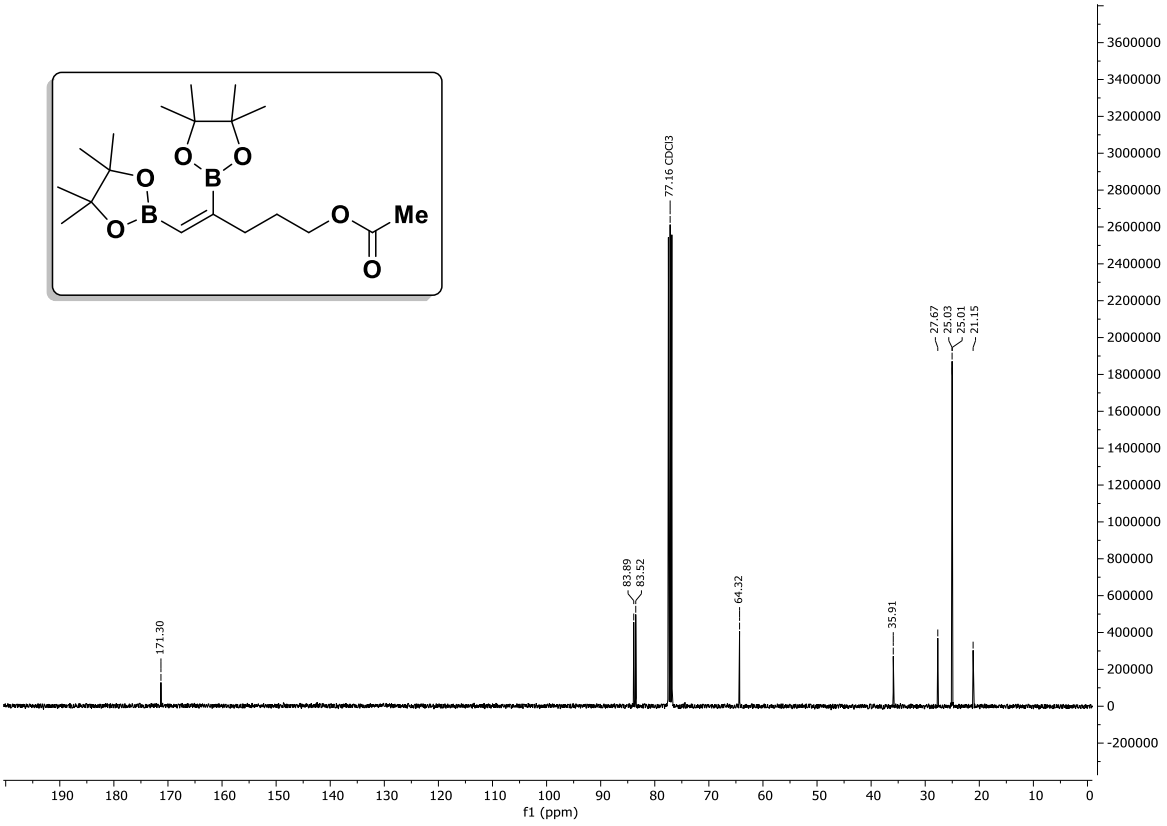
^{1}H NMR of S8 (400 MHz, $CDCl_3$)



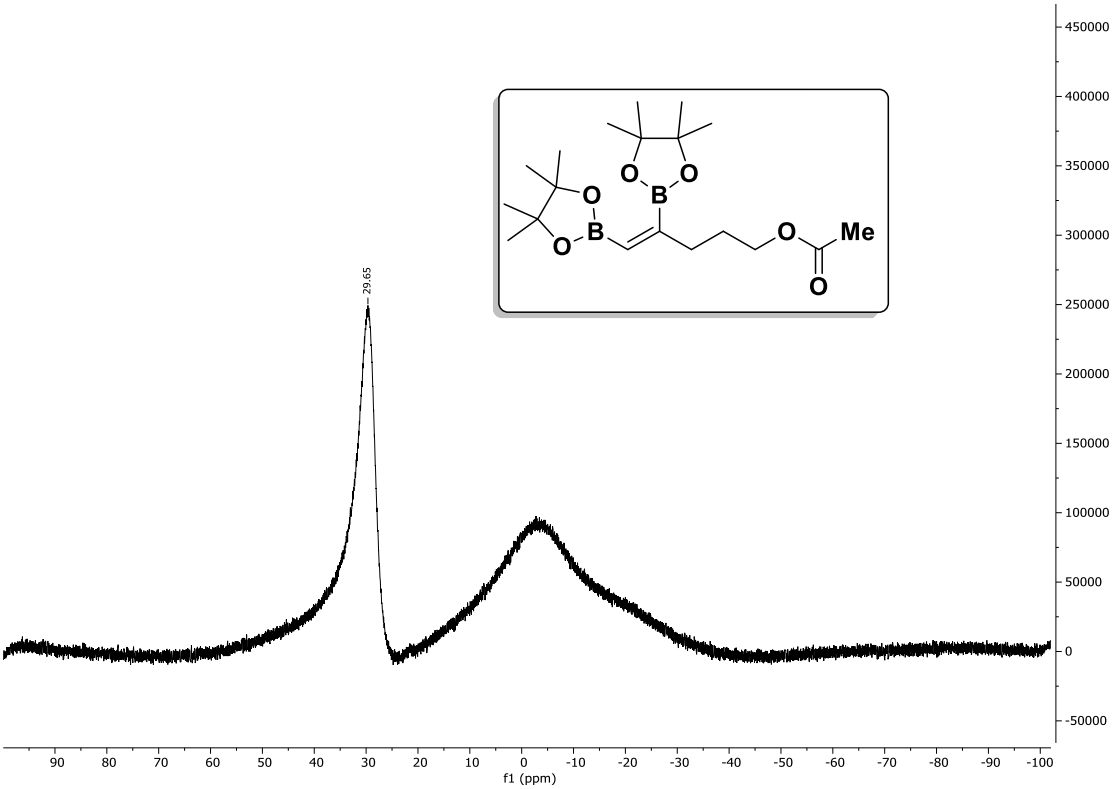
^{1}H NMR of S9 (400 MHz, $CDCl_3$)



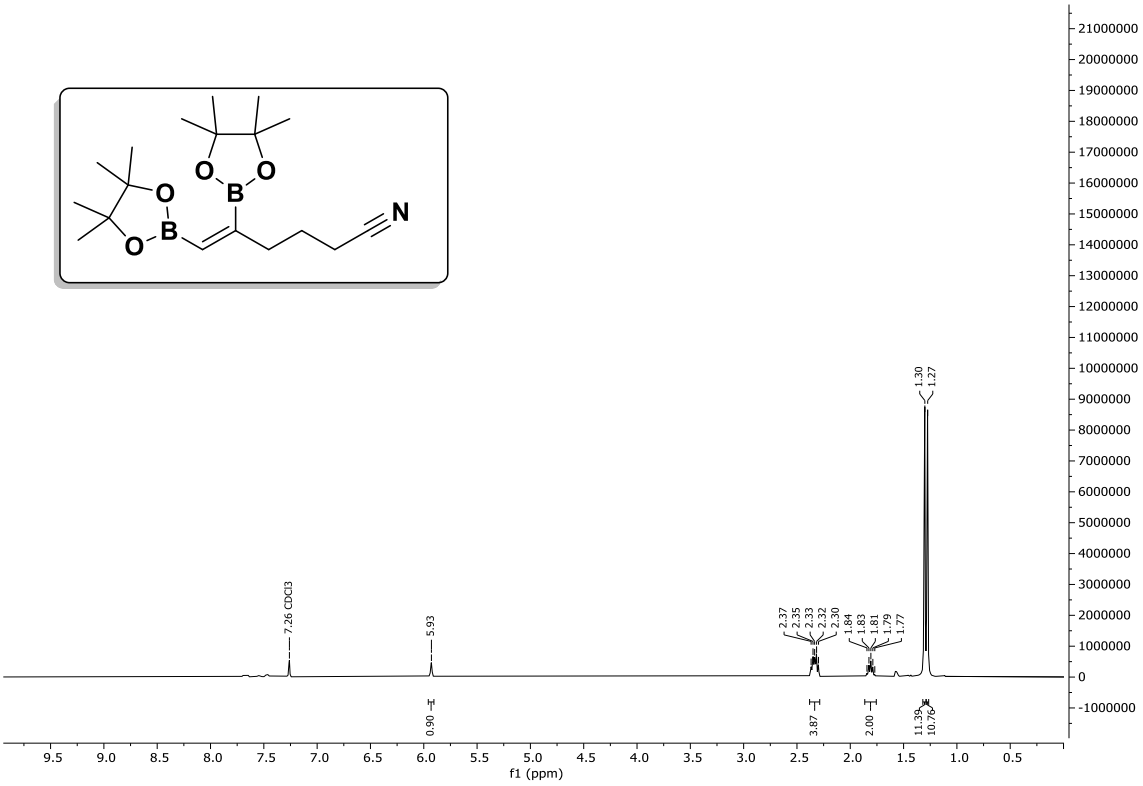
^{13}C NMR of S9 (101 MHz, $CDCl_3$)



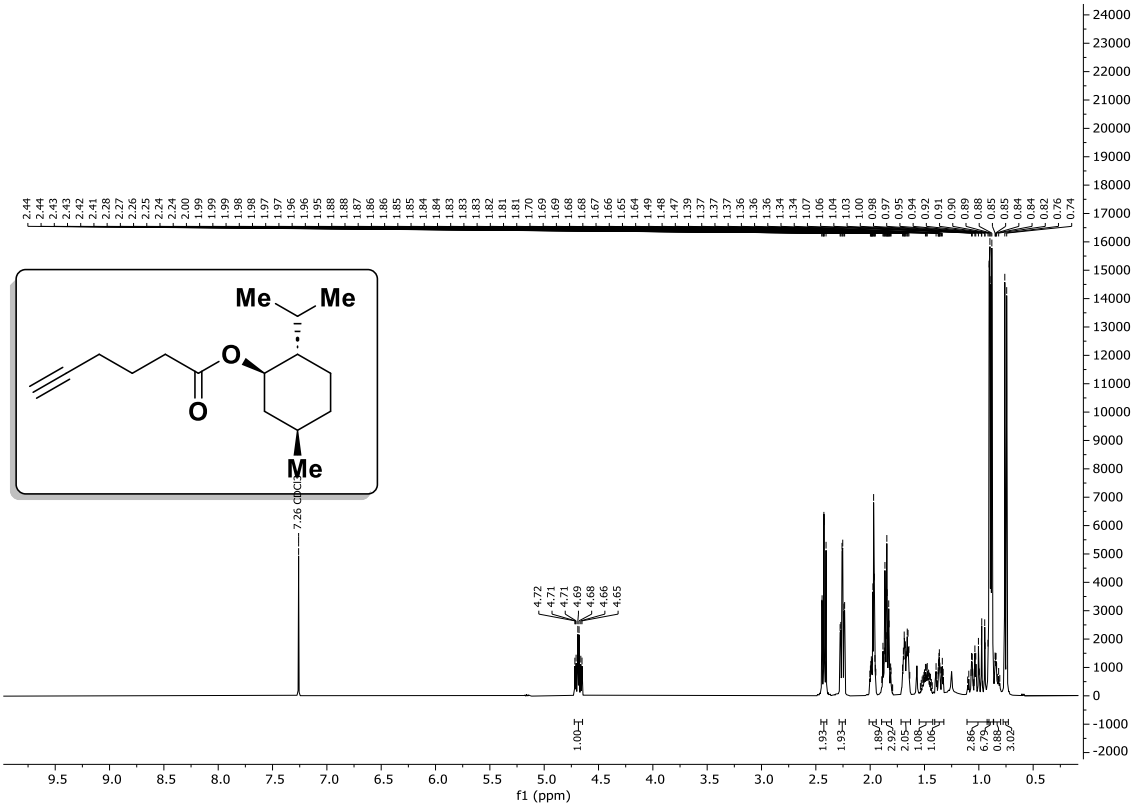
^{11}B NMR of S9 (128 MHz, $CDCl_3$)



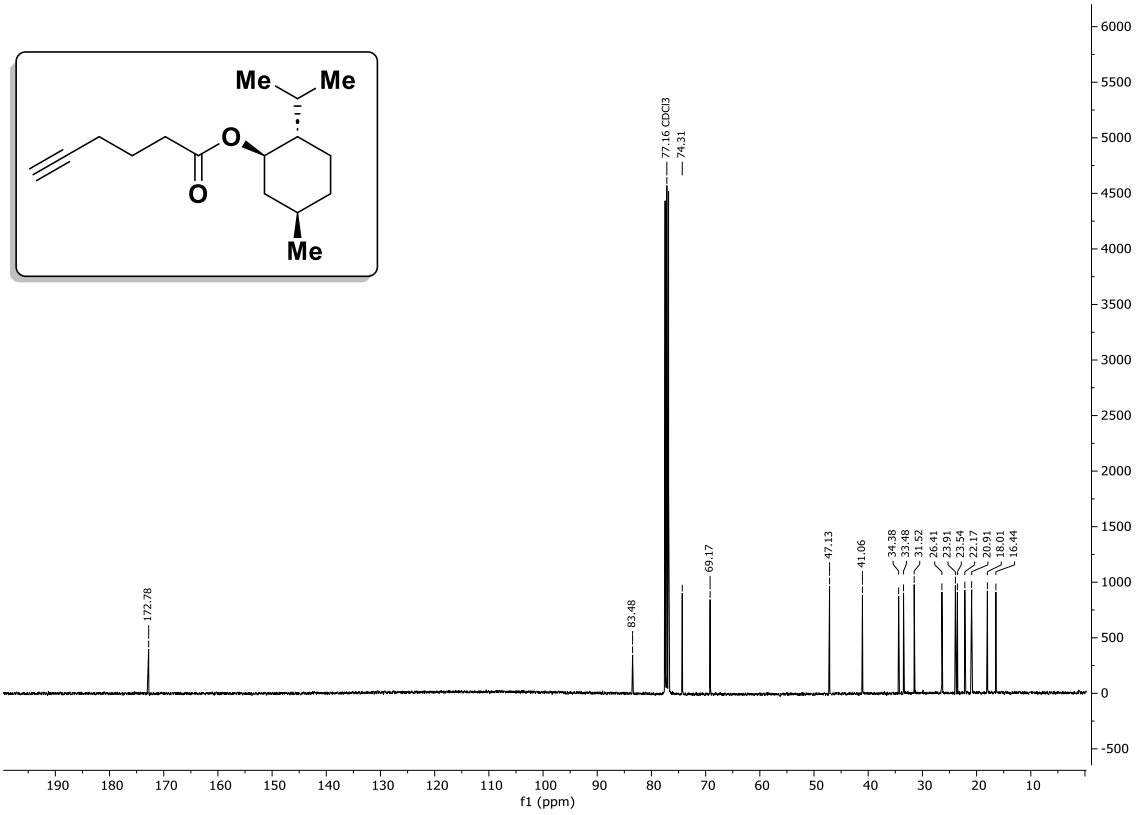
^{1}H NMR of S10 (400 MHz, $CDCl_3$)



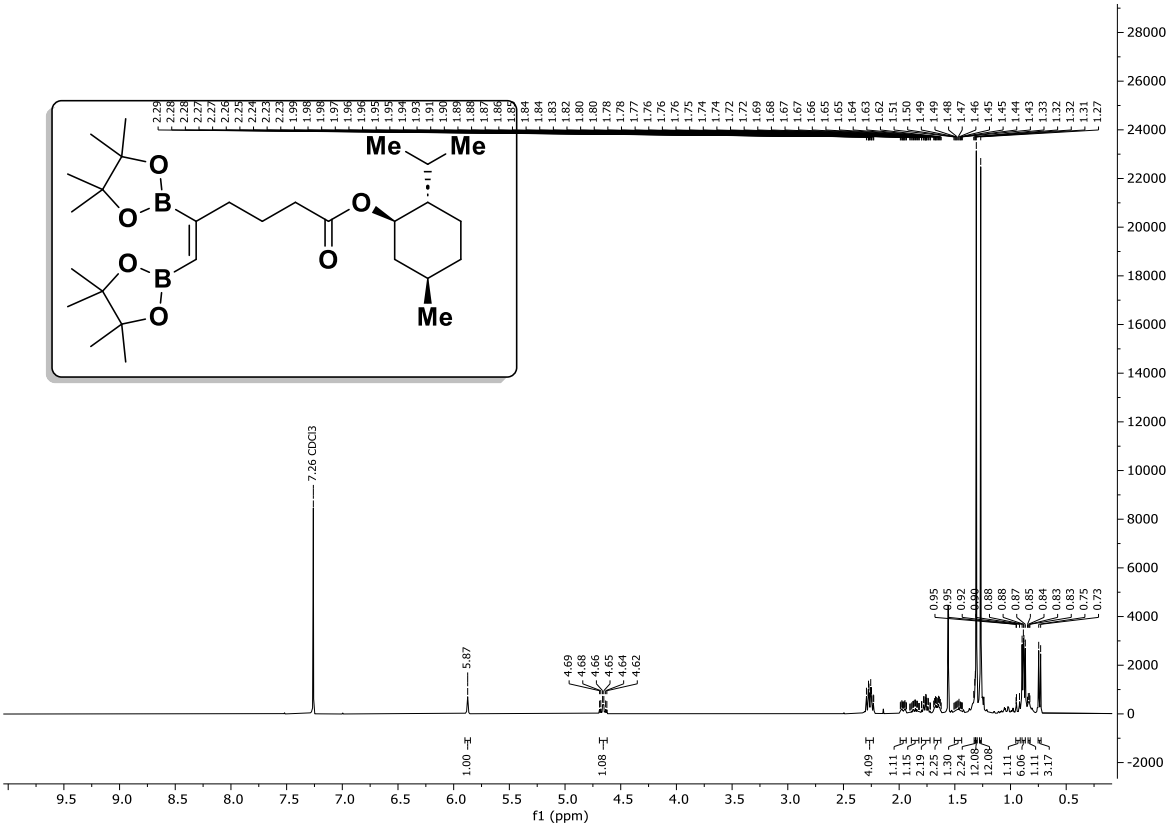
^{1}H NMR of S11 (400 MHz, $CDCl_3$)



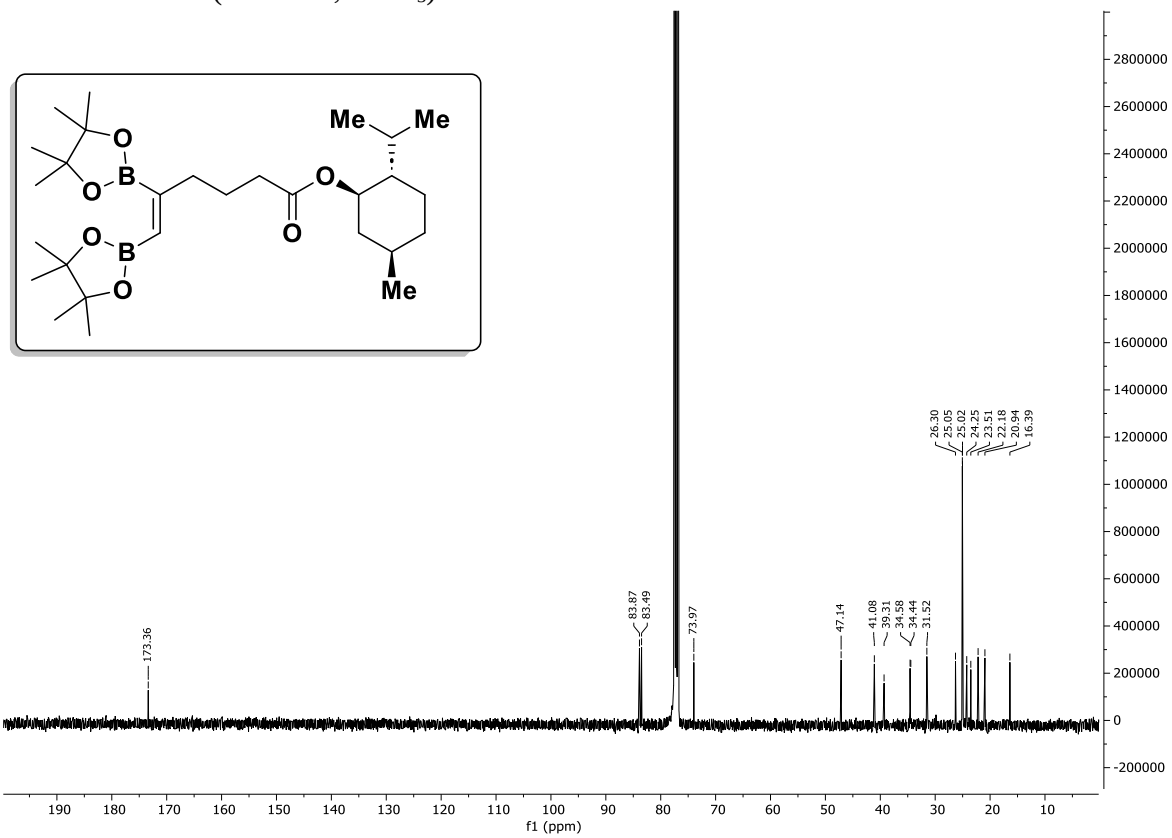
^{13}C NMR of S11 (101 MHz, $CDCl_3$)



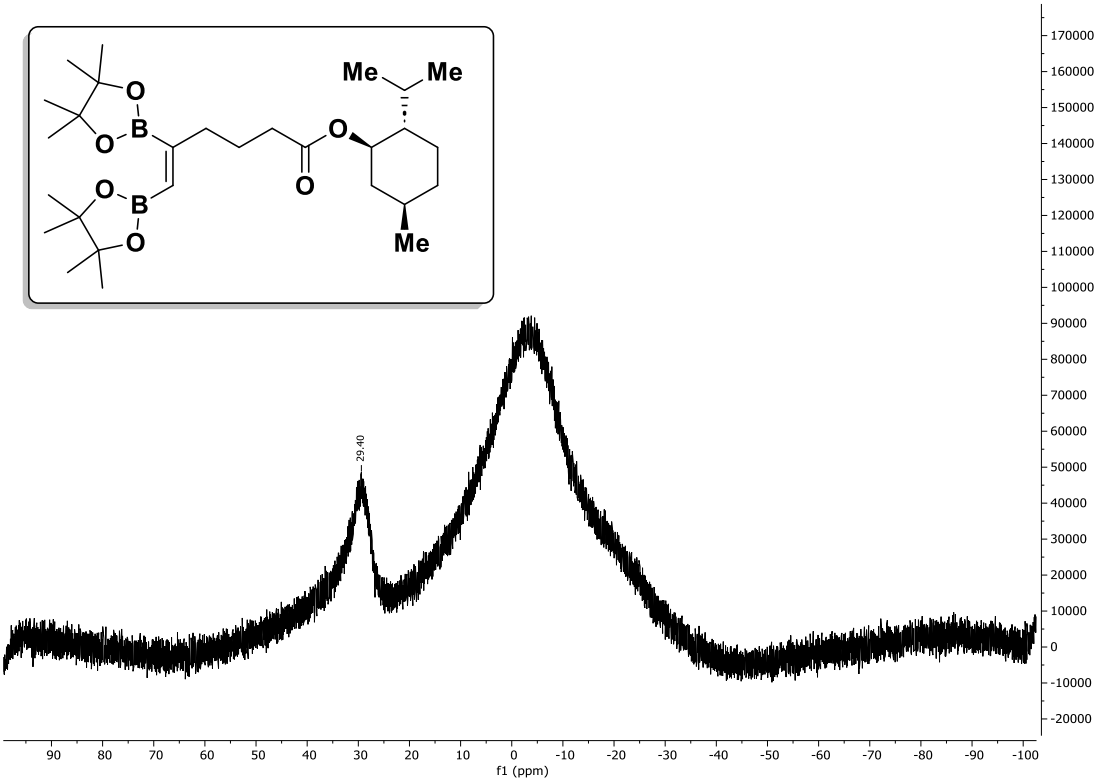
^{1}H NMR of S12 (400 MHz, $CDCl_3$)



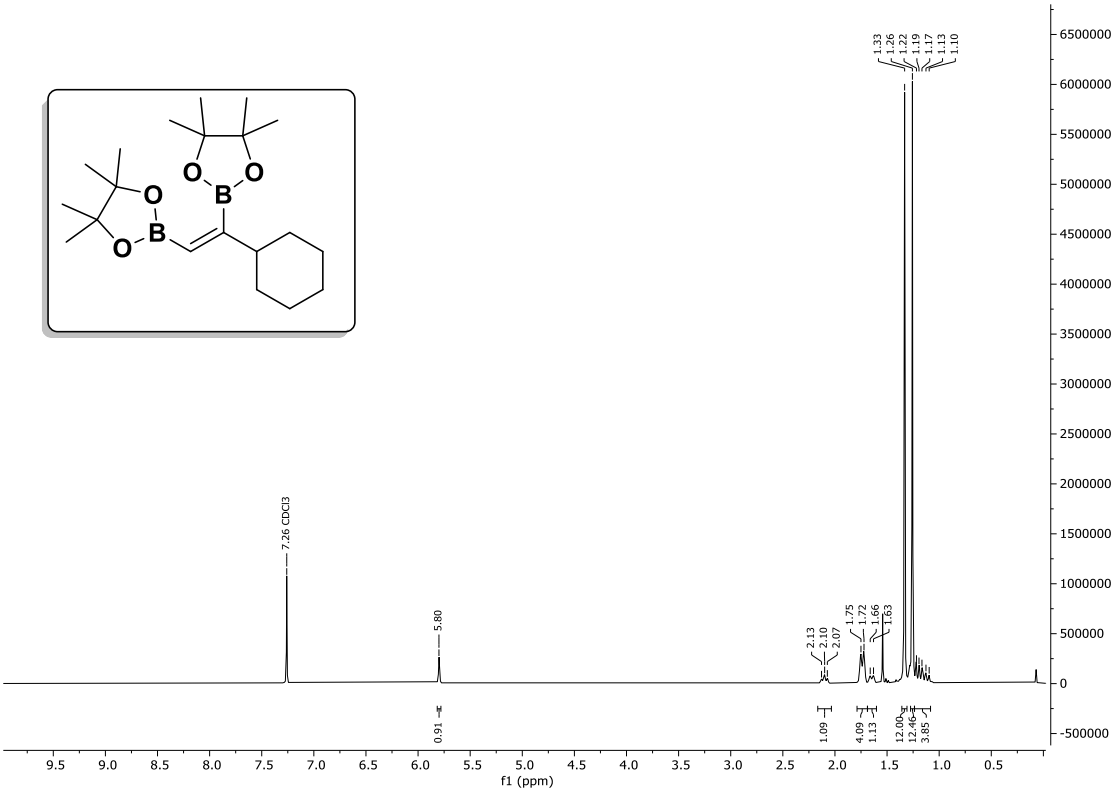
^{13}C NMR of S12 (101 MHz, $CDCl_3$)



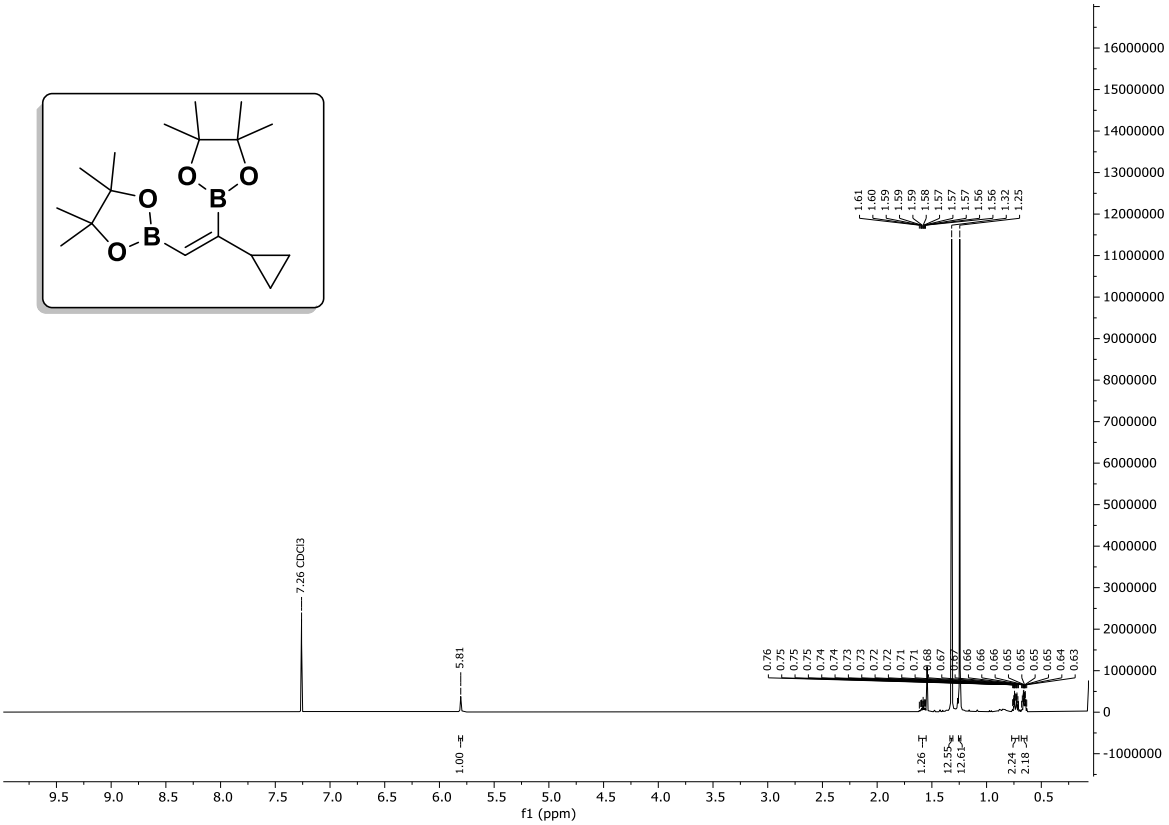
^{11}B NMR of S12 (128 MHz, $CDCl_3$)



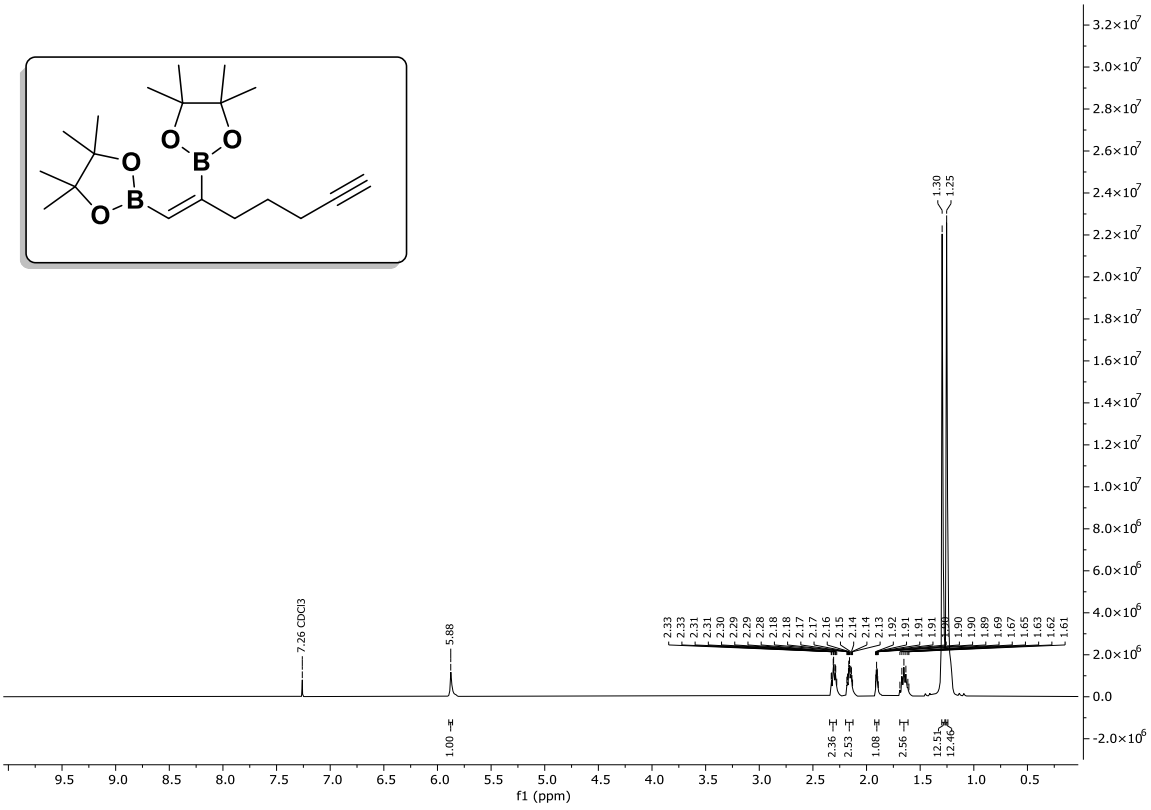
^{1}H NMR of S13 (400 MHz, $CDCl_3$)



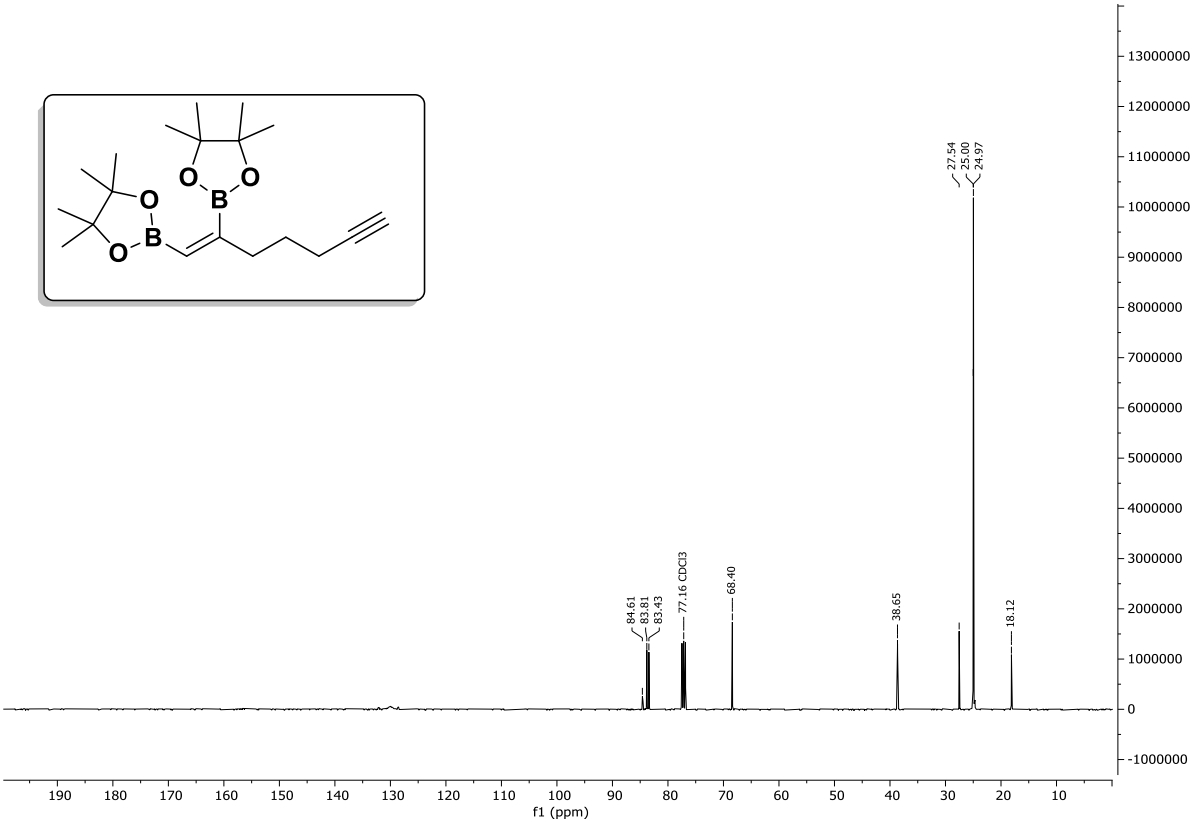
^{1}H NMR of S14 (400 MHz, $CDCl_3$)



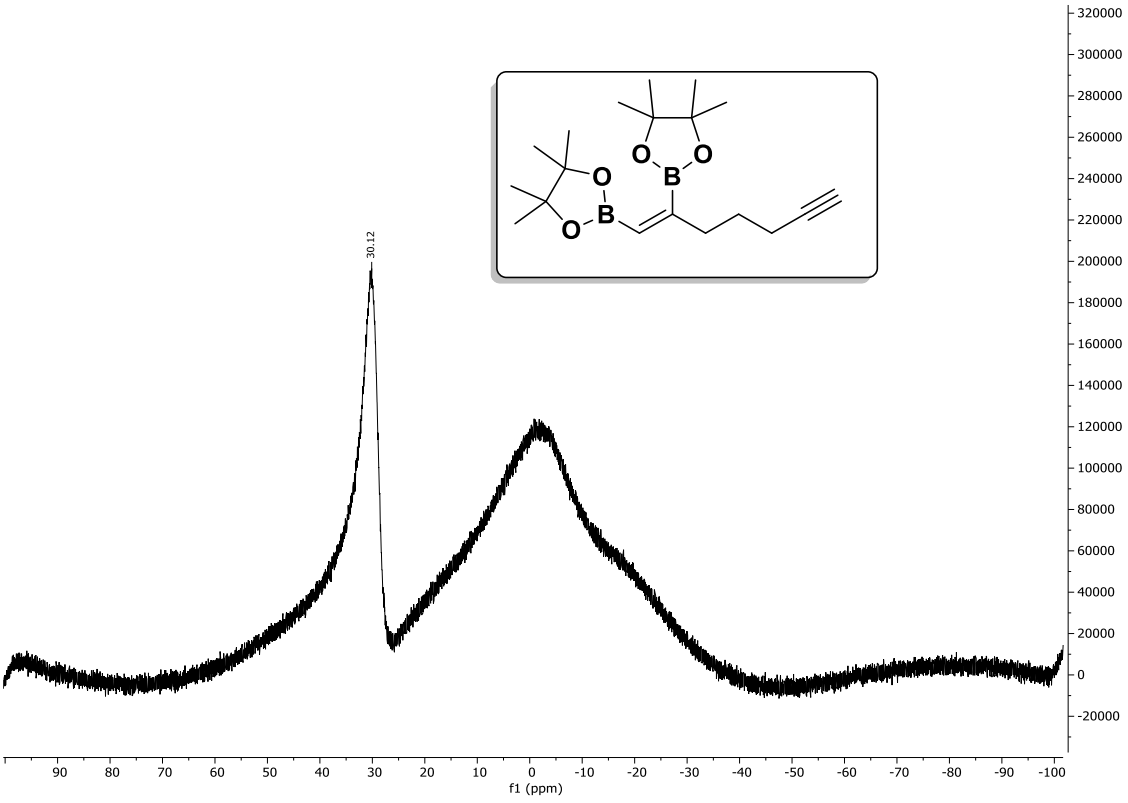
^{1}H NMR of S15 (400 MHz, $CDCl_3$)



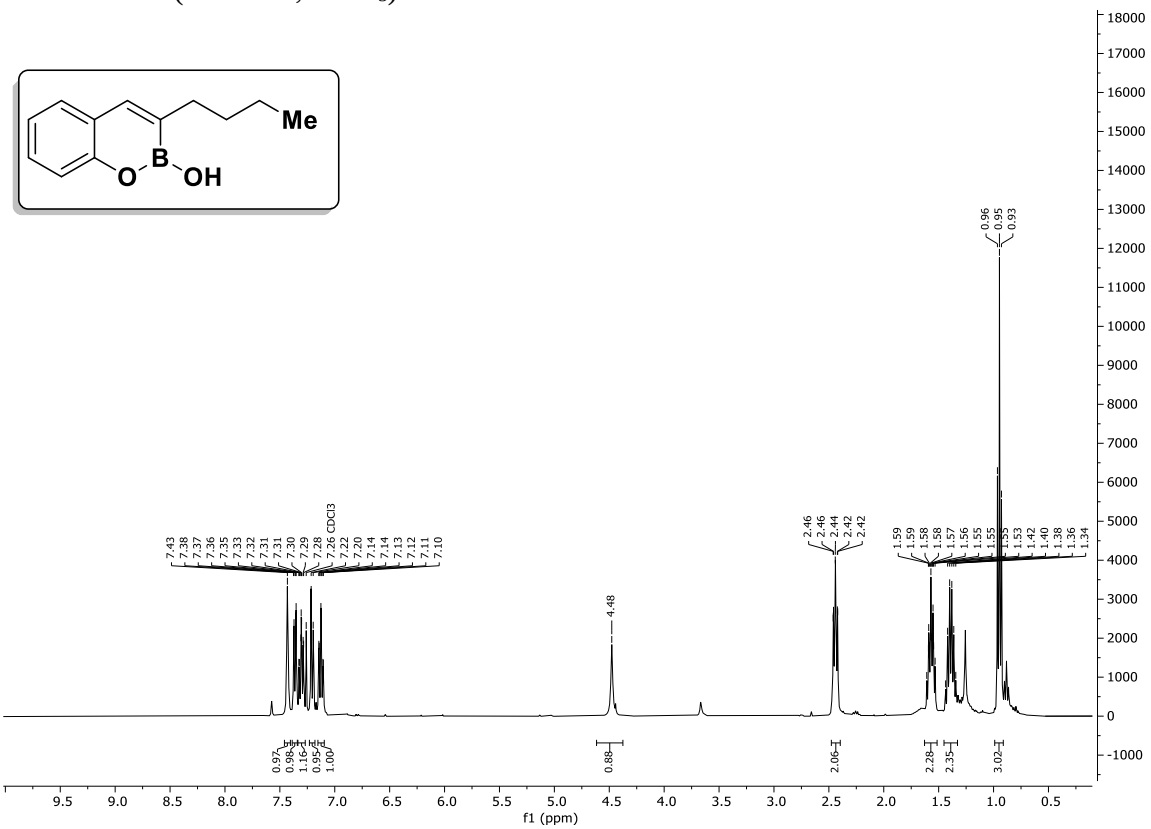
^{13}C NMR of S15 (101 MHz, $CDCl_3$)



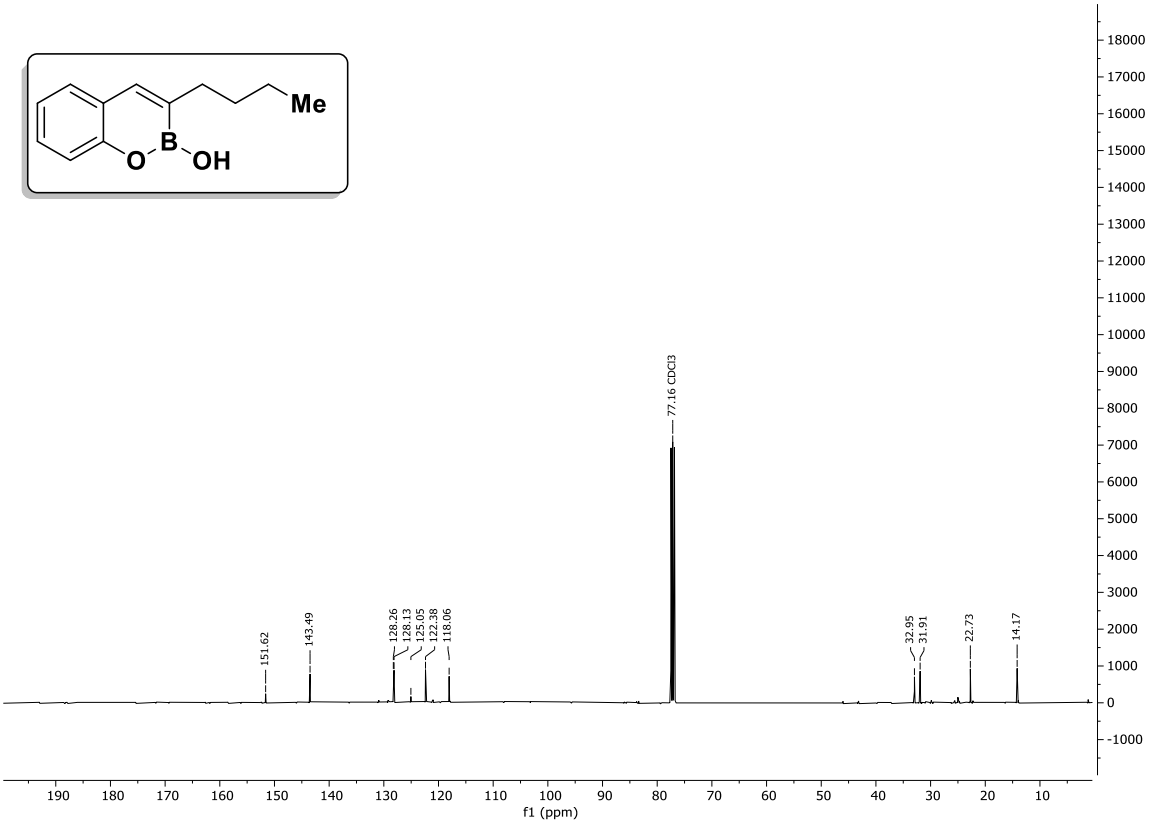
^{11}B NMR of S15 (128 MHz, $CDCl_3$)



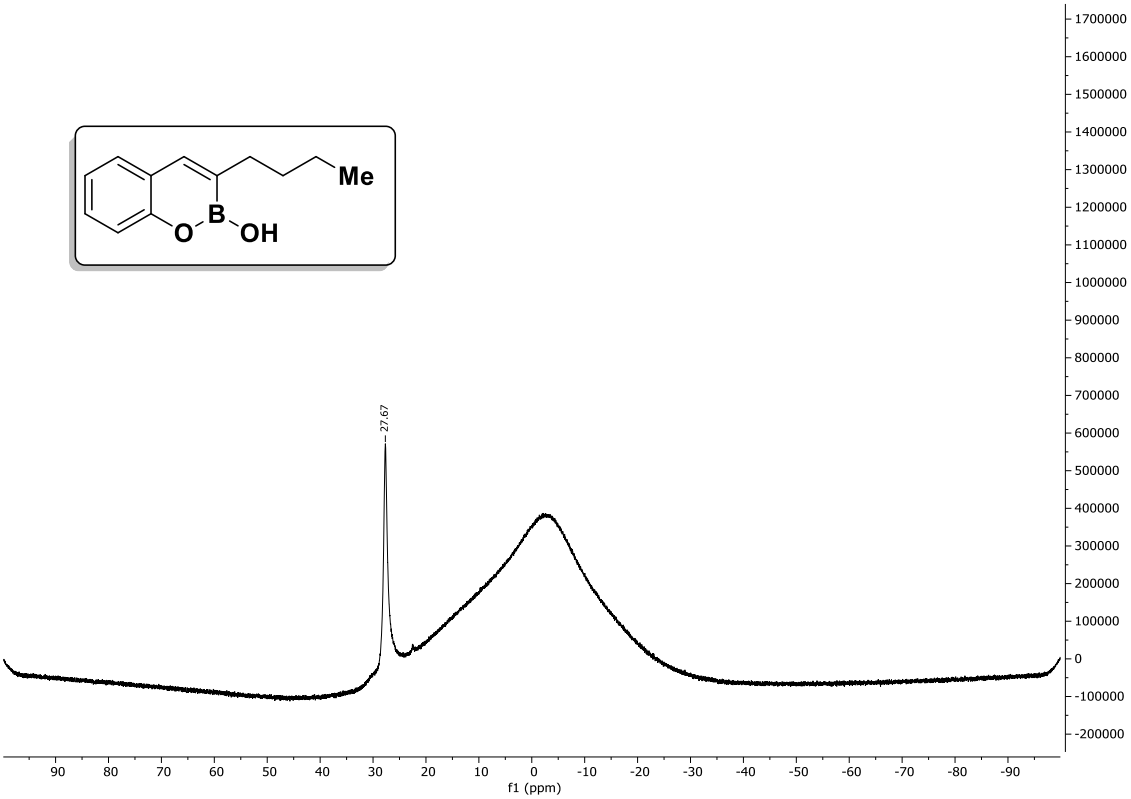
^{1}H NMR of 3 (400 MHz, $CDCl_3$)



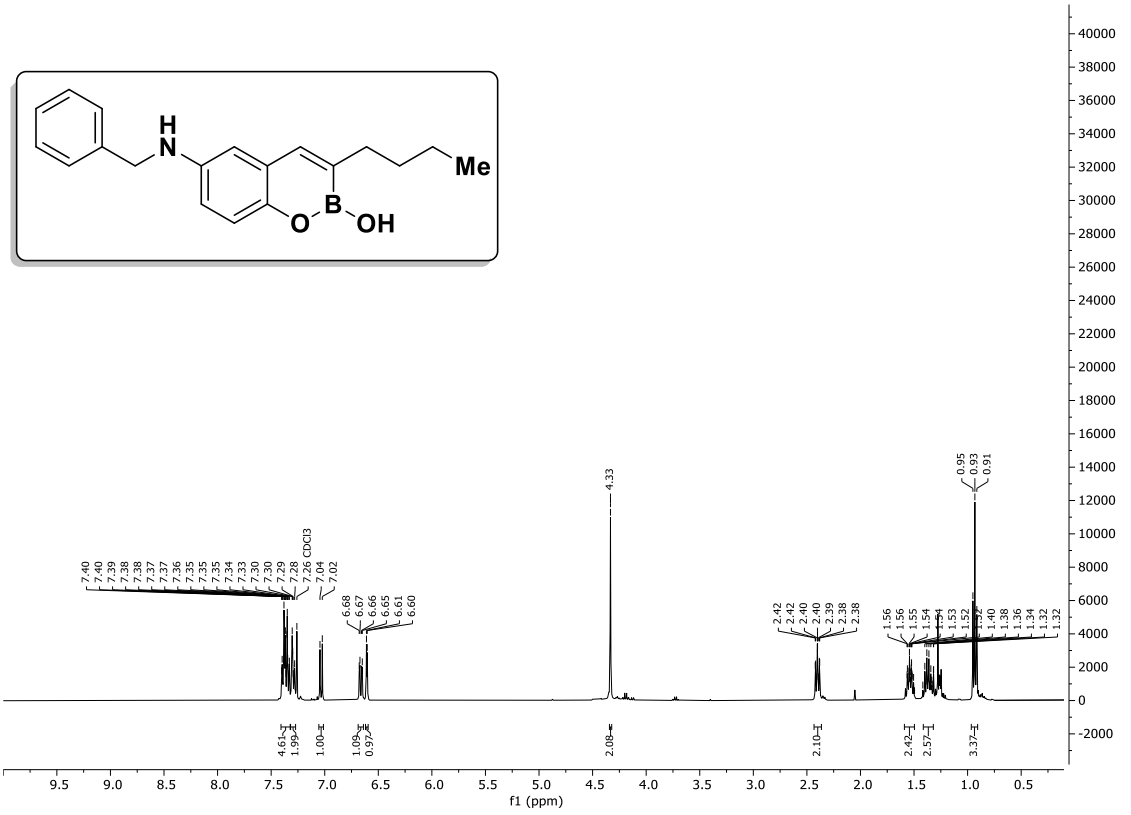
^{13}C NMR of 3 (101 MHz, $CDCl_3$)



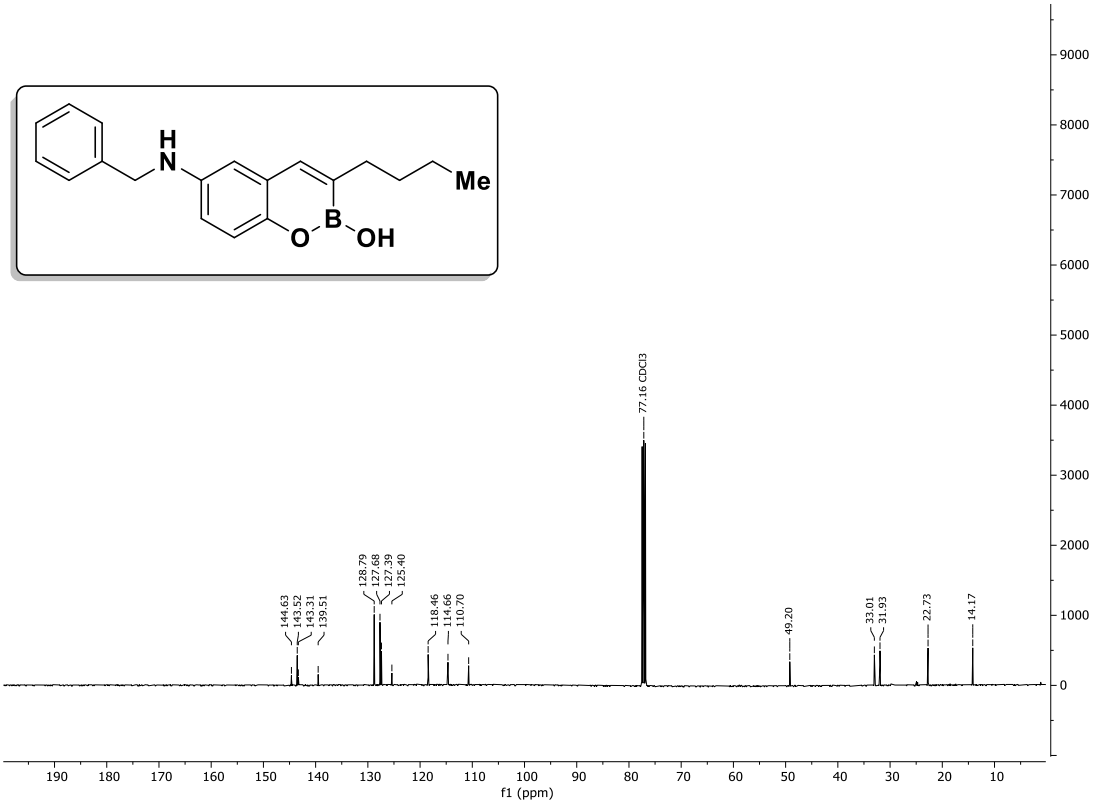
^{11}B NMR of 3 (192 MHz, $CDCl_3$)



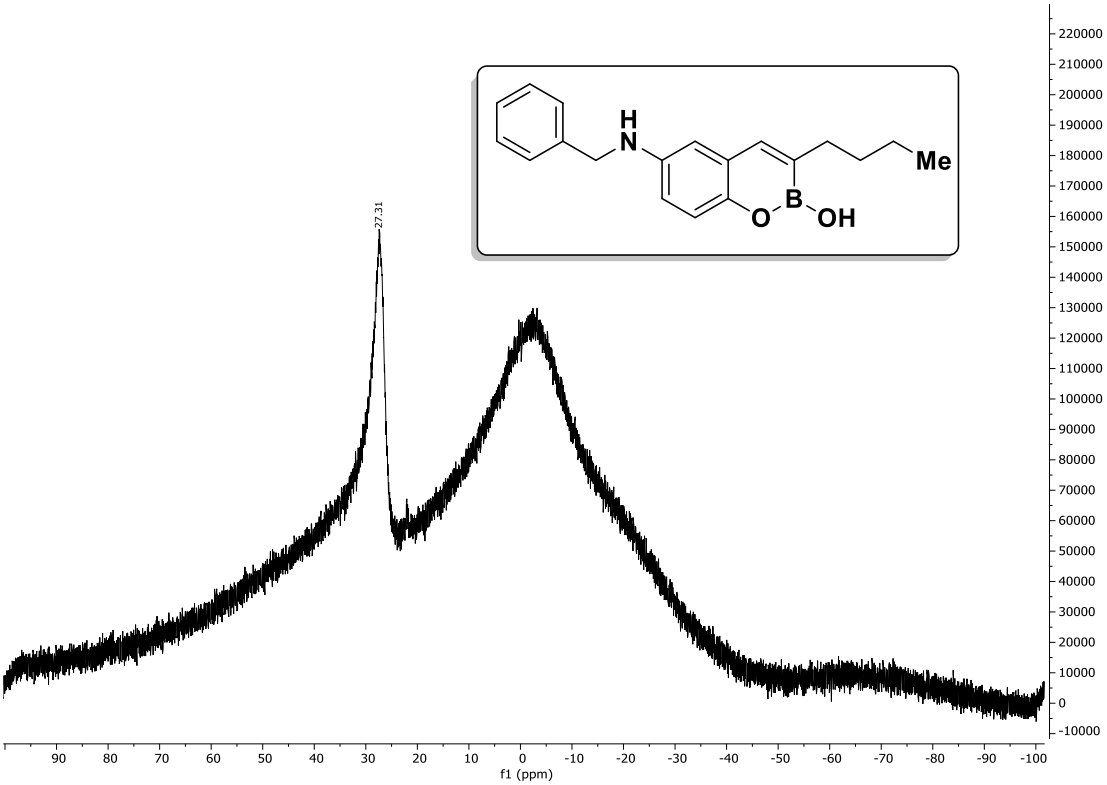
^{1}H NMR of 4 (400 MHz, $CDCl_3$)



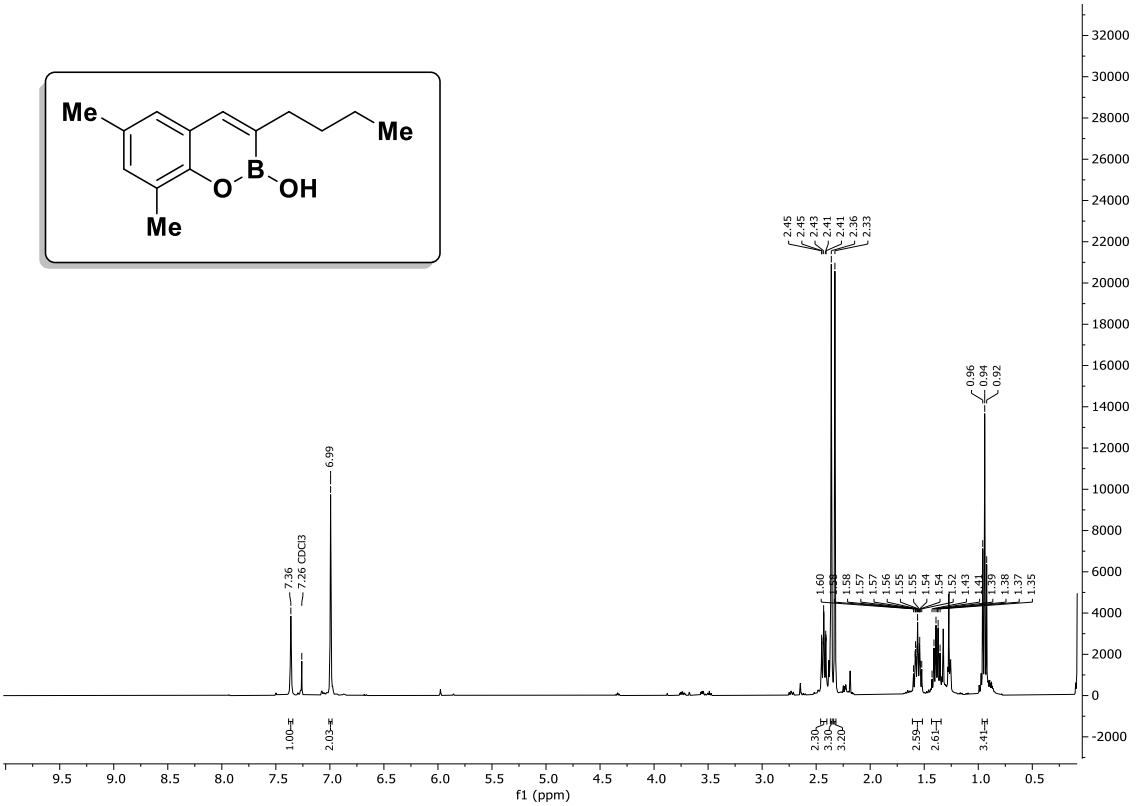
^{13}C NMR of 4 (101 MHz, $CDCl_3$)



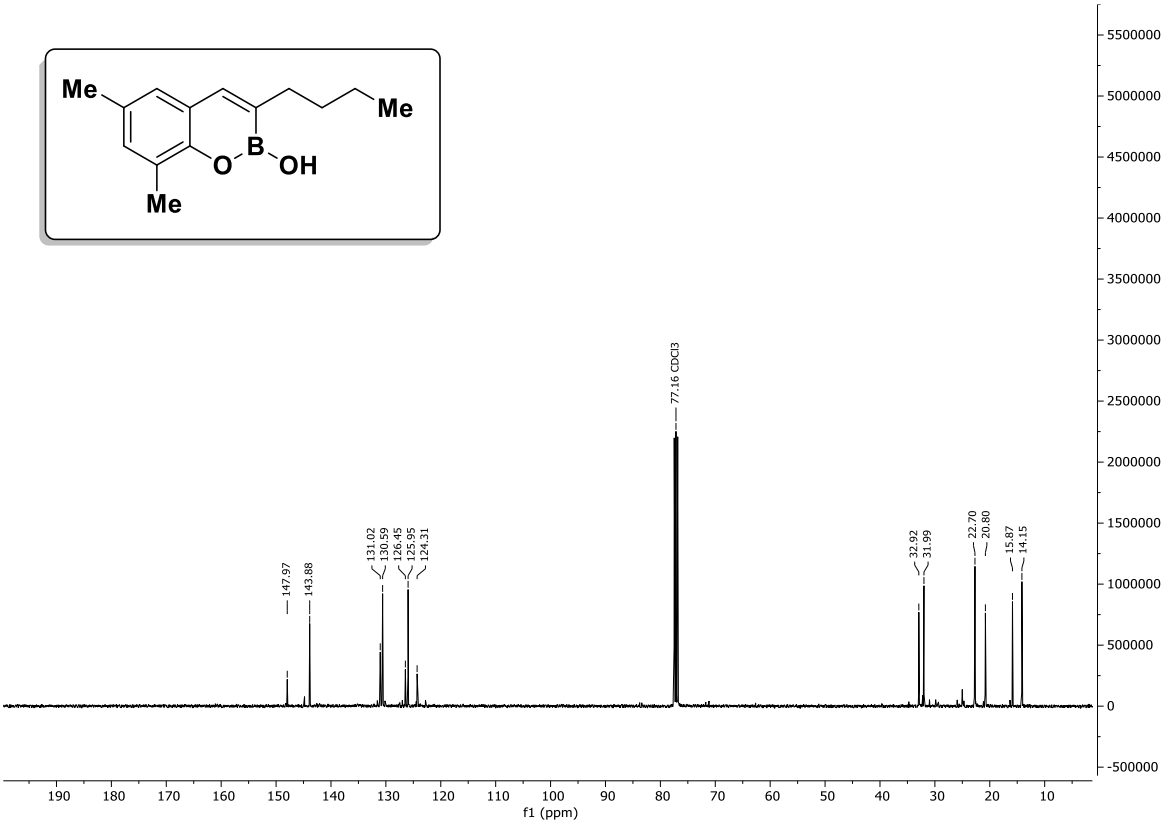
^{11}B NMR of 4 (128 MHz, $CDCl_3$)



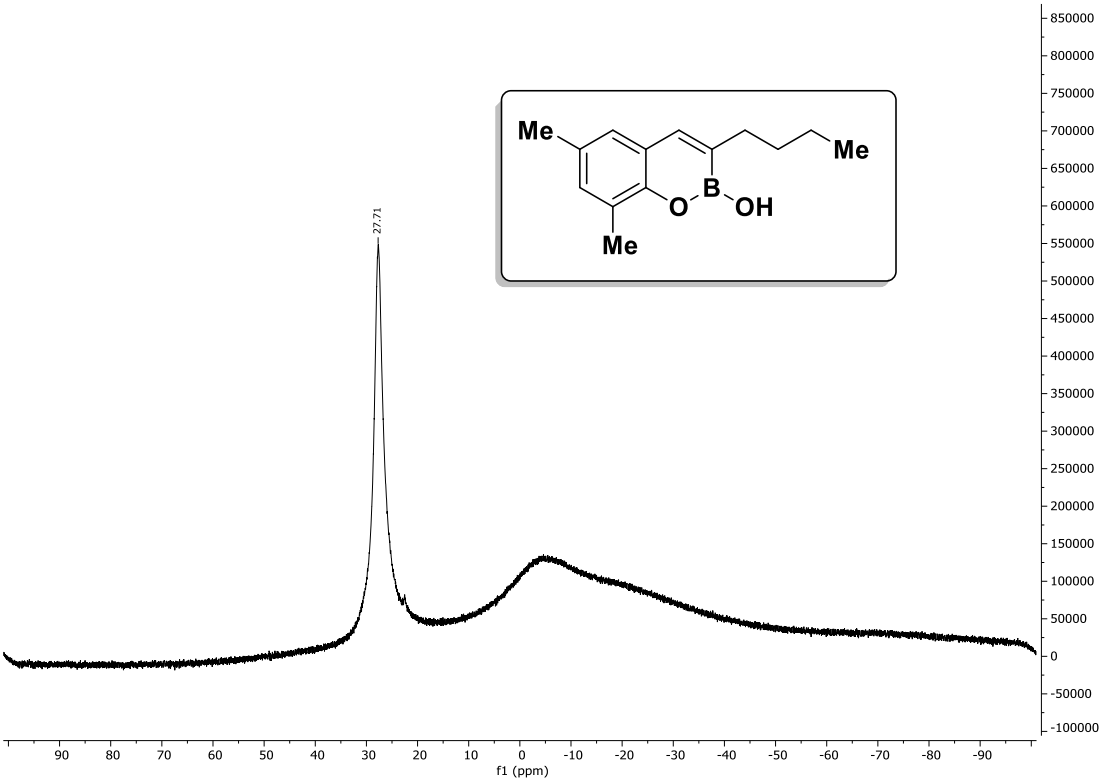
^{1}H NMR of 5 (400 MHz, $CDCl_3$)



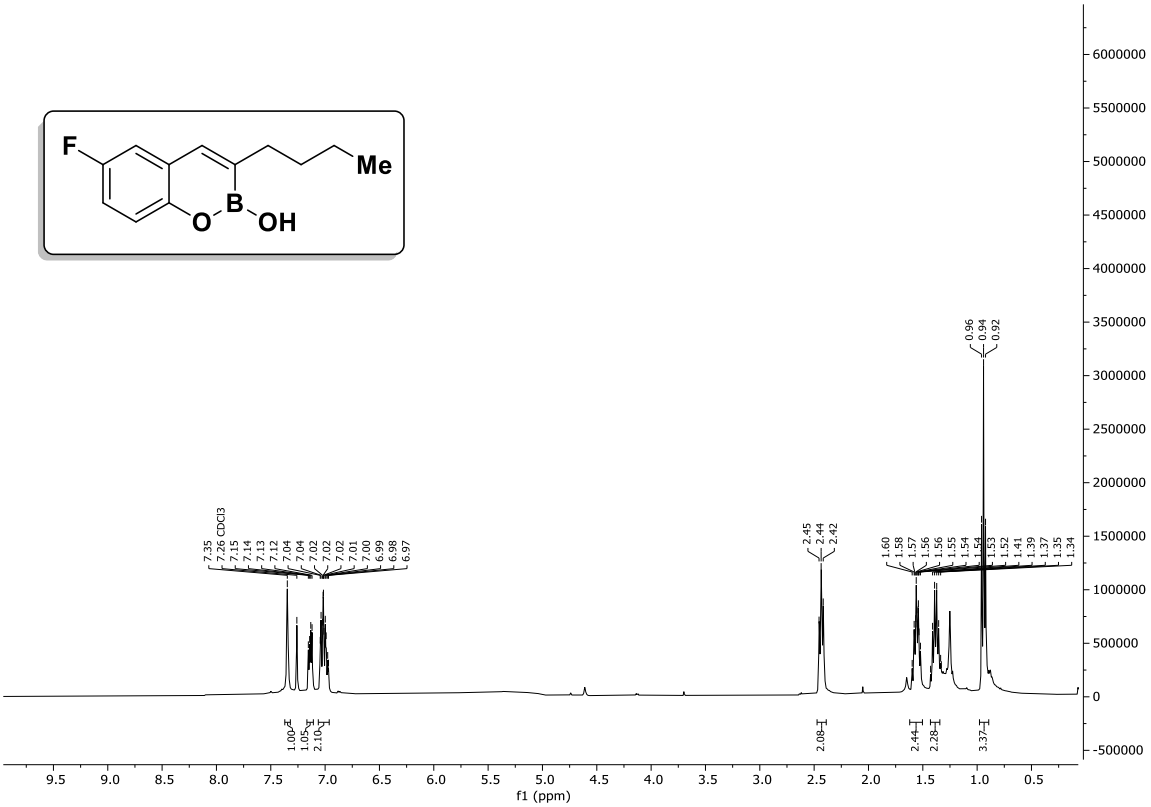
^{13}C NMR of 5 (101 MHz, $CDCl_3$)



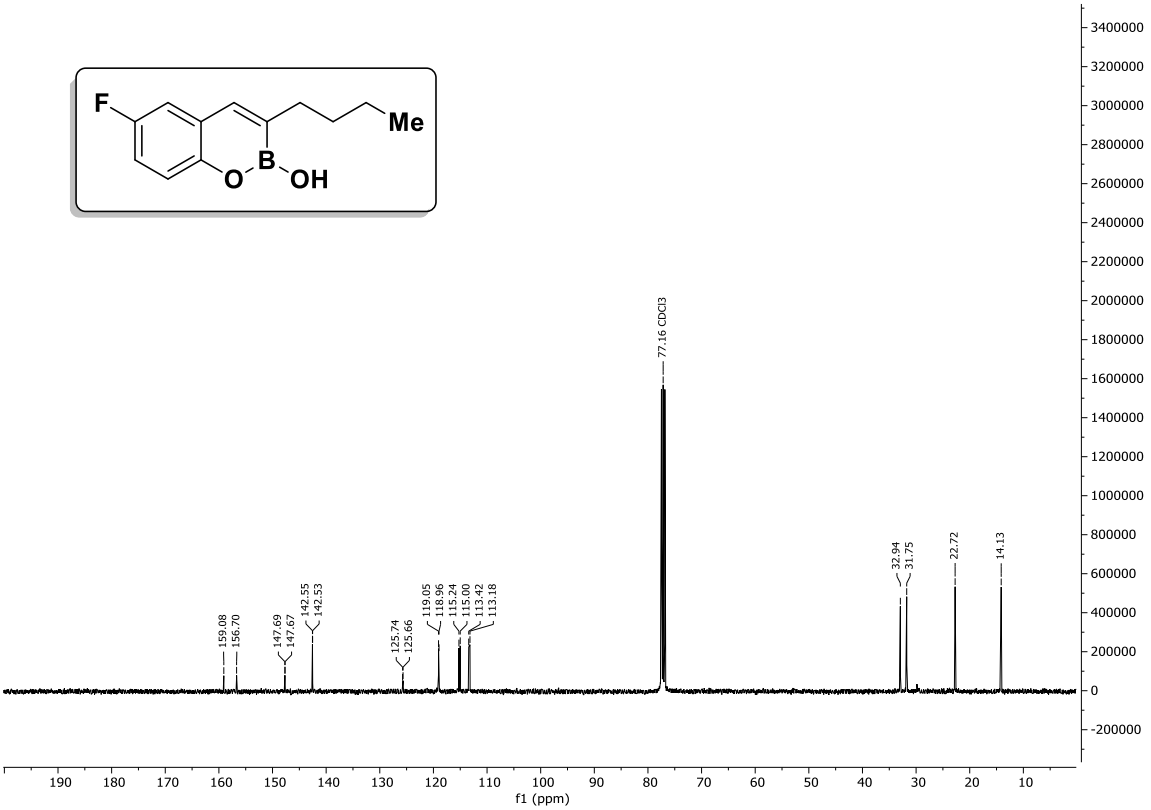
^{11}B NMR of 5 (128 MHz, $CDCl_3$)



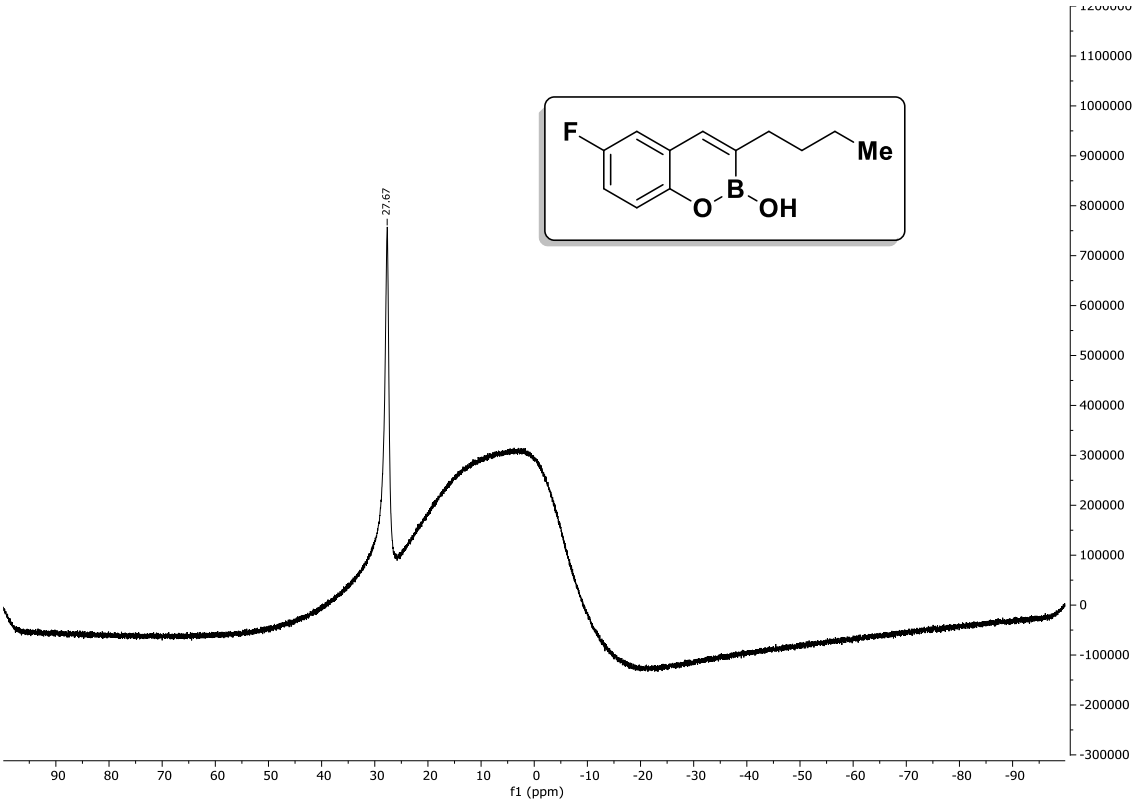
^{1}H NMR of 6 (400 MHz, $CDCl_3$)



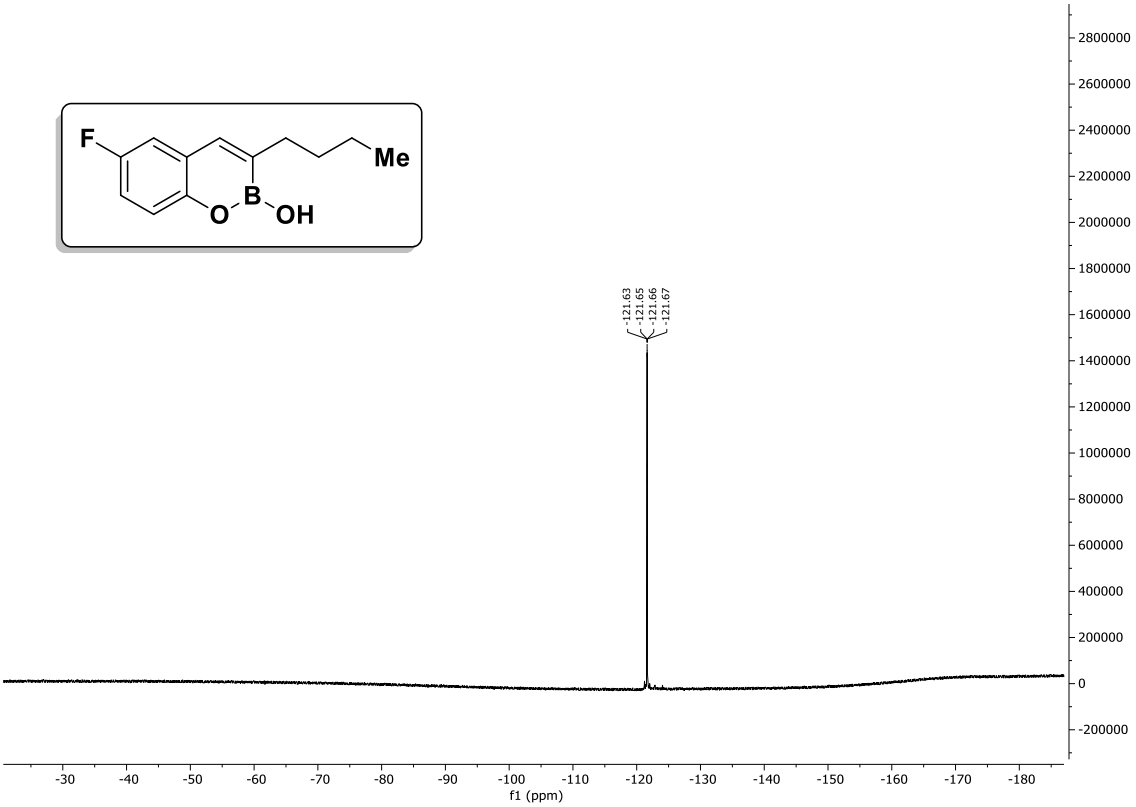
^{13}C NMR of 6 (151 MHz, $CDCl_3$)



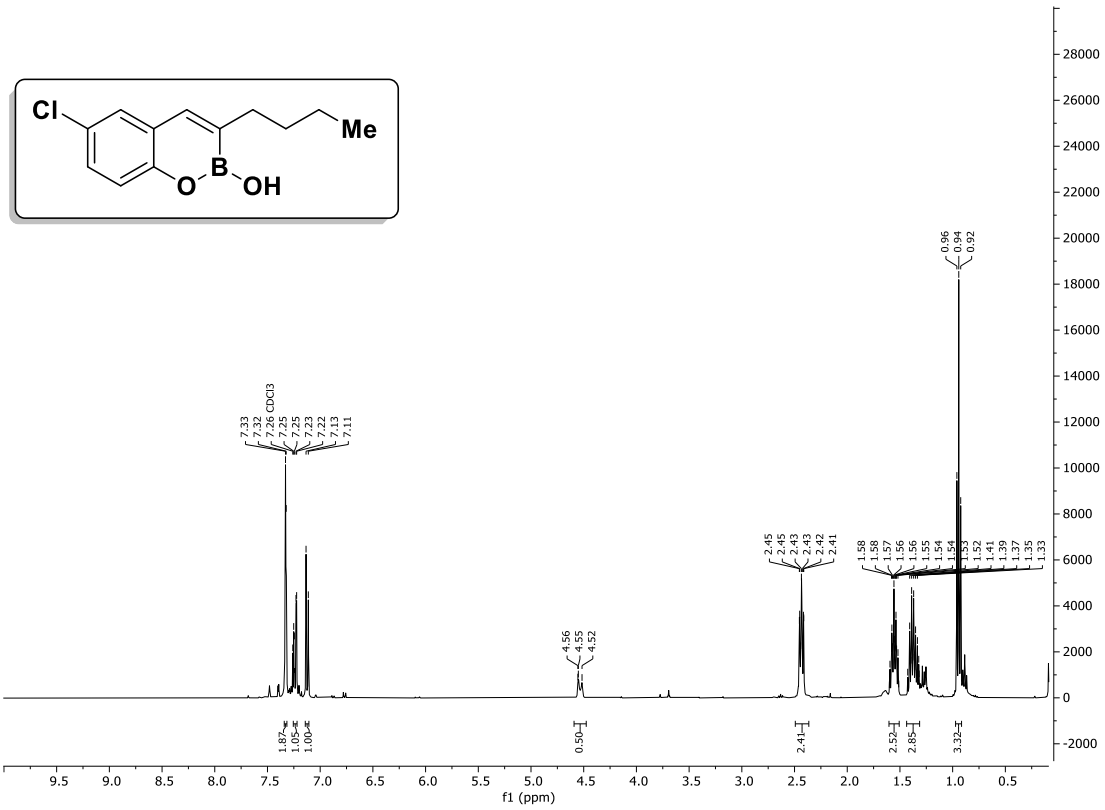
^{11}B NMR of 6 (192 MHz, $CDCl_3$)



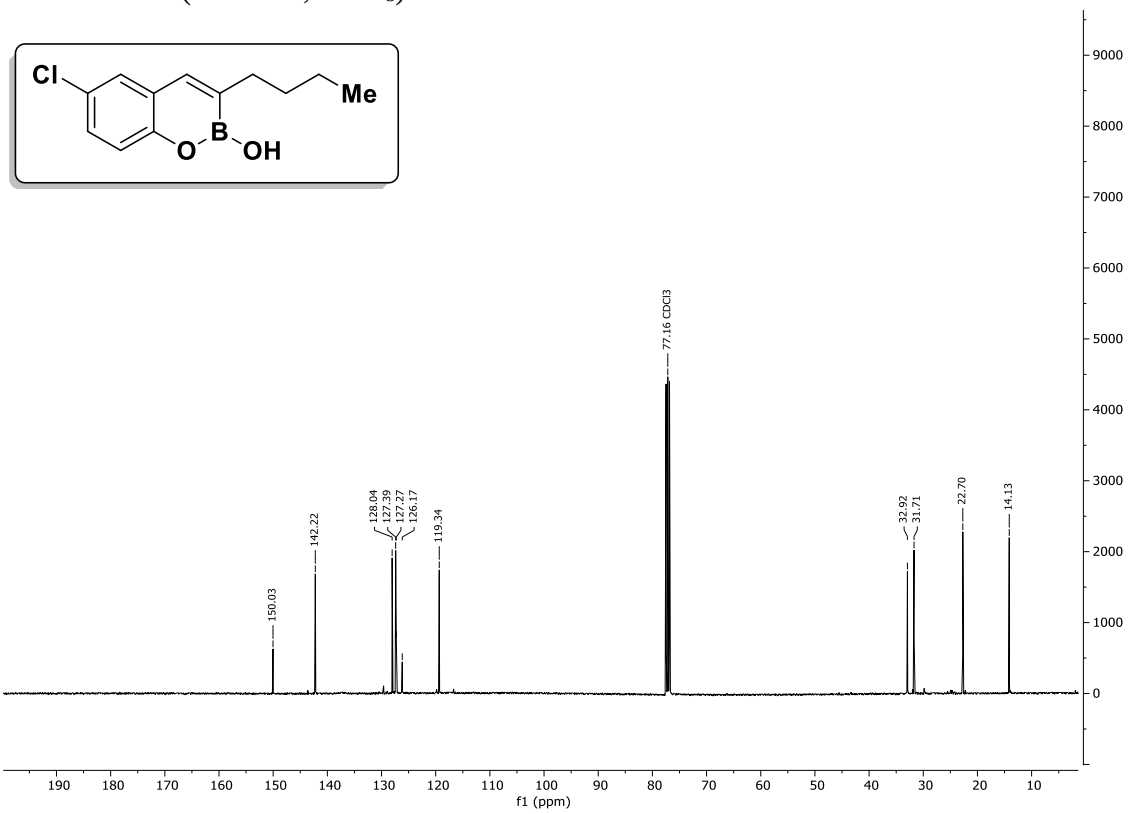
^{19}F NMR of 6 (376 MHz, $CDCl_3$)



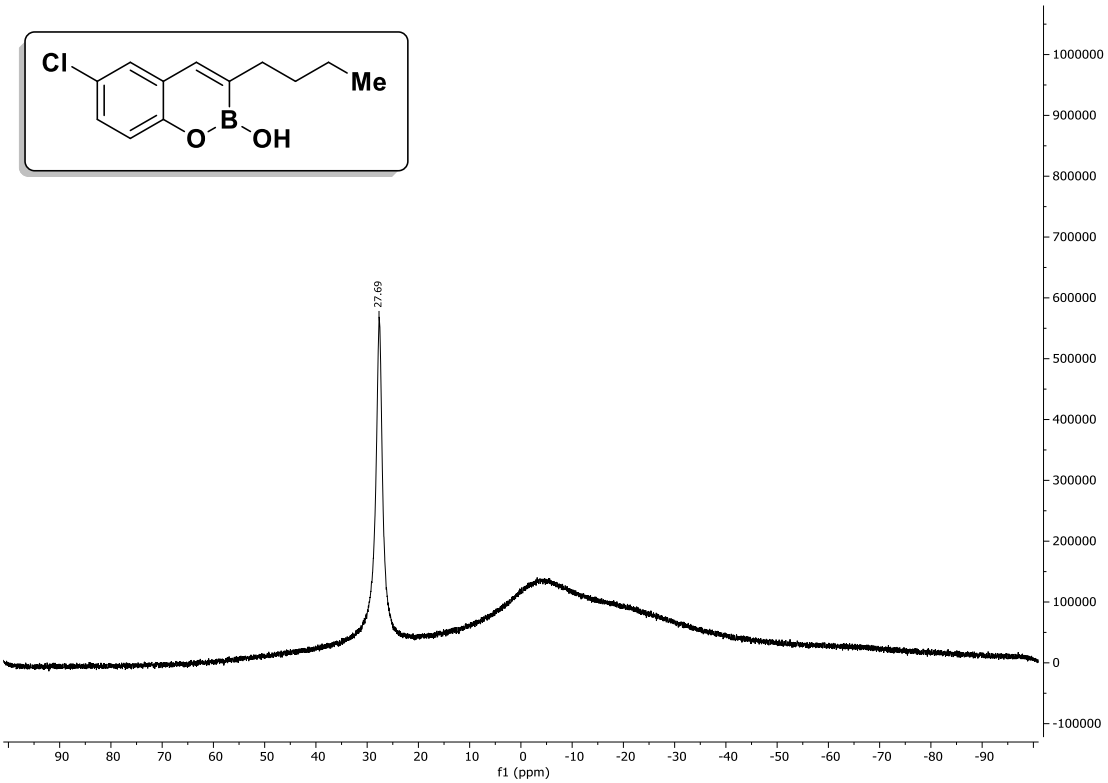
^{1}H NMR of 7 (400 MHz, $CDCl_3$)



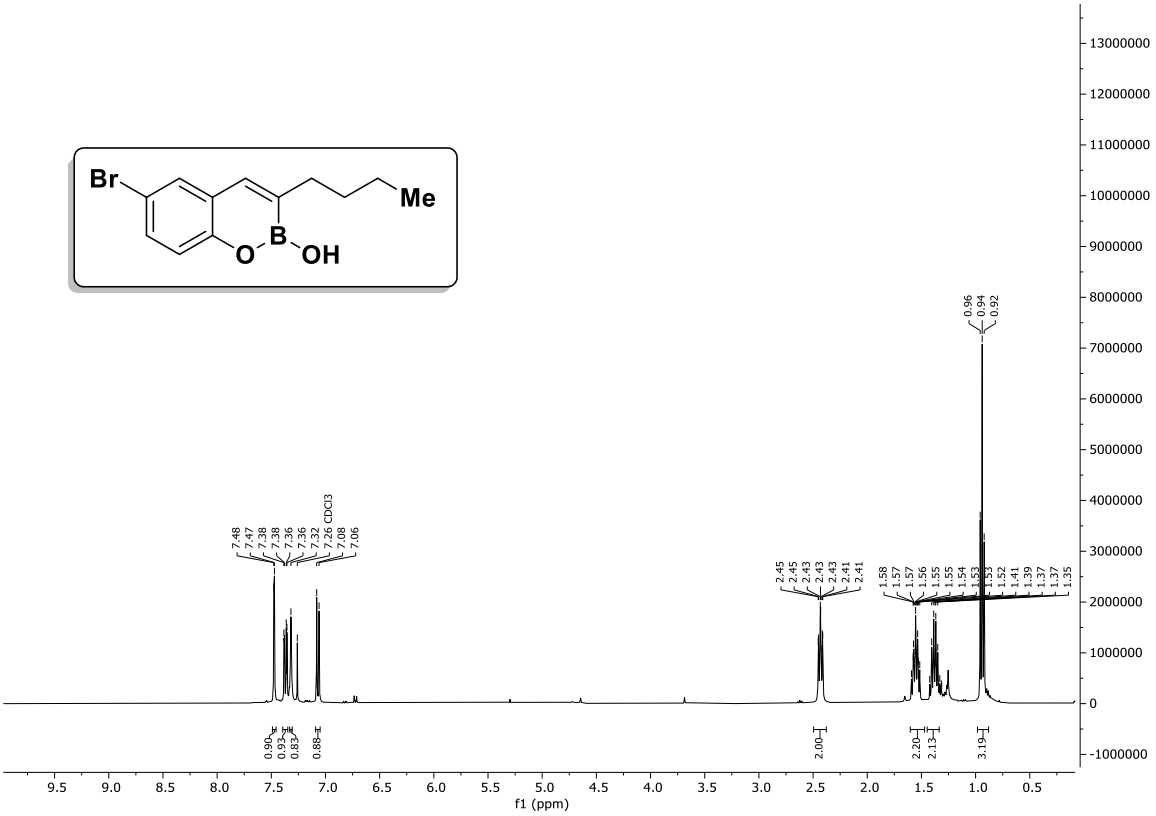
^{13}C NMR of 7 (101 MHz, $CDCl_3$)



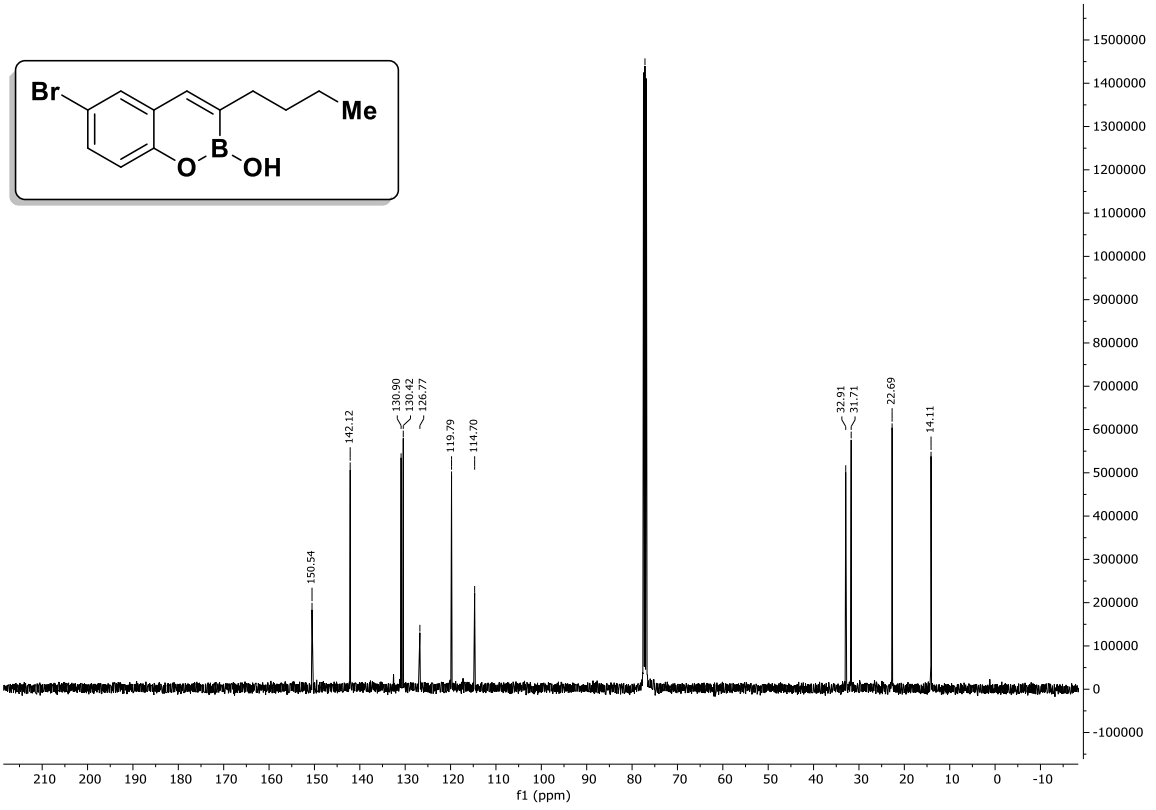
^{11}B NMR of 7 (128 MHz, $CDCl_3$)



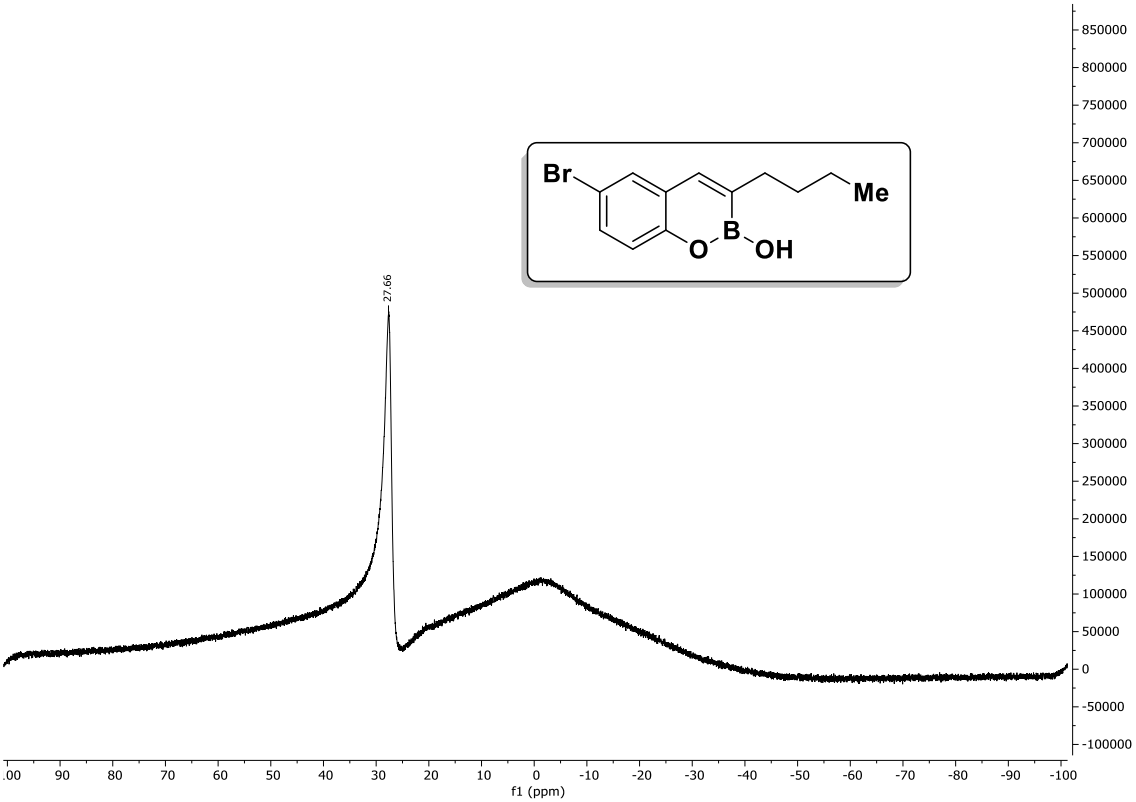
^{1}H NMR of 8 (400 MHz, $CDCl_3$)



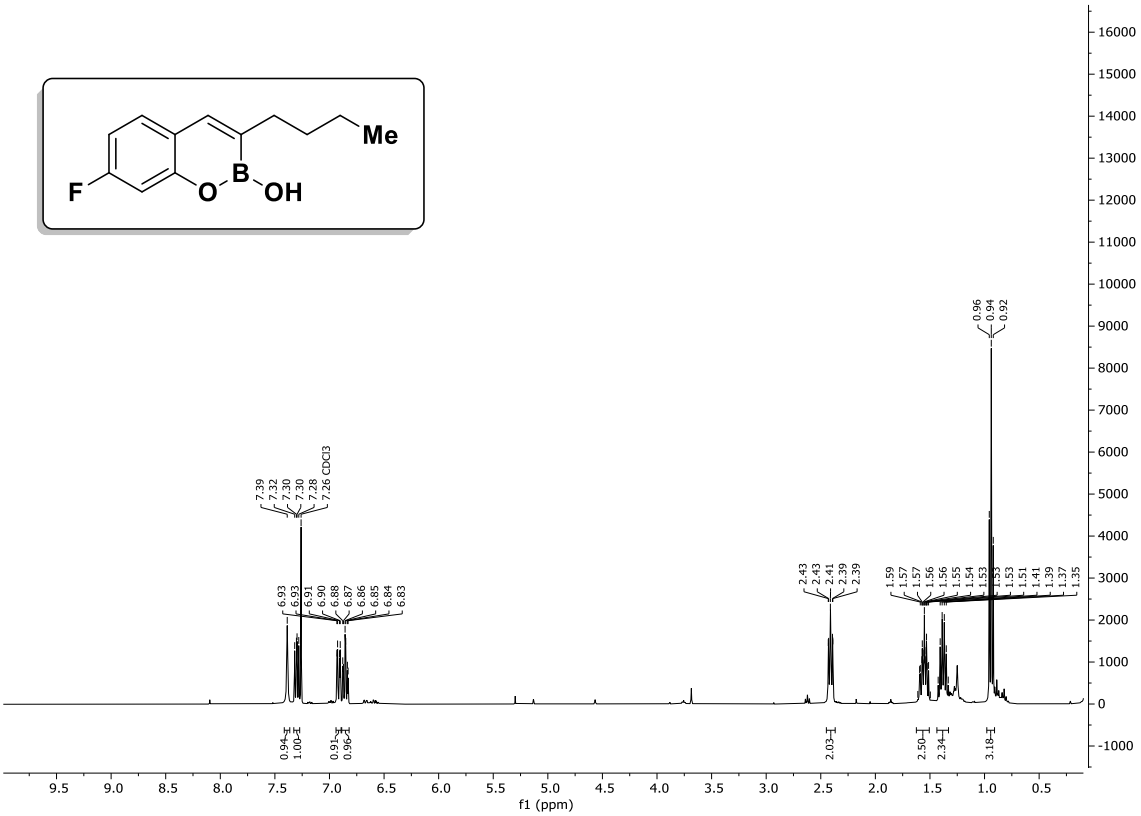
^{13}C NMR of 8 (101 MHz, $CDCl_3$)



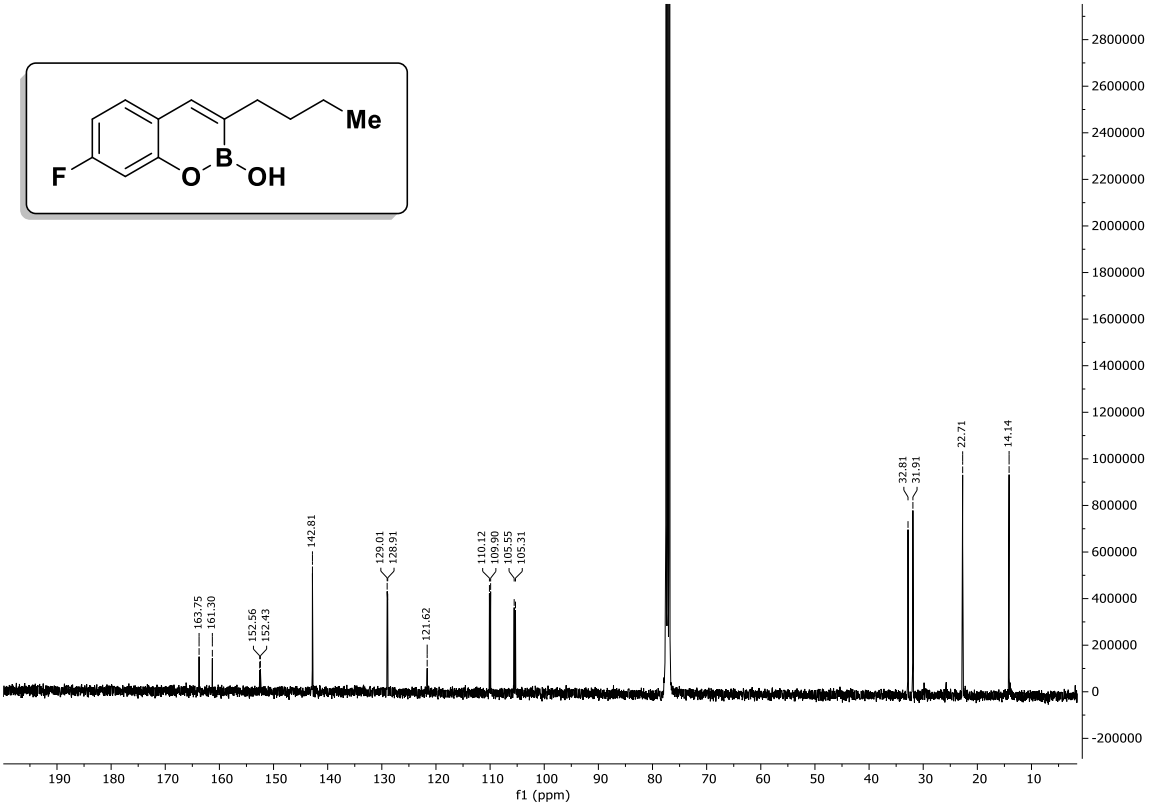
^{11}B NMR of 8 (128 MHz, $CDCl_3$)



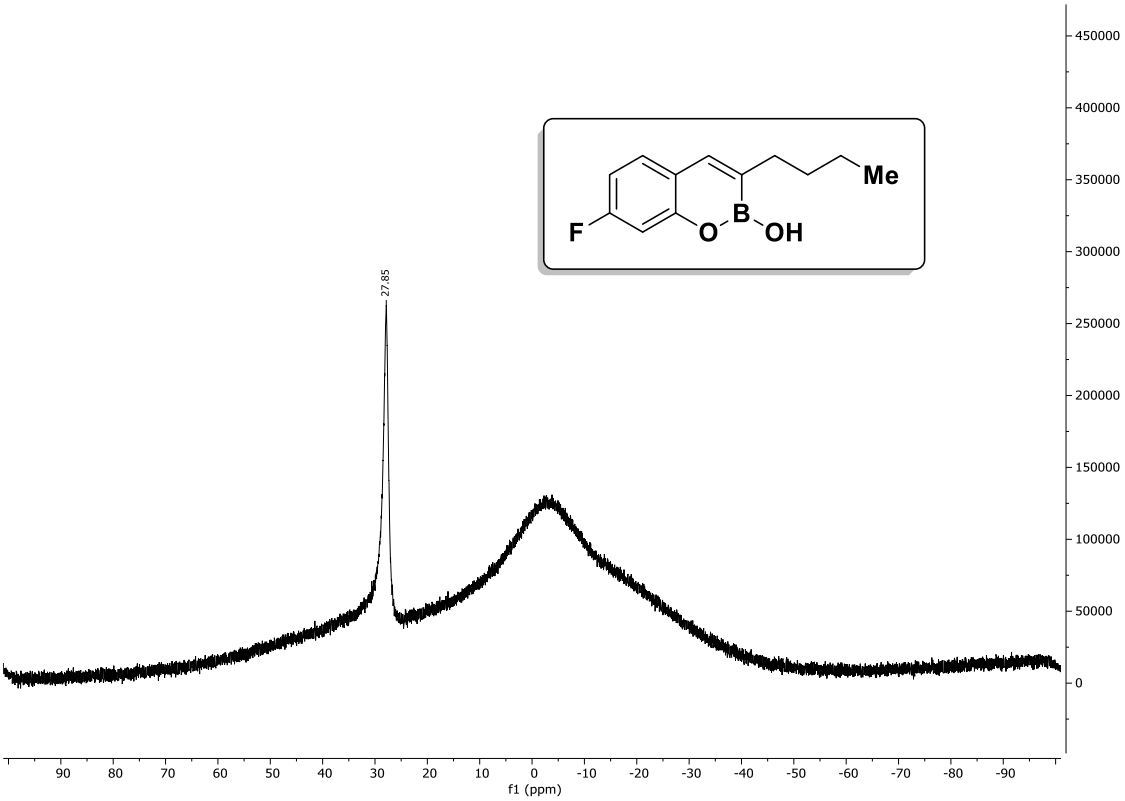
^{1}H NMR of 9 (400 MHz, $CDCl_3$)



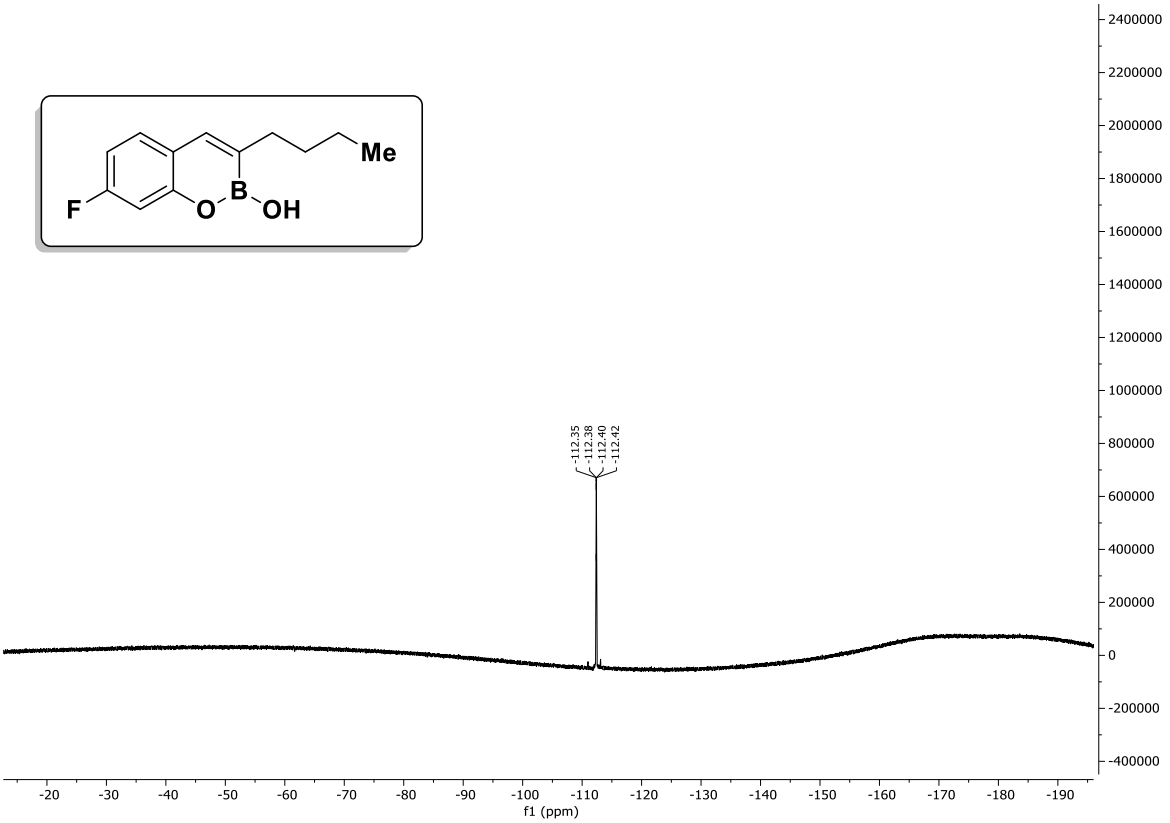
^{13}C NMR of 9 (101 MHz, $CDCl_3$)



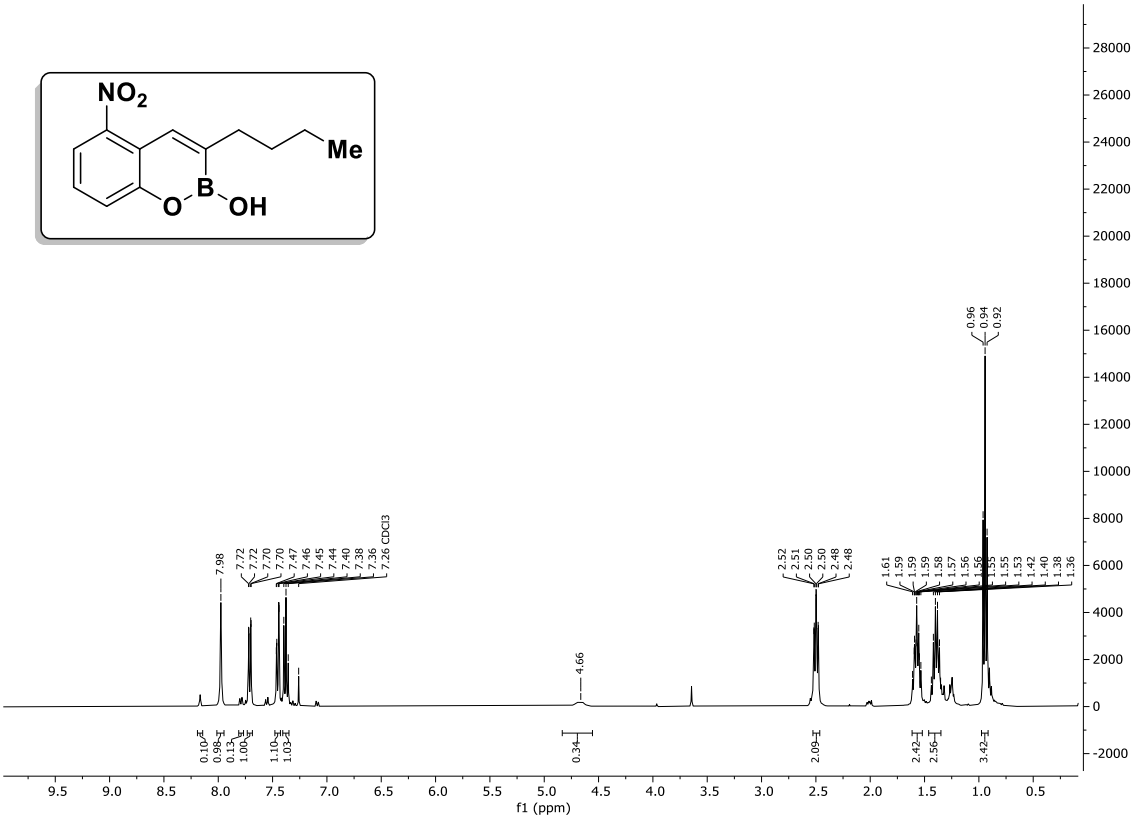
^{11}B NMR of 9 (128 MHz, $CDCl_3$)



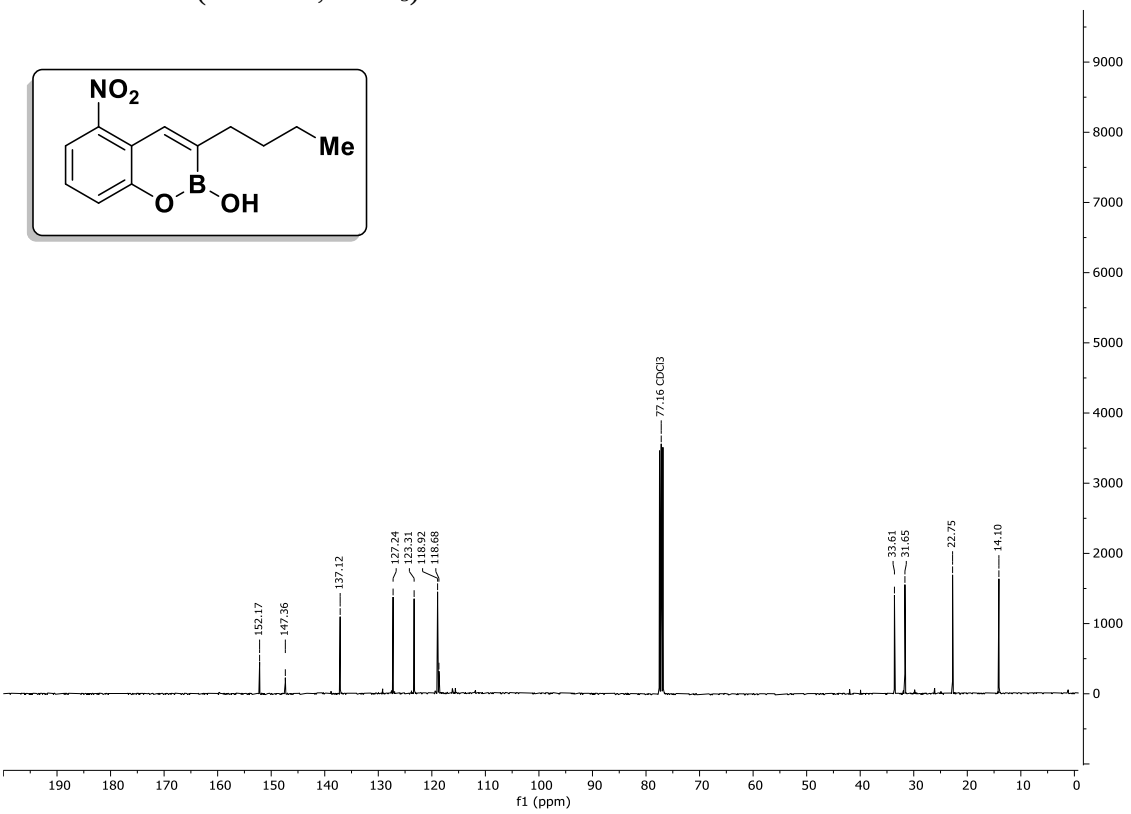
^{19}F NMR of 9 (376 MHz, $CDCl_3$)



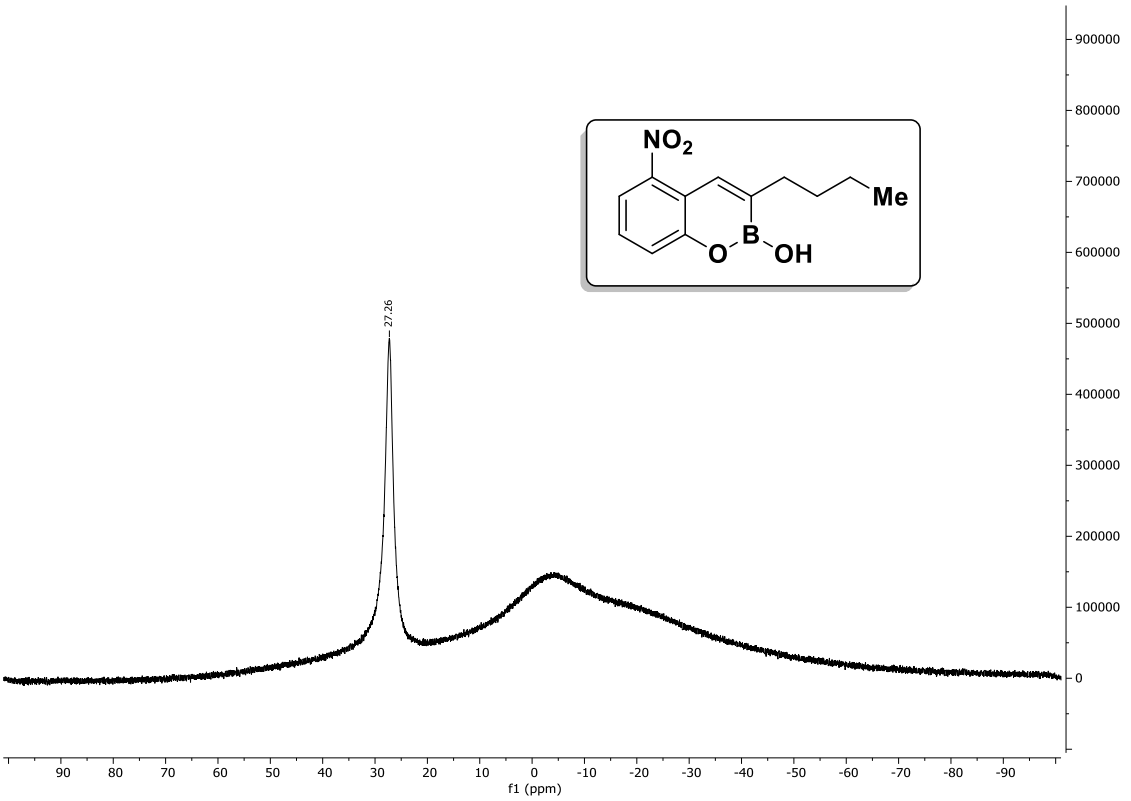
^{1}H NMR of 10 (400 MHz, $CDCl_3$)



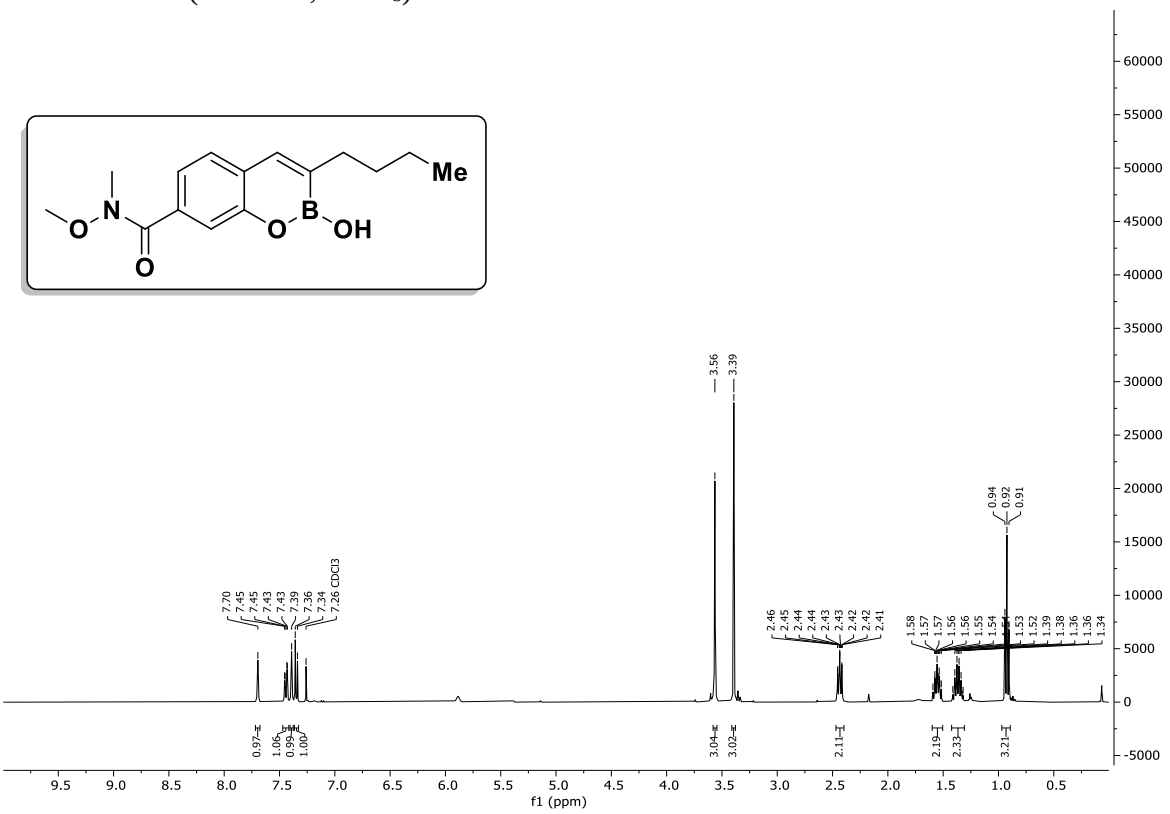
^{13}C NMR of 10 (101 MHz, $CDCl_3$)



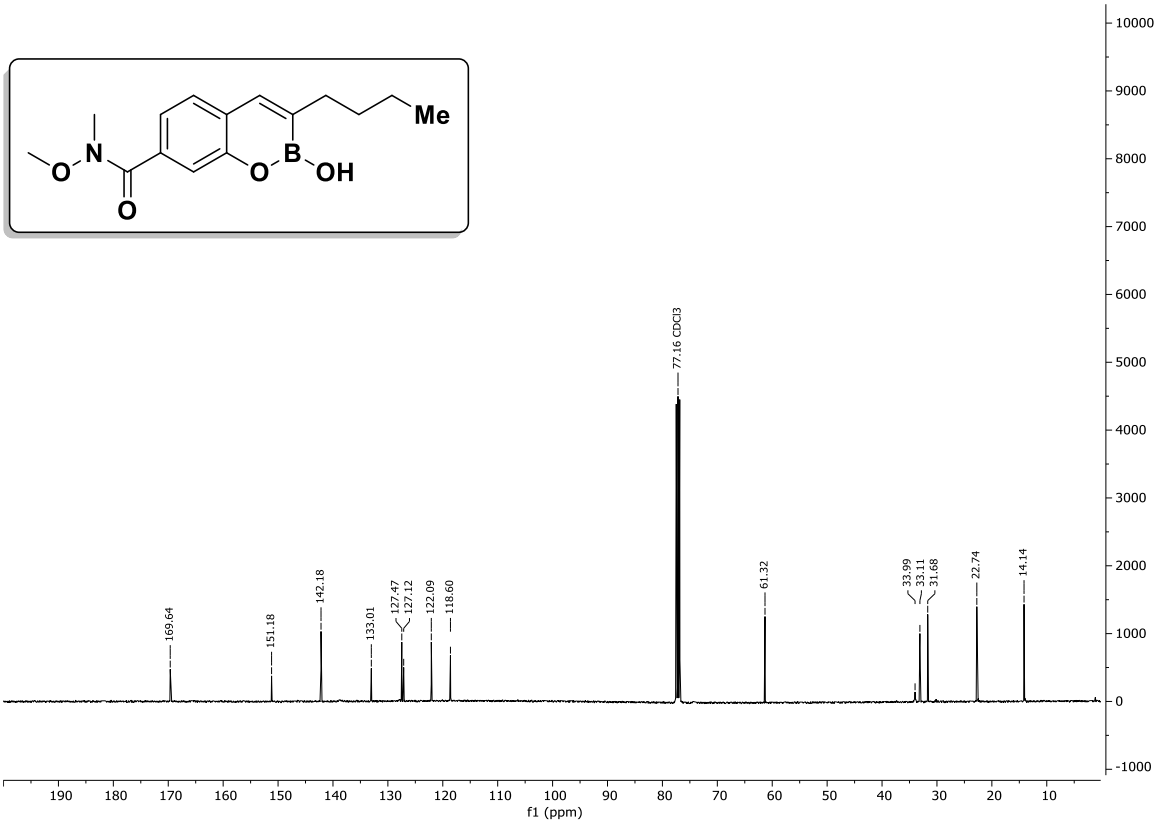
^{11}B NMR of 10 (128 MHz, $CDCl_3$)



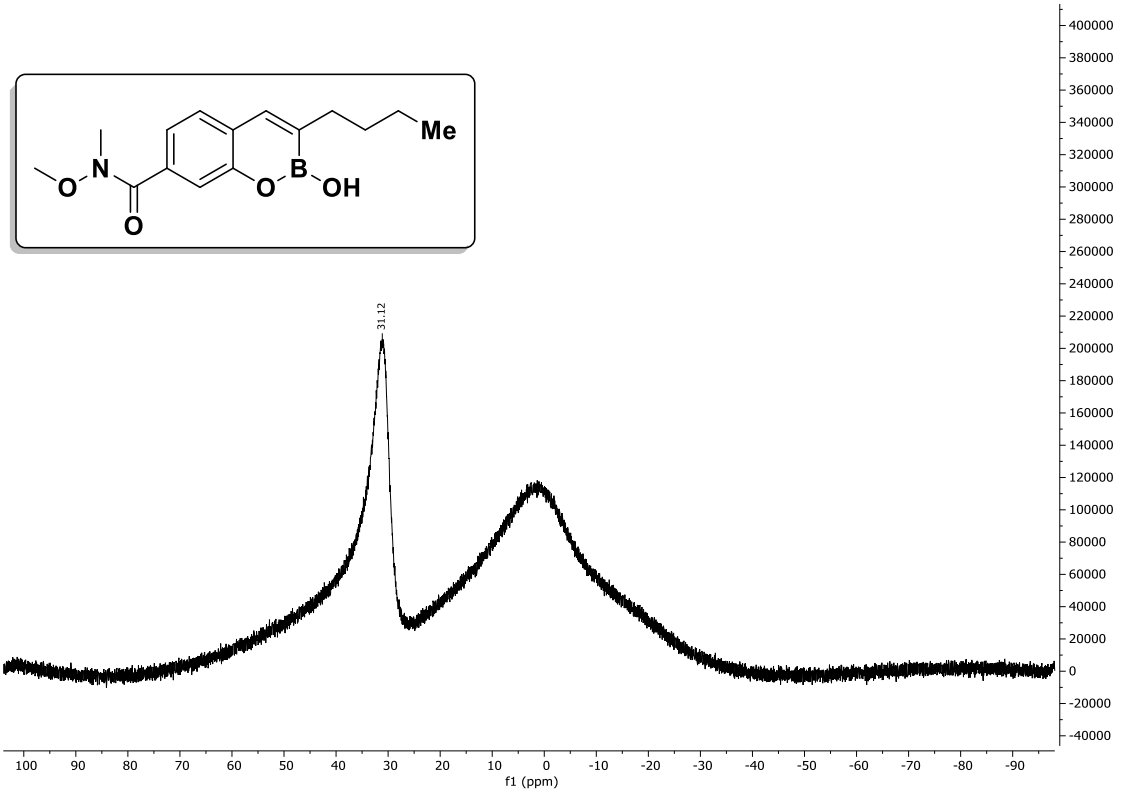
^{1}H NMR of 11 (400 MHz, $CDCl_3$)



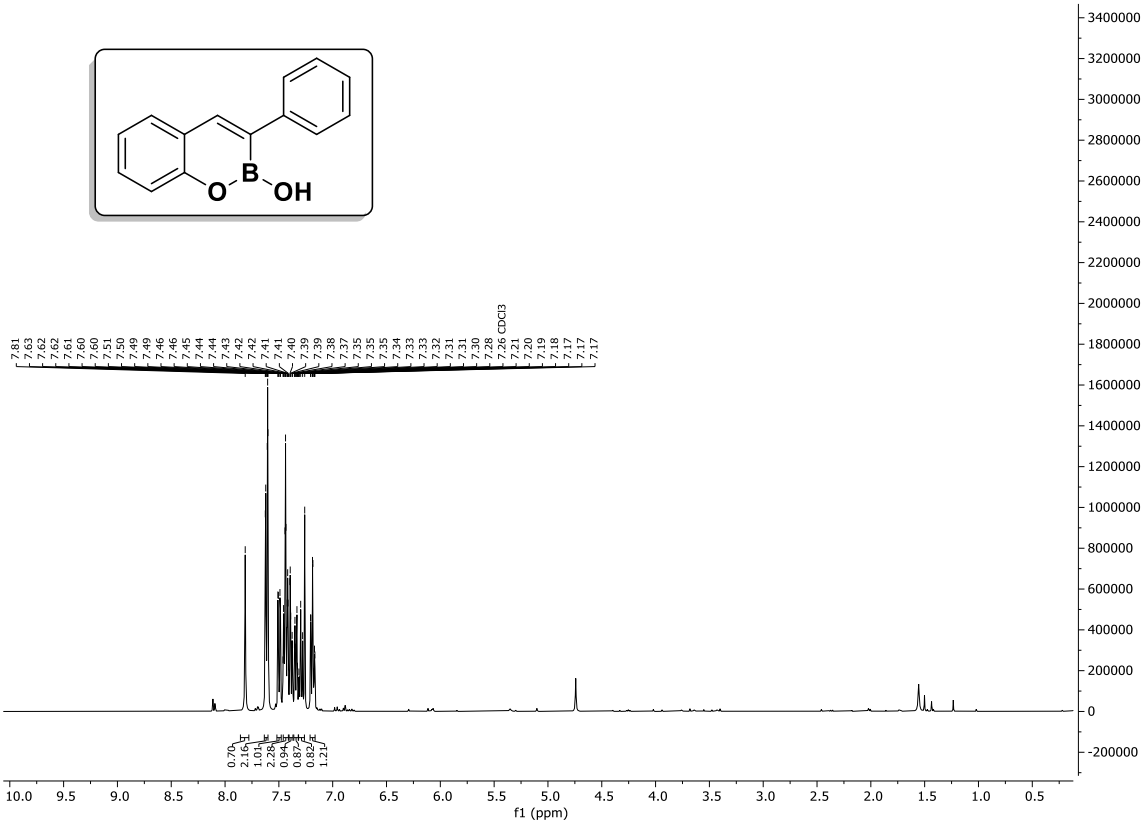
^{13}C NMR of 11 (101 MHz, $CDCl_3$)



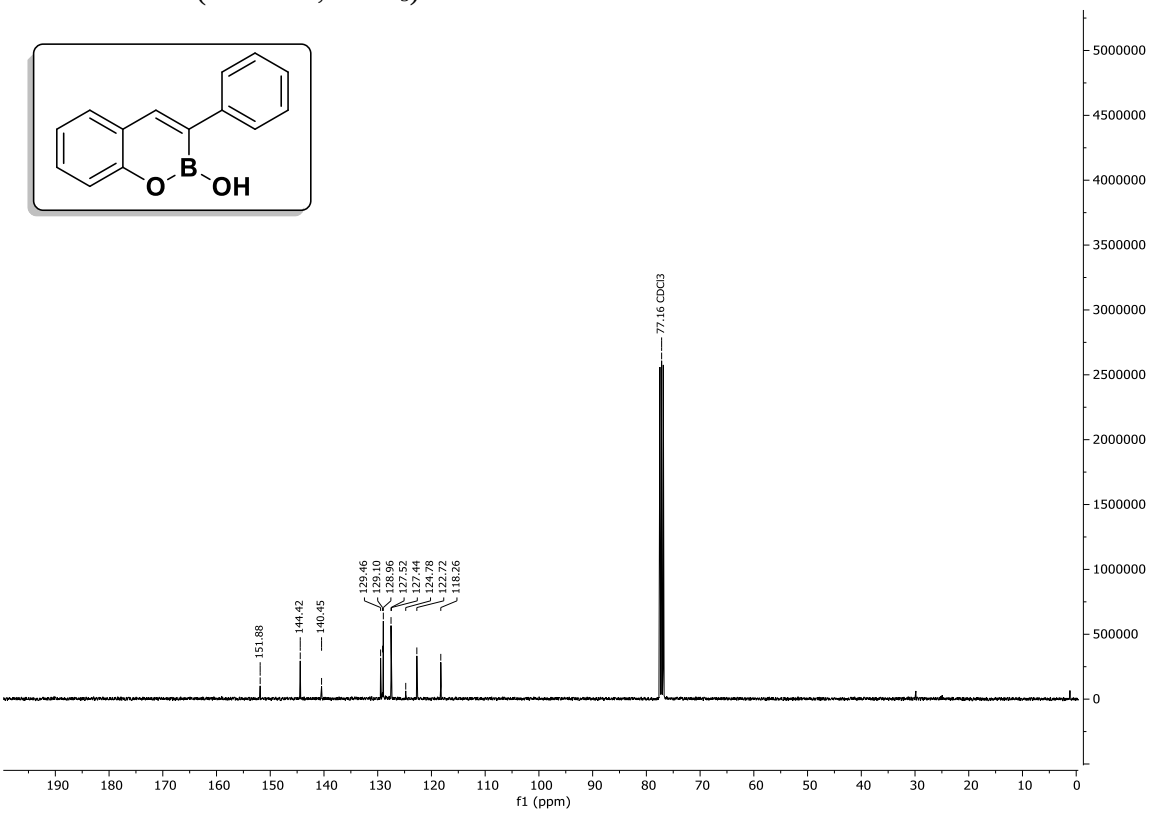
^{11}B NMR of 11 (128 MHz, $CDCl_3$)



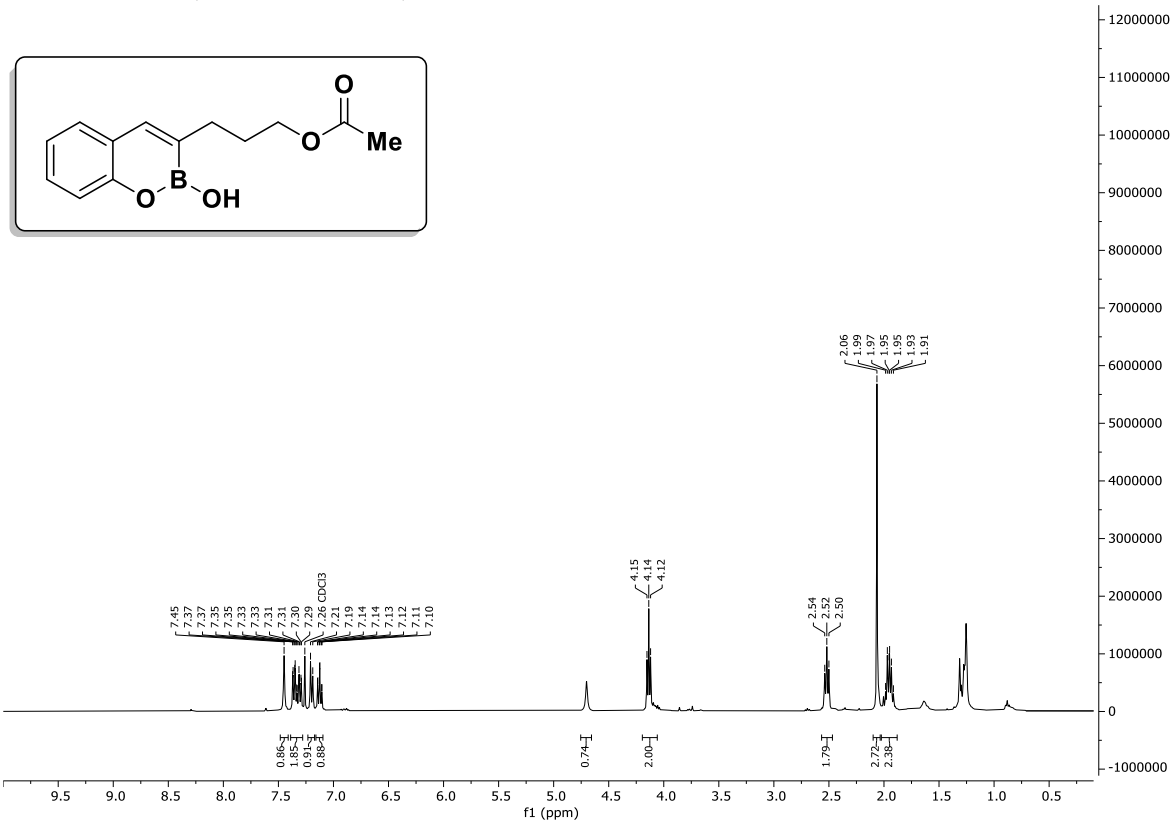
^{1}H NMR of 12 (400 MHz, $CDCl_3$)



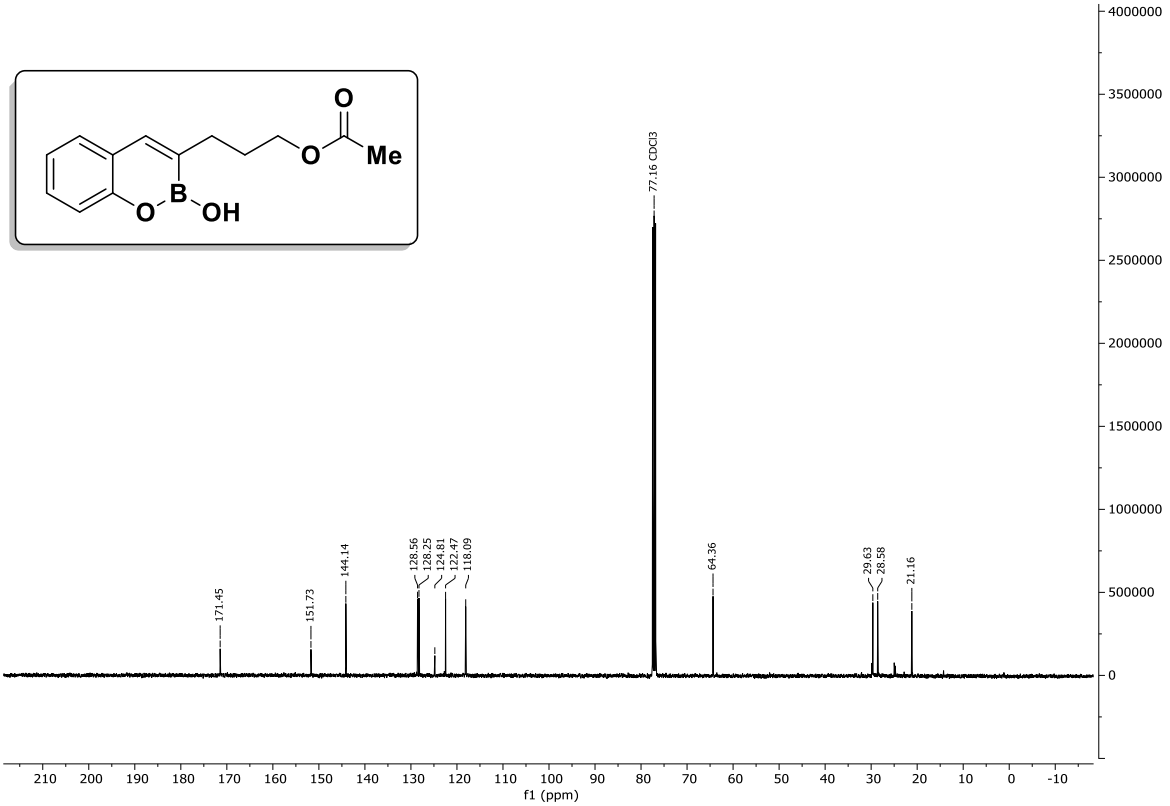
^{13}C NMR of 12 (101 MHz, $CDCl_3$)



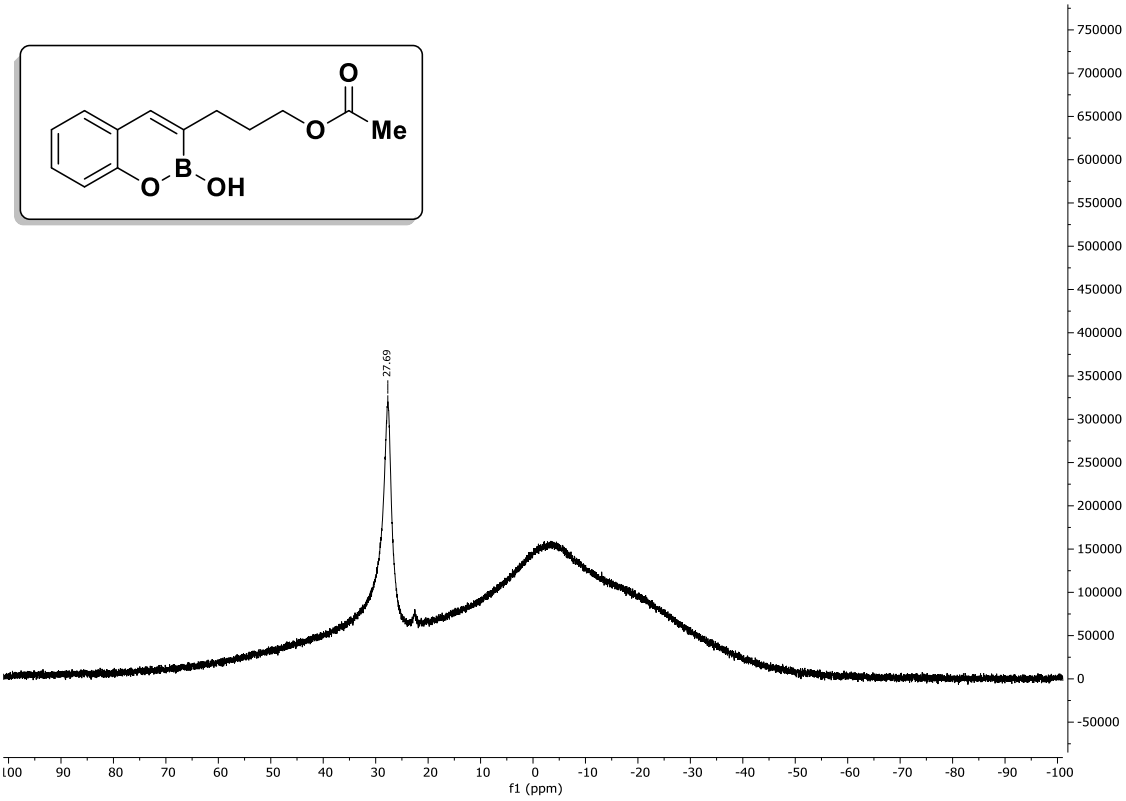
^{1}H NMR of 13 (400 MHz, $CDCl_3$)



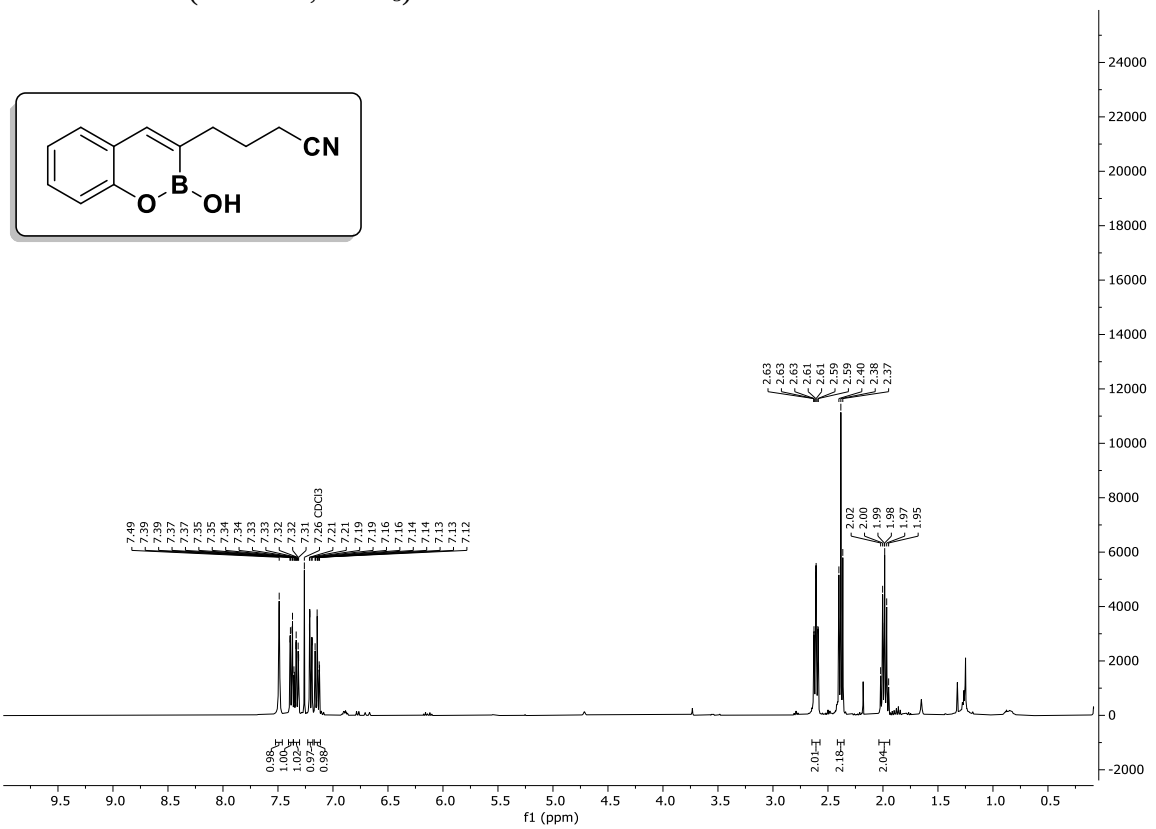
^{13}C NMR of 13 (101 MHz, $CDCl_3$)



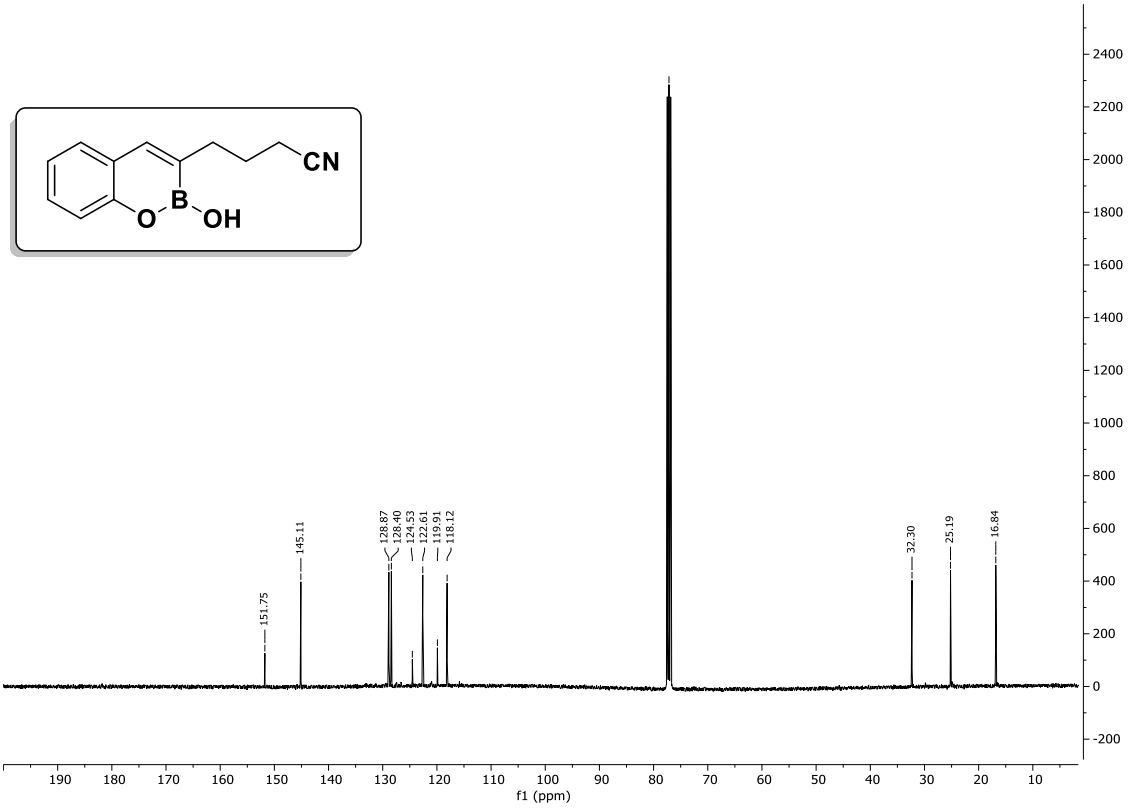
^{11}B NMR of 13 (128 MHz, $CDCl_3$)



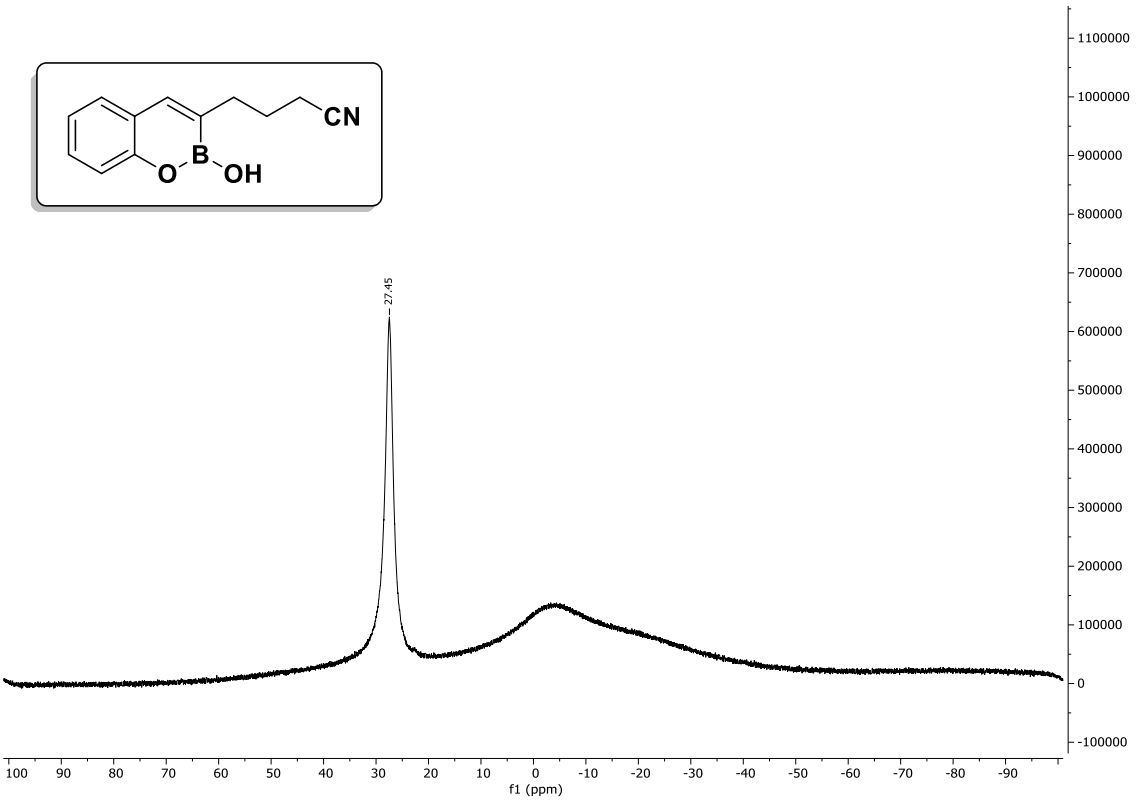
^{1}H NMR of 14 (400 MHz, $CDCl_3$)



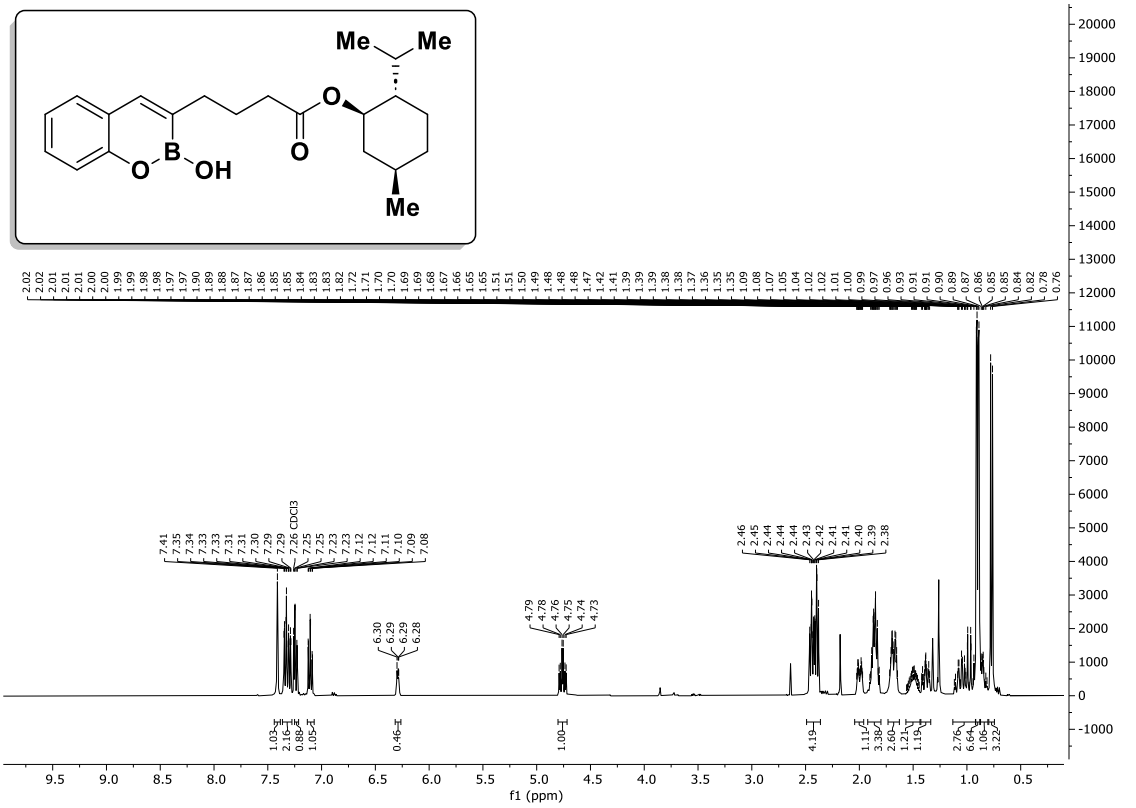
^{13}C NMR of 14 (101 MHz, $CDCl_3$)



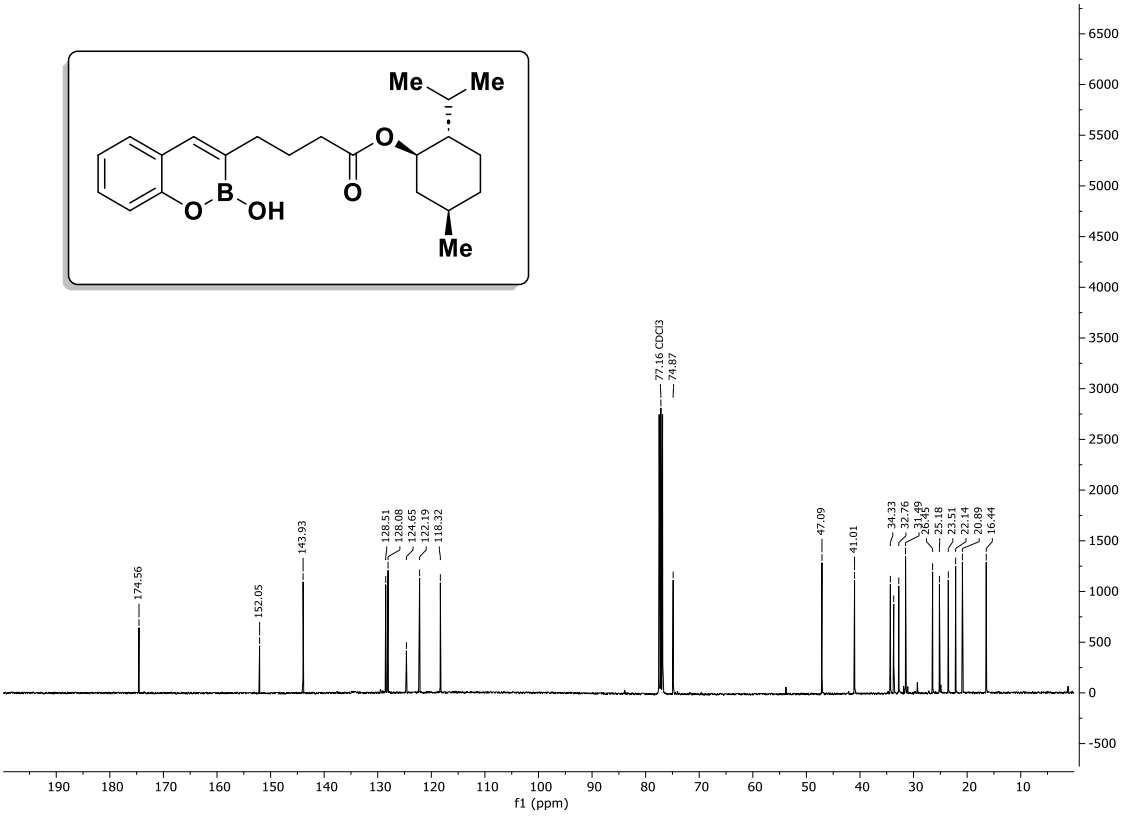
^{11}B NMR of 14 (128 MHz, $CDCl_3$)



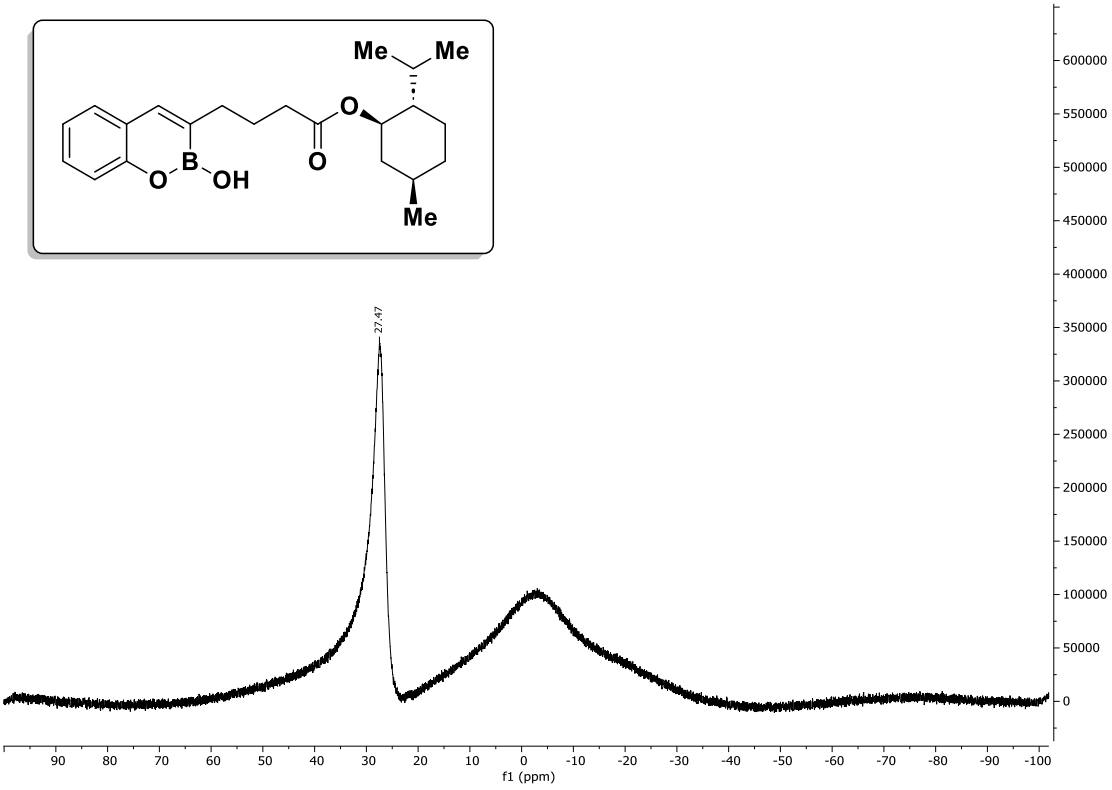
^{1}H NMR of 15 (400 MHz, $CDCl_3$)



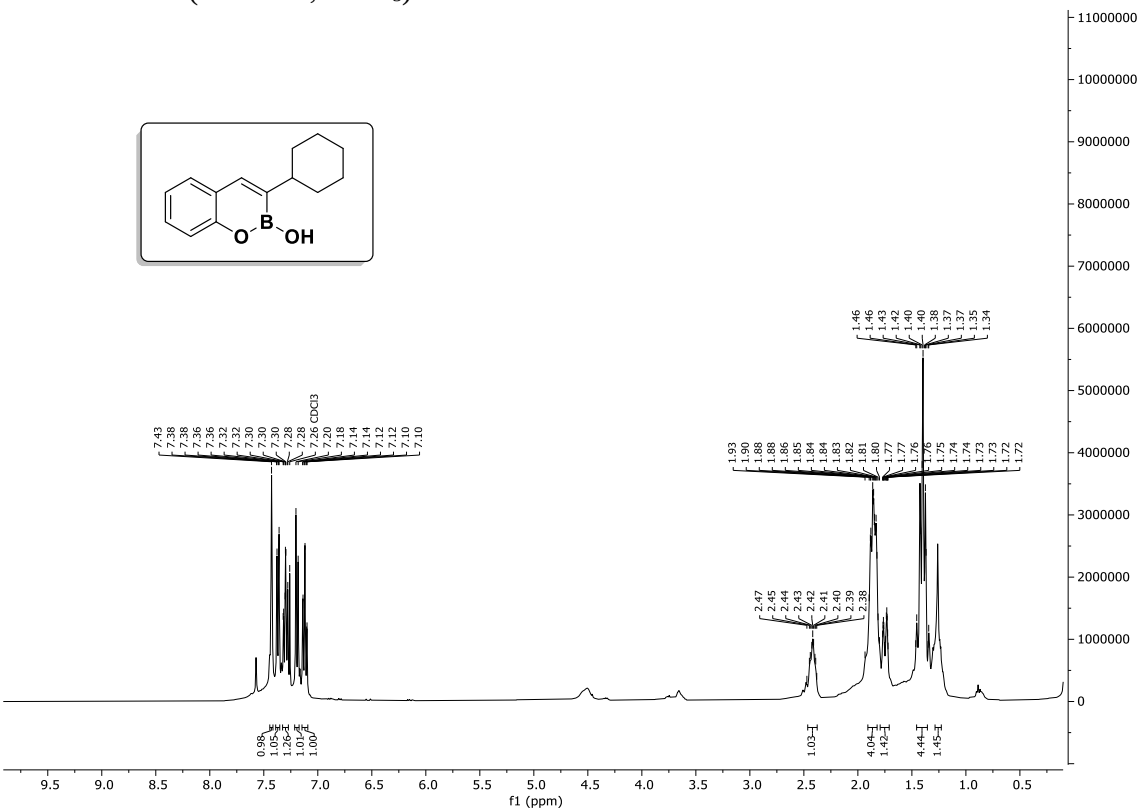
^{13}C NMR of 15 (101 MHz, $CDCl_3$)



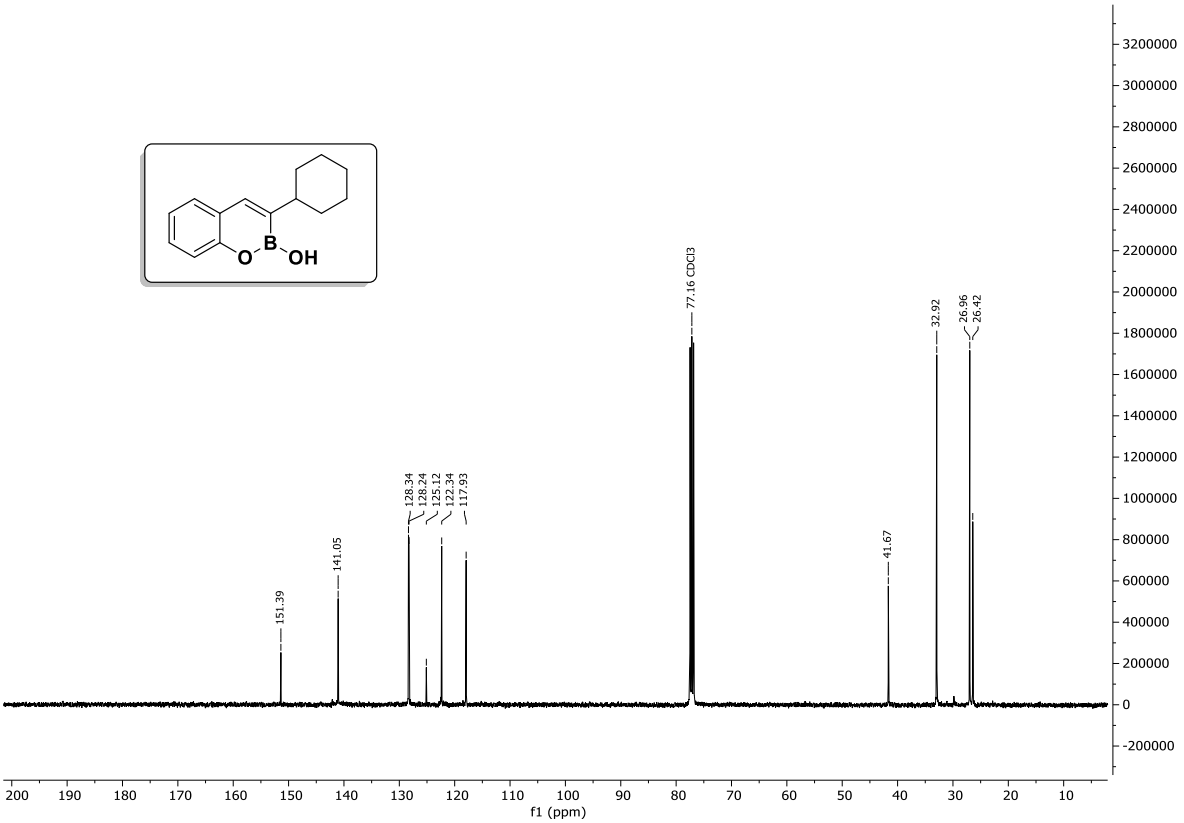
^{11}B NMR of 15 (128 MHz, $CDCl_3$)



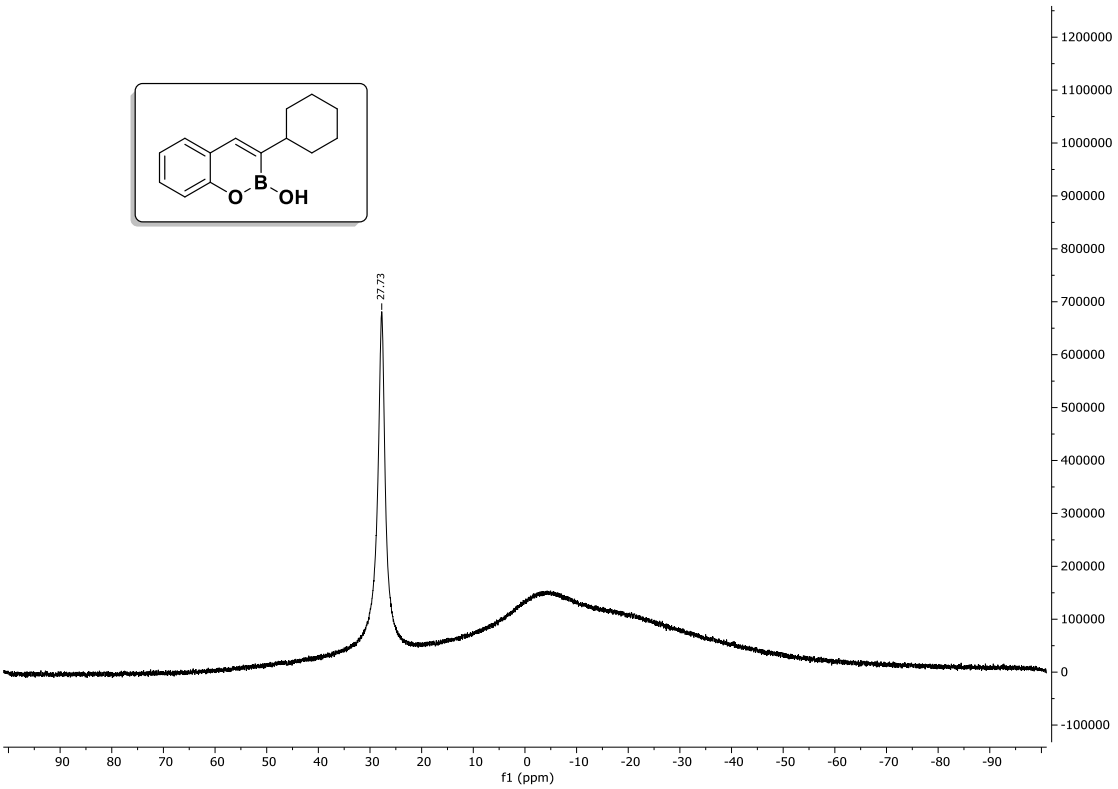
^{1}H NMR of 16 (400 MHz, $CDCl_3$)



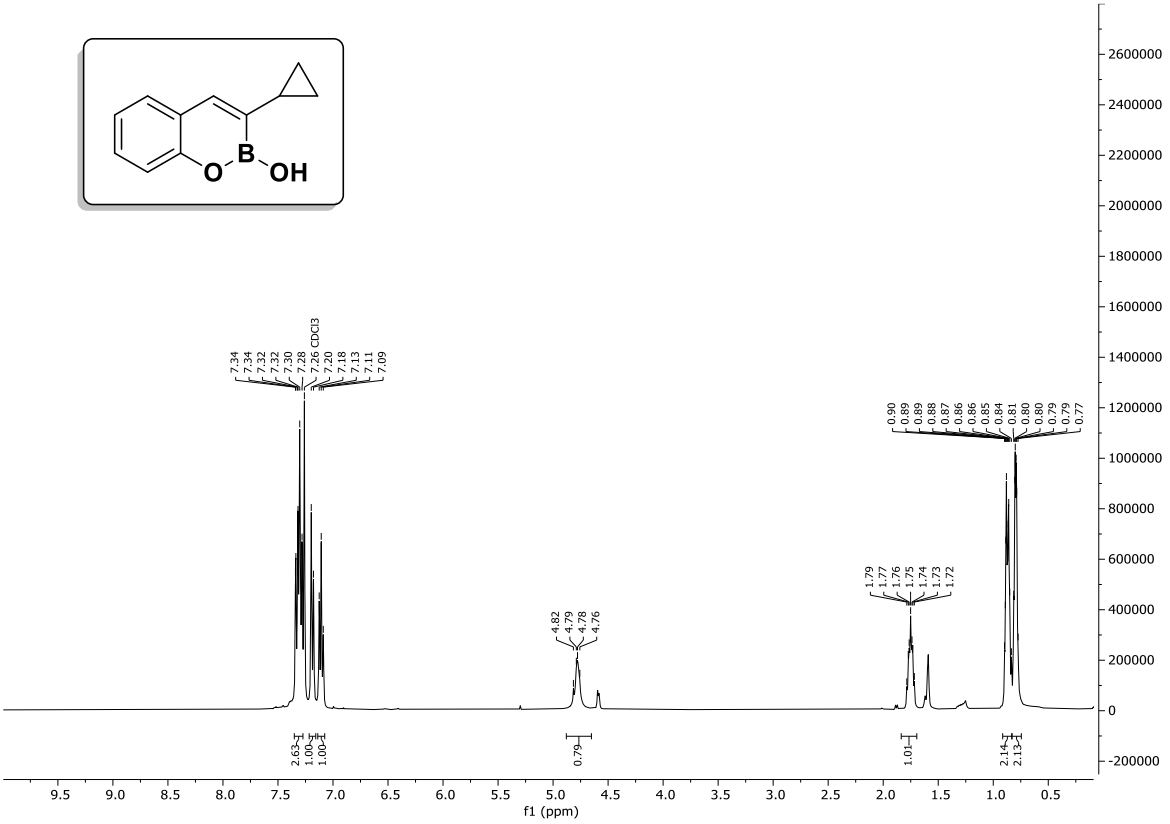
^{13}C NMR of 16 (101 MHz, $CDCl_3$)



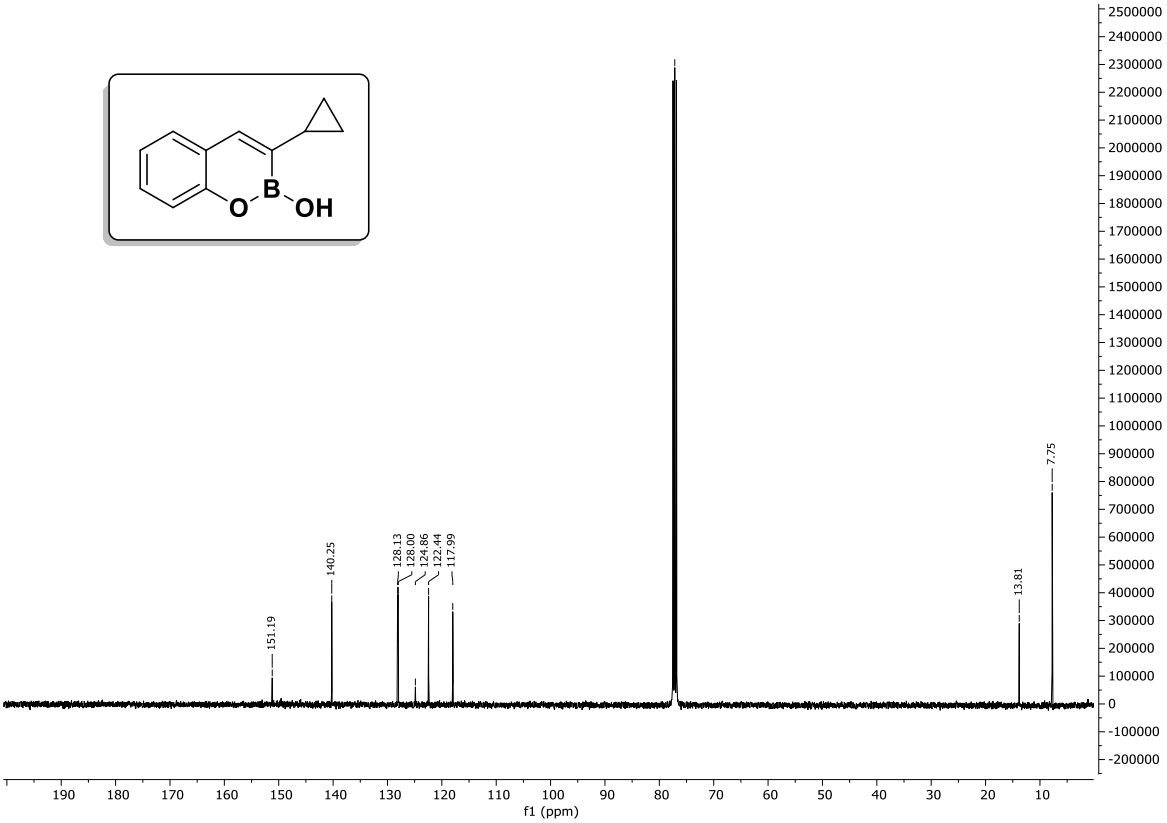
^{11}B NMR of 16 (128 MHz, $CDCl_3$)



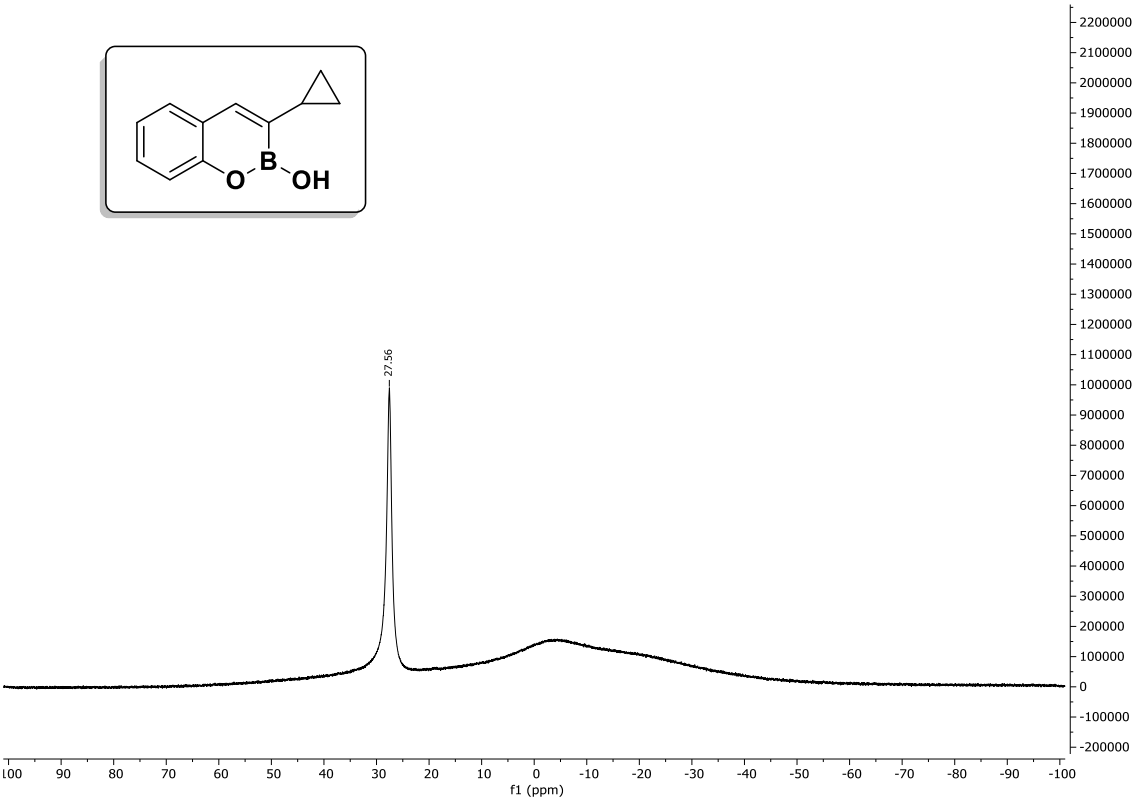
^{1}H NMR of 17 (400 MHz, $CDCl_3$)



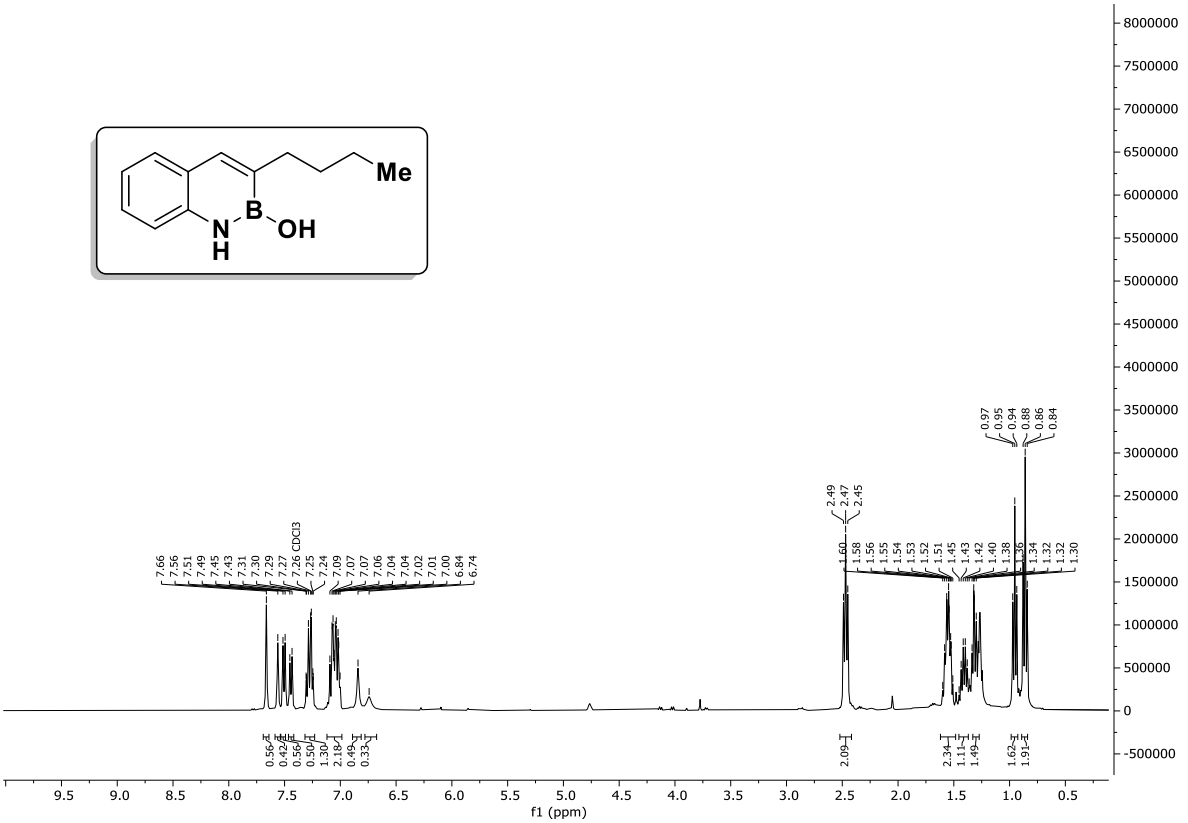
^{13}C NMR of 17 (101 MHz, $CDCl_3$)



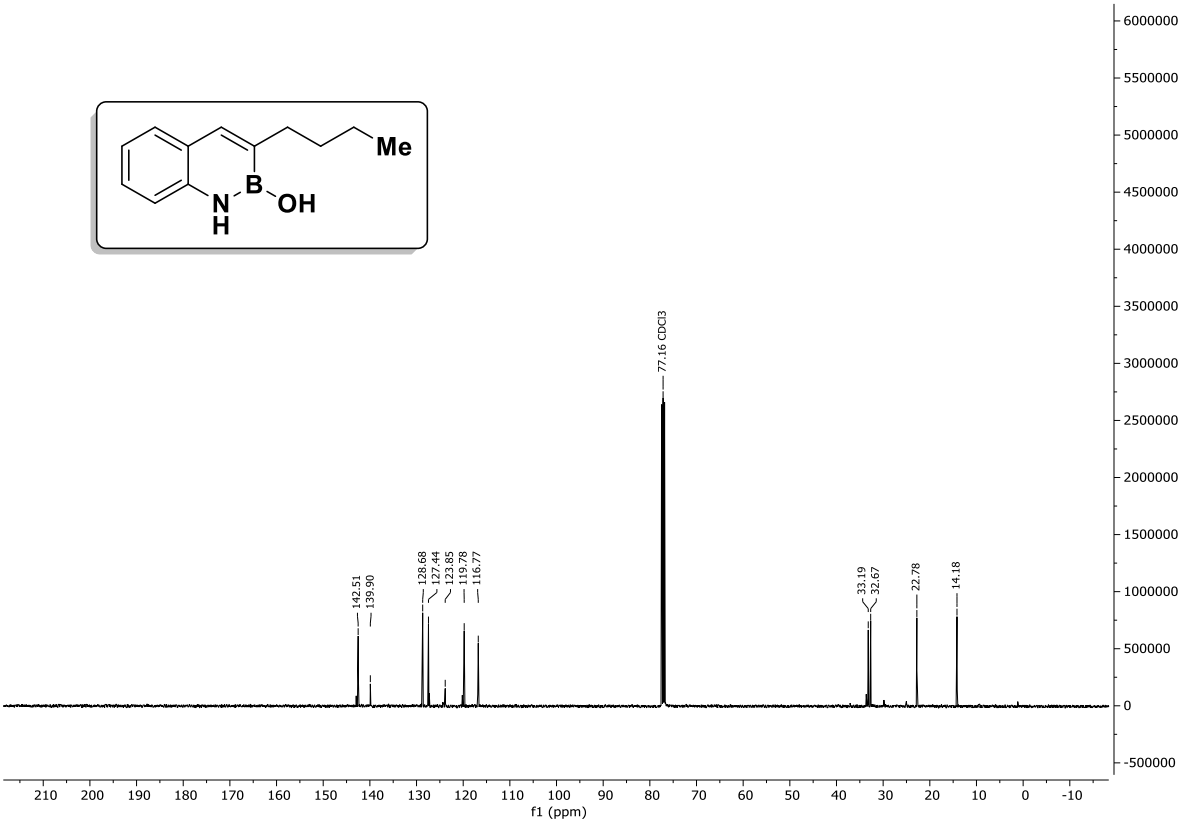
^{11}B NMR of 17 (128 MHz, $CDCl_3$)



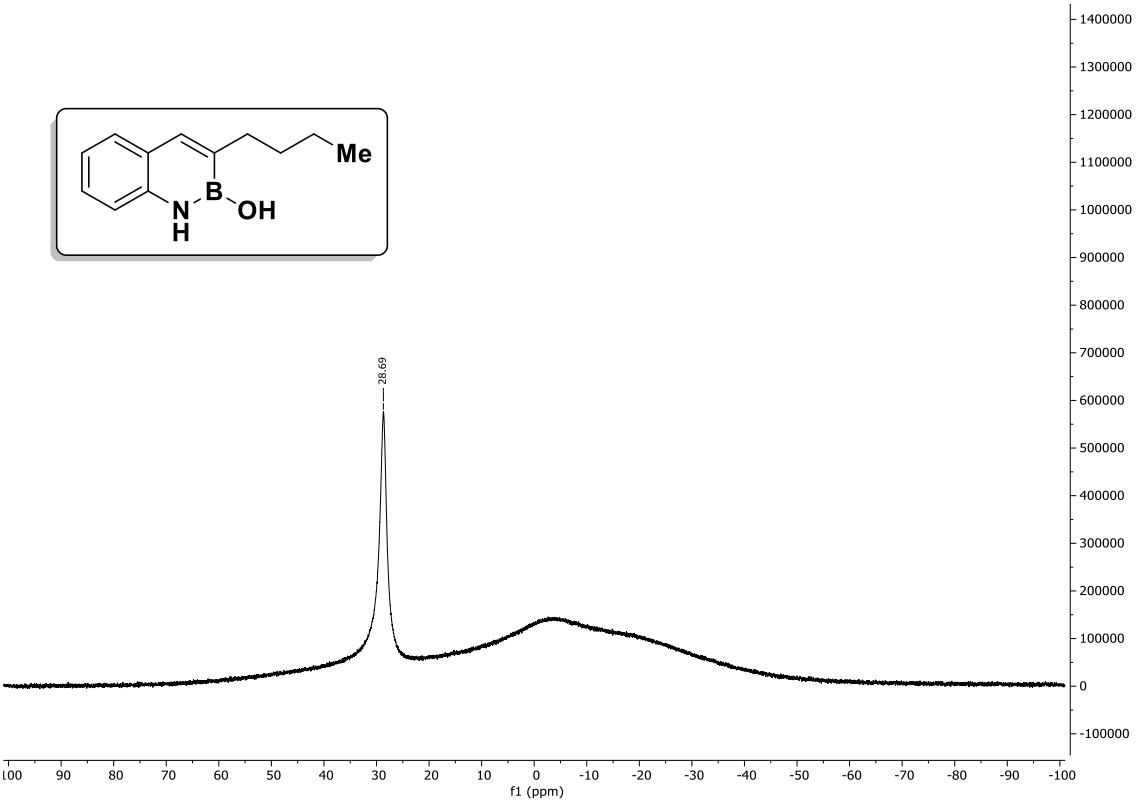
^{1}H NMR of 18 (400 MHz, $CDCl_3$)



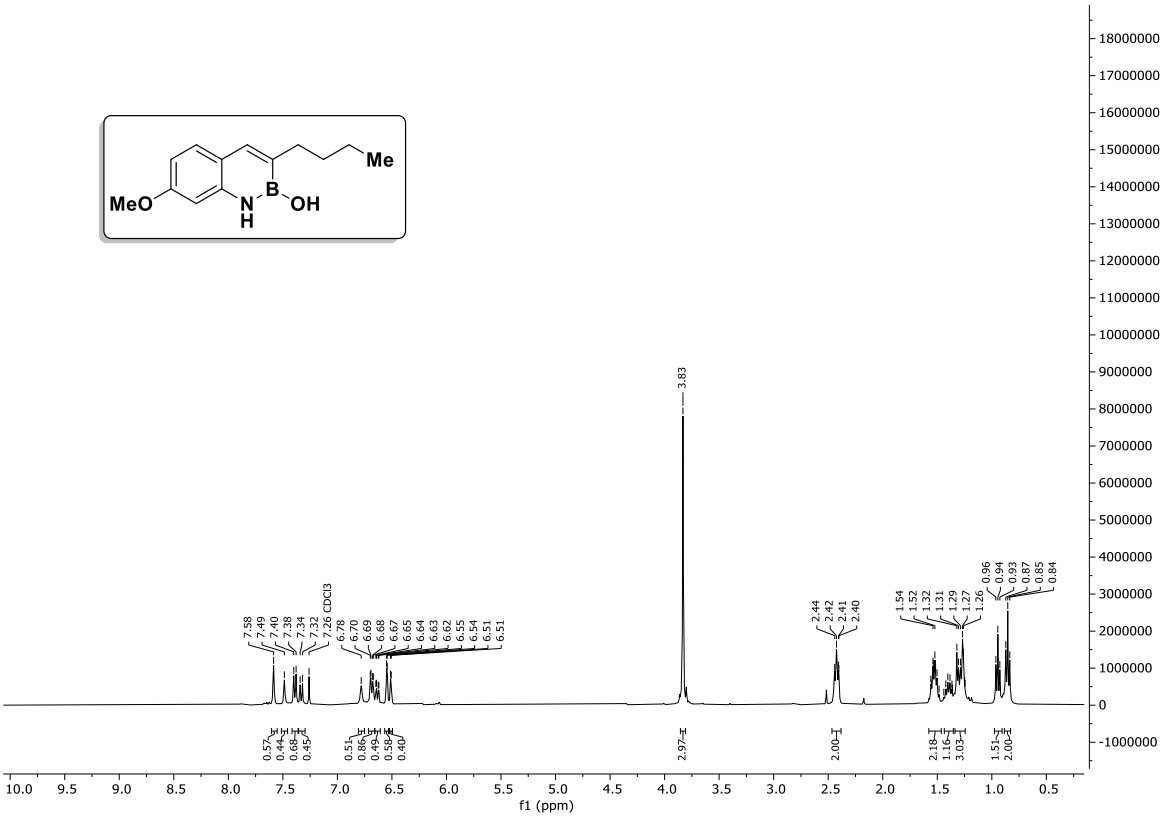
^{13}C NMR of 18 (101 MHz, $CDCl_3$)



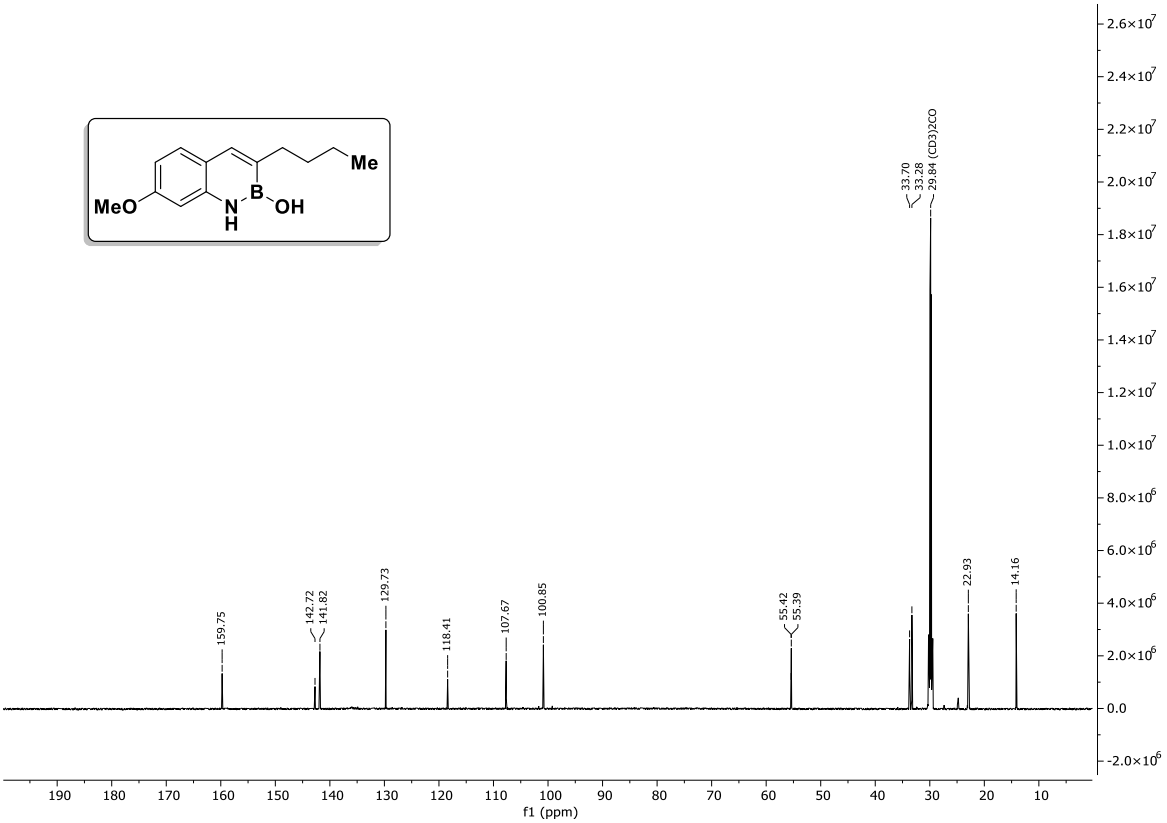
^{11}B NMR of 18 (128 MHz, $CDCl_3$)



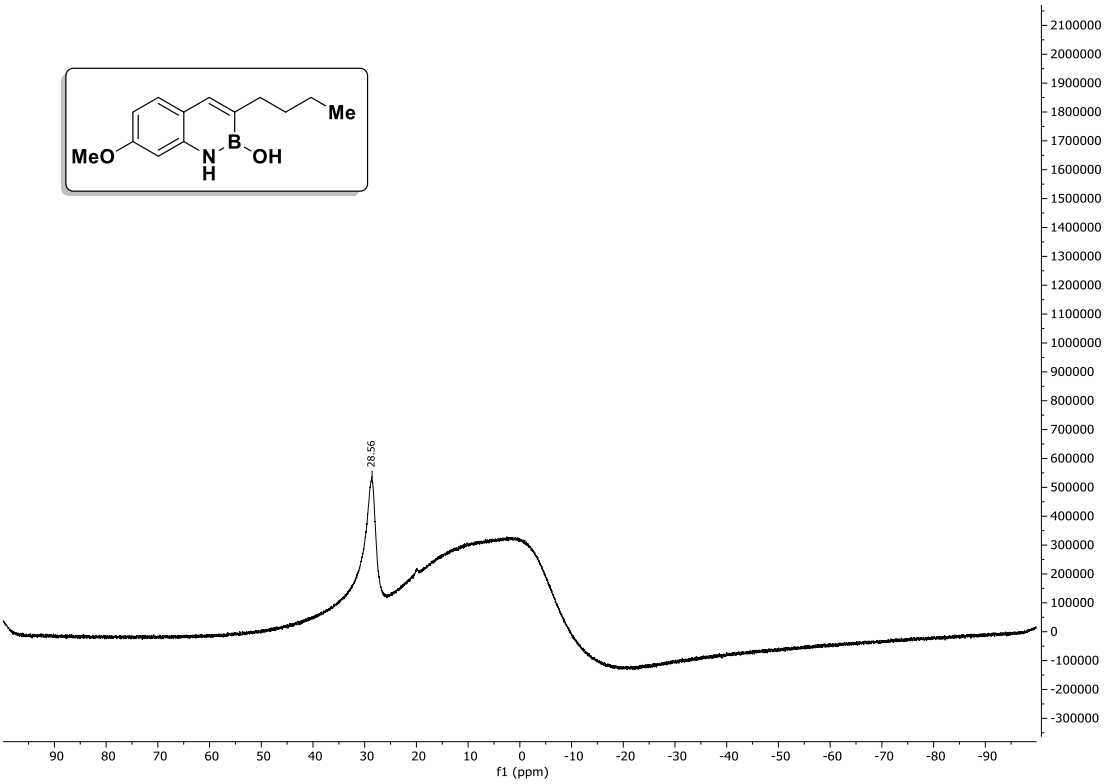
^{1}H NMR of 19 (400 MHz, $CDCl_3$)



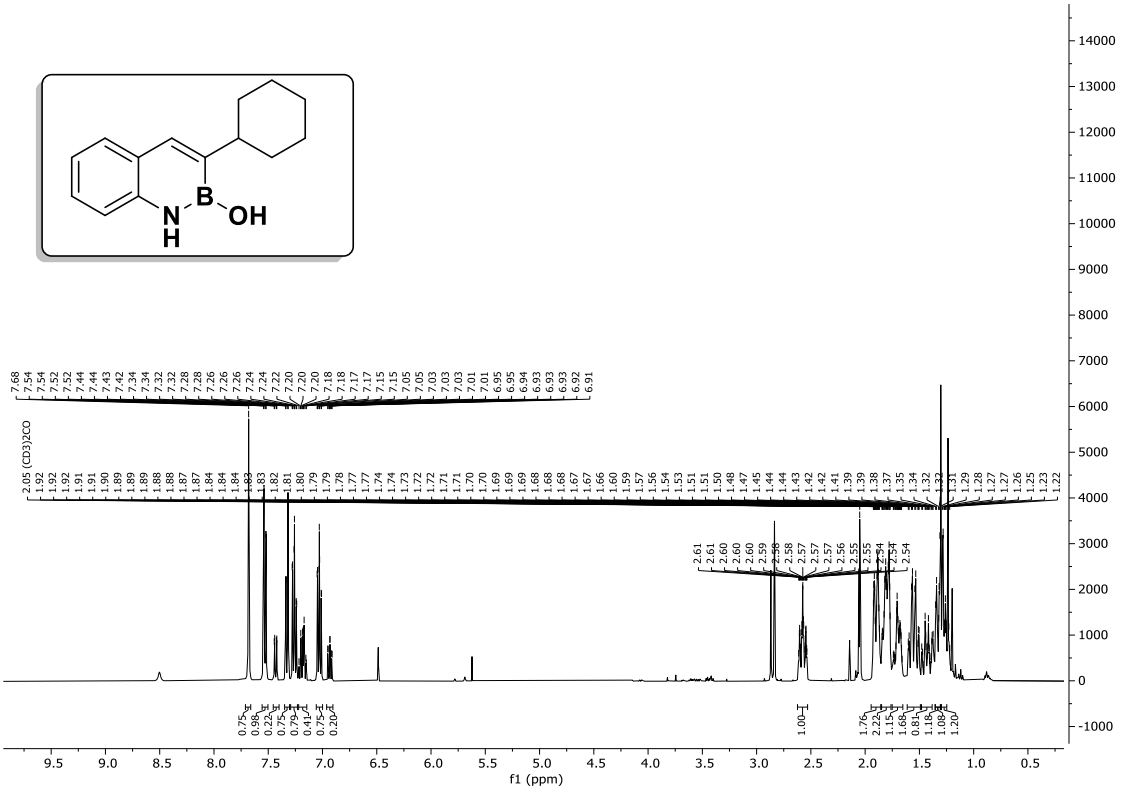
^{13}C NMR of 19 (151 MHz, Acetone d_6)



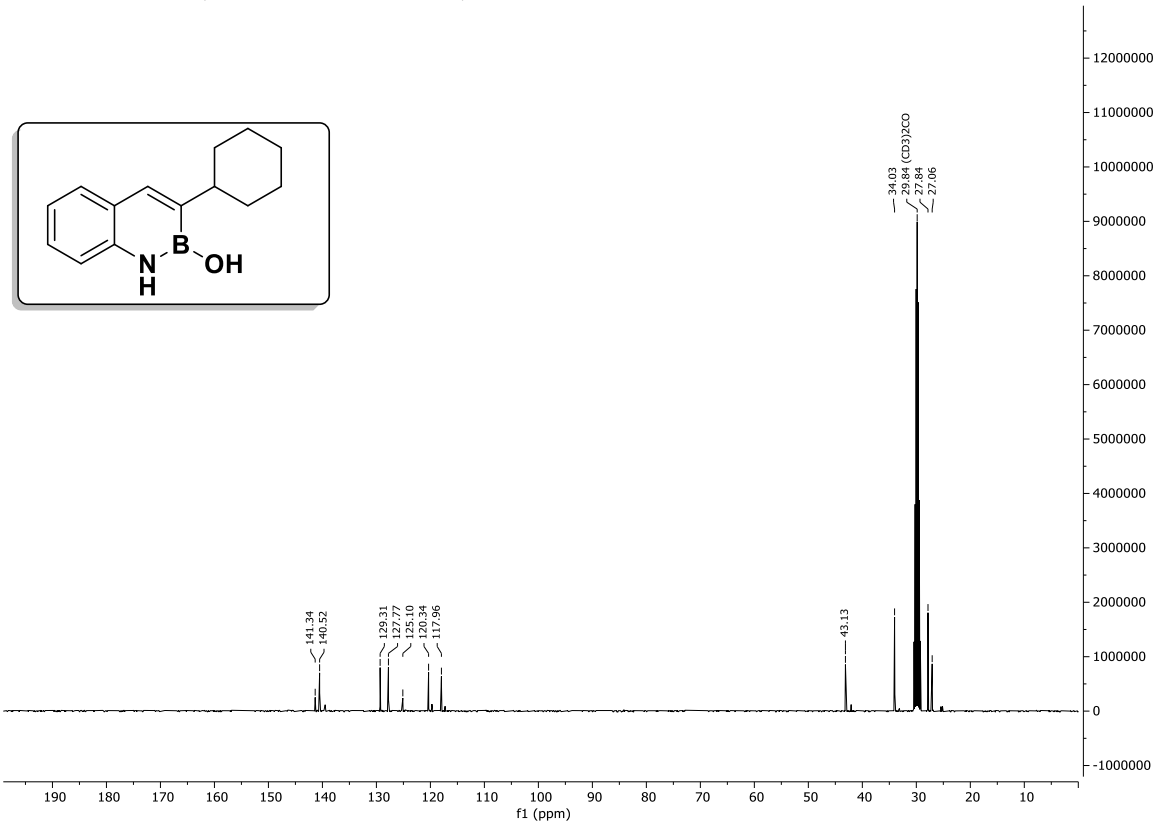
^{11}B NMR of 19 (192 MHz, Acetone d_6)



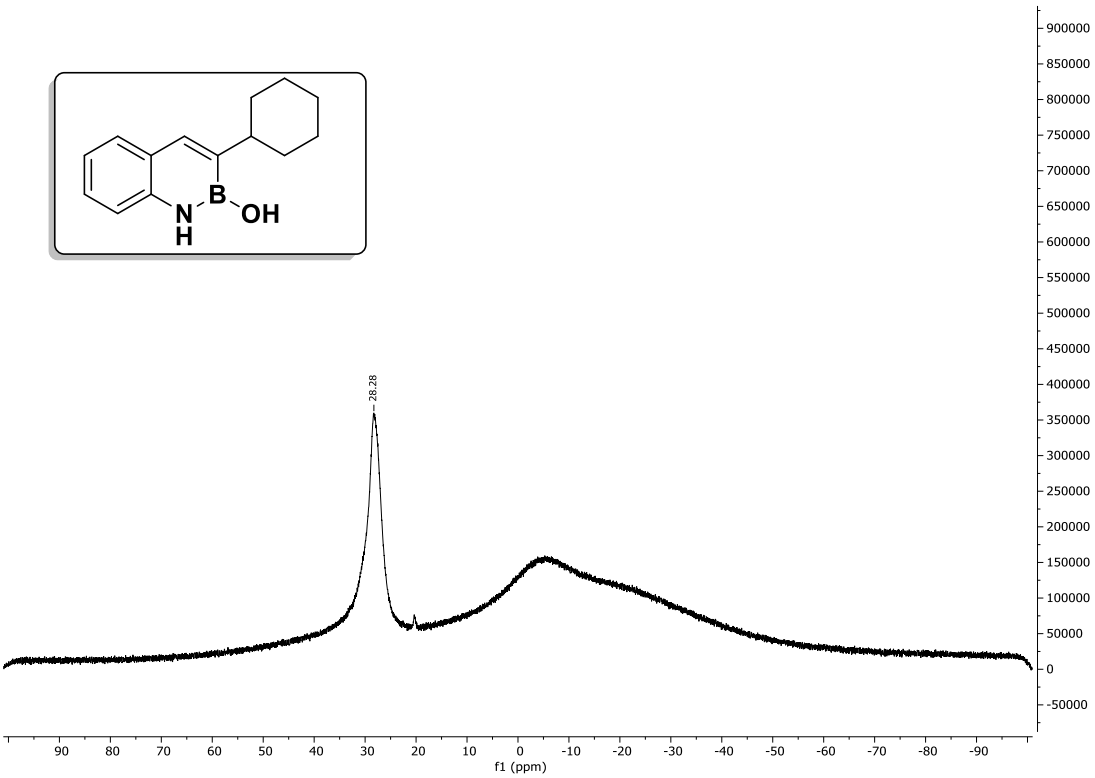
^{1}H NMR of 20 (400 MHz, Acetone d_6)



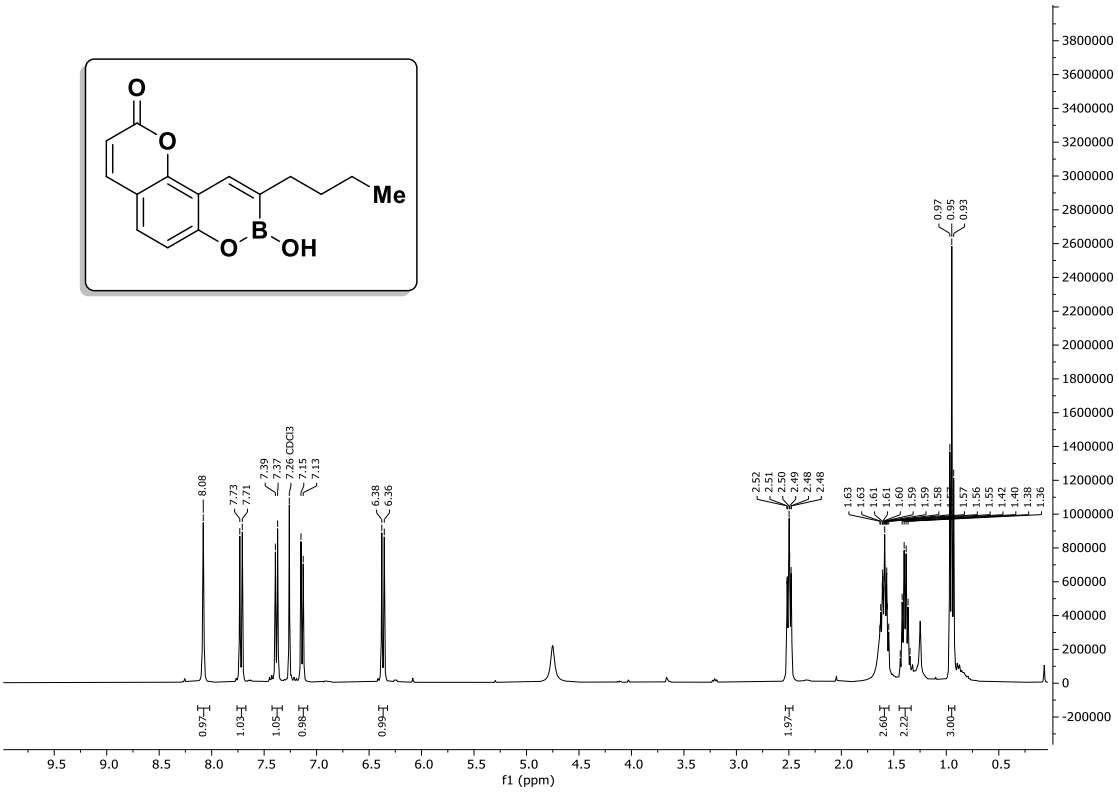
^{13}C NMR of 20 (101 MHz, Acetone d_6)



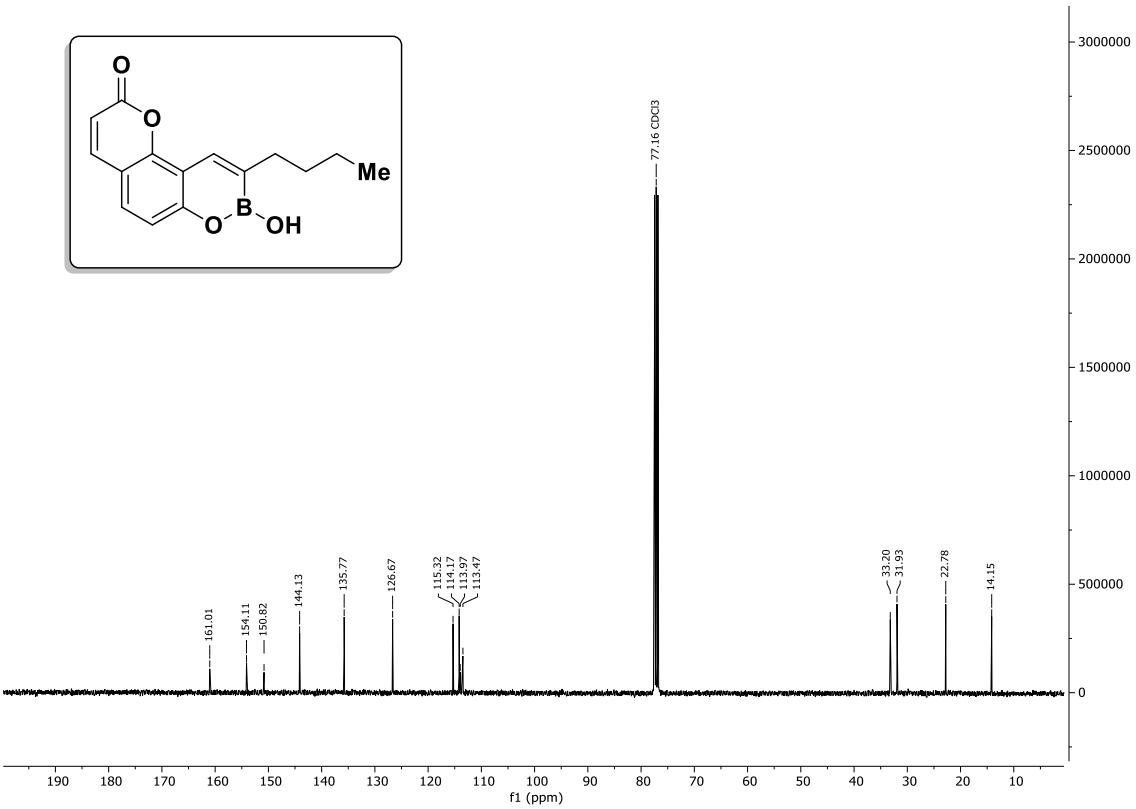
^{11}B NMR of 20 (128 MHz, Acetone d_6)



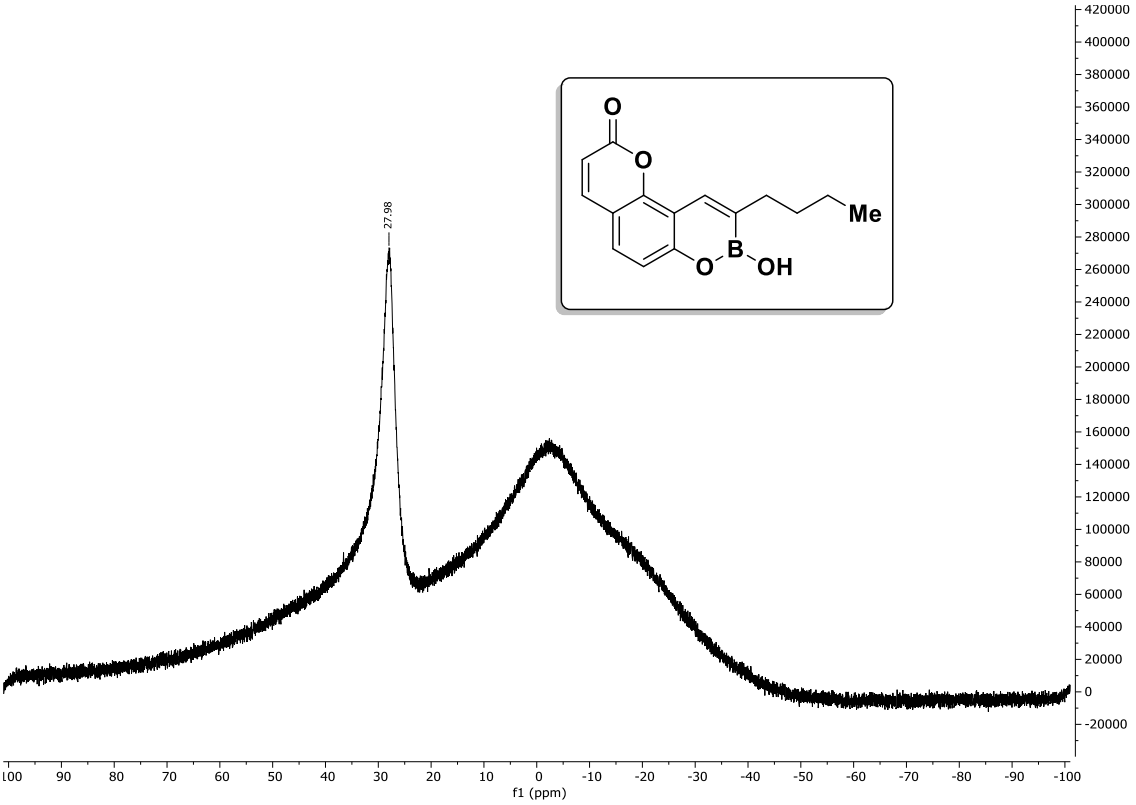
^{1}H NMR of 21 (400 MHz, $CDCl_3$)



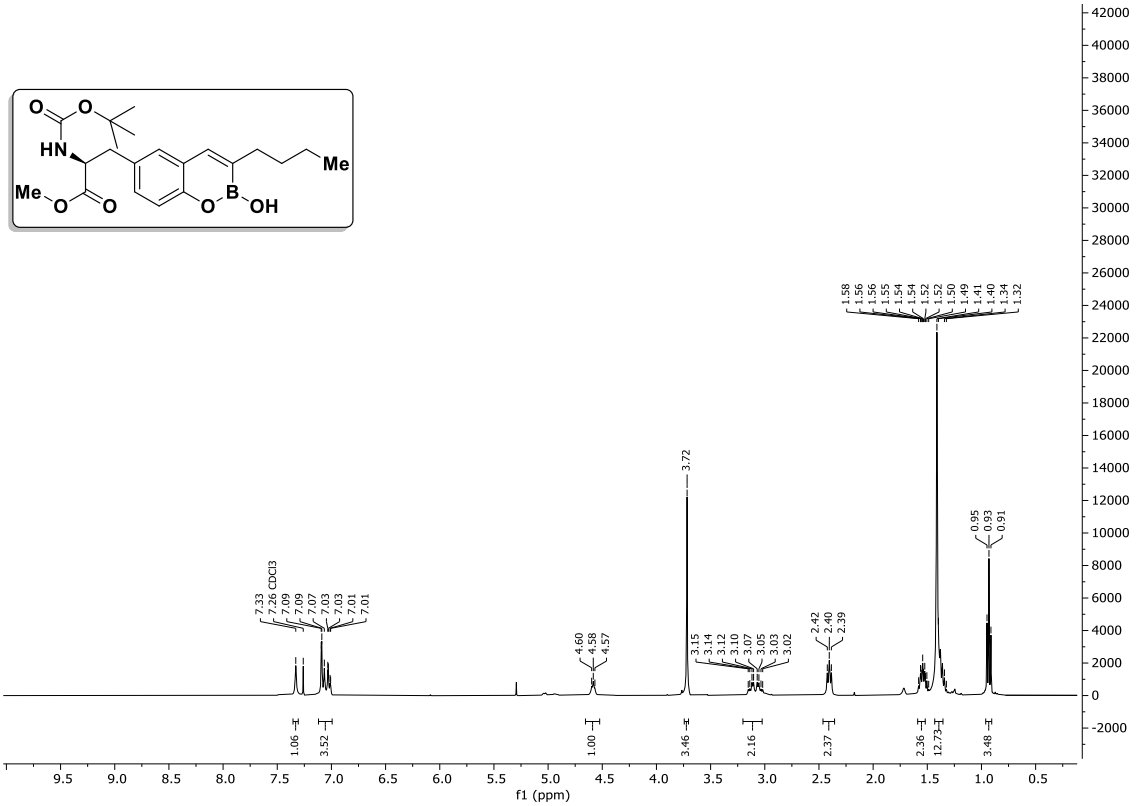
^{13}C NMR of 21 (101 MHz, $CDCl_3$)



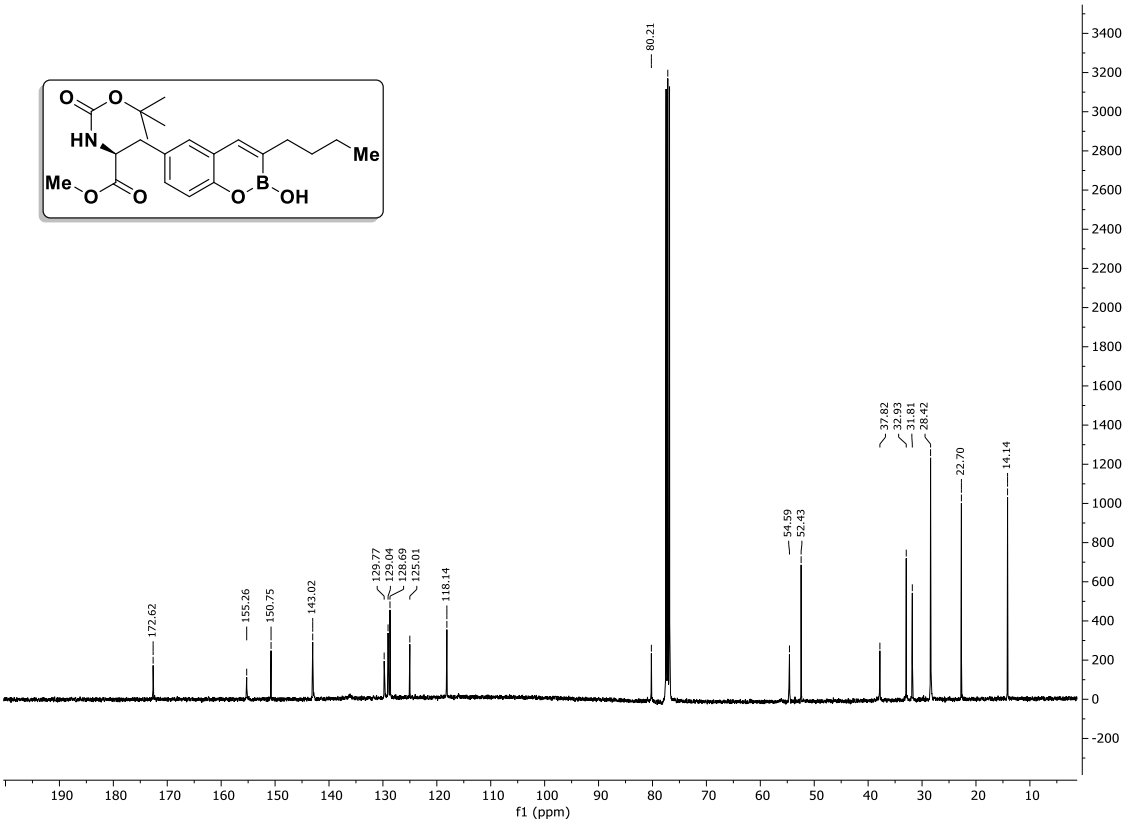
^{11}B NMR of 21 (128 MHz, $CDCl_3$)



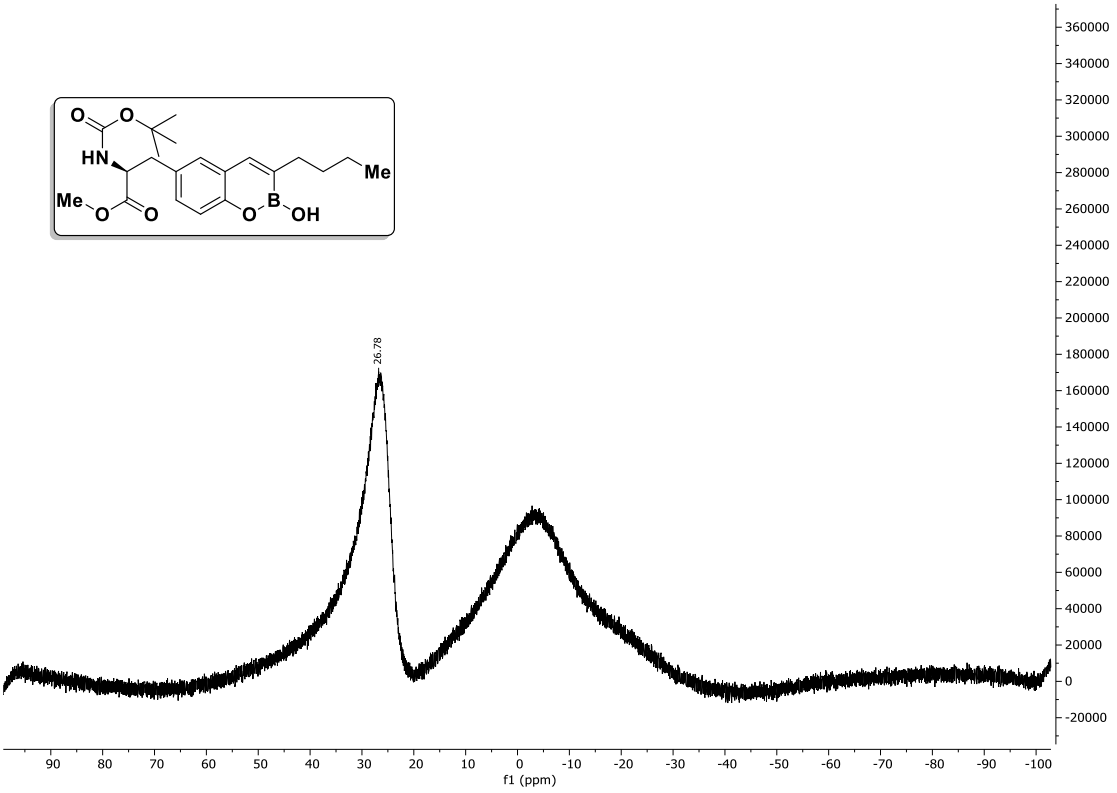
^{1}H NMR of 22 (400 MHz, $CDCl_3$)



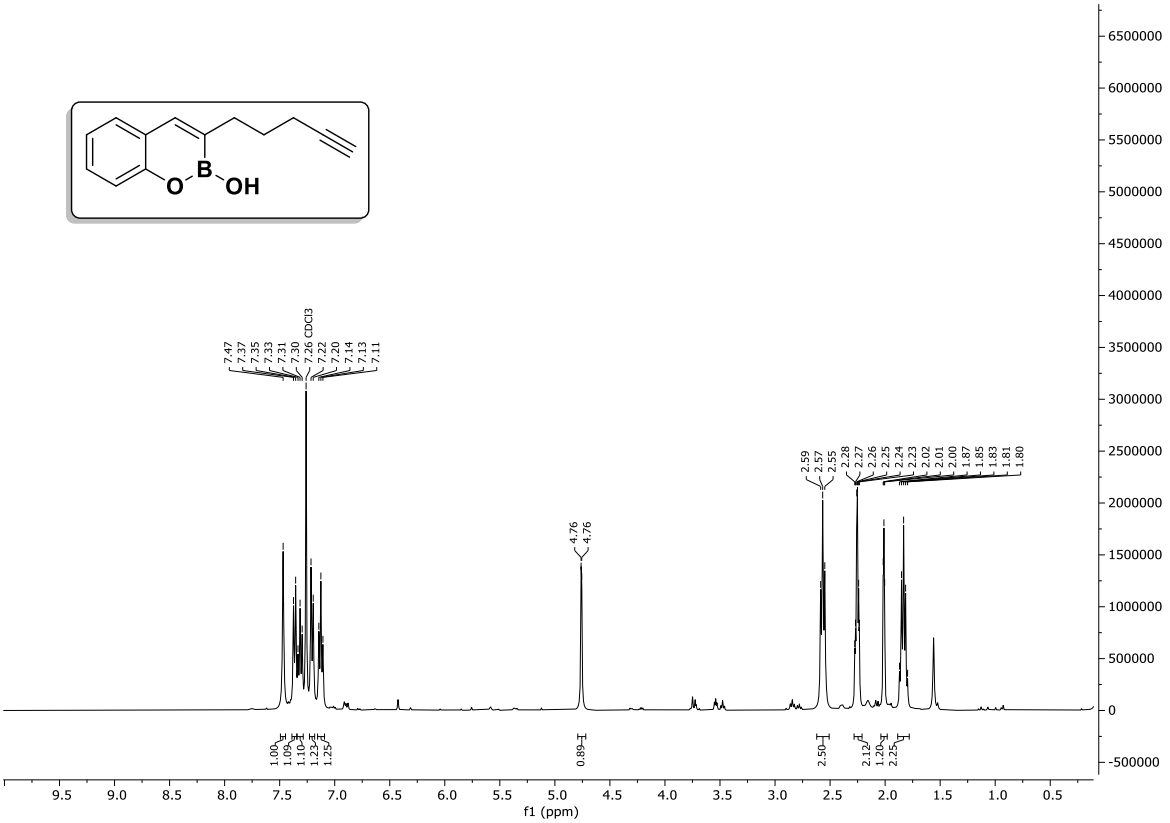
^{13}C NMR of 22 (101 MHz, $CDCl_3$)



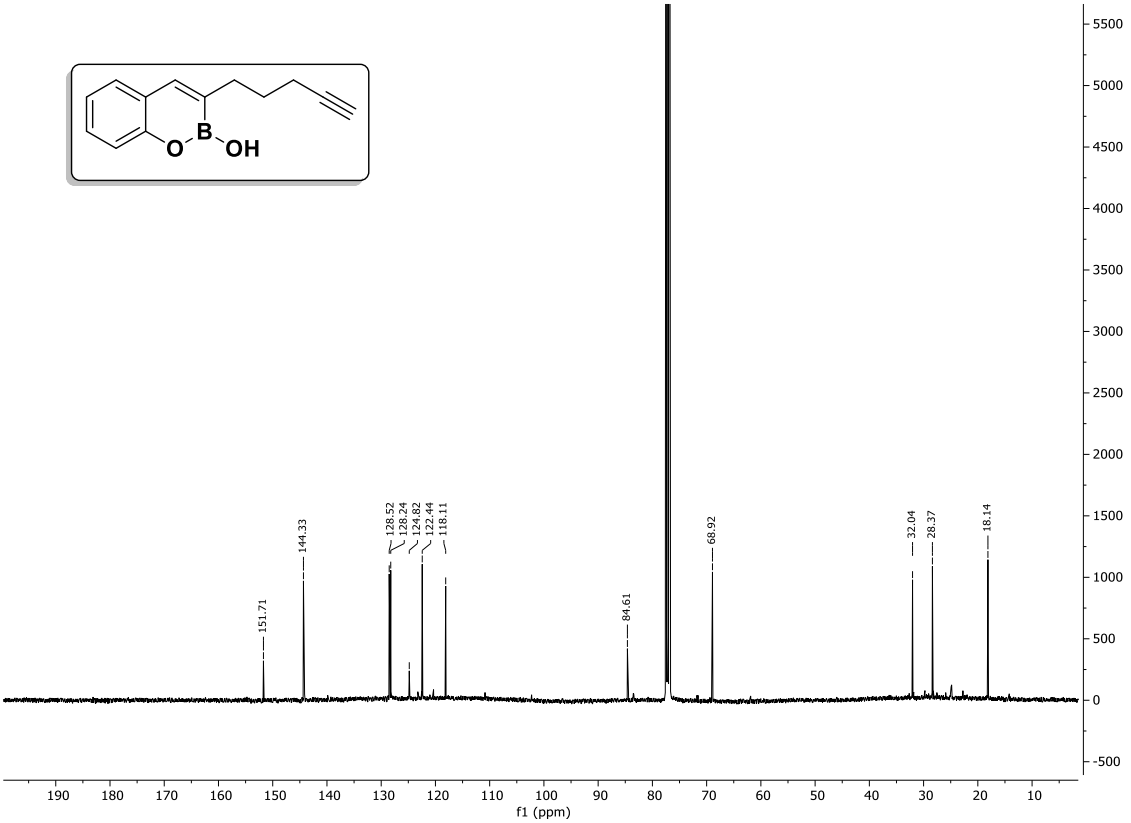
^{11}B NMR of 22 (128 MHz, $CDCl_3$)



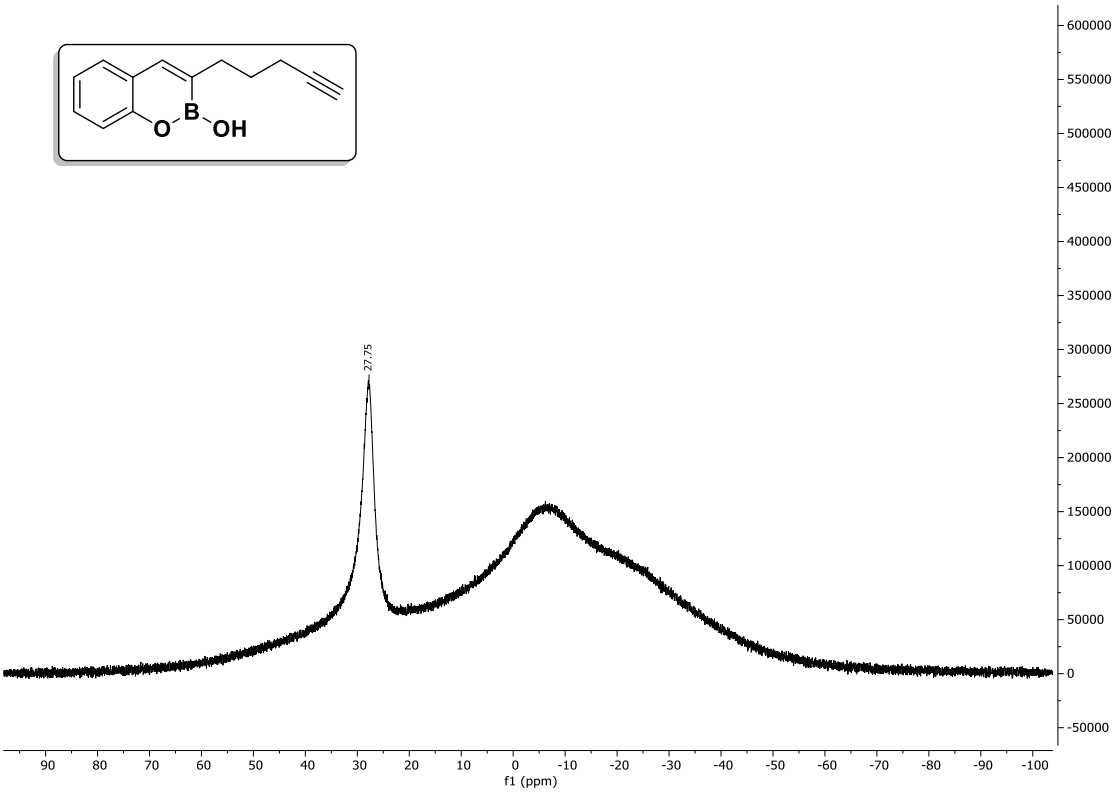
^{1}H NMR of 23 (400 MHz, $CDCl_3$)



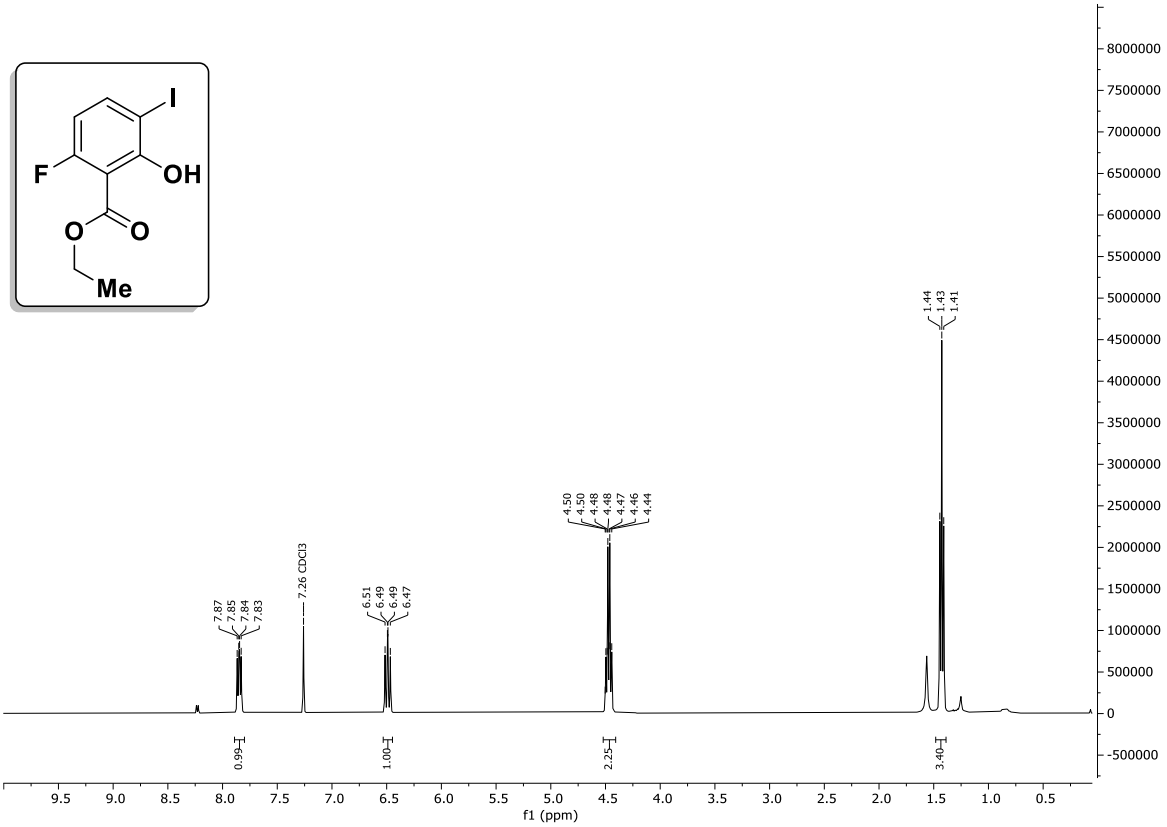
^{13}C NMR of 23 (101 MHz, $CDCl_3$)



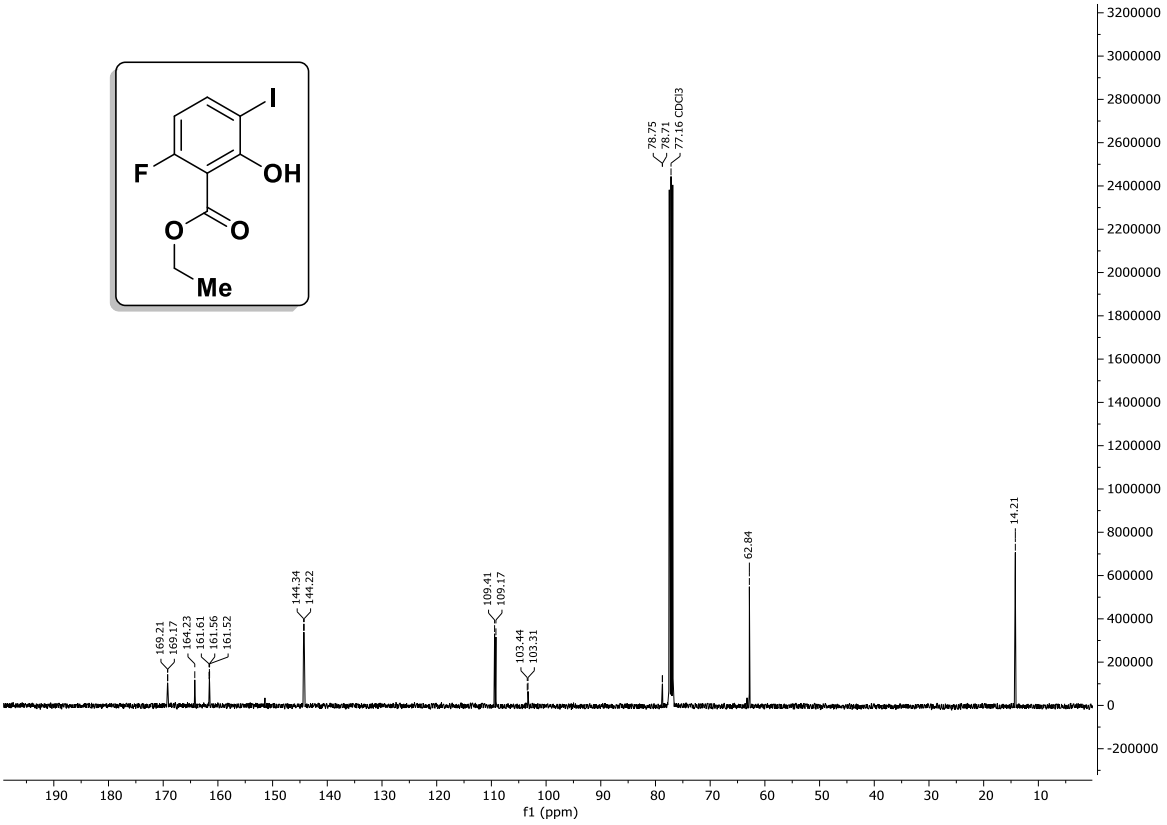
^{11}B NMR of 23 (128 MHz, $CDCl_3$)



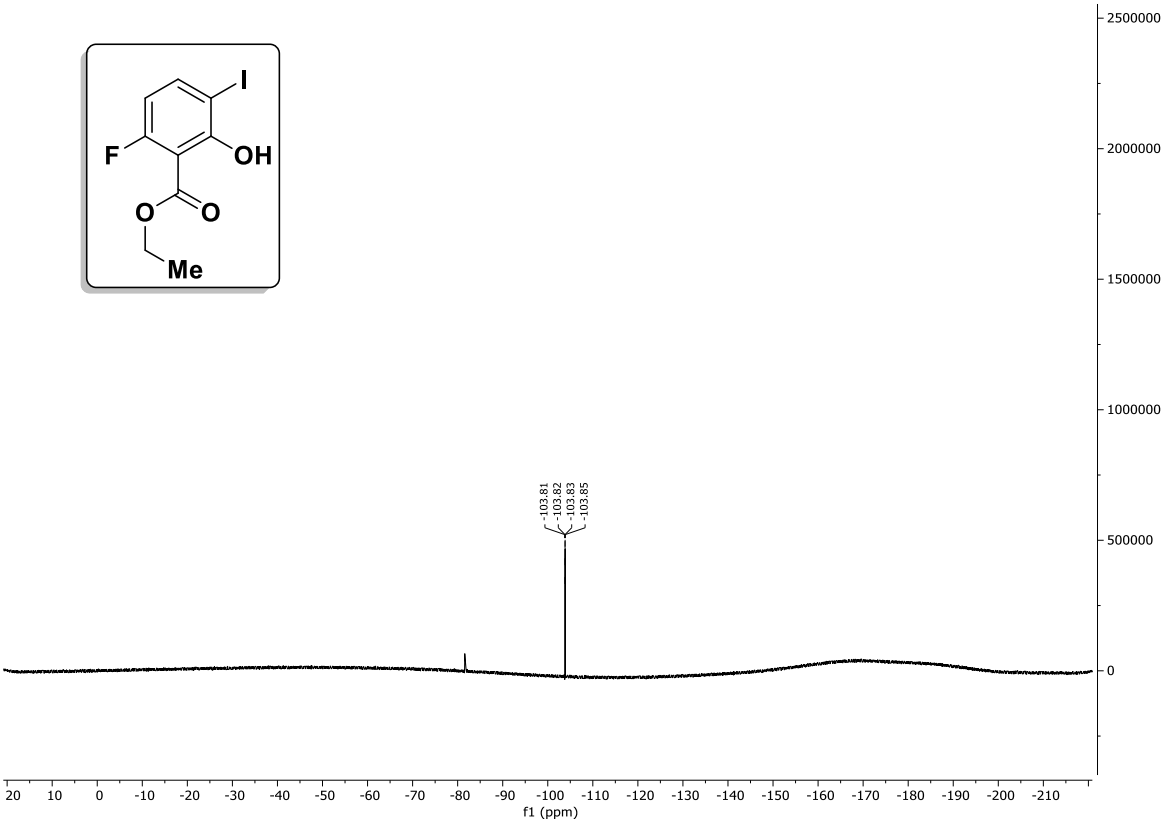
^{1}H NMR of 25 (400 MHz, $CDCl_3$)



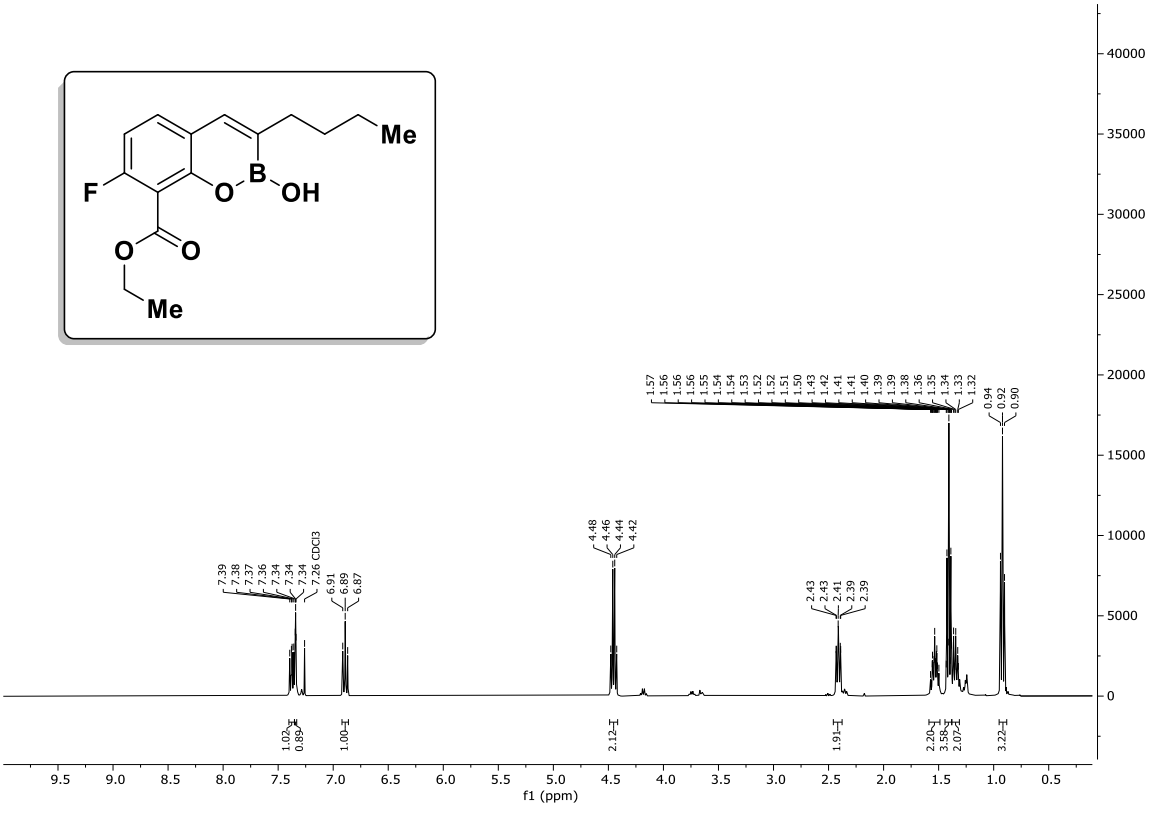
^{13}C NMR of 25 (101 MHz, $CDCl_3$)



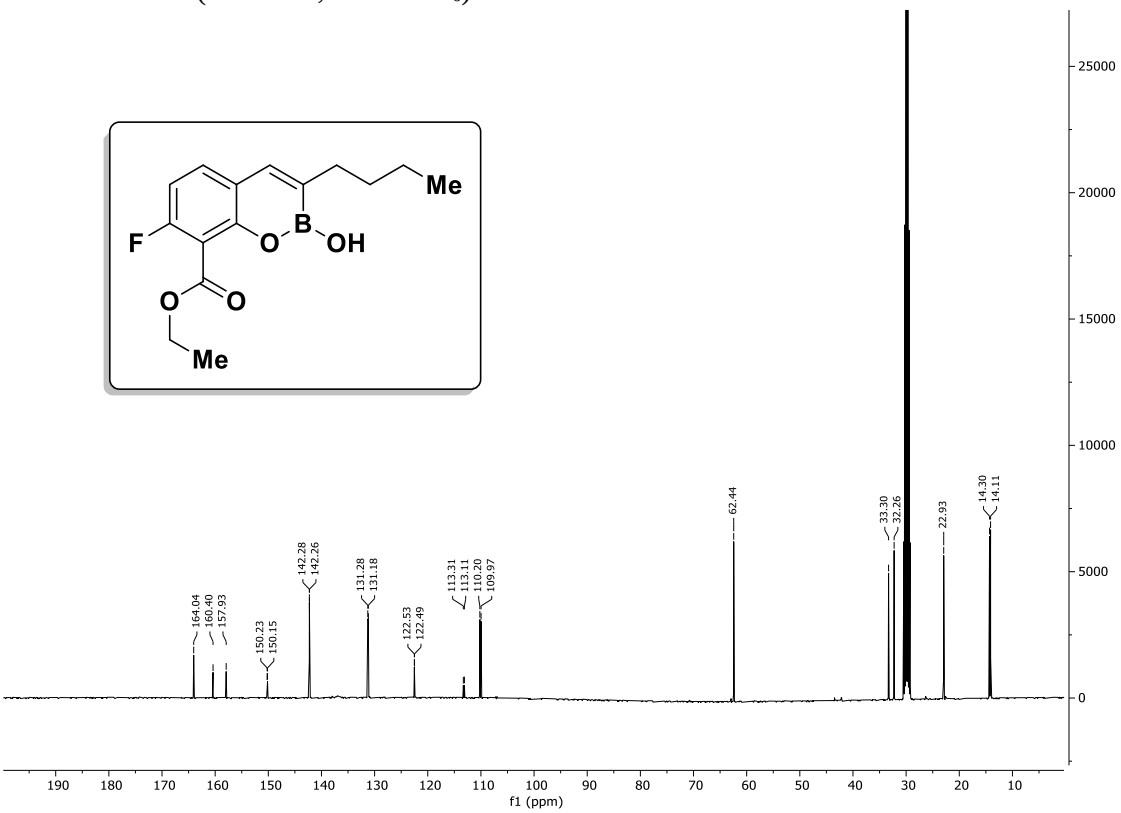
^{19}F NMR of 25 (376 MHz, $CDCl_3$)



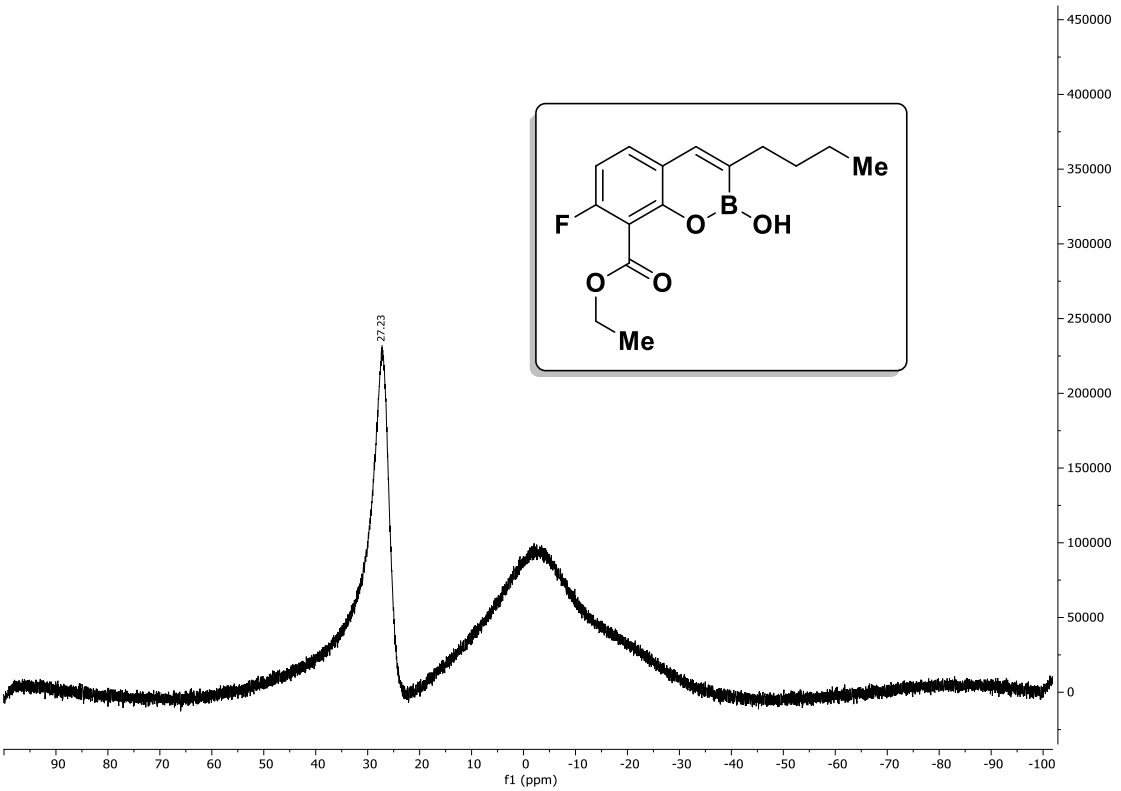
^{1}H NMR of 26 (400 MHz, $CDCl_3$)



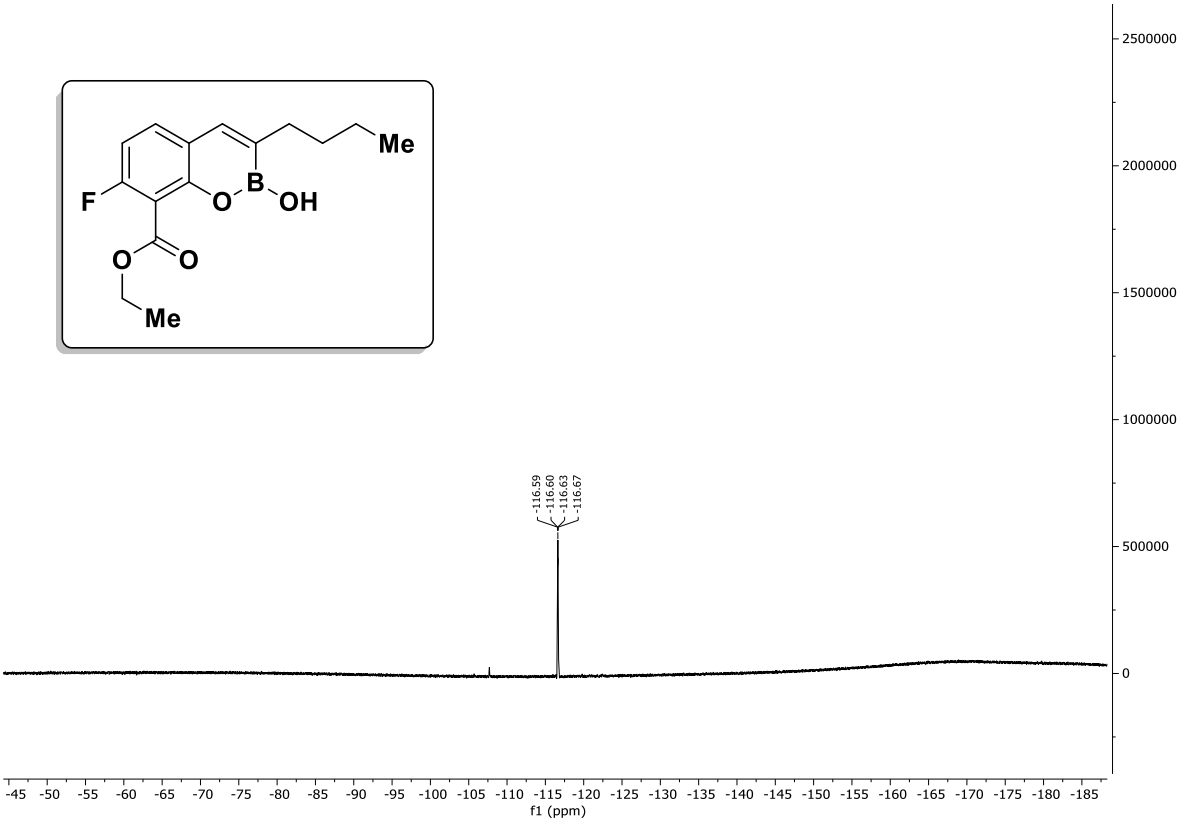
^{13}C NMR of 26 (101 MHz, Acetone d_6)



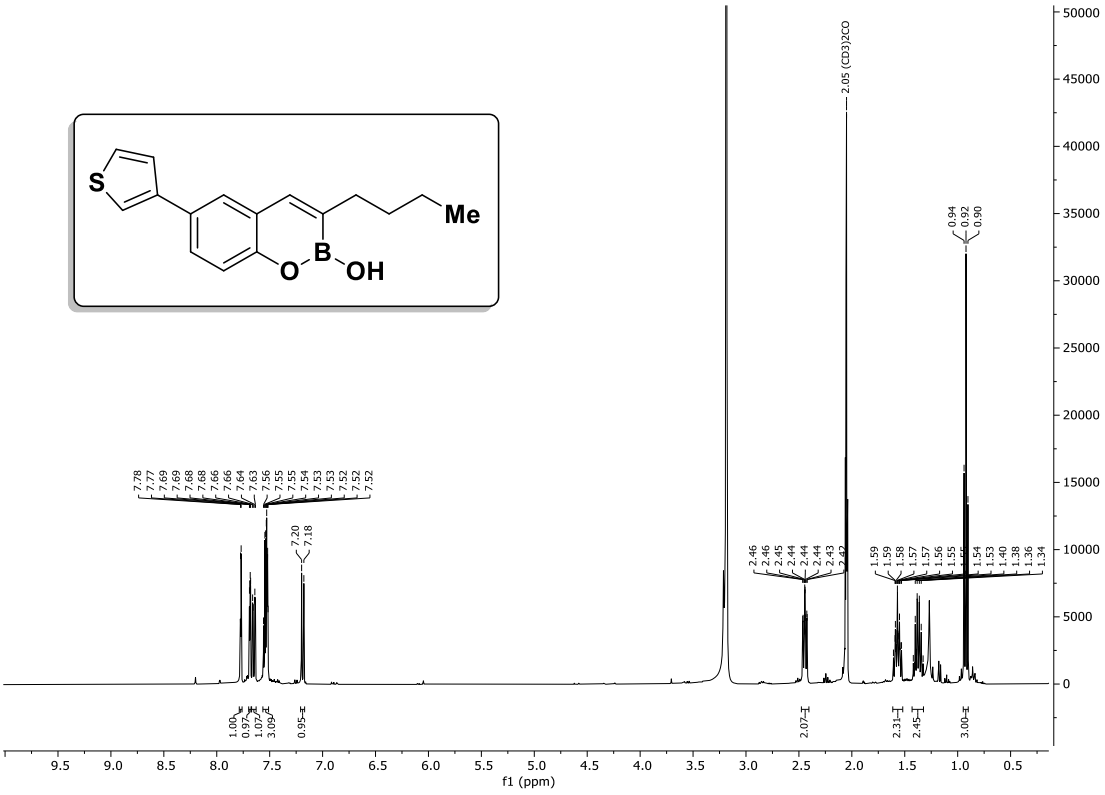
^{11}B NMR of 26 (128 MHz, $CDCl_3$)



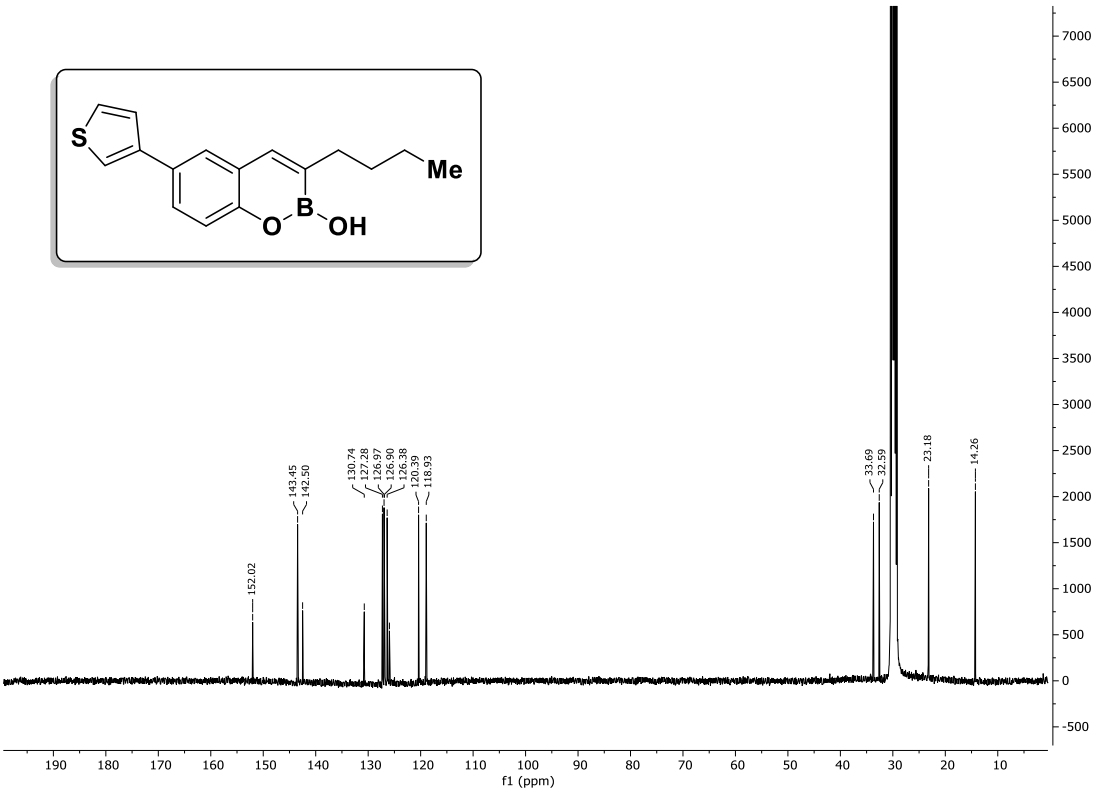
^{19}F NMR of 26 (376 MHz, Acetone d_6)



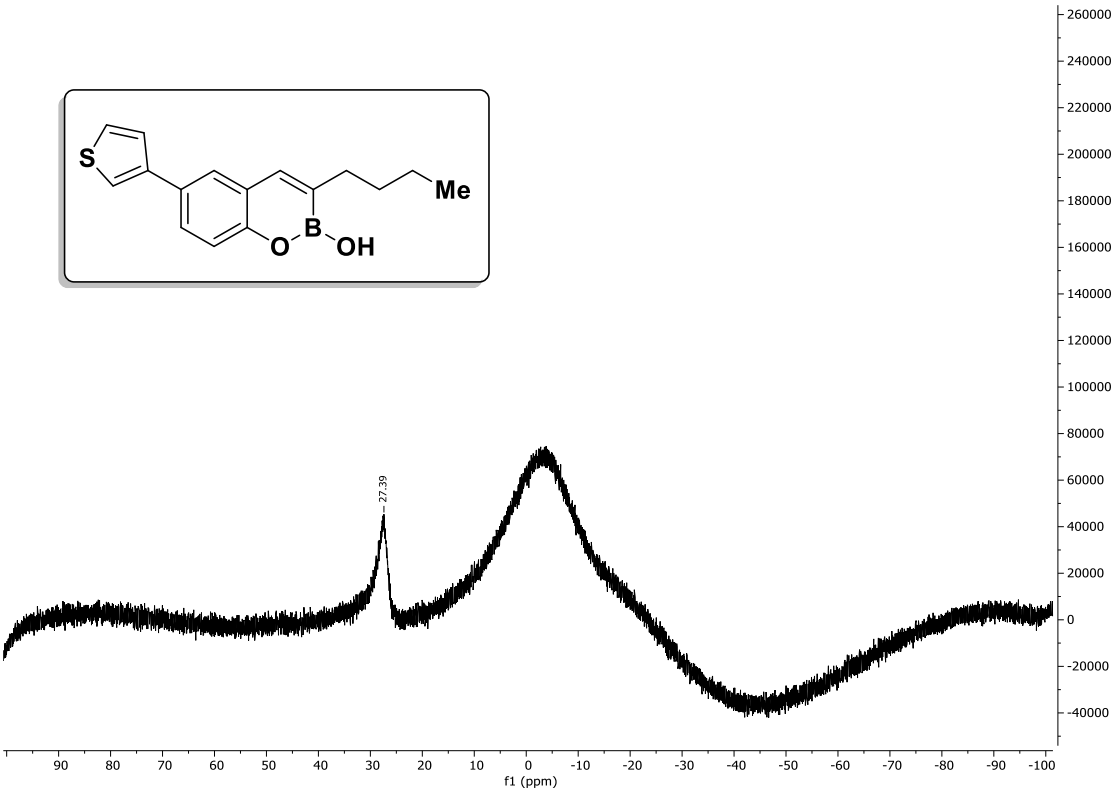
^{1}H NMR of 27 (400 MHz, Acetone d_6)



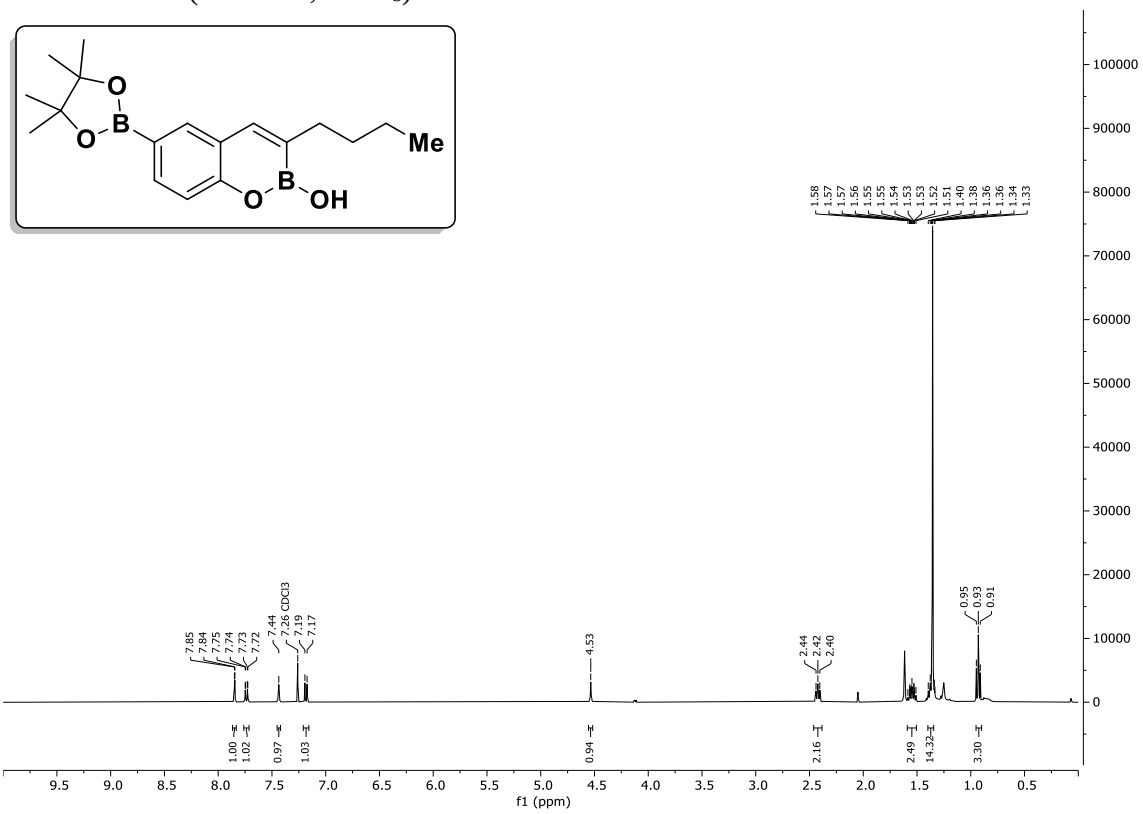
^{13}C NMR of 27 (101 MHz, Acetone d_6)



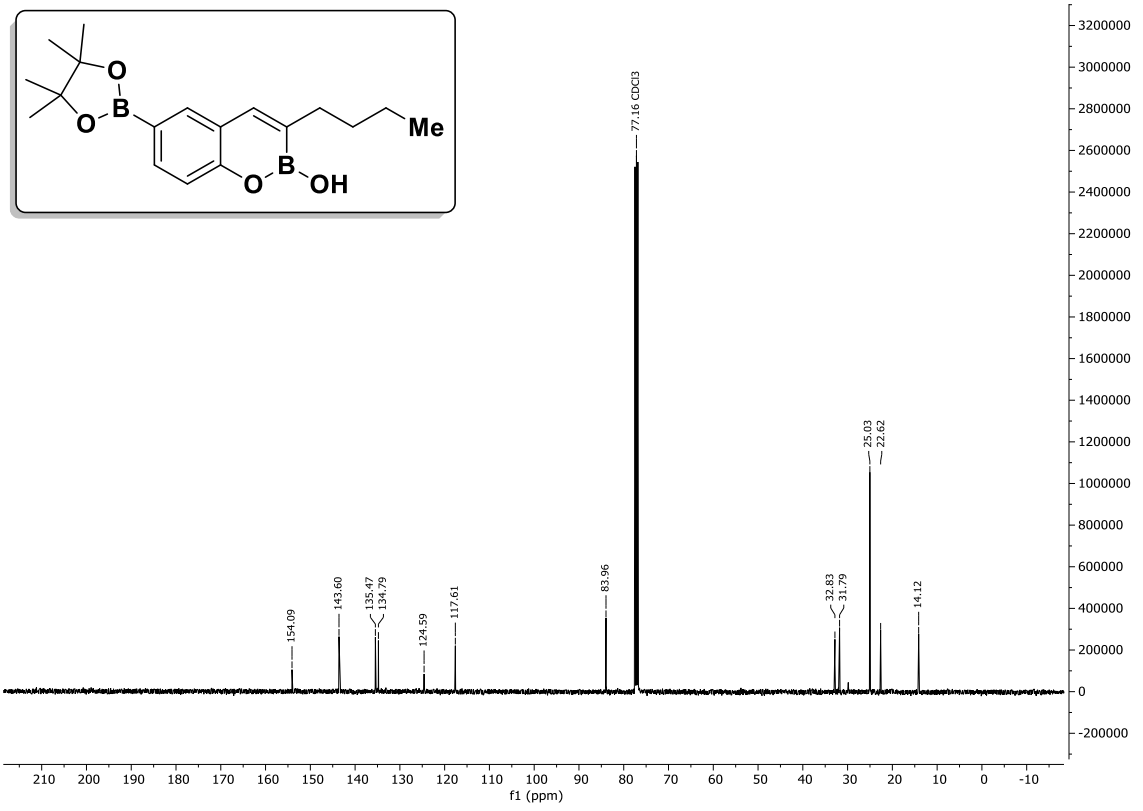
^{11}B NMR of 27 (128 MHz, Acetone d_6)



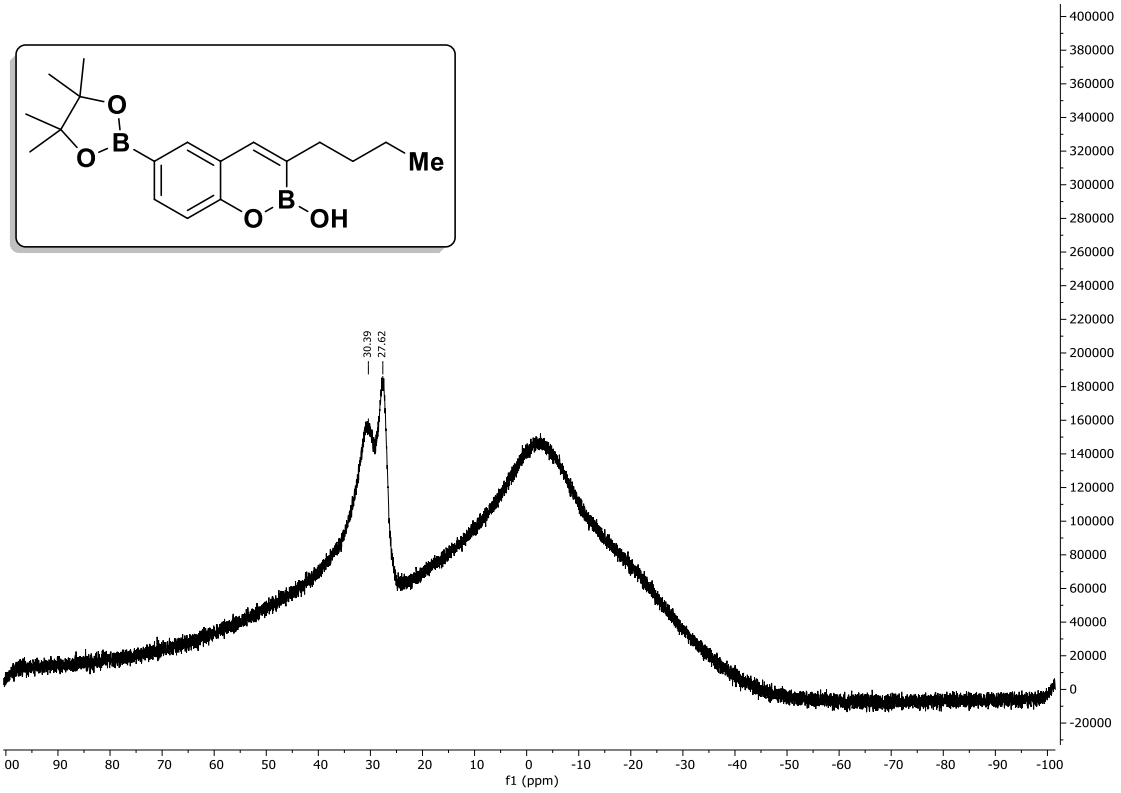
^{1}H NMR of 28 (400 MHz, $CDCl_3$)



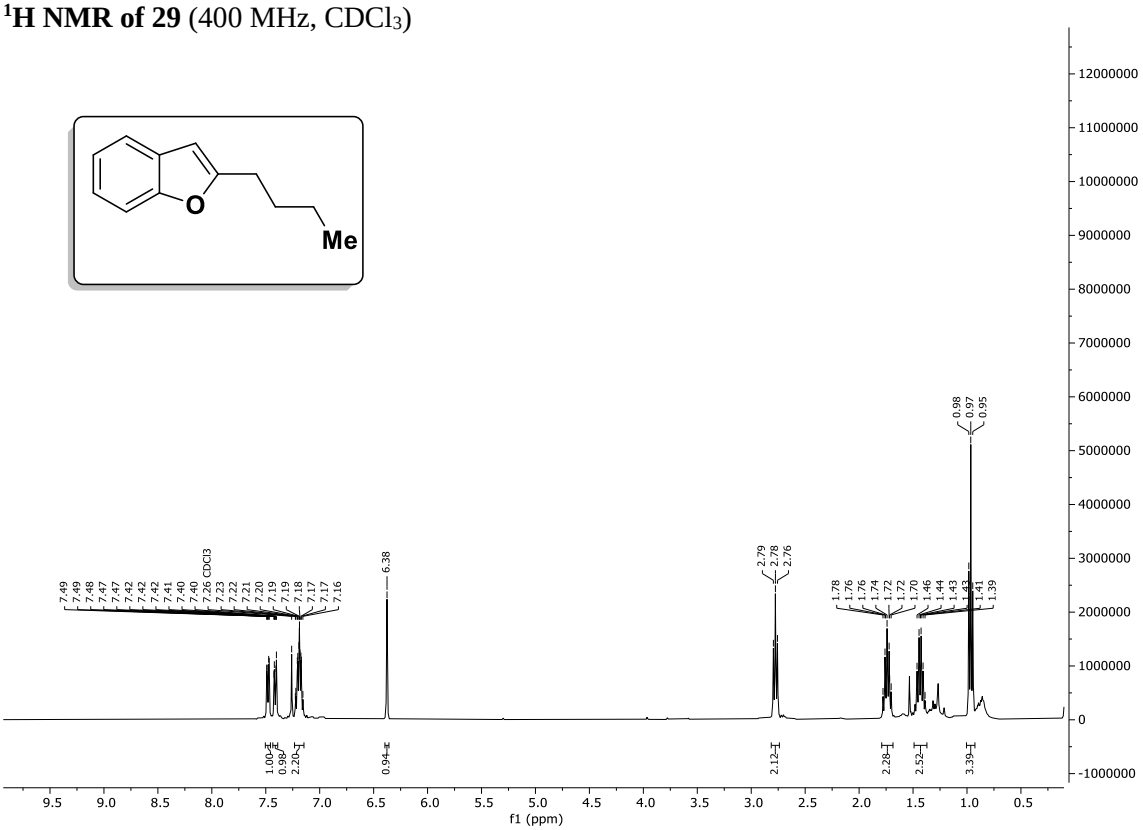
^{13}C NMR of 28 (101 MHz, $CDCl_3$)



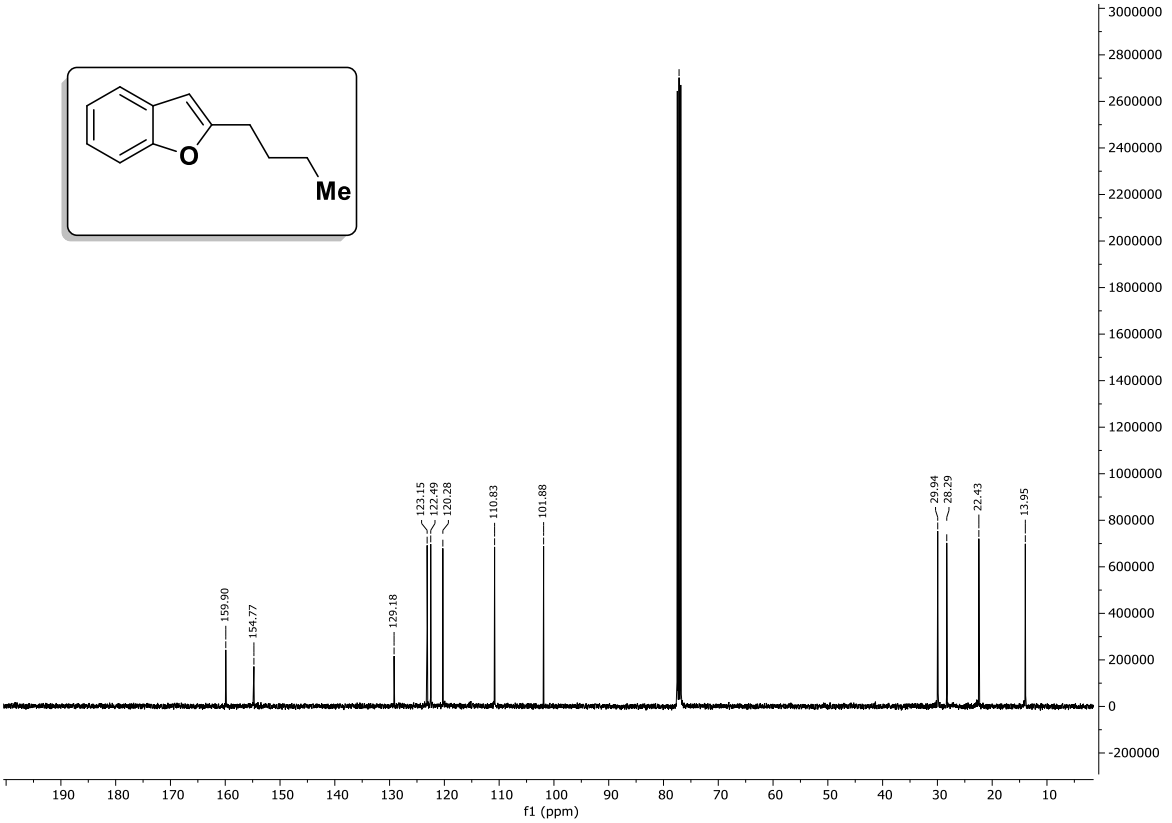
^{11}B NMR of 28 (128 MHz, $CDCl_3$)



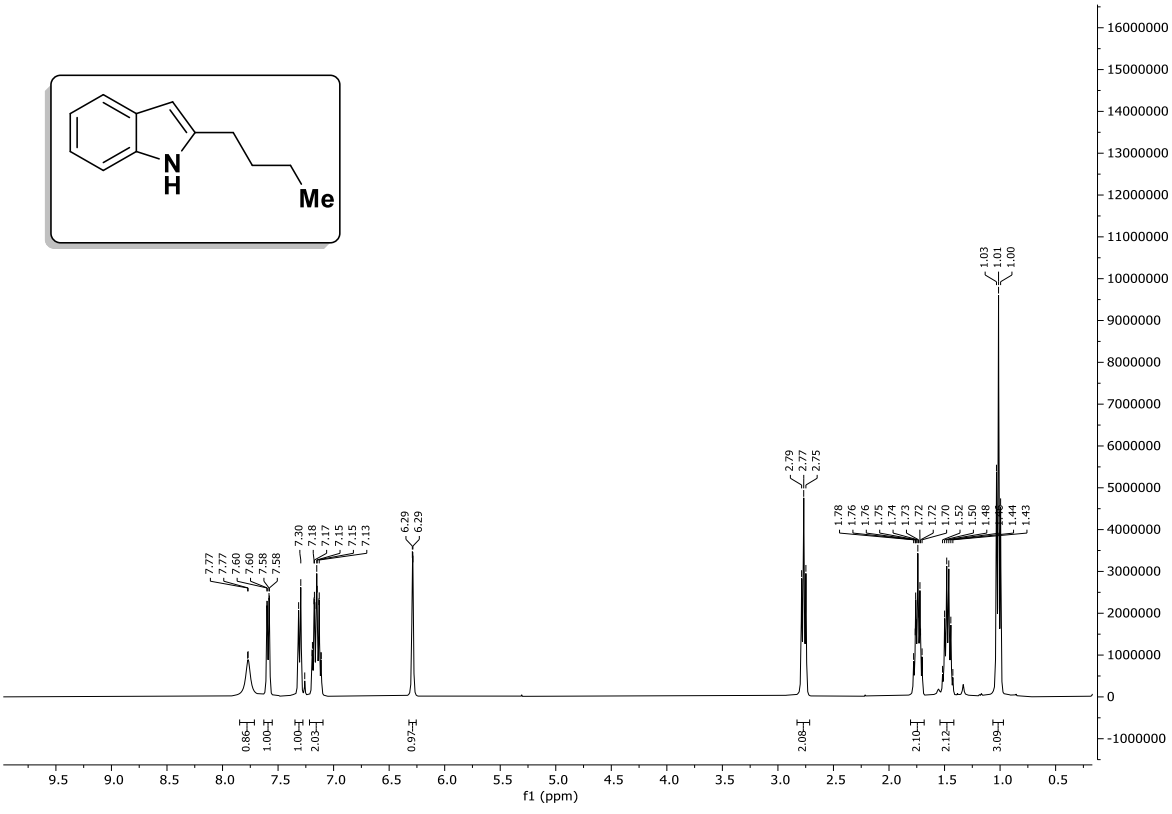
^{1}H NMR of 29 (400 MHz, $CDCl_3$)



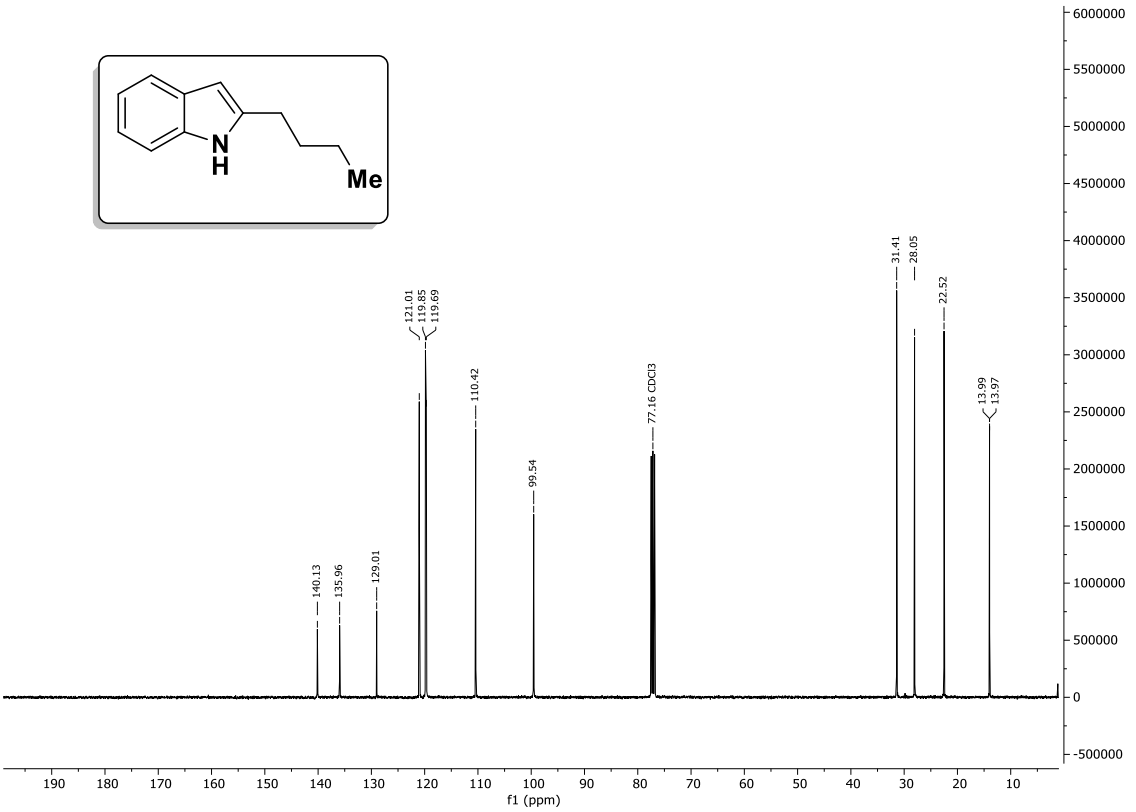
^{13}C-NMR of 29 (101 MHz, $CDCl_3$)



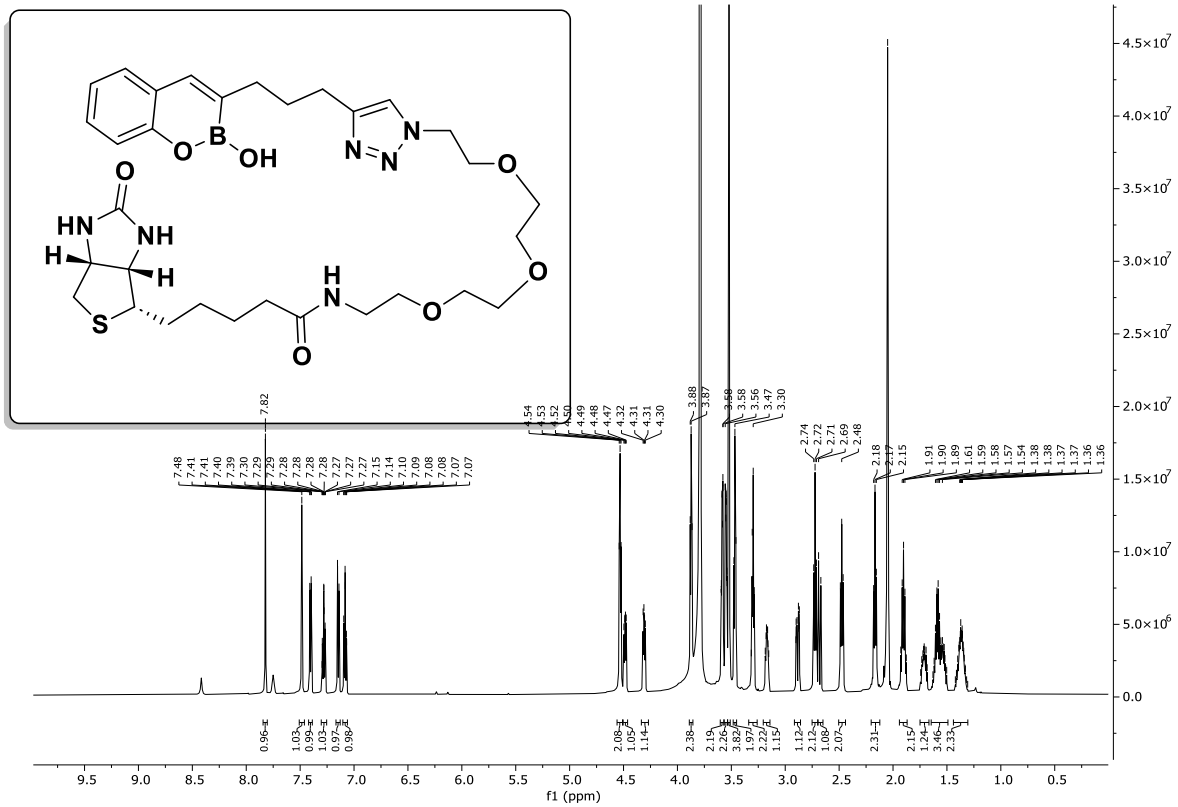
^{1}H NMR of 30 (400 MHz, $CDCl_3$)



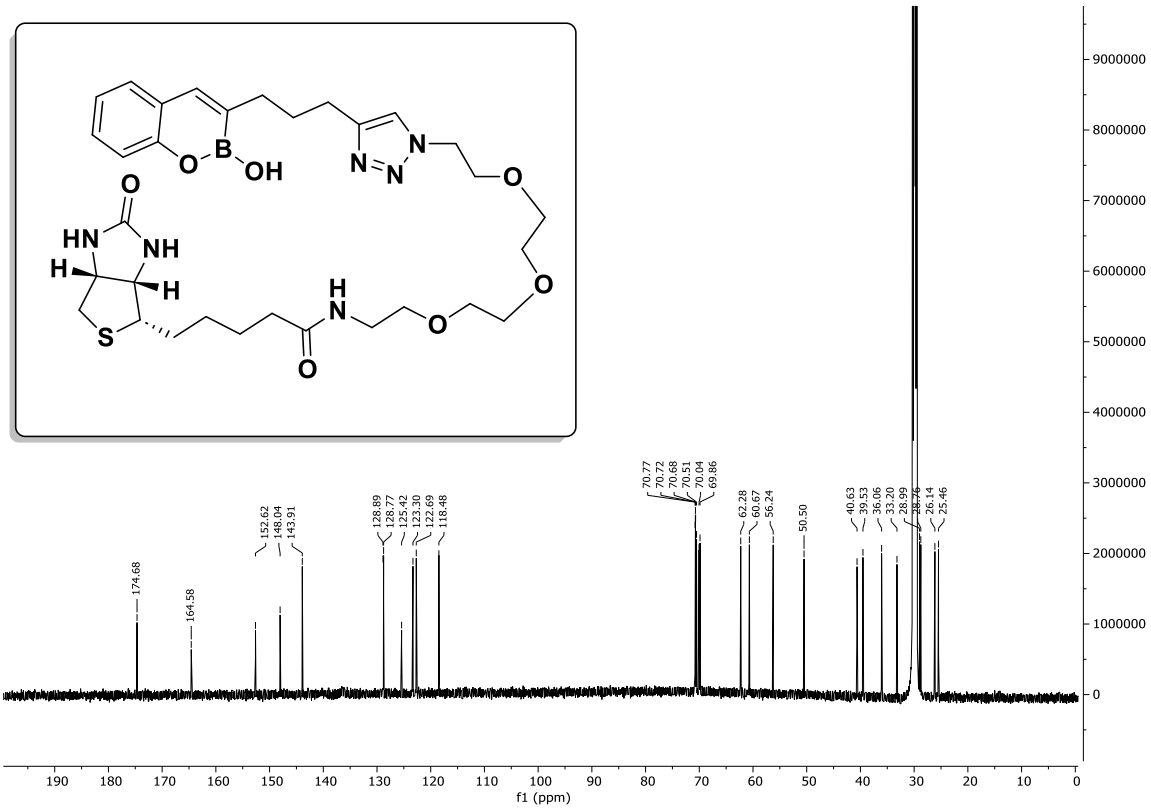
^{13}C NMR of 30 (101 MHz, $CDCl_3$)



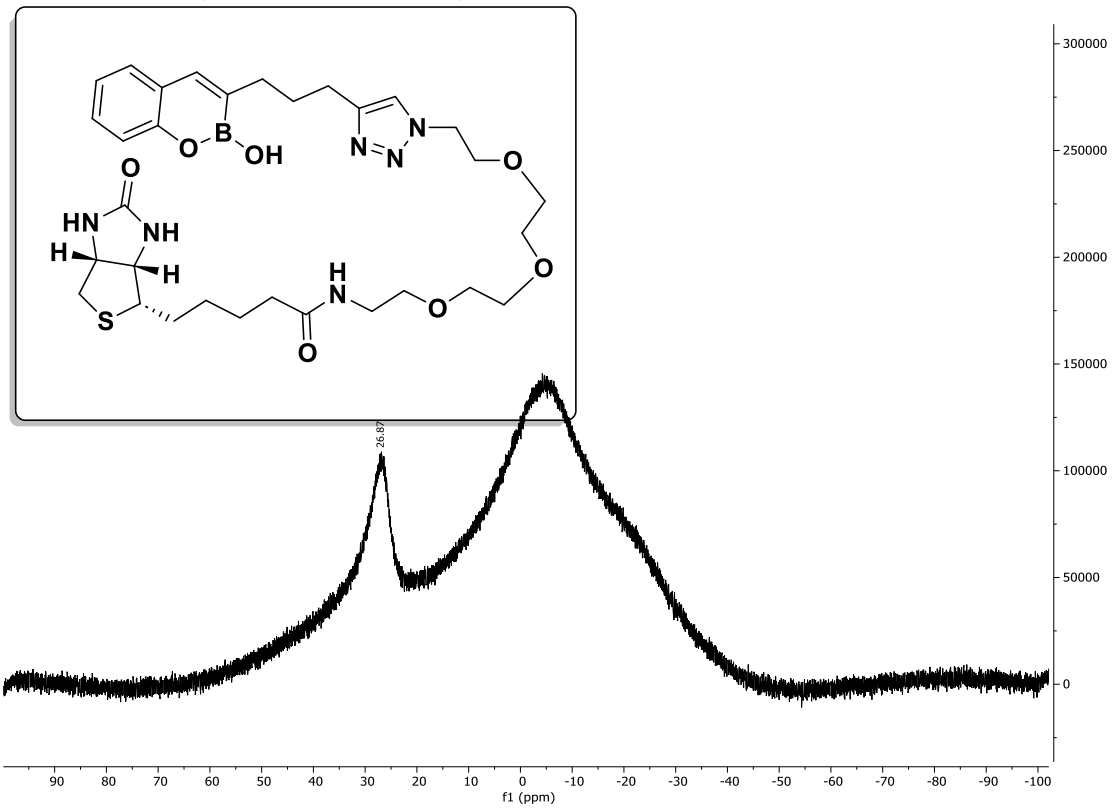
^{1}H NMR of 31 (600 MHz, Acetone d_6)



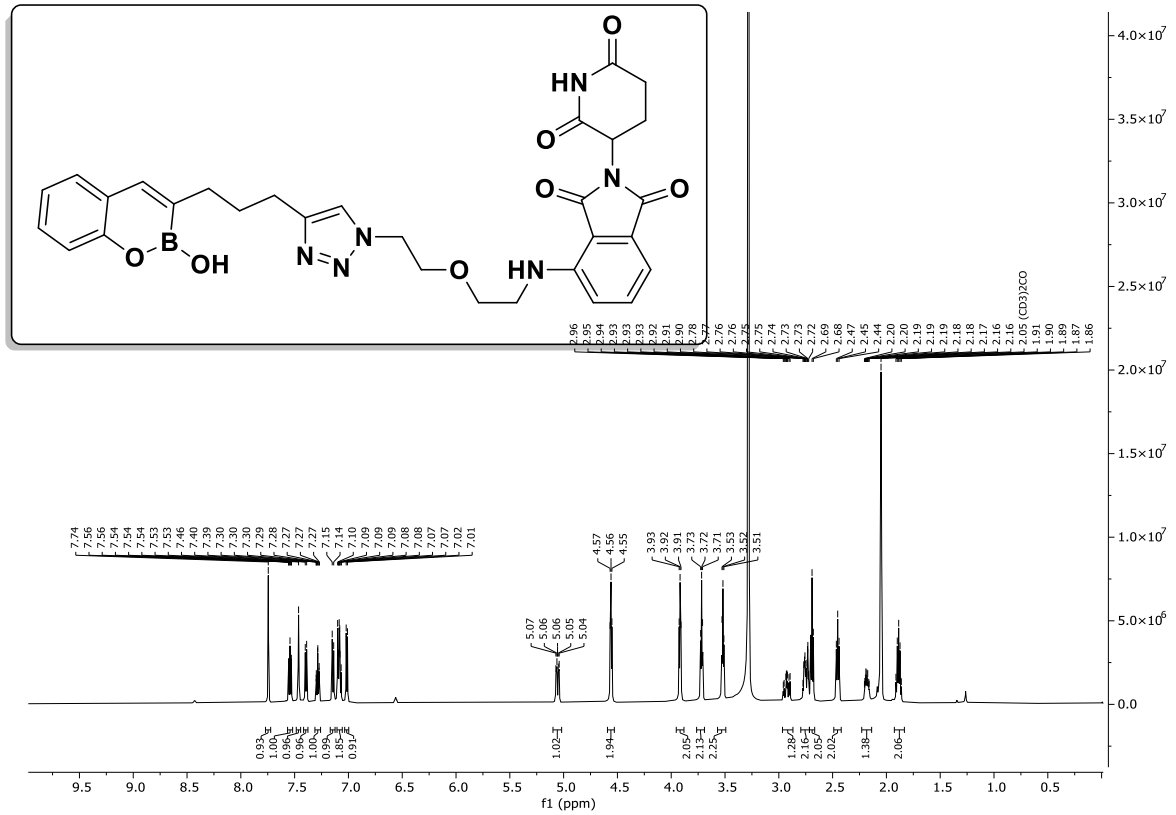
^{13}C NMR of 31 (151 MHz, Acetone d_6)



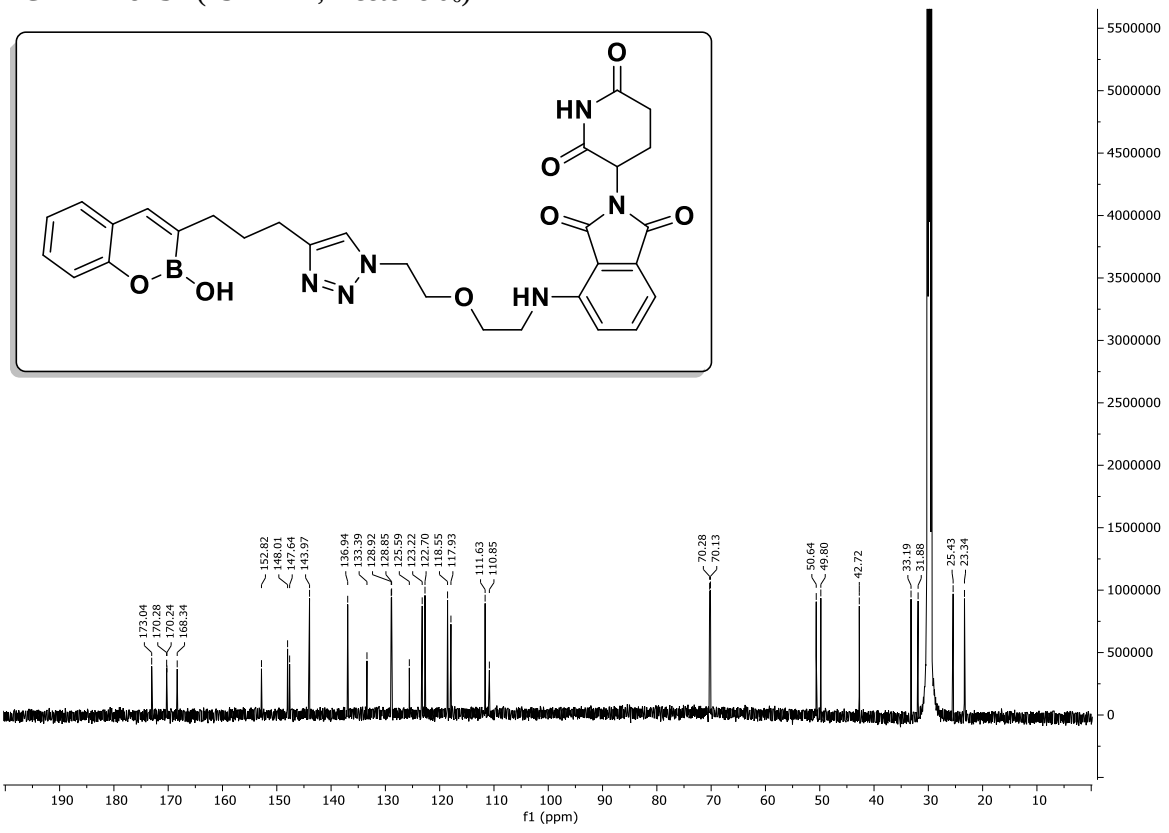
^{11}B NMR of 31 (128 MHz, Acetone d_6)



^{1}H NMR of 32 (600 MHz, Acetone d_6)



^{13}C NMR of 32 (151 MHz, Acetone d_6)



^{11}B NMR of 32 (128 MHz, Acetone d_6)