

Supporting Information

Synthesis of Functionalized Cyclic Boronates

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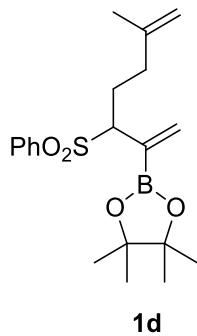
General

All glassware and needles were oven-dried and allowed to cool in a desiccator prior to use. Tetrahydrofuran (THF), diethyl ether and toluene were purchased from Fisher Scientific and distilled from sodium-benzophenone prior to use. Dichloromethane, diisopropylamine, triethylamine and methanol were distilled over calcium hydride prior to use. *n*Butyl lithium (*n*BuLi) was purchased from Aldrich and titrated with freshly recrystallized diphenylacetic acid prior to use. 2-isopropenylboronic acid pinacol ester was used as received from Frontier Scientific. All products were purified by flash chromatography using 230-400 mesh silica purchased from Aldrich and, if crystalline, were recrystallized from hexane-diethyl ether until a constant melting point was observed. All compounds were characterized by ¹H, and ¹³C Nuclear Magnetic Resonance (NMR) spectroscopy using a 500 MHz Bruker instrument. Proton spectra were reported in δ units, parts per million (ppm), relative to trimethylsilane internal standard (0.00 ppm). Carbon spectra were recorded in ppm relative to deuterated chloroform peak (77.16 ppm) or (39.52 ppm) where DMSO was used. Samples were further characterized using mass spectroscopy on a Bruker Apex-Qe instrument. Infrared spectra were recorded on a Thermo Nicolet NEXUS 670 FT-IR instrument.

Experimental Procedures

General Alkylation Procedure

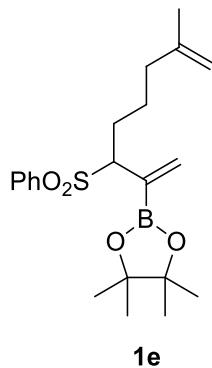
To a solution of diisopropylamine (120 μL , 0.84 mmol) in THF (4.0mL) was added *n*BuLi (2.04 M in THF, 380 μL , 0.77mmol) at -78 °C and stirred for one hour. To the stirring solution of LDA was added **3** (200 mg, 0.648 mmol) in 2.0 mL THF and stirred for an additional hour before addition of iodide (0.712 mmol). After dropwise addition of the iodide, the reaction was removed from cold bath and allowed to warm to room temperature over 3 h. The reaction was quenched with a saturated solution of ammonium chloride and the mixture was extracted with EtOAc (3 x 10 mL). The combined organic layers were dried over MgSO₄, filtered and concentrated in *vacuo*. The residue was absorbed onto silica and purified via flash chromatography (20% EtOAc in Hexanes) affording the corresponding mono-alkylated product.



4,4,5,5-tetramethyl-2-(6-methyl-3-(phenylsulfonyl)hepta-1,6-dien-2-yl)-1,3,2-dioxaborolane

(1d): ¹H NMR (500 MHz, CDCl₃) δ 7.80 (d, *J* = 8 Hz, 2H), 7.59 (t, *J* = 7 Hz, 1H), 7.49 (t, *J* = 7 Hz, 2H), 6.15 (d, *J* = 2 Hz, 1H), 5.88 (s, 1H), 4.72 (s, 1H), 4.64 (s, 1H), 3.90 (dd, *J* = 3.5 Hz, *J* = 11.5 Hz, 1H), 2.37 – 2.31 (m, 1H), 2.18 – 2.10 (m, 1H), 2.08 – 2.03 (m, 1H), 1.97 – 1.91 (m,

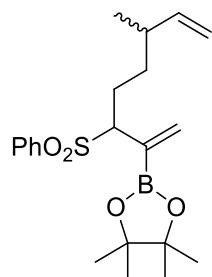
1H), 1.68 (s, 3H), 1.14 (s, 6H), 1.13 (s, 6H)); ^{13}C NMR (500 MHz, CDCl_3) δ 144.1, 138.3, 136.7, 133.3, 129.7, 128.7, 111.4, 83.9, 67.6, 34.7, 24.9, 24.8, 24.6, 22.1; IR (film) $\nu_{\text{max}} = 3021$, 2979, 2930, 1447, 1423, 1305, 1216, 1145, 1085 cm^{-1} ; HRMS calcd for $(\text{C}_{20}\text{H}_{29}\text{BO}_4\text{S})\text{Na}^+$ 399.1771; Found: 399.1766.



1e

4,4,5,5-tetramethyl-2-(7-methyl-3-(phenylsulfonyl)octa-1,7-dien-2-yl)-1,3,2-dioxaborolane

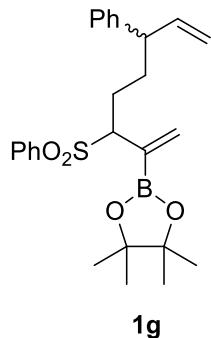
(1e): ^1H NMR (500 MHz, CDCl_3) δ 7.80 (d, $J = 8$ Hz, 2H), 7.58 (t, $J = 7$ Hz, 1H), 7.49 (t, $J = 7$ Hz, 2H), 6.14 (d, $J = 2$ Hz, 1H), 5.90 (s, 1H), 4.68 (s, 1H), 4.63 (s, 1H), 3.93 (dd, $J = 12$ Hz, $J = 4$ Hz, 1H), 2.18 – 2.12 (m, 1H), 2.05 – 1.93 (m, 3H), 1.66 (s, 3H), 1.52 – 1.44 (m, 1H), 1.41 – 1.32 (m, 1H), 1.14 (s, 12H); ^{13}C NMR (500 MHz, CDCl_3) δ 145.2, 138.5, 136.6, 133.3, 129.8, 128.7, 110.5, 84.0, 67.8, 37.4, 26.6, 24.8, 24.8, 24.7, 22.4; IR (film) $\nu_{\text{max}} = 3071$, 2977, 2935, 1647, 1447, 1423, 1305, 1144, 1086 cm^{-1} ; HRMS calcd for $(\text{C}_{21}\text{H}_{31}\text{BO}_4\text{S})\text{Na}^+$ 413.1928; Found: 413.1926.



1f

4,4,5,5-tetramethyl-2-(6-methyl-3-(phenylsulfonyl)octa-1,7-dien-2-yl)-1,3,2-dioxaborolane

(1f): ^1H NMR (500 MHz, CDCl_3) δ 7.89 (d, $J = 7.5$ Hz, 4H), 7.58 (t, $J = 7.5$ Hz, 2H), 7.49 (t, $J = 7.5$ Hz, 4H), 6.13 (dd, $J = 2.5$ Hz, 1.5 Hz, 2H), 5.87 (d, $J = 1.5$ Hz, 2H), 5.68 – 5.56 (m, 1H), 3.88 (td, $J = 11$ Hz, $J = 3.5$ Hz, 2H), 2.22 – 2.07 (m, 2H), 2.03 – 1.93 (m, 1H), 1.32 – 1.22 (m, 2H), 1.15(s, 6H), 1.14 (s, 6H), 0.96 (dd, $J = 7$ Hz, $J = 3$ Hz, 6H); ^{13}C NMR (500 MHz, CDCl_3) δ 144.1, 143.7, 138.5, 138.4, 136.5, 136.5, 133.3, 129.7, 129.7, 128.7, 113.5, 113.1, 84.0, 68.2, 68.0, 37.7, 37.6, 33.6, 33.5, 24.8, 24.8, 24.7, 24.7, 20.5, 19.7; IR (film) $\nu_{\text{max}} = 2976, 1447, 1422, 1380, 1372, 1305, 1143, 1084 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{21}\text{H}_{31}\text{BO}_4\text{S})\text{Na}^+$ 413.1928; Found: 413.1927.

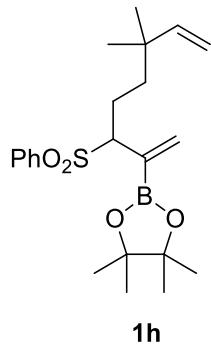


1g

4,4,5,5-tetramethyl-2-(6-phenyl-3-(phenylsulfonyl)octa-1,7-dien-2-yl)-1,3,2-dioxaborolane

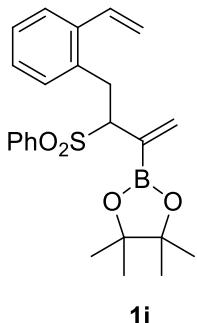
(1g): d.r. (1.00 : 0.36) ^1H NMR (500 MHz, CDCl_3) δ 7.75 (d, $J = 8$ Hz, 4H), 7.56 (t, $J = 7.5$ Hz, 2H), 7.46 (t, $J = 7.5$ Hz, 4H), 7.30 – 7.25 (m, 4H), 7.17 (t, $J = 7$ Hz, 2H), 7.12 (t, $J = 7.5$ Hz, 4H), 6.13 (d, $J = 2$ Hz, 1H), 6.09 (d, $J = 2$ Hz, 1H), 5.93 – 5.83(m, 2H), 5.83 (s, 1H), 5.75 (s, 1H), 5.04 – 4.97 (m, 4H), 3.92 (dd, $J = 12$ Hz, $J = 3.5$ Hz, 1H), 3.90 (dd, $J = 10.5$ Hz, $J = 5.5$ Hz, 1H), 3.21 (q, $J = 7.5$ Hz, 2H), 2.18 – 2.06 (m, 2H), 1.91 – 1.83 (m, 2H), 1.76 – 1.61 (m, 4H), 1.15 – 1.14 (m, 24H); ^{13}C NMR (500 MHz, CDCl_3) δ 144.1, 143.5, 141.8, 141.2, 138.3, 138.3, 136.6, 136.5, 133.3, 129.7, 129.6, 128.7, 128.6, 127.6, 127.5, 126.5, 126.4, 115.0, 114.5, 84.0,

67.9, 49.7, 49.6, 32.5, 32.5, 25.2, 25.1, 24.8, 24.8, 24.7; IR (film) ν_{\max} = 3062, 3026, 2937, 1634, 1601, 1492, 1447, 1307, 1208, 1178, 1146, 1084, 1025 cm⁻¹; HRMS calcd for (C₂₆H₃₃BO₄S)Na+ 475.2085; Found: 475.2084.



1h

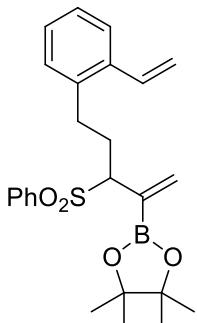
2-(6,6-dimethyl-3-(phenylsulfonyl)octa-1,7-dien-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (1h): ¹H NMR (500 MHz, CDCl₃) δ 7.78 (d, J = 7.5 Hz, 2H), 7.58 (t, J = 7.5 Hz, 1H), 7.48 (t, J = 7.5 Hz, 2H), 6.09 (d, J = 2.5 Hz, 1H), 5.80 (s, 1H), 5.69 (dd, J = 17.5 Hz, J = 11 Hz, 1H), 4.92 – 4.91 (m, 1H), 4.88 (dd, J = 10 Hz, J = 1.5 Hz, 1H), 3.80 (dd, J = 12 Hz, J = 3 Hz, 1H), 2.17 – 2.10 (m, 1H), 1.98 – 1.90 (m, 1H), 1.30 – 1.24 (m, 1H), 1.21 – 1.17 (m, 1H), 1.16 (s, 6H), 1.15 (s, 6H), 0.97 (s, 6H); ¹³C NMR (500 MHz, CDCl₃) δ 147.7, 138.4, 136.4, 133.3, 129.7, 128.7, 111.1, 84.0, 69.0, 39.6, 36.7, 26.7, 26.7, 24.9, 24.7, 22.2; IR (film) ν_{\max} = 2973, 2930, 1447, 1423, 1305, 1216, 1145, 1085 cm⁻¹; HRMS calcd for (C₂₂H₃₃BO₄S)Na+ 427.2084; Found: 427.2084.



1i

4,4,5,5-tetramethyl-2-(3-(phenylsulfonyl)-4-(2-vinylphenyl)but-1-en-2-yl)-1,3,2-dioxaborolane (1i):

¹H NMR (500 MHz, CDCl₃) δ 7.84 (d, *J* = 8 Hz, 2H), 7.58 (t, *J* = 8 Hz, 1H), 7.50 (t, *J* = 8 Hz, 2H), 7.40 (t, *J* = 8 Hz, 1H), 7.14 (t, *J* = 7 Hz, 1H), 7.11 – 7.06 (m, 2H), 6.92 (dd, *J* = 17.5 Hz, *J* = 11 Hz, 1H), 6.03 (d, *J* = 2 Hz, 1H), 5.92 (s, 1H), 5.59 (dd, *J* = 17.5 Hz, *J* = 1.5 Hz, 1H), 5.30 (dd, *J* = 11 Hz, *J* = 1 Hz, 1H), 4.19 (dd, *J* = 11.5 Hz, *J* = 3 Hz, 1H), 3.72 (dd, *J* = 14 Hz, *J* = 3 Hz, 1H), 3.32 (dd, *J* = 14 Hz, *J* = 12 Hz, 1H), 1.08 (s, 6H), 1.04 (s, 6H); ¹³C NMR (500 MHz, CDCl₃) δ 138.6, 137.3, 137.2, 134.6, 134.4, 133.4, 130.7, 129.5, 128.8, 127.6, 127.0, 126.2, 116.5, 83.9, 68.1, 30.7, 24.8, 24.5; IR (film) ν_{max} = 3066, 2978, 2932, 1481, 1447, 1424, 1390, 1372, 1306, 1215, 1145, 1085 cm⁻¹; HRMS calcd for (C₂₄H₂₉BO₄S)Na+ 447.1772; Found: 447.1766.

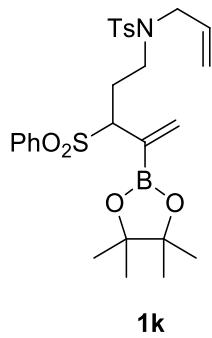


1j

4,4,5,5-tetramethyl-2-(3-(phenylsulfonyl)-5-(2-vinylphenyl)pent-1-en-2-yl)-1,3,2-dioxaborolane (1j):

¹H NMR (500 MHz, CDCl₃) δ 7.77 (d, *J* = 8 Hz, 2H), 7.58 (t, *J* = 8 Hz, 1H),

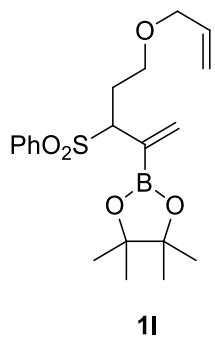
7.49 – 7.45 (m, 3H), 7.21 – 7.15 (m, 2H), 7.10 – 7.08 (m, 1H), 6.89 (dd, J = 17 Hz, J = 11 Hz, 1H), 6.18 (d, J = 2 Hz, 1H), 5.89 (s, 1H), 5.60 (dd, J = 17 Hz, J = 2 Hz, 1H), 5.25 (dd, J = 11 Hz, J = 1 Hz, 1H), 3.94 (dd, J = 11 Hz, J = 3.5 Hz, 1H), 2.74 (ddd, J = 15 Hz, J = 11 Hz, J = 3 Hz, 1H), 2.56 (ddd, J = 13.5 Hz, J = 11 Hz, J = 6 Hz, 1H), 2.43 – 2.36 (m, 1H), 2.30 – 2.22 (m, 1H), 1.19 (s, 6H), 1.18 (s, 6H); ^{13}C NMR (500 MHz, CDCl_3) δ 138.3, 138.2, 136.7, 136.6, 134.4, 133.4, 129.7, 129.7, 128.7, 127.9, 126.8, 126.0, 116.0, 84.1, 68.3, 30.6, 28.2, 24.9, 24.7; IR (film) $\nu_{\text{max}} = 2977, 1461, 1446, 1422, 1372, 1305, 1144 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{24}\text{H}_{29}\text{BO}_4\text{S})\text{Na}^+$ 461.1928; Found: 461.1921.



1k

N-allyl-4-methyl-N-(3-(phenylsulfonyl)-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)pent-4-en-1-yl)benzenesulfonamide (1k): ^1H NMR (500 MHz, CDCl_3) δ 7.78 (d, J = 8 Hz, 2H), 7.65 (d, J = 8 Hz, 2H), 7.61 (t, J = 8 Hz, 1H), 7.50 (t, J = 8.0 Hz, 2H), 7.28 (d, J = 8 Hz, 2H), 6.12 (s, 1H), 5.79 (s, 1H), 5.56 (dddd, J = 16.5 Hz, J = 10 Hz, J = 6.5 Hz, J = 6.5 Hz, 1H), 5.17 (d, J = 17 Hz, 1H), 5.12 (d, J = 10 Hz, 1H), 3.94 (dd, J = 10.5 Hz, J = 3.5 Hz, 1H), 3.77 (d, J = 6 Hz, 2H), 3.23 (ddd, J = 15 Hz, J = 8 Hz, J = 8 Hz, 1H), 3.12 (ddd, J = 13.5 Hz, J = 8.5 Hz, J = 4.5 Hz, 1H), 2.42 (s, 4H), 2.20 – 2.13 (m, 1H), 1.17 (s, 12H); ^{13}C NMR (500 MHz, CDCl_3) δ 143.5, 137.8, 137.0, 136.7, 133.6, 132.9, 129.9, 129.8, 128.8, 127.3, 119.4, 84.2, 65.8, 50.7, 44.8, 25.7, 24.9, 24.8, 21.7; IR (film) $\nu_{\text{max}} = 3067, 3021, 2979, 2930, 2872, 1598, 1495, 1447, 1423, 1305,$

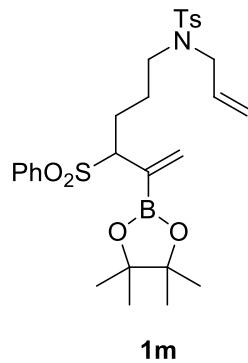
1216, 1145, 1085, 1320, 998 cm⁻¹; HRMS calcd for (C₂₇H₃₆BNO₆S₂)Na⁺ 568.1969; Found: 568.1967.



11

2-(5-(allyloxy)-3-(phenylsulfonyl)pent-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane

(**11**): ¹H NMR (500 MHz, CDCl₃) δ 7.82 (d, *J* = 8 Hz, 2H), 7.59 (t, *J* = 6.5 Hz, 1H), 7.49 (t, *J* = 8 Hz, 2H), 6.12 (d, *J* = 2 Hz, 1H), 5.87 – 5.80 (m, 2H), 5.84 (s, 1H), 5.22 (dq, *J* = 17 Hz, *J* = 1Hz, 1H), 5.12 (dq, *J* = 10.5 Hz, *J* = 1.5 Hz, 1H), 4.12 (dd, *J* = 11.5 Hz, *J* = 4 Hz, 1H), 3.93 – 3.84 (m, 2H), 3.52 (ddd, *J* = 10 Hz, *J* = 6.5 Hz, *J* = 4.5 Hz, 1H), 3.38 – 3.33 (m, 1H), 2.53 – 2.47 (m, 1H), 2.26 – 2.19 (m, 1H), 1.15 (s, 12H); ¹³C NMR (500 MHz, CDCl₃) δ 138.3, 136.7, 134.8, 133.3, 129.7, 128.7, 116.8, 83.9, 71.8, 66.7, 65.6, 27.2, 24.8, 24.7, 24.7; IR (film) ν_{max} = 3069, 2978, 2933, 2865, 1479, 1460, 1447, 1423, 1372, 1306, 1216, 1141 cm⁻¹; HRMS calcd for (C₂₀H₂₉BO₅S)Na⁺ 415.1721; Found: 415.1720.

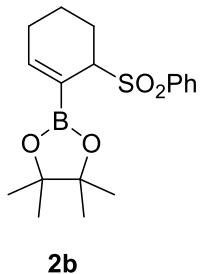


N-allyl-4-methyl-N-(4-(phenylsulfonyl)-5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)hex-5-en-1-yl)benzenesulfonamide (1m):

¹H NMR (500 MHz, CDCl₃) δ 7.78 (d, *J* = 8.5 Hz, 2H), 7.66 (d, *J* = 8.5 Hz, 2H), 7.60 (t, *J* = 7.5 Hz, 1H), 7.50 (t, *J* = 8 Hz, 2H), 7.28 (d, *J* = 8 Hz, 2H), 6.09 (d, *J* = 2 Hz, 1H), 5.76 (s, 1H), 5.58 (dd, *J* = 16.5 Hz, *J* = 10 Hz, *J* = 6.5 Hz, *J* = 6.5 Hz, 1H), 5.15 – 5.10 (m, 2H), 3.86 (dd, *J* = 11 Hz, *J* = 4 Hz, 1H), 3.79 – 3.70 (m, 2H), 3.07 (t, *J* = 7.5 Hz, 2H), 2.42 (s, 3H), 2.12 – 2.06 (m, 1H), 1.98 – 1.90 (m, 1H), 1.62 – 1.56 (m, 1H), 1.55 – 1.47 (m, 1H), 1.16 (s, 12H); ¹³C NMR (500 MHz, CDCl₃) δ 143.4, 138.0, 137.0, 136.7, 133.5, 133.2, 129.8, 129.8, 128.8, 127.3, 119.1, 84.1, 68.1, 50.9, 46.9, 25.9, 24.8, 24.8, 24.2, 21.6; IR (film) ν_{max} = 3062, 2978, 2933, 1627, 1601, 1492, 1447, 1410, 1379, 1315, 1304, 1143 cm⁻¹; HRMS calcd for (C₂₈H₃₈BNO₆S₂)Na⁺ 582.2125; Found: 582.2124.

Ring Closing Metathesis Procedure 1

Diene **1b** (36.0 mg, 95 μmol) was dissolved in 700 μL dry dichloromethane (0.1M) that was degassed with argon prior to use. The solution was added to a sealed tube under argon atmosphere and charged with Grubbs 2nd generation catalyst (4.1 mg, 5 mol %). The tube was sealed with Teflon coated cap and heated to 45 °C for 2 h. Solvent was evaporated and the crude residue was purified on a flash column (20% EtOAc/Hexanes) affording **2b** as a solid (23 mg, 70%).

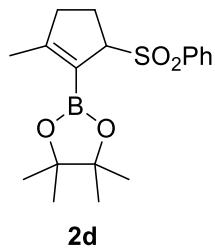


2b

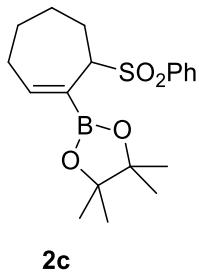
4,4,5,5-tetramethyl-2-(6-(phenylsulfonyl)cyclohex-1-en-1-yl)-1,3,2-dioxaborolane (2b): ^1H NMR (500 MHz, CDCl_3) δ 7.91 (d, $J = 7$ Hz, 2H), 7.61 (t, $J = 7$ Hz, 1H), 7.53 (t, $J = 7$ Hz, 2H), 6.84 (t, $J = 3$ Hz, 1H), 4.03 (d, $J = 5.5$ Hz, 1H), 2.14 – 2.03 (m, 3H), 1.85 – 1.76 (m, 1H), 1.74 – 1.67 (m, 1H), 1.53 – 1.48 (m, 1H), 1.26 (s, 12H); ^{13}C NMR (500 MHz, CDCl_3) δ 149.0, 139.2, 133.4, 129.3, 129.0, 83.8, 61.4, 25.5, 25.0, 24.8, 22.4, 17.1; IR (film) $\nu_{\text{max}} = 2959, 1628, 1447, 1409, 1373, 1317, 1304, 1145 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{18}\text{H}_{25}\text{BO}_4\text{S})\text{Na}^+$ 371.1459; Found: 371.1459.

Ring Closing Metathesis Procedure 2

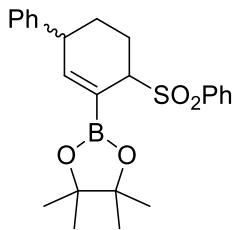
Diene **1d** (115 mg, 0.305 mmol) was dissolved in 60 mL dry toluene (0.005 M) that was degassed with argon prior to use. The solution was added to a sealed tube under argon atmosphere and treated with Hoveyda - Grubbs 2nd generation catalyst (19.1 mg, 10 mol %) and benzoquinone (66 mg, 0.610 mmol). The tube was sealed with a Teflon coated cap and heated to 110 °C for 24 h. Solvent was evaporated and the crude black residue was purified on a flash column (20% EtOAc/Hexanes) affording **2d** as a solid (83 mg, 78%).



4,4,5,5-tetramethyl-2-(5-(phenylsulfonyl)cyclopent-1-en-1-yl)-1,3,2-dioxaborolane (2d): ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, $J = 8$ Hz, 2H), 7.61 (t, $J = 8$ Hz, 1H), 7.50 (t, $J = 8$ Hz, 2H), 4.43 (d, $J = 8.5$ Hz, 1H), 2.27 (dd, $J = 14.5$ Hz, $J = 9$ Hz, 1H), 2.16 – 2.03 (m, 2H), 1.89 (s, 3H), 1.82 – 1.76 (m, 1H), 1.29 (s, 6H), 1.28 (s, 6H); ^{13}C NMR (500 MHz, CDCl_3) δ 165.6, 137.5, 133.3, 129.7, 128.6, 83.6, 76.1, 38.9, 26.3, 25.2, 24.7, 17.3; IR (film) $\nu_{\text{max}} = 2978, 2932, 1638, 1446, 1386, 1372, 1315, 1302, 1143, 1130 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{18}\text{H}_{25}\text{BO}_4\text{S})\text{Na}^+$ 371.1459; Found: 371.1455.

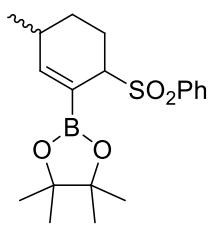


4,4,5,5-tetramethyl-2-(7-(phenylsulfonyl)cyclohept-1-en-1-yl)-1,3,2-dioxaborolane (2c): ^1H NMR (500 MHz, CDCl_3) δ 7.88 (d, $J = 8$ Hz, 2H), 7.59 (t, $J = 8$ Hz, 1H), 7.50 (t, $J = 8$ Hz, 2H), 7.11 (dd, $J = 9$ Hz, $J = 4$ Hz, 1H), 4.25 (t, $J = 5$ Hz, 1H), 2.81 – 2.74 (m, 1H), 2.56 – 2.53 (m, 1H), 2.34 – 2.27 (m, 2H), 1.84 – 1.82 (m, 2H), 1.71 – 1.64 (m, 1H), 1.30 – 1.25 (m, 1H), 1.05 (s, 6H), 1.01 (s, 6H); ^{13}C NMR (500 MHz, CDCl_3) δ 156.4, 140.2, 133.2, 129.4, 128.9, 83.8, 66.0, 30.1, 26.9, 26.3, 25.9, 25.0, 24.7; IR (film) $\nu_{\text{max}} = 2978, 2928, 2859, 1629, 1446, 1409, 1331, 1305 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{19}\text{H}_{27}\text{BO}_4\text{S})\text{Na}^+$ 385.1615; Found: 385.1611.



2g

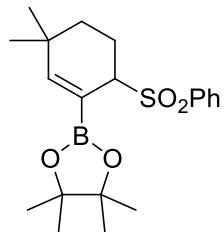
4,4,5,5-tetramethyl-2-(4-(phenylsulfonyl)-1,4,5,6-tetrahydro-[1,1'-biphenyl]-3-yl)-1,3,2-dioxaborolane (2g): d.r. (1.00 : 0.34)¹H NMR (500 MHz, CDCl₃) δ 7.97 – 7.93 (m, 4H), 7.64 (t, J = 7.5 Hz, 2H), 7.56 (t, J = 7.5 Hz, 4H), 7.29 – 7.16 (m, 6H), 7.06 (d, J = 7 Hz, 2H), 7.03 (d, J = 8.5 Hz, 2H), 6.80 (d, J = 2 Hz, 1H), 6.75 (s, 1H), 4.19 – 4.17 (m, 1H), 4.10 – 4.09 (m, 1H), 3.32 – 3.29 (m, 1H), 3.27 – 3.23 (m, 1H), 2.26 – 2.23 (m, 1H), 2.17 – 2.09 (m, 1H), 1.97 – 1.78 (m, 6H), 1.31 (s, 6H), 1.30 (s, 6H), 1.28 (s, 6H), 1.27 (s, 6H);¹³C NMR (500 MHz, CDCl₃) δ 150.9, 150.1, 144.2, 144.1, 139.0, 138.4, 133.6, 133.5, 129.5, 129.4, 129.1, , 129.0, 128.6, 128.6, 128.0, 127.8, 126.6, 84.1, 84.0, 62.0, 61.3, 43.3, 40.7, 27.1, 26.6, 25.1, 24.8, 24.7, 22.9, 20.0; IR (film) ν_{max} = 2978, 2933, 1447, 1410, 1379, 1304, 1143, cm⁻¹; HRMS calcd for (C₂₄H₂₉BO₄S)Na⁺ 447.1772; Found: 447.1771.



2f

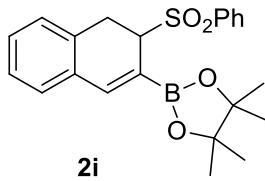
4,4,5,5-tetramethyl-2-(3-methyl-6-(phenylsulfonyl)cyclohex-1-en-1-yl)-1,3,2-dioxaborolane (2f): d.r. (1.00 : 0.75) ¹H NMR (500 MHz, CDCl₃) δ 7.91 – 7.88 (m, 4H), 7.63 – 7.59 (m, 2H), 7.54 – 7.50 (m, 4H), 6.64 – 6.33 (m, 2H), 4.06 – 4.04 (m, 1H), 4.00 (d, J = 6 Hz, 1H), 2.20 –

2.14 (m, 1H), 2.14 – 2.07 (m, 1H), 2.06 – 1.98 (m, 1H), 1.92 – 1.82 (m, 1H), 1.78 – 1.69 (m, 1H), 1.57 – 1.50 (m, 1H), 1.29 (s, 24H), 1.26 – 1.25 (m, 1H) 1.24 – 1.19 (m, 1H), 1.19 – 1.10 (m, 2H), 0.94 (d, J = 7 Hz, 3H), 0.88 (d, J = 7 Hz, 3H); ^{13}C NMR (500 MHz, CDCl_3) δ 154.2, 153.9, 139.1, 138.4, 133.4, 133.4, 129.5, 129.4, 128.9, 128.9, 83.9, 62.2, 61.6, 31.1, 29.6, 26.2, 25.6, 25.1, 24.8, 24.7, 22.6, 20.6, 20.4, 20.4; IR (film) ν_{max} = 2978, 2928, 1446, 1331, 105, 1142 cm^{-1} ; HRMS calcd for $(\text{C}_{19}\text{H}_{27}\text{BO}_4\text{S})\text{Na}^+$ 385.1615; Found: 385.1615.



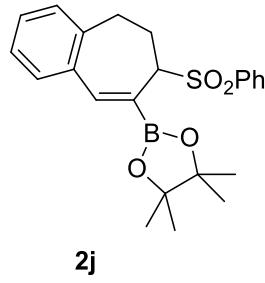
2h

2-(3,3-dimethyl-6-(phenylsulfonyl)cyclohex-1-en-1-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2h): ^1H NMR (500 MHz, CDCl_3) δ 7.89 (d, J = 8 Hz, 2H), 7.61 (t, J = 8 Hz, 1H), 7.52 (t, J = 8 Hz, 2H), 6.46 (s, 1H), 3.98 (d, J = 6 Hz, 1H), 2.07 – 2.02 (m, 1H), 1.88 – 1.80 (m, 1H), 1.42 (ddd, J = 13.5 Hz, J = 13.5 Hz, J = 4 Hz, 1H), 1.30 (s, 12H), 1.22 (ddd, J = 14 Hz, 4.5 Hz, 4.5 Hz, 1 H), 0.90 (s, 3H), 0.79 (s, 3H); ^{13}C NMR (500 MHz, CDCl_3) δ 157.3, 138.8, 133.4, 129.5, 128.9, 83.9, 61.9, 32.1, 31.6, 29.0, 28.4, 25.1, 24.7, 20.1; IR (film) ν_{max} = 2976, 2930, 1447, 1422, 1372, 1305, 1143, 1084 cm^{-1} ; HRMS calcd for $(\text{C}_{20}\text{H}_{29}\text{BO}_4\text{S})\text{Na}^+$ 399.1771; Found: 399.1771.



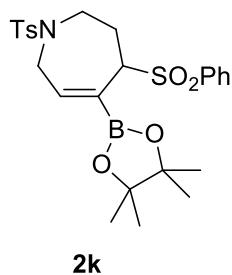
4,4,5,5-tetramethyl-2-(3-(phenylsulfonyl)-3,4-dihydronaphthalen-2-yl)-1,3,2-dioxaborolane

(2i): ^1H NMR (500 MHz, CDCl_3) δ 7.55 (d, $J = 8$ Hz, 2H), 7.28 (t, $J = 8$ Hz, 1H), 7.18 (s, 1H), 7.13 (t, $J = 8$ Hz, 2H), 7.06 (t, $J = 7$ Hz, 1H), 6.97 (d, $J = 7.5$ Hz, 1H), 6.91 (t, $J = 7.5$ Hz, 1H), 6.70 (d, $J = 7.5$ Hz, 1H), 4.24 (d, $J = 8$ Hz, 1H), 3.60 (d, $J = 18$ Hz, 1H), 3.28 (dd, $J = 18$ Hz, $J = 8.5$ Hz, 1H), 1.34 (s, 6H), 1.33 (s, 6H); ^{13}C NMR (500 MHz, CDCl_3) δ 145.0, 136.8, 133.2, 132.5, 131.8, 129.8, 129.4, 127.9, 127.8, 127.7, 126.9, 84.3, 61.2, 28.1, 25.1, 24.7; IR (film) $\nu_{\text{max}} = 3062, 3026, 2937, 2867, 1634, 1601, 1585, 1492, 1447, 1307, 1208, 1149, 1084, 1025 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{22}\text{H}_{25}\text{BO}_4\text{S})\text{Na}^+$ 419.1459; Found: 419.1456.



4,4,5,5-tetramethyl-2-(7-(phenylsulfonyl)-6,7-dihydro-5H-benzo[7]annulen-8-yl)-1,3,2-dioxaborolane (2j):

^1H NMR (500 MHz, CDCl_3) δ 7.78 (d, $J = 8$ Hz, 2H), 7.50 (t, $J = 8$ Hz, 1H), 7.40 (t, $J = 8$ Hz, 2H), 7.34 (s, 1H), 7.12 – 7.08 (m, 3H), 7.03 – 7.02 (m, 1H), 4.61 (t, $J = 7.5$ Hz, 1H), 2.92 – 2.79 (m, 2H), 2.43 – 2.39 (m, 2H), 1.31 (s, 12H); ^{13}C NMR (500 MHz, CDCl_3) δ 147.6, 141.7, 137.7, 135.3, 133.4, 132.0, 129.7, 128.7, 128.5, 126.4, 84.3, 67.5, 31.8, 31.3, 25.1, 24.9, 24.7; IR (film) $\nu_{\text{max}} = 2978, 2932, 1638, 1446, 1386, 1372, 1315, 1302, 1143, 1130, 1085 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{23}\text{H}_{27}\text{BO}_4\text{S})\text{Na}^+$ 433.1615; Found: 433.1615.

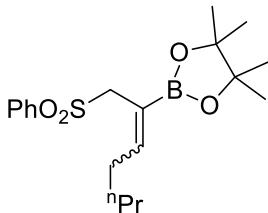


2k

4-(phenylsulfonyl)-5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1-tosyl-2,3,4,7-tetrahydro-1H-azepine (2k): ^1H NMR (500 MHz, CDCl_3) δ 7.81 (d, $J = 8$ Hz, 2H), 7.65 (d, $J = 8$ Hz, 2H), 7.62 (t, $J = 8$ Hz, 1H), 7.51 (t, $J = 8$ Hz, 2H), 7.28 (d, $J = 8$ Hz, 2H), 7.03 (dd, $J = 8$ Hz, $J = 4$ Hz, 1H), 4.33 – 4.28 (m, 2H), 3.98 – 3.92 (m, 2H), 3.70 (t, $J = 12.5$ Hz, 1H), 2.57 (ddd, $J = 15$ Hz, $J = 3.5$ Hz, $J = 3.5$ Hz, 1H), 2.41 (s, 3H), 2.14 – 2.06 (m, 1H), 1.04 (s, 6H), 1.00 (s, 6H); ^{13}C NMR (500 MHz, CDCl_3) δ 149.5, 143.5, 139.2, 136.5, 133.8, 129.9, 129.3, 129.2, 127.2, 84.3, 64.4, 47.5, 46.8, 27.6, 24.9, 24.7, 21.6; IR (film) $\nu_{\text{max}} = 2977, 2925, 1636, 157, 1332, 1305, 1143, 1094 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{25}\text{H}_{32}\text{BO}_6\text{S}_2)\text{Na}^+$ 540.1656; Found: 540.1656.

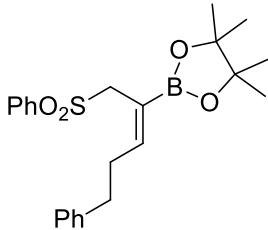
Intermolecular Cross Metathesis Procedure 1

Vinyl boronate **3** (100 mg, 0.324 mmol), Grubbs 2nd generation catalyst (13.7 mg, 16 μmol) and 1-hexene (80 μL , 0.648 mmol) were added to a flask under argon atmosphere. The starting materials were dissolved in 1.62 mL dry dichloromethane, which was degassed with argon prior to use. The flask was fitted with a reflux condenser and heated to reflux for 24 h. The solvent was removed and the crude was purified on a flash column (20% EtOAc/Hexanes) affording **14** as a solid (86 mg, 73%).



15

4,4,5,5-tetramethyl-2-(1-(phenylsulfonyl)hept-2-en-2-yl)-1,3,2-dioxaborolane (15): Z/E (1.00 : 0.18) ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, $J = 8$ Hz, 2H), 7.81 (d, $J = 8$ Hz, 2H), 7.60 (t, $J = 8$ Hz, 2H), 7.51 (t, $J = 8$ Hz, 4H), 6.58 (t, $J = 7$ Hz, 1H), 6.06 (t, $J = 8$ Hz, 1H), 4.03 (s, 2H), 3.87 (s, 2H), 2.32 (q, $J = 2$ Hz, 2H), 1.94 (q, $J = 4$ Hz, 2H), 1.28 – 1.21 (m, 8 H), 1.19 (s, 12H), 1.13 (s, 12H), 0.84 (t, $J = 7$ Hz, 6H); ^{13}C NMR (500 MHz, CDCl_3) δ 157.6, 155.3, 139.4, 138.9, 133.4, 133.3, 129.1, 129.0, 128.8, 83.9, 83.7, 62.6, 556.0, 31.5, 31.2, 30.7, 29.3, 24.9, 24.8, 24.8, 22.6, 22.2, 13.9, 13.9; IR (film) $\nu_{\text{max}} = 2976, 2930, 2871, 1631, 1147, 1415, 1373, 1316 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{19}\text{H}_{22}\text{BO}_4\text{S})\text{Na}^+$ 387.1772; Found: 387.1767.



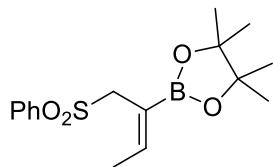
16

4,4,5,5-tetramethyl-2-(5-phenyl-1-(phenylsulfonyl)pent-2-en-2-yl)-1,3,2-dioxaborolane (16): ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, $J = 8$ Hz, 2H), 7.60 (t, $J = 8$ Hz, 1H), 7.51 (t, $J = 8$ Hz, 2H), 7.28 – 7.25 (m, 2H), 7.18 (t, $J = 8$ Hz, 1H), 7.12 (d, $J = 8$ Hz, 2H), 6.67 (t, $J = 7$ Hz, 1H), 3.97 (s, 2H), 2.63 – 2.60 (m, 2H), 2.35 – 2.30 (m, 2H), 1.12 (s, 12H); ^{13}C NMR (500 MHz, CDCl_3) δ 153.6, 141.2, 139.1, 133.2, 128.9, 128.8, 128.3, 128.2, 125.9, 83.7, 55.6, 34.5, 31.4,

24.5; IR (film) $\nu_{\text{max}} = 2977, 2934, 1447, 1423, 1372, 1316, 1305, 1145, 1084 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{23}\text{H}_{29}\text{BO}_4\text{S})\text{Na}^+$ 435.1772; Found: 435.1772.

Intermolecular Cross Metathesis Procedure 2

Vinyl boronate **3** (50 mg, 0.162 mmol), Grubbs 2nd generation catalyst (6.9 mg, 8 μmol) and 1-hexene (80 μL , 0.648 mmol) were added to a sealed tube under argon atmosphere. The starting materials were dissolved in 1.62 mL dry toluene which was degassed with argon prior to use. The tube was fitted with a Teflon screw cap and heated to 135 °C for 12 h. The solvent was removed and the crude was purified on a flash column (20% EtOAc/Hexanes) affording **16** as a solid (16 mg, 30%).

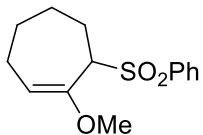


17

(Z)-4,4,5,5-tetramethyl-2-(1-(phenylsulfonyl)but-2-en-2-yl)-1,3,2-dioxaborolane (17): ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, $J = 8 \text{ Hz}$, 2H), 7.61 (t, $J = 8 \text{ Hz}$, 1H), 7.51 (t, $J = 8 \text{ Hz}$, 2H), 6.72 (q, $J = 7 \text{ Hz}$, 1H), 4.04 (s, 2H), 1.58 (s, 3H), 1.13 (s, 12H); ^{13}C NMR (500 MHz, CDCl_3) δ 149.8, 139.3, 133.5, 133.4, 129.1, 129.0, 129.0, 83.9, 83.8, 55.6, 24.8, 24.7, 15.3; IR (film) $\nu_{\text{max}} = 2978, 2932, 1638, 1446, 1386, 1302 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{16}\text{H}_{23}\text{BO}_4\text{S})\text{Na}^+$ 345.1302; Found: 345.1298.

Conversion of 2c to vinyl ether 5

Vinyl boronate **2c** (1.02 g, 2.82 mmol) was dissolved in 21 mL (5:1 MeOH/DCM) solvent system (0.1 M), and to the solution was added triethylamine (1.6 mL, 11.2 mmol) and copper(II) acetate (1.02 mg, 5.60 mmol). The resulting mixture was heated to 40 °C and stirred for 6 days open to air. Over the course of the reaction additional solvent was added as needed due to evaporation. The mixture was diluted with ether and washed with water. The organic layer was separated, dried over magnesium sulfate and concentrated under reduced pressure resulting in a white solid which could be recrystallized from a 2:1 mixture of pentane/ether (672 mg, 75%).

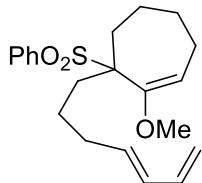


5

4,4,5,5-tetramethyl-2-(7-(phenylsulfonyl)cyclohept-1-en-1-yl)-1,3,2-dioxaborolane (5): ¹H NMR (500 MHz, CDCl₃) δ 7.87 (d, *J* = 8 Hz, 2H), 7.61 (t, *J* = 7 Hz, 1H), 7.51 (t, *J* = 8 Hz, 2H), 5.01 (dd, *J* = 8.5 Hz, *J* = 4.5 Hz, 1H), 3.78 (t, *J* = 5 Hz, 1H), 3.06 (s, 3H), 2.61 – 2.54 (m, 1H), 2.51 – 2.46 (m, 1H), 2.28 – 2.20 (m, 1H), 2.09 – 2.03 (m, 1H), 1.91 – 1.74 (m, 3H), 1.38 – 1.31 (m, 1H); ¹³C NMR (500 MHz, CDCl₃) δ 151.3, 139.6, 133.4, 128.8, 128.7, 104.7, 70.8, 54.4, 27.4, 25.3, 24.7, 23.1; IR (film) ν_{max} = 2977, 2935, 1447, 1305, 1144 cm⁻¹; HRMS calcd for (C₁₄H₁₈O₃S)Na⁺ 289.0869; Found: 289.0869.

Alkylation of 5

Sulfone **5** (564 mg, 2.11 mmol) was dissolved in 10.5mL dry THF (0.2 M), cooled to -78 °C, treated with *n*BuLi (1.53 M in THF, 1.10 mL, 2.53 mmol) and allowed to stir an additional 30 minutes before addition of iodide (564 mg, 2.53 mmol). The reaction was then allowed to reach room temperature over the course of 1 hour before being quenched with saturated ammonium chloride. The aqueous layer was extracted with dichloromethane (2 x 10 mL), and the organic layers were separated, dried over magnesium sulfate and concentrated under reduced pressure. The resulting crude residue was purified on a flash column (20% EtOAc/Hexanes) affording the product as a colorless oil (643 mg, 84%).

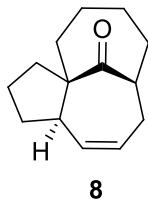


7

(E)-7-(hepta-4,6-dien-1-yl)-1-methoxy-7-(phenylsulfonyl)cyclohept-1-ene (7): ^1H NMR (500 MHz, CDCl_3) δ 7.80 (d, J = 8 Hz, 2H), 7.58 (t, J = 8 Hz, 1H), 7.47 (t, J = 8 Hz, 2H), 6.25 (ddd, J = 17 Hz, J = 10 Hz, J = 10 Hz, 1H), 5.98 (dd, J = 15 Hz, J = 10.5 Hz, 1H), 5.60 (dt, J = 15 Hz J = 7 Hz, 1H), 5.06 (d, J = 17 Hz, 1H), 5.00 (t, J = 7 Hz, 1H), 4.94 (d, J = 10 Hz, 1H), 3.20 (s, 3H), 2.43 – 2.36 (m, 2H), 2.12 – 2.07 (m, 1H), 2.05 – 1.97 (m 5H), 1.79 – 1.65 (m 3H), 1.52 – 1.43 (m, 2H), 1.28 – 1.20 (m, 1H); ^{13}C NMR (500 MHz, CDCl_3) δ 151.5, 138.4, 137.2, 134.5, 133.2, 131.4, 130.3, 128.2, 115.1, 105.0, 76.4, 54.2, 35.5, 33.0, 29.1, 25.5, 24.3, 22.6, 21.6; IR (film) $\nu_{\text{max}} = 2978, 2932, 1638, 1446, 1386, 1302, 1315, 1236, 1143, 1130, 1085 \text{ cm}^{-1}$; HRMS calcd for $(\text{C}_{21}\text{H}_{28}\text{O}_3\text{S})\text{Na}^+$ 383.1651; Found: 383.1651.

Intramolecular [4+3] Cycloaddition of 7

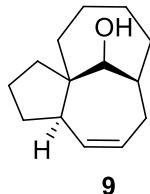
The enol ether **7** (643 mg, 1.78 mmol) was dissolved in 17.8 mL dry dichloromethane (0.1 M) and cooled to -78 °C. The solution was treated with titanium(IV) chloride (215 µL, 1.95 mmol) and stirred 4 minutes before quenched with water. After warming to room temperature, the reaction was extracted with dichloromethane (3 x 5 mL) and the organic layers were combined, dried over magnesium sulfate, and concentrated under reduced pressure affording a colorless oil (293 mg, 81%).



(3aR,8S,11aR)-1,2,3,4,5,6,7,8,9,11a-decahydro-3a,8-methanocyclopenta[10]annulen-12-one (8): ^1H NMR (500 MHz, CDCl_3) δ 5.70 – 5.65 (m, 1H), 5.45 (dt, $J = 11$ Hz, $J = 4.5$ Hz, 1H), 2.89 – 2.84 (m, 1H), 2.77 – 2.71 (m, 1H), 2.63 – 2.56 (m, 1H), 2.41 – 2.34 (m, 1H), 2.16 – 2.10 (m, 1H), 2.02 – 1.93 (m, 2H), 1.82 – 1.67 (m, 6H), 1.61 – 1.55 (m, 1H), 1.53 – 1.46 (m, 1H), 1.44 – 1.38 (m, 1H), 1.35 – 1.30 (m, 1H), 1.27 – 1.22 (m, 1H); ^{13}C NMR (500 MHz, CDCl_3) δ 216.1, 135.0, 128.2, 62.6, 55.3, 47.8, 40.0, 35.9, 34.6, 31.2, 29.2, 26.8, 26.1, 22.9; IR (film) $\nu_{\text{max}} =$ 3026, 2937, 1634, 1447, 1307, 1208, 1149, 1084 cm^{-1} ; HRMS calcd for $(\text{C}_{14}\text{H}_{20}\text{O})\text{Na}^+$ 227.1406; Found: 227.1708.

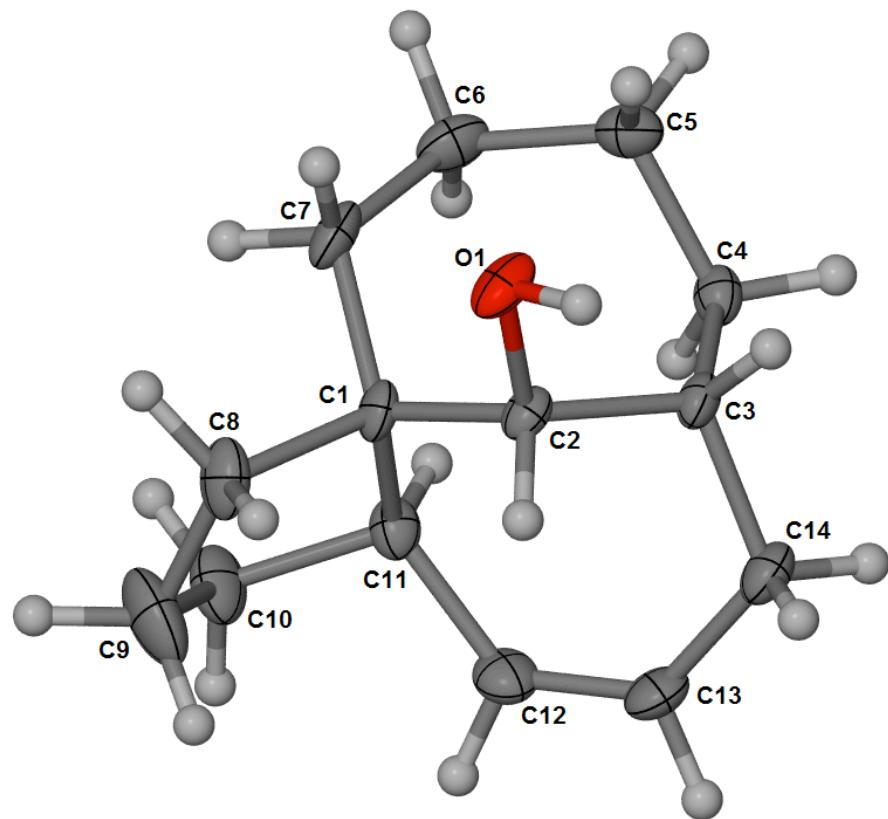
LAH Reduction of 8

To a suspension of lithium aluminum hydride (20 mg, 0.543 mmol) in diethyl ether at 0 °C was added ketone **8** (74 mg, 0.362 mmol) as a solution in 1.0 mL diethyl ether. After dropwise addition, the reaction was allowed to warm to room temperature over the course of 1 hour. After the reaction was determined complete by TLC, it was cooled to 0 °C and 5 mL ethyl acetate was added slowly. The reaction was warmed back to room temperature, and a saturated solution of Rochelle's salt was added to the biphasic system which was stirred vigorously for one hour. The organic layer was separated from the mixture, dried over magnesium sulfate, and concentrated under reduced pressure. The crude residue was purified on a flash column in (2.5% EtOAc/Hexanes) giving two diastereomers; one of which could be recrystallized with ethanol.



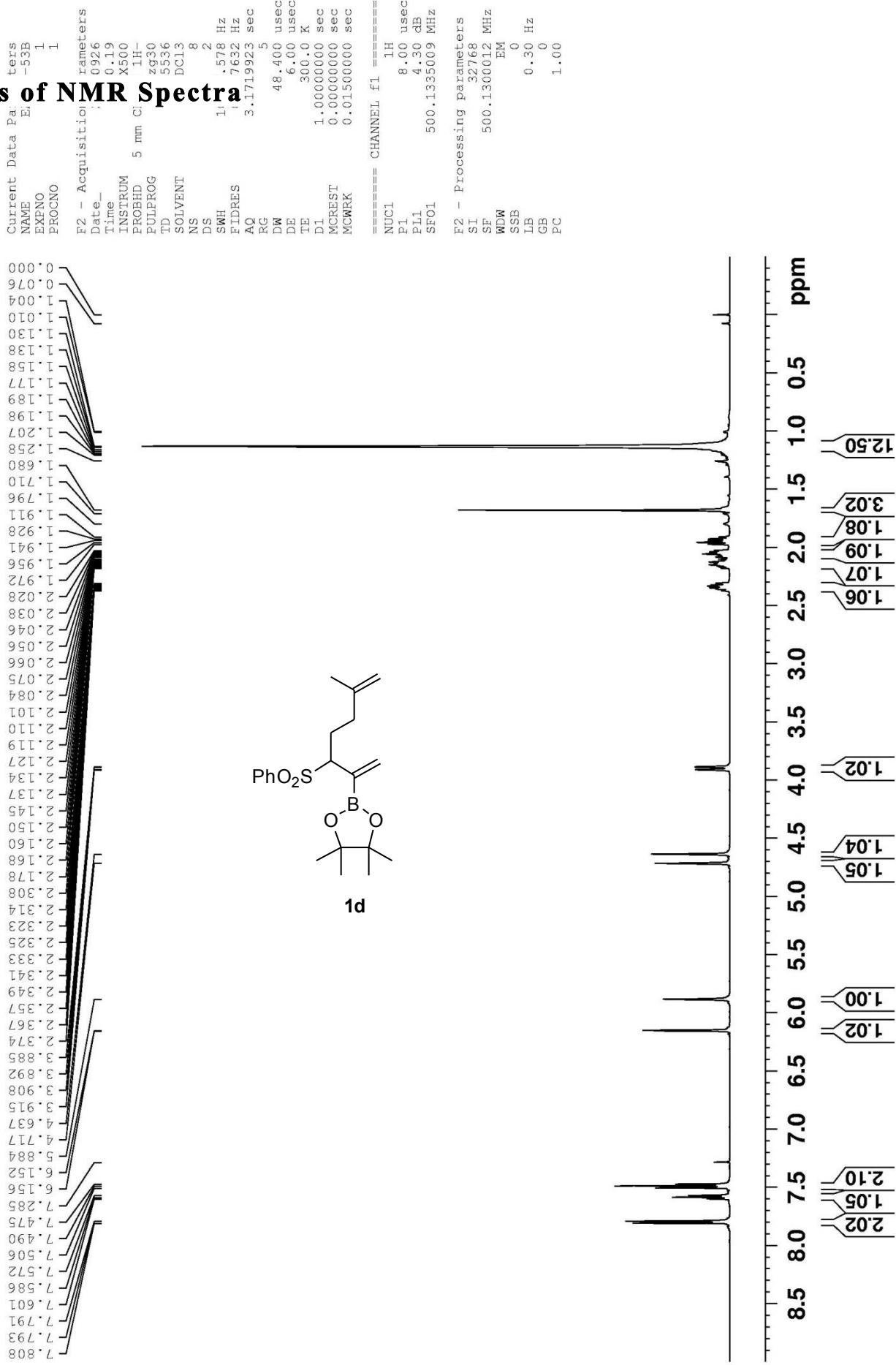
(3aR,8S,11aR,12R)-1,2,3,4,5,6,7,8,9,11a-decahydro-3a,8-methanocyclopenta[10]annulen-12-ol (9): ^1H NMR (500 MHz, CDCl_3) δ 5.48 – 5.46 (m, 1H), 5.31 (d, $J = 11$ Hz, 1H), 3.81 (s, 1H), 2.71 (s, 1H), 2.35 – 2.10 (m, 3H), 1.99 – 1.88 (m, 2H), 1.86 – 1.84 (m, 1H), 1.67 – 1.48 (m, 12H); ^{13}C NMR (500 MHz, CDCl_3) δ 134.1, 126.7, 80.9, 52.4, 44.9, 42.5, 40.9, 37.9, 34.9, 33.8, 31.6, 26.4, 26.1, 23.1; HRMS calcd for $(\text{C}_{14}\text{H}_{22}\text{O})\text{Na}^+$ 229.1562; Found: 229.1564.

Crystallographic Data

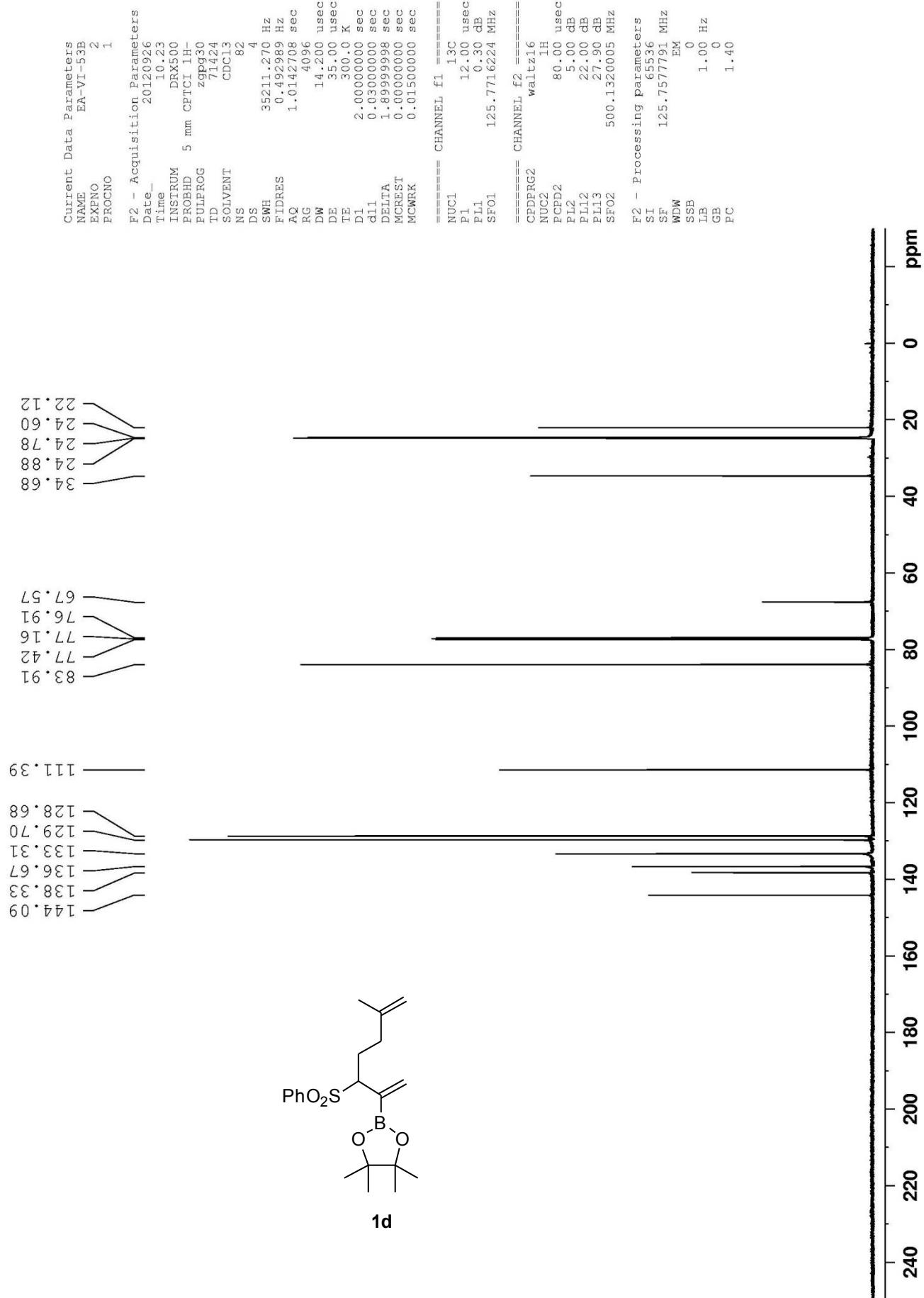


Compound 9

Copies of NMR Spectra



13C NMR



EA-VII-16B

Current Data Parameters

NAME	EA-VII-16B
EXENO	1
PROCNO	

F2 - Acquisition Parameters

Date_	20130206
Time	18.07
INSTRUM	DRX500
PROPHD	5 mm CPTCI 1H-
PULPROG	zg30
TD	65536
SOLVENT	CDCl ₃
NS	8
DS	2
SWH	10330.578 Hz
FLDRES	0.151632 Hz
AQ	3.1713923 sec
RG	22.6
DW	48.400 usec
DE	6.00 usec
TE	300.0 K
DL	1.0000000 sec
MCEST	0.0000000 sec
MCWRK	0.0150000 sec

===== CHANNEL f1 =====

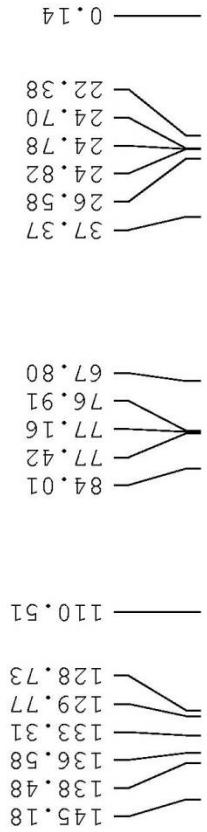
NUC1	1H
P1	8.00 usec
PLL	4.30 dB
SFO1	500.1335009 MHz

F2 - Processing parameters

SI	32768
SF	500.1300128 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00

1e

¹³C NMR



```

Current Data Parameters
NAME          EA-VII-16B
EXPNO         2
PROCNO        1
13C NMR

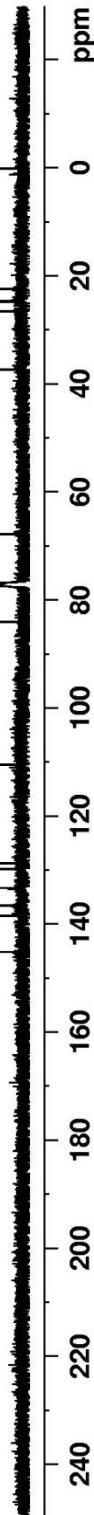
F2 - Acquisition Parameters
Date_        20130206
Time_        18.12
INSTRUM     DIEX500
PROBHD      5 mm CPTCI 1H-
PULPROG    zg30
TD          71424
SOLVENT      CDCl3
NS           101
DS           4
SWH         35211.270 Hz
FIDRES     0.492989 Hz
AQ          1.0142408 sec
RG          4096
DW          14.200 usec
DE          35.00 usec
TE          300.0 K
D1          0.1300000 sec
d1          0.1300000 sec
DELTAB     1.8999998 sec
MCREFST    0.0000000 sec
MCWRK      0.01500000 sec

===== CHANNEL f1 =====
NUC1        13C
P1          12.00 usec
PL1         0.30 dB
SF01       125.7716224 MHz
SFO2       500.1320005 MHz

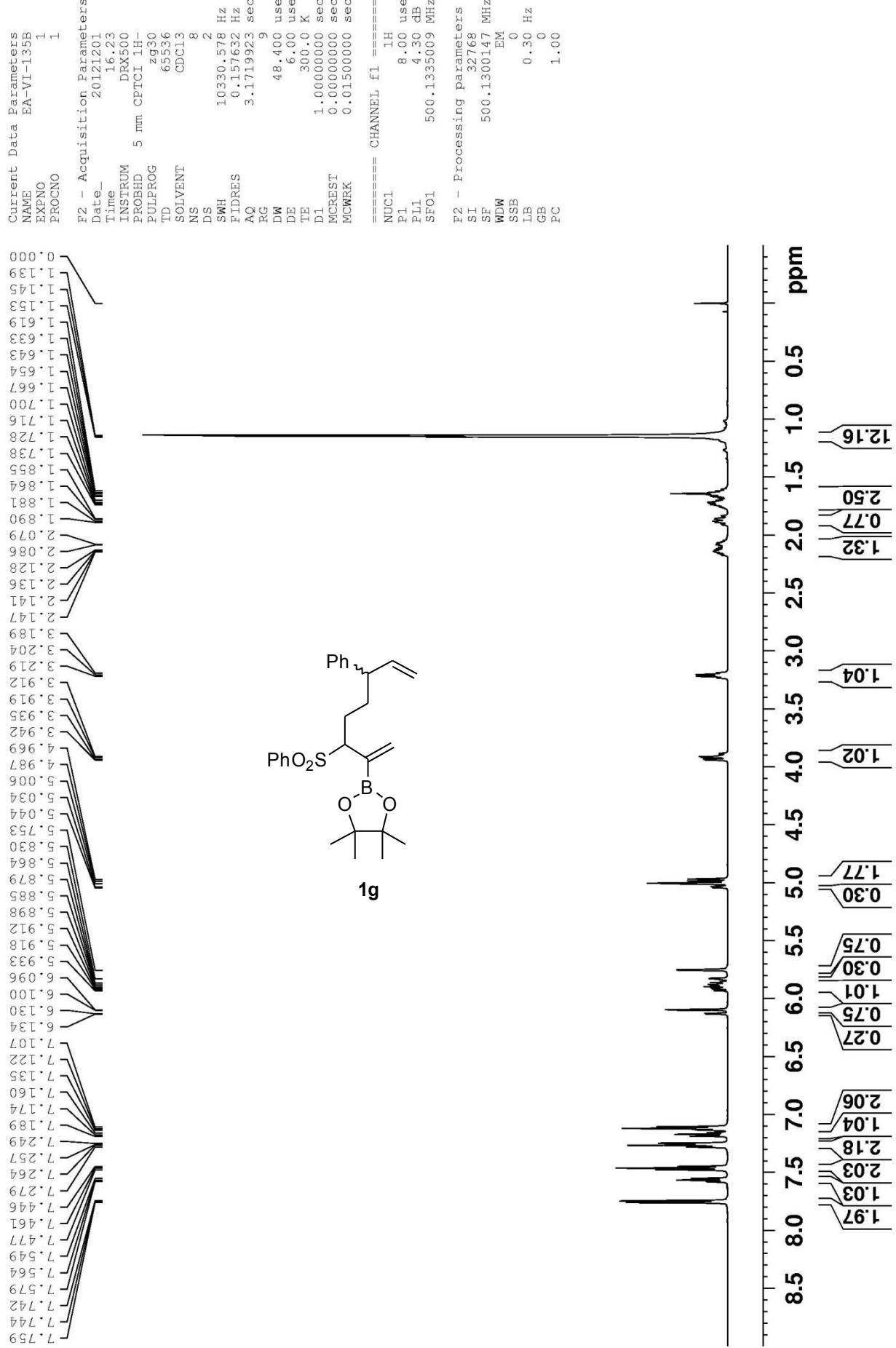
===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2        1H
PCPD2      80.00 usec
PL2          5.00 dB
PL12       22.00 dB
PL13       27.90 dB
SFO2       500.1320005 MHz

F2 - Processing parameters
SI          65536
SF          125.757716 MHz
WDW        EM
SSB        0
LB          1.00 Hz
GB          0
PC        1.40

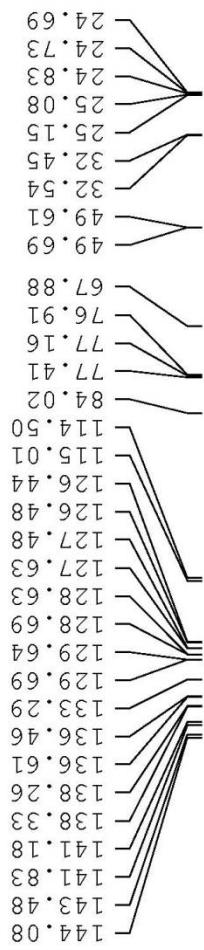
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EA-VI-135B



13C NMR



```

Current Data Parameters
NAME          EA-VI-135B
EXNRO        2
PROCNO       1

F2 - Acquisition Parameters
Date_      20121201
Time       16.28
INSTRUM   DRX500
PROSHD    5 mm CPTCI 1H-
PULPROG  zpg30
TD        71424
SOLVENT    CDC13
NS         88
DS         4
SWH      3521.270 Hz
FIDRES   0.4922989 Hz
AQ        1.0142708 sec
RG        4096
DW        14.200 usec
DE        35.00 usec
TE        300.0 K
D1        2.0000000 sec
d11       0.0300000 sec
DETA     1.8999998 sec
MCPIST   0.0000000 sec
MCRWK   0.0150000 sec

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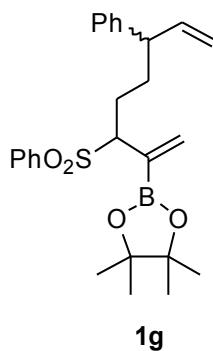
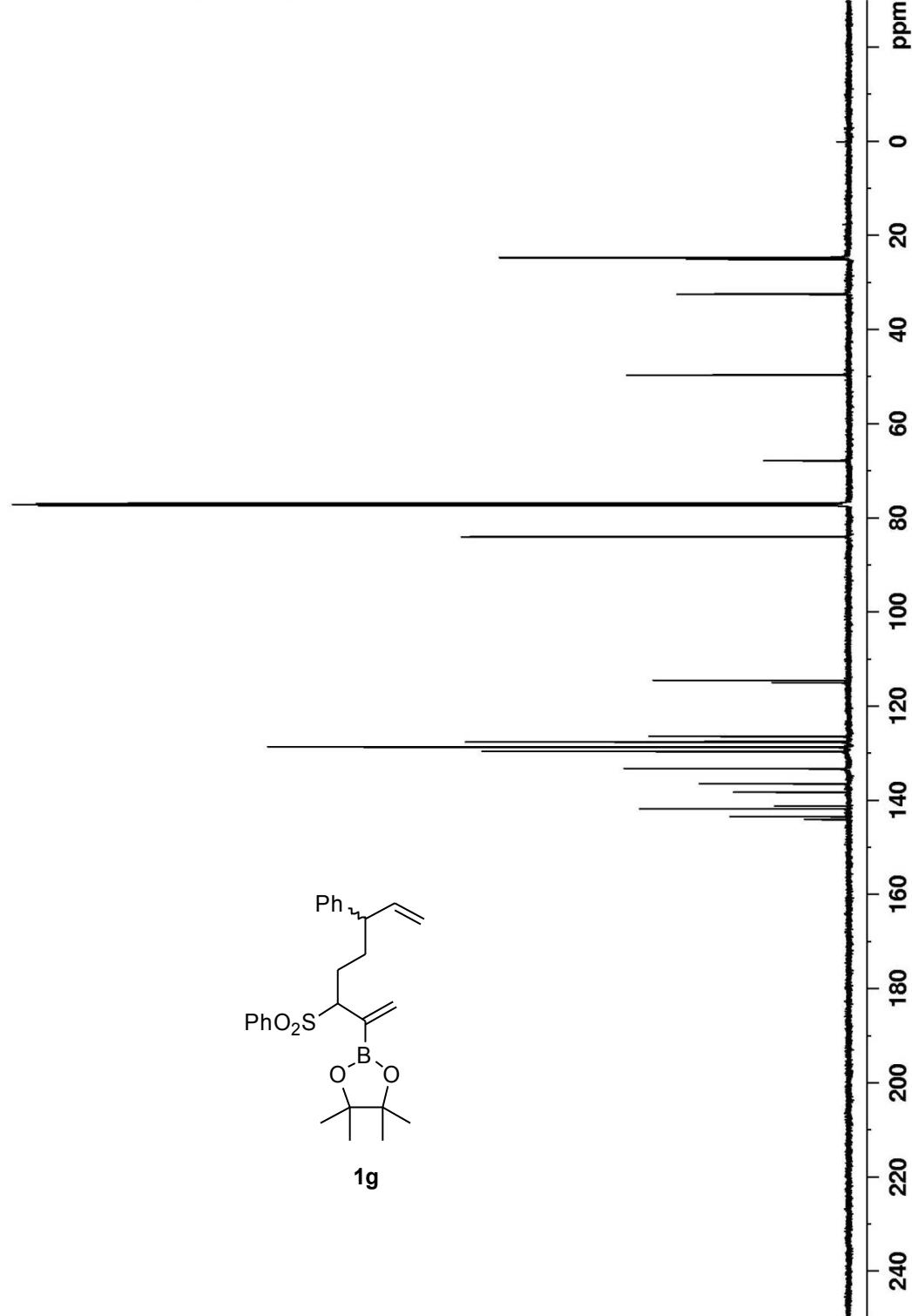
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===== CHANNEL f1 =====
NUC1          13C
P1           waltz16
              1H
              12.00 usec
PL1          0.30 dB
SF01        125.7716224 MHz

===== CHANNEL f2 =====
CPDPRG2    65536
NUC2          1H
PCD2        80.00 usec
PL2           5.00 dB
PL12        22.00 dB
PL13        27.90 dB
SF02        500.1320005 MHz

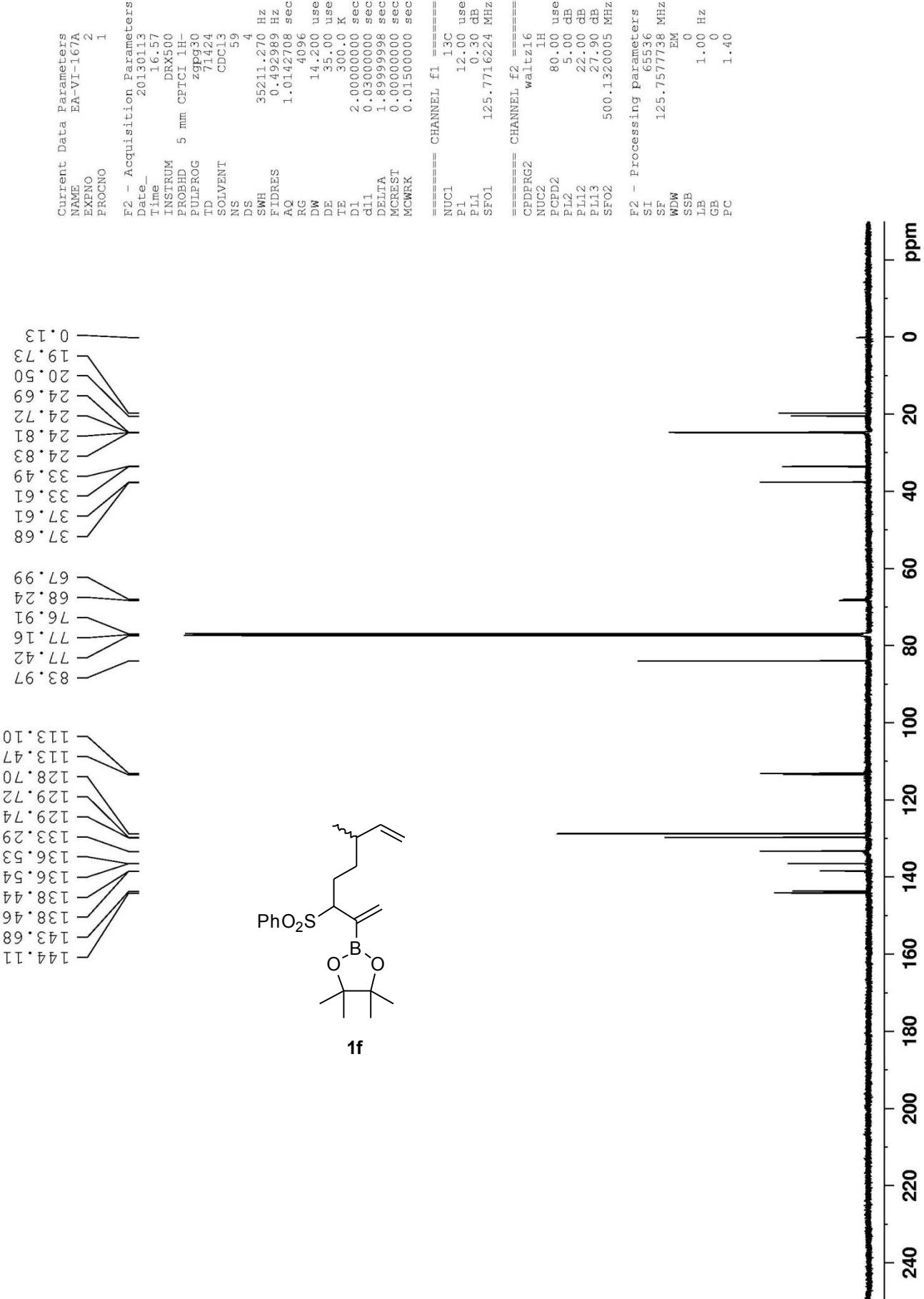
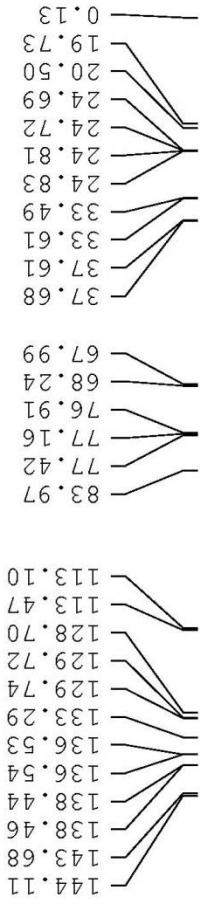
F2 - Processing parameters
SI          65536
SF        125.757770 MHz
WDW        EM
SSB          0
LB        1.00 Hz
GB          0
PC        1.40

```



EA-VI-167A

13C NMR



EA-VI-180A

Current Data Parameters
NAME EA-VI-180A
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20130122
Time 8.41
INSTRUM DIX500
PROBHD 5 mm CPTCI 1H-
PULPROG zg30
TD 65536
CDC13 8
SOLVENT NS
DS 2
SWH 10330.578 Hz
FIDRES 3.1719923 sec
AQ 1.8
RG 48.400 usec
DW 6.00 usec
DE 300.0 K
TE 1.0000000 sec
D1 0.0000000 sec
MCREST 0.0150000 sec
MCMRK

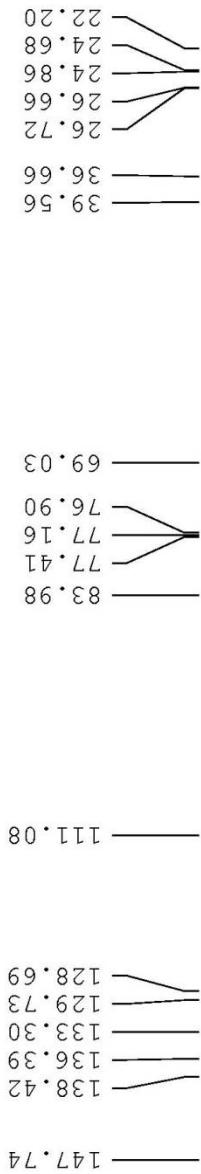
===== CHANNEL f1 =====

NJ1C1 1H
P1 8.00 usec
PL1 4.30 dB
SF01 500.1335009 MHz

F2 - Processing parameters
SI 32768
SF 500.1300112 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

<img alt="1H NMR spectrum of compound 1h. The x-axis represents chemical shift in ppm, ranging from 0.00 to 10.00. The spectrum shows several distinct signals: a sharp peak at 1.02 ppm (t, integration 1.05), a peak at 1.10 ppm (t, integration 1.02), a peak at 1.30 ppm (t, integration 1.05), a peak at 1.63 ppm (s, integration 1.31), a peak at 2.06 ppm (t, integration 1.00), a peak at 2.10 ppm (t, integration 1.05), a peak at 2.48 ppm (s, integration 1.02), a peak at 3.87 ppm (t, integration 1.05), a peak at 4.89 ppm (t, integration 1.05), a peak at 5.72 ppm (t, integration 1.05), a peak at 6.09 ppm (t, integration 1.05), a peak at 7.26 ppm (t, integration 1.05), a peak at 7.46 ppm (t, integration 1.05), a peak at 7.50 ppm (t, integration 1.05), a peak at 7.53 ppm (t, integration 1.05), a peak at 7.59 ppm (t, integration 1.05), a peak at 7.78 ppm (t, integration 1.05), a peak at 7.95 ppm (t, integration 1.05), a peak at 8.50 ppm (t, integration 1.05), a peak at 8.73 ppm (t, integration 1.05), a peak at 8.94 ppm (t, integration 1.05), a peak at 9.10 ppm (t, integration 1.05), a peak at 9.16 ppm (t, integration 1.05), a peak at 9.23 ppm (t, integration 1.05), a peak at 9.31 ppm (t, integration 1.05), a peak at 9.47 ppm (t, integration 1.05), a peak at 9.56 ppm (t, integration 1.05), a peak at 9.65 ppm (t, integration 1.05), a peak at 9.71 ppm (t, integration 1.05), a peak at 9.79 ppm (t, integration 1.05), a peak at 9.80 ppm (t, integration 1.05), a peak at 9.82 ppm (t, integration 1.05), a peak at 9.83 ppm (t, integration 1.05), a peak at 9.84 ppm (t, integration 1.05), a peak at 9.85 ppm (t, integration 1.05), a peak at 9.86 ppm (t, integration 1.05), a peak at 9.87 ppm (t, integration 1.05), a peak at 9.88 ppm (t, integration 1.05), a peak at 9.89 ppm (t, integration 1.05), a peak at 9.90 ppm (t, integration 1.05), a peak at 9.91 ppm (t, integration 1.05), a peak at 9.92 ppm (t, integration 1.05), a peak at 9.93 ppm (t, integration 1.05), a peak at 9.94 ppm (t, integration 1.05), a peak at 9.95 ppm (t, integration 1.05), a peak at 9.96 ppm (t, integration 1.05), a peak at 9.97 ppm (t, integration 1.05), a peak at 9.98 ppm (t, integration 1.05), a peak at 9.99 ppm (t, integration 1.05), a peak at 10.00 ppm (t, integration 1.05). The chemical structure of compound 1h is shown, featuring a central carbon atom bonded to a phenylsulfone group (-PhO2S-) and two allyl groups, with two boron atoms coordinated to two diisopropyl ether groups.</p>

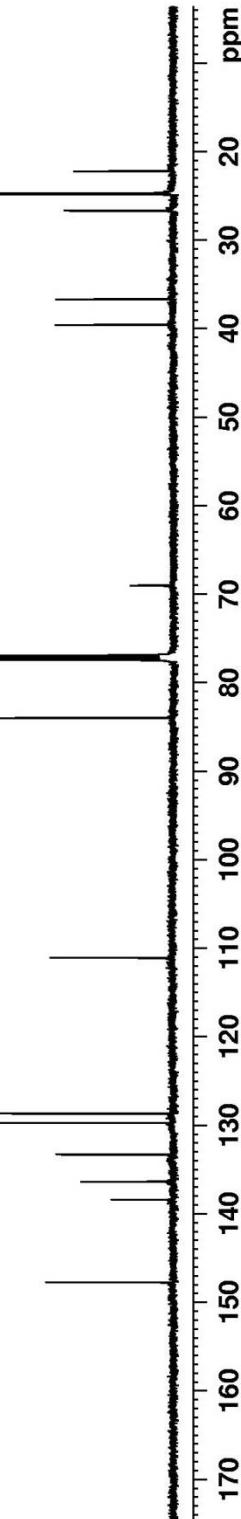
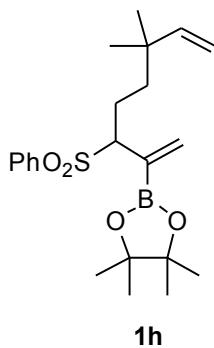
¹³C NMR



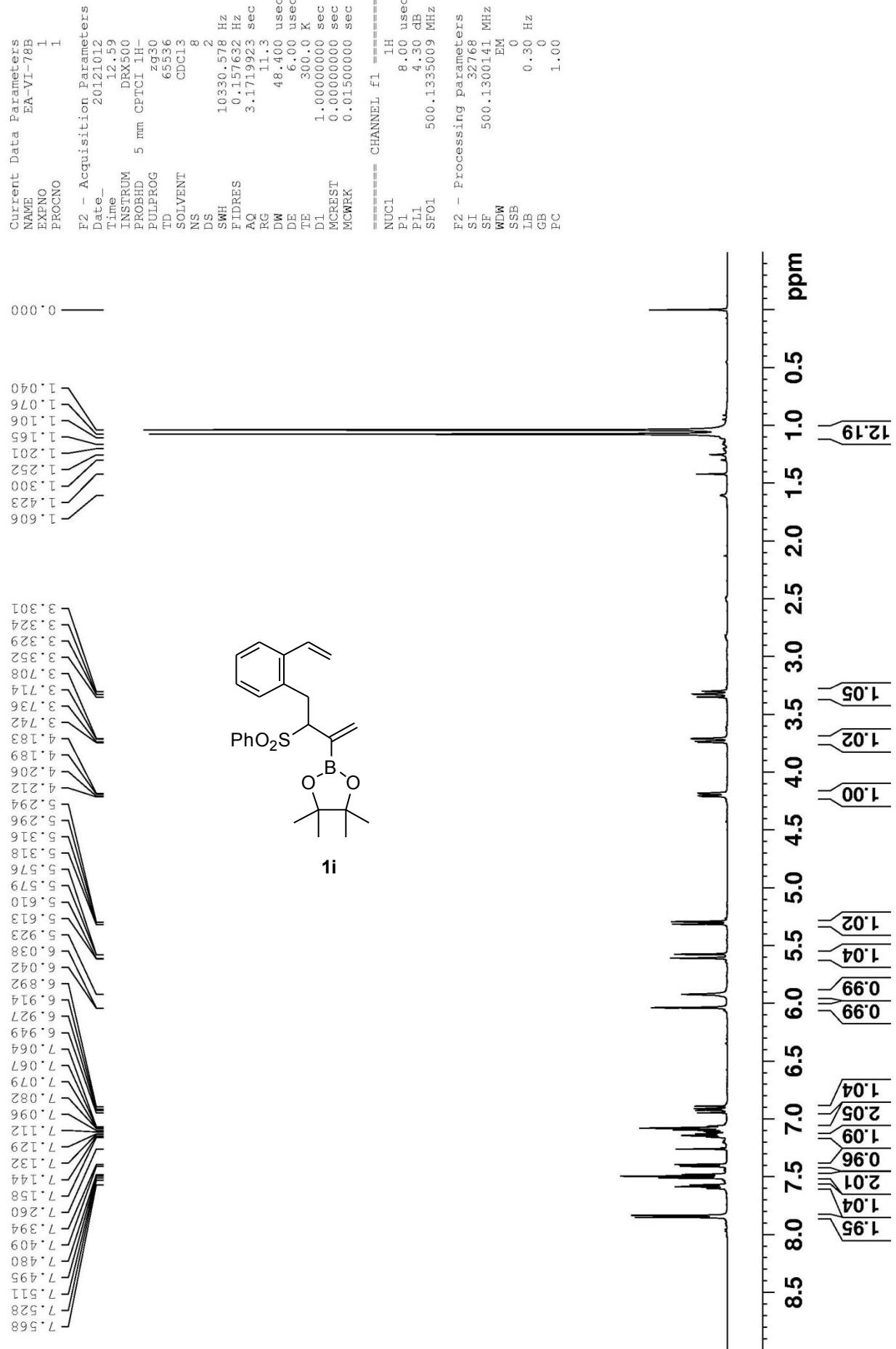
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Current Data Parameters
NAME          EA-VI-180A
EXPNO         2
PROCNO        1
F2 - Acquisition Parameters
Date_        20130122
Time       8.45
INSTRUM     DRX500
PROBHD      5 mm CPTCI 1H-
PULPROG    zgpp30
TD        71124
SOLVENT      CDCl3
NS           78
DS            4
SWH       35211.270 Hz
FIDRES     0.492289 Hz
AQ        1.0142208 sec
RG        4096
DW        14.200 usec
DE        35.00 usec
TE        300.0 K
D1        2.0000000 sec
d11       0.03000000 sec
DELT1      1.8999998 sec
MCREST      0.0000000 sec
MCWRK      0.01500000 sec
===== CHANNEL f1 =====
NUC1        13C
P1        12.00 usec
PL1       0.30 dB
SFO1     125.7716224 MHz
===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2        1H
PCPD2      80.00 usec
PL2        5.00 dB
PL12      22.00 dB
PL13      27.90 dB
SFO2     500.1320005 MHz
F2 - Processing parameters
SI        65536
SF       125.7577727 MHz
WDW        EM
SSB        0
LB        1.00 Hz
GB        0
PC        1.40

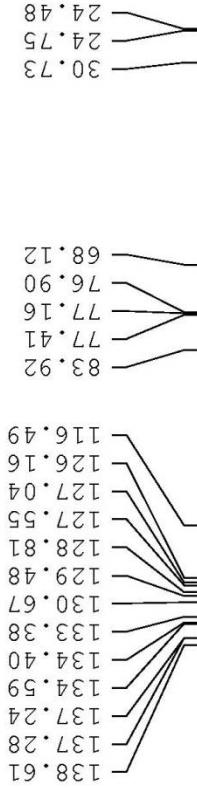
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EA-VI-78B



13C NMR



F2 - Acquisition Parameters

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Date_ 20121012
Time 13.04
INSTRUM DRX500
PROBHD 5 mm CPTCI 1H-
PULPROG zppg30
TD 71424
SOLVENT CDCl3
NS 95
DS 4
SWH 35211.270 Hz
FIDRES 0.493989 Hz
AQ 1.0142708 sec
RG 4096
DW 14.200 usec
DE 35.00 usec
TE 300.0 K
D1 2.0000000 sec
d11 0.0300000 sec
sec
DELTA 1.8999998 sec
MCREST 0.00000 sec
MCWRK 0.0150000 sec

```

===== CHANNEL f1 =====

```

NUC1 13C
P1 12.00 usec
PL1 0.30 dB
SF01 125.7716224 MHz

```

===== CHANNEL f2 =====

```

CPDRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 5.00 dB
PL12 22.00 dB
PL13 27.90 dB
SF02 500.1320005 MHz

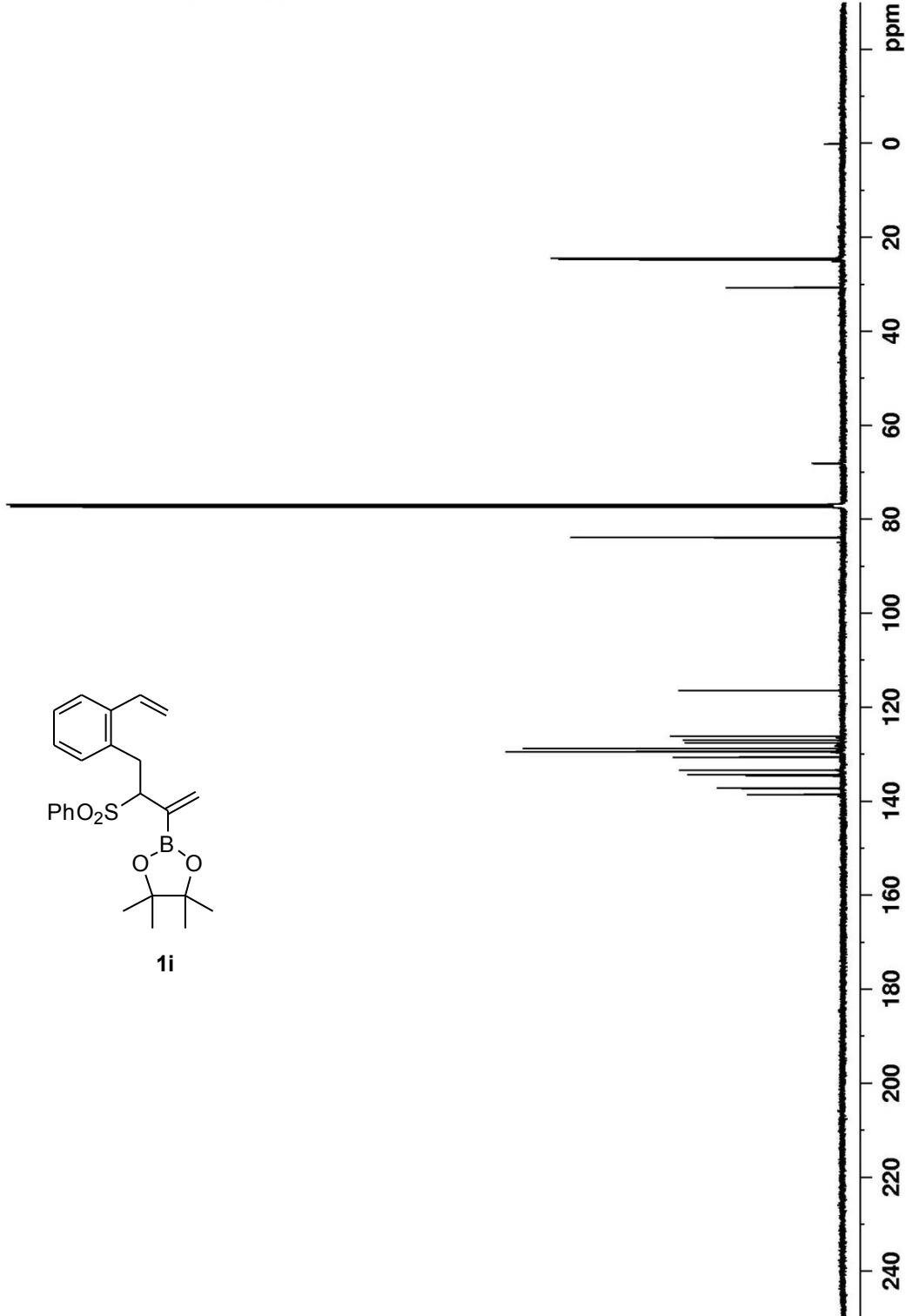
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F2 - Processing parameters

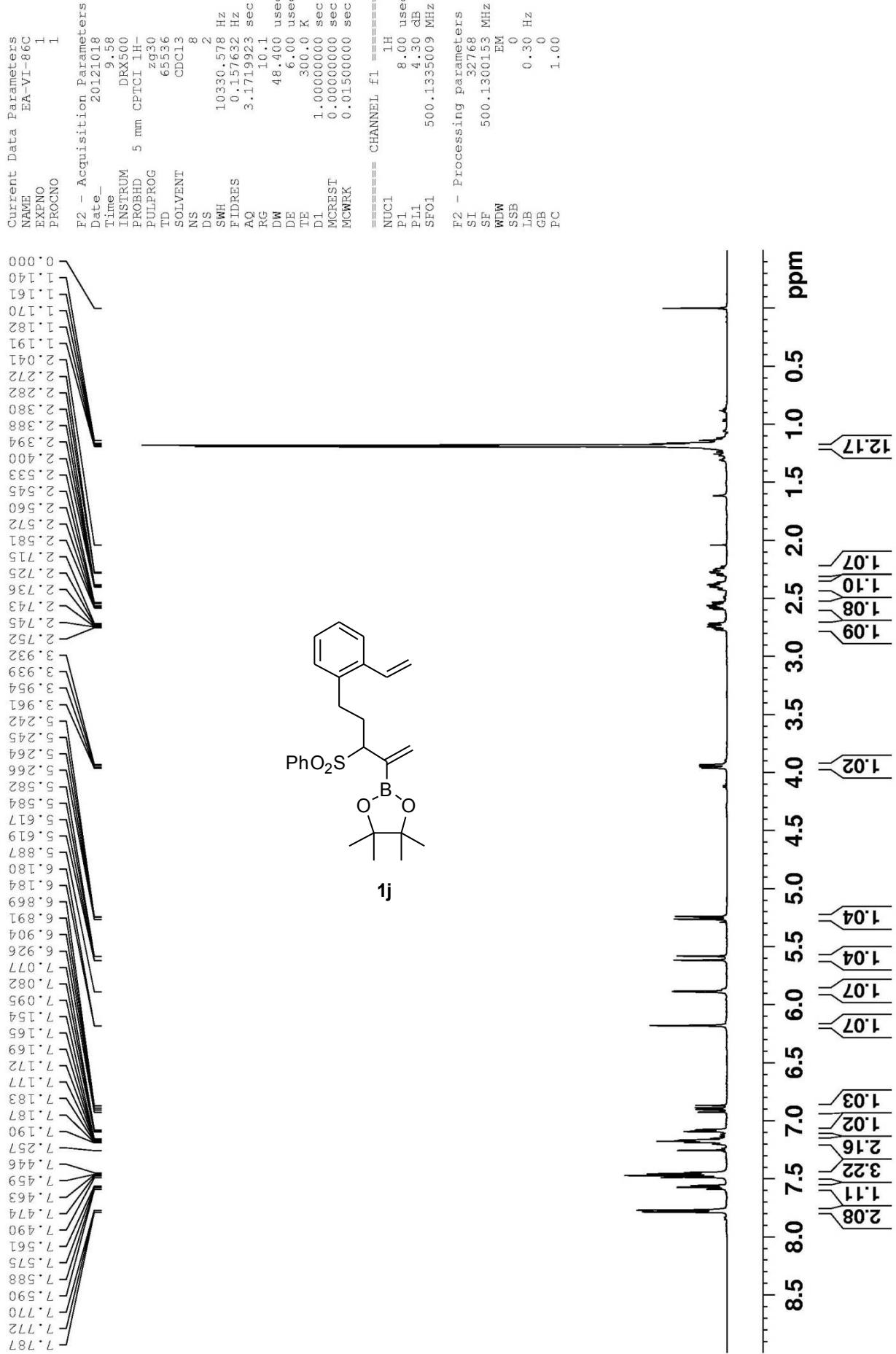
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SI 65536
SF 125.7577748 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

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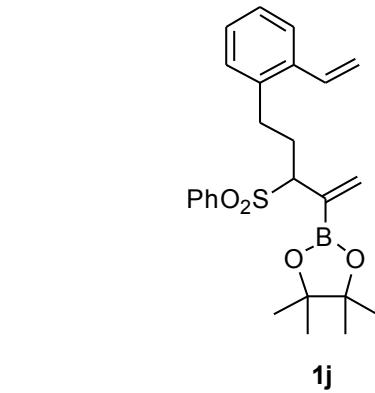


EA-VI-86C



13C NMR

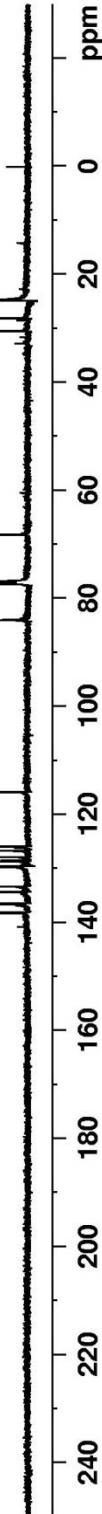
30.60
28.22
24.88
24.72
24.10
77.16
77.41
76.90
68.24
115.95
126.02
126.77
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129.70
129.76
133.43
134.43
136.69
138.18
138.31



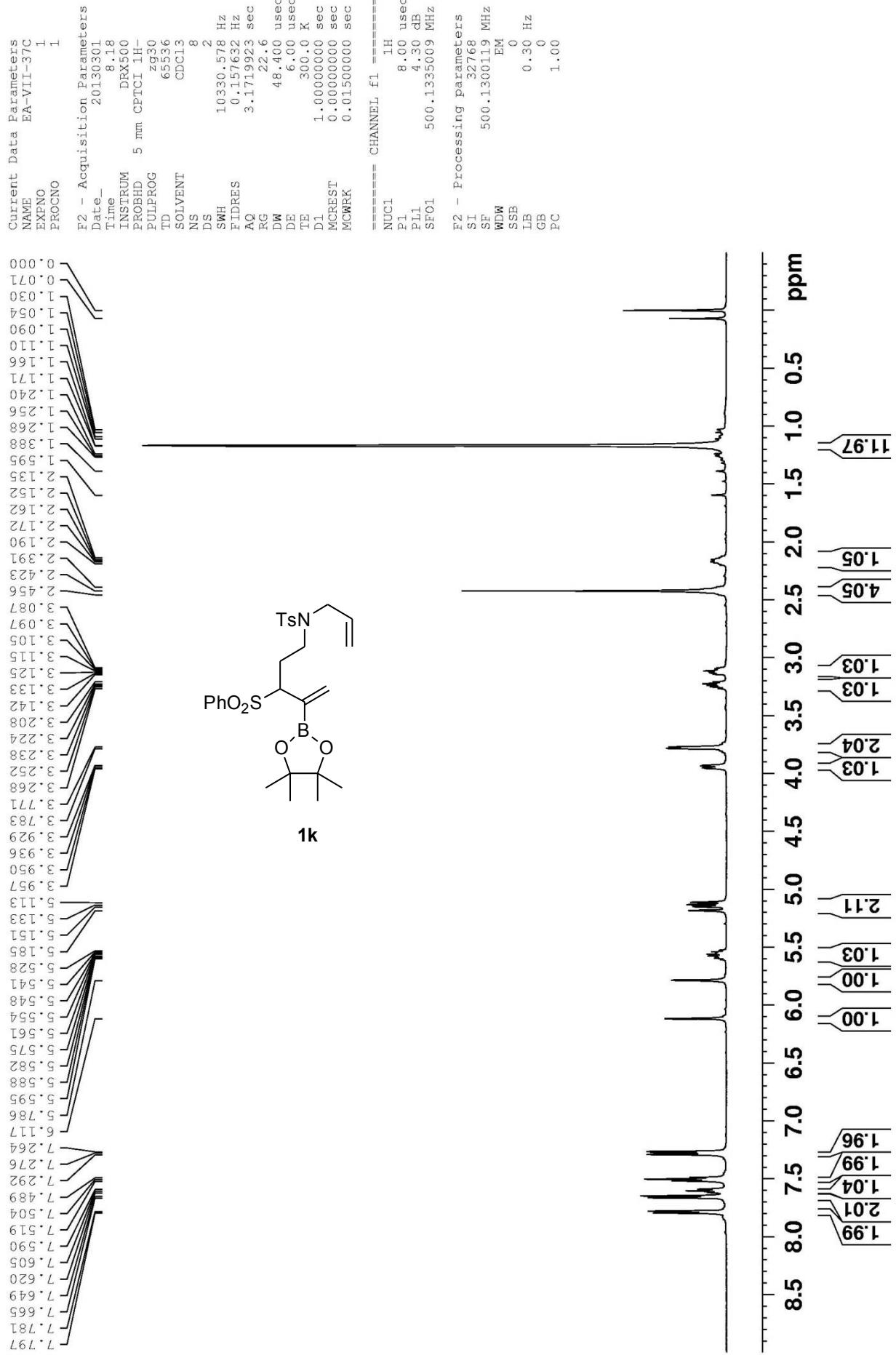
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Current Data Parameters          EA-VI-86C
NAME                           2
EXPNO                          1
PROCNO                         1
F2 - Acquisition Parameters
Date_                           2012/01/18
Time                            10:06
INSTRUM                        DRX500
PROBHD                         5 mm CPTCI 1H-
PULPROG                        zpp930
TD                             71424
SOLVENT                         CDCl3
NS                            139
DS                            4
SWH                           35211.270 Hz
ETIDRES                        0.492389 Hz
AQ                            1.0142708 sec
RG                            4096
DW                            14.200 usec
DE                            35.00 usec
TE                            300.0 K
D1                            2.0000000 sec
Q1                            0.0300000 sec
DELTA                          1.8999998 sec
NUCREST                        0.0000000 sec
NCWRFK                         0.0150000 sec
===== CHANNEL f1 =====
NUC1                           13C
F1                            12.00 usec
PL1                           0.30 dB
SF01                          125.7716224 MHz
===== CHANNEL f2 =====
CPDPRG2                        1H
NUC2                           1H
ECPD2                          80.00 usec
PL2                            5.00 dB
PL12                           22.00 dB
PL13                           27.90 dB
SF02                          500.1320005 MHz
F2 - Processing parameters
SI                            65536
SF                            125.7577754 MHz
WDW                           EM
SSB                           0
LB                            1.00 Hz
GB                           0
EC                            1.40

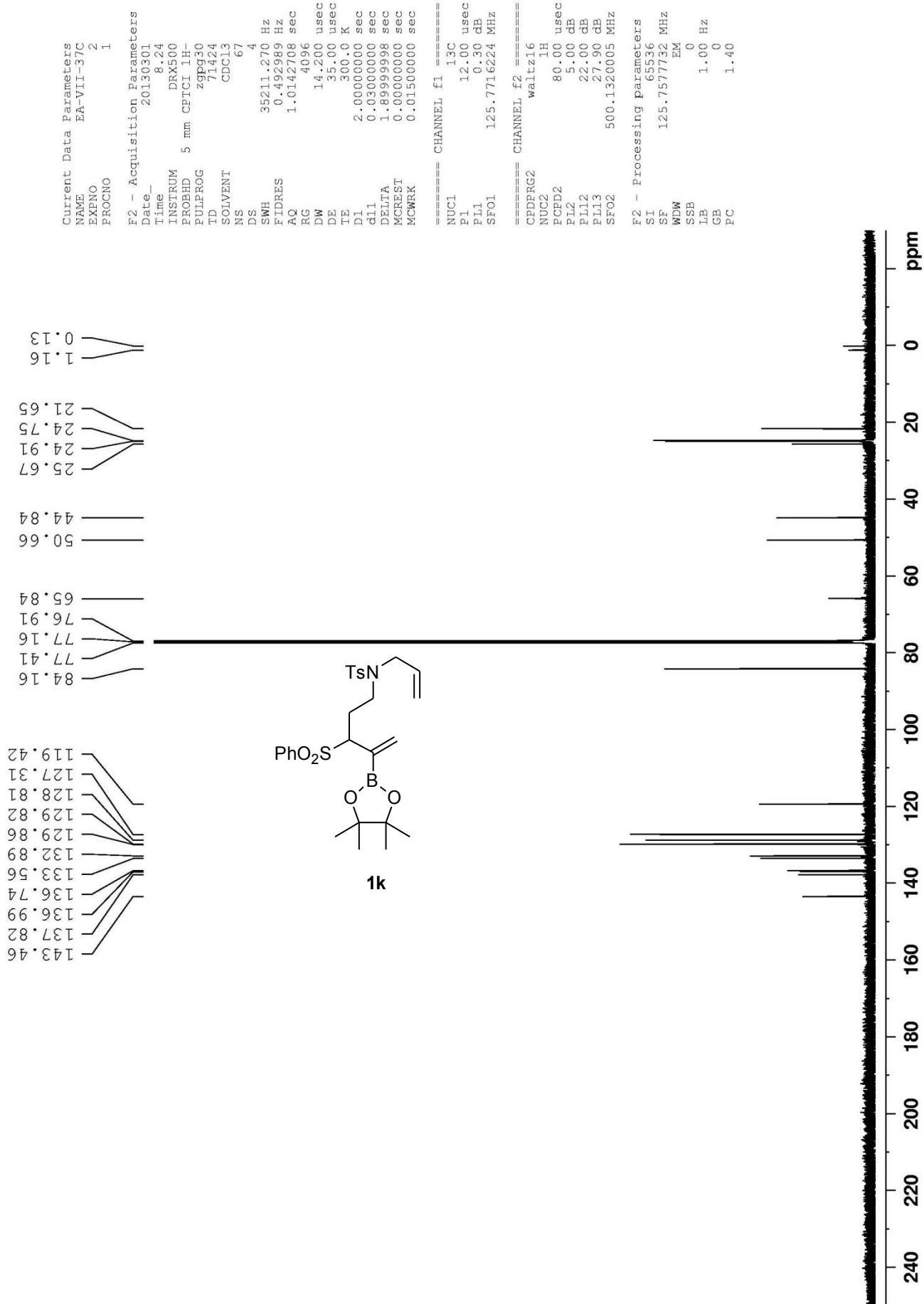
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1H NMR

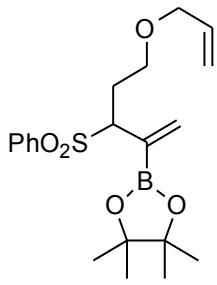
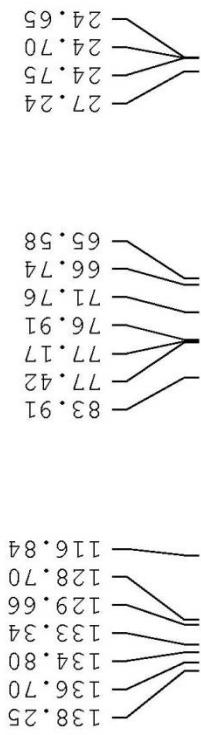


¹³C NMR



EA-VII-37A

¹³C NMR



```

Current Data Parameters
NAME          EA-VII-36C
EXPNO         2
PROCNO        1

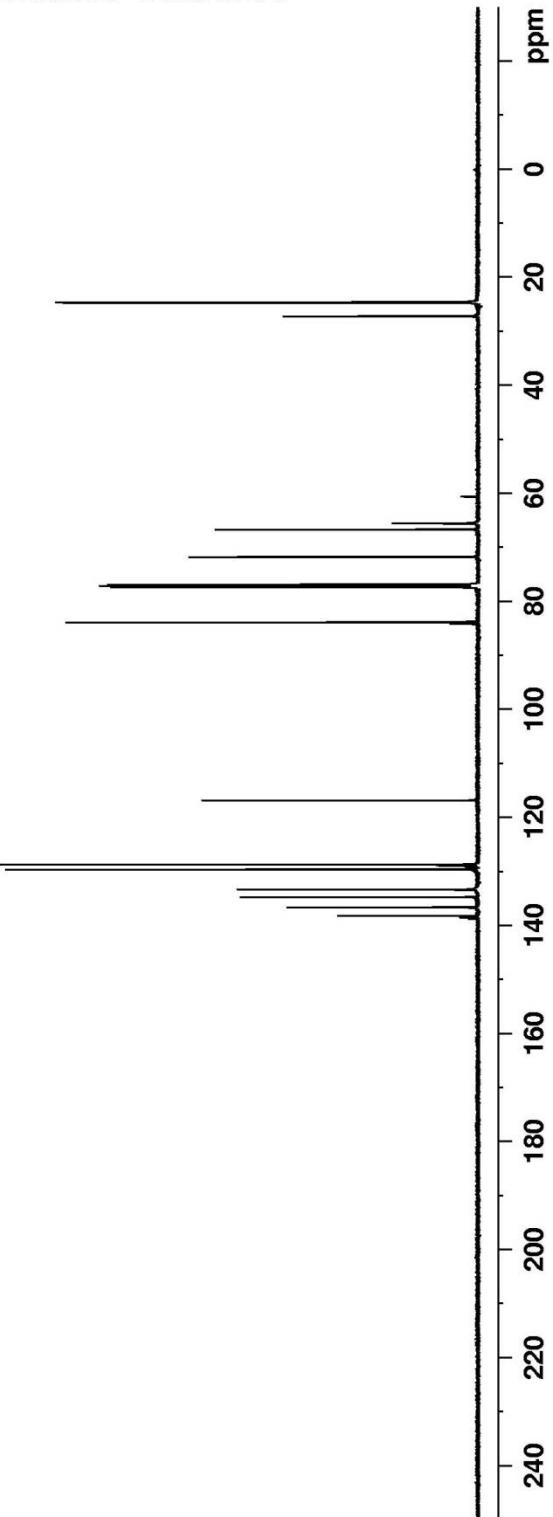
F2 - Acquisition Parameters
Date_        20130227
Time          10.18
INSTRUM      DRX500
PROBHD      5 mm CPTCI 1H-
PULPROG     zgpp930
TD           71424
SOLVENT       CDCl3
NS            84
DS            4
SWH         35211.270 Hz
FIDRES      0.492989 Hz
AQ           1.0142708 sec
RG           4096
DW           14.200 usec
DE           35.00 usec
TE           300.0 K
D1           2.0000000 sec
d11          0.0300000 sec
DELT1        1.8999998 sec
MCREST      0.0000000 sec
MCWRK       0.0150000 sec

===== CHANNEL f1 =====
NUC1        13C
PL1          12.00 usec
PL1         0.30 dB
SFO1       125.7716224 MHz

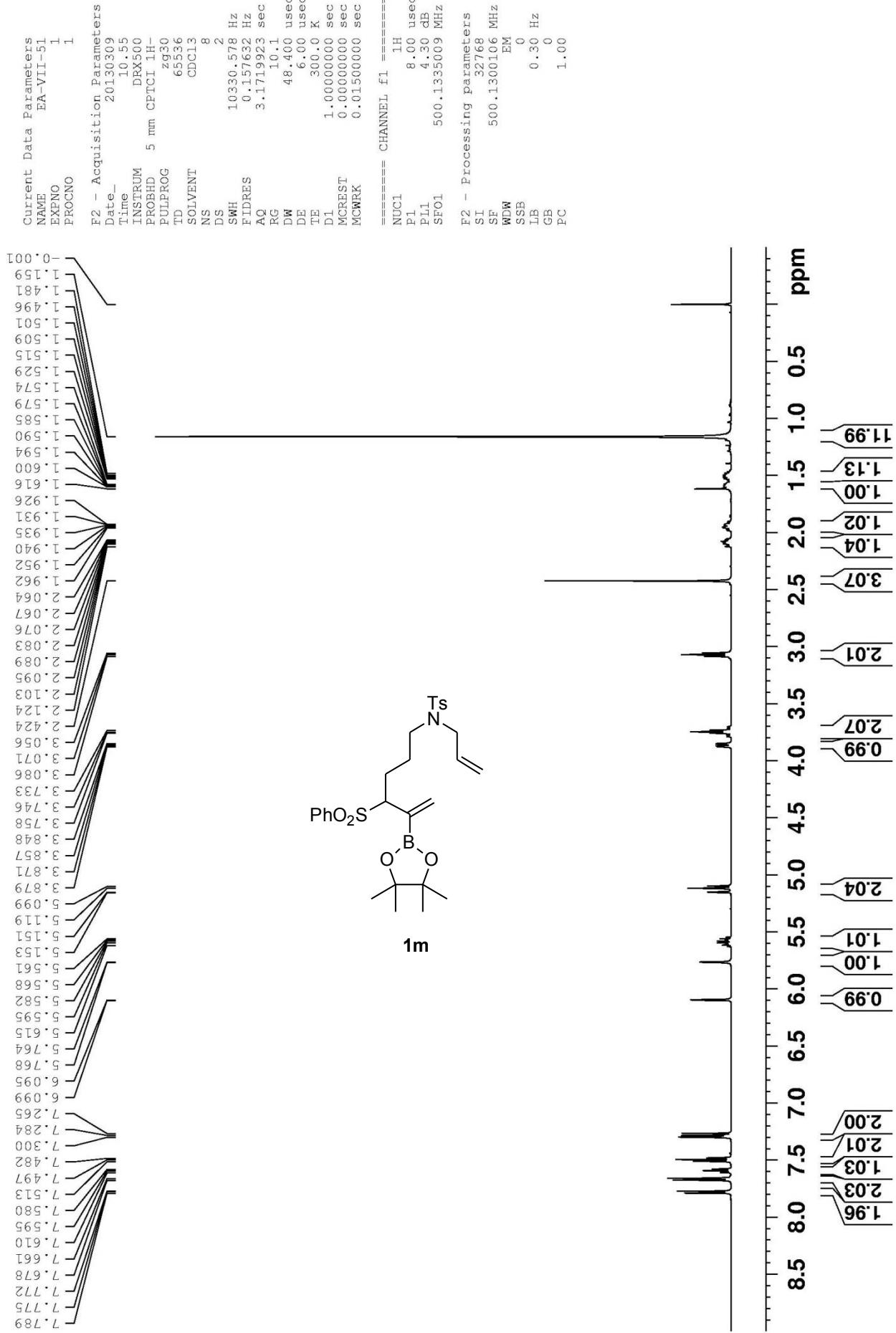
===== CHANNEL f2 =====
CPDPRG2    waltz16
NUC2          1H
PCPD2        80.00 usec
PL2          5.00 dB
PL12        22.00 dB
PL13        27.90 dB
SF02      500.1320005 MHz

F2 - Processing parameters
SI           65536
SF          125.757779 MHz
WDW         EM
SSB           0
LB           1.00 Hz
GB           0
PC          1.40

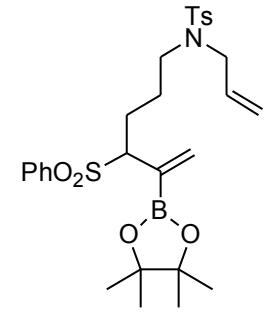
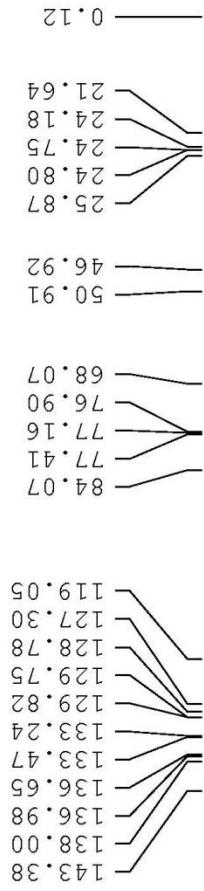
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EA-VII-51C



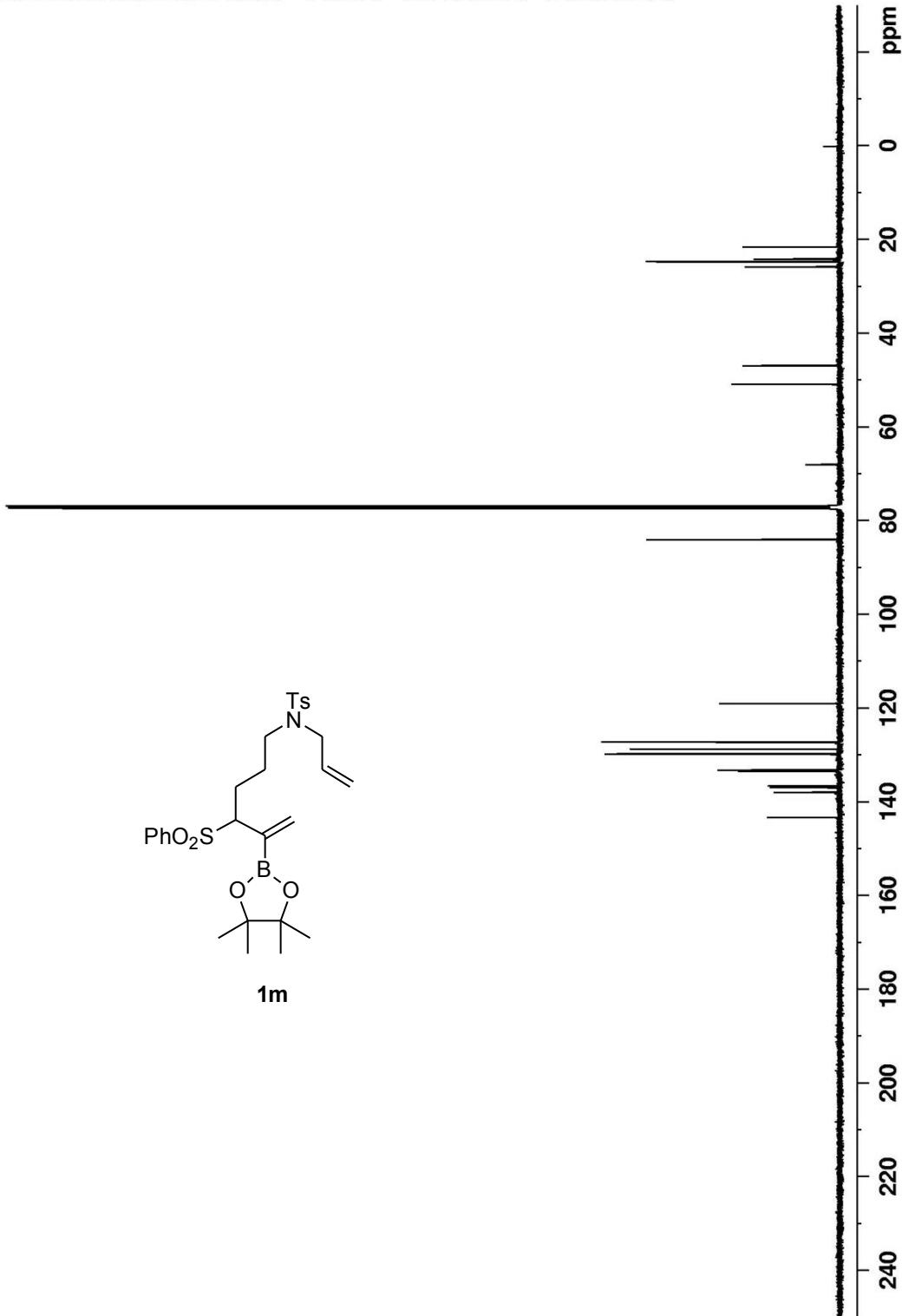
¹³C NMR



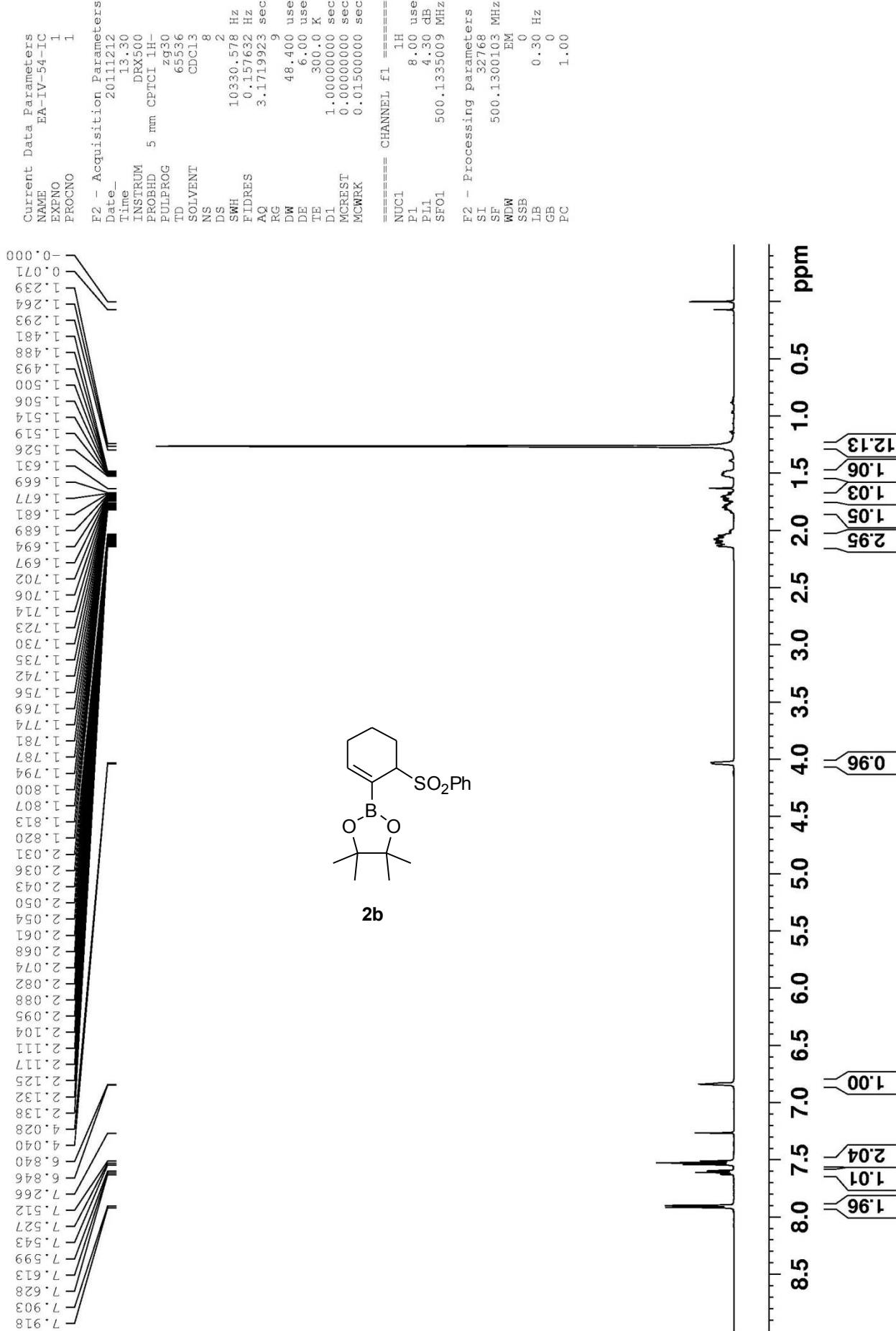
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Current Data Parameters
NAME          EA-VII-31
EXPTNO       2
PROCNO        1
Date_        20130309
Time_         11:02
INSTRUM     DRX500
PROBHD      5 mm CPTII 1H-
PULPROG    zgpg30
TD           71424
SOLVENT      CDCl3
NS            108
DS            4
SWH         35211.270 Hz
FIDRES     0.492983 Hz
AQ           1.0142708 sec
RG           4096
DW           14.200 usec
DE           35.00 usec
TE           300.0 K
D1           2.0000000 sec
d11        0.03000000 sec
DELT1       1.8939998 sec
MCPIST      0.0000000 sec
MCIRK       0.01500000 sec
===== CHANNEL f1 =====
NUC1        13C
P1           12.00 usec
PL1          0.30 dB
SFO1      125.7716224 MHz
===== CHANNEL f2 =====
CPDPRG2    waltz16
NUC2        1H
PCDD2      80.00 usec
PL2           5.00 dB
PL12         22.00 dB
PL13         27.90 dB
SFQ2      500.1320005 MHz
===== Processing parameters
SI           65536
SF          125.7577743 MHz
WDW         EM
SSB           0
LB           1.00 Hz
GB           0
PC          1.40

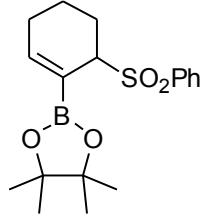
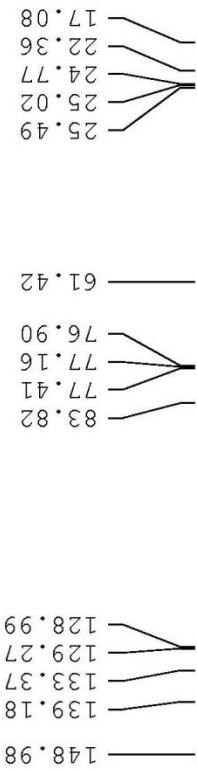
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EA-IV-54-IC



¹³C NMR



2b

```

Current Data Parameters
NAME      EA-IV-54-IC
EXPNO    2
PROCNO   1

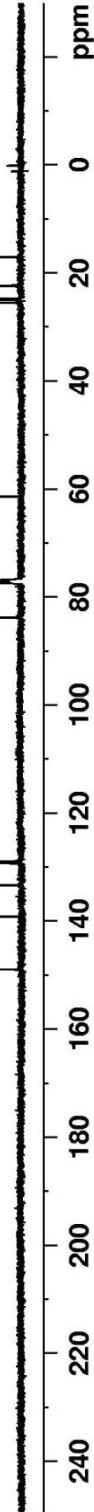
F2 - Acquisition Parameters
Date_   20111212
Time    13.39
INSTRUM DRX500
PROBID  5 mm CPTCI 1H-
PULPROG zgppg30
TD      71424
SOLVENT NS
NS      85
DS      4
SWH    35211.270 Hz
FIDRES 0.492989 Hz
AQ     1.012708 sec
RG      4096
DW      14.200 usec
DE      35.00 usec
TE      300.0 K
D1     2.0000000 sec
d11    0.0300000 sec
DELTAT 1.8999998 sec
MCREST 0.0000000 sec
MCRWKR 0.01500000 sec

===== CHANNEL f1 =====
NUC1    13C
P1      12.00 usec
PL1    0.30 dB
SF01   125.7716224 MHz

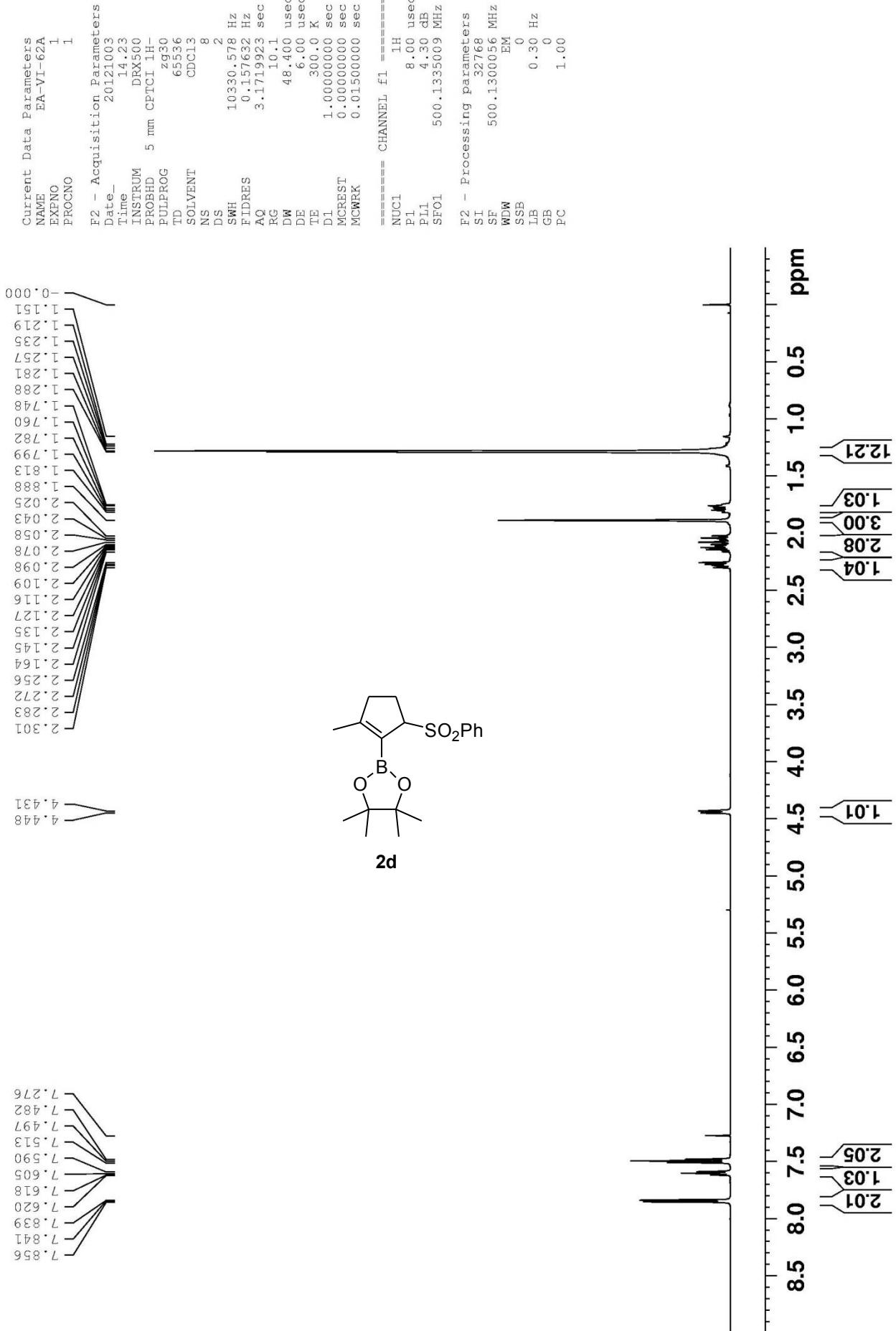
===== CHANNEL f2 =====
CPDPRG2  Waltz16
NUC2    1H
PCPD2   80.00 usec
PL2     5.00 dB
PL12   22.00 dB
PL13   27.90 dB
SF02   500.1320005 MHz

F2 - Processing parameters
SI      65536
SF      125.7577738 MHz
WDW    EM
SSB    0
LB     1.00 Hz
GB    0
PC    1.40

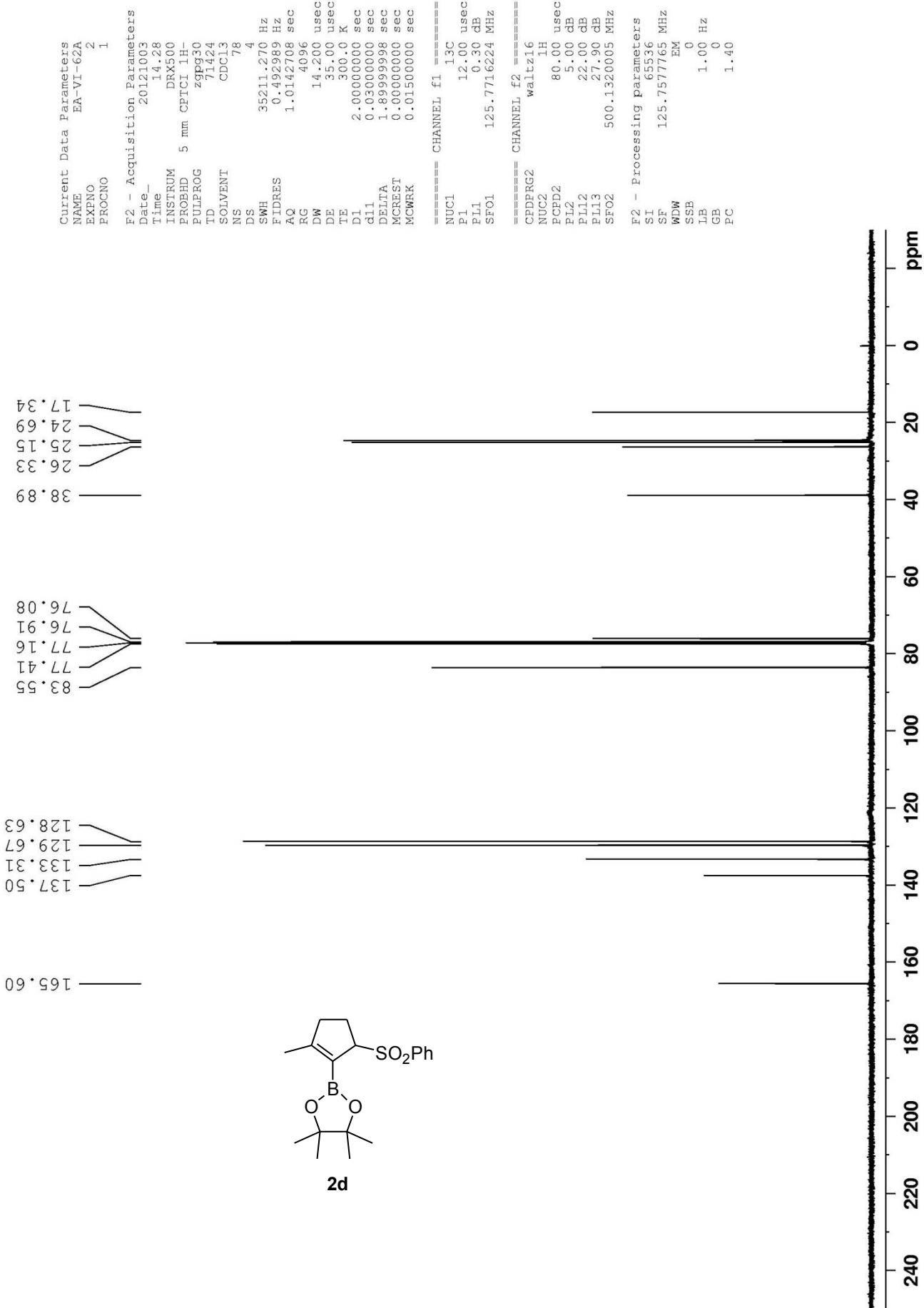
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EA-VI-62A

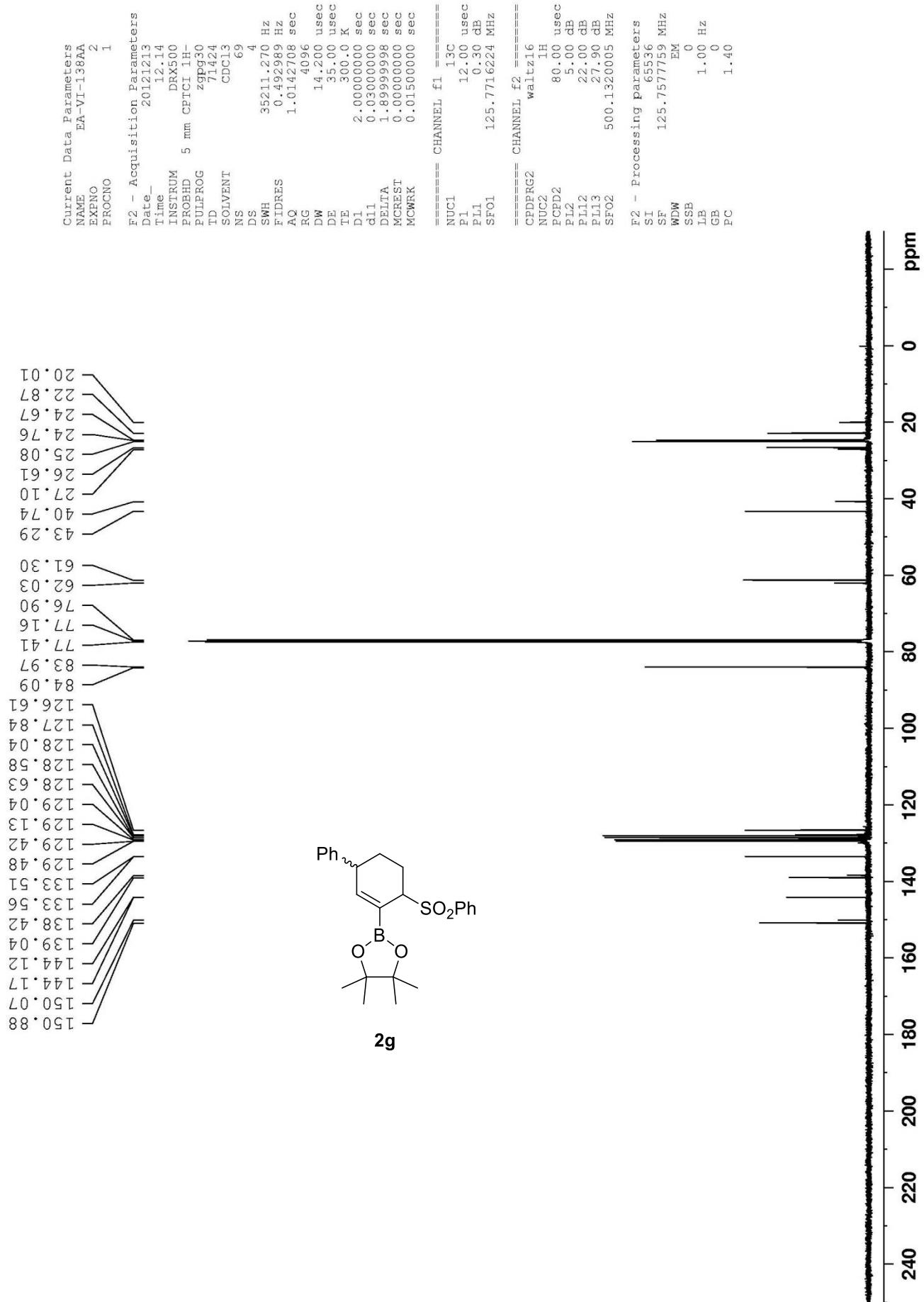


13C NMR

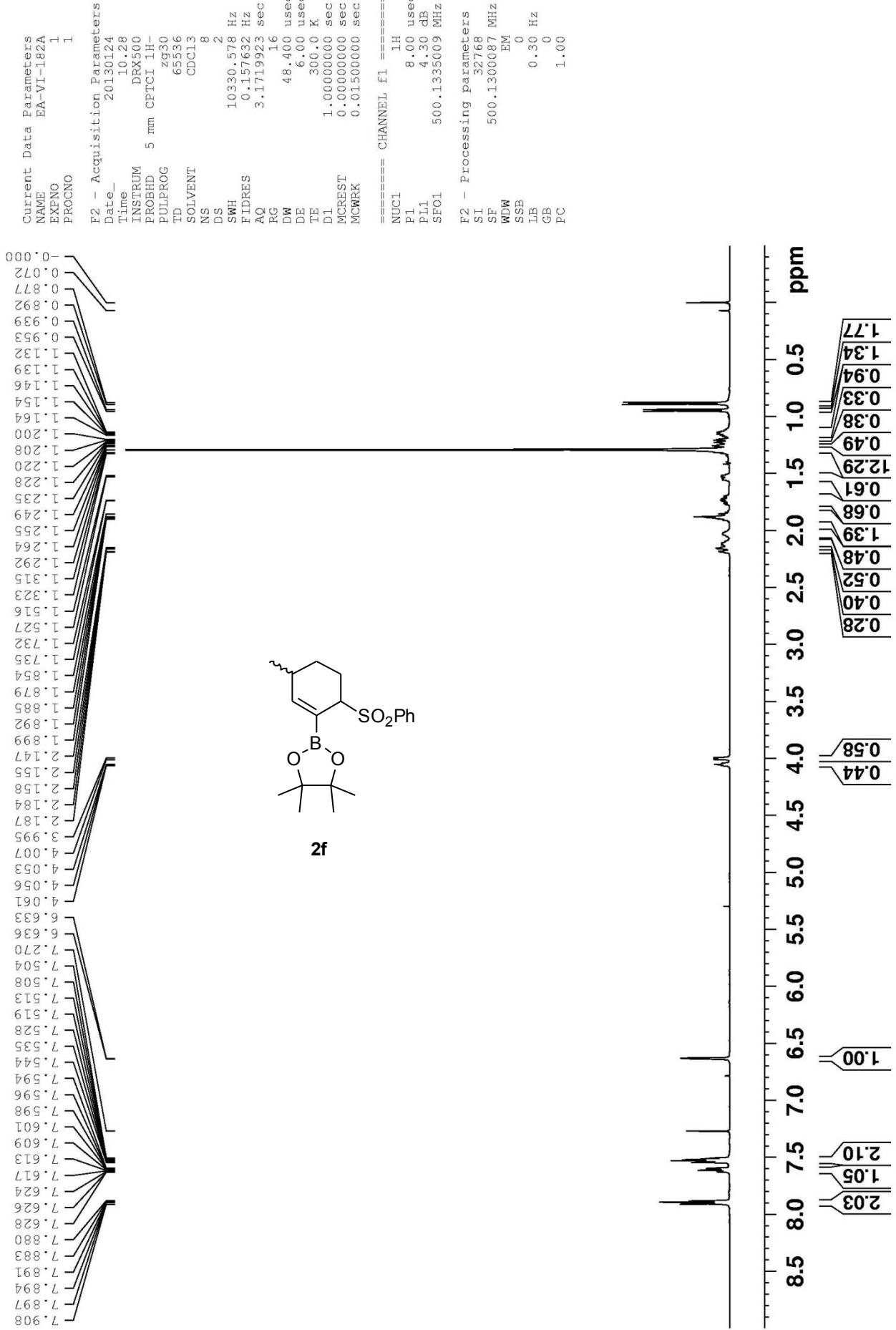


EA-VI-138AA

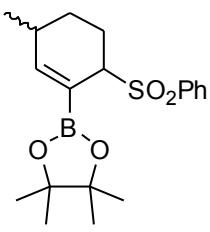
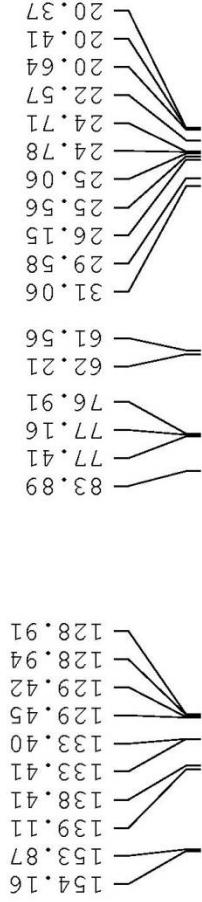
¹³C NMR



EA-VI-182A



¹³C NMR



2f

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Current Data Parameters
NAME EA-VI-182A
EXPNO 2
PROCNO 1

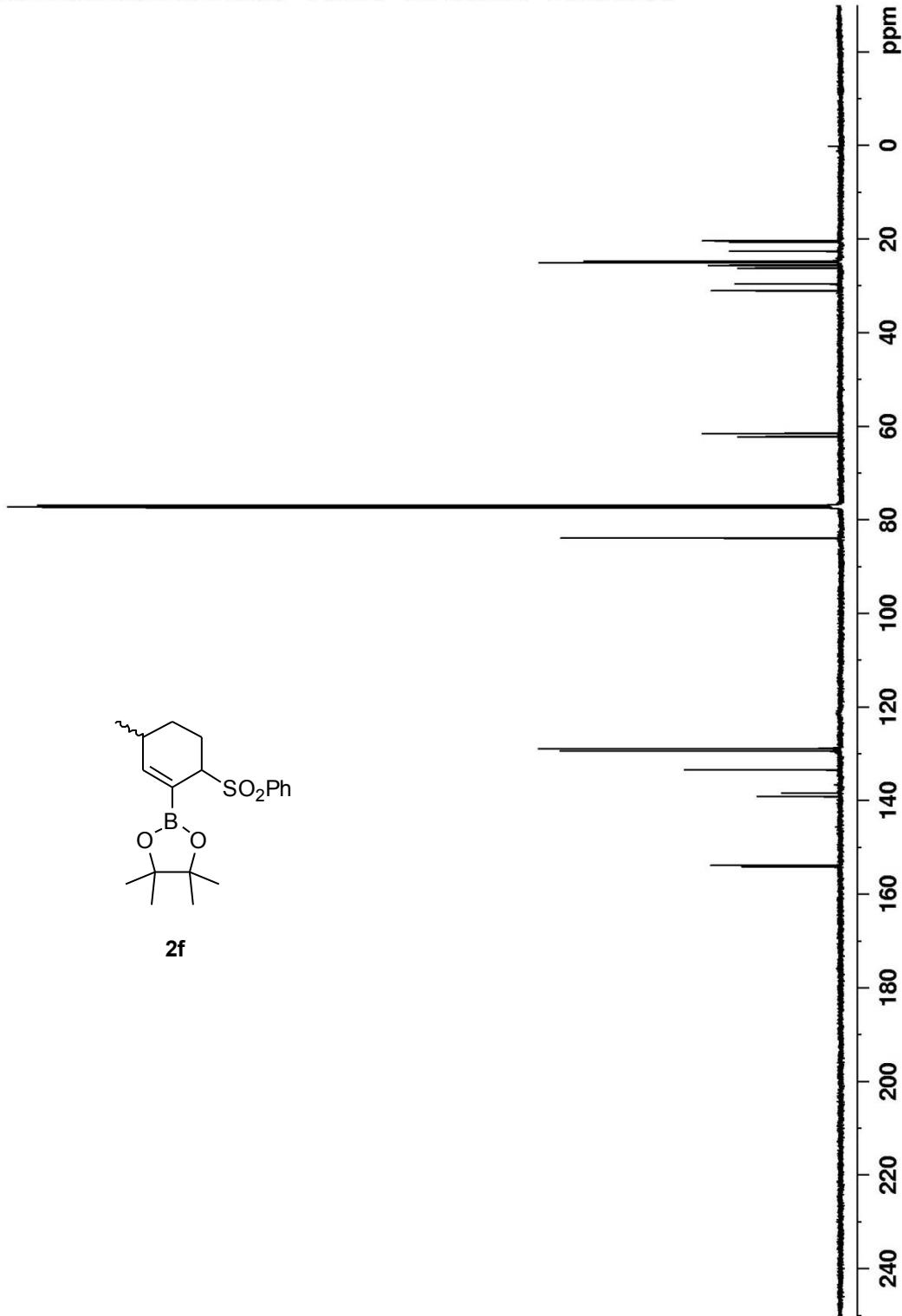
F2 - Acquisition Parameters
Date_ 20130124
Time 10.40
INSTRUM DRX500
PROBHD 5 mm CPTCI 1H-
PULPROG zgpg30
TD 71124
SOLVENT CDCl3
NS 160
DS 4
SWH 35211.270 Hz
FIDRES 0.492289 Hz
AQ 1.0142708 sec
RG 4096
DW 14.200 usec
DE 35.40 usec
TE 300.0 K
D1 2.0000000 sec
d11 0.0300000 sec
DELTA 1.8999998 sec
MCBEST 0.0000000 sec
MCWRK 0.01500000 sec

===== CHANNEL f1 =====
NUC1 13C
P1 12.00 usec
PL1 0.30 dB
SF01 125.7716224 MHz

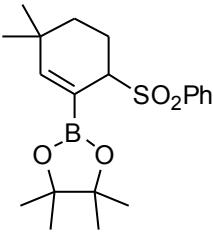
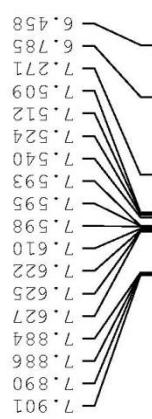
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL12 5.00 dB
PL12 22.00 dB
PL13 27.90 dB
SF02 500.1320005 MHz

F2 - Processing parameters
SI 65336
SF 125.7577738 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

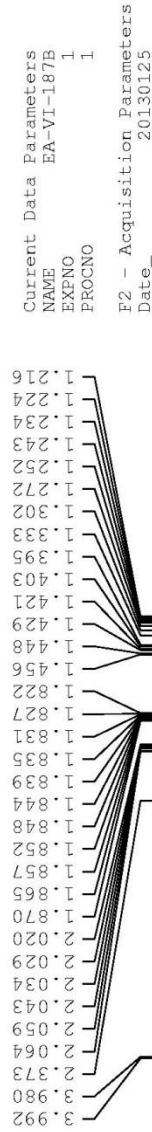
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EA-VI-187B



2h

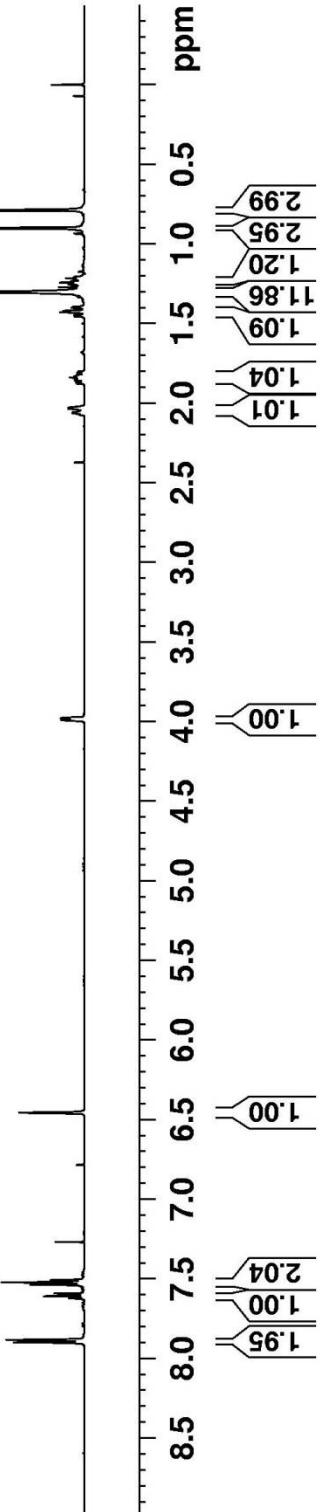


Current Data Parameters
NAME EA-VI-187B
EXPNO 1
PROCNO 1

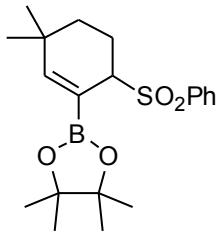
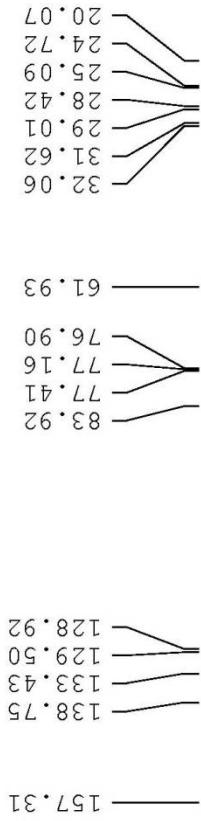
F2 - Acquisition Parameters
Date_ 20130125
Time 8.04
INSTRUM DRX500
PROBHD 5 mm CPTCI 1H-
PULPROG zg30
TD 65336
SOLVENT CDCl3
NS 8
DS 2
SWH 10330.578 Hz
FIDRES 0.157632 Hz
AQ 3.171923 sec
RG 14.3
DW 48.400 usec
DE 6.00 usec
TE 300.0 K
D1 1.0000000 sec
MCREST 0.0000000 sec
MWKR 0.0150000 sec

===== CHANNEL f1 =====
NUC1 1H
P1 8.00 usec
PL1 4.30 dB
SF01 500.1335009 MHz

F2 - Processing parameters
SI 32768
SF 500.1300078 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



¹³C NMR



2h

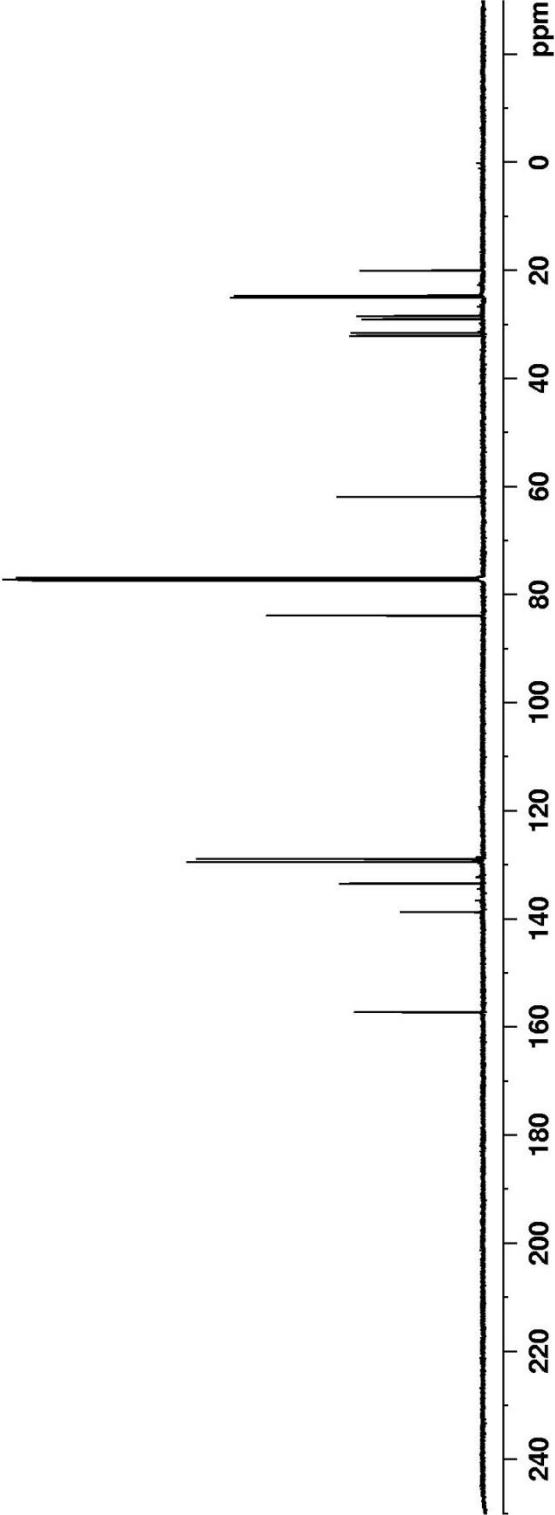
Current Data Parameters
NAME EA-VI-1878
EXFNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20130125
Time_ 8:09
INSTRUM DRX500
PROBHD 5 mm CPTCI 1H
PULPROG zgpg30
TD 71424
SOLVENT CDCl3
NS 61
DS 4
SWH 35211.270 Hz
FIDRES 0.492983 Hz
AQ 1.0142708 sec
RG 4096

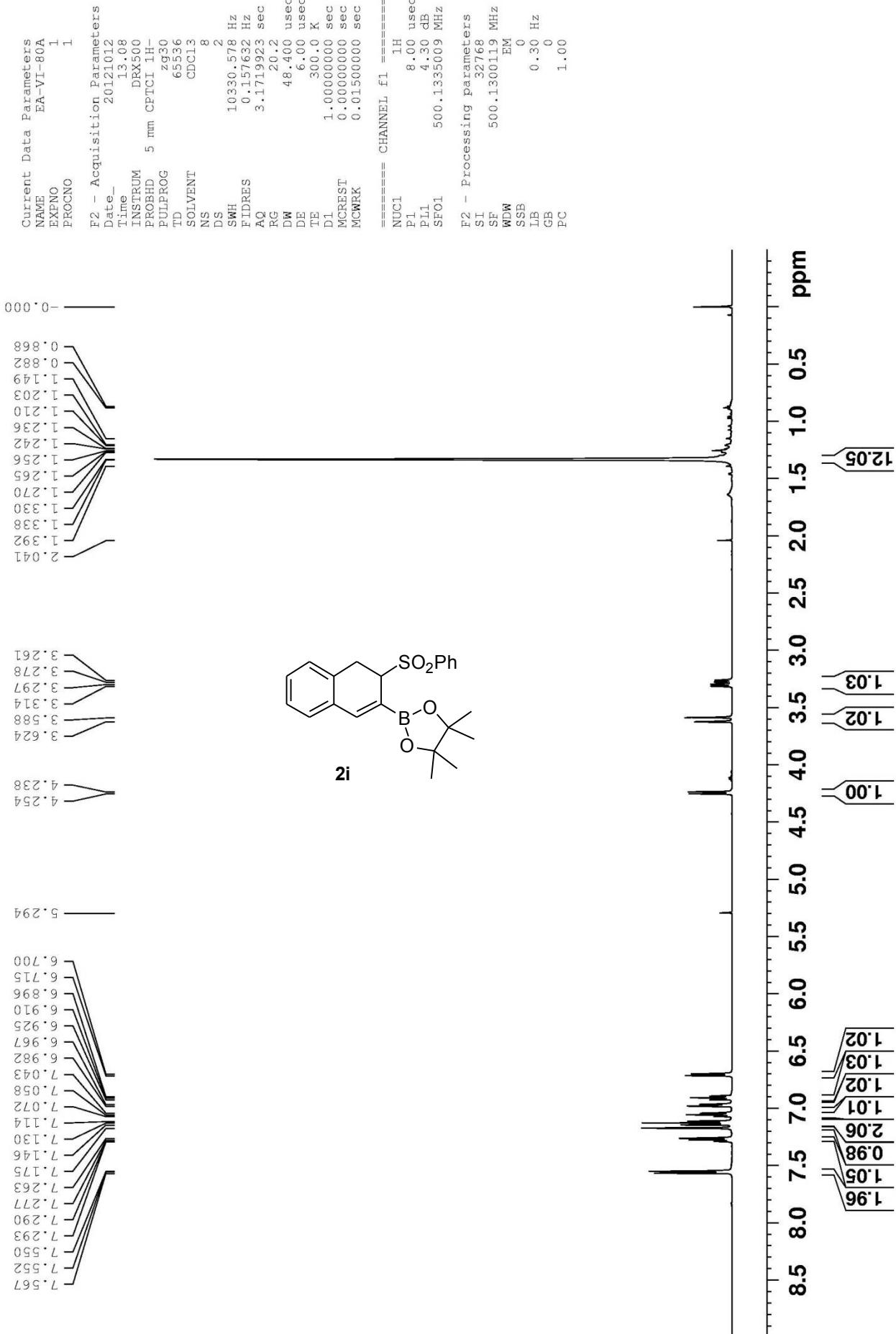
DW 14.200 usec
DE 35.00 usec
TE 300.0 K
D1 2.0000000 sec
d11 0.03000000 sec
DELT1 1.8939998 sec
MCNEST 0.0000000 sec
MCNTRK 0.01500000 sec

===== CHANNEL f1 ======
NUC1 13C
P1 12.00 usec
PL1 0.30 dB
SFO1 125.7716224 MHz
===== CHANNEL f2 ======
NUC2 1H
PCPD2 80.00 usec
PL2 5.00 dB
PL12 22.00 dB
PL13 27.90 dB
SFQ2 500.1320005 MHz

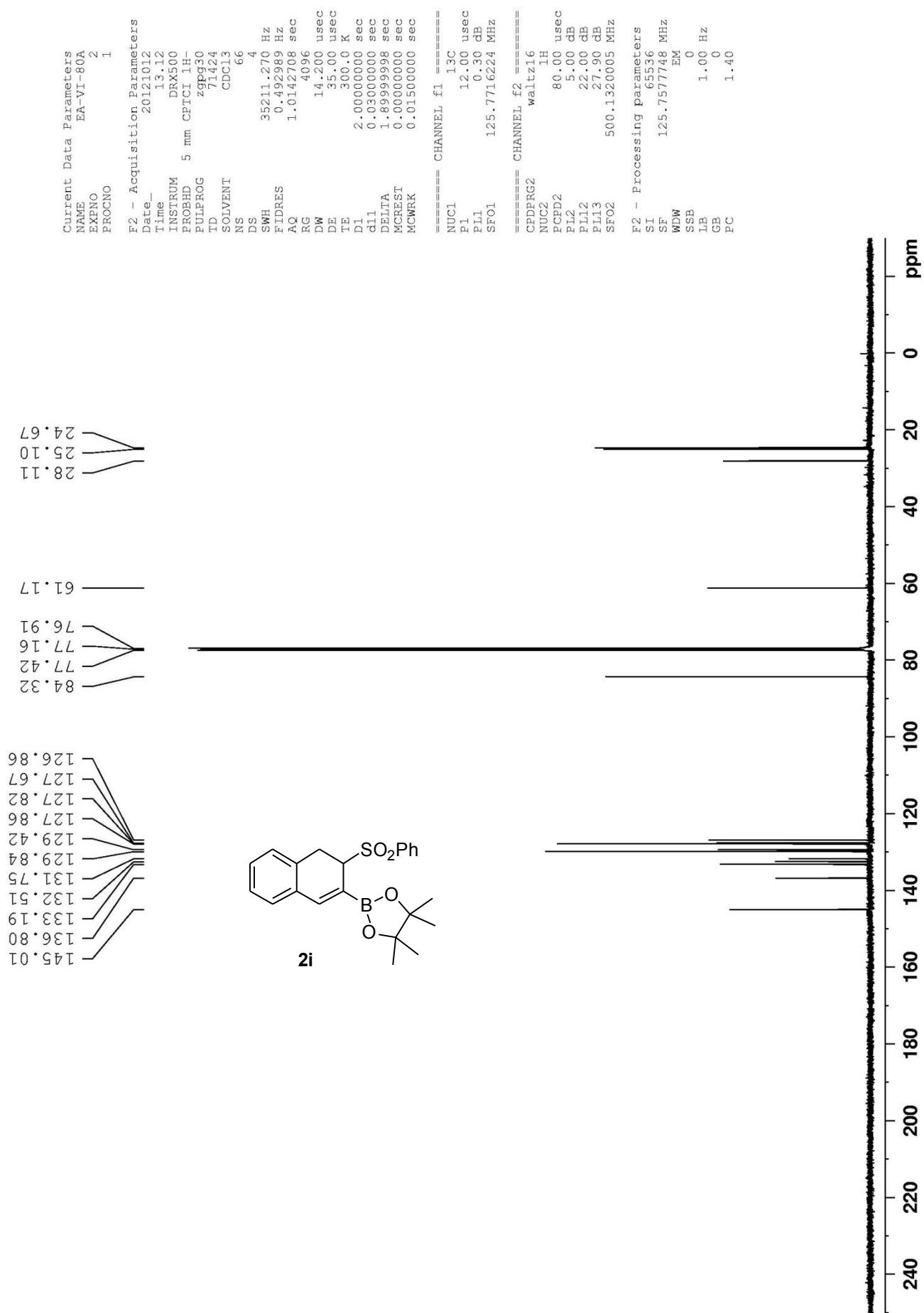
F2 - Processing parameters
SI 65536
SF 125.7577748 MHz
WIDW 0
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



EA-VI-80A

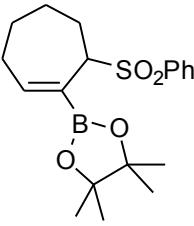


¹³C NMR



EA-VI-34B

6.787
7.093
7.105
7.115
7.123
7.262
7.483
7.498
7.514
7.570
7.585
7.600
7.871
7.873
7.888



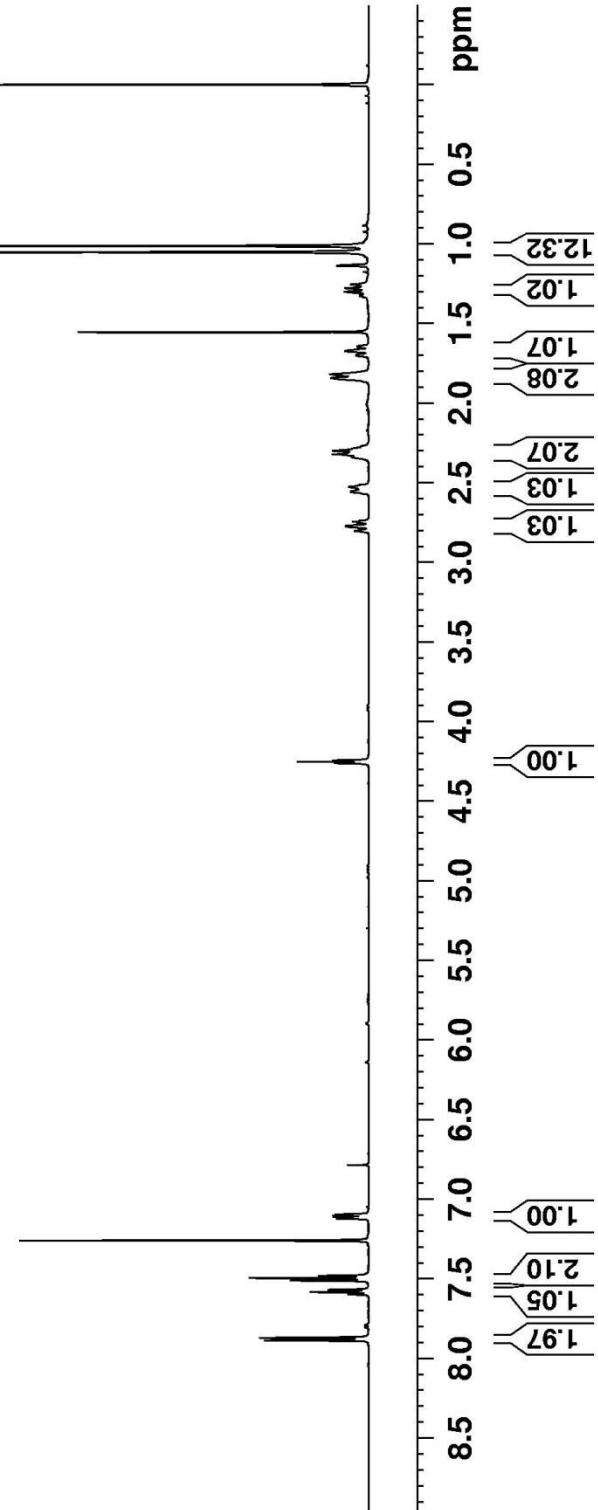
2c

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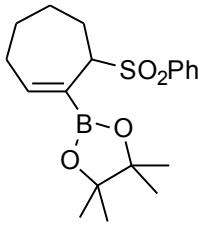
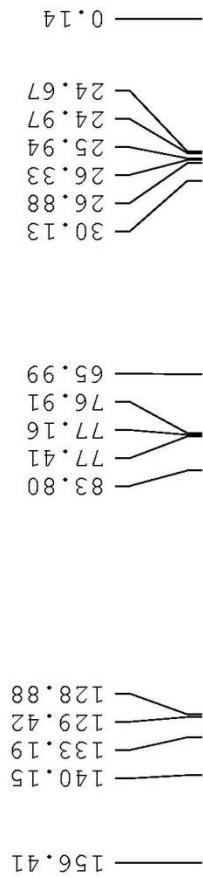
===== CHANNEL f1 =====
NUC1          1H
P1           8.00  usec
PLL          4.30  dB
SFO1        500.1335009 MHz

F2 - Processing Parameters
SI            32768
SF          500.1300131 MHz
WFW          EM
SSB            0
LB            0.30  Hz
GB            0
PC            1.00

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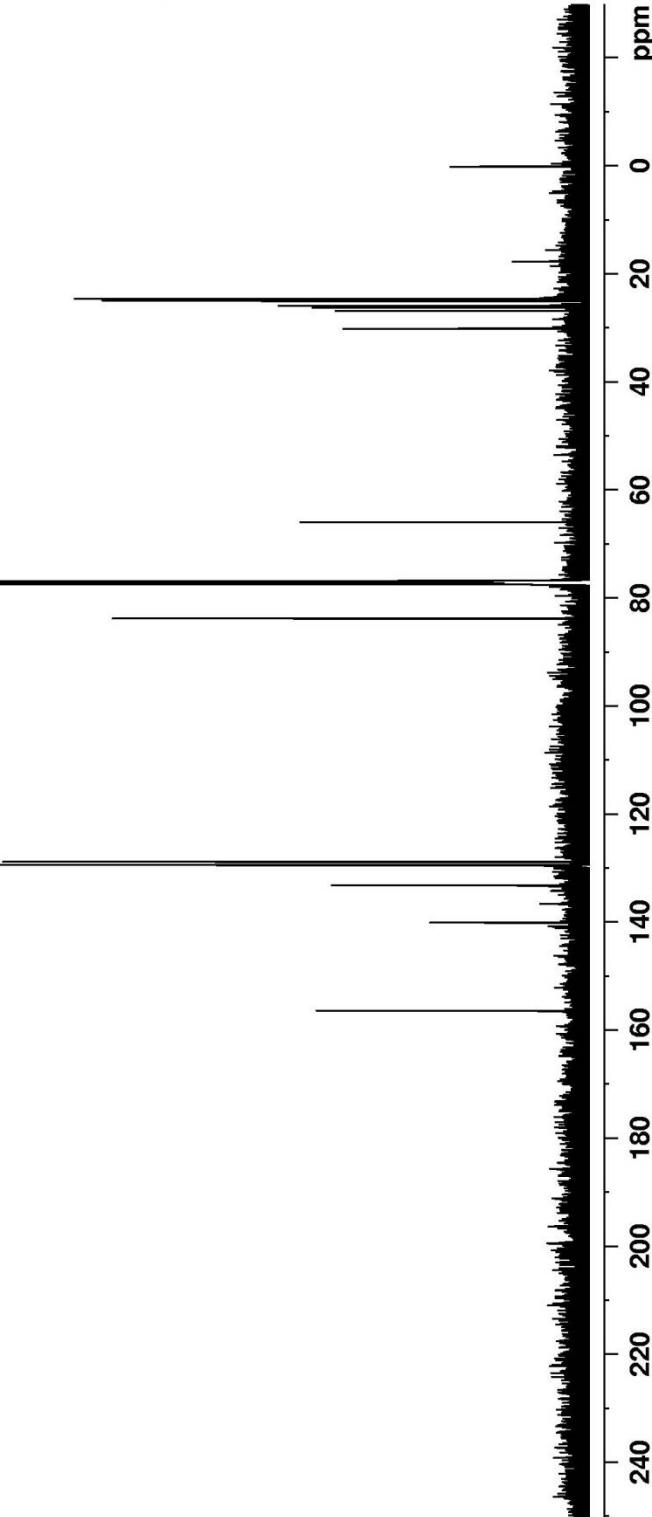
¹³C NMR



```

Current Data Parameters
NAME          EA-VI-34B
EXPNO         2
PROCNO        1
F2 - Acquisition Parameters
Date_        20120916
Time       11:10
INSTRUM     DRX500
PROBHD      5 mm CPTCI 1H-
PULPROG    zpp930
TD        71124
SOLVENT      CDCl3
NS           119
DS            4
SWH       35211.270 Hz
FIDRES     0.492289 Hz
AQ        1.0142208 sec
RG          4096
DW          14.200 usec
DE          35.00 usec
TE          300.0 K
D1        2.0000000 sec
d11       0.03000000 sec
DELT1      1.8999998 sec
MCREST      0.0000000 sec
MCWRK       0.01500000 sec
===== CHANNEL f1 =====
NUC1        13C
P1          12.00 usec
PL1        0.30 dB
SF01      125.7716224 MHz
===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2        1H
PCPD2      80.00 usec
PL2          5.00 dB
PL12        22.00 dB
PL13        27.90 dB
SF02      500.1320005 MHz
===== Processing parameters
SI          65536
SF        125.7577116 MHz
WDW        EM
SSB          0
LB          1.00 Hz
GB          0
PC        1.40

```



EA-VI-91A

Current Data Parameters

NAME	EA-VI-91A
EXENO	1
PROCNO	

F2 - Acquisition Parameters

Date-	2012/02/23
Time	14:11
INSTRUM	DRA500
PROBHD	5 mm CPTCI 1H-
PULPROG	Zg30
TD	65536
SOLVENT	CDC13
NS	8
DS	2
SWH	0.157632 Hz
FLDRES	3.1719923 sec
AQ	1.0_1
RG	4.8_400
DW	6.00 usec
DE	300.0 K
TE	1.0000000 sec
D1	0.0000000 sec
MCEST	0.0150000 sec
MCWRK	

===== CHANNEL f1 =====

NUC1	1H
P1	8.00 usec
P1L	4.30 dB
SFO1	500.1335009 MHz

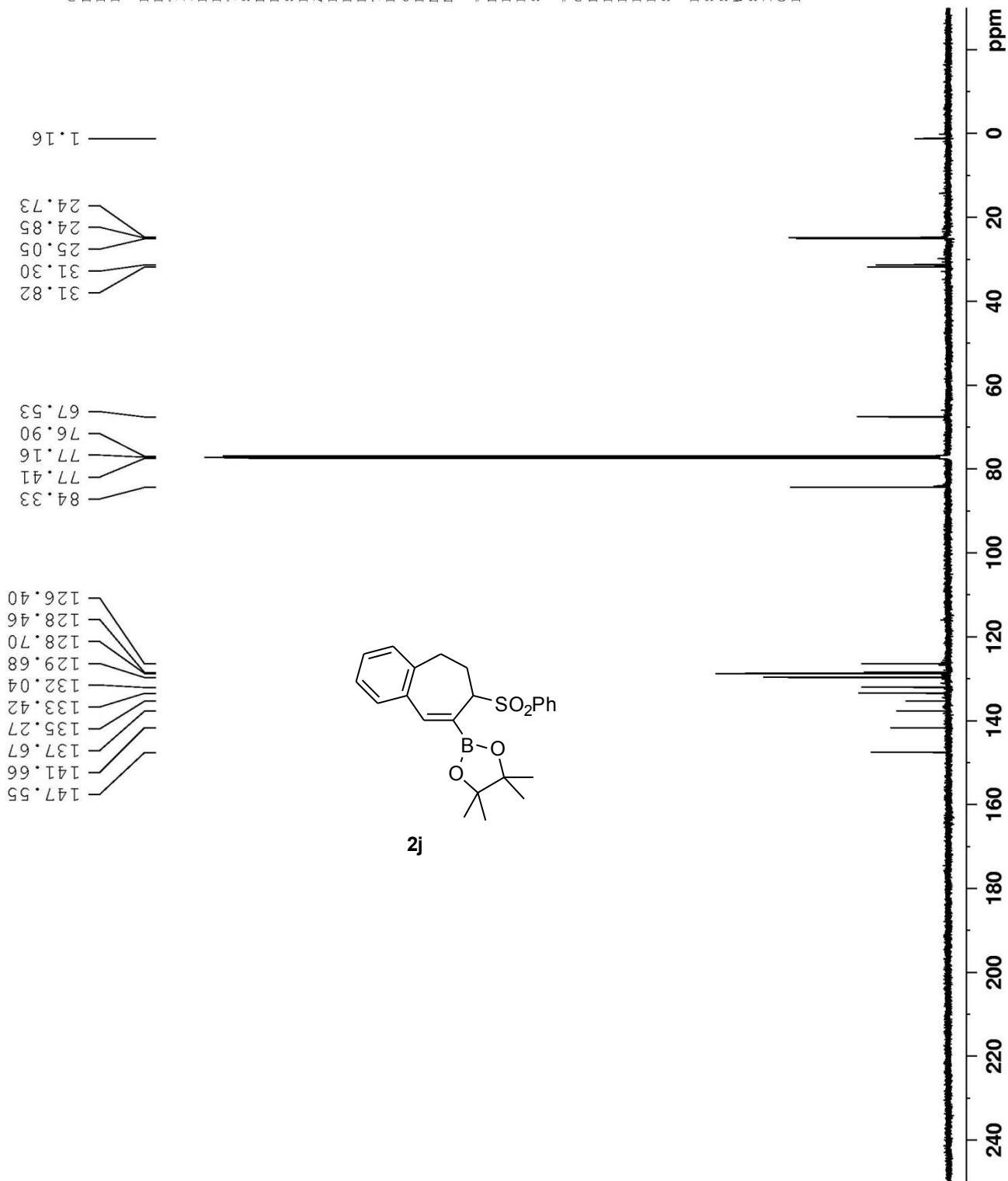
F2 - Processing parameters

SI	32768
SF	500.1300128 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00

2j

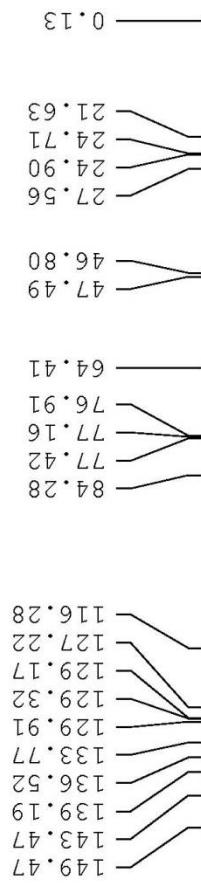
1.06 1.08 1.09 1.16 2.00 2.11 2.16 3.04 3.05 7.01 7.343 7.386 7.401 7.416 7.480 7.495 7.510 7.775 7.791 8.50 8.60 8.70 8.80 8.90 9.00 9.10 9.19 9.28 9.37 9.46 9.55 9.64 9.73 9.82 9.91 10.00 10.09 10.18 10.24 10.31 10.38 10.45 10.52 10.61 10.68 10.75 10.84 10.91 10.98 11.06 11.13 11.21 11.29 11.37 11.45 11.53 11.61 11.69 11.77 11.85 11.93 11.98 12.06 12.14 12.22 12.30 12.38 12.46 12.54 12.62 12.70 12.78 12.86 12.94 13.02 13.10 13.18 13.26 13.34 13.42 13.50 13.58 13.66 13.74 13.82 13.90 13.98 14.06 14.14 14.22 14.30 14.38 14.46 14.54 14.62 14.70 14.78 14.86 14.94 15.02 15.10 15.18 15.26 15.34 15.42 15.50 15.58 15.66 15.74 15.82 15.90 15.98 16.06 16.14 16.22 16.30 16.38 16.46 16.54 16.62 16.70 16.78 16.86 16.94 16.98 17.06 17.14 17.22 17.30 17.38 17.46 17.54 17.62 17.70 17.78 17.86 17.94 17.98 18.06 18.14 18.22 18.30 18.38 18.46 18.54 18.62 18.70 18.78 18.86 18.94 18.98 19.06 19.14 19.22 19.30 19.38 19.46 19.54 19.62 19.70 19.78 19.86 19.94 19.98 20.06 20.14 20.22 20.30 20.38 20.46 20.54 20.62 20.70 20.78 20.86 20.94 20.98 21.06 21.14 21.22 21.30 21.38 21.46 21.54 21.62 21.70 21.78 21.86 21.94 21.98 22.06 22.14 22.22 22.30 22.38 22.46 22.54 22.62 22.70 22.78 22.86 22.94 22.98 23.06 23.14 23.22 23.30 23.38 23.46 23.54 23.62 23.70 23.78 23.86 23.94 23.98 24.06 24.14 24.22 24.30 24.38 24.46 24.54 24.62 24.70 24.78 24.86 24.94 24.98 25.06 25.14 25.22 25.30 25.38 25.46 25.54 25.62 25.70 25.78 25.86 25.94 25.98 26.06 26.14 26.22 26.30 26.38 26.46 26.54 26.62 26.70 26.78 26.86 26.94 26.98 27.06 27.14 27.22 27.30 27.38 27.46 27.54 27.62 27.70 27.78 27.86 27.94 27.98 28.06 28.14 28.22 28.30 28.38 28.46 28.54 28.62 28.70 28.78 28.86 28.94 28.98 29.06 29.14 29.22 29.30 29.38 29.46 29.54 29.62 29.70 29.78 29.86 29.94 29.98 30.06 30.14 30.22 30.30 30.38 30.46 30.54 30.62 30.70 30.78 30.86 30.94 30.98 31.06 31.14 31.22 31.30 31.38 31.46 31.54 31.62 31.70 31.78 31.86 31.94 31.98 32.06 32.14 32.22 32.30 32.38 32.46 32.54 32.62 32.70 32.78 32.86 32.94 32.98 33.06 33.14 33.22 33.30 33.38 33.46 33.54 33.62 33.70 33.78 33.86 33.94 33.98 34.06 34.14 34.22 34.30 34.38 34.46 34.54 34.62 34.70 34.78 34.86 34.94 34.98 35.06 35.14 35.22 35.30 35.38 35.46 35.54 35.62 35.70 35.78 35.86 35.94 35.98 36.06 36.14 36.22 36.30 36.38 36.46 36.54 36.62 36.70 36.78 36.86 36.94 36.98 37.06 37.14 37.22 37.30 37.38 37.46 37.54 37.62 37.70 37.78 37.86 37.94 37.98 38.06 38.14 38.22 38.30 38.38 38.46 38.54 38.62 38.70 38.78 38.86 38.94 38.98 39.06 39.14 39.22 39.30 39.38 39.46 39.54 39.62 39.70 39.78 39.86 39.94 39.98 40.06 40.14 40.22 40.30 40.38 40.46 40.54 40.62 40.70 40.78 40.86 40.94 40.98 41.06 41.14 41.22 41.30 41.38 41.46 41.54 41.62 41.70 41.78 41.86 41.94 41.98 42.06 42.14 42.22 42.30 42.38 42.46 42.54 42.62 42.70 42.78 42.86 42.94 42.98 43.06 43.14 43.22 43.30 43.38 43.46 43.54 43.62 43.70 43.78 43.86 43.94 43.98 44.06 44.14 44.22 44.30 44.38 44.46 44.54 44.62 44.70 44.78 44.86 44.94 44.98 45.06 45.14 45.22 45.30 45.38 45.46 45.54 45.62 45.70 45.78 45.86 45.94 45.98 46.06 46.14 46.22 46.30 46.38 46.46 46.54 46.62 46.70 46.78 46.86 46.94 46.98 47.06 47.14 47.22 47.30 47.38 47.46 47.54 47.62 47.70 47.78 47.86 47.94 47.98 48.06 48.14 48.22 48.30 48.38 48.46 48.54 48.62 48.70 48.78 48.86 48.94 48.98 49.06 49.14 49.22 49.30 49.38 49.46 49.54 49.62 49.70 49.78 49.86 49.94 49.98 50.06 50.14 50.22 50.30 50.38 50.46 50.54 50.62 50.70 50.78 50.86 50.94 50.98 51.06 51.14 51.22 51.30 51.38 51.46 51.54 51.62 51.70 51.78 51.86 51.94 51.98 52.06 52.14 52.22 52.30 52.38 52.46 52.54 52.62 52.70 52.78 52.86 52.94 52.98 53.06 53.14 53.22 53.30 53.38 53.46 53.54 53.62 53.70 53.78 53.86 53.94 53.98 54.06 54.14 54.22 54.30 54.38 54.46 54.54 54.62 54.70 54.78 54.86 54.94 54.98 55.06 55.14 55.22 55.30 55.38 55.46 55.54 55.62 55.70 55.78 55.86 55.94 55.98 56.06 56.14 56.22 56.30 56.38 56.46 56.54 56.62 56.70 56.78 56.86 56.94 56.98 57.06 57.14 57.22 57.30 57.38 57.46 57.54 57.62 57.70 57.78 57.86 57.94 57.98 58.06 58.14 58.22 58.30 58.38 58.46 58.54 58.62 58.70 58.78 58.86 58.94 58.98 59.06 59.14 59.22 59.30 59.38 59.46 59.54 59.62 59.70 59.78 59.86 59.94 59.98 60.06 60.14 60.22 60.30 60.38 60.46 60.54 60.62 60.70 60.78 60.86 60.94 60.98 61.06 61.14 61.22 61.30 61.38 61.46 61.54 61.62 61.70 61.78 61.86 61.94 61.98 62.06 62.14 62.22 62.30 62.38 62.46 62.54 62.62 62.70 62.78 62.86 62.94 62.98 63.06 63.14 63.22 63.30 63.38 63.46 63.54 63.62 63.70 63.78 63.86 63.94 63.98 64.06 64.14 64.22 64.30 64.38 64.46 64.54 64.62 64.70 64.78 64.86 64.94 64.98 65.06 65.14 65.22 65.30 65.38 65.46 65.54 65.62 65.70 65.78 65.86 65.94 65.98 66.06 66.14 66.22 66.30 66.38 66.46 66.54 66.62 66.70 66.78 66.86 66.94 66.98 67.06 67.14 67.22 67.30 67.38 67.46 67.54 67.62 67.70 67.78 67.86 67.94 67.98 68.06 68.14 68.22 68.30 68.38 68.46 68.54 68.62 68.70 68.78 68.86 68.94 68.98 69.06 69.14 69.22 69.30 69.38 69.46 69.54 69.62 69.70 69.78 69.86 69.94 69.98 70.06 70.14 70.22 70.30 70.38 70.46 70.54 70.62 70.70 70.78 70.86 70.94 70.98 71.06 71.14 71.22 71.30 71.38 71.46 71.54 71.62 71.70 71.78 71.86 71.94 71.98 72.06 72.14 72.22 72.30 72.38 72.46 72.54 72.62 72.70 72.78 72.86 72.94 72.98 73.06 73.14 73.22 73.30 73.38 73.46 73.54 73.62 73.70 73.78 73.86 73.94 73.98 74.06 74.14 74.22 74.30 74.38 74.46 74.54 74.62 74.70 74.78 74.86 74.94 74.98 75.06 75.14 75.22 75.30 75.38 75.46 75.54 75.62 75.70 75.78 75.86 75.94 75.98 76.06 76.14 76.22 76.30 76.38 76.46 76.54 76.62 76.70 76.78 76.86 76.94 76.98 77.06 77.14 77.22 77.30 77.38 77.46 77.54 77.62 77.70 77.78 77.86 77.94 77.98 78.06 78.14 78.22 78.30 78.38 78.46 78.54 78.62 78.70 78.78 78.86 78.94 78.98 79.06 79.14 79.22 79.30 79.38 79.46 79.54 79.62 79.70 79.78 79.86 79.94 79.98 80.06 80.14 80.22 80.30 80.38 80.46 80.54 80.62 80.70 80.78 80.86 80.94 80.98 81.06 81.14 81.22 81.30 81.38 81.46 81.54 81.62 81.70 81.78 81.86 81.94 81.98 82.06 82.14 82.22 82.30 82.38 82.46 82.54 82.62 82.70 82.78 82.86 82.94 82.98 83.06 83.14 83.22 83.30 83.38 83.46 83.54 83.62 83.70 83.78 83.86 83.94 83.98 84.06 84.14 84.22 84.30 84.38 84.46 84.54 84.62 84.70 84.78 84.86 84.94 84.98 85.06 85.14 85.22 85.30 85.38 85.46 85.54 85.62 85.70 85.78 85.86 85.94 85.98 86.06 86.14 86.22 86.30 86.38 86.46 86.54 86.62 86.70 86.78 86.86 86.94 86.98 87.06 87.14 87.22 87.30 87.38 87.46 87.54 87.62 87.70 87.78 87.86 87.94 87.98 88.06 88.14 88.22 88.30 88.38 88.46 88.54 88.62 88.70 88.78 88.86 88.94 88.98 89.06 89.14 89.22 89.30 89.38 89.46 89.54 89.62 89.70 89.78 89.86 89.94 89.98 90.06 90.14 90.22 90.30 90.38 90.46 90.54 90.62 90.70 90.78 90.86 90.94 90.98 91.06 91.14 91.22 91.30 91.38 91.46 91.54 91.62 91.70 91.78 91.86 91.94 91.98 92.06 92.14 92.22 92.30 92.38 92.46 92.54 92.62 92.70 92.78 92.86 92.94 92.98 93.06 93.14 93.22 93.30 93.38 93.46 93.54 93.62 93.70 93.78 93.86 93.94 93.98 94.06 94.14 94.22 94.30 94.38 94.46 94.54 94.62 94.70 94.78 94.86 94.94 94.98 95.06 95.14 95.22 95.30 95.38 95.46 95.54 95.62 95.70 95.78 95.86 95.94 95.98 96.06 96.14 96.22 96.30 96.38 96.46 96.54 96.62 96.70 96.78 96.86 96.94 96.98 97.06 97.14 97.22 97.30 97.38 97.46 97.54 97.62 97.70 97.78 97.86 97.94 97.98 98.06 98.14 98.22 98.30 98.38 98.46 98.54 98.62 98.70 98.78 98.86 98.94 98.98 99.06 99.14 99.22 99.30 99.38 99.46 99.54 99.62 99.70 99.78 99.86 99.94 99.98 100.06 100.14 100.22 100.30 100.38 100.46 100.54 100.62 100.70 100.78 100.86 100.94 100.98 101.06 101.14 101.22 101.30 101.38 101.46 101.54 101.62 101.70 101.78 101.86 101.94 101.98 102.06 102.14 102.22 102.30 102.38 102.46 102.54 102.62 102.70 102.78 102.86 102.94 102.98 103.06 103.14 103.22 103.30 103.38 103.46 103.54 103.62 103.70 103.78 103.86 103.94 103.98 104.06 104.14 104.22 104.30 104.38 104.46 104.54 104.62 104.70 104.78 104.86 104.94 104.98 105.06 105.14 105.22 105.30 105.38 105.46 105.54 105.62 105.70 105.78 105.86 105.94 105.98 106.06 106.14 106.22 106.30 106.38 106.46 106.54 106.62 106.70 106.78 106.86 106.94 106.98 107.06 107.14 107.22 107.30 107.38 107.46 107.54 107.62 107.70 107.78 107.86 107.94 107.98 108.06 108.14 108.22 108.30 108.38 108.46 108.54 108.62 108.70 108.78 108.86 108.94 108.98 109.06 109.14 109.22 109.30 109.38 109.46 109.54 109.62 109.70 109.78 109.86 109.94 109.98 110.06 110.14 110.22 110.30 110.38 110.46 110.54 110.62 110.70 110.78 110.86 110.94 110.98 111.06 111.14 111.22 111.30 111.38 111.46 111.54 111.62 111.70 111.78 111.86 111.94 111.98 112.06 112.14 112.22 112.30 112.38 112.46 112.54 112.62 112.70 112.78 112.86 112.94 112.98 113.06 113.14 113.22 113.30 113.38 113.46 113.54 113.62 113.70 113.78 113.86 113.94 113.98 114.06 114.14 114.22 114.30 114.38 114.46 114.54 114.62 114.70 114.78 114.86 114.94 114.98 115.06 115.14 115.22 115.30 115.38 115.46 115.54 115.62 115.70 115.78 115.86 115.94 115.98 116.06 116.14 116.22 116.30 116.38 116.46 116.54 116.62 116.70 116.78 116.86 116.94 116.98 117.06 117.14 117.22 117.30 117.38 117.46 117.54 117.62 117.70 117.78 117.86 117.94 117.98 118.06 118.14 118.22 118.30 118.38 118.46 118.54 118.62 118.70 118.78 118.86 118.94 118.98 119.06 119.14 119.22 119.30 119.38 119.46 119.54 119.62 119.70 119.78 119.86 119.94 119.98 120.06 120.14 120.22 120.30 120.38 120.46 120.54 120.62 120.70 120.78 120.86 120.94 120.98 121.06 121.14 121.22 121.30 121.38 121.46 121.54 121.62 121.70 121.78 121.86 121.94 121.98 122.06 122.14 122.22 122.30 122.38 122.46 122.54 122.62 122.70 122.78 122.86 122.94 122.98 123.06 123.14 123.22 123.30 123.38 123.46 123.54 123.62 123.70 123.78 123.86 123.94 123.98 124.06 124.14 124.22 124.30 124.38 124.46 124.54 124.62 124.70 124.78 124.86 124.94 124.98 125.06 125.14 125.22 125.30 125.38 125.46 125.54 125.62 125.70 125.78 125.86 125.94 125.98 126.06 126.14 126.22 126.30 126.38 126.46 126.54 126.62 126.70 126.78 126.86 126.94 126.98 127.06 127.14 127.22 127.30 127.38 127.46 127.54 127.62 127.70 127.78 127.86 127.94 127.98 128.06 128.14 128.22 128.30 128.38 128.46 128.54 128.62 128.70 128.78 128.86 128.94 128.98 129.06 129.14 129.22 129.30 129.38 129.46 129.54 129.62 129.70 129.78 129.86 129.94 129.98 130.06 130.14 130.22 130.30 130.38 130.46 130.54 130.62 130.70 130.78 130.86 130.94 130.98 131.06 131.14 131.22 131.30 131.38 131.46 131.54 131.62 131.70 131.78 131.86 131.94 131.98 132.06 132.14 132.22 132.30 132.38 132.46 132.54 132.62 132.70 132.78 132.86 132.94 132.98 133.06 133.14 133.22 133.30 133.38 133.46 133.54 133.62 133.70 133.78 133.86 133.94 133.98 134.06 134.14 134.22 134.30 134.38 134.46 134.54 134.62 134.70 134.78 134.86 134.94 134.98 135.06 135.14 135.22 135.30 135.38 135.46 135.54 135.62 135.70 135.78 135.86 135.94 135.98 136.06 136.14 136.22 136.30 136.38 136.46 136.54 136.62 136.70 136.78 136.86 136.94 136.98 137.06 137.14 137.22 137.30 137.38 137.46 137.54 137.62 137.70 137.78 137.86 137.94 137.98 138.06 138.14 138.22 138.30 138.38 138.46 138.54 138.62 138.70 138.78 138.86 138.94 138.98 139.06 139.14 139.22 139.30 139.38 139.46 139.54 139.62 139.70 139.78 139.86 139.94 139.98 140.06 140.14 140.22 140.30 140.38 140.46 140.54 140.62 140.70 140.78 140.86 140.94 140.98 141.06 141.14 141.22 141.30 141.38 141.46 141.54 141.62 141.70 141.78 141.86 141.94 141.98 142.06 142.14 142.22 142.30 142.38 142.46 142.54 142.62 142.70 142.78 142.86 142.94 142.98 143.06 143.14 143.22 143.30 143.38 143.46 143.54 143.62 143.70 143.78 143.86 143.94 143.98 144.06 144.14 144.22 144.30 144.38 144.46 144.54 144.62 144.70 144.78 144.86 144.94 144.98 145.06 145.14 145.22 145.30 145.38 145.46 145.54 145.62 145.70 145.78 145.86 145.94 145.98 146.06 146.14 146.22 146.30 146.38 146.46 146.54 146.62 146.70 146.78 146.86 146.94 146.98 147.06 147.14 147.22 147.30 147.38 147.46 147.5

13C NMR



EA-VII-40B

¹³C NMR



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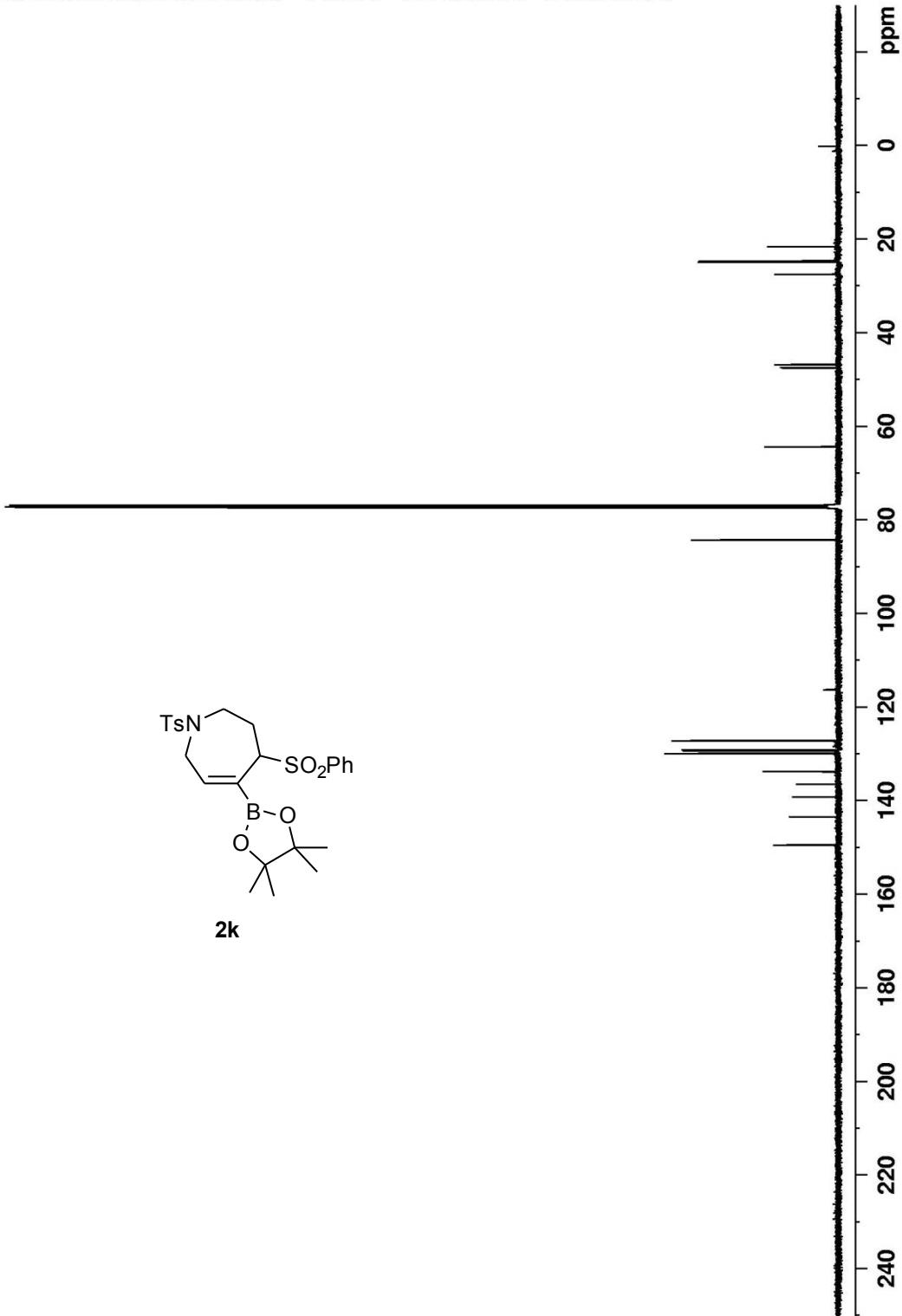
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NAME          EA-VII-40BB
EXPNO         2
PROCNO        1
13C DPFGPRG2D

F2 - Acquisition Parameters
Date_        20130304
Time         19.35
INSTRUM     DRX500
PROBHD      5 mm GPTCI 1H-
PULPROG    zgpp30
TD           71424
SOLVENT      CDCl3
NS            112
DS            4
SWH         35211.270 Hz
FIDRES     0.492989 Hz
AQ           1.0142108 sec
RG           4096
DW           14.200 usec
DE           35.00 usec
TE           300.0 K
D1           2.0000000 sec
d1           0.0300000 sec
DELTA       1.8999998 sec
MCREST      0.0000000 sec
MCWRK       0.0150000 sec

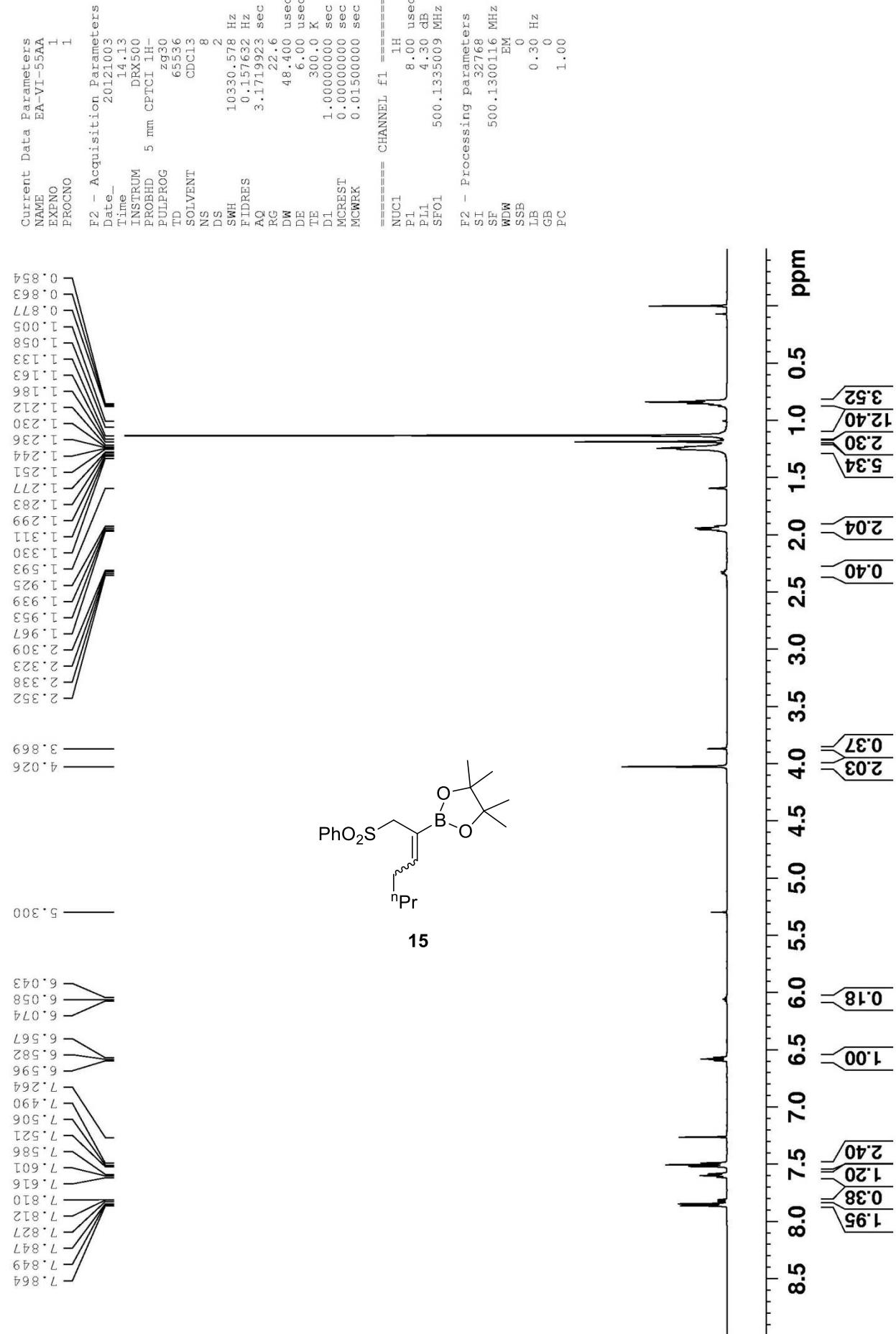
===== CHANNEL f1 =====
NUC1        13C
P1           12.00 usec
PLL         125.7716224 MHz
SFO1        500.1320005 MHz

===== CHANNEL f2 =====
CPDPRG2    1H
NUC2        1H
PCPD2       80.00 usec
PL2          5.00 dB
PL12        22.00 dB
PL13        27.90 dB
SFO2        65536 EM
              125.7577732 MHz
              0
LB           1.00 Hz
GB           0
PC           1.40

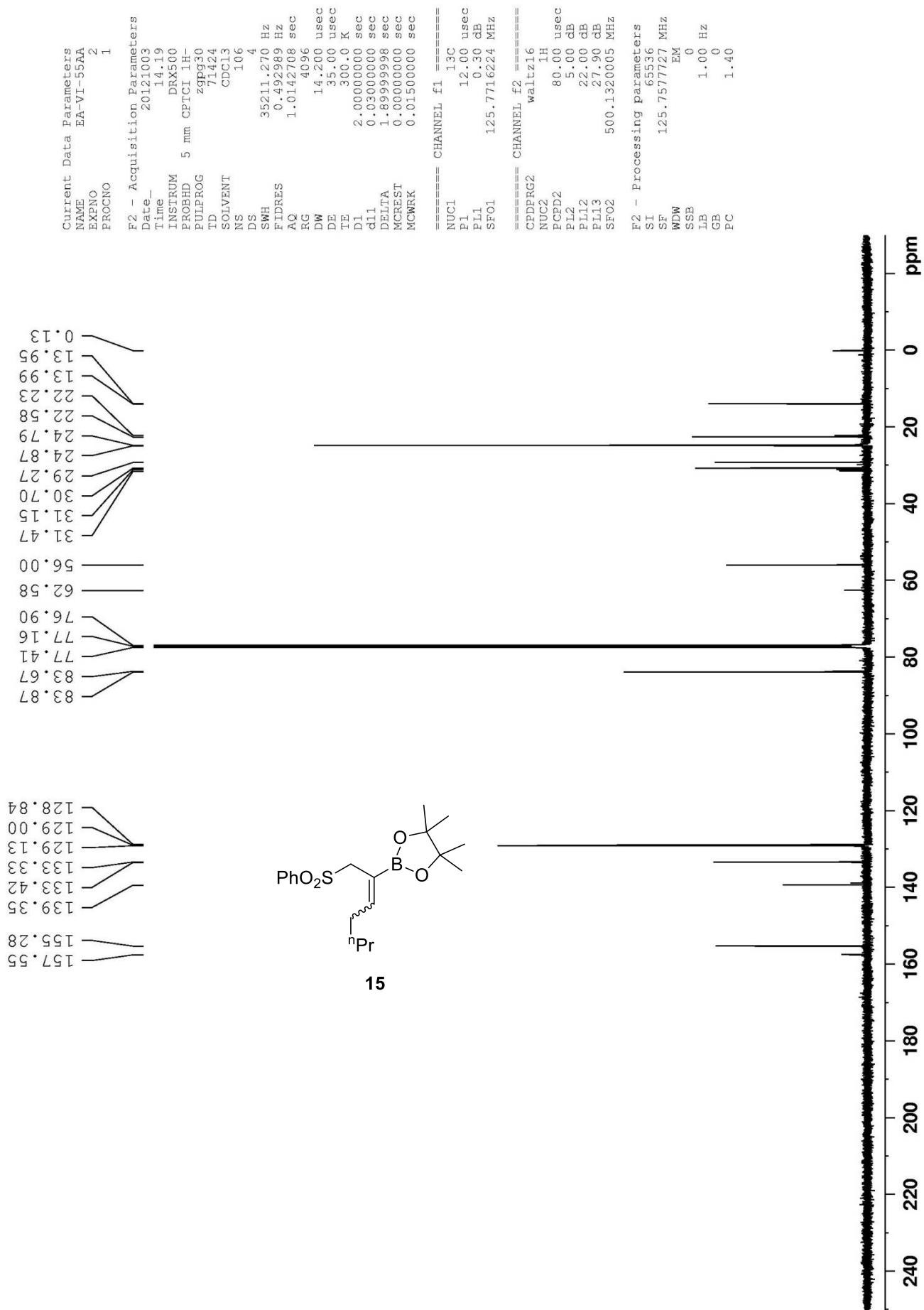
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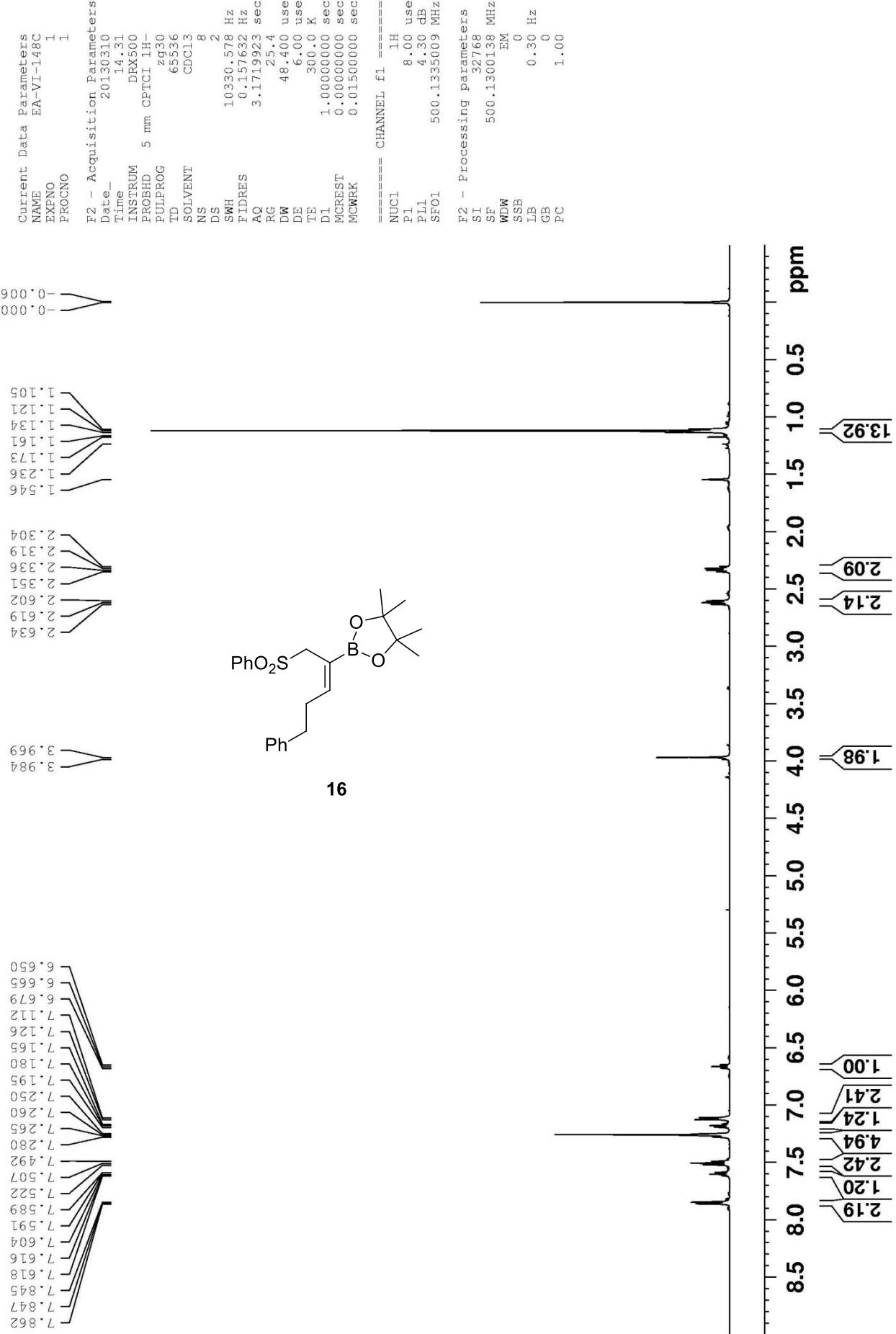
EA-VI-55A



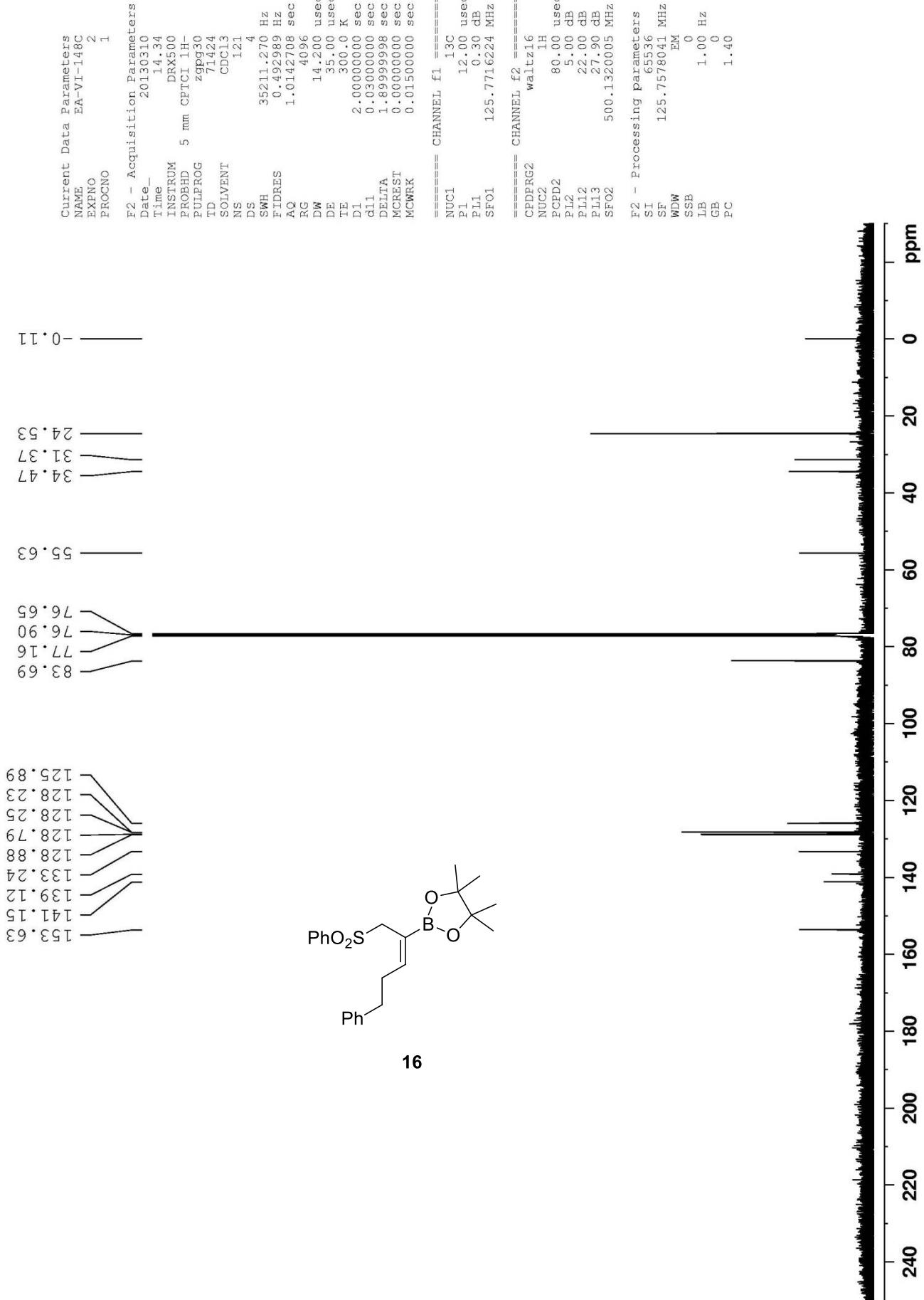
¹³C NMR



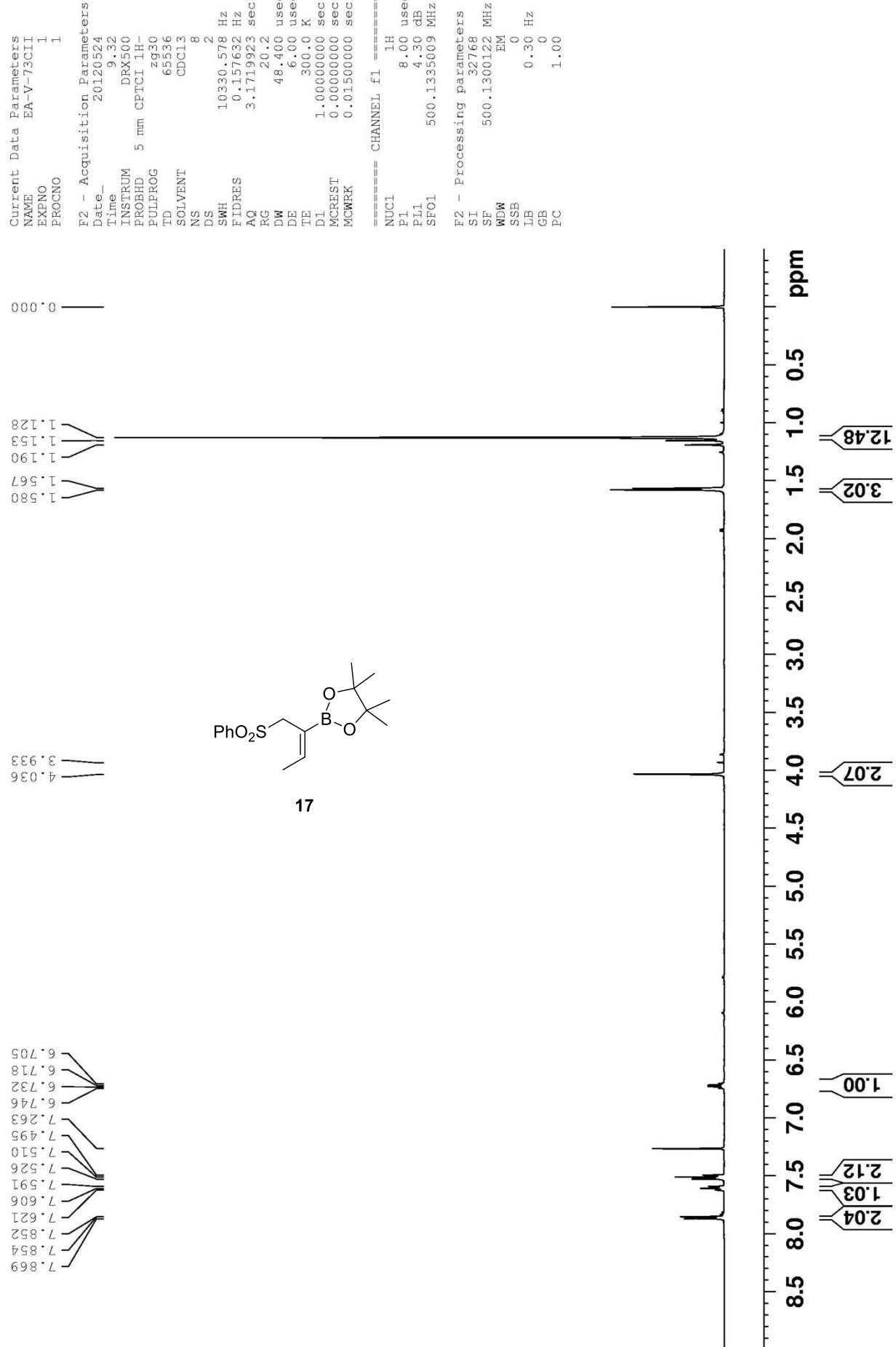
EA-VI-148C



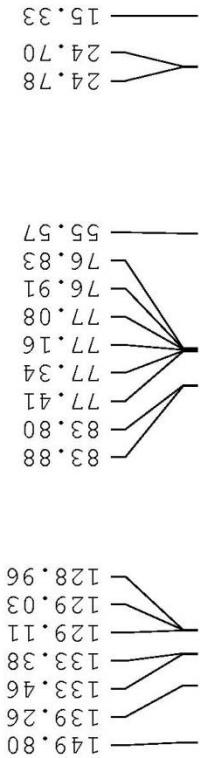
¹³C NMR



EA-V-73CII



¹³C NMR



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Current Data Parameters
NAME          EA-V-73C
EXPNO         2
PROCNO        1

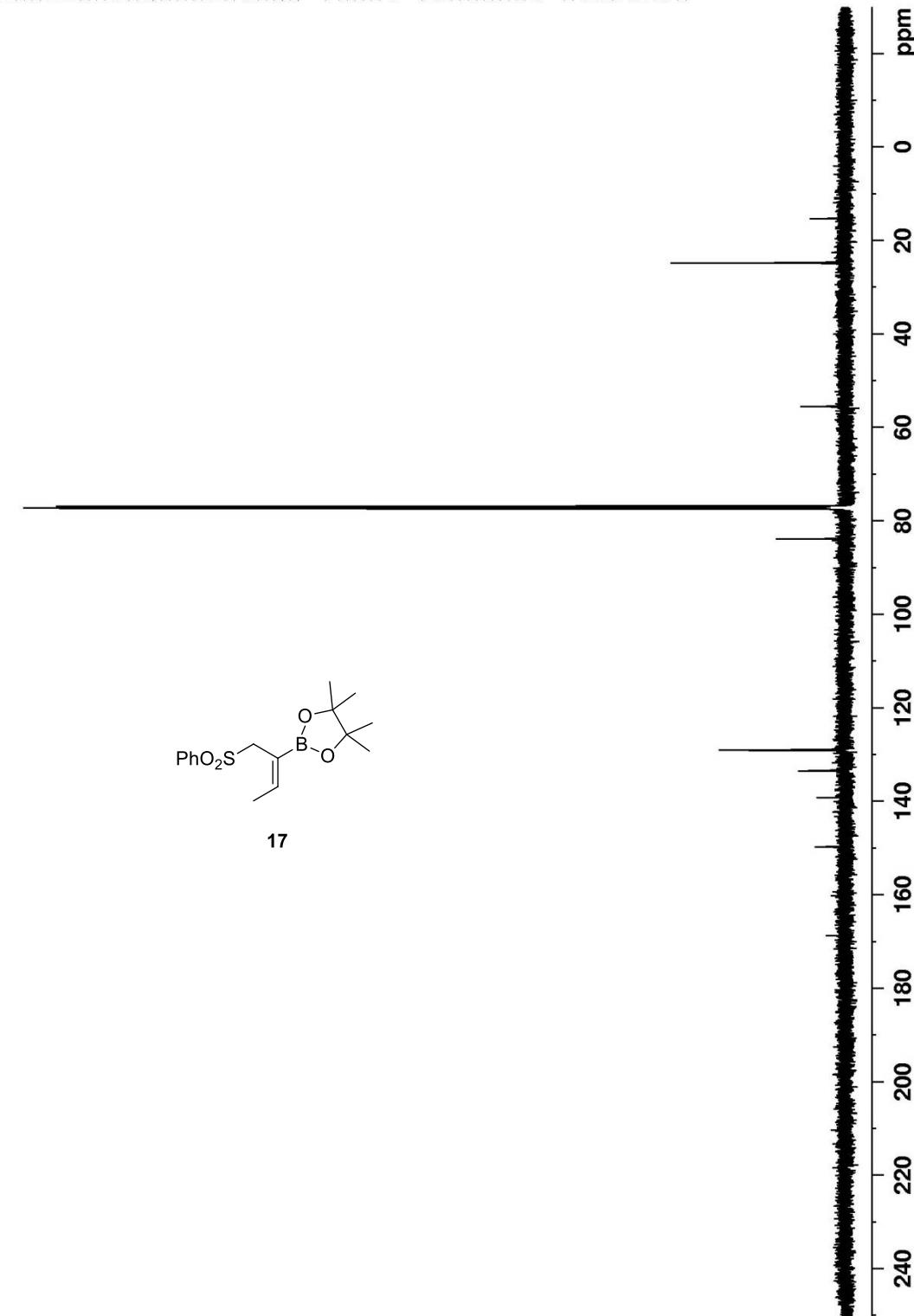
F2 - Acquisition Parameters
Date_        20120513
Time       11:13
INSTRUM   DRX300
PROBHD   5 mm CPTCI 1H-
PULPROG zppg30
TD        71424
SOLVENT    CDCl3
NS           16
DS            4
SW1      35211.270 Hz
FIDRES   0.492289 Hz
AQ        1.0142708 sec
RG        4096
DW        14.200 usec
DE        35.00 usec
TE        300.4 K
D1        2.0000000 sec
d11      0.03000000 sec
DELT1     1.8999998 sec
MCREST    0.0000000 sec
MCWRK    0.01500000 sec

===== CHANNEL f1 =====
NUC1        13C
P1        12.00 usec
PL1      0.30 dB
SF01    125.7716224 MHz

===== CHANNEL f2 =====
CPDPRG2
NUC2        1H
PCPD2      80.00 usec
PL2        5.00 dB
PL12     22.00 dB
PL13     27.90 dB
SF02    500.1320005 MHz

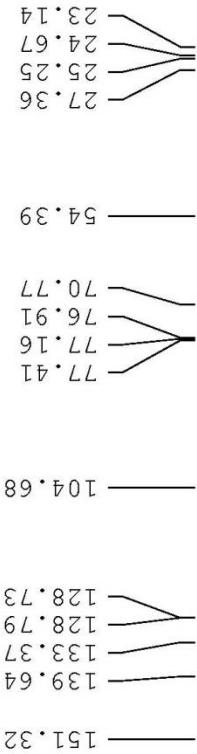
F2 - Processing parameters
SI        65536
SF       125.7577727 MHz
WDW        EM
SSB        0
LB        1.00 Hz
GB        0
PC       1.40

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EA-VII-86A

¹³C NMR



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Current Data Parameters
NAME EA-VIT-86A
EXPNO 2
PROCNO 1

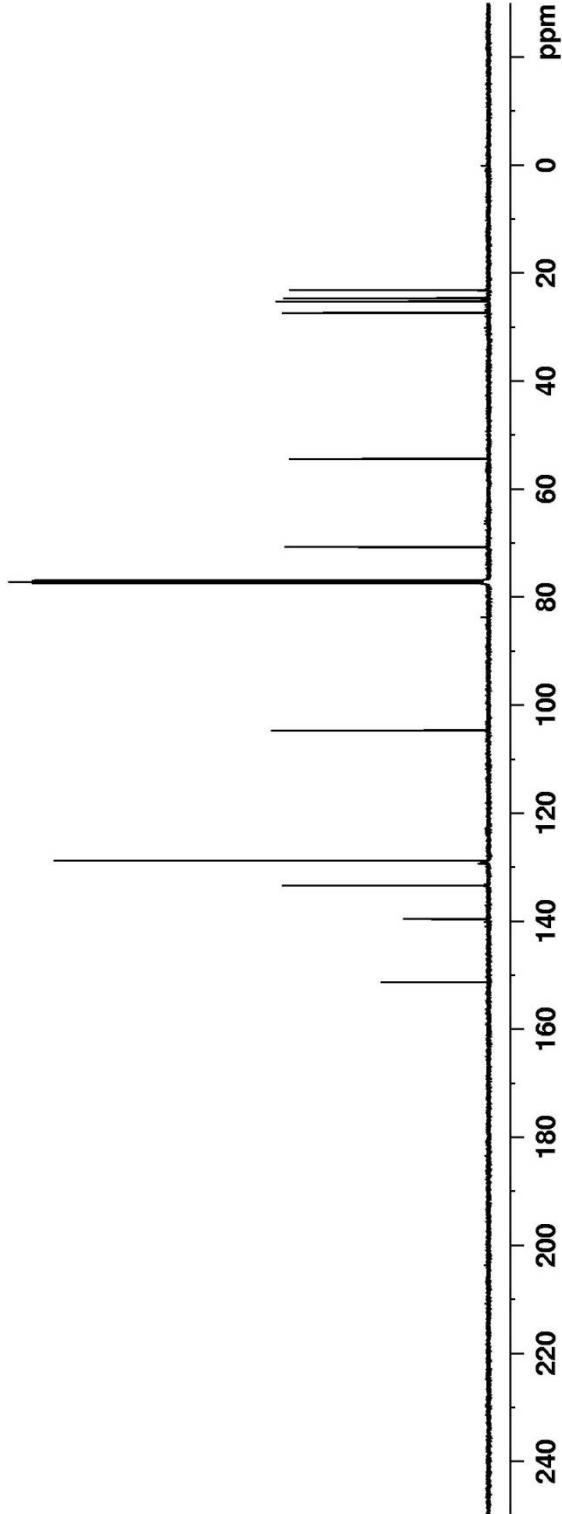
F2 - Acquisition Parameters
Date_ 20130409
Time 11.32
INSTRUM DRX500
PROBID 5 mm CPTCI 1H-
PULPROG zgpg30
TD 71424
SOLVENT CDCl3
NS 70
DS 4
SWH 35211.270 Hz
FIDRES 0.4922989 Hz
AQ 1.0142708 sec
RG 4096
DW 14.200 usec
DE 35.00 usec
TE 300.0 K
d1 2.0000000 sec
d1l 0.0300000 sec
DELTA 1.8999998 sec
MCREST 0.0000000 sec
MCWRK 0.01500000 sec

===== CHANNEL f1 =====
NUC1
P1 13C
PL1 12.00 usec
SFO1 125.7716224 MHz

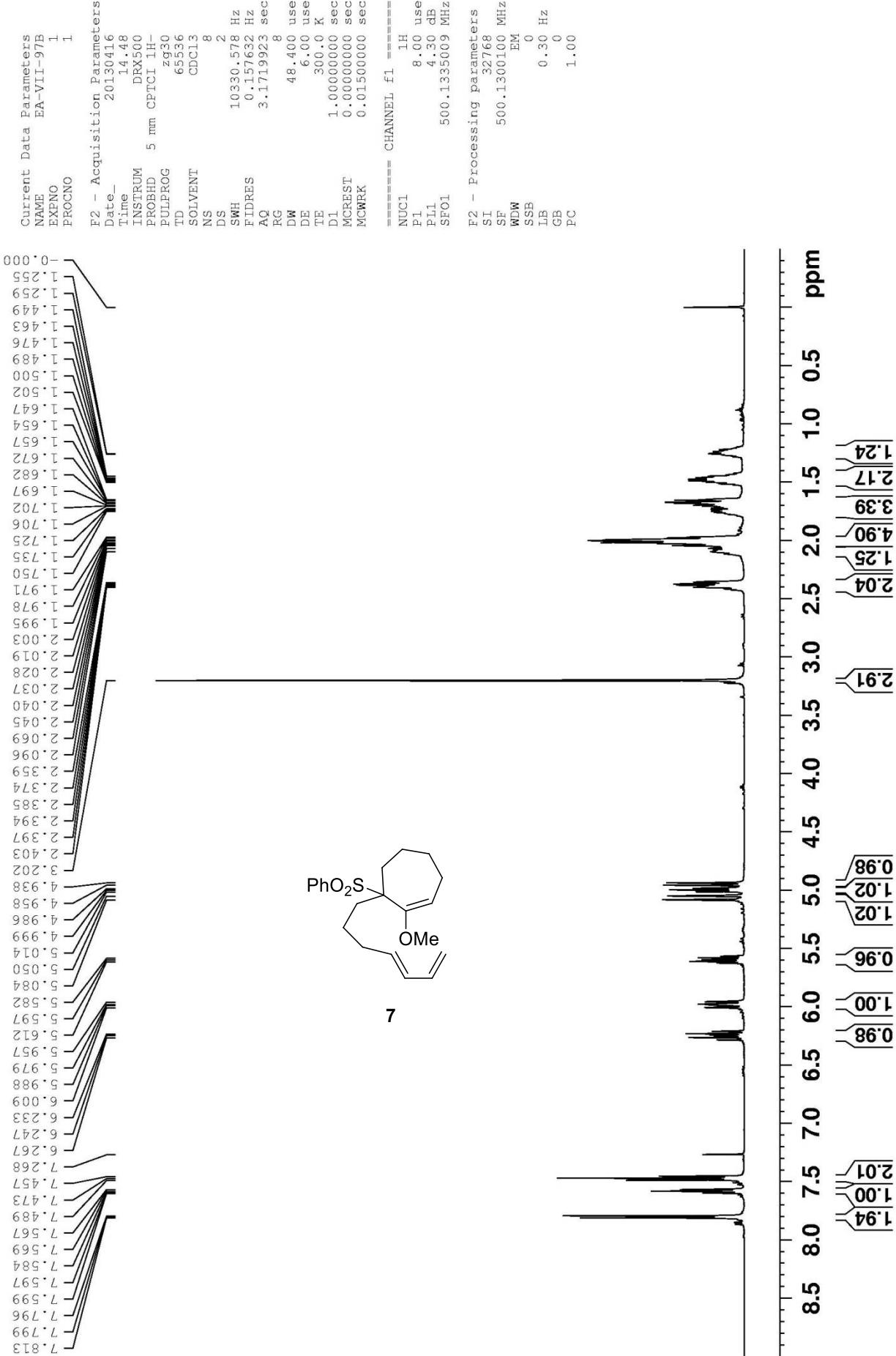
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 5.00 dB
PL12 22.00 dB
PL13 27.90 dB
SFO2 500.1320005 MHz

F2 - Processing parameters
SI 65536
SF 125.7577759 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

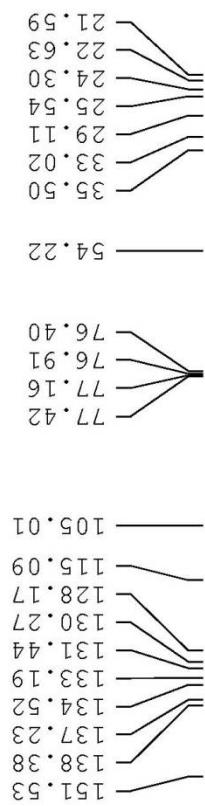
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EA-VII-97B



¹³C NMR



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Current Data Parameters
NAME          EA-VII-97B
EXPNO         2
PROCNO        1

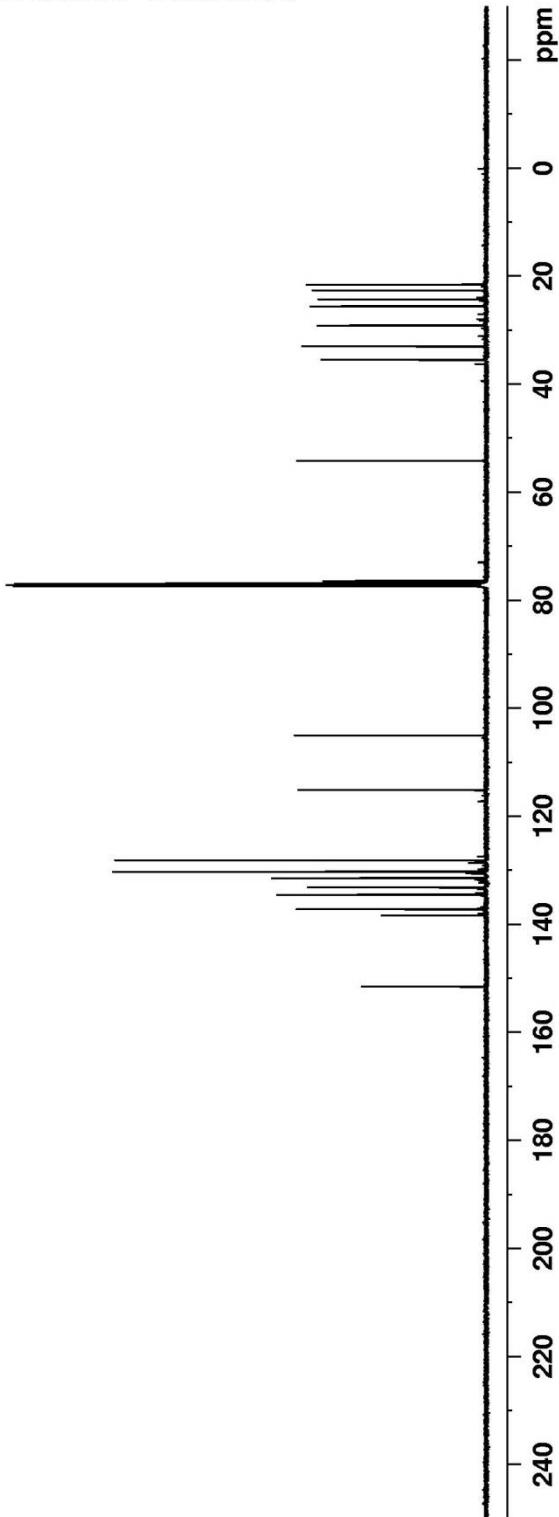
F2 - Acquisition Parameters
Date_        20130416
Time          14:54
INSTRUM      DRX500
PROBHD      5 mm CPTCI 1H-
PULPROG     zgpp30
TD           71424
SOLVENT      CDCl3
NS            80
DS            4
SWH         35211.270 Hz
FIDRES      0.492989 Hz
AQ           1.0142708 sec
RG           4096
DW           14.200 usec
DE           35.00 usec
TE           300.0 K
D1           2.0000000 sec
d1           0.0300000 sec
DELT1        1.9999998 sec
MCREST      0.0000000 sec
MCWRK       0.0150000 sec

===== CHANNEL f1 =====
NUC1          13C
CPDPG2      waltz16
NUC2          1H
PCPD2      12.00 usec
PL1           0.30 dB
SFO1        125.7716224 MHz

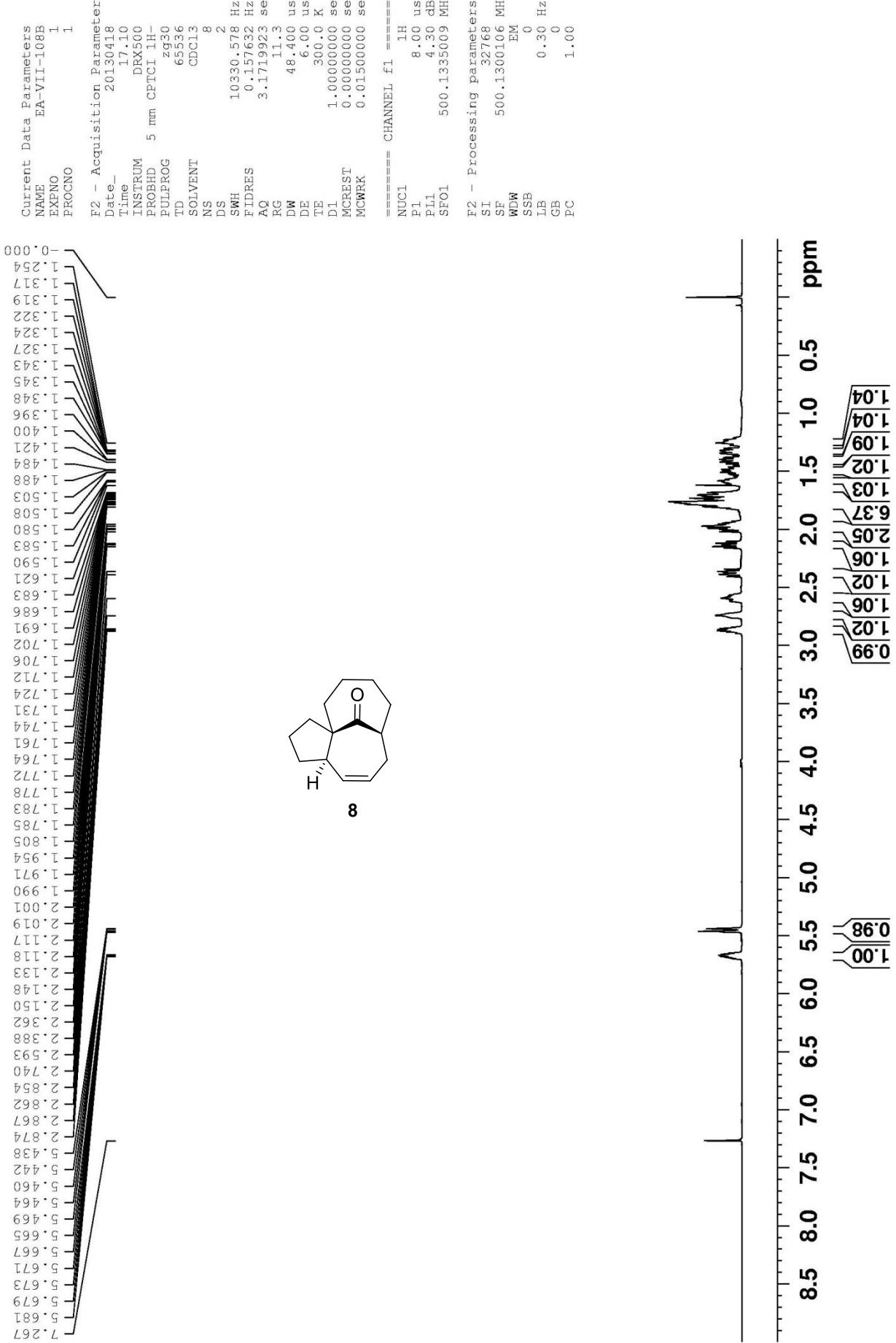
===== CHANNEL f2 =====
CPDPG2      waltz16
NUC1          13C
PCPD2      80.00 usec
PL2           5.00 dB
PL12        22.00 dB
PL13        27.90 dB
SFO2        500.1320005 MHz

F2 - Processing parameters
SI           65536
SF          125.757775 MHz
WDW         EM
SSB           0
LB            1.00 Hz
GB            0
PC           1.40

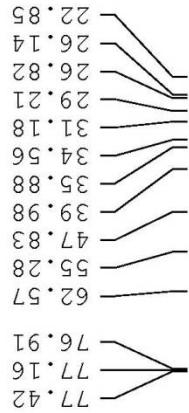
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EA-VII-108B



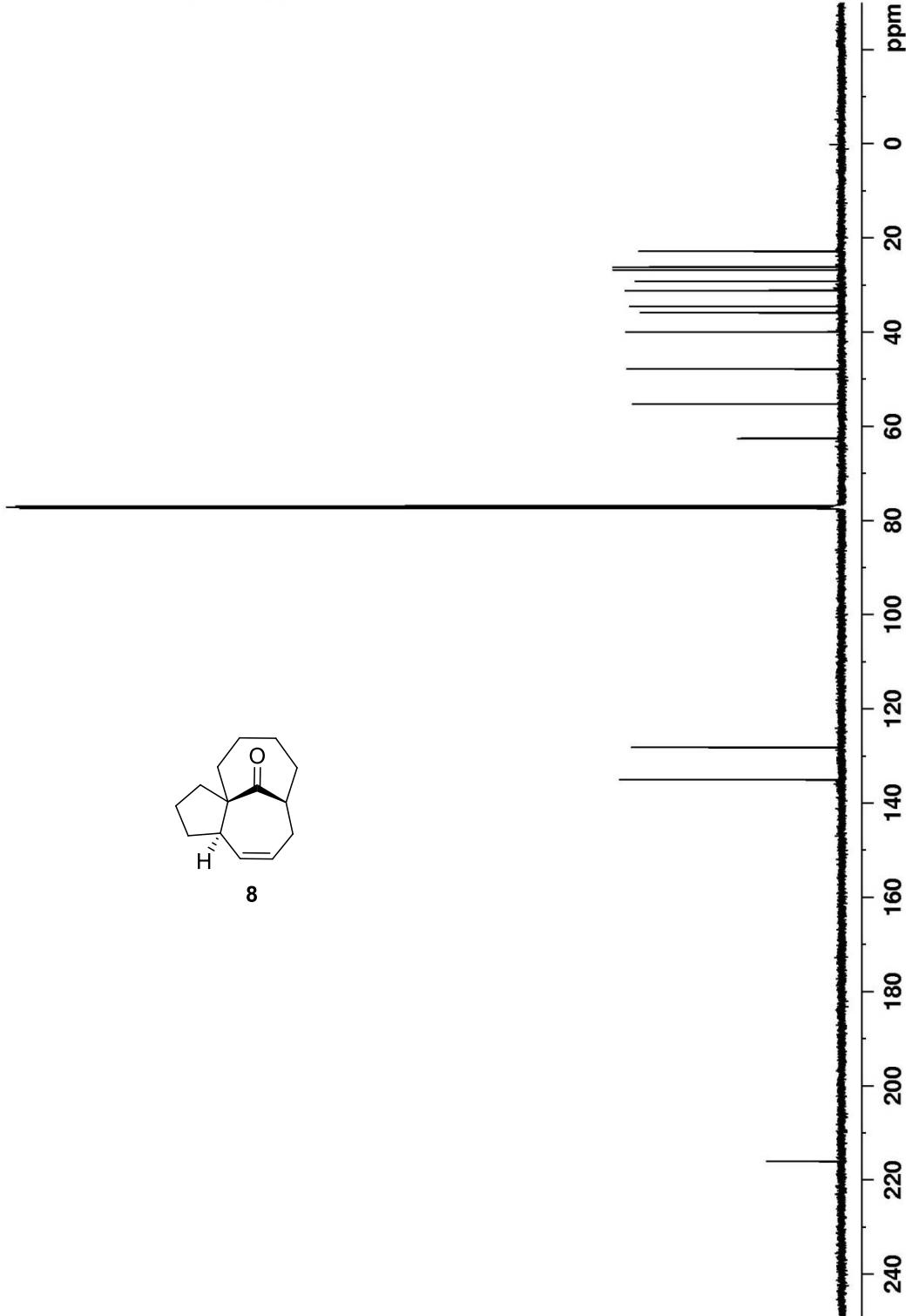
¹³C NMR



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Current Data Parameters
NAME          EA-VII-108B
EXPNO         2
PROCNO        1
F2 - Acquisition Parameters
Date_        20130418
Time       17:18
INSTRUM     DRX500
PROBHD      5 mm CPTCI 1H-
PULPROG    zppg30
TD        71424
SOLVENT      CDCl3
NS           54
DS            4
SWH       35211.270 Hz
ETDRS        FIDRES
AQ        1.0142708 sec
RG        4096
DW        14.200 usec
DE        35.00 usec
TE        300.0 K
D1        2.0000000 sec
d11       0.0300000 sec
DETA      1.8999998 sec
MCREST      0.0000000 sec
MCWRK      0.0150000 sec
===== CHANNEL f1 =====
NUC1        13C
P1        12.00 usec
PL1      0.30 dB
SFQ1     125.7716224 MHz
===== CHANNEL f2 =====
CPDPG2      waltz16
NUC2        1H
PCPD2      80.00 usec
PL2        5.00 dB
PL12       22.00 dB
PL13       27.90 dB
SFQ2     500.1320005 MHz
F2 - Processing parameters
SI        65536
SF       125.7577727 MHz
WDW        EM
SSB          0
LB        1.00 Hz
GB          0
PC        1.40

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1H NMR

Time	7.59	
INSTRUM	DRX500	
PROBHD	5 mm	CPTCI 1H-
PULPROG		Z930
TD	65536	
SOLVENT	CDCl ₃	
NS	8	
DS	2	
SWH	10330.578	Hz
FIDRES	0.157632	Hz
AQ	3.1719923	sec
RG	20.2	
DW	48.400	used
DE	6.00	used
TE	300.0	K
D1	1.00000000	sec
MCREST	0.00000000	sec
MCWRK	0.01500000	sec

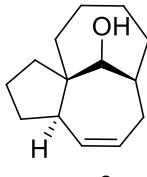
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=====
CHANNEL f1 =====
          1H
          8.00  usec
          4.30  dB
500.1335009 MHz

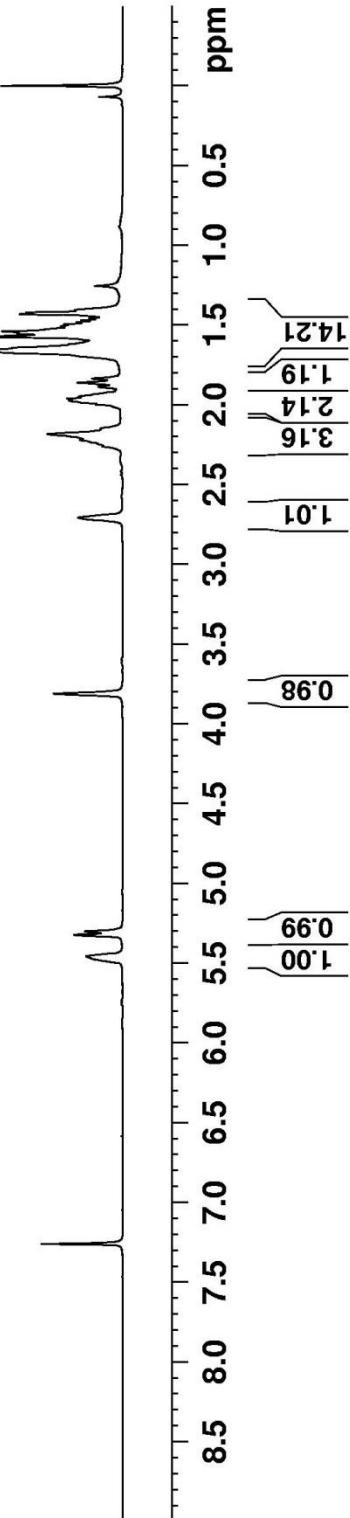
          EM
          0
          0.30  Hz
          0
          1.00

2 - Processing parameters
          32768
500.1300128 MHz

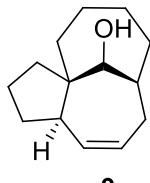
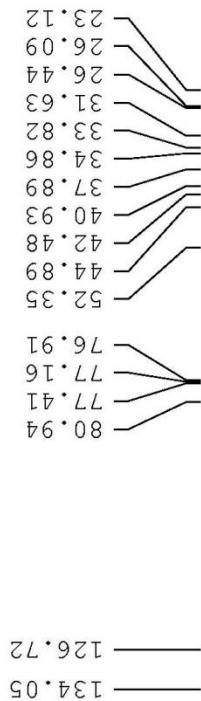
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1



13C NMR



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Current Data Parameters
NAME          EA-VIII-74B
EXPNO         2
PROCNO        1

F2 - Acquisition Parameters
Date_        20130814
Time         8:01
INSTRUM     DRX300
PROBHD      5 mm CPTCI 1H-
PULPROG    zppg30
TD           71424
SOLVENT      CDCl3
NS            95
DS            4
SW1       35211.270 Hz
FIDRES     0.492289 Hz
AQ           1.0142708 sec
RG           4096
DW           14.200 usec
DE           35.00 usec
TE           300.4 K
D1           2.0000000 sec
d11          0.03000000 sec
DELT1        1.8999998 sec
MCREST      0.0000000 sec
MCWRK       0.01500000 sec

===== CHANNEL f1 =====
NUC1          13C
P1           12.00 usec
PL1          0.30 dB
SF01        125.7716224 MHz

===== CHANNEL f2 =====
CPDPRG2
NUC2          1H
PCPD2        80.00 usec
PL2           5.00 dB
PL12         22.00 dB
PL13         27.90 dB
SF02        500.1320005 MHz

F2 - Processing parameters
SI           65536
SF          125.7577716 MHz
WDW         EM
SSB           0
LB           1.00 Hz
GB           0
PC          1.40

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