Electronic Supplementary Information

Approach to the functionalized cyclopentane core of marine prostanoids by applying a radical cyclization of β-disubstituted acrylates

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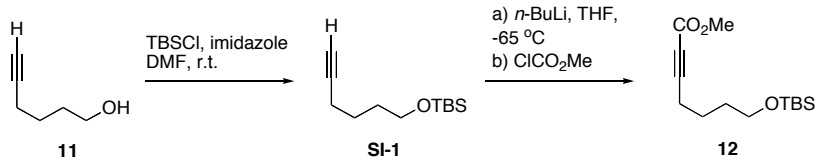


11 **SI-1** **12**

***tert*-Butyl(hex-5-ynyloxy)dimethylsilane (SI-1)**

To 5-hexyn-1-ol **11** (3.00 g, 30.5 mmol) in CH_2Cl_2 (60 mL) were added imidazole (2.18 g, 32.1 mmol) and TBS-Cl (4.60 g, 30.5 mmol) and the mixture was stirred at r.t. for 1 h. After diluting with H_2O (40 mL) the mixture was extracted with Et_2O (2 × 60 mL) and the combined organic layers were washed successively with H_2O (2 × 50 mL), dilute HCl (50 mL), dilute $NaHCO_3$ (50 mL) and brine (50 mL). The resultant organic layer was then dried ($MgSO_4$) and concentrated *in vacuo* to give the title compound **SI-1** as a colourless oil (6.15 g, 95%) that was used without further purification. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 0.05 (s, 6H, $Si(Me)_2$), 0.89 (s, 9H, Si^tBu), 1.54–1.65 (m, 4H, CH_2-2 and CH_2-3), 1.94 (t, J = 2.7 Hz, 1H, CH-6), 2.21 (td, J = 7.0, 2.7 Hz, 2H, CH_2-4), 3.63 (t, J = 6.1 Hz, 2H, CH_2-1); ^{13}C NMR (125 MHz, $CDCl_3$): δ = –5.3, 18.2, 18.3, 25.0, 26.0, 31.8, 62.6, 68.2, 84.5.

The spectroscopic data (^{1}H and ^{13}C NMR) were consistent with reported values.[S1]

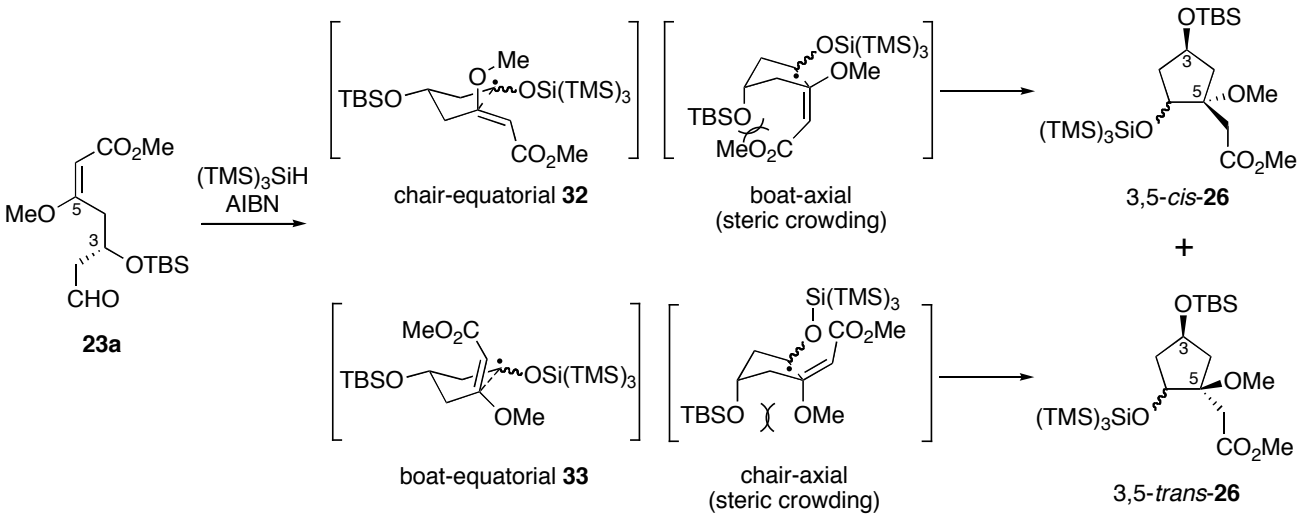
Methyl-7-(*tert*-butyldimethylsilyloxy)hept-2-ynoate (12)

Acetylene **SI-1** (324 mg, 1.53 mmol) was dissolved in dry THF (6 mL) and the solution cooled to –65 °C. *n*-BuLi (732 µL, 1.83 mmol) was then added dropwise and the reaction allowed to stir for 40 min. Methyl chloroformate (154 µL, 1.99 mmol) was added dropwise and the reaction allowed to warm to r.t. over 2 h. The mixture was then diluted with H_2O (10 mL) and extracted with Et_2O (3 × 10 mL). The combined organic layers were washed with brine (3 × 20 mL), dried ($MgSO_4$) and concentrated *in vacuo*. Flash column chromatography (EtOAc-PE, 1:9) yielded the title compound **12** (345 mg, 84%) as a colourless oil. R_f = 0.36 (EtOAc-PE, 1:15); ^{1}H NMR (500 MHz, $CDCl_3$): δ = 0.04 (s, 6H, $Si(Me)_2$), 0.89 (s, 9H, Si^tBu), 1.60–1.69 (m, 4H, CH_2-5 and CH_2-6), 2.37 (t, J = 6.8 Hz, 2H, CH_2-4), 3.63 (t, J = 5.8 Hz, 2H, CH_2-7), 3.76 (s, 3H, CO_2Me).

The spectroscopic data (^{1}H NMR) were consistent with reported values.[S2]

S1 J.-E. Nyström, T. D. McCanna, P. Helquist, R. Amouroux, *Synthesis*, 1988, 56-58.
S2 G. A. Molander, C. R. Harris, *J. Org. Chem.*, 1997, **62**, 7418-7429.

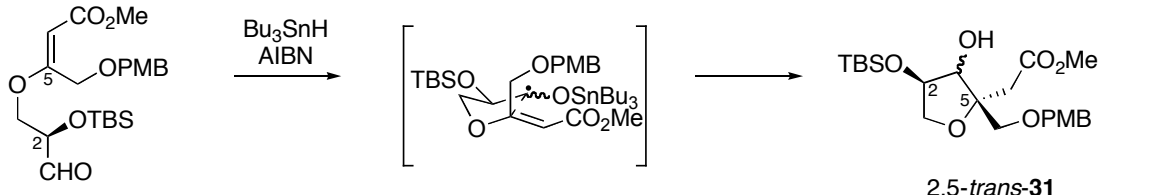
Ketyl radical cyclization of β-disubstituted acrylate 23a



26 obtained in 94% yield as mixture of four diastereoisomers (35:25:20:20)

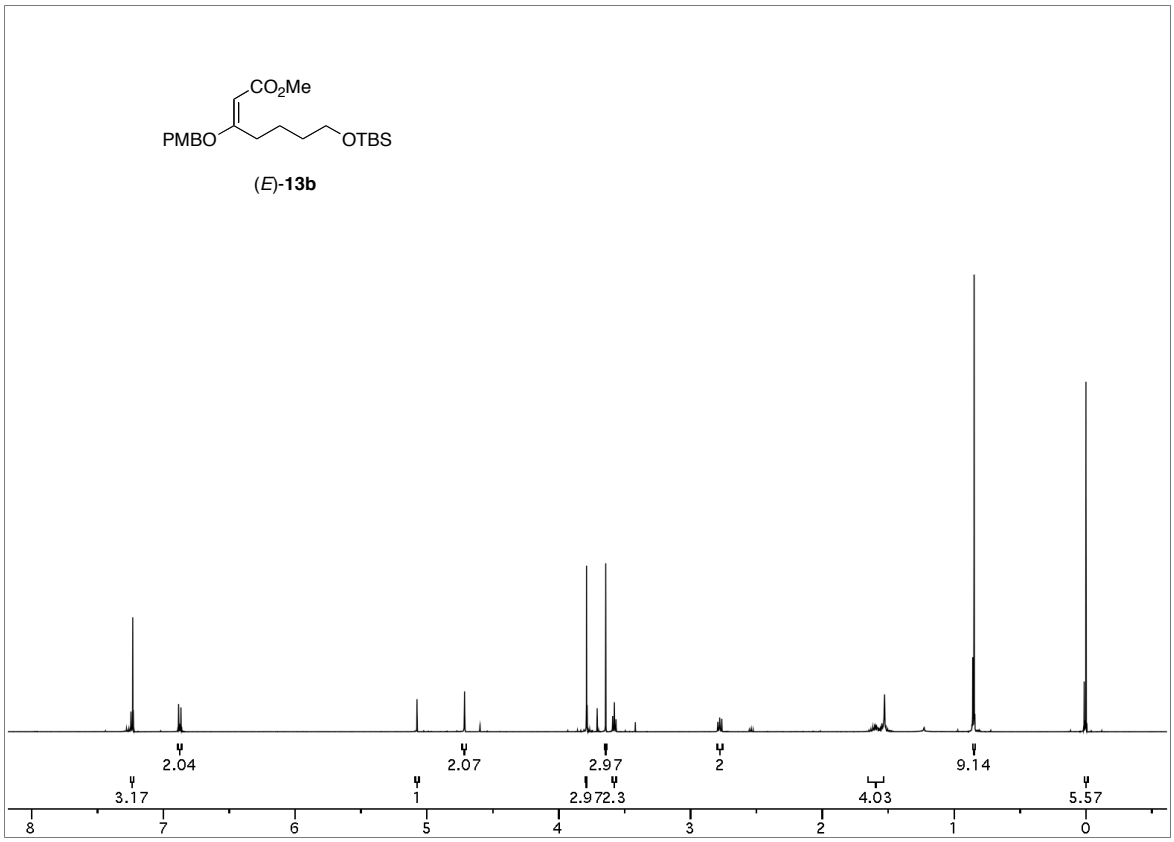
(Numbering used by analogy with corresponding 5-hexenyl radical)

Ketyl radical cyclization of β-disubstituted acrylate 29[S3]

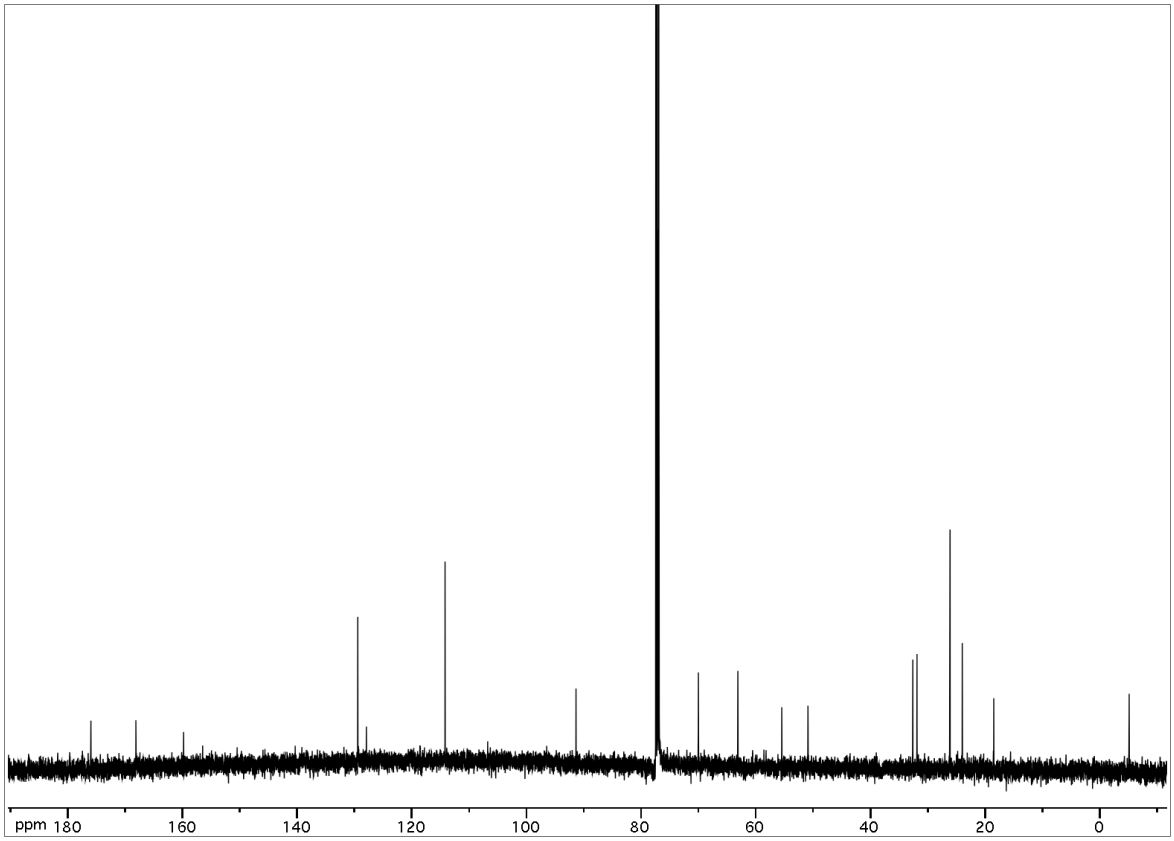


(Numbering used by analogy with corresponding 5-hexenyl radical)

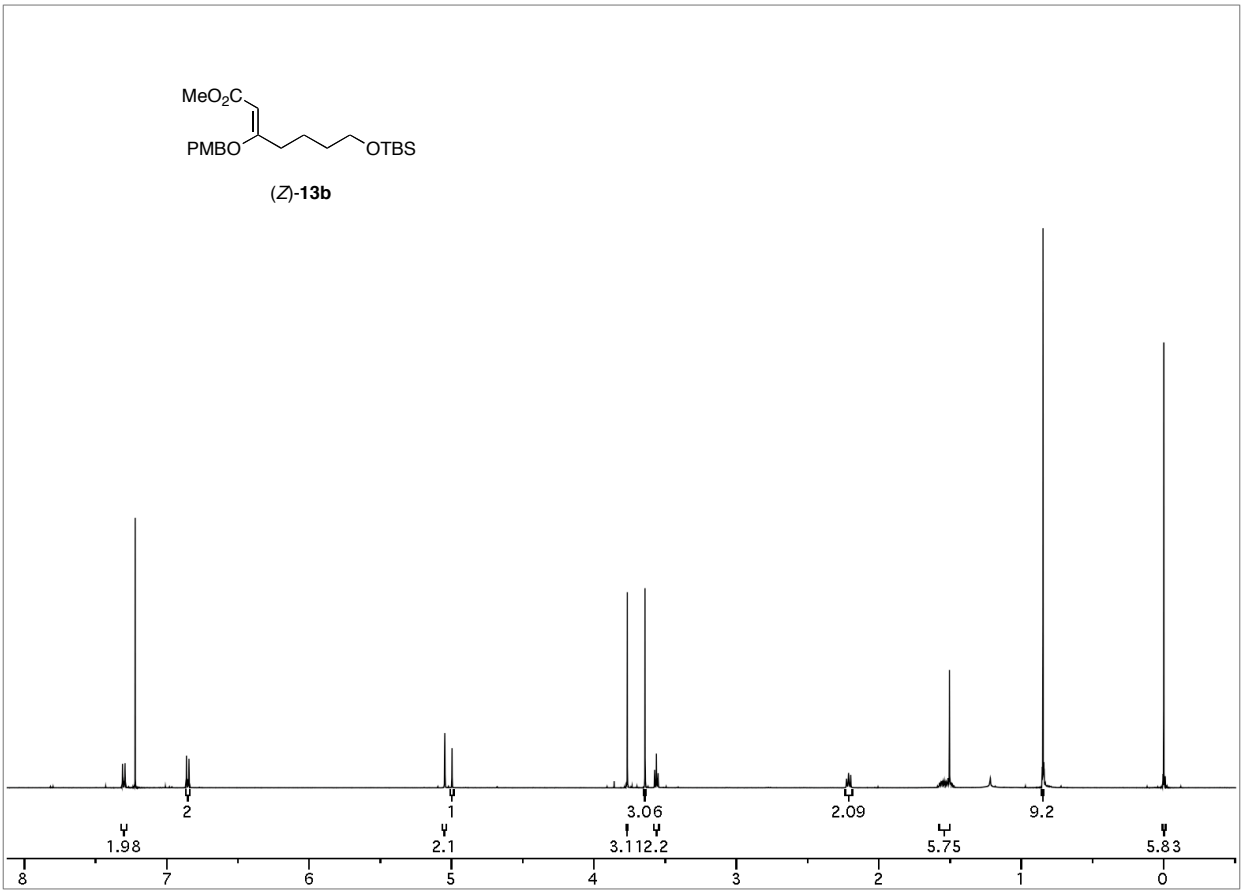
S3 C. D. Donner, *Org. Lett.*, 2013, **15**, 1258-1261.



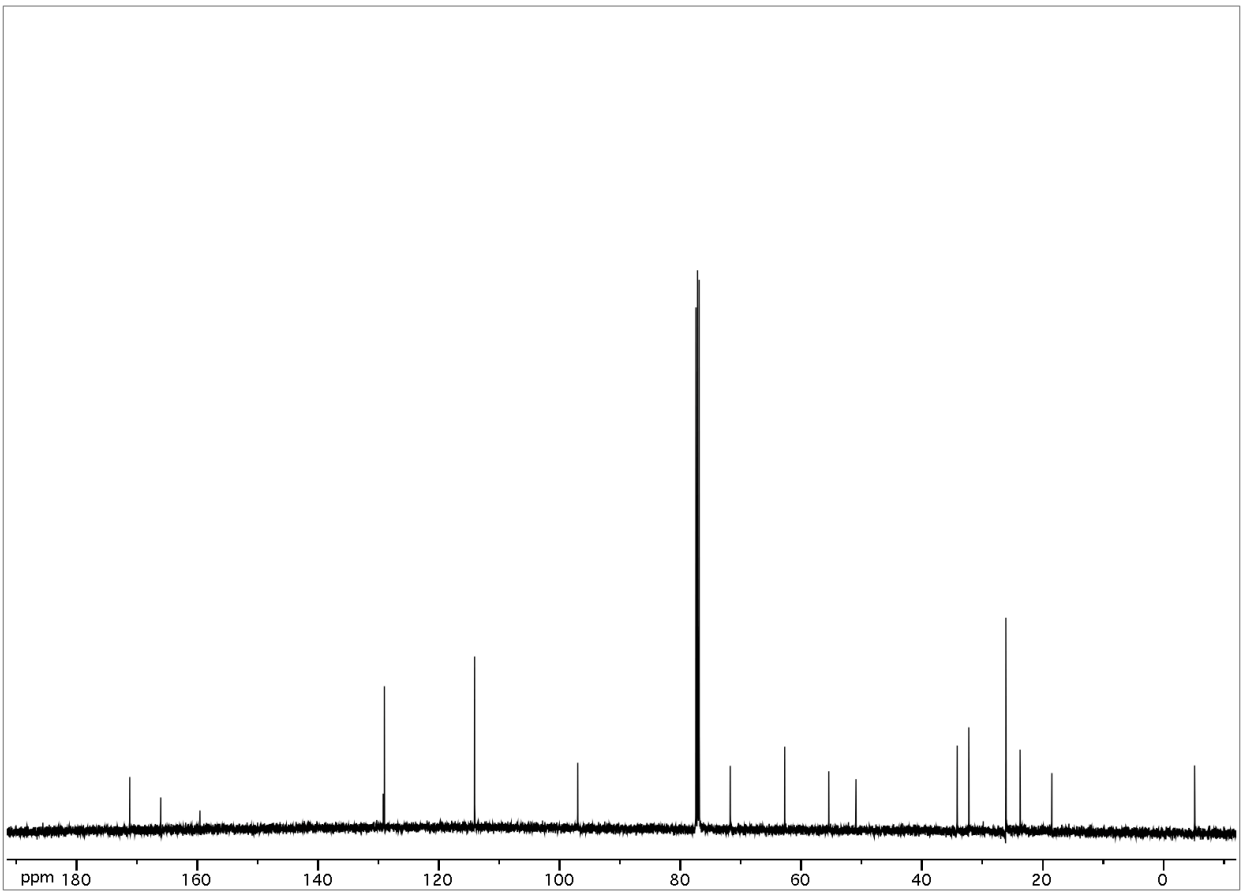
^{1}H NMR (500 MHz) spectrum of (*E*)-**13b** in $CDCl_3$.



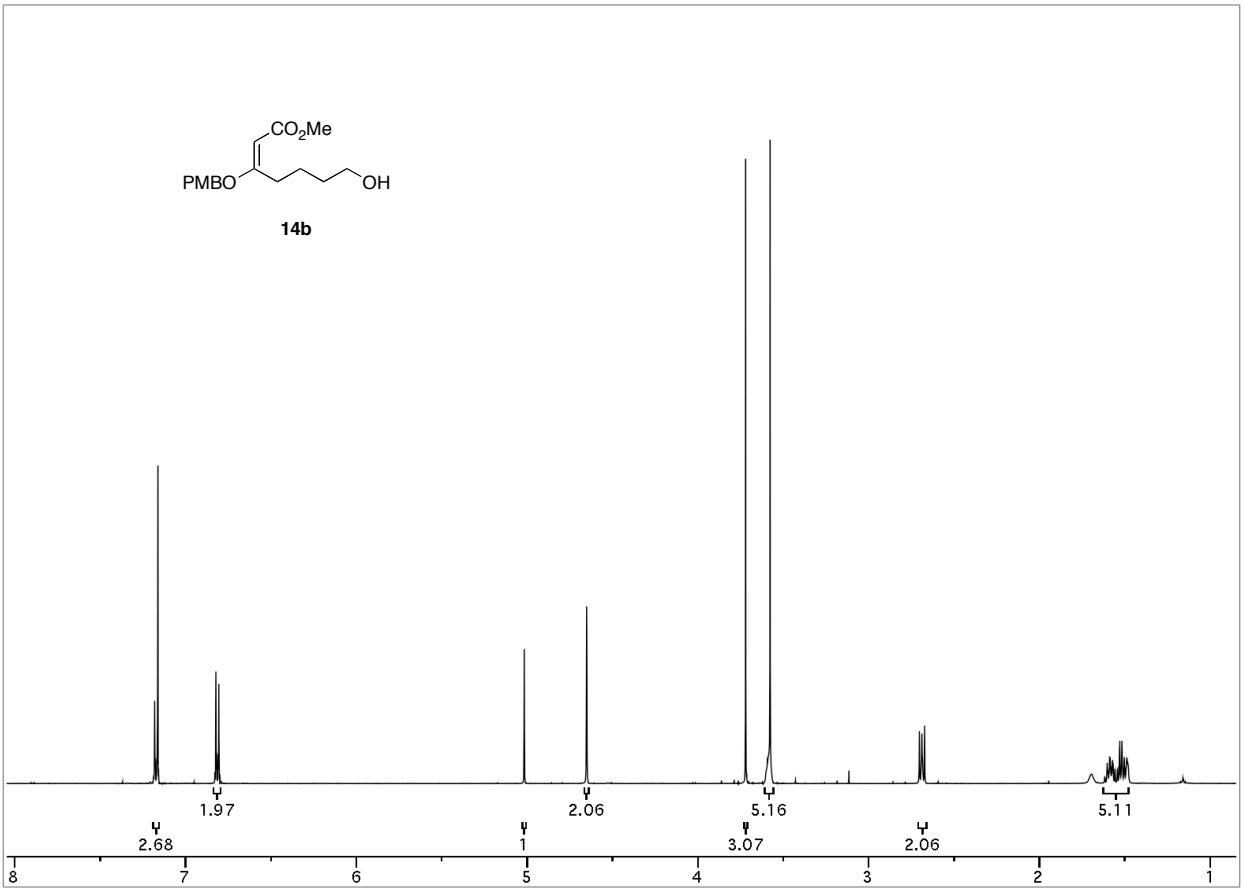
^{13}C NMR (125 MHz) spectrum of (*E*)-**13b** in $CDCl_3$.



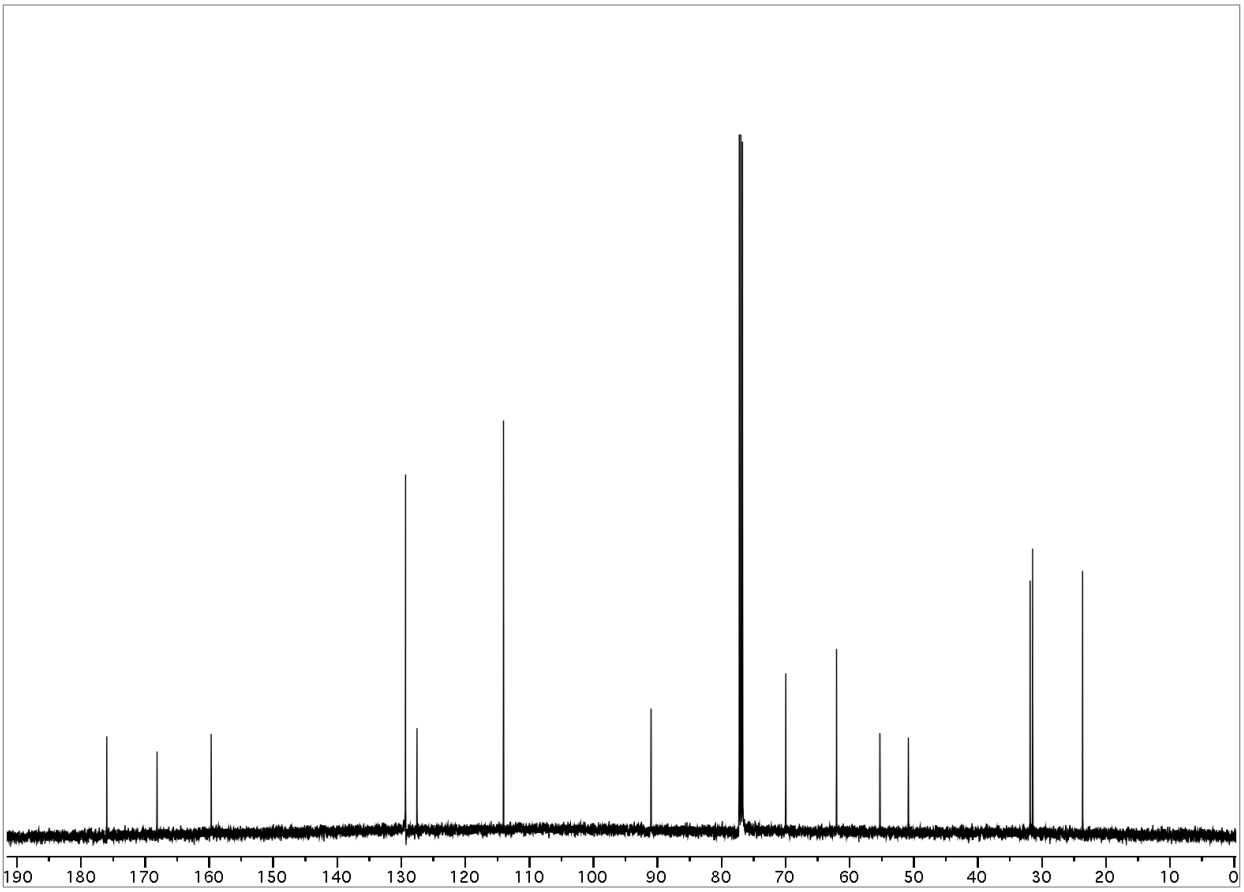
^{1}H NMR (500 MHz) spectrum of (*Z*)-**13b** in $CDCl_3$.



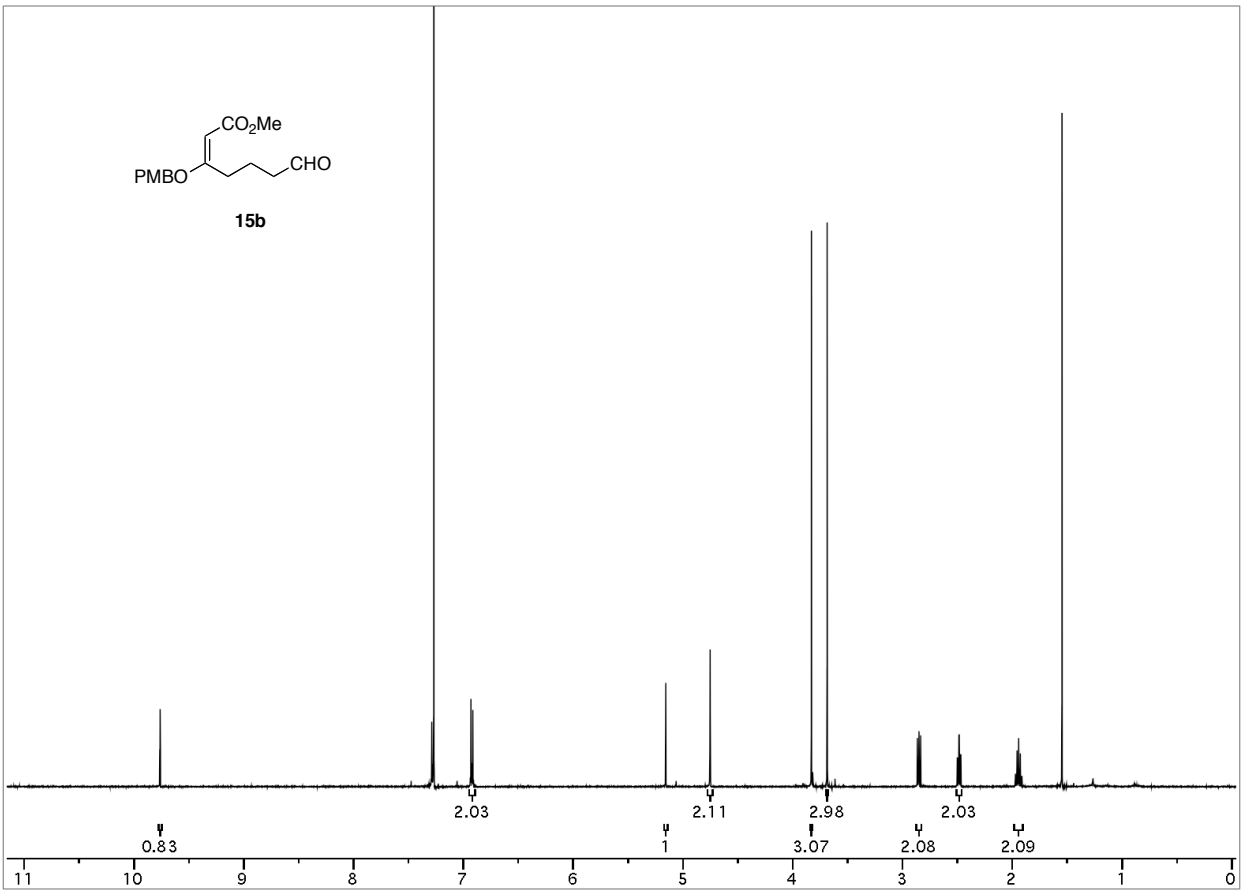
^{13}C NMR (125 MHz) spectrum of (*Z*)-**13b** in $CDCl_3$.



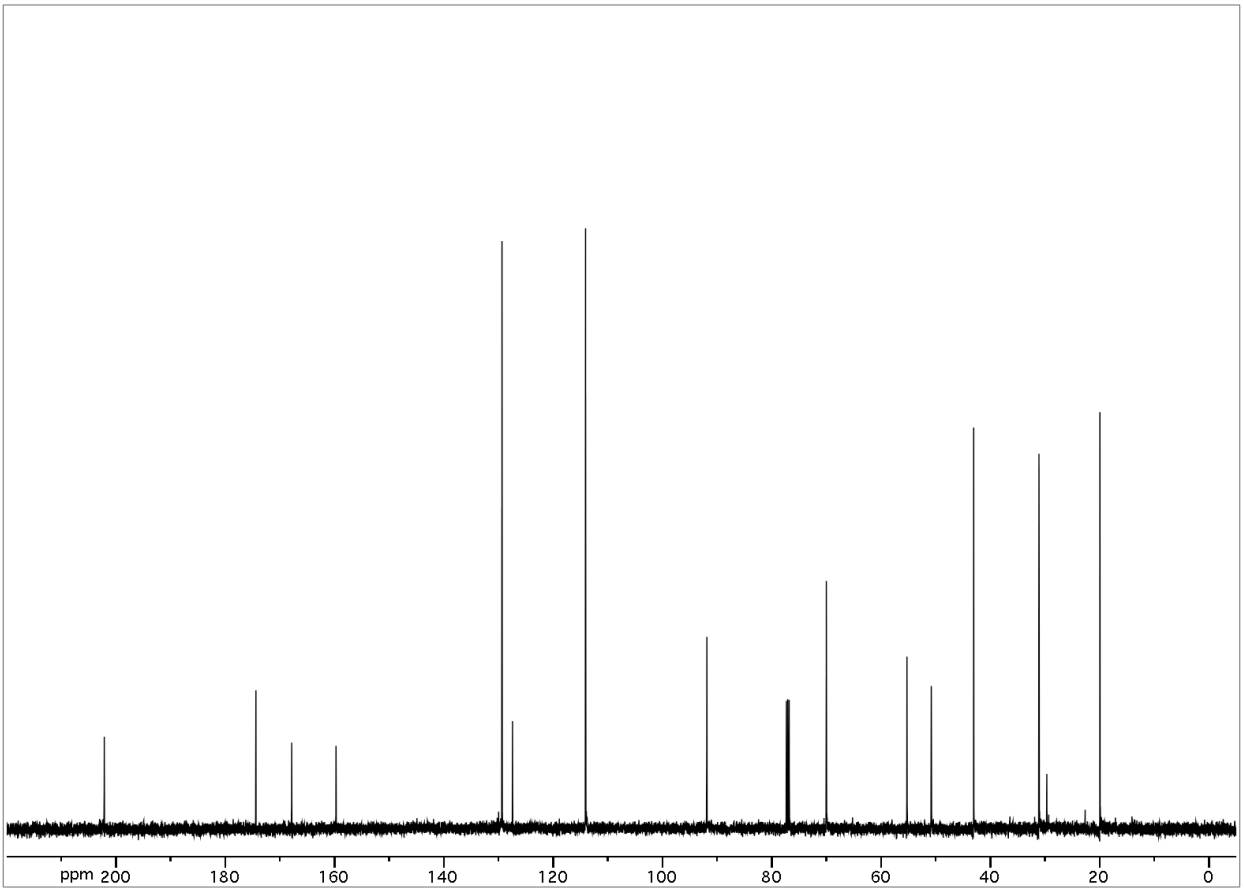
^{1}H NMR (500 MHz) spectrum of **14b** in $CDCl_3$.



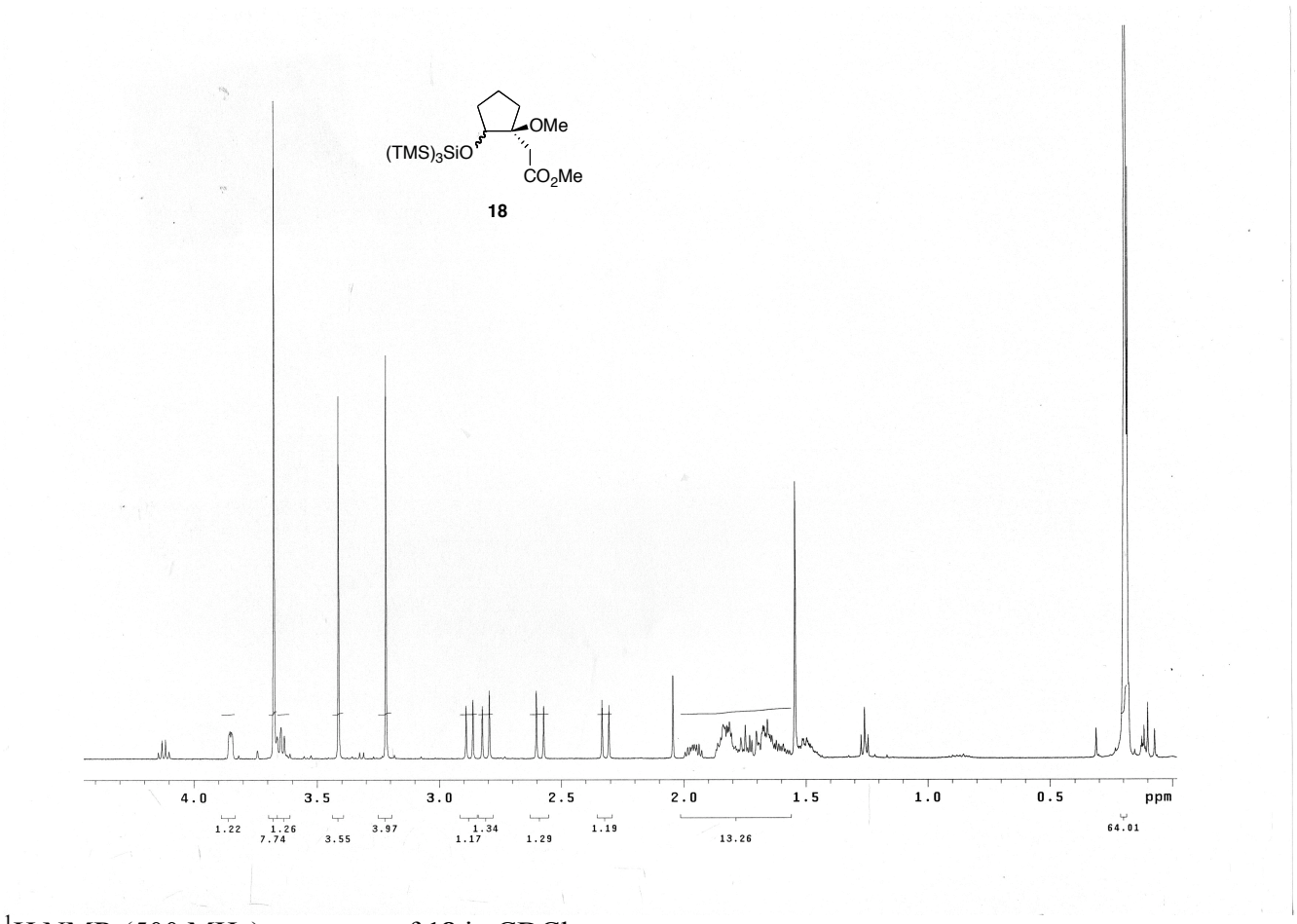
^{13}C NMR (125 MHz) spectrum of **14b** in $CDCl_3$.



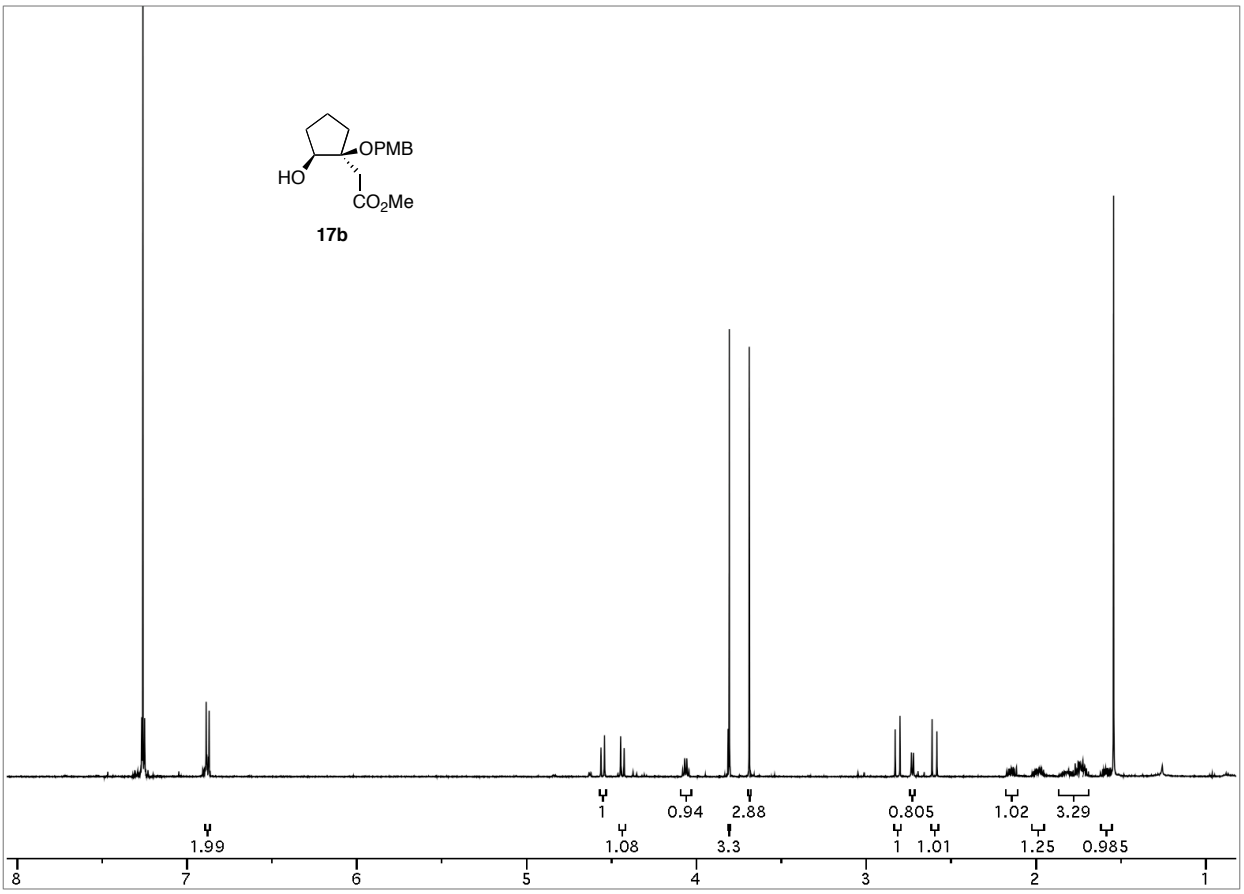
^{1}H NMR (500 MHz) spectrum of **15b** in $CDCl_3$.



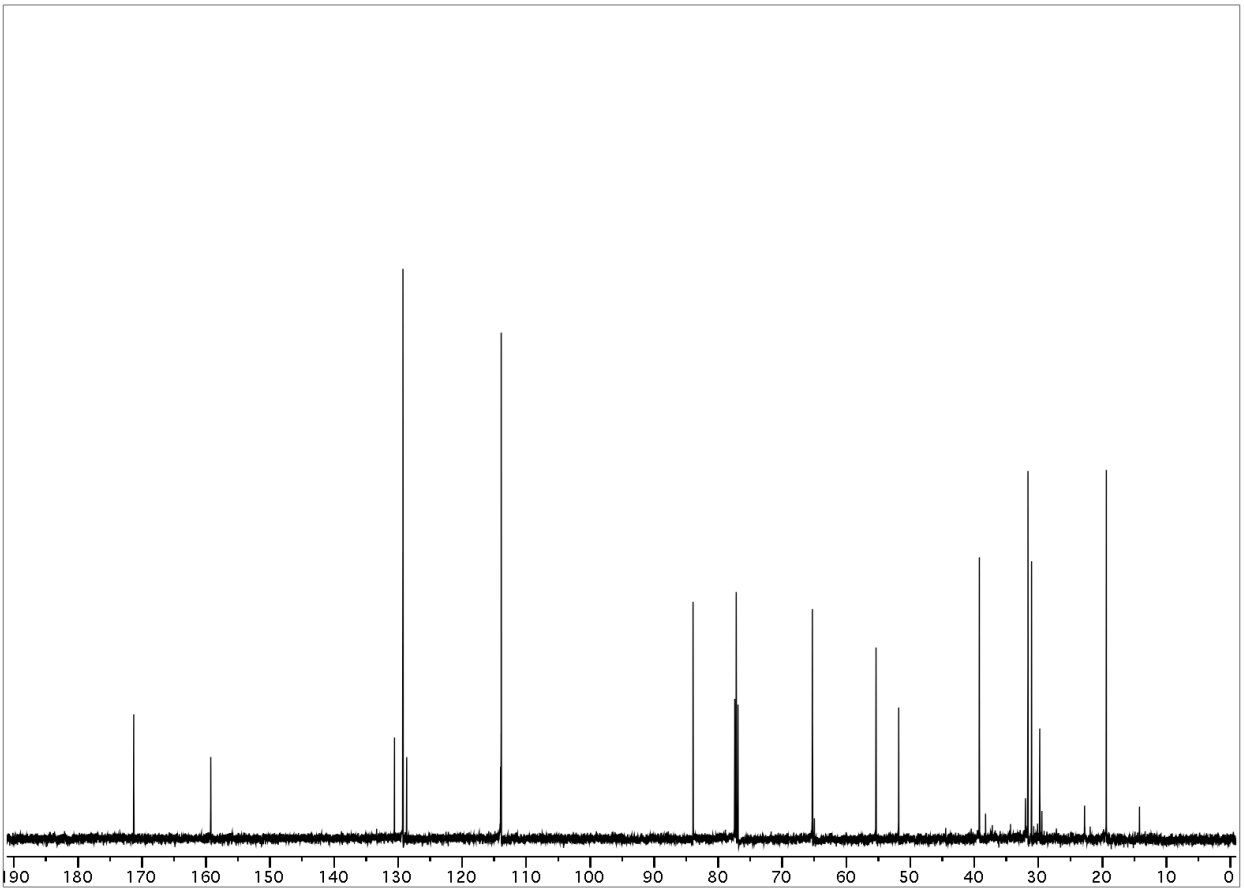
^{13}C NMR (125 MHz) spectrum of **15b** in $CDCl_3$.



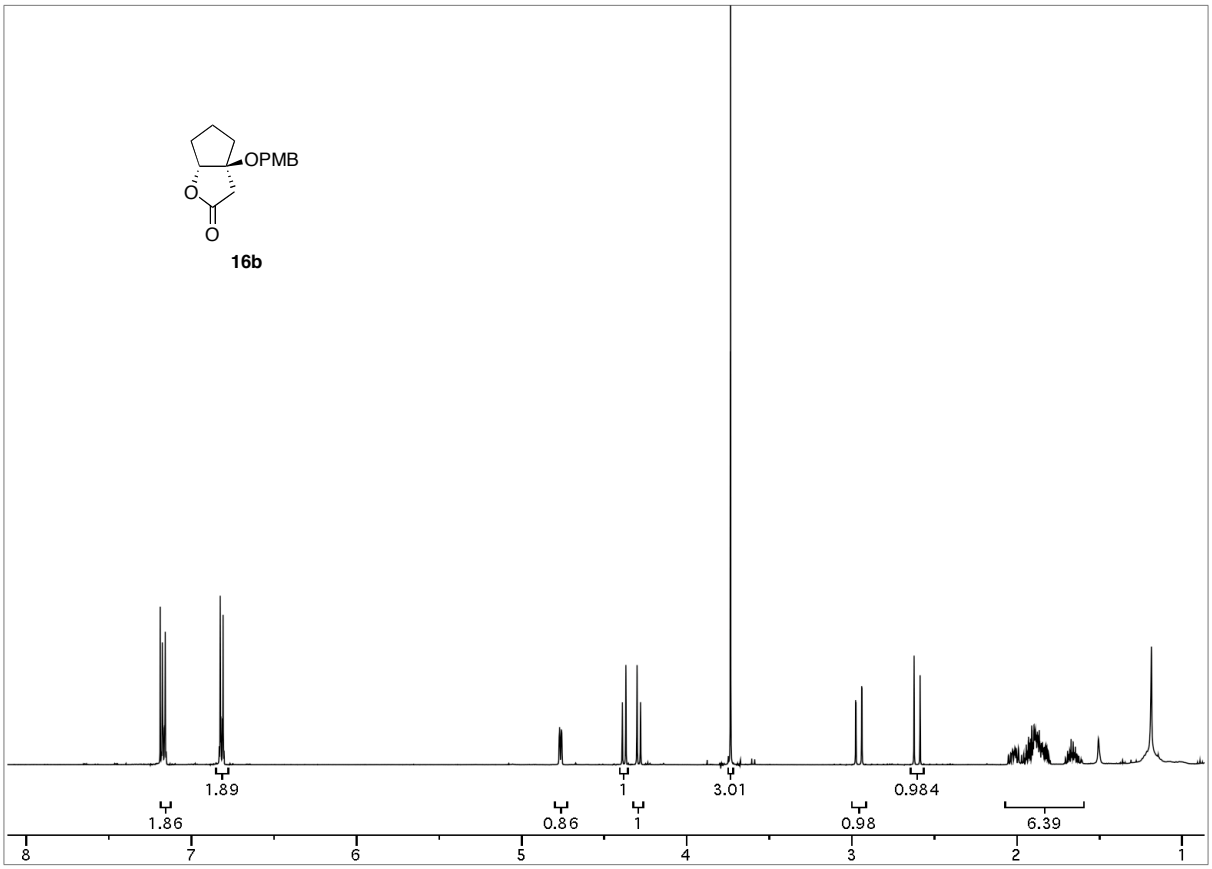
^{1}H NMR (500 MHz) spectrum of **18** in $CDCl_3$.



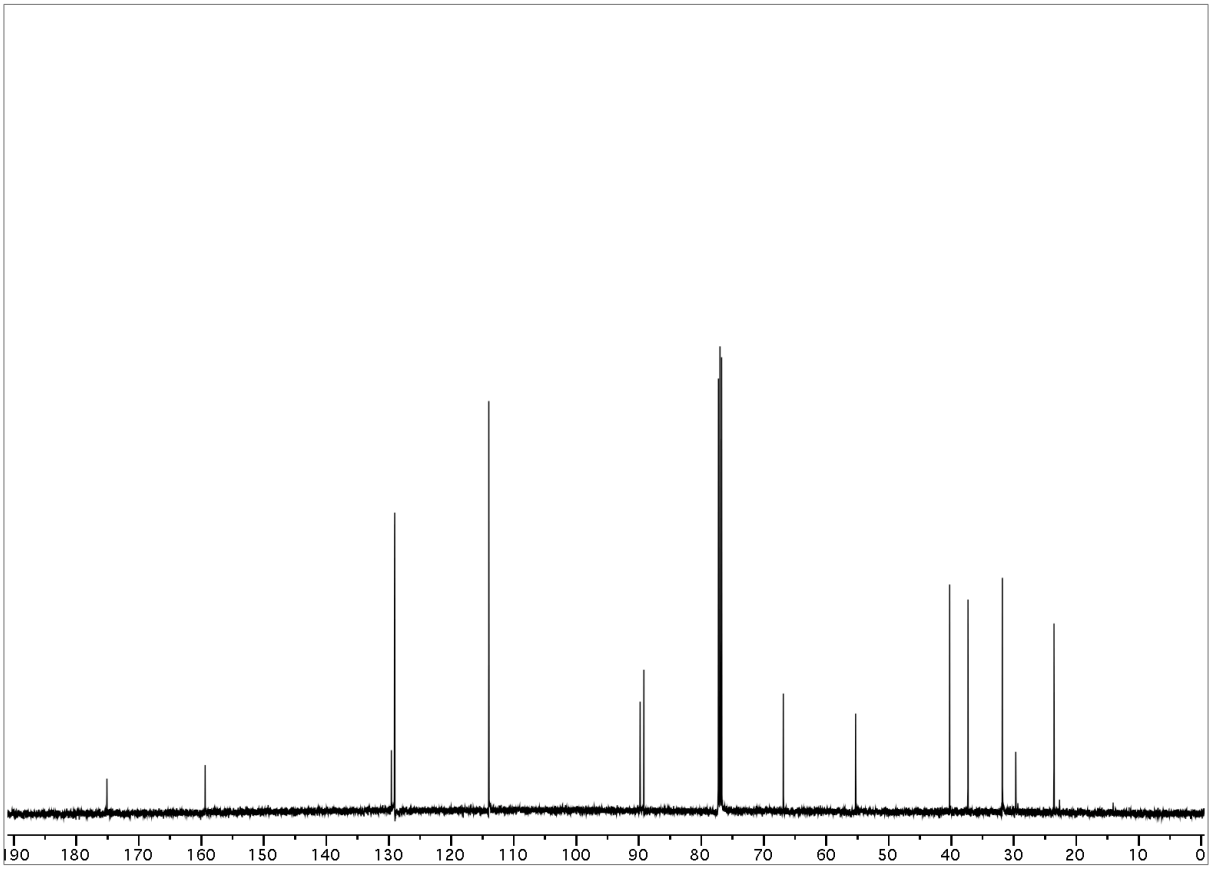
^{1}H NMR (500 MHz) spectrum of **17b** in $CDCl_3$.



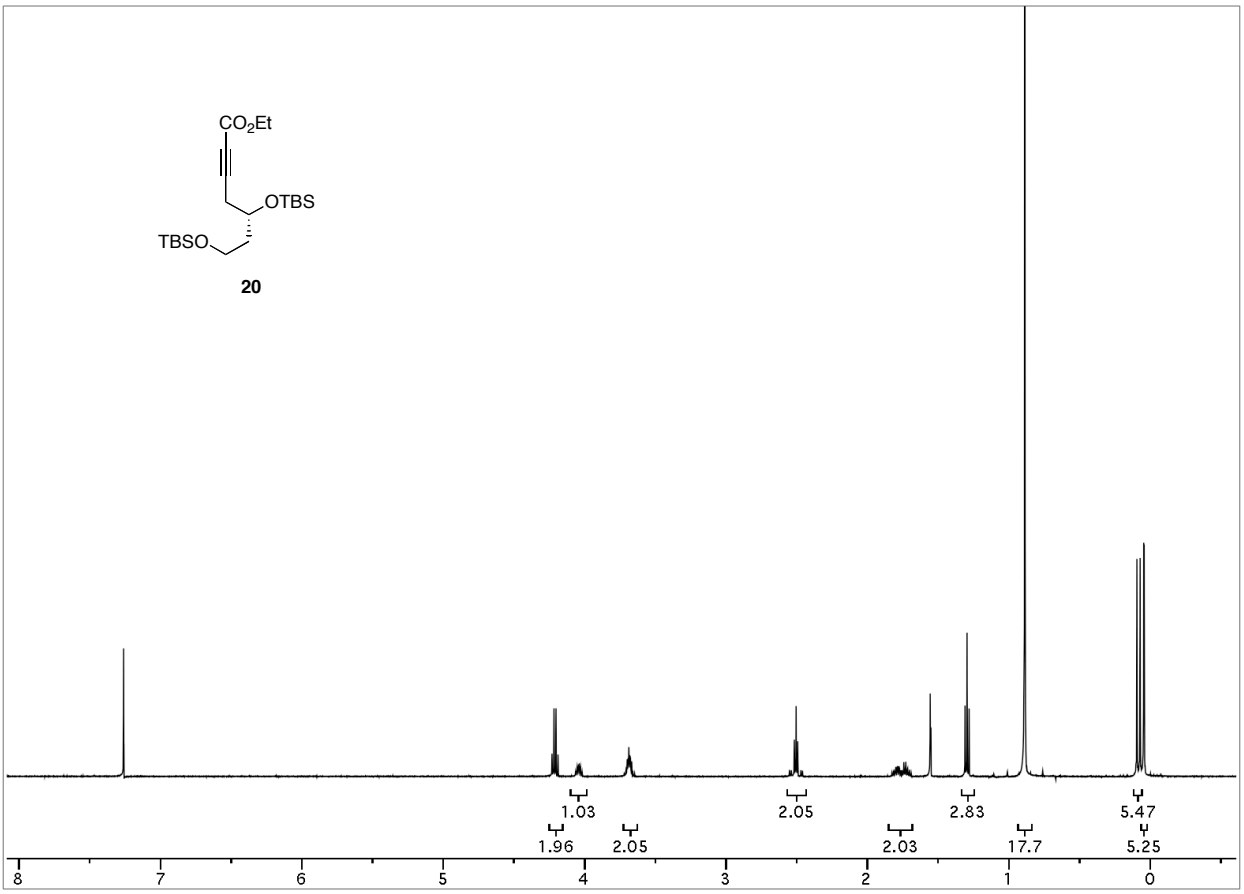
^{13}C NMR (125 MHz) spectrum of **17b** in $CDCl_3$.



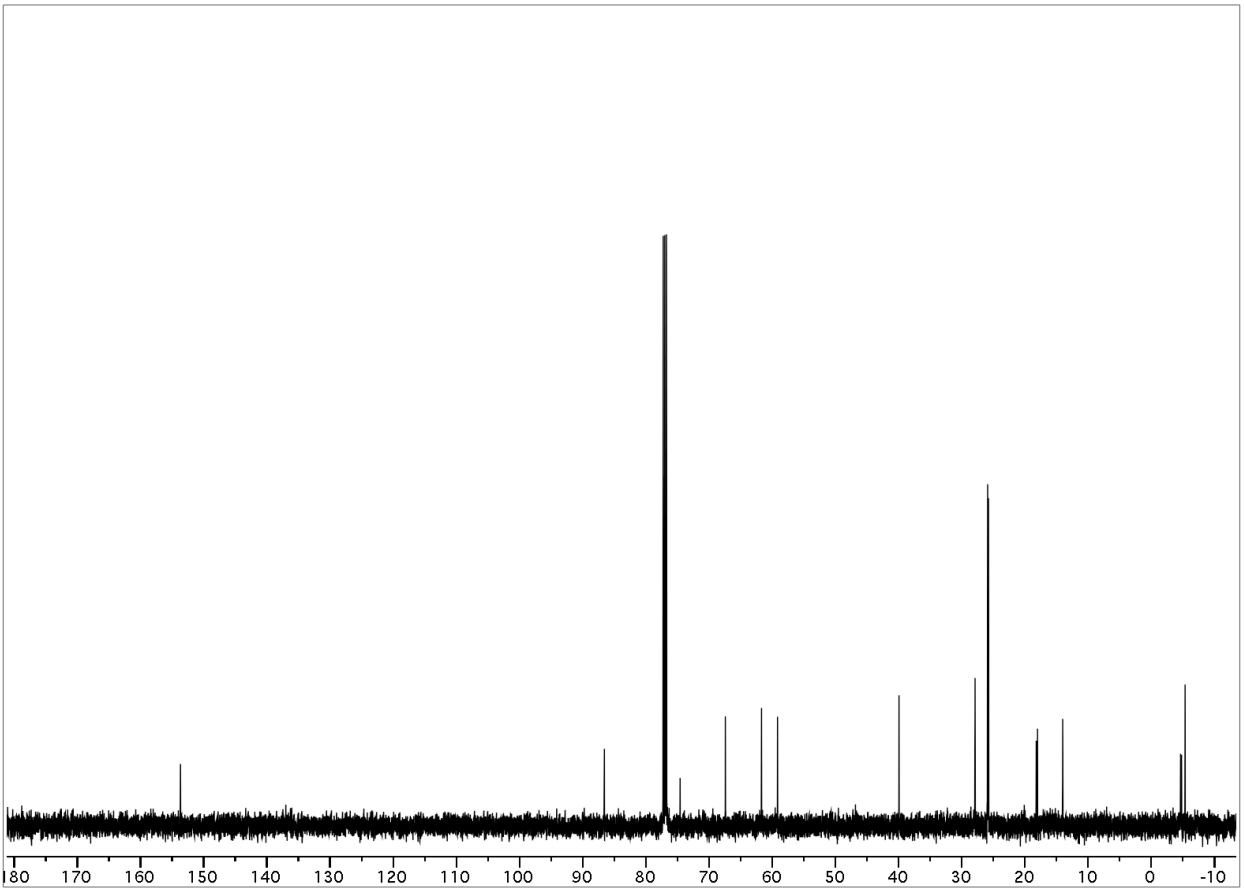
^{1}H NMR (500 MHz) spectrum of **16b** in $CDCl_3$.



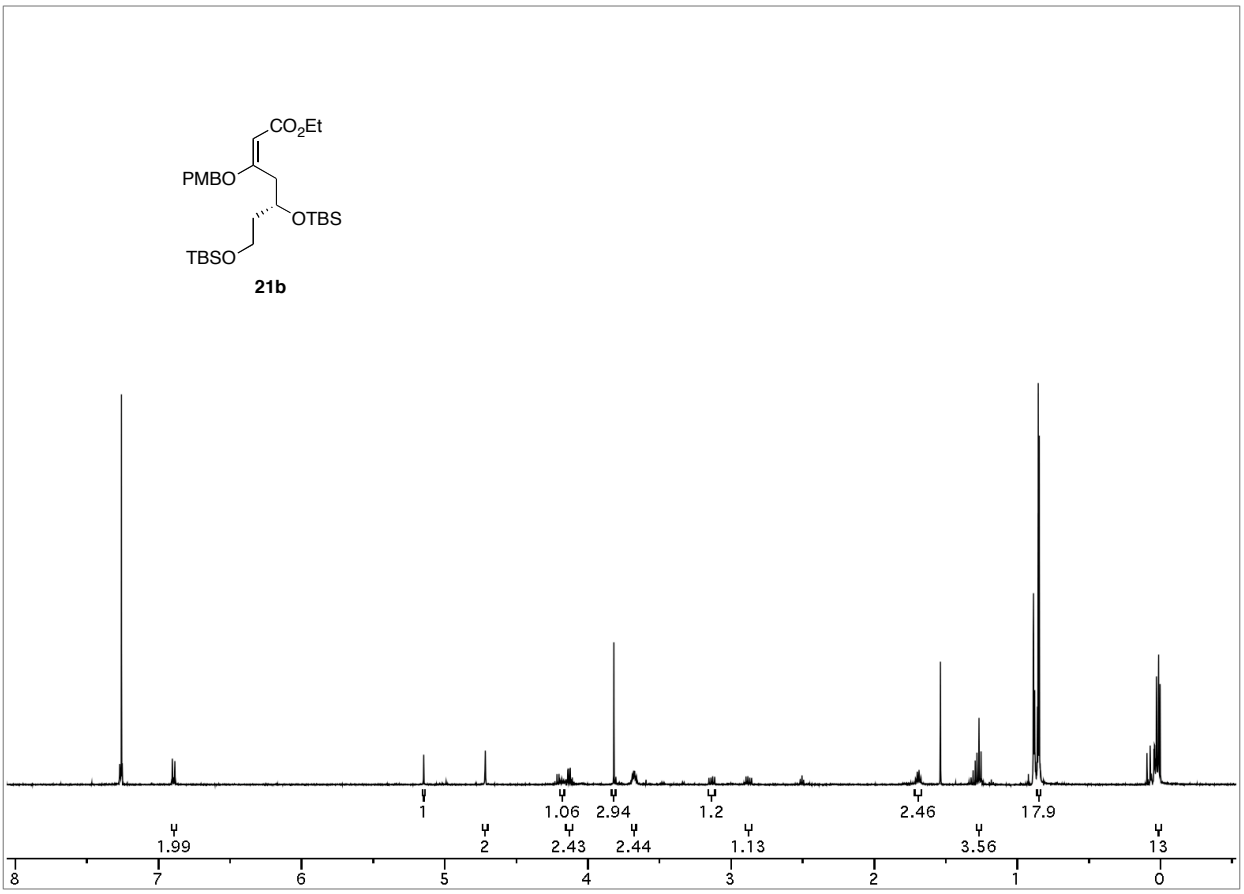
^{13}C NMR (125 MHz) spectrum of **16b** in $CDCl_3$.



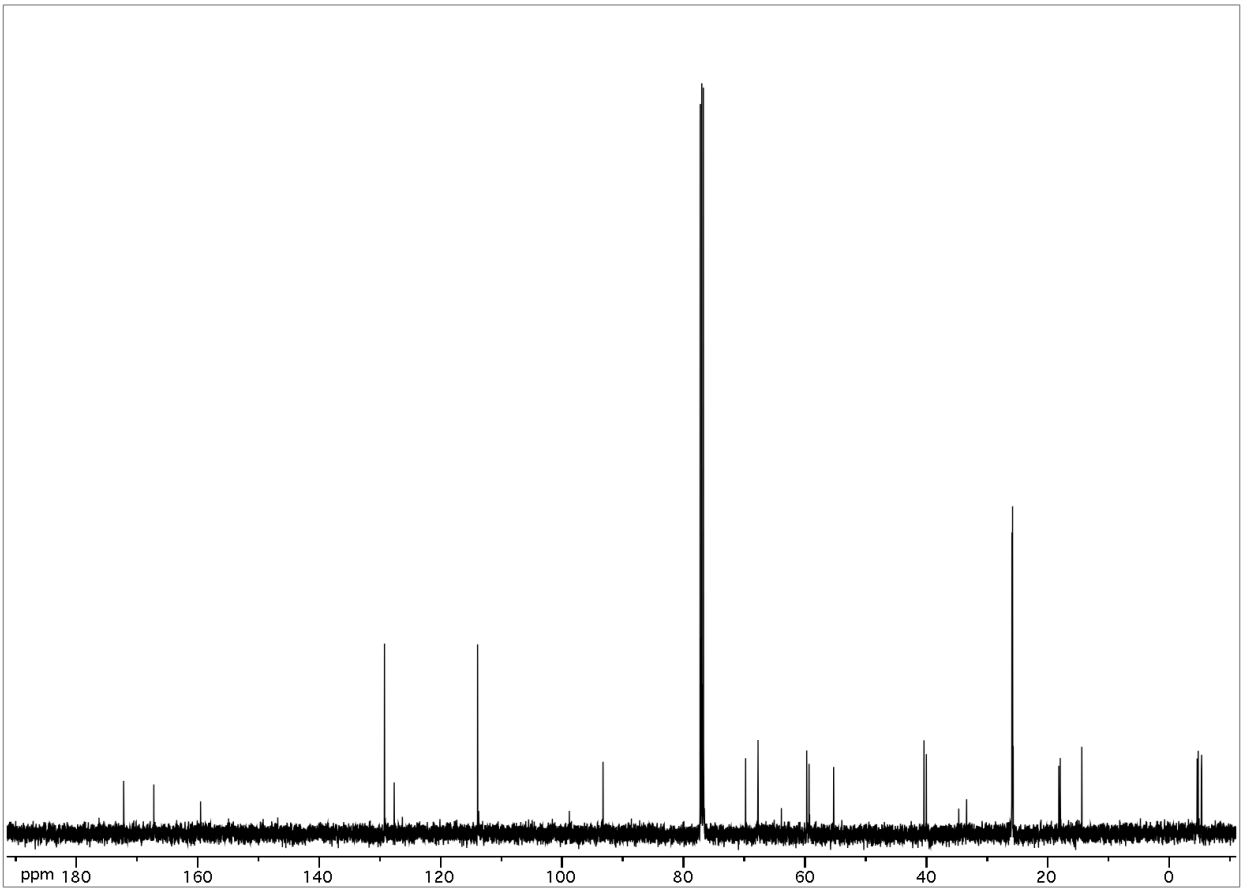
^{1}H NMR (500 MHz) spectrum of **20** in $CDCl_3$.



^{13}C NMR (125 MHz) spectrum of **20** in $CDCl_3$.



^{1}H NMR (500 MHz) spectrum of **21b** in $CDCl_3$.



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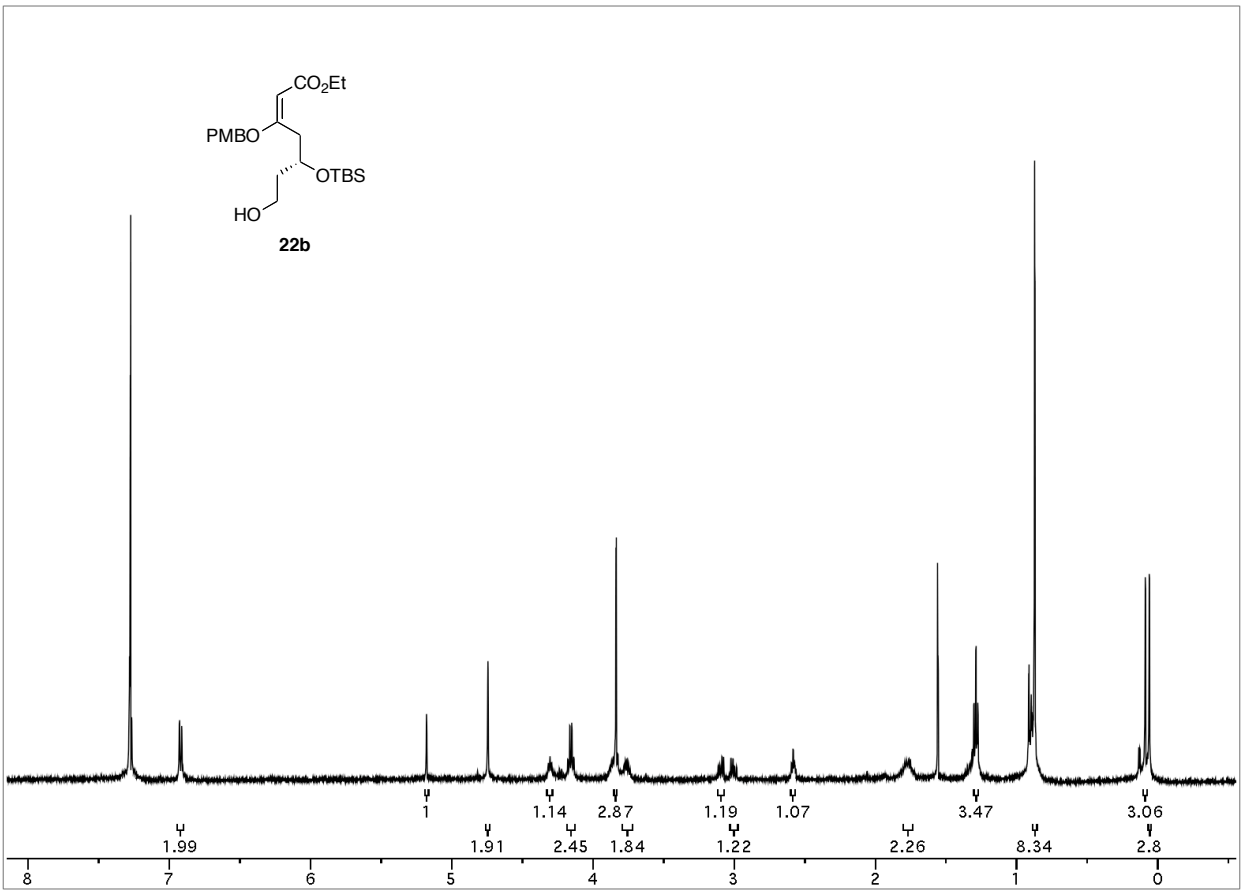

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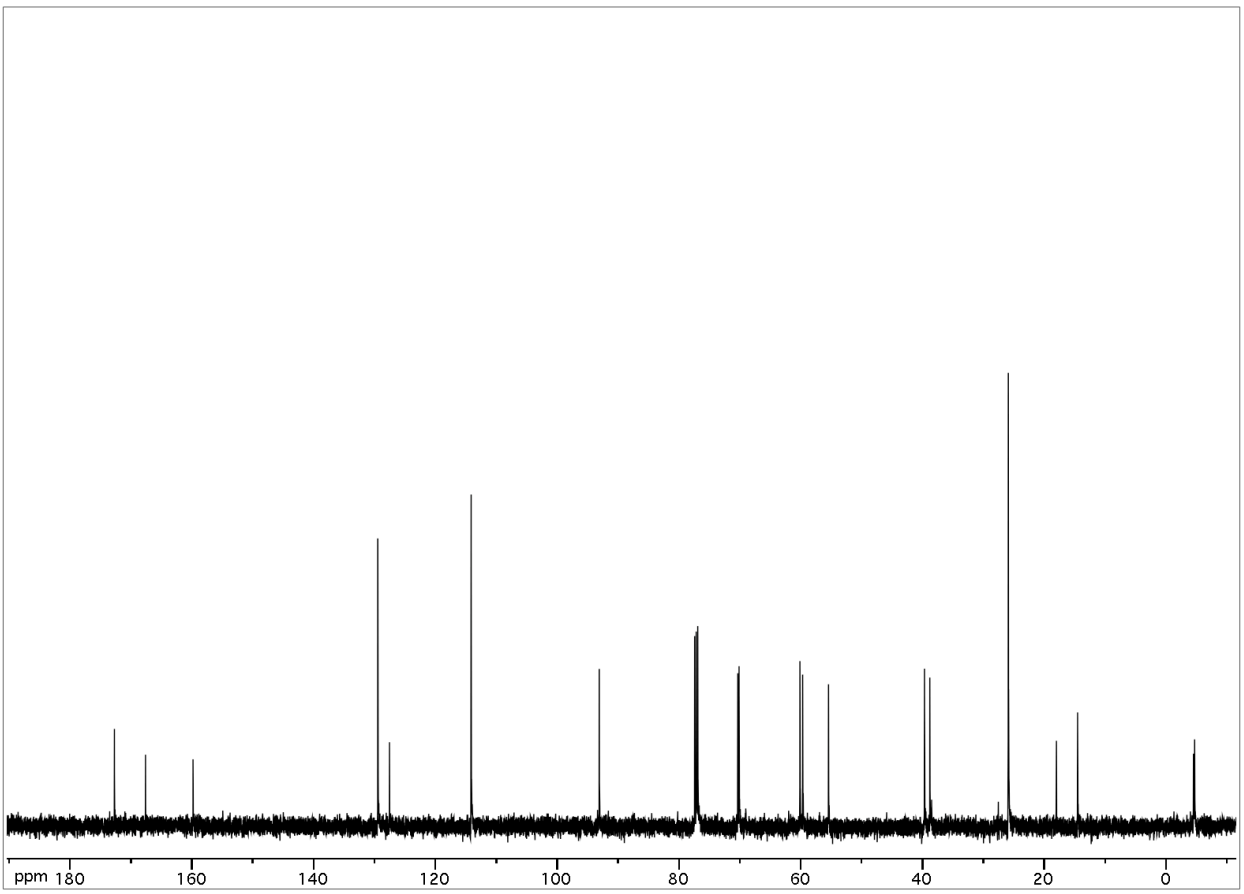

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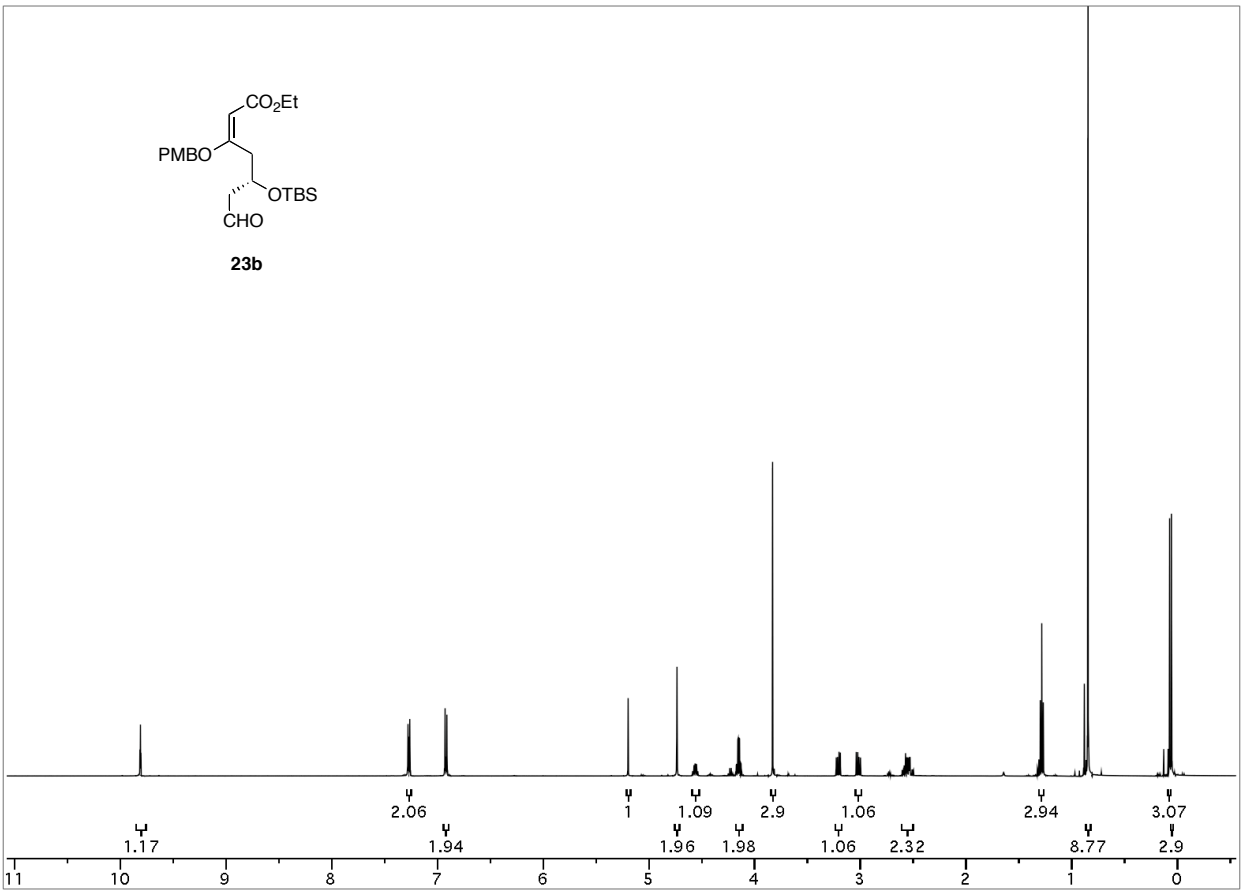
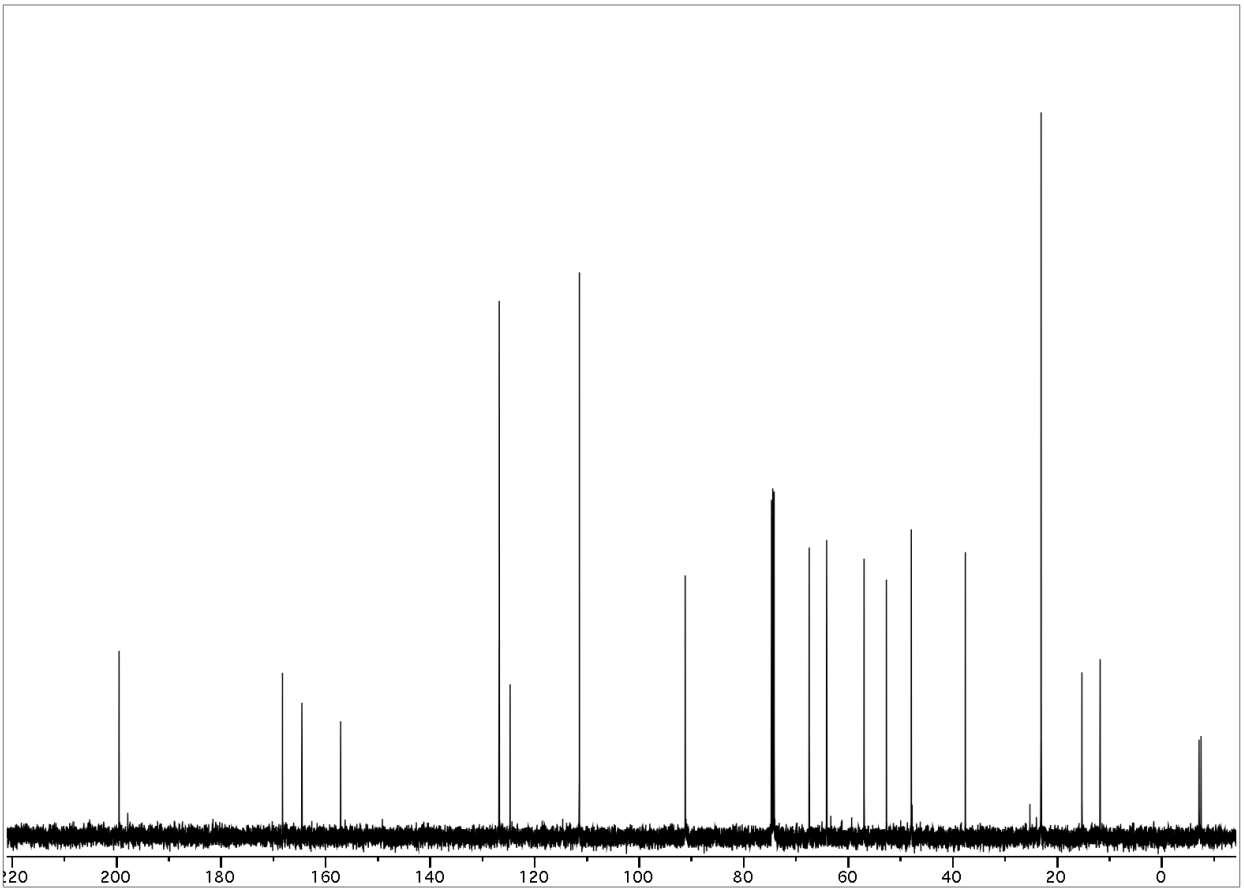


^{1}H NMR (500 MHz) spectrum of **23b** in $CDCl_3$.



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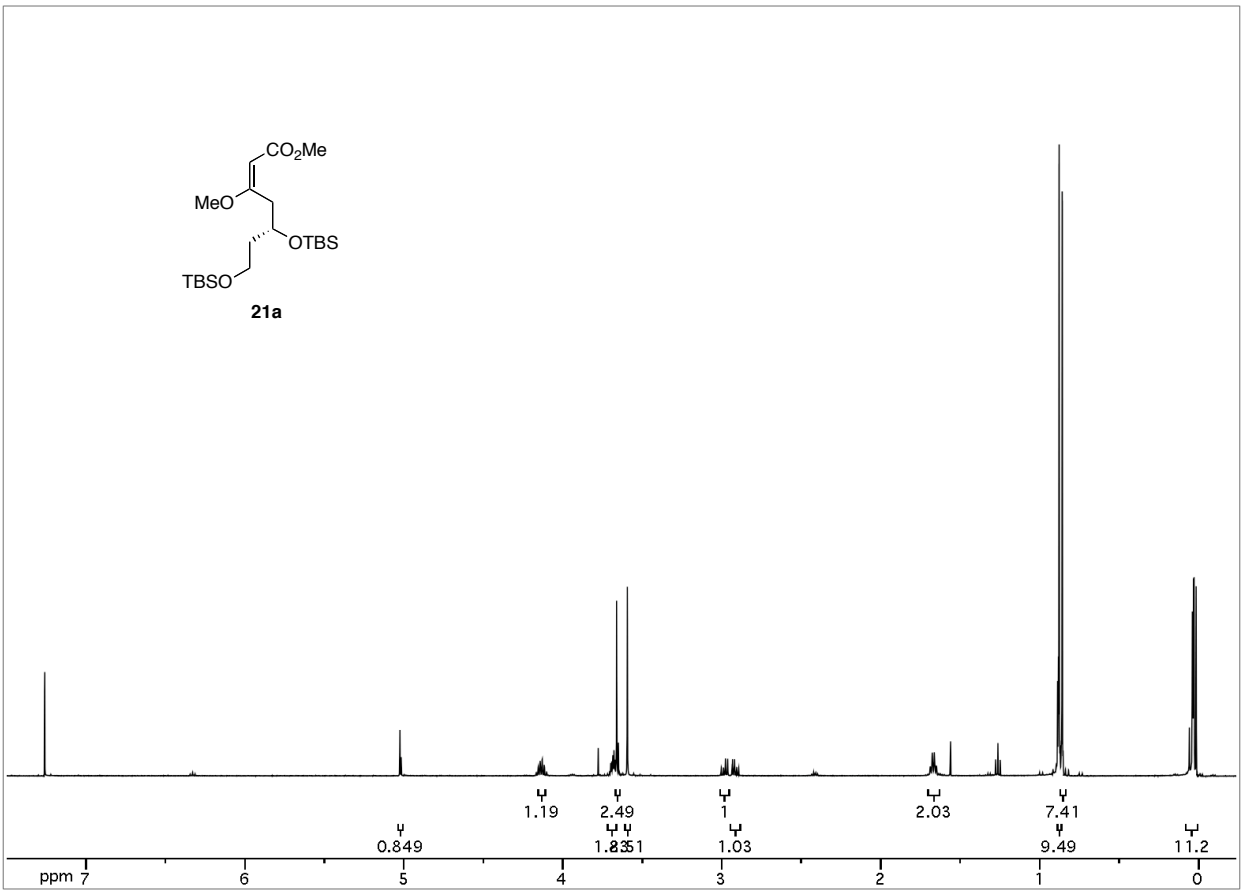
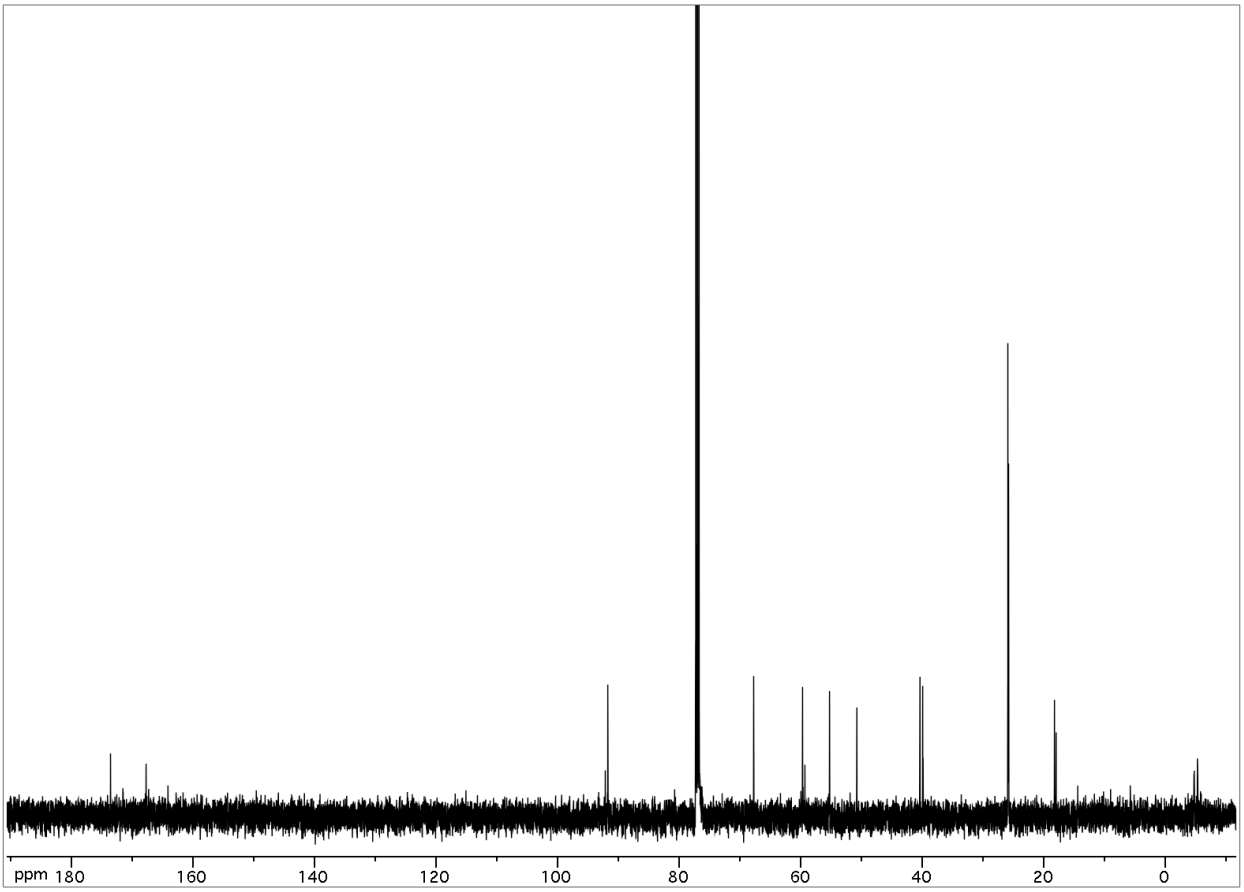
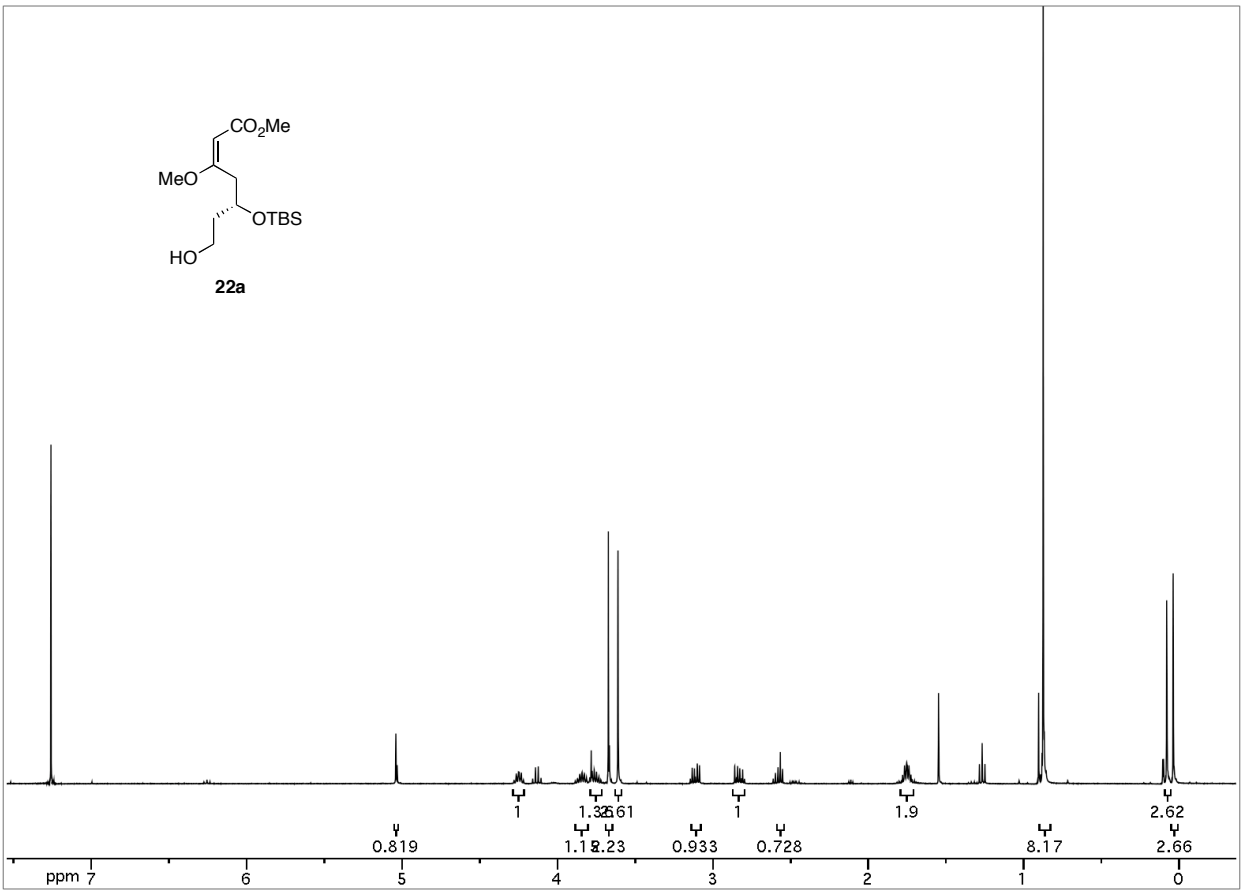


^{1}H NMR (500 MHz) spectrum of **21a** in $CDCl_3$.



^{13}C NMR (125 MHz) spectrum of **21a** in $CDCl_3$.



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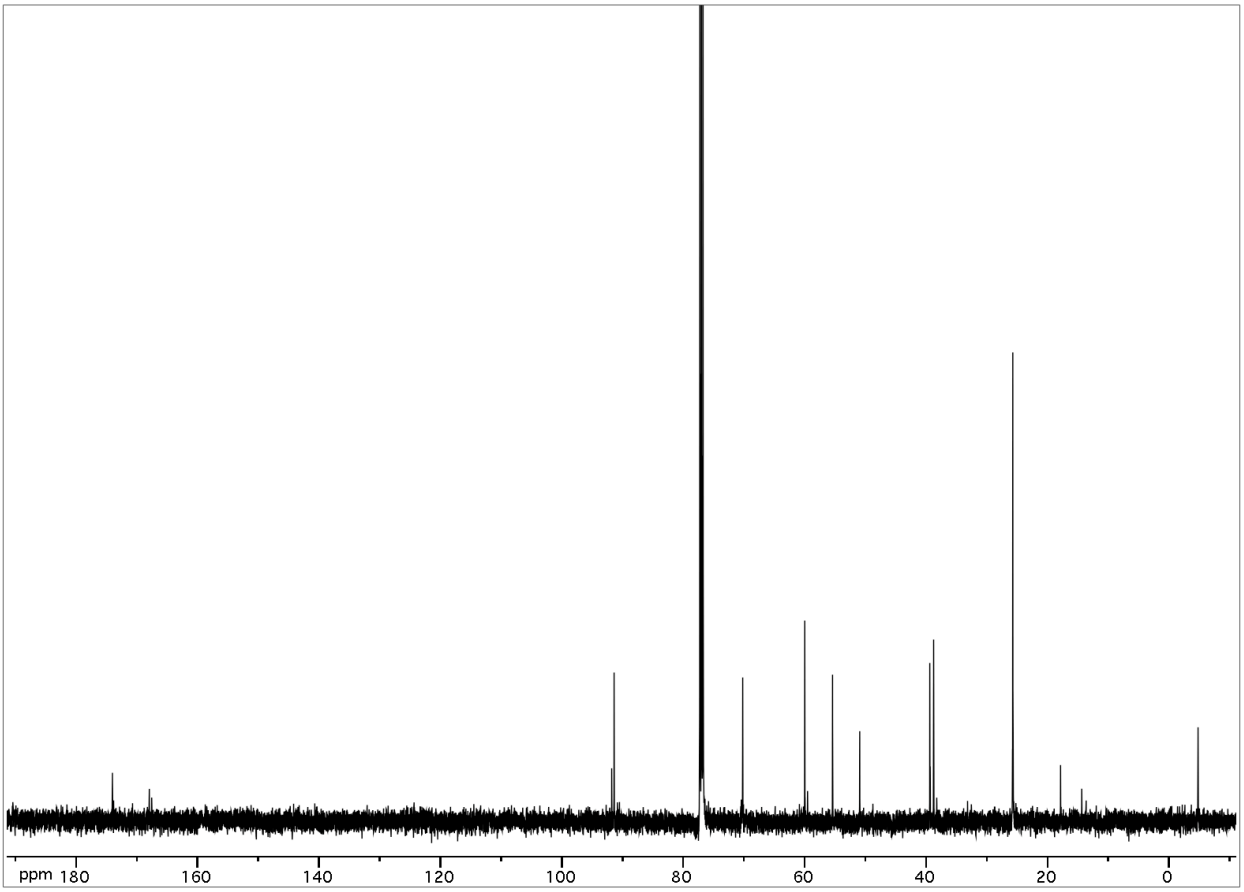
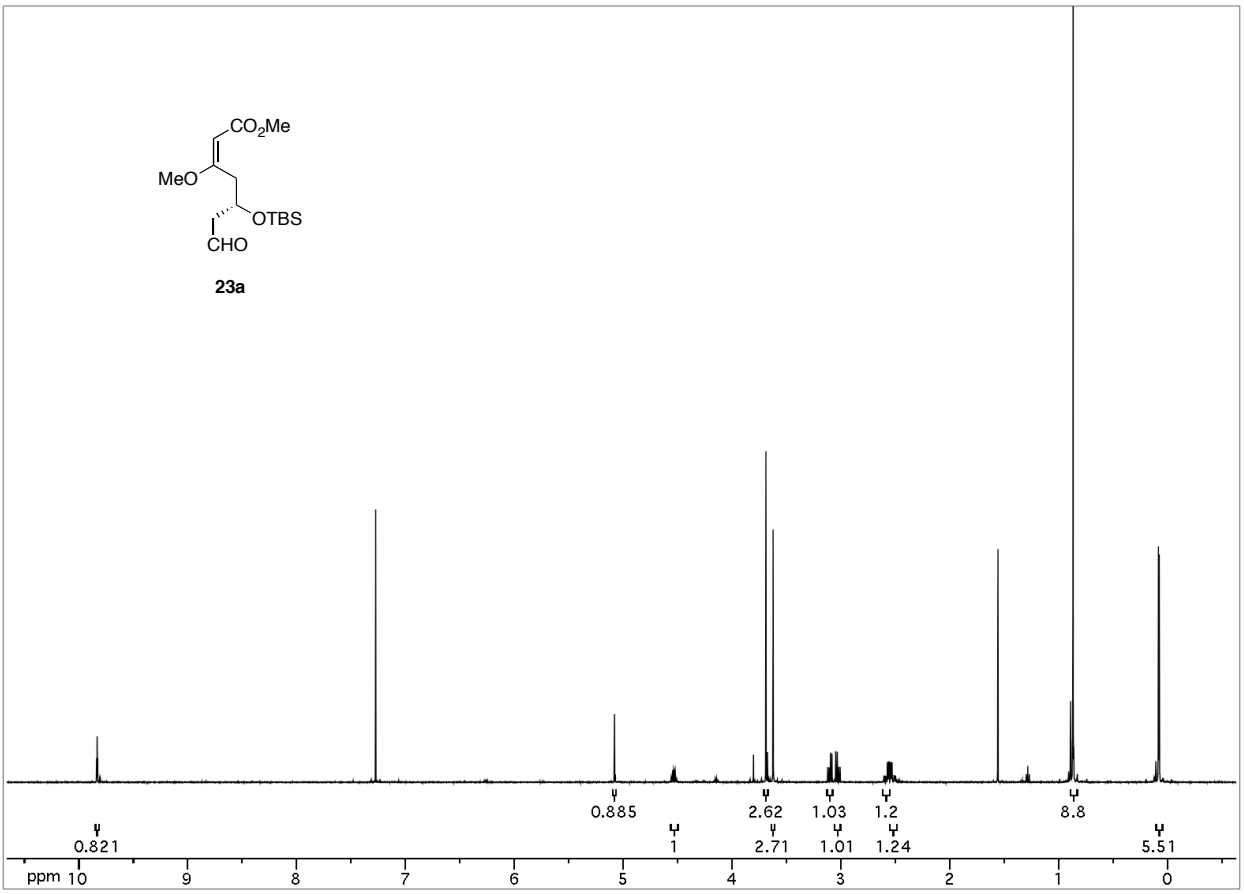
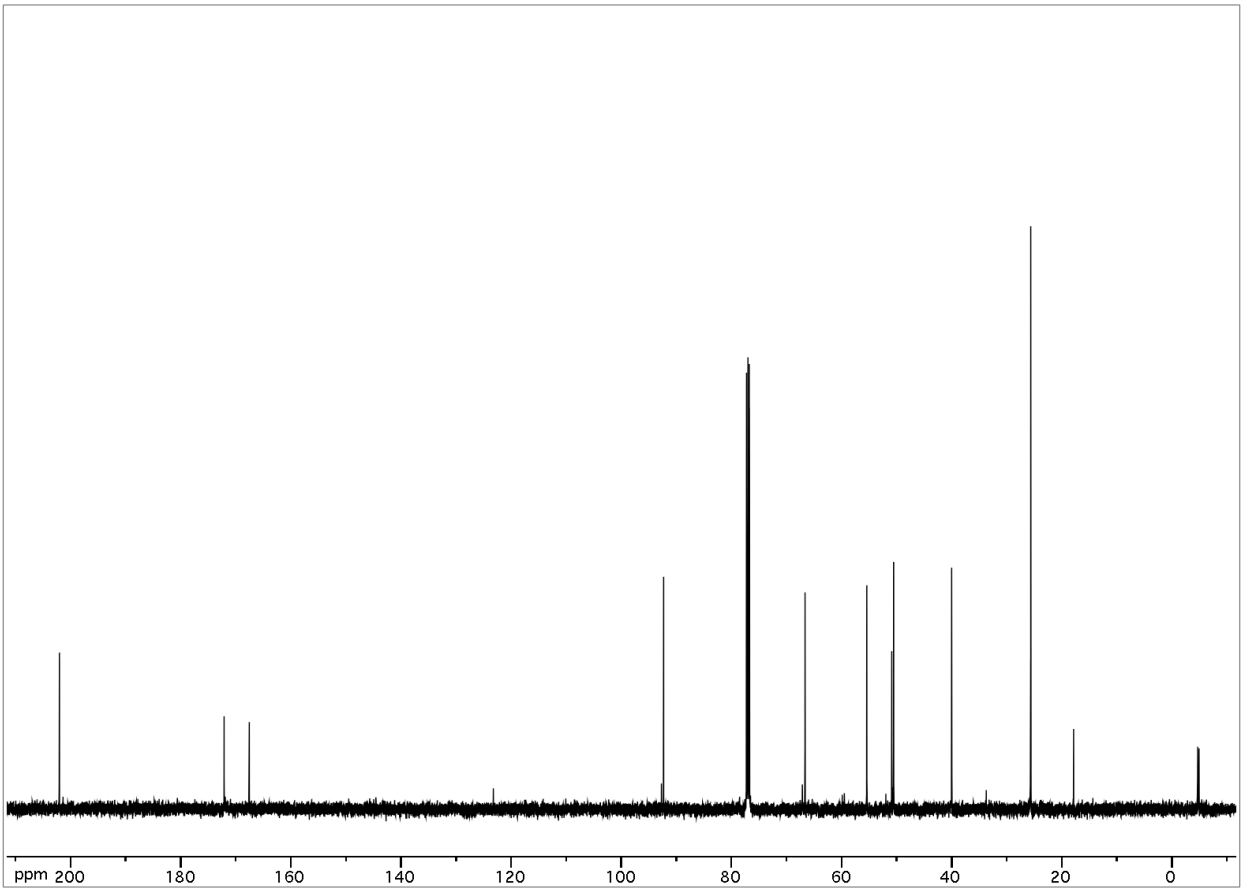


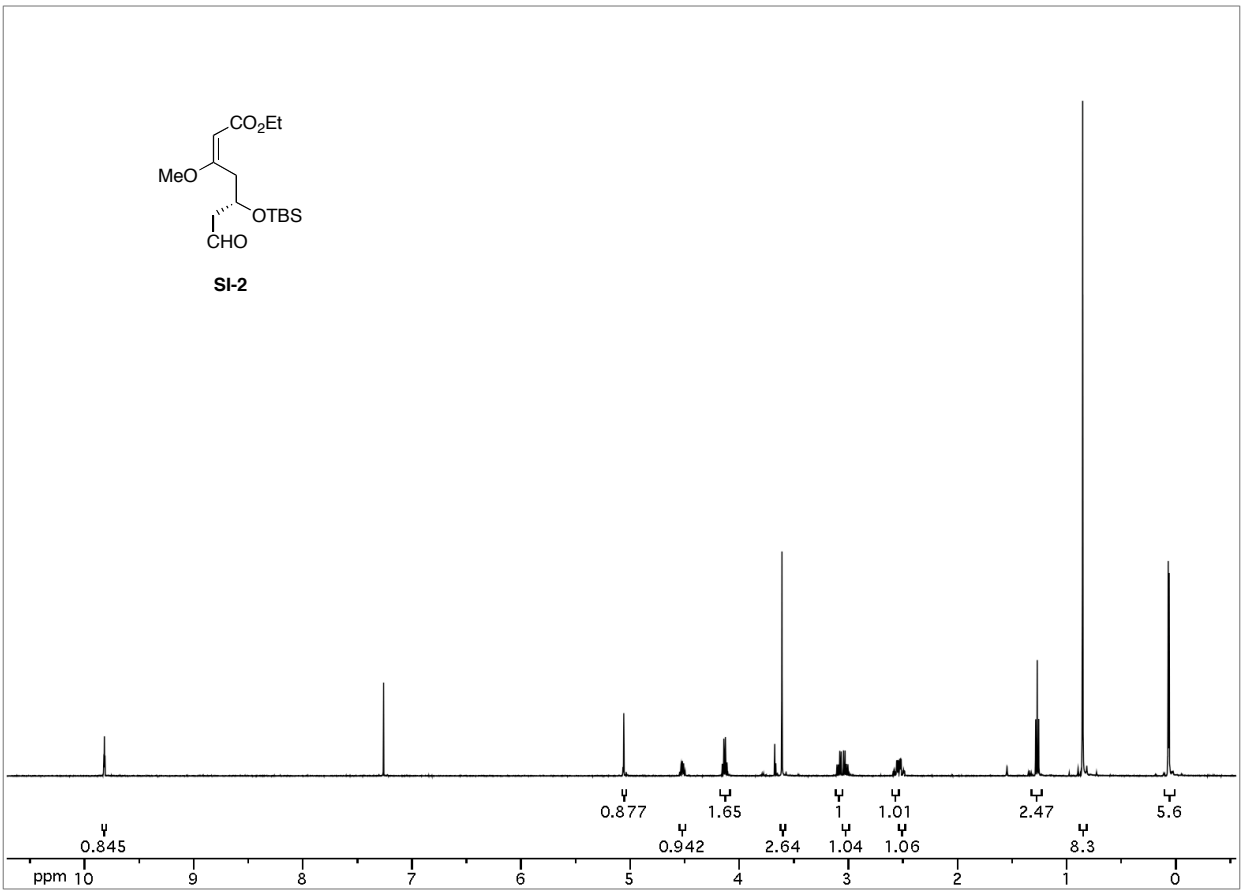
^{13}C NMR (125 MHz) spectrum of **22a** in $CDCl_3$.



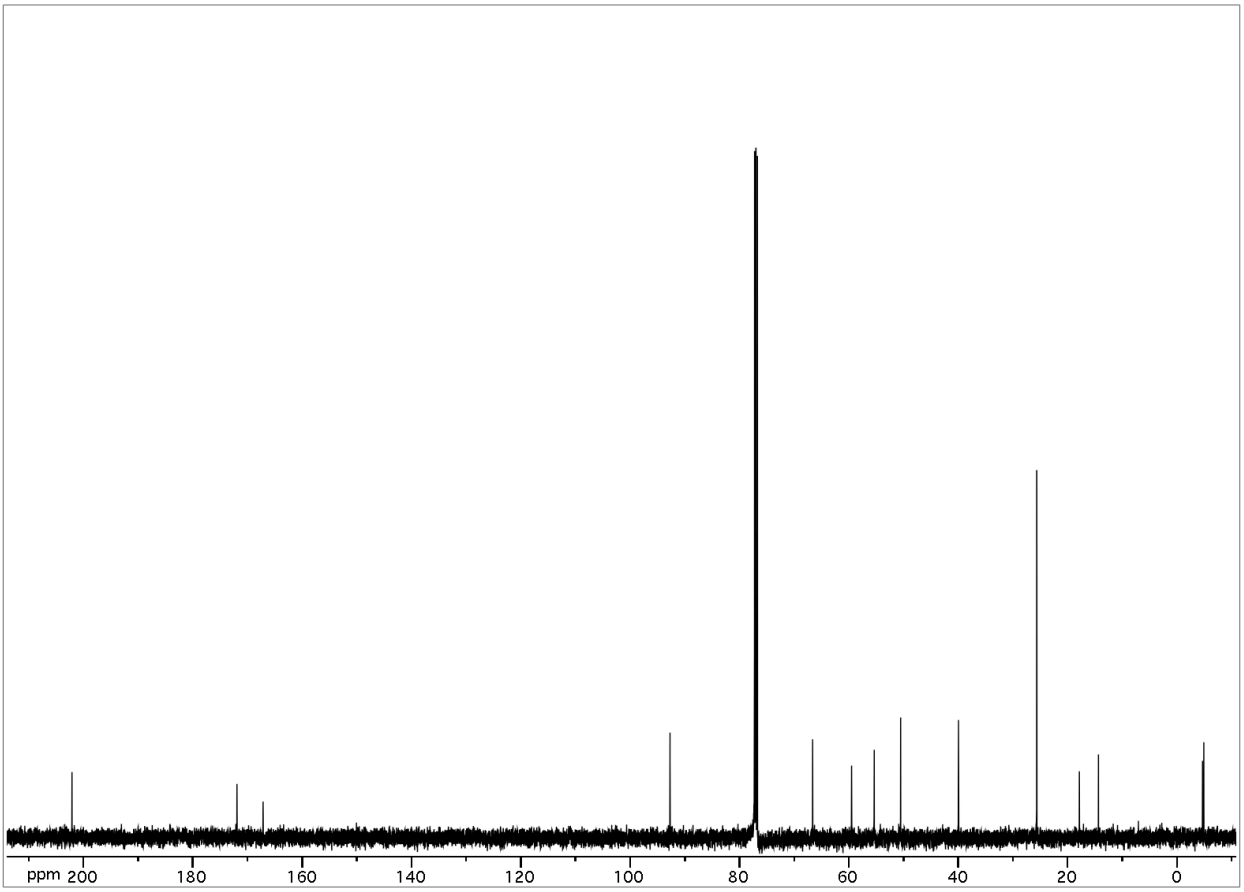
^{1}H NMR (500 MHz) spectrum of **23a** in $CDCl_3$.



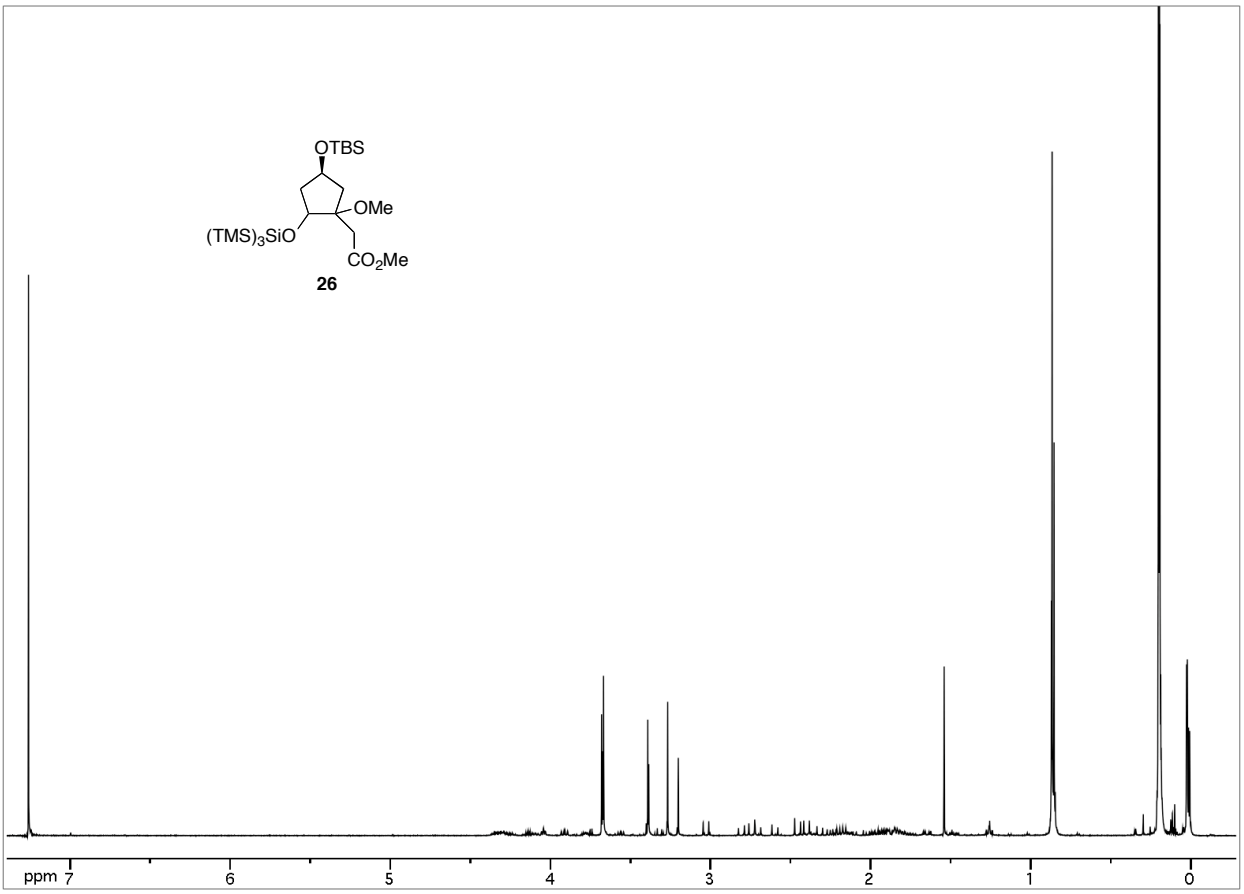
^{13}C NMR (125 MHz) spectrum of **23a** in $CDCl_3$.



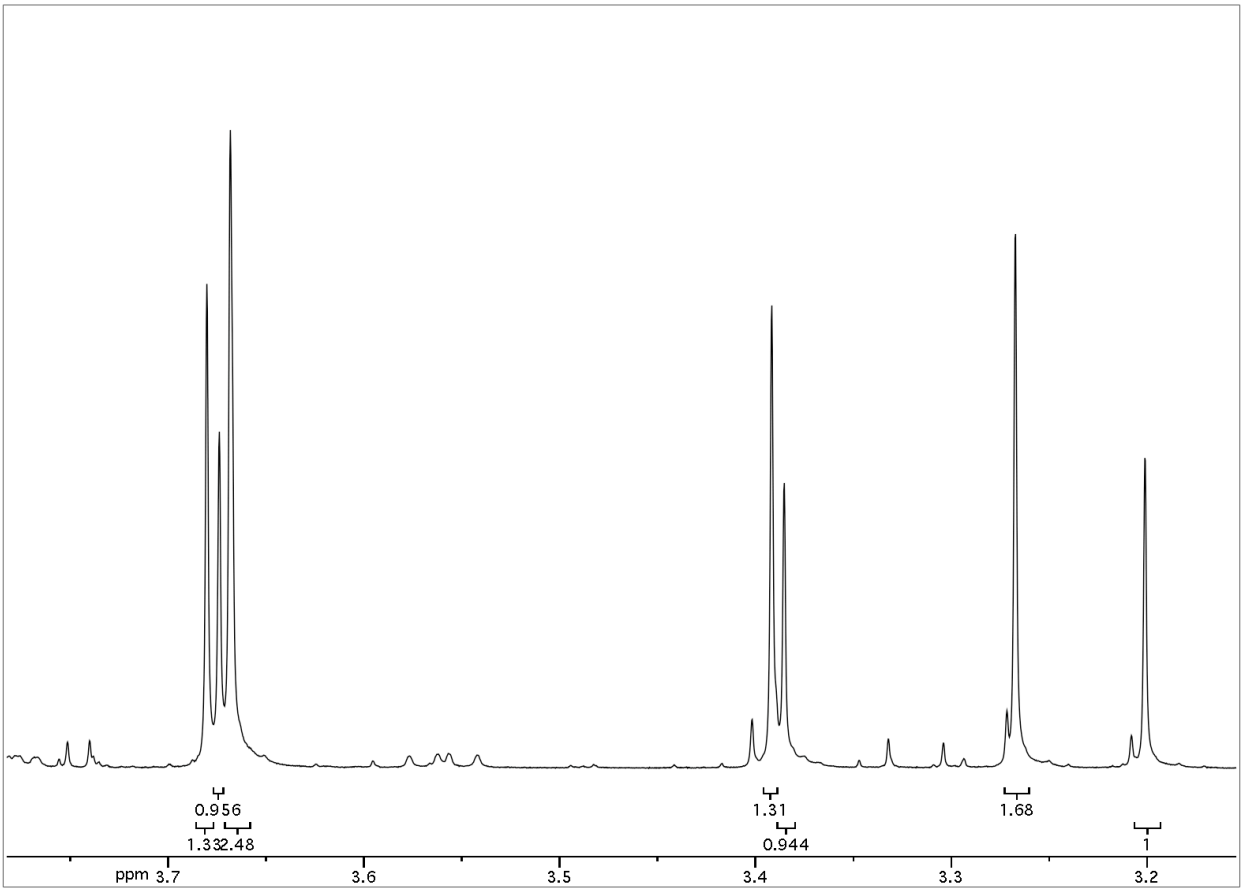
^{1}H NMR (500 MHz) spectrum of **SI-2** in $CDCl_3$.



^{13}C NMR (125 MHz) spectrum of **SI-2** in $CDCl_3$.



^{1}H NMR (500 MHz) spectrum of **26** in $CDCl_3$.



Partial ^{1}H NMR (500 MHz) spectrum of **26** (4 diastereoisomers) showing OMe signals.