Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry

First Synthesis of (+)-Myrrhanol C, an anti-prostate cancer lead.

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Supporting Information

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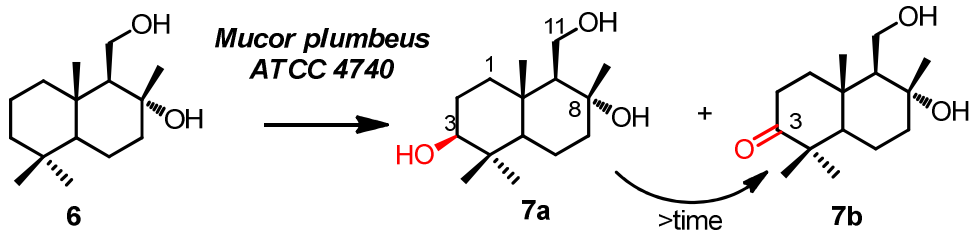
General Details

The solvents used were purified according to standard literature techniques and stored under Argon. THF and toluene were freshly distilled immediately prior to use from sodium/benzophenone.. Reagents were purchased at the higher commercial quality and used without further purification, unless otherwise stated. Yields refer to chromatographically and spectroscopically (1H NMR) homogeneous materials, unless otherwise stated. IR spectra were recorded on a Mattson Satellite FTIR spectrometer. NMR spectra were performed with a Varian Direct-Drive 600 (^{1}H 500 MHz/^{13}C 150 MHz), Varian Direct-Drive 500 (^{1}H 500 MHz/^{13}C 125 MHz), Varian Direct-Drive 400 (^{1}H 400 MHz/^{13}C 100 MHz) and Varian Inova Unity 300 (^{1}H 300 MHz/^{13}C 75 MHz) spectrometers. The accurate mass determination was carried out with a mass spectometer equipped with a TOF, system Triwave® *WATERS model SYNAP G2* and a AutoSpec-Q mass spectrometer arranged in a EBE geometry (Micromass Instrument, Manchester, UK) and equipped with a FAB (LSIMS) source. The instrument was operated at 8 KV of accelerating voltage and Cs+ were used as primary ions. Optical rotations were measured on a Perkin-Elmer 141 polarimeter, using $CHCl_3$ as the solvent. Silica gel SDS 60 (35-70 μm) was used for flash column chromatography. Reactions were monitored by thin layer chromatography (TLC) carried out on 0.25 mm E. Merck silica gel plates (60F-254) using UV light as the visualizing agent and solutions of phosphomolybdic acid in ethanol or acidic mixture of anisaldehyde and heat as developing agents. HPLC with UV and RI detection was used. Semi-preparative HPLC separations were carried out on a column (5 μm Silica, 10 x 250 mm) at a flow rate of 2.0 mL/min in an Agilent Series 1100 instrument. GC-MS analysis was performed on a CARLO ERBA 8000 Series mod. 8060, with a split ratio of 1: 100, 1ml/

min helium flow. Column temperature was held at 240 ºC for 2 min, then increased to 330 ºC with a rate of 20 ºC/min, followed by keeping at 330 ºC for 15 min. A ZB-5ms (30 mx0.25 mm I.D., 0.25 μm film thickness, Phenomenex Inc., Torrance, CA, USA) column was used. The mass spectrometer ionization mode was electron impact (EI+), the acquisition mode was full scan (m/z range 45–500 Da), and the detector voltage was 70 eV. All air- and water-sensitive reactions were performed in flaks flame-dried under a positive flow of Argon and conducted under an Argon atmosphere. The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, quint = quintet, m = multiplet, pent = pentet, hex = hexet, br = broad.

Experimental



Compounds 7a and 7b:

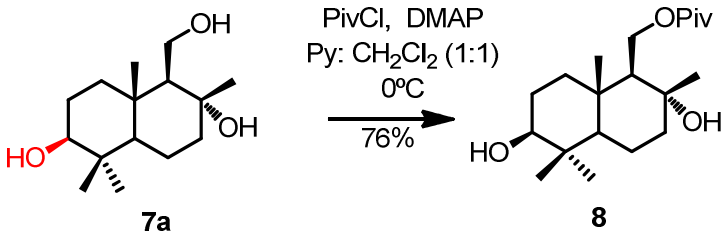
A typical batch consisted of 24 x 500 ml erlenmeyer flasks containing each 200 ml of liquid medium (Corn steep liquor, l g; K_2HP0_4, 2g; $NaN0_3$, 0.5g; KCl, 0.5 g; $MgS0_4.7H_20$, 0.02 g; $FeS0_4,7H_20$, 30 g; glucose, 10 g in water, 1 L.), inoculated with freshly obtained spores of *M. plumbeus* ATCC 4740 and incubated in an orbital shaker (27ºC, 250 rpm). After 48 hours growth, a solution of **6** (40 mg), dissolved in ethanol (0.2 ml) and Tween 80 (0.04 ml), was added to each flask, and incubation was continued in the same conditions. After different times, the incubation medium was filtered and the filtrate was continuously extracted during 48 hours with ethyl acetate. The organic extract was evaporated in *vacuo* to give the crude transformation product which was then submitted to silica gel chromatography.

Entry	Time	7a	7b
1	10 h.	32.7 %	
2	14 h.	35.4 %	
3	16 h.	39.5 %	
4	24 h.	52 %	2.4 %
5	48 h.	35 %	21 %
6	60 h.	18.6 %	12.3 %

7	5 d.	14.8 %	21.3 %

3β-Hydroxy,8α,11 drimanediol (7a): white solid, mp. 199-203 ºC; $[\alpha]^{25}_{d}$= +2.25º (*c* 0.4, CH_3OH); IR (film) 3256 (OH) cm^{-1}; ^{1}HRMN (CD_3OD, 500 MHz), δ 3.89 (dd, *J* = 10.9, 8.3 Hz, 1H), 3.82 (dd, *J* = 11.0, 4.5 Hz, 1H), 3,18 (dd, *J* = 10.5, 5.9 Hz, 1H), 1.84 (dt, *J* = 12.5, 3.2 Hz,1H), 1.79 (dt, *J* = 13.2, 3.5 Hz, 1H), 1,52 (dt, *J* = 13.3, 3.6 Hz, 1H), 1,44 (dd, *J* = 8.2, 4.1 Hz,1H), 1.26 (s, 3H), 0.99 (s, 3H), 0.96 (dd, *J* = 12.2, 2.3 Hz, 1H), 0.85 (s, 3H), 0.76 (s, 3H); ^{13}C RMN (CD_3OD, 125 MHz) δ 79.3, 74.8, 61.7, 60.9, 56.5, 44.7, 39.9, 39.5, 38.4, 28.8, 27.9, 24.5, 20.9, 16.4, 16.2. HRFABMS: calcd. $C_{15}H_{28}NaO_3$ $[M+Na]^+$ 279,1936, found 279,1936.

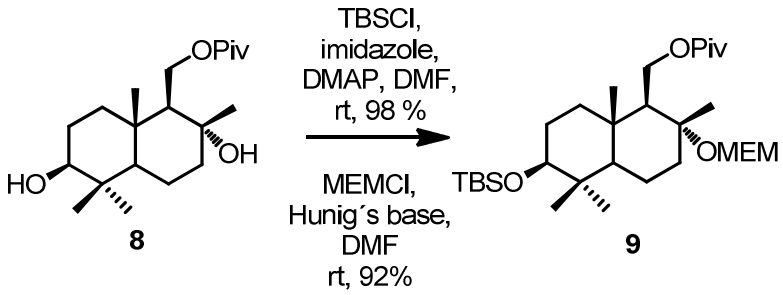
3-Keto-8α, 11 drimanediol (7b): mp. 188-197 ºC; $[\alpha]^{25}_{d}$= +5.34º (c 1, $CHCl_3$); IR (film) 3346 (OH), 1704 (C=O) cm^{-1}; ^{1}HRMN ($CDCl_3$, 300 MHz), δ 3.94 (dd, *J* = 10.9, 9.8 Hz, 1H), 3.87 (dd, *J* = 10.9, 3.4 Hz, 1H), 2.49 (m, 2H), 1.37 (s, 3H), 1.11 (s, 3H), 1.01 (s, 3H), 0.85 (s, 3H) ^{13}C RMN ($CDCl_3$, 75Mhz) δ 217.3, 74.4, 61.1, 59.2, 54.3, 47.2, 43.2, 38.7, 36.9, 33.8, 27.2, 23.9, 21.2, 21.1, 15.9. HRFABMS: calcd. $C_{15}H_{26}NaO_3$ $[M+Na]^+$ 277,1780, found 277,1781.



7a **8**

3β,8α Dihydroxy, 11-drimanyl pivalate (8): To a solution of **7a** (114 mg, 0.444 mmol) in CH_2Cl_2 (3 mL), pyridine (2 mL), pivaloyl chloride (0.06 mL, 0.532 mmol) and dimethylaminopyridine (DMAP, 0.005 g, 0.04 mmol) were consecutively added.

After 1.5 h, the reaction mixture was quenched by addition of a solution HCl (2 N, 5.0 mL). The organic layer was washed with a saturated solution of $NaHCO_3$ (10 mL) and brine (10 mL) and then dried (Na_2SO_4) and concentrated under vacuo. The residue was purified by flash chromatography (silica gel, hexanes: *t*-BuOMe, 1:1 v/v) to give **8** (115 mg 76%) as a colorless oil. TLC (*t*-BuOMe) R_f = 0.3, $[\alpha]^{25}_d$= +3.25º (c 0.4, $CHCl_3$); IR (film) 3431, 2967, 1722, 1288, 1169, 662 cm^{-1}; ^{1}HRMN ($CDCl_3$, 500 Mhz), δ 4.37 (dd, *J* = 11.8, 4.3 Hz, 1H), 4.21 (dd, *J* = 11.8, 4.3 Hz, 1H), 3.24 (dd, *J* = 11.6, 4.6 Hz, 1H), 1.90 (dt, *J* = 12.6, 3.2 Hz, 1H), 1.73-1.44 (m, 6H), 1.37-1.31 (m, 2H), 1.19 (s, 9H), 1.17 (s, 3H), 1.00 (s, 3H), 0.95 (dd, *J* = 11.9, 2.1 Hz, 1H), 0.88 (s, 3H), 0.78 (s, 3H); ^{13}C RMN ($CDCl_3$, 125 MHz) δ 178.6, 78.5, 72.2, 62.3, 59.8, 54.8, 43.8, 38.8, 38.6, 38.2, 37.8, 28.2, 27.1 (4C), 24.5, 20.0, 15.8, 15.4. HRFABMS: calcd. $C_{20}H_{36}NaO_4$ $[M+Na]^+$ 323.2586, found 323.2580.

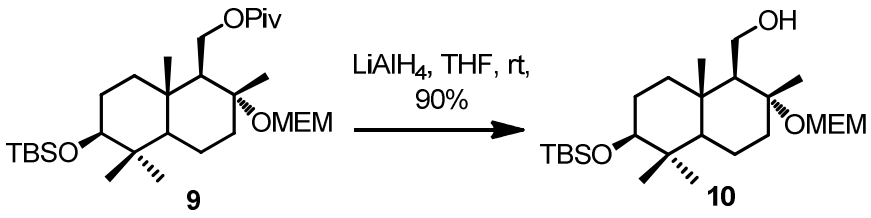


((2*S*,4a*S*,5*S*,6*R*)-decahydro-2-*tert*-butyldimethylsilyloxy,6-(2-methoxyethoxy)methoxy-1,1,4a,6-tetramethylnaphthalen-5-yl)pivalate (9).

To a stirred solution of **8** (384 mg, 1.13 mmol) in DMF (13 mL), imidazole (335 mg, 4.9 mmol) and TBSCl (742 mg, 4.9 mmol) were added at room temperature. After stirring for 16 h (TLC monitoring), the mixture was diluted with *t*-BuOMe and water and extracted with *t*-BuOMe. The combined organic layer was washed with 2N HCl, brine, dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The

resulting crude was purified by flash chromatography (hexane/t-BuOMe, 1:1) on silica gel to afford 503 mg (98%) of the corresponding silylated derivative.

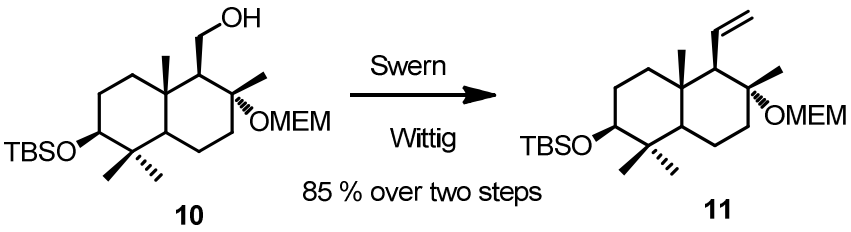
The silylated compound was dissolved in 6 mL of DMF and MEMCl (0.34 mL, 3 mmol) and N,N-diisopropylethylamine (0.6 mL, 3.42 mmol) were added. The mixture was stirred for 6.5 h at room temperature, and then was diluted with brine and extracted with Et_2O. The organic layer was dried over Na_2SO_4. Evaporation of the organic solvent gave a crude product, which was chromatographed on silica gel (hexane/t-BuOMe, 1:1) to afford 552 mg of the corresponding protected-derivative **9** (92%) as a colorless oil. TLC (hexanes: *t*-BuOMe, 1:1). R_f = 0.5, $[\alpha]^{25}_d$= +2.55º (c 0,4, $CHCl_3$); IR (film) 3429, 2966, 2935, 1710, 1288, 1168 cm^{-1}; ^{1}HRMN ($CDCl_3$, 500 Mhz), δ 4.85 (d, *J* = 7.7 Hz, 1H), 4.74 (d, *J* = 7.7 Hz, 1H), 4.28 (dd, *J* = 12.0, 1.7 Hz, 1H), 4.09 (dd, *J* = 12.0, 6.0 Hz, 1H), 3.76-3.6 (m, 2H), 3.51 (t, *J* = 4.7 Hz, 2H), 3.36 (s, 3H), 3.19 (dd, *J* = 11.5, 4.6 Hz, 1H), 1.90-1.87 (m, 1H), 1.72-1.43 (m, 8H), 1.32 (t, *J*= 13.0 Hz, 1H), 1.16 (s, 12 H), 0.90 (s, 3H), 0.89 (s, 3H), 0.87 (s, 9H), 0.72 (s, 3H), 0.03 (s, 6H), ^{13}C RMN ($CDCl_3$, 125 MHz) δ 178.6, 89.0, 79.1, 78.3, 72.0, 66.8, 62.1, 59.1, 57.6, 54.6, 40.0, 39.5, 38.7, 38.4, 37.9, 28.7, 27.6, 27.3 (3C), 26.0 (3C), 21.9, 20.1, 18.2, 16.5, 16.0, -3.6, -4.8. HRFABMS: calcd. $C_{30}H_{58}NaO_6Si$ $[M+Na]^+$ 565.3900, found 565.3893.



9 **10**

((2*S*,4a*S*,5*S*,6*R*)-Decahydro-2-*tert*-butyldimethylsilyloxy,6-(2-methoxyethoxy) methoxy-1,1,4a,6-tetramethylnaphthalen-5-yl)methanol (10).

Compound **9** (200 mg, 0.368 mmol) was dissolved in THF (7 mL) and then $LiAlH_4$ (42 mg, 1.10 mmol) was added slowly at 0ºC. The mixture was stirred for 30 minutes (TLC monitoring) at room temperature and the reaction was quenched by diluting with *t*-BuOMe and adding dropwise 0.25 mL of NaOH 5 N and 0.50 mL of H_2O. After stirring for 10 min the mixture was filtrated through Na_2SO_4 and silica gel to afford the desired hydroxy-derivative 165 mg (98%) **10**. $[\alpha]^{20}_D$= +3.4 (c 1.0, CH_2Cl_2) TLC (hexanes: *t*-BuOMe, 1:2) R_f = 0.12; IR (film):3449, 2930, 2855, 1651, 1462, 1387, 1252, 1098, 1034, 835, 773 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 4.84 (d, *J* = 7.8 Hz, 1H), 4.77 (d, *J* = 7.8 Hz, 1H), 3.84 (dd, *J* = 11.2, 7.3 Hz, 1H), 3.74-3.60 (m, 3H), 3.51 (t, *J* = 4.6 Hz, 2H), 3.35 (s, 3H), 3.17 (dd, *J* = 10.8, 4.8 Hz, 1H), 1.94 (dt, *J* = 12.3, 2.9 Hz, 1H), 1.77 (dt, *J* = 13.2, 3.4 Hz, 1H), 1.69-1.46 (m, 6H), 1.31-1.18 (m, 2H), 1.30 (s, 3H), 0.87 (s, 3H), 0.85 (s, 9H), 0.78 (s, 3H), 0.69 (s, 3H), 0.01 (s, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 88.7, 81.7, 78.9, 71.7, 67.2, 60.5, 60.1, 58.9, 54.7, 39.6, 39.3, 38.2, 37.5, 28.5, 27.5, 25.8 (3C), 21.4, 19.8, 18.0, 16.4, 15.9, -3.8, -4.9.[1]



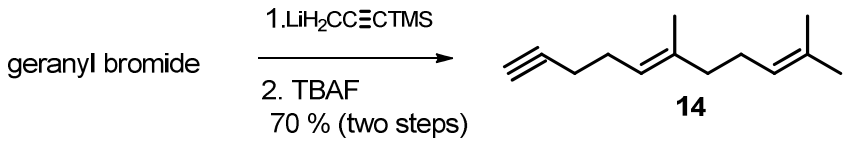
10 **11**

((2*S*,4a*S*,5*R*,6*R*)-6-((2-Methoxyethoxy)methoxy)-decahydro-1,1,4a,6-tetramethyl-5-vinylnaphthalen-2-yloxy)(*tert*-butyl)dimethylsilane (11).

Oxalyl chloride (1 mL, 2.0 M in CH_2Cl_2, 1.93 mmol) was added to a solution of dry DMSO (0.3 mL, 3.86 mmol) in dry CH_2Cl_2 (7 mL) at - 60 °C, under argon. The mixture

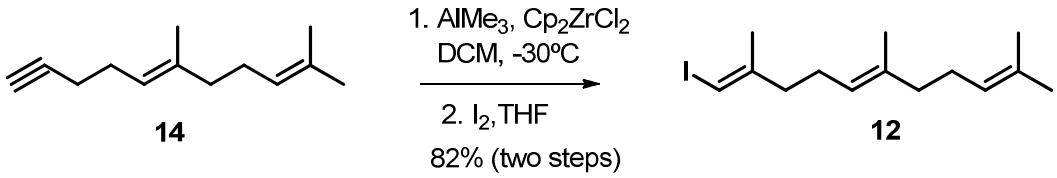
[1] Domingo, V.; Silva, L.; Dieguez, H. R.; Arteaga, J. F.; Quilez del Moral, J. F.; Barrero, A. F. *J. Org. Chem*., **2009**,*74*, 6151–6156.

was stirred for 30 min and a solution of the unprotected alcohol **10** (295 mg, 0.64 mmol) in CH_2Cl_2 (5 mL) was added. Upon 30 min additional stirring at -60 °C, Et_3N (0.9 mL, 6.43 mmol) was added, and the mixture was allowed to warm up to 0 °C, poured into ice cold water, diluted with CH_2Cl_2 and worked up in the usual way to give the corresponding crude aldehyde, directly used in the next step. A solution of potassium *tert*-butoxide (205 mg, 1.83 mmol) in 3.8 mL of dry toluene was stirred under argon at room temperature as methyltriphenylphosphonium bromide (653 mg, 1.83 mmol) was added. The resulting bright yellow solution was stirred for 1 h, cooled to 0 °C before the aldehyde (0.610 mmol) was added in dry toluene (2.5 mL). The ice bath was removed and the solution was stirred at room temperature while the reaction progress was monitored by TLC. After TLC analysis indicated consumption of the starting aldehyde (45 min), the reaction mixture was diluted with hexane and worked up as usual. Rapid filtration on silica gel with hexane as eluent afforded 248 mg (85% over two steps) of a colourless oil compound **11**. $[\alpha]^{20}_D$ = -5.4 (*c* 1.0, CH_2Cl_2), TLC (hexanes: *t*-BuOMe, 1:1). R_f = 0.57; IR (film): 3443, 2933, 2855, 2096, 1641, 1461, 1387, 1251, 1130, 1096, 1040, 916, 834, 772 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 5.77 (dt, *J* = 16.7, 10.3 Hz, 1H), 5.13 (dd, *J* = 10.3, 2.5 Hz, 1H), 4.99 (dd, *J* = 16.7, 2.5 Hz, 1H), 4.80 (d, *J* = 7.8 Hz, 1H), 4.71 (d, *J* = 7.8 Hz, 1H), 3.65 (m, 2H), 3.51 (t, *J* = 4.8, 2H), 3.36 (s, 3H), 3.18 (dd, *J* = 11.3, 4.4 Hz, 1H), 1.92 (m, 1H), 1.80 (d, *J* = 7.8 Hz, 1H), 1.68-1.24 (m, 6H), 1.28 (s, 3H), 0.99-0.80 (m, 2H), 0.89 (s, 6H), 0.87 (s, 9H), 0.72 (s, 3H), 0.01 (s, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 134.8, 119.0, 89.0, 79.3, 78.6, 71.9, 66.3, 64.4, 58.9, 54.6, 40.4, 39.4, 38.9, 37.5, 28.6, 27.5, 25.9 (3C), 21.3, 19.9, 18.1, 16.3, 15.9, -3.81, -4.96. [1]

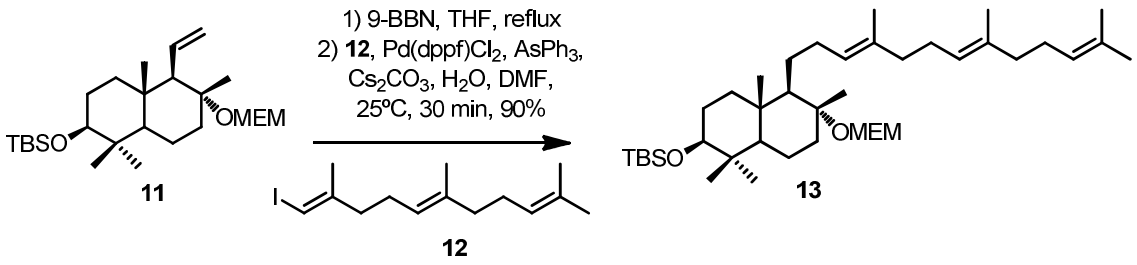


Compound 14: To a solution of 1-(trimethylsilyl)-1-propyne (3 mL, 19.8 mmol) in THF (12 mL) at -20 ºC was added *n*BuLi (2.0 M, 9.9 mL, 19.8 mmol) dropwise. After 30 minutes, geranyl bromide (521 mg, 2.4 mmol) in THF (5.6 mL) was added to the above solution and the temperature was raised to 0 ºC slowly. The reaction mixture was stirred for 5 minutes at 0 ºC and then quenched with H_2O. The aqueous layer was separated and extracted with Et_2O (2 × 20 mL). The combined organic layer was washed with saturated aqueous $NaHCO_3$ (3 × 15 mL), brine (15 mL) and dried over Na_2SO_4. The resulting crude was dissolved in THF (40 ml) and treated with TBAF (1.0 M in THF, 8 mL) at room temperature for 30 minutes followed by quenching with saturated aqueous $NaHCO_3$. The aqueous layer was separated and extracted with Et_2O (2 × 50 mL). The combined organic layer was washed with saturated aqueous $NaHCO_3$ (3 × 50 mL), brine (50 mL) and dried over Na_2SO_4. Concentration followed by flash chromatography on silica gel with a 1:1 mixture of hexane/ *t*-BuOMe as eluent provided the desired product **14** as a colorless oil (296 mg, 1.68 mmol) (70% two steps). TLC (hexanes: *t*-BuOMe, 1:1). R_f = 0.91 IR (film): 3350, 3034, 2919, 2857, 1668, 1436, 1383 1010 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 5,37 (t, 1H, *J* = 6,4 Hz), 5,18 (t, 1H, *J* = 6,9 Hz), 2,25 (m, 4H), 1,93 (t, *J* = 2,5 Hz, 2H), 1.69 (s, 3H) 1,63 (s, 3H), 1,61 (s, 3H), 1,57 (s, 1H);^{13}C NMR ($CDCl_3$, 100 MHz) δ 136.7, 131.4, 124.2, 122.4, 84.5, 68.0, 39.6, 27.2, 26.6, 25.6, 18.9, 17.7, 16.1. [2]

[2] Clausen, D. J.; Wan, S.; Floreancig, P. E. *Angew. Chem., Int. Ed*. **2011**, *50*, 5178-5181.

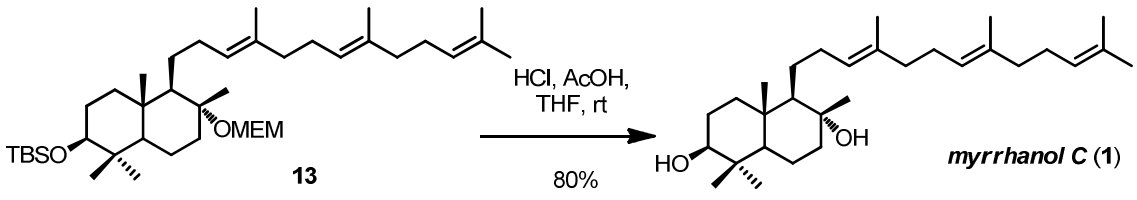


Compound 12: To a solution of zirconocene dichloride (2141 mg, 7.3 mol) in CH_2Cl_2 (6 mL) at rt under an argon atmosphere, was added dropwise a solution of trimethylaluminum in heptane (2 M in heptane, 4.4 mL, 8.79 mmol). After 15 min, the solution was cooled to 0 °C, and a solution of alkyne **14** (516 mg, 2.93 mmol) dissolved in CH_2Cl_2 (6 mL) was added to the above lemon yellow solution. The reaction mixture was stirred at 0 °C for 6 h and then cooled to -30 °C. Iodine (869 mg, 3.42 mmol) was added as a solution in 4 mL of THF. The resulting brown slurry was raised to 0 °C and poured slowly with stirring into an iced saturated aqueous $NaHCO_3$. The aqueous layer was extracted with ether (3 × 50 mL). The combined organic layer was washed with saturated aqueous $NaHCO_3$ and dried over Na_2SO_4. Concentration followed by flash chromatography on silica gel with 2:1 hexane/ether as eluent provided the desired product **12** as a colorless oil (464 mg, 1.39 mmol, 82%). TLC (hexanes: *t*-BuOMe, 1:1). R_f = 0.84. ^{1}H NMR ($CDCl_3$, 400 MHz) δ 5,86 (s, 1H), 5,08 (t, *J* = 6,9Hz, 1H), 5,07 (t, *J* = 6,9Hz, 1H), 2,22 (m, 3H), 2,16-1.95 (m, 6H), 1,83 (s,3H), 1,68 (s, 3H), 1,68 (s, 3H), 1,59 (s, 3H).;^{13}C NMR ($CDCl_3$, 100 MHz) δ 147.9, 136.2, 131.5, 124.4, 123.1, 74.9, 39.8, 39.6, 26.8, 26.4, 25.8, 24.1, 17.8, 16.1.[3]



[3] Prestwich, G. D.; Wawrzenczyk, C. *Tetrahedron Lett.* **1989**, *30*, 403-6.

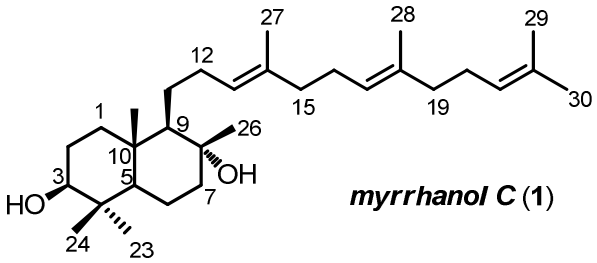
Compound 13: To olefin **11** (240 mg, 0.527 mmol) was added a solution of 9-BBN (3.16 mL, 0.5 M in THF) and the solution was stirred at reflux for 4 h. This solution was transferred by cannula to another flask containing a mixture of vinyl iodide **12** (207 mg, 0.652 mmol), Pd(dppf)Cl_2. CH_2Cl_2 (53 mg, 0.065 mmol), $AsPh_3$ (29 mg, 0.097 mmol), Cs_2CO_3 (664 mg, 2.04 mmol) and water (0.375 mL, 15 mmol) in DMF (7.5 mL). After 30 minutes, the brown reaction mixture was diluted with water and extracted three times with *t*-BuOMe. The organic layer was washed with water, brine and dried over Na_2SO_4. Concentration followed by silica gel flash-chromatography (hexane: *t*-BuOMe, 6:1) yielding 340 mg (90%) of **13**. $[\alpha]^{20}_D$= +1.9 (*c* 1.0, CH_2Cl_2) TLC (hexanes: *t*-BuOMe, 6:1) R_f = 0.47.; IR (film): 2956, 2927, 2855, 1458, 1256, 1098, 1068, 1038, 835, 772 cm^{-1}; ^{1}HNMR (400 MHz, $CDCl_3$) δ 5.17-5.07 (m, 3H), 4.85 (d, *J* = 7.4 Hz, 1H), 4.73 (d, *J* = 7.4 Hz, 1H), 3.75-3.61 (m, 2H), 3.53 (t, *J* = 4.5 Hz, 2H), 3.38 (s, 3H), 3.18 (dd, *J* = 11.3, 4.9 Hz, 1H), 2.11-1.89 (m, 12H), 1.68 (s, 3H), 1.60 (s, 9H), 1.56-1.03 (m, 13H), 1.18 (s, 3H), 0.88 (s, 9H), 0.81 (s, 3H), 0.71 (s, 3H), 0.03 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 135.0, 134.6, 131.4, 125.4, 124.5, 124.4, 88.9, 80.4, 79.4, 72.1, 66.5, 59.4, 59.1, 55.1, 40.3, 39.9, 39.8, 39.5, 38.8, 38.2, 31.5, 28.6, 27.7, 26.9, 26.8, 26.3, 26.1 (3C), 25.8, 20.9, 20.1, 18.2, 17.8, 16.2, 16.1, 16.0, 15.9, -3.6, -4.8. HRFABMS: calcd. for $C_{40}H_{74}NaO_4Si$ [M+Na]+ 669,5254, found 669.5276.



Myrrhanol C (1): To a solution of **13** (87 mg, 0.135 mmol), 80% aqueous AcOH (2.1 mL) in THF (1.4 mL) was gradually added 2 M HCl (0.35 mL) at room temperature for

30 minutes and the whole mixture was stirred for 3.5 h at the same temperature. The reaction mixture was diluted with brine and extracted with *t*-BuOMe. The organic layer was washed with 7% aqueous $NaHCO_3$ and dried over Na_2SO_4. Evaporation of the organic solvent gave a residue, which was chromatographed on silica gel (hexane: *t*-BuOMe, 3:1) to give (+)-myrrhanol A (**1**) (48 mg, 80%). Colorless oil, $[\alpha]^{20}_D$ = +4.3 (*c* 0,5, $CHCl_3$); IR(film): 3416, 2963, 2927, 2854, 1655, 1458, 1386, 1050 cm^{-1}; HRFABMS: calcd. for $C_{30}H_{52}NaO_2$ [M+Na]+ 467,3865, found 483.3865.

Table 1. ^{1}H NMR data comparison between synthetic *myrrhanol C* (**1**), and natural *myrrhanol C* (**1**) reported data. [4]



***myrrhanol C* (1)**

Natural *Myrrhanol C* (**1**) ^{1}H NMR ($CDCl_3$, 500 MHz) (δ, multiplicity, coupling constant (Hz))	Synthetic *Mirrhanol C* (**1**) ^{1}H NMR ($CDCl_3$, 600 MHz) (δ, multiplicity, coupling constant (Hz))
5,16 (1H, t, *J* = 7,3 Hz, H-13)	5,17 (1H, t, *J* = 7,3 Hz, H-13)
5,12 (1H, t, *J* = 7,3 Hz, H-17)	5,12 (1H, t, *J* = 7,3 Hz, H-17)
5,11 (1H, t, *J* = 7,3 Hz, H-21)	5,10 (1H, t, *J* = 7,3 Hz, H-21)
3,24 (1H, dd, *J* = 11,6, 4,6 Hz, H-3)	3,23 (1H, dd, *J* = 11,6, 4,6 Hz, H-3)
2,08 (2H, m, H-12)	
2,05 (2H, m, H-16)	
2,05 (2H, m, H-20)	2,11-2.02 (10H, m)
2,00 (2H, m, H-15)	
2,00 (2H, m, H-19)	
1,89 (1H, m, H-7a)	1,89 (1H, m, H-7a)
1,73 (1H, m, H-1a)	1,73 (1H, m, H-1a)
1,69 (3H, s, H-30)	1,68 (3H, s, H-30)

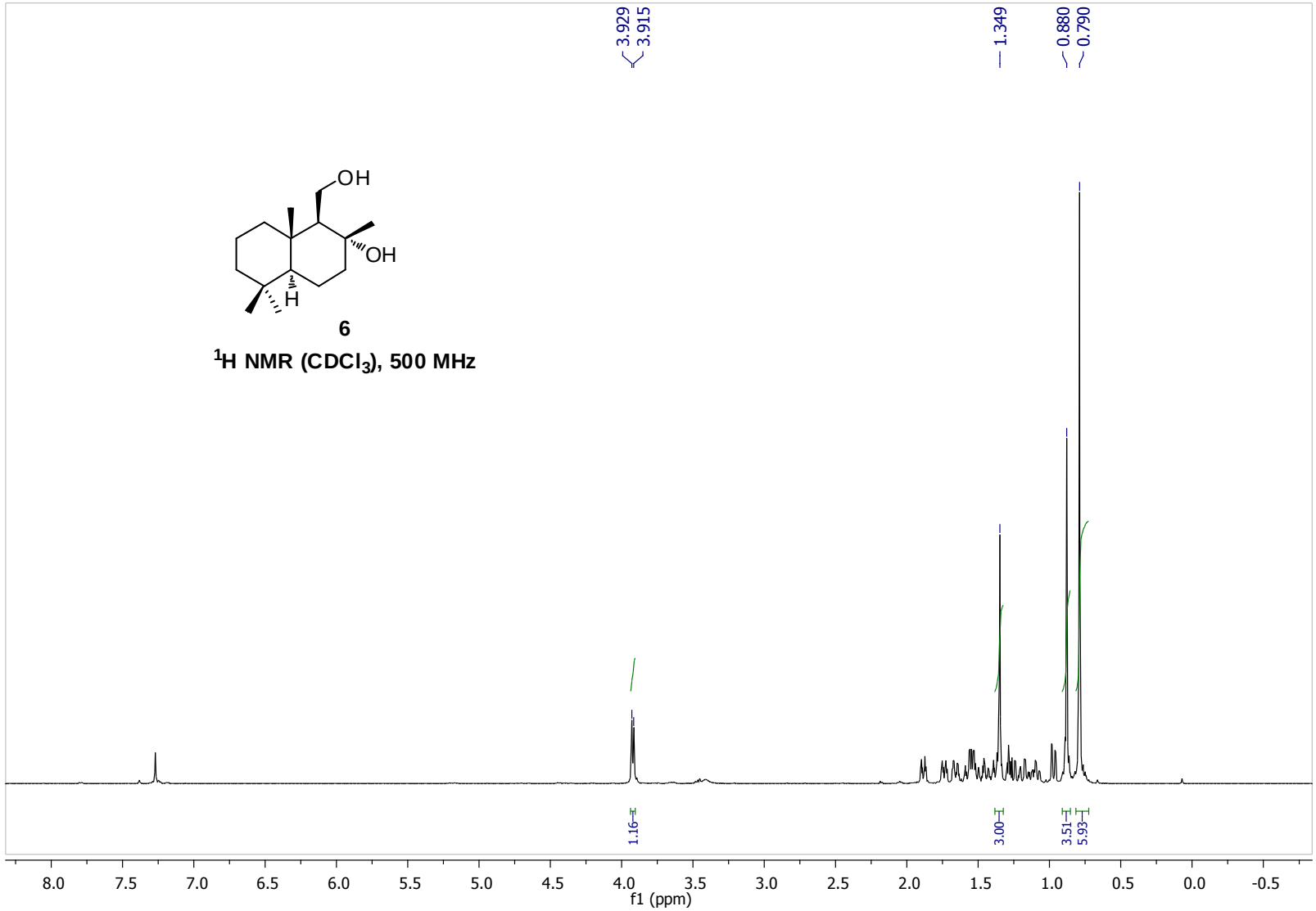
[4] Morad, S. A. F.; Schmidt, C.; Buechele, B.; Schneider, B.; Wenzler, M.; Syrovets, T.; Simmet, T. *J. Nat. Prod.* **2011**, *74*, 1731-1736.

1,67 (1H, m, H-2a)	1,67 (1H, m, H-2a)
1,65 (1H, m, H-6a)	1,65 (1H, m, H-6a)
1,62 (3H, s, H-27)	1,62 (3H, s, H-27)
1,61 (3H, s,H-28)	1,61 (3H, s,H-28)
1,61 (3H, s,H-29)	1,61 (3H, s,H-29)
1,59 (1H,m,H-2b)	1,59 (1H,m,H-2b)
1,46 (1H,m,H-11a)	1,46 (1H,m,H-11a)
1,38 (1H, m, H-7b)	1,38 (1H, m, H-7b)
1,31 (1H, m, H-11b)	1,31 (1H, m, H-11b)
1,15 (3H, s, H3-26)	1,14 (3H, s, H3-26)
1,14 (1H, m, H-1b),	1,14 (1H, m, H-1b),
1,13 (1H, m, H-6b)	1,13 (1H, m, H-6b)
1,03 (1H, m, H-9)	1,03 (1H, m, H-9)
1,00 (3H, s, H-24)	0,99 (3H, s, H-24)
0,91 (1H, m, H-5)	0,91 (1H, m, H-5)
0,81 (3H, s, H-25)	0,80 (3H, s, H-25)
0,77 (3H, s, H-23)	0,76 (3H, s, H-23)

Carbon	Natural *Myrrhanol C* (**1**) ^{13}C NMR ($CDCl_3$, 125 MHz) (δ)	Synthetic *Myrrhanol C* (**1**) ^{13}C NMR ($CDCl_3$, 150 MHz) (δ)
1	38.0	37.8

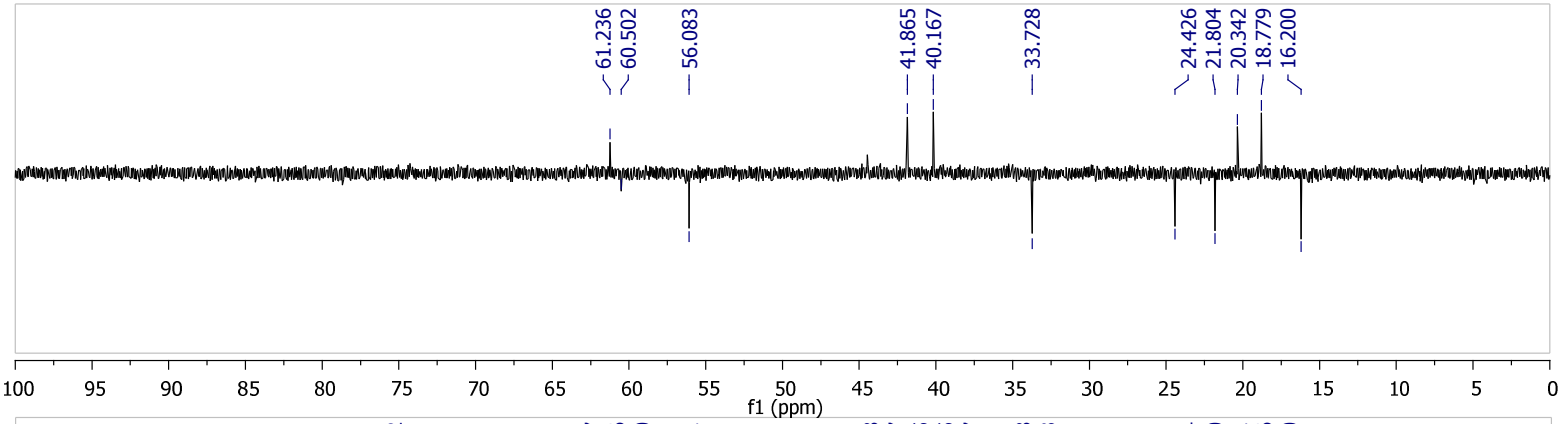
2	27.3	27.1
3	78.9	78.8
4	39.0	38.8
5	55.1	55.0
6	20.3	20.2
7	44.5	44.3
8	74.0	73.8
9	61.3	61.2
10	38.9	38.8
11	25.7	25.5
12	31.4	31.3
13	125.4	124.8
14	135.5	135.3
15	39.9	39.7
16	26.8	26.7
17	124.3	124.1
18	135.1	135.0
19	39.9	39.7
20	26.8	26.6
21	124.5	124.3
22	131.4	131.2
23	15.5	15.3

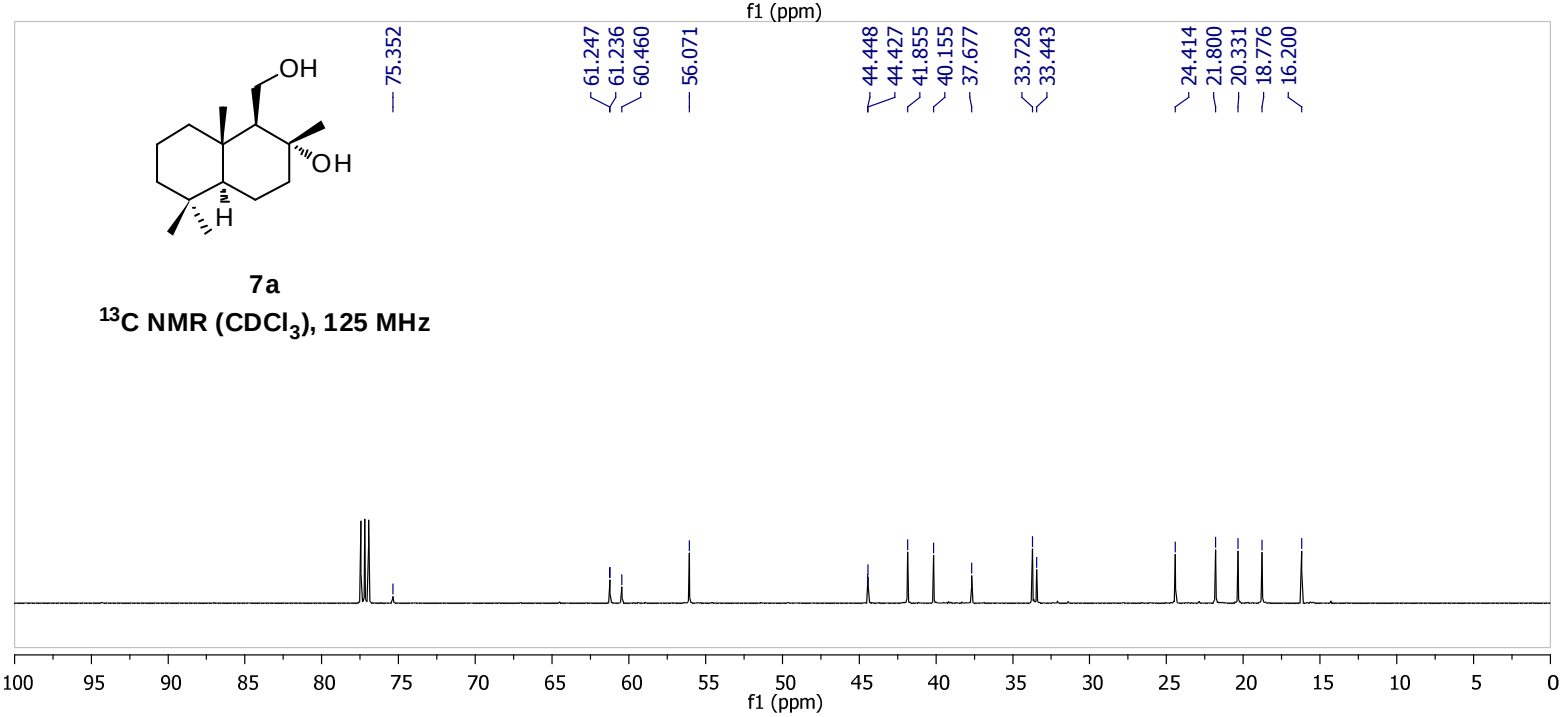
24	28.2	28.1
25	15.6	15.5
26	23.9	23.7
27	16.3	16.2
28	16.1	16.0
29	17.8	17.7
30	25.8	25.7



6

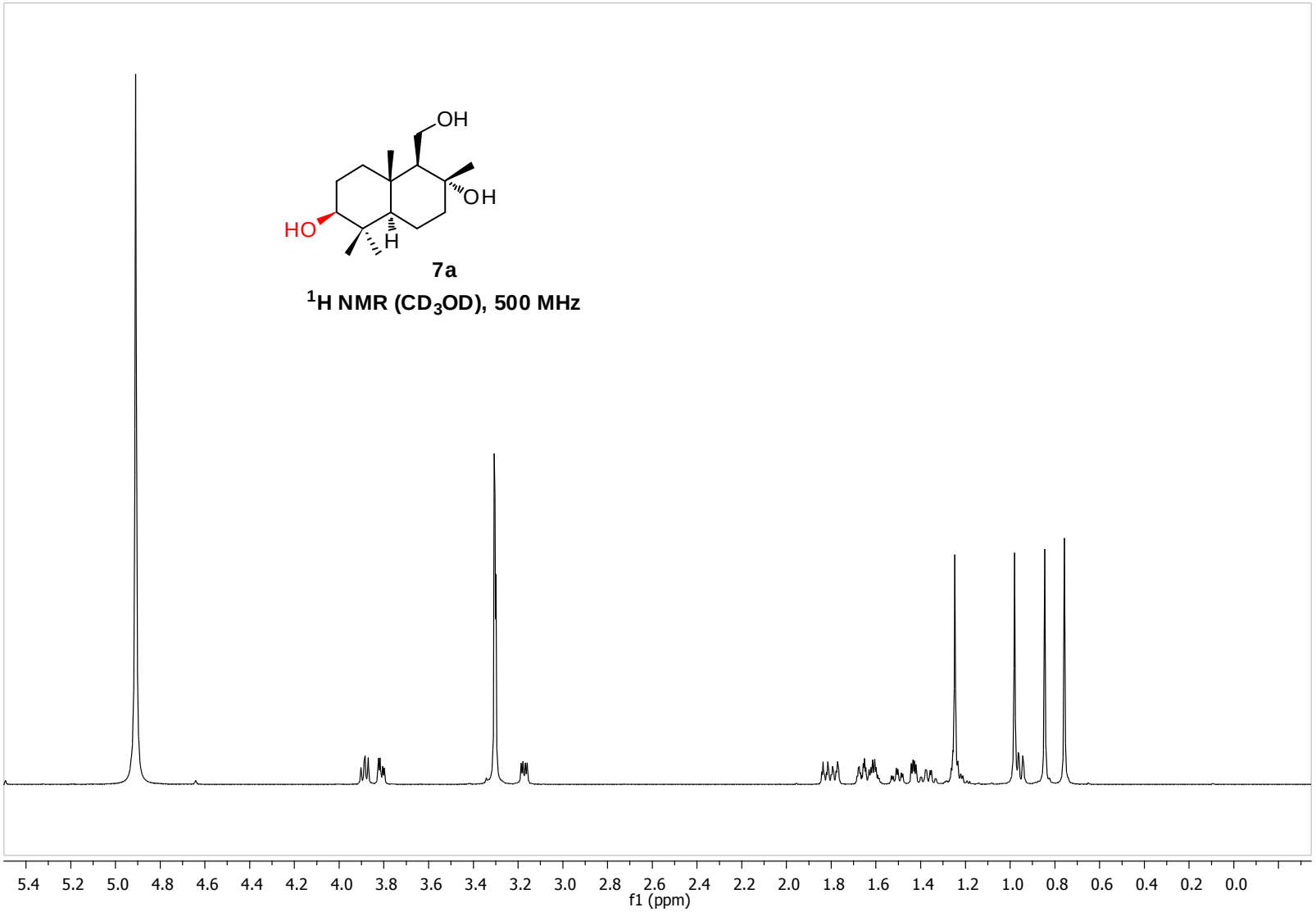
^{1}H NMR ($CDCl_3$), 500 MHz

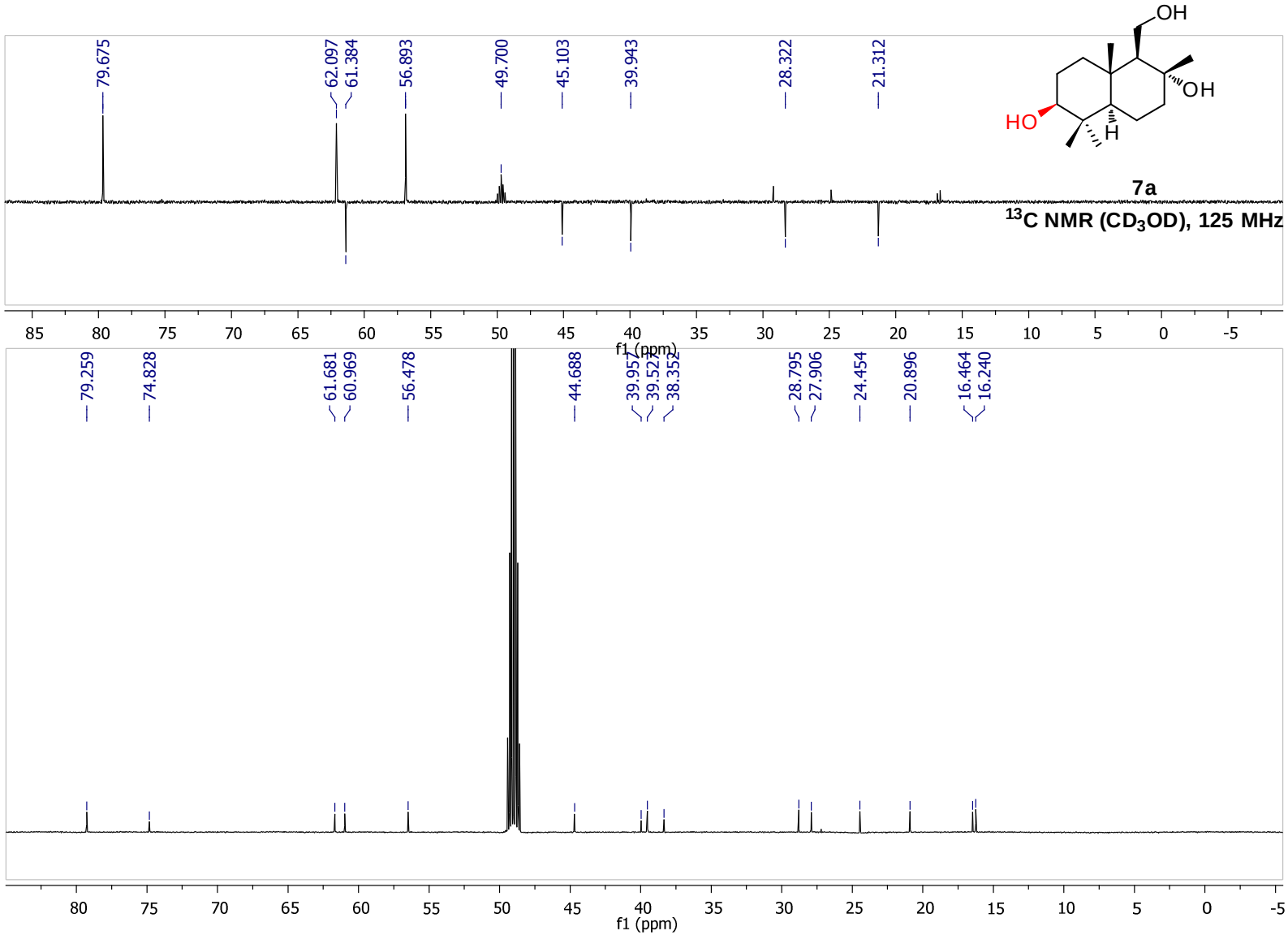


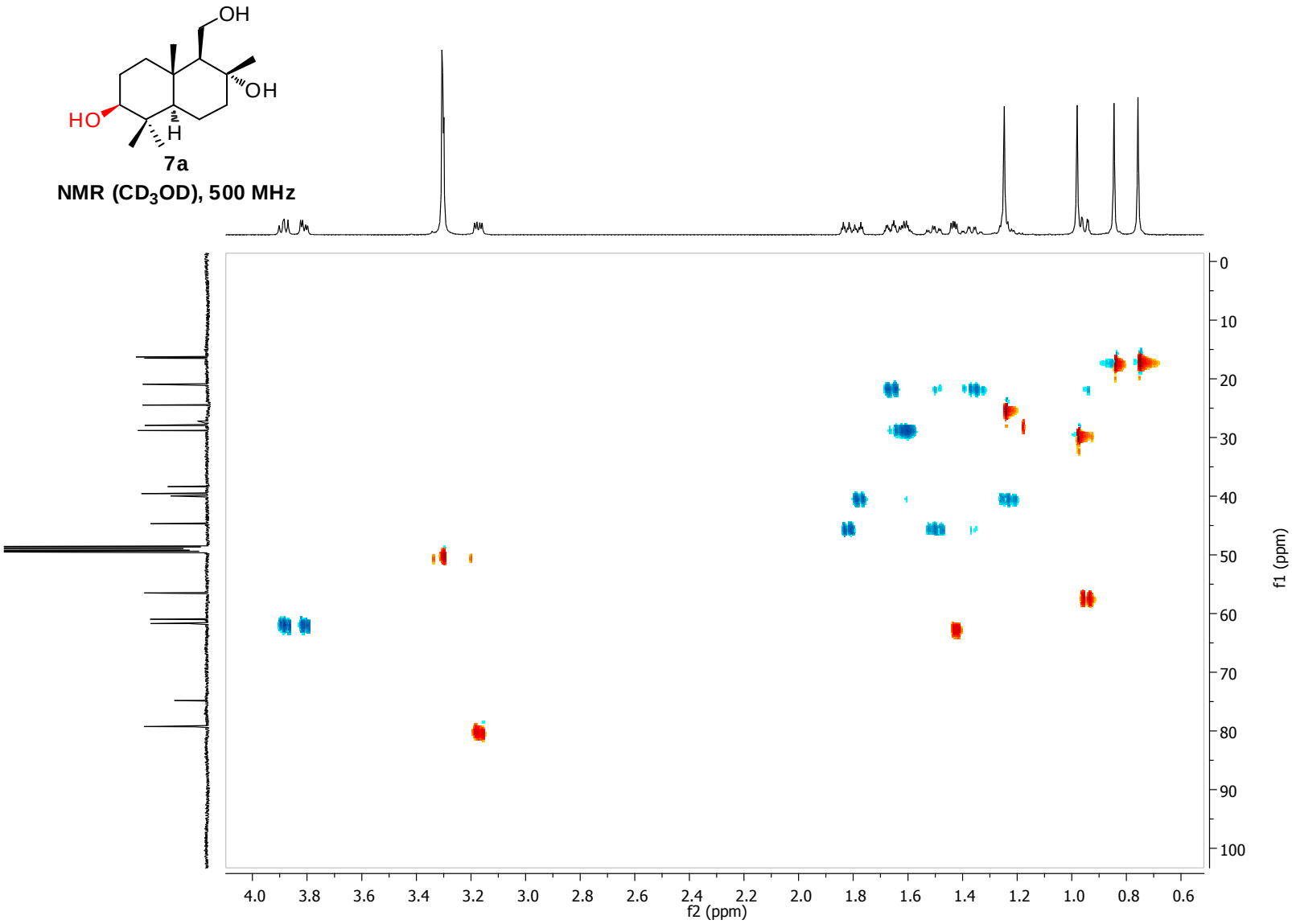


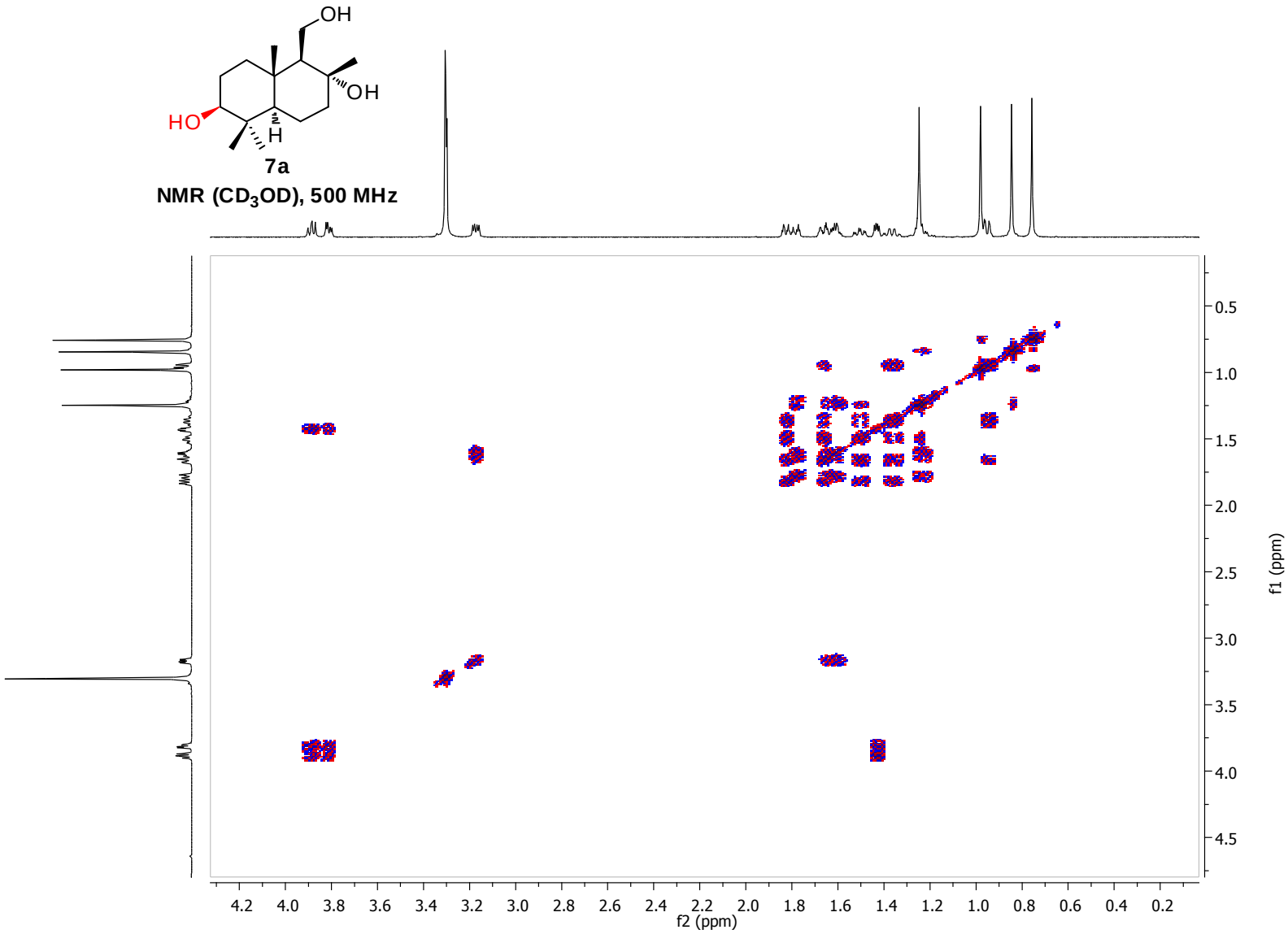
7a

^{13}C NMR ($CDCl_3$), 125 MHz



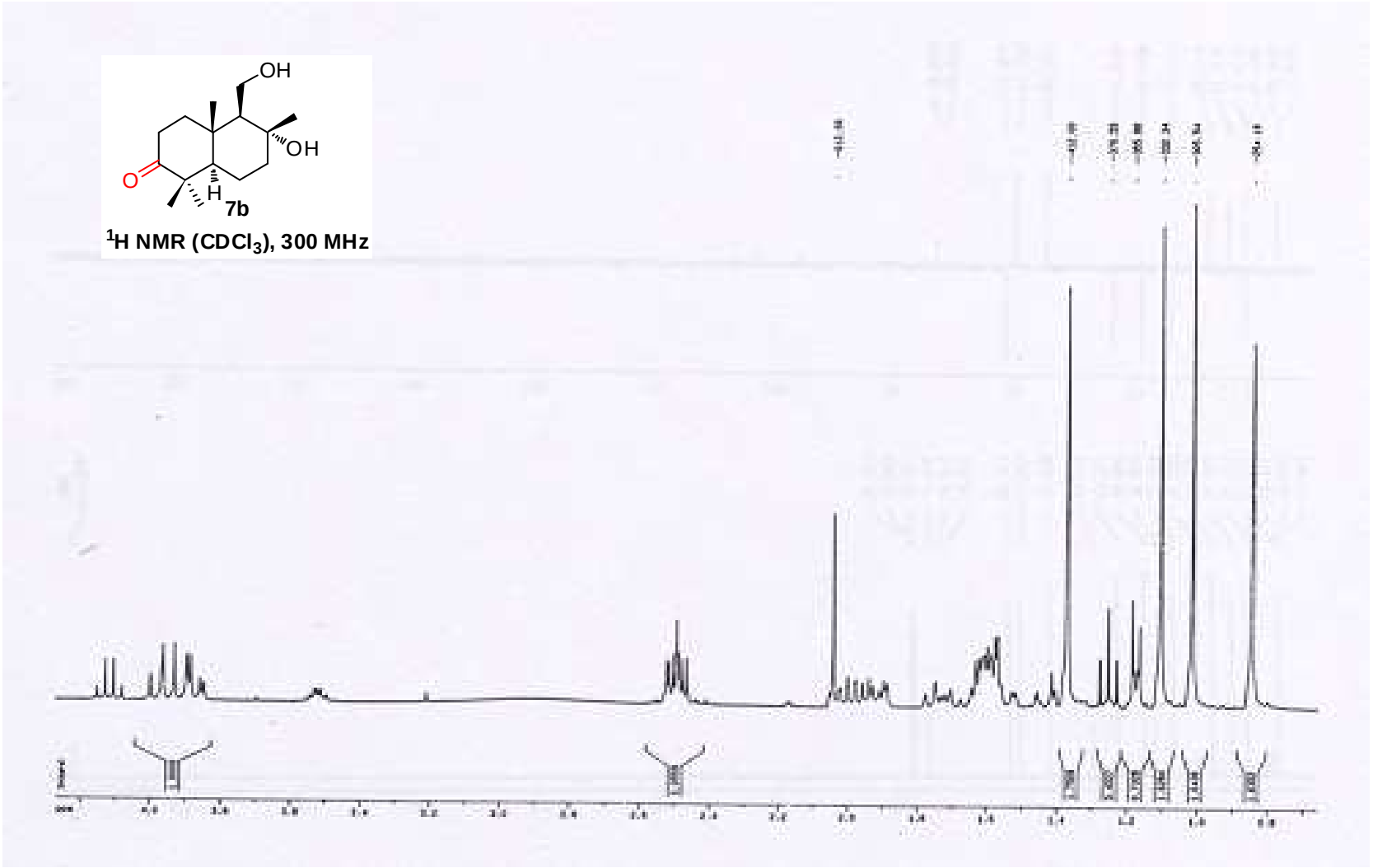


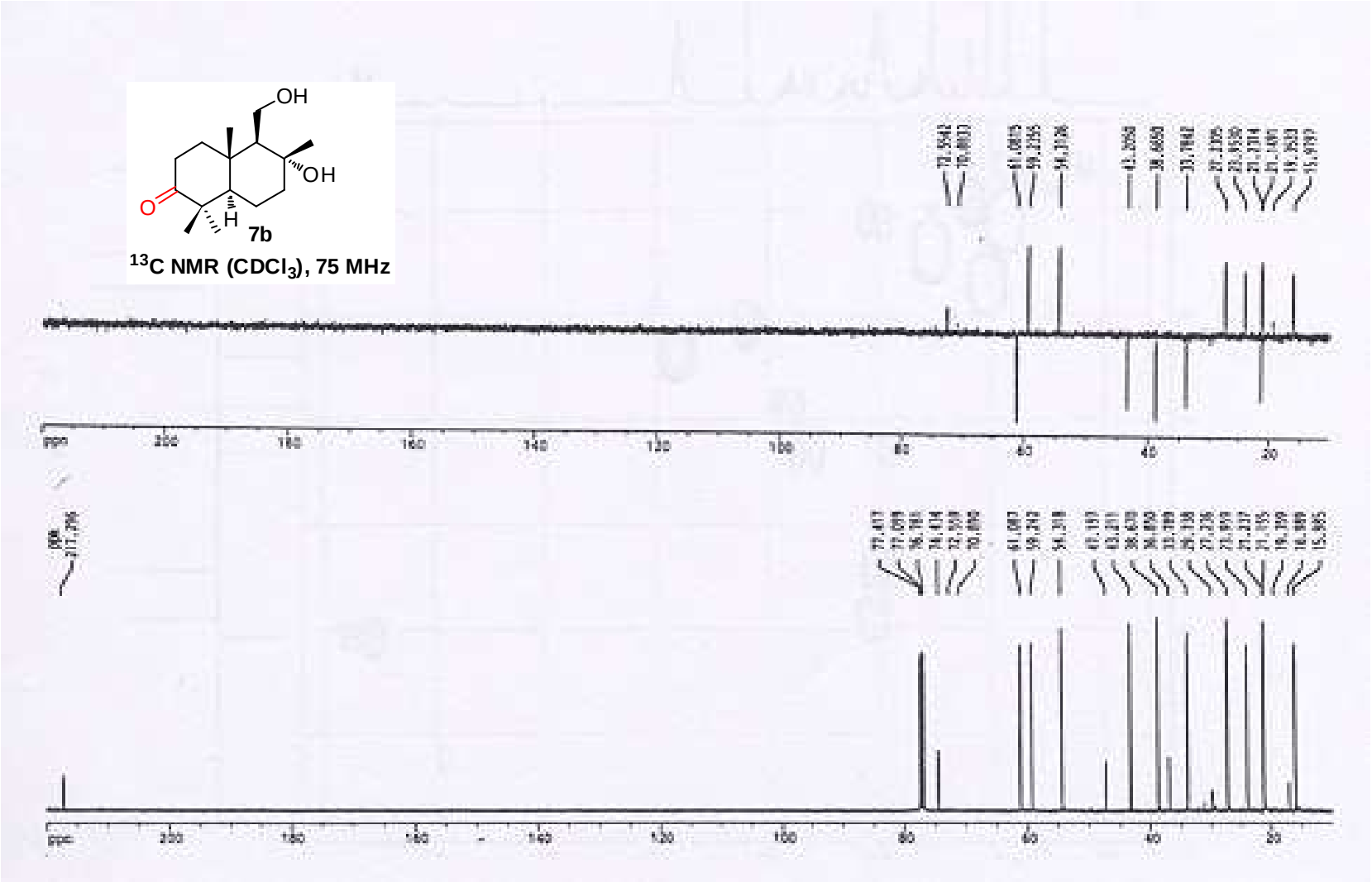


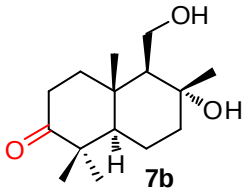


7a

NMR (CD_3OD), 500 MHz

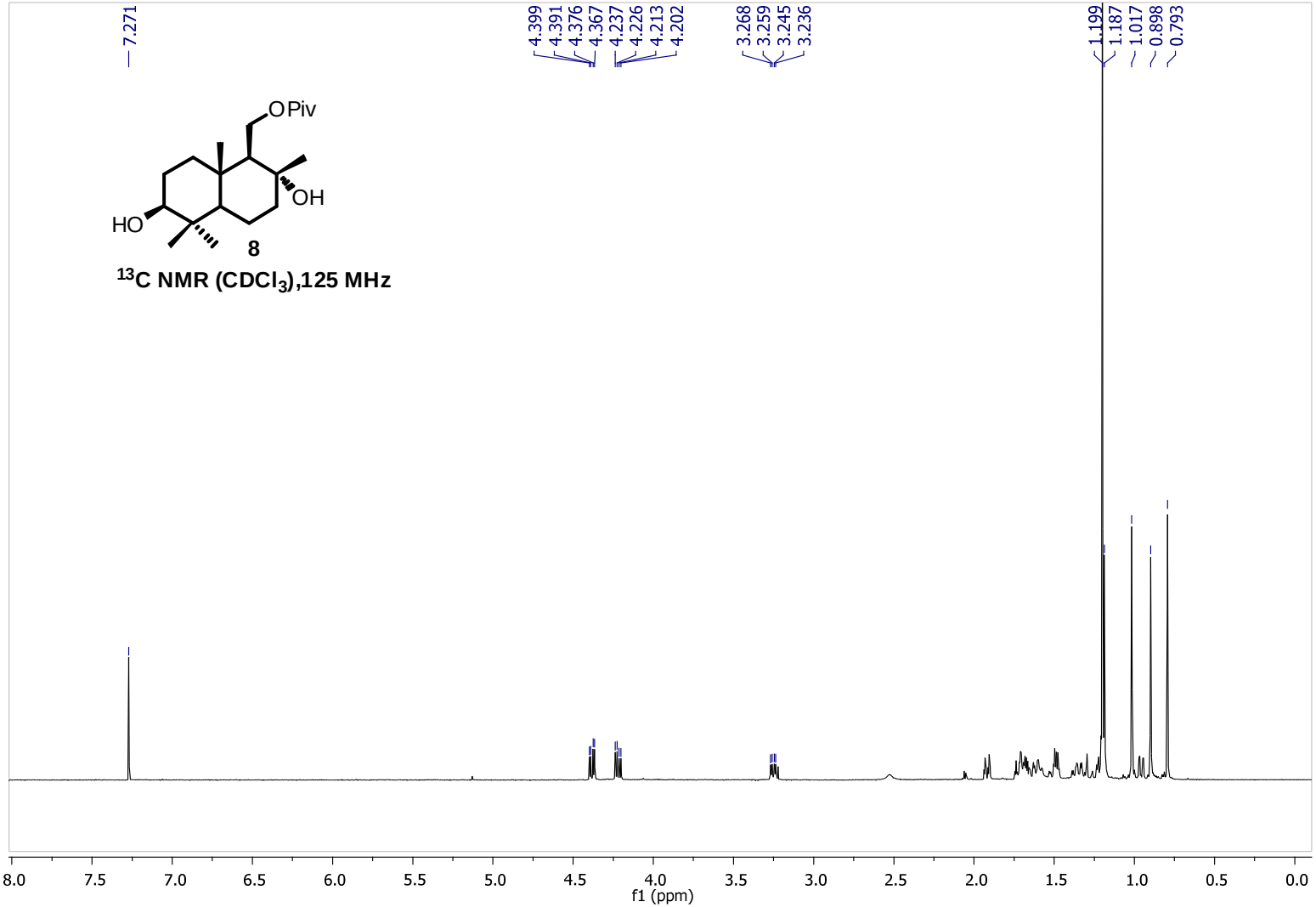


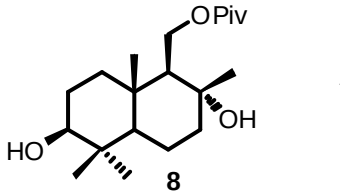




7b

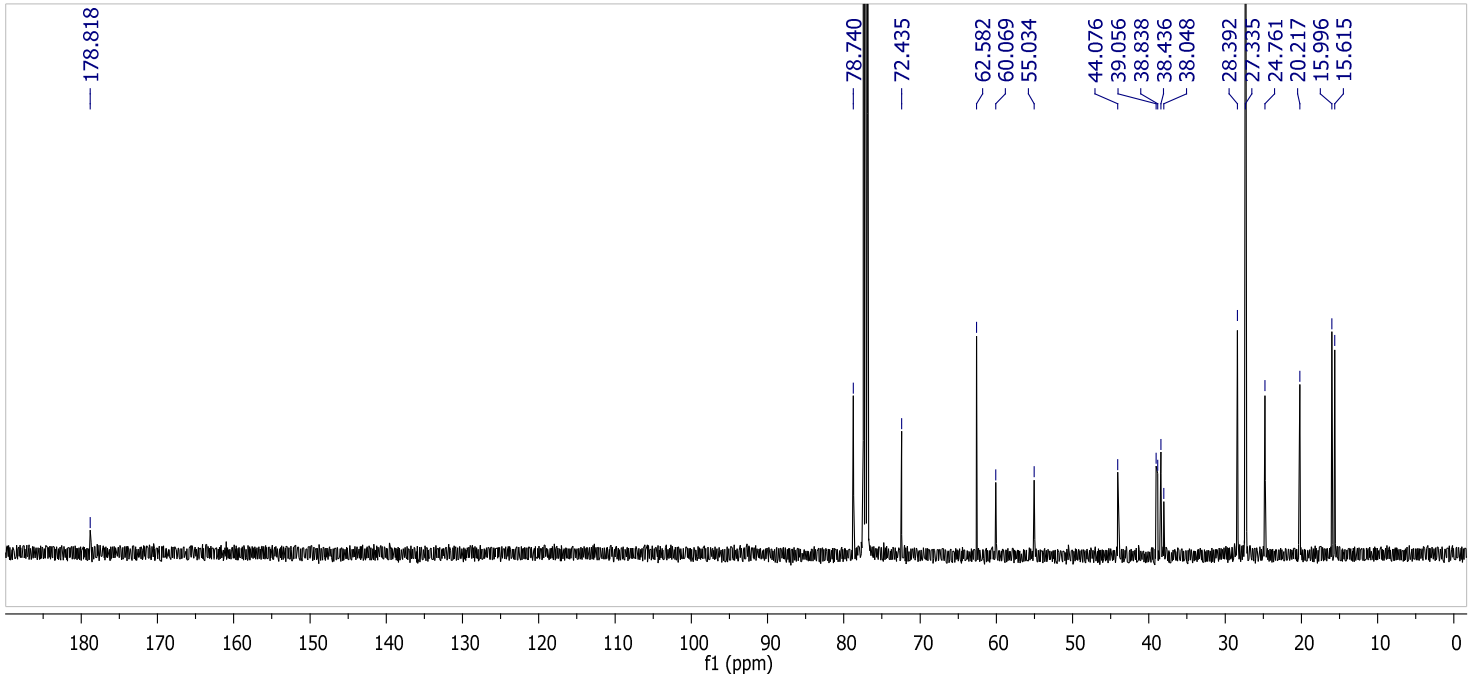
NMR ($CDCl_3$), 300 MHz

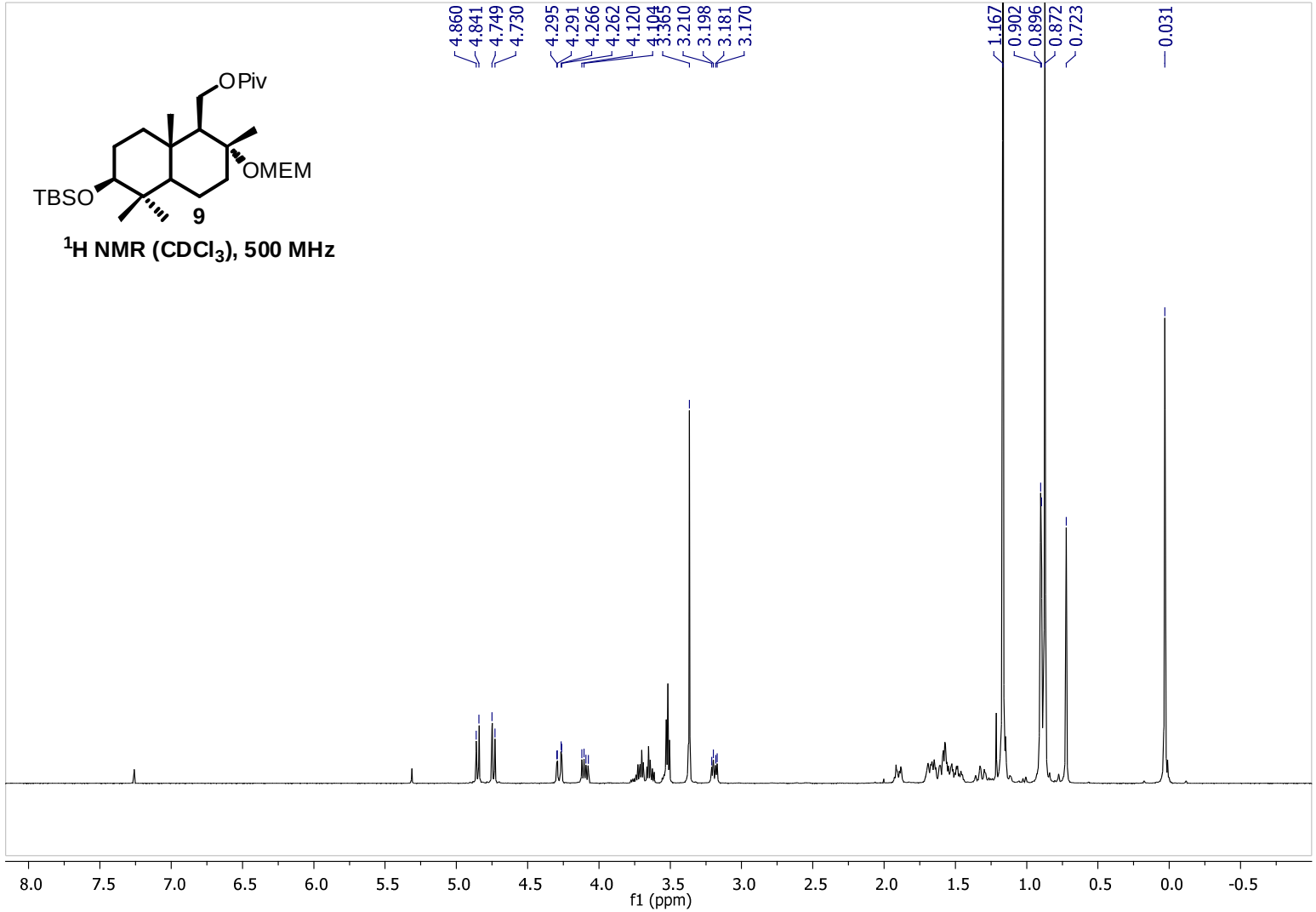


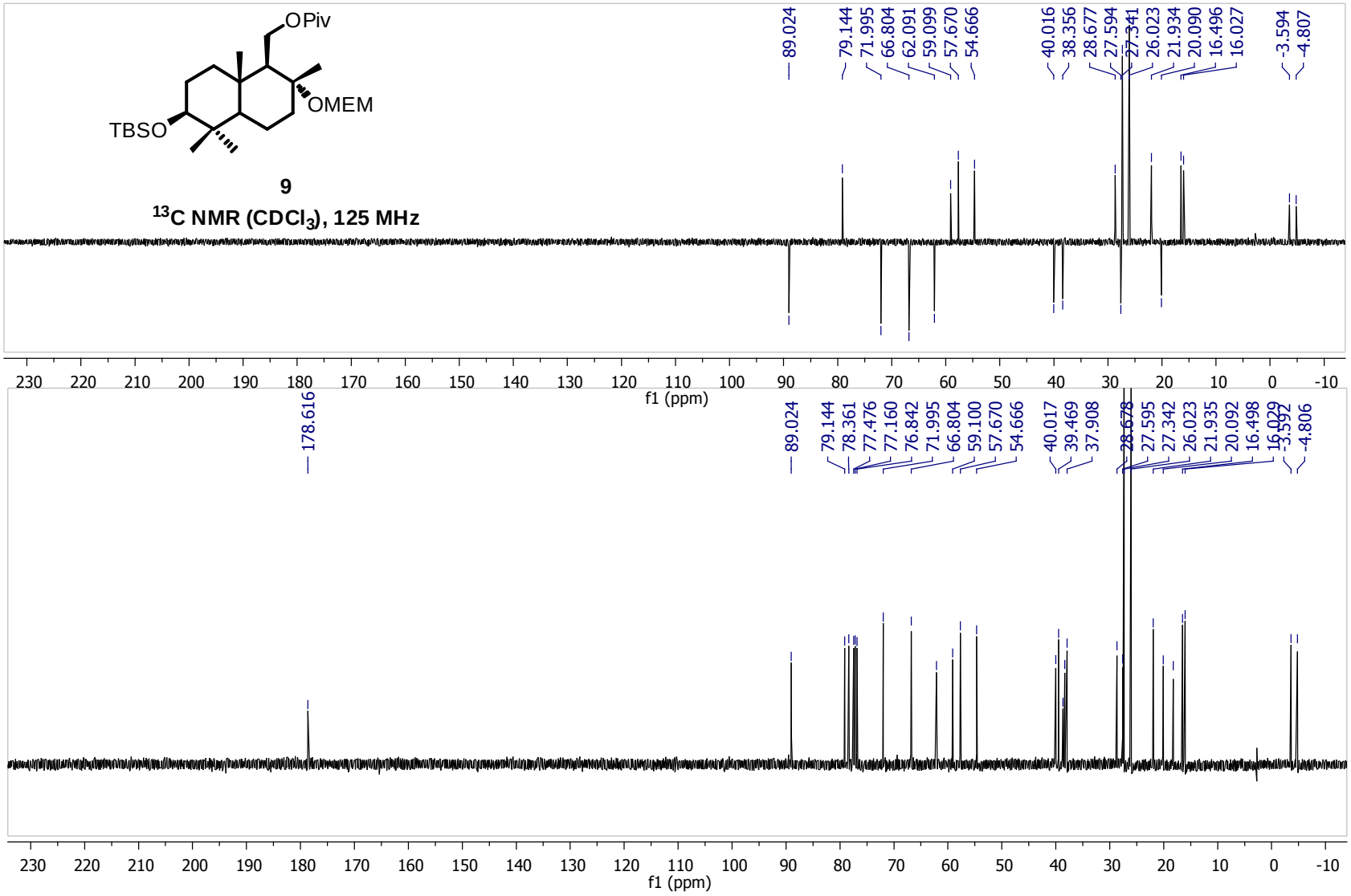


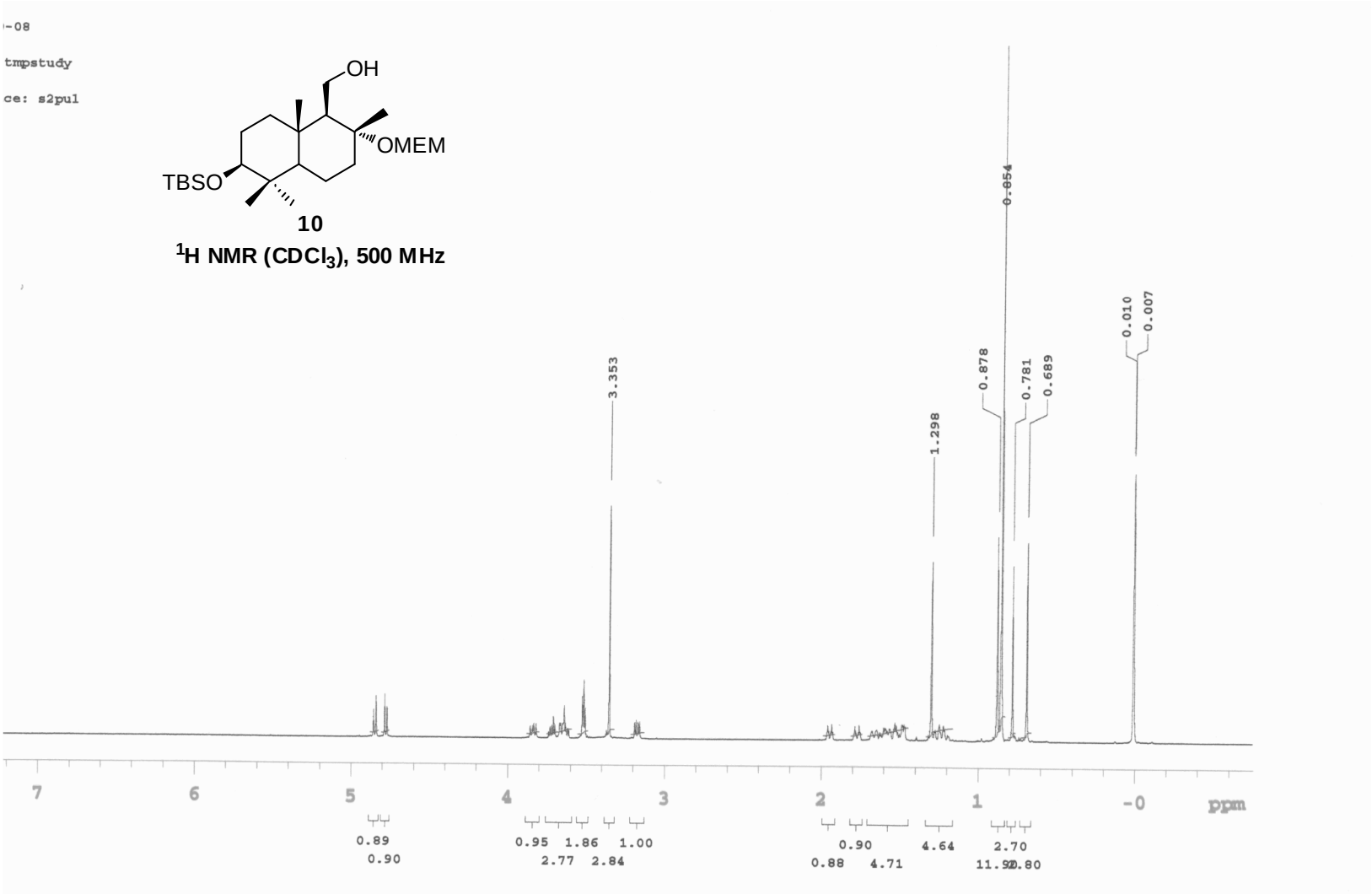
8

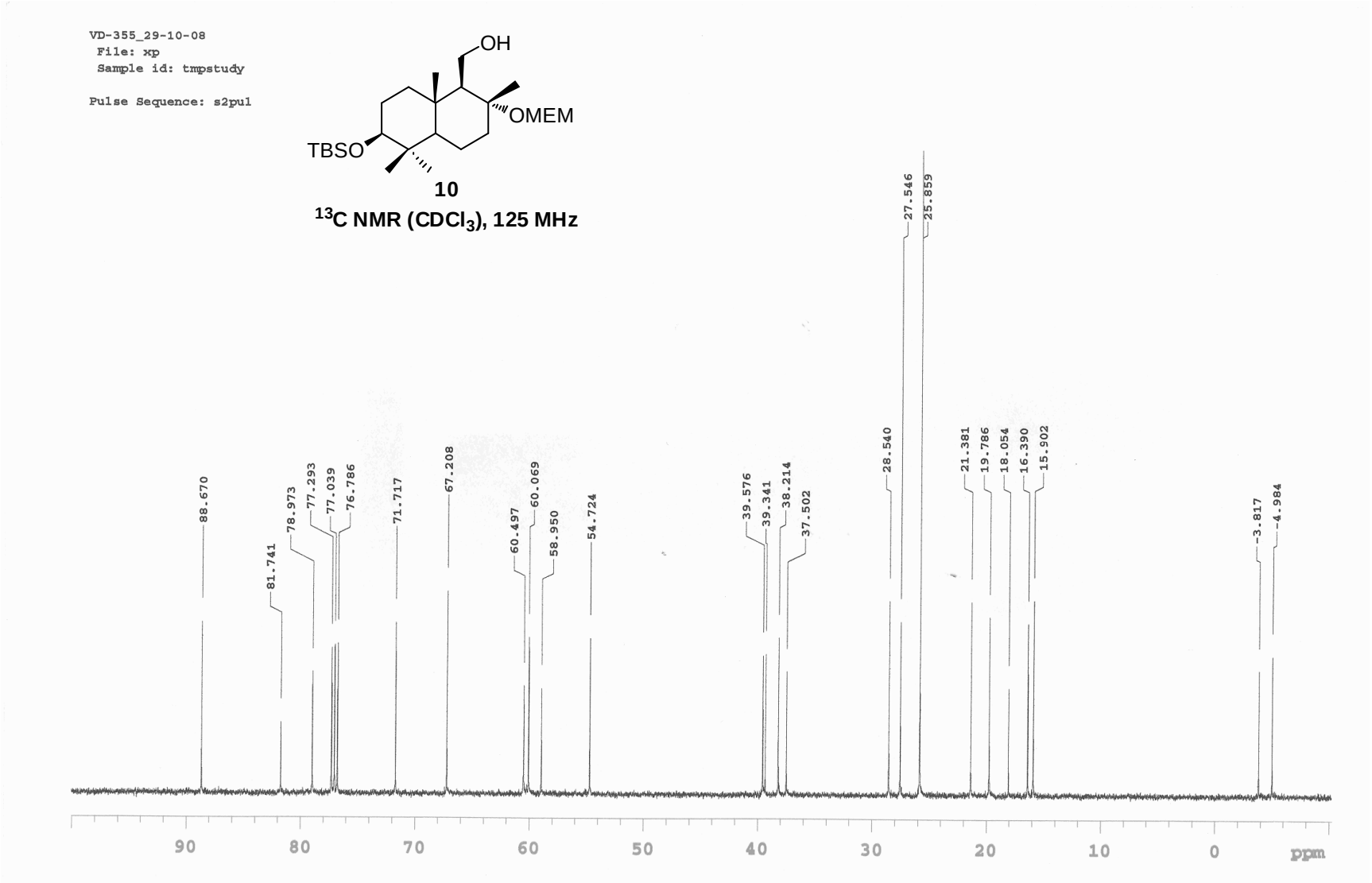
^{13}C NMR ($CDCl_3$),125 MHz





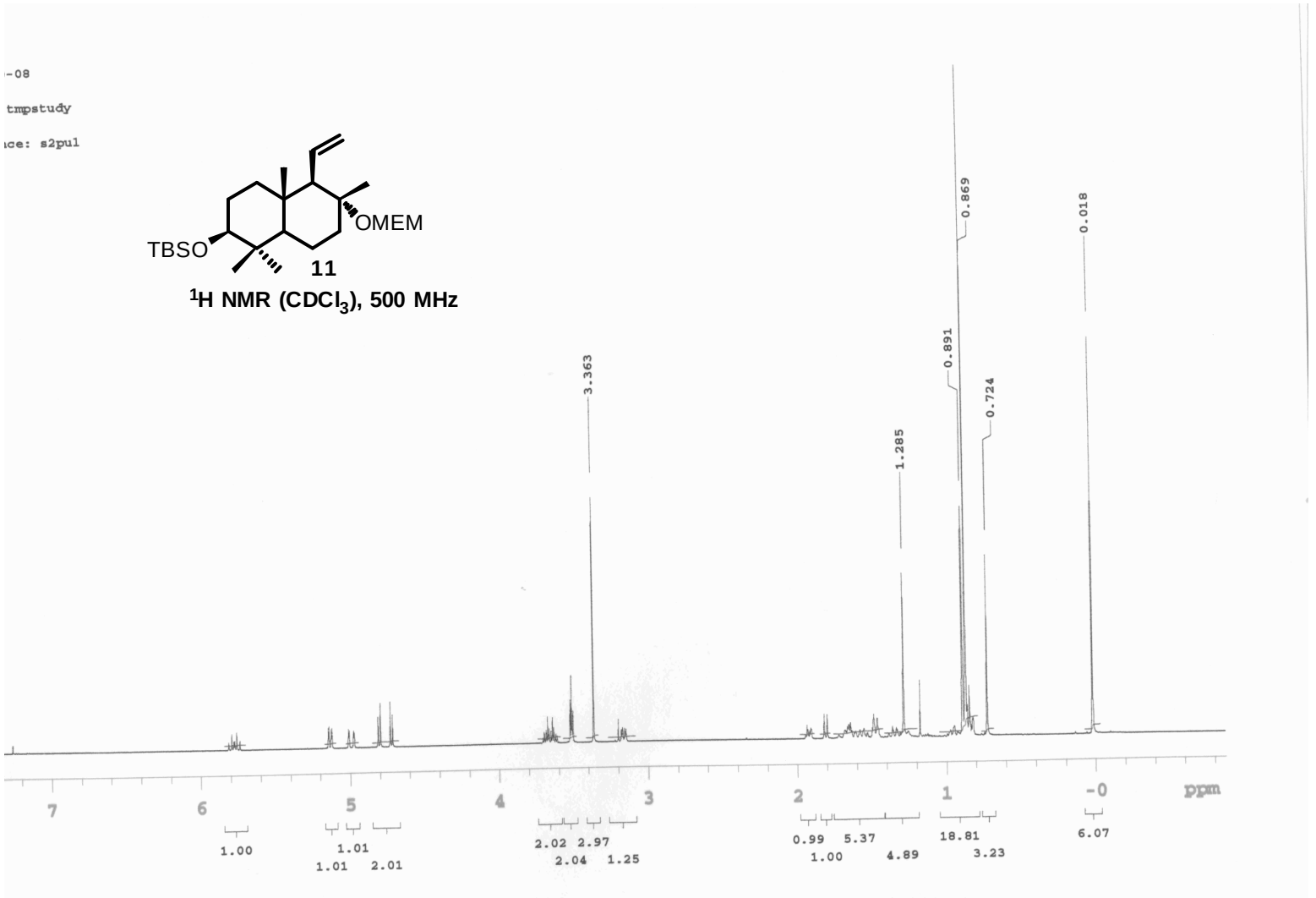






10

^{13}C NMR ($CDCl_3$), 125 MHz



^{1}H NMR ($CDCl_3$), 500 MHz