



Supporting Information

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Stereoselective Total Synthesis of (–)-Borrelidin.

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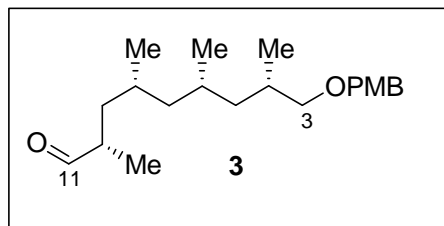
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General Techniques. All reagents were commercially obtained (Aldrich, Acros) at highest commercial quality and used without further purification except where noted. Air- and moisture-sensitive liquids and solutions were transferred via syringe or stainless steel cannula. Organic solutions were concentrated by rotary evaporation below 45 °C at approximately 20 mmHg. All non-aqueous reactions were carried out under anhydrous conditions using flame-dried glassware within an argon atmosphere in dry, freshly distilled solvents, unless otherwise noted. Tetrahydrofuran (THF), diethyl ether (Et₂O), dichloromethane (CH₂Cl₂), toluene (PhCH₃) and benzene (PhH) were purified by passage through a bed of activated alumina.¹ *N,N*-diisopropylethylamine (DIPEA), diisopropylamine, pyridine, triethylamine (TEA) and boron trifluoride etherate were distilled from calcium hydride prior to use.² Dimethyl sulfoxide (DMSO) and dimethylformamide (DMF) were distilled from calcium hydride under reduced pressure (20 mmHg) and stored over 4Å molecular sieves until needed. Yields refer to chromatographically and spectroscopically (¹H NMR, ¹³C NMR) homogeneous materials, unless otherwise stated. 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 10% ethanolic phosphomolybdic acid (PMA) or *p*-anisaldehyde solution and heat as developing agents. E. Merck silica gel (60, particle size 0.040-0.063 mm) was used for flash chromatography. Preparative thin-layer chromatography separations were carried out on 0.25 or 0.50 mm E. Merck silica gel plates (60F-254). NMR spectra were recorded on Varian Mercury 300, 400 and/or Unity 500 MHz instruments and calibrated using the residual undeuterated solvent as an internal reference. The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, b = broad. IR spectra were recorded on a Nicolet 320 Avatar FT-IR spectrometer and values are reported in cm⁻¹ units. Optical rotations were recorded on a Jasco P-1010 polarimeter and values are reported as follows: [α]²⁵_D (c: g/100ml, solvent). High resolution mass spectra (HRMS) were recorded on a VG 7070 HS mass spectrometer under chemical ionization (CI) conditions or on a VG ZAB-ZSE mass spectrometer under fast atom bombardment (FAB) conditions. X-ray data were recorded on a Bruker SMART APEX 3kW Sealed Tube X-ray diffraction system.

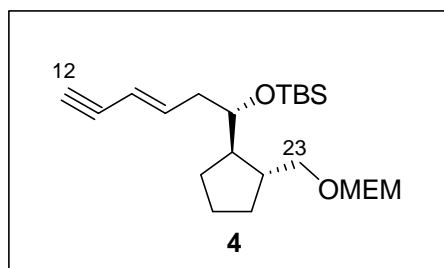
¹ Pangborn, A. B.; Giardello, M. A.; Grubbs, R. H.; Rosen, R. K.; Timmers, F. J. *Organometallics* **1996**, *15*, 1518-1520.

² Perrin, D. D.; Armarego, W. L. *Purification of Laboratory Chemicals*, 3rd ed.; Pergamon Press: Oxford, **1988**.

Key experimental procedures

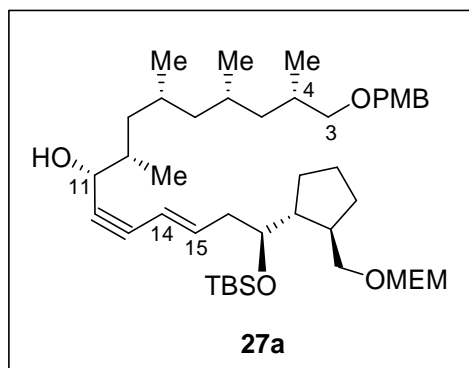


Aldehyde 3: To a solution of alcohol **14** (826 mg, 2.45 mmol) in CH_2Cl_2 at room temperature was added Dess-Martin periodinane (1.25 g, 2.95 mmol) in four portions for a period of 30 min. The reaction mixture was stirred for 1 h and then quenched with a 1:1 mixture of $\text{Na}_2\text{S}_2\text{O}_4/\text{NaHCO}_3$ (30 ml) and extracted with ether (3×50 ml). The organic layer was dried over MgSO_4 , filtered and concentrated under reduced pressure. Purification by flash chromatography (silica gel, 5% ether in hexanes) afforded aldehyde **3** (769 mg, 2.30 mmol, 94% yield) as a yellow oil. **3:** $R_f = 0.6$ (silica, 50% ether in hexanes); $[\alpha]^{25}_{\text{D}} = +5.4$ ($c = 0.5$, CH_2Cl_2); IR (film) ν_{max} 2957, 2921, 2871, 2847, 2709, 1726, 1513, 1247; ^1H NMR (500 MHz, CDCl_3) δ 9.61 (s, 1H), 7.26 (d, $J = 8.5$ Hz, 2H), 6.87 (d, $J = 8.5$ Hz, 2H), 4.42 (ABq, $J = 12.0$ Hz, 2H), 3.81 (s, 3H), 3.31 (dd, $J = 9.0, 5.0$ Hz, 1H), 3.17 (dd, $J = 9.0, 7.0$ Hz, 1H), 2.46-2.37 (m, 1H), 1.87-1.80 (m, 1H), 1.65-1.55 (m, 2H), 1.43-1.38 (m, 1H), 1.33-1.19 (m, 4H), 1.06 (d, $J = 7.0$ Hz, 3H), 1.01-0.95 (m, 1H), 0.92 (d, $J = 6.0$ Hz, 3H), 0.85 (d, $J = 5.0$ Hz, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 205.4, 159.0, 130.8, 129.1, 113.6, 75.5, 72.6, 55.2, 45.4, 44.2, 41.6, 36.8, 30.8, 27.3 (2), 20.6, 20.0, 18.2, 13.1; HRMS, calcd for $\text{C}_{21}\text{H}_{34}\text{O}_3$ ($\text{M}+\text{H}^+$) 335.2586, found 335.2599.



Alkyne 4: A solution of alcohol **26** (1.0 g, 3.5 mmol) in dichloromethane (20 ml) was sequentially treated with imidazole (480 mg, 6.98 mmol), TBSOTf (1.2 ml, 5.1 mmol), and DMAP (37 mg, 0.30 mmol) catalyst. After stirring overnight (8 h) at room temperature, the reaction was quenched with saturated NH_4Cl solution and extracted with ether (3×50 ml). The combined ethereal solutions were washed with a brine solution, dried over MgSO_4 , and concentrated *in vacuo*. The residue was chromatographed in silica gel (5 % ether in hexanes) to obtain silyl ether **4** as a yellow oil (1.3 g, 3.3 mmol, 93 % yield). **4:** $R_f = 0.5$ (silica, 50% ether in hexanes); $[\alpha]^{25}_{\text{D}} = +3.3$ ($c = 0.5$, CH_2Cl_2); IR (film) ν_{max} 3313, 2951, 2931, 2859, 1730, 1047, 835; ^1H

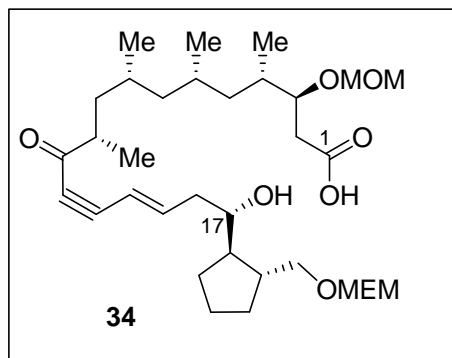
NMR (500 MHz, CDCl₃) δ 6.29-6.23 (m, 1H), 5.47 (d, *J* = 16.0 Hz, 1H), 4.70 (s, 2H), 3.71-3.66 (m, 2H), 3.65-3.61 (m, 1H), 3.57-3.54 (t, *J* = 5.0 Hz, 2H), 3.53-3.49 (m, 1H), 3.39 (s, 3H), 3.30 (t, *J* = 9.0 Hz, 1H), 2.80, (d, *J* = 2.0 Hz, 1H), 2.36-2.21 (m, 2H), 2.10-2.05 (m, 1H), 1.70-1.25 (m, 7H), 0.88 (s, 9H), 0.05 (s, 3H), 0.04 (s, 3H); ¹³C NMR (125 MHz, CDCl₃) δ 143.2, 110.6, 95.6, 82.4, 75.1, 72.4, 71.8, 66.7, 59.03, 46.9, 41.0, 39.0, 30.4, 29.6, 25.3, 18.0, -4.2, -4.6; HRMS, calcd for C₂₂H₄₀O₄Si (M+H⁺) 397.2774, found 397.2792.



Coupling of 3+4: A solution of *n*-butyllithium in hexanes (2.50 M, 1.5 ml, 3.6 mmol) was added dropwise to a solution of alkyne **4** (1.1 g, 2.8 mmol) in a 1:1 anhydrous THF/DME (50 ml) mixture at -78 °C in the presence of 4Å molecular sieves. The solution gradually turned orange and was stirred at -78 °C for 30 min. A solution of aldehyde **3** (718 mg, 2.15 mmol) in THF (3 ml) was

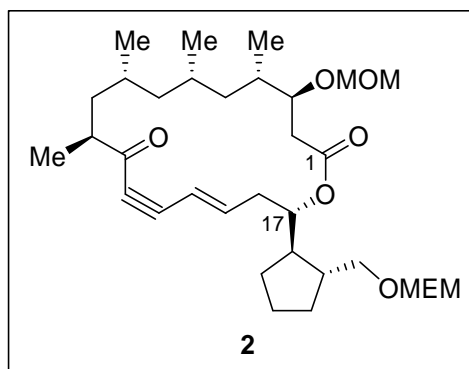
added dropwise to this solution at -78 °C. After stirring for 1 h, the reaction was warmed to 25 °C and quenched with saturated solution of NH₄Cl. The mixture was extracted with four 50 ml portions of ether. The combined organic extracts were washed sequentially with water (20 ml) and brine (20 ml). The ether extracts were dried over magnesium sulfate and concentrated. Purification of the residue by flash column chromatography (20% ether in petroleum ether) afforded coupled enyne **27a** (1.46 g, 2.00 mmol, 93% yield). **27a**: yellow oil; *R_f* = 0.3 (silica, 50% ether in hexanes); [α]_D²⁵ = -10.2 (c = 1.00, CH₂Cl₂); IR (film) ν_{max} 3444 (br), 2953, 2928, 2858, 1249, 1095, 1042; ¹H NMR (400 MHz, CDCl₃) δ 7.25 (d, *J* = 8.8 Hz, 2H), 6.87 (d, *J* = 8.8 Hz, 2H), 6.17-6.10 (m, 1H), 5.50 (d, *J* = 15.6 Hz, 1H), 4.70 (s, 2H), 4.42 (ABq, *J* = 11.6 Hz, 2H), 4.29 (d, *J* = 5.2 Hz, 1H), 3.80 (s, 3H), 3.72-3.67 (m, 2H), 3.65-3.61 (m, 1H), 3.56 (t, *J* = 4.4 Hz, 2H), 3.52-3.48 (m, 1H), 3.39 (s, 3H), 3.34-3.29 (m, 2H), 3.17 (dd, *J* = 8.8, 7.2 Hz, 1H), 2.35-2.19 (m, 2H), 2.10-2.04 (m, 1H), 1.86-1.16 (m, 19H), 0.98-0.82 (m, 21H), 0.05 (s, 3H), 0.04 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 159.0, 141.5, 130.9, 129.0, 113.7, 111.1, 95.6, 87.7, 75.6, 75.2, 72.6, 74.4, 71.7, 67.9, 66.7, 59.0, 55.2, 47.0, 56.0, 41.8, 40.9, 39.3, 39.0, 37.1, 30.8,

30.5, 29.6, 27.2, 25.9, 25.3, 20.8, 20.1, 20.0, 18.3, 14.7, -4.2, -4.5.; HRMS, calcd for $C_{43}H_{74}O_7Si$ ($M+Na^+$) 753.5102, found 753.5121.



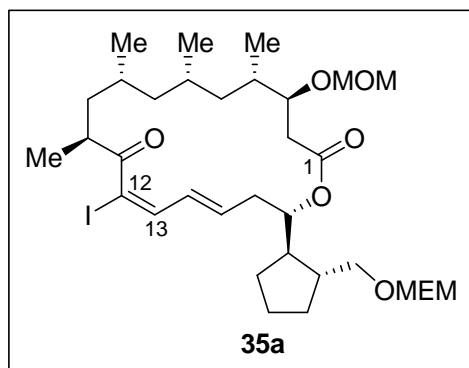
Hydroxy acid 34: To a solution of PMB ester **33** (361.6 mg, 0.5044 mmol) in CH_2Cl_2 (20 ml) at 0 °C was slowly added trifluoroacetic acid (TFA, 0.6 ml) to maintain 3% TFA in CH_2Cl_2 . The reaction was stirred at 0 °C for 3 h. The reaction mixture was diluted with cold toluene (20 ml) and concentrated to remove organic solvents and excess TFA. The crude liquid was purified by column

chromatography to provide free carboxylic acid **34** (249.9 mg, 0.4187 mmol, 83% yield). **34**: colorless oil; $R_f = 0.2$ (silica, 80% ether in hexanes); $[\alpha]_D = -40.9$ ($c = 1.83$, CH_2Cl_2); IR (film) ν_{max} 3444, 2929, 2182, 1731, 1664, 1039; 1H NMR (400 MHz, $CDCl_3$) δ 6.62, (dt, $J = 16.0, 8.0$ Hz, 1H), 5.72 (d, $J = 16.0$ Hz, 1H), 4.78-4.74 (m, 2H), 3.96-3.90 (m, 1H), 3.73-3.70 (m, 2H), 3.57-3.55 (m, 2H), 3.48-3.45 (m, 1H), 3.39 (s, 3H), 3.36 (s, 3H), 3.33-3.27 (m, 1H), 2.65-1.13 (m, 21H), 1.12 (d, $J = 6.8$ Hz, 3H), 0.99-0.86 (m, 12H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 192.2, 175.6, 148.8, 109.5, 96.5, 95.2, 90.9, 86.2, 78.0, 74.8, 71.9, 71.6, 67.2, 59.0, 55.8, 51.6, 46.2, 45.3, 43.6, 40.6, 40.0, 39.3, 37.6, 34.1, 31.3, 29.9, 27.8, 27.6, 24.9, 20.8, 20.6, 15.8, 15.4; HRMS, calcd for $C_{33}H_{56}O_9$ ($M+Na^+$) 619.3822, found 619.3851.



Macrocycle 2: To a solution of hydroxy carboxylic acid **34** (249.9 mg, 0.4187 mmol) in THF (5.0 ml) was added triethylamine (0.47 ml, 3.4 mmol) and 2,4,6-trichlorobenzoyl chloride (0.34 ml, 2.1 mmol) at 0 °C. The reaction mixture was slowly warmed to 25 °C and stirred for 3 h to furnish acid anhydride intermediate. The solution was diluted with toluene (5.0 ml) and added to a solution of DMAP (755.0 mg, 6.118 mmol) in degassed toluene (250 ml) at 25 °C for 5 h by the use of syringe pump. The reaction was continued for additional 7 h. After the completion of the

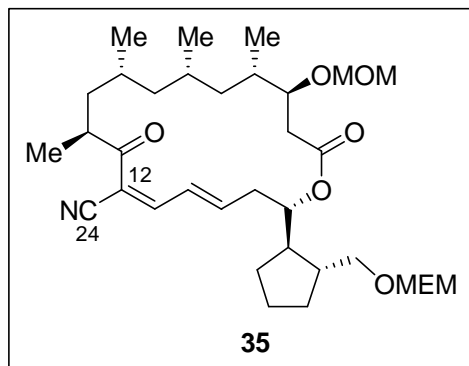
reaction, the solution was filtered through a pad of silica gel and concentrated. The concentrated residue was then purified by column chromatography to yield macrolide **2** in 59% yield (142.9 mg, 0.2469 mmol). **2**: colorless oil; $R_f = 0.5$ (silica, 70% ether in hexanes); $[\alpha]_D^{25} = -35.5$ ($c = 1.09$, CH_2Cl_2); IR (film) ν_{max} 2928, 2183, 1733, 1665, 1036; ^1H NMR (400 MHz, CDCl_3) δ 7.40-7.24 (m, 5H), 4.51 (d, $J = 4.8$ Hz, 2H), 3.38-3.26 (m, 1H), 3.24-3.16 (m, 1H), 2.60-2.48 (m, 1H), 1.92-1.80 (m, 1H), 1.66-1.52 (m, 2H), 1.50-1.20 (m, 4H), 1.15 (d, $J = 6.8$ Hz, 3H), 0.95 (d, $J = 6.4$ Hz, 3H), 0.864 (d, $J = 6.0$ Hz, 3H), 0.855 (d, $J = 6.4$ Hz, 3H), 1.00-0.80 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ 192.7, 171.3, 146.8, 125.5, 110.5, 95.9, 95.5, 91.1, 86.1, 76.4, 75.6, 71.7, 66.7, 59.0, 56.0, 46.9, 46.0, 45.4, 42.3, 42.0, 38.9, 37.0, 36.6, 34.0, 30.1, 29.6, 28.2, 27.3, 25.0, 21.6, 19.1, 16.1, 15.6.; HRMS, calcd for $\text{C}_{33}\text{H}_{54}\text{O}_8$ ($\text{M}+\text{Na}^+$) 601.3717, found 601.3710.



Vinyl iodide 35a: To a solution of lactone **2** (144.0 mg, 0.2488 mmol) in THF (10 ml) at 25 °C was added a solution of hydroquinone (160.0 mg, 1.439 mmol) in THF (5.0 ml), MOBI_3 (53.2 mg, 0.124 mmol) in THF (5.0 ml), and $(n\text{Bu})_3\text{SnH}$ (5.0 ml, 18 mmol). The reaction was heated at 55 °C and stirred for 12 h. The reaction mixture was chromatographed to remove the excess $(n\text{Bu})_3\text{SnH}$.

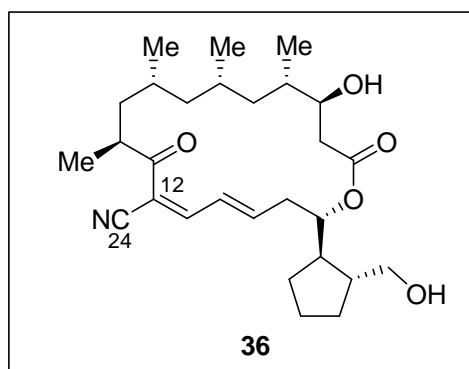
The resulting vinyl stannane was dissolved in CH_2Cl_2 (10 ml) and treated with saturated I_2 solution in CH_2Cl_2 . After 5 min, the reaction mixture was quenched with $\text{Na}_2\text{S}_2\text{O}_3$ (aq) and extracted with Et_2O (4×25 ml). The crude product was then purified by column chromatography to afford vinyl iodide **35a** (96.7 mg, 0.1368 mmol, 54% yield over two steps). **35a**: yellow oil; $R_f = 0.5$ (silica, 70% ether in hexanes); $[\alpha]_D^{25} = +44.5$ ($c = 0.22$, CH_2Cl_2); ^1H NMR (400 MHz, CDCl_3) δ 7.37 (d, $J = 10.0$ Hz, 1H), 6.48 (dd, $J = 15.6, 10.4$ Hz, 1H), 6.31-6.23 (m, 1H), 4.99 (ddd, $J = 10.8, 7.6, 3.2$ Hz, 1H), 4.71 (d, $J = 6.8$ Hz, 1H), 4.70 (s, 2H), 4.57 (d, $J = 6.8$ Hz, 1H), 3.76-3.71 (m, 1H), 3.70-3.68 (m, 2H), 3.57-3.54 (m, 2H), 3.49 (dd, $J = 9.6, 5.6$ Hz, 1H), 3.39 (s, 3H), 3.39 (s, 3H), 3.37-3.33 (m, 1H), 2.60-2.54 (m, 1H), 2.49-2.34 (m, 3H), 2.10-2.02 (m, 1H), 1.93-1.86 (m, 1H), 1.84-0.78 (m, H), 1.11 (d, $J = 6.8$ Hz, 3H), 0.88 (d, $J = 6.8$ Hz, 3H), 0.85 (d, $J = 5.6$ Hz, 3H), 0.79 (d, $J = 6.4$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 200.4, 171.2, 145.4, 143.4, 135.7, 105.5, 95.7, 95.5, 76.5, 76.1, 71.8, 71.7, 66.7, 59.0, 56.0, 46.7, 46.1, 43.2, 41.8,

40.5, 39.0, 37.0, 36.6, 35.1, 30.1, 29.9, 29.6, 28.3, 25.1, 23.1, 21.1, 19.1, 15.3.; HRMS, calcd for C₃₃H₅₅IO₈ (M+H⁺) 707.3020, found 707.3036.



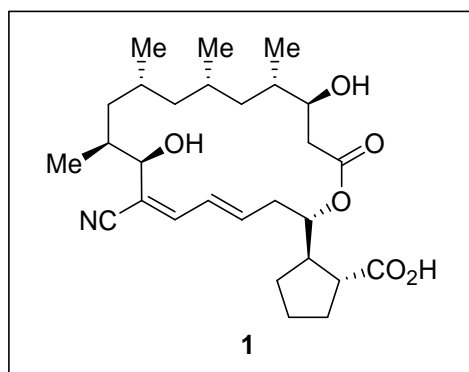
Ketonitrile 35: To a solution of vinyl iodide **35a** (21.4 mg, 0.0303 mmol) in toluene (2.0 ml) was added CuI (2.2 mg, 0.012 mmol), Pd(PPh₃)₄ (20.6 mg, 0.0178 mmol), and (nBu)₃SnCN (22.6 mg, 0.0694 mmol). The reaction was heated at 80 °C for 8 h. The reaction mixture was cooled to 25 °C and filtered through celite. After concentration, the crude mixture was purified by column

chromatography to give vinyl cyanide **35** (15.9 mg, 0.0262 mmol, 90% yield). **35**: colorless oil; *R_f* = 0.5 (silica, 70% ether in hexanes); [α]_D²⁵ = +91.7 (c = 0.57, CH₂Cl₂); IR (film) ν_{max} 2930, 1731, 1461, 1360, 1255, 1099, 835, 774; ¹H NMR (400 MHz, CDCl₃) δ 7.75 (d, *J* = 12.0 Hz, 1H), 6.66 (dd, *J* = 14.4, 12.0 Hz, 1H), 6.42 (ddd, *J* = 15.2, 10.8, 4.8 Hz, 1H), 5.06 (ddd, *J* = 11.2, 7.2, 2.8 Hz, 1H), 4.69 (s, 2H), 4.59 (d, 6.8 Hz, 1H), 4.50 (d, *J* = 7.2 Hz, 1H), 3.75 (dt, *J* = 10.4, 3.2 Hz, 1H), 3.69-3.67 (m, 2H), 3.57-3.54 (m, 2H), 3.46 (dd, *J* = 9.2, 5.6 Hz, 1H), 3.41-3.36 (m, 1H), 3.39 (s, 3H), 3.34 (s, 3H), 2.61 (d, *J* = 12.8 Hz, 1H), 2.43 (dt, *J* = 12.8, 11.2 Hz, 1H), 2.33 (dd, *J* = 16.0, 3.6 Hz, 1H), 2.18 (dd, *J* = 16.0, 10.4 Hz, 1H), 2.07-2.01 (m, 1H), 1.93-1.85 (m, 1H), 1.80-0.84 (m, 15H), 1.14 (d, *J* = 6.4 Hz, 3H), 0.90 (d, *J* = 6.4 Hz, 3H), 0.85 (d, *J* = 6.4 Hz, 6H), 0.65-0.57 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 197.8, 171.5, 154.3, 149.9, 130.6, 116.4, 110.9, 95.7, 95.4, 77.2, 75.0, 71.8, 71.6, 66.7, 59.1, 56.1, 46.5, 46.0, 42.0, 41.7, 40.8, 38.7, 37.5, 36.7, 34.5, 30.3, 30.2, 29.9, 28.1, 25.2, 23.7, 22.1, 18.4, 16.8.; HRMS, calcd for C₃₄H₅₅NO₈ (M+Na⁺) 628.3826, found 628.3808.



Diol 36: To a solution of vinyl cyanide **35** (15.9 mg, 0.0262 mmol) in CH₂Cl₂ (5.0 ml) at -78 °C was added 0.35M Me₂BBr in CH₂Cl₂ (0.2 ml). The reaction mixture was stirred at -78 °C for 2 h, and was then quenched with NaHCO₃ (aq) and extracted with Et₂O (3×20 ml). After drying over MgSO₄, filtration, and concentration, the

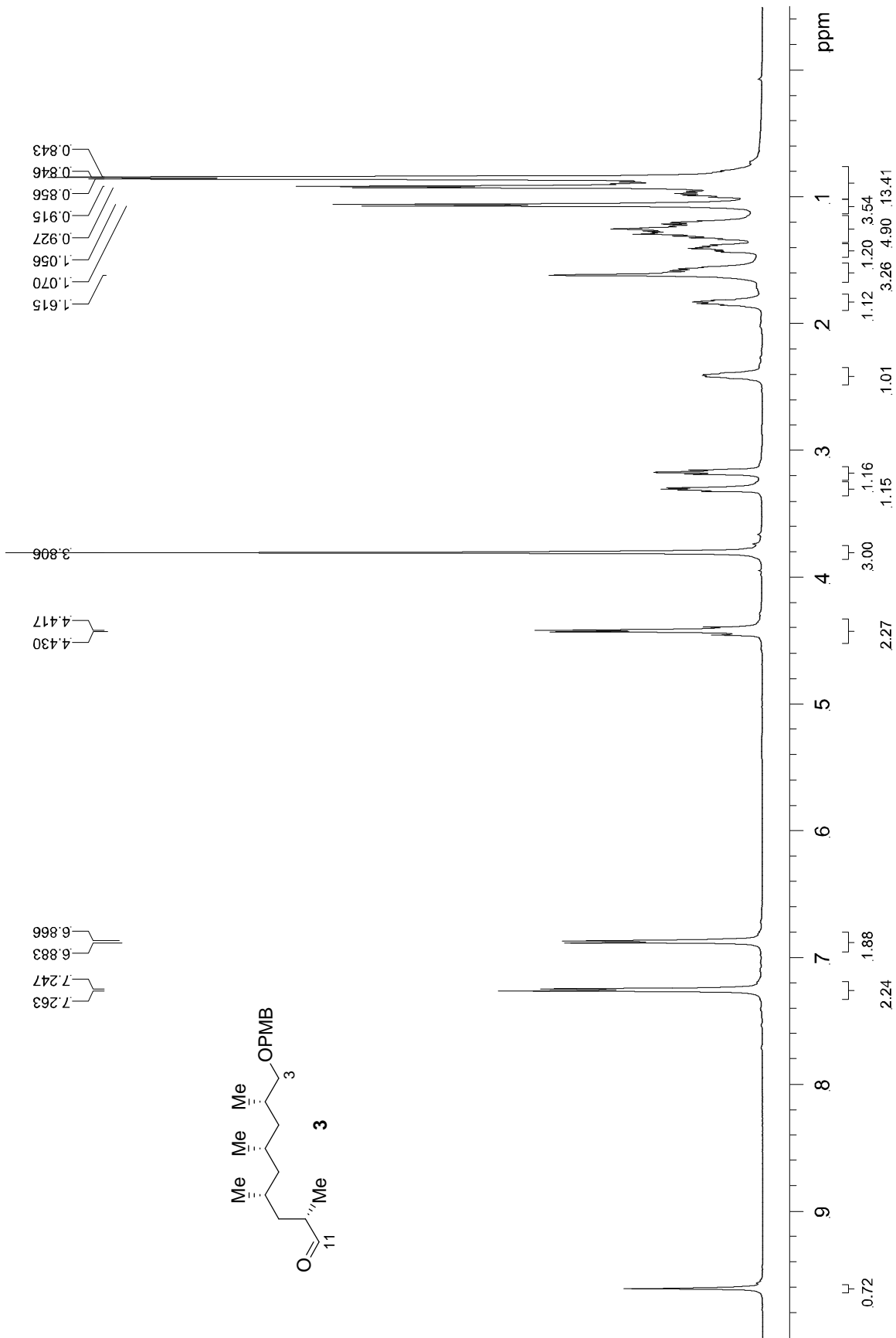
crude mixture was purified by column chromatography to afford free alcohol **36** (8.5 mg, 0.0179 mmol) in 69% yield. **36**: white solid; $R_f = 0.3$ (silica, 80% ether in hexanes); $[\alpha]_D^{25} = +44.3$ ($c = 0.19$, CH_2Cl_2); IR (film) ν_{max} 2923, 2358, 2340, 2214, 1695, 1648, 1558, 1454, 1373, 1174, 1049, 985; ^1H NMR (400 MHz, CDCl_3) δ 7.76 (d, $J = 11.6$ Hz, 1H), 6.66 (dd, $J = 15.2, 11.6$ Hz, 1H), 6.54 (ddd, $J = 15.2, 10.8, 4.8$ Hz, 1H), 5.06-5.04 (m, 1H), 3.74 (dt, $J = 10.0, 3.2$ Hz, 1H), 3.52 (d, $J = 6.8$ Hz, 2H), 2.69 (d, $J = 9.2$ Hz, 1H), 2.43 (dt, $J = 13.2, 10.8$ Hz, 1H), 2.31 (dd, $J = 16.0, 2.4$ Hz, 2H), 2.21 (dd, $J = 15.6, 10.0$ Hz, 2H), 1.98-0.83 (m, 15H), 1.14 (d, $J = 7.2$ Hz, 3H), 0.89 (d, $J = 6.8$ Hz, 3H), 0.87 (d, $J = 6.0$ Hz, 3H), 0.87 (d, $J = 7.6$ Hz, 3H), 0.75-0.68 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3) δ 197.7, 173.0, 153.5, 149.7, 130.1, 116.4, 111.6, 75.7, 70.7, 66.6, 46.2, 45.6, 44.5, 42.5, 40.6, 39.2, 39.1, 38.2, 38.0, 30.4, 29.8, 29.7, 29.0, 25.3, 22.5, 22.3, 18.5, 16.3; HRMS calcd for $\text{C}_{28}\text{H}_{43}\text{NO}_5$ ($\text{M}+\text{Na}^+$) 496.3039, found 496.3021.

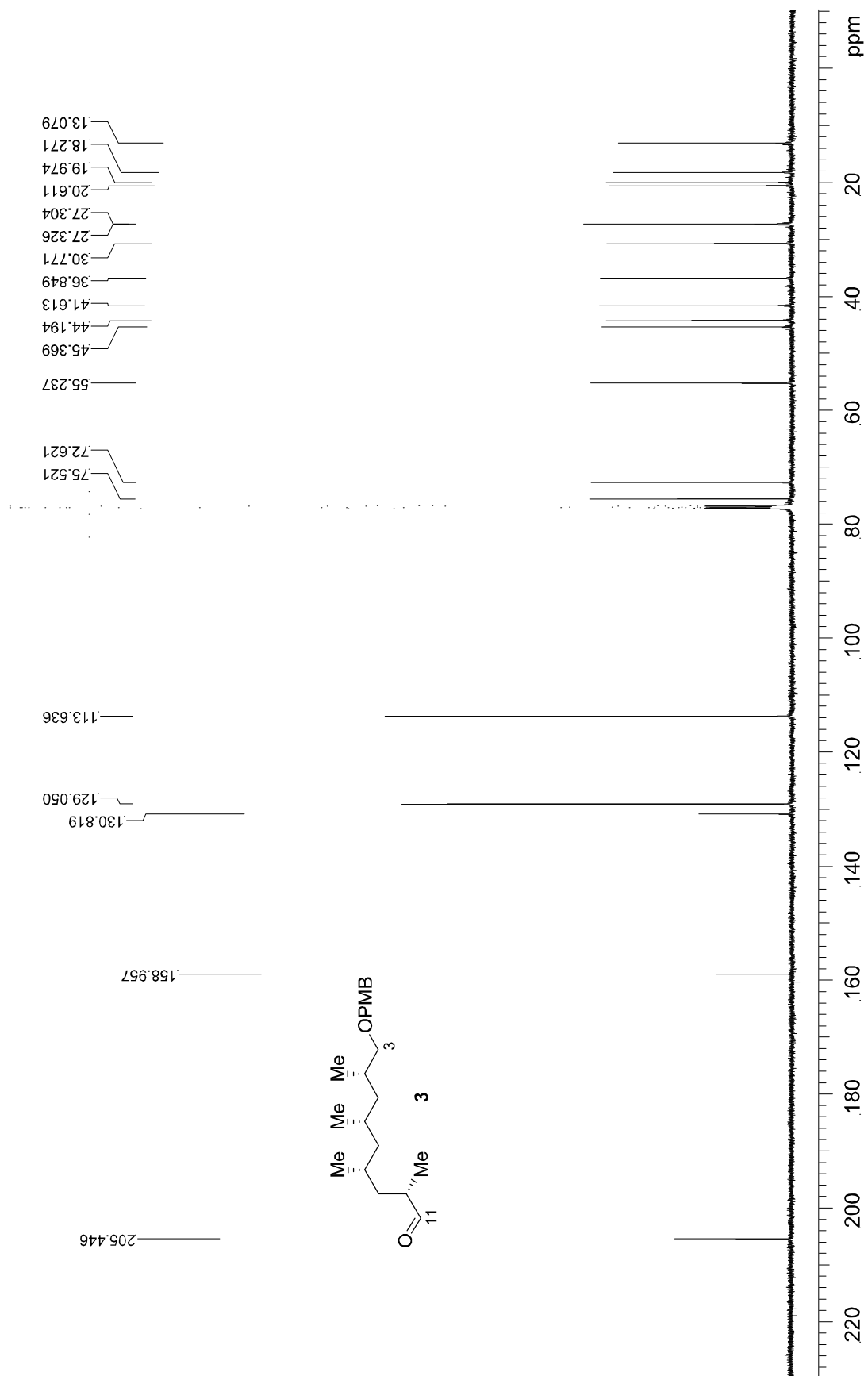


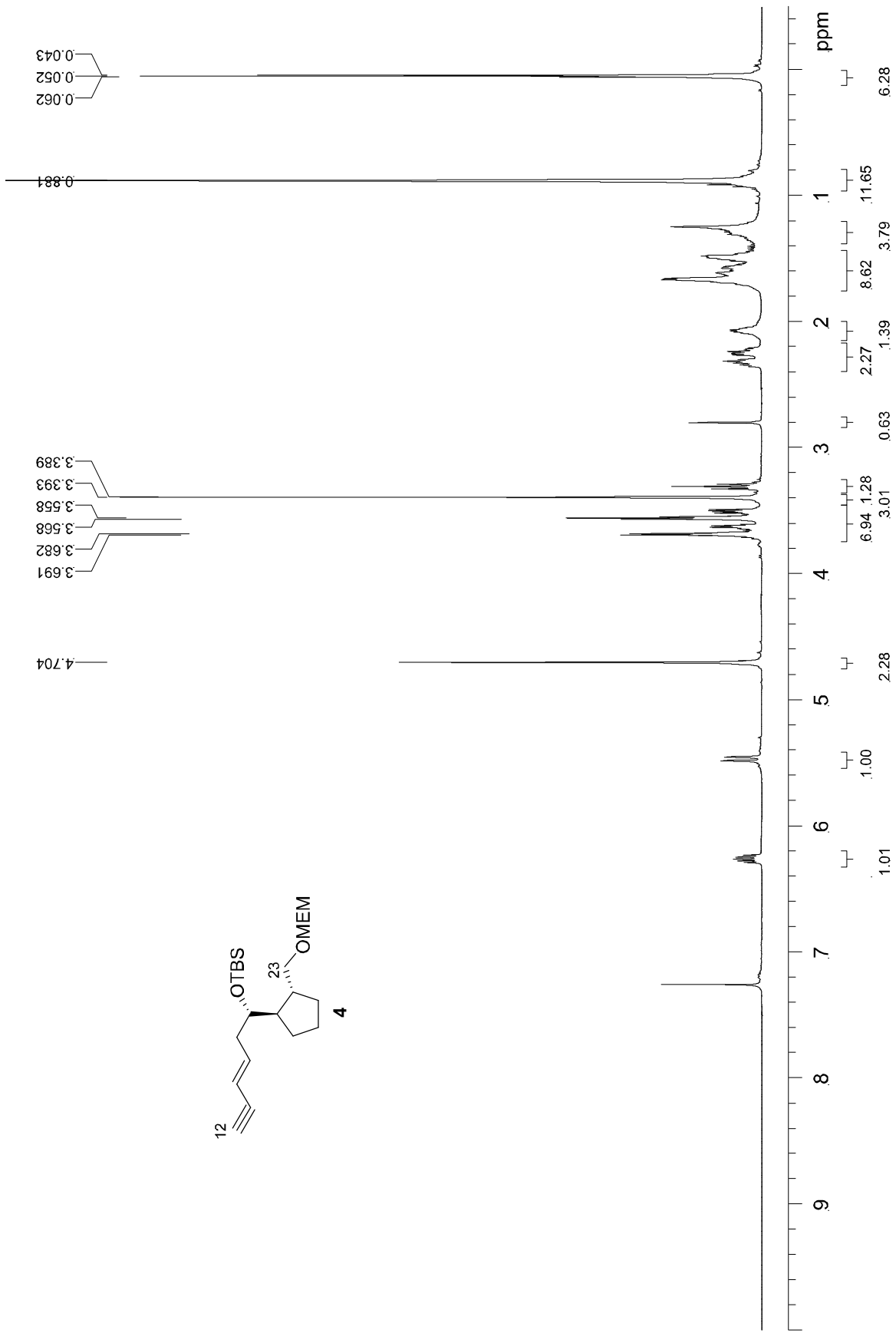
Borrelidin 1: To a solution of the diol **36** (4.8 mg, 0.010 mmol) in CH_2Cl_2 (2.0 ml) was added TCCA (7.1 mg, 0.021 mmol) and TEMPO (catalytic amount) at 0 °C. The solution was stirred at 25 °C for 30 min. The reaction was quenched with 25 ml NaHCO_3 (aq) and extracted with Et_2O (4×5 ml). After drying over MgSO_4 , the combined layers were filtered and concentrated and the crude

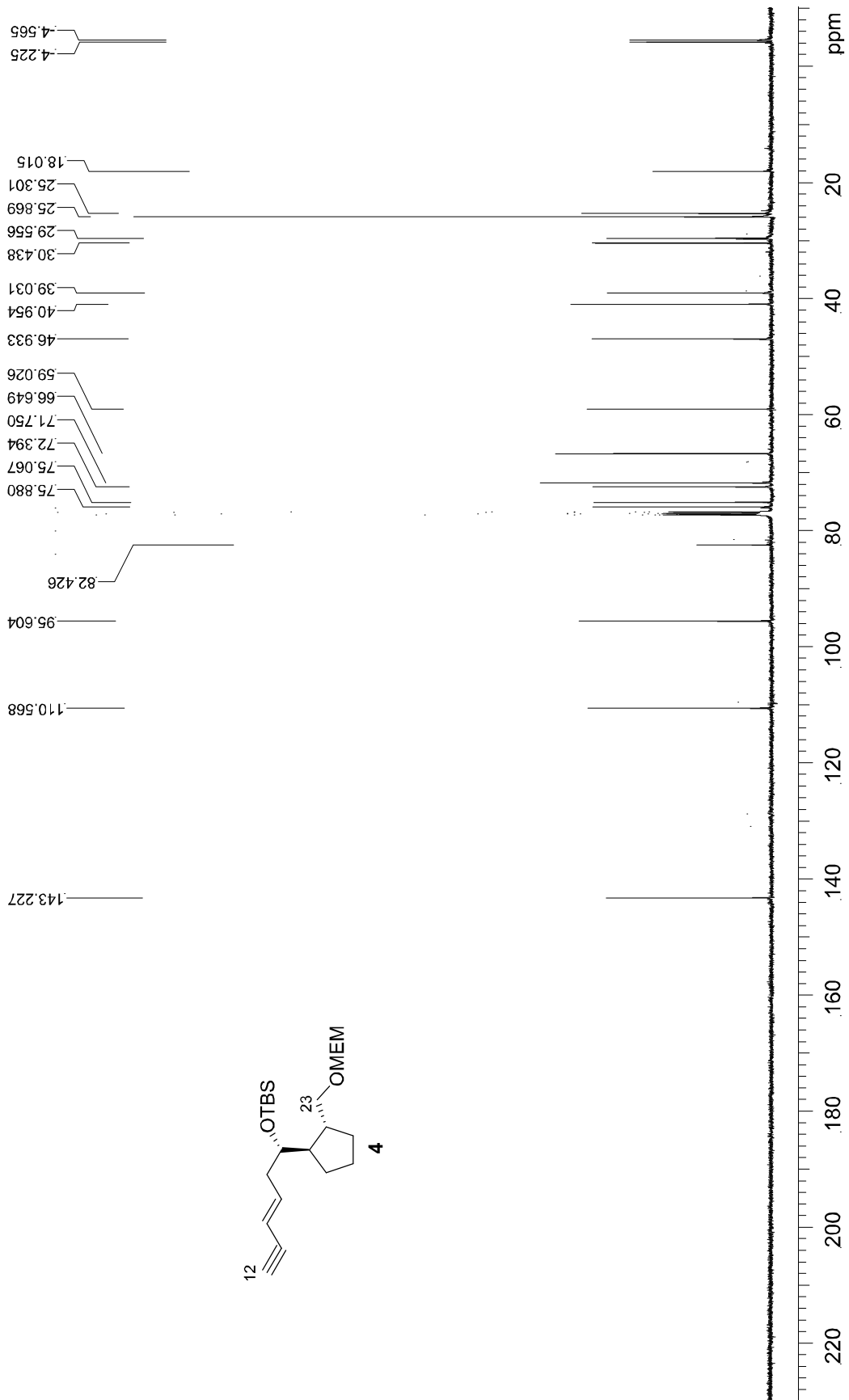
mixture was purified by preparative plate (100% ether) to afford the labile C23 aldehyde (4.0 mg, 0.0085 mmol) in 85% yield which was immediately subjected to the next step. This aldehyde was dissolved in *tert*-BuOH/ H_2O (3:1, 1 ml) and sequentially subjected to sodium hydrogen phosphate (3.5 mg, 0.025 mmol), 2-methyl-2-butene (0.021 ml, 2.0 M in THF) and sodium chlorite (2.3 mg, 0.025 mmol). After stirring for 30 min at 25 °C, the reaction mixture was extracted with ethyl acetate (3×40 ml). The combined extracts were dried (MgSO_4), filtered and concentrated *in vacuo*. A solution of the resulting crude carboxylic acid in methanol (1 ml) was treated with sodium borohydride (1 mg, 0.027 mmol) in the presence of catalytic $\text{CeCl}_3 \cdot 7\text{H}_2\text{O}$ at 0 °C. The resulting solution was stirred for 1 h, and then quenched with water. The mixture was extracted with ethyl acetate (3×20 ml) and the combined ether layer was dried over magnesium sulfate, filtered, and concentrated under reduced pressure. Purification by

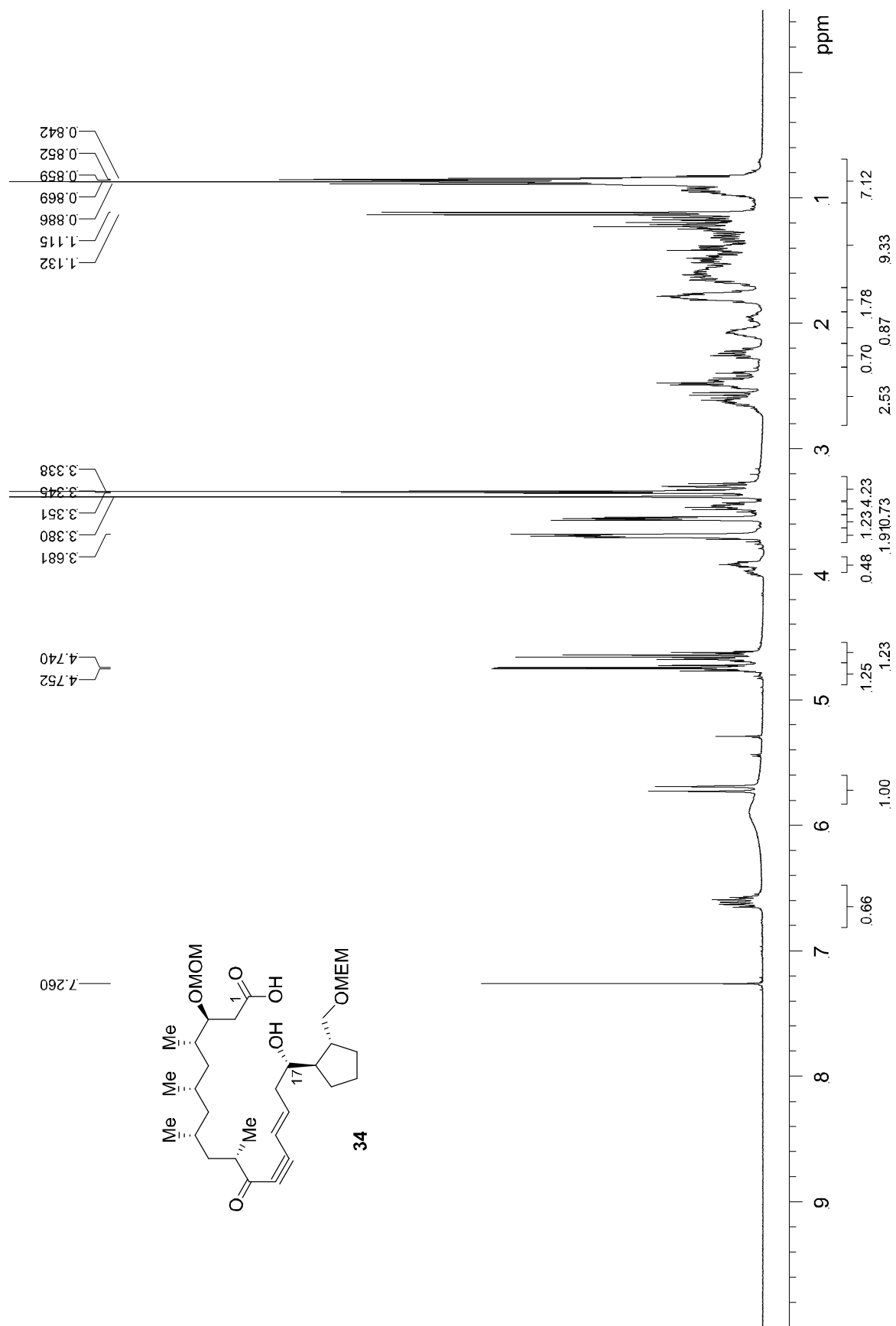
preparative plate with ether gave synthetic borrelidin **1** (1.9 mg, 0.0037 mmol, 39% over three steps). **1**: white solid; $R_f = 0.45$ (ether); $[\alpha]_D^{25} = -22.6$ ($c = 0.12$, EtOH); IR (film) ν_{\max} 3446 (br), 2958, 2925, 2858, 2212, 1727, 1273; ^1H NMR (400 MHz, CDCl_3) δ 6.82 (d, $J = 11.2$ Hz, 1H), 6.38 (dd, $J = 4.5, 11.2$ Hz, 1H), 6.197 (ddd, $J = 14.5, 9.2, 5.3$ Hz, 1H), 4.98 (dd, $J = 10.6, 3.3$ Hz, 1H), 4.11 (d, $J = 9.6$ Hz, 1H), 3.87 (dt, $J = 9.9, 2.3$ Hz, 1H), 2.76-2.34 (m, 6H), 2.06-1.47 (m, 9H), 1.43-0.70 (m, 9H), 1.05 (d, $J = 6.4$ Hz, 3H), 0.84 (d, $J = 6.4$ Hz, 3H), 0.83 (d, $J = 6.8$ Hz, 3H), 0.80 (d, $J = 6.0$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 179.7, 172.1, 143.9, 138.4, 126.9, 118.0, 115.9, 77.2, 73.1, 69.9, 48.3, 47.8, 45.8, 42.9, 39.1, 37.4, 35.9, 31.2, 29.7, 27.1, 26.2, 25.3, 20.2, 18.2, 17.0, 14.9; HRMS calcd. for $\text{C}_{28}\text{H}_{43}\text{NO}_6$ (M-H^-) 488.3017, found 488.3020.

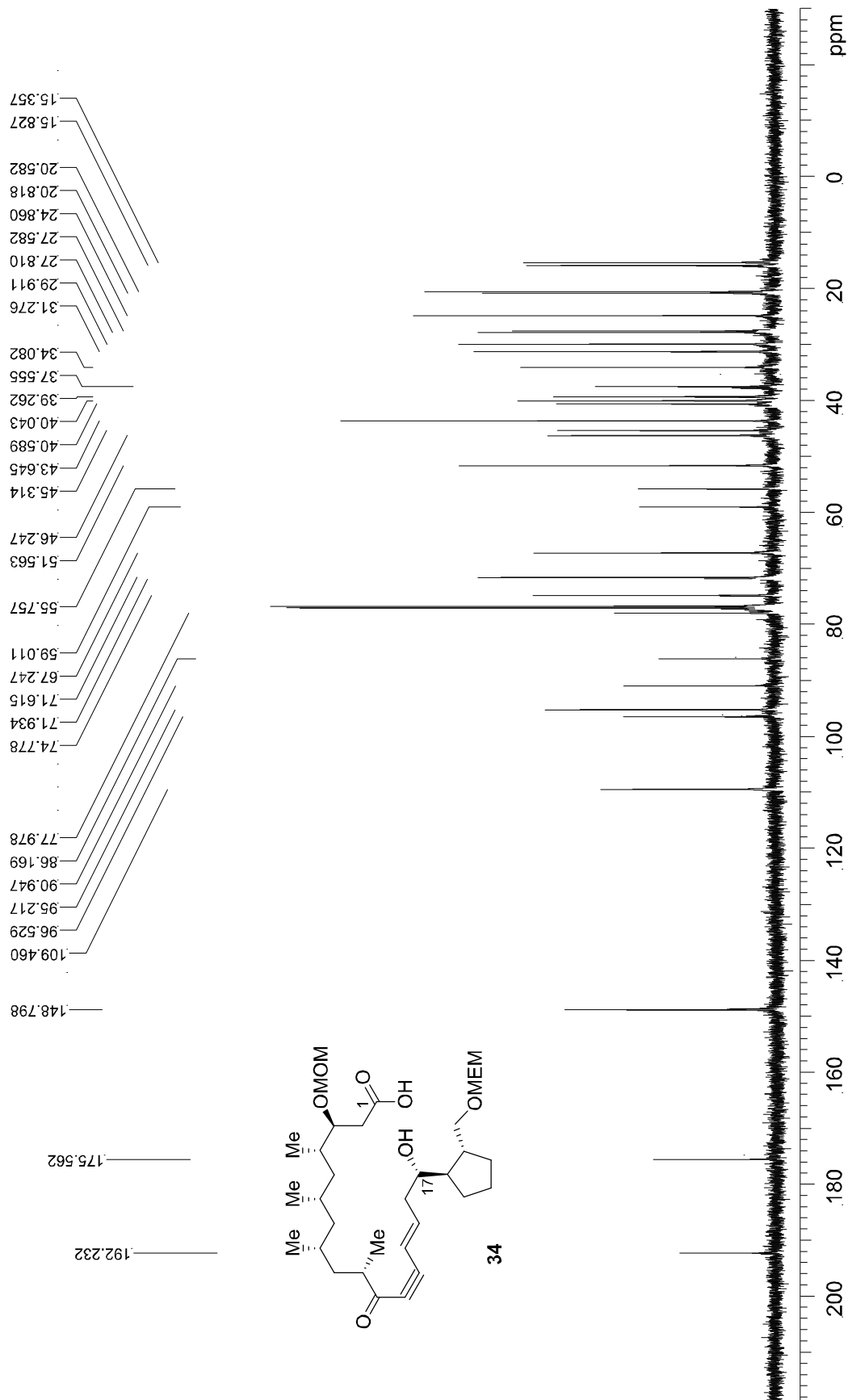


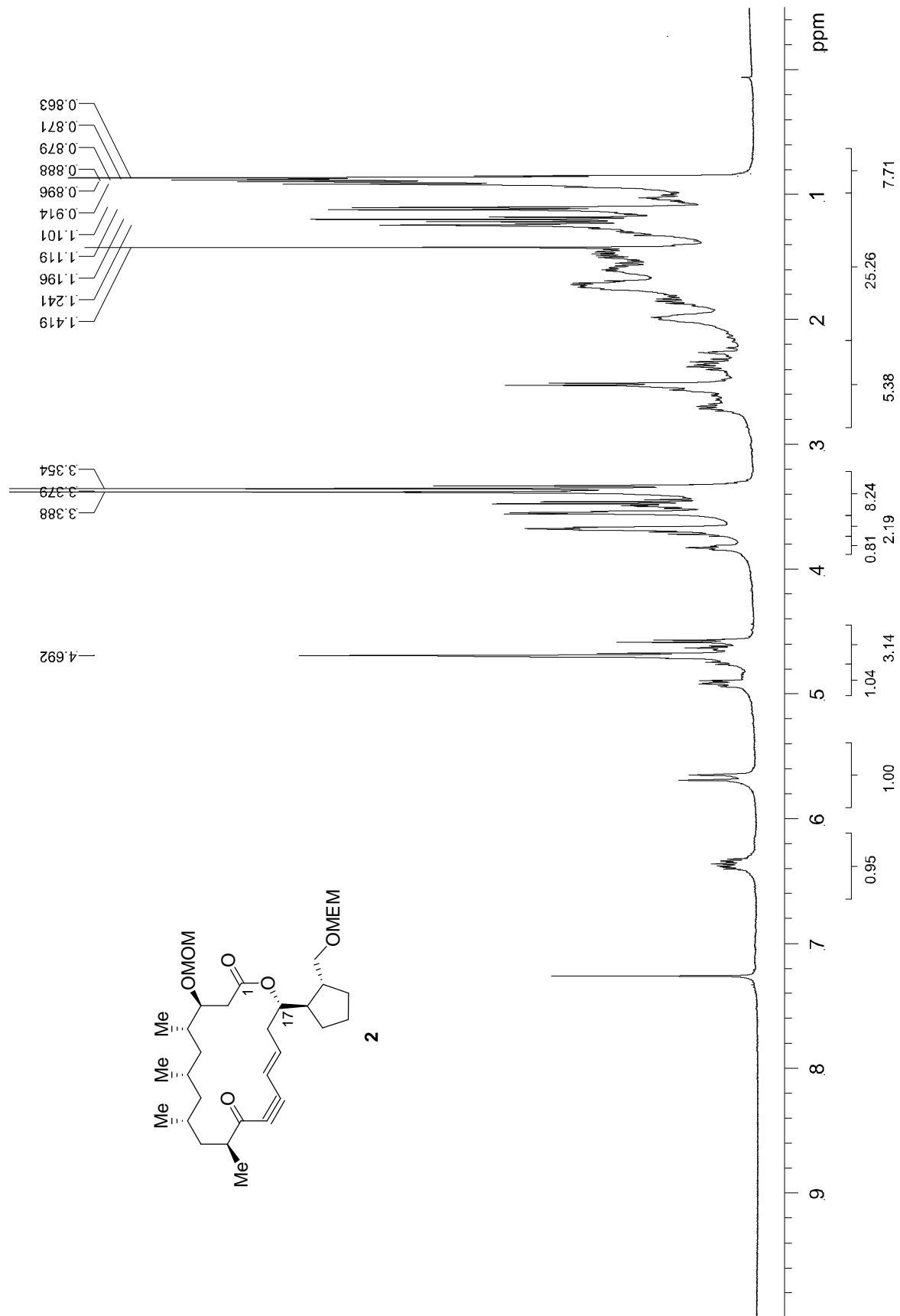


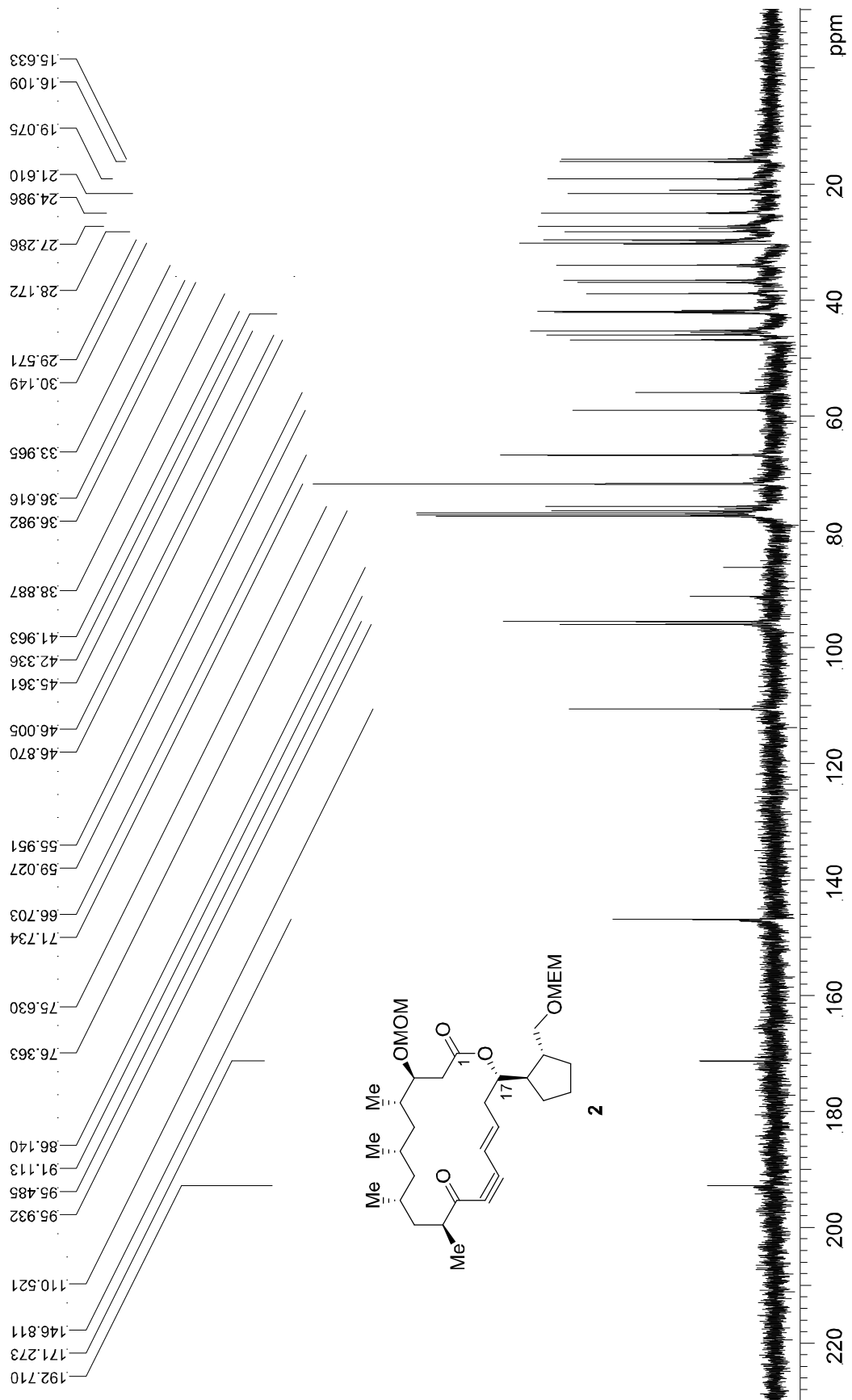


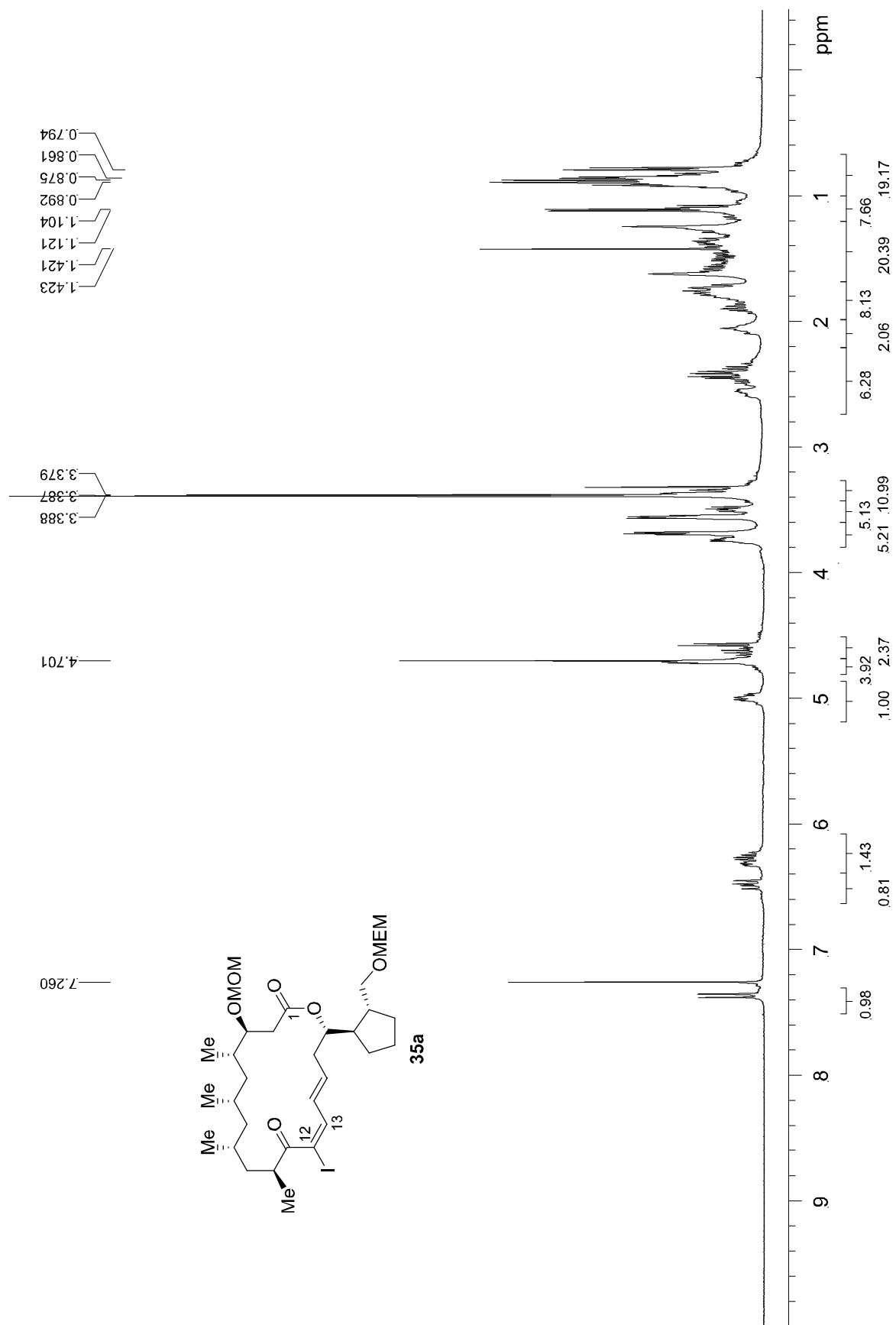


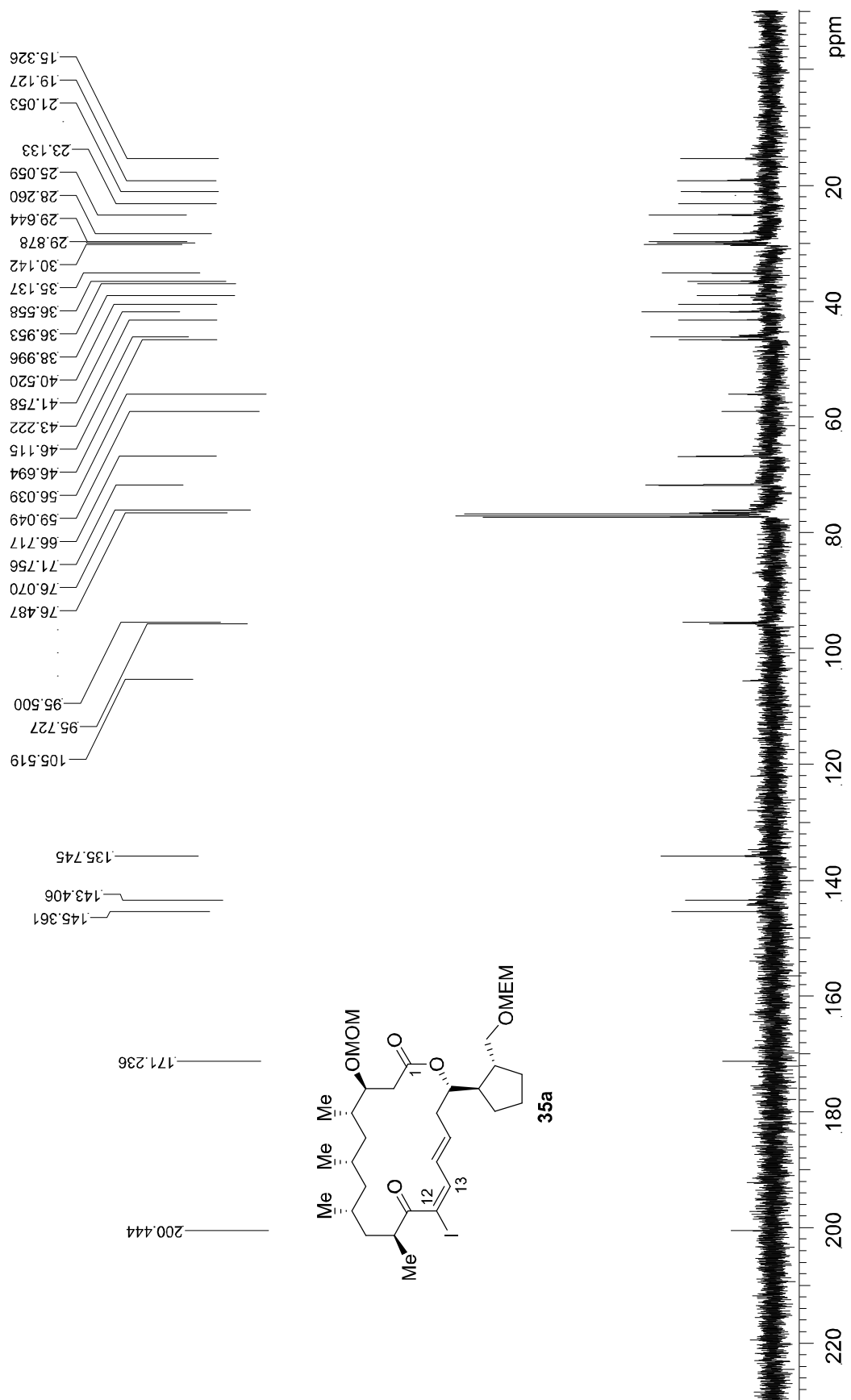


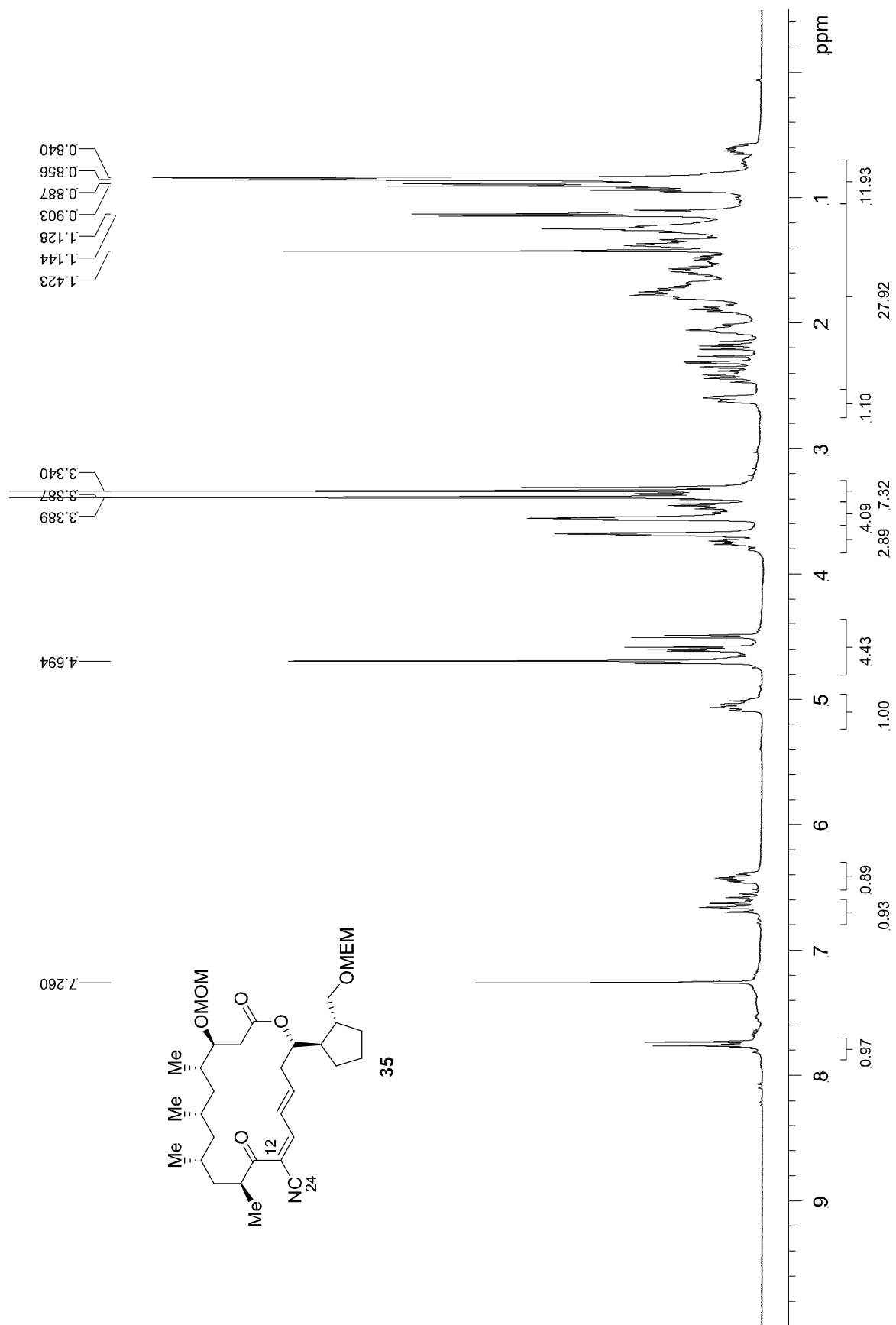


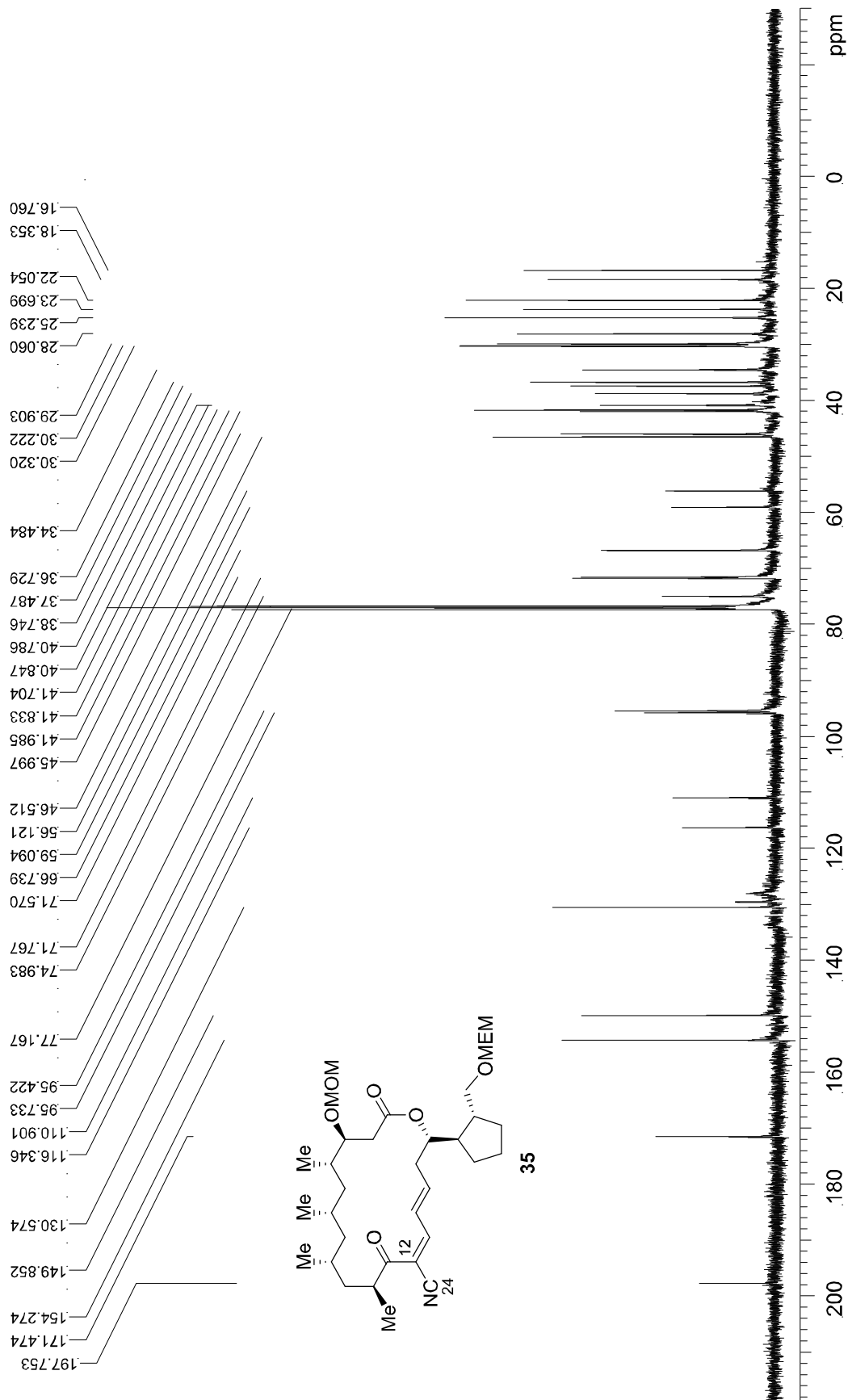


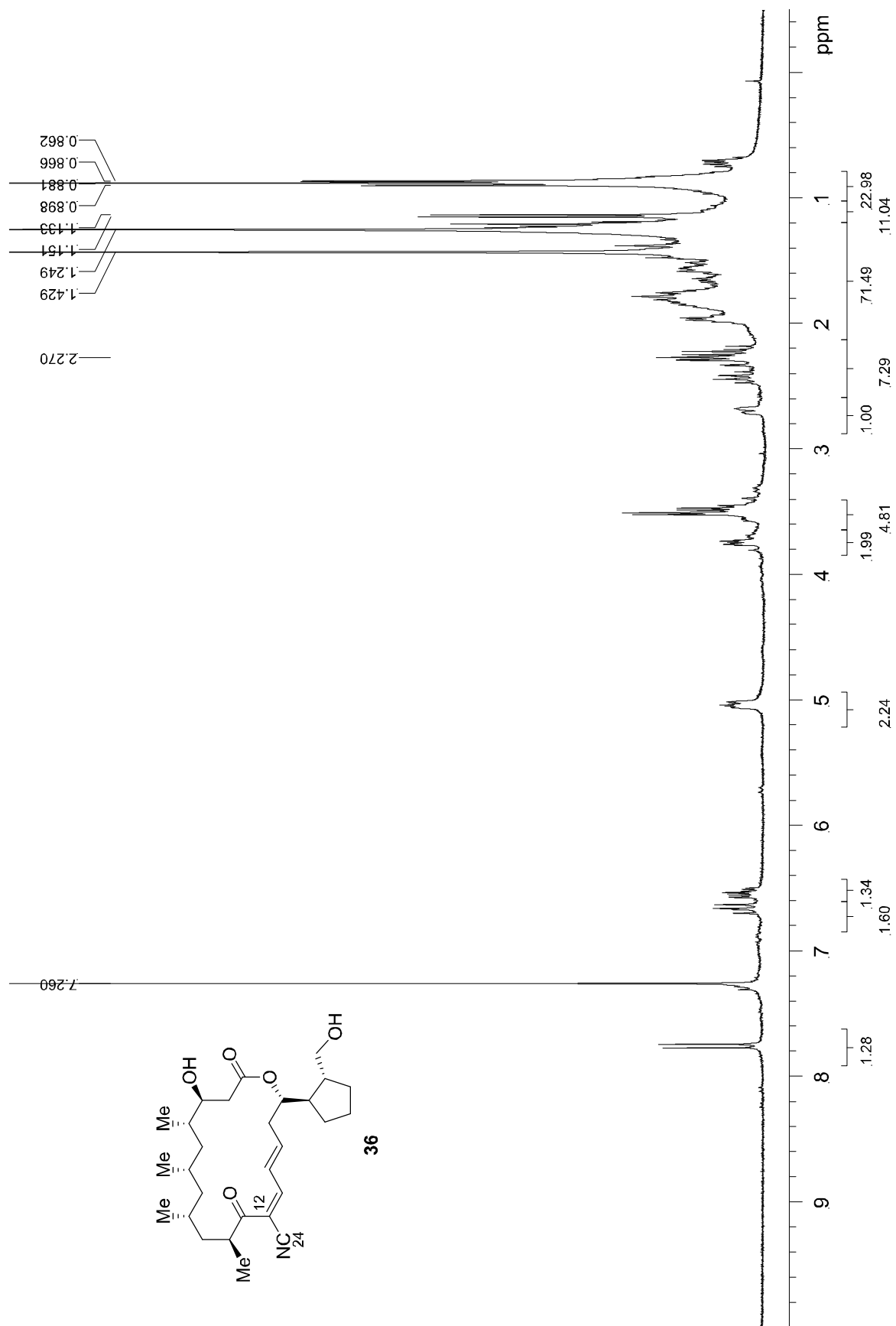


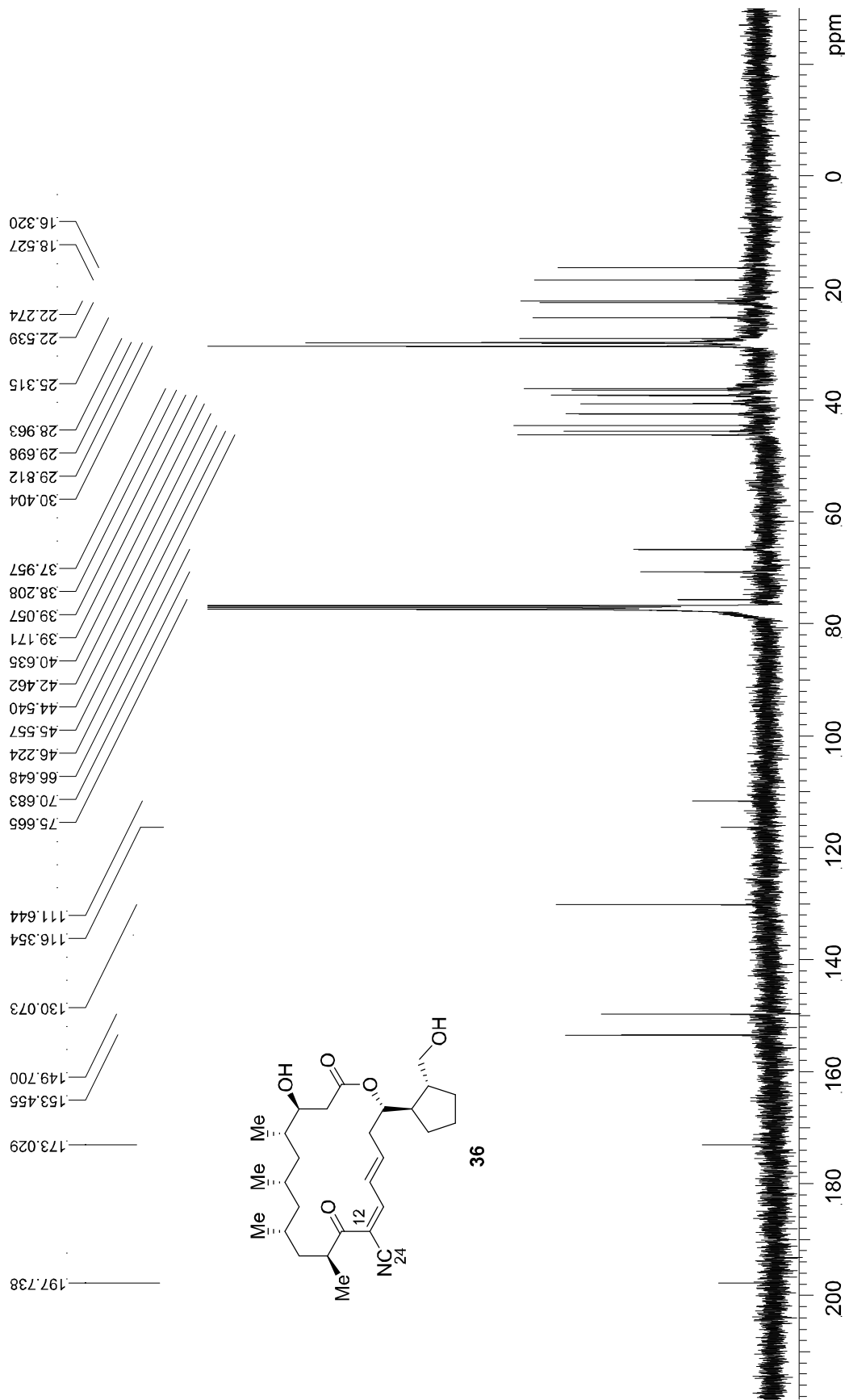




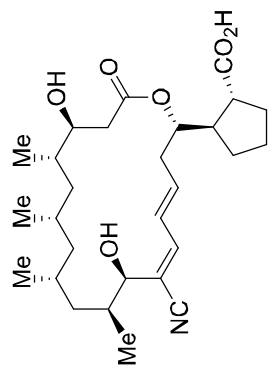




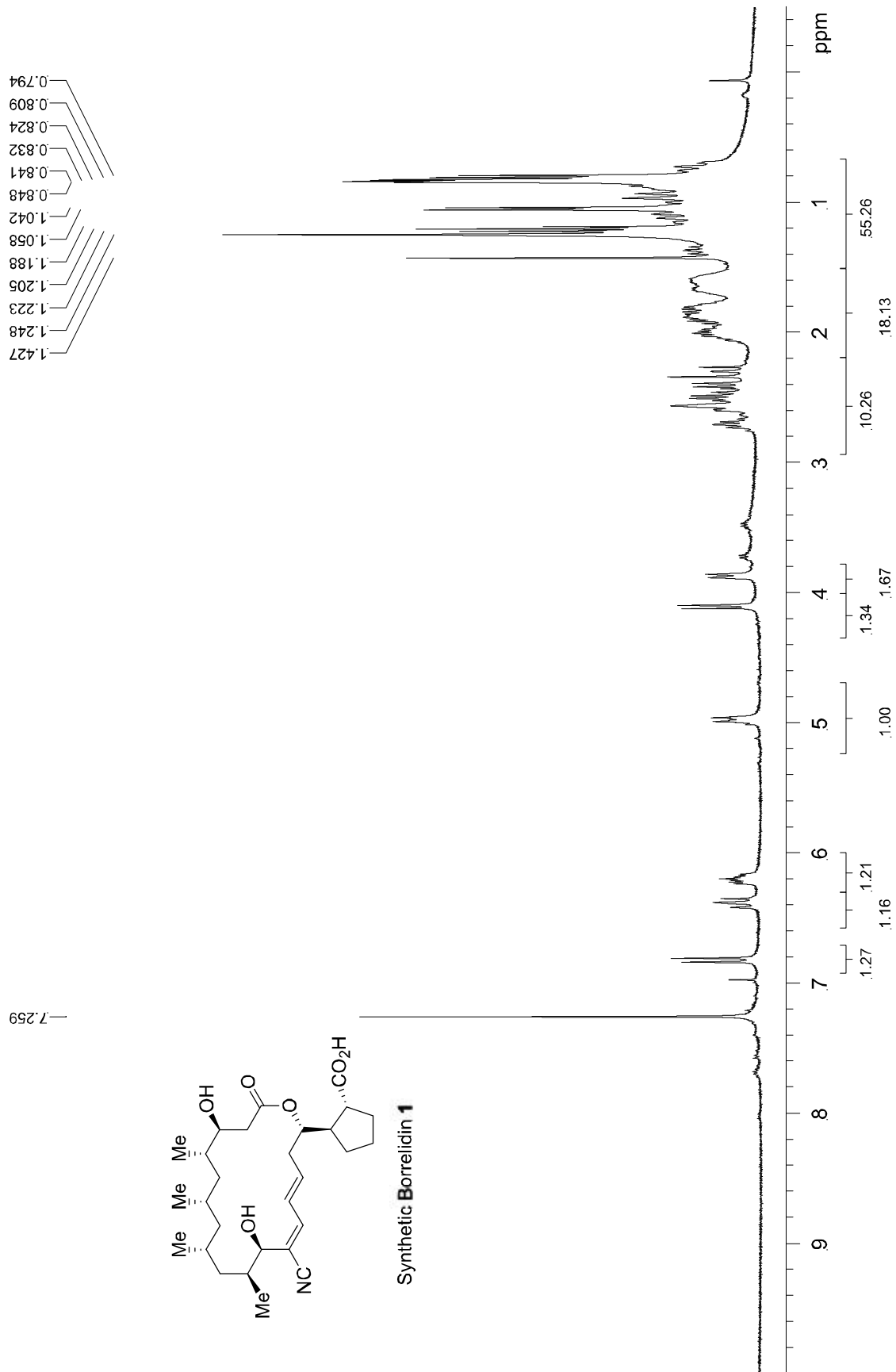


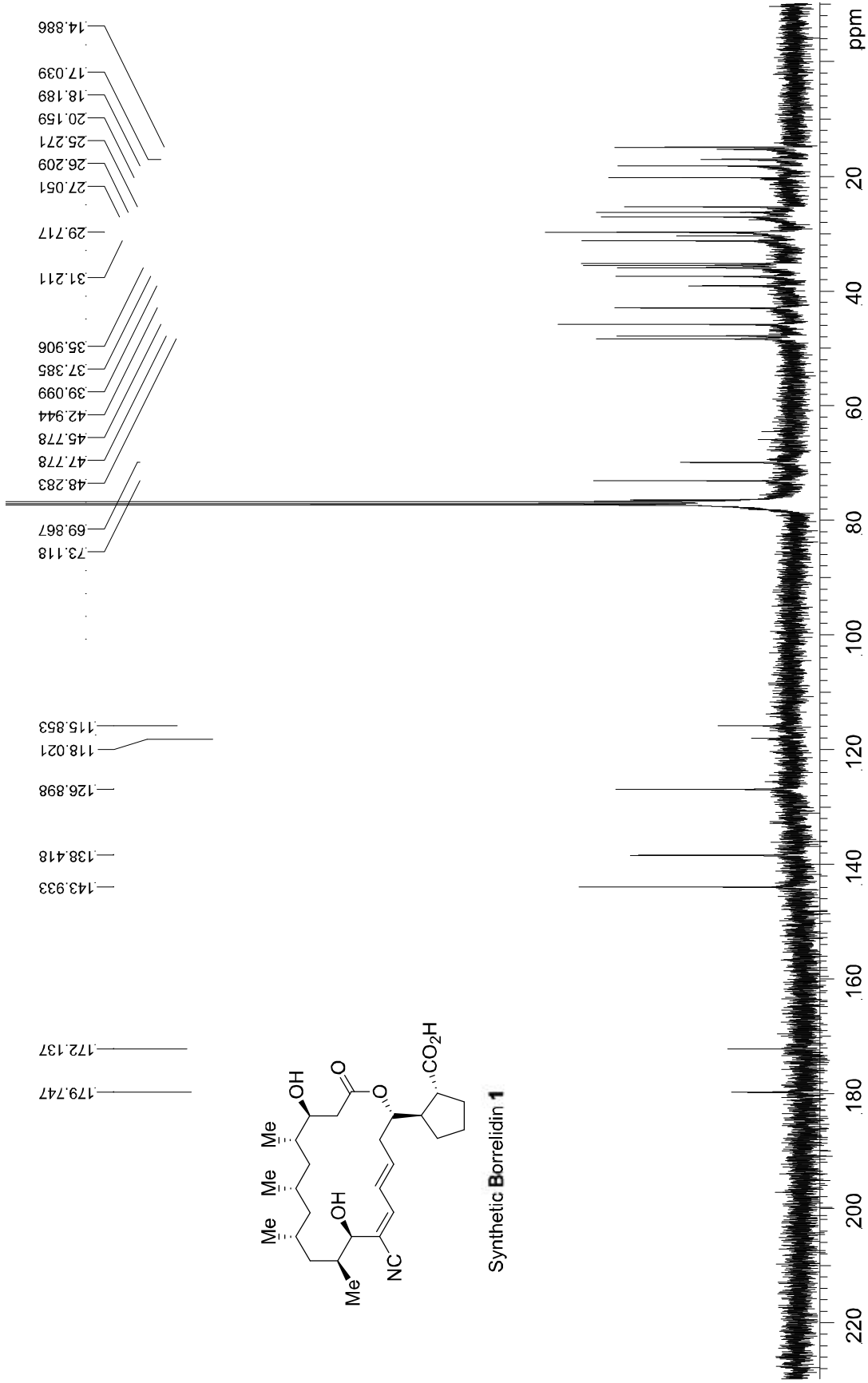


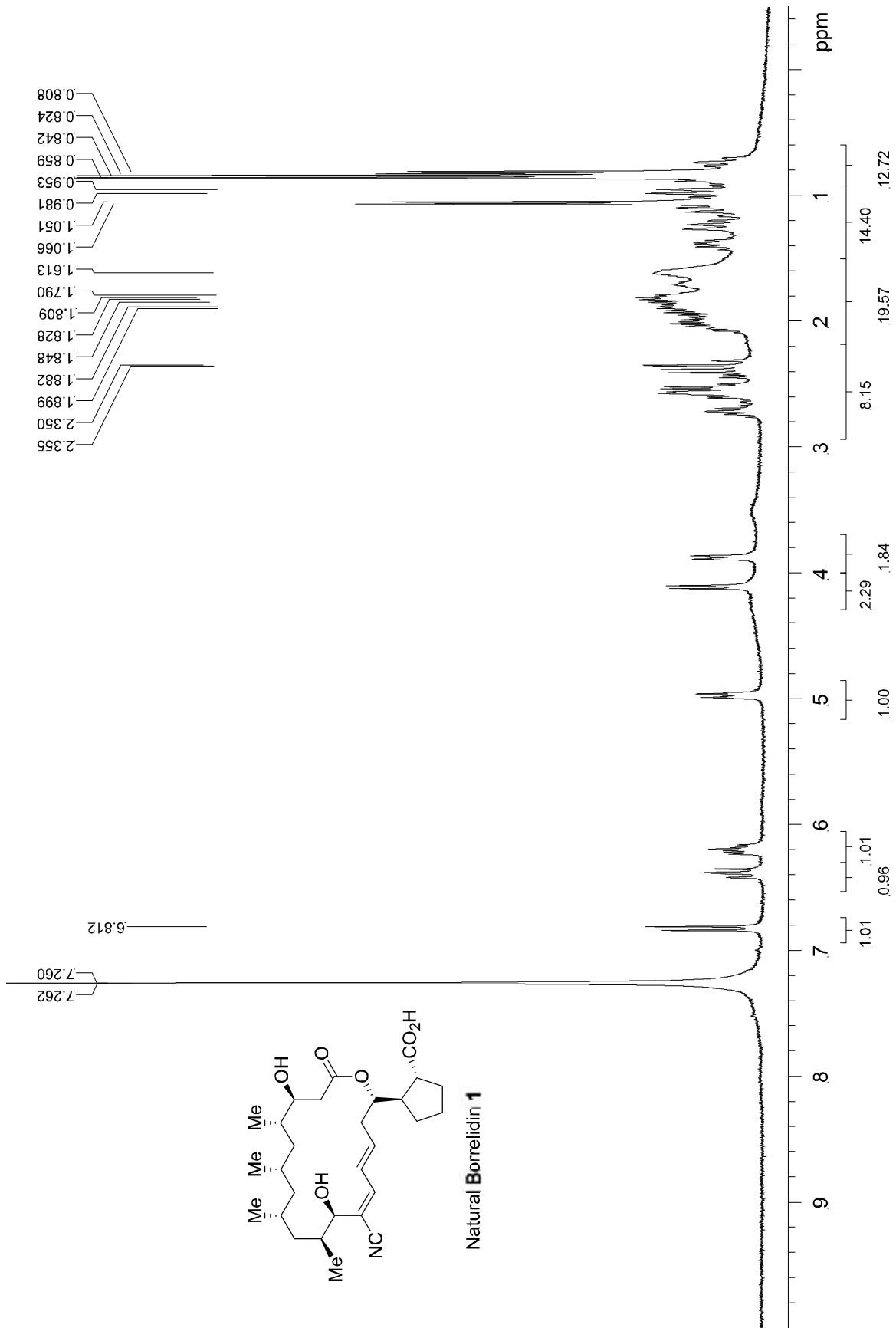
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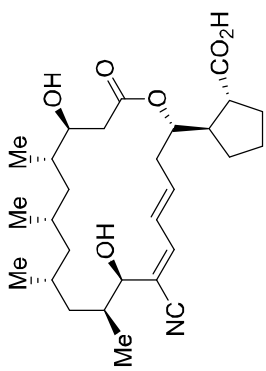


Synthetic Borrelidin 1









Natural Borrelidin 1

