Supporting Information

Second-generation derivatives of the eukaryotic translation initiation inhibitor pateamine A targeting eIF4A as potential anticancer agents

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Supporting Information Available:

Supplementary data Figure S1

Detailed procedures and characterization data (including ^{1}H and/or ^{13}C NMR spectra) for compounds **2, 4, 5, 6, 8, 9a-g,** and **10a-g**.

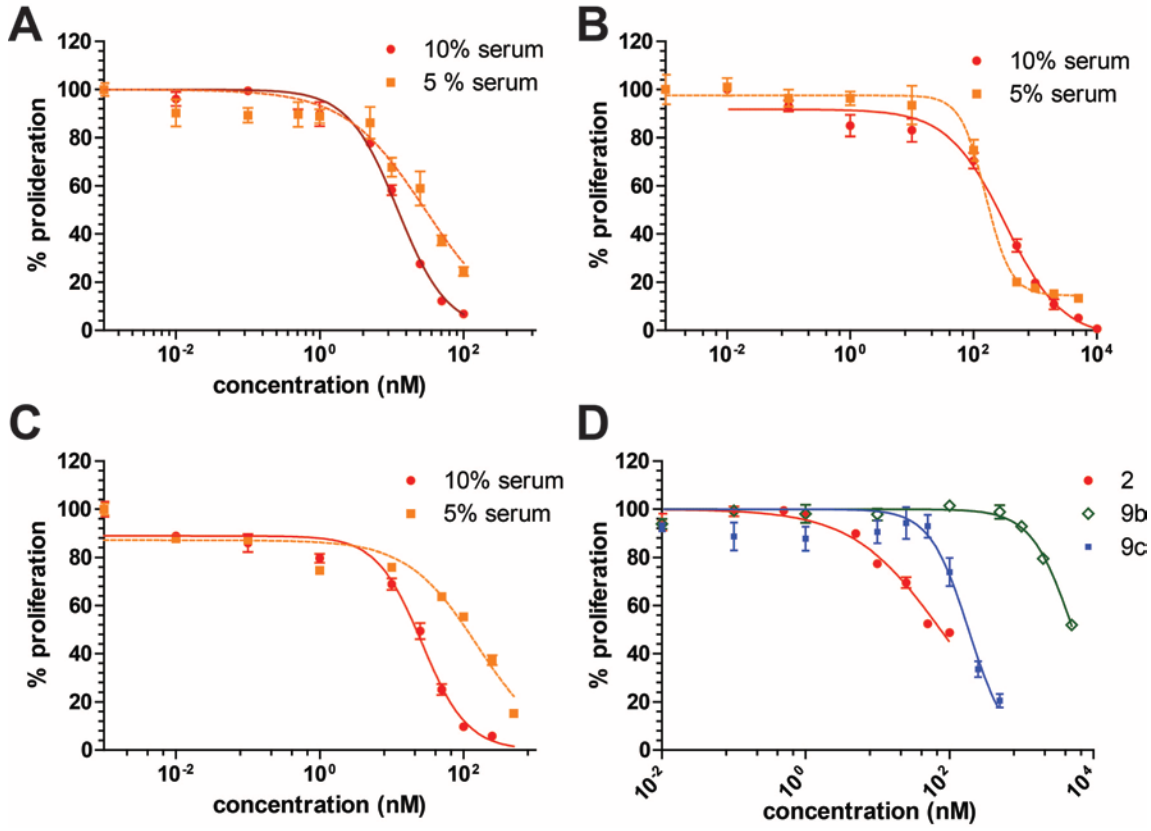
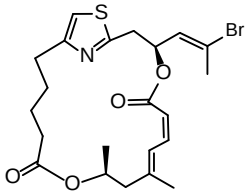
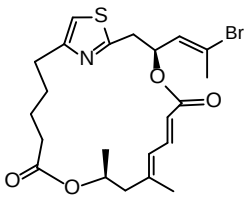


Figure S1: Anti-proliferation activity of **2**, **9b**, and **9c** against SK-MEL2 cell line under slower growth conditions (5% serum) and against mouse embryonic fibroblasts. (A-C) Proliferation assays were carried out as described in the main text substituting 10% FBS in growth media with 5% FBS. (D) Proliferation assay was carried out as described in the main text using immortalized mouse embryonic fibroblasts grown in DMEM media supplemented with 10% FBS. (A-D) Two independent assays were performed where each data point was replicated in quadruplicate with comparable results between the independent assays and one representative assay is shown. Each data point represents the mean of the quadruplicate assays with error bars representing ± S.E.M. Curve fitting was performed as described in the main text. Immortalized MEF cell lines were generously provided by Dr. Andre Nussenzweig, Experimental Immunology Branch, National Cancer Institute, National Institutes of Health, Bethesda, MD 20892.

*General procedure for Stille coupling reaction (**GP**).* A stock solution of Pd(0) catalyst was prepared by mixing Pd_2dba_3•$CHCl_3$ (Aldrich, cat. no. 366315, 17 mg, 0.016 mmol) and PPh_3 (Aldrich, cat. no. T84409, 35 mg, 0.133 mmol) with 1 mL of degassed THF (EMD, cat. no. TX0280-7) and stirred for 5 min to give a clear yellow solution. The final concentration of Pd(0) was ~0.033 M. The macrocycle (0.025 mmol, 1equiv.) and tin reagent (0.028~0.050 mmol, 1.1~2.0 equiv.) were charged in a 5 mL round bottom flask and purged with N_2. Degassed THF (0.8 ml) was added to dissolve the material to give a clear light yellow solution. To this solution was added freshly prepared Pd(0) catalyst stock solution (0.1 mL) and the mixture was stirred at room temperature under N_2 for 2 h. Additional 0.2 mL of Pd(0) stock solution was added and the mixture was continue stirred at room temperature for 20 h until the reaction was complete by TLC analysis. The crude reaction mixture was concentrated to dryness and the residue was purified by flash chromatography on silica gel to afford the product.



5

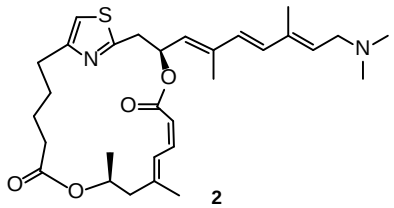


6

(3*S*,6*Z*,8*E*,11*S*)-3-((*E*)-2-bromoprop-1-en-1-yl)-9,11-dimethyl-4,12-dioxa-20-thia-21-azabicyclo[16.2.1]henicosa-1(21),6,8,18-tetraene-5,13-dione (Z isomer 5 and E isomer 6): The macrocycle enyne (**4**, 372 mg, 0.78 mmol) was charged in a 100 mL round bottom flask and dissolved in MeOH (EMD, cat. no. MX0485-7, 30 mL), Lindlar catalyst (Aldrich, cat. no. 62145, 180 mg) was added under N_2. The atmosphere in the flask was exchanged to H_2 using standard technique, and the reaction mixture was stirred under H_2 atmosphere (1 atm) for 15 h until TLC analysis conformed the completion of the reaction. The mixture was filtered through a short Celite (Aldrich, cat. no. 419931) pad, rinsed with MeOH (EMD, cat. no. MX0485-7, 5 x 2 mL). The combined filtrate was concentrated and the residue was purified by flash chromatography on silica gel (10~40% EtOAc/hexane) to give Z isomer **5** (274 mg, 73%) as white foam. E isomer **6** (52 mg) was also isolated in 14% yield.

Z isomer **5**: ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.99 (d, *J* = 12 Hz, 1H), 6.69 (s, 1H), 6.68 (t, *J* = 12 Hz, 1H), 6.04 (dt, *J* = 10.5, 3.5 Hz, 1H), 5.93 (dd, *J* = 9.5, 1.5 Hz, 1H), 5.33 (d, *J* = 11.5 Hz, 1H), 5.16-5.11 (m, 1H), 3.22-3.12 (m, 2H), 2.84 (dt, *J* = 14, 5.0 Hz, 1H), 2.57 (ddd, *J* = 15, 10.5, 5.0 Hz, 1H), 2.47 (s, 3H), 2.34 (dd, *J* = 13, 11 Hz, 1H), 2.26 (dd, *J* = 11, 6.0 Hz, 1H), 2.19 (dd, *J* = 11.5, 4.5 Hz, 1H), 2.12 (d, *J* = 13.5 Hz, 1H), 1.86-1.78 (m, 1H), 1.83 (s, 3H), 1.69-1.60 (m, 1H), 1.40-1.33 (m, 1H), 1.24 (d, *J* = 6.5 Hz, 3H), 1.26-1.21 (m, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 173.1, 164.7, 164.3, 156.7, 146.2, 141.4, 129.8, 126.9, 123.8, 114.3, 113.5, 68.9, 67.2, 48.3, 38.1, 34.6, 30.8, 28.1, 24.6, 23.1, 21.2, 16.9; HRMS (ESI+) calcd. for $C_{22}H_{28}BrNO_4S$ ($M+H^+$) 482.0995, found 482.0977.

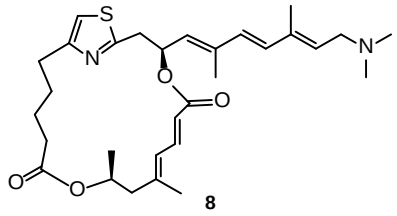
E isomer **6**: ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.21 (dd, *J* = 15.5, 11.5 Hz, 1H), 6.76 (s, 1H), 6.07 (dd, *J* = 9.0, 1.0 Hz, 1H), 5.90-5.86 (m, 2H), 5.61 (d, *J* = 15 Hz, 1H), 5.33-5.29 (m, 1H), 3.37 (dd, *J* = 15, 4.0 Hz, 1H), 3.29 (dd, *J* = 15, 9.0 Hz, 1H), 2.65-2.58 (m, 2H), 2.42 (d, *J* = 1.5 Hz, 3H), 2.38 (ddd, *J* = 17, 6.0, 4.5 Hz, 1H), 2.29-2.21 (m, 2H), 2.13 (ddd, *J* = 17, 10.5, 3.5 Hz, 1H), 1.83 (s, 3H), 1.75-1.68 (m, 1H), 1.58-1.51 (m, 1H), 1.46-1.39 (m, 1H), 1.35-1.28 (m, 1H), 1.26 (d, *J* =6.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.8, 165.7, 163.9, 157.1, 145.4, 140.5, 129.6, 126.5, 126.3, 119.7, 113.4, 69.2, 66.9, 47.8, 38.0, 33.7, 32.1, 29.9, 24.7, 24.5, 21.0, 17.5; HRMS (ESI+) calcd. for $C_{22}H_{28}BrNO_4S$ ($M+H^+$) 482.0995, found 482.0986.



2

Des-methyl-des-amino pateamine A, desired *Z* isomer (2). A stock solution of Pd(0) catalyst was prepared by mixing Pd_2dba_3•$CHCl_3$ (17 mg, 0.016 mmol) and PPh_3 (35 mg, 0.133 mmol) with 1 mL of degassed THF and stirred for 5 min to give a clear yellow solution. The final concentration of Pd(0) was ~0.033 M. The macrocycle core Z isomer (xx, JL-368-A) (12 mg, 0.025 mmol) and tin reagent (20.6 mg, 0.050 mmol) were charged in a 5 mL round bottom flask and purged with N_2. 0.8 mL of degassed THF was added to dissolve the material to give a clear light yellow solution. To this solution was added freshly prepared Pd(0) catalyst stock solution

(0.1 mL) and the mixture was stirred at room temperature under N_2 for 2 h. Additional 0.2 mL of Pd(0) stock solution was added and the mixture was continue stirred at room temperature for 20 h until the reaction was complete by TLC analysis. The crude reaction mixture was concentrated to dryness and the residue was purified by flash chromatography on silica gel (5%~30% MeOH/DCM) to give the desired product (13.5 mg, quantitative yield) as yellow oil. Data matched that previously reported[1] (significant chemical shift of few protons were observed while concentration of the samples varies) and additional ^{13}C was added this time: ^1H NMR (500 MHz, $CDCl_3$) δ 6.99 (d, *J* = 12.0 Hz, 1H), 6.69 (s, 1H), 6.52 (t, *J* = 11.5 Hz, 1H), 6.36 (d, *J* = 16.5 Hz, 1H), 6.26 (dt, *J* = 9.5, 4.0 Hz, 1H), 6.23 (d, *J* = 16.5 Hz, 1H), 5.64 (t, *J* = 7.0 Hz, 1H), 5.53 (d, *J* = 9.0 Hz, 1H), 5.35 (d, *J* = 9.0 Hz, 1H), 5.16-5.11 (m, 1H), 3.18 (s, 1H), 3.14 (d, *J* = 10.5 Hz, 1H), 3.12 (d, *J* = 7.0 Hz, 2H), 2.84 (dt, *J* = 14.5, 5.0 Hz, 1H), 2.58 (ddd, *J* = 15.0, 10.5, 5.0 Hz, 1H), 2.35-2.24 (m, 2H), 2.28 (s, 6H), 2.19 (dd, *J* = 11.5, 4.5 Hz, 1H), 2.11 (d, *J* = 13.0 Hz, 1H), 2.00 (s, 3H), 1.87-1.80 (m, 1H), 1.81 (s, 3H), 1.80 (s, 3H), 1.70-1.64 (m, 1H), 1.39-1.33 (m, 1H), 1.28-1.22 (m, 1H), 1.23 (d, *J* = 6.0 Hz, 3H); ^1H NMR (500 MHz, C_6D_6) δ 7.46 (d, *J* = 12.0 Hz, 1H), 6.74 (dd, *J* = 8.5, 5.5 Hz, 1H), 6.50 (t, *J* = 11.5 Hz, 1H), 6.29 (d, *J* = 16.0 Hz, 1H), 6.26 (d, *J* = 16.0 Hz, 1H), 6.21 (s, 1H), 5.69 (t, *J* = 7.0 Hz, 1H), 5.57-5.54 (m, 2H), 5.17-5.15 (m, 1H), 3.48 (d, *J* = 6.5 Hz, 2H), 3.11-3.09 (m, 2H), 2.80-2.77 (m, 1H), 2.46-2.33 (m, 2H), 2.41 (s, 6H), 2.17-2.05 (m, 3H), 1.92 (s, 3H), 1.67 (s, 3H), 1.58 (s, 3H), 1.58-0.99 (m, 4H), 0.99 (d, *J* = 6.5 Hz, 3H); ^{13}C NMR (125 MHz, C_6D_6) δ 172.5, 165.2, 164.9, 157.4, 145.9, 141.4, 138.1, 133.8, 133.1, 130.8, 126.9, 124.6, 122.1, 115.3, 113.2, 69.7, 66.8, 55.1, 48.5, 42.3, 38.9, 35.0, 31.2, 30.2, 28.5, 23.7, 21.2, 16.7, 13.4, 13.1.

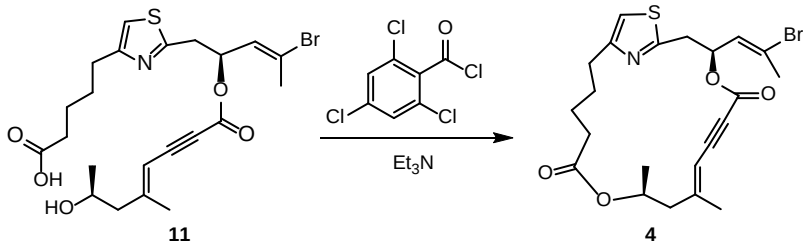


8

Des-methyl-des-amino pateamine A, E isomer (8). A stock solution of Pd(0) catalyst was prepared by mixing Pd_2dba_3•$CHCl_3$ (7.9 mg, 0.0075 mmol) and PPh_3 (16.3 mg, 0.062 mmol) with 0.46 mL of degassed THF and stirred for 5 min to give a clear yellow solution. The final

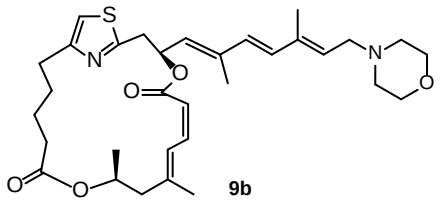
[1] Romo, D., Choi, N. S., Li, S., Buchler, I., Shi, Z., Liu, J. O. *J. AM. Chem. Soc.* **2004**, *126*, 10582-10588.

concentration of Pd(0) was ~0.033 M. The macrocycle core E isomer (xx, JL-368-C) (12 mg, 0.025 mmol) and tin reagent (20.6 mg, 0.050 mmol) were charged in a 5 mL round bottom flask and purged with N_2. 0.8 mL of degassed THF was added to dissolve the material to give a clear light yellow solution. To this solution was added freshly prepared Pd(0) catalyst stock solution (0.1 mL) and the mixture was stirred at room temperature under N_2 for 3 h. Additional 0.2 mL of Pd(0) stock solution was added and the mixture was continue stirred at room temperature for 20 h. The crude reaction mixture was concentrated to dryness and the residue was purified by flash chromatography on silica gel (5%~30% MeOH/DCM) to give the desired product (5.9 mg, 45% yield) as yellow oil. 5.6 mg of starting material (macrocycle core) was recovered in 47% yield. Data of DMDAPat A E isomer: ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.21 (dd, *J* = 15.5, 11.5 Hz, 1H), 6.75 (s, 1H), 6.37 (d, *J* = 15.5 Hz, 1H), 6.26 (d, *J* = 16.0 Hz, 1H), 6.10 (dt, *J* = 9.0, 4.0 Hz, 1H), 5.86 (d, *J* = 12.0 Hz, 1H), 5.68 (d, *J* = 8.5 Hz, 1H), 5.63 (dd, *J* = 15.5, 7.0 Hz, 1H), 5.61 (d, *J* = 16.0 Hz, 1H), 5.34-5.28 (m, 1H), 3.43 (dd, *J* = 14.5, 4.0 Hz, 1H), 3.27 (dd, *J* = 15.0, 8.5 Hz, 1H), 3.07 (d, *J* = 7.5 Hz, 2H), 2.66-2.58 (m, 2H), 2.39 (ddd, *J* = 16.5, 5.5, 4.0 Hz, 1H), 2.25 (s, 6H), 2.25-2.20 (m, 2H), 2.15-2.08 (m, 1H), 1.96 (s, 3H), 1.82 (s, 6H), 1.78-1.51 (m, 3H), 1.36-1.25 (m, 1H), 1.26 (d, *J* = 6.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.8, 165.9, 164.5, 157.1, 144.9, 140.1, 137.5, 132.8, 132.3, 129.8, 128.7, 128.6, 126.3, 120.3, 113.4, 69.5, 66.9, 56.0, 47.8, 43.4, 38.6, 34.6, 33.8, 32.2, 24.7, 23.5, 21.0, 17.5, 13.4, 13.1; HRMS (MALDI+) calcd. for $C_{30}H_{42}N_2O_4S$ ($M+H^+$) calc. 527.2938, found 527.2962.



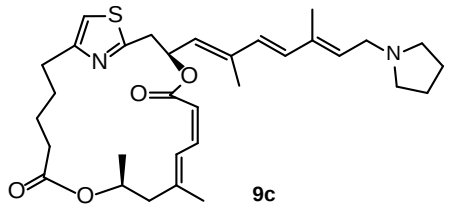
Enyne macrolide 4. To a solution of **11** (165 mg, 0.331 mmol) in THF (8.0 ml) were added Et_3N (277 µl, 1.99 mmol) and 2,4,6-trichlorobenzoyl chloride (1.754 mmol, 274 µl) at 0 ^{o}C under N_2. The mixture was continued to be stirred at 0 ^{o}C for 20 minutes and was transferred to a solution of DMAP (404 mg, 3.31 mmol) in toluene (160 ml) at room temperature. The reaction was complete within1 hour. The mixture was diluted with 100 ml of EtOAC and was washed with

brine. The organic layer was dried over MgSO4 and concentrated. The residue was submitted to a flash chromatography (hexanes : MTBE = 10:1 → 3:1) to give the title product as a colorless oil (136 mg, 86%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.80 (s, 1H), 6.03 (dt, *J* = 9.3, 1.3 Hz, 1H), 5.88 (ddd, *J* = 9.2, 8.0, 4.9 Hz, 1H), 5.33 (d, *J* = 0.9 Hz, 1H), 5.31-5.22 (m, 1H), 3.33 (dd, *J* = 15.0, 4.9 Hz, 1H), 3.29 (dd, *J* = 15.0, 8.1 Hz, 1H), 2.71 (ddd, *J* = 14.2, 10.5, 5.7 Hz, 1H), 2.65 (ddd, *J* = 14.2, 10.7, 4.9 Hz, 1H), 2.43-2.38 (m, 1H), 2.40 (d, *J* = 1.3 Hz, 3H), 2.28 (d, *J* = 7.2 Hz, 2H), 2.19 (ddd, *J* = 17.0, 10.2, 4.0 Hz, 1H), 1.94 (d, *J* = 1.2 Hz, 1H), 1.83-1.71 (m, 2H), 1.53-1.45 (m, 2H), 1.26 (d, *J* = 6.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.7, 163.5, 157.8, 157.4, 153.4, 128.9, 127.2, 113.7, 105.7, 85.5, 83.6, 71.0, 66.8, 46.5, 38.0, 33.8, 32.2, 29.6, 24.7, 24.6, 21.0, 20.3. HRMS (ESI+) calcd. for $C_{22}H_{27}BrNO_4S$ ($M+H^+$) calc. 480.0844, found 480.0866.



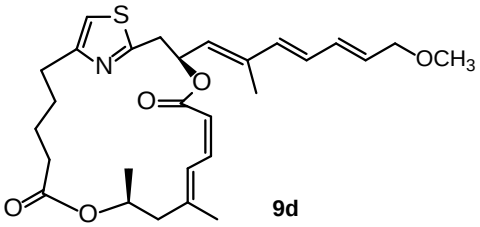
9b

Diene 9b. The reaction between **5** (6.0 mg, 0.0124 mmol) and organotin reagent **7b** (11.3 mg, 0.0248 mmol) was out carried based on the GP. The crude product was purified by flash chromatography on silica gel (CH_2Cl_2 : MeOH = 100:1 → 40:1) to give **9b** as a colorless oil (4.5 mg, 64%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.00 (d, *J* = 11.6 Hz, 1H), 6.70 (s, 1H), 6.66 (t, J = 11.6 Hz, 1H), 6.36 (d, J = 16.0 Hz, 1H), 6.26 (ddd, J = 10.1, 9.0, 4.1 Hz, 1H), 6.23 (d, J = 16.0 Hz, 1H), 5.63 (t, J = 7.0 Hz, 1H), 5.53 (d, J = 9.0 Hz, 1H), 5.36 (d, J = 11.5 Hz, 1H), 5.14 (ddq, J = 10.9, 1.5, 6.4 Hz, 1H), 3.72 (t, J = 4.5 Hz, 4H), 3.21 (dd, J = 14.4, 4.1 Hz, 1H), 3.16 (dd, J = 14.4, 10.1 Hz, 1H), 3.14 (d, J = 7.0 Hz, 2H), 2.86 (dt, J = 14.5, 4.9 Hz, 1H), 2.59 (ddd, J = 14.5, 10.6, 4.5 Hz, 1H), 2.48 (brs, 4H), 2.34 (dd, J = 13.1, 10.9 Hz, 1H), 2.29 (ddd, J = 15.9, 11.2, 6.1 Hz, 1H), 2.18 (ddd, J = 15.9, 11.3, 4.3 Hz, 1H), 2.01 (d, J = 1.0 Hz, 3H), 1.82 (s, 3H), 1.81 (s, 3H), 1.72-1.60 (m, 2H), 1.41-1.32 (m, 2H), 1.24 (d, J = 6.4 Hz, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 173.4, 168.0, 165.5, 164.7, 156.8, 145.8, 141.0, 138.2, 134.1, 132.7, 131.1, 129.0, 124.2, 115.1, 113.5, 69.5, 69.4, 67.3/67.2, 56.8, 54.0, 48.5, 39.0, 34.9, 30.6, 29.2, 24.0, 23.2, 16.9, 14.3, 11.2. HRMS (ESI+) calcd. for $C_{32}H_{45}N_2O_5S$ ($M+H^+$) calc. 569.3049, found 569.3062.



9c

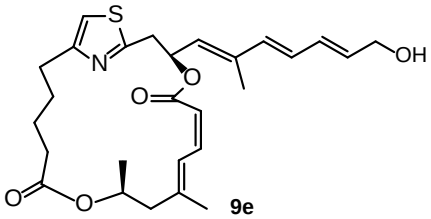
Diene 9c. Following the GP, **5** (5.0 mg, 0.0104 mmol) coupled with **7c** (9.2 mg, 0.0208 mmol). The crude product was purified by flash chromatography on silica gel (hexanes:acetone:Et_3N = 150:75:1) to provide **9c** as a yellow oil (3.0 mg, 52%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.00 (d, *J* = 11.6 Hz, 1H), 6.70 (s, 1H), 6.67 (t, J = 11.8 Hz, 1H), 6.37 (d, J = 15.9 Hz, 1H), 6.27 (d, J = 15.9 Hz, 1H), 6.29-6.24 (m, 1H), 5.75 (t, J = 6.7 Hz, 1H), 5.56 (d, J = 8.7 Hz, 1H), 5.36 (d, J = 11.5 Hz, 1H), 5.15 (dq, J = 10.7, 5.7 Hz, 1H), 3.62-3.49 (m, 2H), 3.22-3.14 (m, 2H), 2.95-2.90 (m, 4H), 2.82-2.76 (m, 1H), 2.52 (ddd, J = 14.4, 10.3, 4.4 Hz, 1H), 2.30-2.20 (m, 2H), 2.15-2.08 (m, 1H), 2.05 (d, J = 12.9 Hz, 1H), 1.94 (s, 3H), 1.78 (s, 3H), 1.76 (s, 3H), 1.72-1.64 (m, 2H), 1.43-1.33 (m, 2H), 1.26 (t, J = 7.1 Hz, 4H), 1.17 (d, J = 6.2 Hz, 1H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 173.4, 169.7, 165.4, 164.7, 156.9, 145.9, 140.1, 138.0, 133.0, 130.2, 124.2, 115.0, 113.5, 69.4, 67.3, 53.6, 53.1, 48.5, 39.0, 34.9, 31.0, 28.3, 23.8, 23.4, 21.4, 16.9, 14.4, 13.1. HRMS (APCI+) calcd. for $C_{32}H_{45}N_2O_4S$ ($M+H^+$) calc. 553.3100, found 553.3093.



9d

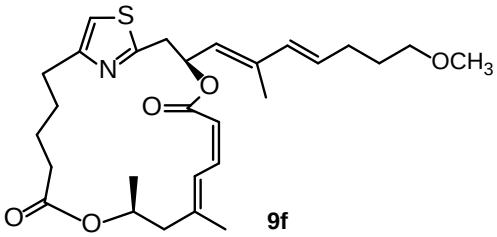
Diene 9d. Following the GP, **5** (10.0 mg, 0.0207 mmol) coupled with **7d** (9.2 mg, 0.0228 mmol). The crude product was purified by flash chromatography on silica gel (1% → 4% MeOH/CH_2Cl_2) to provide **9d** as a yellow oil (5.5 mg, 53%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.00 (d, J = 11.8 Hz, 1H), 6.70 (s, 1H), 6.66 (t, J = 11.6 Hz, 1H), 6.36-6.22 (m, 3H), 5.81 (dt, J = 14.3, 6.2 Hz, 1H), 5.51 (d, J = 9.0 Hz, 1H), 5.36 (J = 11.5 Hz, 1H), 5.14 (dqd, J = 10.9, 6.1, 1.3 Hz, 1H), 3.98 (d, J = 6.1 Hz, 1H), 3.34 (s, 3H), 3.20 (dd, J = 14.3, 3.0 Hz, 1H), 3.15 (dd, J =14.3, 10.3 Hz, 1H), 2.85 (dt, J = 14.5, 5.1 Hz, 1H), 2.58 (ddd, J = 14.8, 10.4, 4.4 Hz, 1H), 2.33 (dd, J = 13.2, 11.1 Hz, 1H), 2.29 (ddd, J = 16.0, 11.1, 6.2 Hz, 1H), 2.18 (ddd, J = 16.0, 11.5, 4.7 Hz, 1H), 2.12 (d, J = 13.2 Hz, 1H), 1.99 (s, 3H), 1.90-1.79 (m, 1H), 1.82 (s, 3H), 1.72-1.61 (m, 1H), 1.41-1.32 (m, 1H),

1.29-1.19 (m, 1H), 1.23 (d, J = 6.4 Hz, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 173.4, 165.5, 164.7, 156.8, 145.9, 141.1, 138.0, 136.7, 133.0, 130.4, 129.4, 129.2, 124.2, 115.0, 113.5, 73.0, 69.4, 67.3, 58.1, 48.5, 39.0, 34.9, 31.0, 29.9, 28.3, 23.4, 17.0, 13.5. HRMS (ESI+) calcd. for $C_{28}H_{38}NO_5S$ ($M+H^+$) calc. 500.2471, found 500.2449.



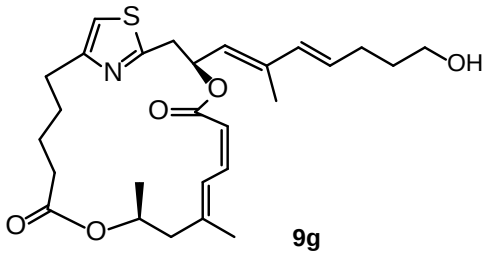
9e

Diene 9e. Following the GP, **5** (5.0 mg, 0.0104 mmol) coupled with **7e** (7.8 mg, 0.0208 mmol). The crude product was purified by flash chromatography on silica gel (2% → 5% MeOH/CH_2Cl_2) to provide **9e** as a yellow oil (3.0 mg, 60%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.99 (d, J = 11.7 Hz, 1H), 6.74-6.71 (m, 1H), 6.67 (t, J = 11.6 Hz, 1H), 6.36-6.24 (m, 3H), 6.23 (d, J = 14.6 Hz, 1H), 5.91 (dt, J = 14.0, 5.8 Hz, 1H), 5.51 (d, J = 8.9 Hz, 1H), 5.36 (d, J = 11.4 Hz, 1H), 5.17-5.11 (m, 1H), 4.22 (d, J = 5.8 Hz, 1H), 3.25 (brs, 1H), 3.17 (dd, J = 13.5, 11.7 Hz, 1H), 2.89 (d, J = 13.2 Hz, 1H), 2.6 (ddd, J = 14.5, 10.8, 4.5 Hz, 1H), 2.33 (dd, J = 13.0, 11.4 Hz, 1H), 2.30 (ddd, J = 16.1, 11.1, 6.1 Hz, 1H), 2.18 (ddd, J = 16.1, 11.3, 4.5 Hz, 1H), 2.12 (d, J = 13.0 Hz, 1H), 2.00 (s, 3H), 1.91-1.80 (m, 2H), 1.82 (s, 3H), 1.73-1.61 (m, 2H), 1.24 (d, J = 6.4 Hz, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 173.2, 166.0, 164.7, 156.7, 146.0, 141.3, 138.1, 136.6, 133.0, 131.6, 129.2, 128.1, 124.2, 114.9, 113.8, 69.3, 67.4, 63.6, 48.5, 38.8, 34.9, 30.8, 29.9, 28.2, 23.3, 17.0, 13.5. HRMS (ESI+) calcd. for $C_{27}H_{36}NO_5S$ ($M+H^+$) calc. 486.2314, found 486.2297.



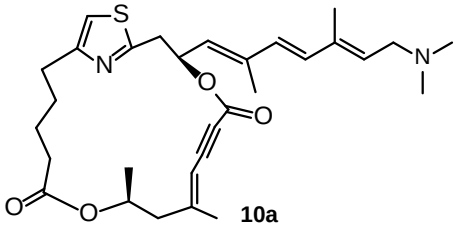
9f

Diene 9f. Following the GP, **5** (5.0 mg, 0.0104 mmol) coupled with **7f** (7.8 mg, 0.0208 mmol). The crude product was purified by flash chromatography on silica gel (hexanes:EtOAc = 3:1) to provide **9f** as a yellow oil (2.7 mg, 52%). ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.00 (d, J = 11.7 Hz, 1H), 6.71 (s, 1H), 6.66 (t, J = 11.5 Hz, 1H), 6.29-6.16 (m, 1H), 6.07 (d, J = 15.8 Hz, 1H), 5.77 (dt, J = 15.5, 6.9 Hz, 1H), 5.36 (d, J = 11.5 Hz, 1H), 5.19-5.10 (m, 1H), 3.38 (t, J = 6.51 Hz, 1H), 3.33 (s, 3H), 3.26-3.13 (m, 2H), 2.93-2.81 (m, 1H), 2.65-2.54 (m, 1H), 2.37-2.17 (m, 2H), 2.12 (d, J = 13.2 Hz, 1H), 1.97 (s, 3H), 1.83 (s, 3H), 1.73-1.62 (m, 4H), 1.37-1.28 (m, 2H), 1.24 (d, J = 7.2 Hz, 3H).



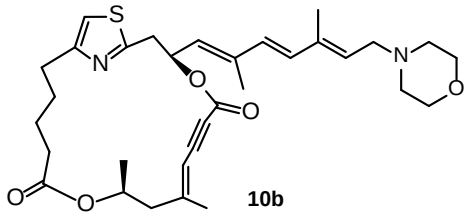
9g

Diene 9g. Following the GP, **5** (5.0 mg, 0.0104 mmol) coupled with **7g** (7.8 mg, 0.0208 mmol). The crude product was purified by flash chromatography on silica gel (1% → 2% MeOH/CH_2Cl_2) to provide **9g** as a yellow oil (2.1 mg, 41%).^{1}H NMR (500 MHz, $CDCl_3$) δ 7.00 (d, *J* = 11.8 Hz, 1H), 6.71 (s, 1H), 6.66 (t, J = 11.5 Hz, 1H), 6.27-6.22 (m, 1H), 6.10 (d, J = 15.5 Hz, 1H), 5.78 (dt, J = 15.6, 6.9 Hz, 1H), 5.40 (d, J = 9.0 Hz, 1H), 5.36 (d, J = 11.5 Hz, 1H), 5.14 (dq, J = 11.2, 6.2 Hz, 1H), 3.67 (t, J = 6.4 Hz, 1H), 3.23-3.14 (m, 2H), 2.90-2.84 (m, 1H), 2.59 (ddd, J = 14.5, 10.7, 4.4 Hz, 1H), 2.33 (dd, J = 13.1, 10.9 Hz, 1H), 2.32-2.15 (m, 2H), 2.12 (d, J = 13.1 Hz, 1H), 1.97 (s, 3H), 1.82 (s, 3H), 1.72-1.65 (m, 4H), 1.42-1.32 (m, 2H), 1.24 (d, J = 6.4 Hz, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 173.4, 165.5, 164.6, 156.6, 145.6, 140.8, 137.9, 134.2, 130.8, 126.9, 124.0, 115.0, 113.3, 69.2, 67.2, 62.4, 48.3, 38.8, 34.7, 32.3, 29.7, 29.2, 28.1, 23.2, 21.2, 16.8, 13.4. HRMS (ESI+) calcd. for $C_{27}H_{38}NO_5S$ ($M+H^+$) calc. 488.2471, found 488.2492.



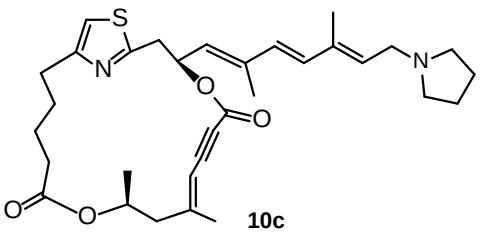
10a

Enyne 10a. Following the GP, **4** (8.0 mg, 0.0167 mmol) coupled with **7a** (8.3 mg, 0.0200 mmol). The crude product was purified by flash chromatography on silica gel (1% → 5% MeOH/CH_2Cl_2) to provide **10a** as a yellow oil (3.5 mg, 40%).^{1}H NMR (500 MHz, $CDCl_3$) δ 6.77 (s, 1H), 6.42 (d, J = 15.8 Hz, 1H), 6.38 (d, J = 15.8 Hz, 1H), 6.12-6.07 (m, 1H), 5.80-5.71 (m, 2H), 5.35 (s, 1H), 5.28-5.21 (m, 1H), 3.26-3.16 (m, 4H), 2.94-2.91 (m, 2H), 2.79-2.76 (m, 6H), 2.64-2.57 (m, 1H), 2.29 (d, J = 6.5 Hz, 2H), 2.14-2.06 (m, 1H), 1.96 (s, 3H), 1.90-1.86 (m, 2H), 1.87 (s, 3H), 1.79 (s, 3H), 1.65-1.58 (m, 2H), 1.27 (d, J = 6.3 Hz, 1H). HRMS (ESI+) calcd. for $C_{30}H_{41}N_2O_4S$ ($M+H^+$) calc. 525.2787, found 525.2778.



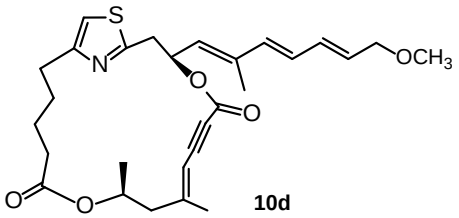
10b

Enyne 10b. Following the GP, **4** (10.0 mg, 0.0208 mmol) coupled with **7b** (19.0 mg, 0.0416 mmol). The crude product was purified by flash chromatography on silica gel (1% → 5% MeOH/CH_2Cl_2) to provide **10b** as a yellow oil (4.5 mg, 38%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.79 (s, 1H), 6.36 (d, J = 16.2 Hz, 1H), 6.24 (d, J = 16.2 Hz, 1H), 6.10 (ddd, J = 12.3, 8.4, 3.5 Hz, 1H), 5.63 (t, J = 5.6 Hz, 1H), 5.33 (s, 1H), 5.31-5.23 (m, 1H), 3.72 (t, J = 4.2 Hz, 4H), 3.39-3.26 (m, 2H), 3.16-3.10 (m, 2H), 2.75-2.63 (m, 2H), 2.47 (s, 4H), 2.43-2.36 (m, 1H), 2.27 (d, J = 7.1 Hz, 1H), 2.24-2.15 (m, 1H), 1.94 (s, 3H), 1.93 (s, 3H), 1.82 (s, 3H), 1.75-1.69 (m, 2H), 1.52-1.47 (m, 2H), 1.25 (d, J = 6.1 Hz, 3H). HRMS (ESI+) calcd. for $C_{32}H_{43}N_2O_5S$ ($M+H^+$) calc. 567.2893, found 567.2870.



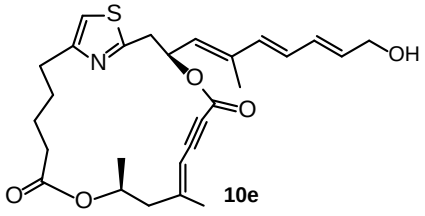
10c

Enyne 10c. Following the GP, **4** (10.0 mg, 0.0208 mmol) coupled with **7c** (18.0 mg, 0.0416 mmol). The crude product was purified by flash chromatography on silica gel (1% → 5% MeOH/CH_2Cl_2) to provide **10c** as a yellow oil (4.2 mg, 37%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.79 (s, 1H), 6.37-6.32 (m, 2H), 5.81-5.72 (m, 2H), 5.66 (d, J = 9.0 Hz, 1H), 5.33 (s, 1H), 5.28-5.24 (m, 1H), 3.66-3.55 (m, 2H), 3.37-3.27 (m, 2H), 2.97 (brs, 6H), 2.73-2.63 (m, 2H), 2.44-2.37 (m, 1H), 2.27 (d, J = 6.9 Hz, 2H), 2.04-2.00 (s, 4H), 1.94 (s, 3H), 1.87 (s, 3H), 1.85 (s, 3H), 1.81-1.70 (m, 2H), 1.52-1.44 (m, 2H), 1.26 (d, J = 5.8 Hz, 3H). HRMS (ESI+) calcd. for $C_{32}H_{43}N_2O_4S$ ($M+H^+$) calc. 551.2944, found 551.2922.



10d

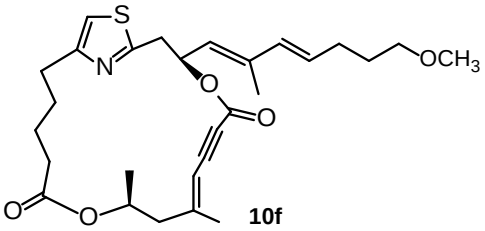
Enyne 10d. Following the GP, **4** (16.0 mg, 0.0333 mmol) coupled with **7d** (19.3 mg, 0.050 mmol). The crude product was purified by flash chromatography on silica gel (hexanes:MTBE = 2:1) to provide **10d** as a yellow oil (11.0 mg, 66%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.79 (s, 1H), 6.40-6.24 (m, 2H), 6.08 (td, J = 8.7, 4.3 Hz, 1H), 5.89-5.80 (m, 1H), 5.60 (d, J = 8.3 Hz, 1H), 5.33 (s, 1H), 5.31-5.23 (m, 1H), 4.02-3.98 (m, 2H), 3.35 (s, 3H), 3.31-3.26 (m, 2H), 2.75-2.62 (m, 2H), 2.45-2.38 (m, 1H), 2.27 (d, J = 7.3 Hz, 1H), 2.26-2.17 (m, 1H), 1.95 (s, 3H), 1.92 (s, 3H), 1.84-1.76 (m, 2H), 1.53-1.47 (m, 2H), 1.26 (d, J = 6.3 Hz, 1H). HRMS (ESI+) calcd. for $C_{28}H_{35}NO_5S$ ($M+H^+$) calc. 498.2314, found 498.2308.



10e

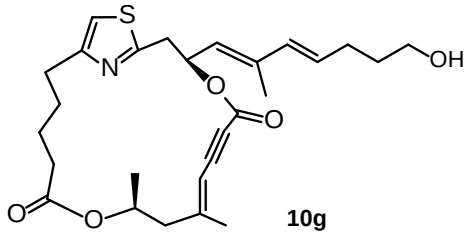
Enyne 10e. Following the GP, **4** (8.0 mg, 0.0167 mmol) coupled with **7e** (7.5 mg, 0.020 mmol). The crude product was purified by flash chromatography on silica gel (hexanes:EtOAc = 2:1) to provide **10e** as a yellow oil (3.2 mg, 40%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.79 (s, 1H), 6.35-6.30 (m, 1H), 6.28-6.24 (m, 1H), 6.08 (td, J = 8.8, 4.0 Hz, 1H), 5.92 (dt, J = 14.0, 5.9 Hz, 1H), 5.61 (d, J = 8.5 Hz, 1H), 5.33 (s, 1H), 5.29-5.24 (m, 1H), 4.23 (t, J = 4.7 Hz, 1H), 3.39-3.26 (m, 2H),

2.74-2.60 (m, 2H), 2.44-2.39 (m, 1H), 2.27 (d, J = 7.2 Hz, 1H), 2.25-2.19 (m, 1H), 1.95 (brs, 3H), 1.92 (s, 3H), 1.83-1.74 (m, 2H), 1.53-1.46 (m, 2H), 1.26 (d, J = 6.5 Hz, 1H). HRMS (ESI+) calcd. for $C_{27}H_{34}NO_5S$ ($M+H^+$) calc. 484.2158, found 484.2175.



10f

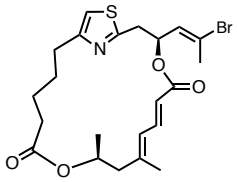
Enyne 10f. Following the GP, **4** (10.0 mg, 0.0208 mmol) coupled with **7f** (16.2 mg, 0.0416 mmol). The crude product was purified by flash chromatography on silica gel (hexanes:MTBE = 2:1) to provide **10f** as a yellow oil (4.0 mg, 38%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.81 (s, 1H), 6.11-6.02 (m, 1H), 6.10 (d, J = 15.7 Hz, 1H), 5.85-5.76 (m, 1H), 5.48 (d, J = 15.7 Hz, 1H), 5.33 (s, 1H), 5.30-5.24 (m, 1H), 3.39 (t, J = 6.15 Hz, 1H), 3.35-3.29 (m, 2H), 3.34 (s, 3H), 2.77-2.63 (m, 2H), 2.44-2.39 (m, 1H), 2.35-2.29 (m, 1H), 2.27 (d, J = 6.9 Hz, 2H), 2.24-2.17 (m, 2H), 1.95 (s, 3H), 1.89 (s, 3H), 1.83-1.76 (m, 2H), 1.72-1.66 (m, 2H), 1.54-1.46 (m, 2H), 1.25 (brs, 3H). HRMS (ESI+) calcd. for $C_{28}H_{38}NO_5S$ ($M+H^+$) calc. 500.2471, found 500.2483.



10g

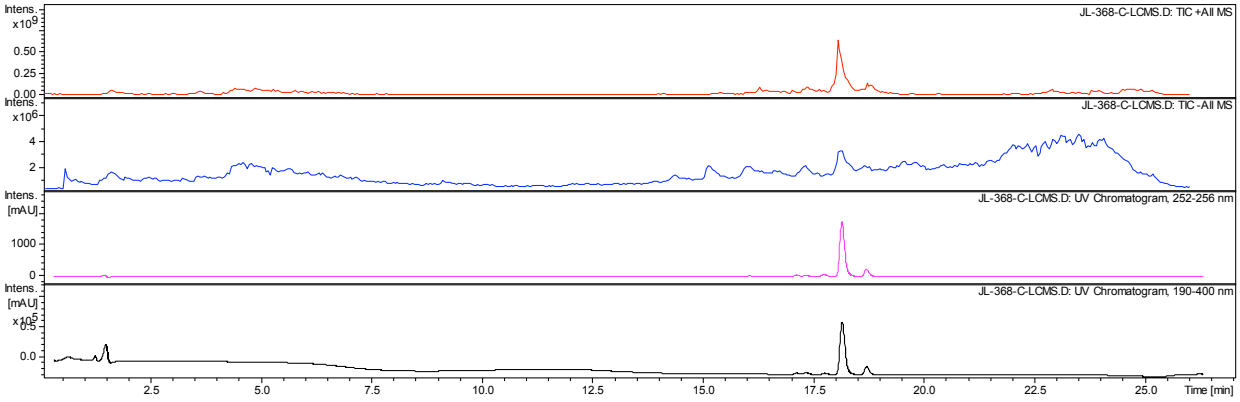
Enyne 10g. Following the GP, **4** (10.0 mg, 0.0208 mmol) coupled with **7g** (15.6 mg, 0.0416 mmol). The crude product was purified by flash chromatography on silica gel (hexanes:EtOAc = 1:1) to provide **10g** as a yellow oil (4.9 mg, 48%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.79 (s, 1H), 6.12 (d, J = 15.1 Hz, 1H), 6.09-6.05 (m, 1H), 5.80 (dt, J = 15.8, 6.9 Hz, 1H), 5.47 (d, J = 15.1 Hz, 1H), 5.32 (s, 1H), 5.29-5.25 (m, 1H), 3.71-3.68 (m, 2H), 3.42-3.28 (m, 2H), 2.77-2.65 (m, 2H), 2.45-2.35 (m, 1H), 2.29 (d, J = 7.1 Hz, 2H), 2.25 (q, J = 7.2 Hz, 2H), 2.21-2.16 (m, 1H), 1.97 (s,

3H), 1.91 (s, 3H), 1.83-1.76 (m, 2H), 1.75-1.67 (m, 2H), 1.53-1.45 (m, 2H), 1.28 (d, J = 6.8 Hz, 3H). HRMS (ESI+) calcd. for $C_{27}H_{36}NO_5S$ ($M+H^+$) calc. 486.2314, found 486.2309.

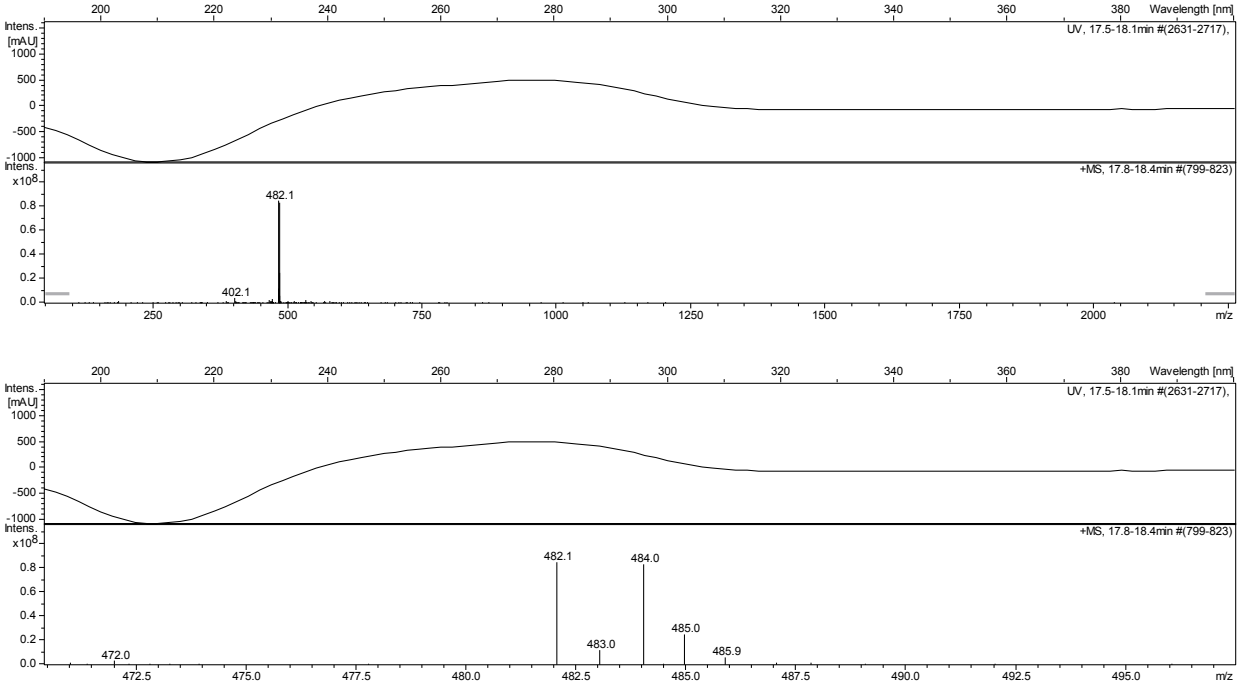


LC/MS of 6

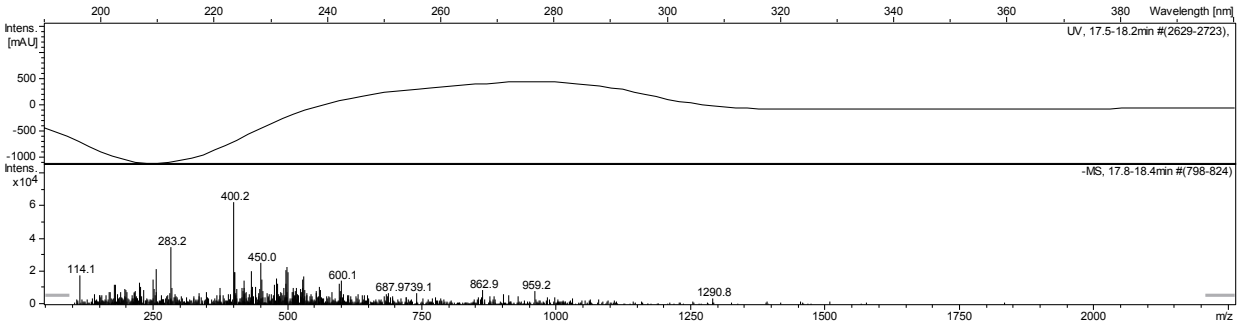
Chemical Formula: $C_{22}H_{28}BrNO_4S$
Exact Mass: 481.0922
Molecular Weight: 482.4310

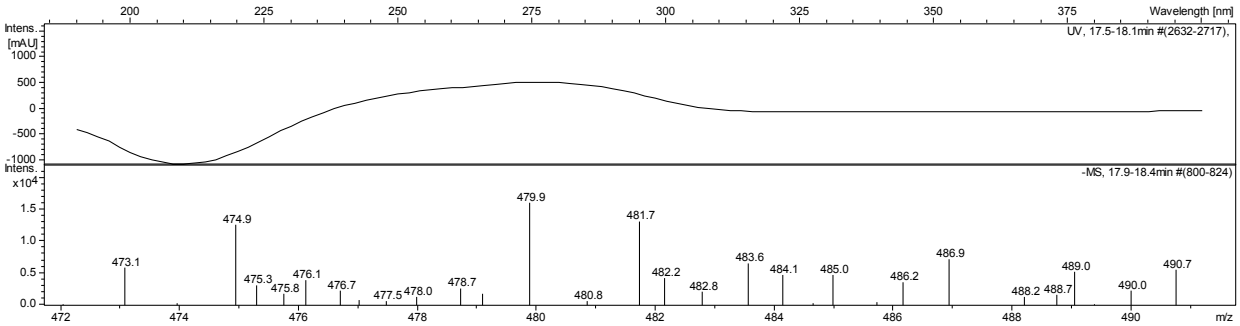


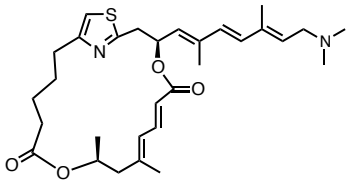
Major peaks (+ mode):



Major peaks (- mode):

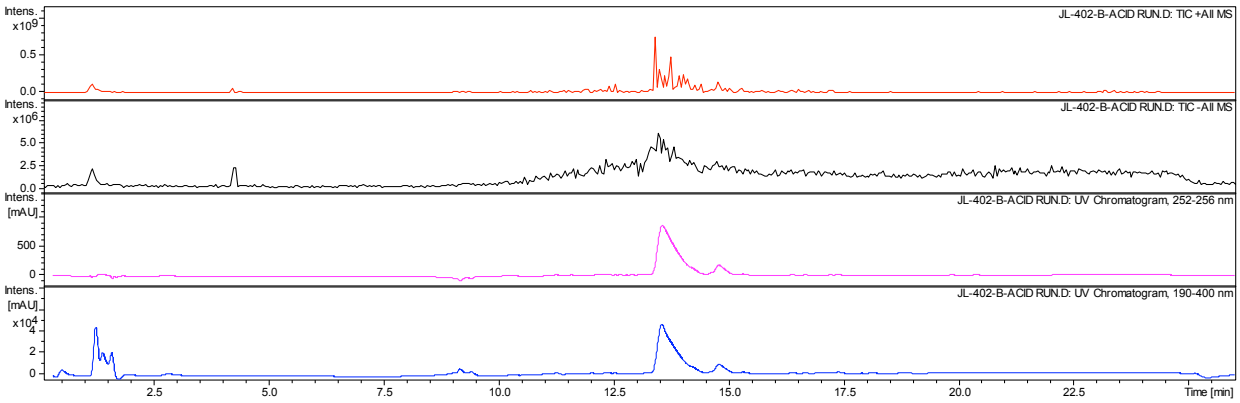




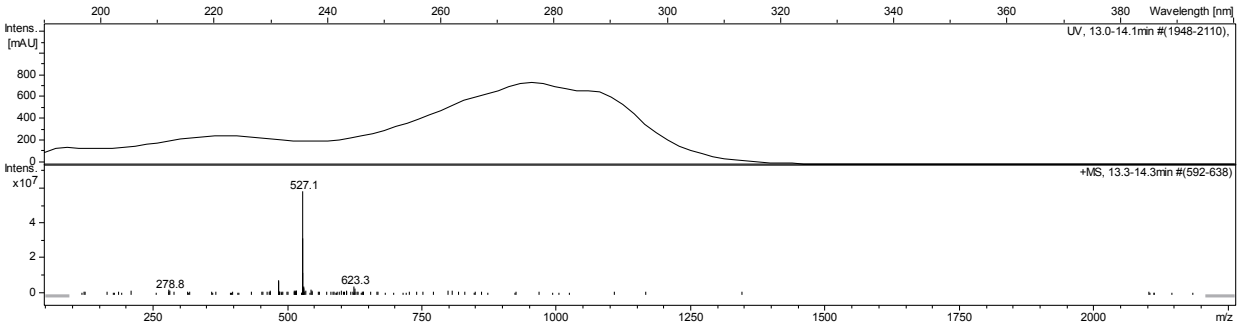


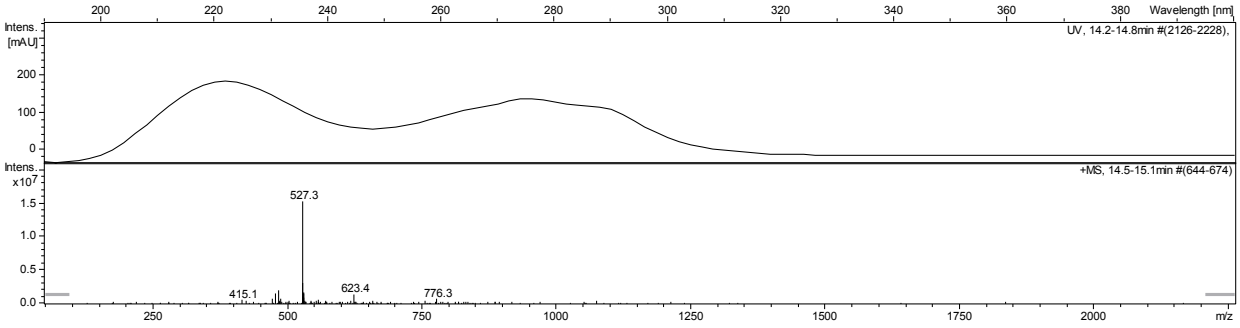
LC/MS of 8

Chemical Formula: $C_{30}H_{42}N_2O_4S$
Exact Mass: 526.2865
Molecular Weight: 526.7305

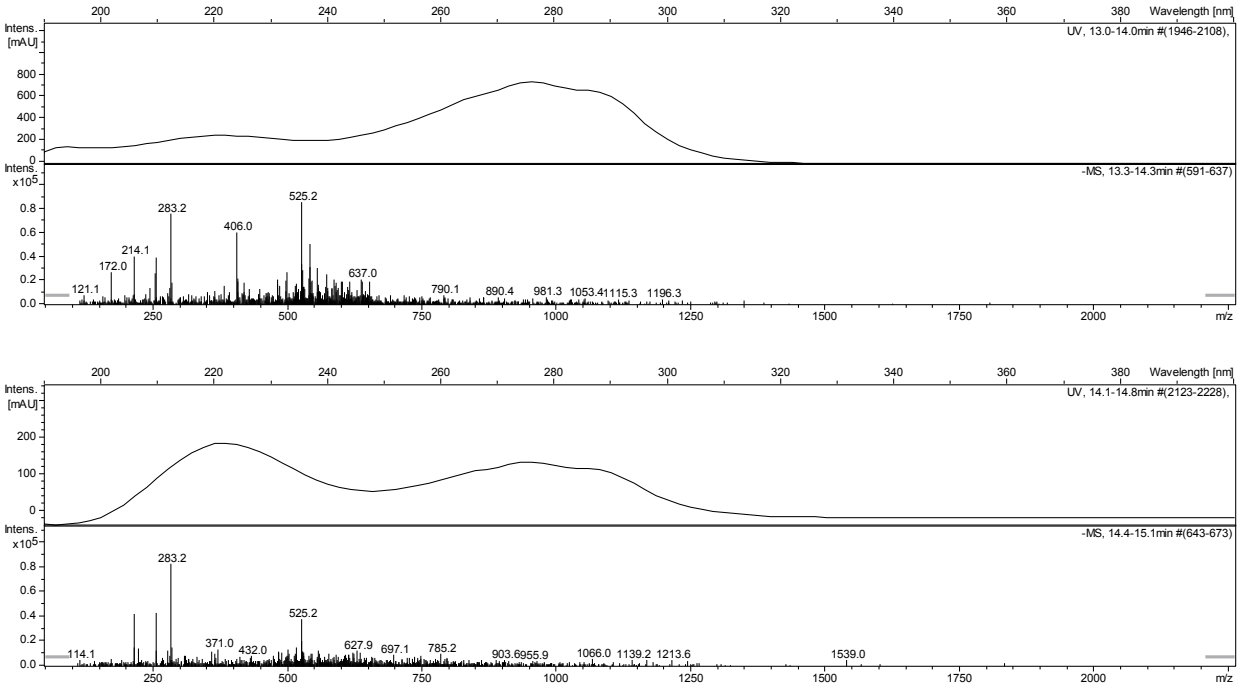


Major peaks (+ mode):

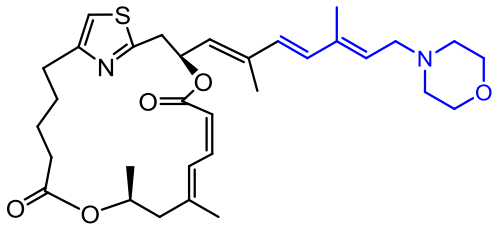




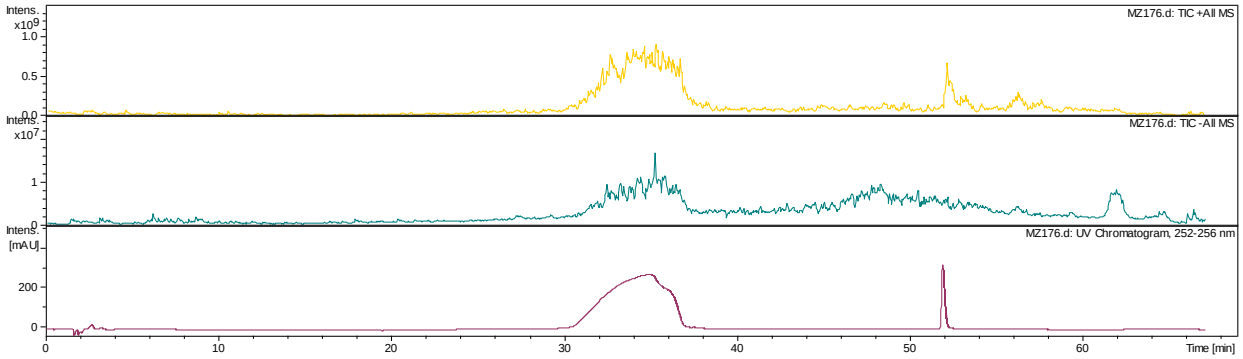
Major peaks (- mode):

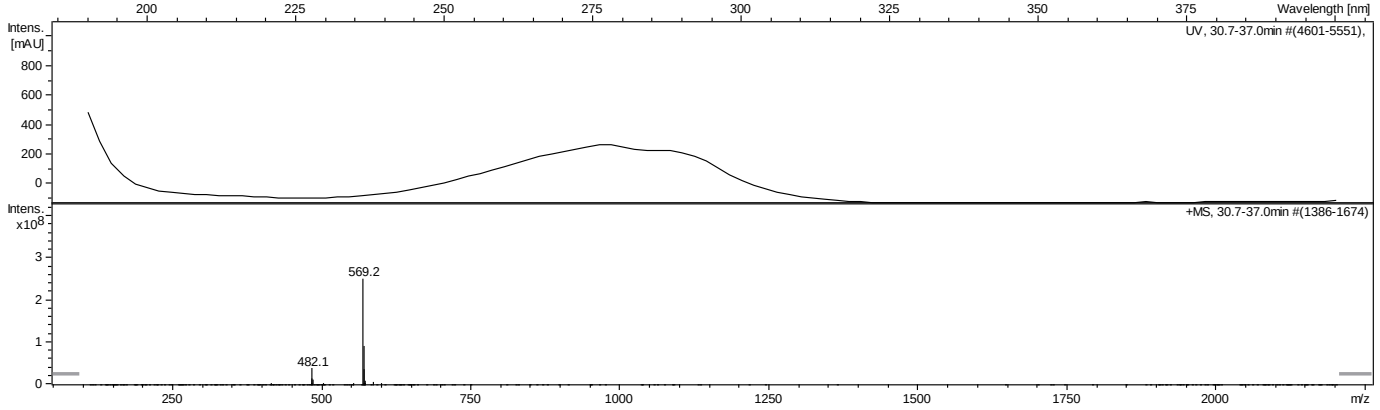


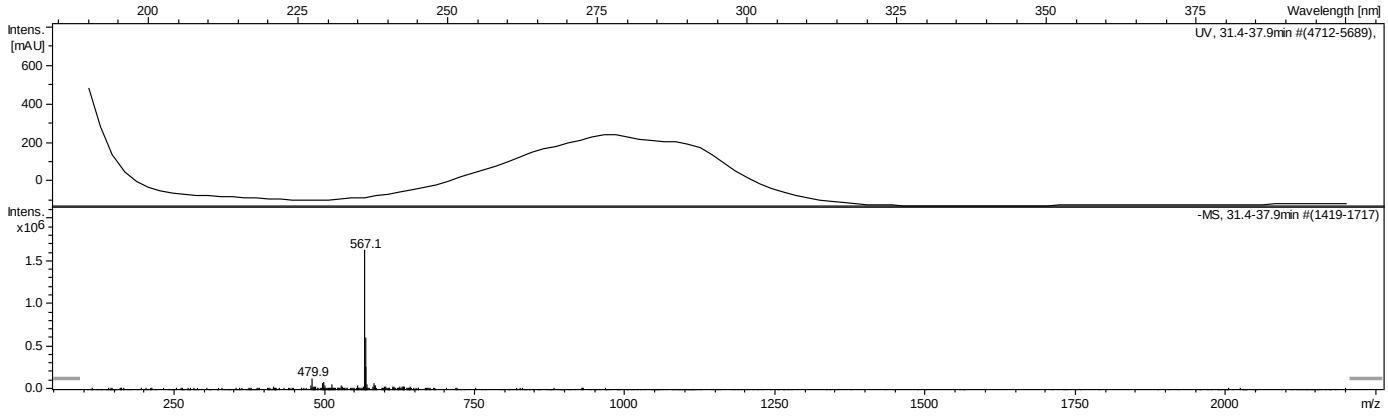
LC/MS of **9b**



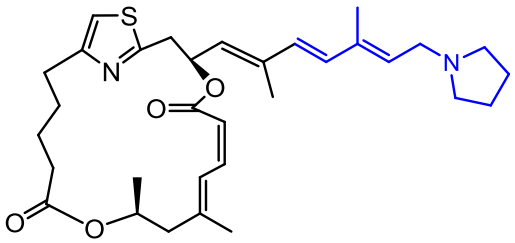
Chemical Formula: $C_{32}H_{44}N_2O_5S$
Molecular Weight: 568.7672



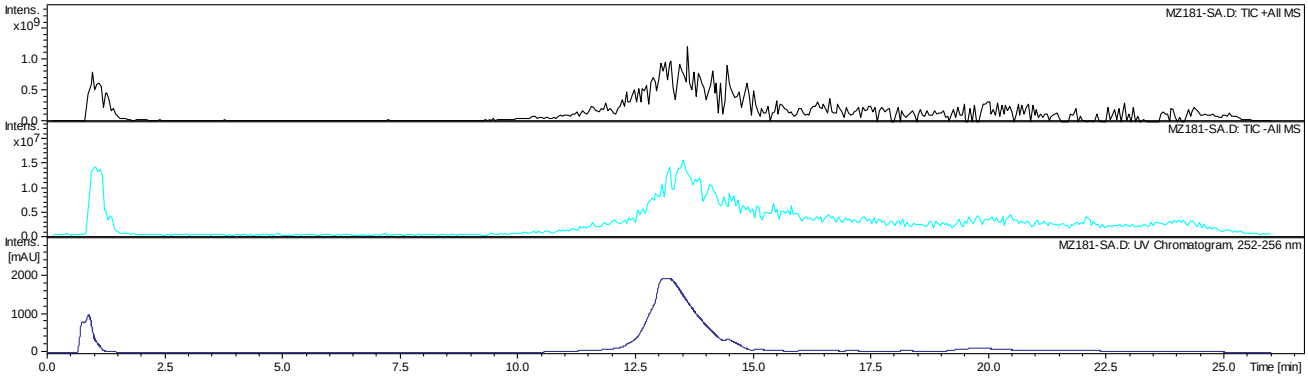


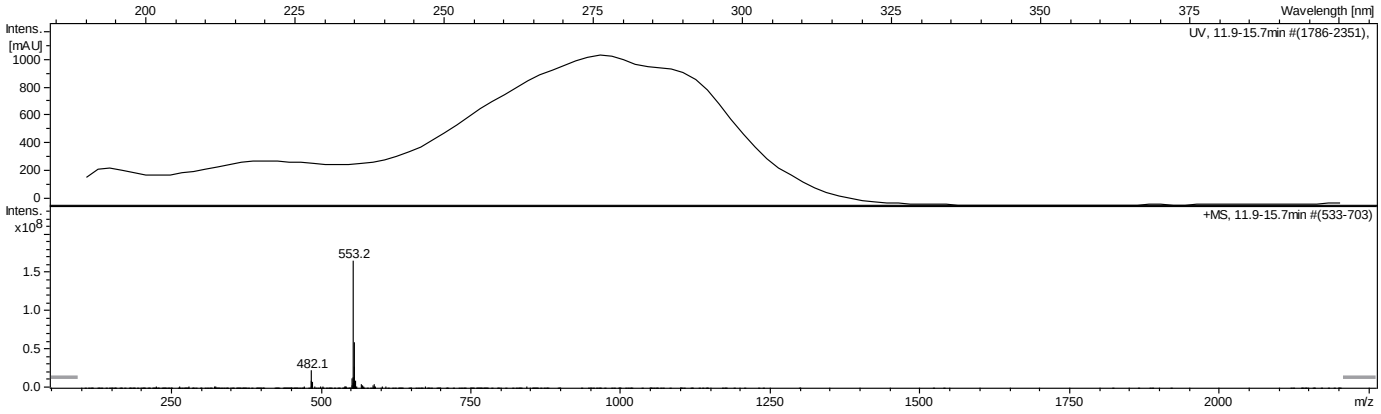


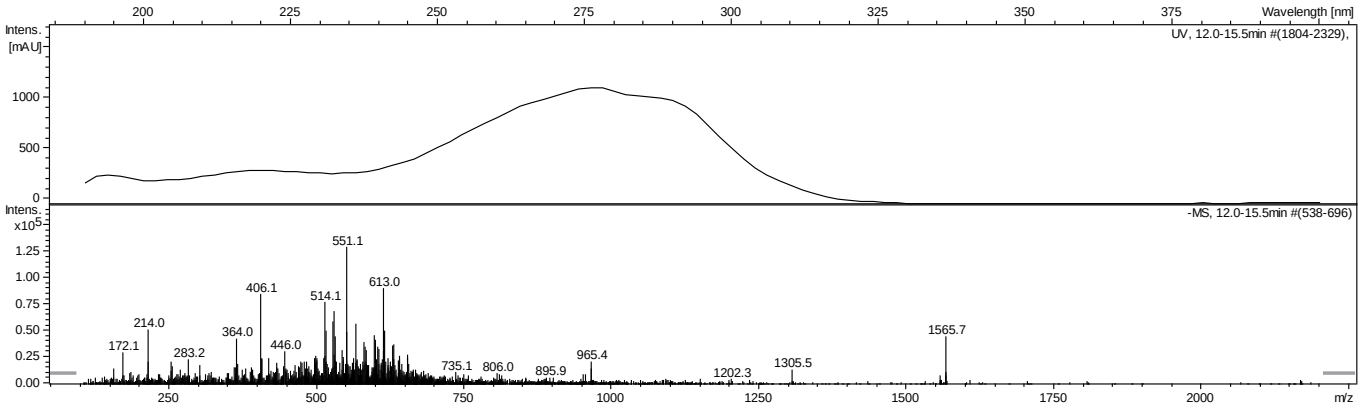
LC/MS of **9c**



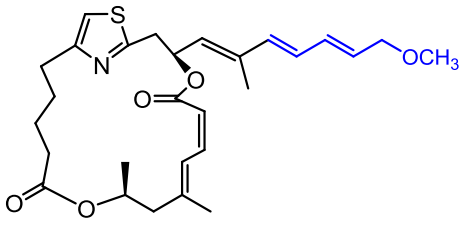
Chemical Formula: $C_{32}H_{44}N_2O_4S$
Molecular Weight: 552.7678



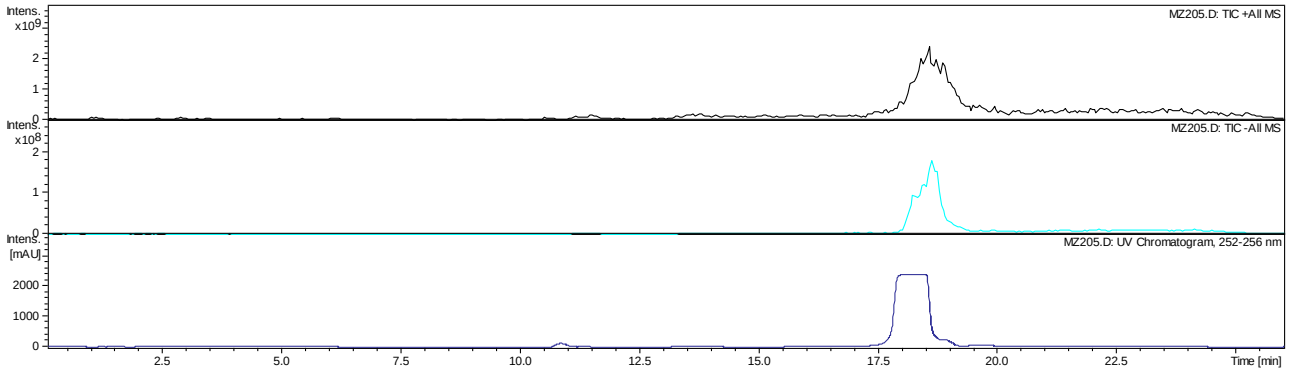


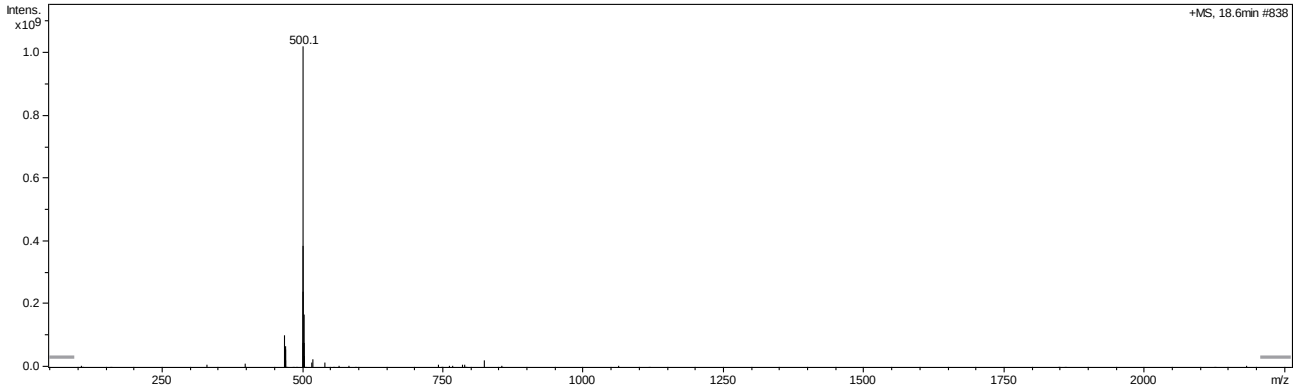


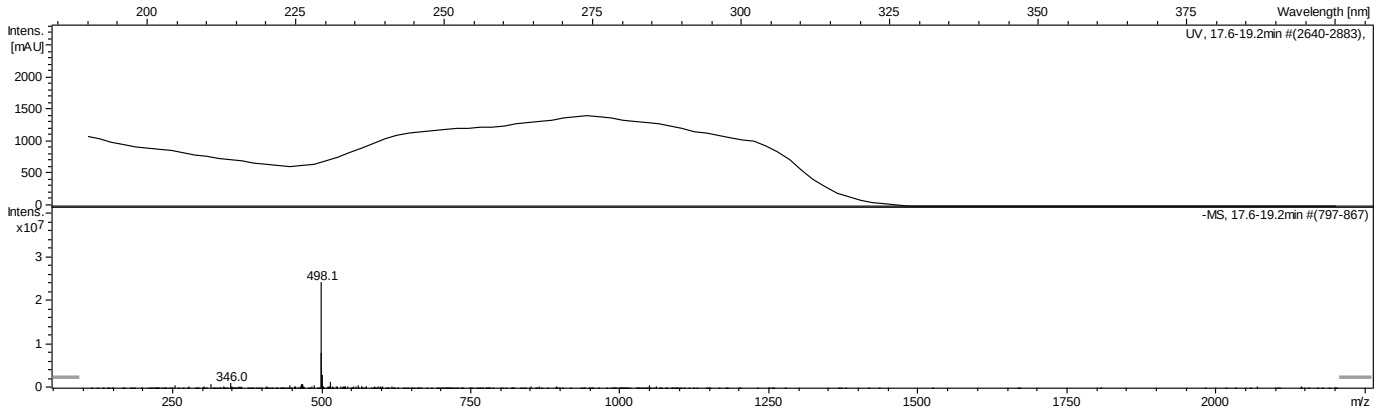
LC/MS of **9d**



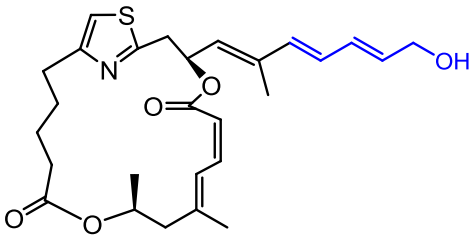
Chemical Formula: $C_{28}H_{37}NO_5S$
Molecular Weight: 499.6621



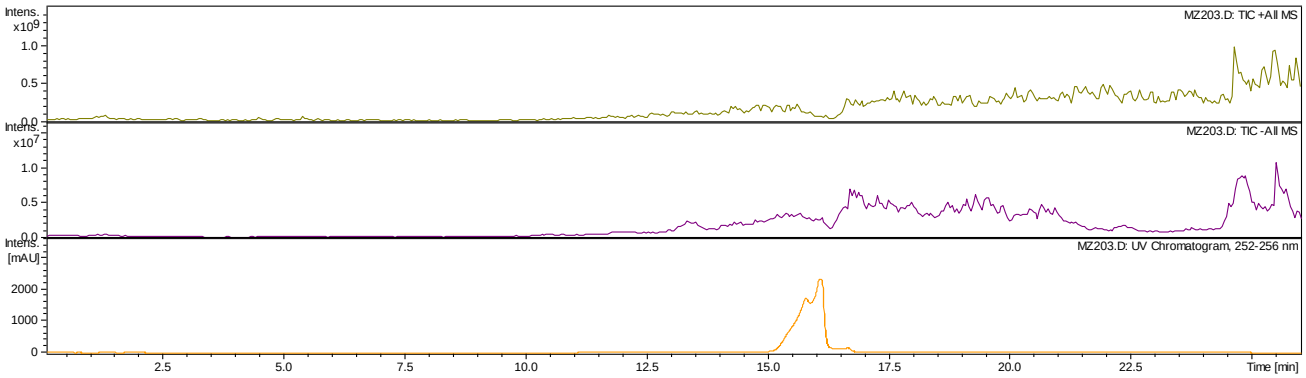


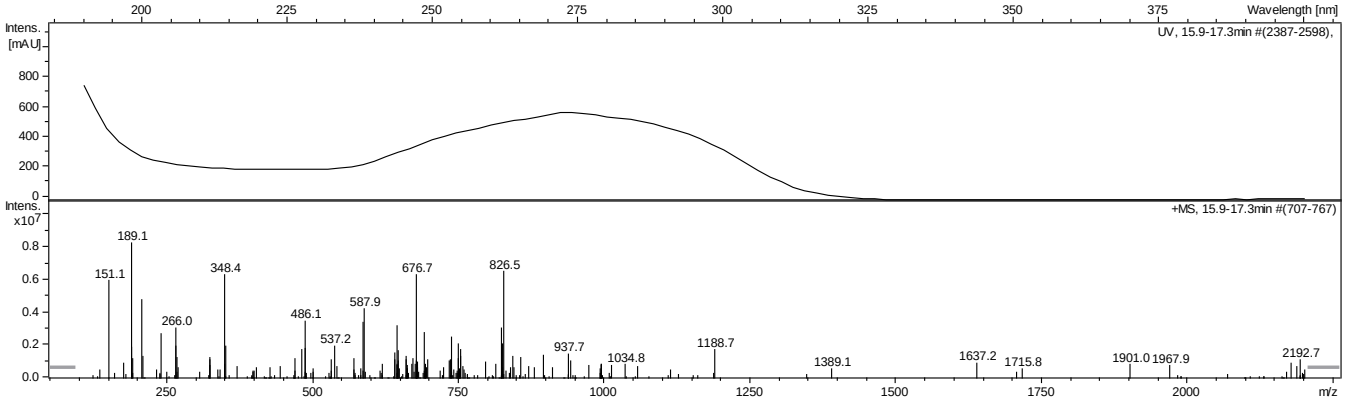


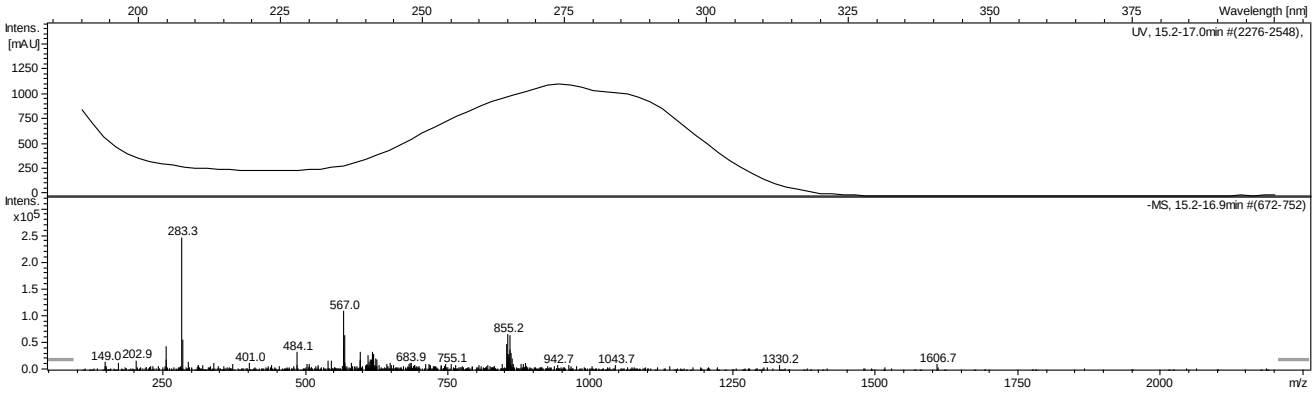
LC/MS of **9e**



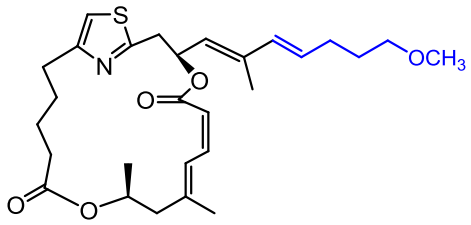
Chemical Formula: $C_{27}H_{35}NO_5S$
Molecular Weight: 485.6355



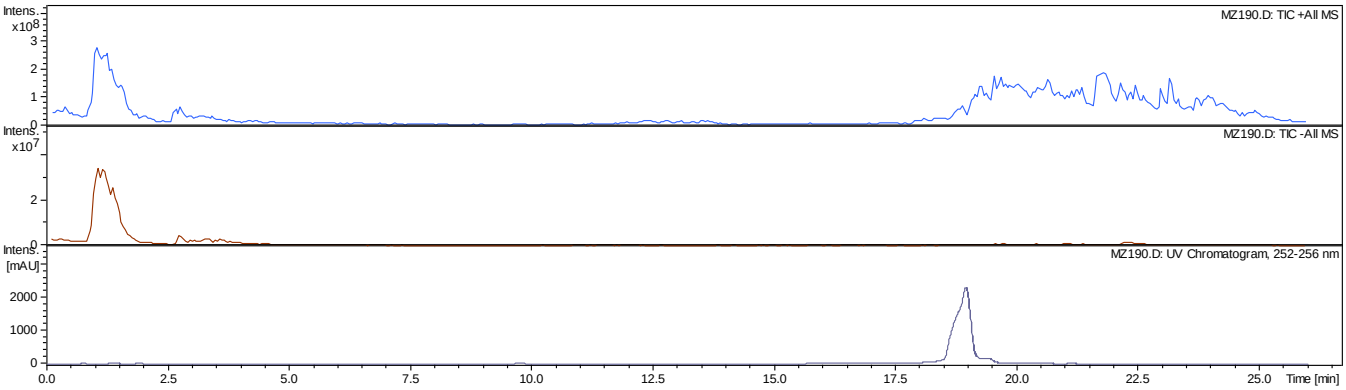


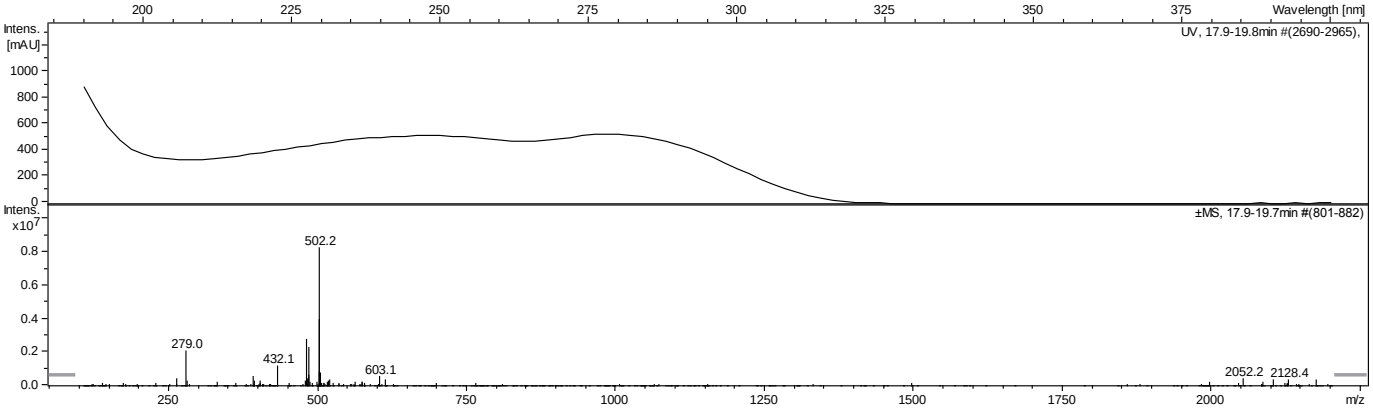


LC/MS of **9f**

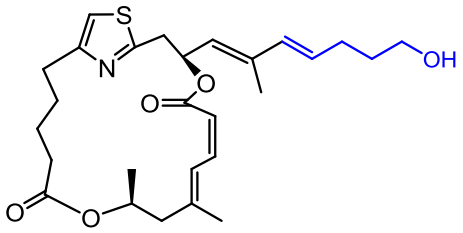


Chemical Formula: $C_{28}H_{39}NO_5S$
Molecular Weight: 501.6780

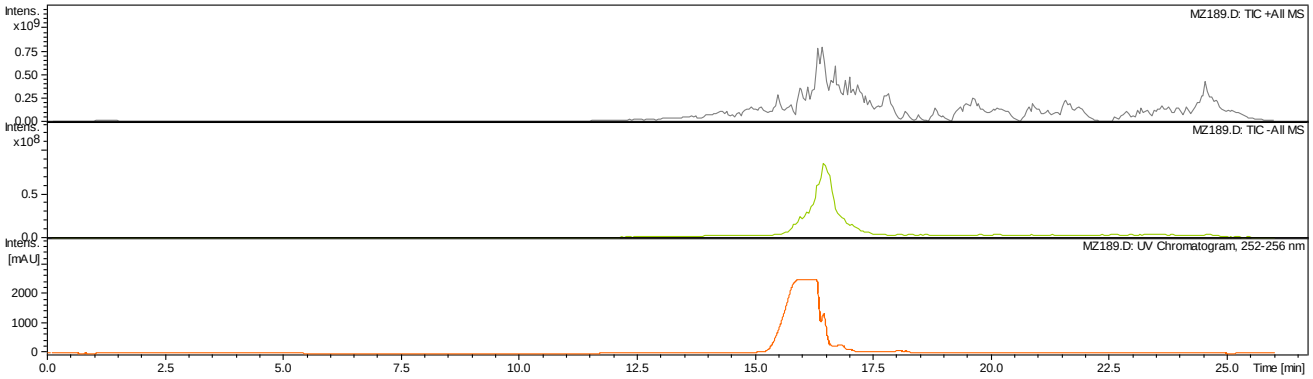


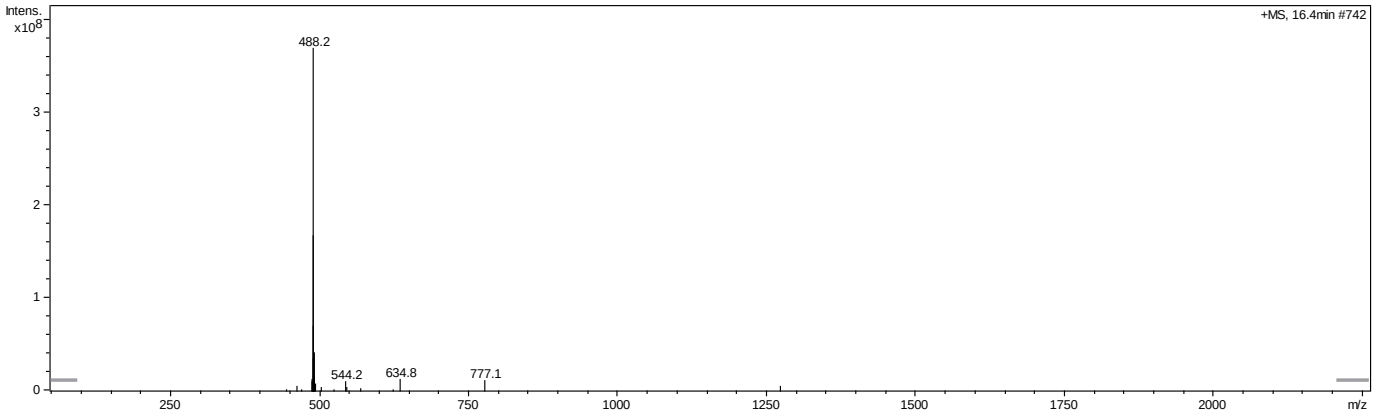


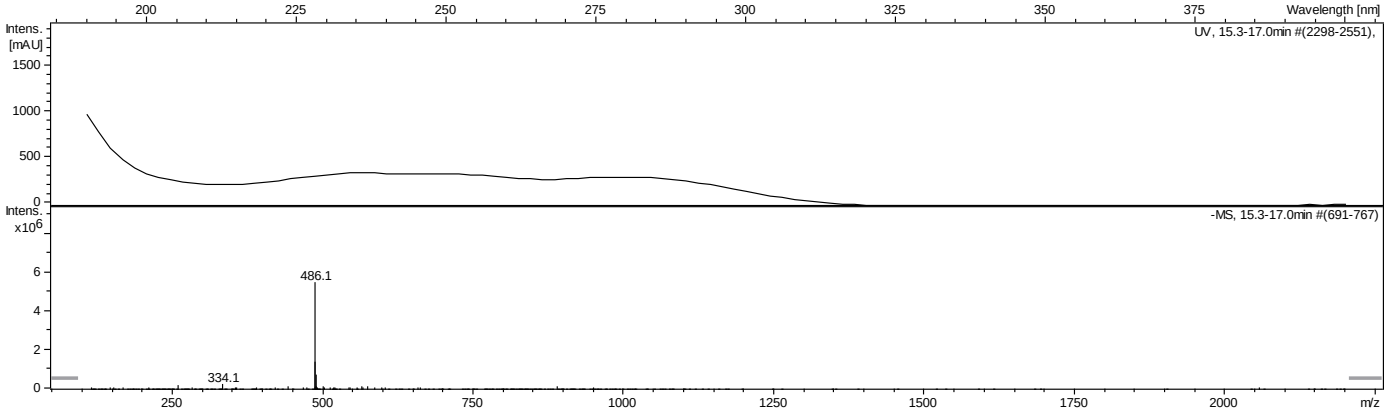
LC/MS of **9g**



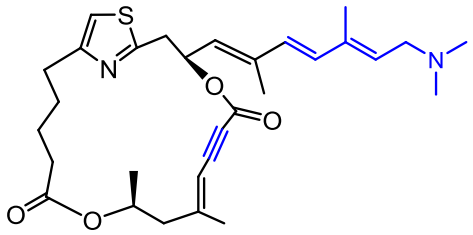
Chemical Formula: $C_{27}H_{37}NO_5S$
Molecular Weight: 487.6514



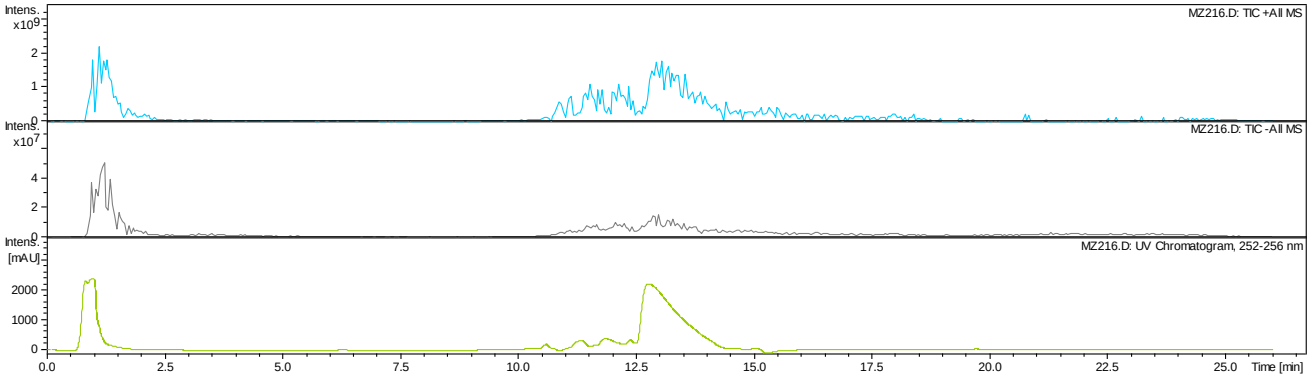


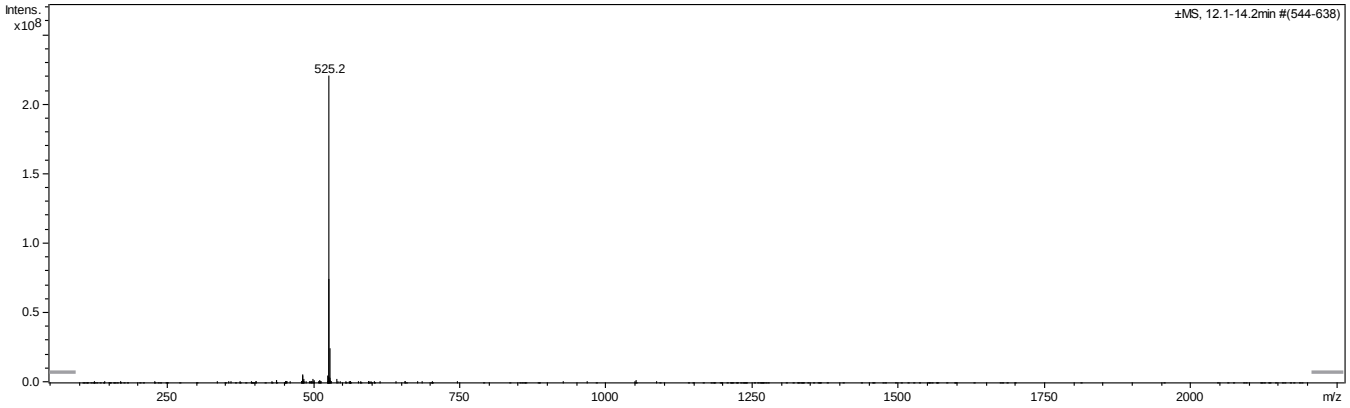


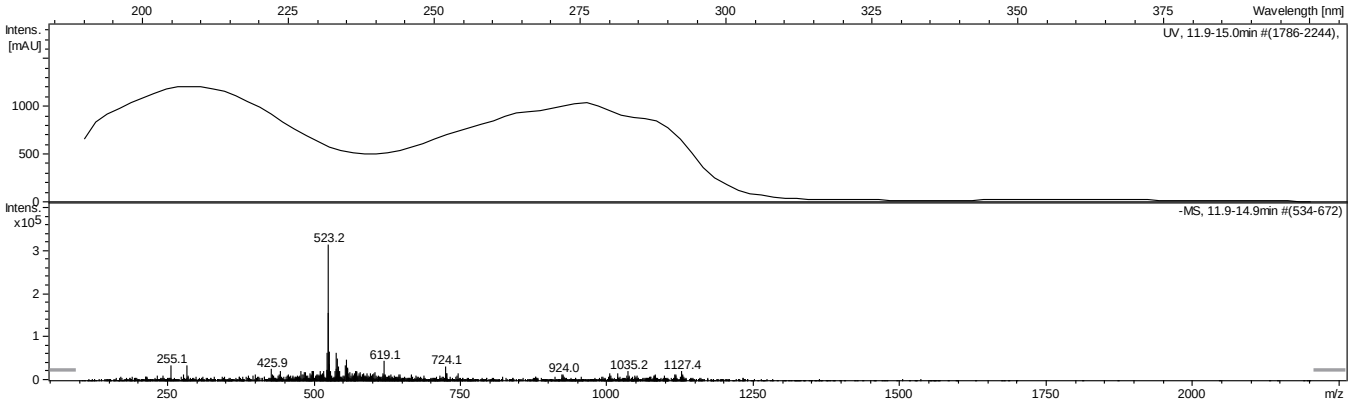
LC/MS of **10a**



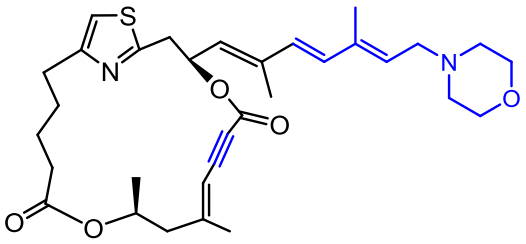
Chemical Formula: $C_{30}H_{40}N_2O_4S$
Molecular Weight: 524.7146



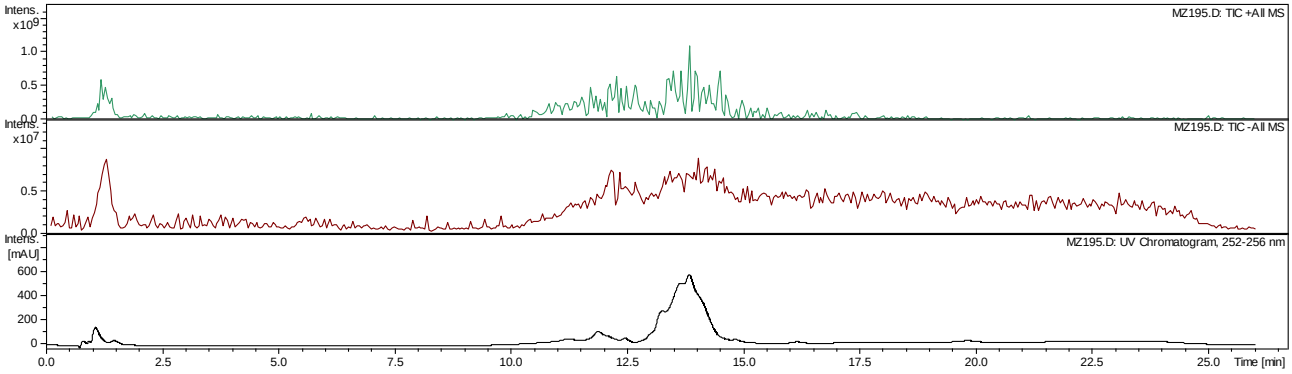


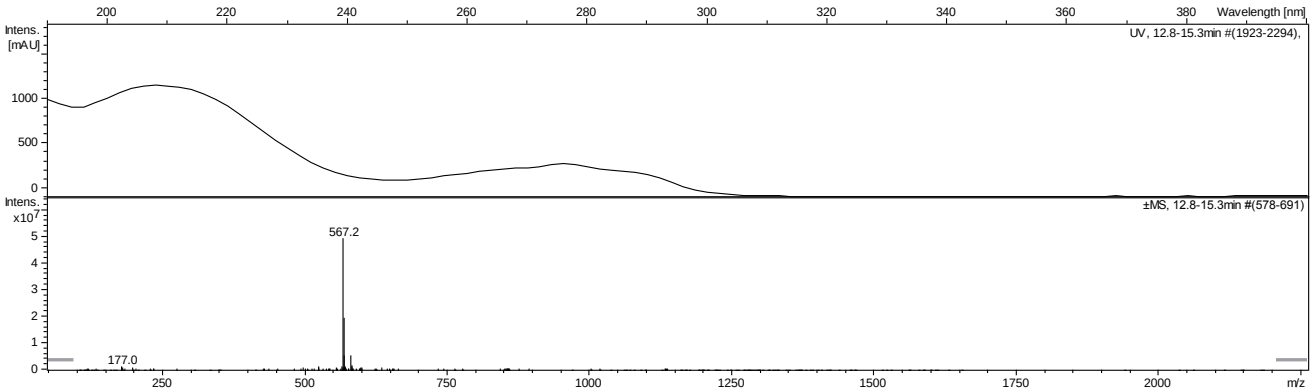


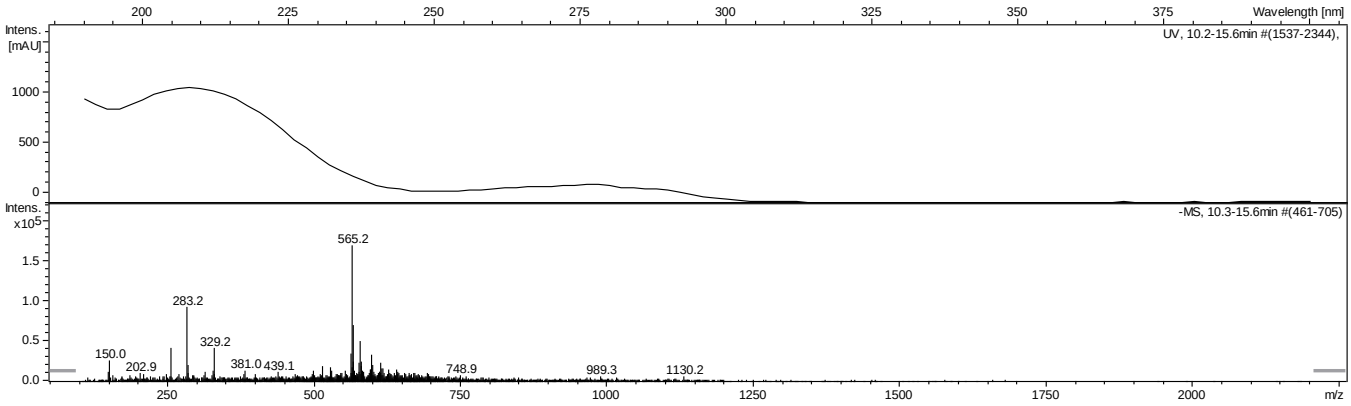
LC/MS of **10b**



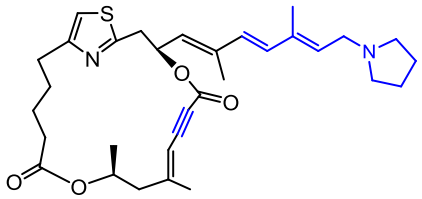
Chemical Formula: $C_{32}H_{42}N_2O_5S$
Molecular Weight: 566.7513



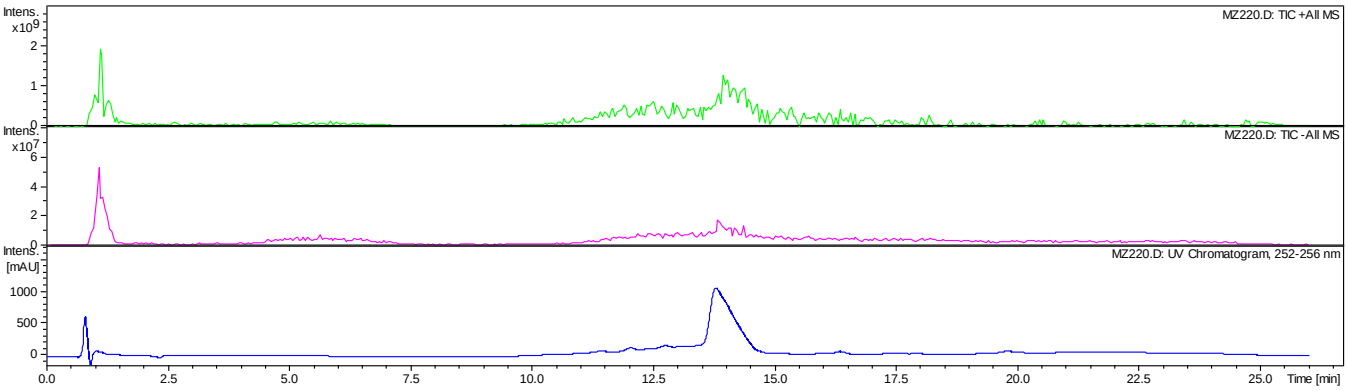


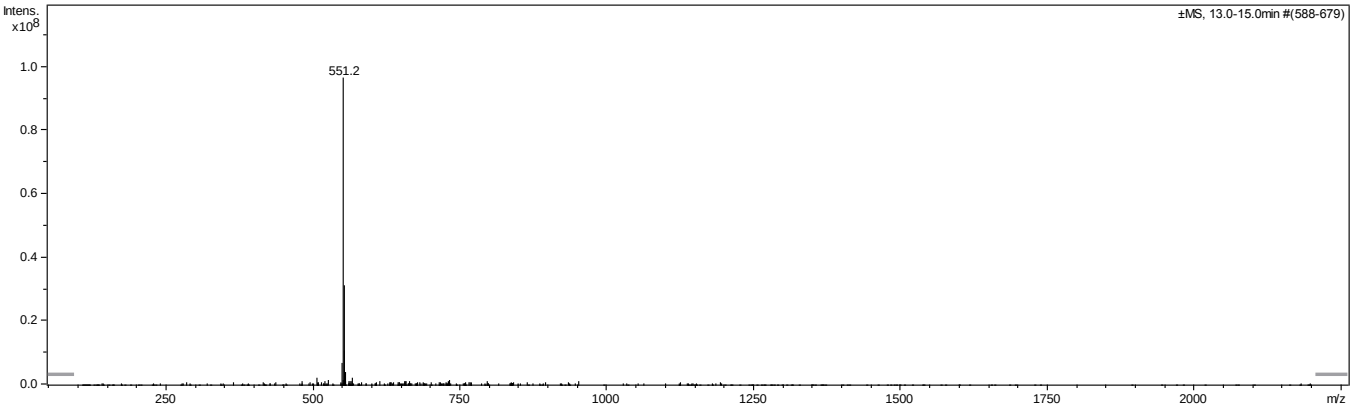


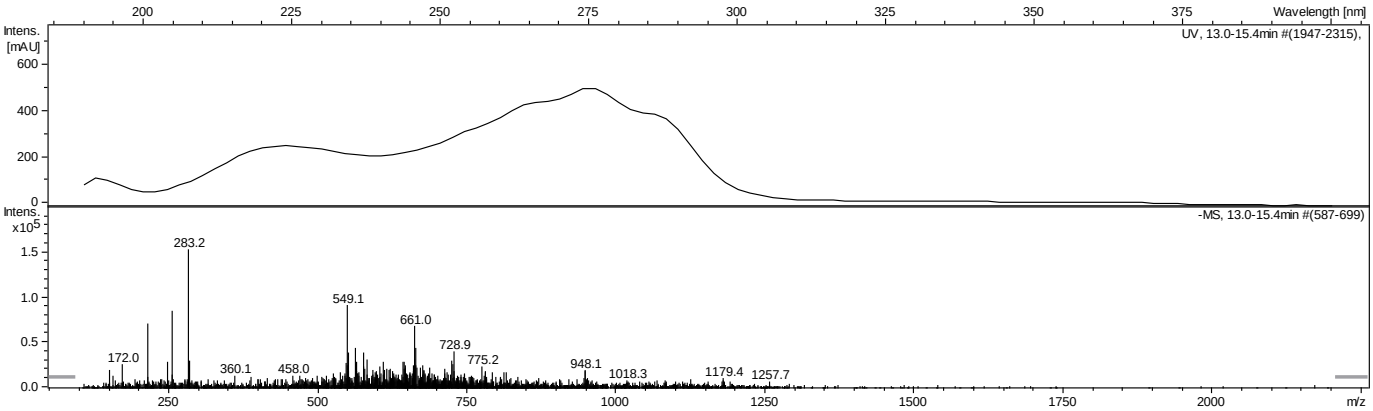
LC/MS of **10c**



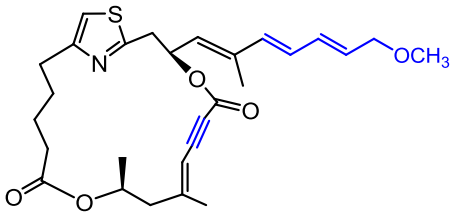
Chemical Formula: $C_{32}H_{42}N_2O_4S$
Molecular Weight: 550.7519



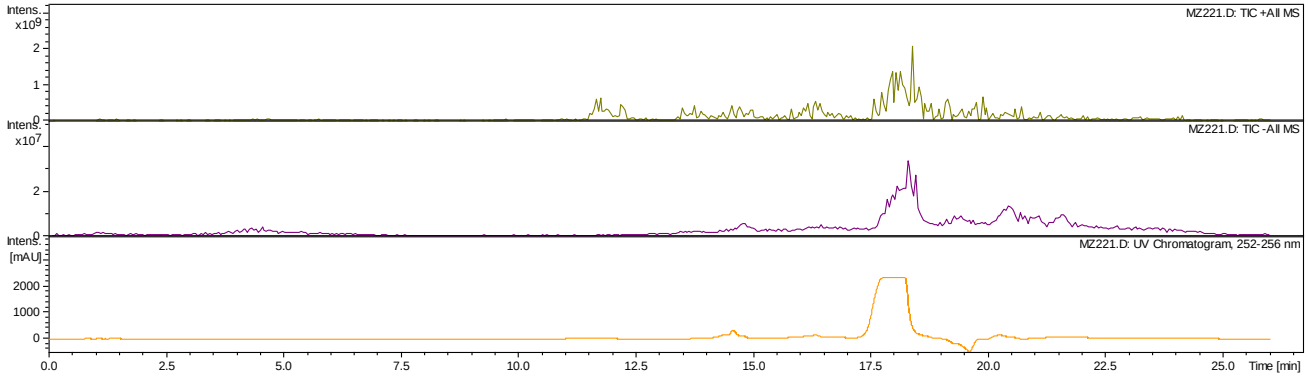


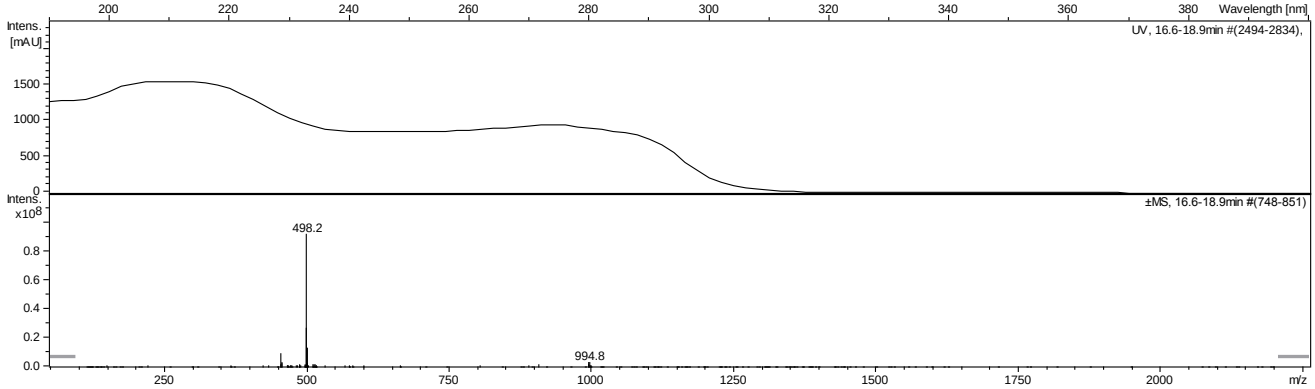


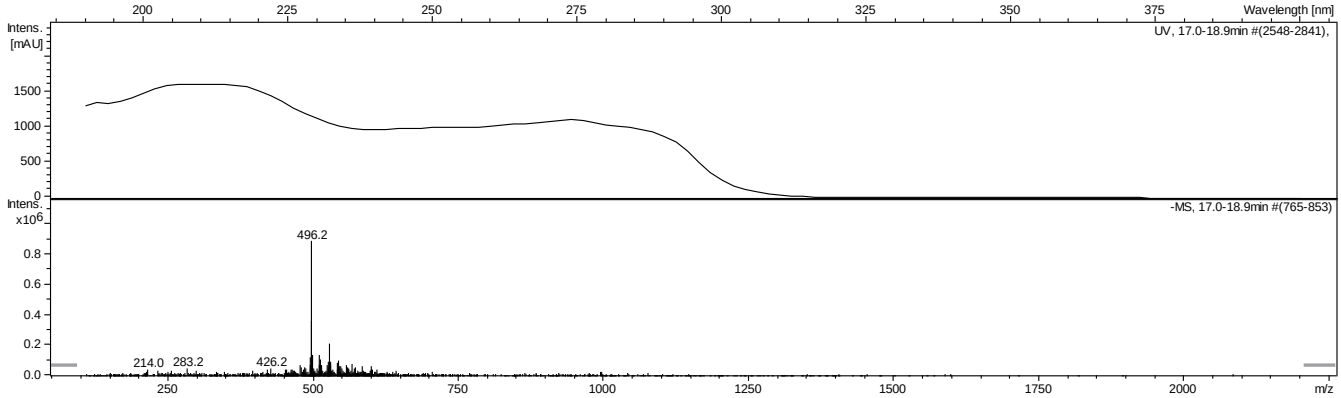
LC/MS of **10d**



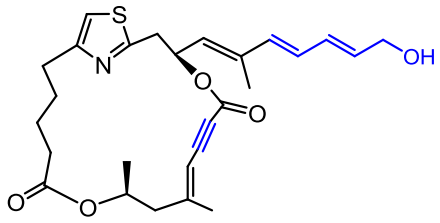
Chemical Formula: $C_{28}H_{35}NO_5S$
Molecular Weight: 497.6462



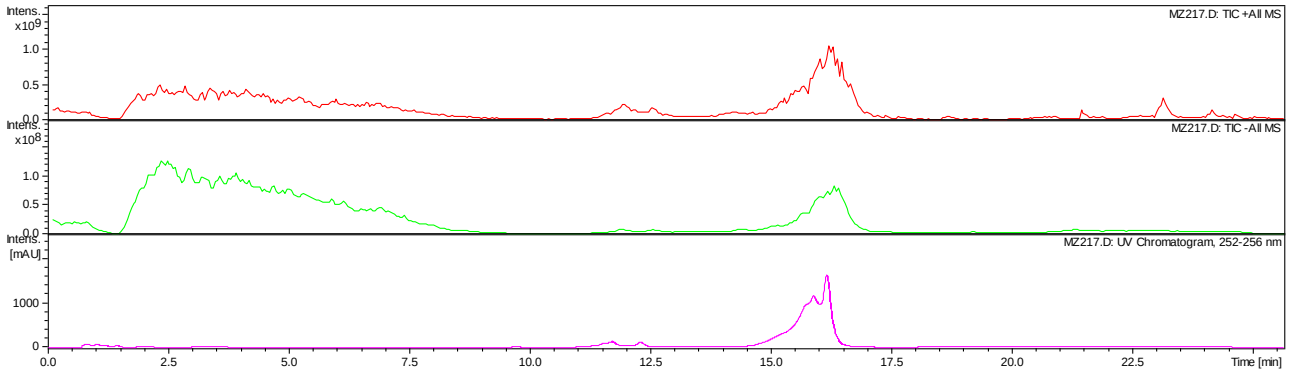


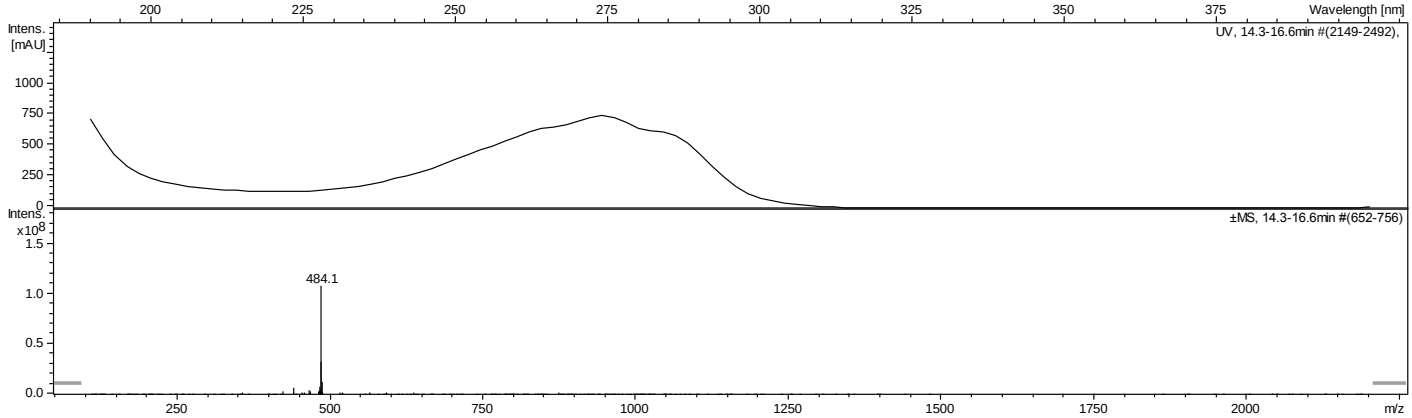


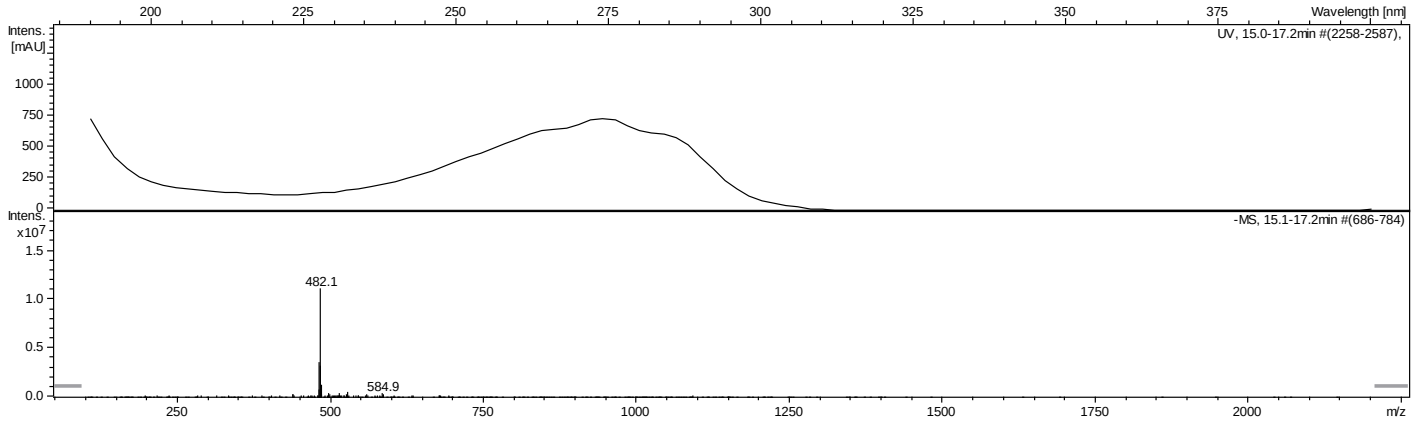
LC/MS of **10e**



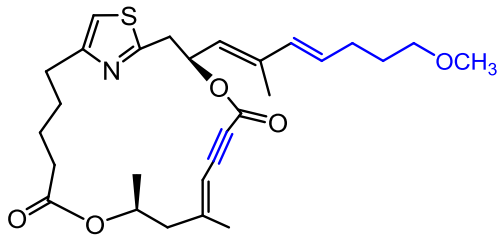
Chemical Formula: $C_{27}H_{33}NO_5S$
Molecular Weight: 483.6196



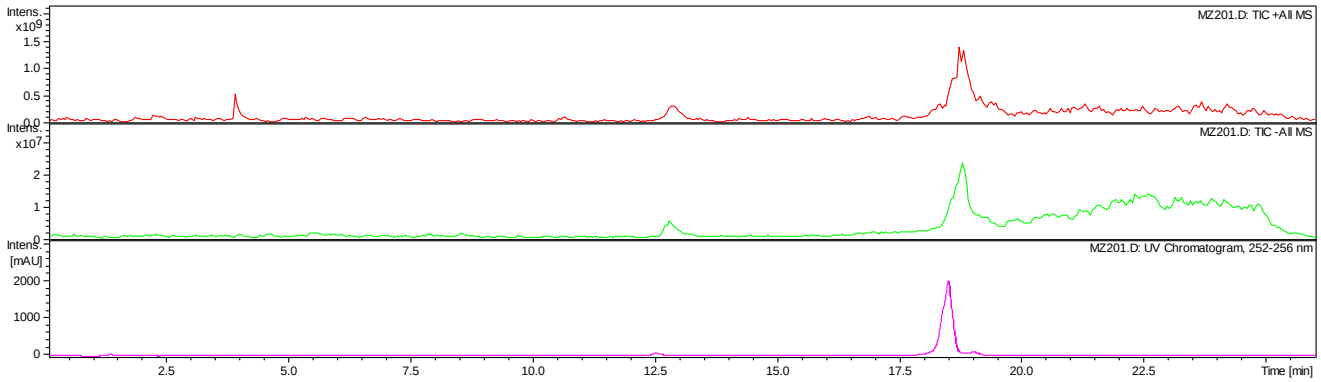


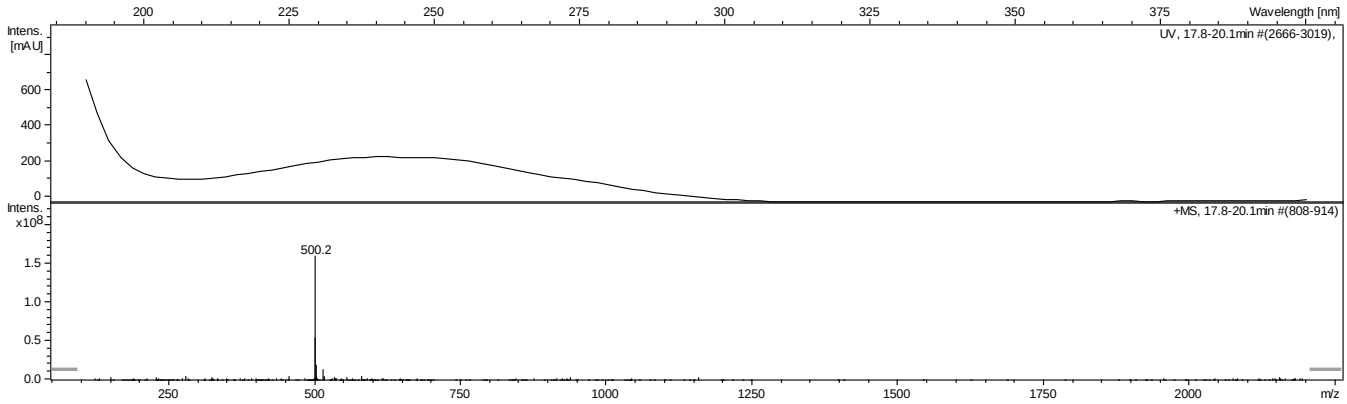


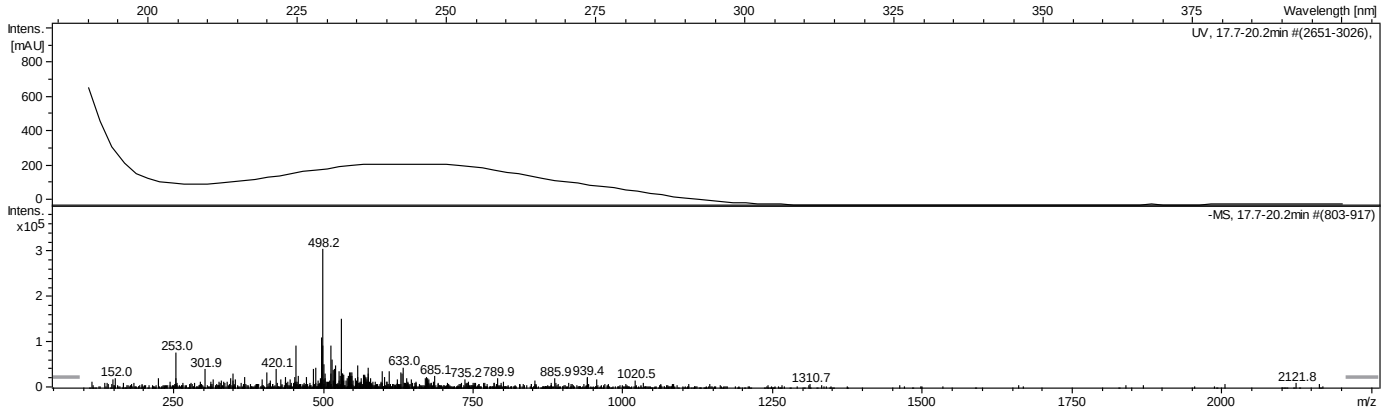
LC/MS of **10f**



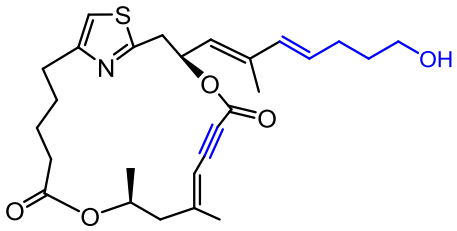
Chemical Formula: $C_{28}H_{37}NO_5S$
Molecular Weight: 499.6621



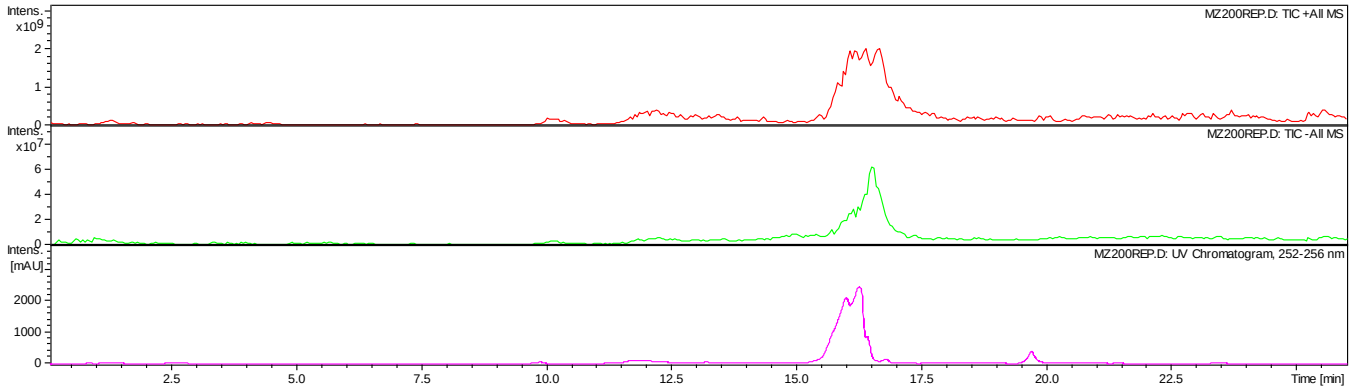


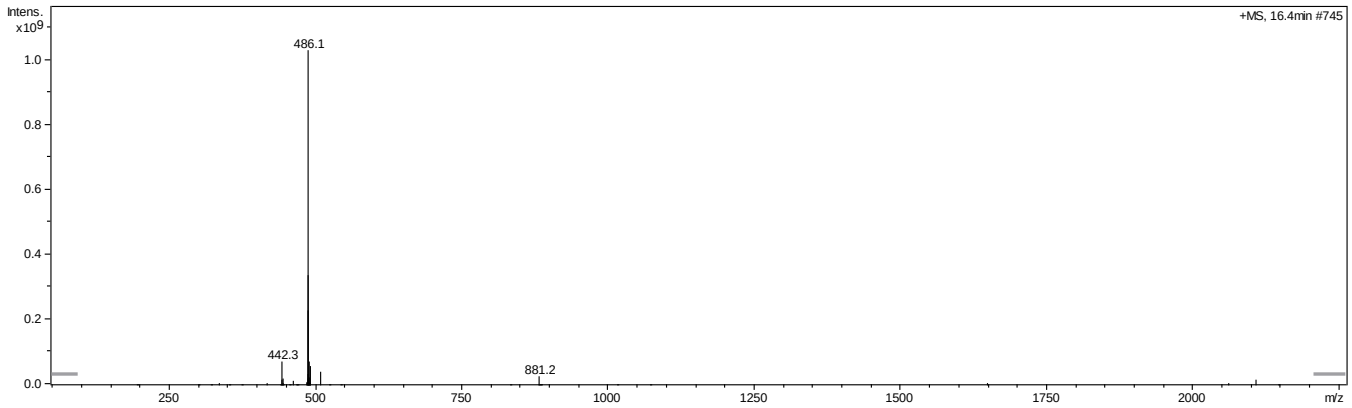


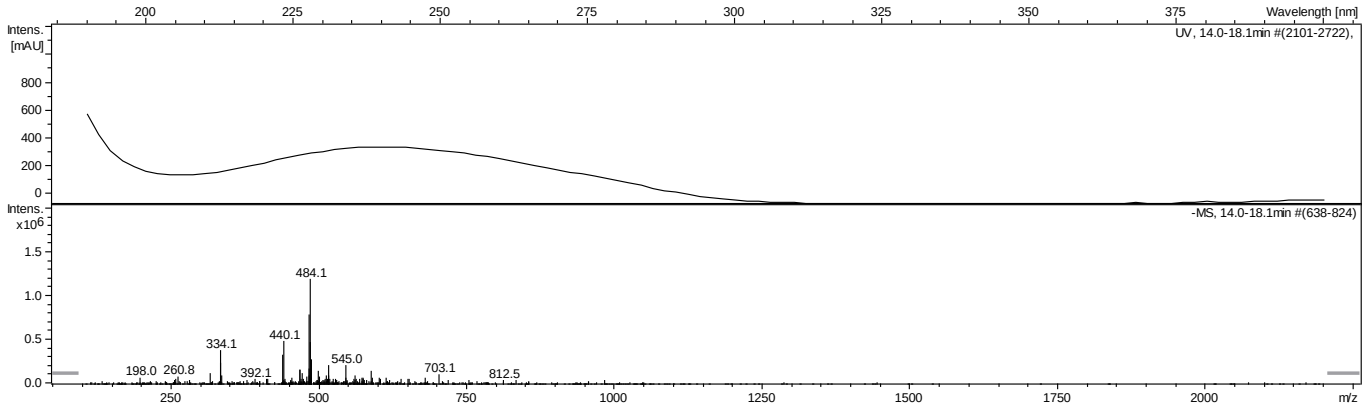
LC/MS of **10g**



Chemical Formula: $C_{27}H_{35}NO_5S$
Molecular Weight: 485.6355







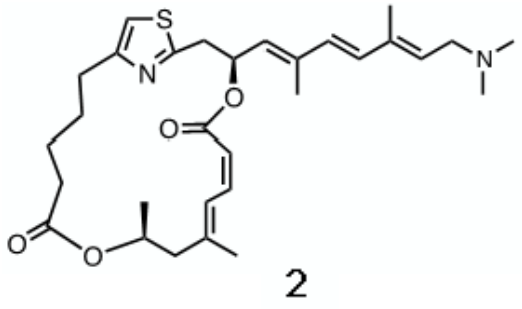
JL-321-A run3 1H CDCl3 11/10/11

File: nmrdata/romo/jingli/NMR/2012/JL-1H 07-03-12/JL-321-Arun3-1.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: jingli
File: JL-321-Arun3-1
INOVA-500 "nmrsun1"

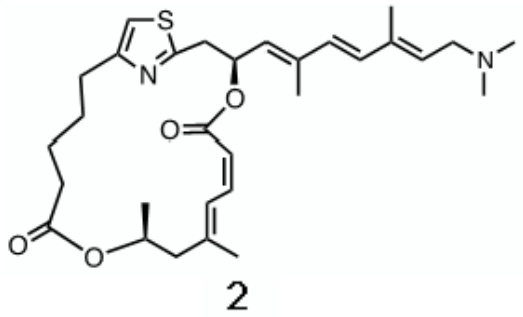
Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7990.4 Hz
256 repetitions
OBSERVE H1, 499.7251539 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 13 min, 9 sec



2

JL-321-A 13C C6D6 02/28/12

File: nmrdata/romo/jingli/NMR/2012/JL-13C 07-03-12/JL-321-A-48h-2.fid

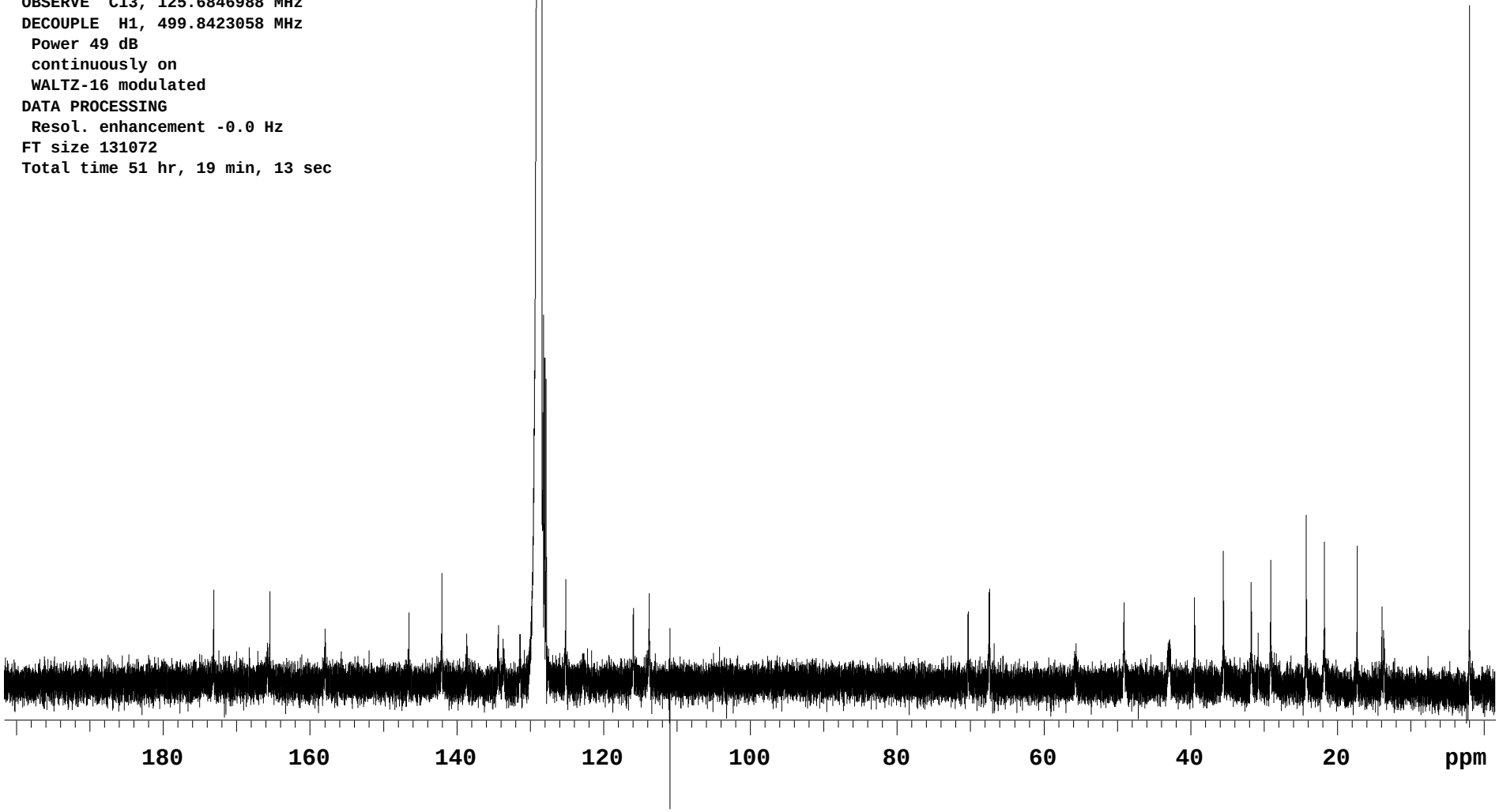


2

Pulse Sequence: s2pul

Solvent: c6d6
Ambient temperature
Operator: jingli
File: JL-321-A-48h-2
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 32894.7 Hz
73552 repetitions
OBSERVE C13, 125.6846988 MHz
DECOUPLE H1, 499.8423058 MHz
Power 49 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 131072
Total time 51 hr, 19 min, 13 sec



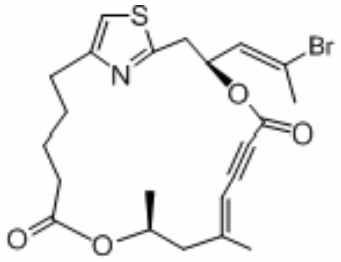
MZ215

Sample: MZ215
File: home/romo/mzhu/vnmrsys/data/MZ215.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ215
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7995.2 Hz
16 repetitions
OBSERVE H1, 499.4254488 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 0 min, 55 sec



4

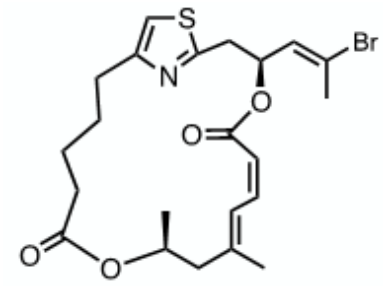
JL-365-A 1H CDCl3 08/10/11

File: nmrdata/romo/jingli/NMR/2012/JL-1H 07-03-12/JL-365-A-1.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: jingli
File: JL-365-A-1
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7996.0 Hz
32 repetitions
OBSERVE H1, 499.4254488 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 1 min, 44 sec



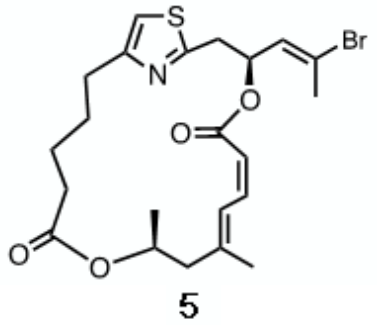
5

JL-365-A 13C CDCl3 02/28/12

File: nmrdata/romo/jingli/NMR/2012/JL-13C 07-03-12/JL-365-A-2.fid

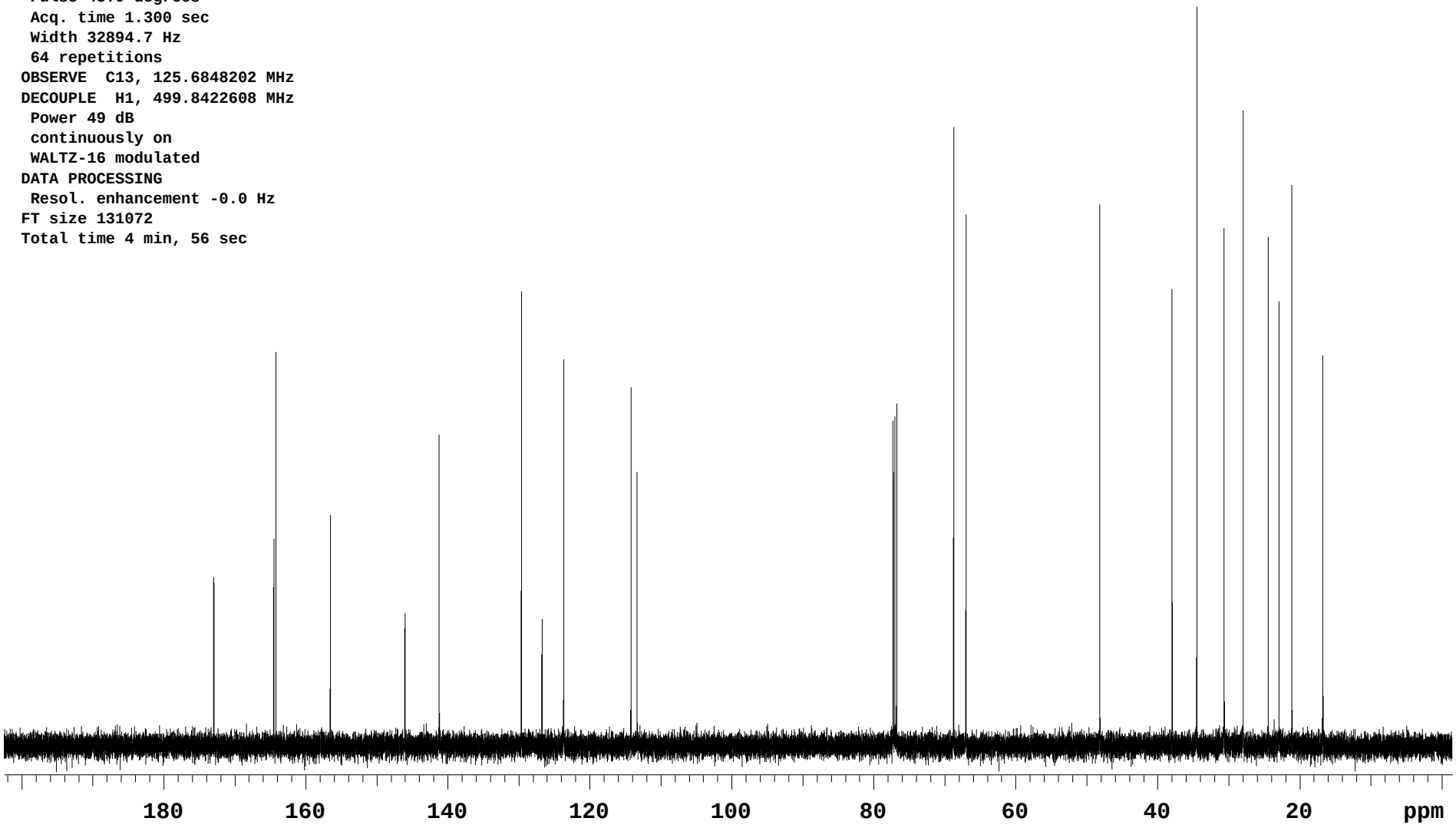
Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: jingli
File: JL-365-A-2
INOVA-500 "nmrsun1"



5

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 32894.7 Hz
64 repetitions
OBSERVE C13, 125.6848202 MHz
DECOUPLE H1, 499.8422608 MHz
Power 49 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 131072
Total time 4 min, 56 sec



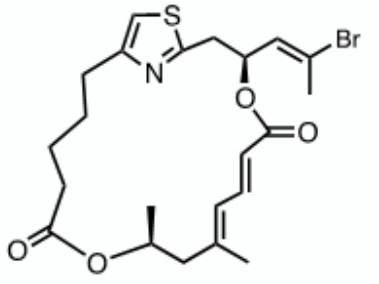
JL-267-C 1H CDCl3 08/19/10

File: nmrdata/romo/jingli/NMR/2011/JL-1H-07-22-11 update/JL-267-C-1.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Temp. 22.0 C / 295.1 K
Operator: jingli
File: JL-267-C-1
INOVA-500 "nmrsun1"

Pulse 30.0 degrees
Acq. time 2.892 sec
Width 7997.6 Hz
49 repetitions
OBSERVE H1, 499.7830868 MHz
DATA PROCESSING
FT size 65536
Total time 1 hr, 1 min, 53 sec



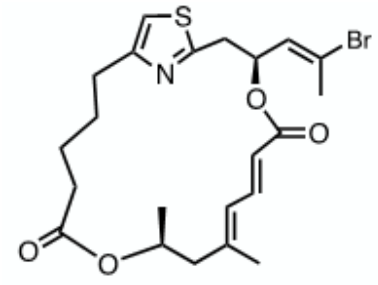
6

JL-368-C 13C CDCl3 02/20/12

File: nmrdata/romo/jingli/NMR/2012/JL-13C 07-03-12/JL-368-C-2.fid

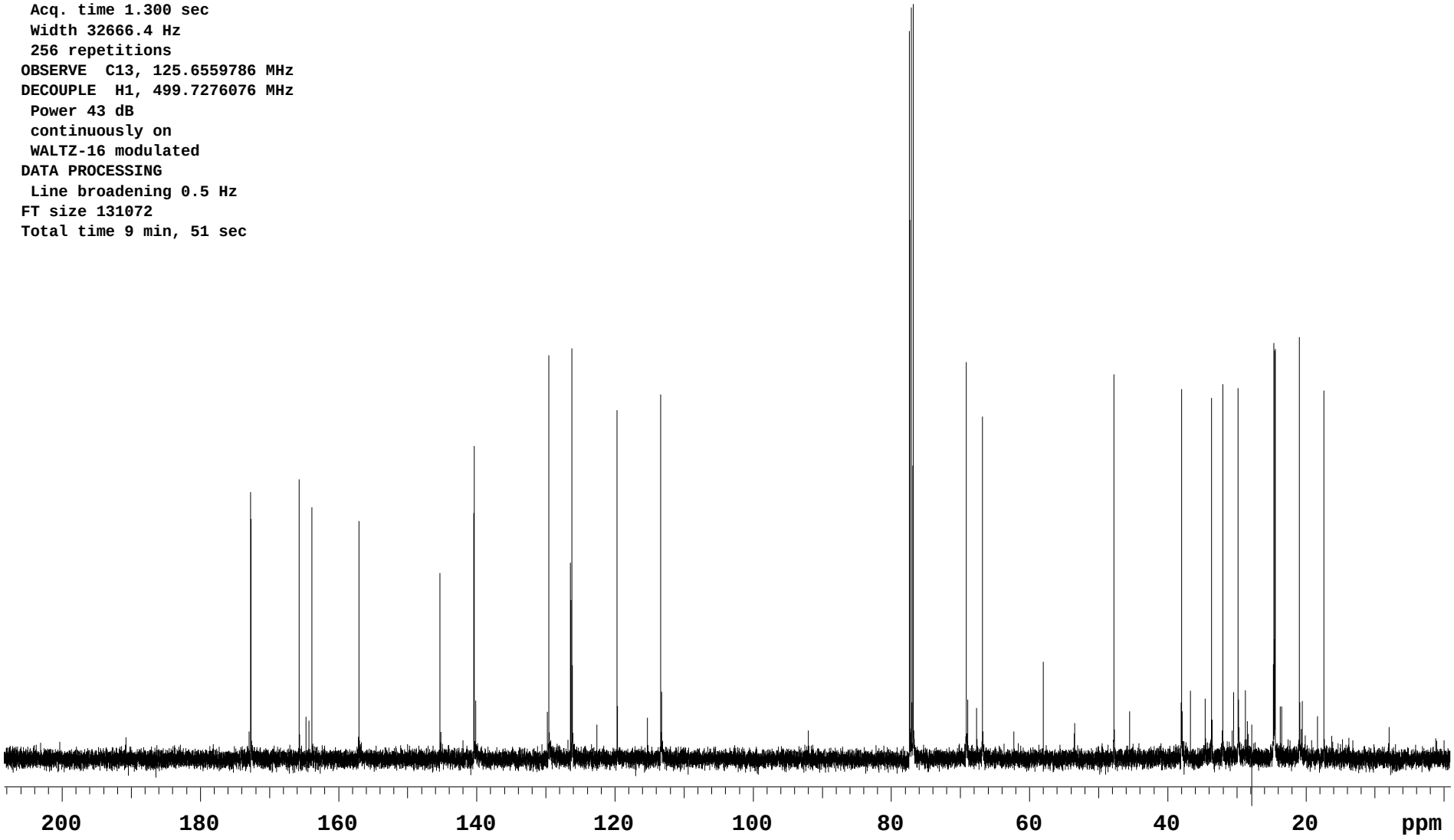
Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: jingli
File: JL-368-C-2
INOVA-500 "nmrsun1"



6

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 32666.4 Hz
256 repetitions
OBSERVE C13, 125.6559786 MHz
DECOUPLE H1, 499.7276076 MHz
Power 43 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Line broadening 0.5 Hz
FT size 131072
Total time 9 min, 51 sec



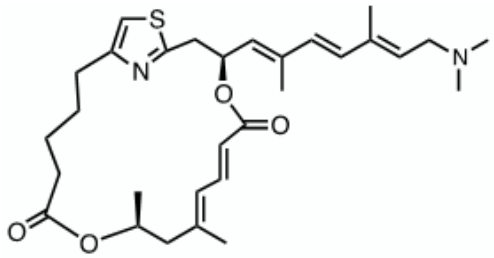
JL-402-B-repurify 1H CDCl3 11/07/11

File: nmrdata/romo/jingli/NMR/2012/JL-1H 07-03-12/JL-402-B-1.fid

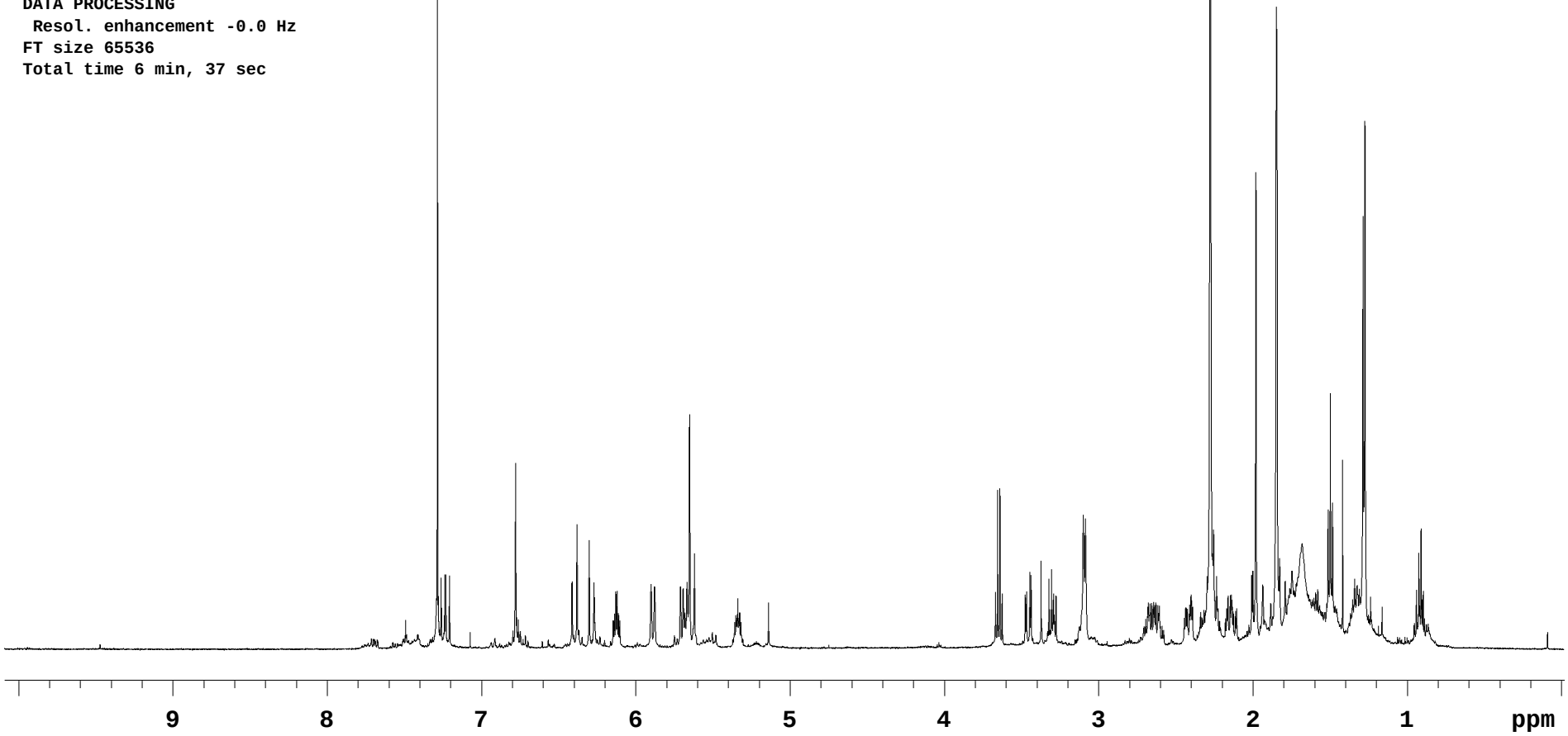
Pulse Sequence: s2pul

Solvent: cdcl3
Temp. 23.0 C / 296.1 K
Operator: jingli
File: JL-402-B-1
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7990.4 Hz
49 repetitions
OBSERVE H1, 499.7251090 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 6 min, 37 sec



8



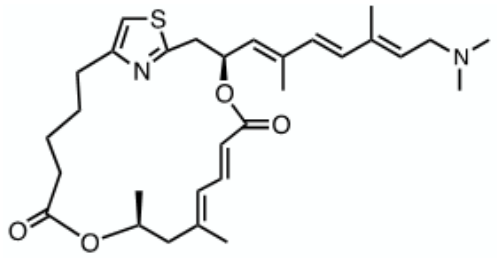
JL-402-B-repurify 13C CDCl3 02/27/12

File: nmrdata/romo/jingli/NMR/2012/JL-13C 07-03-12/JL-402-B-2.fid

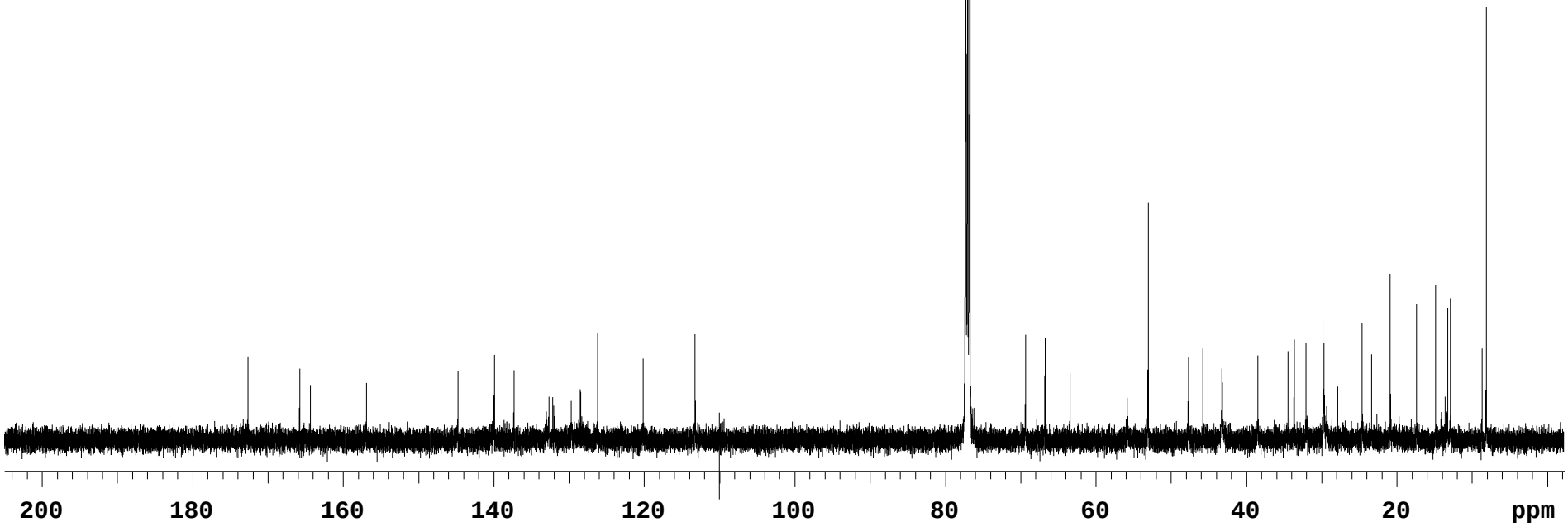
Pulse Sequence: s2pul

```
 Solvent: cdcl3
 Ambient temperature
Operator: jingli
File: JL-402-B-2
INOVA-500  "nmrsun1"

 Relax. delay 1.000 sec
 Pulse 45.0 degrees
 Acq. time 1.300 sec
 Width 32894.7 Hz
 34944 repetitions
OBSERVE  C13, 125.6848087 MHz
DECOUPLE  H1, 499.8422608 MHz
 Power 49 dB
 continuously on
 WALTZ-16 modulated
DATA PROCESSING
 Resol. enhancement -0.0 Hz
FT size 131072
Total time 32 hr, 50 min, 42 sec
```



8



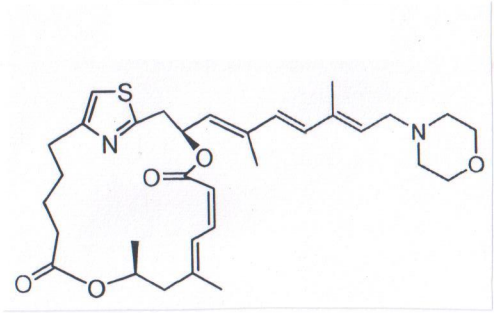
MZ176

Sample: MZ176
File: home/romo/mzhu/vnmrsys/data/MZ176-500MHz.fid

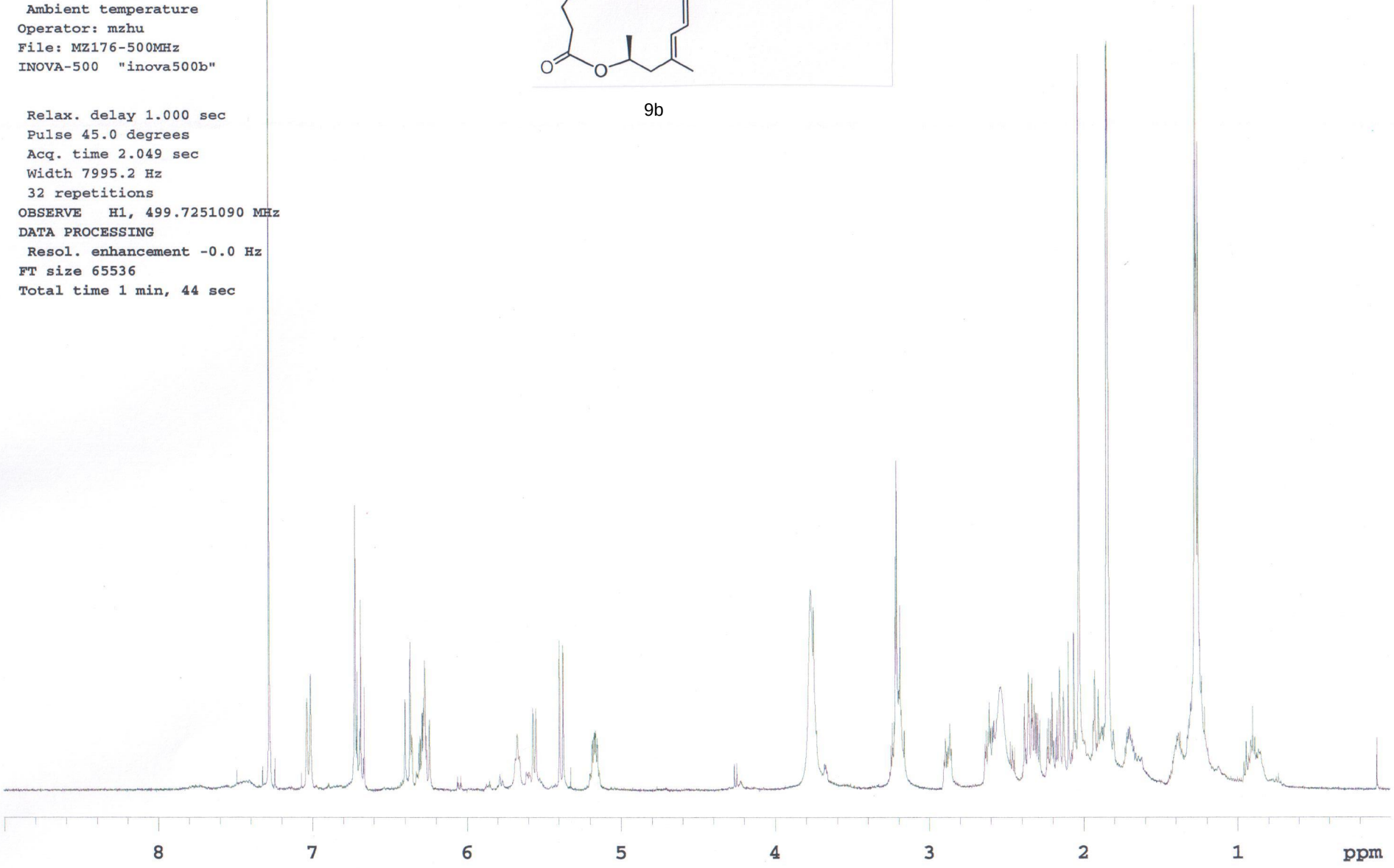
Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ176-500MHz
INOVA-500 "inova500b"

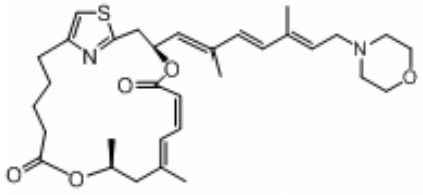
Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7995.2 Hz
32 repetitions
OBSERVE H1, 499.7251090 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 1 min, 44 sec



9b



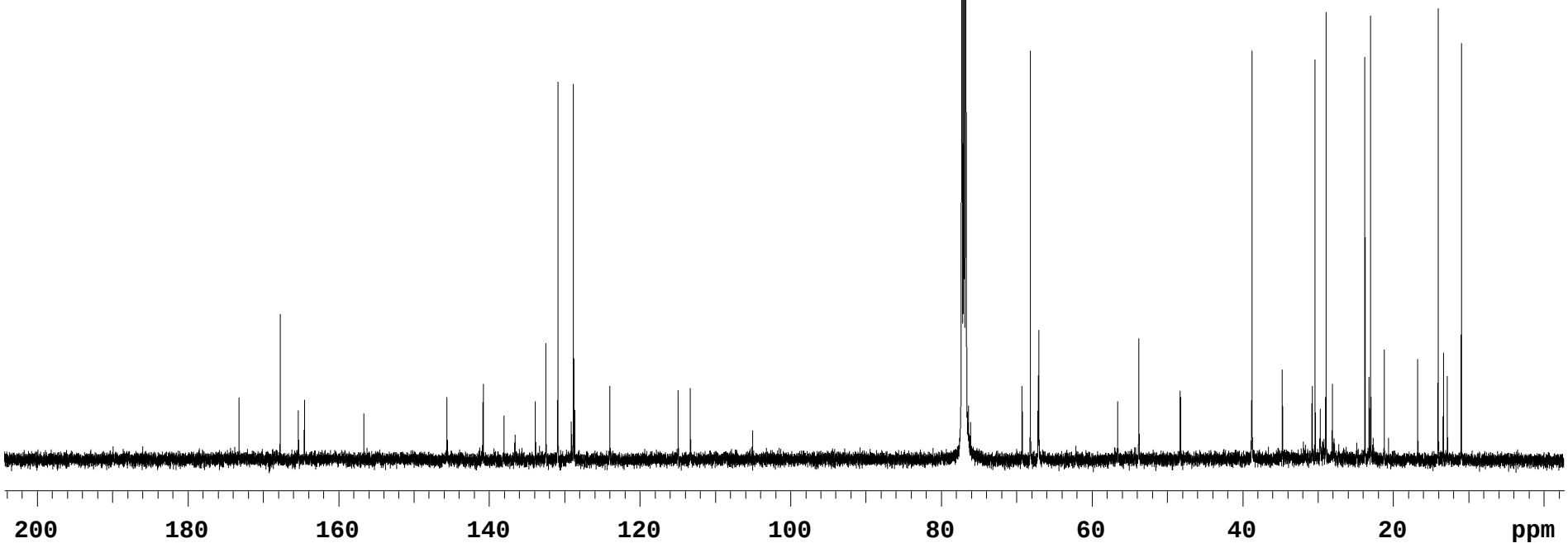
MZ176



9b

Sample: MZ176
Date: home/romo/mzhu/vnmrsys/data/MZ176-13C.fid
File: home/romo/mzhu/vnmrsys/data/MZ176-13C.fid
Pulse Sequence: s2pul
Pulse Sequence: s2pul
Solvent: cdcl3
Ambient temperature
Operator: jingli
File: MZ176-13C
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 30487.8 Hz
61688 repetitions
OBSERVE C13, 125.6848069 MHz
DECOUPLE H1, 499.8422608 MHz
Power 49 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Line broadening 0.5 Hz
FT size 131072
Total time 164 hr, 13 min, 32 sec



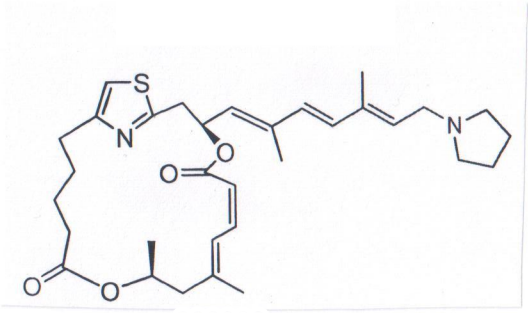
MZ181

Sample: MZ181
File: home/romo/mzhu/vnmrsys/data/MZ181-300MHz-rep.fid

Pulse Sequence: s2pul

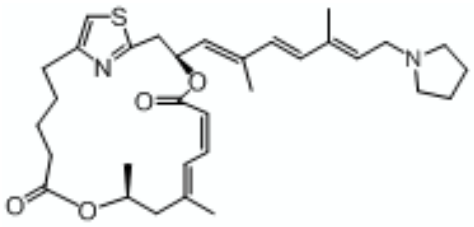
Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ181-300MHz-rep
INOVA-500 "inova500b"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 3599.6 Hz
8 repetitions
OBSERVE H1, 299.9579261 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 0 min, 31 sec



9c

MZ181



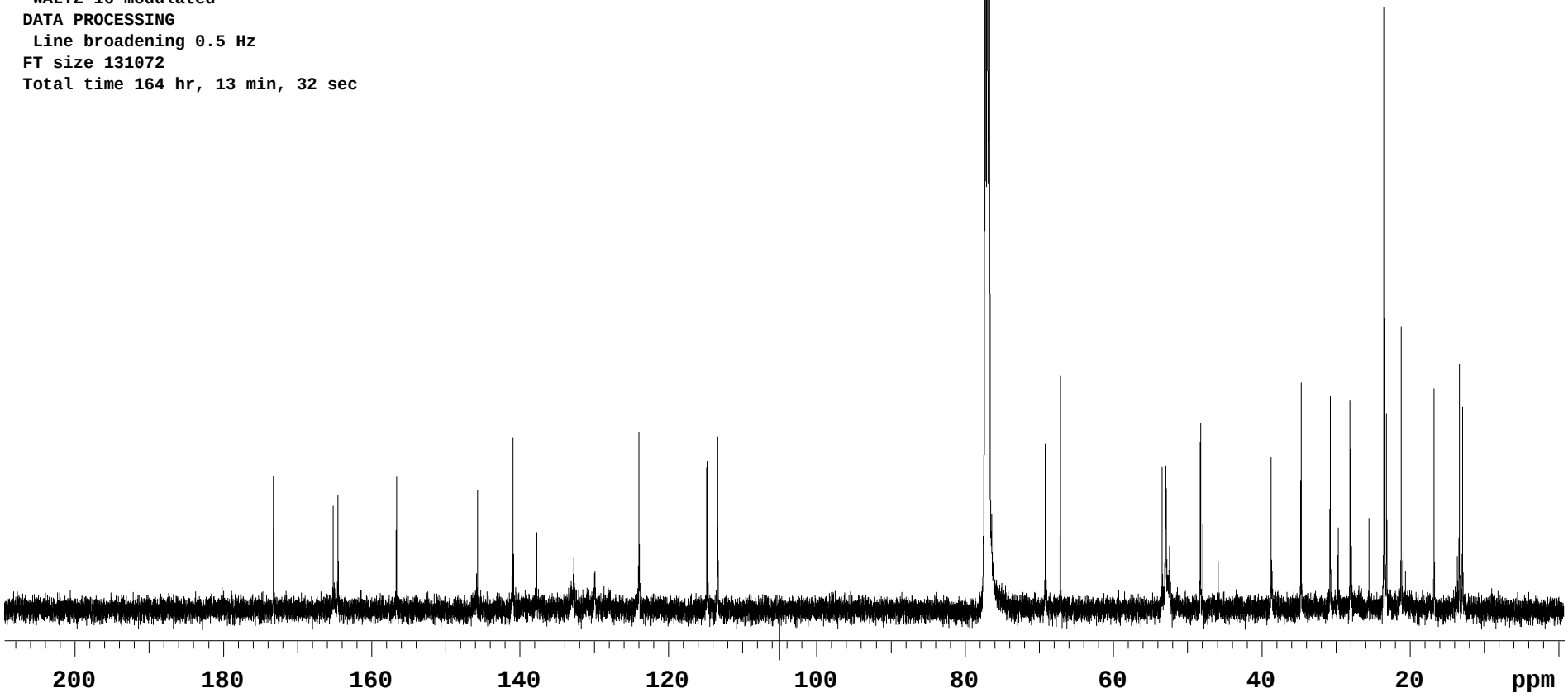
9c

Sample: MZ181
File: home/romo/mzhu/vnmrsys/data/MZ181-13C.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: jingli
File: MZ181-13C
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 30487.8 Hz
57728 repetitions
OBSERVE C13, 125.6848079 MHz
DECOUPLE H1, 499.8422608 MHz
Power 49 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Line broadening 0.5 Hz
FT size 131072
Total time 164 hr, 13 min, 32 sec



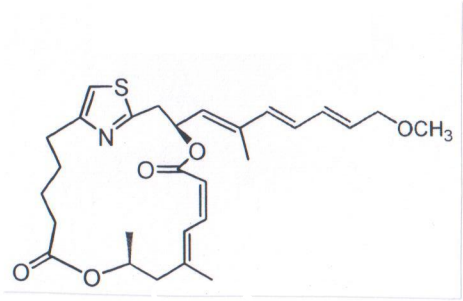
MZ205

Sample: MZ205
File: home/romo/mzhu/vnmrsys/data/MZ205-500MHz.fid

Pulse Sequence: s2pul

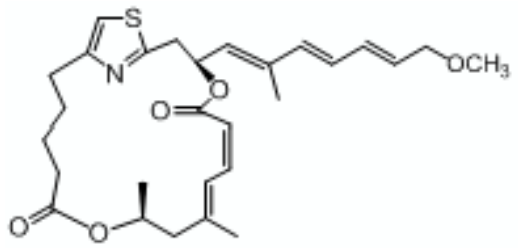
Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ205-500MHz
INOVA-500 "inova500b"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 5996.6 Hz
16 repetitions
OBSERVE H1, 499.7251090 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 0 min, 55 sec



9d

MZ205



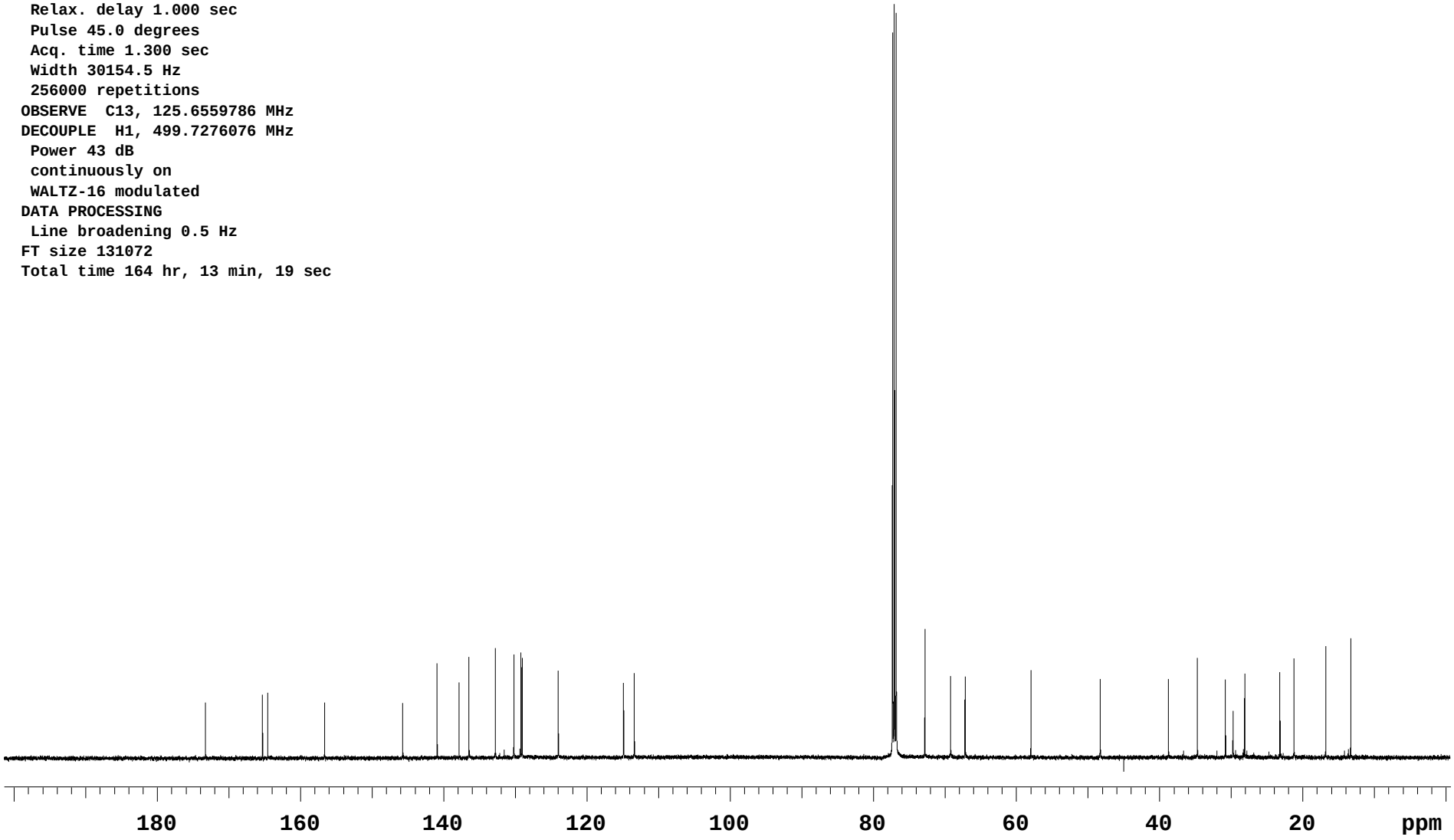
9d

Sample: MZ205
File: home/romo/mzhu/vnmrsys/data/MZ205-13C.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ205-13C
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 30154.5 Hz
256000 repetitions
OBSERVE C13, 125.6559786 MHz
DECOUPLE H1, 499.7276076 MHz
Power 43 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Line broadening 0.5 Hz
FT size 131072
Total time 164 hr, 13 min, 19 sec



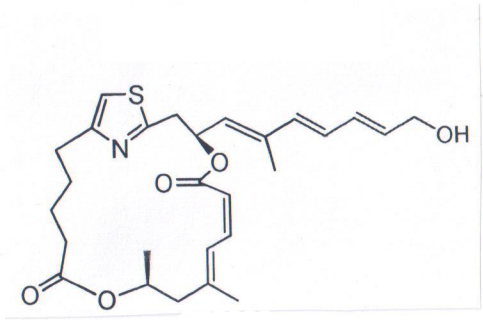
MZ203

Sample: MZ203
File: home/romo/mzhu/vnmrsys/data/MZ203-500MHz.fid

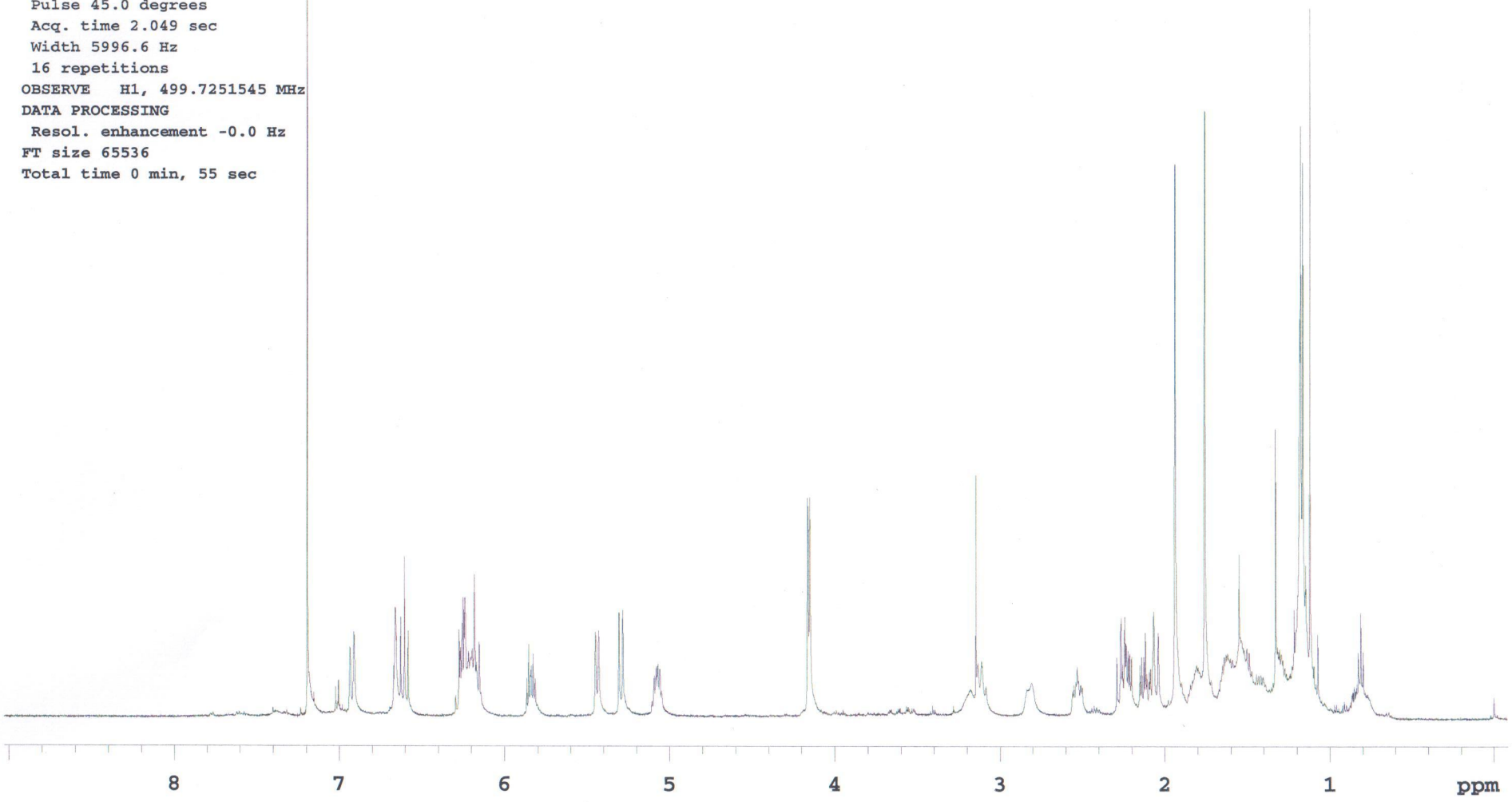
Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ203-500MHz
INOVA-500 "inova500b"

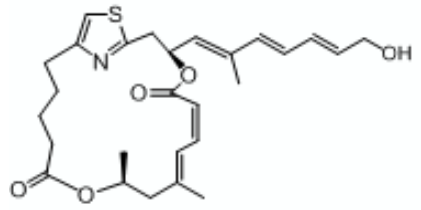
Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 5996.6 Hz
16 repetitions
OBSERVE H1, 499.7251545 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 0 min, 55 sec



9e



MZ-203



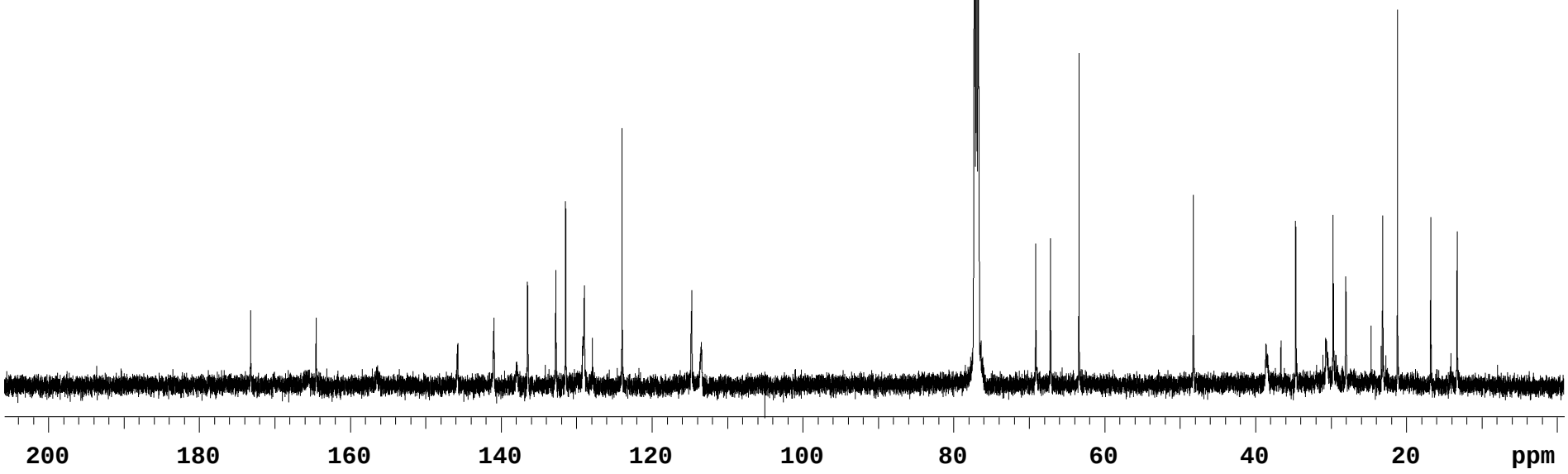
9e

File: home/romo/mzhu/vnmrsys/data/MZ203-13C-500MHz

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: jingli
File: MZ203-13C-500MHz (copy)
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 30487.8 Hz
31984 repetitions
OBSERVE C13, 125.6848065 MHz
DECOUPLE H1, 499.8422608 MHz
Power 49 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Line broadening 0.5 Hz
FT size 131072
Total time 164 hr, 13 min, 32 sec



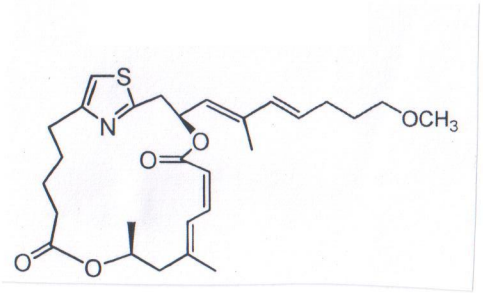
MZ190

Sample: MZ190
File: home/romo/mzhu/vnmrsys/data/MZ190-300MHz.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ190-300MHz
INOVA-500 "inova500b"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 3599.6 Hz
32 repetitions
OBSERVE H1, 299.9579261 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 1 min, 44 sec



9f

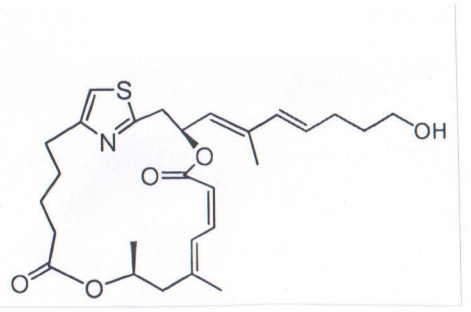
MZ189

Sample: MZ189
File: home/romo/mzhu/vnmrsys/data/MZ189-500MHz.fid

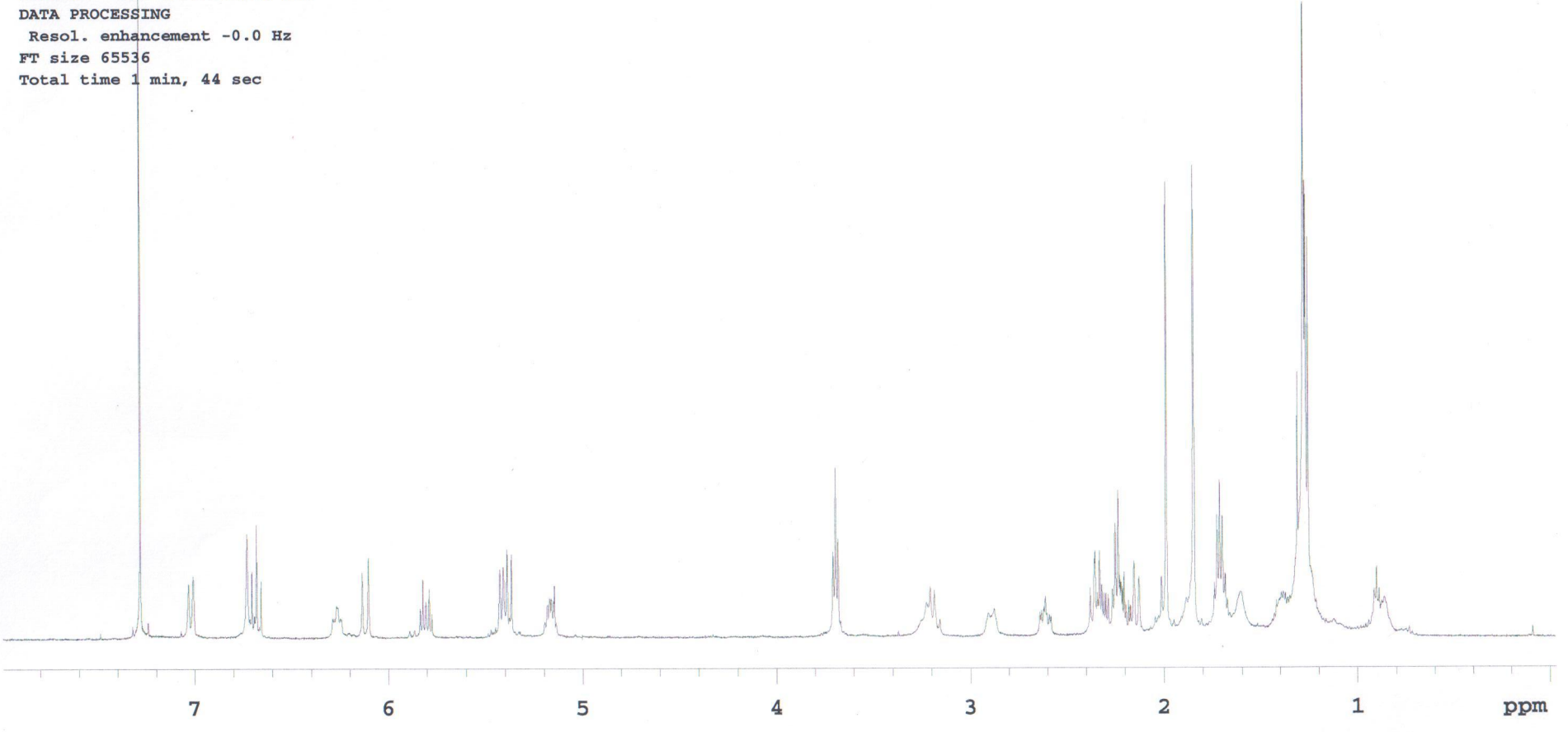
Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ189-500MHz
INOVA-500 "inova500b"

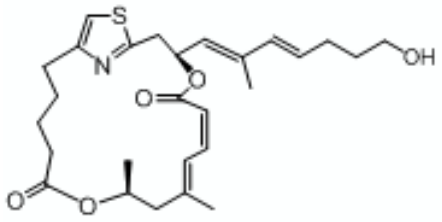
Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 5996.6 Hz
32 repetitions
OBSERVE H1, 499.7251090 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 1 min, 44 sec



9g



MZ189



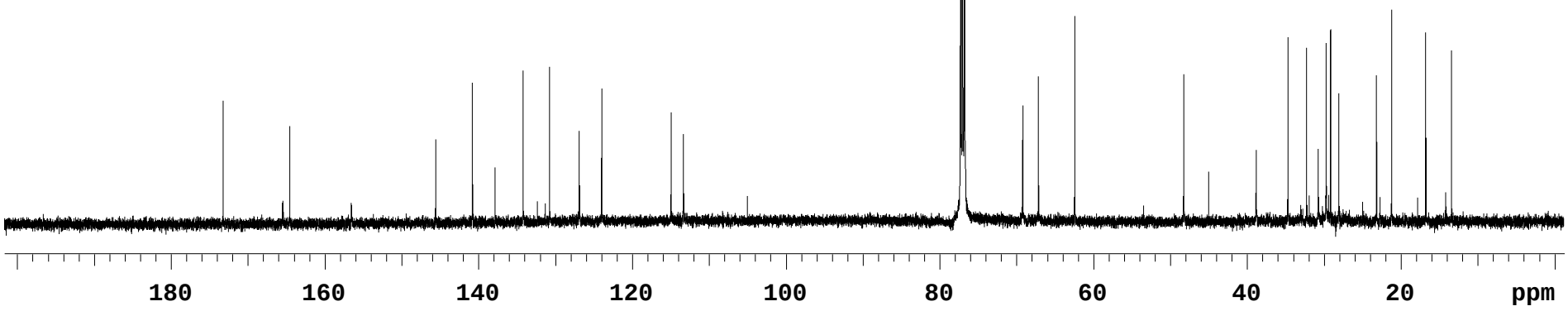
9g

Sample: MZ189
File: home/romo/mzhu/vnmrsys/data/MZ189-13C.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ189-13C
INOVA-500 "nmrsun1"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 1.300 sec
Width 30154.5 Hz
30976 repetitions
OBSERVE C13, 125.6559786 MHz
DECOUPLE H1, 499.7276076 MHz
Power 43 dB
continuously on
WALTZ-16 modulated
DATA PROCESSING
Line broadening 0.5 Hz
FT size 131072
Total time 164 hr, 13 min, 19 sec



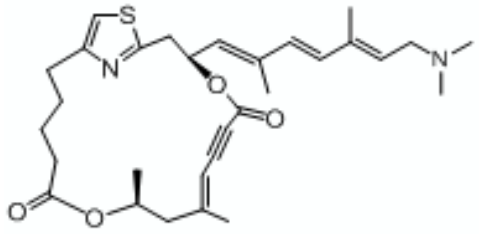
MZ216

Sample: MZ216
File: home/romo/mzhu/vnmrsys/data/MZ216-500MHz.fid

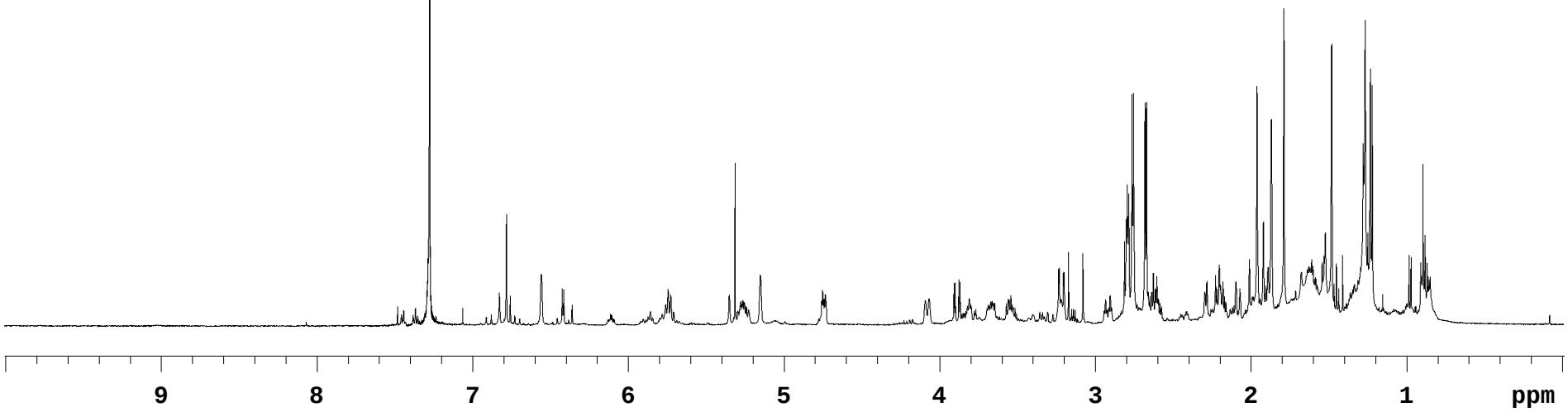
Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ216-500MHz
INOVA-500 "inova500"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7995.2 Hz
128 repetitions
OBSERVE H1, 499.6879772 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 16 hr, 59 min, 15 sec



10a



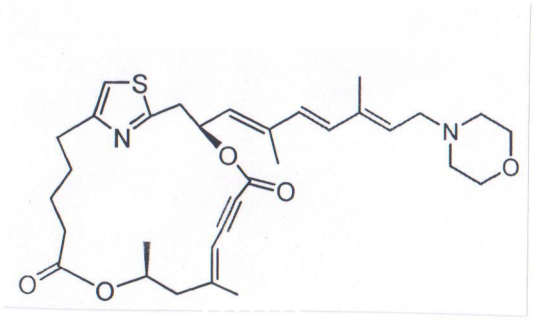
MZ195

Sample: MZ195
File: home/romo/mzhu/vnmrsys/data/MZ195-500MHz.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ195-500MHz
INOVA-500 "inova500b"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 5996.6 Hz
64 repetitions
OBSERVE H1, 499.7251090 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 3 min, 22 sec



10b

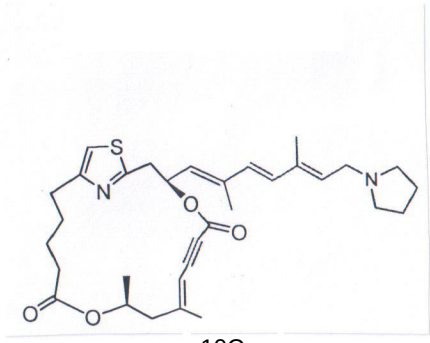
MZ220

Sample: MZ220
File: xp

Pulse Sequence: s2pul

Solvent: cdcl3
Temp. 37.0 C / 310.1 K
Operator: mzhu
INOVA-500 "inova500b"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 5993.0 Hz
32 repetitions
OBSERVE H1, 499.4256482 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 1 min, 44 sec



10C

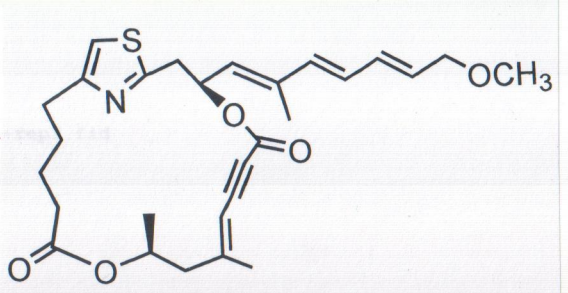
MZ221

Sample: MZ221
File: home/romo/mzhu/vnmrsys/data/MZ221

Pulse Sequence: s2pul

Solvent: cdcl3
Temp. 37.0 C / 310.1 K
Operator: mzhu
File: MZ221-rep2
INOVA-500 "inova500"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7995.2 Hz
32 repetitions
OBSERVE H1, 499.7055660 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 1 min, 44 sec



10d

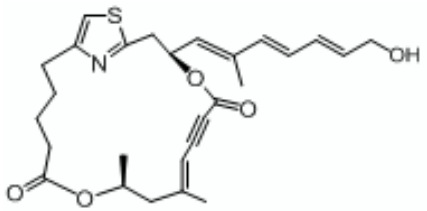
MZ217

Sample: MZ217
File: home/romo/mzhu/vnmrsys/data/MZ217-rep.fid

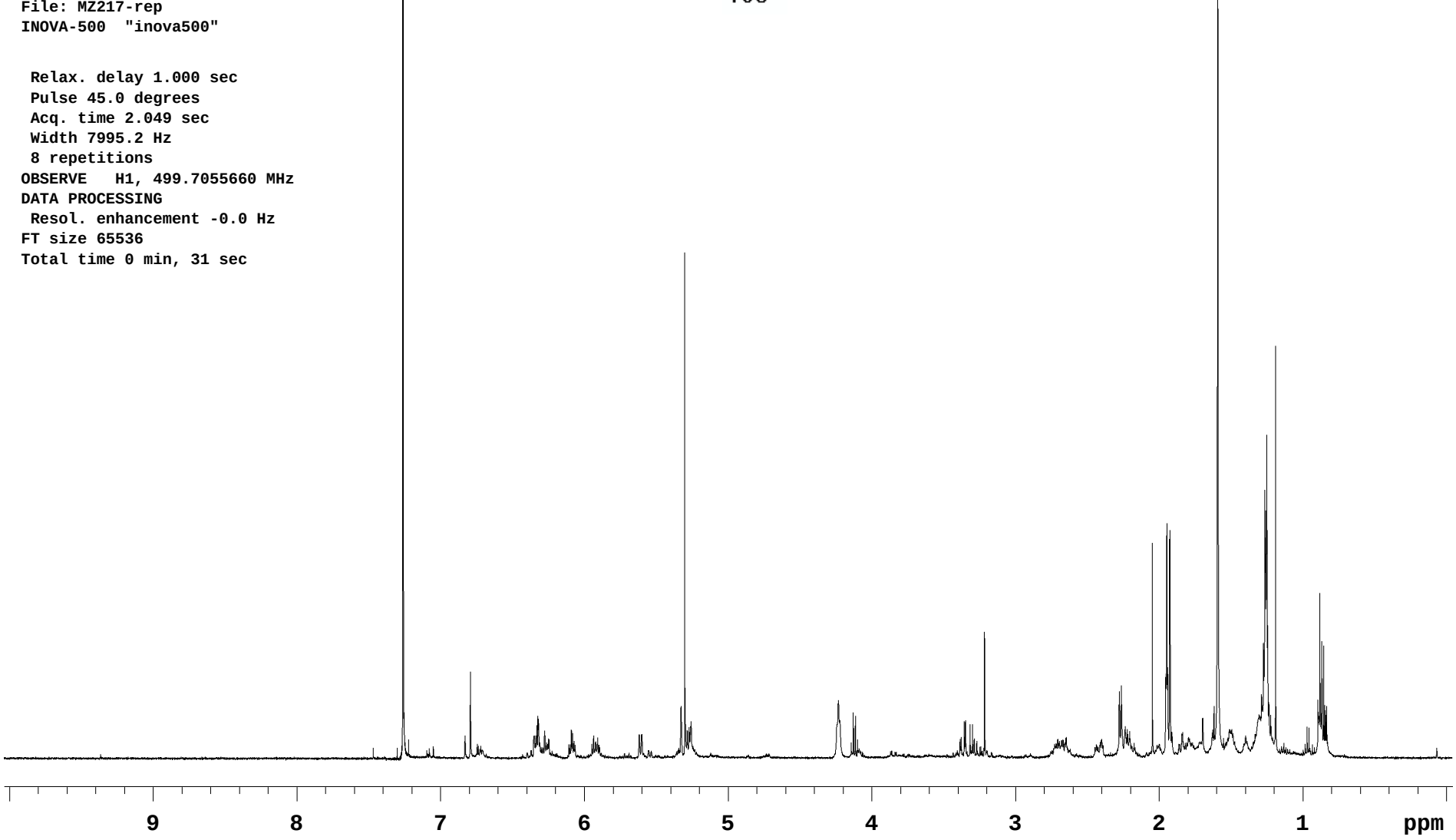
Pulse Sequence: s2pul

Solvent: cdcl3
Temp. 37.0 C / 310.1 K
Operator: mzhu
File: MZ217-rep
INOVA-500 "inova500"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 7995.2 Hz
8 repetitions
OBSERVE H1, 499.7055660 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 0 min, 31 sec



10e



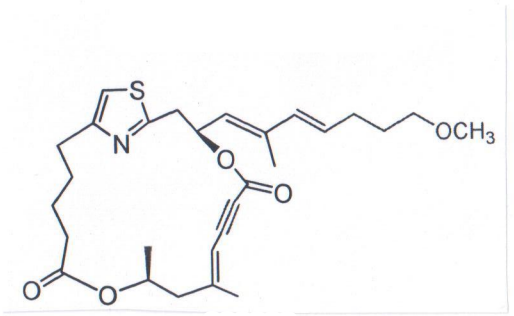
MZ201

Sample: MZ201
File: home/romo/mzhu/vnmrsys/data/MZ201-500MHz.fid

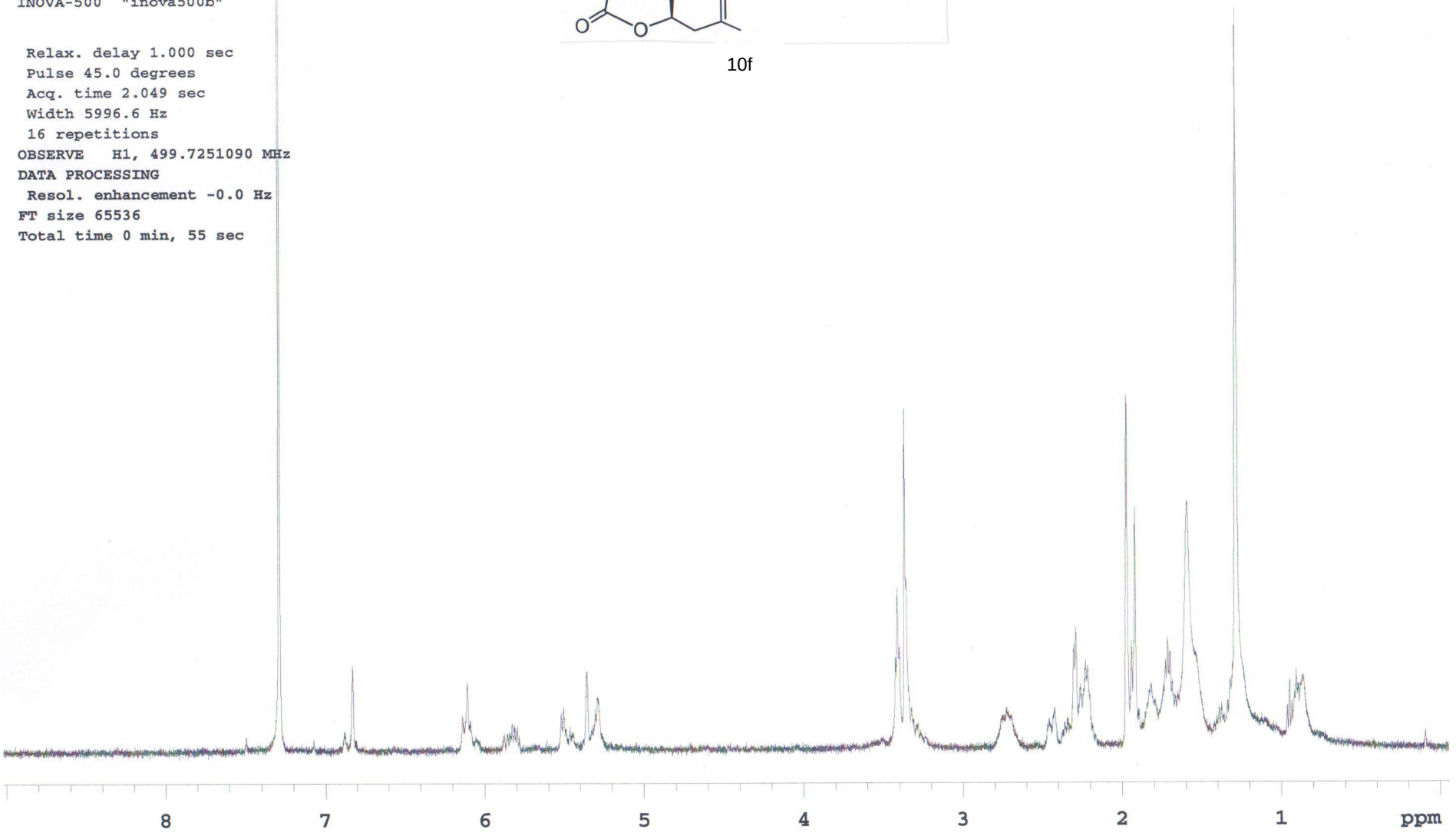
Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ201-500MHz
INOVA-500 "inova500b"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 5996.6 Hz
16 repetitions
OBSERVE H1, 499.7251090 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 0 min, 55 sec



10f



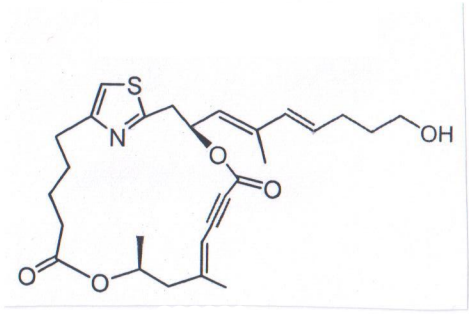
MZ200

Sample: MZ200
File: home/romo/mzhu/vnmrsys/data/MZ200-500MHz.fid

Pulse Sequence: s2pul

Solvent: cdcl3
Ambient temperature
Operator: mzhu
File: MZ200-500MHz
INOVA-500 "inova500b"

Relax. delay 1.000 sec
Pulse 45.0 degrees
Acq. time 2.049 sec
Width 5996.6 Hz
32 repetitions
OBSERVE H1, 499.7251090 MHz
DATA PROCESSING
Resol. enhancement -0.0 Hz
FT size 65536
Total time 1 min, 44 sec



10g