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Supporting information
For

The "Left-hand strategy" for design, synthesis and discovery of novel triazole-mercaptobenzothiazole hybrid compounds as potent quorum sensing inhibitors and anti-biofilm formation of *Pseudomonas aeruginosa*.

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1. Materials and methods

1.1. Chemistry

Solvent, reagents were purchased from Sigma-Aldrich, TCI and were used as is. The reported NMR-spectra (^{1}H-NMR) were recorded with 400/500 MHz Bruker Avance and the samples ran at 300K. ^{13}C-NMR were analysed at 151 MHz or 101 MHz (as indicated). Chemical shifts (δ) are reported in ppm which calibrated to the internal standard (the peak of NMR solvent). *J* values are reported in Hertz. Silica gel 60 F_{254} plates (pre-coated) were used for TLC and visualized under UV light. All synthesized compounds possess at least 95% purity before biological studies. Purities were analyzed on a Waters 2795 system equipped with a Waters 996 PDA detector and a Waters Symmetry C18 Column (2.1 x 50 mm, 3.5 l m), flow rate 0.2 mL/min. HRMS data were recorded on an electrospray (ESI) mass spectrometer

1.2. Biological sceering of the library compounds

1.2.1. Quorum sensing assay

Using the previously described methodology with a slight modification [1] *P. aeruginosa* quorum sensing reporter strains *lasB-gfp* was used for screening [2] the inhibition of QS system. The *Las* reporter strain was cultured, and grown for 20 h at 37 °C (180 rpm). Then the overnight cultures were diluted to a final OD_{450} of 0.1. The 96-well microtiter dishes were used for the assay (Black Isoplate, Waltham MA, USA). Library compounds, **4-NPO**, growth media and reporter strains OHHL [*N*-(3-oxohexanoyl)-l-homoserine lactone were added to the microtiter dishes. Victor X4 multilabel plate reader was used for monitoring the growth, green fluorescent protein (GFP) expression

(Waltham MA, USA). The assays were maintained at 34 °C, and the data was read every 15 min (over 20 h). GFP expression was recorded as fluorescence at 485 nm, 535 nm.

1.2.2. Anti-biofilm biomass.

The *P. aeruginosa* PA14 was used for the assay using the method previously described [3,4] with slight modification. Compounds was test with the concentration of 100 μM unless otherwise noted. DMSO was used as negative control. **4-NPO** was used as positive control. Briefly, the bacterial cultures were diluted to an OD600 of 0.02 in a fresh M63 minimal medium. 200 μL bacterial culture was transferred to each well of a 24- well imaging plate. After the compounds were added, plates were incubated at 30 °C for 48 h. Bacteria grew to the same density as the DMSO control under each condition tested. [4]. The measurements of biofilm biomass were performed by crystal violet (CV) staining method [9,10]. In three wells of the 96-well biofilm microplate were added 190 μL of 0.01% CV (Sigma-Aldrich). The resulting was incubated 30 min at room temparature. After that, the CV solution was removed. The resulting was washed with sterile water (3xtimes) and dry at 50 °C. Then 96% ethanol was added dropwise to each well for detaching biofilm. Absorbance measurement values at 570 nm. If a negative value for optical density (OD) was obtained, it was presented as zero. The experiment was performed with three replicates. Statistical significance was calculated using the students *t* test

1.2.3. Anti-violacein formation of *CviR* receptor.

The *C. violaceum* 31532 was used and grown at 30 °C for 24 h. The compounds were added to evaluate the production of violacein and analyzed by violacein extraction and quantification as described [5]. The overnight culture was incubated with or without peptides (100 μM) at 30 °C for 24 h. Then collect the bacterial cells. Re-dissolved in 1 mL

DMSO, remove cell debris and the absorbance of soluble violacein was read at 585nm using a microplate reader.

1.2.4. The protease assays.

The assay was performed using the previously described method [6]. Briefly, dilute the logarithmic growth phase of *P. aeruginosa* to OD600 = 0.1 PTSB medium. They then incubated at 37 °C for 8 h. In a 96 well plate, the bacterial culture and **4g**, **4h**, **4m** were added at a concentration of 50 μM. Then cultured for 24h at 37 °C. The absorbance was recorded using Spectramax M4 (Molecular Devices, USA) at 440 nm. Data was calculated subtracting OD440 recorded with the final OD600 values.

1.2.5. Cytotoxicity Assay.

Using the previously described methodology with a slight modification [7]. Firstly, the stock solution of the active compounds **4g, 4h, 4m** was prepared in DMSO as 200 uM. The testing concentrations were prepared from stock solution by diluting in growth medium (90% high glucose medium supplemented with 10% fetal bovine serum). The HeLa cells were grown as monolayers in the growth medium at 37°C (atmosphere containing 5% CO_2). When cells reached 70% confluence were detached from the culture flask with 5% trypsin-EDTA and resuspended in fresh culture media at a density of 5 x 104 cells/mL. By use of a Falcon 24-well, flat bottom plate, 500 μL of the cell suspension was added to each of the wells, and the cells were incubated for 24h at 37°C. Then the active compounds (with concentrations of 0, 1, 5, 10, 15, 20, 25, 30, 40, 50, 70, 100 μM) were added to each cell in triplicates and incubated for 24 h. Th cytotoxicity was performed using the in vitro toxicology assay kit, MTT based (Sigma). Absorbance values were measured at 570 nm and 690 nm. The absorbance values measured at 690 nm

were subtracted from the values measured at 570 nm when the data was analyzed. Data were normalized by subtracting the absorbance values of the growth medium treated equally than the rest of the samples.

2. Characterization of compounds

Compounds 3a-p:

Intermediate **2** alkyne (1 equiv), corresponding alkyne (1.1 equiv), CuI (10 mol%) were added to microwave vial in DMSO. The mixture was irradiated under microwave condition at 120 ^{o}C for 10 minutes (high absorption mode) using in Biotage microwave system. The reaction mixture was then diluted in 20 mL H_2O and extracted with 20 mL of ethyl acetae (x3 times). Organic solvent was removed under vacuum and purified using flash column chromatography to afford **3a**-**p**.

2-chloro-4-(4-phenyl-1H-1,2,3-triazol-1-yl)aniline (3a). 90% from **2**; mp 167- 1169 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.08 (s, 1H, CH-triazole), 7.94 – 7.88 (m, 2H, CH-phenyl), 7.63 (dd, J_1 = 12.1, J_2 = 2.4, 1H, CH-phenyl), 7.48 (dd, J_1 = 8.6, J_2 = 6.8, 3H, CH-phenyl), 7.37 (td, J_1 = 7.1, J_2 = 1.5, 1H, CH-phenyl), 6.94 (t, J = 9.1, 1H, CH-phenyl), 5.57 (s, 2H, NH_2).

2-chloro-4-(4-(*p*-tolyl)-1*H*-1,2,3-triazol-1-yl)aniline (3b). 94% from **2**; mp 175- 176 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.02 (s, 1H, CH-triazole), 7.83 – 7.76 (m, 2H, CH-phenyl), 7.62 (dd, J_1 = 12.1, J_2 = 2.4, 1H, CH-phenyl), 7.50 – 7.43 (m, 1H, CH-phenyl), 7.29 (d, J = 7.9, 2H, CH-phenyl), 6.93 (dd, J_1 = 9.6, J_2 = 8.6, 1H, CH-phenyl), 5.56 (s, 2H, NH_2), 2.34 (s, 3H, CH_3).

2-chloro-4-(3-bromophenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3c). 89% from **2**; mp 170-172 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.24 (d, J = 1.8, 1H, CH-triazole), 8.12 (t, J = 1.8,

1H, CH-phenyl), 7.96 (dd, J_1 = 7.8, J_2 = 1.4, 1H, CH-phenyl), 7.81 (d, J = 2.5, 1H, CH-phenyl), 7.61 (ddd, J_1 = 15.0, J_2 = 7.1, J_3 = 2.8, 2H, CH-phenyl), 7.48 (td, J_1 = 7.9, J_2 = 2.7, 1H, CH-phenyl), 6.99 (d, J = 8.7, 1H, CH-phenyl), 5.83 (s, 2H, NH_2).

2-chloro-4-(2-chlorophenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3d). 76% from **2**; mp 206-208 ^{O}C; ^{1}H NMR (600 MHz, DMSO) δ = 9.19 (s, 1H, CH-triazole), 7.98 – 7.93 (m, 2H, CH-phenyl), 7.81 (d, J = 2.5, 1H, CH-phenyl), 7.62 (dd, J_1 = 8.7, J_2 = 2.5, 1H, CH-phenyl), 7.62 – 7.56 (m, 2H, CH-phenyl), 6.99 (d, J = 8.7, 1H, CH-phenyl), 5.83 (s, 2H, NH_2).

2-chloro-4-(4-chlorophenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3e). 87% from **2**; mp 157-160 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.08 (s, 1H, CH-triazole), 8.10 (dd, J_1 = 7.7, J_2 = 1.8, 1H, CH-phenyl), 7.89 (d, J = 2.5, 1H, CH-phenyl), 7.73 – 7.41 (m, 5H, CH-phenyl), 6.99 (d, J = 8.8, 1H, CH-phenyl), 5.82 (s, 2H, NH_2).

2-chloro-4-benzyl-1*H*-1,2,3-triazol-1-yl)aniline (3f). 81% from **2**; mp 112- 113 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 8.41 (s, 1H, CH-triazole), 7.71 (d, J = 2.4, 1H, CH-phenyl), 7.52 (dd, J_1 = 8.8, J_2 = 2.5, 1H, CH-phenyl), 7.30 (d, J = 5.3, 4H, CH-phenyl), 7.21 (tt, J_1 = 5.1, J_2 = 3.2, 1H, CH-phenyl), 6.91 (d, J = 8.8, 1H, CH-phenyl), 5.71 (s, 2H, NH_2), 4.04 (s, 2H, CH_2).

2-chloro-4-(3-fluorophenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3g). 89% from **2**; yellow oil; ^{1}H NMR (400 MHz, DMSO) δ = 9.19 (s, 1H, CH-triazole), 7.79 (dt, J_1 = 7.7, J_2 =1.2, 1H, CH-phenyl), 7.73 (ddd, J_1 = 10.3, J_2 = 2.6, J_3 = 1.5, 1H, CH-phenyl), 7.68 – 7.52 (m, 2H, CH-phenyl), 7.52 – 7.45 (m, 1H, CH-phenyl), 7.28 – 7.18 (m, 1H, CH-phenyl), 6.97 (dd, J_1 = 9.5, J_2 = 8.6, 1H, CH-phenyl), 5.63 (s, 2H, NH_2).

2-chloro-4-(4-fluorophenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3h) was synthesized previously [8].

2-chloro-4-(2,4-difluorophenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3i). 80% from **2**; mp 164-165 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 8.90 (d, *J* = 3.2, 1H, CH-triazole), 8.17 (td, J_1 = 8.7, J_2 = 6.5, 1H, CH-phenyl), 7.85 (d, *J* = 2.5, 1H, CH-phenyl), 7.64 (dd, J_1 = 8.7, J_2 = 2.5, 1H, CH-phenyl), 7.44 (ddd, J_1 = 11.5, J_2 = 9.3, J_3 = 2.6, 1H, CH-phenyl), 7.33 – 7.16 (m, 1H, CH-phenyl), 6.95 (d, *J* = 8.7, 1H, CH-phenyl), 5.79 (s, 2H, NH_2).

2-chloro-4-(2-trifluoromethyl)phenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3j). 82% from **2**; mp 112- 114 ^{O}C; ^{1}H NMR (600 MHz, DMSO) δ = 8.84 (s, 1H, CH-triazole), 7.92 (d, *J* = 7.9, 1H, CH-phenyl), 7.85 (d, *J* = 2.5, 1H, CH-phenyl), 7.84 – 7.79 (m, 2H, CH-phenyl), 7.74 – 7.68 (m, 1H, CH-phenyl), 7.66 (dd, J_1 = 8.7, J_2 = 2.5, 1H, CH-phenyl), 6.99 (d, *J* = 8.7, 1H, CH-phenyl), 5.83 (s, 2H, NH_2).

2-chloro-4-(3-trifluoromethyl)phenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3k). 86% from **2**; mp 161- 162 ^{O}C;^{1}H NMR (400 MHz, DMSO) δ = 9.34 (s, 1H, CH-triazole), 8.25 (d, *J* = 4.3, 2H, CH-phenyl), 7.83 (d, *J* = 2.5, 1H, CH-phenyl), 7.82 – 7.72 (m, 2H, CH-phenyl), 7.64 (dd, J_1 = 8.8, J_2 = 2.5, 1H, CH-phenyl), 7.00 (d, *J* = 8.7, 1H, CH-phenyl), 5.84 (s, 2H, NH_2).

2-chloro-4-(4-trifluoromethyl)phenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3l). 85% from **2**; mp 215-217 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.32 (s, 1H, CH-triazole), 8.15 (d, *J* = 8.1, 2H, CH-phenyl), 7.89 (d, *J* = 8.1, 2H, CH-phenyl), 7.83 (d, *J* = 2.5, 1H, CH-phenyl), 7.64 (dd, J_1 = 8.7, J_2 = 2.5, 1H, CH-phenyl), 7.00 (d, *J* = 8.7, 1H, CH-phenyl), 5.84 (s, 2H, NH_2).

2-chloro-4-(3-methoxyphenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3m). 94% from **2**; light yellow oil; ^{1}H NMR (600 MHz, DMSO) δ = 9.11 (s, 1H, CH-triazole), 7.62 (dd, J_1 = 12.0,

J_2 = 2.4, 1H, CH-phenyl), 7.54 – 7.44 (m, 3H, CH-phenyl), 7.39 (t, J =7.9, 1H, CH-phenyl), 6.96 – 6.90 (m, 2H, CH-phenyl), 5.58 (s, 2H, NH_2), 3.83 (s, 3H, OCH_3).

2-chloro-4-(thiophen-3-yl)phenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3n). 93% from **2**; mp 188-189 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.00 (s, 1H, CH-triazole), 7.92 (dd, J_1 = 2.9, J_2 = 1.3, 1H, CH-thiophen), 7.79 (d, J = 2.5, 1H, CH-phenyl), 7.71 (dd, J_1 = 5.0, J_2 = 2.9, 1H, CH-thiphen), 7.65 – 7.55 (m, 2H, CH-phenyl & CH-thiophen), 6.99 (d, J = 8.8, 1H, CH-phenyl), 5.80 (s, 2H, NH_2).

2-chloro-4-(4-ethylphenyl)-1*H*-1,2,3-triazol-1-yl)aniline (3o). 98% from **2**; mp 120-122 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.08 (s, 1H, CH-triazole), 7.88 – 7.79 (m, 3H, CH-phenyl), 7.63 (dd, J_1 = 8.7, J_2 = 2.5, 1H, CH-phenyl), 7.35 (d, J = 8.1, 2H, CH-phenyl), 6.99 (d, J = 8.8, 1H, CH-phenyl), 5.80 (s, 2H, NH_2), 2.67 (q, J = 7.6, 2H, CH_2), 1.24 (t, J = 7.6, 3H, CH_3).

2-chloro-4-(4-(pyridin-2-yl)-1H-1,2,3-triazol-1-yl)aniline (3p). 89% from **2**; mp 170.1-172.1 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 9.15 (s, 1H, CH-triazole), 8.67 (dt, J_1 = 4.7, J_2 = 1.4, 1H, CH-pyridine), 8.15 – 8.08 (m, 1H, CH-phenyl), 7.95 (td, J_1 = 7.7, J_2 = 1.8, 1H, CH-pyridine), 7.90 (d, J = 2.5, 1H, CH-pyridine), 7.69 (dd, J_1 = 8.7, J_2 = 2.6, 1H, CH-phenyl), 7.41 (ddd, J_1 = 7.6, J_2 = 4.9, 1.2, 1H, CH-pyridine), 6.98 (d, J = 8.7, 1H, CH-phenyl), 5.81 (s, 2H, NH_2).

Compounds 4a-p

Compounds **3a-n** (100 mg) was dissolved in 10 mL DMAC followed by *O*-isopropylxanthic acid potassium salt (1.5 equiv). The mixture was irradiated under microwave condition (150 ^{o}C, 5 min). The reaction mixture was then diluted in 50 mL H_2O and kept at room

temperature for 1h. The precipitated product was filtered and washed several times with H_2O, cold acetone, cold ethanol to afforded the products **4a**-**p**.

6-(4-phenyl-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4a): Purity 98.2% by HPLC; Yield 88%**;** mp 266- 267 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.03 (s, 1H, SH), 9.28 (s, 1H, CH-triazole), 8.36 (d, *J* = 2.2, 1H, CH-benzothiazole), 8.02 – 7.92 (m, 3H, CH-phenyl & benzothiazole), 7.56 – 7.47 (m, 3H, CH-phenyl & benzothiazole), 7.45 – 7.36 (m, 1H). ^{13}C NMR (101 MHz, DMSO) δ 190.56, 147.35, 141.26, 133.11, 130.76, 130.13, 129.01, 128.28, 125.31, 119.83, 119.67, 113.85, 113.12. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{15}H_{11}N_4S_2^+$ 311.0425, found 311.0425.

6-(4-(p-tolyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4b): Purity 100% by HPLC; Yield 70%**;** mp 282-283 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.03 (s, 1H, SH), 9.22 (s, 1H, CH-triazole), 8.35 (d, *J* = 2.2, 1H, CH-benzothiazole), 7.97 (dd, J_1 = 8.7, J_2 = 2.2, 1H, CH-benzothiazole), 7.88 – 7.81 (m, 2H, CH-phenyl), 7.51 (d, *J* = 8.7, 1H, CH-benzothiazole), 7.33 (d, *J* = 7.9, 2H, CH-phenyl), 2.38 (s, 3H, CH_3). ^{13}C NMR (101 MHz, DMSO) δ 190.52, 147.41, 141.23, 137.66, 133.13, 130.75, 129.54, 127.34, 125.23, 119.59, 119.35, 113.75, 113.10, 20.85. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{16}H_{13}N_4S_2^+$ 325.0582, found 325.0580.

6-(4-(3-bromophenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4c): Purity 98.8% by HPLC; Yield 89%**;** mp 216-217 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.06 (s, 1H, SH), 9.40 (s, 1H, CH-triazole), 8.35 (d, *J* = 2.2, 1H, CH-benzothiazole), 8.14 (t, *J* = 1.8, 1H, CH-phenyl), 7.97 (ddd, J_1 = 8.8, J_2 = 6.0, J_3 = 1.8, 2H, CH-phenyl), 7.60 (dt, J_1 = 8.3, J_2 = 1.2, 1H, CH-benzothiazole), 7.55 – 7.45 (m, 2H, CH-benzothiazole & phenyl). ^{13}C NMR (101 MHz, DMSO) δ 190.59, 145.86, 141.38, 132.97, 132.46, 131.26, 130.95,

130.80, 127.79, 124.14, 122.35, 120.64, 119.63, 113.86, 113.17. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{15}H_{10}BrN_4S_2^+$ 388.9530, found 388.9532.

6-(4-(2-chlorophenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4d): Purity 100% by HPLC; Yield 80%**;** mp 268-269 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.02 (s, 1H, SH), 9.22 (s, 1H, CH-triazole), 8.42 (d, *J* = 2.2, 1H, CH-benzothiazole), 8.13 (dd, J_1 = 7.7, J_2 = 1.8, 1H, CH-phenyl), 8.05 (dd, J_1 = 8.7, J_2 = 2.2, 1H, CH-benzothiazole), 7.64 (dd, J_1 = 7.8, J_2 = 1.5, 1H, CH-phenyl), 7.50 (dqd, J_1 = 14.7, J_2 = 7.5, J_3 = 1.6, 3H, CH-benzothiazole & phenyl). ^{13}C NMR (101 MHz, DMSO) δ 190.59, 143.86, 141.34, 132.90, 130.68, 130.28, 129.90, 129.85, 128.66, 127.59, 122.34, 119.97, 114.15, 113.04. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{15}H_{10}ClN_4S_2^+$ 345.0035, found 345.0035.

6-(4-(4-chlorophenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4e): Purity 99.9% by HPLC; Yield 90%**;** mp 278-280 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.03 (s, 1H, SH), 9.33 (dd, *J* = 4.3, 1.6, 1H, CH-triazole), 8.35 (q, *J* = 2.4, 1H, CH-benzothiazole), 7.97 (ddt, J_1 = 8.4, J_2 = 4.6, J_3 = 1.9, 2H, CH-phenyl), 7.60 (dt, J_1 = 8.6, J_2 = 2.1, 2H, CH-phenyl), 7.51 (dd, J_1 = 8.7, J_2 = 2.4, 1H, CH-benzothiazole), 7.43 – 7.30 (m, 1H, CH-benzothiazole). ^{13}C NMR (101 MHz, DMSO) δ 190.58, 146.25, 141.33, 133.00, 132.73, 130.77, 129.09, 129.04, 126.97, 120.20, 119.68, 113.87, 113.12. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{15}H_{10}ClN_4S_2^+$ 345.0035, found 345.0035.

6-(4-benzyl-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4f): Purity 96.6% by HPLC; Yield 77%**;** mp 238- 239 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 13.97 (s, 1H, SH), 8.54 (s, 1H, CH-triazole), 8.28 (s, 1H, CH-benzothiazole), 7.91 (dd, J_1 = 8.7, J_2 = 2.2, 1H, CH-benzothiazole), 7.45 (d, *J* = 8.8, 1H, CH-benzothiazole), 7.33 (d, *J* = 4.4, 4H, CH-phenyl), 7.25 (m, 1H, CH-phenyl), 4.11 (s, 2H, CH_2). ^{13}C NMR (151 MHz, DMSO) δ 147.94,

139.79, 133.80, 129.18, 129.09, 126.90, 121.55, 120.10, 114.26, 31.83. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{16}H_{13}N_4S_2^+$ 325.0582, found 325.0581.

6-(4-(3-fluorophenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4g): Purity 99.7% by HPLC, Yield 90%**;** mp 266-267 ^oC; ^1H NMR (400 MHz, DMSO) δ = 14.04 (s, 1H, SH), 9.36 (s, 1H, CH-triazole), 8.35 (d, *J* = 2.2, 1H, CH-benzothiazole), 7.96 (dd, J_1 = 8.7, J_2 = 2.2, 1H, CH-benzothiazole), 7.81 (dt, J_1 = 7.7, J_2 = 1.2, 1H, CH-phenyl), 7.75 (ddd, J_1 = 10.2, J_2 = 2.6, J_3 = 1.4, 1H, CH-phenyl), 7.64 – 7.47 (m, 2H, CH-phenyl), 7.25 (td, J_1 = 8.5, J_2 = 2.4, 1H, CH-benzothiazole).^{13}C NMR (101 MHz, DMSO-d_6) *δ* 190.61, 163.79 (d, *J* = 243.4 Hz), 146.24 (d, *J* = 2.8 Hz), 141.36, 132.97, 132.53 (d, *J* = 8.5 Hz), 131.14 (d, *J* = 8.6 Hz), 130.79, 121.34 (d, *J* = 2.9 Hz), 120.59, 119.69, 115.09 (d, *J* = 21.1 Hz), 113.91, 113.14, 112.00 (d, *J* = 23.0 Hz). HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{15}H_{10}FN_4S_2^+$ 329.0331, found 329.0330.

6-(4-(4-fluorophenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4h): Purity 100% by HPLC; Yield 71%**;** mp 270-273 ^oC; ^1H NMR (600 MHz, DMSO) δ = 14.06 (s, 1H, SH), 9.29 (s, 1H, CH-triazole), 8.35 (d, *J* = 2.3, 1H, CH-benzothiazole), 7.99 (tdd, J_1 = 14.6, J_2 = 7.8, J_3 = 3.1, 3H, CH-benzothiazole & phenyl), 7.52 (d, *J* = 8.6, 1H, CH-benzothiazole), 7.38 (t, *J* = 8.8, 2H, CH-phenyl).^{13}C NMR (151 MHz, DMSO-d_6) δ 191.06, 163.30 (d, *J* = 245.0 Hz), 146.96, 141.79, 133.55, 131.26, 127.87 (d, *J* = 8.5 Hz), 127.74 (d, *J* = 3.7 Hz), 120.27, 120.15, 116.56 (d, *J* = 22.2 Hz), 114.34, 113.62. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{15}H_{10}FN_4S_2^+$ 329.0331, found 329.0333.

6-(4-(2,4-difluorophenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4i): Purity 98.3% by HPLC; Yield 88%**;** mp 230-232 ^oC; ^1H NMR (400 MHz, DMSO) δ = 14.00 (s,

1H, SH), 9.03 (d, *J* = 3.1, 1H, CH-triazole), 8.39 (d, *J* = 2.3, 1H, CH-benzothiazole), 8.21 (td, J_1 = 8.7, J_2 = 6.5, 1H, CH-phenyl), 8.03 (dd, J_1 = 8.7, J_2 = 2.3, 1H, CH-benzothiazole), 7.47 (td, J_1 = 9.8, J_2 = 3.3, 2H, CH-benzothiazole & phenyl), 7.28 (td, J_1 = 8.5, J_2 = 2.6, 1H, CH-phenyl).^{13}C NMR (151 MHz, DMSO-d_6) *δ* 191.18, 162.50 (dd, *J* = 247.9, 12.5 Hz), 159.13 (dd, *J* = 251.8, 13.5 Hz), 141.92, 140.89 (d, *J* = 4.4 Hz), 133.46, 131.24, 129.42 (dd, *J* = 10.6, 5.5 Hz), 122.00 (d, *J* = 11.3 Hz), 119.01, 114.65 (dd, *J* = 14.0, 4.5 Hz), 114.54, 113.49, 112.85 (dd, *J* = 21.9, 4.3 Hz), 105.18 (t, *J* = 26.2 Hz). HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{15}H_8F_2N_4S_2^+$ 347.0237, found 347.0236.

6-(4-(2-(trifluoromethyl)phenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4j): Purity 98.8% by HPLC; Yield 73%**;** mp 266-267 ^{O}C; ^{1}H NMR (600 MHz, DMSO) δ = 14.06 (s, 1H, SH), 8.98 (s, 1H, CH-triazole), 8.40 (d, *J* = 2.2, 1H, CH-benzothiazole), 8.03 (dd, J_1 = 8.7, J_2 = 2.2, 1H, CH-benzothiazole), 7.95 (d, *J* = 7.9, 1H, CH-phenyl), 7.88 – 7.80 (m, 2H, CH-phenyl), 7.73 (td, J_1 = 6.6, J_2 = 3.0, 1H, CH-phenyl), 7.52 (d, *J* = 8.7, 1H, CH-benzothiazole). ^{13}C NMR (151 MHz, DMSO-d_6) *δ* 191.10, 145.20, 142.12, 133.37, 133.23, 132.68, 131.32, 129.79, 129.38 (d, *J* = 2.3 Hz), 127.25 (q, *J* = 30.1 Hz), 126.95 (q, *J* = 5.5 Hz), 124.52 (q, *J* = 273.5 Hz), 122.82 (q, *J* = 3.2 Hz), 120.44, 114.62, 113.72. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{16}H_{10}F_3N_4S_2^+$ 379.0299, found 379.0299.

6-(4-(3-(trifluoromethyl)phenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4k): Purity 99.1 % by HPLC; Yield 78%**;** mp 268-272 ^{O}C; ^{1}H NMR (600 MHz, DMSO) δ = 14.08 (s, 1H, SH), 9.50 (s, 1H, CH-triazole), 8.37 (s, 1H, CH-benzothiazole), 8.28 (d, *J* = 2.7, 2H, CH-phenyl), 7.98 (dd, J_1 = 8.5, 2.3, 1H, CH-benzothiazole), 7.78 (dd, J_1 = 4.8, J_1 = 1.9, 2H, CH-phenyl), 7.54 (d, *J* = 8.7, 1H, CH-benzothiazole). ^{13}C NMR (151 MHz, DMSO-d_6) *δ* 191.04, 146.41, 142.01, 133.43, 131.71, 131.39, 130.78, 130.46 (q, *J* = 32.8, 31.8

Hz), 129.51, 125.24 (d, *J* = 4.1 Hz), 124.52 (q, *J* = 273.7 Hz), 122.22 (d, *J* = 4.6 Hz), 121.36, 120.08, 114.33, 113.69. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{16}H_{10}F_3N_4S_2^+$ 379.0299, found 379.0299.

6-(4-(4-(trifluoromethyl)phenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4l): Purity 99.0% by HPLC; Yield 72%**;** mp 260-263 ^{O}C; ^{1}H NMR (600 MHz, DMSO) δ = 14.05 (s, 1H, SH), 9.47 (s, 1H, CH-triazole), 8.37 (s, 1H, CH-benzothiazole), 8.18 (d, *J* = 8.0, 2H, CH-phenyl), 7.99 (d, *J* = 9.6, 1H, CH-benzothiazole), 7.91 (d, *J* = 8.0, 2H, CH-phenyl), 7.52 (d, *J* = 8.7, 1H, CH-benzothiazole). ^{13}C NMR (151 MHz, DMSO-d_6) *δ* 191.30, 146.62, 142.10, 134.77, 133.61, 131.45, 129.10 (q, *J* = 31.8 Hz), 127.52 (q, *J* = 3.9 Hz), 126.30, 124.67 (q, *J* = 271.8 Hz), 121.64, 120.23, 114.45, 113.62. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{16}H_{10}F_3N_4S_2^+$ 379.0299, found 379.0299.

6-(4-(3-methoxyphenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4m): Purity 100% by HPLC; Yield 91%**;** mp 252-253 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.03 (s, 1H, SH), 9.30 (s, 1H, CH-triazole), 8.35 (d, *J* = 2.1, 1H, CH-benzothiazole), 7.97 (dd, J_1 = 8.7, J_2 = 2.2, 1H, CH-benzothiazole), 7.58 – 7.48 (m, 3H, CH-benzothiazole & phenyl), 7.44 (t, *J* = 7.9, 1H, CH-phenyl), 6.98 (ddd, J_1 = 8.2, J_2 = 2.5, J_3 = 1.0, 1H, CH-phenyl), 3.86 (s, 3H, CH_3). ^{13}C NMR (101 MHz, DMSO) δ 190.57, 159.73, 147.26, 141.26, 133.08, 131.44, 130.76, 130.16, 120.04, 119.62, 117.61, 114.01, 113.80, 113.11, 110.56, 55.16. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{16}H_{13}N_4OS_2^+$ 341.0531, found 341.0532.

6-(4-(thiophen-3-yl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4n): Purity 100% by HPLC; Yield 75%**;** mp 266-269 ^{O}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.05 (s, 1H, SH), 9.18 (s, 1H, CH-triazole), 8.38 (s, 1H, CH-benzothiazole), 8.02 – 7.95 (m, 2H, CH-

benzothiazole & thiophen), 7.76 (dd, J_1 = 5.0, J_1 = 2.9, 1H, CH-thiophen), 7.63 (dd, J_1 = 5.0, J_1 = 1.3, 1H, CH-thiophen), 7.54 (d, J_1 = 8.7, 1H, CH-benzothiazole). ^{13}C NMR (101 MHz, DMSO) δ 191.06, 144.38, 141.73, 133.56, 131.86, 131.26, 127.94, 126.22, 121.98, 120.11, 120.01, 114.31, 113.60. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{13}H_9N_4S_3^+$ 316.9989, found 316.9987.

6-(4-(4-ethylphenyl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thiol (4o). Purity 99.7% by HPLC; Yield 84%**;** mp 276-279 ^{o}C; ^{1}H NMR (400 MHz, DMSO) δ = 14.03 (s, 1H, SH), 9.23 (s, 1H, CH-triazole), 8.35 (d, J = 2.2, 1H, CH-benzothizole), 7.98 (dd, J_1 = 8.7, J_2 = 2.2, 1H, CH-benzothizole), 7.87 (d, J = 8.1, 2H, CH-phenyl), 7.51 (d, J = 8.7, 1H, CH-benzothizole), 7.36 (d, J = 8.0, 2H, CH-phenyl), 2.68 (q, J = 7.6, 2H, CH_2), 1.24 (t, J = 7.6, 3H, CH_3). ^{13}C NMR (101 MHz, DMSO) δ 190.53, 147.44, 143.98, 133.14, 130.76, 128.37, 127.60, 125.33, 119.61, 119.38, 113.77, 113.11, 27.94, 15.44. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{17}H_{15}N_4S_2^+$ 339.0738, found 339.0738.

6-(4-(pyridin-2-yl)-1H-1,2,3-triazol-1-yl)benzo[d]thiazole-2-thio (4p): Purity 97.4% by HPLC; Yield 59%; mp 292-296 ^{O}C; ^{1}H NMR (600 MHz, DMSO) δ = 14.06 (s, 1H, SH), 9.35 (s, 1H, CH-triazole), 8.72 – 8.68 (m, 1H, CH-pyridine), 8.44 (d, J = 2.2, 1H, CH-benzothiazole), 8.17 (d, J = 7.9, 1H, CH-pyridine), 8.07 (dd, J = 8.7, 2.2, 1H, CH-benzothiazole), 8.03 (td, J_1 = 7.7, J_1 = 1.8, 1H, CH-pyridine), 7.53 – 7.45 (m, 2H, CH-benzothiazole & pyridine). ^{1}H NMR (600 MHz, DMSO-d_6) δ 14.04 (s, 1H), 9.32 (s, 1H), 8.68 (d, J = 4.2 Hz, 1H), 8.42 (d, J = 2.2 Hz, 1H), 8.15 (d, J = 7.9 Hz, 1H), 8.05 (dd, J = 8.7, 2.2 Hz, 1H), 8.00 (td, J = 7.7, 1.8 Hz, 1H), 7.49 (d, J = 8.7 Hz, 1H), 7.45 (ddd, J = 7.6, 4.9, 1.2 Hz, 1H). ^{13}C NMR (151 MHz, DMSO) δ 190.45, 149.17, 148.83, 147.64,

141.27, 137.79, 132.83, 130.58, 123.42, 121.52, 119.90, 119.71, 113.91, 112.97. HRMS (ESI) m/z $[M+H]^+$ calcd for $C_{14}H_{10}N_5S_2^+$ 312.0377, found 312.0376.

References

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6.Copy of NMR of all compounds and Chromatographic Analysis for 4a-p

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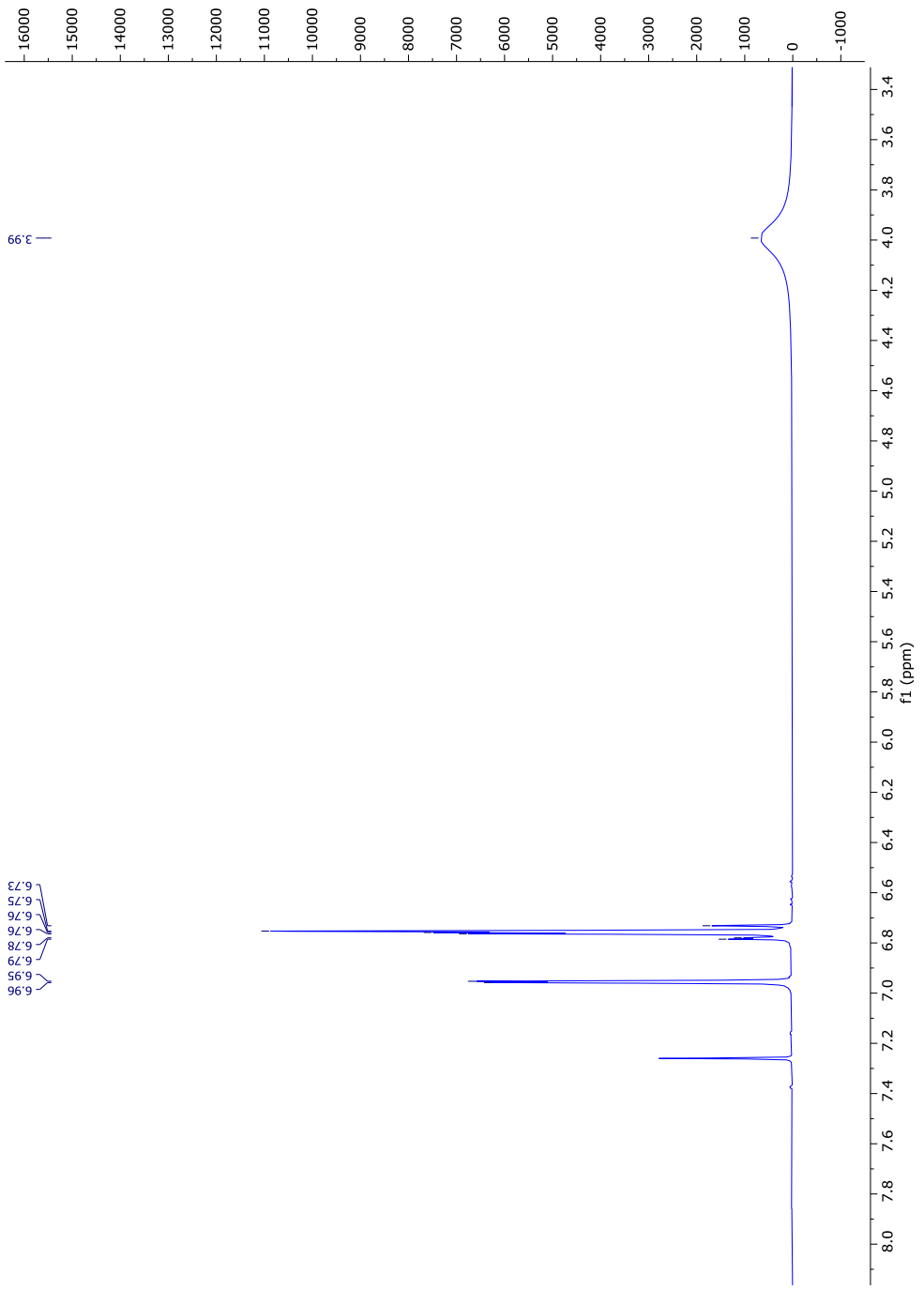

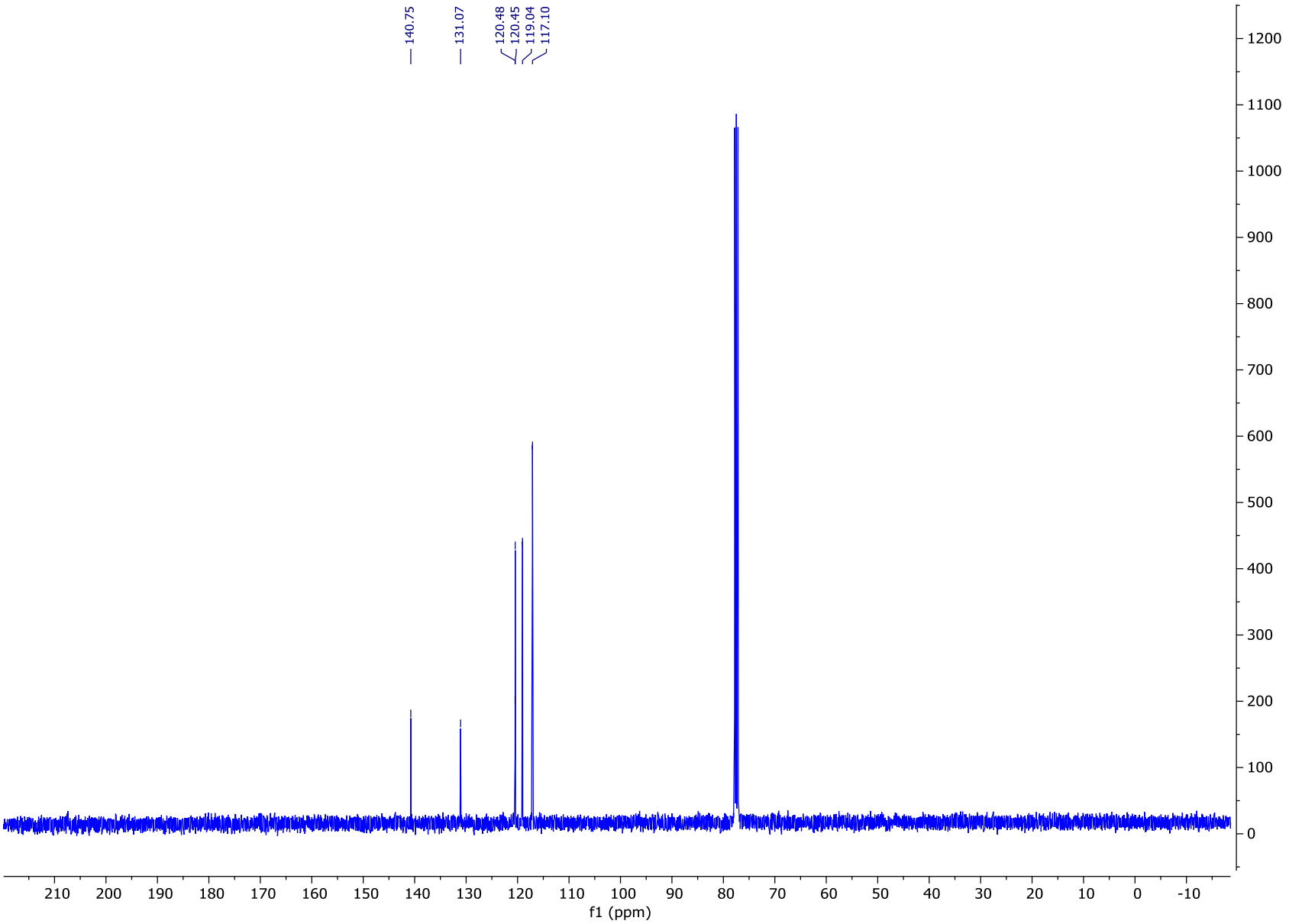
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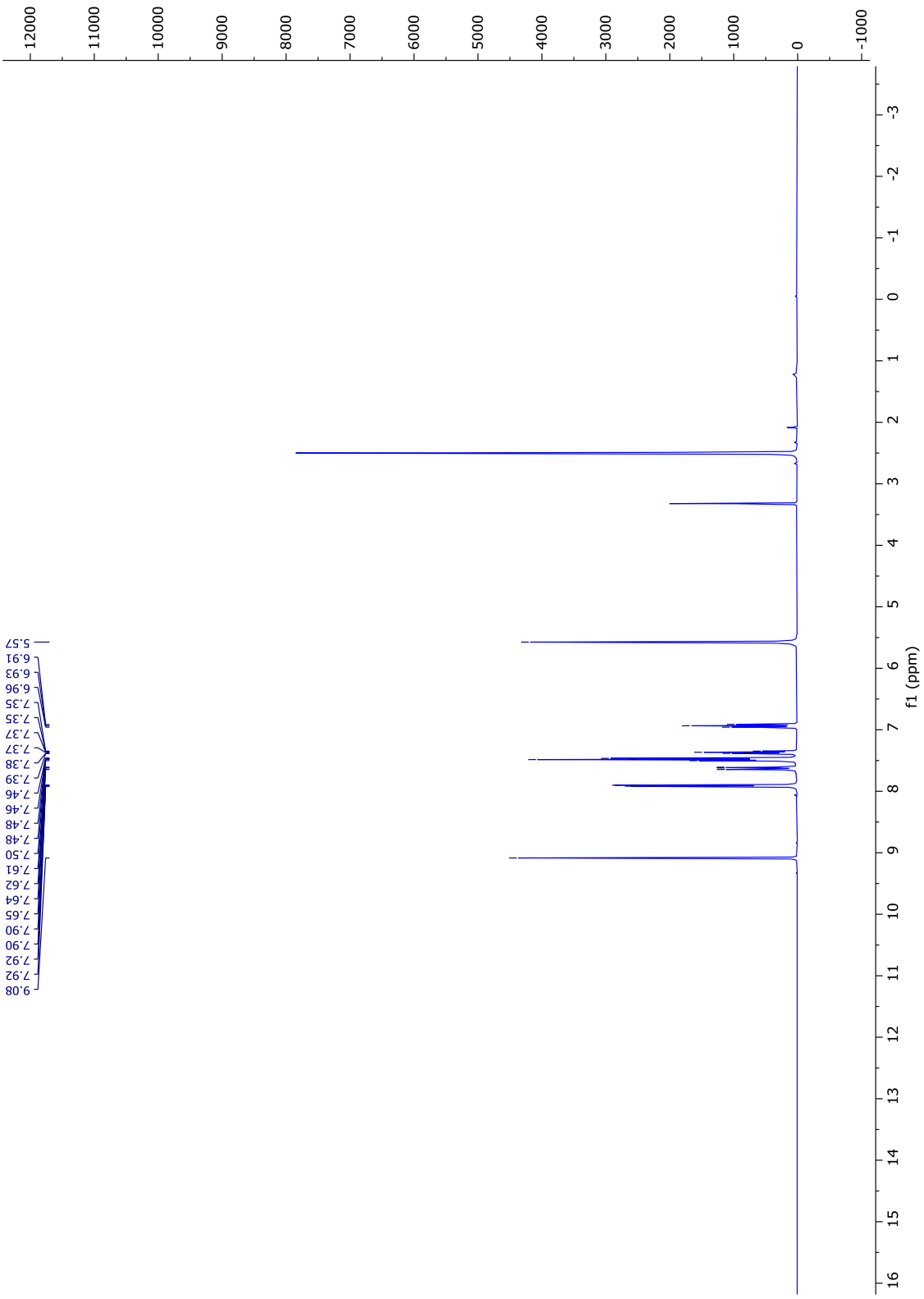
f1 (ppm)

Compound **3a**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9
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11
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13
14
15
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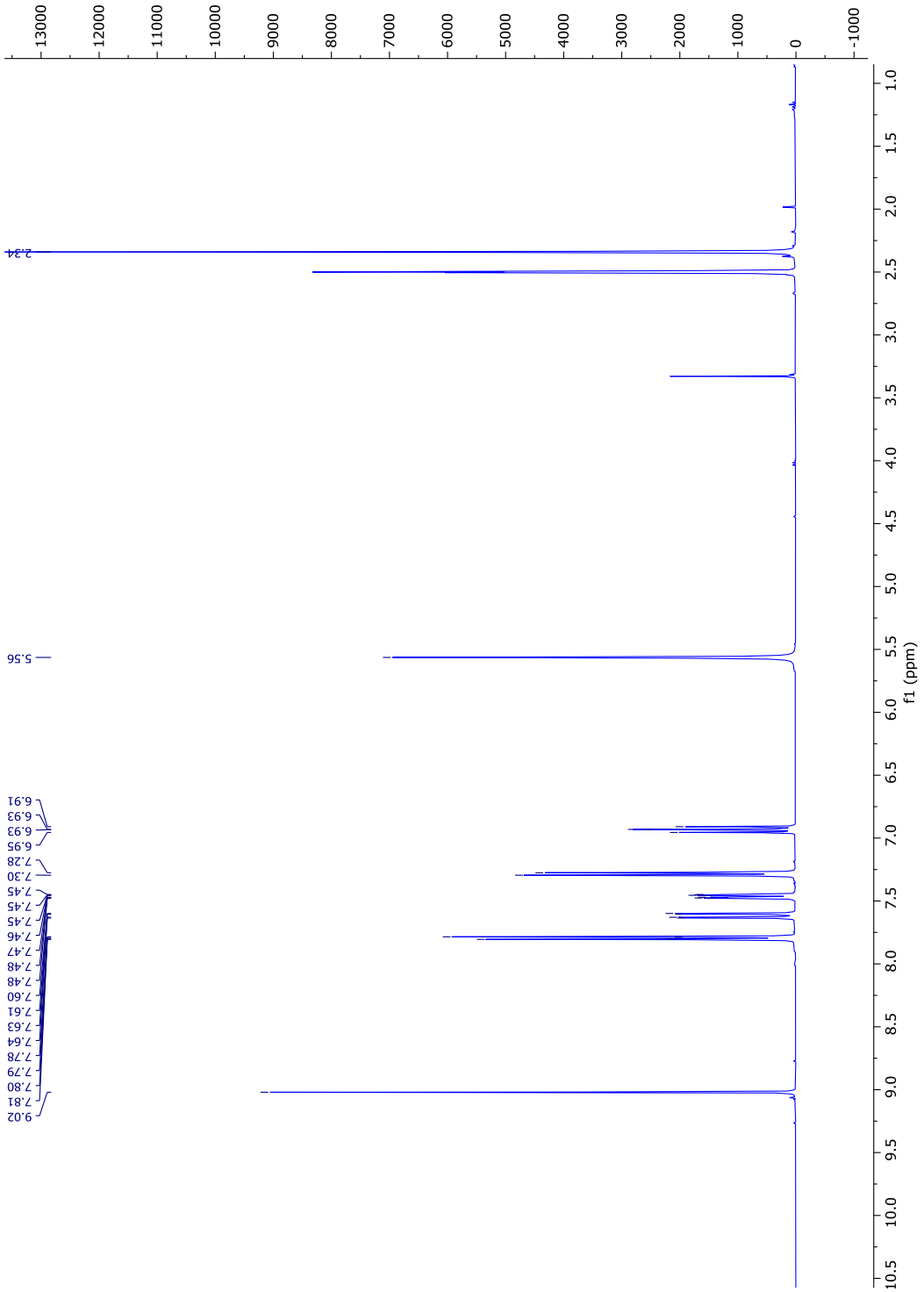
Compound **3b**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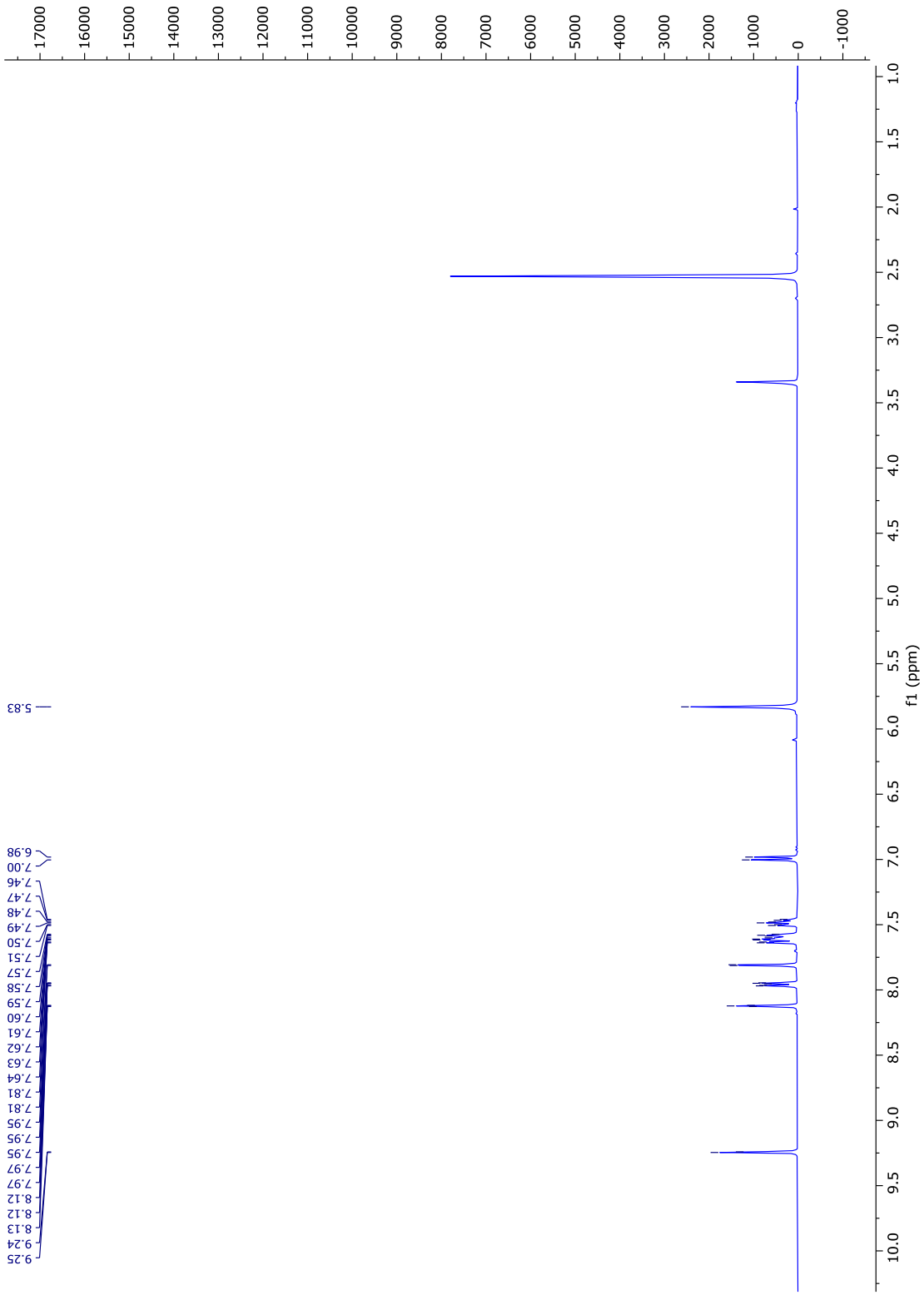
f1 (ppm)

Compound **3c**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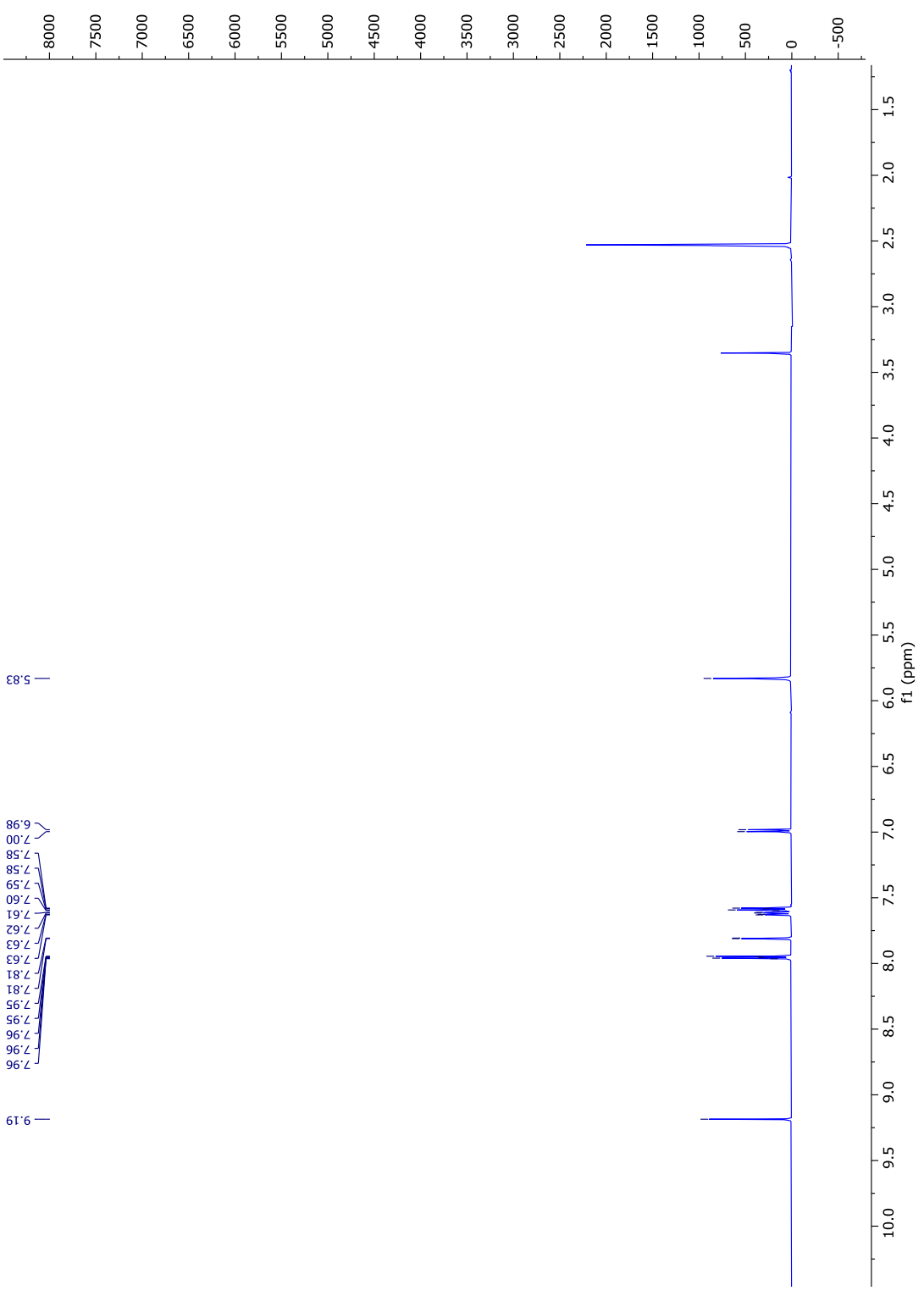
Compound **3d**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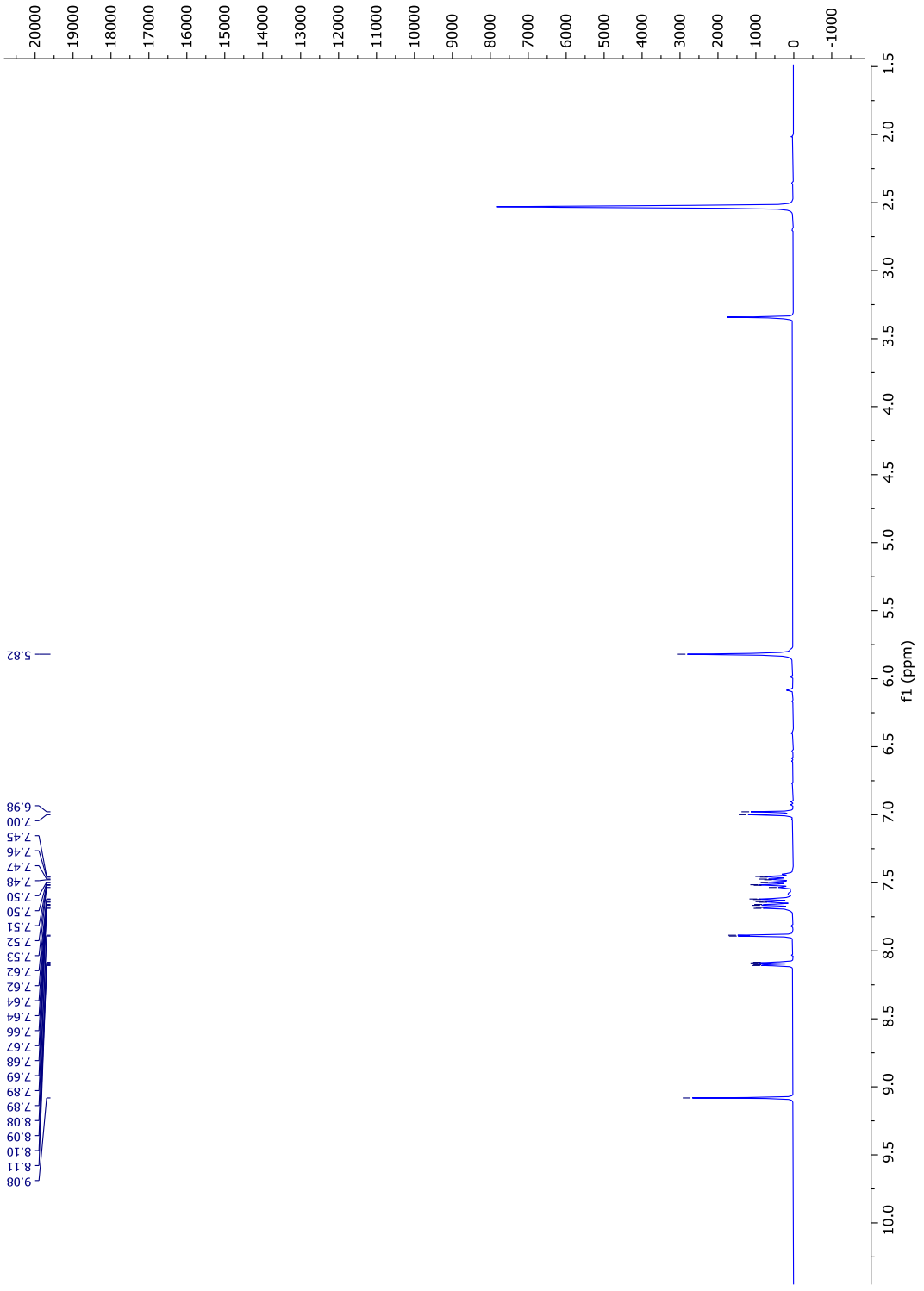
Compound **3e**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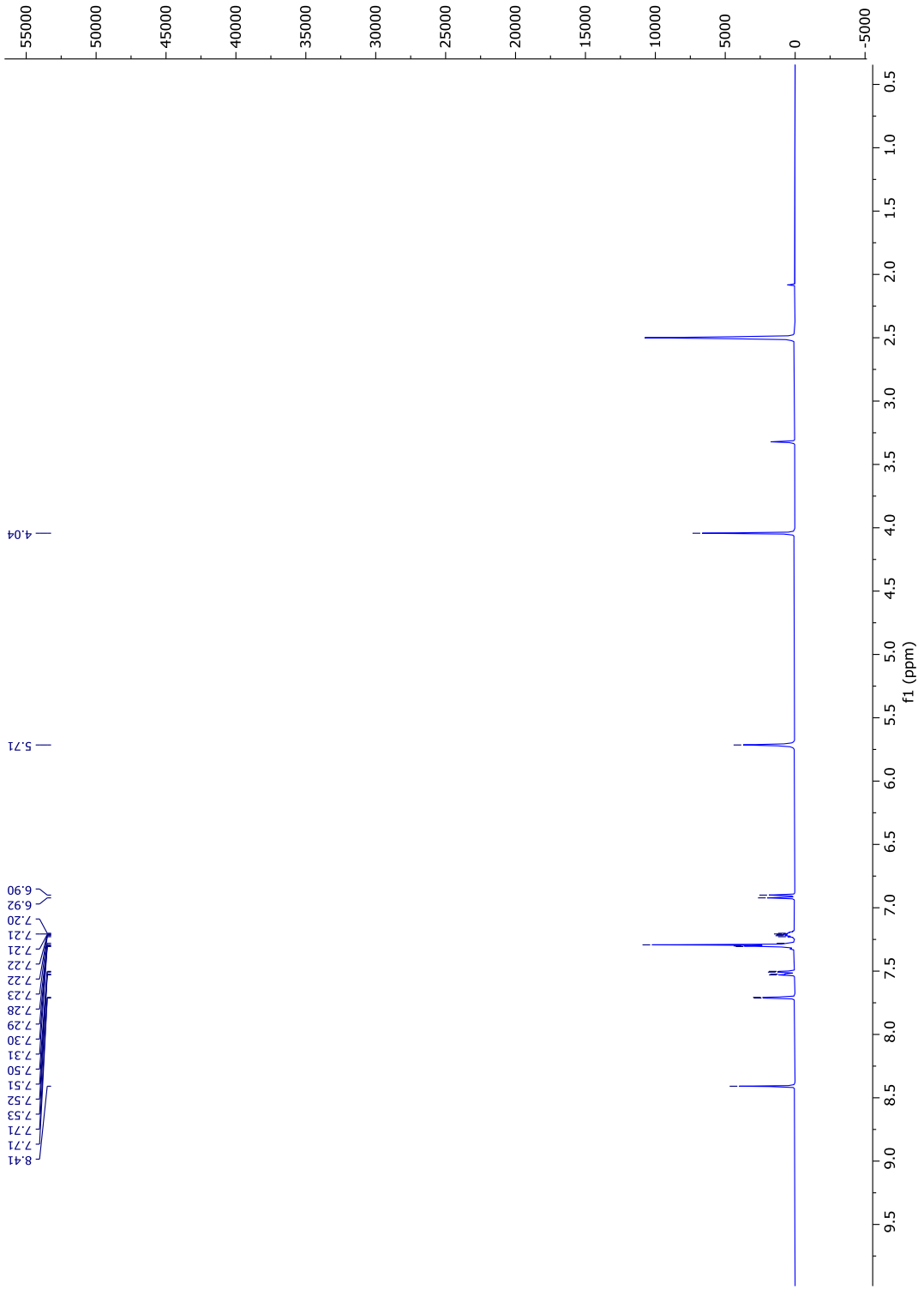
Compound **3f**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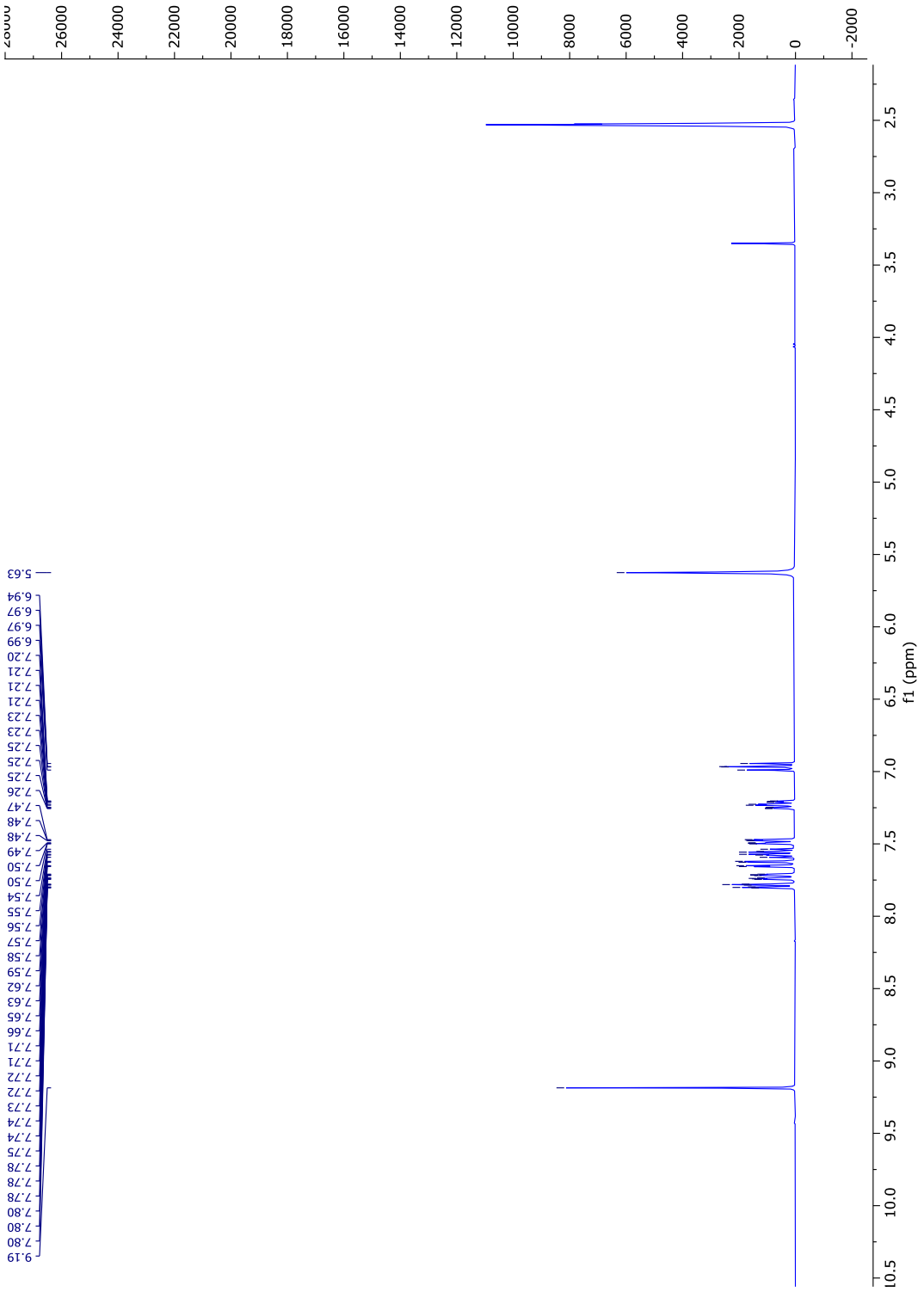

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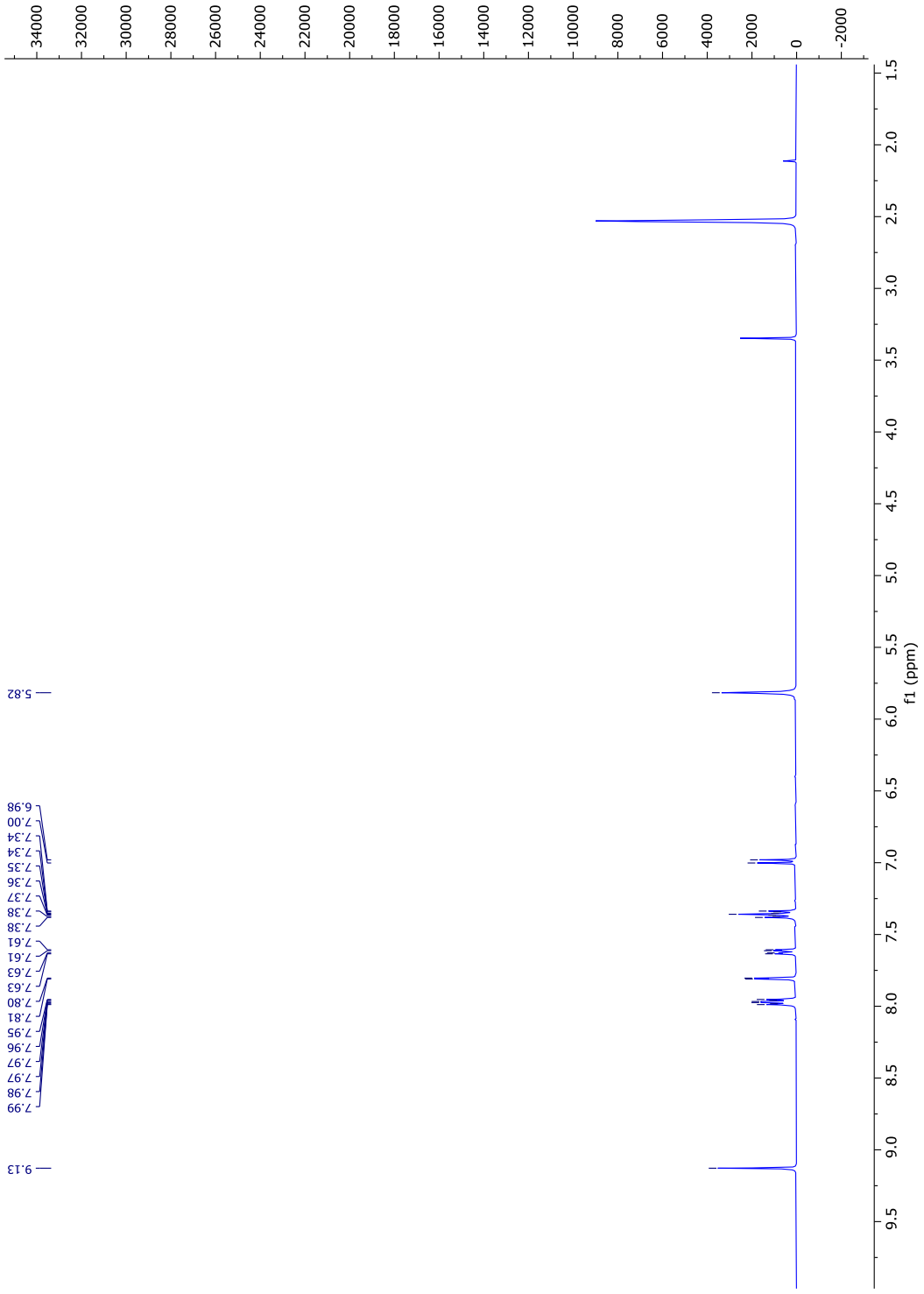
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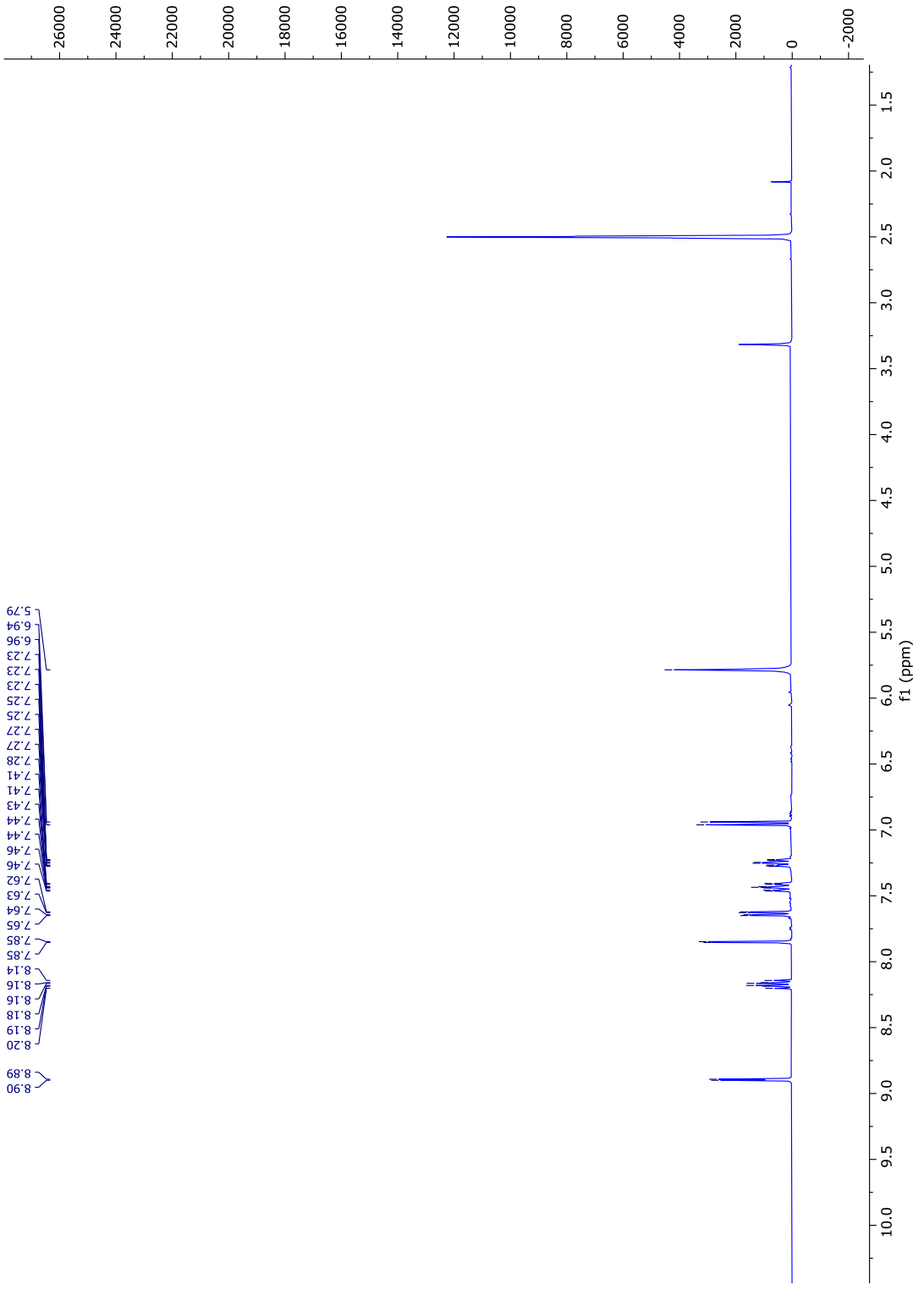
Compound **3i**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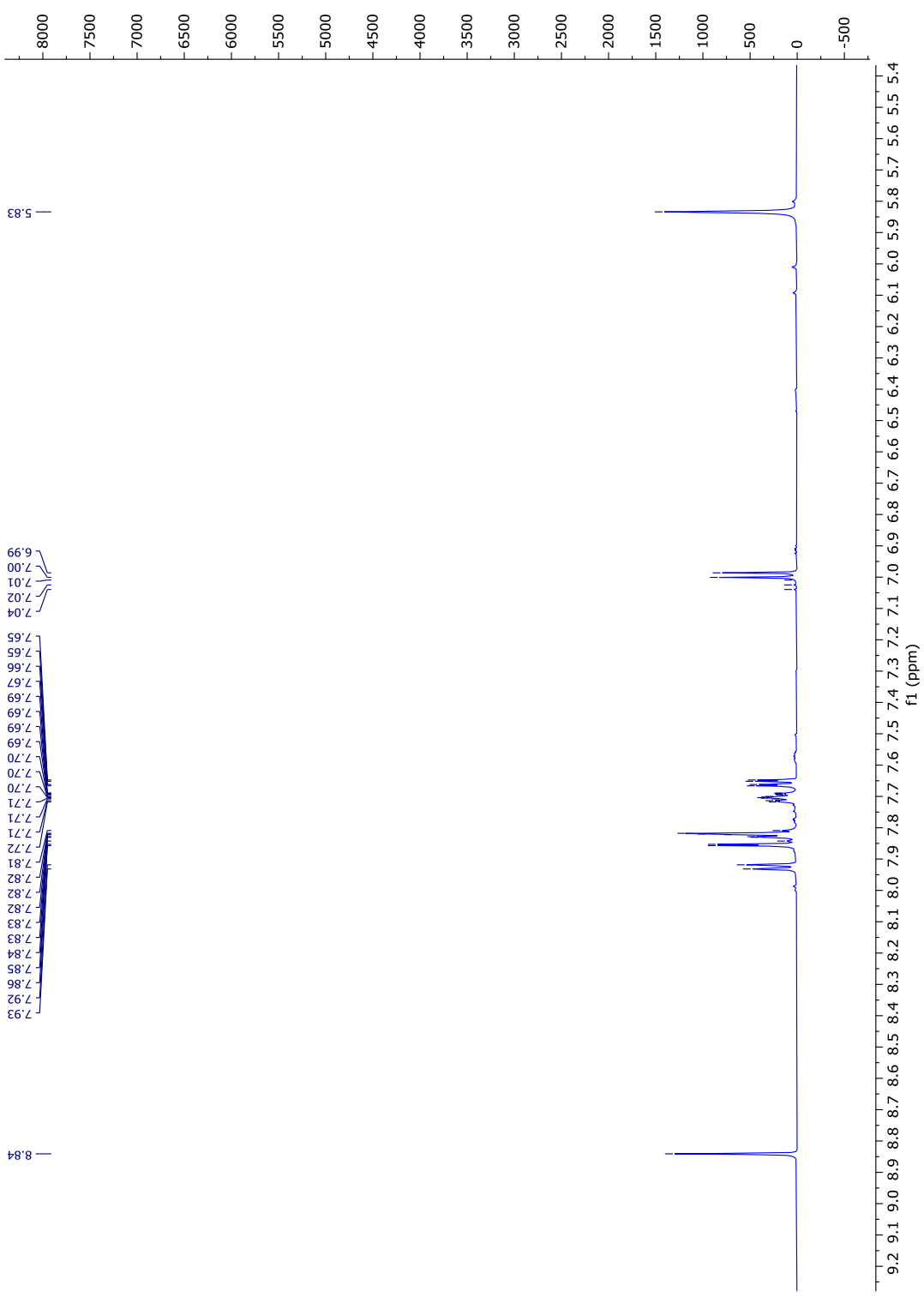
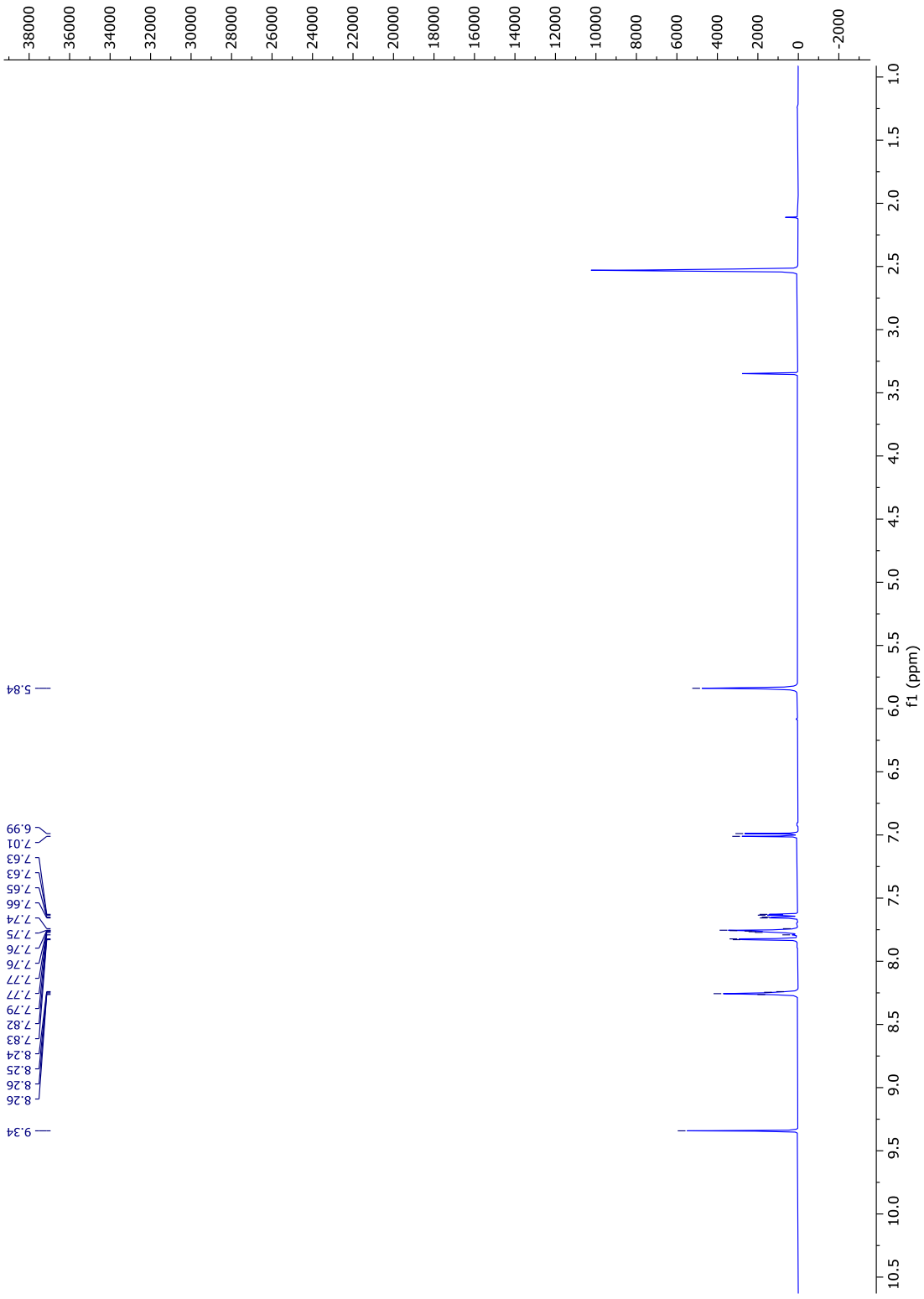
7.64
7.65
7.85
7.85
8.14
8.16
8.16
8.18
8.19
8.20
8.89
8.90

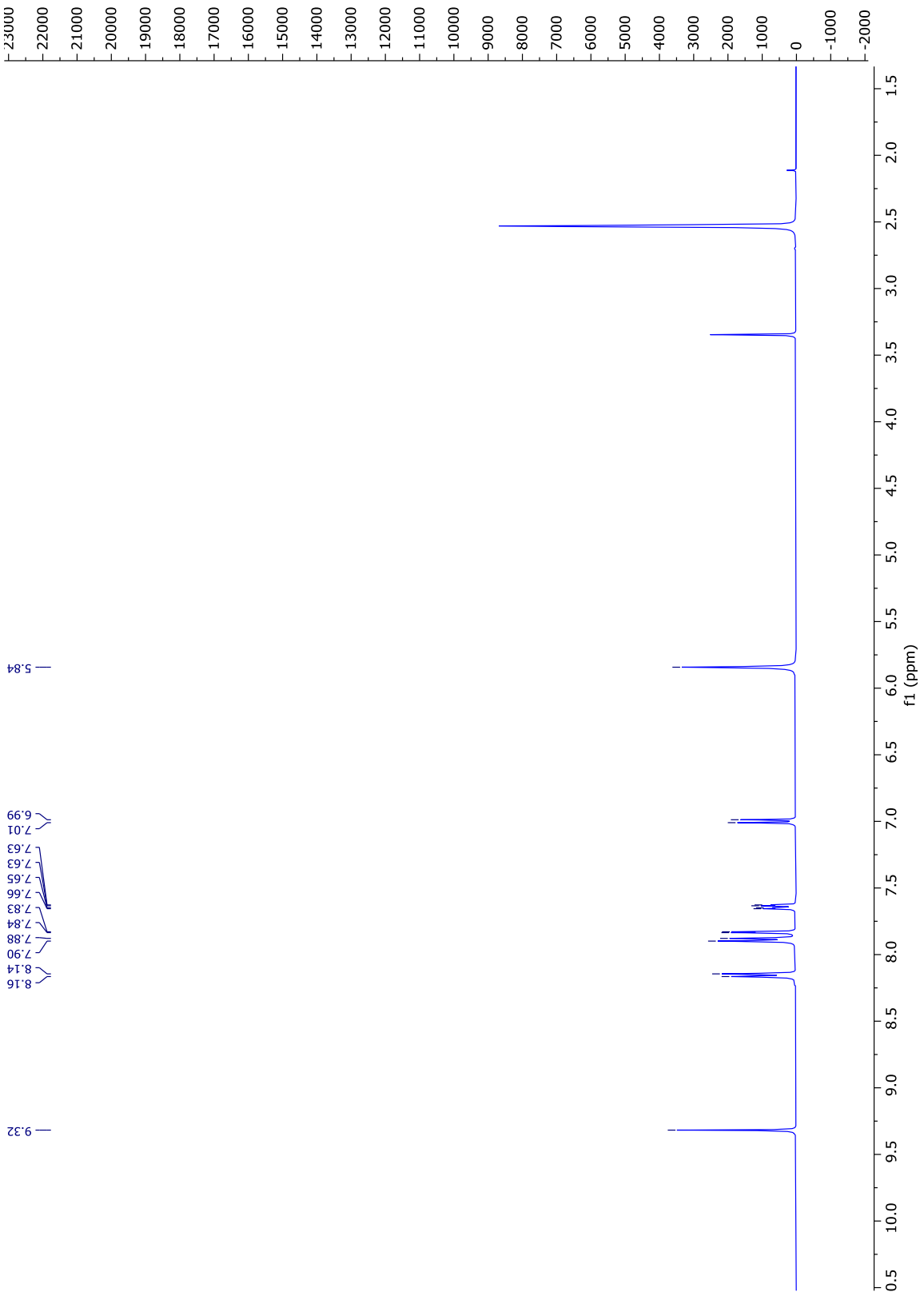
Compound **3j**


8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
5.83
6.99
7.00
7.01
7.02
7.04
7.65
7.65
7.66
7.67
7.69
7.69
7.69
7.69
7.70
7.70
7.70
7.71
7.71
7.71
7.72
7.81
7.82
7.82
7.82
7.83
7.83
7.84
7.85
7.86
7.92
7.93
8.84
5.4
5.5
5.6
5.7
5.8
5.9
6.0
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
7.0
7.1
7.2
7.3
7.4
7.5
7.6
7.7
7.8
7.9
8.0
8.1
8.2
8.3
8.4
8.5
8.6
8.7
8.8
8.9
9.0
9.1
9.2
f1 (ppm)

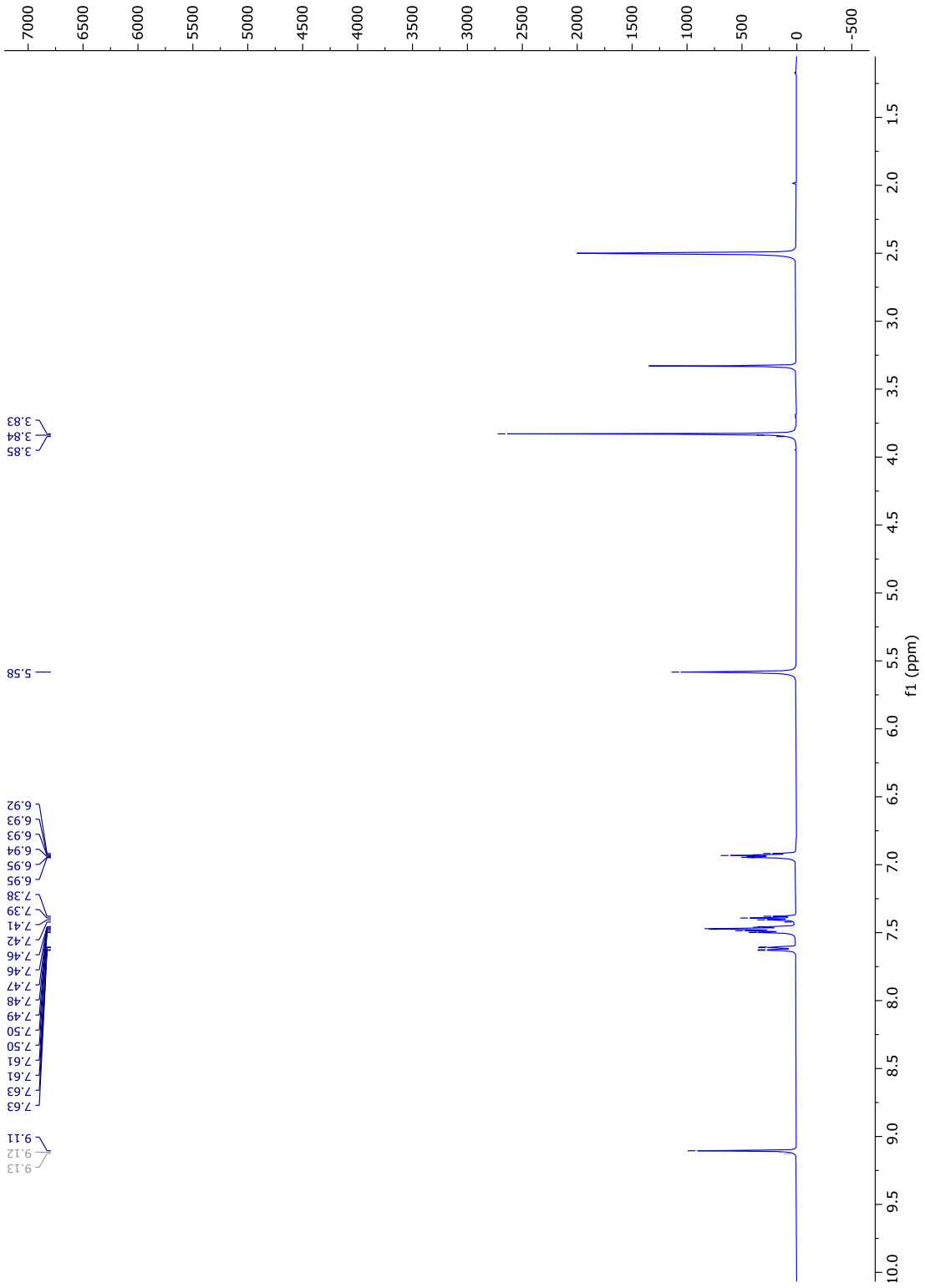
Compound **3k**


38000
36000
34000
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
f1 (ppm)
5.84
6.99
7.01
7.63
7.63
7.65
7.66
7.74
7.75
7.76
7.76
7.77
7.77
7.79
7.82
7.83
8.24
8.25
8.26
8.26
9.34

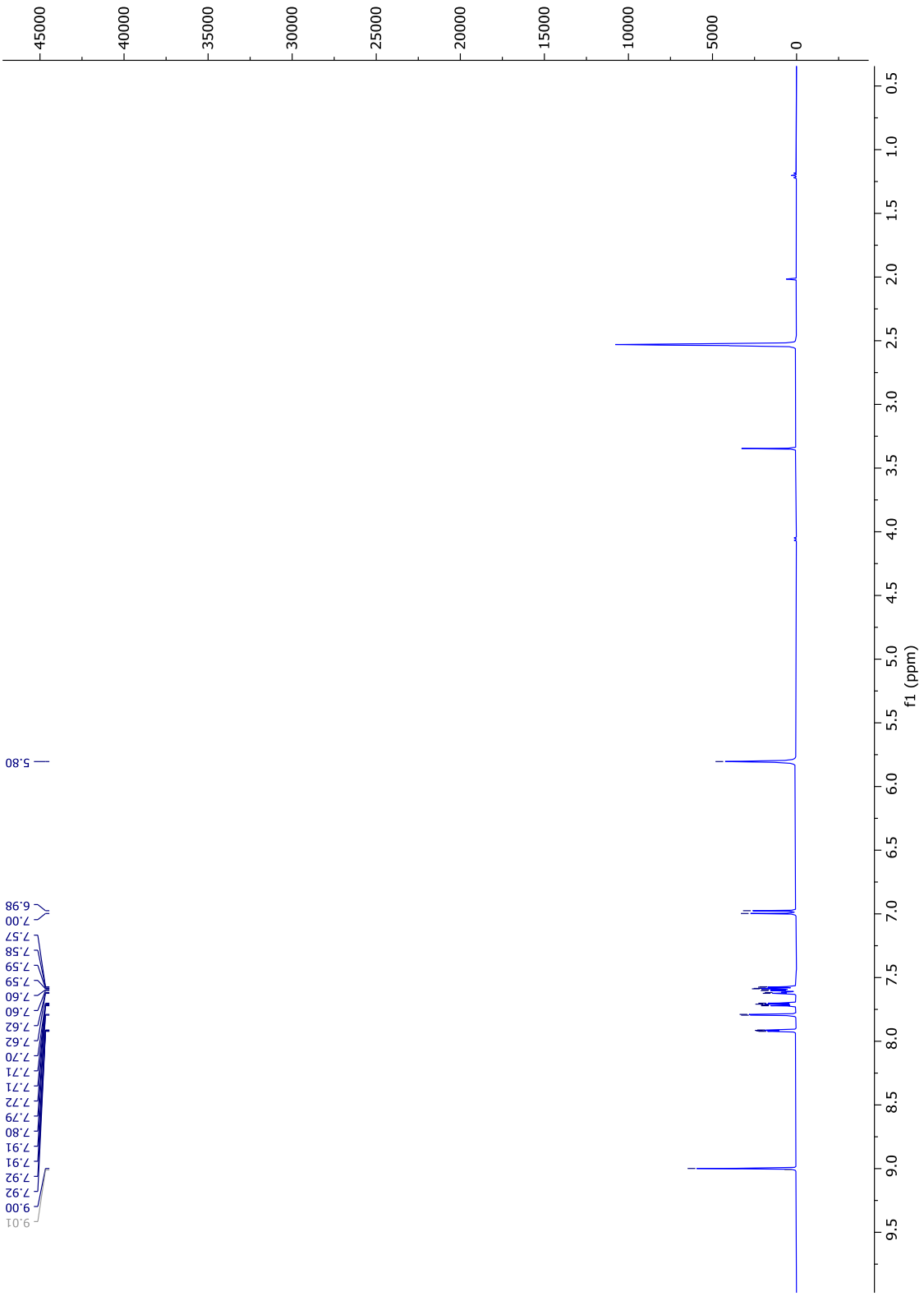
Compound **3l**



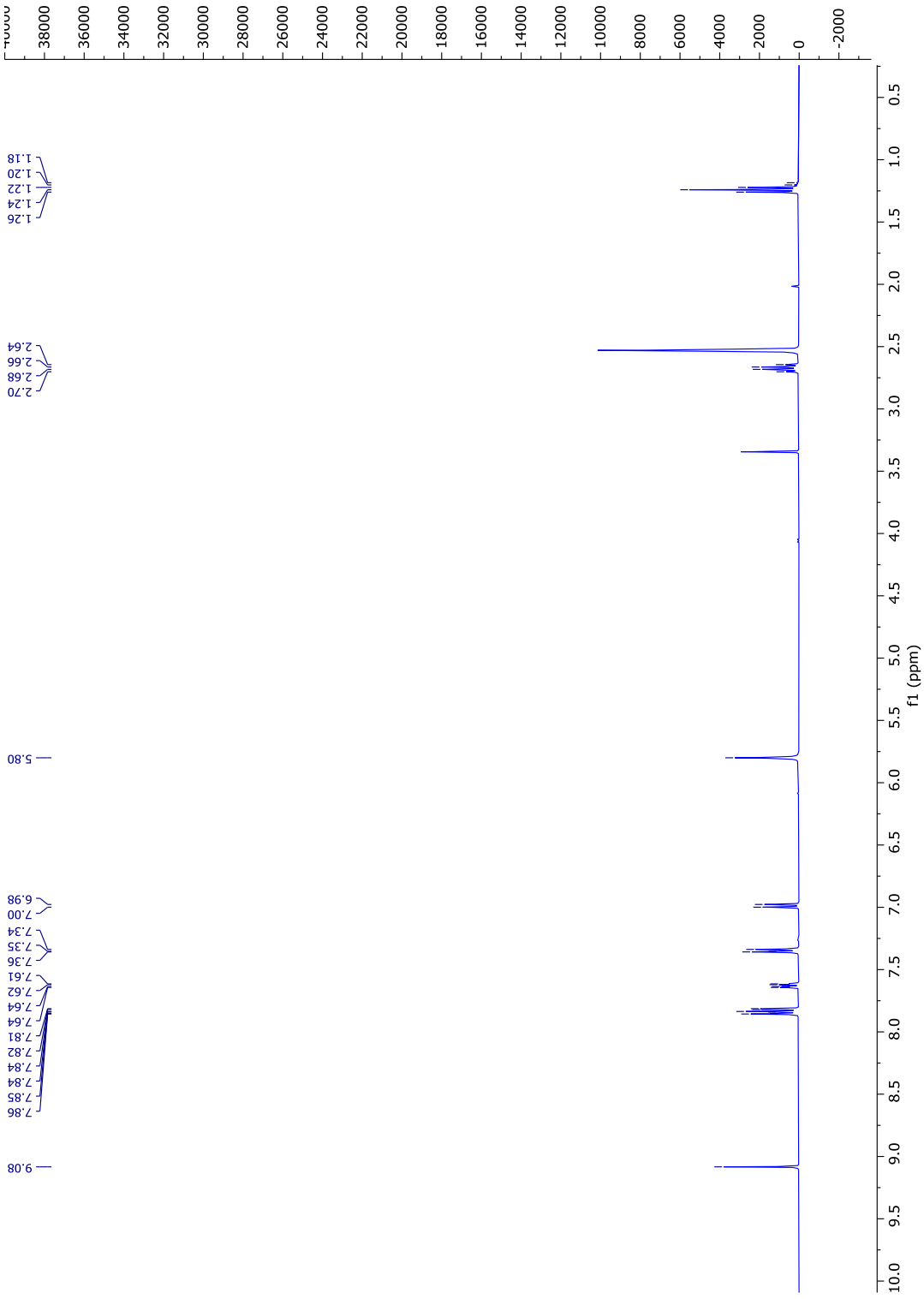
Compound **3m**


7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
3.83
3.84
3.85
5.58
6.92
6.93
6.93
6.94
6.95
6.95
7.38
7.39
7.41
7.42
7.46
7.46
7.47
7.48
7.49
7.50
7.50
7.61
7.61
7.63
7.63
9.11
9.12
9.13
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
f1 (ppm)

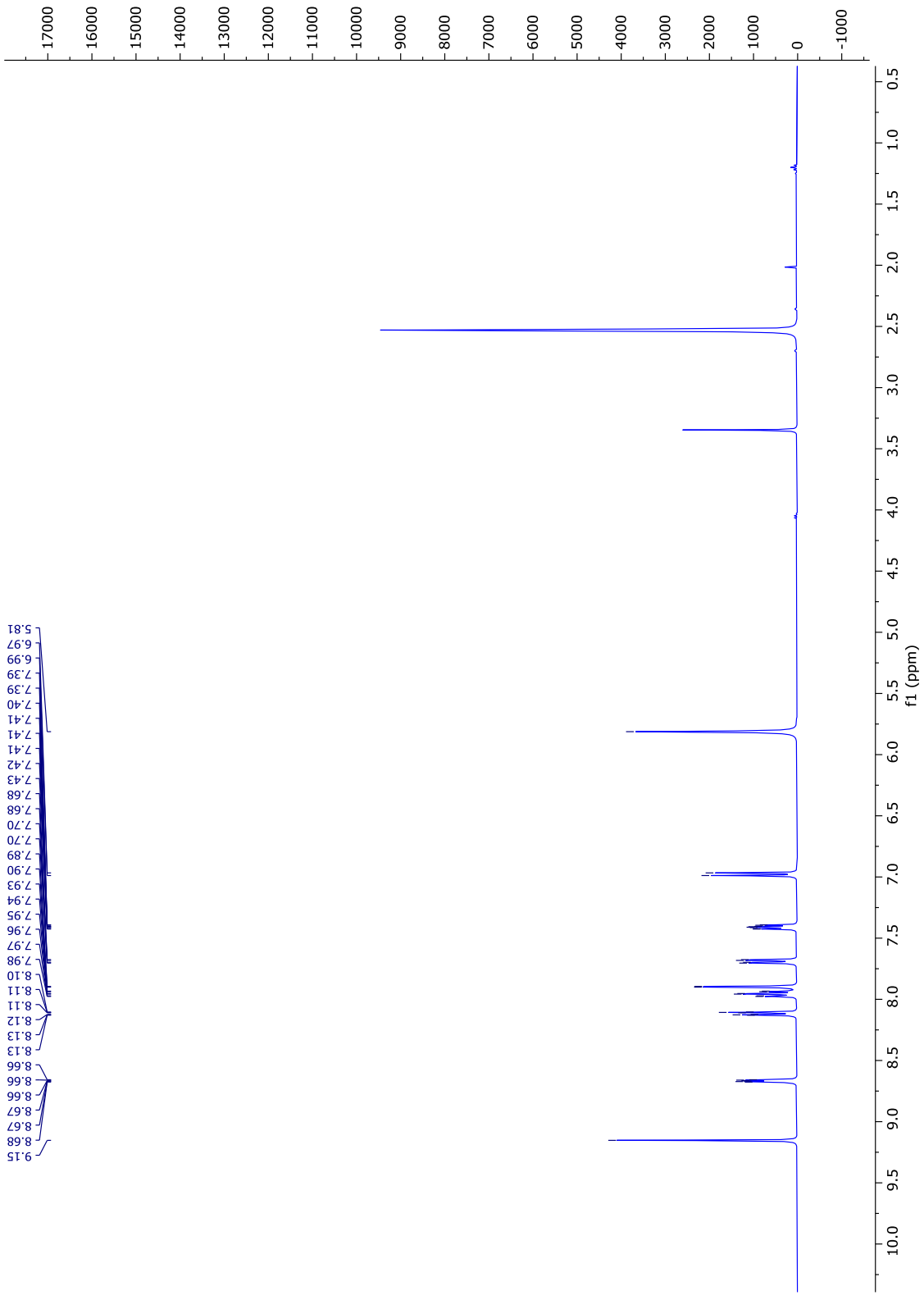
Compound **3n**


45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
f1 (ppm)
5.80
6.98
7.00
7.57
7.58
7.59
7.59
7.60
7.60
7.62
7.62
7.70
7.71
7.71
7.72
7.79
7.80
7.91
7.91
7.92
7.92
9.00
9.01

Compound **3o**


1.18
1.20
1.22
1.24
1.26
2.64
2.66
2.68
2.70
5.80
6.98
7.00
7.34
7.35
7.36
7.61
7.62
7.64
7.64
7.81
7.82
7.84
7.84
7.85
7.86
9.08
f1 (ppm)

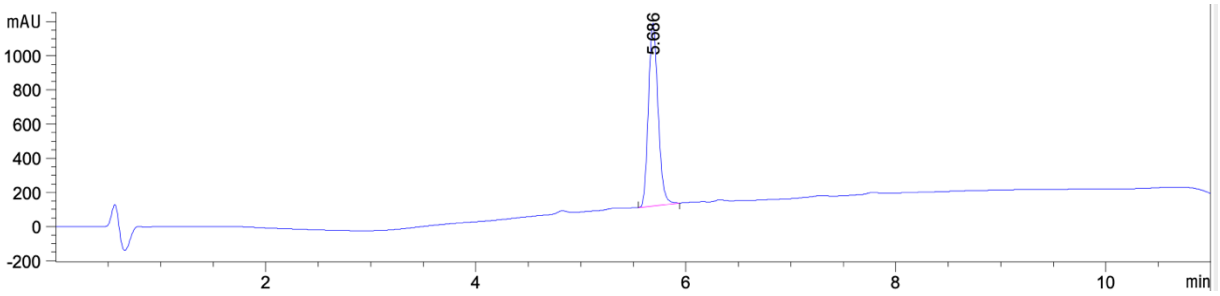
Compound **3p**


17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
f1 (ppm)
5.81
6.97
6.99
7.39
7.39
7.40
7.41
7.41
7.41
7.42
7.43
7.68
7.68
7.70
7.70
7.89
7.90
7.93
7.94
7.95
7.96
7.97
7.98
8.10
8.11
8.11
8.12
8.13
8.13
8.66
8.66
8.66
8.67
8.67
8.68
9.15

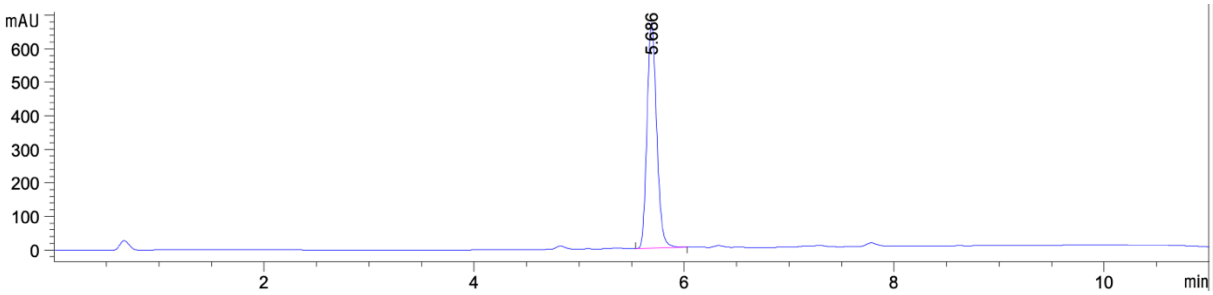
Compound **4a**

Copy of Chromatographic Analysis of 4a

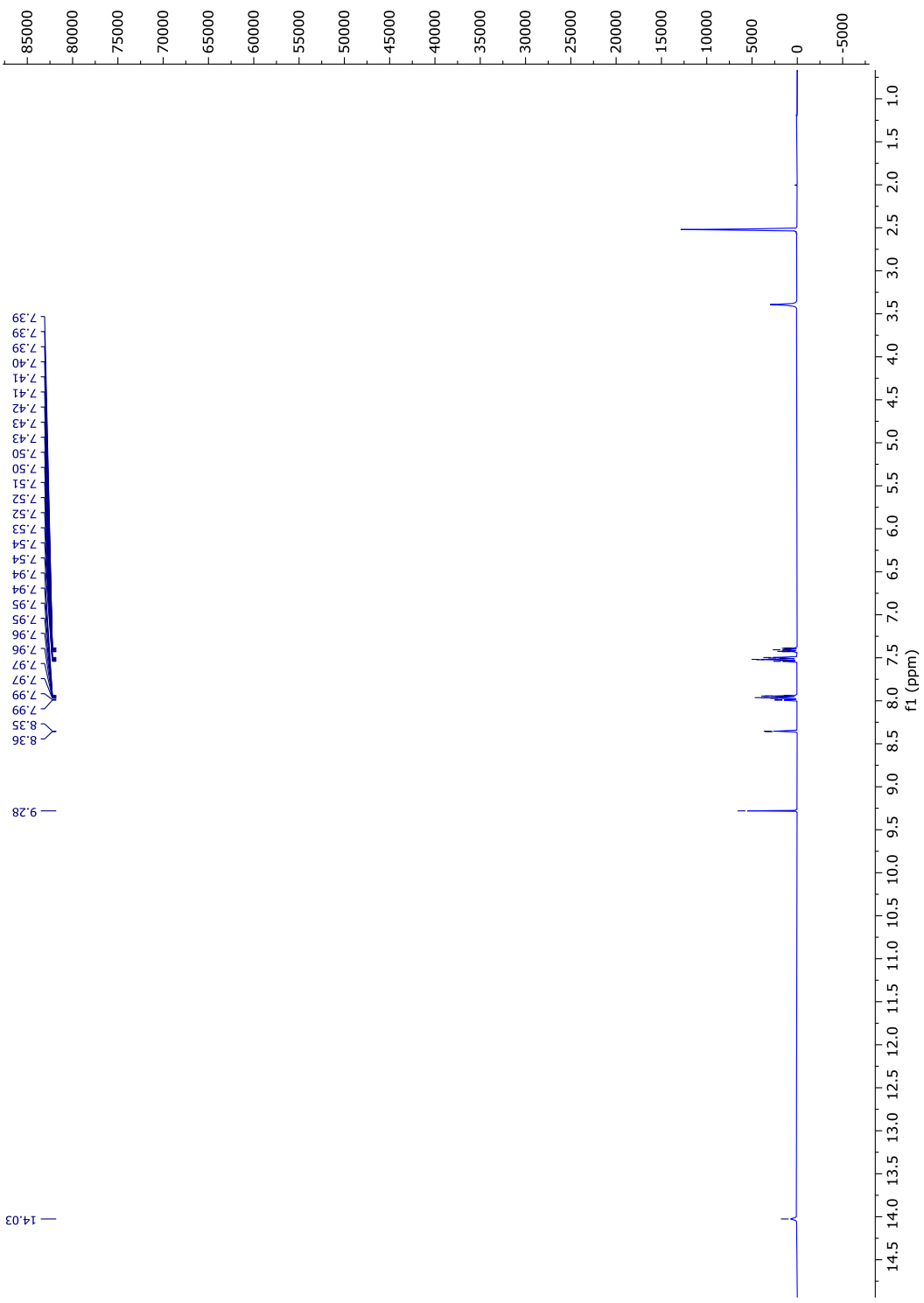
220nm

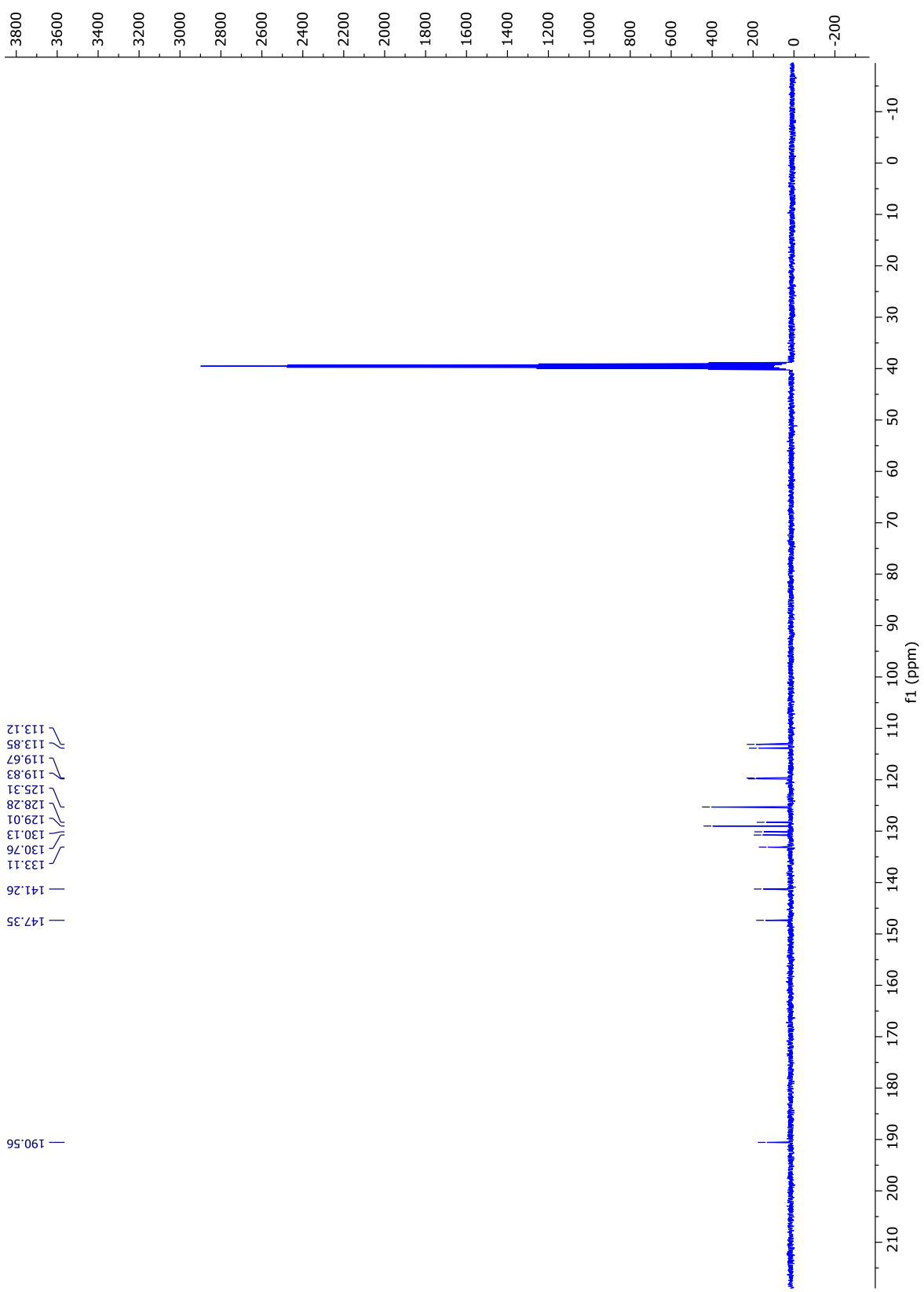


254nm



Copy of NMR of 4a

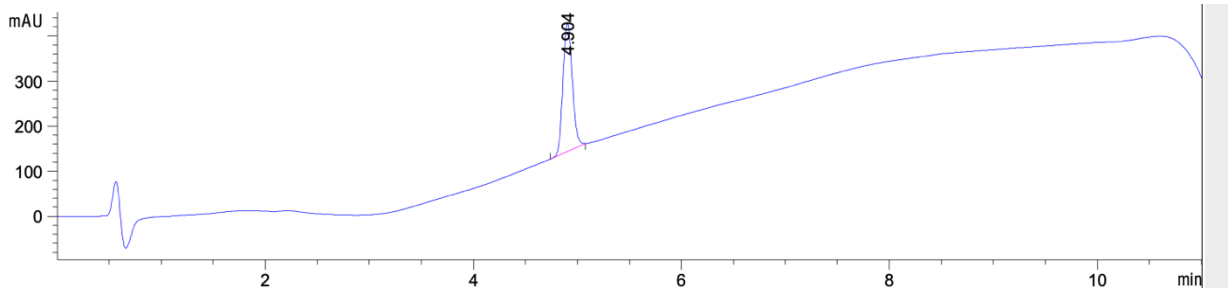



190.56
147.35
141.26
133.11
130.76
130.13
129.01
128.28
125.31
119.83
119.67
113.85
113.12
f1 (ppm)

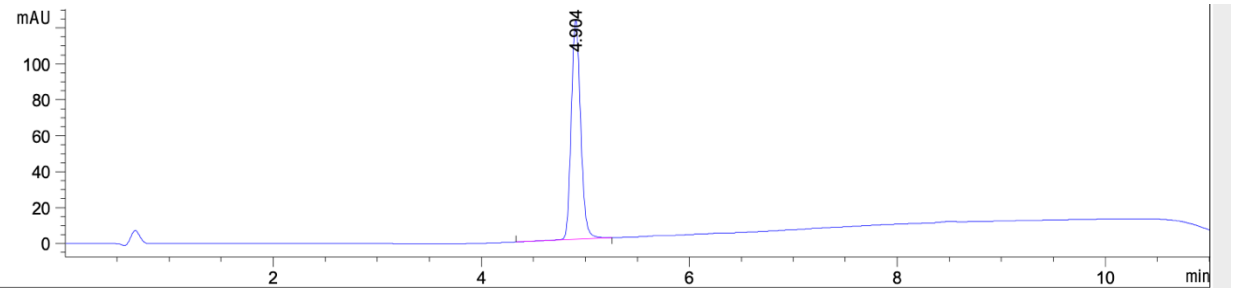
Compound **4b**

Copy of Chromatographic Analysis of 4b

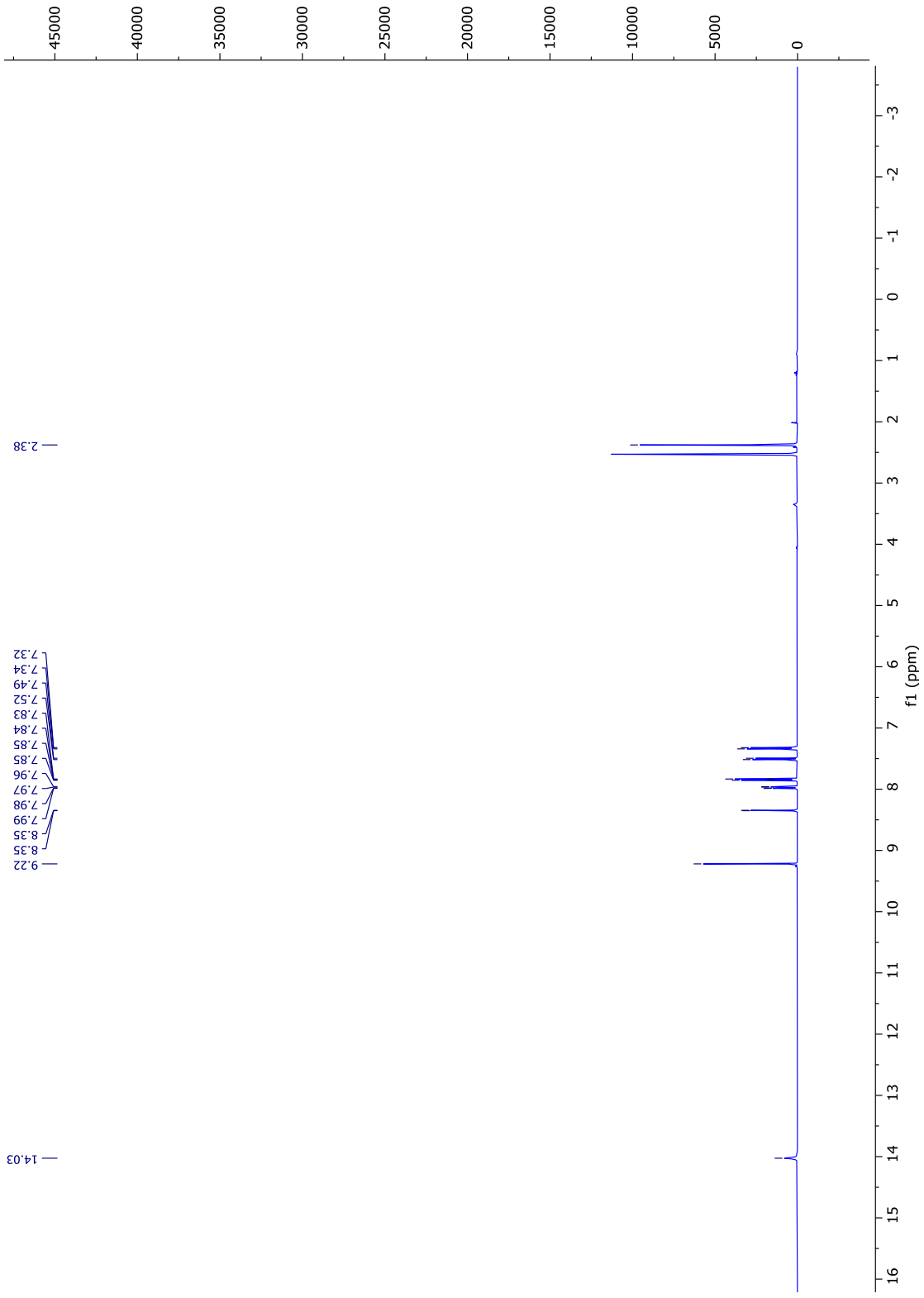
220nm

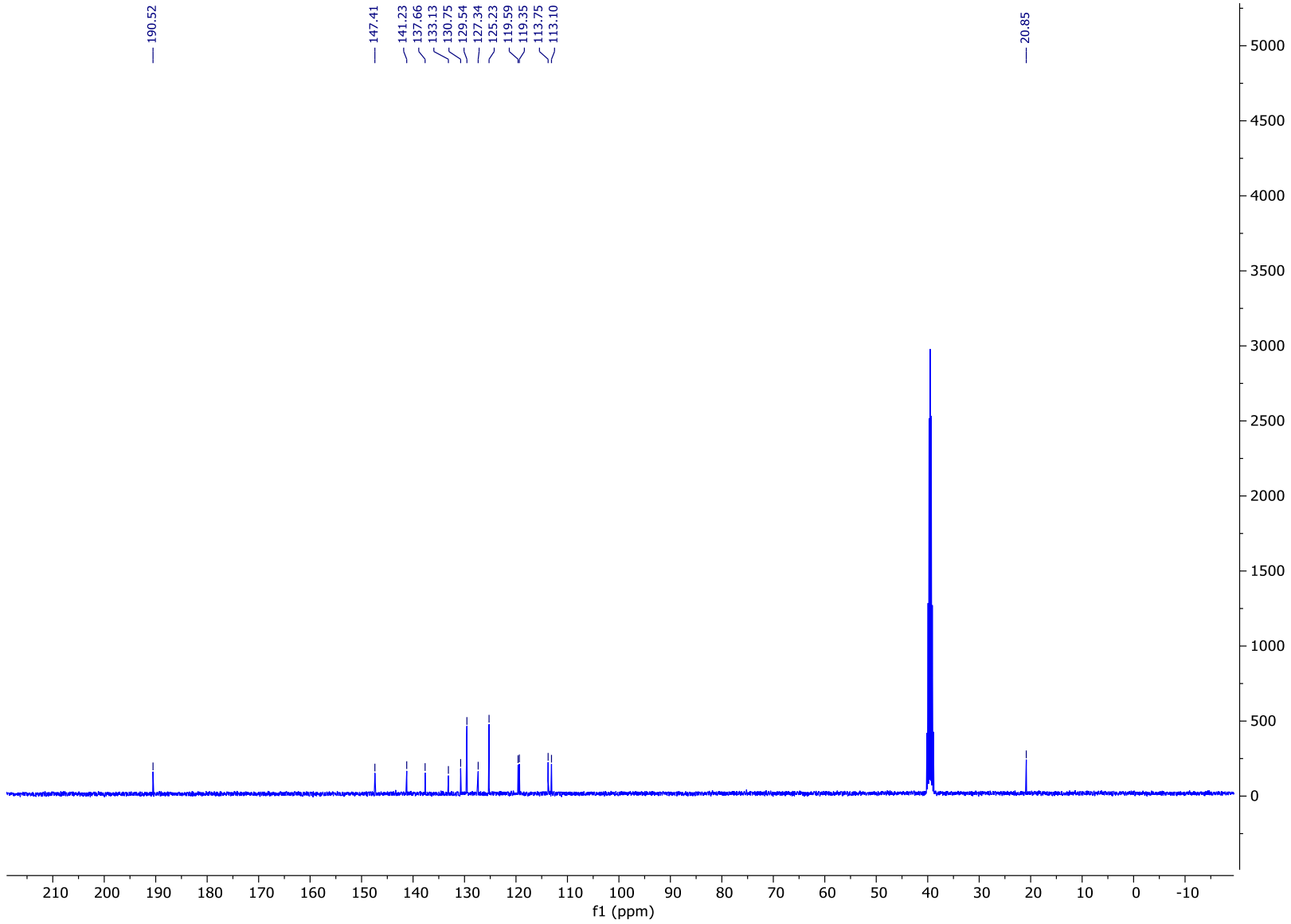


254nm



Copy of NMR of 4b

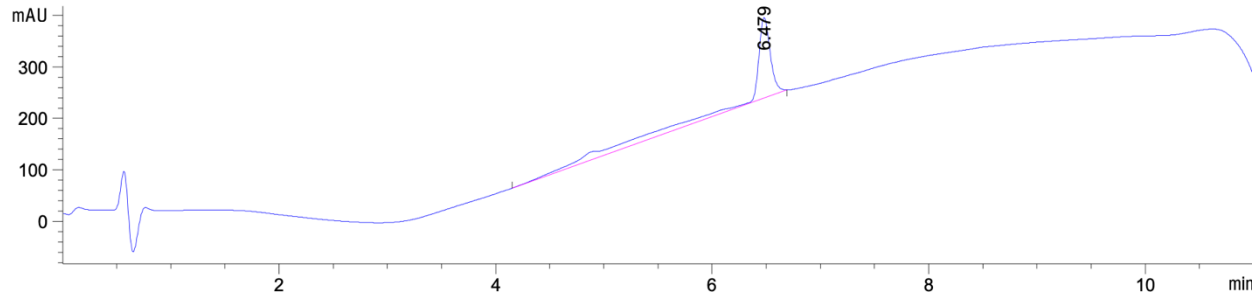



190.52
147.41
141.23
137.66
133.13
130.75
129.54
127.34
125.23
119.59
119.35
113.75
113.10
20.85
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

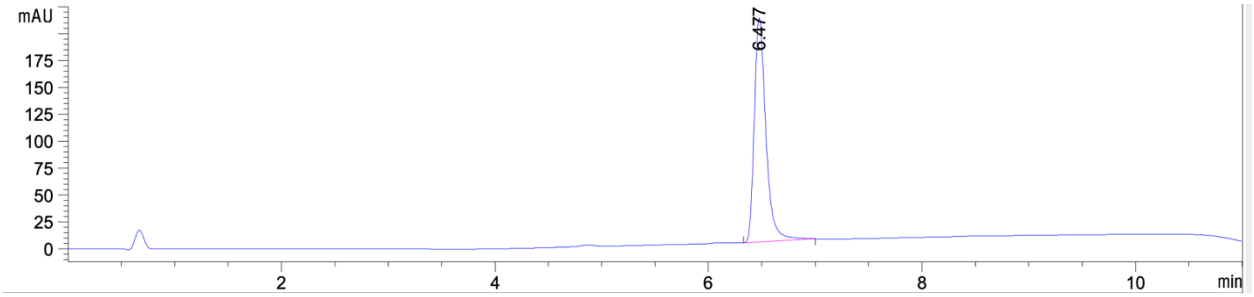
Compound **4c**

Copy of Chromatographic Analysis of 4c

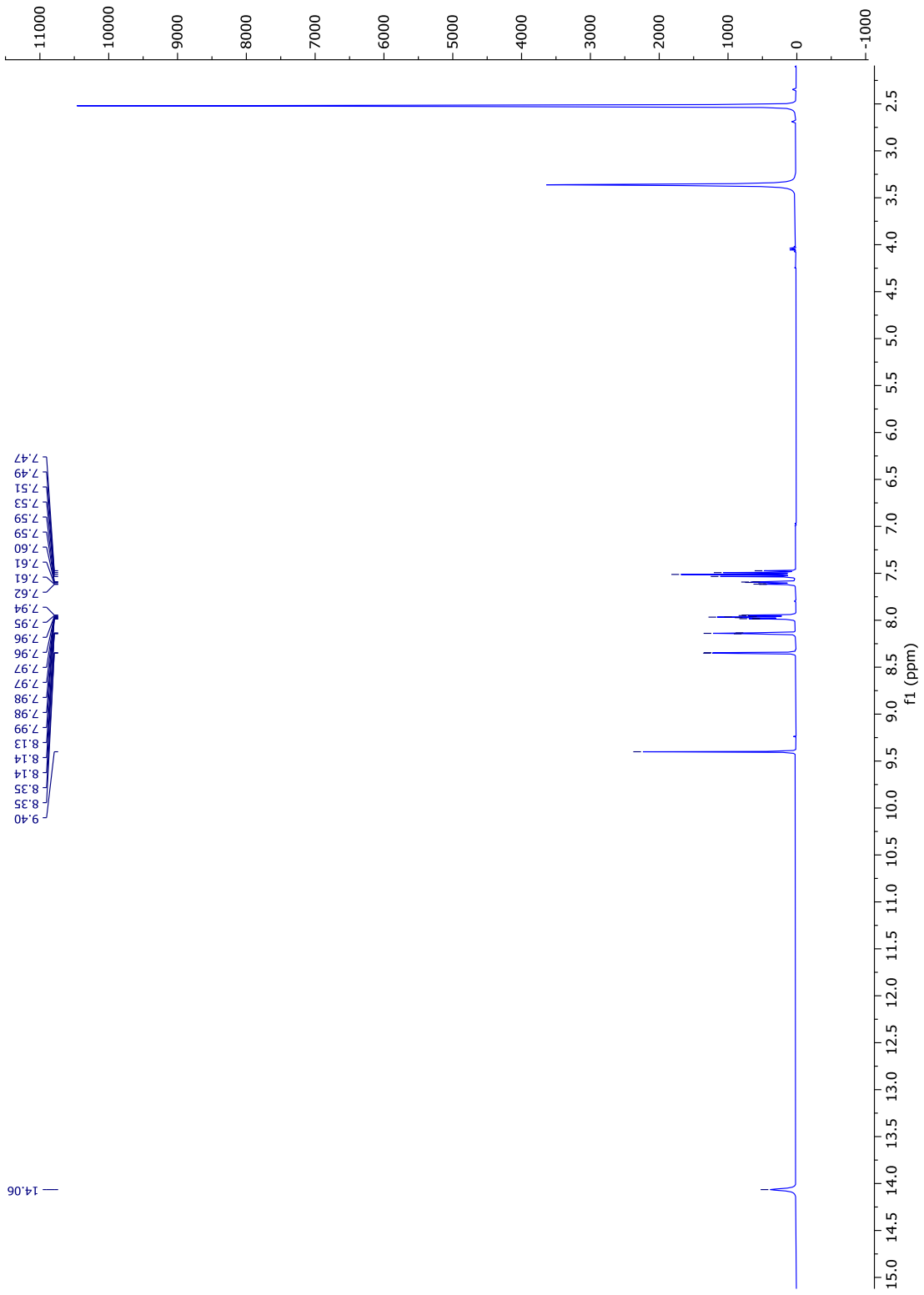
220nm

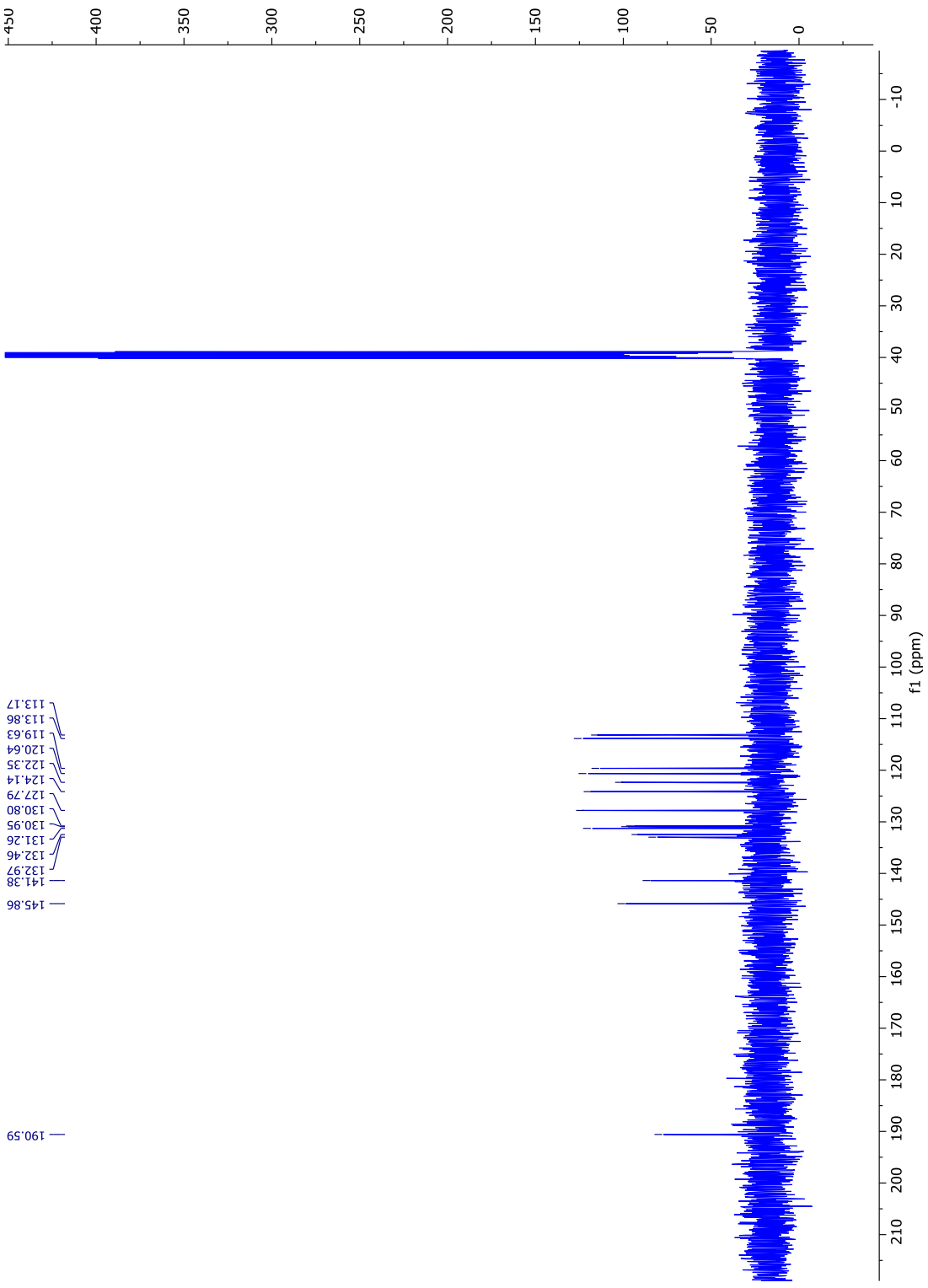


254nm



Copy of NMR of 4c

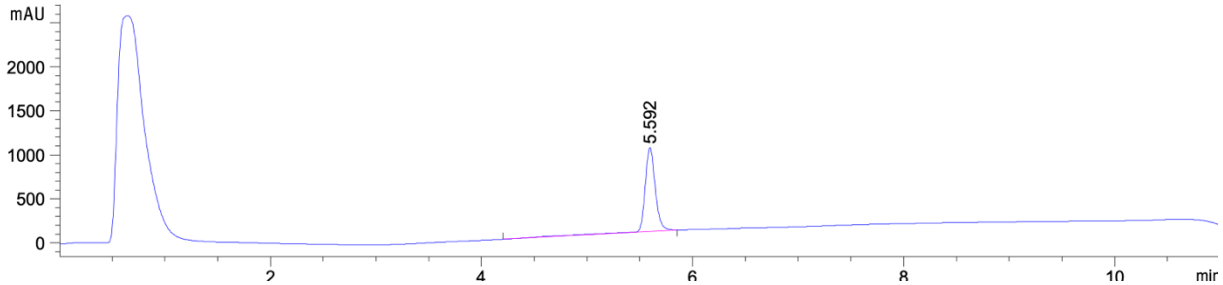



190.59
145.86
141.38
132.97
132.46
131.26
130.95
130.80
127.79
124.14
122.35
120.64
119.63
113.86
113.17
f1 (ppm)

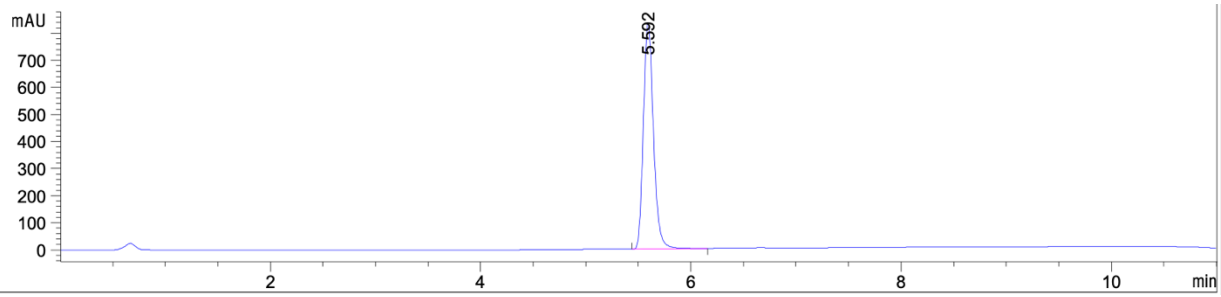
Compound **4d**

Copy of Chromatographic Analysis of 4d

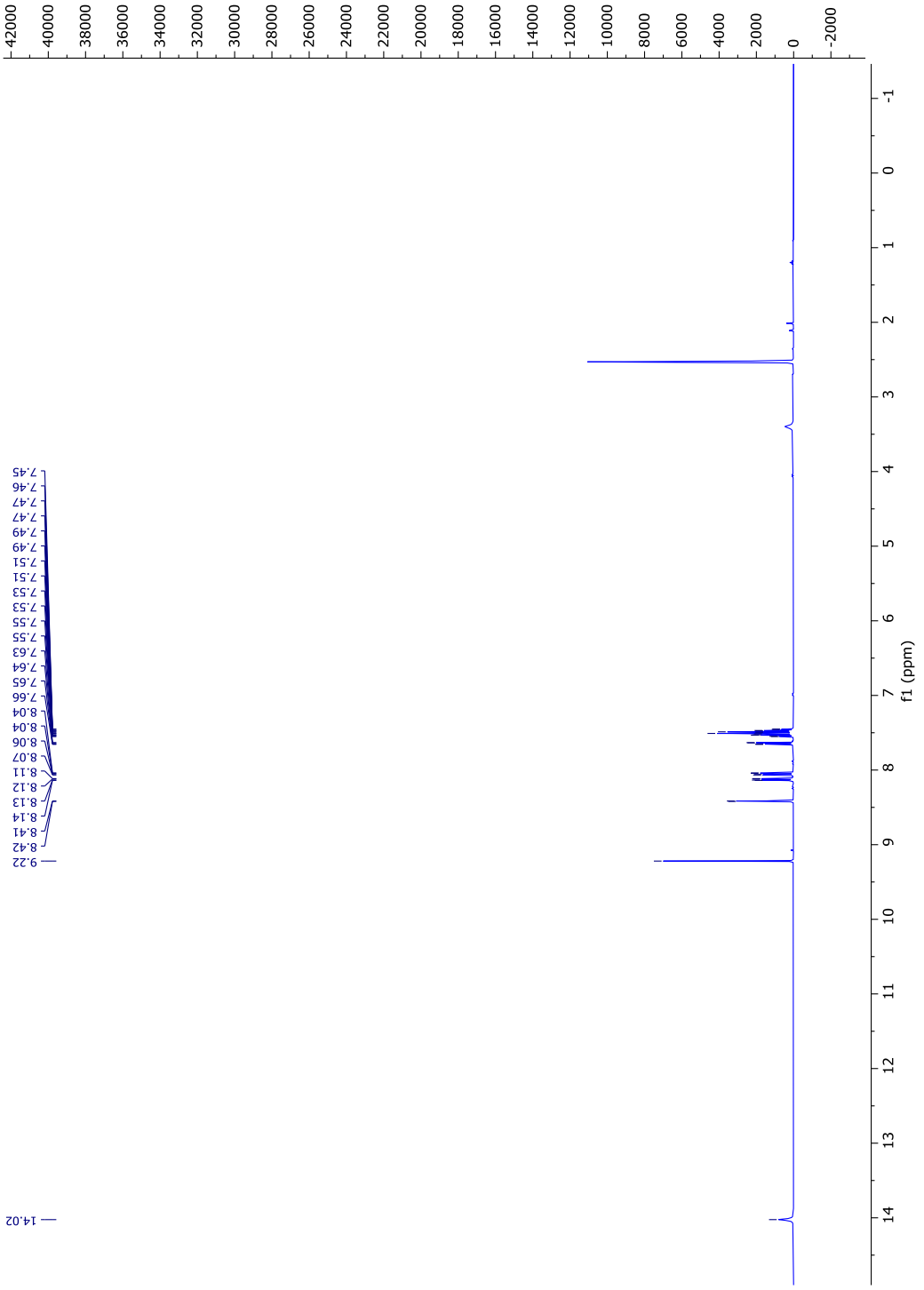
220nM

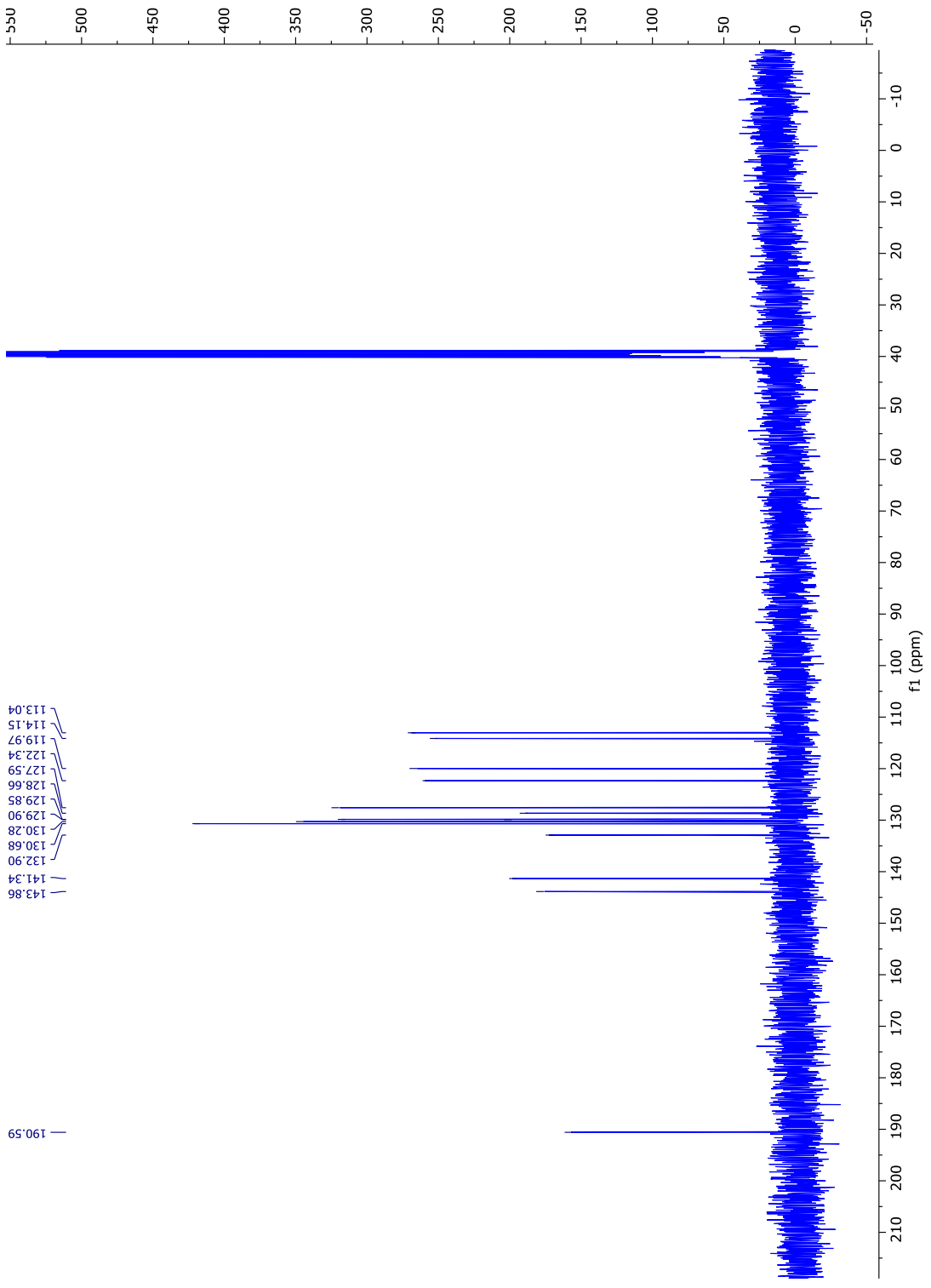


254nm



Copy of NMR of 4d

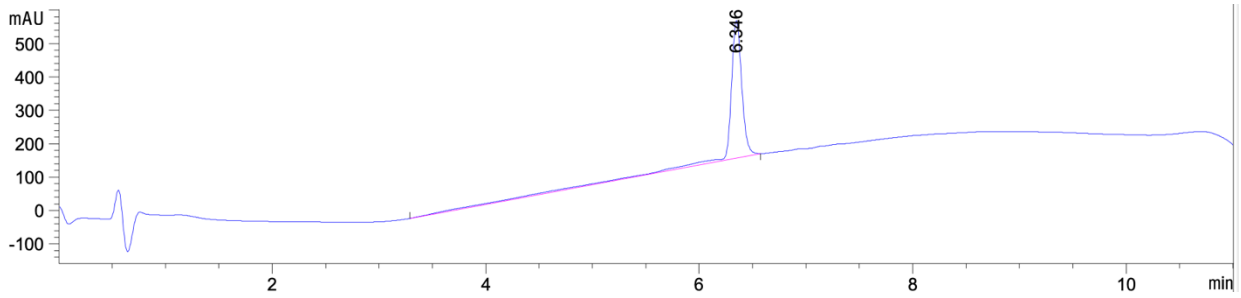



190.59
143.86
141.34
132.90
130.68
130.28
129.90
129.85
128.66
127.59
122.34
119.97
114.15
113.04
f1 (ppm)

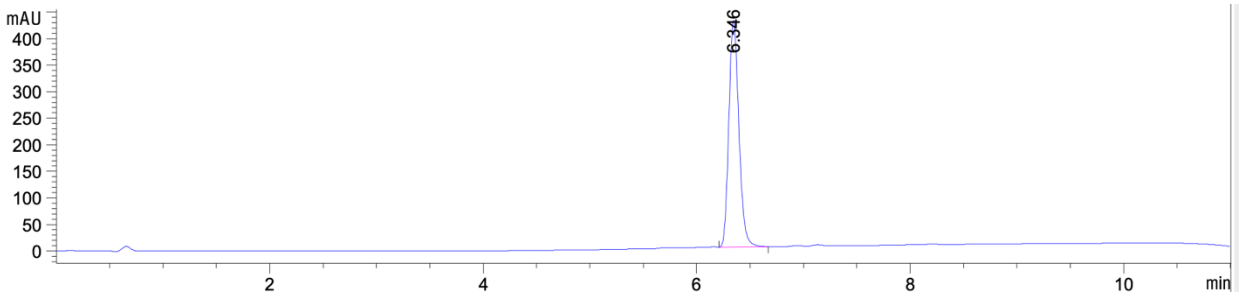
Compound **4e**

Copy of Chromatographic Analysis of 4e

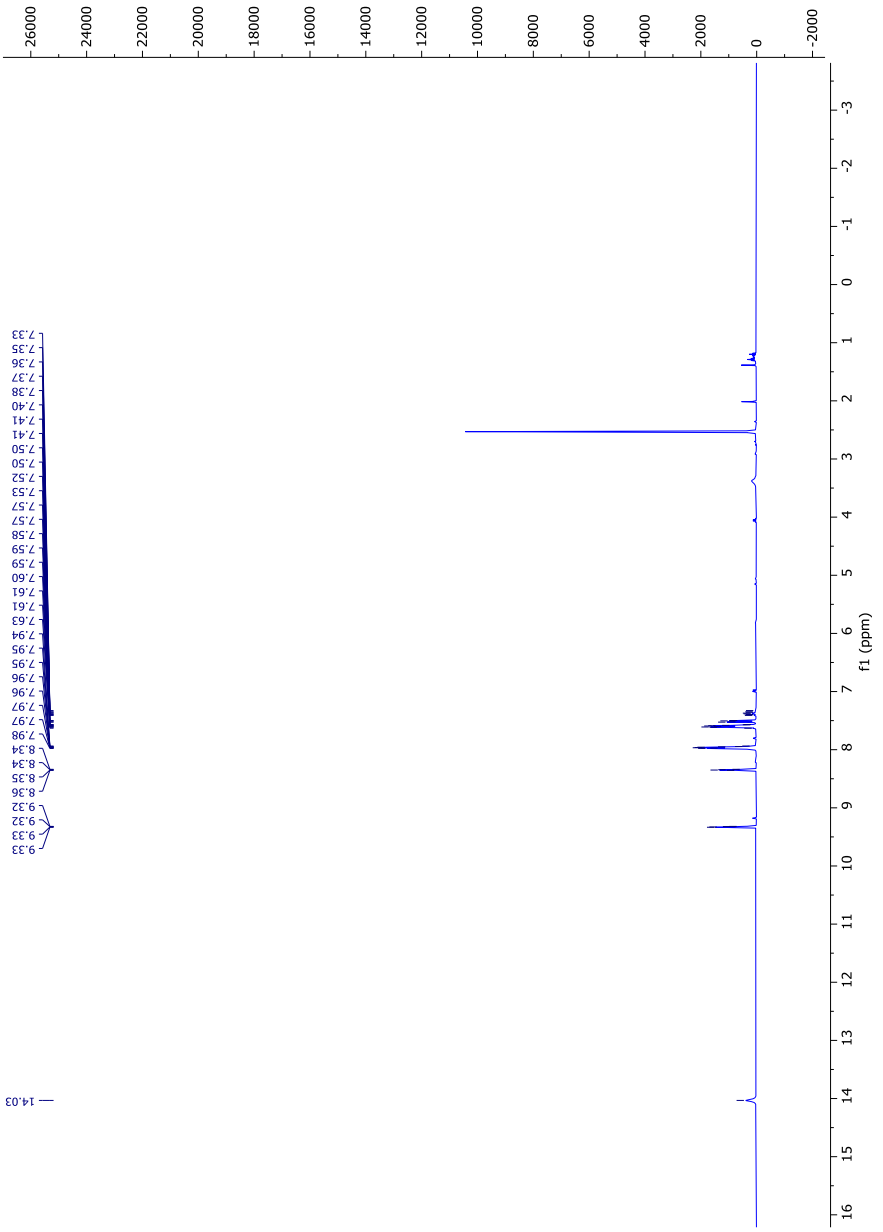
220nm

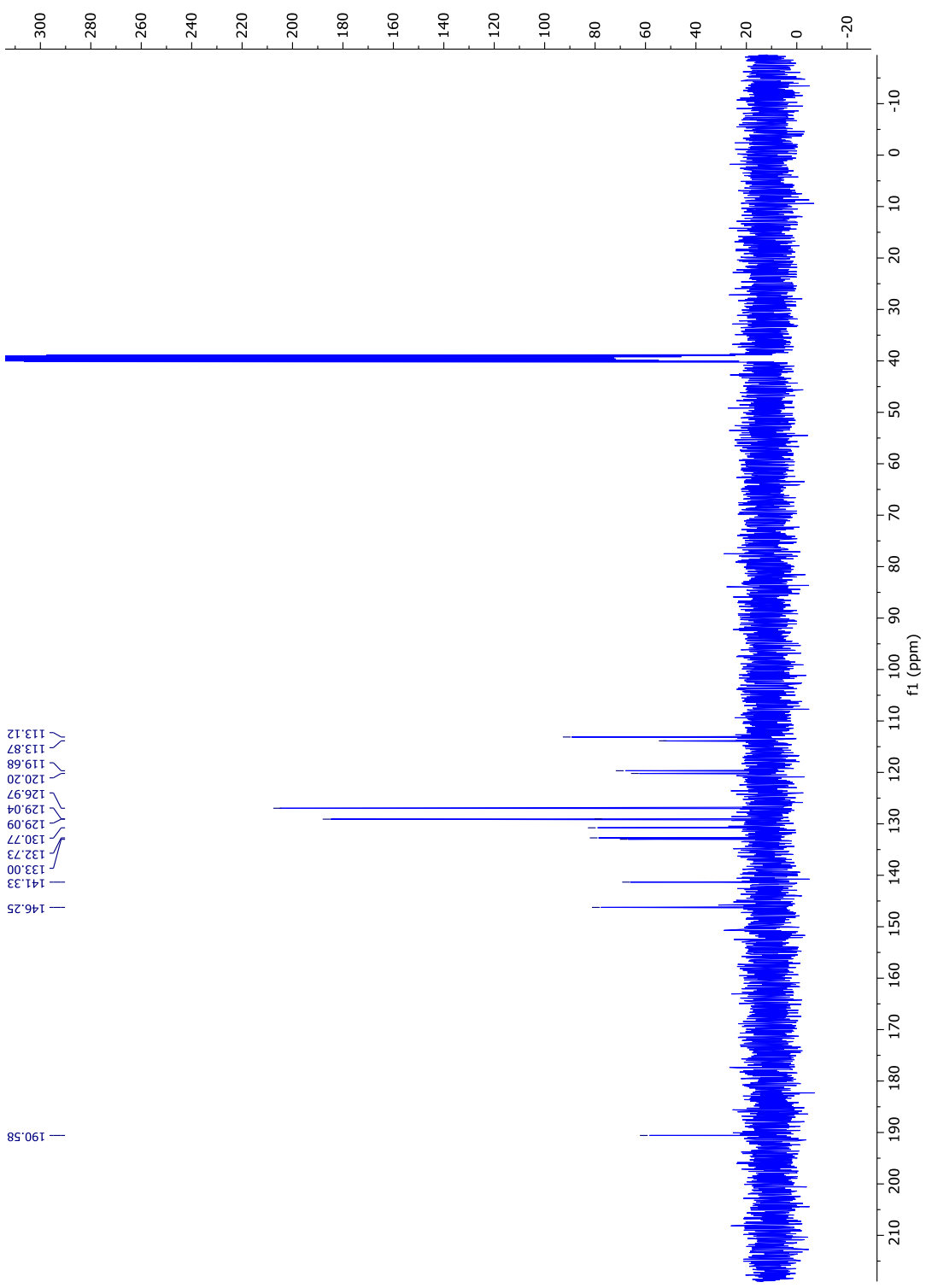


254nm



Copy of NMR of 4e

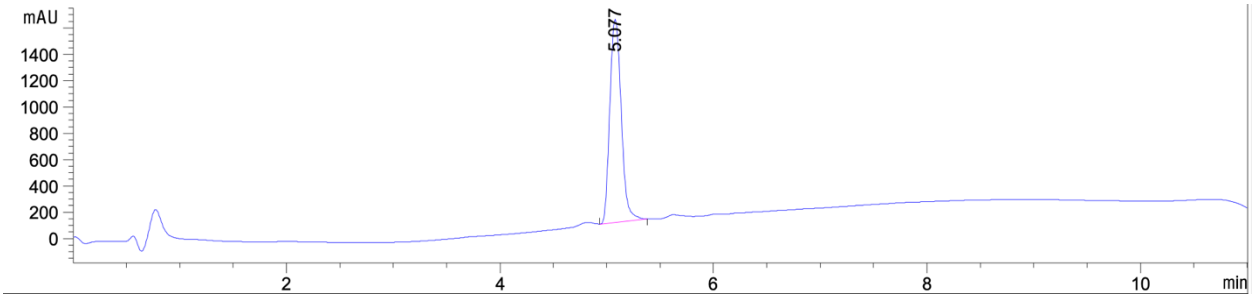



190.58
146.25
141.33
133.00
132.73
130.77
129.09
129.04
126.97
120.20
119.68
113.87
113.12
f1 (ppm)

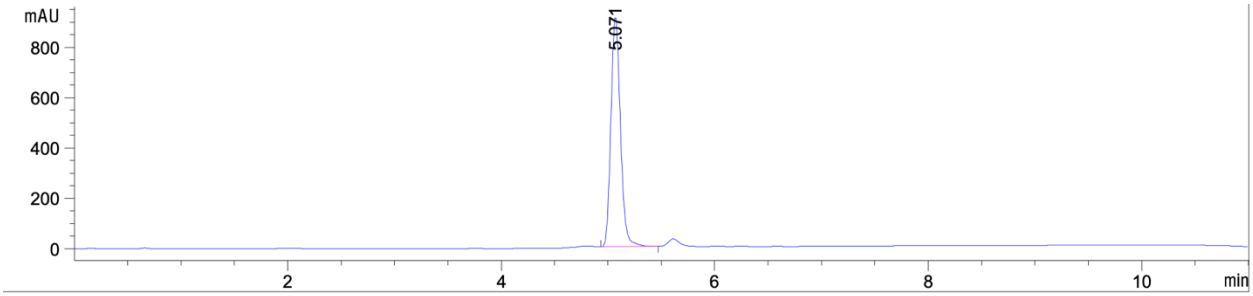
Compound **4f**

Copy of Chromatographic Analysis of 4f

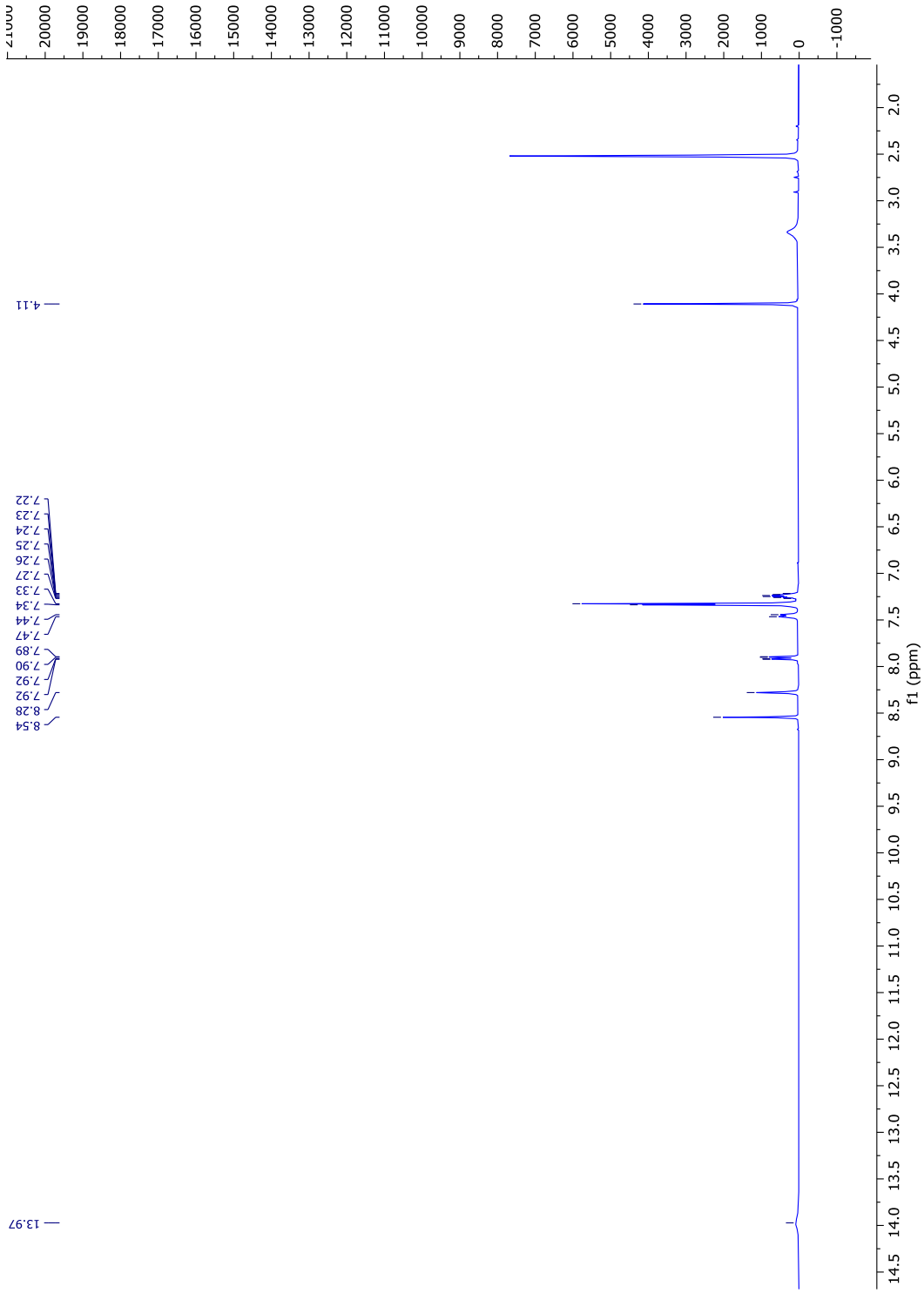
220nm

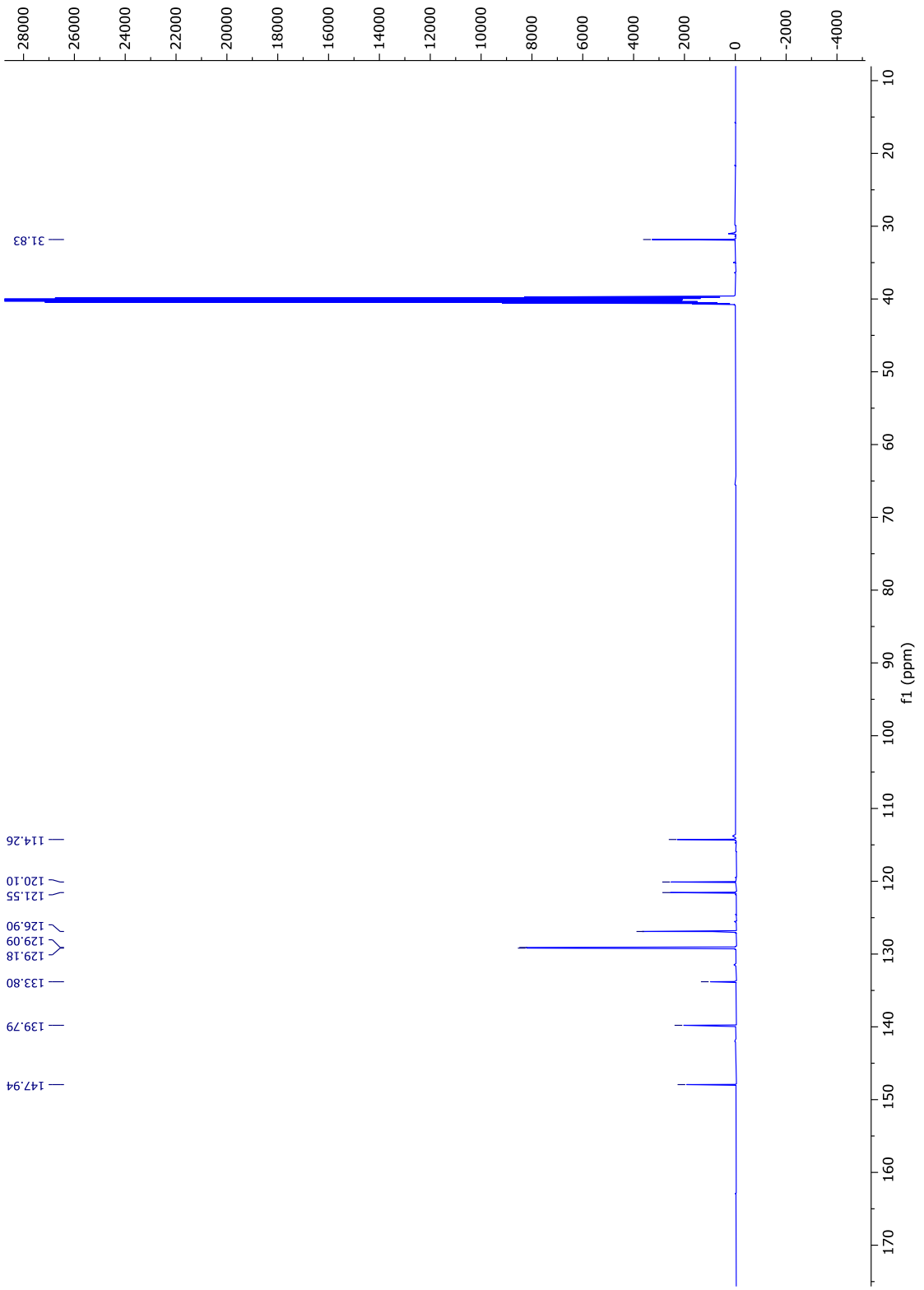


254nm



Copy of NMR of 4f

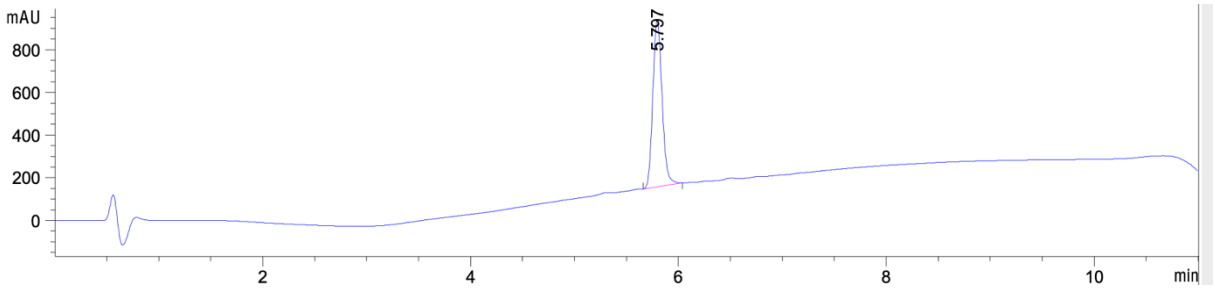



31.83
114.26
120.10
121.55
126.90
129.09
129.18
133.80
139.79
147.94
f1 (ppm)

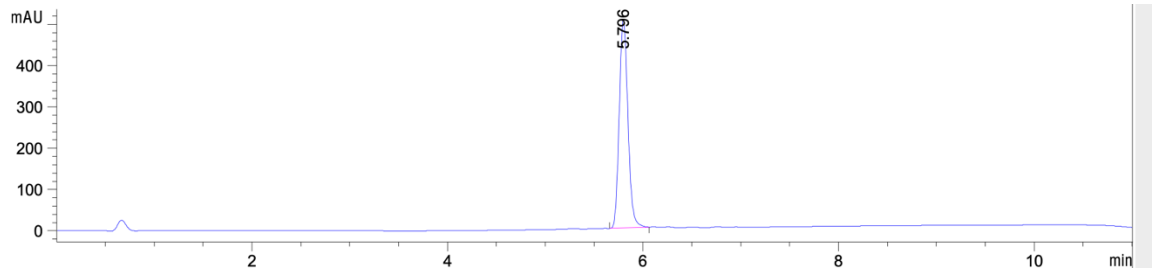
Compound **4g**

Copy of Chromatographic Analysis of 4g

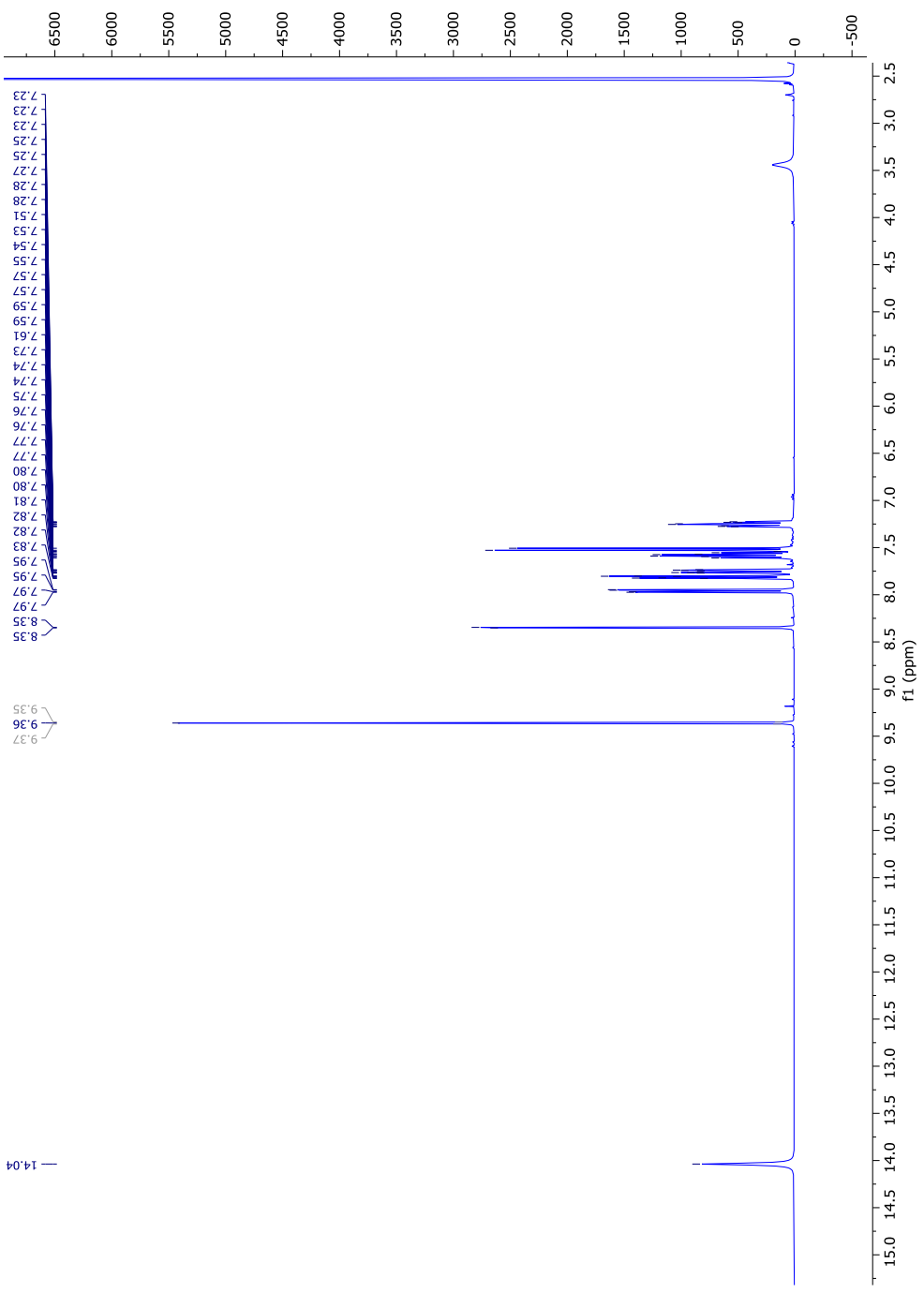
220nm

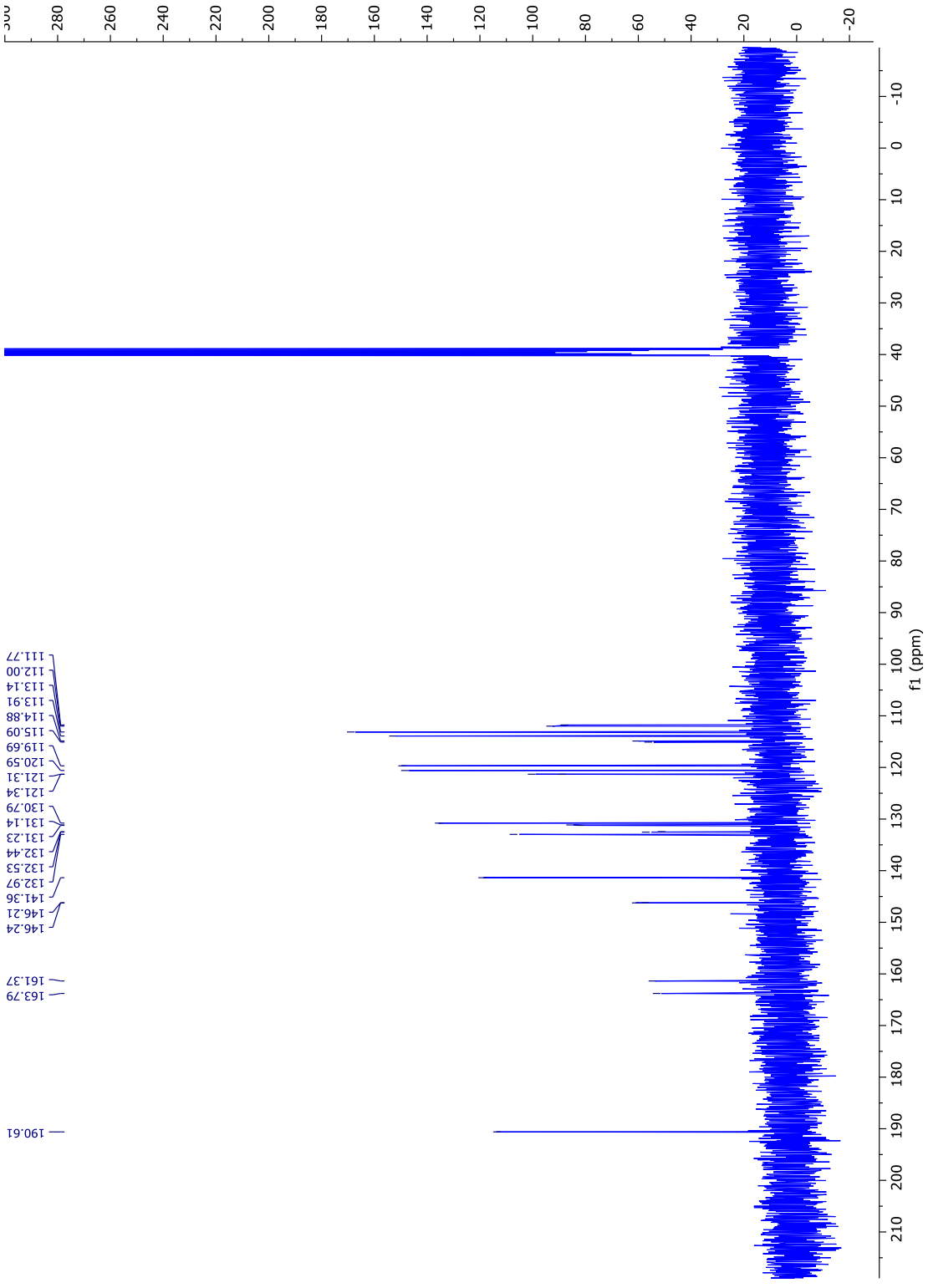


254nm



Copy of NMR of 4g

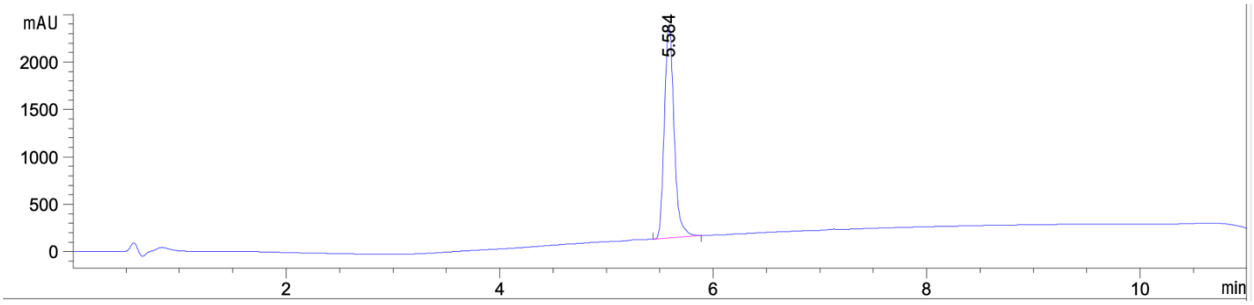



190.61
163.79
161.37
146.24
146.21
141.36
132.97
132.53
132.44
131.23
131.14
130.79
121.34
121.31
120.59
119.69
115.09
114.88
113.91
113.14
112.00
111.77
f1 (ppm)

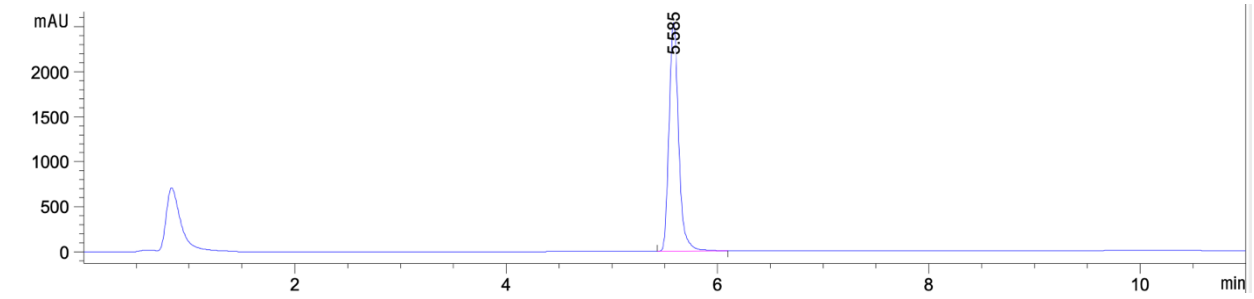
Compound **4h**

Copy of Chromatographic Analysis of 4h

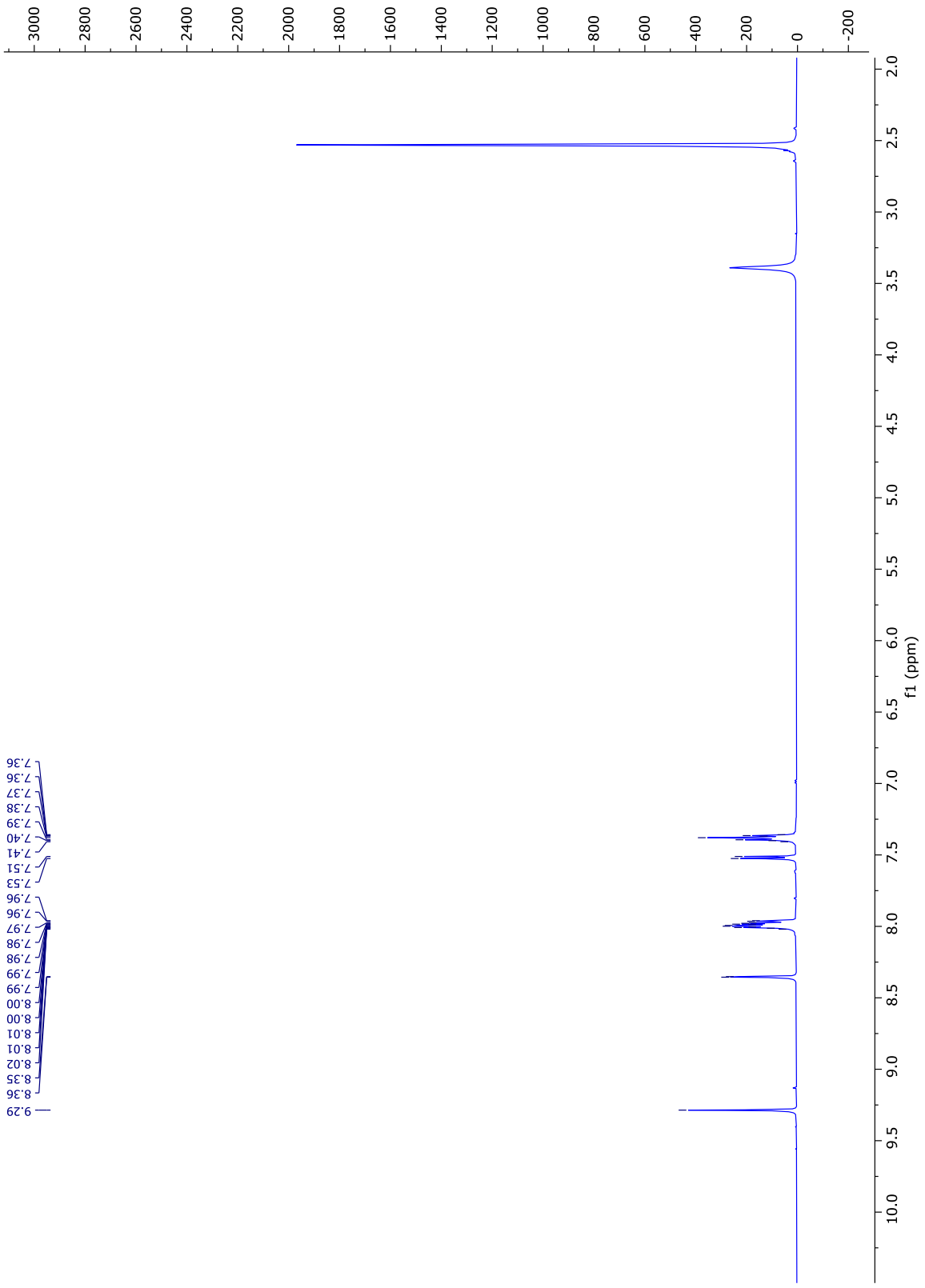
220nm

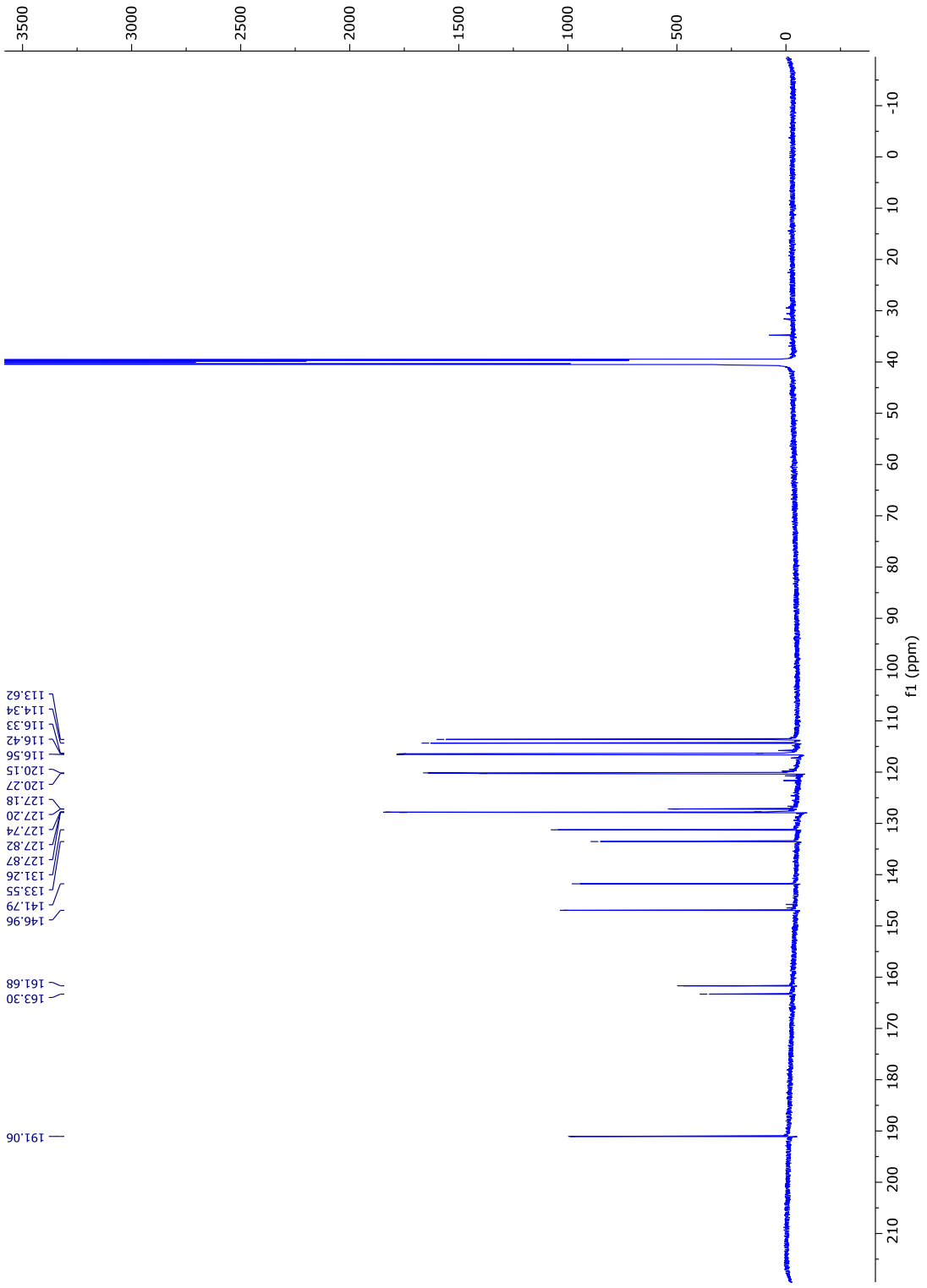


254nm



Copy of NMR of 4h

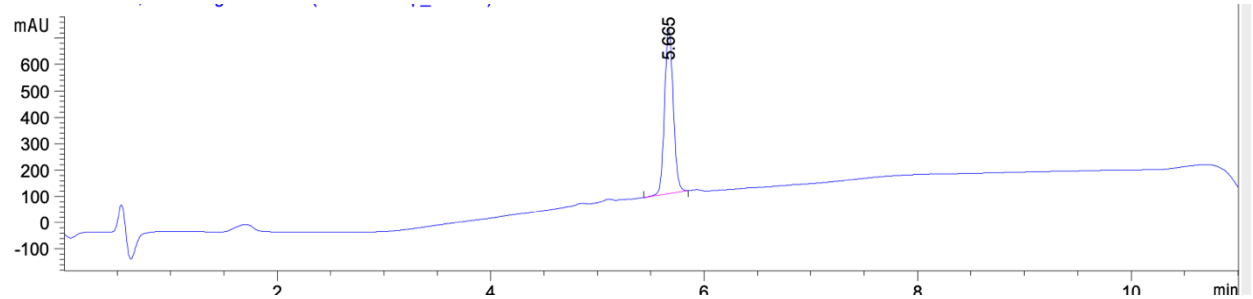



191.06
163.30
161.68
146.96
141.79
133.55
131.26
127.87
127.82
127.74
127.20
127.18
120.27
120.15
116.56
116.42
116.33
114.34
113.62
f1 (ppm)

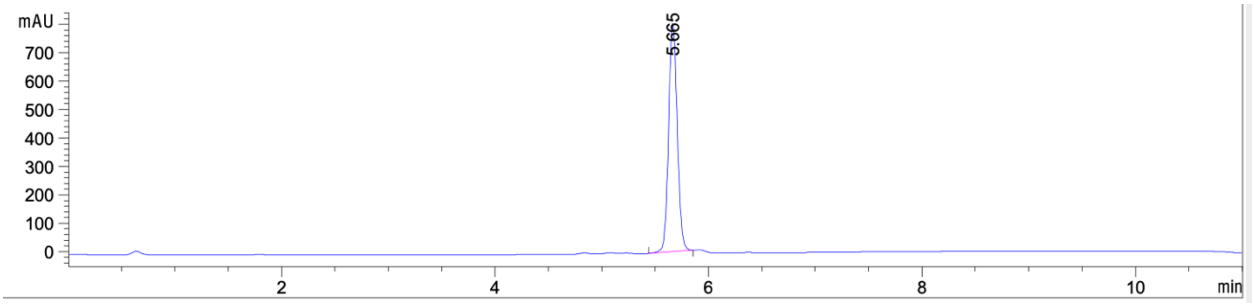
Compound **4i**

Copy of Chromatographic Analysis of 4i

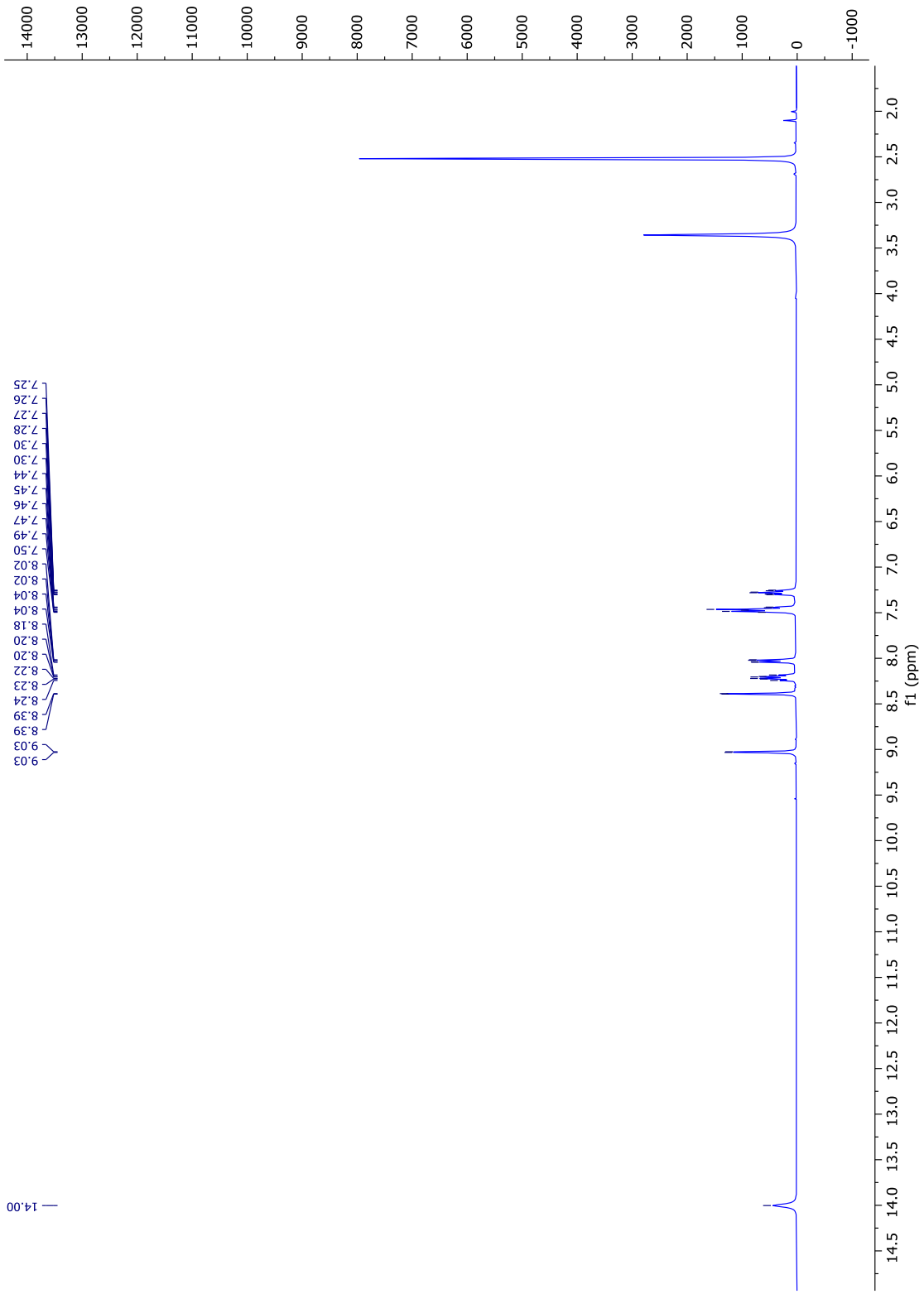
220nm

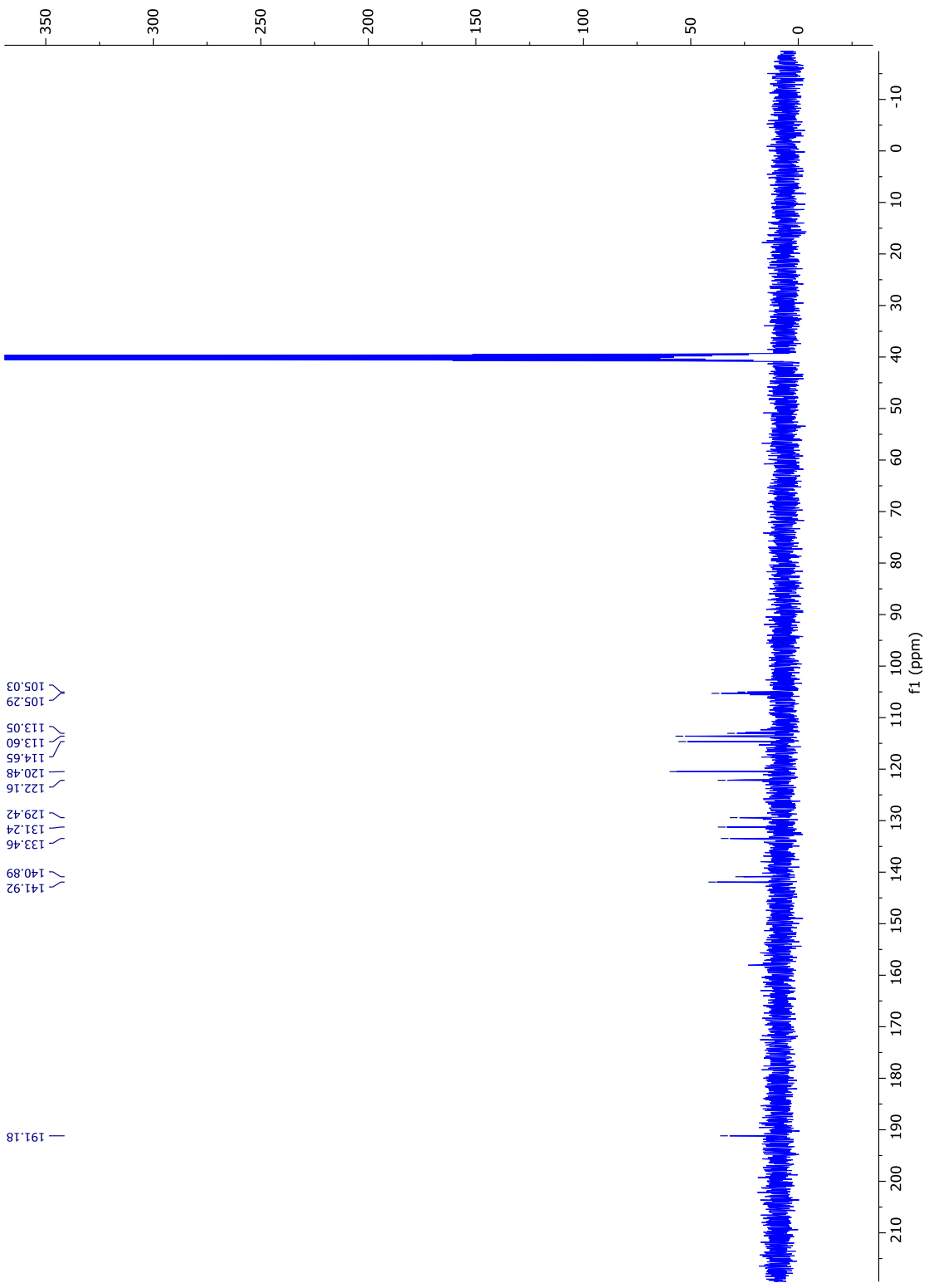


254nm



Copy of NMR of 4i

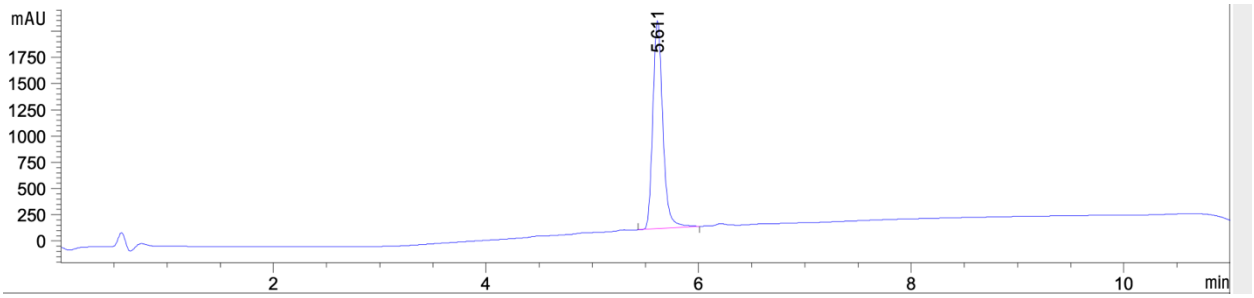



191.18
141.92
140.89
133.46
131.24
129.42
122.16
120.48
114.65
113.60
113.05
105.29
105.03
f1 (ppm)

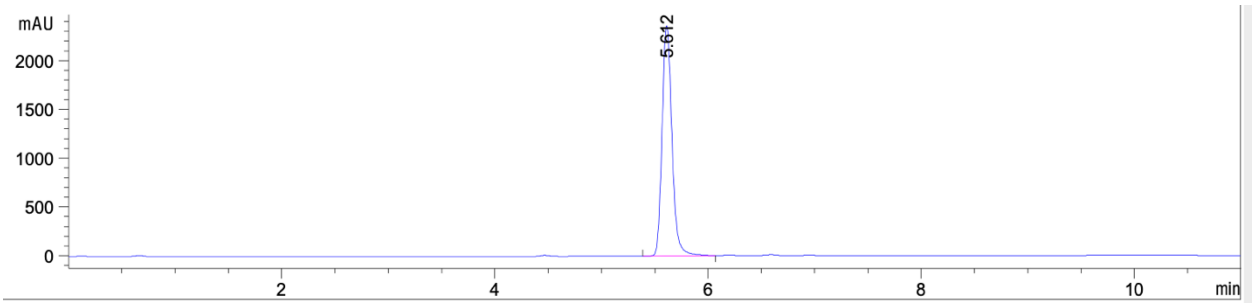
Compound **4j**

Copy of Chromatographic Analysis of 4j

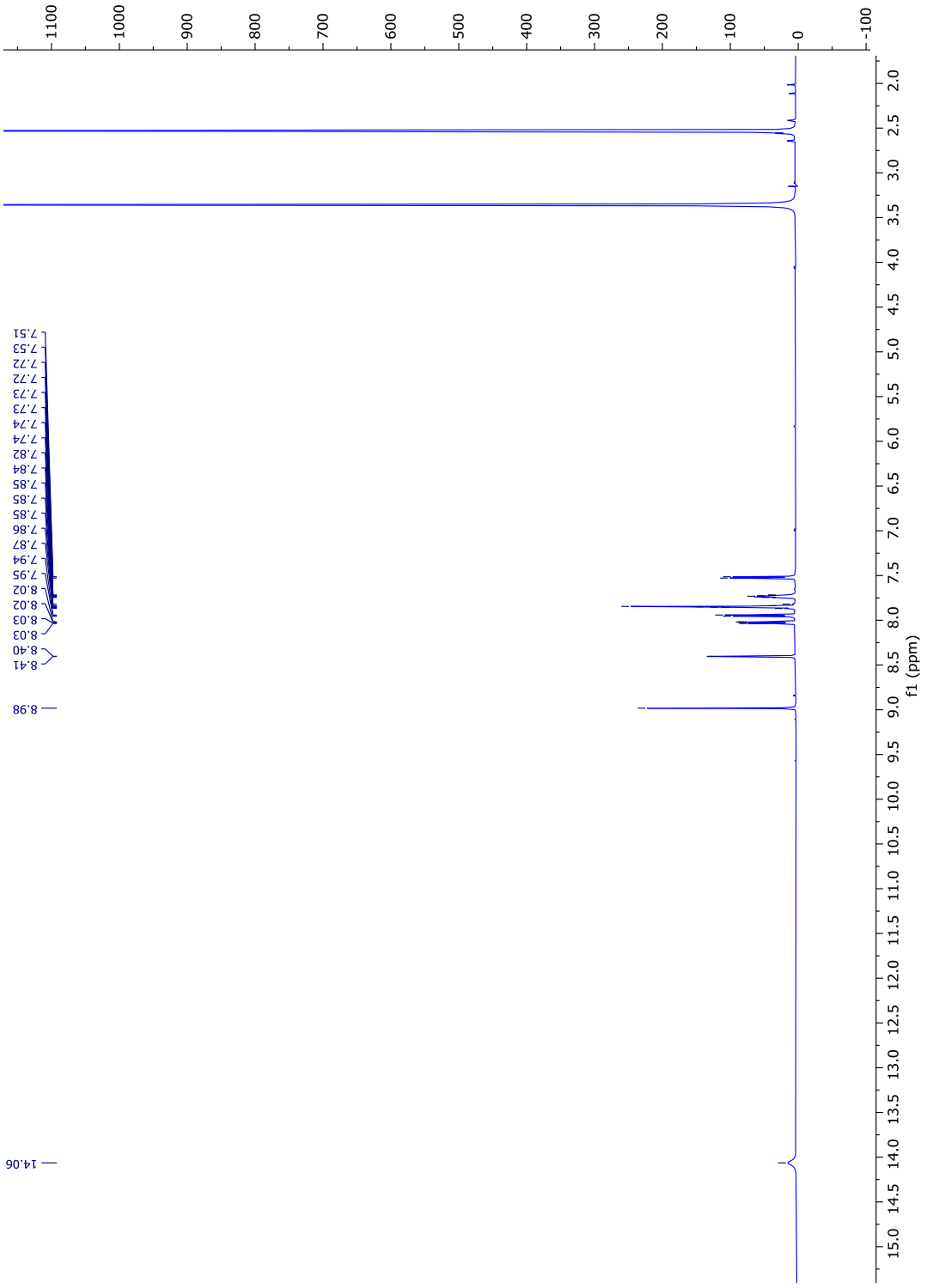
220nm

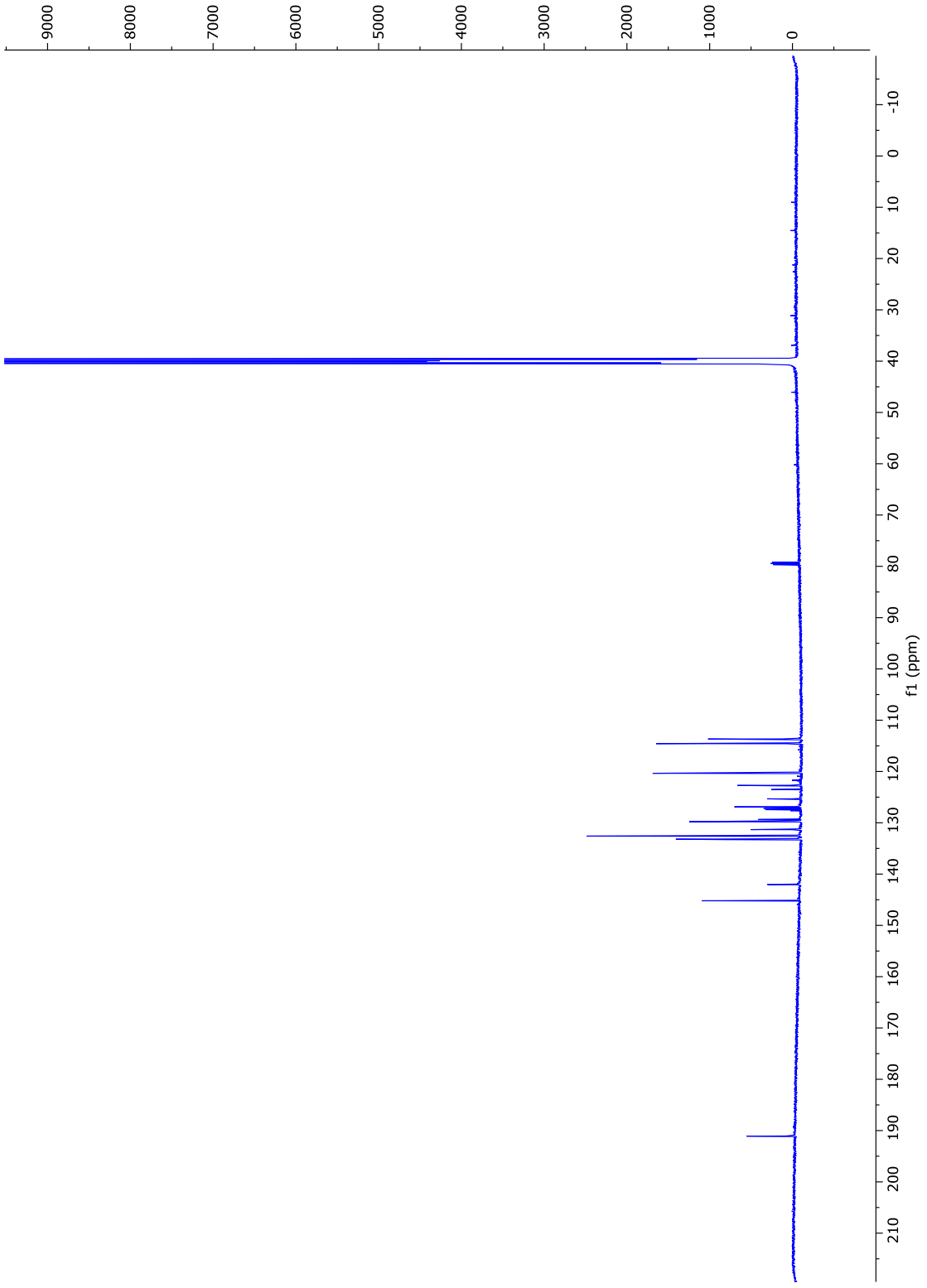


254nm



Copy of NMR of 4j

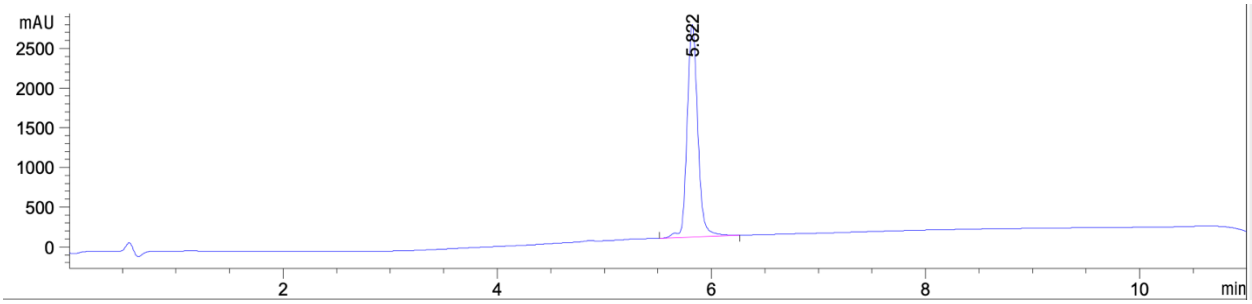



9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
f1 (ppm)

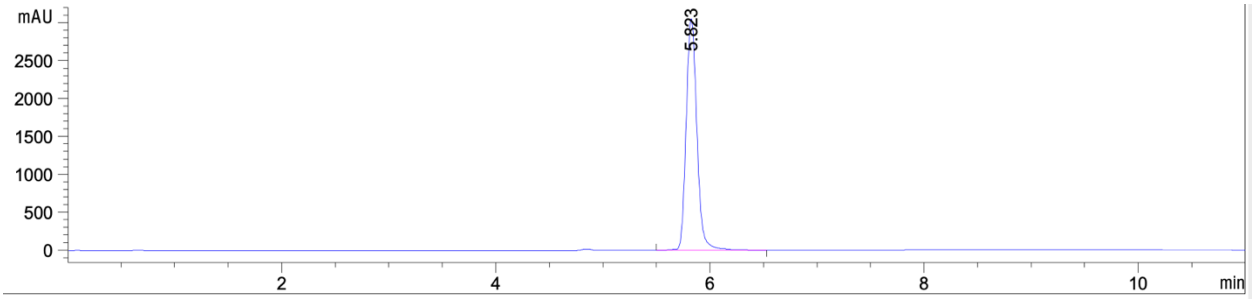
Compound **4k**

Copy of Chromatographic Analysis of 4k

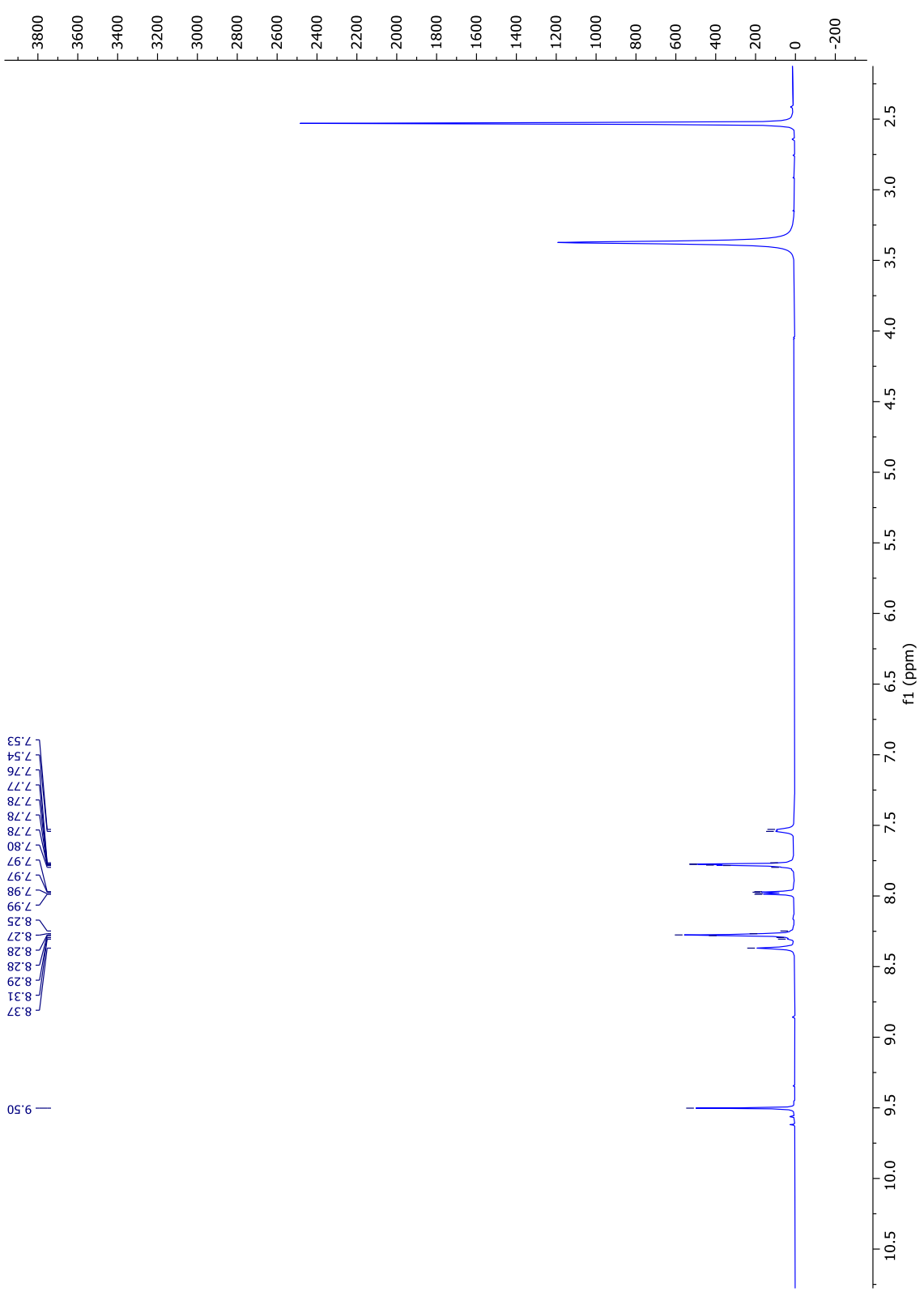
220nm

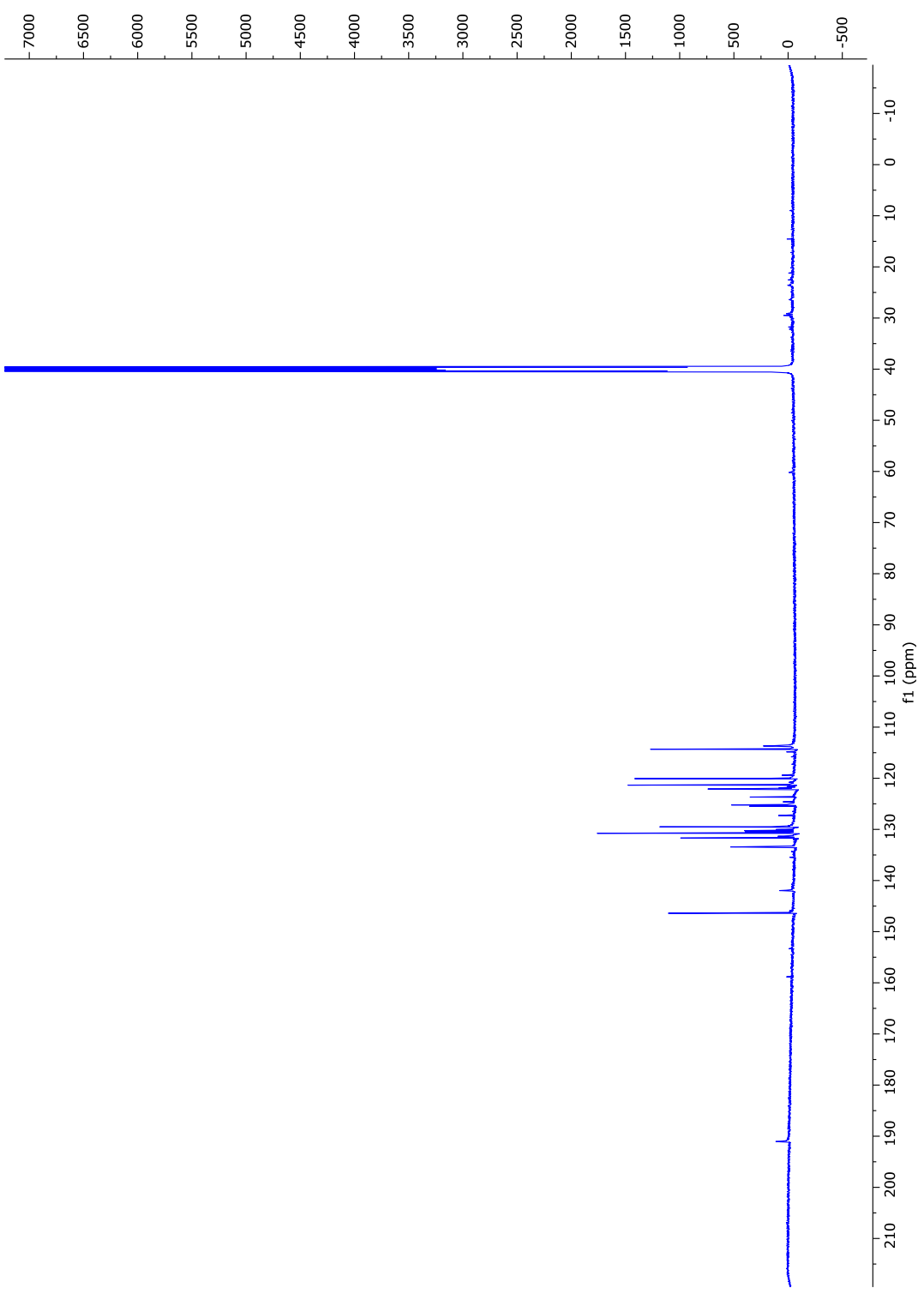


254nm



Copy of NMR of 4k

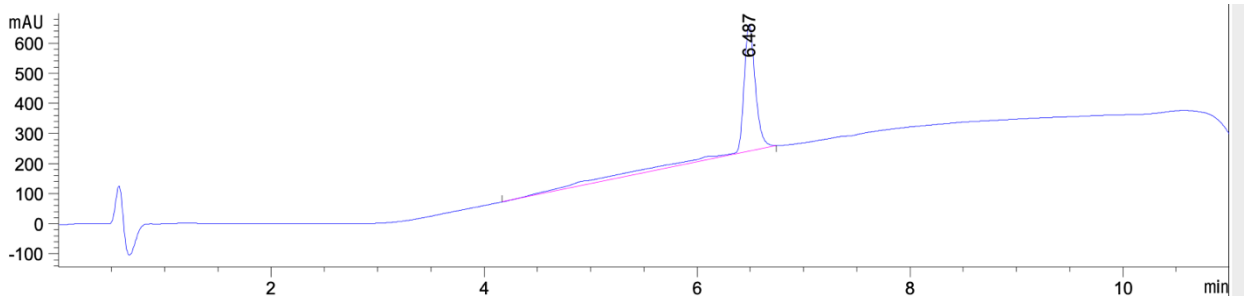



7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
f1 (ppm)

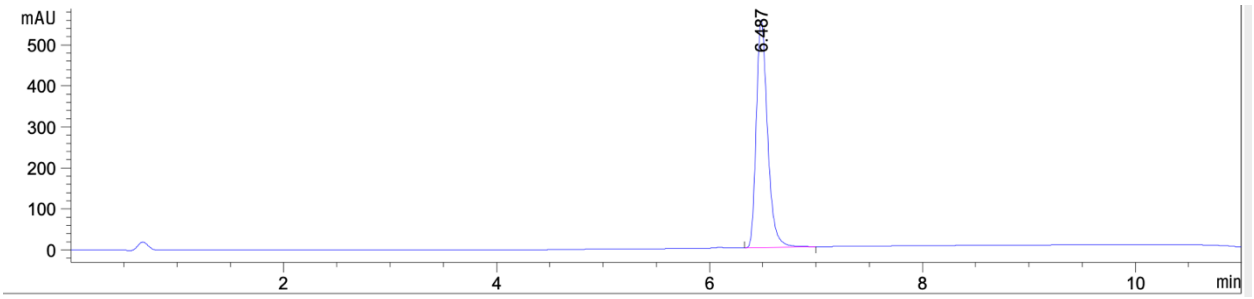
Compound **4l**

Copy of Chromatographic Analysis of 4l

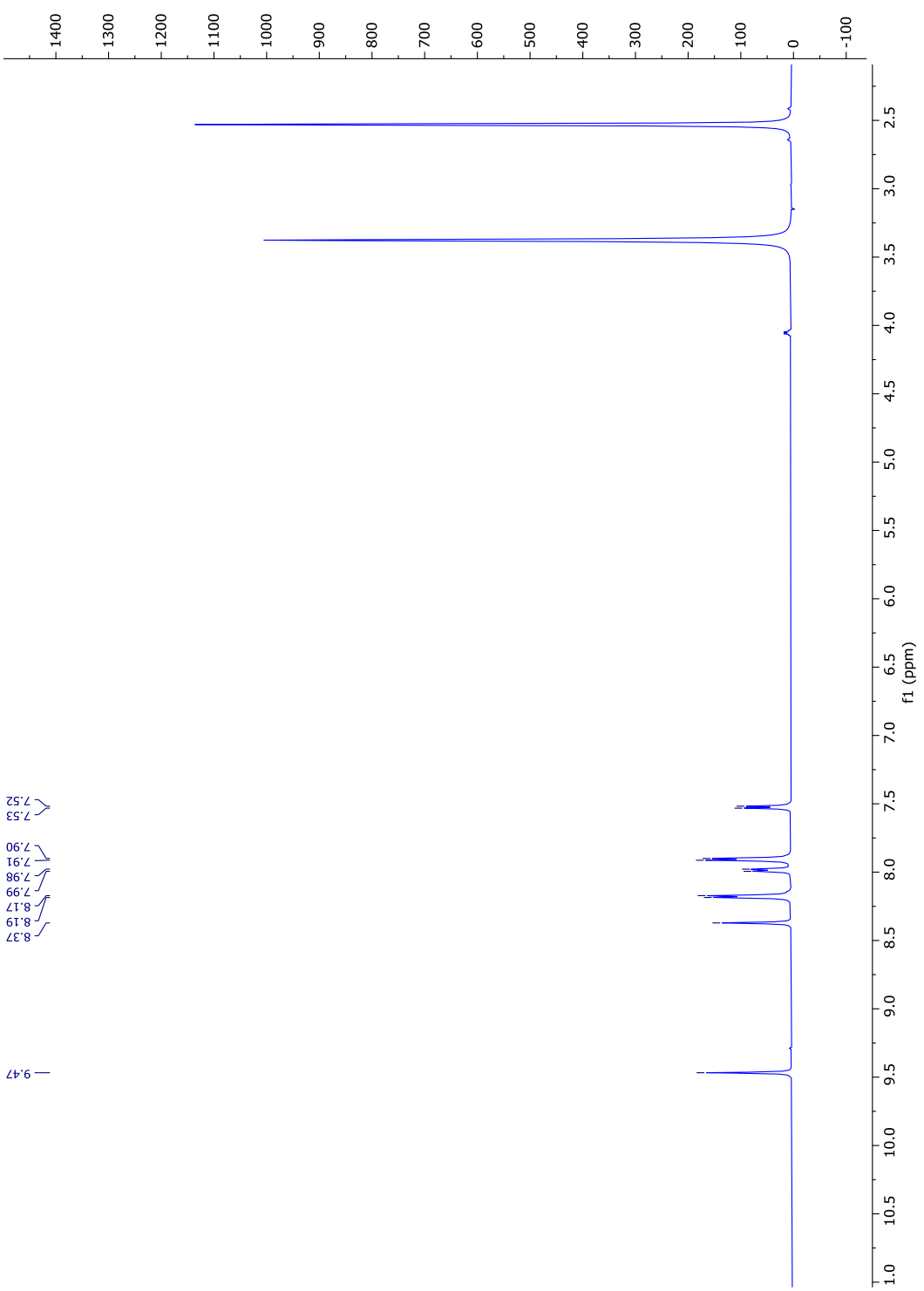
220nm

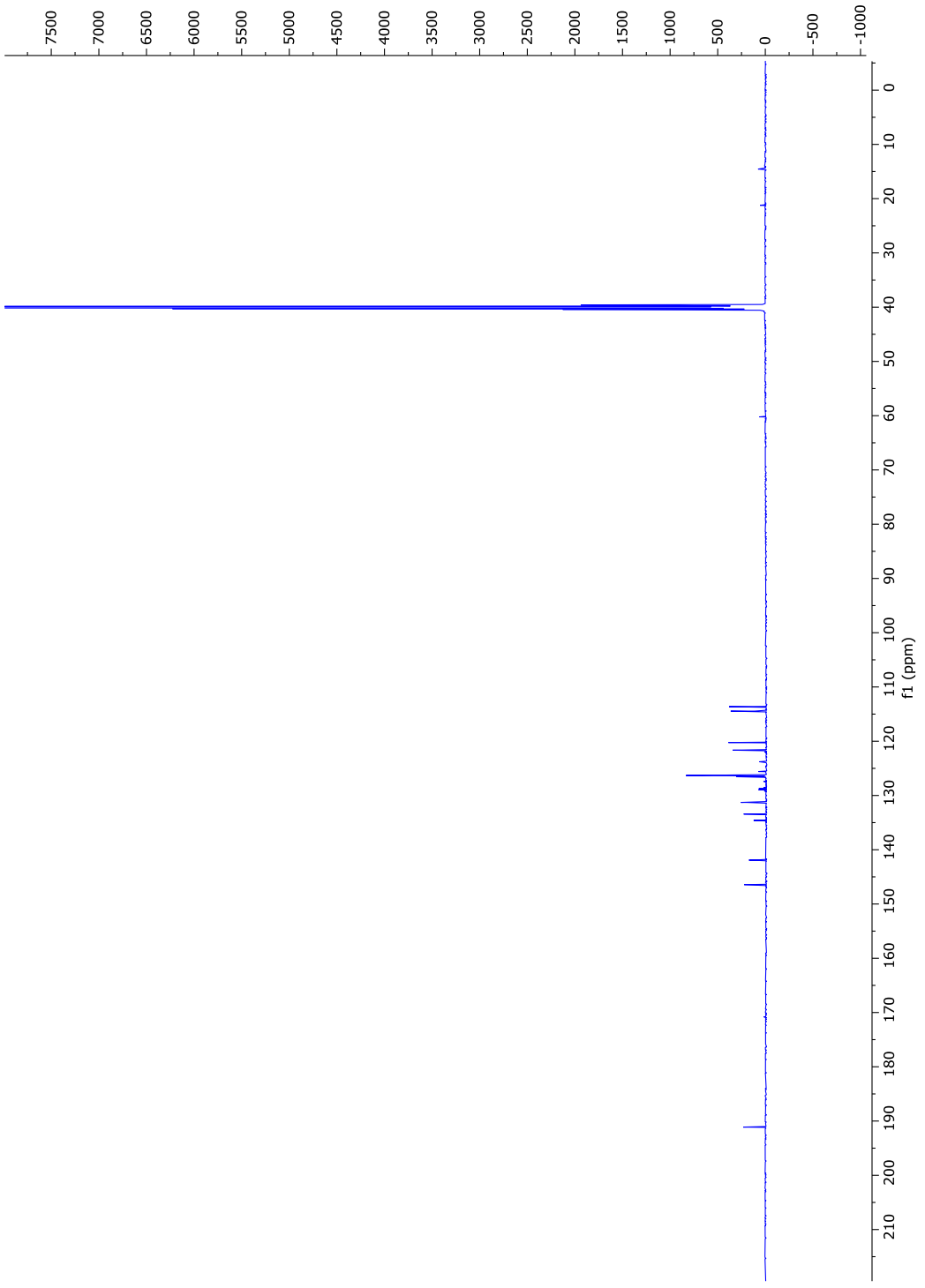


254nm



Copy of NMR of 4l

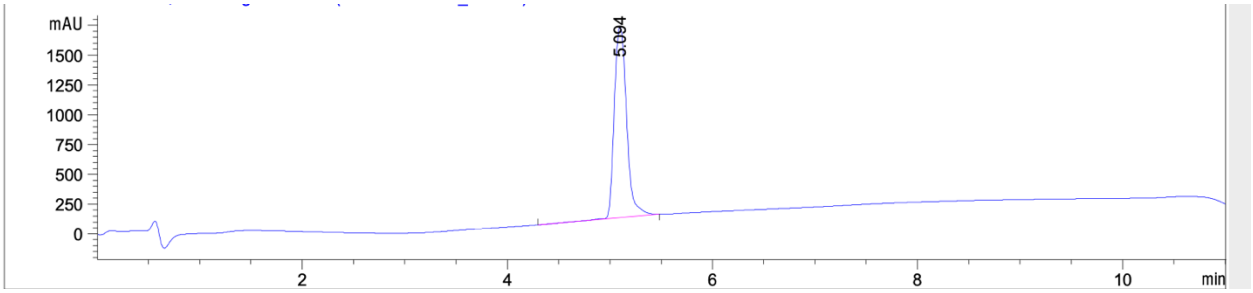



7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
f1 (ppm)

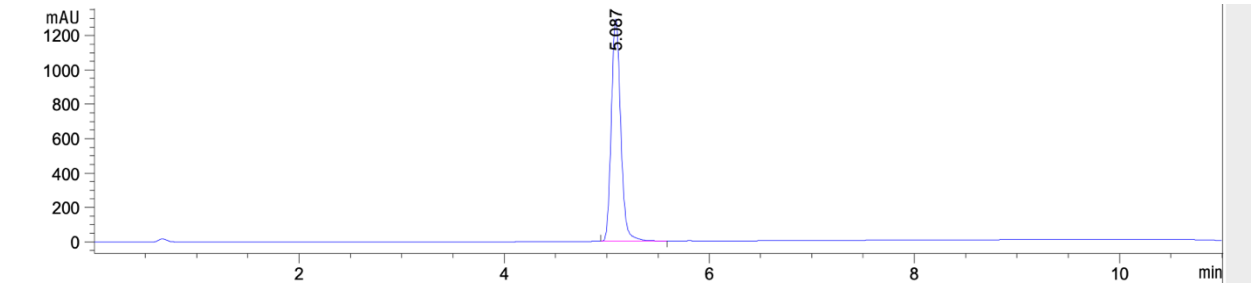
Compound **4m**

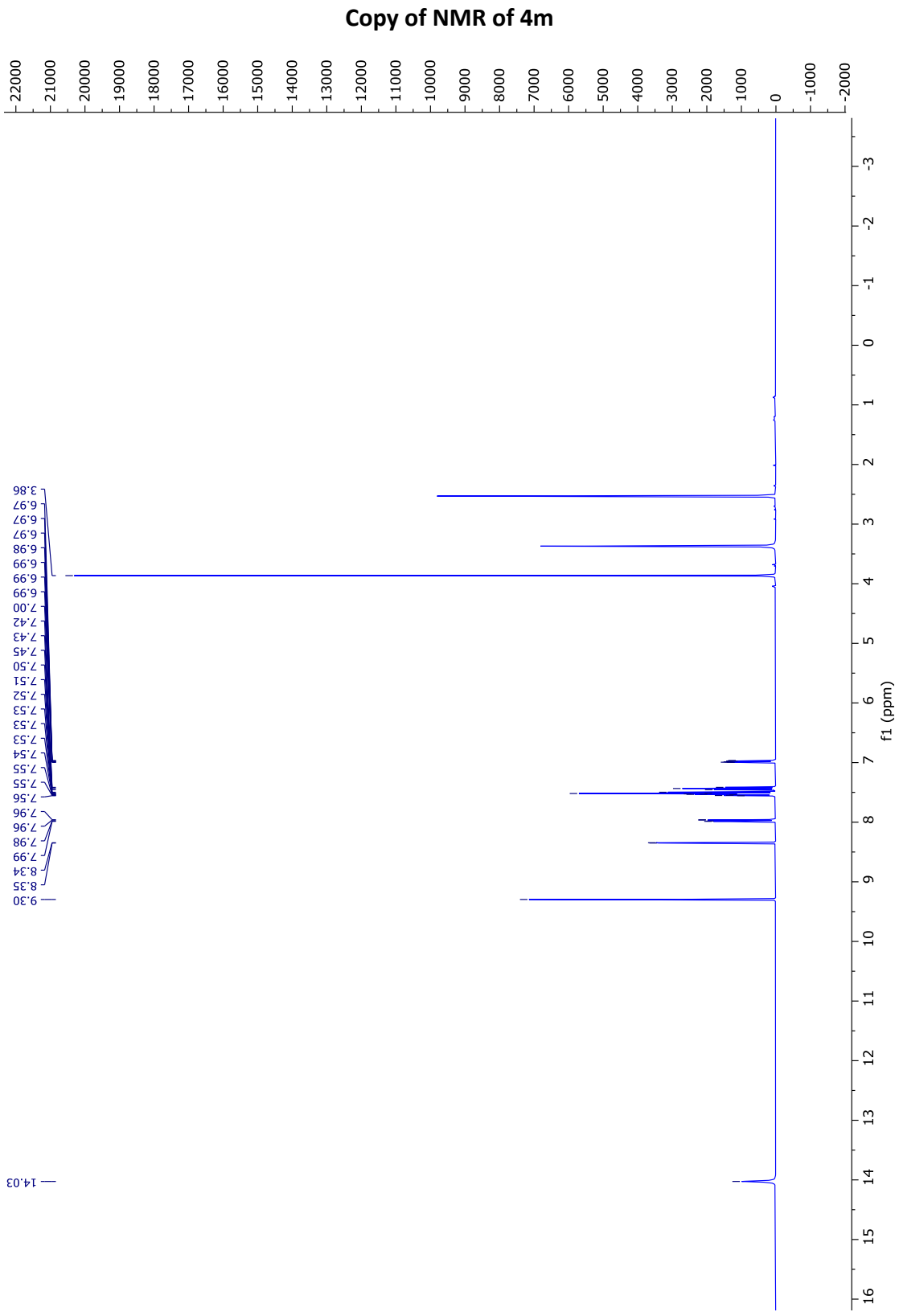
Copy of Chromatographic Analysis of 4m

220nm



254nm




Copy of NMR of 4m
f1 (ppm)
14.03
9.30
8.35
8.34
7.99
7.98
7.96
7.96
7.56
7.55
7.55
7.54
7.53
7.53
7.53
7.52
7.51
7.50
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7.42
7.00
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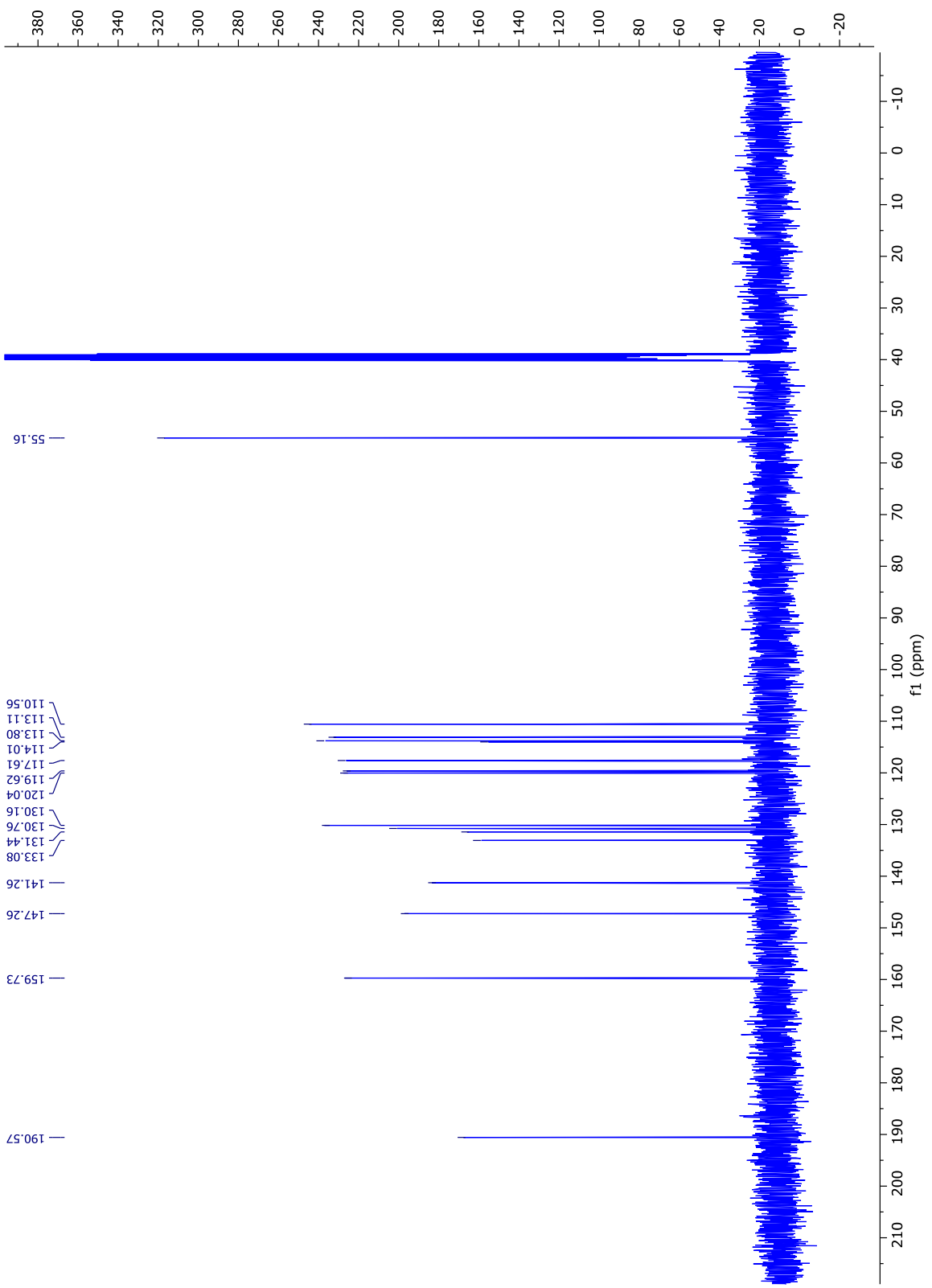
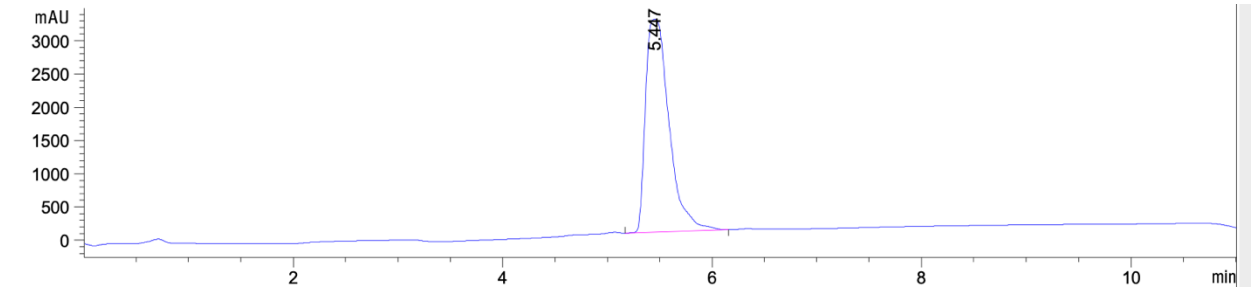
6.99
6.98
6.97
6.97
6.97
3.86


190.57
159.73
147.26
141.26
133.08
131.44
130.76
130.16
120.04
119.62
117.61
114.01
113.80
113.11
110.56
55.16
f1 (ppm)

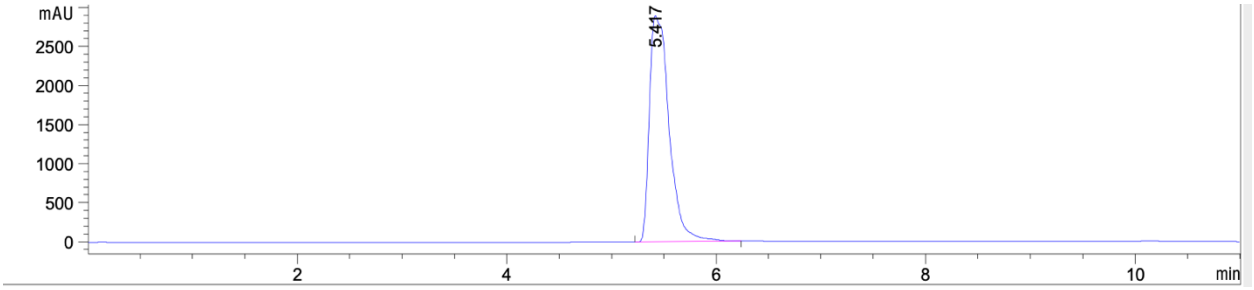
Compound **4n**

Copy of Chromatographic Analysis of 4n

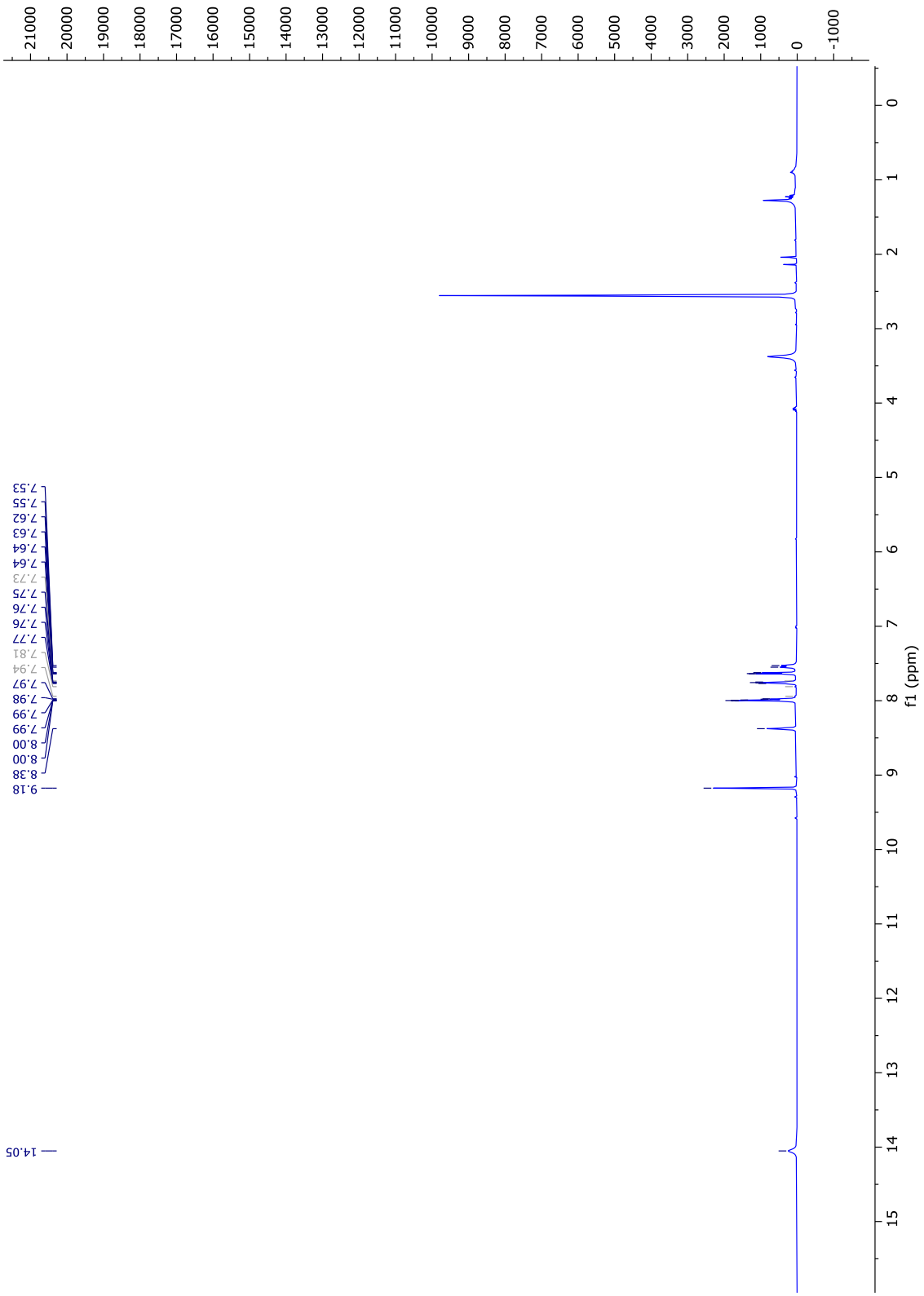
220nm

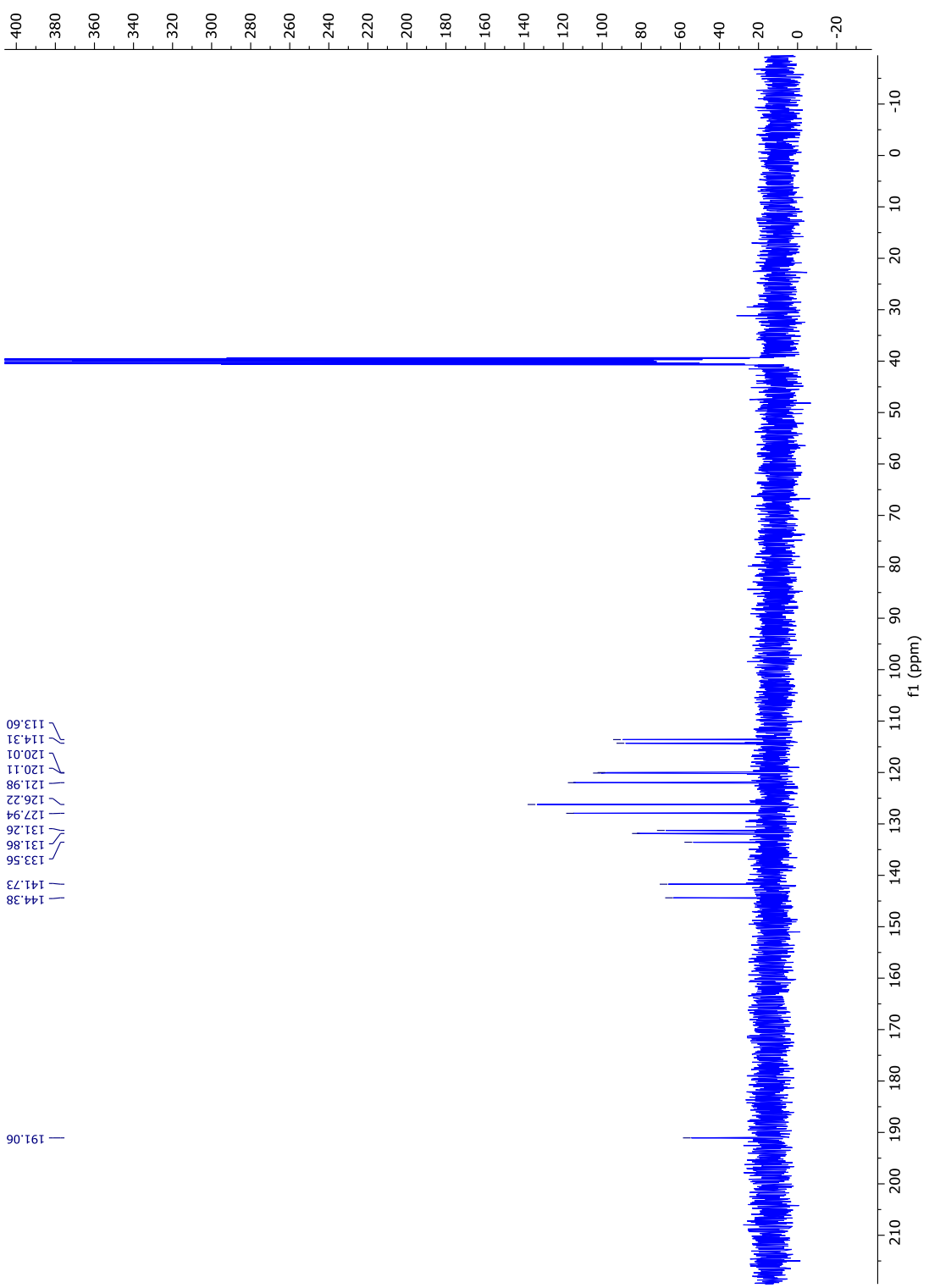


254nm



Copy of NMR of 4n

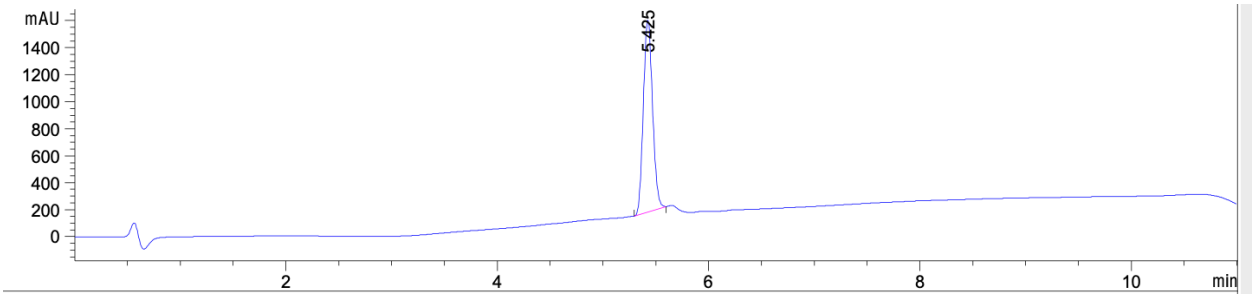



191.06
144.38
141.73
133.56
131.86
131.26
127.94
126.22
121.98
120.11
120.01
114.31
113.60
f1 (ppm)

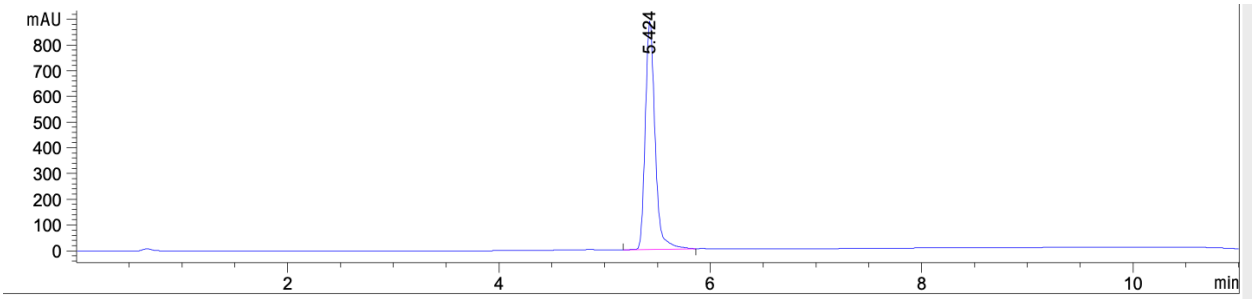
Compound **4o**

Copy of Chromatographic Analysis of 4o

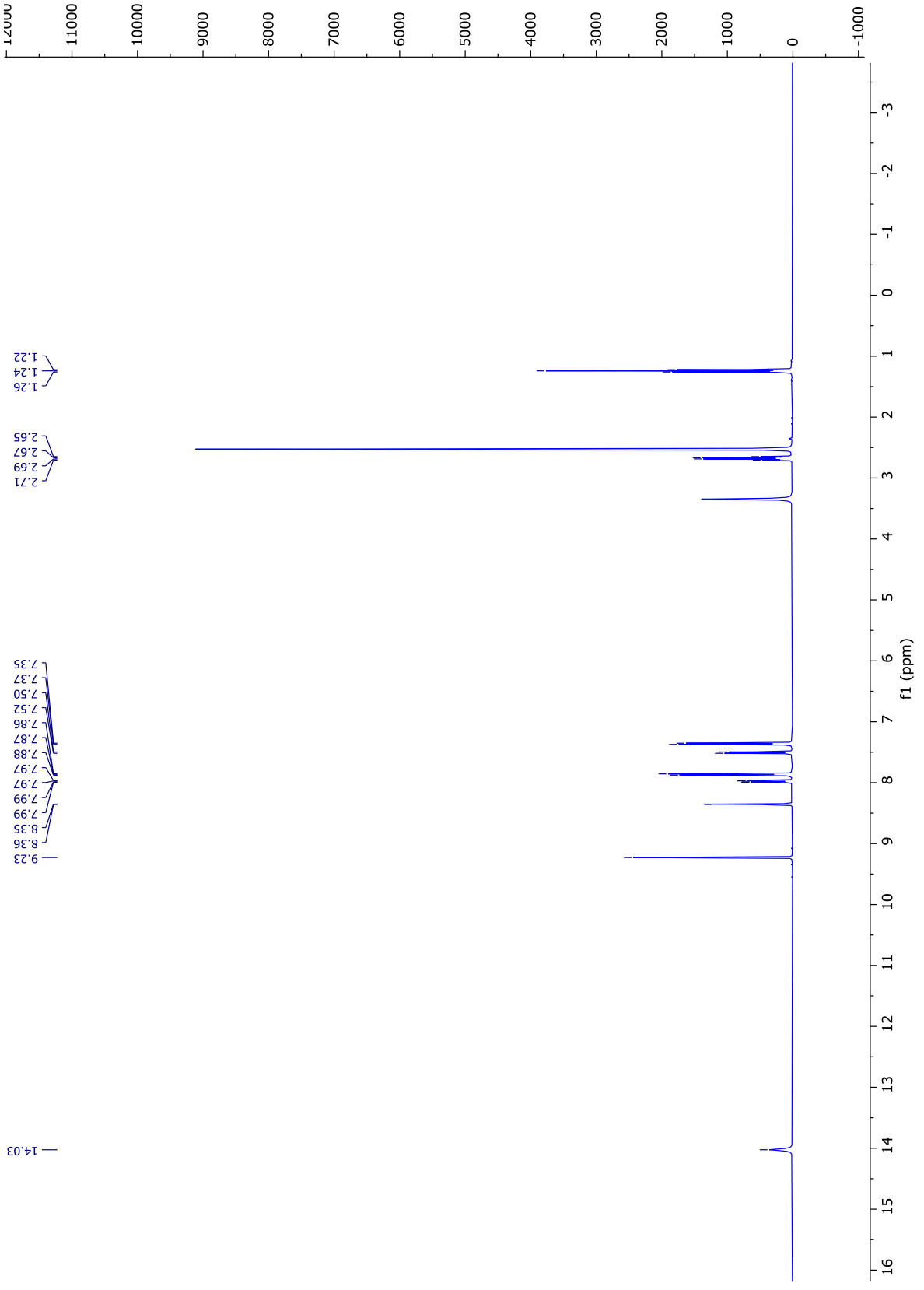
220nm

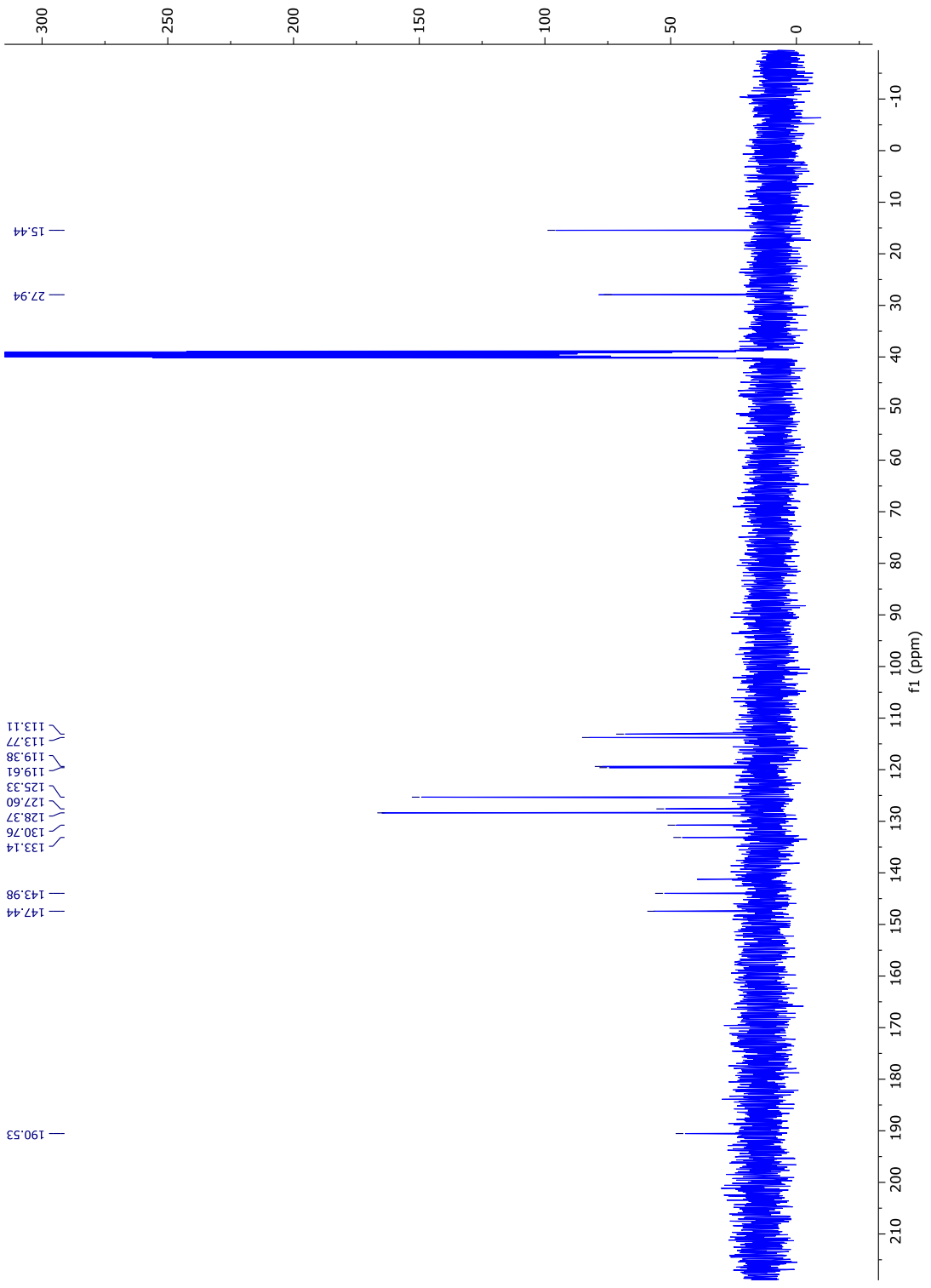


254nm



Copy of NMR of 4o

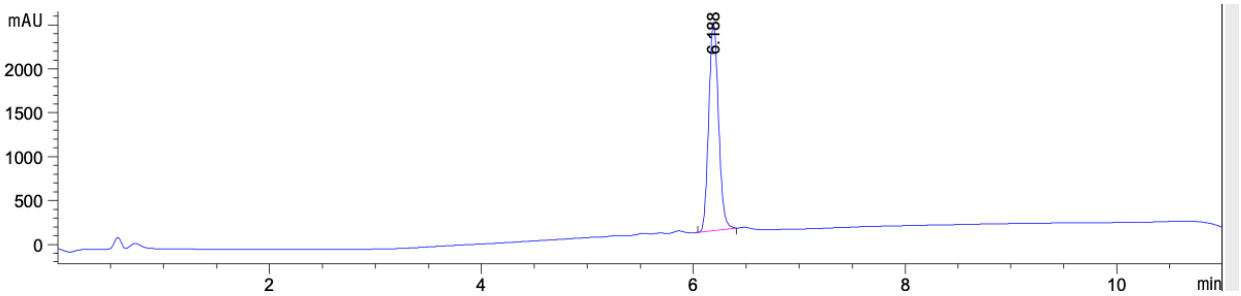



15.44
27.94
113.11
113.77
119.38
119.61
125.33
127.60
128.37
130.76
133.14
143.98
147.44
190.53
f1 (ppm)

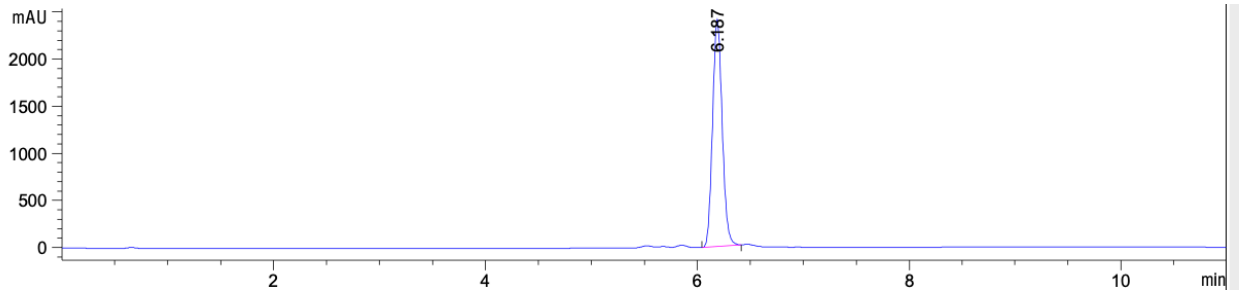
Compound **4p**

Copy of Chromatographic Analysis of 4p

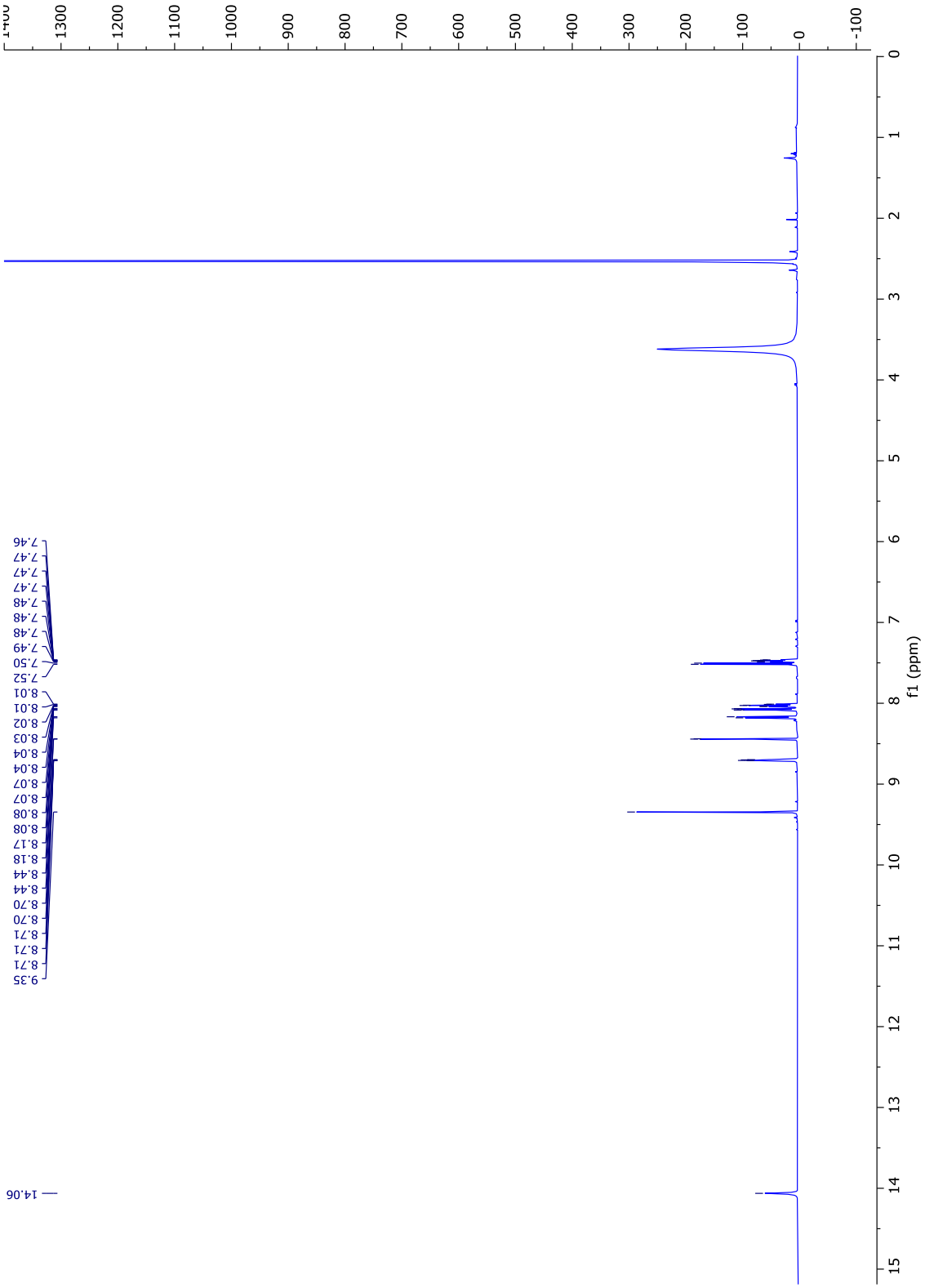
220nm

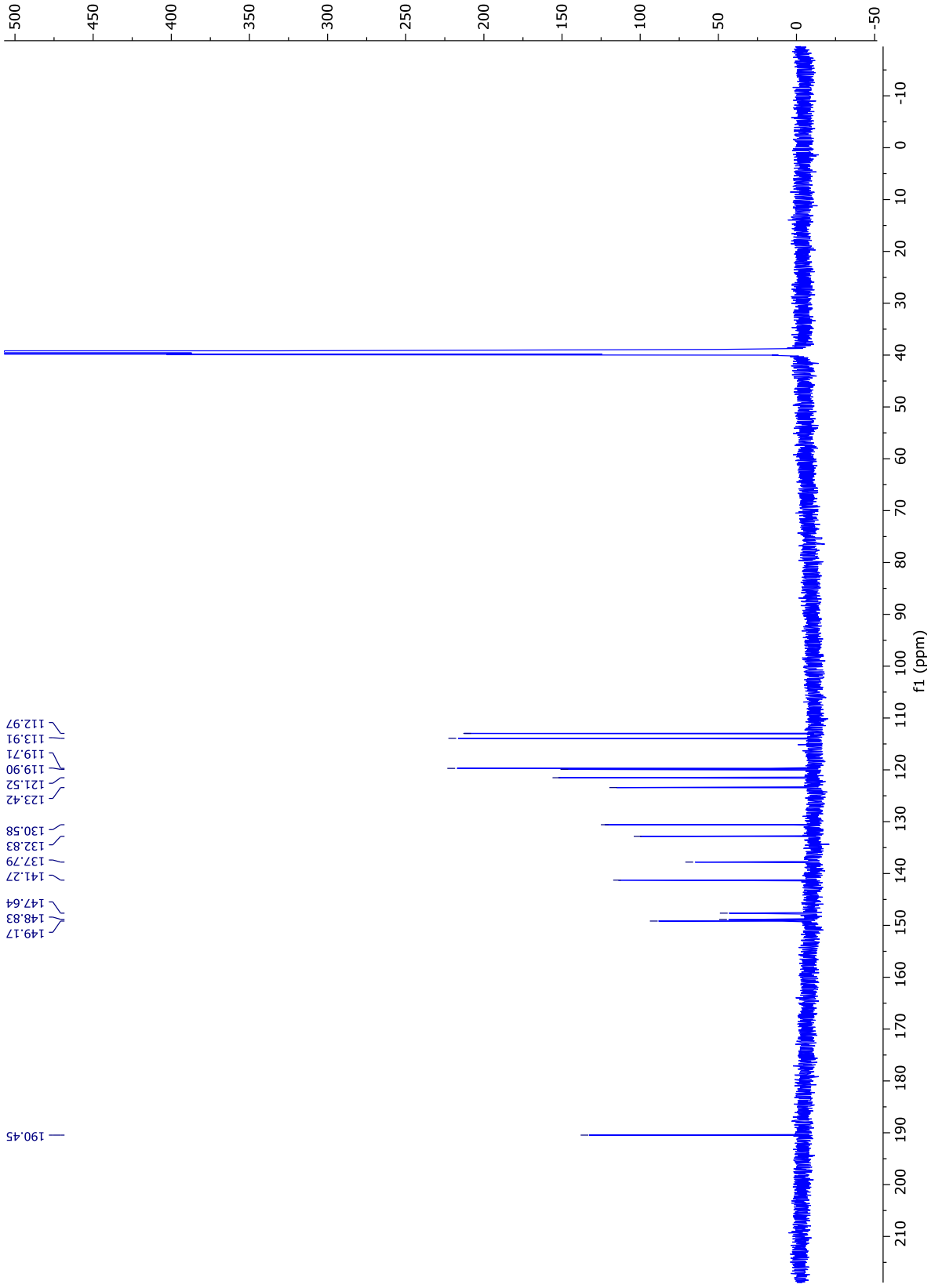


254nm



Copy of NMR of 4p




190.45
149.17
148.83
147.64
141.27
137.79
132.83
130.58
123.42
121.52
119.90
119.71
113.91
112.97
f1 (ppm)