Supporting Information

N-Heterocyclic Carbene Catalyzed Chemo- and Enantioselective Cross-Benzoin Reaction of Aldehydes with Isatins

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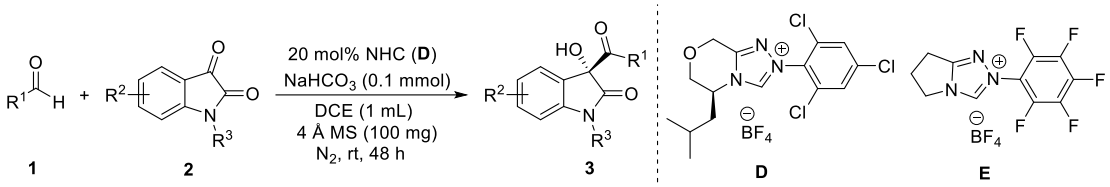
General Information

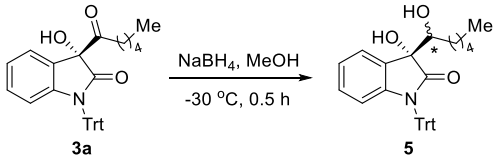
Commercially available materials purchased from Energy-Chemical were used as received. Proton nuclear magnetic resonance (^{1}H NMR) spectra were recorded on a Zhongke-Niujin AS 400 (400 MHz) spectrometer. Chemical shifts were recorded in parts per million (ppm, δ) relative to tetramethylsilane (δ 0.00) or chloroform (δ = 7.26, singlet). ^{1}H NMR splitting patterns are designated as singlet (s), doublet (d), triplet (t), quartet (q), dd (doublet of doublets); m (multiplets), and etc. All first-order splitting patterns were assigned on the basis of the appearance of the multiplet. Splitting patterns that could not be easily interpreted are designated as multiplet (m) or broad (br). Carbon nuclear magnetic resonance (^{13}C NMR) spectra were recorded on a Zhongke-Niujin AS 400 (100 MHz) spectrometer. High resolution mass spectral analysis (HRMS) was performed on a Waters Xevo G2-S QTof mass spectrometer. The determination of ee was performed via chiral HPLC analysis using Waters Breeze 2 HPLC system. X-ray crystallography analysis was performed on a Bruker X8 APEX X-ray diffractionmeter. Optical rotations were measured using a 2 mL cell with a 1 dm path length on a Rudolph Autopol IV automatic polarimeter and are reported as follows: $[\alpha]^{rt}_{D}$ (*c* in g per 100 mL solvent). Infrared spectral analysis (IR) was performed on a Nicolet iS10 infrared spectrometer. Analytical thin-layer chromatography (TLC) was carried out on with GF 254 silica gel coated plates. Flash column chromatography was carried out using 200−300 mesh silica gel. Melting points were uncorrected. N-protected isatins,[1] NHC pre-catalyst[2] **D** and **E** were synthesized according to reported method.

General procedure for the cross-benzoin reaction:



To a dry 10 mL Schlenk tube equipped with a magnetic stir bar, were added NHC pre-catalyst **D** or **E** (0.02 mmol), isatin **2** (0.1 mmol), 4 Å MS (100 mg, powder), and $NaHCO_3$ (0.1 mmol). The tube was sealed with a septum, evacuated and refilled with nitrogen (3 cycles). DCE (1 mL) and aldehyde **1** (0.15 mmol) were then added and the reaction mixture was stir for 48 hours (or 24 hours) at room temperature (or at 40 ^oC). After complete consumption of isatin **2**, DCE was removed under reduced pressure and the residue was subjected to column chromatography using petroleum ether/EtOAc = 9/1~5/1 as eluent to afford the desired product **3**.

Reduction of 3a to 5:



At -30 ^oC, to a solution of **3a** (48.9 mg, 0.1 mmol, 94% ee) in MeOH (1 mL) was added $NaBH_4$ (3.8 mg, 0.1 mmol), the reaction mixture was allowed to stir at that temperature for 0.5 hour, then it was warmed to room temperature and directly subjected to column chromatography using petroleum ether/EtOAc = 5/1 as eluent to afford the reductive product **5** (41.2 mg, 84% combined yield, 6:1 dr, 94% ee of the major diastereomer).

Deprotection of 3a to 6.[3]

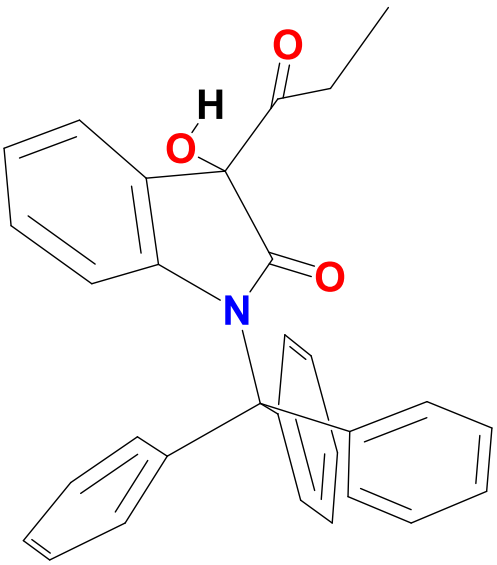
Under a nitrogen atmosphere, to a solution of **3a** (97.8 mg, 0.2 mmol, 94% ee) in DCM (6 mL) were successively added Et_3SiH (128 μL, 0.8 mmol) and TFA (2 mL), the reaction mixture was then stirred at room temperature for 6 hours. After complete consumption of **3a** (monitored by TLC), the reaction mixture was quenched with saturated aq. $NaHCO_3$ (8 mL) and extracted with DCM (6 mL × 3). The combined organic layer was dried over Na_2SO_4, filtered, and concentrated under vacuum. The residue was purified by column chromatography using petroleum ether/EtOAc = 5/1 as eluent to afford the desired product **6** (38.1 mg, 77% yield, 94% ee).

References cited in the SI:

1. R. Shintani, K. Takatsu, T, Hayashi, *Chem. Commun.* **2010**, *46*, 6822-6824.
2. M. S. Kerr, J. Read de Alaniz, T. Rovis, *J. Org. Chem.* **2005**, *70*, 5725-5728.
3. J. Guang, Q. Guo, J. C. –G. Zhao, *Org. Lett.* **2012**, *14*, 3174-3177.

X-ray structure of product 3b

Absolute configurations of the products **3** were assigned based on the crystal X-ray structures of **3b**. CCDC 1865244 (**3b**, obtained as yellow crystals *via* evaporation of a hexane/DCM solution) contains the supplementary X-ray crystallographic data. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif.



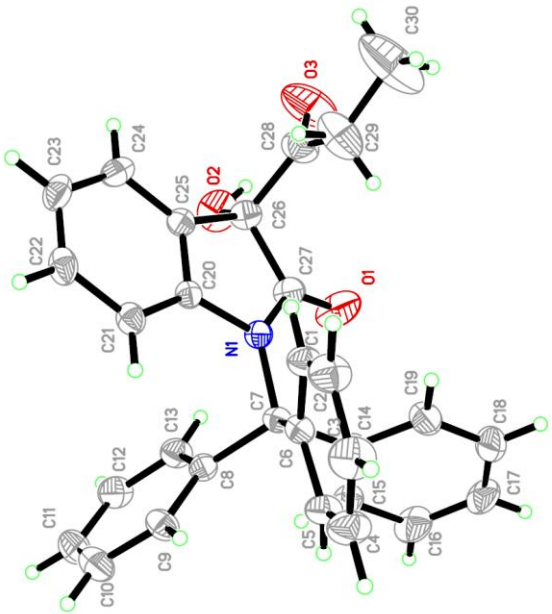
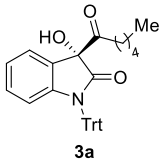


Table S1. Crystal data and structure refinement for 3c.

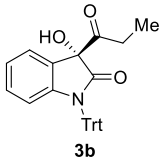
Empirical formula	$C_{30}H_{25}NO_3$	
Formula weight	554.07	
Temperature	293(2) K	
Wavelength	1.54184 Å	
Crystal system, Space group	monoclinic,	P 21 21 21
Unit cell dimensions	a = 8.5256(3) Å	α=90°
	b = 16.9053(5) Å	β=112.310(4) °
	c = 8.9274(3) Å	γ=90°
Volume	1190.37(7) $Å^3$	
Z	2	
Density (calculated)	1.249 Mg/m^3	
Absorption coefficient	0.638 mm^{-1}	
F(000)	472	
Crystal size	0.12*0.11*0.11 mm^3	
Theta range for data collection	5.23 to 67.25^o	
Index ranges	-10<=h<=9, -17<=k<=20, -10<=l<=10	
Reflections collected	4216	
Independent reflections	3161 [*R*(int)= 0.0135]	
Completeness to theta= 67.25	100.0%	
Max. and min. transmission	0.9331 and 0.9273	
Refinement method	Full-matrix least-squares on F2	
Data/restraints/parameters	3161/1/310	
Goodness-of-fit on F2	1.045	
Final R indices [I>2sigma(I)]	*R1*= 0.0348, *wR2*= 0.0962	
R indices(all data)	*R1*= 0.0359, *wR2*= 0.0974	
Absolute structure parameter	0.0(3)	
Extinction coefficient	0.0103(9)	
Largest diff. peak and hole	0.176 and -0.125 e.$Å^{-3}$	

Characterization of products:



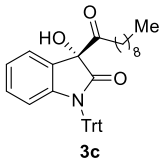
3a

(*R*)-3-Hexanoyl-3-hydroxy-1-tritylindolin-2-one (3a): 36.7 mg, 75% yield, yellow solid; mp 66-68 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (d, *J* = 7.6 Hz, 6H), 7.29-7.19 (m, 9H), 7.07 (d, *J* = 6.8 Hz, 1H), 7.02-6.95 (m, 2H), 6.36 (d, *J* = 7.6 Hz, 1H), 4.78 (br, 1H), 1.96 (t, *J* = 7.6 Hz, 2H), 1.48-1.37 (m, 2H), 1.17-1.10 (m, 2H), 1.06-0.99 (m, 2H), 0.81 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.0, 173.5, 144.6, 141.5, 129.3, 129.0, 127.8, 127.1, 123.5, 123.1, 116.5, 82.9, 75.1, 36.5, 30.9, 22.9, 22.1, 13.8; IR ν_{max} (KBr, cm^{-1}): 3440, 1736, 1464, 747, 705, 628; HRMS (ESI, m/z): calcd. for $C_{33}H_{31}NO_3Na^+$ 512.2196, found 512.2203. $[\alpha]^{29}_D$ = -6.5 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 94% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 5.3 min (minor), 8.2 min (major)].



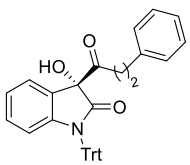
3b

(*R*)-3-Hydroxy-3-propionyl-1-tritylindolin-2-one（3b）: 34.4 mg, 77% yield, yellow solid; mp 184-186 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (d, *J* = 7.6 Hz, 6H), 7.29-7.19 (m, 9H), 7.08 (d, *J* = 6.8 Hz, 1H), 7.02-6.94 (m, 2H), 6.37 (d, *J* = 7.6 Hz, 1H), 4.76 (br, 1H), 2.09-1.95 (m, 2H), 0.91 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.7, 173.8, 144.6, 141.5, 129.3, 129.0, 127.8, 127.2, 127.1, 123.5, 123.2, 116.6, 82.9, 75.2, 29.9, 7.5; IR ν_{max} (KBr, cm^{-1}): 3466, 1740, 1465, 751, 738, 700; HRMS (ESI, m/z): calcd. for $C_{30}H_{25}NO_3Na^+$ 470.1727, found 470.1736. $[\alpha]^{24}_D$ = +0.3 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 96% ee,[CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 6.1 min (minor), 8.3 min (major)].



3c

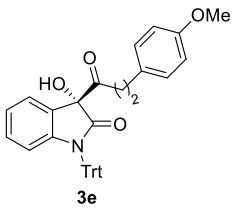
(*R*)-3-Decanoyl-3-hydroxy-1-tritylindolin-2-one (3c): 38.7 mg, 71% yield, yellow solid; mp 87-89 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (d, *J* = 7.6 Hz, 6H), 7.28-7.21 (m, 9H), 7.07 (d, *J* = 7.2 Hz, 1H), 7.02-6.94 (m, 2H), 6.36 (d, *J* = 7.6 Hz, 1H), 4.82 (br, 1H), 1.98 (t, *J* = 7.6 Hz, 2H), 1.45-1.36 (m, 2H), 1.28-1.04 (m, 12H), 0.87 (t, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.0, 173.6, 144.5, 141.5, 129.3, 129.0, 127.8, 127.0, 126.9, 123.5, 123.1, 116.5, 82.9, 75.0, 36.5, 31.8, 29.2, 29.1, 29.0, 28.7, 23.2, 22.6, 14.0; IR ν_{max} (KBr, cm^{-1}): 3448, 1736, 1464, 774, 748, 705; HRMS(ESI, m/z): calcd. for $C_{37}H_{39}NO_3Na^+$ 568.2822, found 568.2823. $[\alpha]^{26}_D$ = -1.9 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 94% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 5.3 min (minor), 7.7 min (major)].



3d

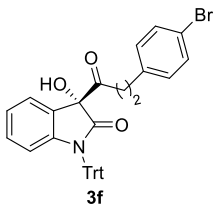
(*R*)-3-Hydroxy-3-(3-phenylpropanoyl)-1-tritylindolin-2-one (3d): 31.9 mg, 61% yield, yellow solid; mp 61-63 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (d, *J* = 7.2 Hz, 6H), 7.25-7.16 (m, 12H), 7.00-6.88 (m, 5H), 6.33 (d, *J* = 8.0 Hz, 1H), 4.73 (br, 1H), 2.74 (t, *J* = 7.6 Hz, 2H), 2.39-2.23 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.2, 173.6, 144.5, 141.4, 139.9, 129.3, 128.9, 128.4, 128.1, 127.8, 127.1, 126.7, 126.2, 123.5, 123.2, 116.5, 83.0, 75.1, 38.2, 29.3; IR ν_{max} (KBr, cm^{-1}): 3433, 1736, 1464, 803, 747,

704; HRMS (ESI, m/z): calcd. for $C_{36}H_{29}NO_3Na^+$ 546.2040, found 546.2053. $[\alpha]^{27}_D$ = +0.8 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 92% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 6.8 min (minor), 11.0 min (major)].



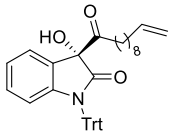
3e

(*R*)-3-Hydroxy-3-(3-(4-methoxyphenyl)propanoyl)-1-trityl indolin-2-one (3e): 32.1 mg, 58% yield, yellow solid; mp 79-81 ^oC; ^1H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 7.2 Hz, 6H), 7.24-7.15 (m, 9H), 6.99-6.87 (m, 3H), 6.84 (d, *J* = 8.4 Hz, 2H), 6.74 (d, *J* = 8.8 Hz, 2H), 6.33 (d, *J* = 8.0 Hz, 1H), 4.71 (br, 1H), 3.77 (s, 3H), 2.69 (t, *J* = 8.0 Hz, 2H), 2.37-2.20 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.2, 173.6, 158.1, 144.6, 141.5, 132.0, 129.3, 129.0, 129.0, 127.8, 127.1, 126.7, 123.5, 123.1, 116.5, 113.8, 83.0, 75.2, 55.3, 38.5, 28.5; IR ν_{max} (KBr, cm^{-1}): 3408, 1736, 1513, 824, 747, 705; HRMS (ESI, m/z): calcd. for $C_{37}H_{31}NO_4H^+$ 554.2326, found 554.2325. $[\alpha]^{25}_D$ = -1.0 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 92% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 8.3 min (minor), 14.2 min (major)].



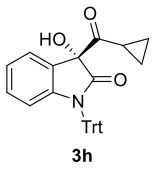
3f

(*R*)-3-(3-(4-Bromophenyl)propanoyl)-3-hydroxy-1-tritylindolin -2-one (3f): 30.7 mg, 51% yield, yellow solid; mp 82-84 ^oC; ^1H NMR (400 MHz, $CDCl_3$) δ 7.46 (d, *J* = 7.6 Hz, 6H), 7.31 (d, *J* = 8.4 Hz, 2H), 7.25-7.17 (m, 9H), 7.01-6.97 (m, 1H), 6.93-6.88 (m, 2H), 6.76 (d, *J* = 8.0 Hz, 2H), 6.32 (d, *J* = 8.0 Hz, 1H), 4.65 (br, 1H), 2.67 (t, *J* = 7.6 Hz, 2H), 2.30-2.13 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 202.9, 173.4, 144.5, 141.4, 138.8, 131.4, 129.8, 129.4, 129.2, 128.9, 127.8, 127.1, 123.5, 123.2, 120.0, 116.5, 82.9, 75.1, 37.9, 28.6 ; IR ν_{max} (KBr, cm^{-1}): 3434, 1735, 1488, 812, 746, 705; HRMS (ESI, m/z): calcd. for $C_{36}H_{28}NO_3BrNa^+$ 624.1145, found 624.1150. $[\alpha]^{24}_D$ = -0.6 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 90% ee, [CHIRALPAK IA column; 0.5 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 12.4 min (minor), 29.9 min (major)].



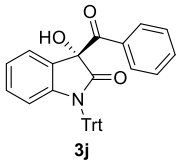
3g

(*R*)-3-Hydroxy-1-trityl-3-(undec-10-enoyl)indolin-2-one (3g): 42.3 mg, 76% yield, orange solid; mp 137-139 ^oC; ^1H NMR (400 MHz, $CDCl_3$) δ 7.48 (d, *J* = 7.2 Hz, 6H), 7.28-7.19 (m, 9H), 7.07 (d, *J* = 6.8 Hz, 1H), 7.02-6.94 (m, 2H), 6.36 (d, *J* = 8.4 Hz, 1H), 5.85-5.74 (m, 1H), 5.01-4.91 (m, 2H), 4.79 (br, 1H), 2.03-1.95 (m, 4H), 1.43-1.03(m, 12H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.0, 173.5, 144.6, 141.5, 139.1, 129.3, 129.0, 127.8, 127.0, 127.0, 123.5, 123.1, 116.5, 114.1, 82.9, 75.1, 36.5, 33.7, 29.1, 29.0, 28.9, 28.8, 28.7, 23.2; IR ν_{max} (KBr, cm^{-1}): 3440, 1737, 1464, 746, 705, 629; HRMS (ESI, m/z): calcd. for $C_{38}H_{39}NO_3Na^+$ 580.2822, found 580.2833. $[\alpha]^{27}_D$ = -0.4 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 92% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 5.2 min (minor), 7.9 min (major)].



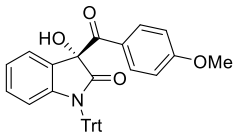
3h

(*R*)-3-(Cyclopropanecarbonyl)-3-hydroxy-1-tritylindolin-2-one(3h): 32.1 mg, 70% yield, yellow solid; mp 191-193 ^{o}C ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (d, *J* = 7.6 Hz, 6H), 7.27-7.13 (m, 10H),7.04-6.96 (m,2H), 6.39 (d, *J* = 8.8 Hz, 1H), 4.88 (br, 1H), 1.28-1.24 (m, 1H), 1.16-1.05 (m, 2H), 0.85-0.74 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.9, 173.6, 144.7, 141.6, 129.2, 129.0, 127.8, 127.1, 127.0, 123.9, 123.2, 116.4, 83.1, 75.1, 16.4, 13.9, 12.0; IR ν_{max} (KBr, cm^{-1}): 3444, 1734, 1470, 763, 739, 706; HRMS (ESI, m/z): calcd. for $C_{31}H_{25}NO_3Na^+$ 482.1727, found 482.1732. $[\alpha]^{26}_D$ = -0.7 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 65% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 6.6 min (minor), 18.3 min (major)].



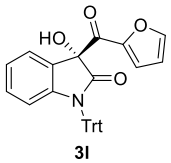
3j

(*R*)-3-benzoyl-3-hydroxy-1-tritylindolin-2-one (3j): 15.8 mg, 32% yield, yellow slurry; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46-7.45 (m, 8H), 7.24-7.20 (m, 10H), 6.92 (t, *J* = 7.6 Hz, 3H), 7.03 (t, *J* = 8.0 Hz, 1H), 6.92 (t, *J* = 7.6 Hz, 1H), 6.44 (d, *J* = 8.0 Hz, 1H), 5.42 (br, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 194.9, 173.3, 144.4, 141.4, 133.6, 133.5, 130.2, 129.4, 129.1, 129.0, 128.4, 127.8, 127.0, 124.4, 123.2, 116.6, 81.5, 74.6; IR ν_{max} (KBr, cm^{-1}): 3415, 1733, 1340, 740, 704, 629; HRMS (ESI, m/z): calcd. for $C_{34}H_{25}NO_3Na^+$ 518.1727, found 518.1730. $[\alpha]^{26}_D$ = +1.3 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 28% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 7.3 min (major), 8.9 min (minor)].



3k

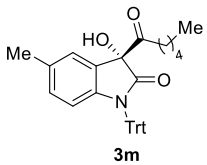
(*R*)-3-hydroxy-3-(4-methoxybenzoyl)-1-tritylindolin-2-one (3k): 23.6 mg, 45% yield, yellow slurry; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.2 Hz, 6H), 7.28-7.17 (m, 11H), 7.07-7.00 (m, 2H), 6.90 (t, *J* = 7.6 Hz, 1H), 6.51 (d, *J* = 8.8 Hz, 2H), 6.45 (d, *J* = 8.0 Hz, 1H), 5.57 (br, 1H), 3.77 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 192.7, 173.4, 163.8, 144.2, 141.6, 132.3, 131.8, 129.3, 129.0, 127.8, 126.9, 125.0, 124.4, 123.1, 116.5, 113.7, 80.6, 74.4, 55.4; IR ν_{max} (KBr, cm^{-1}): 3415, 1735, 1400, 1259, 738, 706; HRMS (ESI, m/z): calcd. for $C_{35}H_{27}NO_4Na^+$ 548.1832, found 548.1841. $[\alpha]^{23}_D$ = +0.8 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 34% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 9.0 min (major), 11.0 min (minor)].



3l

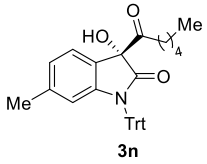
(*R*)-3-(Furan-2-carbonyl)-3-hydroxy-1-tritylindolin-2-one(3l): 30.6 mg, 63% yield, yellow solid; mp 198-200 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.6 Hz, 6H), 7.27-7.21 (m, 10H), 7.09 (d, *J* = 7.2 Hz, 1H), 7.01 (t, *J* = 7.6 Hz, 1H), 6.90 (t, *J* = 7.6 Hz, 1H), 6.57 (d, *J* = 3.6 Hz, 1H), 6.43 (d, *J* = 7.6 Hz, 1H), 6.25 (d, *J* =2.0 Hz, 1H), 5.12 (br, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 182.4, 173.2, 148.5, 147.7, 144.7, 141.6, 129.3, 129.2, 128.0, 127.8, 126.9, 124.2, 122.9, 121.2, 116.4, 112.5, 80.4, 74.7; IR ν_{max} (KBr, cm^{-1}): 3385, 1726, 1463, 746, 706, 699; HRMS (ESI, m/z): calcd. for $C_{32}H_{23}NO_4Na^+$ 508.1519, found 508.1531. $[\alpha]^{26}_D$ = -1.2 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 43% ee,

[CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 9.8 min (minor), 16.9 min (major)].



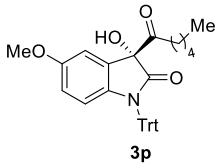
3m

(*R*)-3-Hexanoyl-3-hydroxy-5-methyl-1-tritylindolin-2-one (3m): 40.7 mg, 81% yield, yellow solid; mp 117-119 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (d, *J* = 7.6 Hz, 6H), 7.28-7.18 (m, 9H), 6.88 (s, 1H), 6.80 (d, *J* = 8.4 Hz, 1H), 6.23 (d, *J* = 8.0 Hz, 1H), 4.77 (br, 1H), 2.20 (s, 3H), 1.98 (t, *J* = 7.2 Hz, 2H), 1.47-1.38 (m, 2H), 1.18-1.11 (m, 2H), 1.07-1.01 (m, 2H), 0.82 (t, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.1, 173.6, 142.1, 141.6, 132.9, 129.7, 129.0, 127.9, 127.8, 127.0, 124.1, 116.3, 83.0, 75.0, 36.5, 30.9, 22.9, 22.1, 20.6, 13.8; IR ν_{max} (KBr, cm^{-1}): 3435, 1737, 1488, 743, 706; HRMS (ESI, m/z): calcd. for $C_{34}H_{33}NO_3Na^+$ 526.2353, found 526.2362. $[\alpha]^{26}_D$ = -1.6 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 92% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 5.8 min (minor), 8.4 min (major)].



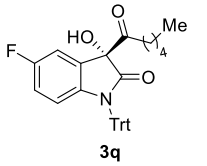
3n

(*R*)-3-Hexanoyl-3-hydroxy-6-methyl-1-tritylindolin-2-one (3n): 36.2 mg, 72% yield, yellow solid; mp 99-101 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (d, *J* = 8.4 Hz, 6H), 7.28-7.19 (m, 9H), 6.94 (d, *J* = 7.6 Hz, 1H), 6.77 (d, *J* = 7.6 Hz, 1H), 6.09 (s, 1H), 4.75 (br, 1H), 2.07 (s, 3H), 1.96-1.91 (m, 2H), 1.44-1.35 (m, 2H), 1.17-1.10 (m, 2H), 1.06-0.98 (m, 2H), 0.81 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.2, 173.8, 144.8, 141.6, 139.5, 129.1, 127.7, 127.0, 124.2, 123.7, 123.2, 117.3, 82.7, 75.0, 36.5, 30.9, 22.9, 22.1, 22.0, 13.7; IR ν_{max} (KBr, cm^{-1}): 3436, 1736, 1612, 1449, 1146, 706; HRMS (ESI, m/z): calcd. for $C_{34}H_{33}NO_3Na^+$ 526.2353, found 526.2357. $[\alpha]^{24}_D$ = +0.1 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 95% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 5.5 min (minor), 8.0 min (major)].



3p

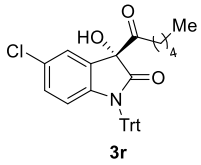
(*R*)-3-Hexanoyl-3-hydroxy-5-methoxy-1-tritylindolin-2-one (3p): 41.0 mg, 79% yield, red solid; mp 92-94 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (d, *J* = 7.6 Hz, 6H), 7.29-7.19 (m, 9H), 6.64 (d, *J* = 2.8 Hz, 1H), 6.53 (d, *J* = 8.8 Hz, 1H), 6.25 (d, J = 9.2 Hz, 1H), 4.84 (br, 1H), 3.67 (s, 3H), 1.98 (t, *J* = 7.2 Hz, 2H), 1.47-1.38 (m, 2H), 1.19-1.11 (m, 2H), 1.08-1.01 (m, 2H), 0.82 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.0, 173.5, 155.9, 141.6, 137.6, 129.0, 128.2, 127.8, 127.0, 117.3, 114.6, 109.4, 83.2, 75.1, 55.6, 36.4, 30.9, 22.9, 22.1, 13.8; IR ν_{max} (KBr, cm^{-1}): 3428, 1733, 1488, 807, 742, 706; HRMS (ESI, m/z): calcd. for $C_{34}H_{33}NO_4Na^+$ 542.2302, found 542.2317. $[\alpha]^{25}_D$ = -2.5 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 92% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 6.3 min (minor), 9.4 min (major)].



3q

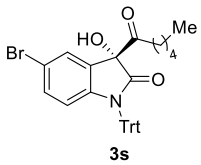
(R)-5-Fluoro-3-hexanoyl-3-hydroxy-1-tritylindolin-2-one (3q): 19.8 mg, 39% yield, yellow solid; mp 87-89 ^{o}C; ^{1}H NMR (400

MHz, $CDCl_3$) δ 7.46 (d, *J* = 7.2 Hz, 6H), 7.29-7.20 (m, 9H), 6.83-6.81 (m, 1H), 6.74-6.69 (m, 1H), 6.32-6.29 (m, 1H), 4.78 (br, 1H), 2.02 (t, *J* = 7.2 Hz, 2H), 1.49-1.42 (m, 2H), 1.20-1.13 (m, 2H), 1.10-1.03 (m, 2H), 0.83 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.4, 173.5, 158.9 (d, J_{C-F} = 243.1 Hz), 141.3, 140.5, 129.0, 128.6 (d, J_{C-F} = 7.4 Hz), 127.9, 127.2, 117.3 (d, J_{C-F} = 7.3 Hz), 115.8 (d, J_{C-F} = 22.8 Hz), 111.2 (d, J_{C-F} = 24.5 Hz), 82.9, 75.2, 36.6, 30.9, 22.9, 22.1, 13.8; IR ν_{max} (KBr, cm^{-1}): 3442, 1740, 1467, 813, 740, 705; HRMS (ESI, m/z): calcd. for $C_{33}H_{30}NO_3FNa^+$ 530.2102, found 530.2106. $[\alpha]^{23}_D$ = +1.0 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 90% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 4.7 min (minor), 6.5 min (major)].



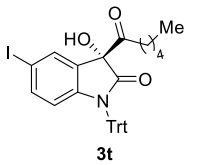
3r

(*R*)-5-Chloro-3-hexanoyl-3-hydroxy-1-tritylindolin-2-one (3r): 24.6 mg, 47% yield, yellow solid; mp 65-67 °C; ^1H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 8.4 Hz, 6H), 7.29-7.21 (m, 9H), 7.06 (d, *J* = 2.4 Hz, 1H), 6.97 (d, *J* = 8.8 Hz, 1H), 6.29 (d, *J* = 8.8 Hz, 1H), 4.77 (br, 1H), 2.03 (t, *J* = 7.6 Hz, 2H), 1.50-1.41 (m, 2H), 1.21-1.14 (m, 2H), 1.10-1.03 (m, 2H), 0.84 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.3, 173.3, 143.2, 141.2, 129.3, 129.0, 128.8, 128.7, 127.9, 127.3, 123.8, 117.4, 82.7, 75.3, 36.6, 30.9, 22.8, 22.2, 13.8; IR ν_{max} (KBr, cm^{-1}): 3427, 1739, 1468, 812, 740, 705; HRMS (ESI, m/z): calcd. for $C_{33}H_{30}NO_3ClNa^+$ 546.1806, found 546.1812. $[\alpha]^{23}_D$ = +1.8 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 84% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 4.8 min (minor), 6.5 min (major)].



3s

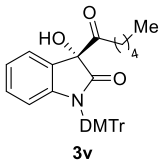
(*R*)-5-Bromo-3-hexanoyl-3-hydroxy-1-tritylindolin-2-one (3s): 24.9 mg, 44% yield, yellow solid; mp 86-88 °C; ^1H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 6.8 Hz, 6H), 7.29-7.19 (m, 10H), 7.12 (d, *J* = 8.8 Hz, 1H), 6.24 (d, *J* = 8.8 Hz, 1H), 4.77 (br, 1H), 2.04 (t, *J* = 6.8 Hz, 2H), 1.50-1.41 (m, 2H), 1.21-1.14 (m, 2H), 1.10-1.03 (m, 2H), 0.84 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.3, 173.2, 143.7, 141.2, 132.2, 129.1, 128.9, 127.9, 127.3, 126.6, 117.9, 116.1, 82.7, 75.3, 36.6, 30.9, 22.9, 22.2, 13.8; IR ν_{max} (KBr, cm^{-1}): 3431, 1740, 1466, 812, 742, 706; HRMS (ESI, m/z): calcd. for $C_{33}H_{30}NO_3BrNa^+$ 590.1301, found 590.1303. $[\alpha]^{26}_D$ = -1.6 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 82% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 4.9 min (minor), 6.7 min (major)].



3t

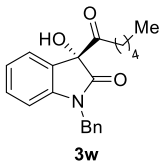
(*R*)-3-hexanoyl-3-hydroxy-5-iodo-1-tritylindolin-2-one (3t): 26.4 mg, 43% yield, yellow solid; mp 98-100 °C; ^1H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 7.6 Hz, 6H), 7.35 (s, 1H), 7.32-7.20 (m, 10H), 6.12 (d, *J* = 8.4 Hz, 1H), 4.76 (br, 1H), 2.03 (t, *J* = 7.2 Hz, 2H), 1.50-1.41 (m, 2H), 1.21-1.14 (m, 2H), 1.10-1.03 (m, 2H), 0.84 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.3, 173.0, 144.4, 141.2, 138.1, 132.2, 129.3, 129.0, 127.9, 127.3, 118.3, 86.1, 82.5, 75.3, 36.6, 30.9, 22.9, 22.2, 13.8; IR ν_{max}

(KBr, cm^{-1}): 3432, 1740, 1466, 741, 705, 628; HRMS (ESI, m/z): calcd. for $C_{33}H_{30}NO_3INa^+$ 638.1163, found 638.1163. $[\alpha]^{25}_D$ = -2.4 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 82% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 5.4 min (minor), 7.4 min (major)].



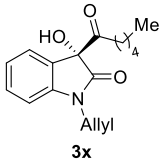
3v

(*R*)-1-(bis(4-Methoxyphenyl)(phenyl)methyl)-3-hexanoyl-3-hydroxyindolin-2-one (3v): 39.5 mg, 72% yield, pale yellow solid; mp 146-148 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43-7.37 (m, 6H), 7.27-7.17 (m, 3H), 7.07 (d, *J* = 6.8 Hz, 1H), 7.03-6.94 (m, 2H), 6.79 (d, *J* = 8.8 Hz, 4H), 6.37 (d, *J* = 8.0 Hz, 1H), 4.80 (br, 1H), 3.76 (s, 6H), 2.01 (t, *J* = 7.2 Hz, 2H), 1.48-1.38 (m, 2H), 1.19-1.12 (m, 2H), 1.08-1.00 (m, 2H), 0.82 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 204.0, 173.6, 158.3, 144.8, 142.3, 133.8, 133.7, 130.3, 129.3, 128.6, 127.7, 127.0, 126.7, 123.4, 123.0, 116.6, 113.0, 83.0, 74.4, 55.1, 36.5, 30.9, 22.9, 22.1, 13.8; IR ν_{max} (KBr, cm^{-1}): 3466, 1728, 1254, 835, 773, 726; HRMS (ESI, m/z): calcd. for $C_{35}H_{35}NO_5Na^+$ 572.2407, found 572.2410. $[\alpha]^{26}_D$ = +0.1 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 95% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 8.8 min (minor), 25.7 min (major)].



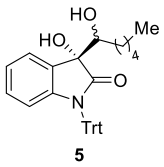
3w

(*R*)-1-Benzyl-3-hexanoyl-3-hydroxyindolin-2-one (3w): 20.9 mg, 62% yield, viscous solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35-7.28 (m, 6H), 7.13 (d, *J* = 7.2 Hz, 1H), 7.07 (t, *J* = 7.6 Hz, 1H), 6.86 (d, *J* = 8.0 Hz, 1H), 5.08 (d, *J* = 15.6 Hz, 1H), 5.06 (br, 1H), 4.79 (d, *J* = 15.2 Hz, 1H), 2.25-2.07 (m, 2H), 1.55-1.45 (m, 2H), 1.15-1.05 (m, 4H), 0.79 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.2, 173.1, 143.9, 135.1, 130.7, 128.9, 128.0, 127.5, 126.5, 124.0, 123.7, 110.0, 83.4, 44.4, 35.9, 30.8, 23.1, 22.0, 13.7; IR ν_{max} (KBr, cm^{-1}): 3421, 1736, 1613, 1468, 752, 698; HRMS (ESI, m/z): calcd. for $C_{21}H_{23}NO_3Na^+$ 360.1570, found 360.1574. $[\alpha]^{25}_D$ = -2.6 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 82% ee, [CHIRALPAK OJ-H column; 1 mL/min; solvent system: *i*-PrOH/hexane = 10/90; retention times: 10.5 min (minor), 12.8 min (major)].



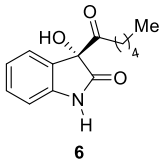
3x

(*R*)-1-Allyl-3-hexanoyl-3-hydroxyindolin-2-one (3x): 18.1 mg, 63% yield, viscous solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 (t, *J* = 8.0 Hz, 1H), 7.16-7.08 (m, 2H), 6.93 (d, *J* = 8.0 Hz, 1H), 5.92-5.82 (m, 1H), 5.35-5.28 (m, 2H), 5.02 (br, 1H), 4,48 (dd, J_1 = 16.0 Hz, J_2 = 5.2 Hz, 1H), 4,29 (dd, J_1 = 16.0 Hz, J_2 = 5.2 Hz, 1H), 2.30-2.12 (m, 2H), 1.54-1.48 (m, 2H), 1.19-1.06 (m, 4H), 0.80 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.3, 172.8, 144.0, 130.7, 130.6, 126.5, 124.0, 123.7, 118.4, 109.9, 83.3, 42.9, 35.7, 30.9, 23.1, 22.1, 13.7; IR ν_{max} (KBr, cm^{-1}): 3333, 1721, 1686, 1469, 760, 683; HRMS (ESI, m/z): calcd. for $C_{17}H_{21}NO_3Na^+$ 310.1414, found 310.1418. $[\alpha]^{26}_D$ = -3.7 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 50% ee, [CHIRALPAK AS-H column; 1 mL/min; solvent system: *i*-PrOH/hexane = 10/90; retention times: 14.3 min (minor), 20.1 min (major)].



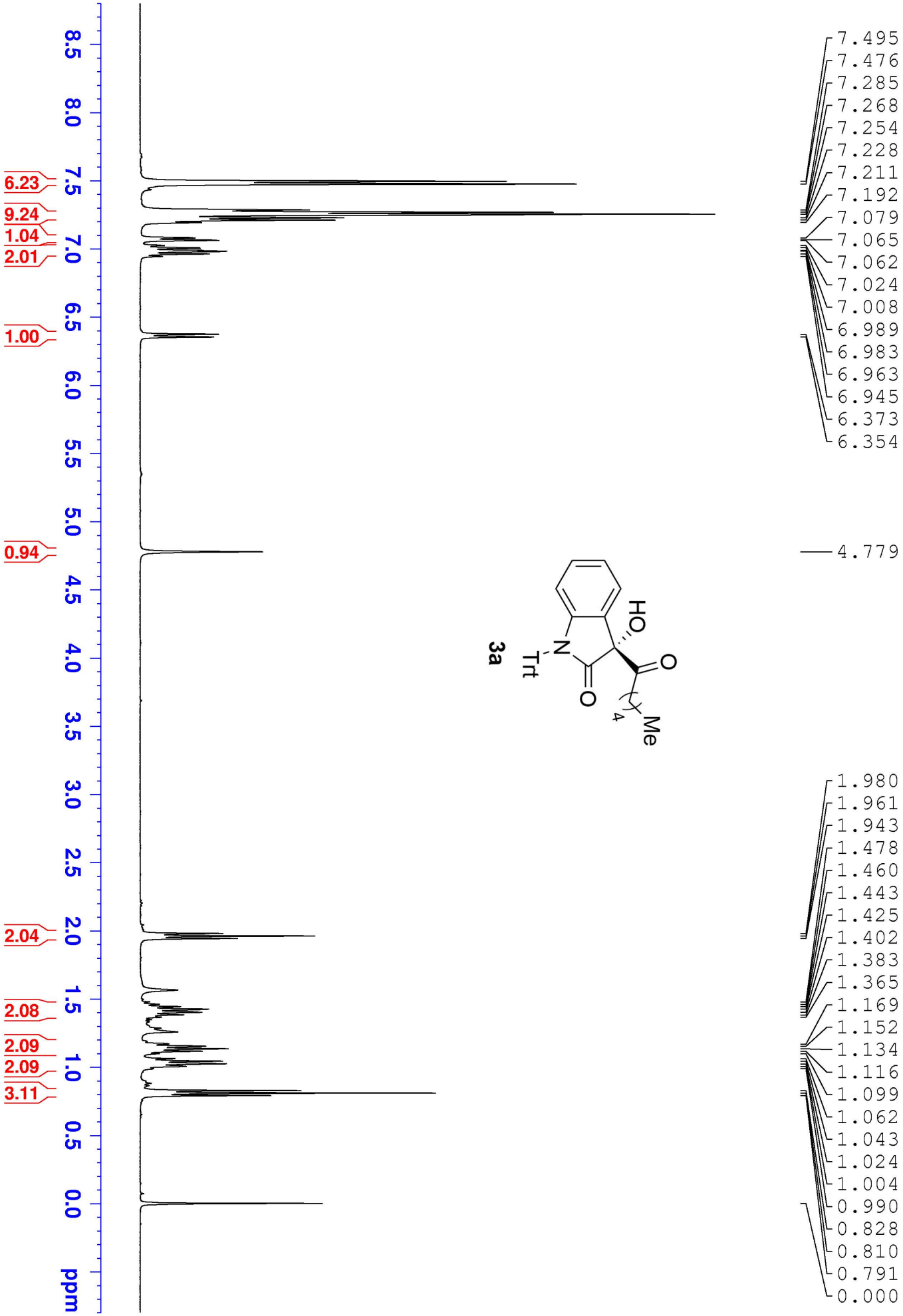
5

(3R)-3-Hydroxy-3-(1-hydroxyhexyl)-1-tritylindolin-2-one (5): 41.2 mg, 84% combined yield, 6:1 dr, viscous solid; ^{1}H NMR (400 MHz, $CDCl_3$) of major diastereomer: δ 7.46 (d, *J* = 7.2 Hz, 6H), 7.27-7.20 (m, 10H), 6.99-6.92 (m, 2H), 6.27 (d, *J* = 7.2 Hz, 1H), 4.07 (br, 1H), 3.82-3.76 (m, 1H), 2.62 (d, *J* = 10.8 Hz, 1H), 1.45-1.39 (m, 1H), 1.17-1.07 (m, 5H), 0.97-0.92 (m, 2H), 0.82 (t, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) of major diastereomer: δ 179.0, 144.1, 141.6, 129.2, 128.5, 128.0, 127.7, 127.6, 127.0, 123.5, 122.8, 116.2, 76.0, 74.6, 31.5, 31.3, 25.7, 22.3, 13.9; IR ν_{max} (KBr, cm^{-1}) of major diastereomer: 3448, 1717, 1464, 739, 704, 654; HRMS (ESI, m/z) of major diastereomer: calcd. for $C_{33}H_{33}NO_3Na^+$ 514.2353, found 514.2360. $[\alpha]^{24}_D$ = -3.9 (*c* = 0.5 in CH_2Cl_2); HPLC analysis of major diastereomer: 94% ee, [CHIRALPAK IC column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 8.1 min (minor), 11.5 min (major)].



6

(*R*)-3-Hexanoyl-3-hydroxyindolin-2-one (6): 38.1 mg, 77% yield, viscous solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.14 (br, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.13 (d, *J* = 7.2 Hz, 1H), 7.08 (t, *J* = 7.6 Hz, 1H), 6.99 (d, *J* = 7.6 Hz, 1H), 5.17 (br, 1H), 2.41-2.33 (m, 1H), 2.29-2.21 (m, 1H), 1.57-1.49 (m, 2H), 1.21-1.08 (m, 4H), 0.80 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.3, 175.8, 141.9, 130.9, 127.0, 124.2, 123.7, 111.1, 83.9, 35.6, 30.8, 23.1, 22.1, 13.7; IR ν_{max} (KBr, cm^{-1}): 3285, 1736, 1619, 1472, 1191, 754; HRMS (ESI, m/z): calcd. for $C_{14}H_{17}NO_3Na^+$ 270.1101, found 270.1102. $[\alpha]^{25}_D$ = -5.8 (*c* = 0.5 in CH_2Cl_2); HPLC analysis: 94% ee, [CHIRALPAK IA column; 1 mL/min; solvent system: *i*-PrOH/hexane = 20/80; retention times: 6.6 min (major), 9.2 min (minor)].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2.09
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6.354
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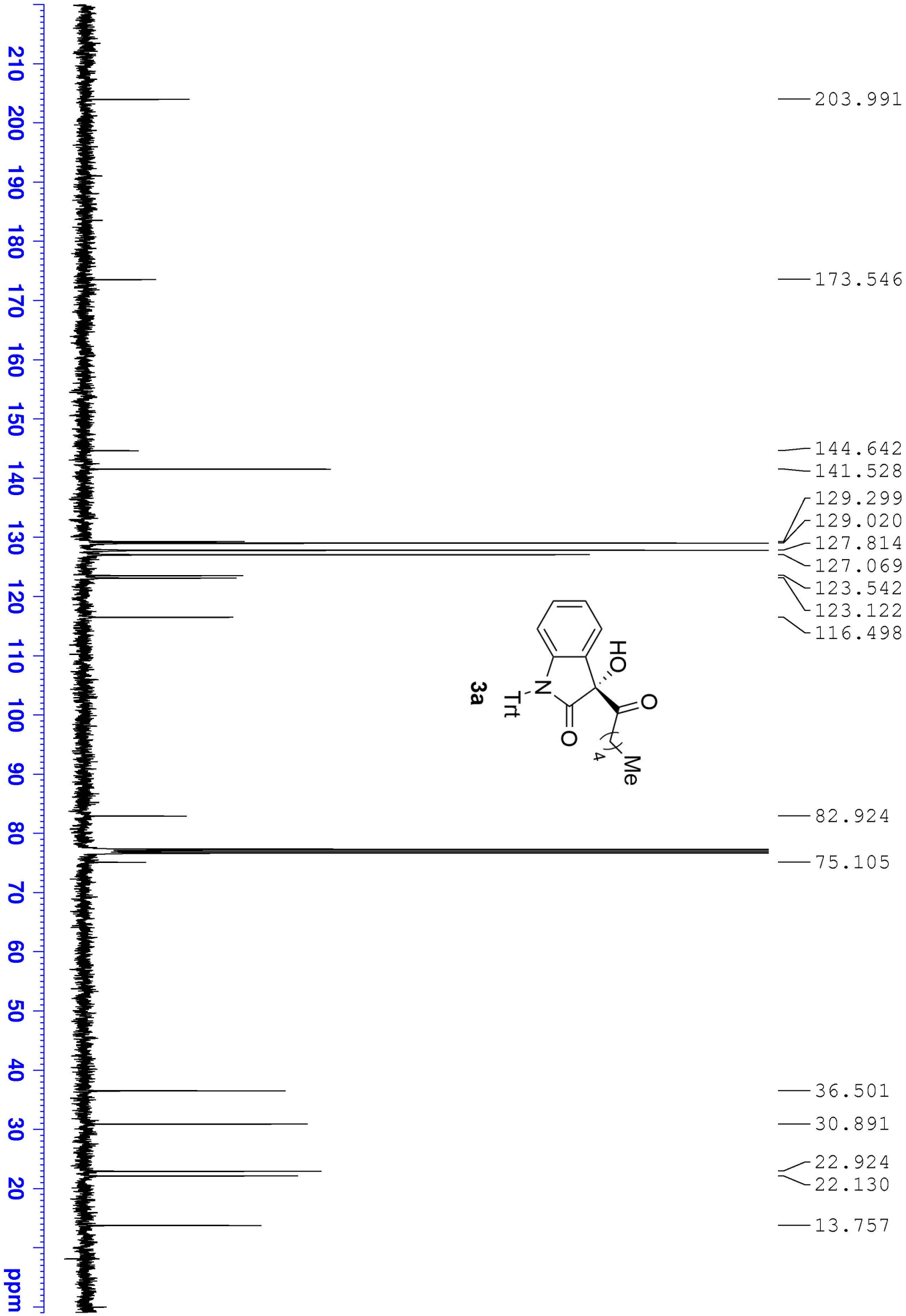
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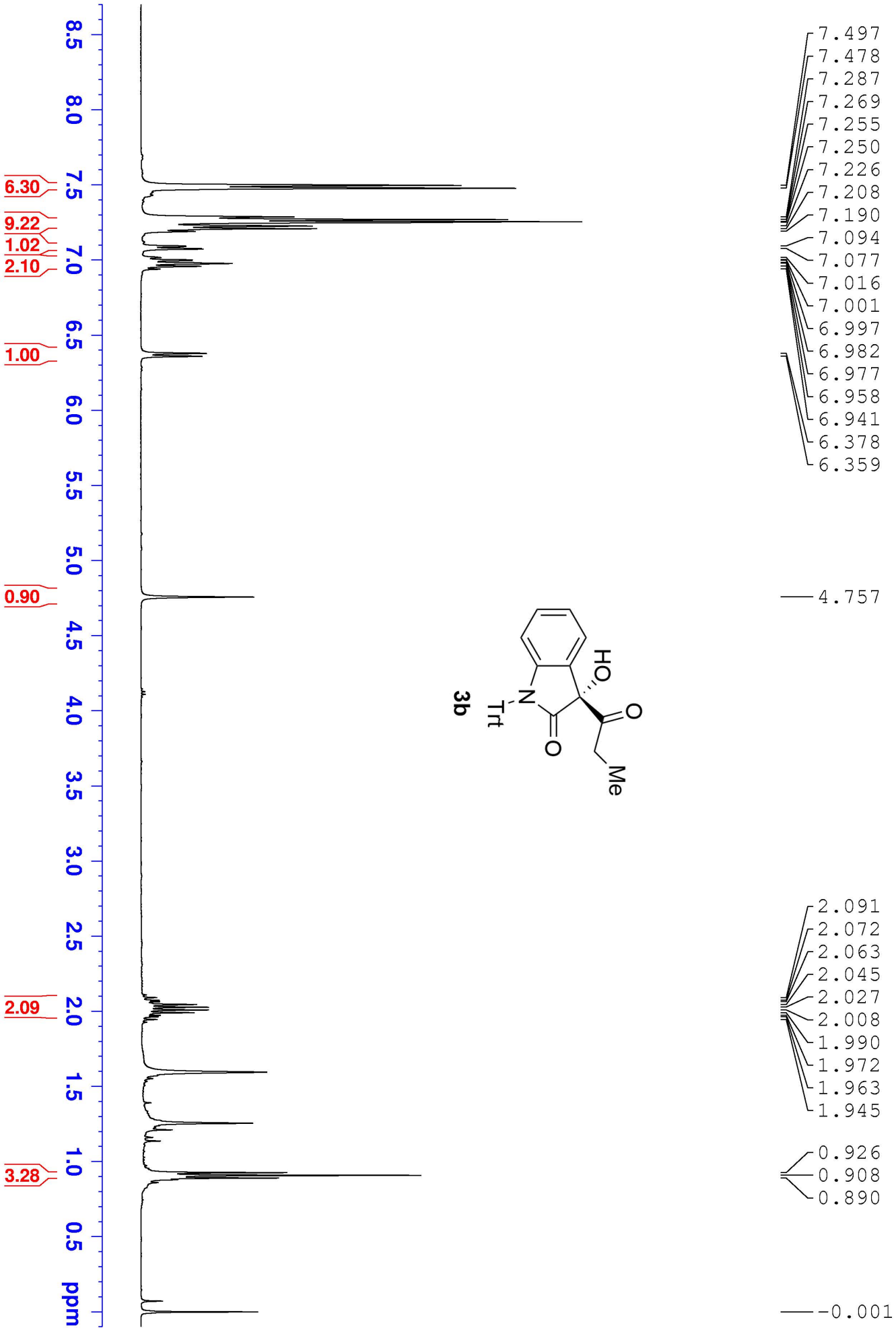
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7.250
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7.208
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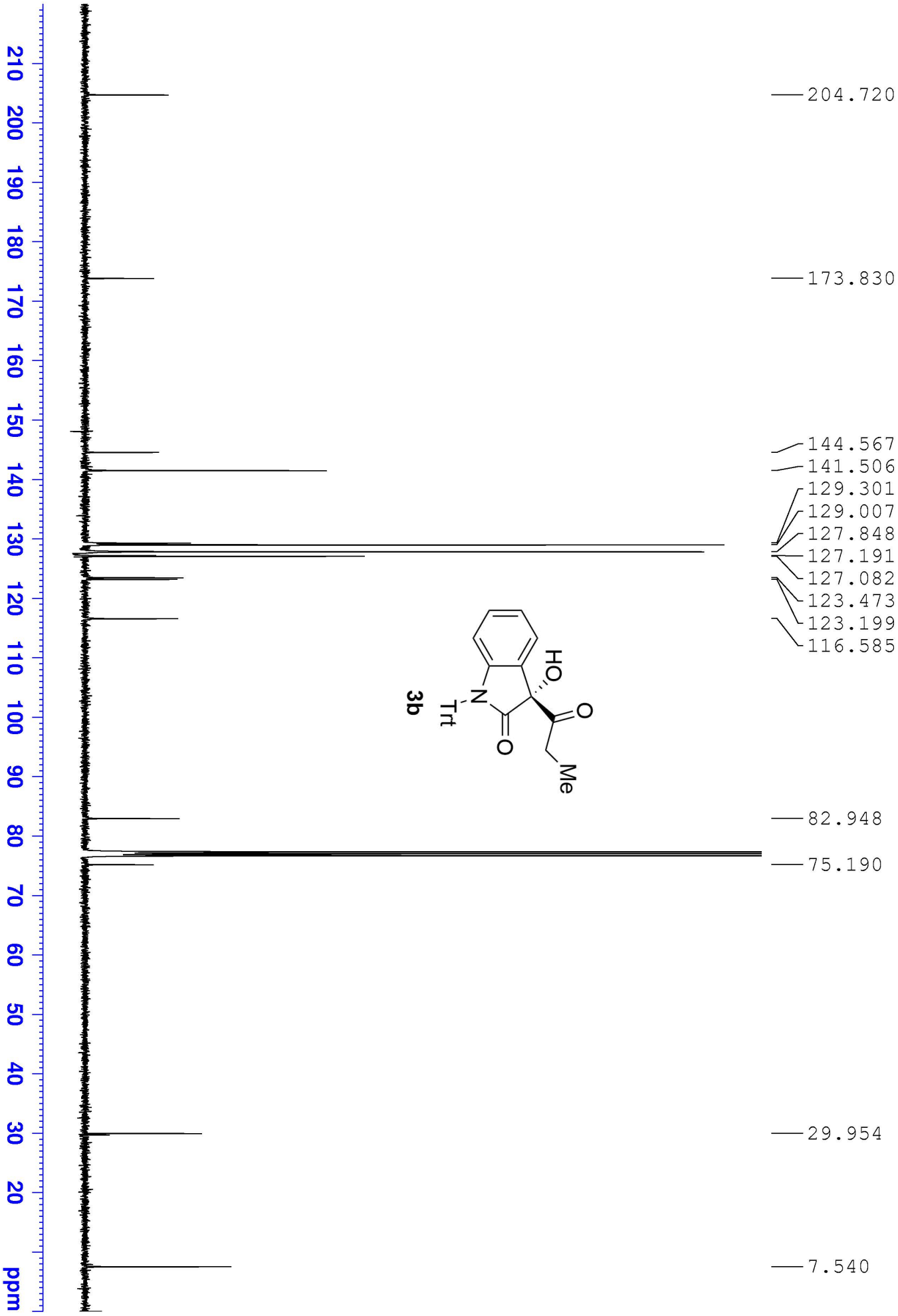
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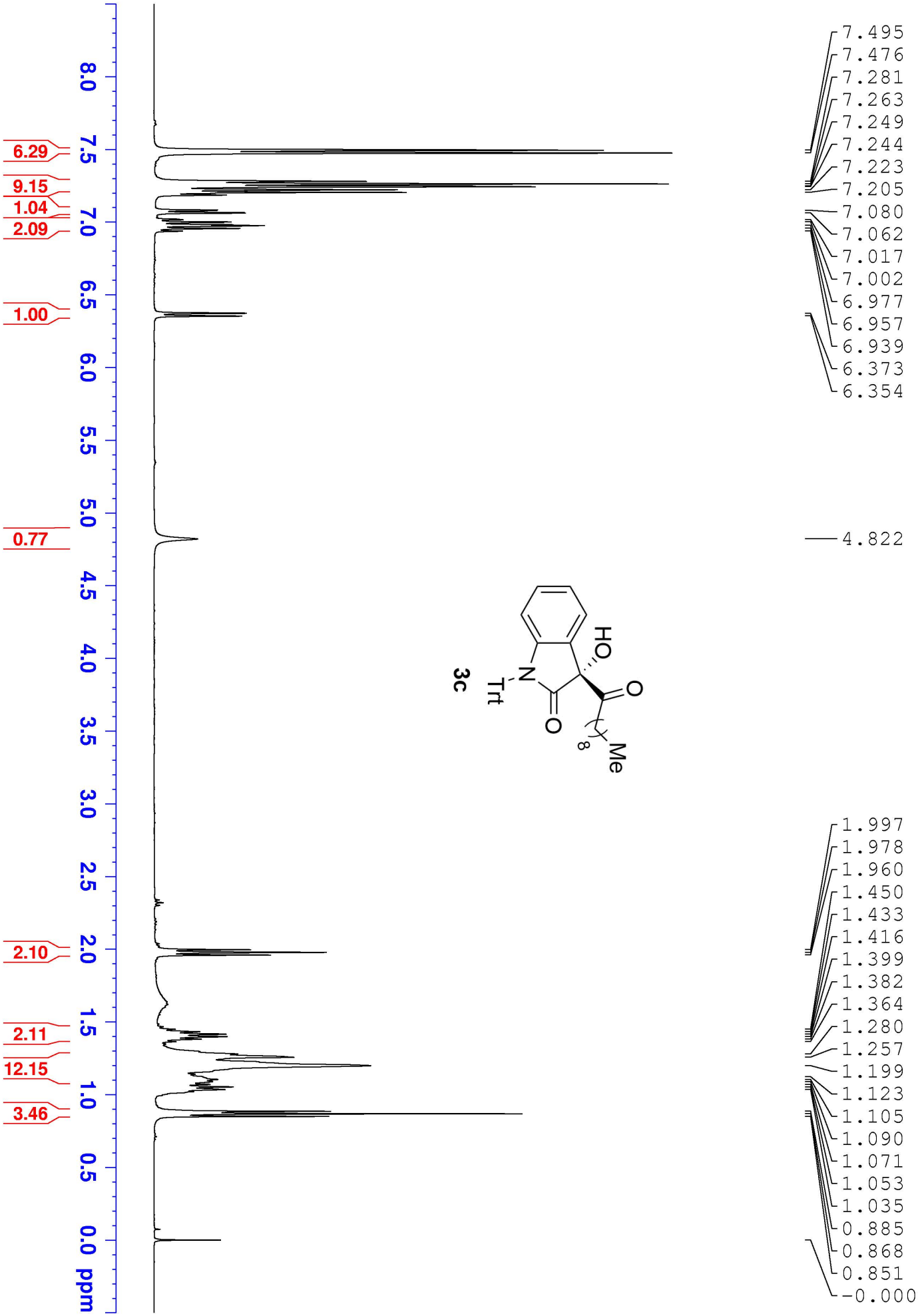
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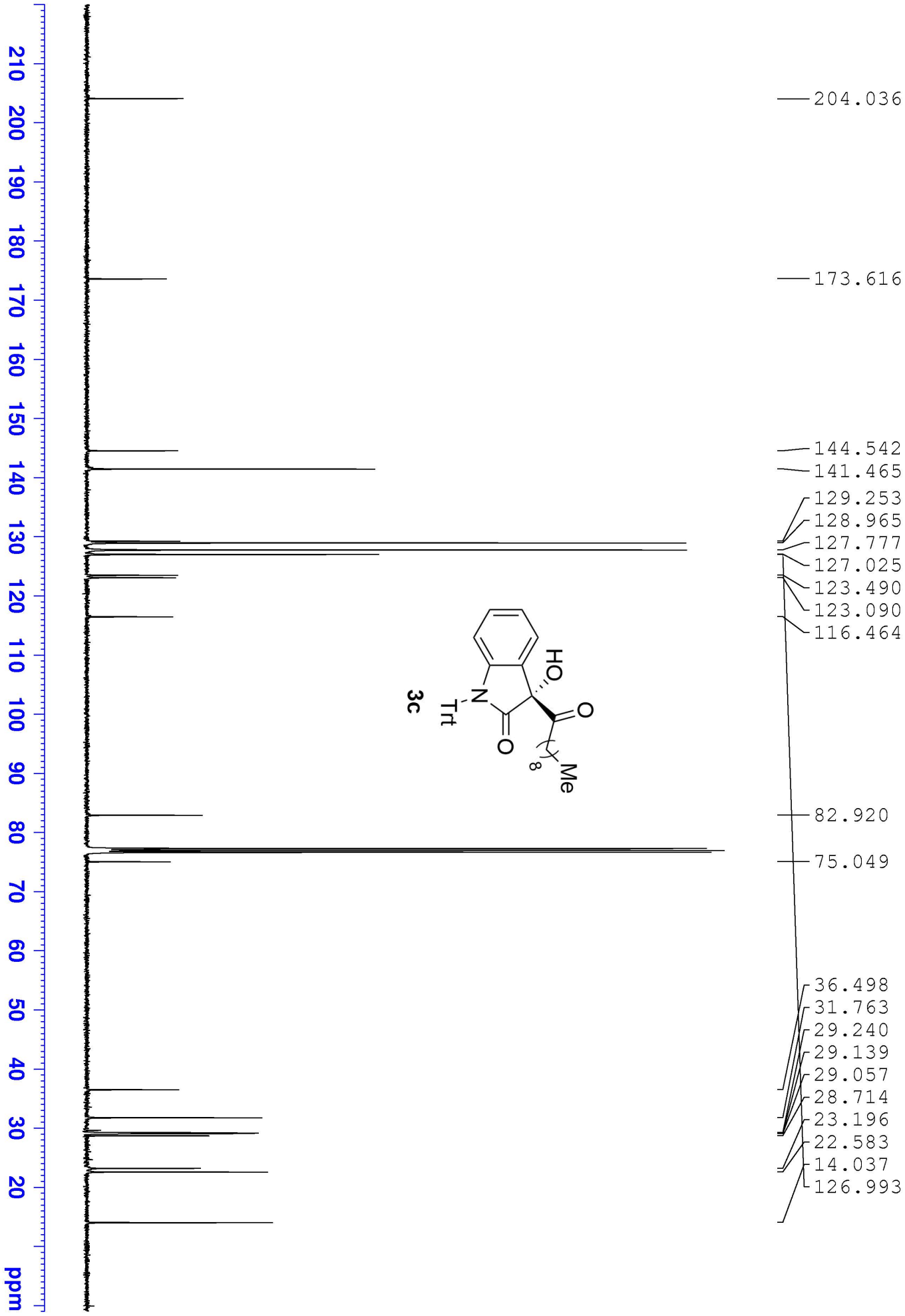
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N
Trt
O
8
Me
3c
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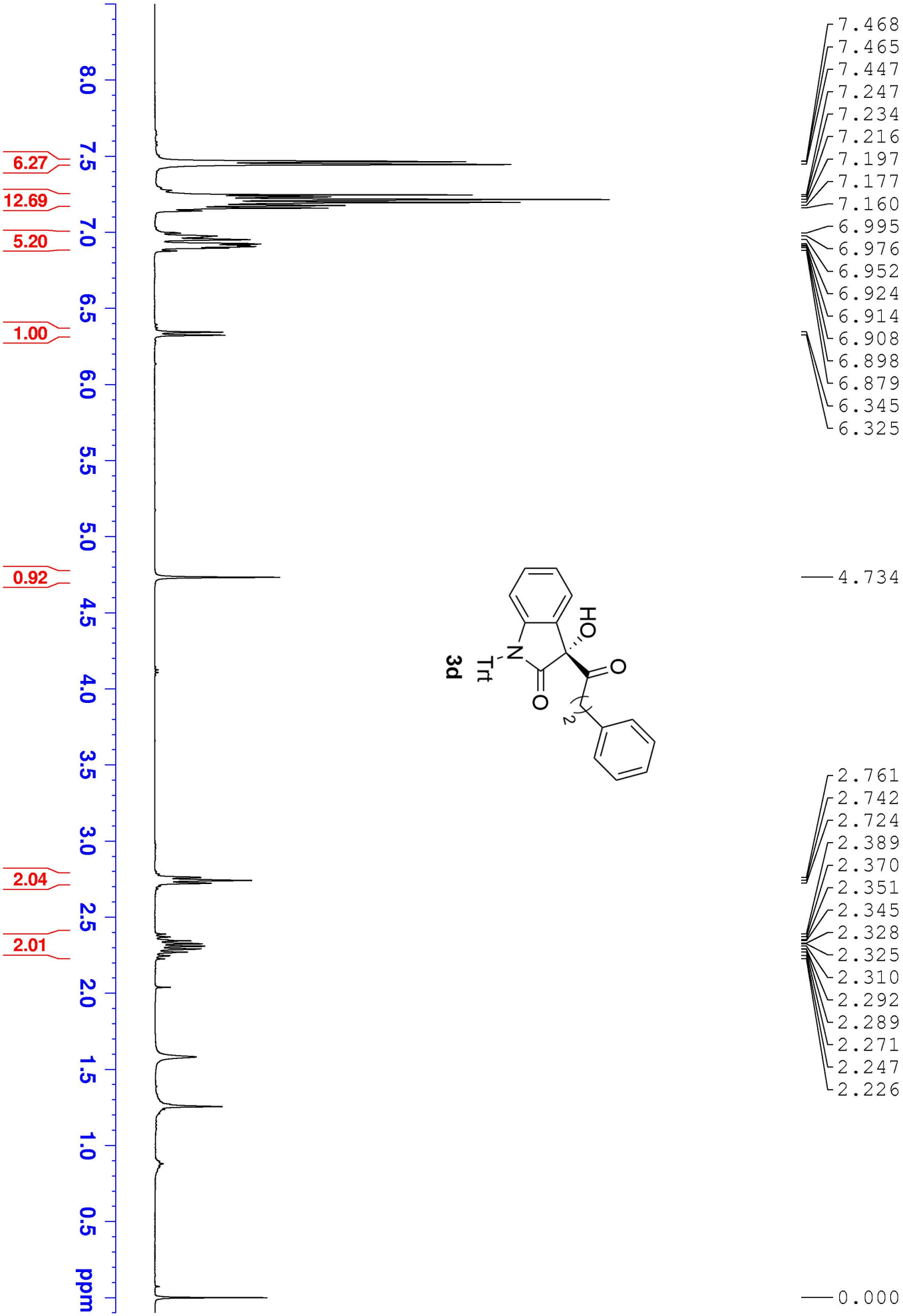
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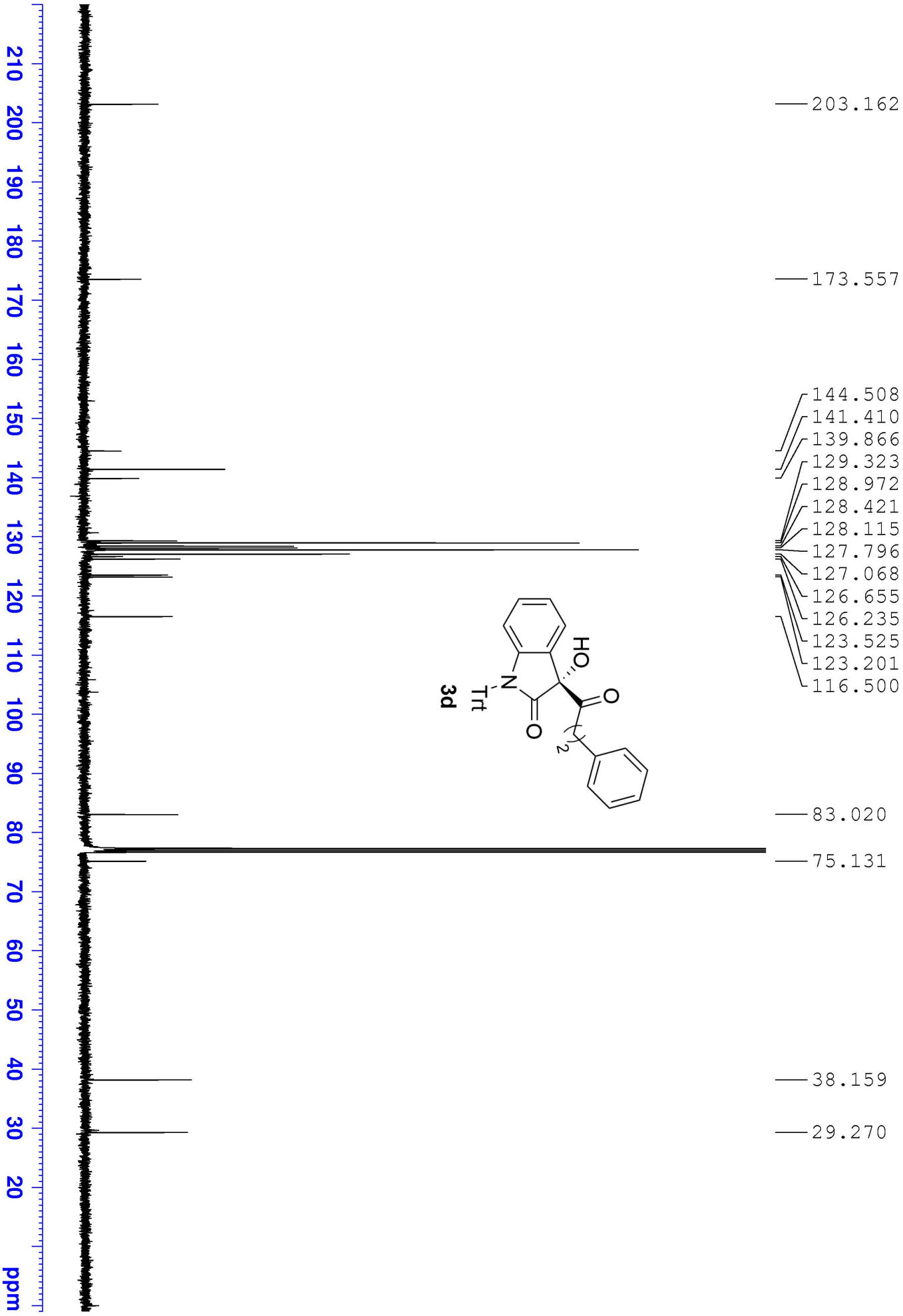
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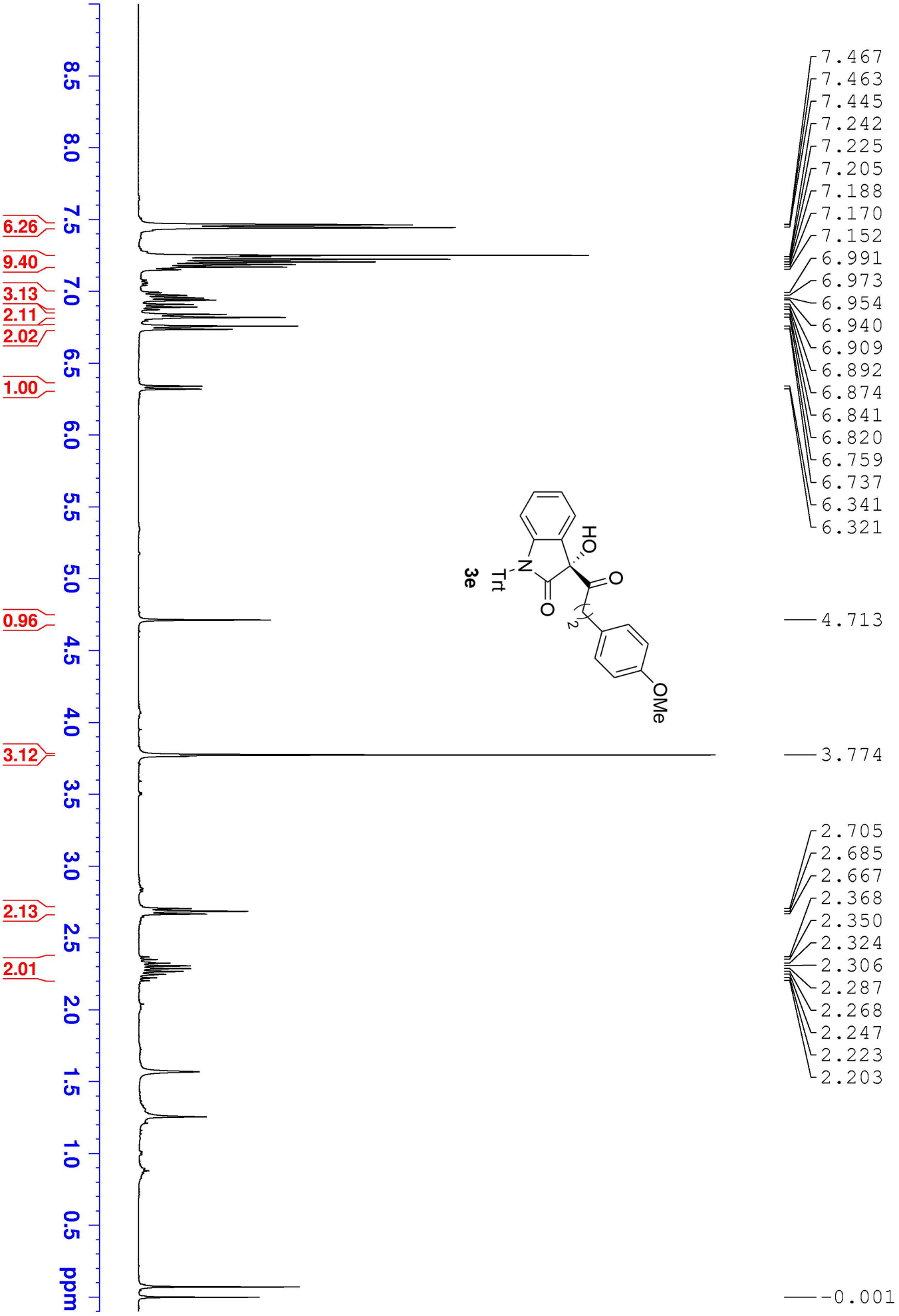
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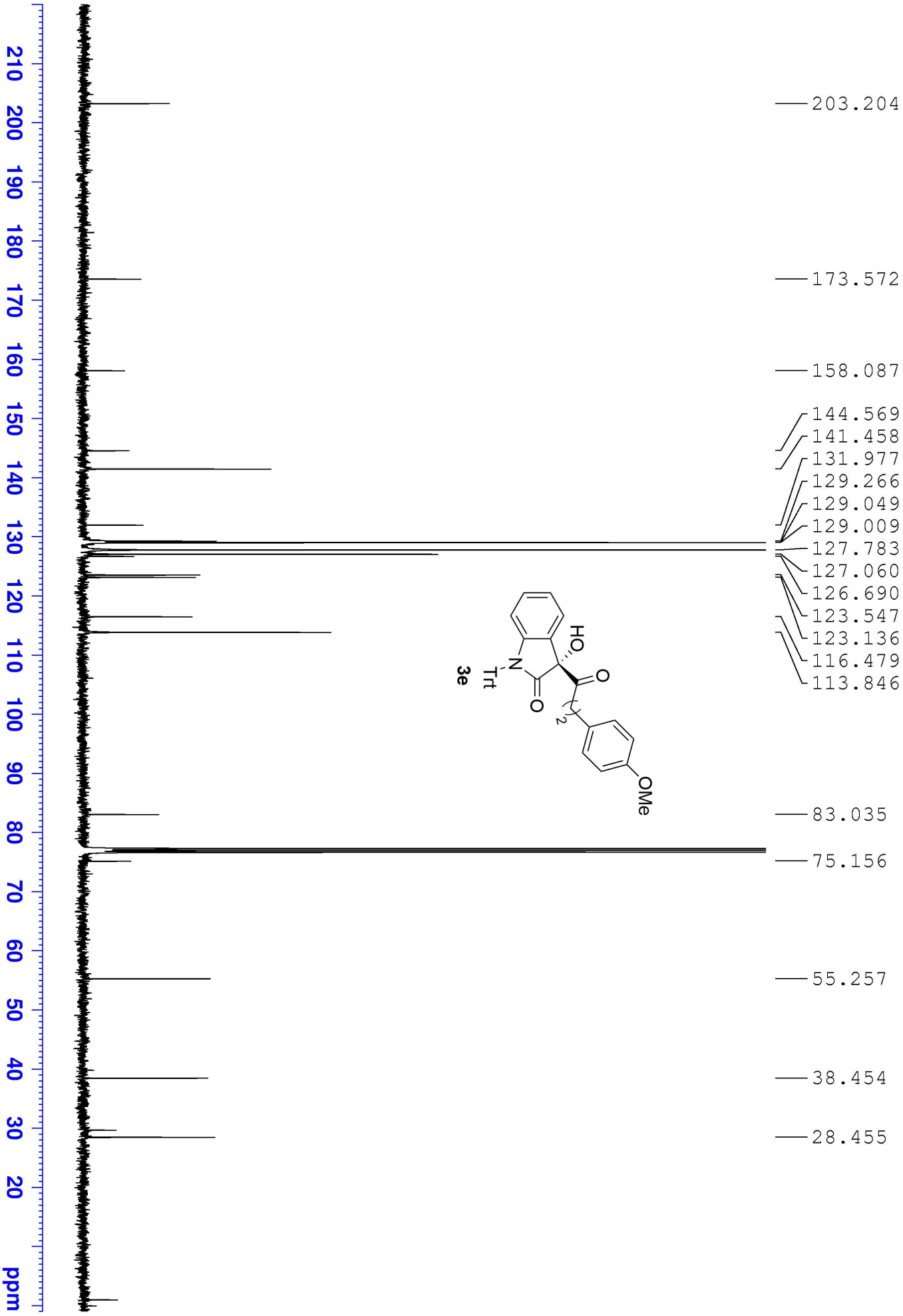
3e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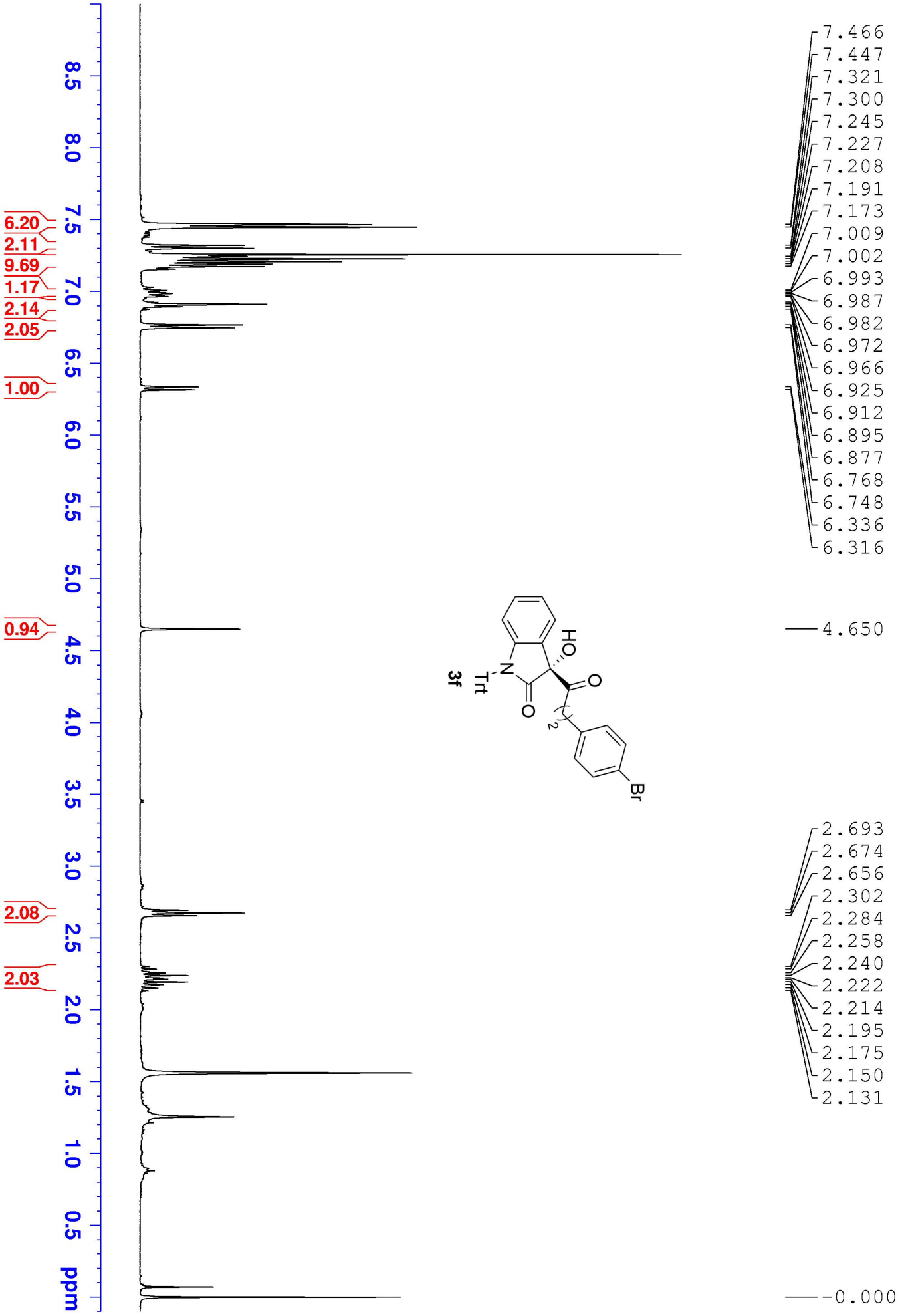
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Trt
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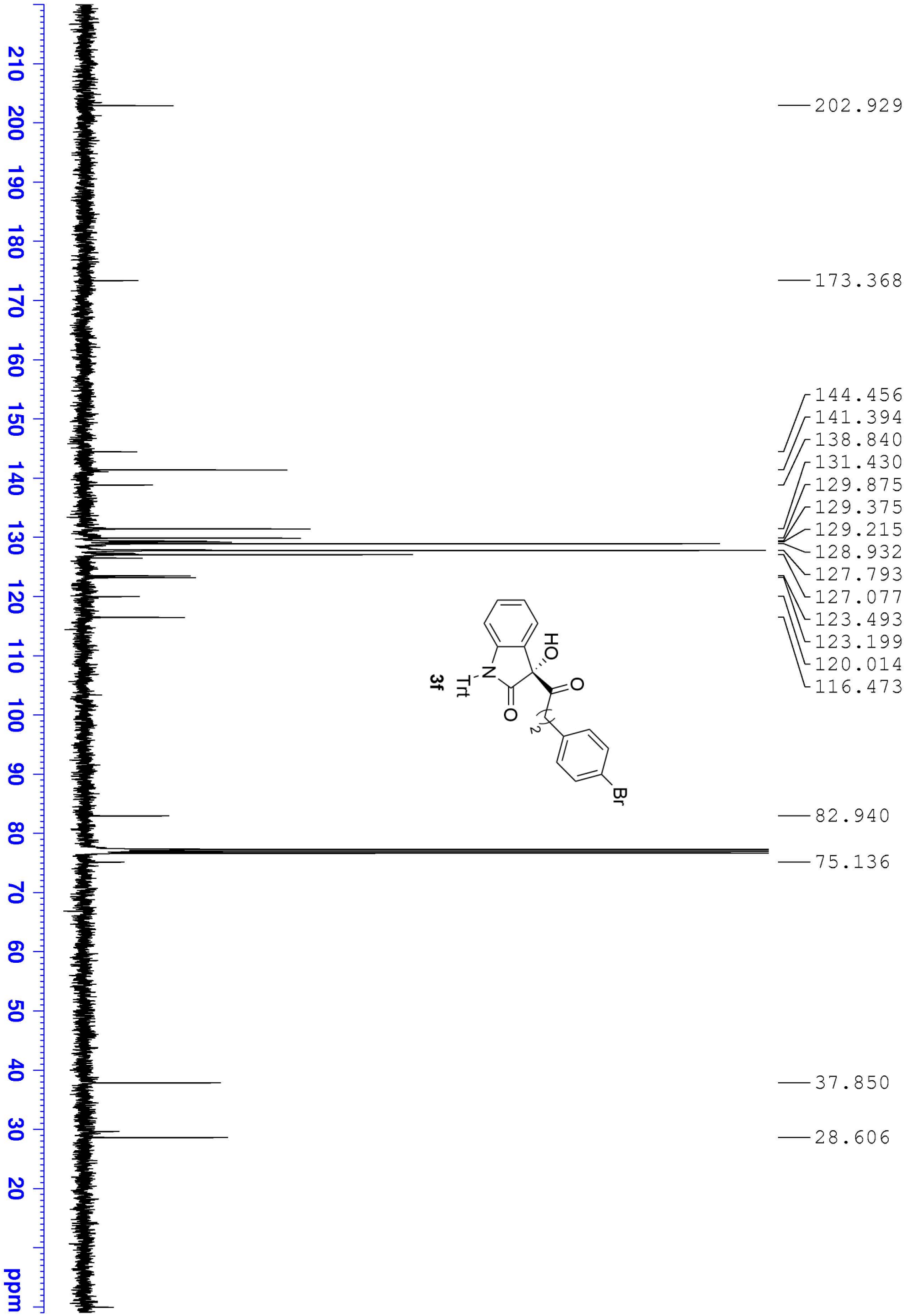
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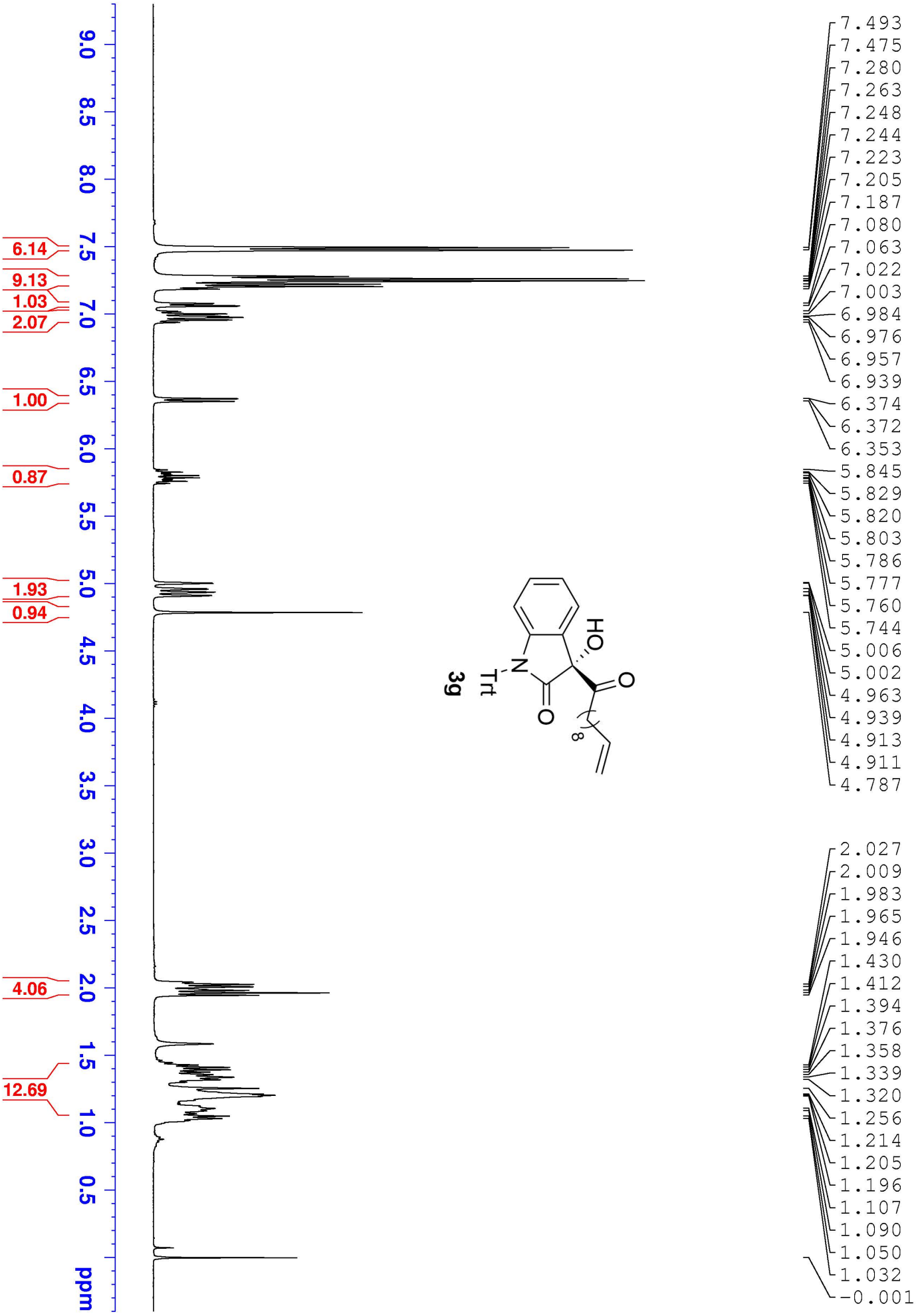
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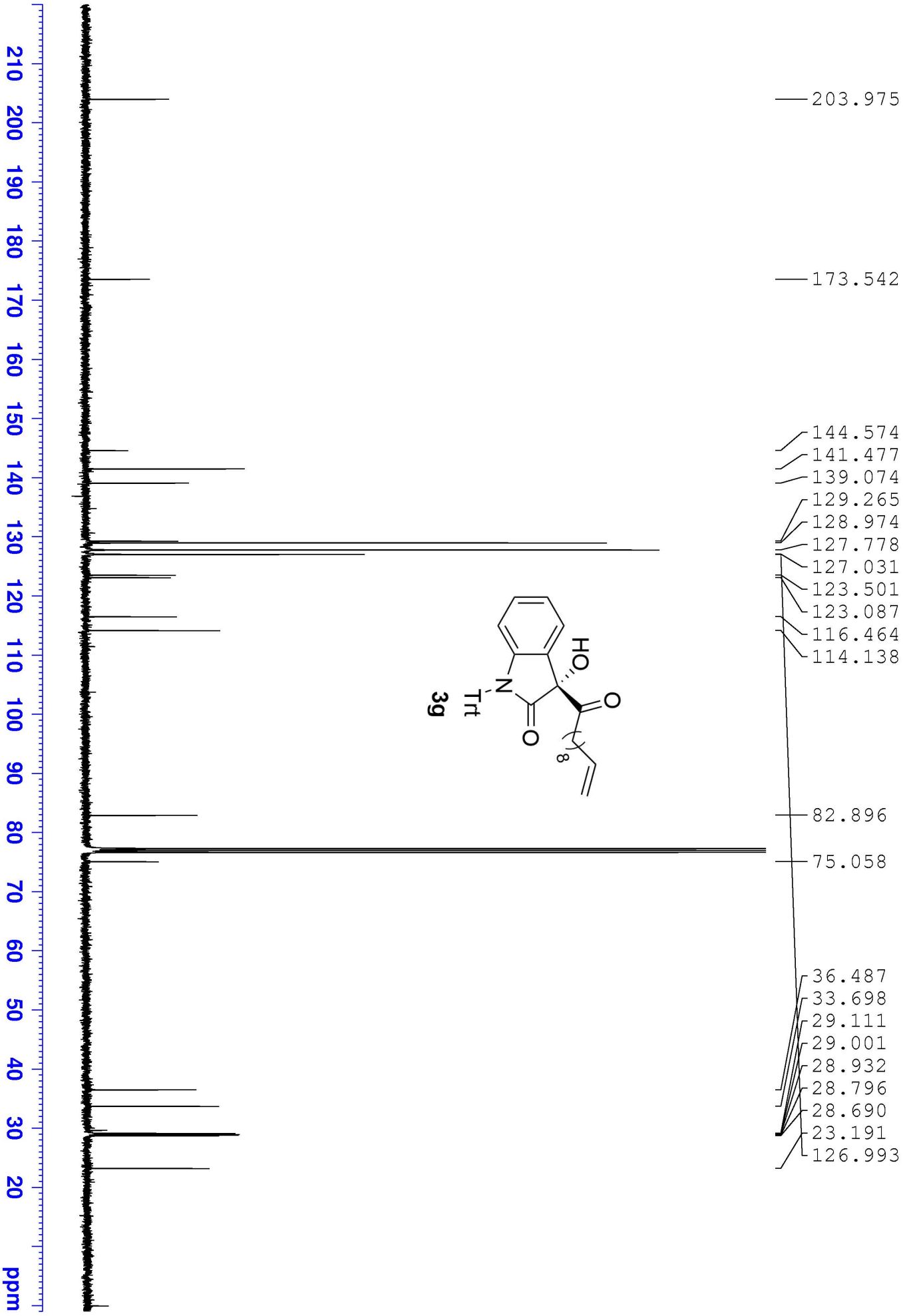
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8
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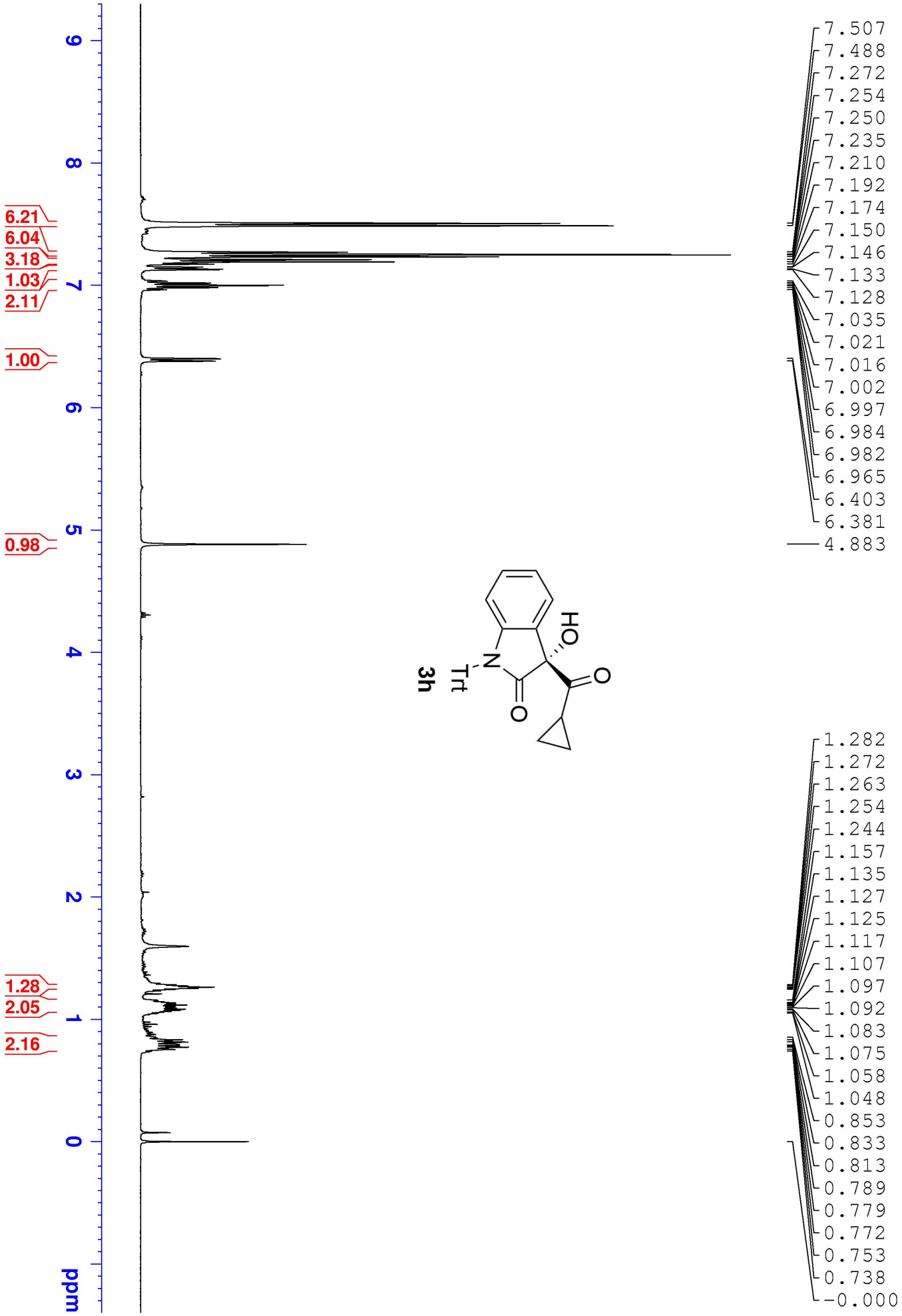
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Trt
O
O
3h
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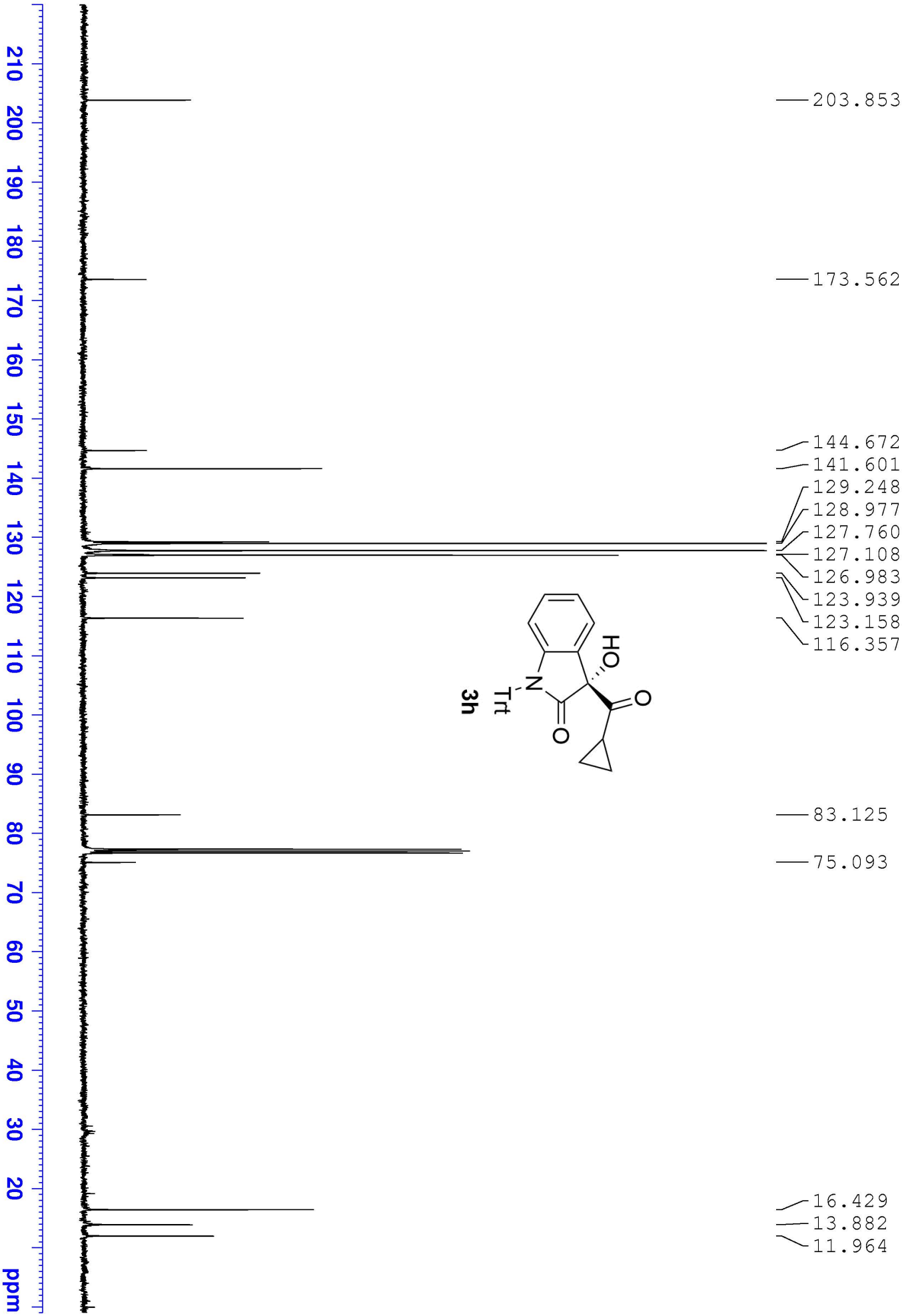
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ppm
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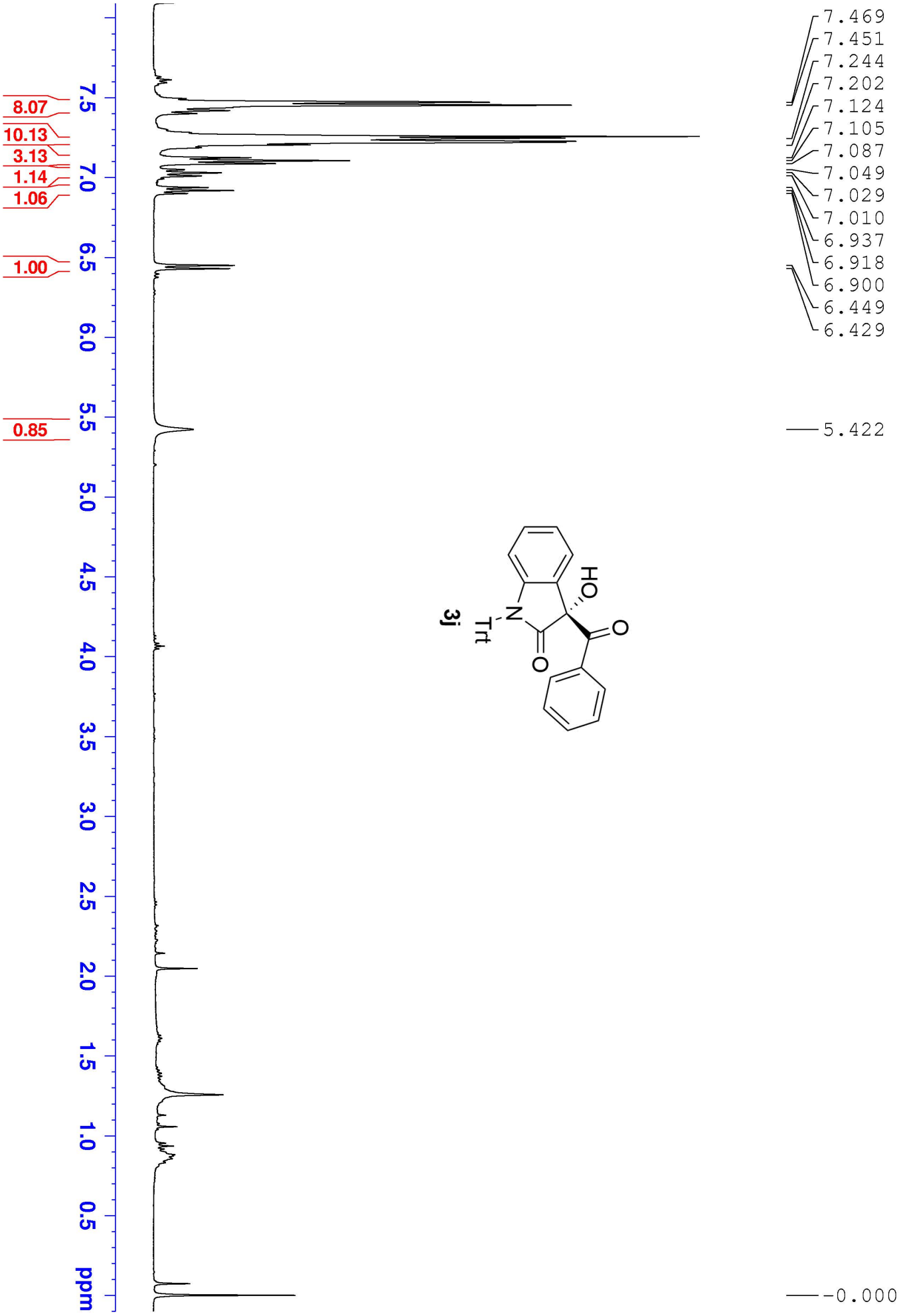
O
3h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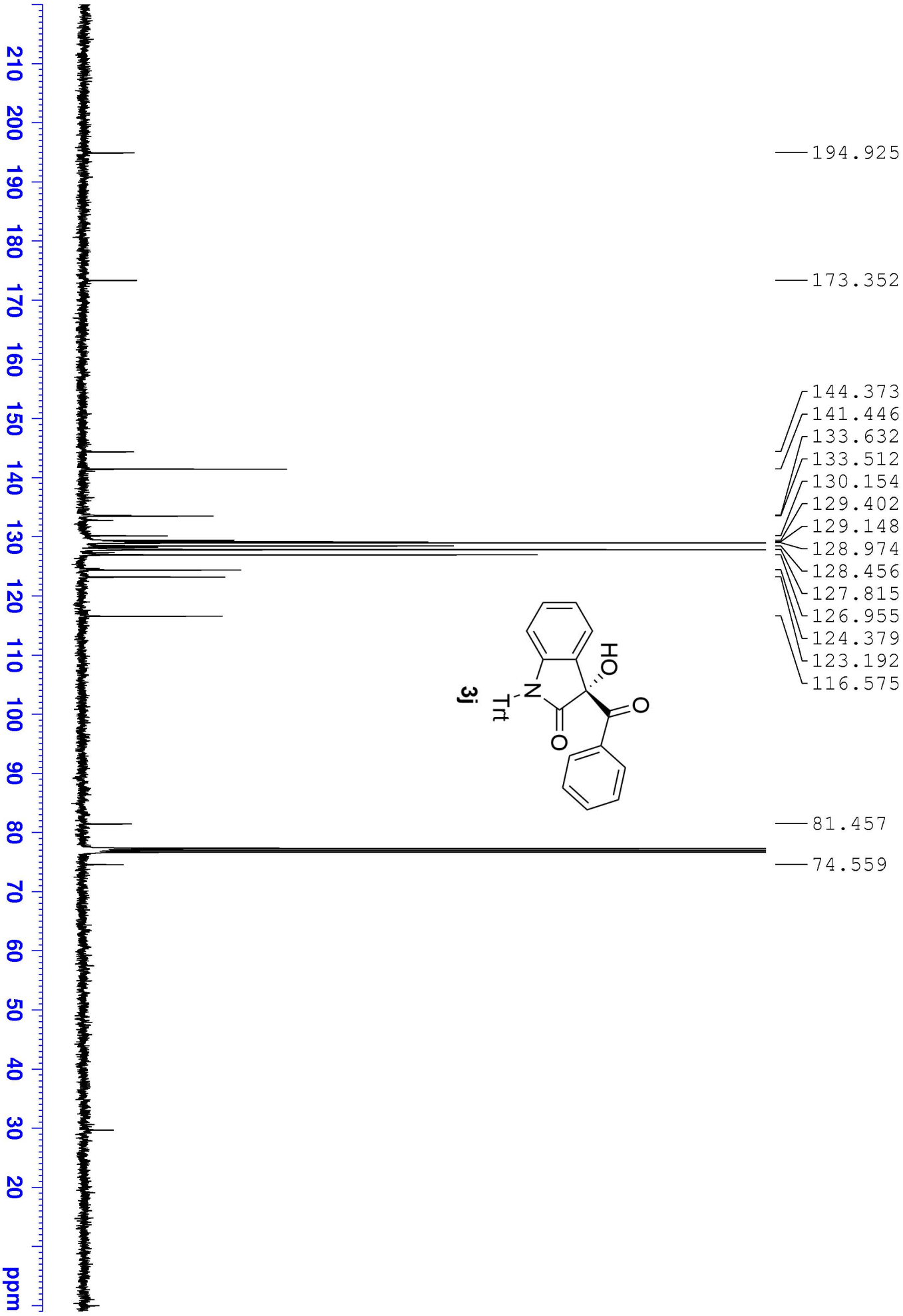
O
O
3j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O
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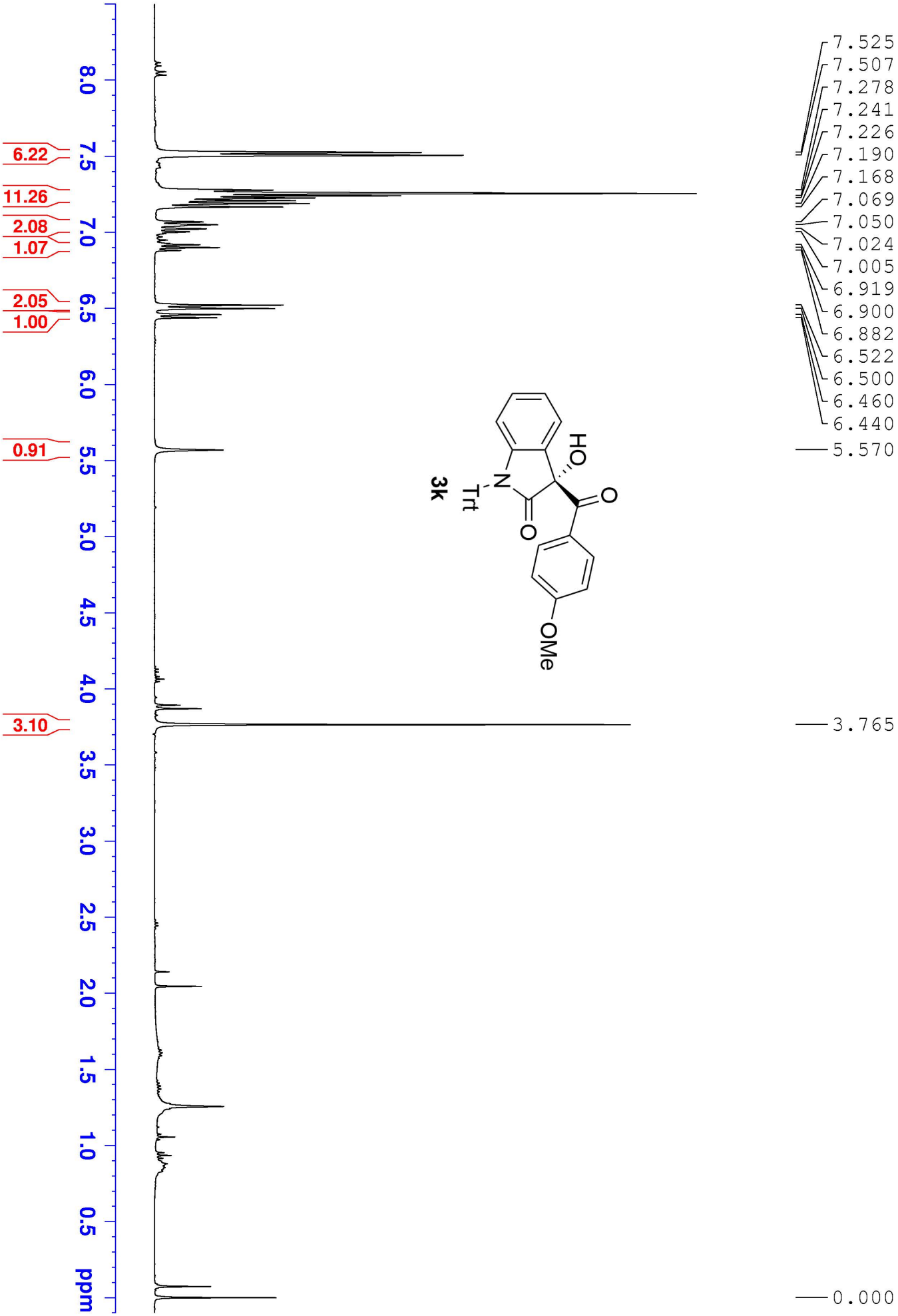
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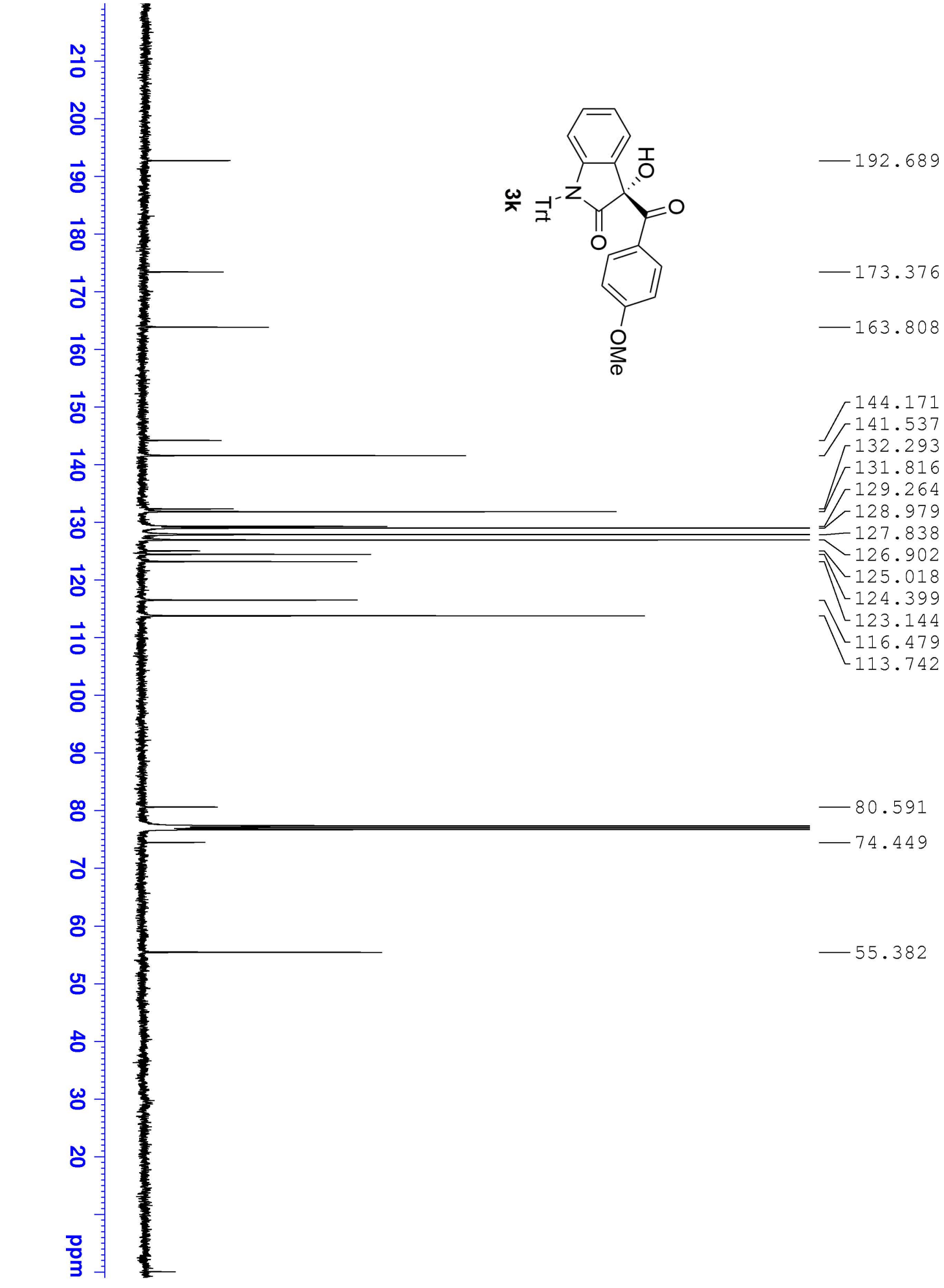
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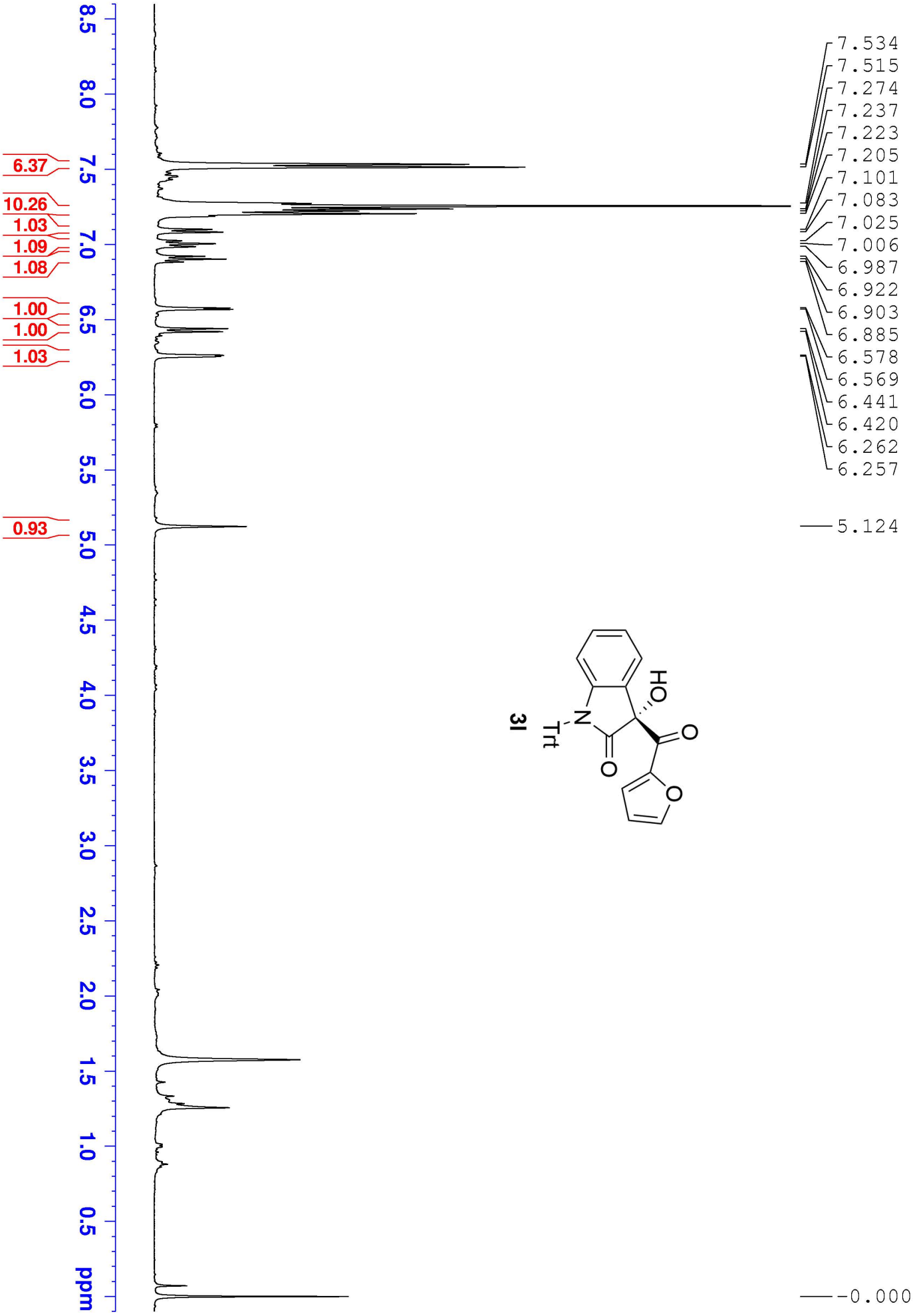
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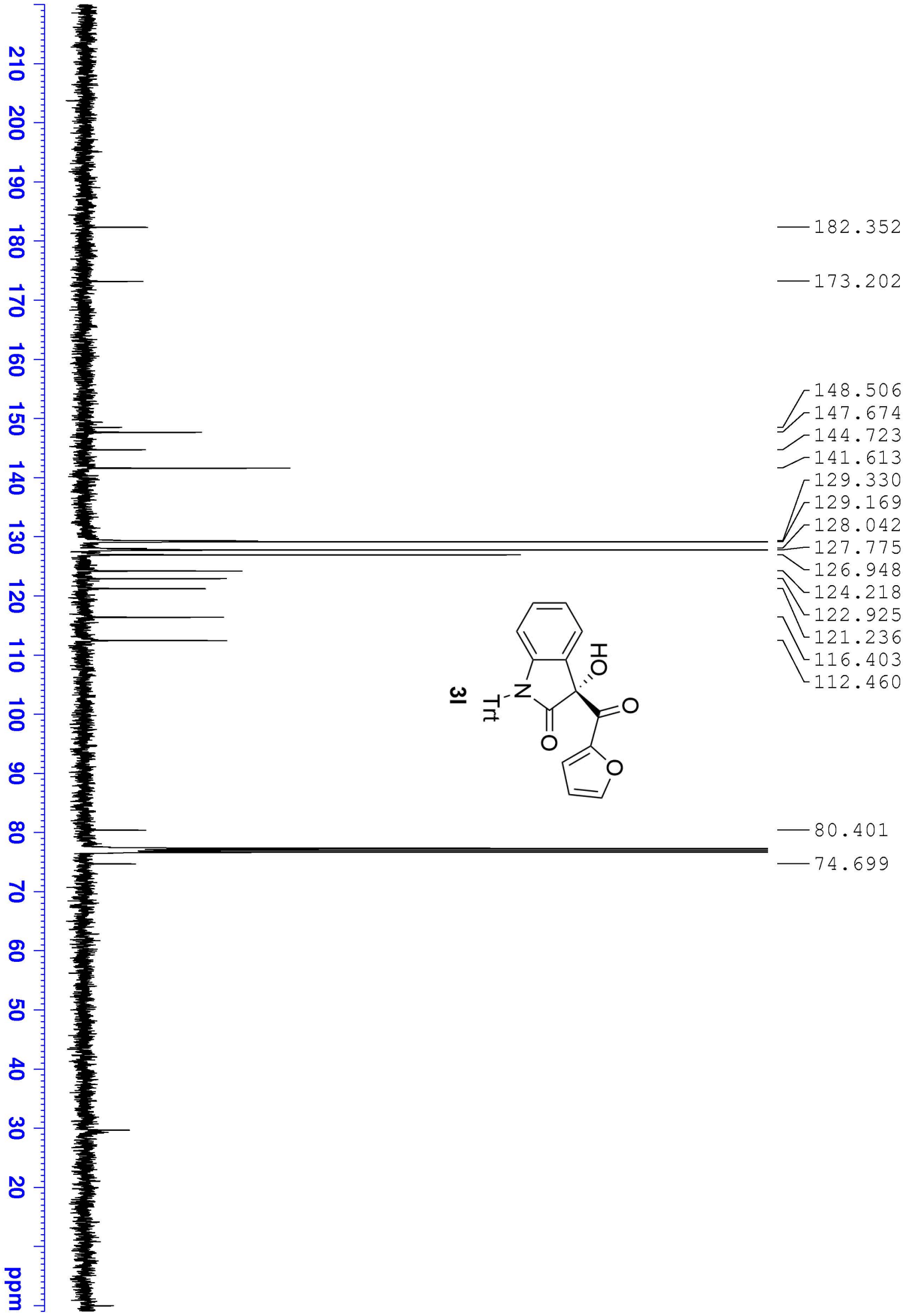
O
O
3l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HO
N
Trt
O
O
O
3l
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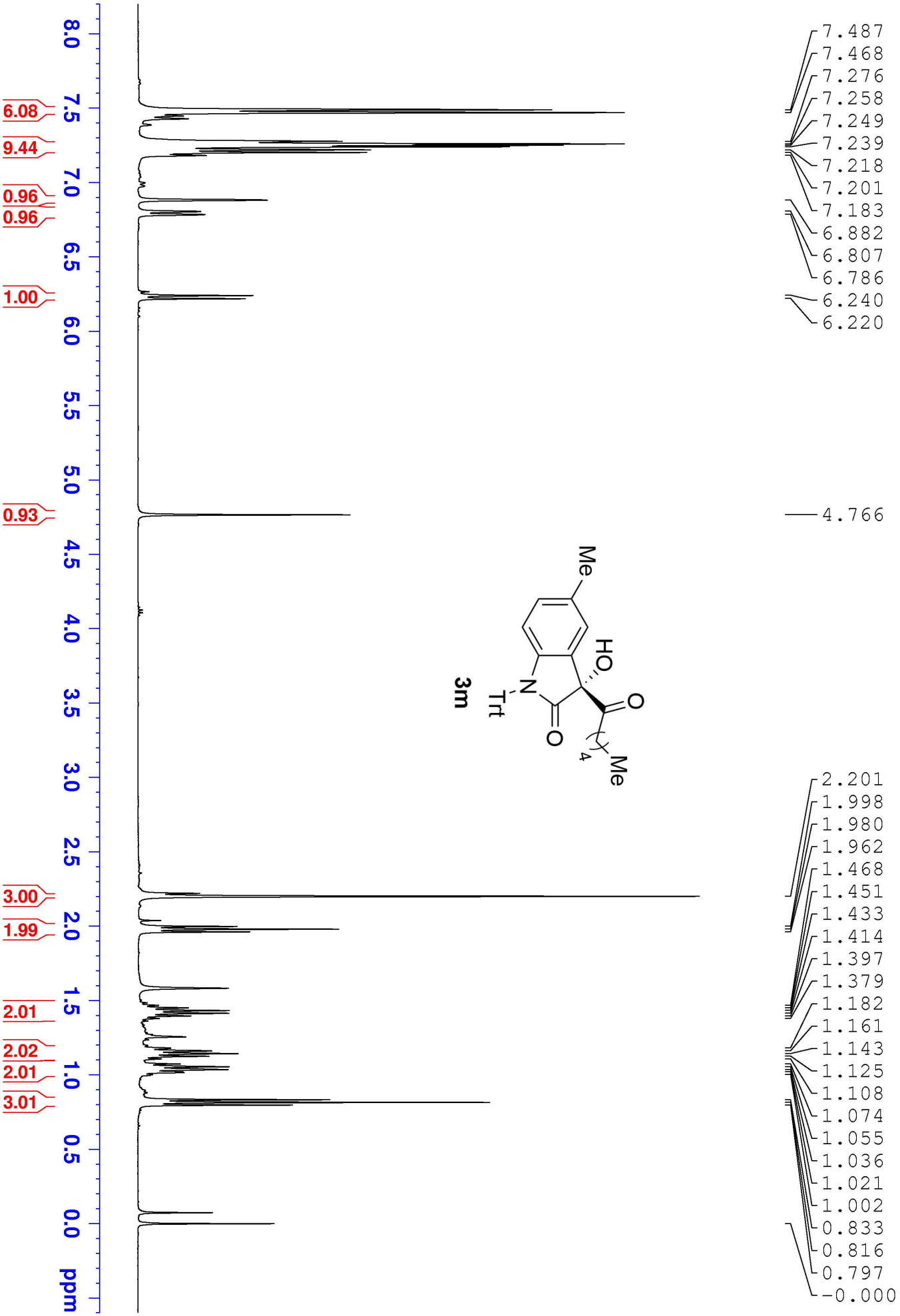
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3.01
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7.249
7.239
7.218
7.201
7.183
6.882
6.807
6.786
6.240
6.220
4.766
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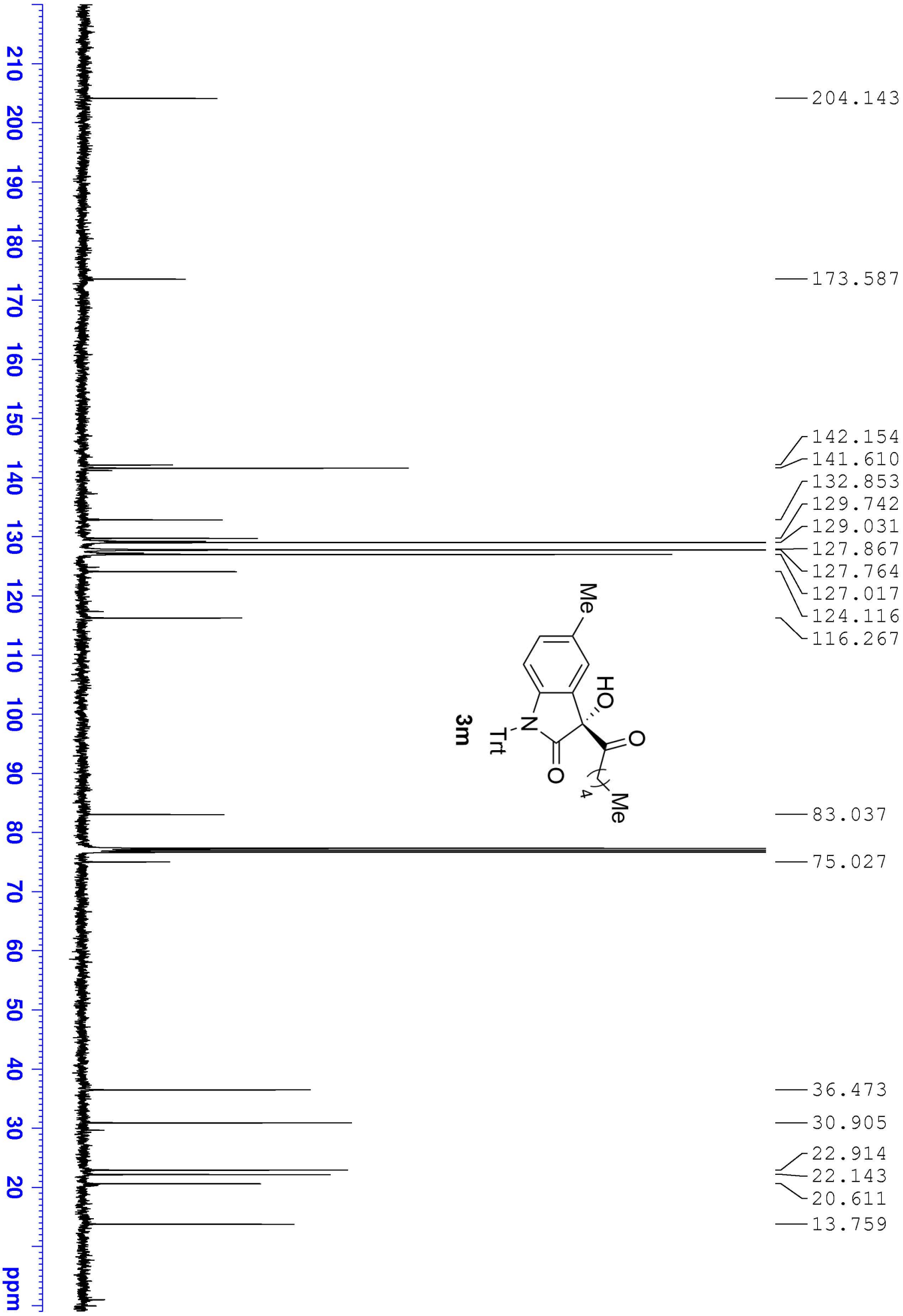
4
Me
3m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150
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130
120
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Me
HO
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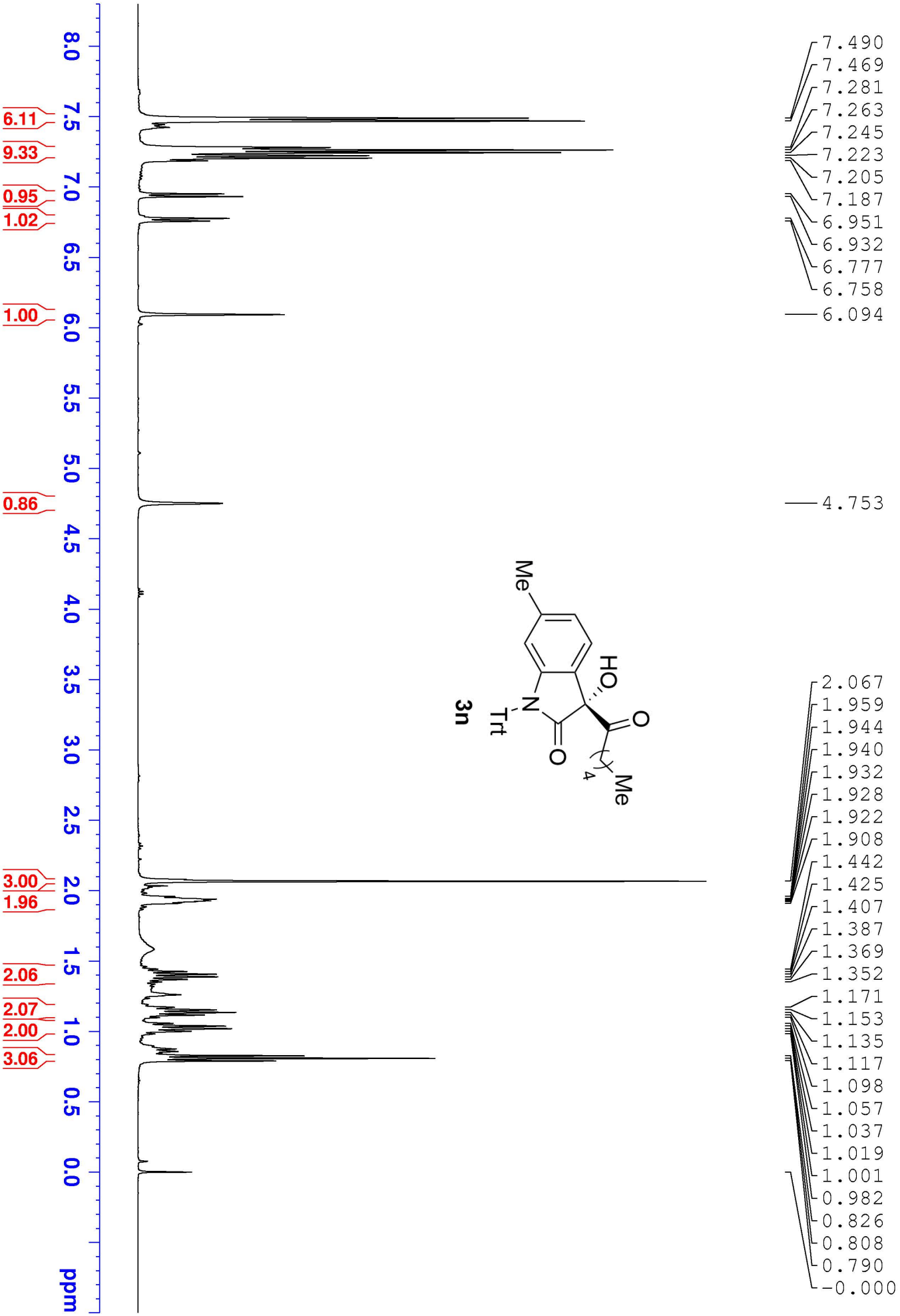
N
Trt
O
4
Me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4.753
2.067
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1.922
1.908
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1.425
1.407
1.387
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1.135
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1.00
0.86
3.00
1.96
2.06
2.07
2.00
3.06
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7.0
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6.0
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5.0
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4.0
3.5
3.0
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O
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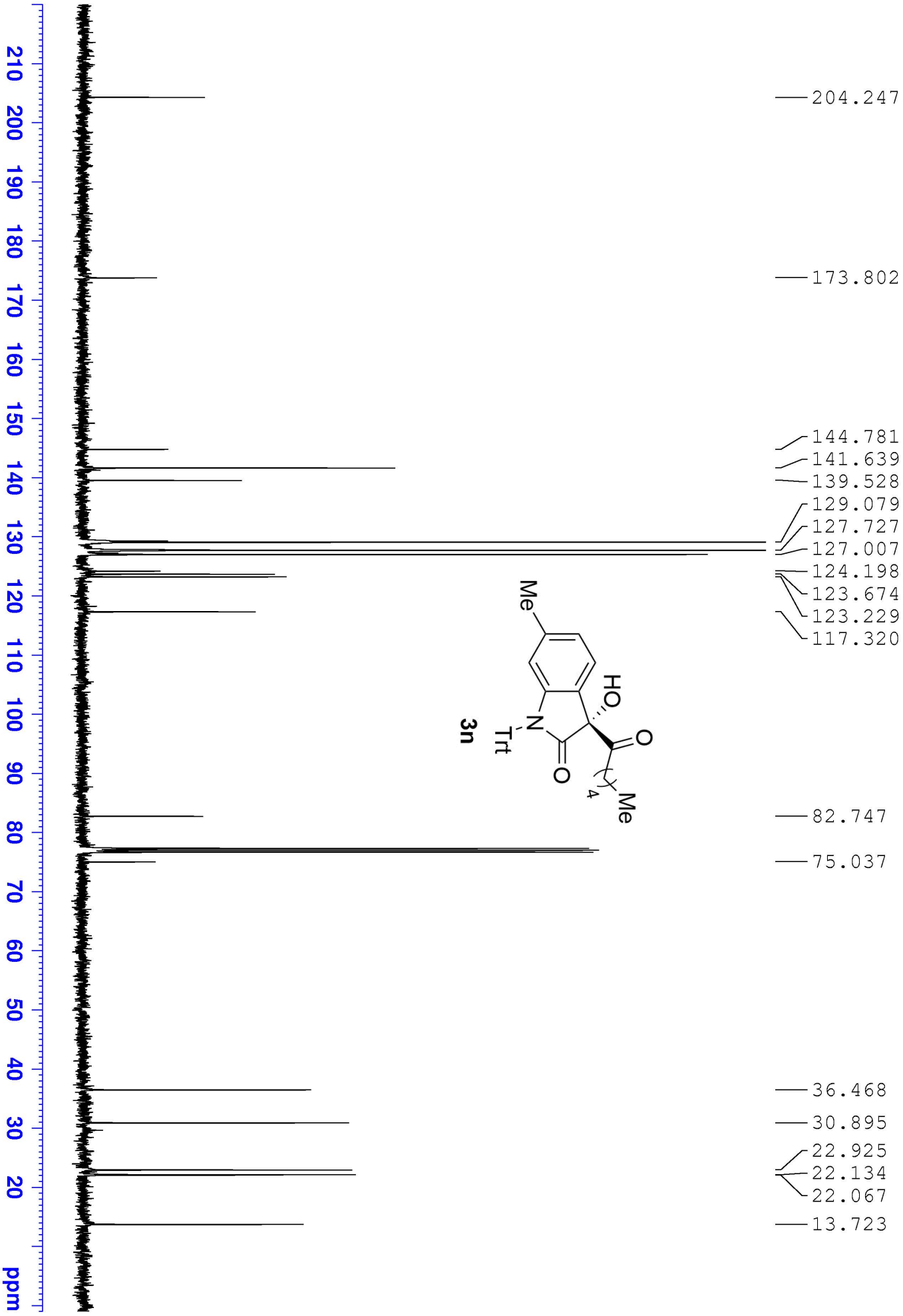
Trt
O
4
Me
3n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O
N
Trt
O
4
Me
3n
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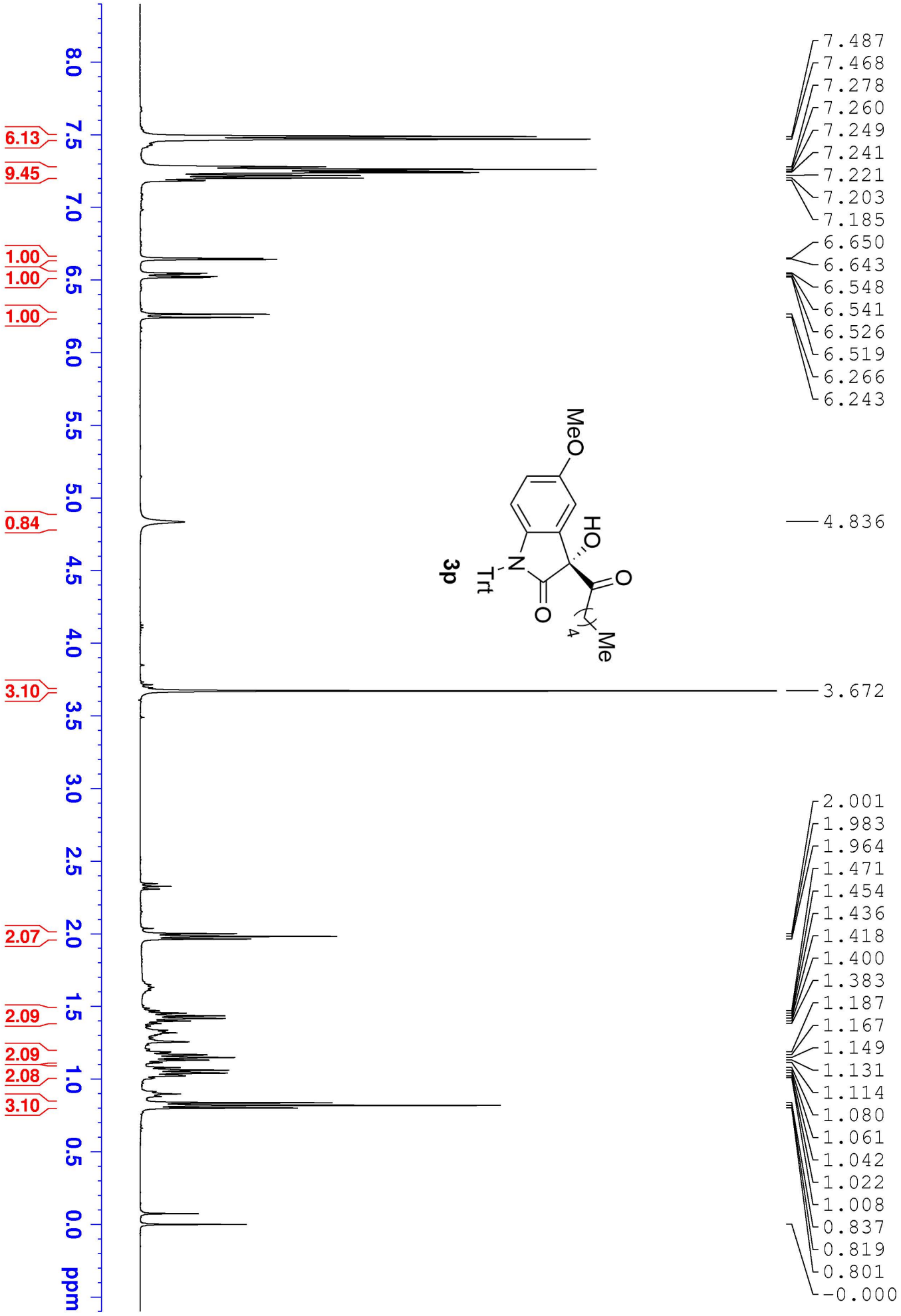
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2.08
3.10
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7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
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O
N
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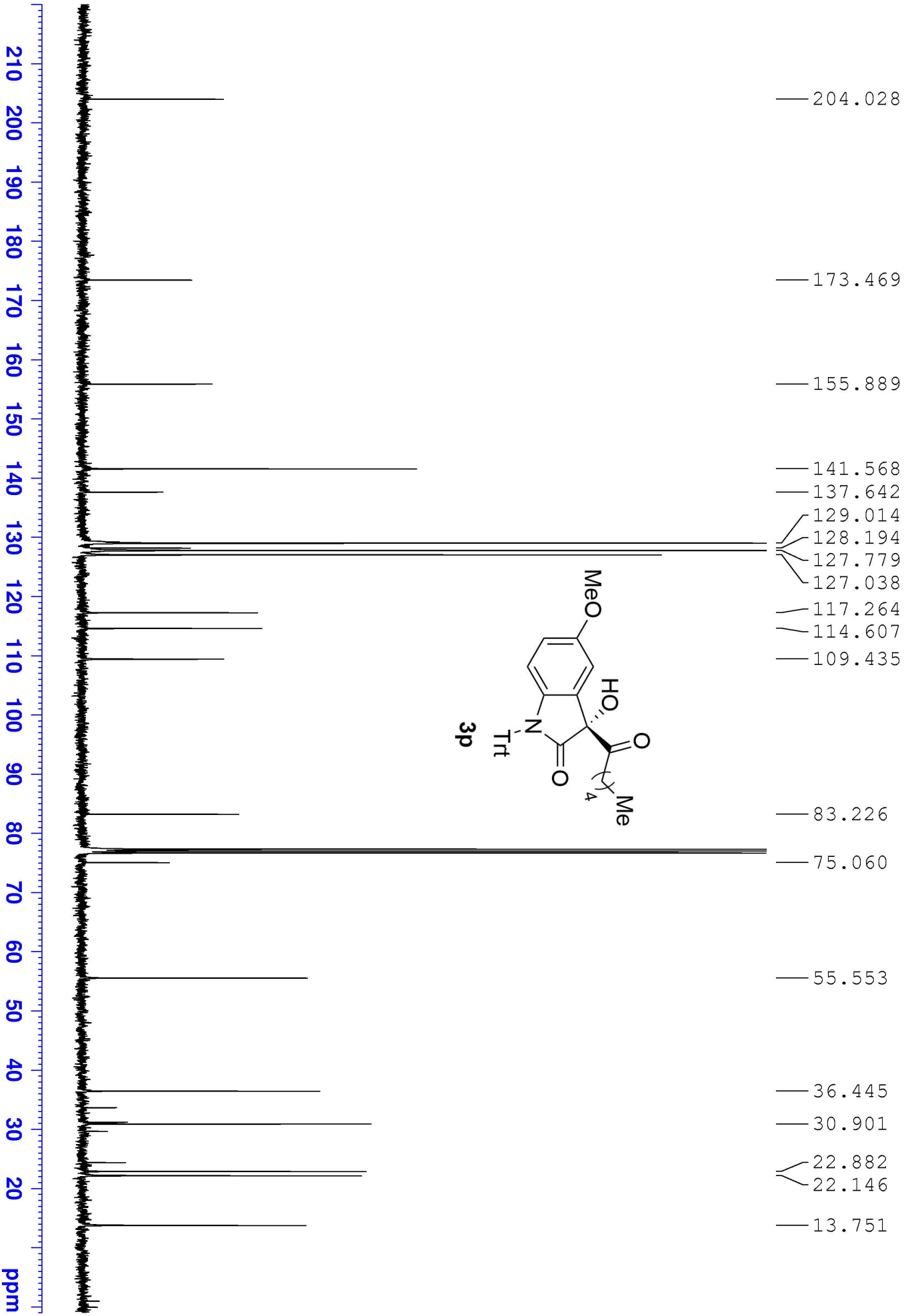
O
4
Me
3p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3p
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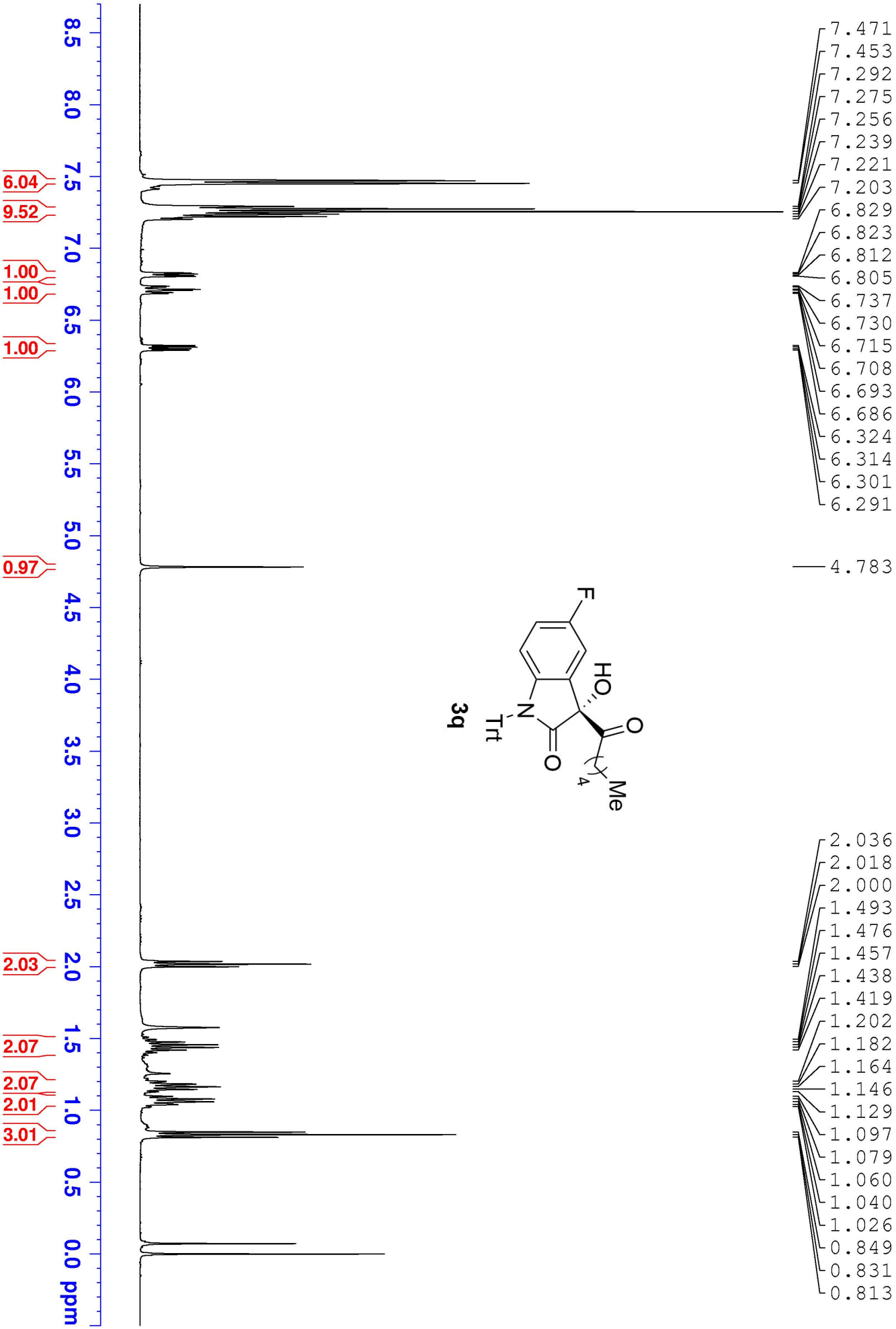
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0.831
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2.07
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5.5
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Trt
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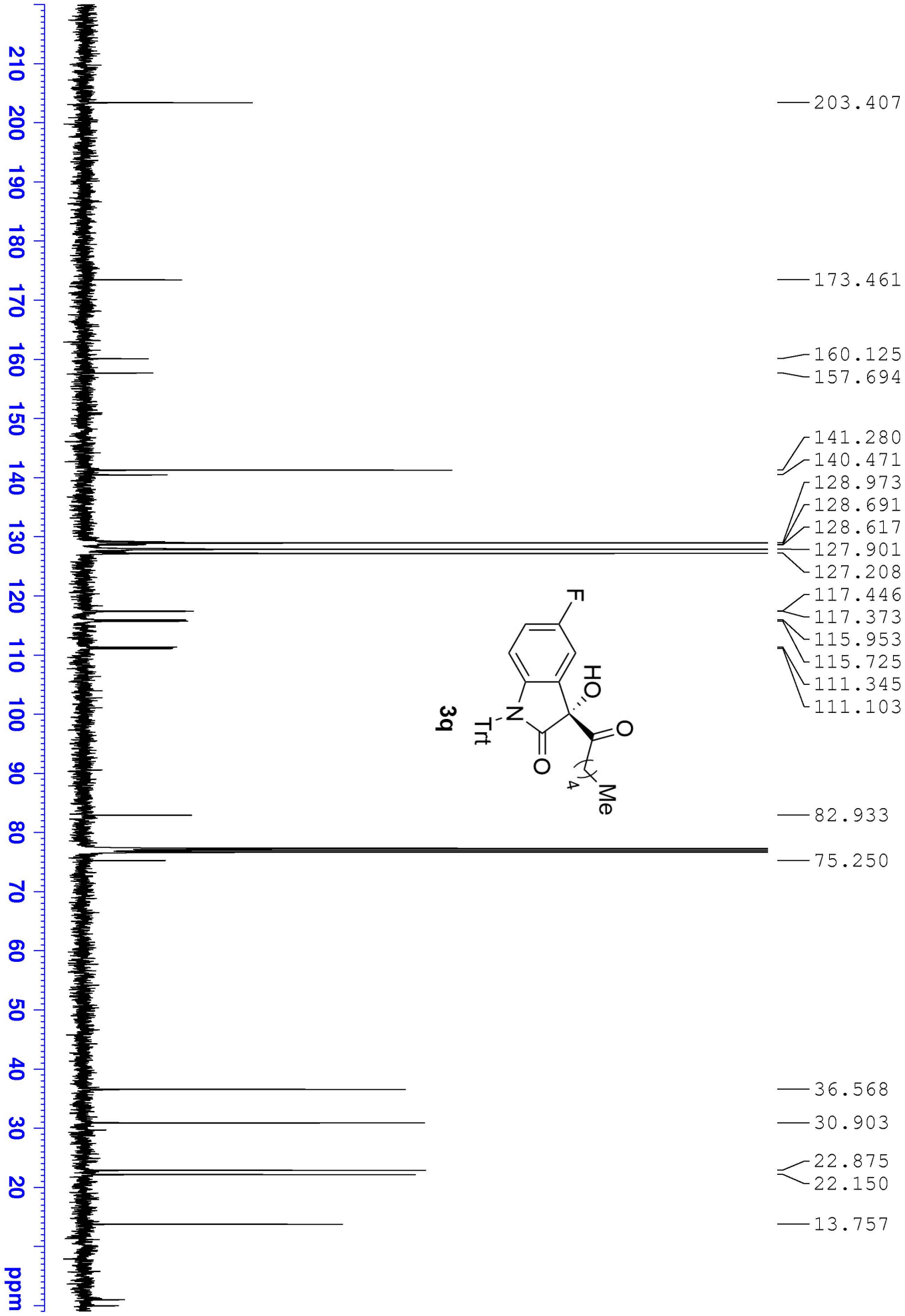
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150
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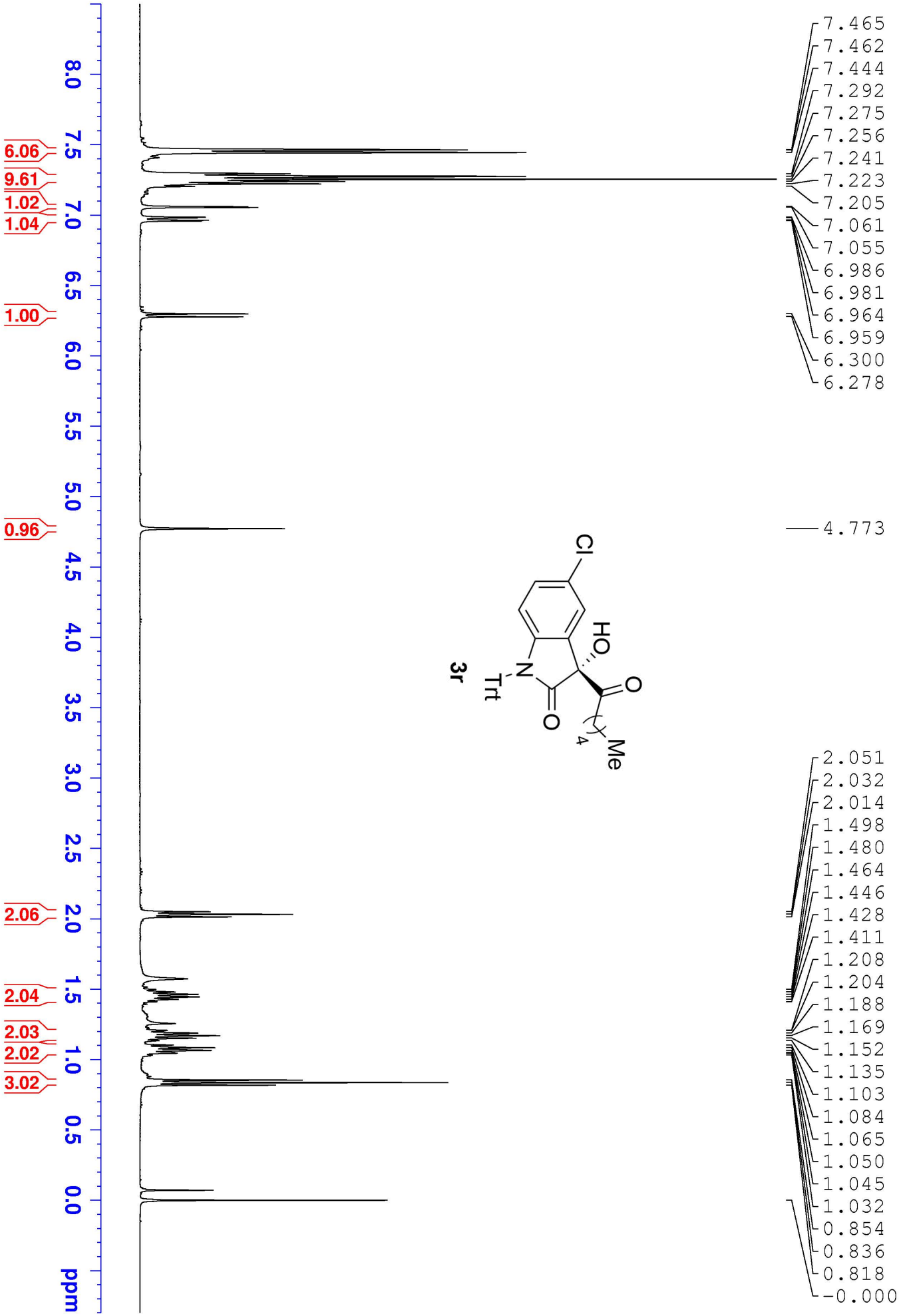
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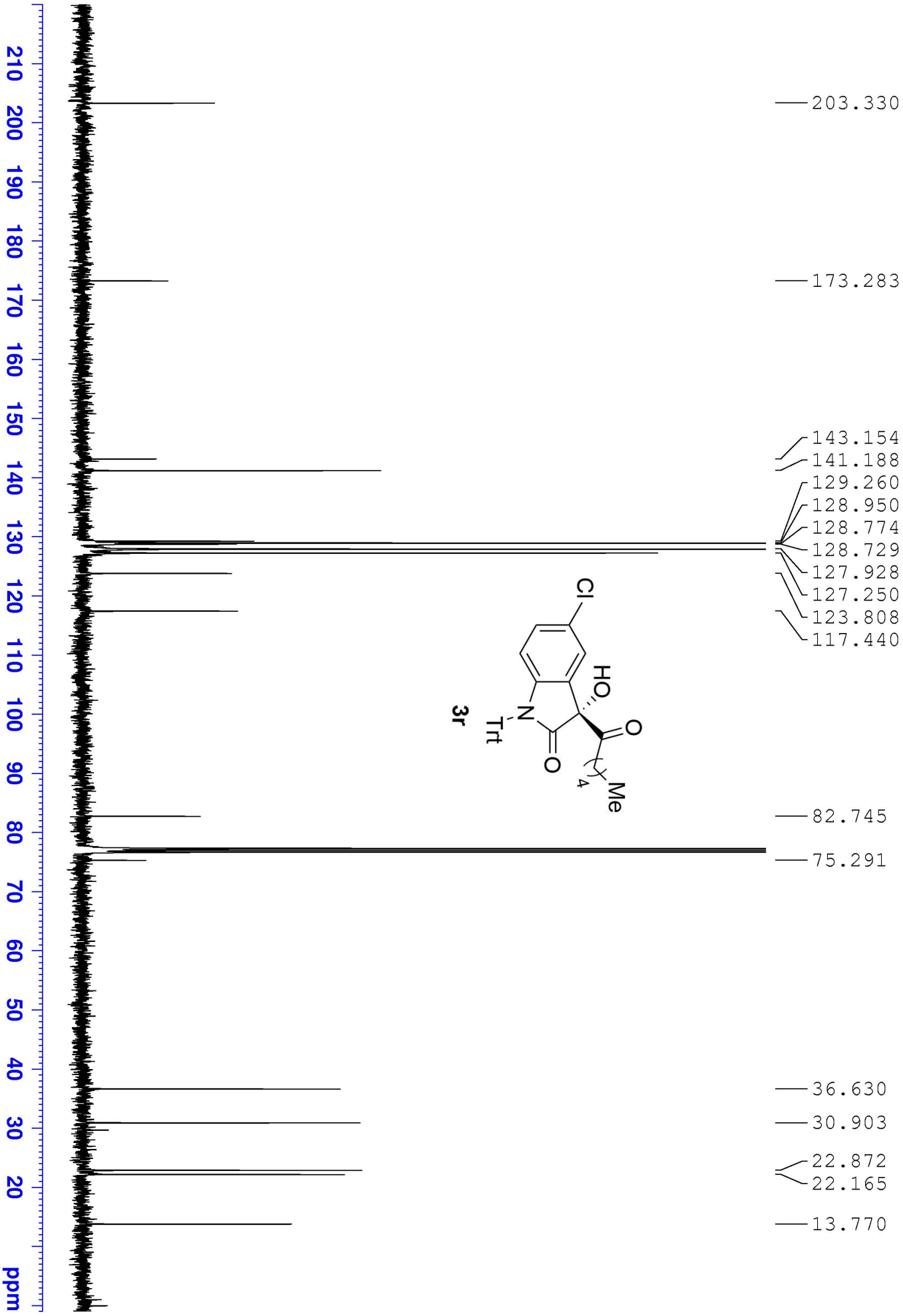
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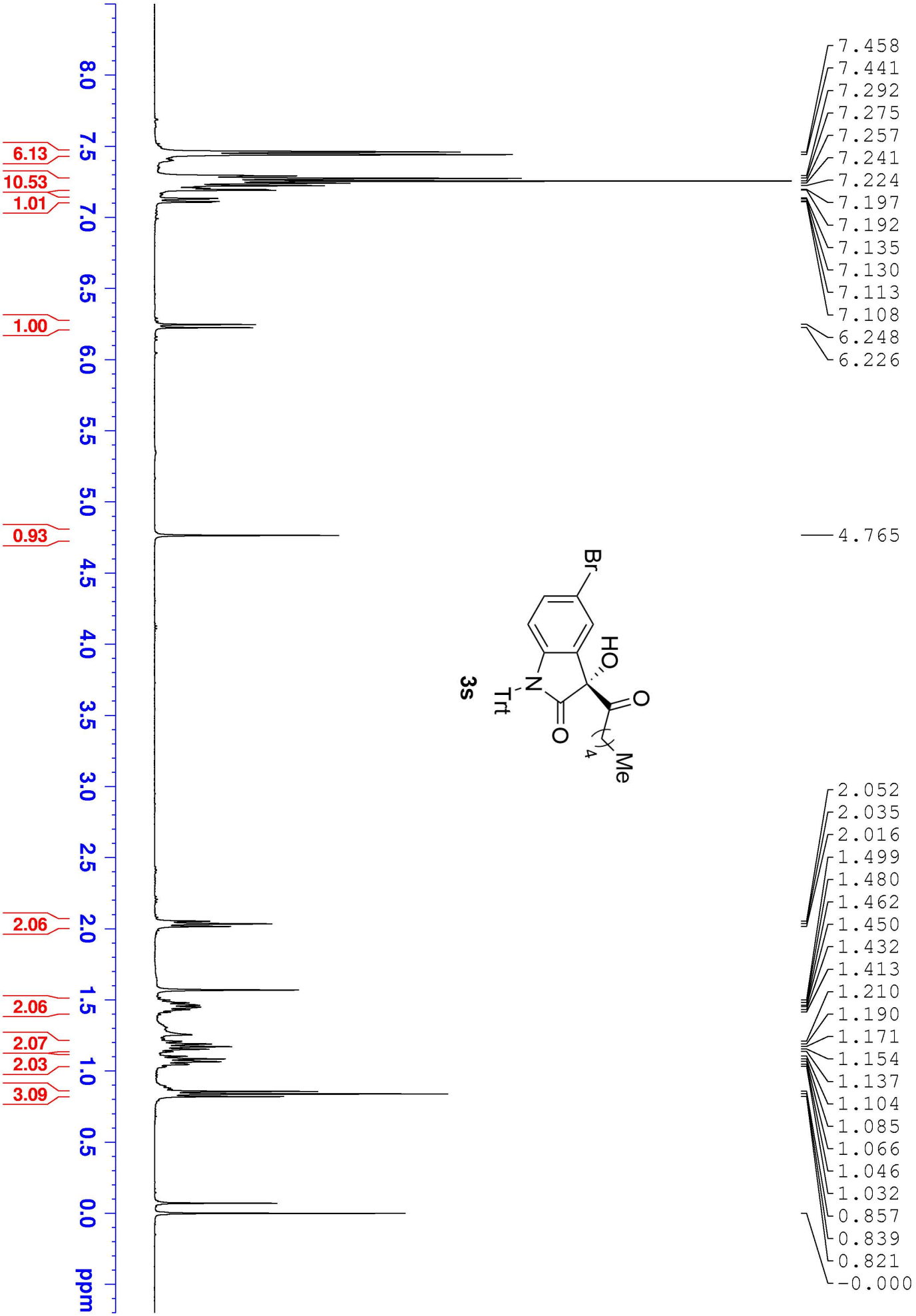
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6.226
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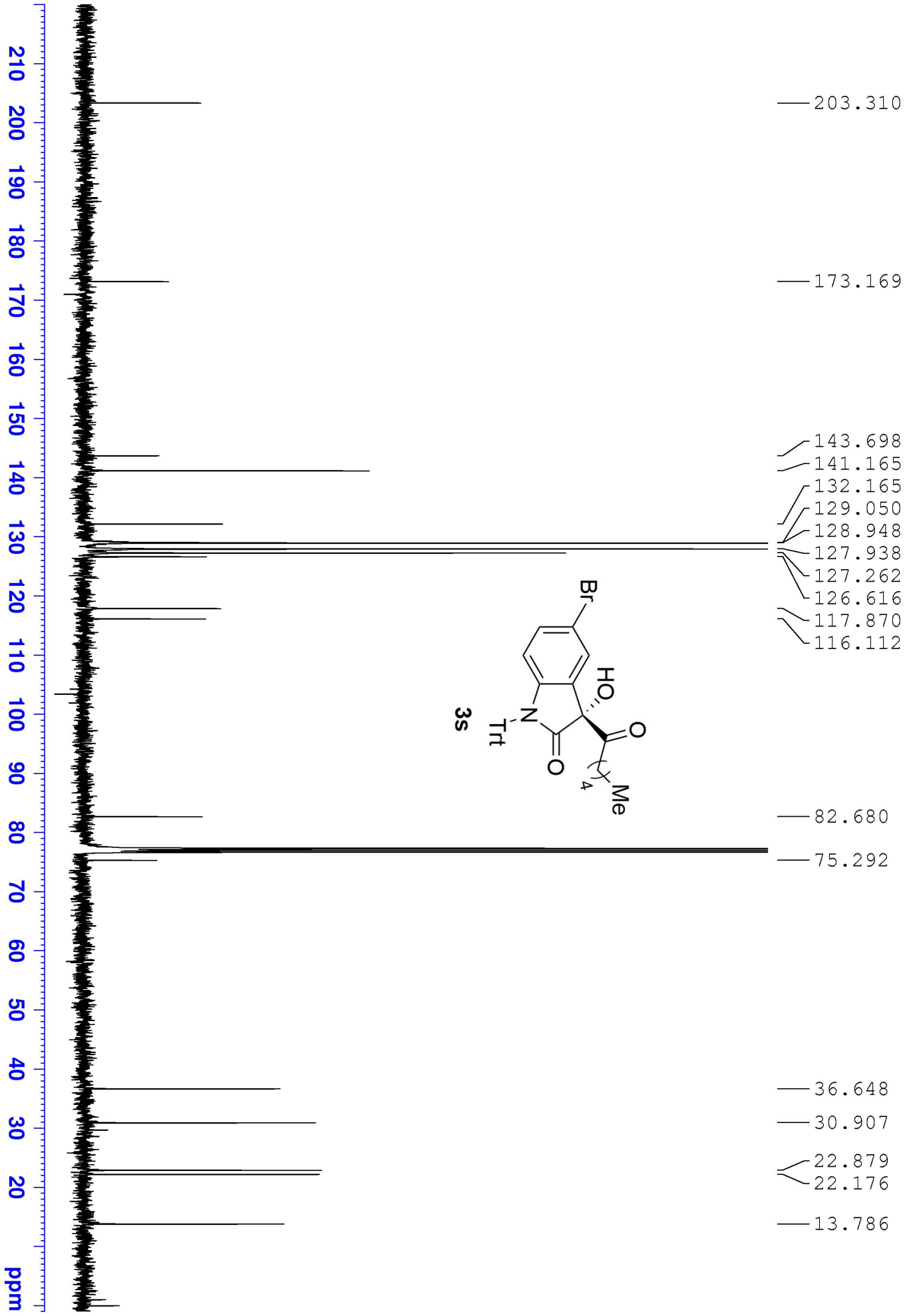
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ppm
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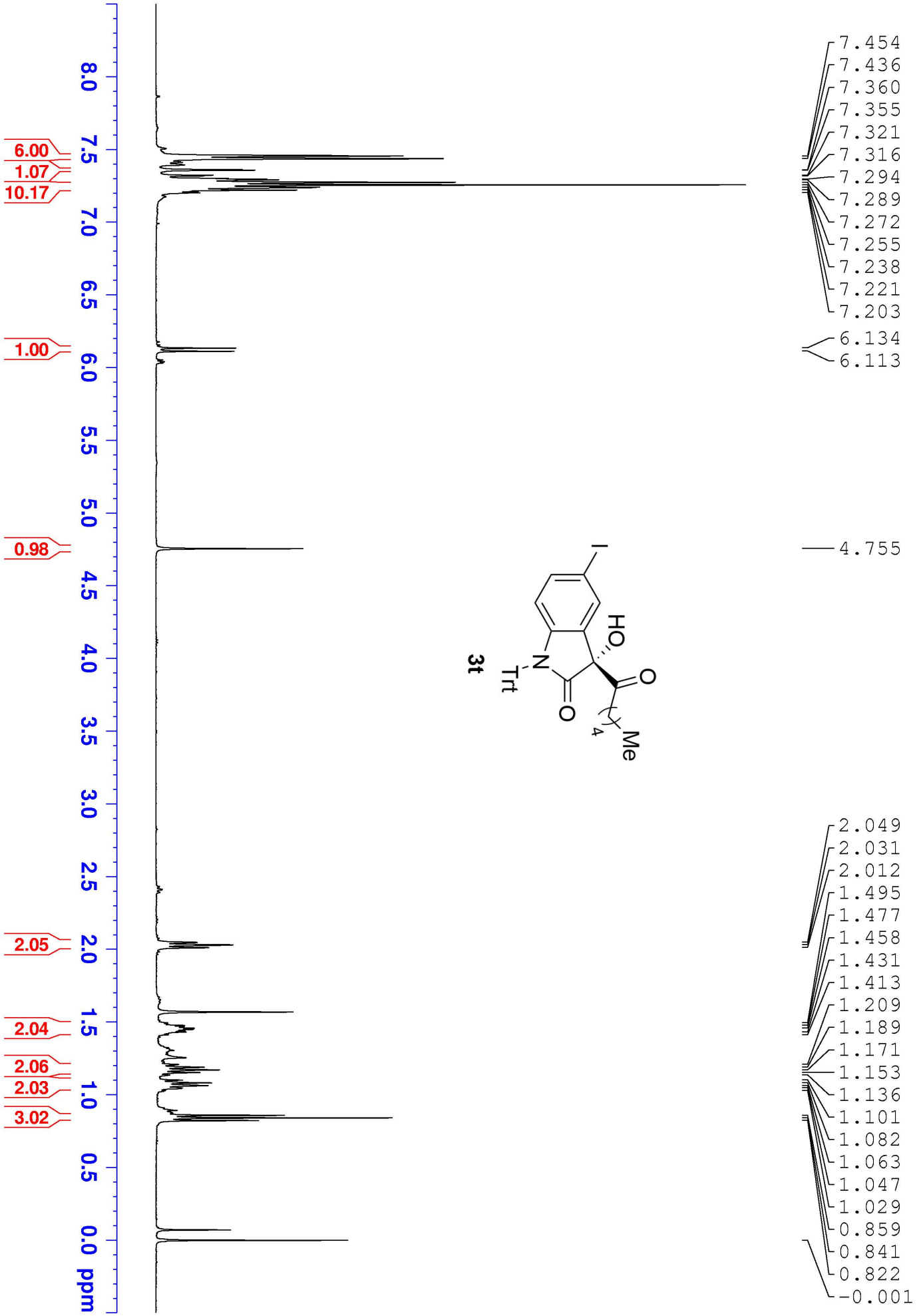
4
Me
3s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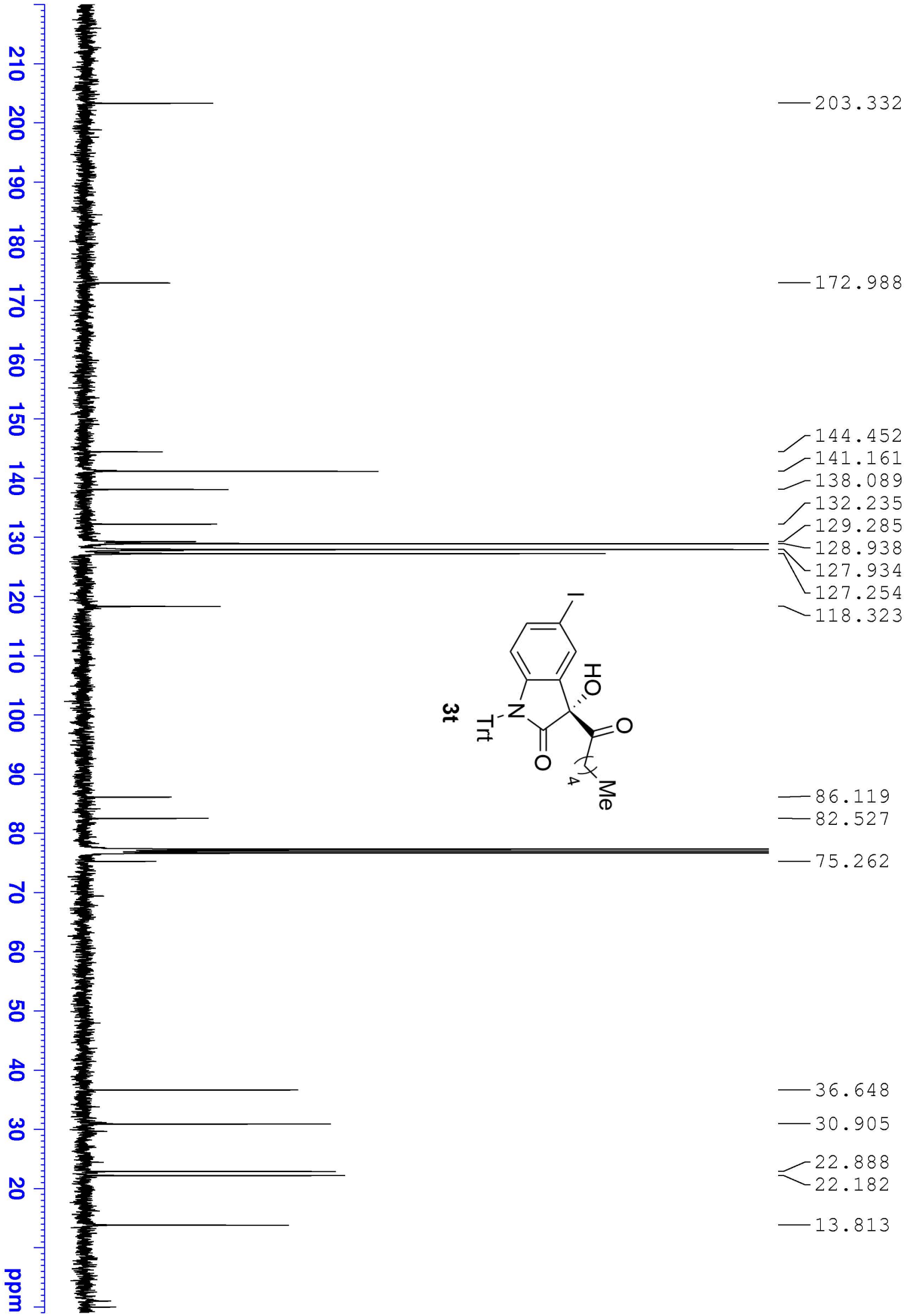
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200
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180
170
160
150
140
130
120
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50
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30
20
ppm
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Trt
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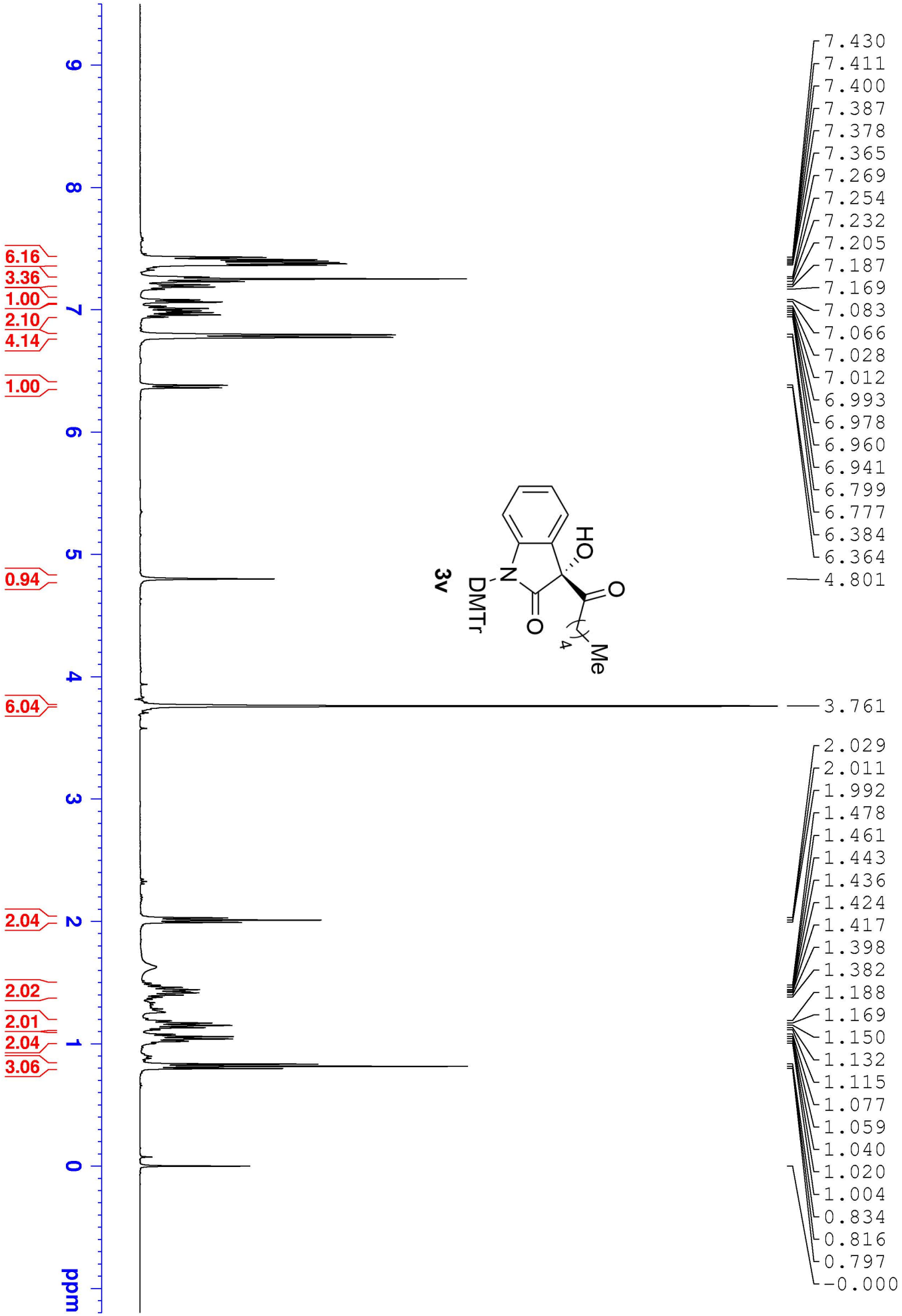
O
Me
4
I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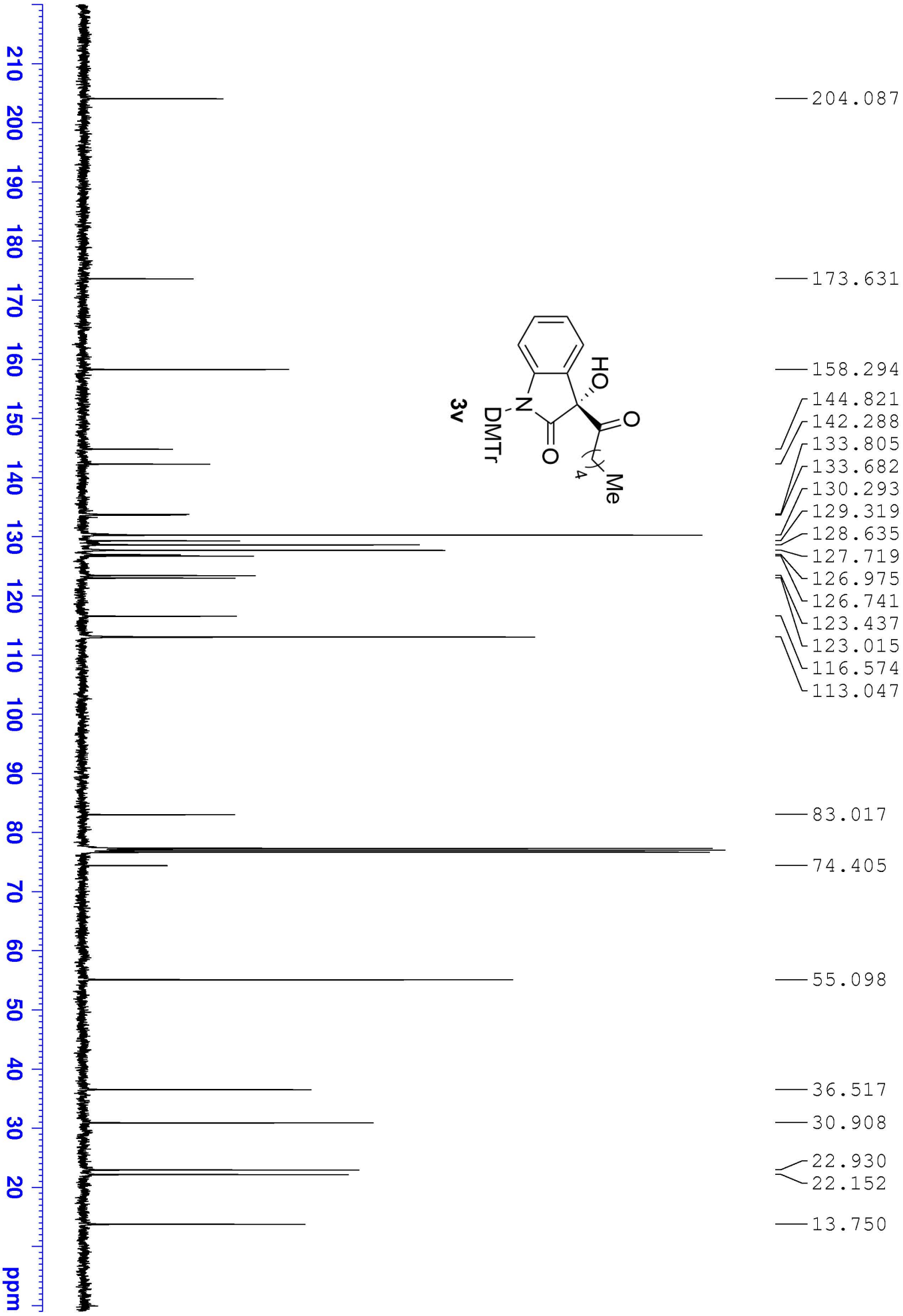
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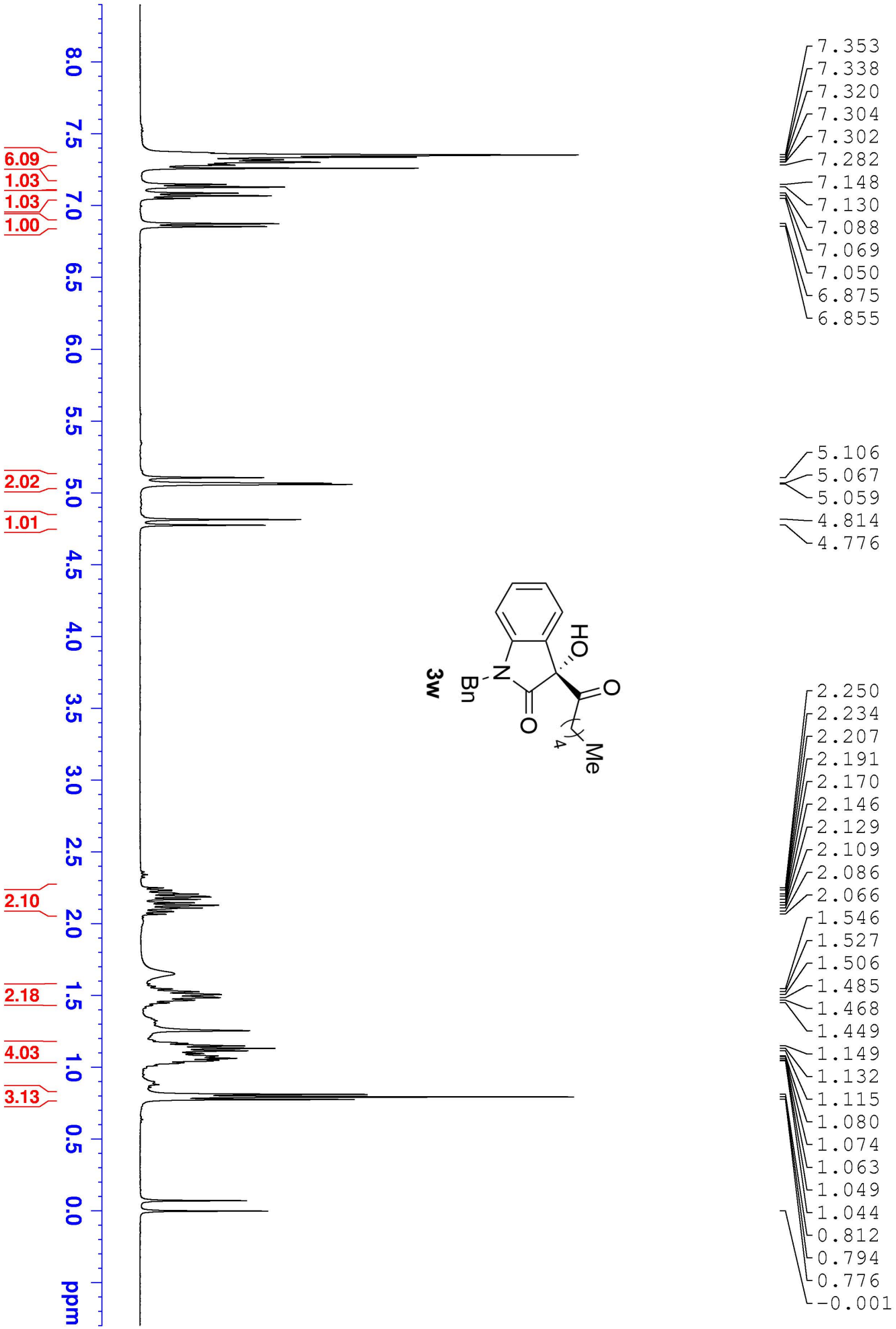
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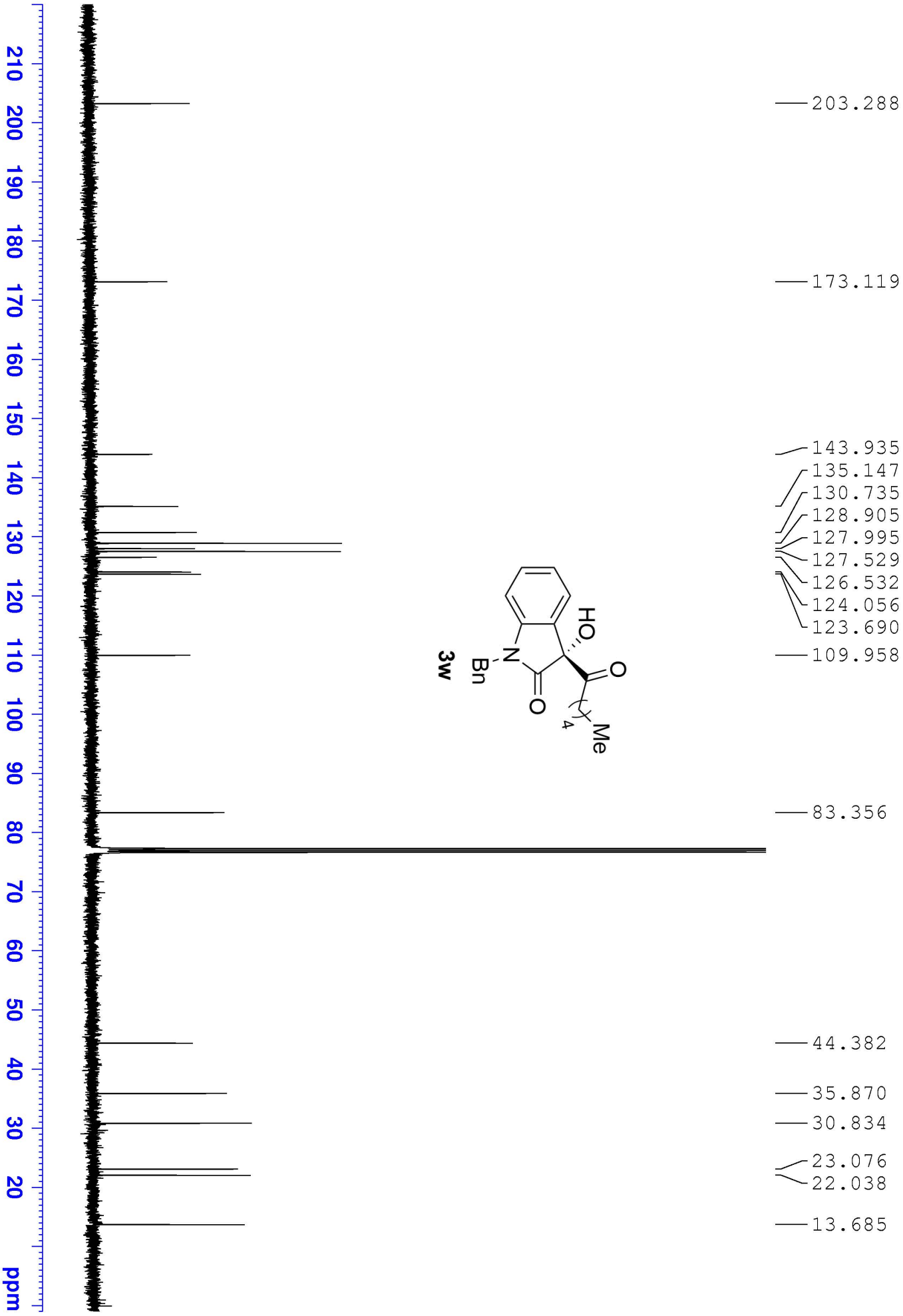
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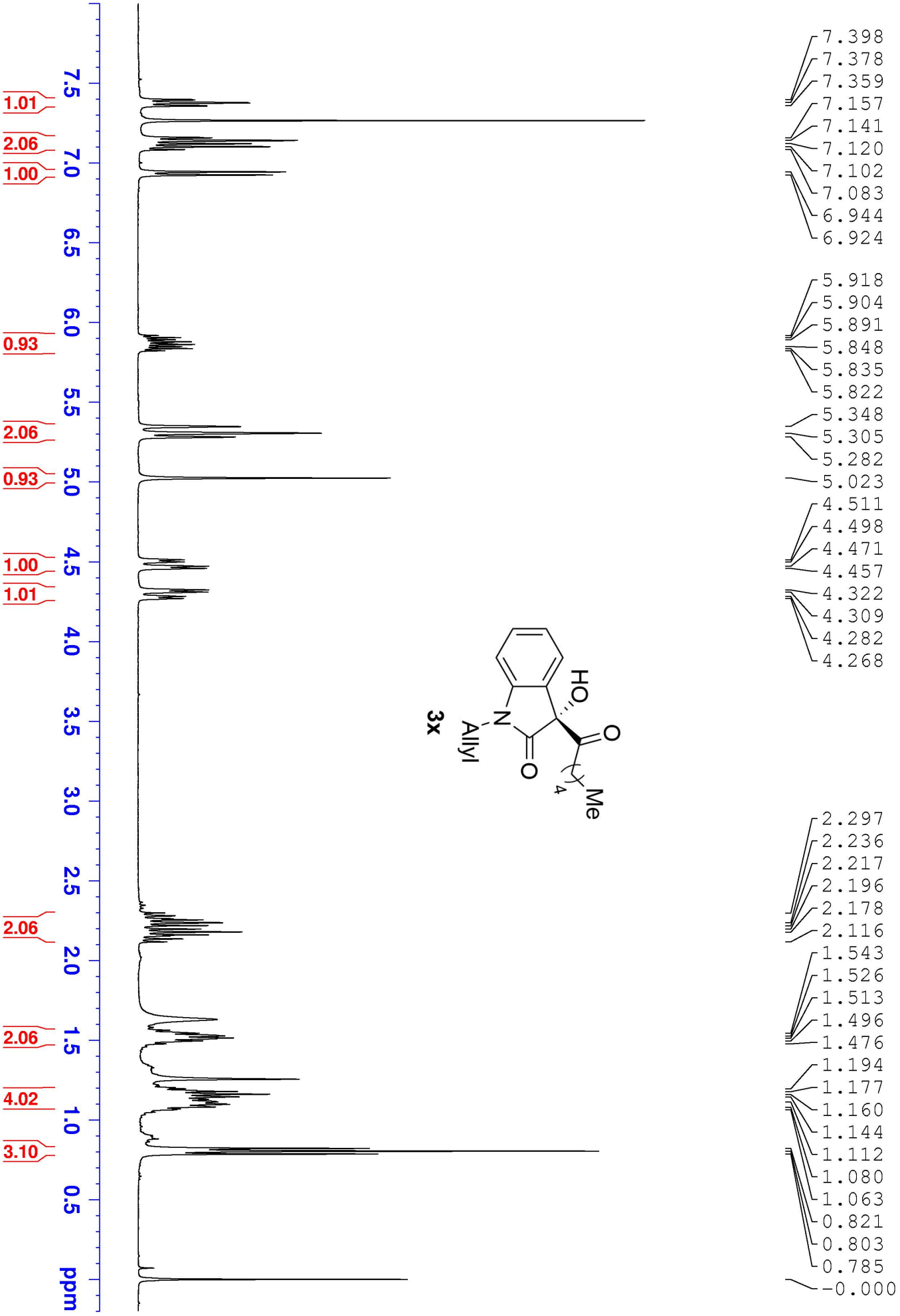
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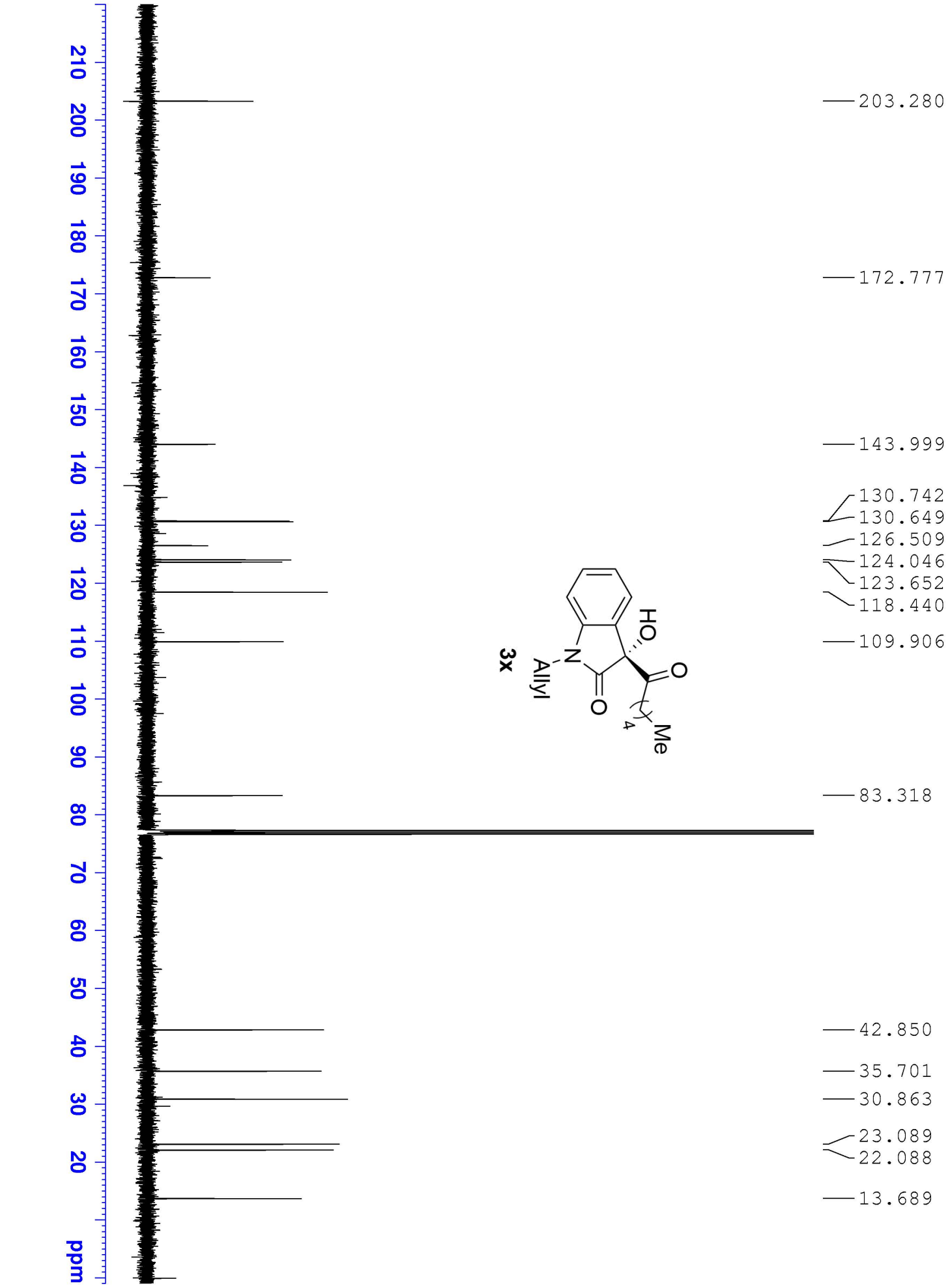
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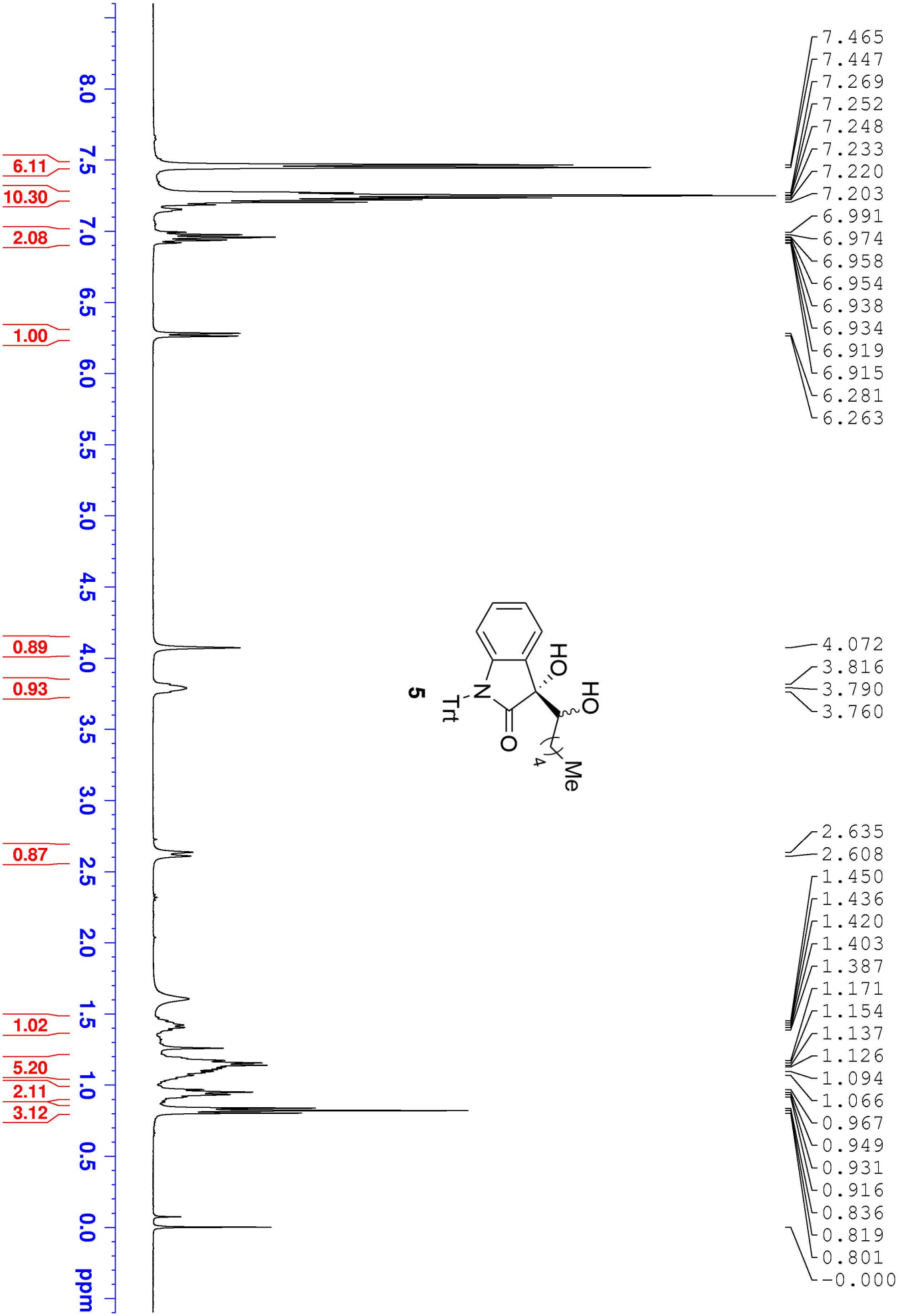
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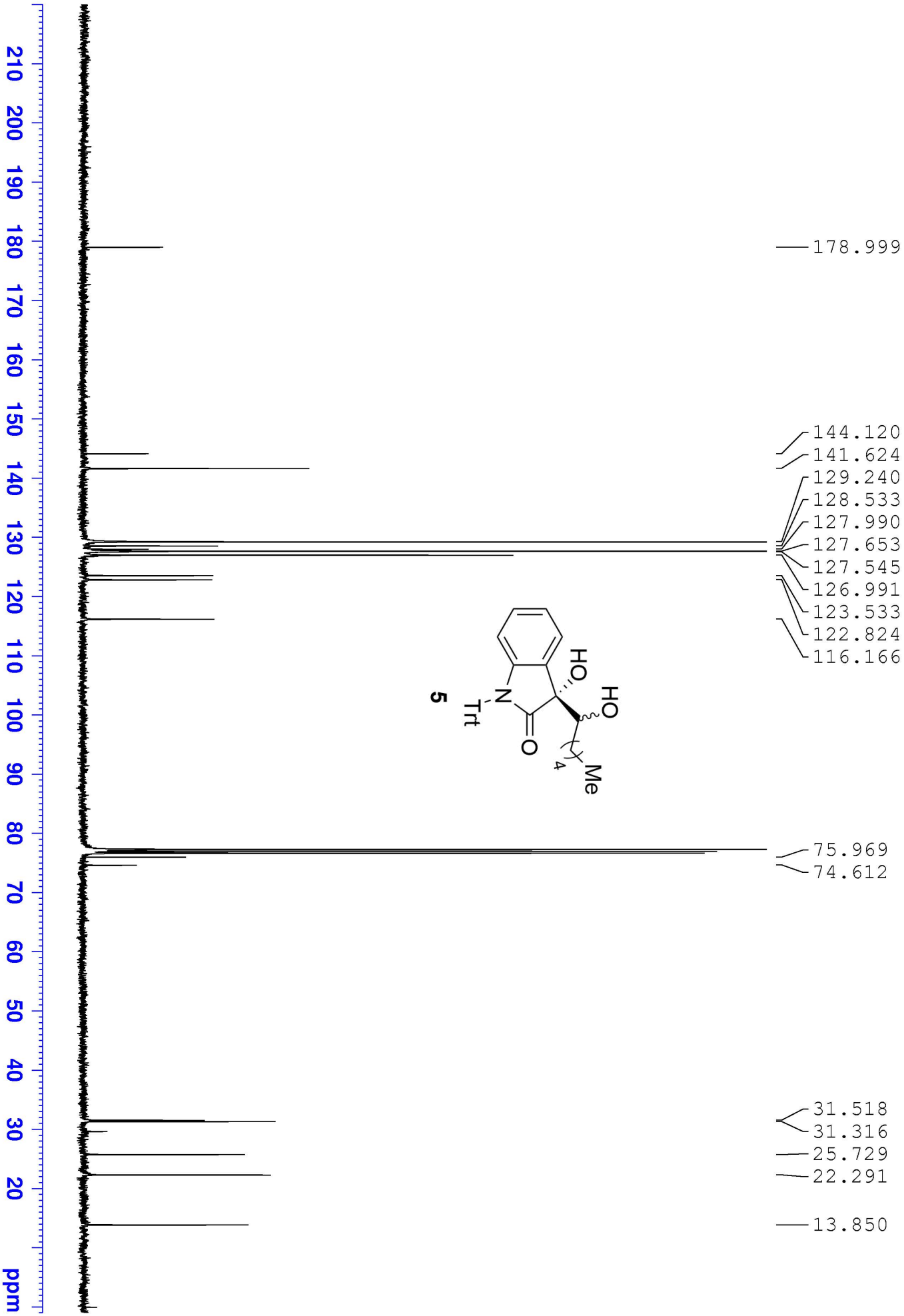
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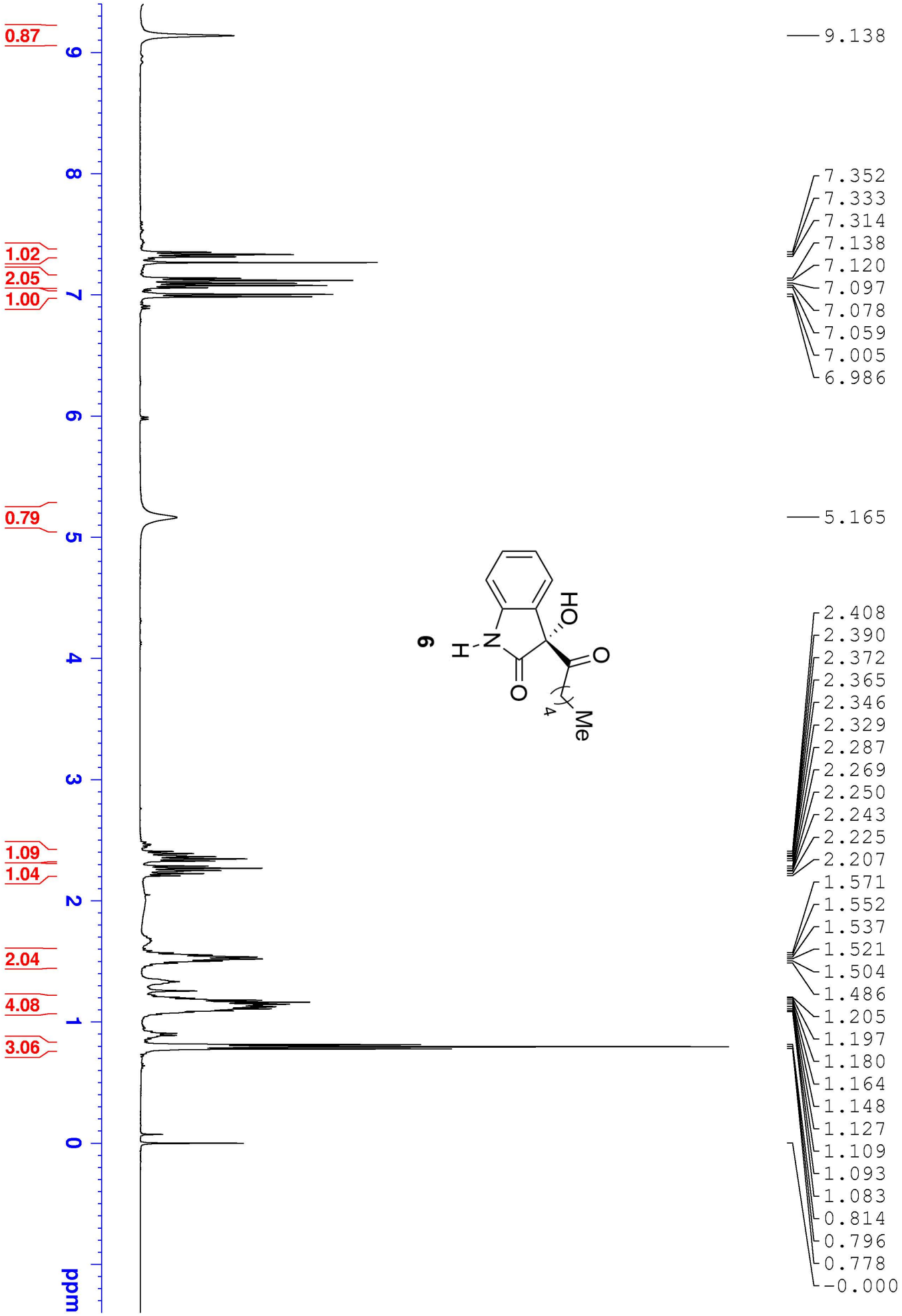
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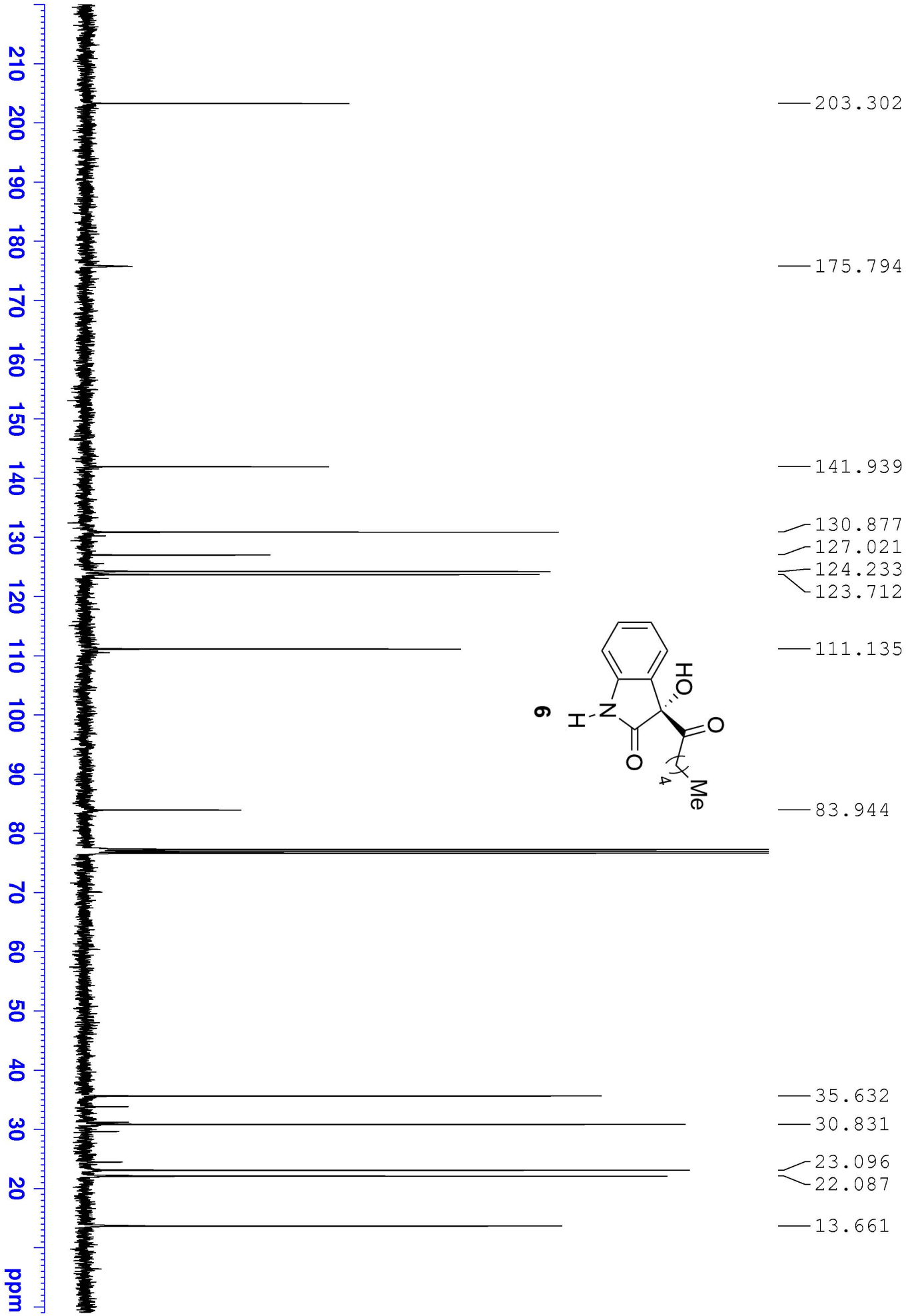
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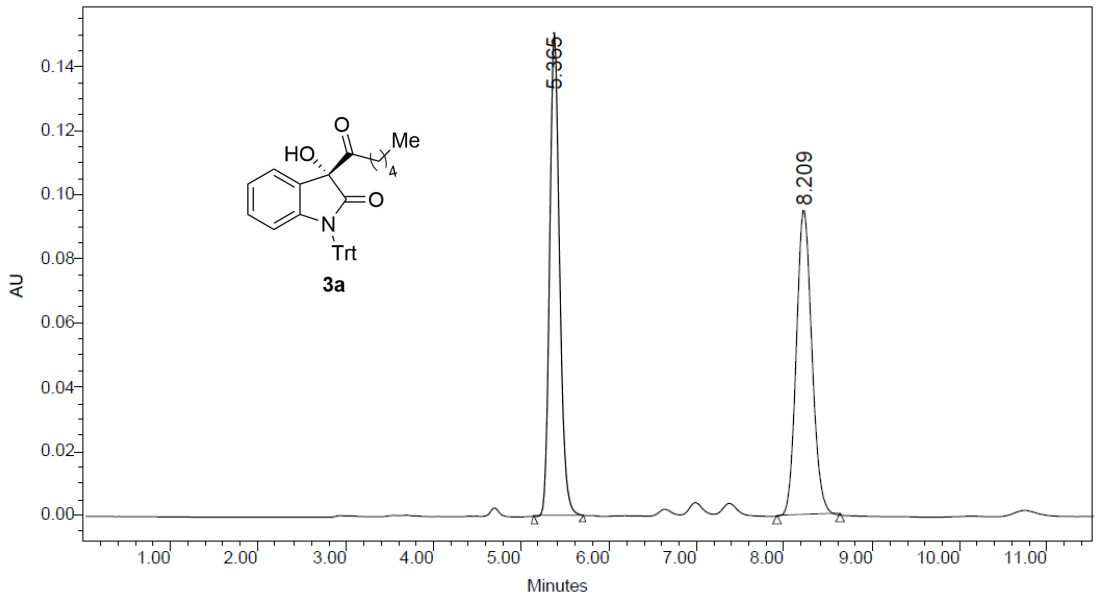
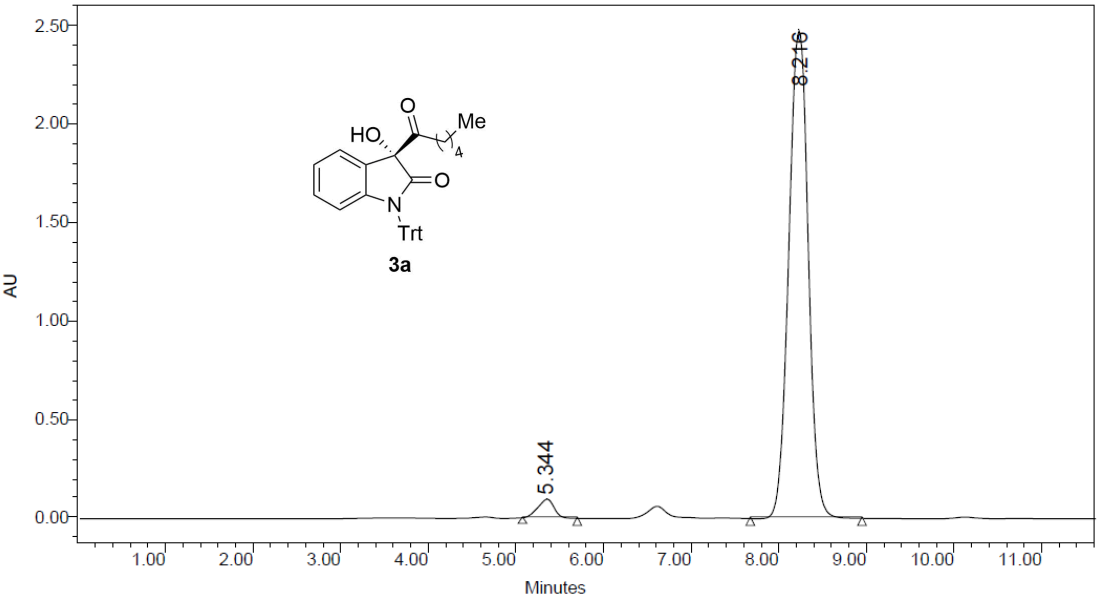
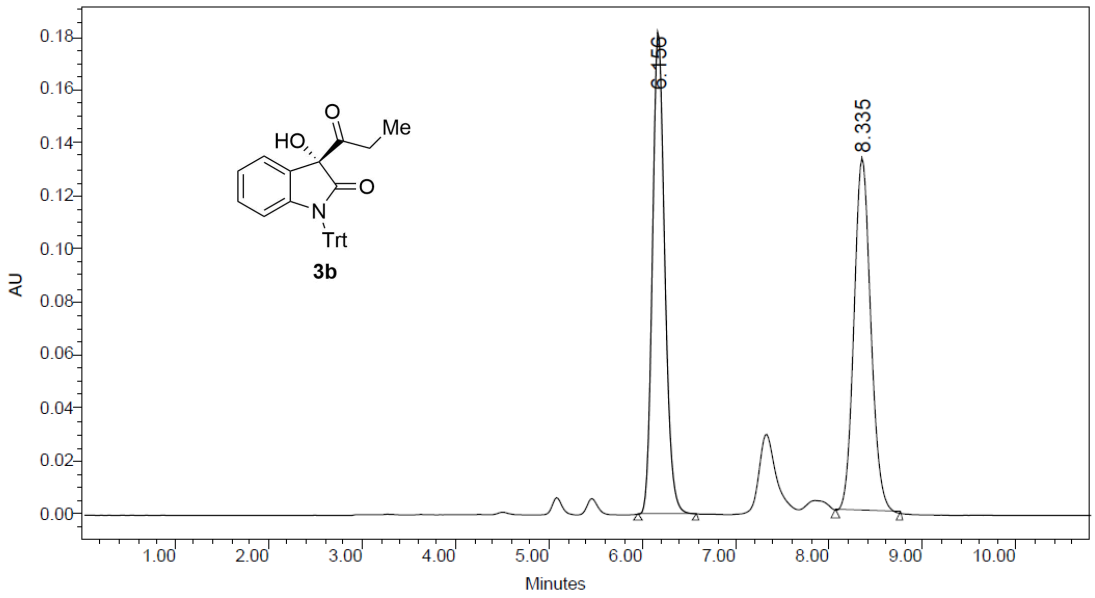


	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.365	Unknown	1187927	50.06	150623	61.18	bb	33	5.150	5.700	5.150
2	8.209	Unknown	1185224	49.94	95587	38.82	bb	43	7.917	8.633	7.917



	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.344	Unknown	1214721	3.07	95272	3.70	bb	37	5.083	5.700	5.083
2	8.216	Unknown	38345286	96.93	2479718	96.30	bb	77	7.667	8.950	7.667



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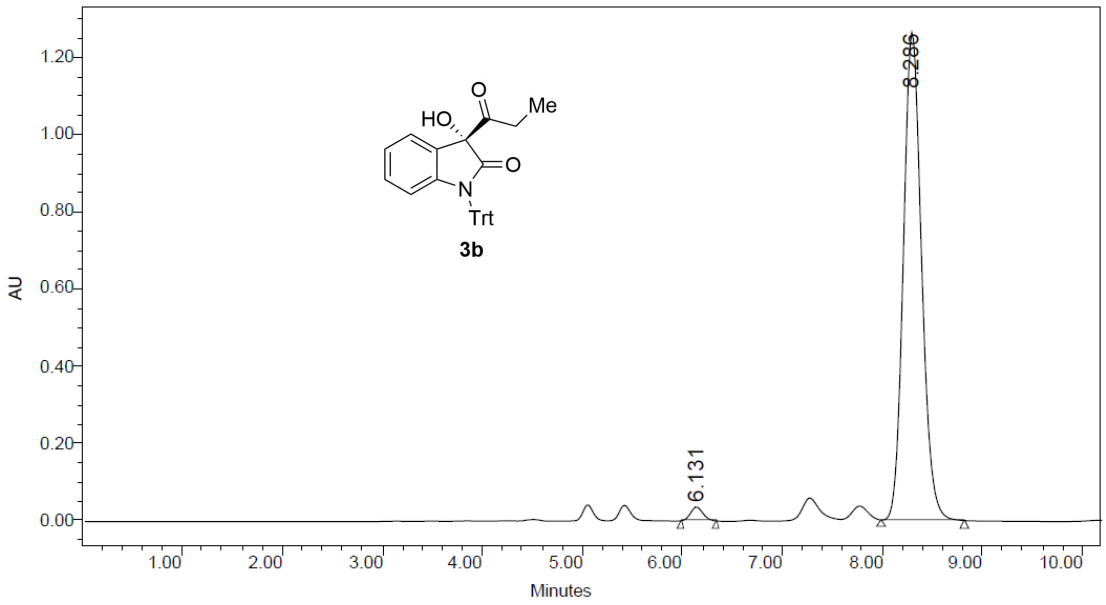
1	6.156	Unknown	1657696	49.73	182101	57.76	bb	36	5.950	6.567	5.950
2	8.335	Unknown	1675871	50.27	133195	42.24	bb	40	8.067	8.750	8.067



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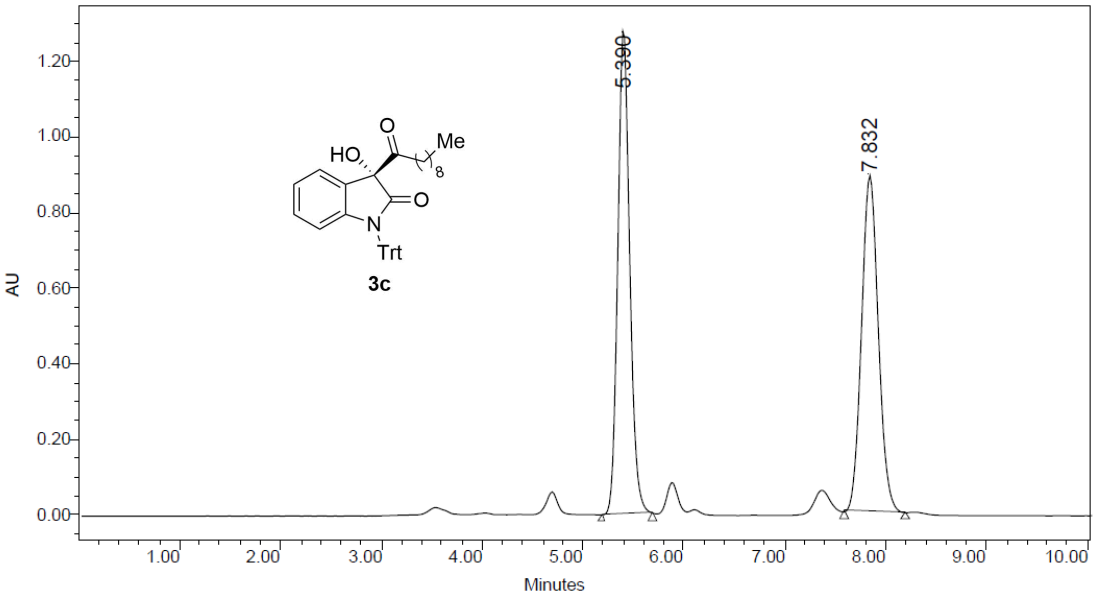
1	6.131	Unknown	307573	1.89	35650	2.74	bb	20	5.983	6.333	5.983
2	8.286	Unknown	15950586	98.11	1264342	97.26	bb	50	7.983	8.817	7.983



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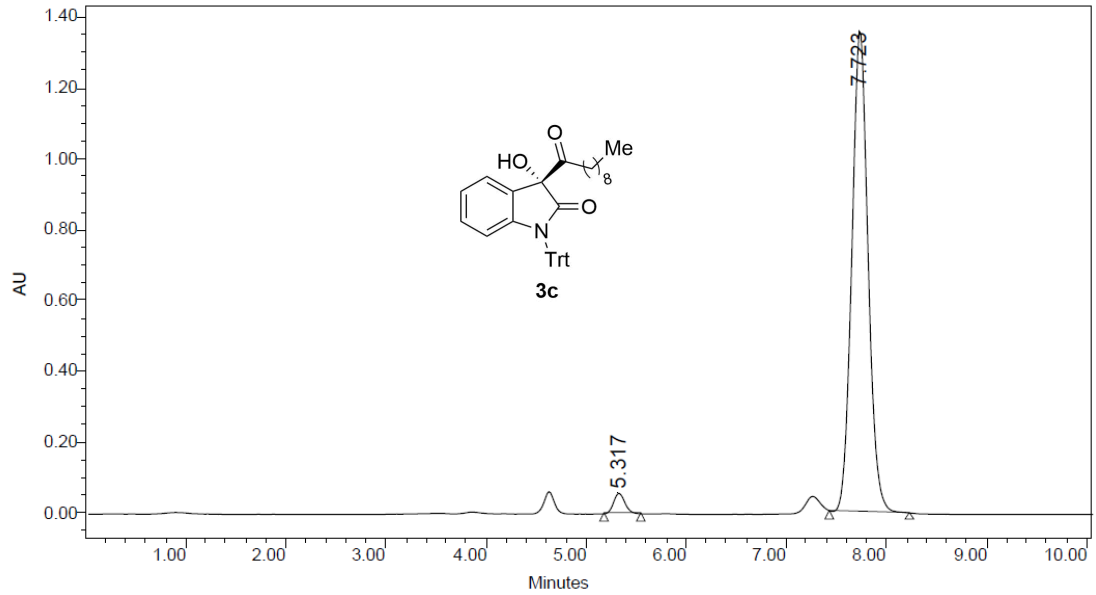
1	5.390	Unknown	10540389	50.52	1282572	59.02	bb	30	5.183	5.683	5.183
2	7.832	Unknown	10324092	49.48	890403	40.98	bb	37	7.583	8.200	7.583



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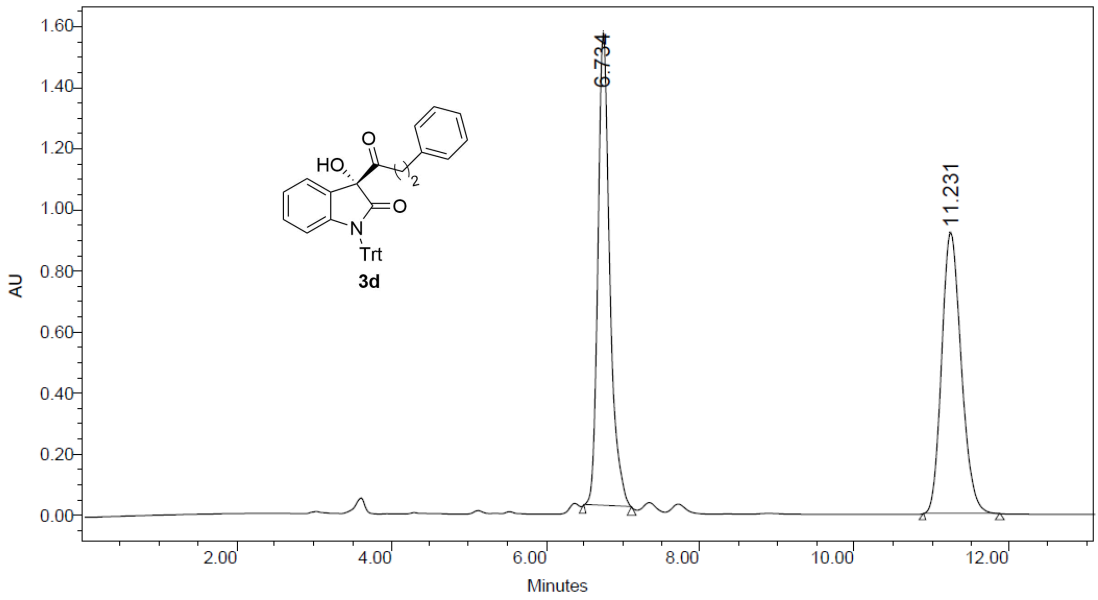
1	5.317	Unknown	450457	2.86	57628	4.06	bb	21	5.183	5.550	5.183
2	7.723	Unknown	15286791	97.14	1360132	95.94	bb	48	7.433	8.233	7.433



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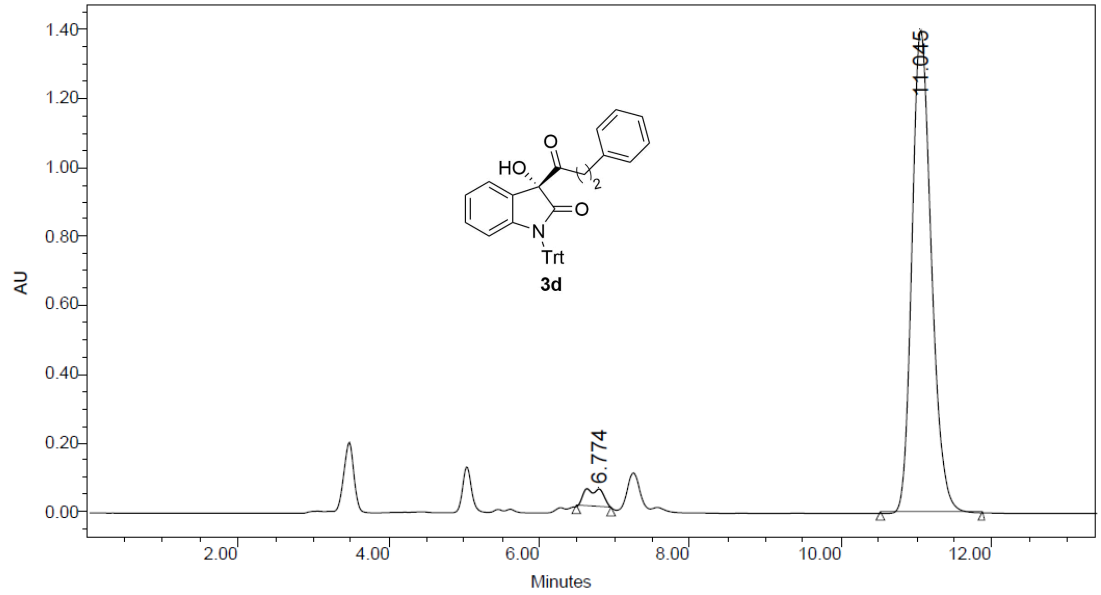
1	6.734	Unknown	16637506	50.63	1548606	62.75	bb	37	6.483	7.117
2	11.231	Unknown	16225789	49.37	919271	37.25	bb	60	10.883	11.883



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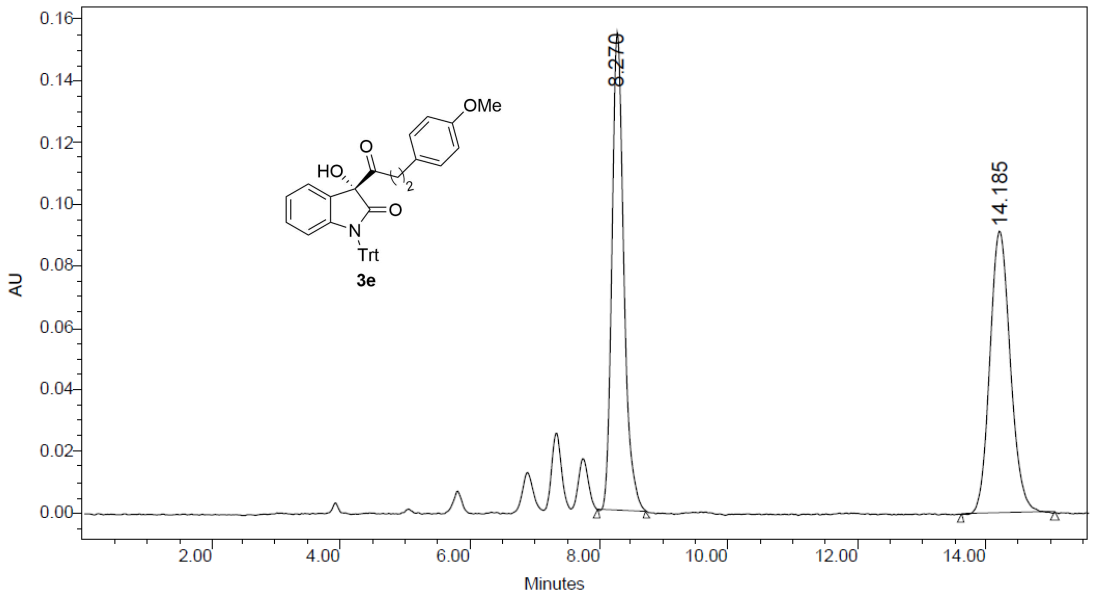
1	6.774	Unknown	950381	3.63	54317	3.73	bb	28	6.483	6.950
2	11.045	Unknown	25244846	96.37	1403240	96.27	bb	80	10.517	11.867



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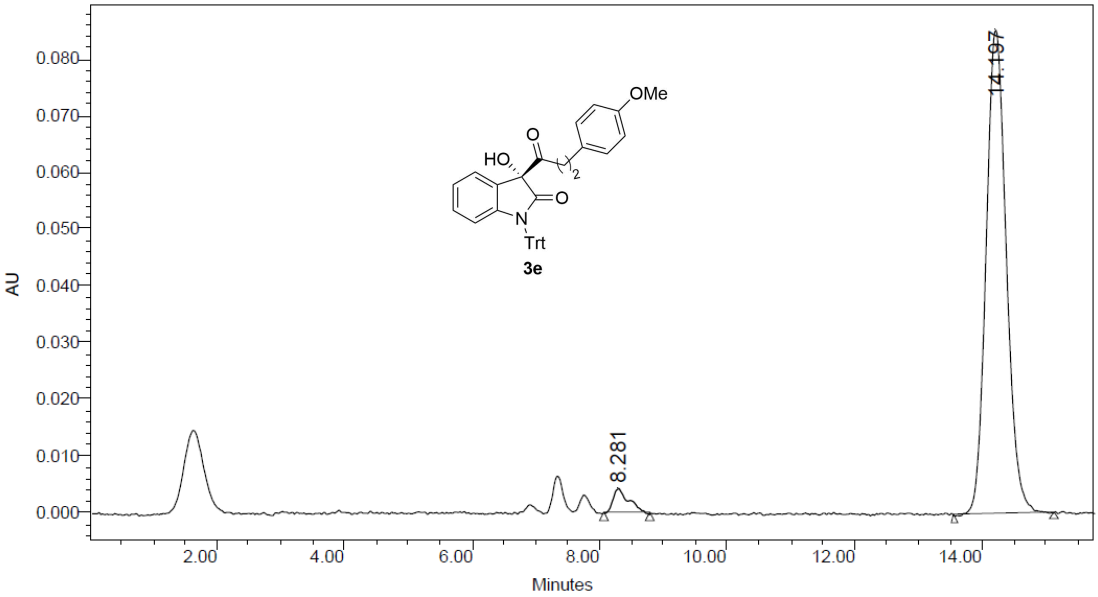
1	8.270	Unknown	1995576	49.53	155166	62.87	bb	46	7.967	8.733	7.967
2	14.185	Unknown	2033501	50.47	91622	37.13	bb	87	13.600	15.067	13.600



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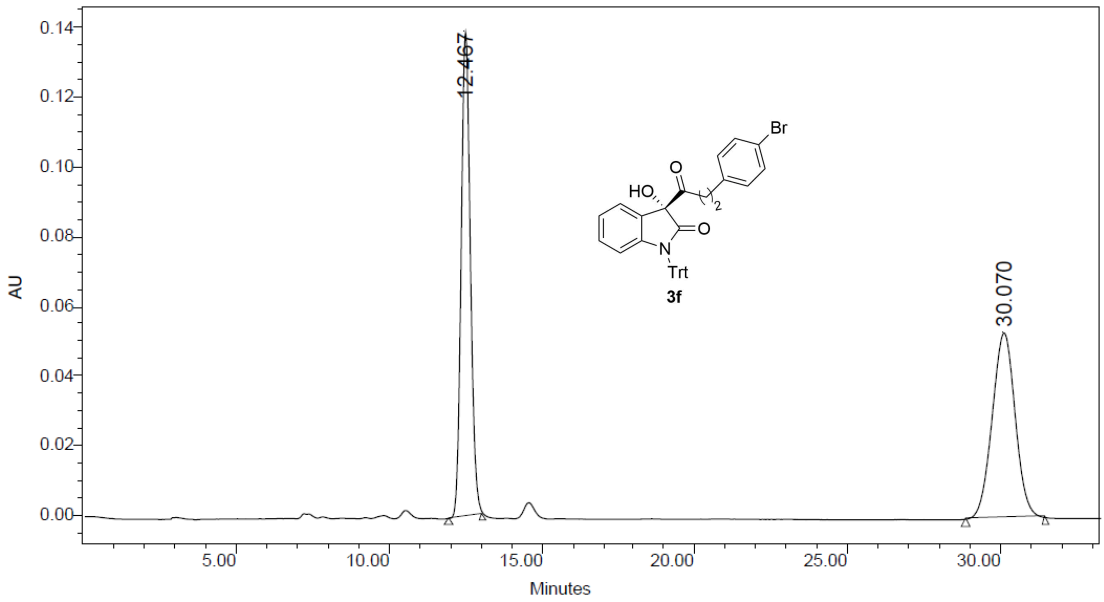
1	8.281	Unknown	74820	3.81	4313	4.80	bb	42	8.067	8.783	8.067
2	14.197	Unknown	1887891	96.19	85448	95.20	bb	93	13.567	15.117	13.567



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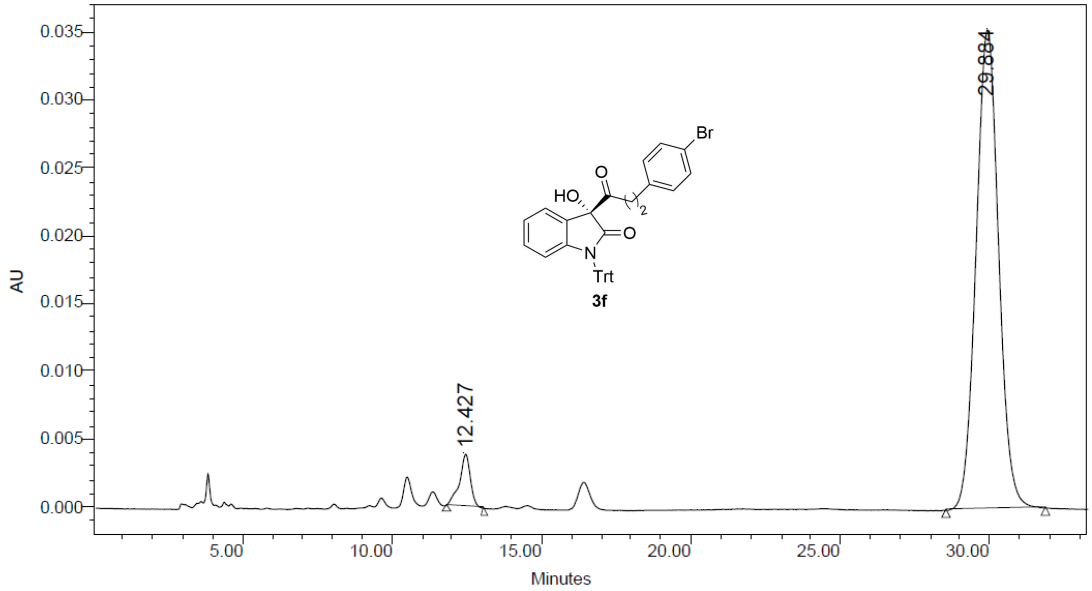
1	12.467	Unknown	2902996	50.93	138804	72.29	bb	65	11.950	13.050	11.950
2	30.070	Unknown	2797380	49.07	53215	27.71	bb	157	28.833	31.450	28.833



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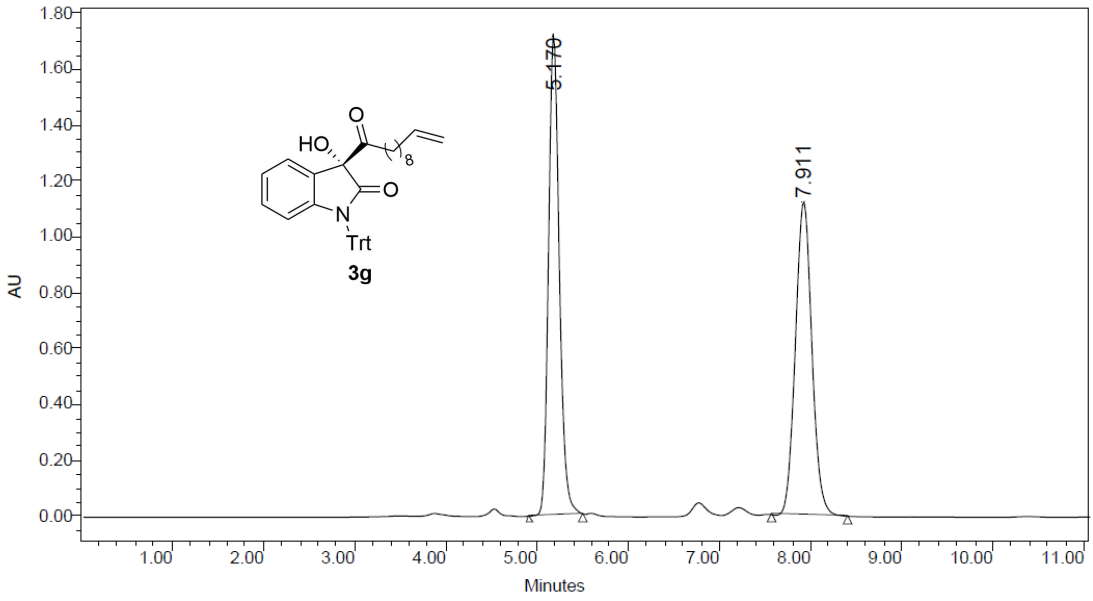
1	12.427	Unknown	98357	5.03	3860	9.84	bb	77	11.800	13.083	11.800
2	29.884	Unknown	1857293	94.97	35353	90.16	bb	200	28.517	31.867	28.517



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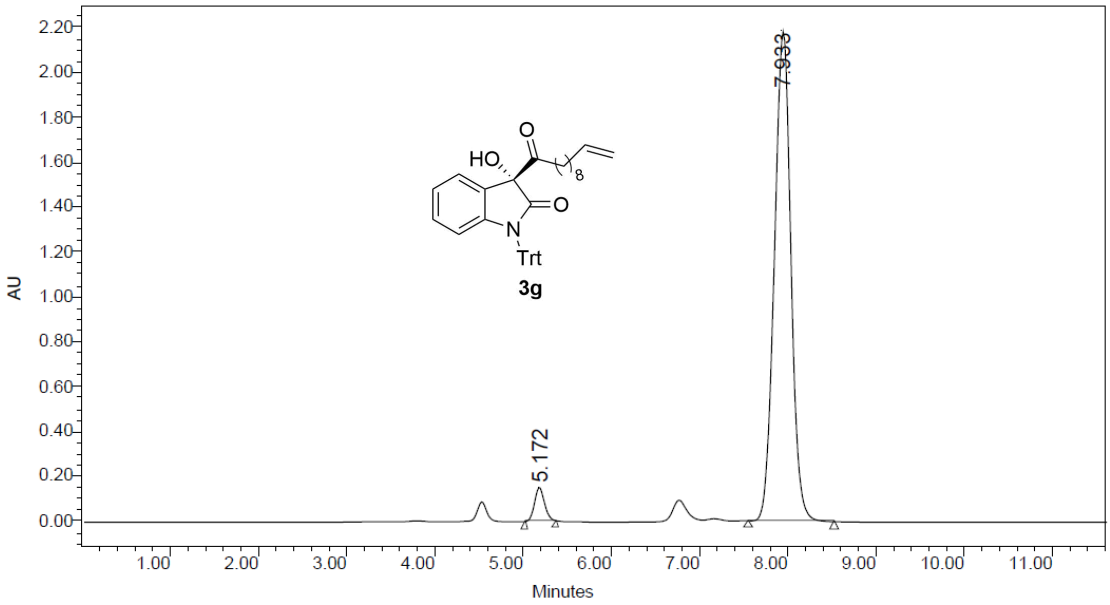
1	5.170	Unknown	14137901	50.01	1724071	60.55	bb	34	4.917	5.500	4.917
2	7.911	Unknown	14134290	49.99	1123495	39.45	bb	50	7.567	8.400	7.567



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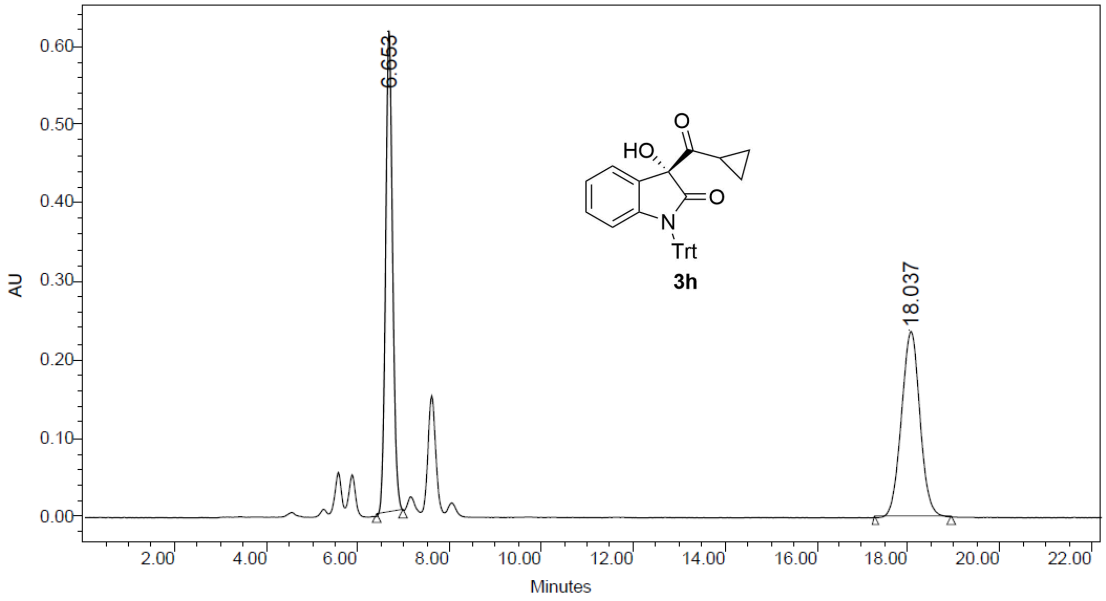
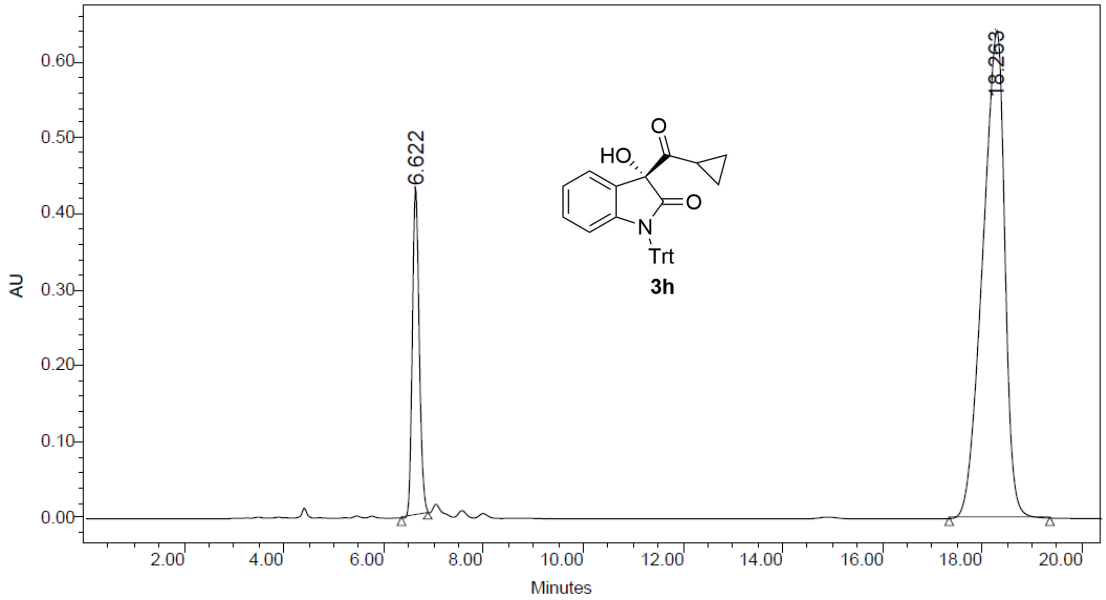
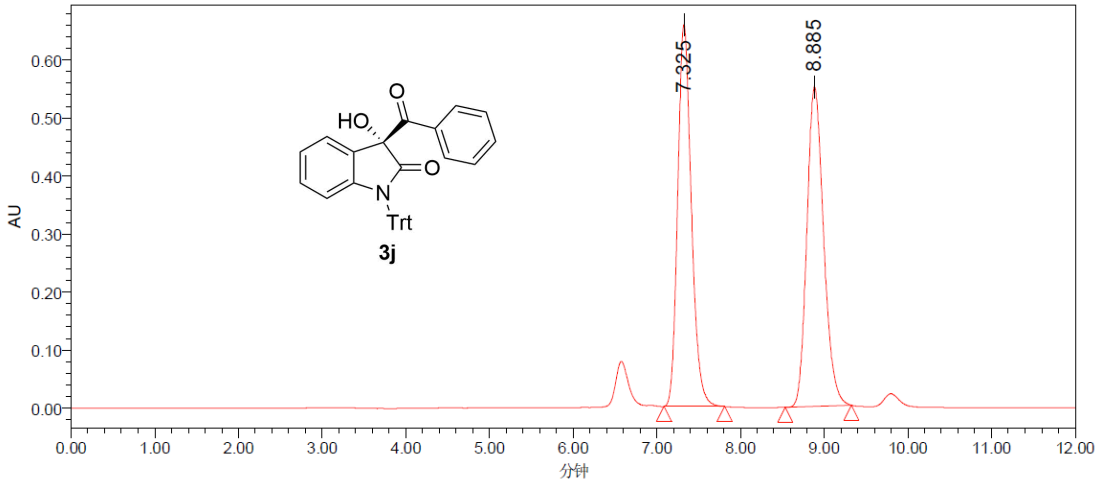
1	5.172	Unknown	1177331	3.99	150133	6.45	bb	20	5.017	5.367	5.017
2	7.933	Unknown	28357286	96.01	2179126	93.55	bb	58	7.550	8.517	7.550



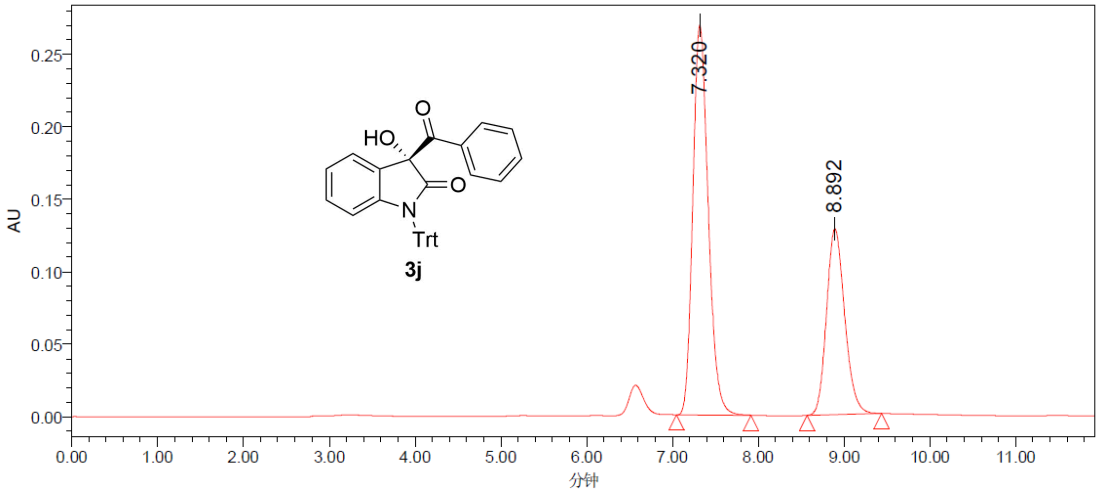
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	6.653	Unknown	6541478	49.49	615151	72.18	bb	33	6.417	6.983	6.417
2	18.037	Unknown	6675721	50.51	237081	27.82	bb	99	17.283	18.933	17.283



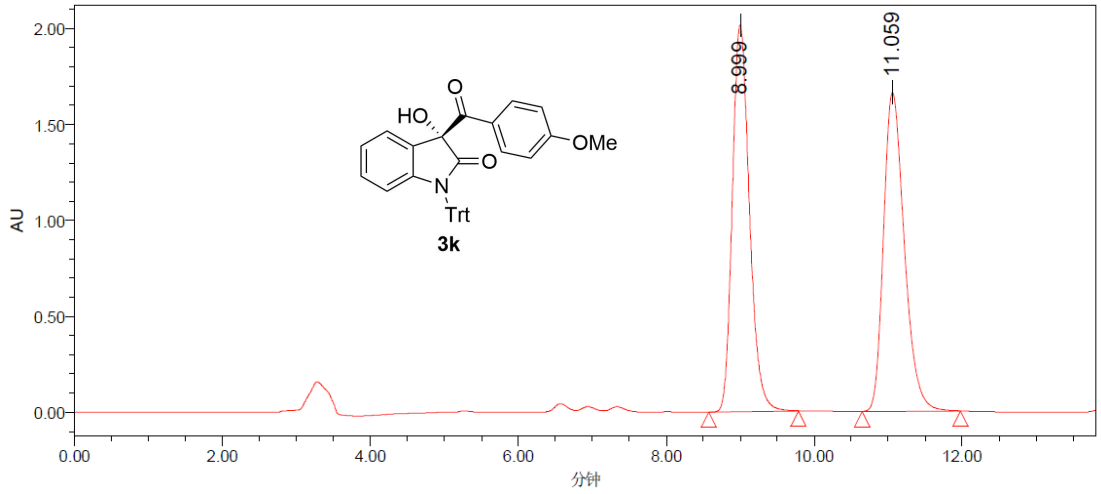
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	6.622	Unknown	4146127	17.35	432163	40.22	bb	32	6.350	6.900	6.350
2	18.263	Unknown	19746707	82.65	642205	59.78	bb	120	17.333	19.350	17.333



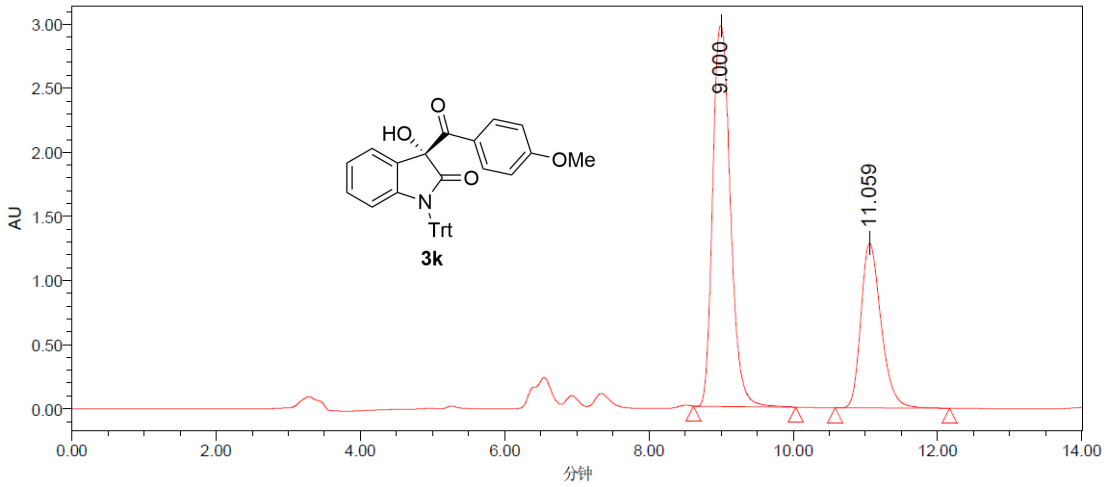
	RT (分钟)	Area (微伏*秒)	% Area	Height (微伏)	% Height	Start Time (分钟)	End Time (分钟)
1	7.325	7483732	49.37	657666	54.45	7.083	7.808
2	8.885	7674774	50.63	550174	45.55	8.533	9.327



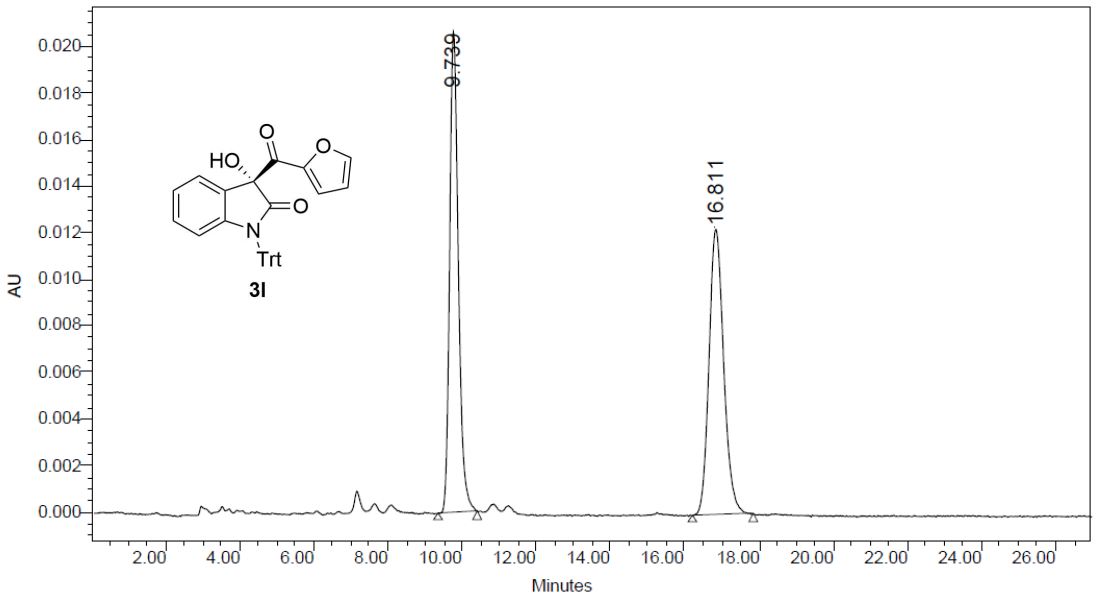
	RT (分钟)	Area (微伏*秒)	% Area	Height (微伏)	% Height	Start Time (分钟)	End Time (分钟)
1	7.320	3360826	64.04	268903	67.74	7.047	7.915
2	8.892	1886932	35.96	128077	32.26	8.567	9.437



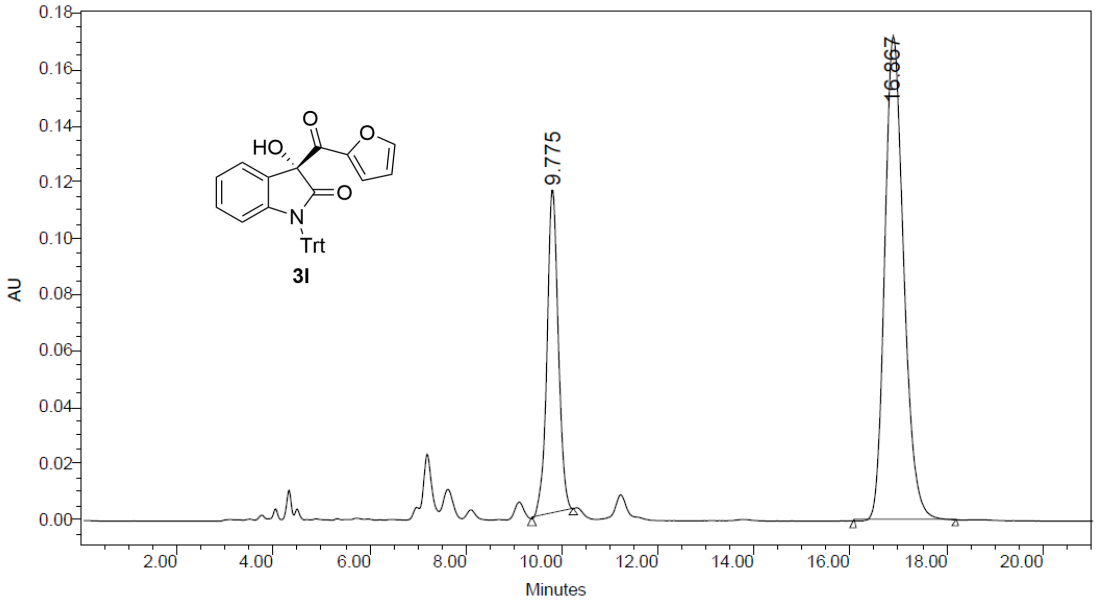
	RT (分钟)	Area (微伏*秒)	% Area	Height (微伏)	% Height	Start Time (分钟)	End Time (分钟)
1	8.999	32305441	49.85	2013598	54.78	8.577	9.788
2	11.059	32501139	50.15	1662156	45.22	10.648	11.975



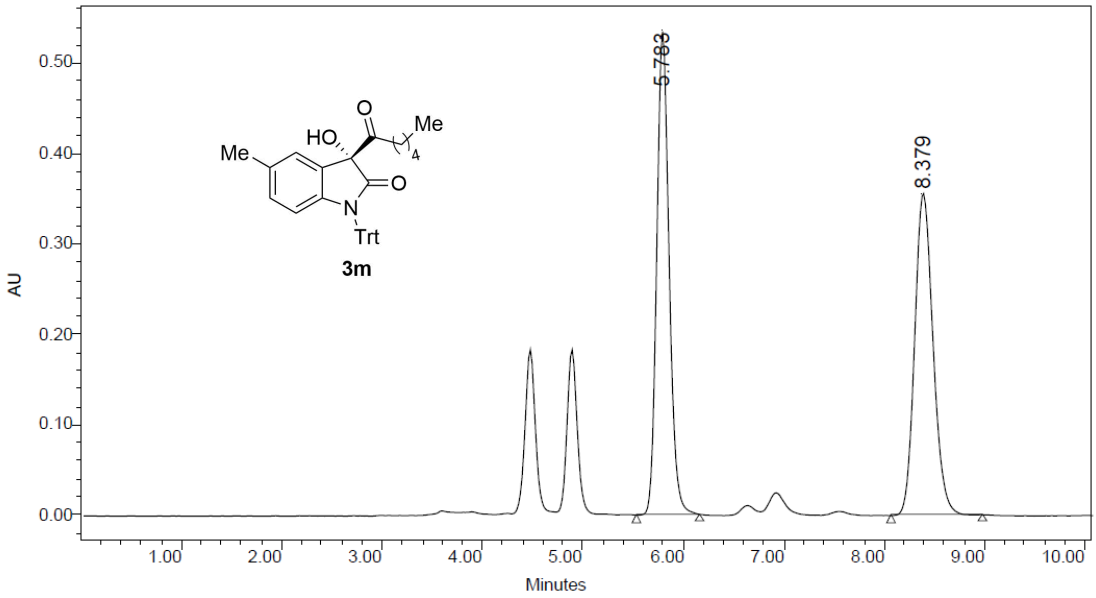
	RT (分钟)	Area (微伏*秒)	% Area	Height (微伏)	% Height	Start Time (分钟)	End Time (分钟)
1	9.000	50640833	66.96	2968003	69.79	8.618	10.035
2	11.059	24992421	33.04	1284910	30.21	10.580	12.167



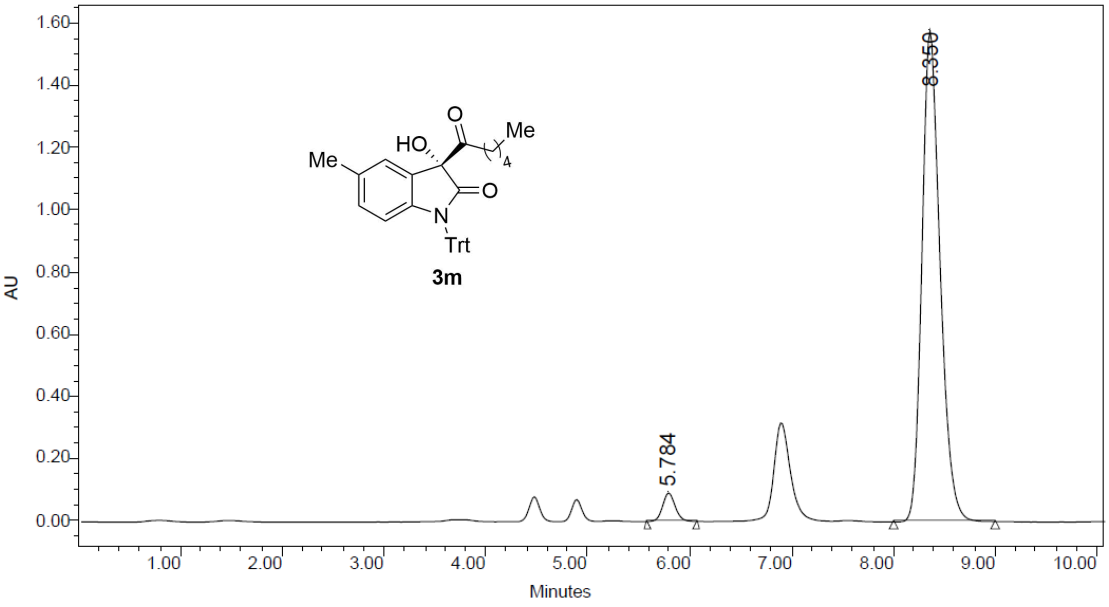
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	9.739	Unknown	337804	49.96	20654	62.73	bb	63	9.333	10.400	9.333
2	16.811	Unknown	338382	50.04	12272	37.27	bb	98	16.200	17.850	16.200



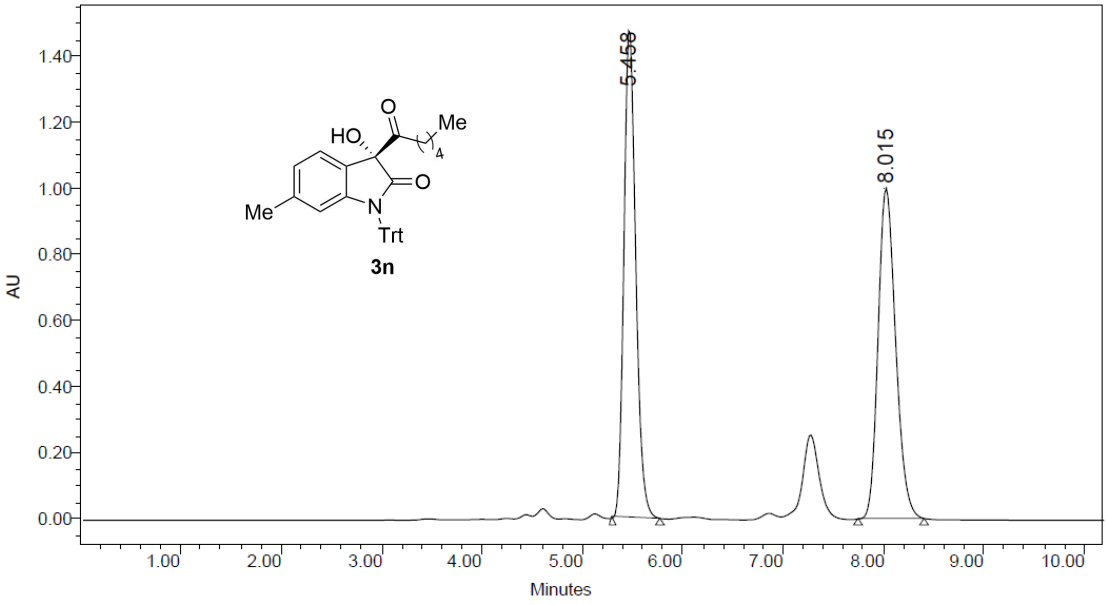
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	9.775	Unknown	1891185	28.49	115375	40.12	bb	52	9.367	10.233	9.367
2	16.867	Unknown	4746132	71.51	172175	59.88	bb	128	16.050	18.183	16.050



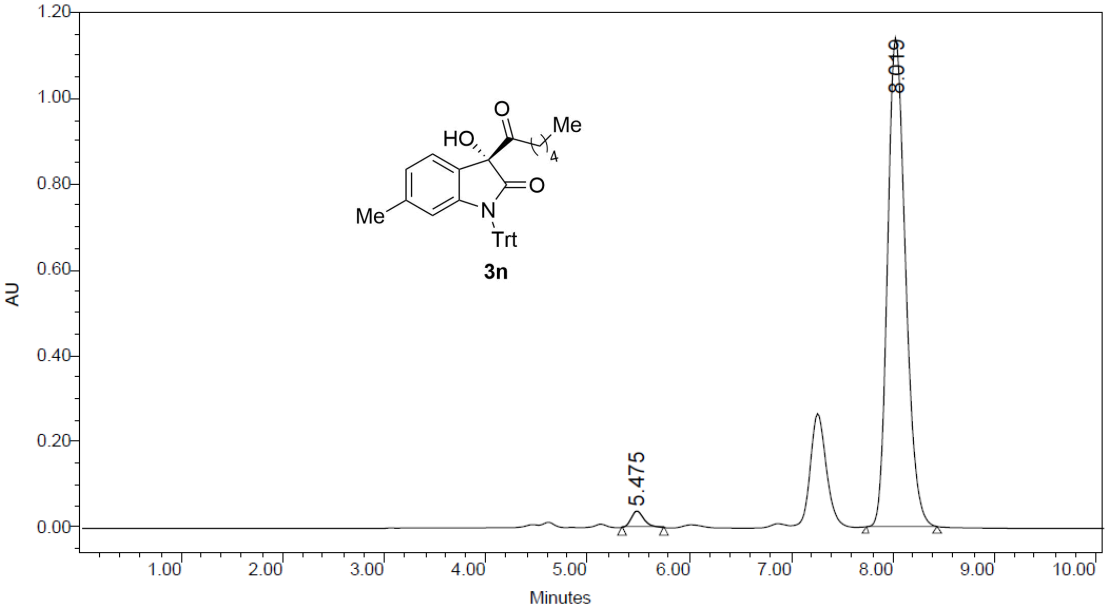
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.783	Unknown	4571964	50.22	533901	59.96	bb	38	5.533	6.167	5.533
2	8.379	Unknown	4532712	49.78	356551	40.04	bb	54	8.067	8.983	8.067



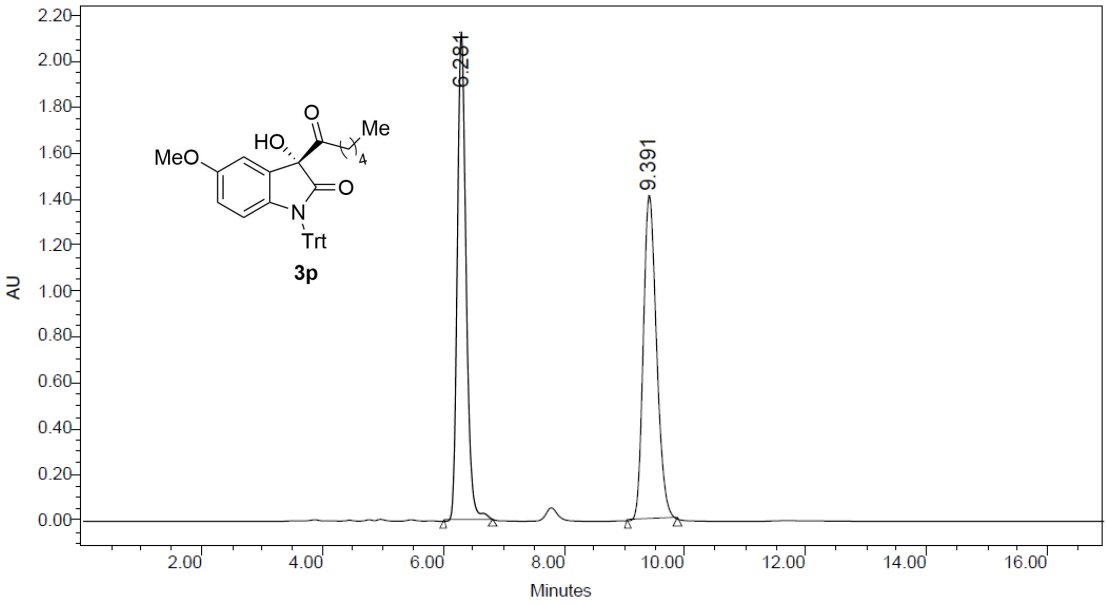
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.784	Unknown	784013	3.86	91372	5.48	bb	29	5.583	6.067	5.583
2	8.350	Unknown	19552373	96.14	1576421	94.52	bb	60	8.000	9.000	8.000



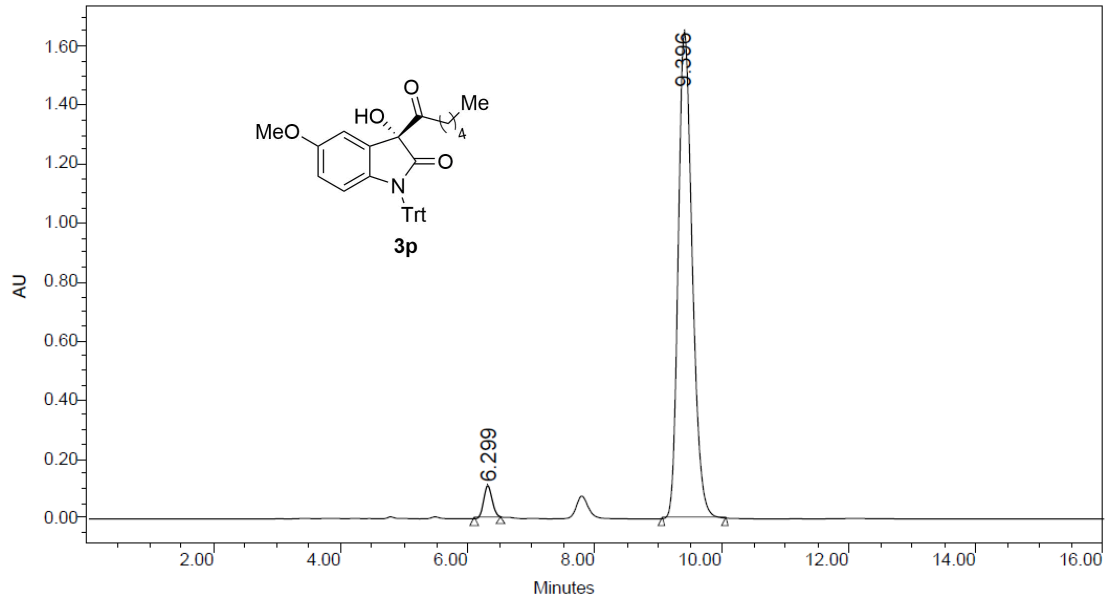
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.458	Unknown	12071478	49.78	1485324	59.75	bb	28	5.300	5.767	5.300
2	8.015	Unknown	12177169	50.22	1000725	40.25	bb	39	7.750	8.400	7.750



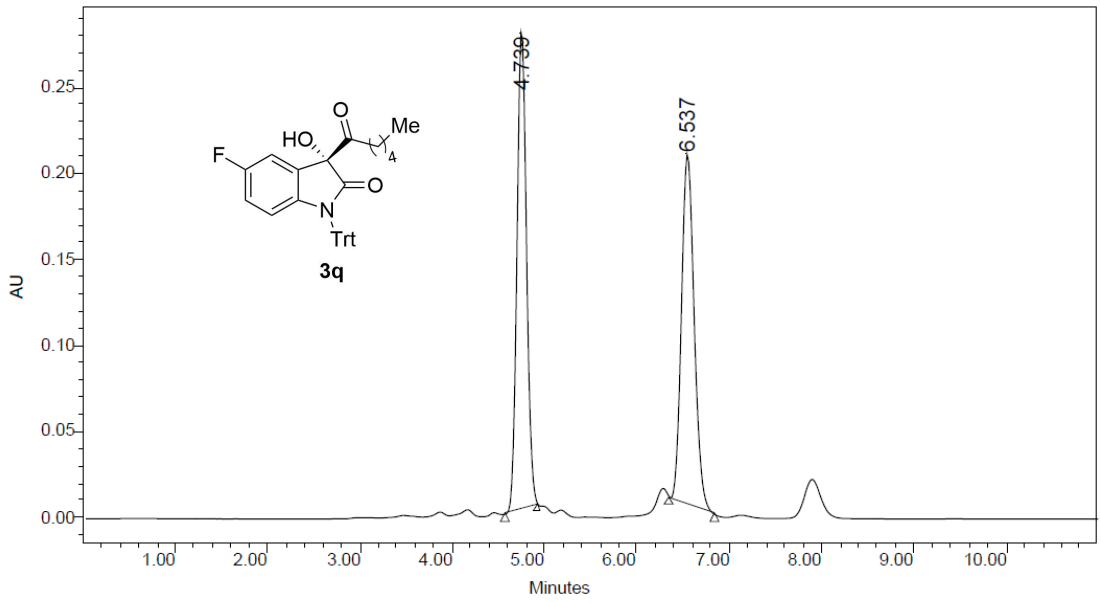
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.475	Unknown	339789	2.37	38281	3.25	bb	25	5.333	5.750	5.333
2	8.019	Unknown	13999788	97.63	1138757	96.75	bb	42	7.733	8.433	7.733



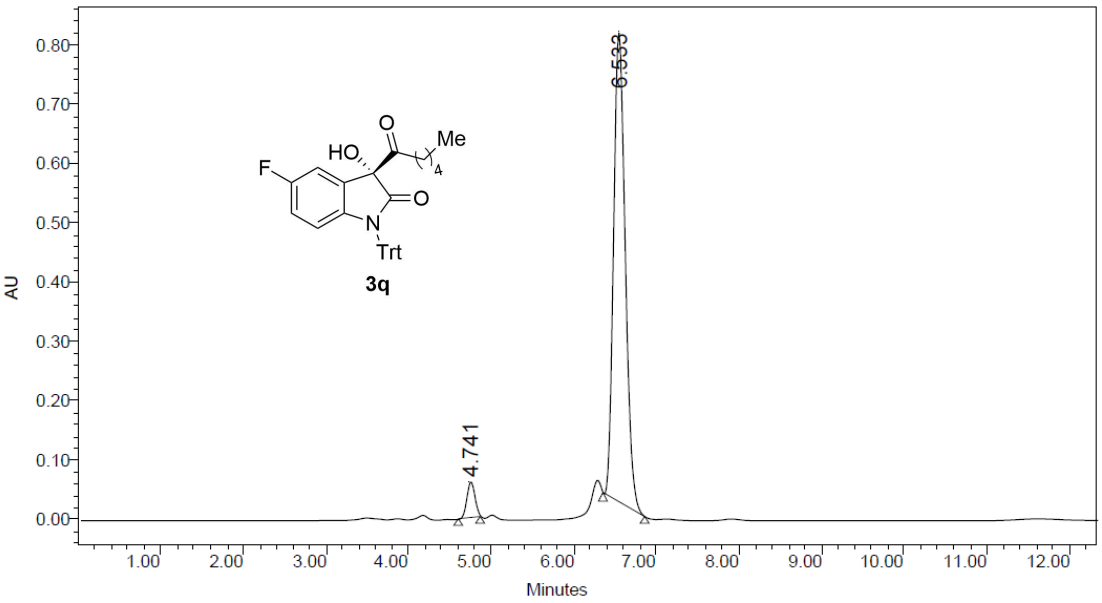
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	6.281	Unknown	21601089	49.95	2130918	60.03	bb	48	6.000	6.817	6.000
2	9.391	Unknown	21644550	50.05	1419122	39.97	bb	48	9.050	9.867	9.050



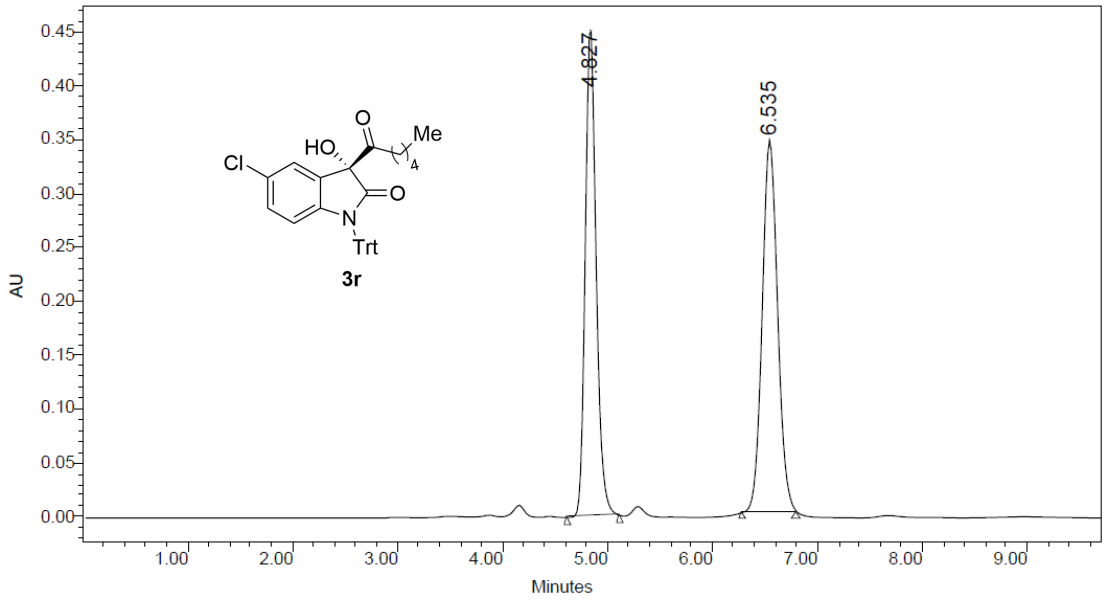
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	6.299	Unknown	1016280	3.85	108912	6.18	bb	25	6.100	6.517	6.100
2	9.396	Unknown	25373171	96.15	1652513	93.82	bb	60	9.050	10.050	9.050



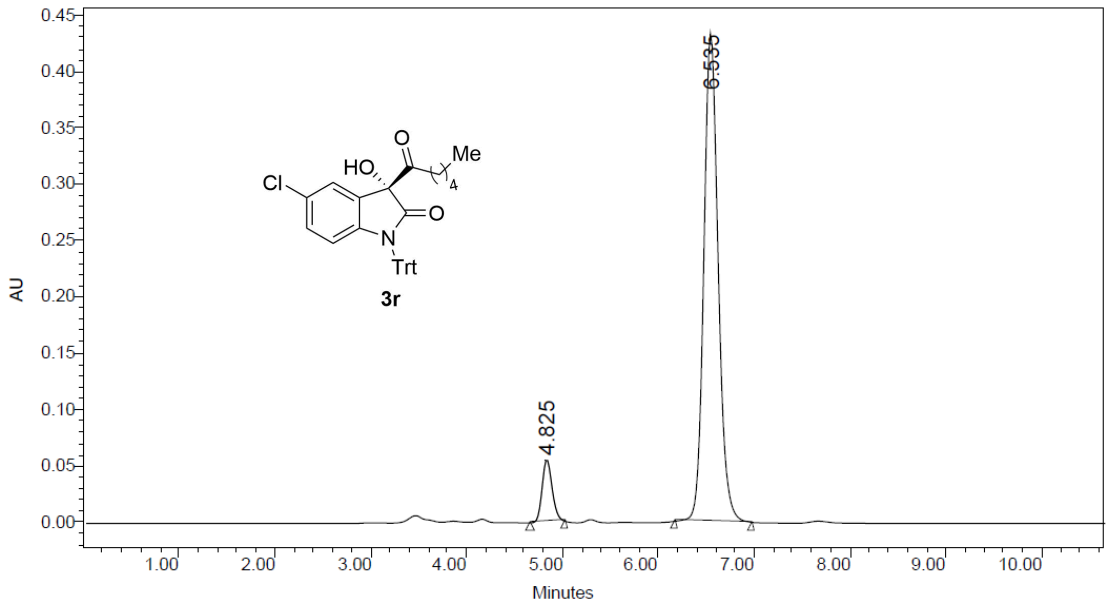
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	4.739	Unknown	1993870	50.67	277952	57.76	bb	21	4.567	4.917	4.567
2	6.537	Unknown	1940773	49.33	203237	42.24	bb	29	6.350	6.833	6.350



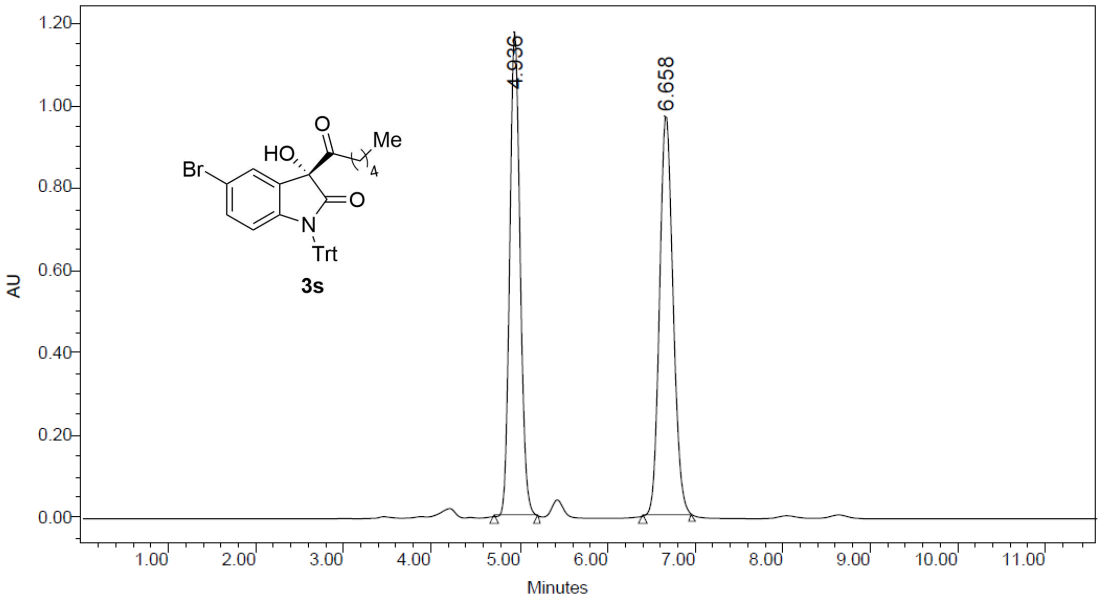
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	4.741	Unknown	413652	5.08	60677	7.12	bb	15	4.600	4.867	4.600
2	6.533	Unknown	7737095	94.92	791110	92.88	bb	30	6.350	6.850	6.350



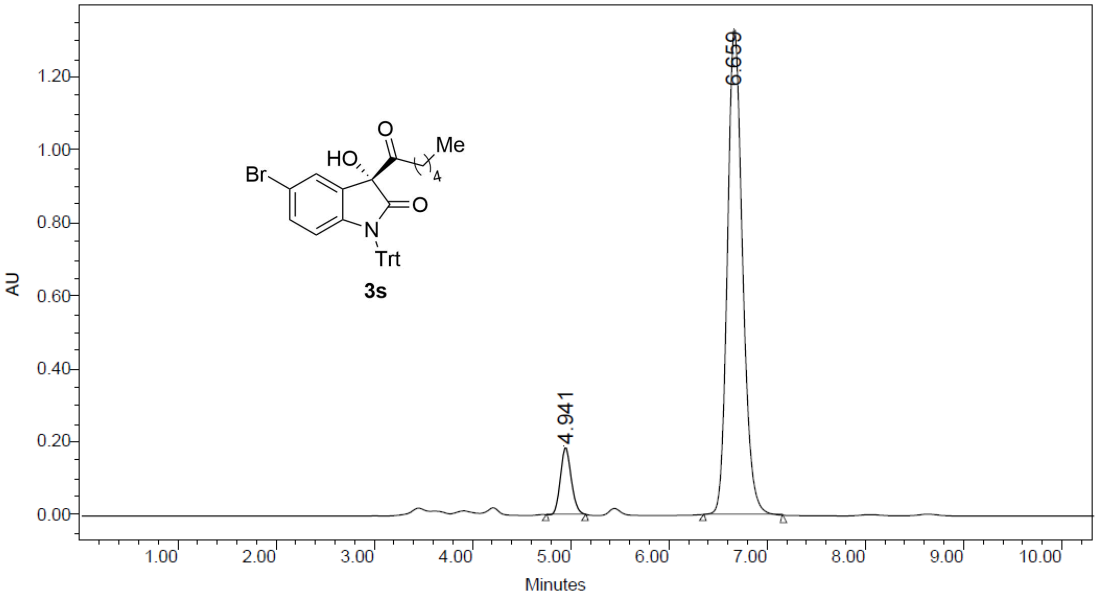
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	4.827	Unknown	3274860	48.18	451919	56.72	bb	30	4.617	5.117	4.617
2	6.535	Unknown	3522341	51.82	344778	43.28	bb	30	6.283	6.800	6.283



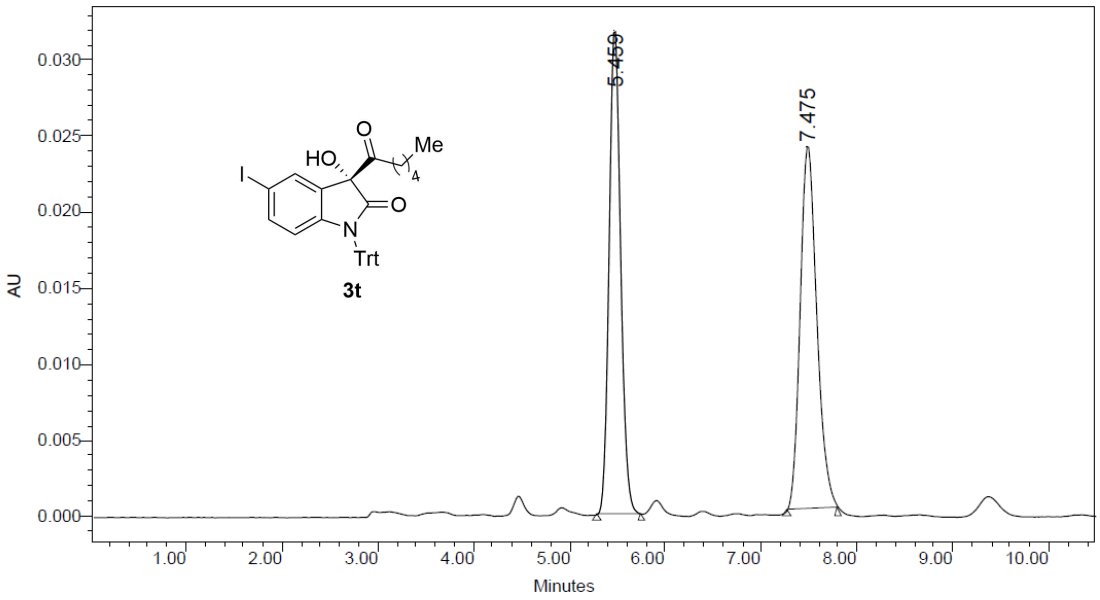
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	4.825	Unknown	402497	8.18	55234	11.32	bb	20	4.667	5.017	4.667
2	6.535	Unknown	4515922	91.82	432861	88.68	bb	47	6.167	6.967	6.167



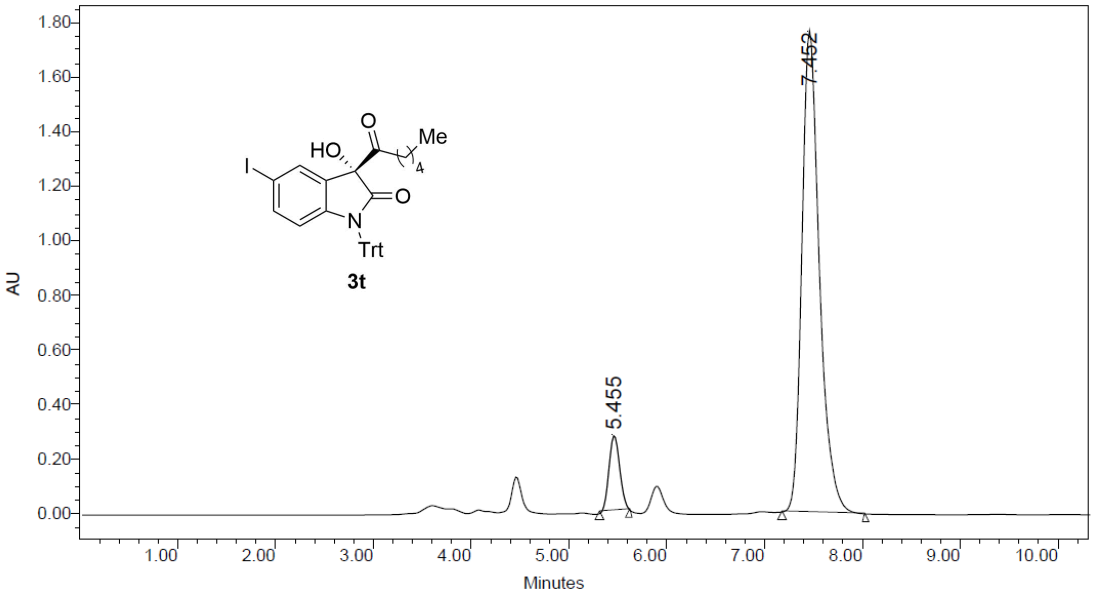
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	4.936	Unknown	9683442	48.13	1175902	54.69	bb	29	4.717	5.200	4.717
2	6.658	Unknown	10436776	51.87	974346	45.31	bb	34	6.400	6.967	6.400



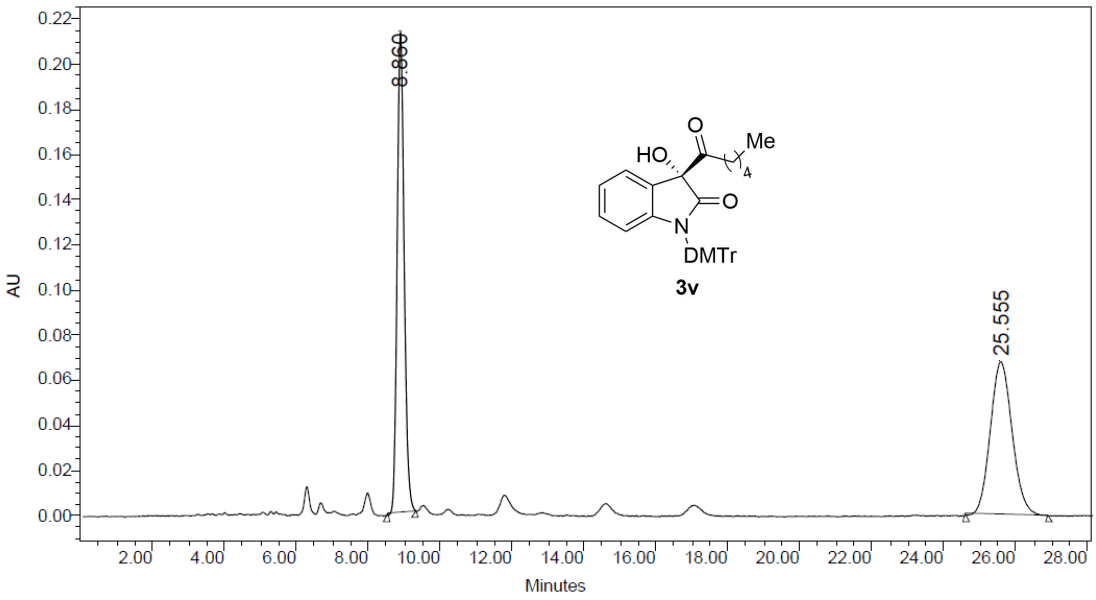
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	4.941	Unknown	1415460	9.00	184033	12.12	bb	23	4.750	5.150	4.750
2	6.659	Unknown	14315418	91.00	1334391	87.88	bb	48	6.350	7.167	6.350



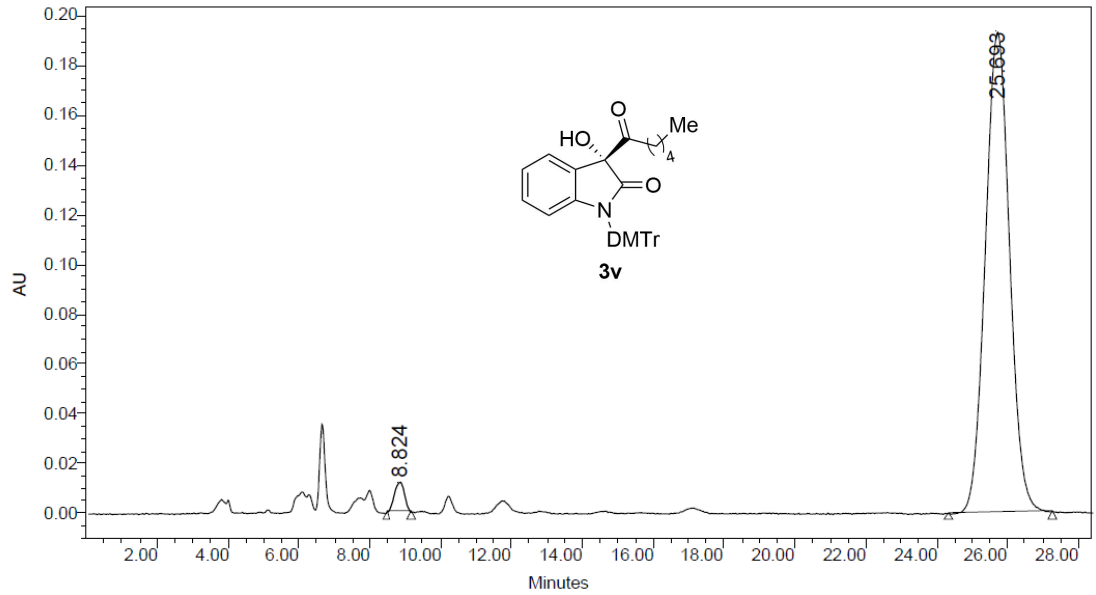
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.459	Unknown	266302	48.04	31894	57.14	bb	28	5.283	5.750	5.283
2	7.475	Unknown	288031	51.96	23924	42.86	bb	31	7.267	7.800	7.267



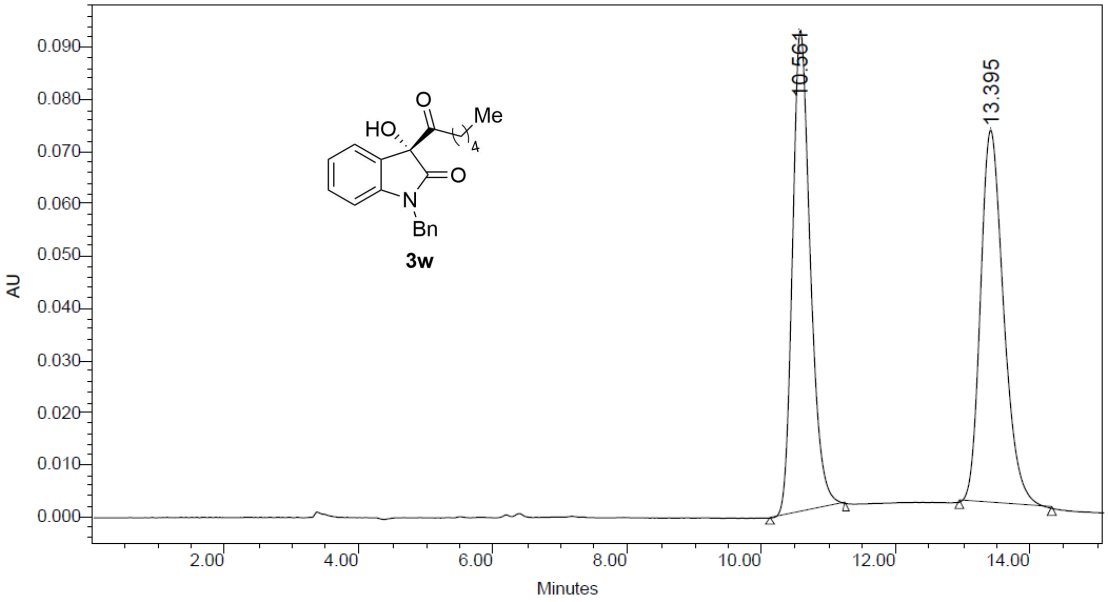
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	5.455	Unknown	2158112	8.92	278922	13.64	bb	17	5.317	5.617	5.317
2	7.452	Unknown	22038575	91.08	1765474	86.36	bb	50	7.183	8.033	7.183



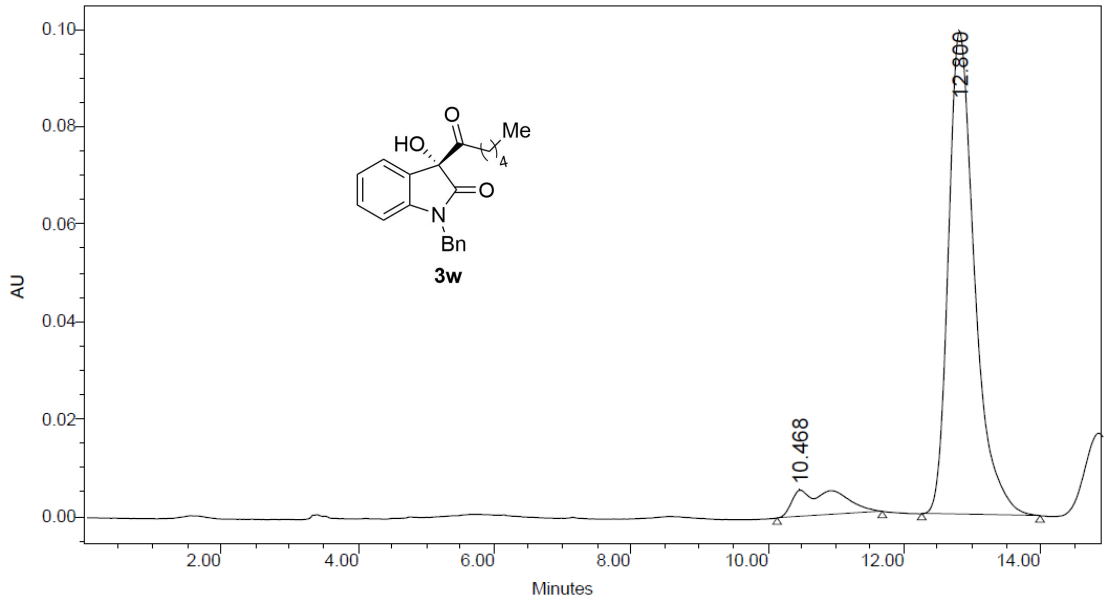
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	8.860	Unknown	2895607	50.00	213678	75.83	bb	46	8.517	9.300	8.517
2	25.555	Unknown	2895405	50.00	68101	24.17	bb	137	24.617	26.917	24.617



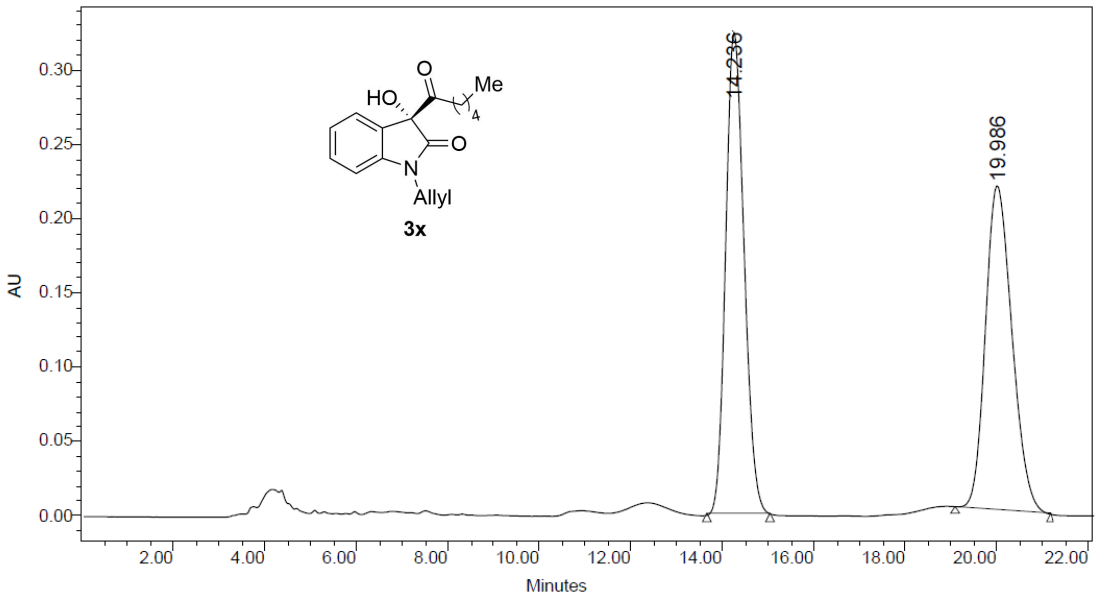
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	8.824	Unknown	240202	2.54	12074	5.88	bb	43	8.467	9.183	8.467
2	25.693	Unknown	9202717	97.46	193406	94.12	bb	176	24.333	27.283	24.333



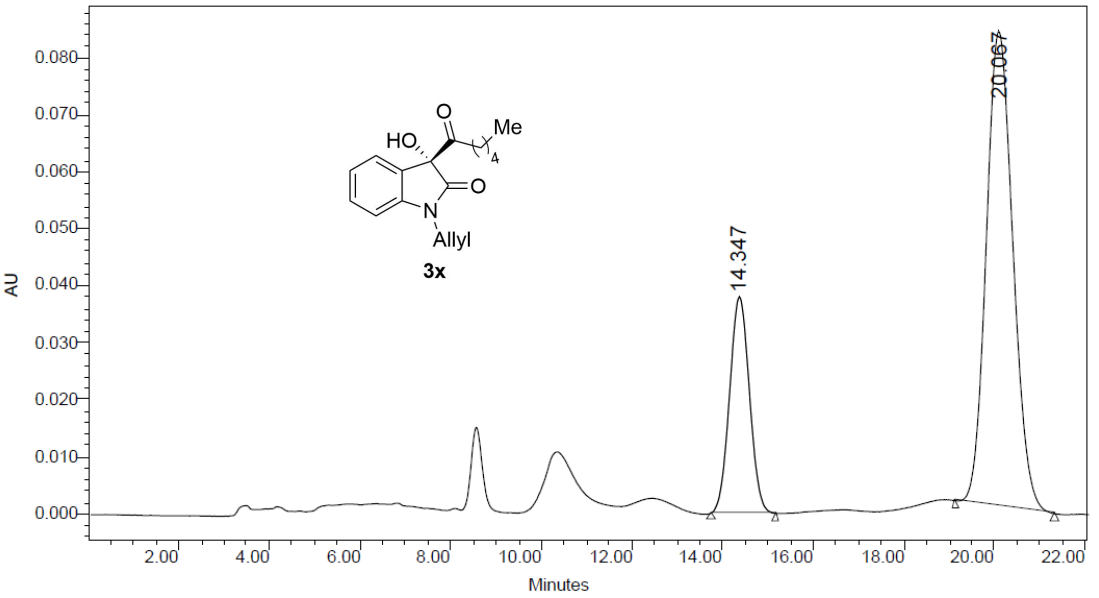
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	10.561	Unknown	1711495	49.81	92484	56.34	bb	66	10.133	11.250	10.133
2	13.395	Unknown	1724695	50.19	71661	43.66	bb	81	12.950	14.317	12.950



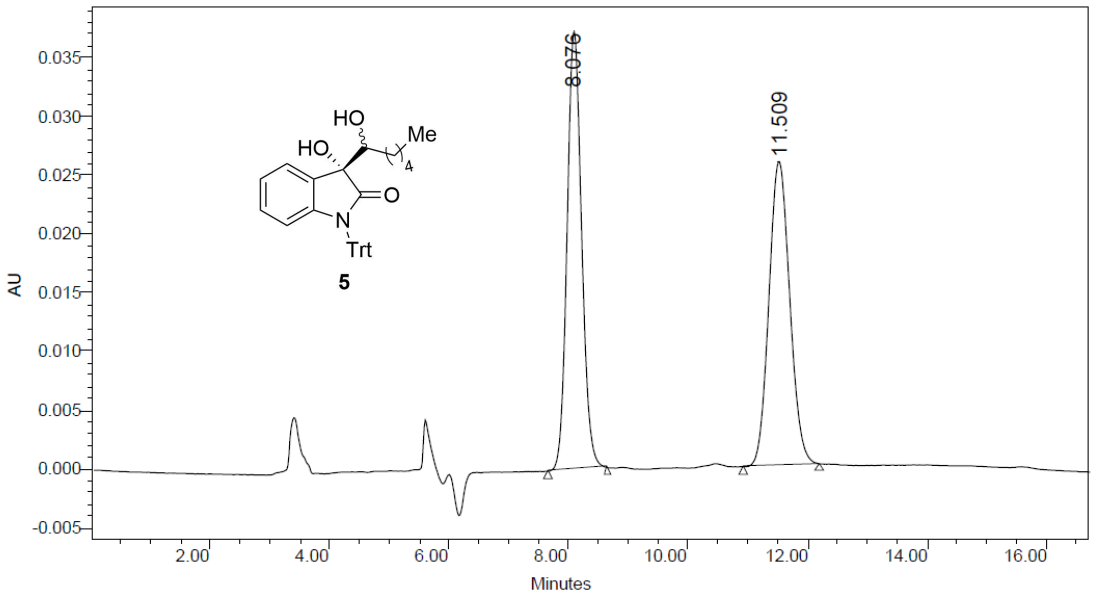
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	10.468	Unknown	262448	9.01	5423	5.19	bb	92	10.150	11.683	10.150
2	12.800	Unknown	2651623	90.99	99103	94.81	bb	103	12.267	14.000	12.267



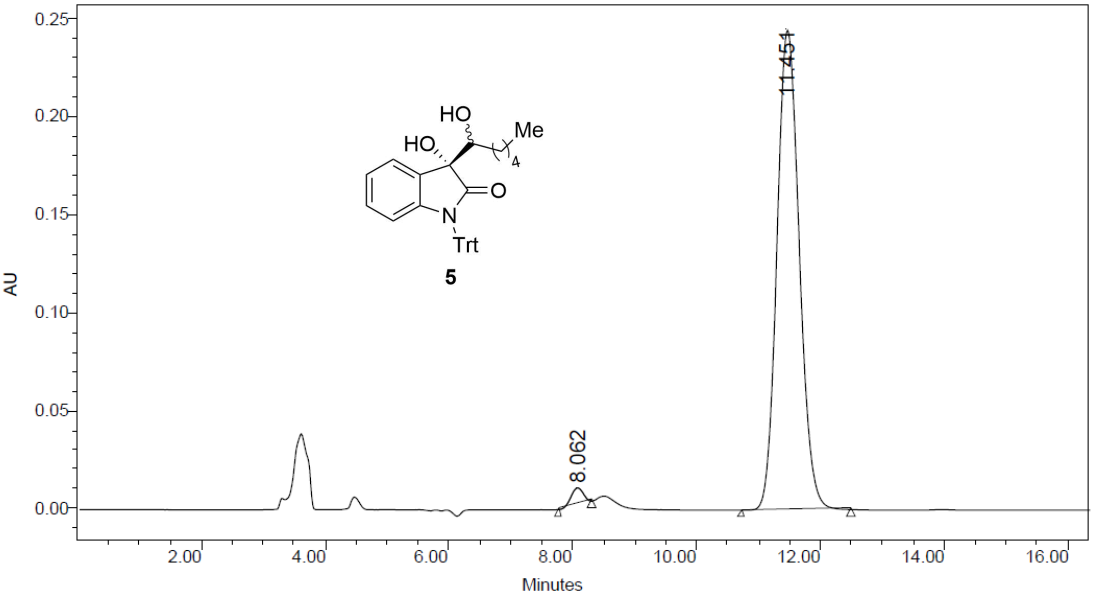
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	14.236	Unknown	9087505	50.72	324758	59.81	bb	81	13.667	15.033	13.667
2	19.986	Unknown	8829638	49.28	218236	40.19	bb	124	19.083	21.167	19.083



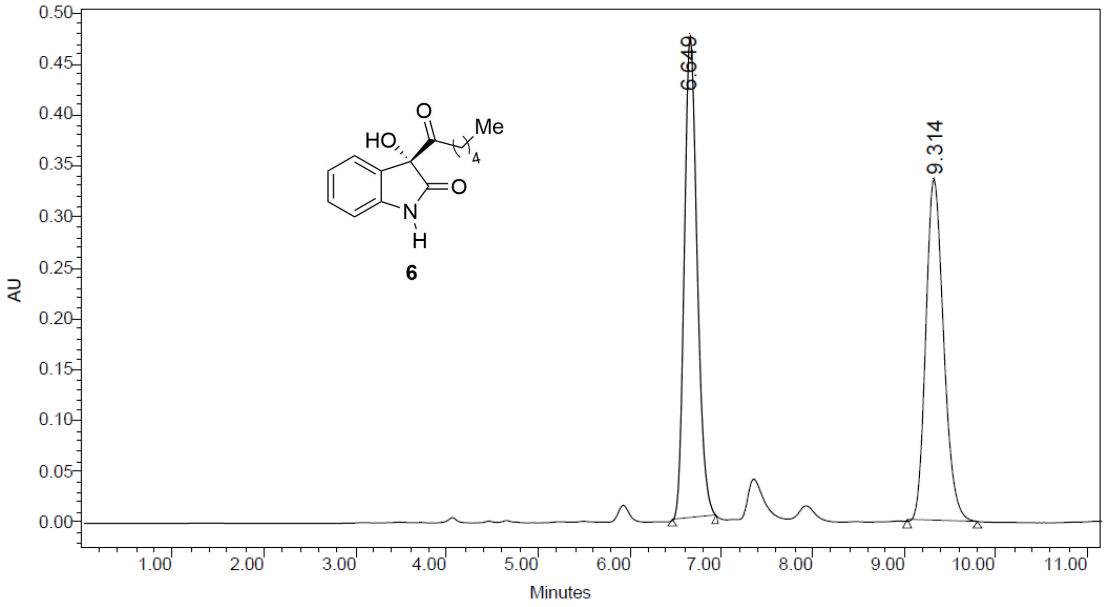
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	14.347	Unknown	1148536	25.21	37818	31.22	bb	85	13.750	15.167	13.750
2	20.067	Unknown	3406871	74.79	83302	68.78	bb	131	19.133	21.333	19.133



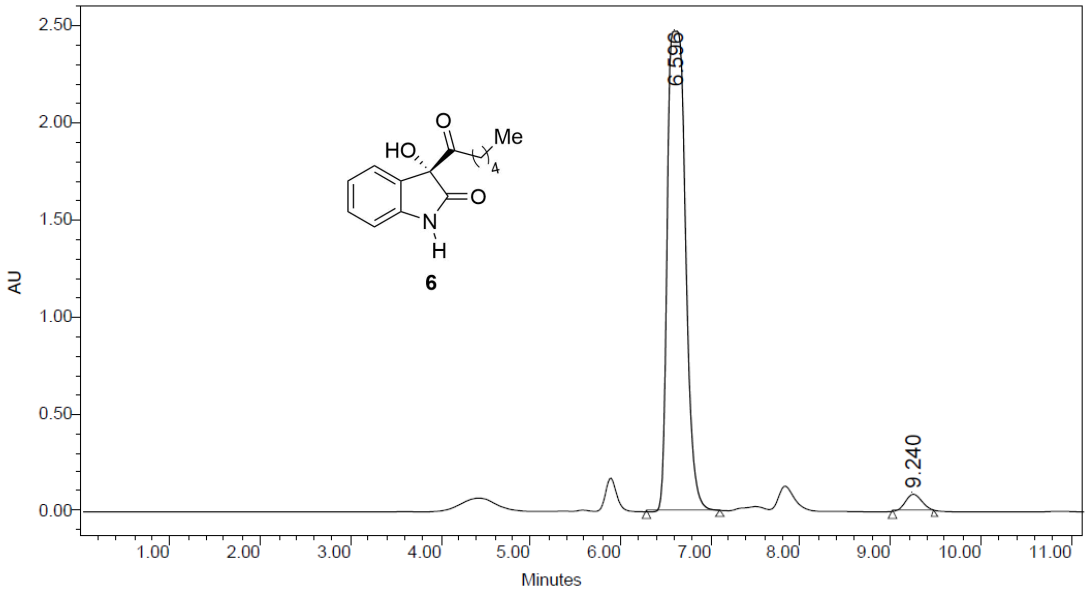
	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	8.076	Unknown	631883	50.19	37300	59.04	bb	59	7.667	8.650	7.667
2	11.509	Unknown	627161	49.81	25879	40.96	bb	76	10.933	12.200	10.933



	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	8.062	Unknown	118232	1.89	8630	3.41	bb	33	7.767	8.317	7.767
2	11.451	Unknown	6127452	98.11	244763	96.59	bb	106	10.717	12.483	10.717



	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	6.649	Unknown	4613573	50.26	473814	58.48	bb	28	6.467	6.933	6.467
2	9.314	Unknown	4566557	49.74	336407	41.52	bb	46	9.033	9.800	9.033



	RT (min)	Peak Type	Area (*sec)	% Area	Height ( )	% Height	Integration Type	Points Across Peak	Start Time (min)	End Time (min)	Baseline Start (min)
1	6.596	Unknown	34602002	96.96	2476218	96.65	bb	48	6.283	7.100	6.283
2	9.240	Unknown	1086122	3.04	85745	3.35	bb	28	9.017	9.483	9.017