Supporting Information for

Synthesis of Modified Bile Acids *via* Palladium-Catalyzed C(sp^3)-H (Hetero)arylation

Somnath Arjun Borade,[a] Sushma Naharwal,[a] Himanshi Bhambri,[b] Sanjay K. Mandal,[b] Kiran Bajaj,[c] Deepak Chitkara,[d] Rajeev Sakhuja[a]*

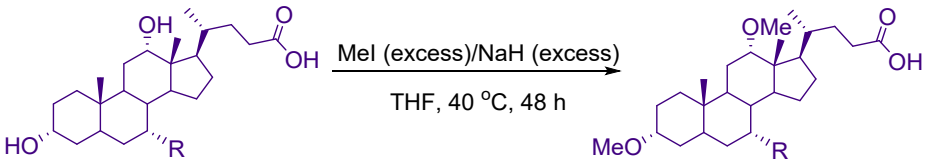
[a]*Department of Chemistry, Birla Institute of Technology and Science, Pilani, Rajasthan 333031, India*
[b]*Department of Chemical Sciences, Indian Institute of Science Education and Research Mohali, Sector 81, SAS Nagar, Manuali P.O., Mohali, Punjab 140306, India*
[c]*Department of Chemistry, Amity Institute of Applied Sciences, Amity University, Noida, Uttar Pradesh, India*
[d]*Department of Pharmacy, Birla Institute of Technology and Science, Pilani, Rajasthan 333031, India*

Contents

1. Preparation of starting materials

General procedure for the synthesis of *O*-methylated cholic acid (CA) and deoxycholic acid (DCA) (1A-B)

To a suspension of NaH [(4.40 g, 183.5 mmol, 15 equiv, 55 % dispersion in mineral oil for cholic acid **A**)/(4.58 g, 191.0 mmol, 15 equiv for deoxycholic acid **B**)] in dry THF (100 mL) at 0 °C, a solution of **A** (5.0 g, 12.23 mmol, 1 equiv)/**B** (5.0 g, 12.73 mmol, 1 equiv) in THF (30 mL) was added. After allowing the reaction mixture to stir at room temperature for 1 h, it was cooled to 0 °C. After this, MeI [(7.61 mL, 122.3 mmol, 10 equiv for **A**) and (7.92 mL, 127.3 mmol, 10 equiv for **B)**] was slowly added to the mixture, and it was allowed to stir for 24 h at 40 °C. A second portion of NaH [(4.40 g for **A** and (4.58 g for **B**)] and MeI [(7.61 mL, 122.3 mmol, for **A)** and (7.92 mL, 127.3 mmol for **B**)] were added to the reaction mixture, and the reaction mixture was allowed to stir for another 24 h at 40 °C. Thereafter, the reaction mixture was quenched by slow addition of saturated aqueous NH_4Cl (50 mL) at 0 °C. Tetrahydrofuran were removed under reduced pressure. To the resulting suspension, ethyl acetate (100 mL) was added and the mixture was washed with water (3 × 50 mL). The organic layers were dried over Na_2SO_4, filtered, and concentrated *in vacuo*. The crude product was purified by flash column chromatography (Hexanes/EtOAc, 70:30) to afford 4.63 g (84%) of compound **1A** and 4.71 g (88%) of compound **1B** as a white solid. TLC R_f = 0.36 (Hexanes/EtOAc, 70:30).



A: R = OH
B: R = H

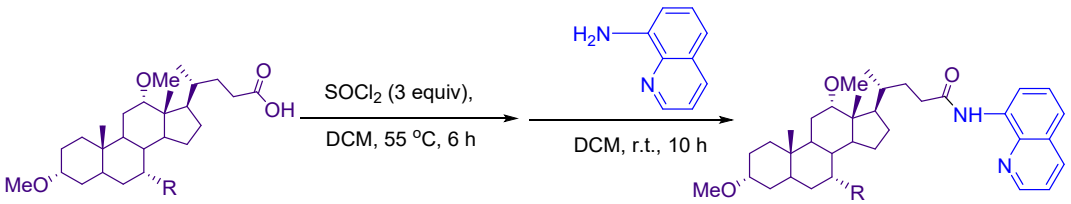
1A: R = OMe
1B: R = H

(4*R*)-4-((3*R*,7*R*,10*S*,12*S*,13*R*,17*R*)-3,7,12-trimethoxy-10,13-dimethylhexadecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)pentanoic acid (1A). Compound **1A** was prepared by literature reported procedure[1] as a white solid; 5.01 g (91%); m.p. 64-68 °C (Lit. m.p. 65-70 °C).

(4*R*)-4-((3*R*,10*S*,12*S*,13*R*,17*R*)-3,12-dimethoxy-10,13-dimethylhexadecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)pentanoic acid (1B). Compound **1B** was prepared by literature reported procedure[2] as a white solid; 4.71 g (88%); m.p. 140-144 °C (Lit. m.p. not reported).

General procedure for the synthesis of *O*-methylated *N*-(quinolin-8-yl)cholyl/deoxylcholyl amides (1a-b)

To a stirred solution of *O*-methylated cholic acid (**1A**) [or deoxycholic acid (**1B**)] [3.0 g, 1 equiv] in dry DCM (100 mL), thionyl chloride (3 equiv) was added at room temperature. The reaction mixture was stirred under reflux conditions at 55 °C for 6 h and was monitored by TLC. After the completion of the reaction, DCM and excess of thionyl chloride was removed under reduced pressure. To the resulting dry crude *O*-methylated cholyl/deoxylcholyl chloride, freshly distilled DCM (100 mL) and 8-aminoquinoline (1.2 equiv) were added and the mixture was stir at room temperature for 10 h. Thereafter, the resulting reaction mixture was washed with 1 M HCl (3 × 50 mL) solution to remove unreacted 8-aminoquinoline.The organic layer were separated, dried to afford crude product, which was purified by flash column chromatography (Hexanes/EtOAc, 90:10) to afford pure *O*-methylated *N*-(quinolin-8-yl)cholyl/deoxylcholyl amide (**1a-b**).



1A: R = OMe
1B: R = H

1a: R = OMe
1b: R = H

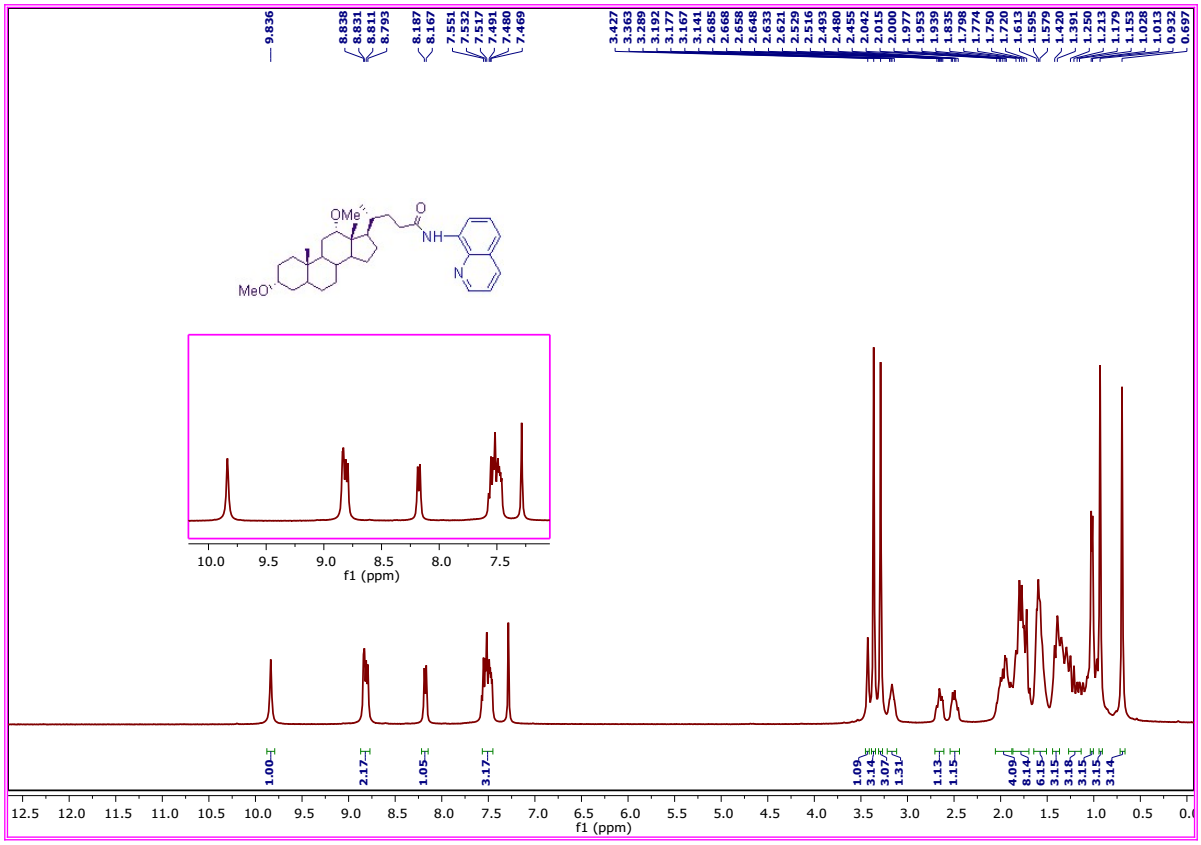
(4*R*)-*N*-(quinolin-8-yl)-4-((3*R*,7*R*,10*S*,12*S*,13*R*,17*R*)-3,7,12-trimethoxy-10,13-dimethylhexadecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)pentanamide (1a).

Compound **1a** was prepared by literature reported procedure[3] as a white solid; 3.56 gm (93%); (Lit. m.p. 158-160 °C).

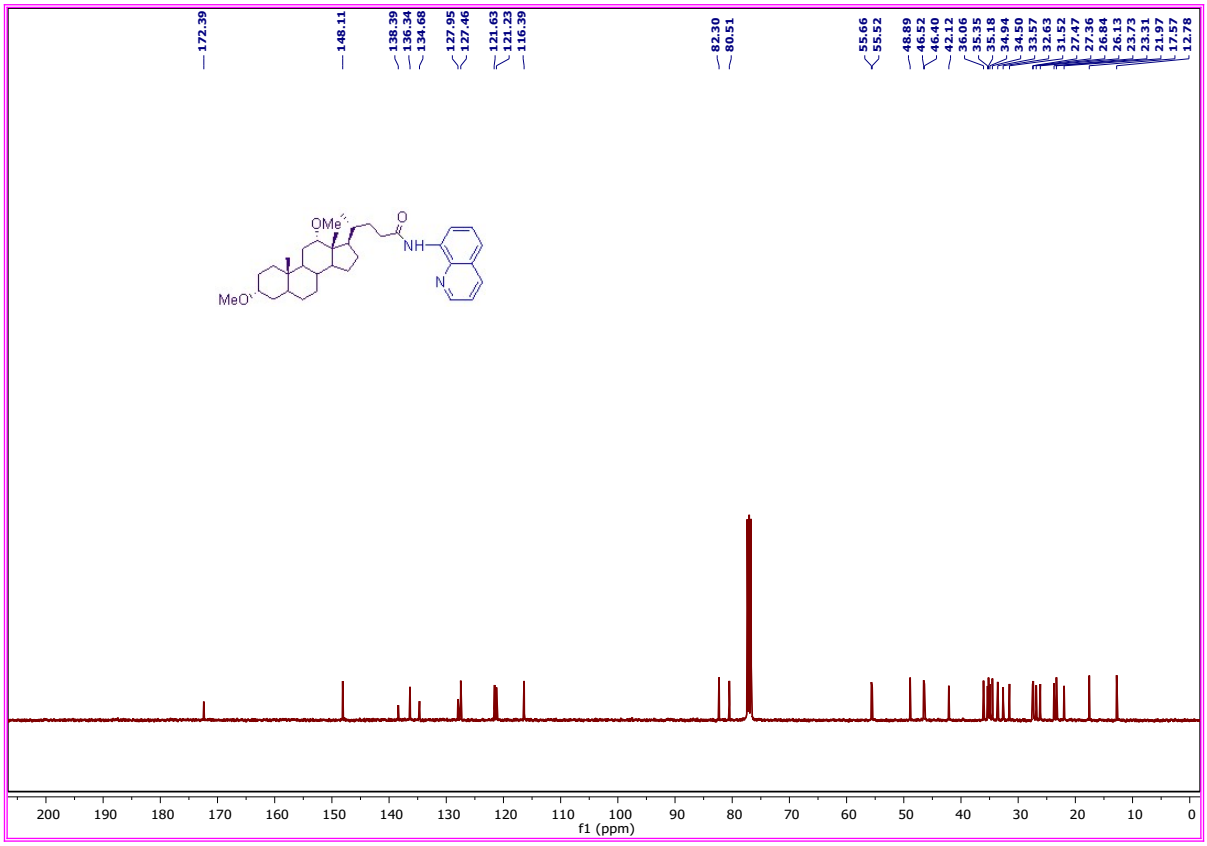
(4*R*)-4-((3*R*,10*S*,12*S*,13*R*,17*R*)-3,12-dimethoxy-10,13-dimethylhexadecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)-*N*-(quinolin-8-yl)pentanamide (**1b**). White solid, 3.51 gm (90%); m.p. 150-152 °C; ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 9.84 (s, 1H), 8.87 - 8.77 (m, 2H), 8.18 (d, J = 8.0 Hz, 1H), 7.58 - 7.45 (m, 3H), 3.45 - 3.40 (m, 1H), 3.63 (s, 3H), 3.29 (s, 3H), 3.22 - 3.11 (m, 1H), 2.70 - 2.61 (m, 1H), 2.54 - 2.44 (m, 1H), 2.06 - 1.88 (m, 4H), 1.86 - 1.70 (m, 8H), 1.64 - 1.51 (m, 6H), 1.44 - 1.31 (m, 3H), 1.25 - 1.13 (m, 3H), 1.02 (d, J = 6.0 Hz, 3H), 0.93 (s, 3H), 0.69 (s, 3H) ; ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 172.4, 148.1, 138.4, 136.3, 134.7, 128.0, 127.5, 121.6, 121.2, 116.4, 82.3, 80.5, 55.7, 55.5, 48.9, 46.5, 46.4, 42.1, 36.1, 35.4, 35.2, 34.9, 34.9, 33.6, 32.6, 31.5, 27.5, 27.4, 26.8, 26.1, 23.7, 23.3, 22.0, 17.6, 12.8; HRMS (ESI) *m/z* Calcd for $C_{35}H_{51}N_2O_3^+$ $(M+H)^+$: 547.3894, found 547.3885.

2. Original ^{1}H & ^{13}C NMR Spectra of 1b, 3 & 4ba

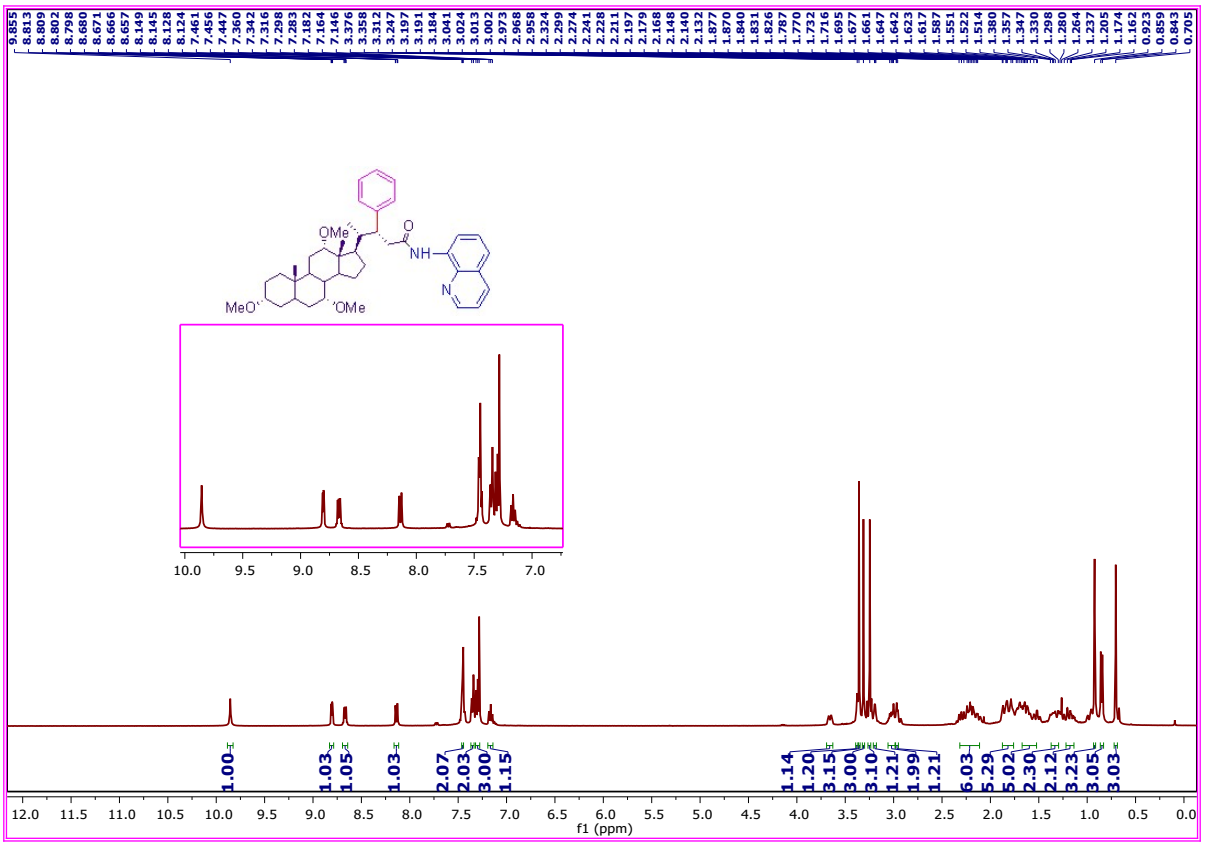
^{1}H NMR of 1b (400 MHz, $CDCl_3$)



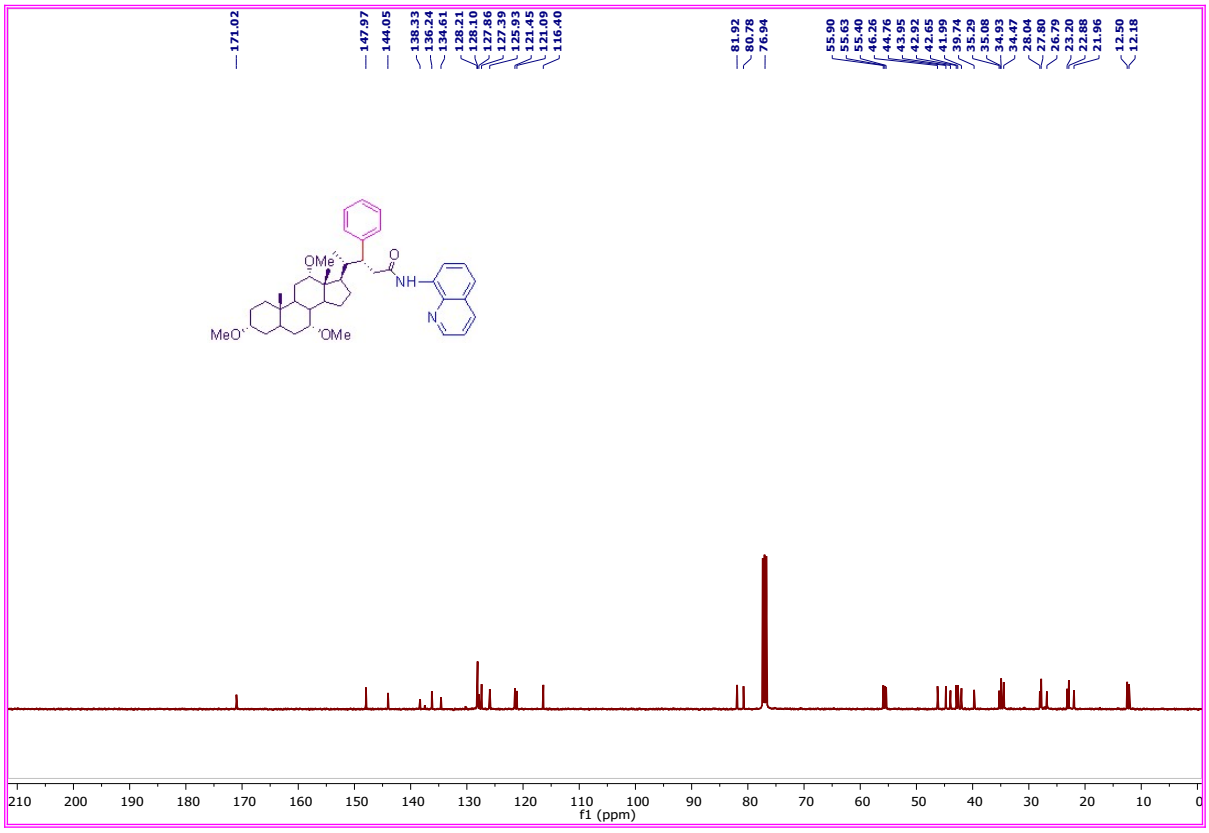
^{13}C NMR of 1b (400 MHz, $CDCl_3$)



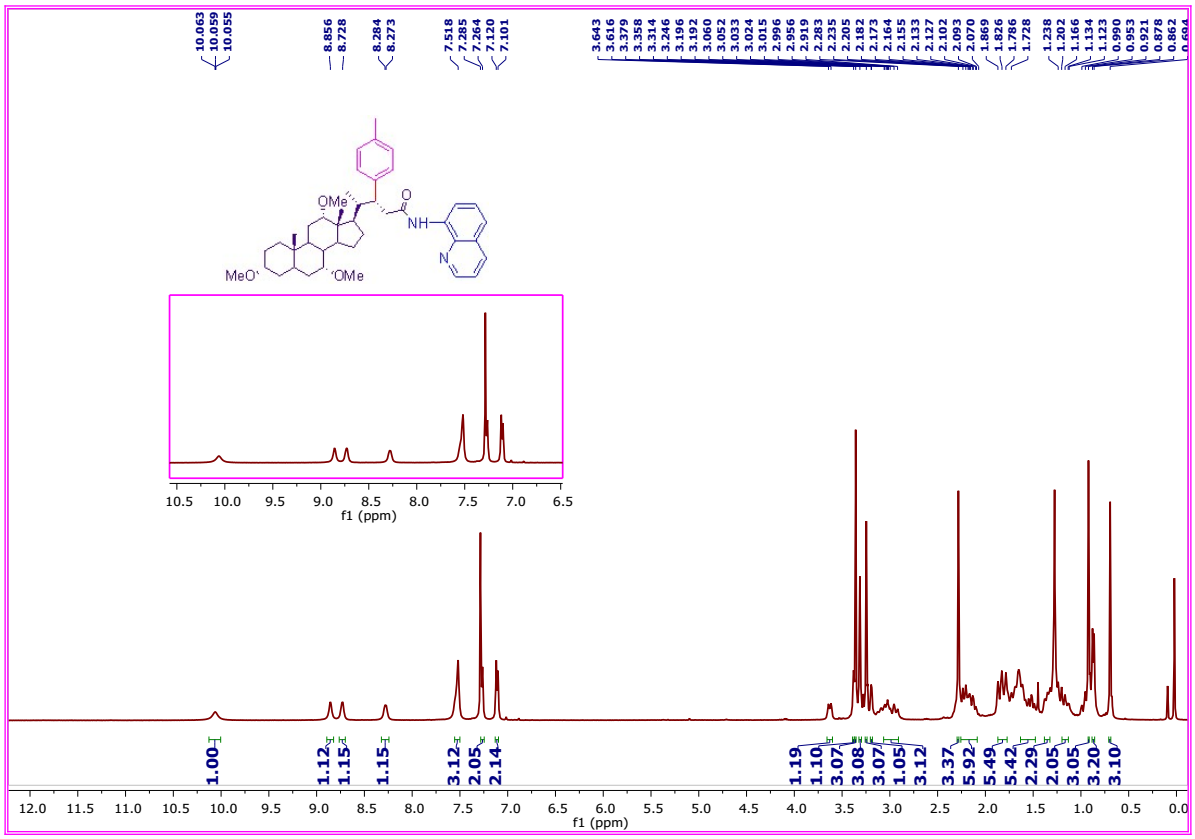
^{1}H NMR of 3aa (400 MHz, $CDCl_3$)



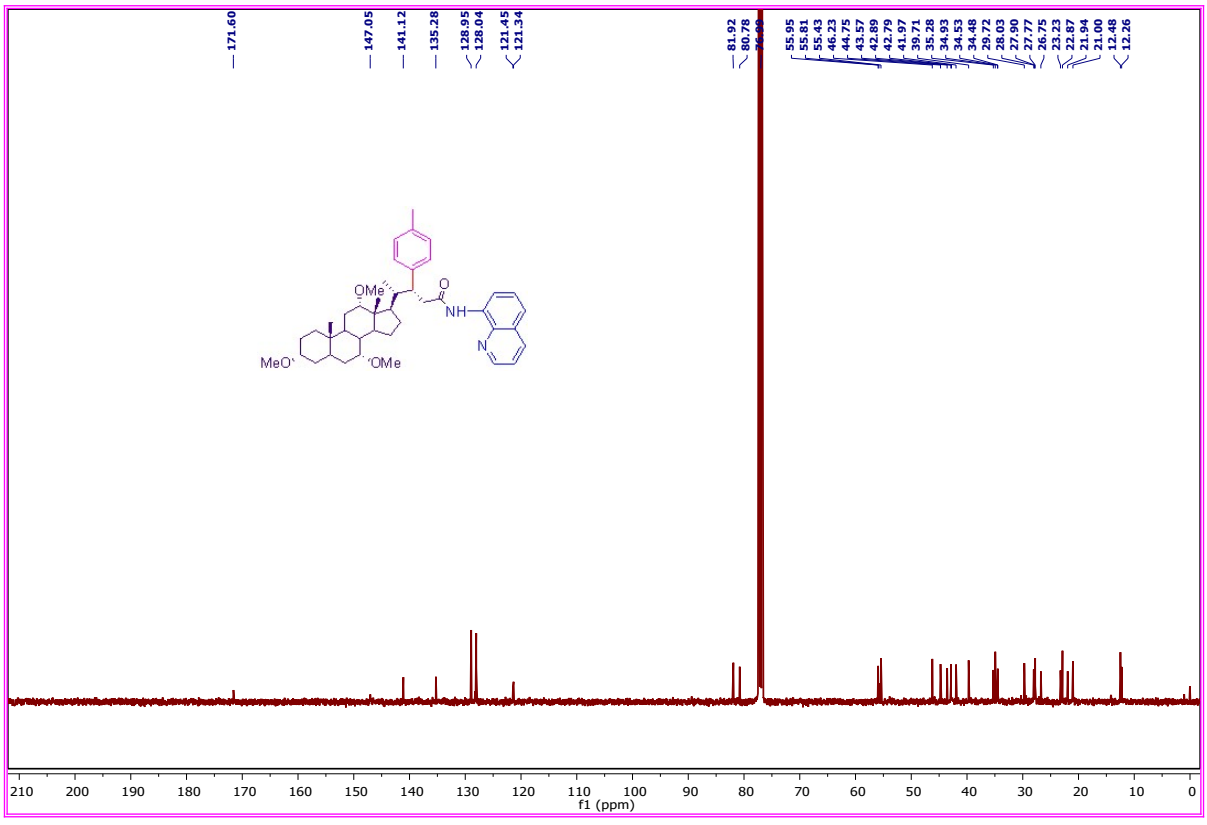
^{13}C NMR of 3aa (400 MHz, $CDCl_3$)



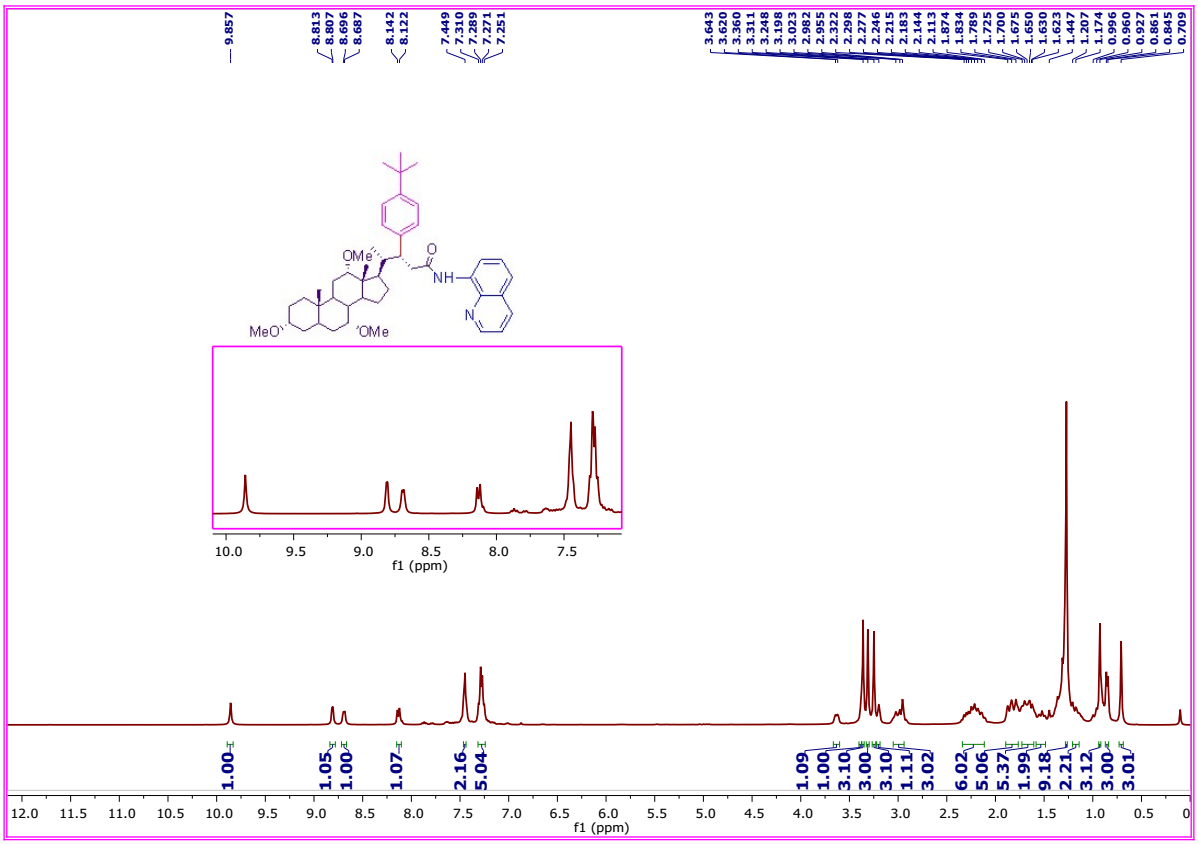
^{1}H NMR of 3ab (400 MHz, $CDCl_3$)



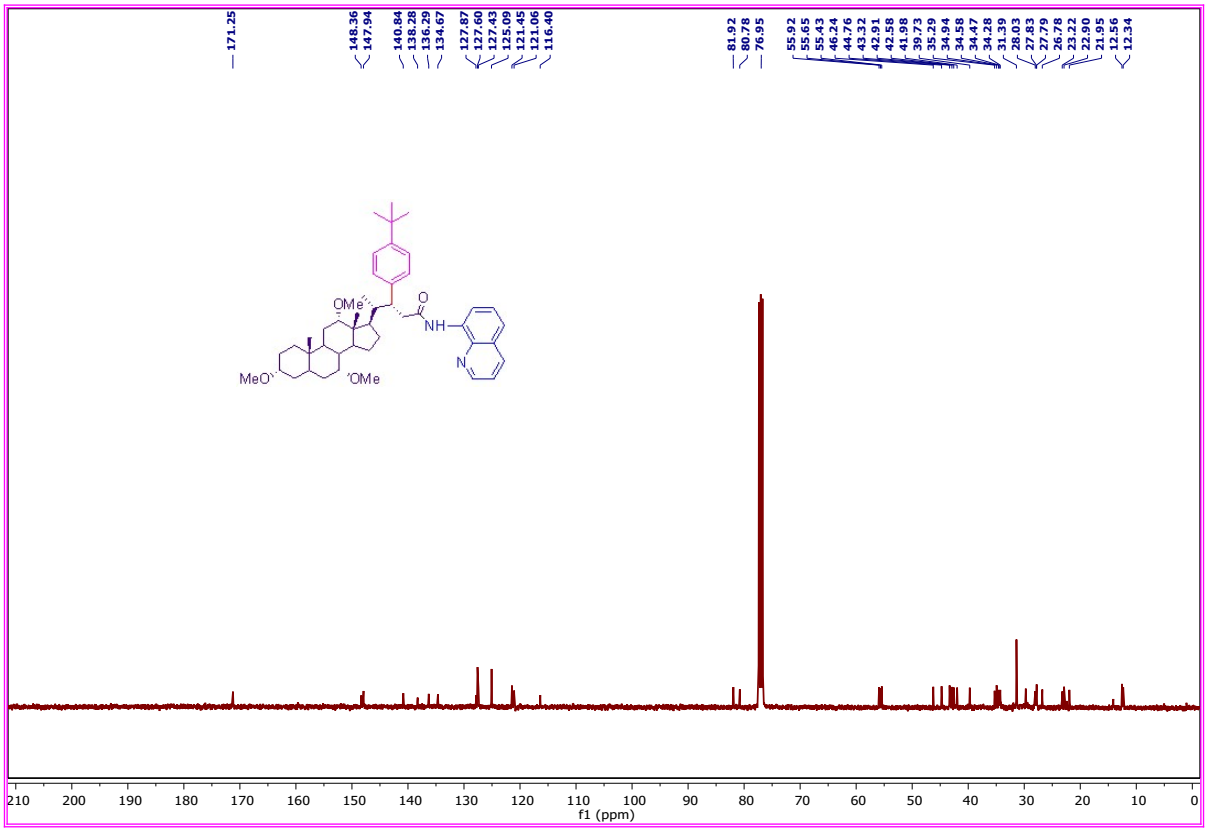
^{13}C NMR of 3ab (400 MHz, $CDCl_3$)



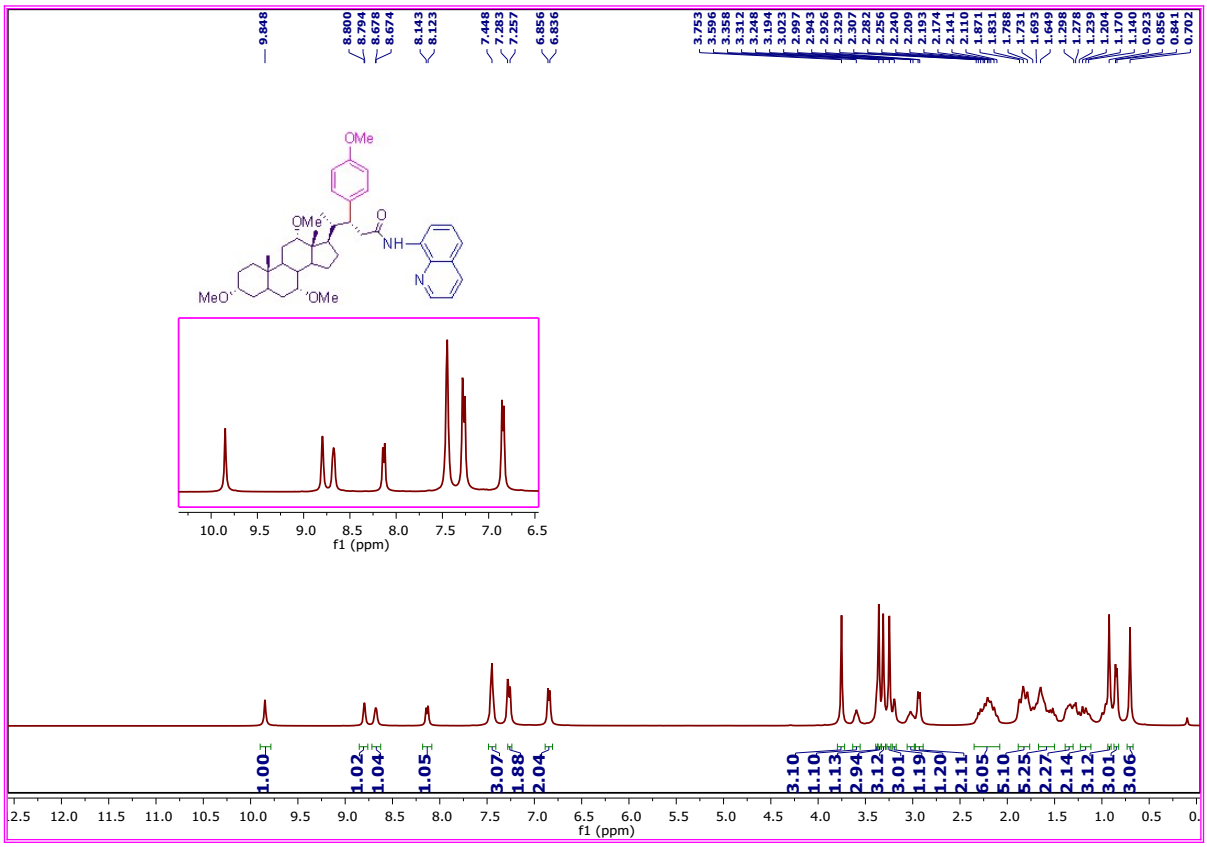
^{1}H NMR of 3ac (400 MHz, $CDCl_3$)



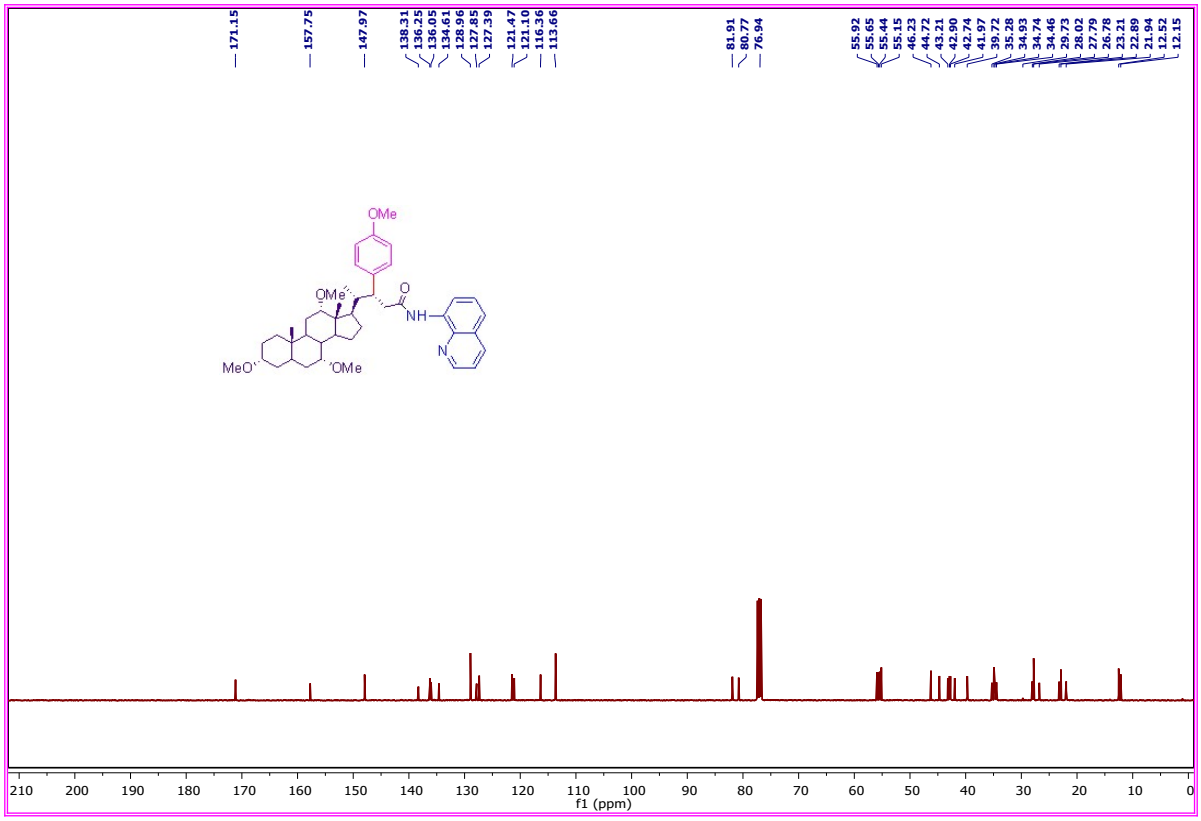
^{13}C NMR of 3ac (400 MHz, $CDCl_3$)



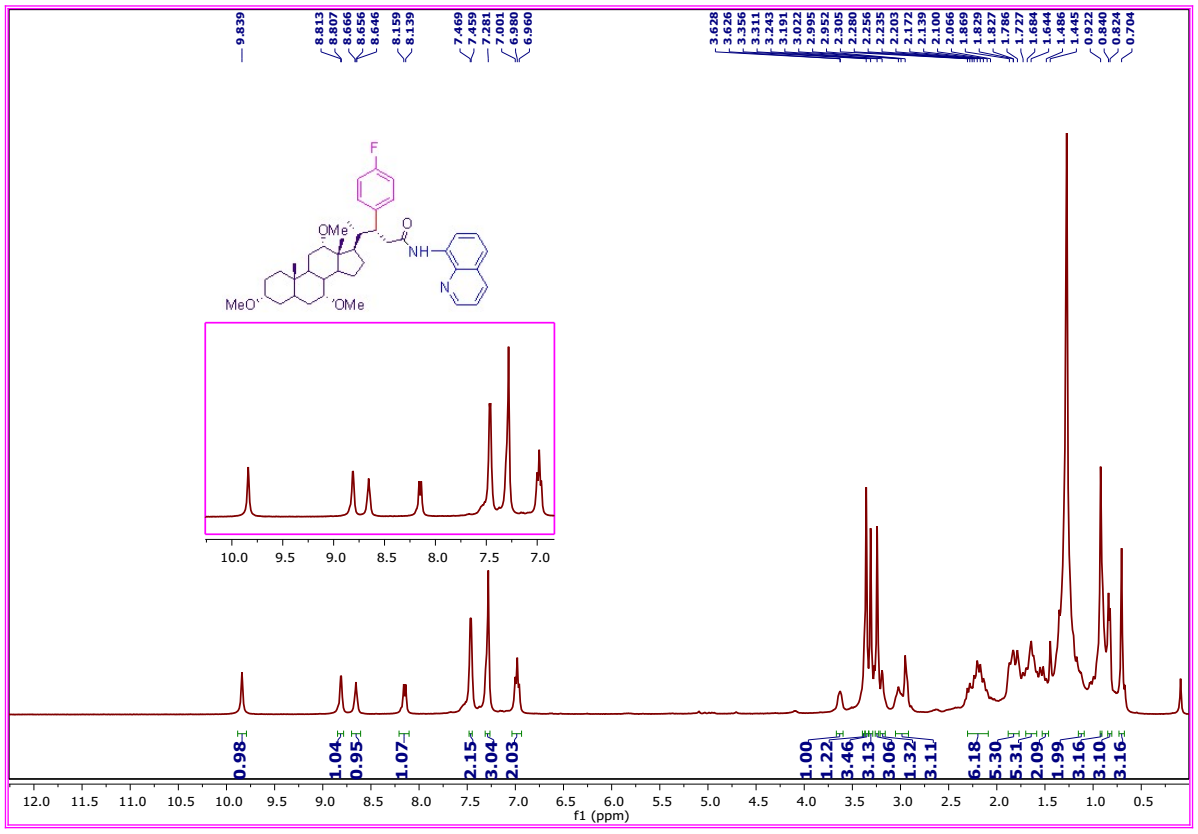
^{1}H NMR of 3ad (400 MHz, $CDCl_3$)



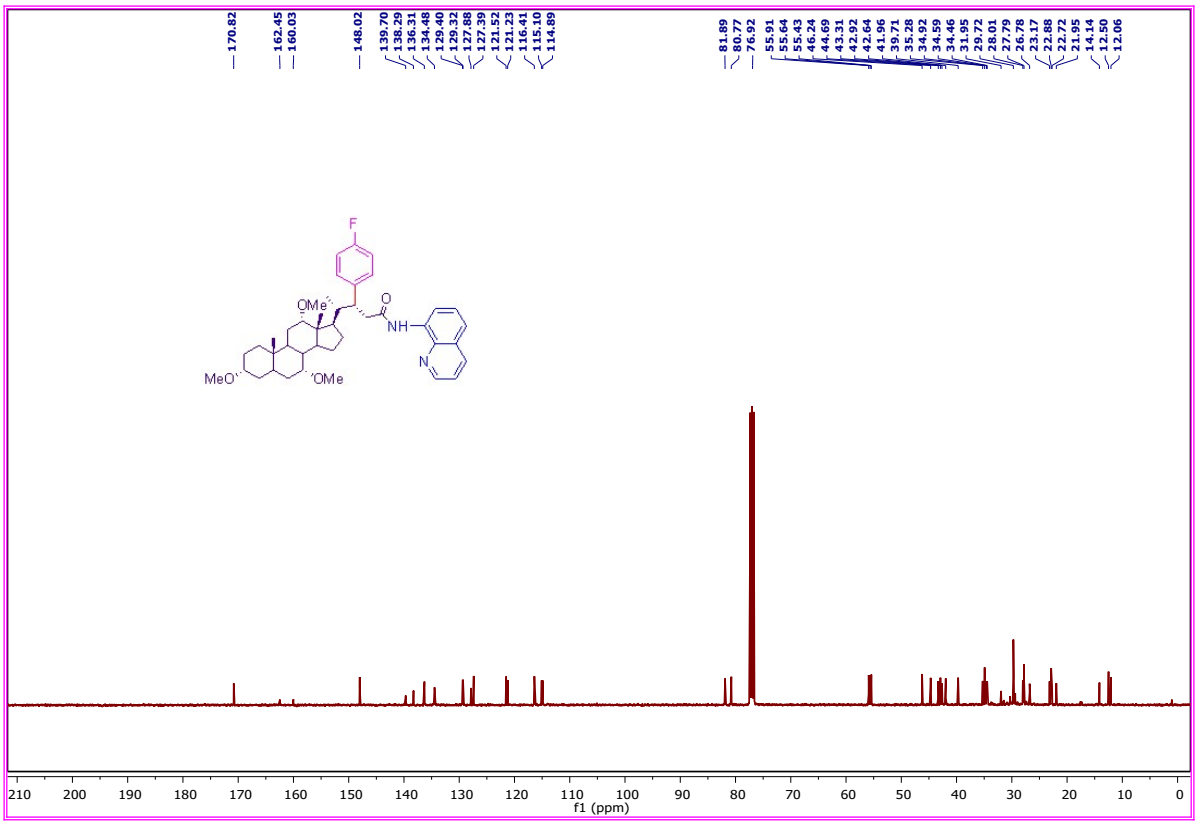
^{13}C NMR of 3ad (400 MHz, $CDCl_3$)



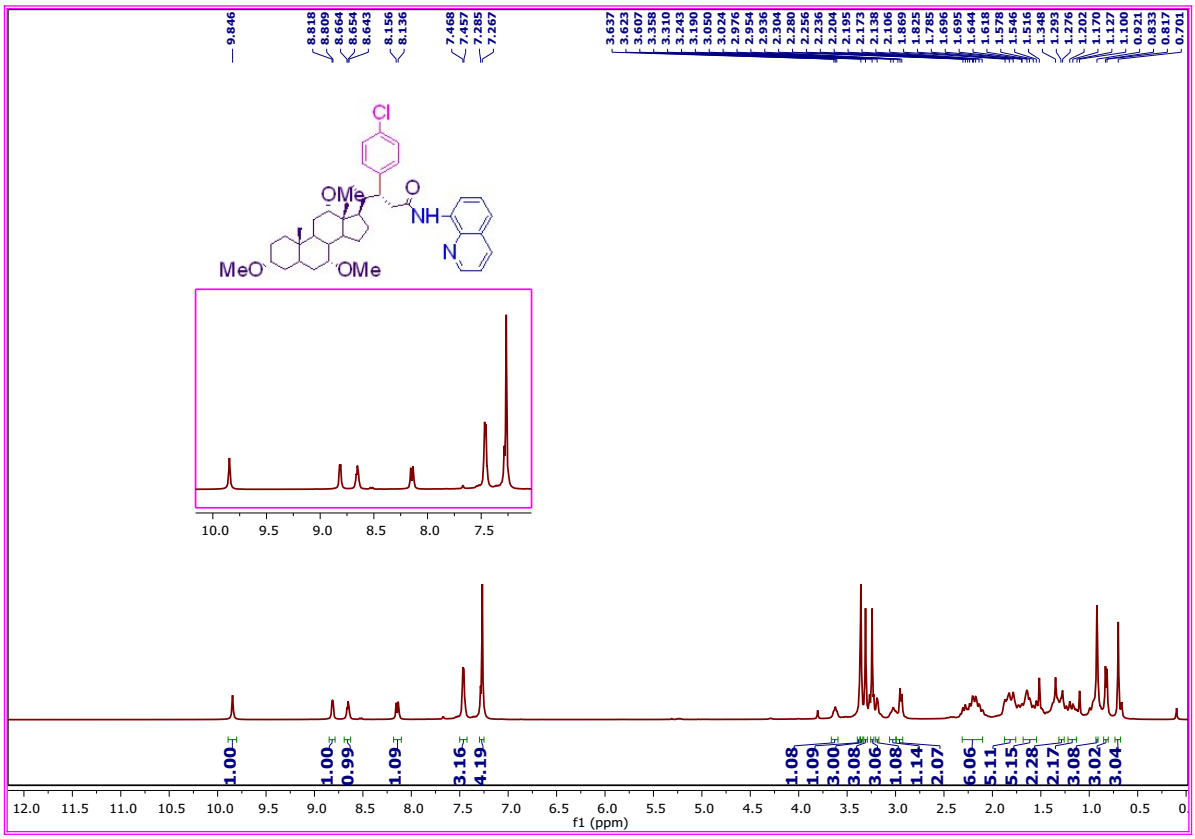
^{1}H NMR of 3ae (400 MHz, $CDCl_3$)



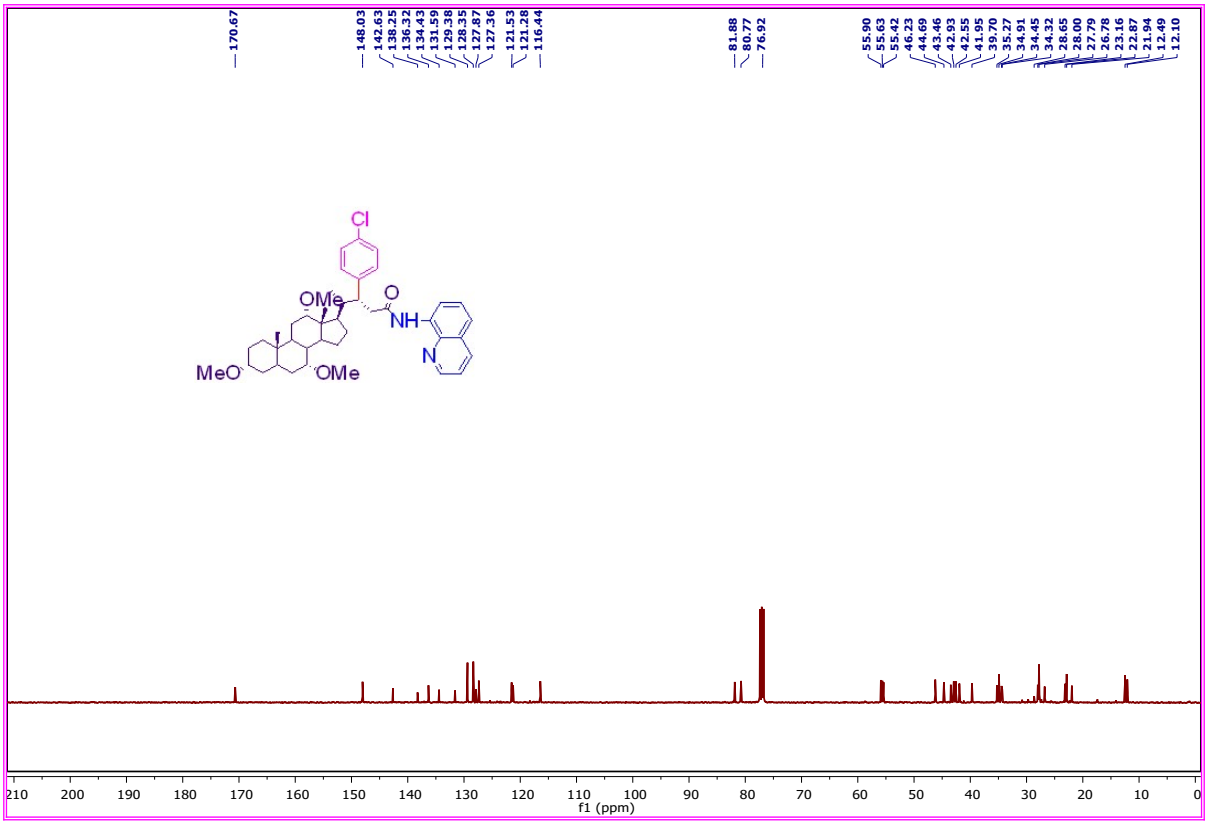
^{13}C NMR of 3ae (400 MHz, $CDCl_3$)



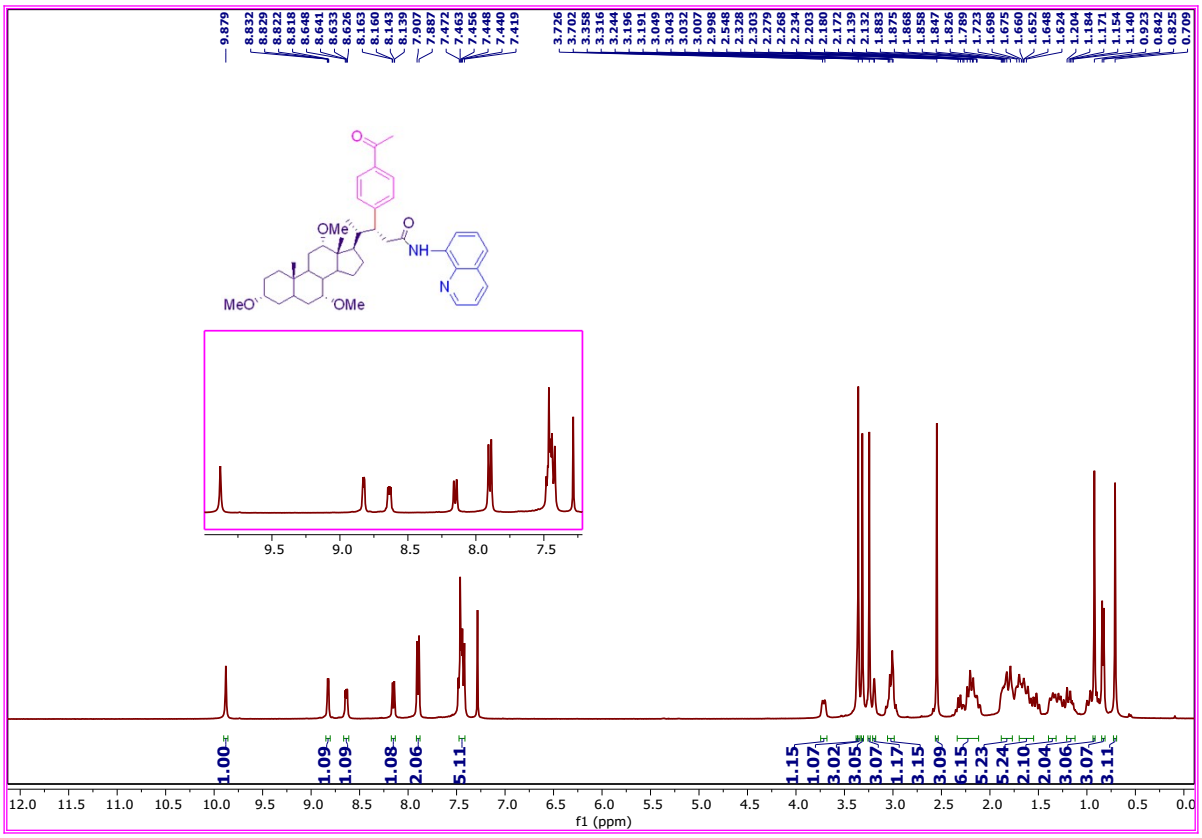
^{1}H NMR of 3af (400 MHz, $CDCl_3$)



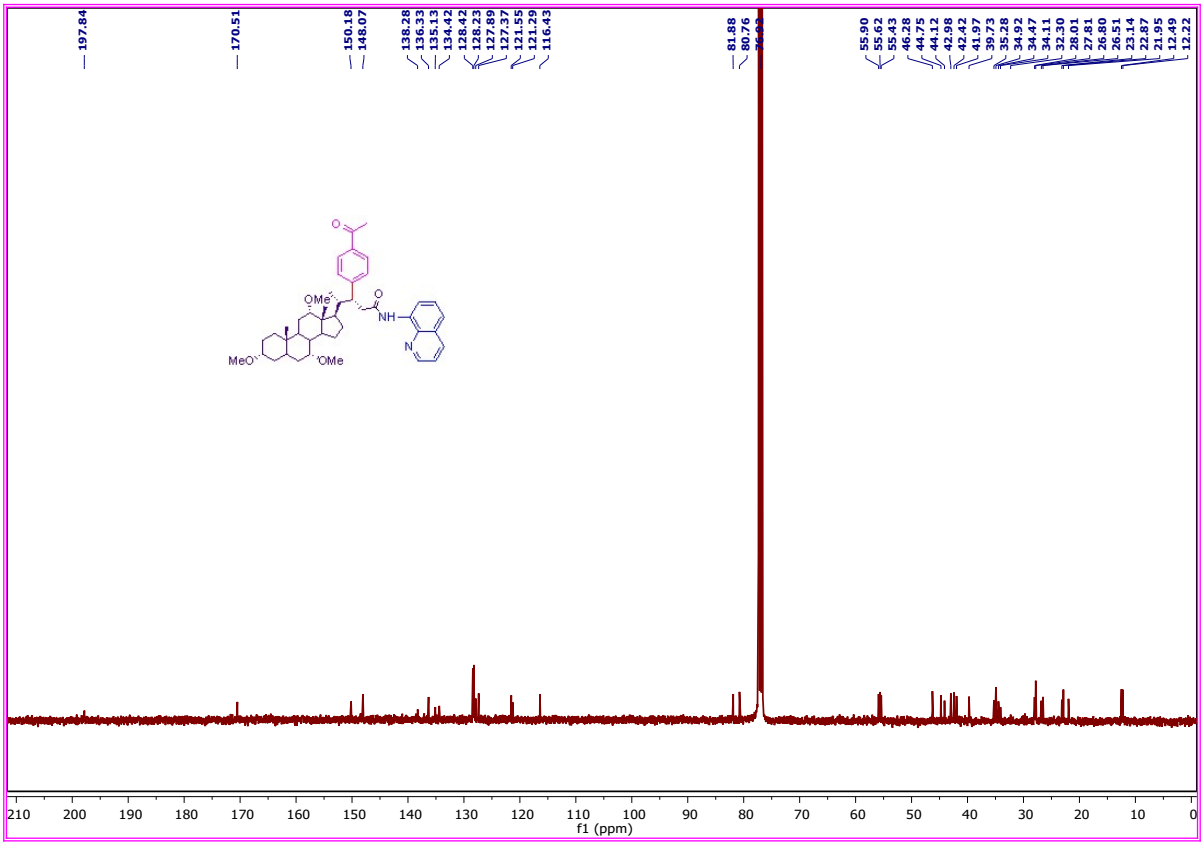
^{13}C NMR of 3af (400 MHz, $CDCl_3$)



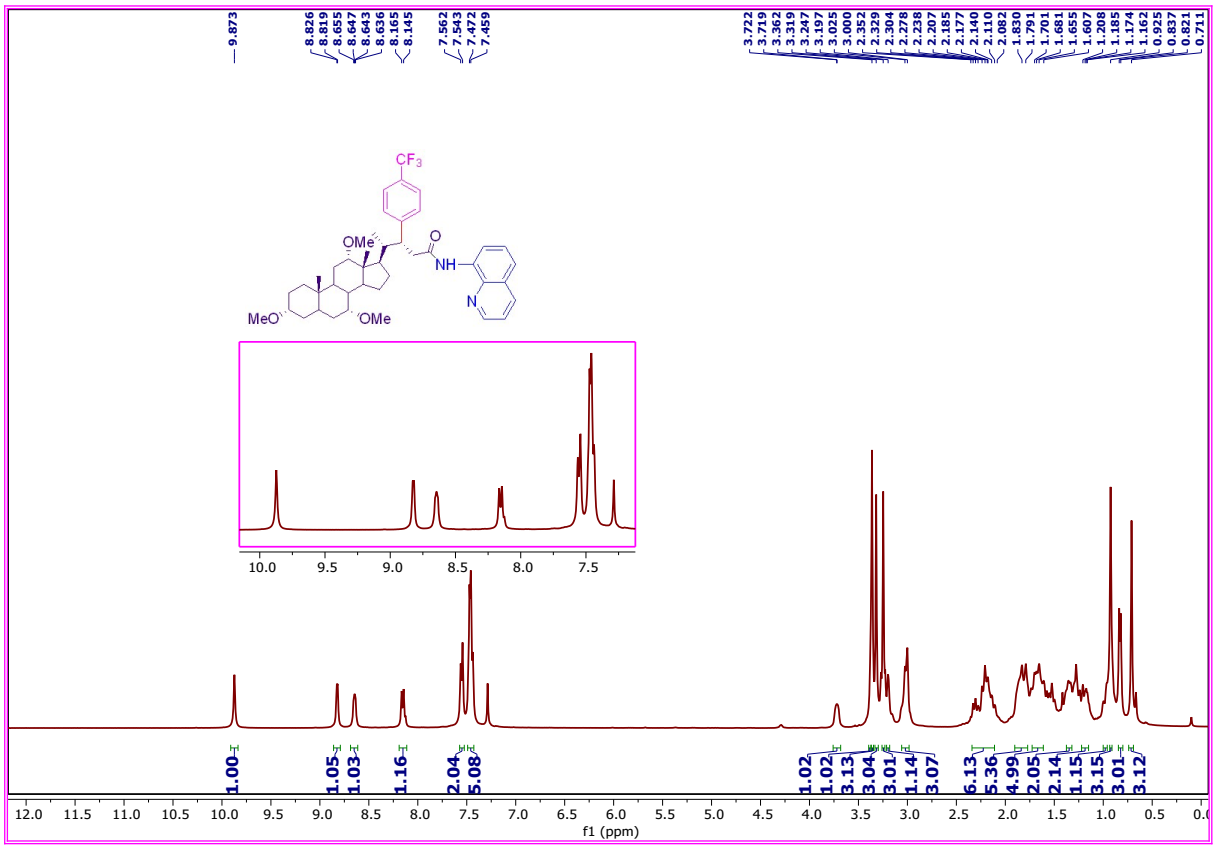
^{1}H NMR of 3ah (400 MHz, $CDCl_3$)



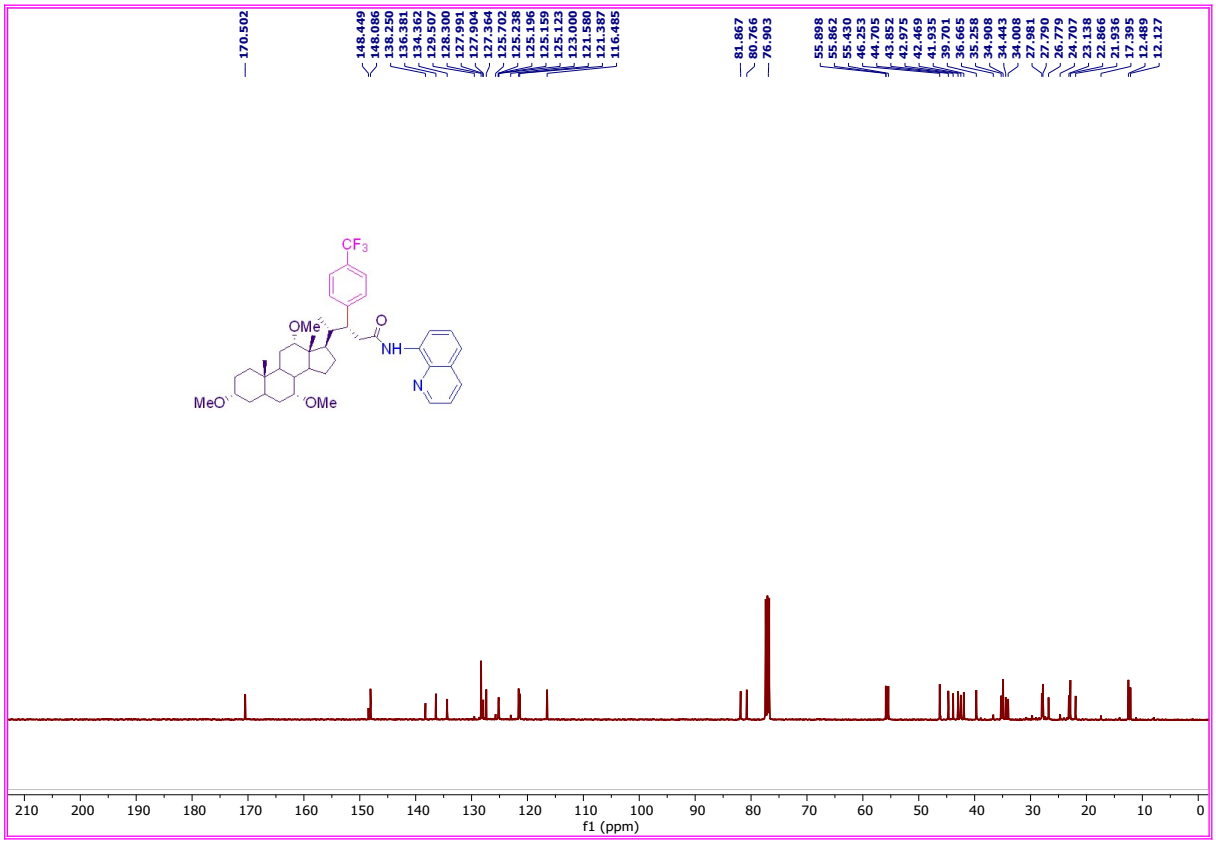
^{13}C NMR of 3ah (400 MHz, $CDCl_3$)



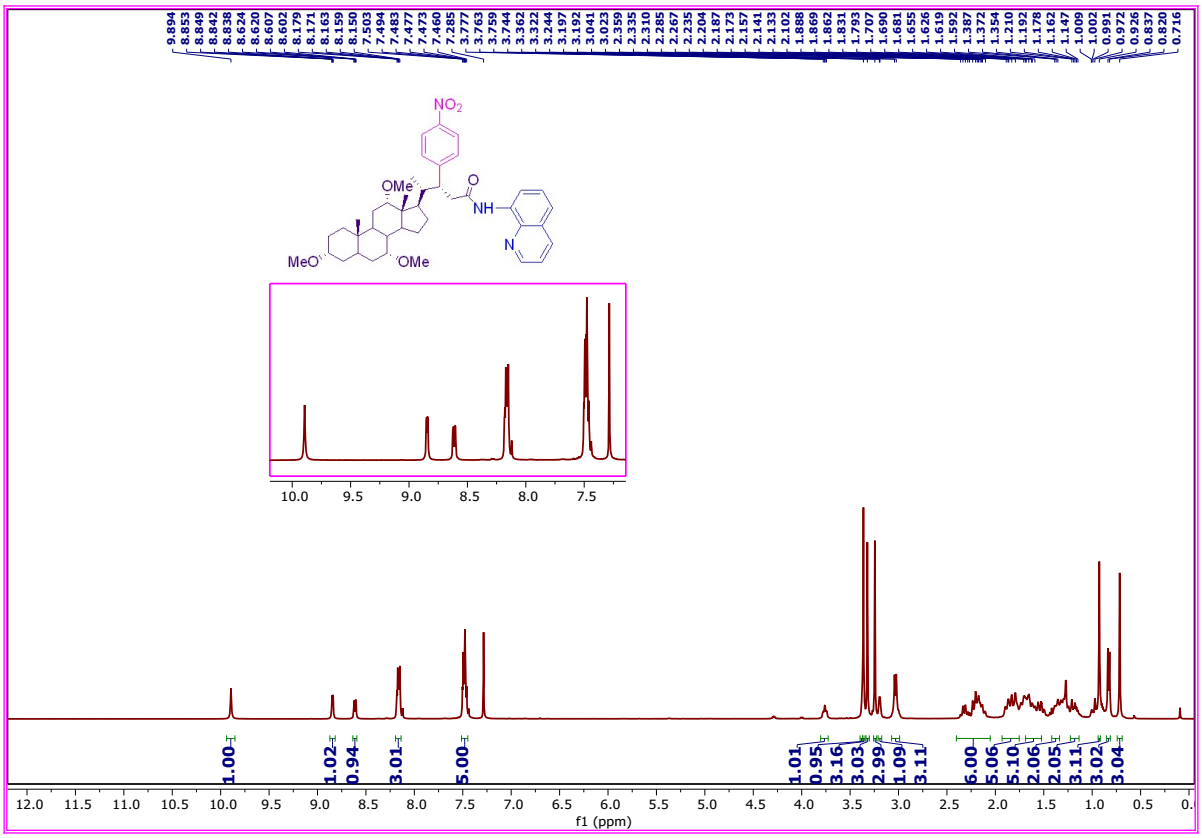
^{1}H NMR of 3ai (400 MHz, $CDCl_3$)



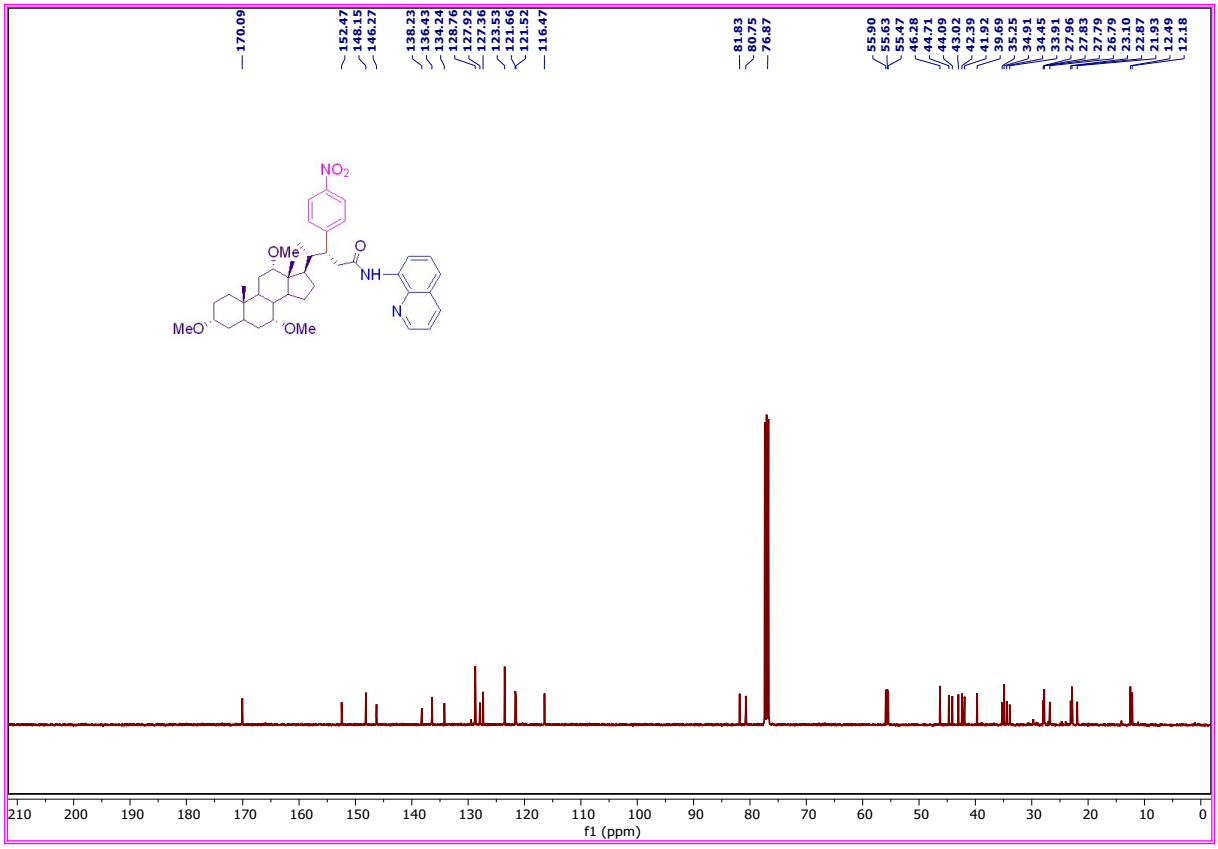
^{13}C NMR of 3ai (400 MHz, $CDCl_3$)



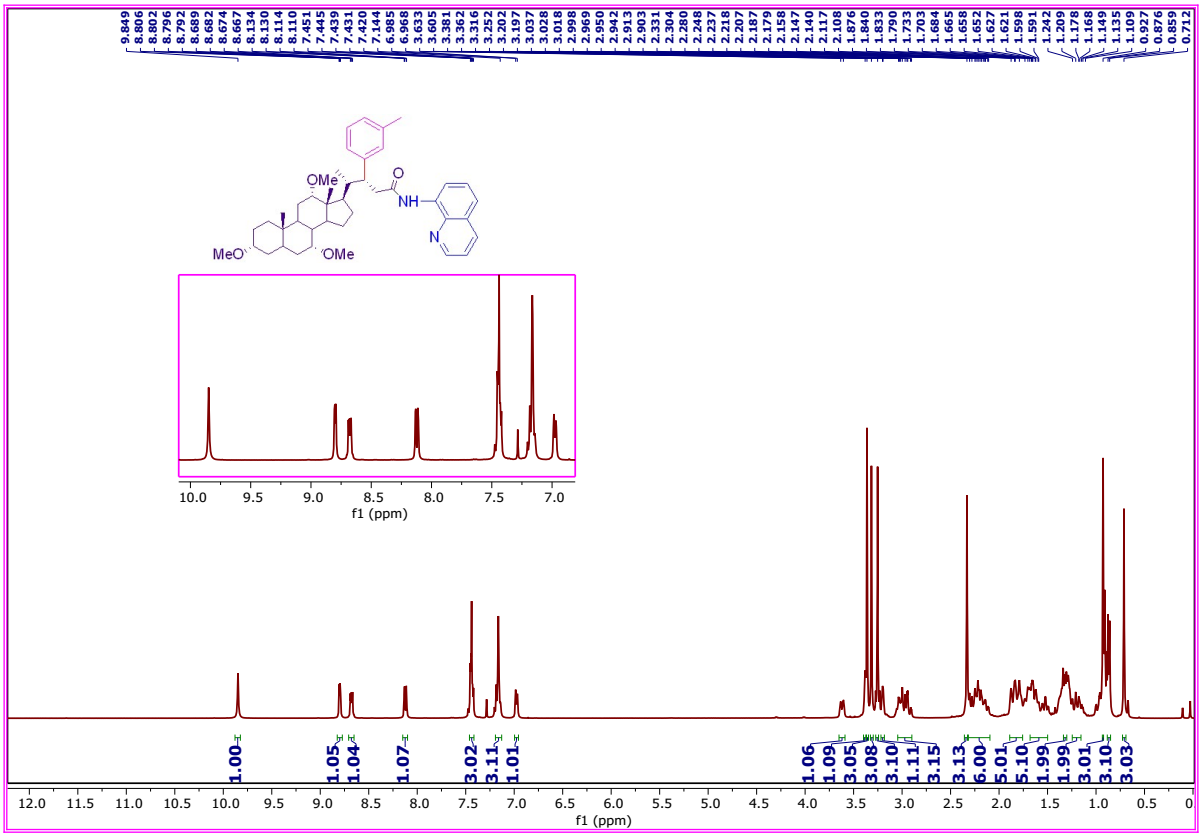
^{1}H NMR of 3aj (400 MHz, $CDCl_3$)



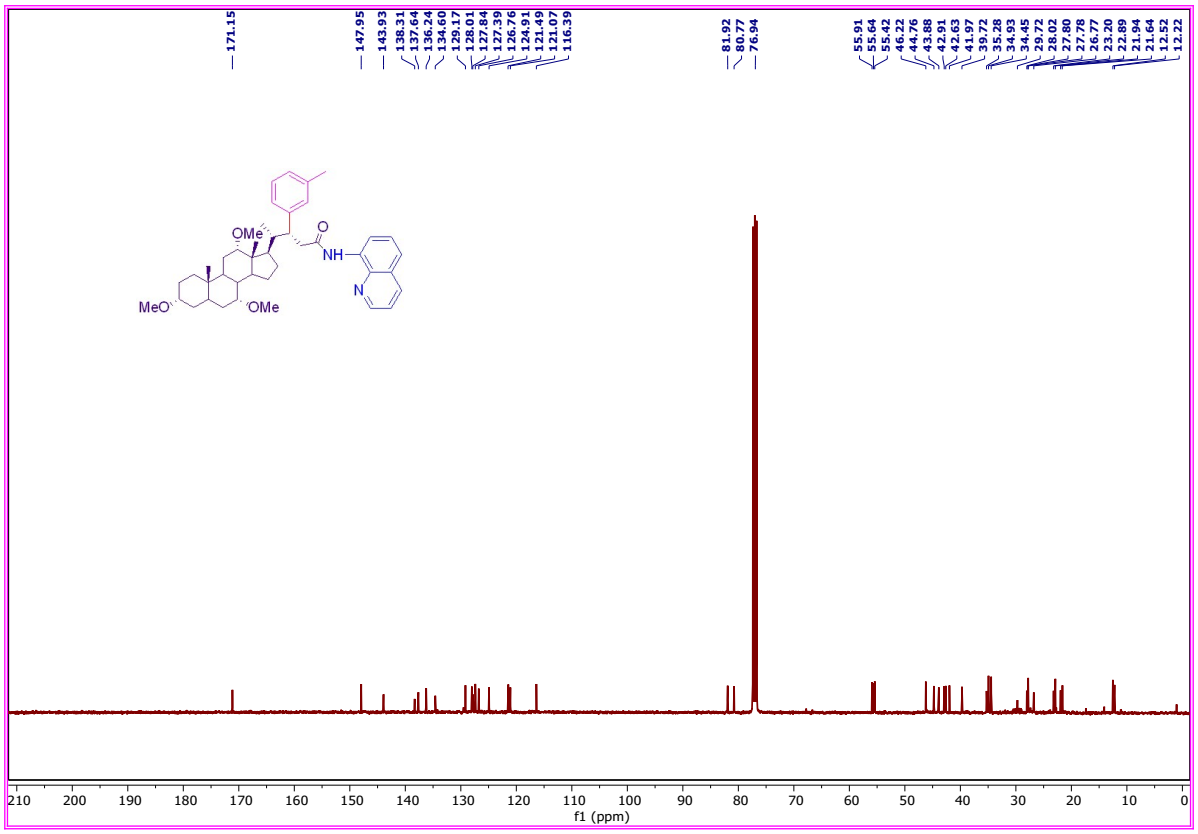
^{13}C NMR of 3aj (400 MHz, $CDCl_3$)



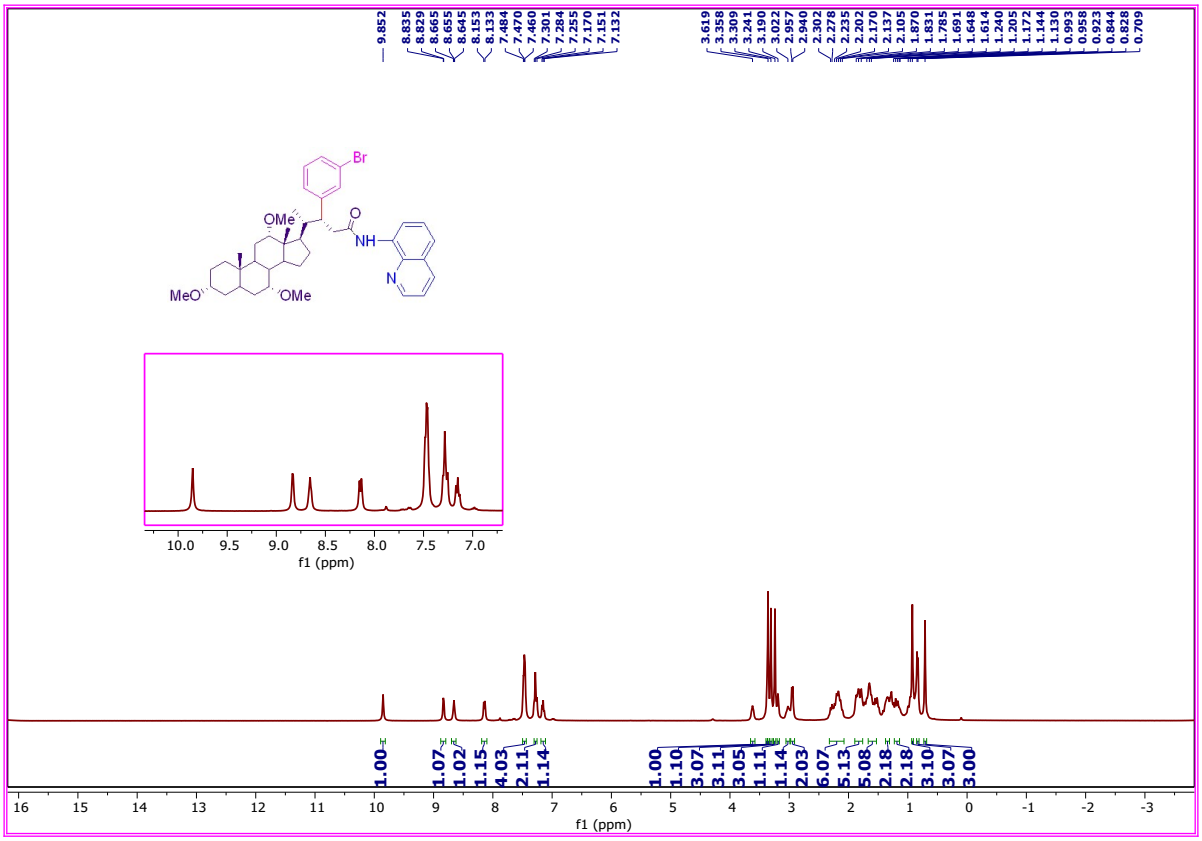
^{1}H NMR of 3ak (400 MHz, $CDCl_3$)



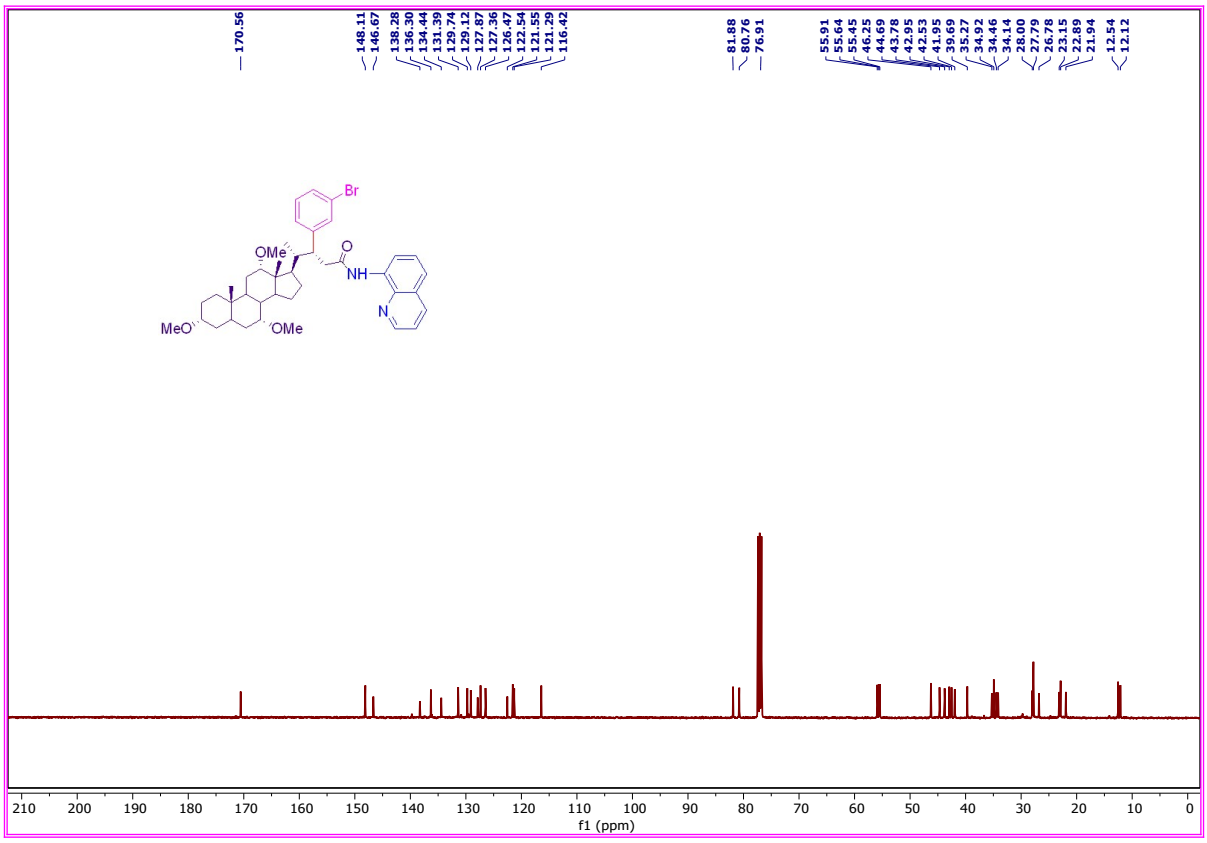
^{13}C NMR of 3ak (400 MHz, $CDCl_3$)



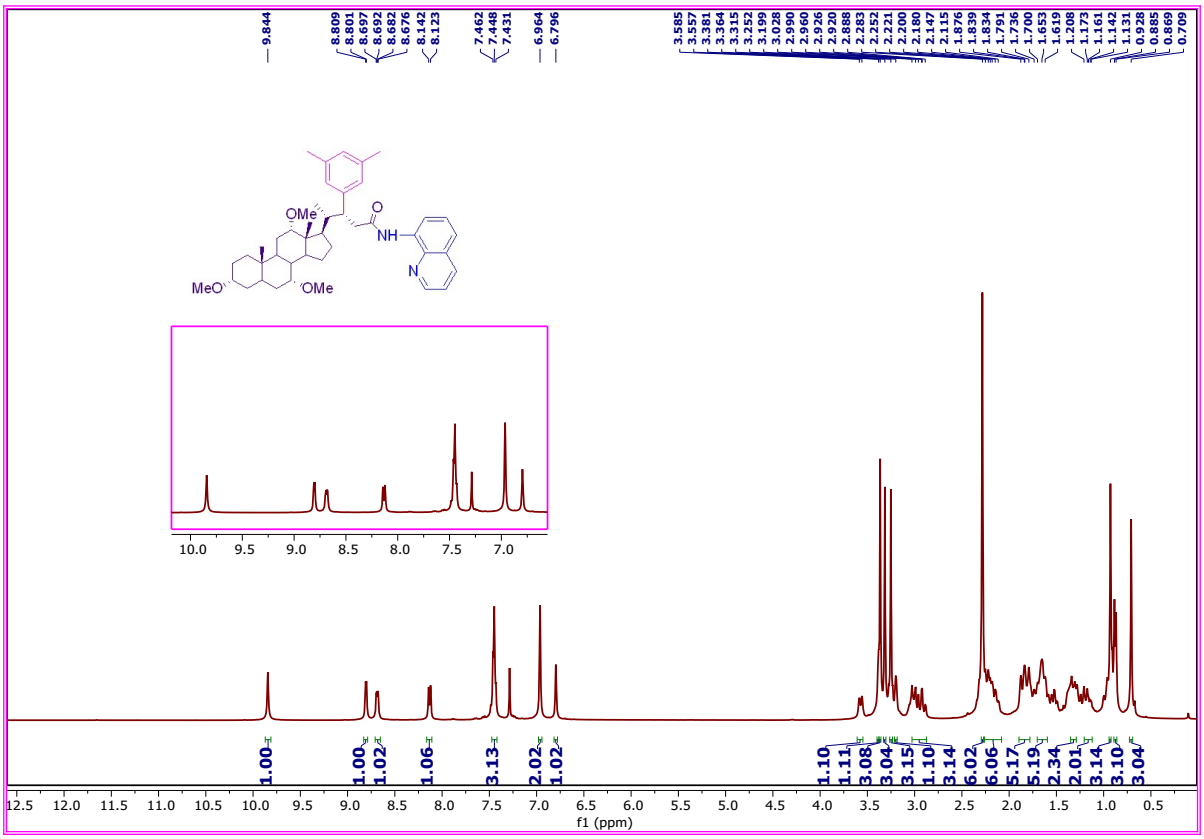
^{1}H NMR of 3al (400 MHz, $CDCl_3$)



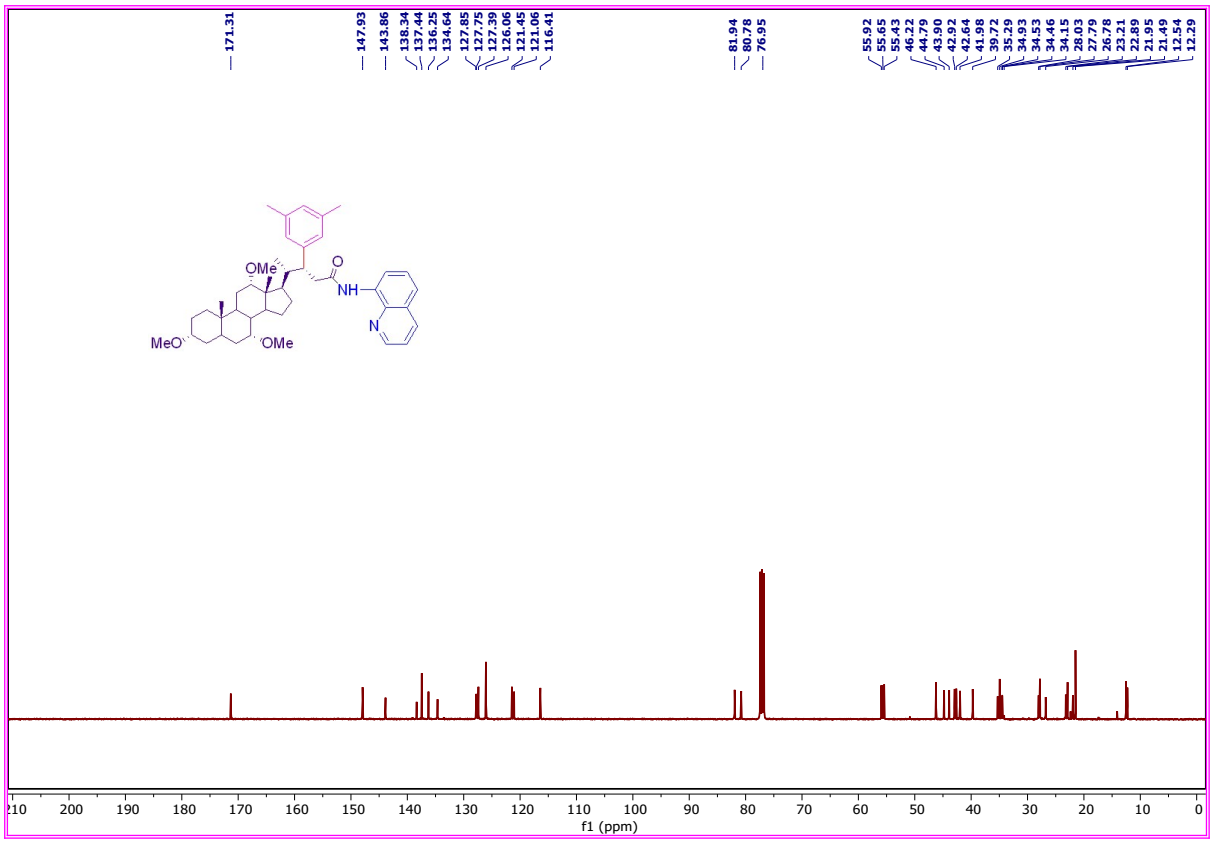
^{13}C NMR of 3al (400 MHz, $CDCl_3$)



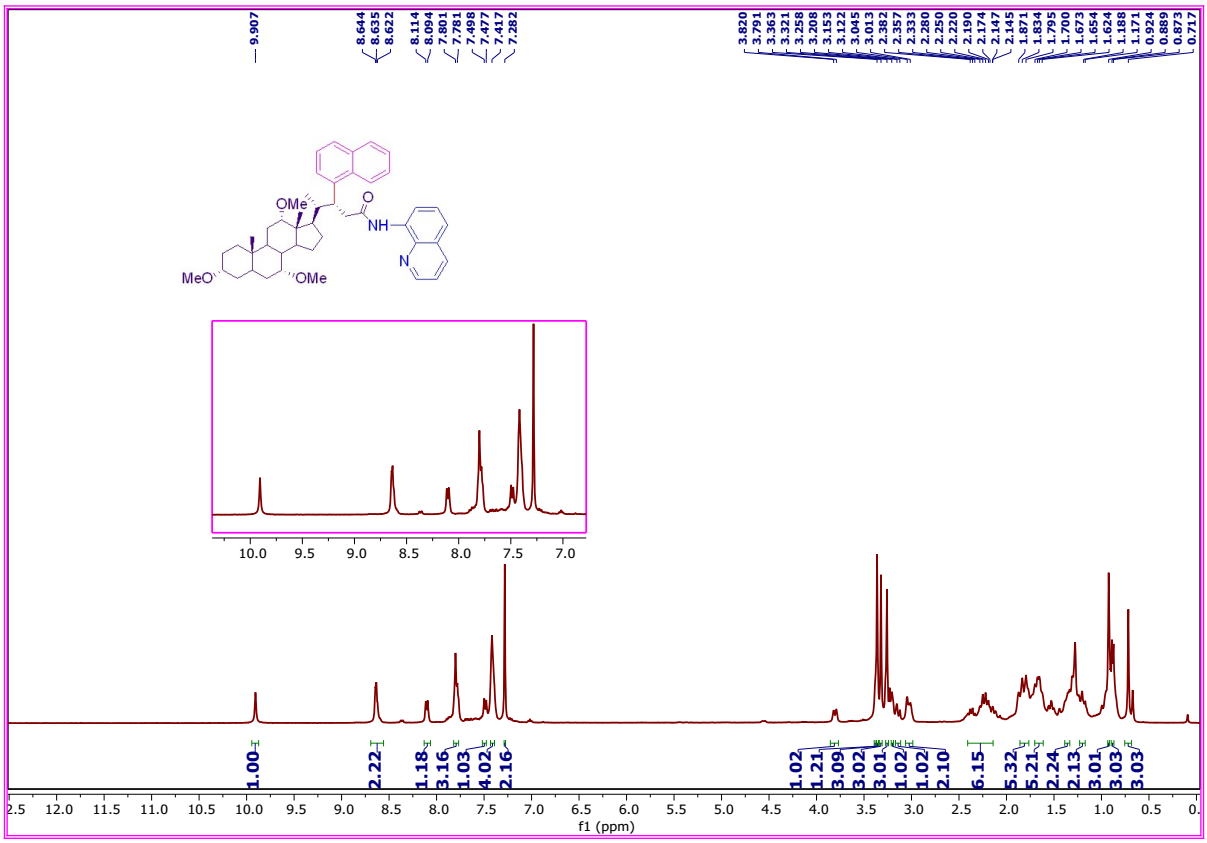
^{1}H NMR of 3aq (400 MHz, $CDCl_3$)



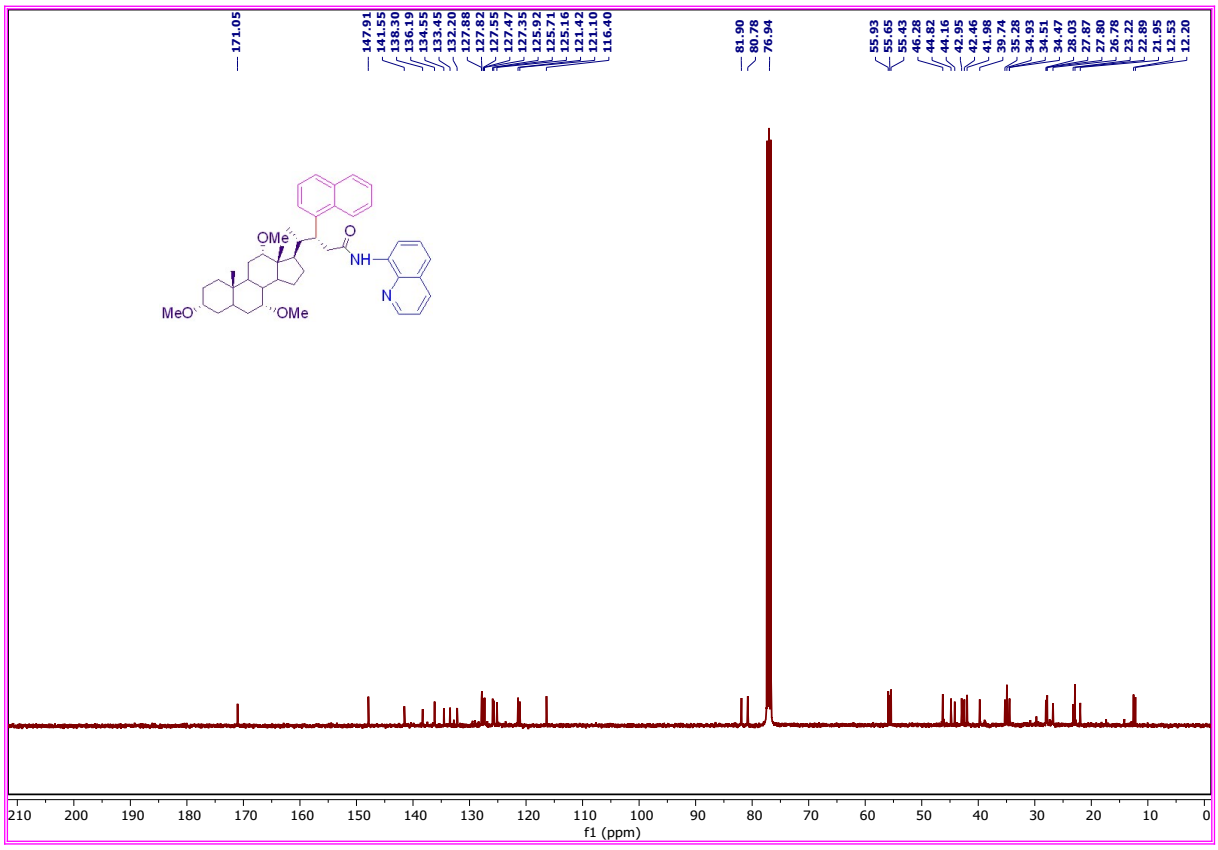
^{13}C NMR of 3aq (400 MHz, $CDCl_3$)



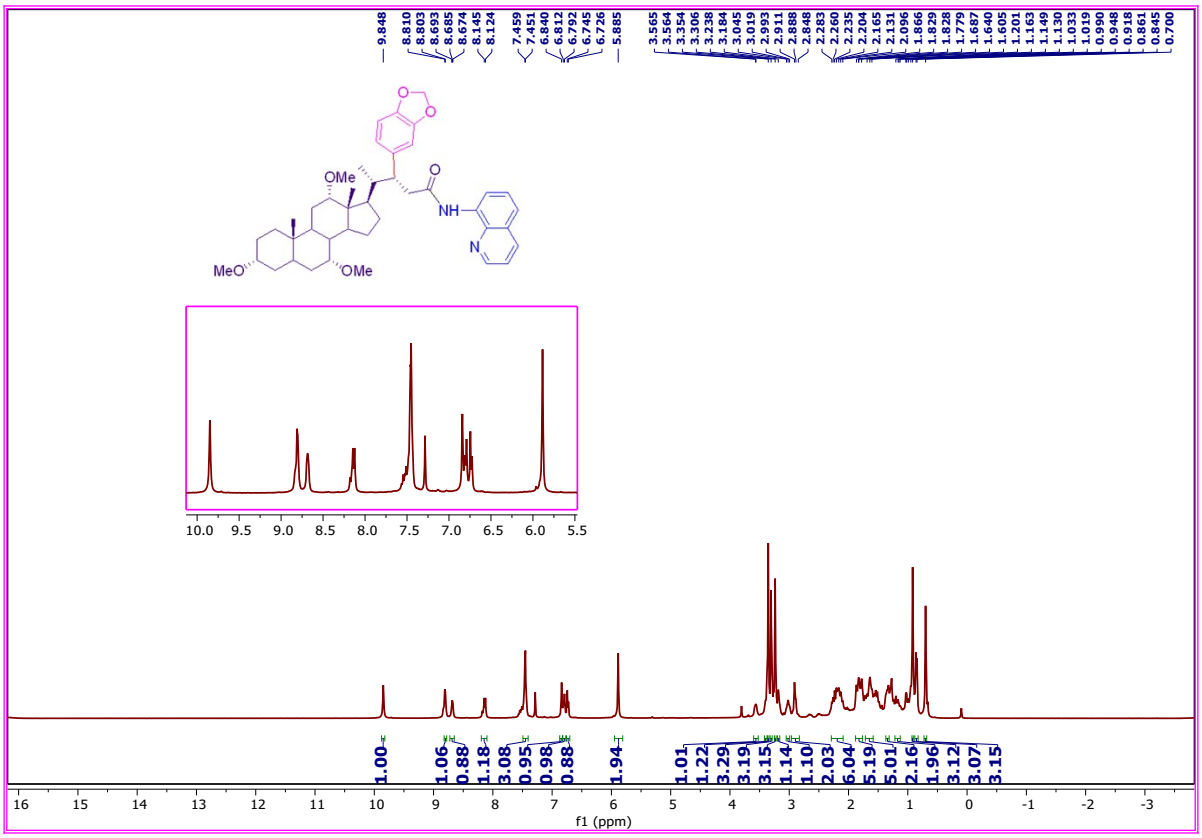
^{1}H NMR of 3ar (400 MHz, $CDCl_3$)



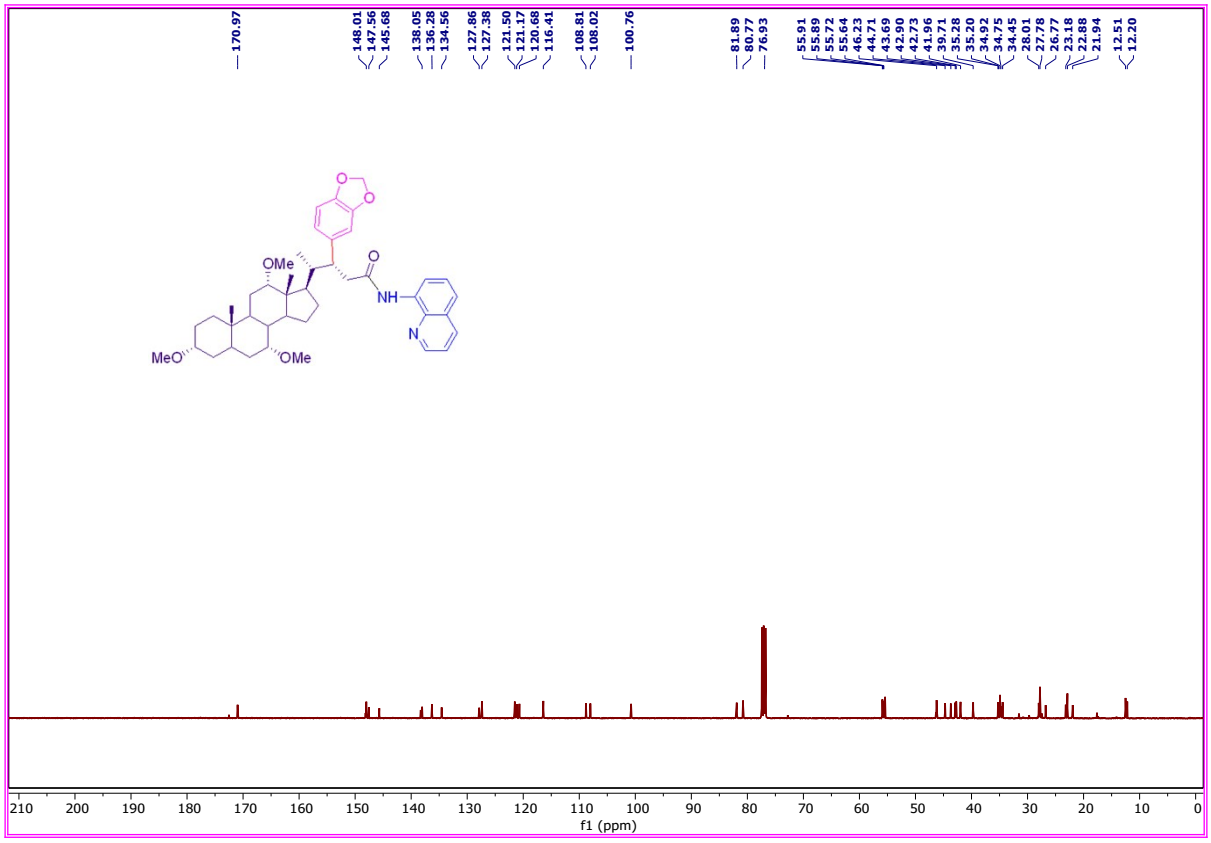
^{13}C NMR of 3ar (400 MHz, $CDCl_3$)



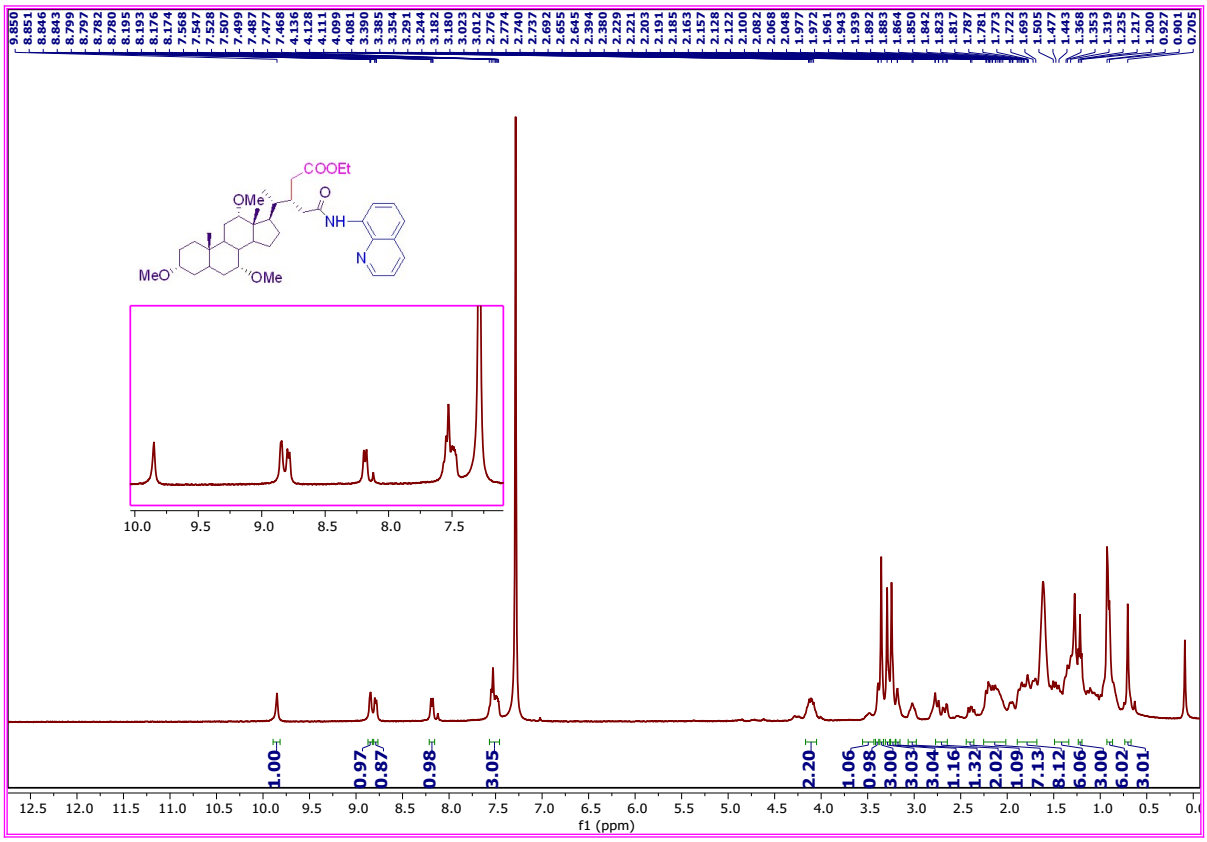
^{1}H NMR of 3as (400 MHz, $CDCl_3$)



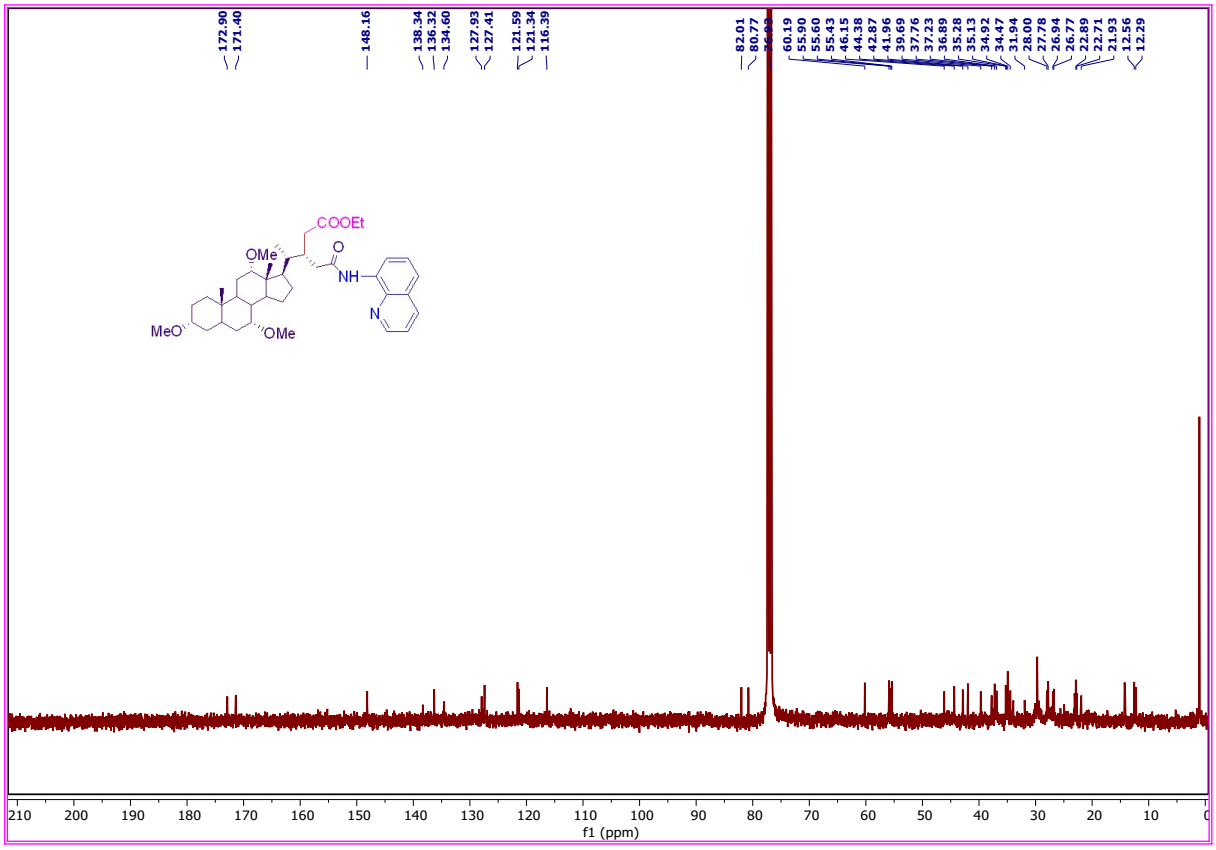
^{13}C NMR of 3as (400 MHz, $CDCl_3$)



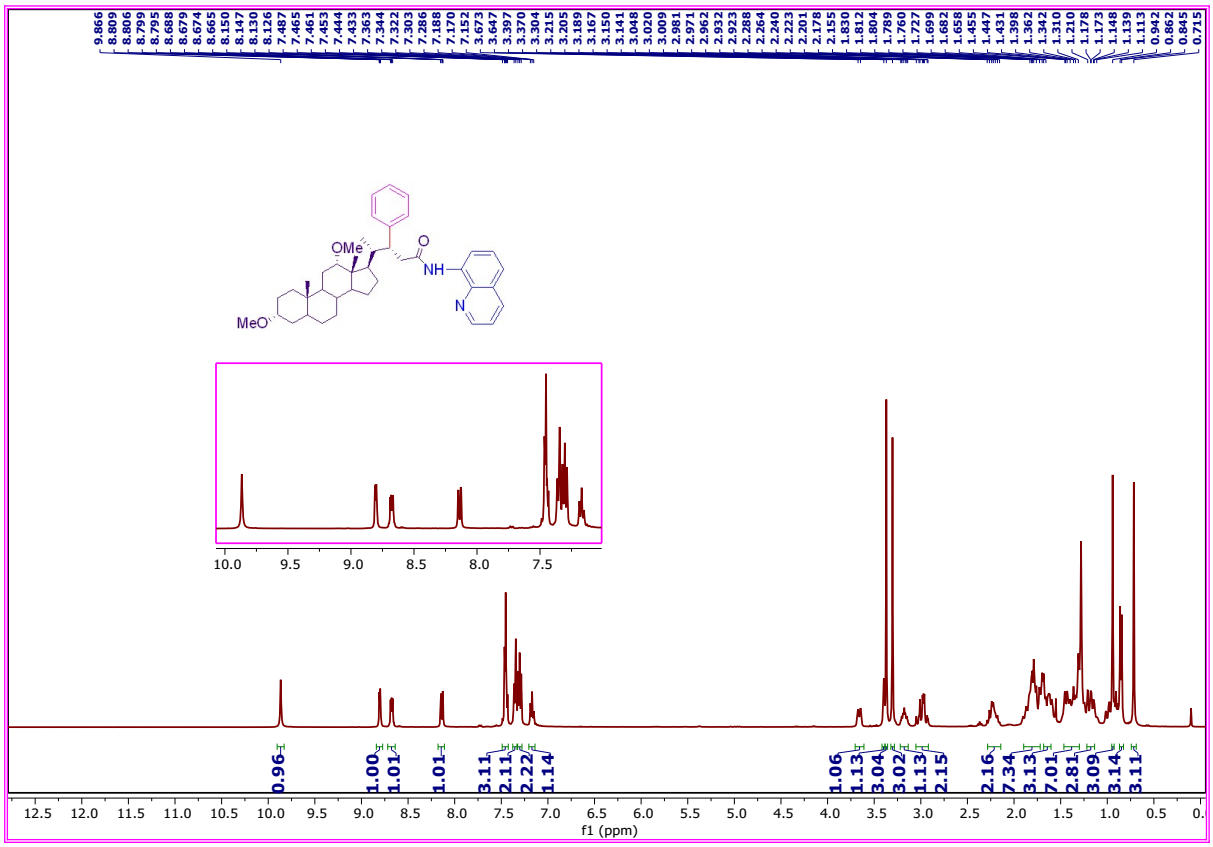
^{1}H NMR of 3ax (400 MHz, $CDCl_3$)



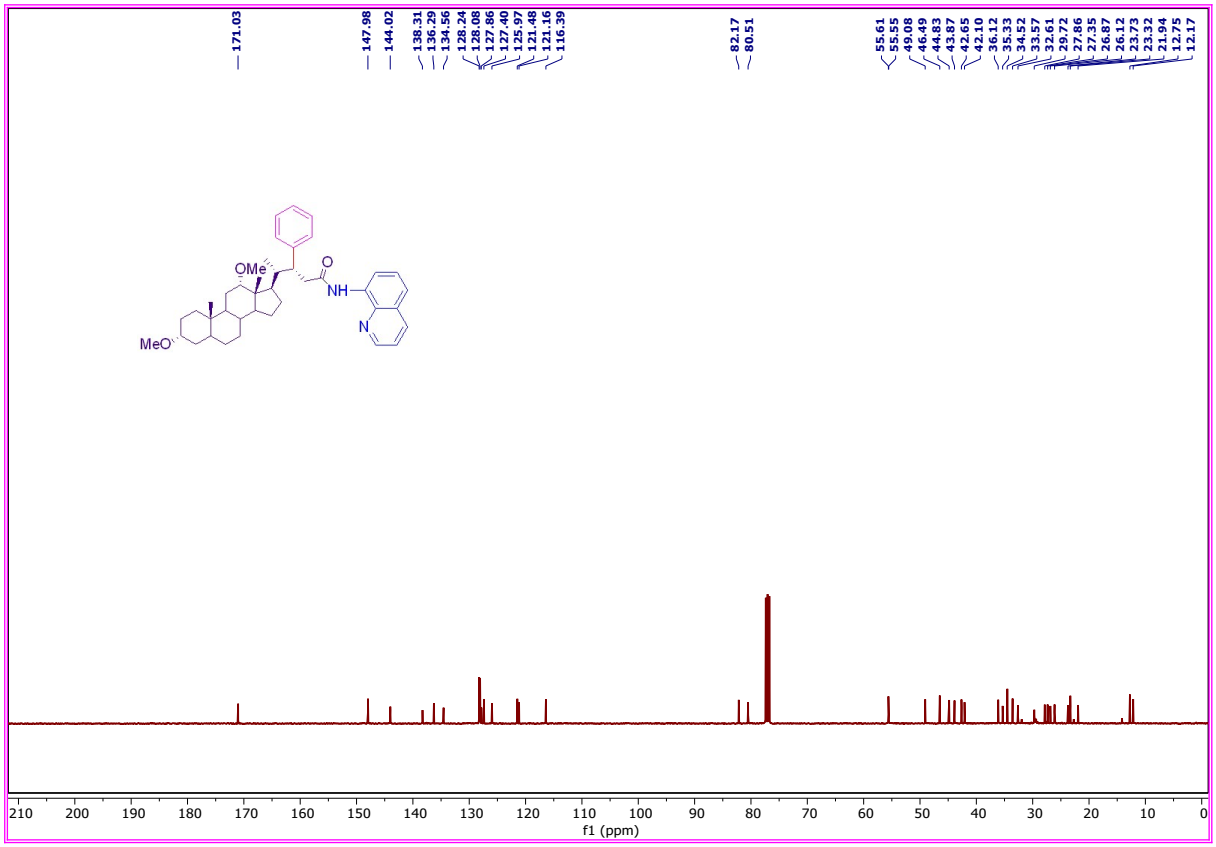
^{13}C NMR of 3ax (400 MHz, $CDCl_3$)



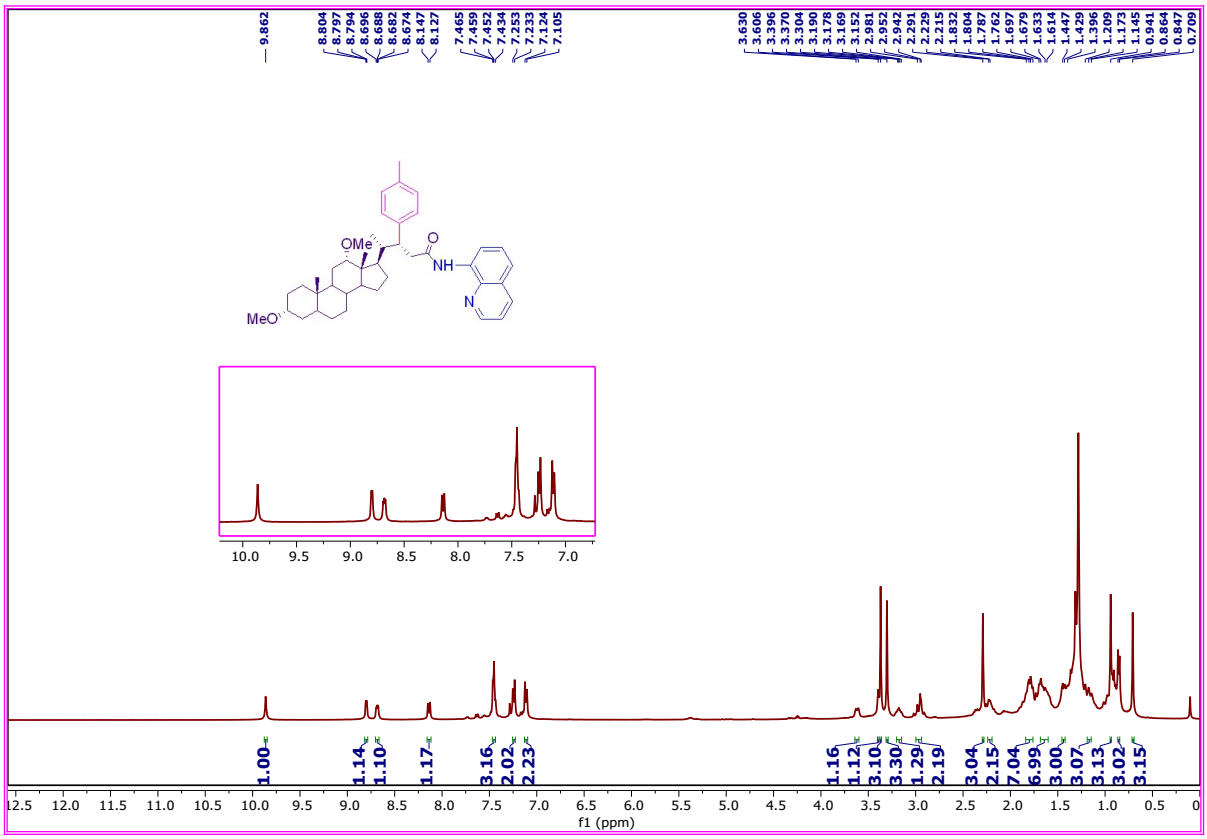
^{1}H NMR of 3ba (400 MHz, $CDCl_3$)



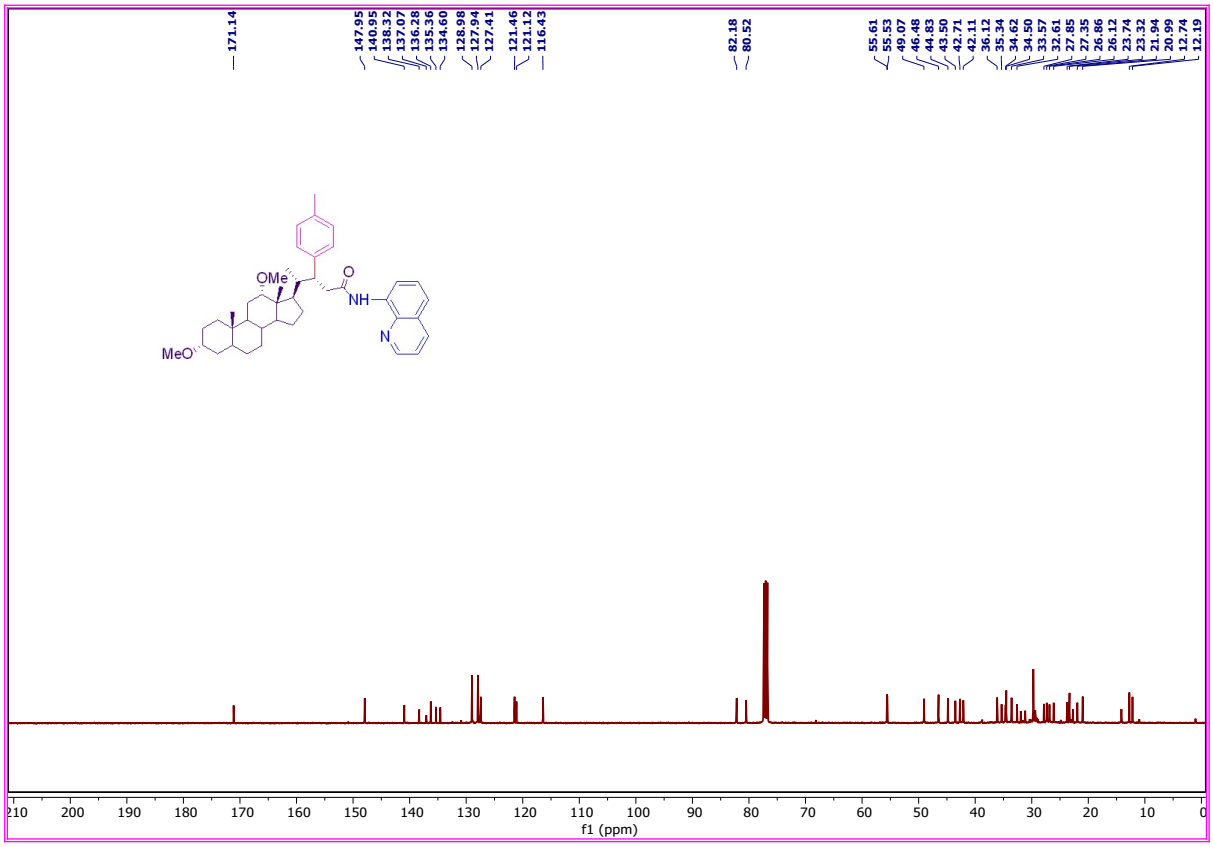
^{13}C NMR of 3ba (400 MHz, $CDCl_3$)



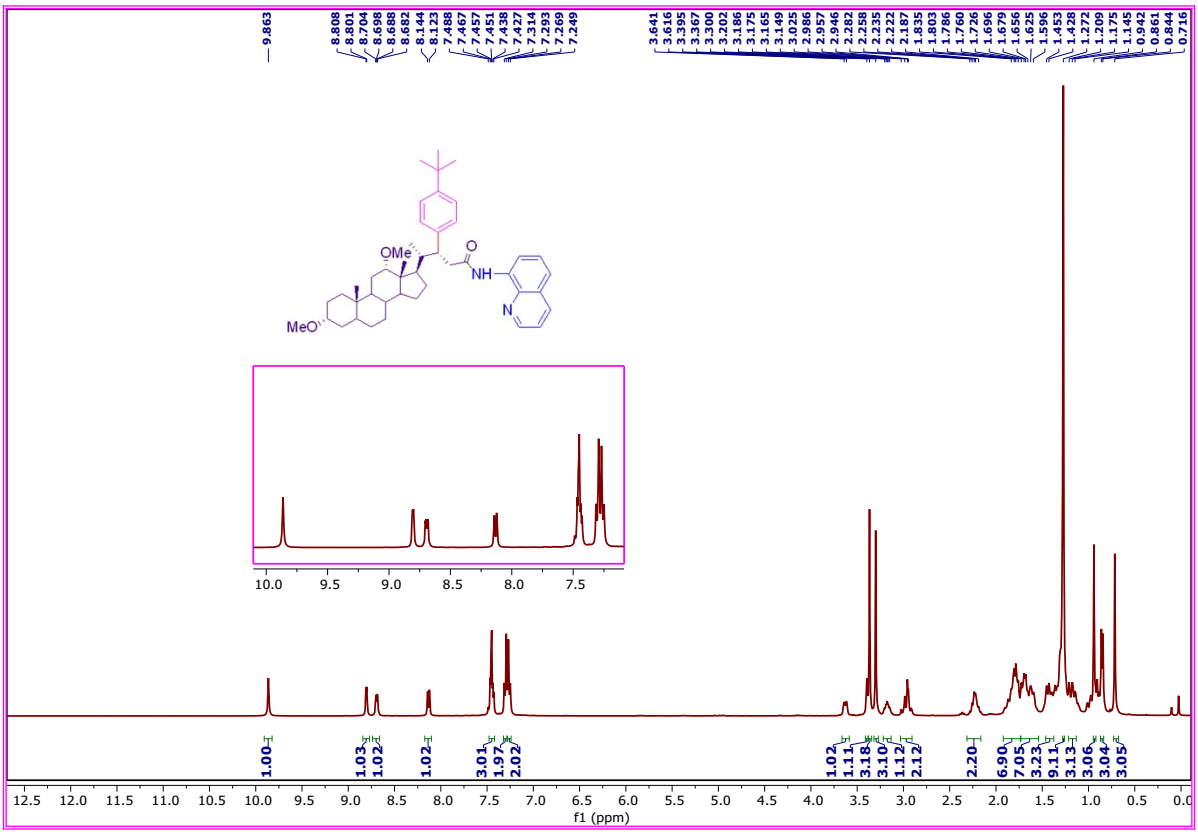
^{1}H NMR of 3bb (400 MHz, $CDCl_3$)



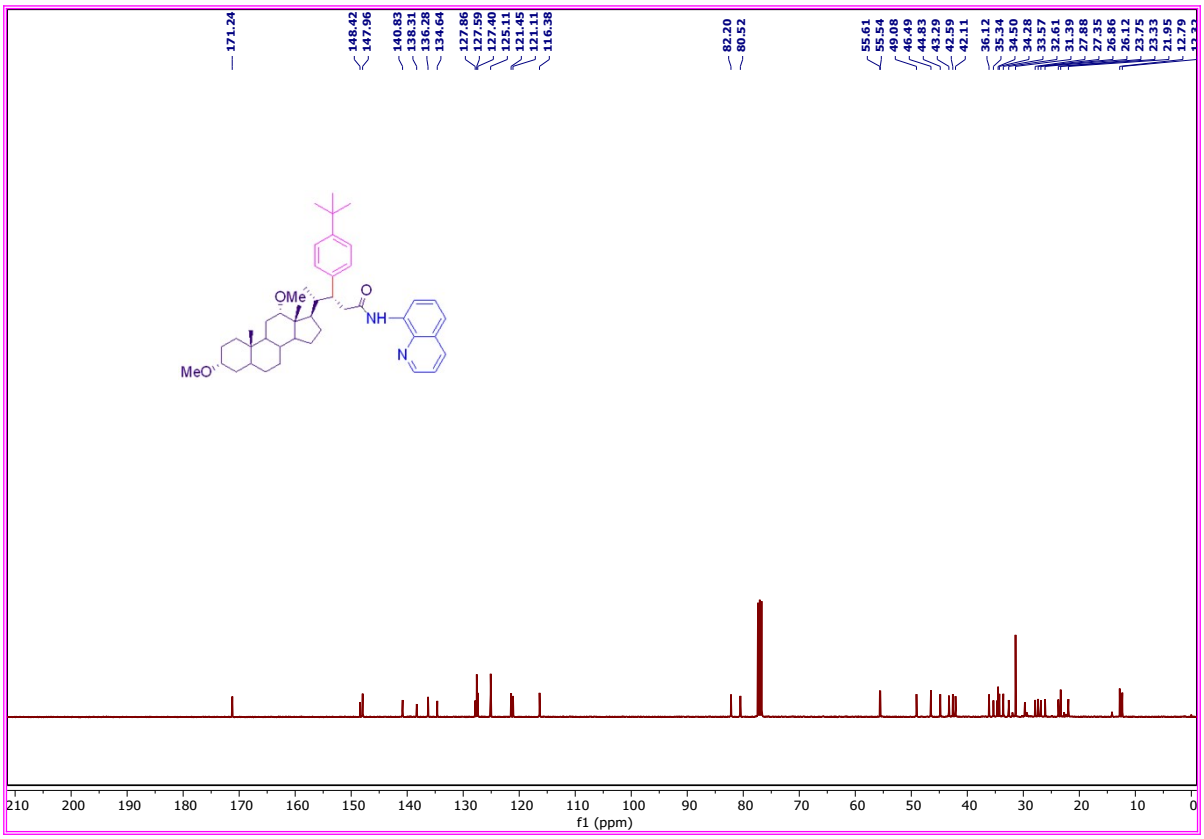
^{13}C NMR of 3bb (400 MHz, $CDCl_3$)



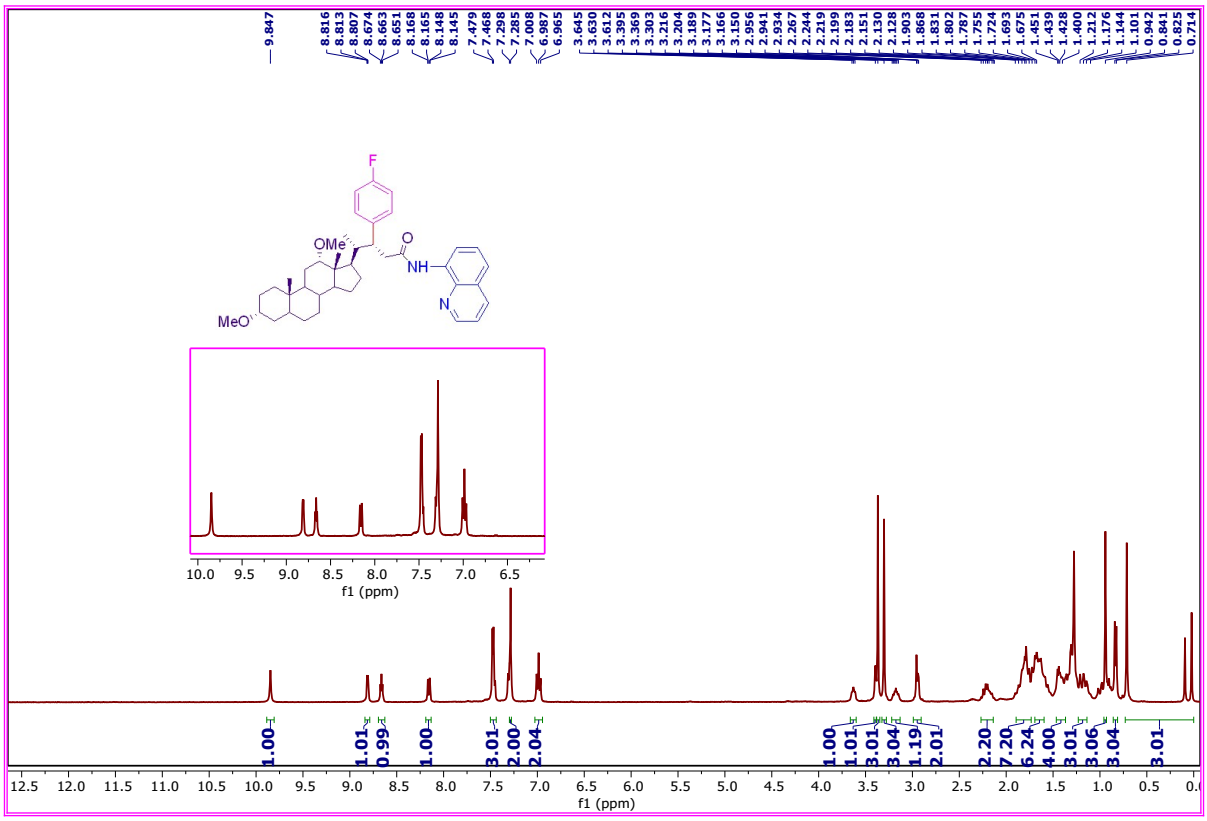
^{1}H NMR of 3bc (400 MHz, $CDCl_3$)



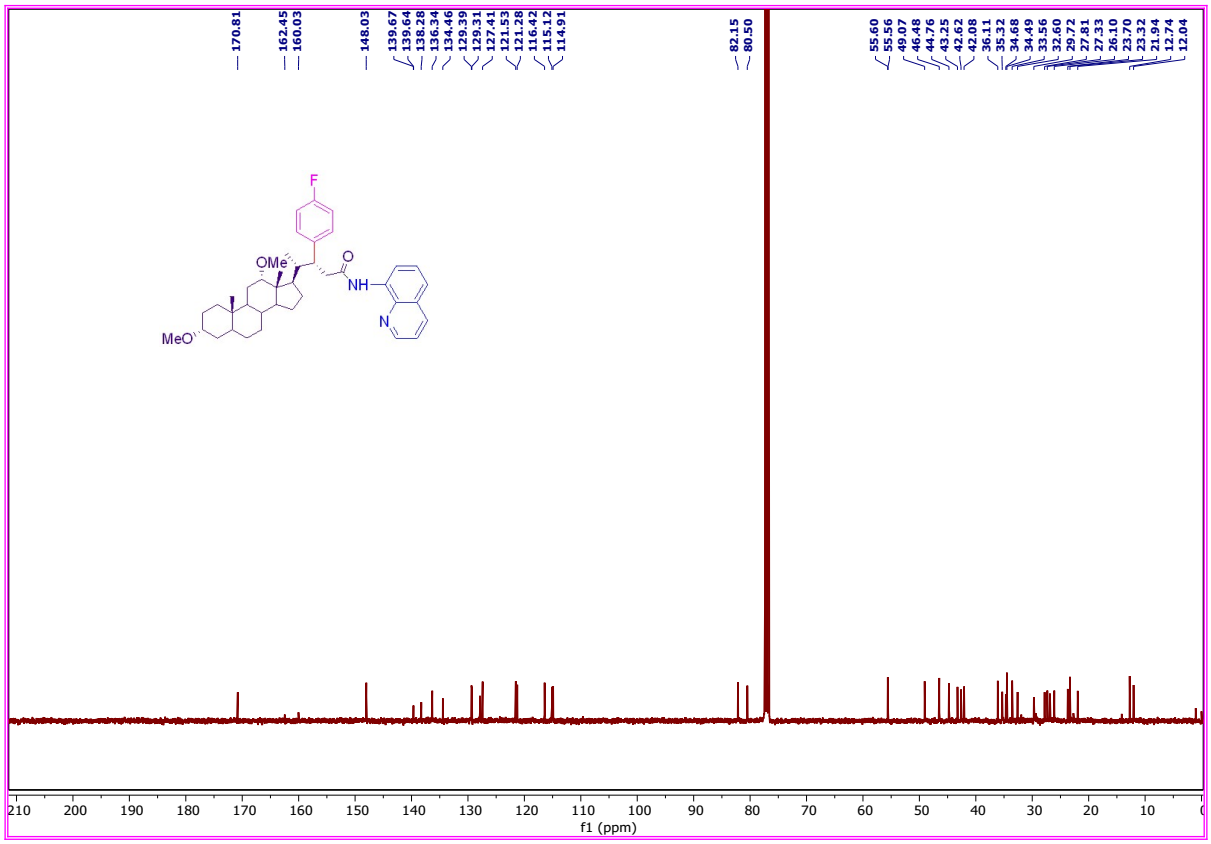
^{13}C NMR of 3bc (400 MHz, $CDCl_3$)



^{1}H NMR of 3be (400 MHz, $CDCl_3$)

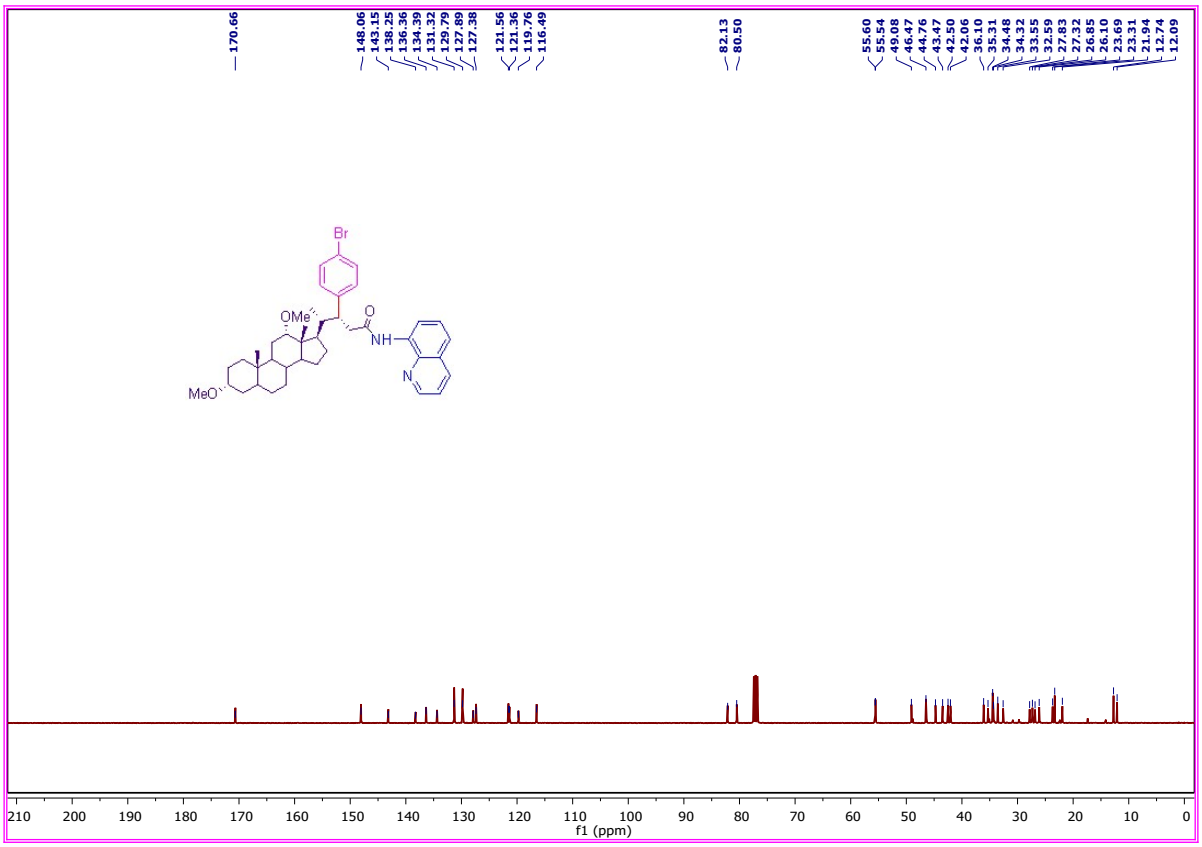


^{13}C NMR of 3be (400 MHz, $CDCl_3$)

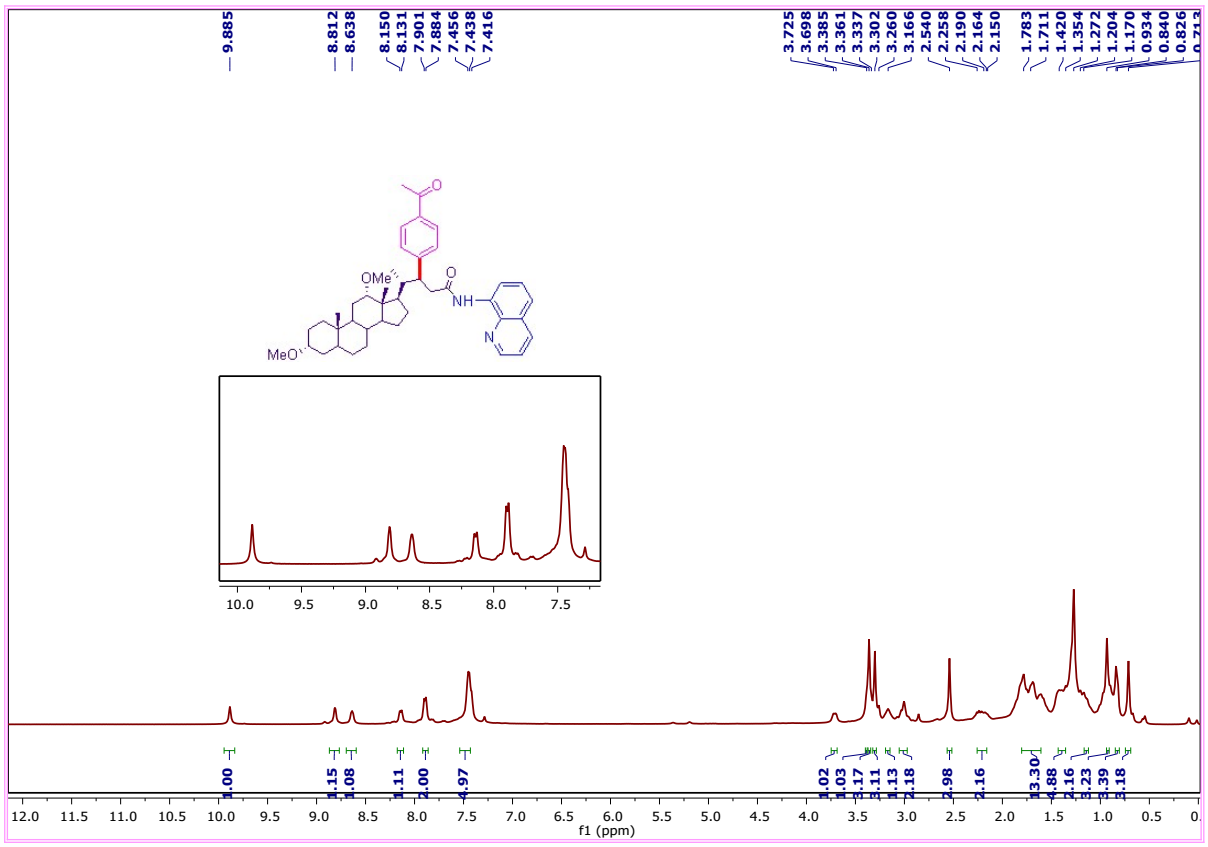


^{1}H NMR of 3bg (400 MHz, $CDCl_3$)

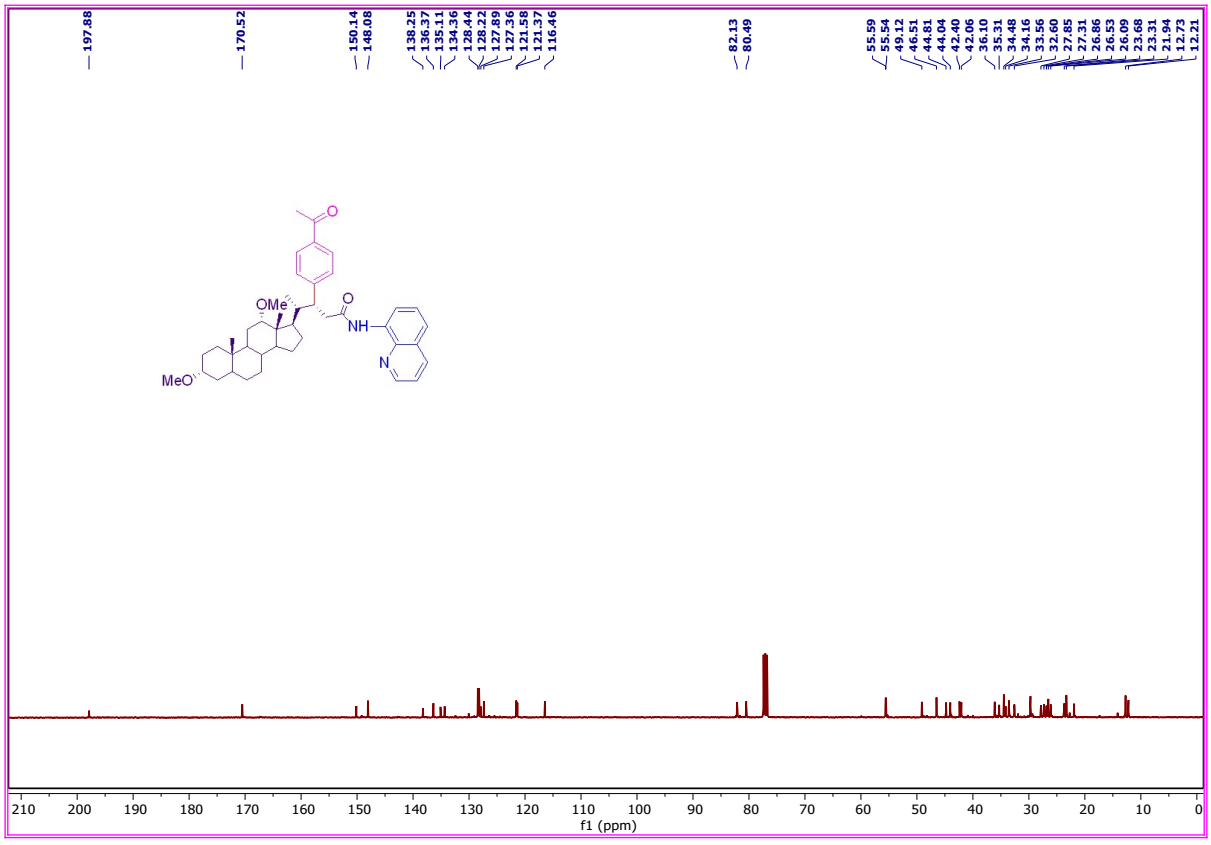
^{13}C NMR of 3bg (400 MHz, $CDCl_3$)



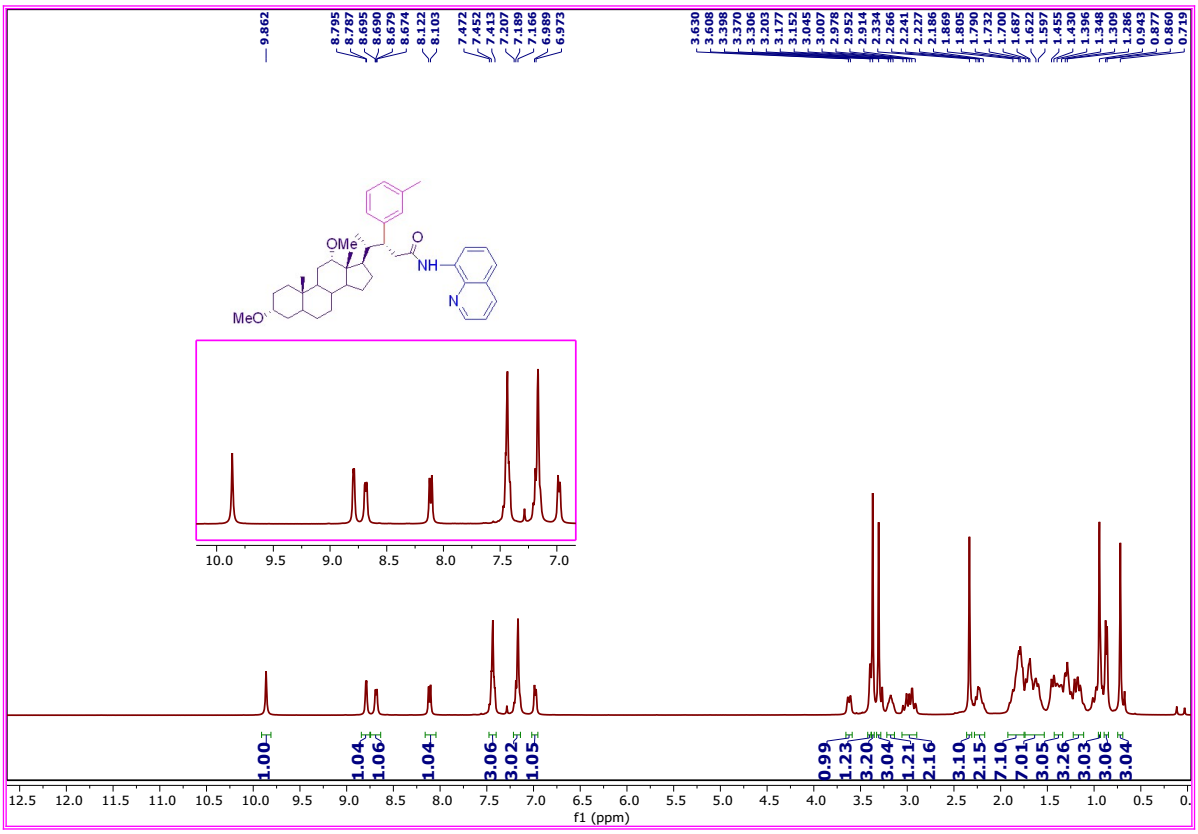
^{1}H NMR of 3bh (400 MHz, $CDCl_3$)



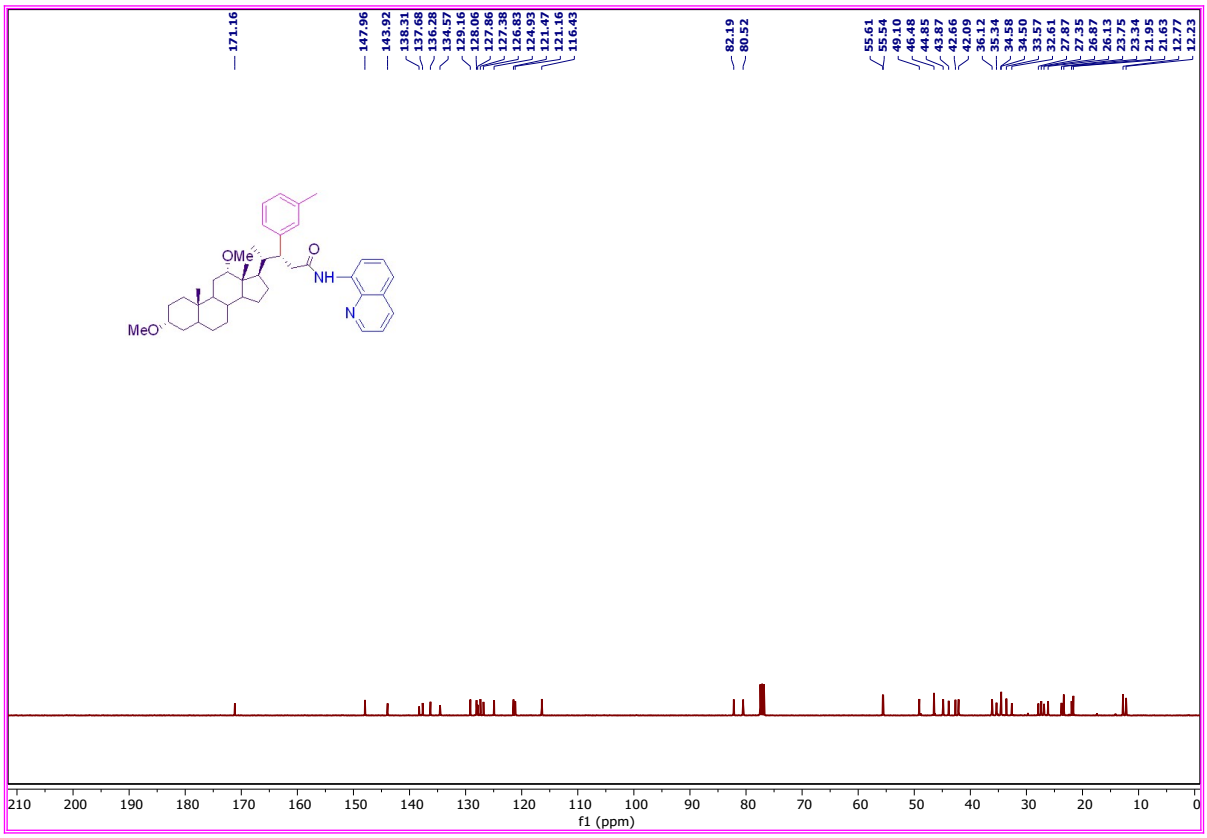
^{13}C NMR of 3bh (400 MHz, $CDCl_3$)



^{1}H NMR of 3bk (400 MHz, $CDCl_3$)

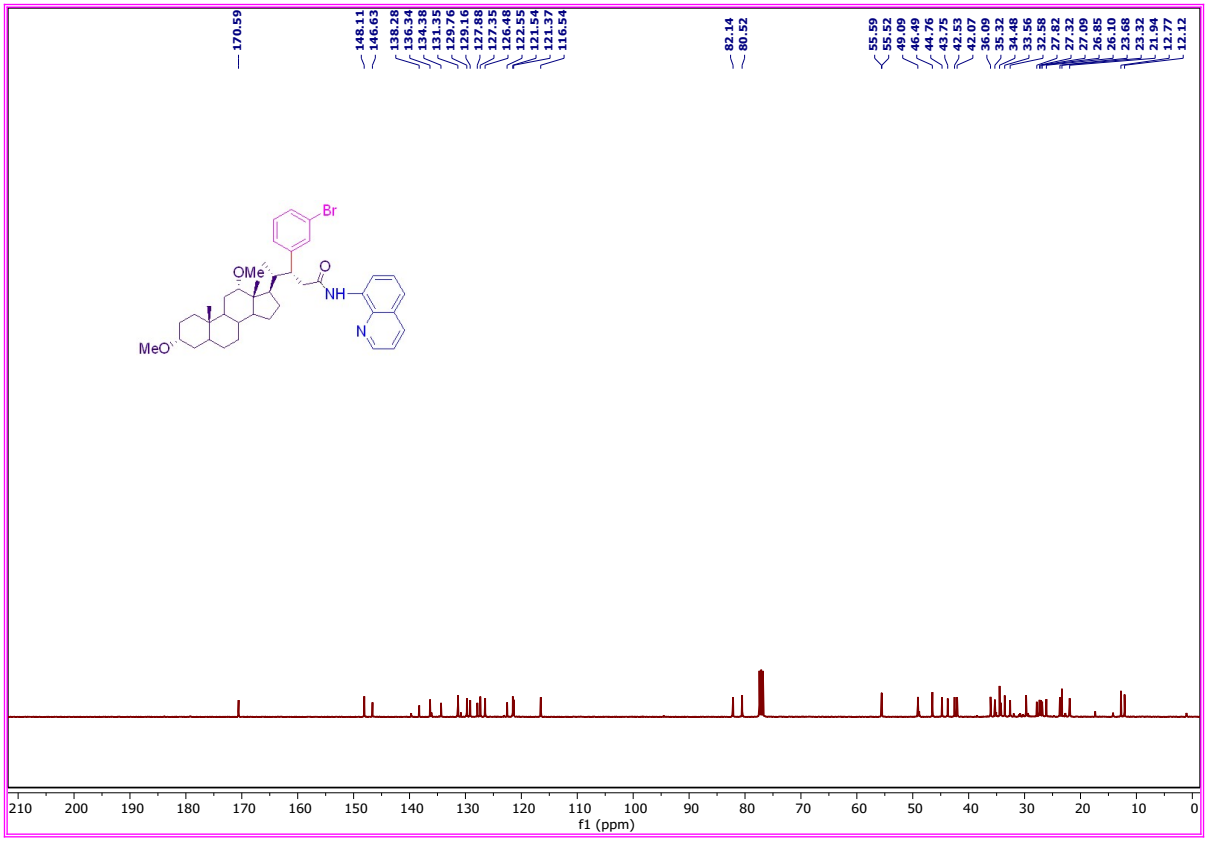


^{13}C NMR of 3bk (400 MHz, $CDCl_3$)

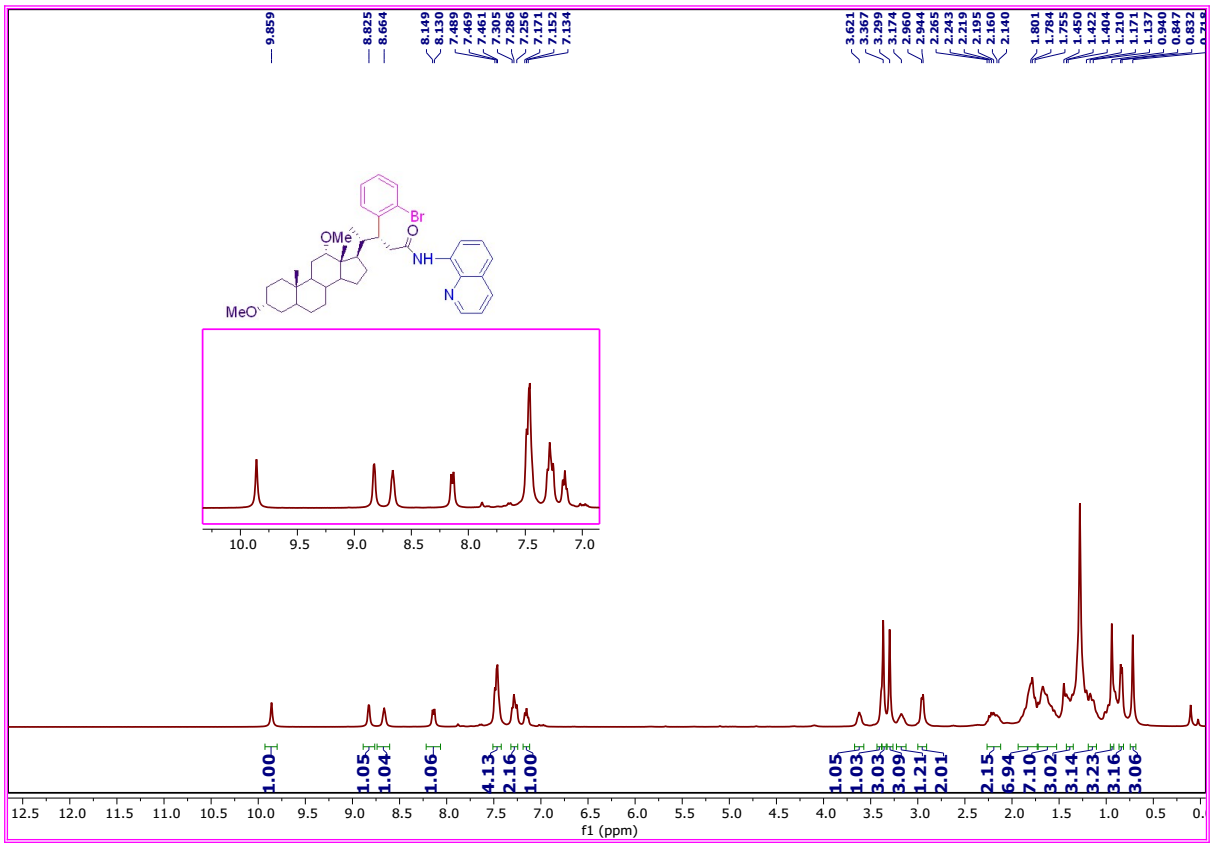


^{1}H NMR of 3bl (400 MHz, $CDCl_3$)

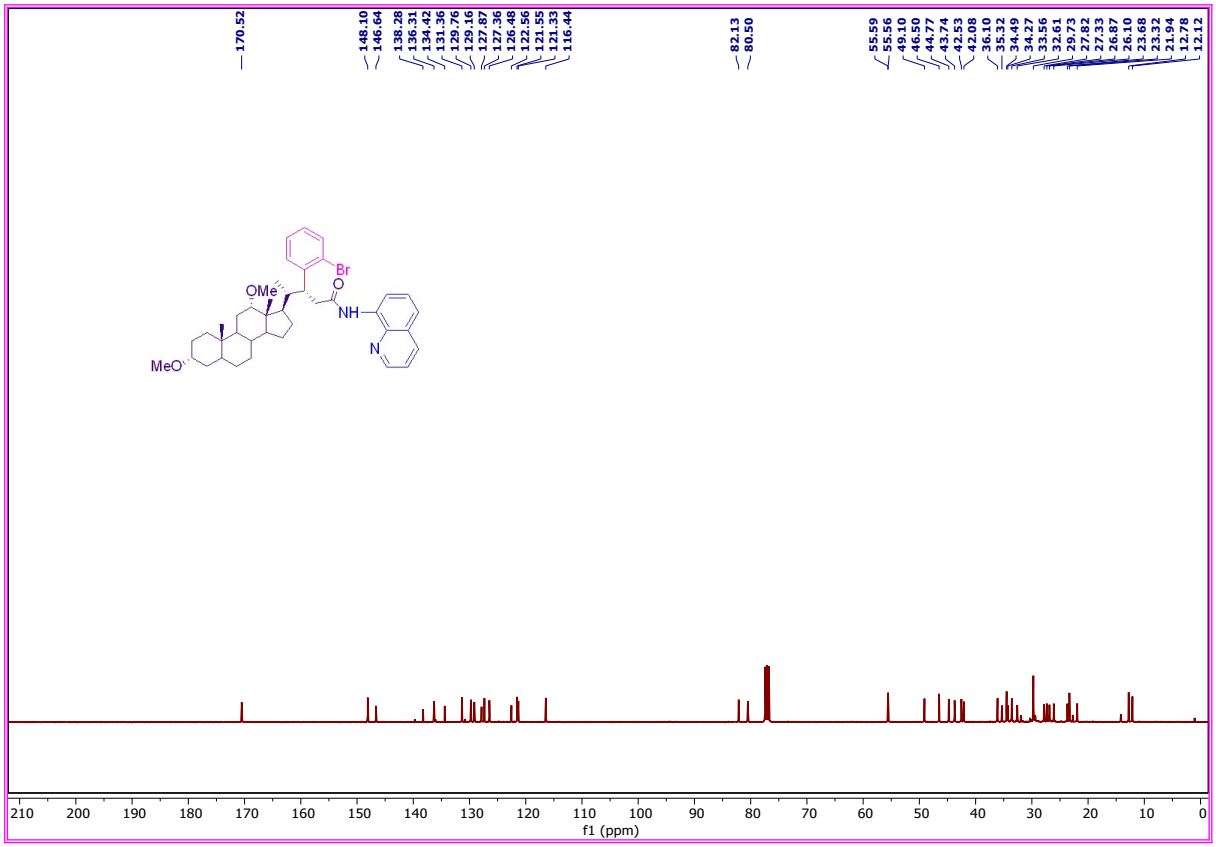
^{13}C NMR of 3bl (400 MHz, $CDCl_3$)



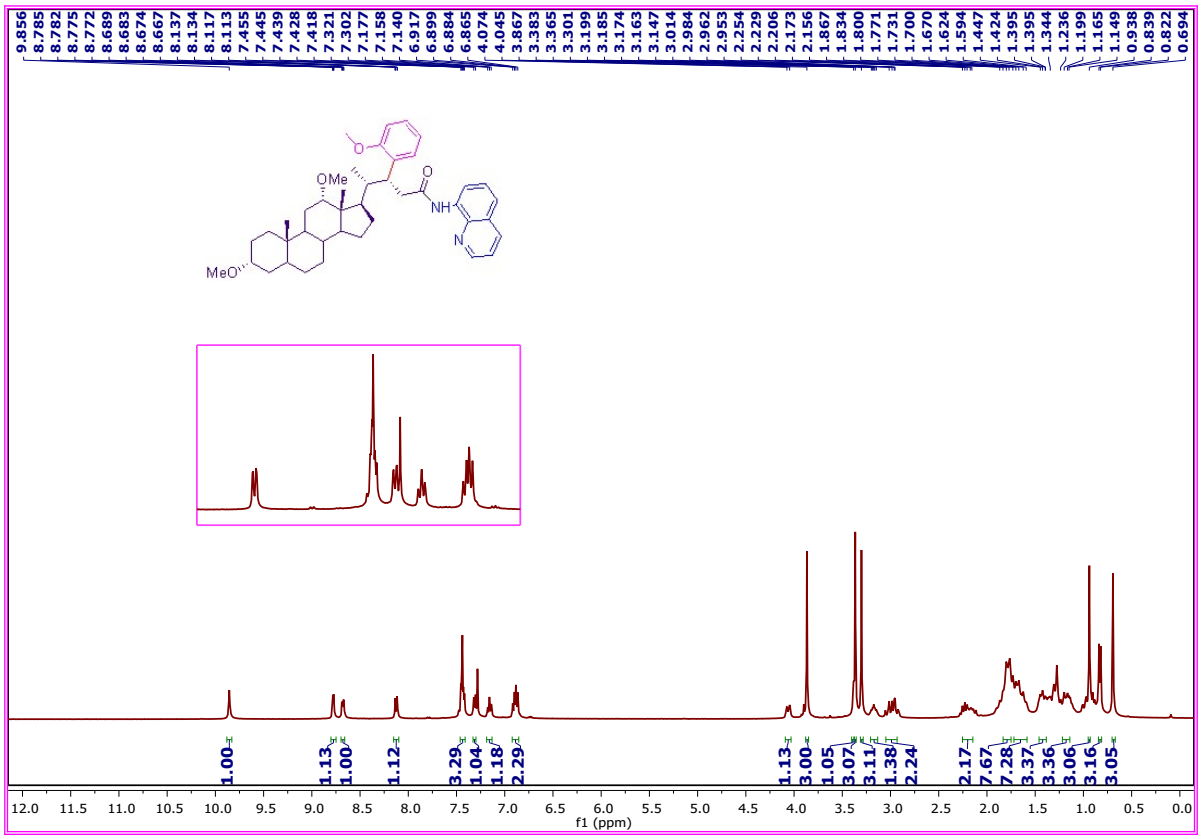
^{1}H NMR of 3bm (400 MHz, $CDCl_3$)



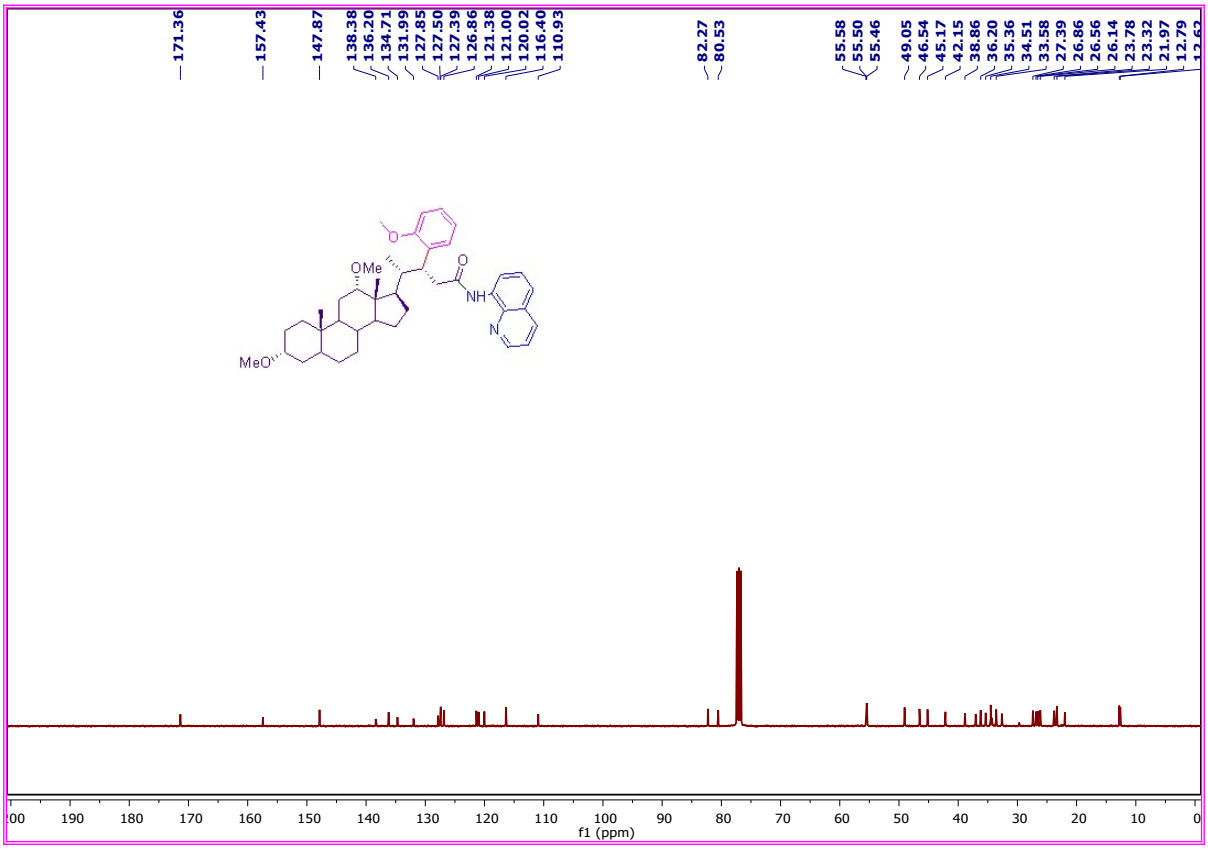
^{13}C NMR of 3bm (400 MHz, $CDCl_3$)



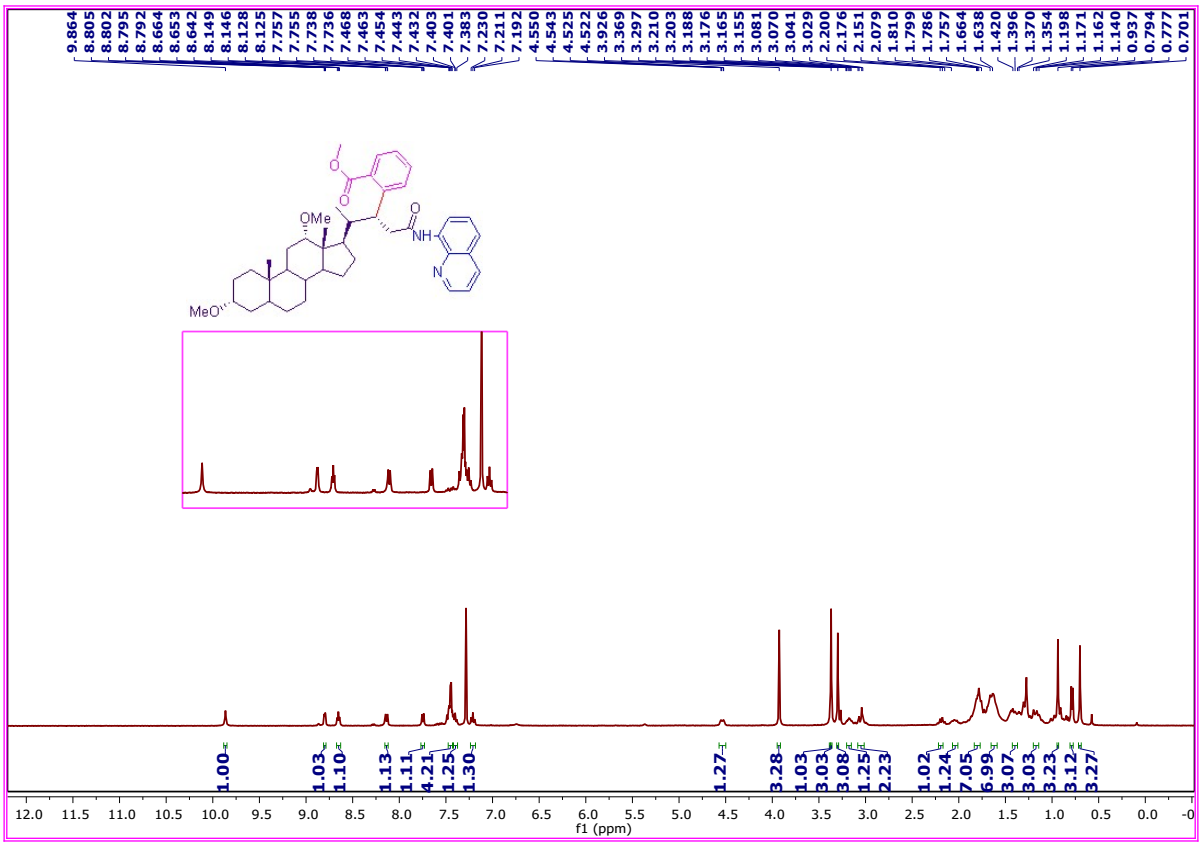
^{1}H NMR of 3bn (400 MHz, $CDCl_3$)



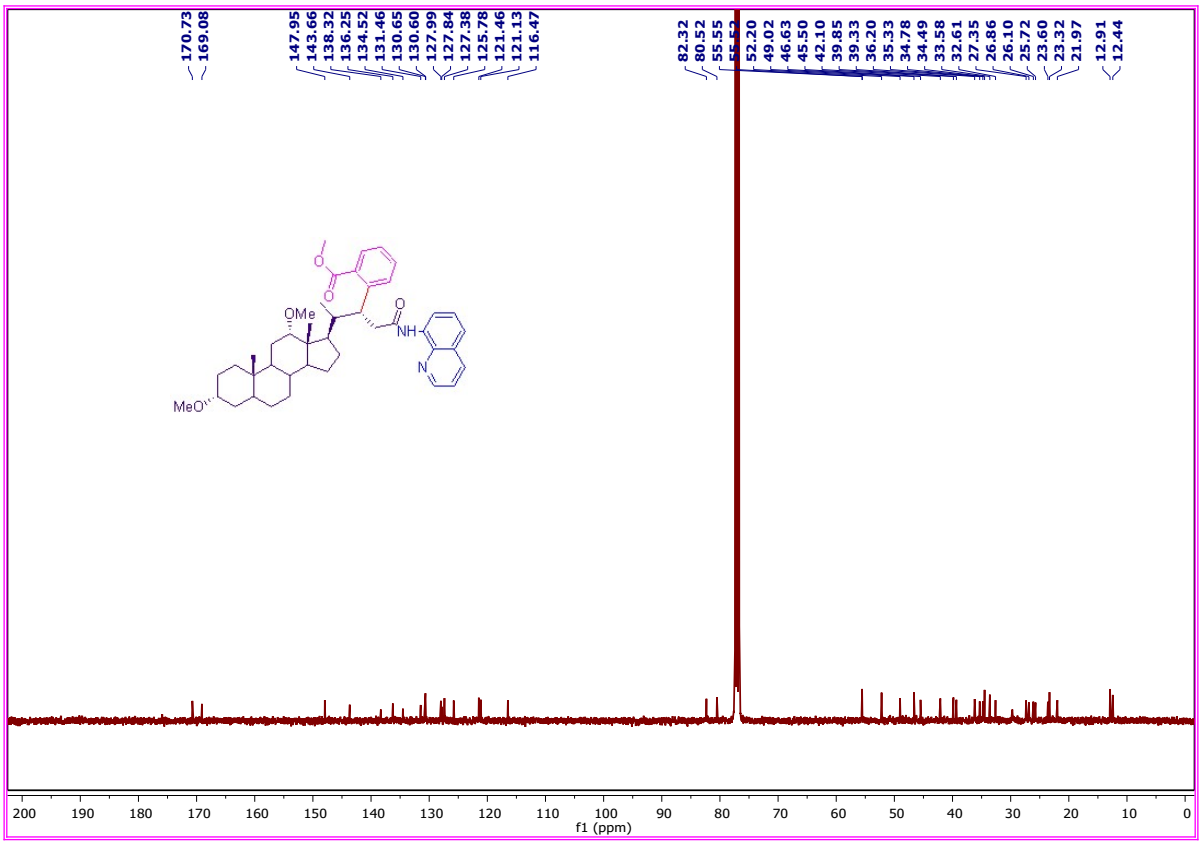
^{13}C NMR of 3bn (400 MHz, $CDCl_3$)



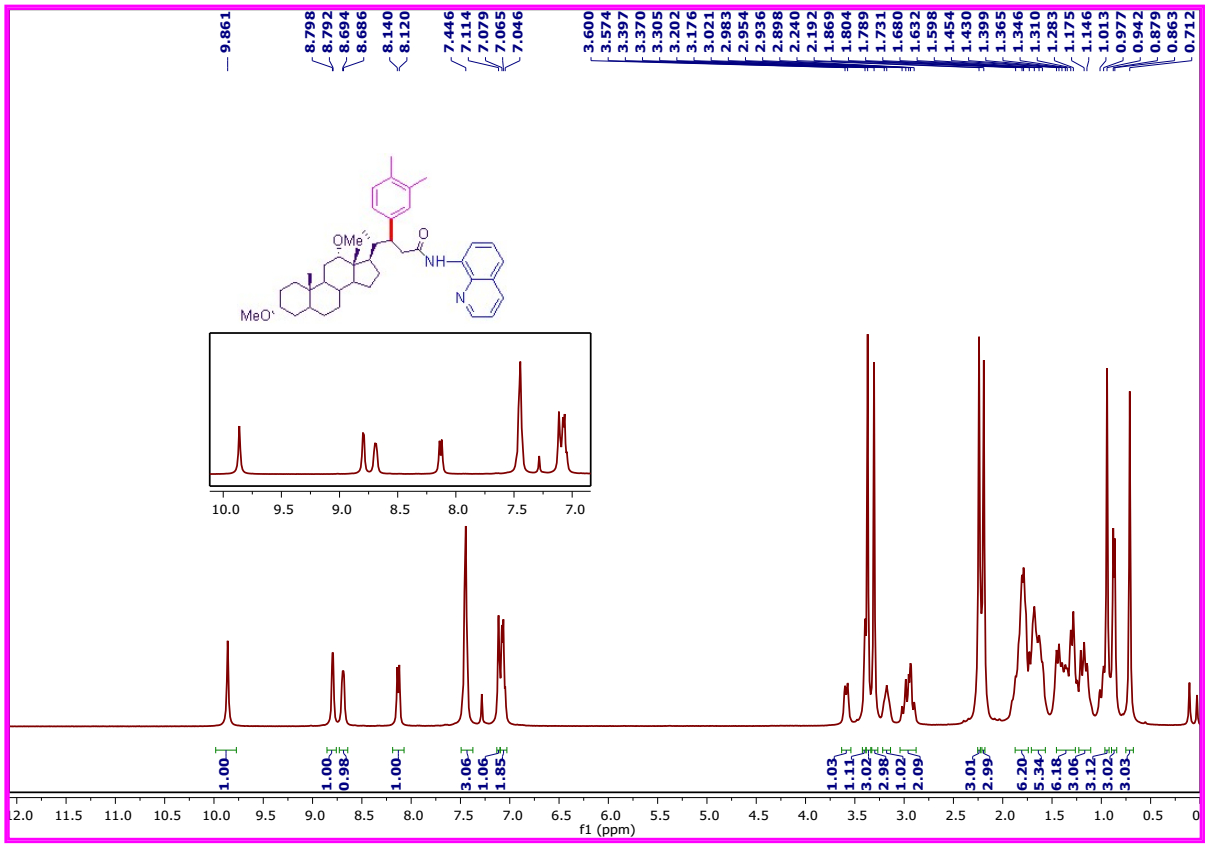
^{1}H NMR of 3bo (400 MHz, $CDCl_3$)



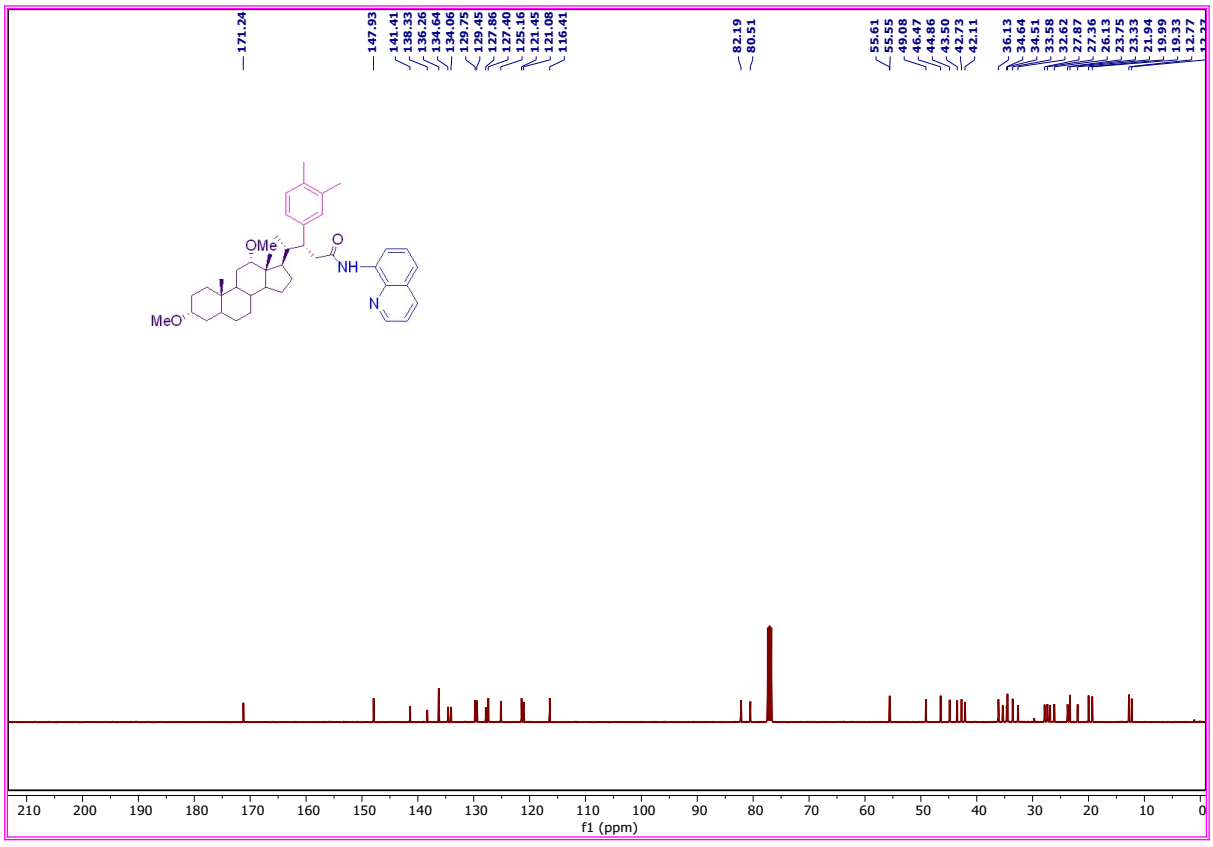
^{13}C NMR of 3bo (400 MHz, $CDCl_3$)



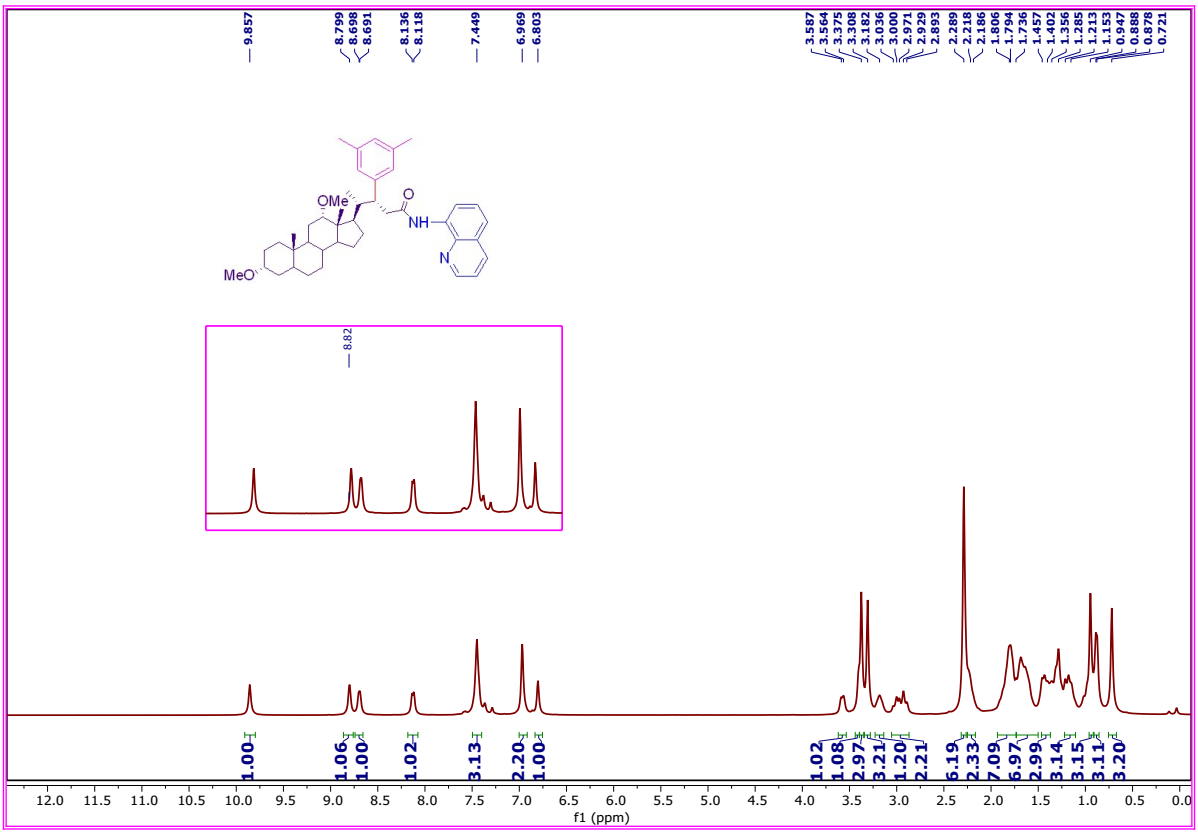
^{1}H NMR of 3bp (400 MHz, $CDCl_3$)



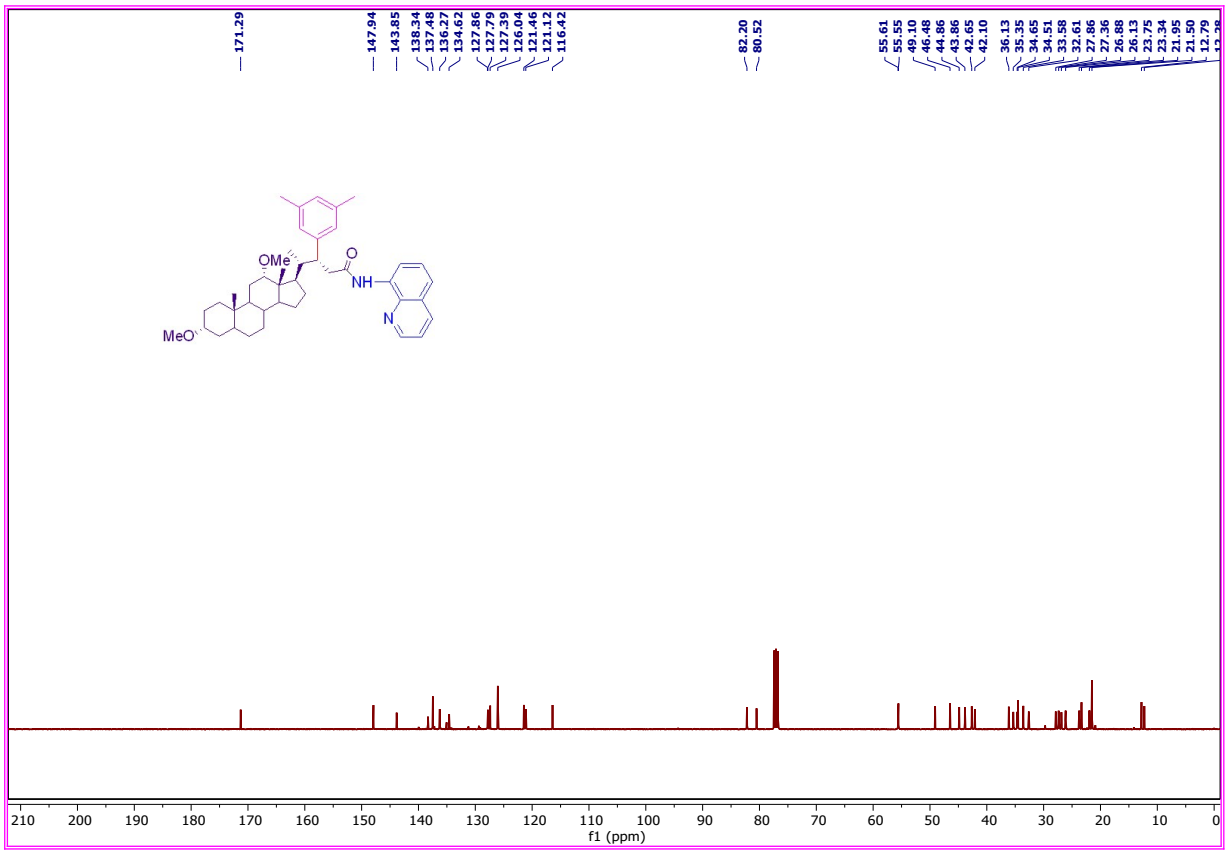
^{13}C NMR of 3bp (400 MHz, $CDCl_3$)



^{1}H NMR of 3bq (400 MHz, $CDCl_3$)

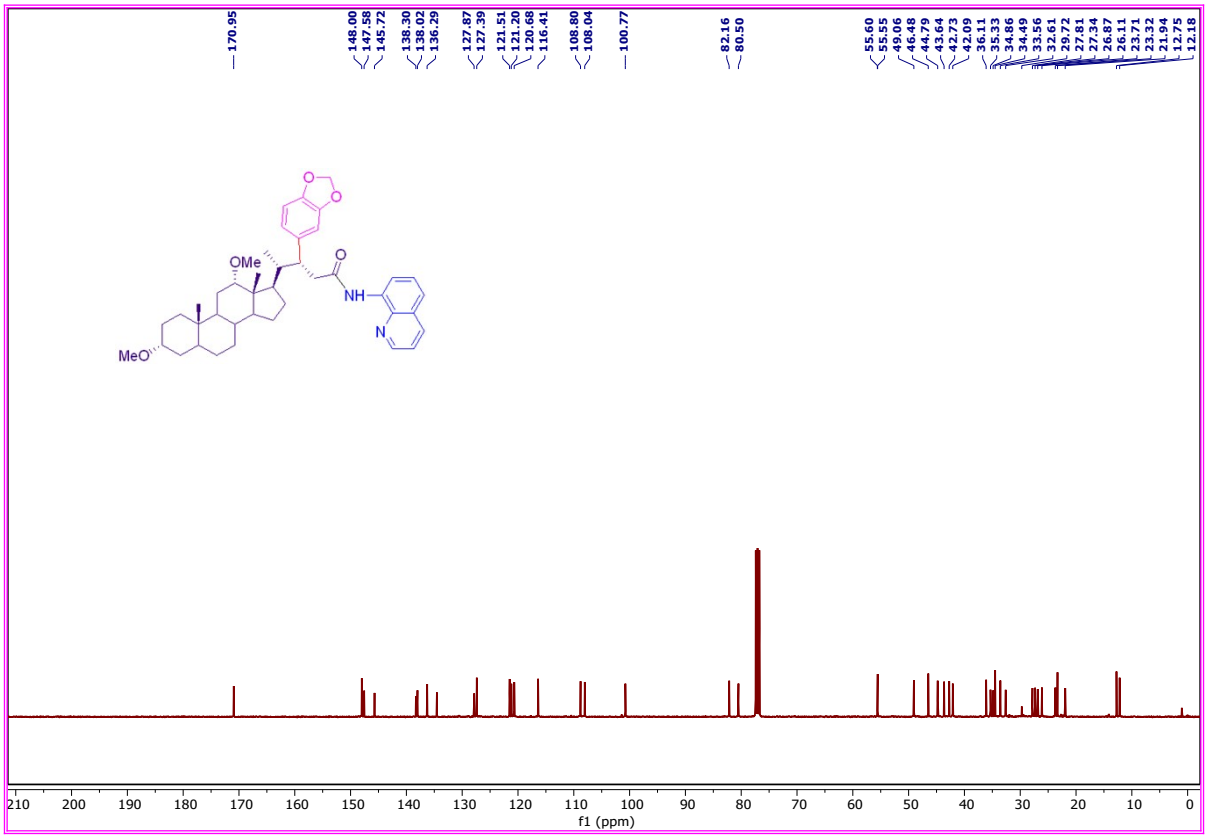


^{13}C NMR of 3bq (400 MHz, $CDCl_3$)

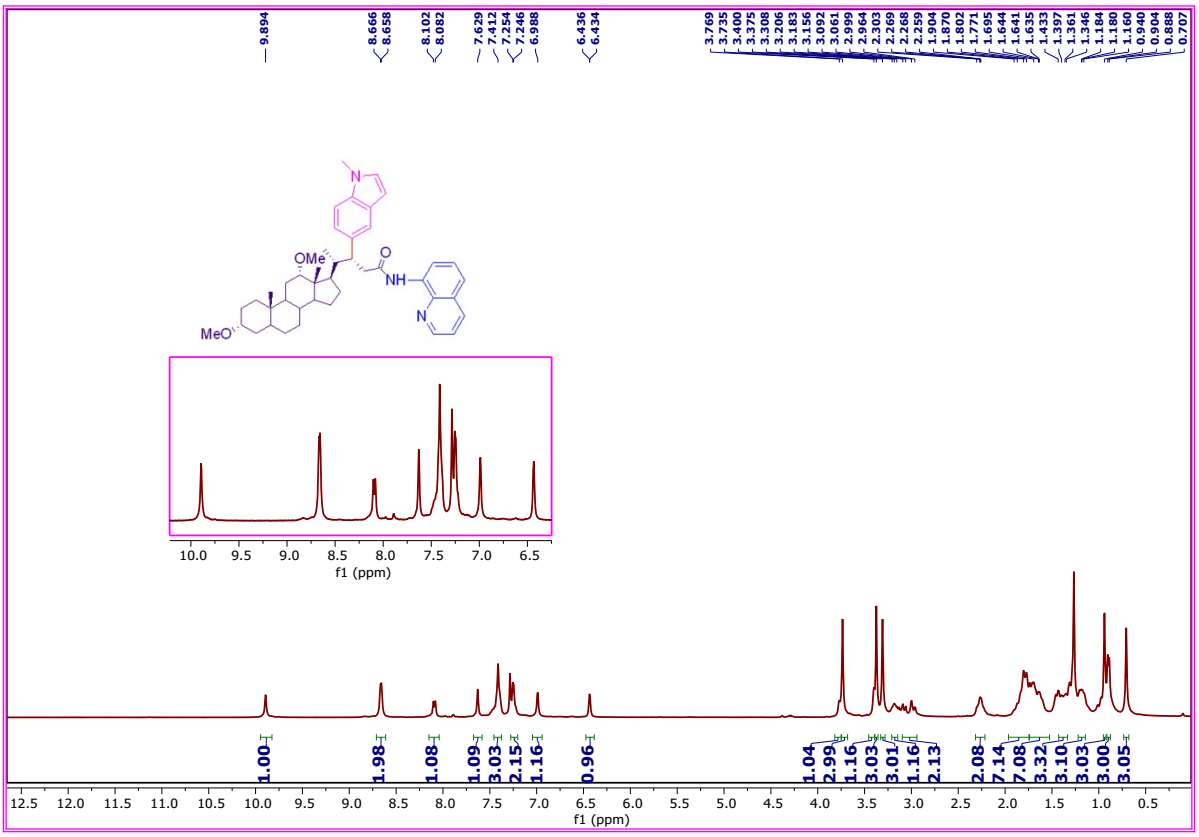


^{1}H NMR of 3bs (400 MHz, $CDCl_3$)

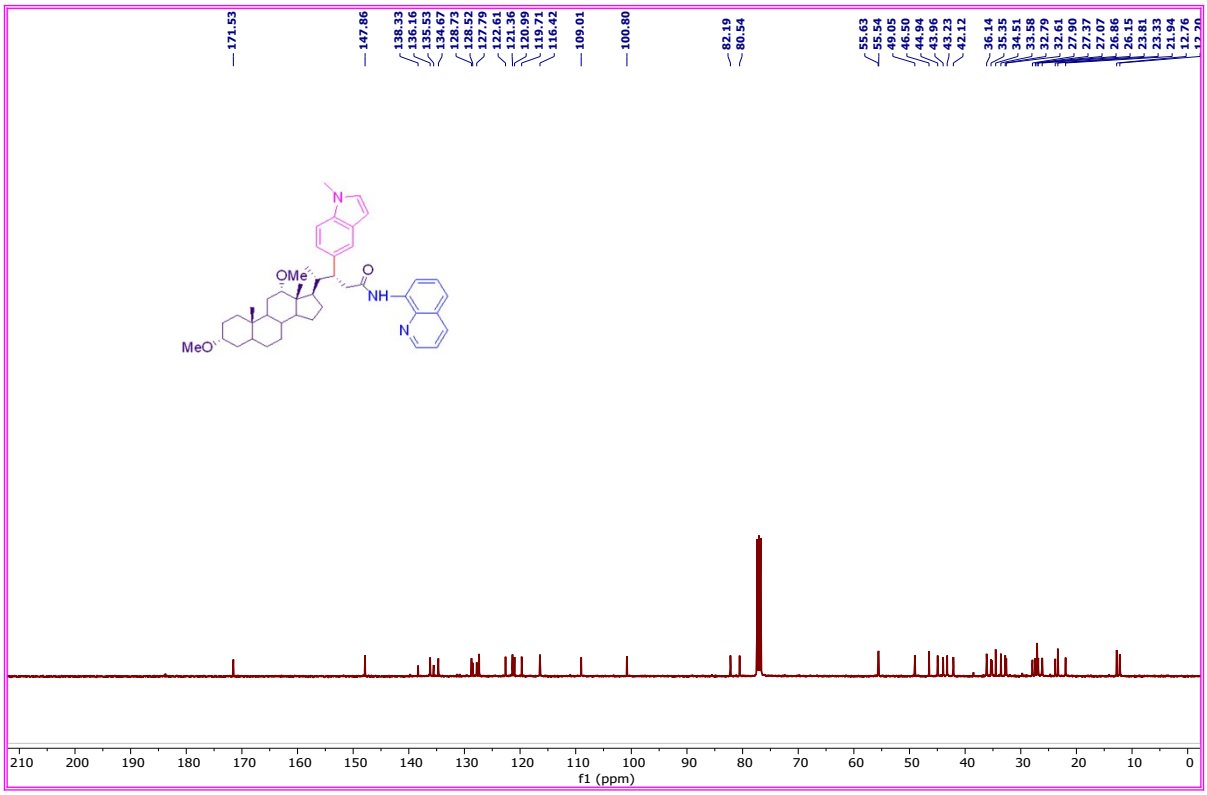
^{13}C NMR of 3bs (400 MHz, $CDCl_3$)



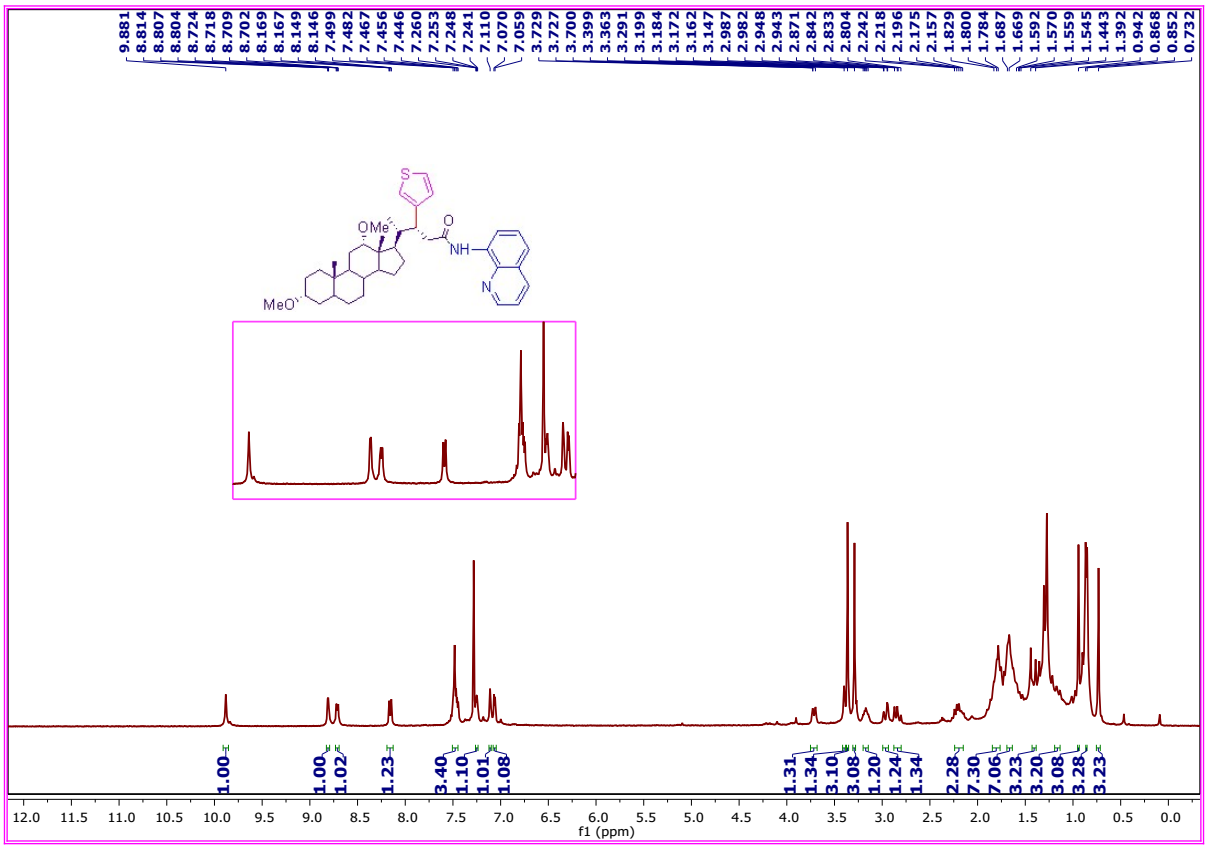
^{1}H NMR of 3bt (400 MHz, $CDCl_3$)



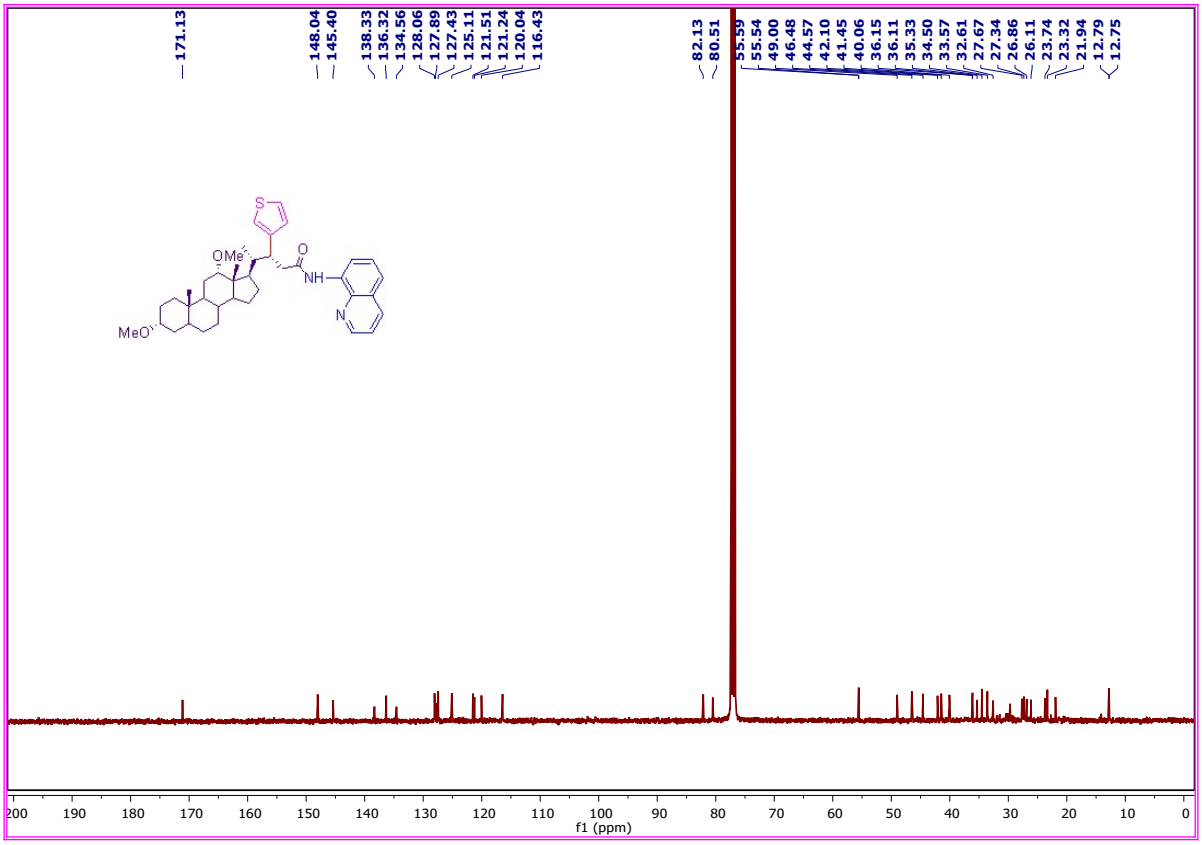
^{13}C NMR of 3bt (400 M Hz, $CDCl_3$)



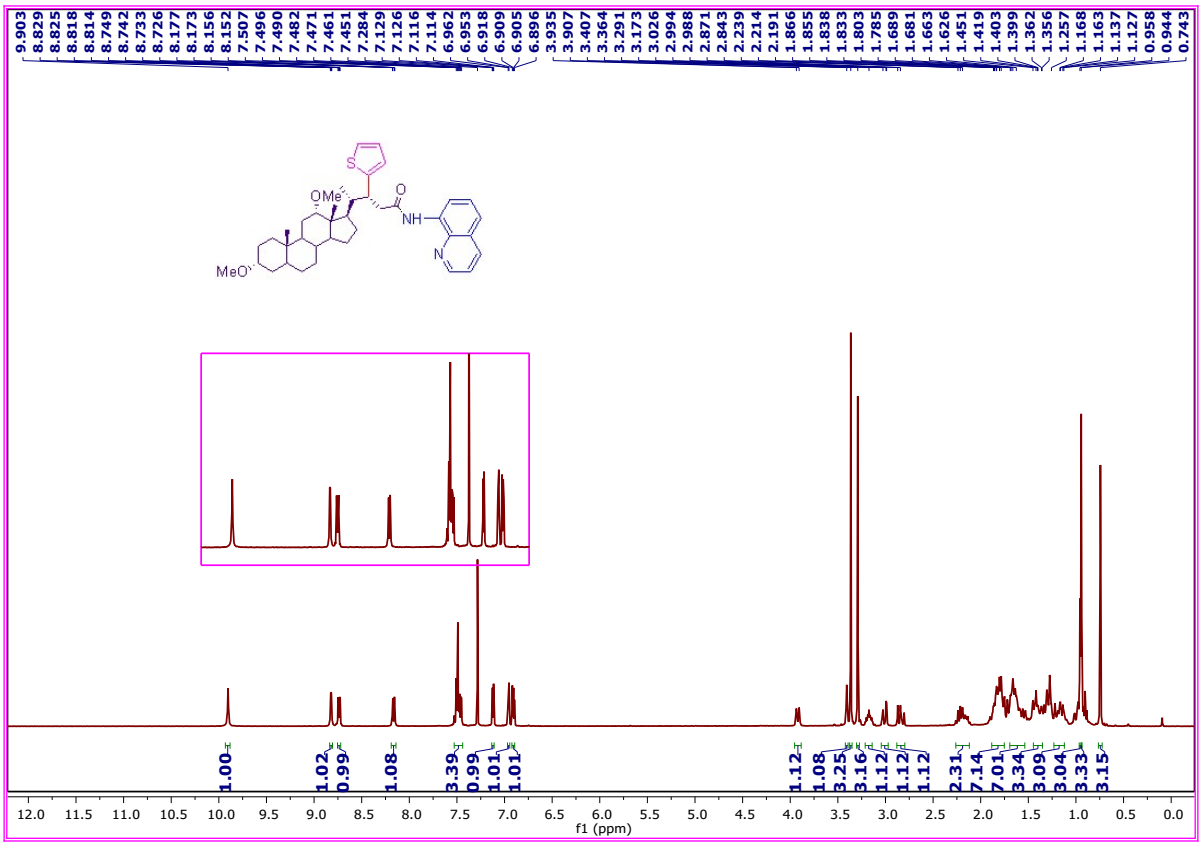
^{1}H NMR of 3bu (400 MHz, $CDCl_3$)



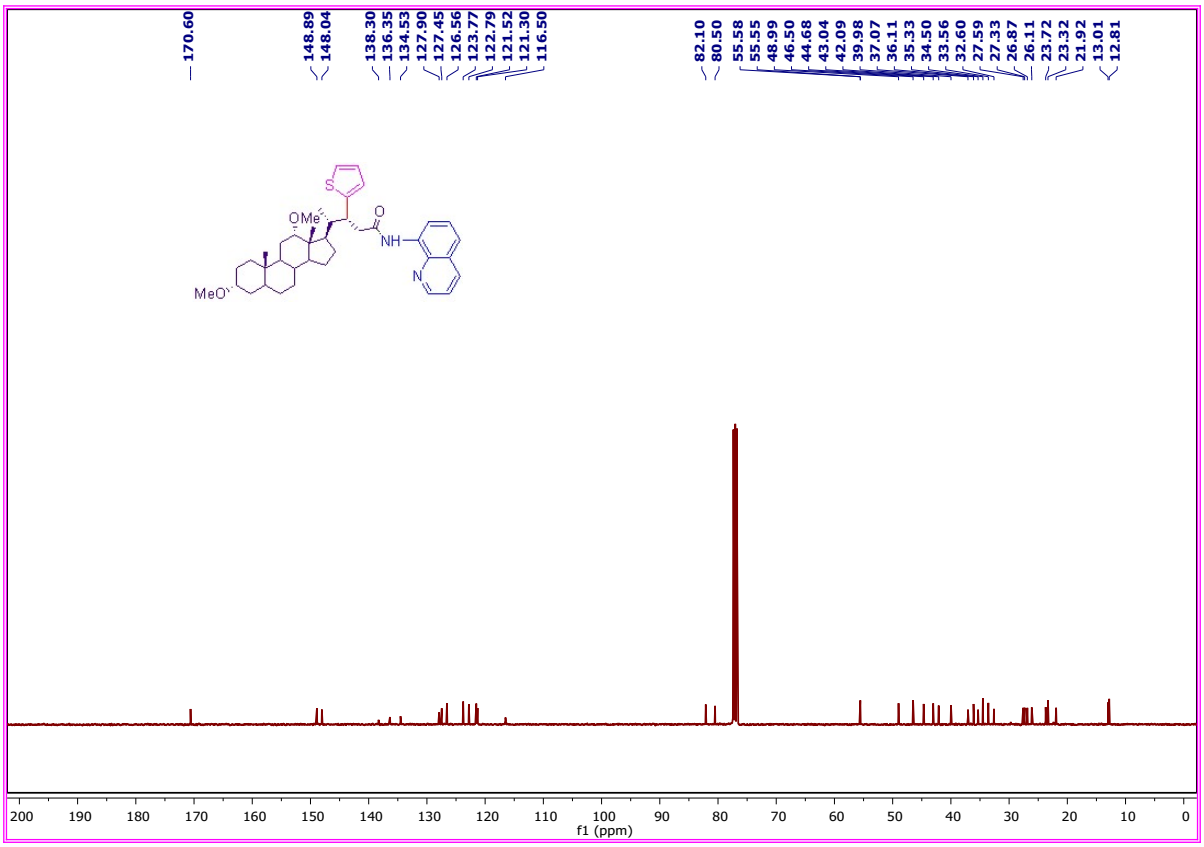
^{13}C NMR of 3bu (400 MHz, $CDCl_3$)



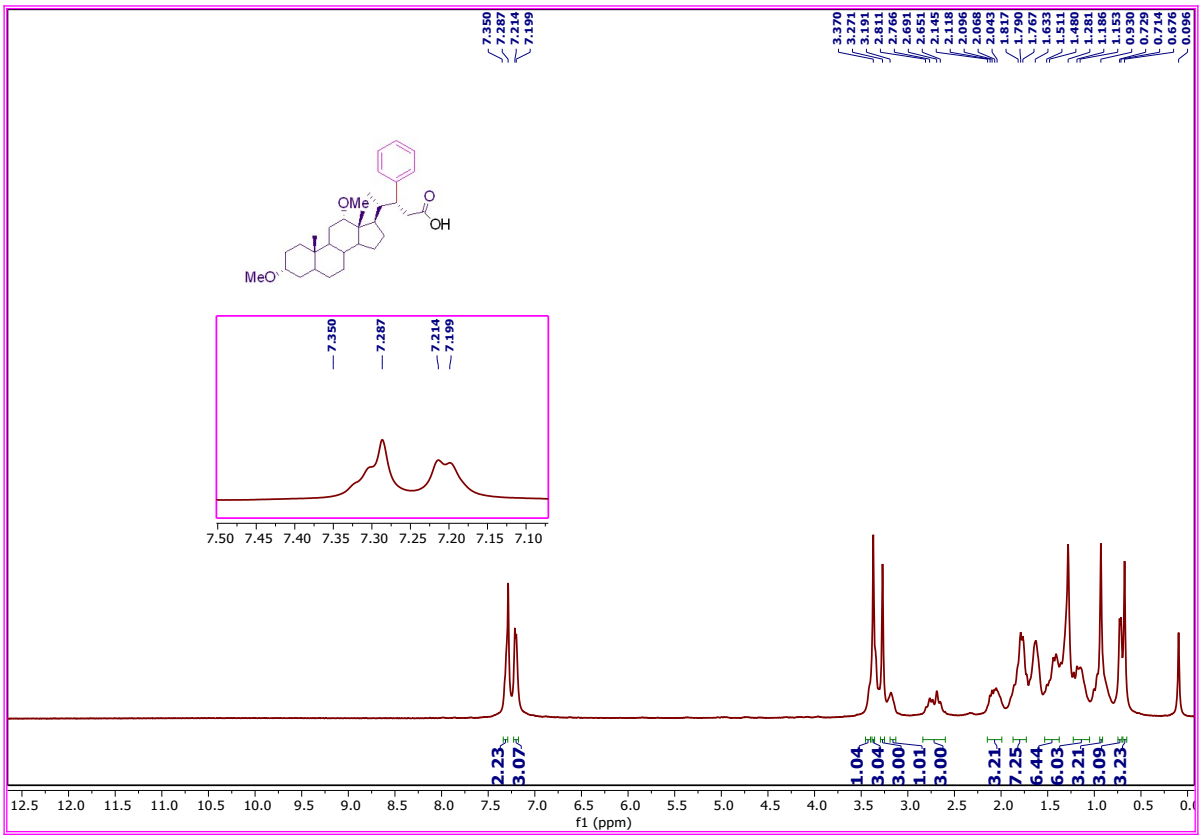
^{1}H NMR of 3bv (400 MHz, $CDCl_3$)



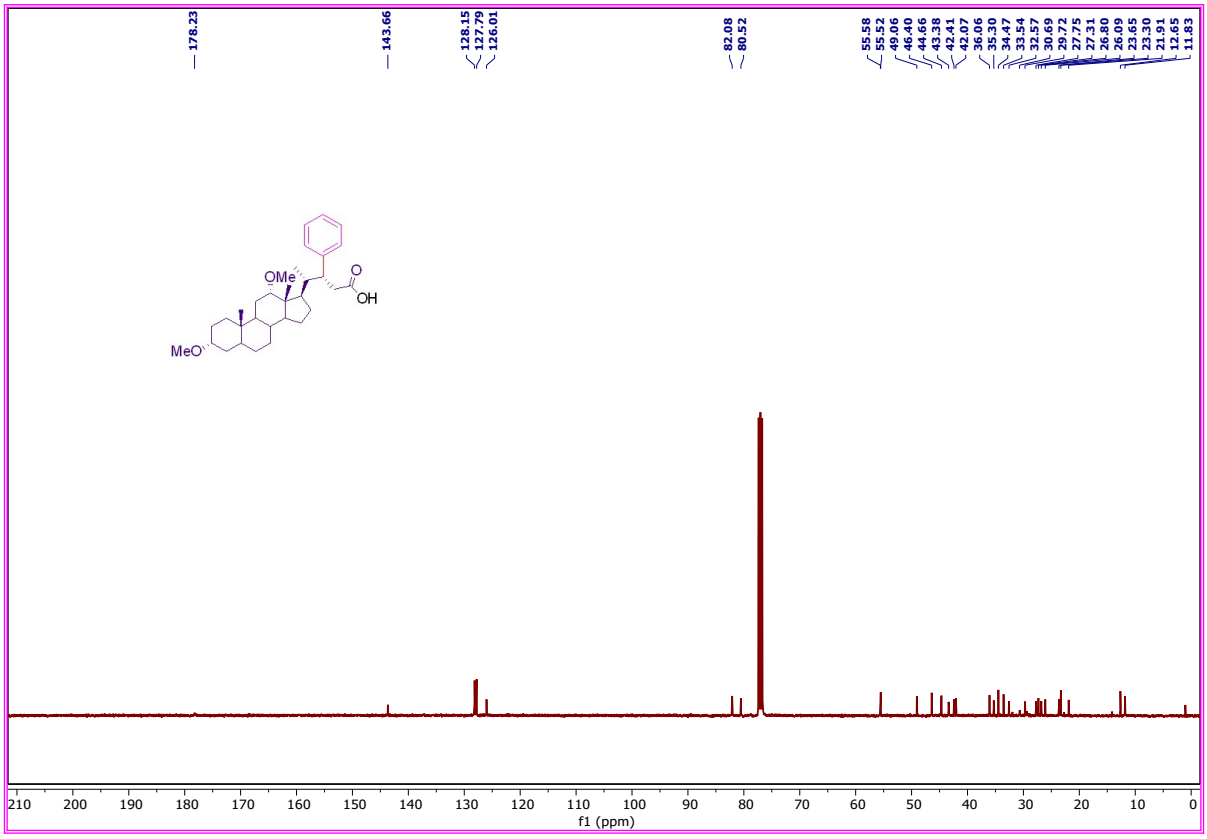
^{13}C NMR of 3bv (400 MHz, $CDCl_3$)



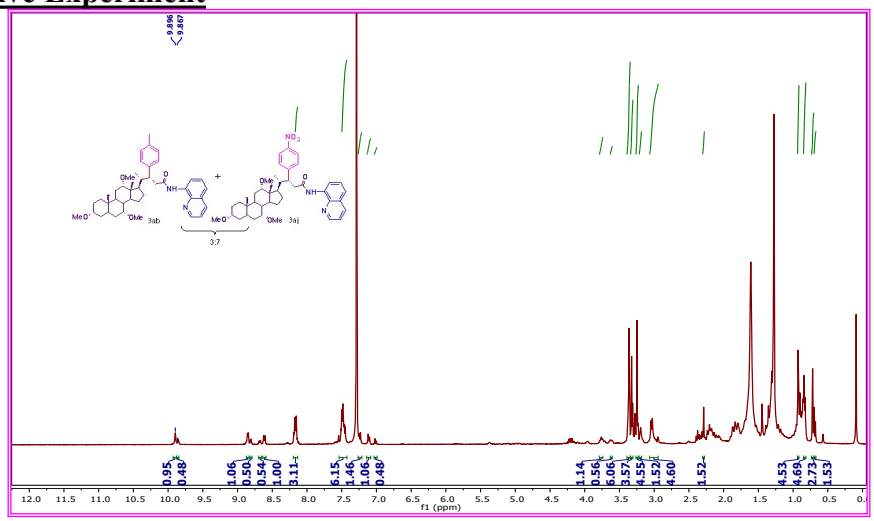
^{1}H NMR of 4ba (400 MHz, $CDCl_3$)



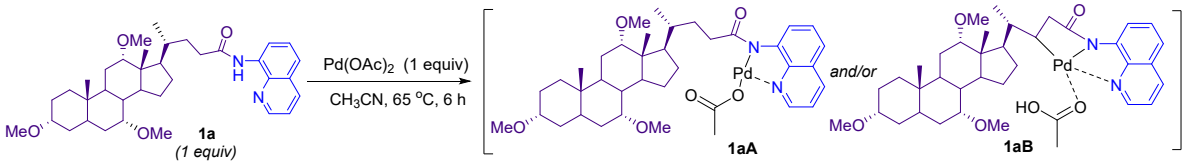
^{13}C NMR of 4ba (400 MHz, $CDCl_3$)



3. Competitive Experiment



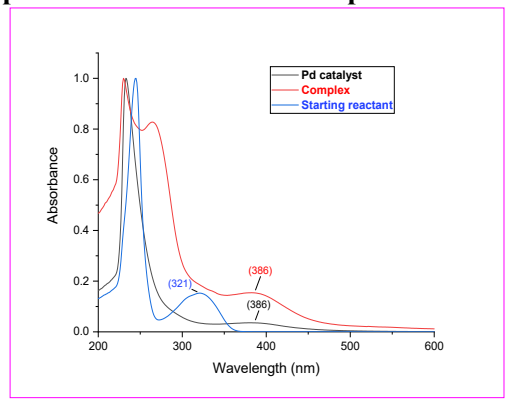
4. Characterization Data of Intermediate Complex (Crude)

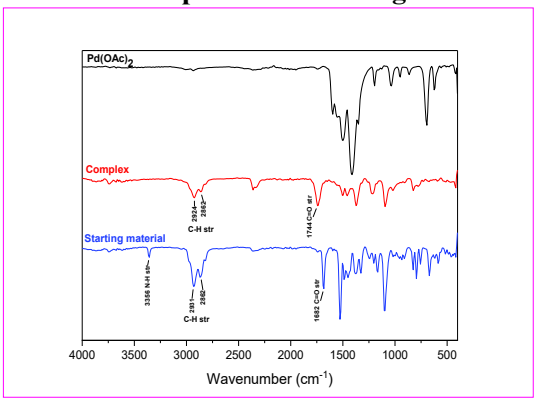


Chemical Formula: $C_{38}H_{54}N_2O_6Pd$ Chemical Formula: $C_{38}H_{54}N_2O_6Pd$

Crude Complex
Confirmed by HRMS and comparison of its UV-Vis and IR spectra with that of **1a**

Comparison of UV-Vis and IR Spectra of Intermediate Complex with Starting Materials

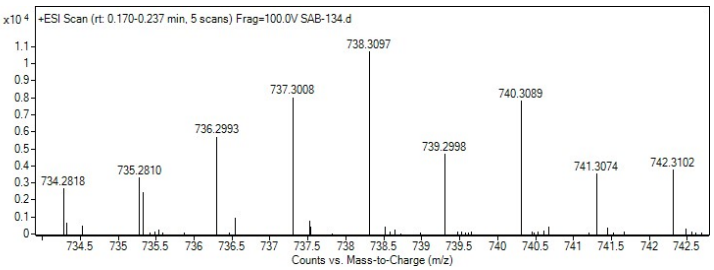


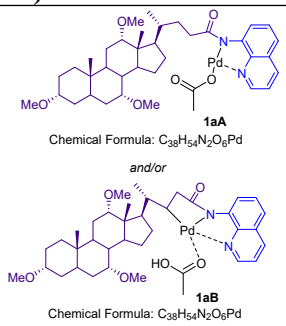


HRMS of the Intermediate Complex (Crude)

detected in crude complex

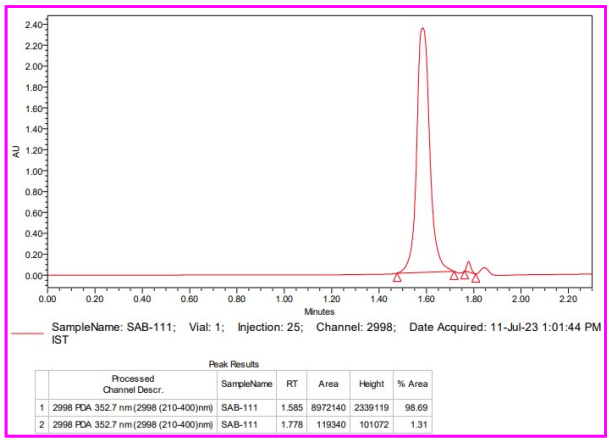
Found: 741.3074 $(M+H)^+$; Calc.: 741.3094





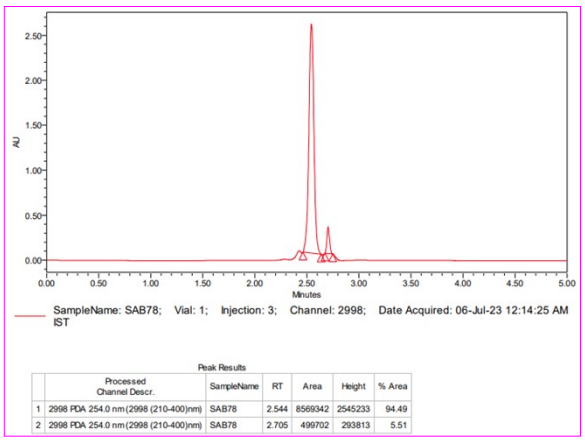
5. HPLC Profiles of 3

HPLC Profiles of 3aa & 3ba



Peak Results

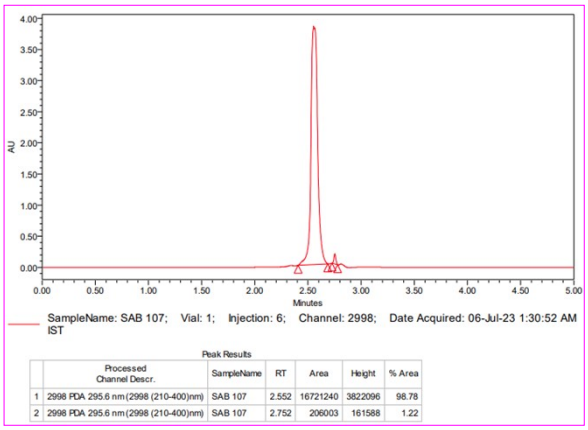
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.585	8972140	2339119	98.69
2	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.778	119340	101072	1.31



Peak Results

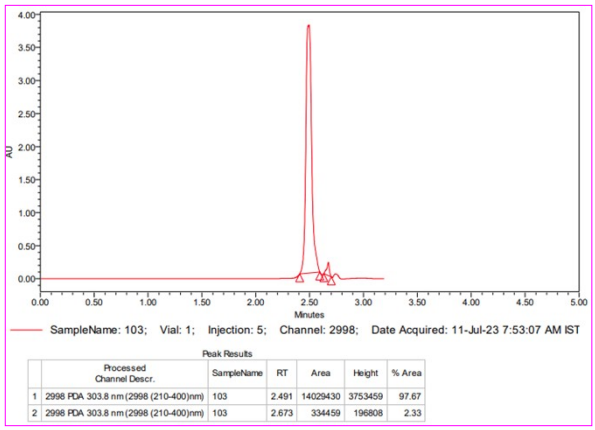
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 254.0 nm (2998 (210-400)nm)	SAB78	2.544	8569342	2545233	94.49
2	2998 PDA 254.0 nm (2998 (210-400)nm)	SAB78	2.705	499702	293813	5.51

HPLC Profiles of 3ab & 3bb



Peak Results

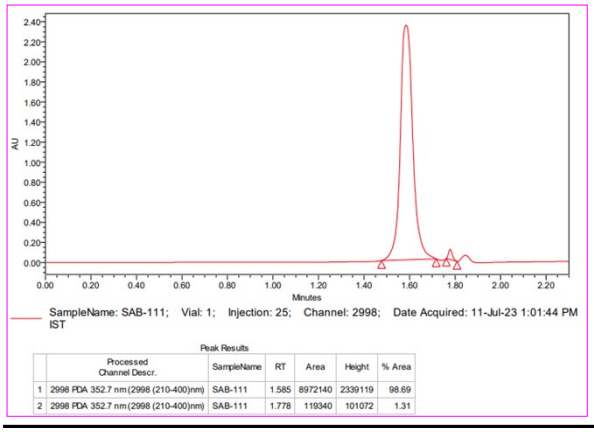
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 295.6 nm (2998 (210-400)nm)	SAB 107	2.552	16721240	3822096	98.78
2	2998 PDA 295.6 nm (2998 (210-400)nm)	SAB 107	2.752	206003	161588	1.22



Peak Results

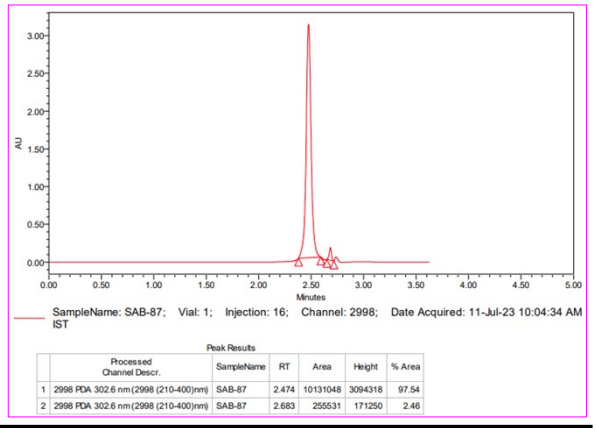
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 303.8 nm (2998 (210-400)nm)	103	2.491	14029430	3753459	97.67
2	2998 PDA 303.8 nm (2998 (210-400)nm)	103	2.673	334459	196808	2.33

HPLC Profile of 3ac & 3bc



Peak Results

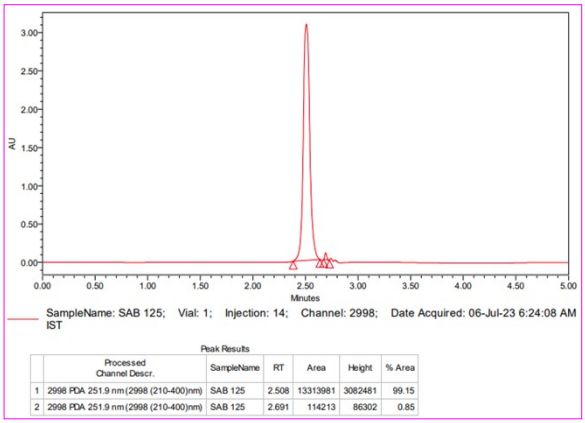
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.585	8972140	2339119	98.69
2	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.778	119340	101072	1.31



Peak Results

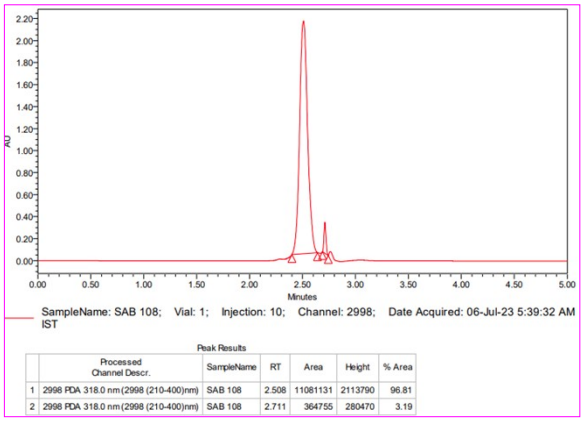
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 302.6 nm (2998 (210-400)nm)	SAB-87	2.474	10131048	3094318	97.54
2	2998 PDA 302.6 nm (2998 (210-400)nm)	SAB-87	2.683	255531	171250	2.46

HPLC Profile of 3ad & 3ae



Peak Results

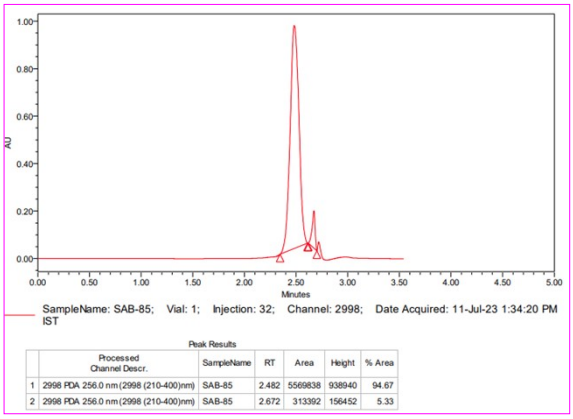
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 251.9 nm (2998 (210-400)nm)	SAB 125	2.508	13313981	3082481	99.15
2	2998 PDA 251.9 nm (2998 (210-400)nm)	SAB 125	2.691	114213	86302	0.85



Peak Results

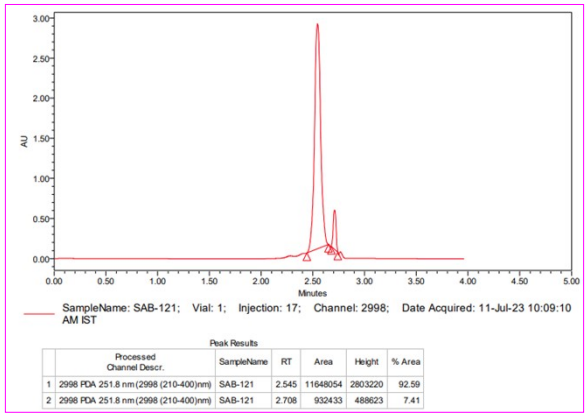
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 318.0 nm (2998 (210-400)nm)	SAB 108	2.508	11081131	2113790	96.81
2	2998 PDA 318.0 nm (2998 (210-400)nm)	SAB 108	2.711	364755	280470	3.19

HPLC Profile of 3be & 3af



Peak Results

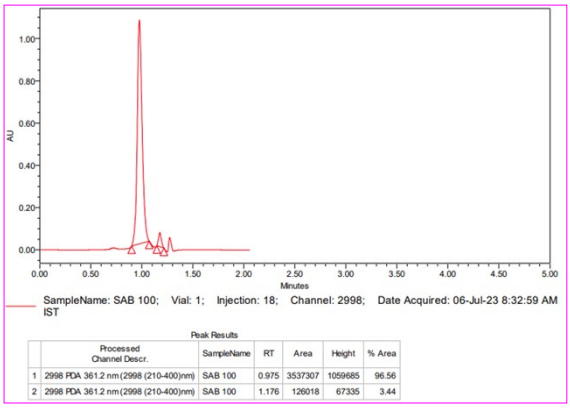
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 256.0 nm (2998 (210-400)nm)	SAB-85	2.482	5569838	938940	94.67
2	2998 PDA 256.0 nm (2998 (210-400)nm)	SAB-85	2.672	313392	156452	5.33



Peak Results

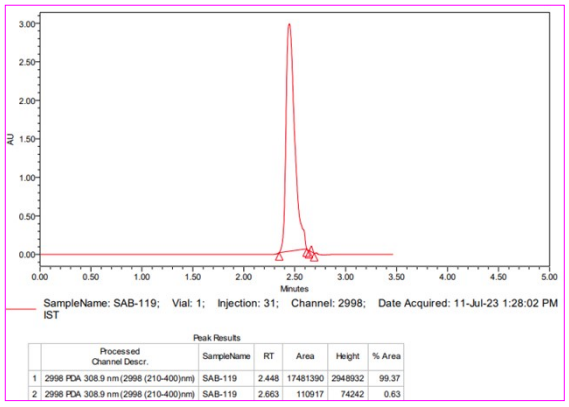
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 251.8 nm (2998 (210-400)nm)	SAB-121	2.545	11648054	2803220	92.59
2	2998 PDA 251.8 nm (2998 (210-400)nm)	SAB-121	2.708	932433	488623	7.41

HPLC Profile of 3bg & 3ah



Peak Results

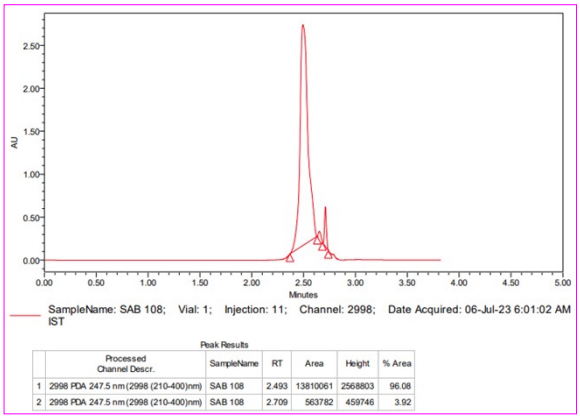
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 361.2 nm (2998 (210-400)nm)	SAB 100	0.975	3537307	1059685	96.56
2	2998 PDA 361.2 nm (2998 (210-400)nm)	SAB 100	1.176	126018	67335	3.44



Peak Results

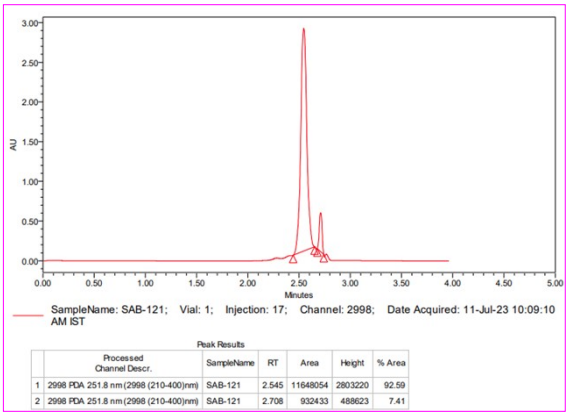
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 308.9 nm (2998 (210-400)nm)	SAB-119	2.448	17481390	2948932	99.37
2	2998 PDA 308.9 nm (2998 (210-400)nm)	SAB-119	2.663	110917	74242	0.63

HPLC Profile of 3bh & 3bi



Peak Results

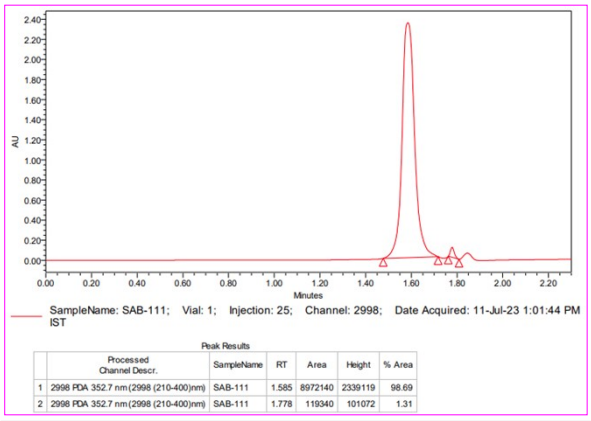
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 247.5 nm (2998 (210-400)nm)	SAB 108	2.493	13810061	2568803	96.08
2	2998 PDA 247.5 nm (2998 (210-400)nm)	SAB 108	2.709	563782	459746	3.92



Peak Results

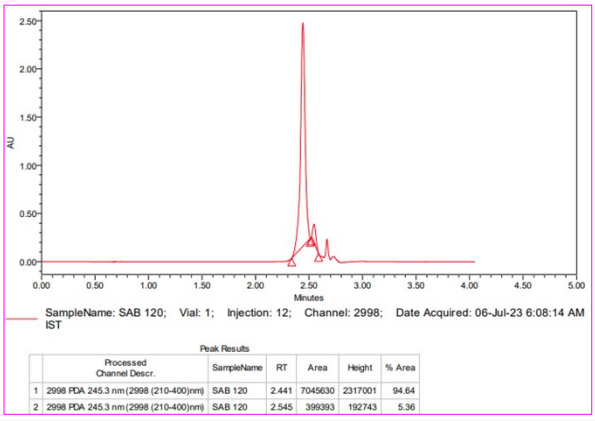
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 251.8 nm (2998 (210-400)nm)	SAB-121	2.545	11648054	2803220	92.59
2	2998 PDA 251.8 nm (2998 (210-400)nm)	SAB-121	2.708	932433	488623	7.41

HPLC Profile of 3aj & 3ak



Peak Results

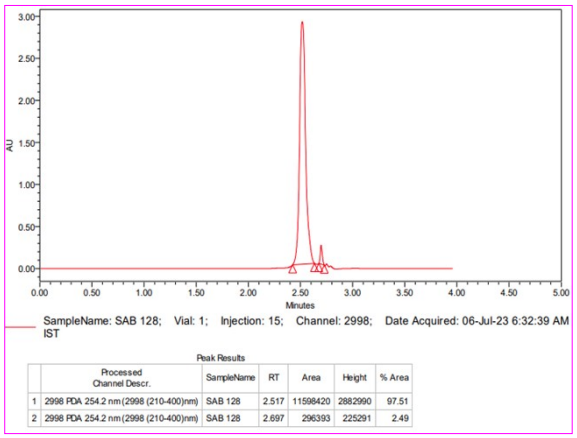
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.585	8972140	2339119	98.69
2	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.778	119340	101072	1.31



Peak Results

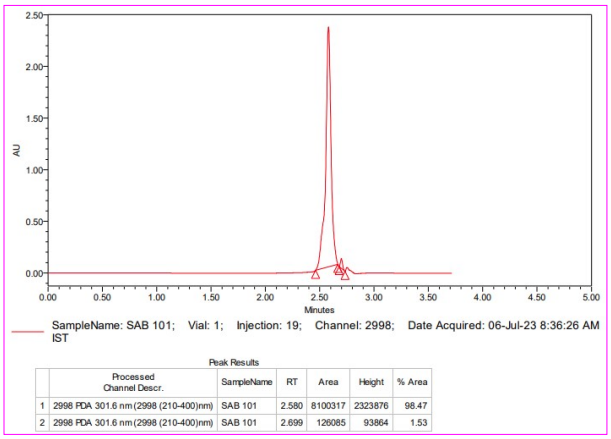
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 245.3 nm (2998 (210-400)nm)	SAB 120	2.441	7045630	2317001	94.64
2	2998 PDA 245.3 nm (2998 (210-400)nm)	SAB 120	2.545	399393	192743	5.36

HPLC Profile of 3bk & 3al



Peak Results

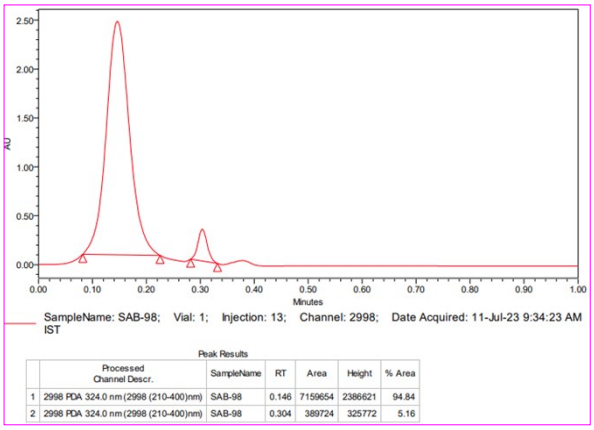
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 254.2 nm (2998 (210-400)nm)	SAB 128	2.517	11598420	2882990	97.51
2	2998 PDA 254.2 nm (2998 (210-400)nm)	SAB 128	2.697	296393	225291	2.49



Peak Results

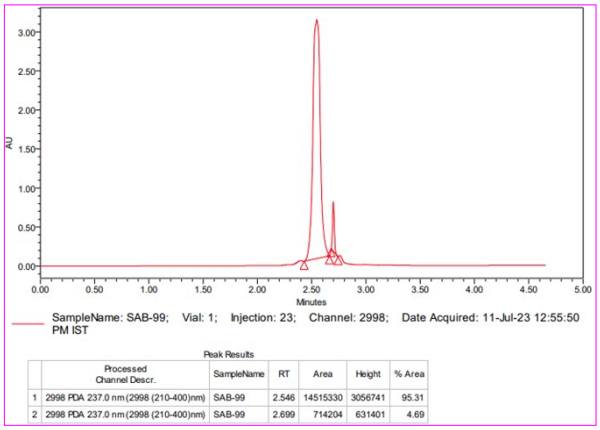
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 301.6 nm (2998 (210-400)nm)	SAB 101	2.580	8100317	2323876	98.47
2	2998 PDA 301.6 nm (2998 (210-400)nm)	SAB 101	2.699	126085	93864	1.53

HPLC Profile of 3bl & 3bm



Peak Results

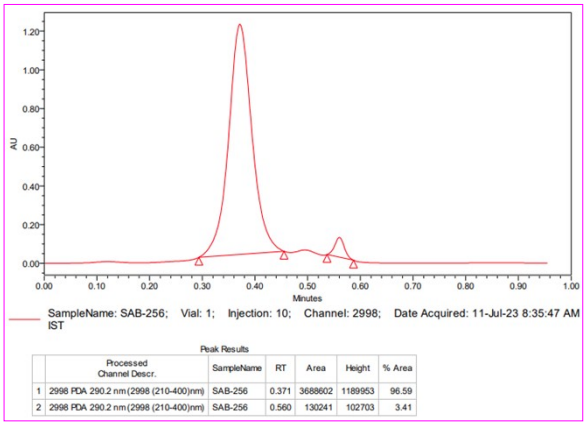
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 324.0 nm (2998 (210-400)nm)	SAB-98	0.146	7159654	2386621	94.84
2	2998 PDA 324.0 nm (2998 (210-400)nm)	SAB-98	0.304	389724	325772	5.16



Peak Results

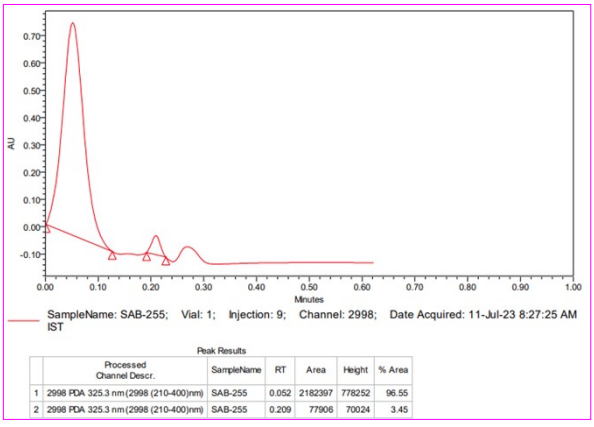
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 237.0 nm (2998 (210-400)nm)	SAB-99	2.546	14515330	3056741	95.31
2	2998 PDA 237.0 nm (2998 (210-400)nm)	SAB-99	2.699	714204	631401	4.69

HPLC Profile of 3bn & 3bo



Peak Results

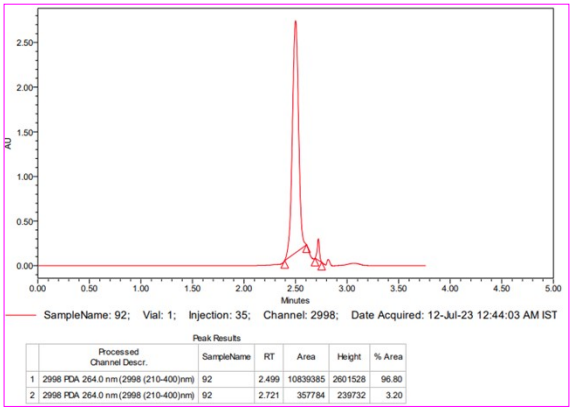
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 290.2 nm (2998 (210-400)nm)	SAB-256	0.371	3688602	1189953	96.59
2	2998 PDA 290.2 nm (2998 (210-400)nm)	SAB-256	0.560	130241	102703	3.41



Peak Results

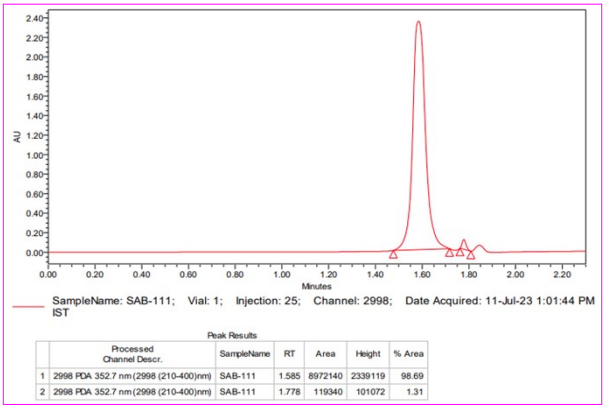
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 325.3 nm (2998 (210-400)nm)	SAB-255	0.052	2182397	778252	96.55
2	2998 PDA 325.3 nm (2998 (210-400)nm)	SAB-255	0.209	77906	70024	3.45

HPLC Profile of 3bp & 3aq



Peak Results

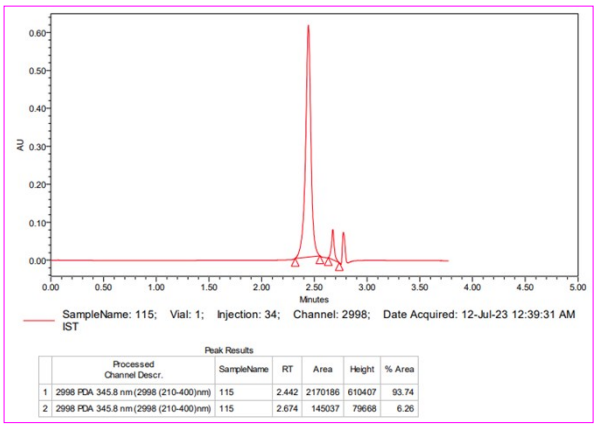
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 264.0 nm (2998 (210-400)nm)	92	2.499	10839385	2601528	96.80
2	2998 PDA 264.0 nm (2998 (210-400)nm)	92	2.721	357784	239732	3.20



Peak Results

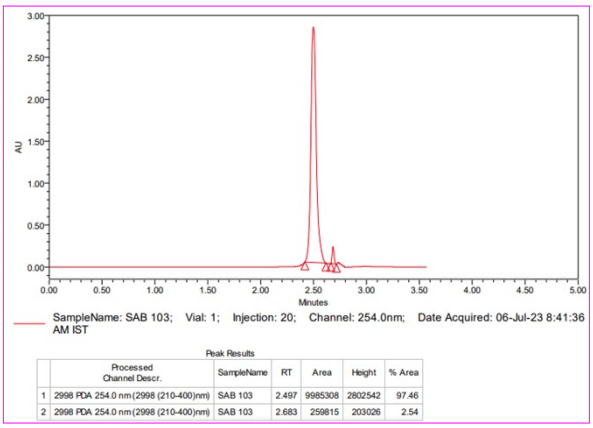
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.585	8972140	2339119	98.69
2	2998 PDA 352.7 nm (2998 (210-400)nm)	SAB-111	1.778	119340	101072	1.31

HPLC Profile of 3bq & 3ar



Peak Results

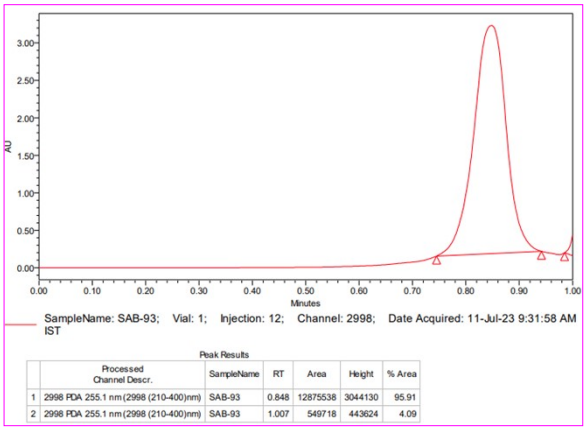
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 345.8 nm (2998 (210-400)nm)	115	2.442	2170186	610407	93.74
2	2998 PDA 345.8 nm (2998 (210-400)nm)	115	2.674	145037	79668	6.26



Peak Results

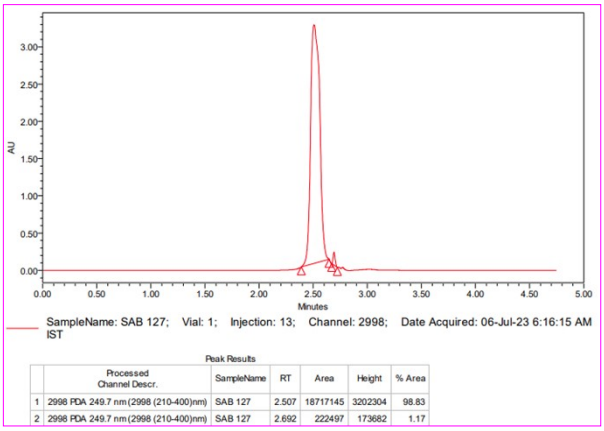
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 254.0 nm (2998 (210-400)nm)	SAB 103	2.497	9985308	2802542	97.46
2	2998 PDA 254.0 nm (2998 (210-400)nm)	SAB 103	2.683	259815	203026	2.54

HPLC Profile of 3as & 3bs



Peak Results

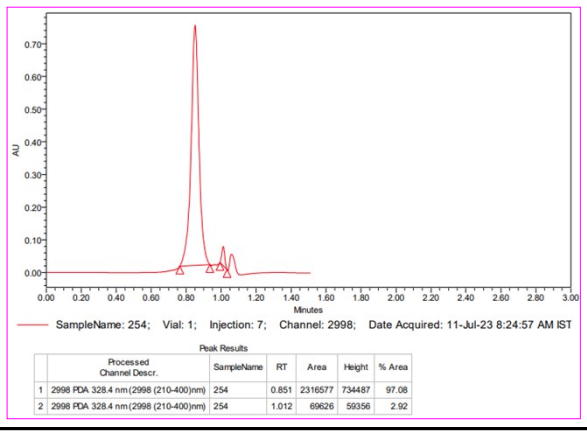
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 255.1 nm (2998 (210-400)nm)	SAB-93	0.848	12875538	3044130	95.91
2	2998 PDA 255.1 nm (2998 (210-400)nm)	SAB-93	1.007	549718	443624	4.09



Peak Results

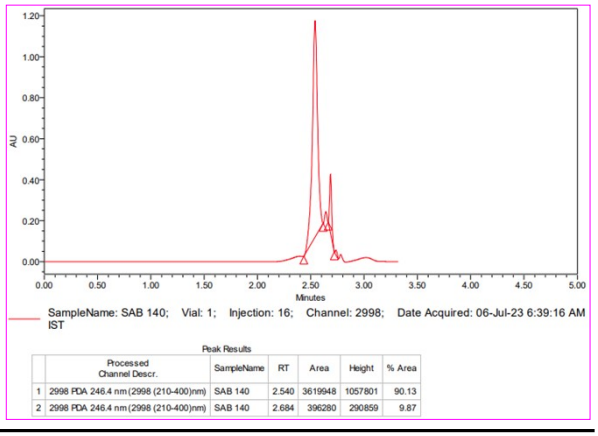
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 249.7 nm (2998 (210-400)nm)	SAB 127	2.507	18717145	3202304	98.83
2	2998 PDA 249.7 nm (2998 (210-400)nm)	SAB 127	2.692	222497	173682	1.17

HPLC Profile of 3bt & 3bu



Peak Results

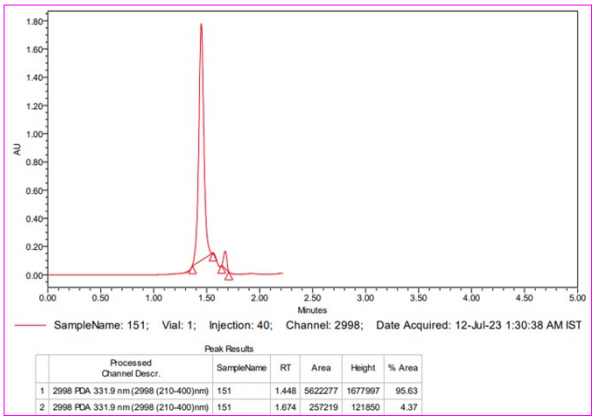
	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 328.4 nm (2998 (210-400)nm)	254	0.851	2316577	734487	97.08
2	2998 PDA 328.4 nm (2998 (210-400)nm)	254	1.012	69626	59356	2.92

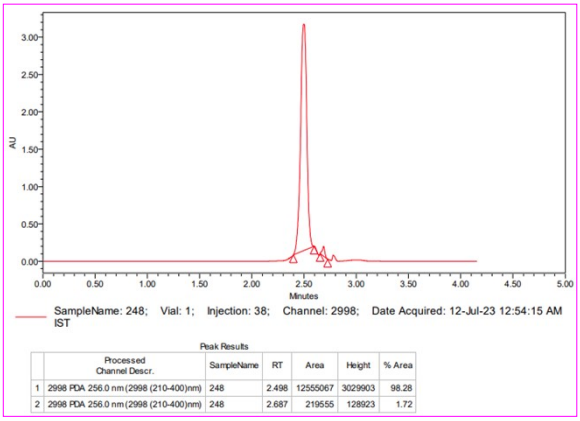


Peak Results

	Processed Channel Descr.	SampleName	RT	Area	Height	% Area
1	2998 PDA 246.4 nm (2998 (210-400)nm)	SAB 140	2.540	3619948	1057801	90.13
2	2998 PDA 246.4 nm (2998 (210-400)nm)	SAB 140	2.684	396280	290859	9.87

HPLC Profile of 3bv & 3ax





6. X-Ray Crystallographic Study of 3aa

A transparent block-shaped crystal was cut to obtain a single crystal, which was chosen by using a polarizing microscope. The crystal was immersed in Paratone-N oil and mounted on goniometer head with nylon loop. To obtain the crystal structure data, a Kappa APEX II diffractometer was used. The diffractometer was equipped with CCD detector and a sealed-tube monochromated MoKα radiation which was used for centering and screening the crystal, determining unit cell for primary evaluation and data collection (with crystal to detector distance 50 mm). The temperature at which data collection was done is 298 K. An APEX3[4] program was used for the data integration, and SAINT[1] program was used to fit the reflections and obtaining F^2 and $\sigma(F^2)$ values. Lorentz and polarization effects were also corrected. To obtain a final structure solution, space group was decided along with absorption correction (SADABS)[4], using a subroutine XPREP.[4] The data was merged and required files were generated for proper analysis and refinement. The direct method was used in structure solution using SHELXS program of SHELXTL package followed by refinement using SHELXL.[5,6] The anisotropic refinement parameters were used to refine all NHAs (non-hydrogen atoms) and the hydrogen atoms present were refined as riding atoms with individual isotropic displacement parameters. All the figures presented were drawn using MERCURY 2023 1.0[7]

Crystal data for **3aa**. $C_{42}H_{56}N_2O_4$, Mr = 652.88 g/mol, orthorhombic, space group $P2_12_12_1$ (No. 19), a = 9.2466(7) Å, b = 11.7371(8) Å, c = 33.379(3) Å, α = 90°, β = 90°, γ = 90°, V = 3622.6(5) $Å^3$, Z = 4, T = 296.15 K, D_{calcd} = 1.197 g/cm^3; Full matrix least-square on F^2; R_1 = 0.0446, wR_2 = 0.0924 for 5377 observed reflections [$I > 2\sigma(I)$] and R_1 = 0.0701, wR_2 = 0.1021 for all 7340 reflections; number of parameters = 443; GOF = 1.024.

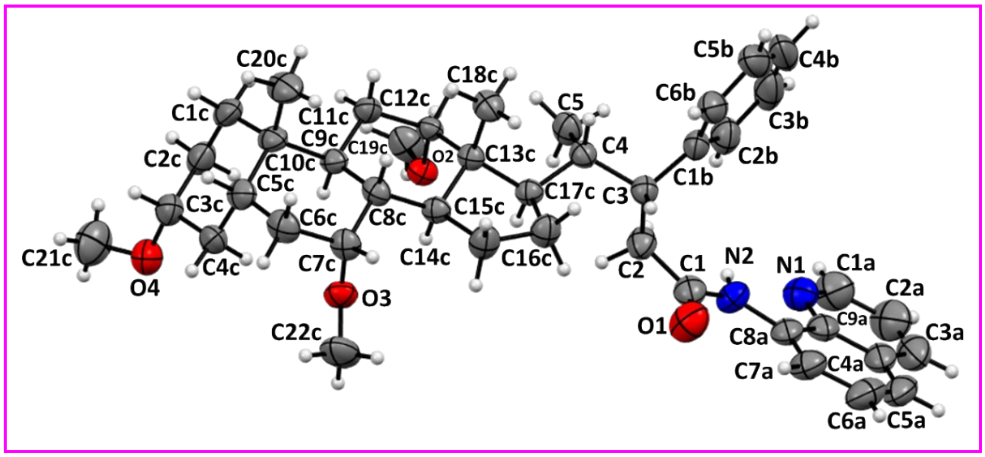


Figure S1. ORTEP view of the asymmetric unit in **3aa**. Non-hydrogen atoms are depicted as ellipsoids with 30% probability. Hydrogen atoms are represented by spheres with random radius.

7. References

1. Behera, H.; Madhavan, N., Anion-selective cholesterol decorated macrocyclic transmembrane ion carriers. *J. Am. Chem. Soc.* **2017**, *139*, 12919-12922.
2. Wang, L.; Jiang, X.; Tang, P., Silver-Mediated Fluorination of Alkyl Iodides with $TMSCF_3$ as The Fluorinating Agent. *Org. Chem. Front.* **2017**, *4*, 1958-1961.
3. Gou, Q.; Zhang, Z.-F.; Liu, Z.-C.; Qin, J., Palladium-Catalyzed Cs_2CO_3-Promoted Arylation of Unactivated C(sp3)–H Bonds by (Diacetoxyiodo) arenes: Shifting the Reactivity of (Diacetoxyiodo) arenes from Acetoxylation to Arylation. *J. Org. Chem.* **2015**, *80*, 3176-3186.
4. APEX2, SADABS and SAINT; Bruker AXS inc: Madison, WI, USA, **2015**.
5. Sheldrick, G. M. Acta Crystallogr., Sect. A: Found. Adv., **2015**, 71, 3-8.
6. Sheldrick, G. M. *Acta Crystallogr., Sect. C: Found. Adv*., **2015**, *71*, 3-8.
7. Macrae, C. F.; Bruno, I. J.; Chisholm, J. A.; Edginton, P. R.; McCabe, P.; Pidocck, E.; Rodriguez-Monge, L.; Taylor, T.; Van de Streek, J.; Wood, P. A. *J. Appl. Cryst.,* **2008**, *41*, 466.