

**Lactol in Asymmetric Aldol-Desymmetrization Sequence:
Access to Tetrahydro-4*H*-furo[2,3-*b*]pyran-2-one and
Tetrahydro-4*H*-furo[2,3-*b*]furan-2-one Derivatives**

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Supporting Information

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1. Optimization of the Reaction Condition

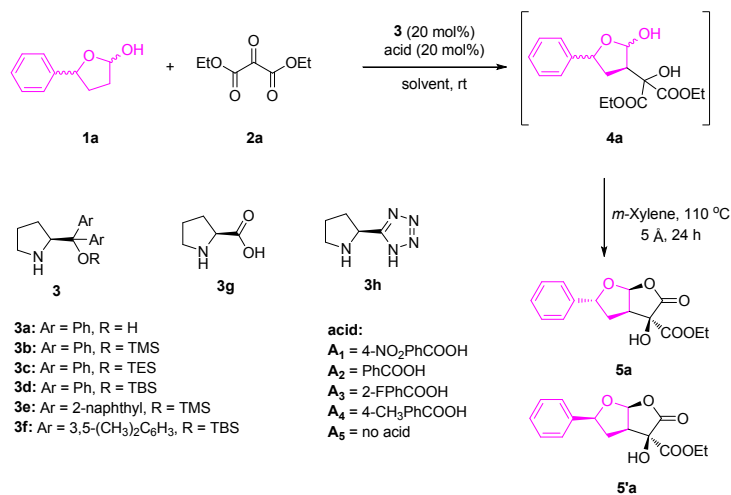


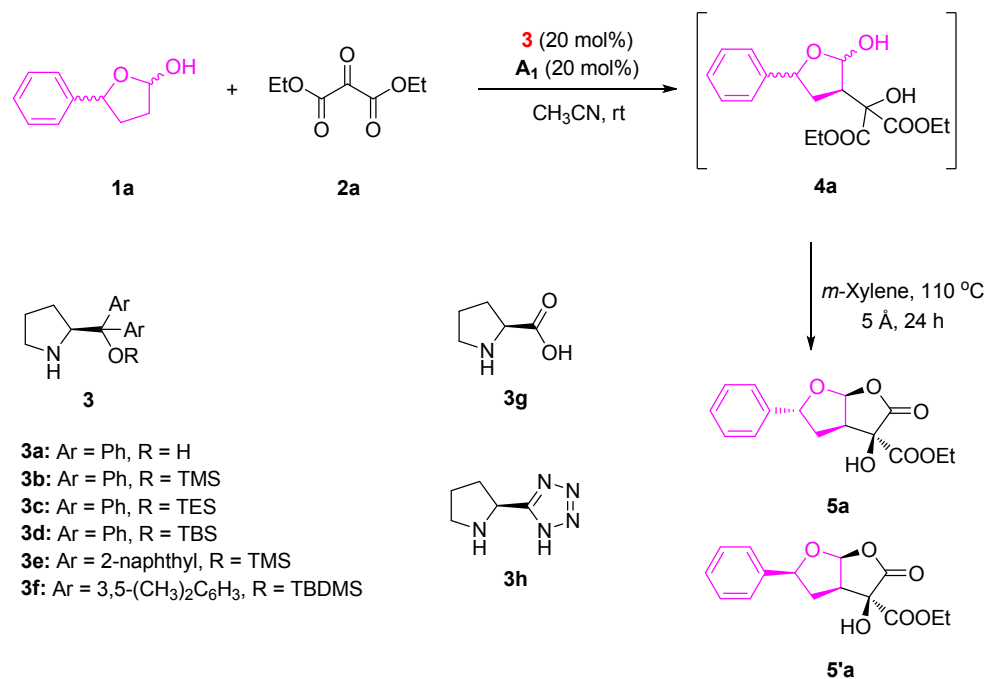
Table 1

Entry	Cat.	Acid	Solvent	Time ^b (h)	Yield ^c (%)		ee ^d (%)		dr ^e
					5a/5'a	5a/5'a	5a/5'a	5a/5'a	
1 ^f	3a	A ₁	CH ₃ CN	-	-	-	-	-	
2	3b	A ₁	CH ₃ CN	15	31/33	>99/96	-/-	-/-	
3	3c	A ₁	CH ₃ CN	24	30/32	97/85	-/-	-/-	
4	3d	A ₁	CH ₃ CN	15	30/32	91/84	-/-	-/-	
5	3e	A ₁	CH ₃ CN	15	27/29	98/96	-/-	-/-	
6	3f	A ₁	CH ₃ CN	15	32/33	94/78	-/-	-/-	
7	3g	A ₁	CH ₃ CN	48	28/29	-93/-99	-/-	-/-	
8	3h	A ₁	CH ₃ CN	>48	trace	-	-	-/-	
9	3b	A ₂	CH ₃ CN	28	26/25	97/96	-/-	-/-	
10	3b	A ₃	CH ₃ CN	24	32/30	98/96	-/-	-/-	
11	3b	A ₄	CH ₃ CN	36	23/24	96/98	-/-	-/-	
12 ^g	3b	A ₅	CH ₃ CN	-	-/-	-/-	-/-	-/-	
13	3b	A ₃	CH ₂ Cl ₂	10	28/27	96/95	-	2.7:1/-	
14	3b	A ₃	toluene	8	24/25	98/99	-	1.0:1/-	
15	3b	A ₃	THF	24	29/28	>96/96	-	35.0:1/-	
16 ^h	3b	A ₃	CH ₃ CN/H ₂ O	12	31/32	>99/98	-	11.0:1/-	
17 ⁱ	3b	A ₃	CH ₂ Cl ₂ /H ₂ O	12	27/26	98/95	-	2.5:1/-	

[a] Unless otherwise specified, all reactions were carried out using **1a** (0.36 mmol, 1.2 equiv), **2a** (0.3 mmol, 1.0 equiv) in solvent (0.6 mL) with **3** (20 mol%) and **acid** (20 mol%) at 25 °C. After workup, the mixture was concentrated and the residue was purified by flash chromatography on silica gel to afford **4a**. Then, *m*-Xylene (2.0 mL) and 5 Å (1.0 equiv) were added to the reaction at 110 °C for 24 hours. After full conversion of the second step, the residue was purified by flash chromatography on silica gel. [c] Yield of **5a** and **5'a**. [b] For the first step. [d/e] Determined by Chiral HPLC analysis. [f/g] No reaction. [h/i] 20% H₂O was added. Entry in online marks optimized conditions.

2. Details of Reaction Conditions Study

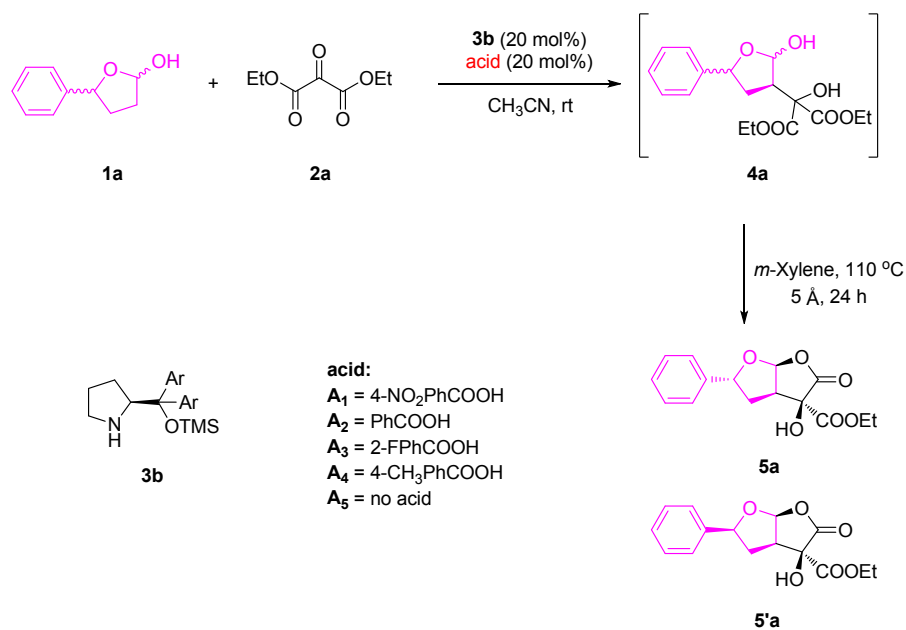
Table 2. Screening of catalysts^a



Entry	Cat.	Acid	Solvent	Time ^b (h)	Yield ^c (%)		ee ^d (%)
					5a/5'a	5a/5'a	
1 ^e	3a	A ₁	CH ₃ CN	-	-	-	-/-
2	3b	A ₁	CH ₃ CN	15	31/33	>99/96	
3	3c	A ₁	CH ₃ CN	24	30/32	97/98	
4	3d	A ₁	CH ₃ CN	15	30/32	91/84	
5	3e	A ₁	CH ₃ CN	15	27/29	98/96	
6	3f	A ₁	CH ₃ CN	15	32/33	94/78	
7	3g	A ₁	CH ₃ CN	48	28/29	-93/-99	
8	3h	A ₁	CH ₃ CN	>48	trace	-/-	

[a] Unless otherwise specified, all reactions were carried out using **1a** (0.36 mmol, 1.2 equiv), **2a** (0.3 mmol, 1.0 equiv) in solvent (0.6 mL) with **3** (20 mol%) and **A₁** (20 mol%) at 25 °C. After workup, the mixture was concentrated and the residue was purified by flash chromatography on silica gel to afford **4a**. Then, *m*-xylene (2.0 mL) and 5 Å (1.0 equiv) were added to the reaction at 110 °C for 24 hours, after full conversion of the second step, the residue was purified by flash chromatography on silica gel. [b] For the first step. [c] Yield of **5a** and **5'a**, [d] Determined by Chiral HPLC analysis. [e] No reaction.

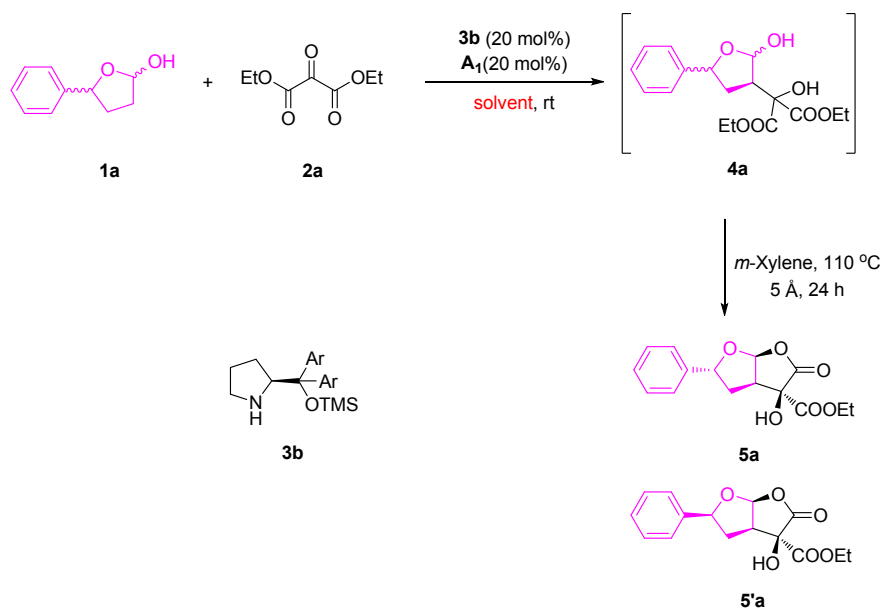
Table 3. Screening of acids^a



Entry	Cat.	Acid	Solvent	Time ^b (h)	Yield ^c (%)		ee ^d (%)	
					5a/5'a		5a/5'a	
1	3b	A ₁	CH ₃ CN	15	31/33	>99/96		
2	3b	A ₂	CH ₃ CN	28	26/25	97/96		
3	3b	A ₃	CH ₃ CN	24	32/30	98/96		
4	3b	A ₄	CH ₃ CN	36	23/24	96/98		
5 ^e	3b	A ₅	CH ₃ CN	-	-/-	-/-		

[a] Unless otherwise specified, all reactions were carried out using **1a** (0.36 mmol, 1.2 equiv), **2a** (0.3 mmol, 1.0 equiv) in solvent (0.6 mL) with **3b** (20 mol%) and **acid** (20 mol%) at 25 °C. After workup, the mixture was concentrated and the residue was purified by flash chromatography on silica gel to afford **4a**. Then, *m*-Xylene (2.0 mL) and 5 Å (1.0 equiv) were added to the reaction at 110 °C for 24 hours, after full conversion of the second step, the residue was purified by flash chromatography on silica gel. [b] For the first step. [c] Yield of **5a** and **5'a**, [d] Determined by Chiral HPLC analysis. [e] No reaction.

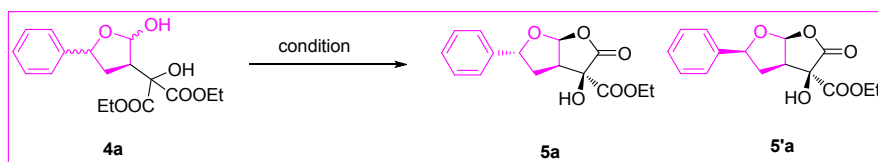
Table 4. Screening of solvents^a



Entry	Cat.	Acid	Solvent	Time ^b (h)	Yield ^c (%)		ee ^d (%)		dr ^e
					5a/5'a	5a/5'a	5a/5'a	5a/5'a	
1	3b	A ₁	CH ₃ CN	15	31/33	>99/96			
2	3b	A ₁	CH ₂ Cl ₂	10	28/27	96/95		2.7:1/-	
3	3b	A ₁	toluene	8	24/25	98/99		1.0:1/-	
4	3b	A ₁	THF	24	29/28	>96/96		35.0:1/-	
5 ^f	3b	A ₁	CH ₃ CN/H ₂ O	12	31/32	>99/98		11.0:1/-	
6 ^g	3b	A ₁	CH ₂ Cl ₂ /H ₂ O	12	27/26	98/95		2.5:1/-	

[a] Unless otherwise specified, all reactions were carried out using **1a** (0.36 mmol, 1.2 equiv), **2a** (0.3 mmol, 1.0 equiv) in solvent (0.6 mL) with **3b** (20 mol%) and **A₁** (20 mol%) at 25 °C. After workup, the mixture was concentrated and the residue was purified by flash chromatography on silica gel to afford **4a**. Then, *m*-xylene (2.0 mL) and 5 Å (1.0 equiv) were added to the reaction at 110 °C for 24 hours, after full conversion of the second step, the residue was purified by flash chromatography on silica gel. [b] For the first step. [c] Yield of **5a** and **5'a**. [d/e] Determined by Chiral HPLC analysis. [f/g] 20 % H₂O was added.

Table 5. Screening of second step



Condition ^a	Time ^b (h)	Yield ^c (%)	Ee ^d (%)
		5a/5'a	5a/5'a
3.0 eq PTSA, DCM, 20 °C	15	25/12	96/90
3.0 eq BF ₃ ·Et ₂ O, DCM, 0 °C	3	mess	-
2.0 eq FeCl ₃ ·6H ₂ O, DCM, 25 °C	5	mess	-
6M HCl : CH ₃ CN 1:1, 40 °C	12	trace	96/90
2.0 eq LiClO ₄ , toluene, 40 °C	>48	-	-
2.0 eq LiClO ₄ , toluene, 110 °C	4	mess	-
0.2 eq PTSA, toluene, 110 °C	4	mess	-
Toluene, 110 °C	24	23/34	99/96
<i>m</i> -Xylene, 110 °C	15	25/33	98/93
<i>m</i>-Xylene, 5 Å, 110 °C	15	31/33	>99/96
1.2 eq DBU, THF, 25 °C	5	-	-

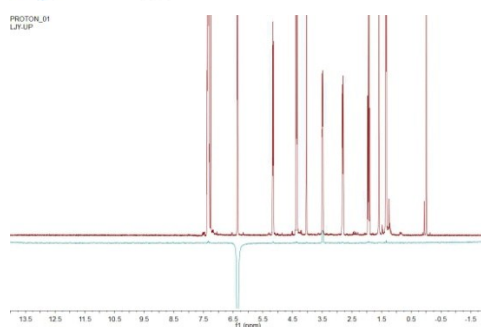
[a] In solvent (1.0 mL) with **4a** (0.1 mmol). [b] For the second step. [c] Yield of **5a** and **5'a**. [d] Determined by Chiral HPLC analysis. DCM = dichloromethane; PTSA = *p*-toluenesulfonic acid; DBU = 1,8-Diazabicyclo[5.4.0]undec-7-ene.

3. The Determination of the Absolute Configuration of Compound 5a/5'd/5h/5'h/5l

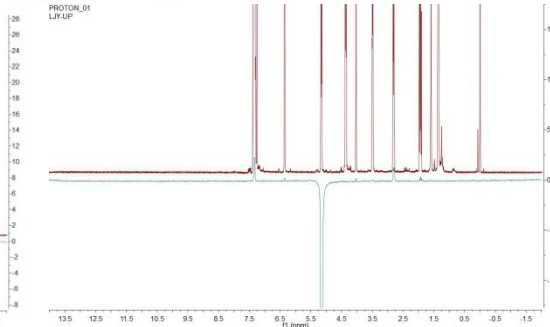
Up Spot 5a:

The determination of the relative configuration of compound 5a by NOE

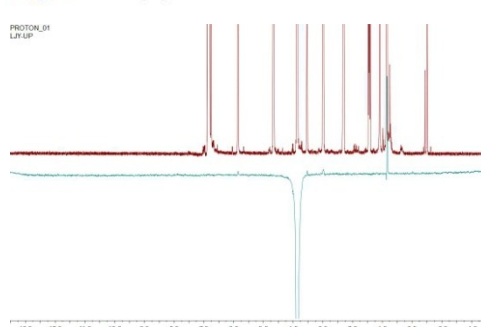
H₃: 6.36 ppm



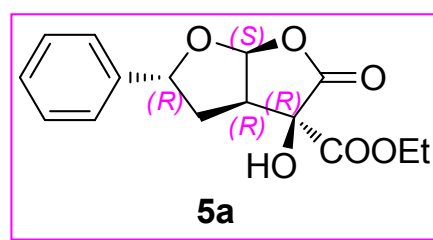
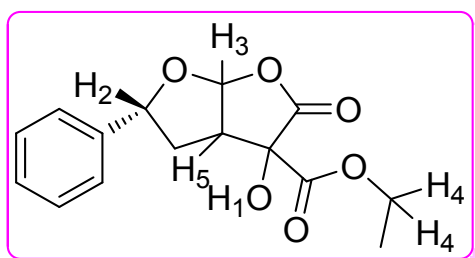
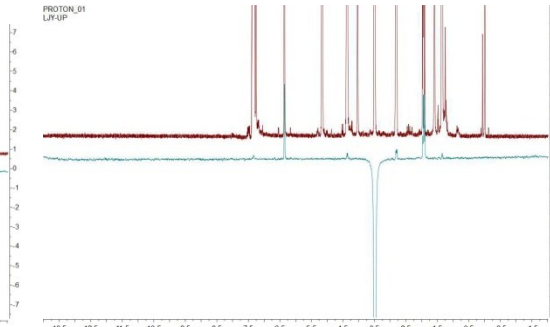
H₂: 5.16 ppm



H₄: 4.36 ppm



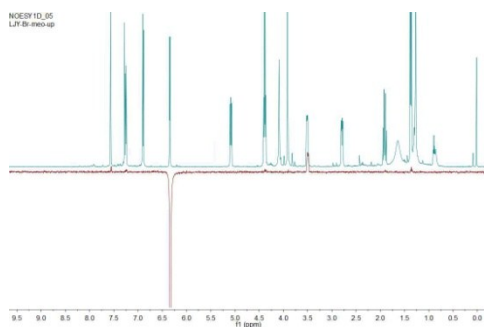
H₅: 3.49 ppm



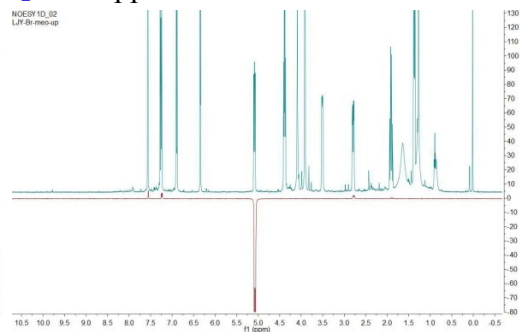
Up Spot 5h:

The determination of the relative configuration of compound 5h by NOE

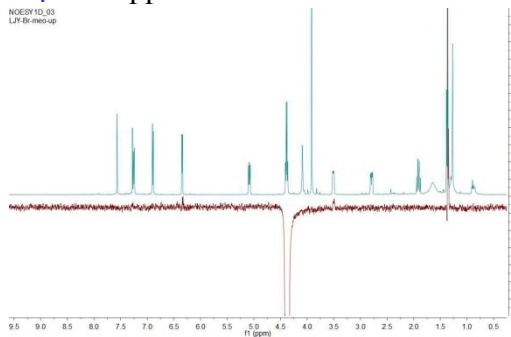
H₃: 6.33 ppm



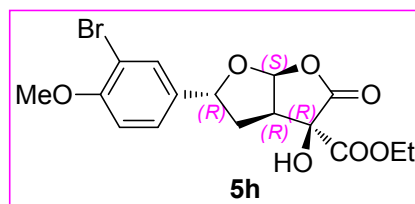
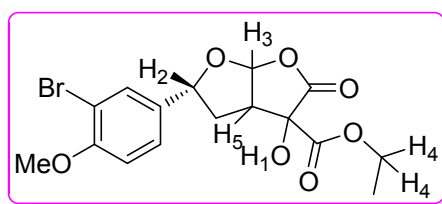
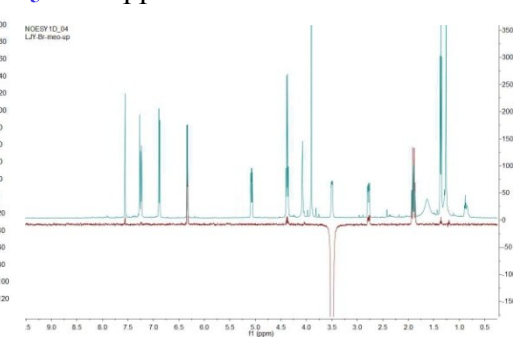
H₂: 5.07 ppm



H₄: 4.37 ppm



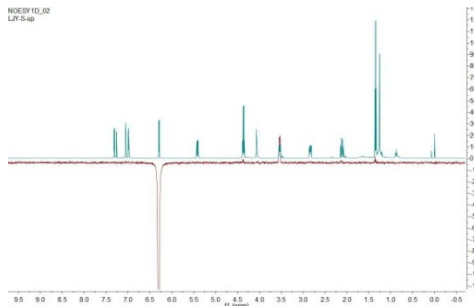
H₅: 3.50 ppm



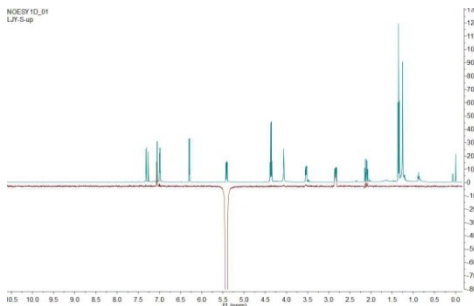
Up Spot 51:

The determination of the relative configuration of compound 51 by NOE

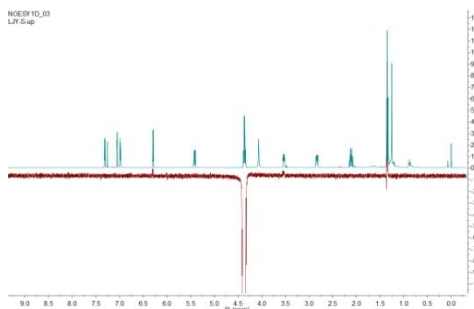
H₃: 6.30 ppm



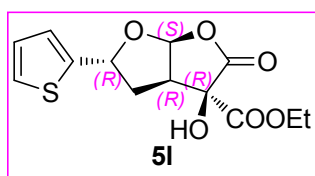
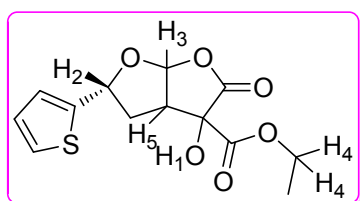
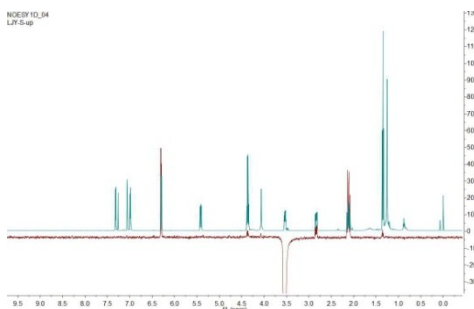
H₂: 5.42 ppm



H₄: 4.37 ppm



H₅: 3.50 ppm

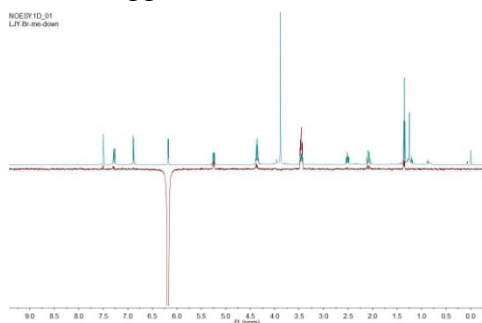


Down Spot 5'h:

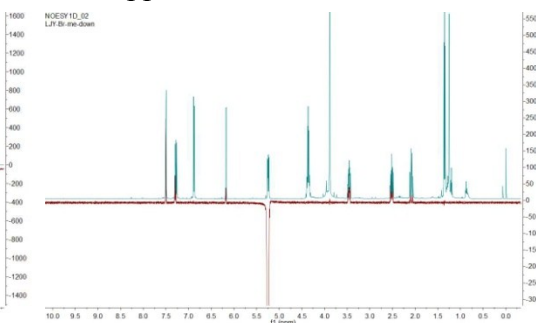
The determination of the absolute configuration of compound 5'h by Single Crystal X-Ray and NOE.

[CCDC 1510140 (5'h) contain the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif.]

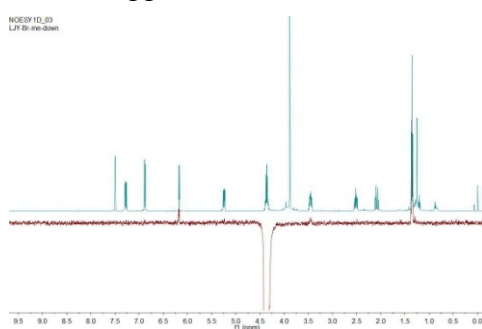
H₃: 6.18 ppm



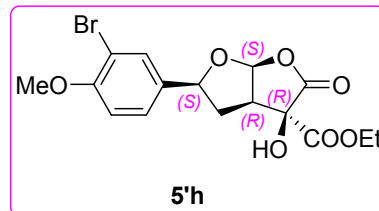
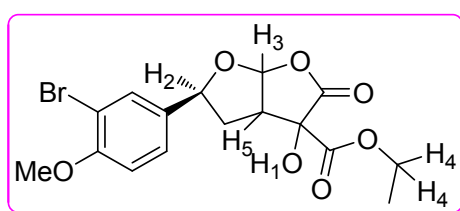
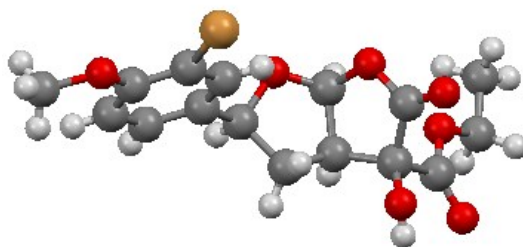
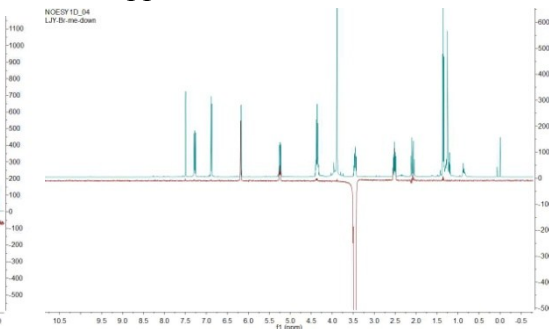
H₂: 5.25 ppm



H₄: 4.37 ppm



H₅: 3.45 ppm

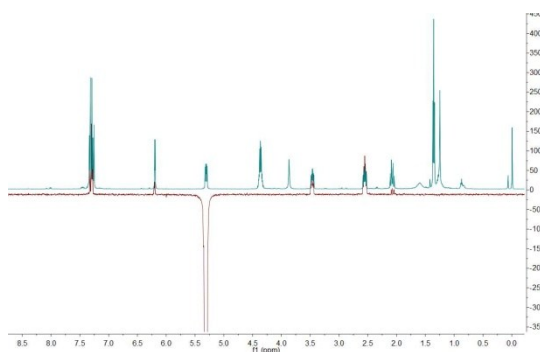
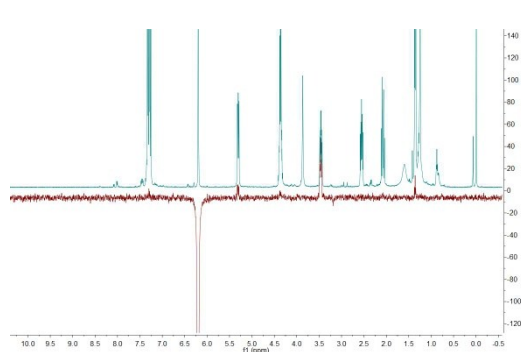


Down Spot 5'd:

The determination of the relative configuration of compound 5'd by NOE

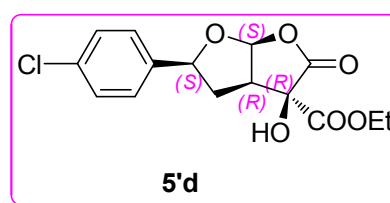
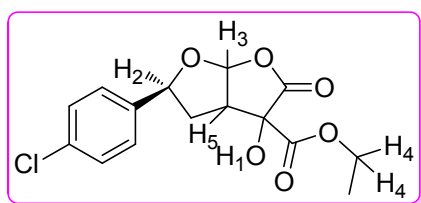
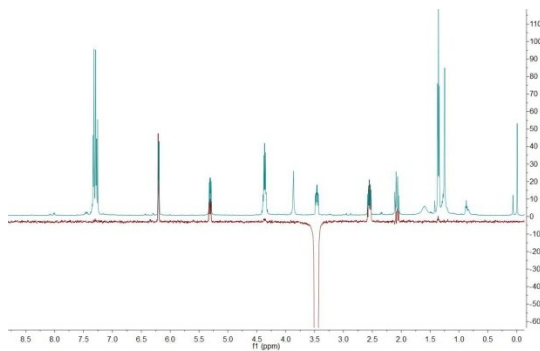
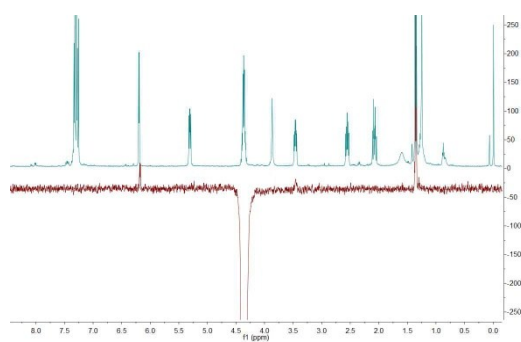
H₃: 6.20 ppm

H₂: 5.32 ppm

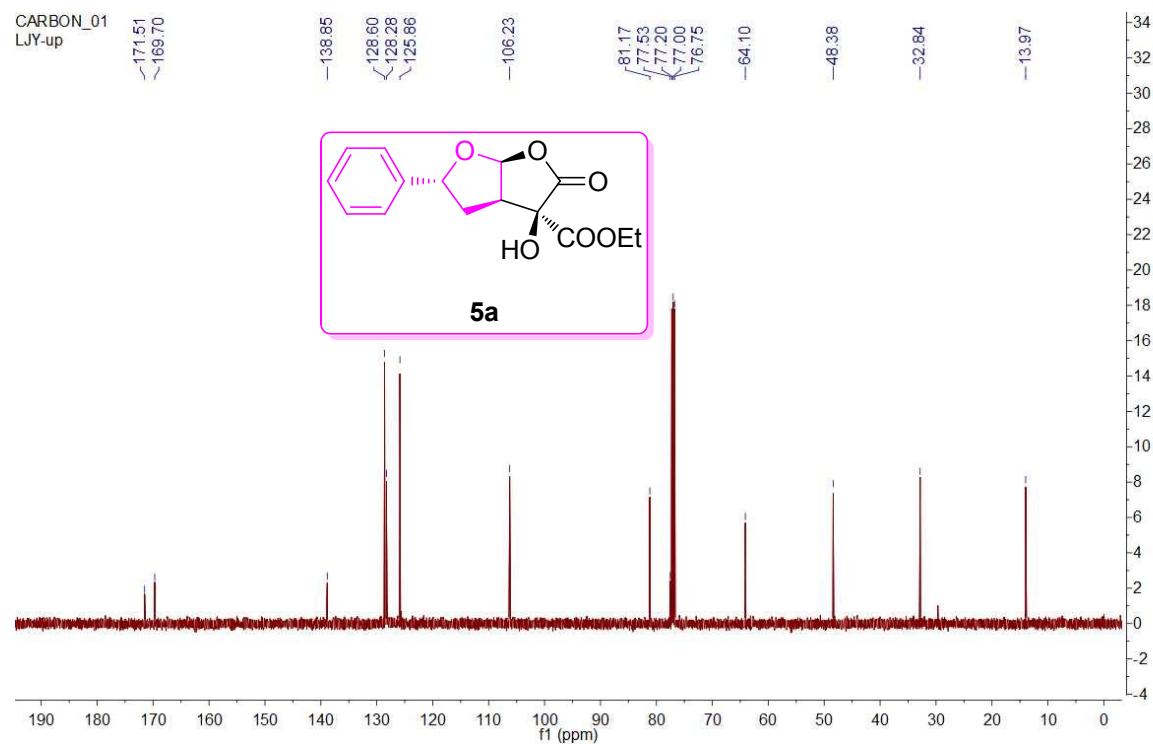
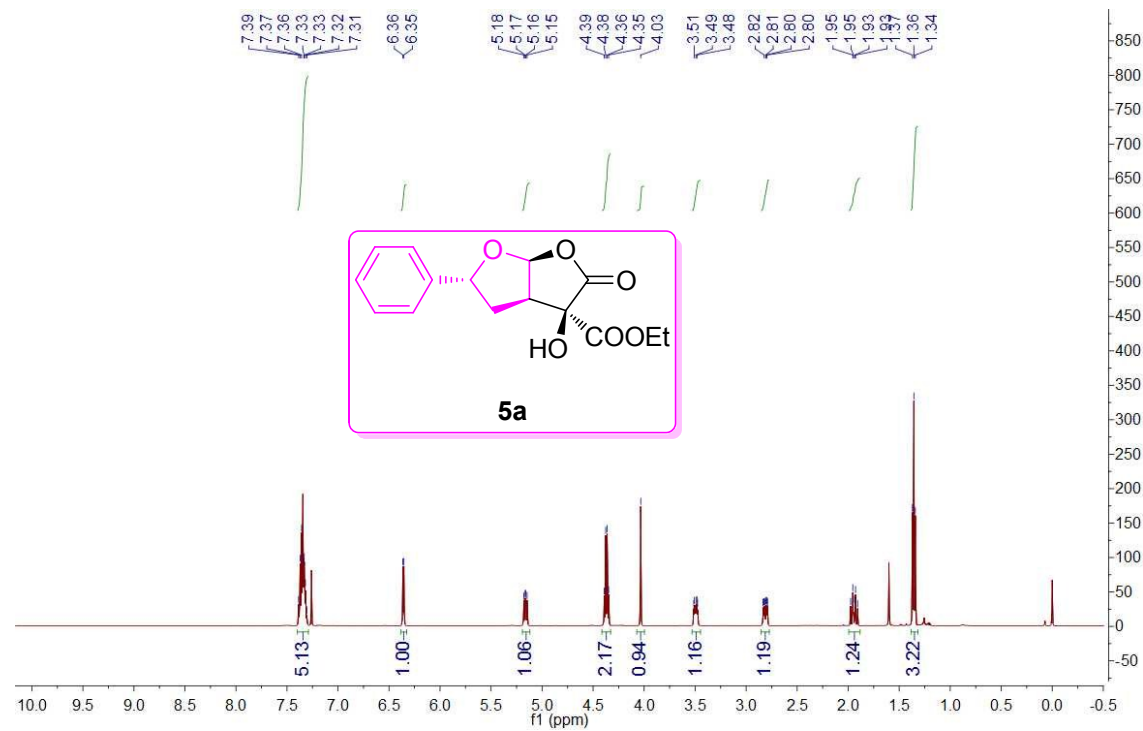


H₄: 4.37 ppm

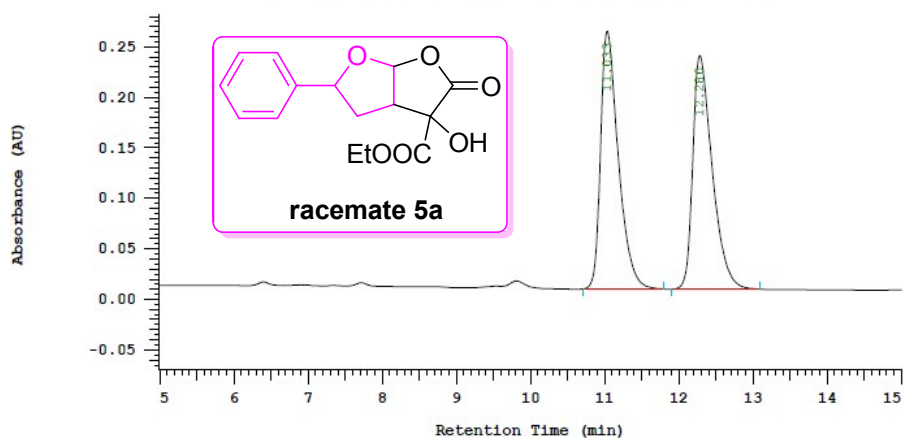
H₅: 3.47 ppm



4. NMR spectra and HPLC Traces



Chrom Type: Fixed WL Chromatogram, 210 nm

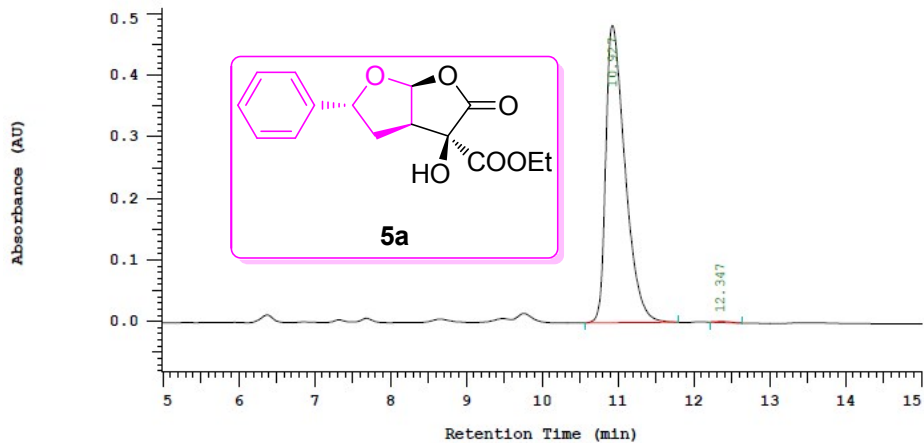


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
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2	12.280	2113991	49.884	BB
		4237823	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

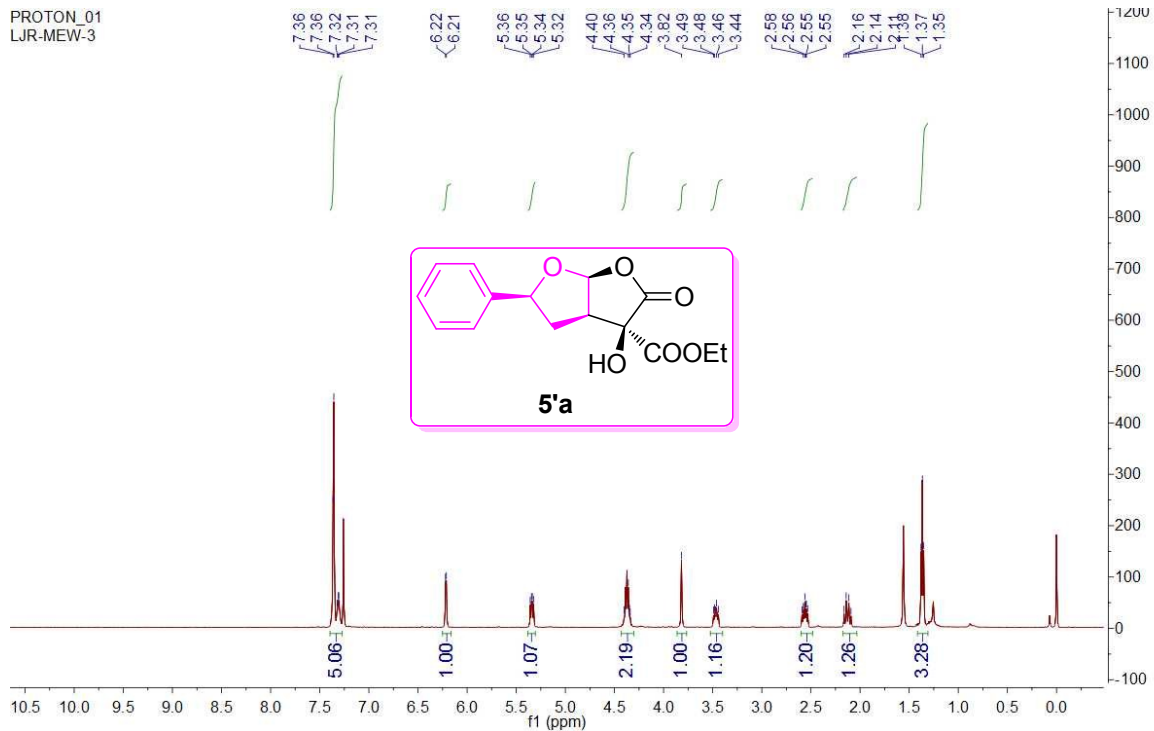


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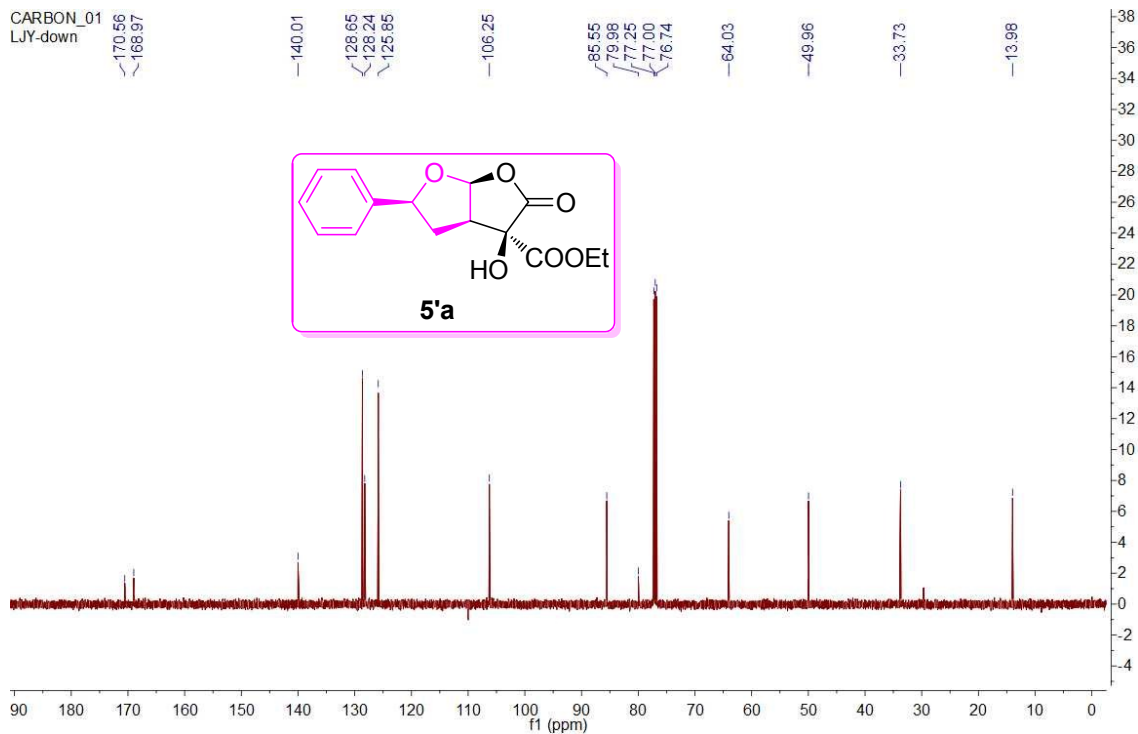
Peak Quantitation: AREA
Calculation Method: AREA%

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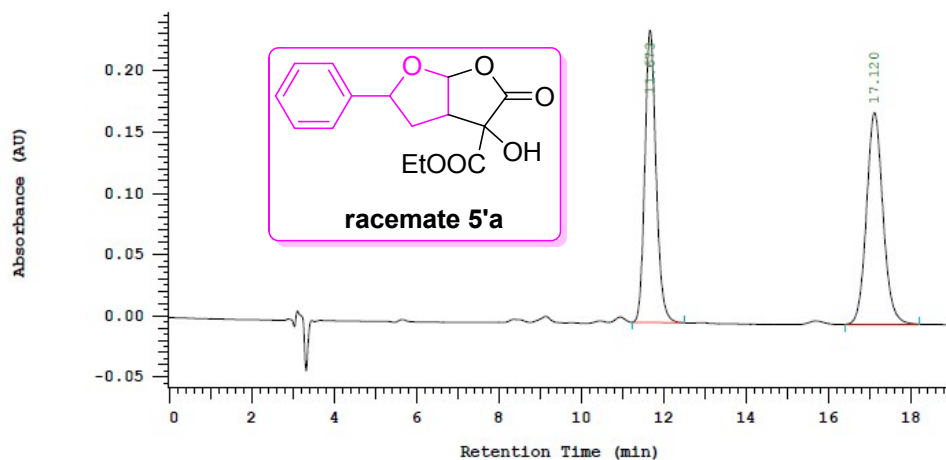
PROTON_01
LJR-MEW-3



CARBON_01
LJY-down



Chrom Type: Fixed WL Chromatogram, 210 nm

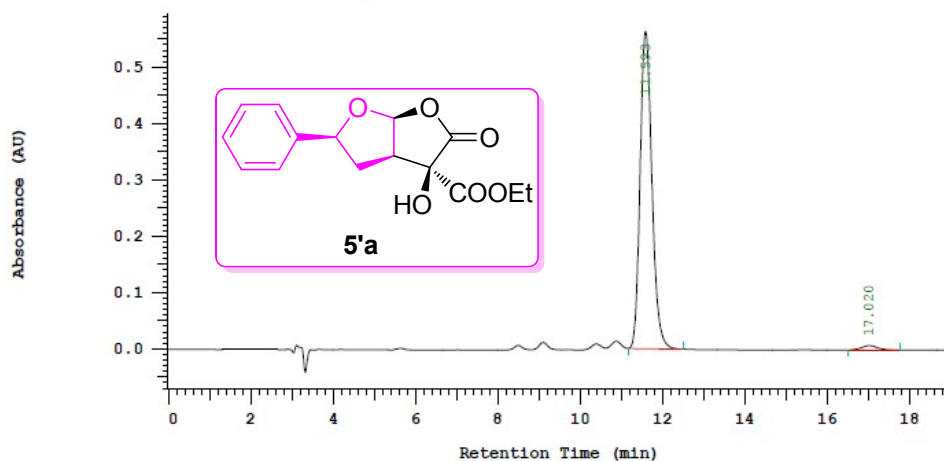


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

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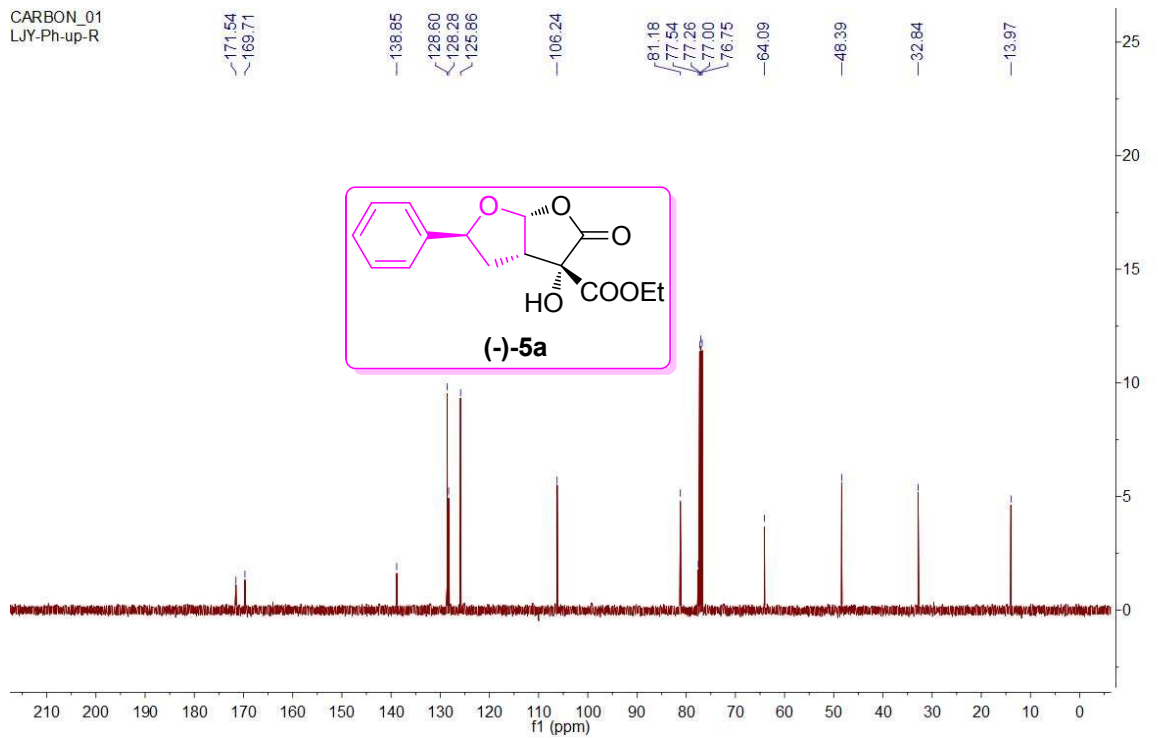
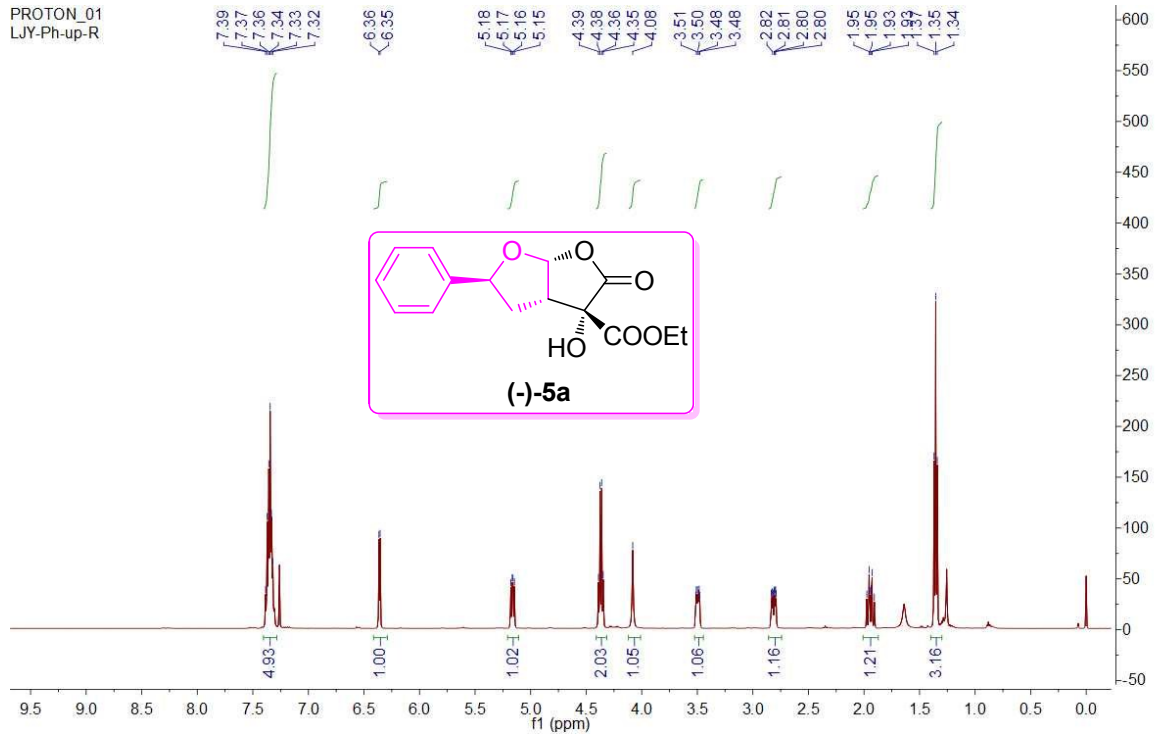
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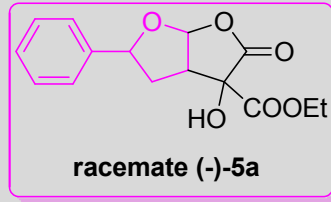


Chrom Type: Fixed WL Chromatogram, 210 nm

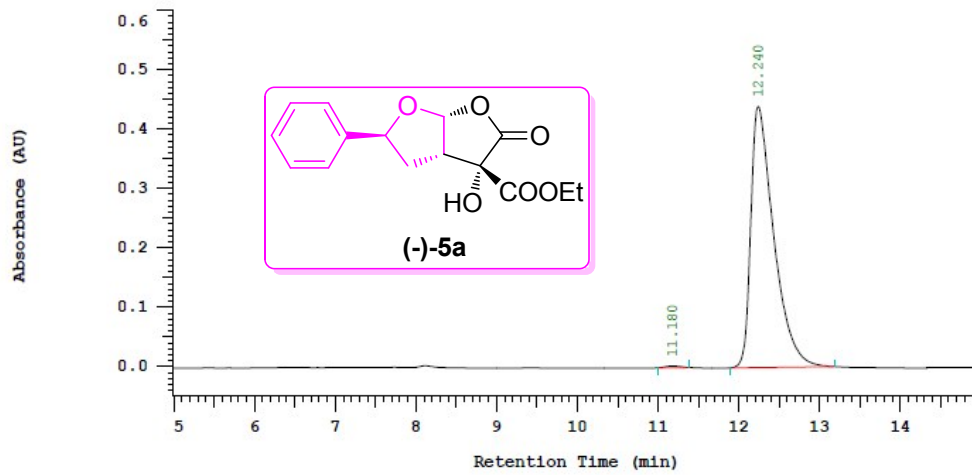
Peak Quantitation: AREA
Calculation Method: AREA%

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		5745590	100.000	





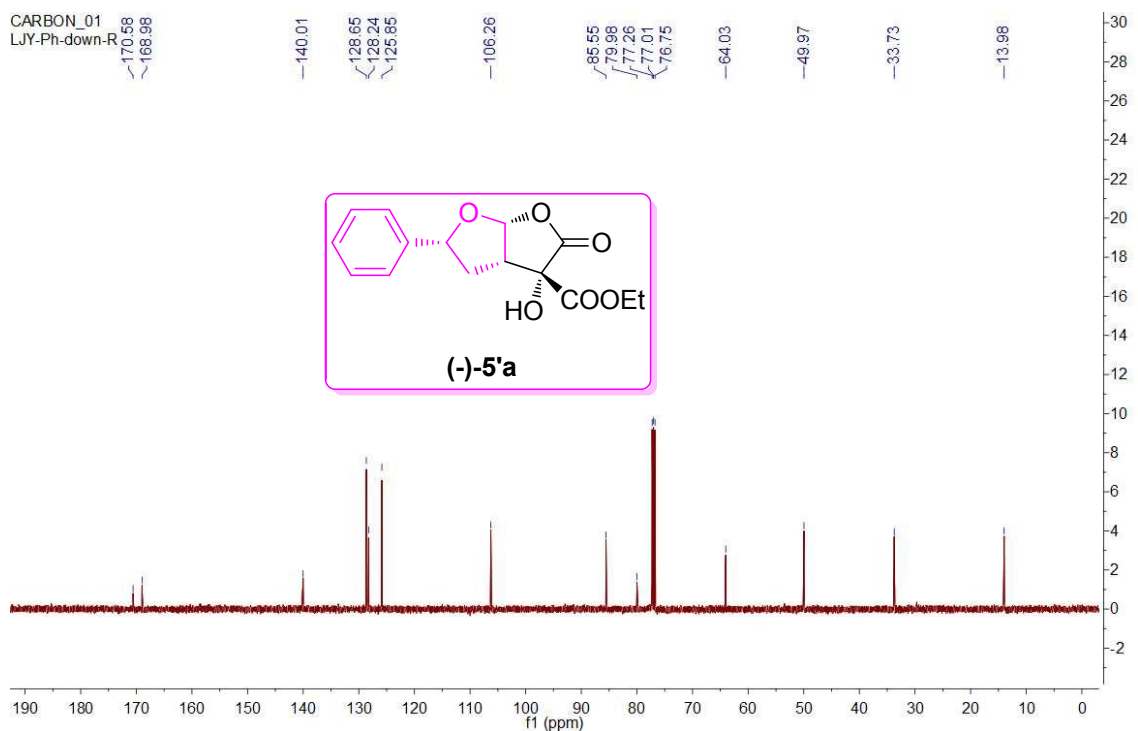
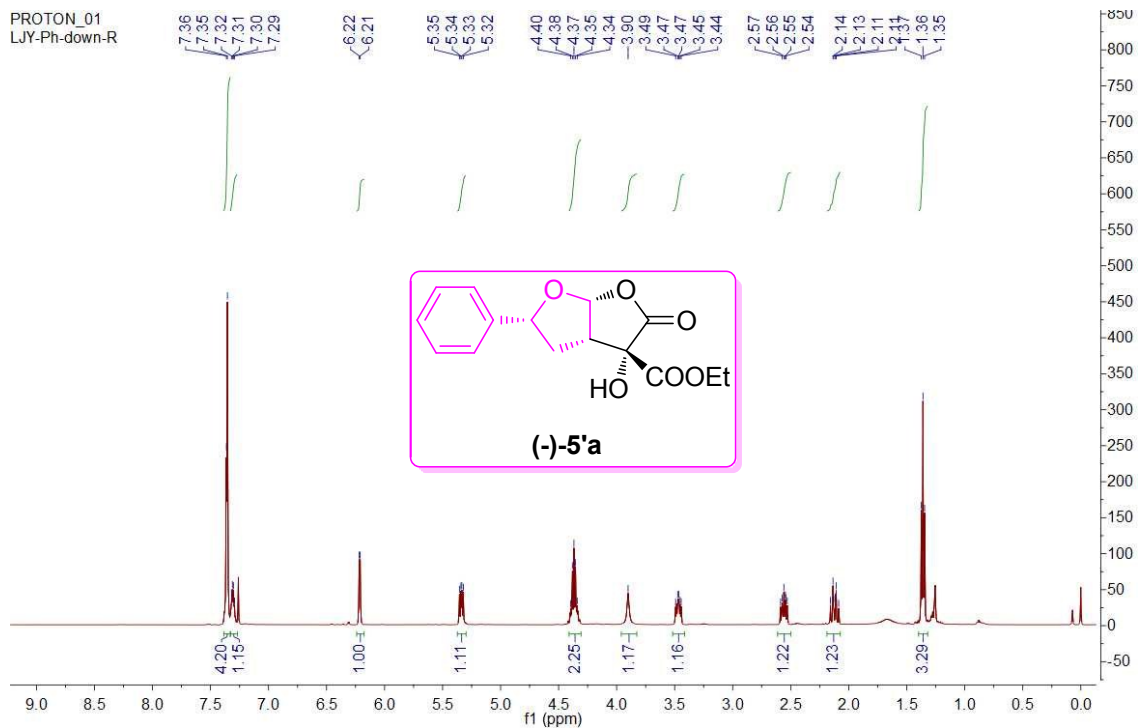
Chrom Type: Fixed WL Chromatogram, 210 nm

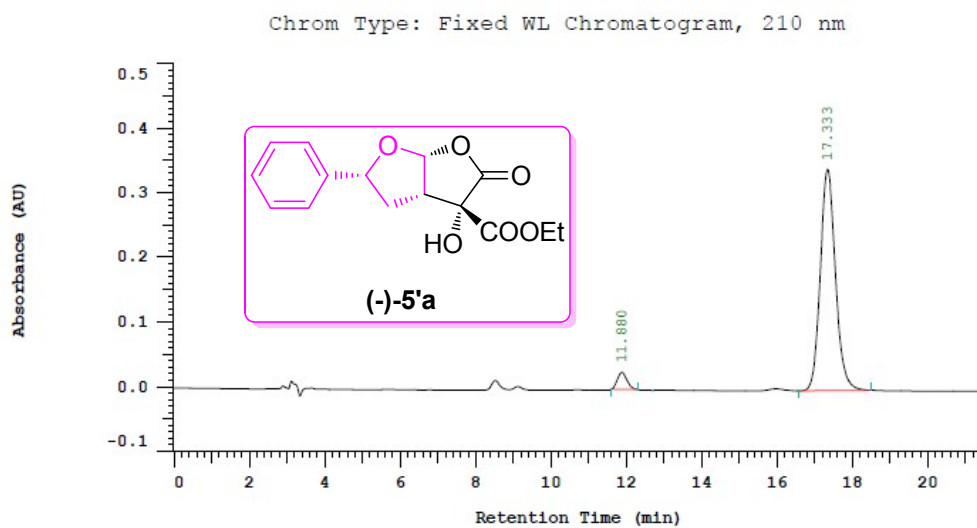
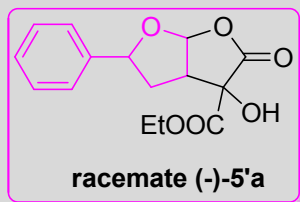


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.180	18639	0.427	BB
2	12.240	4350756	99.573	BB
		4369395	100.000	

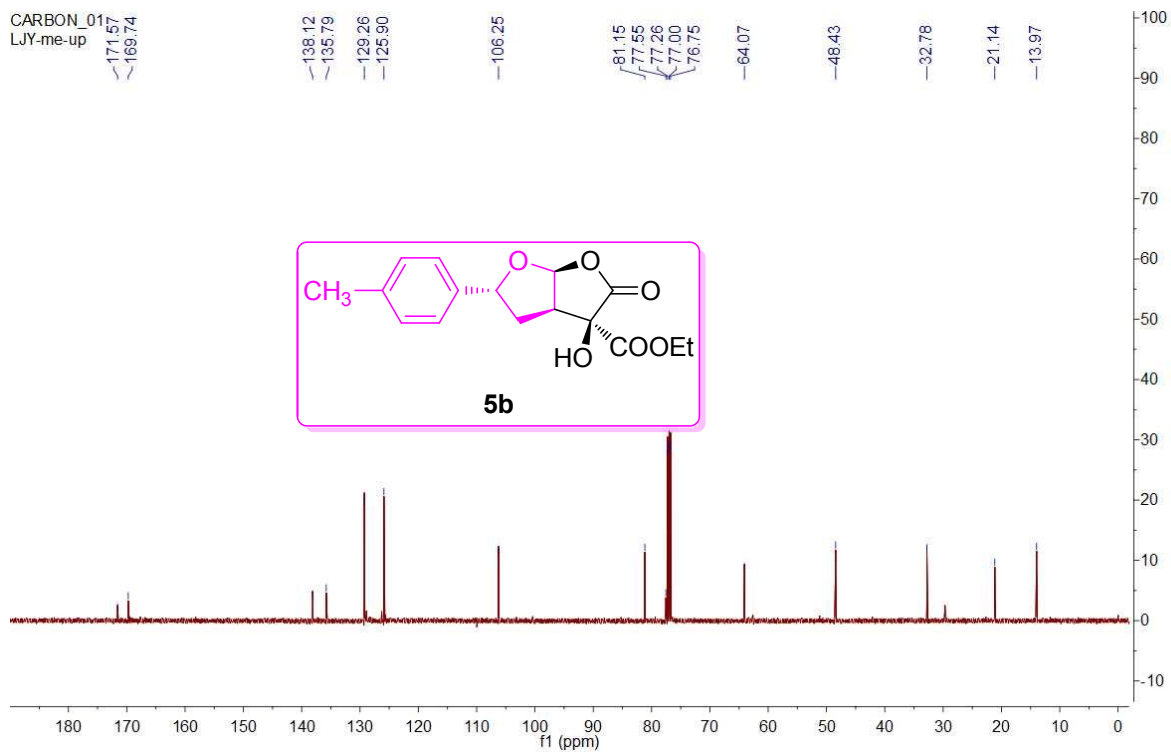
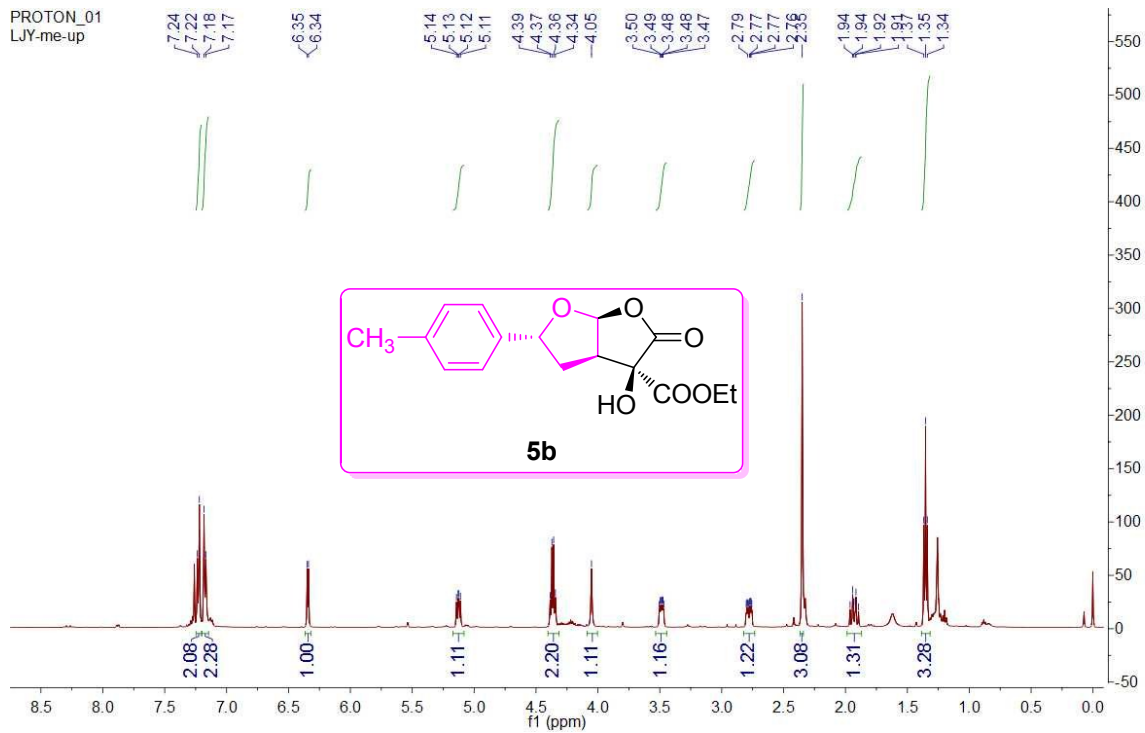




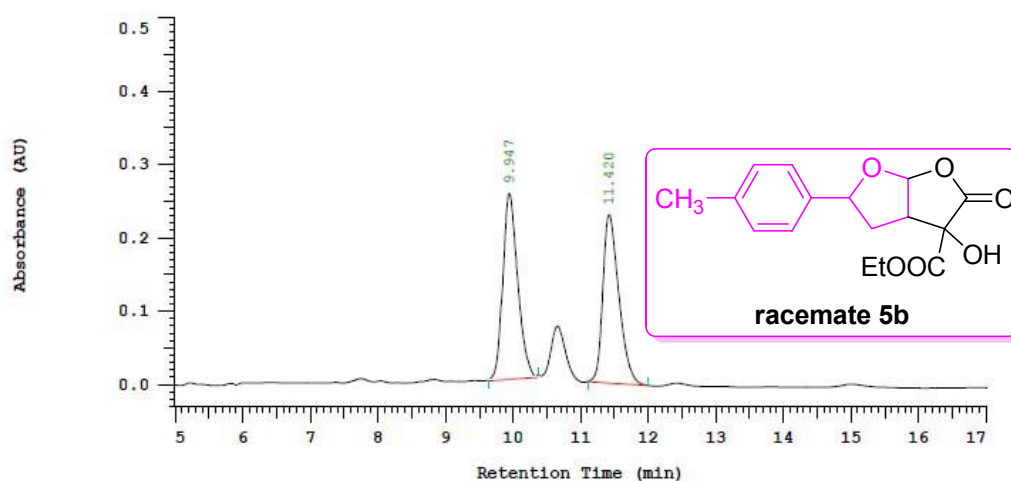
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.880	235022	4.705	BB
2	17.333	4760370	95.295	BB
		4995392	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

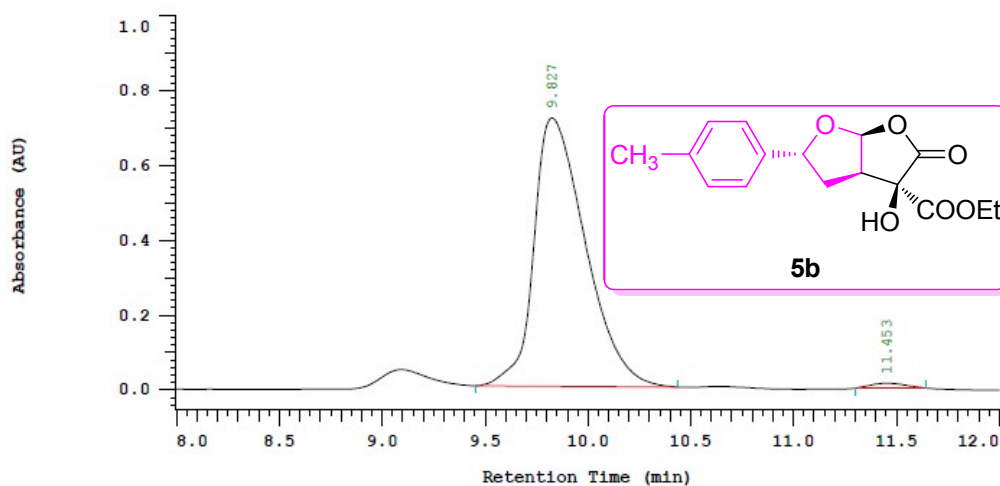


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	9.947	5069200	48.425	BB
2	11.420	5399088	51.575	BB
		10468288	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

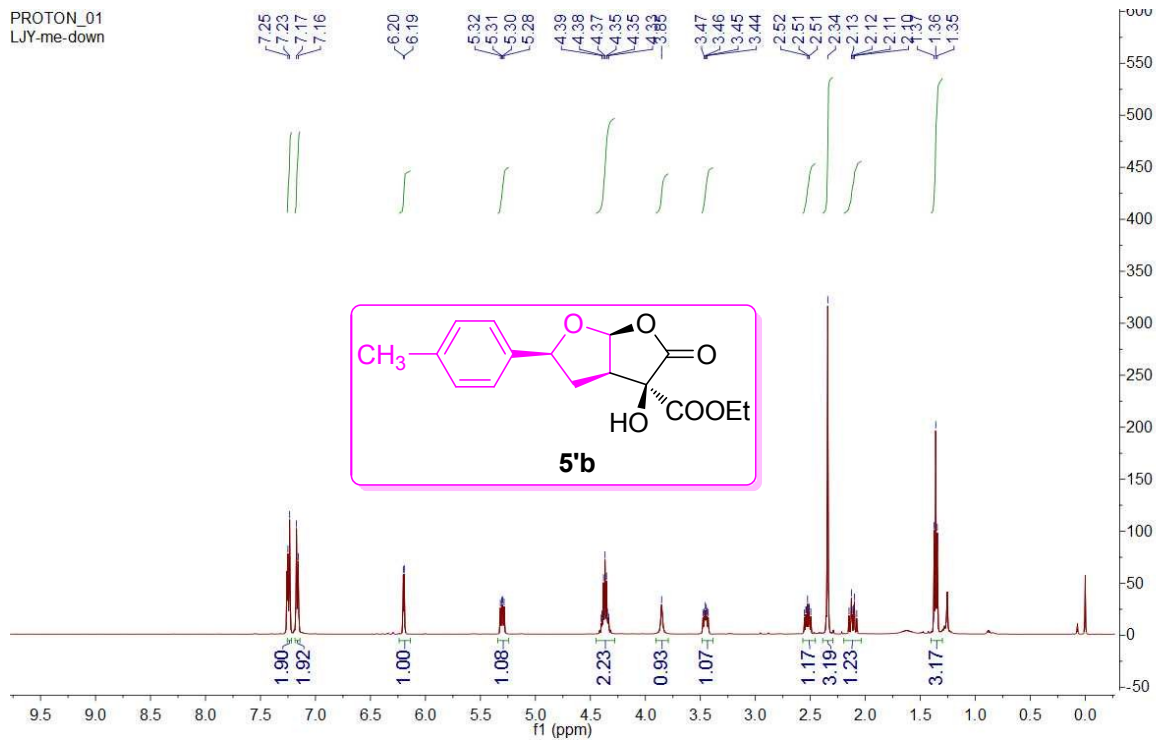


Chrom Type: Fixed WL Chromatogram, 210 nm

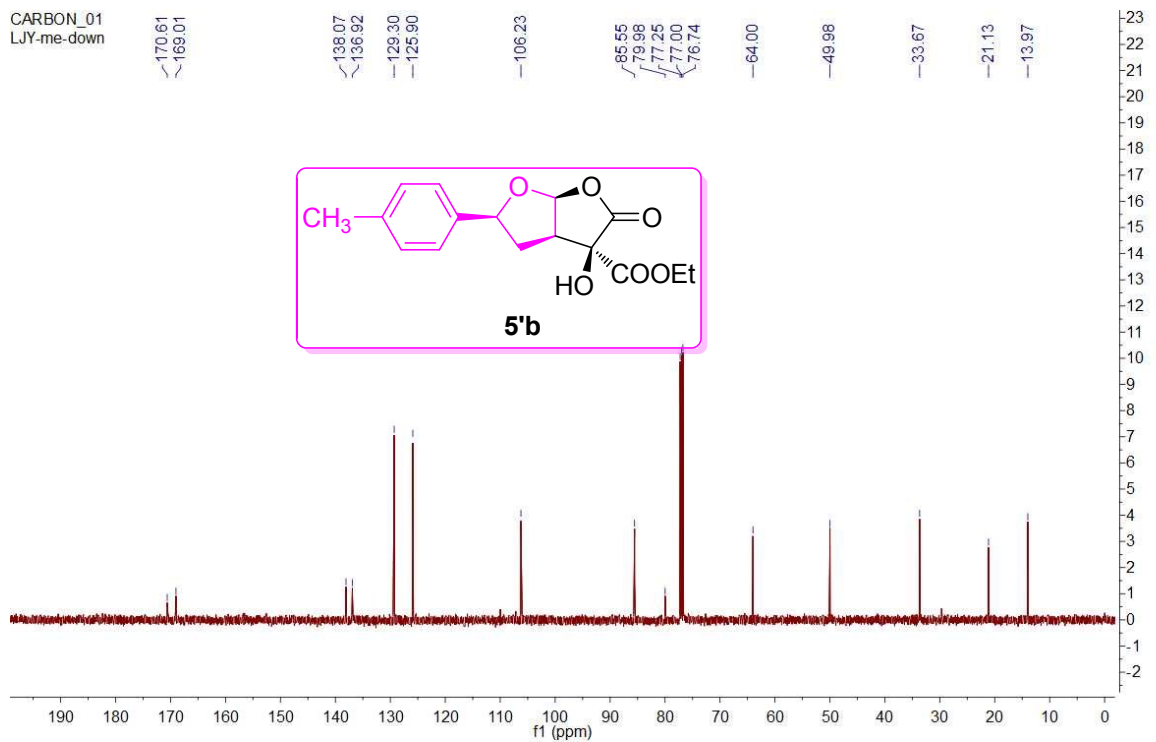
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	9.827	6243921	98.849	BB
2	11.453	72692	1.151	BB
		6316613	100.000	

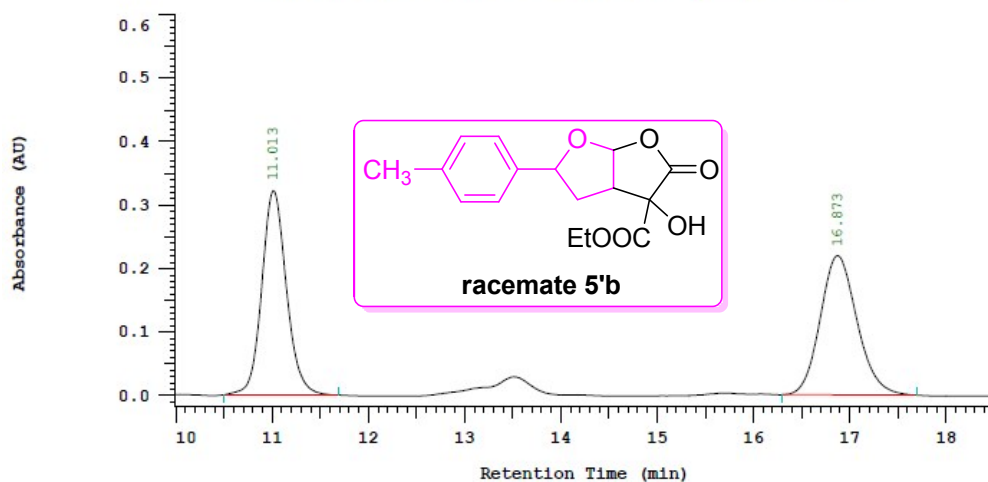
PROTON_01
LJY-me-down



CARBON_01
LJY-me-down



Chrom Type: Fixed WL Chromatogram, 210 nm

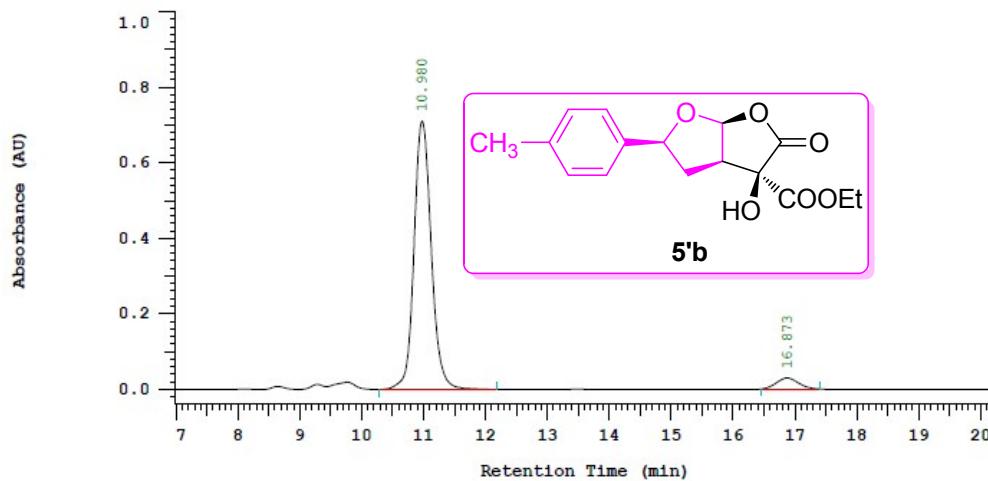


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.013	2864116	49.590	BB
2	16.873	2911456	50.410	BB
		5775572	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

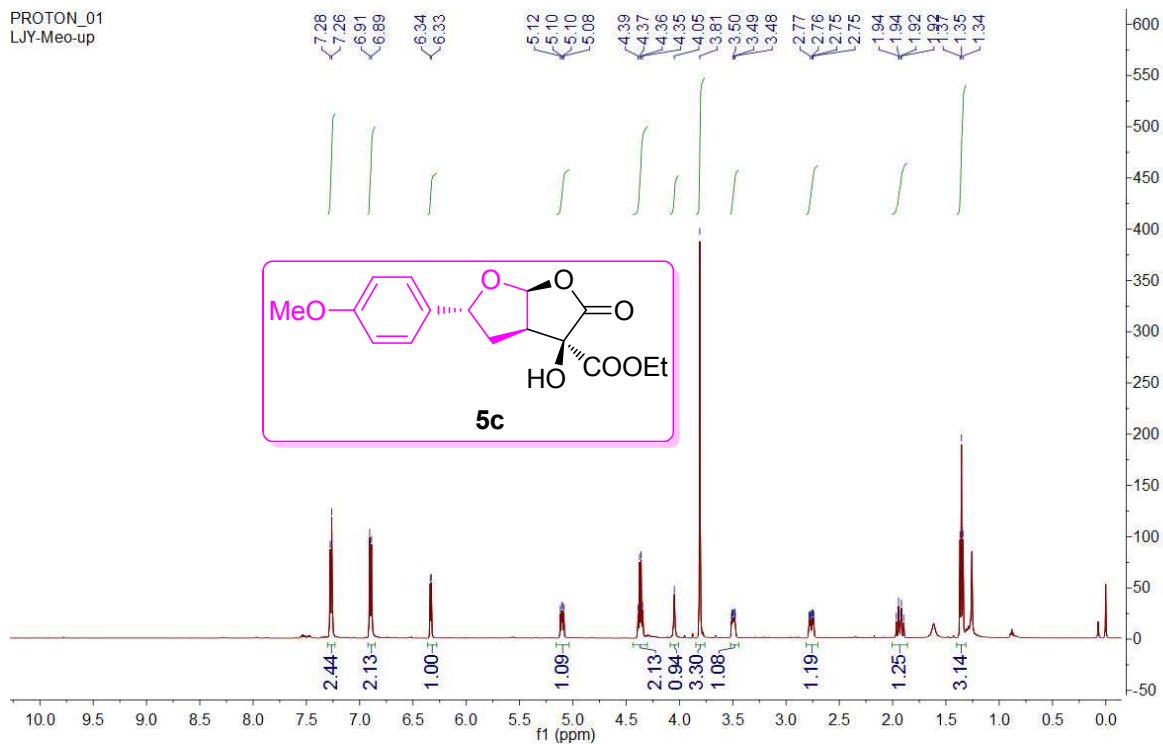


Chrom Type: Fixed WL Chromatogram, 210 nm

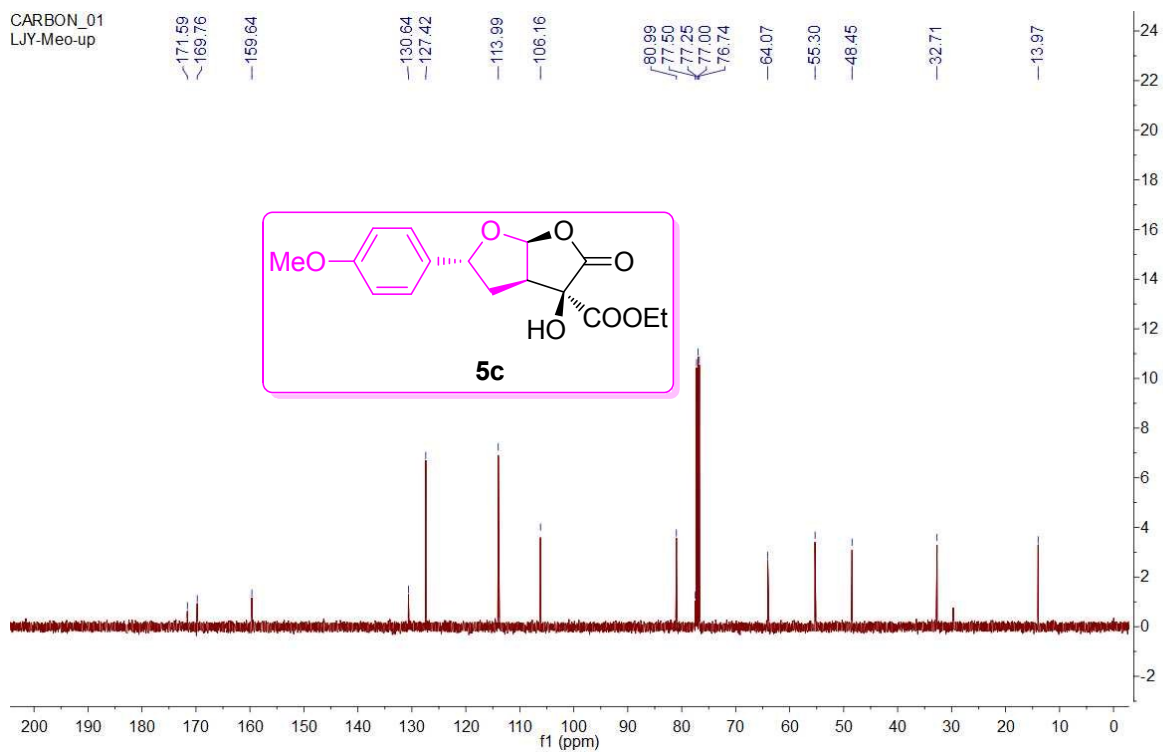
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	10.980	6854928	95.068	BB
2	16.873	355656	4.932	BB
		7210584	100.000	

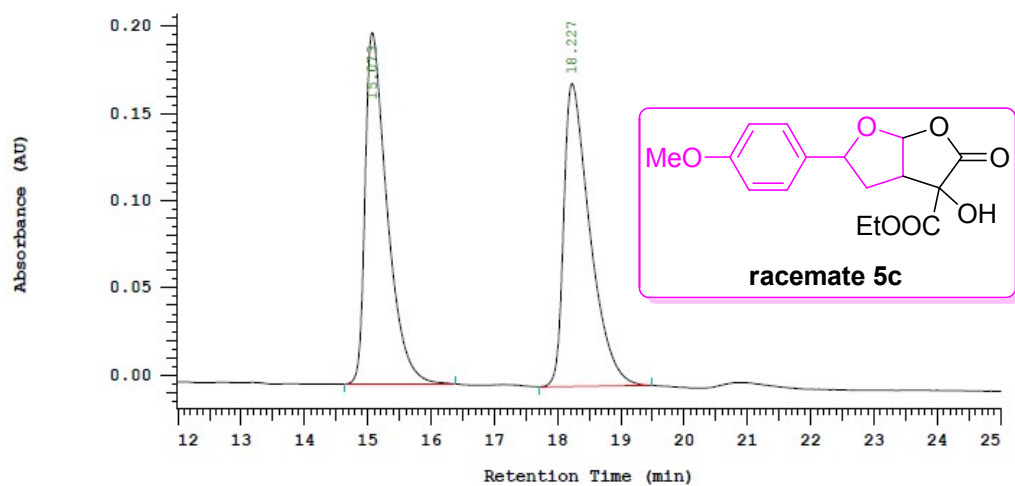
PROTON_01
LJY-Meo-up



CARBON_01
LJY-Meo-up



Chrom Type: Fixed WL Chromatogram, 210 nm

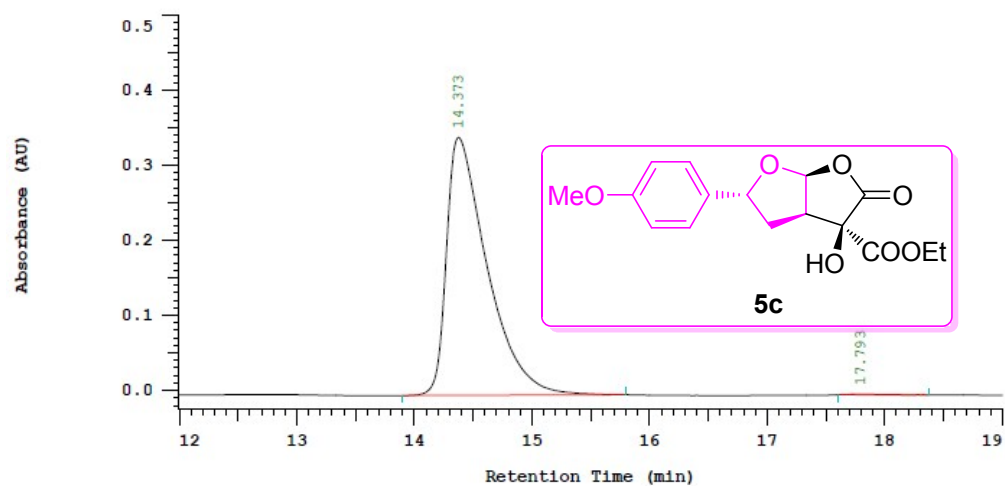


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	15.073	2424158	49.268	BB
2	18.227	2496186	50.732	BB
		4920344	100.000	

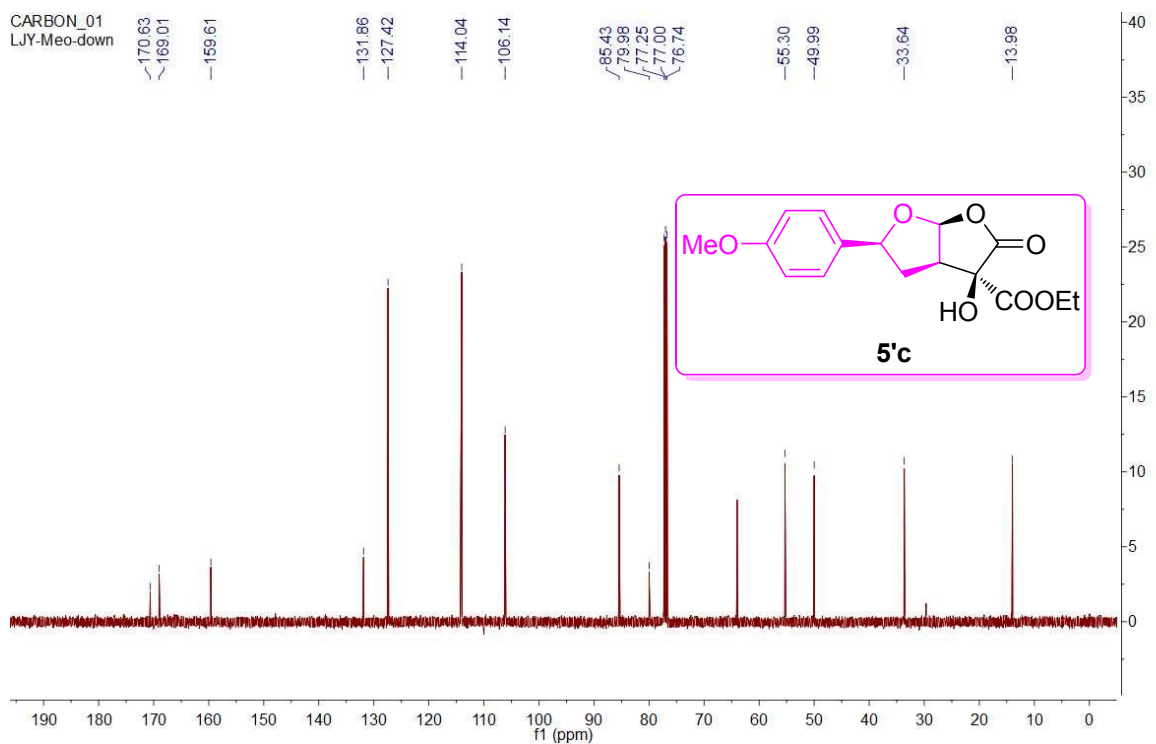
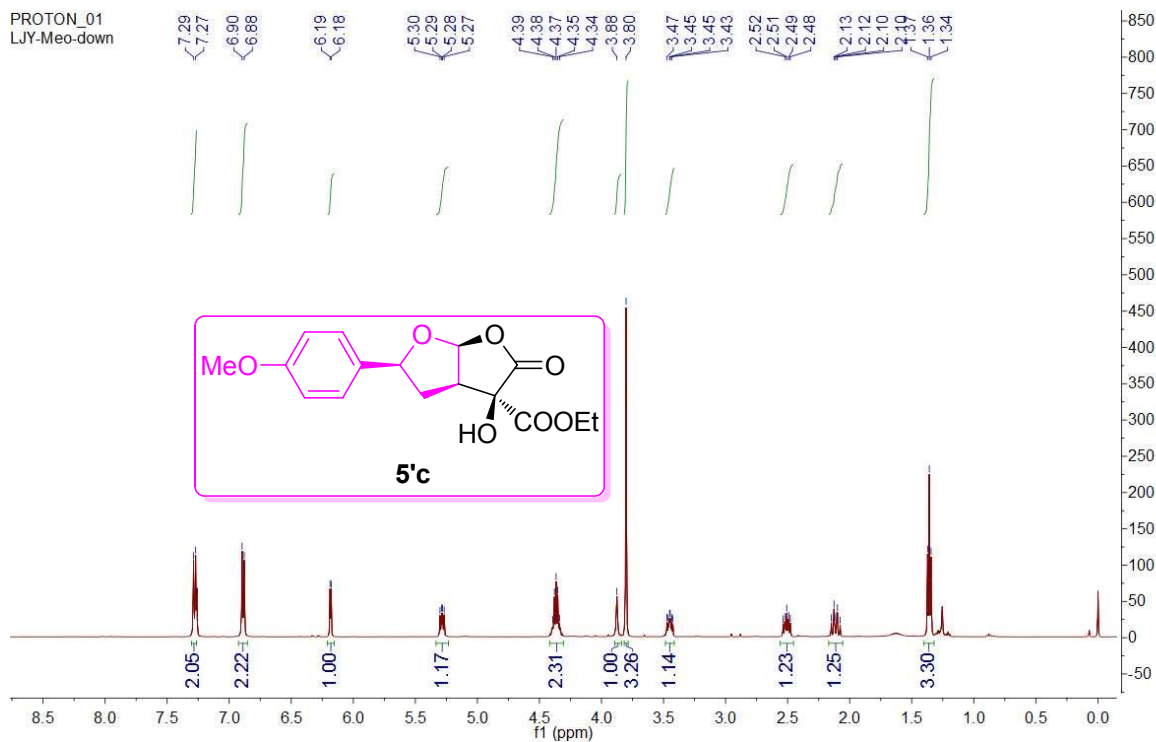
Chrom Type: Fixed WL Chromatogram, 210 nm



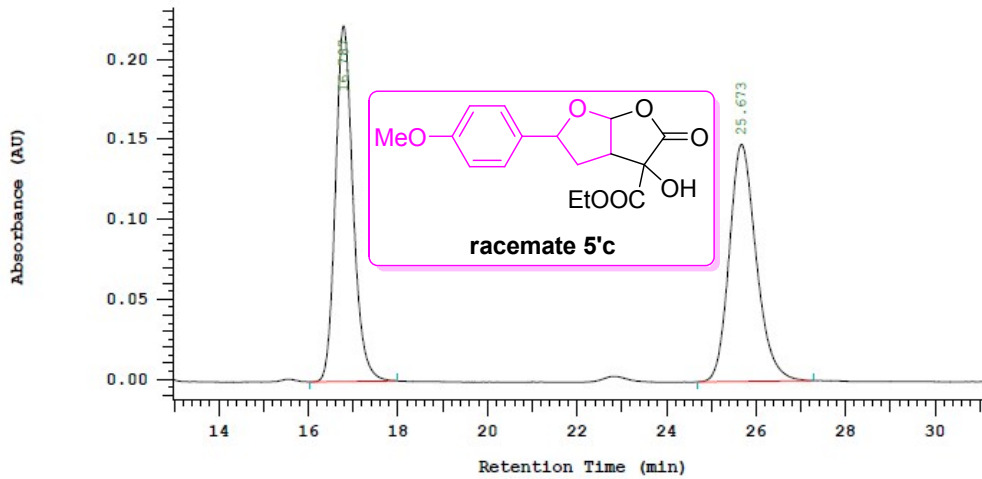
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	14.373	4134039	99.792	BB
2	17.793	8628	0.208	BB
		4142667	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

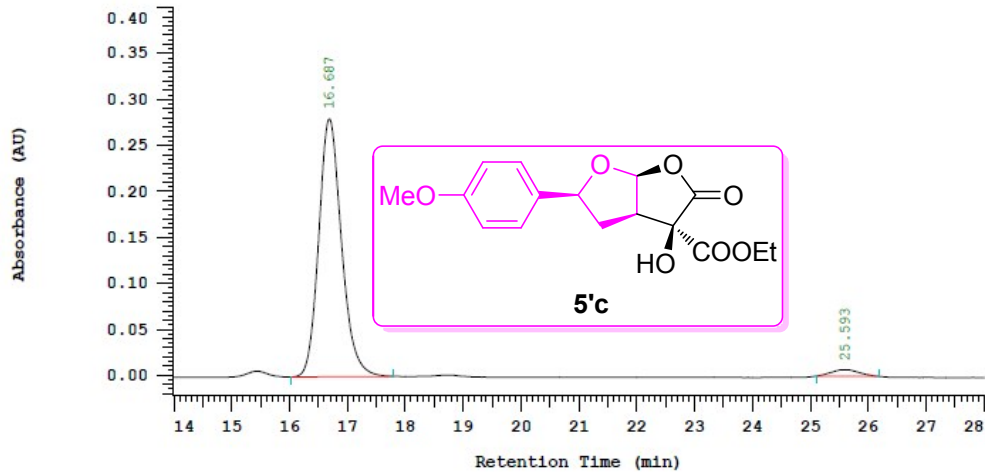


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	16.787	3050218	49.608	BB
2	25.673	3098479	50.392	BB
		6148697	100.000	

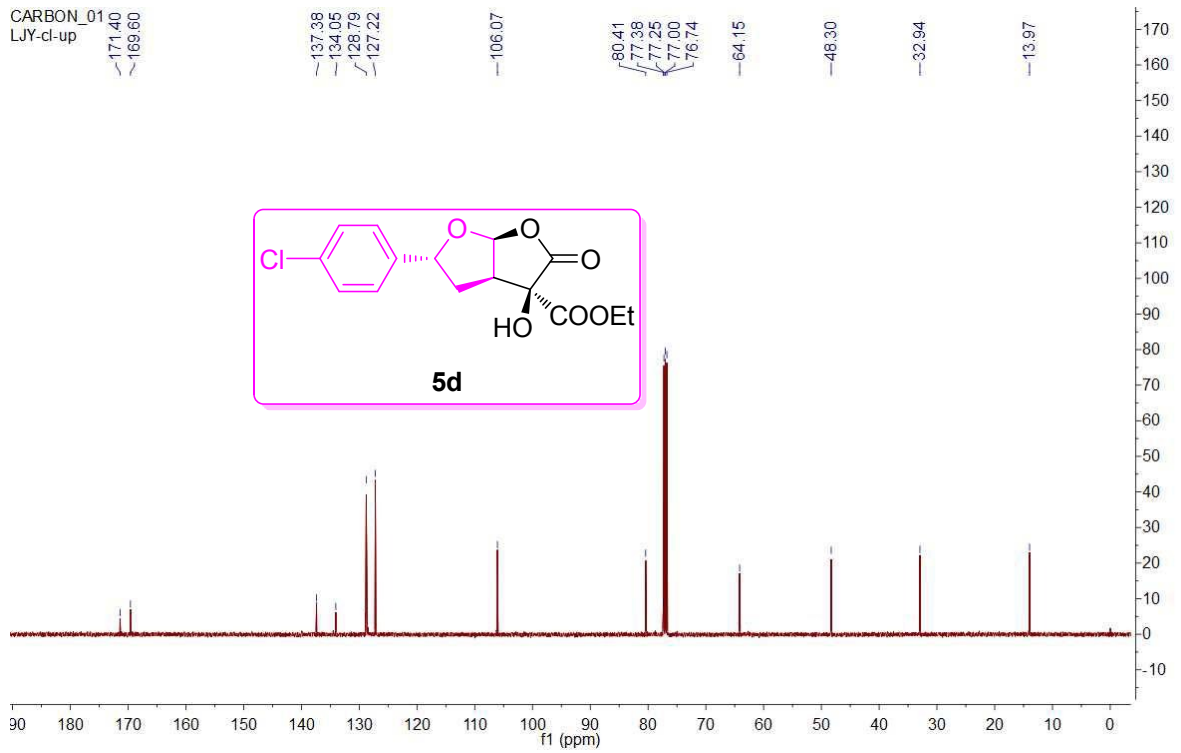
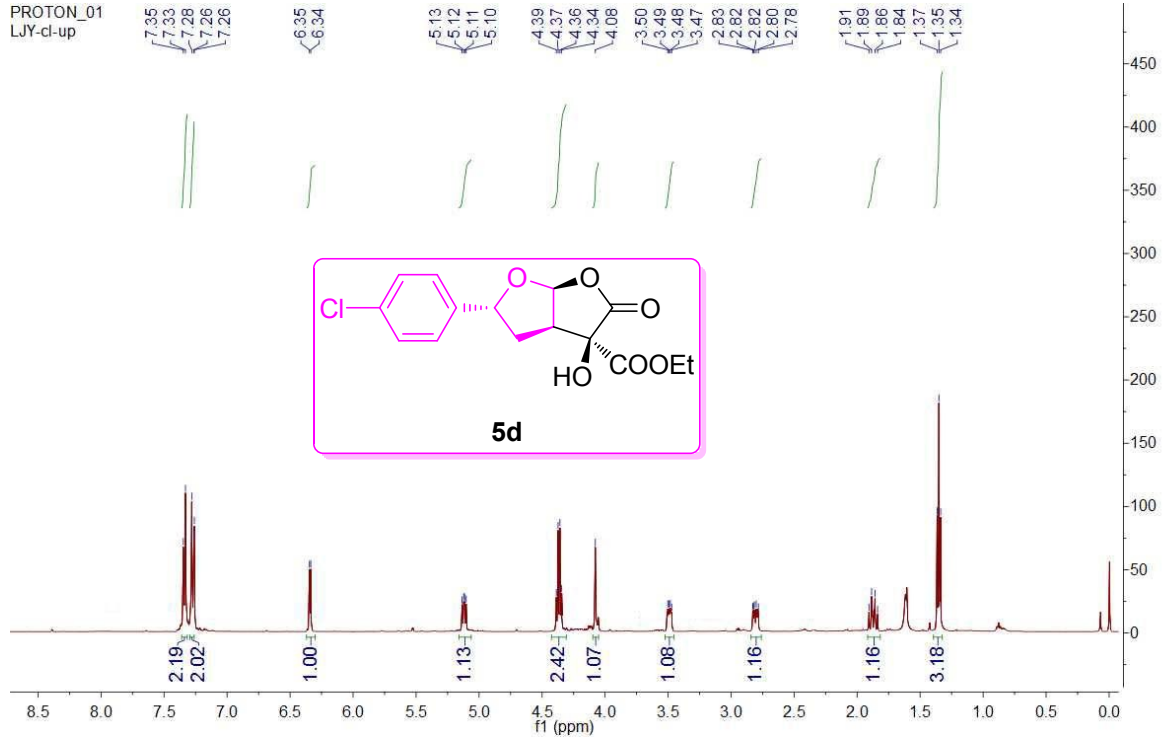
Chrom Type: Fixed WL Chromatogram, 210 nm



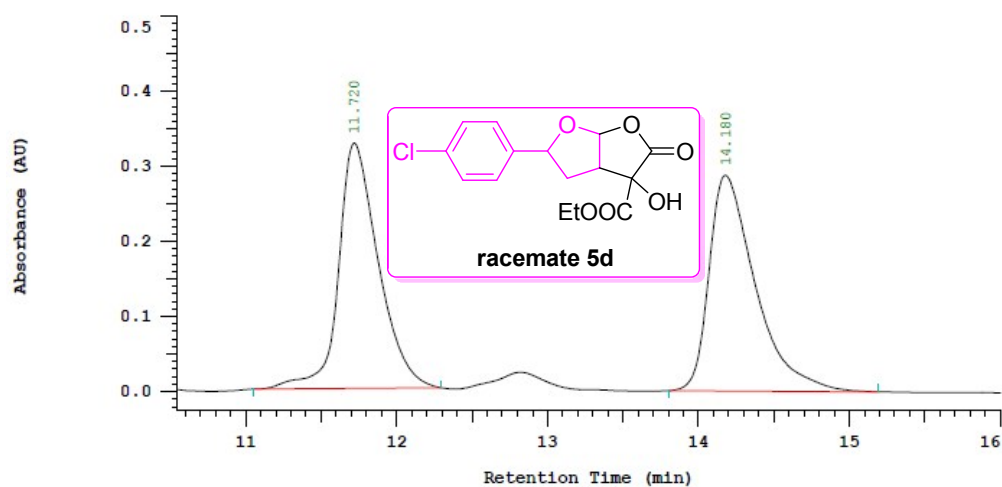
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	16.687	3829228	96.955	BB
2	25.593	120247	3.045	BB
		3949475	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

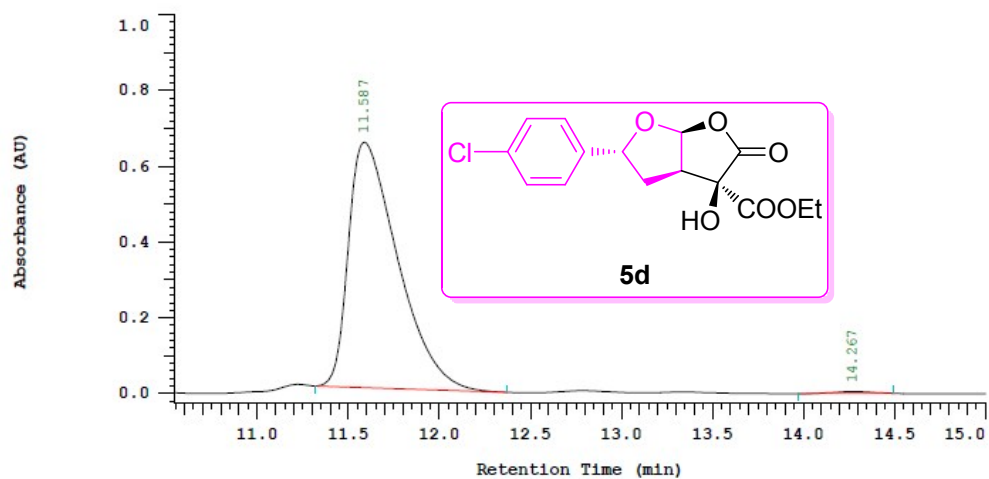


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.720	2993813	49.431	BB
2	14.180	3062715	50.569	BB
		6056528	100.000	

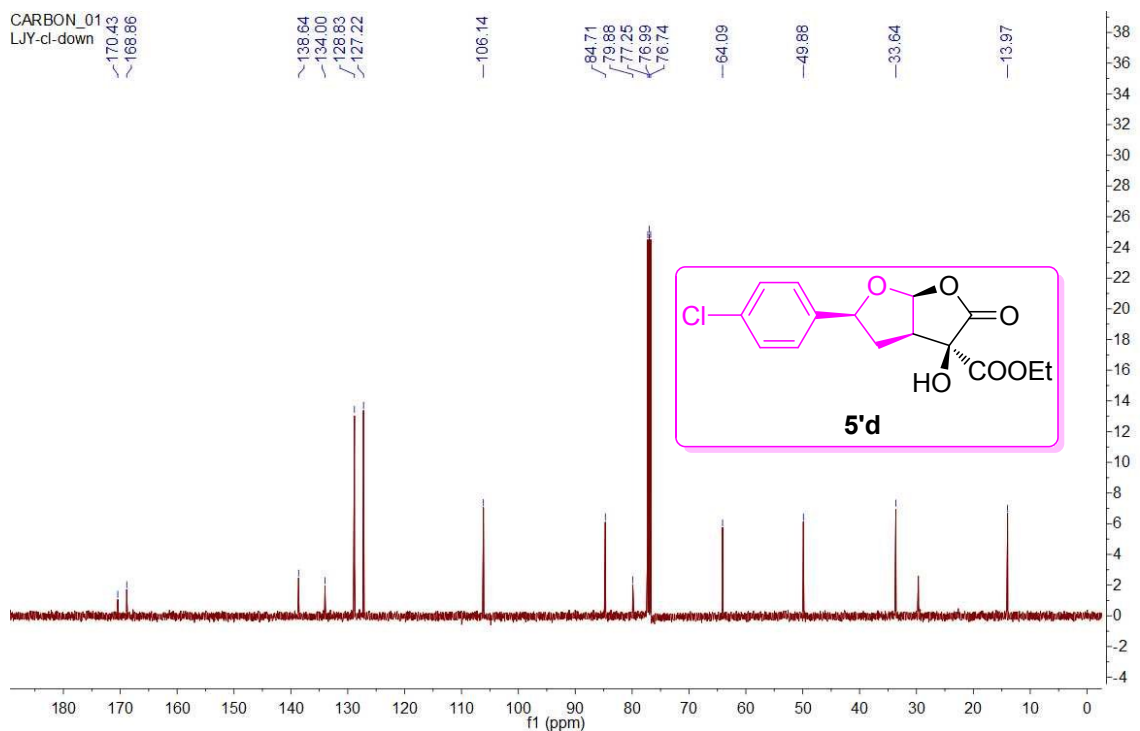
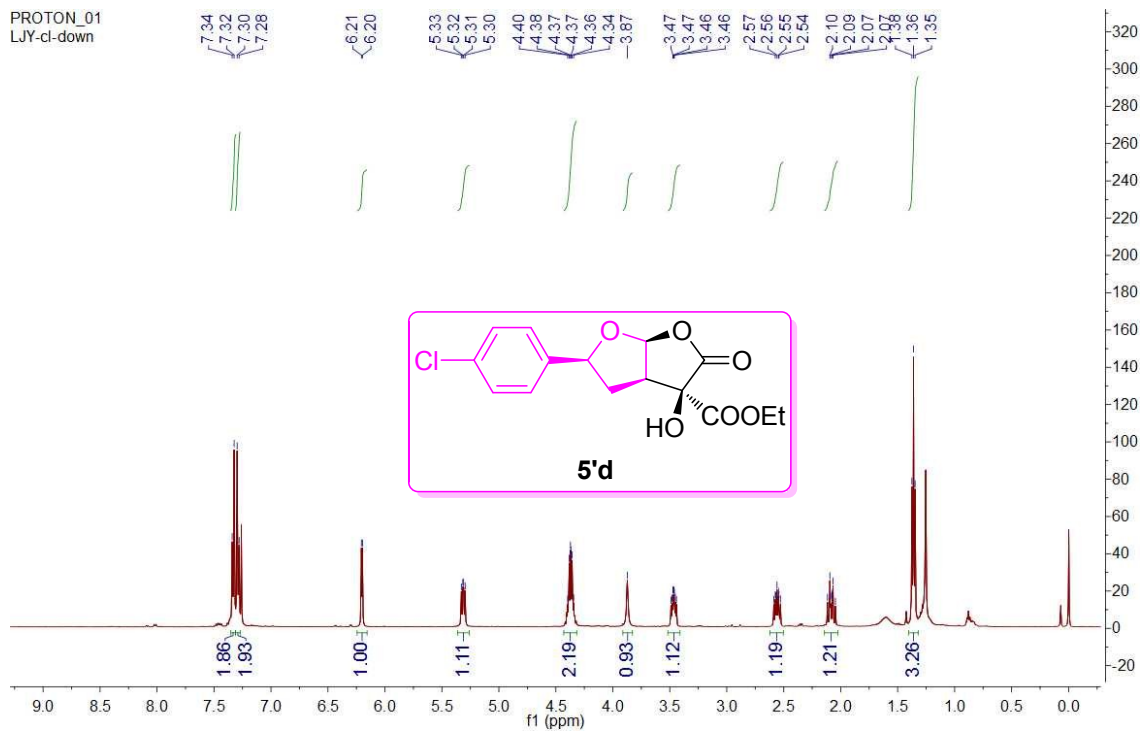
Chrom Type: Fixed WL Chromatogram, 210 nm



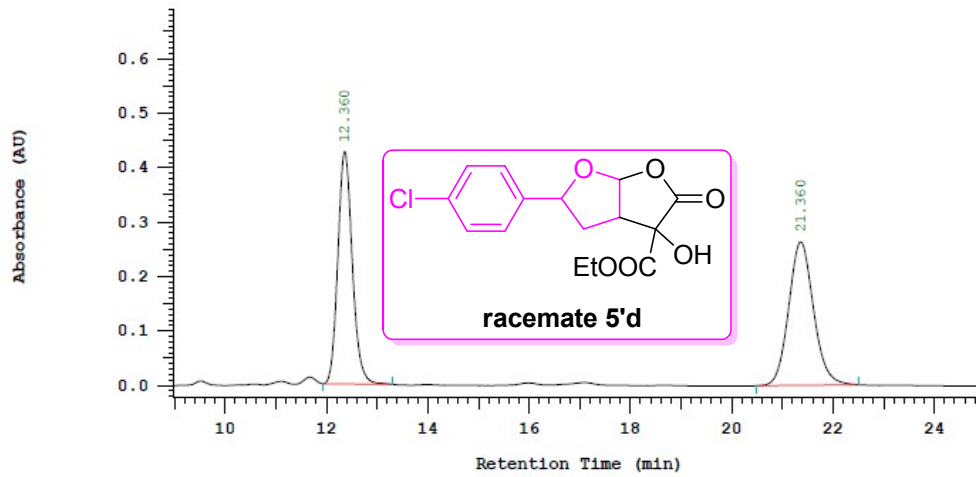
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.587	6114418	99.422	BB
2	14.267	35568	0.578	BB
		6149986	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

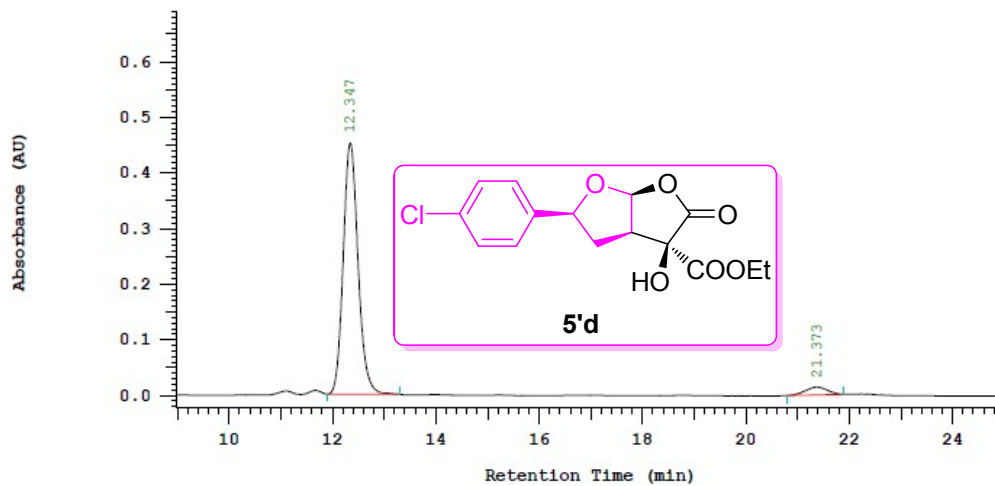


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	12.360	4236575	48.531	BB
2	21.360	4492996	51.469	BB
		8729571	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

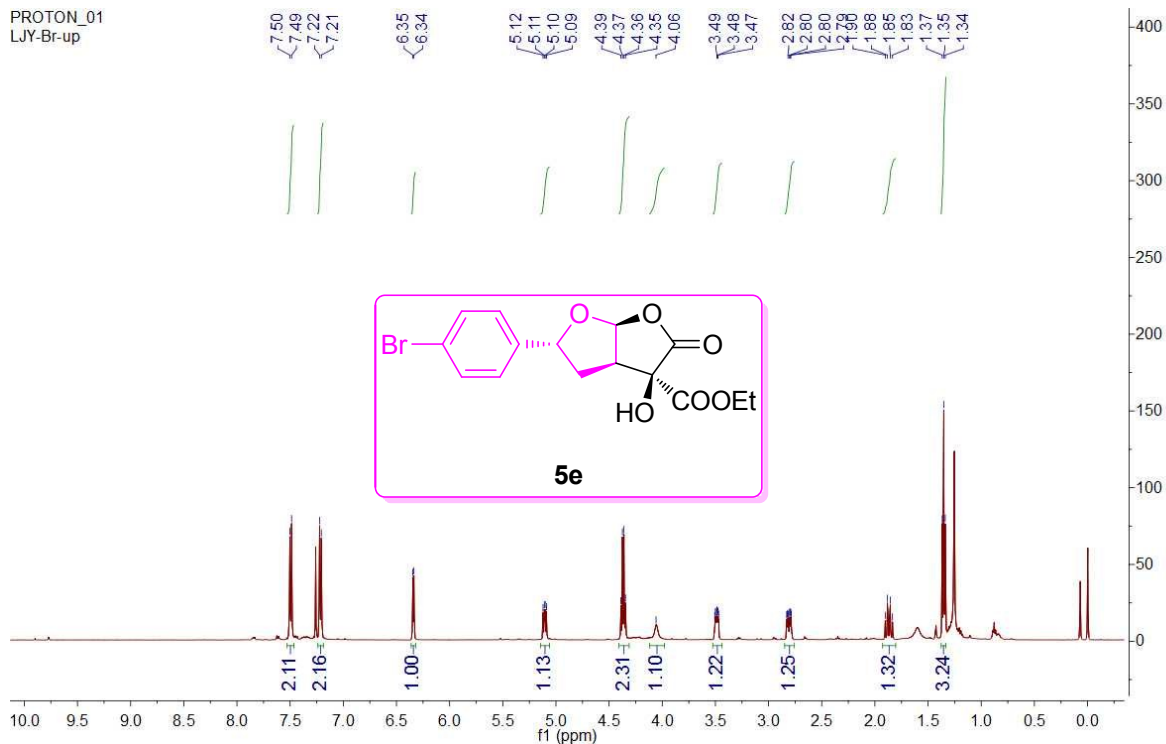


Chrom Type: Fixed WL Chromatogram, 210 nm

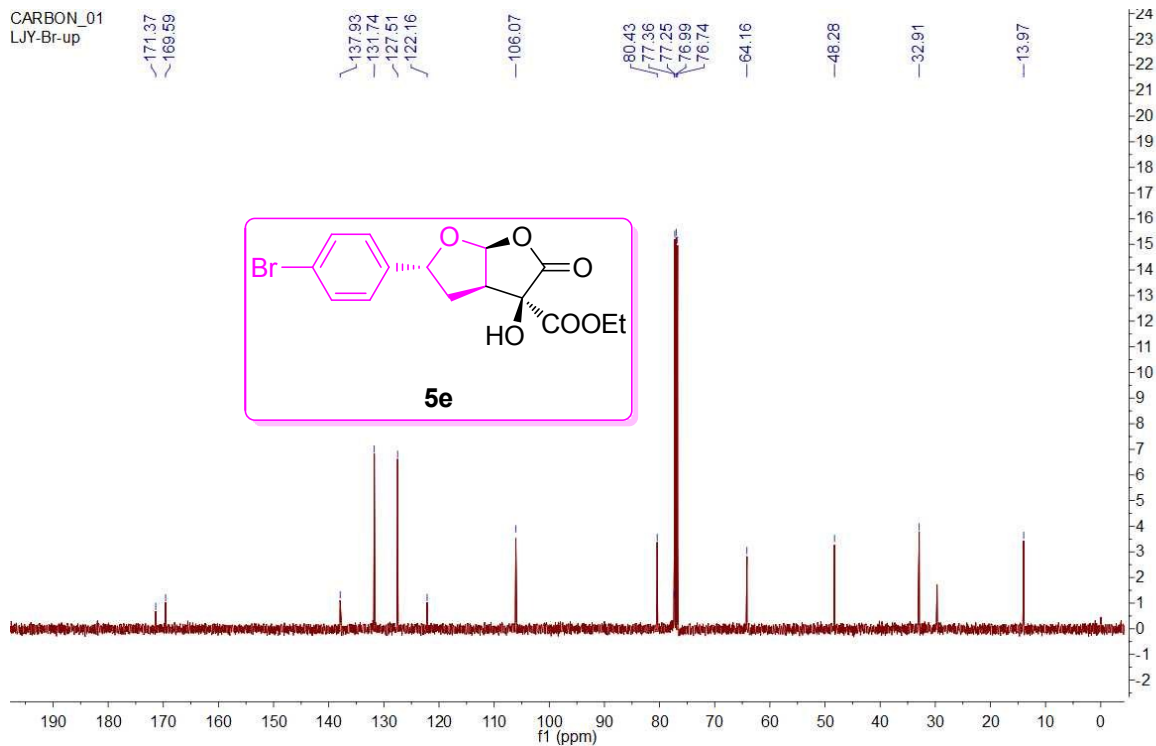
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	12.347	4507033	95.577	BB
2	21.373	208582	4.423	BB
		4715615	100.000	

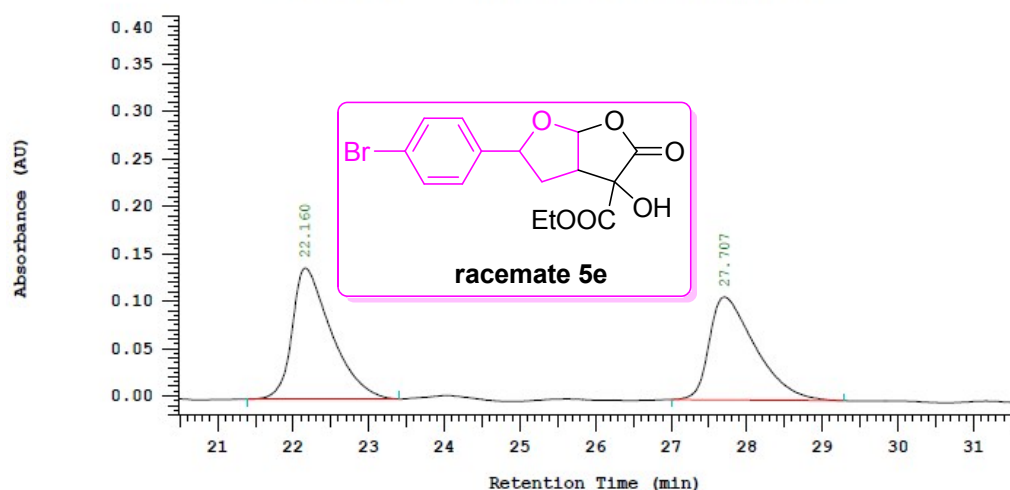
PROTON_01
LJY-Br-up



CARBON_01
LJY-Br-up



Chrom Type: Fixed WL Chromatogram, 210 nm

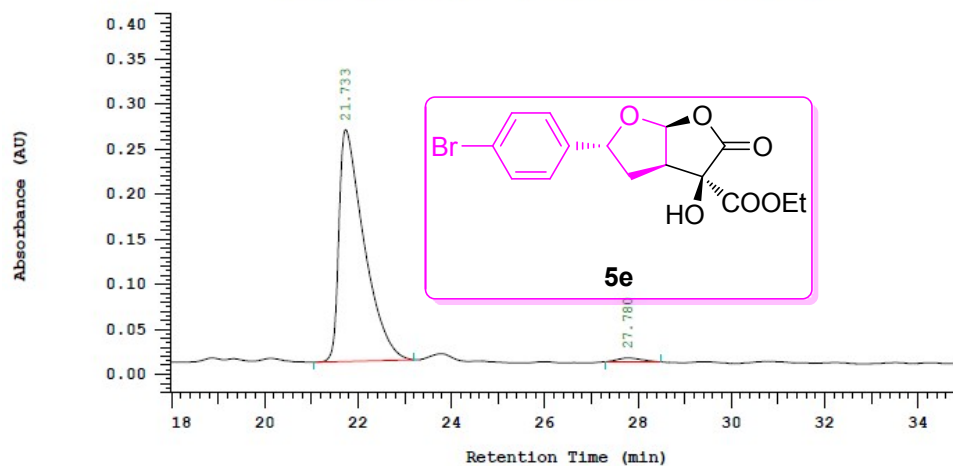


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	22.160	2484514	52.008	BB
2	27.707	2292666	47.992	BB
		4777180	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

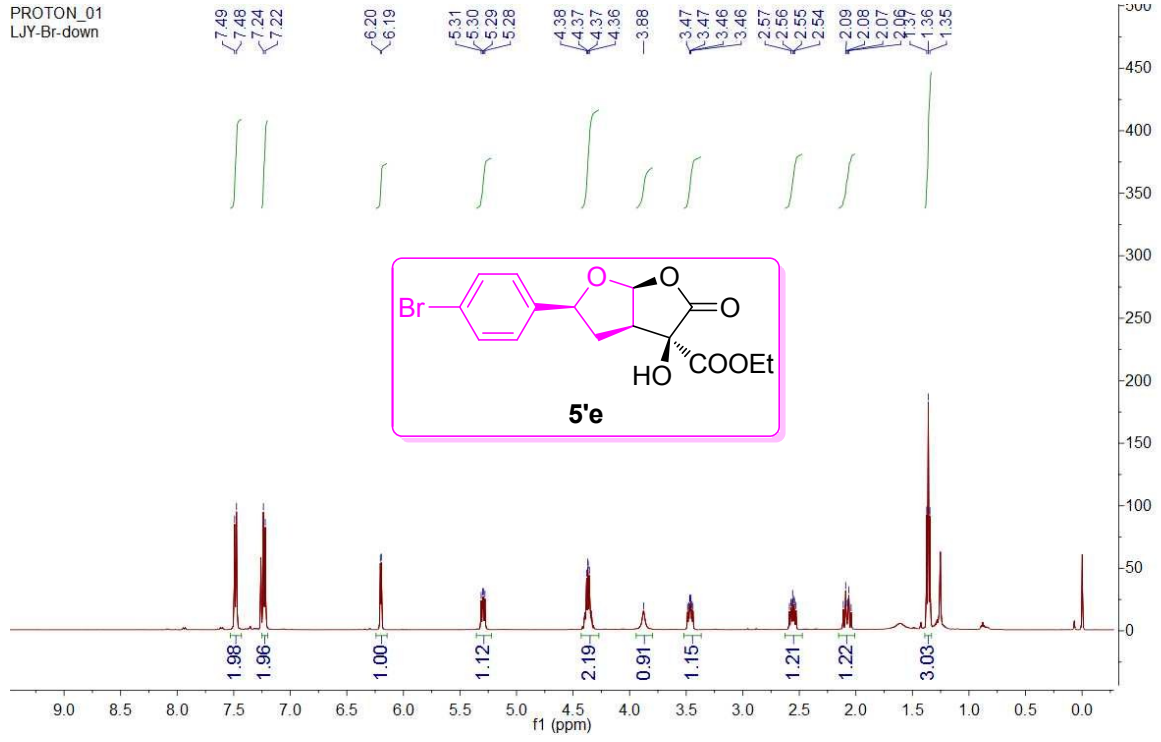


Chrom Type: Fixed WL Chromatogram, 210 nm

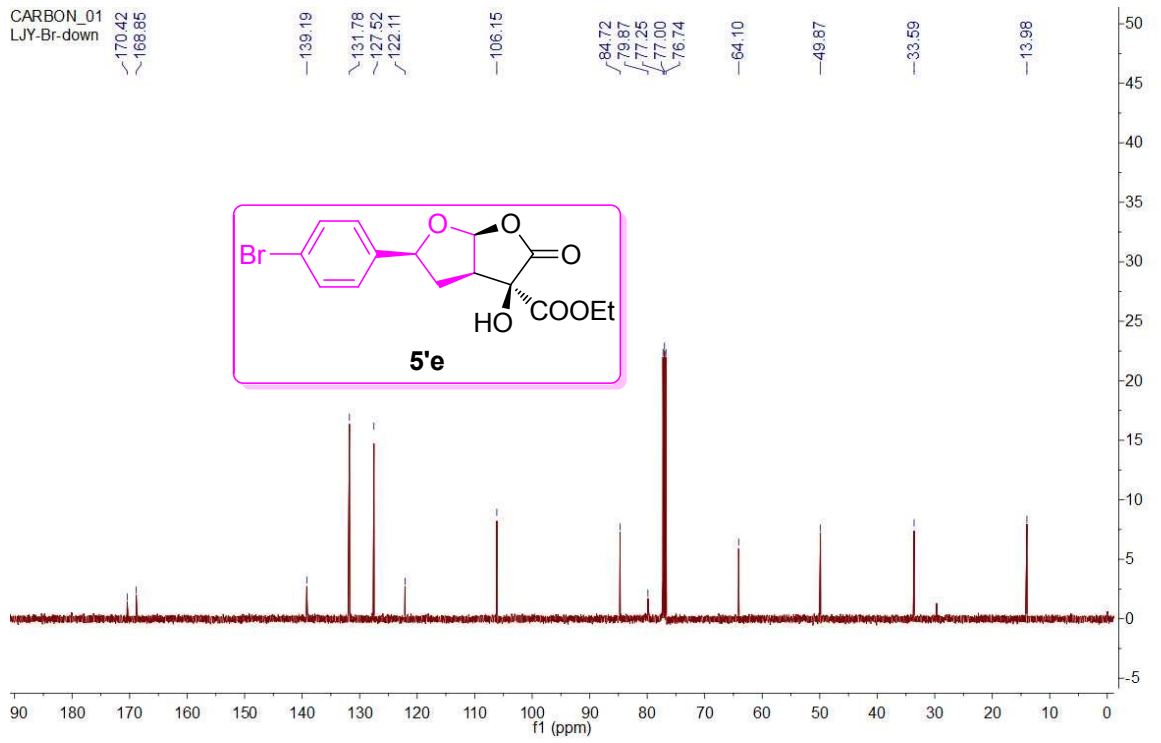
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	21.733	4817629	98.446	BB
2	27.780	76072	1.554	BB
		4893701	100.000	

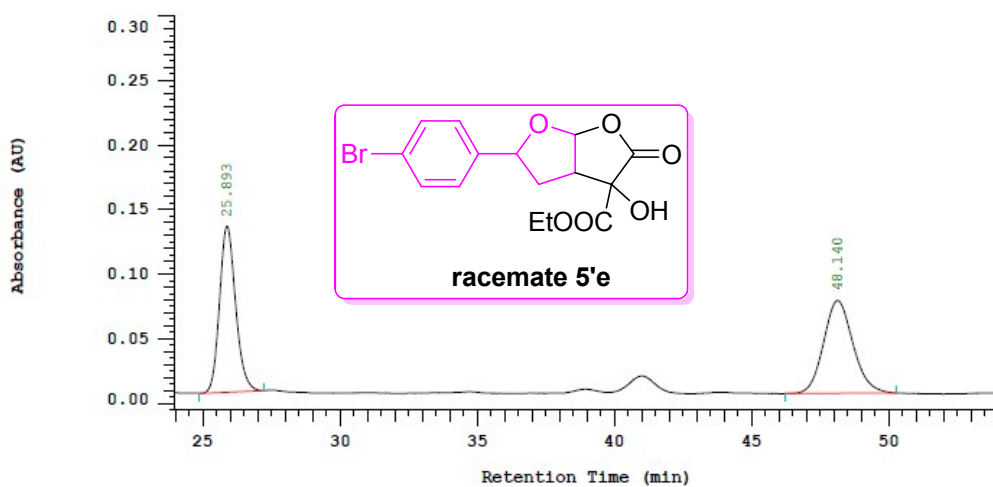
PROTON_01
LJY-Br-down



CARBON_01
LJY-Br-down



Chrom Type: Fixed WL Chromatogram, 210 nm

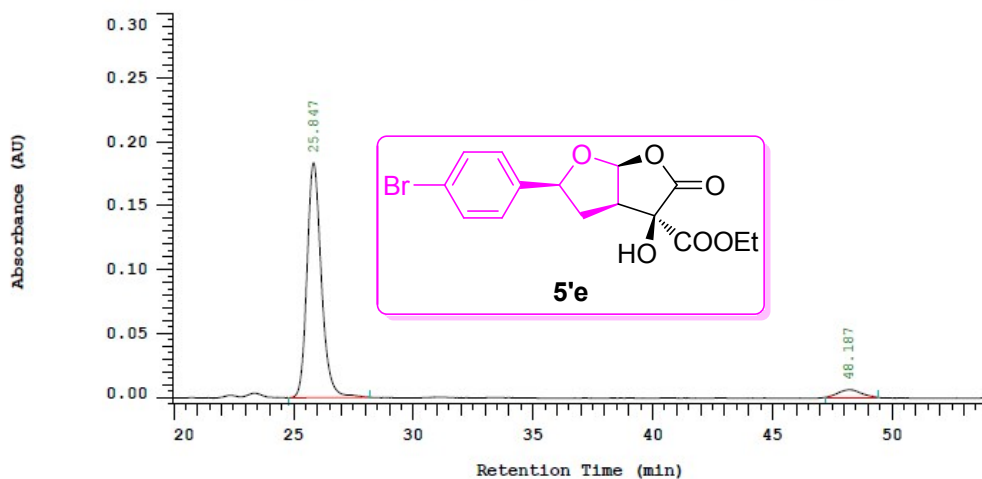


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	25.893	2604697	49.380	BB
2	48.140	2670089	50.620	BB
		5274786	100.000	

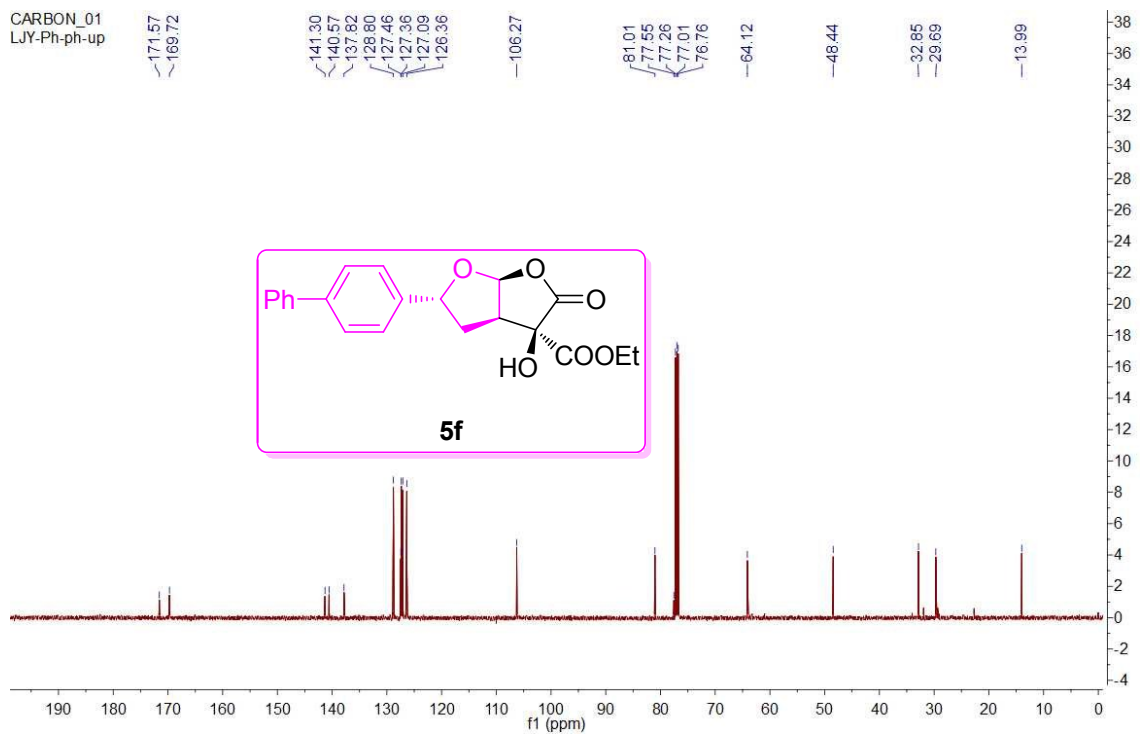
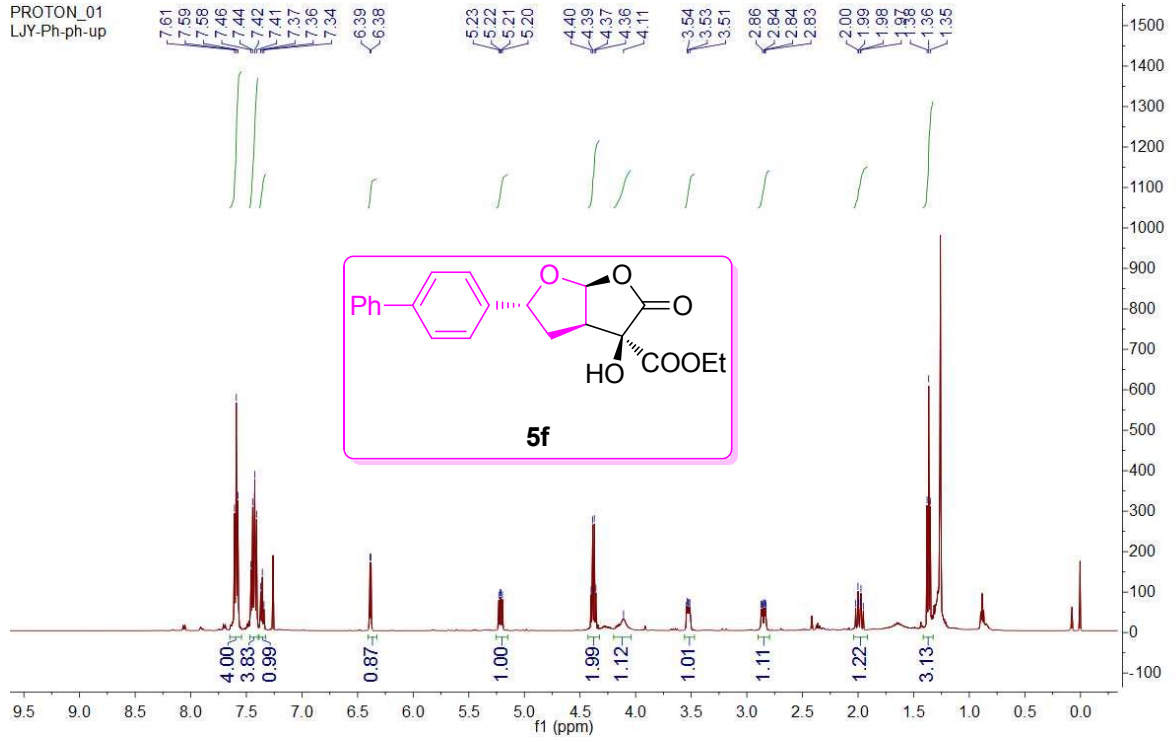
Chrom Type: Fixed WL Chromatogram, 210 nm



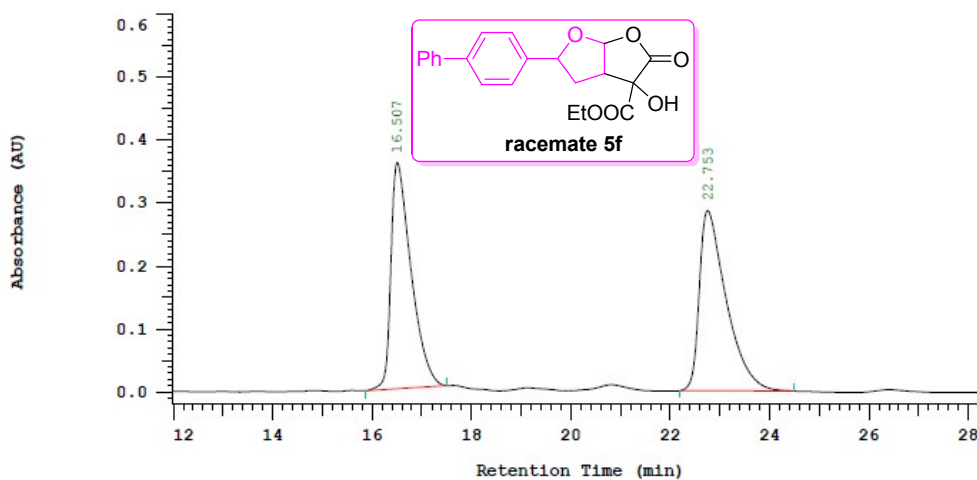
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	25.847	3804105	95.051	BB
2	48.187	198060	4.949	BB
		4002165	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

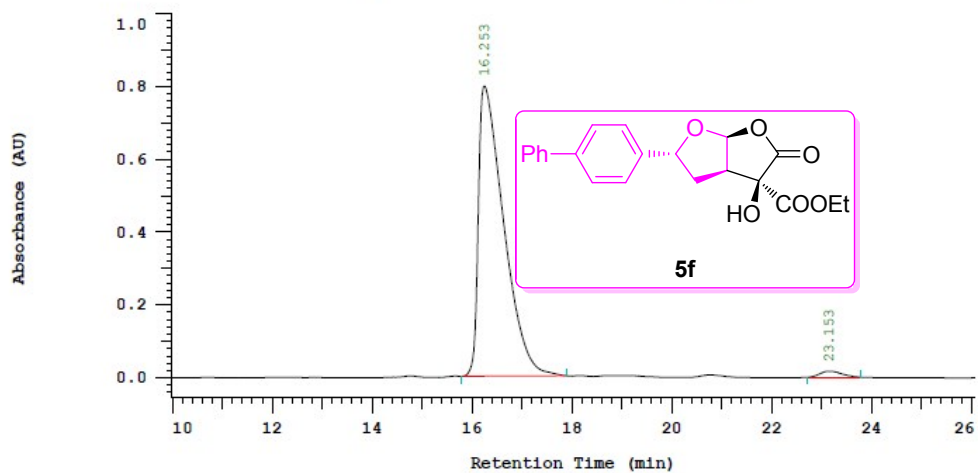


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	16.507	5069276	48.425	BB
2	22.753	5399022	51.575	BB
		10468298	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

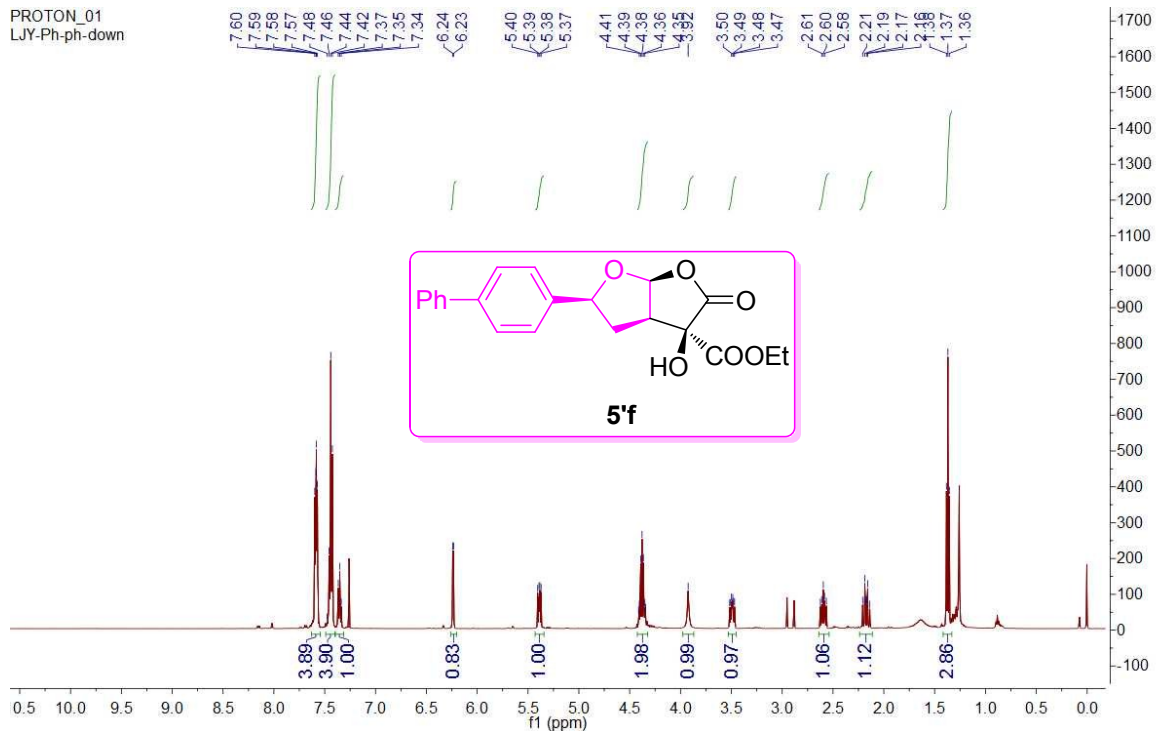


Chrom Type: Fixed WL Chromatogram, 210 nm

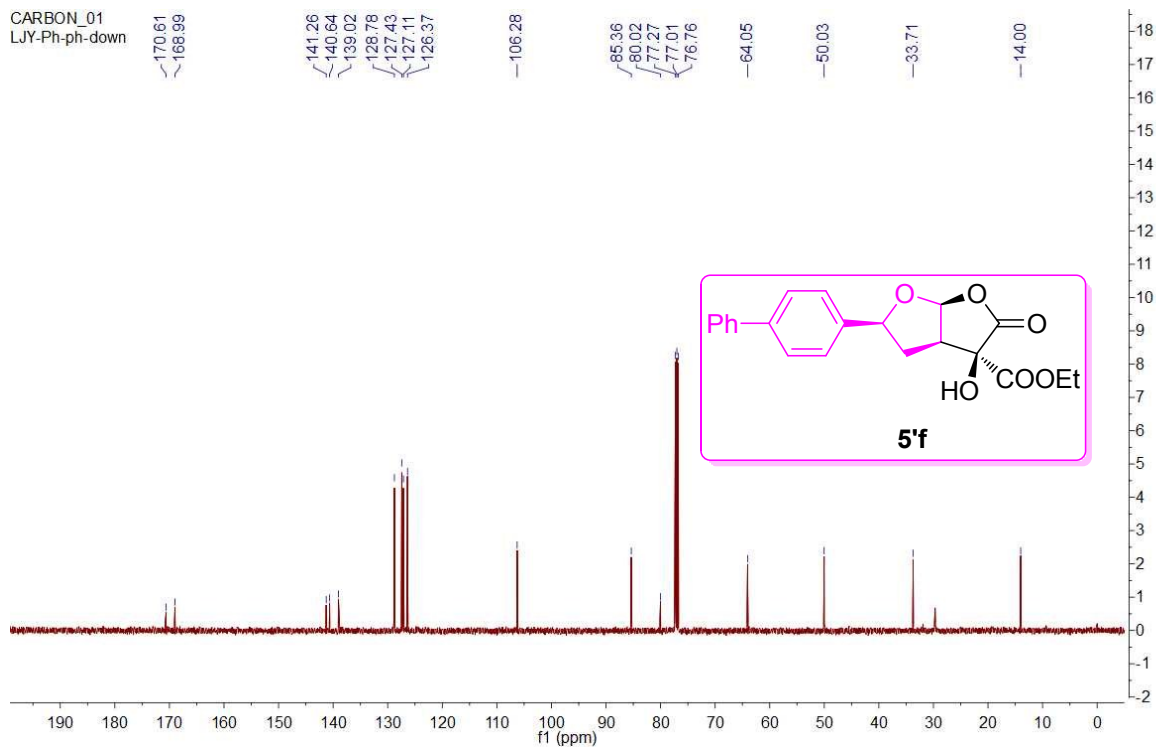
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	16.253	14030490	98.201	BB
2	23.153	257078	1.799	BB
		14287568	100.000	

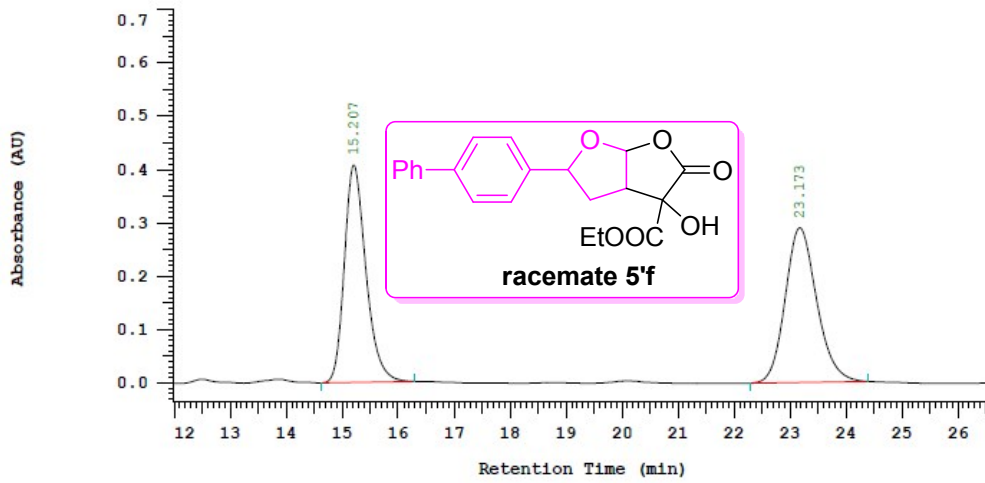
PROTON_01
LJY-Ph-ph-down



CARBON_01
LJY-Ph-ph-down



Chrom Type: Fixed WL Chromatogram, 210 nm

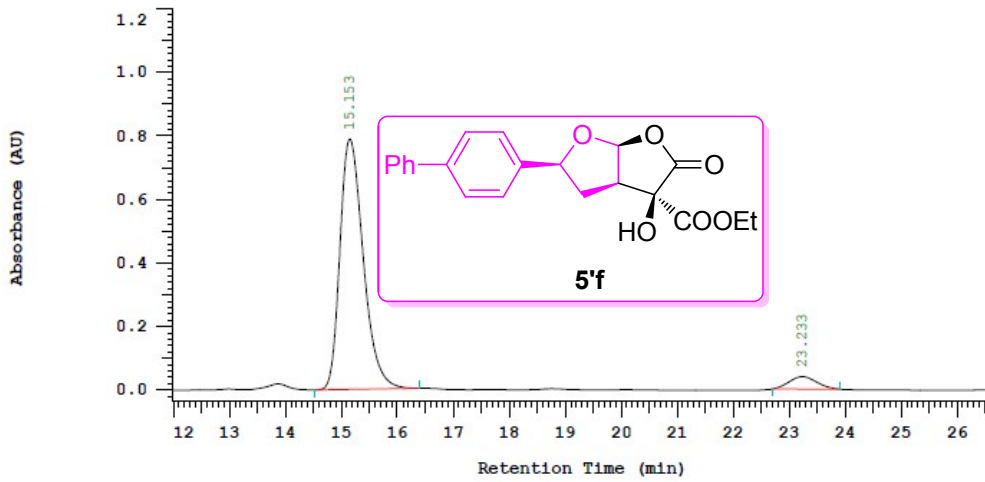


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	15.207	5464139	49.091	BB
2	23.173	5666438	50.909	BB
		11130577	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

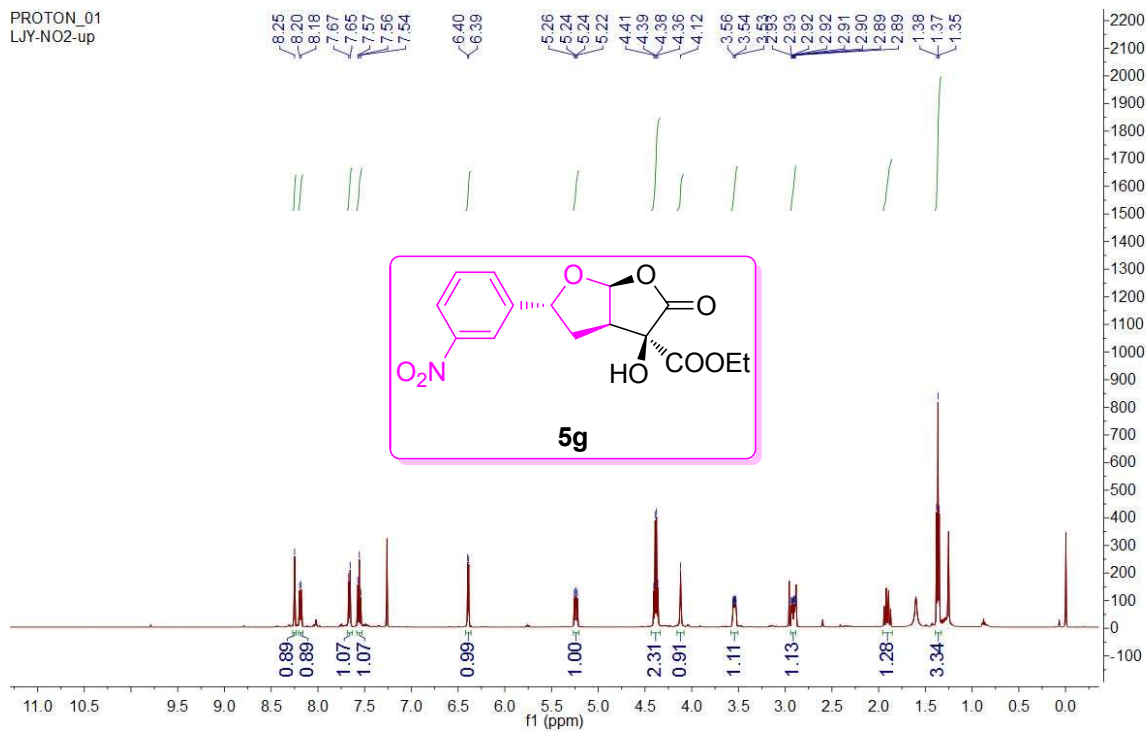


Chrom Type: Fixed WL Chromatogram, 210 nm

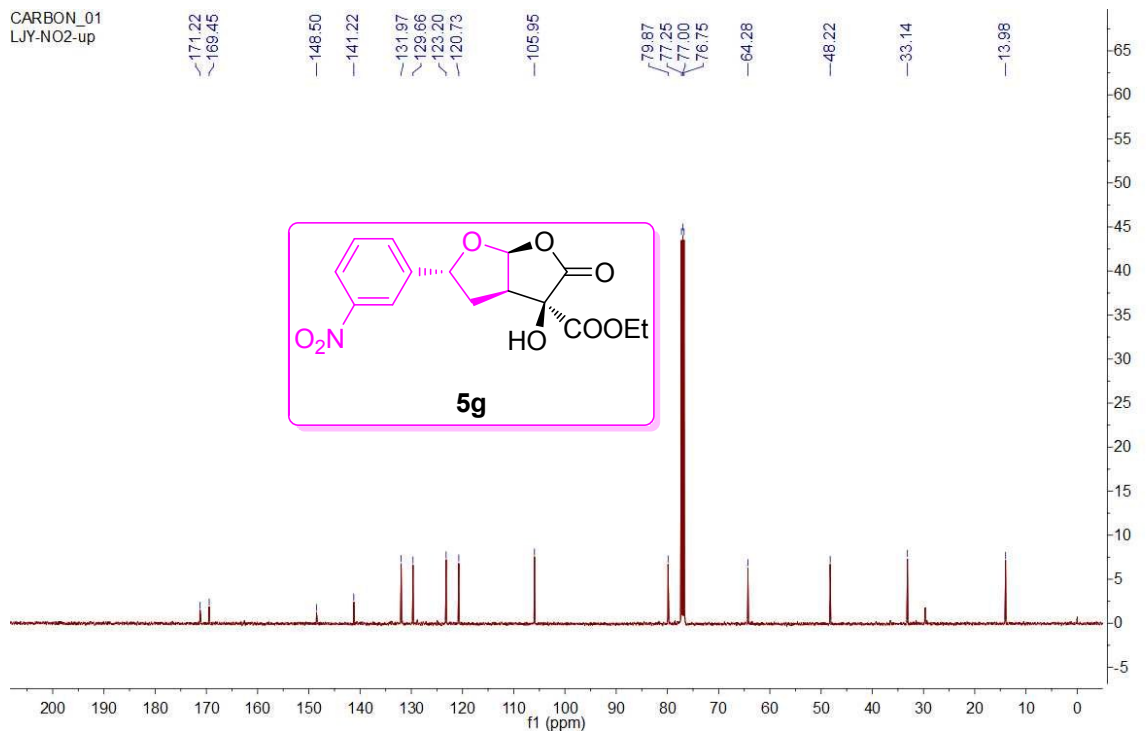
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	15.153	11431783	94.457	BB
2	23.233	670907	5.543	BB
		12102690	100.000	

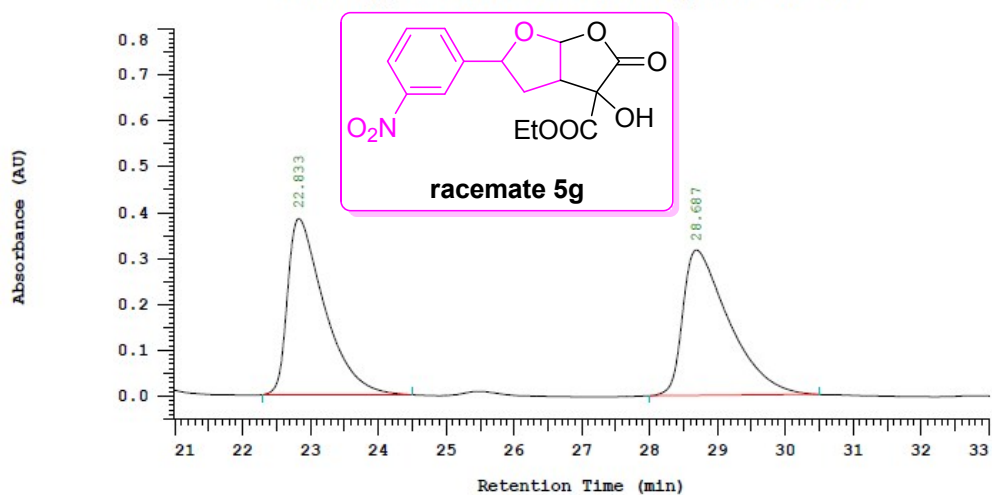
PROTON_01
LJY-NO2-up



CARBON_01
LJY-NO2-up



Chrom Type: Fixed WL Chromatogram, 210 nm

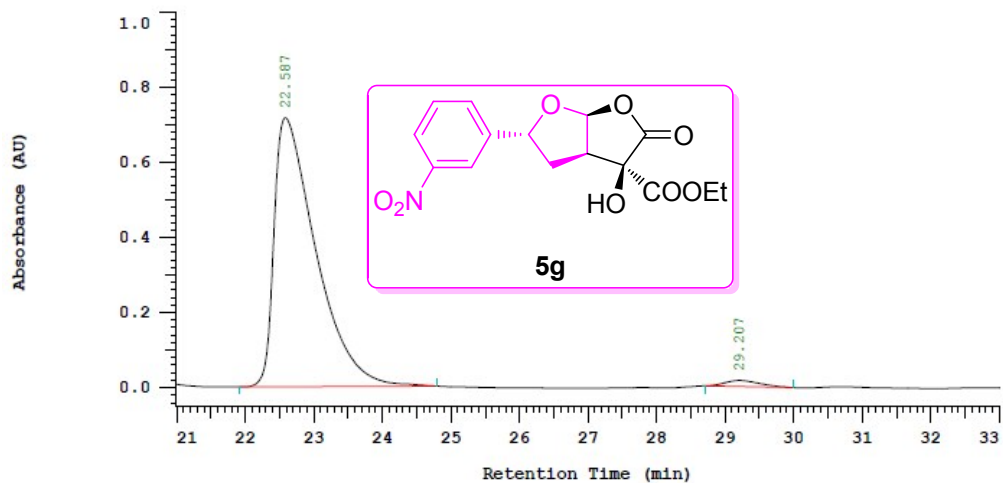


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	22.833	7272795	49.279	BB
2	28.687	7485505	50.721	BB
		14758300	100.000	

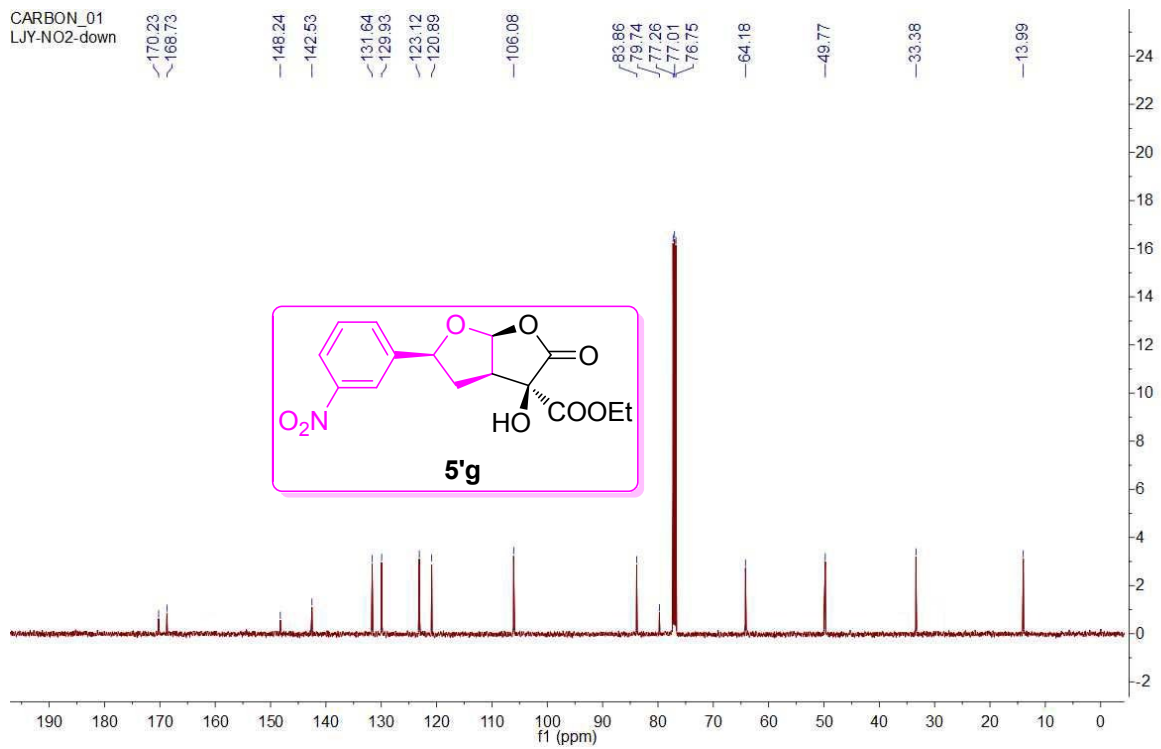
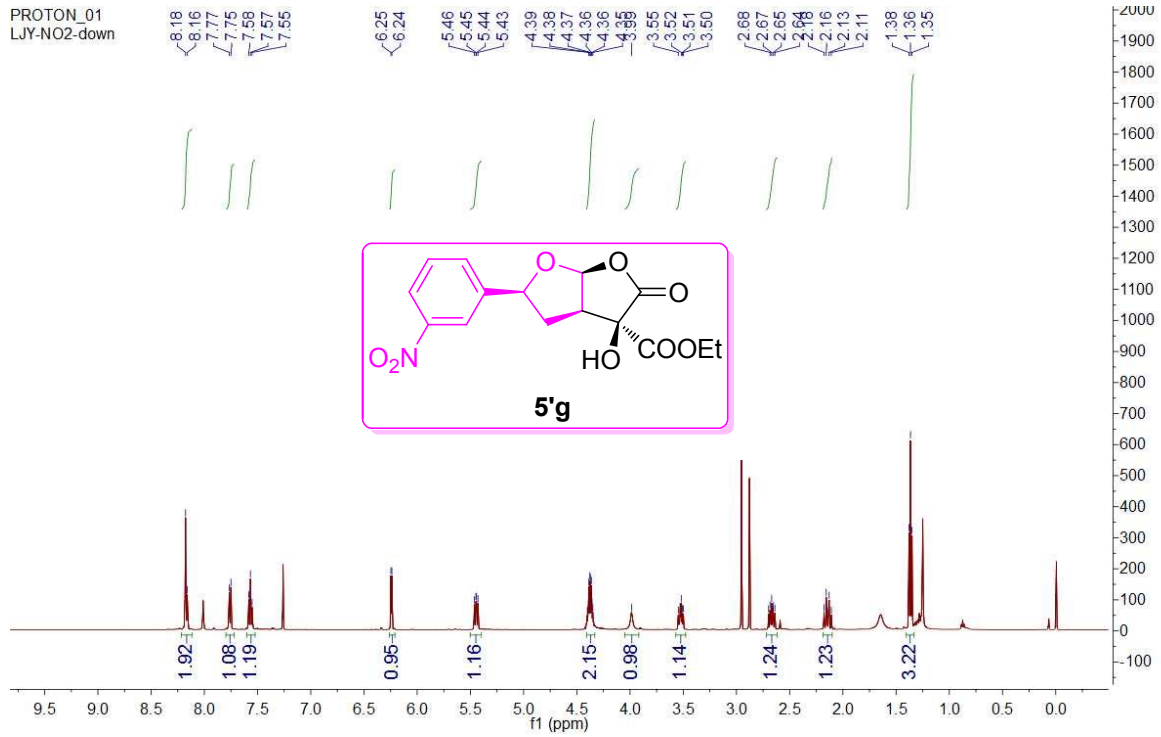
Chrom Type: Fixed WL Chromatogram, 210 nm



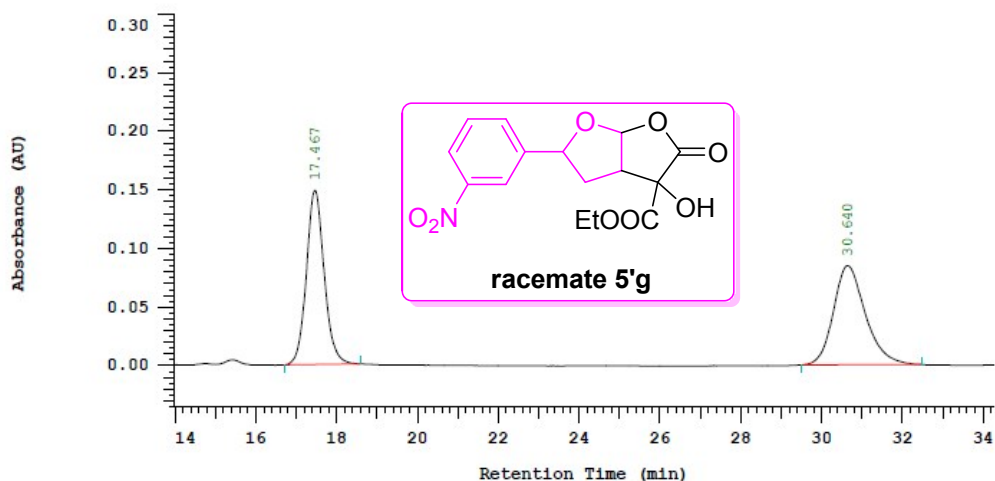
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	22.587	15156526	98.145	BB
2	29.207	286518	1.855	BB
		15443044	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

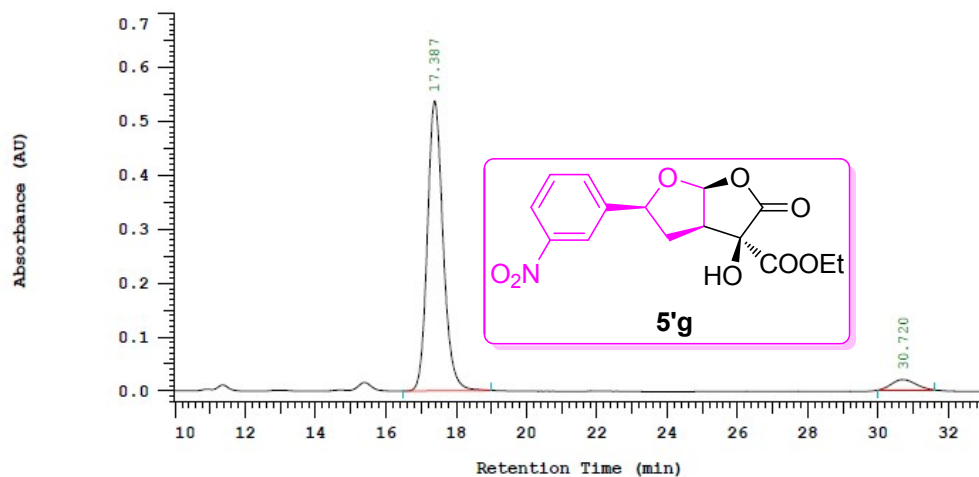


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	17.467	2272576	49.450	BB
2	30.640	2323147	50.550	BB
		4595723	100.000	

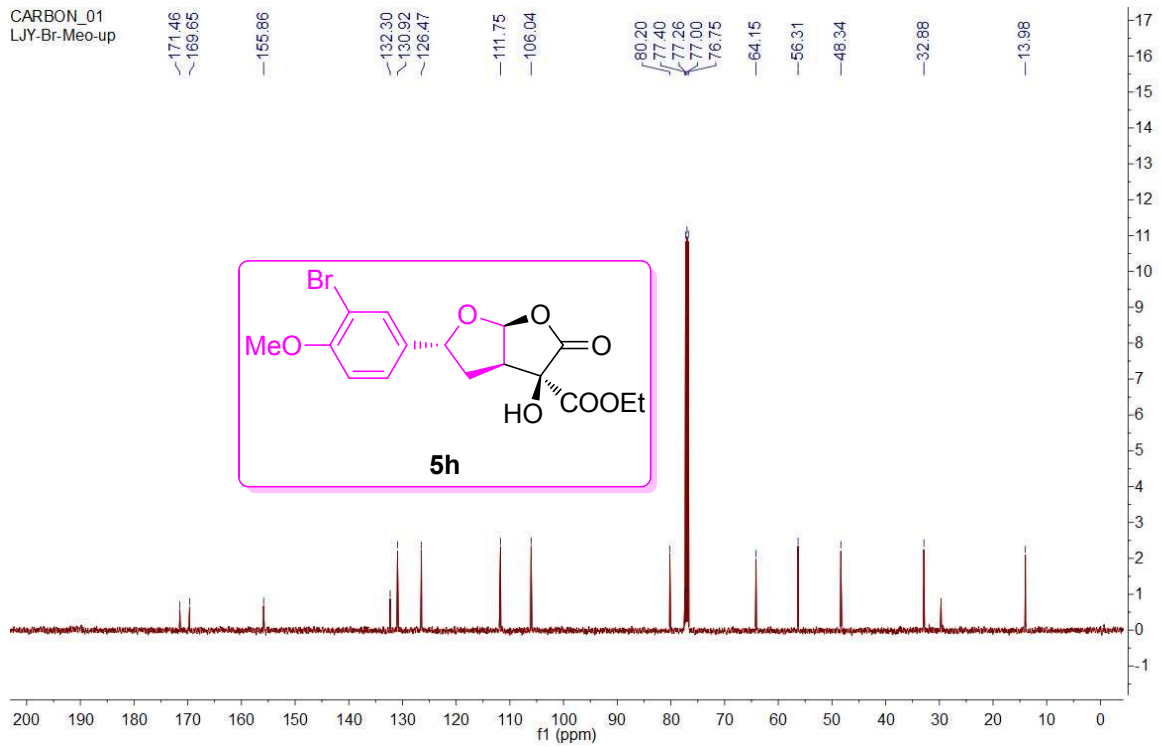
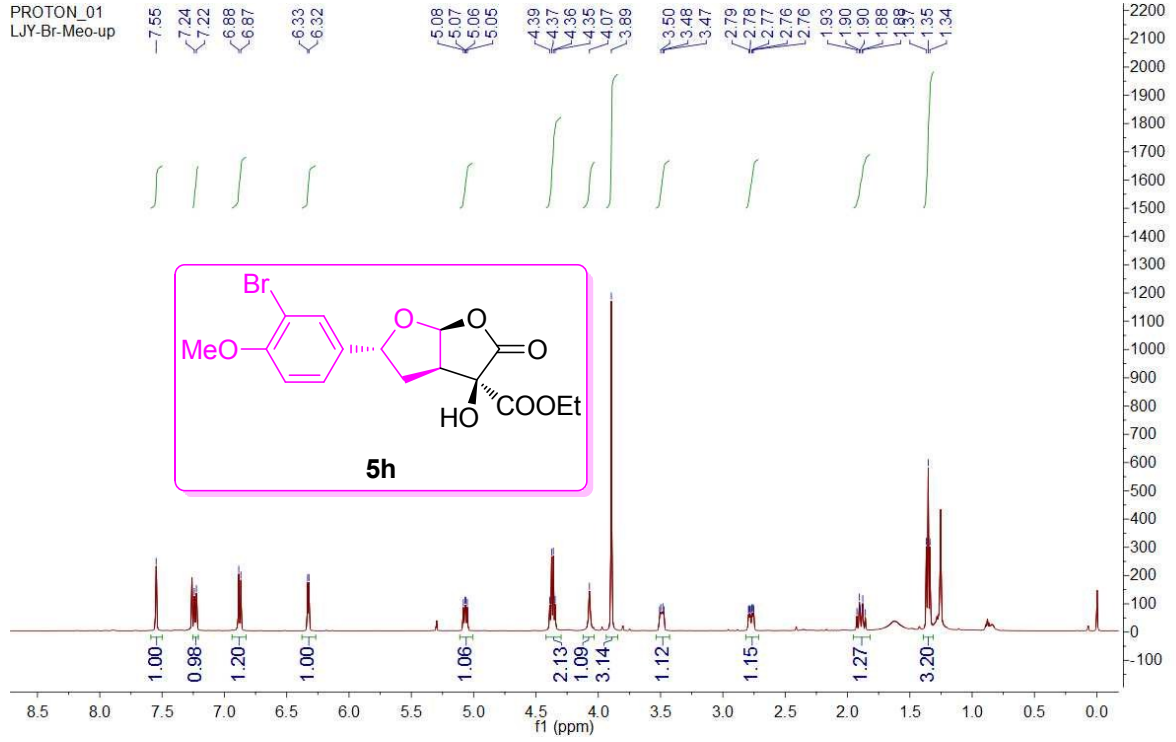
Chrom Type: Fixed WL Chromatogram, 210 nm



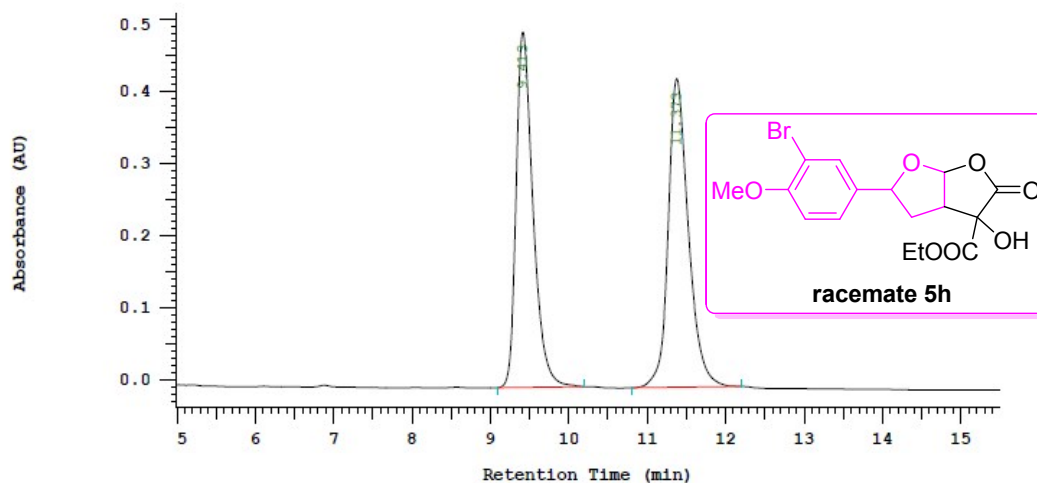
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	17.387	8351667	94.779	BB
2	30.720	460081	5.221	BB
		8811748	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

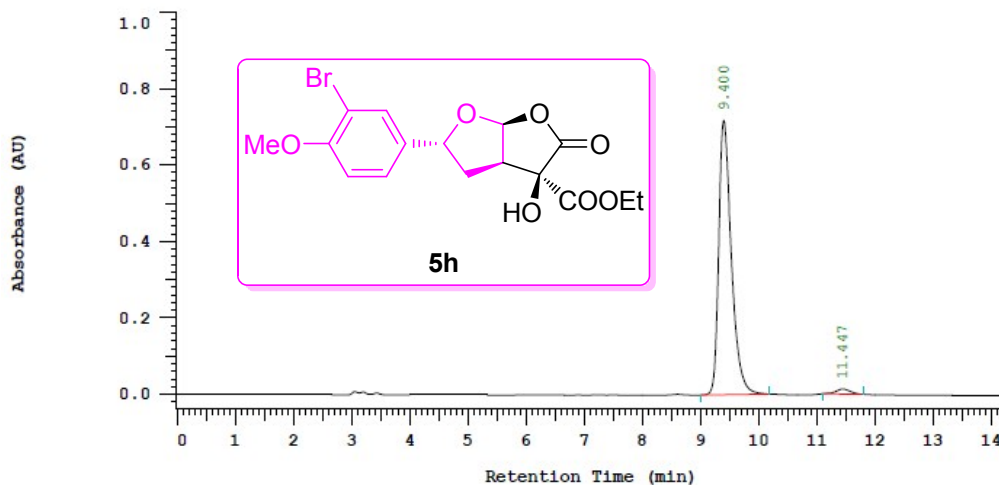


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	9.413	3650086	48.835	BB
2	11.373	3824252	51.165	BB
		7474338	100.000	

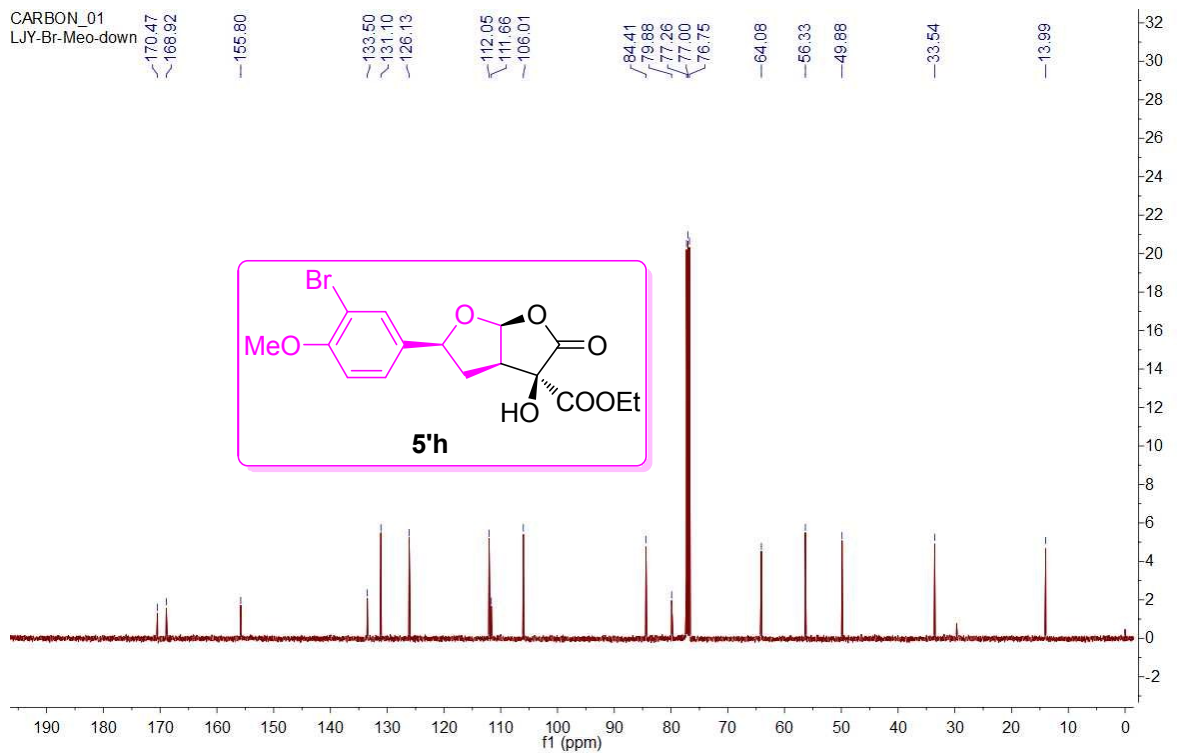
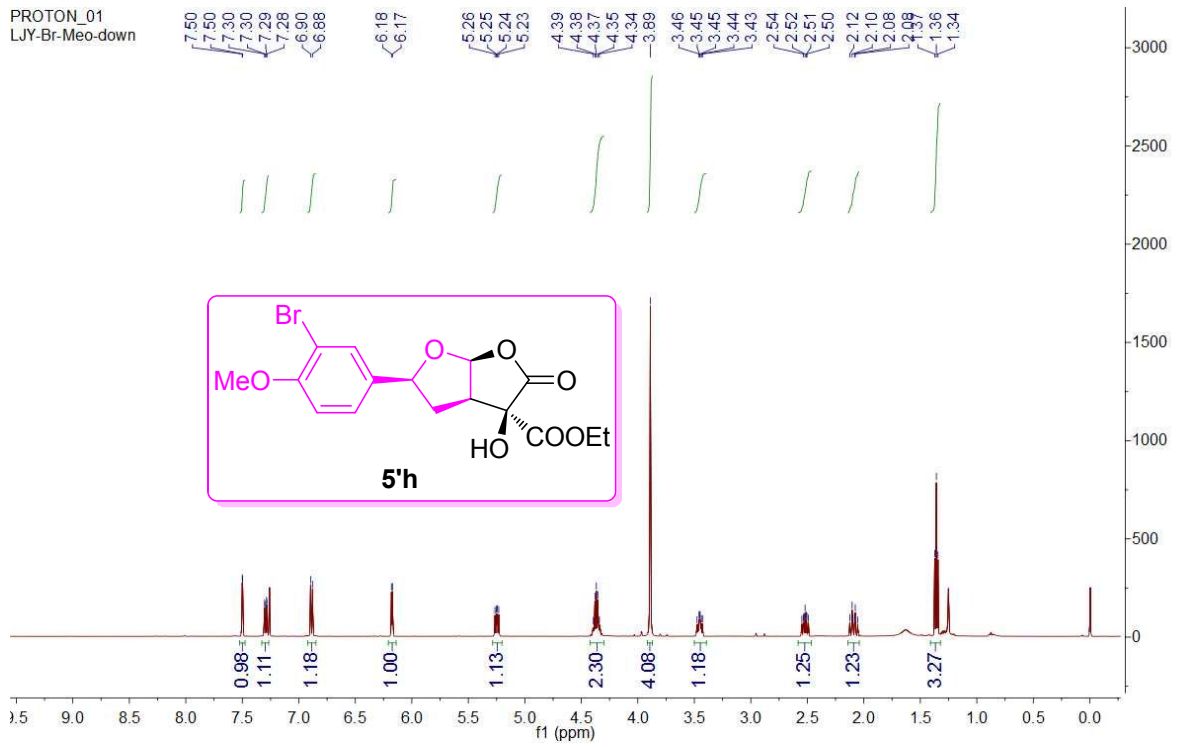
Chrom Type: Fixed WL Chromatogram, 210 nm



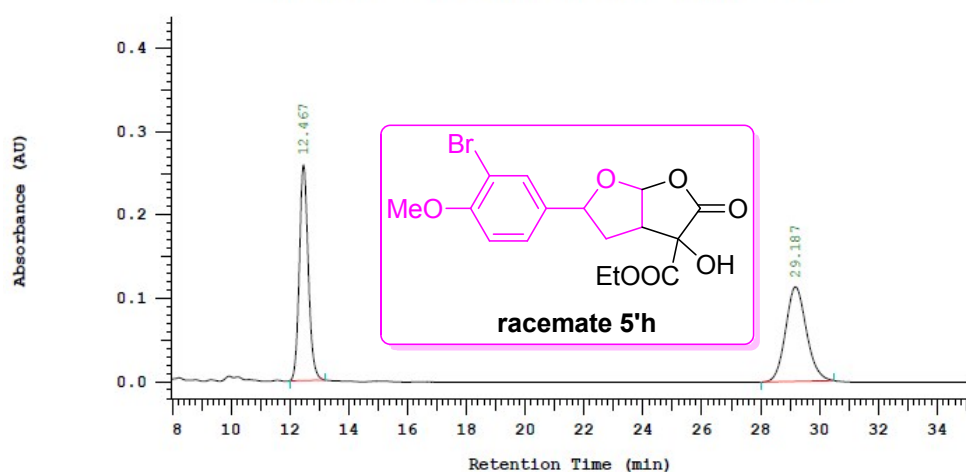
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	9.400	5422723	97.985	BB
2	11.447	111522	2.015	BB
		5534245	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

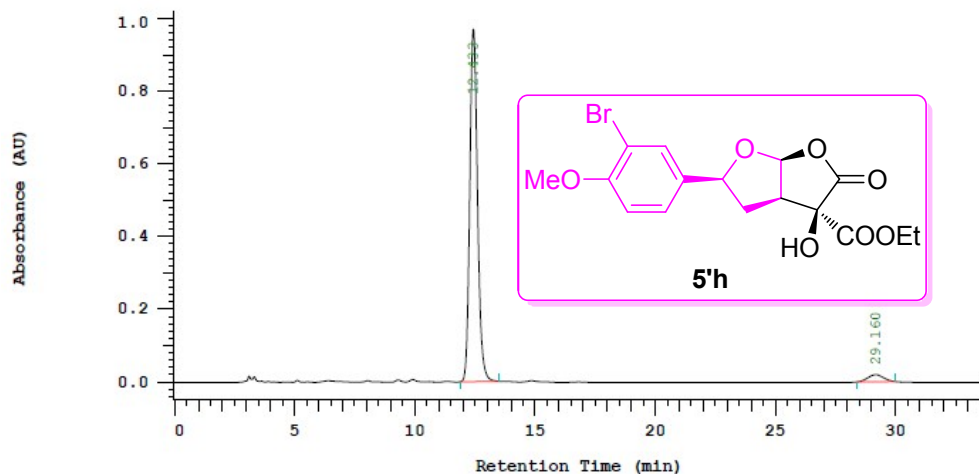


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	12.467	2729667	49.414	BB
2	29.187	2794356	50.586	BB
		5524023	100.000	

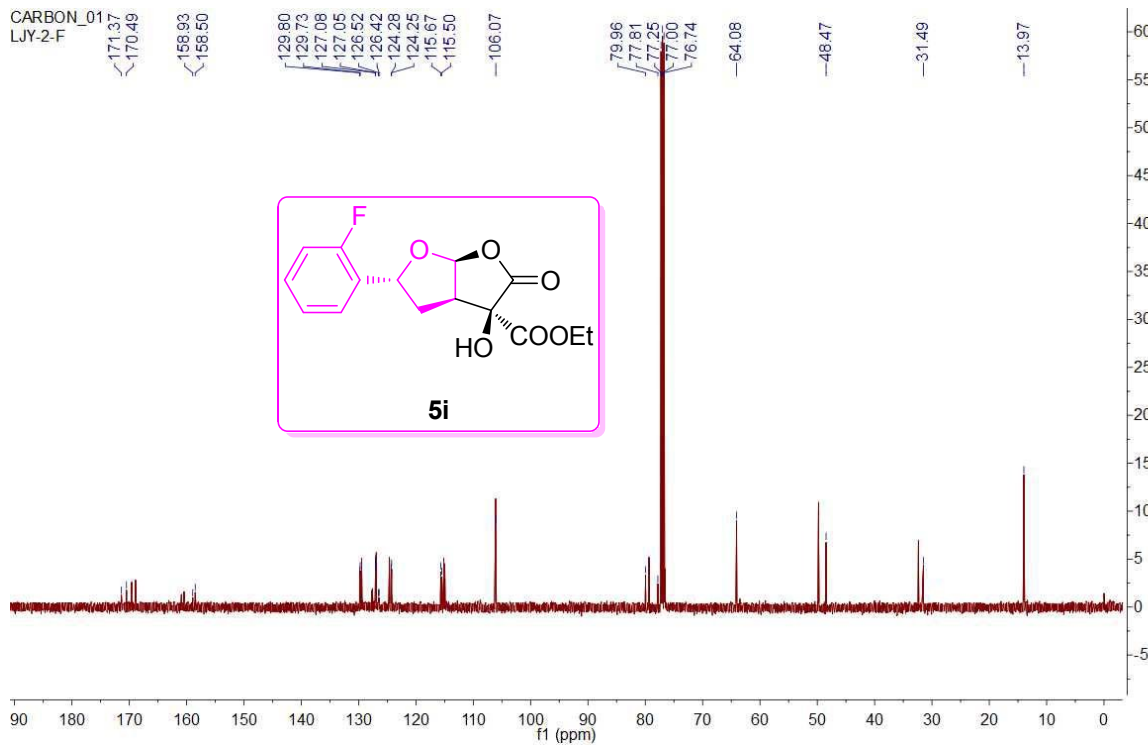
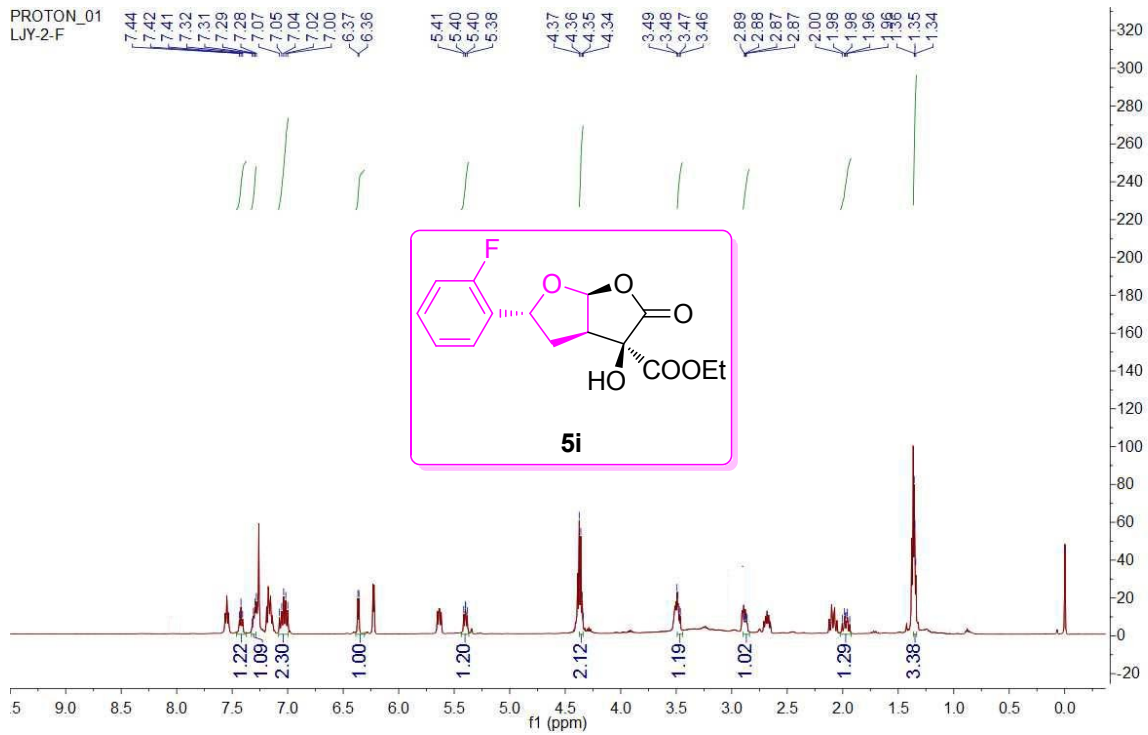
Chrom Type: Fixed WL Chromatogram, 210 nm



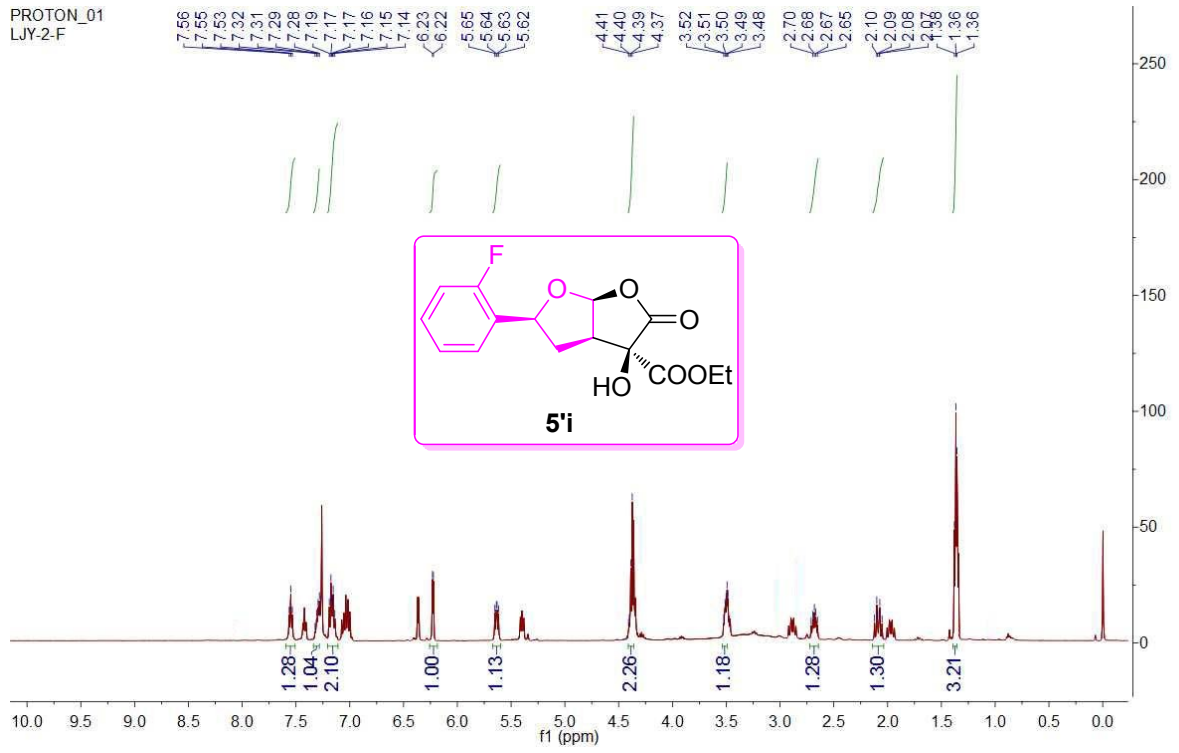
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

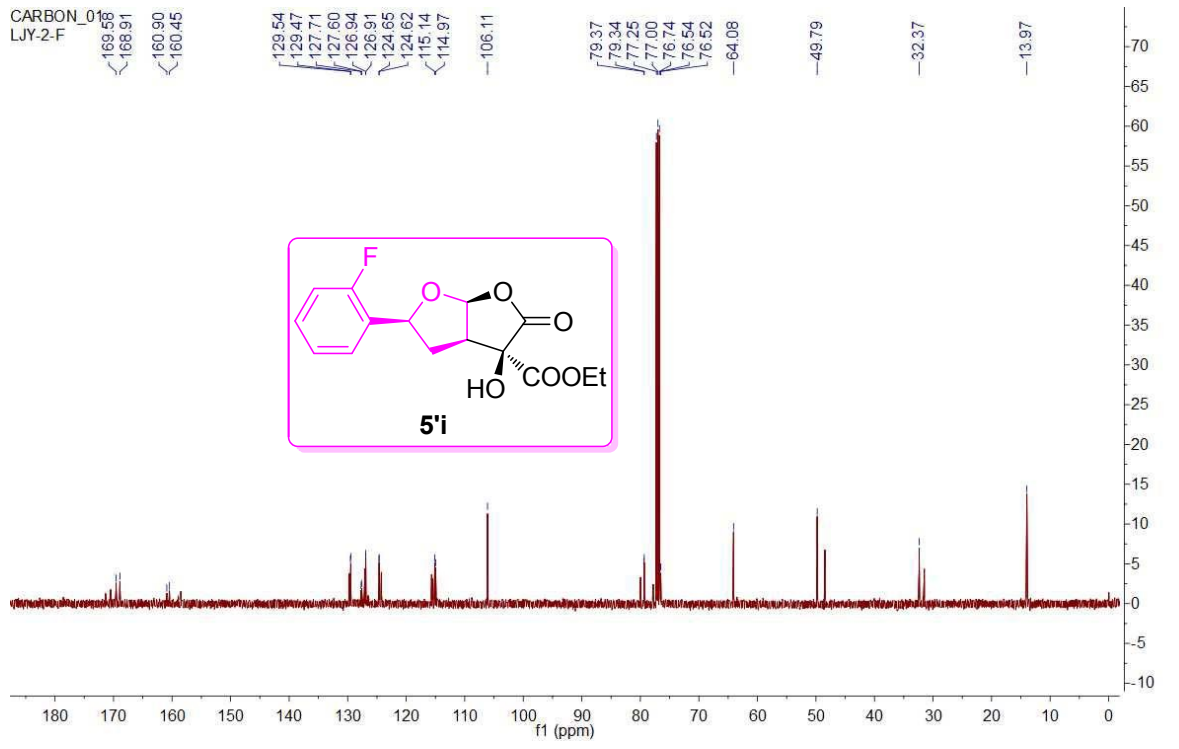
No.	RT	Area	Area %	BC
1	12.433	10701449	96.084	BB
2	29.160	436147	3.916	BB
		11137596	100.000	



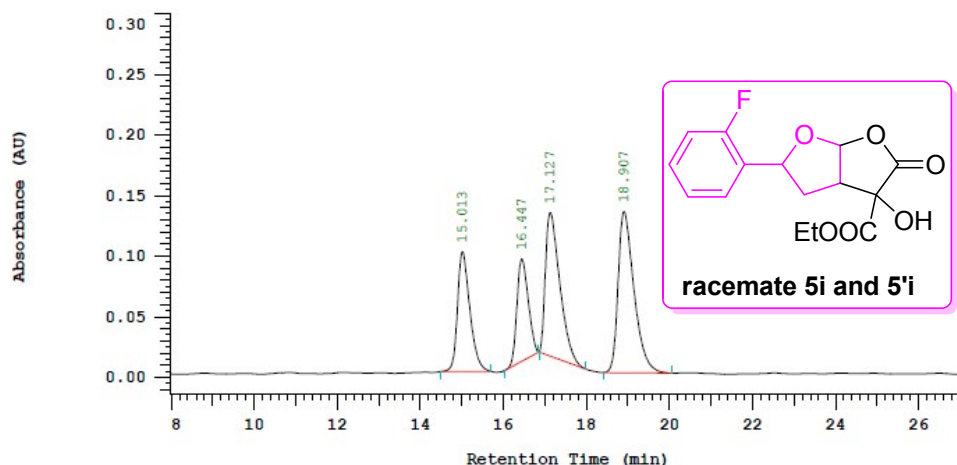
PROTON_01
LJY-2-F



CARBON_01
LJY-2-F



Chrom Type: Fixed WL Chromatogram, 210 nm

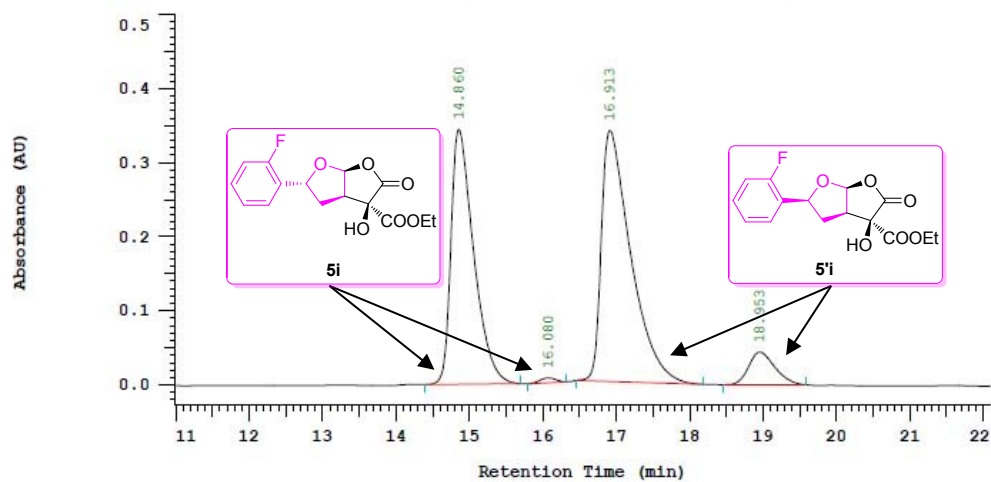


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	15.013	1020620	20.323	BB
2	16.447	800844	15.947	BB
3	17.127	1432071	28.516	BB
4	18.907	1768395	35.213	BB
		5021930	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

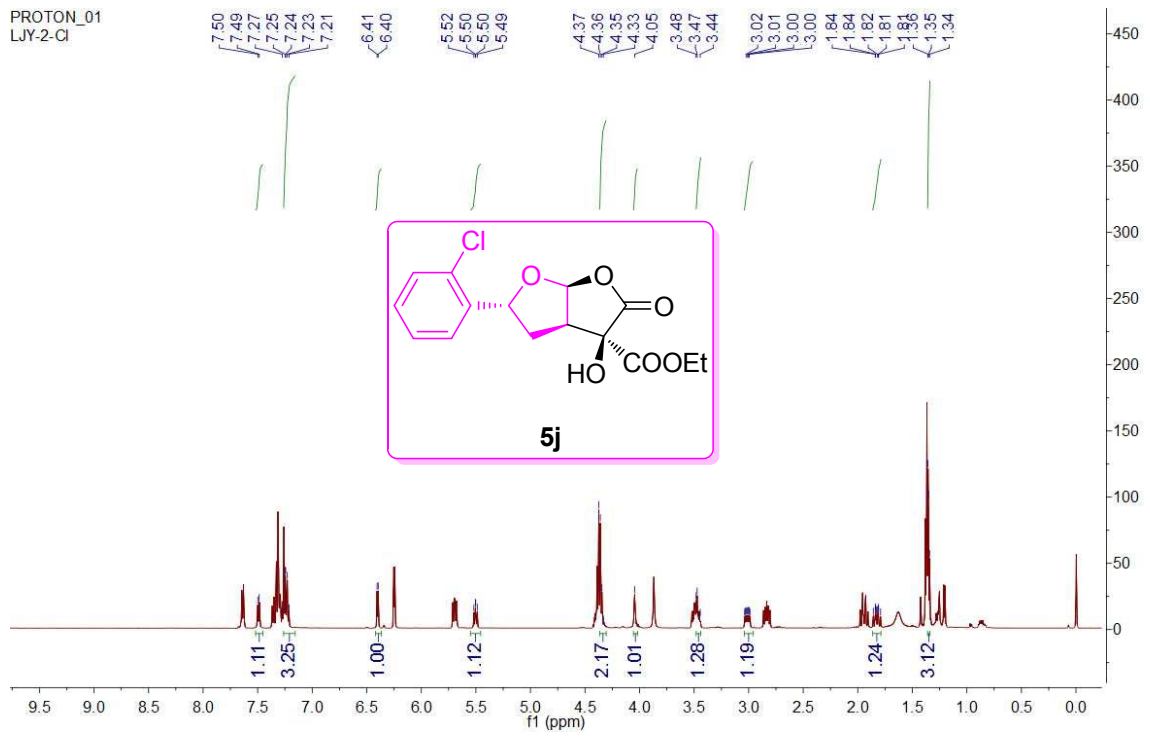


Chrom Type: Fixed WL Chromatogram, 210 nm

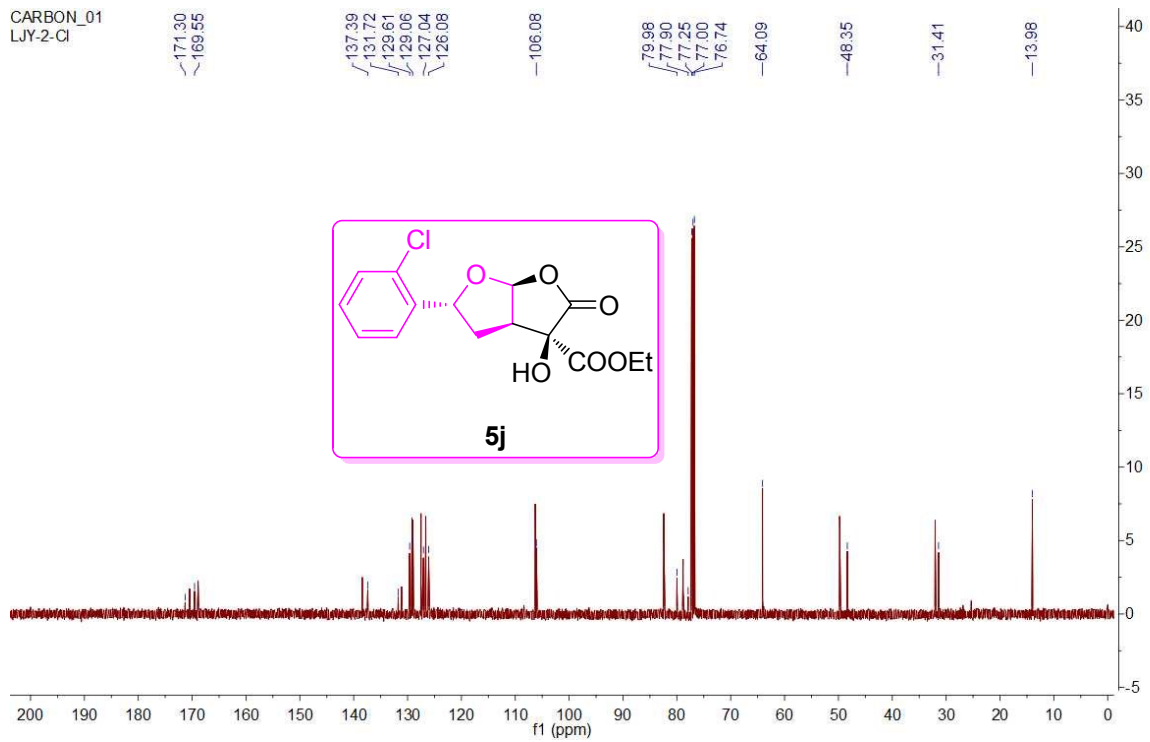
Peak Quantitation: AREA
Calculation Method: AREA%

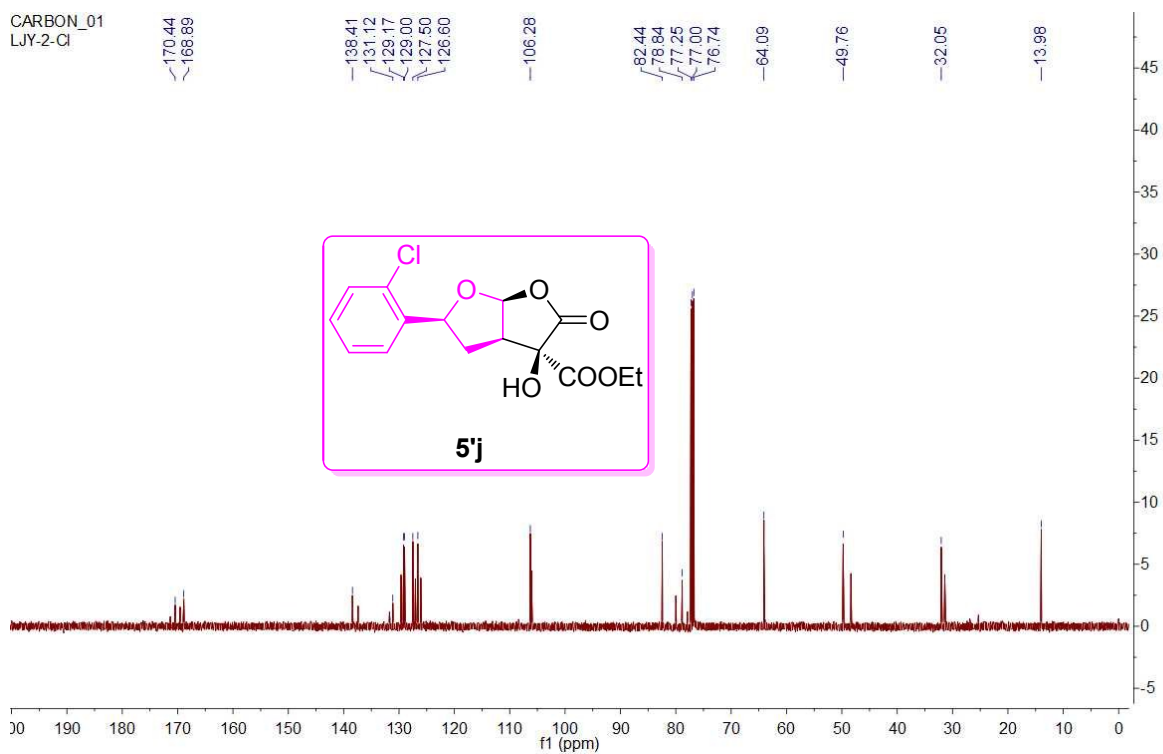
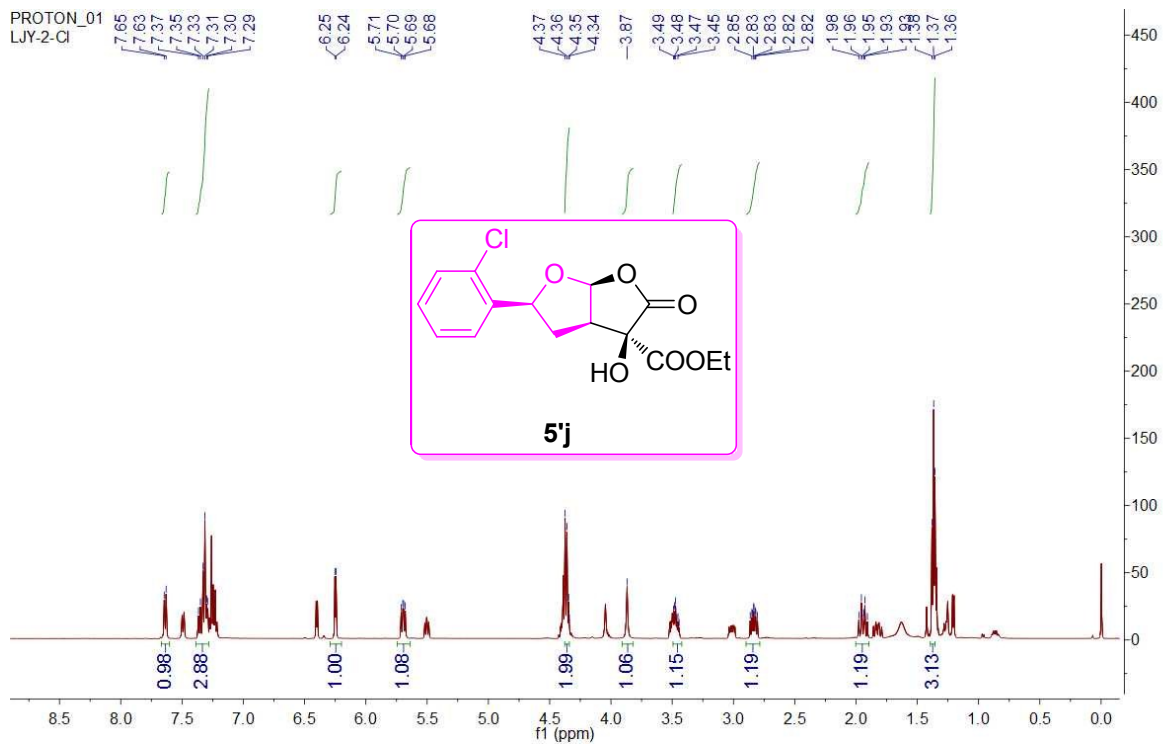
No.	RT	Area	Area %	BC
1	14.860	3684739	42.681	BB
2	16.080	47227	0.547	BB
3	16.913	4693643	54.368	BB
4	18.953	207509	2.404	BB
		8633118	100.000	

PROTON_01
LJY-2-Cl

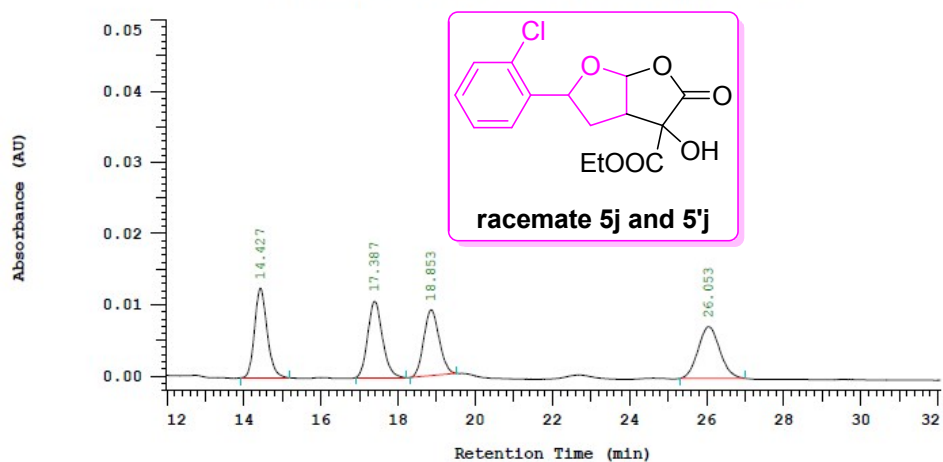


CARBON_01
LJY-2-Cl





Chrom Type: Fixed WL Chromatogram, 231 nm

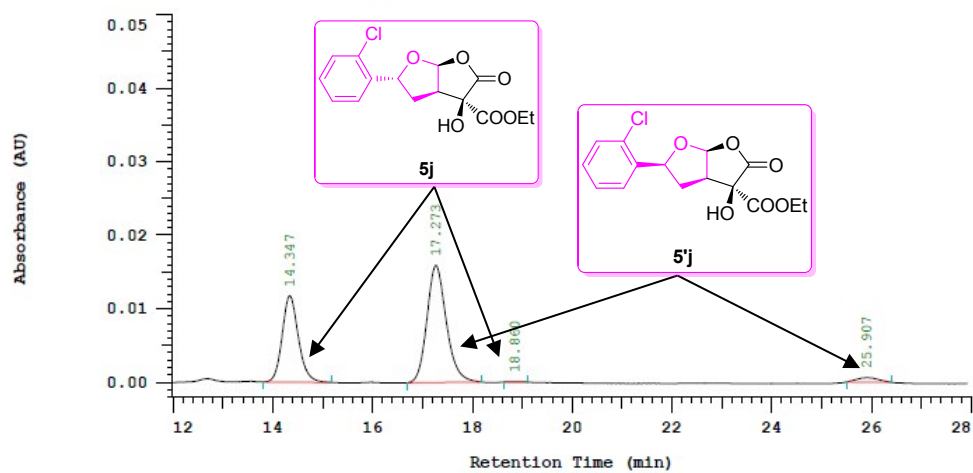


Chrom Type: Fixed WL Chromatogram, 231 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	14.427	142500	25.634	BB
2	17.387	142696	25.669	BB
3	18.853	128099	23.044	BB
4	26.053	142604	25.653	BB
		555899	100.000	

Chrom Type: Fixed WL Chromatogram, 231 nm

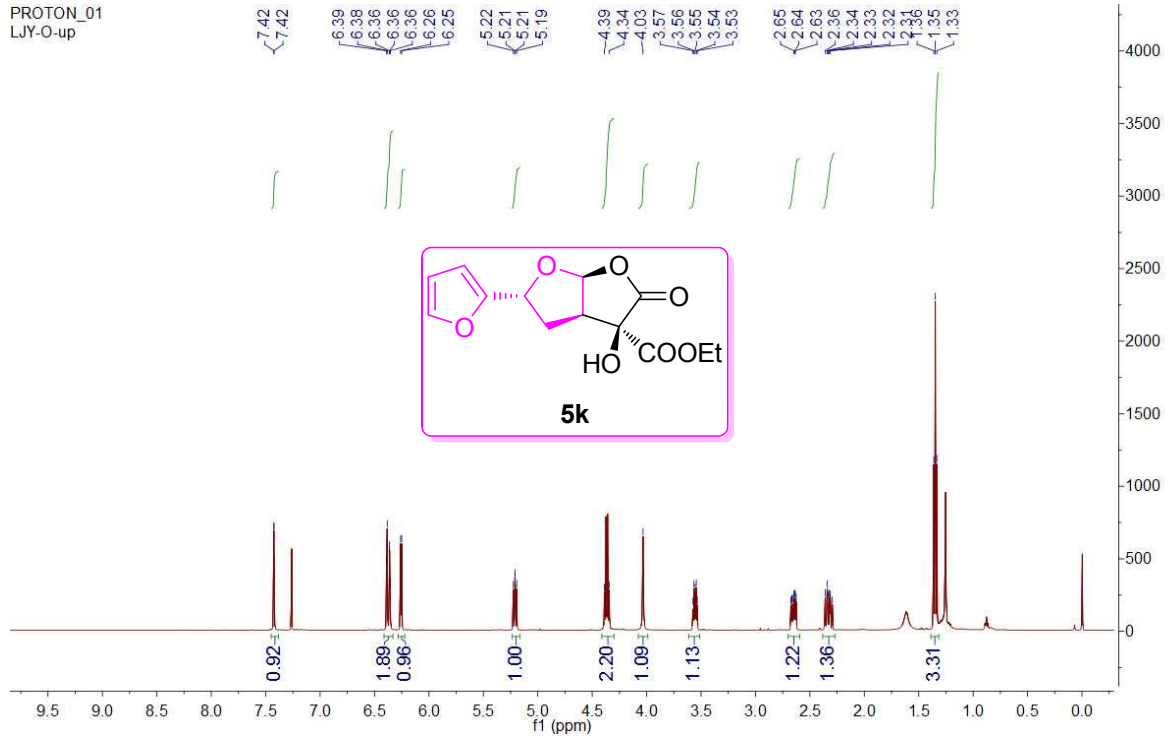


Chrom Type: Fixed WL Chromatogram, 231 nm

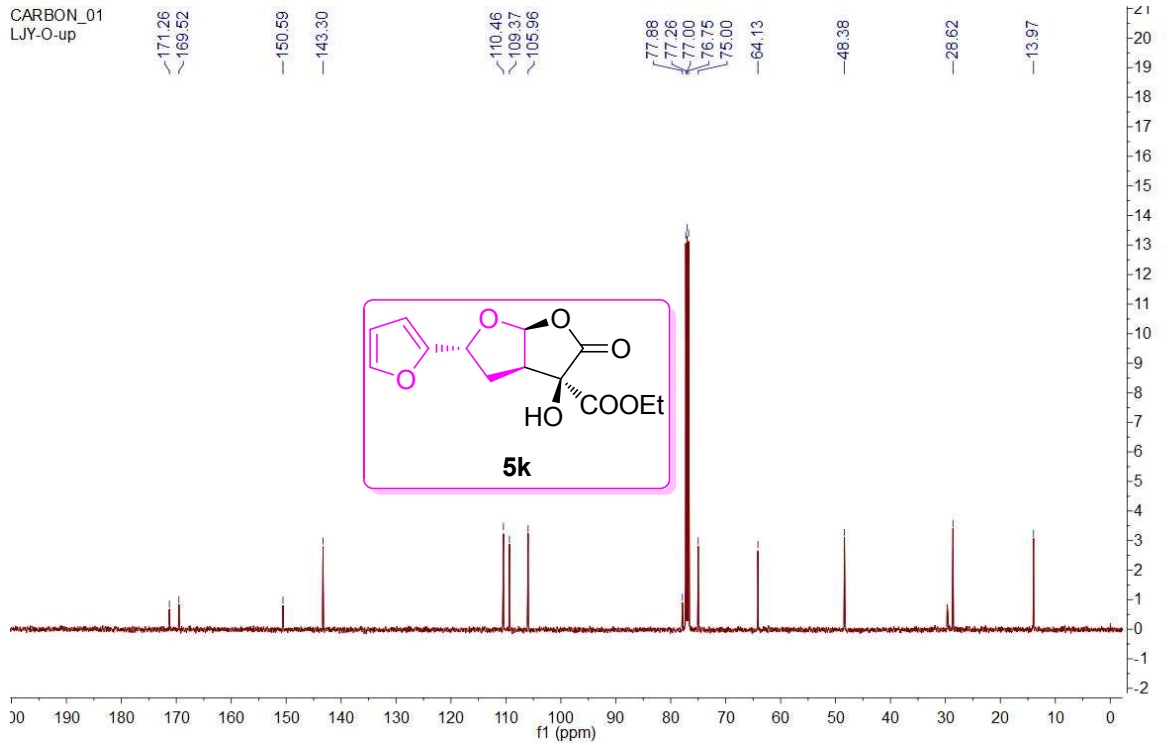
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	14.347	132951	37.074	BB
2	17.273	215910	60.208	BB
3	18.860	623	0.174	BB
4	25.907	9125	2.545	BB
		358609	100.000	

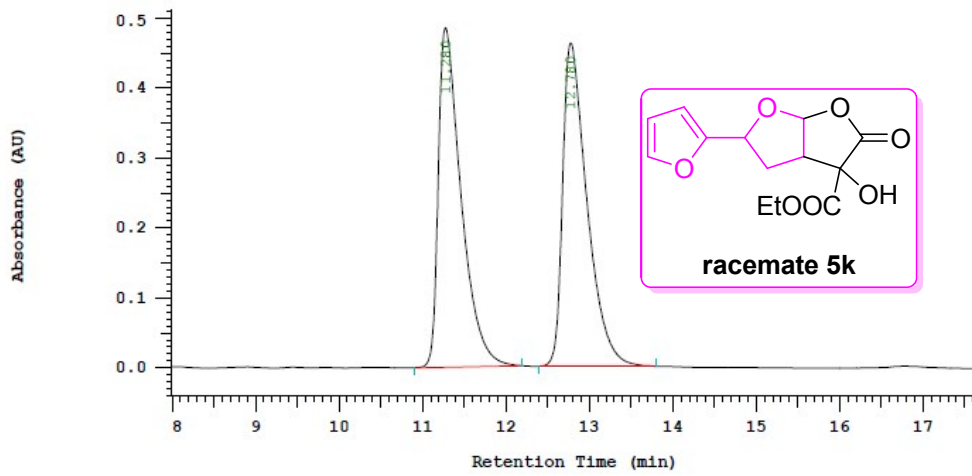
PROTON_01
LJY-O-up



CARBON_01
LJY-O-up



Chrom Type: Fixed WL Chromatogram, 210 nm

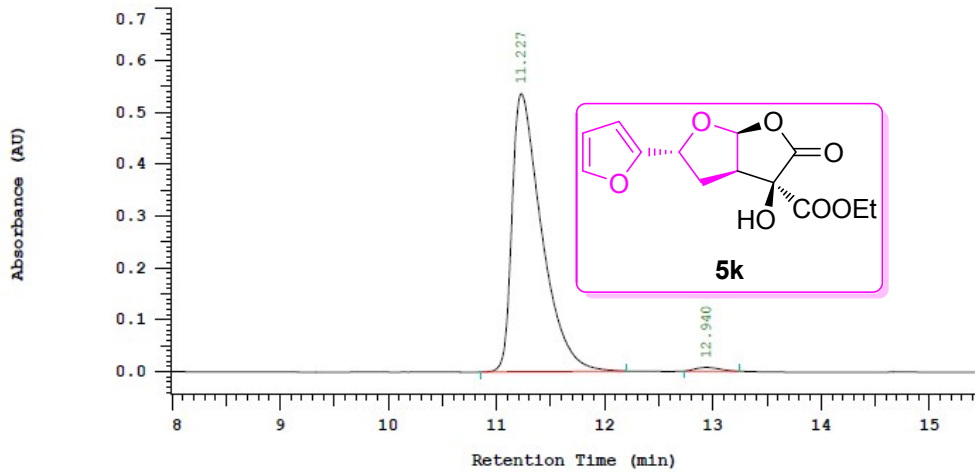


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.280	4605844	49.480	BB
2	12.780	4702667	50.520	BB
		9308511	100.000	

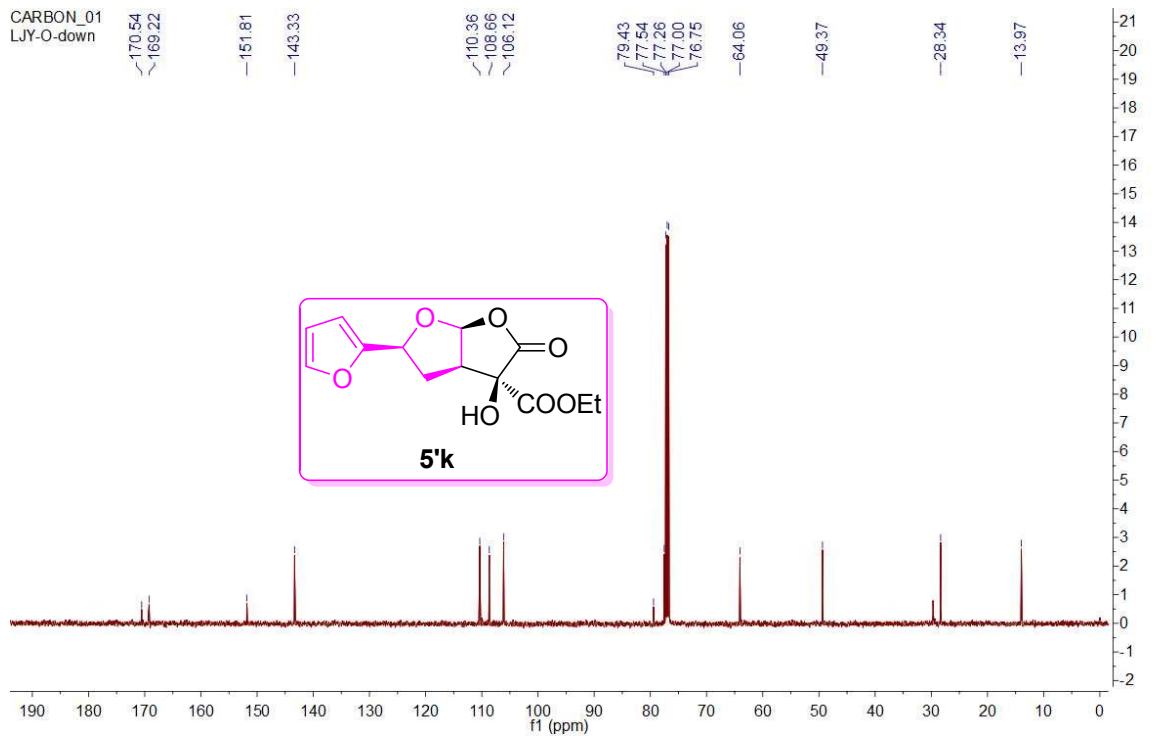
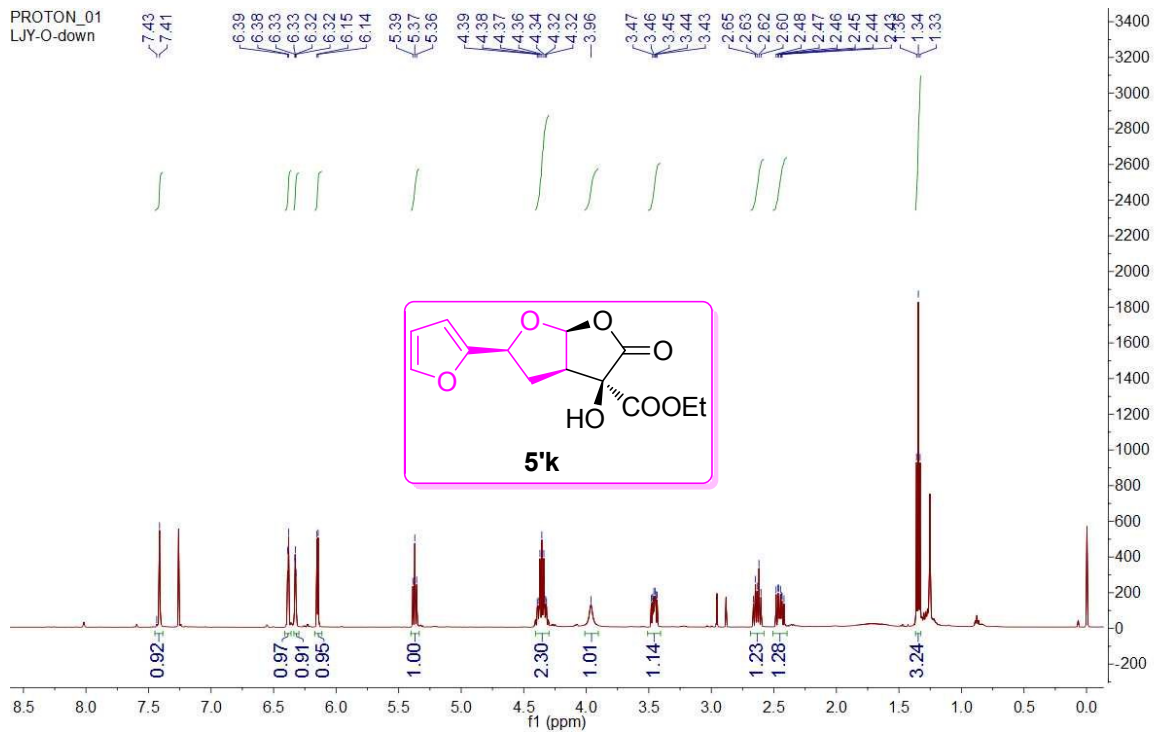
Chrom Type: Fixed WL Chromatogram, 210 nm



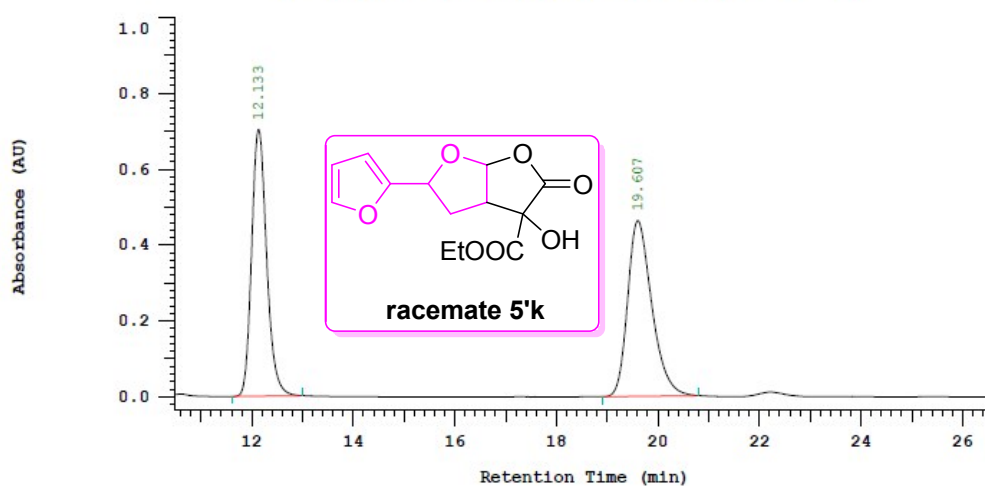
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.227	5103152	98.949	BB
2	12.940	54181	1.051	BB
		5157333	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

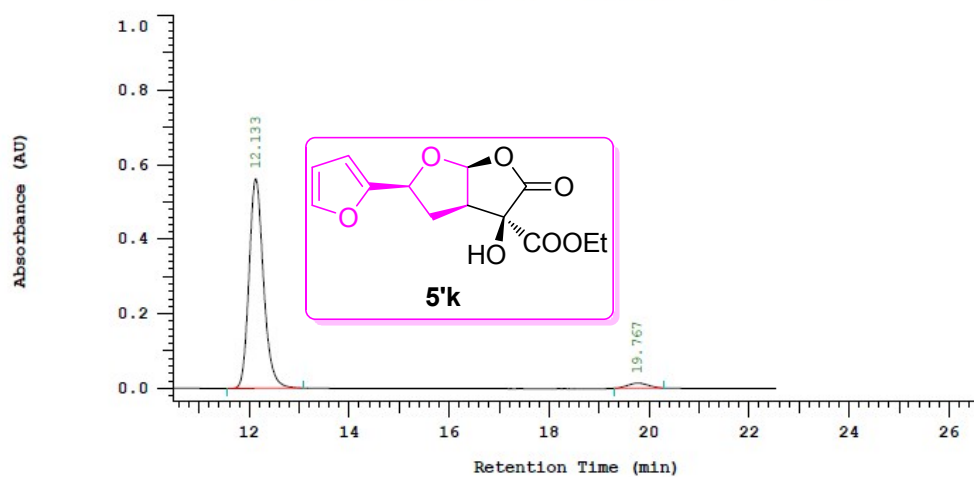


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	12.133	7255588	48.600	BB
2	19.607	7673651	51.400	BB
		14929239	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

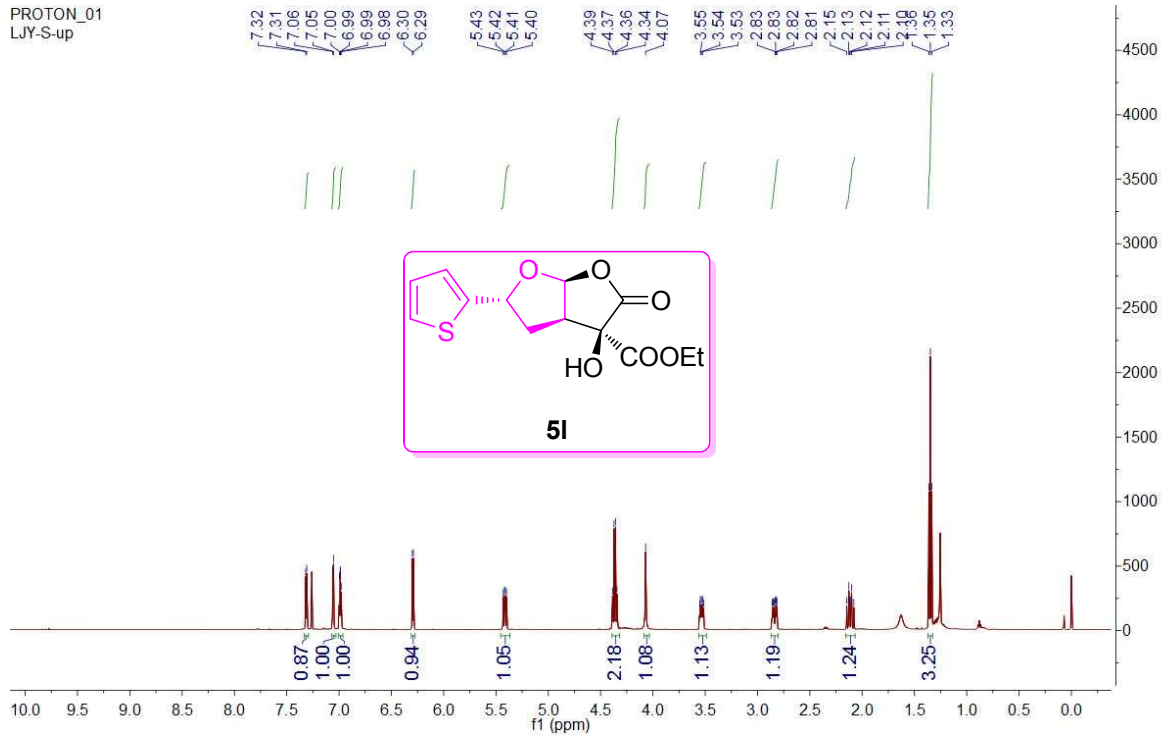


Chrom Type: Fixed WL Chromatogram, 210 nm

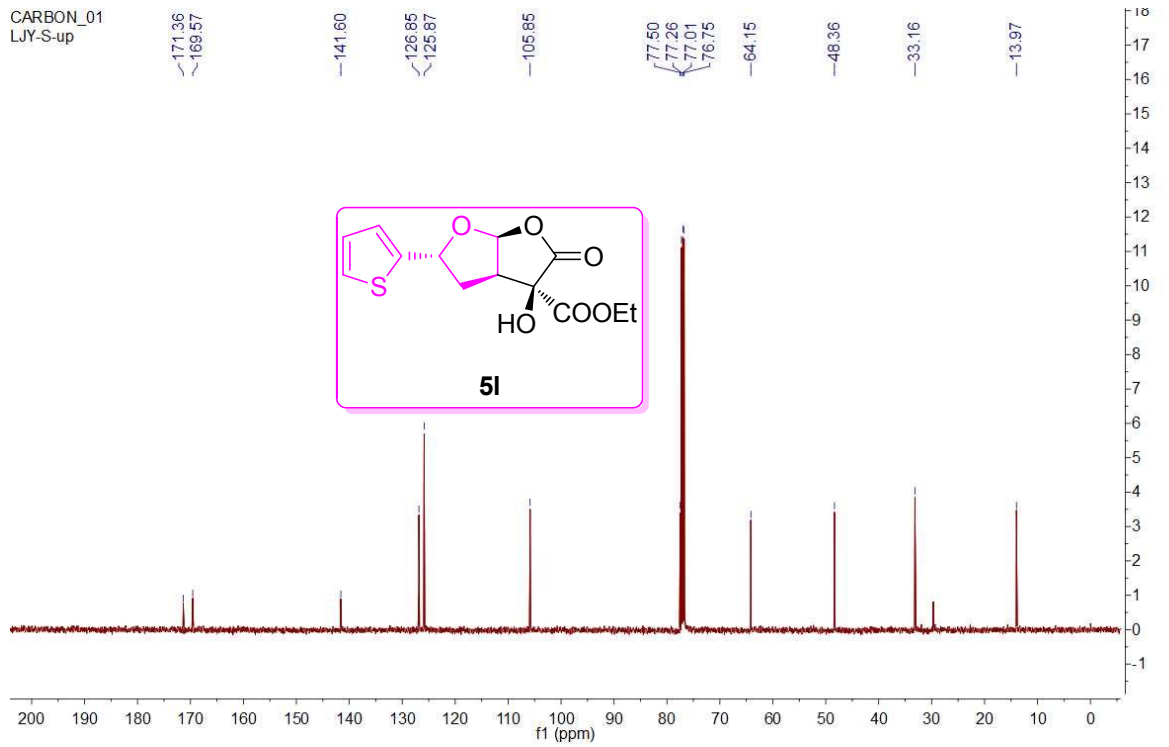
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	12.133	5671060	96.728	BB
2	19.767	191856	3.272	BB
		5862916	100.000	

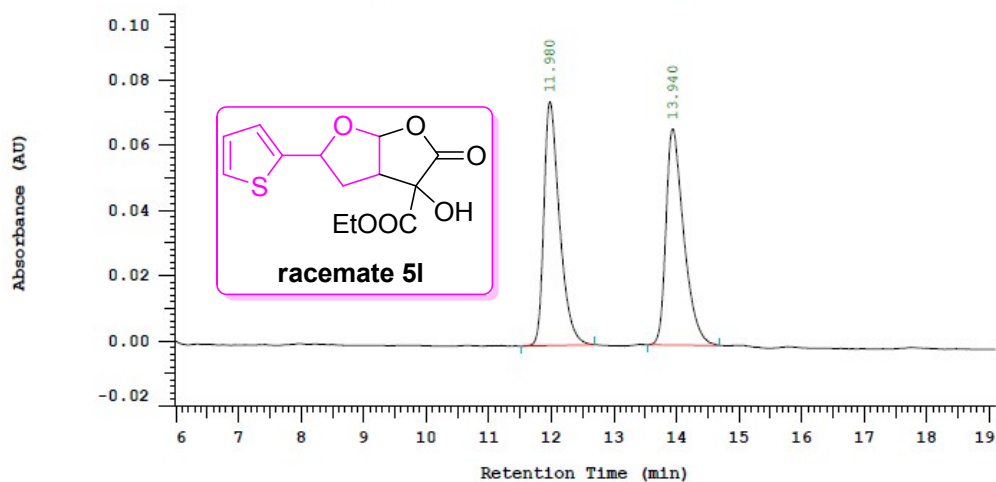
PROTON_01
LJY-S-up



CARBON_01
LJY-S-up



Chrom Type: Fixed WL Chromatogram, 210 nm

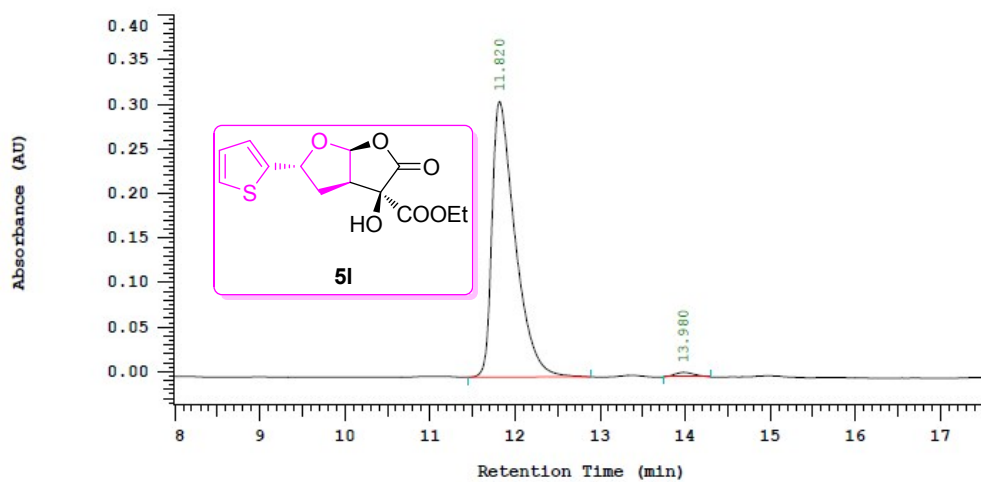


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.980	646666	49.585	BB
2	13.940	657486	50.415	BB
		1304152	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

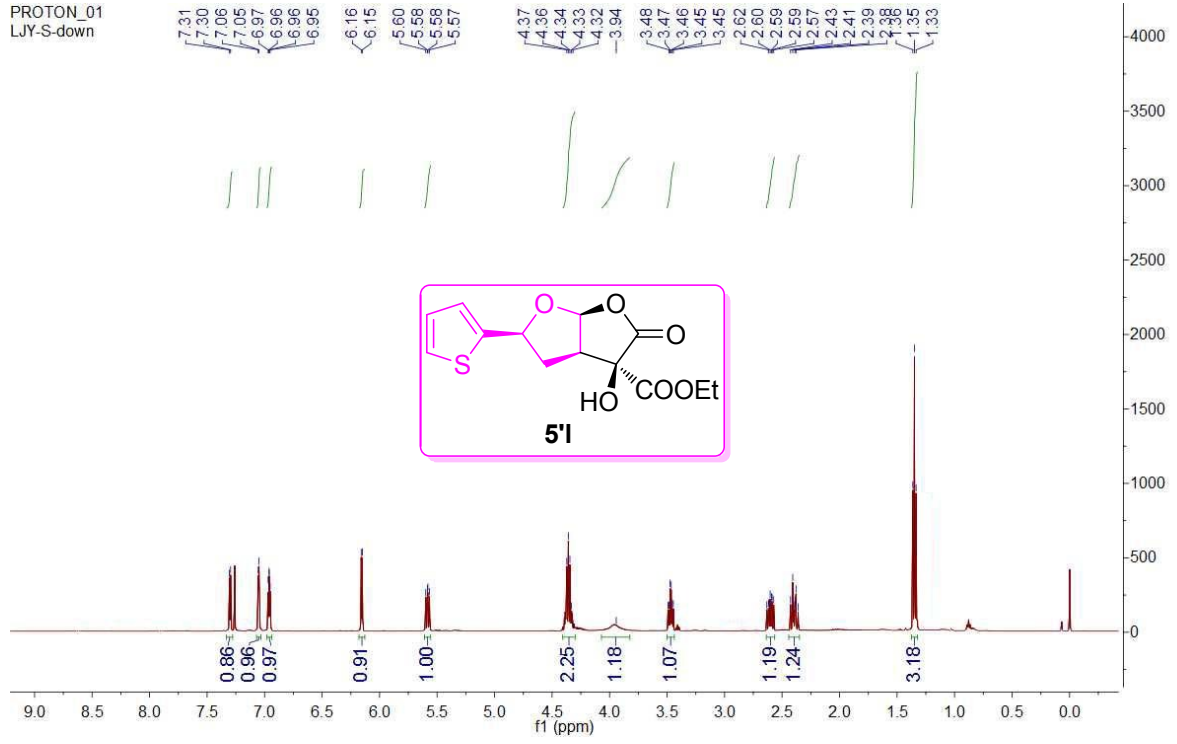


Chrom Type: Fixed WL Chromatogram, 210 nm

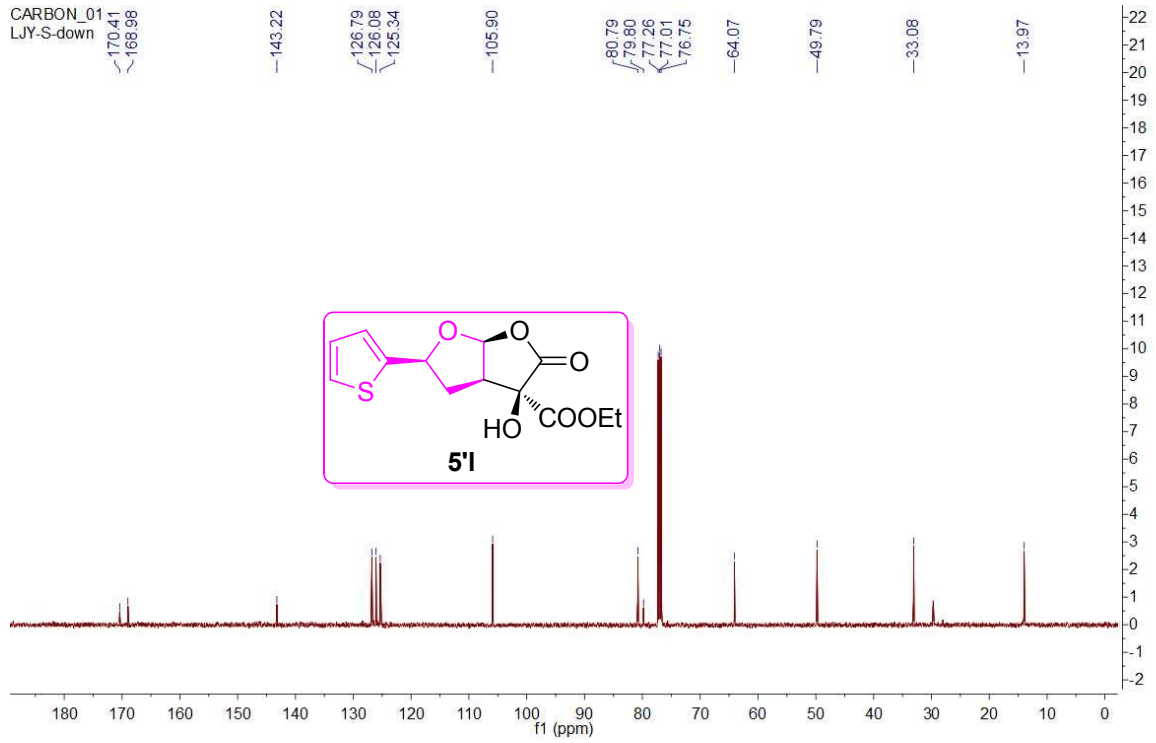
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.820	2917415	98.642	BB
2	13.980	40158	1.358	BB
		2957573	100.000	

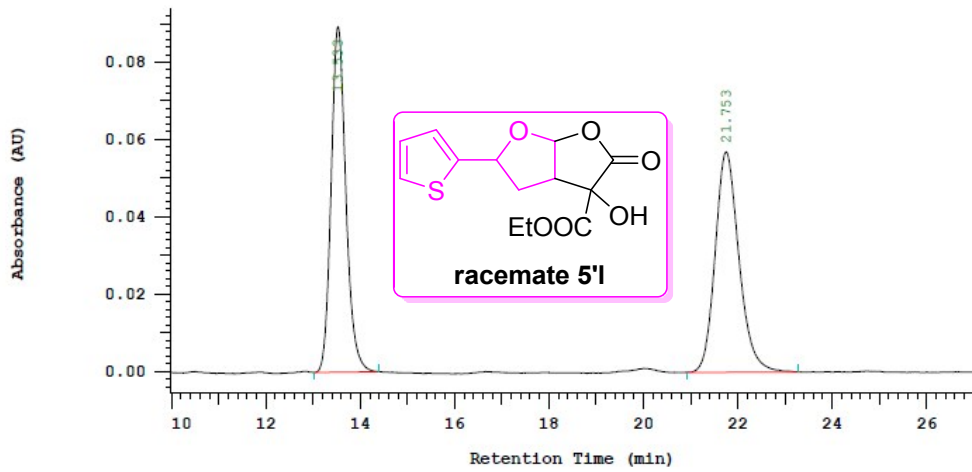
PROTON_01
LJY-S-down



CARBON_01
LJY-S-down



Chrom Type: Fixed WL Chromatogram, 210 nm

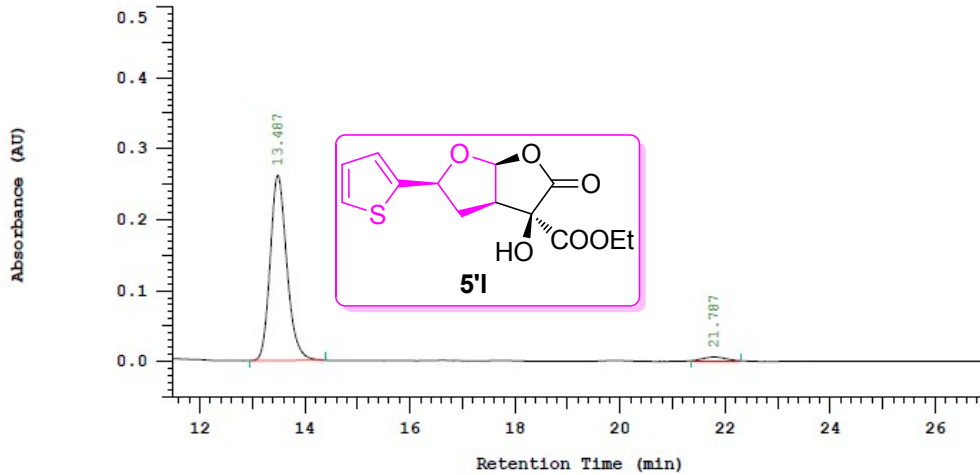


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	13.533	970318	49.276	BB
2	21.753	998836	50.724	BB
		1969154	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

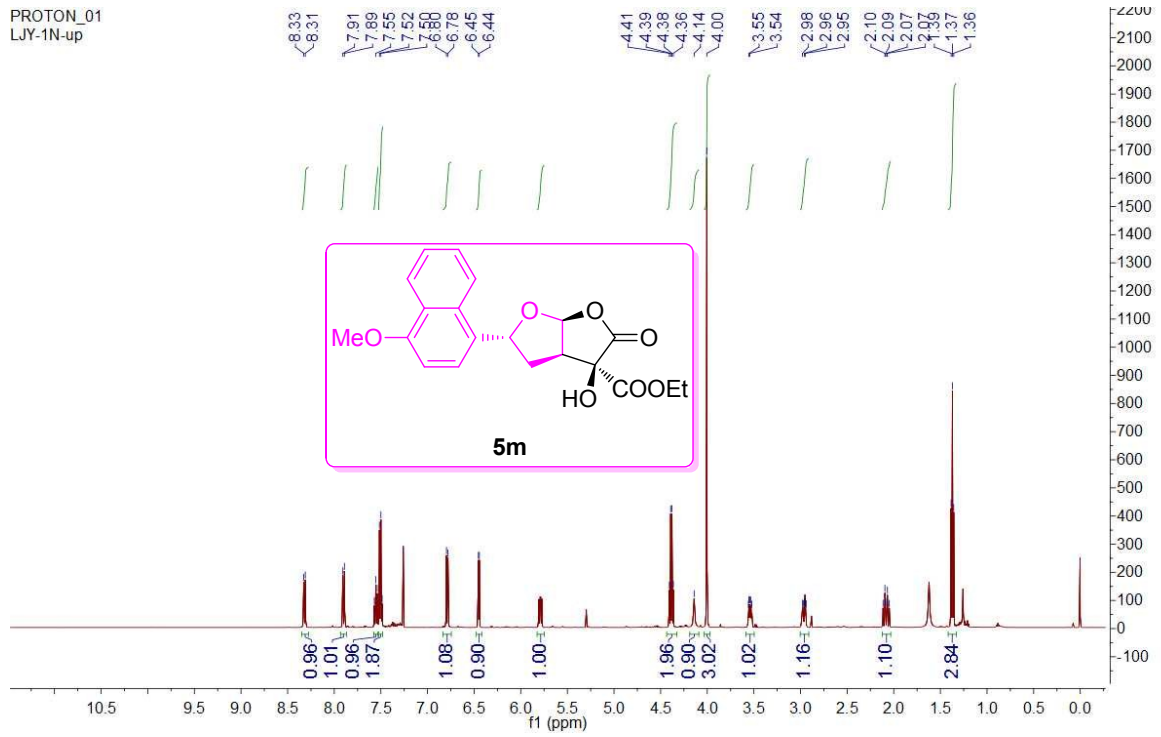


Chrom Type: Fixed WL Chromatogram, 210 nm

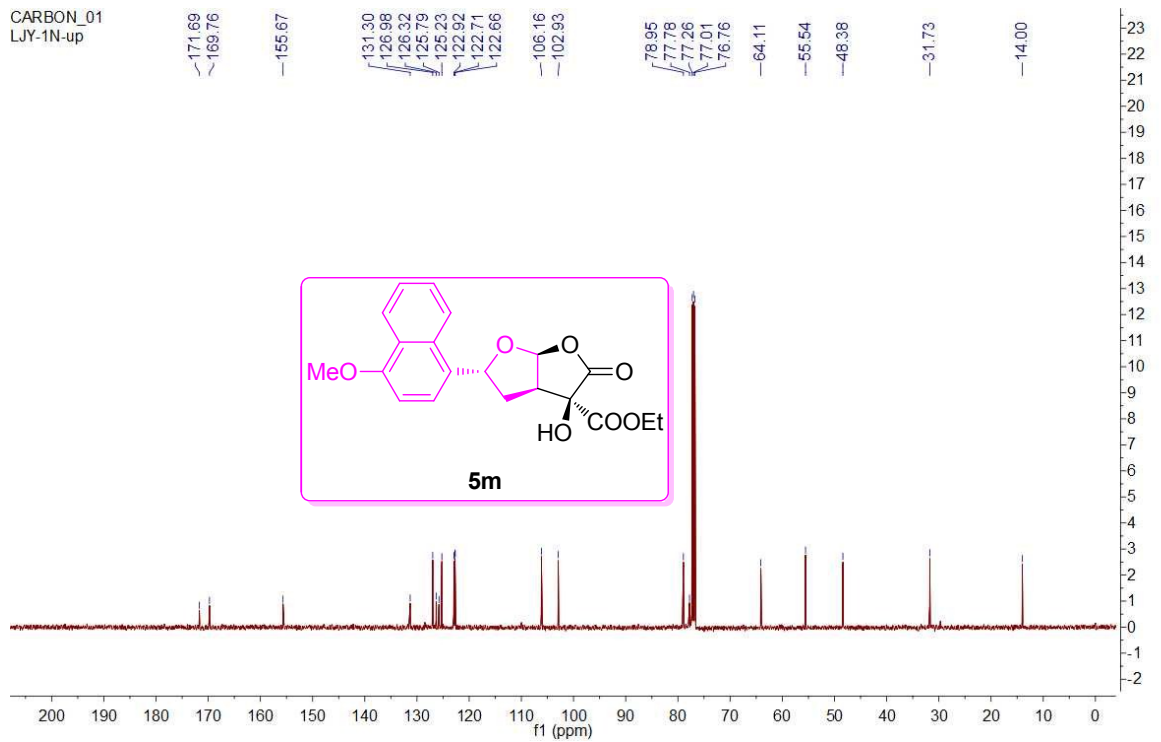
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	13.487	2868748	97.381	BB
2	21.787	77156	2.619	BB
		2945904	100.000	

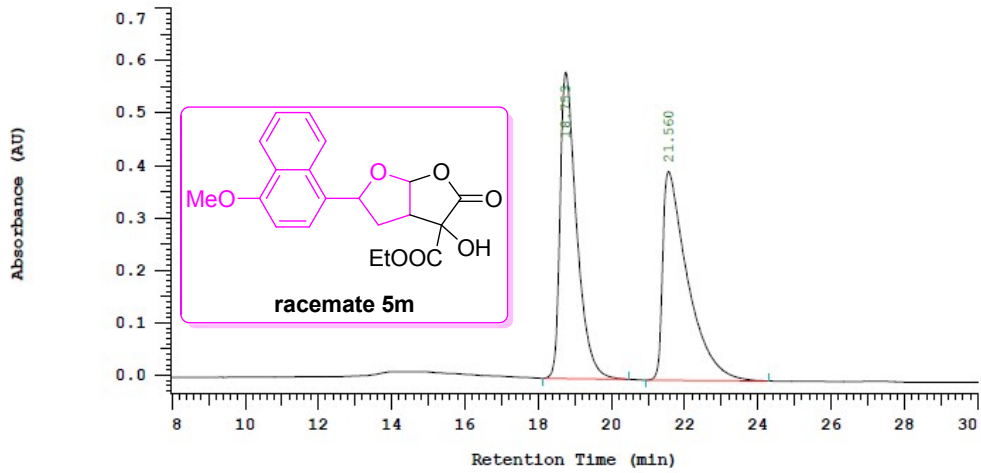
PROTON_01
LJY-1N-up



CARBON_01
LJY-1N-up



Chrom Type: Fixed WL Chromatogram, 210 nm

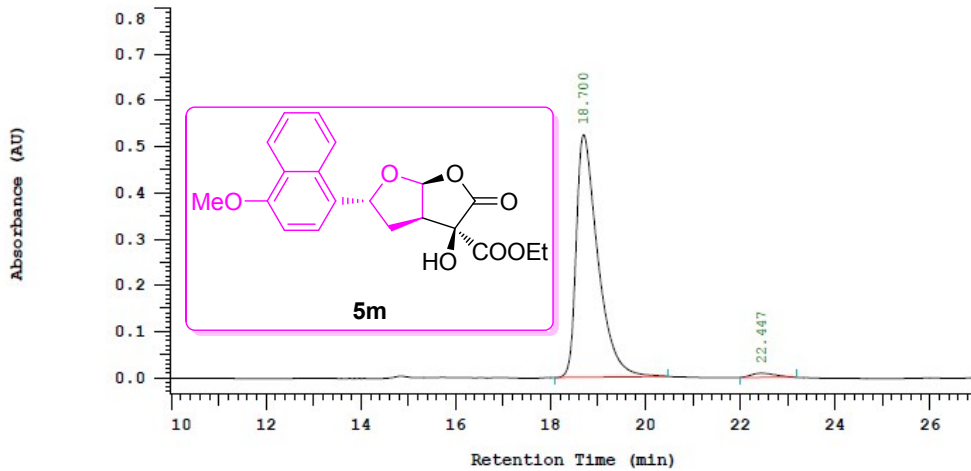


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	18.753	9178247	49.345	BB
2	21.560	9421936	50.655	BB
		18600183	100.000	

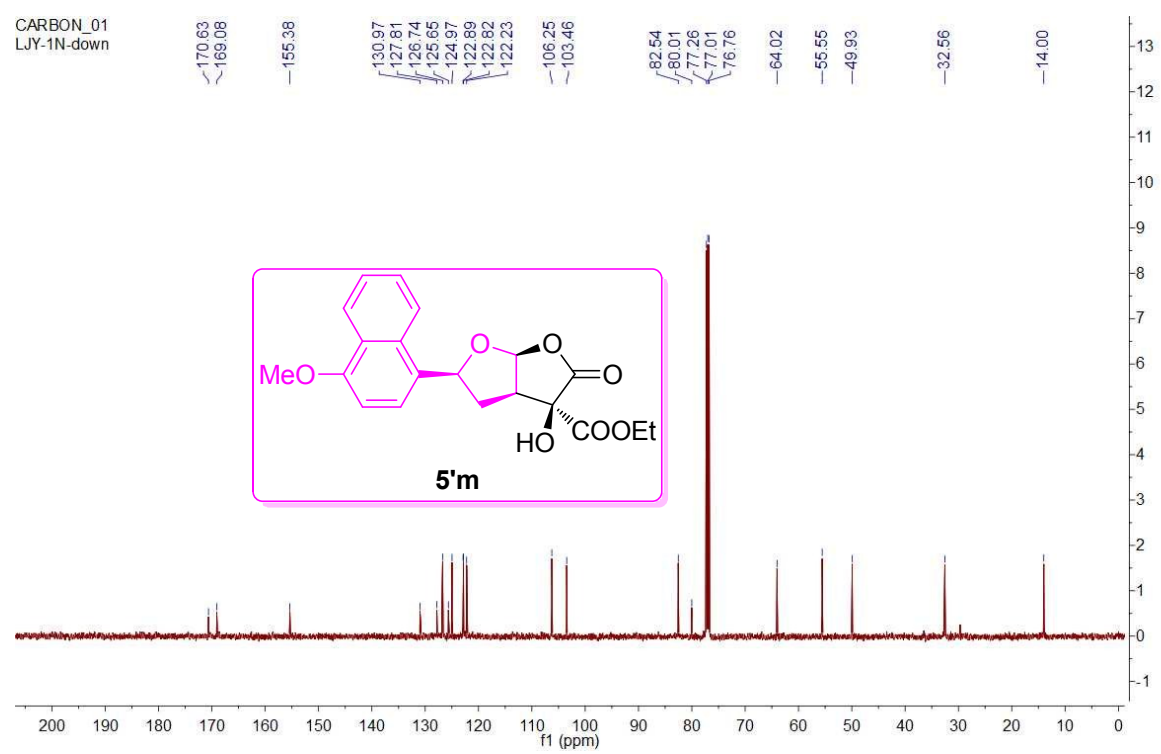
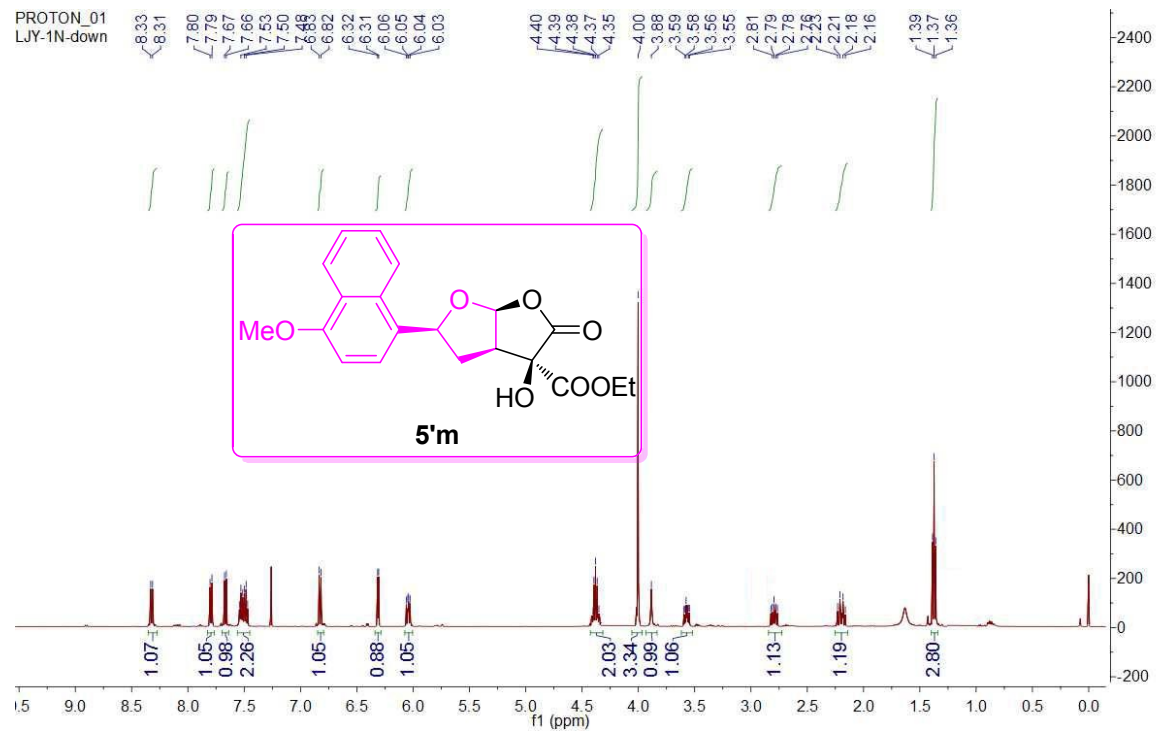
Chrom Type: Fixed WL Chromatogram, 210 nm



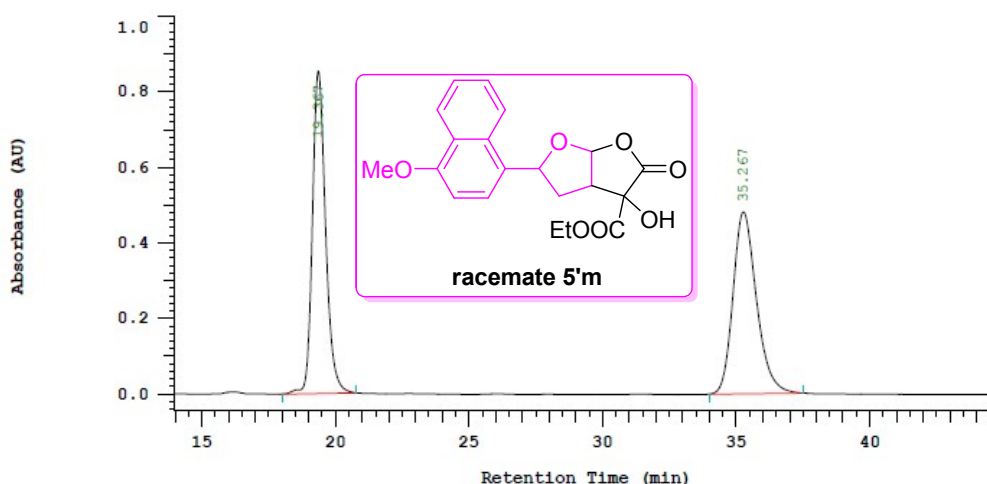
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	18.700	8299237	98.088	BB
2	22.447	161740	1.912	BB
		8460977	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

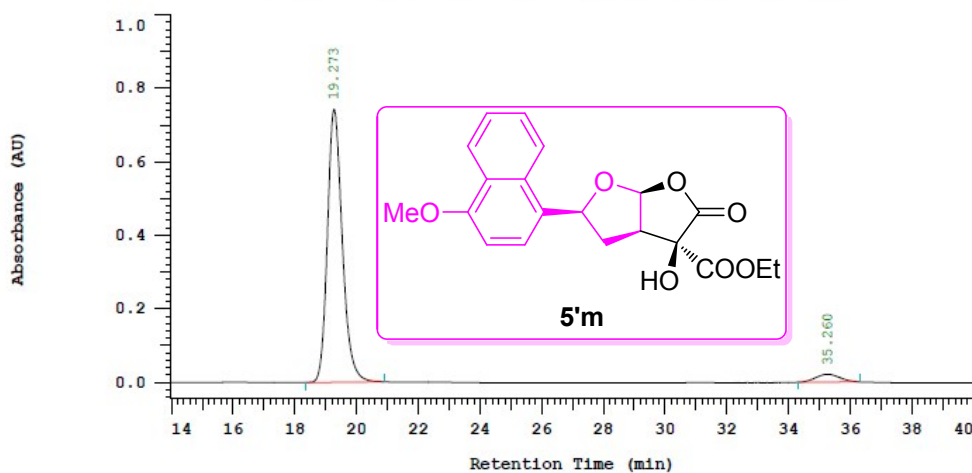


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	19.367	14509425	49.834	BB
2	35.267	14605921	50.166	BB
		29115346	100.000	

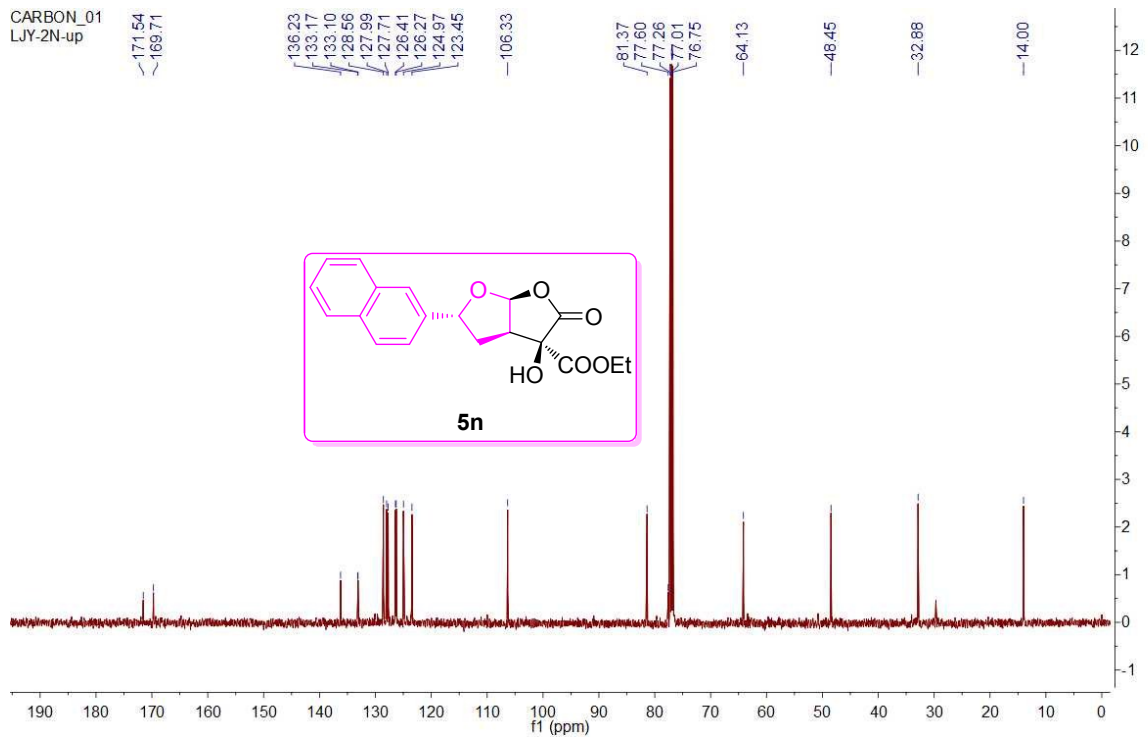
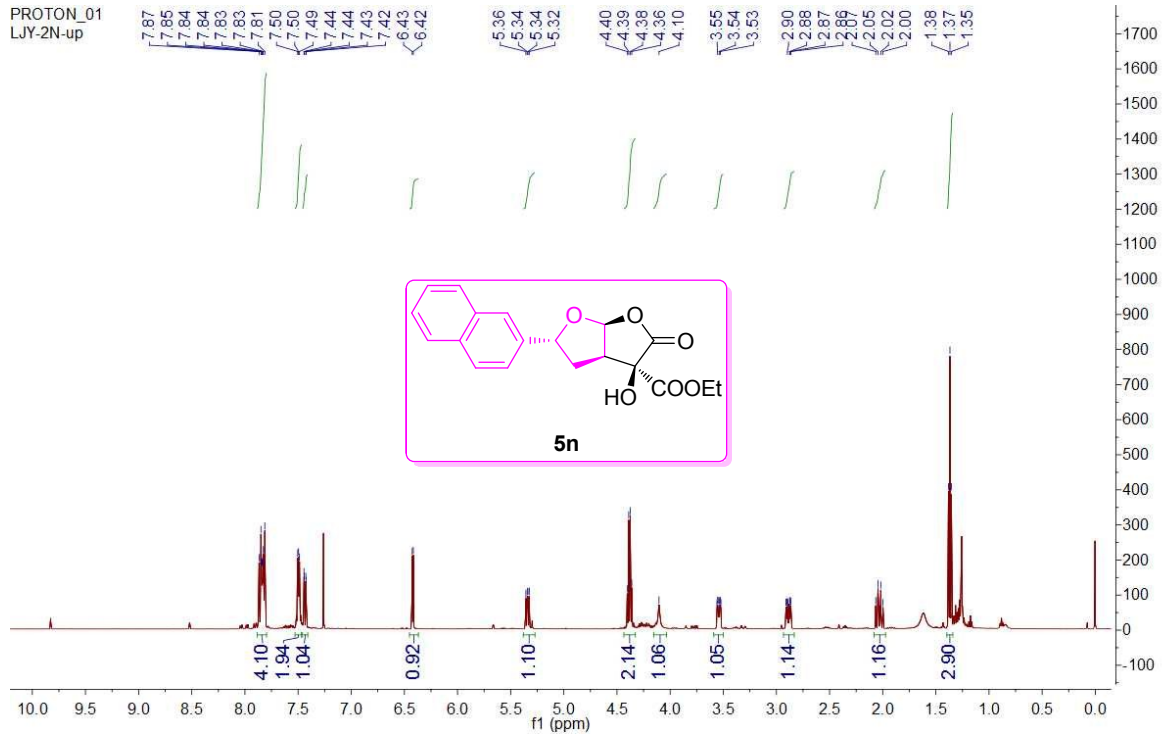
Chrom Type: Fixed WL Chromatogram, 210 nm



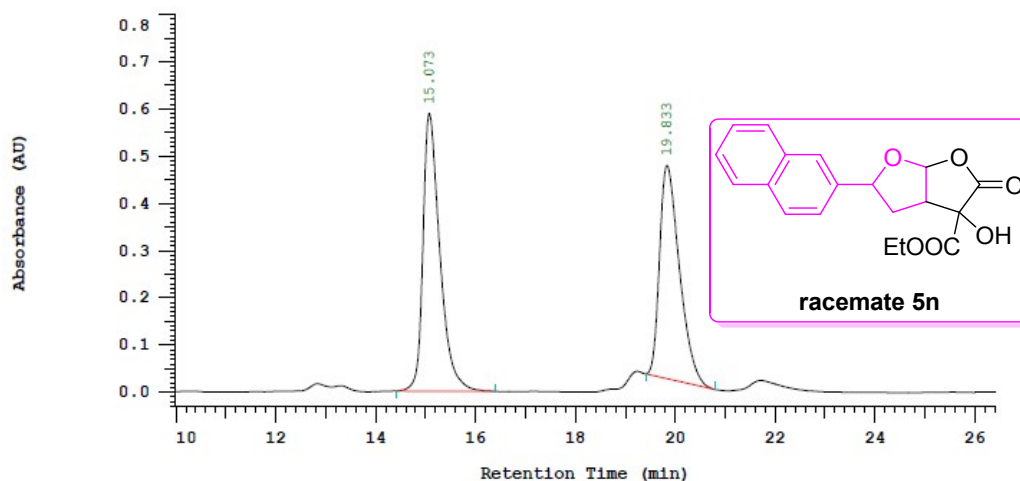
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	19.273	12406667	95.494	BB
2	35.260	585392	4.506	BB
		12992059	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

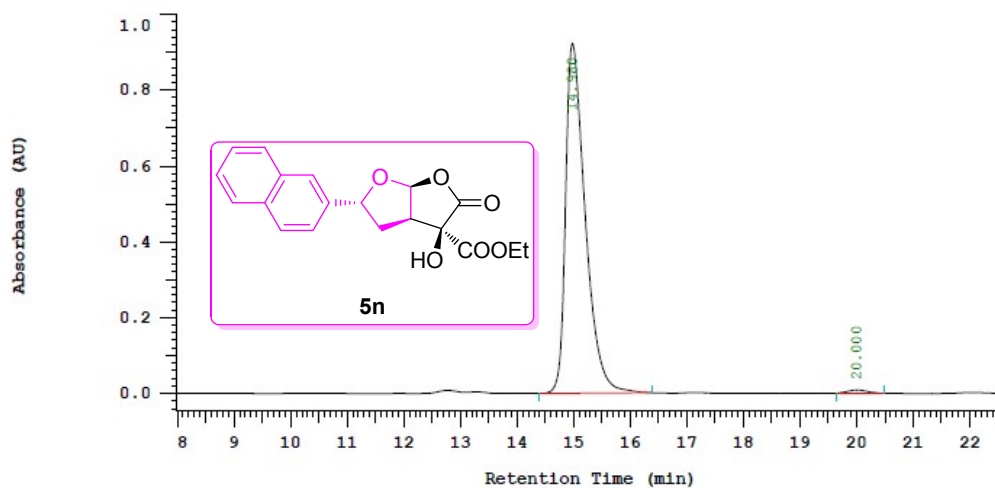


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	15.073	6909830	52.426	BB
2	19.833	6270288	47.574	BB
		13180118	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

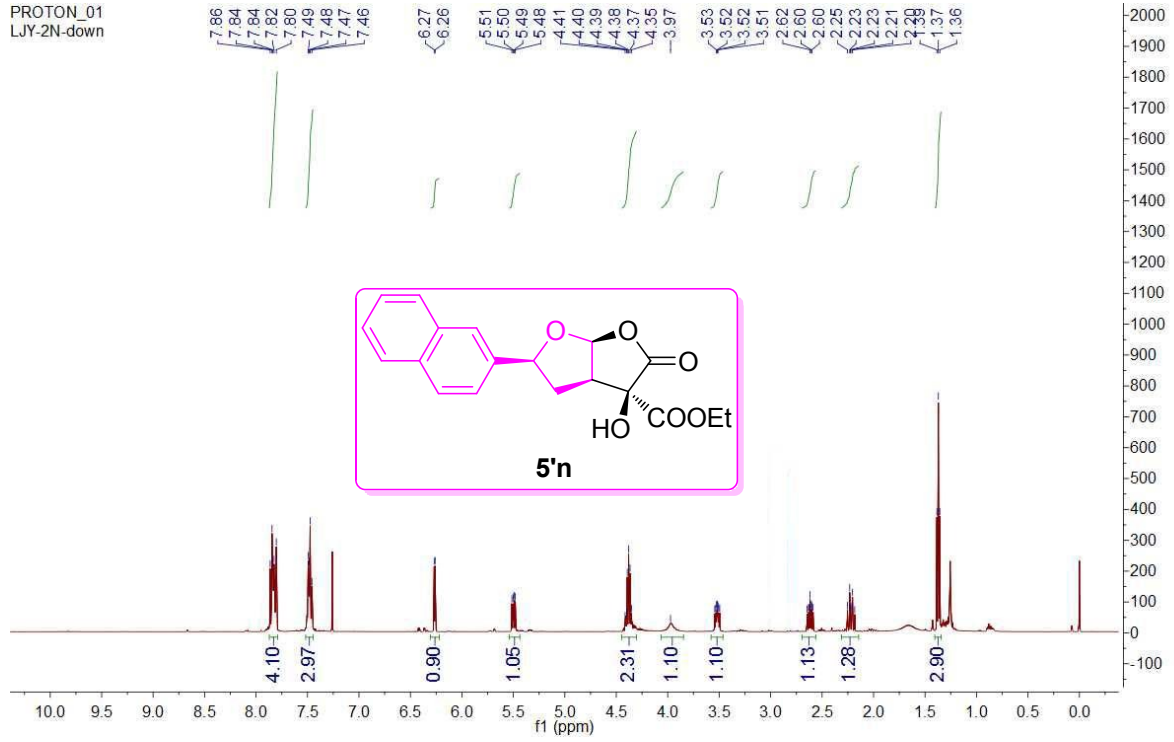


Chrom Type: Fixed WL Chromatogram, 210 nm

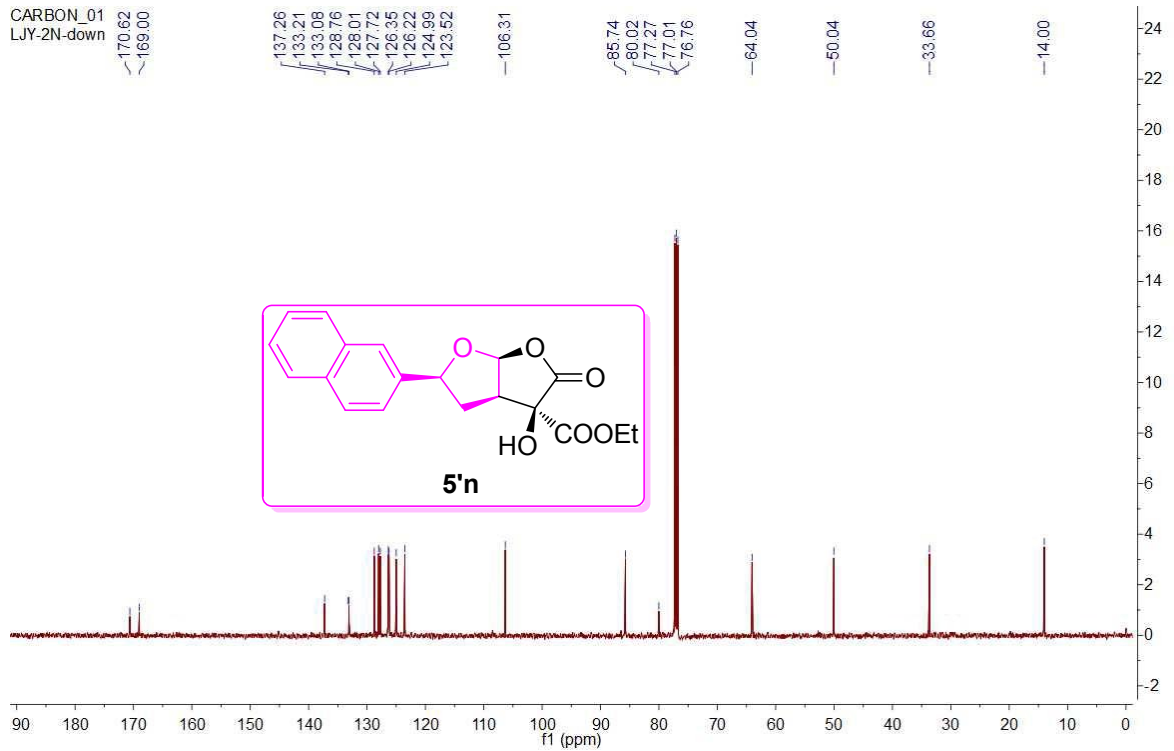
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	14.980	11095870	99.103	BB
2	20.000	100414	0.897	BB
		11196284	100.000	

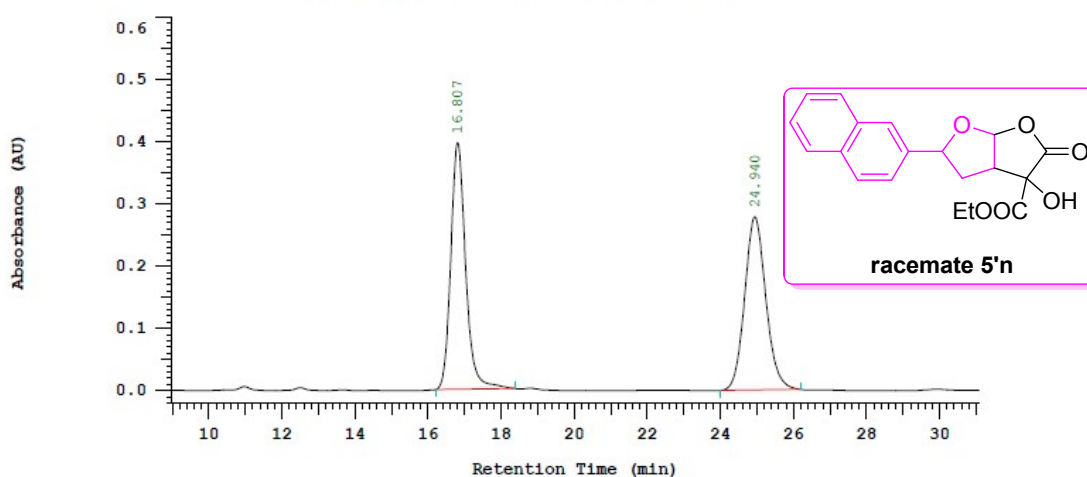
PROTON_01
LJY-2N-down



CARBON_01
LJY-2N-down



Chrom Type: Fixed WL Chromatogram, 210 nm

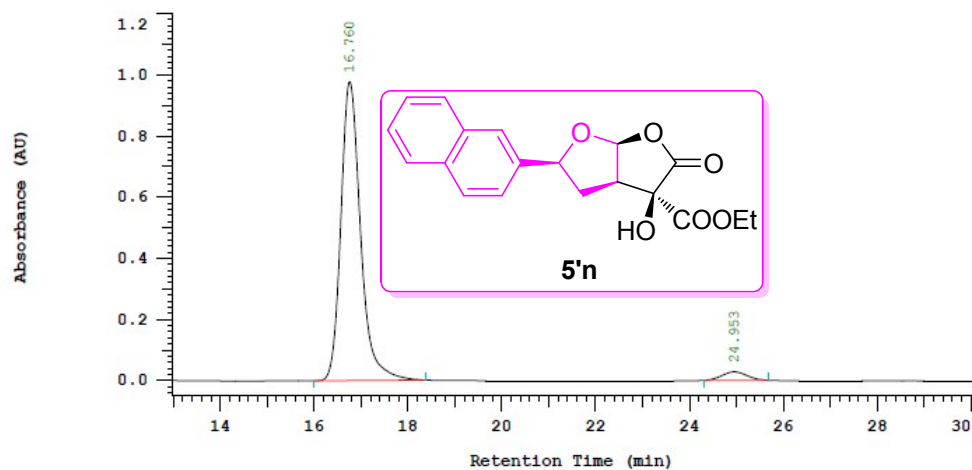


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	16.807	5585612	49.880	BB
2	24.940	5612455	50.120	BB
		11198067	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

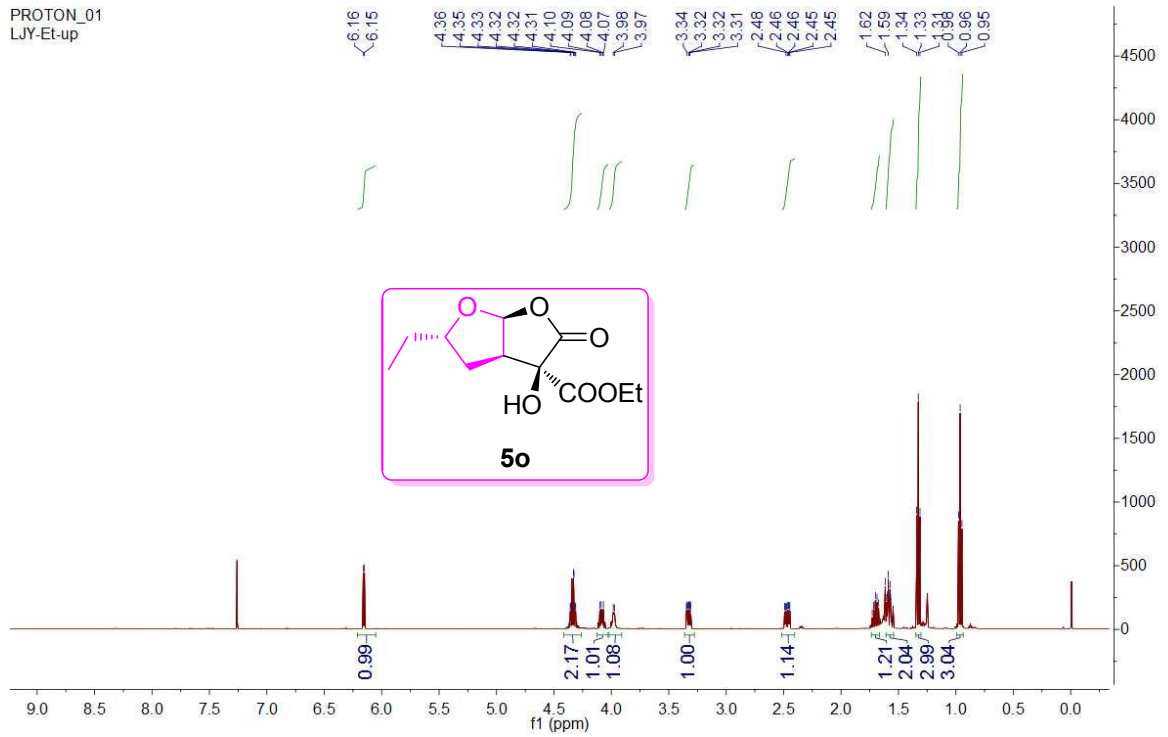


Chrom Type: Fixed WL Chromatogram, 210 nm

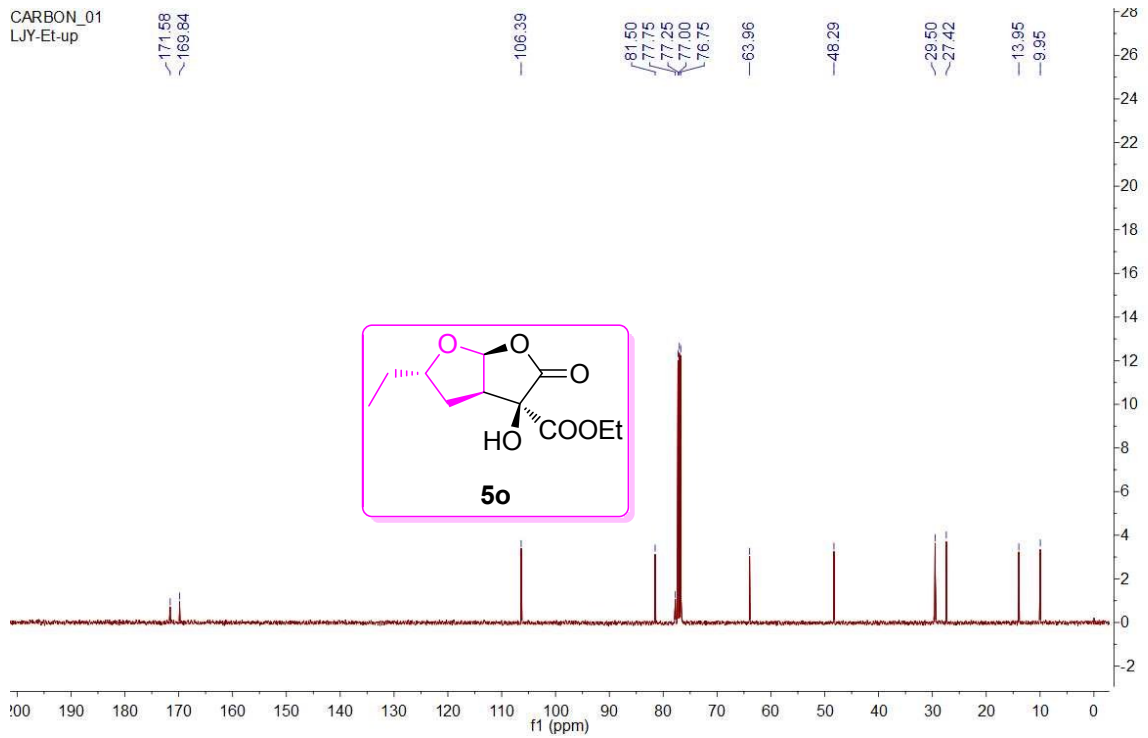
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	16.760	14269208	96.468	BB
2	24.953	522513	3.532	BB
		14791721	100.000	

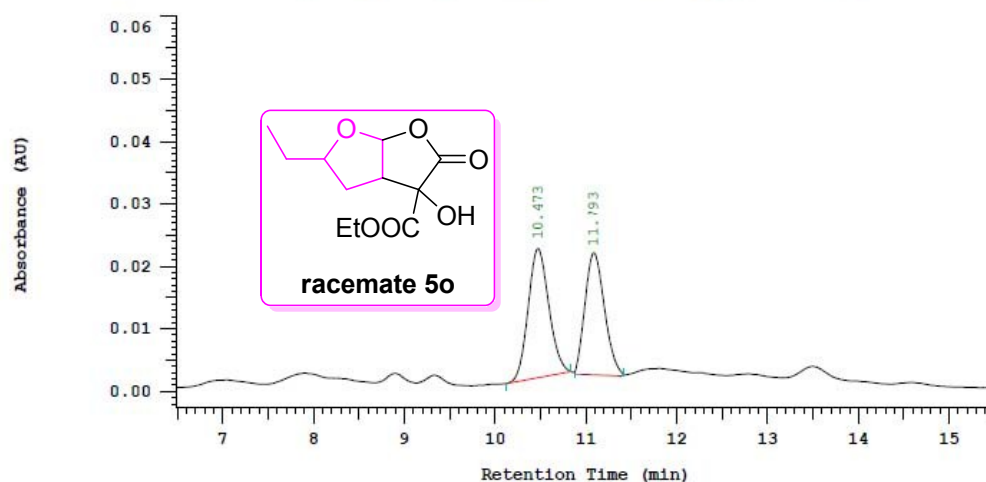
PROTON_01
LJY-Et-up



CARBON_01
LJY-Et-up



Chrom Type: Fixed WL Chromatogram, 210 nm

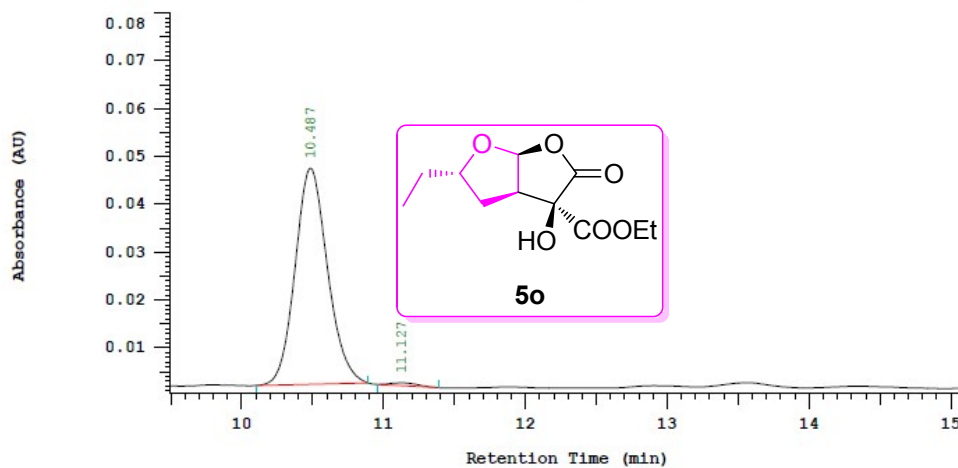


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	10.473	163671	49.941	BB
2	11.193	164056	50.059	BB
		327727	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

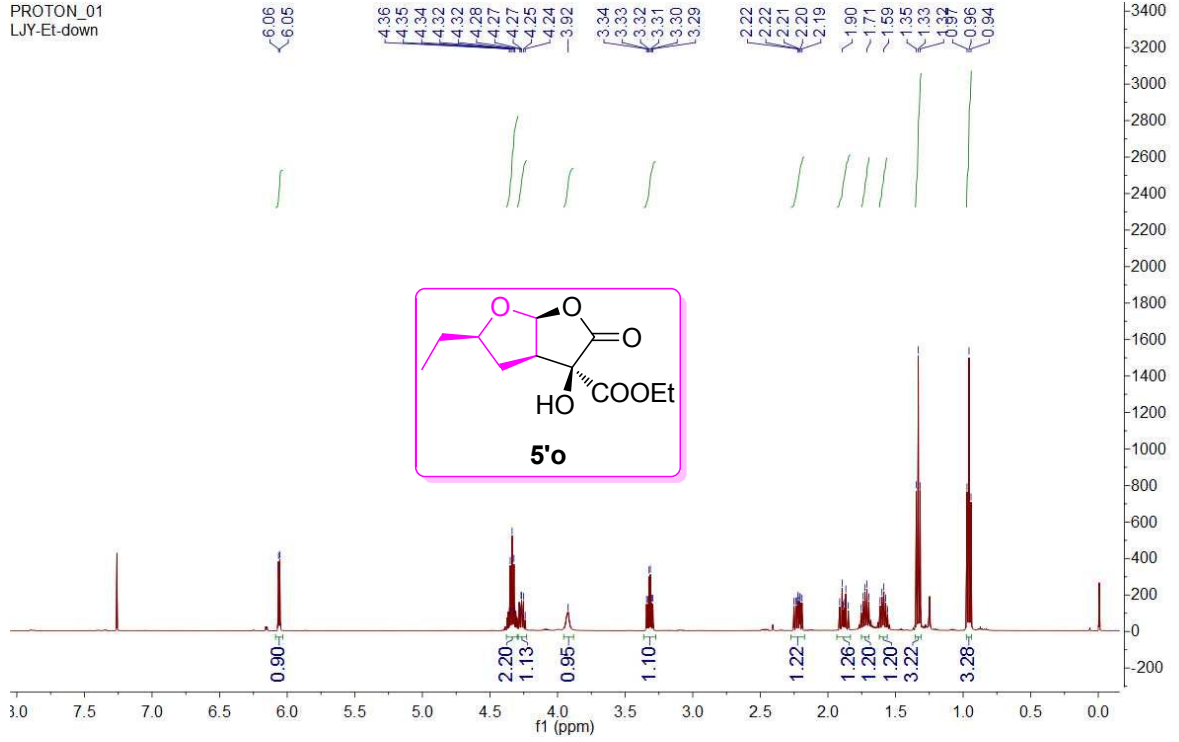


Chrom Type: Fixed WL Chromatogram, 210 nm

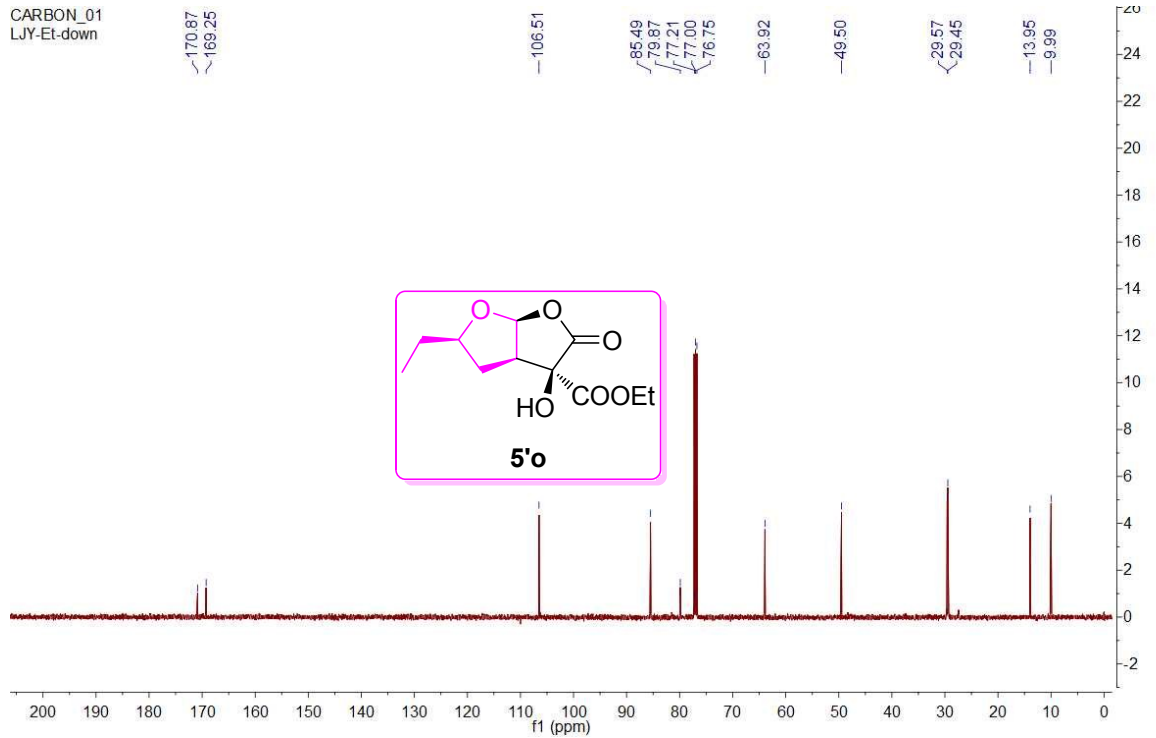
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	10.487	358532	98.846	BB
2	11.127	4185	1.154	BB
		362717	100.000	

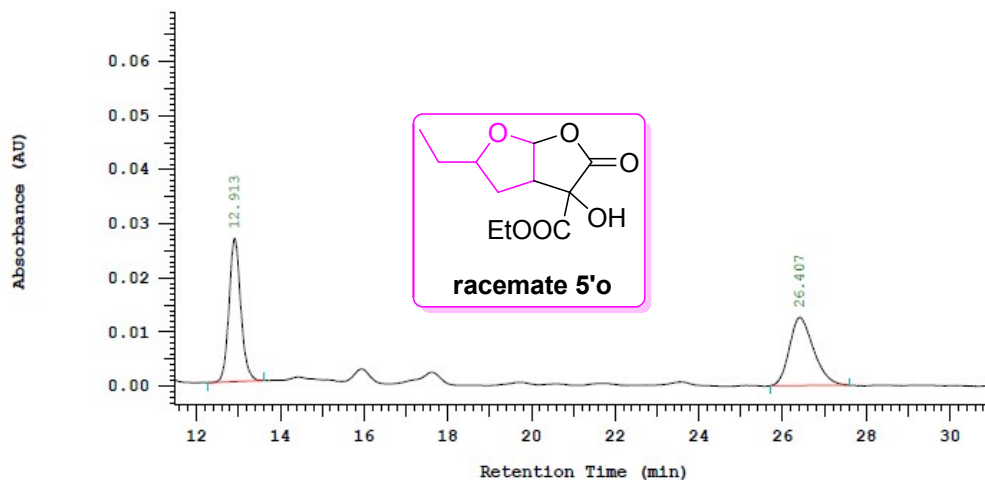
PROTON_01
LJY-Et-down



CARBON_01
LJY-Et-down



Chrom Type: Fixed WL Chromatogram, 210 nm

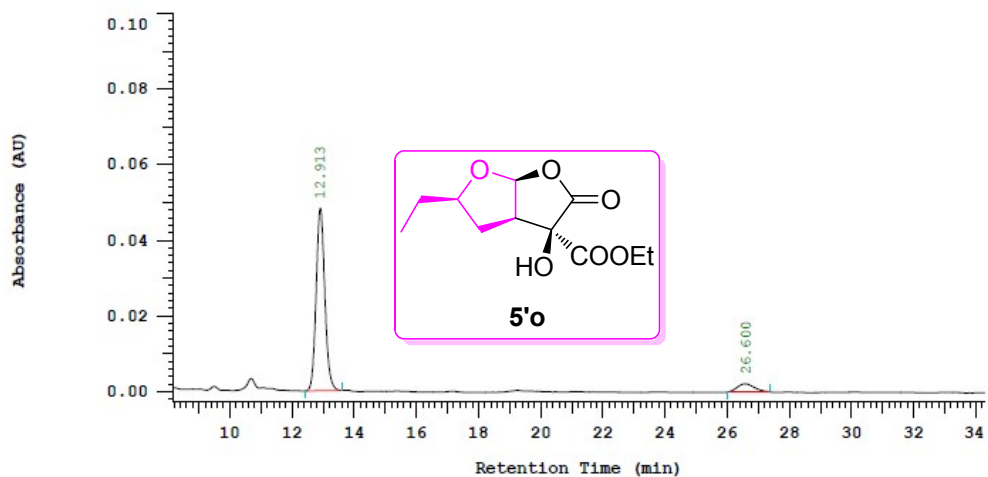


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	12.913	258154	50.552	BB
2	26.407	252517	49.448	BB
		510671	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

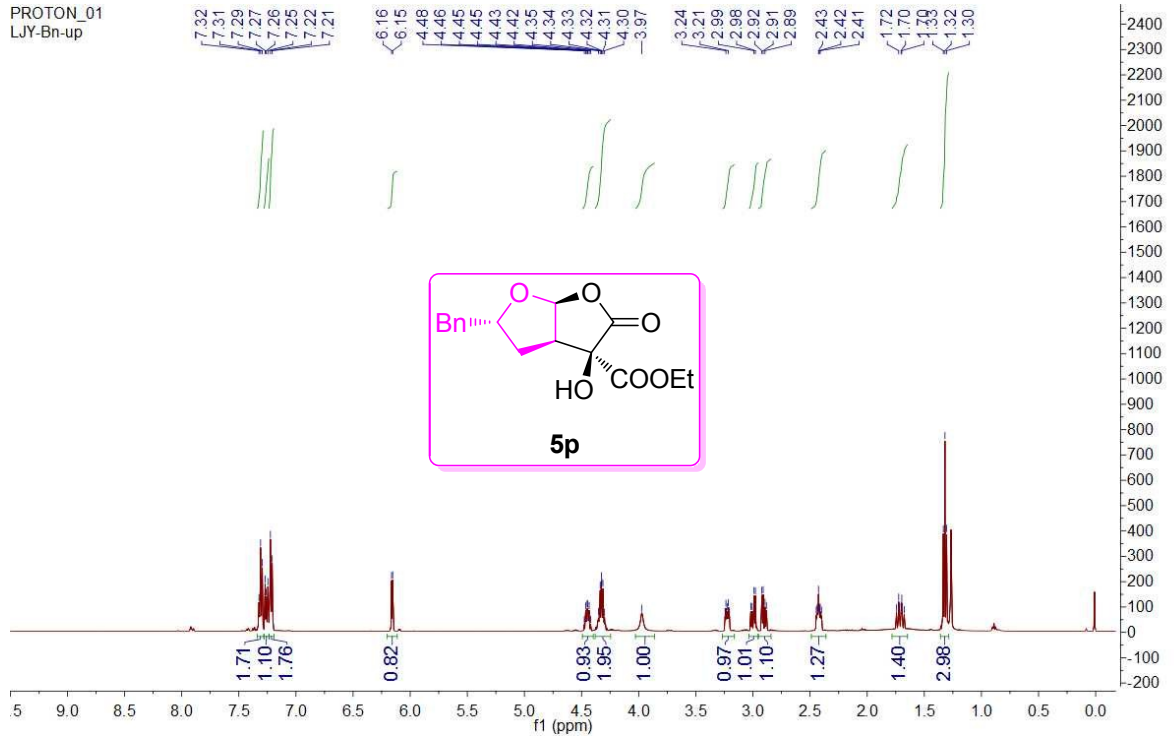


Chrom Type: Fixed WL Chromatogram, 210 nm

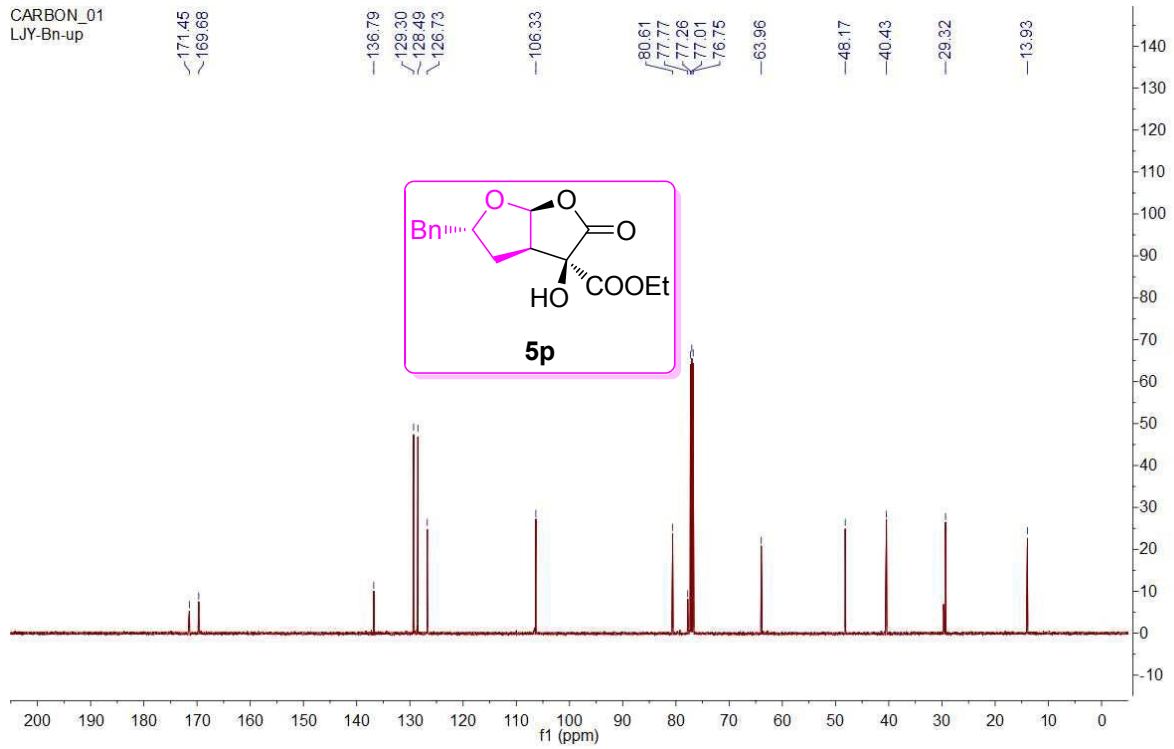
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	12.913	463645	91.770	BB
2	26.600	41579	8.230	BB
		505224	100.000	

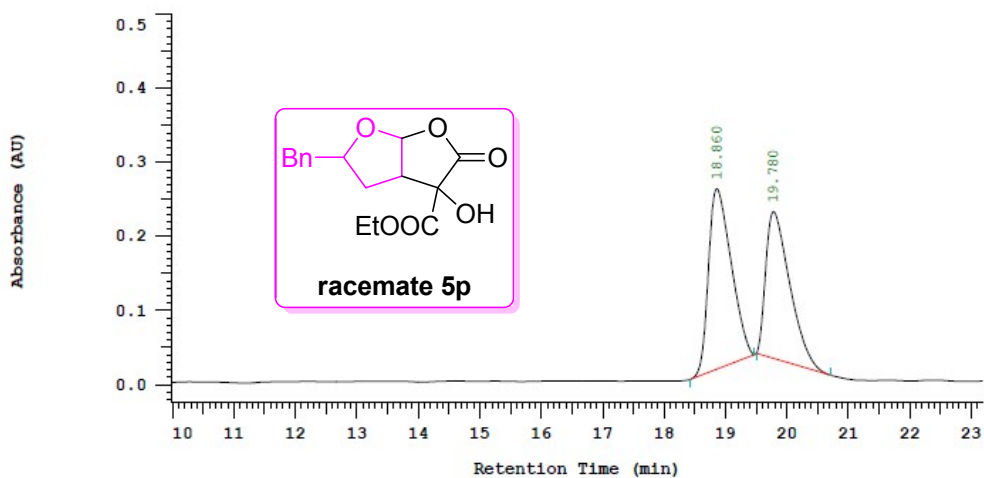
PROTON_01
LJY-Bn-up



CARBON_01
LJY-Bn-up



Chrom Type: Fixed WL Chromatogram, 210 nm

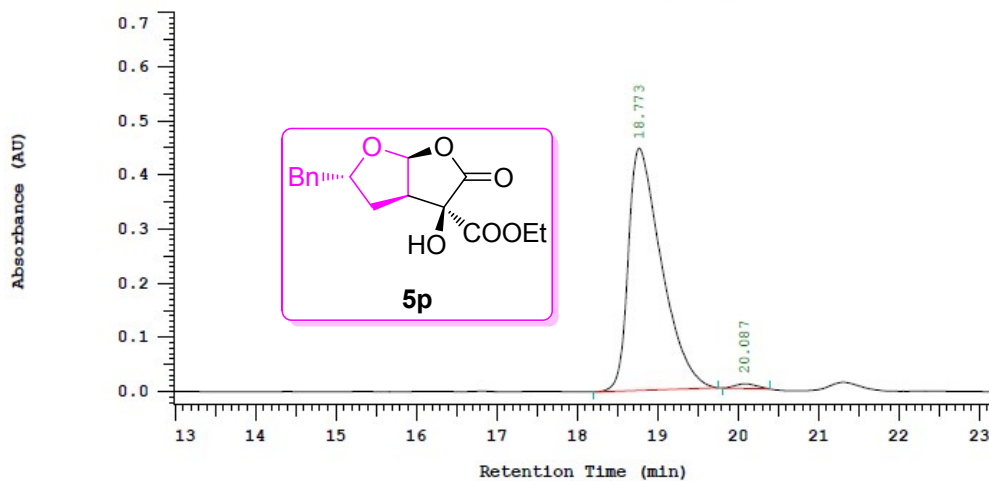


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	18.860	3112573	53.531	BB
2	19.780	2701940	46.469	BB
		5814513	100.000	

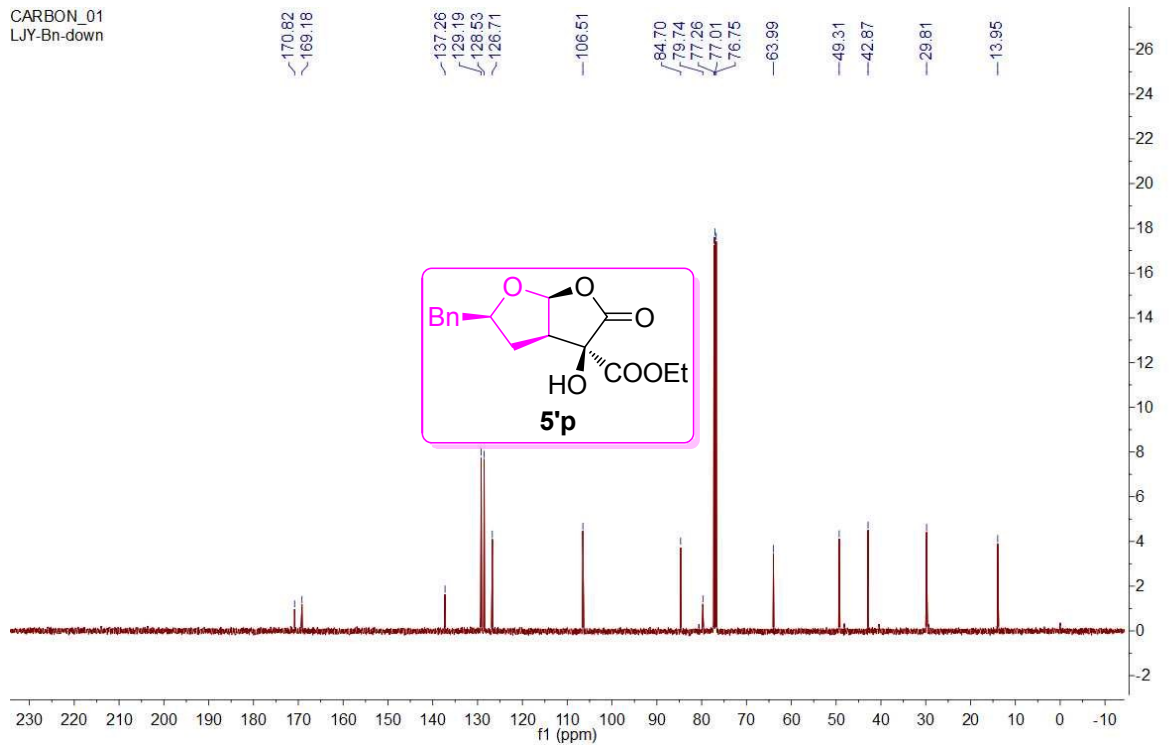
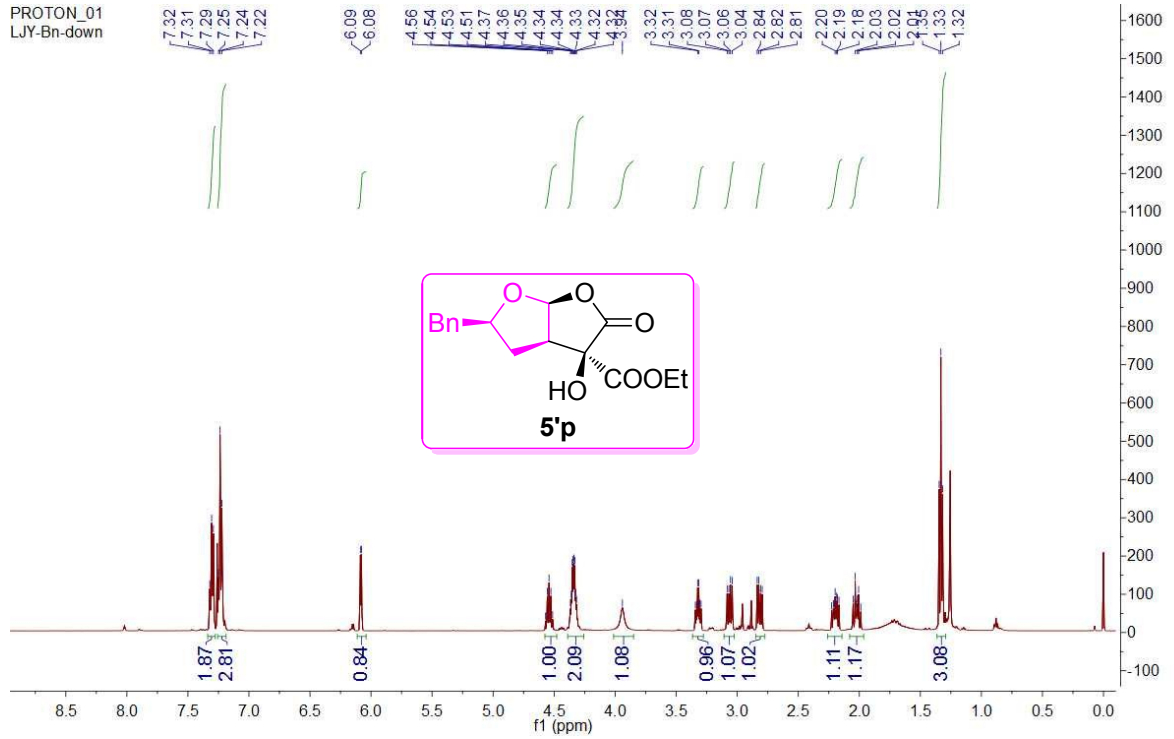
Chrom Type: Fixed WL Chromatogram, 210 nm



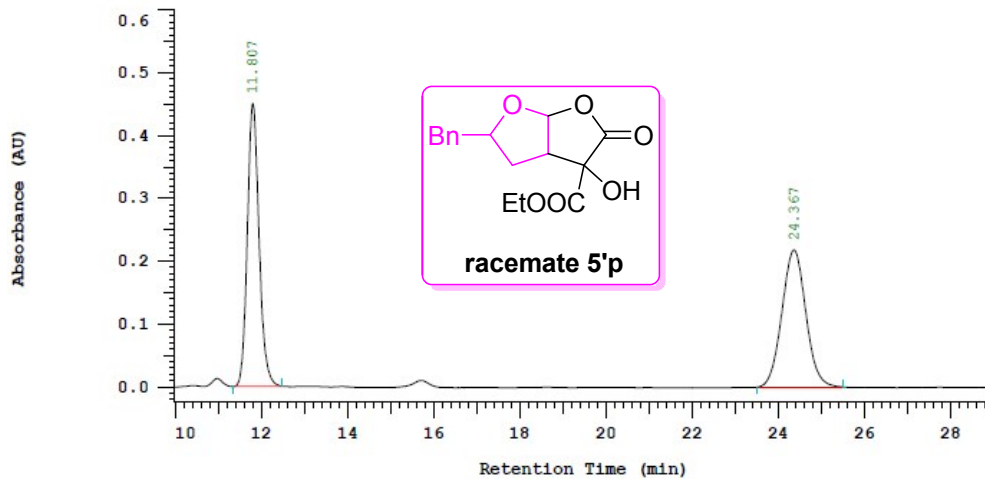
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	18.773	6419059	98.743	BB
2	20.087	81730	1.257	BB
		6500789	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm



Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.807	4262755	50.369	BB
2	24.367	4200225	49.631	BB
		8462980	100.000	

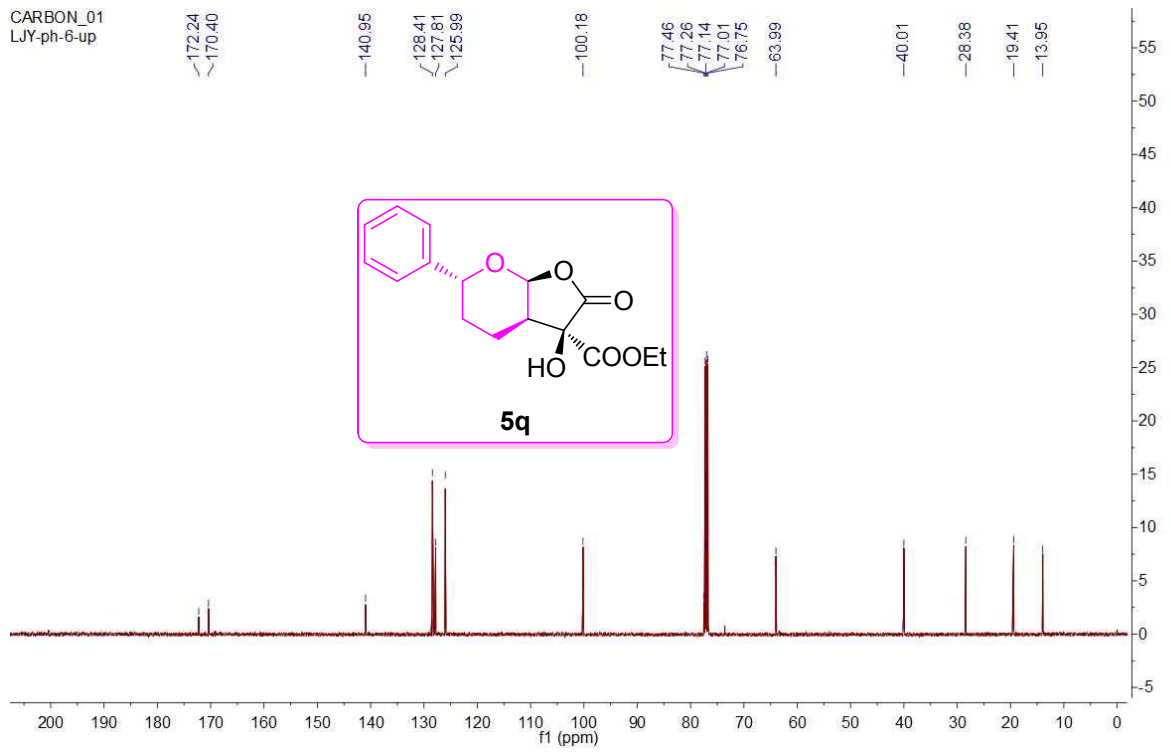
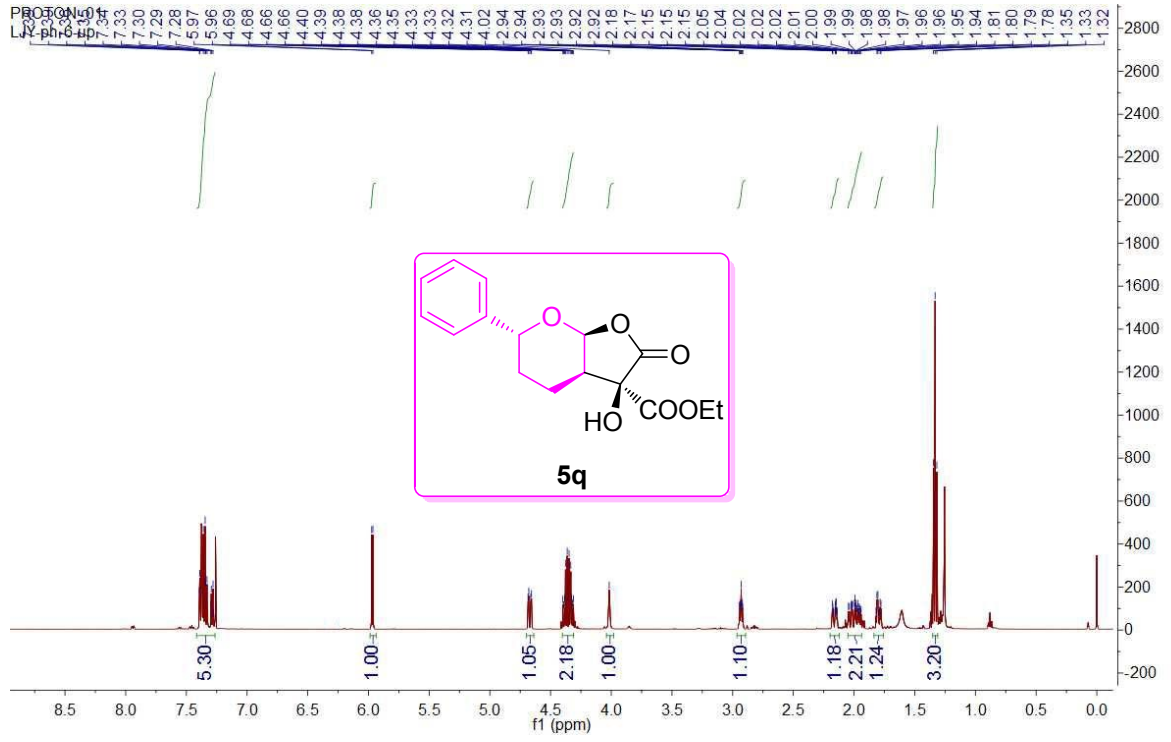
Chrom Type: Fixed WL Chromatogram, 210 nm



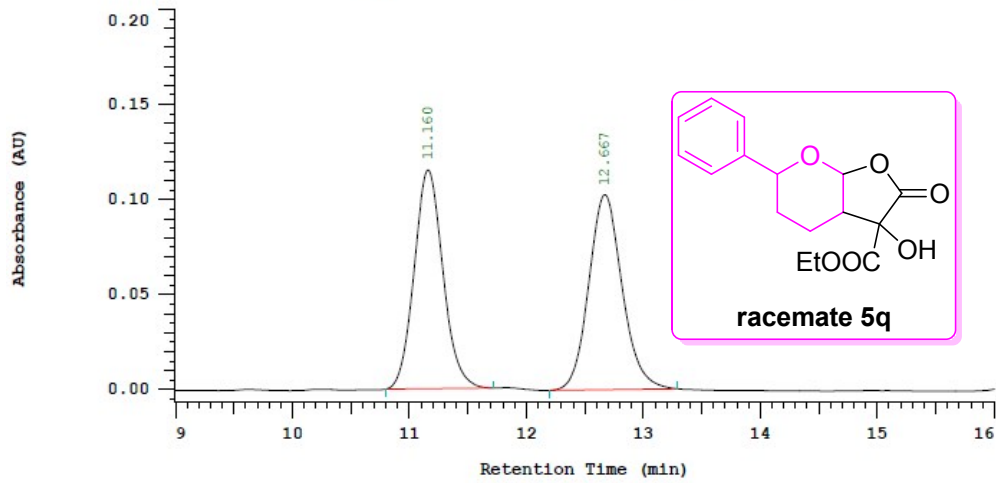
Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.740	6985527	86.575	BB
2	24.200	1083226	13.425	BB
		8068753	100.000	



Chrom Type: Fixed WL Chromatogram, 210 nm

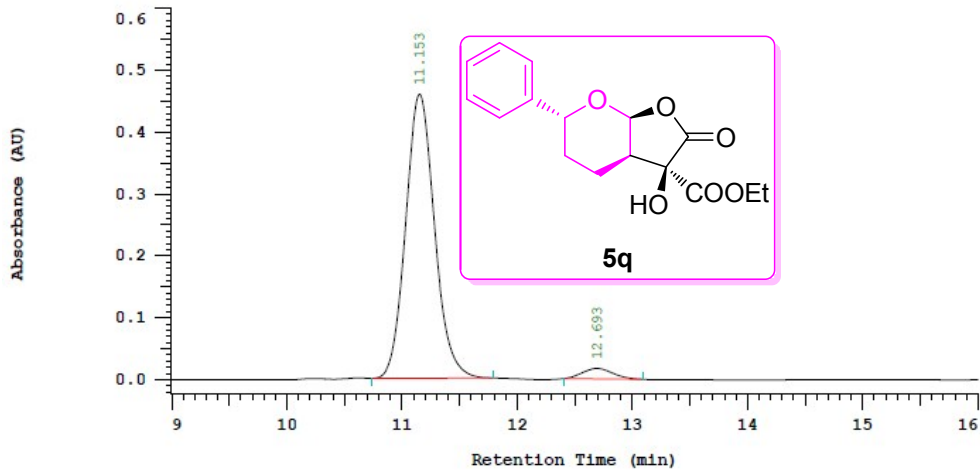


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.160	984584	49.233	BB
2	12.667	1015258	50.767	BB
		1999842	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

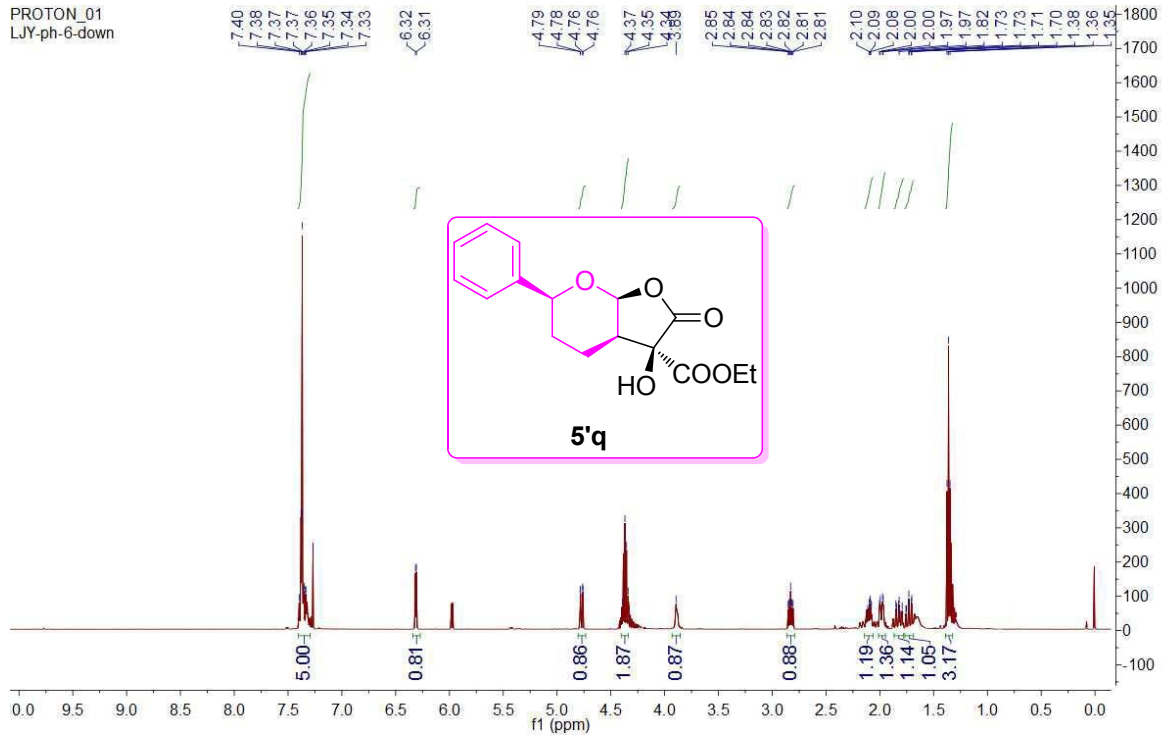


Chrom Type: Fixed WL Chromatogram, 210 nm

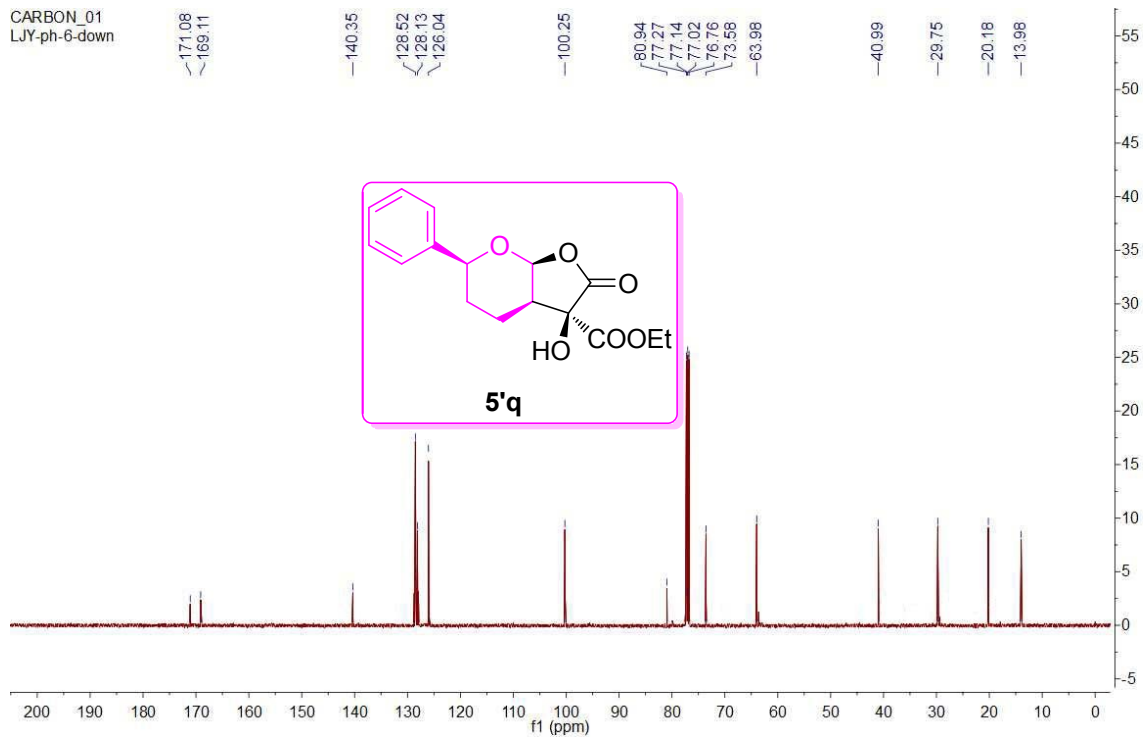
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.153	3997333	96.222	BB
2	12.693	156932	3.778	BB
		4154265	100.000	

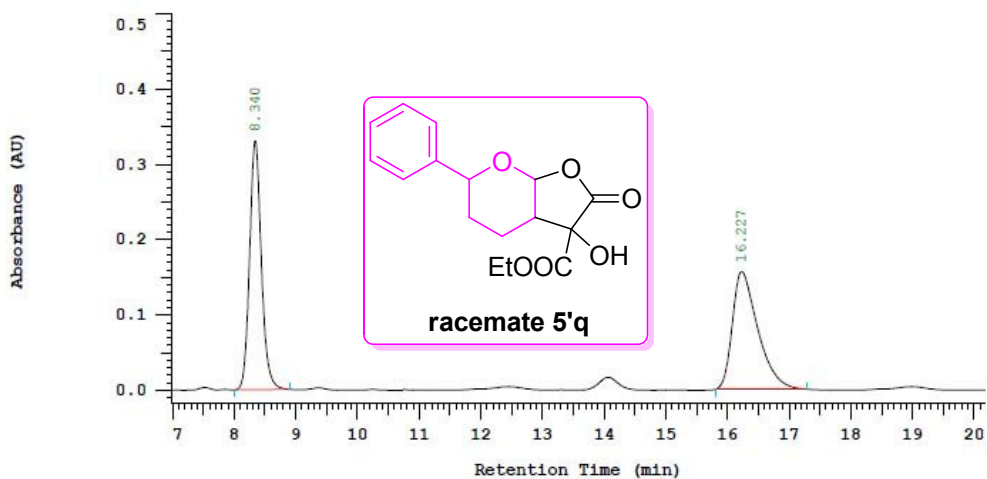
PROTON_01
LJY-ph-6-down



CARBON_01
LJY-ph-6-down



Chrom Type: Fixed WL Chromatogram, 210 nm

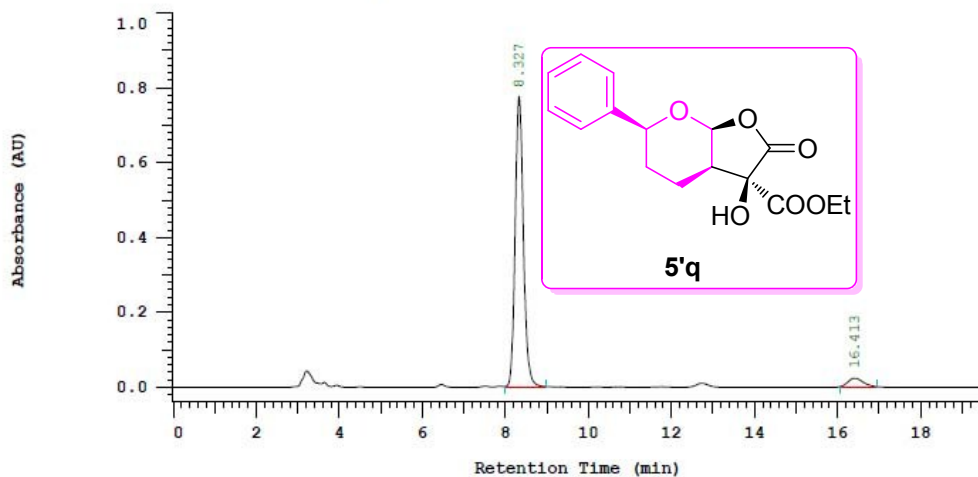


Chrom Type: Fixed WL Chromatogram, 210 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	8.340	2204411	49.549	BB
2	16.227	2244542	50.451	BB
		4448953	100.000	

Chrom Type: Fixed WL Chromatogram, 210 nm

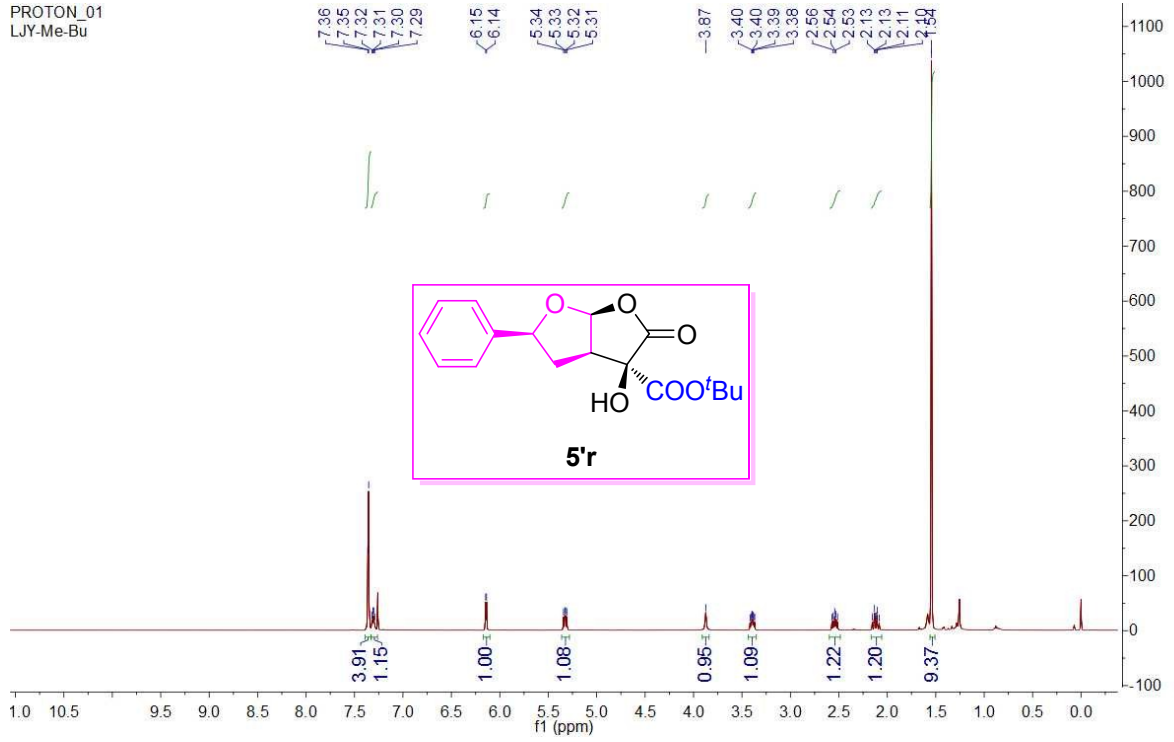


Chrom Type: Fixed WL Chromatogram, 210 nm

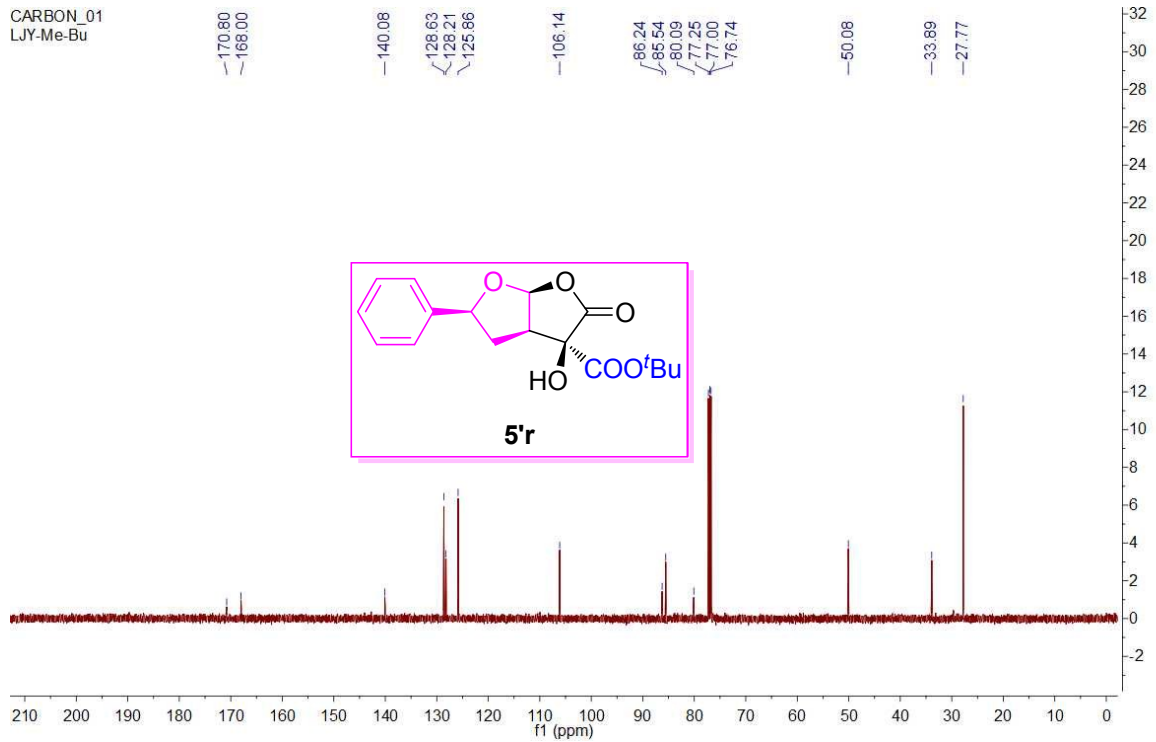
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	8.327	5326867	94.997	BB
2	16.413	280518	5.003	BB
		5607385	100.000	

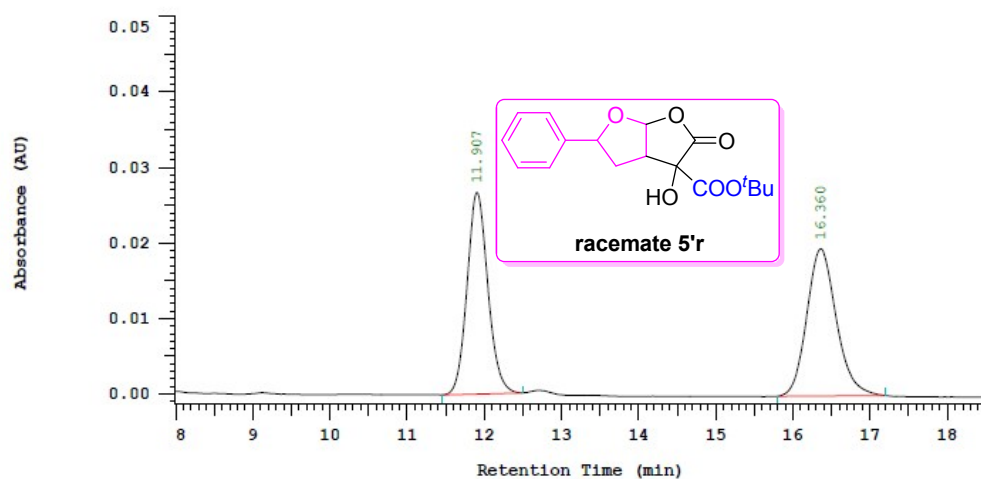
PROTON_01
LJY-Me-Bu



CARBON_01
LJY-Me-Bu



Chrom Type: Fixed WL Chromatogram, 231 nm

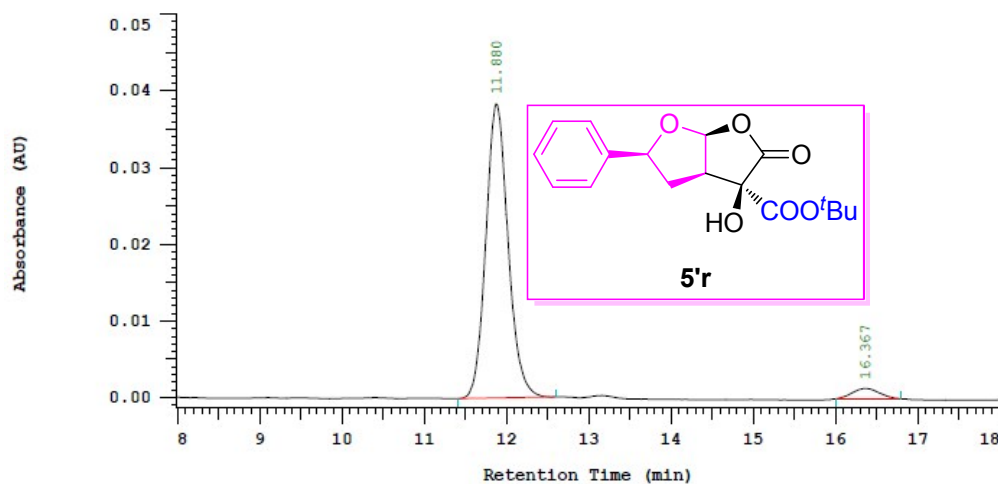


Chrom Type: Fixed WL Chromatogram, 231 nm

Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.907	249943	49.096	BB
2	16.360	259144	50.904	BB
		509087	100.000	

Chrom Type: Fixed WL Chromatogram, 231 nm



Chrom Type: Fixed WL Chromatogram, 231 nm

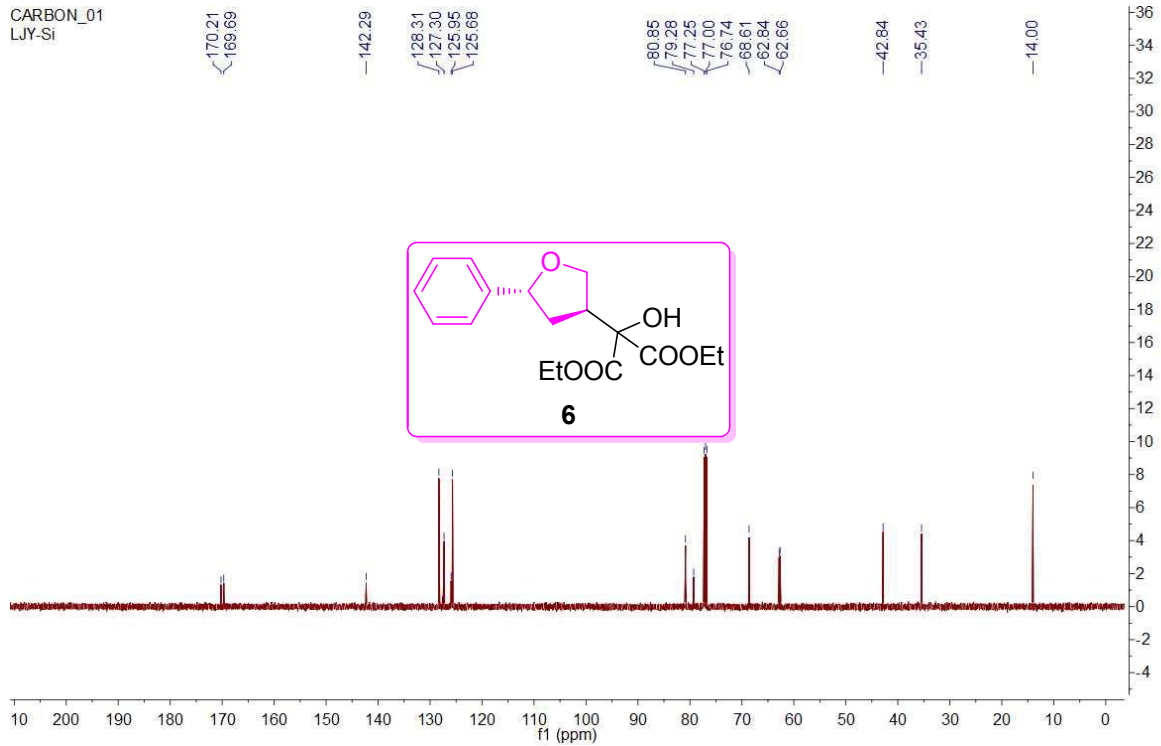
Peak Quantitation: AREA
Calculation Method: AREA%

No.	RT	Area	Area %	BC
1	11.880	360490	95.824	BB
2	16.367	15710	4.176	BB
		376200	100.000	

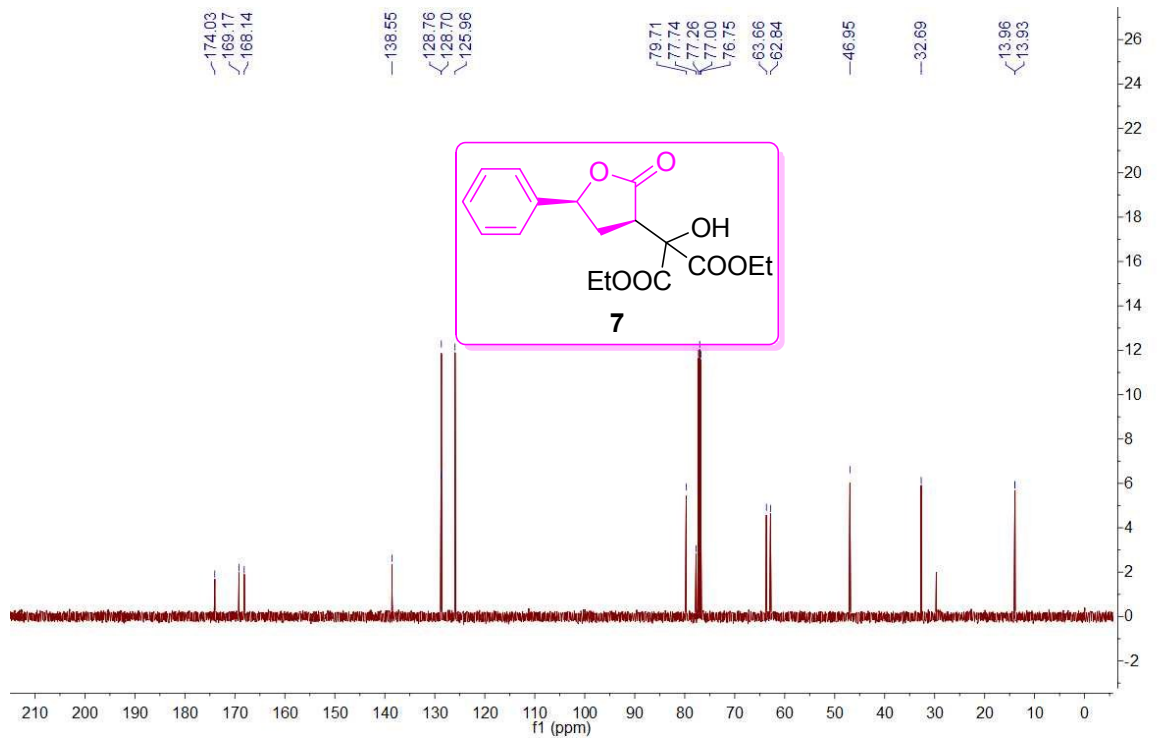
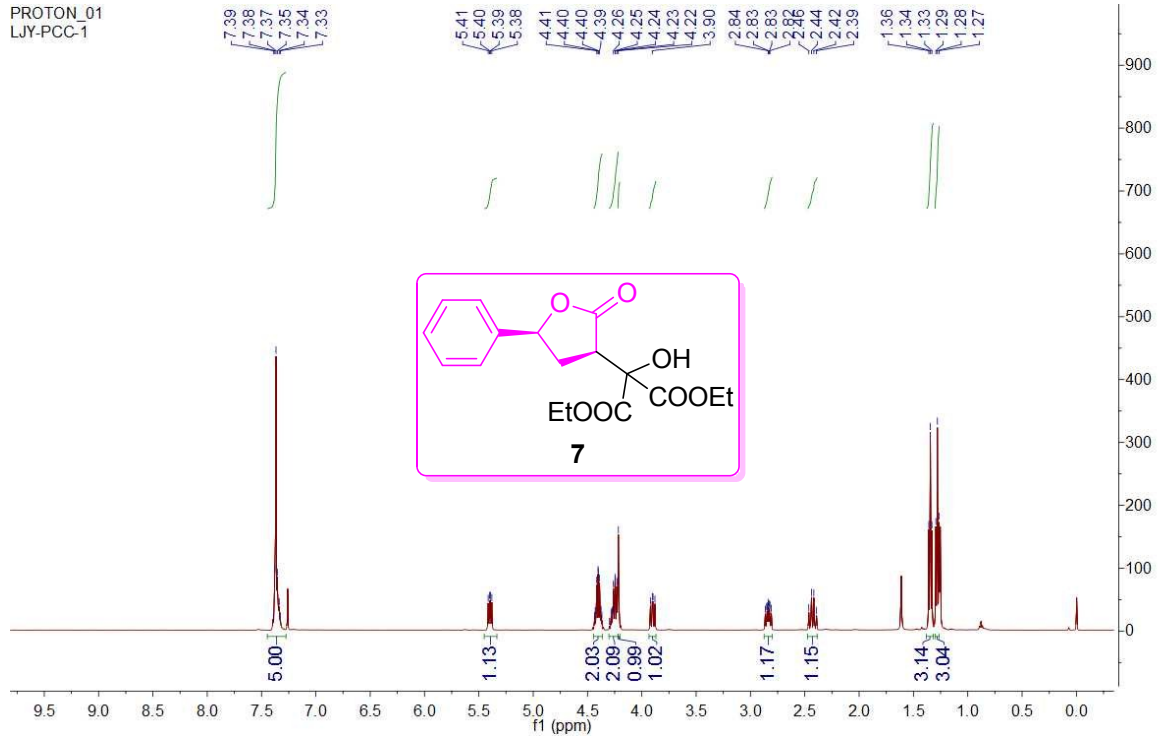
PROTON_01
LJY-Si

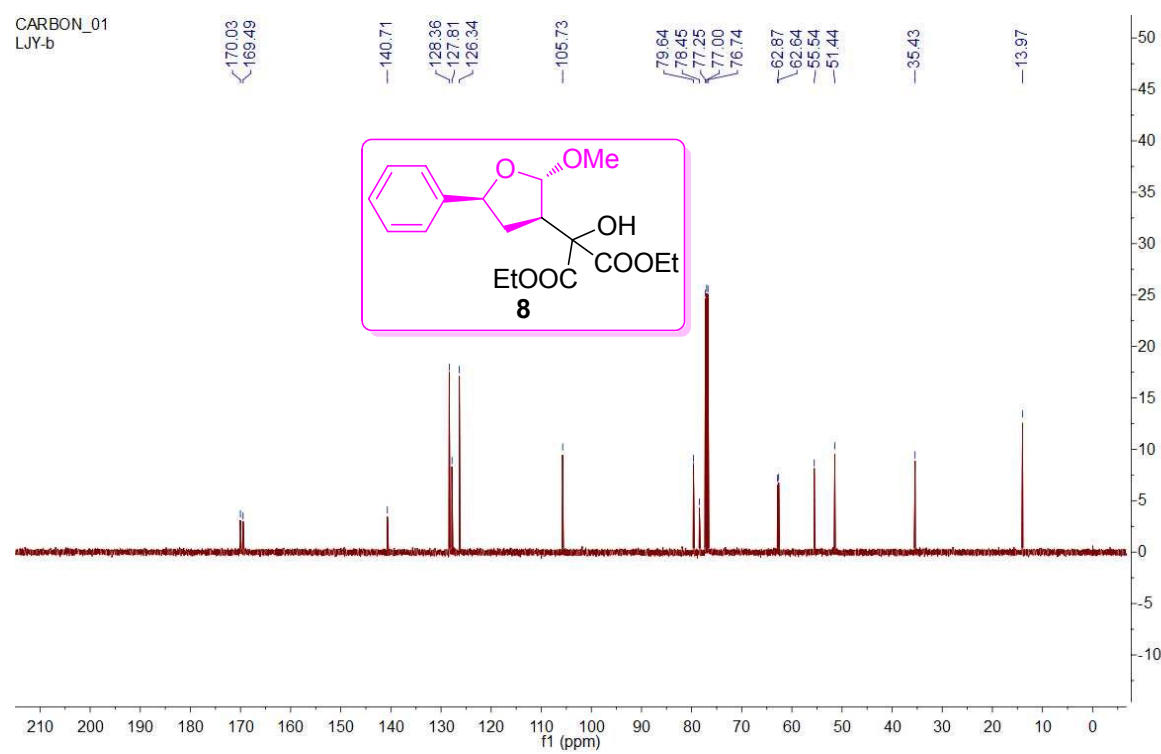
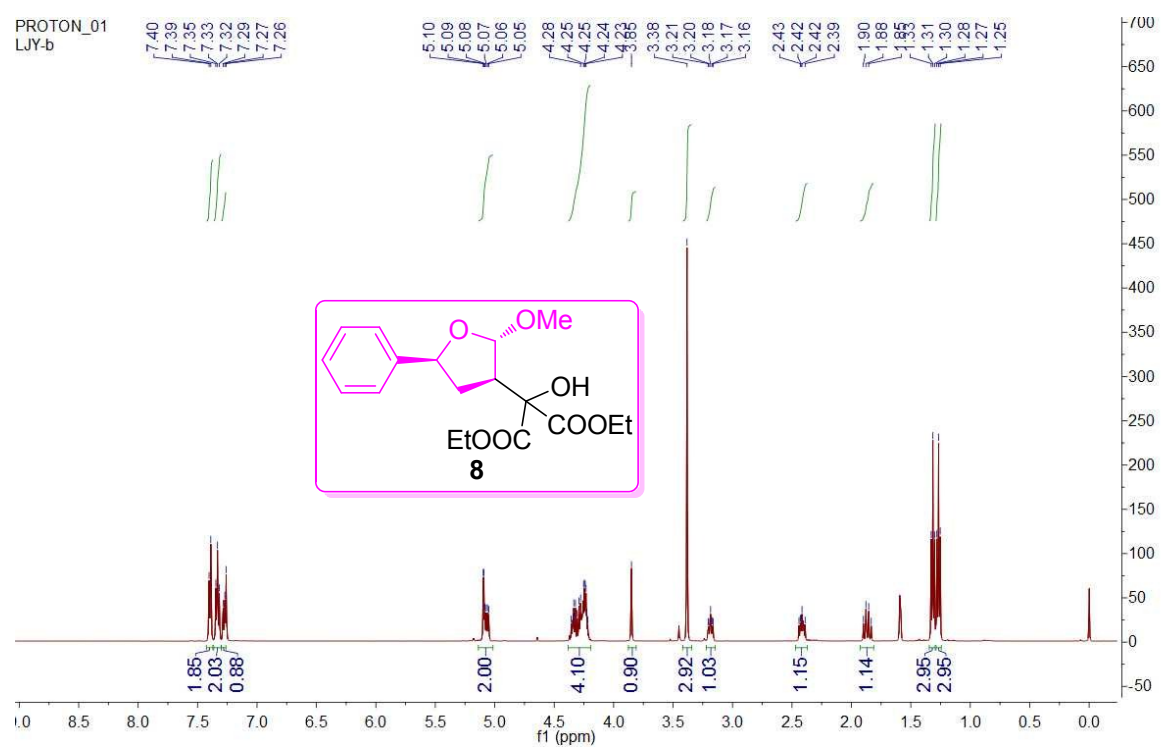


CARBON_01
LJY-Si

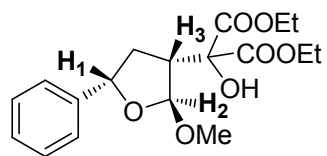
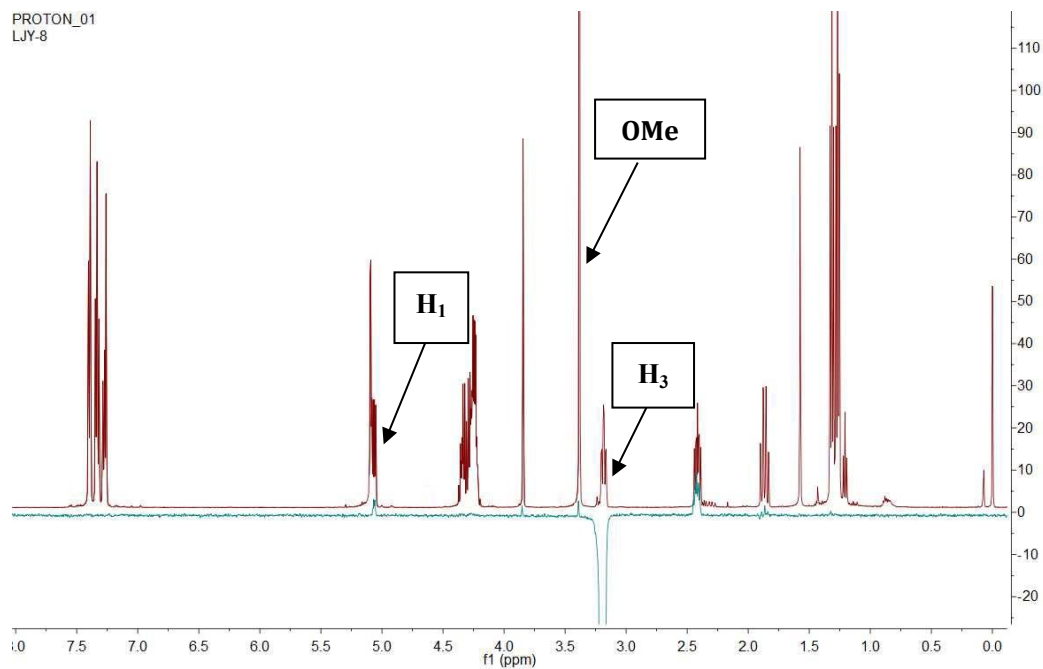


PROTON_01
LJY-PCC-1





The determination of the absolute configuration of compound 8 by NOE



8

