

Supporting Information for:

Radiosynthesis and Evaluation of [^{11}C -*Carbonyl*]-Labeled Carbamates as Fatty Acid Amide Hydrolase Radiotracers for Positron Emission Tomography.

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Contents:

1. Time-dependent inhibition of rat brain FAAH by **1** and **8**
2. Regional brain biodistribution of [^{11}C -*carbonyl*]carbamates in rats.
3. Kinetics of irreversible binding of [^{11}C -*carbonyl*]carbamates to FAAH ex vivo in rat brain.
4. Select RadioHPLC chromatograms from radiosynthesis of [^{11}C - *carbonyl*]carbamates
5. ^1H and ^{13}C NMR spectra of reported compounds.

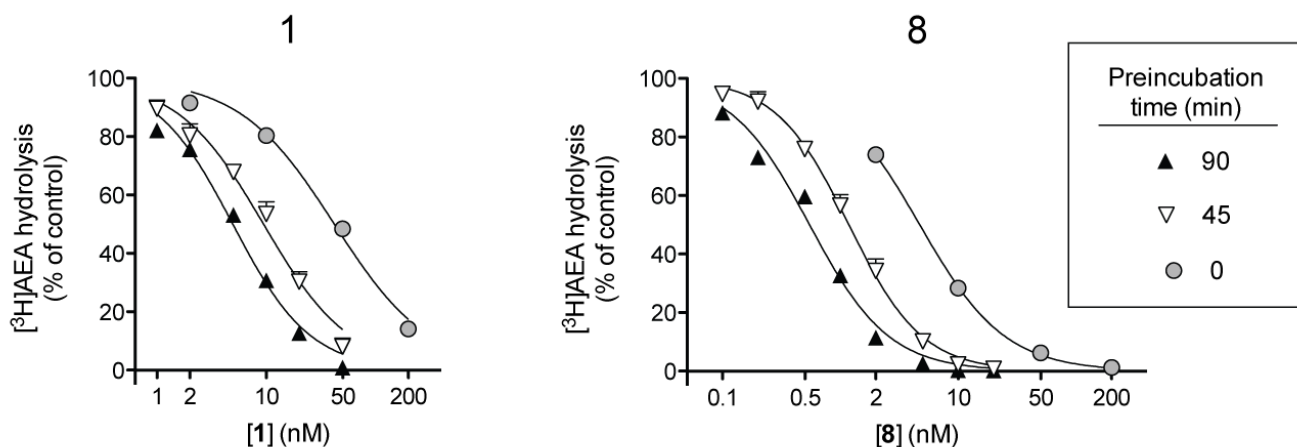
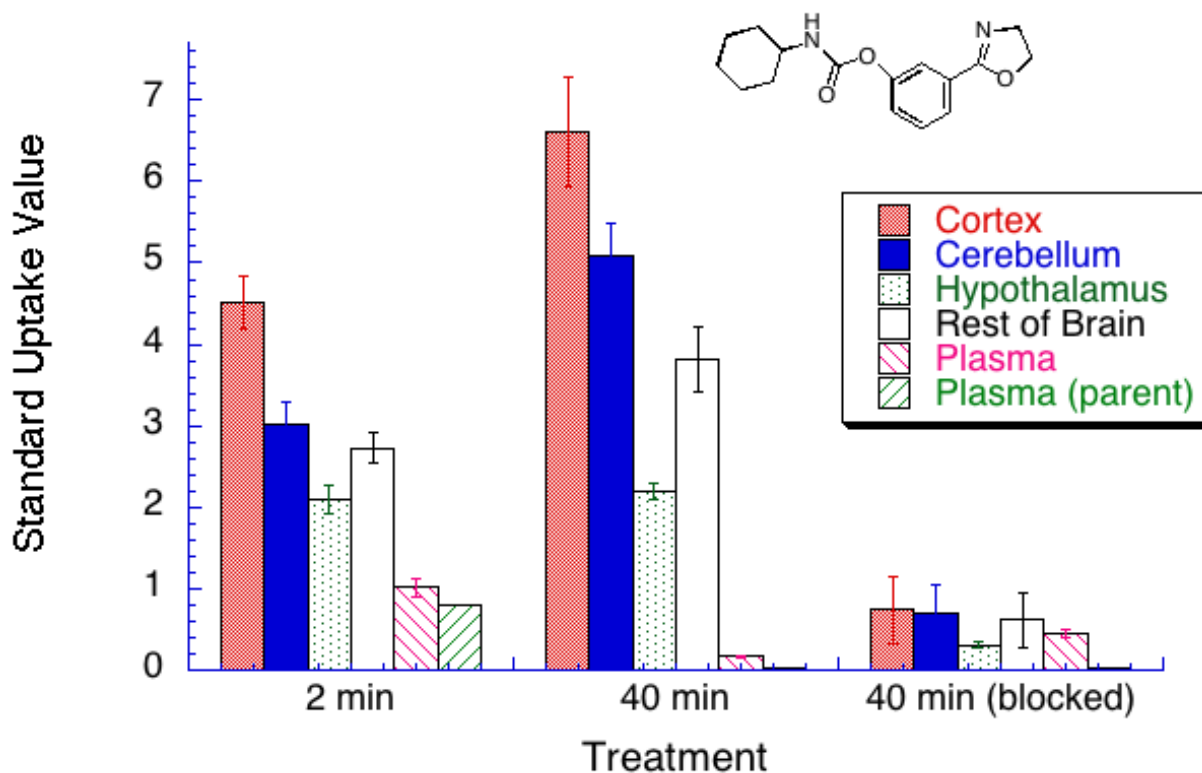
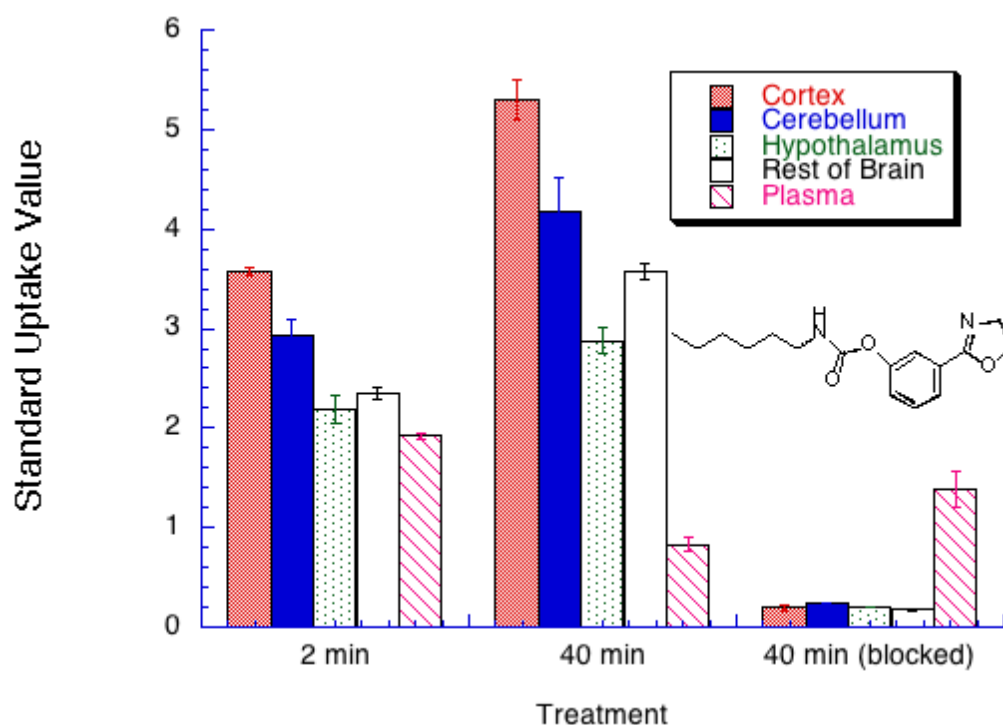


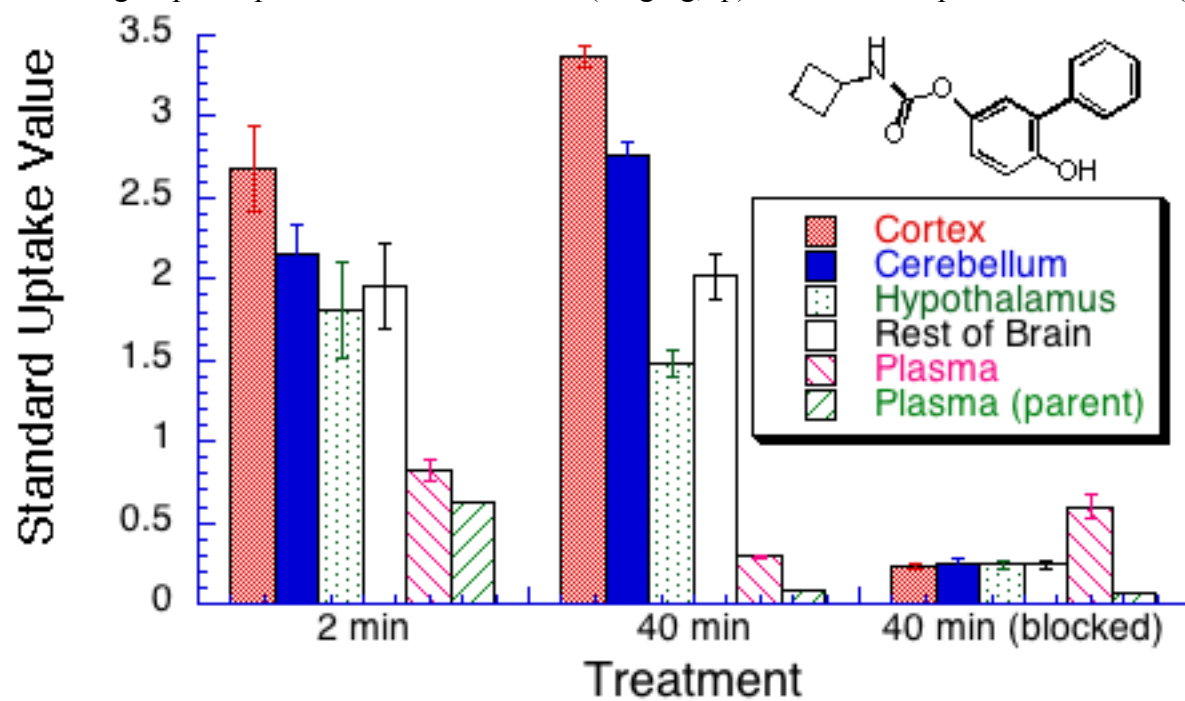
Figure S1. Time-dependent incubation by **8** (top panel) and **1** (bottom panel) of 0.5 μM [³H]anandamide hydrolysis by rat brain homogenates. Shown are means ± s.e.m. (when not enclosed by the symbols), n=3, of the activity as % of the vehicle controls.



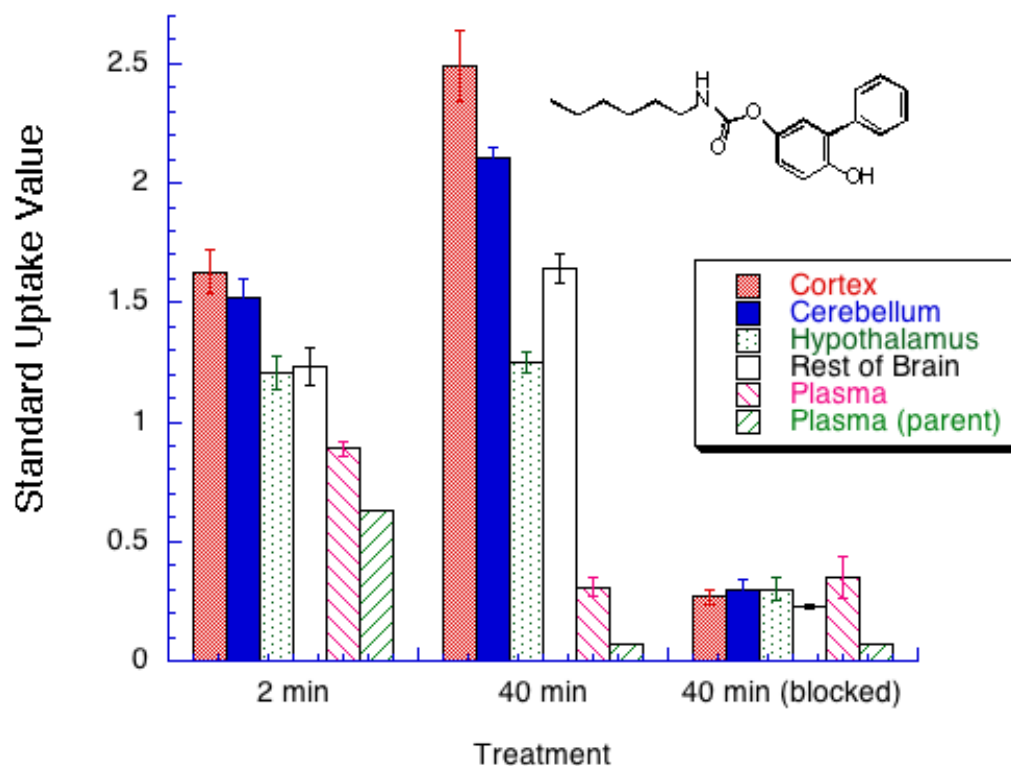
Figures S2. Regional uptake of radioactivity in rat brain [¹¹C]6 at 2 and 40 min post iv injection. The blocked group was pre-treated with URB597 (2mg/kg, ip). Each value represents the mean (n=5) ± SD.



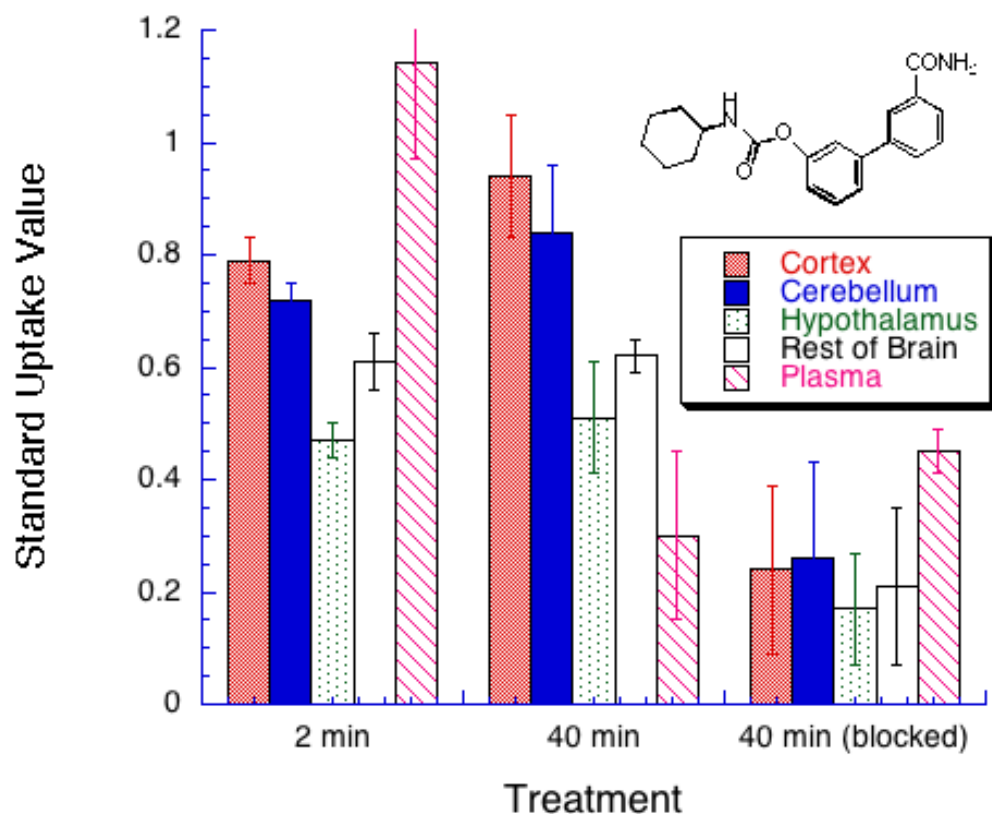
Figures S3. Regional uptake of radioactivity in rat brain [¹¹C]8 at 2 and 40 min post iv injection. The blocked group was pre-treated with URB597 (2mg/kg, ip). Each value represents the mean (n=5) ± SD.



Figures S4. Regional uptake of radioactivity in rat brain [¹¹C]4 at 2 and 40 min post iv injection. The blocked group was pre-treated with URB597 (2mg/kg, ip). Each value represents the mean (n=5) ± SD.



Figures S5. Regional uptake of radioactivity in rat brain [¹¹C]5 at 2 and 40 min post iv injection. The blocked group was pre-treated with URB597 (2mg/kg, ip). Each value represents the mean (n=5) ± SD.



Figures S6. Regional uptake of radioactivity in rat brain [¹¹C]2 at 2 and 40 min post iv injection. The blocked group was pre-treated with URB597 (2mg/kg, ip). Each value represents the mean (n=5) ± SD.

**Amount of [¹¹C] irreversibly bound
to rat brain tissue as a function of time
(n=4/timepoint)**

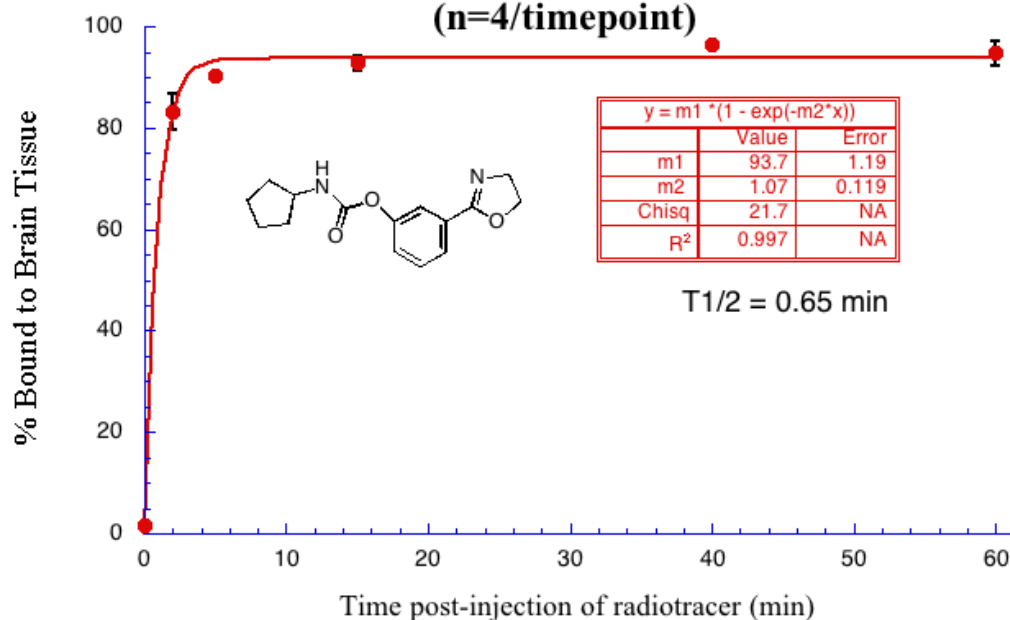


Figure S7. % of radioactivity irreversibly bound to rat brain parenchyma post-intravenous injection of [¹¹C]7 (n=4/group) at various time points.

**Amount of [¹¹C] irreversibly bound
to rat brain tissue as a function of time
(n=4/timepoint)**

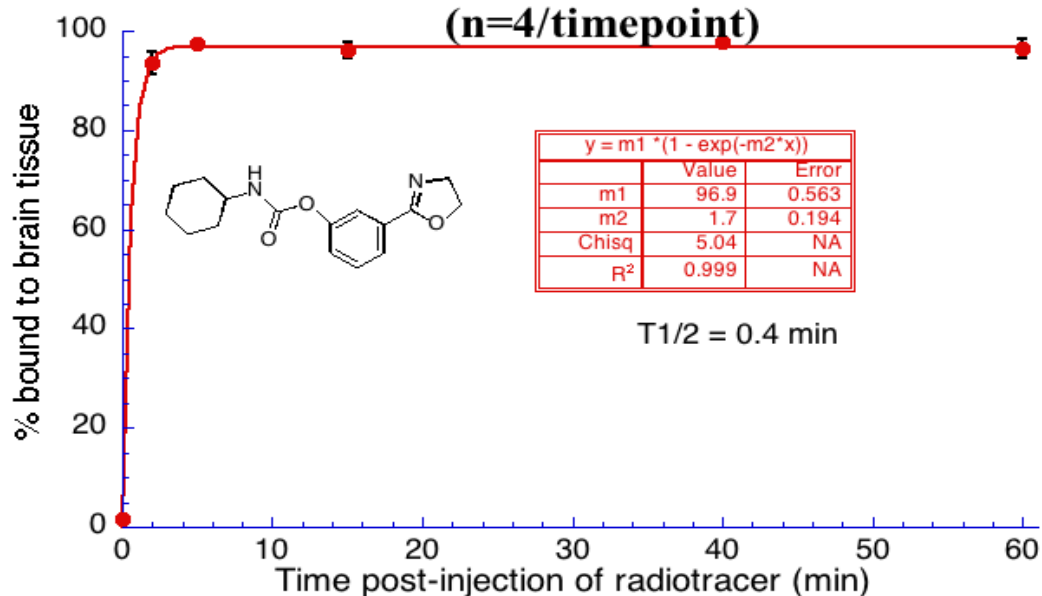


Figure S8. % of radioactivity irreversibly bound to rat brain parenchyma post-intravenous injection of [¹¹C]6 (n=4/group) at various time points.

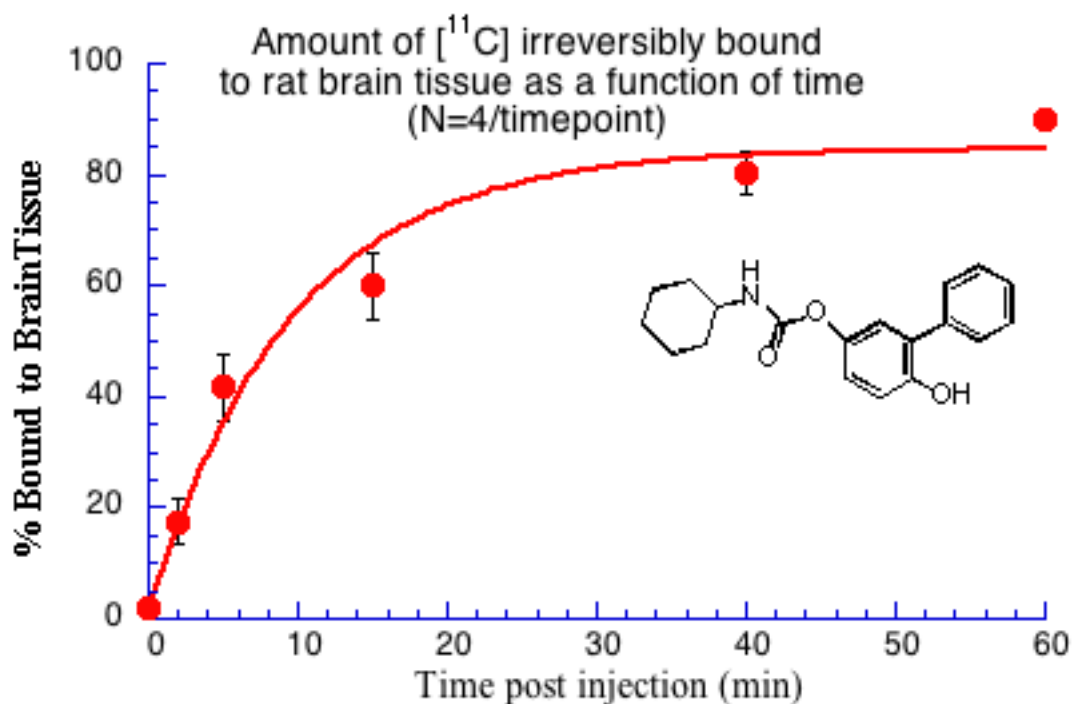


Figure S9. % of radioactivity irreversibly bound to rat brain parenchyma post-intravenous injection of [^{11}C]1 (n= 4/group) at various time points.

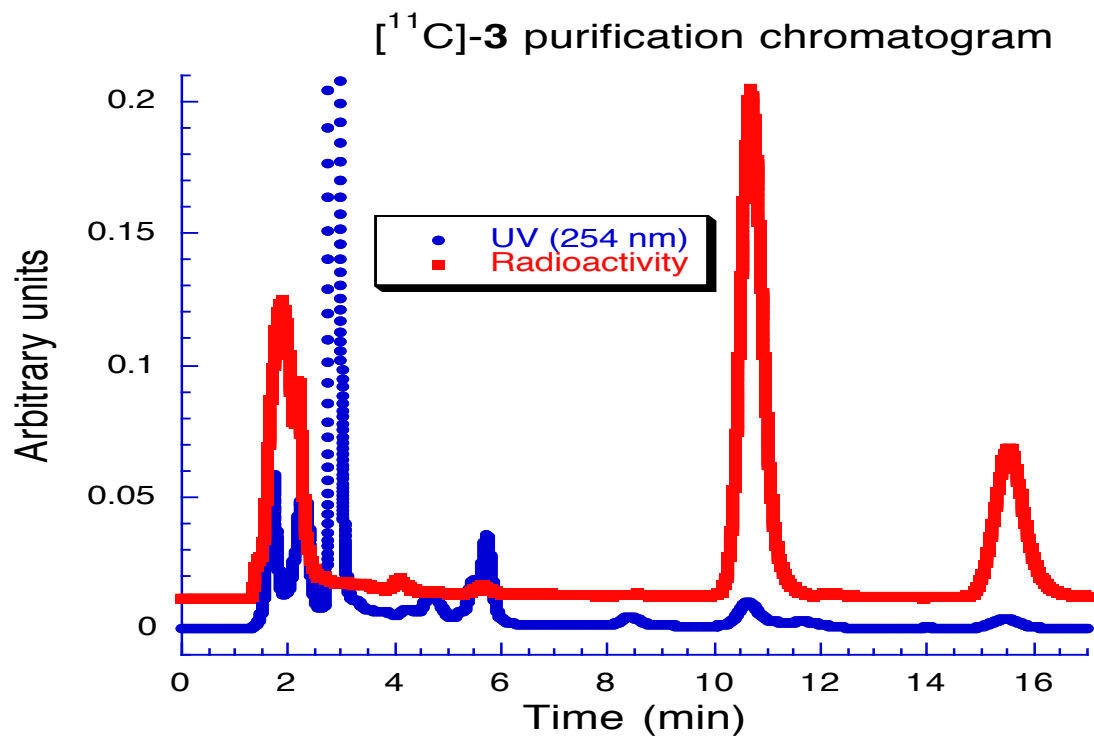


Figure S10. Radio-HPLC chromatogram: purification of [^{11}C]3 which elutes at 15.5 min. The large radioactivity peak at 11 min corresponds to the unwanted regioisomer. Conditions: Phenomenex Luna C18(2), 250x10mm, 10 μ , 60/40 MeOH/H₂O +0.1N ammonium formate, 254nm, 9 mL/min.

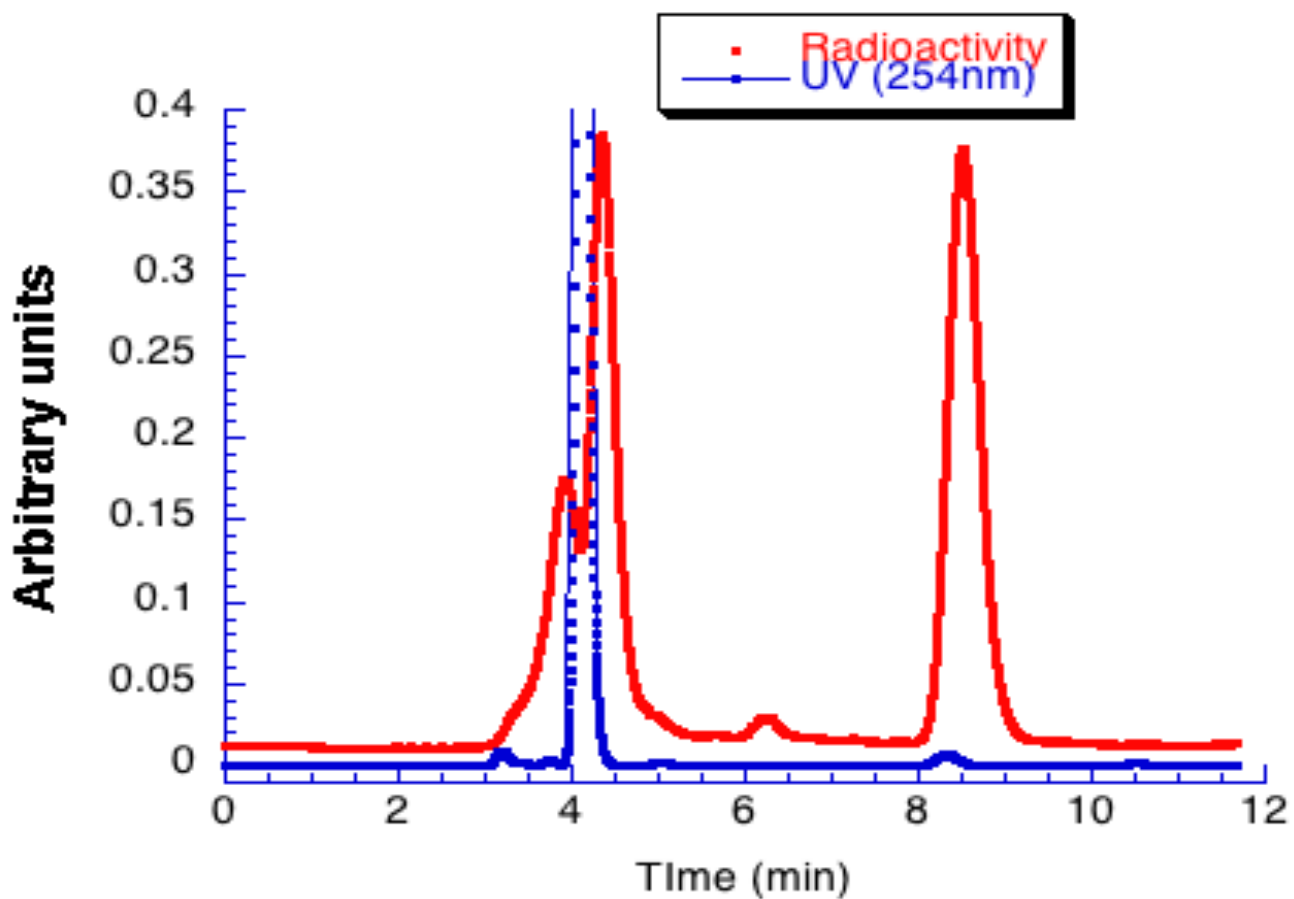


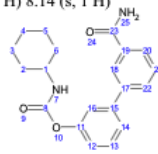
Figure S11. Radio-HPLC chromatogram: purification of [^{11}C]6 which elutes at 8.4 min. Conditions: Phenomenex Luna C18(2), 250x10mm, 10 μ , 40/60 $\text{CH}_3\text{CN}/\text{H}_2\text{O}$ +0.1N ammonium formate, 254nm, 7 mL/min.

¹H and ¹³C NMR of 2

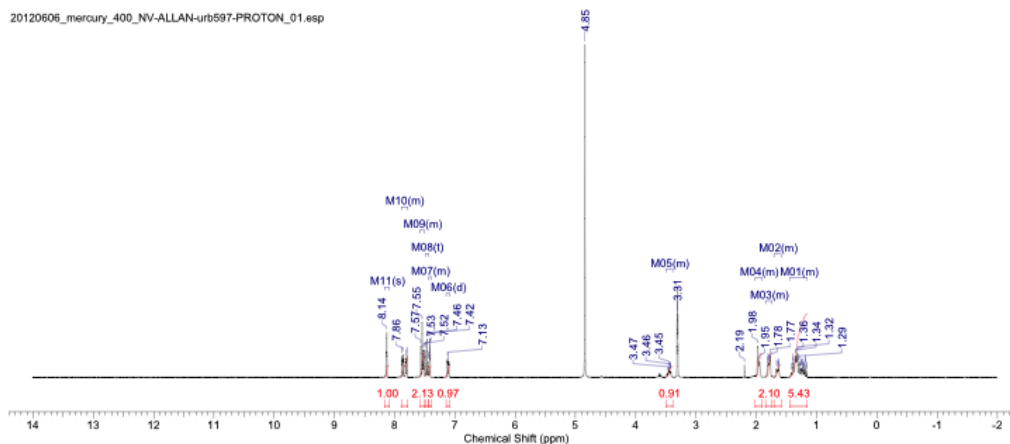
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¹H NMR (399 MHz, METHANOL-d₄) δ ppm 1.16 - 1.45 (m, 5 H) 1.59 - 1.71 (m, 1 H) 1.75 - 1.85 (m, 2 H) 1.90 - 2.02 (m, 2 H) 3.39 - 3.50 (m, 1 H) 7.12 (d, =7.02 Hz, 1 H) 7.39 - 7.43 (m, 1 H) 7.46 (t, =7.80 Hz, 1 H) 7.51 - 7.58 (m, 2 H) 7.78 - 7.89 (m, 2 H) 8.14 (s, 1 H)



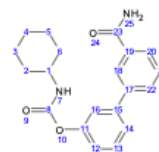
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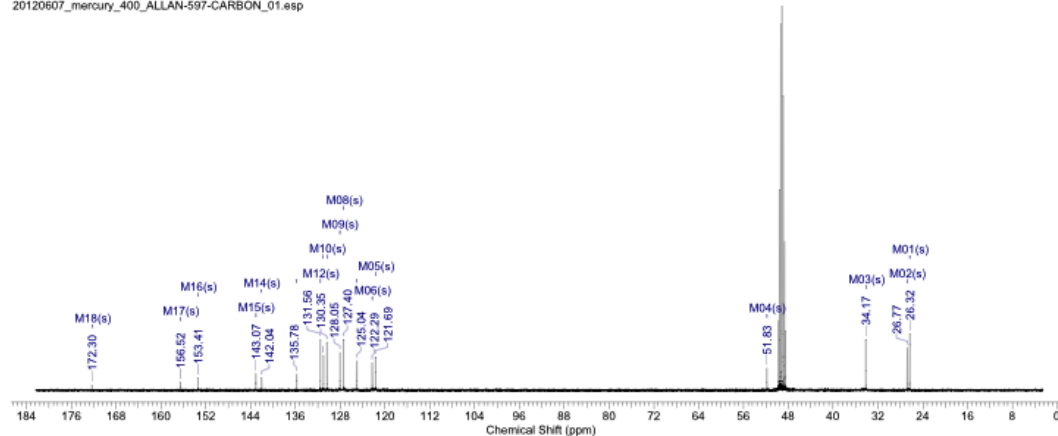
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¹³C NMR (100 MHz, DMSO-d₆) δ ppm 26.32 (s, 1 C) 26.77 (s, 1 C) 34.17 (s, 1 C) 51.83 (s, 1 C) 121.69 (s, 1 C) 122.29 (s, 1 C) 125.04 (s, 1 C) 127.40 (s, 1 C) 128.05 (s, 1 C) 130.35 (s, 1 C) 131.01 (s, 1 C) 131.56 (s, 1 C) 135.78 (s, 1 C) 142.04 (s, 1 C) 143.07 (s, 1 C) 153.41 (s, 1 C) 156.52 (s, 1 C) 172.30 (s, 1 C)



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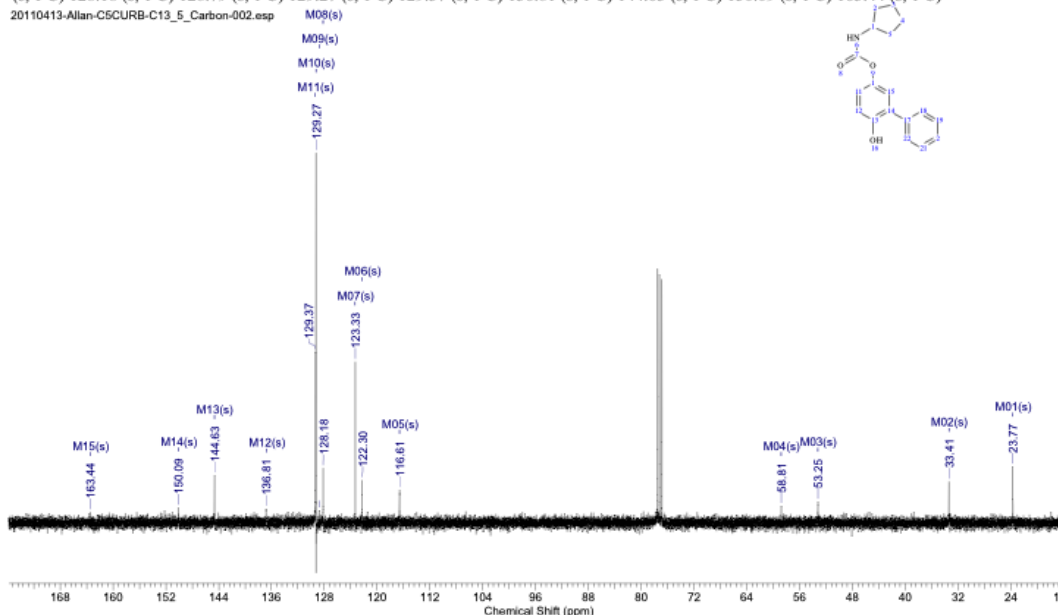
¹H and ¹³C NMR of 3

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Spectrum Offset (Hz)	10544.9658	Sweep Width (Hz)	24096.38	Temperature (degree C)	25.000		

¹³C NMR (100 MHz, CHLOROFORM-d) δ ppm 23.77 (s, 1 C) 33.41 (s, 1 C) 53.25 (s, 1 C) 58.81 (s, 1 C) 116.61 (s, 1 C) 122.30 (s, 1 C) 123.33 (s, 1 C) 128.18 (s, 1 C) 128.79 (s, 1 C) 129.27 (s, 1 C) 129.37 (s, 1 C) 136.81 (s, 1 C) 144.63 (s, 1 C) 150.09 (s, 1 C) 163.44 (s, 1 C)

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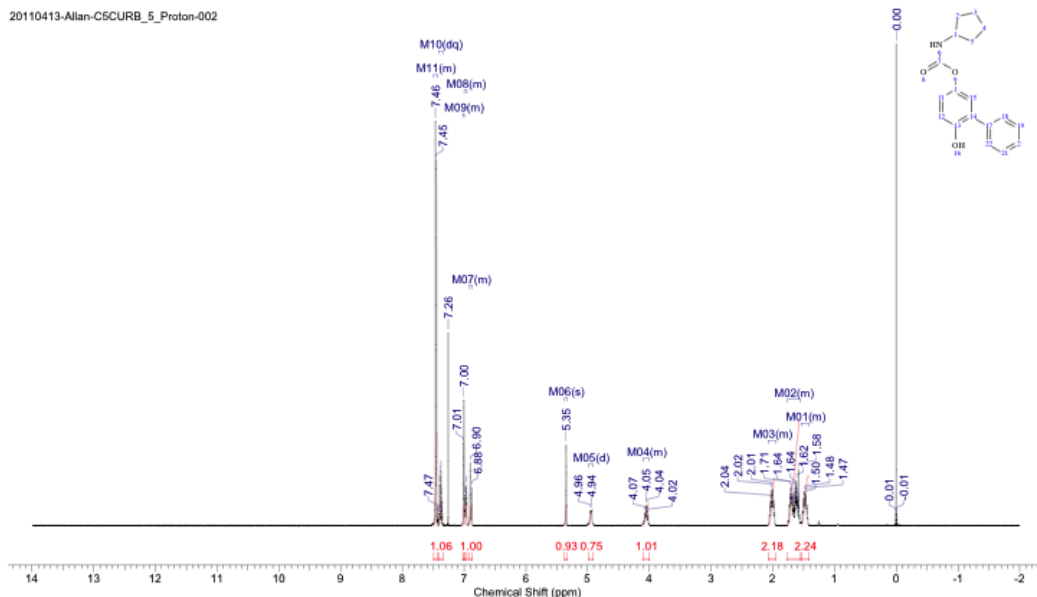


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Sweep Width (Hz)	6385.70	Temperature (degree C)	25.000				

¹H NMR (399 MHz, CHLOROFORM-d) δ ppm 1.42 - 1.54 (m, 2 H) 1.56 - 1.77 (m, 4 H) 1.96 - 2.07 (m, 2 H) 4.00 - 4.11 (m, 1 H) 4.95 (d, =6.63 Hz, 1 H) 5.35 (s, 1 H) 6.87 - 6.92 (m, 1 H) 6.96 - 7.00 (m, 1 H) 7.00 - 7.02 (m, 1 H) 7.38 (dq, =8.50, 4.31 Hz, 1 H) 7.43 - 7.49 (m, 4 H)

20110413-Allan-C5CURB_5_Proton-002

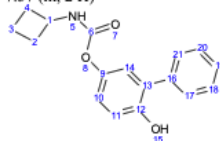


^1H and ^{13}C NMR of 4

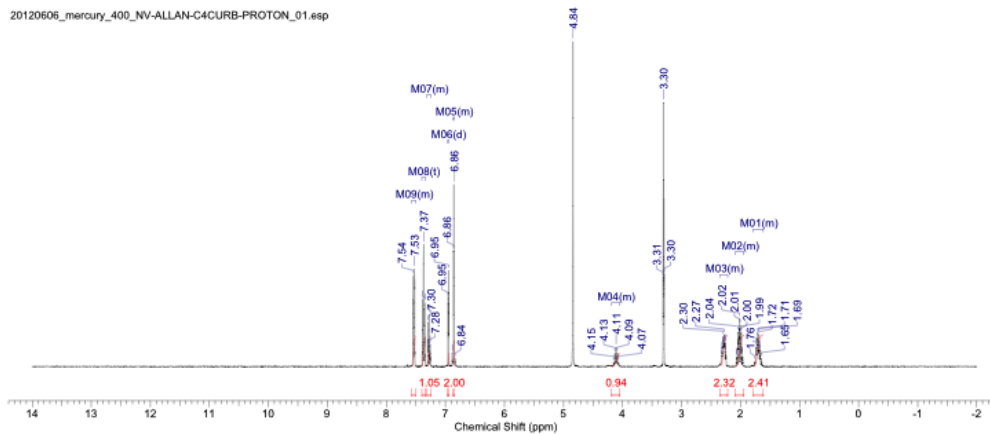
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Pulse Sequence	s2pul	Receiver Gain	39.00	Solvent	METHANOL-d4		
Spectrum Offset (Hz)	2395.9661	Sweep Width (Hz)	6389.78	Temperature (degree C)	25.000		

^1H NMR (399 MHz, METHANOL-*d*₄) δ ppm 1.62 - 1.78 (m, 2 H) 1.94 - 2.09 (m, 2 H) 2.22 - 2.35 (m, 2 H) 4.04 - 4.18 (m, =8.58, 8.29, 8.14, 8.14 Hz, 1 H) 6.85 - 6.87 (m, 2 H) 6.95 (d, =3.12 Hz, 1 H) 7.25 - 7.31 (m, 1 H) 7.37 (t, =7.41 Hz, 2 H) 7.50 - 7.57 (m, 2 H)



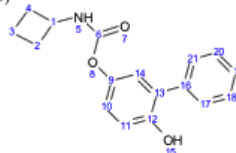
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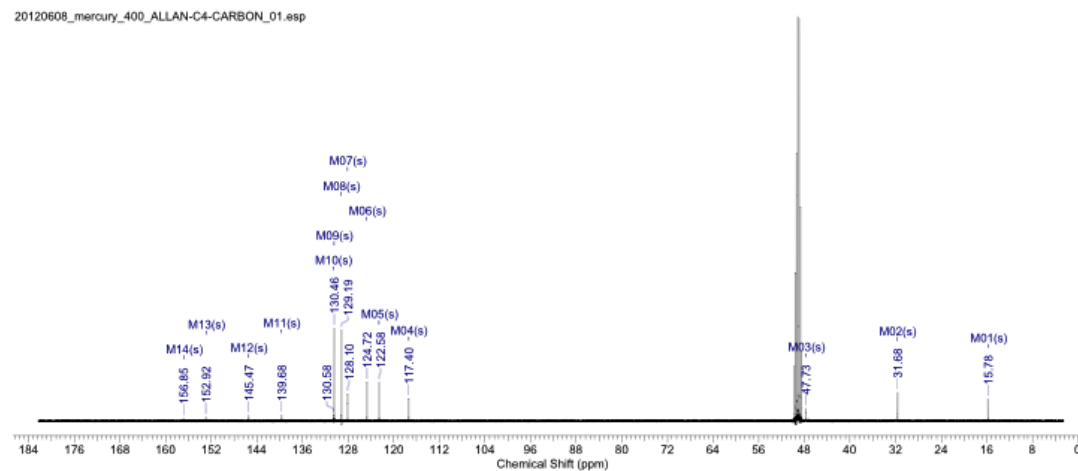
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Pulse Sequence	s2pul	Receiver Gain	39.00	Solvent	DMSO-d6	Spectrum Offset (Hz)	9281.7891
Sweep Width (Hz)	18050.54	Temperature (degree C)	25.000				

^{13}C NMR (100 MHz, DMSO-*d*₆) δ ppm 15.78 (s, 1 C) 31.68 (s, 1 C) 47.73 (s, 1 C) 117.40 (s, 1 C) 122.58 (s, 1 C) 124.72 (s, 1 C) 128.10 (s, 1 C) 129.19 (s, 1 C) 130.46 (s, 1 C) 130.58 (s, 1 C) 139.68 (s, 1 C) 145.47 (s, 1 C) 152.92 (s, 1 C) 156.85 (s, 1 C)



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¹H and ¹³C NMR of 5

XX

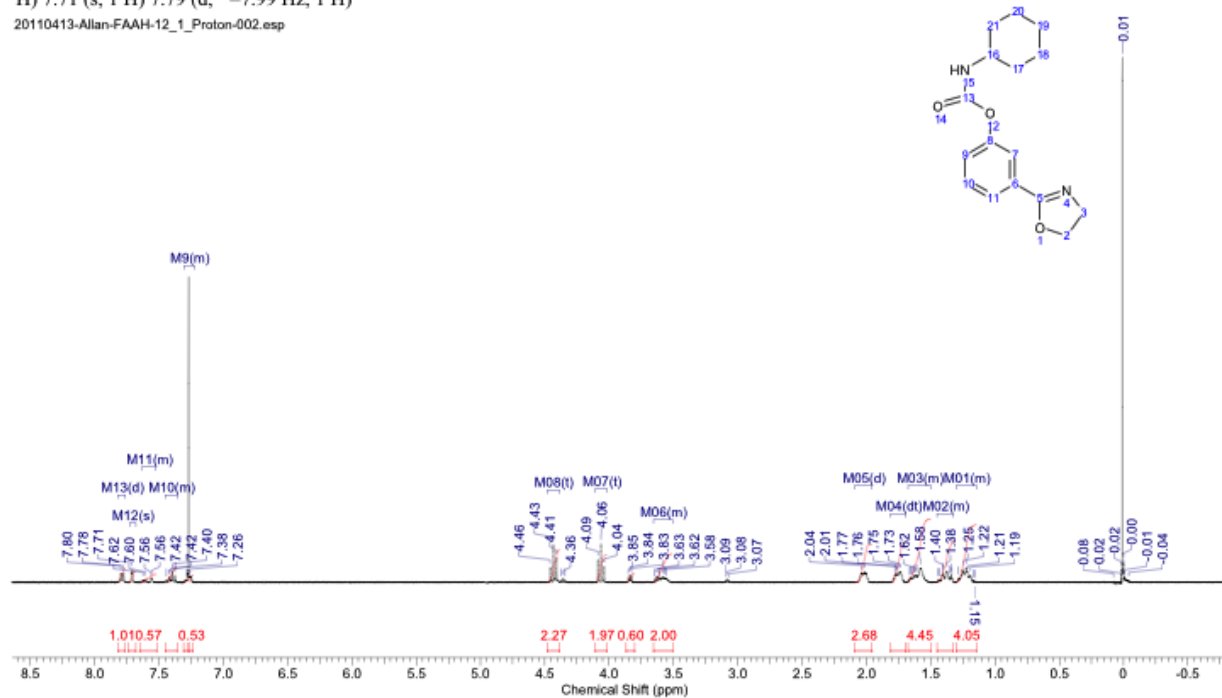
¹H NMR of 6

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Receiver Gain	39.00	Solvent	CHLOROFORM-d	Spectrum Offset (Hz)	2400.7354			
Sweep Width (Hz)	6385.70	Temperature (degree C)	25.000					

¹H NMR (399 MHz, CHLOROFORM-d) δ ppm 1.14 - 1.30 (m, 3 H) 1.32 - 1.45 (m, 2 H) 1.50 - 1.68 (m, 3 H) 1.76 (dt, =9.16, 4.58 Hz, 2 H) 2.03 (d, =9.55 Hz, 2 H) 3.51 - 3.66 (m, 1 H) 4.06 (t, =9.45 Hz, 1 H) 4.43 (t, =9.65 Hz, 2 H) 7.22 - 7.31 (m, 2 H) 7.36 - 7.45 (m, 1 H) 7.53 - 7.63 (m, 1 H) 7.71 (s, 1 H) 7.79 (d, =7.99 Hz, 1 H)

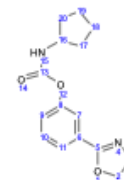
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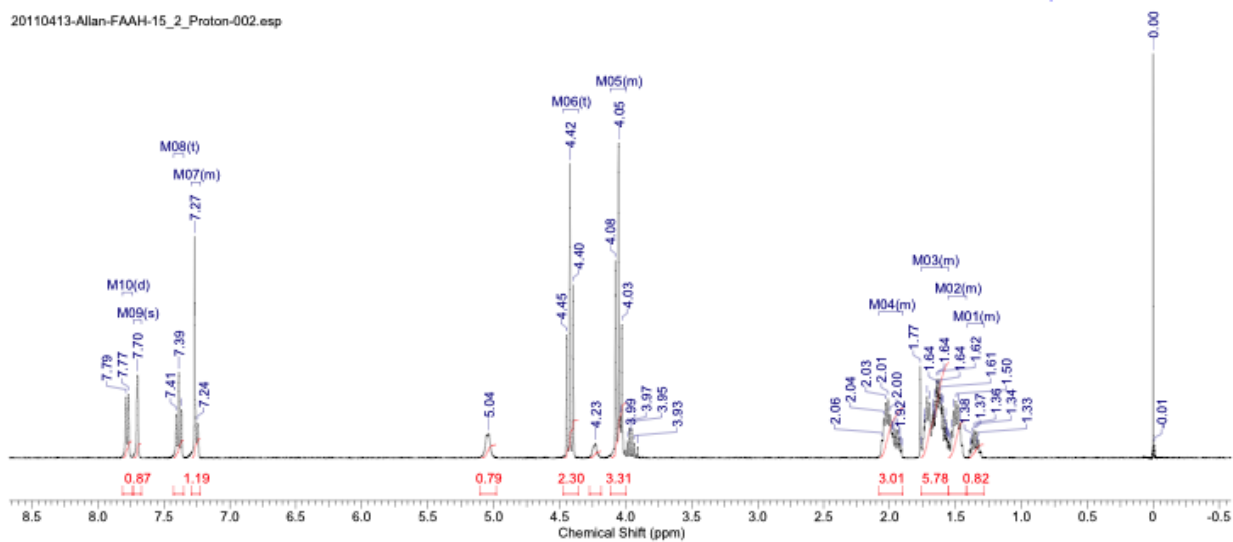
¹H NMR of 7

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Points Count	32768	Receiver Gain	30.00
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Pulse Sequence	s2pul	Temperature (degree C)	25.000
Spectrum Offset (Hz)	2398.5334		

¹H NMR (399 MHz, CHLOROFORM-*d*) δ ppm 1.28 - 1.41 (m, 1 H) 1.42 - 1.55 (m, 2 H) 1.55 - 1.76 (m, 4 H) 1.90 - 2.07 (m, 2 H) 4.00 - 4.11 (m, 2 H) 4.42 (t, =9.45 Hz, 2 H) 7.22 - 7.29 (m, 1 H) 7.39 (t, =7.89 Hz, 1 H) 7.70 (s, 1 H) 7.78 (d, =7.80 Hz, 1 H)



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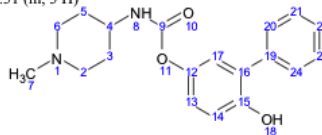
¹H and ¹³C NMR of **8**
XX

^1H and ^{13}C NMR of **9**

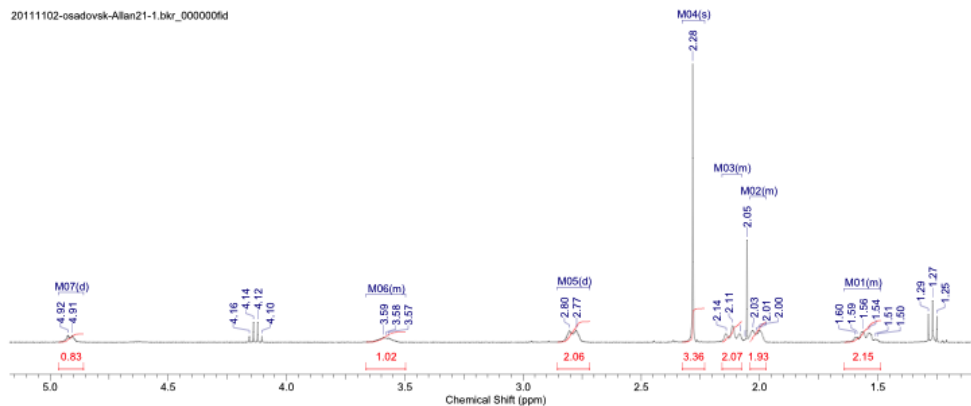
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Original Points Count	16384	Owner	walkup
Receiver Gain	161.00	SWH (Hz)	6410.26
Sweep Width (Hz)	6409.87	Temperature (degree C)	25.160
		Solvent	CHLOROFORM-d
		Pulse Sequence	zg45
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^1H NMR (400 MHz, CHLOROFORM-d) δ ppm 1.49 - 1.64 (m, 2 H) 1.97 - 2.04 (m, 2 H) 2.08 - 2.16 (m, 2 H) 2.28 (s, 3 H) 2.79 (d, =11.74 Hz, 2 H) 3.50 - 3.66 (m, 1 H) 4.92 (d, =7.82 Hz, 1 H) 6.89 - 6.95 (m, 1 H) 6.97 - 7.04 (m, 2 H) 7.36 - 7.51 (m, 5 H)



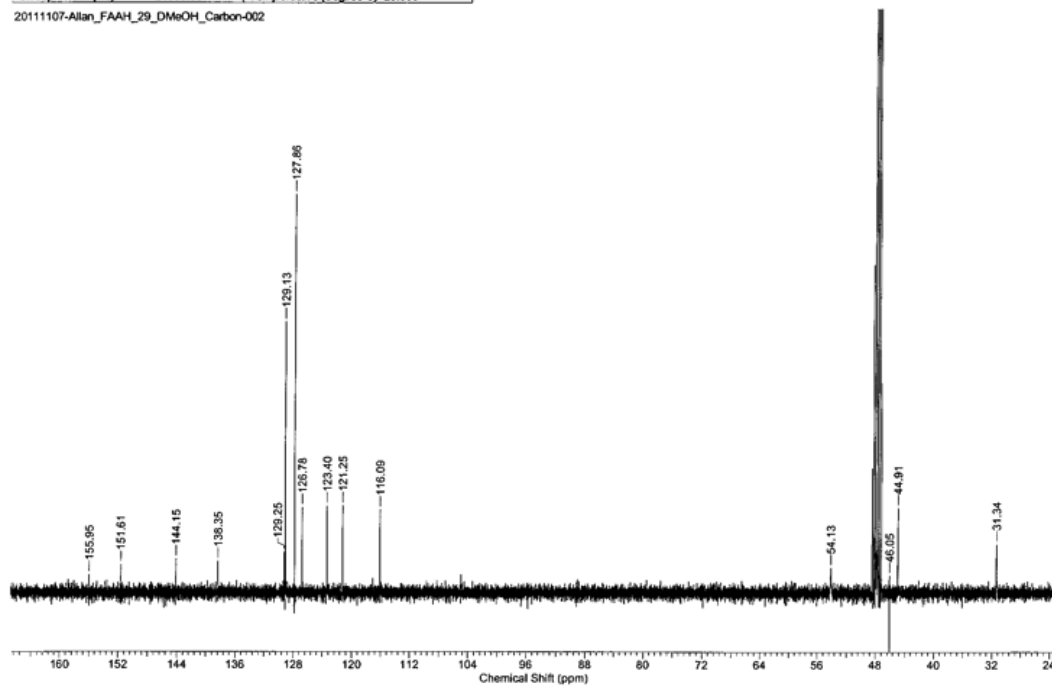
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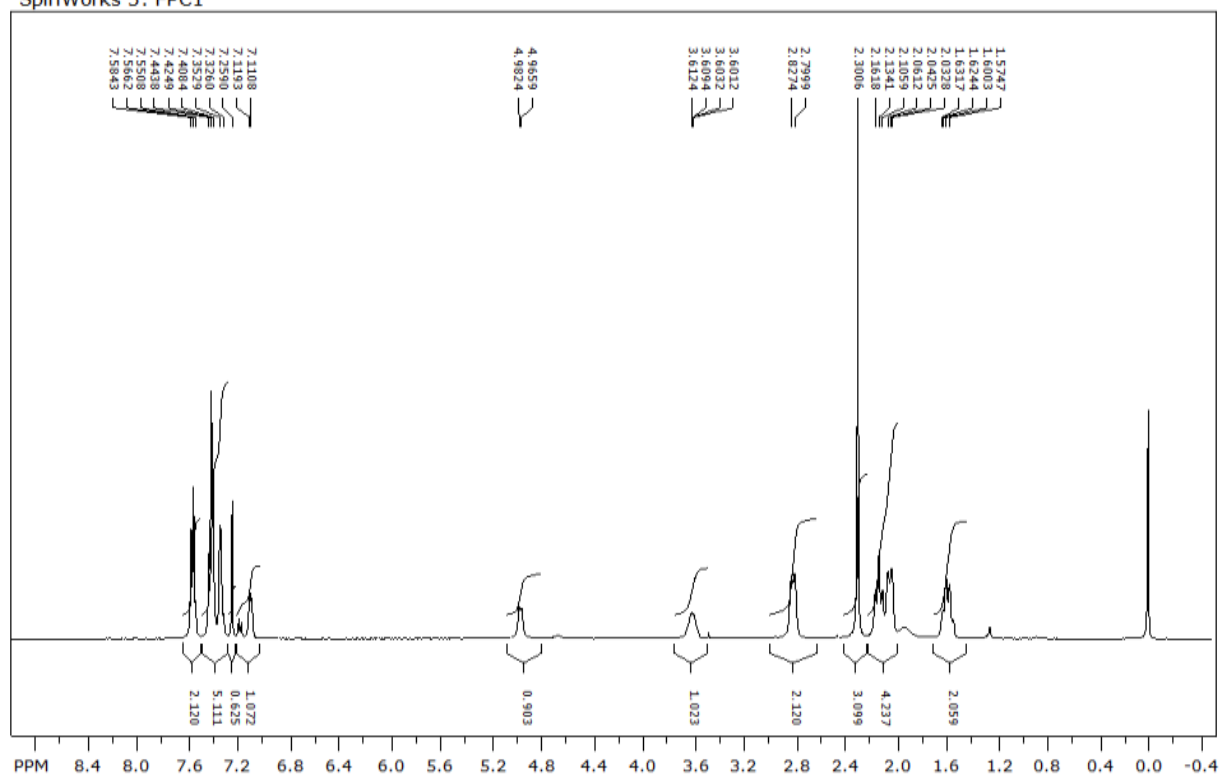
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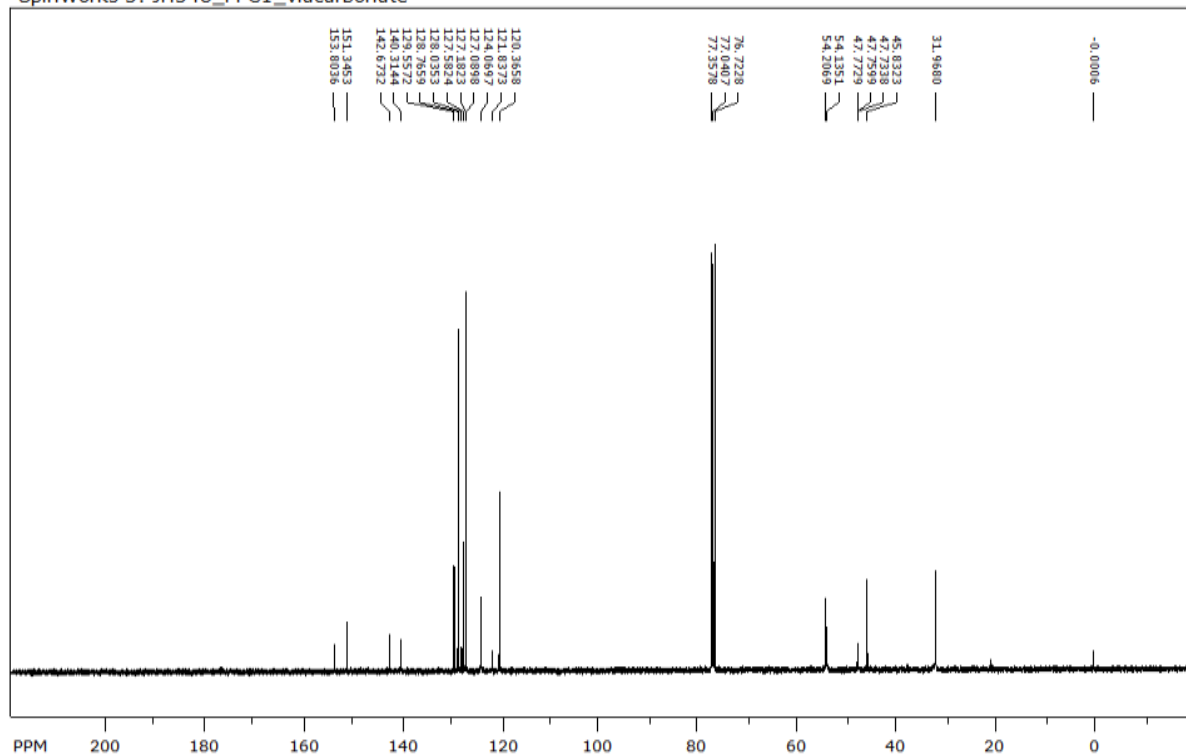


^1H and ^{13}C NMR of **10**

SpinWorks 3: FPC1

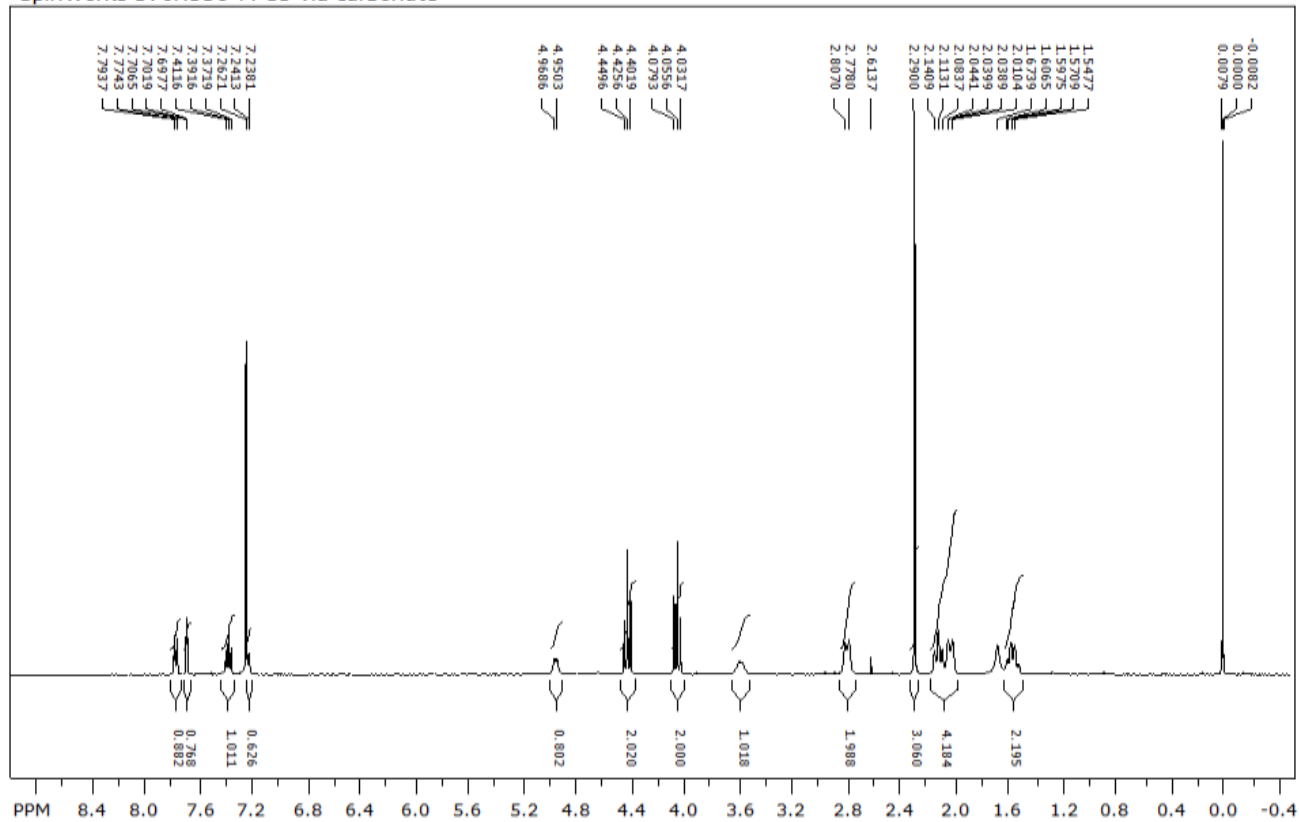


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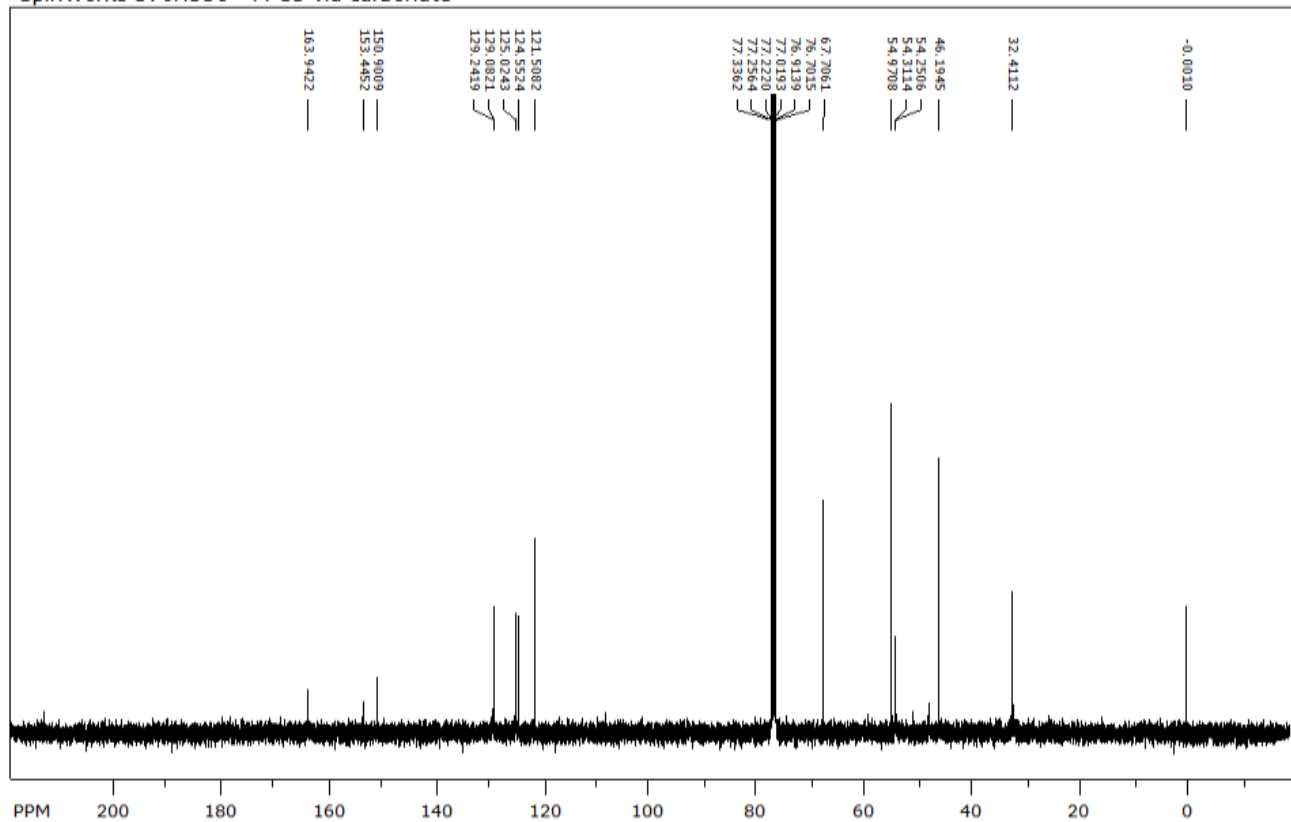


^1H and ^{13}C NMR of **11**

SpinWorks 3: JH356-FPC5 via carbonate



SpinWorks 3: JH356 - FPC5 via carbonate

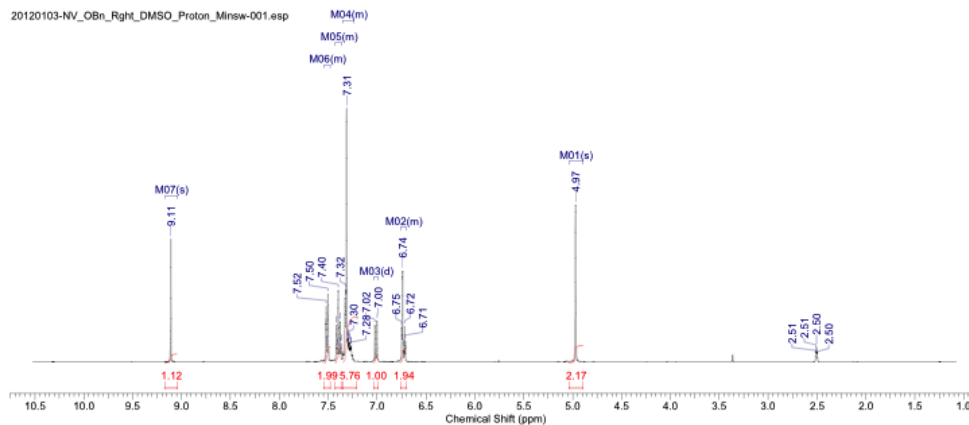
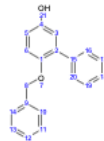


^1H and ^{13}C NMR of **14**

9/24/2012 11:17:25 AM

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Pulse Sequence	s2pul	Receiver Gain	22.00	Solvent	DMSO-d6
Spectrum Offset (Hz)	3773.98	Temperature (degree C)	25.000	Points Count	2316.0420

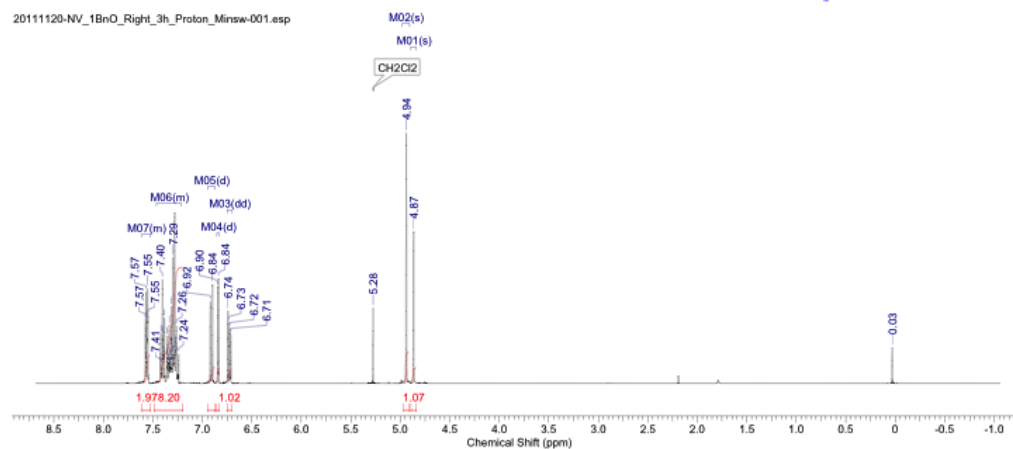
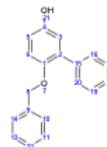
^1H NMR (399 MHz, DMSO- d_6) δ ppm 4.97 (s, 2 H) 6.70 - 6.76 (m, 2 H) 7.01 (d, =8.52 Hz, 1 H) 7.24 - 7.35 (m, 6 H) 7.36 - 7.43 (m, 2 H) 7.48 - 7.54 (m, 2 H) 9.11 (s, 1 H)



9/24/2012 11:22:56 AM

Formula	C	H	O	FW	276.3291
Acquisition Time (sec)	2.9925	Date	Nov 20 2011	Date Stamp	Nov 20 2011
File Name	F:\Flesh-BASH-RABOTA\NV\NV-NMR-2\20111120-NV_1BnO_Right_3h_Proton_Minsw-001			Frequency (MHz)	399.36
Nucleus	^1H	Number of Transients	16	Original Points Count	11644
Pulse Sequence	s2pul	Receiver Gain	18.00	Solvent	CHLOROFORM-d
Spectrum Offset (Hz)	1522.0955	Sweep Width (Hz)	3891.05	Temperature (degree C)	25.000

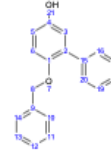
^1H NMR (399 MHz, CHLOROFORM- d) δ ppm 4.87 (s, 1 H) 4.94 (s, 2 H) 6.73 (dd, =8.79, 3.09 Hz, 1 H) 6.84 (d, =3.09 Hz, 1 H) 6.91 (d, =8.79 Hz, 1 H) 7.21 - 7.46 (m, 8 H) 7.53 - 7.61 (m, 2 H)



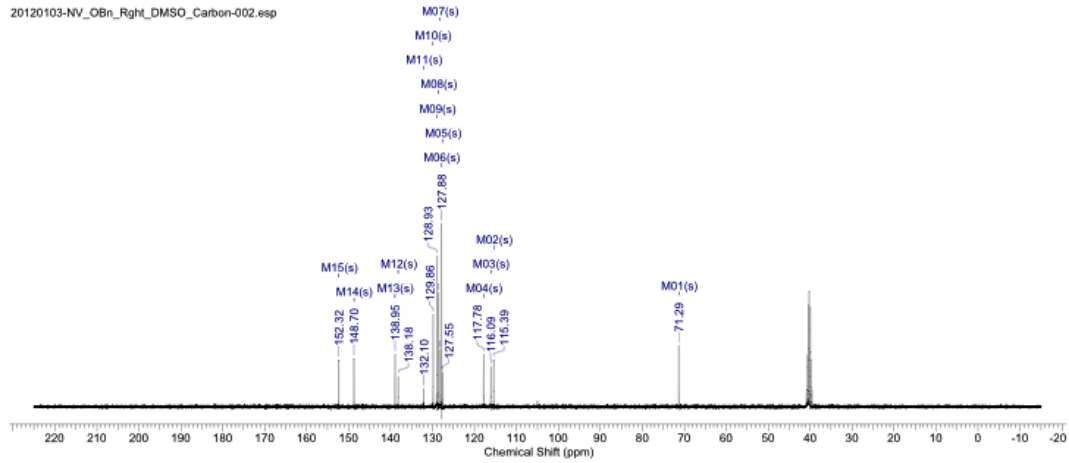
Formula C₁₄H₁₀O₂ FW 276.3291

Acquisition Time (sec)	1.3005	Date	Jan 3 2012	Date Stamp	Jan 3 2012		
File Name	F:\Flash-BASH-RABOTA\NV\NV-NMR-20120103-NV_OBn_Right_DMSO_Carbon-002				Frequency (MHz)	100.43	
Nucleus	13C	Number of Transients	512	Original Points Count	31337	Points Count	32768
Pulse Sequence	s2pul	Receiver Gain	39.00	Solvent	DMSO-d6	Spectrum Offset (Hz)	10544.0293
Sweep Width (Hz)	24096.38	Temperature (degree C)	25.000				

¹³C NMR (100 MHz, DMSO-*d*₆) δ ppm 71.29, 115.39, 116.09, 117.78, 127.55, 127.88, 128.18, 128.61, 128.93, 129.86, 132.10, 138.18, 138.95, 148.70, 152.32



20120103-NV_OBn_Right_DMSO_Carbon-002.esp

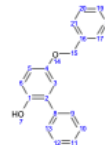


¹H and ¹³C NMR of 15

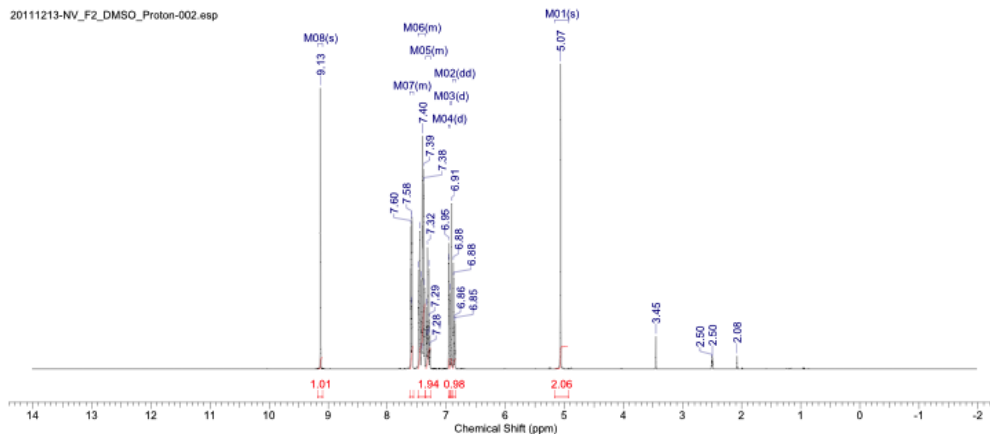
9/21/2012 11:14:10 AM

Formula	C ₁₉ H ₁₆ O ₂	FW	276.3291
Acquisition Time (sec)	2.9925	Date	Dec.13.2011
Date Stamp	Dec.13.2011	File Name	F:\Flesh-BASH-RABOTA\NV\NV-NMR-2\20111213-NV_F2_DMSO_Proton-002
Frequency (MHz)	399.36	Points Count	32768
Nucleus	¹ H	Number of Transients	16
Original Points Count	19109	Pulse Sequence	s2pul
Receiver Gain	12.00	Solvent	DMSO-d ₆
Spectrum Offset (Hz)	2402.2405	Sweep Width (Hz)	6385.70
Temperature (degree C)	25.000		

¹H NMR (399 MHz, DMSO-d₆) δ ppm 5.07 (s, 2 H) 6.87 (dd J=8.77 Hz, J=2.92 Hz, 1 H) 6.92 (d, J=8.77 Hz, 1 H) 6.96 (d, J=2.92 Hz, 1 H) 7.27 - 7.35 (m, 2 H) 7.36 - 7.48 (m, 6 H) 7.55 - 7.62 (m, 2 H) 9.13 (s, 1 H)



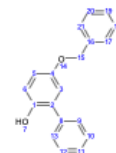
20111213-NV_F2_DMSO_Proton-002.esp



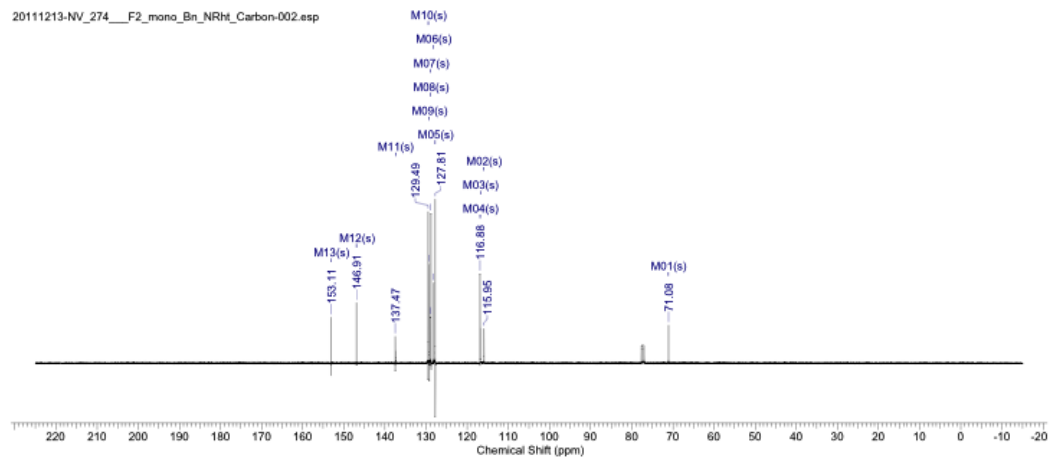
9/21/2012 11:17:13 AM

Formula	C ₁₉ H ₁₆ O ₂	FW	276.3291
Acquisition Time (sec)	1.3005	Date	Dec.13.2011
Date Stamp	Dec.13.2011	File Name	F:\Flesh-BASH-RABOTA\NV\NV-NMR-2\20111213-NV_274_F2_mono_Bn_NRht_Carbon-002
Frequency (MHz)	100.43	Points Count	32768
Nucleus	¹³ C	Number of Transients	512
Original Points Count	31337	Pulse Sequence	s2pul
Receiver Gain	39.00	Solvent	CHLOROFORM-d
Spectrum Offset (Hz)	10543.9844	Sweep Width (Hz)	24096.38
Temperature (degree C)	25.000		

¹³C NMR (100 MHz, CHLOROFORM-d) δ ppm 71.08, 115.95, 116.84, 116.88, 127.81, 128.18, 128.83, 128.98, 129.29, 129.49, 137.47, 146.91, 153.11



20111213-NV_274_F2_mono_Bn_NRht_Carbon-002.esp

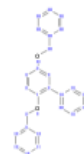


¹H and ¹³C NMR of 16

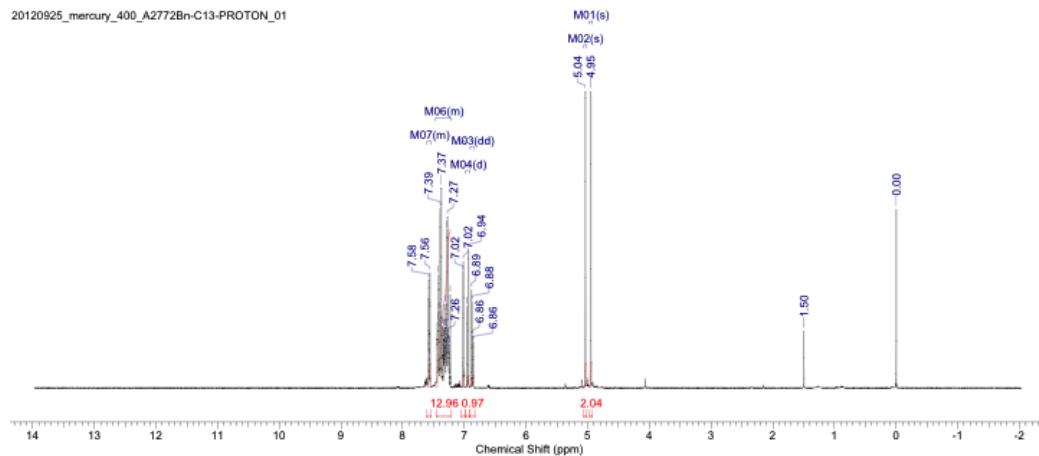
9/25/2012 1:16:23 PM

Formula C ₂₄ H ₂₂ O ₂		FW 366.4517			
Acquisition Time (sec)	2.5641	Date	Sep 25 2012	Date Stamp	Sep 25 2012
File Name	F:\INV-NMR-2\20120925_mercury_400_A2772Bn-C13-PROTON_01	Frequency (MHz)	399.31		
Nucleus	¹ H	Number of Transients	16	Original Points Count	16384
Pulse Sequence	s2pul	Receiver Gain	30.00	Solvent	CHLOROFORM-d
Spectrum Offset (Hz)	2383.6860	Sweep Width (Hz)	6389.78	Temperature (degree C)	25.000

¹H NMR (399 MHz, CHLOROFORM-d) δ ppm 4.95 (s, 2 H) 5.04 (s, 2 H) 6.87 (dd, =8.97 Hz, =3.12 Hz, 1 H) 6.95 (d, =8.97 Hz, 1 H) 7.02 (d, =3.12 Hz, 1 H) 7.22 - 7.47 (m, 13 H) 7.54 - 7.60 (m, 2 H)



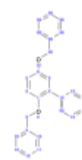
20120925_mercury_400_A2772Bn-C13-PROTON_01



9/25/2012 1:37:11 PM

Formula C ₂₄ H ₂₂ O ₂		FW 366.4517			
Acquisition Time (sec)	1.3042	Date	Sep 25 2012	Date Stamp	Sep 25 2012
File Name	F:\INV-NMR-2\20120925_mercury_400_A2772Bn-C13-CARBON_01	Frequency (MHz)	100.42		
Nucleus	¹³ C	Number of Transients	256	Original Points Count	32768
Pulse Sequence	s2pul	Receiver Gain	39.00	Solvent	CHLOROFORM-d
Spectrum Offset (Hz)	11044.5479	Sweep Width (Hz)	25125.63	Temperature (degree C)	25.000

¹³C NMR (100 MHz, CHLOROFORM-d) δ ppm 70.67, 71.65, 114.29, 115.52, 117.73, 127.02, 127.08, 127.52, 127.55, 127.93, 127.97, 128.36, 128.57, 129.56, 132.72, 137.20, 137.42, 138.33, 150.04, 153.44



20120925_mercury_400_A2772Bn-C13-CARBON_01.esp

