Supporting Information

Organophotocatalytic α-deuteration of unprotected primary amines via H/D exchange with D_2O

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Contents

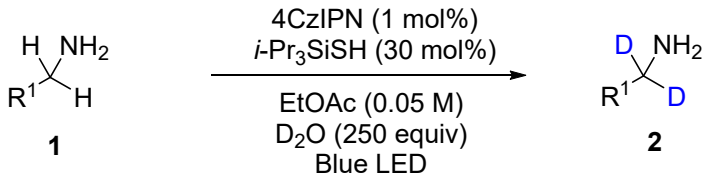
1. General Information

Commercially available reagents were purchased from Sigma Aldrich, Matrix Chemical, AK Sci, Alfa Aesar, TCI, and Chem Cruz, and used as received unless otherwise noted. Except Isatin, 6-Chloroisatin and 5-Bromoisatin are purchased form Sigma Aldrich. Merck 60 silica gel was used for chromatography, and Whatman silica gel plates with a fluorescence F254 indicator were used for thin-layer chromatography (TLC) analysis. ^{1}H and ^{13}C NMR spectra were recorded on Bruker Advance 400/500 or JEOL 400. Chemical shifts in ^{1}H NMR spectra are reported in parts per million (ppm) relative to residual chloroform (7.26 ppm) or dimethyl sulfoxide (2.50 ppm) as internal standards. ^{1}H NMR data are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, m = multiplet), coupling constant in Hertz (Hz) and hydrogen numbers based on integration intensities. ^{13}C NMR chemical shifts are reported in ppm relative to the central peak of $CDCl_3$ (77.16 ppm) as internal standards.

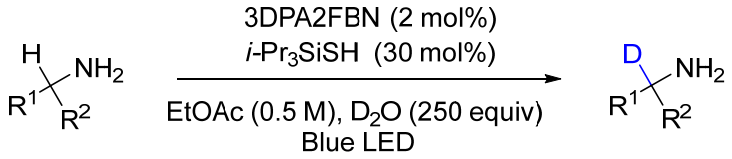
2. General Procedures and Optimization of Reaction Conditions

Figure S1. The Visible-Light Photoredox Catalysis Experimental Setup

2.1 General Procedures of Synthesis of α-Deuterated Amine:

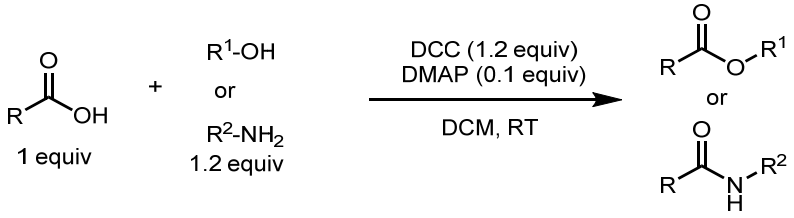


General Procedure A: To an oven-dried 10 mL-Schlenk tube equipped with a stir bar, was added amine (0.2 mmol, 1.0 equiv), photocatalyst 4CzIPN (1.6 mg, 1 mol%), triisopropylsilanethiol (12 μL, 30 mol%) and the tube was evacuated and backfilled with N_2 (three times). Anhydrous EtOAc (4 mL), and 1 mL of D_2O were added by syringe under N_2. The solution was then stirred at room temperature under the irradiation of two 40 W Kessil Blue LEDs for 48 h. After completion of the reaction, the top layer EtOAc was concentrated and treated with a 2.0 M solution of HCl in diethyl ether and filtered. The solid was then washed with diethyl ether and dried under a vacuum to give the pure product. Alternatively, the top layer EtOAc was concentrated and diluted with CH_2Cl_2 (10 mL) and HCl (5 mL, 1.0 M, aq). The organic layer was disposed and the aqueous layer diluted with CH_2Cl_2 (10 mL) and Ammonium hydroxide solution (10 mL, 33%, aq). The aqueous layer was extracted with CH_2Cl_2 (3×10 mL). Organic layers were combined, dried over Na_2SO_4, filtered, and concentrated. Percentages of exchanged protons are determined by ^1H NMR.



General Procedure B: To an oven-dried 10 mL-Schlenk tube equipped with a stir bar, was added amine (0.2 mmol, 1.0 equiv), photocatalyst 3DPA2FBN (2.6 mg, 2 mol%), triisopropylsilanethiol (12 uL, 30 mol%) and the tube was evacuated and backfilled with N_2 (three times). 4 mL anhydrous EtOAc, and 1 ml D_2O were added by syringe under N_2. The solution was then stirred at room temperature under the irradiation of two 40 W Kessil Blue LEDs for 48h. After completion of the reaction, the top layer EtOAc was concentrated and treated with a 2.0 M solution of HCl in diethyl ether and filtered. The solid was then washed with diethyl ether and dried under a vacuum to give the pure product. Percentages of exchanged protons are determined by ^1H NMR.

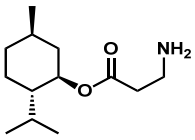
2.2 General Procedure for Synthesis of 1as-1au



To an oven-dried round-bottom flask with a magnetic stir bar was added acid (3 mmol, 1.0 equiv.), alcohol or amine (3.6 mmol, 1.2 equiv.), DCC (742 mg, 3.6 mmol, 1.2 equiv.) and DMAP (37m

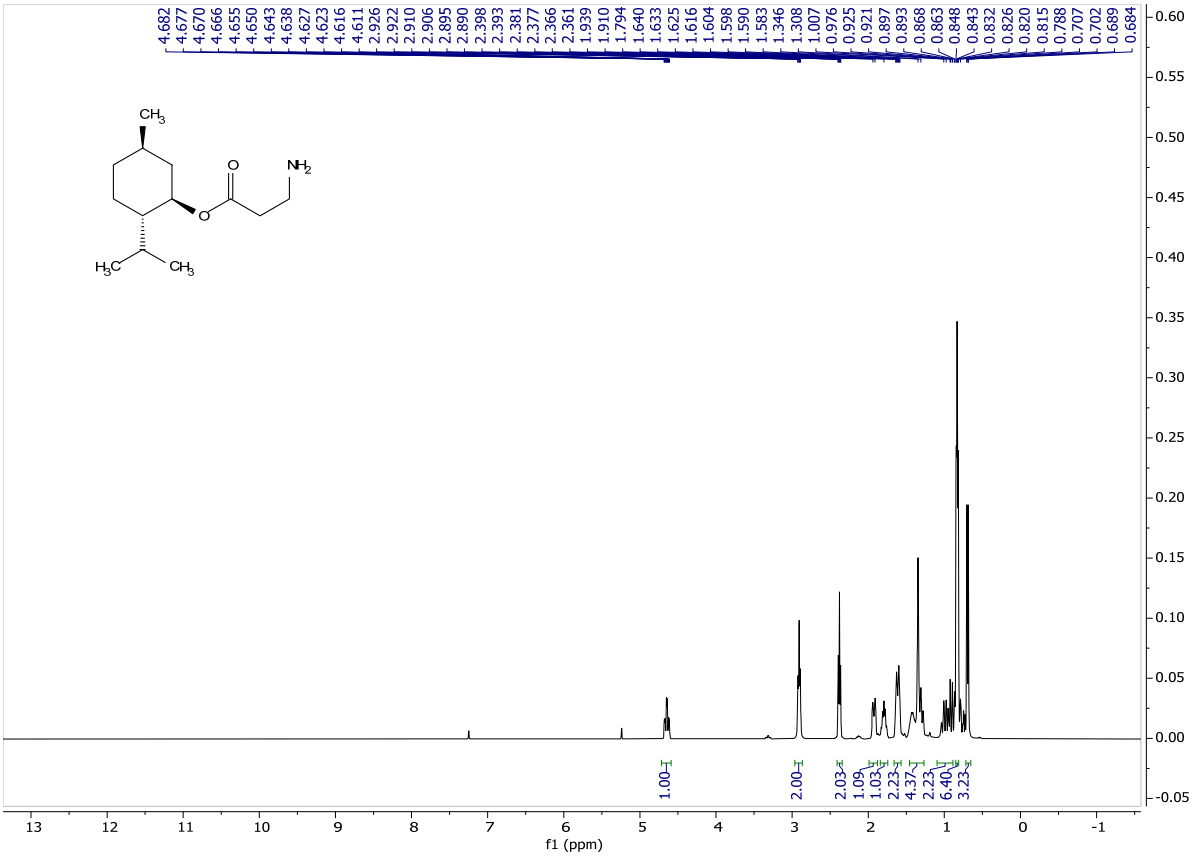
g, 0.30 mmol, 0.1 equiv.). Dry dichloromethane (20 mL) was added and the mixture was allowed to stir at room temperature until the acid was consumed (followed by TLC). Typical reaction times were between 12 h. The white precipitates were filtered off and the solvent was removed under reduced pressure. The desired products were obtained in the corresponding yields after purification by flash chromatography on silica gel eluting with hexane/ethyl acetate.

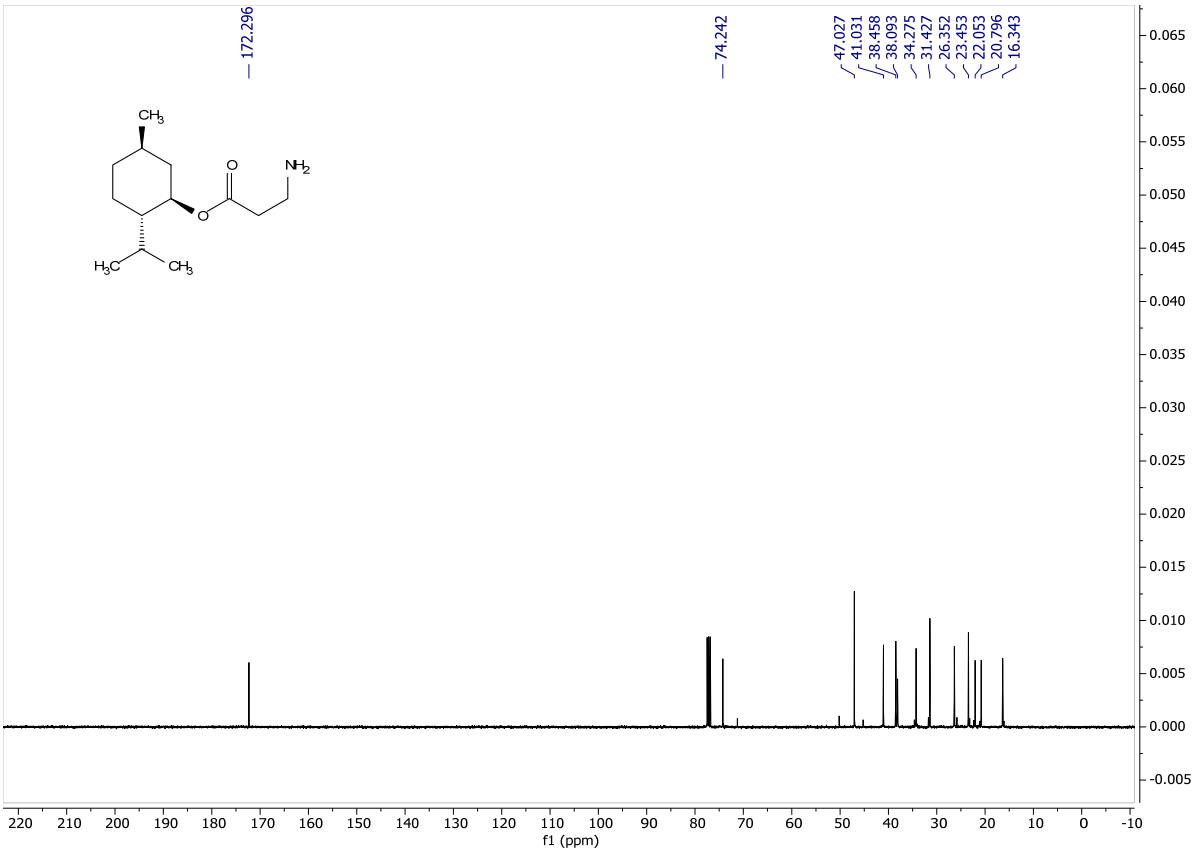
(1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl 3-aminopropanoate (1as): The title product was prepared according to the general procedure and purified by column chromatography on silica gel eluting with hexane/ethyl acetate (8:1) as white soild about 500 mg (73%).



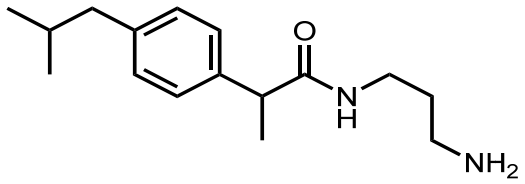
^{1}H NMR (400 MHz, $CDCl_3$) δ 4.65 (tdd, *J* = 10.9, 4.5, 1.8 Hz, 1H), 2.91 (td, *J* = 6.3, 1.9 Hz, 2H), 2.38 (td, *J* = 6.3, 1.9 Hz, 2H), 1.92 (d, *J* = 11.7 Hz, 1H), 1.79 (s, 1H), 1.61 (ddd, *J* = 13.2, 5.8, 2.9 Hz, 2H), 1.33 (d, *J* = 15.2 Hz, 4H), 1.09 – 0.89 (m, 2H), 0.83 (td, *J* = 5.4, 4.4, 2.0 Hz, 6H), 0.70 (dd, *J* = 7.1, 2.0 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 172.3, 74.2, 47.0, 41.0, 38.5, 38.1, 34.3, 31.4, 26.4, 23.5, 22.1, 20.8, 16.3.



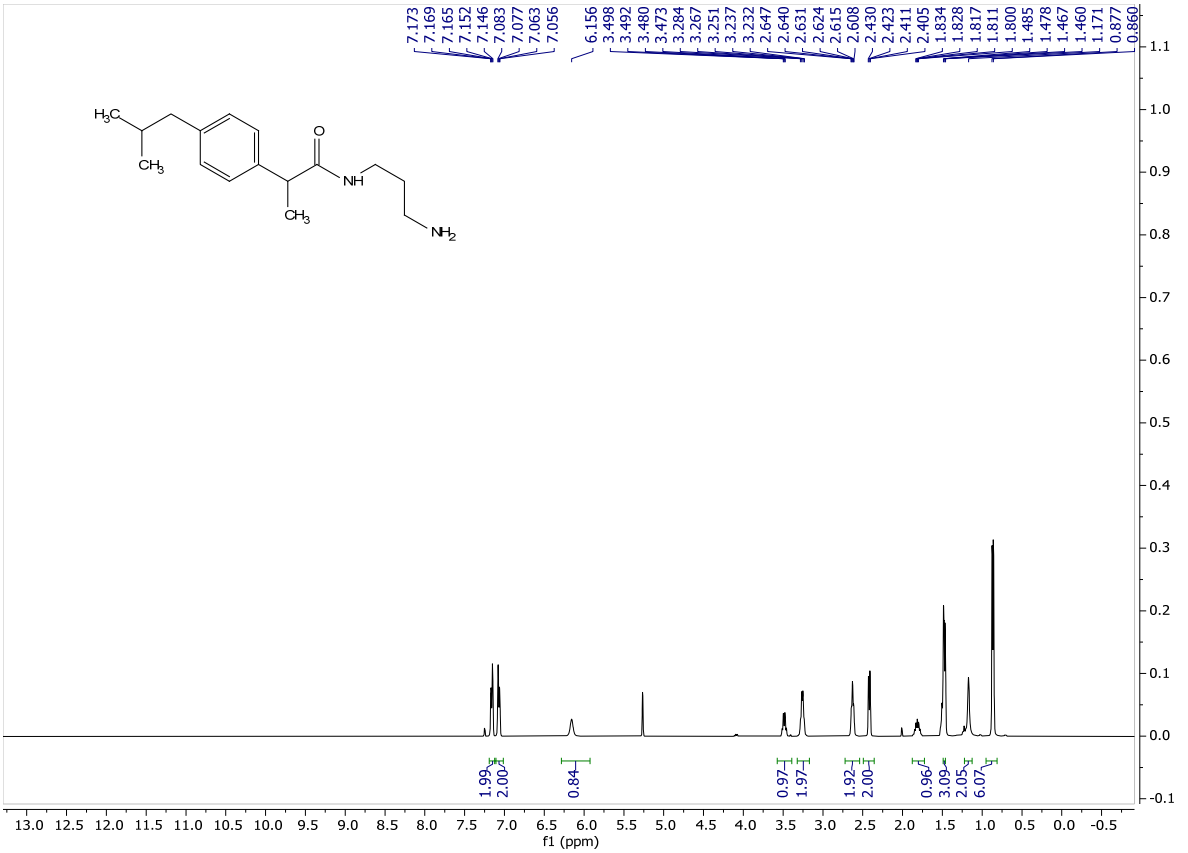


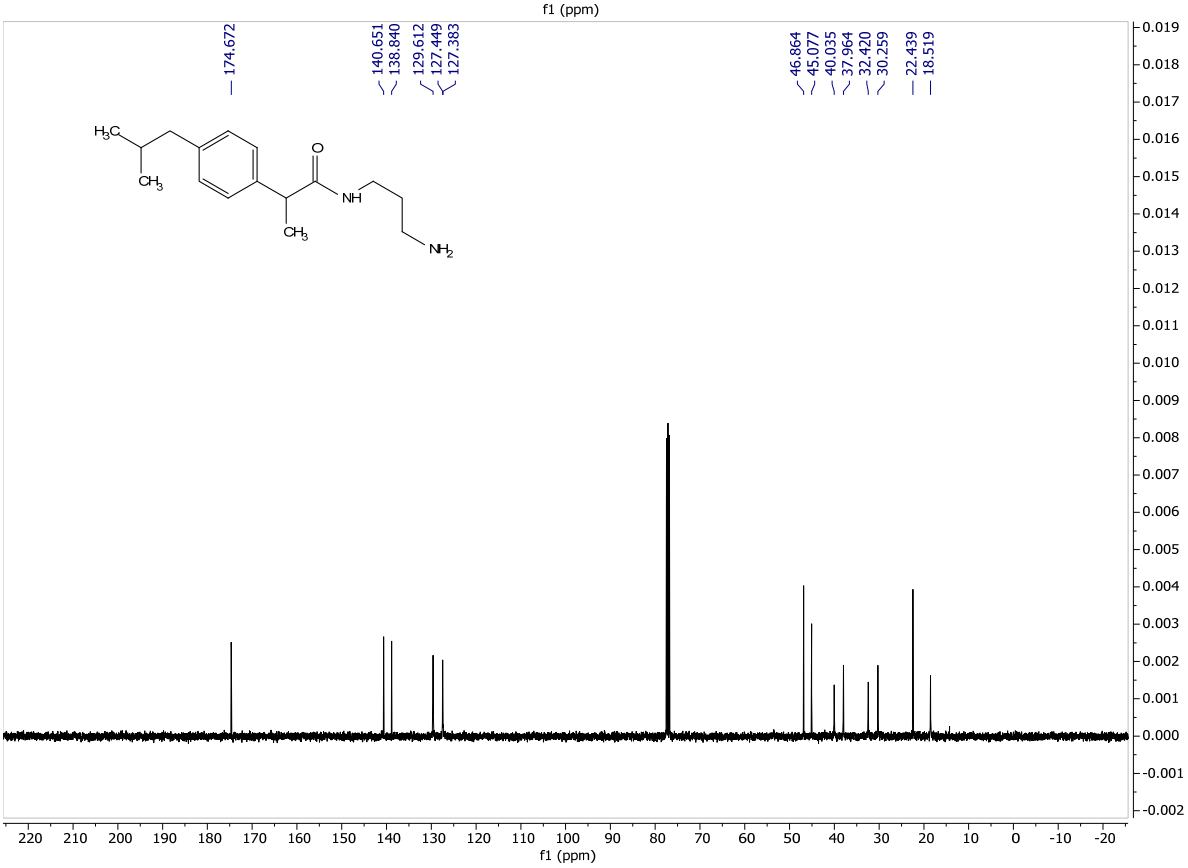
***N*-(3-Aminopropyl)-2-(4-isobutylphenyl)propanamide (1at):** The title product was prepared according to the general procedure and purified by column chromatography on silica gel eluting with hexane/ethyl acetate (10:1) as white oil about 660 mg (83%).



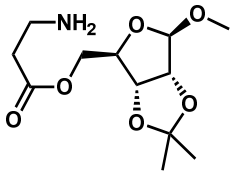
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.19 – 7.11 (m, 2H), 7.07 (dd, *J* = 8.3, 2.7 Hz, 2H), 6.16 (s, 1H), 3.49 (dd, *J* = 7.4, 2.6 Hz, 1H), 3.26 (q, *J* = 7.0 Hz, 2H), 2.63 (td, *J* = 6.4, 2.6 Hz, 2H), 2.42 (dd, *J* = 7.4, 2.6 Hz, 2H), 1.81 (dtd, *J* = 13.6, 6.7, 2.3 Hz, 1H), 1.49 – 1.46 (m, 3H), 1.17 (s, 2H), 0.87 (d, *J* = 6.8 Hz, 6H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 174.7, 140.7, 138.8, 129.6, 127.4, 127.4, 46.9, 45.1, 40.0, 38.0, 32.4, 30.3, 22.4, 18.5.


7.173
7.169
7.165
7.152
7.146
7.083
7.077
7.063
7.056
6.156
3.498
3.492
3.480
3.473
3.284
3.267
3.251
3.237
3.232
2.647
2.640
2.631
2.624
2.615
2.608
2.430
2.423
2.411
2.405
1.834
1.828
1.817
1.811
1.800
1.485
1.478
1.467
1.460
1.171
0.877
0.860
1.99
2.00
0.84
0.97
1.97
1.92
2.00
0.96
3.09
2.05
6.07
f1 (ppm)

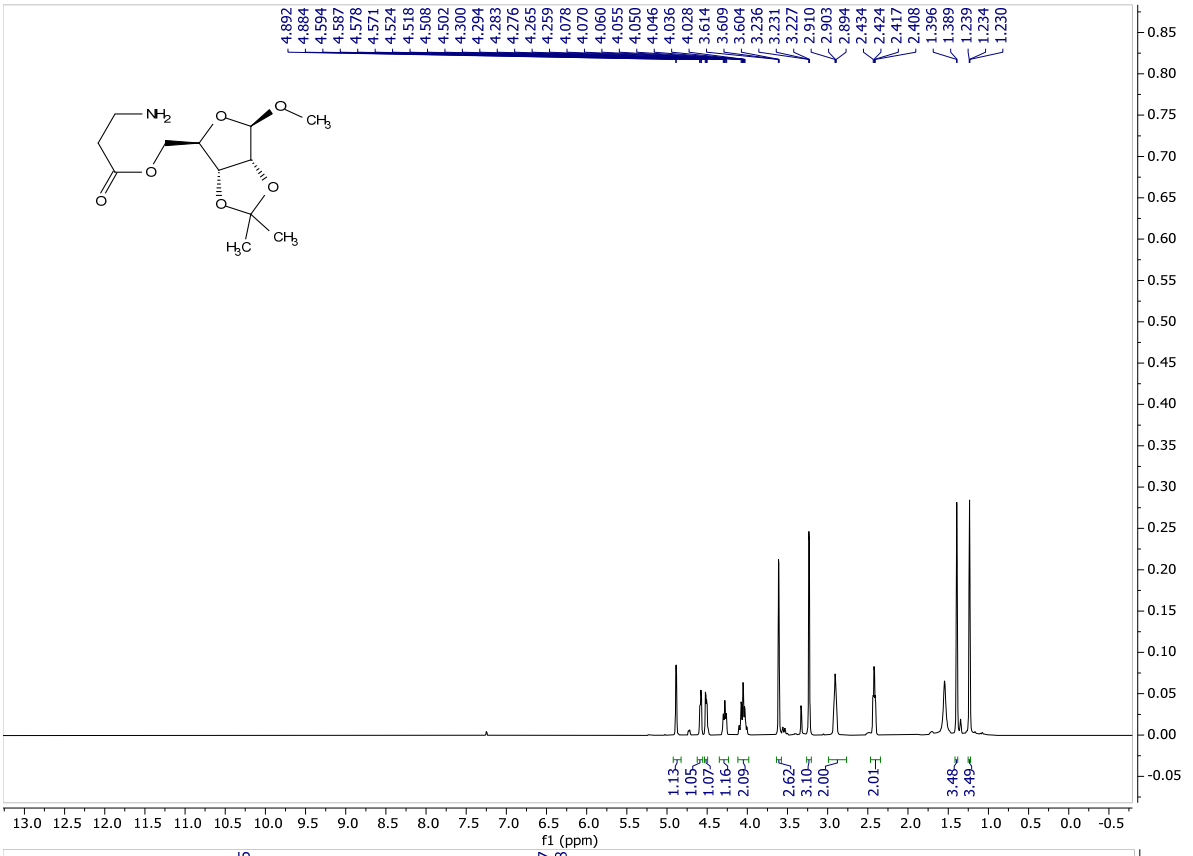

174.672
140.651
138.840
129.612
127.449
127.383
46.864
45.077
40.035
37.964
32.420
30.259
22.439
18.519
f1 (ppm)

((3a*R*,4*R*,6*R*,6a*R*)-6-Methoxy-2,2-dimethyltetrahydrofuro[3,4-*d*][1,3]dioxol-4-yl)methyl 3-aminopropanoate (1au): The title product was prepared according to the general procedure and purified by column chromatography on silica gel eluting with hexane/ethyl acetate (10:1) as white oil about 600 mg (73%).



^{1}H NMR (400 MHz, CHLOROFORM-*D*) δ 4.89 (d, *J* = 3.0 Hz, 1H), 4.58 (dd, *J* = 6.4, 2.6 Hz, 1H), 4.51 (dd, *J* = 6.4, 2.7 Hz, 1H), 4.33 – 4.24 (m, 1H), 4.05 (ddd, *J* = 10.8, 8.0, 3.1 Hz, 2H), 3.66 – 3.49 (m, 3H), 3.27 – 3.18 (m, 3H), 2.91 (d, *J* = 3.1 Hz, 2H), 2.42 (d, *J* = 2.9 Hz, 2H), 1.40 (s, 3H), 1.23 (s, 3H).

^{13}C NMR (101 MHz, CHLOROFORM-*D*) δ 172.2, 112.6, 109.4, 85.2, 84.2, 81.8, 64.6, 55.0, 37.9, 37.8, 26.4, 25.0.


4.892
4.884
4.594
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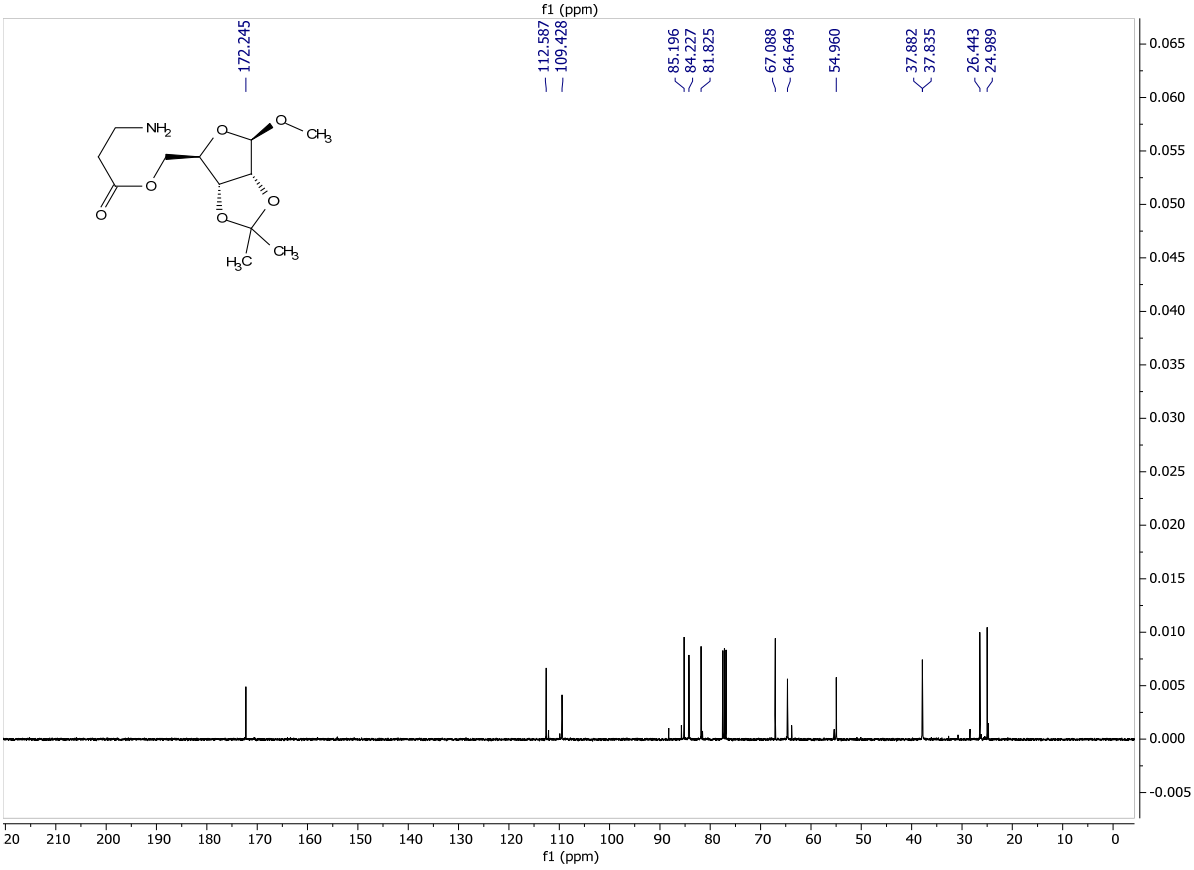
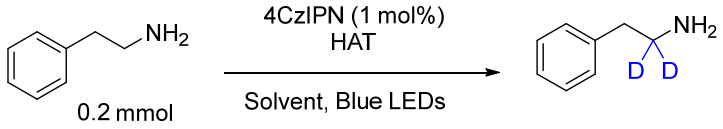
4.578
4.571
4.524
4.518
4.508
4.502
4.300
4.294
4.283
4.276
4.265
4.259
4.078
4.070
4.060
4.055
4.050
4.046
4.036
4.028
3.614
3.609
3.604
3.236
3.231
3.227
2.910
2.903
2.894
2.434
2.424
2.417
2.408
1.396
1.389
1.239
1.234
1.230
NH2
O
CH3
H3C
1.13
1.05
1.07
1.16
2.09
2.62
3.10
2.00
2.01
3.48
3.49
f1 (ppm)

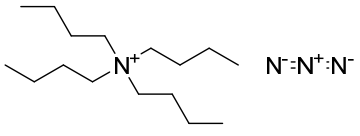

172.245
112.587
109.428
85.196
84.227
81.825
67.088
64.649
54.960
37.882
37.835
26.443
24.989
NH2
O
CH3
H3C
f1 (ppm)

2.3 Reaction Conditions Optimization

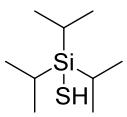
Table S1. Optimization of reaction conditions for primary alkylamines



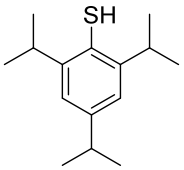
Entry	HAT-Cat	Solvent	D_2O	Times	D/%
1	HAT-1 (15 mol%), HAT-2 (30 mol%)	EA (0.1 M)	80 equiv.	16 h	45
2	HAT-1 (15 mol%), HAT-3 (30 mol%)	EA (0.1 M)	80 equiv.	16 h	32
3[a]	HAT-1 (15 mol%), HAT-4 (30 mol%)	EA (0.1 M)	80 equiv.	16 h	49
4	HAT-1 (15 mol%), HAT-3 (30 mol%)	ACN (0.1 M)	80 equiv.	16 h	25
5	HAT-1 (15 mol%), HAT-3 (30 mol%)	MeOH (0.1M)	80 equiv.	16 h	0
6	HAT-1 (15 mol%), HAT-3 (30 mol%)	DCM (0.1 M)	80 equiv.	16 h	nd
7	HAT-1 (15 mol%), HAT-3 (30 mol%)	Acetone (0.1 M)	80 equiv.	16 h	0
8	HAT-1 (15 mol%)	EA (0.1 M)	80 equiv.	16 h	0
9	HAT-2 (30 mol%)	EA (0.1M)	80 equiv.	16 h	69
10	HAT-1 (15 mol%), HAT-2 (30 mol%)	D_2O (0.2M)		16 h	39
11	HAT-1 (15 mol%), HAT-2 (30 mol%)	THF (0.1 M)	80 equiv.	16 h	37
12	HAT-2 (50 mol%)	EA (0.1 M)	80 equiv.	16 h	85
13	HAT-4 (30 mol%)	EA (0.1 M)	80 equiv.	16 h	50
14	HAT-2 (30 mol%)	EA (0.05 M)	80 equiv.	16 h	75
15	HAT-2 (30 mol%)	EA (0.1 M)	250 equiv.	16 h	87
16	HAT-2 (100 mol%)	EA (0.1 M)	80 equiv.	16 h	94
17	HAT-2 (30 mol%)	EA (0.1M)	250 equiv.	36 h	95
18	HAT-2 (50 mol%)	EA (0.1M)	250 equiv.	16 h	83
19	HAT-2 (30 mol%)	EA (0.1M)	80 equiv.	36 h	90
20	HAT-2 (20 mol%)	EA (0.1 M)	80 equiv.	36 h	83
21	HAT-2 (30 mol%)	EA (0.05 M)	250 equiv.	36 h	100



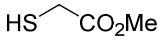
HAT-1



HAT-2



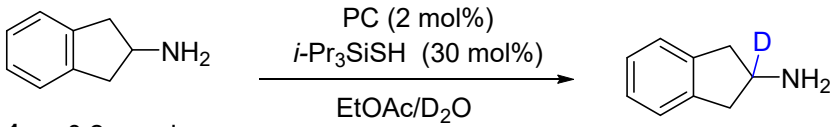
HAT-3



HAT-4

[a]The crude NMR spectra is messy.

Table S2. Optimization of reaction conditions for secondary alkylamines



1ap, 0.2 mmol

2ap

Entry	PC	Solvent	D_2O	Times	D/%
1	PC-1	EA (0.05 M)	250 equiv.	48 h	30
2	PC-2	EA (0.05 M)	250 equiv.	16 h	100
3	PC-3	EA (0.05 M)	250 equiv.	16 h	0
4	PC-4	EA (0.05 M)	250 equiv.	16 h	0

4CzIPN **PC-1**

[$E_{1/2}$ ($PC^*/PC^{-\cdot}$)= +1.35 V vs SCE

[$E_{1/2}$ ($PC/PC^{-\cdot}$)= -1.21 V vs SCE

3DPA2FBN **PC-2**

[$E_{1/2}$ ($PC^*/PC^{-\cdot}$)= +0.92 V vs SCE

[$E_{1/2}$ ($PC/PC^{-\cdot}$)= -1.92 V vs SCE

$[Ir(dFCF_3ppy)_2(5,5'\text{-}dFbpy)]PF_6$ **PC-3**

[$E_{1/2}$ ($PC^*/PC^{-\cdot}$)= +1.61 V vs SCE

[$E_{1/2}$ ($PC/PC^{-\cdot}$)= -1.54 V vs SCE

$[Ir(dFCF_3ppy)_2(5,5'\text{-}dCF_3bpy)]PF_6$ **PC-4**

[$E_{1/2}$ ($PC^*/PC^{-\cdot}$)= +1.68 V vs SCE

[$E_{1/2}$ ($PC/PC^{-\cdot}$)= -1.07 V vs SCE

$^{i}Pr_3SiSH$

$E^{ox}_{1/2}$ = +0.28 V vs. SCE

$E^{red}_{1/2}$ = -0.82 V vs. SCE

$E^{ox}_{1/2}$ ($nBuNH_2$)= +1.40 V vs SCE

3. Stern-Volmer Quenching Experiments

In a typical experiment, a solution of photocatalyst 4CzIPN in ethyl acetate (1.25×10^{-4} M) was added with an appropriate amount of quencher in a quartz cuvette. Then the emission of the sample was collected. The emission intensity at 520 nm was collected with excited wavelength of 360 nm.

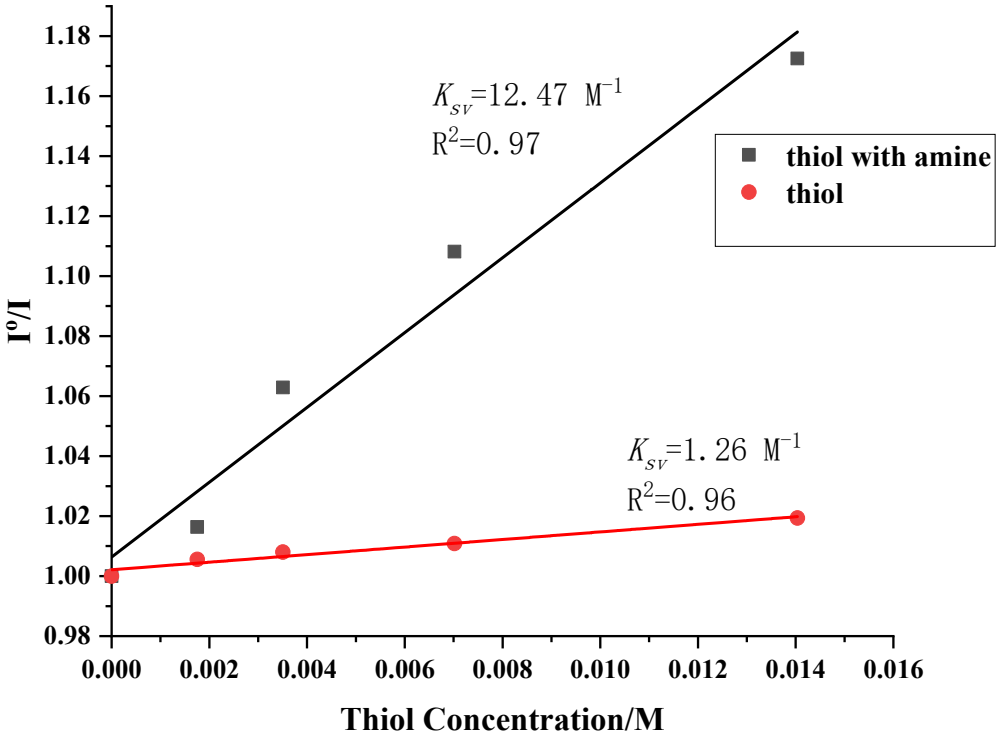


Figure S2. Stern-Volmer plot of 4CzIPN with varying reaction components. Dark Line: Stern-Volmer plot of 4CzIPN with constant phenylethylamine (0.3 M) and varying concentration of triisopropylsilanethiol. The Stern-Volmer constant (*KSV*) for the quenching of Thiol in the presence of amine is K_{SV} = 12.47 M^{-1}. Red line: Stern-Volmer plot of 4CzIPN with varying concentration of triisopropylsilanethiol. The Stern-Volmer constant (*KSV*) for the quenching of Thiol is K_{SV} = 1.26 M^{-1}. The deprotonated thiol showed enhanced quenching ability than thiol.

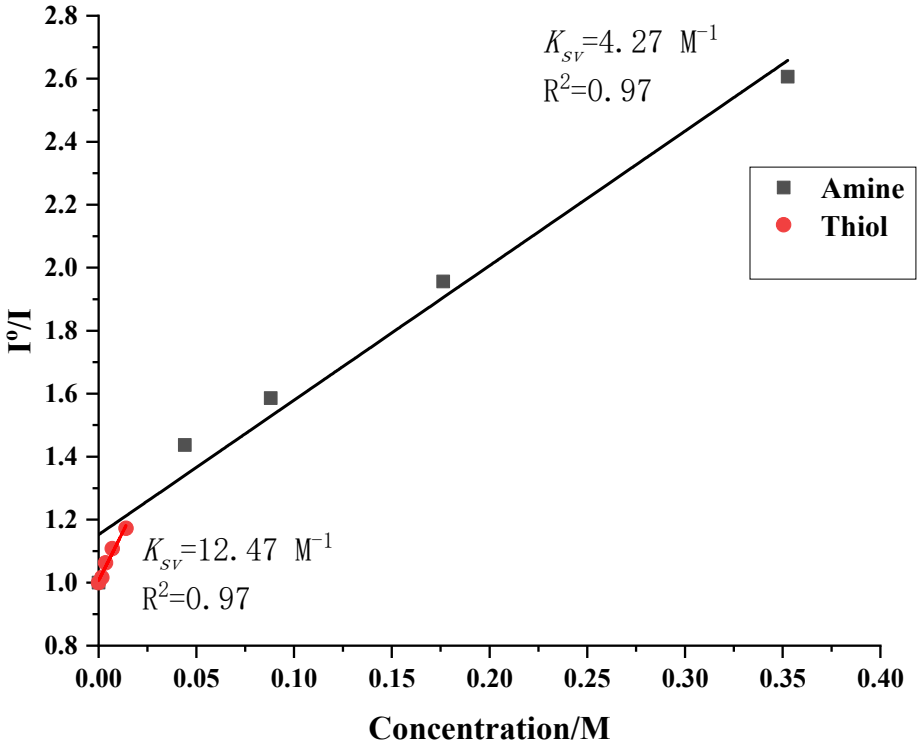
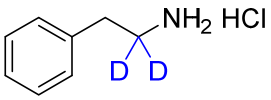


Figure S3. Stern-Volmer plot of 4CzIPN with varying reaction components. Dark Line: Stern-Volmer plot of 4CzIPN with varying concentration of phenylethylamine. The Stern-Volmer constant (*KSV*) for the quenching of amine is K_{SV} = 4.27 M^{-1}. Red Line: Stern-Volmer plot of 4CzIPN with constant phenylethylamine (0.3 M) and varying concentration of triisopropylsilanethiol. The Stern-Volmer constant (*KSV*) for the quenching of Thiol in the presence of amine is K_{SV} = 12.47 M^{-1}. The deprotonated thiol showed enhanced quenching ability than the phenylethylamine.

4. Compound Characterization Data

The compounds **2a, 2r, 2o, 2y, 2z, 2ac, 2ad, 2ai, 2an, 2ao and 2ap** are known compounds.[1-4]

2-Phenylethan-1,1-*d*$_2$-1-amine hydrochloride (2a):

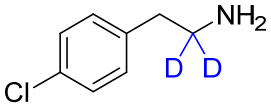


The title product was prepared according to the general procedure and isolated as white solid about 30.2 mg (95%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.05 (s, 3H), δ 7.29 (t, *J* = 7.5 Hz, 2H), 7.22 (d, *J* = 7.2 Hz, 3H), 2.84 (s, 2H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 137.9, 129.2, 129.2, 127.3, 33.3.

2-(4-Chlorophenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2b):



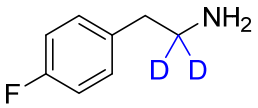
The title product was prepared according to the general procedure Aand isolated as white solid about 37 mg (96%).

^{1}H NMR (500 MHz, DMSO) δ 8.45 – 7.99 (m, 2H), 7.39 (d, *J* = 8.5 Hz, 2H), 7.31 (d, *J* = 8.4 Hz, 2H), 2.90 (s, 2H).

^{13}C NMR (126 MHz, DMSO) δ 136.9, 131.8, 131.1, 129.0, 32.5, 32.4, 32.4, 32.3.

HRMS (ESI-TOF) m/z: $[C_8H_8D_2ClN + H]^+$ calcd for $C_8H_9D_2ClN$: 158.0706, found: 158.0700.

2-(4-Fluorophenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2c):



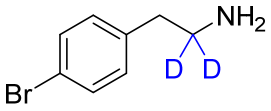
The title product was prepared according to the general procedure A and isolated as white solid about 33.6 mg (95%).

^{1}H NMR (500 MHz, DMSO) δ 8.16 (t, *J* = 20.1 Hz, 2H), 7.36 – 7.24 (m, 2H), 7.23 – 7.12 (m, 2H), 2.88 (s, 2H).

^{13}C NMR (126 MHz, DMSO) δ 162.6, 160.7, 134.0, 131.1, 131.0, 115.9, 115.7, 32.4, 32.3, 32.2.

HRMS (ESI-TOF) m/z: $[C_8H_8D_2FN + H]^+$ calcd for $C_8H_9D_2FN$: 142.1001, found: 142.0996.

2-(4-Bromophenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2d):



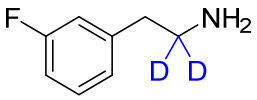
The title product was prepared according to the general procedure A and isolated as white solid about 45 mg (95%).

^{1}H NMR (500 MHz, DMSO) δ 7.57 – 7.47 (m, 2H), 7.28 – 7.20 (m, 2H), 2.89 (s, 2H).

^{13}C NMR (126 MHz, DMSO) δ 137.4, 131.9, 131.5, 120.3, 32.5, 32.4, 32.4, 32.3.

HRMS (ESI-TOF) m/z: $[C_8H_8D_2BrN + H]^+$ calcd for $C_8H_9D_2BrN$: 202.0200, found: 202.0195.

3-(3-Fluorophenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2e):



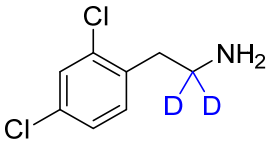
The title product was prepared according to the general procedure A and isolated as white solid about 33.3 mg (94%).

^{1}H NMR (500 MHz, DMSO) δ 8.48 – 8.01 (m, 2H), 7.42 – 7.28 (m, 2H), 7.26 – 7.10 (m, 2H), 2.95 (s, 2H).

^{13}C NMR (126 MHz, DMSO) δ 162.0, 160.1, 131.6, 131.5, 129.5, 129.4, 125.1, 125.1, 124.6, 124.4, 115.9, 115.7, 26.7, 26.6, 26.6, 26.6.

HRMS (ESI-TOF) m/z: $[C_8H_8D_2FN + H]^+$ calcd for $C_8H_9D_2FN$: 142.1001, found: 142.0995.

2-(2,4-Dichlorophenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2f):



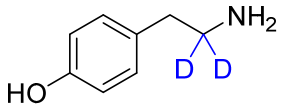
The title product was prepared according to the general procedure A and isolated as white solid about 43.5 mg (96%).

^{1}H NMR (500 MHz, DMSO) δ 8.70 – 8.15 (m, 2H), 7.61 (d, J = 2.1 Hz, 1H), 7.49 – 7.35 (m, 2H), 3.04 (s, 2H).

^{13}C NMR (126 MHz, DMSO) δ 134.5, 132.8, 129.3, 128.1, 30.4, 30.3, 30.3.

HRMS (ESI-TOF) m/z: $[C_8H_7D_2Cl_2N + H]^+$ calcd for $C_8H8D_2Cl_2N$: 192.0316, found: 192.0310.

4-(2-Aminoethyl-2,2-*d*$_2$)phenol hydrochloride (2g):



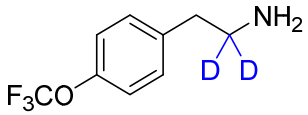
The title product was prepared according to the general procedure A and isolated as white solid about 33.2 mg (90%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 9.32 (s, 1H), 7.96 (s, 3H), 7.06 – 6.87 (m, 2H), 6.75 – 6.60 (m, 2H), 2.72 (d, *J* = 5.6 Hz, 2H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 156.7, 130.1, 127.8, 115.9, 32.5.

HRMS (ESI-TOF) m/z: $[C_8H_9D_2NO + H]^+$ calcd for $C_8H_{10}D_2NO$: 140.1044, found: 140.1039.

2-(4-(Trifluoromethoxy)phenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2h):



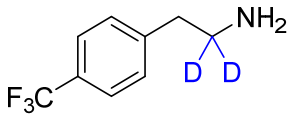
The title product was prepared according to the general procedure A and isolated as white solid about 47.1 mg (93%).

^{1}H NMR (400 MHz, DMSO) δ 8.62 – 7.79 (m, 2H), 7.45 – 7.37 (m, 2H), 7.32 (dt, *J* = 7.7, 1.1 Hz, 2H), 2.95 (s, 2H).

^{13}C NMR (101 MHz, DMSO) δ 147.6, 147.6, 137.5, 131.1, 124.4, 121.8, 121.6, 119.3, 116.7, 32.4, 32.4, 32.3.

HRMS (ESI-TOF) m/z: $[C_9H_8D_2F_3NO + H]^+$ calcd for $C_9H_9D_2F_3NO$: 208.0918, found: 208.0913.

2-(4-(Trifluoromethyl)phenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2i):



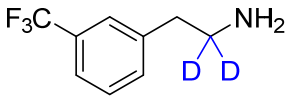
The title product was prepared according to the general procedure A and isolated as white solid about 43.1 mg (95%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.56 – 7.95 (m, 2H), 7.65 (d, *J* = 7.9 Hz, 2H), 7.47 (d, *J* = 7.9 Hz, 2H), 2.97 (s, 2H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 142.9, 130.2, 128.9, 128.5, 128.1, 127.8, 127.5, 126.2, 126.0, 125.9, 125.9, 125.9, 123.5, 120.8, 33.0, 32.9, 32.9.

HRMS (ESI-TOF) m/z: [$C_9H_8D_2F_3N$ + H]$^+$ calcd for $C_9H_9D_2F_3N$: 192.0969, found: 192.0964.

2-(3-(Trifluoromethyl)phenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2j):



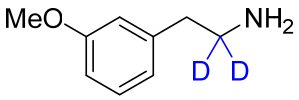
The title product was prepared according to the general procedure A and isolated as white solid about 43.1 mg (95%).

^{1}H NMR (500 MHz, DMSO) δ 8.10 (s, 3H), 7.65 (s, 1H), 7.64 – 7.55 (m, 3H), 2.99 (s, 2H).

^{13}C NMR (126 MHz, DMSO) δ 138.3, 132.4, 129.0, 129.0, 128.8, 128.5, 124.8, 124.8, 124.7, 124.7, 122.9, 122.9, 122.6, 31.8.

HRMS (ESI-TOF) m/z: [$C_9H_8D_2F_3N$ + H]$^+$ calcd for $C_9H_9D_2F_3N$: 192.0969, found: 192.0964.

2-(3-Methoxyphenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2k):



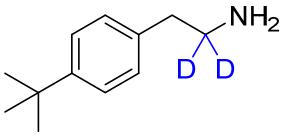
The title product was prepared according to the general procedure A and isolated as white solid about 35.9 mg (95%).

^{1}H NMR (500 MHz, DMSO) δ 8.06 (s, 2H), 7.24 (t, *J* = 7.7 Hz, 1H), 6.87 – 6.78 (m, 3H), 3.75 (s, 3H), 2.85 (s, 2H).

^{13}C NMR (126 MHz, DMSO) δ 158.8, 138.3, 129.0, 120.2, 113.7, 111.6, 54.4, 32.2.

HRMS (ESI-TOF) m/z: [$C_9H_{11}D_2NO$ + H]$^+$ calcd for $C_9H_{12}D_2NO$: 154.1201, found: 154.1195.

2-(4-(*tert*-Butyl)phenyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2l):



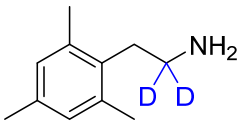
The title product was prepared according to the general procedure A and isolated as white solid about 41.2 mg (96%).

^{1}H NMR (500 MHz, DMSO) δ 7.43 – 7.26 (m, 2H), 7.18 (d, *J* = 8.3 Hz, 2H), 2.86 (d, *J* = 7.1 Hz, 2H), 1.27 (s, 9H).

^{13}C NMR (126 MHz, DMSO) δ 149.5, 134.8, 128.8, 125.8, 34.6, 32.8, 32.8, 32.7, 32.7, 31.6.

HRMS (ESI-TOF) m/z: $[C_{12}H_{17}D_2N + H]^+$ calcd for $C_{12}H_{18}D_2N$: 180.1721, found: 180.1715.

2-Mesitylethan-1,1-*d*$_2$-1-amine hydrochloride (2m):



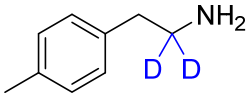
The title product was prepared according to the general procedure A and isolated as white solid about 39.4 mg (98%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 6.73 (s, 2H), 2.57 (s, 2H), 2.19 (d, *J* = 1.6 Hz, 6H), 2.12 (s, 3H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 136.2, 134.6, 134.2, 129.1, 34.0, 21.0, 20.0.

HRMS (ESI-TOF) m/z: $[C_{11}H_{15}D_2N + H]^+$ calcd for $C_{11}H_{16}D_2N$: 166.1565, found: 166.1559.

2-(*p*-Tolyl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2n):



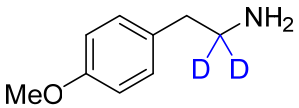
The title product was prepared according to the general procedure A and isolated as white solid about 33.5 mg (97%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.40 – 7.99 (m, 2H), 7.09 (d, *J* = 1.8 Hz, 5H), 2.81 (s, 2H), 2.23 (d, *J* = 1.7 Hz, 3H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 136.2, 134.9, 129.7, 129.0, 32.9, 32.8, 32.8, 21.2.

HRMS (ESI-TOF) m/z: $[C_9H_{11}D_2N + H]^+$ calcd for $C_9H_{12}D_2N$: 138.1252, found: 138.1246.

2-Phenylethan-1,1-*d*$_2$-1-amine hydrochloride (2o):



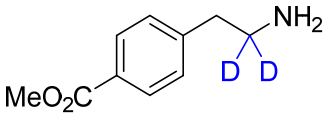
The title product was prepared according to the general procedure A and isolated as white solid about 36.2 mg (96%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.05 (s, 3H), δ 7.29 (t, *J* = 7.5 Hz, 2H), 7.22 (d, *J* = 7.2 Hz, 3H), 2.84 (s, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 137.9, 129.2, 129.2, 127.3, 33.3.

HRMS (ESI-TOF) m/z: $[C_9H_{11}D_2NO + H]^+$ calcd for $C_9H_{12}D_2NO$: 154.1201, found: 154.1195.

Methyl 4-(2-aminoethyl-2,2-d_2)benzoate hydrochloride (2p):



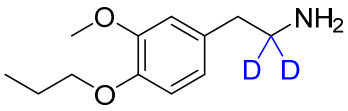
The title product was prepared according to the general procedure A and isolated as white solid about 43 mg (99%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 7.87 (dt, J = 8.2, 2.0 Hz, 2H), 7.38 (dd, J = 8.3, 1.9 Hz, 2H), 2.96 (s, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 166.6, 143.7, 130.0, 129.7, 128.6, 52.6, 33.1, 33.1, 33.0, 33.0.

HRMS (ESI-TOF) m/z: $[C_{10}H_{11}D_2NO_2 + H]^+$ calcd for $C_{10}H_{12}D_2NO_2$: 182.1150, found: 182.1145.

2-(3-Methoxy-4-propoxyphenyl)ethan-1,1-d_2-1-amine hydrochloride (2q):



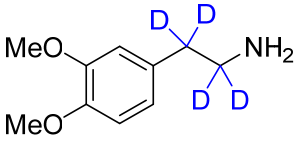
The title product was prepared according to the general procedure A and isolated as white solid about 46.4 mg (94%).

^{1}H NMR (500 MHz, DMSO) δ 8.33 – 7.84 (m, 2H), 6.88 (d, J = 8.2 Hz, 2H), 6.74 (dd, J = 8.1, 2.0 Hz, 1H), 3.87 (t, J = 6.6 Hz, 2H), 3.76 (s, 3H), 2.82 (s, 2H), 1.70 (q, J = 7.1 Hz, 2H), 0.96 (t, J = 7.4 Hz, 3H).

^{13}C NMR (126 MHz, DMSO) δ 149.5, 147.4, 130.2, 121.1, 113.8, 113.3, 70.2, 56.0, 32.8, 22.6, 10.9.

HRMS (ESI-TOF) m/z: $[C_{12}H_{17}D_2NO_2 + H]^+$ calcd for $C_{12}H_{18}D_2NO_2$: 212.1620, found: 212.1614.

2-(3,4-Dimethoxyphenyl)ethan-1,1,2,2-d_4-1-amine (2r):

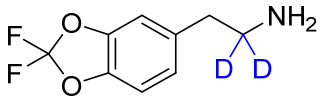


The title product was prepared according to the general procedure A and isolated as white solid about 42.4 mg (96%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 6.93 – 6.73 (m, 2H), 6.65 (d, J = 7.7 Hz, 1H), 3.69 (dd, J = 11.5, 2.1 Hz, 6H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 149.2, 147.6, 133.4, 120.9, 113.1, 112.4, 56.0, 55.9.

2-(2,2-Difluorobenzo[*d*][1,3]dioxol-5-yl)ethan-1,1-d_2-1-amine hydrochloride (2s):



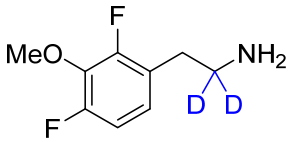
The title product was prepared according to the general procedure A and isolated as white solid about 43 mg (90%).

^{1}H NMR (500 MHz, DMSO) δ 7.98 (s, 3H), 7.44 – 7.29 (m, 2H), 7.11 (dd, J = 8.3, 1.7 Hz, 1H), 2.91 (d, J = 6.8 Hz, 2H).

^{13}C NMR (126 MHz, DMSO) δ 142.3, 141.0, 133.6, 130.6, 124.2, 110.0, 109.4, 31.8.

HRMS (ESI-TOF) m/z: $[C_9H_7D_2F_2NO_2 + H]^+$ calcd for $C_9H_8D_2F_2NO_2$: 204.0805, found: 204.0800.

2-(2,4-Difluoro-3-methoxyphenyl)ethan-1,1-d_2-1-amine hydrochloride (2t):



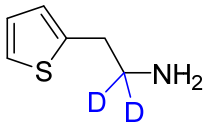
The title product was prepared according to the general procedure A and isolated as white solid about 40.5 mg (90%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 7.32 – 6.71 (m, 2H), 3.87 (s, 3H), 2.91 (q, J = 8.7, 6.0 Hz, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 155.9, 155.9, 155.6, 155.5, 153.5, 153.4, 153.1, 153.1, 136.5, 136.4, 136.2, 124.8, 124.7, 124.7, 124.6, 122.1, 122.0, 112.7, 112.7, 112.5, 112.5, 62.3, 62.3, 62.3, 26.4.

HRMS (ESI-TOF) m/z: $[C_9H_9D_2F_2NO + H]^+$ calcd for $C_9H_{10}D_2F_2NO$: 190.1012, found: 190.1007.

2-(Thiophen-2-yl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2u):



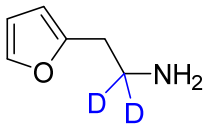
The title product was prepared according to the general procedure A and isolated as white solid about 30.3 mg (92%).

^{1}H NMR (500 MHz, D_2O) δ 7.30 (dd, *J* = 5.1, 1.2 Hz, 1H), 6.98 (dd, *J* = 5.1, 3.4 Hz, 1H), 6.95 (dq, *J* = 3.4, 1.0 Hz, 1H), 3.15 (s, 2H).

^{13}C NMR (126 MHz, D_2O) δ 138.5, 127.6, 126.7, 125.4, 26.7.

HRMS (ESI-TOF) m/z: $[C_6H_7D_2NS + H]^+$ calcd for $C_6H_8D_2NS$: 130.0659, found: 130.0654.

2-(Furan-2-yl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2v):



The title product was prepared according to the general procedure A and isolated as white solid about 28.3 mg (95%).

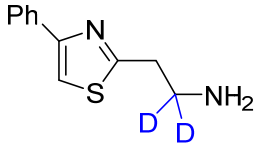
^{1}H NMR (400 MHz, DMSO-D_6) δ 8.07 (d, *J* = 48.8 Hz, 1H), 7.54 (d, *J* = 2.0 Hz, 1H), 6.36 (dt, *J* = 3.7, 1.9 Hz, 1H), 6.22 (t, *J* = 2.5 Hz, 1H), 2.92 (d, *J* = 5.9 Hz, 1H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 151.4, 142.7, 111.1, 107.2, 26.1, 26.0, 25.9, 25.9.

HRMS (ESI-TOF) m/z: $[C_6H_7D_2NO + H]^+$ calcd for $C_6H_8D_2NO$: 114.0888, found: 114.0882.

2-(4-Phenylthiazol-2-yl)ethan-1,1-*d*$_2$-1-amine hydrochloride (2w):

The title product was prepared according to the general procedure A and isolated as white solid about 46.46 mg (95%).

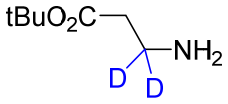


^{1}H NMR (400 MHz, DMSO-D_6) δ 7.95 – 7.84 (m, 3H), 7.39 (td, *J* = 7.7, 1.7 Hz, 2H), 7.29 (td, *J* = 7.2, 1.4 Hz, 1H), 3.03 (s, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 169.5, 154.2, 134.8, 129.3, 128.4, 126.5, 114.1, 37.4.

HRMS (ESI-TOF) m/z: $[C_{11}H_{10}D_2N_2S + H]^+$ calcd for $C_{11}H_{11}D_2N_2S$: 207.0925, found: 207.0920.

tert-Butyl 3-aminopropanoate-3,3-d_2 hydrochloride (2x):



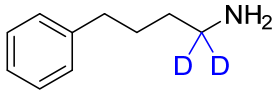
The title product was prepared according to the general procedure A and isolated as colorless oil about 30 mg (82%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.13 – 7.86 (m, 3H), 2.56 (s, 2H), 1.38 (s, 9H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 170.1, 81.3, 32.7, 28.3.

HRMS (ESI-TOF) m/z: $[C_7H_{13}D_2NO_2 + H]^+$ calcd for $C_7H_{14}D_2NO_2$: 148.1307, found: 148.1301.

4-Phenylbutan-1,1-d_2-1-amine hydrochloride (2y):

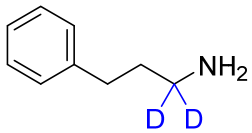


The title product was prepared according to the general procedure A and isolated as white solid about 35.5 mg (95%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.04 (d, J = 17.8 Hz, 2H), 7.24 (t, J = 7.3 Hz, 2H), 7.21 – 7.05 (m, 3H), 2.54 (t, J = 7.2 Hz, 2H), 1.64 – 1.47 (m, 3H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 142.3, 128.9, 128.8, 126.3, 35.1, 28.2, 26.9, 26.9, 26.8.

3-Phenylpropan-1,1-d_2-1-amine hydrochloride (2z):

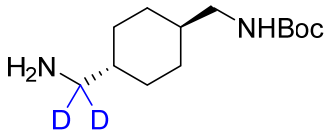


The title product was prepared according to the general procedure A and isolated as white solid about 35.5 mg (95%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 7.29 – 7.23 (m, 2H), 7.16 (dd, J = 12.1, 7.4 Hz, 3H), 2.61 (t, J = 7.8 Hz, 2H), 1.95 – 1.75 (m, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 141.5, 129.0, 128.8, 126.6, 32.3, 29.1, 29.0, 28.9.

***tert*-Butyl (((1*r*,4*r*)-4-(aminomethyl-*d*$_2$)cyclohexyl)methyl)carbamate hydrochloride (2aa):**



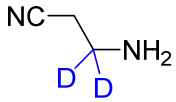
The title product was prepared according to the general procedure A and isolated as white solid about 50.4 mg (90%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.10 (t, *J* = 19.5 Hz, 2H), 2.71 (d, *J* = 6.3 Hz, 2H), 1.73 (d, *J* = 12.5 Hz, 2H), 1.64 (d, *J* = 11.8 Hz, 2H), 1.45 (t, *J* = 11.3 Hz, 1H), 1.39 – 1.25 (m, 9H), 1.23 (t, *J* = 6.4 Hz, 1H), 0.82 (dq, *J* = 21.1, 12.5, 11.7 Hz, 4H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 156.3, 77.8, 46.6, 46.4, 38.2, 35.9, 35.9, 35.8, 30.0, 29.8, 28.8.

HRMS (ESI-TOF) m/z: [$C_{13}H_{24}D_2N_2O_2$+ H]$^+$ calcd for $C_{13}H_{25}D_2N_2O_2$: 245.2198, found: 245.2193.

3-Aminopropanenitrile-3,3-*d*$_2$ hydrochloride (2ab):



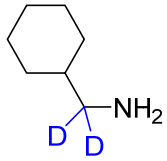
The title product was prepared according to the general procedure A and isolated as white solid about 19 mg (90%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.18 (s, 3H), 2.82 (s, 2H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 118.4, 16.0.

HRMS (ESI-TOF) m/z: [$C_3H_4D_2N_2$+ H]$^+$ calcd for $C_3H_5D_2N_2$: 73.0735, found: 73.0729.

Cyclohexylmethan-*d*$_2$-amine hydrochloride (2ac):



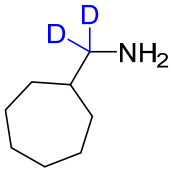
The title product was prepared according to the general procedure A and isolated as brown solid about 26.8 mg (89%).

^{1}H NMR (400 MHz, DMSO) δ 7.88 (s, 2H), 1.76 – 1.63 (m, 4H), 1.56 – 1.49 (m, 1H), 1.25 – 1.12 (m, 3H), 0.93 (td, *J* = 11.9, 3.1 Hz, 2H).

^{13}C NMR (101 MHz, DMSO) δ 35.7, 35.7, 30.1, 26.1, 25.5.

HRMS (ESI-TOF) m/z: $[C_7H_{13}D_2N+H]^+$ calcd for $C_7H_{14}D_2N$: 116.1408, found: 116.1403.

Cycloheptylmethan-*d*$_2$-amine hydrochloride (2ad):

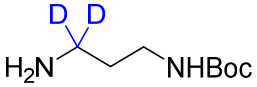


The title product was prepared according to the general procedure A and isolated as brown solid about 28 mg (85%).

^{1}H NMR (500 MHz, DMSO) δ 7.82 (s, 3H), 1.73 – 1.38 (m, 11H), 1.23 – 1.13 (m, 2H).

^{13}C NMR (126 MHz, DMSO) δ 39.3, 36.6, 31.9, 31.9, 27.8.

***tert*-Butyl (3-aminopropyl-3,3-*d*$_2$)carbamate hydrochloride (2ae):**



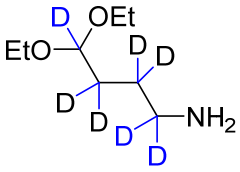
The title product was prepared according to the general procedure A and isolated as white solid about 34.7 mg (82%).

^{1}H NMR (500 MHz, DMSO) δ 2.98 (d, J = 6.1 Hz, 2H), 1.65 (t, J = 6.8 Hz, 2H), 1.39 (s, 9H).

^{13}C NMR (126 MHz, DMSO) δ 156.2, 78.2, 37.3, 28.7, 28.0.

HRMS (ESI-TOF) m/z: $[C_8H_{16}D_2N_2O_2+H]^+$ calcd for $C_8H_{17}D_2N_2O_2$: 177.1572, found: 177.1567.

4,4-Diethoxybutan-1,1,2,2,3,3,4-*d*$_7$-1-amine hydrochloride (2af):



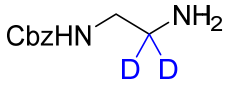
The title product was prepared according to the general procedure A and isolated as colorless oil about 28.5 mg (70%).

^{1}H NMR (500 MHz, DMSO) δ 3.39 (q, J = 7.0 Hz, 4H), 1.24 (s, 2H), 1.13 – 1.04 (m, 6H).

^{13}C NMR (126 MHz, DMSO) δ 65.4, 15.6.

HRMS (ESI-TOF) m/z: [$C_8H_{12}D_7NO_2$+ H]$^+$ calcd for $C_8H_{13}D_7NO_2$: 169.1933, found: 169.1928.

Benzyl (2-aminoethyl-2,2-*d*$_2$)carbamate hydrochloride (2ag):



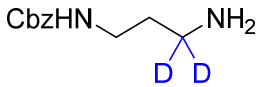
The title product was prepared according to the general procedure A and isolated as white solid about 42.6 mg (92%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.37 – 8.05 (m, 2H), 7.38 – 7.25 (m, 5H), 4.99 (s, 2H), 3.23 (s, 2H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 156.8, 137.5, 128.9, 128.4, 128.3, 66.1, 38.4, 38.4, 38.3, 38.2.

HRMS (ESI-TOF) m/z: [$C_{10}H_{12}D_2N_2O_2$+ H]$^+$ calcd for $C_{10}H_{13}D_2N_2O_2$: 197.1259, found: 197.1254.

Benzyl (3-aminopropyl-3,3-*d*$_2$)carbamate hydrochloride (2ah):



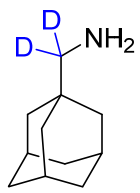
The title product was prepared according to the general procedure A and isolated as white solid about 45.7 mg (93%).

^{1}H NMR (400 MHz, DMSO-*D*$_6$) δ 8.11 (t, *J* = 18.7 Hz, 1H), 7.30 (q, *J* = 7.3 Hz, 5H), 4.98 (s, 2H), 3.02 (t, *J* = 6.4 Hz, 2H), 1.67 (t, *J* = 6.7 Hz, 2H).

^{13}C NMR (101 MHz, DMSO-*D*$_6$) δ 156.7, 137.7, 128.9, 128.3, 128.3, 65.8, 37.9, 37.8, 27.9, 27.8, 27.8, 27.7.

HRMS (ESI-TOF) m/z: [$C_{11}H_{14}D_2N_2O_2$+ H]$^+$ calcd for $C_{11}H_{15}D_2N_2O_2$: 211.1416, found: 211.1410.

Adamantan-1-ylmethan-*d*$_2$-amine hydrochloride (2ai):

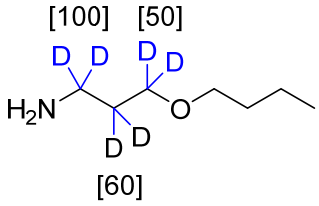


The title product was prepared according to the general procedure A and isolated as white solid about 36.5 mg (90%).

^{1}H NMR (500 MHz, DMSO) δ 8.16 – 7.74 (m, 2H), 1.96 (q, *J* = 3.3 Hz, 3H), 1.81 – 1.54 (m, 8H), 1.52 (d, *J* = 2.9 Hz, 4H).

^{13}C NMR (126 MHz, DMSO) δ 39.3, 36.6, 31.9, 27.8.

3-Butoxypropan-1,1,2,2,3,3-*d*$_6$-1-amine hydrochloride (2aj):



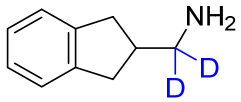
The title product was prepared according to the general procedure A and isolated as colorless oil about 28.3 mg (82%).

^{1}H NMR (400 MHz, CHLOROFORM-*D*) δ 3.56 (dd, *J* = 8.0, 3.2 Hz, 1H), 3.42 (tt, *J* = 9.6, 4.8 Hz, 2H), 2.03 (t, *J* = 5.8 Hz, 1H), 1.52 (q, *J* = 7.1 Hz, 2H), 1.39 – 1.30 (m, 2H), 1.25 (d, *J* = 7.0 Hz, 2H), 0.91 (td, *J* = 7.4, 1.6 Hz, 3H).

^{13}C NMR (101 MHz, CHLOROFORM-*D*) δ 71.4, 69.1, 31.7, 29.8, 19.4, 17.8, 14.0.

HRMS (ESI-TOF) m/z: $[C_7H_{11}D_6NO+ H]^+$ calcd for $C_7H_{12}D_6NO$: 138.1765, found: 138.1760.

(2,3-Dihydro-1*H*-inden-2-yl)methan-*d*$_2$-amine hydrochloride: (2ak):



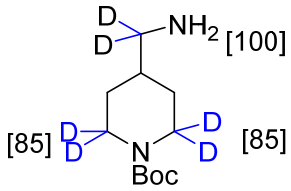
The title product was prepared according to the general procedure A and isolated as white solid about 33.3 mg (90%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.25 (d, *J* = 18.8 Hz, 2H), 7.16 (p, *J* = 4.4 Hz, 2H), 7.08 (dq, *J* = 4.7, 2.9, 1.7 Hz, 2H), 2.98 (q, *J* = 9.8 Hz, 2H), 2.68 (dd, *J* = 9.1, 5.0 Hz, 3H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 142.5, 126.9, 124.9, 37.8, 36.8.

HRMS (ESI-TOF) m/z: $[C_{10}H_{11}D_2N+ H]^+$ calcd for $C_{10}H_{12}D_2N$: 150.1252, found: 150.1246.

tert-Butyl 4-(aminomethyl-d_2)piperidine-1-carboxylate-2,2,6,6-d_4 hydrochloride (2al):



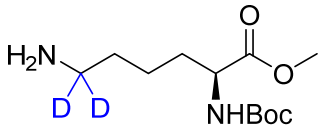
The title product was prepared according to the general procedure A and isolated as white solid about 45 mg (88%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.08 (d, J = 40.5 Hz, 3H), 3.85 (s, 2H), 1.68 (ddd, J = 27.7, 12.0, 5.4 Hz, 3H), 1.35 (d, J = 1.6 Hz, 9H), 1.04 – 0.93 (m, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 154.3, 79.1, 34.0, 29.2, 28.6.

HRMS (ESI-TOF) m/z: $[C_{11}H_{16}D_6N_2O_2 + H]^+$ calcd for $C_{11}H_{17}D_6N_2O_2$: 211.2136, found: 211.2130.

Methyl (_tert_-butoxycarbonyl)-_L_-lysinate-6,6-d_2 hydrochloride (2am):



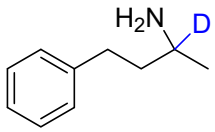
The title product was prepared according to the general procedure A and isolated as white solid about 47.7 mg (80%).

^{1}H NMR (400 MHz, CHLOROFORM-D) δ 5.06 (dd, J = 26.2, 7.9 Hz, 1H), 4.28 (d, J = 9.1 Hz, 1H), 3.72 (d, J = 1.5 Hz, 3H), 2.08 (s, 2H), 1.86 – 1.73 (m, 1H), 1.62 (dt, J = 13.6, 7.0 Hz, 1H), 1.43 (s, 9H), 1.36 (q, J = 7.6, 7.2 Hz, 2H).

^{13}C NMR (101 MHz, CHLOROFORM-D) δ 173.4, 155.5, 80.0, 53.4, 52.4, 32.7, 29.8, 28.0, 23.1, 22.6.

HRMS (ESI-TOF) m/z: $[C_{12}H_{22}D_2N_2O_4 + H]^+$ calcd for $C_{12}H_{23}D_2N_2O_4$: 263.1940, found: 263.1934.

4-Phenylbutan-2-_d_-2-amine hydrochloride (2an):

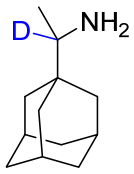


The title product was prepared according to the general procedure B and isolated as white solid about 35.7 mg (96%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.41 – 7.85 (m, 2H), 7.32 – 7.22 (m, 2H), 7.22 – 7.11 (m, 3H), 2.71 – 2.53 (m, 2H), 1.96 – 1.80 (m, 1H), 1.70 (dtd, J = 13.9, 6.5, 3.1 Hz, 1H), 1.19 (d, J = 1.8 Hz, 3H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 141.6, 129.0, 128.8, 126.5, 36.3, 36.2, 36.2, 31.3, 18.4, 18.4, 18.3.

1-(Adamantan-1-yl)ethan-1-*d*-1-amine hydrochloride (2ao):

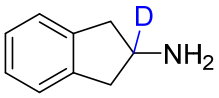


The title product was prepared according to the general procedure B and isolated as white solid about 38.9 mg (90%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 7.92 (d, J = 20.0 Hz, 2H), 1.97 – 1.87 (m, 3H), 1.63 (d, J = 12.4 Hz, 3H), 1.50 (dt, J = 25.1, 12.1 Hz, 9H), 1.06 (d, J = 1.7 Hz, 3H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 37.6, 36.7, 34.5, 34.5, 34.5, 28.0, 13.1, 13.1, 13.0.

2,3-Dihydro-1*H*-inden-2-*d*-2-amine hydrochloride (2ap):



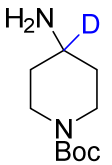
The title product was prepared according to the general procedure B and isolated as white solid about 32.6 mg (96%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.43 (s, 2H), 7.23 (dd, J = 6.0, 3.2 Hz, 2H), 7.15 (dt, J = 5.2, 2.1 Hz, 2H), 3.21 (d, J = 16.4 Hz, 2H), 2.97 (d, J = 16.3 Hz, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 140.4, 127.4, 125.2, 37.7.

HRMS (ESI-TOF) m/z: $[C_{10}H_{11}D_2N+ H]^+$ calcd for $C_{10}H_{12}D_2N$: 150.1252, found: 150.1246.

***tert*-Butyl 4-aminopiperidine-1-carboxylate-4-*d* hydrochloride (2aq):**



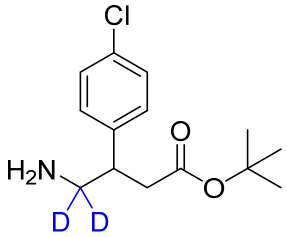
The title product was prepared according to the general procedure B and isolated as white solid about 43.1 mg (91%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.07 (s, 3H), 3.89 (d, J = 13.7 Hz, 2H), 2.74 (s, 2H), 1.83 (d, J = 12.6 Hz, 2H), 1.36 (d, J = 1.7 Hz, 10H), 1.31 (dd, J = 12.8, 4.3 Hz, 2H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 154.3, 79.5, 41.5, 29.8, 28.6.

HRMS (ESI-TOF) m/z: $[C_{10}H_{19}DN_2O_2+ H]^+$ calcd for $C_{10}H_{20}DN_2O_2$: 202.1666, found: 202.1660.

tert-Butyl 4-amino-3-(4-chlorophenyl)butanoate-4,4-d_2 hydrochloride (2ar):



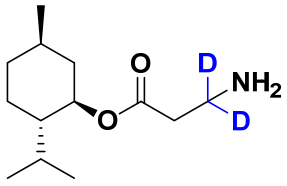
The title product was prepared according to the general procedure A and isolated as white solid about 55.2 mg (90%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 8.05 (s, 3H), 7.36 (dd, J = 8.5, 2.0 Hz, 2H), 7.31 (dd, J = 8.5, 2.0 Hz, 2H), 3.33 – 3.26 (m, 1H), 2.79 (ddd, J = 15.7, 5.3, 1.9 Hz, 1H), 2.53 – 2.47 (m, 1H), 1.18 (d, J = 1.9 Hz, 9H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 170.5, 139.4, 132.4, 130.6, 129.0, 80.5, 39.4, 39.3, 28.1.

HRMS (ESI-TOF) m/z: $[C_{14}H_{18}D_2ClNO_2+ H]^+$ calcd for $C_{14}H_{19}D_2ClNO_2$: 272.1386, found: 272.1381.

(1*R*,2*S*,5*R*)-2-Isopropyl-5-methylcyclohexyl 3-aminopropanoate-3,3-d_2 (2as):



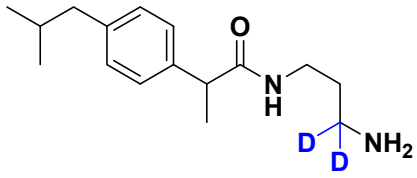
The title product was prepared according to the general procedure A and isolated as white solid about 46.6 mg (88%).

^{1}H NMR (400 MHz, CHLOROFORM-*D*) δ 4.71 – 4.67 (m, 1H), 2.52 (s, 2H), 1.95 (d, *J* = 6.9 Hz, 2H), 1.81 (q, *J* = 7.2 Hz, 1H), 1.71 – 1.62 (m, 2H), 1.46 (dtt, *J* = 12.0, 6.1, 3.1 Hz, 1H), 1.41 – 1.31 (m, 1H), 1.07 – 0.93 (m, 2H), 0.92 – 0.82 (m, 7H), 0.73 (dd, *J* = 7.0, 1.9 Hz, 3H).

^{13}C NMR (101 MHz, CHLOROFORM-*D*) δ 171.9, 74.8, 47.0, 41.0, 34.3, 31.5, 26.4, 23.5, 22.1, 20.8, 16.4.

HRMS (ESI-TOF) m/z: $[C_{13}H_{23}D_2NO_2+ H]^+$ calcd for $C_{13}H_{24}D_2NO_2$: 230.2089, found: 230.2084.

_N_-(3-Aminopropyl-3,3-_d_$_2$)-2-(4-isobutylphenyl)propanamide (2at):

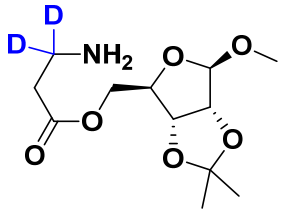


The title product was prepared according to the general procedure A and isolated as white solid about 55.2 mg (92%).

^{1}H NMR (400 MHz, DMSO-D_6) δ 7.84 (t, *J* = 6.0 Hz, 1H), 7.16 (dd, *J* = 8.1, 2.0 Hz, 2H), 7.02 (dd, *J* = 8.1, 2.1 Hz, 2H), 3.59 – 3.42 (m, 1H), 3.01 (p, *J* = 6.7 Hz, 2H), 2.35 (dd, *J* = 7.1, 2.1 Hz, 2H), 1.75 (dtt, *J* = 14.3, 7.7, 3.8 Hz, 1H), 1.36 (t, *J* = 7.0 Hz, 2H), 1.25 (dd, *J* = 7.0, 2.0 Hz, 3H), 0.81 (dd, *J* = 6.7, 2.0 Hz, 6H).

^{13}C NMR (101 MHz, DMSO-D_6) δ 173.8, 140.2, 139.7, 129.3, 127.4, 45.3, 44.8, 36.7, 33.3, 30.2, 22.7, 19.2.
HRMS (ESI-TOF) m/z: $[C_{16}H_{24}D_2N_2O+ H]^+$ calcd for $C_{16}H_{25}D_2N_2O$: 265.2249, found: 265.2243.

((3a*R*,4*R*,6*R*,6a*R*)-6-Methoxy-2,2-dimethyltetrahydrofuro[3,4-*d*][1,3]dioxol-4-yl)methyl 3-aminopropanoate-3,3-_d_$_2$ (2au):



The title product was prepared according to the general procedure A and isolated as white solid about 50 mg (80%).

^{1}H NMR (400 MHz, CHLOROFORM-*D*) δ 4.96 (d, *J* = 3.3 Hz, 1H), 4.87 – 4.75 (m, 1H), 4.63 – 4.53 (m, 1H), 4.43 (d, *J* = 3.3 Hz, 1H), 3.67 (s, 1H), 3.62 (d, *J* = 3.4 Hz, 1H), 3.43 (d, *J* = 3.2 Hz, 3H), 3.31 (d, *J* = 3.4 Hz, 1H), 1.47 (s, 3H), 1.31 (s, 3H).
^{13}C NMR (101 MHz, CHLOROFORM-*D*) δ 169.0, 110.1, 110.0, 88.5, 85.9, 81.6, 64.1, 55.6, 33.6, 26.4, 24.9, 24.8.

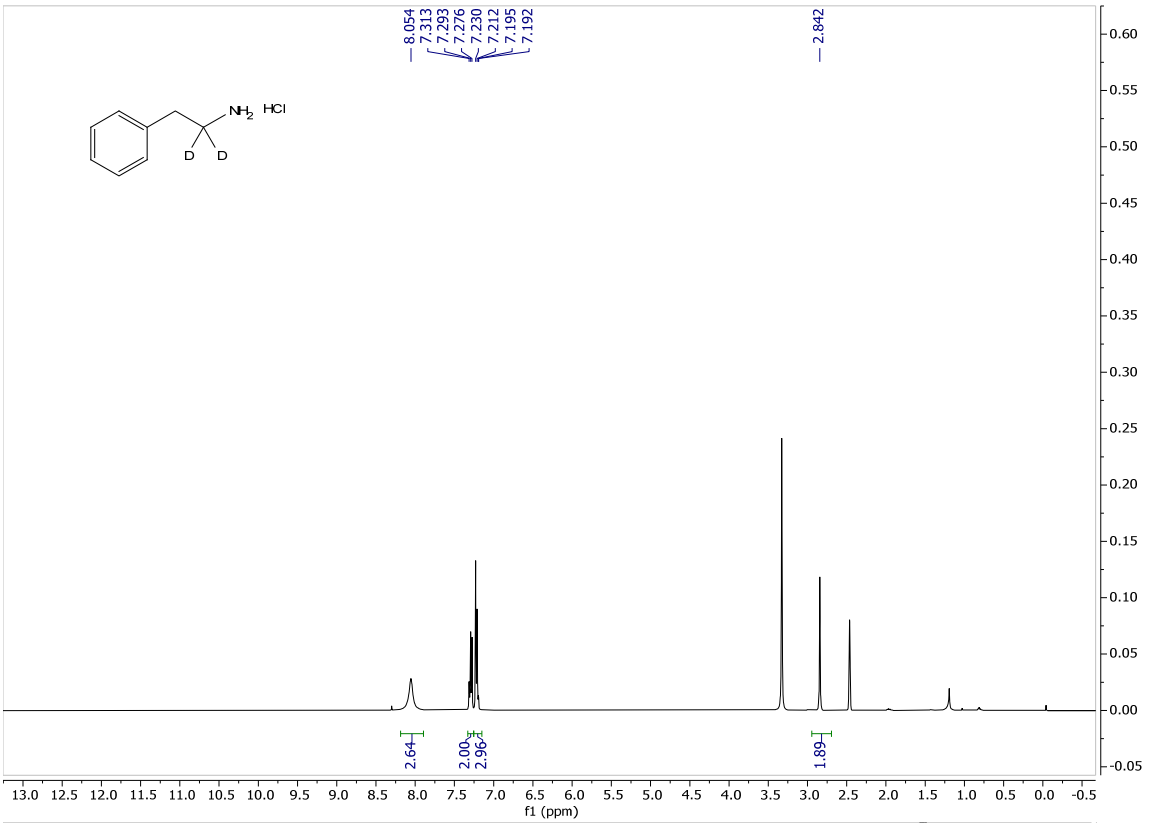
HRMS (ESI-TOF) m/z: $[C_{12}H_{19}D_2NO_6 + H]^+$ calcd for $C_{12}H_{20}D_2NO_6$: 278.1573, found: 278.1567.

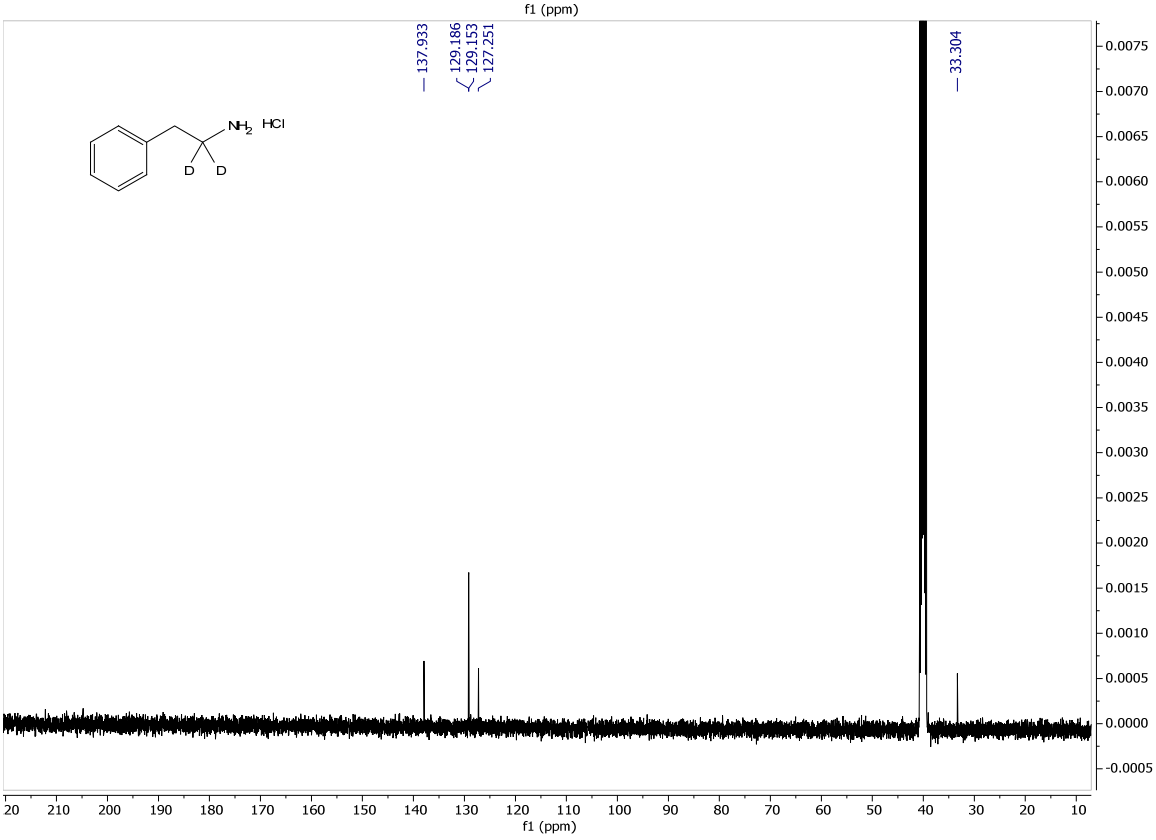
5. References

1. Y. Ding, S. Luo, A. Adijiang, H. Zhao and J. An, *J. Org. Chem.*, 2018, **83**, 12269-12274.
2. Y. Ding, S. Luo, C. Weng and J. An, *J. Org. Chem.*, 2019, **84**, 15098-15105.
3. L. Ning, H. Li, Z. Lai, M. Szostak, X. Chen, Y. Dong, S. Jin and J. An, *J. Org. Chem.*, 2021, **86**, 2907-2916.
4. S. Luo, C. Weng, Z. Qin, K. Li, T. Zhao, Y. Ding, C. Ling, Y. Ma and J. An, *J. Org. Chem.*, 2021, **86**, 11862-11870.

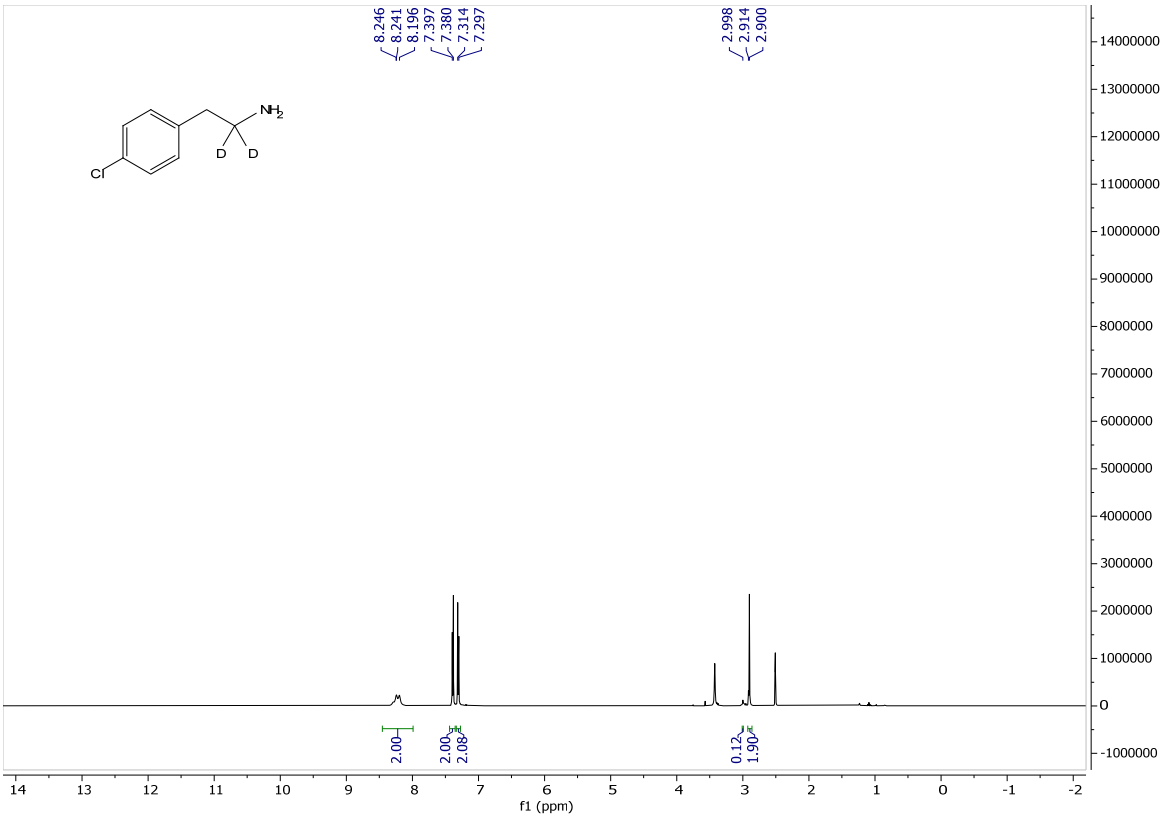
6. ^{1}H and ^{13}C NMR Spectra

2a





2b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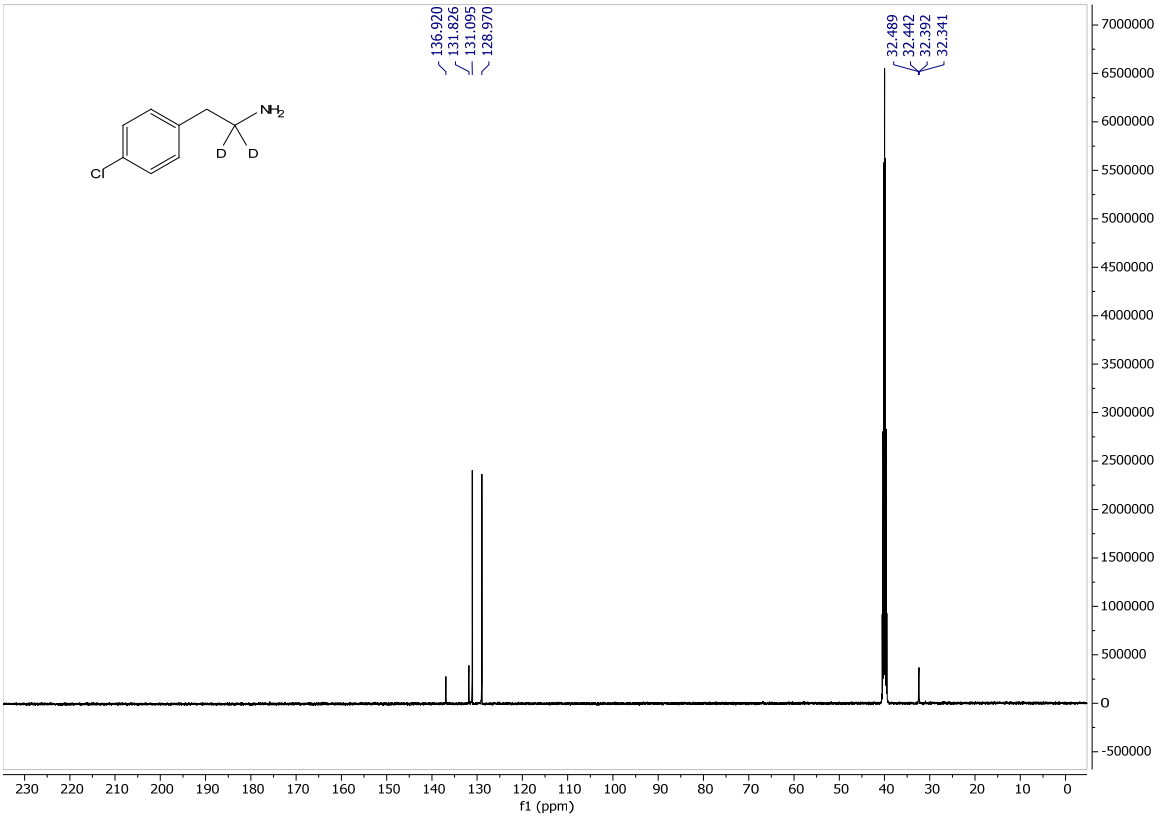
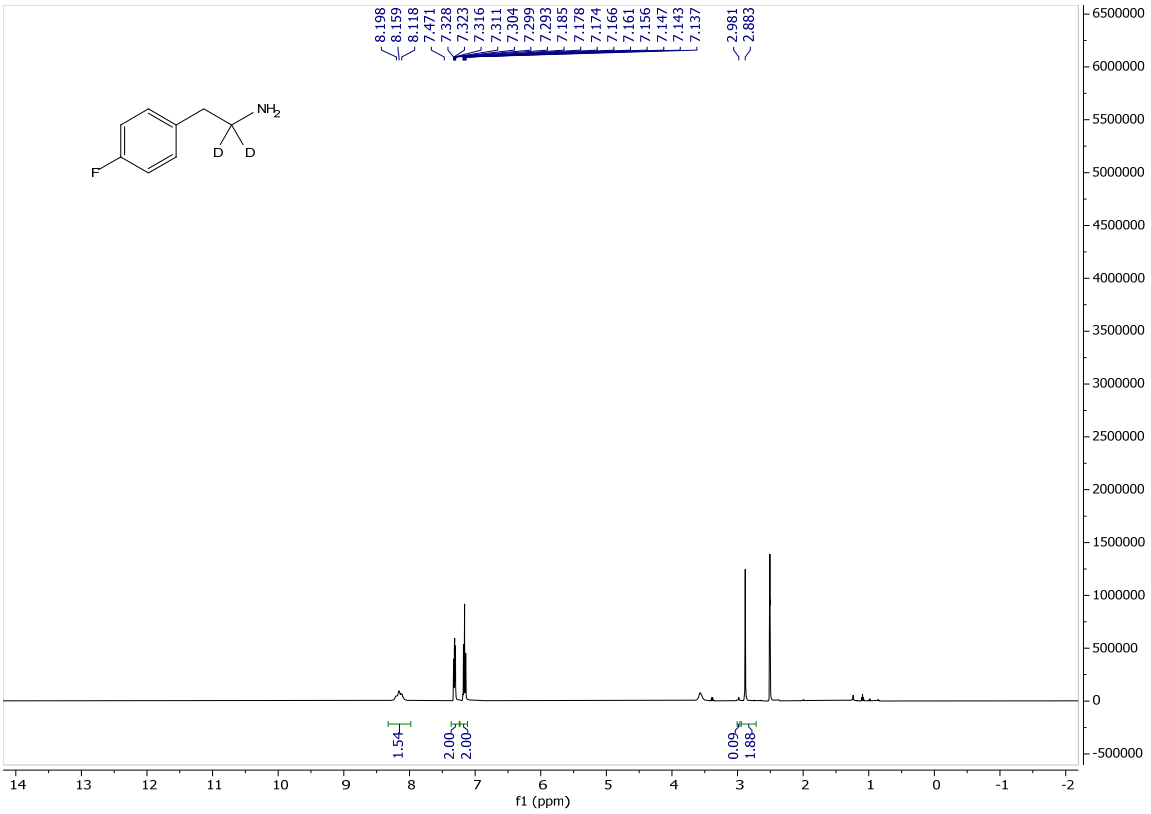
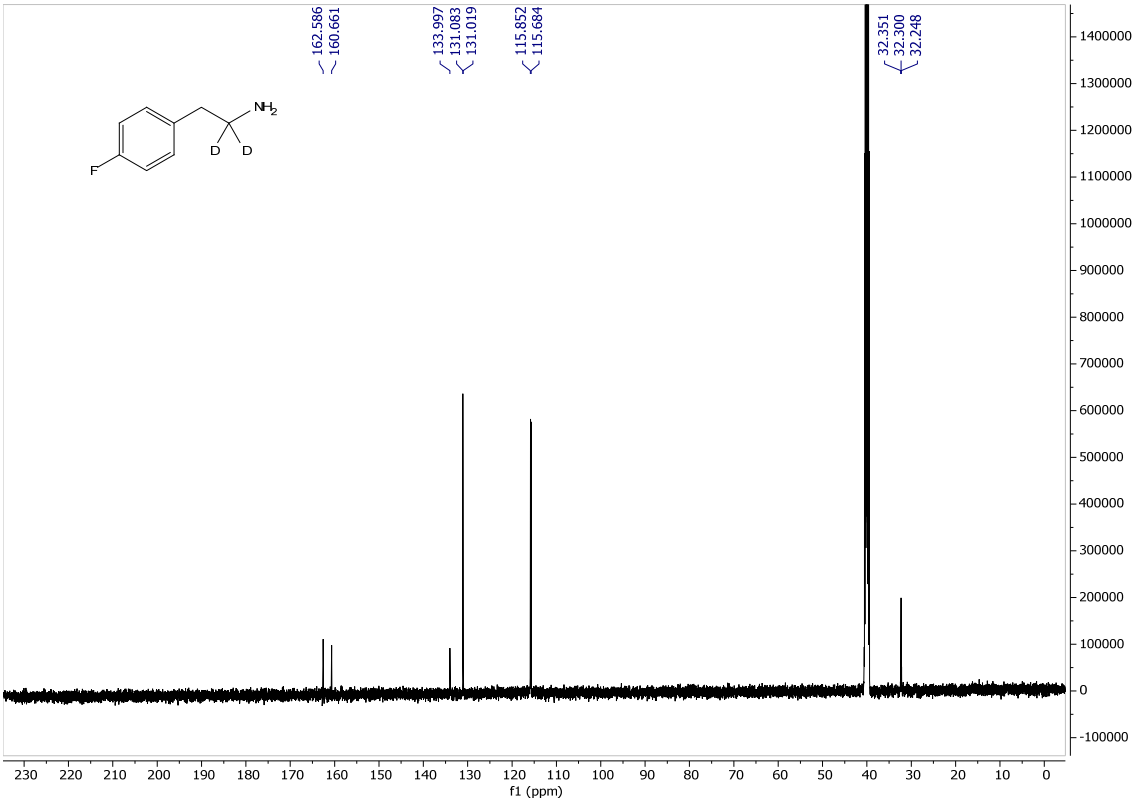
8.241
8.196
7.397
7.380
7.314
7.297
2.998
2.914
2.900
NH2
D
D
Cl
2.00
2.00
2.08
0.12
1.90
f1 (ppm)

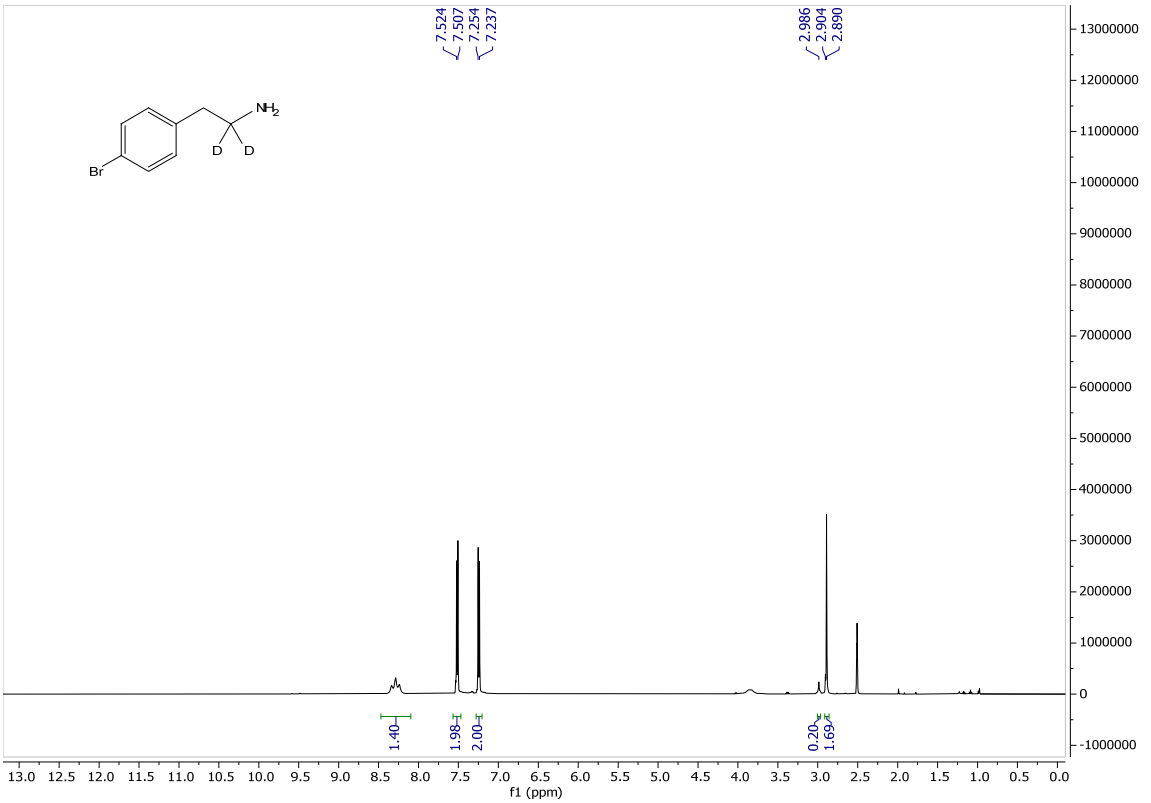

136.920
131.826
131.095
128.970
32.489
32.442
32.392
32.341
NH2
D
D
Cl
f1 (ppm)

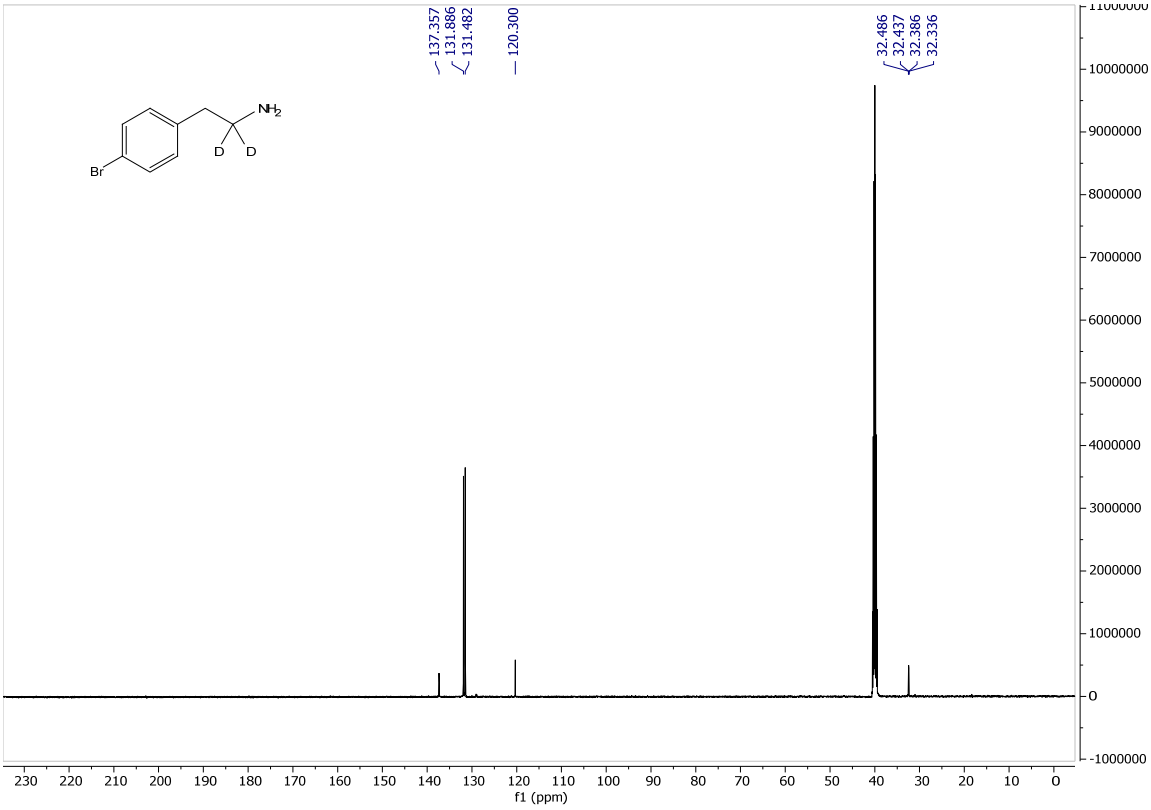
2c


8.198
8.159
8.118
7.471
7.328
7.323
7.316
7.311
7.304
7.299
7.293
7.185
7.178
7.174
7.166
7.161
7.156
7.147
7.143
7.137
2.981
2.883
NH2
D
D
F
1.54
2.00
2.00
0.09
1.88
f1 (ppm)

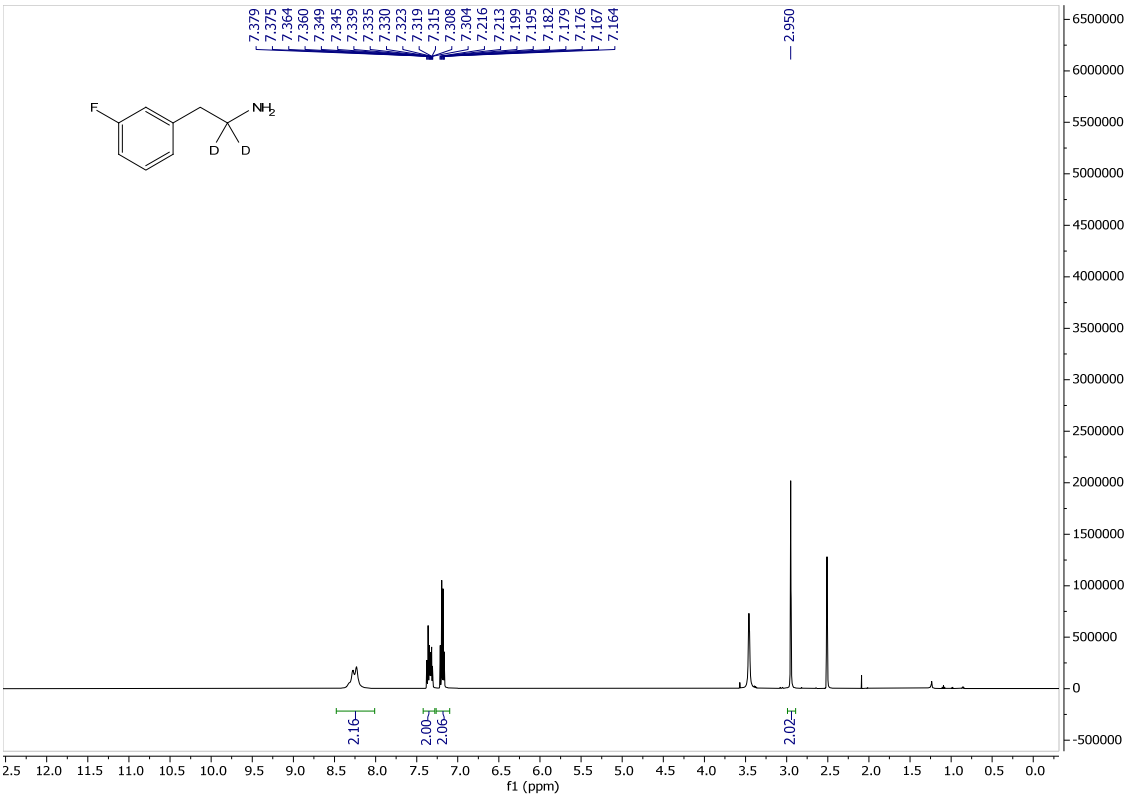

162.586
160.661
133.997
131.083
131.019
115.852
115.684
32.351
32.300
32.248
NH2
D
D
F
f1 (ppm)

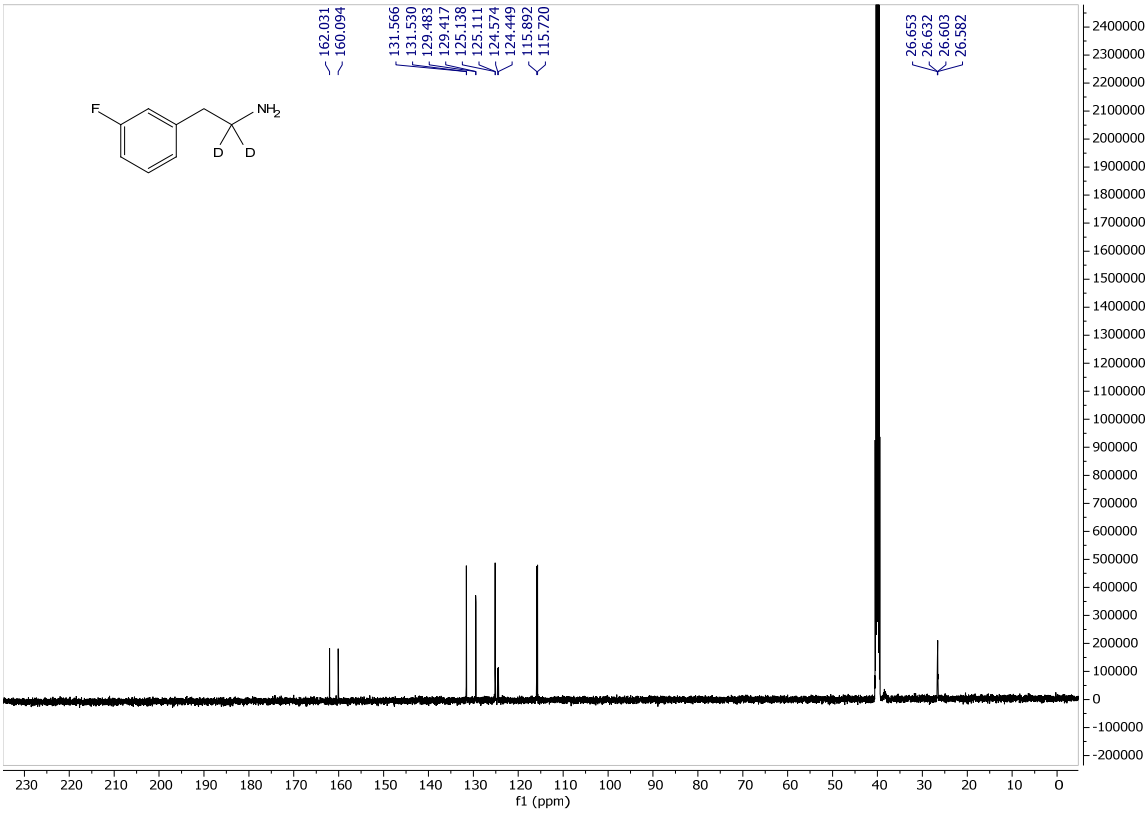
2d


7.524
7.507
7.254
7.237
2.986
2.904
2.890
NH2
D
D
Br
1.40
1.98
2.00
0.20
1.69
f1 (ppm)


137.357
131.886
131.482
120.300
32.486
32.437
32.386
32.336
NH2
D
D
Br
f1 (ppm)

2e


7.379
7.375
7.364
7.360
7.349
7.345
7.339
7.335
7.330
7.323
7.319
7.315
7.308
7.304
7.216
7.213
7.199
7.195
7.182
7.179
7.176
7.167
7.164
2.950
F
NH2
D
D
2.16
2.00
2.06
2.02
f1 (ppm)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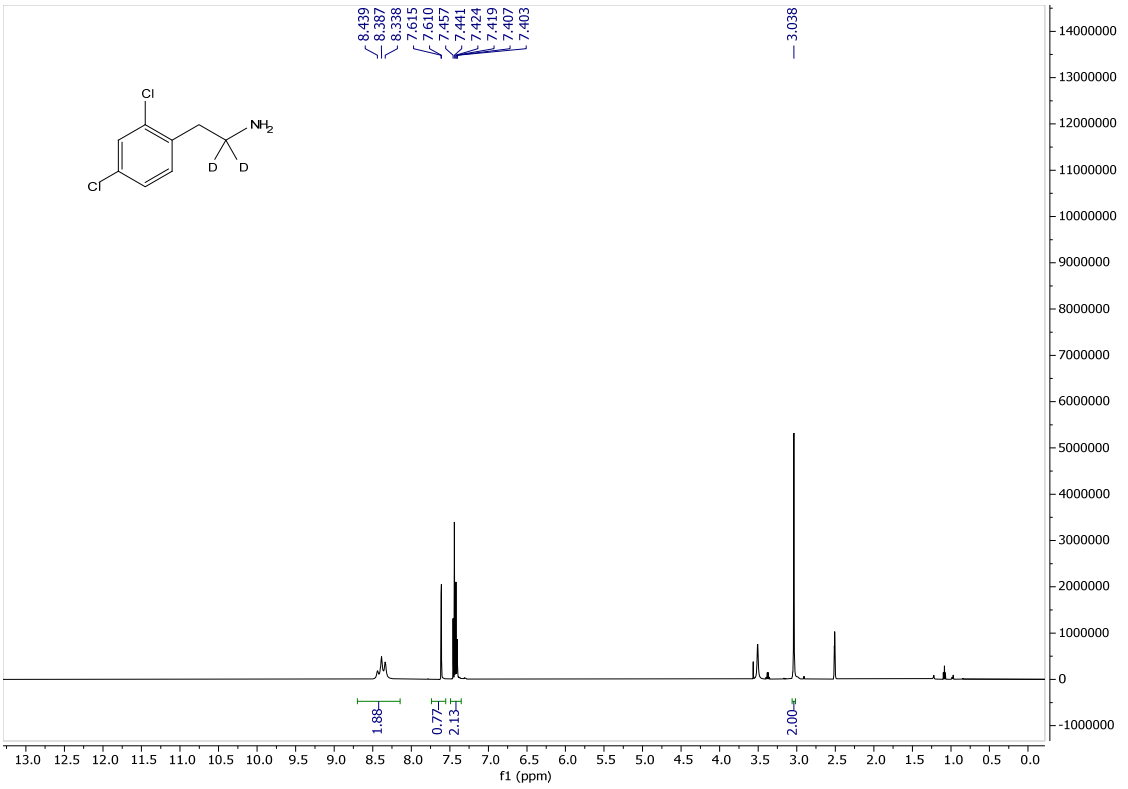
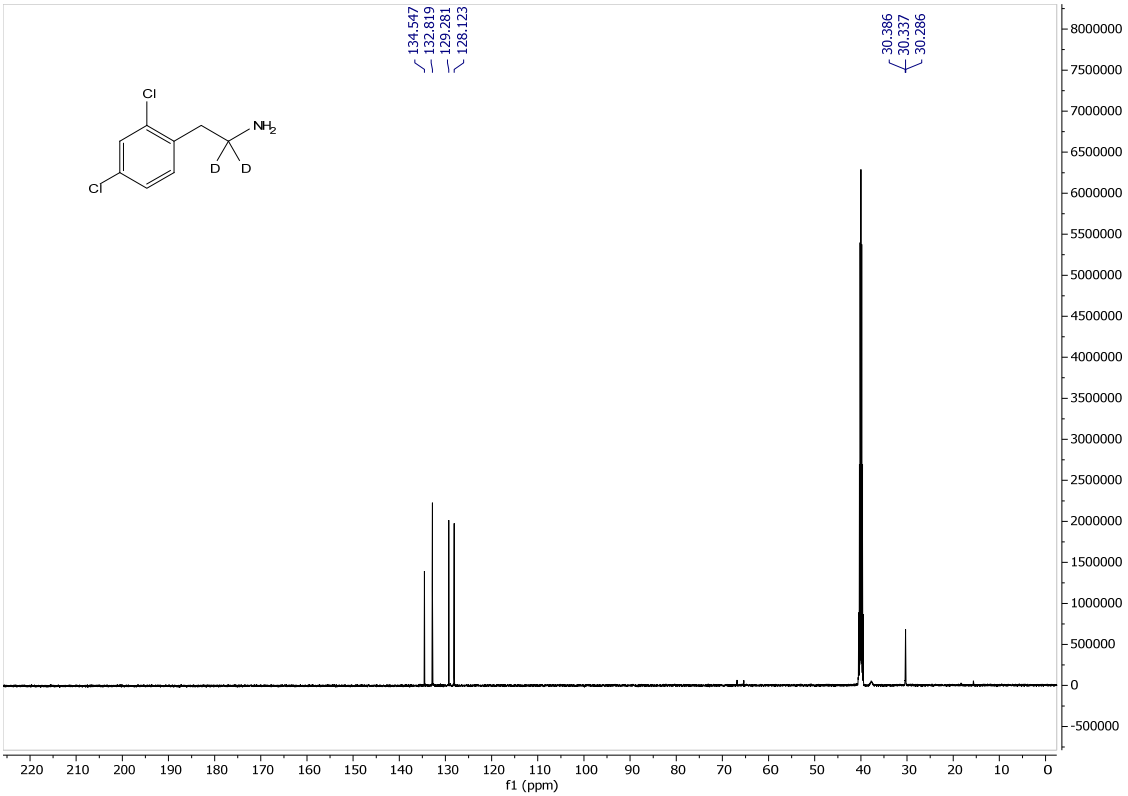
160.094
131.566
131.530
129.483
129.417
125.138
125.111
124.574
124.449
115.892
115.720
26.653
26.632
26.603
26.582
F
NH2
D
D
f1 (ppm)

2f


8.439
8.387
8.338
7.615
7.610
7.457
7.441
7.424
7.419
7.407
7.403
3.038
Cl
NH2
D
D
Cl
1.88
0.77
2.13
2.00
f1 (ppm)


134.547
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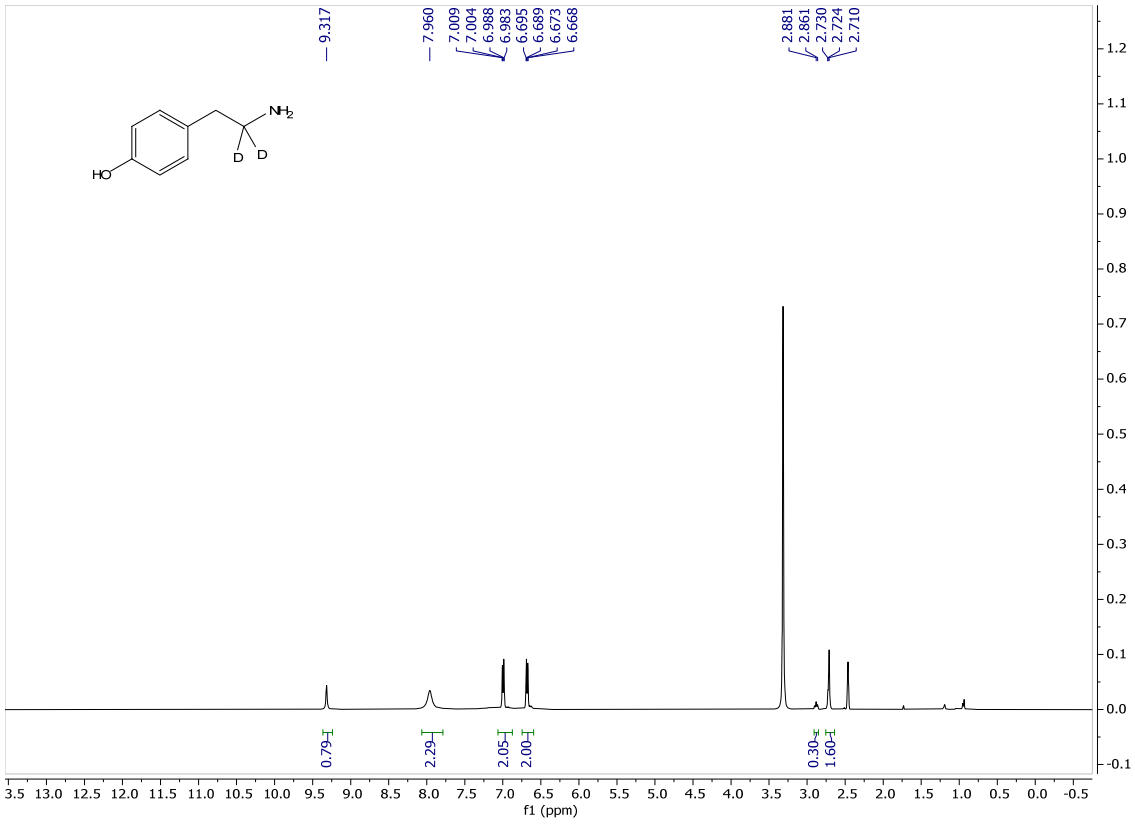
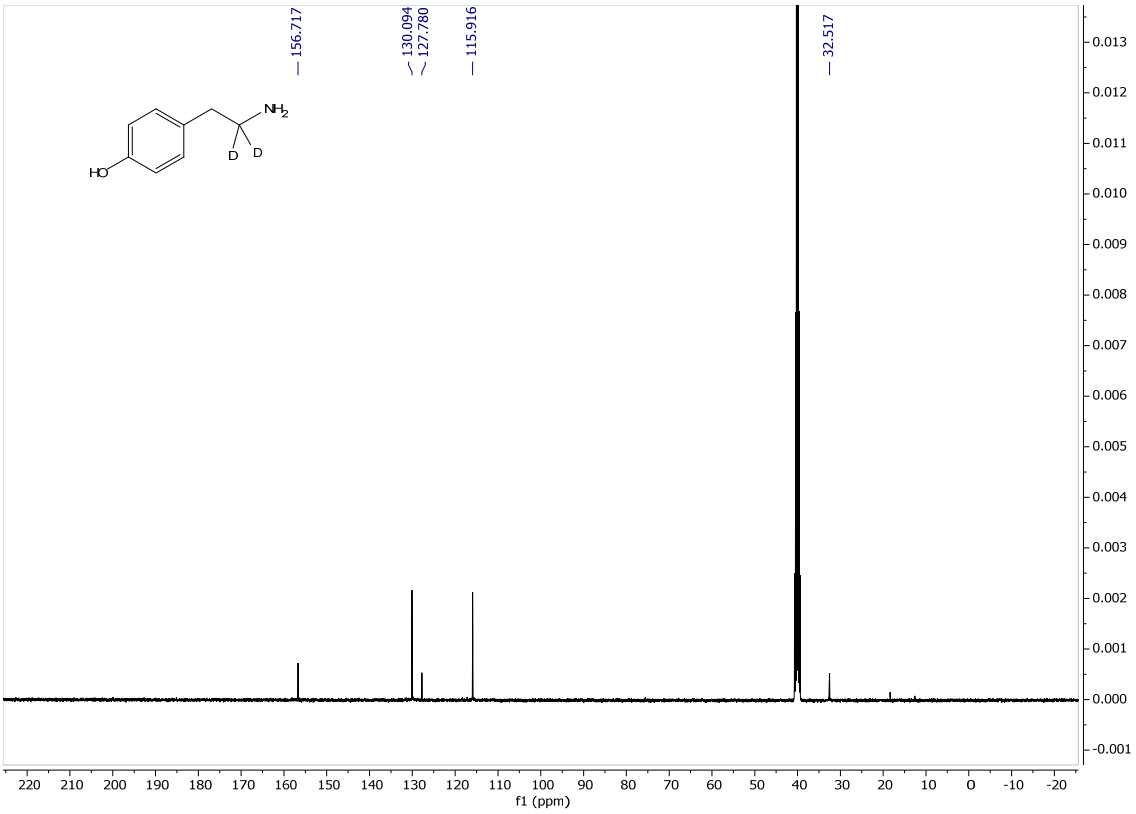
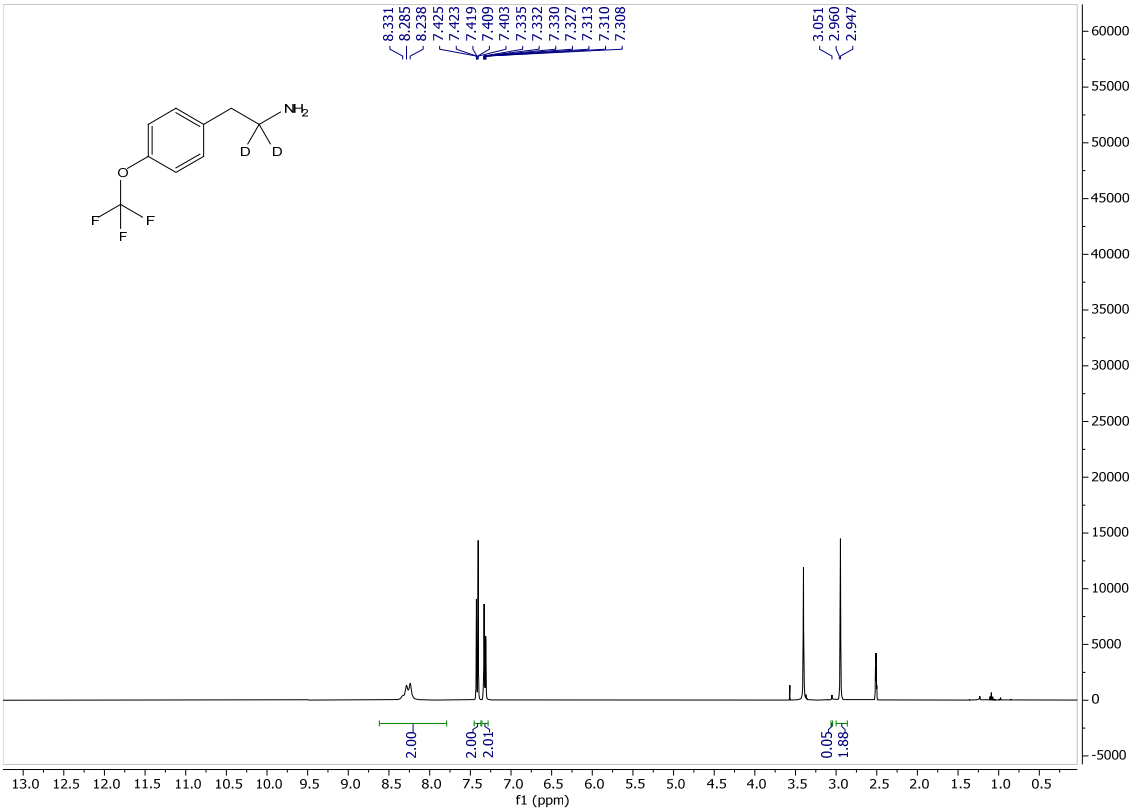
128.123
30.386
30.337
30.286
Cl
NH2
D
D
Cl
f1 (ppm)

2g


9.317
7.960
7.009
7.004
6.988
6.983
6.695
6.689
6.673
6.668
2.881
2.861
2.730
2.724
2.710
NH2
D
D
HO
0.79
2.29
2.05
2.00
0.30
1.60
f1 (ppm)


156.717
130.094
127.780
115.916
32.517
NH2
D
D
HO
f1 (ppm)

2h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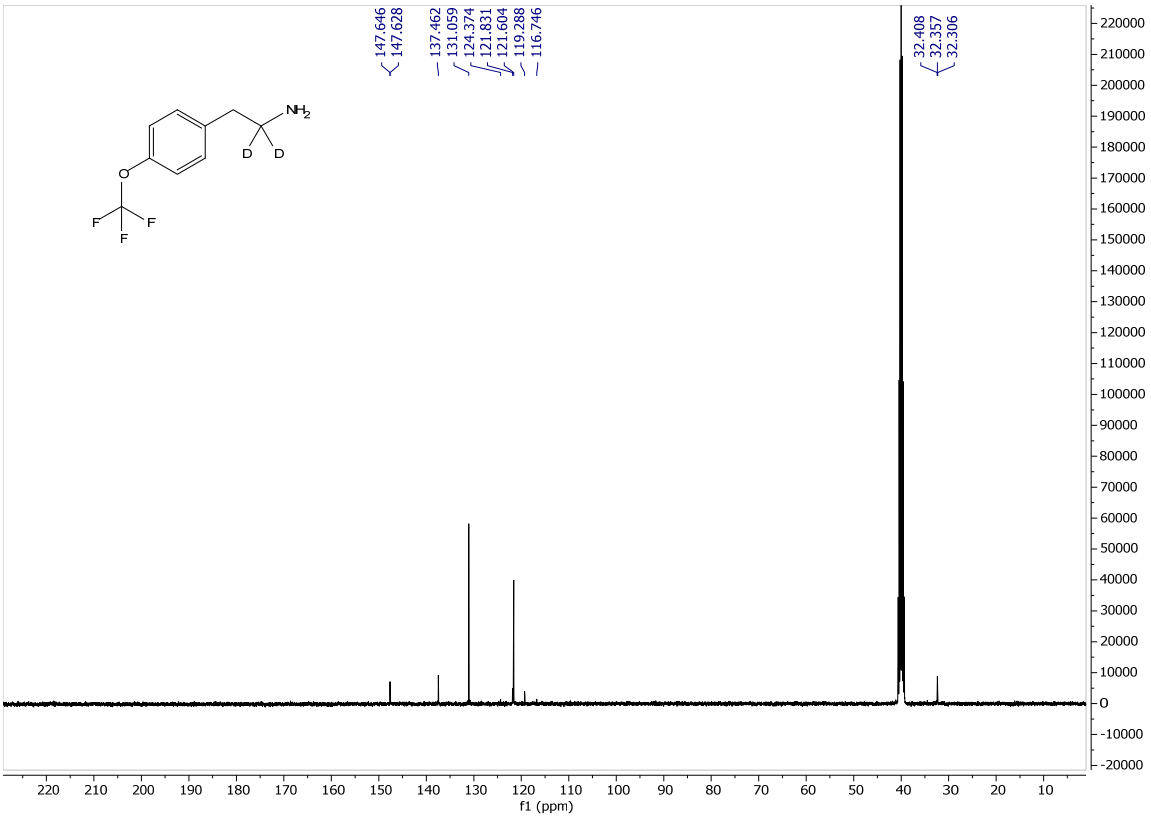
8.285
8.238
7.425
7.423
7.419
7.409
7.403
7.335
7.332
7.330
7.327
7.313
7.310
7.308
3.051
2.960
2.947
NH2
D
D
O
F
F
F
2.00
2.00
2.01
0.05
1.88
f1 (ppm)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147.628
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124.374
121.831
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119.288
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32.408
32.357
32.306
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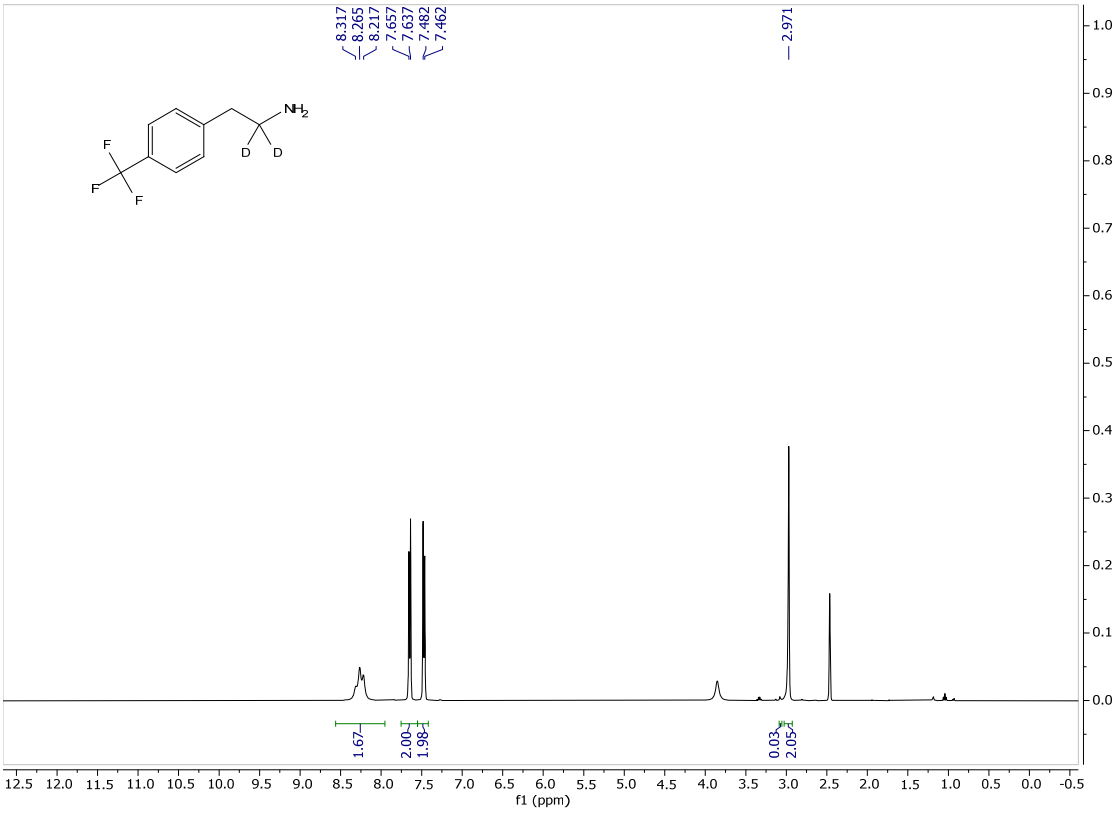
D
D
O
F
F
F
f1 (ppm)

2i


8.317
8.265
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7.657
7.637
7.482
7.462
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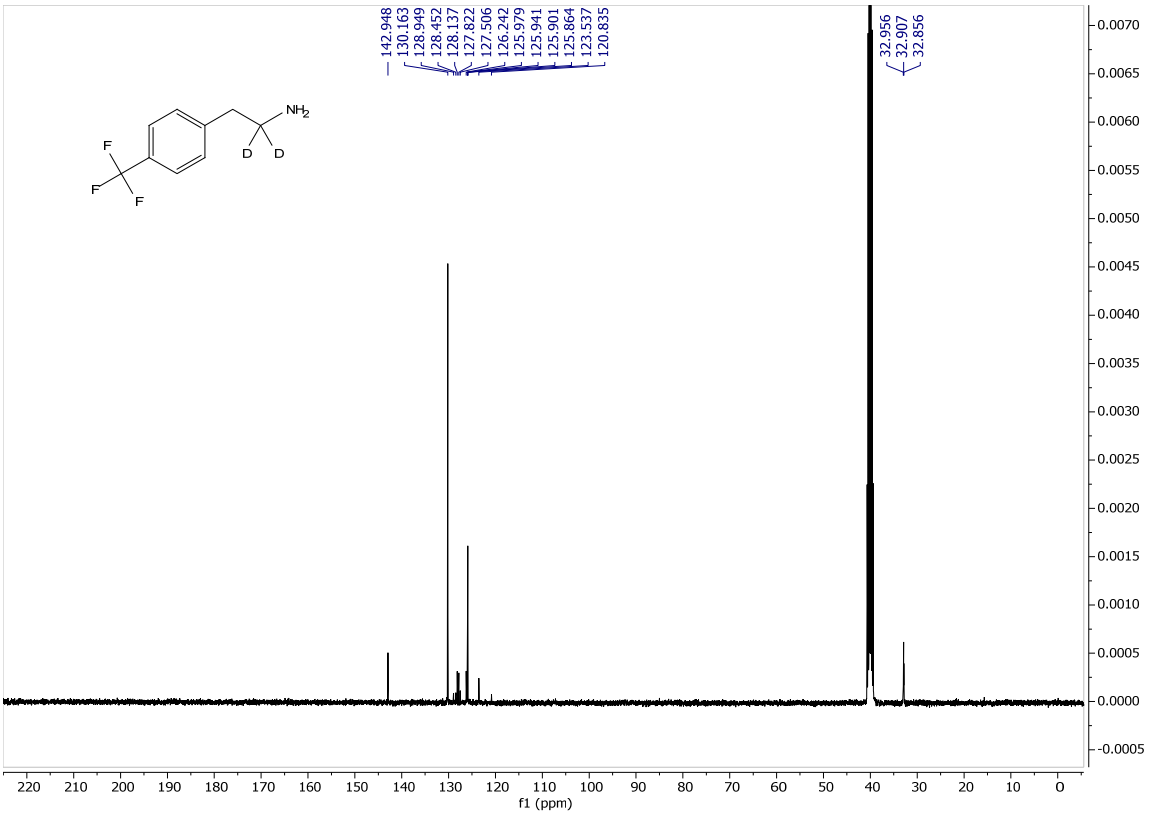
D
D
F
F
F
1.67
2.00
1.98
0.03
2.05
f1 (ppm)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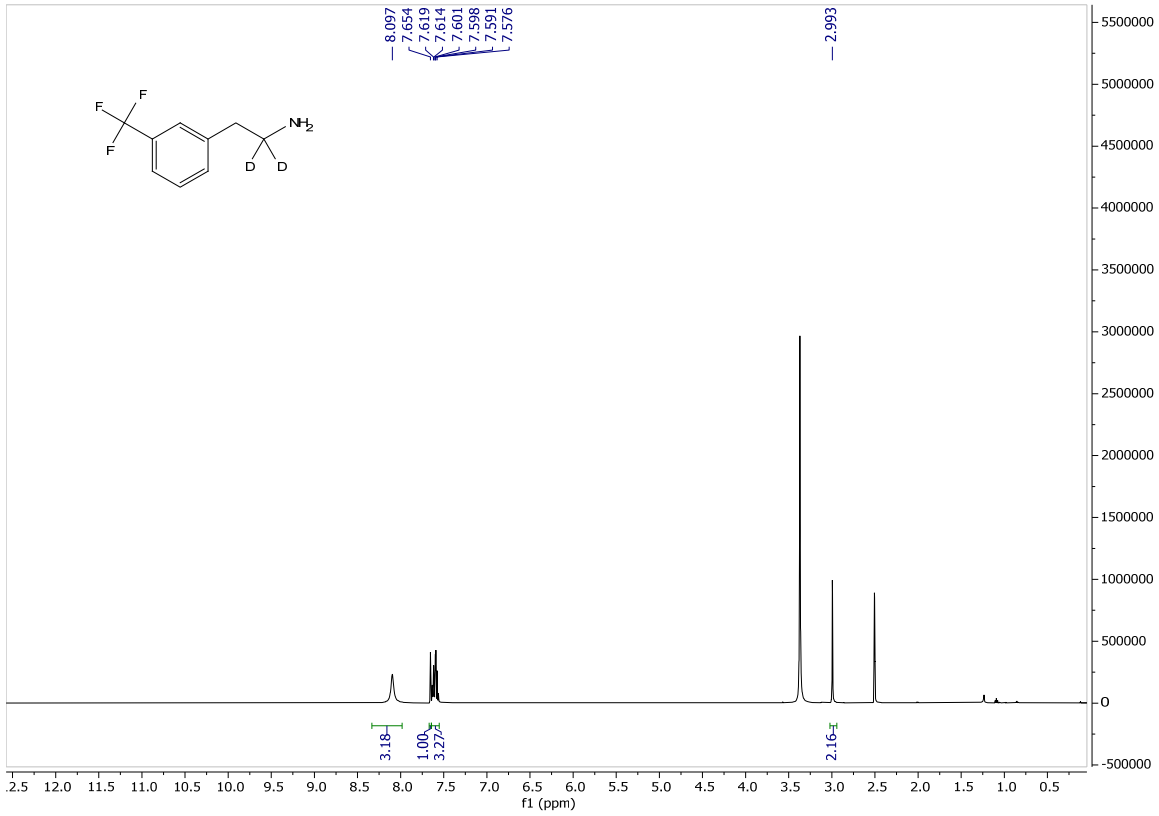
128.137
127.822
127.506
126.242
125.979
125.941
125.901
125.864
123.537
120.835
32.956
32.907
32.856
NH2
D
D
F
F
F
f1 (ppm)

2j


8.097
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7.598
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D
F
F
F
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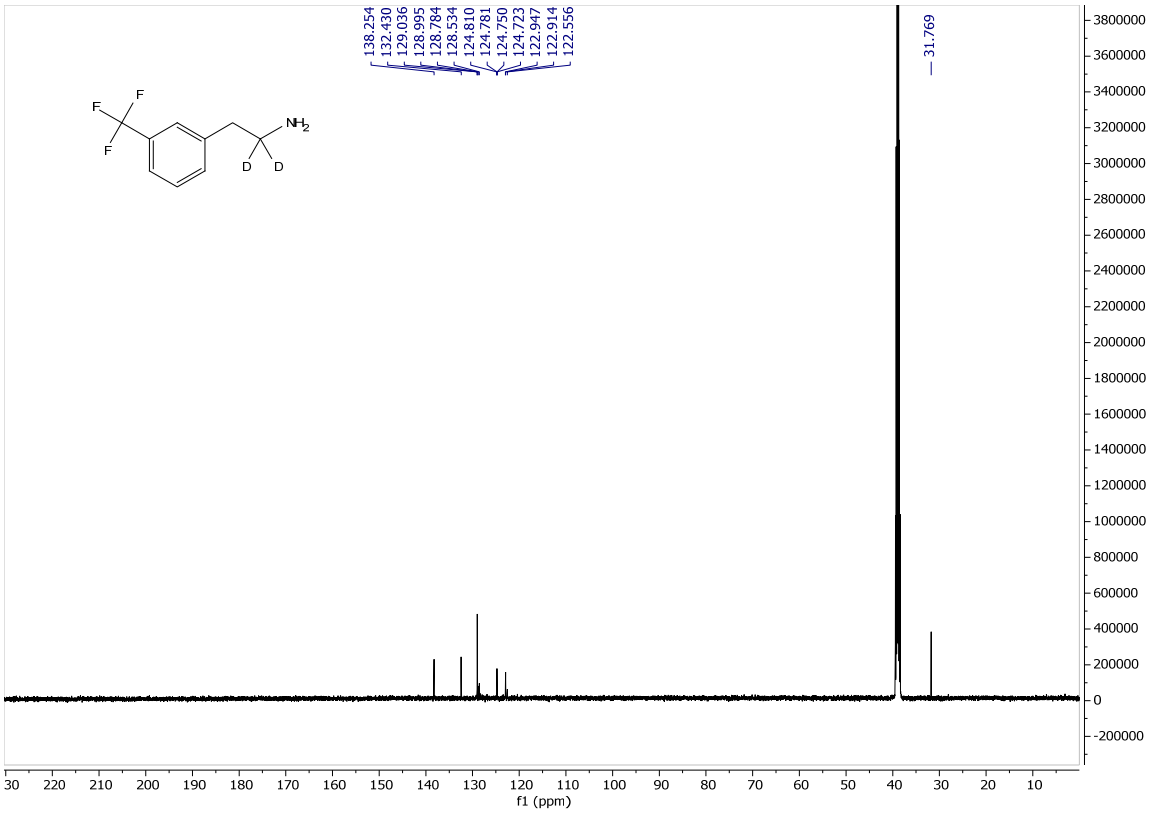
1.00
3.27
2.16
f1 (ppm)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124.723
122.947
122.914
122.556
31.769
F
F
F
NH2
D
D
3800000
3600000
3400000
3200000
3000000
2800000
2600000
2400000
2200000
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
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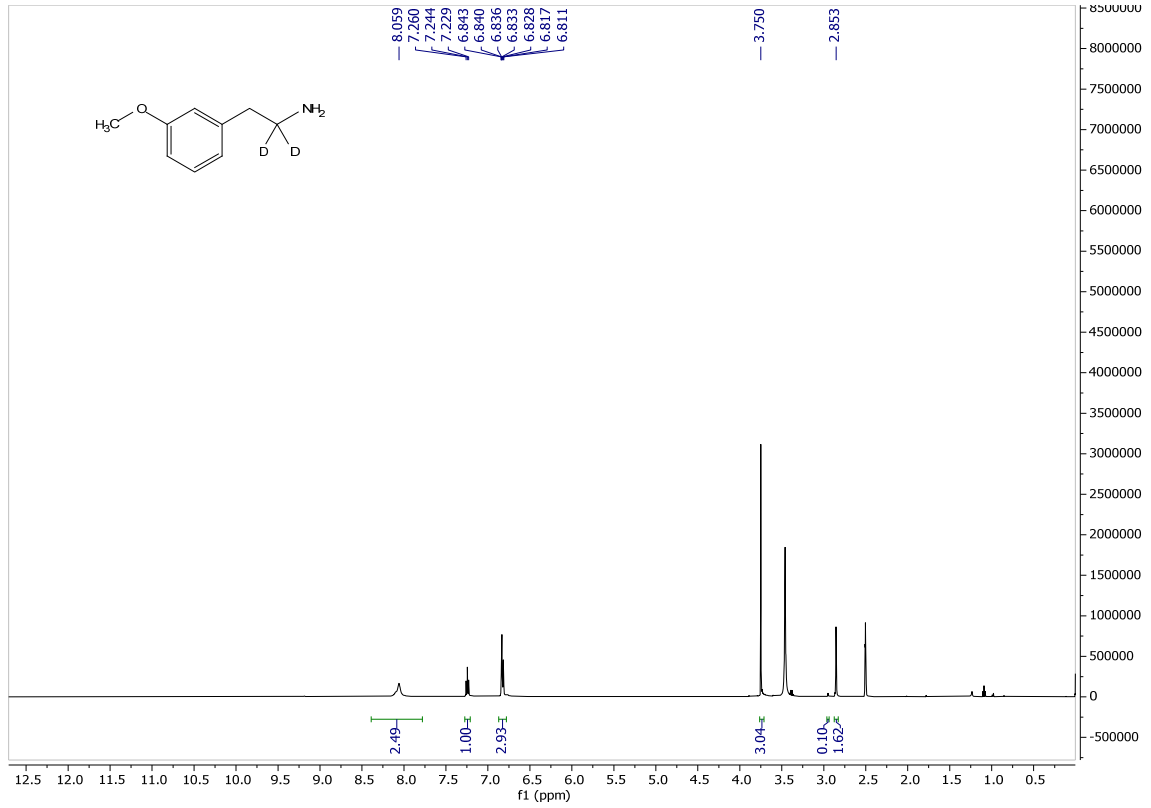
30 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

2k


8.059
7.260
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6.840
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6.833
6.828
6.817
6.811
3.750
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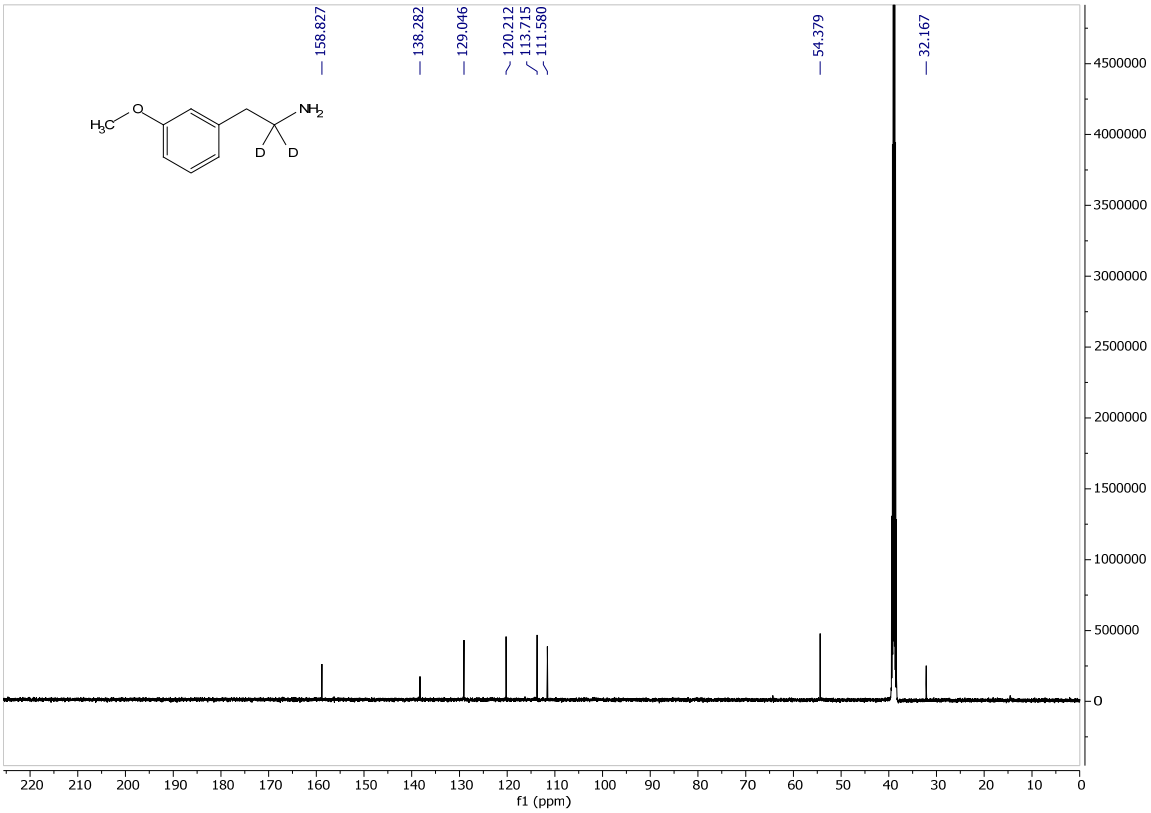
O
H3C
NH2
D
D
2.49
1.00
2.93
3.04
0.10
1.62
f1 (ppm)


158.827
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111.580
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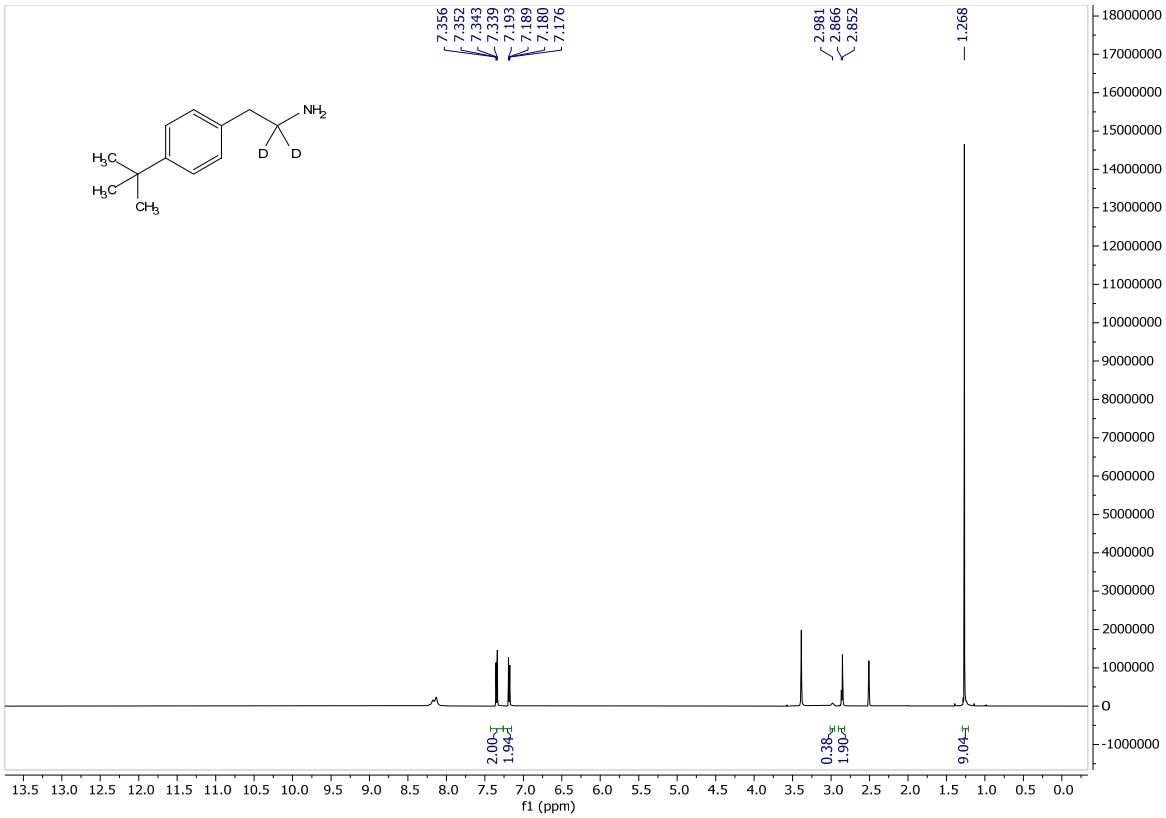
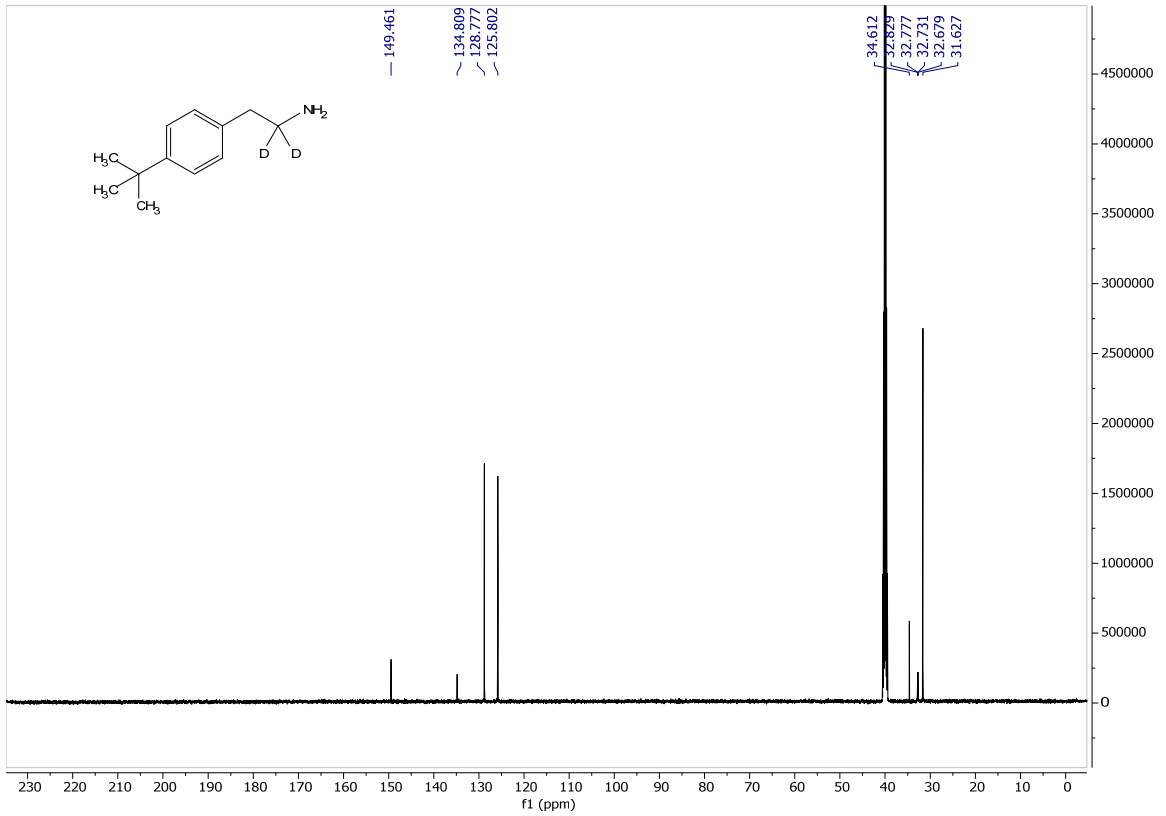
32.167
O
H3C
NH2
D
D
f1 (ppm)

21


7.356
7.352
7.343
7.339
7.193
7.189
7.180
7.176
2.981
2.866
2.852
1.268
NH2
D D
H3C
H3C
CH3
2.00
1.94
0.38
1.90
9.04
f1 (ppm)


149.461
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125.802
34.612
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32.731
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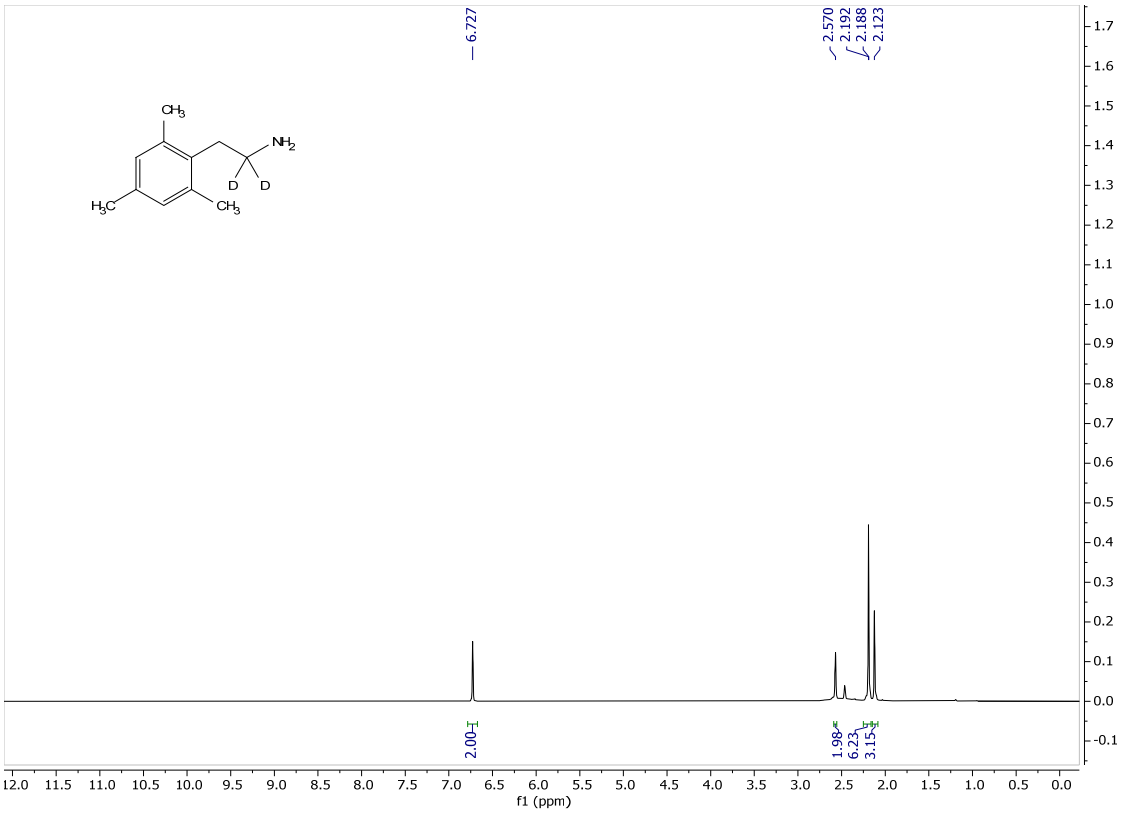
31.627
NH2
D D
H3C
H3C
CH3
f1 (ppm)

2m


6.727
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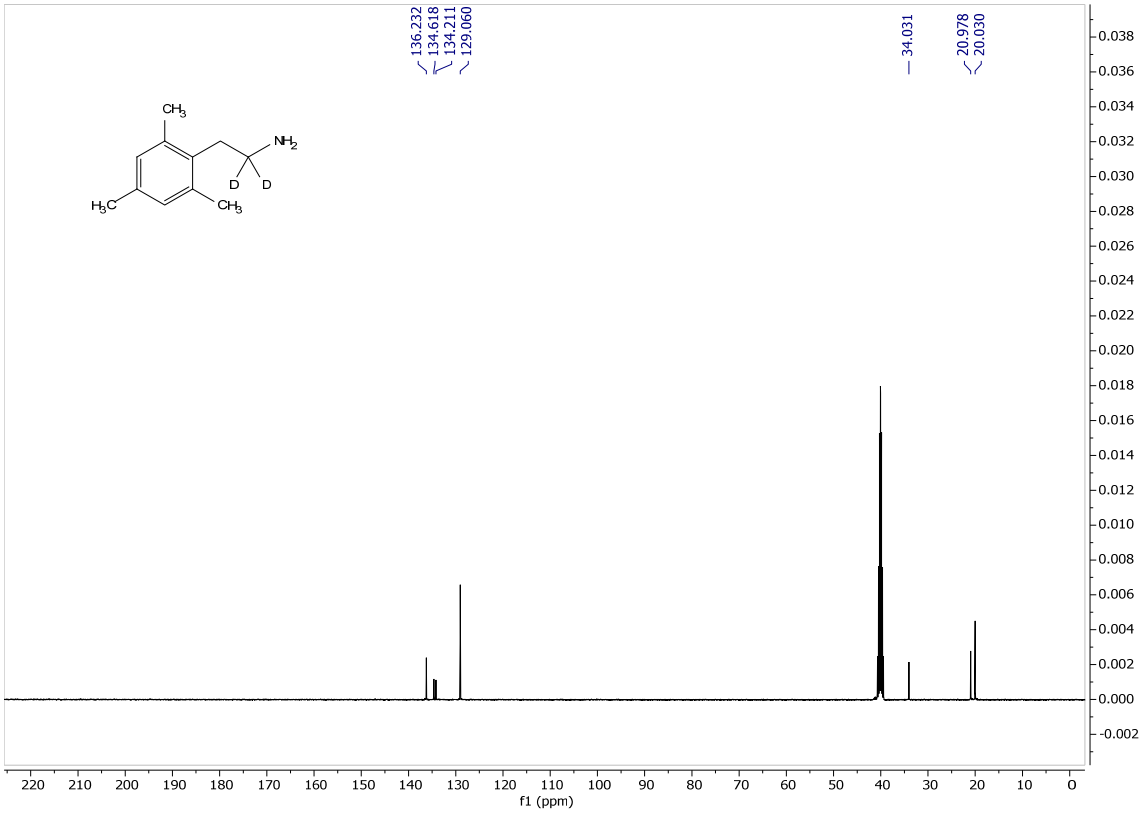
2.123
2.00
1.98
6.23
3.15
f1 (ppm)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34.031
20.978
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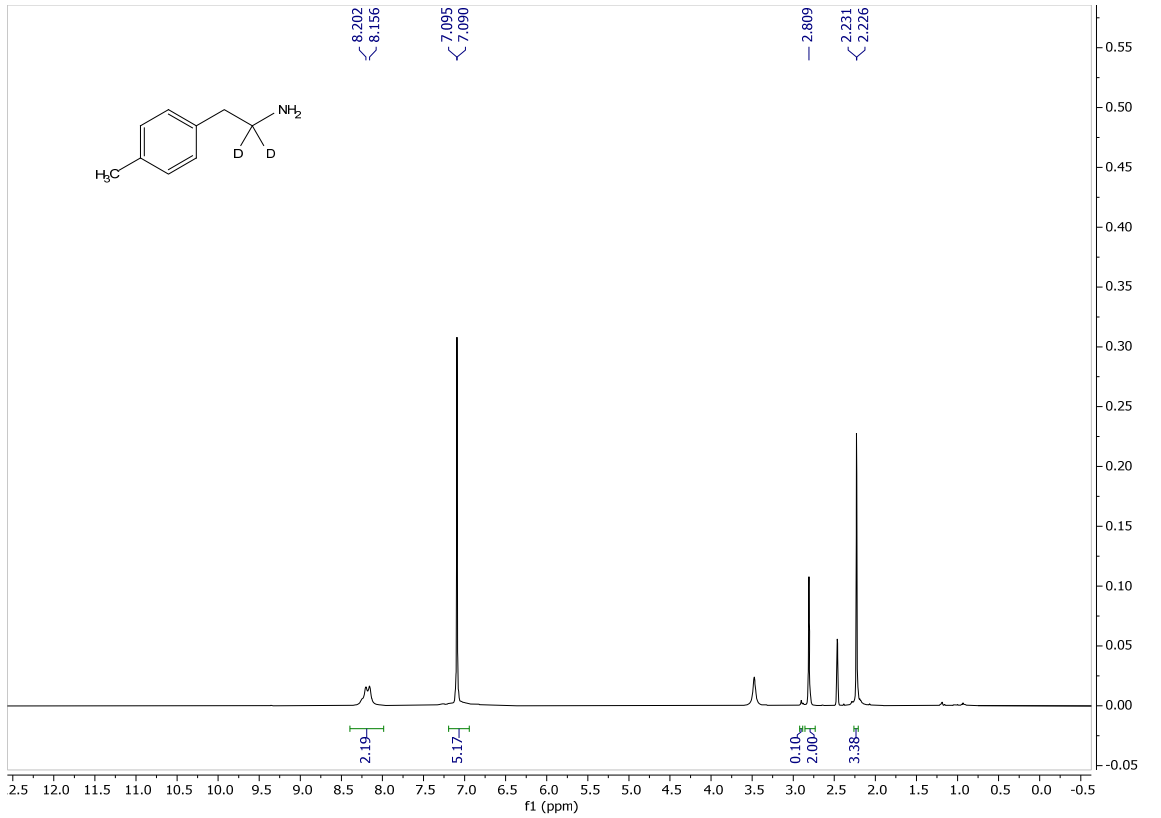
f1 (ppm)

2n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8.156
7.095
7.090
2.809
2.231
2.226
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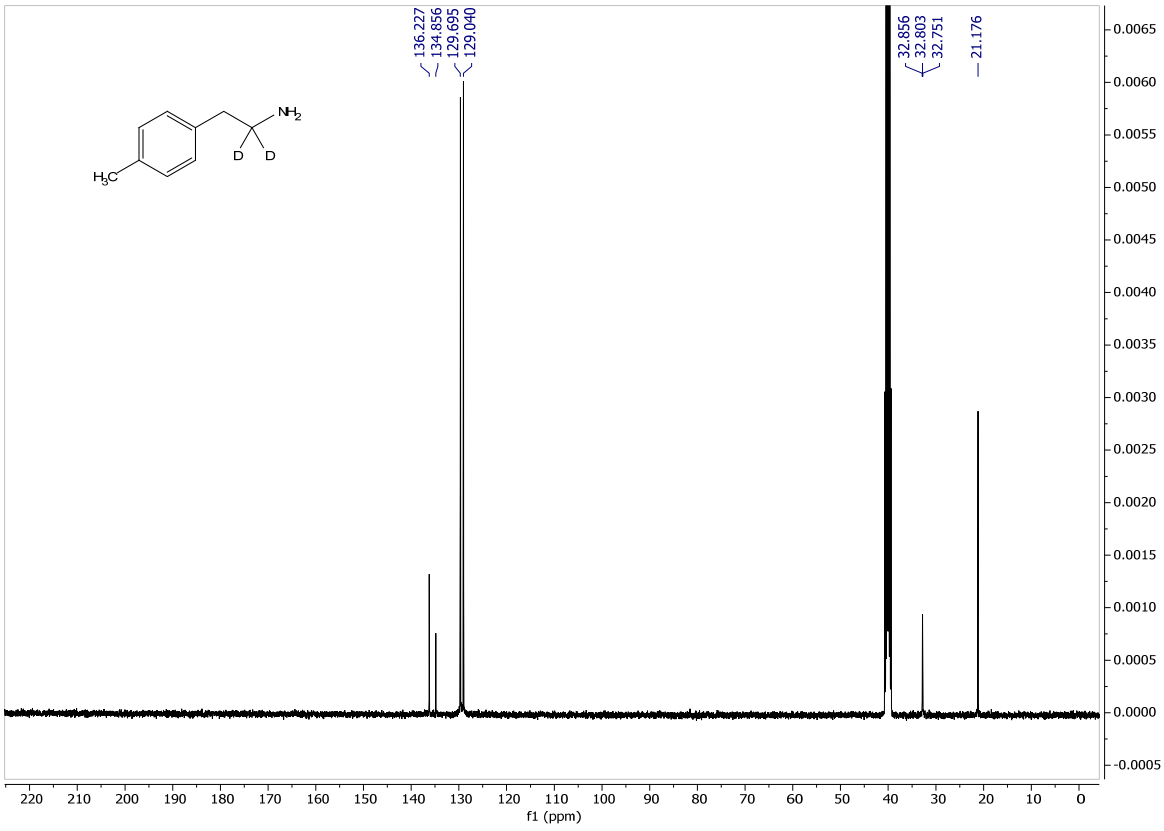
D
H3C
2.19
5.17
0.10
2.00
3.38
f1 (ppm)


136.227
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32.856
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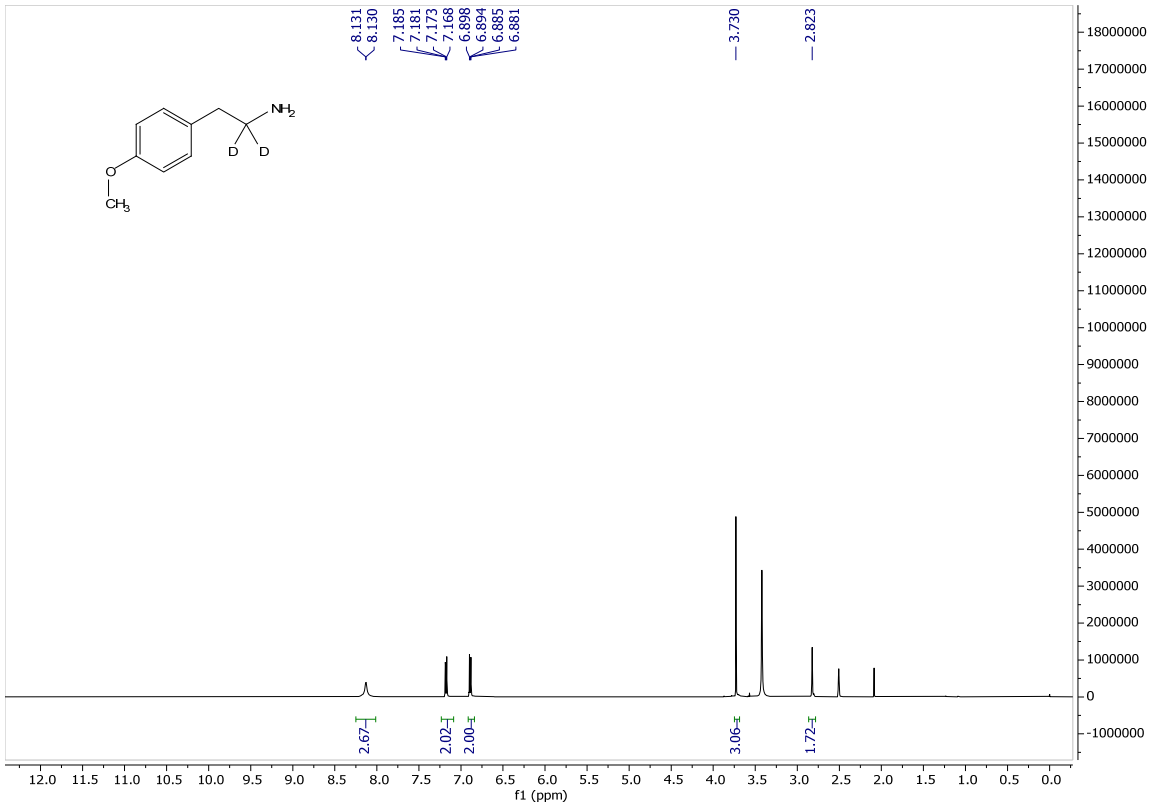
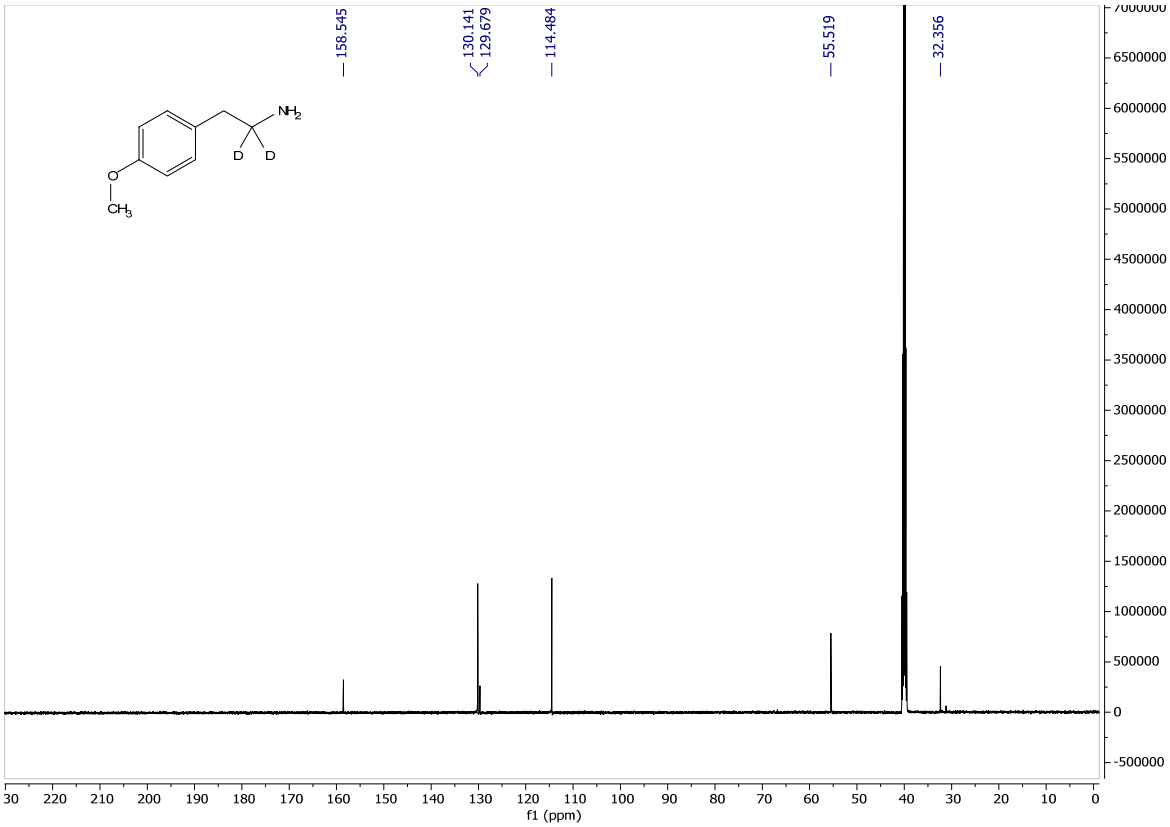
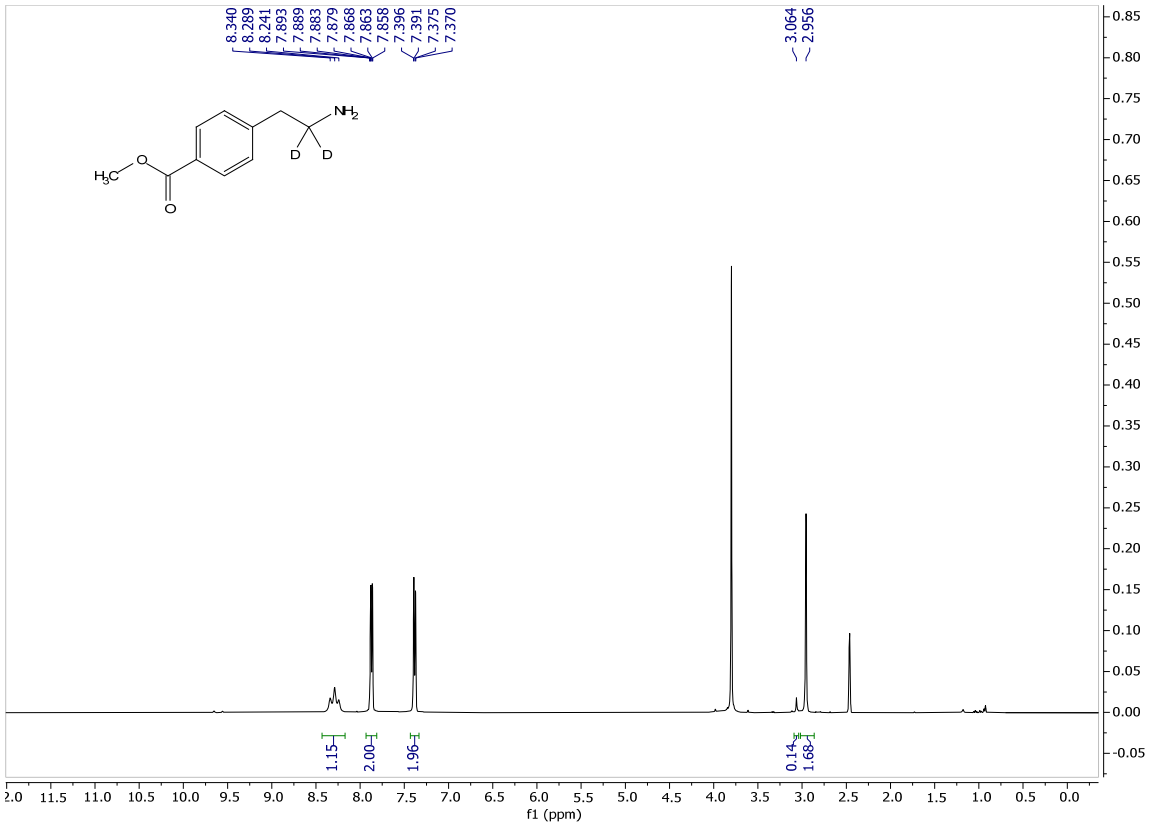
32.751
21.176
NH2
D
D
H3C
f1 (ppm)

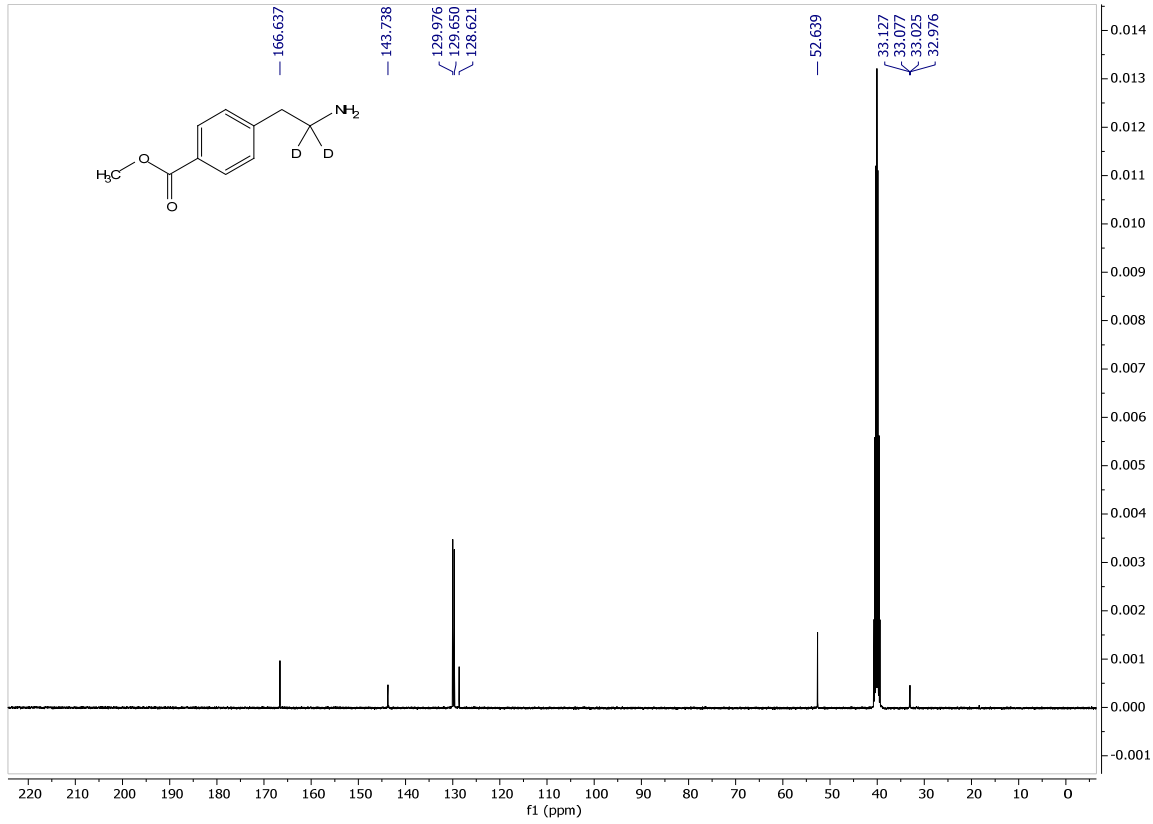
2o


8.131
8.130
7.185
7.181
7.173
7.168
6.898
6.894
6.885
6.881
3.730
2.823
NH2
D
D
O
CH3
2.67
2.02
2.00
3.06
1.72
f1 (ppm)

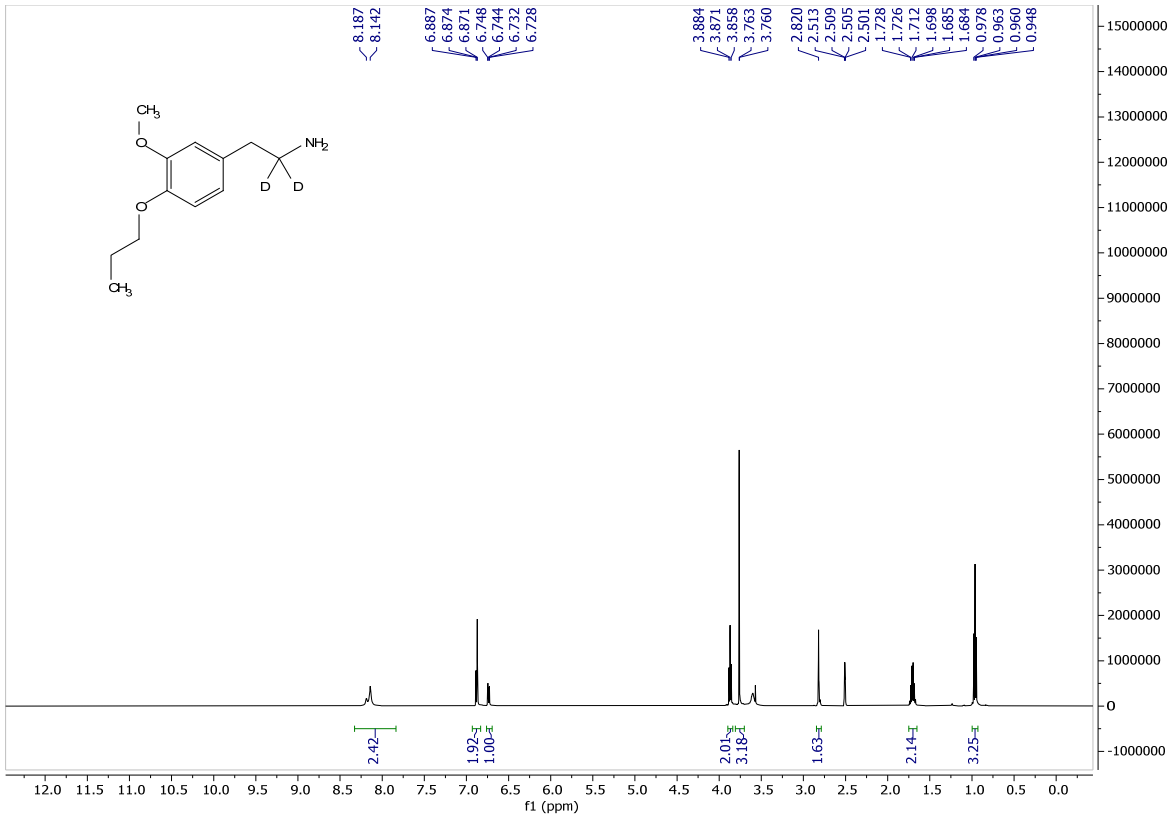

158.545
130.141
129.679
114.484
55.519
32.356
NH2
D
D
O
CH3
f1 (ppm)

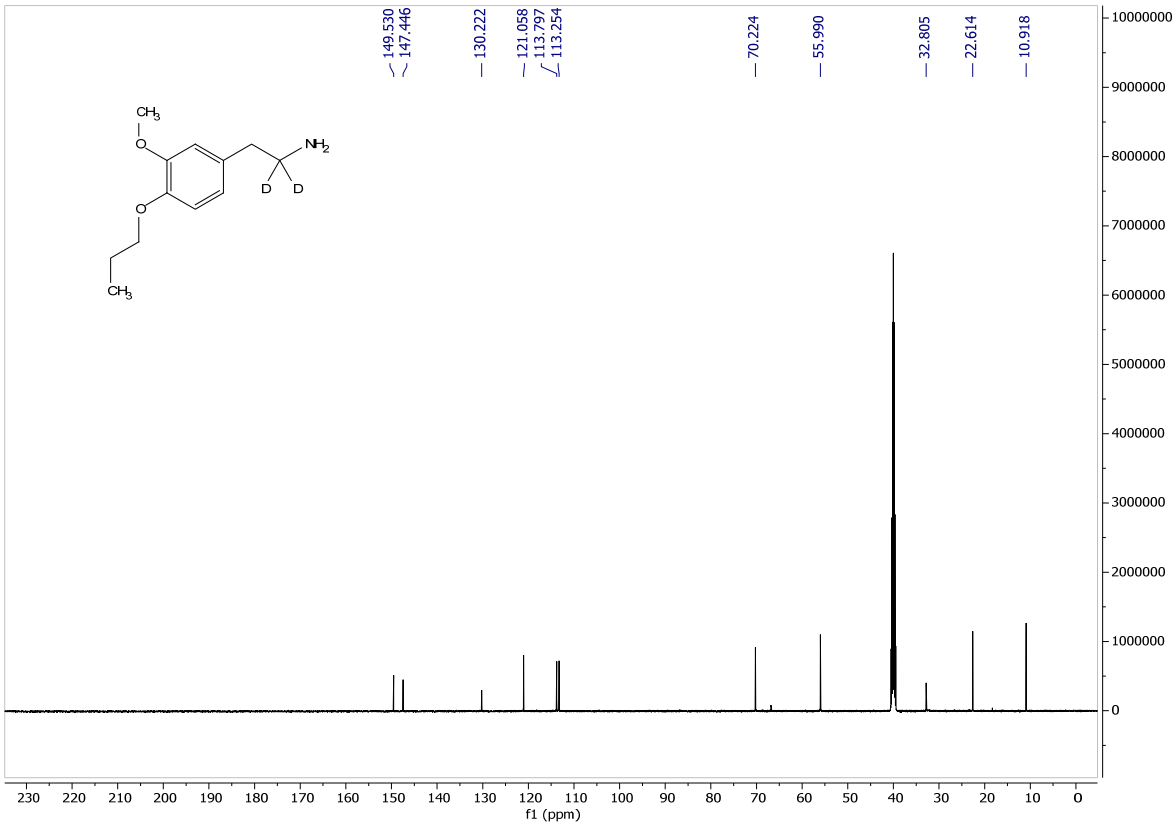
2p


8.340
8.289
8.241
7.893
7.889
7.883
7.879
7.868
7.863
7.858
7.396
7.391
7.375
7.370
3.064
2.956
NH2
D
D
H3C
O
O
1.15
2.00
1.96
0.14
1.68
f1 (ppm)

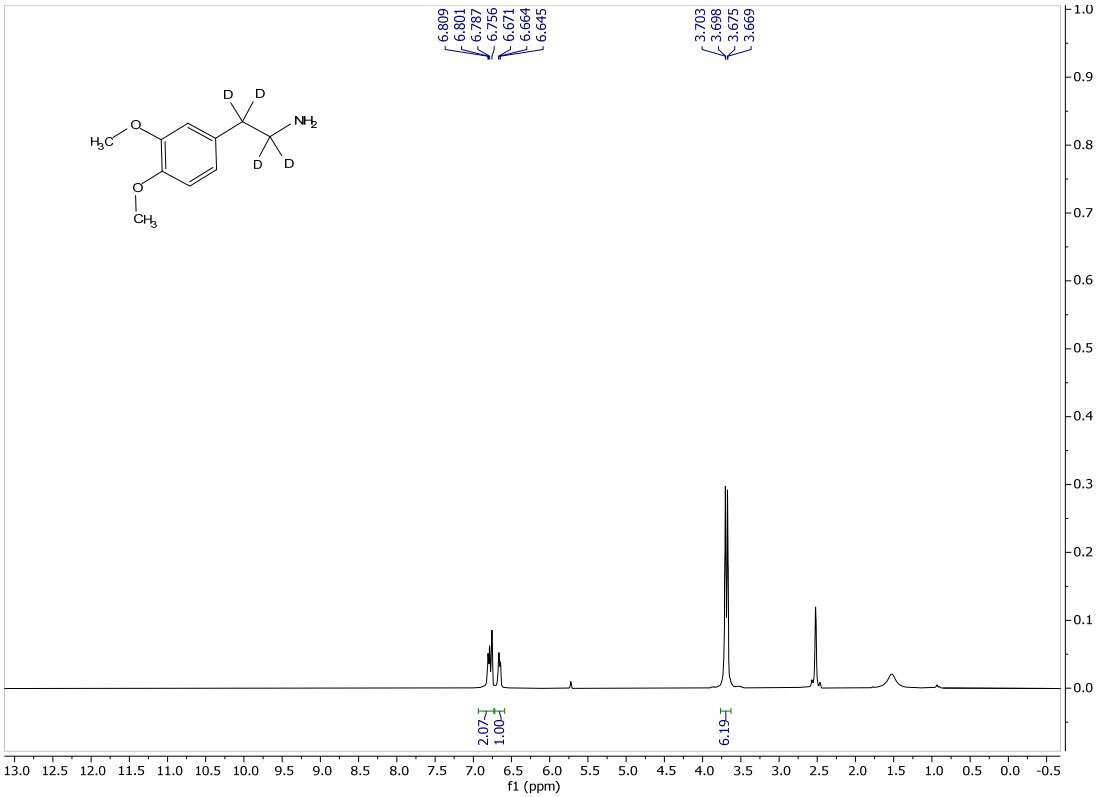

166.637
143.738
129.976
129.650
128.621
52.639
33.127
33.077
33.025
32.976
NH2
D
D
H3C
O
O
f1 (ppm)

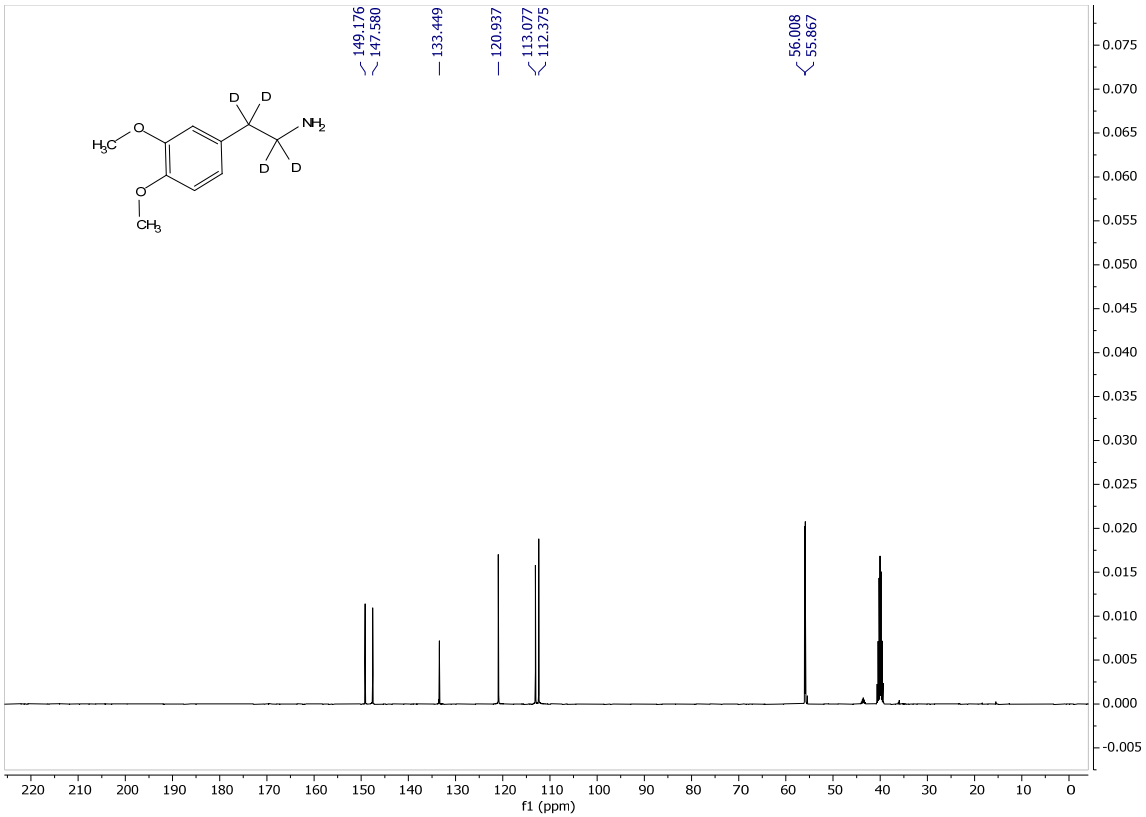
2q


8.187
8.142
6.887
6.874
6.871
6.748
6.744
6.732
6.728
3.884
3.871
3.858
3.763
3.760
2.820
2.513
2.509
2.505
2.501
1.728
1.726
1.712
1.698
1.685
1.684
0.978
0.963
0.960
0.948
2.42
1.92
1.00
2.01
3.18
1.63
2.14
3.25
f1 (ppm)

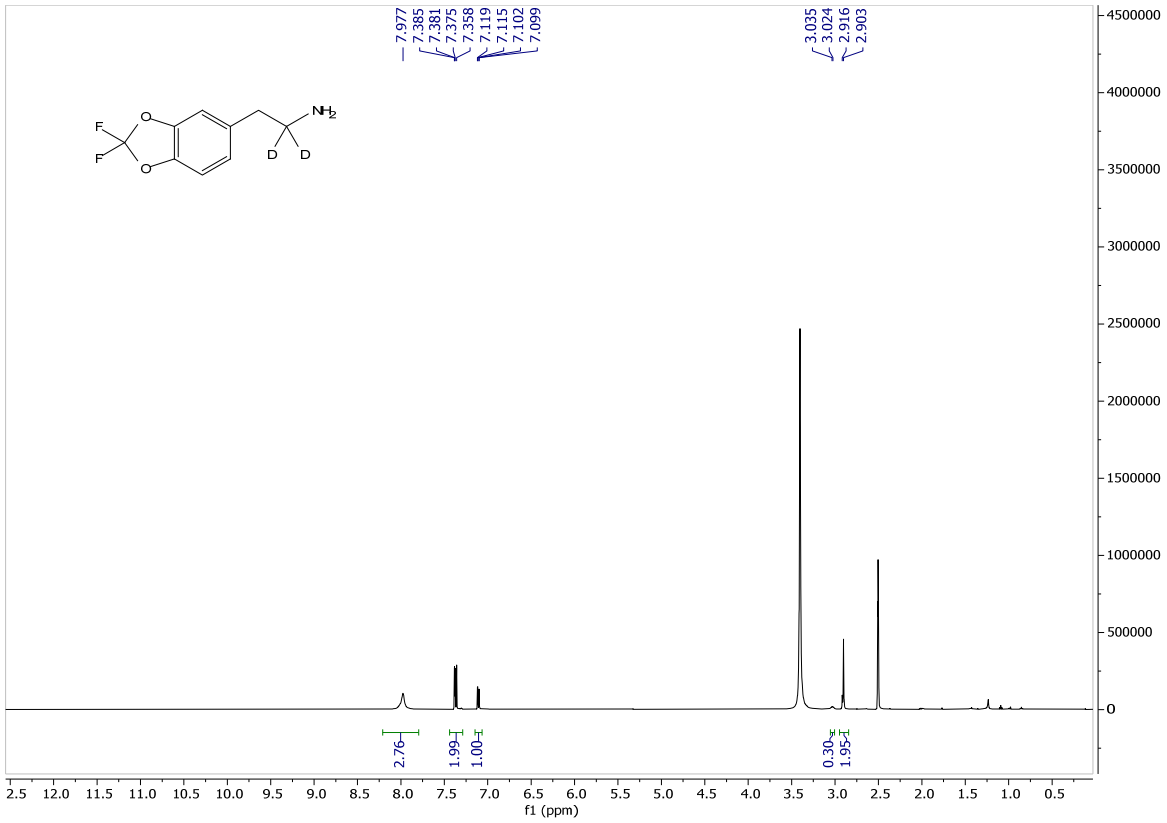

149.530
147.446
130.222
121.058
113.797
113.254
70.224
55.990
32.805
22.614
10.918
f1 (ppm)

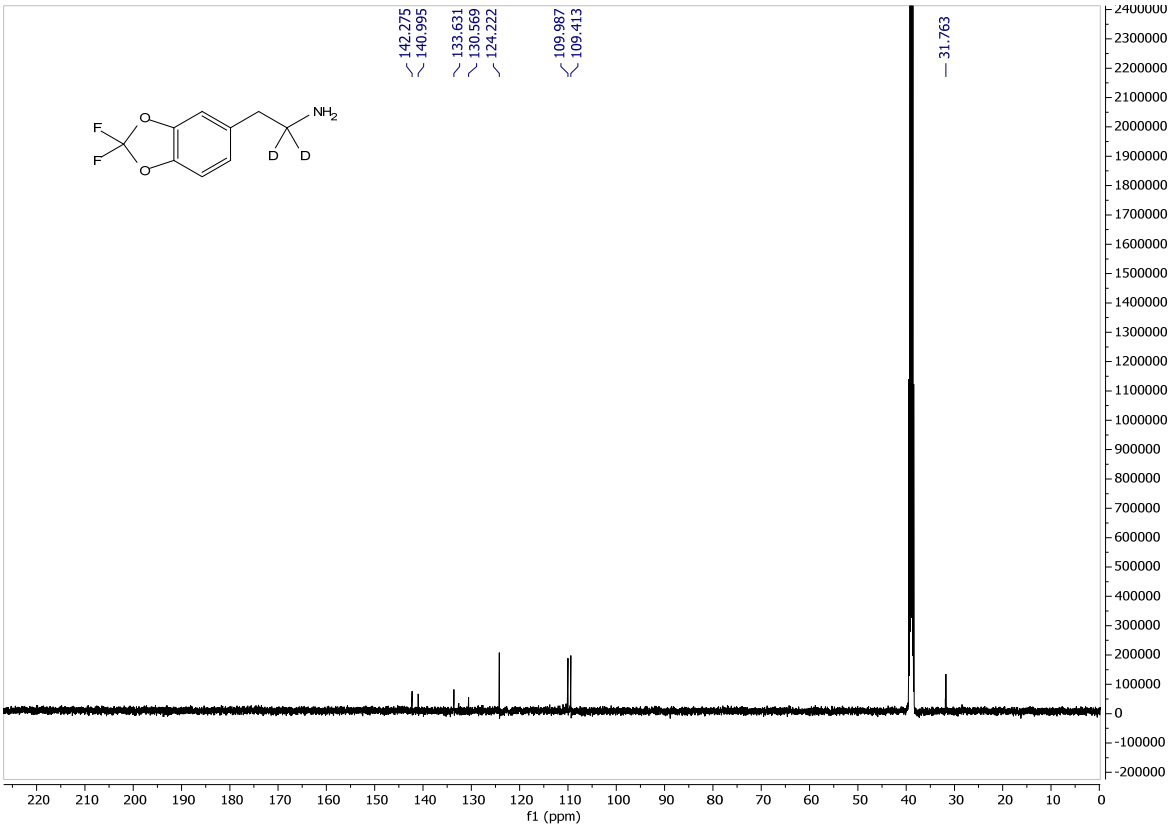
2r


6.809
6.801
6.787
6.756
6.671
6.664
6.645
3.703
3.698
3.675
3.669
D
D
NH2
H3C
O
D
D
O
CH3
2.07
1.00
6.19
f1 (ppm)

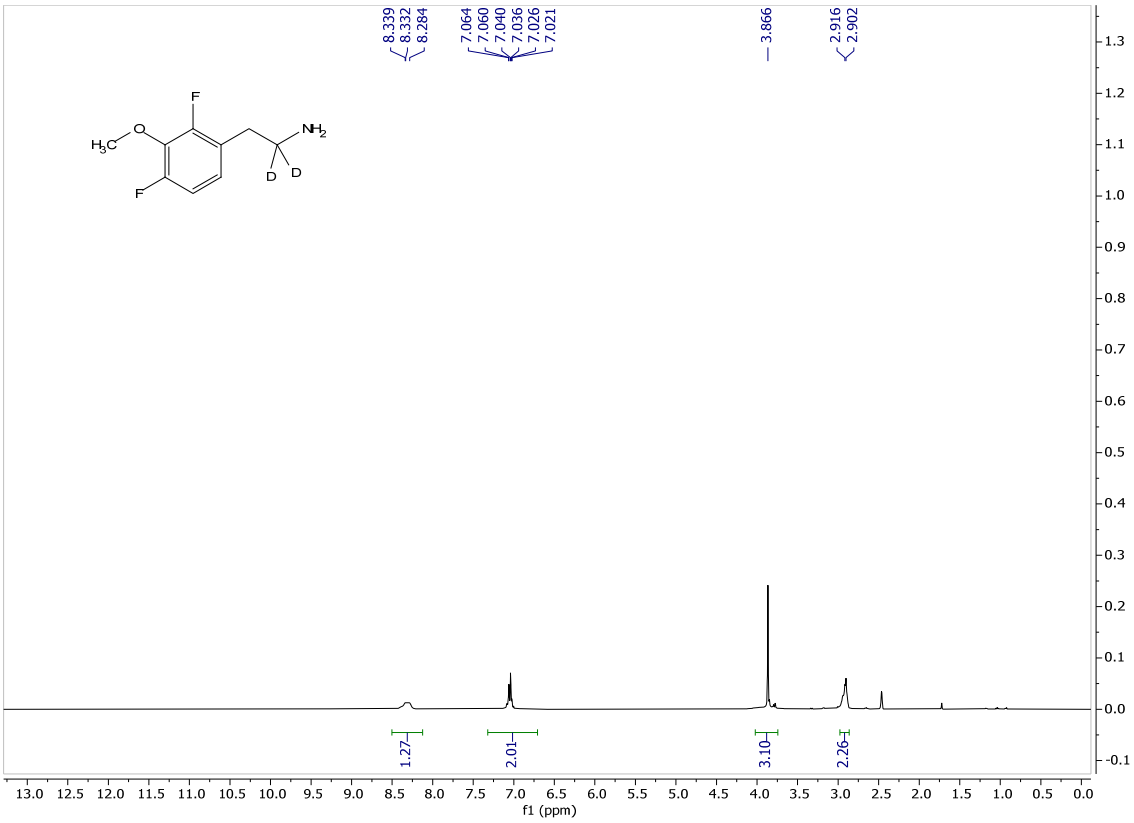

149.176
147.580
133.449
120.937
113.077
112.375
56.008
55.867
D
D
NH2
H3C
O
D
D
O
CH3
f1 (ppm)

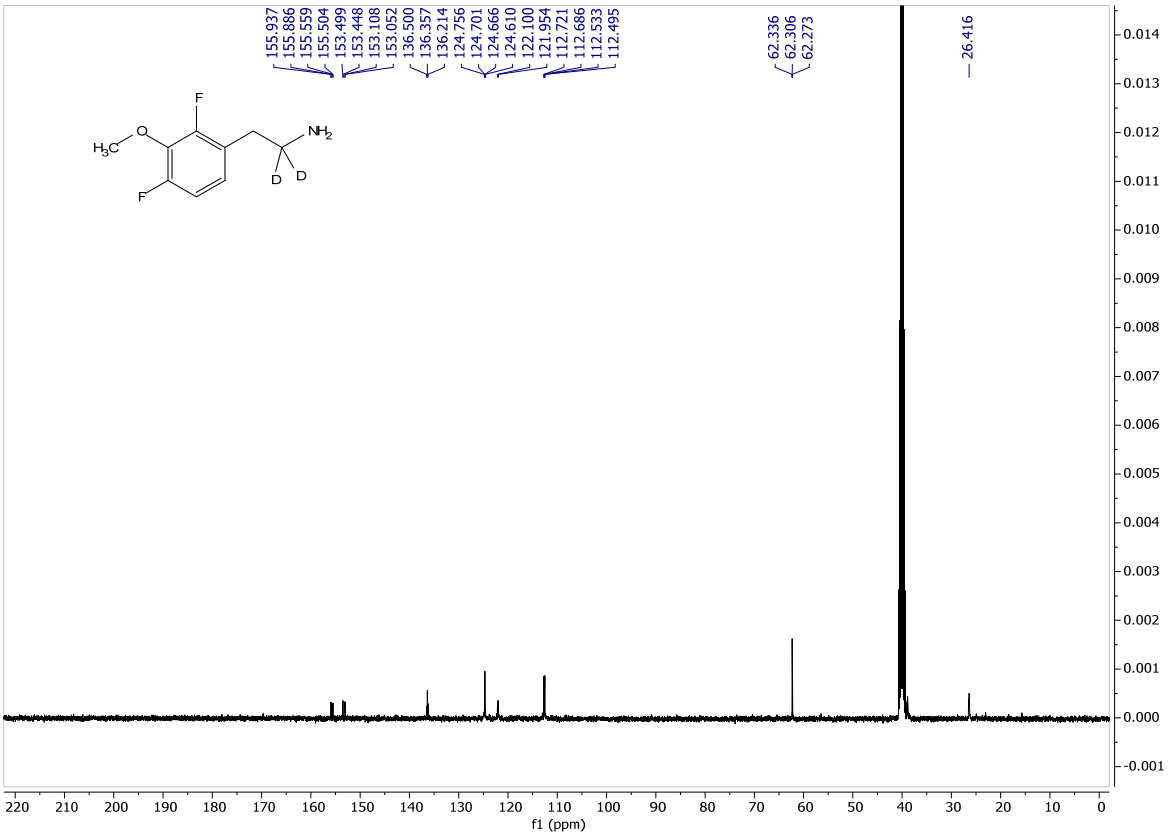
2s


7.977
7.385
7.381
7.375
7.358
7.119
7.115
7.102
7.099
3.035
3.024
2.916
2.903
F
F
O
O
O
NH2
D
D
2.76
1.99
1.00
0.30
1.95
f1 (ppm)

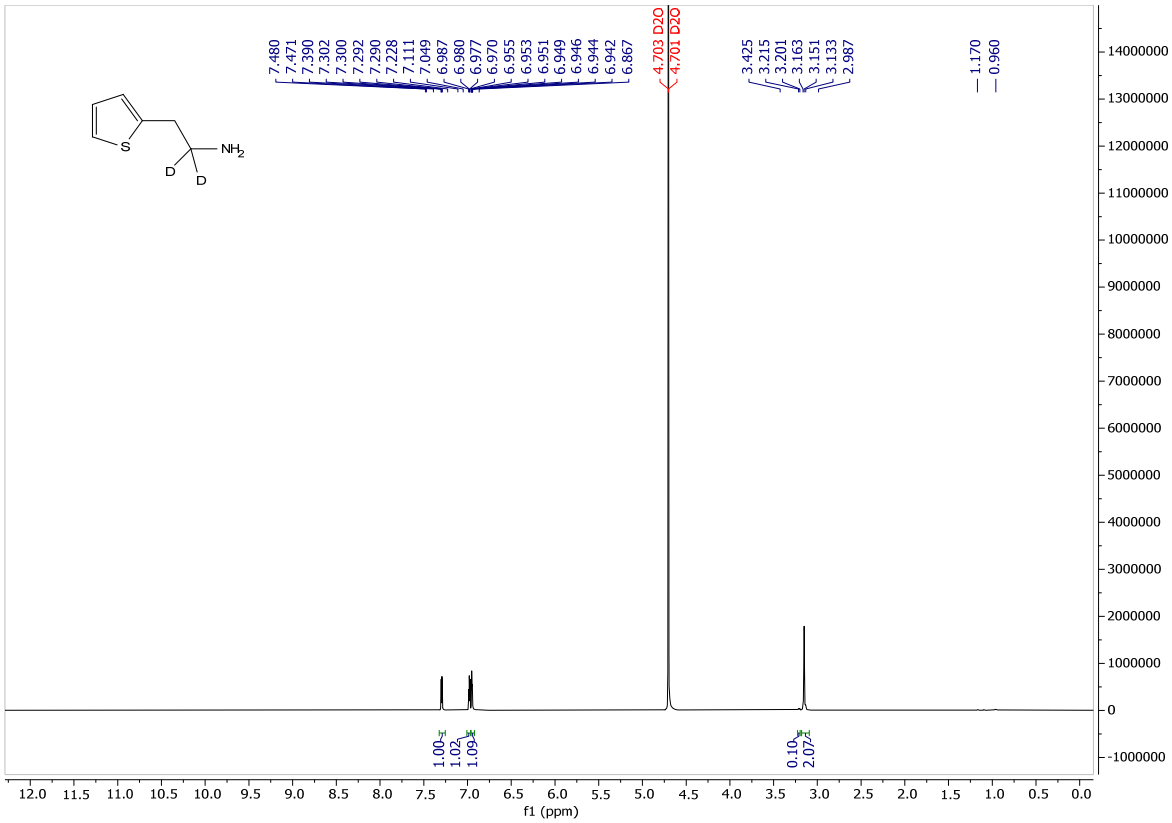

142.275
140.995
133.631
130.569
124.222
109.987
109.413
31.763
F
F
O
O
O
NH2
D
D
f1 (ppm)

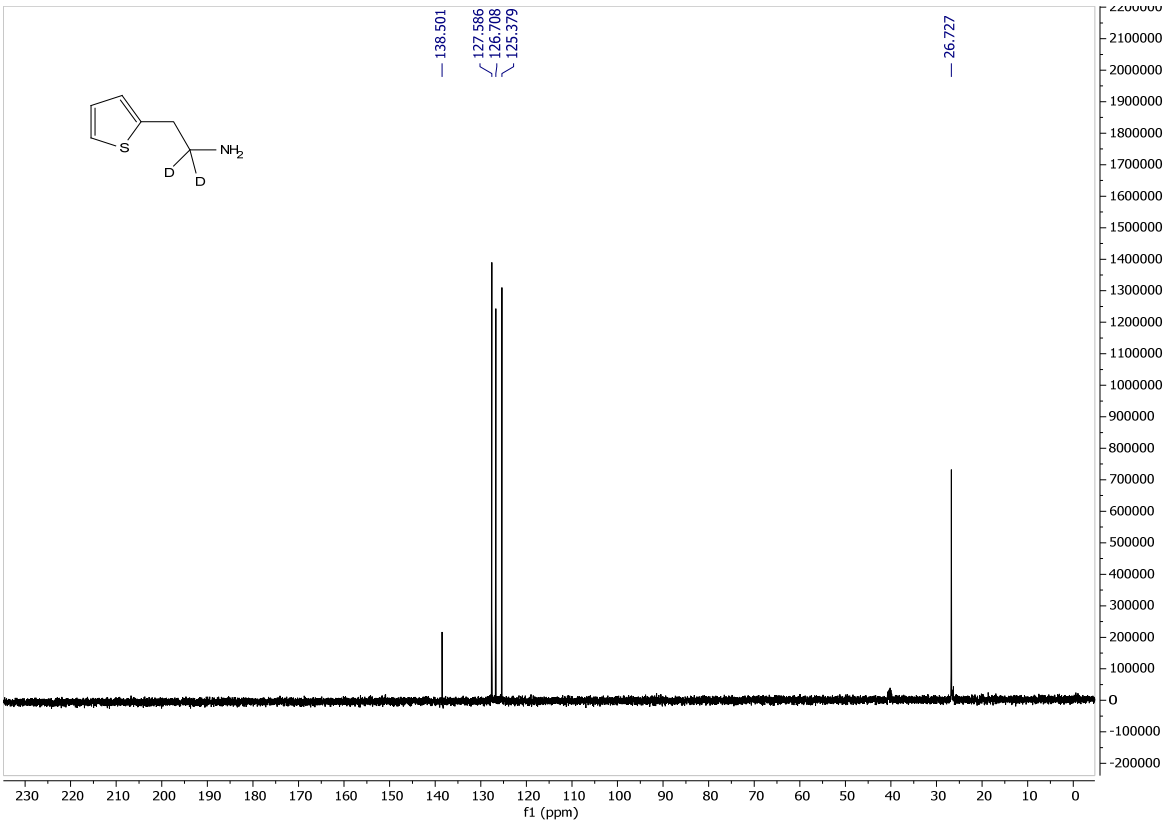
2t


8.339
8.332
8.284
7.064
7.060
7.040
7.036
7.026
7.021
3.866
2.916
2.902
F
O
H3C
NH2
D
D
F
1.27
2.01
3.10
2.26
f1 (ppm)

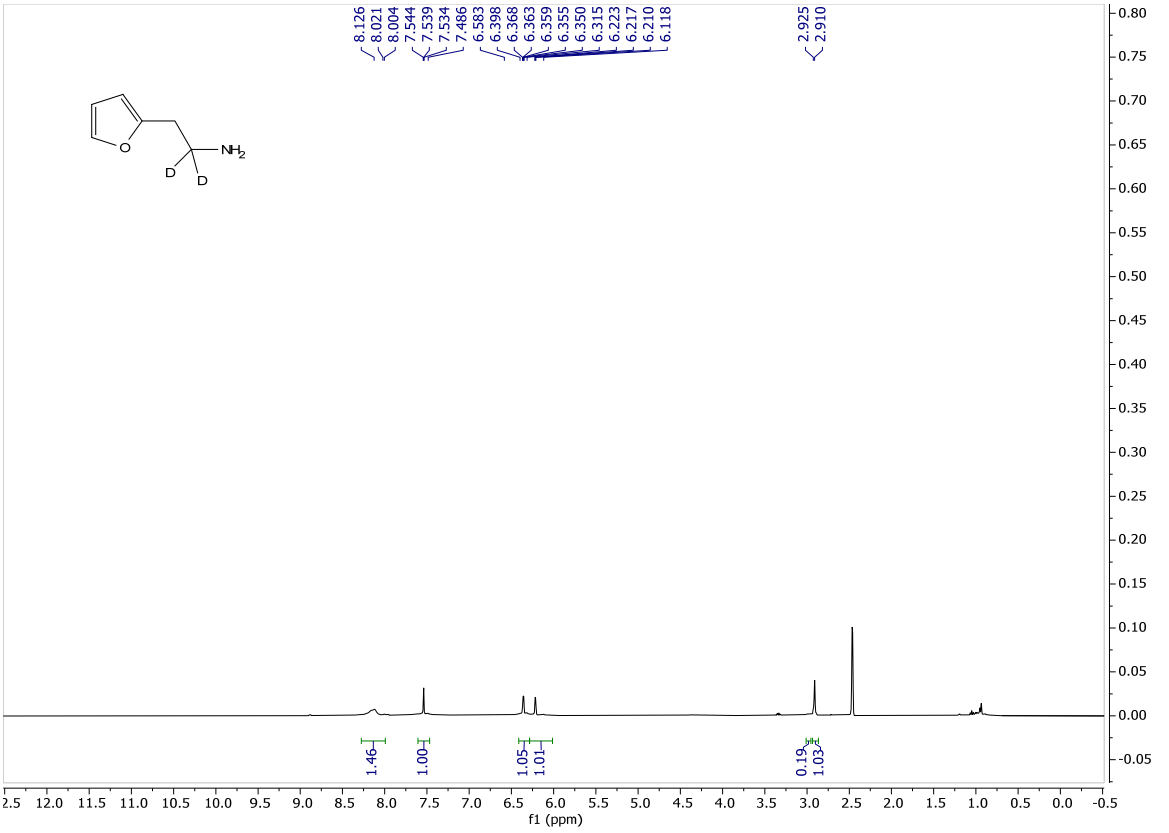

155.937
155.886
155.559
155.504
153.499
153.448
153.108
153.052
136.500
136.357
136.214
124.756
124.701
124.666
124.610
122.100
121.954
112.721
112.686
112.533
112.495
62.336
62.306
62.273
26.416
F
O
H3C
NH2
D
D
F
f1 (ppm)

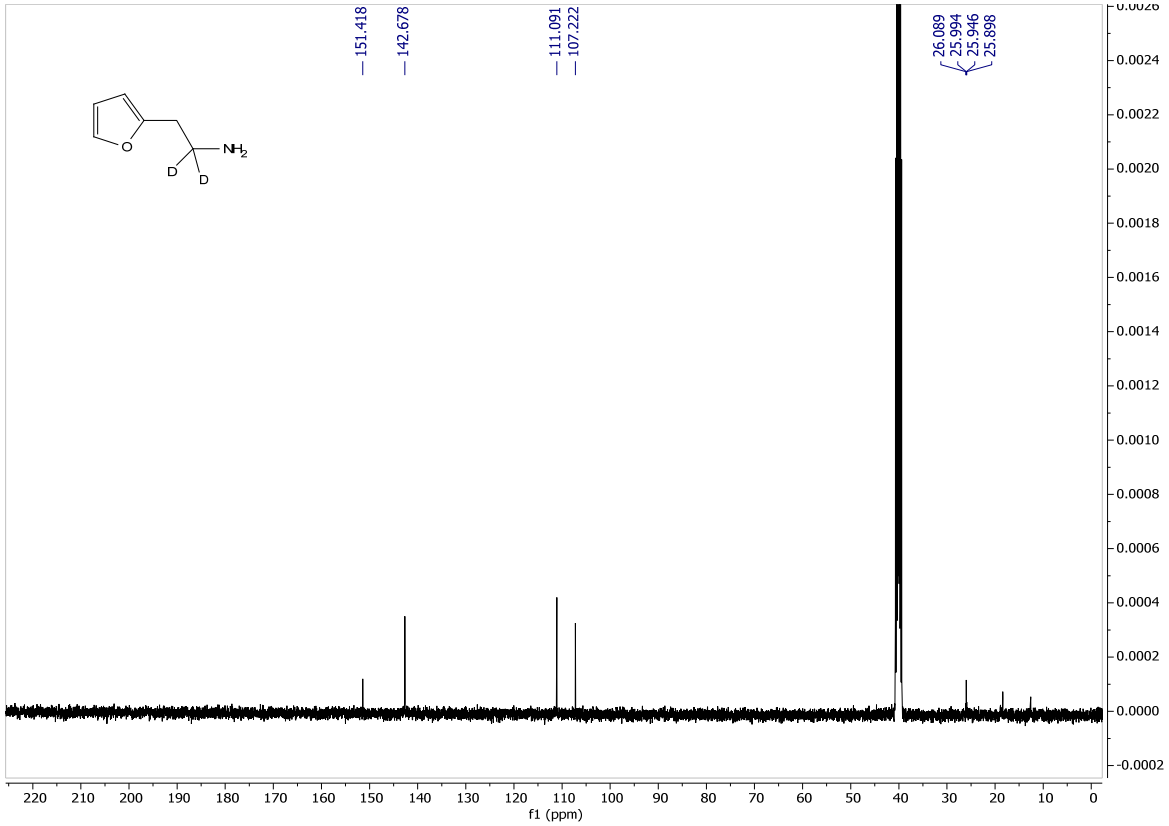
2u


7.480
7.471
7.390
7.302
7.300
7.292
7.290
7.228
7.111
7.049
6.987
6.980
6.977
6.970
6.955
6.953
6.951
6.949
6.946
6.944
6.942
6.867
4.703 D2O
4.701 D2O
3.425
3.215
3.201
3.163
3.151
3.133
2.987
1.170
0.960
S
NH2
D
D
1.00
1.02
1.09
0.10
2.07
f1 (ppm)

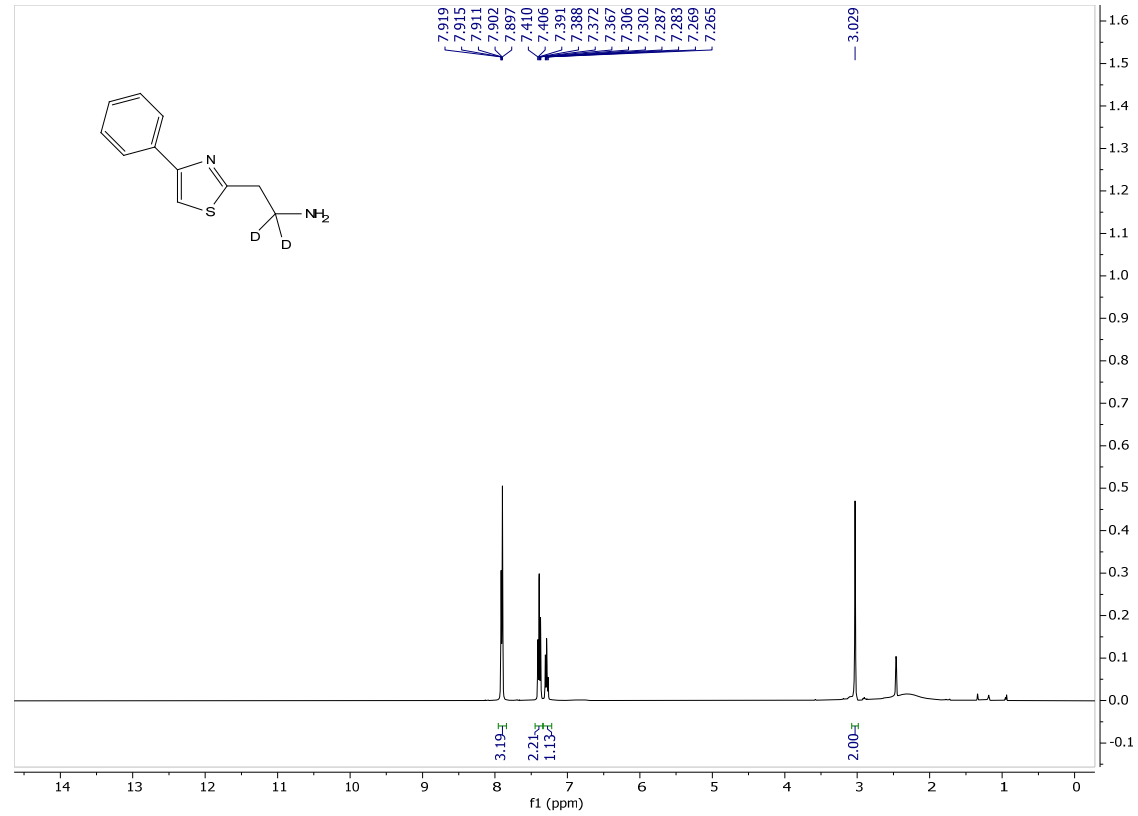

138.501
127.586
126.708
125.379
26.727
S
NH2
D
D
f1 (ppm)

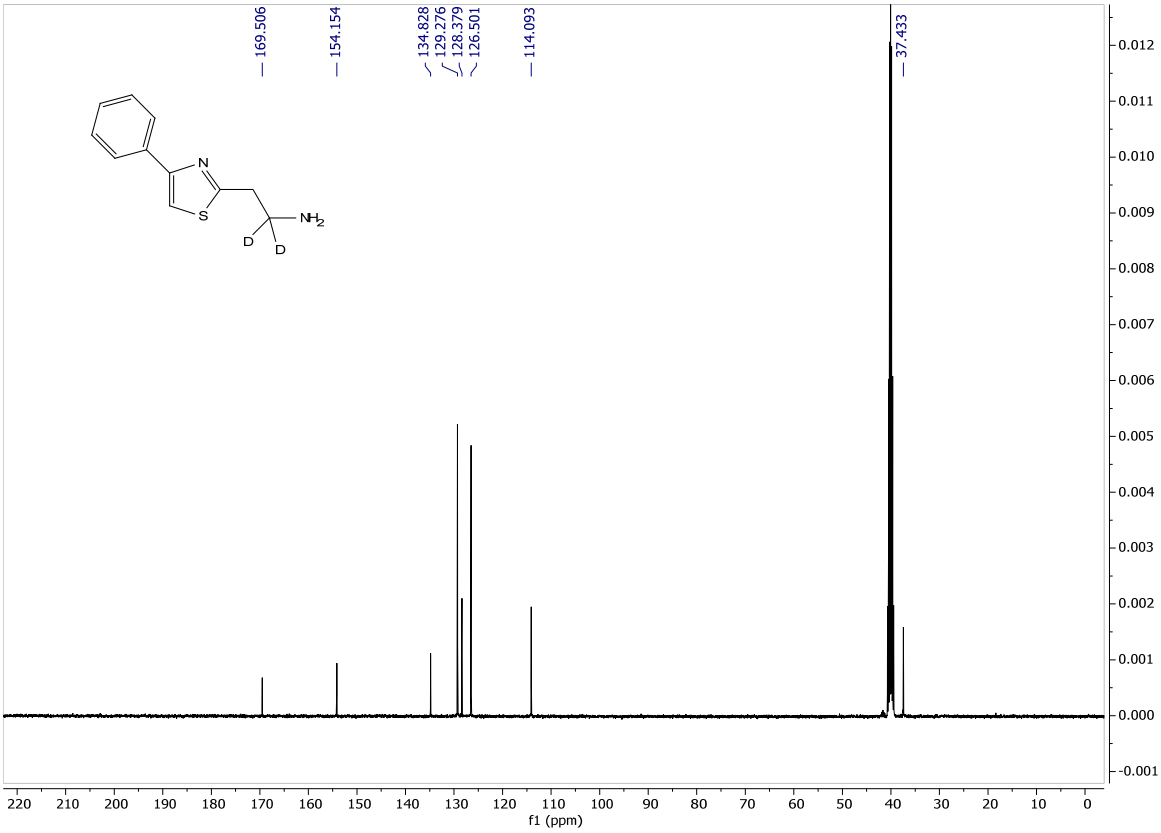
2v


8.126
8.021
8.004
7.544
7.539
7.534
7.486
6.583
6.398
6.368
6.363
6.359
6.355
6.350
6.315
6.223
6.217
6.210
6.118
2.925
2.910
1.46
1.00
1.05
1.01
0.19
1.03
f1 (ppm)

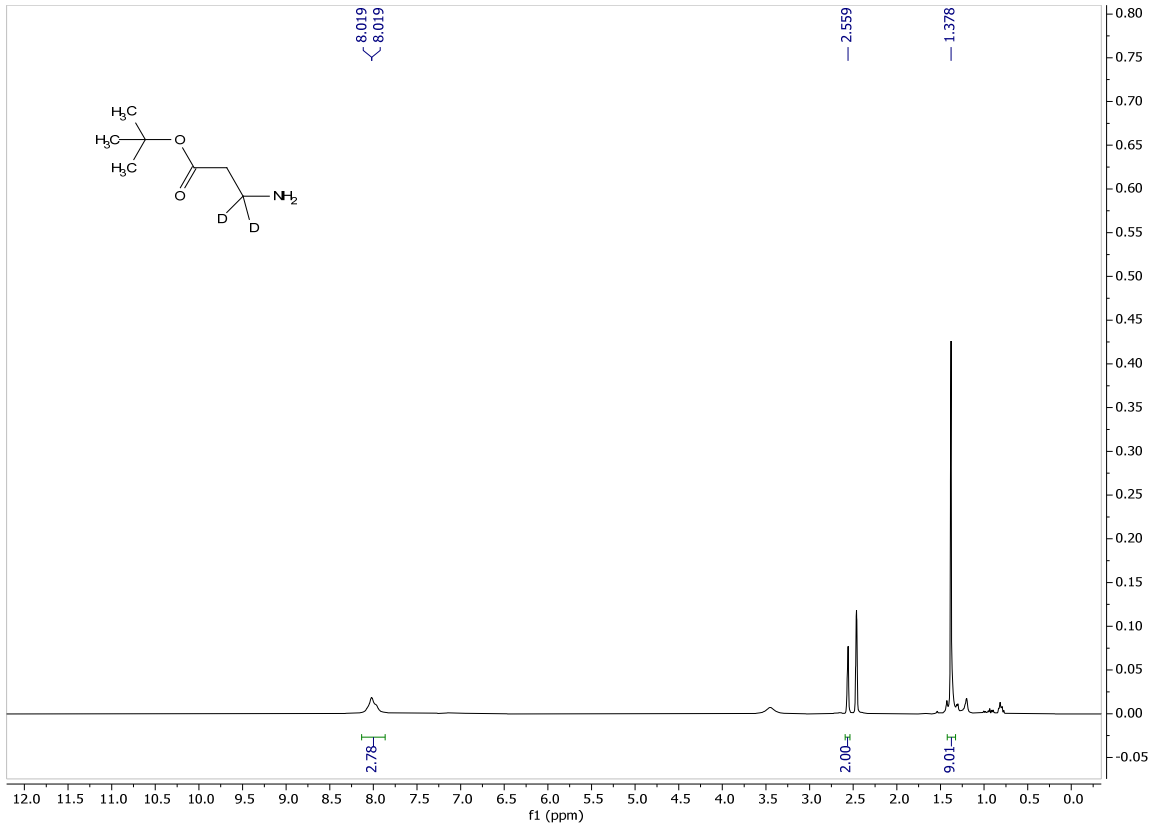

151.418
142.678
111.091
107.222
26.089
25.994
25.946
25.898
f1 (ppm)

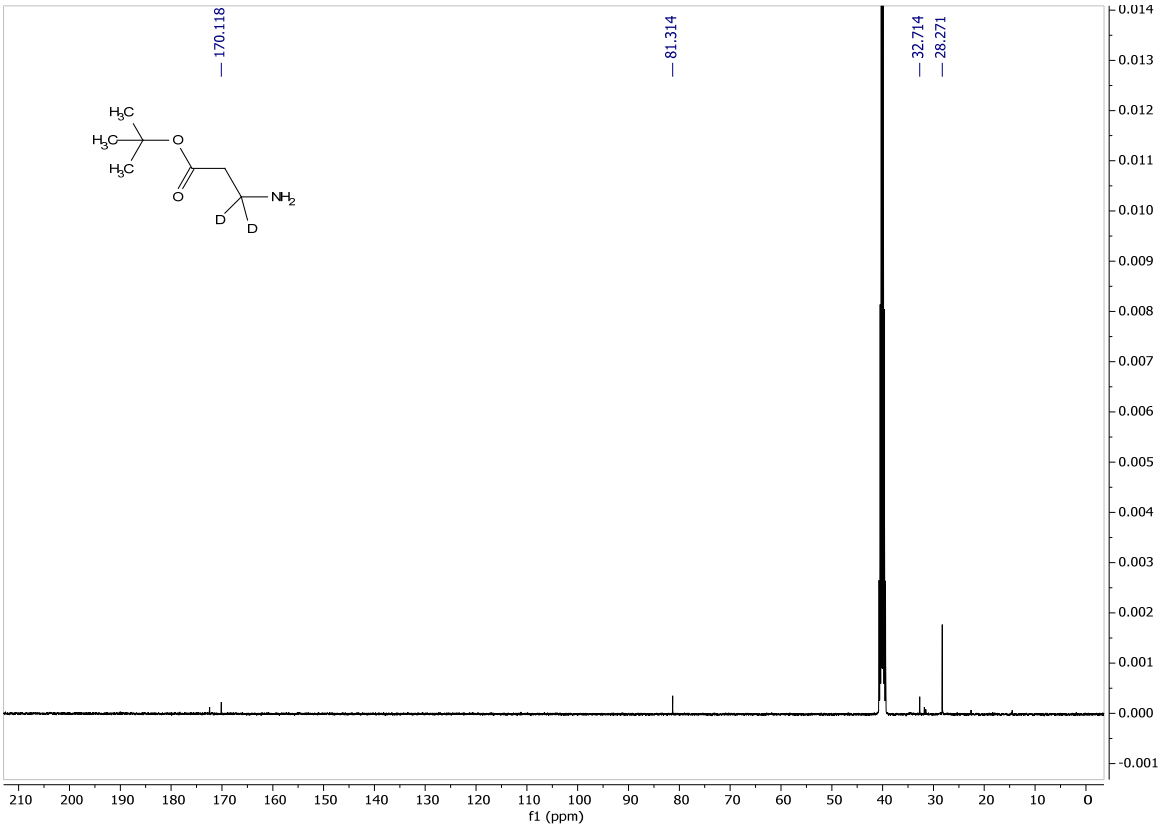
2w


7.919
7.915
7.911
7.902
7.897
7.410
7.406
7.391
7.388
7.372
7.367
7.306
7.302
7.287
7.283
7.269
7.265
3.029
N
S
NH2
D
D
3.19
2.21
1.13
2.00
f1 (ppm)

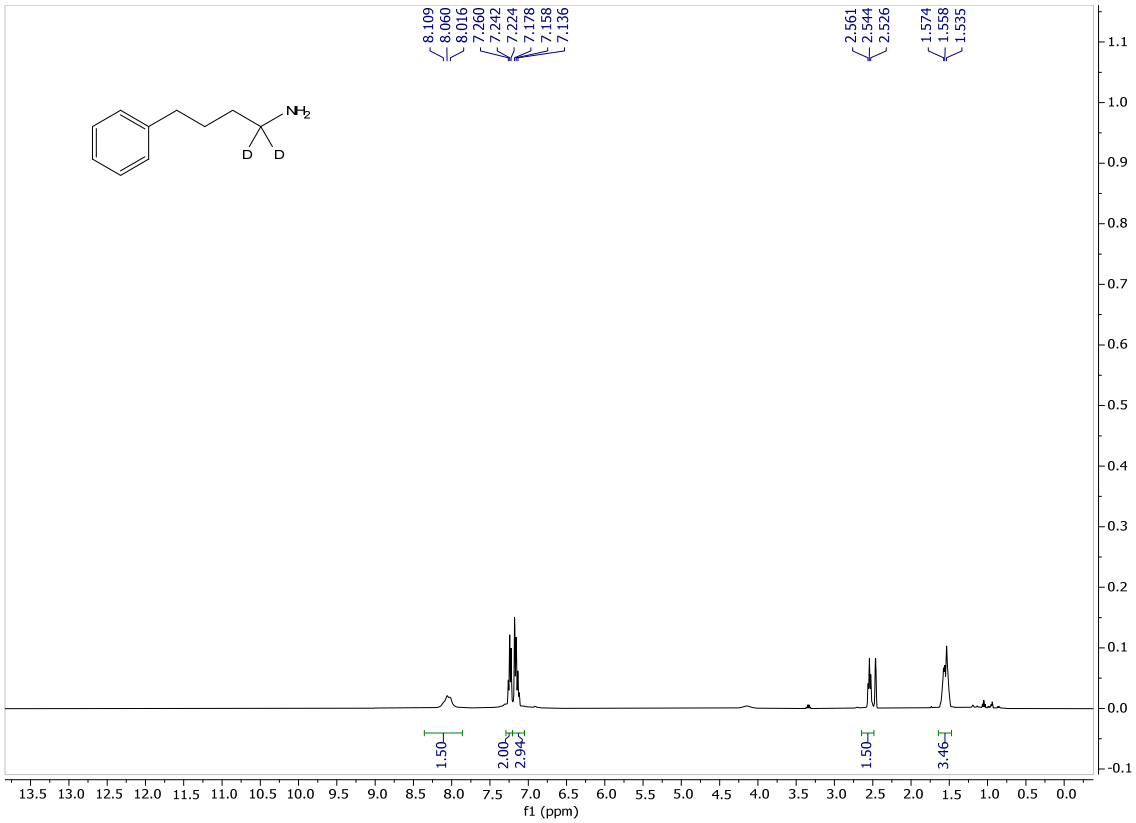

169.506
154.154
134.828
129.276
128.379
126.501
114.093
37.433
N
S
NH2
D
D
f1 (ppm)

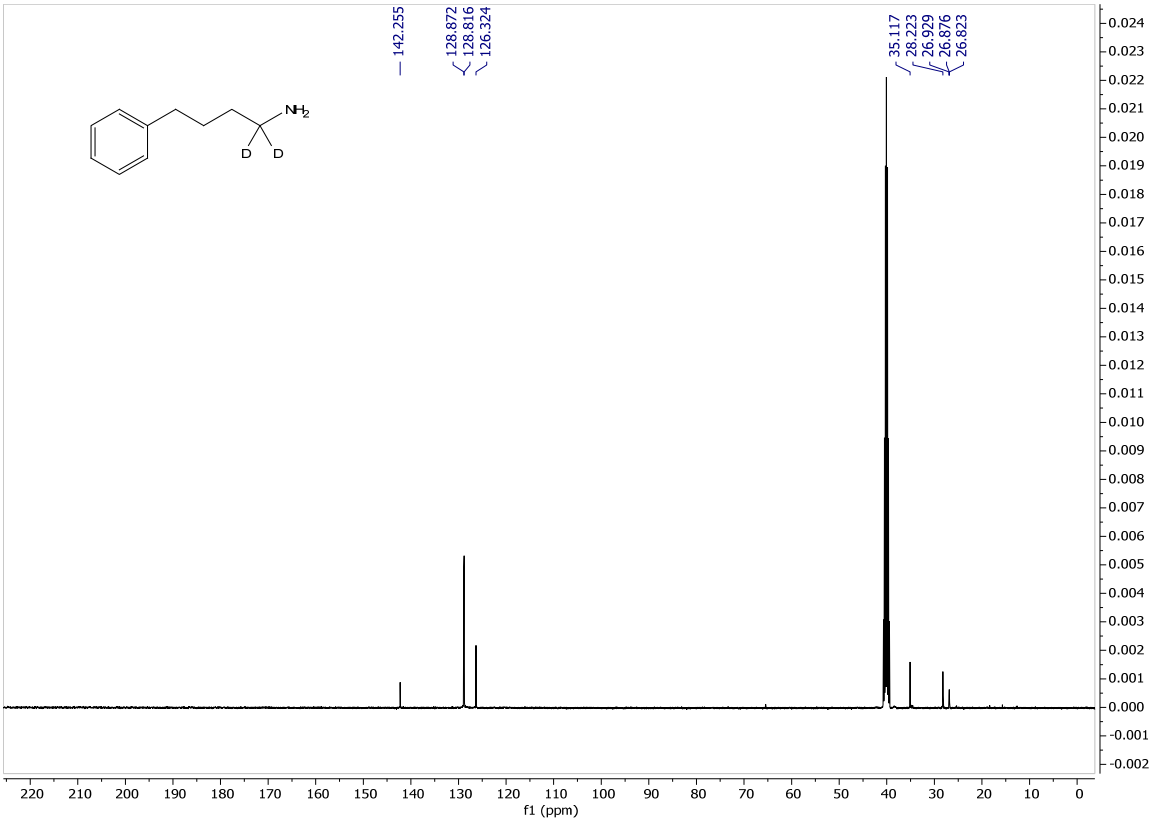
2x


8.019
8.019
2.559
1.378
2.78
2.00
9.01
f1 (ppm)

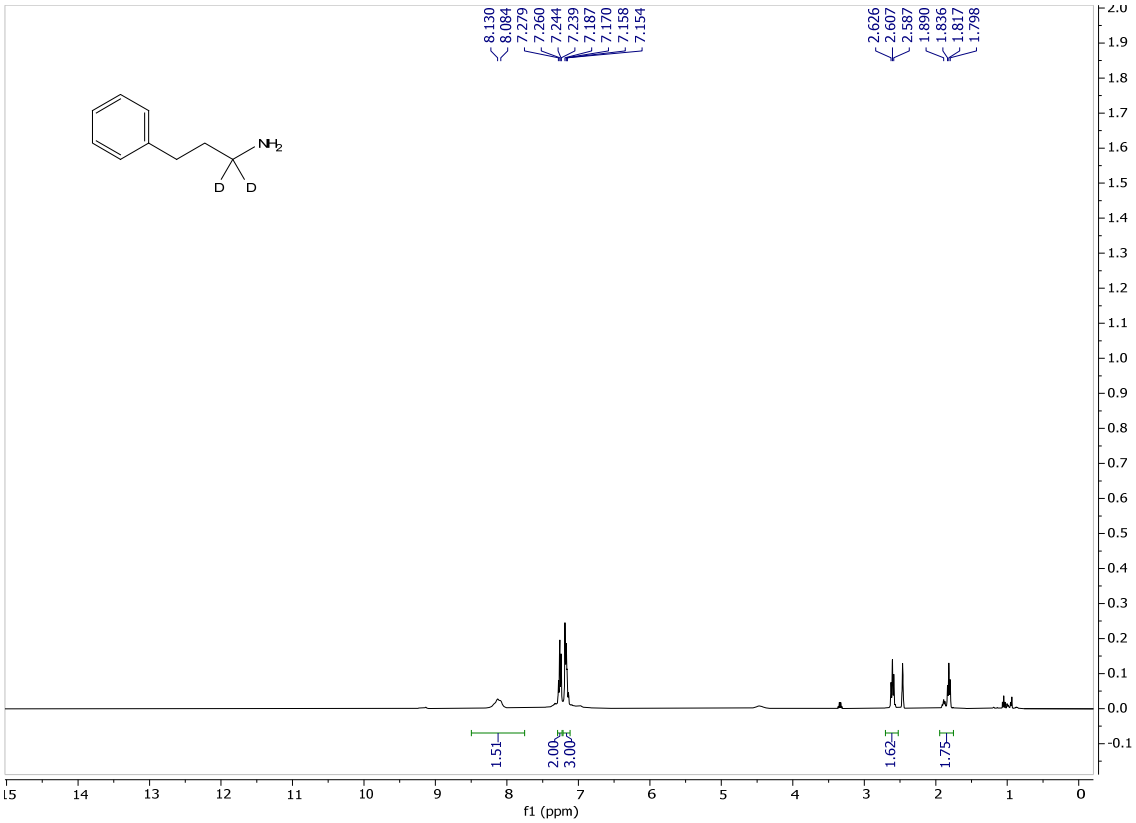

170.118
81.314
32.714
28.271
f1 (ppm)

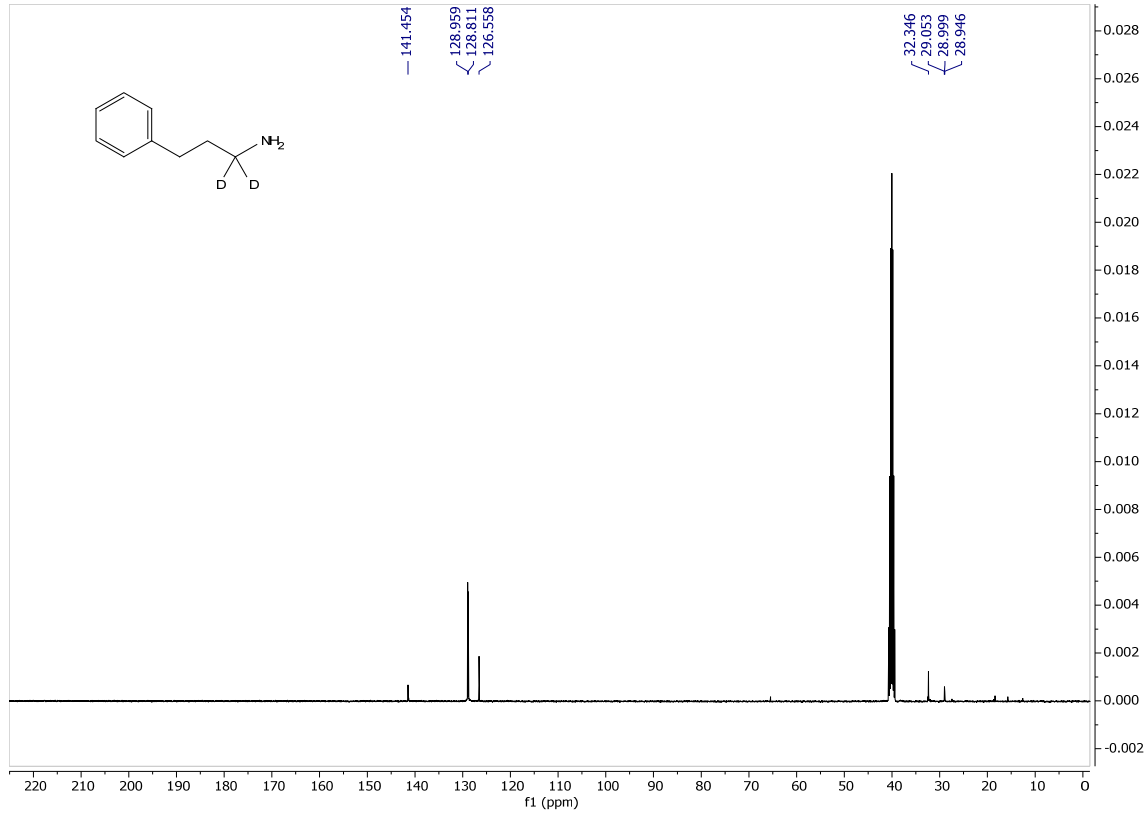
2y


8.109
8.060
8.016
7.260
7.242
7.224
7.178
7.158
7.136
2.561
2.544
2.526
1.574
1.558
1.535
NH2
D D
1.50
2.00
2.94
1.50
3.46
f1 (ppm)

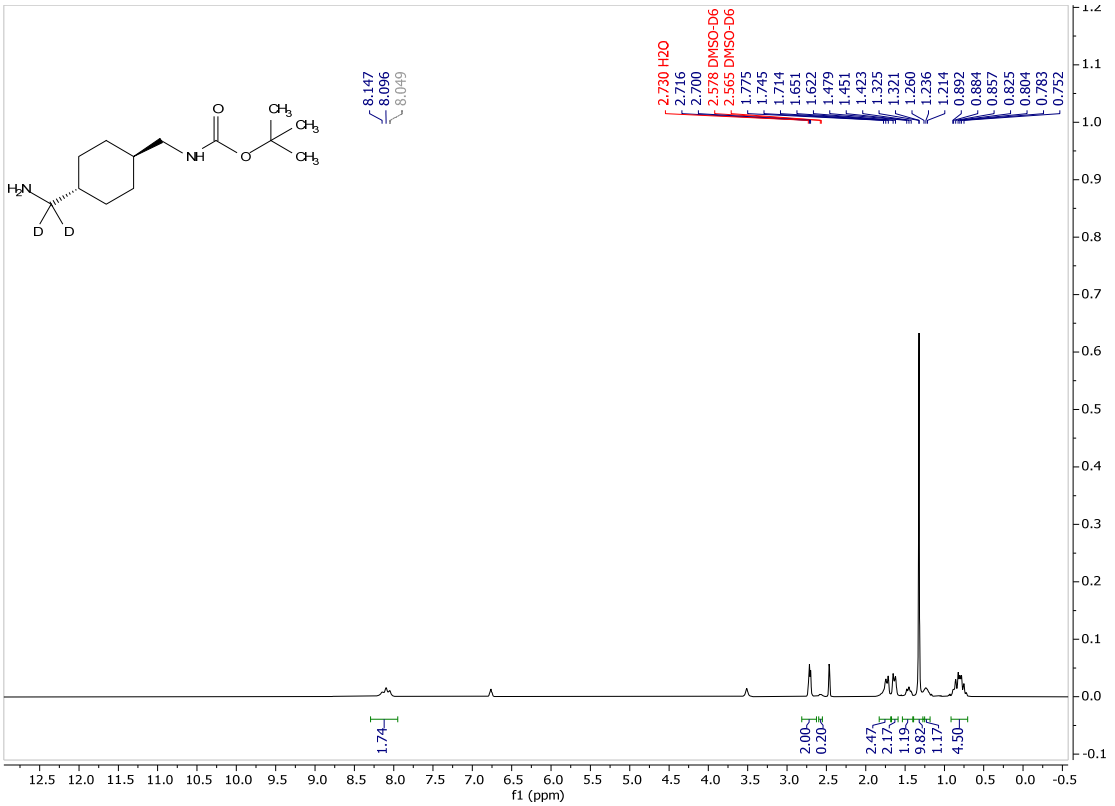

142.255
128.872
128.816
126.324
35.117
28.223
26.929
26.876
26.823
NH2
D D
f1 (ppm)

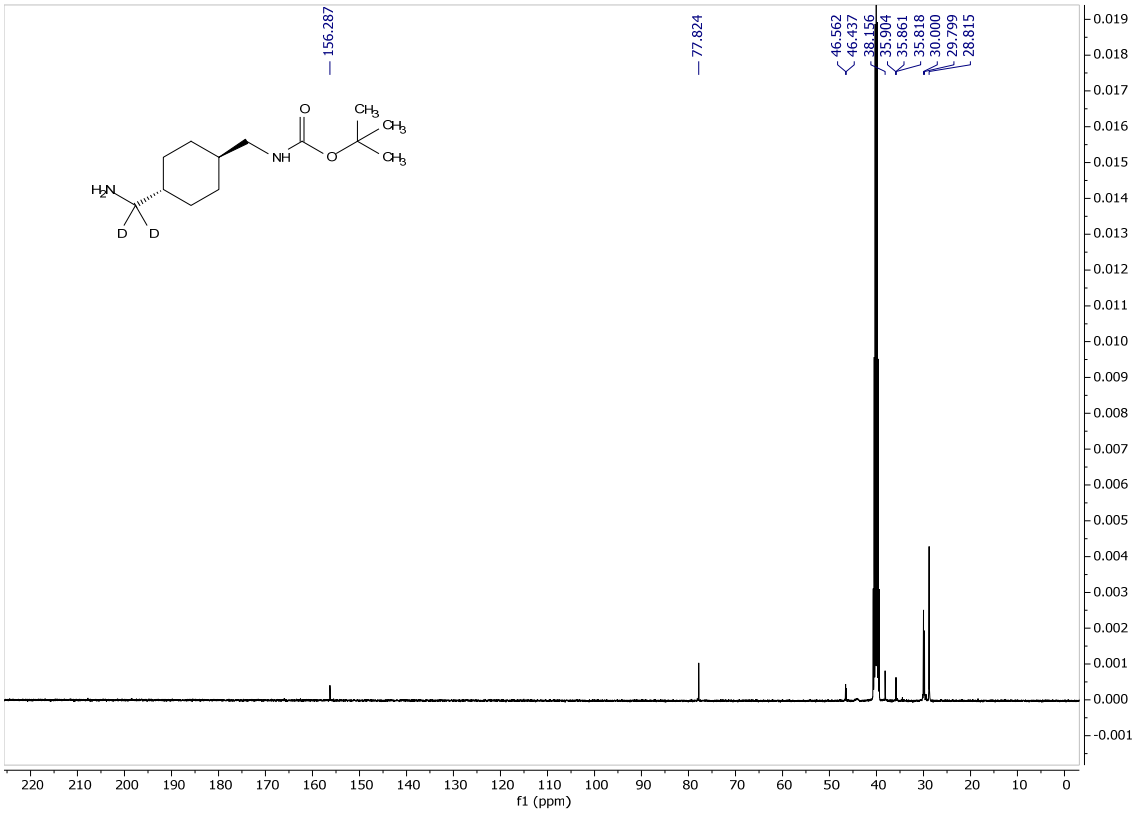
2z


8.130
8.084
7.279
7.260
7.244
7.239
7.187
7.170
7.158
7.154
2.626
2.607
2.587
1.890
1.836
1.817
1.798
NH2
D D
1.51
2.00
3.00
1.62
1.75
f1 (ppm)

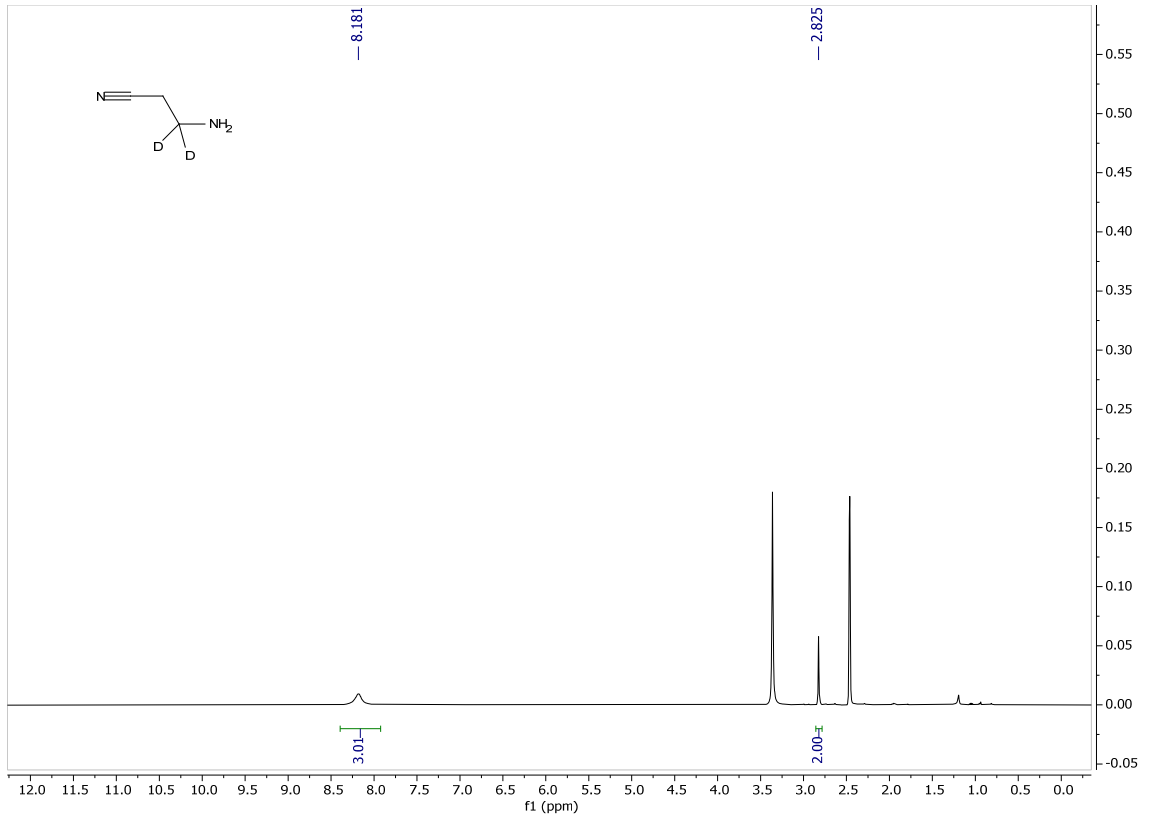

141.454
128.959
128.811
126.558
32.346
29.053
28.999
28.946
NH2
D D
f1 (ppm)

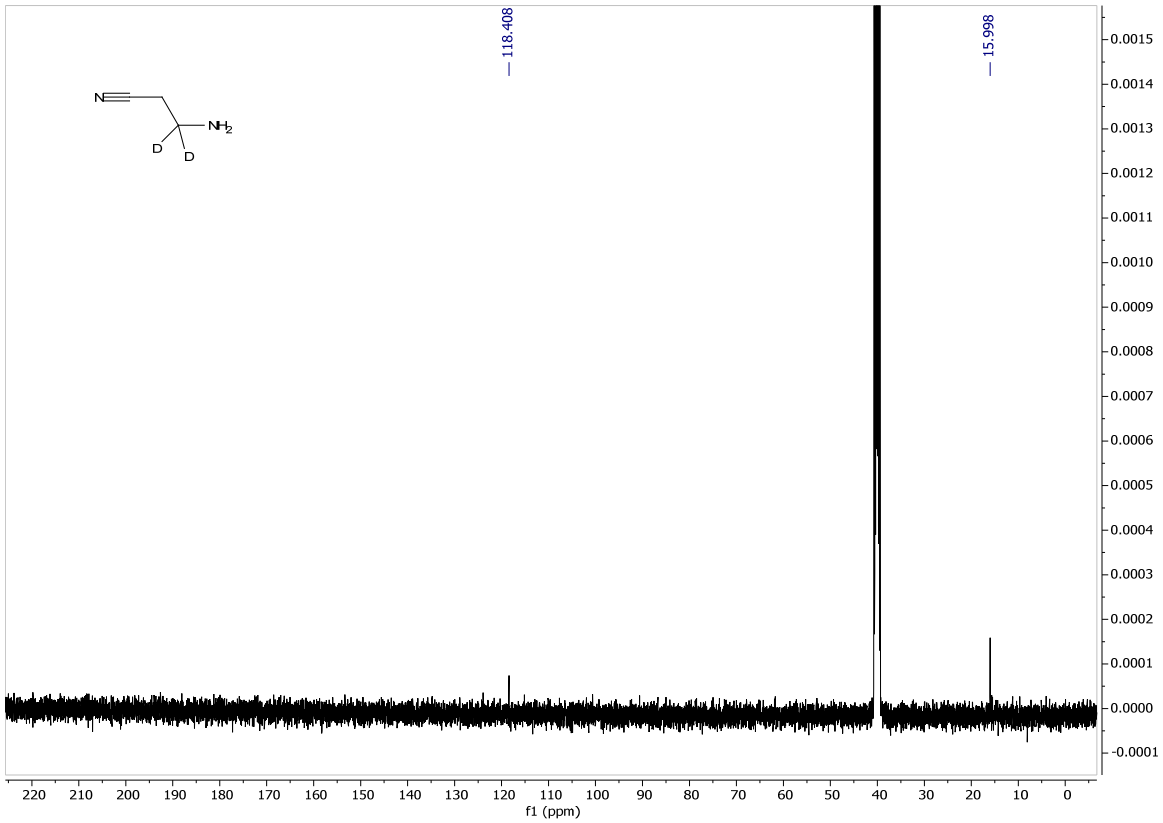
2aa


8.147
8.096
8.049
2.730 H2O
2.716
2.700
2.578 DMSO-D6
2.565 DMSO-D6
1.775
1.745
1.714
1.651
1.622
1.479
1.451
1.423
1.325
1.321
1.260
1.236
1.214
0.892
0.884
0.857
0.825
0.804
0.783
0.752
1.74
2.00
0.20
2.47
2.17
1.19
9.82
1.17
4.50
f1 (ppm)

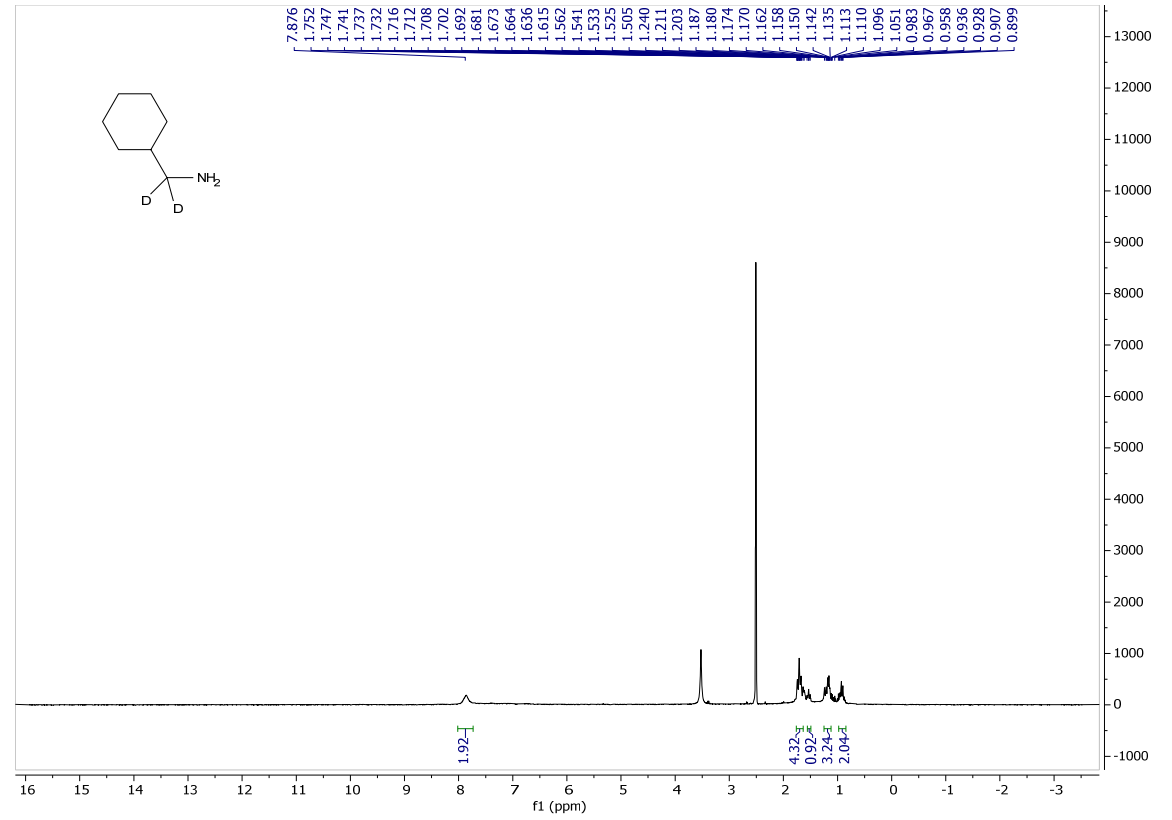

156.287
77.824
46.562
46.437
38.156
35.904
35.861
35.818
30.000
29.799
28.815
f1 (ppm)

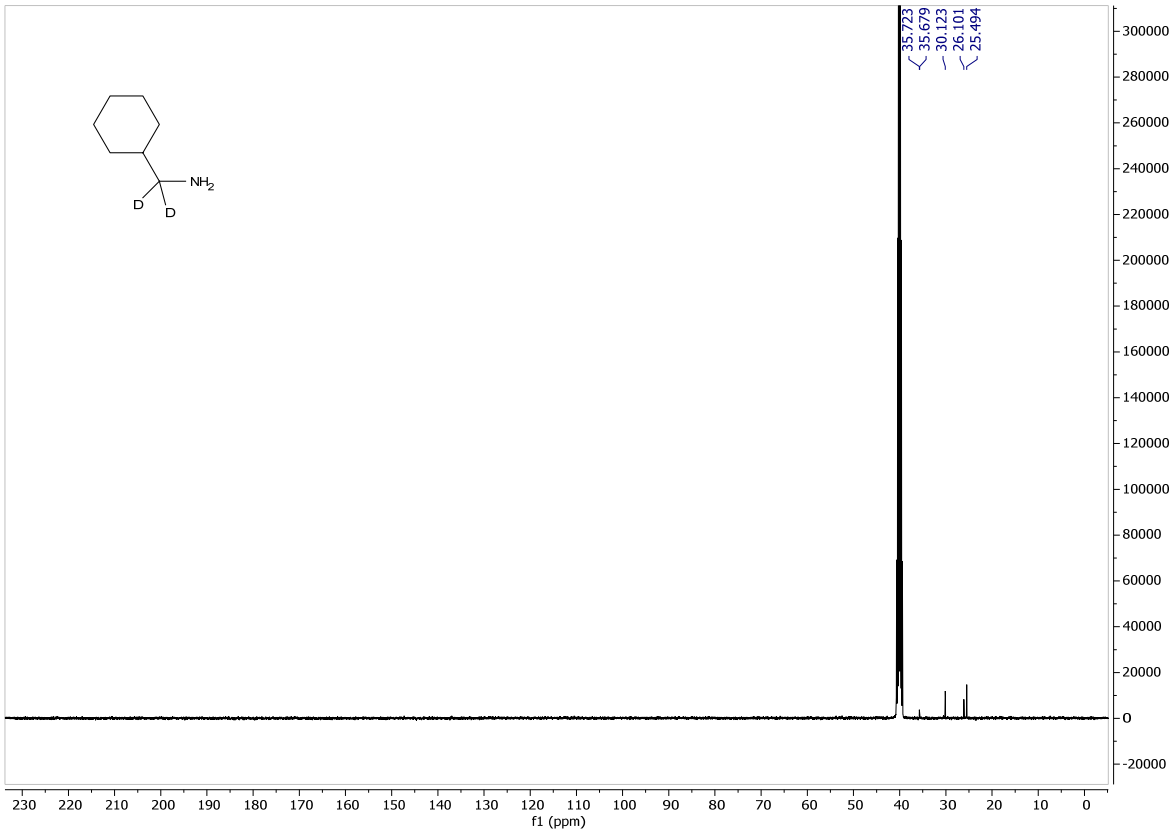
2ab



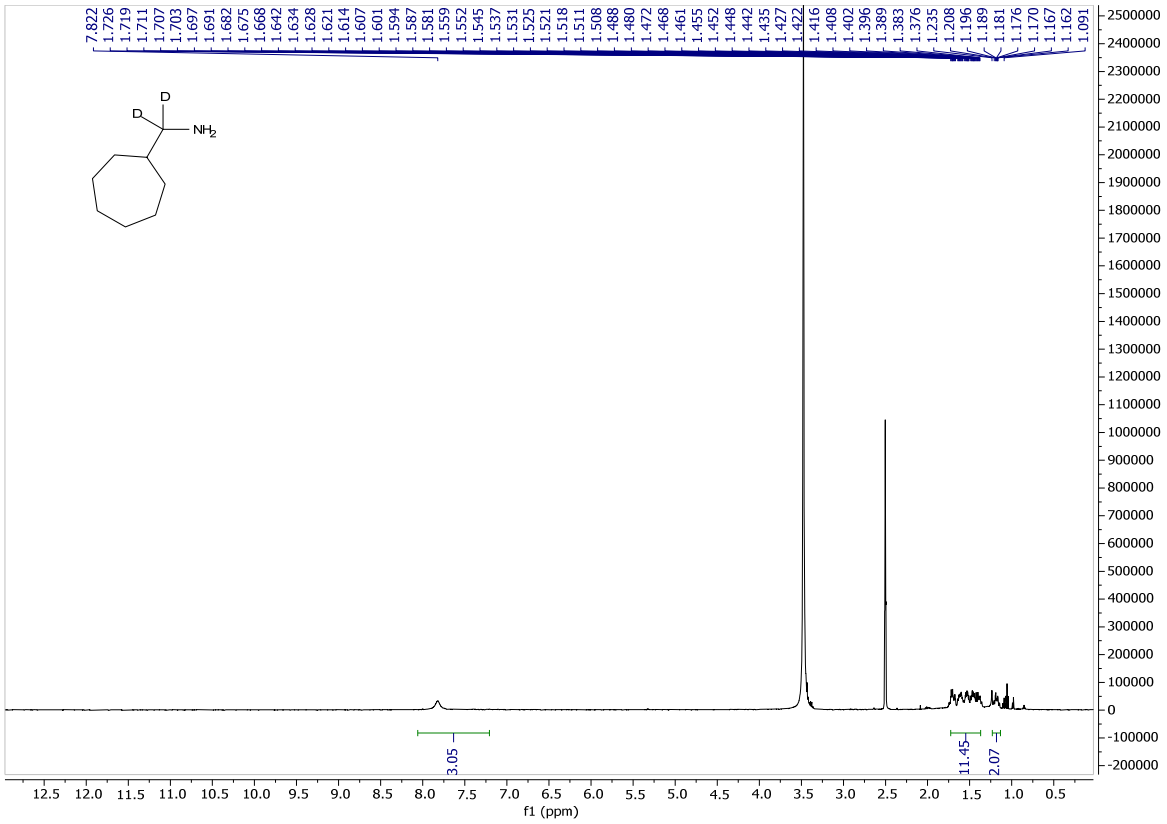


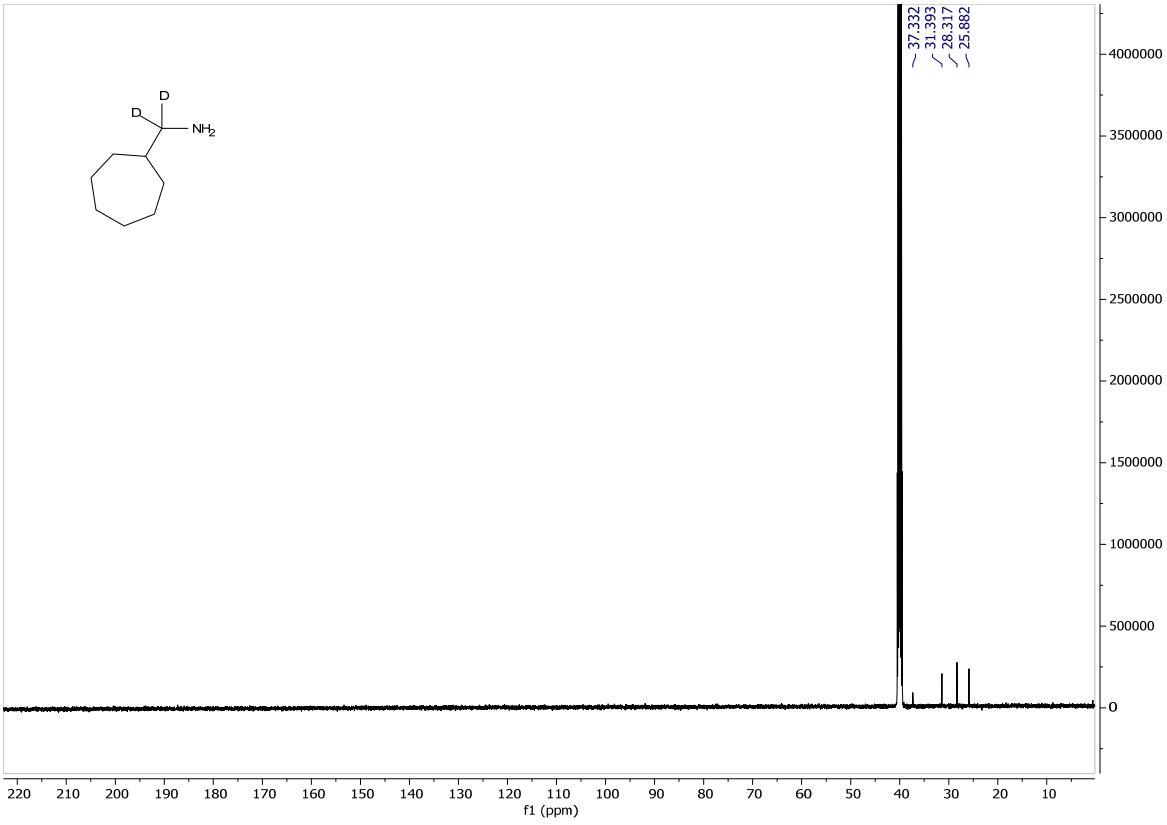
2ac


7.876
1.752
1.747
1.741
1.737
1.732
1.716
1.712
1.708
1.702
1.692
1.681
1.673
1.664
1.636
1.615
1.562
1.541
1.533
1.525
1.505
1.240
1.211
1.203
1.187
1.180
1.174
1.170
1.162
1.158
1.150
1.142
1.135
1.113
1.110
1.096
1.051
0.983
0.967
0.958
0.936
0.928
0.907
0.899
NH2
D
D
1.92
4.32
0.92
3.24
2.04
f1 (ppm)

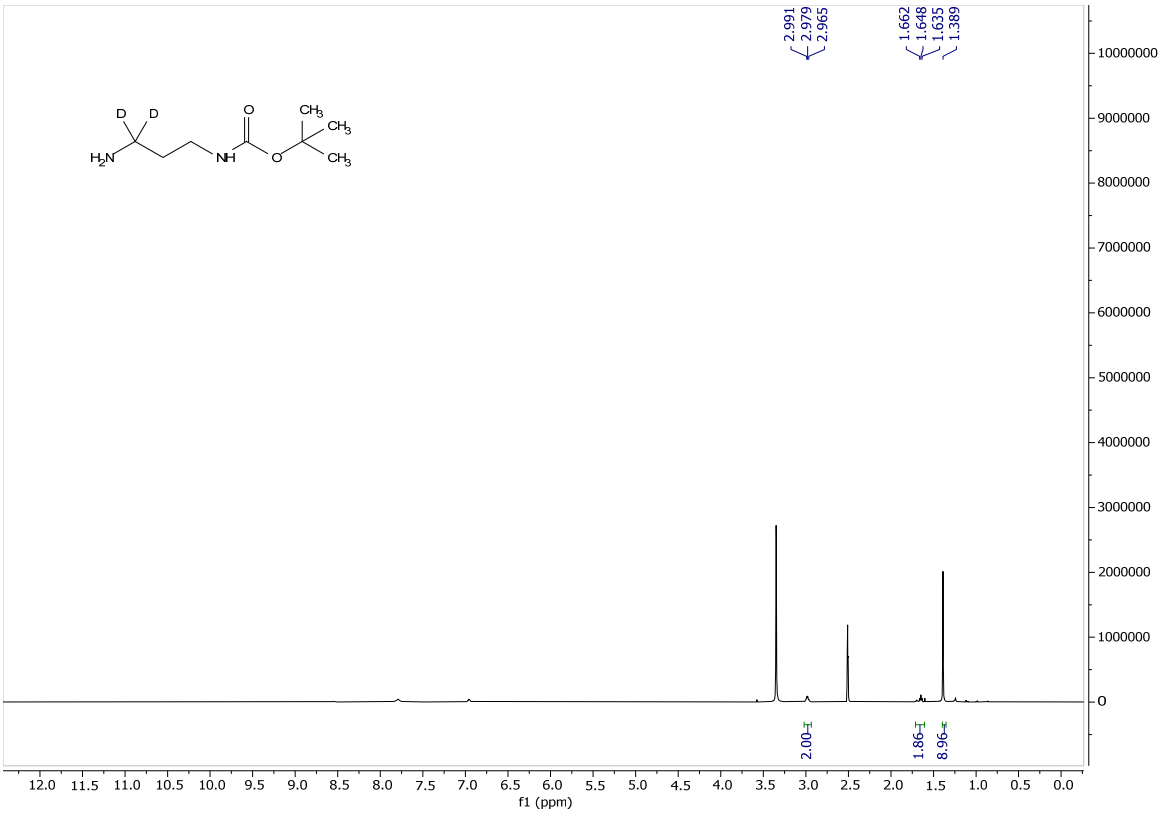

35.723
35.679
30.123
26.101
25.494
NH2
D
D
f1 (ppm)

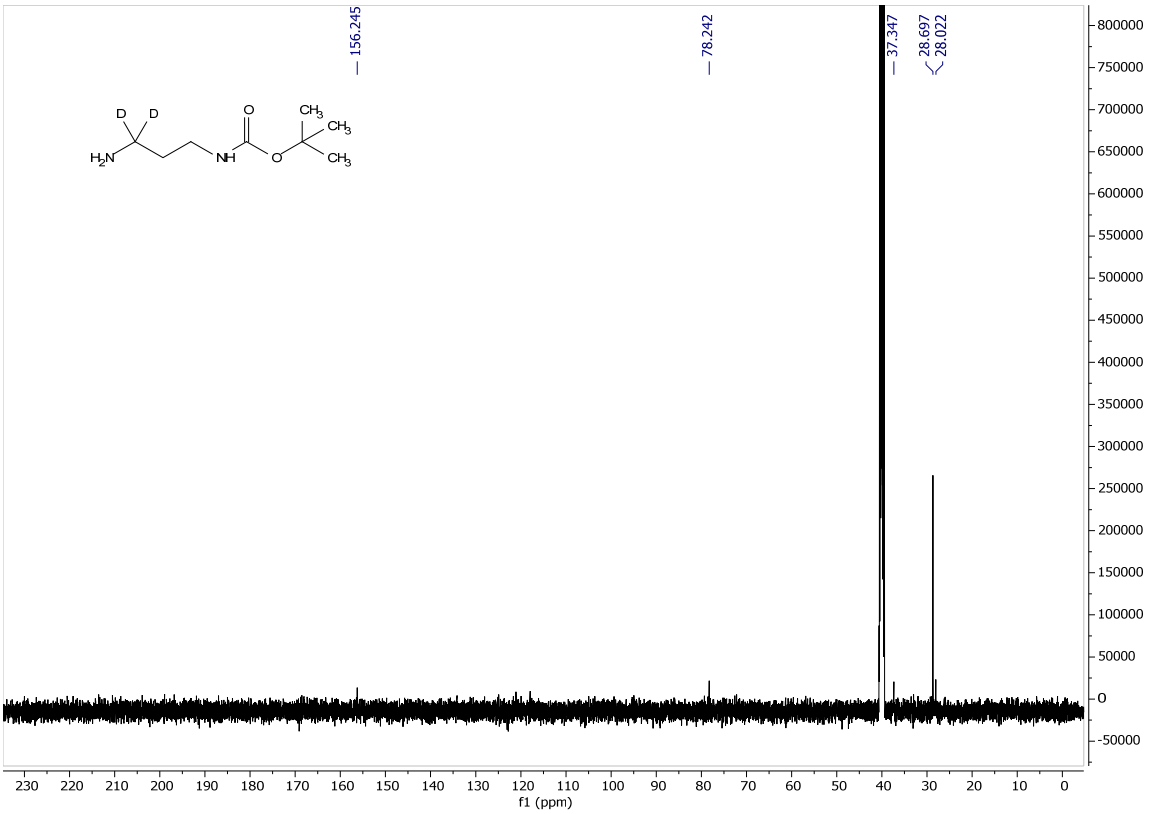
2ad


7.822
1.726
1.719
1.711
1.707
1.703
1.697
1.691
1.682
1.675
1.668
1.642
1.634
1.628
1.621
1.614
1.607
1.601
1.594
1.587
1.581
1.559
1.552
1.545
1.537
1.531
1.525
1.521
1.518
1.511
1.508
1.488
1.480
1.472
1.468
1.461
1.455
1.452
1.448
1.442
1.435
1.427
1.422
1.416
1.408
1.402
1.396
1.389
1.383
1.376
1.235
1.208
1.196
1.189
1.181
1.176
1.170
1.167
1.162
1.091
D
D
NH2
3.05
11.45
2.07
f1 (ppm)

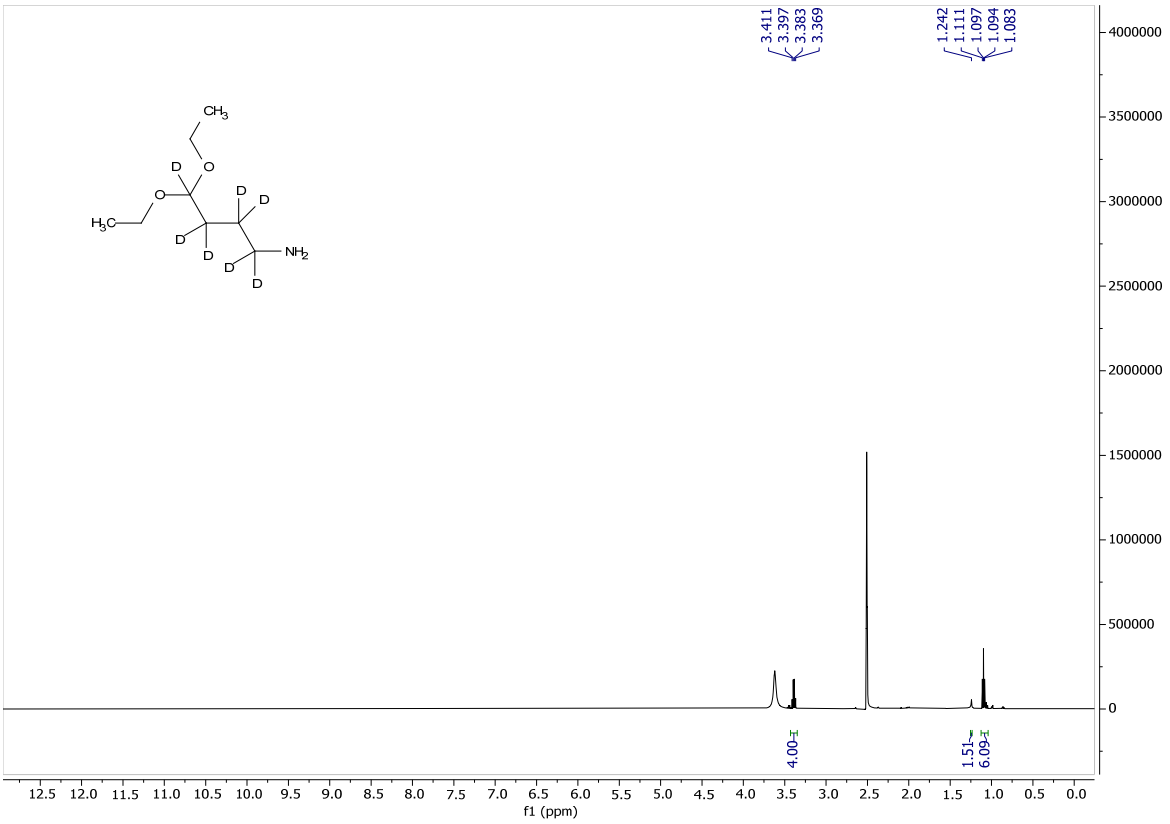

37.332
31.393
28.317
25.882
D
D
NH2
f1 (ppm)

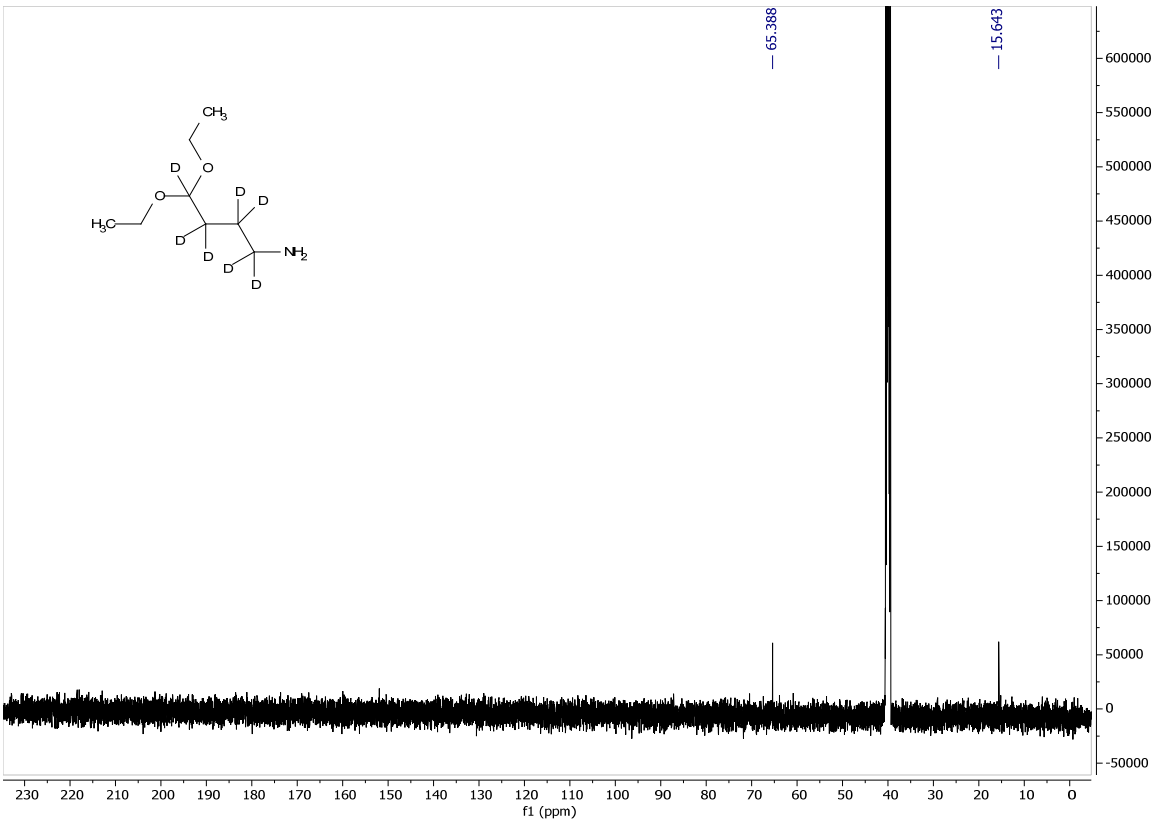
2ae


2.991
2.979
2.965
1.662
1.648
1.635
1.389
2.00
1.86
8.96
f1 (ppm)

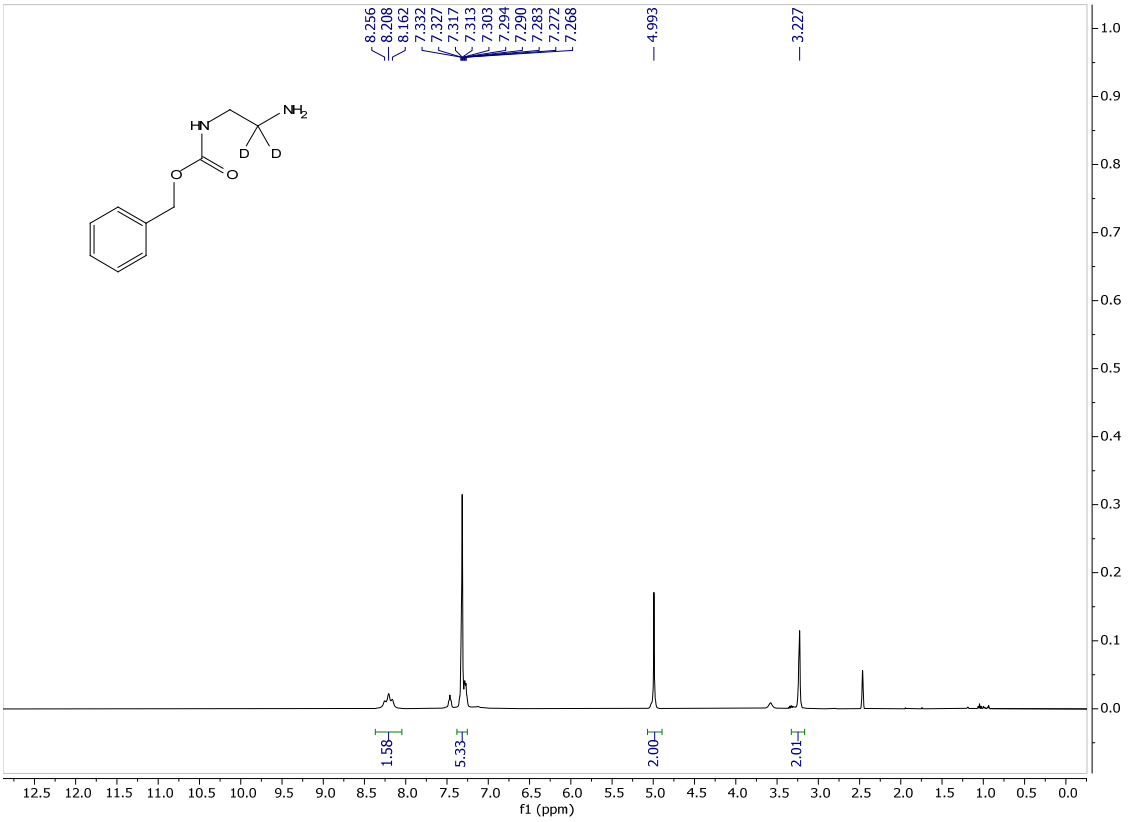

156.245
78.242
37.347
28.697
28.022
f1 (ppm)

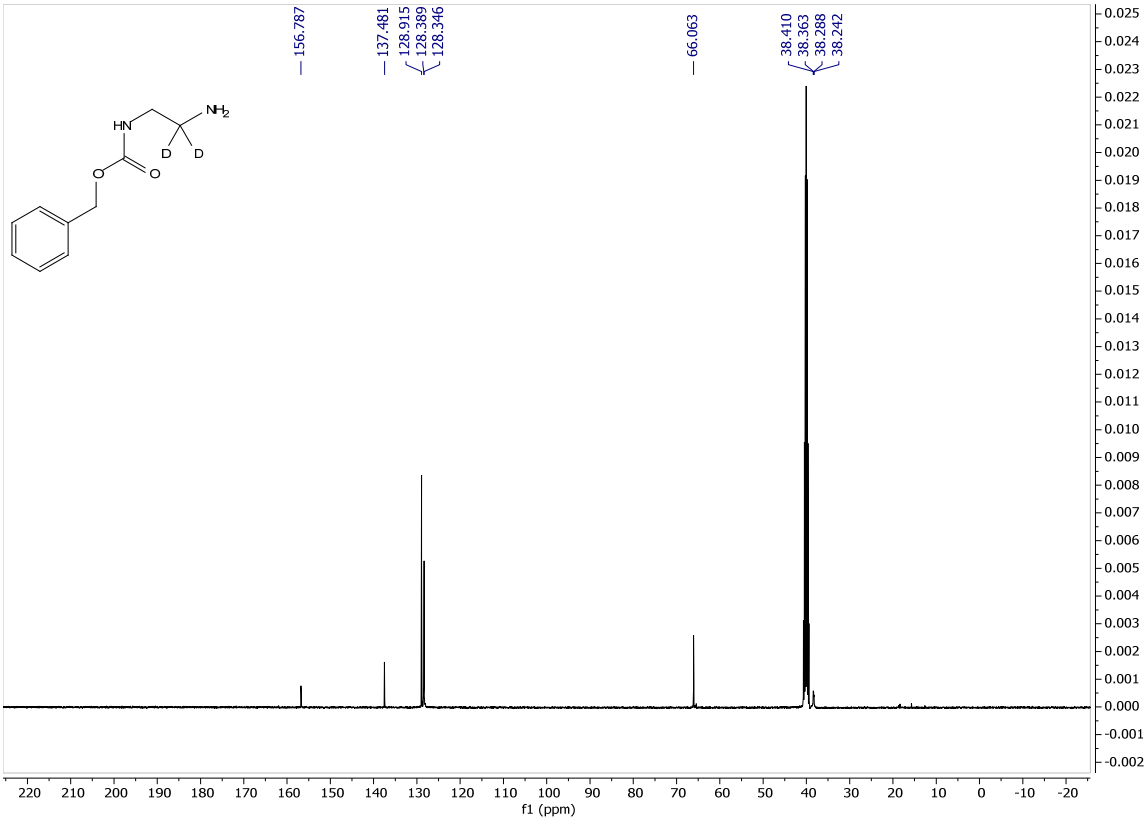
2af


3.411
3.397
3.383
3.369
1.242
1.111
1.097
1.094
1.083
4.00
1.51
6.09
f1 (ppm)

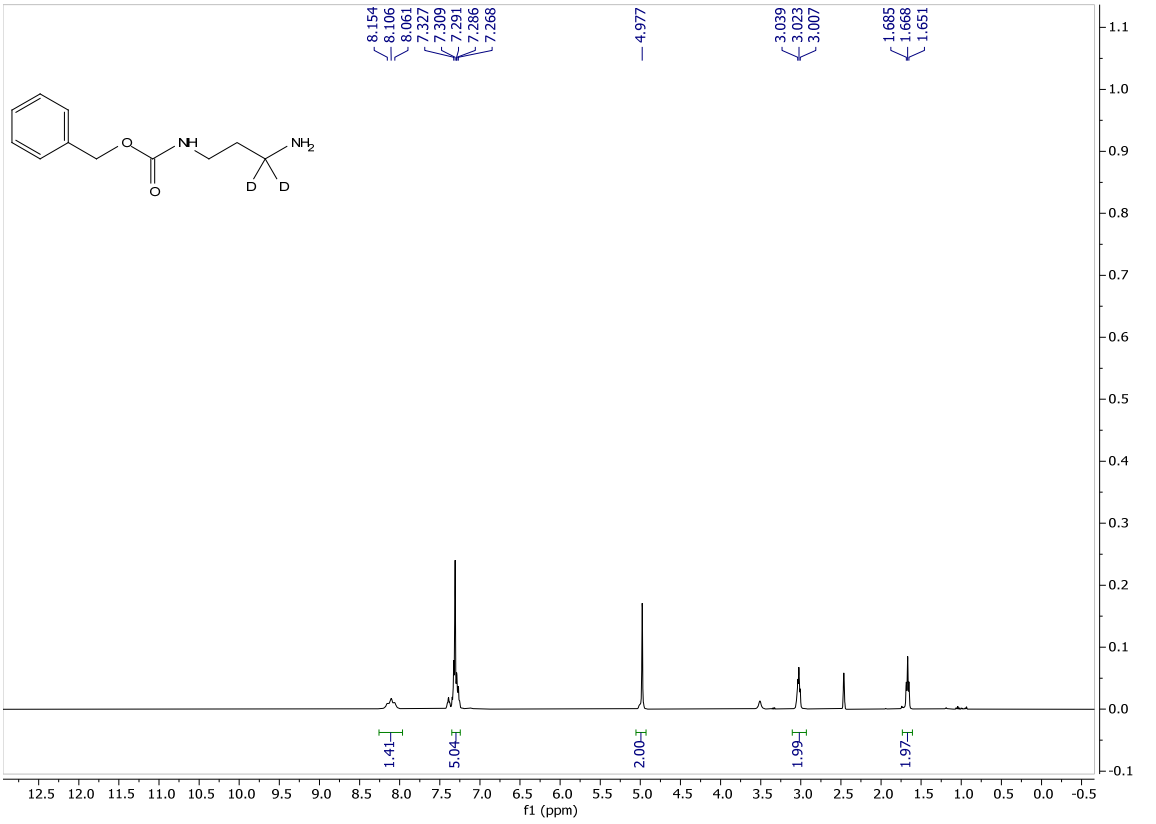

65.388
15.643
f1 (ppm)

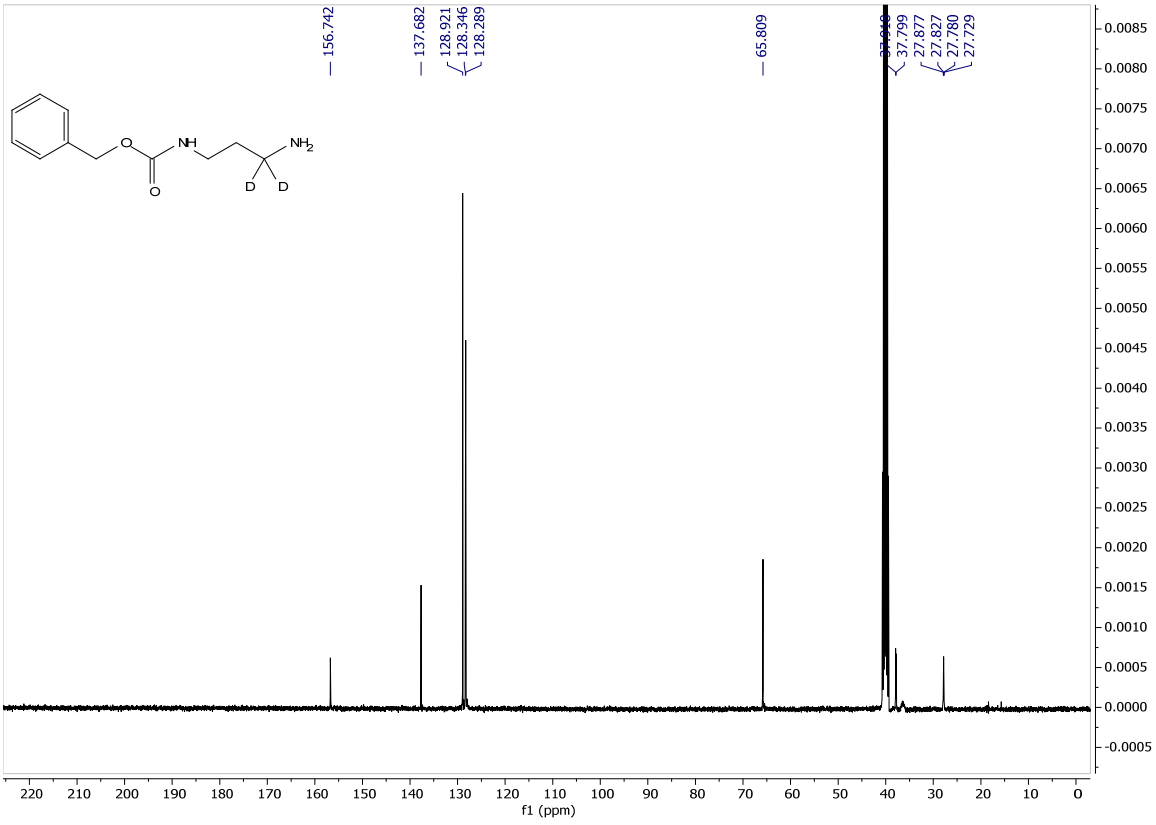
2ag


8.256
8.208
8.162
7.332
7.327
7.317
7.313
7.303
7.294
7.290
7.283
7.272
7.268
4.993
3.227
1.58
5.33
2.00
2.01
f1 (ppm)

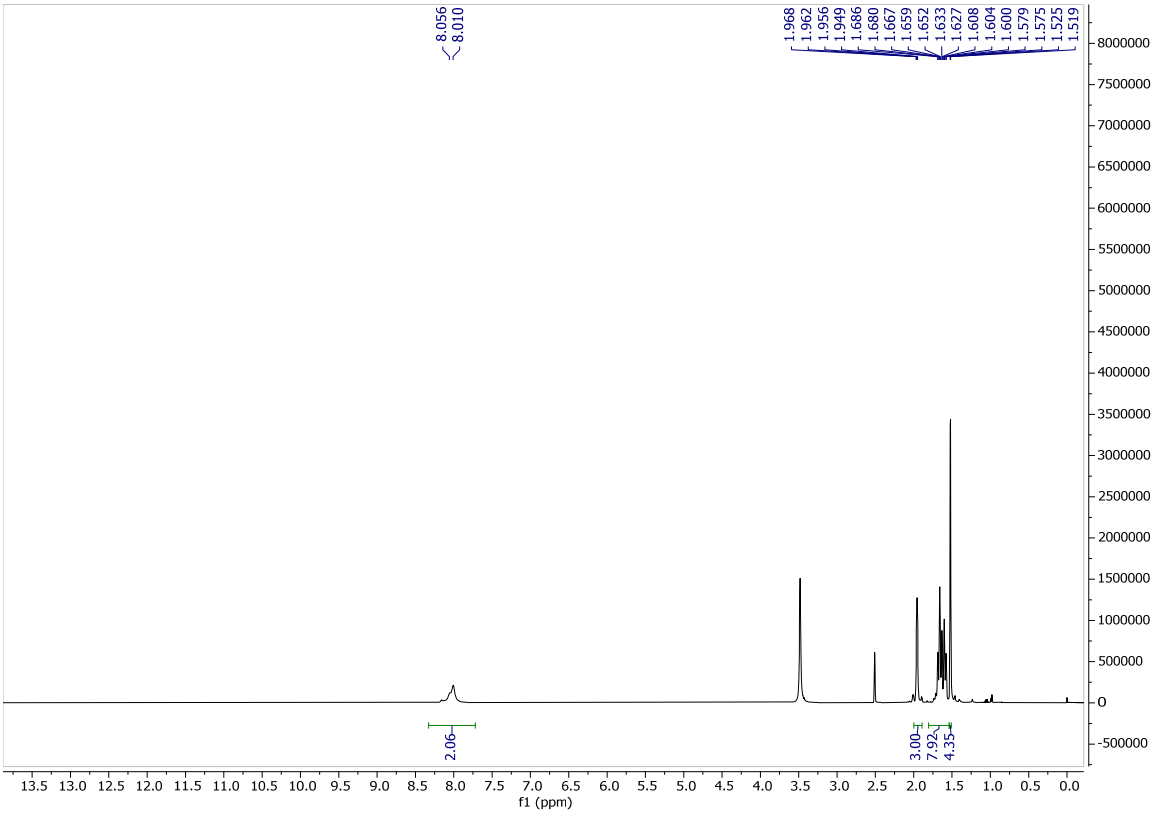

156.787
137.481
128.915
128.389
128.346
66.063
38.410
38.363
38.288
38.242
f1 (ppm)

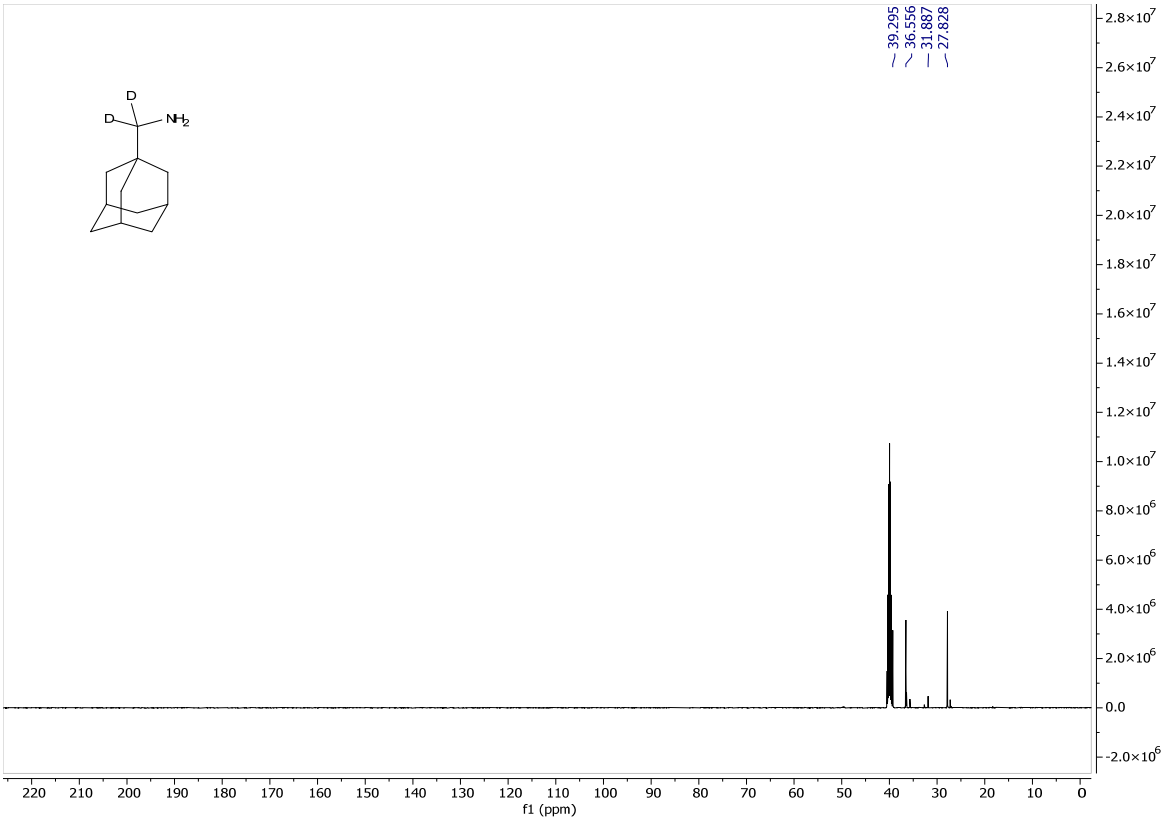
2ah


8.154
8.106
8.061
7.327
7.309
7.291
7.286
7.268
4.977
3.039
3.023
3.007
1.685
1.668
1.651
1.41
5.04
2.00
1.99
1.97
f1 (ppm)

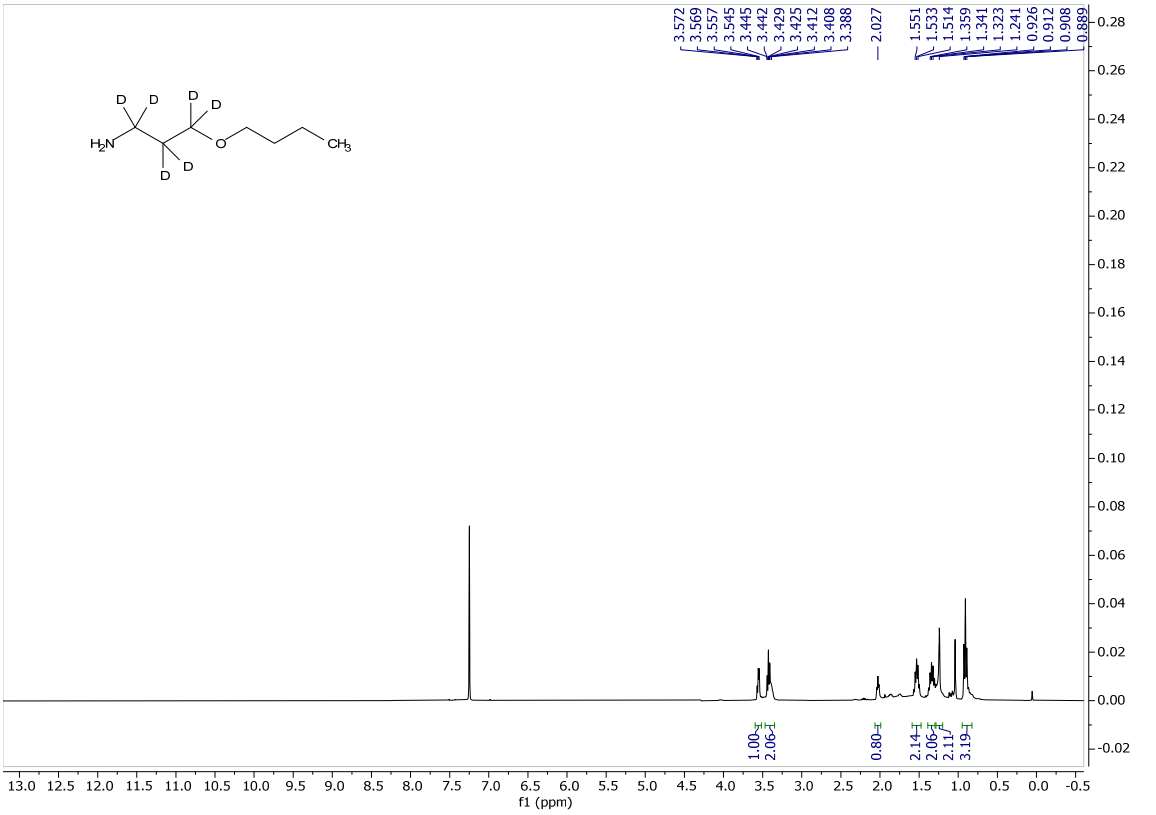

156.742
137.682
128.921
128.346
128.289
65.809
37.799
27.877
27.827
27.780
27.729
f1 (ppm)

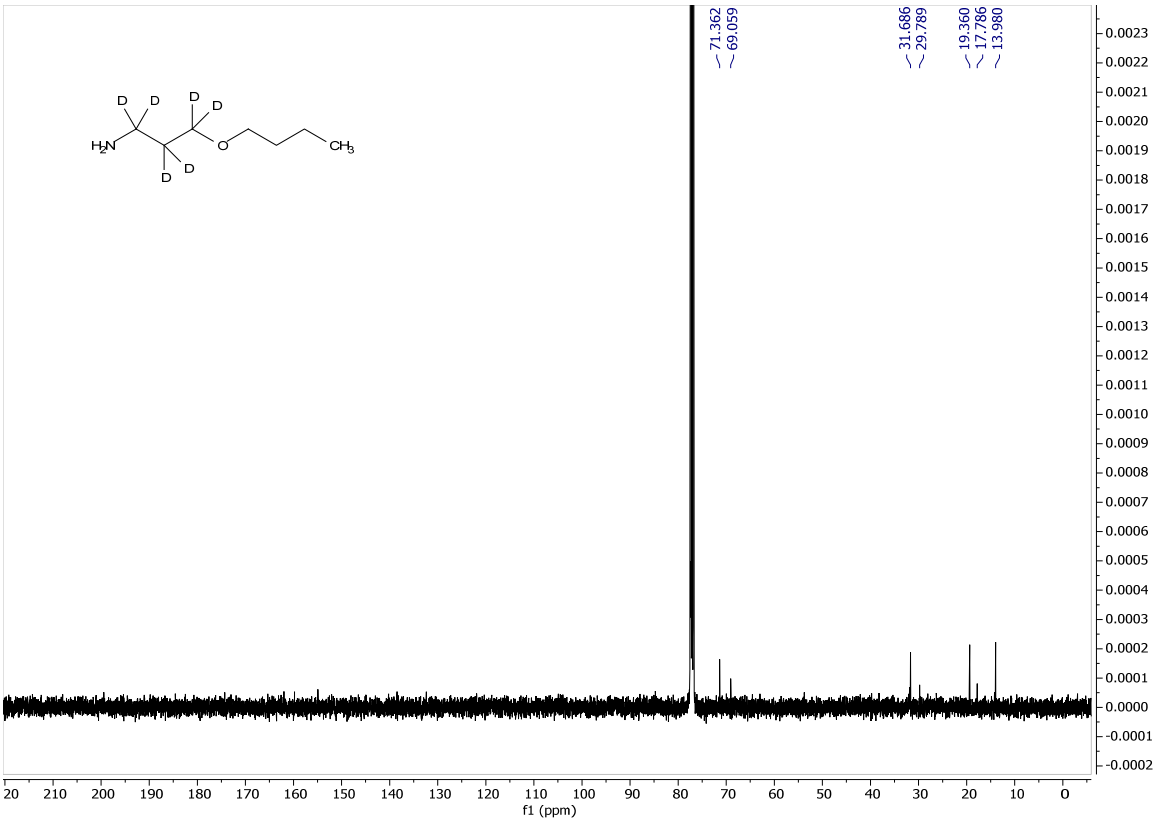
2ai


8.056
8.010
1.968
1.962
1.956
1.949
1.686
1.680
1.667
1.659
1.652
1.633
1.627
1.608
1.604
1.600
1.579
1.575
1.525
1.519
2.06
3.00
7.92
4.35
f1 (ppm)

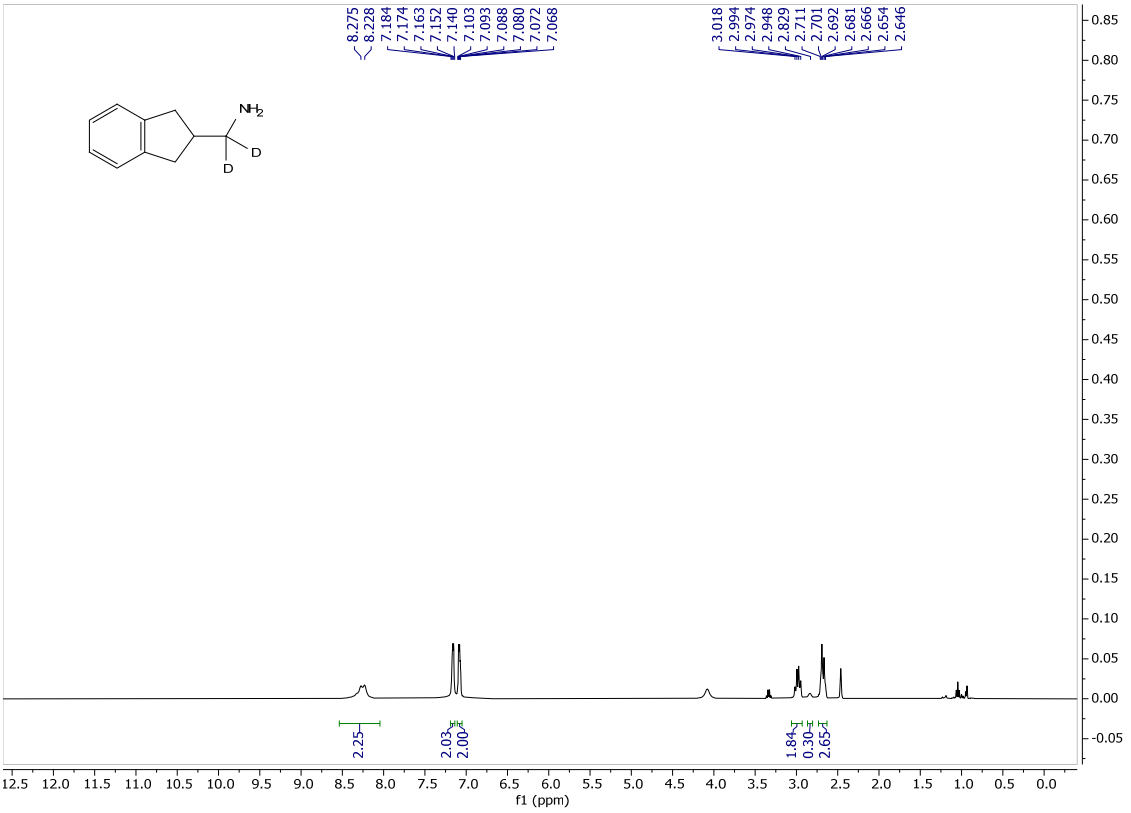

39.295
36.556
31.887
27.828
D
D
NH2
f1 (ppm)

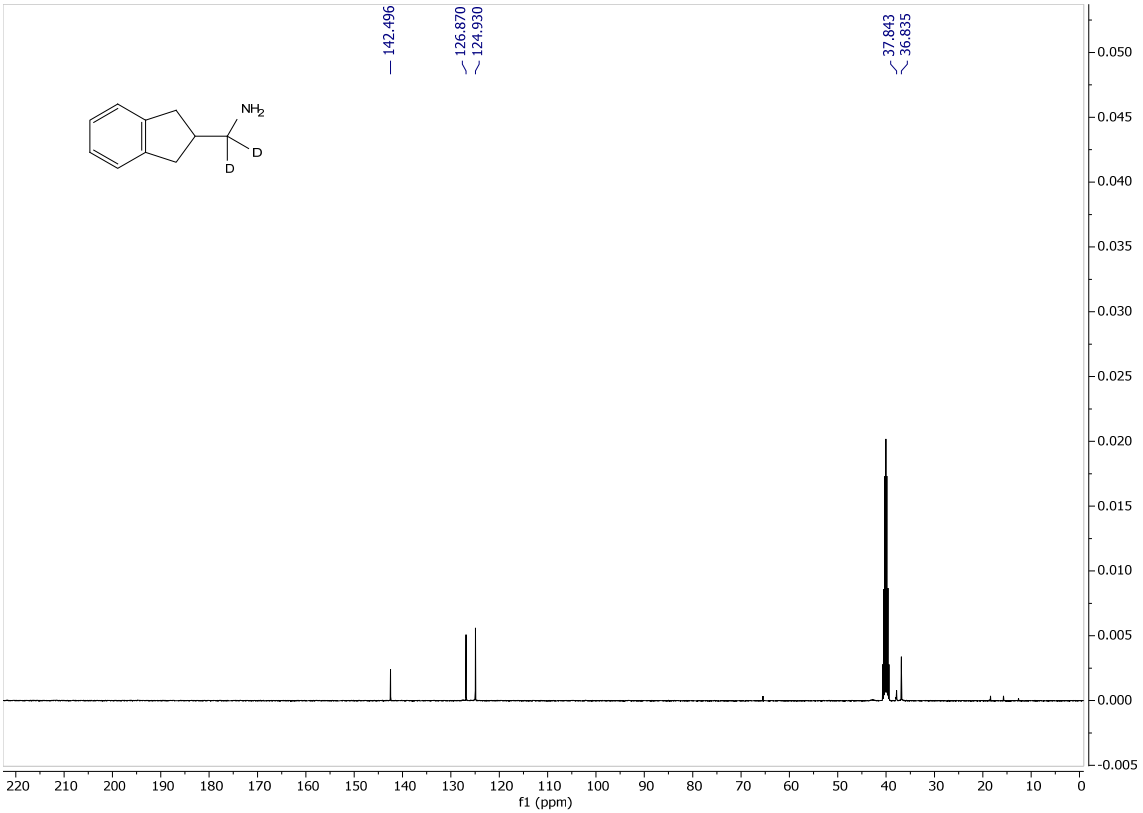
2aj


3.572
3.569
3.557
3.545
3.445
3.442
3.429
3.425
3.412
3.408
3.388
2.027
1.551
1.533
1.514
1.359
1.341
1.323
1.241
0.926
0.912
0.908
0.889
1.00
2.06
0.80
2.14
2.06
2.11
3.19
f1 (ppm)

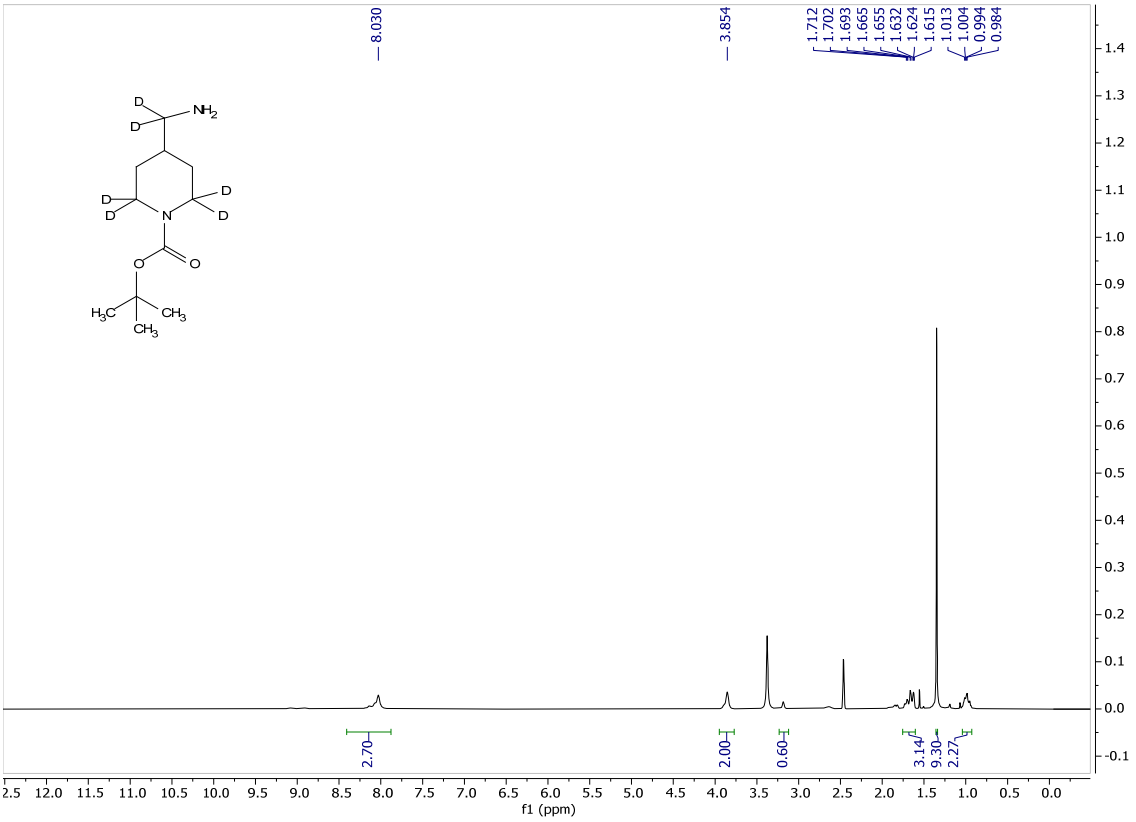

71.362
69.059
31.686
29.789
19.360
17.786
13.980
f1 (ppm)

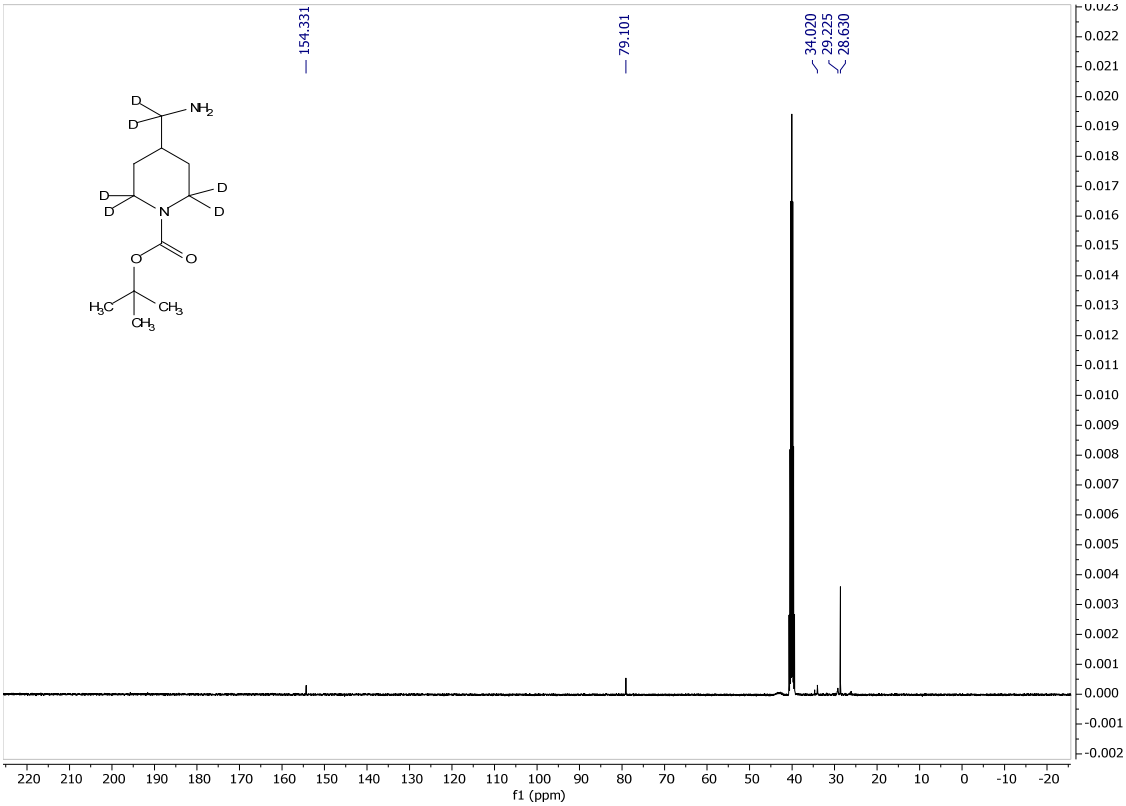
2ak


8.275
8.228
7.184
7.174
7.163
7.152
7.140
7.103
7.093
7.088
7.080
7.072
7.068
3.018
2.994
2.974
2.948
2.829
2.711
2.701
2.692
2.681
2.666
2.654
2.646
NH2
D
D
2.25
2.03
2.00
1.84
0.30
2.65
f1 (ppm)

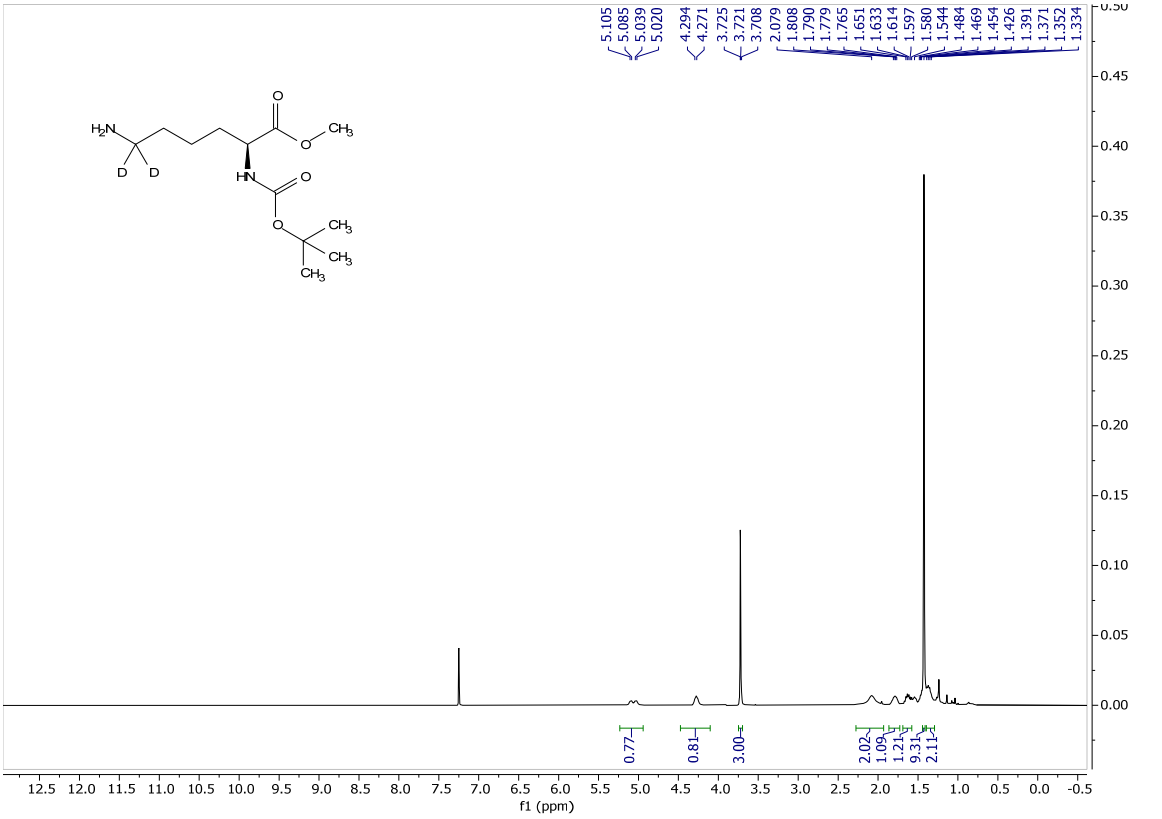

142.496
126.870
124.930
37.843
36.835
NH2
D
D
f1 (ppm)

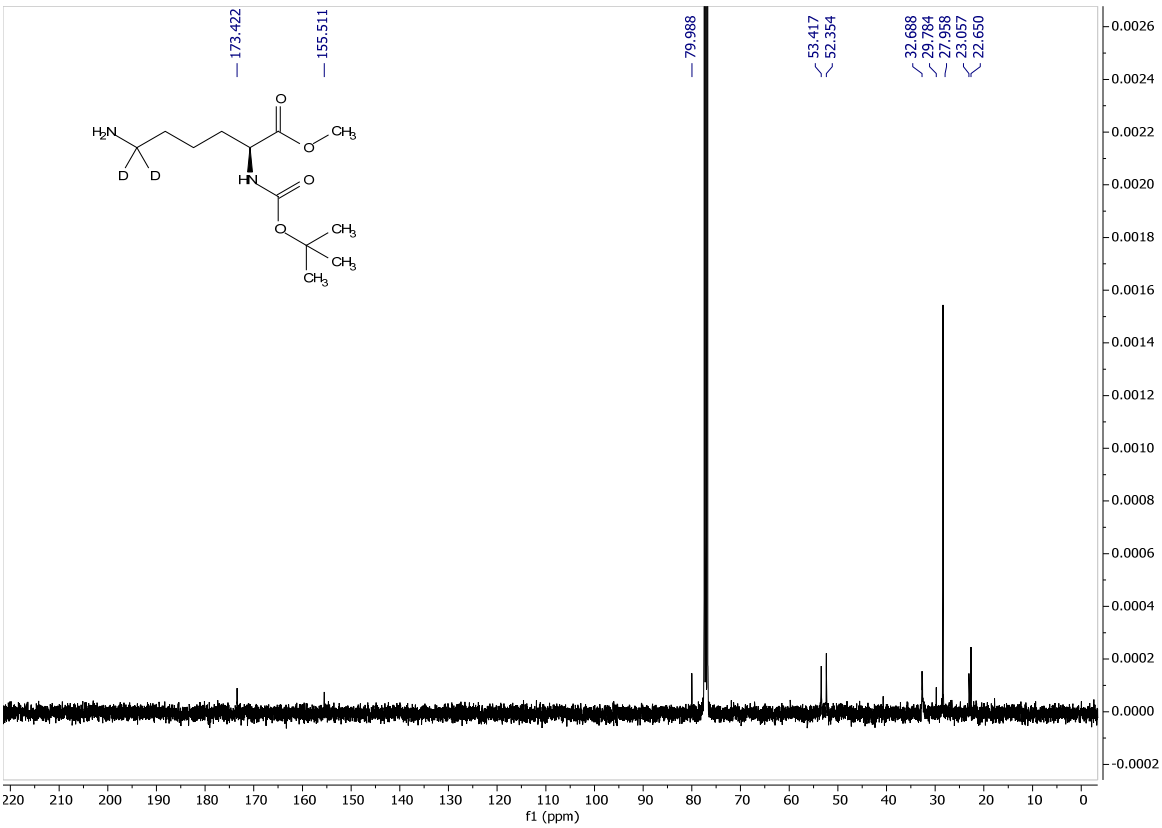
2al


8.030
3.854
1.712
1.702
1.693
1.665
1.655
1.632
1.624
1.615
1.013
1.004
0.994
0.984
2.70
2.00
0.60
3.14
9.30
2.27
f1 (ppm)

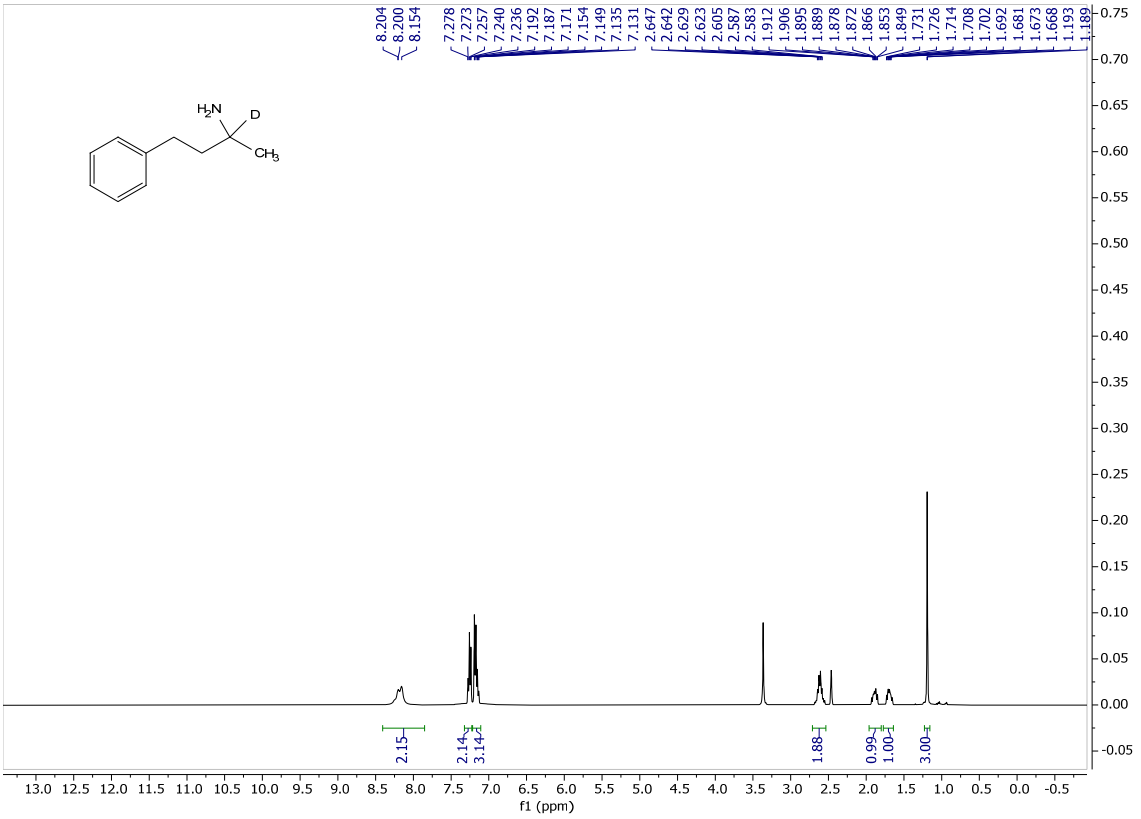

154.331
79.101
34.020
29.225
28.630
f1 (ppm)

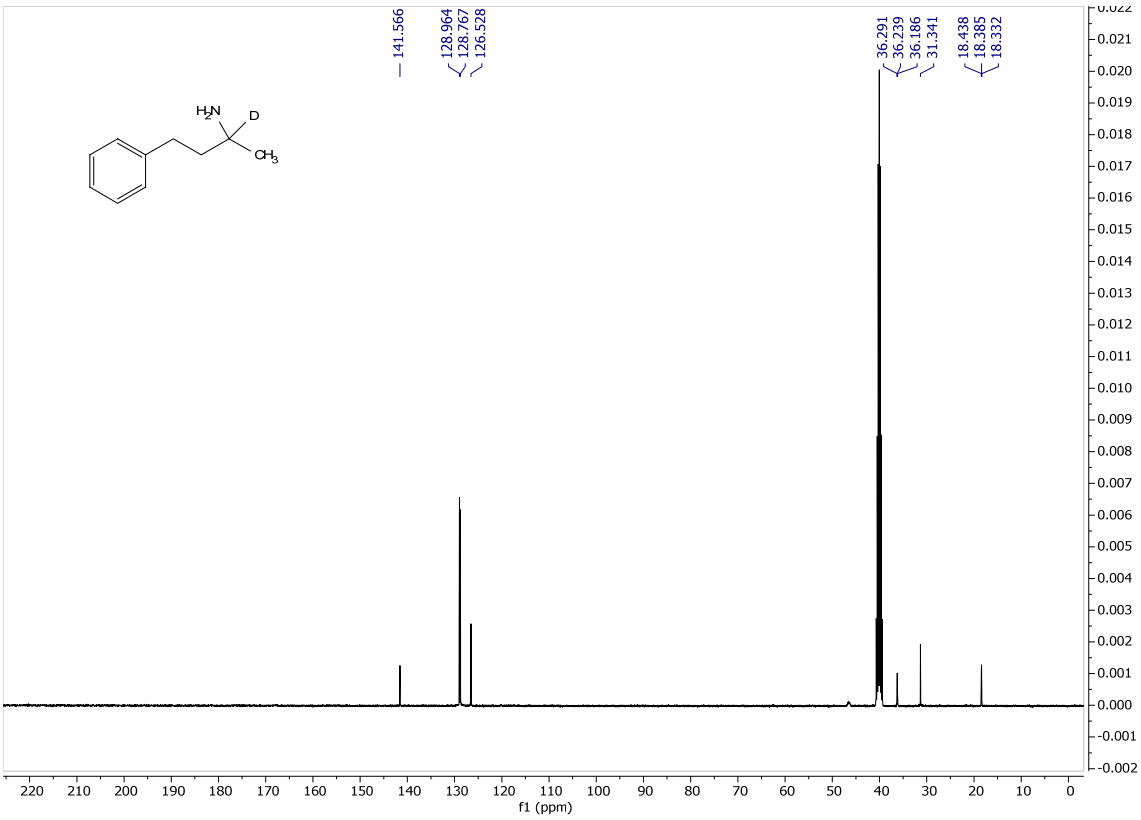
2am


5.105
5.085
5.039
5.020
4.294
4.271
3.725
3.721
3.708
2.079
1.808
1.790
1.779
1.765
1.651
1.633
1.614
1.597
1.580
1.544
1.484
1.469
1.454
1.426
1.391
1.371
1.352
1.334
0.77
0.81
3.00
2.02
1.09
1.21
9.31
2.11
f1 (ppm)

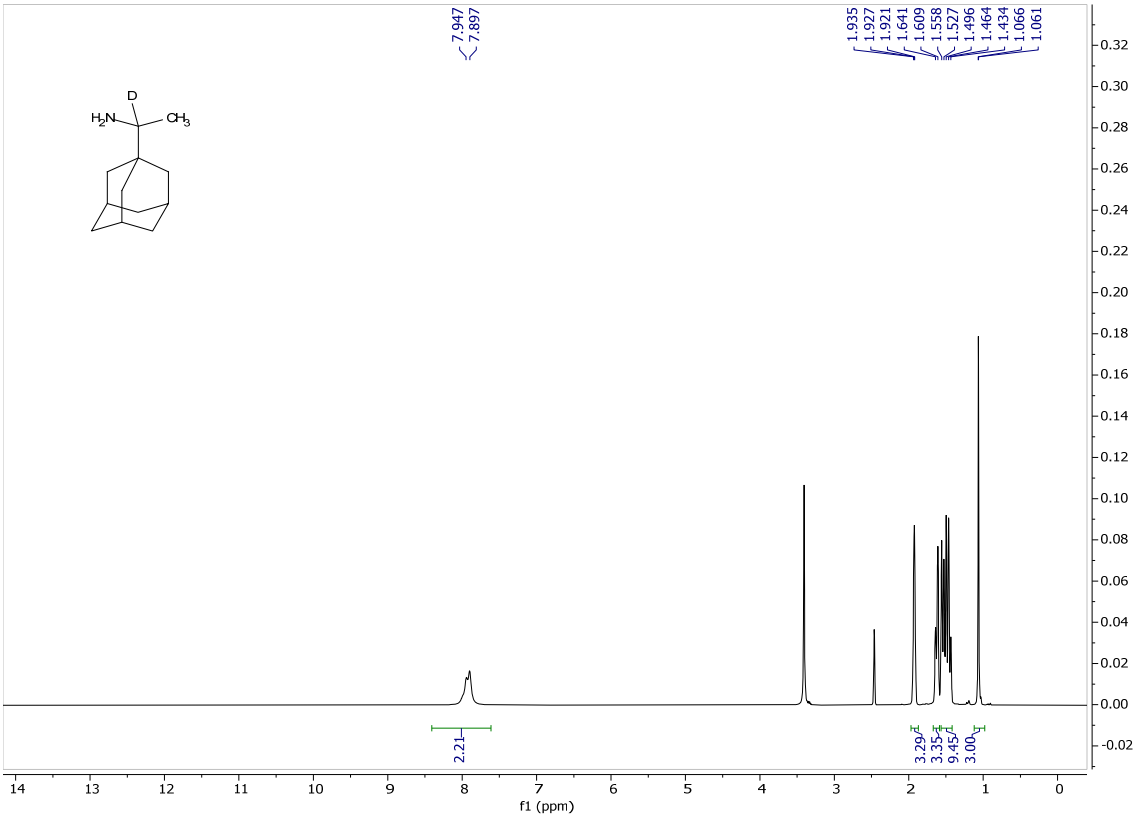

173.422
155.511
79.988
53.417
52.354
32.688
29.784
27.958
23.057
22.650
f1 (ppm)

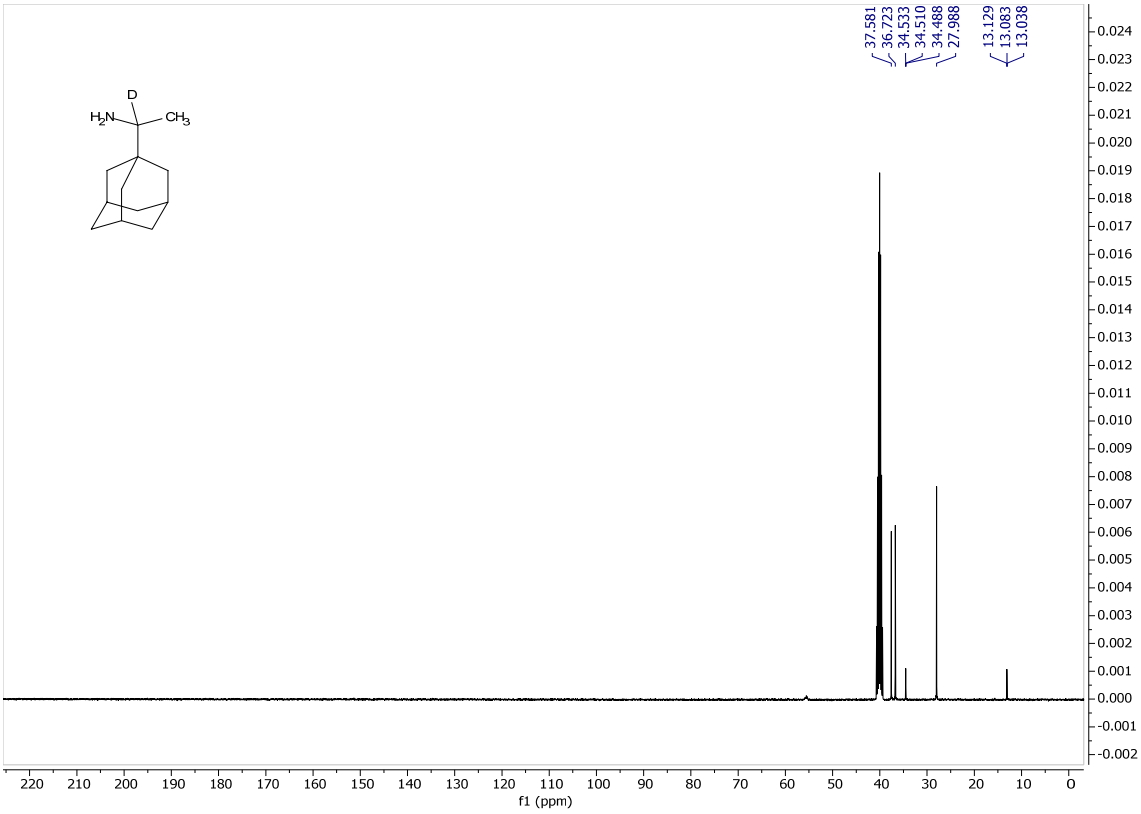
2an


8.204
8.200
8.154
7.278
7.273
7.257
7.240
7.236
7.192
7.187
7.171
7.154
7.149
7.135
7.131
2.647
2.642
2.629
2.623
2.605
2.587
2.583
1.912
1.906
1.895
1.889
1.878
1.872
1.866
1.853
1.849
1.731
1.726
1.714
1.708
1.702
1.692
1.681
1.673
1.668
1.193
1.189
H2N
D
CH3
2.15
2.14
3.14
1.88
0.99
1.00
3.00
f1 (ppm)

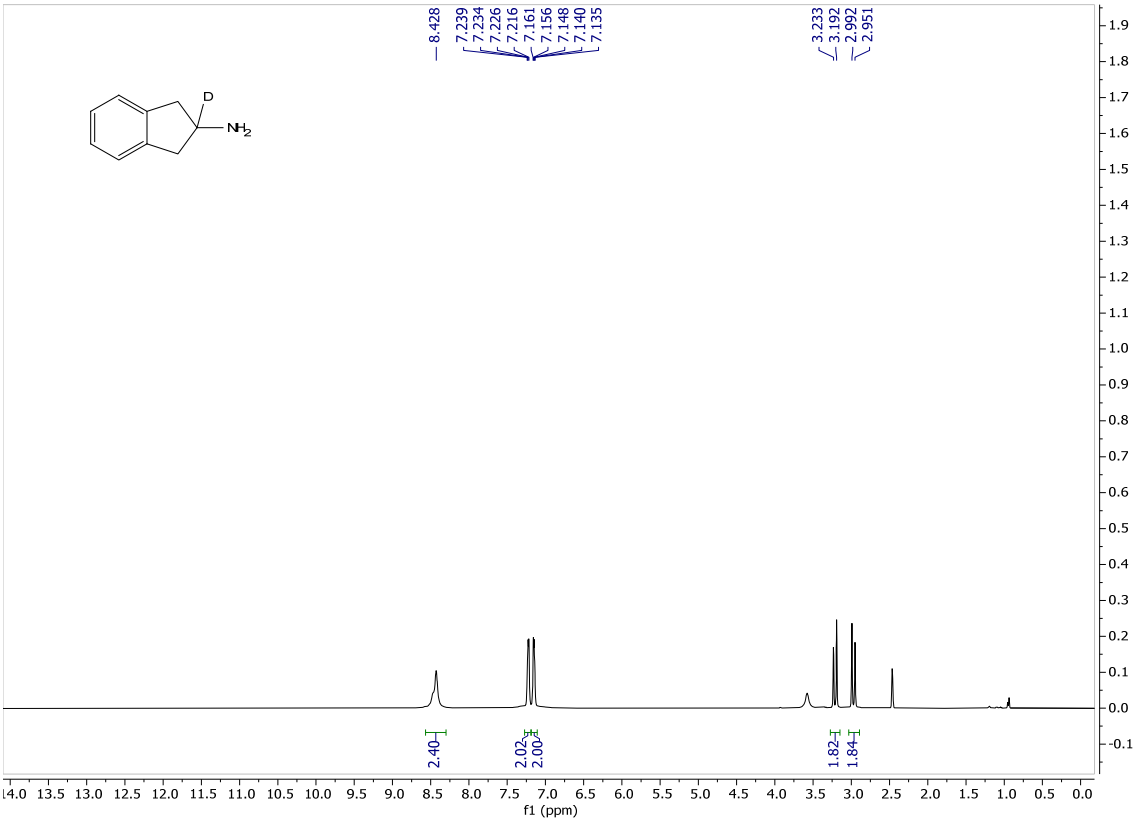

141.566
128.964
128.767
126.528
36.291
36.239
36.186
31.341
18.438
18.385
18.332
H2N
D
CH3
f1 (ppm)

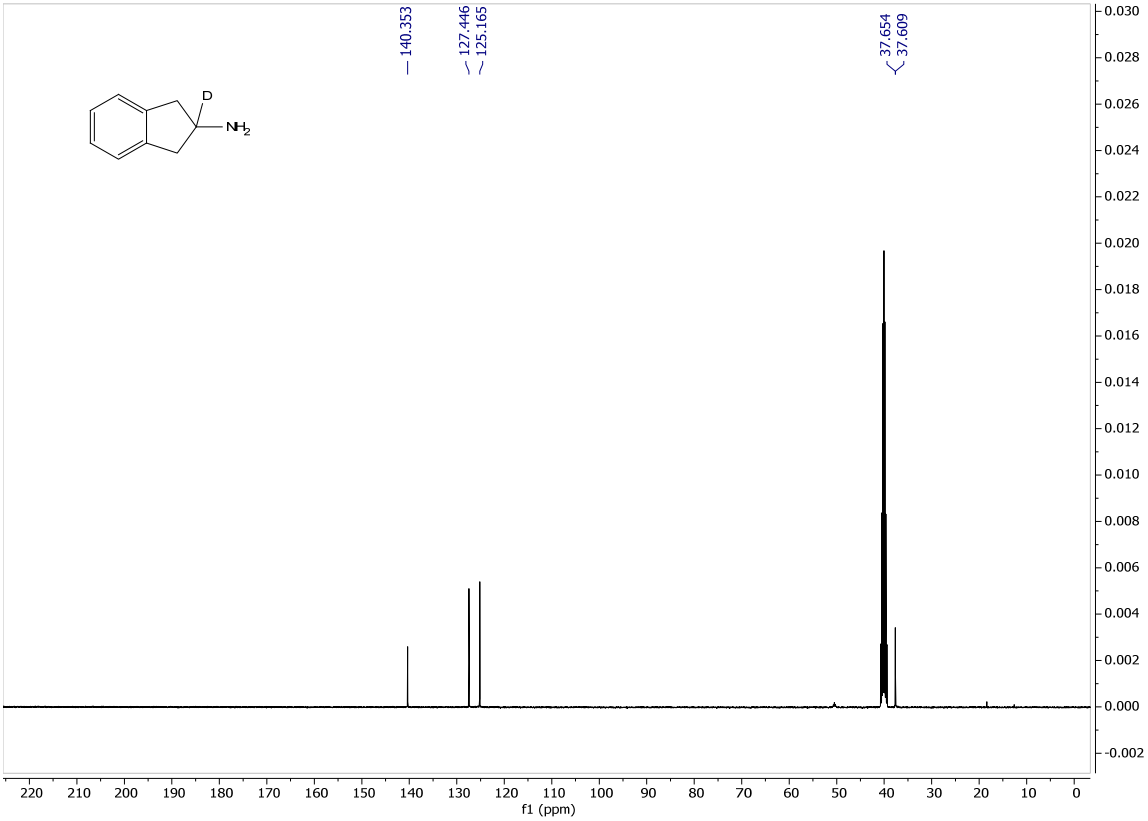
2ao


7.947
7.897
1.935
1.927
1.921
1.641
1.609
1.558
1.527
1.496
1.464
1.434
1.066
1.061
D
H2N
CH3
2.21
3.29
3.35
9.45
3.00
f1 (ppm)

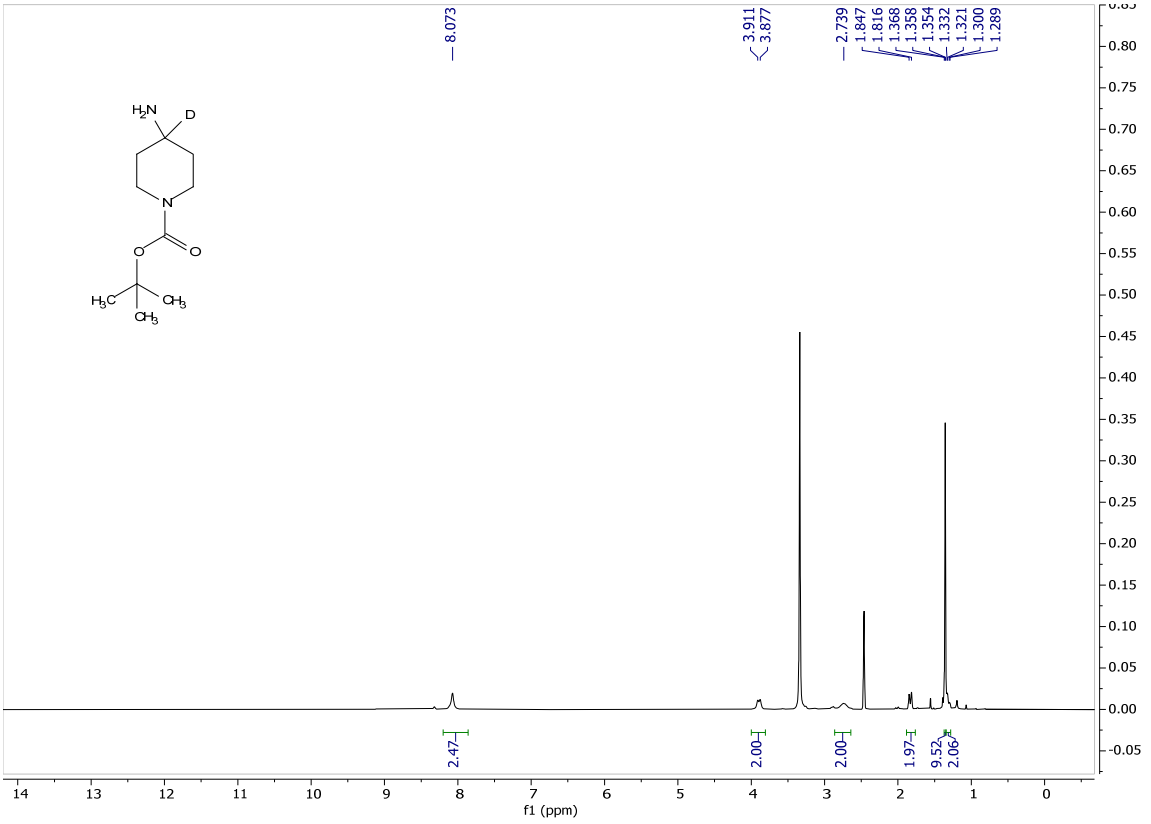

37.581
36.723
34.533
34.510
34.488
27.988
13.129
13.083
13.038
D
H2N
CH3
f1 (ppm)

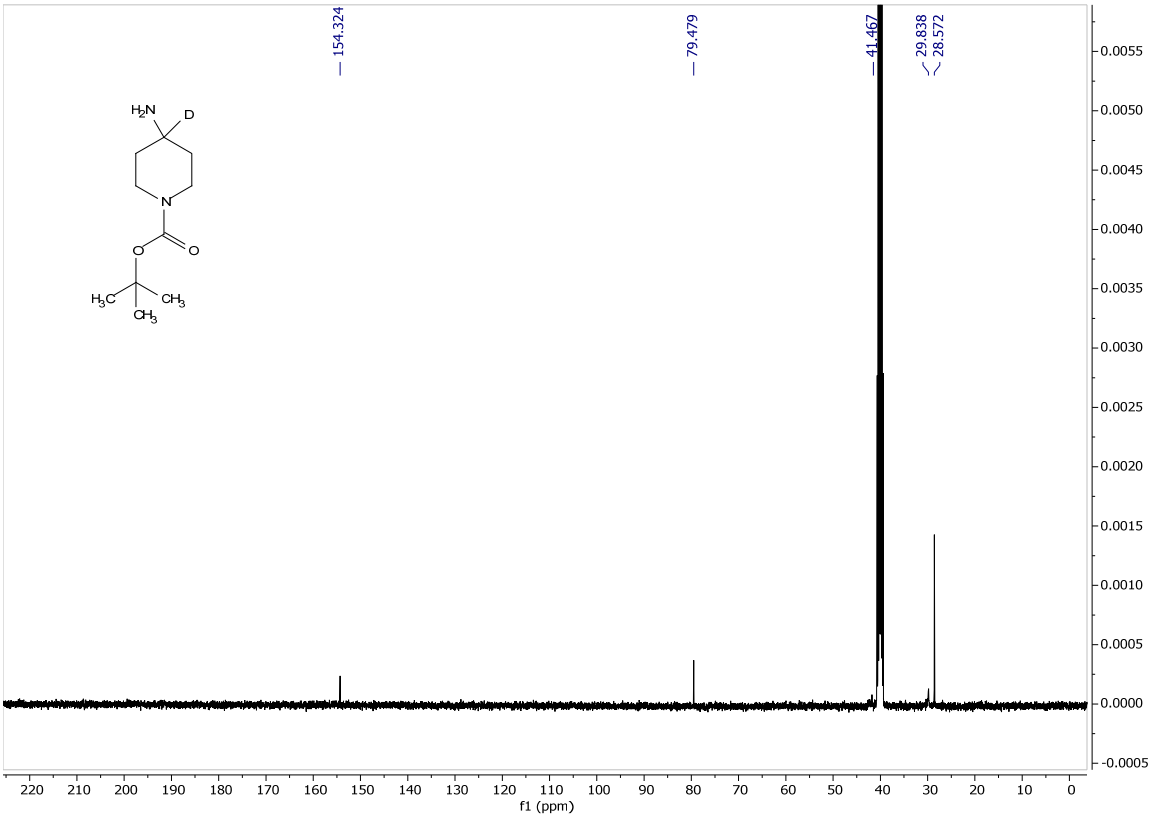
2ap


8.428
7.239
7.234
7.226
7.216
7.161
7.156
7.148
7.140
7.135
3.233
3.192
2.992
2.951
D
NH2
2.40
2.02
2.00
1.82
1.84
f1 (ppm)

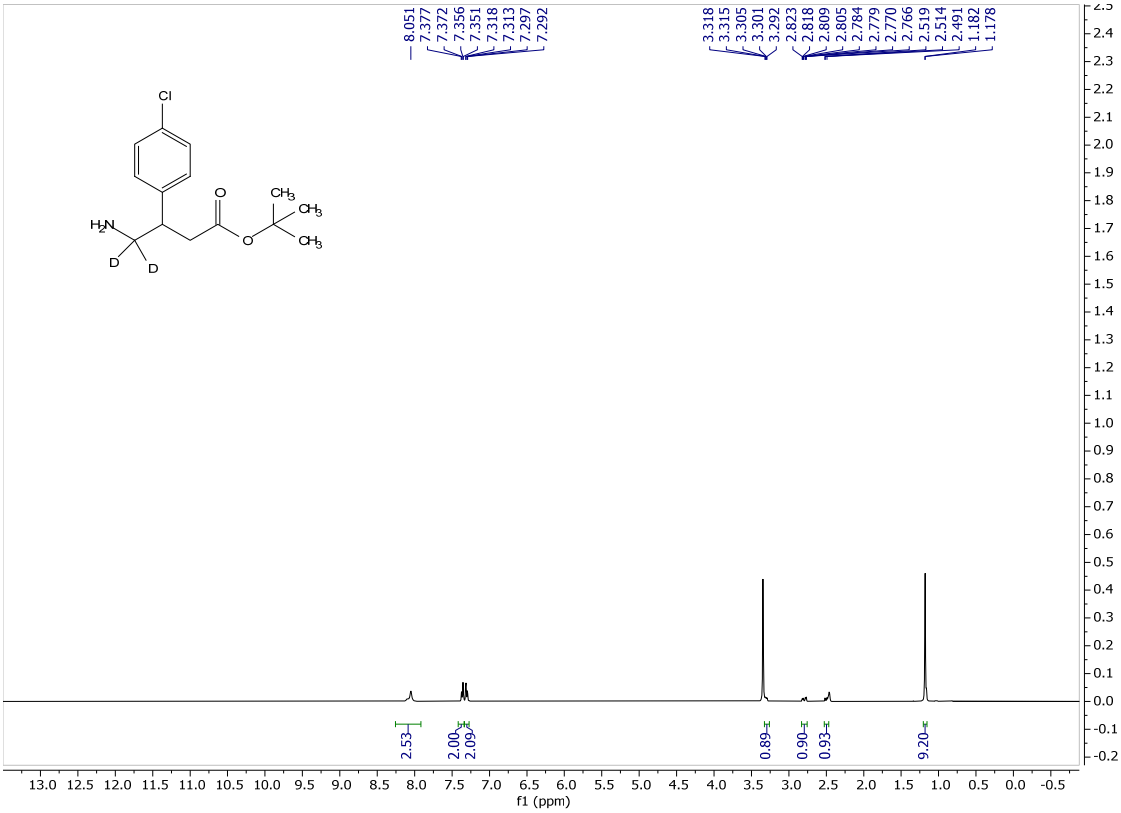

140.353
127.446
125.165
37.654
37.609
D
NH2
f1 (ppm)

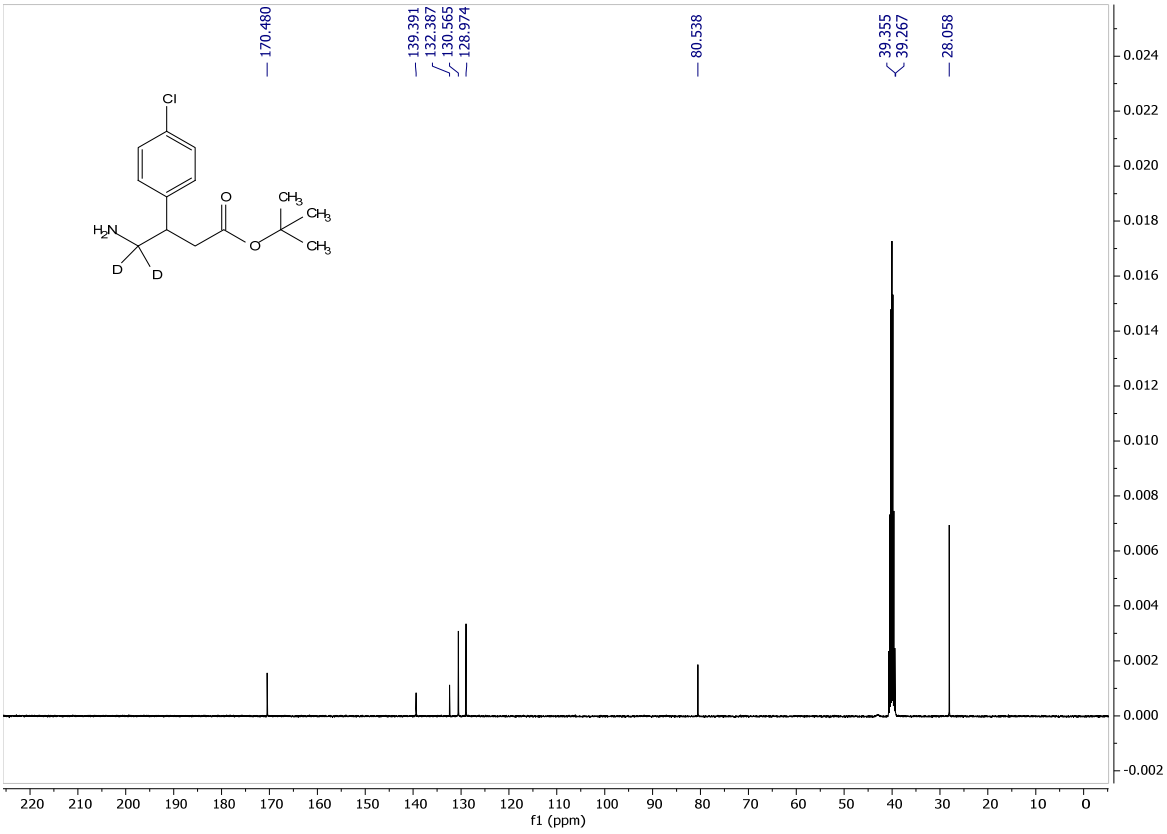
2aq


8.073
3.911
3.877
2.739
1.847
1.816
1.368
1.358
1.354
1.332
1.321
1.300
1.289
2.47
2.00
2.00
1.97
9.52
2.06
f1 (ppm)

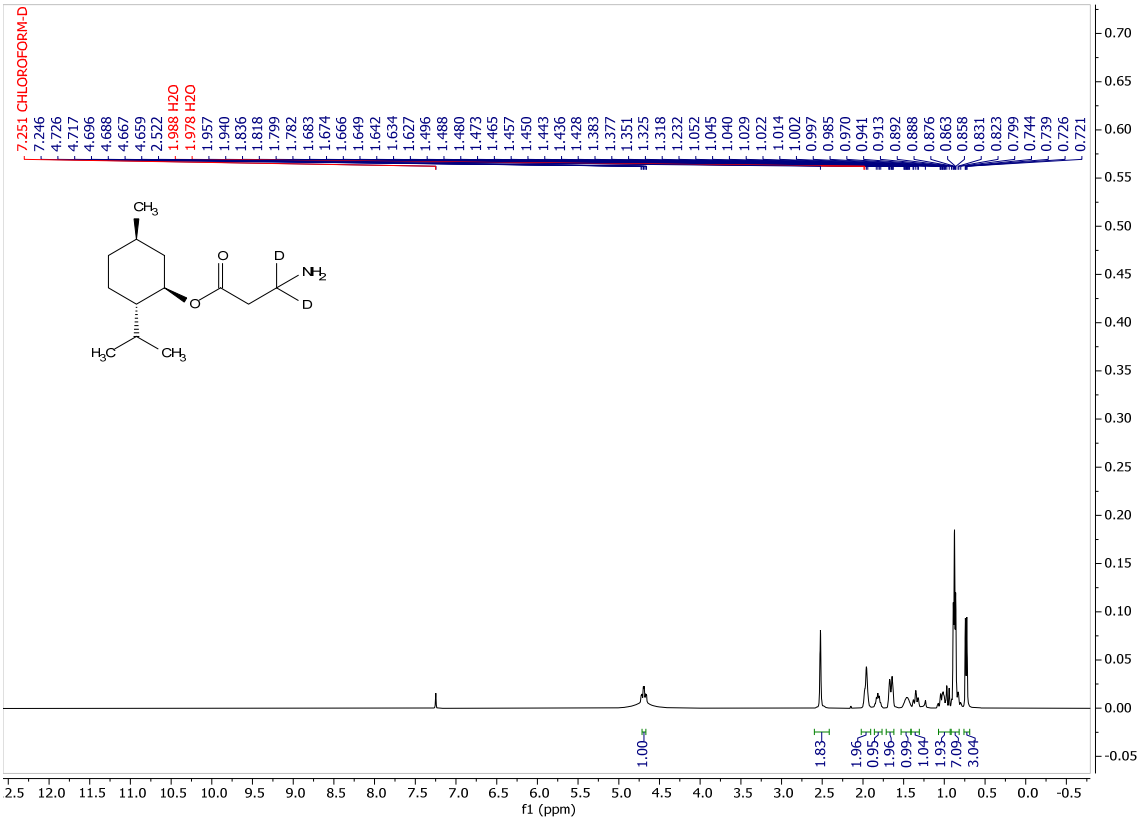

154.324
79.479
41.467
29.838
28.572
f1 (ppm)

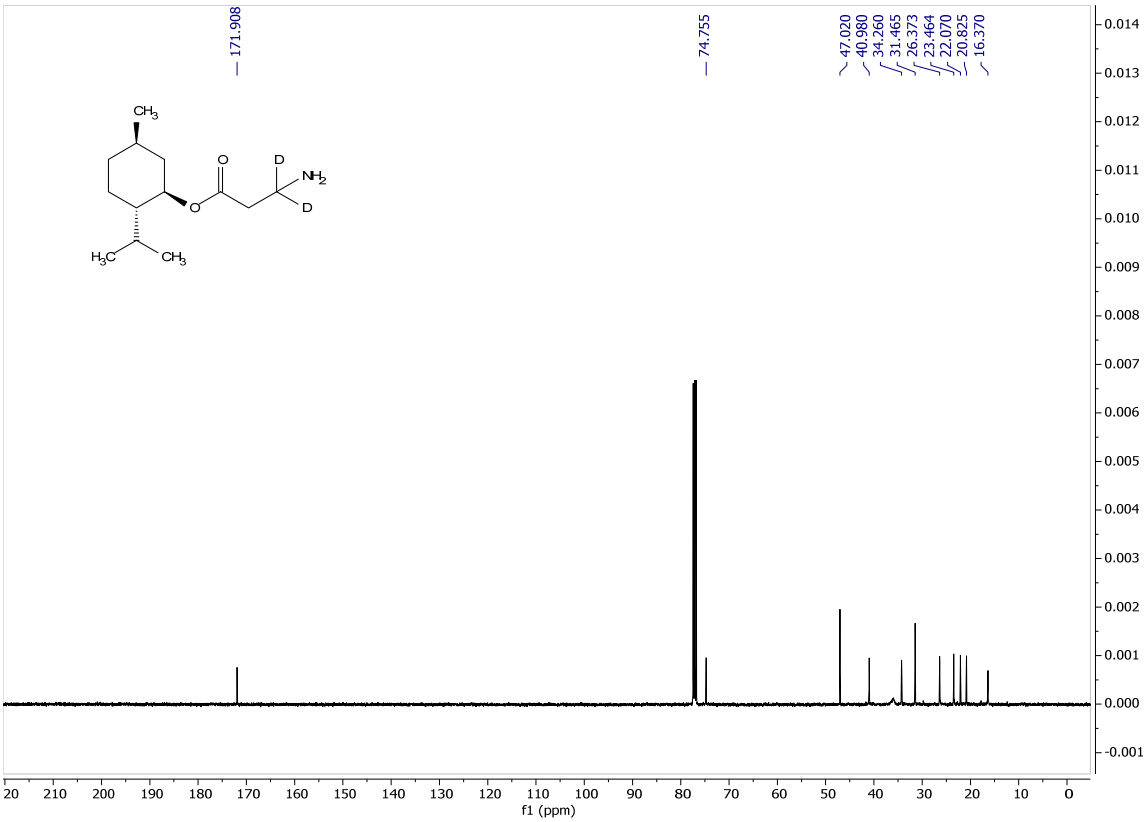
2ar


8.051
7.377
7.372
7.356
7.351
7.318
7.313
7.297
7.292
3.318
3.315
3.305
3.301
3.292
2.823
2.818
2.809
2.805
2.784
2.779
2.770
2.766
2.519
2.514
2.491
1.182
1.178
Cl
O
CH3
CH3
CH3
H2N
D
D
O
2.53
2.00
2.09
0.89
0.90
0.93
9.20
f1 (ppm)

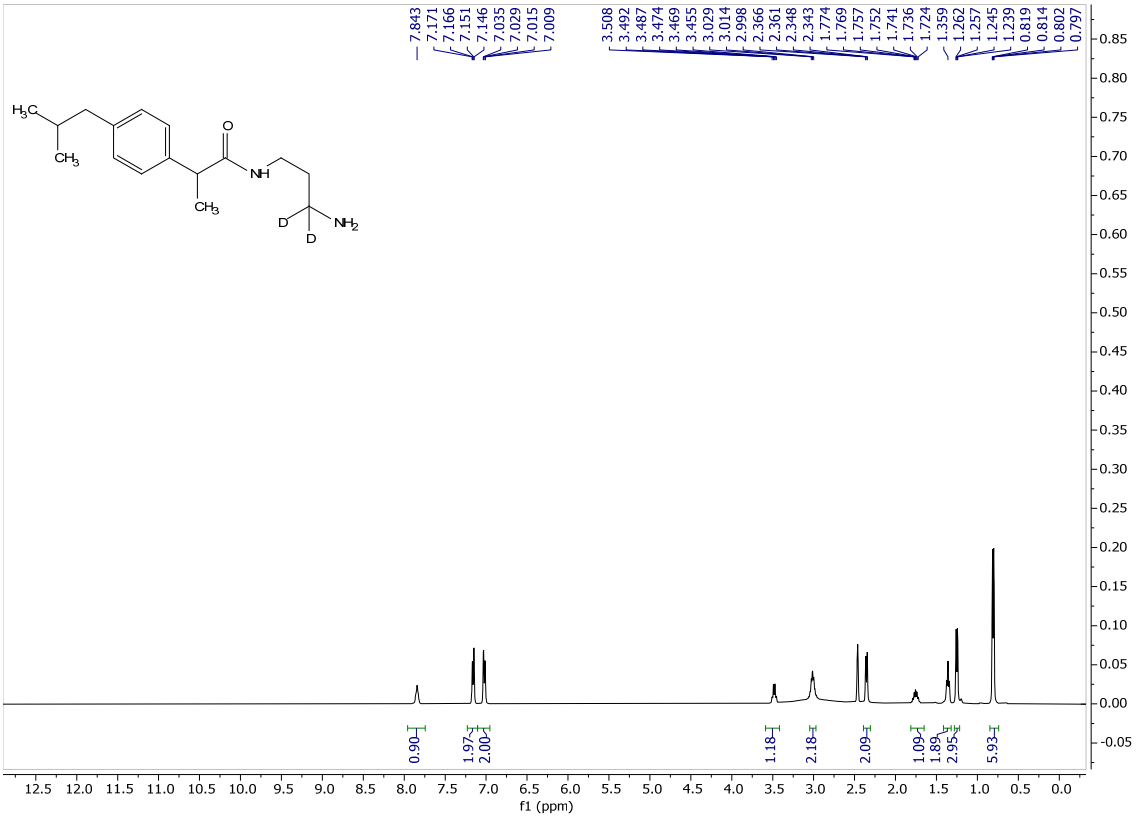

170.480
139.391
132.387
130.565
128.974
80.538
39.355
39.267
28.058
Cl
O
CH3
CH3
CH3
H2N
D
D
O
f1 (ppm)

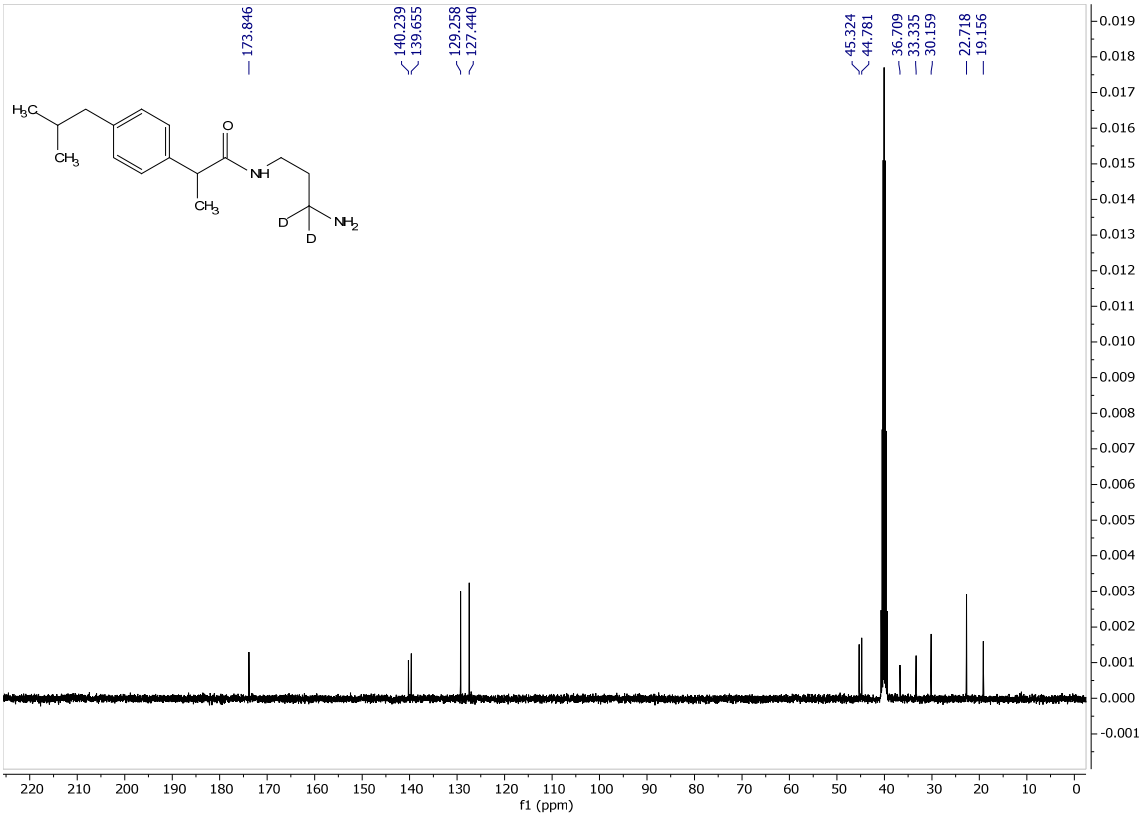
2as


7.251 CHLOROFORM-D
1.988 H2O
1.978 H2O
f1 (ppm)

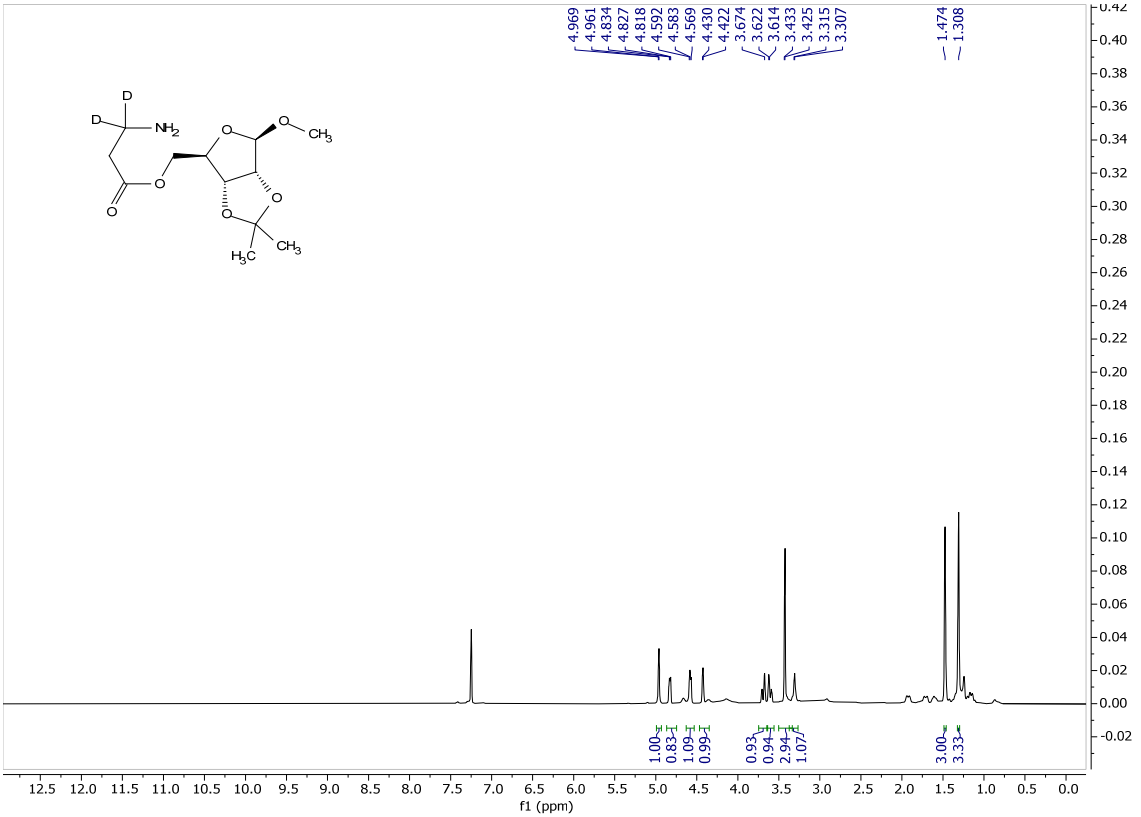

171.908
74.755
47.020
40.980
34.260
31.465
26.373
23.464
22.070
20.825
16.370
f1 (ppm)

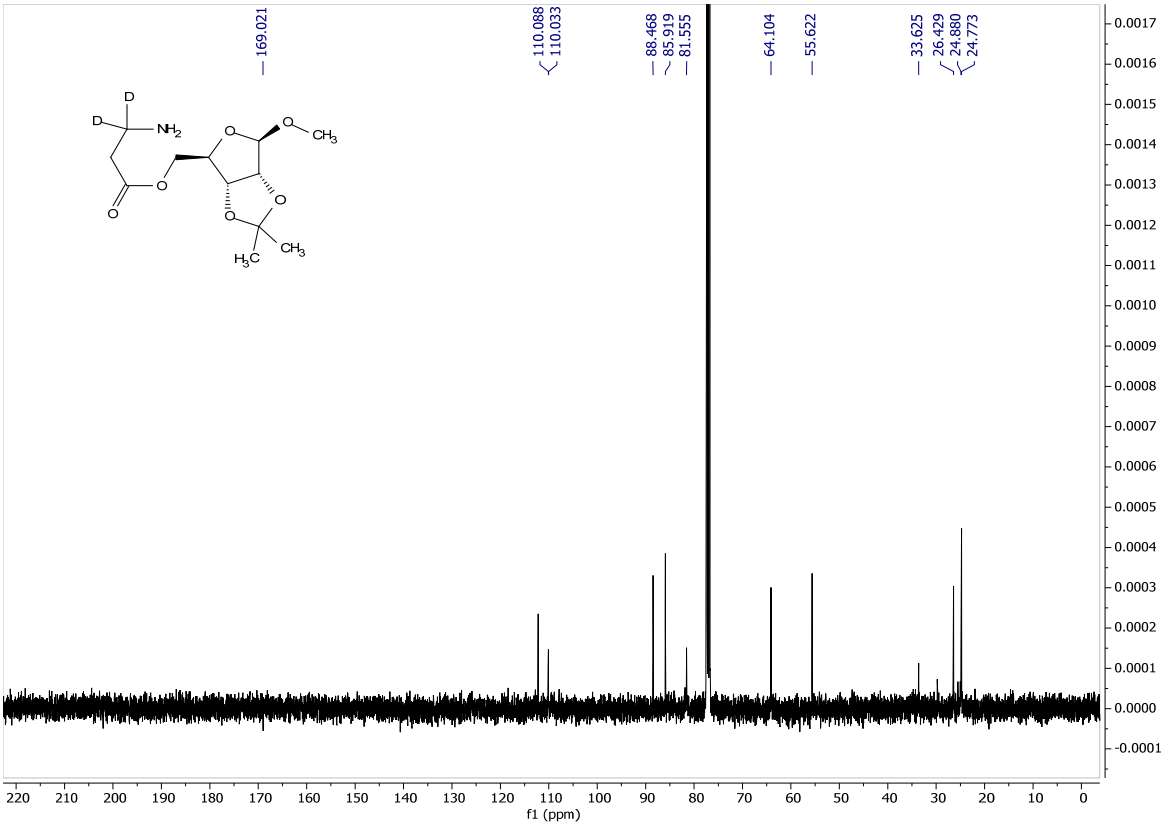
2at


7.843
7.171
7.166
7.151
7.146
7.035
7.029
7.015
7.009
3.508
3.492
3.487
3.474
3.469
3.455
3.029
3.014
2.998
2.366
2.361
2.348
2.343
1.774
1.769
1.757
1.752
1.741
1.736
1.724
1.359
1.262
1.257
1.245
1.239
0.819
0.814
0.802
0.797
0.90
1.97
2.00
1.18
2.18
2.09
1.09
1.89
2.95
5.93
f1 (ppm)


173.846
140.239
139.655
129.258
127.440
45.324
44.781
36.709
33.335
30.159
22.718
19.156
f1 (ppm)

2au


4.969
4.961
4.834
4.827
4.818
4.592
4.583
4.569
4.430
4.422
3.674
3.622
3.614
3.433
3.425
3.315
3.307
1.474
1.308
1.00
0.83
1.09
0.99
0.93
0.94
2.94
1.07
3.00
3.33
f1 (ppm)


169.021
110.088
110.033
88.468
85.919
81.555
64.104
55.622
33.625
26.429
24.880
24.773
f1 (ppm)