Daphenylline, a New Alkaloid with an Unusual Skeleton, from *Daphniphyllum longeracemosum*

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Index

General Experimental Procedures

Optical rotation was carried out on a Perkin-Elmer model 241 polarimeter. IR spectrum was measured in a Bio-Rad FTS-135 spectrometer with KBr pellets. FAB, ESI and high-resolution mass spectra were recorded using a Finnigan MAT 90 instrument and VG Autospec-3000 spectrometer respectively. ^{1}H and ^{13}C NMR spectra were measured on a Bruker AM-400 spectrometer, while 2D NMR spectra were recorded on Bruker DRX-500 instrument. Chemical shifts were reported using residual $CDCl_3$ (δ_H 7.26 and δ_C 77.0) as internal standard. Column chromatography was performed on silica gel H (10–40 μm; Qingdao Marine Chemical Inc.), C_{18} silica gel (20-45 μm; Chromatorex, Japan), Ion Exchange Resin (weak cation, Diaion WK 40, Japan), Precoated silica gel GF_{254} and HF_{254} plates (Qingdao Haiyang Chemical Plant, Qingdao, People's Republic of China) were used for TLC.

Plant Material

The fruits of *Daphniphyllum longeracemosum* Rosenth. were collected in Hekou of Yunnan Province, People's Republic of China, in October 2005, and identified by Prof. Xun Gong, Kunming Institute of Botany, Chinese Academy Sciences.

Extraction and isolation

The powdered fruits of the plant (60 Kg) were extracted with 95% EtOH (3 times, each 3 hours). Evaporation of the solvent under vacuum gave a residue, which was suspended in water and adjusted to pH 2 with 2% HCl. The acidic mixture was defatted with petroleum ether and $CHCl_3$, then the aqueous layer was basified to pH10 with 3% NaOH followed by exhaustive extraction with $CHCl_3$ and n-BuOH respectively. The crude alkaloids (2.5kg) extracted by n-BuOH were separated on a silica gel column chromatography eluted with acetone, MeOH and MeOH/Et_2NH (20:1) respectively to yield Fraction A, B, and C. Fraction C was further purificated by a Diaion ion exchange resin, and then chromatographed over C_{18} silica gel (eluted by MeOH/water from 5:95 to 50:50) to afford two fractions. The two fractions were further purification respectively on another two silica gel column chromatography (eluted by $CHCl_3$/MeOH 30:1~0:1 and petroleum/isopropanol/diethylamine 30:10:1) to yield Daphenylline (**1**, 44mg) and Daphnilongeranin C (**2**, 1.5g) separately.

Computational Methods for Optical Rotation of **1** and Its Enantiomer

The 3D structures of **1** and its enantiomer were preoptimized at HF/6-31G level in Gaussian 03 program package (http://www.gaussian.com). And their minimum geometries were further optimized by DFT calculation B3LYP at 6-311G(d,p) level in the gas phase, which was further checked by frequency calculation and resulted in no imaginary frequencies. The OR values were calculated by B3LYP/6-311G+(d,p) method under Self-Consistent Reaction Field model of solvent (MeOH). The computed optical rotation values for **1** was − 64.3 and for its enantiomor was + 64.3.

Cartesian coordinate of **1** optimized:

Standard orientation:

Center Number	Atomic Number	Atomic Type	Coordinates (Angstroms) X	Y	Z
1	6	0	-2.043745	1.122293	0.648637

2	6	0	-2.270339	-0.067440	1.583079
3	6	0	-1.653054	-1.301414	0.928311
4	6	0	-0.106090	-1.188991	0.777861
5	6	0	0.356533	0.243916	0.486156
6	6	0	-0.550760	1.322812	0.438092
7	6	0	0.124430	-2.100188	-0.473916
8	6	0	1.444102	-1.977027	-1.253436
9	6	0	2.696539	-1.863753	-0.378952
10	6	0	2.914006	-0.445164	0.209034
11	6	0	1.715848	0.512502	0.236986
12	6	0	3.964104	0.376573	-0.581367
13	6	0	3.648637	1.848485	-0.261879
14	7	0	-2.196043	-1.536330	-0.428369
15	6	0	-1.091257	-1.782197	-1.356058
16	6	0	-3.206057	-0.583906	-0.869773
17	6	0	-2.817563	0.906439	-0.704588
18	6	0	-4.061942	1.795310	-0.805079
19	1	0	-2.432378	2.032994	1.114398
20	1	0	-1.858712	-2.182357	1.552286
21	6	0	0.538128	-1.716707	2.076363
22	6	0	2.155679	1.813955	-0.030581
23	6	0	1.260406	2.875965	-0.053597
24	6	0	-0.084382	2.617796	0.178624
25	1	0	-3.335871	-0.225373	1.774282
26	1	0	-1.800759	0.111742	2.554860
27	1	0	0.032233	-3.134314	-0.117376
28	1	0	1.530519	-2.850649	-1.908730
29	1	0	1.397061	-1.106741	-1.917503
30	1	0	2.652924	-2.611776	0.417468
31	1	0	3.578604	-2.120224	-0.975074
32	1	0	3.285237	-0.547340	1.238520
33	1	0	4.987837	0.083917	-0.334609
34	1	0	3.818028	0.198849	-1.652917
35	1	0	3.944315	2.537037	-1.057987
36	1	0	4.169529	2.169112	0.650091
37	1	0	-0.866001	-0.900042	-1.977132
38	1	0	-1.323733	-2.607991	-2.039380
39	1	0	-3.440821	-0.794247	-1.917545
40	1	0	-4.133705	-0.772592	-0.314798
41	1	0	-2.142374	1.181264	-1.520667
42	1	0	-3.797660	2.856331	-0.779983
43	1	0	-4.751439	1.602276	0.024255
44	1	0	-4.607076	1.610724	-1.736417

45	1	0	1.620720	-1.612101	2.098163
46	1	0	0.296881	-2.774678	2.217281
47	1	0	0.147654	-1.167410	2.938254
48	1	0	1.600680	3.886945	-0.253826
49	1	0	-0.798722	3.435412	0.159153

Cartesian coordinate of the enantiomer optimized:

Standard orientation:

Center Number	Atomic Number	Atomic Type	Coordinates (Angstroms) X	Y	Z
1	6	0	2.043859	1.122099	0.648980
2	6	0	2.270378	-0.067627	1.583103
3	6	0	1.653022	-1.301604	0.928267
4	6	0	0.105958	-1.189002	0.778052
5	6	0	-0.356385	0.244061	0.486379
6	6	0	0.550893	1.322798	0.438183
7	6	0	-0.124652	-2.100150	-0.473923
8	6	0	-1.444465	-1.976882	-1.253315
9	6	0	-2.696706	-1.863598	-0.378935
10	6	0	-2.914049	-0.444869	0.209003
11	6	0	-1.715806	0.512552	0.236909
12	6	0	-3.963940	0.376809	-0.581563
13	6	0	-3.648465	1.848488	-0.262274
14	7	0	2.195729	-1.536253	-0.428299
15	6	0	1.090822	-1.782266	-1.356086
16	6	0	3.205830	-0.584071	-0.869882
17	6	0	2.817730	0.906255	-0.704514
18	6	0	4.062010	1.795144	-0.804838
19	1	0	2.432587	2.032942	1.114366
20	1	0	1.858670	-2.182476	1.552469
21	6	0	-0.537947	-1.716724	2.076535
22	6	0	-2.155475	1.814087	-0.030799
23	6	0	-1.260001	2.876022	-0.053771
24	6	0	0.084583	2.617802	0.178336
25	1	0	3.335945	-0.225833	1.774230
26	1	0	1.801098	0.111244	2.555079
27	1	0	-0.032561	-3.134294	-0.117385
28	1	0	-1.530825	-2.850534	-1.908680

29	1	0	-1.397287	-1.106762	-1.917593
30	1	0	-2.653441	-2.611416	0.417674
31	1	0	-3.578993	-2.119884	-0.974909
32	1	0	-3.285460	-0.547165	1.238405
33	1	0	-4.987741	0.083974	-0.335138
34	1	0	-3.817811	0.198733	-1.653119
35	1	0	-3.943947	2.537132	-1.058405
36	1	0	-4.169240	2.169449	0.649651
37	1	0	0.865737	-0.900120	-1.977163
38	1	0	1.323501	-2.608060	-2.039329
39	1	0	3.440323	-0.794467	-1.917675
40	1	0	4.133685	-0.773012	-0.315200
41	1	0	2.142264	1.181317	-1.520312
42	1	0	3.797697	2.856172	-0.779773
43	1	0	4.751341	1.602114	0.024604
44	1	0	4.607301	1.610758	-1.736146
45	1	0	-1.620623	-1.612720	2.098419
46	1	0	-0.296153	-2.774479	2.217876
47	1	0	-0.148051	-1.166883	2.938368
48	1	0	-1.600523	3.886925	-0.254050
49	1	0	0.799241	3.435166	0.158745

Frisch, M. J.; Trucks, G. W.; Schlegel, H. B.; Scuseria, G. E.; Robb,M. A.; Cheeseman, J. R.; Montgomery, Jr., J. A.; Vreven, T.; Kudin, K. N.; Burant, J. C.; Millam, J. M.; Iyengar, S. S.; Tomasi, J.; Barone, V.; Mennucci, B.; Cossi, M.; Scalmani, G.; Rega, N.; Petersson, G. A.; Nakatsuji, H.; Hada, M.; Ehara, M.; Toyota, K.; Fukuda, R.; Hasegawa, J.; Ishida, M.; Nakajima, T.; Honda, Y.; Kitao, O.; Nakai, H.; Klene, M.; Li, X.; Knox, J. E.; Hratchian, H. P.; Cross, J. B.; Bakken, V.; Adamo, C.; Jaramillo, J.; Gomperts, R.; Stratmann, R. E.; Yazyev, O.; Austin, A. J.; Cammi, R.; Pomelli, C.; Ochterski, J. W.; Ayala, P. Y.; Morokuma, K.; Voth, G. A.; Salvador, P.; Dannenberg, J. J.; Zakrzewski, V. G.; Dapprich, S.; Daniels, A. D.; Strain, M. C.; Farkas, O.; Malick, D. K.; Rabuck, A. D.; Raghavachari, K.; Foresman, J. B.; Ortiz, J. V.; Cui, Q.; Baboul, A. G.; Clifford, S.; Cioslowski, J.; Stefanov, B. B.; Liu, G.; Liashenko, A.; Piskorz, P.; Komaromi, I.; Martin, R. L.; Fox, D. J.; Keith, T.; Al-Laham, M. A.; Peng, C. Y.; Nanayakkara, A.; Challacombe, M.; Gill, P. M. W.; Johnson, B.; Chen, W.; Wong, M. W.; Gonzalez, C.; Pople, J. A. *Gaussian 03*, revision D.01; Gaussian, Inc.: Wallingford, CT, 2005.

Figure S1: ^{1}H NMR Spectrum of **1** in $CDCl_3$

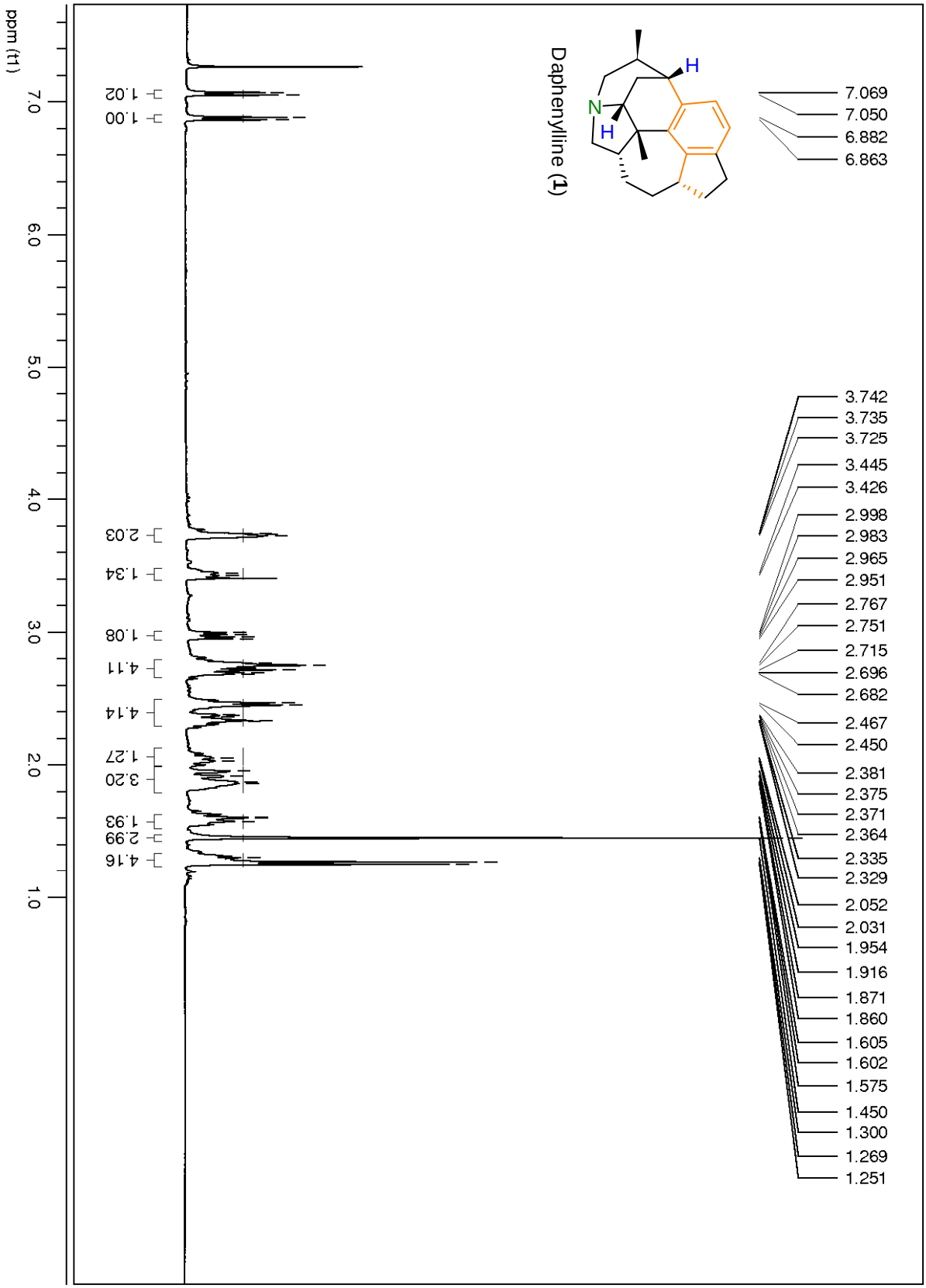

Figure S2: ^{13}C and DEPT NMR Spectrum of **1** in $CDCl_3$

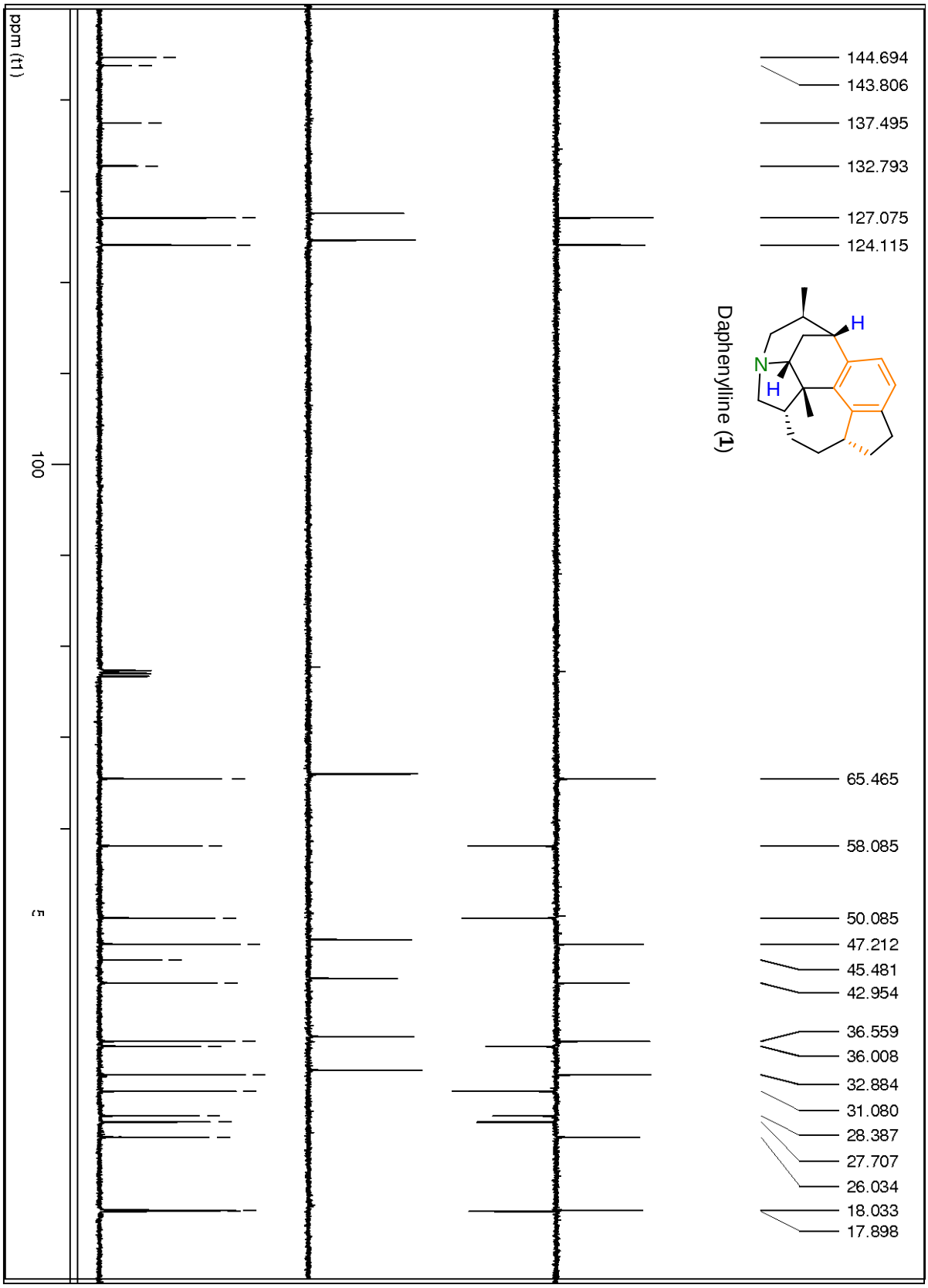

Figure S3: HSQC Spectrum of **1** in $CDCl_3$

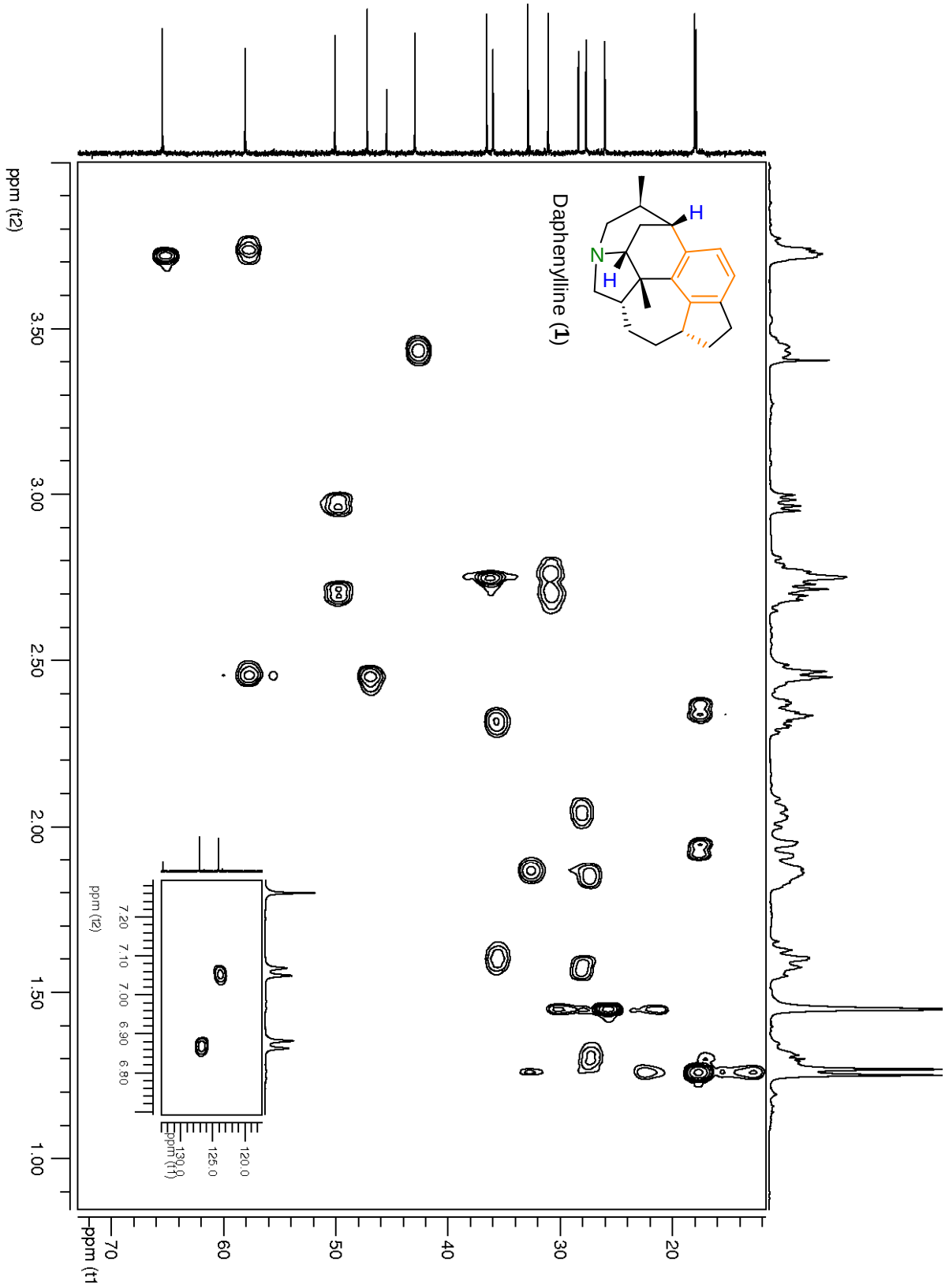

Figure S4: ^{1}H-^{1}H COSY Spectrum of **1** in $CDCl_3$

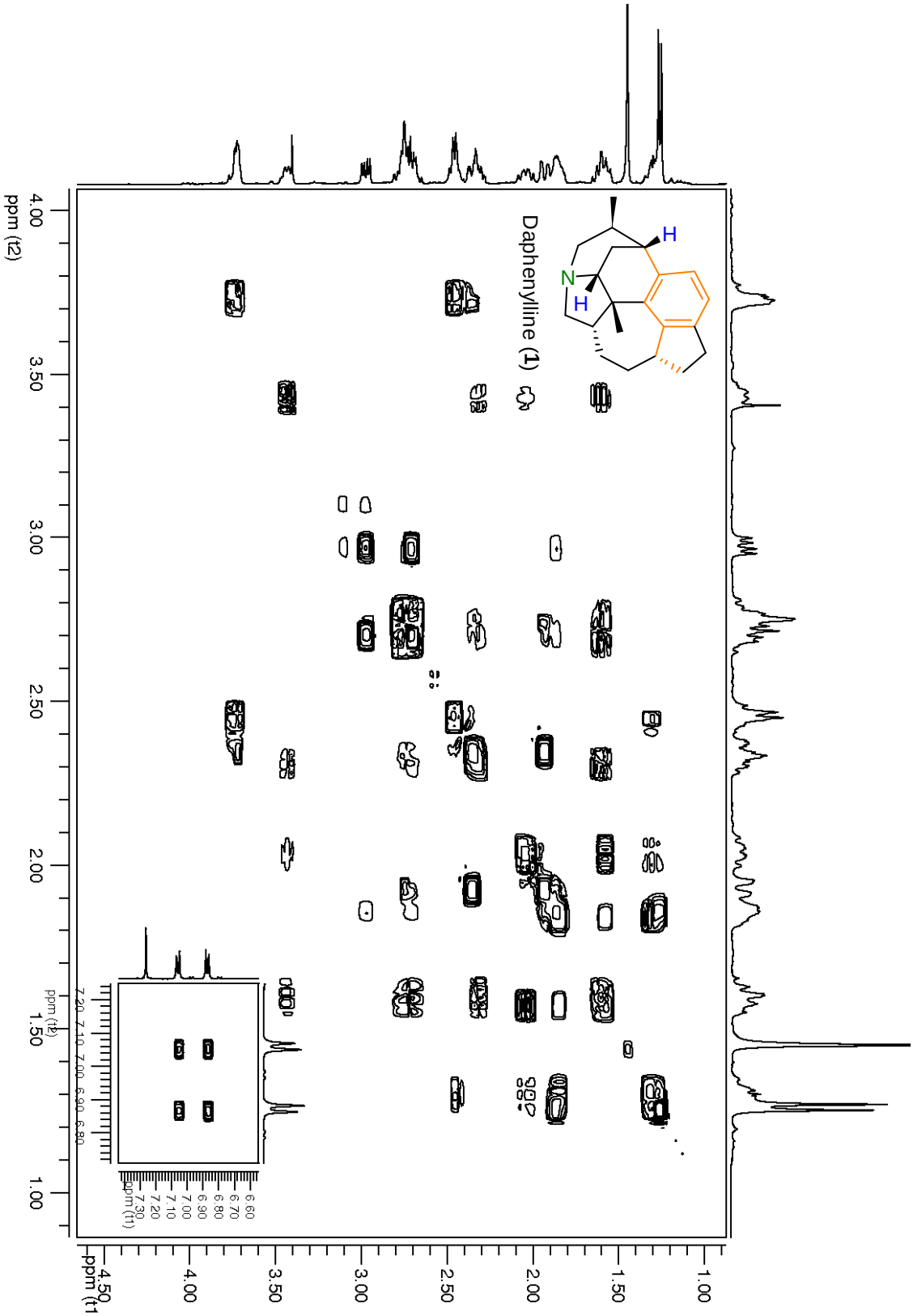

Figure S5: HMBC Spectrum of **1** in $CDCl_3$

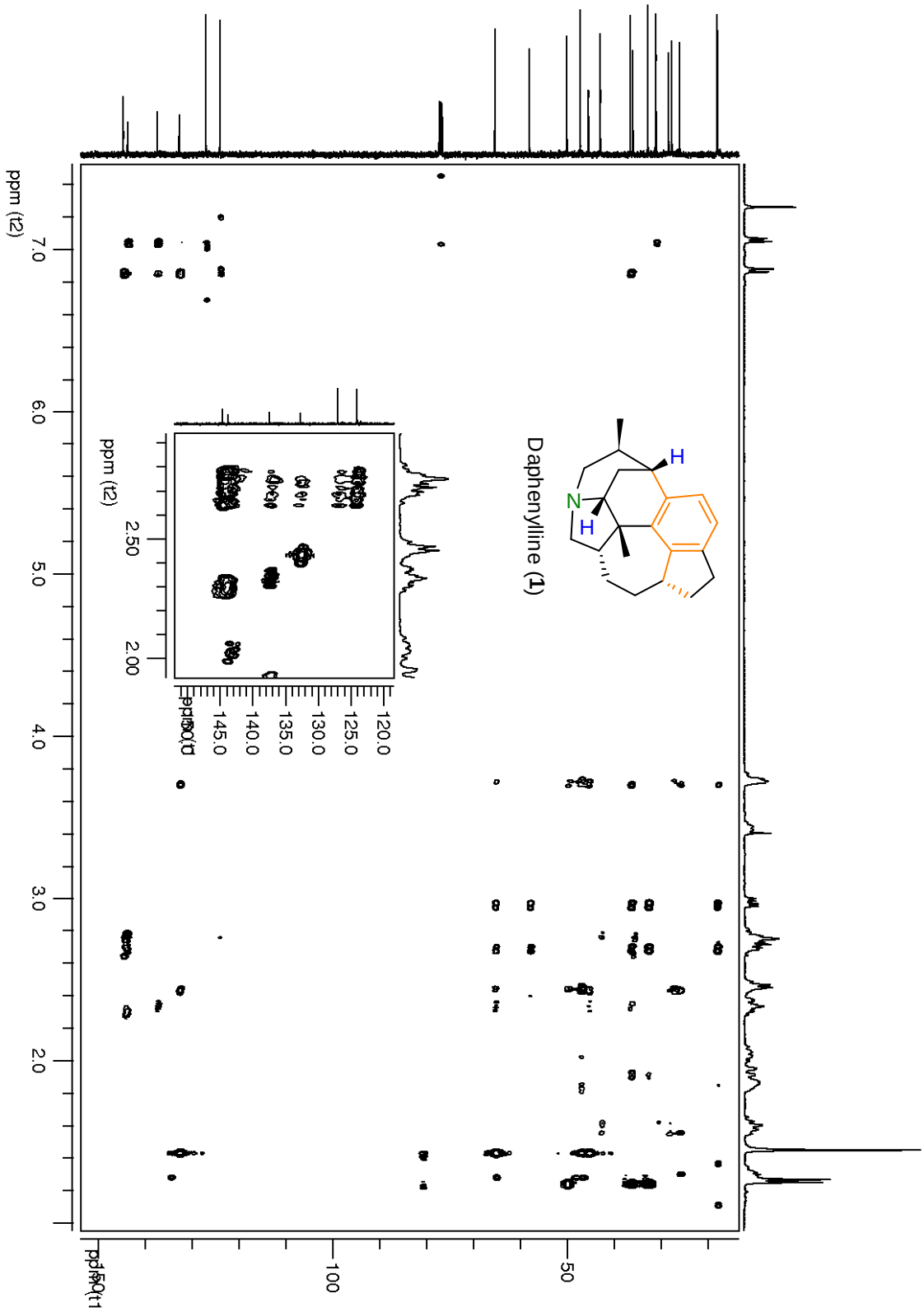

Figure S6: ROESY Spectrum of **1** in $CDCl_3$

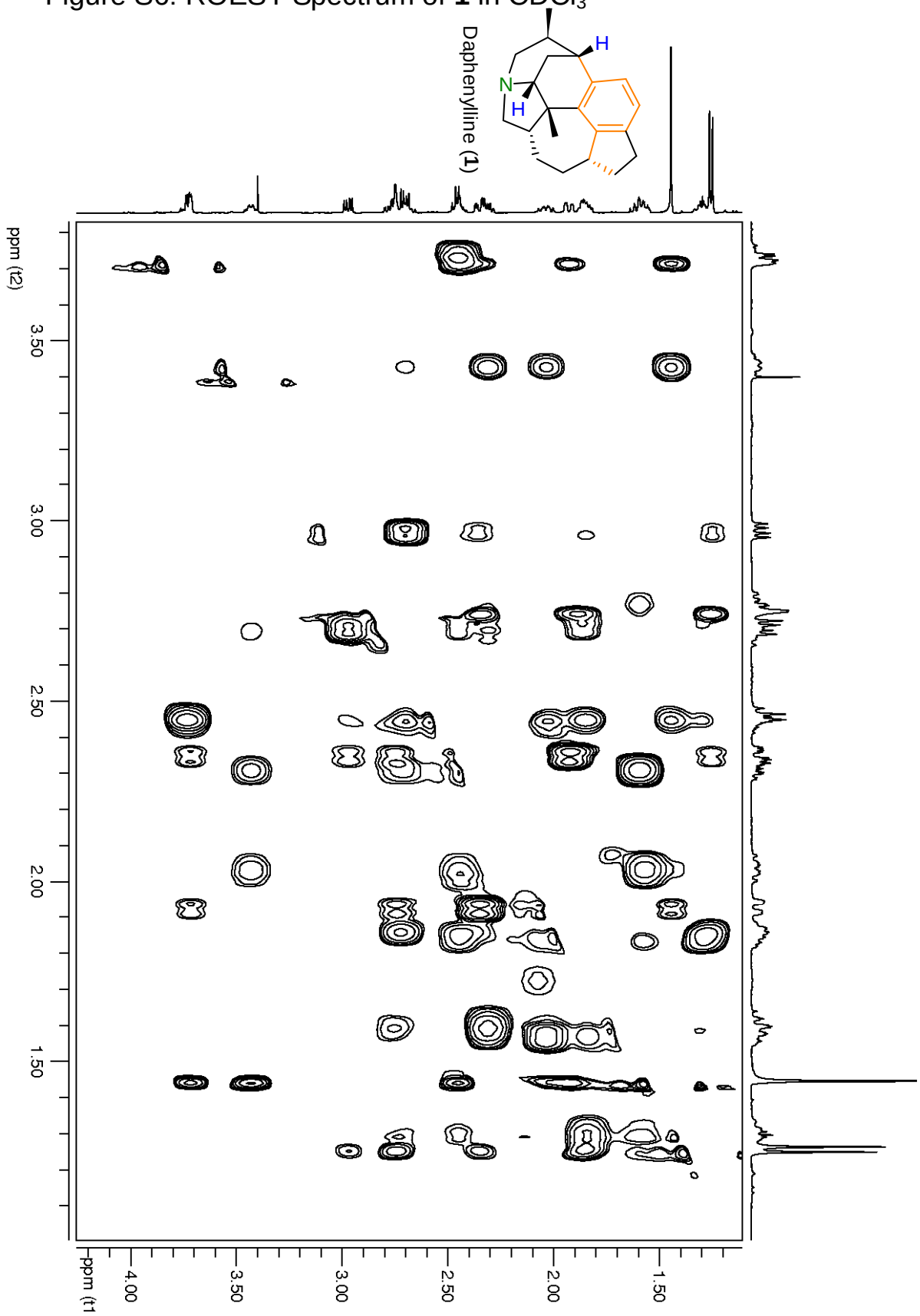

Figure S7: FAB^{+} Mass Spectrometry of **1**

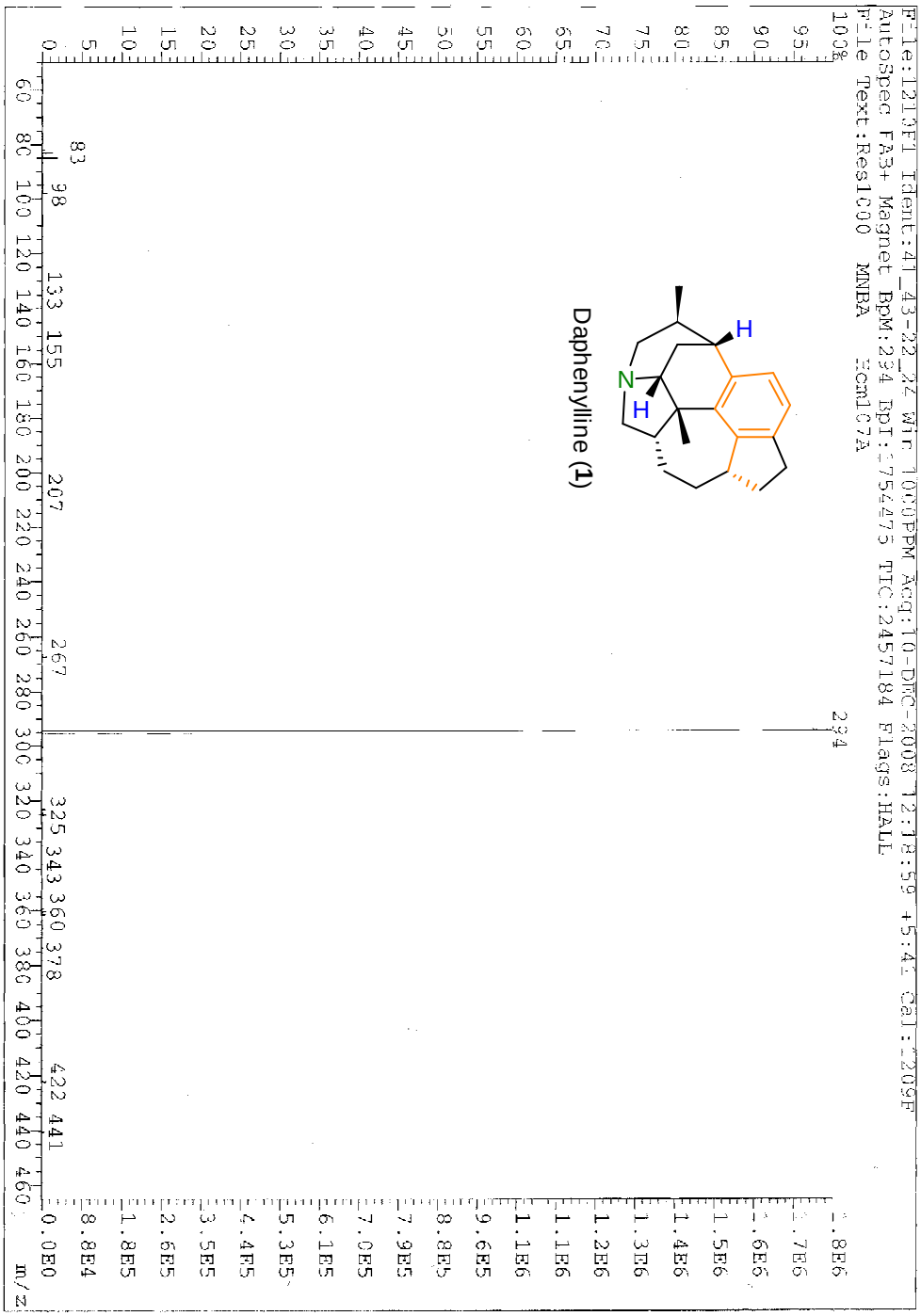

Figure S8: ESI^{+} Mass Spectrometry of **1**

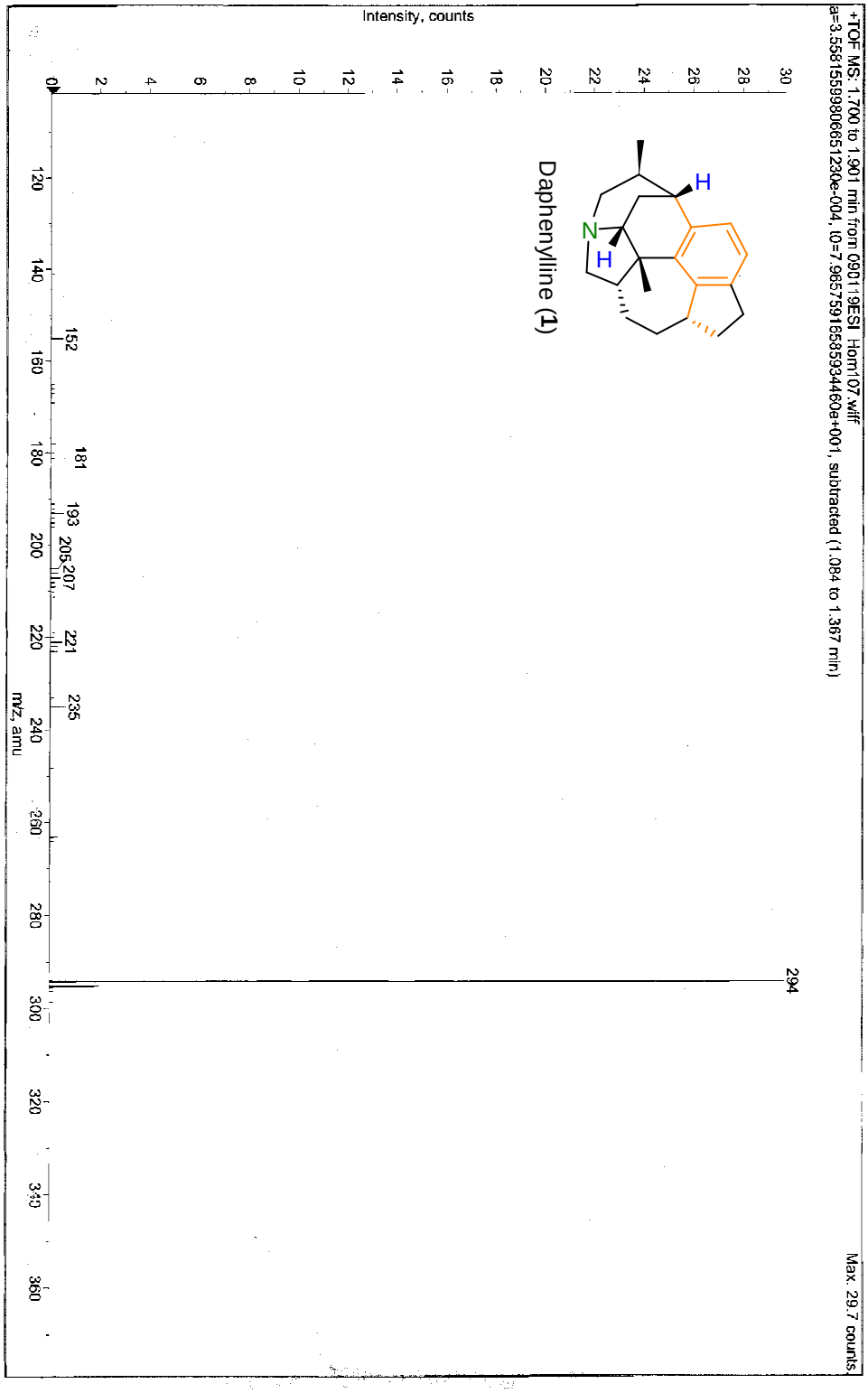

Figure S9: HRESI Mass Spectrometry of **1**