Araiosamines A–D: *Tris*-bromoindole Cyclic Guanidine Alkaloids from the Marine Sponge *Clathria (Thalysias) araiosa*— Supporting Information

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NMR data for araiosamine A (1)

Table S1. NMR data for araiosamine A (**1**) in DMSO-d_6

Posn.	δ_H mult (*J* in Hz)	δ_C	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
1	4.86 dd (7.9, 7.5)	77.2 CH		2, 7a(vw),1-OH	2, 3, 1-OH	3, 7a, 1-OH, 4'(w)	
2	2.61 dd (10.2, 7.5)	40.7 CH		1, 3	1, 3, 5, 1-OH	1-OH(w), 2'(w)	3, 3'
3	4.62 d (10.2)	51.3 CH		2, 4, 7c	1, 2, 4, 5, 1-OH	1, 4, 5, 6, 7c, 8a, 2', 4'	
4	3.24 d (9.5)	42.0 CH		3, 5	3, 5, 6, 8a	3, 6(s), 8a(w), 4"	
5	4.43 dd (9.5, 3.2)	63.1 CH		4, 6, 8a	2, 3, 4, 6, 8a	3, 7c, 8a, 2"	
6	4.38 d (3.2)	56.0 CH		5, 8c	4, 5, 8c	3, 4(s), 8c, 2"(vw), 2"'	8, 2"'
7		-					
7a	8.36 s		103.7	1(vw)		1, 7b, 1-OH	2
7b	6.95 s		72.0			7a, 7c	
7c	8.33 s		84.6	3		3, 5, 7b, 8a, 2"	2
8		157.6 C					
8a	9.42 s		89.3	5, 8c	4, 5, 8c	3, 4(w), 5, 7c, 8b	5, 6, 8
8b	7.95 s		70.6			8a, 8c	
8c	8.46 s		93.0	6, 8a	6, 8a	6, 8b	5, 6, 8
1-OH	6.28 d (7.9)			1	1, 2, 3	1, 2(w), 7a	1, 2
1'	11.36 br s		134.9	2'	2'	2', 7'(w)	3', 8', 9'
2'	6.99 br s	125.5 CH		1'	1'	2(w), 3, 1'	
3'		109.9 C					
4'	7.28 d (7.8)	120.6 CH		5'	5', 7'	1(w), 3, 5'	
5'	7.07 d (7.8)	121.3 CH		4', 7'	4', 7'	4'	7'
6'		114.1 C					
7'	7.63 d (1.1)	114.2 CH		5'	4', 5'	1'	5', 6', 9'
8'		137.4 C					
9'		125.2 C					
1"	11.39 s		137.0	2"	2"	2", 7"(w)	3", 9"

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Table S1 – continued from previous page

Posn.	δ_H mult (*J* in Hz)	δ_C	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
2”	7.13 s	125.3 CH		1”	1”	5, 6(vw), 7c, 1”	3”, 8”
3”		107.4 C					
4”	6.74 d (8.6)	119.9 CH		5”	5”, 7”	4, 5”	
5”	6.93 d (8.6)	121.3 CH		4”, 7”	4”, 7”	4”	7”
6”		114.1 C					
7”	7.61 s	113.9 CH		5”	4”, 5”	1”(w)	5”, 6”, 9”
8”		136.3 C					
9”		127.3 C					
1”’	11.08 br s		134.0	2”’	2”’	2”’, 7”’(w)	3”’, 8”’, 9”’
2”’	6.54 d (1.9)	123.2 CH		1”’	1”’	6, 1”’	3”’, 8”’, 9”’
3”’		114.4 C					
4”’	6.56 d (8.8)	119.3 CH		5”’	5”’, 7”’	5”’	3”’, 8”’
5”’	6.97 d (8.8)	121.3 CH		4”’, 7”’	4”’, 7”’	4”’	7”’, 9”’
6”’		114.3 C					
7”’	7.47 s	114.1 CH		5”’	4”’, 5”’	1”’(w)	5”’, 6”’, 9”’
8”’		137.2 C					
9”’		123.2 C					

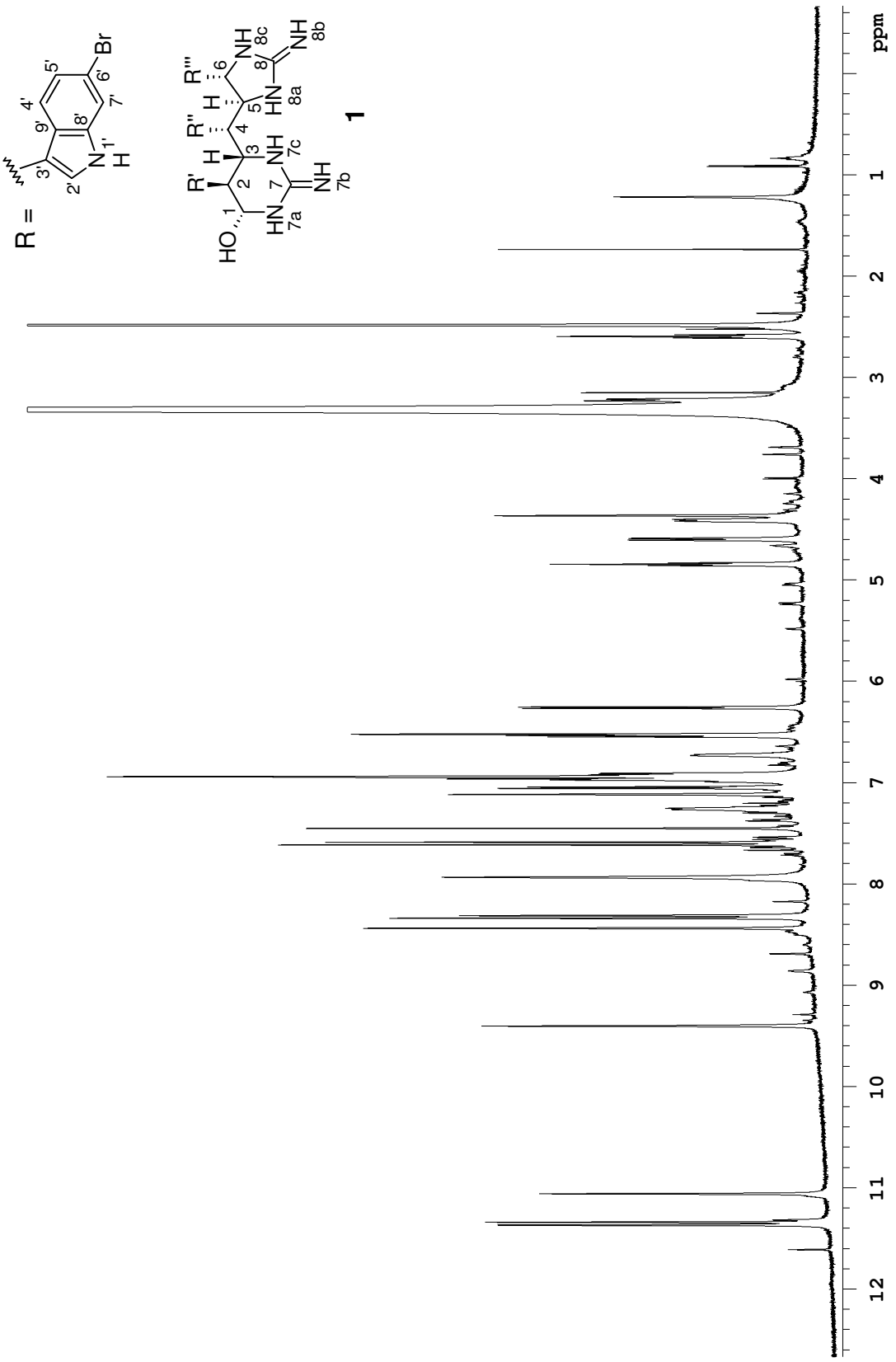

FIGURE S1. ^{1}H NMR spectrum of araiosamine A (**1**) in DMSO-d_6.

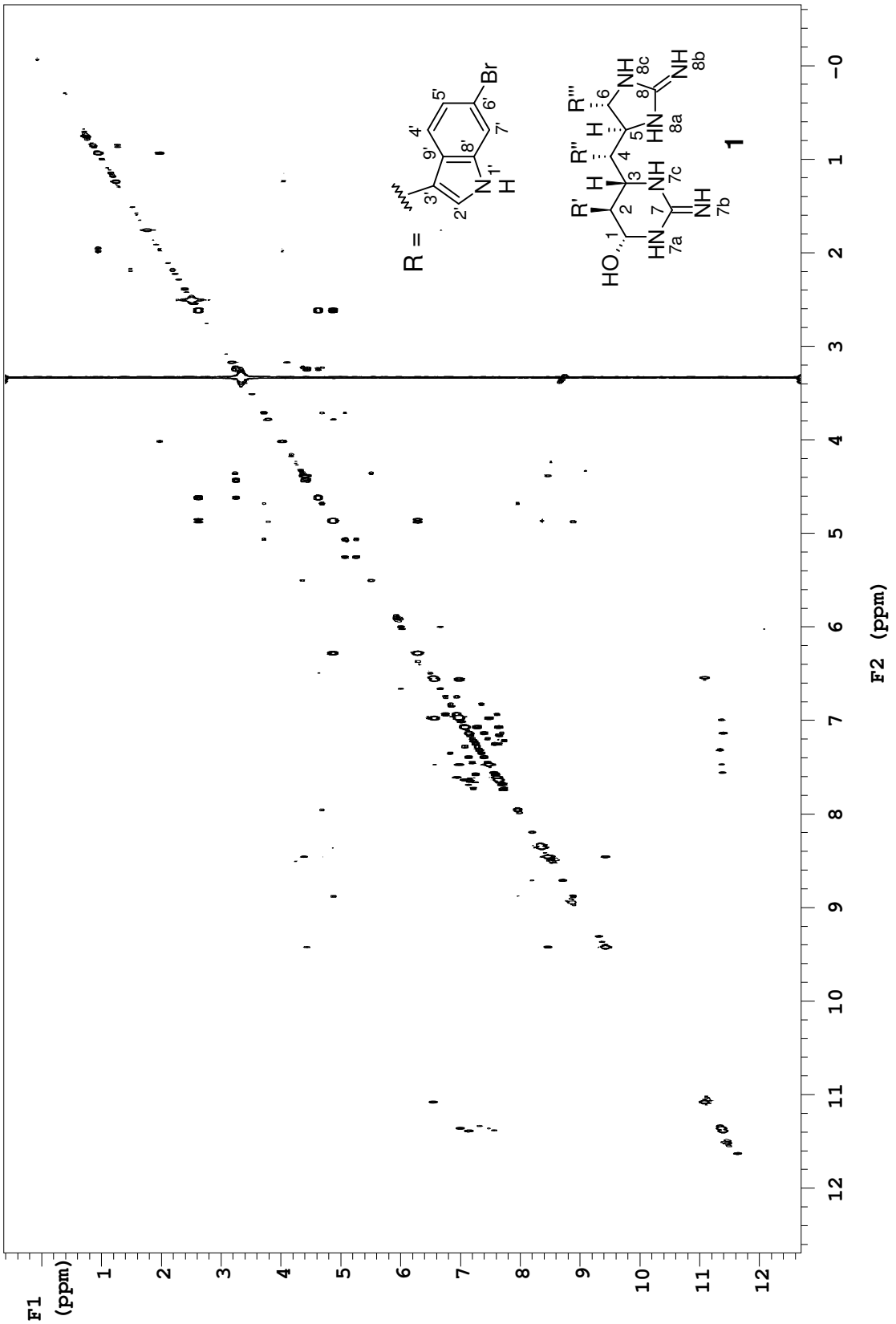

FIGURE S2. COSY spectrum of araiosamine A (**1**) in DMSO-d_6.

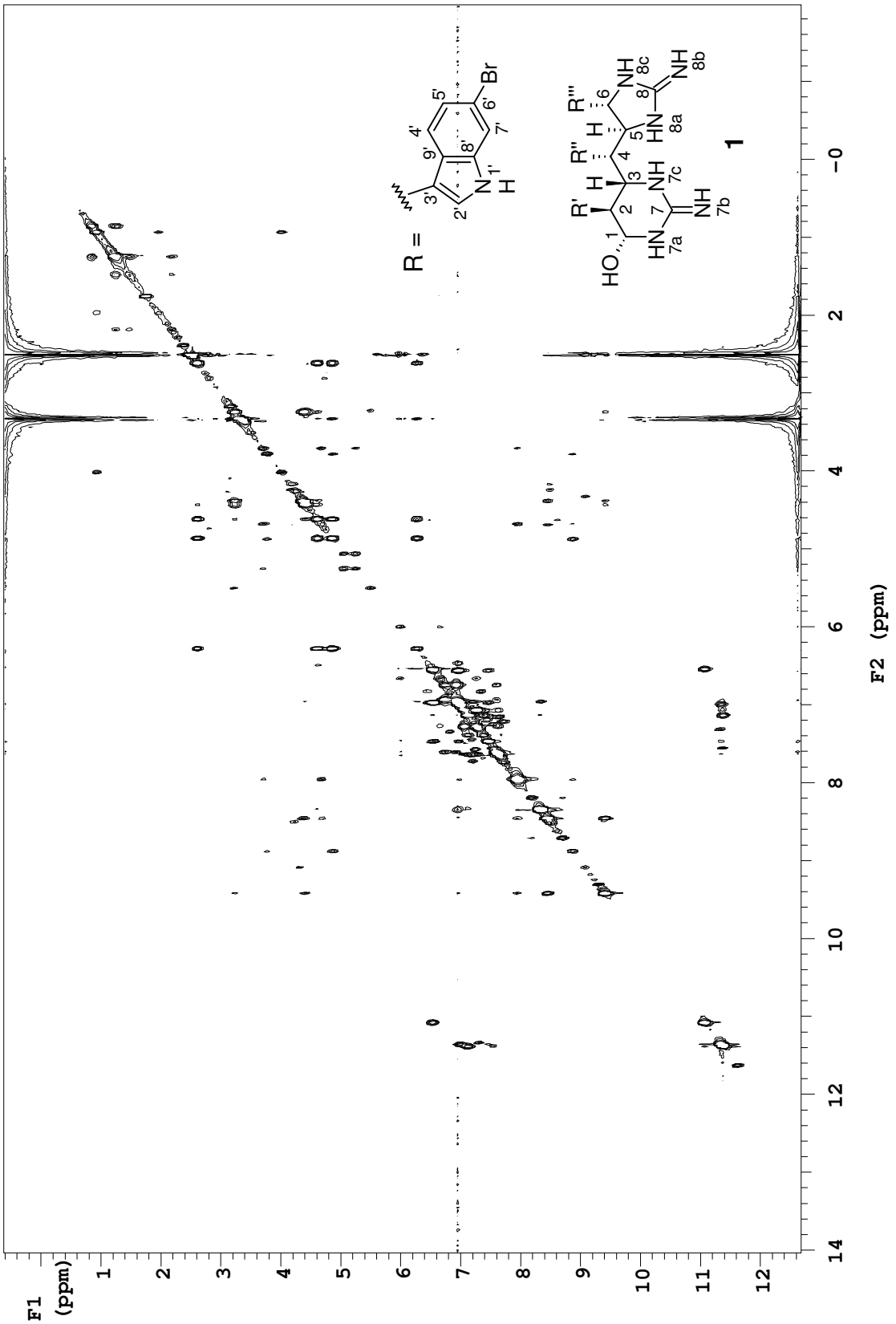

FIGURE S3. TOCSY spectrum of araiosamine A (**1**) in DMSO-d_6.

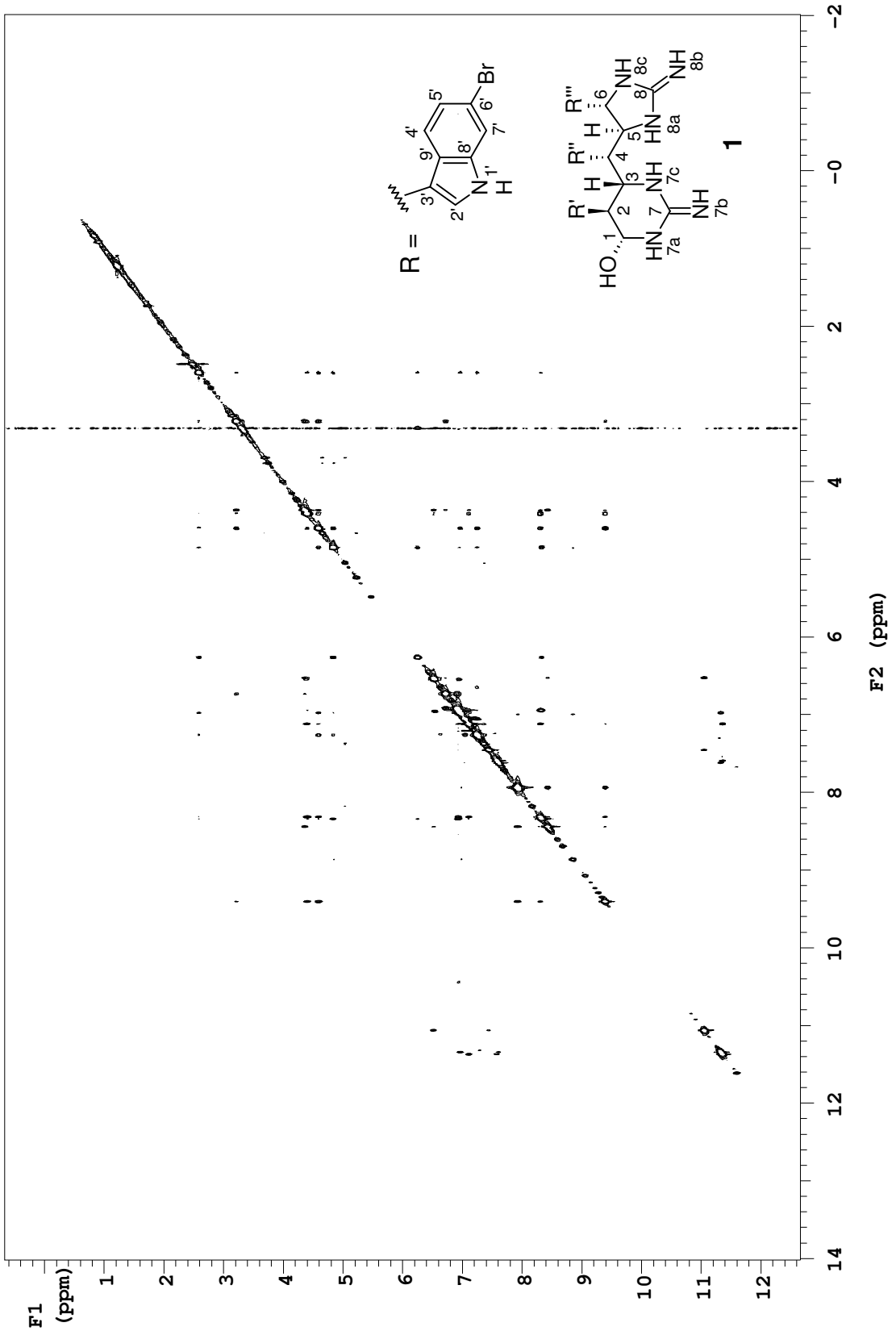

FIGURE S4. NOESY spectrum of araiosamine A (**1**) in DMSO-d_6.

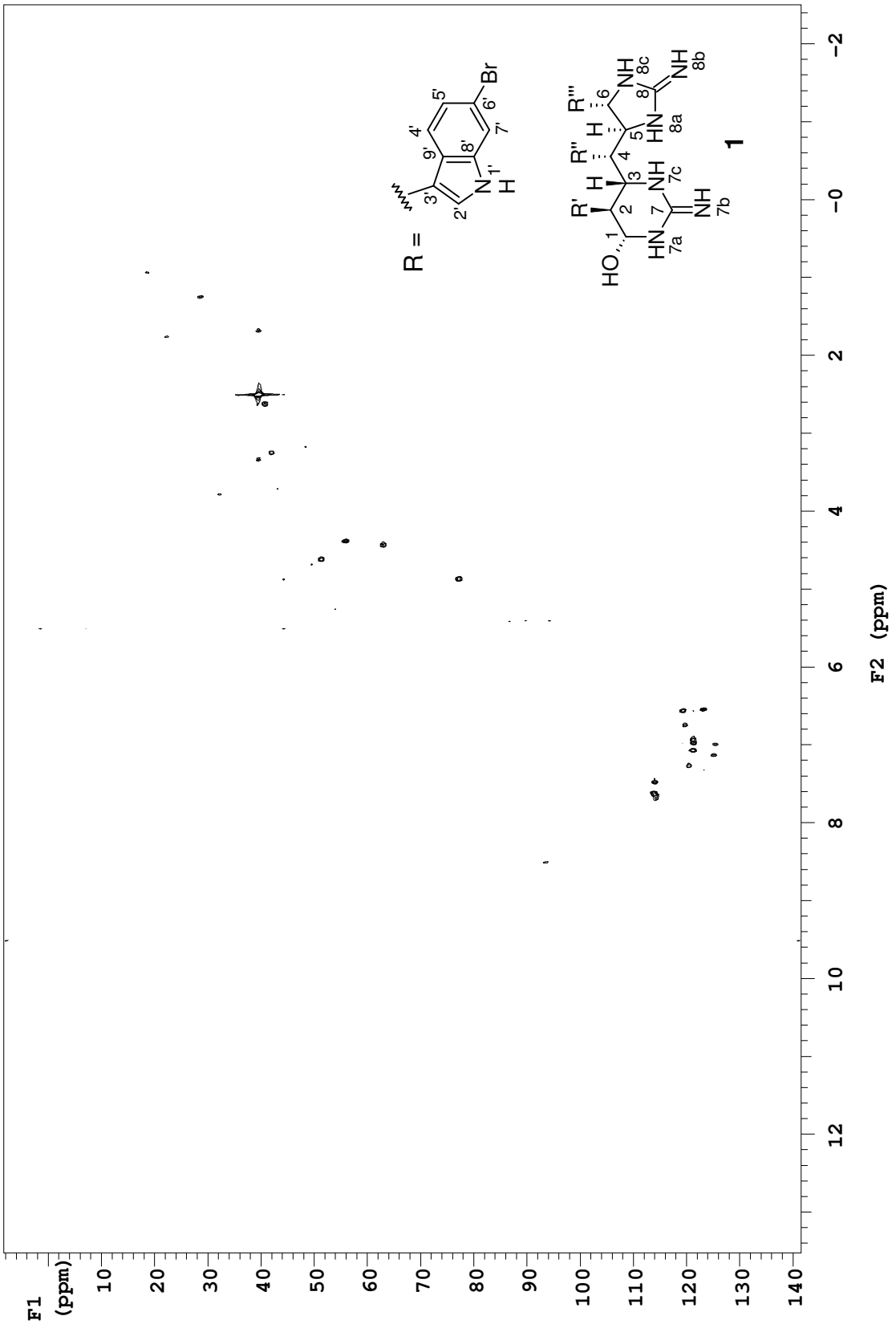

FIGURE S5. [^{13}C, ^{1}H] HSQC spectrum of araiosamine A (**1**) in DMSO-d_6.

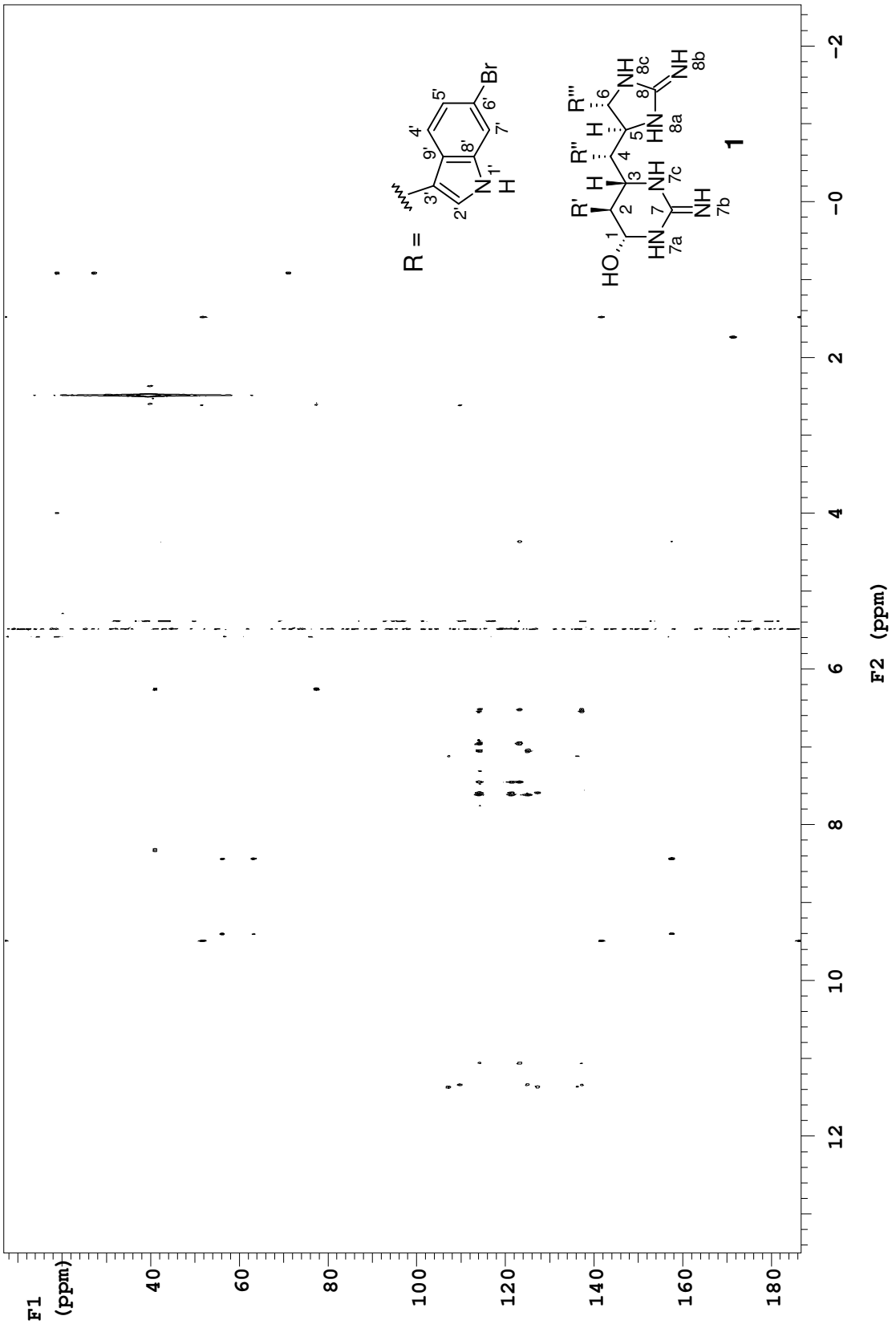

FIGURE S6. [^{13}C, ^{1}H] HMBC spectrum of araiosamine A (**1**) in DMSO-d_6.

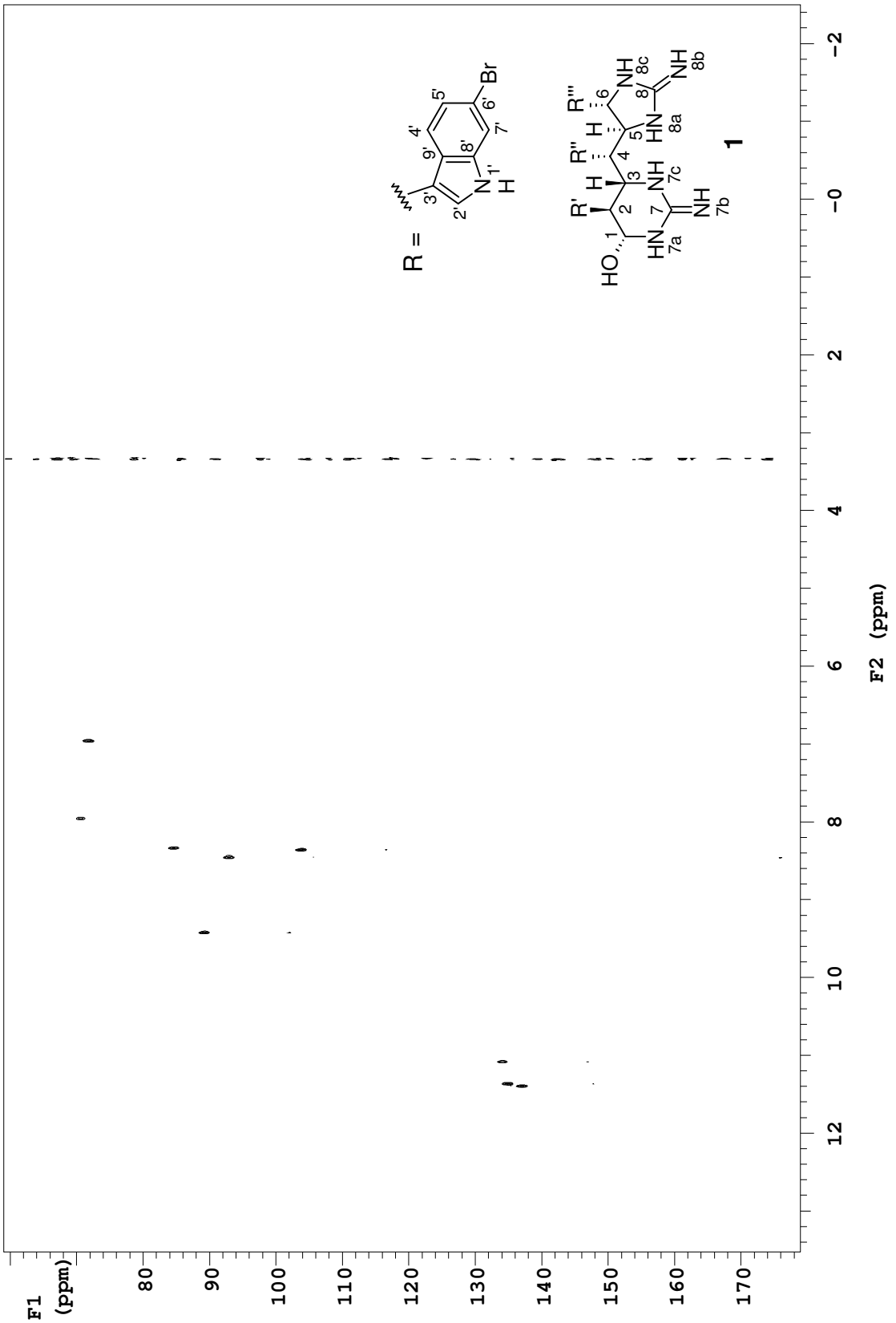

FIGURE S7. [^{15}N, ^{1}H] HSQC spectrum of araiosamine A (**1**) in DMSO-d_6.

Table S2. NMR data for araiosamine A (**1**) in CD_3OD

Posn.	δ_H mult (J in Hz)	δ_C ($^1J_{H-C}$ in Hz)	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
1	5.09 d (8.3)	78.7 CH (162)	2	2, 3, 4	4'	3(w), 7, 3'
2	2.81 dd (9.6, 8.3)	42.5 CH (130)	1, 3	1, 3	2', 4'	1, 3, 4(w), 2', 3'
3	4.67 dd (6.7, 2.0)	53.6 CH (142)	2, 4	1, 2, 4	4, 2', 4'	1, 2, 3"
4	3.52 dd (9.8, 2.0)	43.9 CH (127)	5	1, 2, 3, 5	3, 6, 4"	
5	4.60 dd (9.8, 5.5)	64.9 CH (145)	4, 6	4, 6	2", 4"'	6, 8, 3", 3"'
6	4.64 d (5.5)	58.4 CH (145)	5	4, 5	4, 2"', 4"'	4, 5, 8, 2"', 3"'
7		155.4 C				
8		159.6 C				
2'	6.96 s	126.2 CH			2, 3	3', 8', 9'
3'		110.9 C				
4'	7.15 d (8.5)	121.0 CH	5'	5', 7'	3	9'
5'	7.06 d (8.5)	123.3 CH	4', 7'	4', 7'		7', 9'
6'		116.0 C				
7'	7.60 s	115.4 CH	5'	4', 5'		5', 6', 9'
8'		138.9 C				
9'		126.2 C				
2"	7.00 s	125.4 CH			5	3", 8", 9"
3"		108.5 C				
4"	6.75 d (8.5)	120.6 CH	5"	5", 7"	4, 5	6", 8"
5"	6.99 d (8.5)	123.1 CH	4", 7"	4", 7"		7", 9"
6"		116.2 C				
7"	7.56 s	115.3 CH	5"	4", 5"		5", 6", 9"
8"		137.9 C				
9"		128.6 C				
2"'	6.35 s	124.4 CH			6	3"', 8"', 9"'
3"'		114.9 C				
4"'	6.71 d (8.4)	120.1 CH	5"'	5"', 7"'		6"', 8"', 9"'
5"'	6.97 d (8.4)	123.3 CH	4"', 7"'	4"', 7"'		7"', 9"'
6"'		116.0 C				
7"'	7.38 s	115.3 CH	5"'	4"', 5"'		5"', 6"', 9"'
8"'		139.0 C				
9"'		124.4 C				

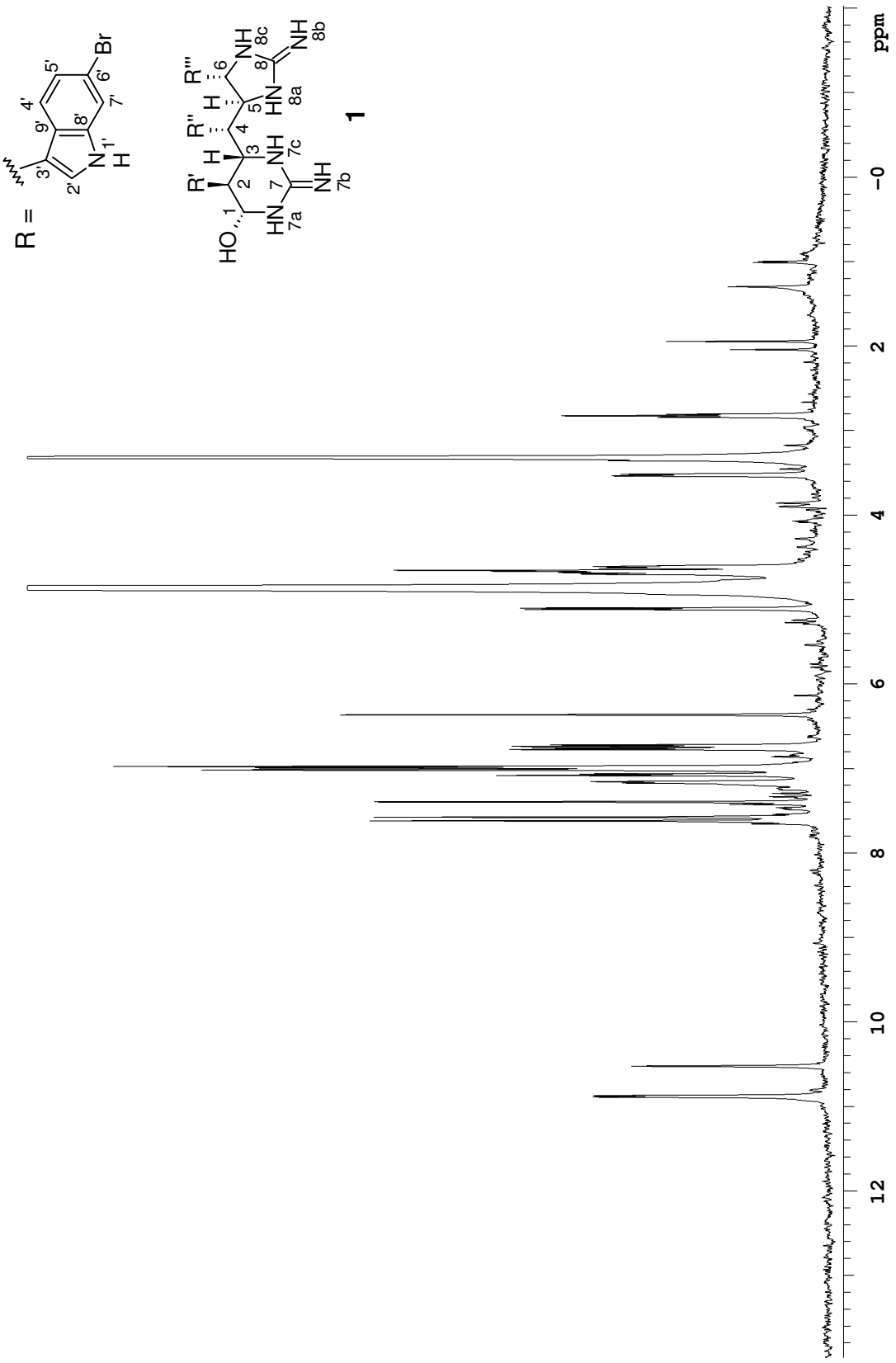

FIGURE S8. ^{1}H NMR spectrum of araiosamine A (**1**) in CD_3OD.

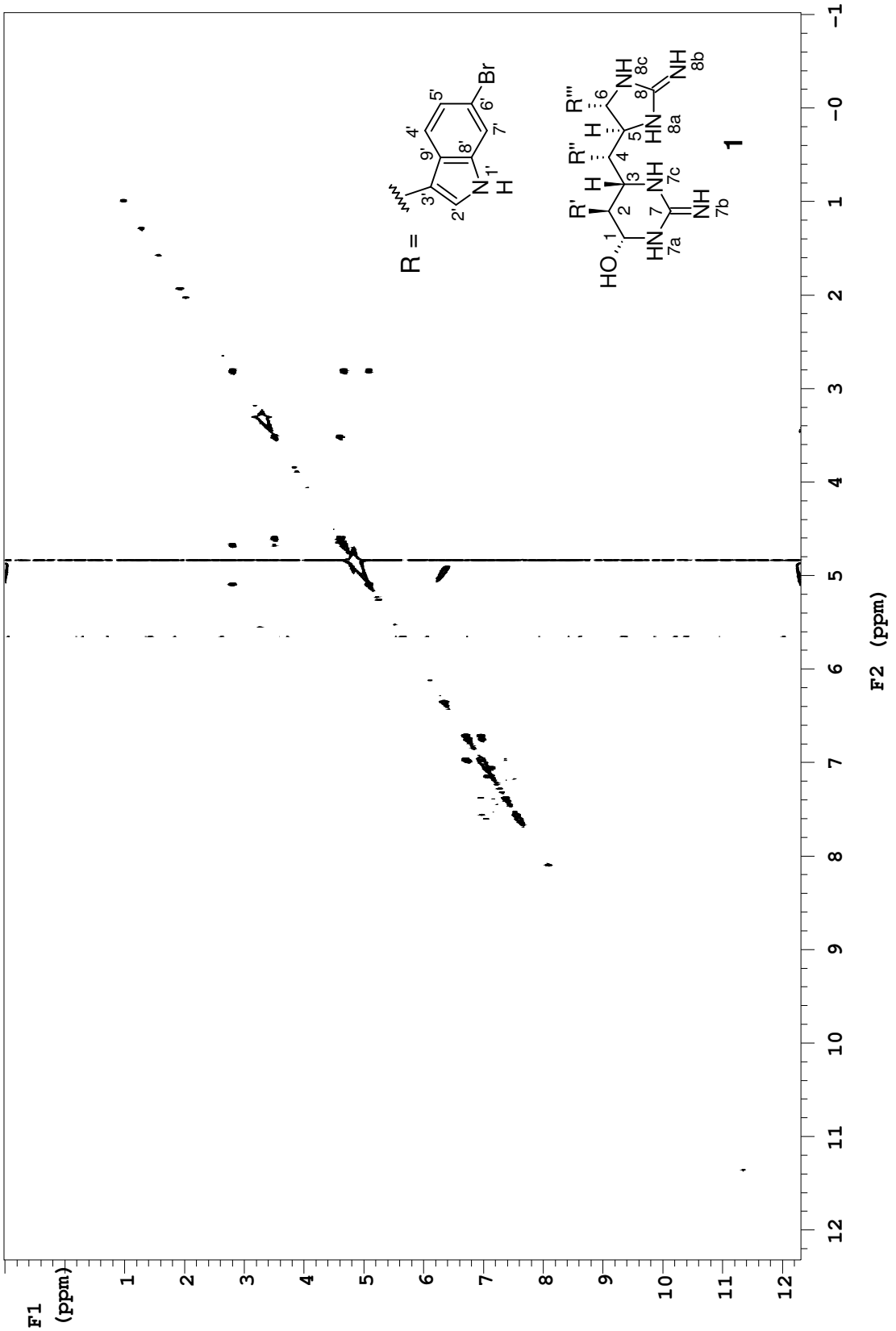

FIGURE S9. COSY spectrum of araiosamine A (**1**) in CD_3OD.

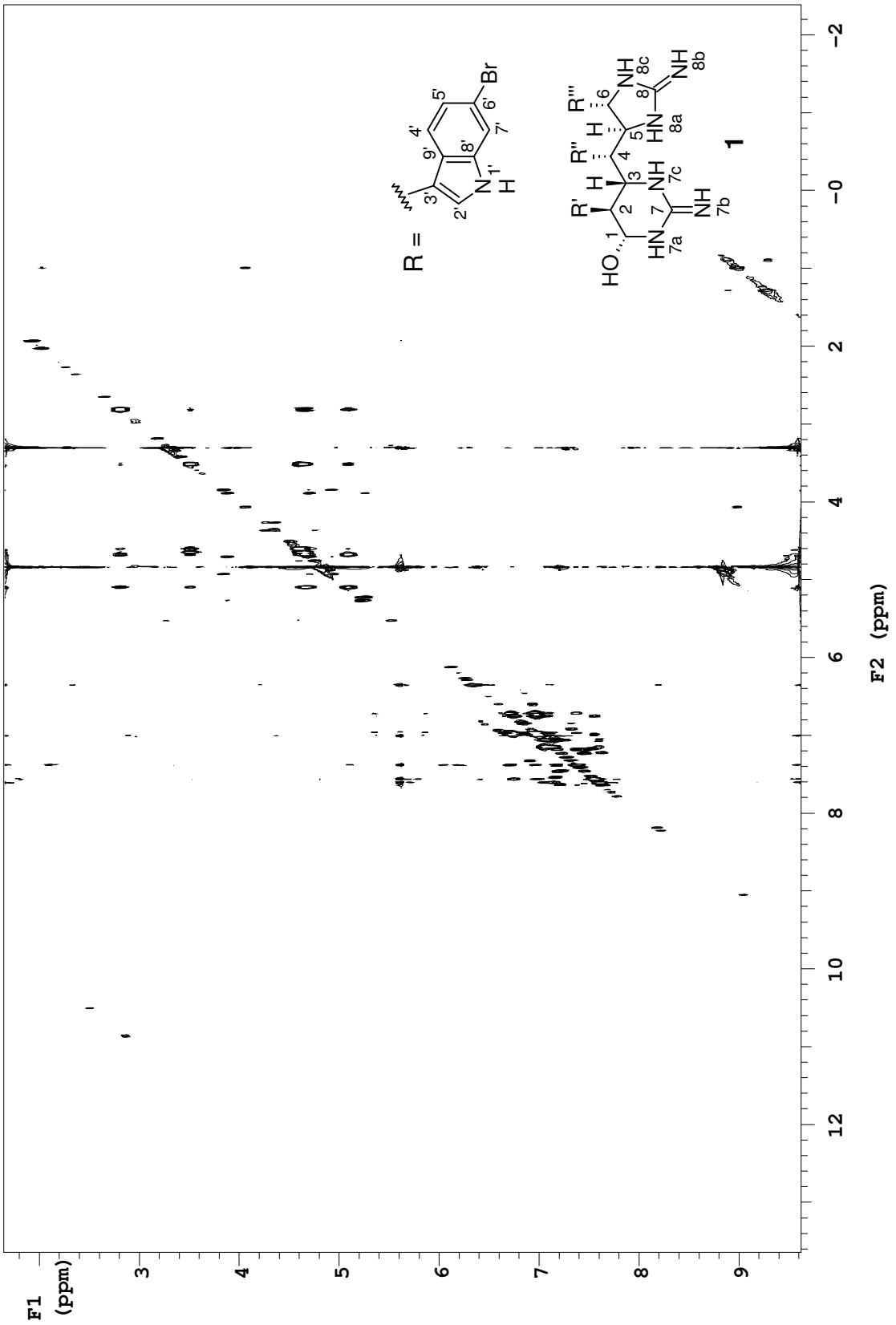

FIGURE S10. TOCSY spectrum of araiosamine A (**1**) in CD_3OD.

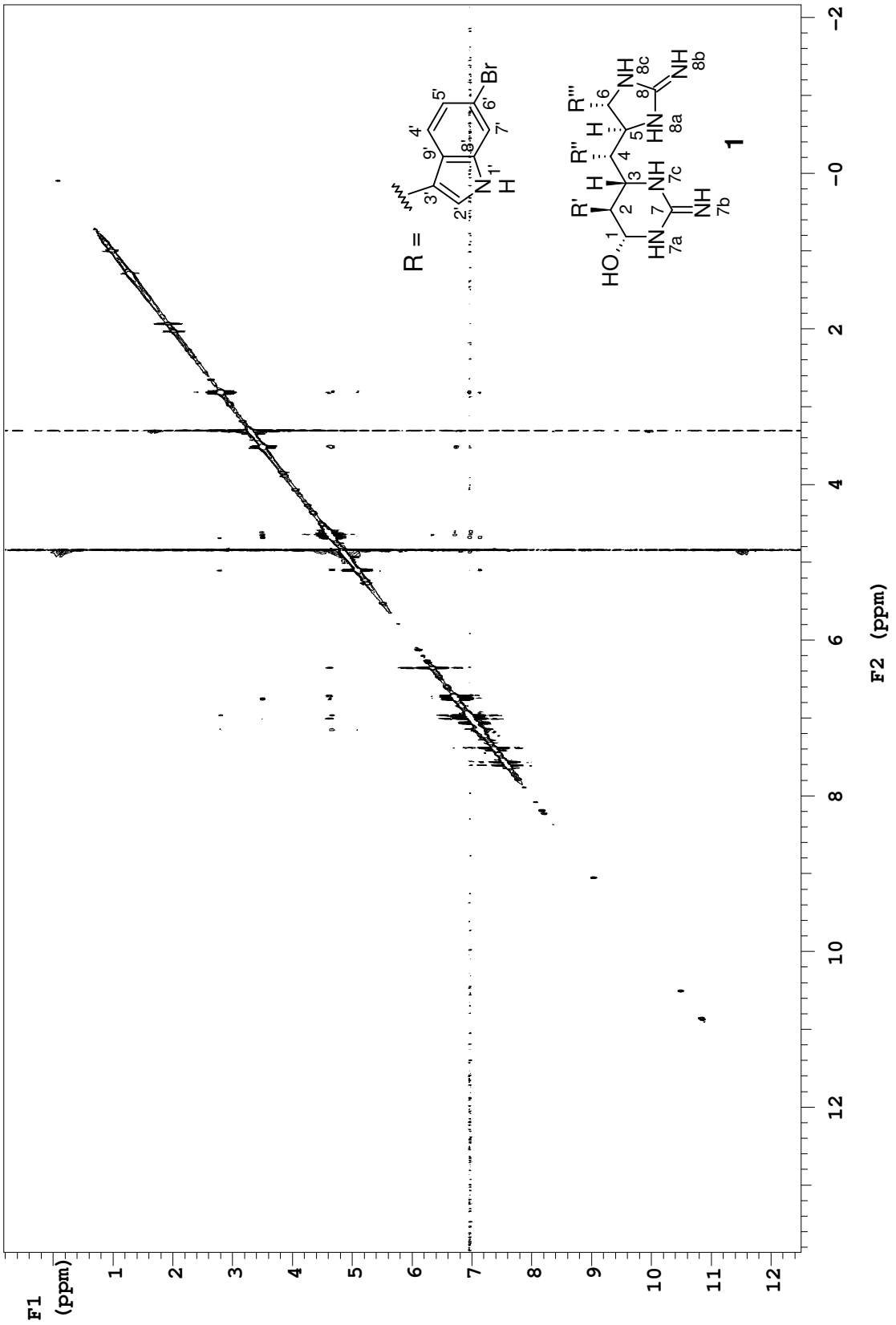

FIGURE S11. NOESY spectrum of araiosamine A (**1**) in CD_3OD.

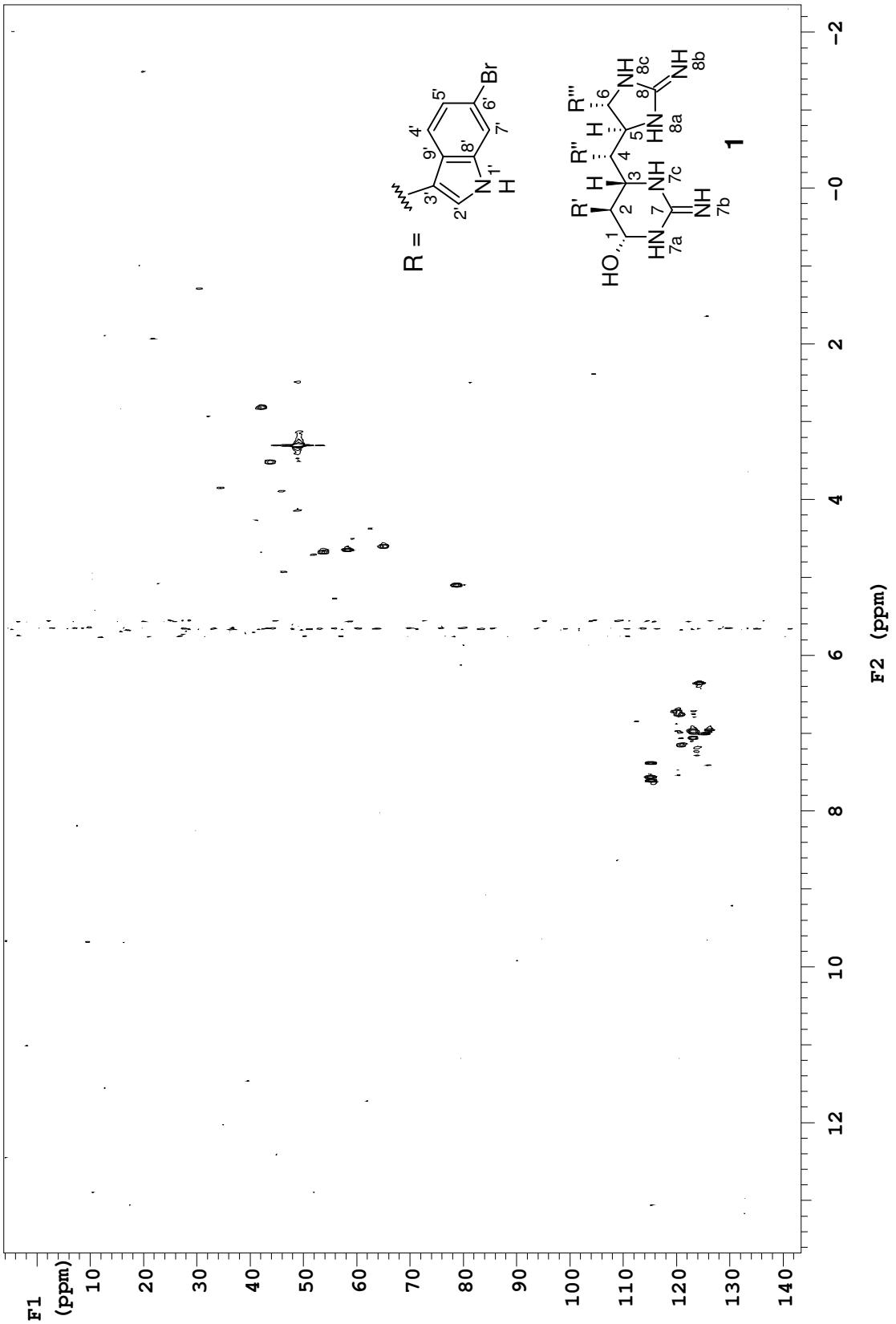

FIGURE S12. [^{13}C, ^{1}H] HSQC spectrum of araiosamine A (**1**) in CD_3OD.

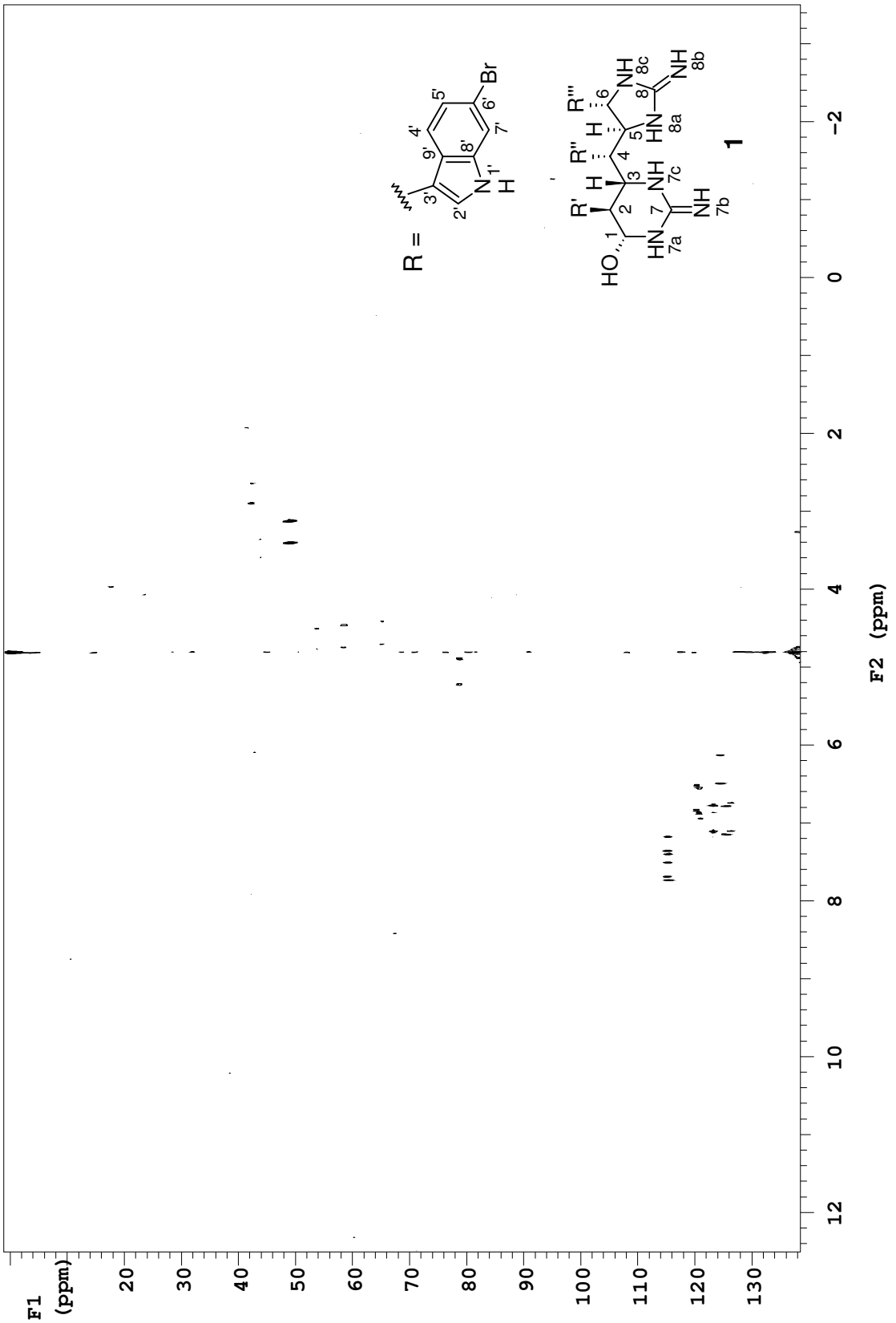

FIGURE S13. Coupled [^{13}C, ^{1}H] HSQC spectrum of araiosamine A (**1**) in CD_3OD.

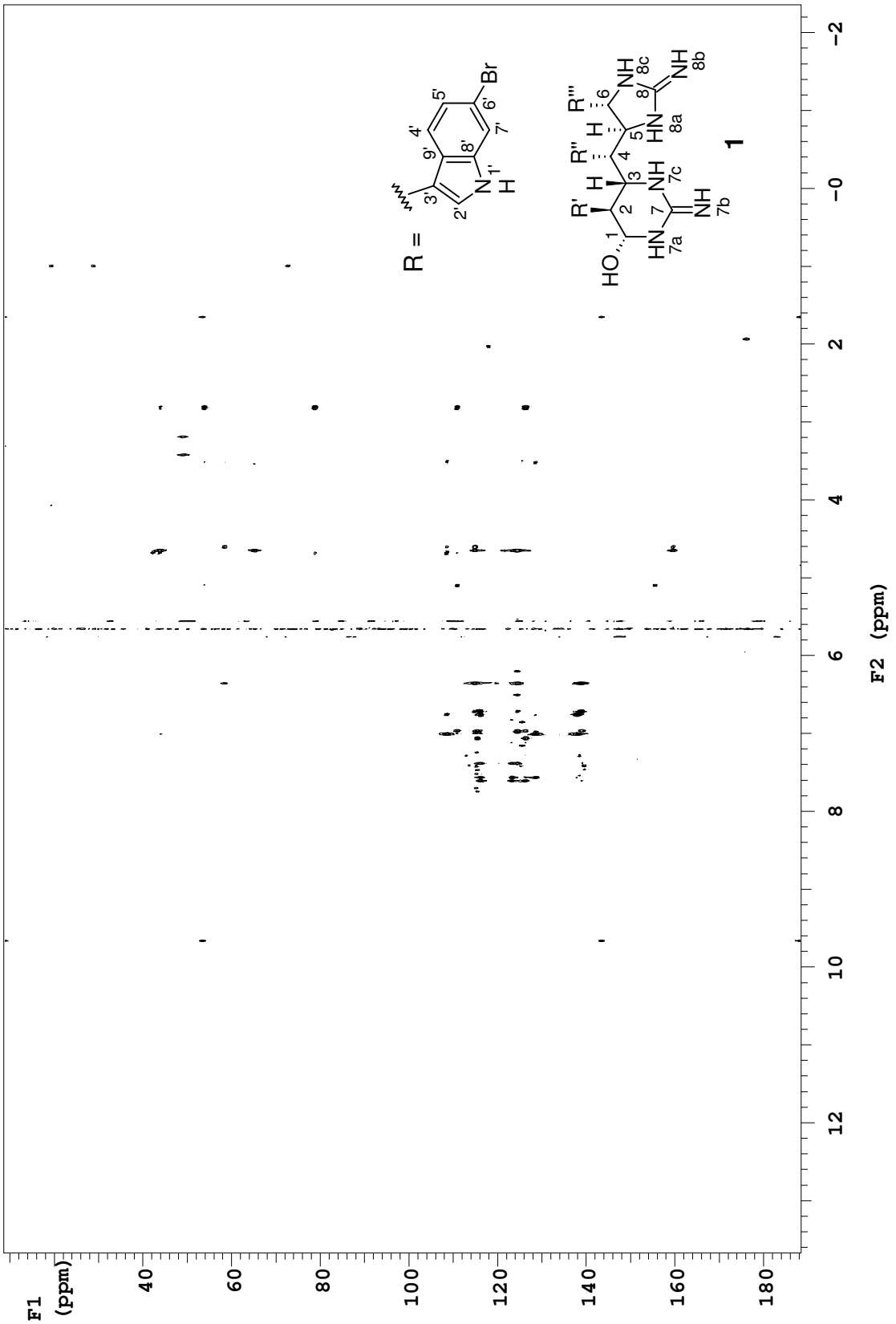

FIGURE S14. [^{13}C, ^{1}H] HMBC spectrum of araiosamine A (**1**) in CD_3OD.

NMR data for araiosamine B (2)

Table S3. NMR data for araiosamine B (**2**) in DMSO-d_6

Posn.	δ_H mult (*J* in Hz)	δ_C	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
1	4.32 br s	81.3 CH	2, 7a	2, 3, 7a	2, 7a, 1-OMe	
2	2.81 d (11.0)	37.7 CH	1, 3	1, 3, 7a	1, 1-OMe, 2', 4'(w)	
3	4.74 d (11.0)	48.3 CH	2	1, 2, 7c	4, 7c, 1-OMe, 2', 4'	
4	3.17 m	48.6 CH	5	5, 6	3, 6	
5	4.41 m	62.7 CH	4, 6	4, 6	7c, 8a, 2"(w), 4"'	
6	4.26 br s	56.3 CH	5	4, 5, 8c	4, 8c, 2"', 4"'	
7		-				
7a	9.21 s		1, 7c	1, 7b, 7c	1, 7b, 1-OMe	
7b	7.40 s			7a	7a, 7c	
7c	8.60 s		7a	7a	3, 5, 7b, 8a(w)	
8		-				
8a	9.49 s		8c	4, 5, 6, 8c	3, 5, 7c, 8b	
8b	8.03 s				8a, 8c	
8c	8.53 s			6, 8a	6, 8b	
1-OMe	3.09 s	54.7 CH_3			1, 7a, 4'	1
1'	11.40 s		2'	2'	2', 7'(w)	
2'	7.06 s	125.8 CH	1'	1'	2, 3, 1'	
3'		-				
4'	7.38 d (8.5)	121.2 CH	5'	5', 7'	1(vw), 2(w), 3, 1-OMe(vw), 5'	
5'	7.07 d (8.5)	121.4 CH	4', 7'	4', 7'	4'	
6'		114.1 C				
7'	7.63 s	114.3 CH	5'	4', 5'	1'(w)	5', 6', 9'
8'		-				

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Table S3 – continued from previous page

Posn.	δ_H mult (*J* in Hz)	δ_C	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
9'		124.9 C				
1"	11.40 s		2"	2"	2", 7"(w)	
2"	7.05 s	125.8 CH	1"	1"	3, 5, 7c, 1"	
3"		-				
4"	6.47 d (8.3)	119.3 CH	5"	5", 7"	5"	
5"	6.82 d (8.3)	121.4 CH	4", 7"	4", 7"	4"	
6"		-				
7"	7.58 s	114.1 CH	5"	4", 5"	1"(w)	
8"		-				
9"		-				
1"'	11.11 s		2"'	2"'	2"', 7"'(w)	
2"'	6.55 s	123.0 CH	1"'	1"'	5(w), 6(w), 1"'	8"'
3"'		-				
4"'	6.47 d (8.5)	119.3 CH	5"'	5"', 7"'	5, 6, 5"'	
5"'	6.96 d (8.5)	121.4 CH	4"', 7"'	4"', 7"'	4"'	
6"'		114.6 C				
7"'	7.47 s	114.3 CH	5"'	4"', 5"'	1"'(w)	6"', 9"'
8"'		137.0 C				
9"'		122.3 C				

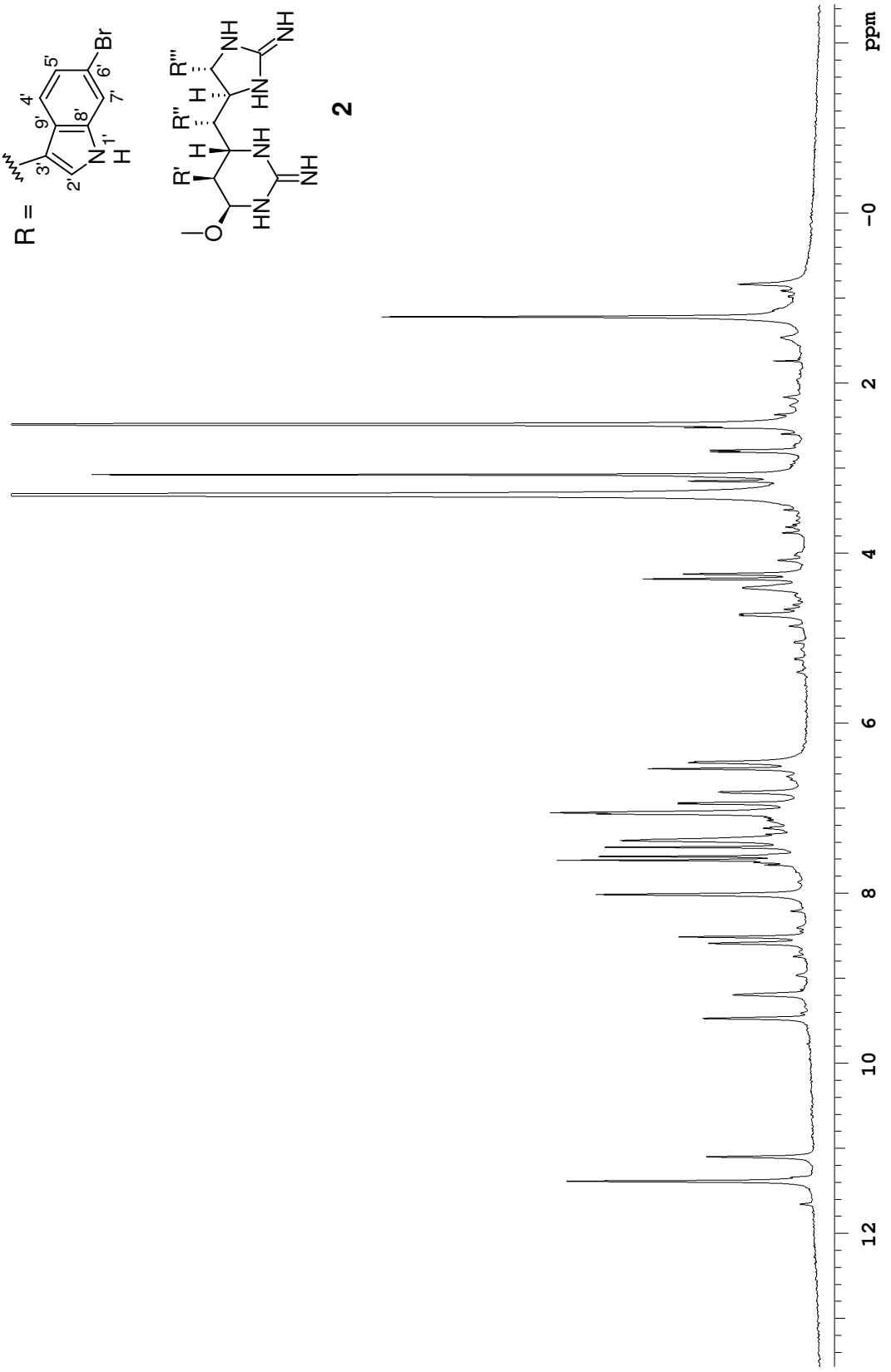

FIGURE S15. ^{1}H NMR spectrum of araiosamine B (**2**) in DMSO-d_6.

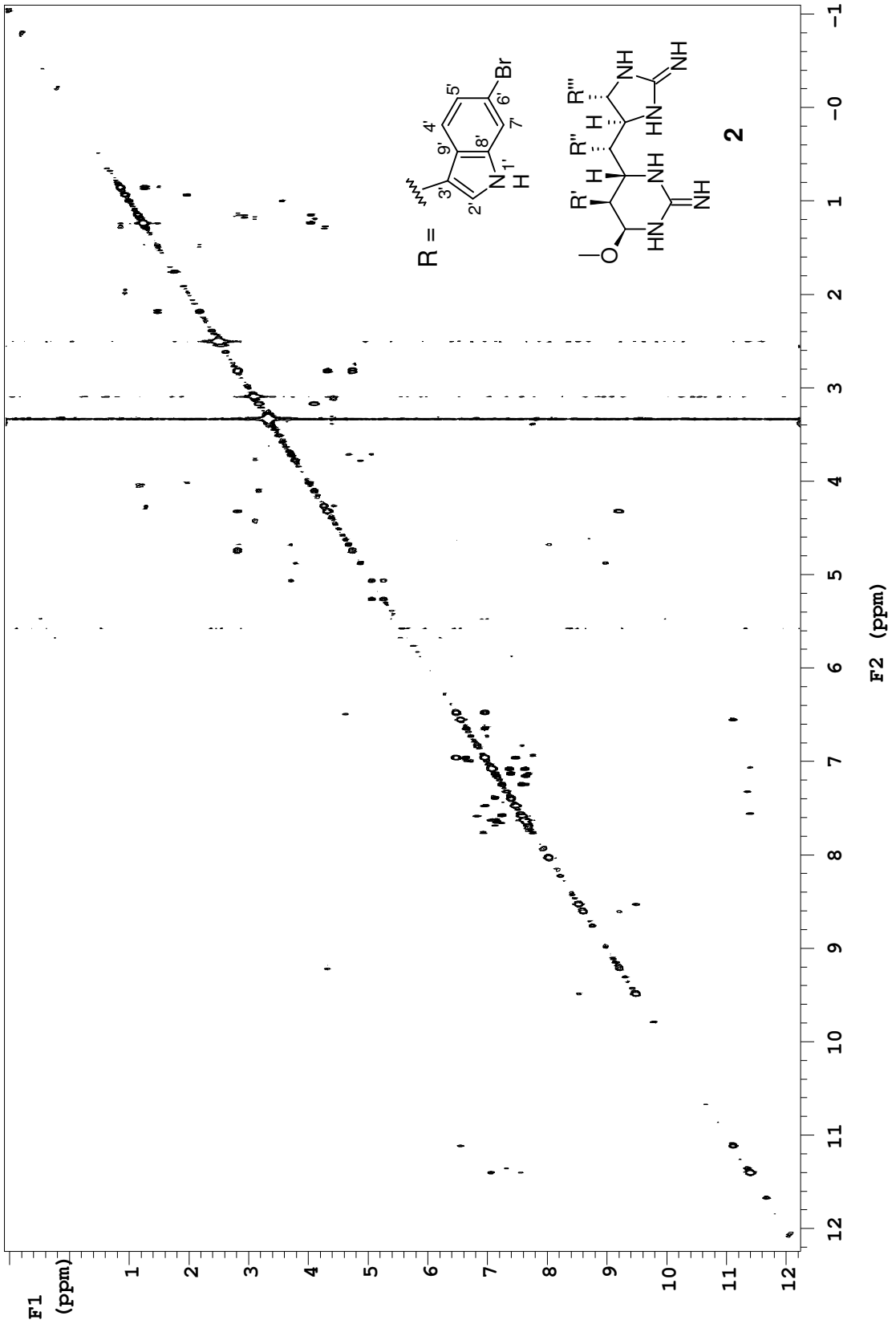

FIGURE S16. COSY spectrum of araiosamine B (**2**) in DMSO-d_6.

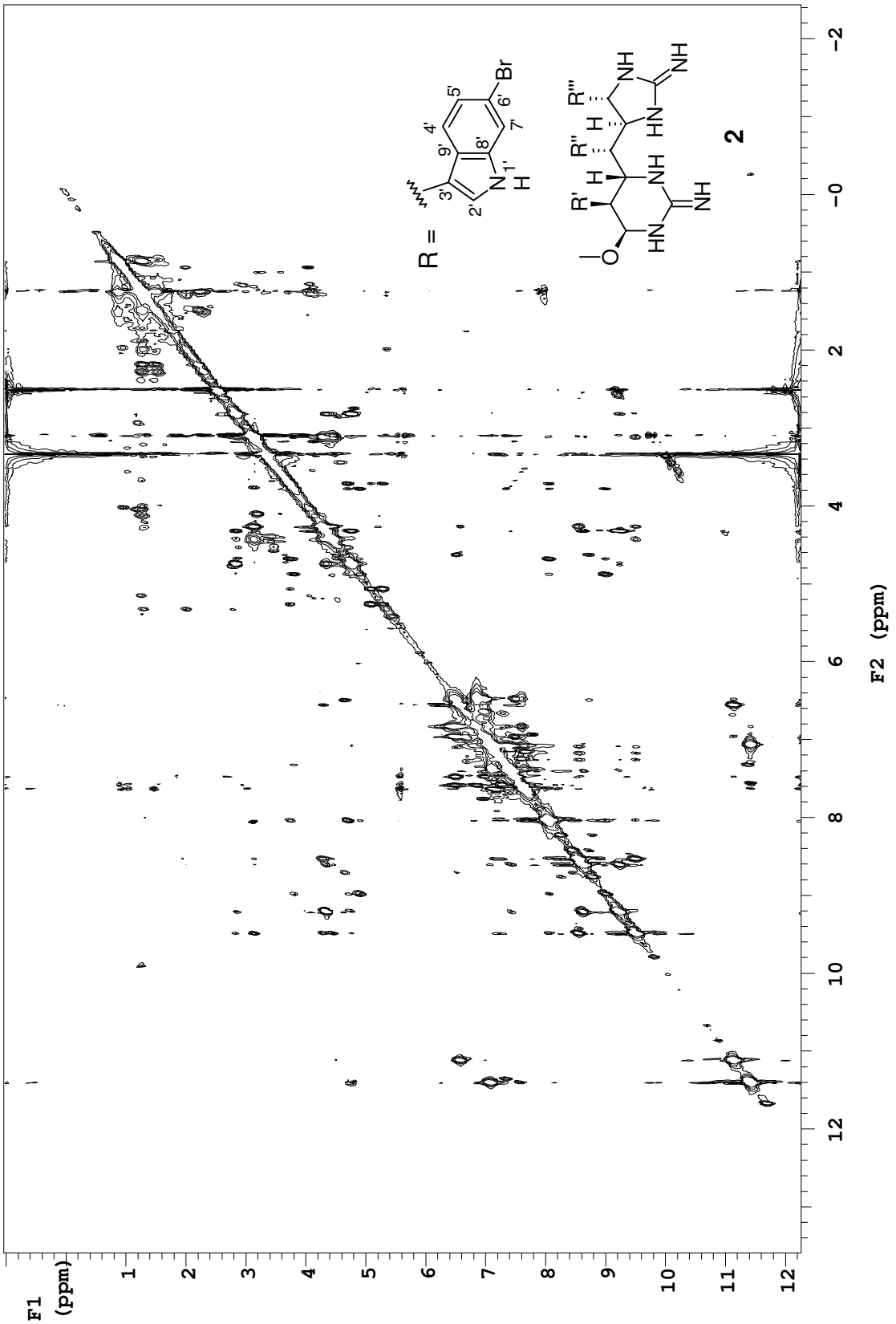

FIGURE S17. TOCSY spectrum of araiosamine B (**2**) in DMSO-d_6.

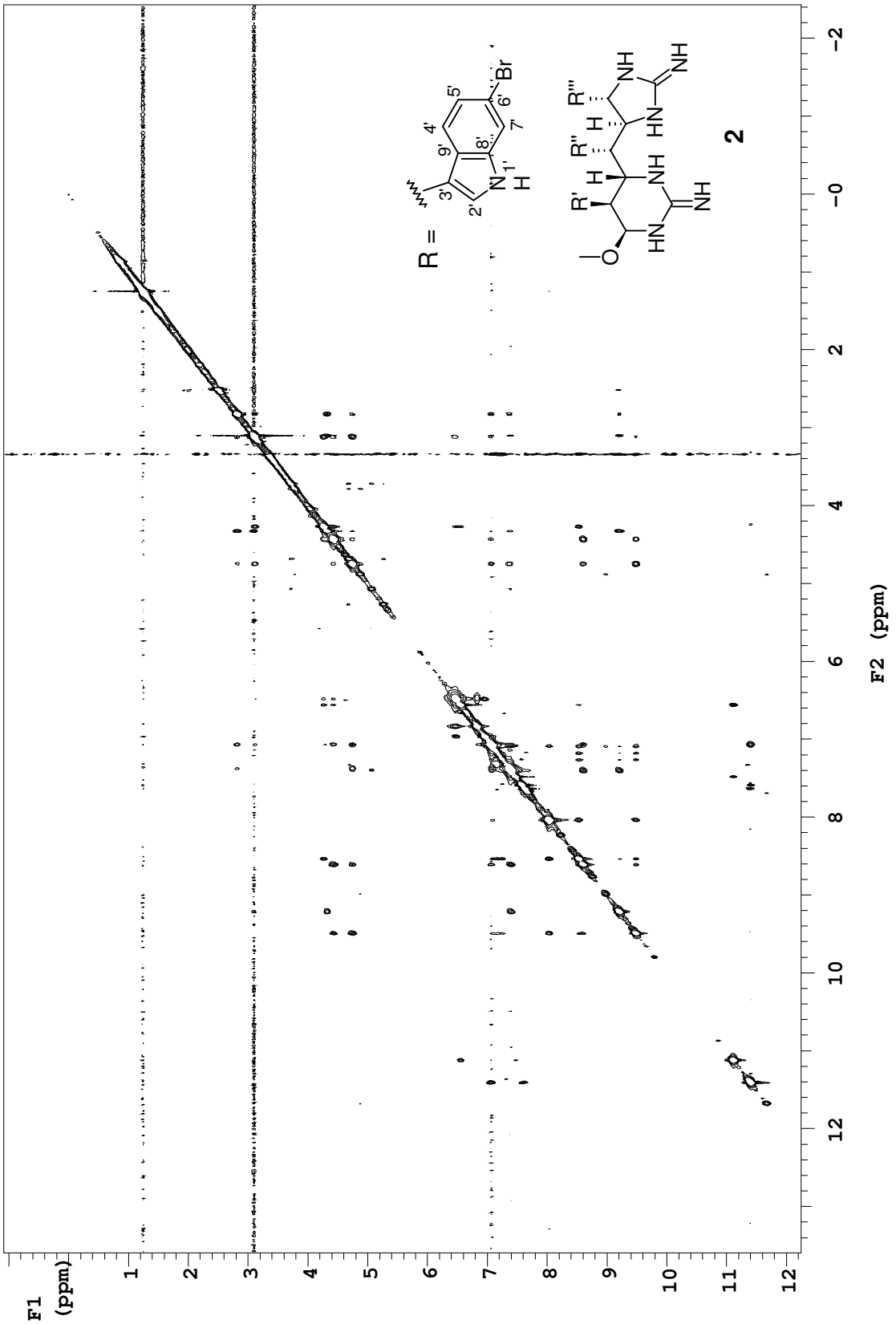

FIGURE S18. NOESY spectrum of araiosamine B (**2**) in DMSO-d_6.

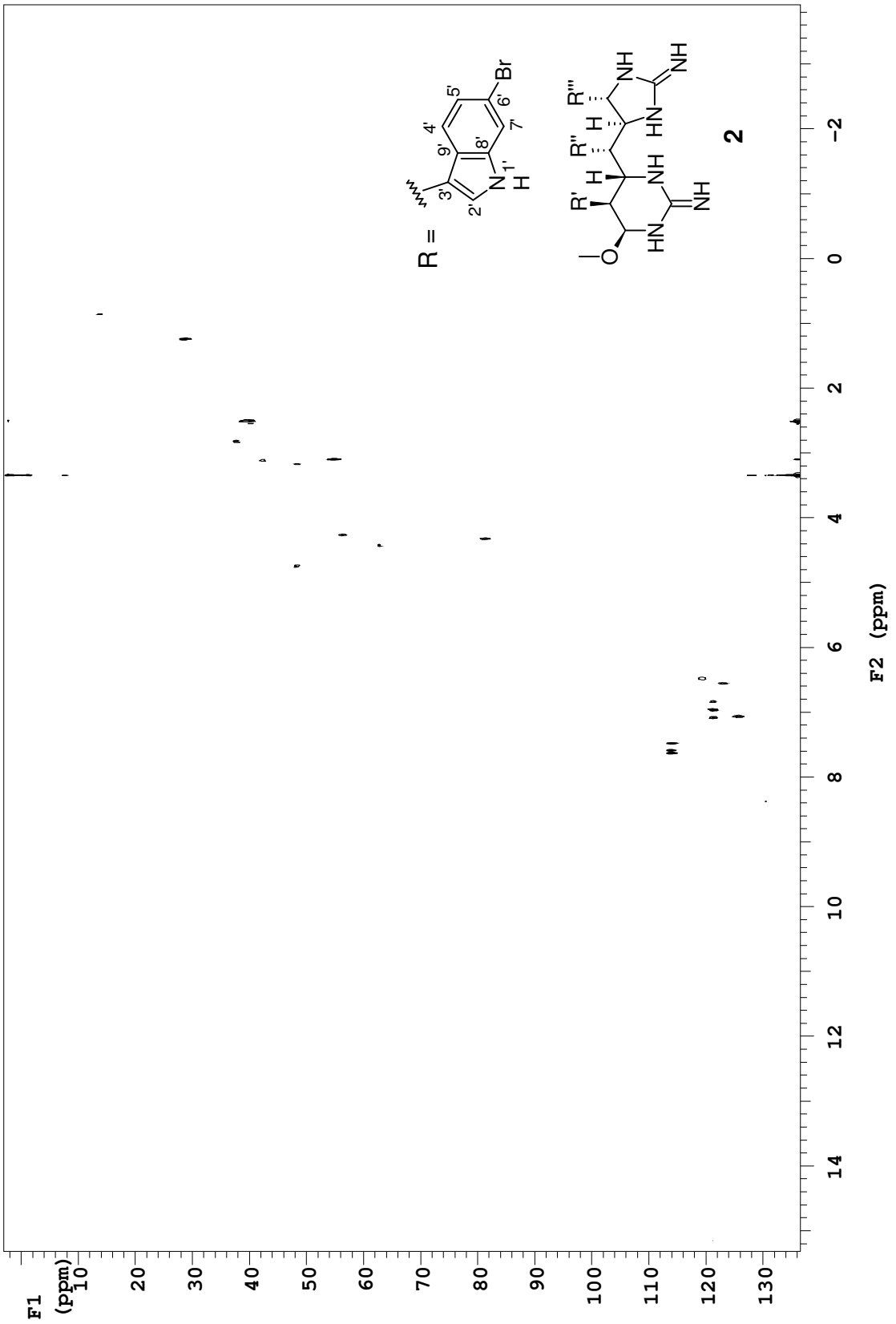

FIGURE S19. [^{13}C, ^{1}H] HSQC spectrum of araiosamine B (**2**) in DMSO-d_6.

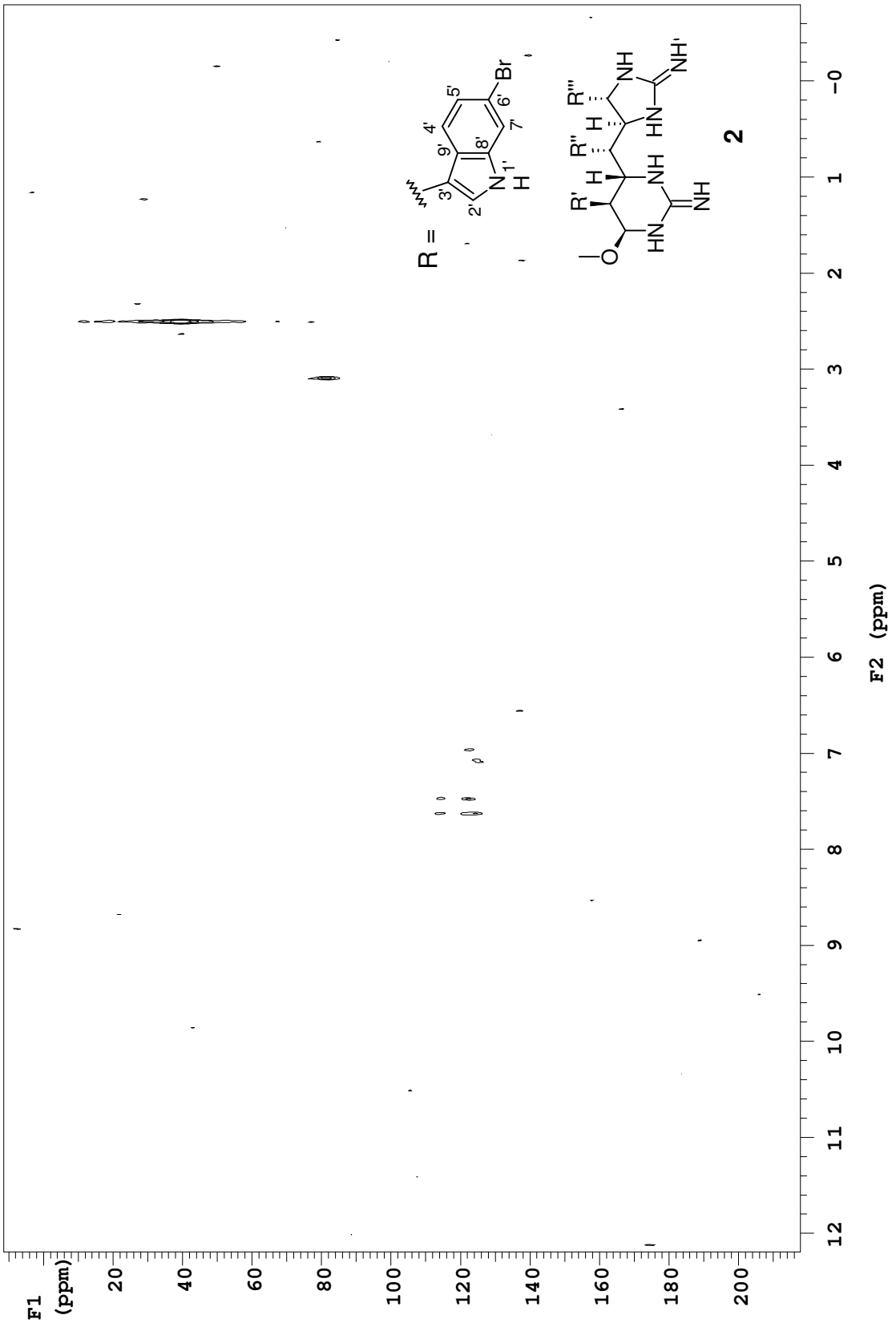

FIGURE S20. [^{13}C, ^{1}H] HMBC spectrum of araiosamine B (**2**) in DMSO-d_6.

Table S4. NMR data for araiosamine B (**2**) in CD_3OD

Posn.	δ_H mult (*J* in Hz)	δ_C ($^1J_{H-C}$ in Hz)	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
1	4.34 d (3.0)	83.6 CH (164)	2	2	2, 1-OMe	3, 7, 1-OMe
2	2.97 d (11.8)	39.6 CH (128)	1, 3	1, 3	1, 2’	3, 3’
3	4.83 d (11.8)	51.3 CH (145)	2	2	4(s)	
4	3.29 m	44.6 CH (127)	5	5, 6	3(s), 6, 4”	5, 2”, 3”, 9”
5	4.57 dd (10.3, 5.0)	65.3 CH (149)	4, 6	4, 6	4”	6, 3”’
6	4.50 d (5.0)	59.2 CH (144)	5	4, 5	4, 2”’, 4”’	4, 5, 8, 2”’, 3”’, 9”’
7		155.8 C				
8		159.9 C				
1-OMe	3.24 s	56.1 CH_3			1	1
2’	7.03 s	127.0 CH			2	
3’		110.7 C				
4’	7.20 d (8.5)	122.1 CH	5’	5’		6’
5’	7.05 d (8.5)	123.4 CH	4’, 7’	4’, 7’		6’, 9’
6’		116.2 C				
7’	7.61 s	115.3 CH	5’	5’		5’, 6’, 8’(w), 9’
8’		139.0 C				
9’		126.9 C				
2”	6.86 s	126.1 CH			4	3”, 8”, 9”
3”		108.5 C				
4”	6.47 d (8.3)	120.8 CH	5”	5”, 7”	5”	6”, 8”
5”	6.85 d (8.3)	123.3 CH	4”	4”, 7”	4”	
6”		116.3 C				
7”	7.52 s	115.2 CH		4”, 5”		4”, 6”, 8”(w), 9”
8”		138.1 C				
9”		128.7 C				
2”’	6.28 s	124.4 CH			6	3”’, 8”’, 9”’
3”’		115.4 C				
4”’	6.59 d (8.6)	120.4 CH	5”’	5”’, 7”’	6, 5”’	6”’, 8”’
5”’	6.92 d (8.6)	123.3 CH	4”’, 7”’	4”’, 7”’	4”’	7”’, 9”’
6”’		116.2 C				
7”’	7.38 s	115.3 CH	5”’	4”’, 5”’		5”’, 6”’, 8”’, 9”’
8”’		139.0 C				
9”’		124.7 C				

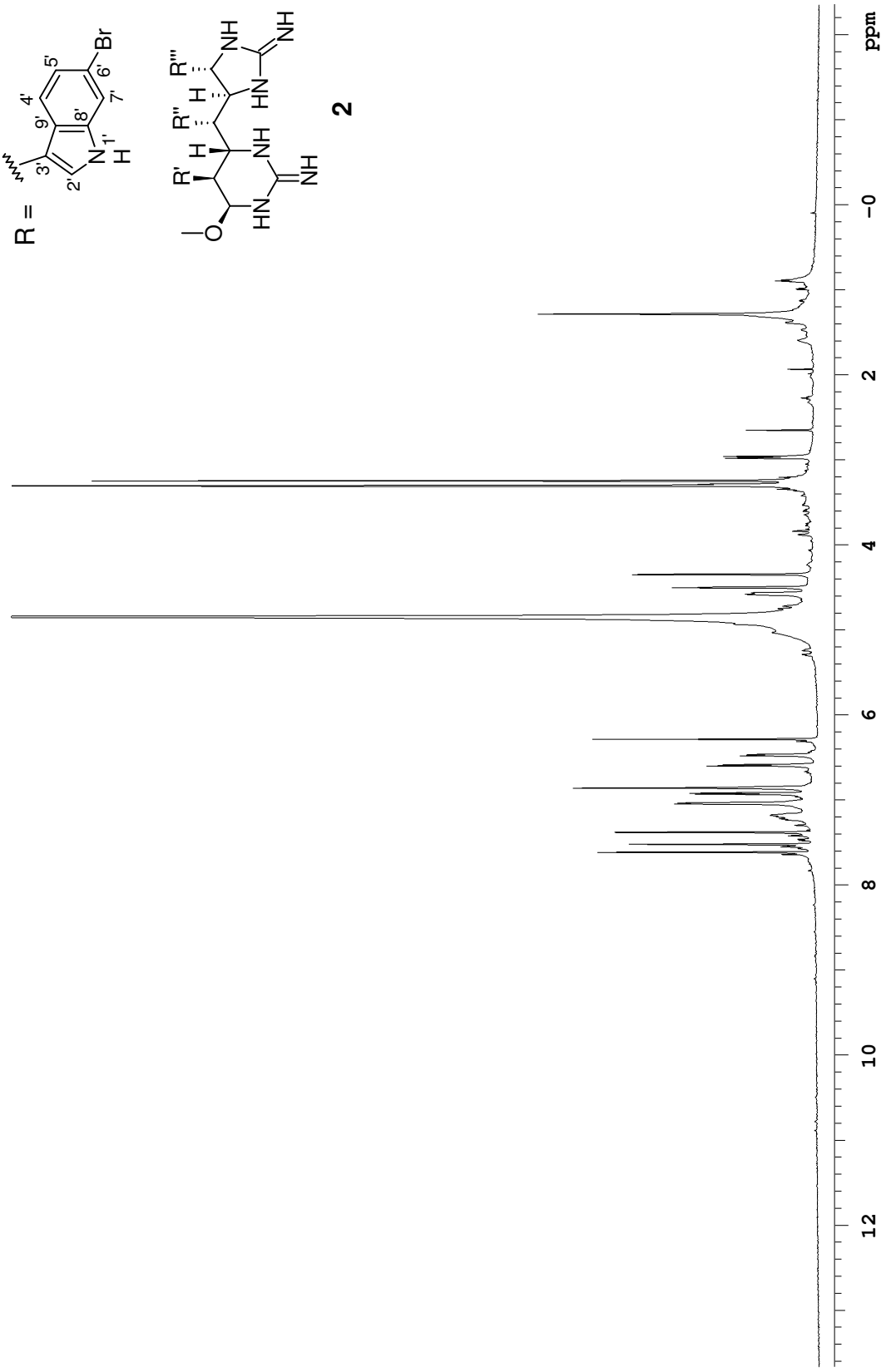

FIGURE S21. ^{1}H NMR spectrum of araiosamine B (**2**) in CD_3OD.

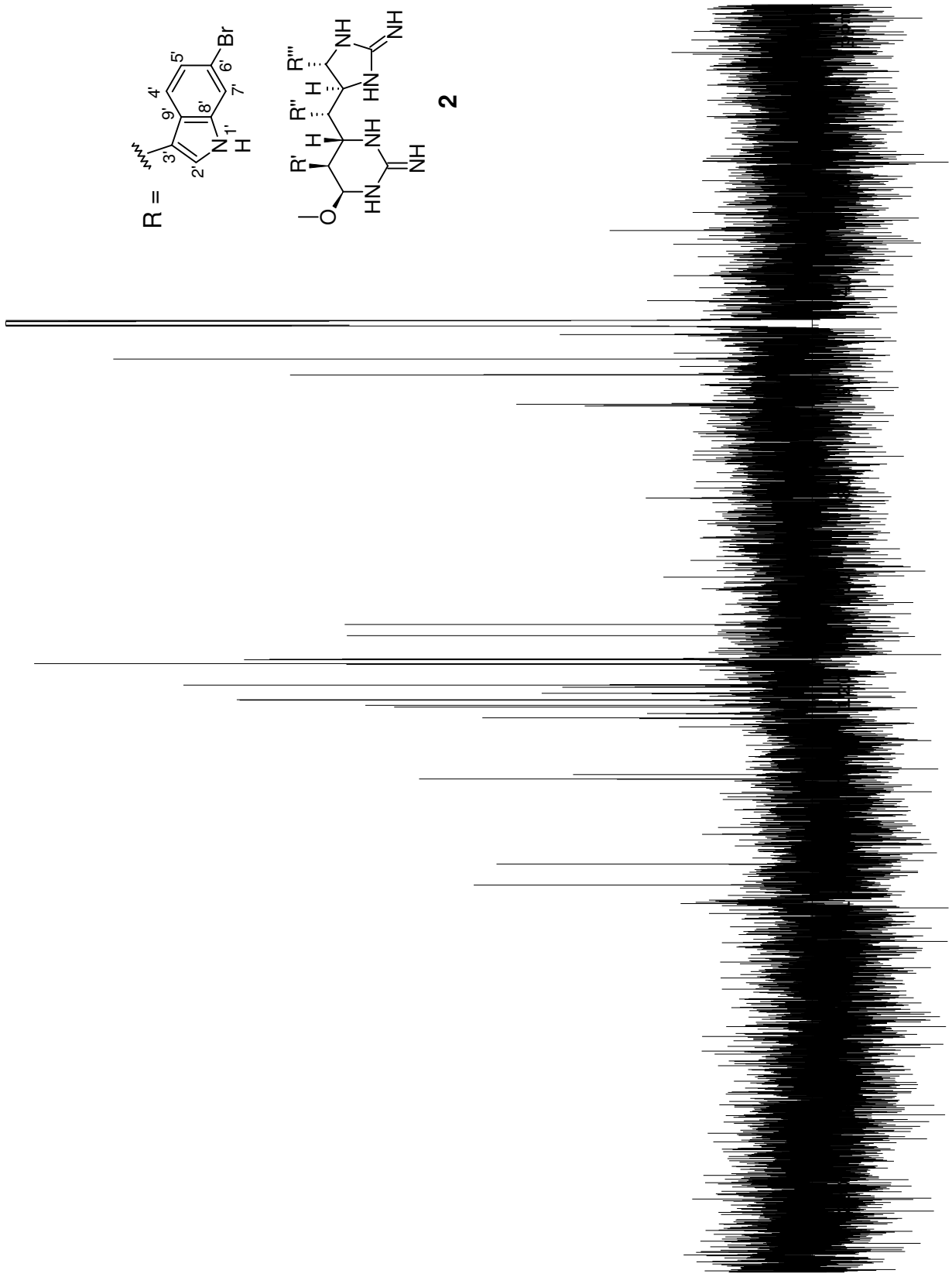

FIGURE S22. ^{13}C NMR spectrum of araiosamine B (**2**) in CD_3OD.

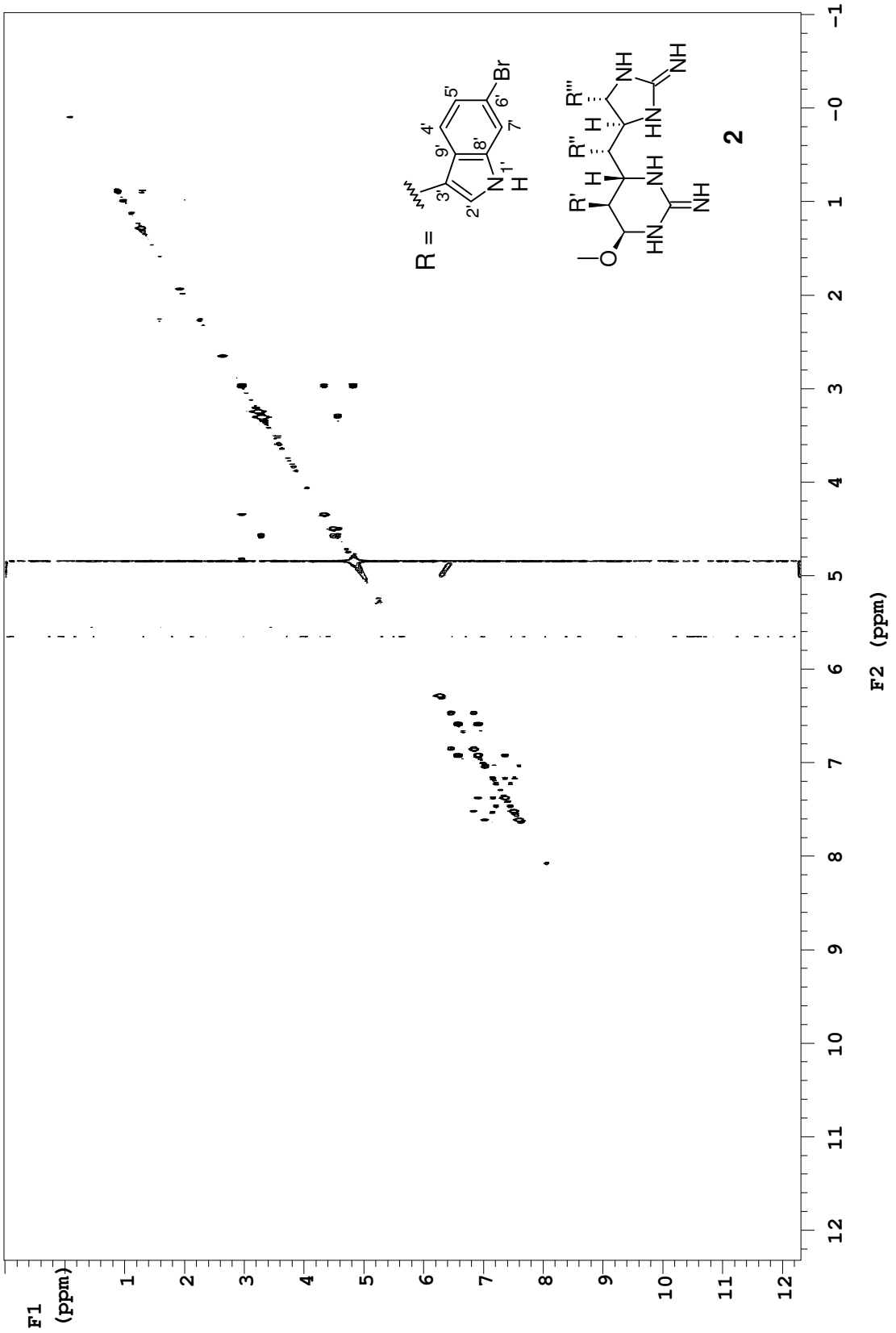

FIGURE S23. COSY spectrum of araiosamine B (**2**) in CD_3OD.

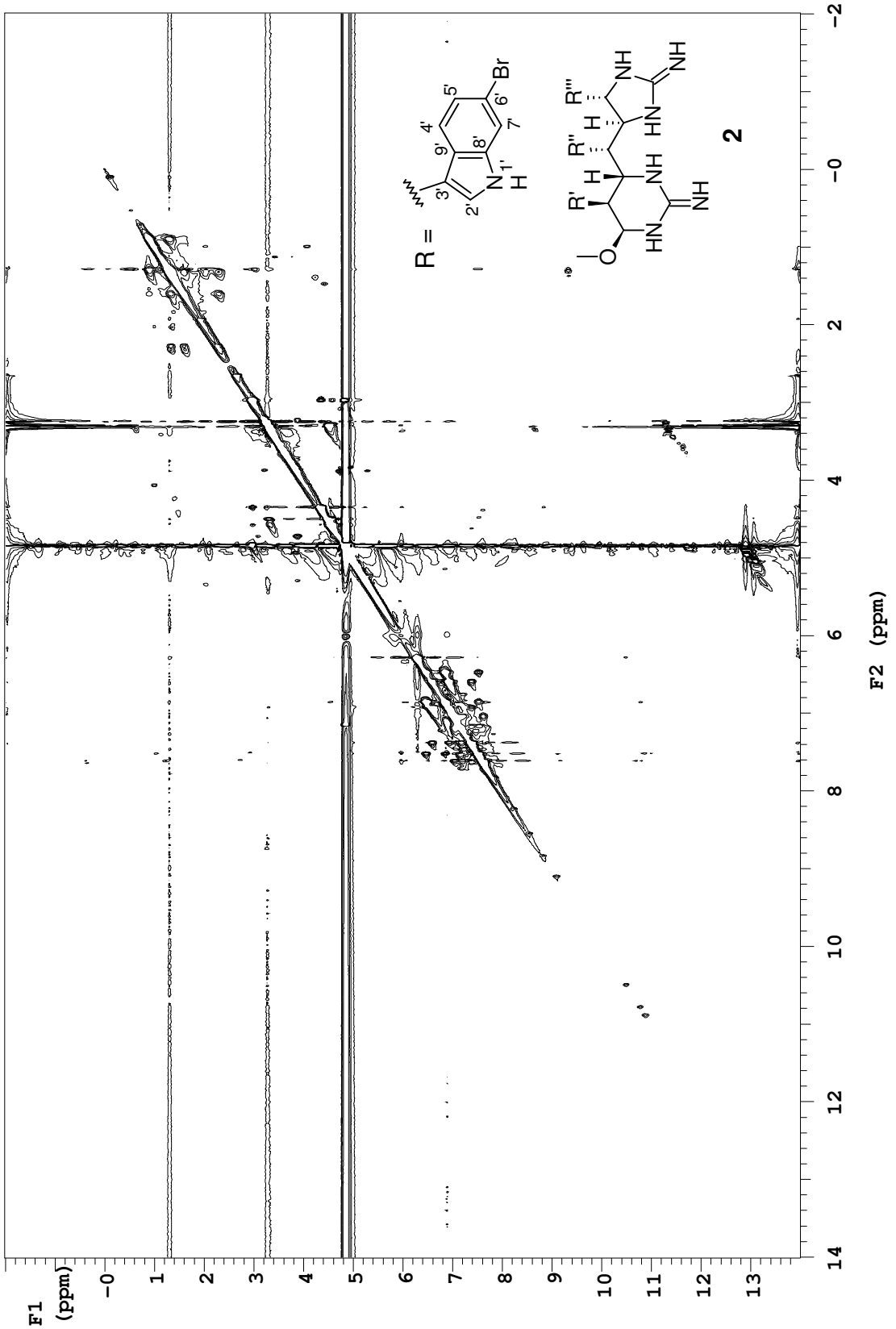

FIGURE S24. TOCSY spectrum of araiosamine B (**2**) in CD_3OD.

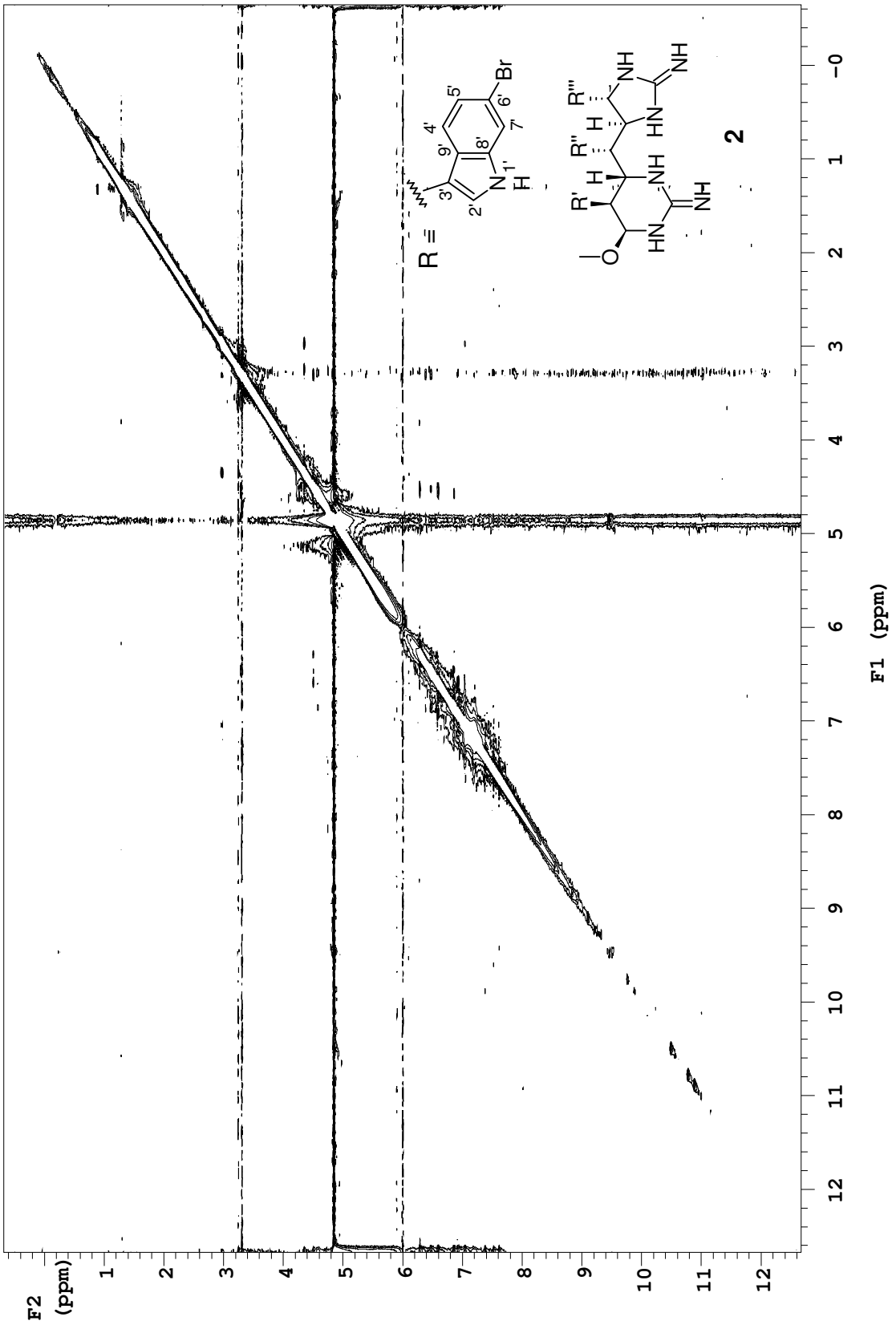

FIGURE S25. NOESY spectrum of araiosamine B (**2**) in CD_3OD.

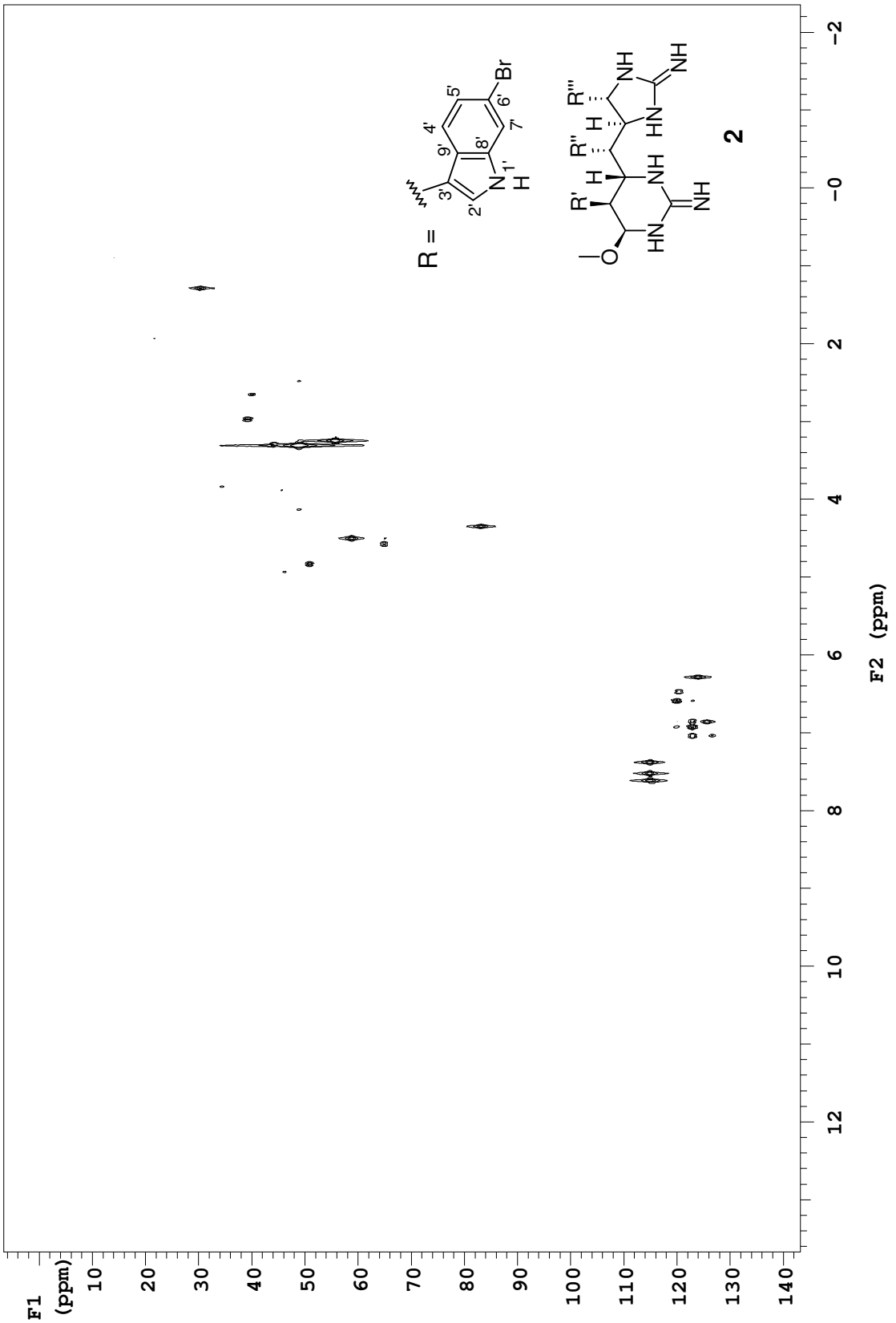

FIGURE S26. [^{13}C, ^{1}H] HSQC spectrum of araiosamine B (**2**) in CD_3OD.

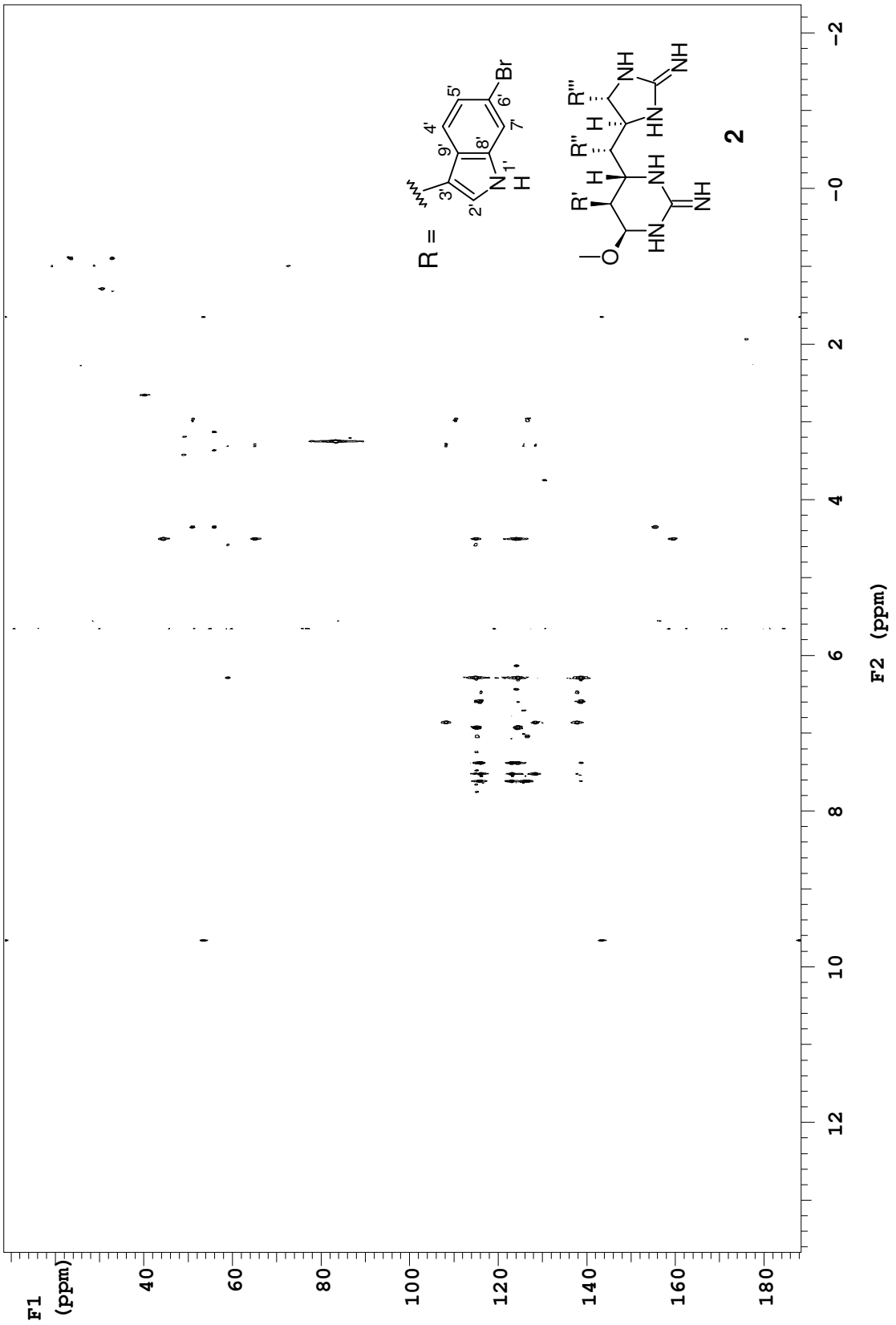

FIGURE S27. [^{13}C, ^{1}H] HMBC spectrum of araiosamine B (**2**) in CD_3OD.

NMR data for araiosamine C (3)

Table S5. NMR data for araiosamine C (**3**) in DMSO-d_6

Posn.	δ_H mult (J in Hz)	δ_C ($^1J_{C-H}$)	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC	[^{15}N, ^{1}H] HMBC
1	5.91 s	57.2 CH (166)		2, 7a	2, 3, 7a	2, 5, 7a, 2', 4'		
2	4.22 s	27.8 CH (134)		1, 3	1, 3	1, 3, 4(w), 5, 4', 2", 4"	2', 3'	
3	3.93 s	52.8 CH (152)		2, 4, 7c	1, 2, 7c	2, 4, 7c, 2', 2", 4"	7	
4	3.77 d (10.3)	47.1 CH (136)		3, 5	5, 6	2(w), 3, 6, 7c, 2", 2"'(w), 4"'	3, 6, 2", 3"	7c
5	4.68 dd (10.3, 9.3)	58.3 CH (149)		4, 6	4, 6	1, 2, 2", 4", 2"', 4"'	3"'	
6	5.11 d (9.3)	58.2 CH (144)		5, 8c	4, 5	4, 8c, 2"', 4"'	4, 5, 2"', 3"', 9"'	
7		151.2 C						
7a	8.58 s		91.8	1, 7c	1, 2, 3, 7c	1, 7b, 4'		
7b	7.65 br s		75.4			7a, 7c		
7c	9.55 s		96.6	3, 7a	1, 2, 3, 7a	3, 4, 7b, 2'		
8		156.0 C						
8a								
8b	8.58 s		96.4			8c		
8c	9.20 s		96.4	6	6	6, 8b	5, 8	
1'	11.30 s		134.6	2'	2'	2', 7'	3', 8', 9'	
2'	7.18 s	123.9 CH		1'	2, 1'	1, 2, 3, 7c, 1'	3', 8', 9'	1'
3'		109.2 C						
4'	7.69 d (8.2)	120.5 CH		5'	5'	1, 2, 5'	3', 6', 8'	
5'	7.19 d (8.2)	121.6 CH		4', 7'	4', 7'	4'	7', 9'	
6'		114.3 C						
7'	7.58 s	114.5 CH		5'	5'	1'	5', 6', 9'	

Continued on next page

Table S5 – continued from previous page

Posn.	δ_H mult (J in Hz)	δ_C ($^1J_{C-H}$)	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC	[^{15}N, ^{1}H] HMBC
8'		136.8 C						
9'		124.7 C						
1"	10.94 s		134.3	2"	2"	2", 7"	3", 9"	
2"	6.91 s	123.2 CH		1"	1"	2, 3, 4, 5, 1"	3", 8", 9"	1"
3"		112.5 C						
4"	7.74 d (8.2)	120.3 CH		5"	5", 7"	4, 5"	3", 6", 9"	
5"	7.12 d (8.2)	121.5 CH		4", 7"	4", 7"	4"	7", 9"	
6"		114.3 C						
7"	7.43 s	114.1 CH		5"	4", 5"	1"	5", 6", 9"	
8"		136.8 C						
9"		124.9 C						
1"'	11.07 s		134.9	2"'	2"'	2"', 7"'	3"', 9"'	
2"'	6.94 s	125.4 CH		1"'	1"'	5, 6, 1"'	3"', 8"', 9"'	1"'
3"'		111.5 C						
4"'	7.49 d (8.2)	120.2 CH		5"'	5"'	5, 5"'	6"', 8"'	
5"'	7.07 d (8.2)	121.6 CH		4"', 7"'	4"', 7"'	4"'	7"', 9"'	
6"'		114.2 C						
7"'	7.48 s	114.1 CH		5"'	4"', 5"'	1"'	3"', 5"', 9"'	
8"'		137.3 C						
9"'		123.9 C						

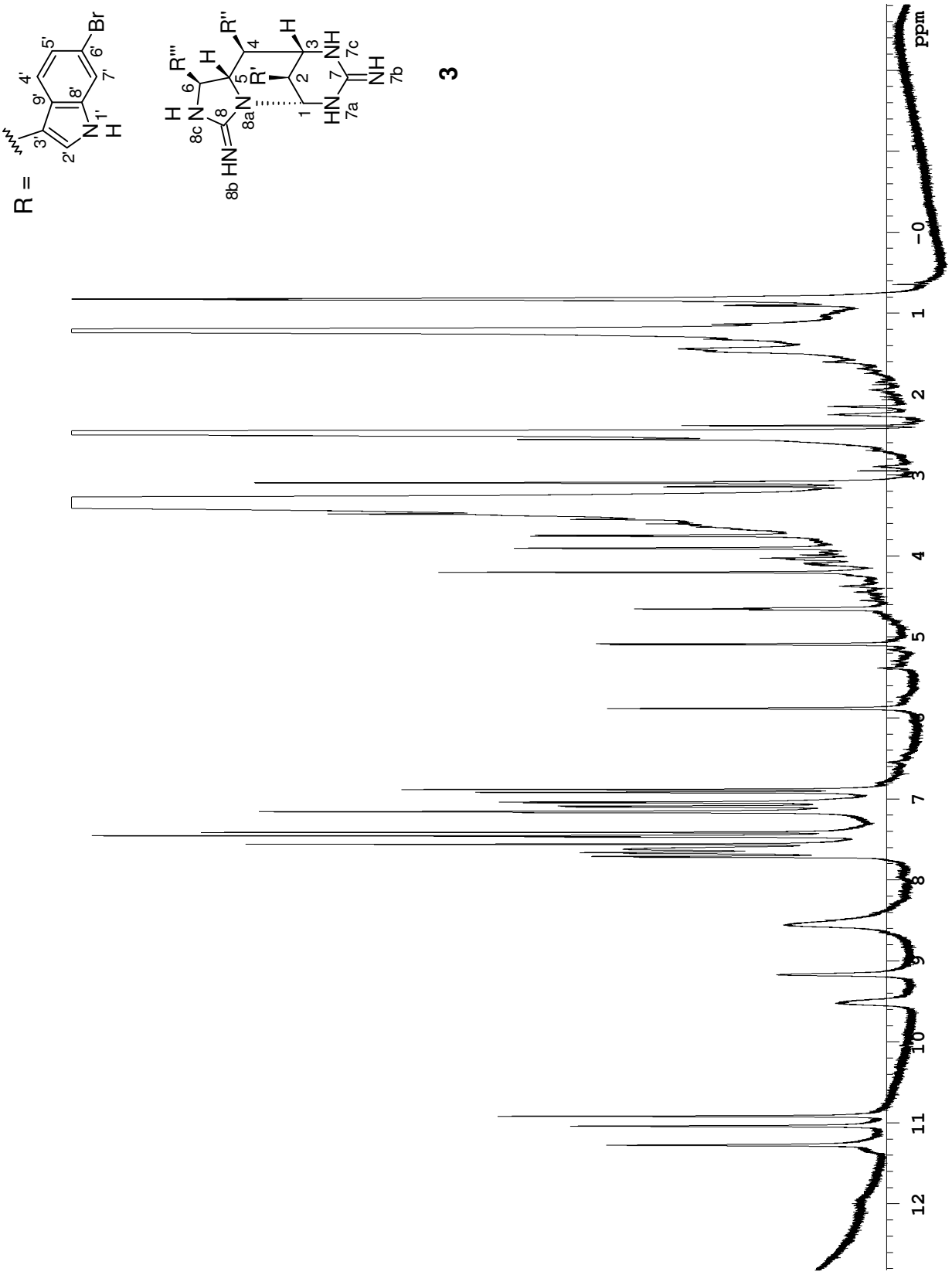

FIGURE S28. ^{1}H NMR spectrum of araiosamine C (**3**) in DMSO-d_6.

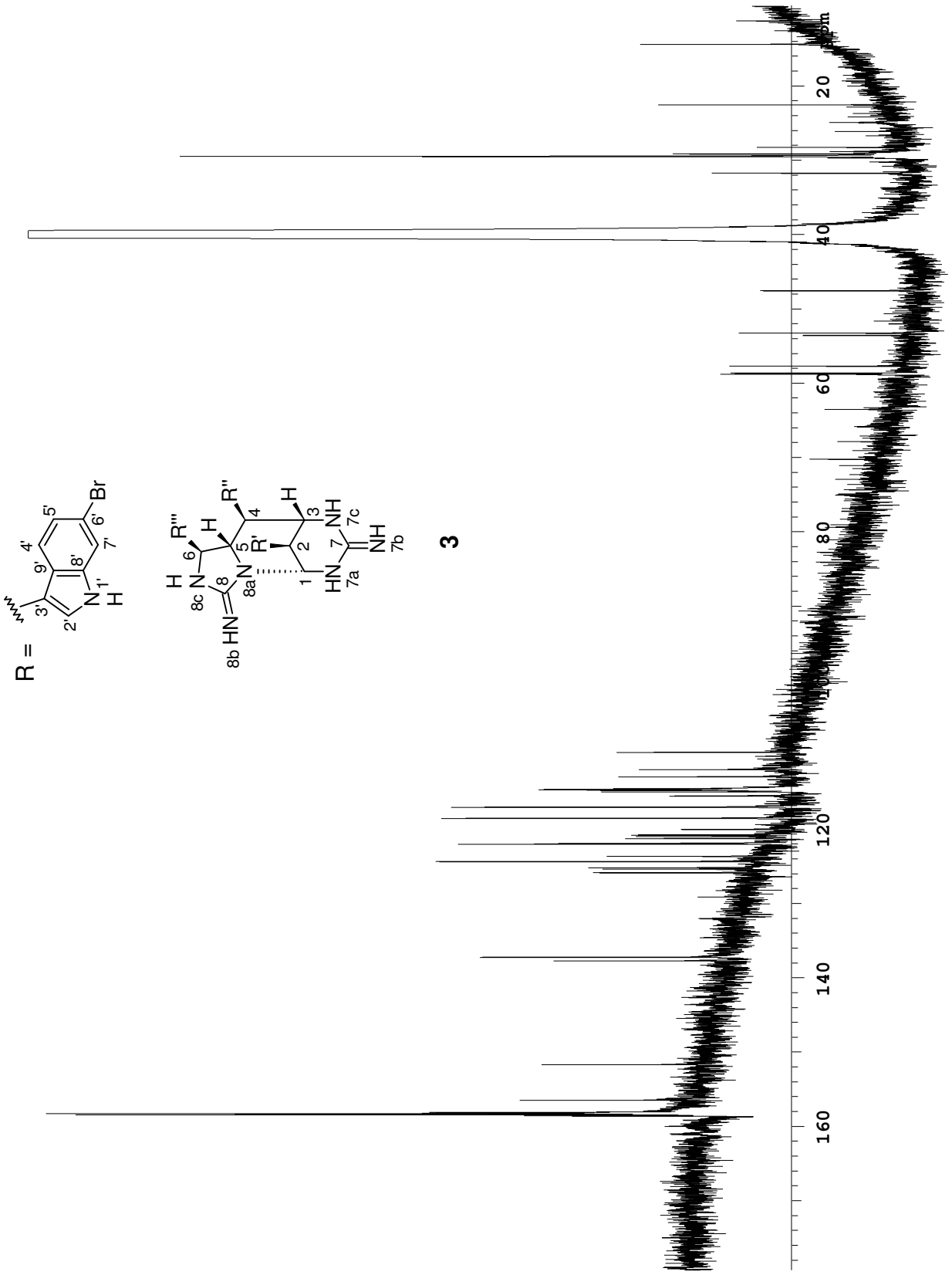

FIGURE S29. ^{13}C NMR spectrum of araiosamine C (**3**) in DMSO-d_6 at 800 MHz.

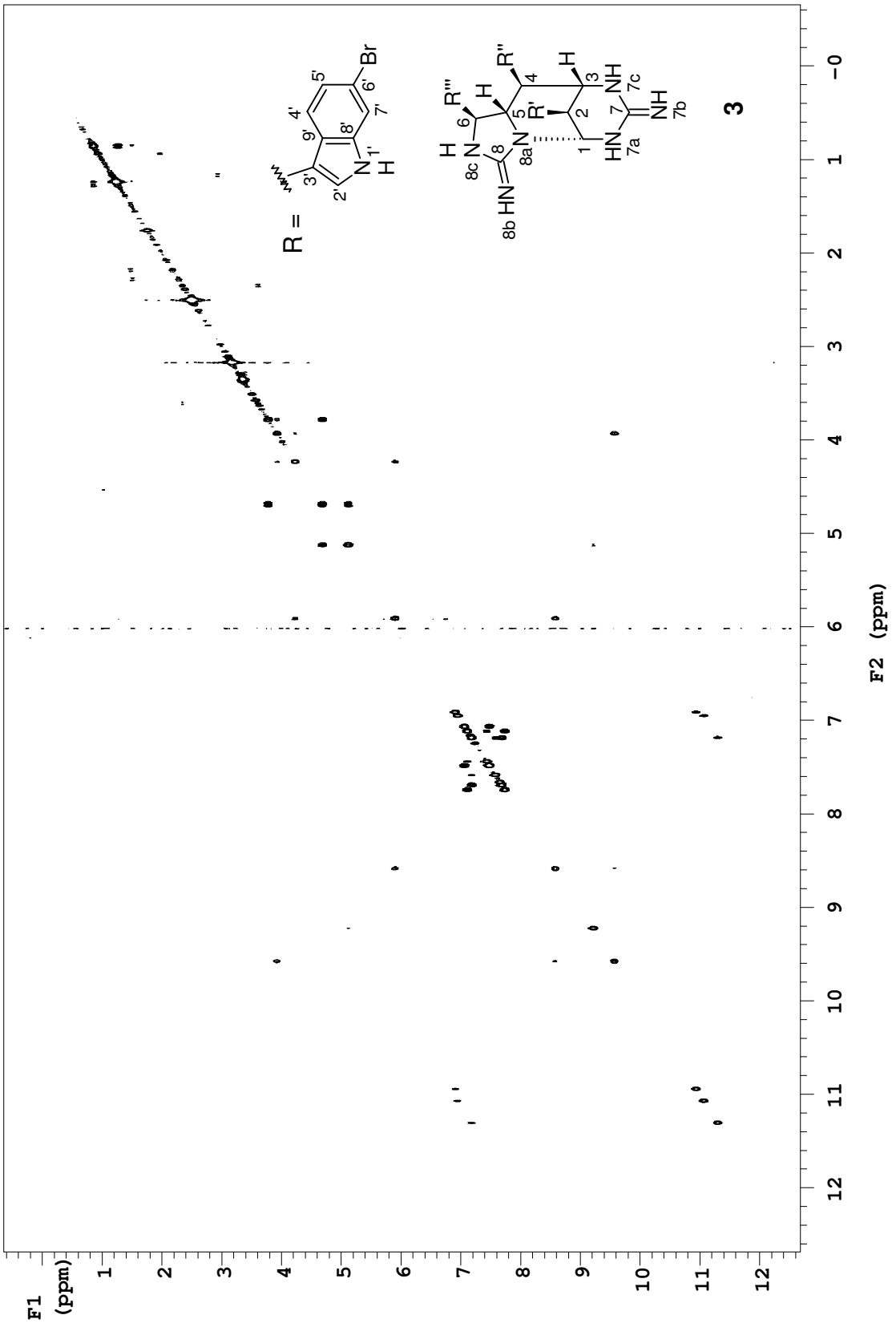

FIGURE S30. COSY spectrum of araiosamine C (**3**) in DMSO-d_6.

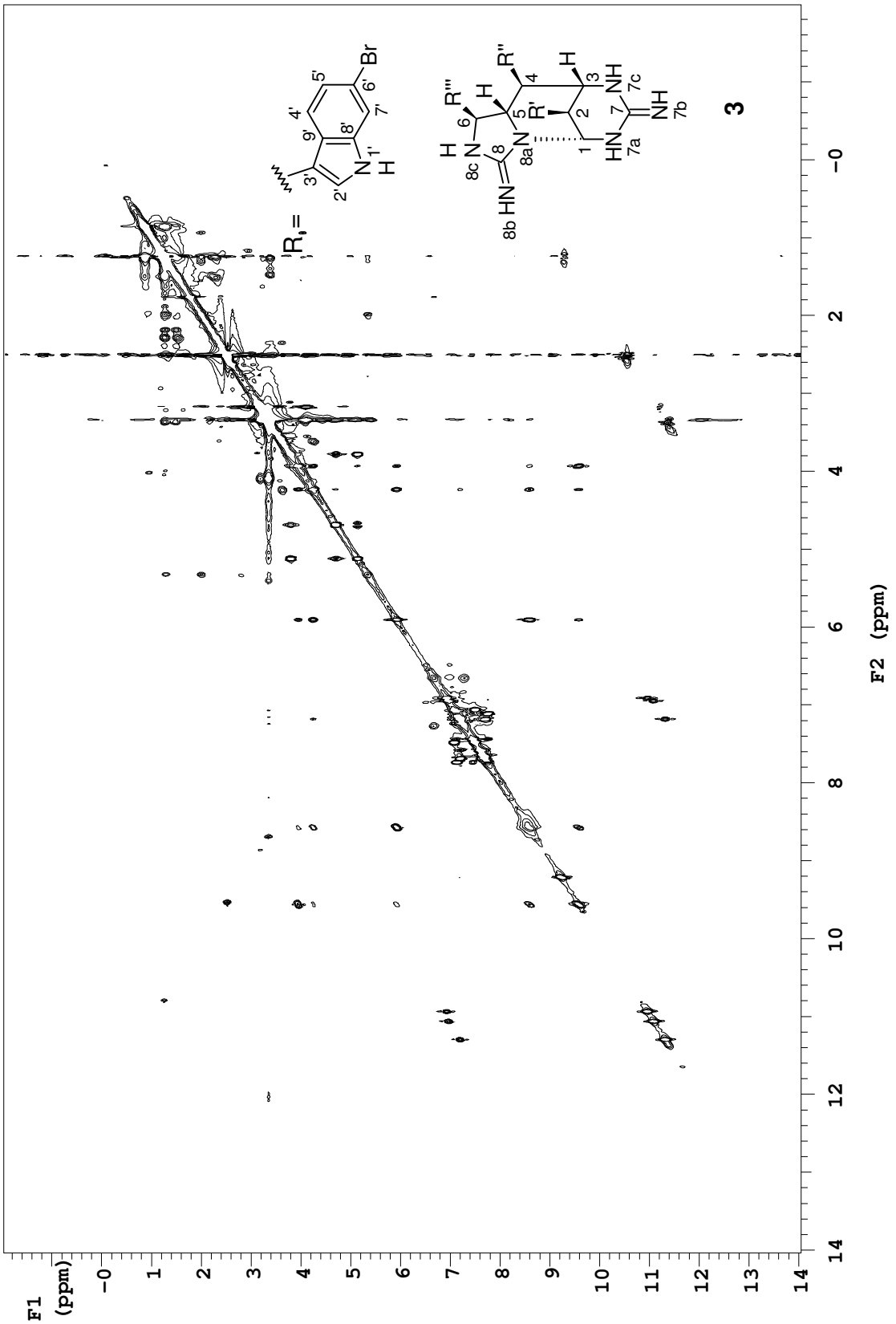

FIGURE S31. TOCSY spectrum of araiosamine C (**3**) in DMSO-d_6.

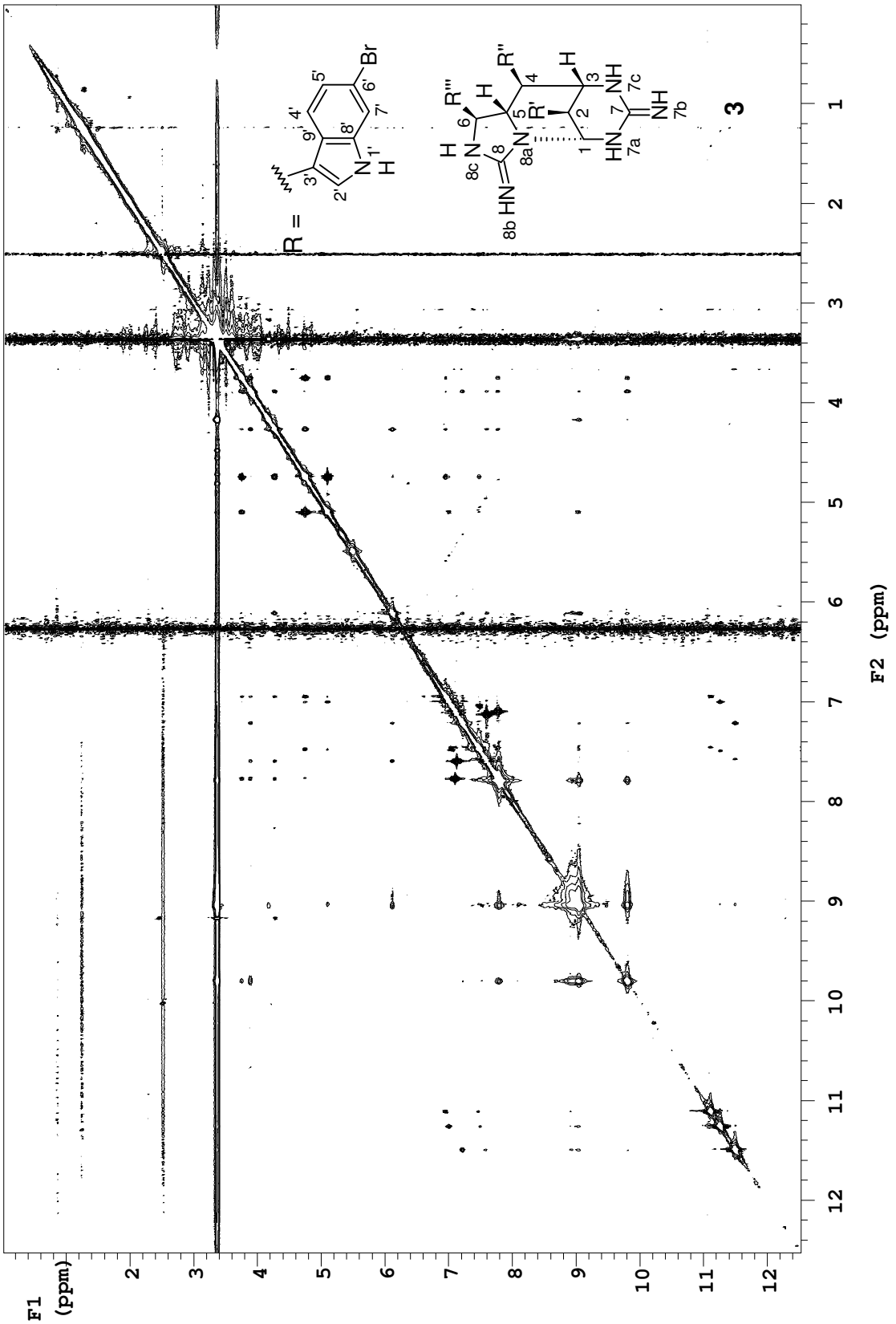

FIGURE S32. NOESY spectrum with 80 ms mixing time of araiosamine C (**3**) in DMSO-d_6.

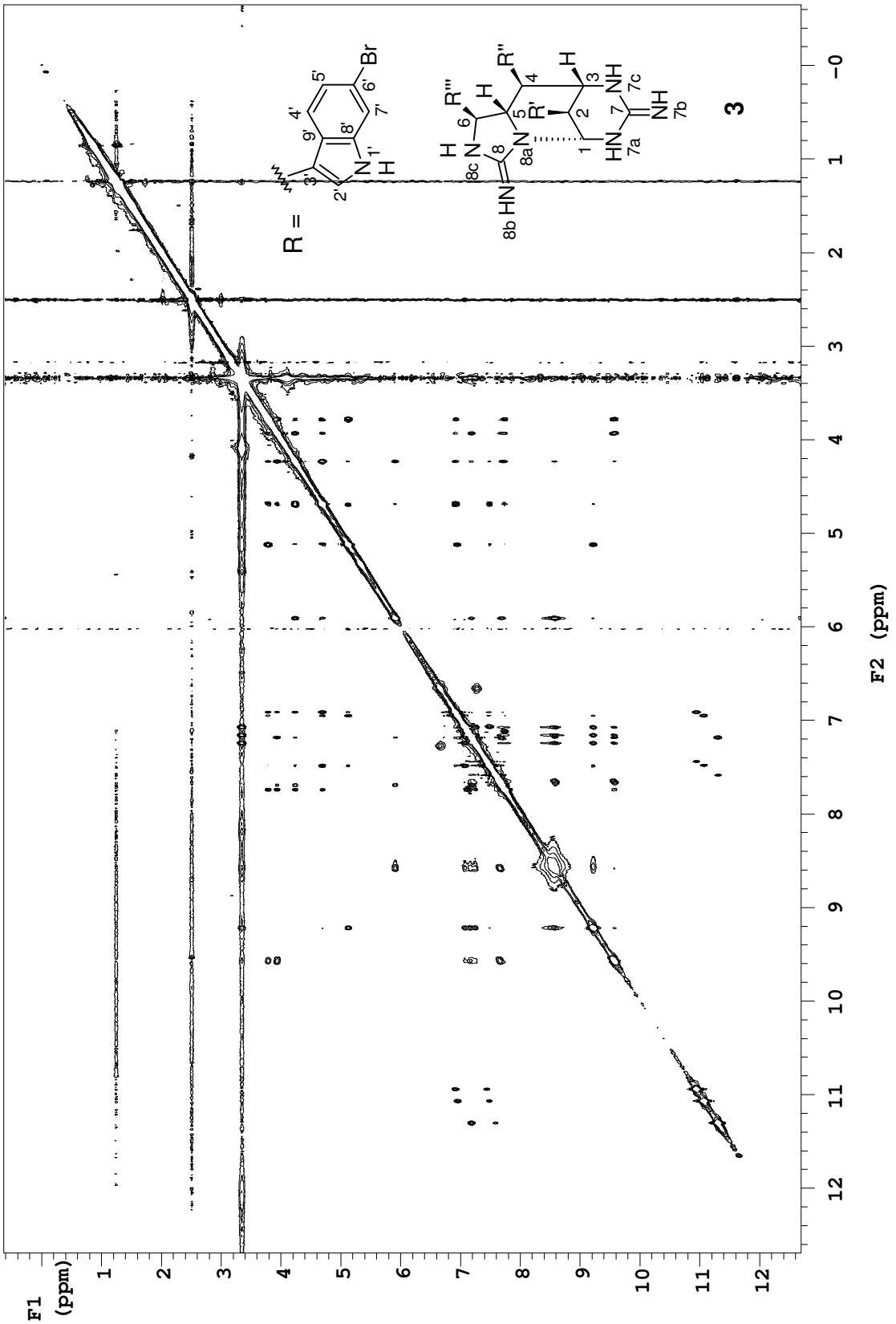

FIGURE S33. NOESY spectrum with 350 ms mixing time of araiosamine C (**3**) in DMSO-d_6.

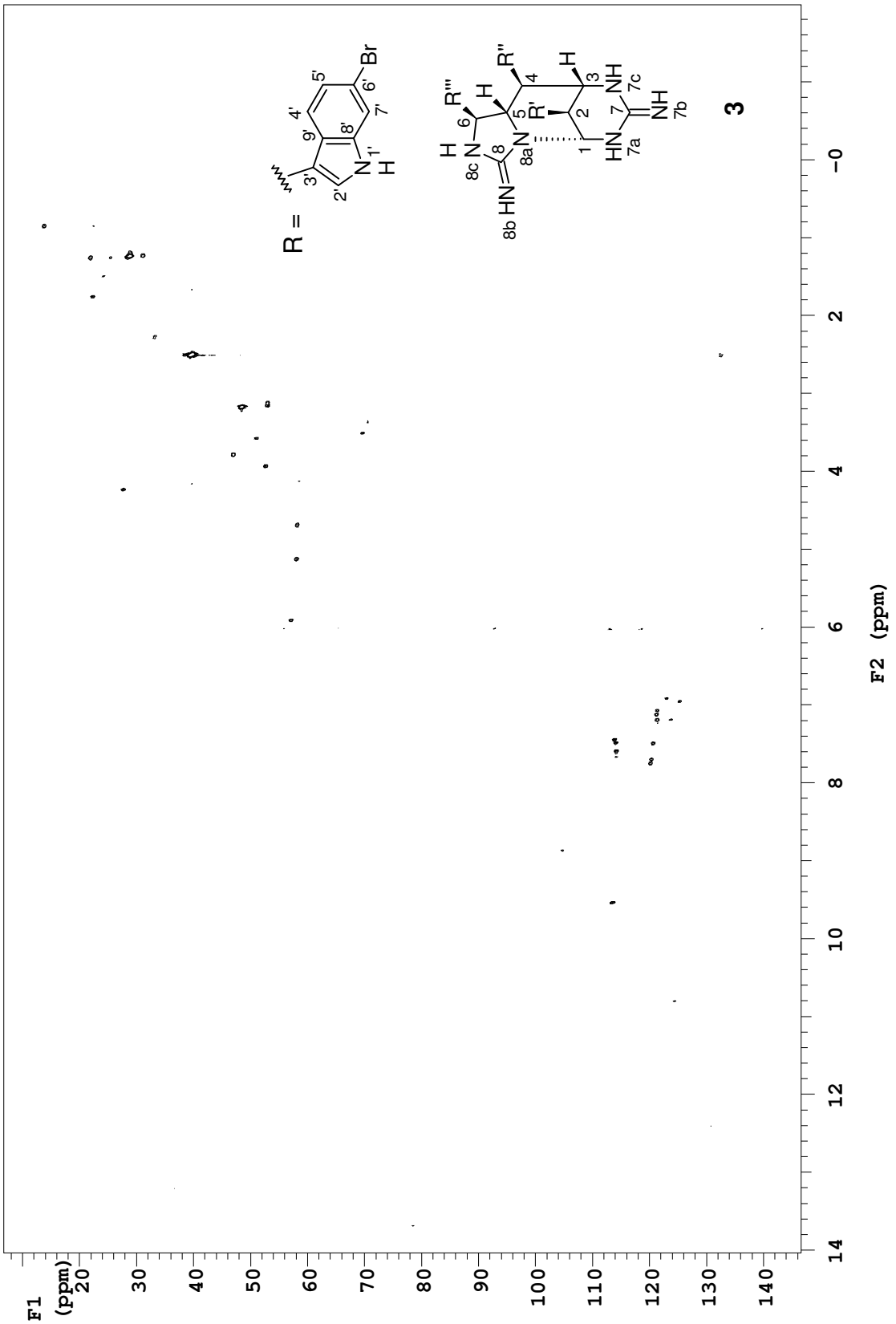

FIGURE S34. [^{13}C, ^{1}H] HSQC spectrum of araiosamine C (**3**) in DMSO-d_6.

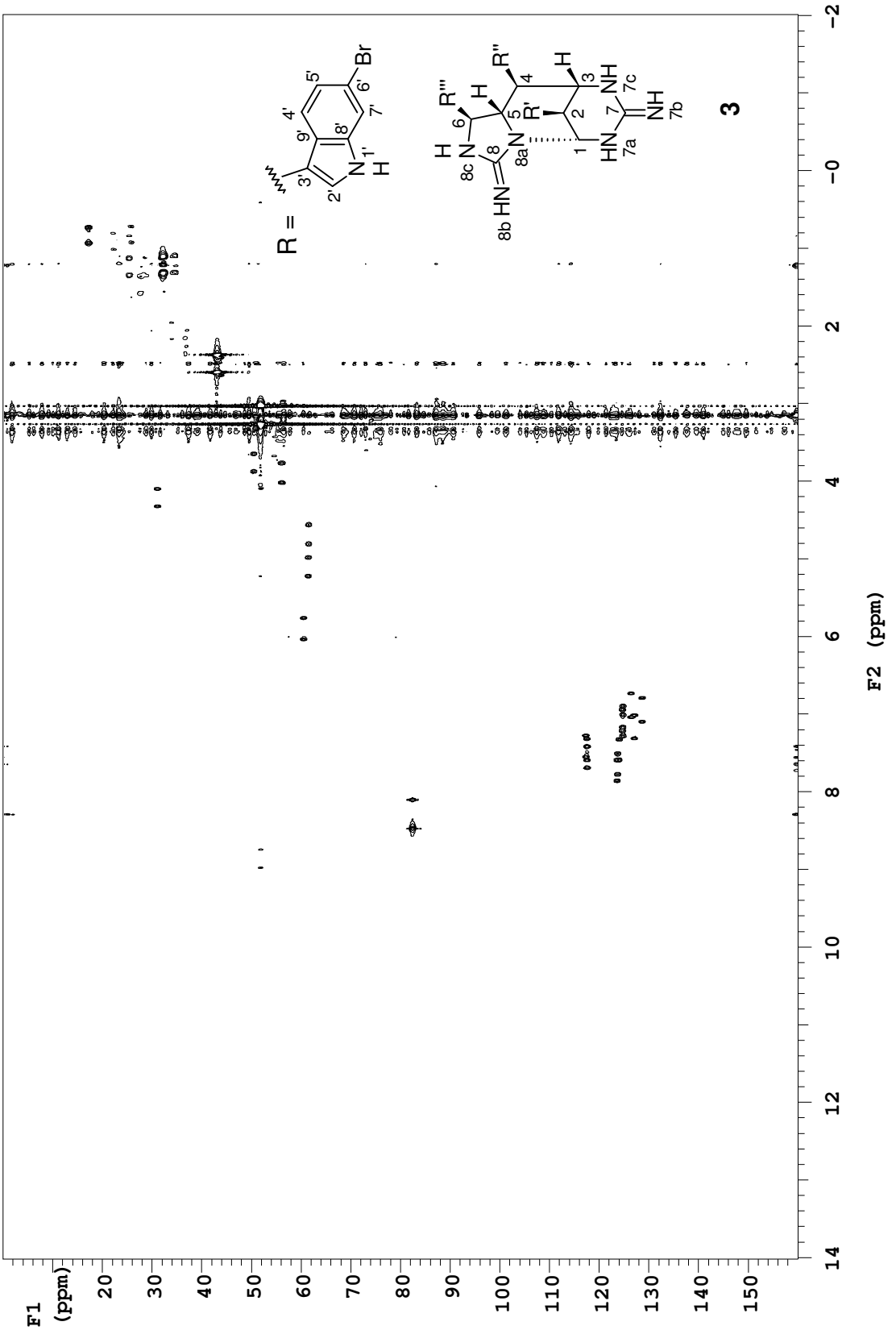

FIGURE S35. Coupled [^{13}C, ^{1}H] HSQC spectrum of araiosamine C (**3**) in DMSO-d_6.

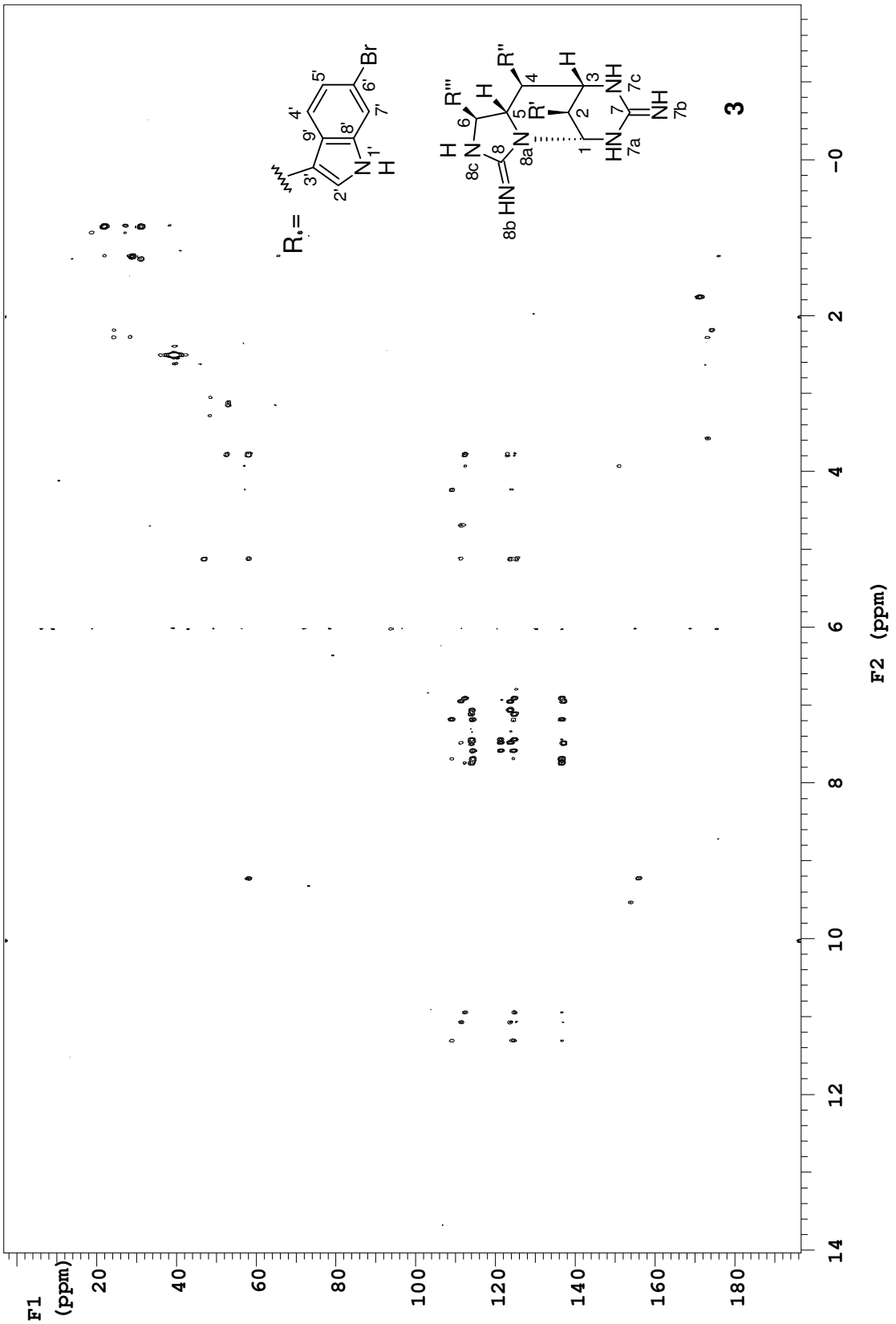

FIGURE S36. [^{13}C, ^{1}H] HMBC spectrum of araiosamine C (**3**) in DMSO-d_6.

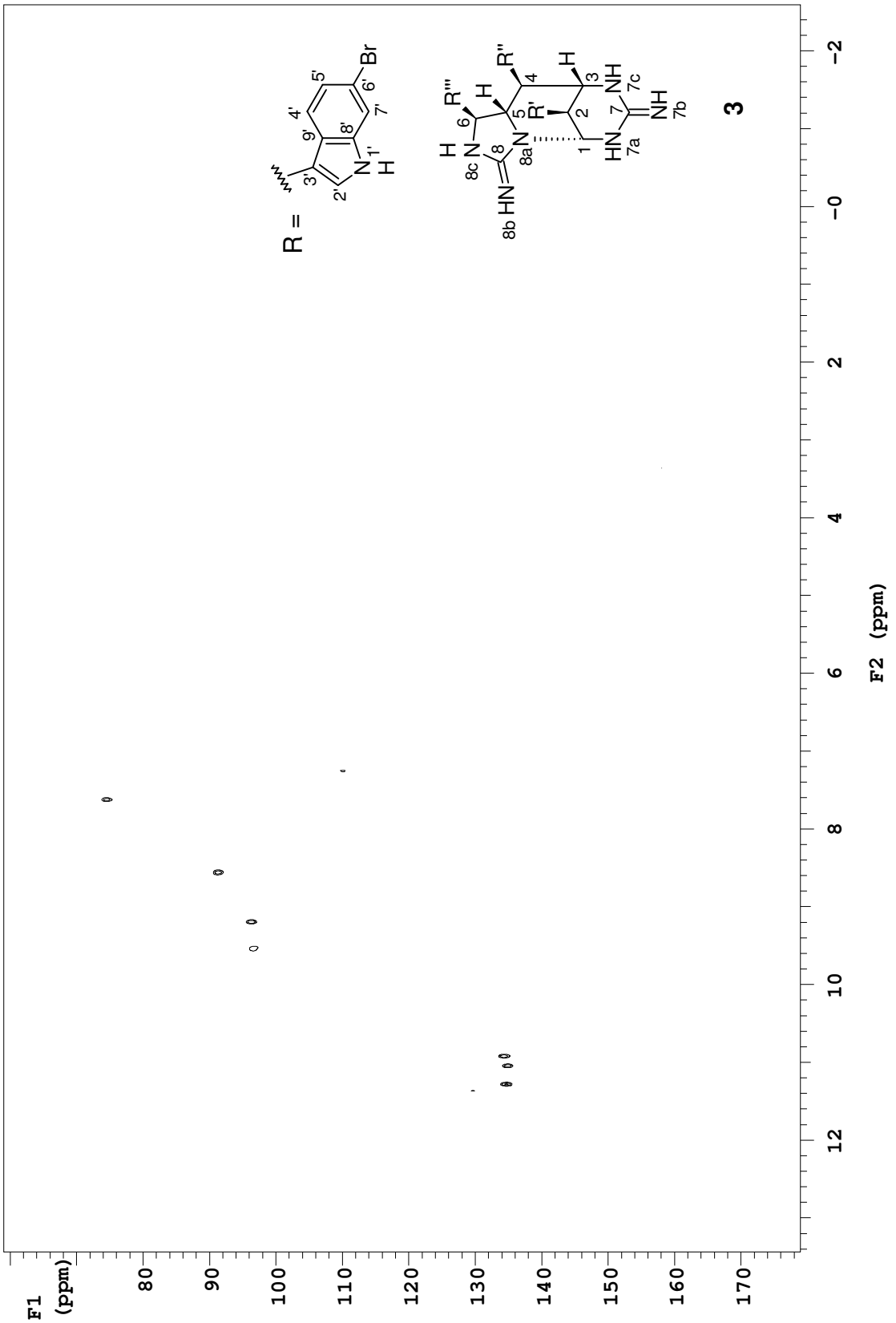

FIGURE S37. [^{15}N, ^{1}H] HSQC spectrum of araiosamine C (**3**) in DMSO-d_6.

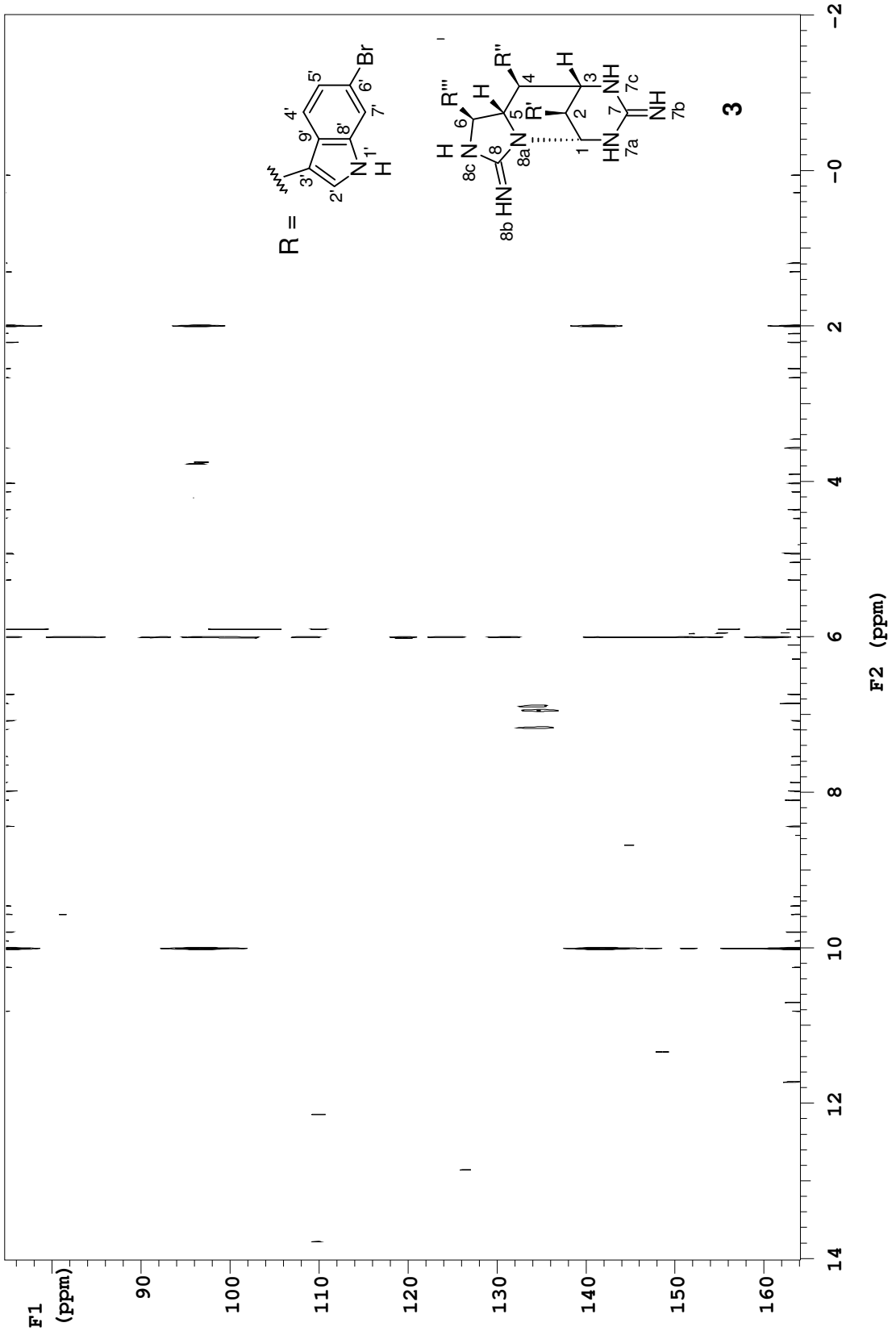

FIGURE S38. [^{15}N, ^{1}H] HMBC spectrum of araiosamine C (**3**) in DMSO-d_6.

Table S6. NMR data for araiosamine C (**3**) in CD_3OD

Posn.	δ_H mult (*J* in Hz)	δ_C	COSY	[^{13}C, ^{1}H] HMBC
1	5.97 d (1.1)	58.8 CH	2, 3	2, 3, 7
2	4.29 d (1.1)	30.0 CH	1, 3, 2’	1, 2’, 3’
3	4.10 d (10.5)	54.8 CH	1, 2, 4	1, 2, 4, 7, 3’, 3”
4	3.83 d (10.5)	48.9 CH	3, 5	3, 5, 2”, 3”
5	4.76 dd (10.5, 9.6)	60.3 CH	4, 6	3”’
6	5.11 d (9.6)	60.6 CH	5	4, 5, 2”’, 3”’
7		153.0 C		
8		-		
2’	7.23 s	124.3 CH	2	3’, 8’, 9’
3’		109.7 C		
4’	7.47 d (8.4)	120.3 CH	5’	3’, 6’, 8’, 9’
5’	7.11 d (8.4)	123.3 CH	4’, 7’	7’, 9’
6’		116.3 C		
7’	7.52 s	115.3 CH	5’	5’, 6’, 9’
8’		138.3 C		
9’		125.6 C		
2”	6.86 s	123.7 CH		3”, 8”, 9”
3”		113.2 C		
4”	7.62 d (8.5)	120.1 CH	5”	3”, 6”, 8”, 9”
5”	7.15 d (8.5)	123.2 CH	4”, 7”	6”, 7”, 9”
6”		116.1 C		
7”	7.42 s	115.2 CH	5”	5”, 6”, 9”
8”		138.3 C		
9”		125.9 C		
2”’	6.85 s	125.6 CH		6, 3”’, 8”’, 9”’
3”’		112.2 C		
4”’	7.37 d (8.5)	120.9 CH	5”’	3”’, 6”’, 8”’, 9”’
5”’	7.02 d (8.5)	123.1 CH	4”’, 7”’	7”’, 9”’
6”’		115.9 C		
7”’	7.40 s	115.1 CH	5”’	5”’, 6”’, 9”’
8”’		138.8 C		
9”’		124.8 C		

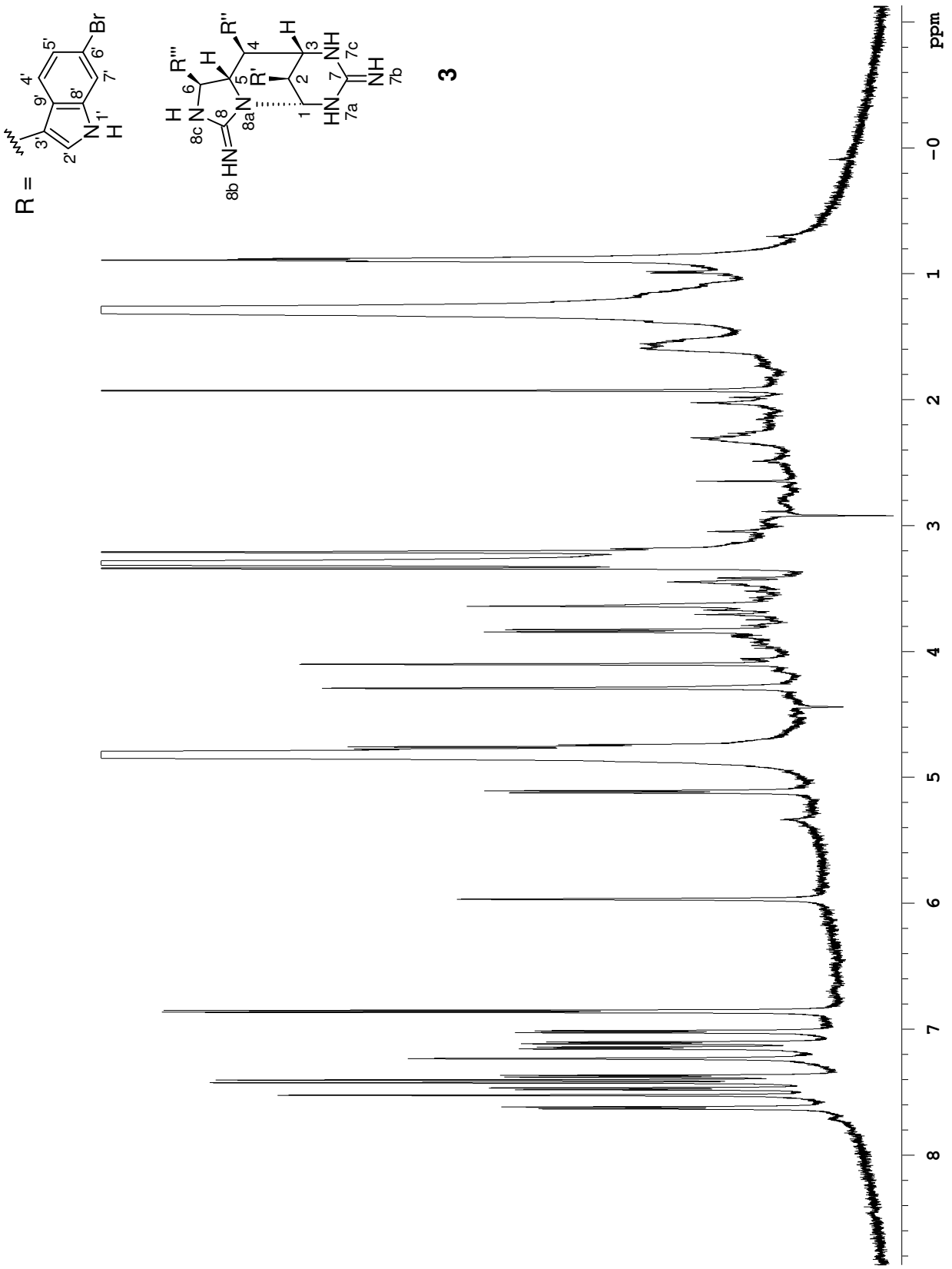

FIGURE S39. ^{1}H NMR spectrum of araiosamine C (**3**) in CD_3OD.

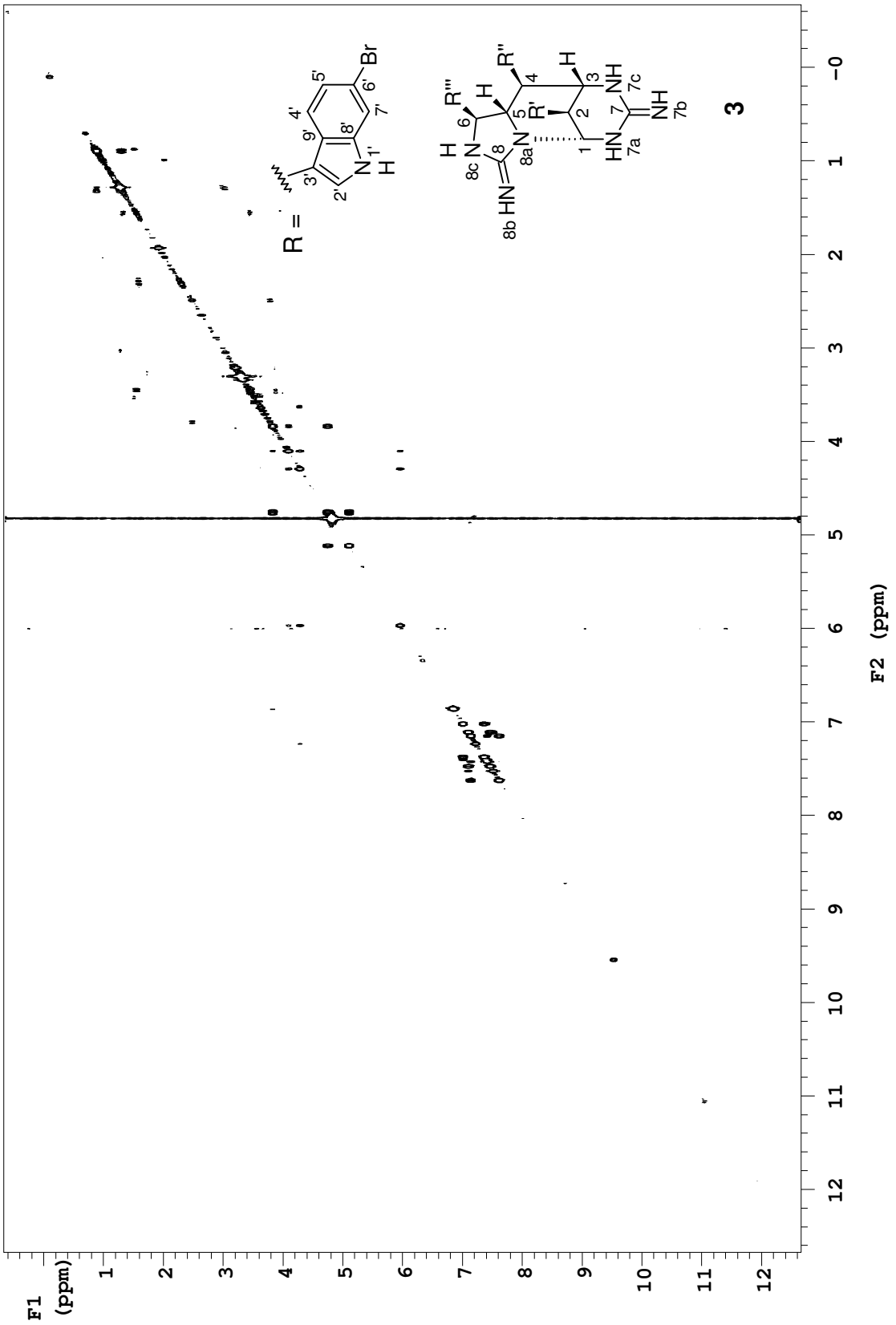

FIGURE S40. COSY spectrum of araiosamine C (**3**) in CD_3OD.

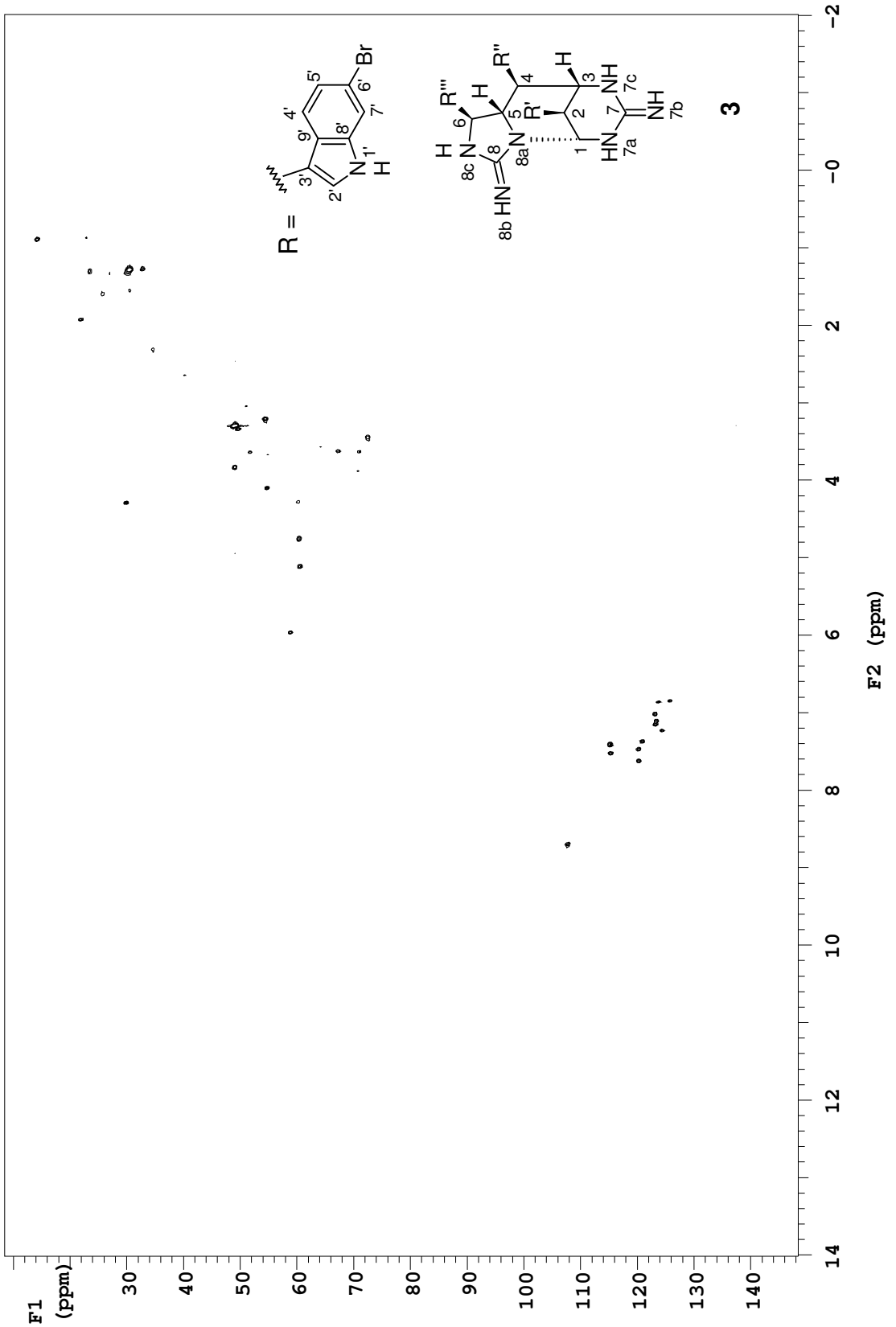

FIGURE S41. [^{13}C, ^{1}H] HSQC spectrum of araiosamine C (**3**) in CD_3OD.

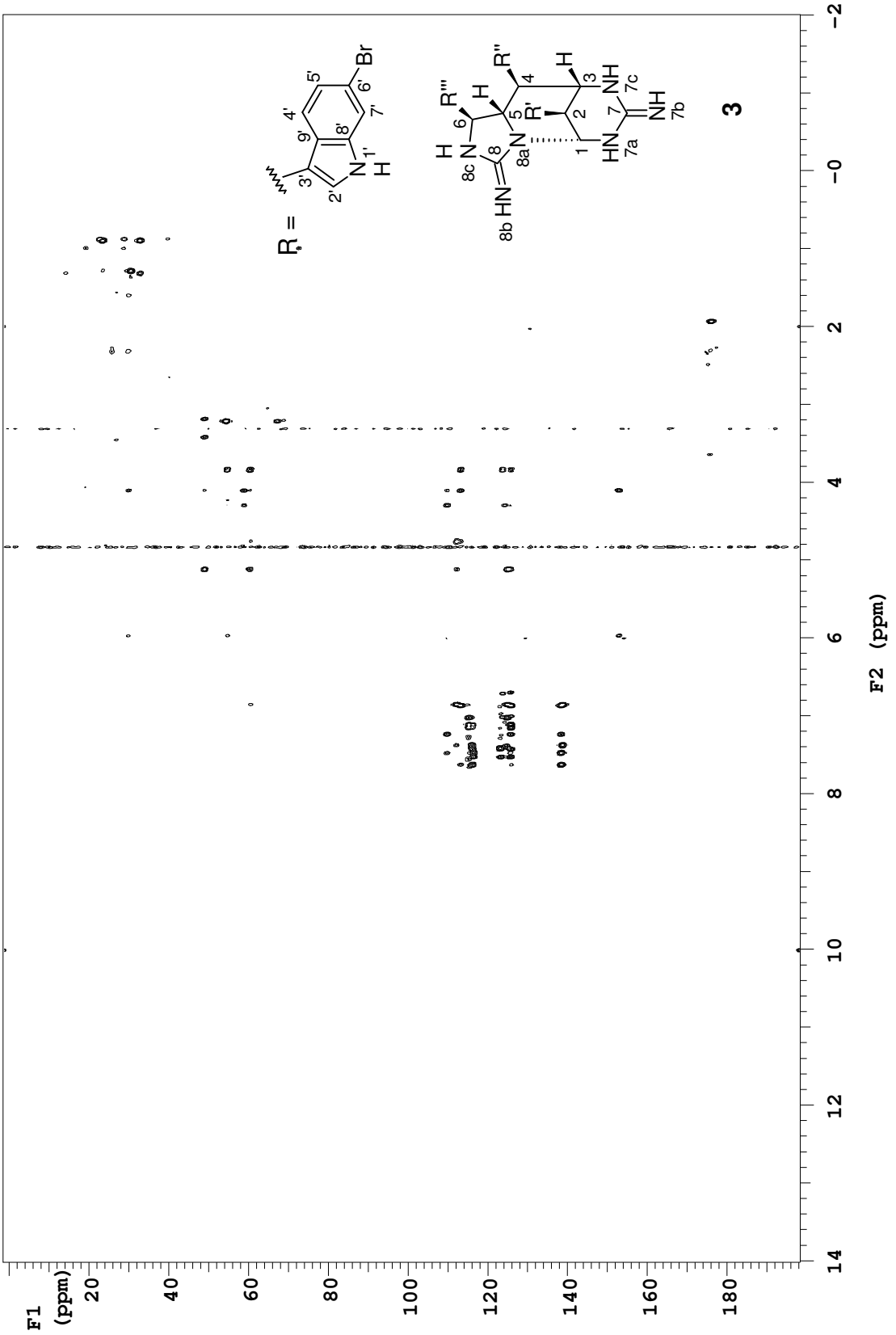

FIGURE S42. [^{13}C, ^{1}H] HMBC spectrum of araiosamine C (**3**) in CD_3OD.

Table S7. NMR data for araiosamine C (**3**) in CD_3OH (0.05% TFA)

Posn.	δ_H mult (*J* in Hz)	δ_C	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC	[^{15}N, ^{1}H] HMBC
1	5.95 s	58.8 CH		2, 7a	2, 3, 7a, 7c	2', 4'		
2	4.27 s	29.8 CH		1, 3, 2'	1, 3, 7a, 7c, 2'	4'	1, 3', 9'	7a
3	4.08 s	54.7 CH		2, 4, 7c	1, 2, 4, 7a, 7c	7c, 2', 4'	1, 2, 7, 3'	
4	3.82 d (10.4)	48.9 CH		3, 5	3, 5, 6	4"	2, 3, 5, 6, 3", 9"	7c
5	4.75 dd (10.4, 8.2)	60.3 CH		4	4, 6	2"', 4"'	6, 3", 3"'	
6	5.10 d (8.2)	60.4 CH			4, 5		4, 2"'	
7		152.9 C						
7a	8.97 s		90.8	1, 7c	1, 2, 3, 7c	1		
7b	7.44 br s		69.5					
7c	9.31 s		95.3	3, 7a	1, 2, 3, 7a	3		
8		157.6 C						
8a			107.2					
8b	8.44 s		69.2					
8c	8.80 s		94.9	6	4, 6		5, 8	8a
1'	10.83 s		130.5	2'	2'	2', 7'	9'	
2'	7.22 s	124.3 CH		2, 1'	2, 1'	1, 3, 1'	3', 8', 9'	1'
3'		109.7 C						
4'	7.46 d (8.3)	120.1 CH		5'	5'	1, 2, 3	3', 6', 8', 9'	
5'	7.09 d (8.3)	123.1 CH		4'	4', 7'		6', 7', 9'	
6'		116.1 C						
7'	7.51 s	115.2 CH				1'	4', 5', 6', 9'	
8'		138.3 C						
9'		125.5 C						
1"	10.48 s		130.2	2"	2"	7"	2", 3", 8", 9"	

Continued on next page

Table S7 – continued from previous page

Posn.	δ_H mult (*J* in Hz)	δ_C	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC	[^{15}N, ^{1}H] HMBC
2”	6.85 s	123.9 CH		4, 1”	1”	1”	3”, 8”, 9”	1”
3”		113.0 C						
4”	7.62 d (8.1)	120.1 CH		5”	5”, 7”	4, 5”	3”, 6”, 8”, 9”	
5”	7.14 d (8.1)	123.0 CH		4”, 7”	4”, 7”		6”, 7”, 9”	
6”		116.0 C						
7”	7.42 s	115.1 CH		5”	4”, 5”	1, 1”	4”, 5”, 6”, 8”, 9”	
8”		138.5 C						
9”		125.6 C						
1”’	10.55 s		130.6	2”’	2”’	7”’	2”’, 3”’, 8”’, 9”’	
2”’	6.84 s	125.9 CH		1”’	1”’	5	3”’, 8”’, 9”’	1”’
3”’		112.2 C						
4”’	7.36 d (8.3)	120.8 CH		5”’	5”’		3”’, 6”’, 8”’, 9”’	
5”’	7.01 d (8.3)	123.0 CH		4”’, 7”’	4”’, 7”’		6”’, 7”’, 9”’	
6”’		115.8 C						
7”’	7.39 s	115.1 CH		5”’	5”’	1”’	4”’, 5”’, 6”’, 8”’, 9”’	
8”’		138.7 C						
9”’		124.8 C						

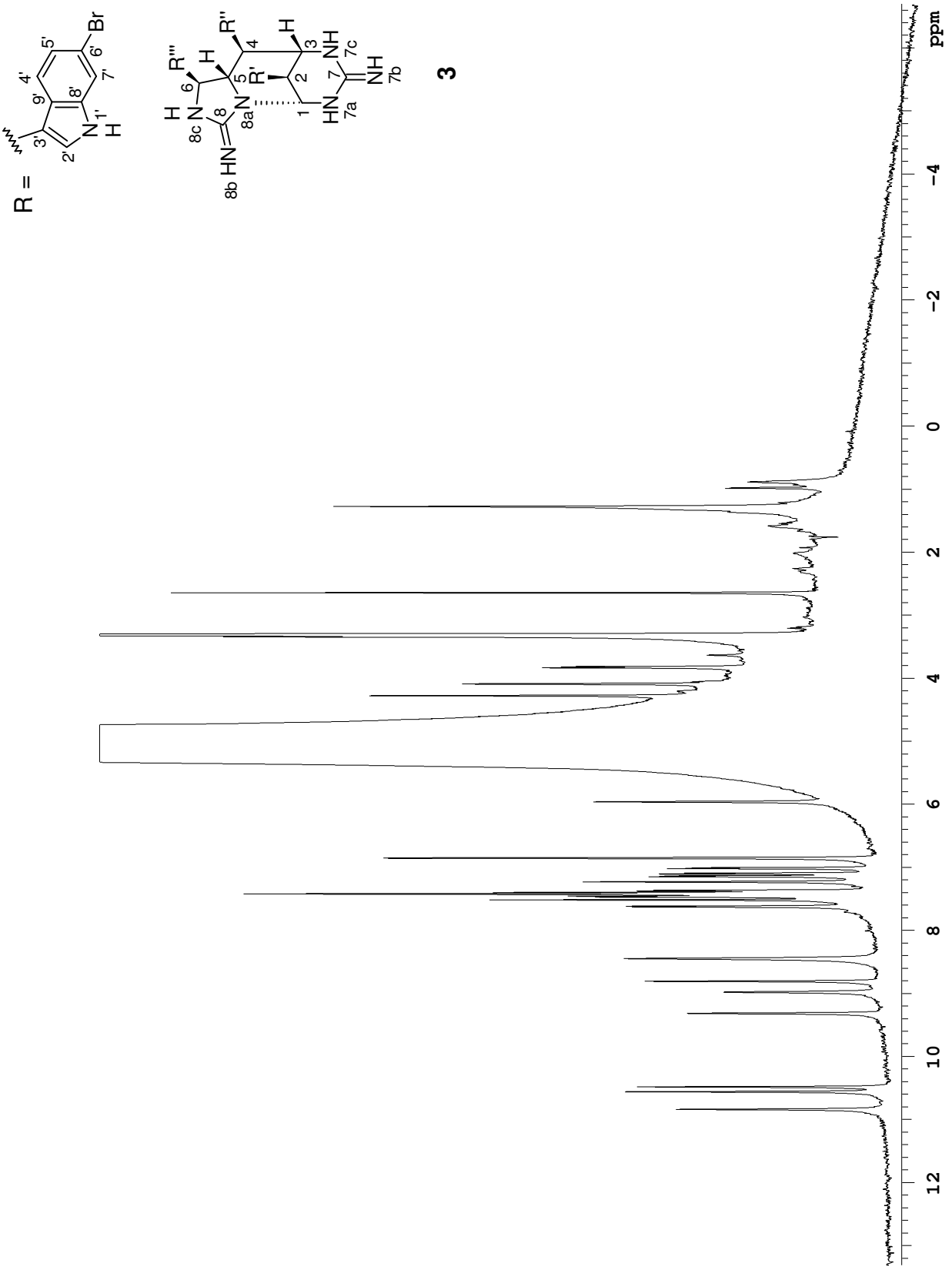

FIGURE S43. ^{1}H NMR spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

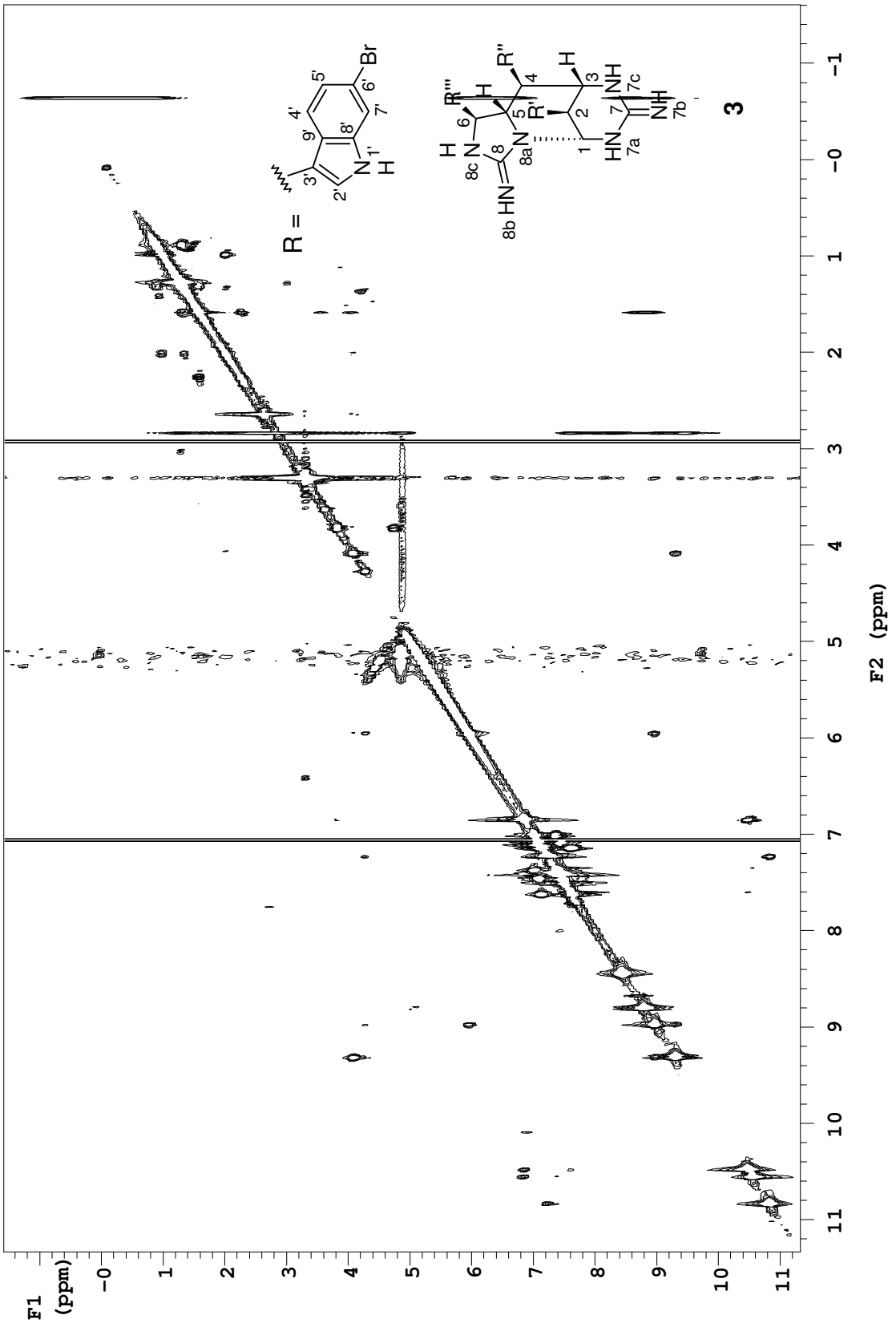

FIGURE S44. COSY spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

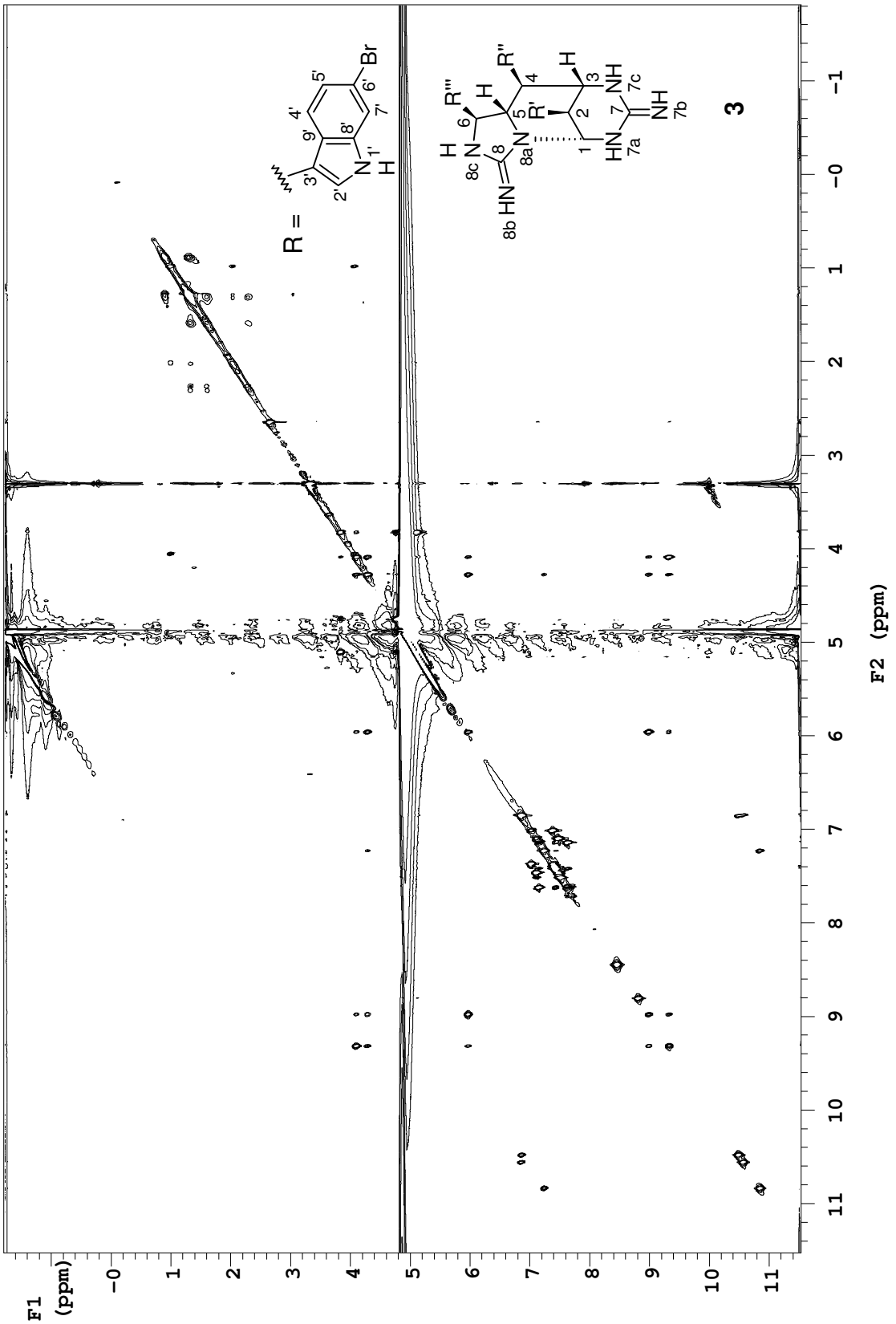

FIGURE S45. TOCSY spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

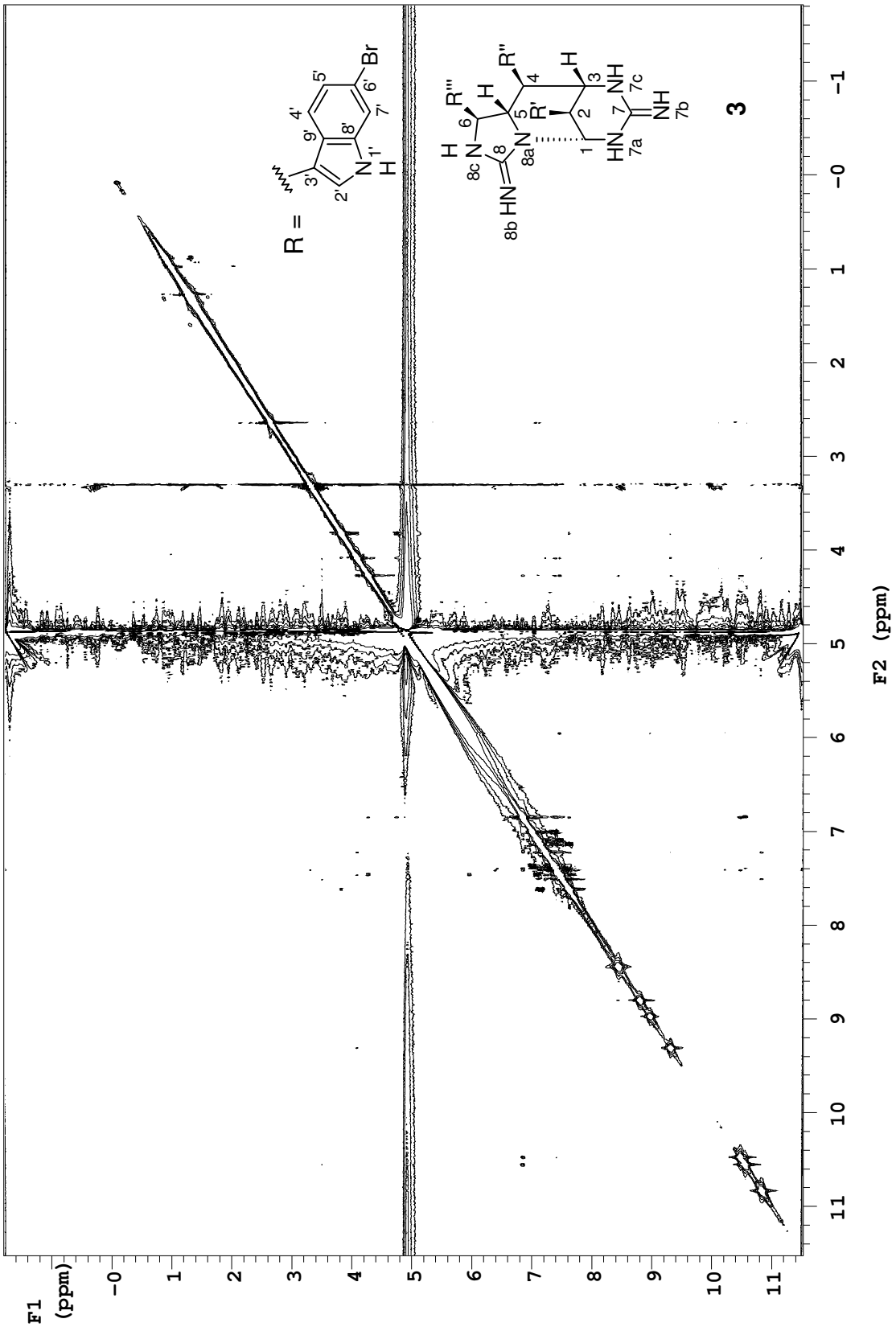

FIGURE S46. NOESY spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

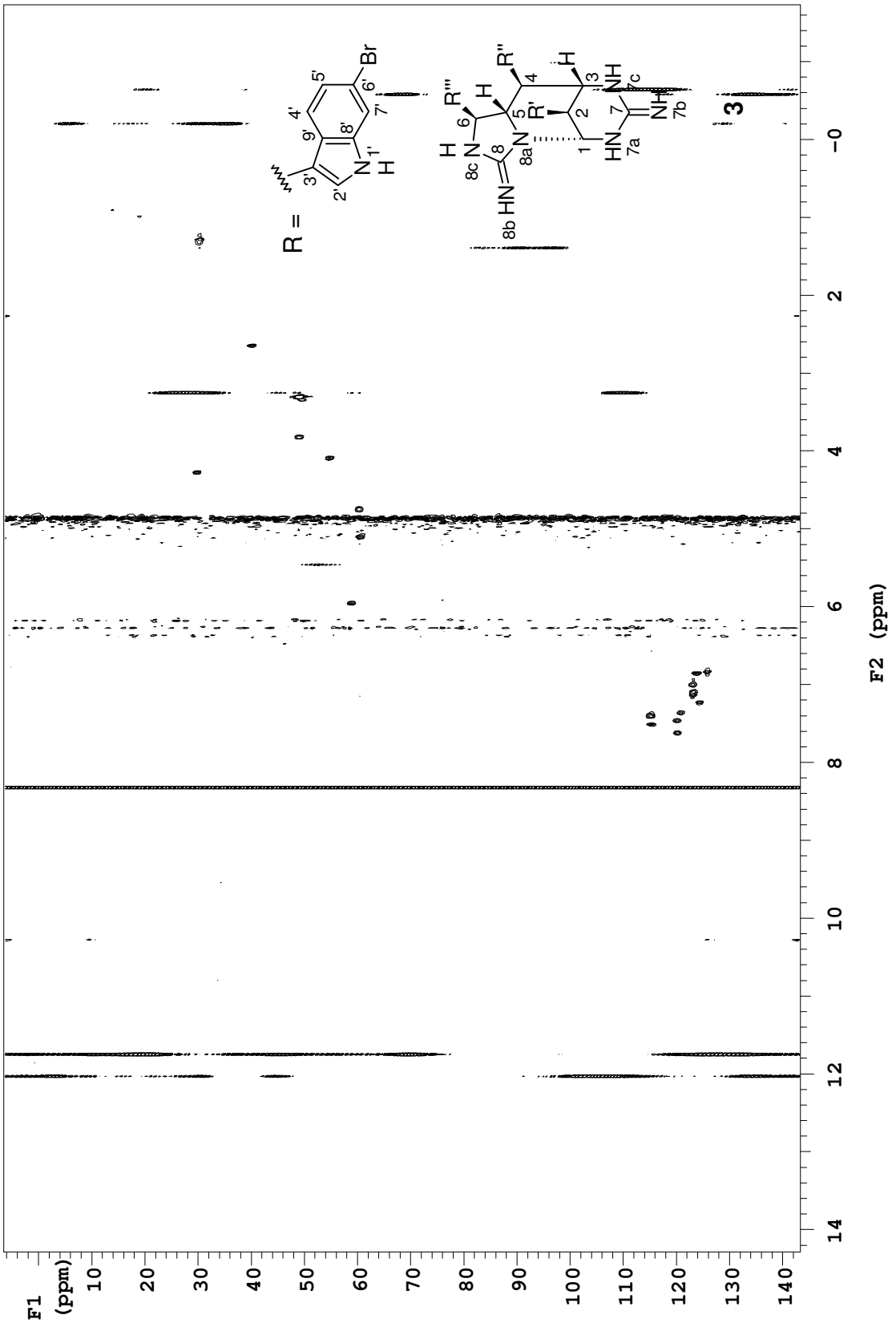

FIGURE S47. [^{13}C, ^{1}H] HSQC spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

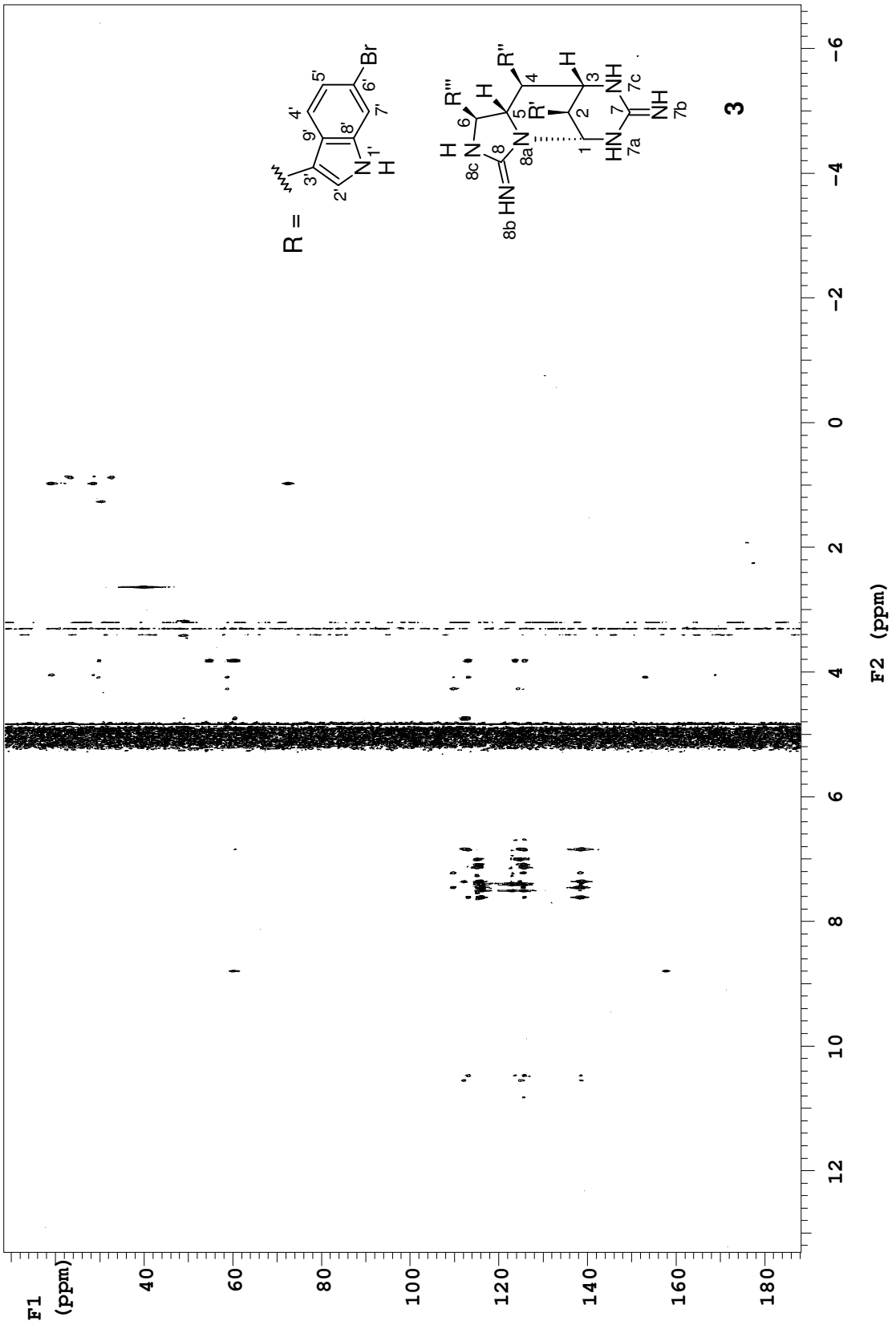

FIGURE S48. [^{13}C, ^{1}H] HMBC spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

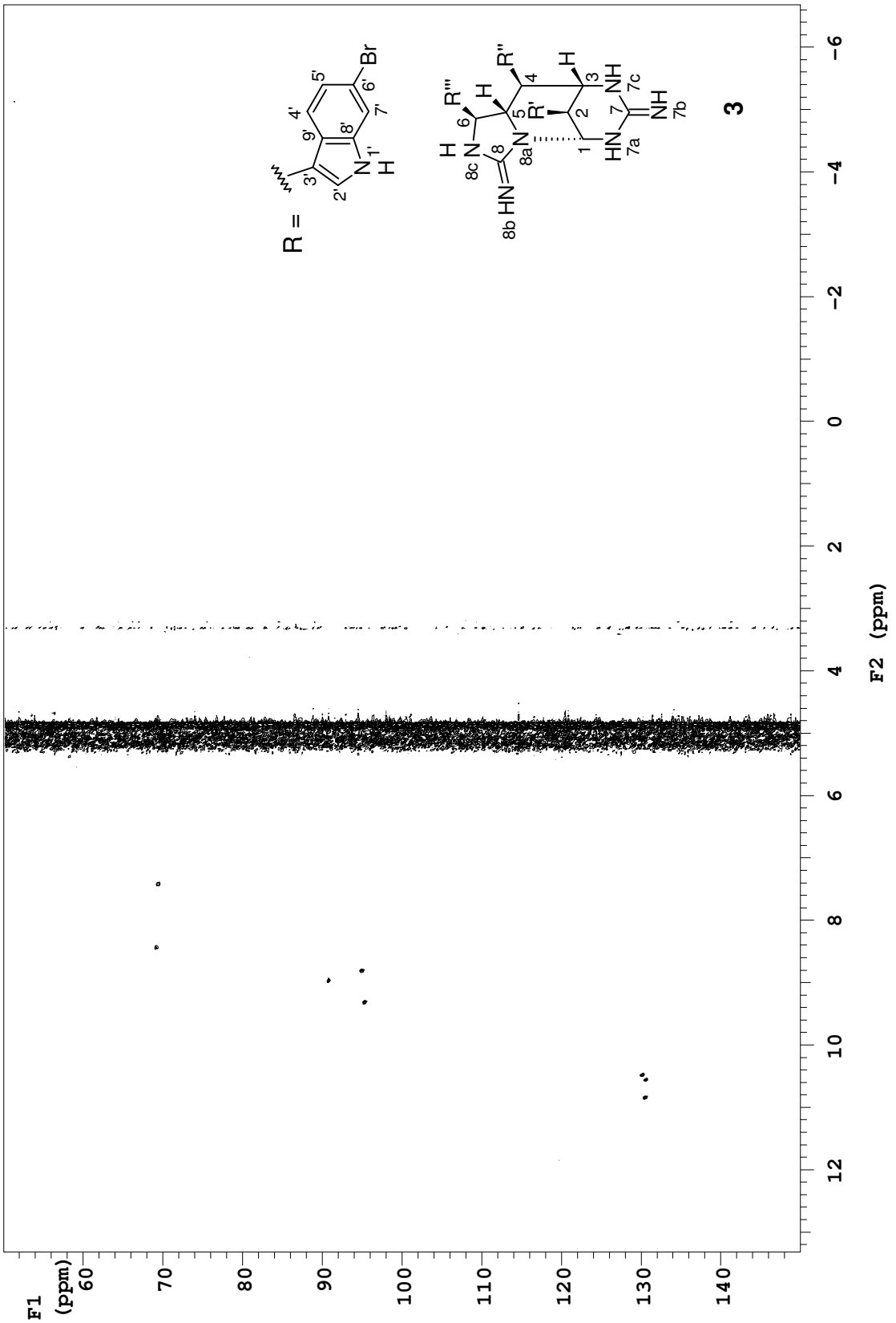

FIGURE S49. [^{15}N, ^{1}H] HSQC spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

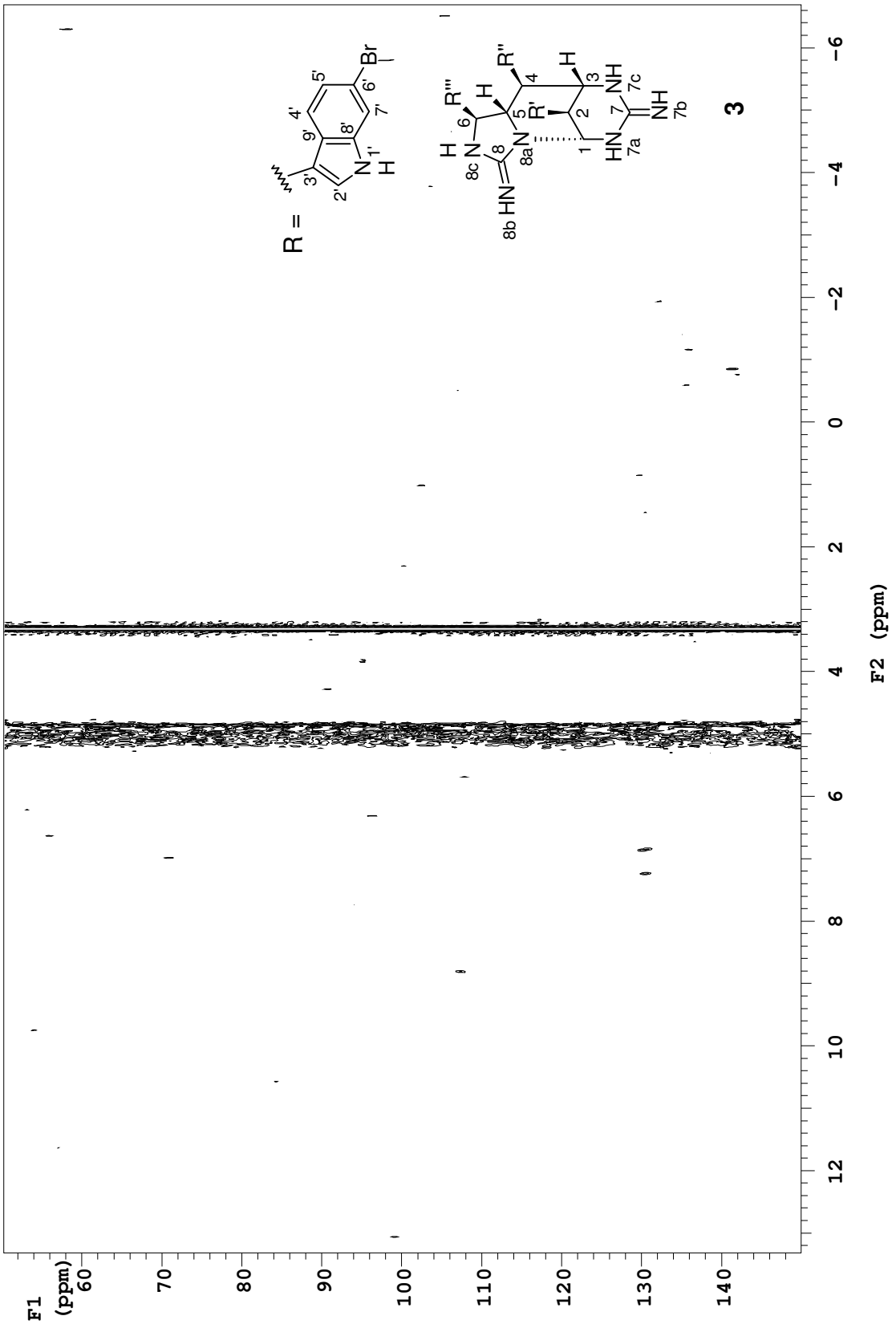

FIGURE S50. [^{15}N, ^{1}H] HMBC spectrum of araiosamine C (**3**) in CD_3OH (0.05% TFA).

NMR data for araiosamine D (4)

Table S8. NMR data for araiosamine D (**4**) in DMSO-d_6

Posn.	δ_H mult (*J* in Hz)	δ_C	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
1	4.87 s	44.1 CH	2, 7a	2, 3, 7a, 7c	2, 7a, 4', 1"	
2	3.77 s	32.2 CH	1, 3, 2'	1, 3, 7a, 7c, 2'	1, 3, 4'	2', 3'
3	4.67 s	49.4 CH	2, 4, 7c	1, 2, 4, 5, 6, 7c	2, 4, 5(w), 6, 7c, 2'	
4	3.71 s	43.1 CH	3, 5	3, 5, 6, 7c	3, 5, 6, 4"	
5	5.06 d (7.7)	62.5 CH	4, 6, 8a	3, 4, 6, 8a, 8c	3(w), 4, 7c(w), 8a, 4"	3"'
6	5.26 d (7.7)	53.6 CH	5, 8c	3, 4, 5, 8a, 8c	3, 4, 8c, 2"'	4, 9"'
7		-				
7a	9.02 s		1, 7c	1, 2, 3, 7c	1, 7b	
7b	7.11 br s				7a, 7c	
7c	8.06 s		3, 7a	1, 3, 4, 7a	3, 5, 6, 7b, 2'	
8		158.1 C				
8a	8.23 s		5, 8c	5, 6, 8c	5, 8b, 4"	6
8b	7.68 s				8a, 8c	
8c	8.77 s		6, 8a	5, 6, 8a	6, 8b	5, 8
1'	11.36 s		2'	2'	2', 7'	3', 8', 9'
2'	7.32 s	123.2 CH	2, 1'	2, 1'	3, 7c, 1'	3', 8', 9'
3'		112.0 C				
4'	7.64 m	120.1 CH	5'	5'	5'	8'
5'	7.15 d (8.5)	121.2 CH	4', 7'	4', 7'	4'	7', 9'
6'		114.1 C				
7'	7.61 s	113.7 CH	5'	5'	1'	5', 6', 9'
8'		136.6 C				
9'		125.1 C				
1"	11.69 s				1, 7"	3", 9"
2"		-				
3"		104.4 C				

Continued on next page

Table S8 – continued from previous page

Posn.	δ_H mult (*J* in Hz)	δ_C	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
4”	7.38 d (8.5)	120.7 CH	5”	5”, 7”	4, 5, 8a, 5”	6”, 8”
5”	7.12 m	121.7 CH	4”, 7”	4”, 7”	4”	7”, 9”
6”		114.0 C				
7”	7.68 s	114.3 CH	5”	4”, 5”	1”	5”, 6”, 9”
8”		137.2 C				
9”		124.3 C				
1”’	11.41 s		2”’	2”’	2”’, 7”’	3”’, 9”’
2”’	7.55 s	119.6 CH	1”’	1”’	6, 1”’	3”’, 8”’, 9”’
3”’		112.3 C				
4”’	7.57 d (8.4)	119.6 CH	5”’	5”’, 7”’	5”’	6”’, 8”’
5”’	7.24 d (8.4)	121.7 CH	4”’, 7”’	4”’, 7”’	4”’	6”’, 9”’
6”’		114.1 C				
7”’	7.65 s	114.4 CH	5”’	4”’, 5”’	1”’	5”’, 6”’, 9”’
8”’		137.7 C				
9”’		124.0 C				

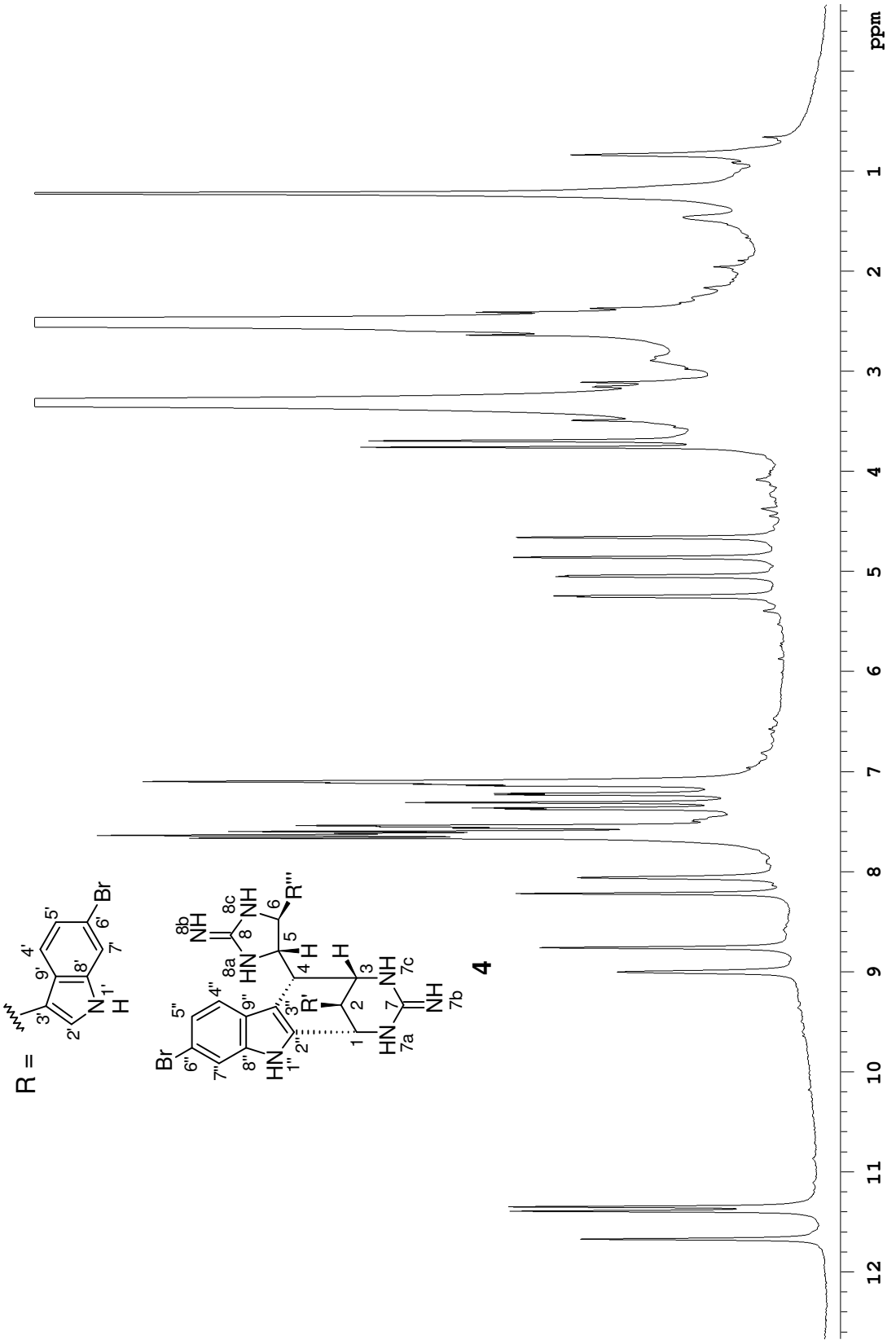

FIGURE S51. ^{1}H NMR spectrum of araiosamine D (**4**) in DMSO-d_6.

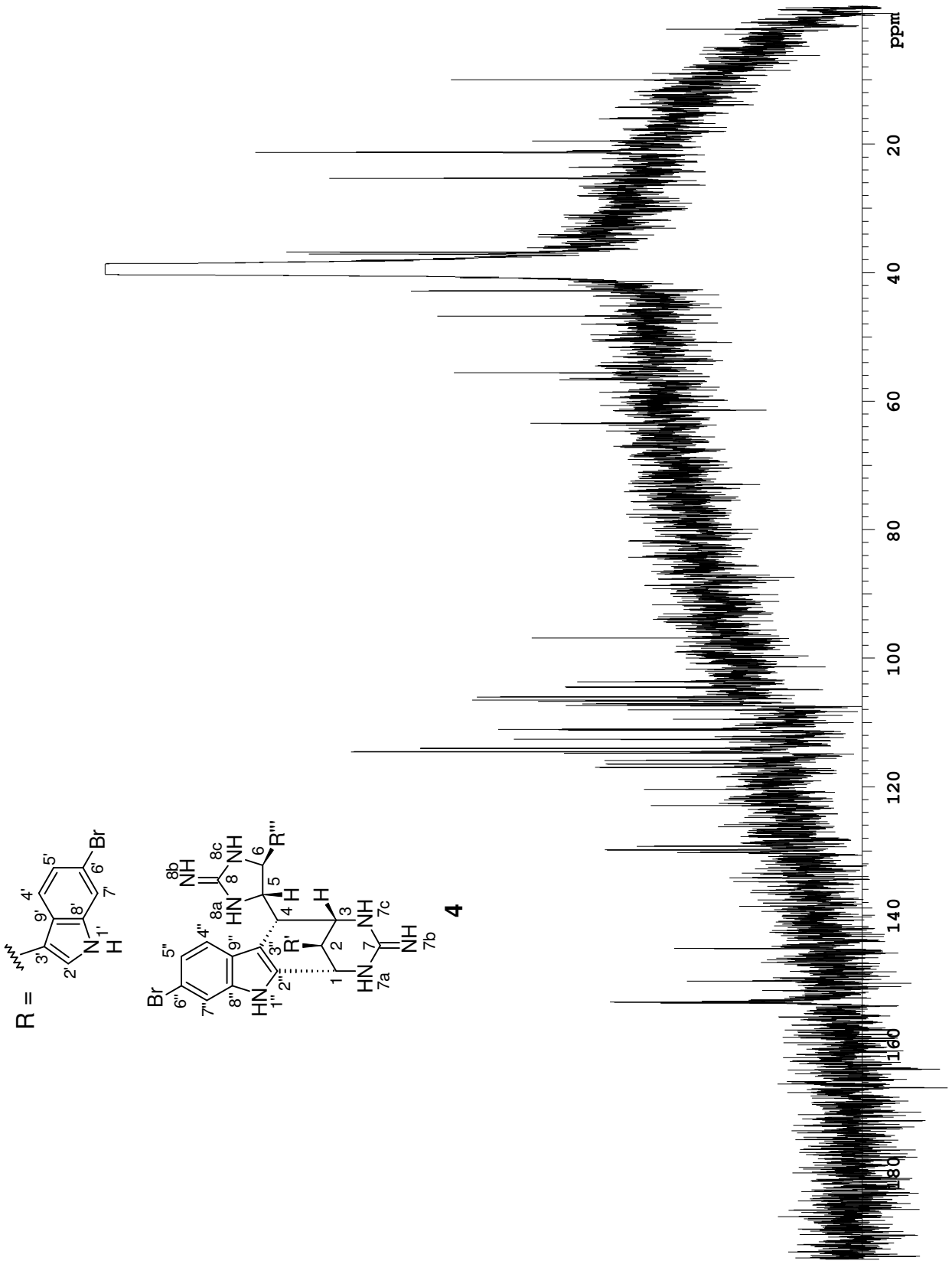

FIGURE S52. ^{13}C NMR spectrum of araiosamine D (**4**) in DMSO-d_6 at 800 MHz.

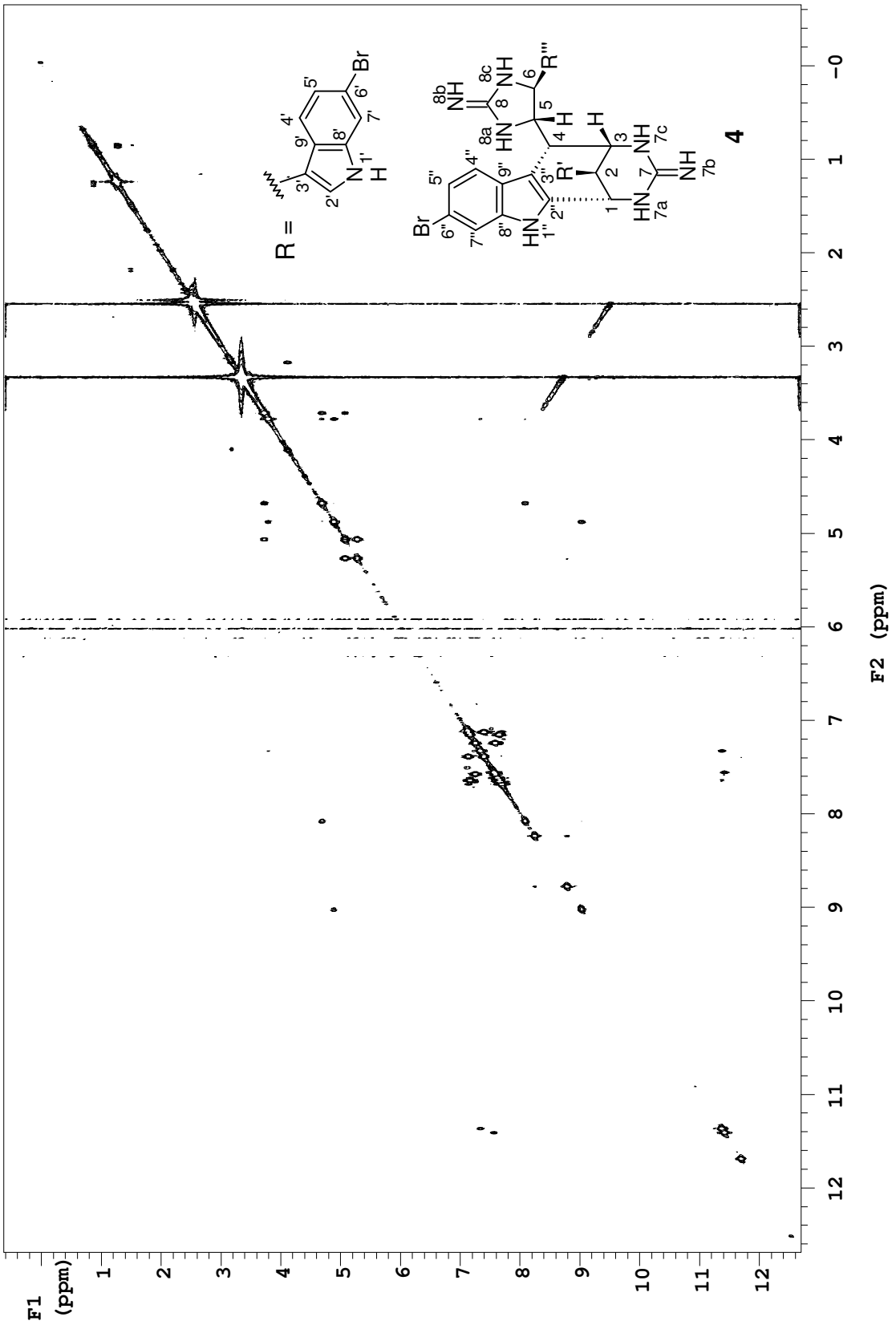

FIGURE S53. COSY spectrum of araiosamine D (**4**) in DMSO-d_6.

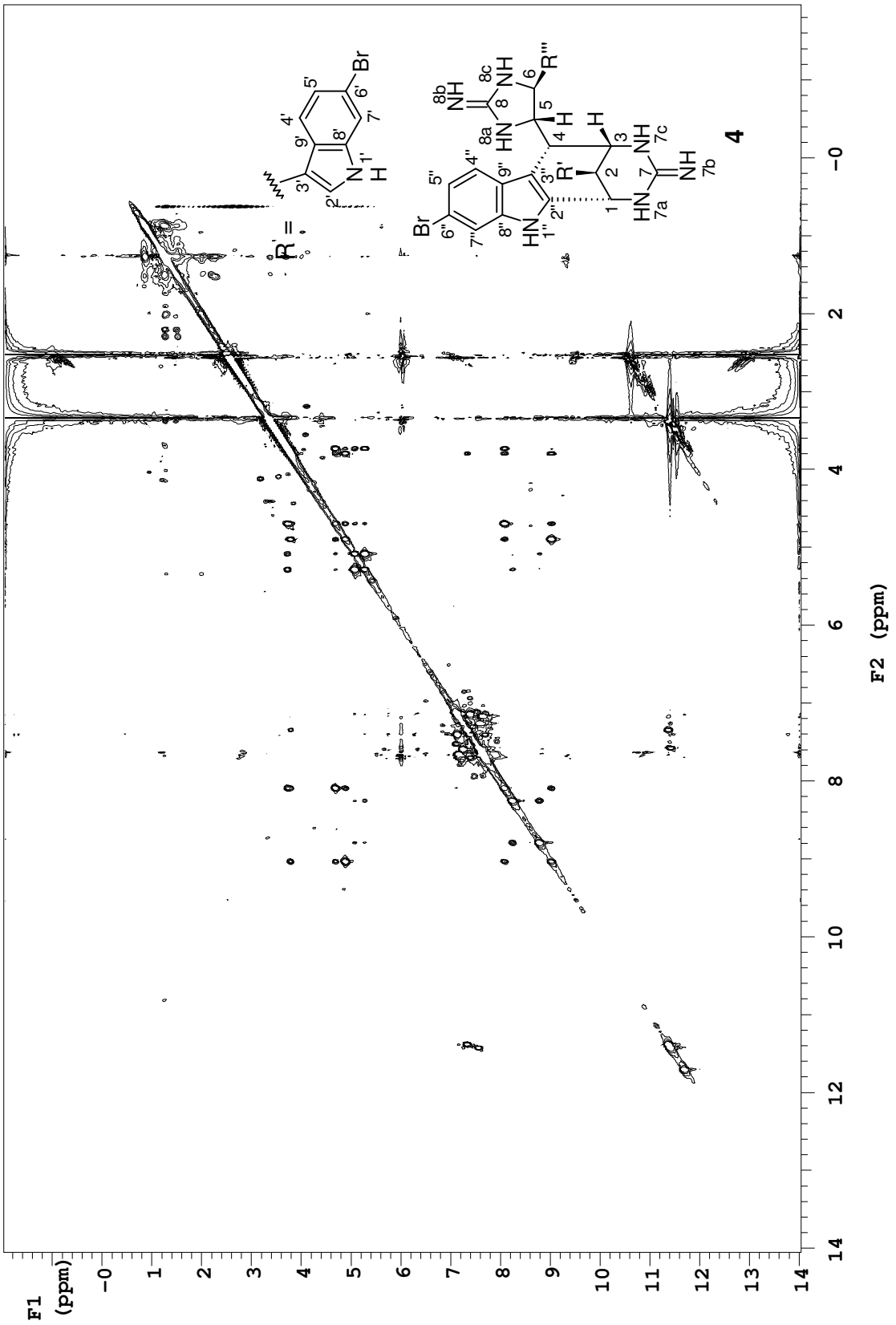

FIGURE S54. TOCSY spectrum of araiosamine D (**4**) in DMSO-d_6.

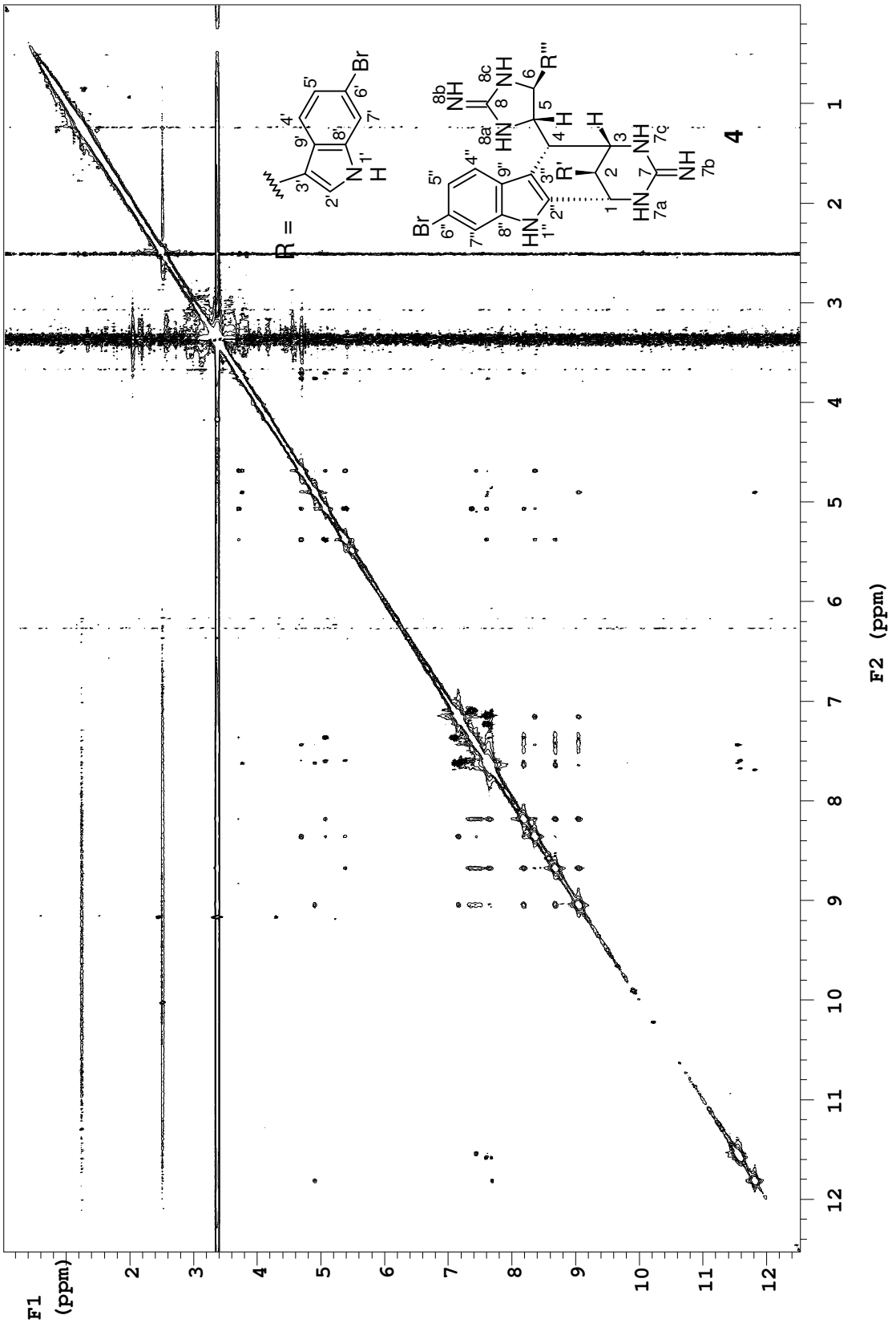

FIGURE S55. NOESY spectrum with 80 ms mixing time of araiosamine D (**4**) in DMSO-d_6.

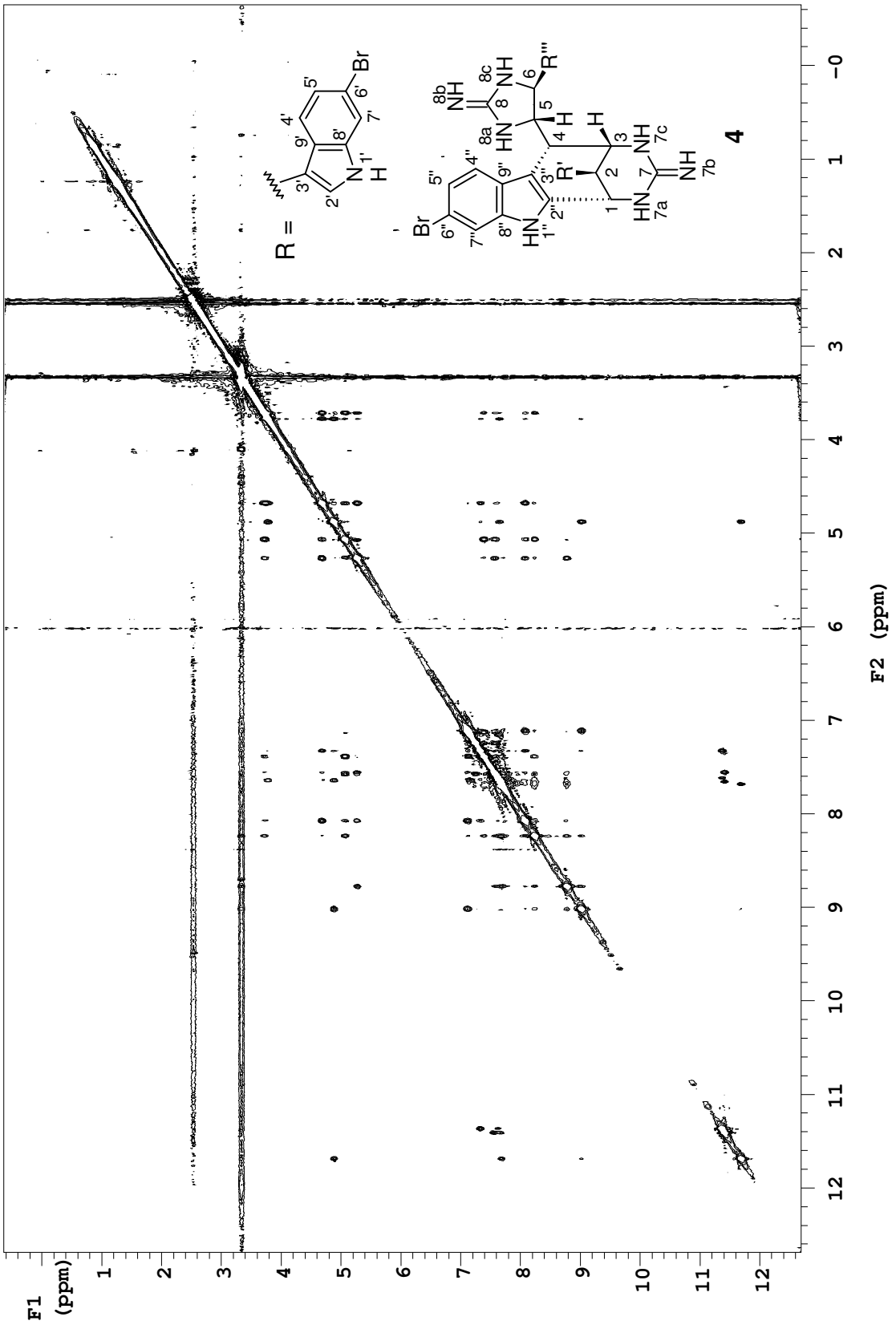

FIGURE S56. NOESY spectrum with 350 ms mixing time of araiosamine D (**4**) in DMSO-d_6.

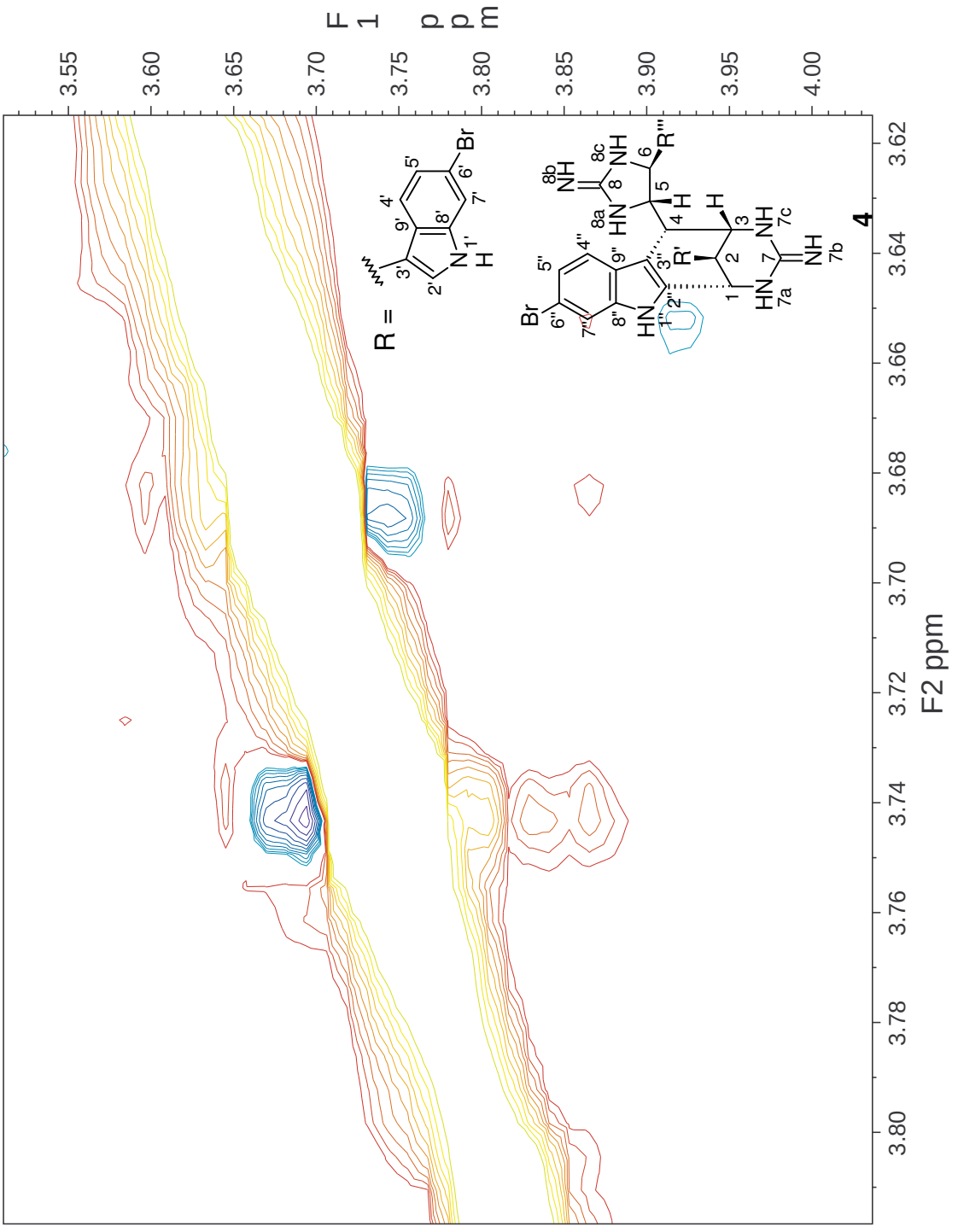

FIGURE S57. ROESY spectrum with 160 ms mixing time of araiosamine D (**4**) in DMSO-d_6. This illustrates the presence of a ROESY correlation between H-6 and H-4 resolved from the spectrum diagonal.

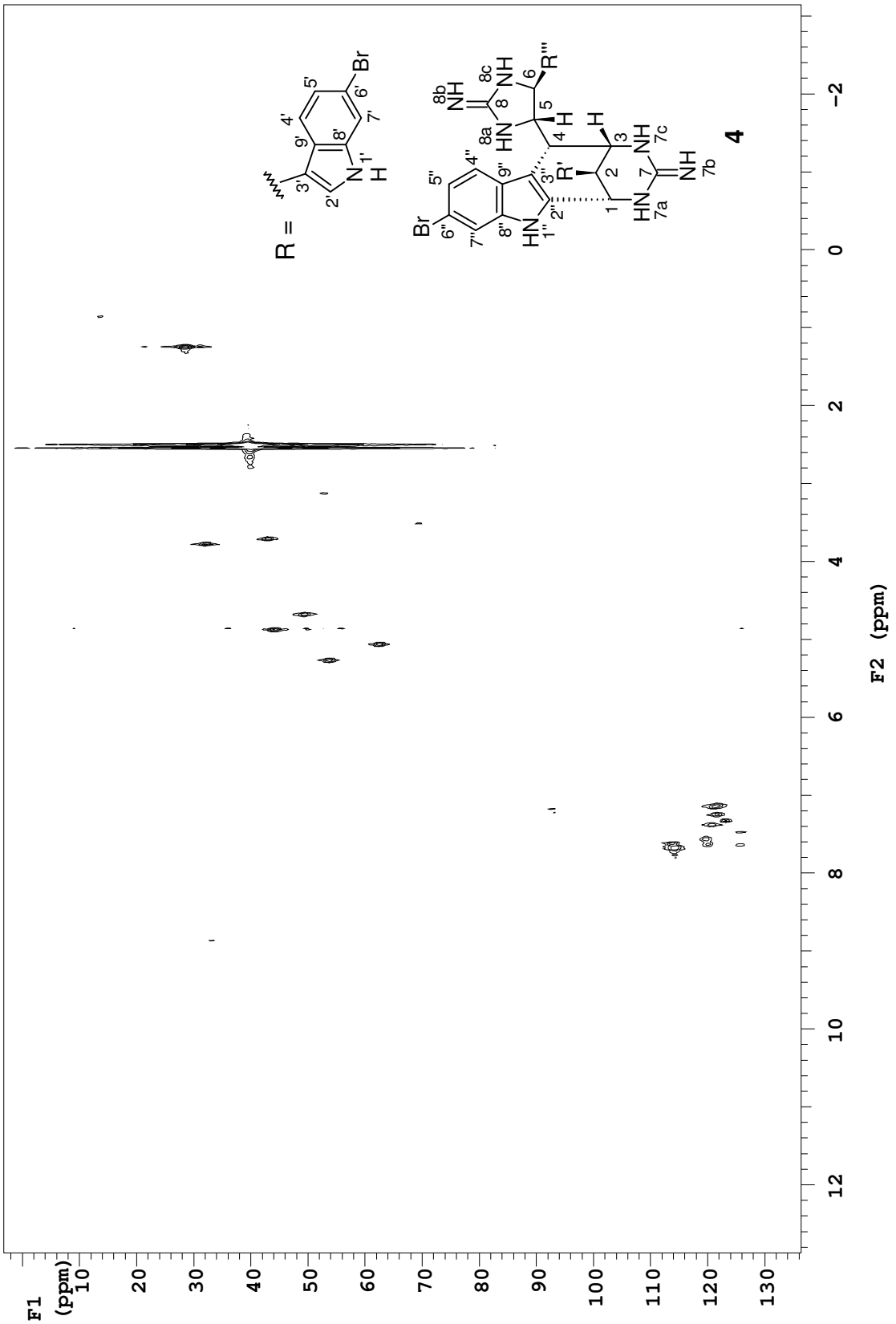

FIGURE S58. [^{13}C, ^{1}H] HSQC spectrum of araiosamine D (**4**) in DMSO-d_6.

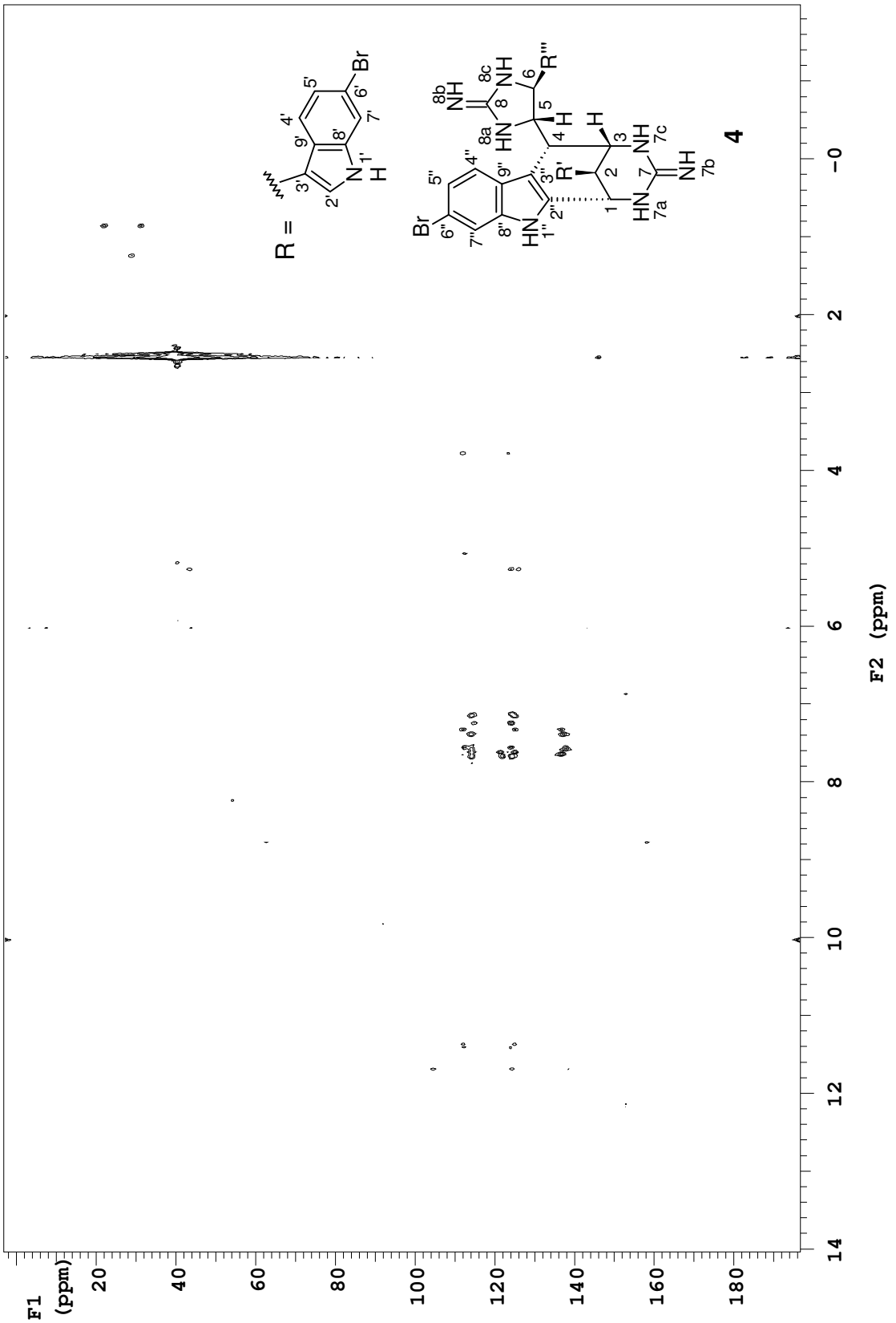

FIGURE S59. [^{13}C, ^{1}H] HMBC spectrum of araiosamine D (**4**) in DMSO-d_6.

Table S9. NMR data for araiosamine D (**4**) in CD_3OD

Posn.	δ_H mult (*J* in Hz)	δ_C ($^1J_{H-C}$ in Hz)	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC
1	4.92 dd (2.3, 1.3)	46.6 CH (148)	2, 3	2, 3, 4	2, 2', 4'	2, 3, 7, 2", 3"
2	3.82 dd (2.3, 1.7)	34.3 CH (135)	1, 3, 2'	1, 3, 2'	1, 3, 4'	3, 2', 3', 9'
3	4.71 d (3.8)	52.3 CH (146)	1, 2, 4	1, 2, 4	2, 4, 5, 6, 2', 4'	
4	3.87 dd (3.8, 2.4)	46.3 CH (129)	3, 5	3, 5, 6	3, 5, 6	
5	5.23 dd (8.2, 2.4)	65.1 CH	4, 6	4, 6	3, 4, 4", 4"'	3, 6, 2", 3", 3"'
6	5.29 d (8.2)	56.3 CH	5	4, 5	3, 4, 2"', 4"'	4, 5, 2"', 3"', 9"'
7		154.7 C				
8		-				
2'	7.29 s	123.7 CH	2	2	1, 3	3', 8', 9'
3'		112.9 C				
4'	7.53 d (8.5)	120.2 CH	5'	5'	1, 2, 3	3', 6', 8', 9'
5'	7.16 d (8.5)	123.0 CH	4', 7'	4', 7'		7', 9'
6'		116.3 C				
7'	7.54 s	115.3 CH	5'	5'		5', 6', 9'
8'		138.7 C				
9'		126.3 C				
2"		139.3 C				
3"		106.3 C				
4"	7.38 d (8.6)	121.6 CH	5"	5", 7"	5, 6, 5"	3", 6", 8", 9"
5"	7.18 dd (8.6, 1.8)	123.9 CH	4", 7"	4", 7"	4"	7", 9"
6"		116.7 C				
7"	7.63 d (1.8)	115.8 CH	5"	4", 5"		5", 6", 8", 9"
8"		139.3 C				
9"		125.8 C				
2"'	7.41 s	126.2 CH			5, 6	6, 3"', 8"', 9"'
3"'		113.6 C				
4"'	7.46 d (8.5)	120.2 CH	5"'	5"', 7"'	5, 6, 5"'	3"', 6"', 8"', 9"'
5"'	7.23 dd (8.5, 1.6)	123.7 CH	4"', 7"'	4"', 7"'	4"'	7"', 9"'
6"'		116.6 C				
7"'	7.61 d (1.6)	115.9 CH	5"'	4"', 5"'		5"', 6"', 9"'
8"'		139.6 C				
9"'		125.3 C				

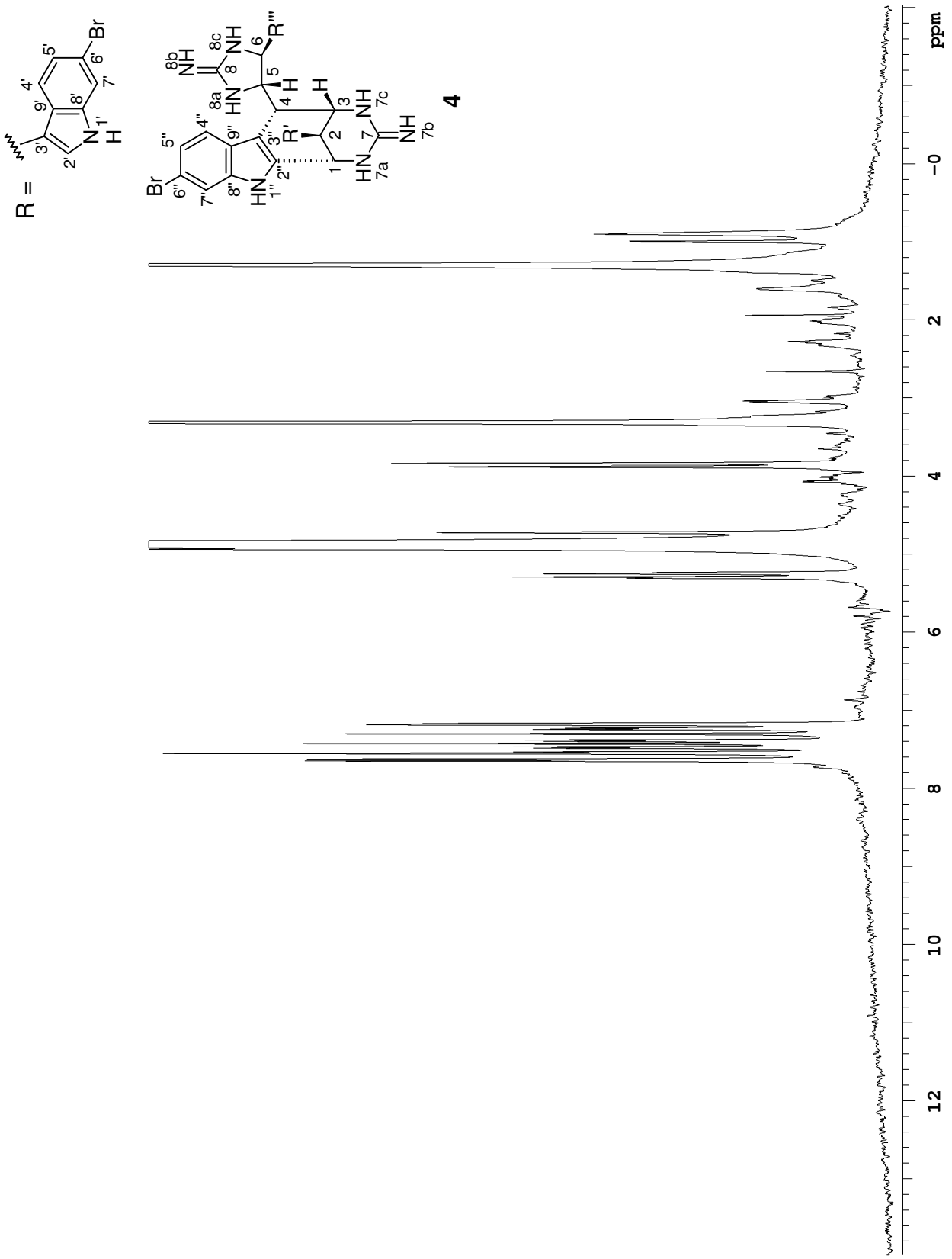

FIGURE S60. ^{1}H NMR spectrum of araiosamine D (**4**) in CD_3OD.

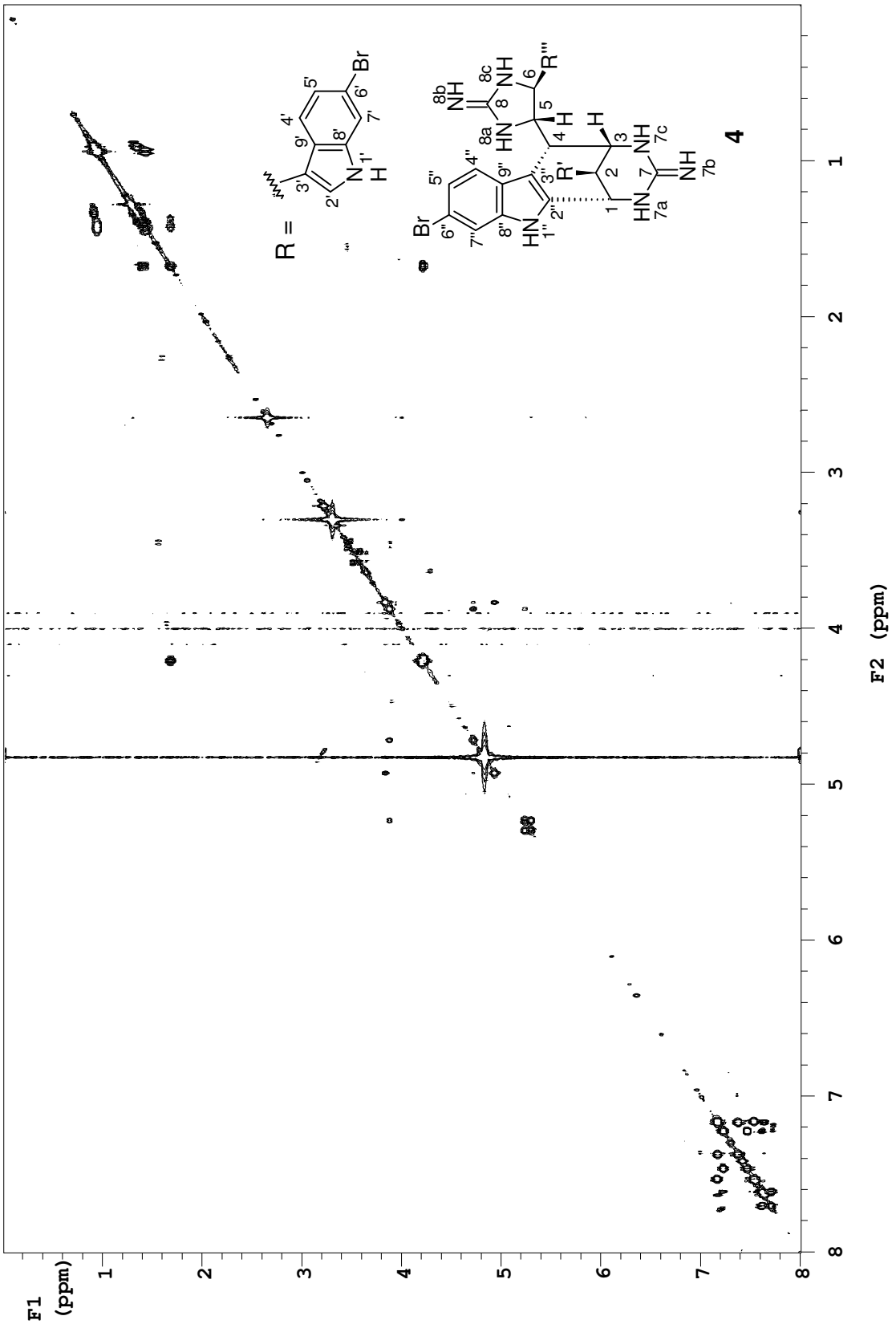

FIGURE S61. COSY spectrum of araiosamine D (**4**) in CD_3OD.

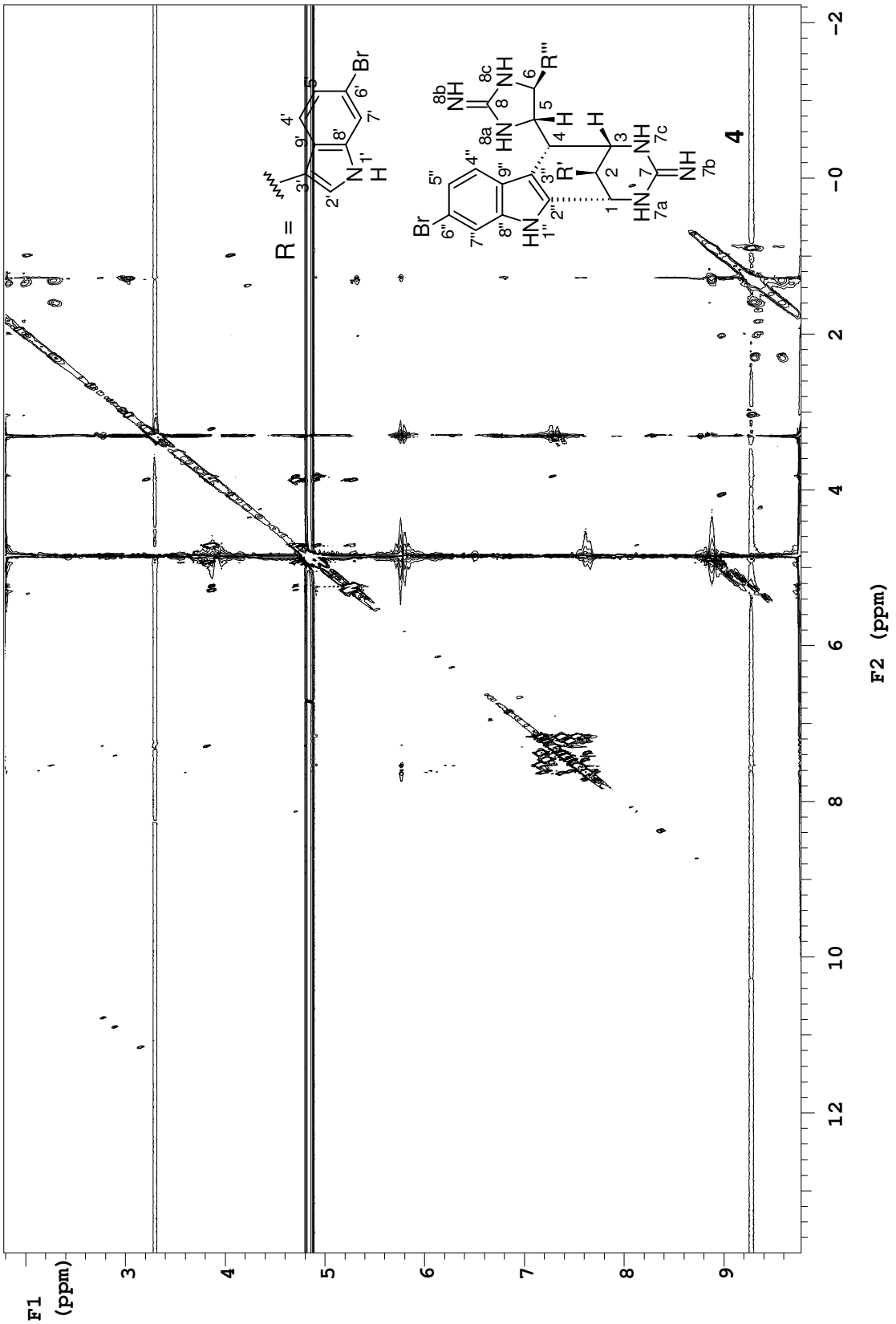

FIGURE S62. TOCSY spectrum of araiosamine D (**4**) in CD_3OD.

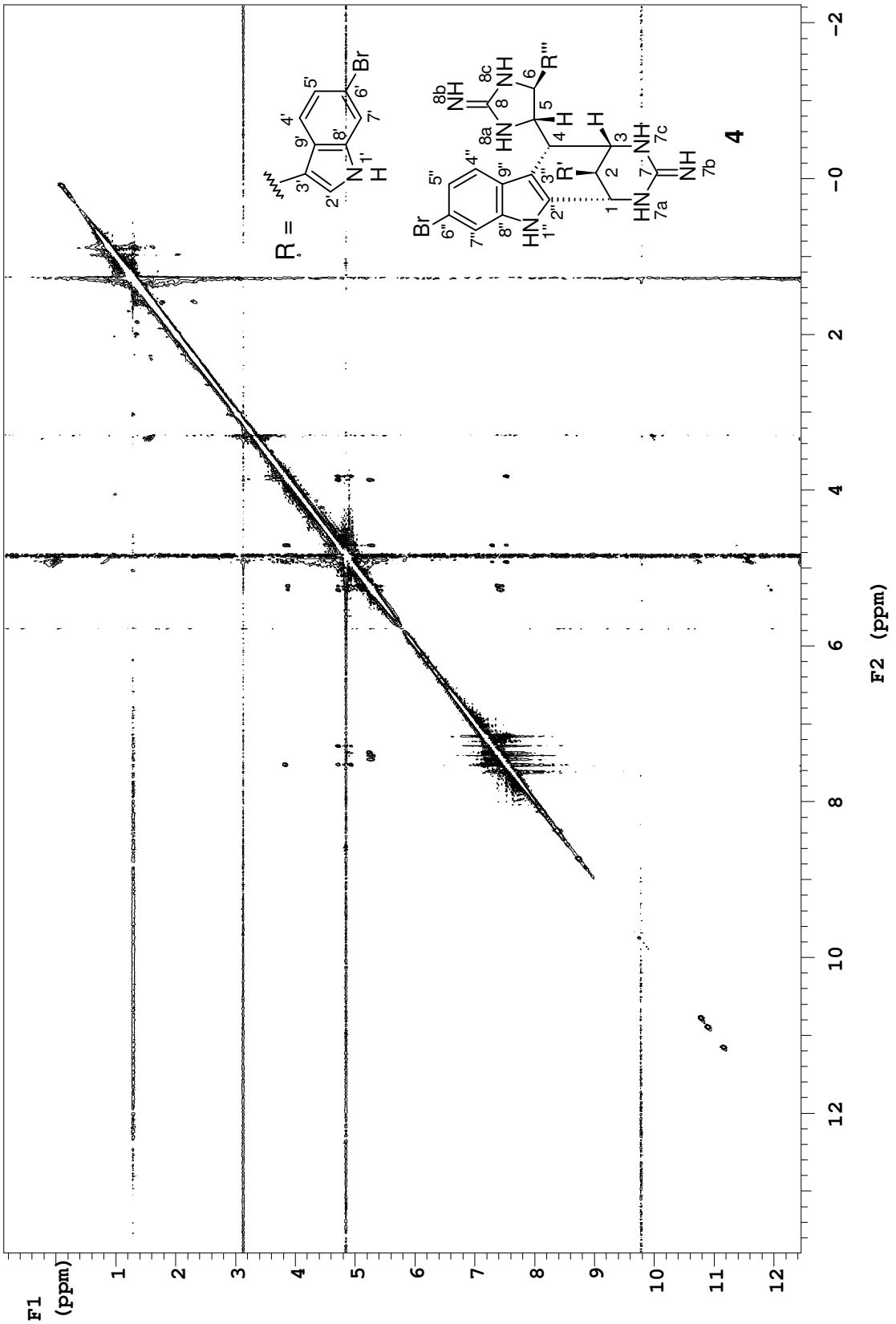

FIGURE S63. NOESY spectrum of araiosamine D (**4**) in CD_3OD.

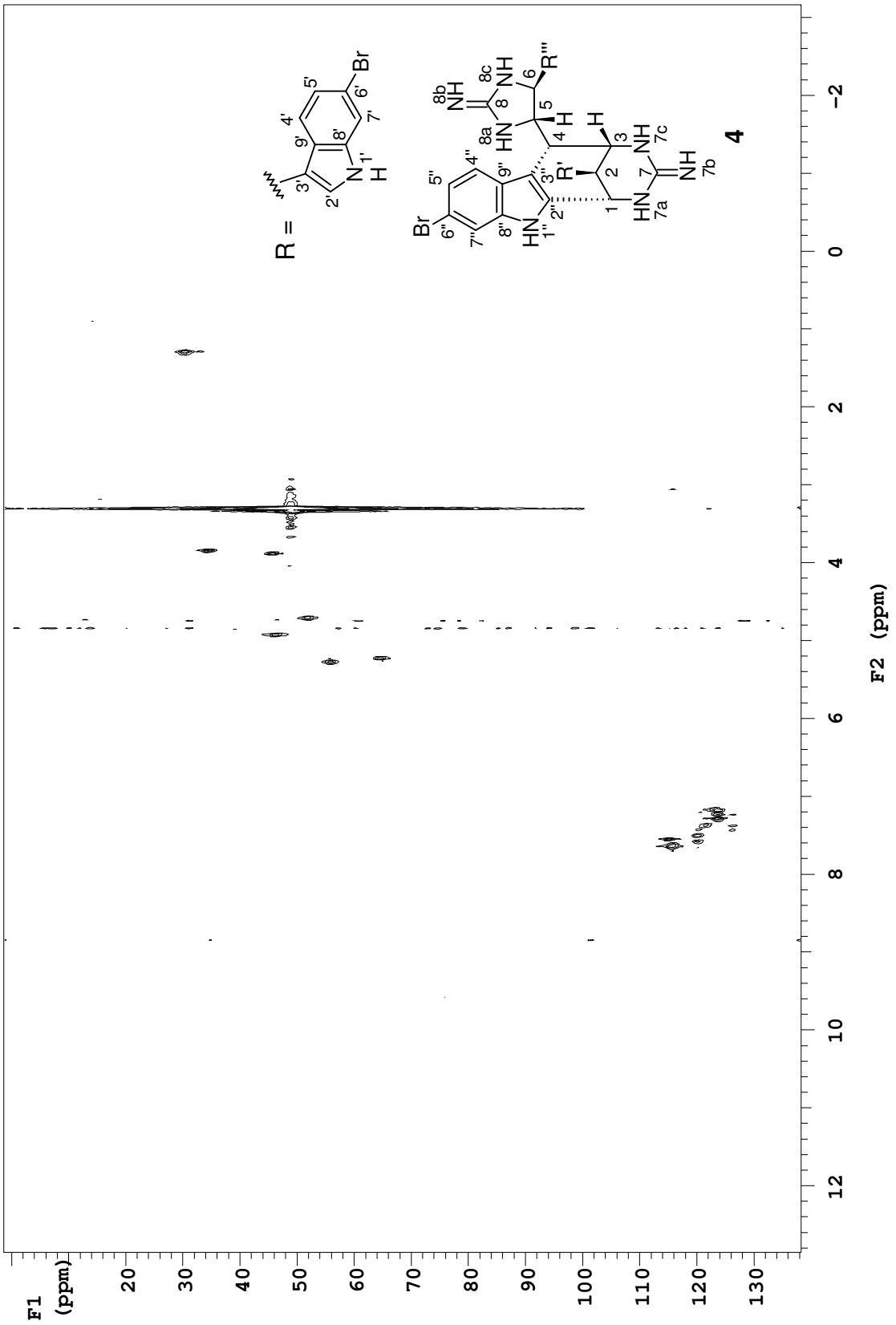

FIGURE S64. [^{13}C, ^{1}H] HSQC spectrum of araiosamine D (**4**) in CD_3OD.

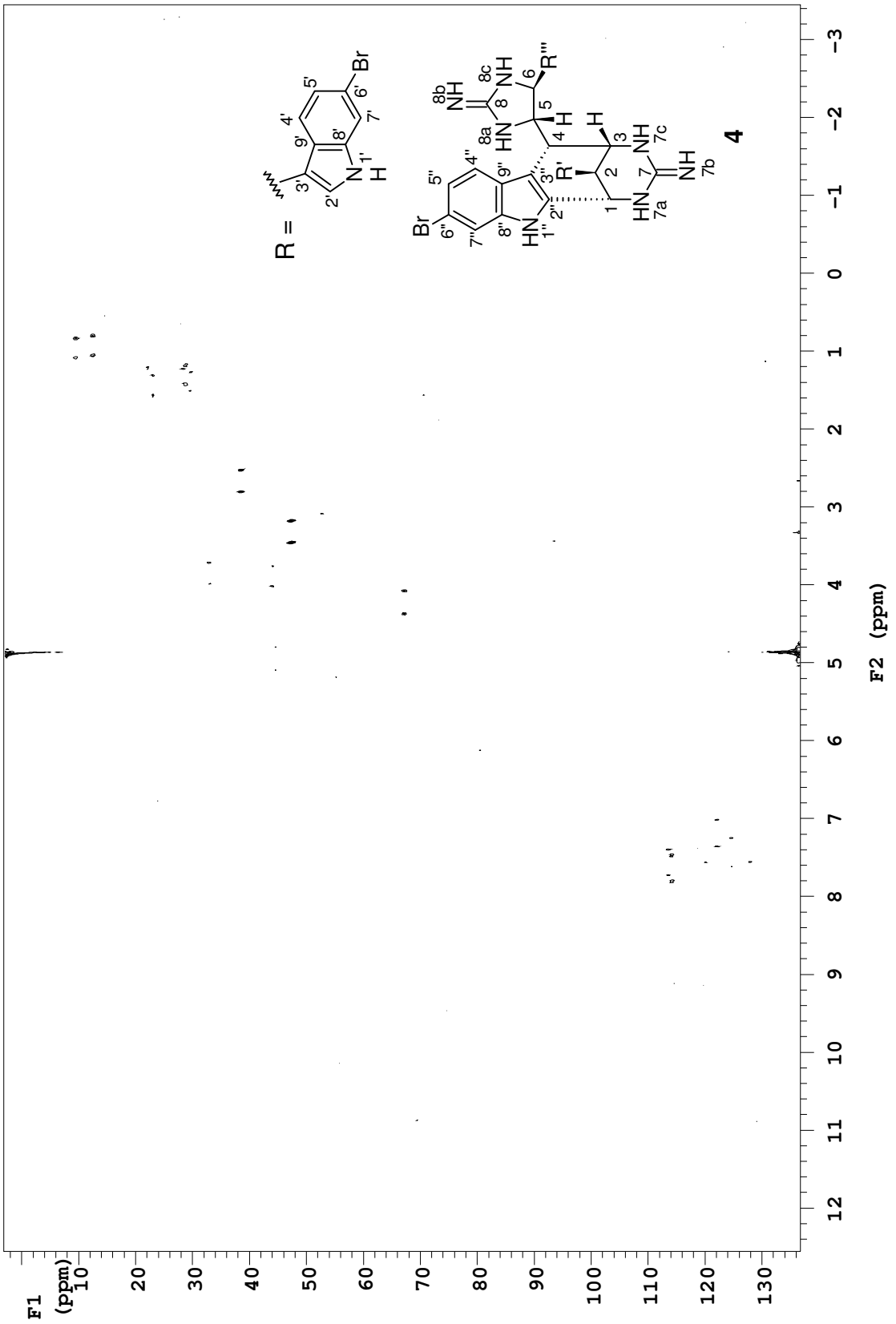

FIGURE S65. Coupled [^{13}C, ^{1}H] HSQC spectrum of araiosamine D (**4**) in CD_3OD.

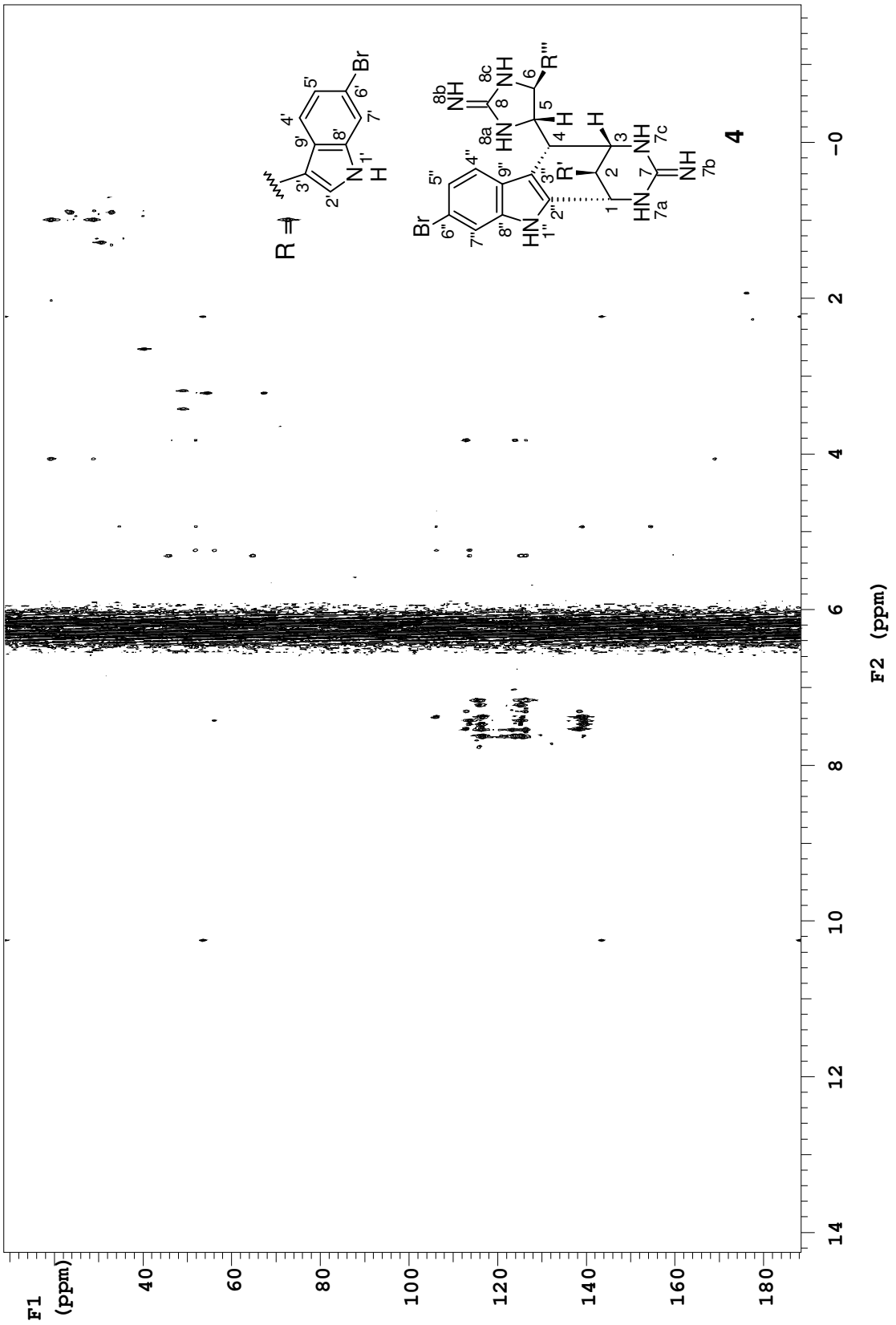

FIGURE S66. [^{13}C, ^{1}H] HMBC spectrum of araiosamine D (**4**) in CD_3OD.

Table S10. NMR data for araiosamine D (**4**) in CD_3OH (0.05% TFA)

Posn.	δ_H mult (*J* in Hz)	δ_C	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC	[^{15}N, ^{1}H] HMBC
1	4.90 s	46.4 CH		2, 7a	2, 3, 4, 7a	2, 4’		
2	3.81 s	34.5 CH		1, 3	1, 3, 7a, 2’	1, 3, 4’	1, 3, 2’, 3’, 9’	7a, 7c
3	4.70 s	52.0 CH		2, 4, 7c	1, 2, 4, 7c	2, 4, 2’, 4’		
4	3.86 s	45.6 CH		3, 5	3, 5, 6, 7c	3, 5, 6(w)	3”	
5	5.22 d (7.9)	64.9 CH		4, 6, 8a	4, 6	4, 4”, 2”’, 4”’	3, 6, 3”, 3”’	
6	5.28 d (7.9)	56.1 CH		5, 8c	5, 8c	2”’, 4”’	4, 5, 8, 2”’, 3”’, 9”’	
7		-						
7a	8.73 s		88.3	1, 7c	1, 2, 3			
7b	7.61 br s		65.7					
7c	8.10 s		84.1	3, 7a	1, 2, 3, 4	3		
8		159.8 C						
8a	8.36 s		96.2	5			5, 8	
8b	6.87 s		67.7					
8c	8.36 s		89.5	6	6		6, 8	
1’	10.78 s		129.6	2’	2’	2’, 7’	3’, 9’	
2’	7.29 s	124.1 CH		1’	2, 1’	1, 3, 1’	3’, 8’, 9’	
3’		112.8 C						
4’	7.52 d (8.6)	120.2 CH		5’	5’	1, 2, 5’	3’, 6’, 8’, 9’	
5’	7.15 d (8.6)	123.2 CH		4’, 7’	4’	4’	7’, 9’	
6’		116.3 C						
7’	7.53 s	115.4 CH				1’	4’, 5’, 6’, 9’	
8’		138.6 C						
9’		126.2 C						
1”	11.17 s		129.5			7”	3”, 8”, 9”	
2”		-						

Continued on next page

Table S10 – continued from previous page

Posn.	δ_H mult (*J* in Hz)	δ_C	δ_N	COSY	TOCSY	NOESY	[^{13}C, ^{1}H] HMBC	[^{15}N, ^{1}H] HMBC
3”		106.1 C						
4”	7.37 d (8.5)	121.8 CH		5”	5”, 7”	5, 5”	3”, 6”, 8”, 9”	
5”	7.16 d (8.5)	123.8 CH		4”, 7”	4”, 7”	4”	7”, 9”	
6”		116.5 C						
7”	7.63 s	115.9 CH		5”	4”, 5”	1”	5”, 6”, 8”, 9”	
8”		139.2 C						
9”		125.8 C						
1”’	10.90 s		131.2	2”’	2”’	2”’, 7”’	2”’, 3”’, 9”’	
2”’	7.41 s	126.4 CH		1”’	1”’	6, 1”’	3”’, 8”’, 9”’	
3”’		113.7 C						
4”’	7.46 d (8.5)	120.6 CH		5”’	5”’, 7”’	5, 6, 5”’	3”’, 6”’, 8”’, 9”’	
5”’	7.21 d (8.5)	123.7 CH		4”’, 7”’	4”’, 7”’	4”’	6”’, 7”’, 9”’	
6”’		116.4 C						
7”’	7.60 s	115.9 CH		5”’	4”’, 5”’	1”’	5”’, 6”’, 8”’, 9”’	
8”’		139.5 C						
9”’		125.1 C						

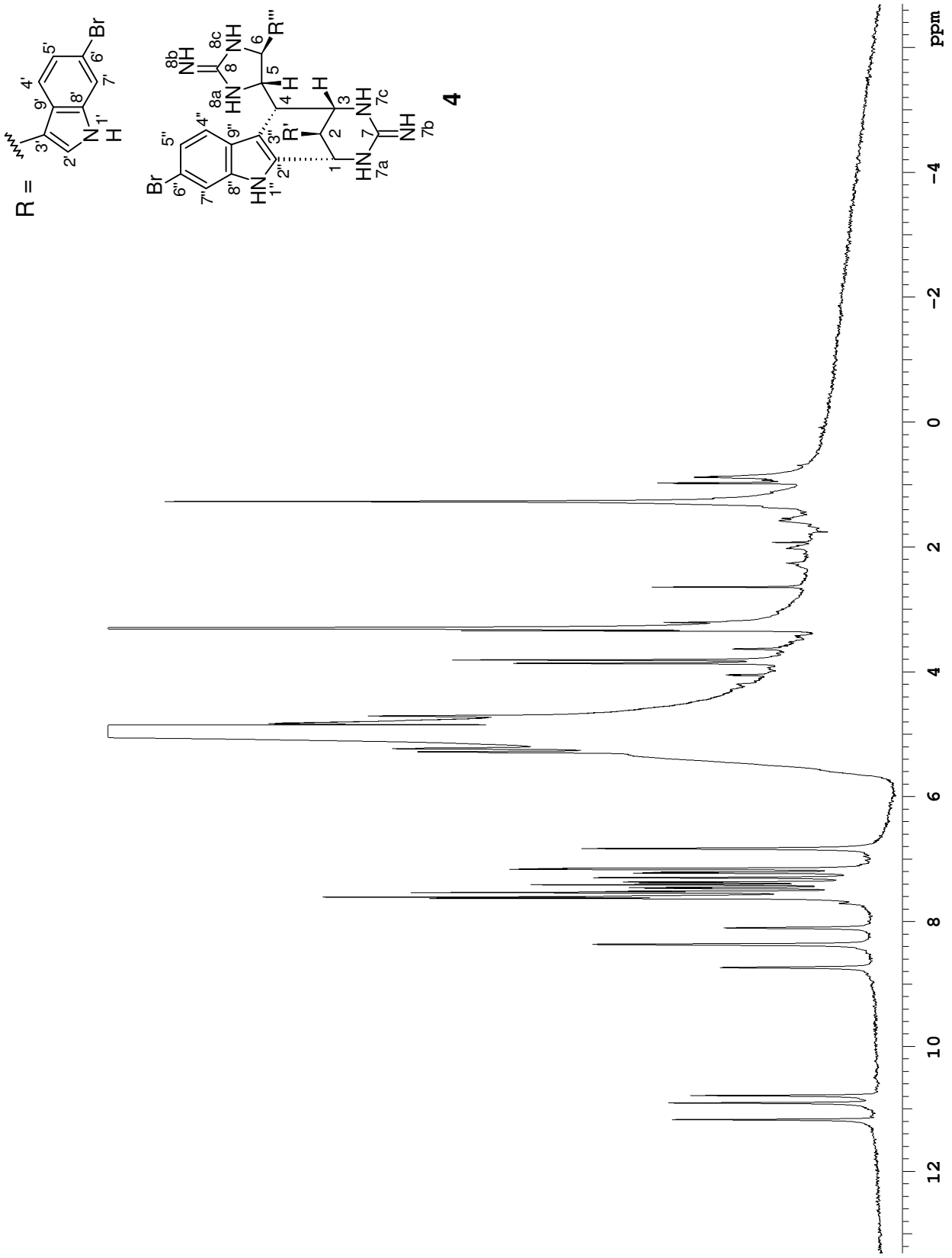

FIGURE S67. ^{1}H NMR spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

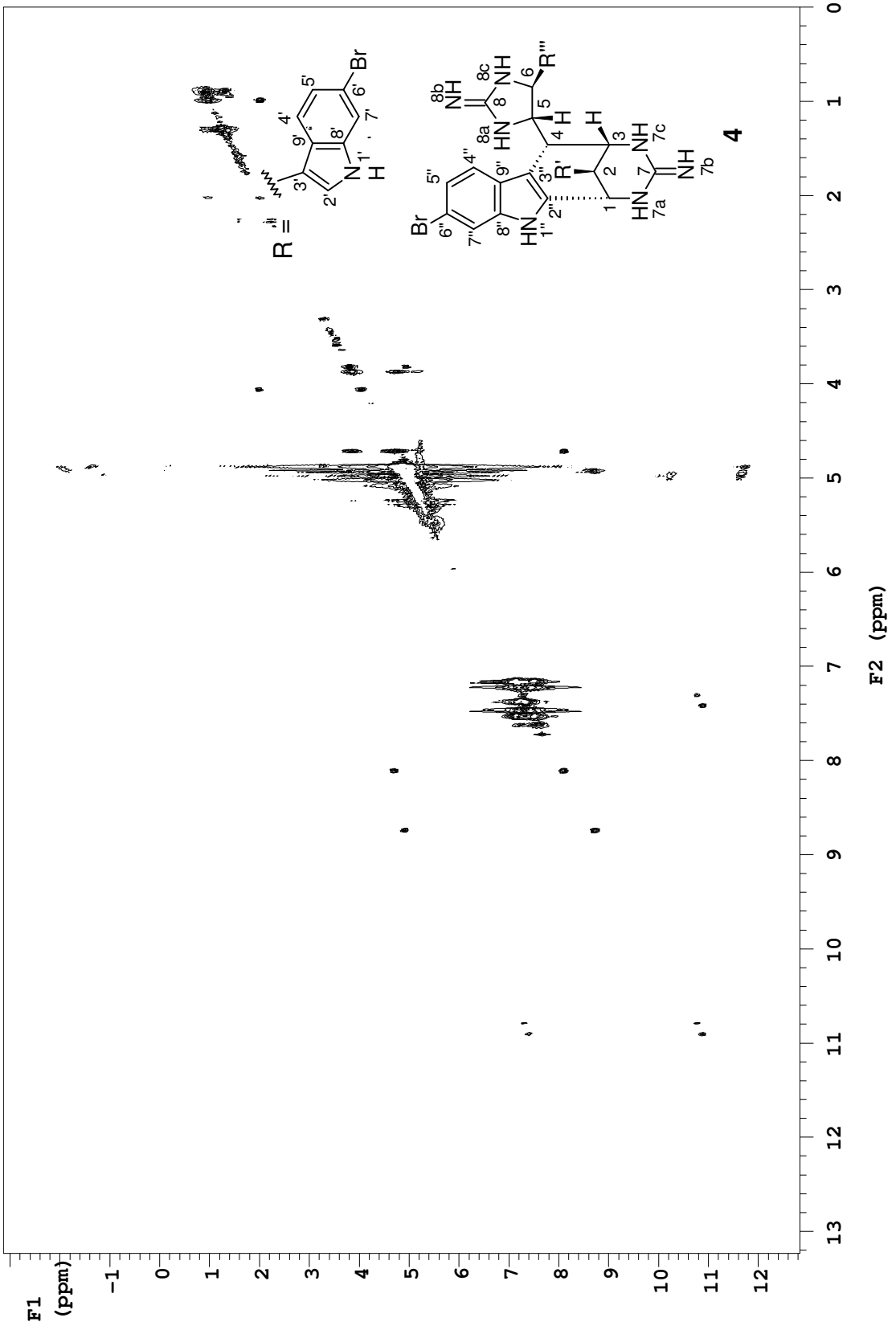

FIGURE S68. COSY spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

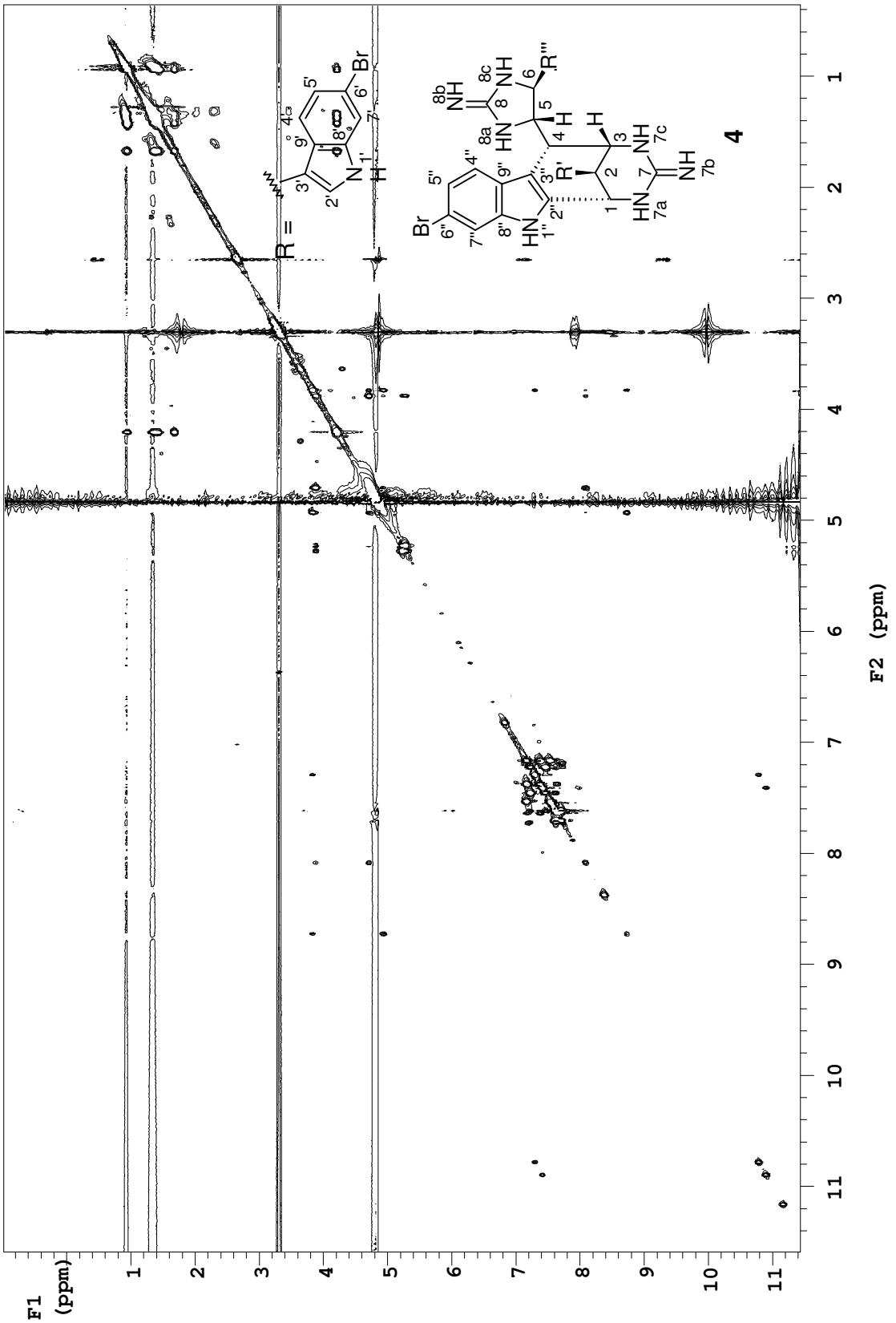

FIGURE S69. TOCSY spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

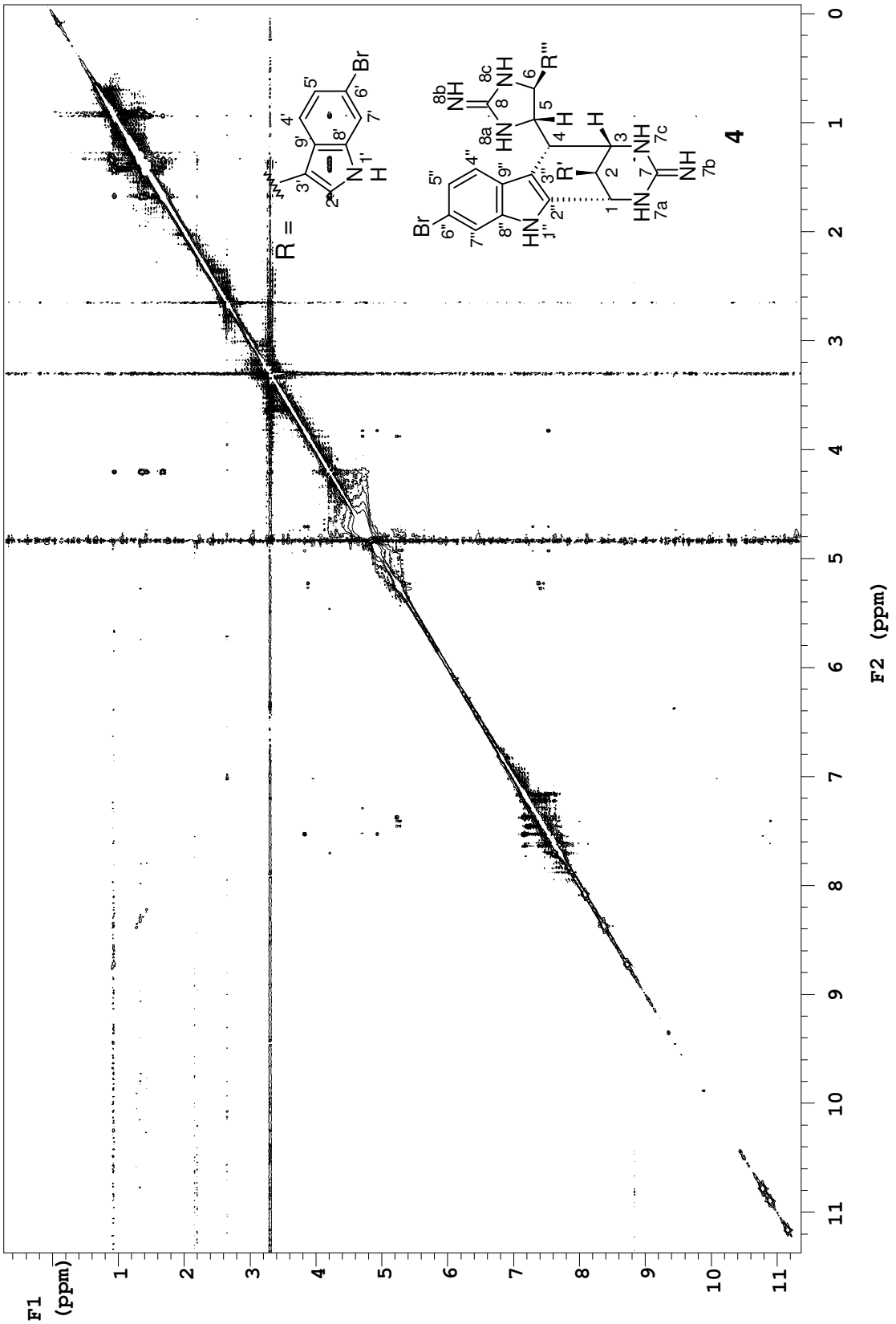

FIGURE S70. NOESY spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

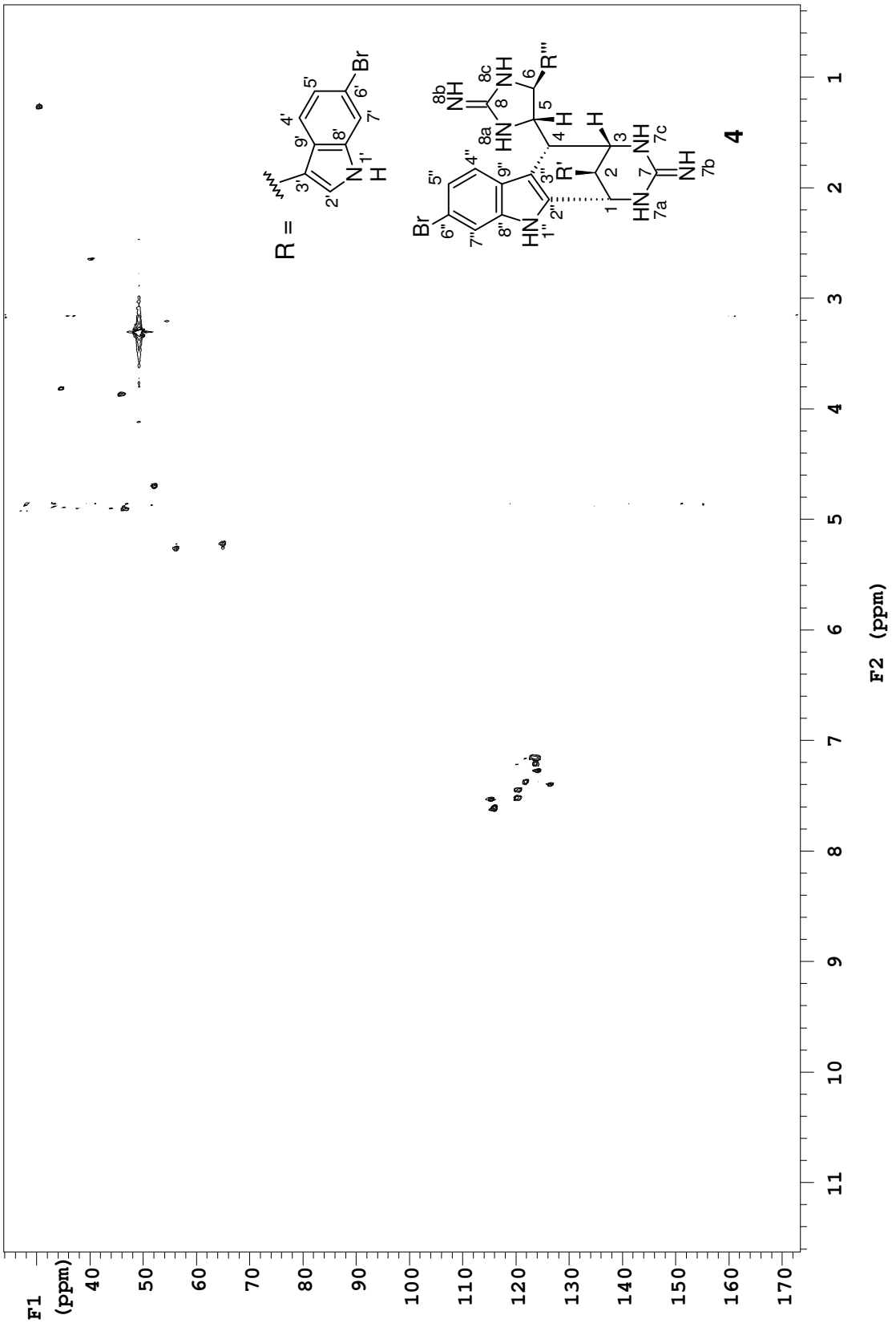

FIGURE S71. [^{13}C, ^{1}H] HSQC spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

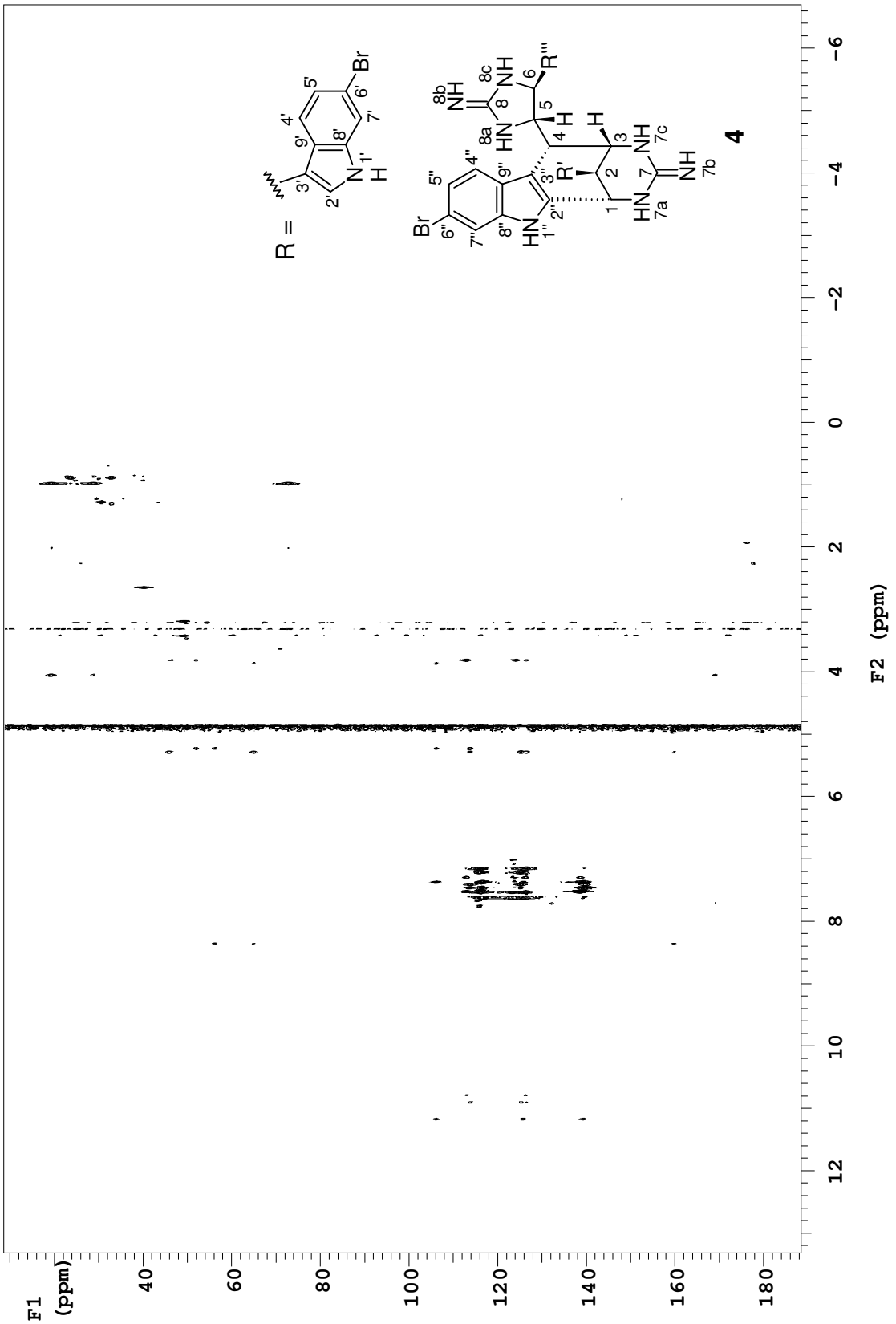

FIGURE S72. [^{13}C, ^{1}H] HMBC spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

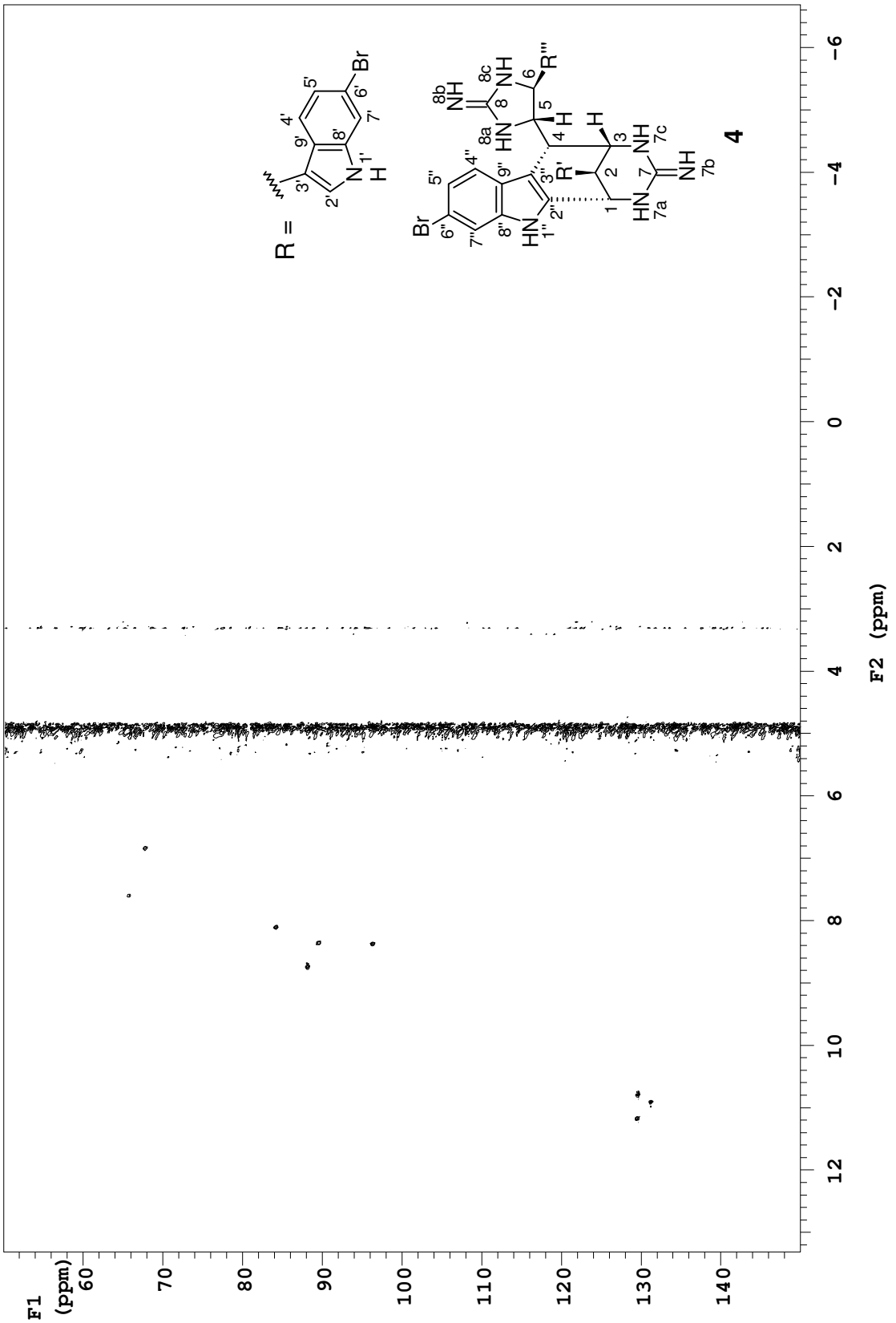

FIGURE S73. [^{15}N, ^{1}H] HSQC spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

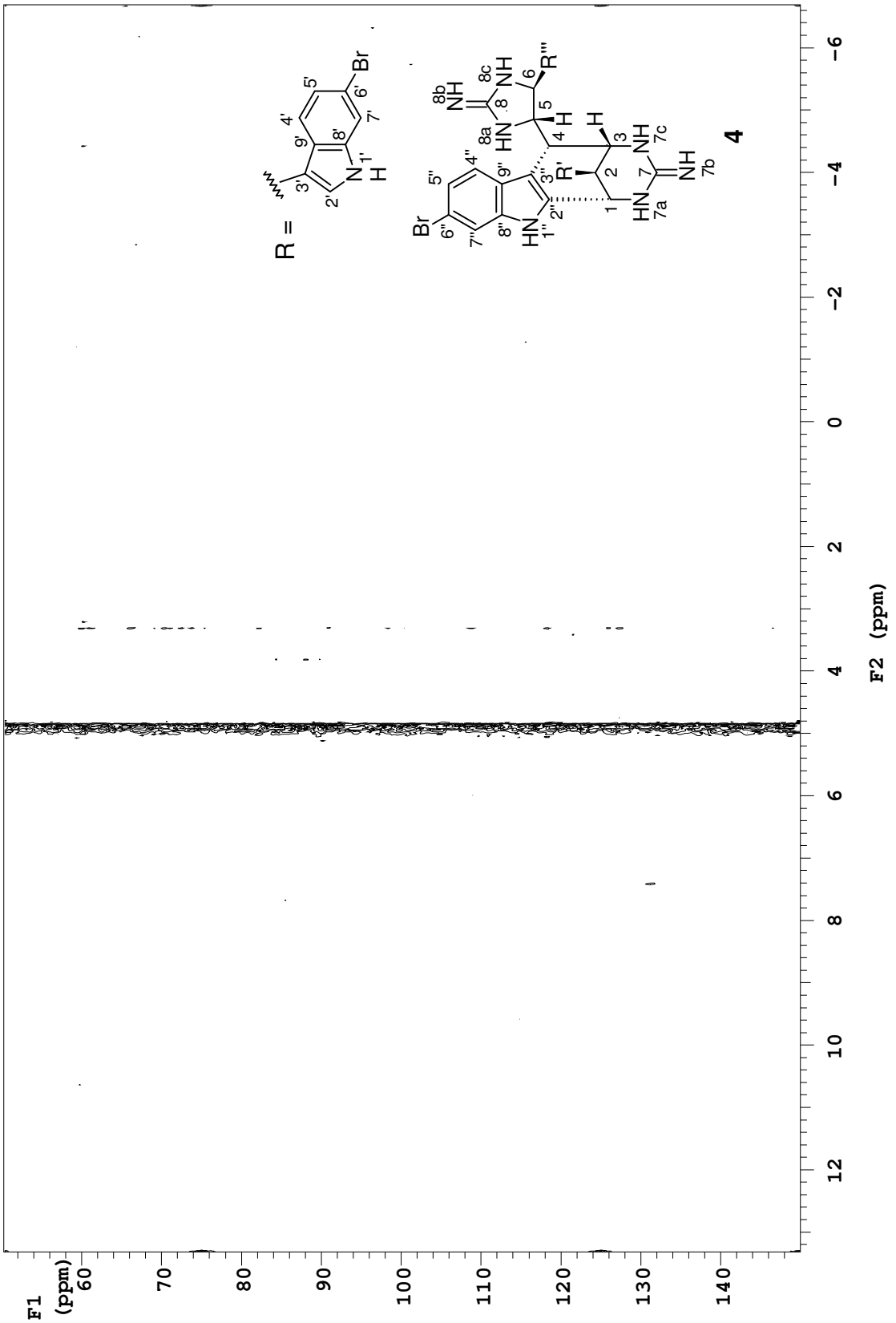

FIGURE S74. [^{15}N, ^{1}H] HMBC spectrum of araiosamine D (**4**) in CD_3OH (0.05% TFA).

CD data for araiosamines A–D (1–4).

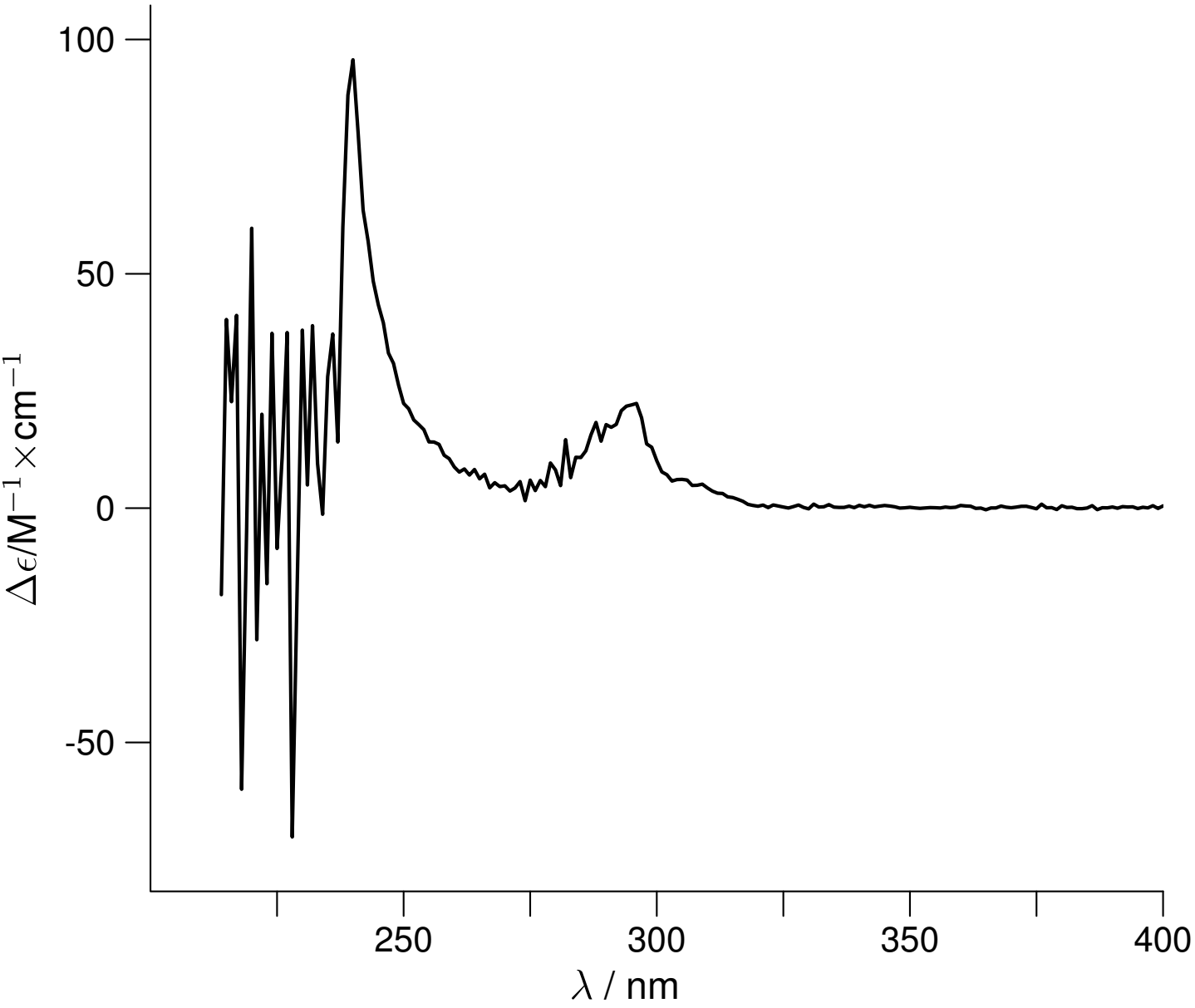

FIGURE S75. CD spectrum of araiosamine A (**1**) in methanol.

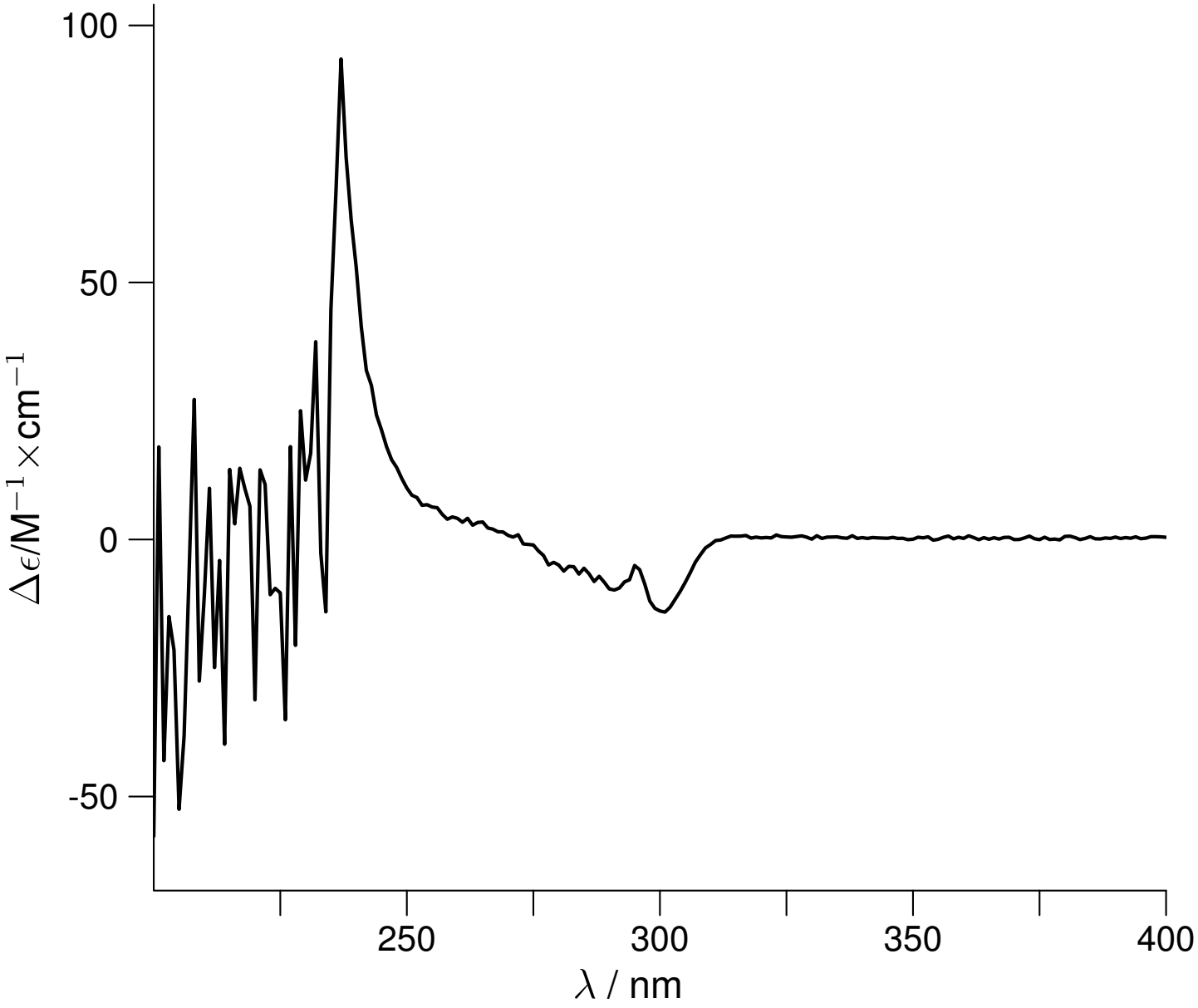

FIGURE S76. CD spectrum of araiosamine B (**2**) in methanol.

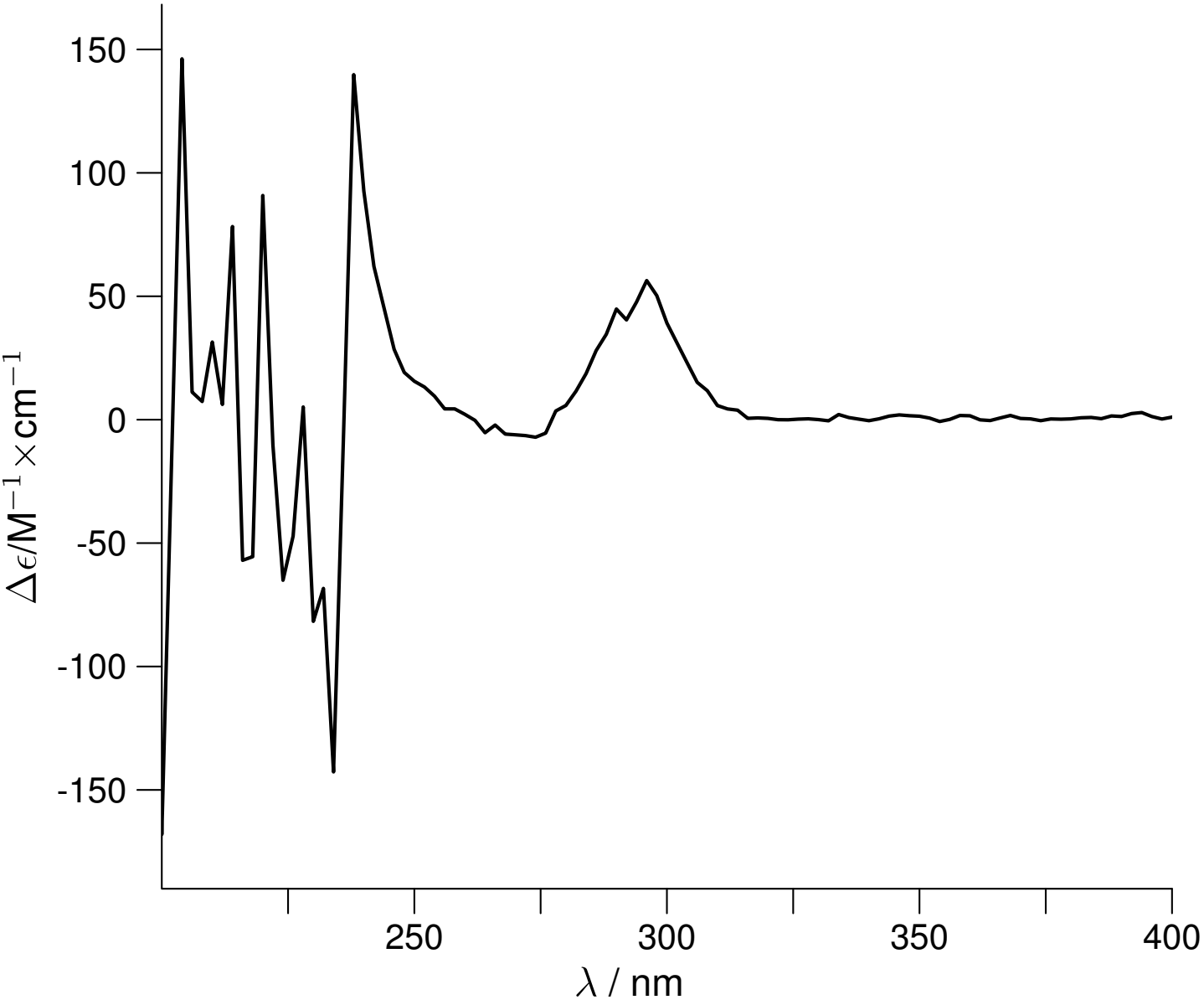

FIGURE S77. CD spectrum of araiosamine C (**3**) in methanol.

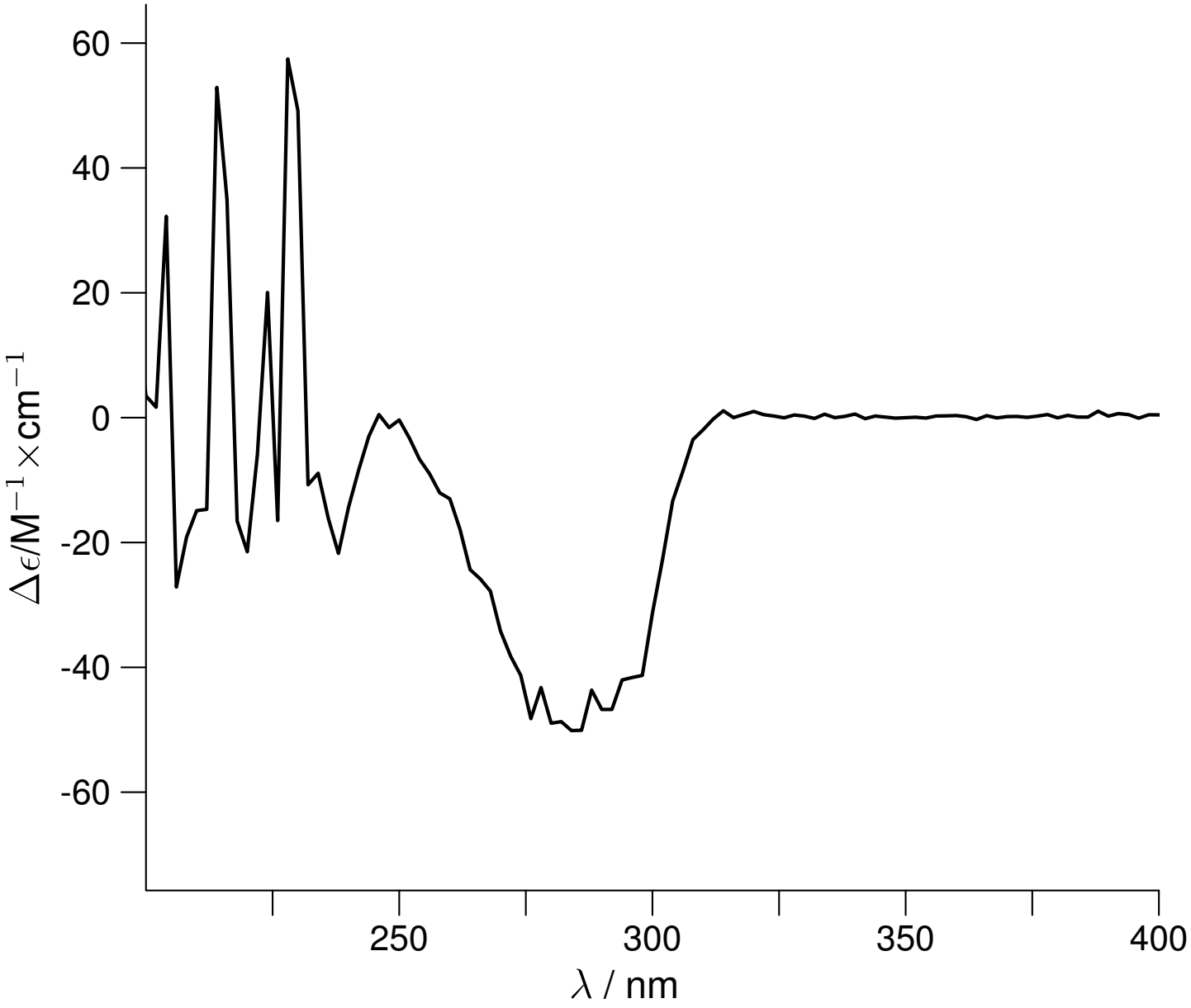

FIGURE S78. CD spectrum of araiosamine D (**4**) in methanol.

Modeling Data

Table S11. Models used in this study.

Structure File[a]	Compound	Configuration	Conformer	Optimization Method
sa_31.opt.pdb	**1**	bc	bc-1	B3LYP/6-311G(d,p)
sa_109.opt.pdb	**1**	bc	bc-2	B3LYP/6-311G(d,p)
c0.opt.pdb	**1**	bc	bc-3	B3LYP/6-311G(d,p)
c4.opt.pdb	**1**	bc	bc-4	B3LYP/6-311G(d,p)
c6.opt.pdb	**1**	bc	bc-5	B3LYP/6-311G(d,p)
456ent-heat-c.rep.c0.opt.pdb	**1**	bc-4,5,6-*ent*	456ent-1	B3LYP/6-311G(d,p)
456ent-heat-c.rep.c9.opt.pdb	**1**	bc-4,5,6-*ent*	456ent-2	B3LYP/6-311G(d,p)
456ent-sa_1.opt.pdb	**1**	bc-4,5,6-*ent*	456ent-3	B3LYP/6-311G(d,p)
456ent-sa_100.opt.pdb	**1**	bc-4,5,6-*ent*	456ent-4	B3LYP/6-311G(d,p)
4ent-heat.c.rep.c8.opt.pdb	**1**	bc-4-*ent*	4ent-1	B3LYP/6-311G(d,p)
4ent-sa_1.opt.pdb	**1**	bc-4-*ent*	4ent-2	B3LYP/6-311G(d,p)
4ent-sa_132.opt.pdb	**1**	bc-4-*ent*	4ent-3	B3LYP/6-311G(d,p)
56ent-heat-c.rep.c0.opt.pdb	**1**	bc-5,6-*ent*	56ent-1	B3LYP/6-311G(d,p)
56ent-heat-c.rep.c1.opt.pdb	**1**	bc-5,6-*ent*	56ent-2	B3LYP/6-311G(d,p)
56ent-heat-c.rep.c5.opt.pdb	**1**	bc-5,6-*ent*	56ent-3	B3LYP/6-311G(d,p)
56ent-sa_1.opt.pdb	**1**	bc-5,6-*ent*	56ent-4	B3LYP/6-311G(d,p)
ara_c_opt.pdb	**3**	1-*R**,2-*S**,3-*S**,4-*S**,5-*S**,6-*S**	1	c.g.[b] w/ MMFF94
ara_d_min.pdb	**4**	1-*S**,2-*S**,3-*R**,4-*S**,5-*S**,6-*S**	1	c.g.[b] w/ MMFF94
ara_d_6ent.pdb	**4**	1-*S**,2-*S**,3-*R**,4-*S**,5-*S**,6-*R**	1	c.g.[b] w/ MMFF94

[a] To extract the PDB file using Adobe Reader right click on the file name and select the option to save the associated file to disk.
[b] Conjugate gradient molecular mechanics optimization.

Table S12. Comparison of energies for low energy conformers optimized by DFT at the B3LYP/6-311G(d,p) level and their satisfaction of experimental observations.

Conformer	MP2 Energy[a]	PCM-MP2 Energy[a]	1, 2, 3 axial	3,4 gauche	4, 5 anti	d_{H3-H8a} (Å)	$d_{H7c-H2''/4''}$ (Å)	d_{H7c-H5} (Å)	d_{H4-H6} (Å)
bc configuration									
bc-1	11.65	4.82	yes	yes	no	4.7	3.9	4.2	3.8
bc-2	6.89	2.48	no	no	no	4.8	4.5	2.8	3.7
bc-3	0.00	0.00	yes	yes	yes	2.5	2.3	4.7	2.4
bc-4	2.88	0.14	no	no	no	4.9	4.1	2.2	3.0
bc-5	3.27	3.49	yes	yes	yes	3.9	2.4	3.1	3.0
bc-4,5,6-*ent* configuration									
456ent-1	2.73	3.04	yes	yes	yes	2.2	2.7	3.2	2.6
456ent-2	0.00	2.25	yes	yes	yes	2.3	2.4	3.2	2.8
456ent-3	4.86	0.00	no	no	no	4.9	3.0	4.7	3.7
456ent-4	4.15	0.30	yes	no	no	4.6	2.3	2.8	2.4
bc-4-*ent* configuration									
4ent-1	4.74	2.67	no	no	yes	4.5	2.6	3.7	2.5
4ent-2	0.00	0.00	yes	no	no	2.7	3.2	4.5	2.6
4ent-3	5.40	4.84	yes	yes	yes	4.6	2.3	2.8	2.4
bc-5,6-*ent* configuration									
56ent-1	1.16	2.00	yes	no	yes	4.4	3.5	2.3	2.5
56ent-2	5.86	0.24	yes	yes	no	4.4	2.6	4.1	2.7
56ent-3	0.00	1.54	yes	no	yes	4.2	3.4	3.4	2.3
56ent-4	0.53	0.00	yes	yes	yes	4.8	2.4	4.7	2.5

[a]Relative energy in kcal/mol within the conformers for a given configuration.