marine drugs

MDPI

Supplementary Information

Antiproliferative Activity of Mycalin A and Its Analogues on Human Skin Melanoma and Human Cervical Cancer Cells

Domenica Capasso [1], Nicola Borbone [2], Monica Terracciano [2], Sonia Di Gaetano [3,*] and Vincenzo Piccialli [4,*]

[1] CESTEV, University of Naples Federico II, 80145 Naples, Italy; domenica.capasso@unina.it
[2] Department of Pharmacy, University of Naples Federico II, 80131 Naples, Italy; nicola.borbone@unina.it (N.B.); monica.terracciano@unina.it (M.T.)
[3] Institute of Biostructures and Bioimaging, CNR, 80134 Naples, Italy
[4] Department of Chemical Sciences, University of Naples Federico II, 80126 Naples, Italy
* Correspondence: digaetan@unina.it (S.D); vinpicci@unina.it (V.P.)

CONTENTS:

Figure S1: ^{1}H NMR spectrum of compound **1** ($CDCl_3$, 400 MHz)
Figure S2: ^{13}C NMR spectrum of compound **1** ($CDCl_3$, 100 MHz
Figure S3: ^{1}H NMR spectrum of compound **2** ($CDCl_3$, 400 MHz)
Figure S4: ^{13}C NMR spectrum of compound **2** ($CDCl_3$, 100 MHz
Figure S5: ^{1}H NMR spectrum of compound **4** ($CDCl_3$, 400 MHz
Figure S6: ^{13}C NMR spectrum of compound **4** ($CDCl_3$, 100 MHz)
Figure S7: ^{1}H NMR spectrum of compound **5** ($CDCl_3$, 400 MHz)
Figure S8: ^{13}C NMR spectrum of compound **5** ($CDCl_3$, 100 MHz)
Figure S9: ^{1}H NMR spectrum of compound **6** ($CDCl_3$, 400 MHz).
Figure S10: ^{13}C NMR spectrum of compound **6** ($CDCl_3$, 100 MHz)
Figure S11: 2D COSY spectrum of compound **6** ($CDCl_3$, 700 MHz)
Figure S12: 2D NOESY spectrum of compound **6** ($CDCl_3$, 700 MHz)
Figure S13: 2D HSQC spectrum of compound **6** ($CDCl_3$, 700 MHz)

Figure S14: 2D HMBC spectrum of compound **6** ($CDCl_3$, 700 MHz)
Figure S15: ^{1}H NMR spectrum of compound **7** ($CDCl_3$, 400 MHz)
Figure S16: ^{13}C NMR spectrum of compound **7** ($CDCl_3$, 100 MHz)
Figure S17: ^{1}H NMR spectrum of compound **8** ($CDCl_3$, 400 MHz)
Figure S18: ^{13}C NMR spectrum of compound **8** ($CDCl_3$, 100 MHz)
Figure S19: 2D COSY spectrum of compound **8** ($CDCl_3$, 700 MHz)
Figure S20: 2D NOESY spectrum of compound **8** ($CDCl_3$, 700 MHz)
Figure S21: ^{1}H NMR spectrum of compound **9** ($CDCl_3$, 400 MHz)
Figure S22: ^{13}C NMR spectrum of compound **9** ($CDCl_3$, 100 MHz)
Figure S23: 2D COSY spectrum of compound **9** ($CDCl_3$, 700 MHz)
Figure S24: 2D NOESY spectrum of compound **9** ($CDCl_3$, 700 MHz)
Figure S25: 2D HSQC spectrum of compound **9** ($CDCl_3$, 700 MHz)
Figure S26: 2D HMBC spectrum of compound **9** ($CDCl_3$, 700 MHz)
Figure S27: ^{1}H NMR spectrum of compound **10** ($CDCl_3$, 400 MHz).
Figure S28: ^{13}C NMR spectrum of compound **10** ($CDCl_3$, 100 MHz)
Figure S29: 2D COSY spectrum of compound **10** ($CDCl_3$, 400 MHz)
Figure S30: 2D NOESY spectrum of compound **10** ($CDCl_3$, 400 MHz)
Figure S31: 2D HSQC spectrum of compound **10** ($CDCl_3$, 700 MHz)
Figure S32: 2D HMBC spectrum of compound **10** ($CDCl_3$, 700 MHz)
Figure S33: ^{1}H NMR spectrum of compound **11** ($CDCl_3$, 400 MHz)
Figure S34: ^{13}C NMR spectrum of compound **11** ($CDCl_3$, 100 MHz)
Figure S35: 2D COSY spectrum of compound **11** ($CDCl_3$, 700 MHz)
Figure S36: 2D NOESY spectrum of compound **11** ($CDCl_3$, 700 MHz)
Figure S37: 2D HSQC spectrum of compound **11** ($CDCl_3$, 700 MHz)
Figure S38: 2D HMBC spectrum of compound **11** ($CDCl_3$, 700 MHz)
Table S1: ^{1}H and ^{13}C chemical shift data for compound **6** (700 MHz, $CDCl_3$)
Table S2: ^{1}H and ^{13}C chemical shift data for compound **8** (700 MHz, $CDCl_3$)

Table S3: ^{1}H and ^{13}C chemical shift data for compound **9** (700 MHz, $CDCl_3$)
Table S4: ^{1}H and ^{13}C chemical shift data for compound **10** (700 MHz, $CDCl_3$)
Table S5: ^{1}H and ^{13}C chemical shift data for compound **11** (700 MHz, $CDCl_3$)

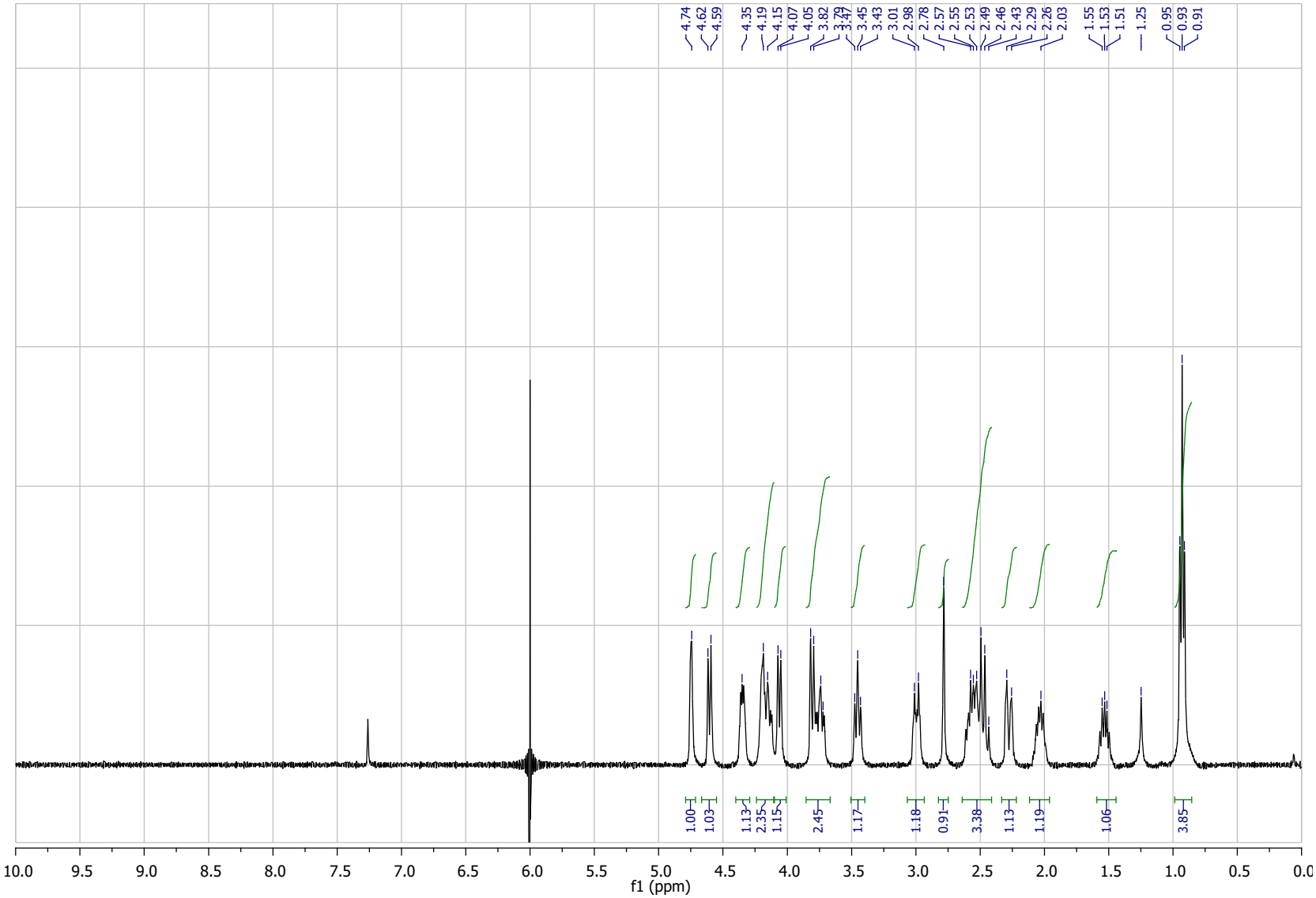


Figure S1: ^{1}H NMR spectrum of compound **1** ($CDCl_3$, 400 MHz).

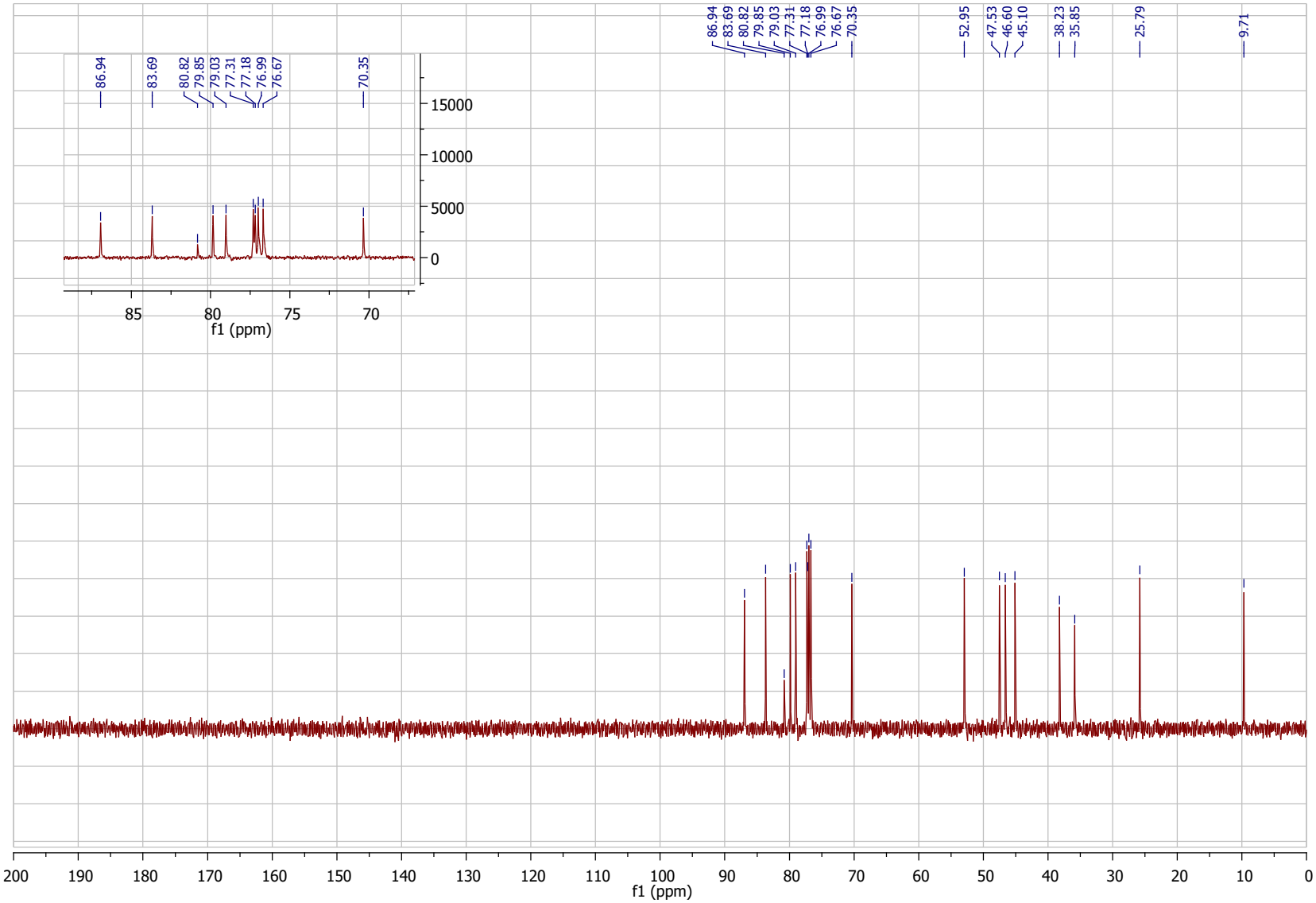


Figure S2: ^{13}C NMR spectrum of compound **1** ($CDCl_3$, 100 MHz).

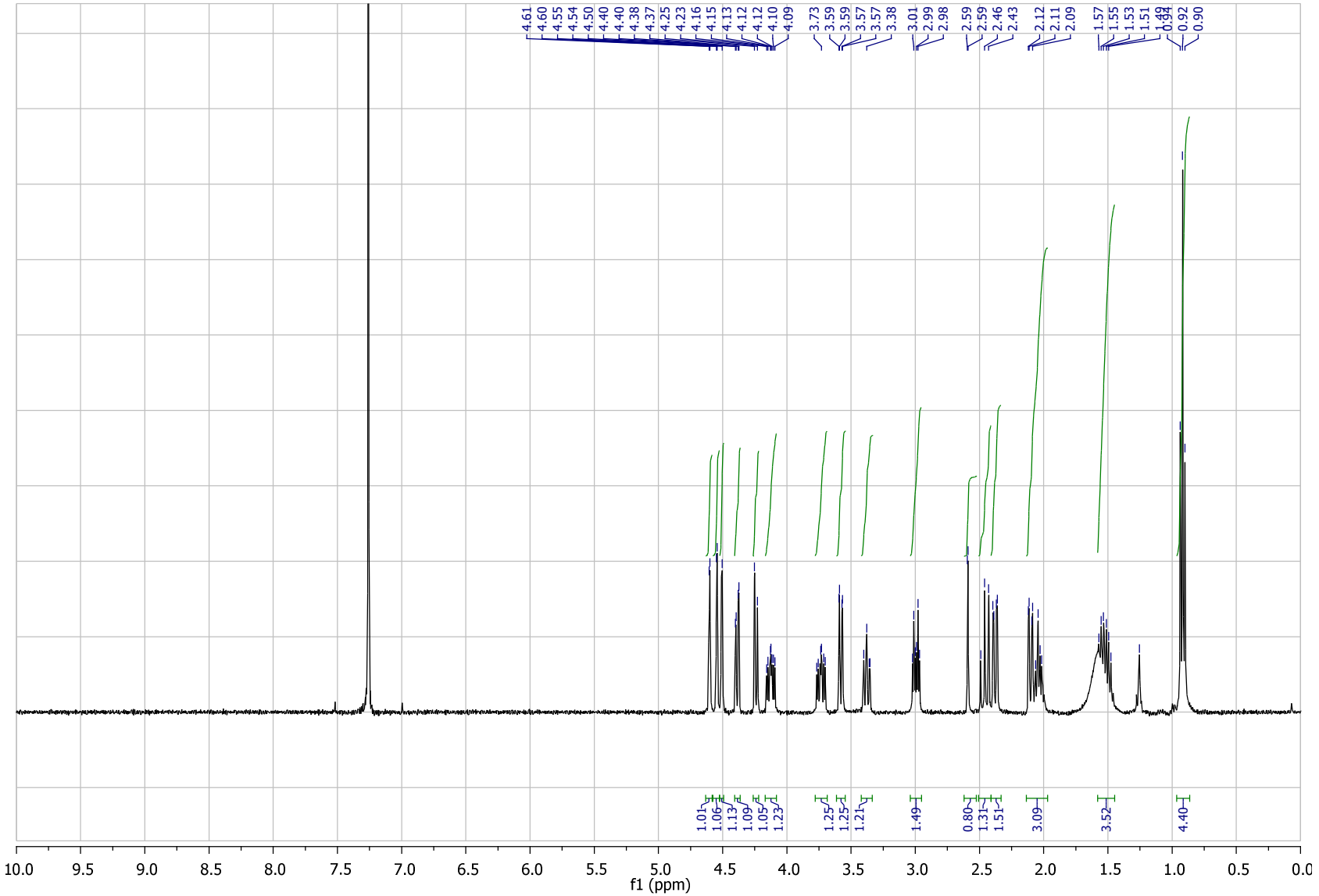


Figure S3: ^{1}H NMR spectrum of compound **2** ($CDCl_3$, 400 MHz).

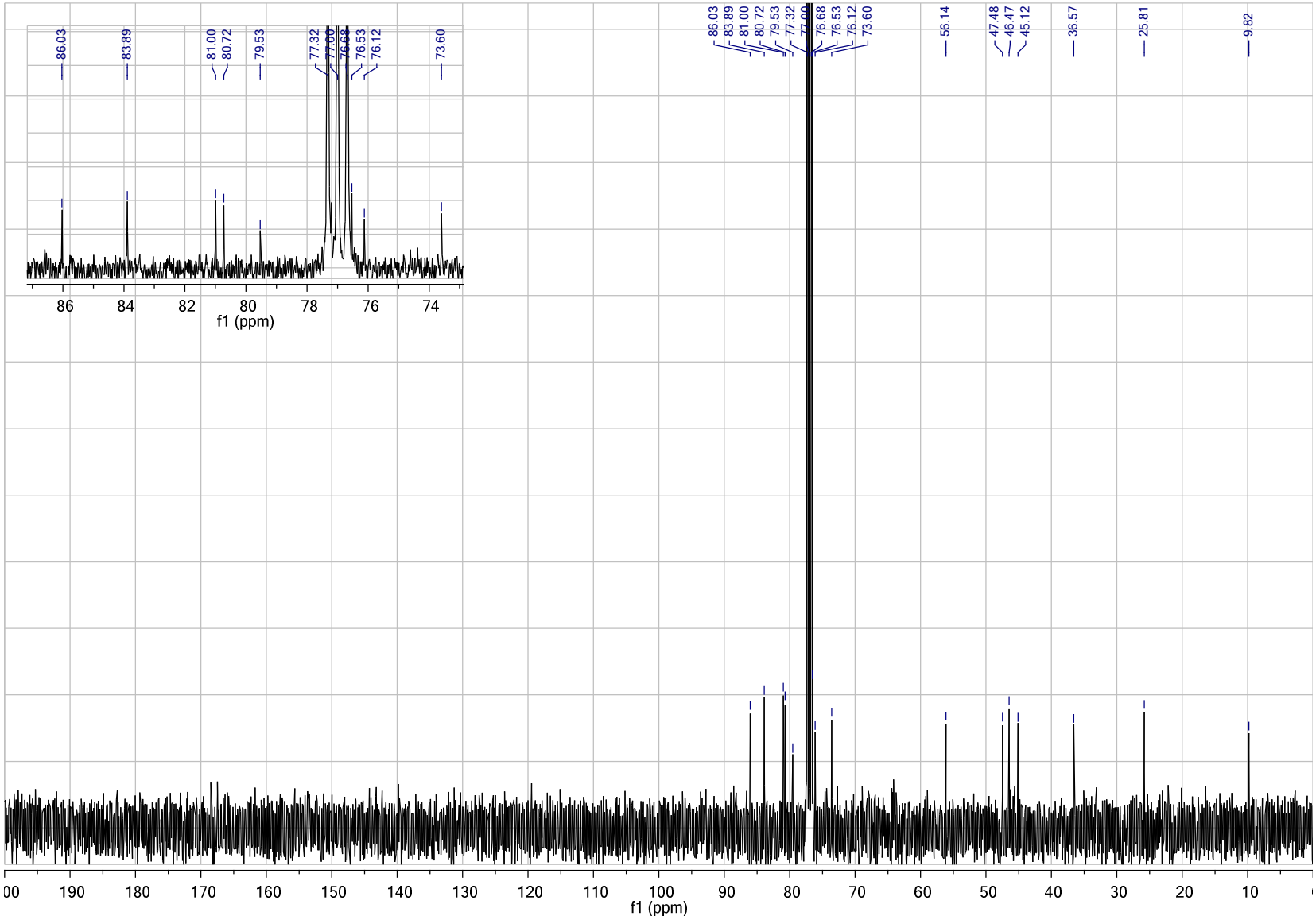


Figure S4: ^{13}C NMR spectrum of compound **2** ($CDCl_3$, 100 MHz).

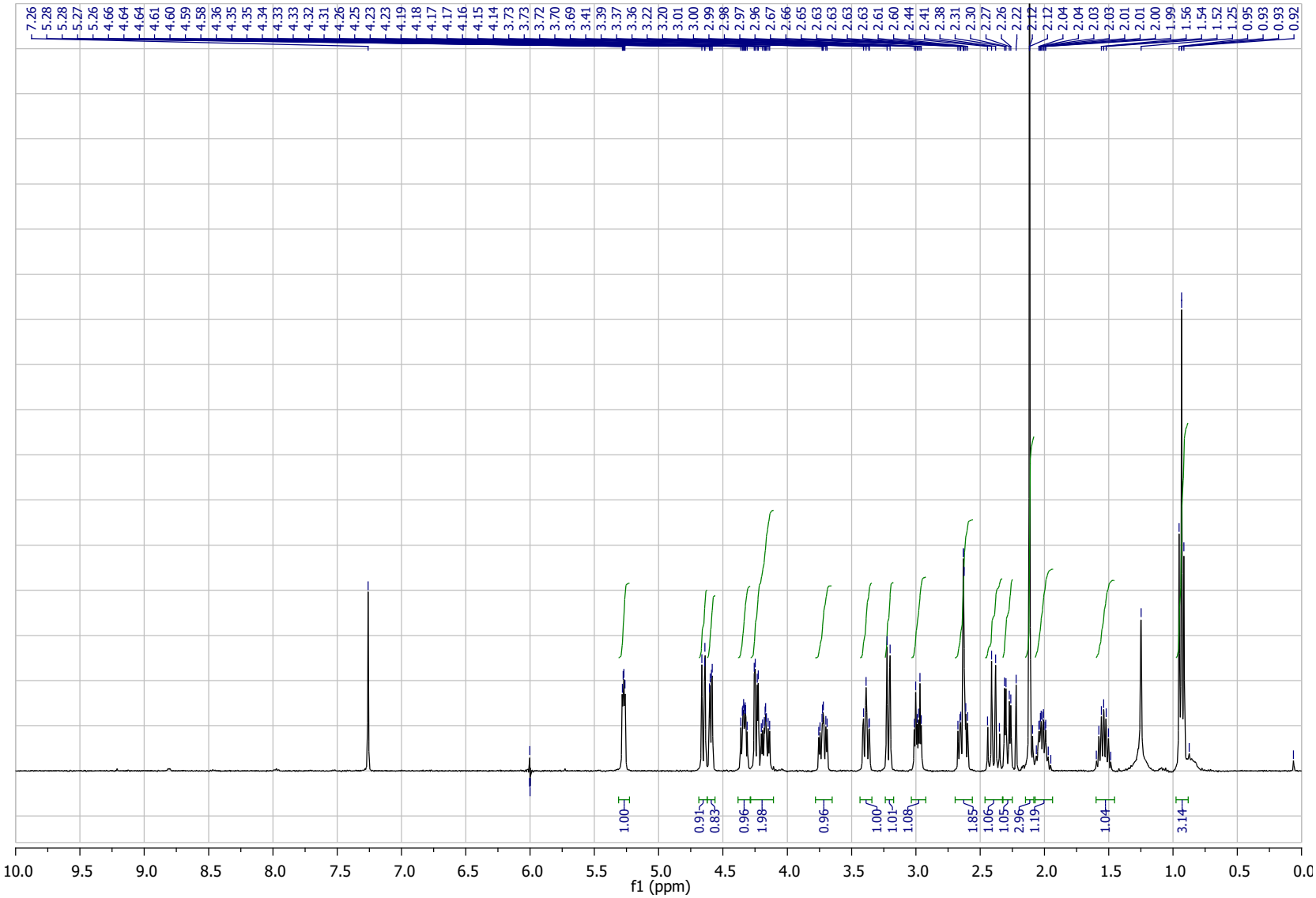


Figure S5: ^{1}H NMR spectrum of compound **4** ($CDCl_3$, 400 MHz).

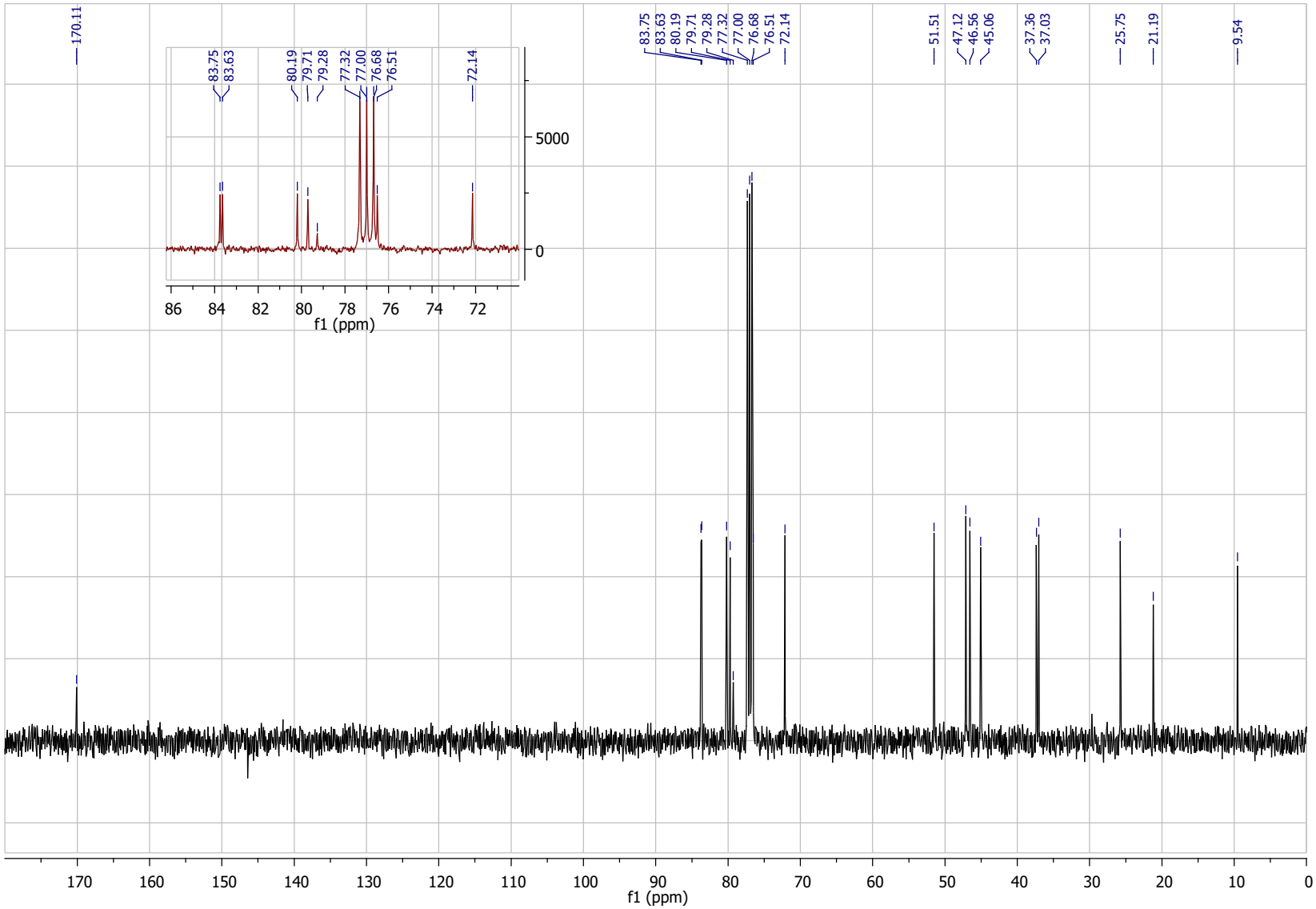


Figure S6: ^{13}C NMR spectrum of compound **4** ($CDCl_3$, 100 MHz).

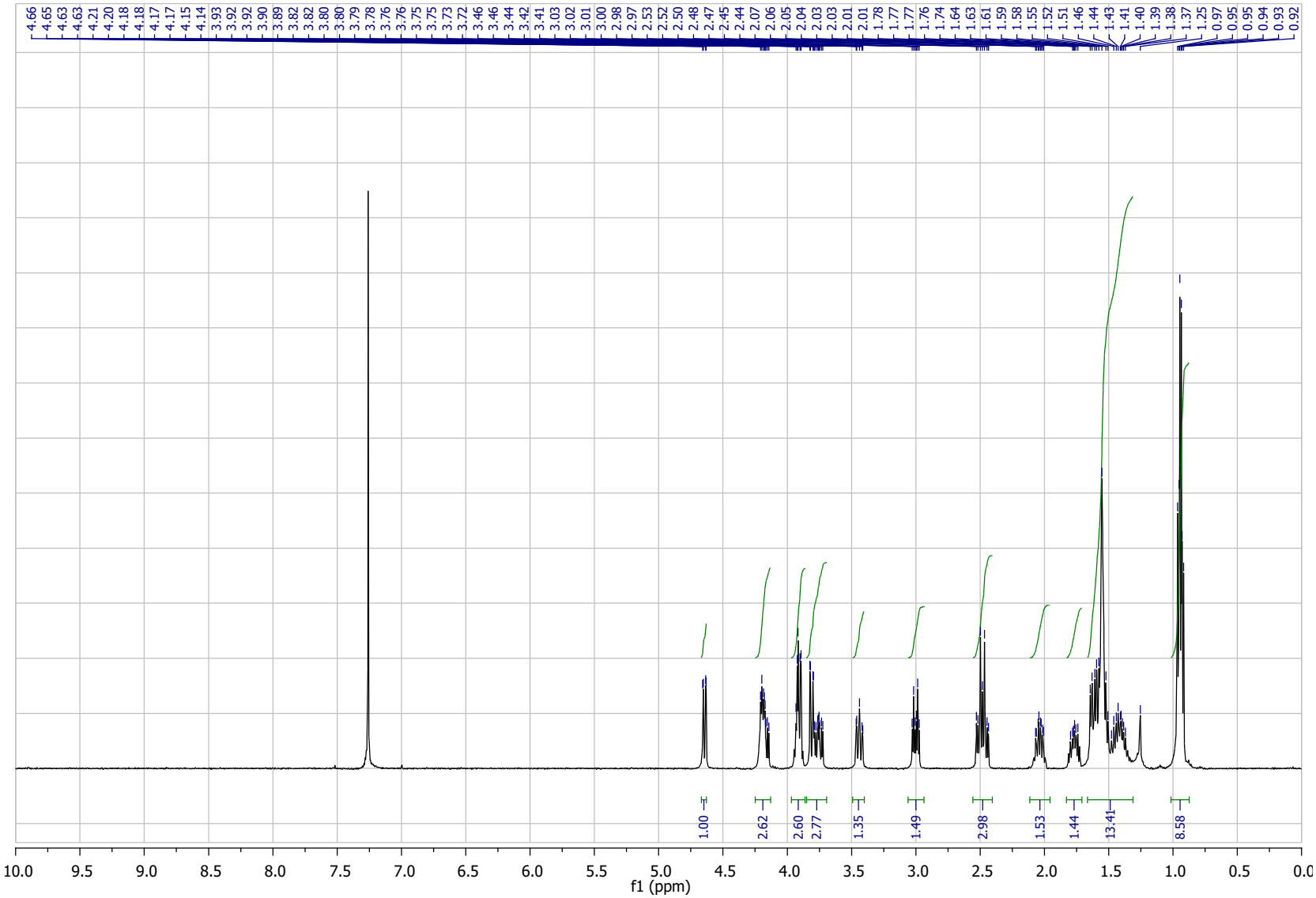


Figure S7: ^{1}H NMR spectrum of compound **5** ($CDCl_3$, 400 MHz).

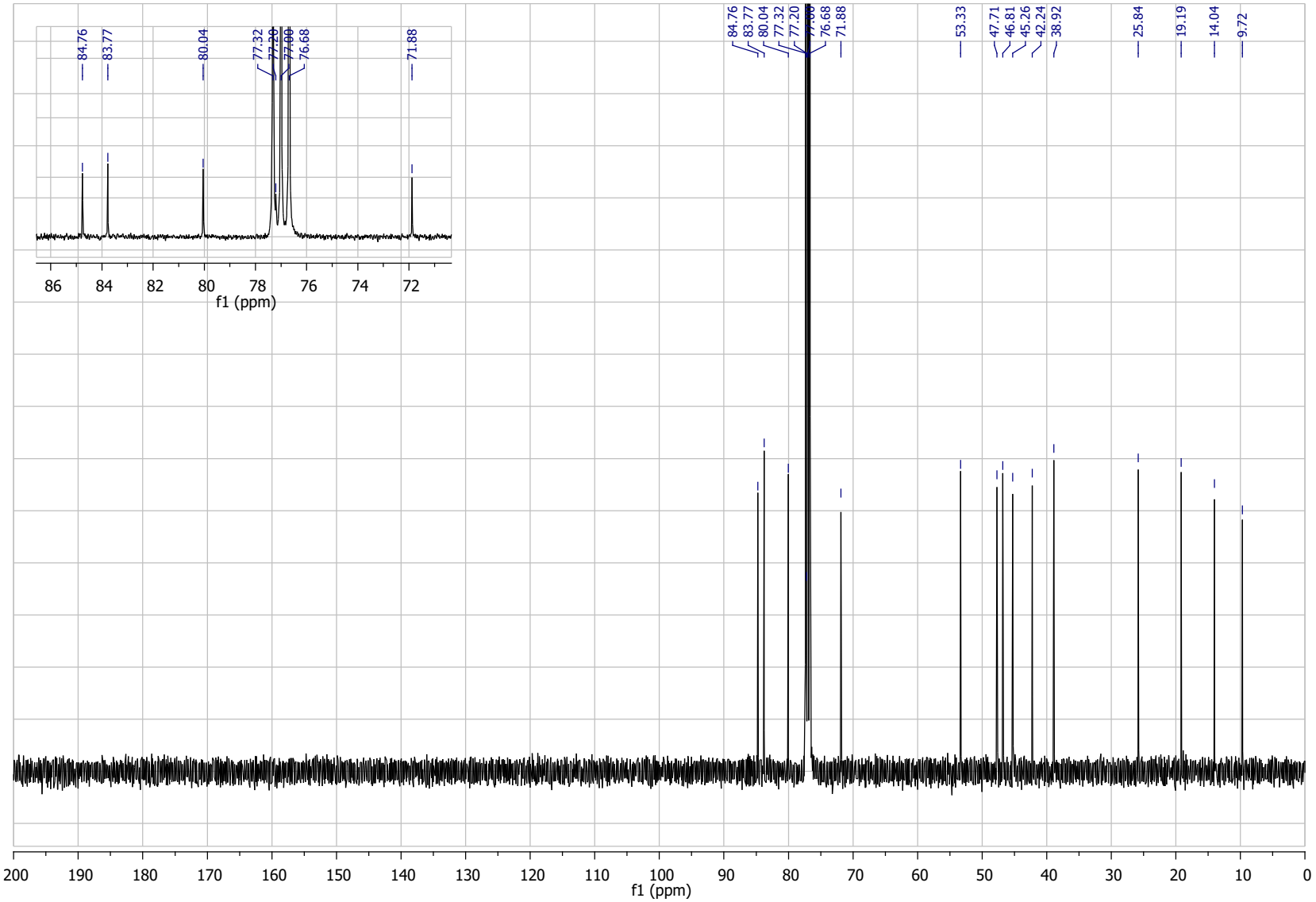


Figure 8. ^{13}C NMR spectrum of compound **5** ($CDCl_3$, 100 MHz).

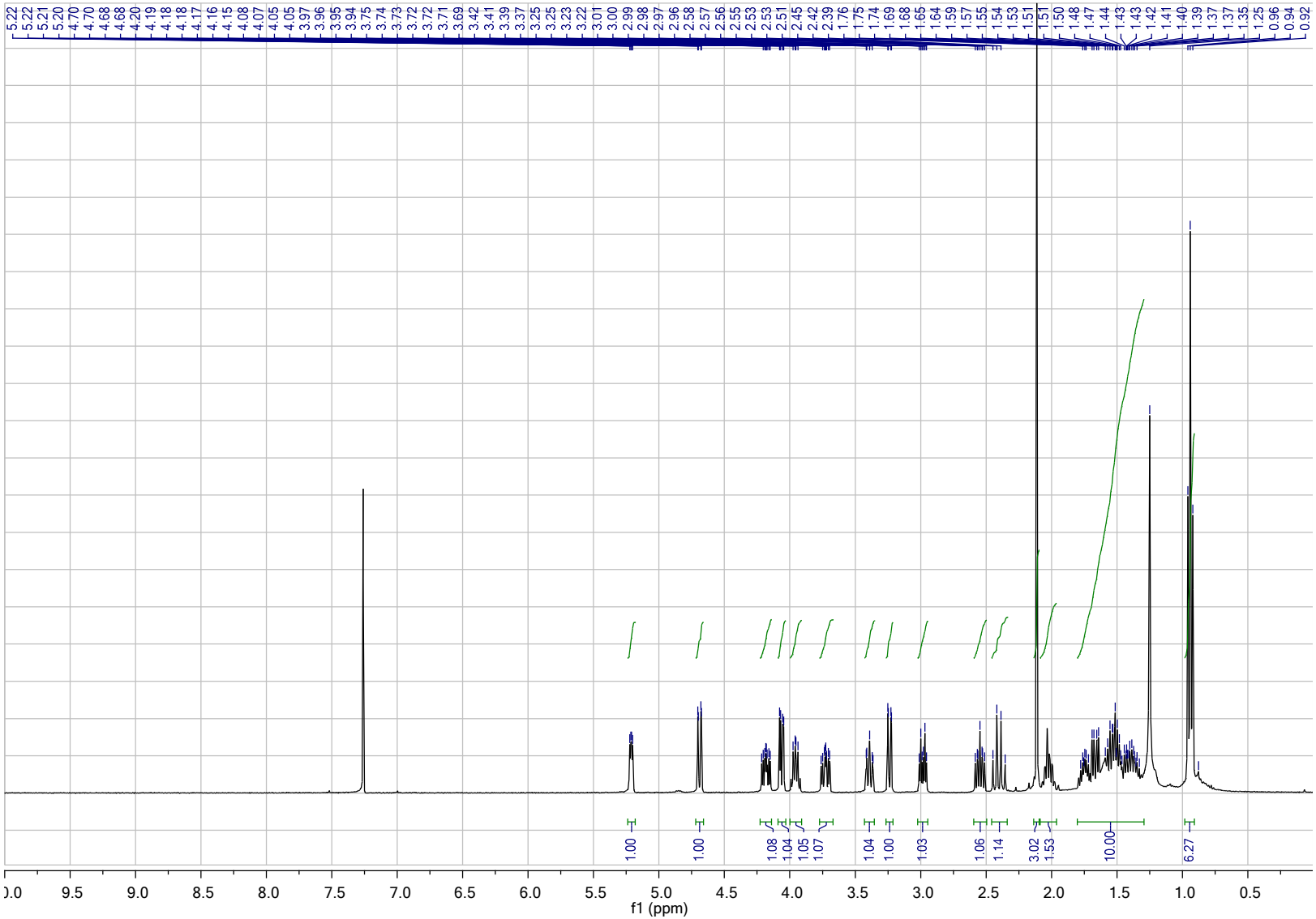


Figure S9: ^{1}H NMR spectrum of compound **6** ($CDCl_3$, 400 MHz).

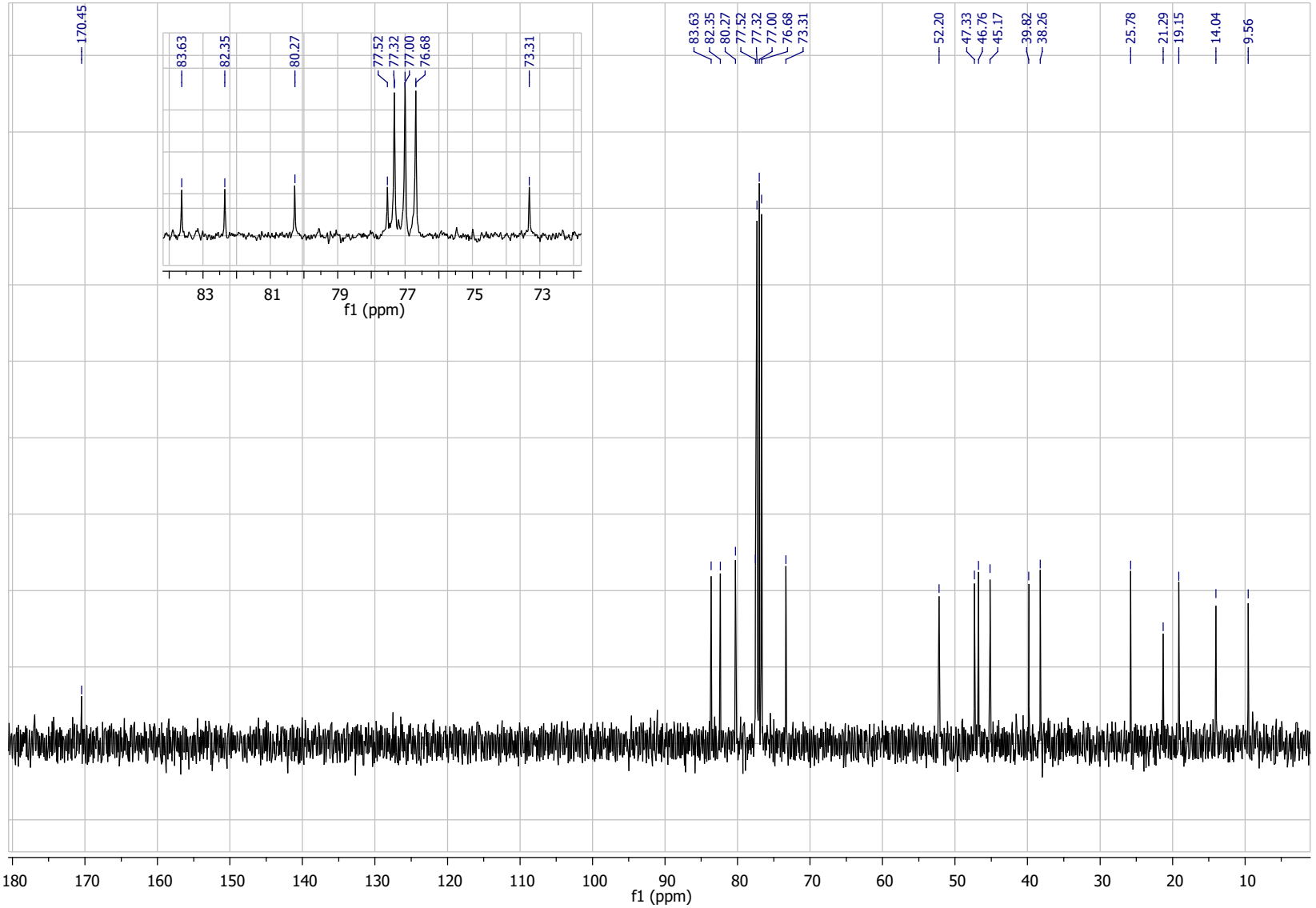


Figure S10: ^{13}C NMR spectrum of compound **6** ($CDCl_3$, 100 MHz).

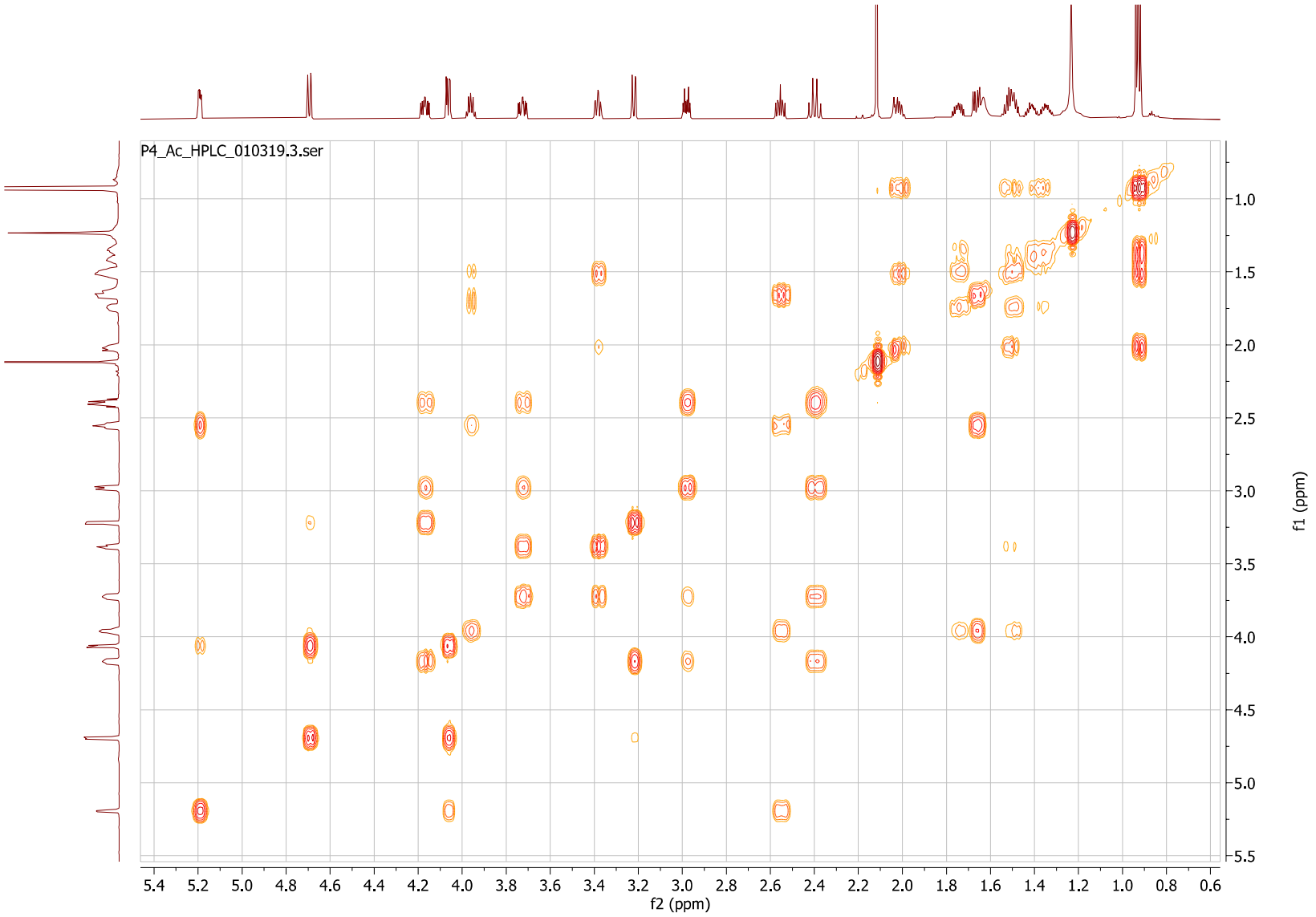


Figure S11: 2D COSY spectrum of compound **6** ($CDCl_3$, 700 MHz).

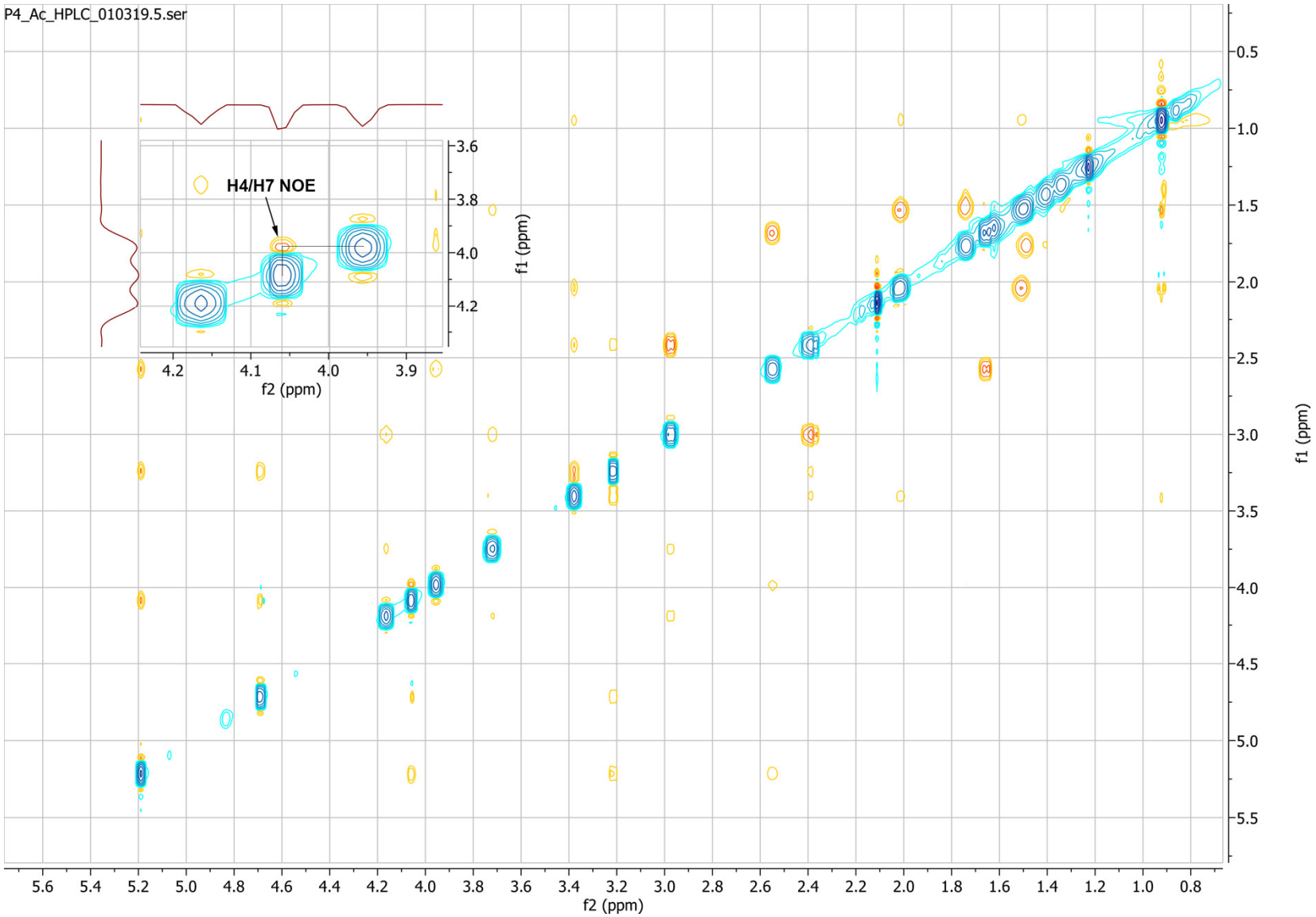


Figure S12: 2D NOESY spectrum of compound **6**. The NOE correlation between H4 and H7 protons is highlighted in the inset (600 ms mixing time, $CDCl_3$, 700 MHz).

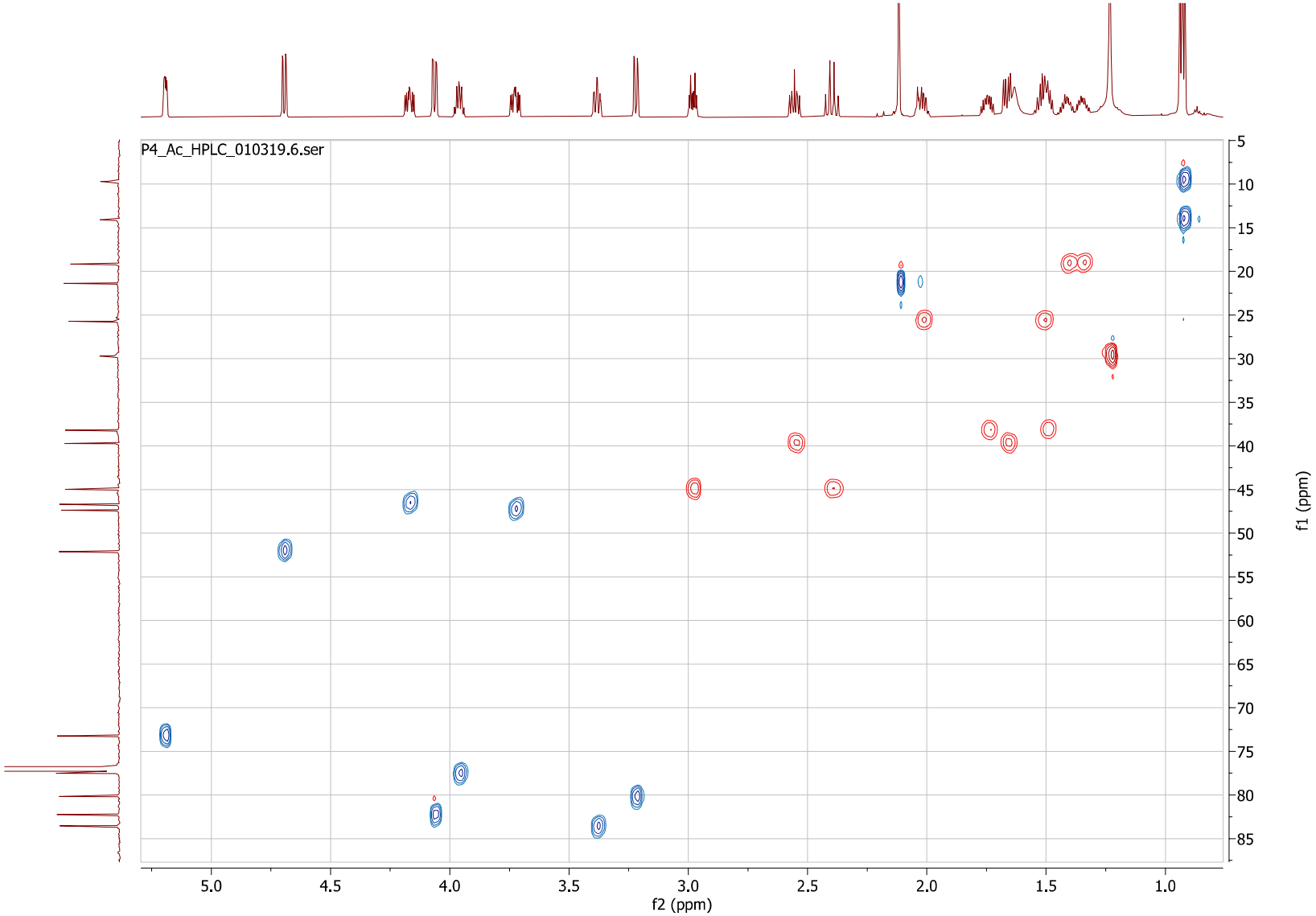


Figure S13: 2D HSQC spectrum of compound **6** ($CDCl_3$, 700 MHz).

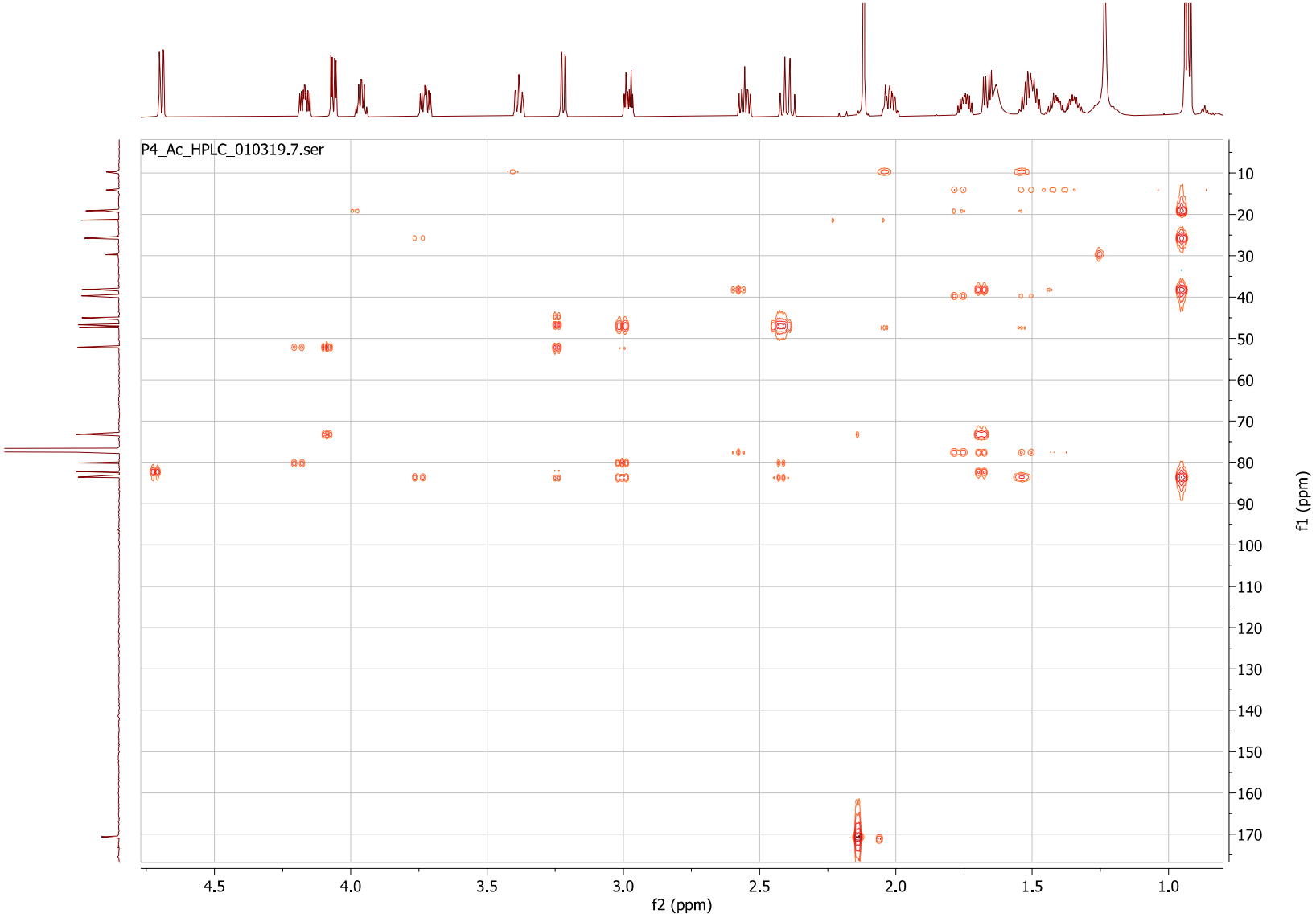


Figure S14: 2D HMBC spectrum of compound **6** ($CDCl_3$, 700 MHz).

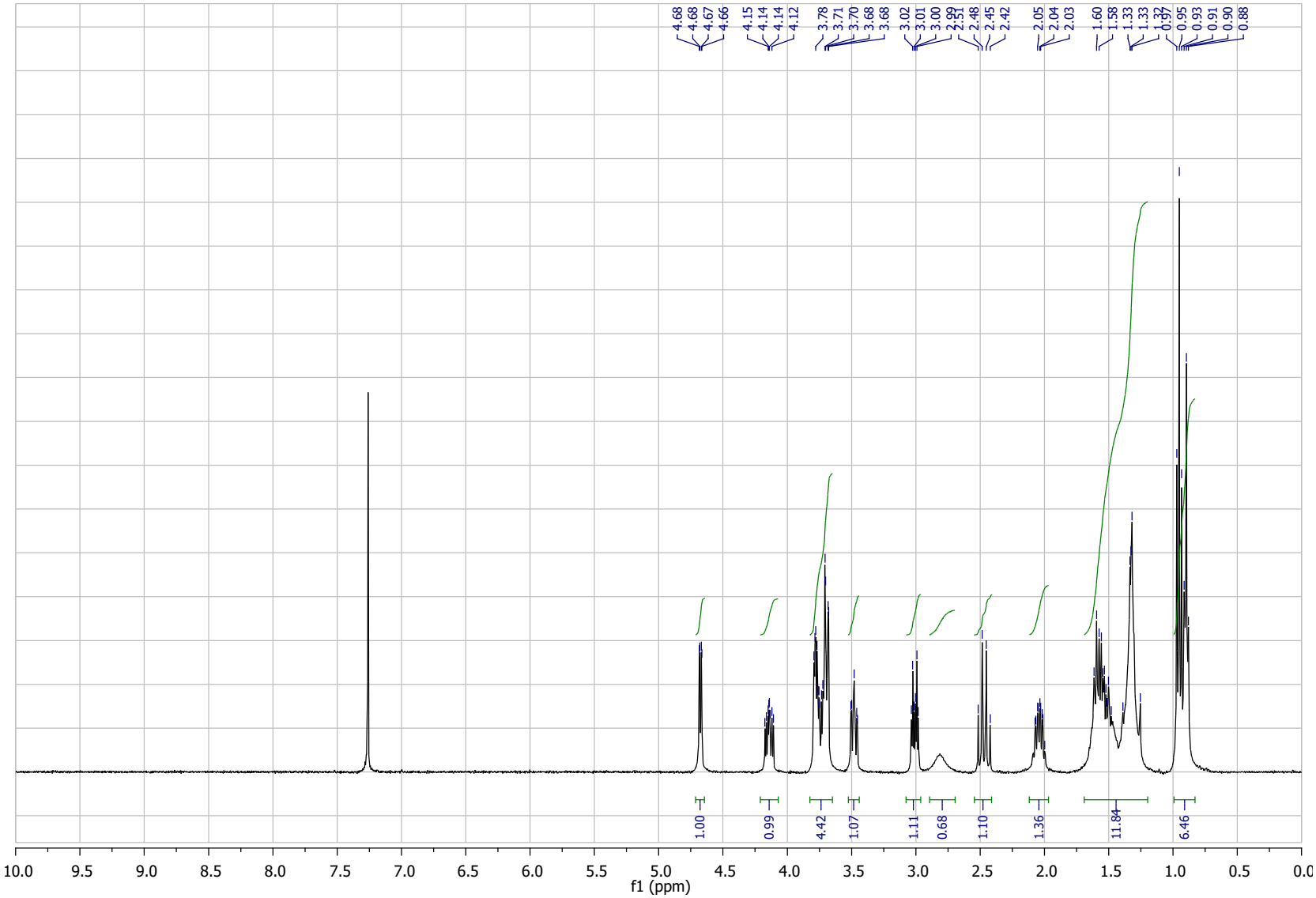


Figure S15: ^{1}H NMR spectrum of compound **7** ($CDCl_3$, 400 MHz).

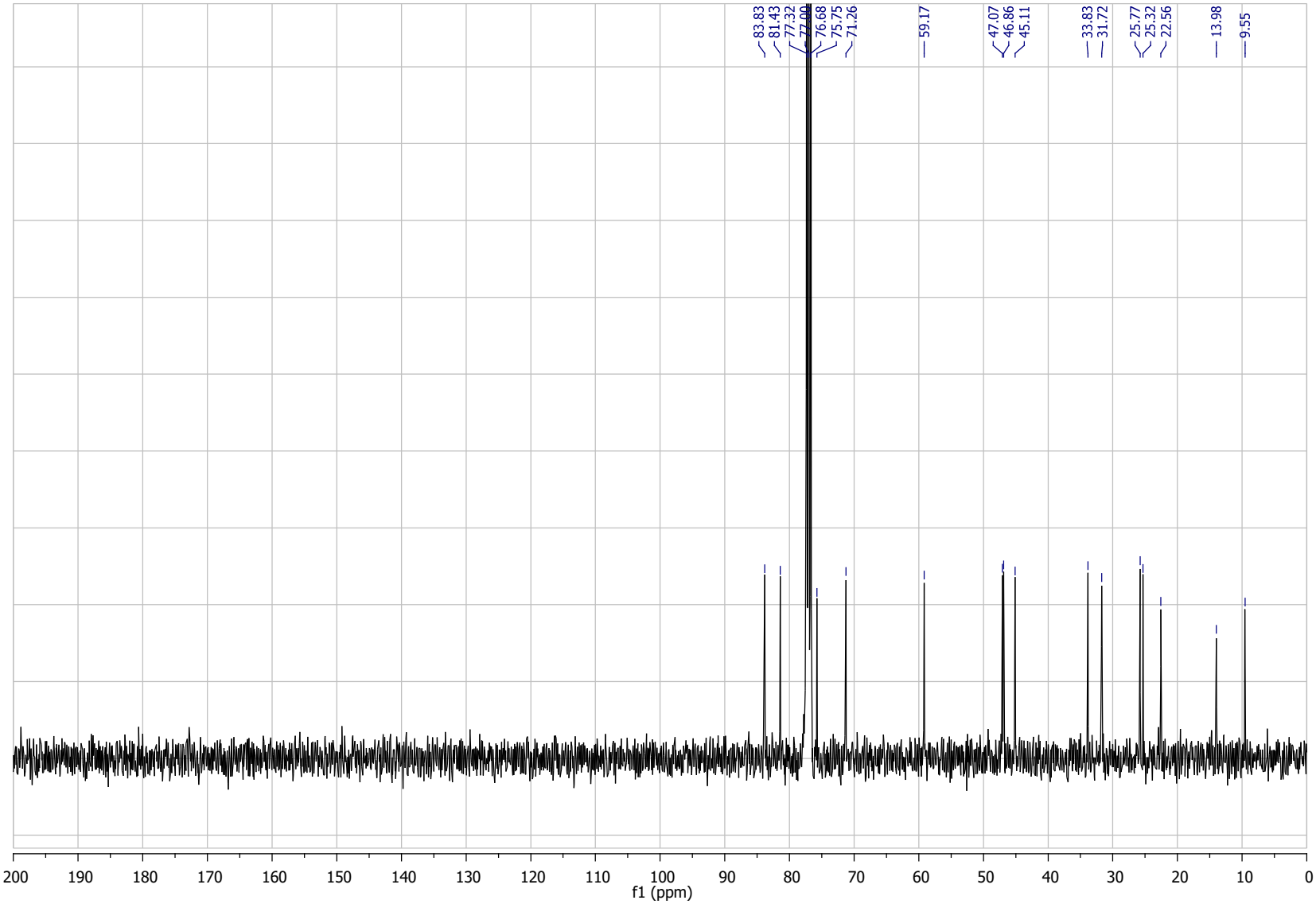


Figure S16: ^{13}C NMR spectrum of compound **7** ($CDCl_3$, 100 MHz).

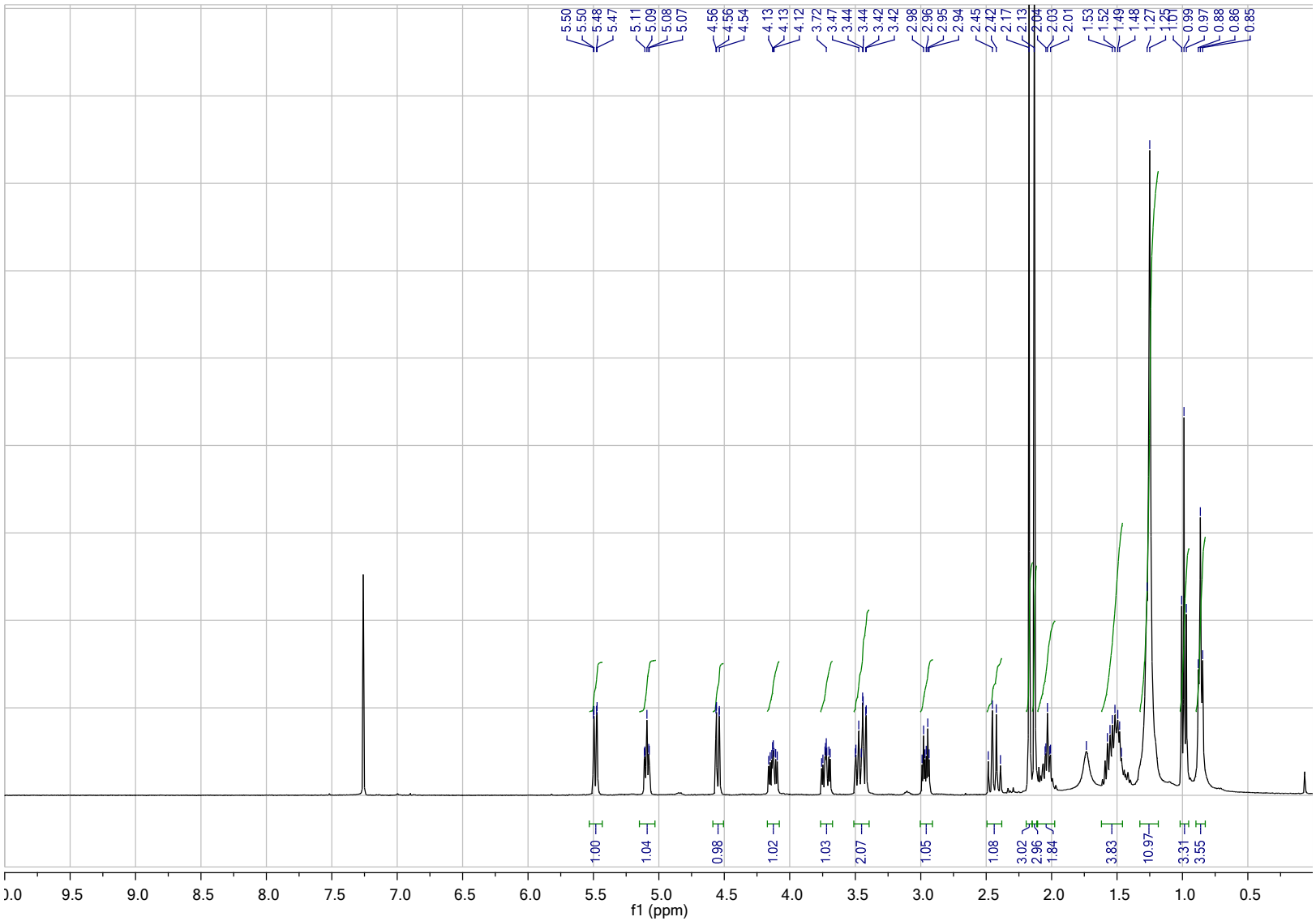


Figure S17: ^{1}H NMR spectrum of compound **8** ($CDCl_3$, 400 MHz).

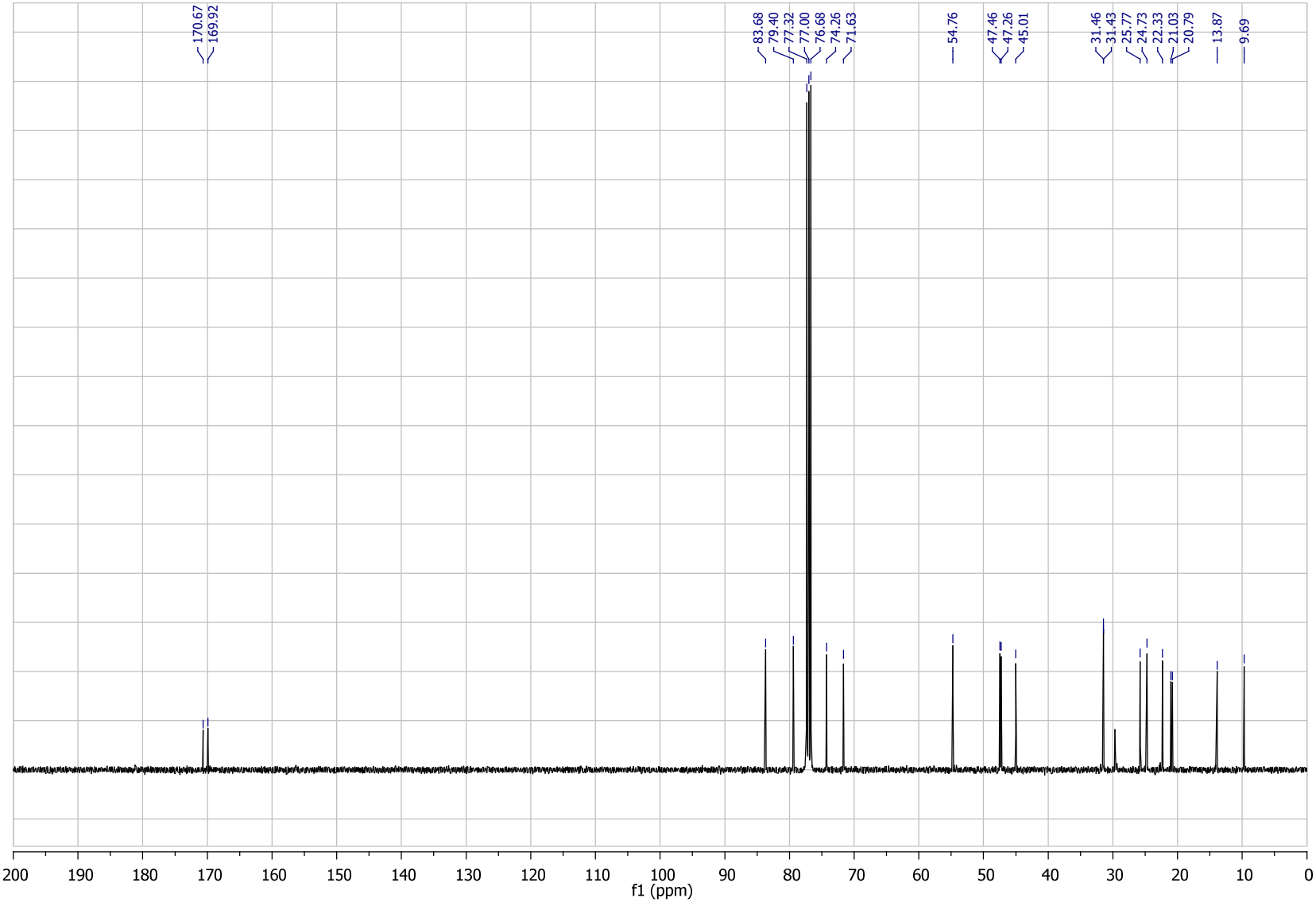


Figure S18: ^{13}C NMR spectrum of compound **8** ($CDCl_3$, 100 MHz).

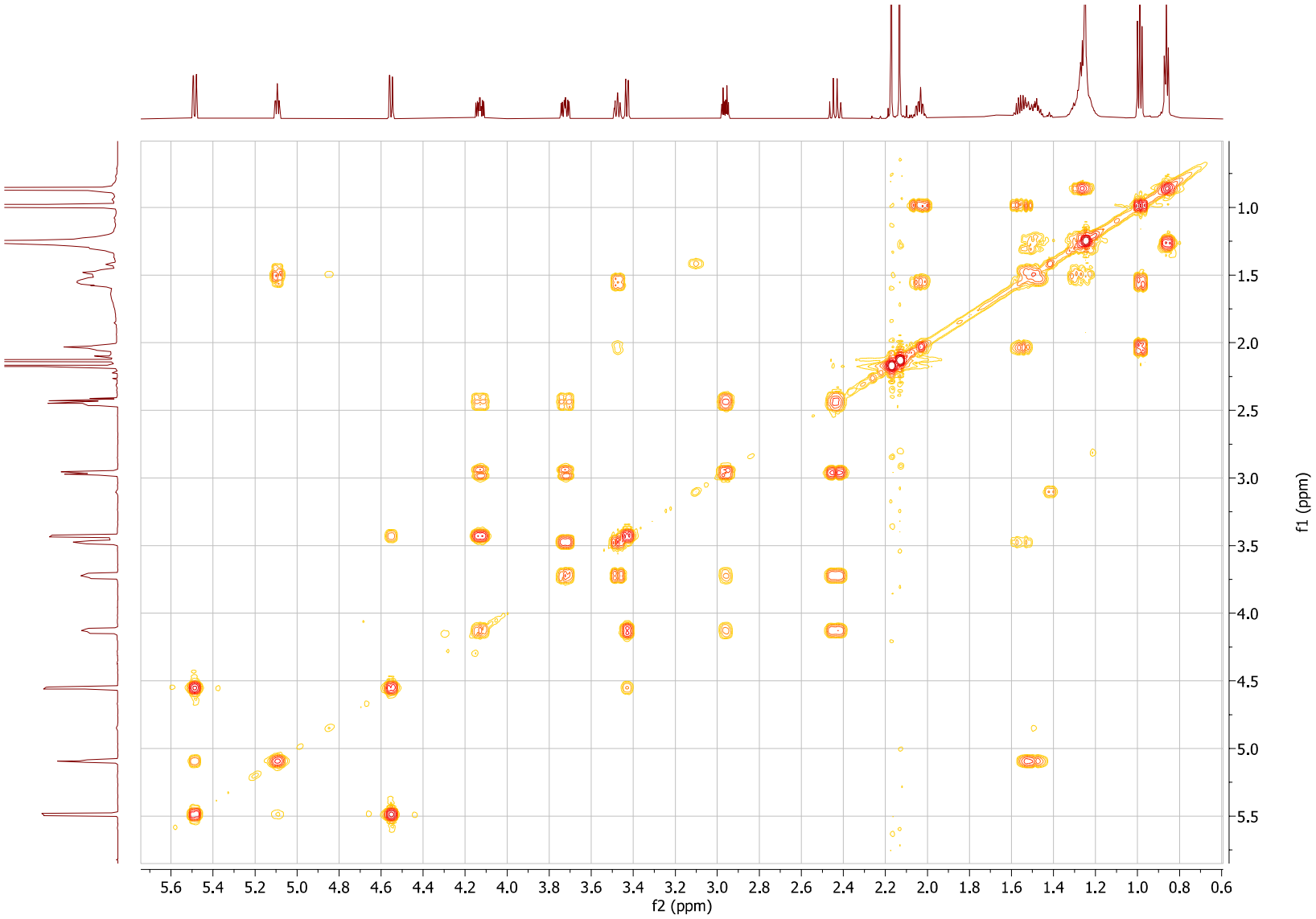


Figure S19: 2D COSY spectrum of compound **8** ($CDCl_3$, 700 MHz).

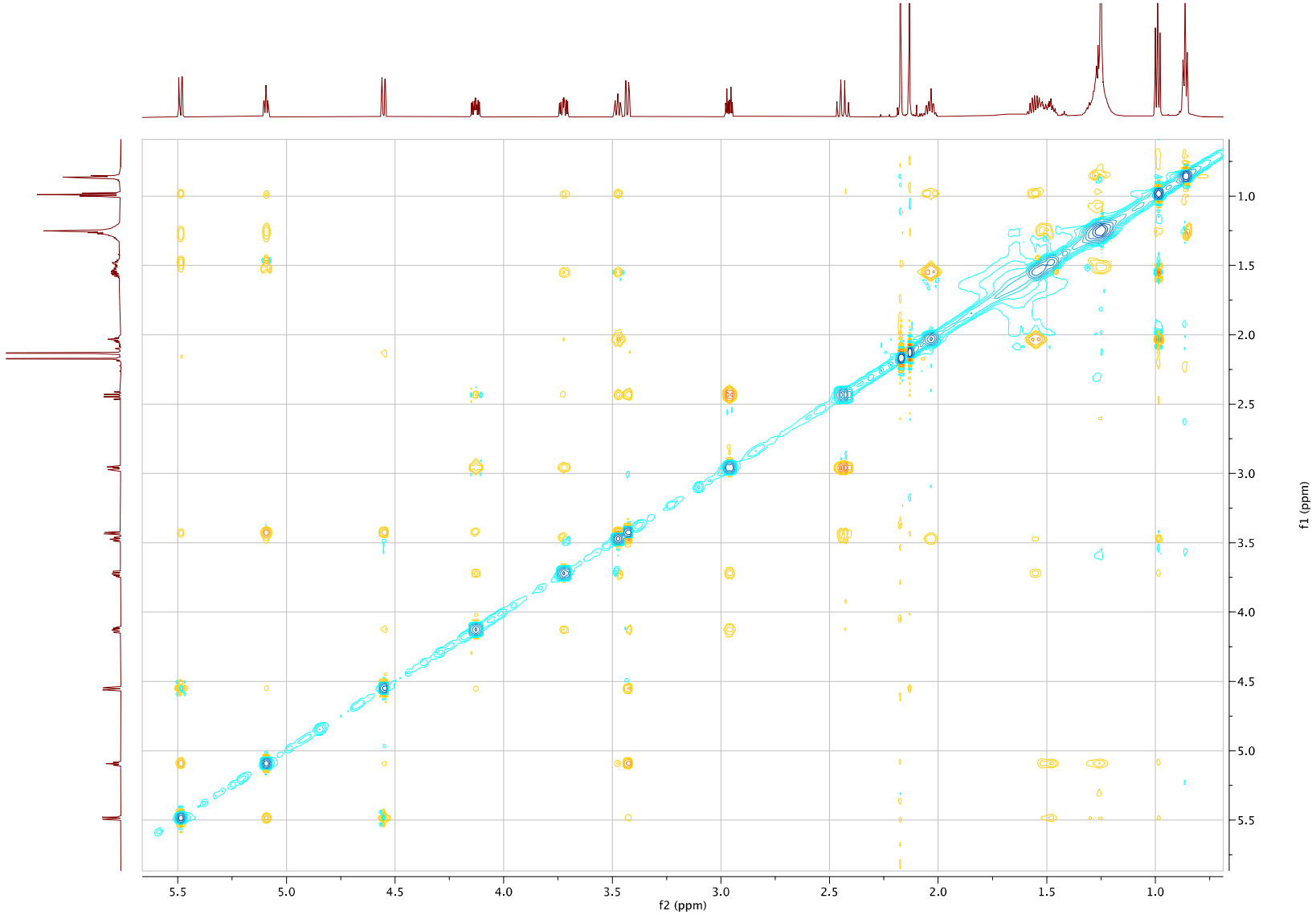


Figure S20: 2D NOESY spectrum of compound **8** (600 ms mixing time, $CDCl_3$, 700 MHz).

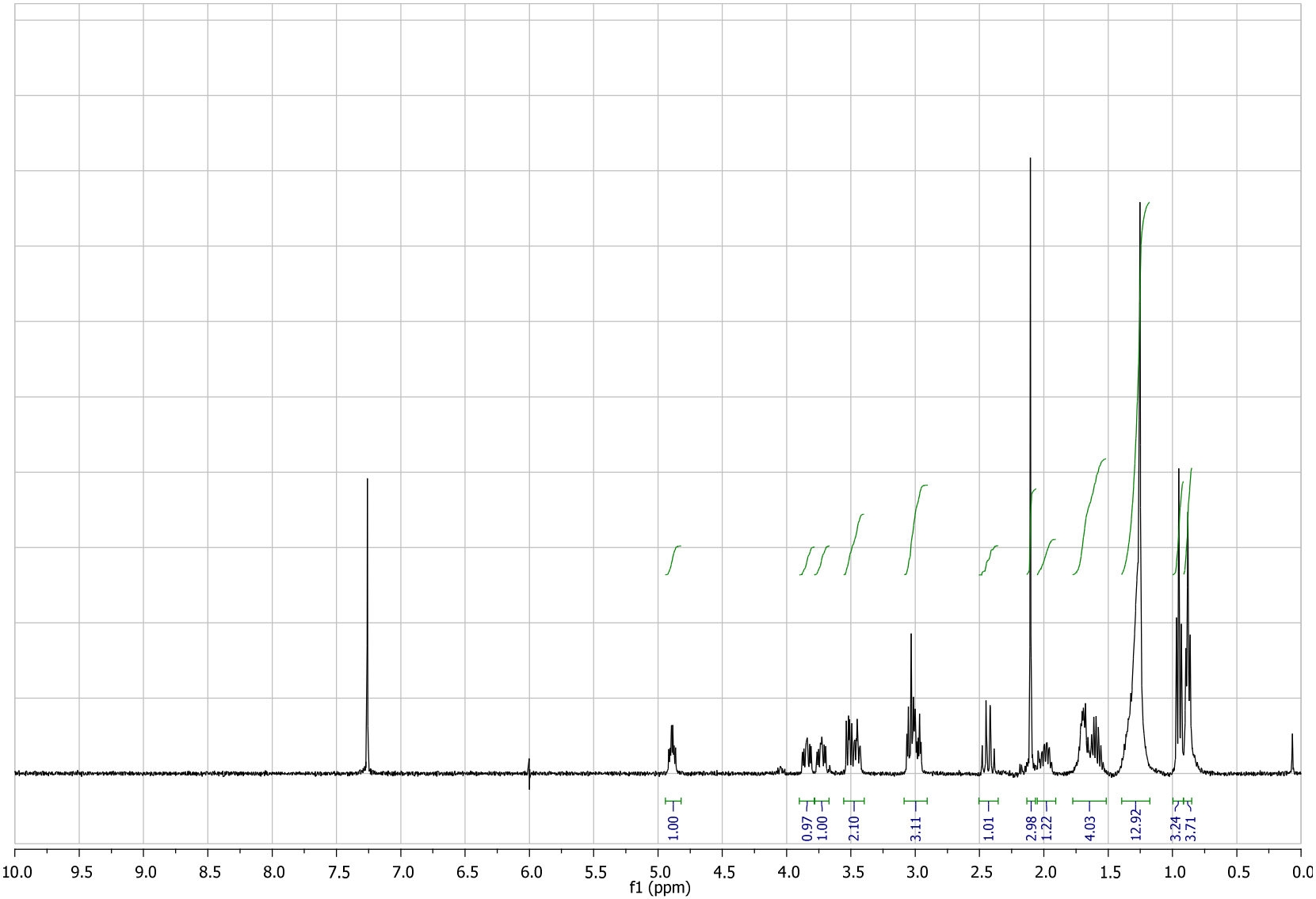


Figure S21: ^{1}H NMR spectrum of compound **9** ($CDCl_3$, 400 MHz).

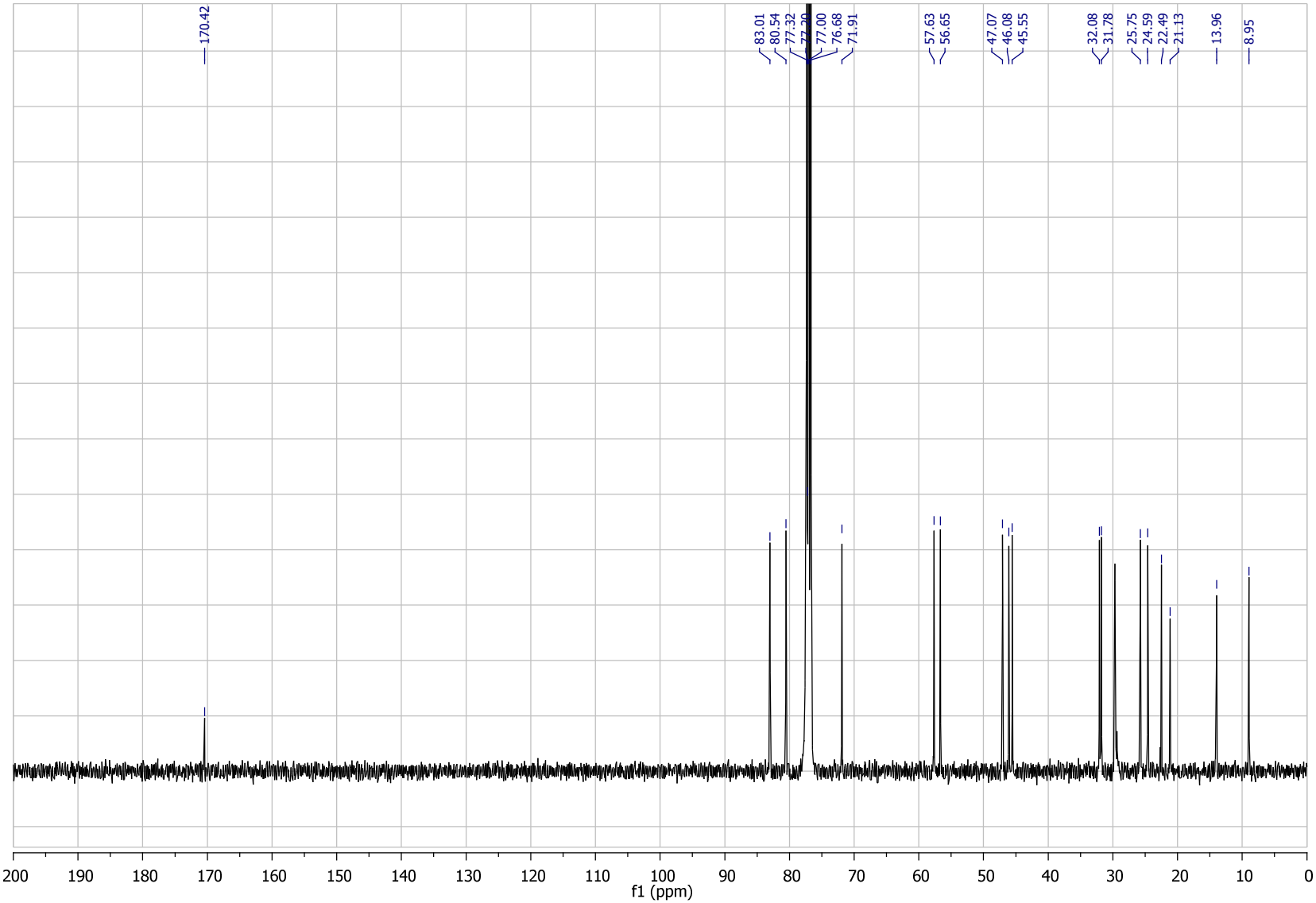


Figure S22: ^{13}C NMR spectrum of compound **9** ($CDCl_3$, 100 MHz).

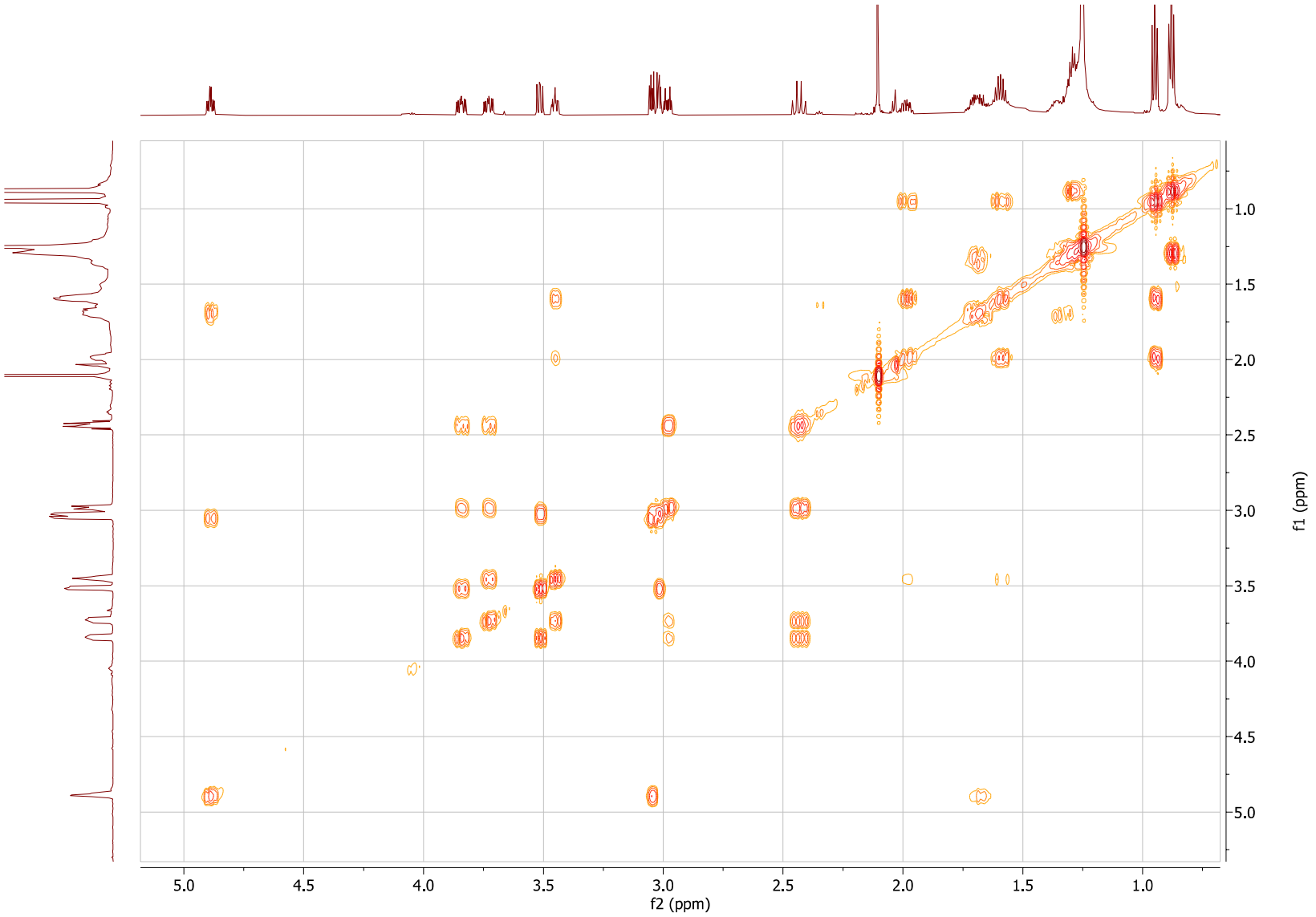


Figure S23: 2D COSY spectrum of compound **9** ($CDCl_3$, 700 MHz).

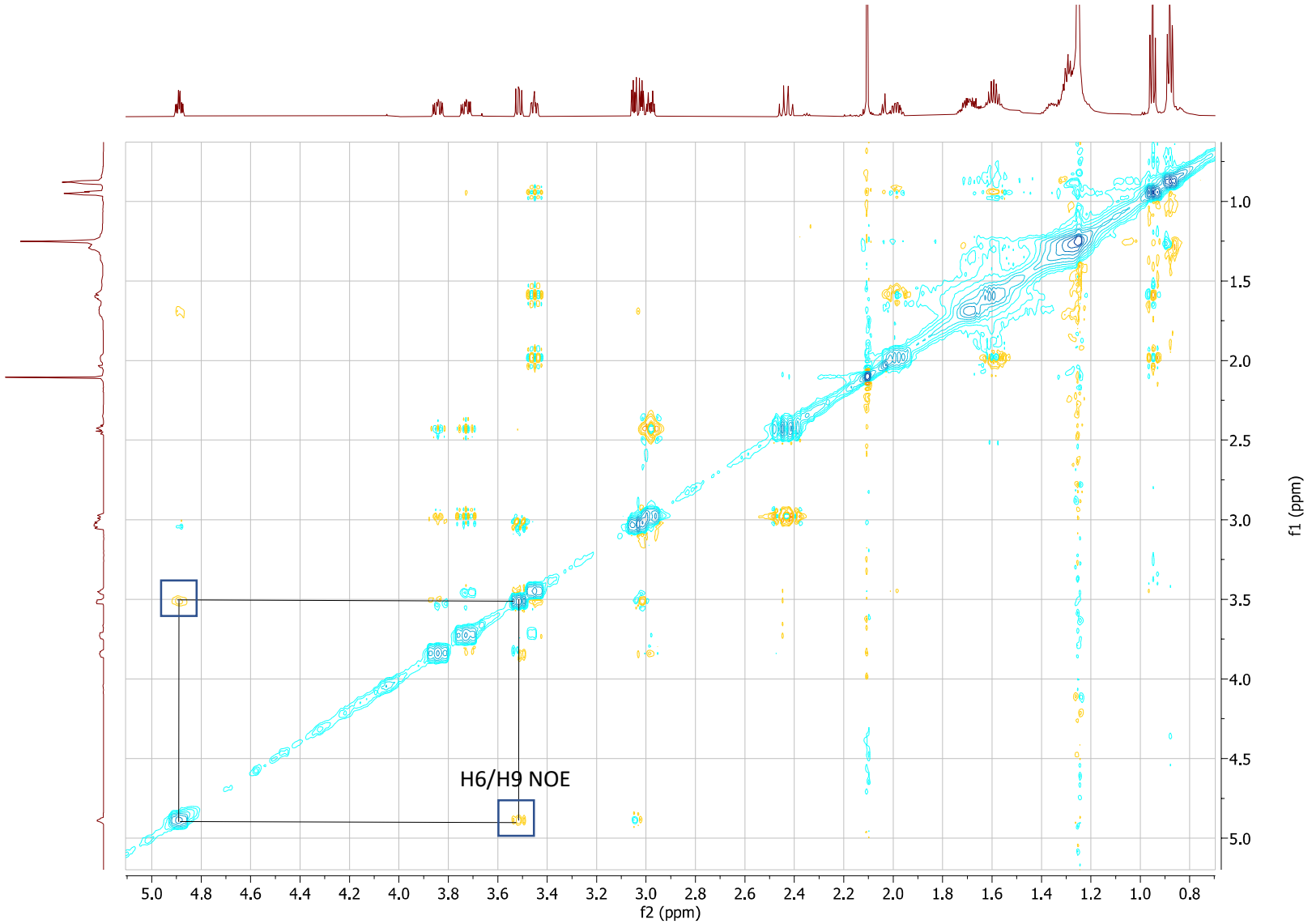


Figure S24: 2D NOESY spectrum of compound **9**. The NOE correlation between H6 and H9 protons is highlighted in the spectrum (600 ms mixing time, $CDCl_3$, 700 MHz).

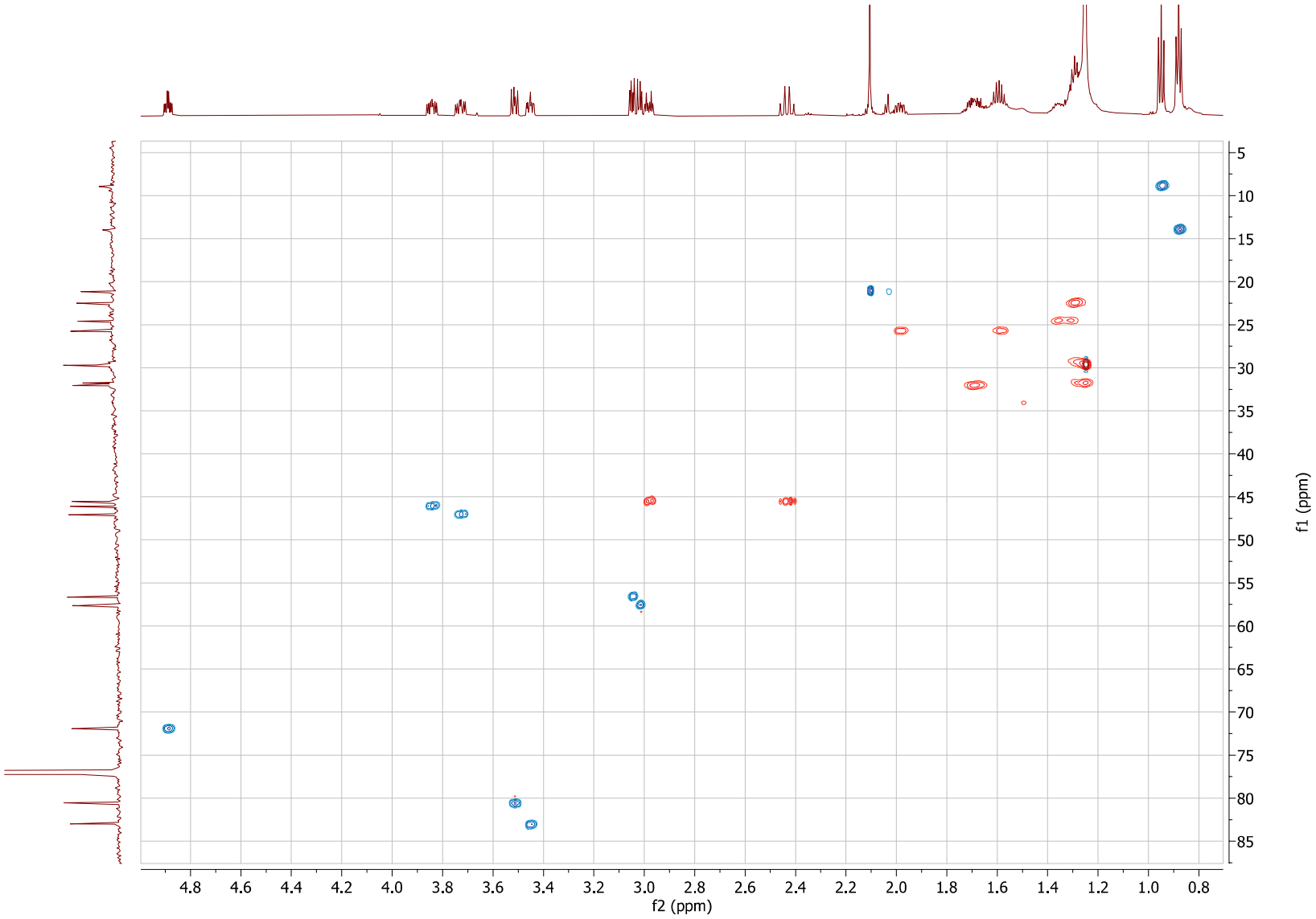


Figure S25: 2D HSQC spectrum of compound **9** ($CDCl_3$, 700 MHz).

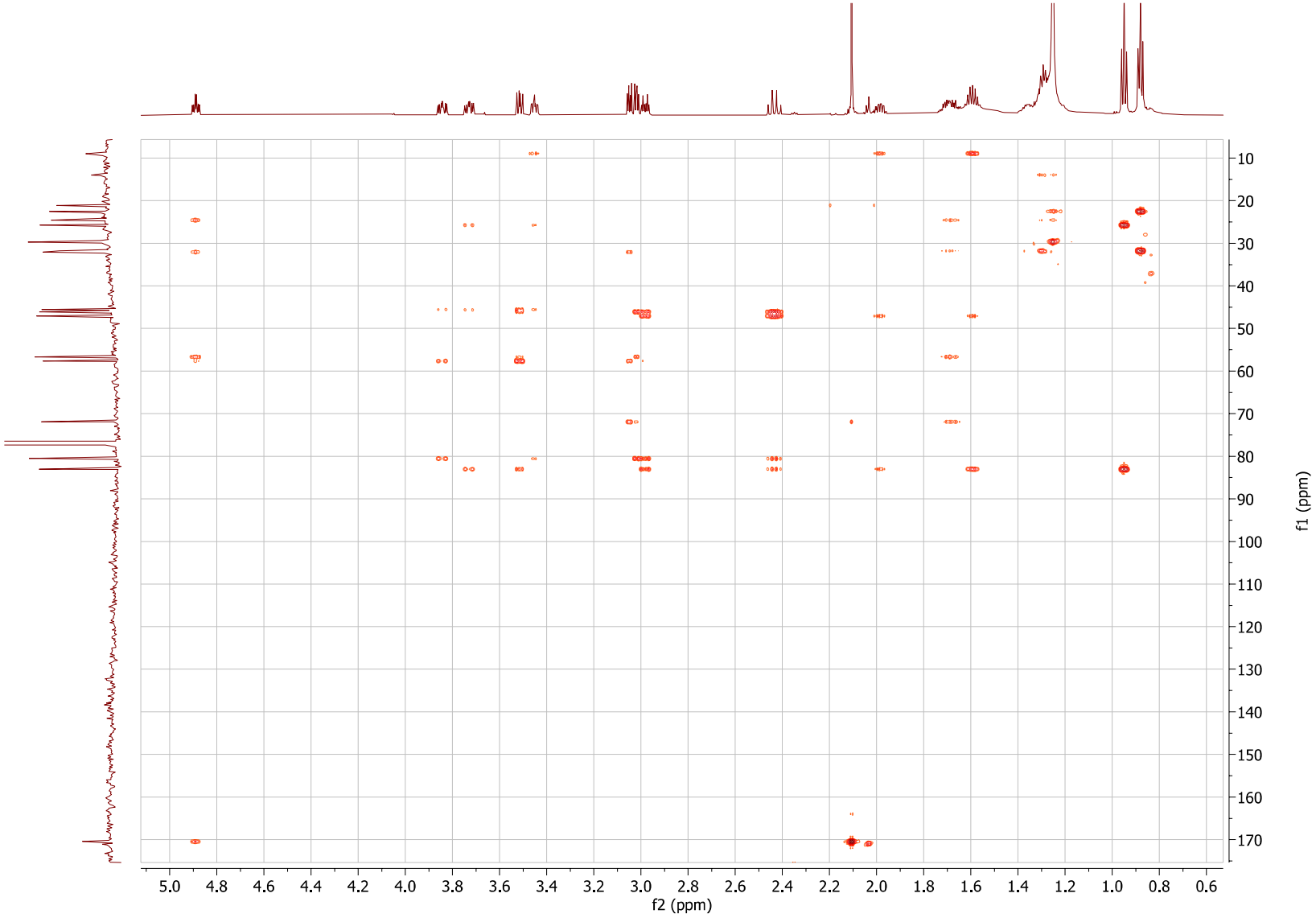


Figure S26: 2D HMBC spectrum of compound **9** ($CDCl_3$, 700 MHz).

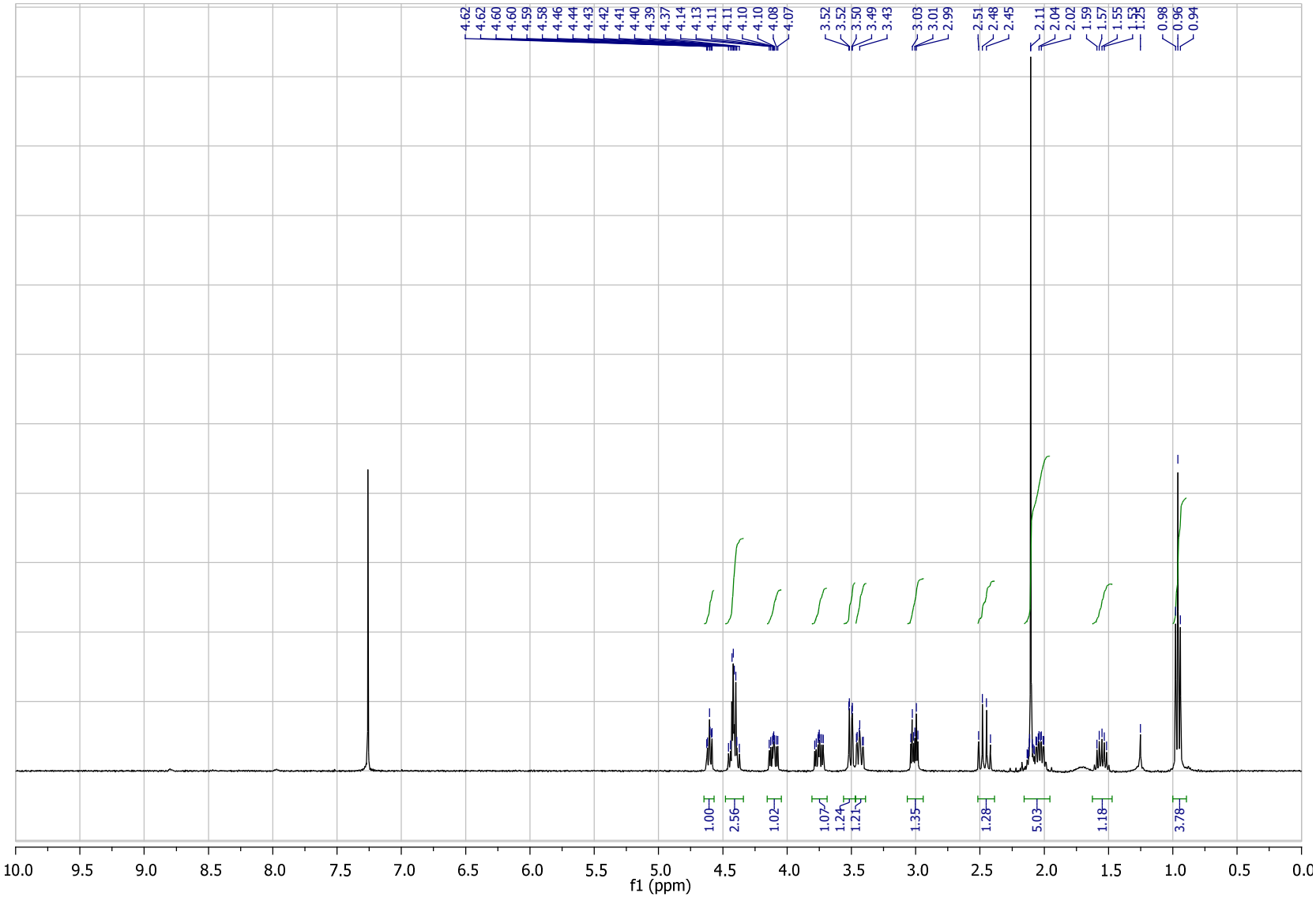


Figure S27: ^{1}H NMR spectrum of compound **10** ($CDCl_3$, 400 MHz).

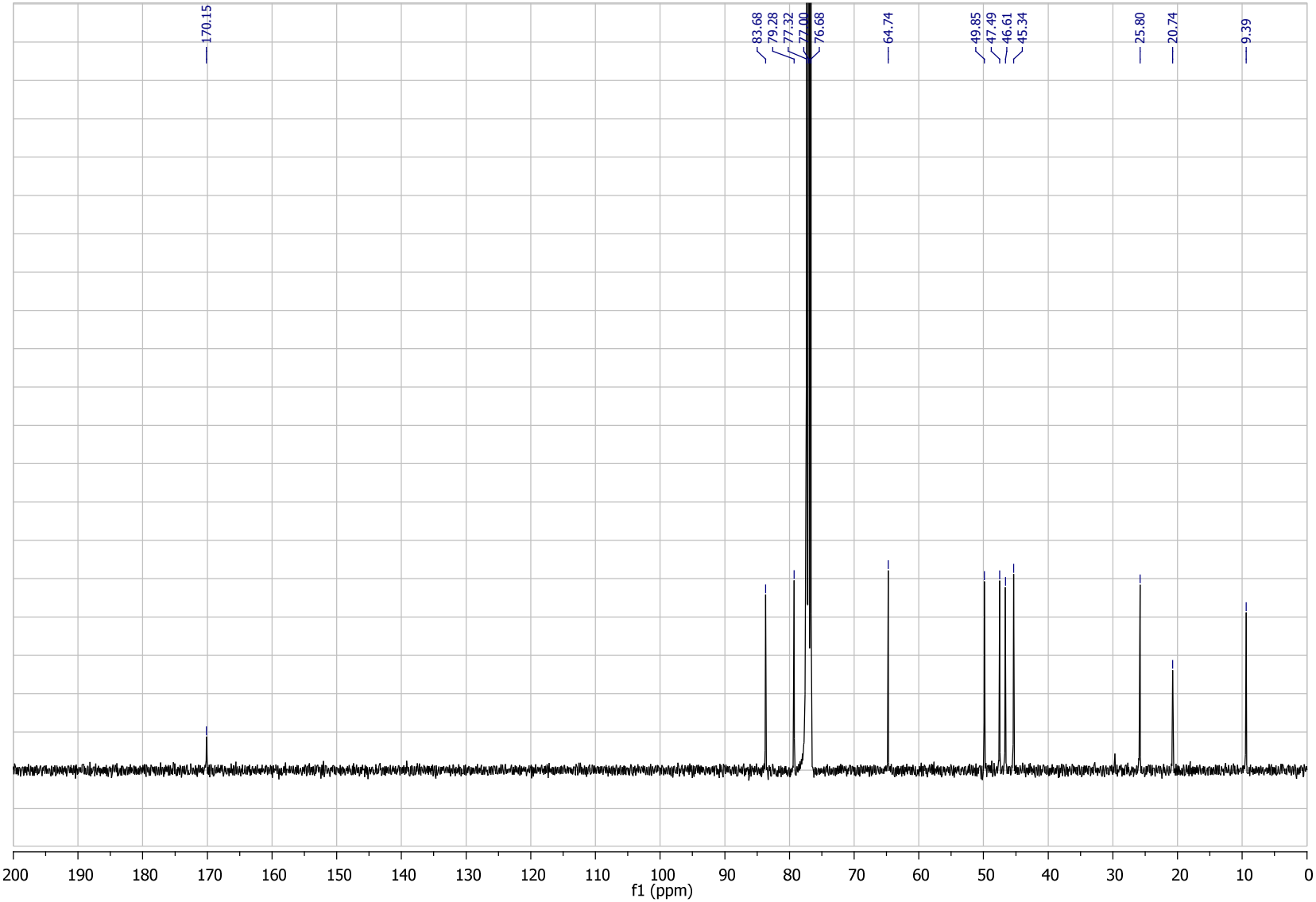


Figure S28: ^{13}C NMR spectrum of compound **10** ($CDCl_3$, 100 MHz).

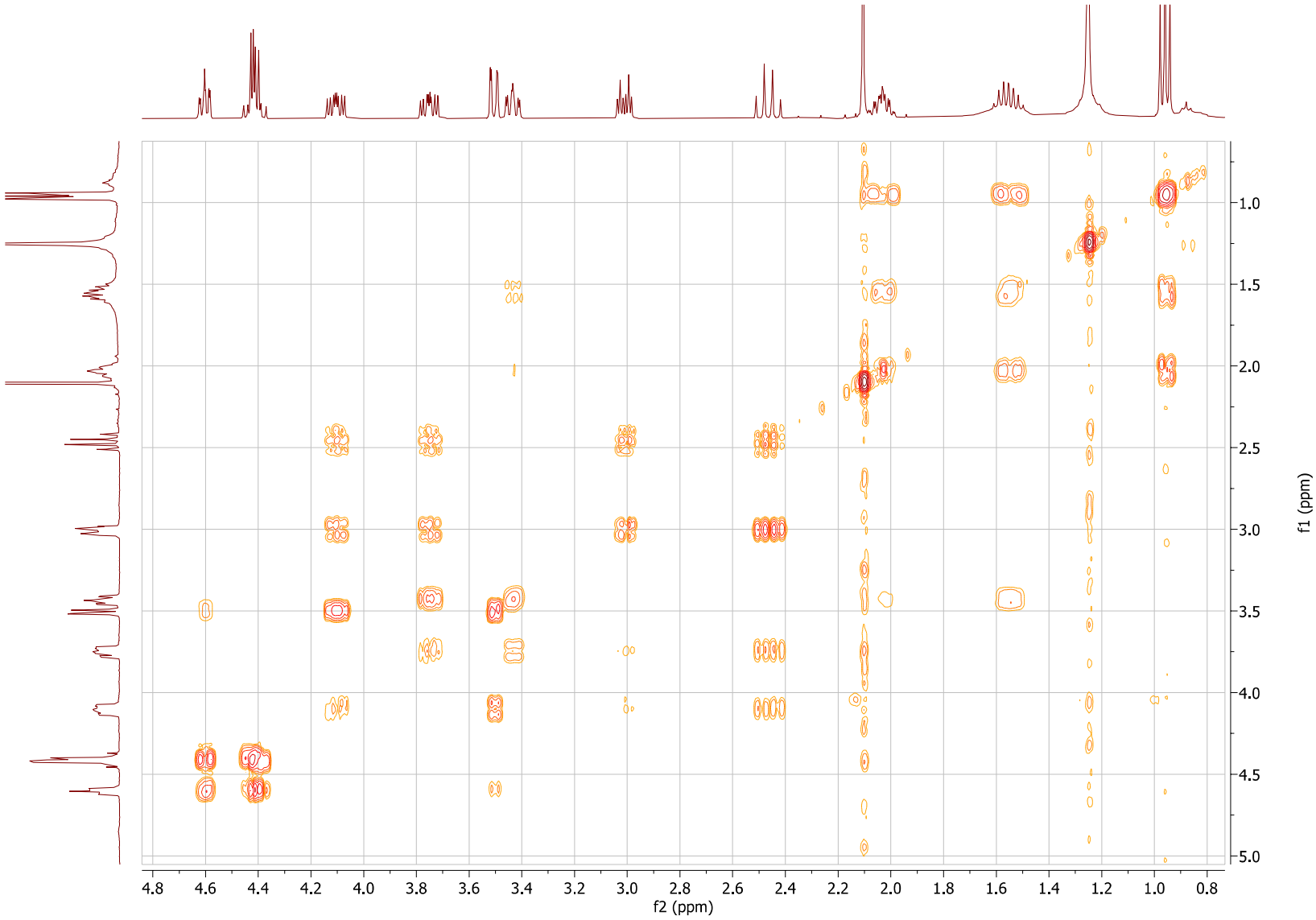


Figure S29: 2D COSY spectrum of compound **10** ($CDCl_3$, 400 MHz).

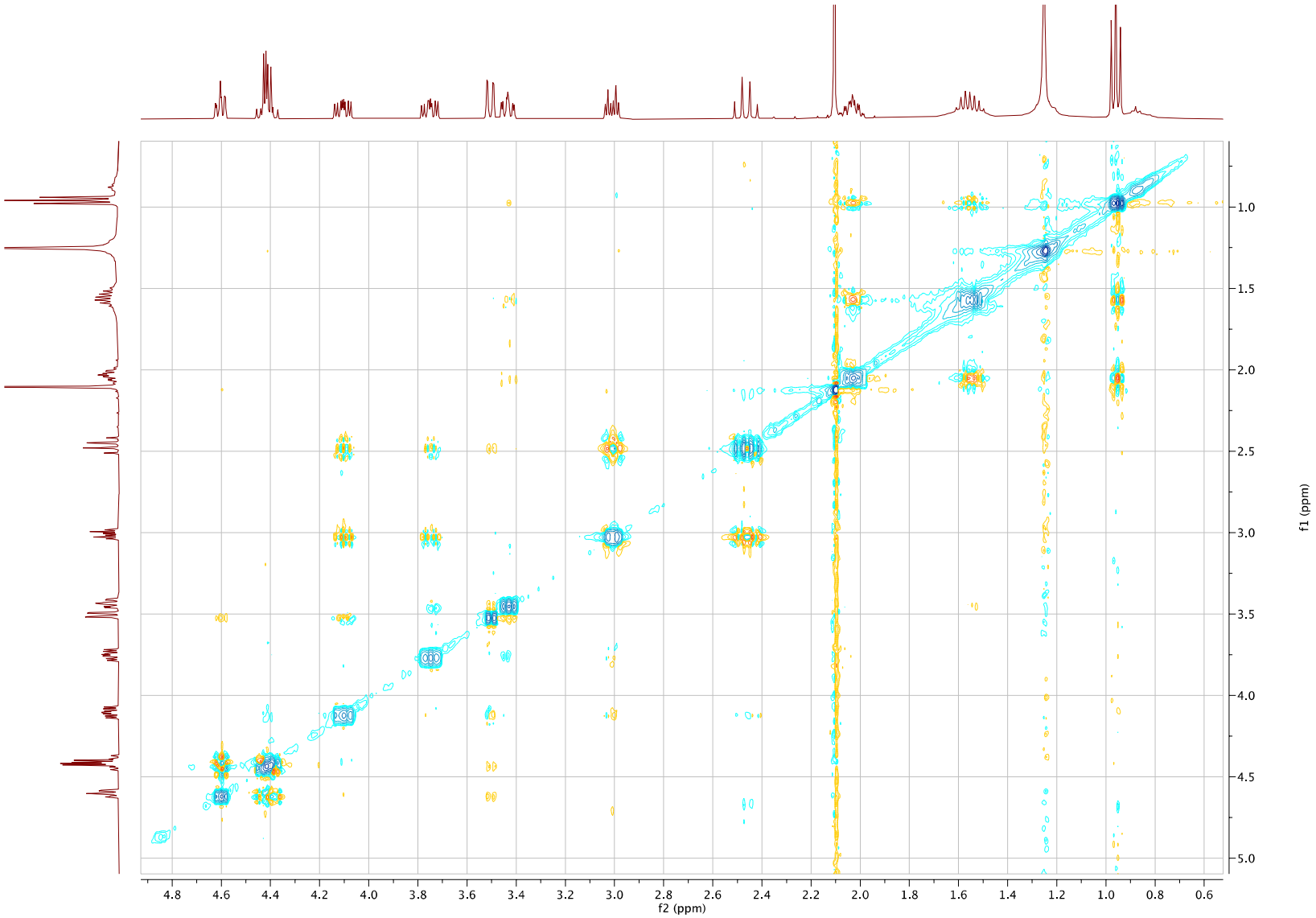


Figure S30: 2D NOESY spectrum of compound **10** (600 ms mixing time, $CDCl_3$, 400 MHz).

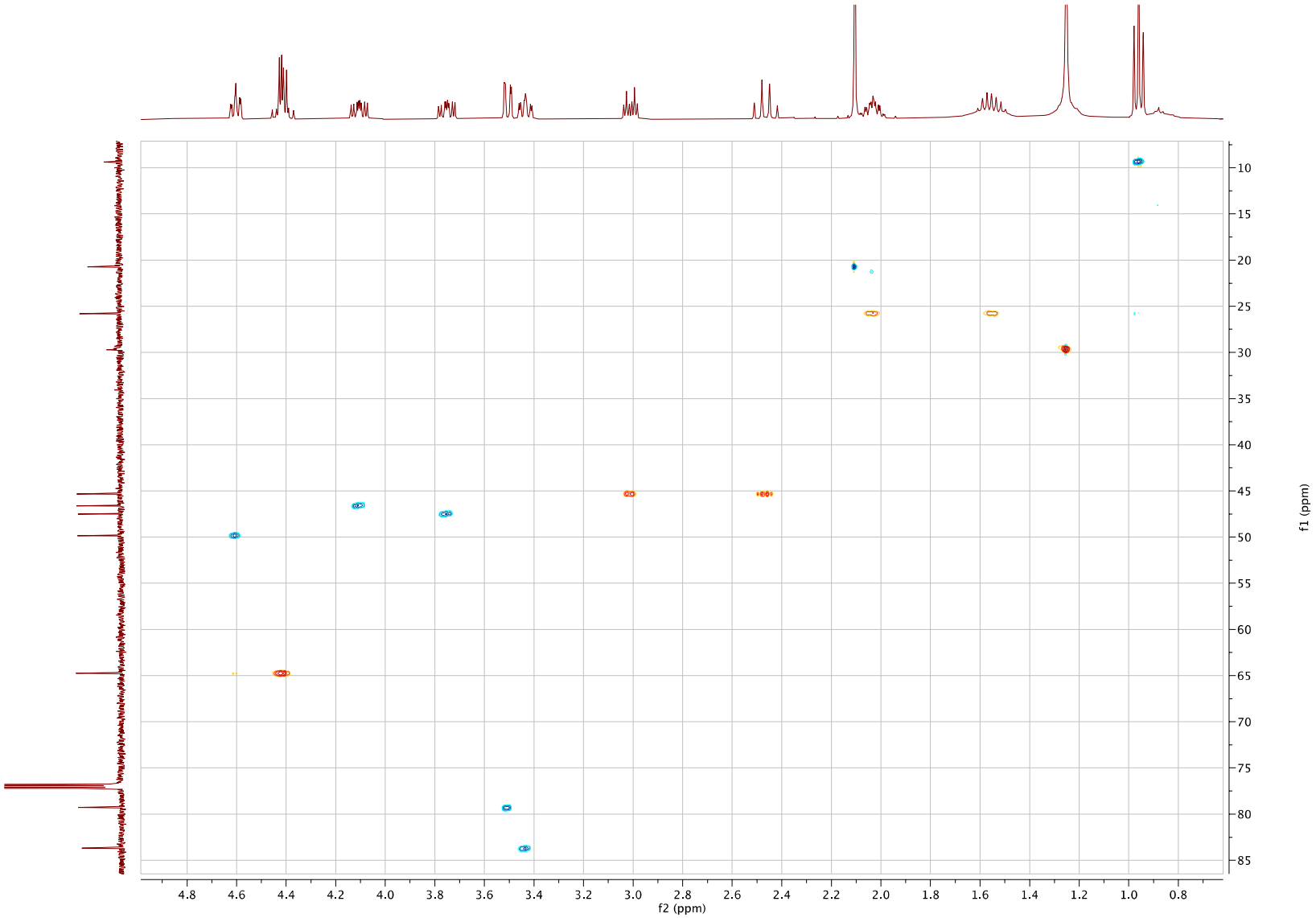


Figure S31: 2D HSQC spectrum of compound **10** ($CDCl_3$, 700 MHz).

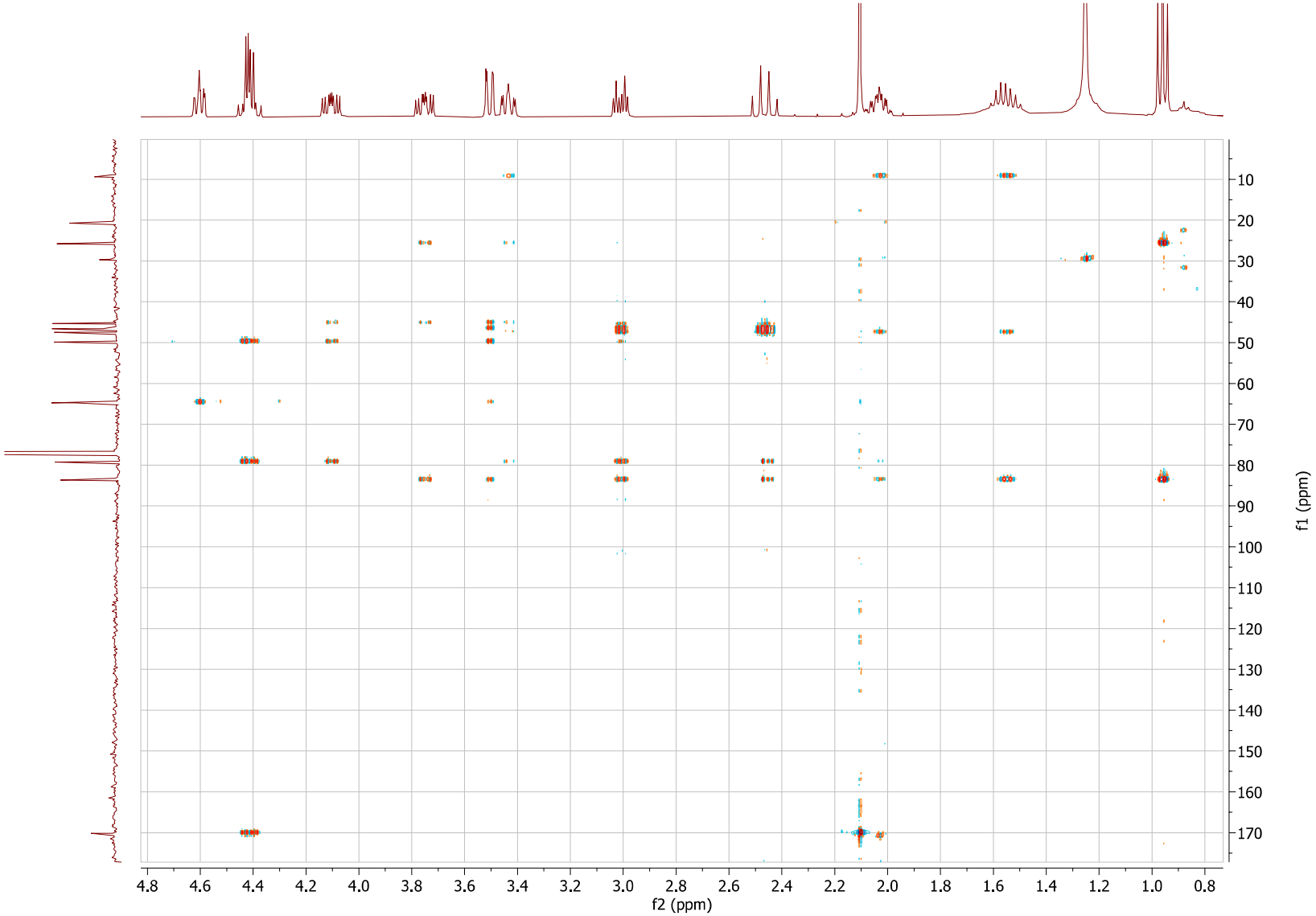


Figure S32: 2D HMBC spectrum of compound **10** ($CDCl_3$, 700 MHz).

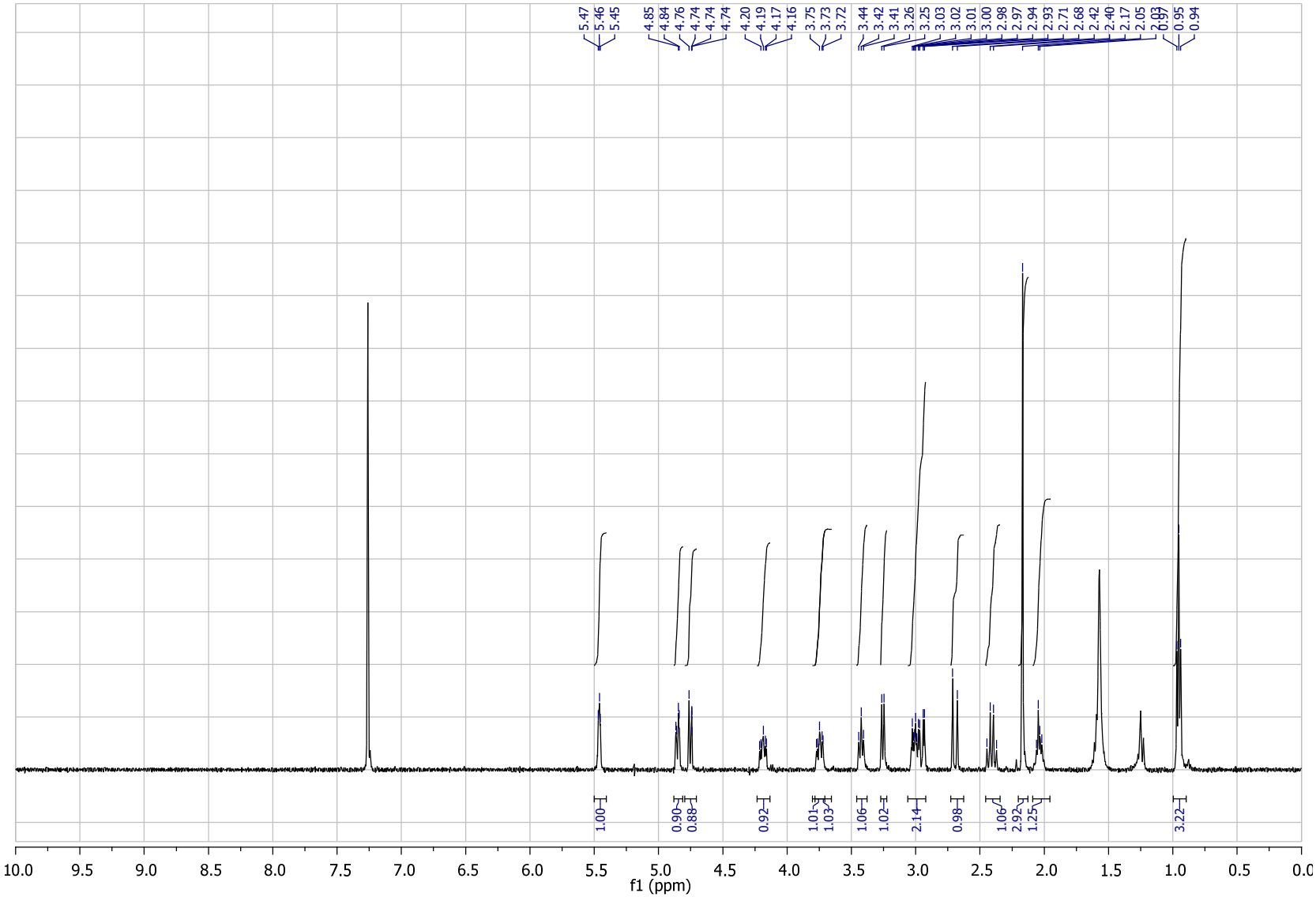


Figure S33: ^{1}H NMR spectrum of compound **11** ($CDCl_3$, 400 MHz).

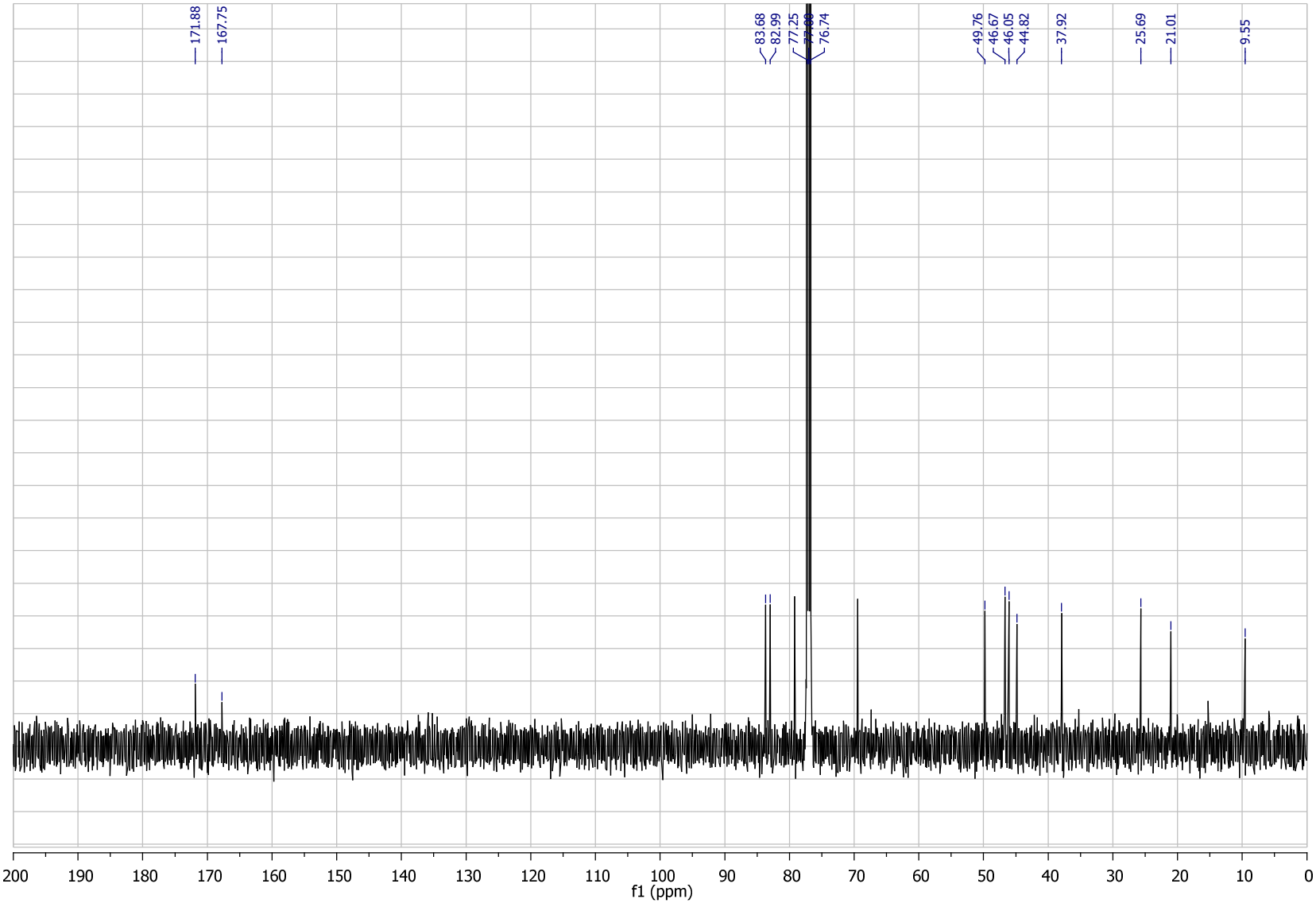


Figure S34: ^{13}C NMR spectrum of compound **11** ($CDCl_3$, 100 MHz).

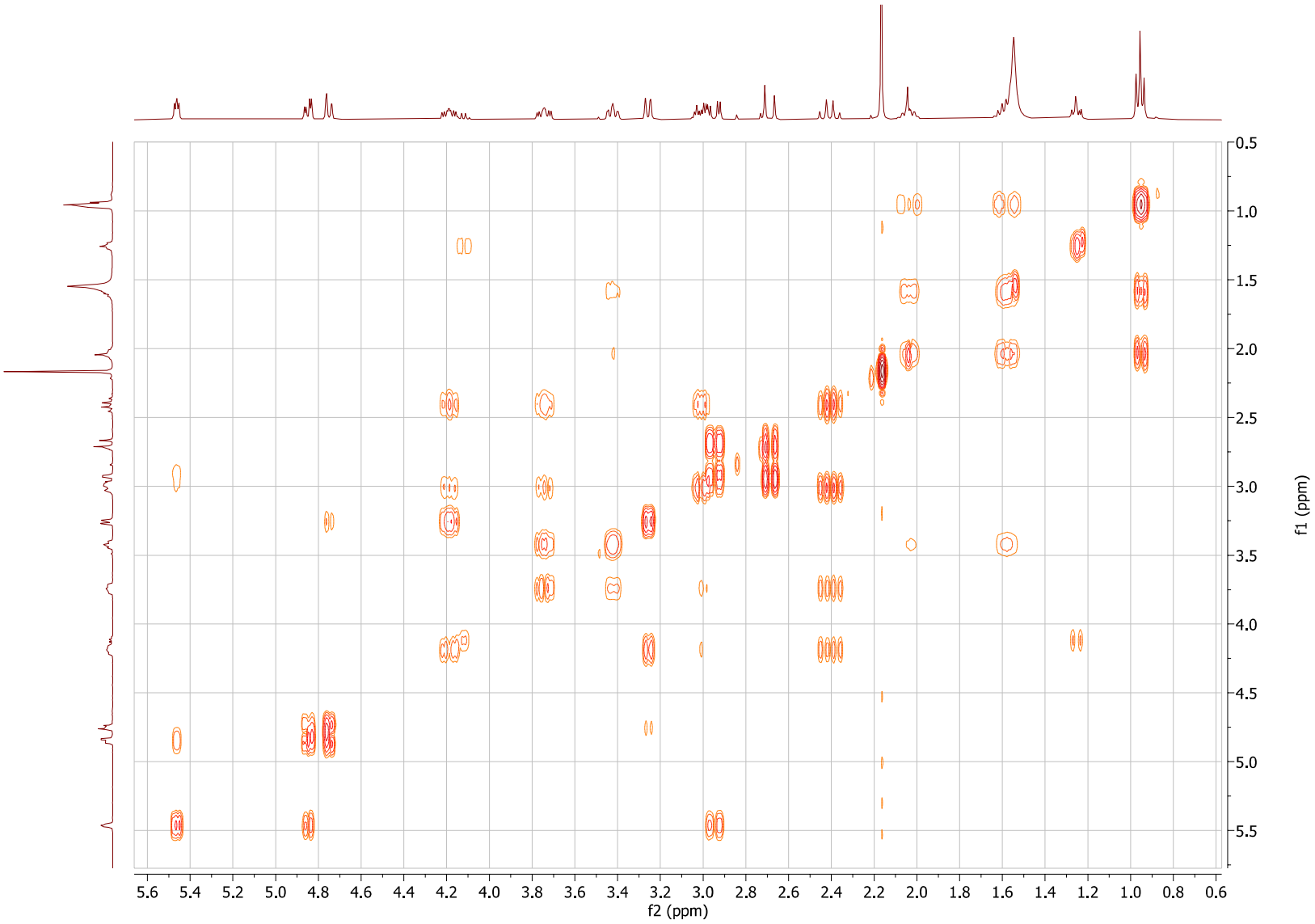


Figure S35: 2D COSY spectrum of compound **11** ($CDCl_3$, 700 MHz).

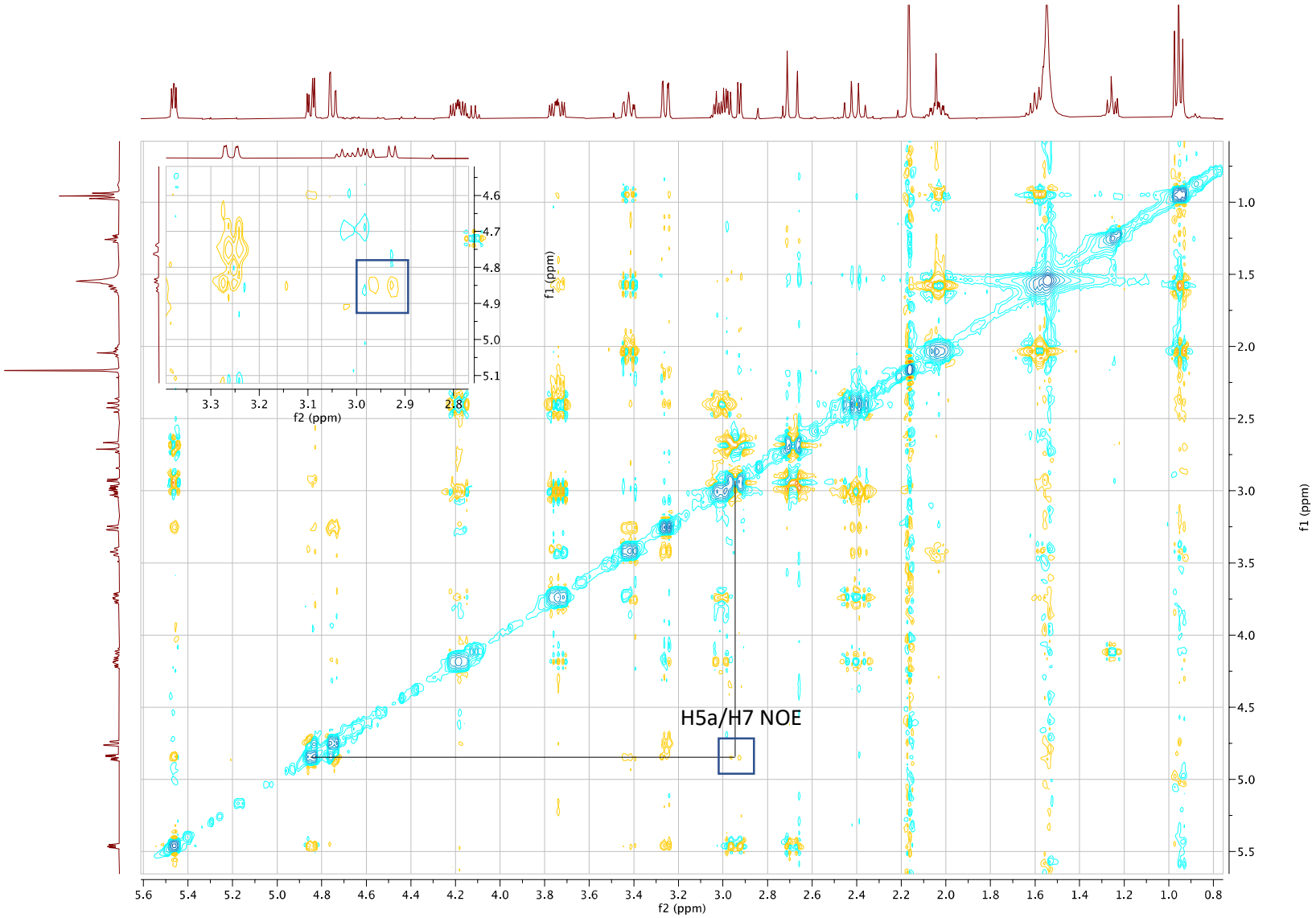


Figure S36: 2D NOESY spectrum of compound **11**. The NOE correlation between H5a and H7 protons is highlighted in the spectrum and in the inset (mixing time 600 ms, $CDCl_3$, 700 MHz).

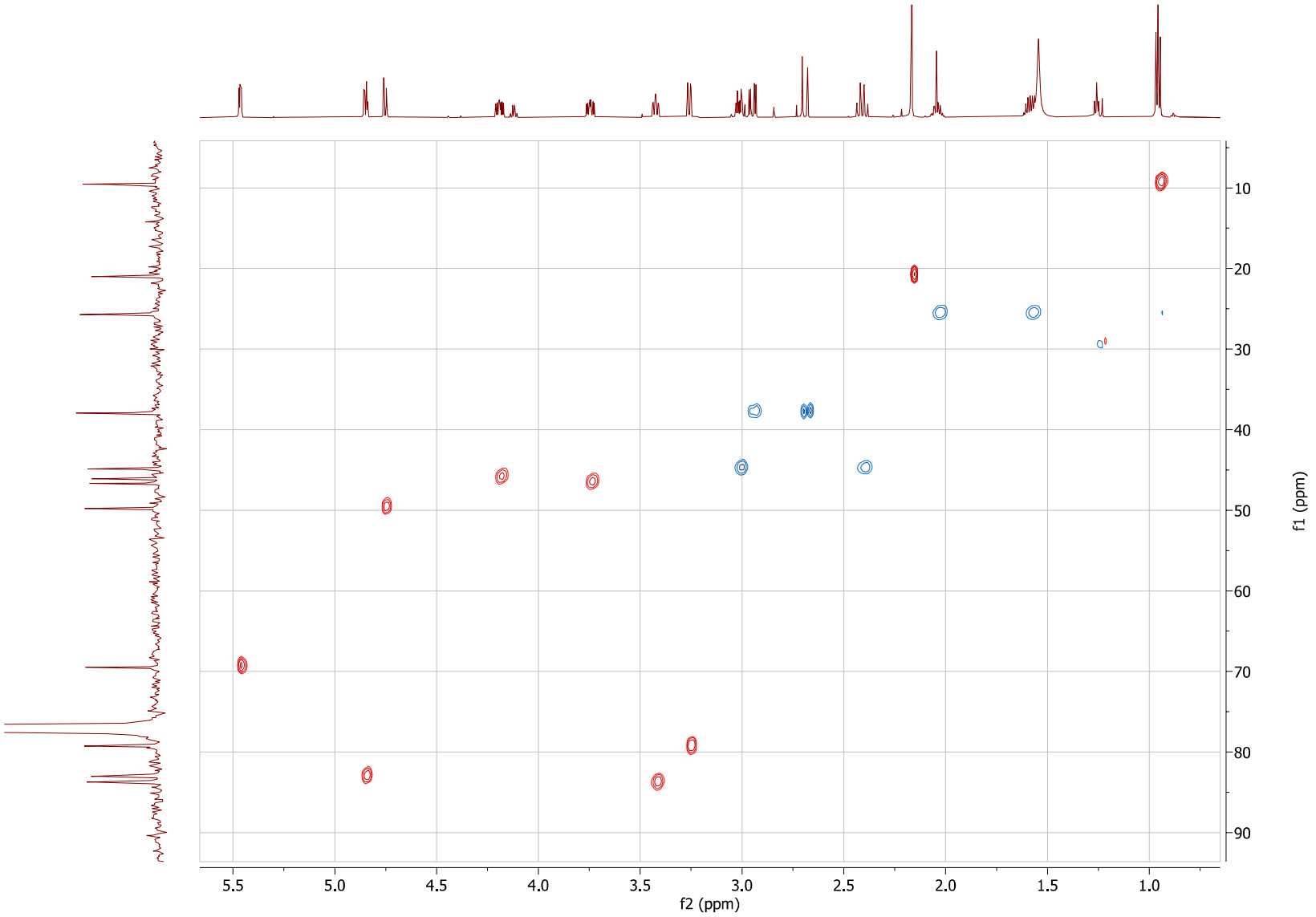


Figure S37: 2D HSQC spectrum of compound **11** ($CDCl_3$, 700 MHz).

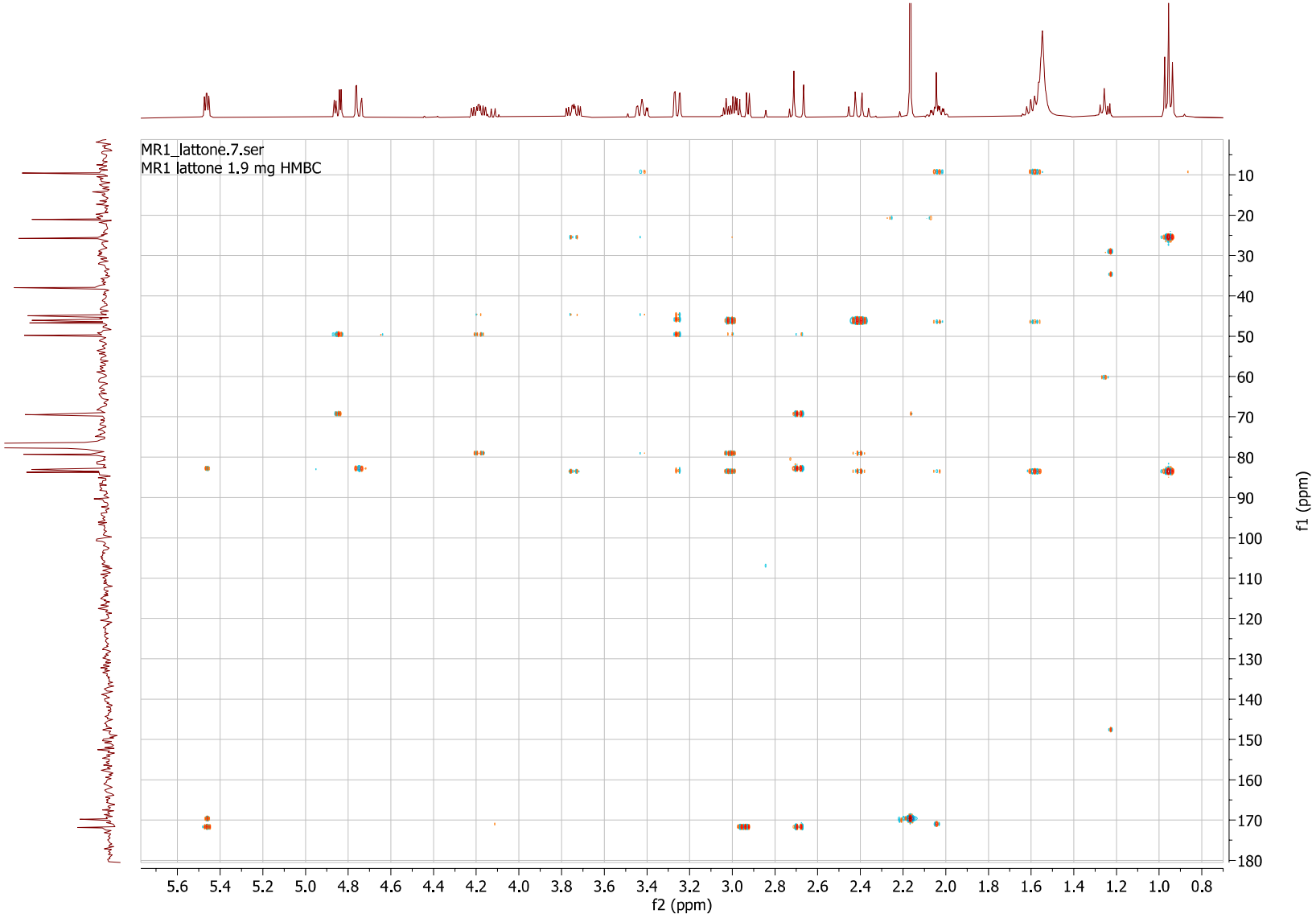
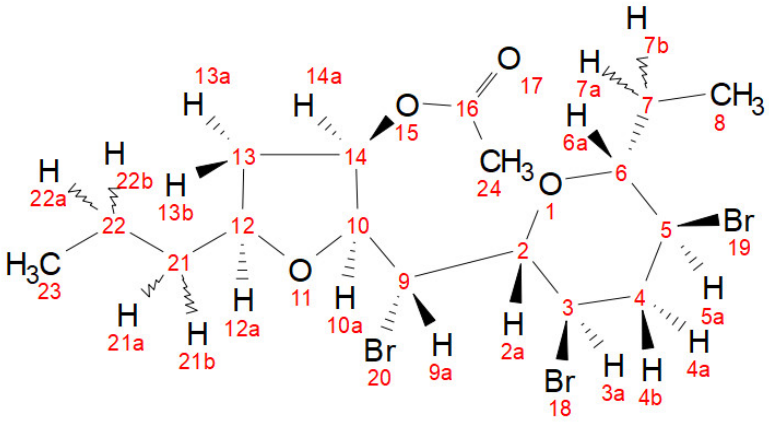


Figure S38: 2D HMBC spectrum of compound **11** ($CDCl_3$, 700 MHz).



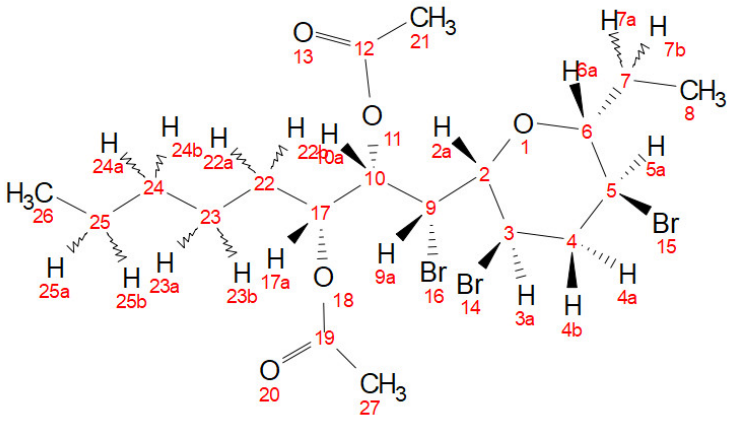
6

Table S2. ^{1}H and ^{13}C chemical shift data for compound **6** (700 MHz, $CDCl_3$)[a]

position	δ_H[b]	δ_C	mult[c]
2	3.22 dd (9.6, 1.6)	80.2	CH
3	4.17 ddd (12.1, 9.6, 4.6)	46.7	CH
4	b) 2.40 ddd (13.0, 12.1, 12.0) a) 2.98 ddd (13.0, 4.3, 4.3)	45.0	CH_2
5	3.73 ddd (12.0, 10.0, 4.3)	47.4	CH
6	3.38 ddd (10.0, 8.8, 2.4)	83.6	CH
7	1.50 m, 2.02 m	25.7	CH_2
8	0.93 t (7.4)	9.7	CH_3
9	4.69 dd (9.7, 1.6)	52.1	CH
10	4.06 dd (9.7, 3.1)	82.3	CH
12	3.96 dq (8.4, 6.4)	77.5	CH
13	a) 1.66 ddd (14.5, 6.4, 1.1) b) 2.55 ddd (14.5, 8.4, 6.3)	39.7	CH_2
14	5.19 ddd (6.3, 3.1, 1.1)	73.2	CH
16		170.6	C=O
21	1.50 m, 1.75 m	38.2	CH_2
22	1.35 m, 1.41 m	19.2	CH_2
23	0.93 t (7.4)	14.1	CH_3

24	2.12 s	21.4	CH_3

[a] The assignments were based on the COSY, TOCSY, HMQC, NOESY and HMBC experiments. [b] Coupling constants in Hz are given in parenthesis. [c] Multiplicities were assigned from the HSQC spectrum.



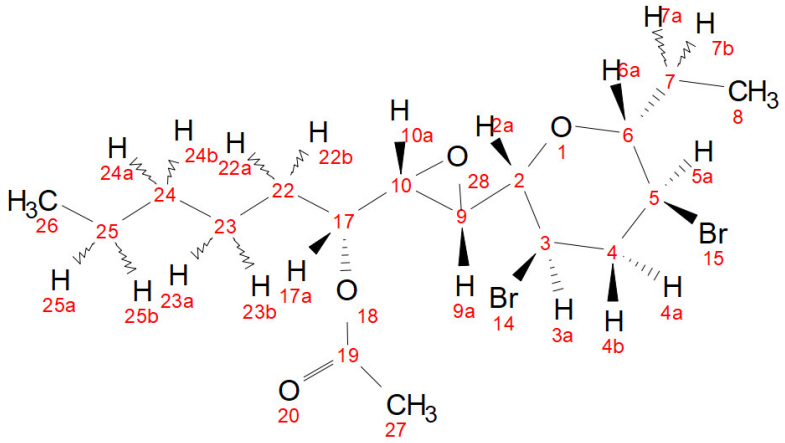
8

Table S2. ^{1}H and ^{13}C chemical shift data for compound **8** (700 MHz, $CDCl_3$)[a]

position	δ_H[b]	δ_C	mult[c]
2	3.43 dd (9.5, 1.9)	79.4	CH
3	4.13 ddd (12.1, 9.5, 4.5)	47.3	CH
4	b) 2.44 ddd (12.9, 12.1, 12.0) a) 2.96 ddd (12.9, 4.5, 4.3)	45.0	CH_2
5	3.72 ddd (12.0, 10.0, 4.3)	54.8	CH
6	3.47 ddd (10.0, 8.6, 2.4)	83.7	CH
7	1.55 m, 2.04 m	25.8	CH_2
8	0.99 t (7.4)	9.7	CH_3
9	4.55 dd (9.4, 1.9)	47.5	CH
10	5.49 dd (9.4, 2.0)	74.3	CH
12	–	170.0	C=O
17	5.09 ddd (7.7, 6.0, 2.0)	71.6	CH
19	–	170.7	C=O
21	2.13 s	20.8	CH_3
22	1.25 m, 1.51 m	31.5	CH_2

23	1.26 m	24.7	CH_2
24	1.26 m	31.5	CH_2
25	1.26 m	22.4	CH_2
26	0.86 t (7.0)	13.9	CH_3
27	2.17 s	21.1	CH_3

[a] The assignments were based on the COSY, TOCSY, HMQC, NOESY and HMBC experiments. [b] Coupling constants in Hz are given in parenthesis. [c] Multiplicities were assigned from the HSQC spectrum.



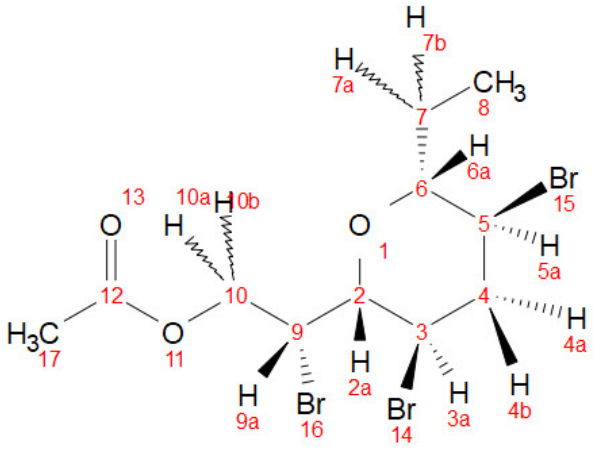
9

Table S3. ^{1}H and ^{13}C chemical shift data for compound **9** (700 MHz, $CDCl_3$)[a]

position	δ_H[b]	δ_C	mult[c]	
2	3.51 dd (10.0, 7.1)	80.5	CH	
3	3.84 ddd (12.2, 10.0, 4.5)	46.1	CH	
4	b) 2.43 ddd (12.9, 12.2, 12.0) a) 2.98 ddd (12.9, 4.5, 4.3)	45.6	CH_2	
5	3.73 ddd (12.0, 10.0, 4.3)	47.1	CH	
6	3.45 ddd (10.0, 7.4, 2.7)	83.0	CH	
7	1.59 ddq (14.9, 7.4, 7.4) 1.98 ddq (14.9, 7.4, 2.7)	25.8	CH_2	
8	0.95 t (7.4)	9.0	CH_3	
9	3.02 dd (7.1, 4.1)	57.6	CH	
10	3.05 dd (8.7, 4.1)	56.7	CH	

17	4.89 ddd (8.7, 8.7, 3.9)	71.9	CH	
19	–	170.5	C=O	
22	1.69 m	32.1	CH_2	
23	1.31 m, 1.36 m	24.6	CH_2	
24	1.25 m	31.8	CH_2	
25	1.29 m	22.5	CH_2	
26	0.87 t (7.0)	14.0	CH_3	
27	2.10 s	21.1	CH_3	

[a] The assignments were based on the COSY, TOCSY, HMQC, NOESY and HMBC experiments. [b] Coupling constants in Hz are given in parenthesis. [c] Multiplicities were assigned from the HSQC spectrum.

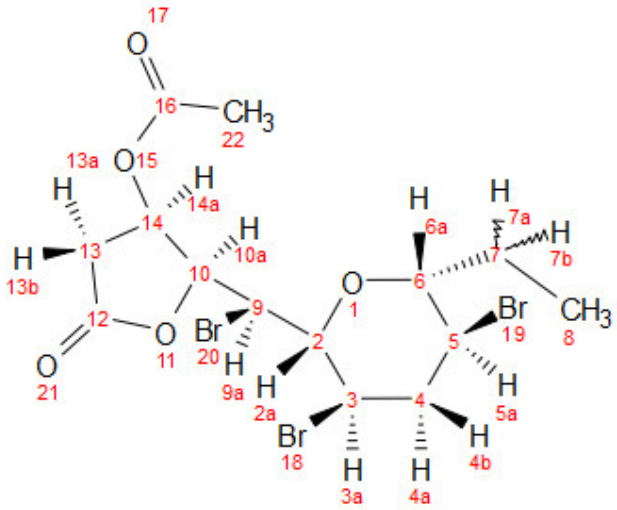


10

Table S4. ^{1}H and ^{13}C chemical shift data for compound **10** (700 MHz, $CDCl_3$)[a]

position	δ_H[b]	δ_C	mult[c]
2	3.51 dd (9.7, 1.8)	79.3	CH
3	4.10 ddd (12.1, 9.7, 4.5)	46.6	CH
4	b) 2.46 ddd (12.9, 12.1, 12.0) a) 3.01 ddd (12.1, 4.5, 4.3)	45.3	CH_2
5	3.75 ddd (12.0, 10.0, 4.3)	47.5	CH
6	3.43 ddd (10.0, 8.5, 2.5)	83.7	CH
7	1.55 ddq (14.5, 8.5, 7.4) 2.03 ddq (14.5, 7.4, 2.5)	25.8	CH_2
8	0.96 t (7.4)	9.4	CH_3
9	4.60 ddd (8.3, 6.7, 1.8)	49.8	CH
10	4.40 dd (11.3, 8.3) 4.43 dd (11.3, 6.7)	64.8	CH
12	–	170.2	CH
17	2.11 s	20.7	C=O

[a] The assignments were based on the COSY, TOCSY, HMQC, NOESY and HMBC experiments. [b] Coupling constants in Hz are given in parenthesis. [c] Multiplicities were assigned from the HSQC spectrum.



11

Table S5. ^{1}H and ^{13}C chemical shift data for compound **11** (700 MHz, $CDCl_3$)[a]

position	δ_H[b]	δ_C	mult[c]
2	3.26 dd (9.5, 1.7)	79.3	CH
3	4.19 ddd (12.1, 9.5, 4.6)	46.1	CH
4	b) 2.41 ddd (12.9, 12.1, 12.0) a) 3.01 ddd (12.9, 4.6, 4.3)	44.9	CH_2
5	3.75 ddd (12.0, 10.5, 4.3)	46.7	CH
6	3.42 ddd (10.5, 8.4, 2.5)	83.7	CH
7	1.59 m, 2.04 m	25.7	CH_2
8	0.96 t (7.4)	9.5	CH_3
9	4.75 dd (9.8, 1.7)	49.8	CH
10	4.85 dd (9.8, 3.3)	83.0	CH
12	–	171.9	C=O
13	b) 2.69 d (18.1) a) 2.95 dd (18.1, 5.1)	37.9	CH_2
14	5.46 dd (5.1, 3.3)	69.5	CH_2
16	–	169.8	C=O
22	2.17 s	21.0	CH_3

[a] The assignments were based on the COSY, TOCSY, HMQC, NOESY and HMBC experiments. [b] Coupling constants in Hz are given in parenthesis. [c] Multiplicities were assigned from the HSQC spectrum.