New Triterpenes from *Cimicifuga yunnanensis* Down-regulating the mRNA Expression of CD147, MMP-2, and MMP-9

Ni-Hong Lu, Jie Li, Yong-Rui Yang, Hong-Lu Liu, Ying-Rong Du*

Department of Respiratory Medicine, The Third People's Hospital of Kunming, Yunnan, 650041, People's Republic of China

Supporting Information List

Figure S1. ^{1}H NMR Spectrum of **1** in Pyridine-d_5

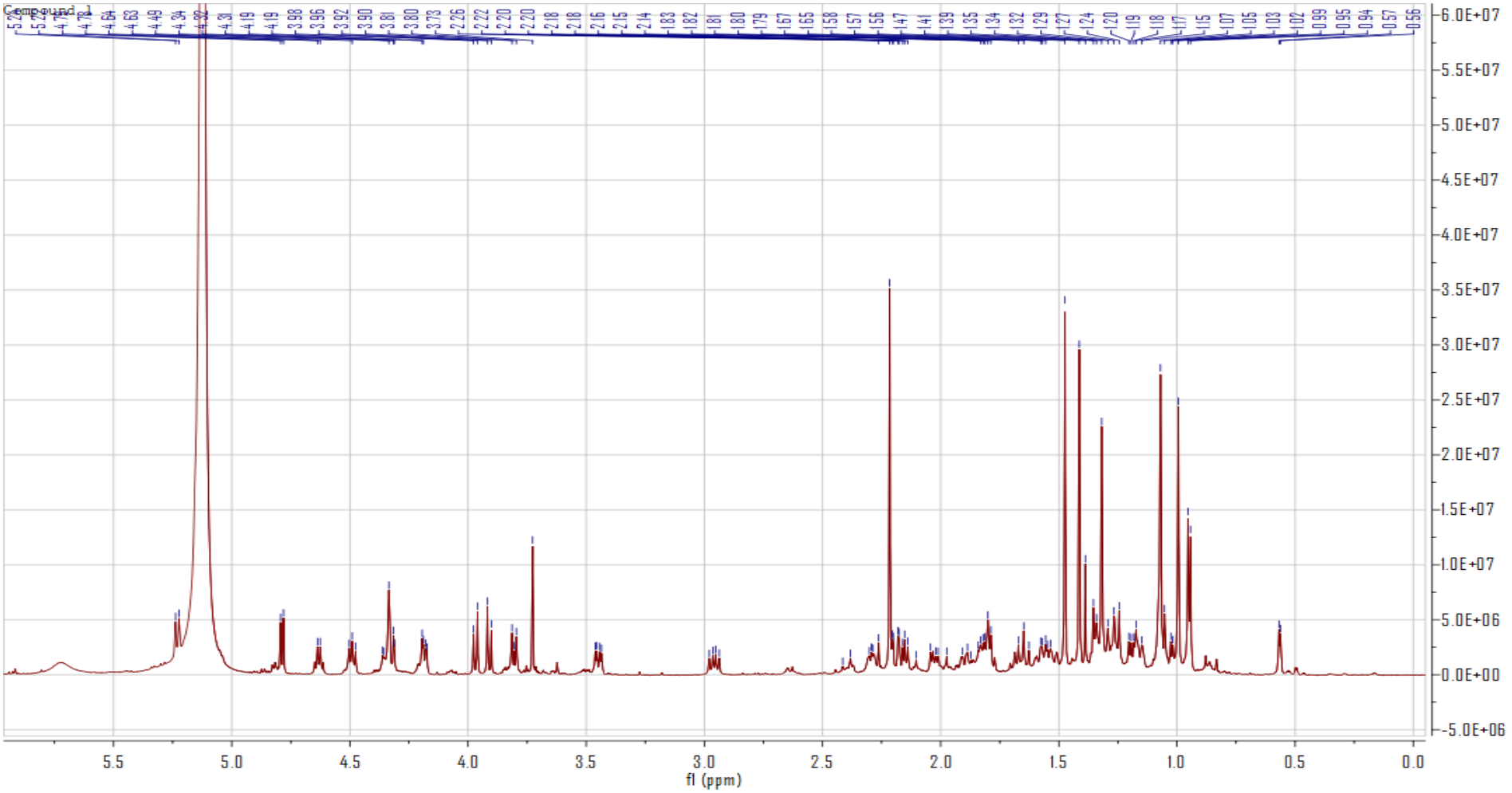


Figure S2. ^{13}C NMR Spectrum of **1** in Pyridine-d_5

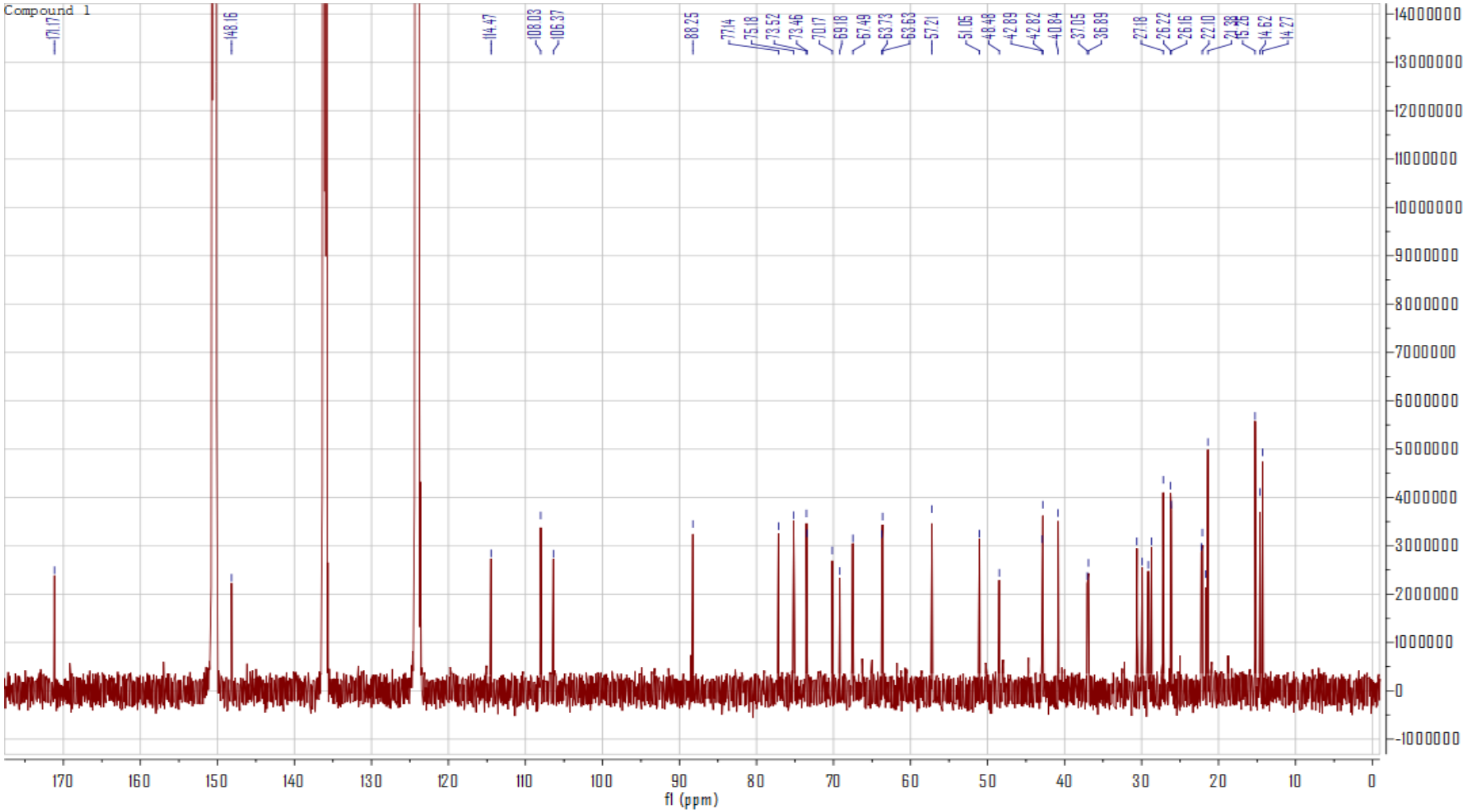


Figure S3. HSQC Spectrum of **1** in Pyridine-d_5

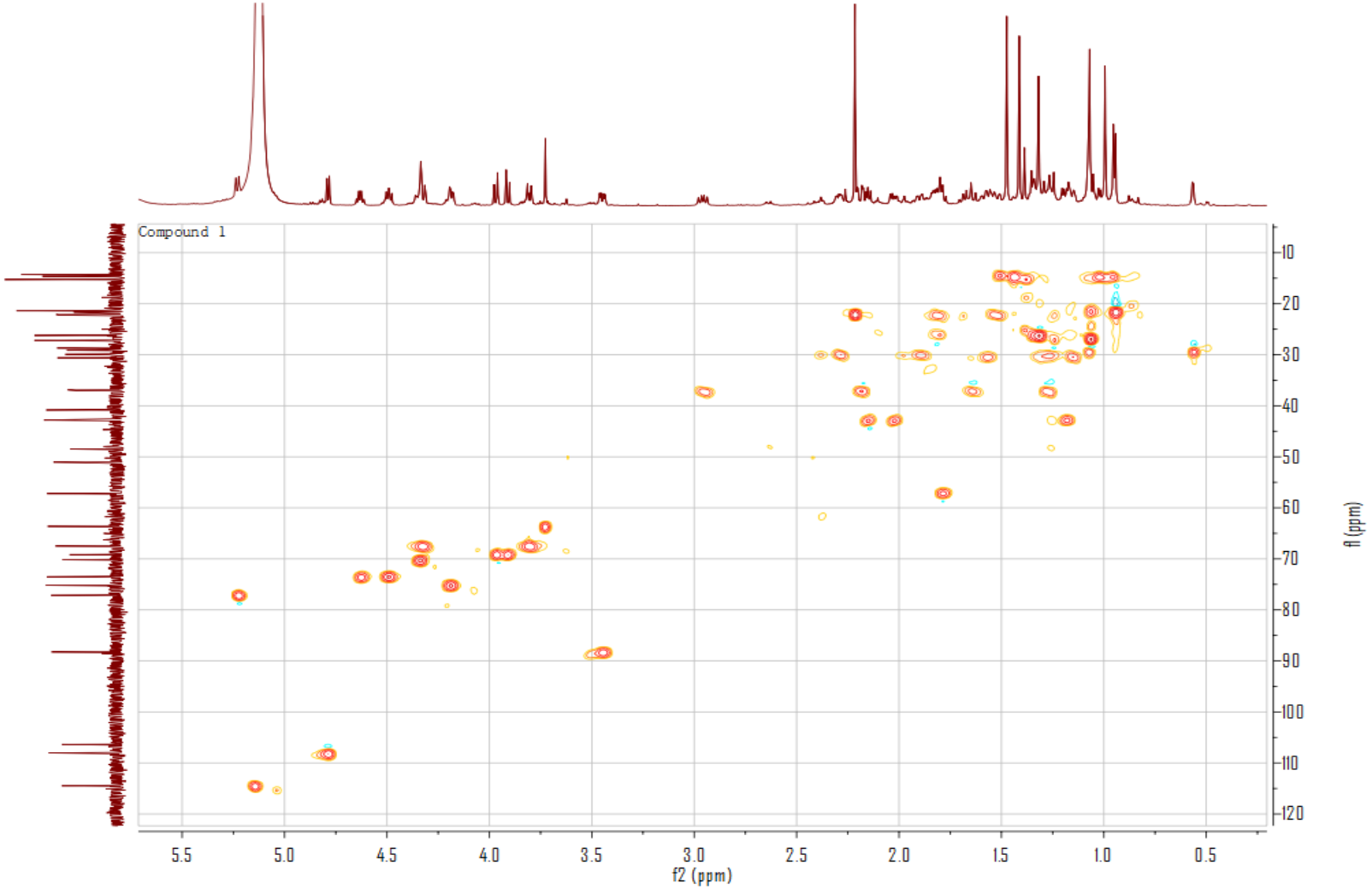


Figure S4. HMBC Spectrum of **1** in Pyridine-d_5

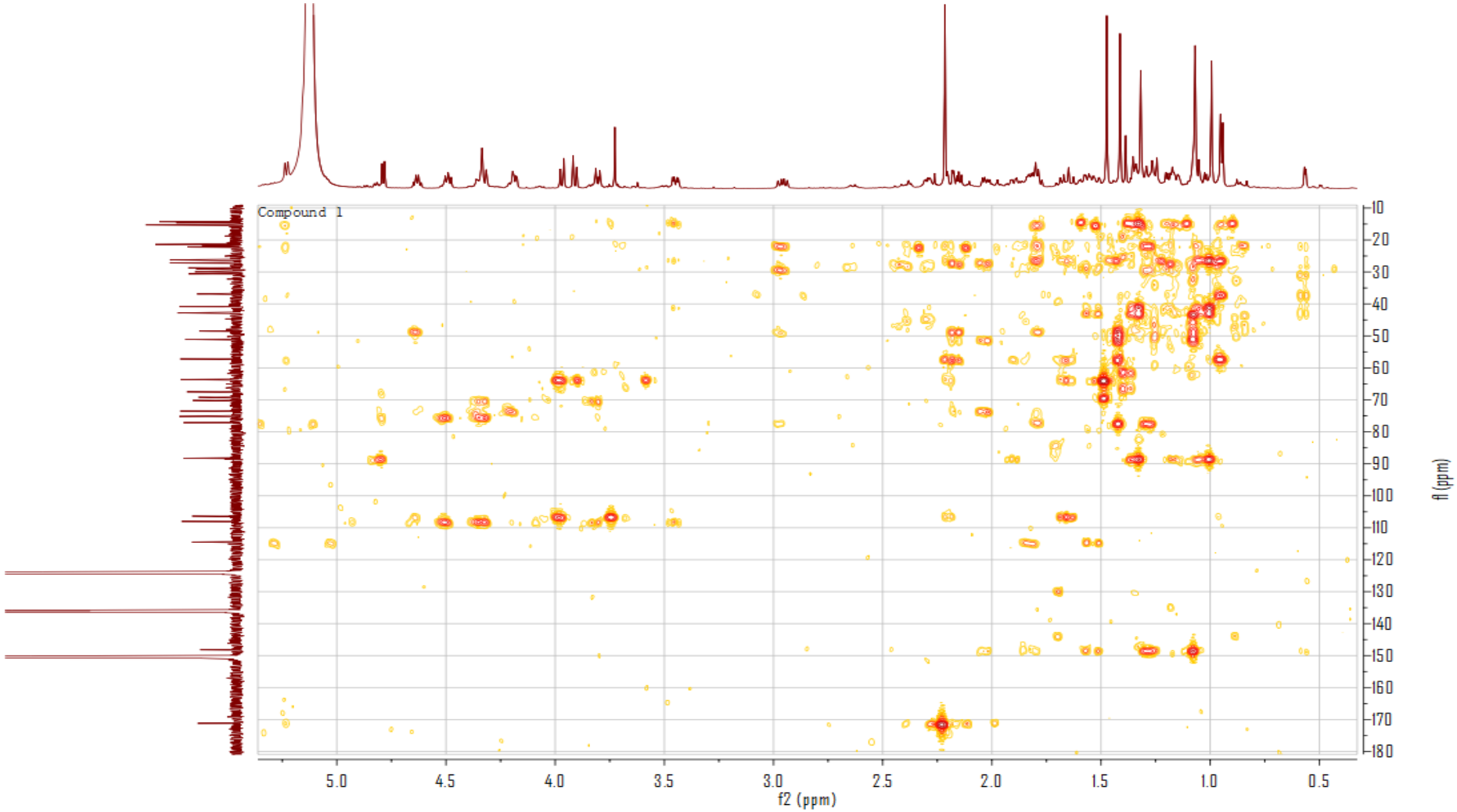


Figure S5. ^{1}H-^{1}H COSY Spectrum of **1** in Pyridine-d_5

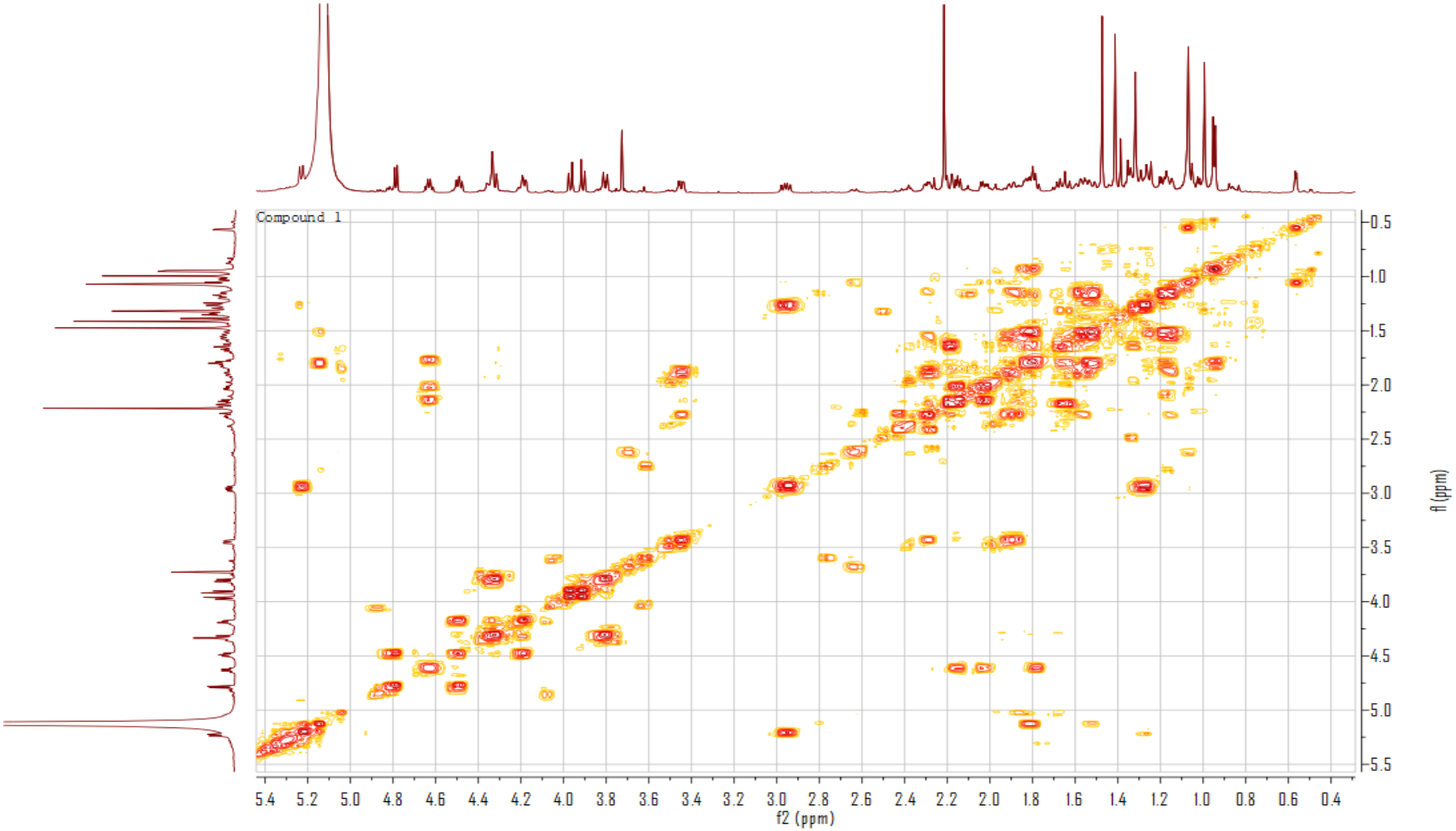


Figure S6. ROESY Spectrum of **1** in Pyridine-d_5

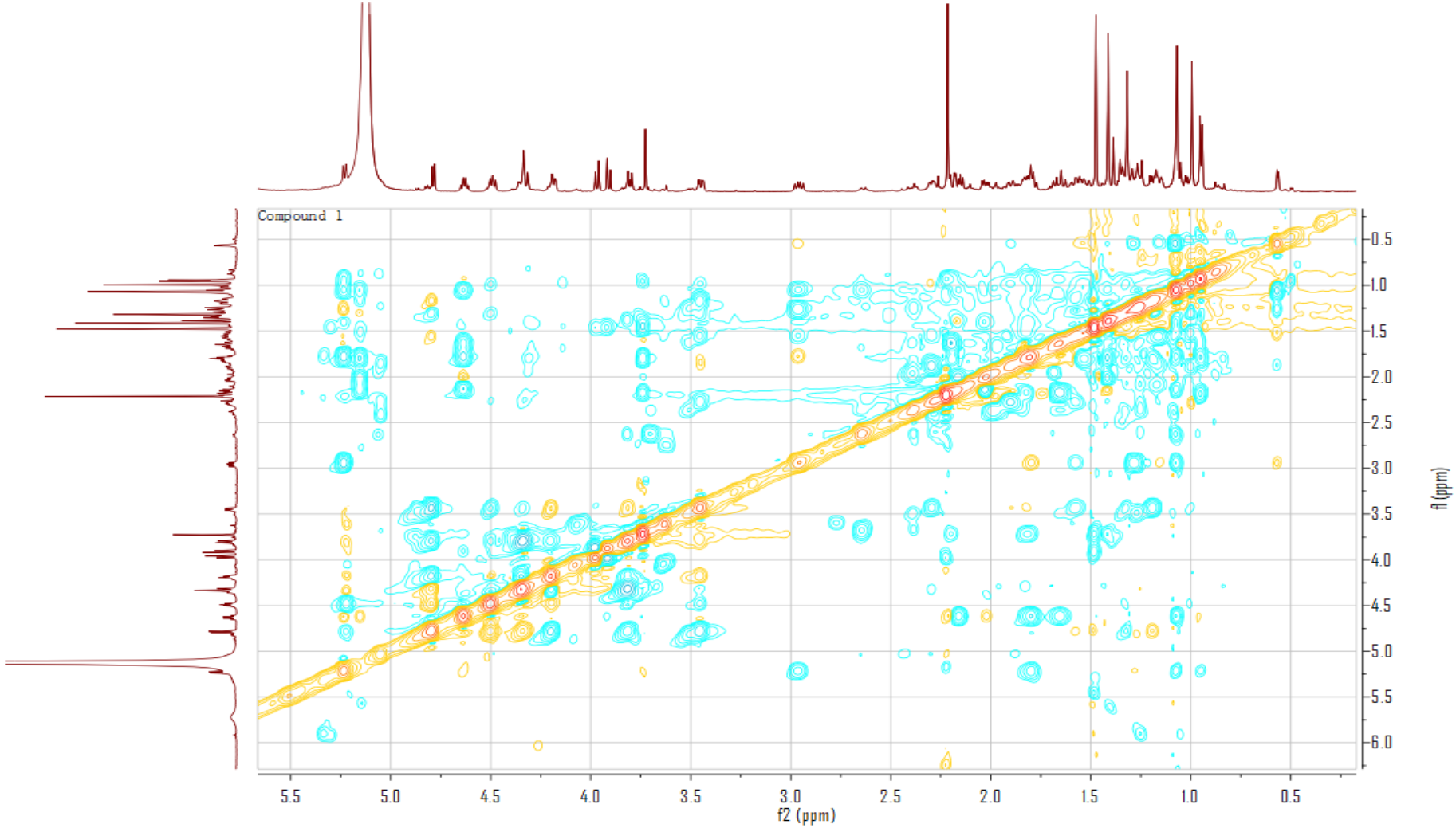


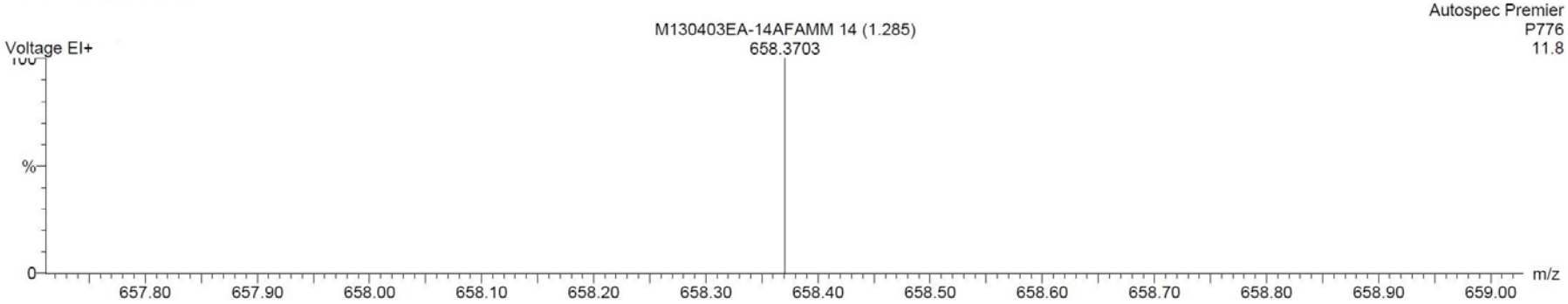
Figure S7. HREIMS of **1**

Elemental Composition Report

Single Mass Analysis

Tolerance = 10.0 PPM / DBE: min = -10.0, max = 120.0
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ions
24 formula(e) evaluated with 1 results within limits (up to 51 closest results for each mass)
Elements Used:
C: 0-200 H: 0-400 O: 9-11



Minimum:				-10.0		
Maximum:		200.0	10.0	120.0		
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Formula
658.3703	658.3717	-1.4	-2.1	11.0	5546027.5	C37 H54 O10

Figure S8. IR Spectrum of **1**

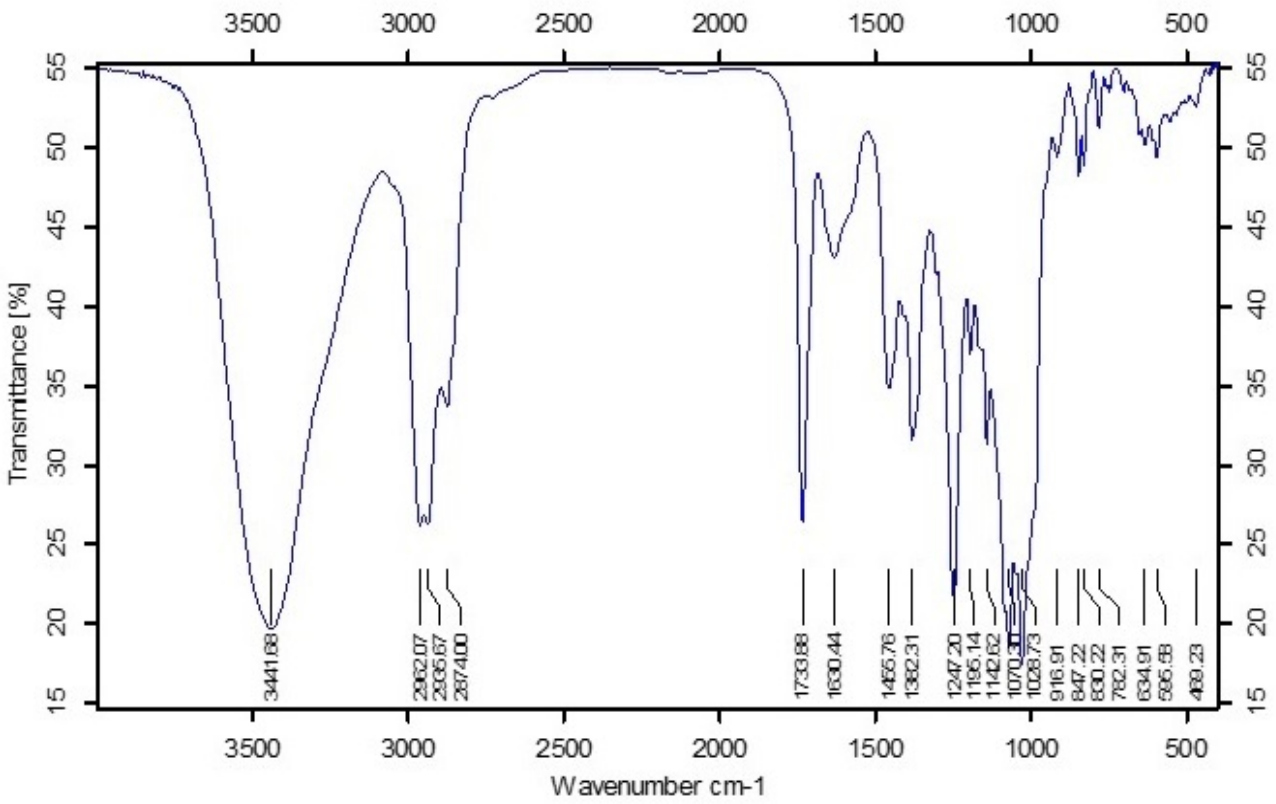


Figure S9. ^{1}H NMR Spectrum of **2** in Pyridine-d_5

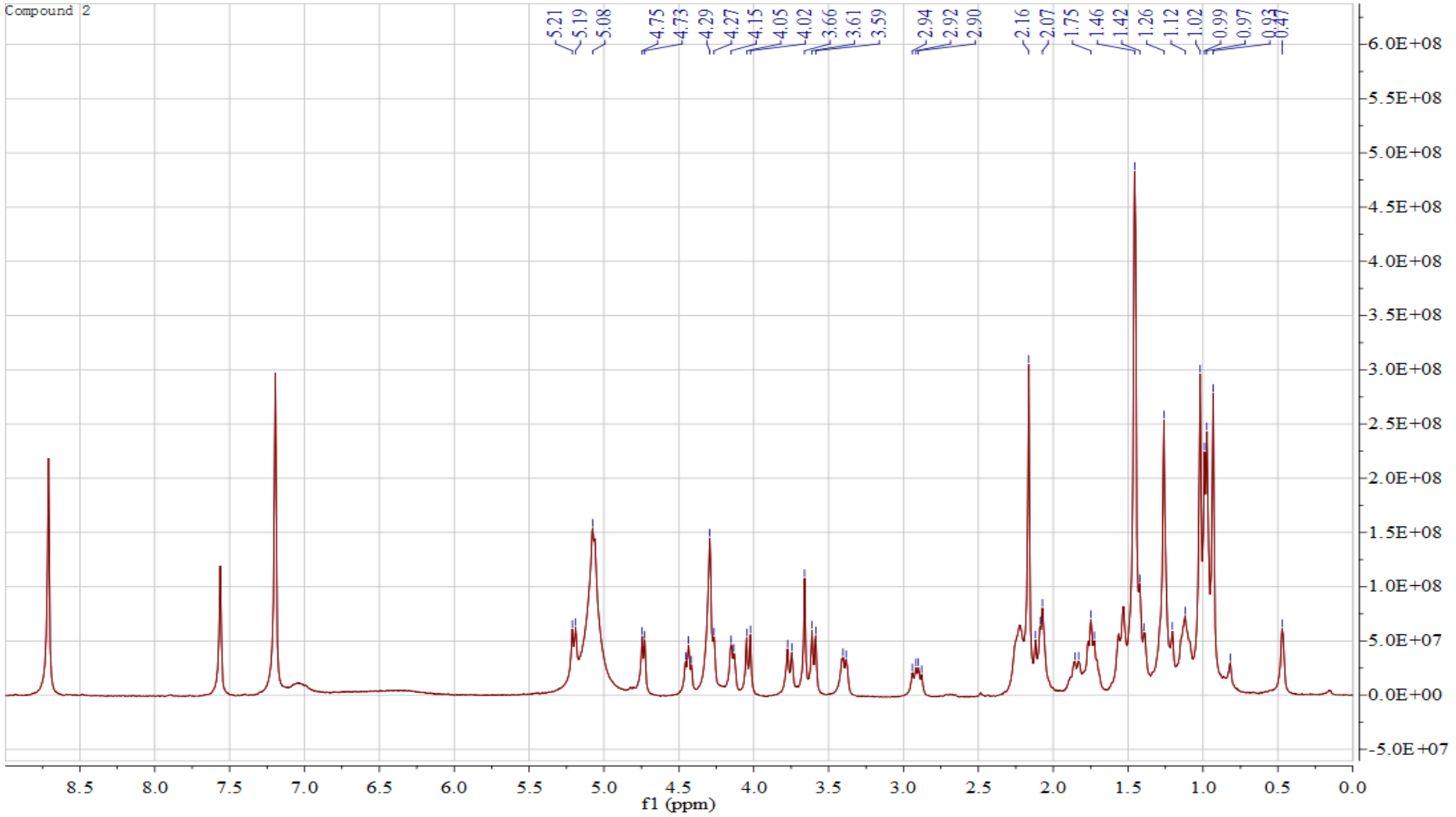


Figure S10. ^{13}C NMR Spectrum of **2** in Pyridine-d_5

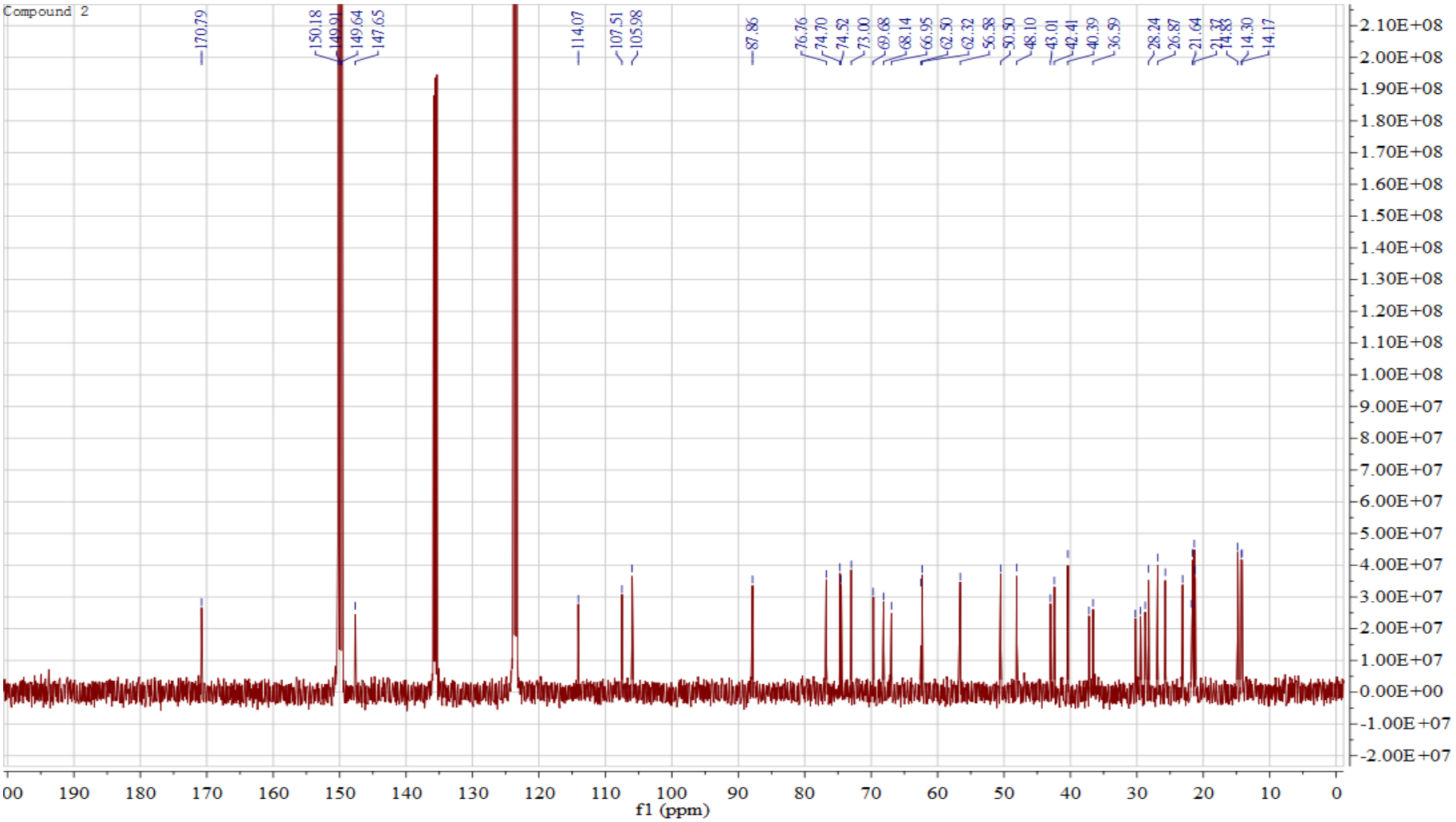


Figure S11. HSQC Spectrum of **2** in Pyridine-d_5

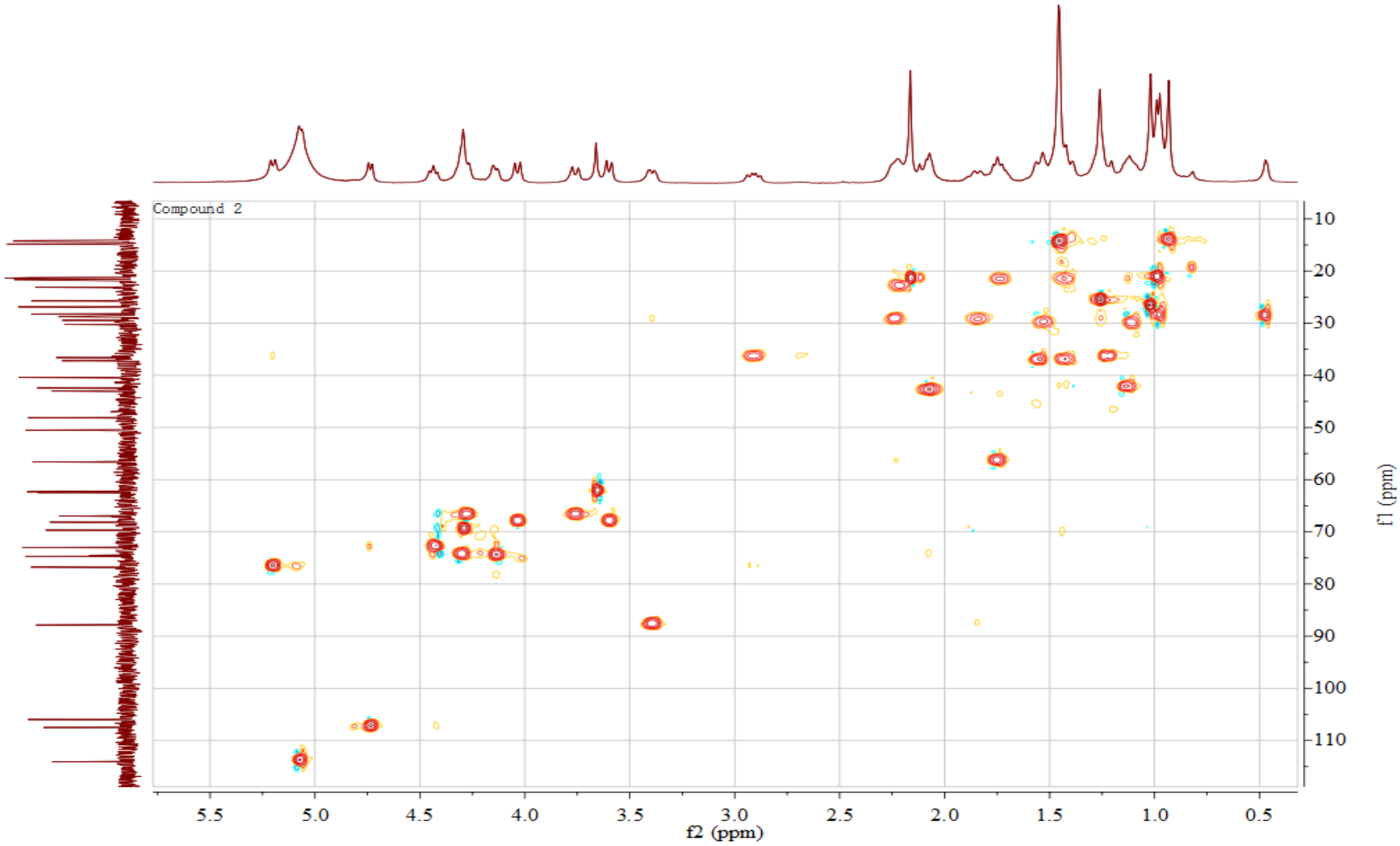


Figure S12. HMBC Spectrum of **2** in Pyridine-d_5

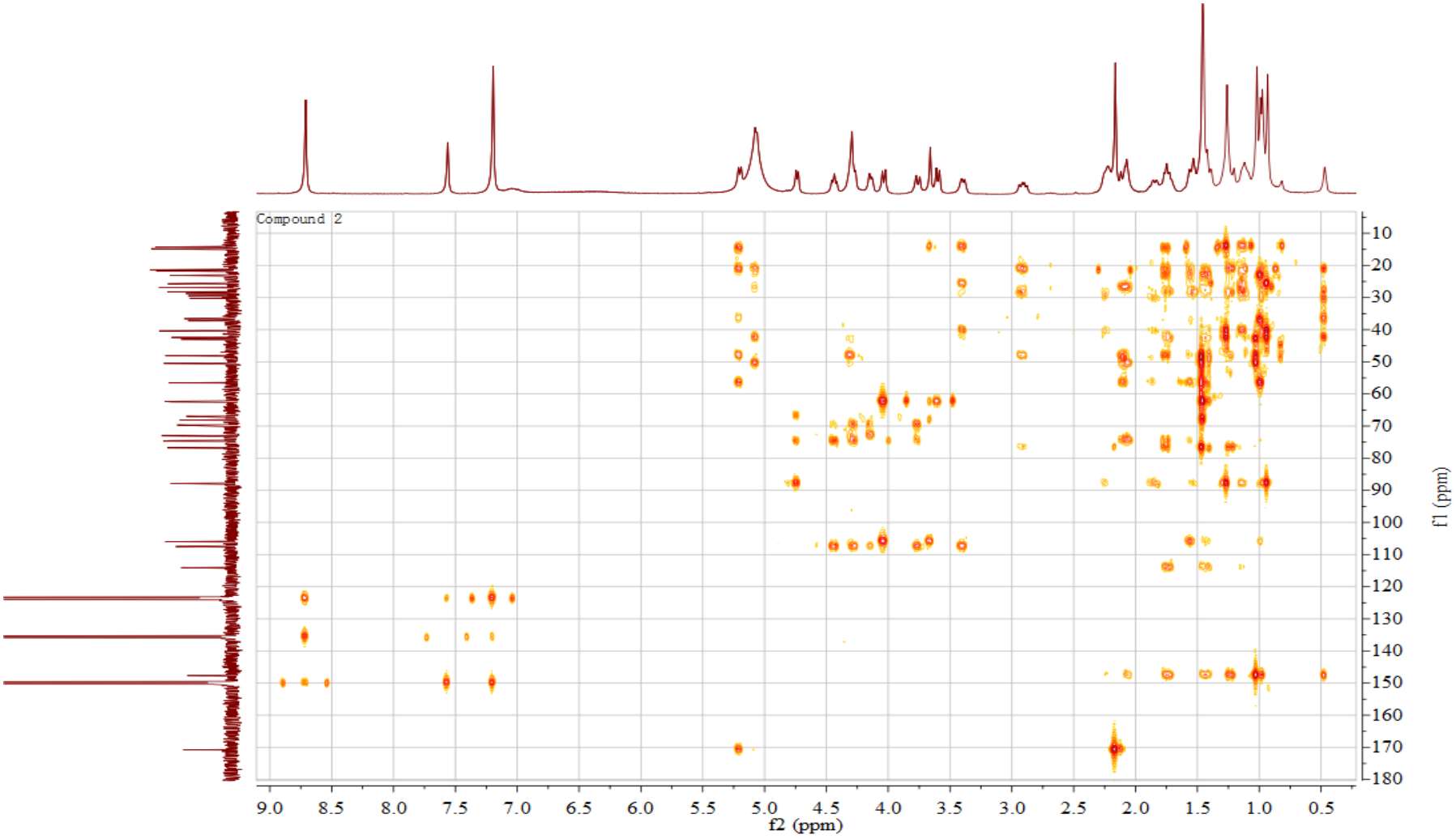


Figure S13. ^{1}H-^{1}H COSY Spectrum of **2** in Pyridine-d_5

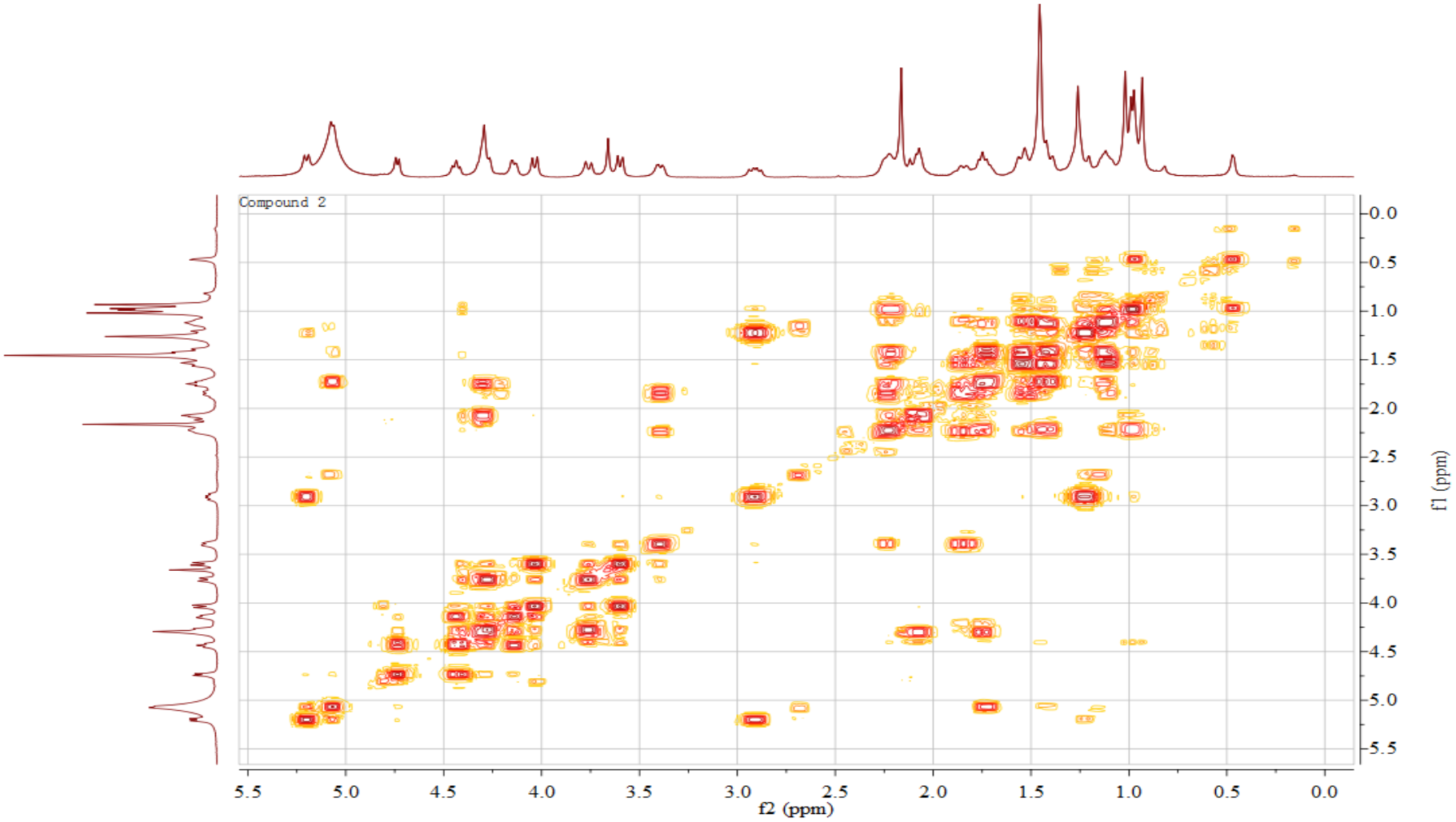


Figure S14. ROESY Spectrum of **2** in Pyridine-d_5

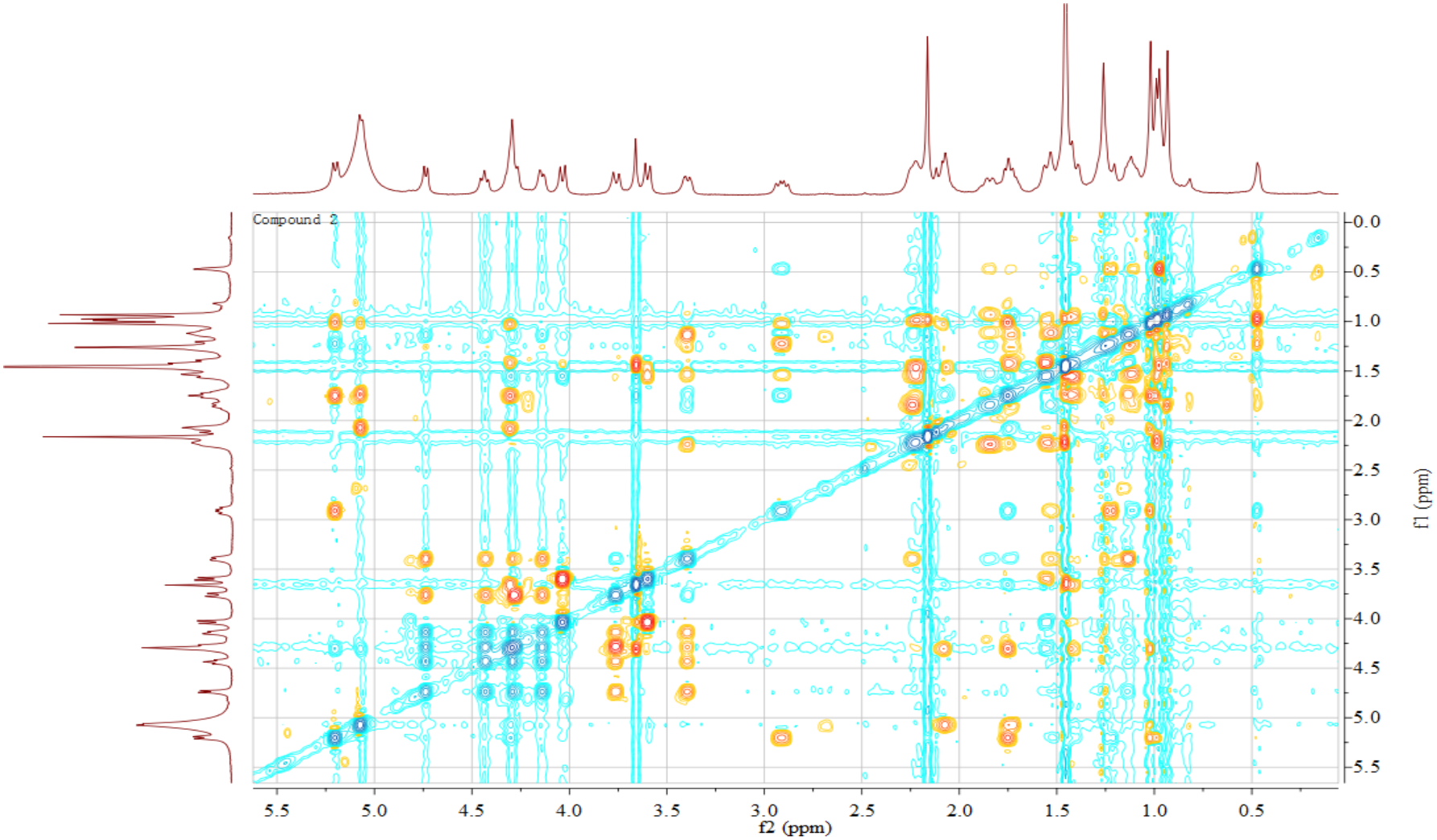


Figure S15. HRESIMS of **2**

Elemental Composition Report

Page 1

Single Mass Analysis

Tolerance = 10.0 PPM / DBE: min = -10.0, max = 120.0

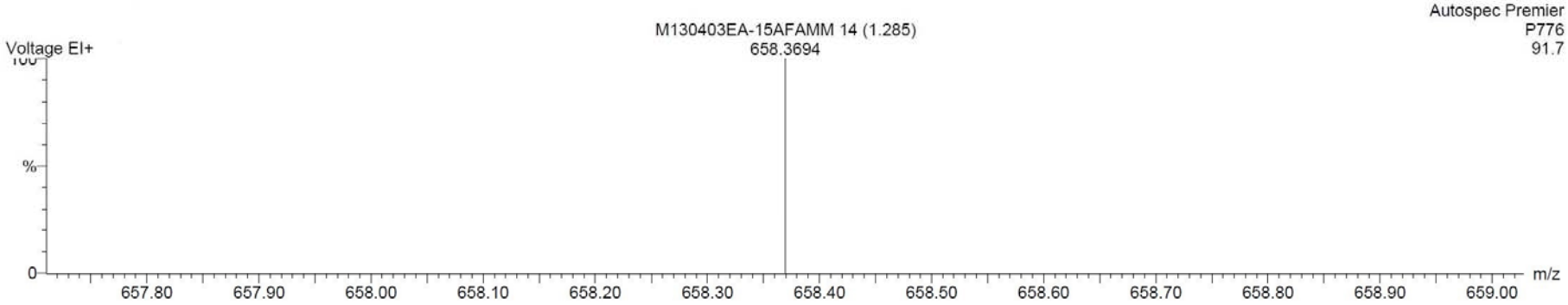
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ions

24 formula(e) evaluated with 1 results within limits (up to 51 closest results for each mass)

Elements Used:

C: 0-200 H: 0-400 O: 9-11



Minimum:				-10.0		
Maximum:		200.0	10.0	120.0		
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Formula
658.3694	658.3717	-2.3	-3.5	11.0	5546066.0	C37 H54 O10

Figure S16. IR Spectrum of **2**

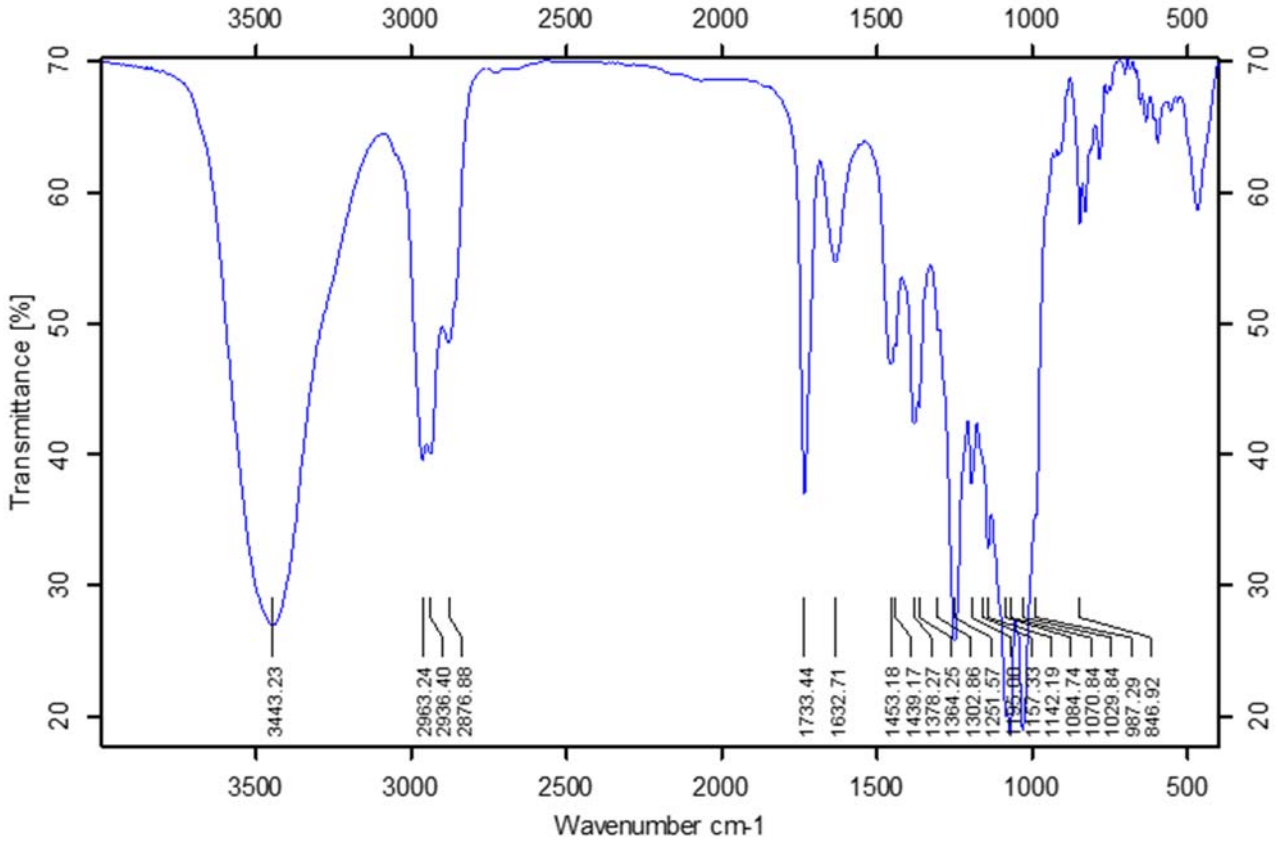


Figure S17. ^{1}H NMR Spectrum of **3** in Pyridine-d_5

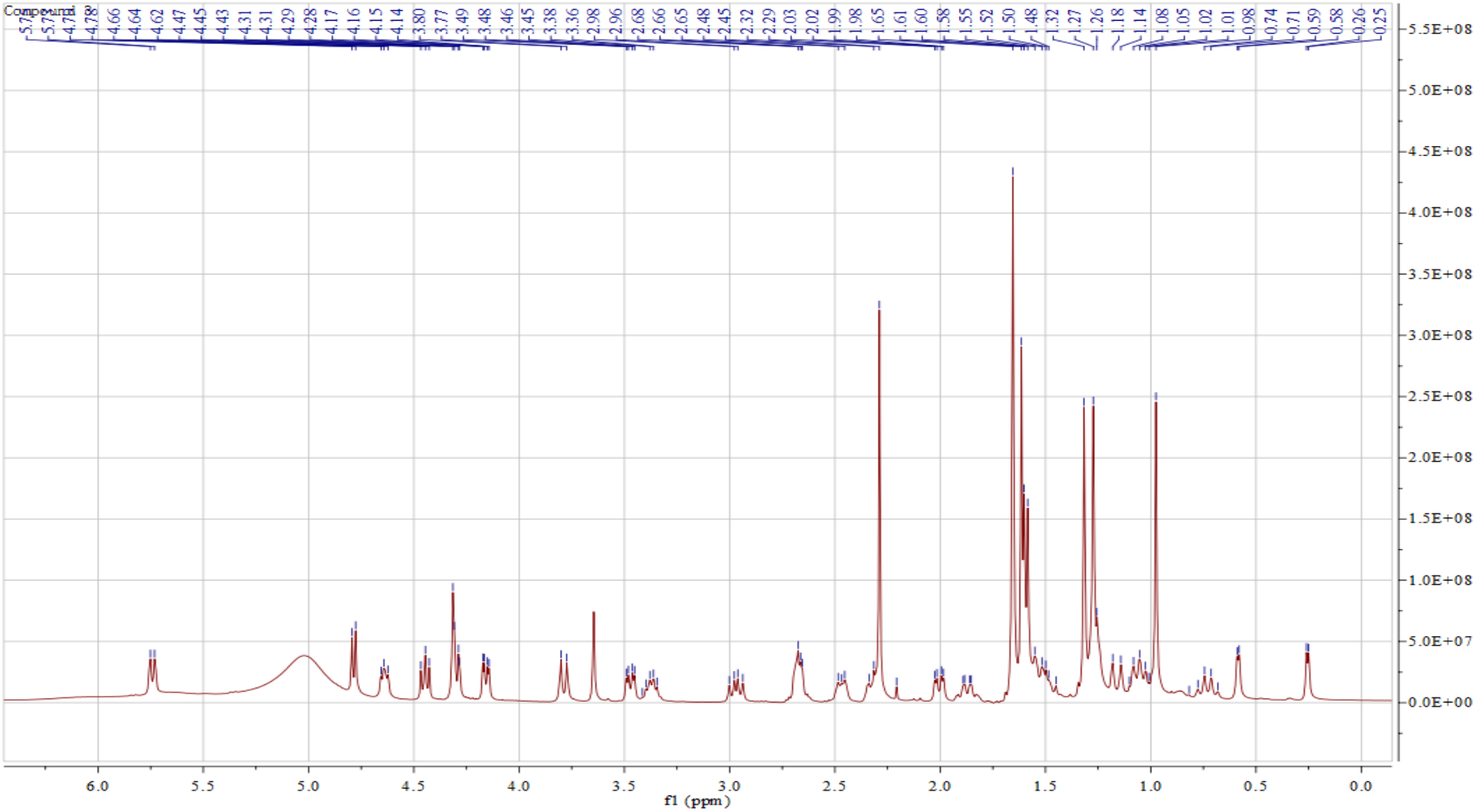


Figure S18. ^{13}C NMR Spectrum of **3** in Pyridine-d_5

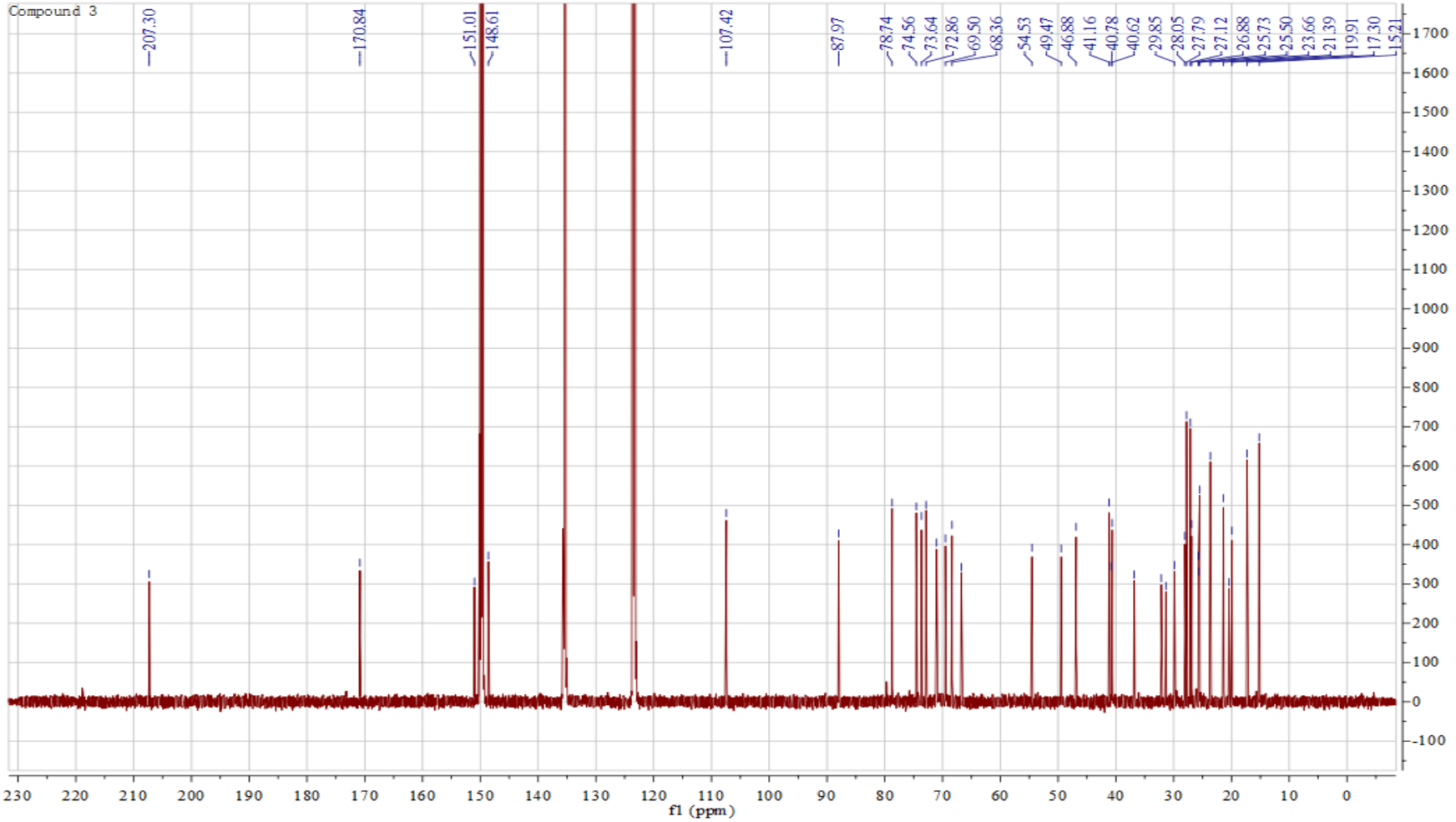


Figure S19. HSQC Spectrum of **3** in Pyridine-d_5

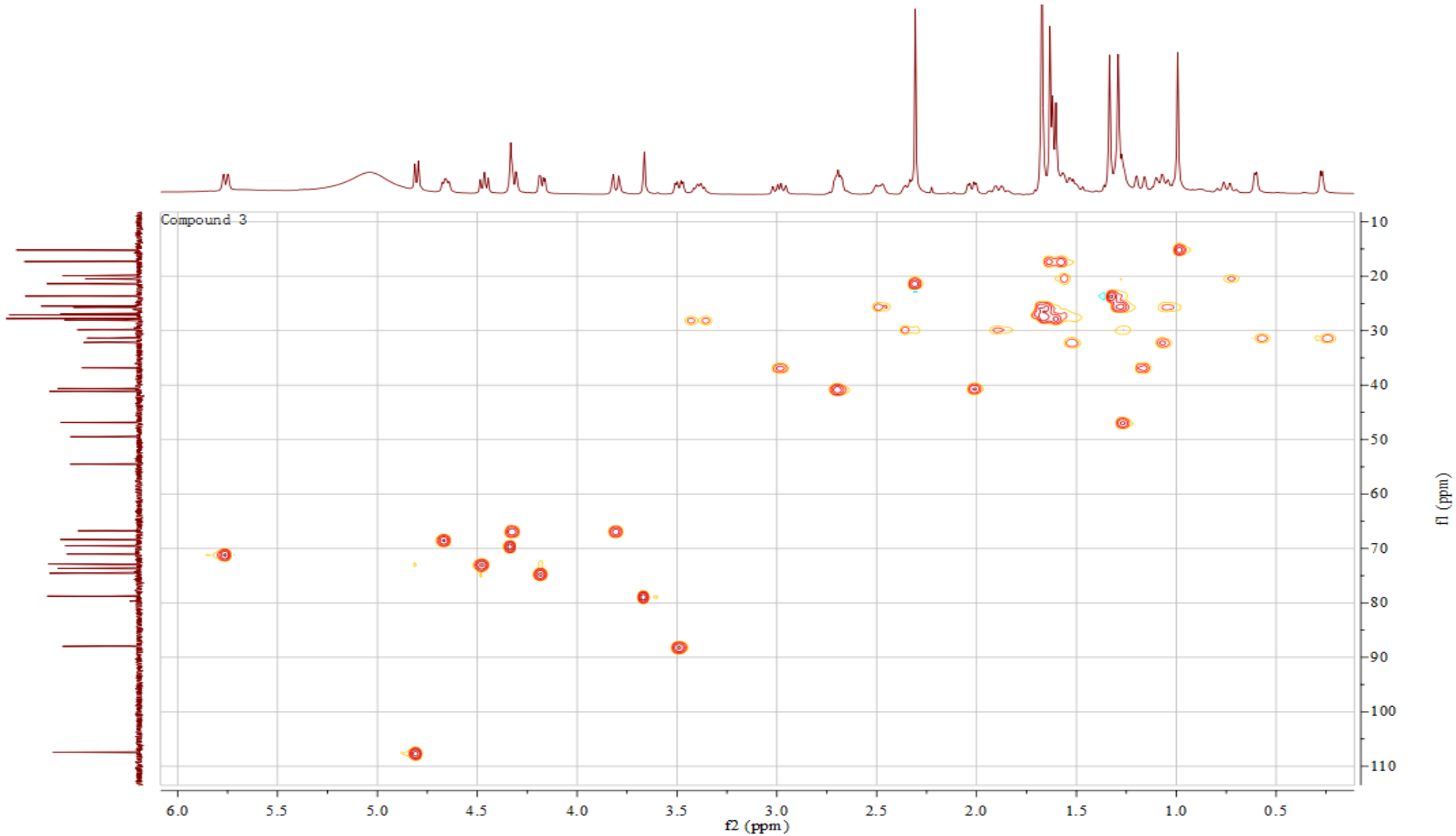


Figure S20. HMBC Spectrum of **3** in Pyridine-d_5

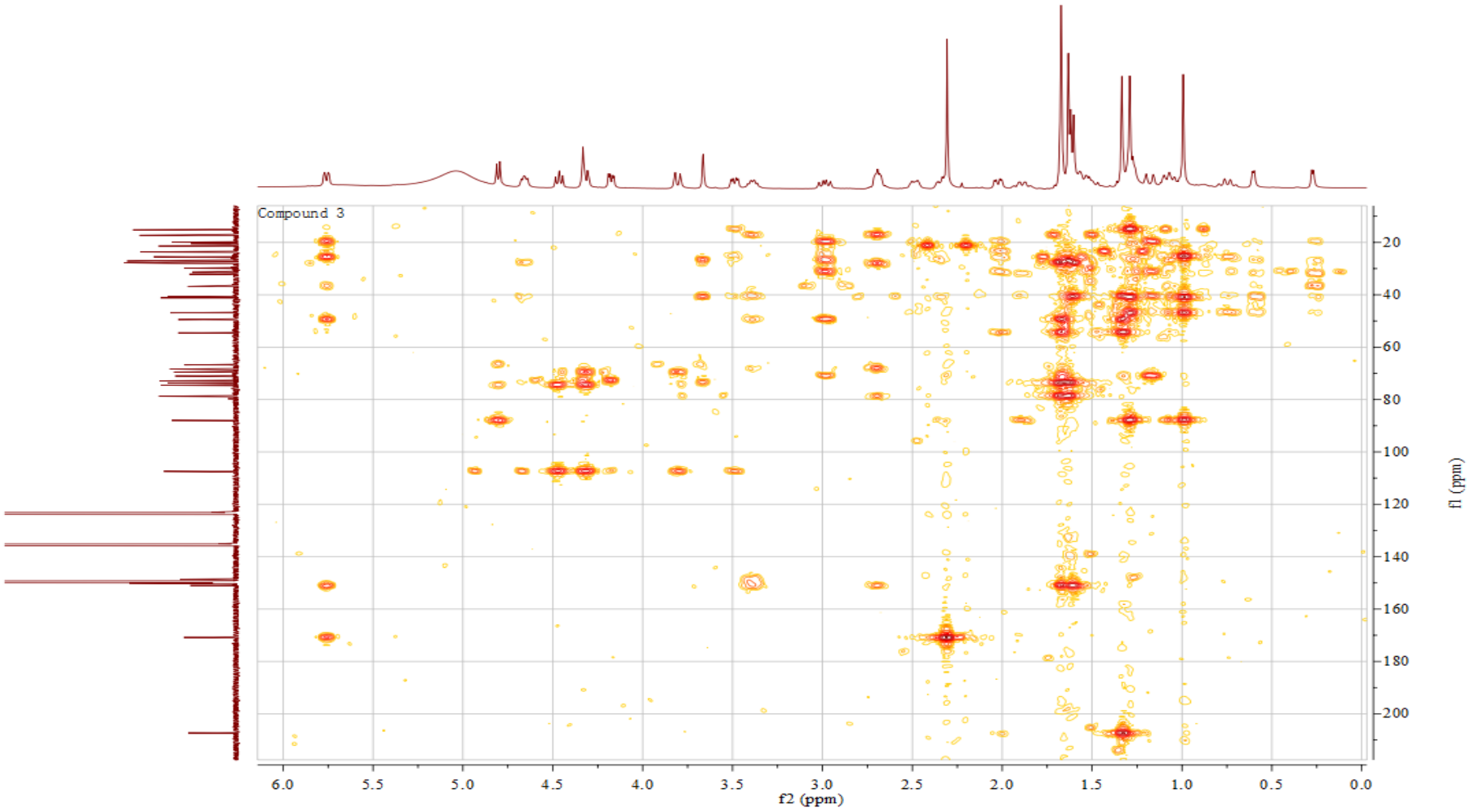


Figure S21. ^{1}H-^{1}H COSY Spectrum of **3** in Pyridine-d_5

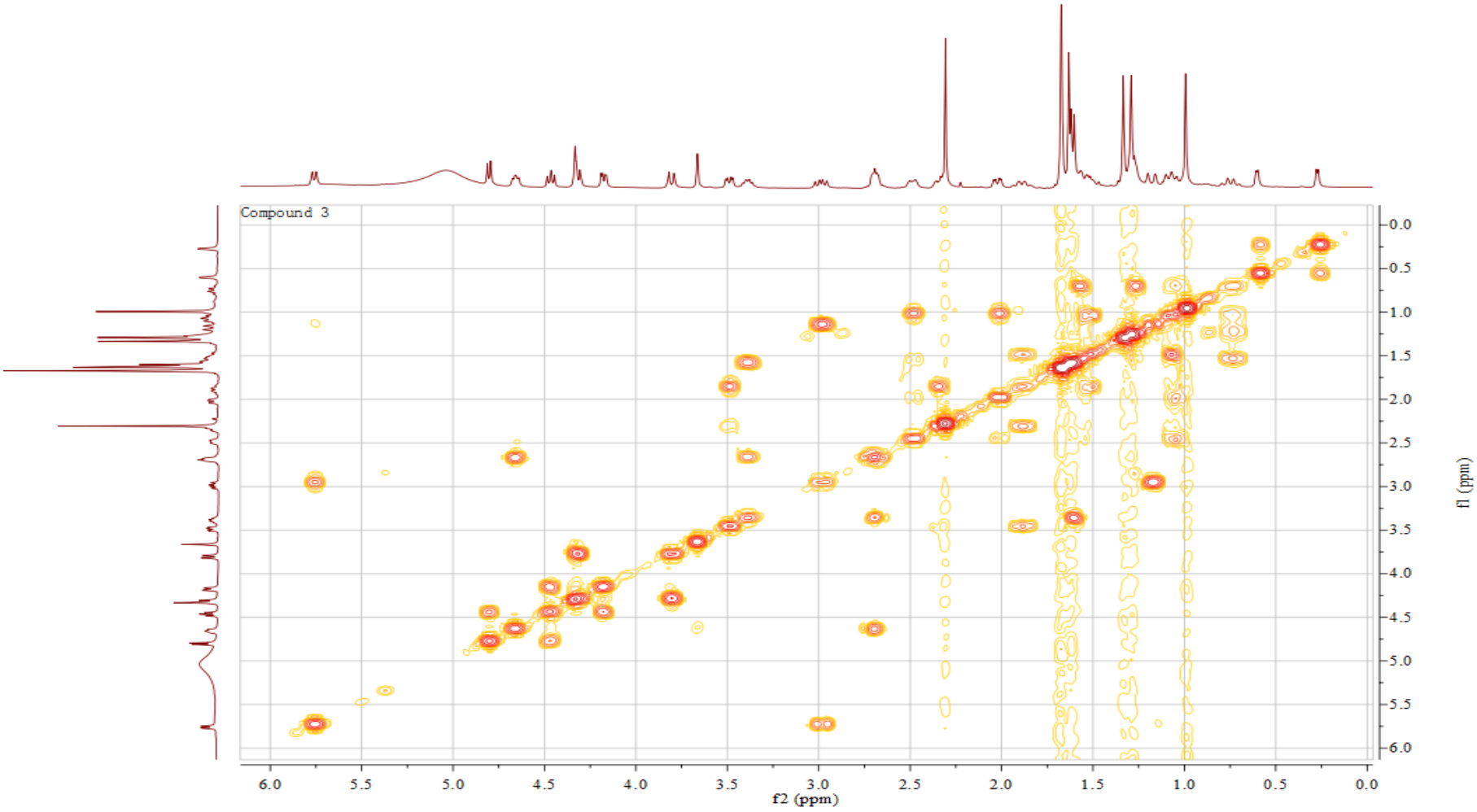


Figure S22. ROESY Spectrum of **3** in Pyridine-d_5

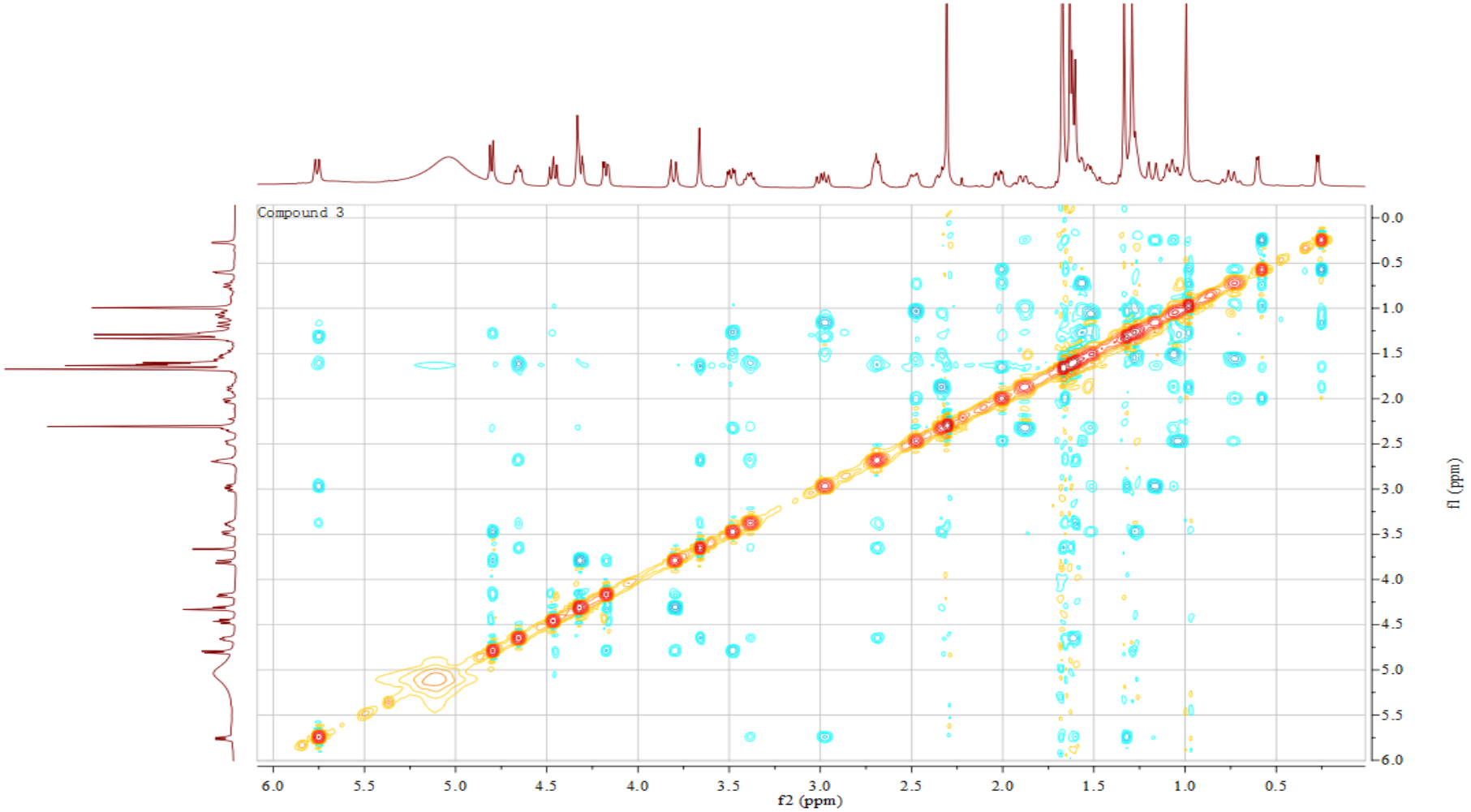


Figure S23. HRESIMS of **3**

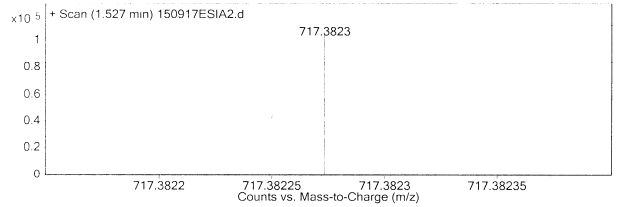
Qualitative Analysis Report

Data Filename		**Sample Name**	
Sample Type	Sample	**Position**	
Instrument Name	Agilent G6230 TOF MS	**User Name**	
Acq Method	ESI.m	**Acquired Time**	
IRM Calibration Status	Success	**DA Method**	ESI.m
Comment			

Sample Group	**Info.**
Acquisition SW Version	6200 series TOF/6500 series Q-TOF B.05.01 (B5125.2)

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
200	0	ESI



Peak List

m/z	z	Abund	Formula	Ion
153.0541		7558.66		
717.3823	1	105559.87	C37 H58 Na O12	M+
718.3854	1	35515.02	C37 H58 Na O12	M+
1064.5778	2	8940.06		
1065.0792	2	10880.18		
1107.6575	1	10876.28		
1379.8281	1	7292.69		
1411.774	1	55602.59		
1412.777	1	15462.13		
1413.7799	1	15454.35		

Formula Calculator Element Limits

Element	Min	Max
C	0	200
H	0	400
O	0	15
Na	1	1

Formula Calculator Results

Formula	CalculatedMass	CalculatedMz	Mz	Diff. (mDa)	Diff. (ppm)	DBE
C37 H58 Na O12	717.3826	717.3820	717.3823	-0.1	-0.2	8.5000

--- End Of Report ---

Figure S24. IR Spectrum of **3**

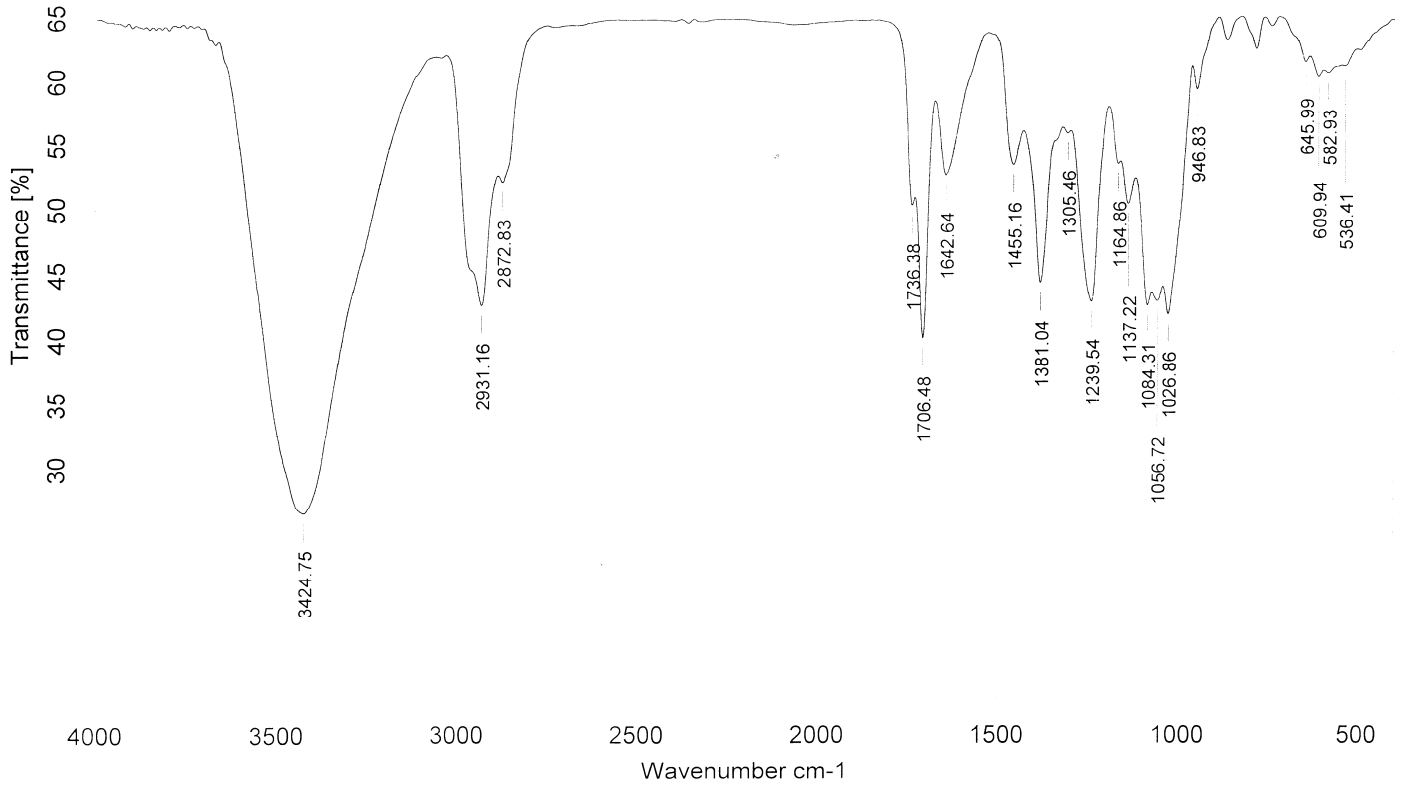


Figure S25. ^{1}H NMR Spectrum of **4** in Pyridine-d_5

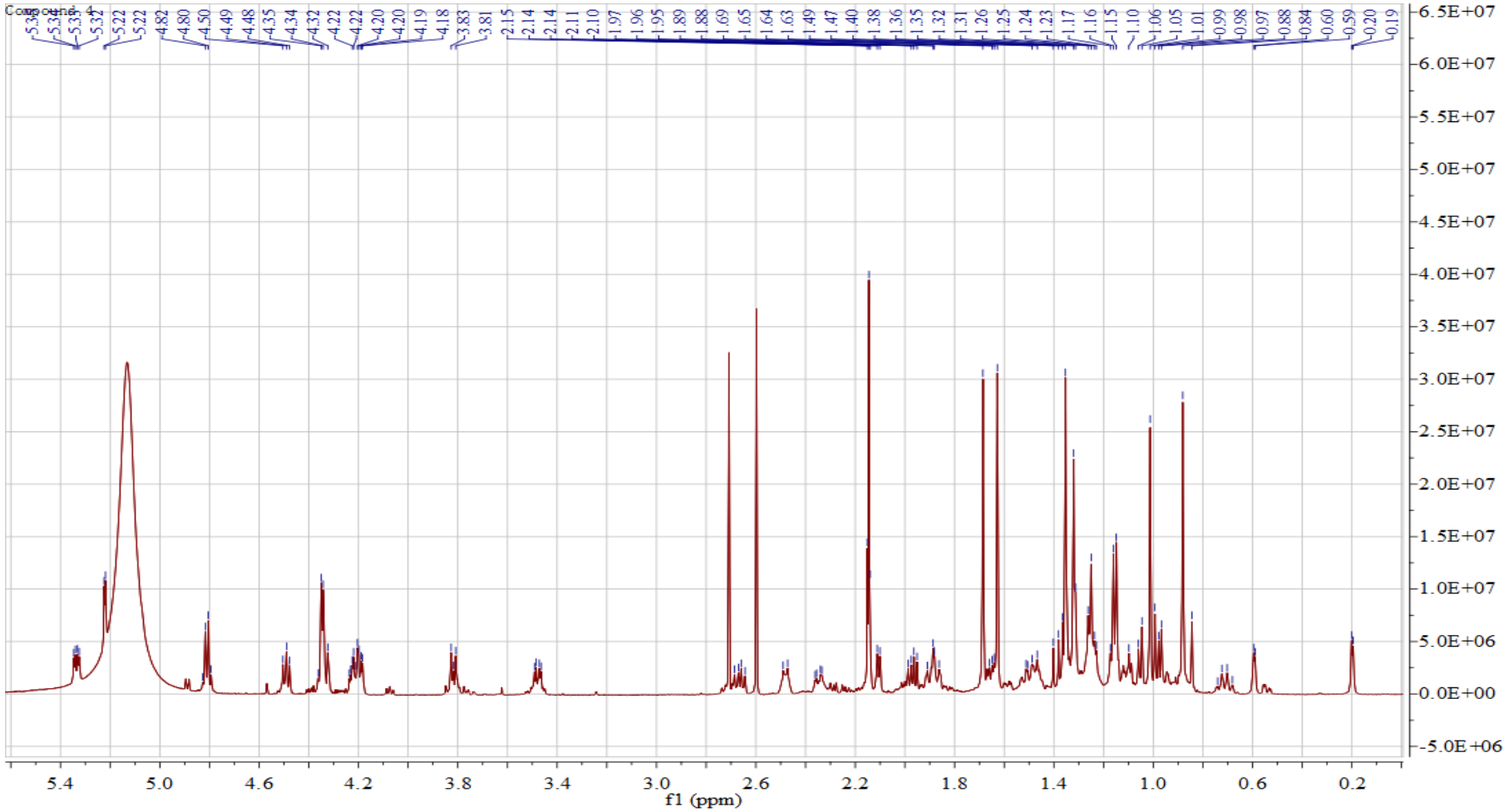


Figure S26. ^{13}C NMR Spectrum of **4** in Pyridine-d_5

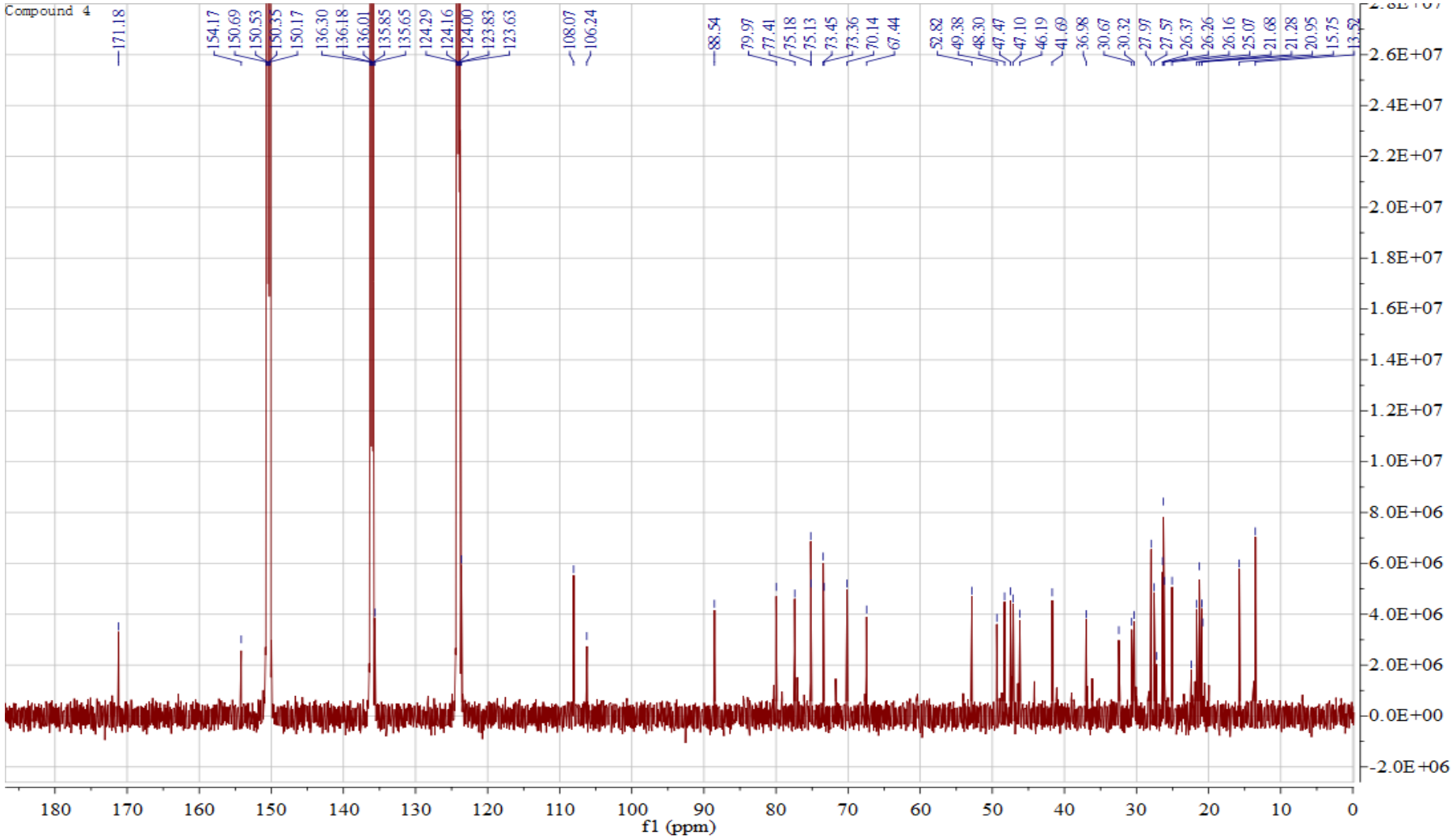


Figure S27. HSQC Spectrum of **4** in Pyridine-d_5

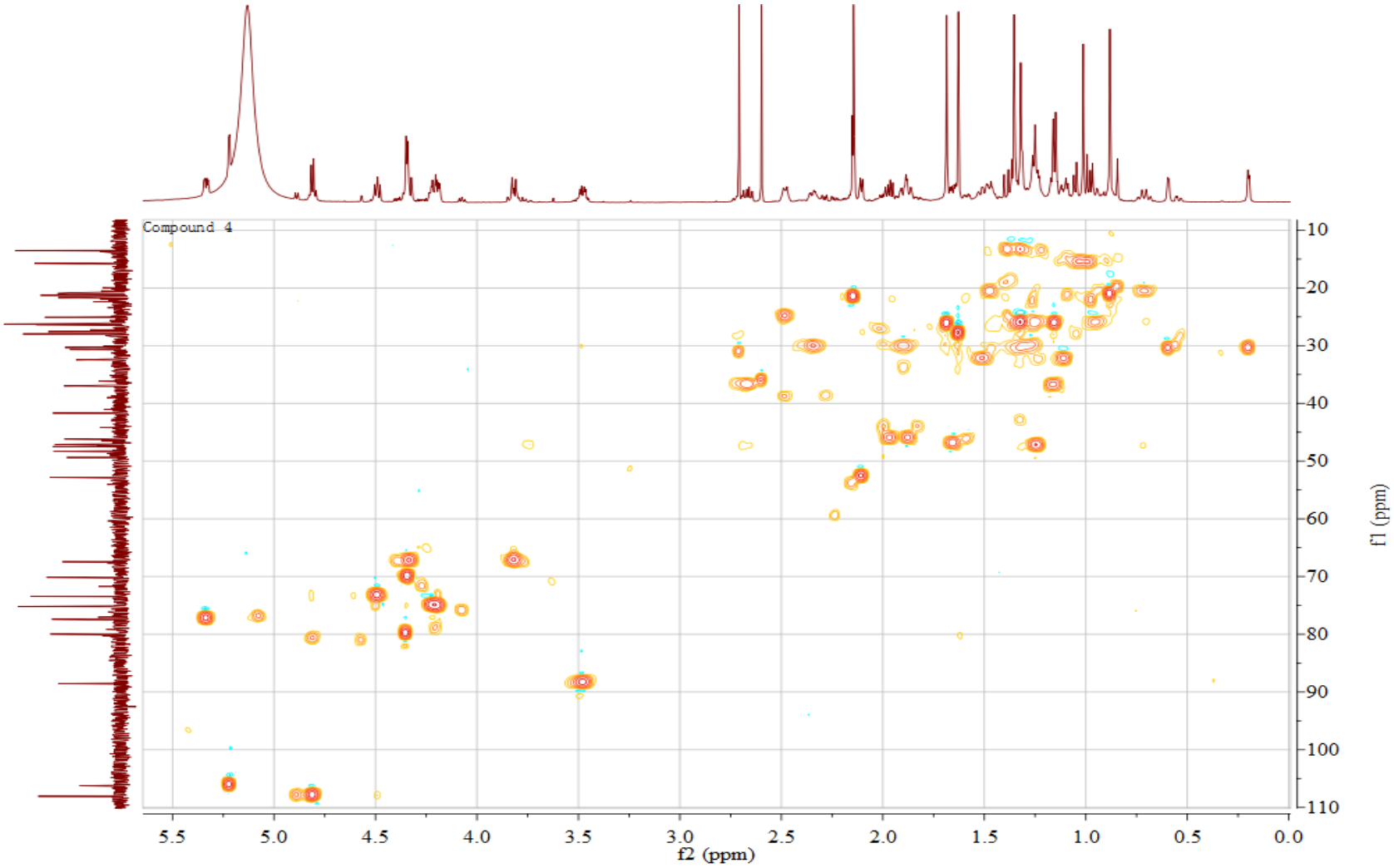


Figure S28. HMBC Spectrum of **4** in Pyridine-d_5

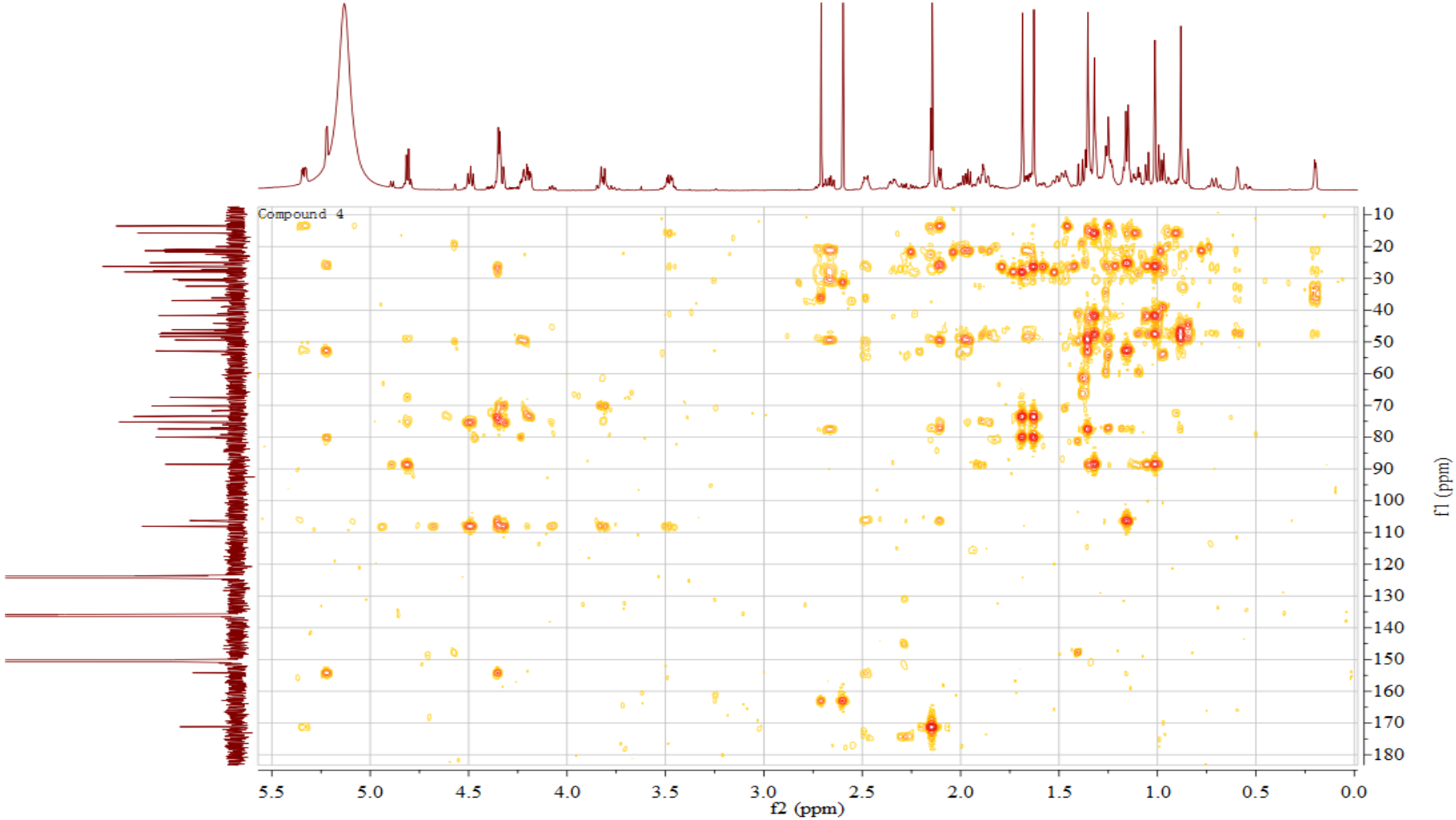


Figure S29. ^{1}H-^{1}H COSY Spectrum of **4** in Pyridine-d_5

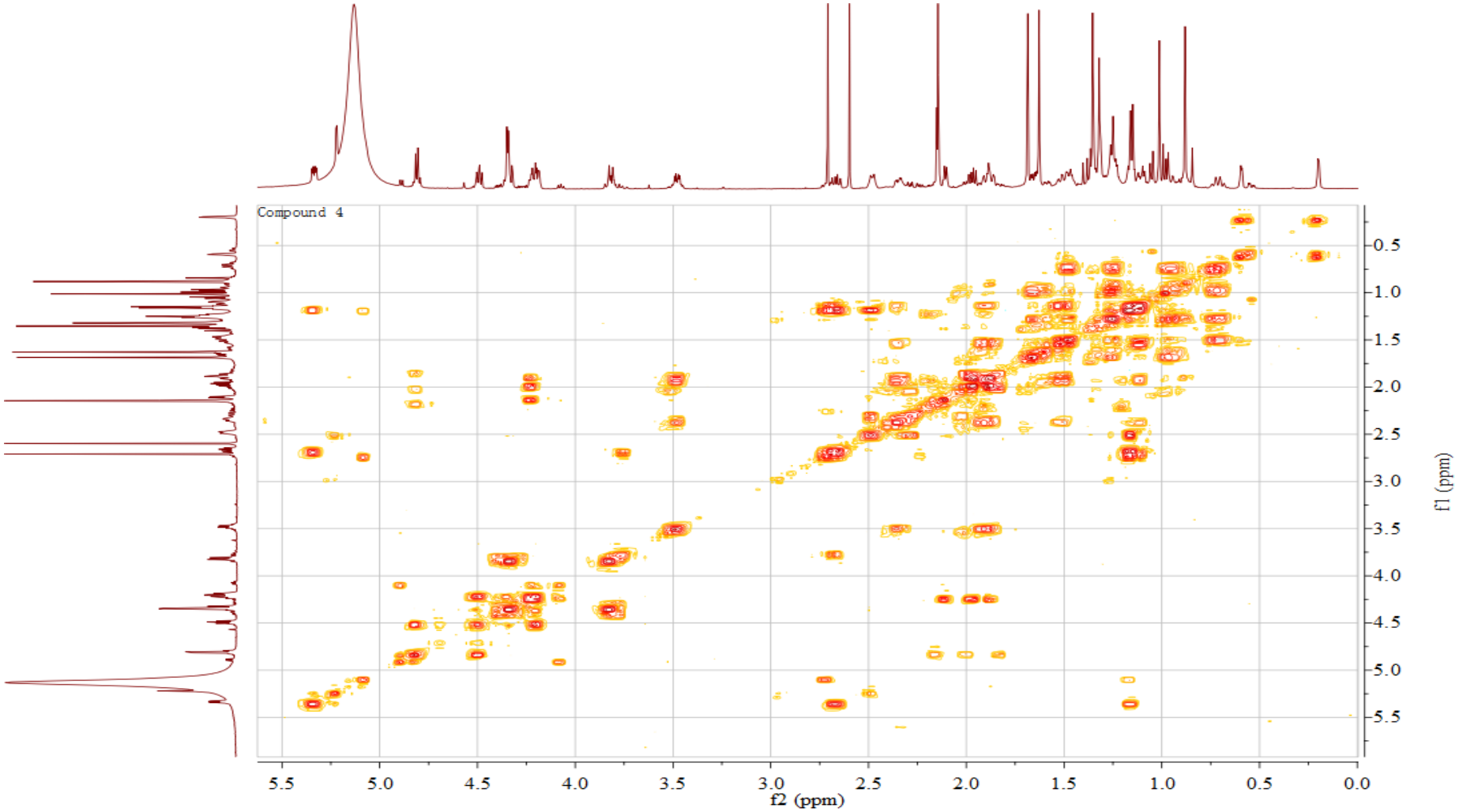


Figure S30. ROESY Spectrum of **4** in Pyridine-d_5

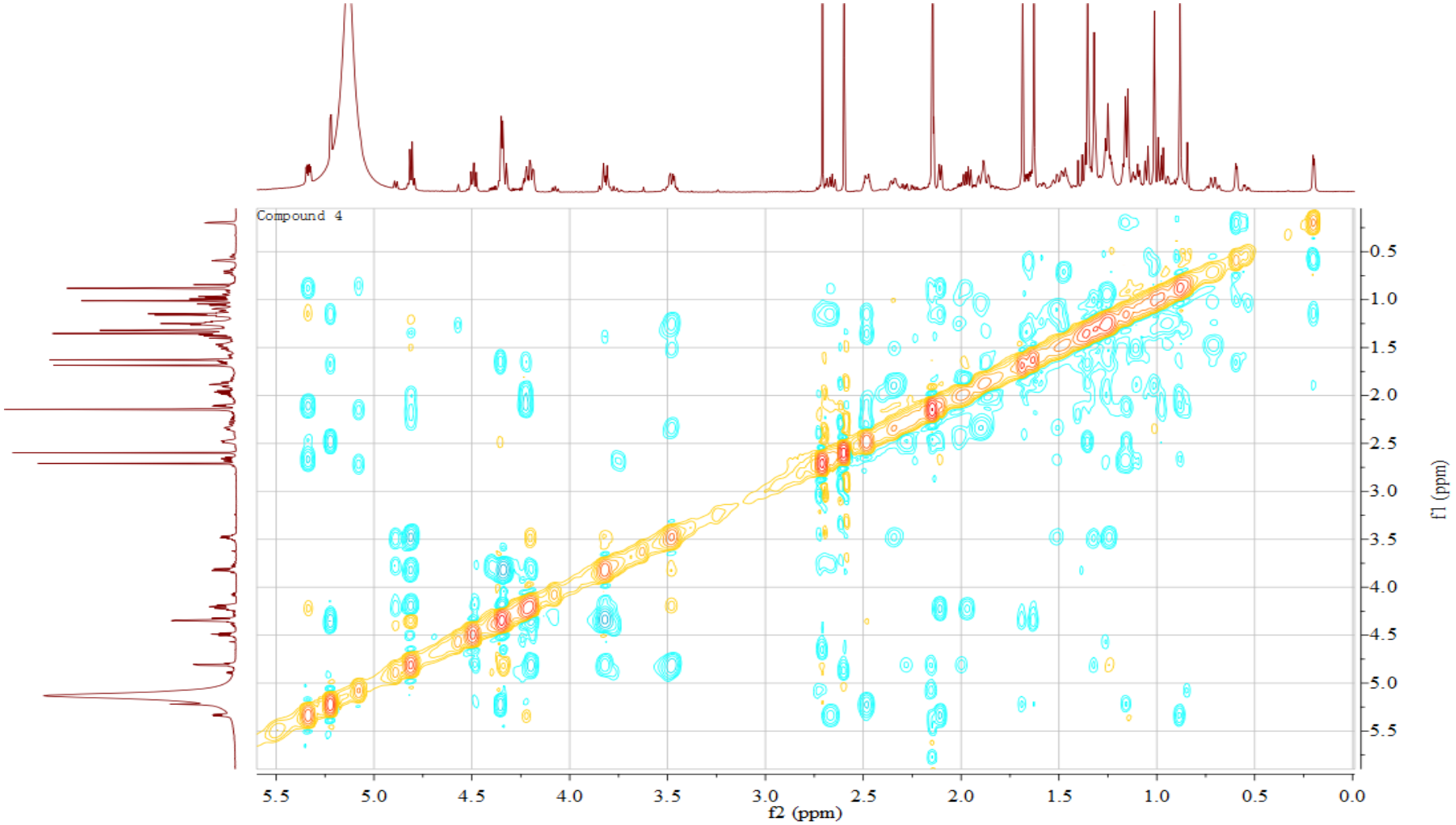


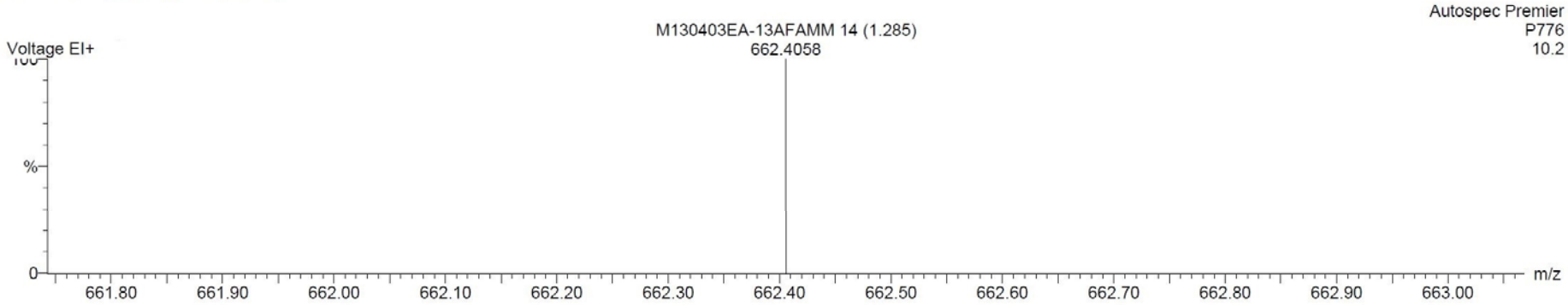
Figure S31. HRESIMS of **4**

Elemental Composition Report

Single Mass Analysis

Tolerance = 10.0 PPM / DBE: min = -10.0, max = 120.0
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ions
25 formula(e) evaluated with 1 results within limits (up to 51 closest results for each mass)
Elements Used:
C: 0-200 H: 0-400 O: 9-11



Minimum:				-10.0		
Maximum:		200.0	10.0	120.0		
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Formula
662.4058	662.4030	2.8	4.2	9.0	5546027.0	C37 H58 O10

Figure S32. IR Spectrum of **4**

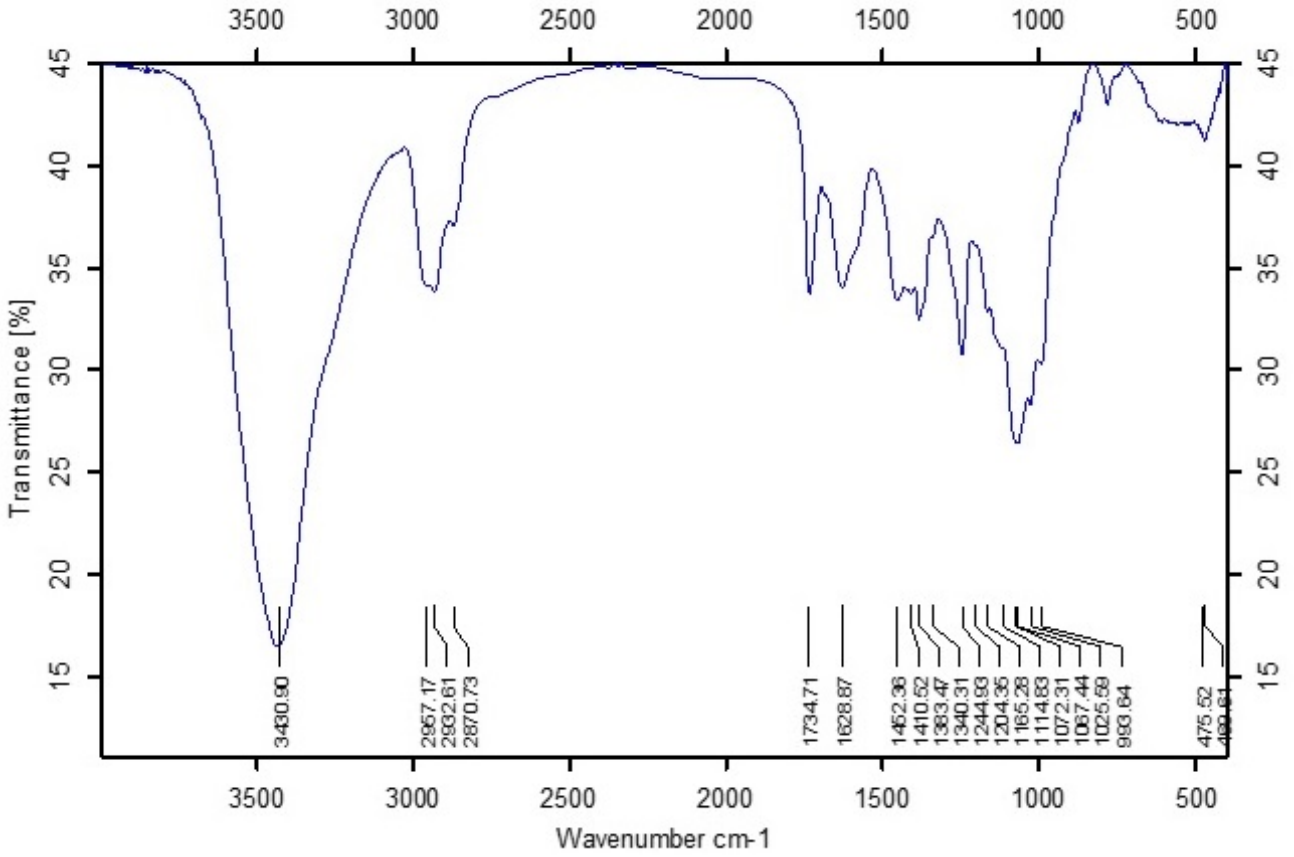


Figure S33. ^{1}H NMR Spectrum of **5** in Pyridine-d_5

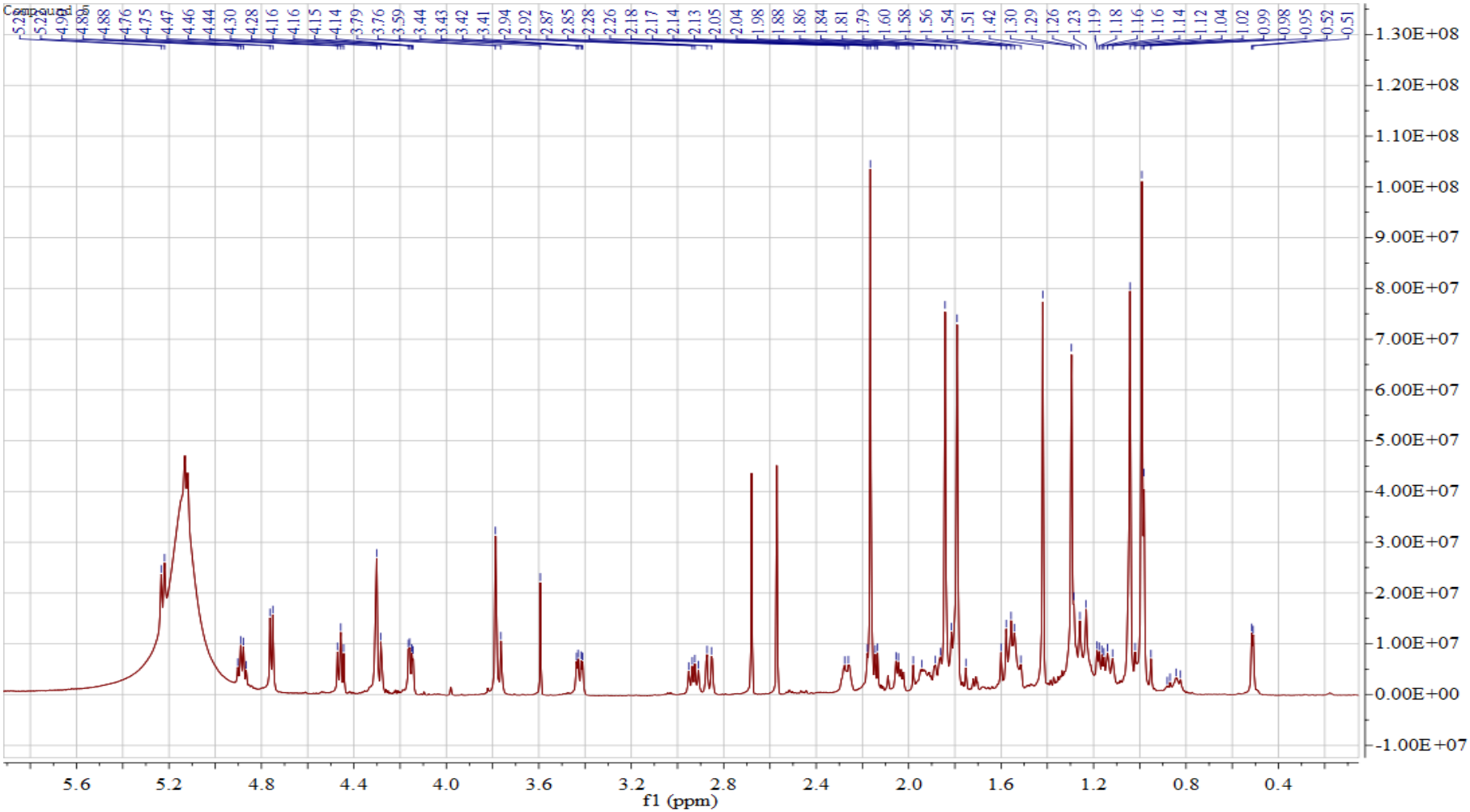


Figure S34. ^{13}C NMR Spectrum of **5** in Pyridine-d_5

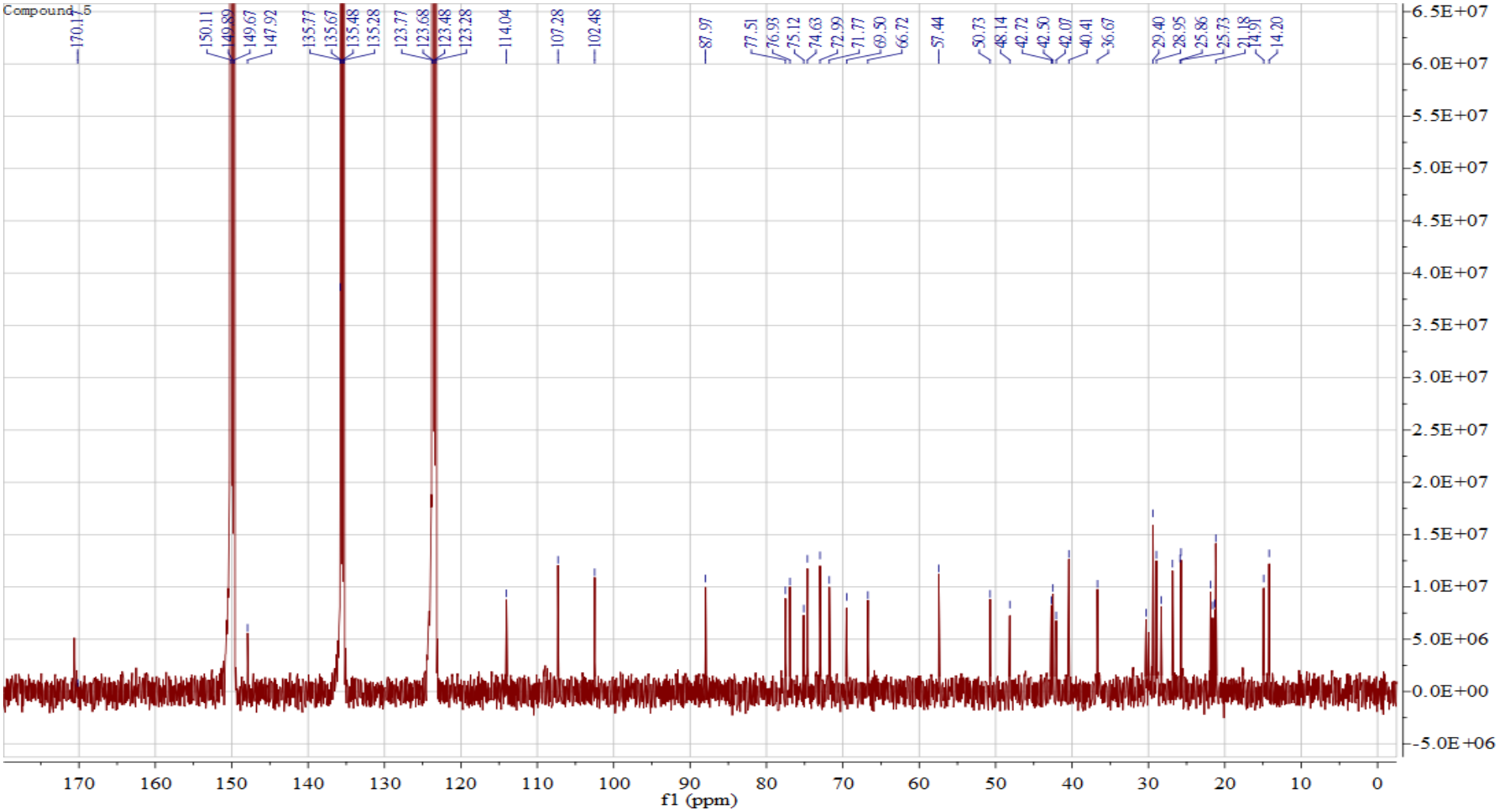


Figure S35. HSQC Spectrum of **5** in Pyridine-d_5

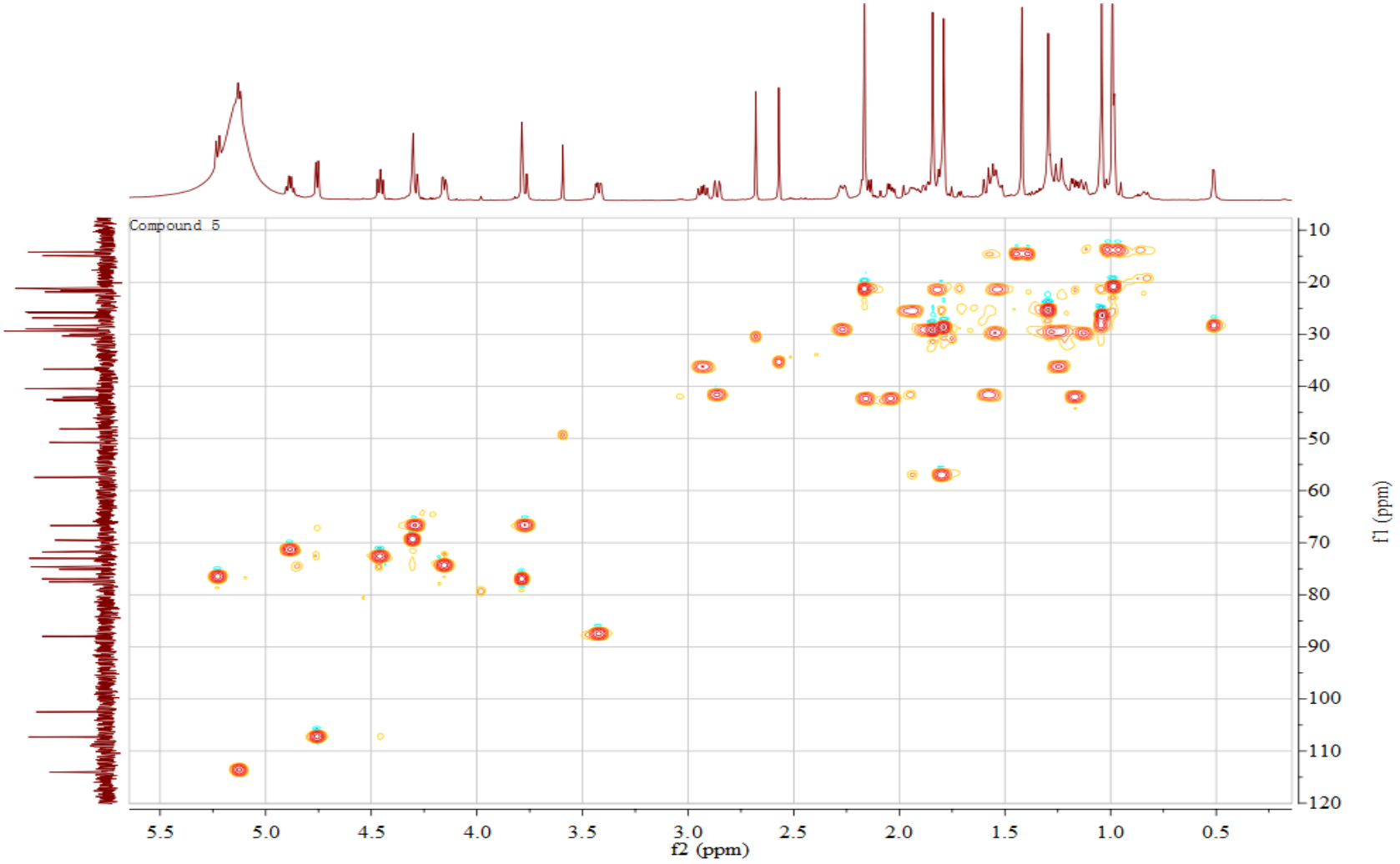


Figure S36. HMBC Spectrum of **5** in Pyridine-d_5

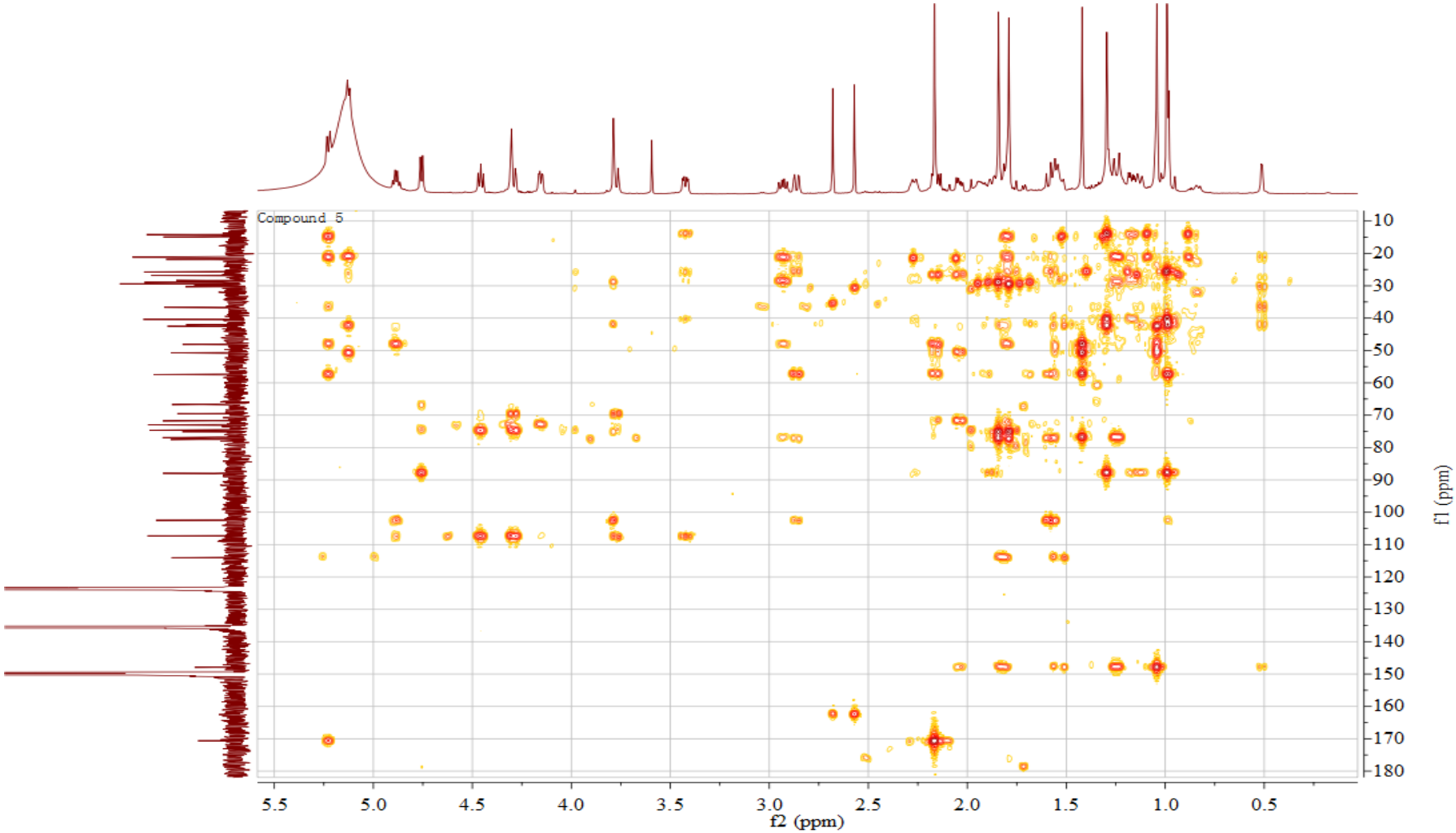


Figure S37. ^{1}H-^{1}H COSY Spectrum of **5** in Pyridine-d_5

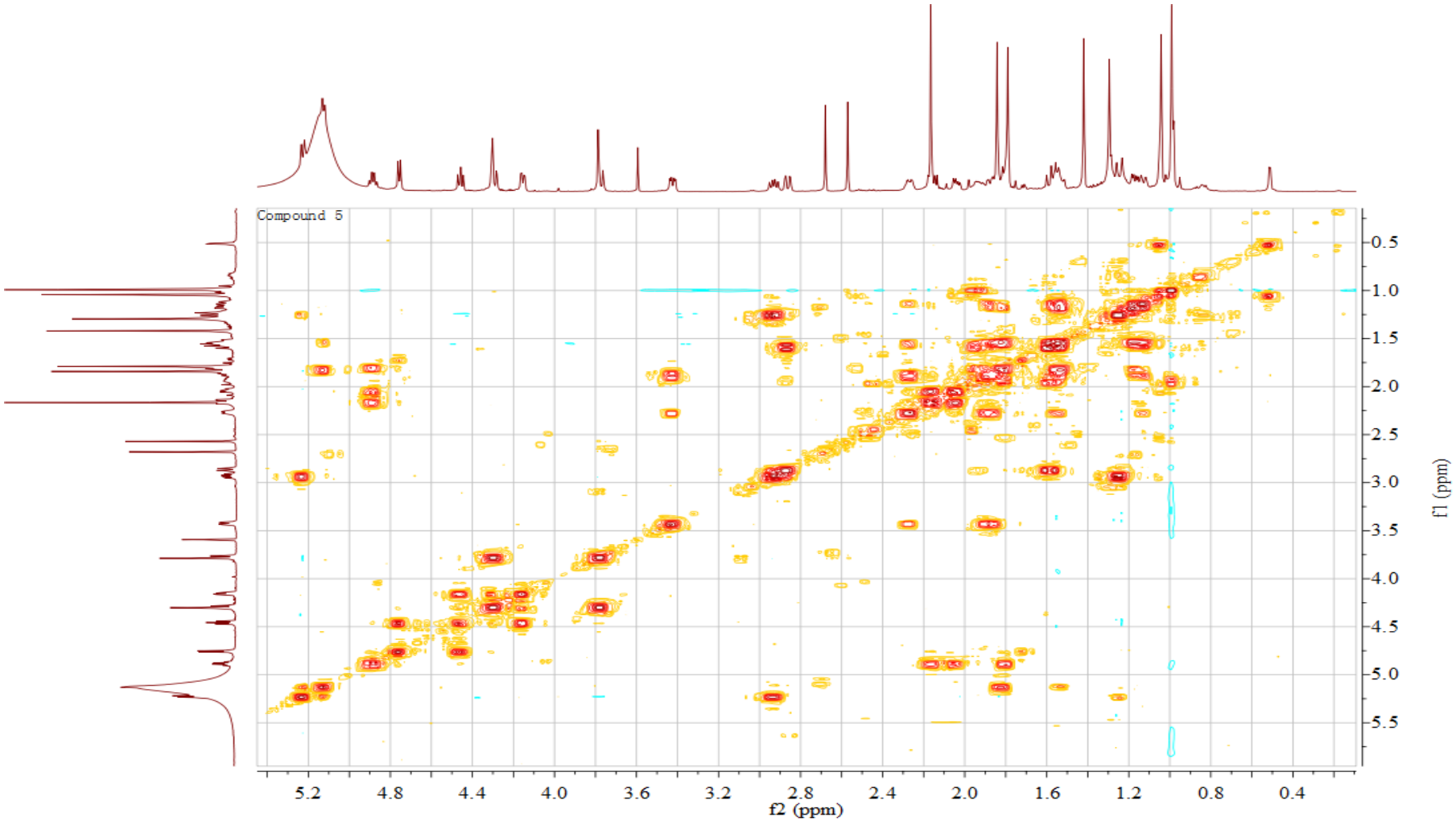


Figure S38. ROESY Spectrum of **5** in Pyridine-d_5

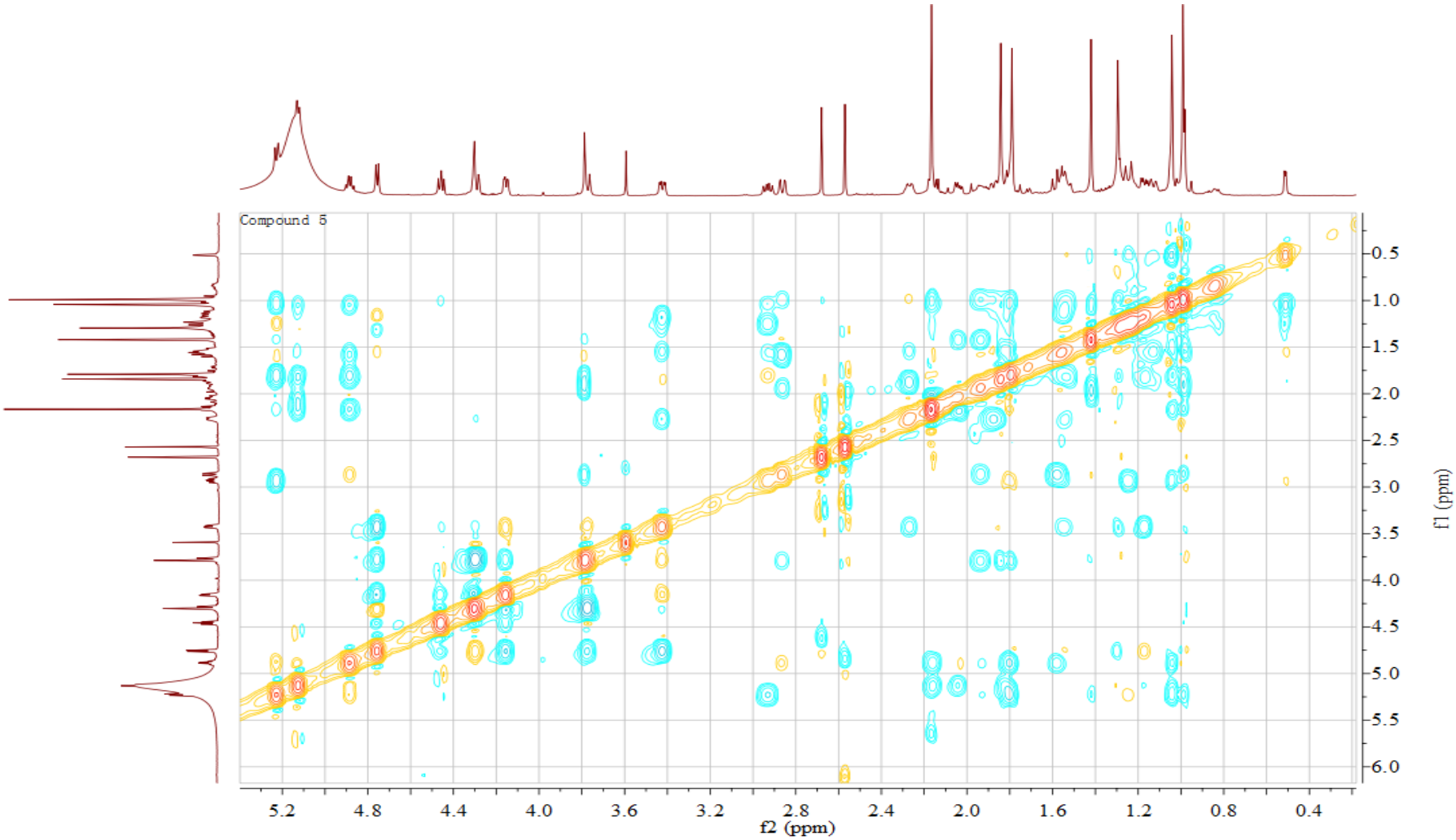


Figure S39. HREIMS of **5**

Elemental Composition Report

Page 1

Single Mass Analysis

Tolerance = 10.0 PPM / DBE: min = -10.0, max = 120.0

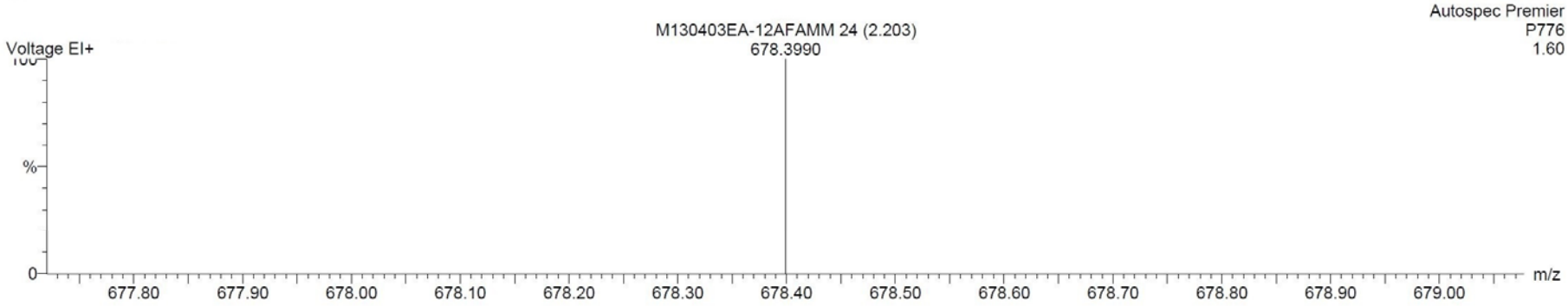
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ions

25 formula(e) evaluated with 1 results within limits (up to 51 closest results for each mass)

Elements Used:

C: 0-200 H: 0-400 O: 10-12



Minimum:				-10.0		
Maximum:		200.0	10.0	120.0		
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Formula
678.3990	678.3979	1.1	1.6	9.0	5546025.5	C37 H58 O11

Figure S40. IR Spectrum of **5**

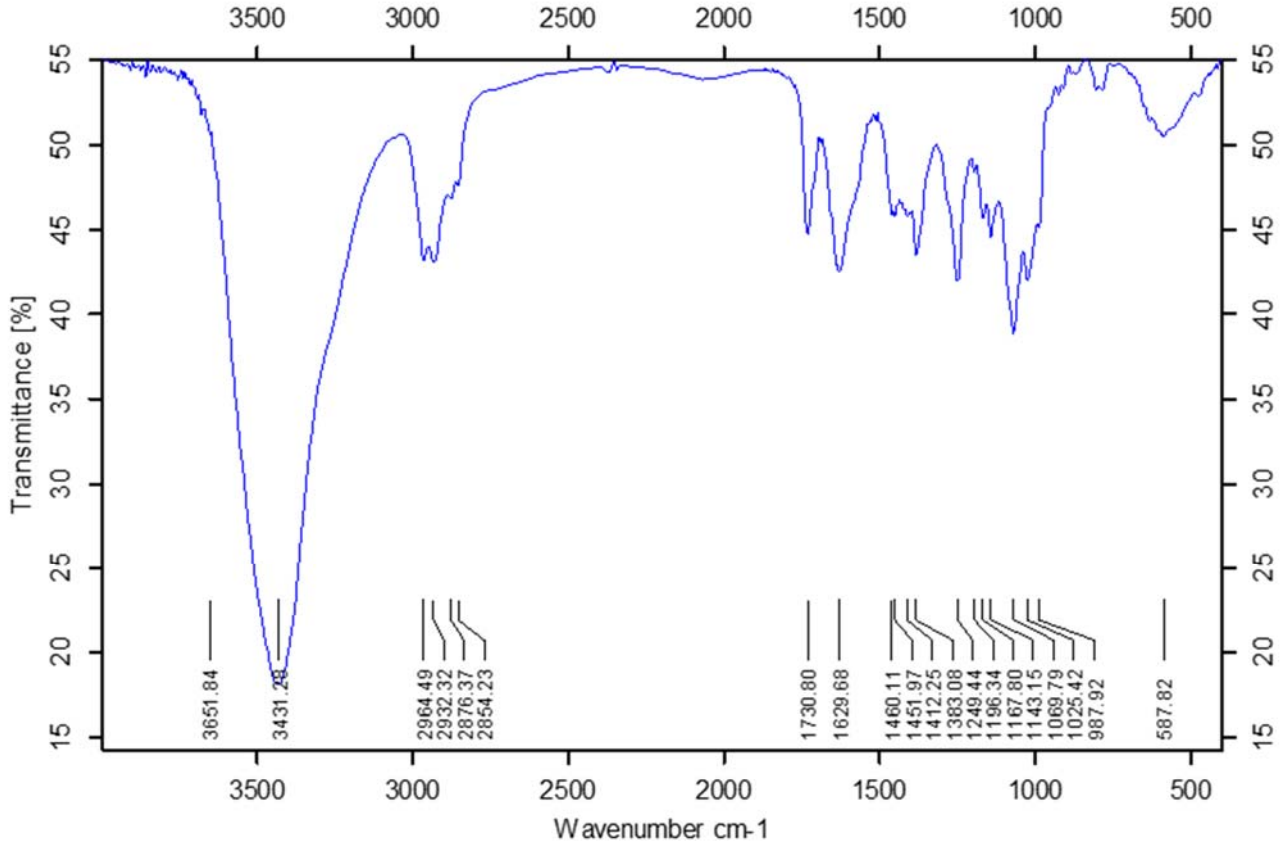


Figure S41. ^{1}H NMR Spectrum of **6** in Pyridine-d_5

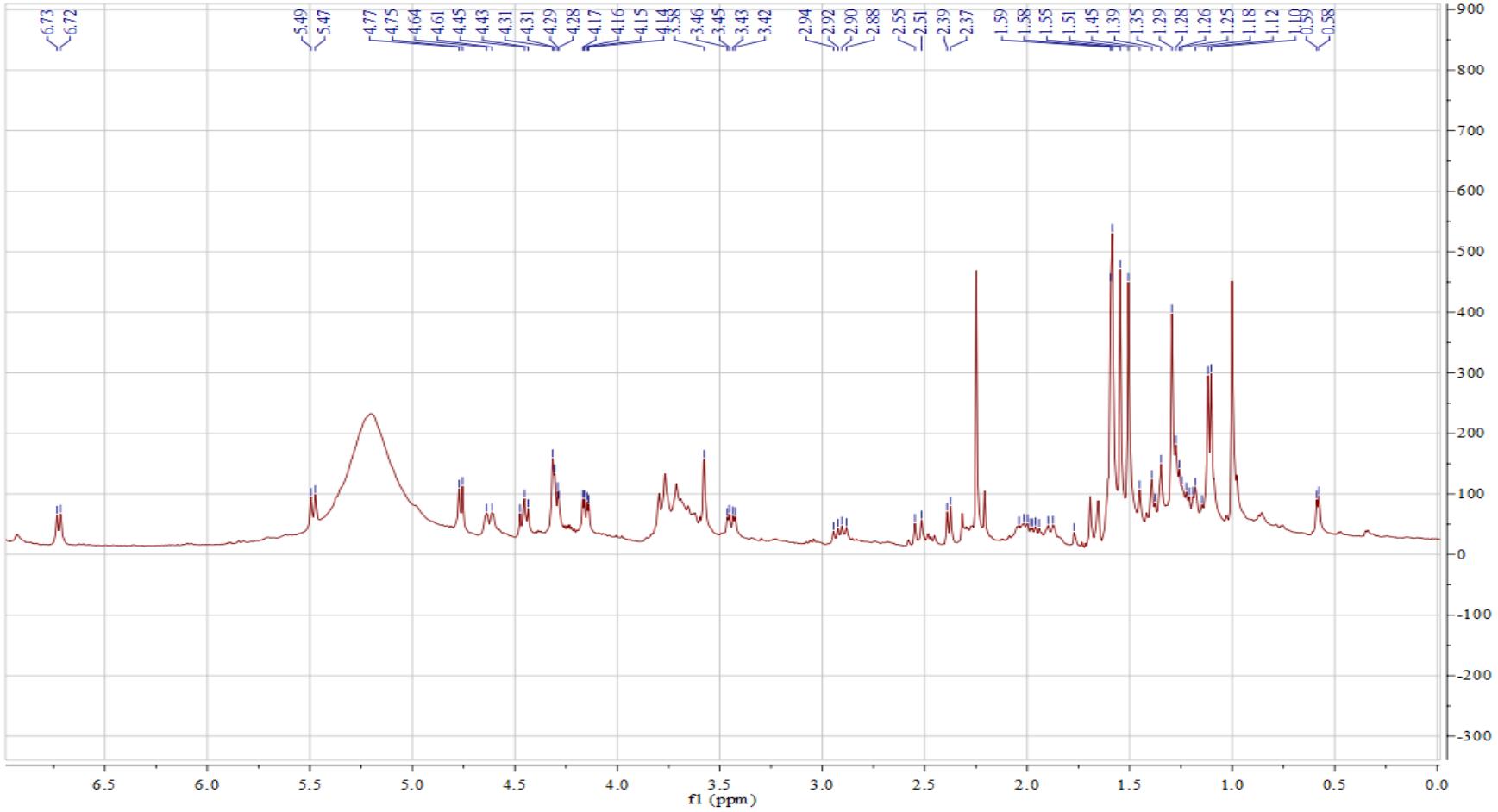


Figure S42. ^{13}C NMR Spectrum of **6** in Pyridine-d_5

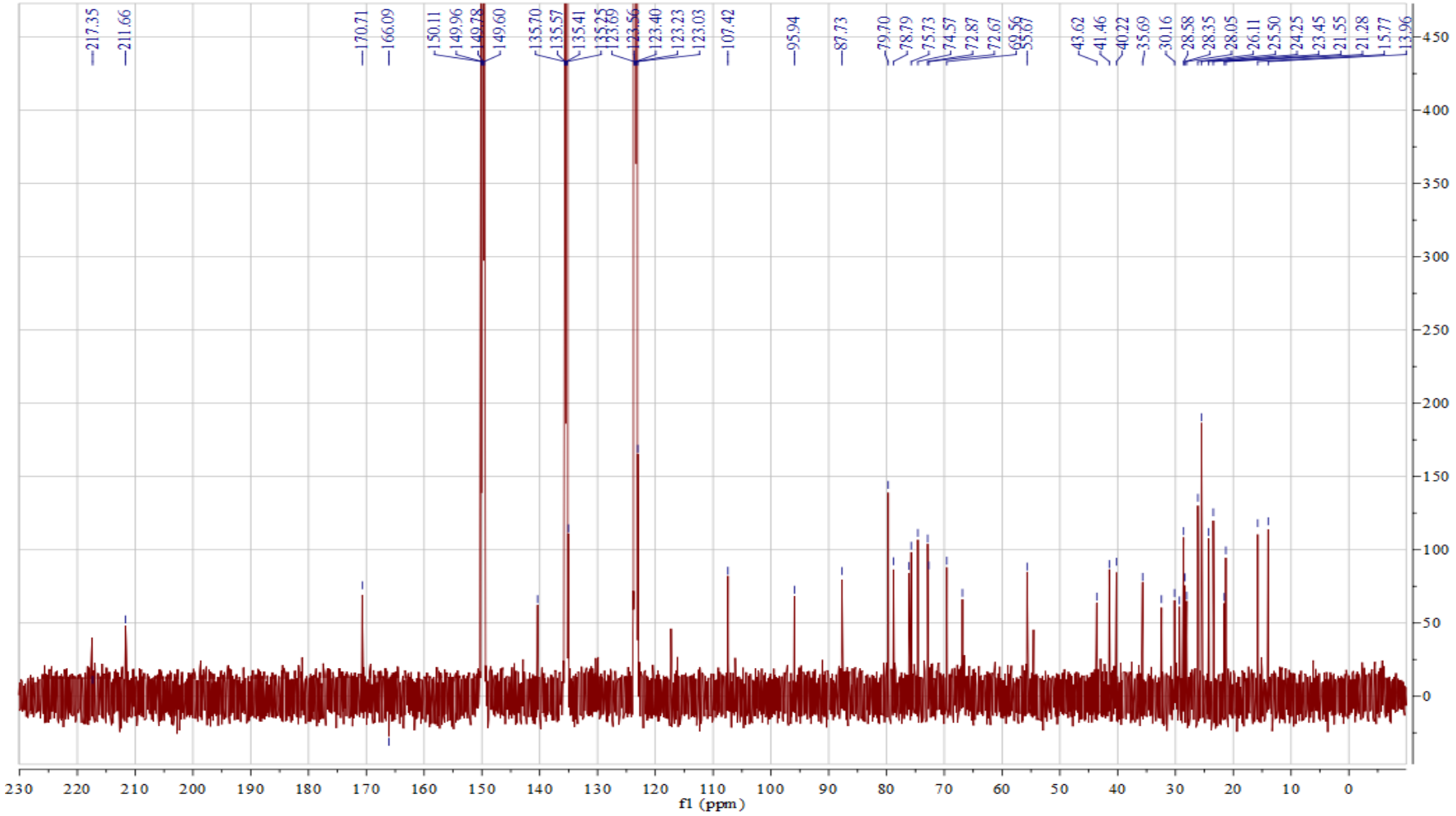


Figure S43. HSQC Spectrum of **6** in Pyridine-d_5

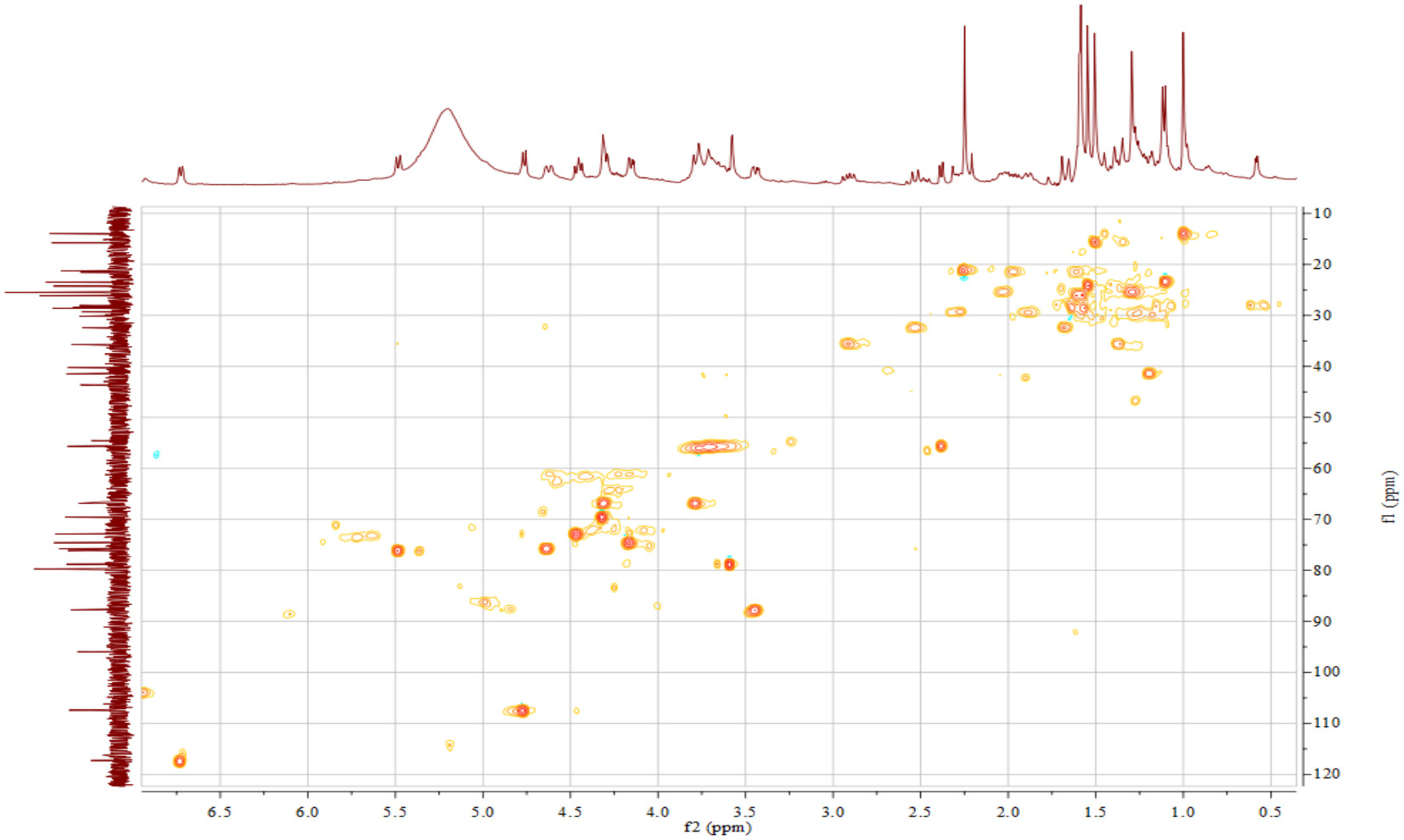


Figure S44. HMBC Spectrum of **6** in Pyridine-d_5

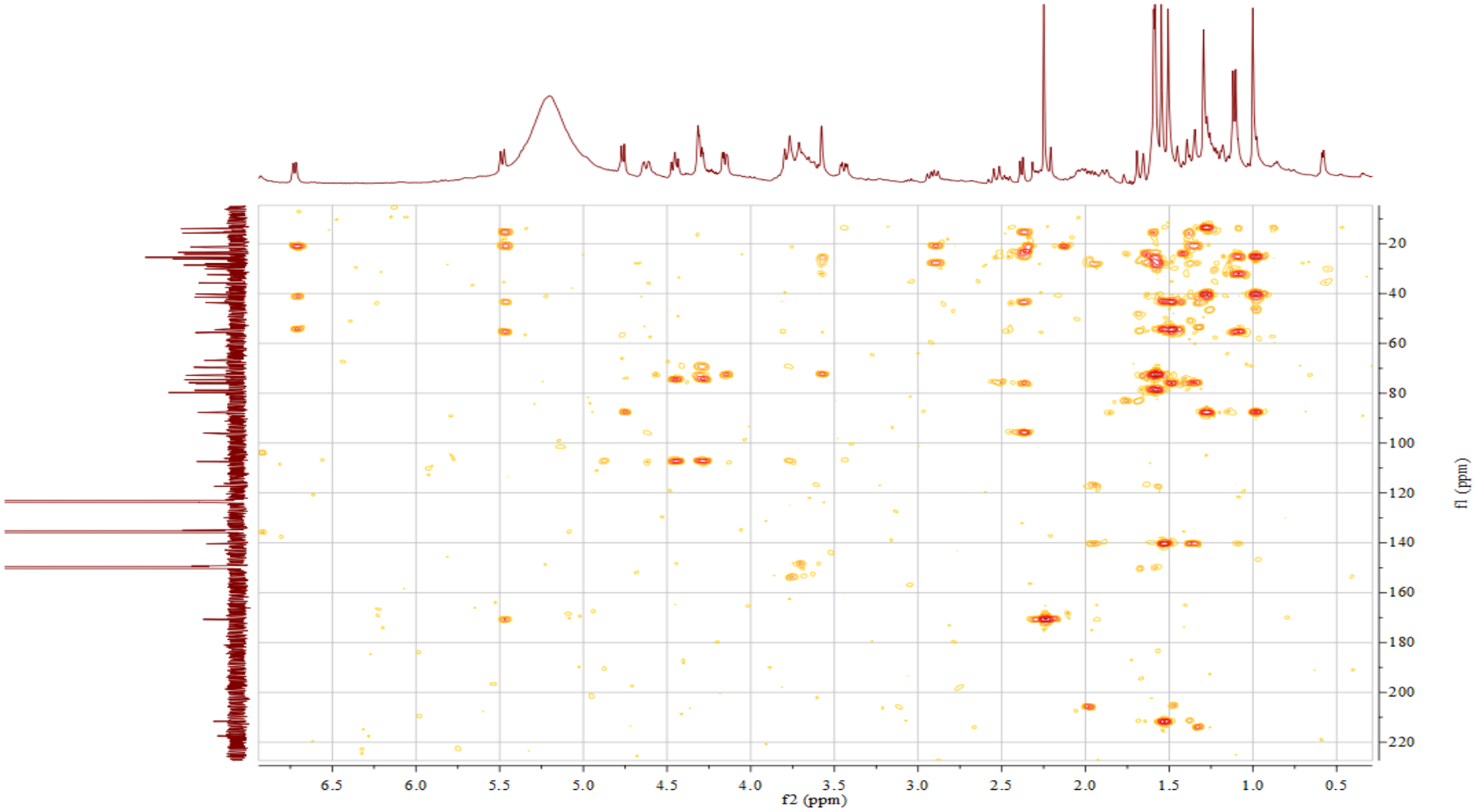


Figure S45. ^{1}H-^{1}H COSY Spectrum of **6** in Pyridine-d_5

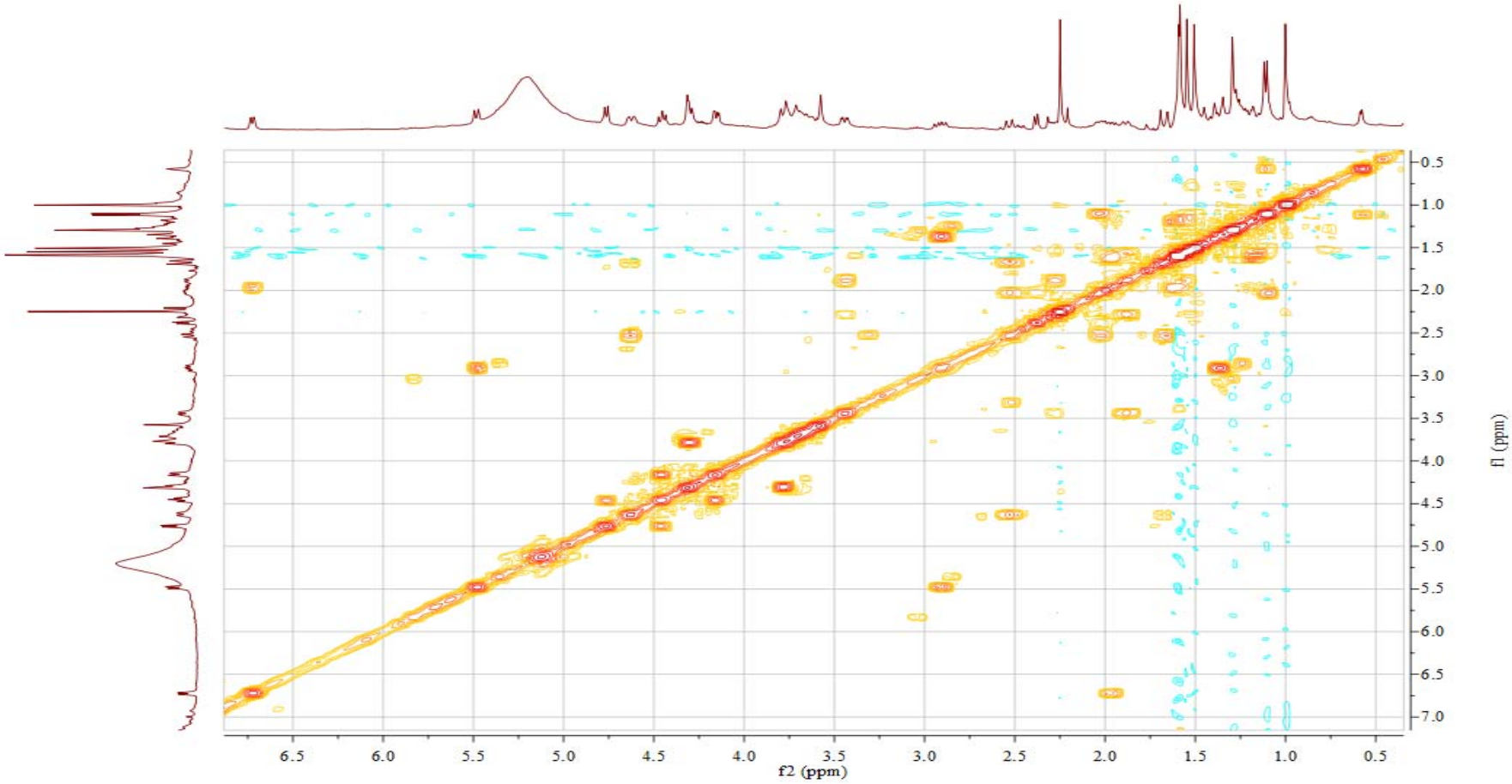


Figure S46. ROESY Spectrum of **6** in Pyridine-d_5

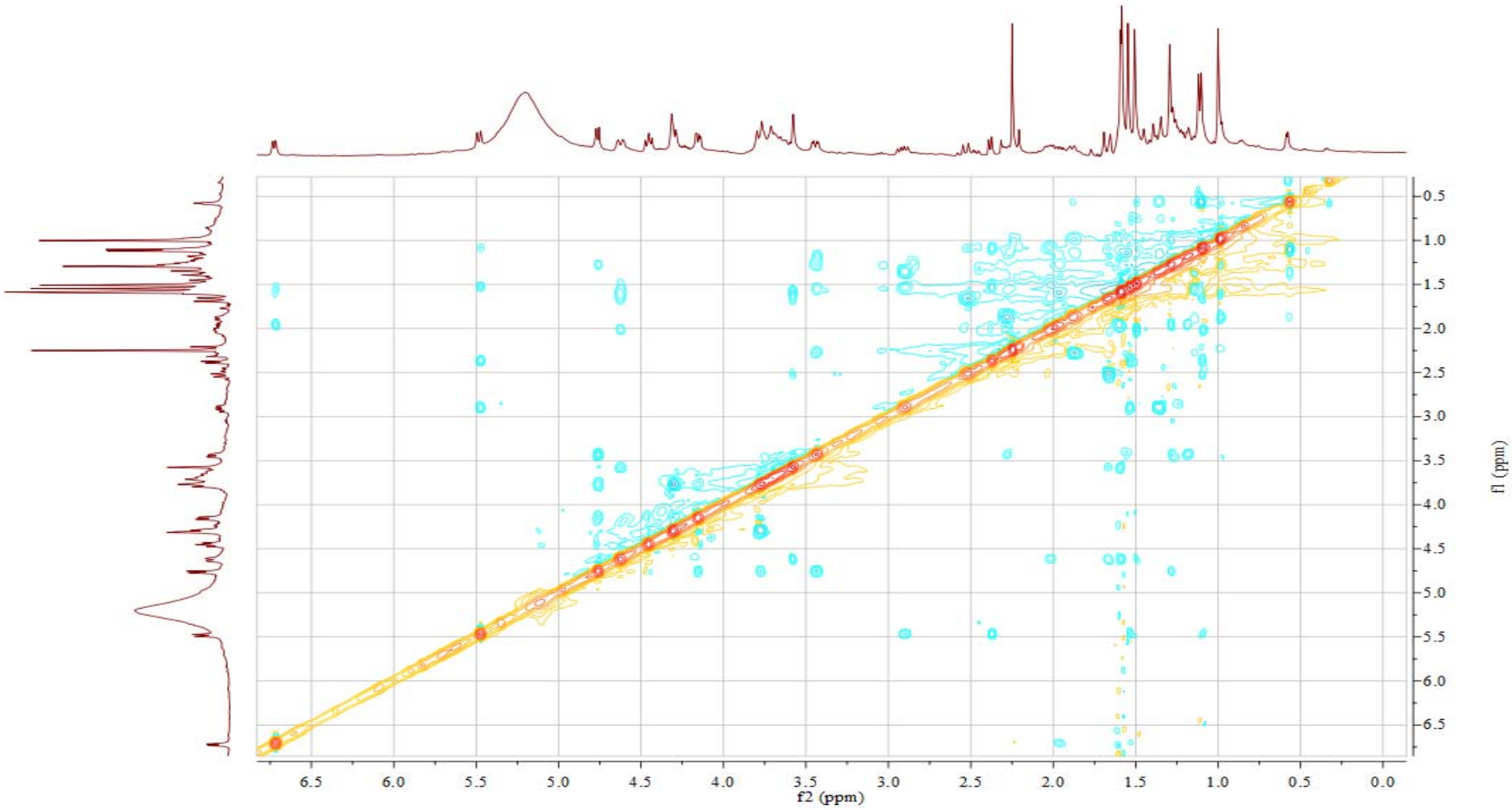
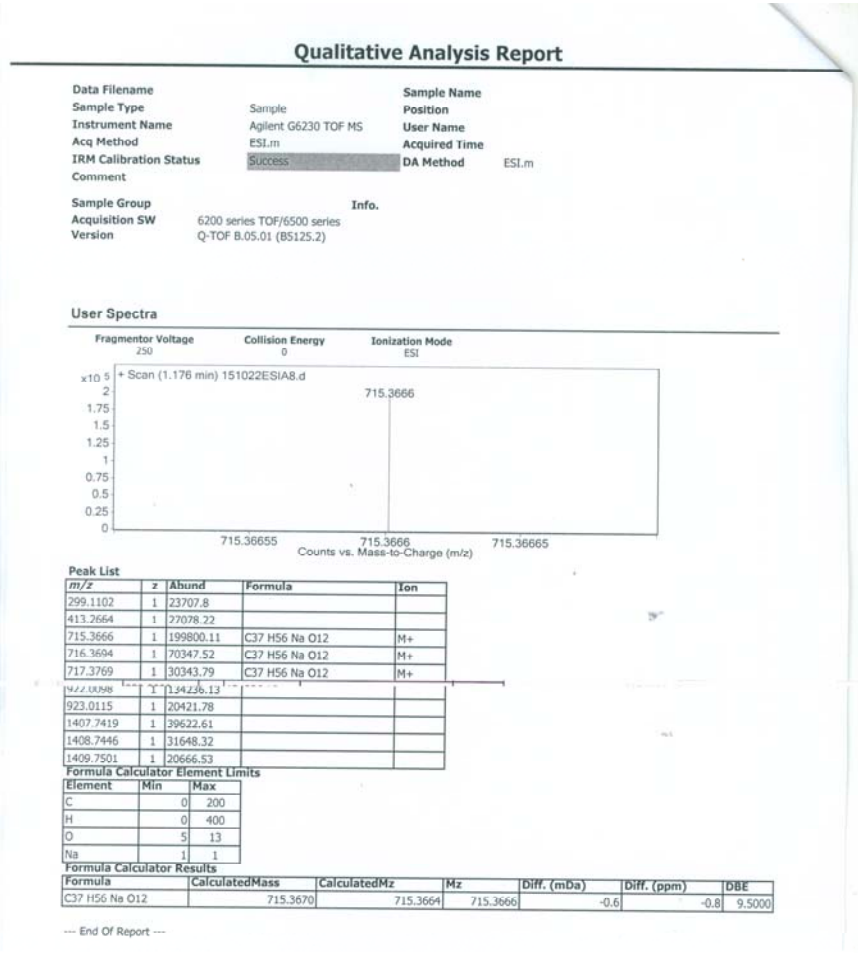


Figure S47. HREIMS of **6**



Qualitative Analysis Report

Data Filename		**Sample Name**	
Sample Type	Sample	**Position**	
Instrument Name	Agilent G6230 TOF MS	**User Name**	
Acq Method	ESI.m	**Acquired Time**	
IRM Calibration Status	Success	**DA Method**	ESI.m
Comment			

Sample Group	**Info.**
Acquisition SW Version	6200 series TOF/6500 series Q-TOF B.05.01 (B5125.2)

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
250	0	ESI

Peak List

m/z	z	Abund	Formula	Ion
299.1102	1	23707.8		
413.2664	1	27078.22		
715.3666	1	199800.11	C37 H56 Na O12	M+
716.3694	1	70347.52	C37 H56 Na O12	M+
717.3769	1	30343.79	C37 H56 Na O12	M+
922.0098	1	134236.13		
923.0115	1	20421.78		
1407.7419	1	39622.61		
1408.7446	1	31648.32		
1409.7501	1	20666.53		

Formula Calculator Element Limits

Element	Min	Max
C	0	200
H	0	400
O	5	13
Na	1	1

Formula Calculator Results

Formula	CalculatedMass	CalculatedMz	Mz	Diff. (mDa)	Diff. (ppm)	DBE
C37 H56 Na O12	715.3670	715.3664	715.3666	-0.6	-0.8	9.5000

--- End Of Report ---

Figure S48. IR Spectrum of **6**

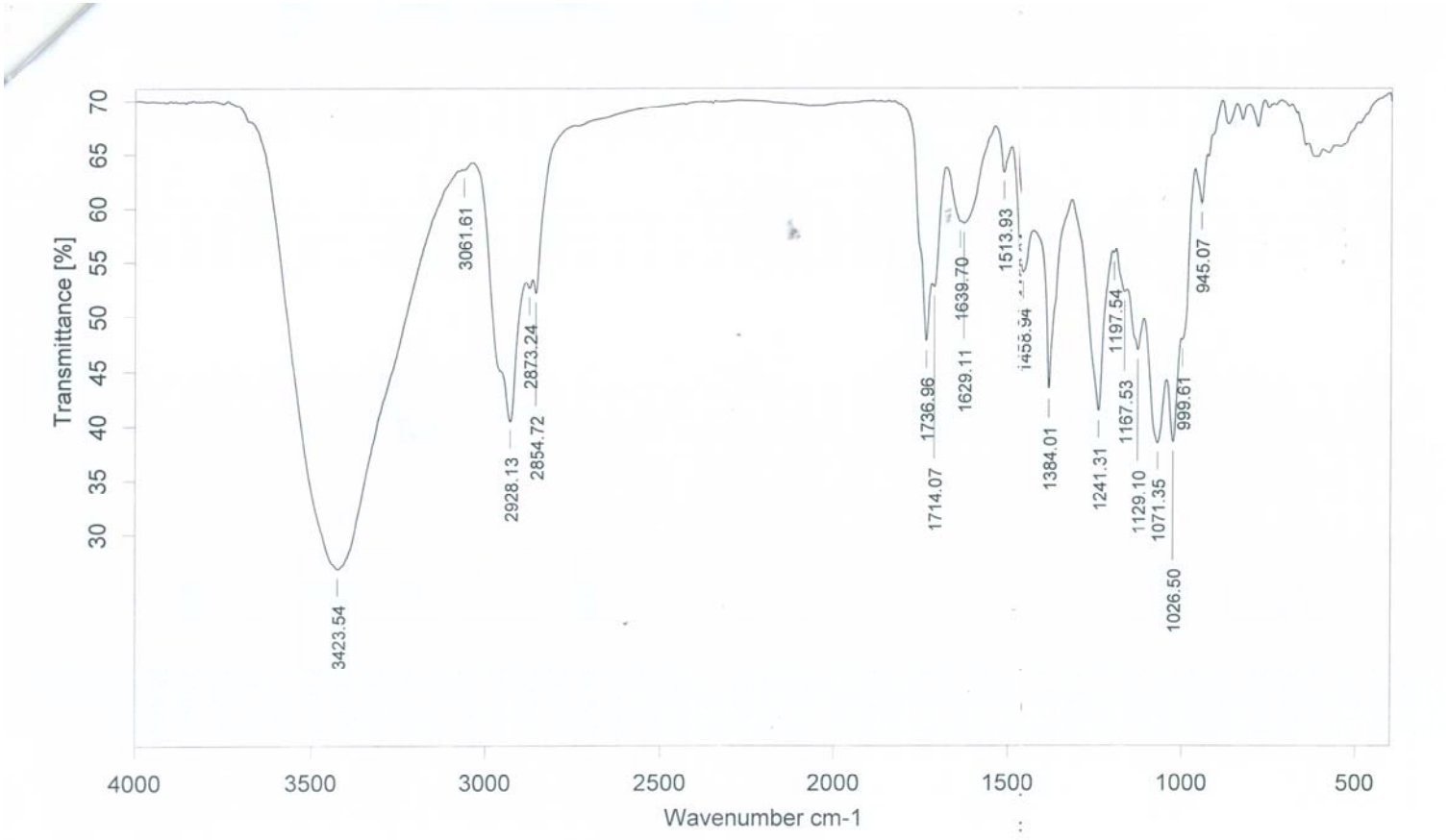


Figure S49. ^{1}H NMR Spectrum of **7** in Pyridine-d_5

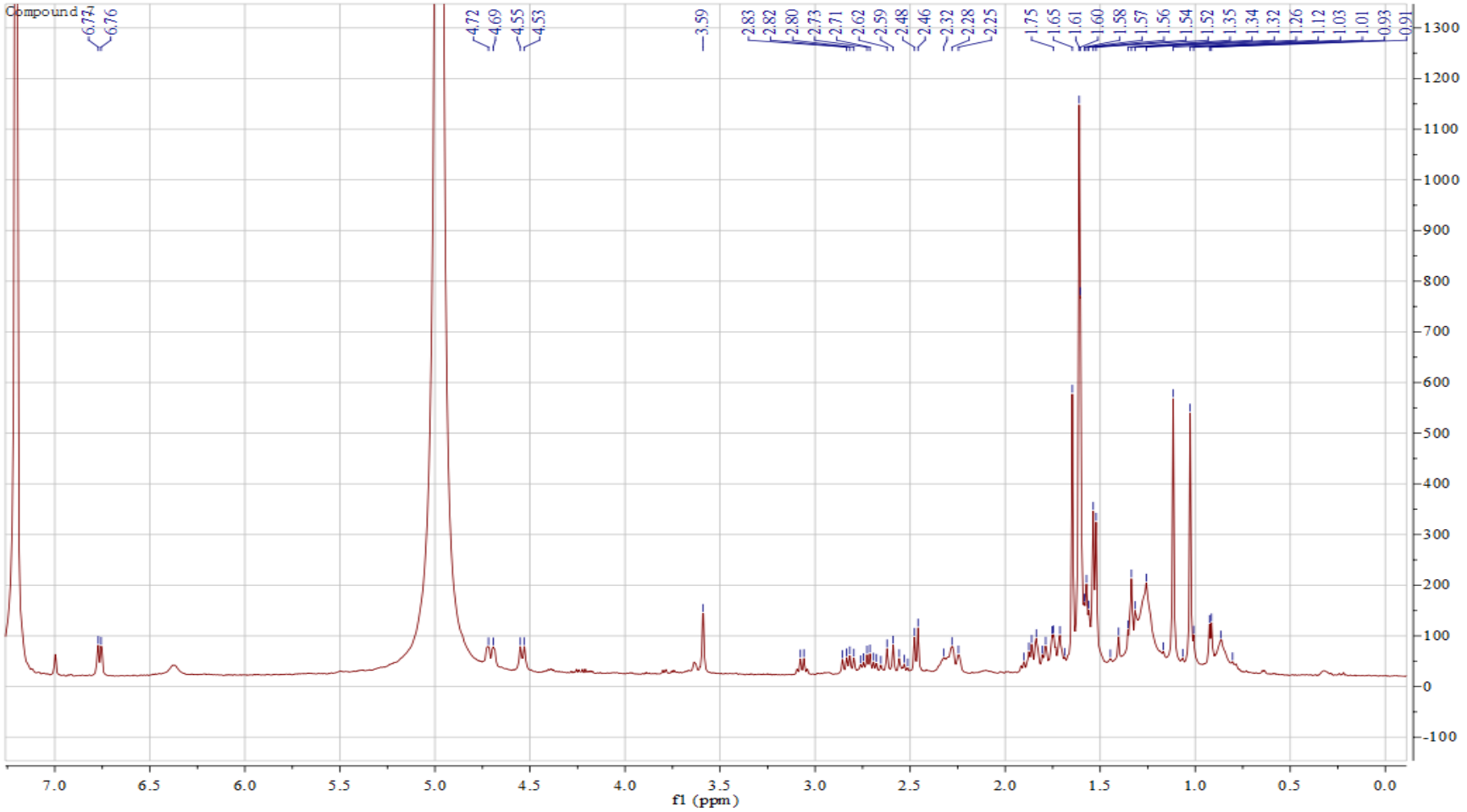


Figure S50. ^{13}C NMR Spectrum of **7** in Pyridine-d_5

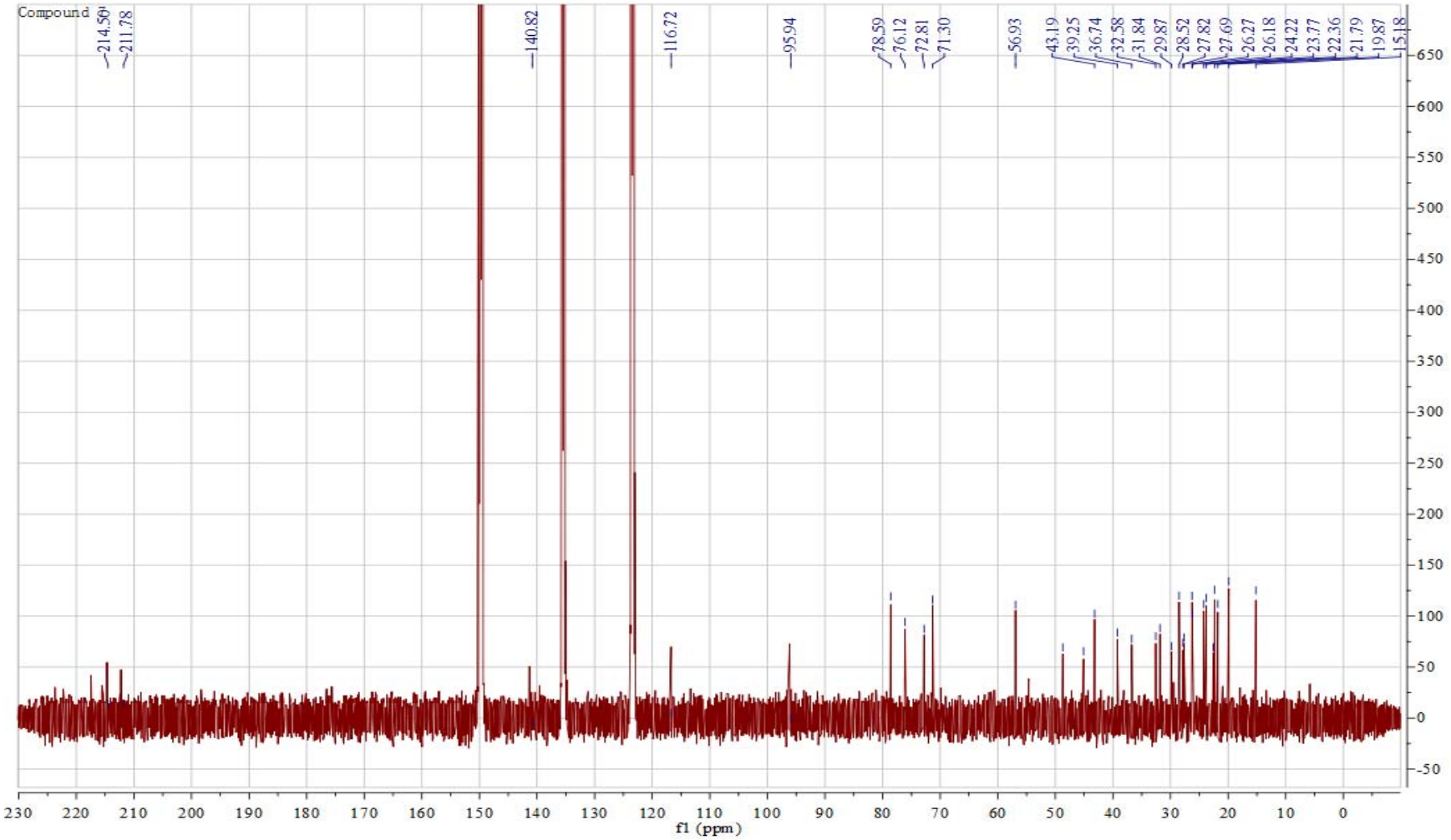


Figure S51. HSQC Spectrum of **7** in Pyridine-d_5

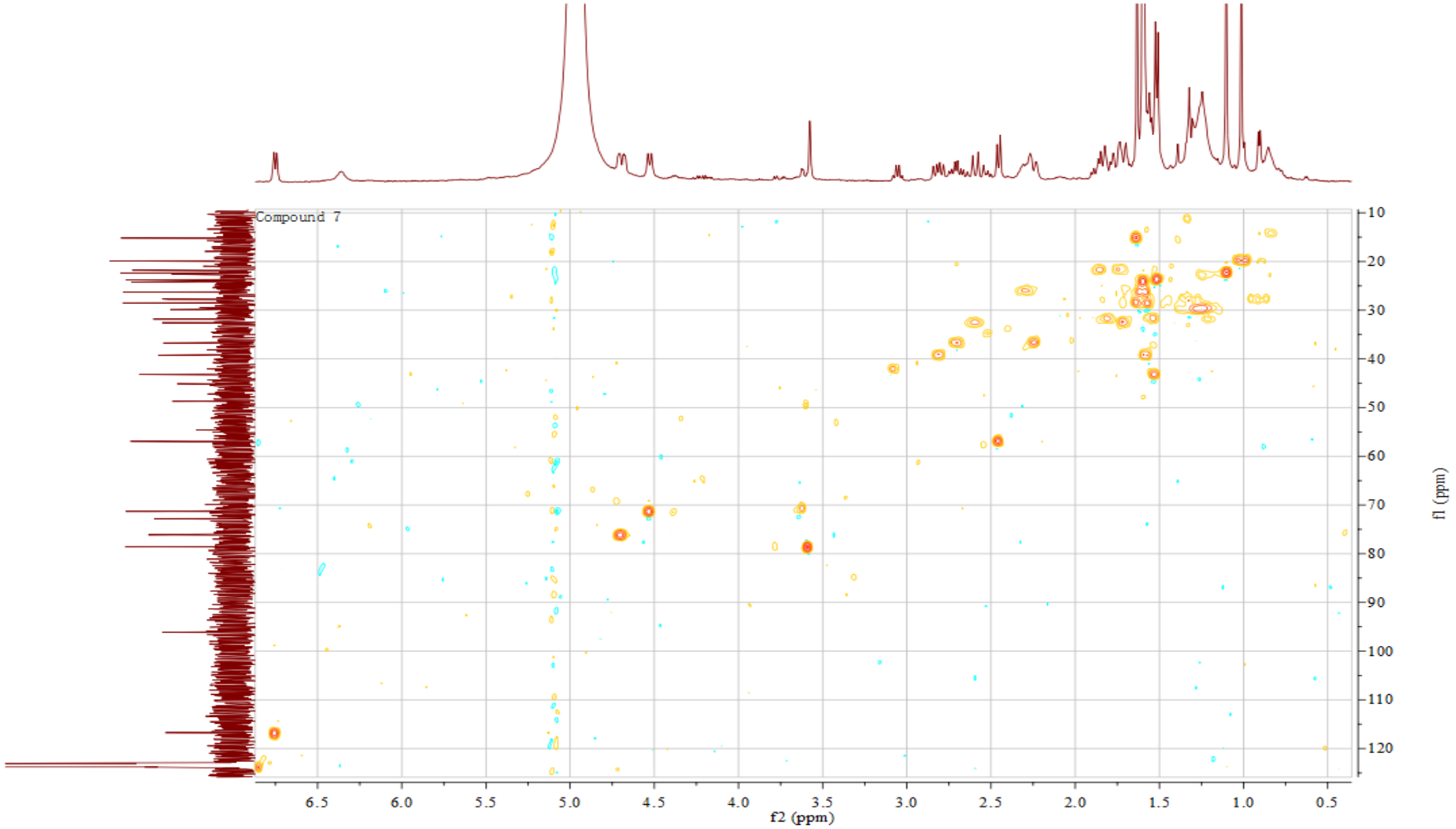


Figure S52. HMBC Spectrum of **7** in Pyridine-d_5

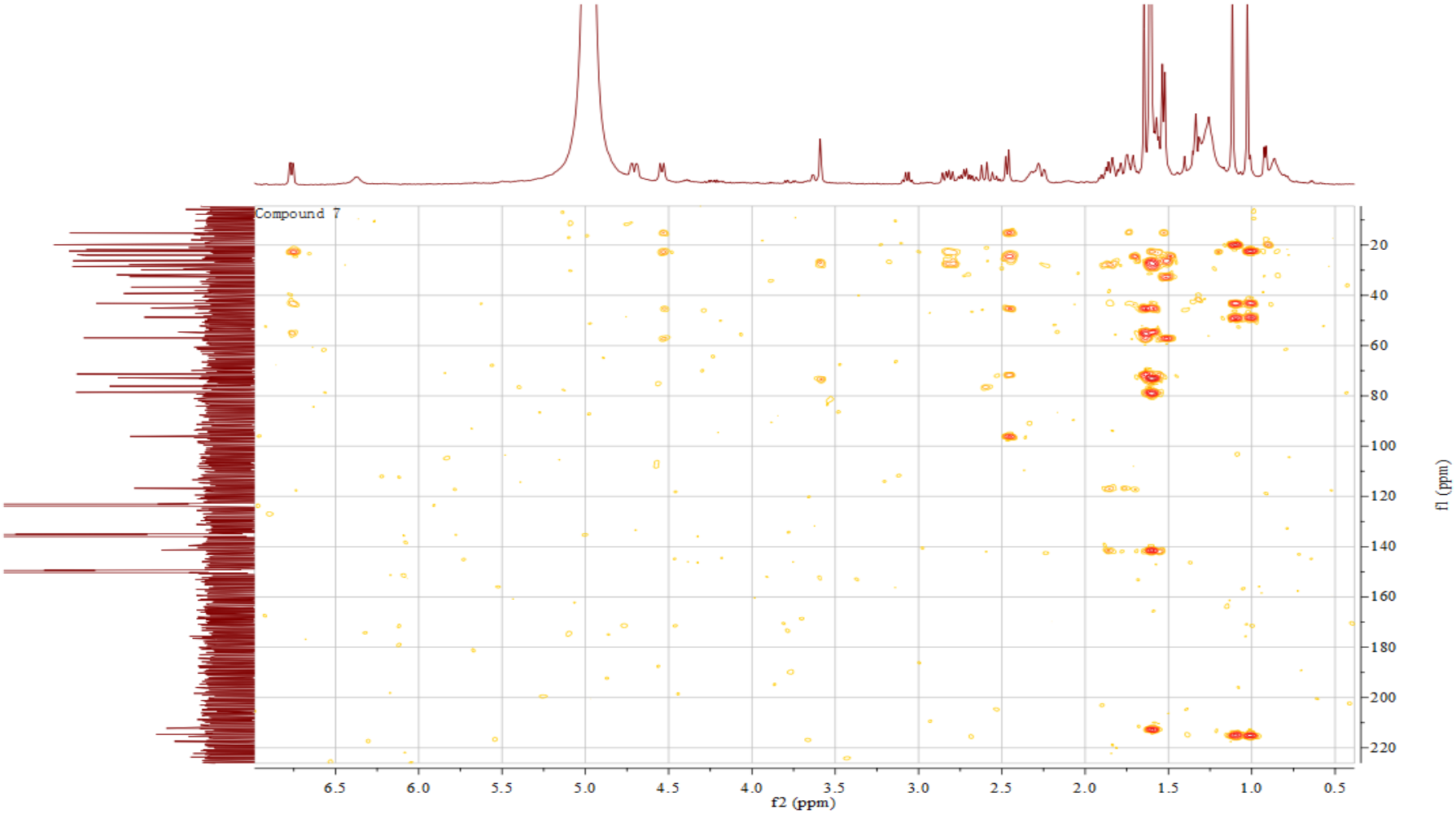


Figure S53. ^{1}H-^{1}H COSY Spectrum of **7** in Pyridine-d_5

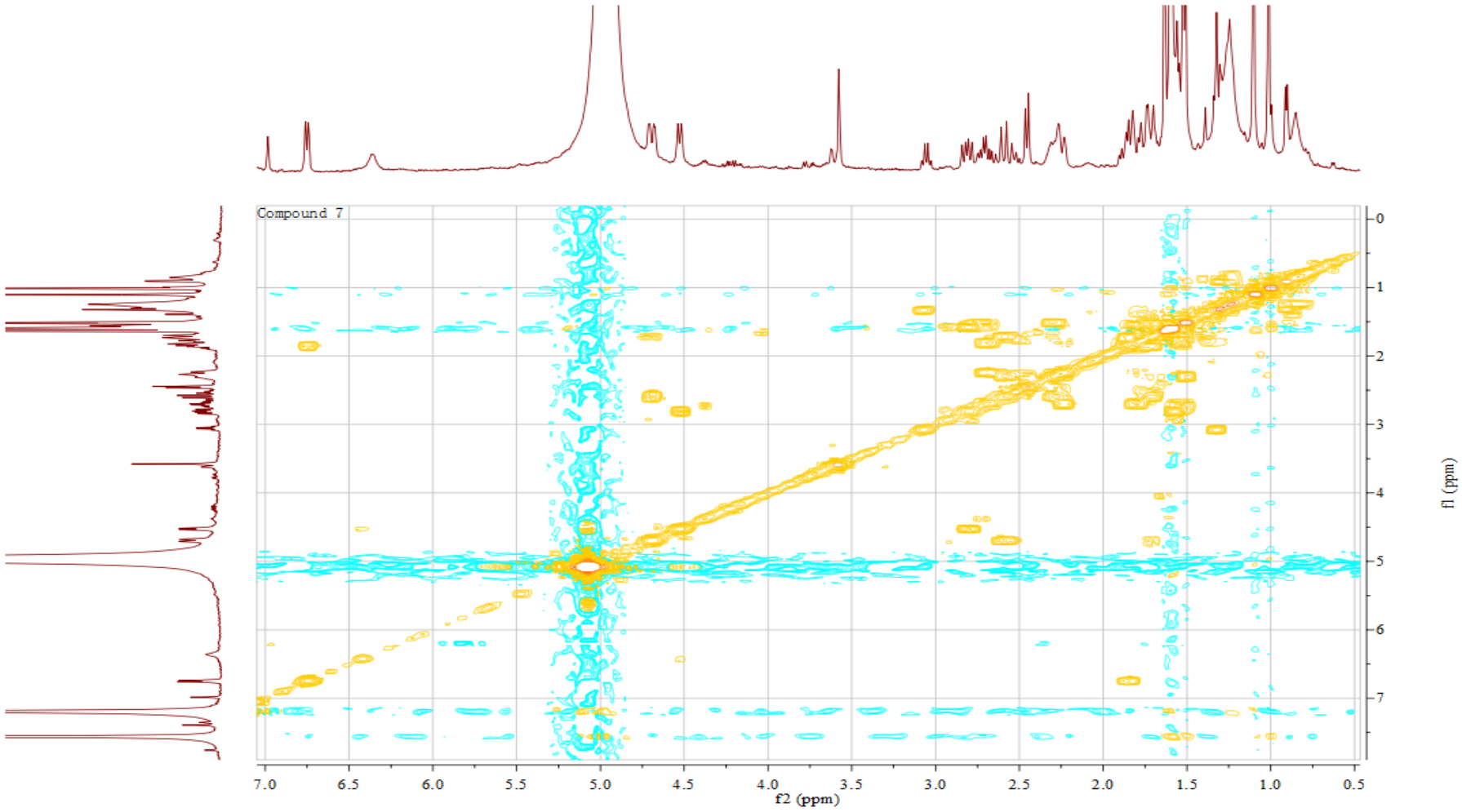


Figure S54. ROESY Spectrum of **7** in Pyridine-d_5

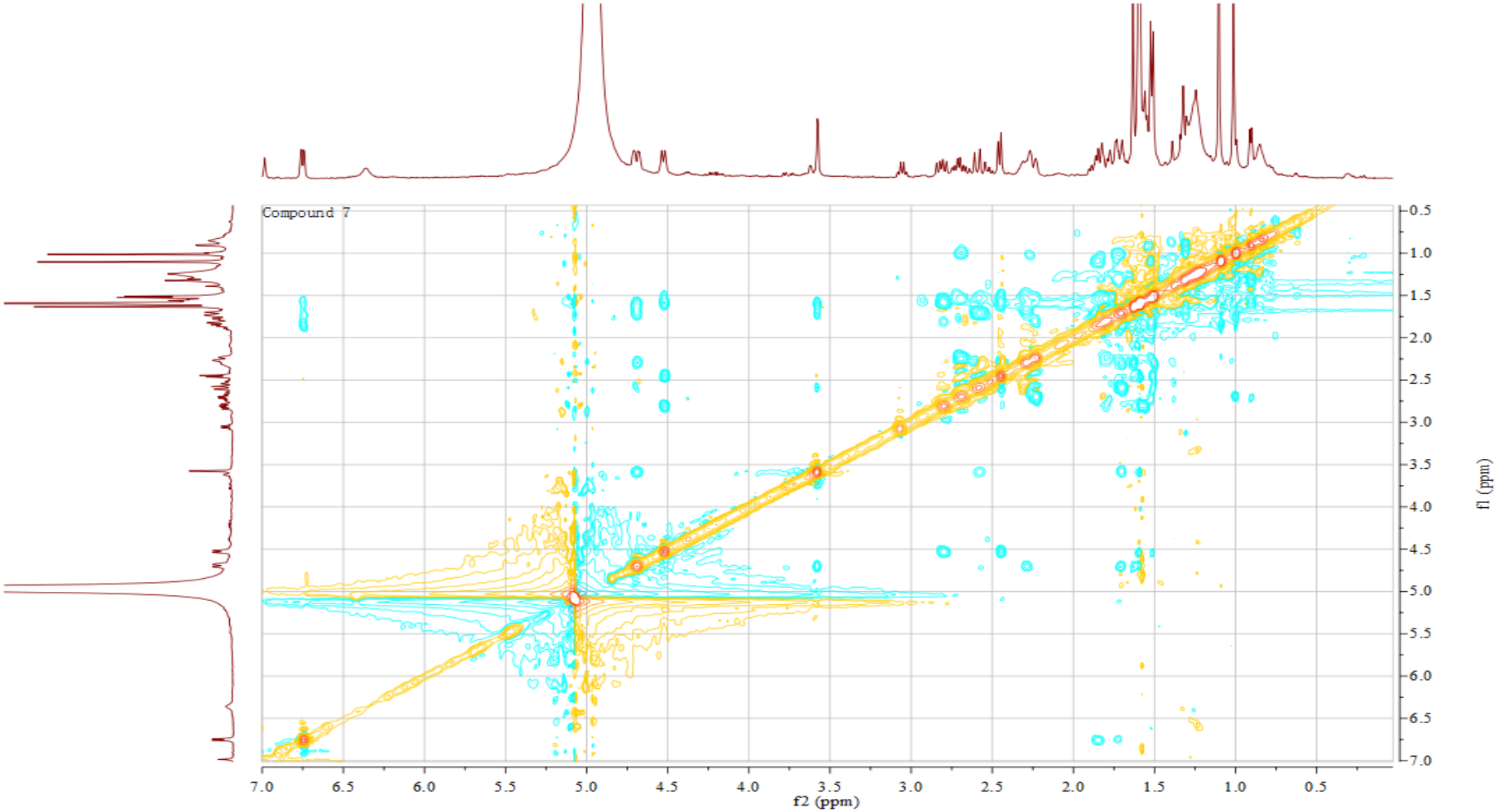
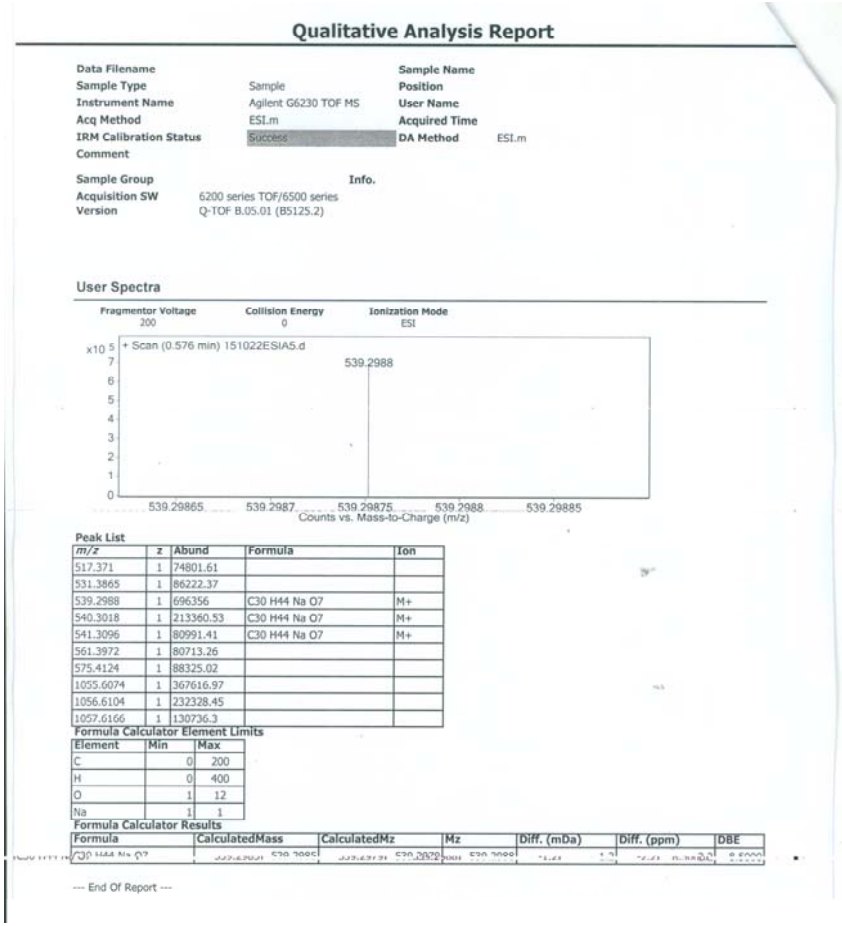


Figure S55. HRESIMS of **7**



Qualitative Analysis Report

Data Filename		**Sample Name**	
Sample Type	Sample	**Position**	
Instrument Name	Agilent G6230 TOF MS	**User Name**	
Acq Method	ESI.m	**Acquired Time**	
IRM Calibration Status	Success	**DA Method**	ESI.m
Comment			

Sample Group	**Info.**
Acquisition SW Version	6200 series TOF/6500 series Q-TOF B.05.01 (B5125.2)

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
200	0	ESI

Peak List

m/z	z	Abund	Formula	Ion
517.371	1	74801.61		
531.3865	1	86222.37		
539.2988	1	696356	C30 H44 Na O7	M+
540.3018	1	213360.53	C30 H44 Na O7	M+
541.3096	1	80991.41	C30 H44 Na O7	M+
561.3972	1	80713.26		
575.4124	1	88325.02		
1055.6074	1	367616.97		
1056.6104	1	232328.45		
1057.6166	1	130736.3		

Formula Calculator Element Limits

Element	Min	Max
C	0	200
H	0	400
O	1	12
Na	1	1

Formula Calculator Results

Formula	CalculatedMass	CalculatedMz	Mz	Diff. (mDa)	Diff. (ppm)	DBE
C30 H44 Na O7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

--- End Of Report ---

Figure S56. IR Spectrum of **7**

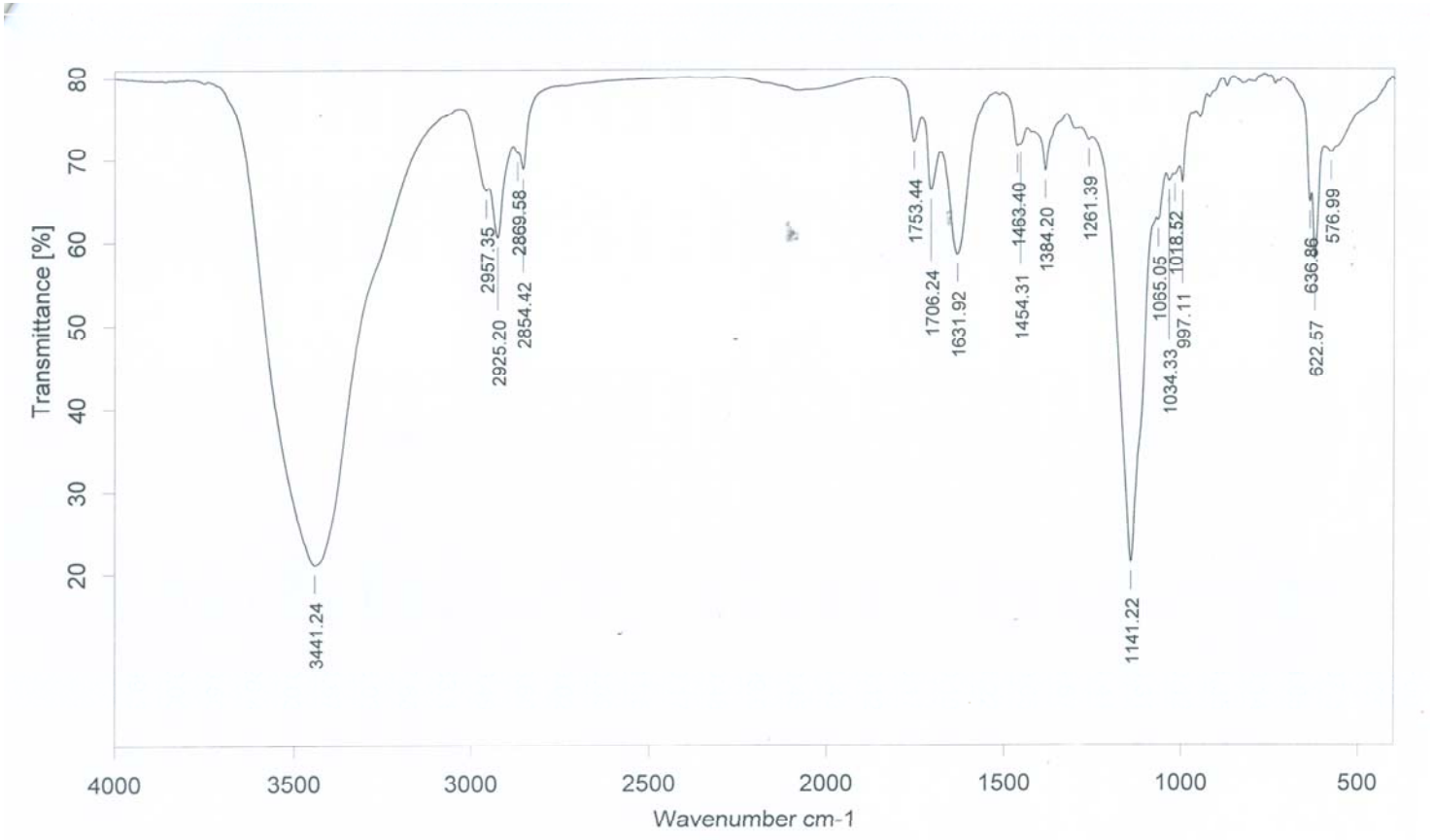


Figure S57. ^{1}H NMR Spectrum of **8** in Pyridine-d_5

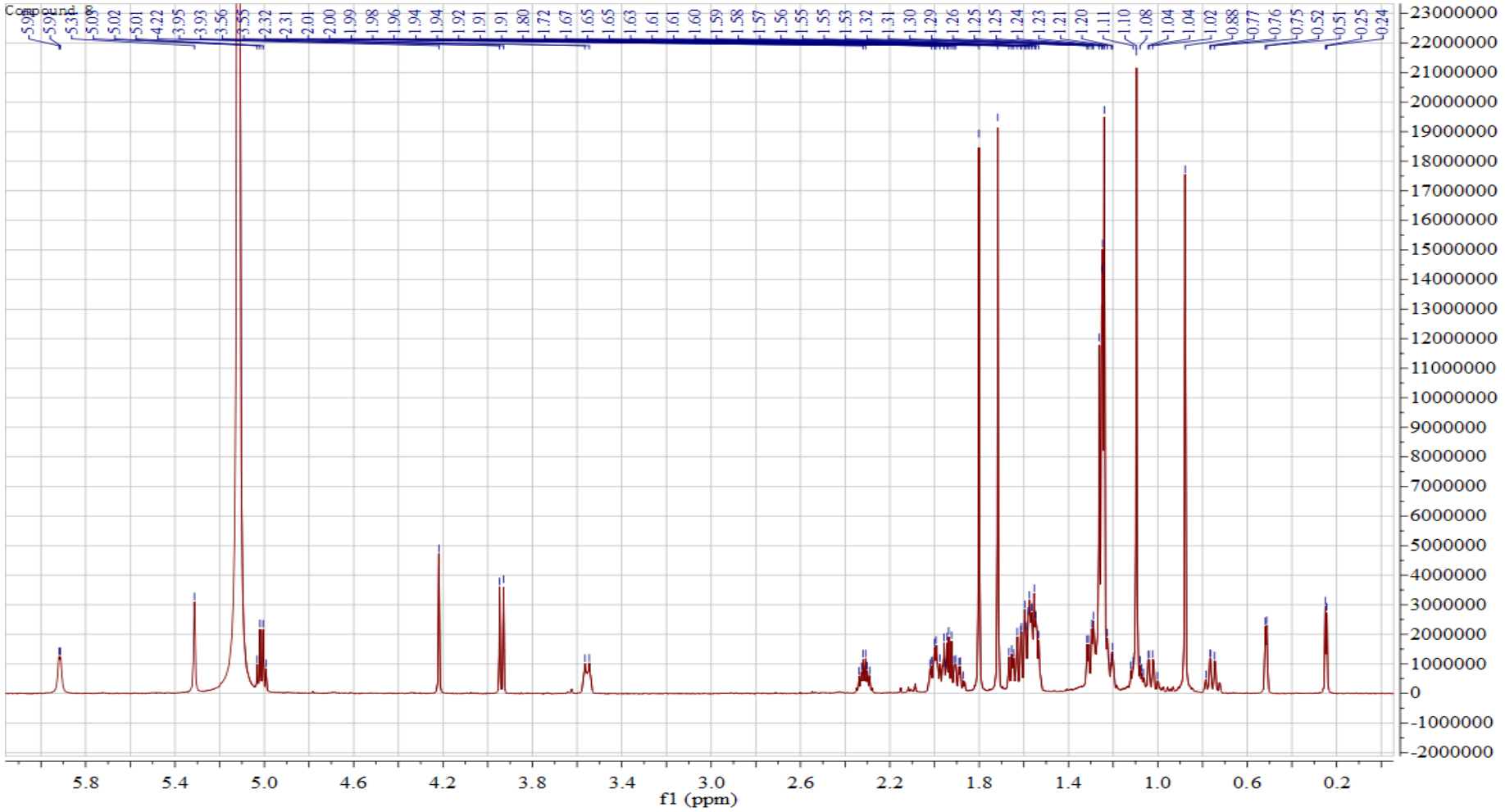


Figure S58 ^{13}C NMR Spectrum of **8** in Pyridine-d_5

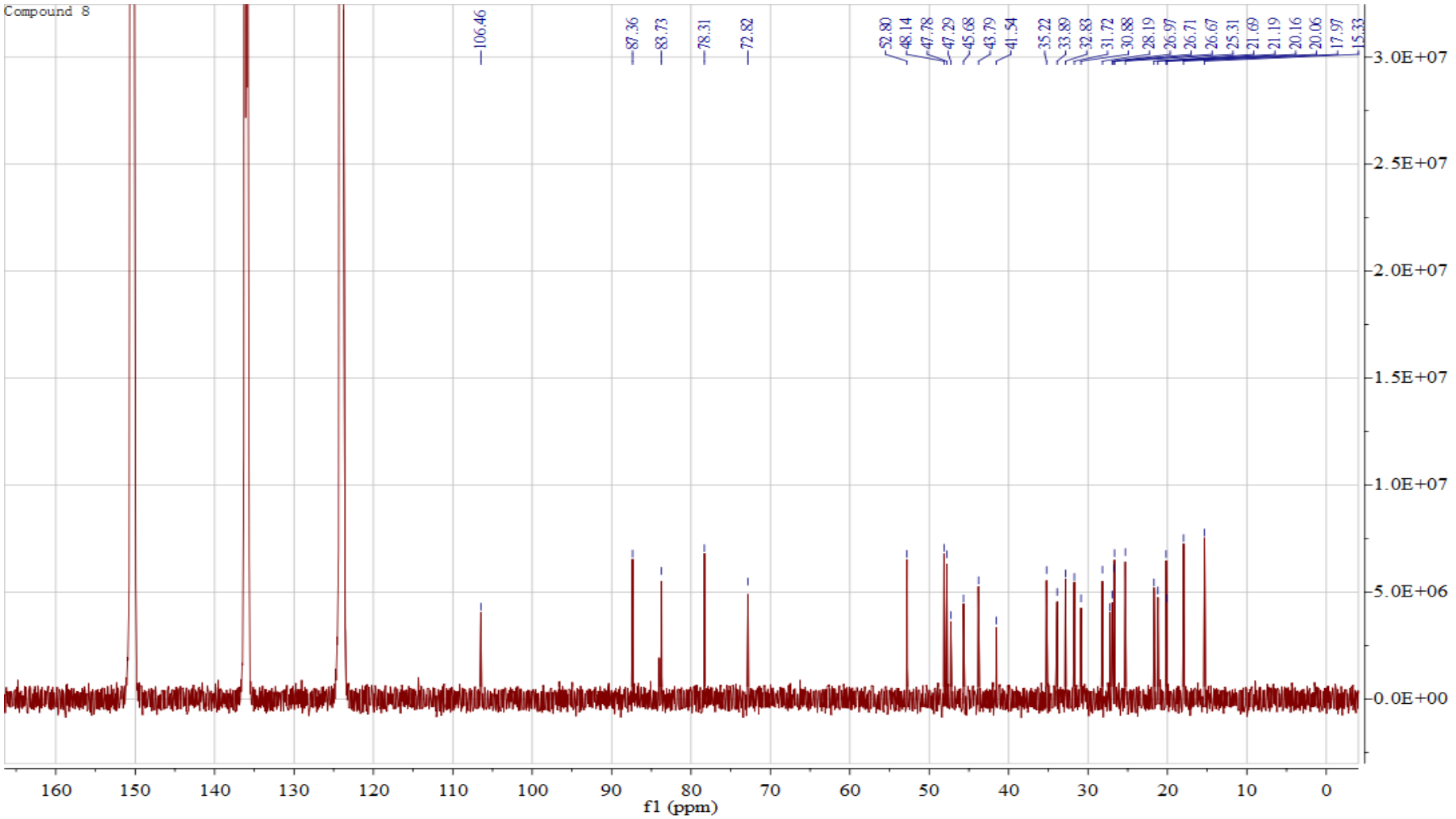


Figure S59. HSQC Spectrum of **8** in Pyridine-d_5

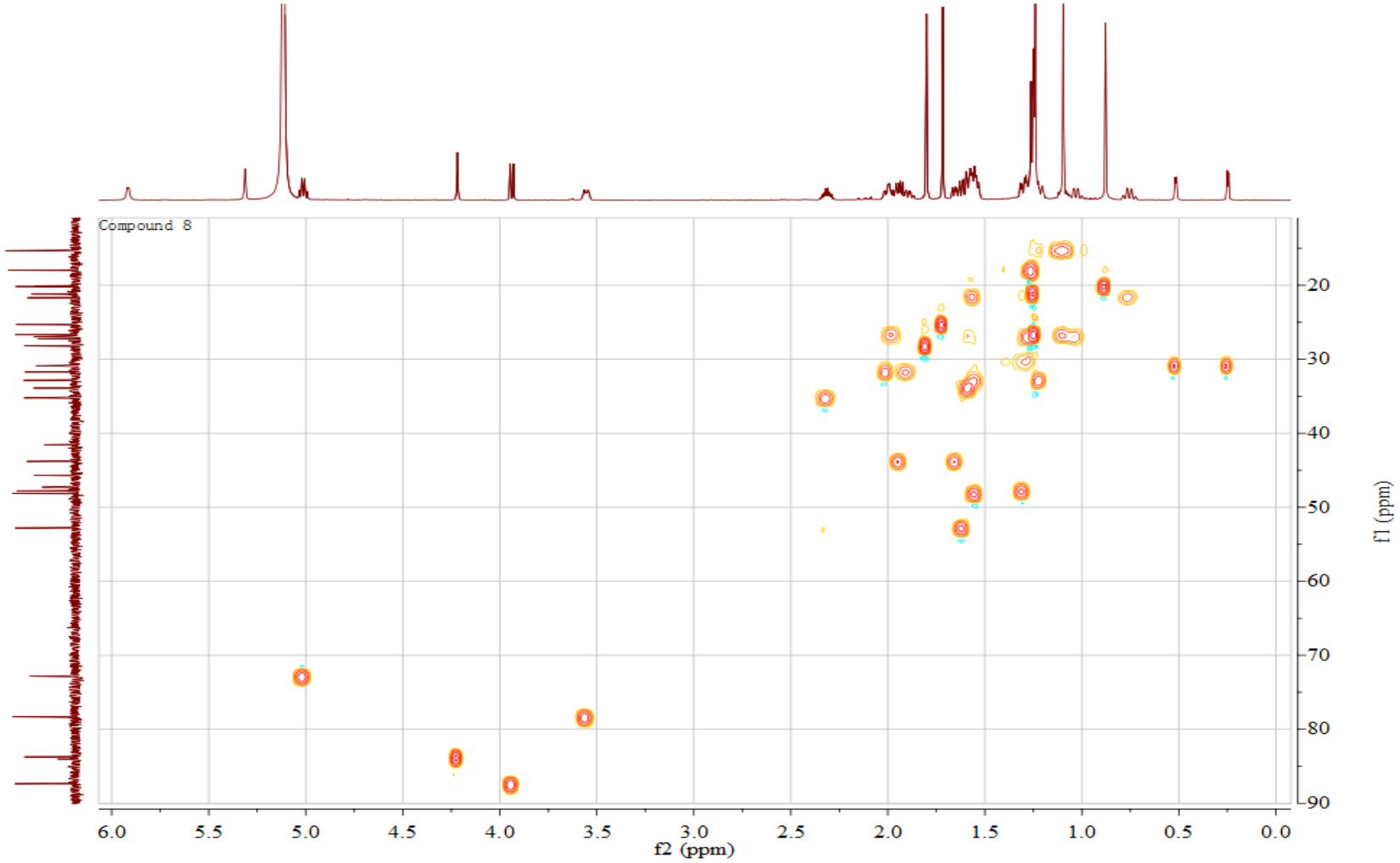


Figure S60. HMBC Spectrum of **8** in Pyridine-d_5

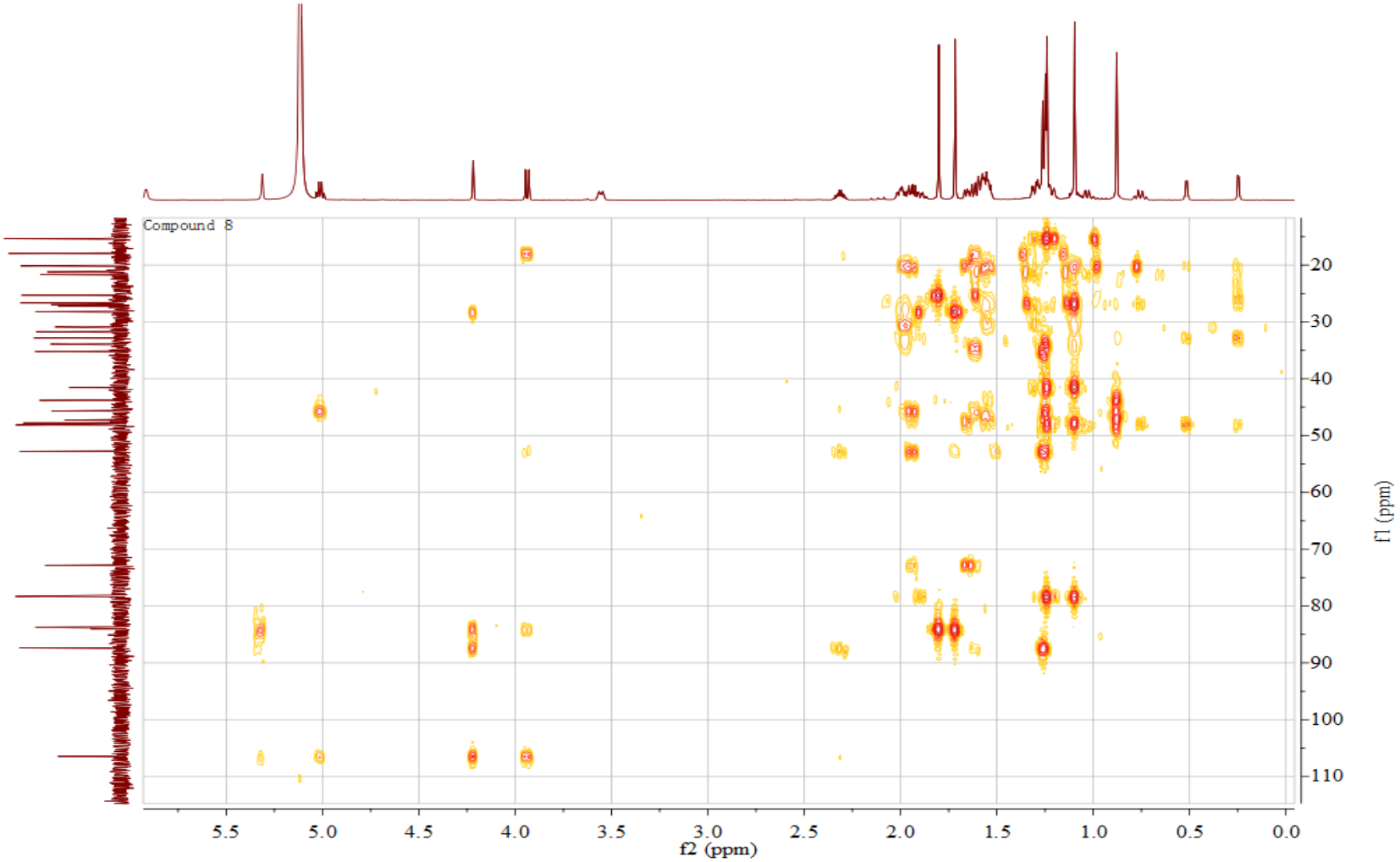


Figure S61. ^{1}H-^{1}H COSY Spectrum of **8** in Pyridine-d_5

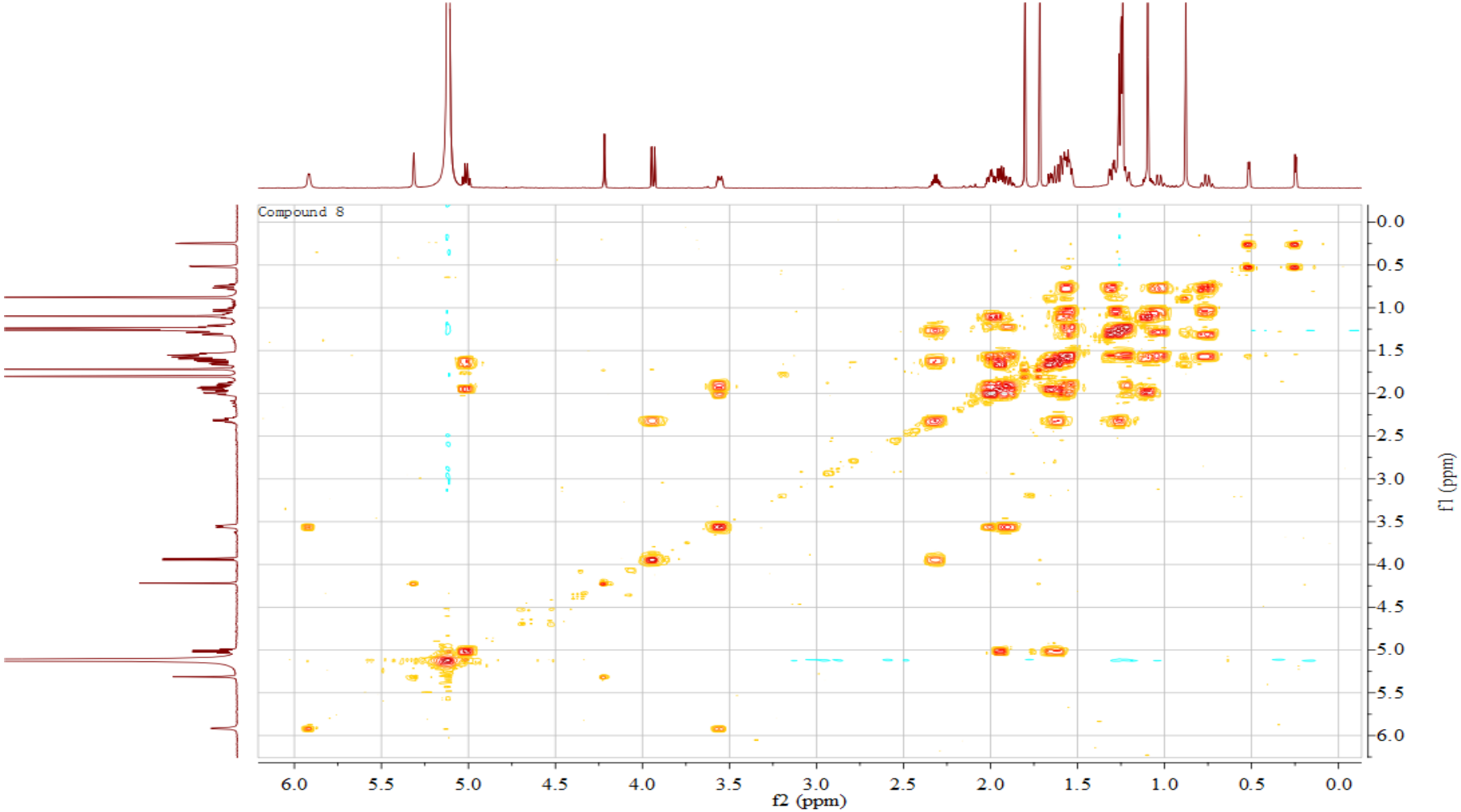


Figure S62. ROESY Spectrum of **8** in Pyridine-d_5

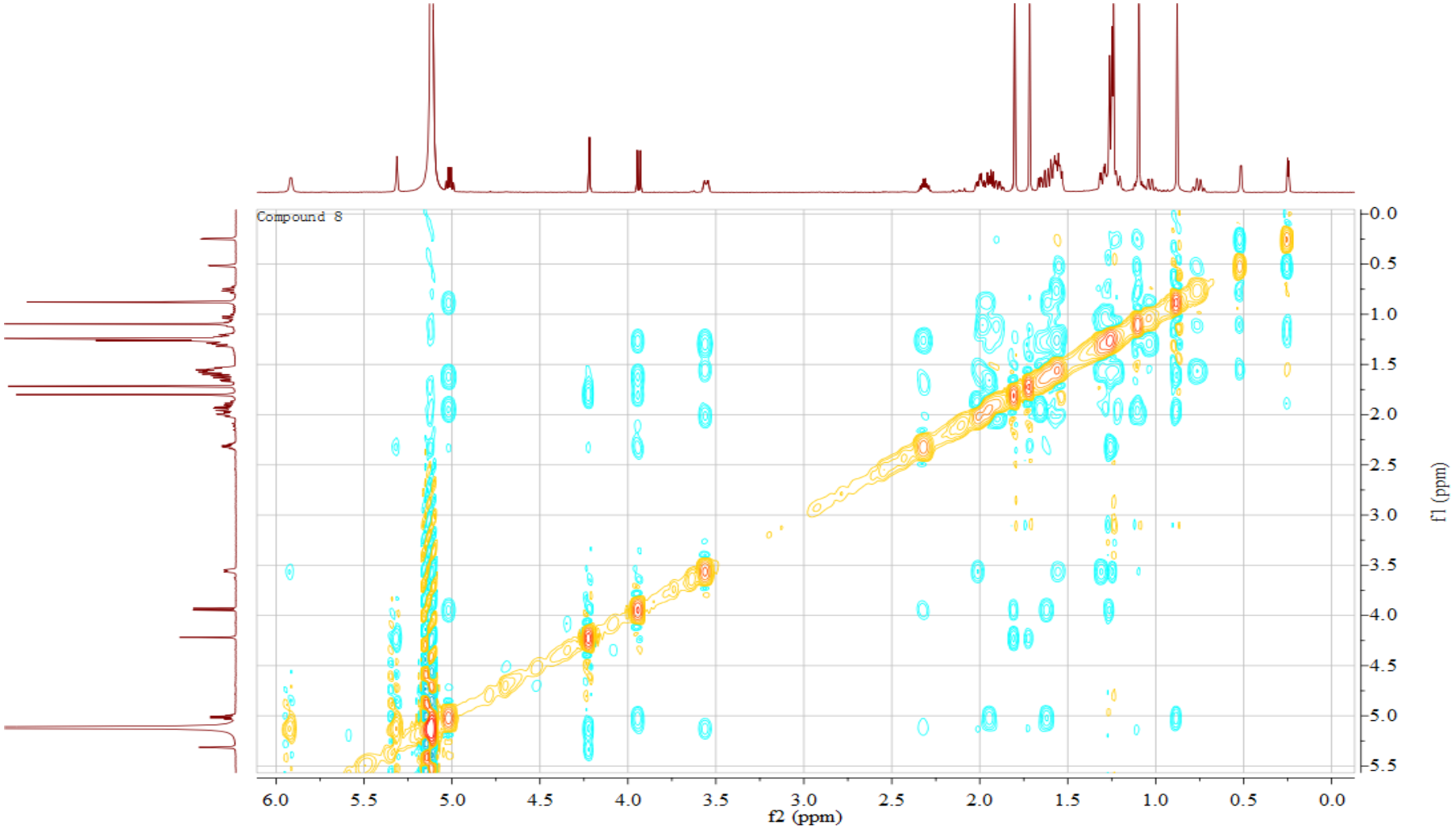


Figure S63. HRESIMS of **8**

Elemental Composition Report

Page 1

Single Mass Analysis

Tolerance = 10.0 PPM / DBE: min = -10.0, max = 120.0

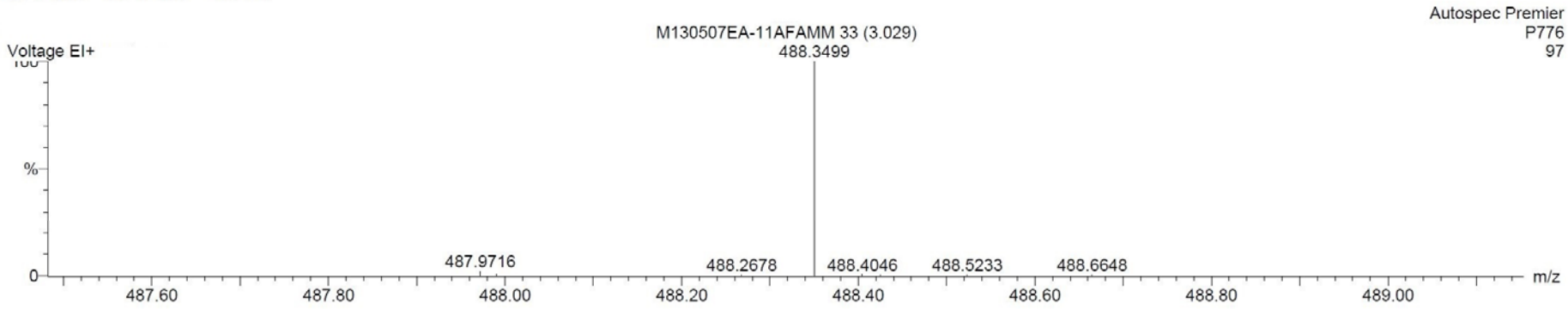
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ions

21 formula(e) evaluated with 1 results within limits (up to 51 closest results for each mass)

Elements Used:

C: 0-200 H: 0-400 O: 4-6



Minimum:				-10.0		
Maximum:		200.0	10.0	120.0		
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Formula
488.3499	488.3502	-0.3	-0.6	7.0	5546067.0	C30 H48 O5

Figure S64. IR Spectrum of **8**

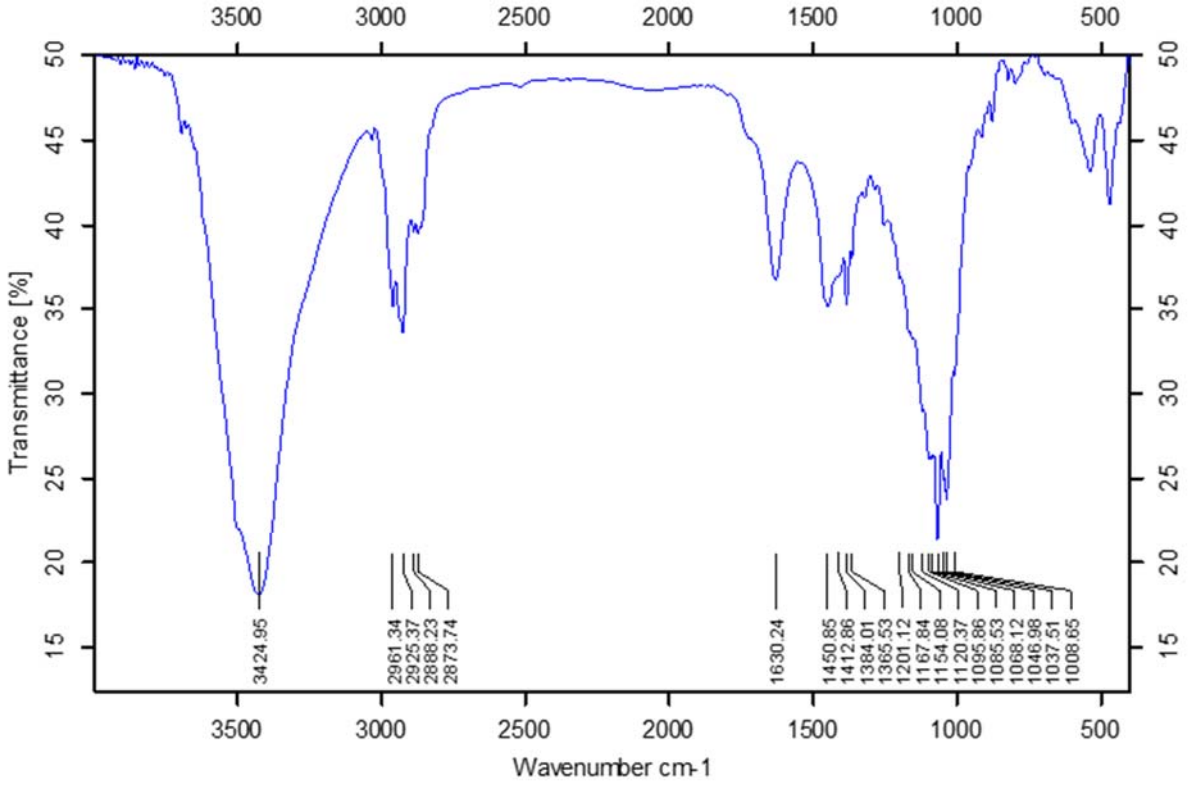


Figure S65. ^{1}H NMR Spectrum of **9** in Pyridine-d_5

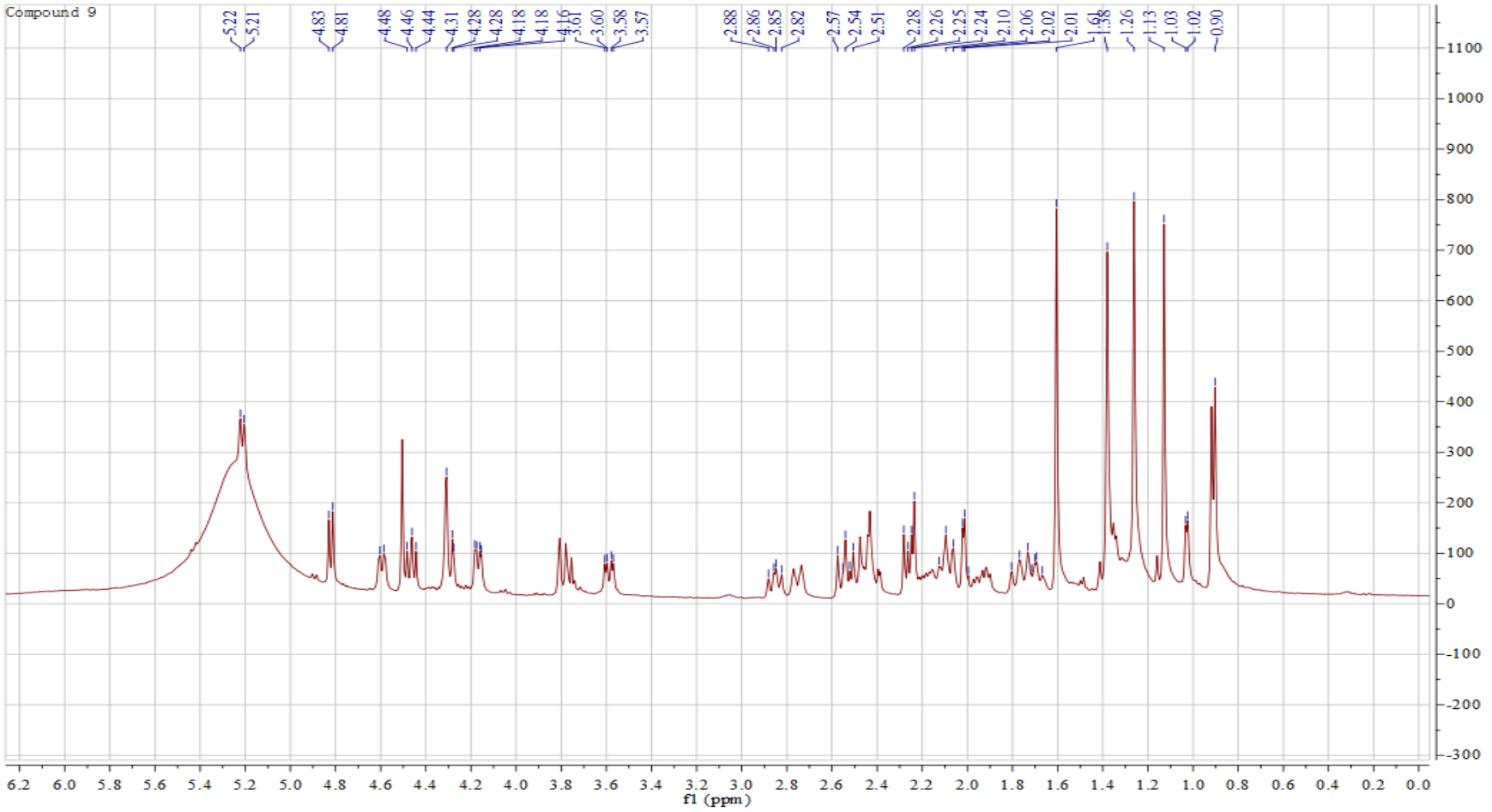


Figure S66 ^{13}C NMR Spectrum of **9** in Pyridine-d_5

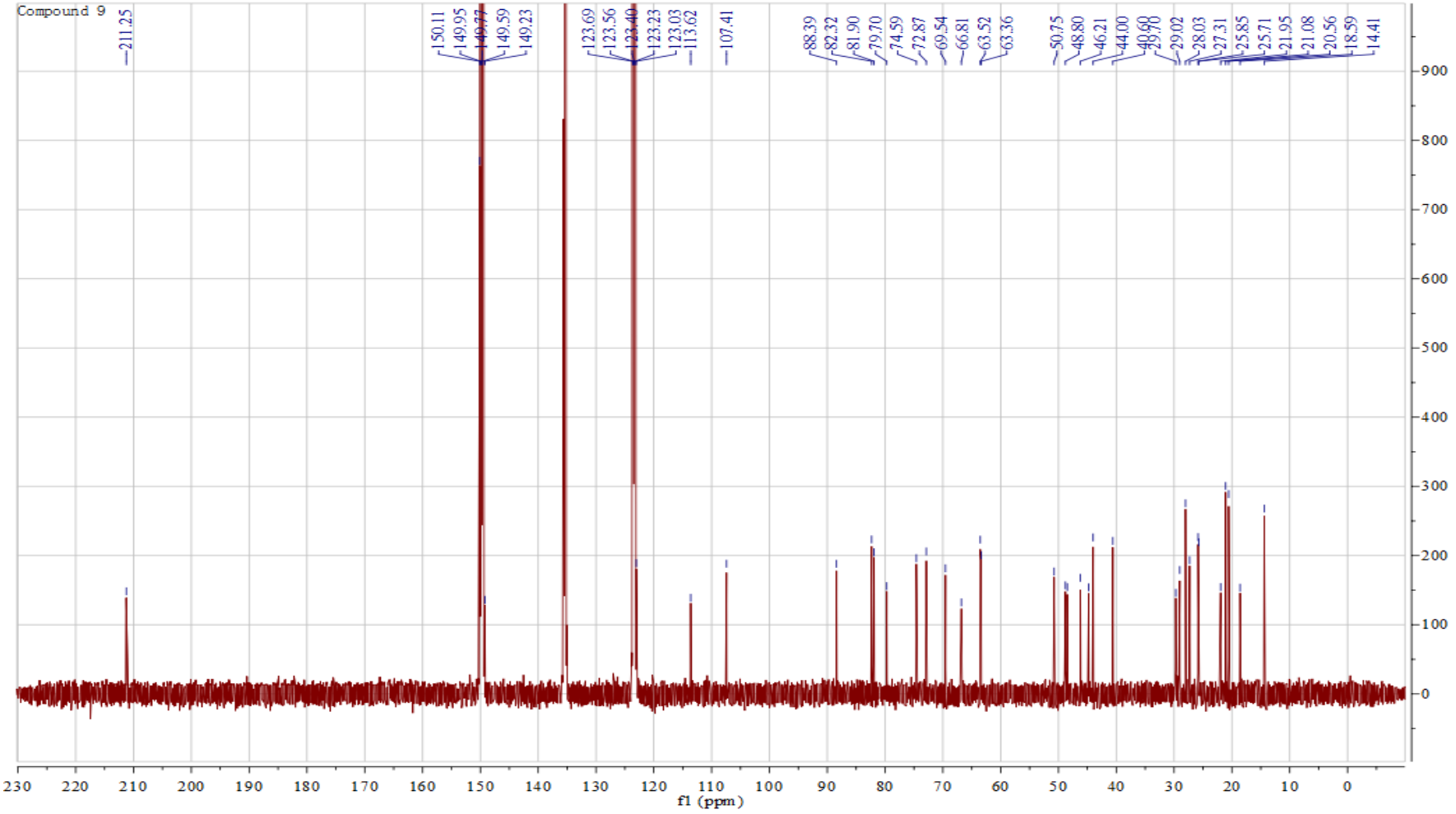


Figure S67. HSQC Spectrum of **9** in Pyridine-d_5

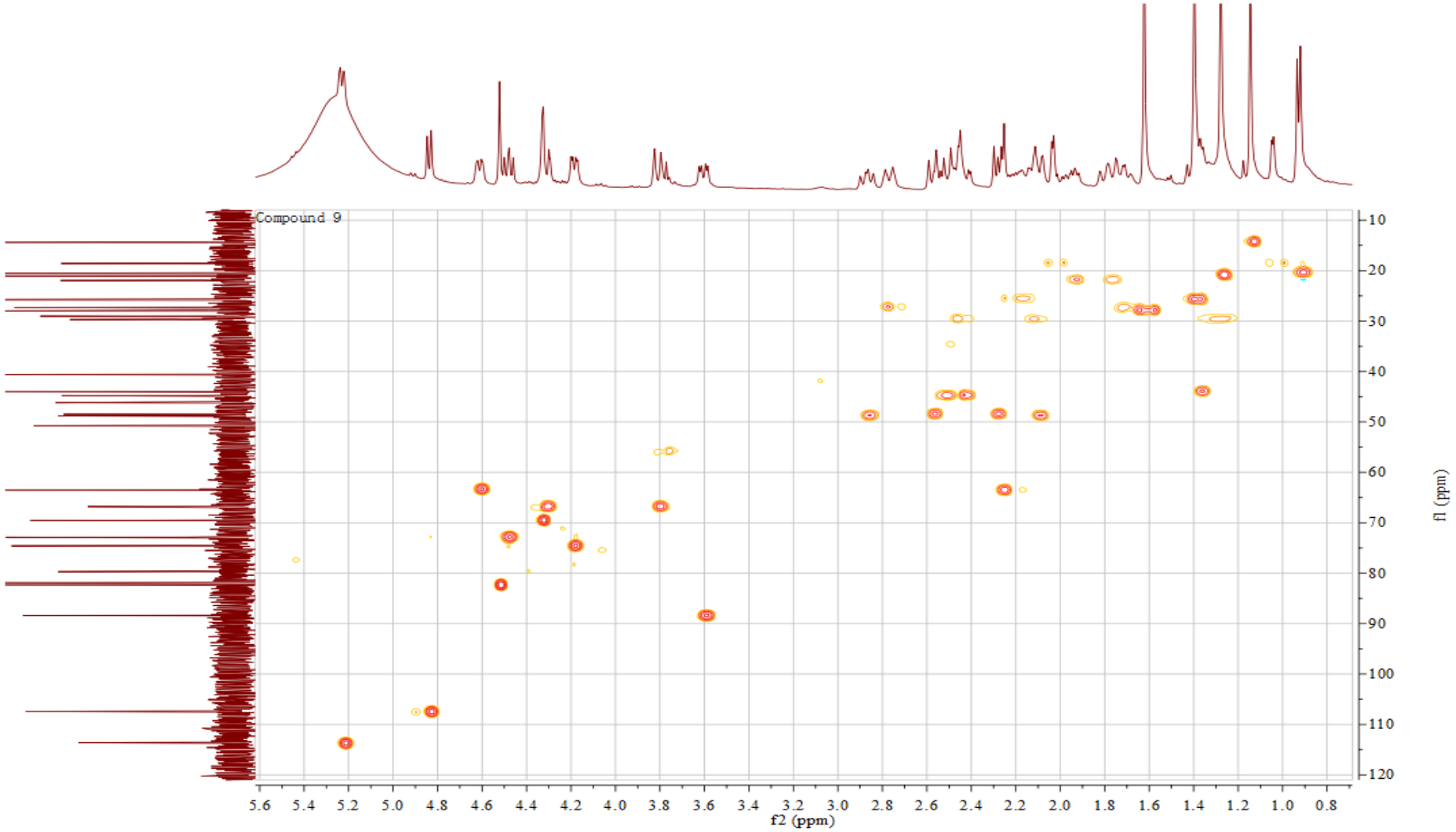


Figure S68. HMBC Spectrum of **9** in Pyridine-d_5

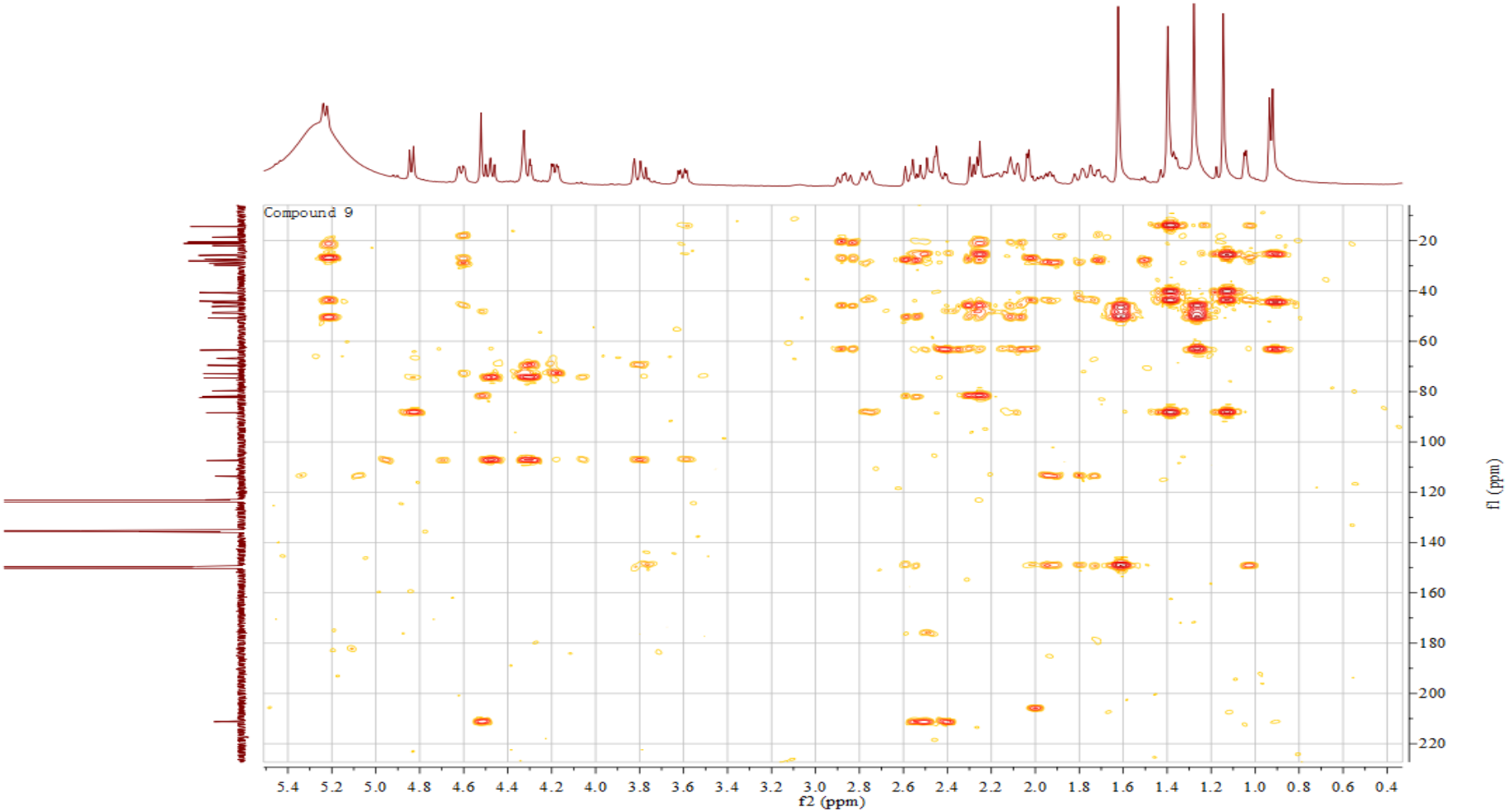


Figure S69. ^{1}H-^{1}H COSY Spectrum of **9** in Pyridine-d_5

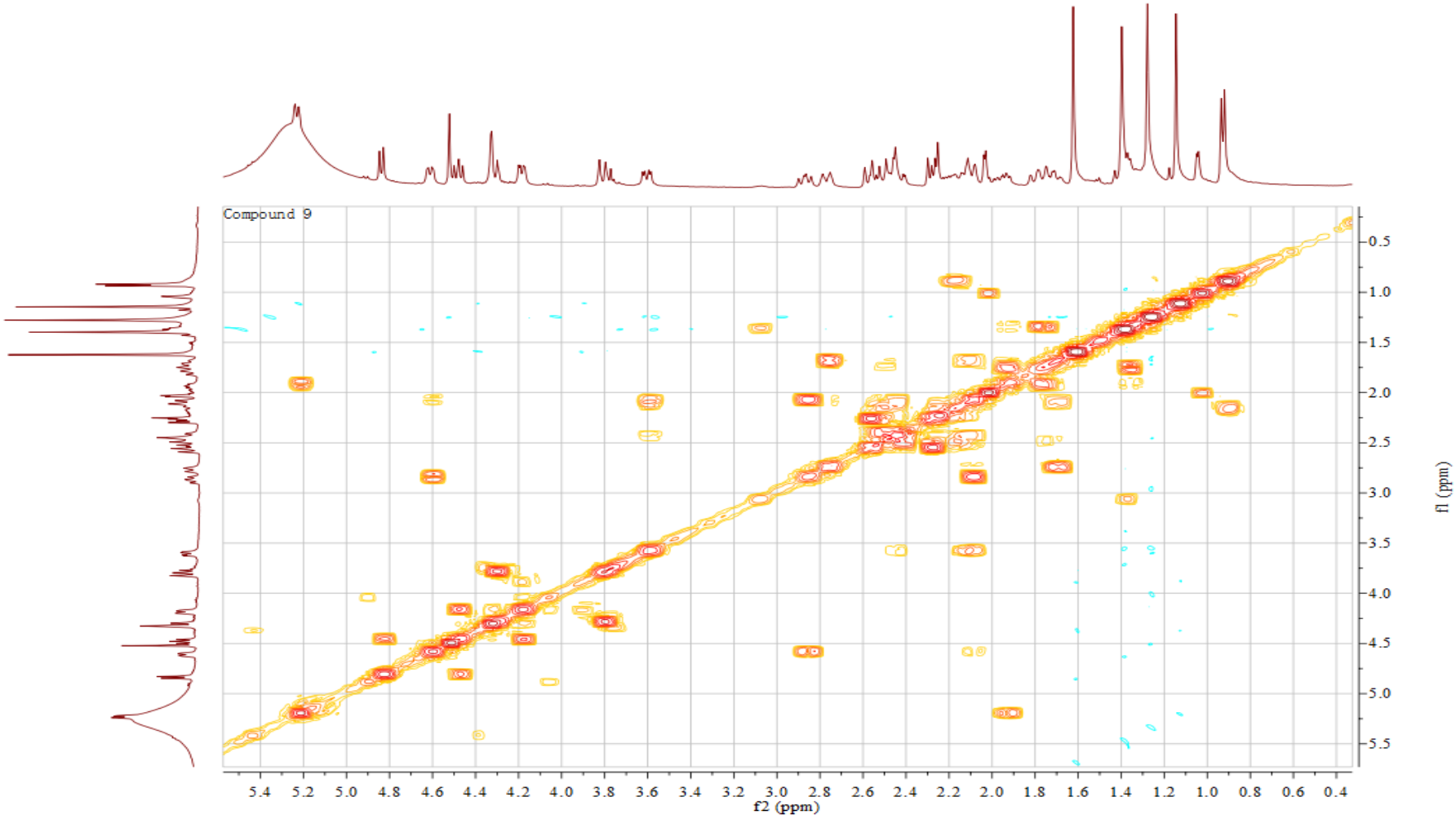


Figure S70. ROESY Spectrum of **9** in Pyridine-d_5

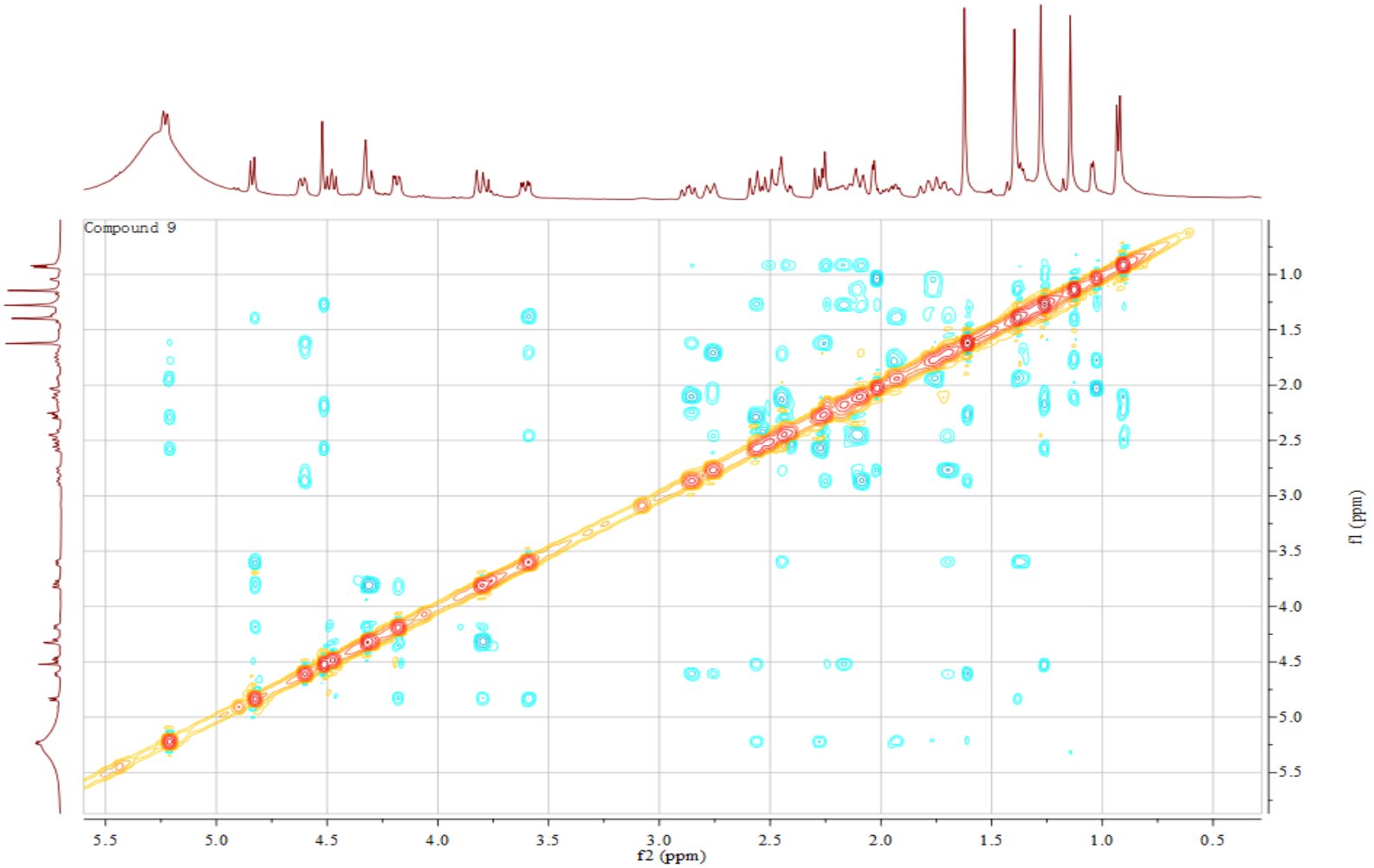


Figure S71. HRESIMS of **9**

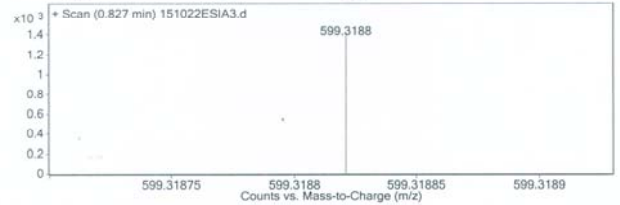
Qualitative Analysis Report

Data Filename	151022ESIA3.d	**Sample Name**	
Sample Type	Sample	**Position**	
Instrument Name	Agilent G6230 TOF MS	**User Name**	KIB
Acq Method	ESI.m	**Acquired Time**	10/20/2015 5:51:34 PM
IRM Calibration Status	Success	**DA Method**	ESI.m
Comment			

Sample Group	**Info.**
Acquisition SW Version	6200 series TOF/6500 series Q-TOF B.05.01 (B5125.2)

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
200	0	ESI



Peak List

m/z	z	Abund
102.1284	1	11537.5
121.0509	1	62614.3
153.0543	1	12896.9
232.1119	1	9774.8
241.1702	1	66952.9
242.173	1	9699.08
299.1101	1	16003.32
301.1409	1	10089.62
922.0098	1	83405.42
923.0109	1	12211.02

Formula Calculator Element Limits

Element	Min	Max
C	0	200
H	0	400
O	1	12
Na	1	1

Formula Calculator Results

Formula	CalculatedMass	CalculatedMz	Mz	Diff. (mDa)	Diff. (ppm)	DBE
C32 H48 Na O9	599.3196	599.3191	599.3188	0.2	0.4	8.5000

--- End Of Report ---

Figure S72. IR Spectrum of **9**

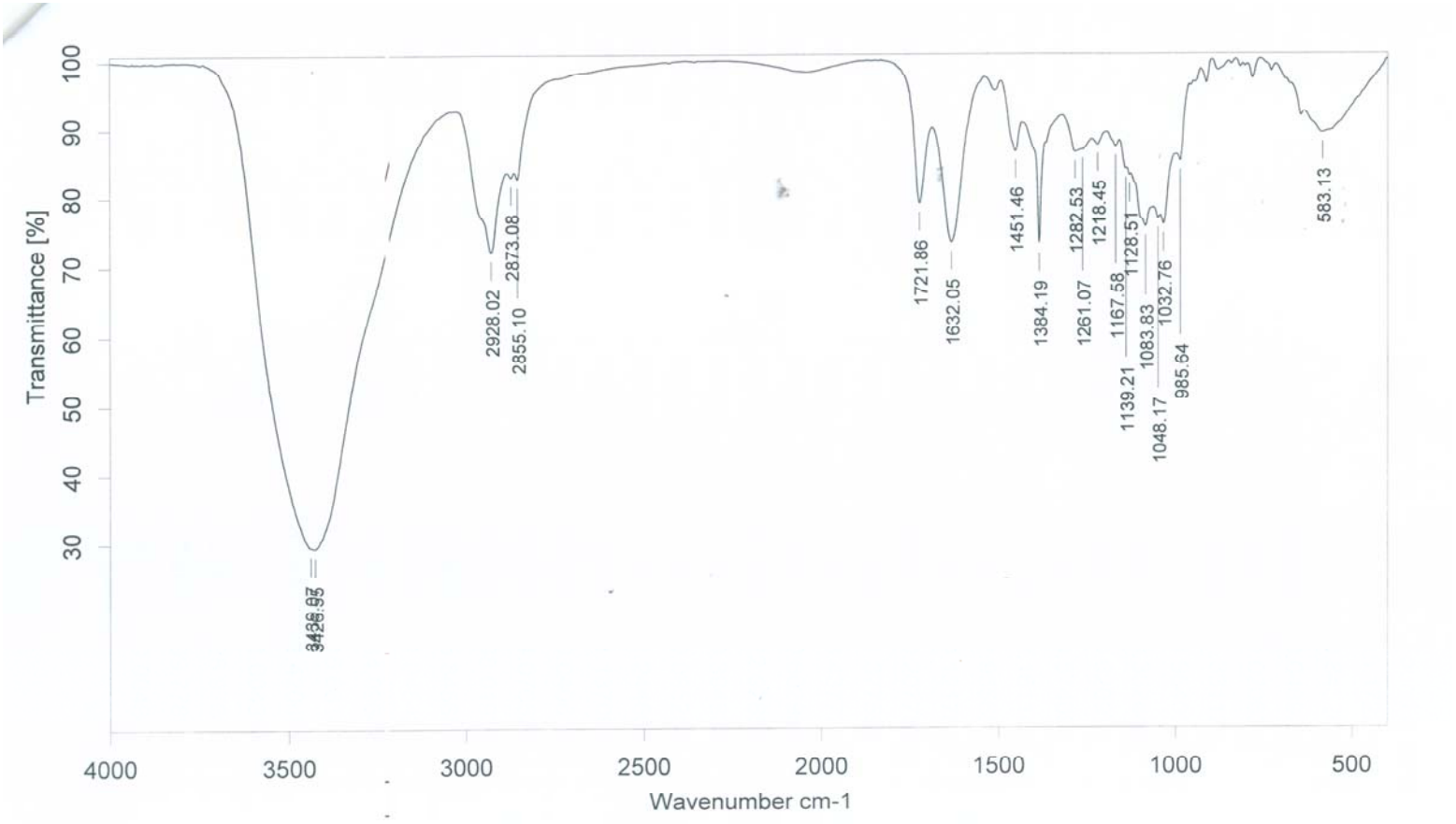


Figure S73. ^{1}H NMR Spectrum of **10** in Pyridine-d_5

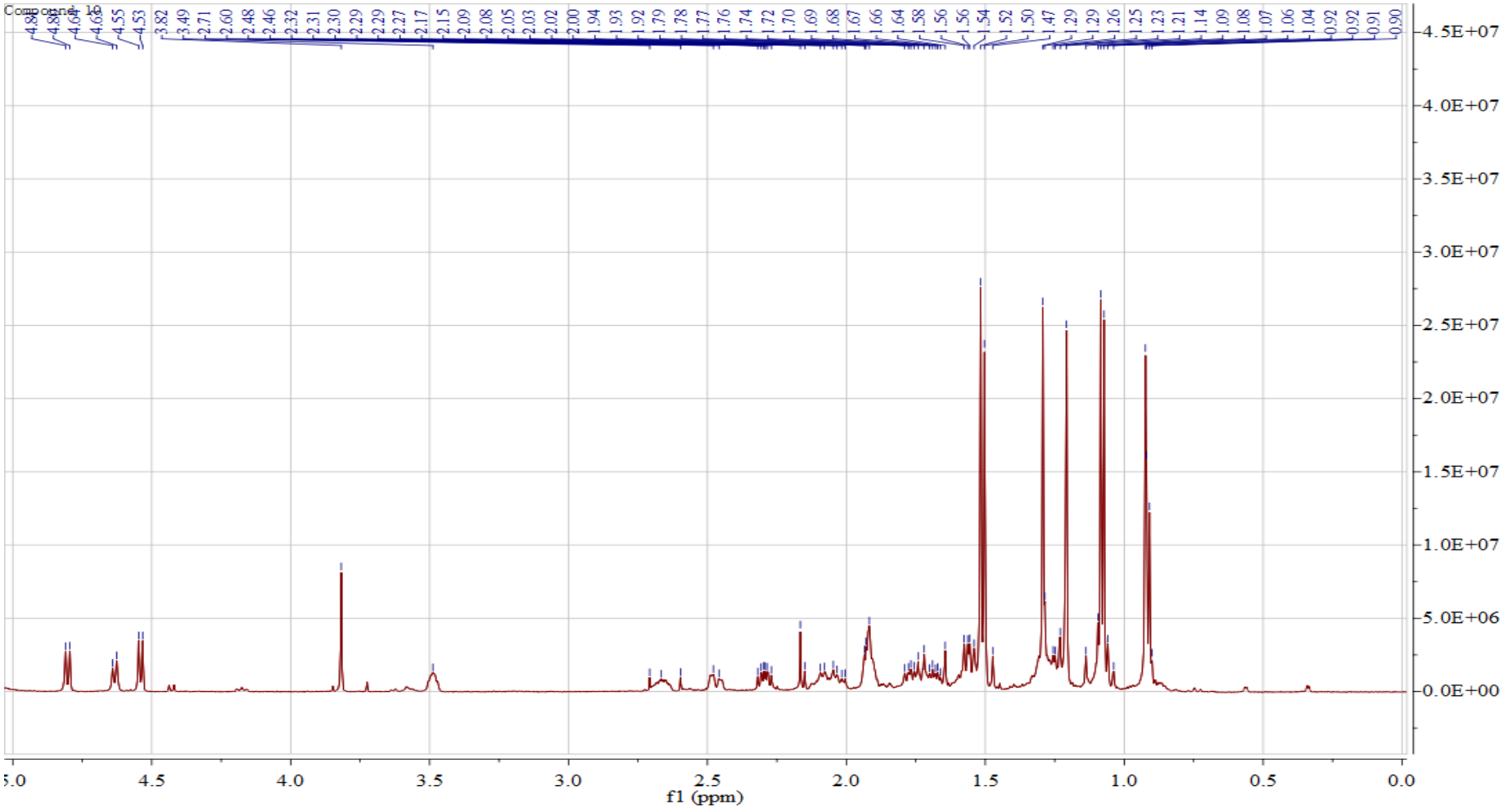


Figure S74 ^{13}C NMR Spectrum of **10** in Pyridine-d_5

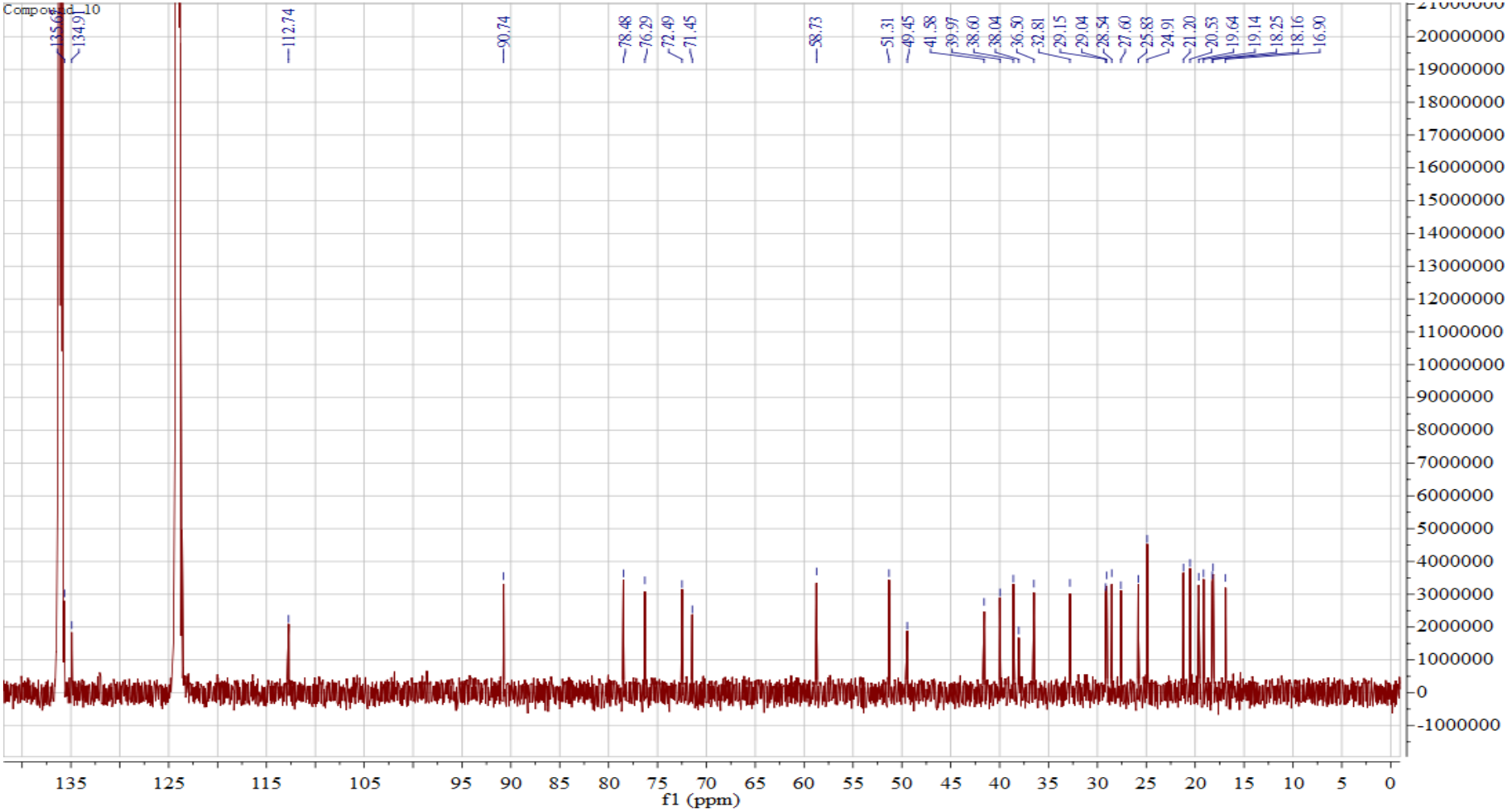


Figure S75. HSQC Spectrum of **10** in Pyridine-d_5

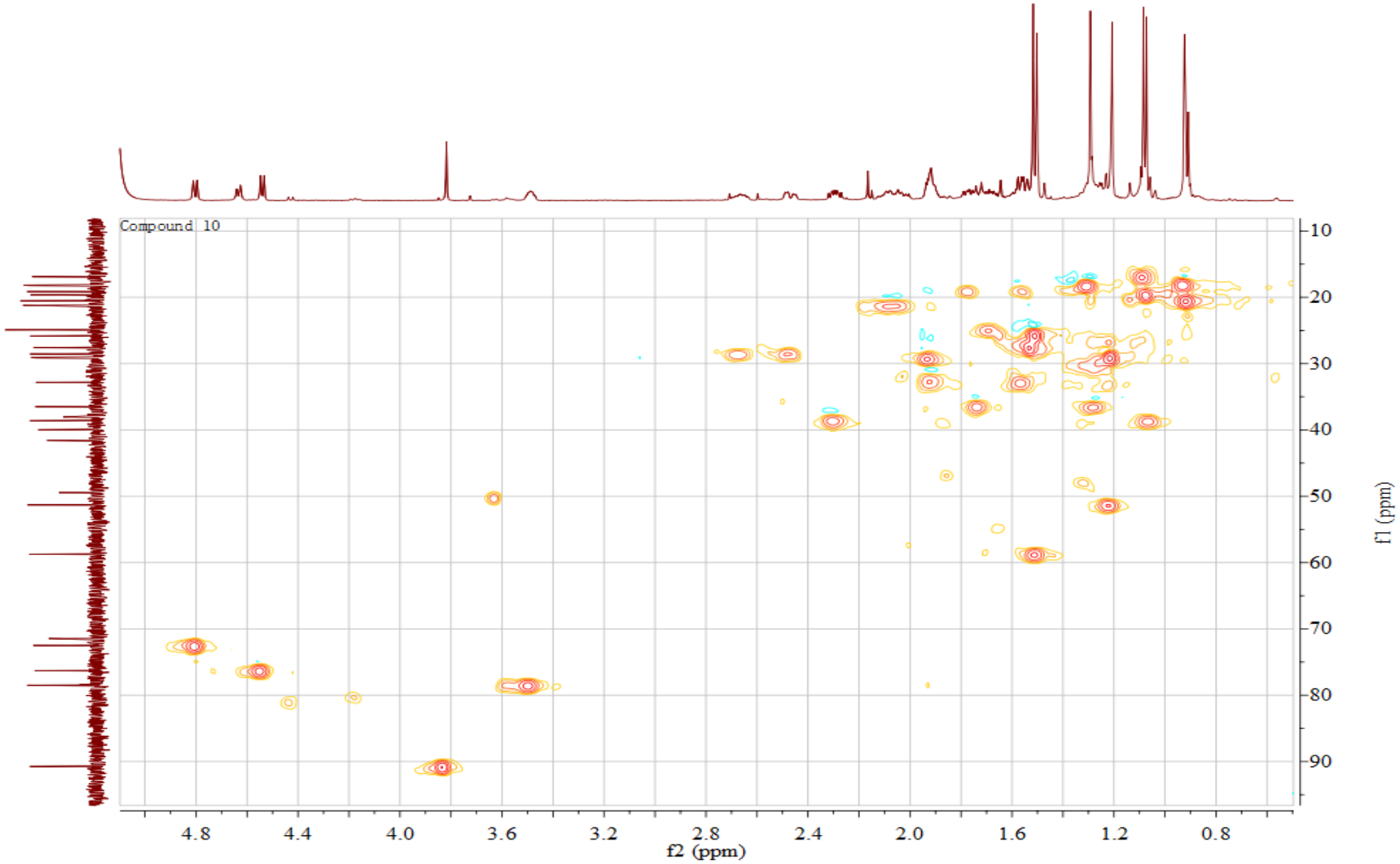


Figure S76. HMBC Spectrum of **10** in Pyridine-d_5

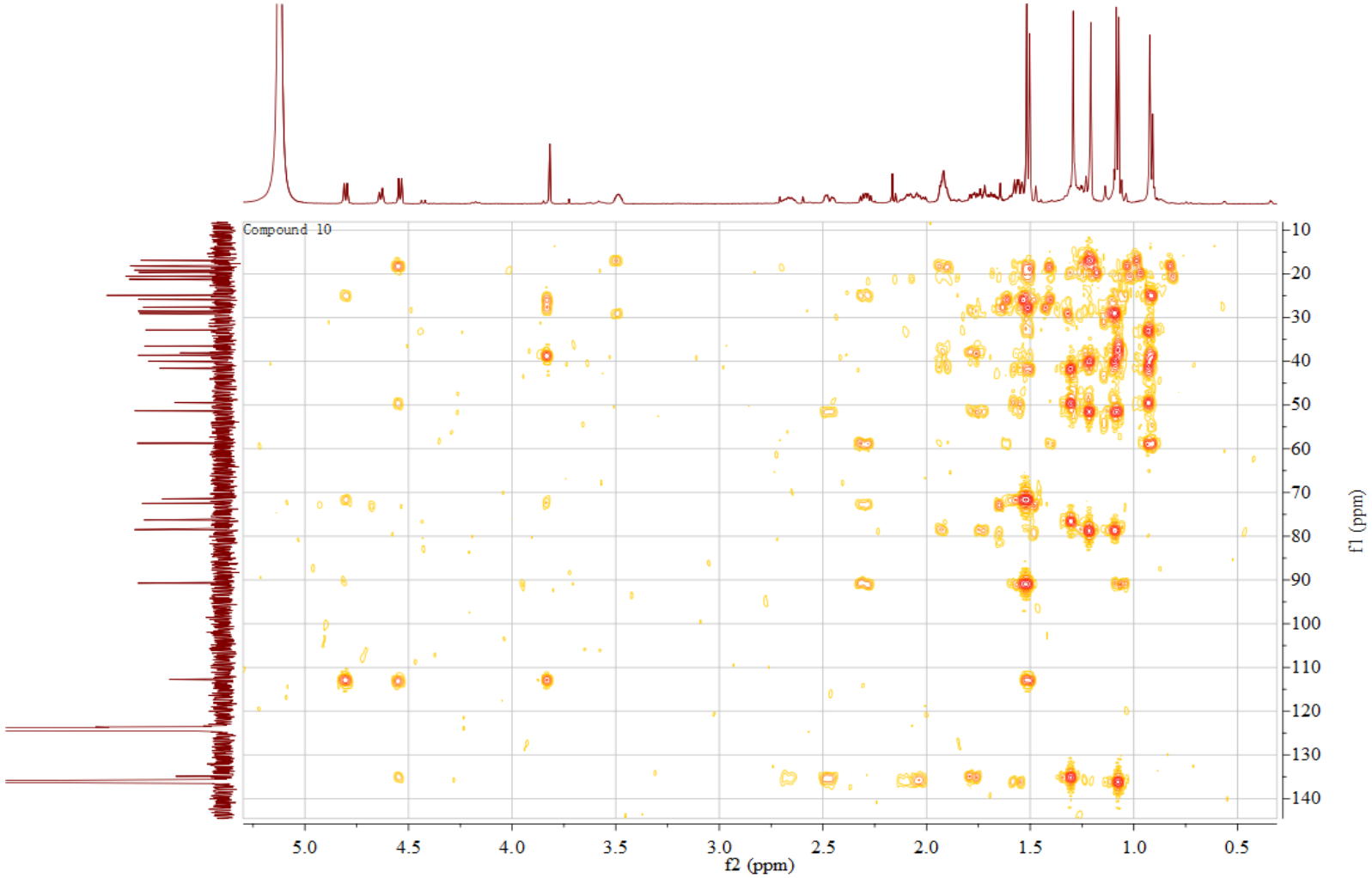


Figure S77. ^{1}H-^{1}H COSY Spectrum of **10** in Pyridine-d_5

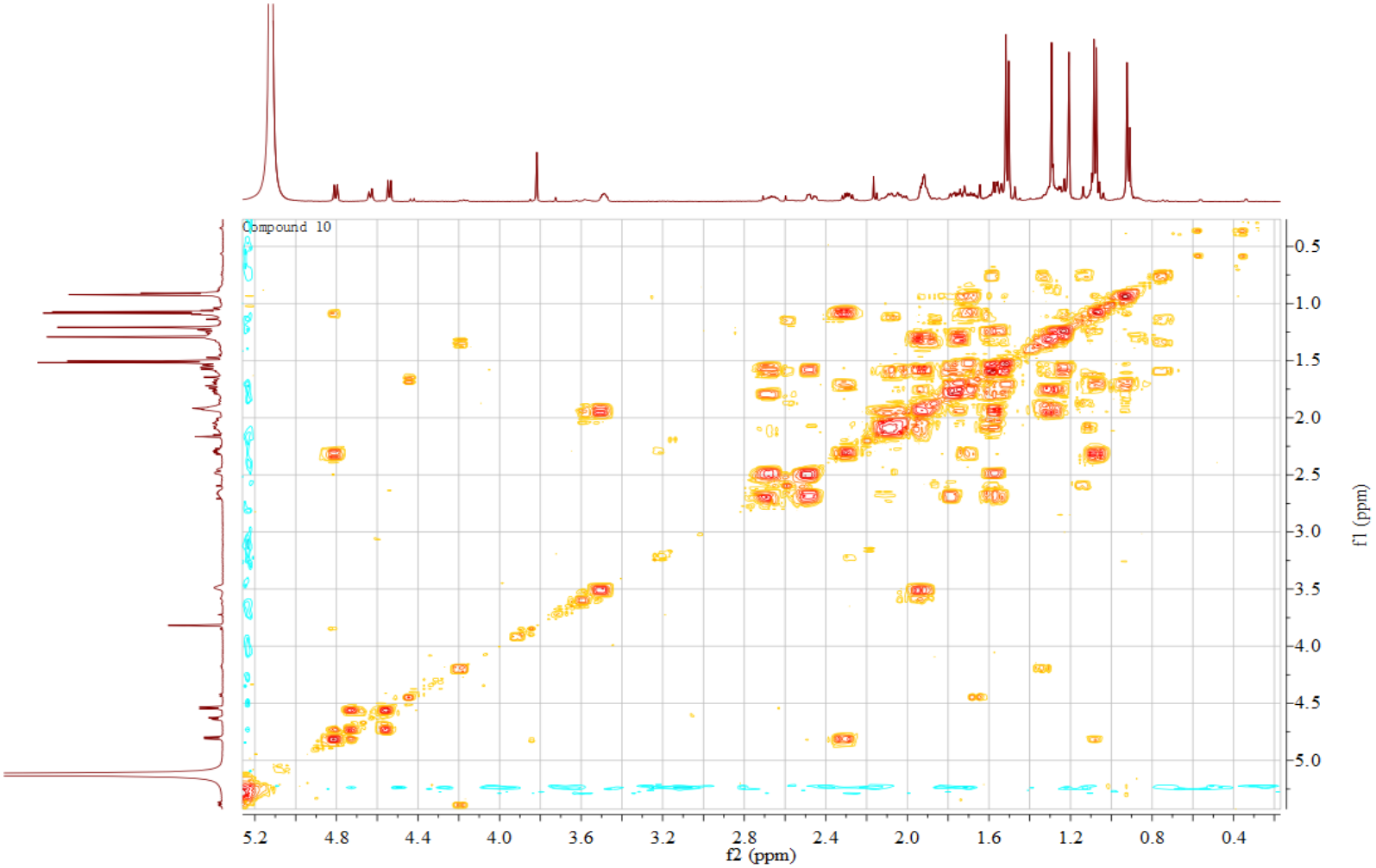


Figure S78. ROESY Spectrum of **10** in Pyridine-d_5

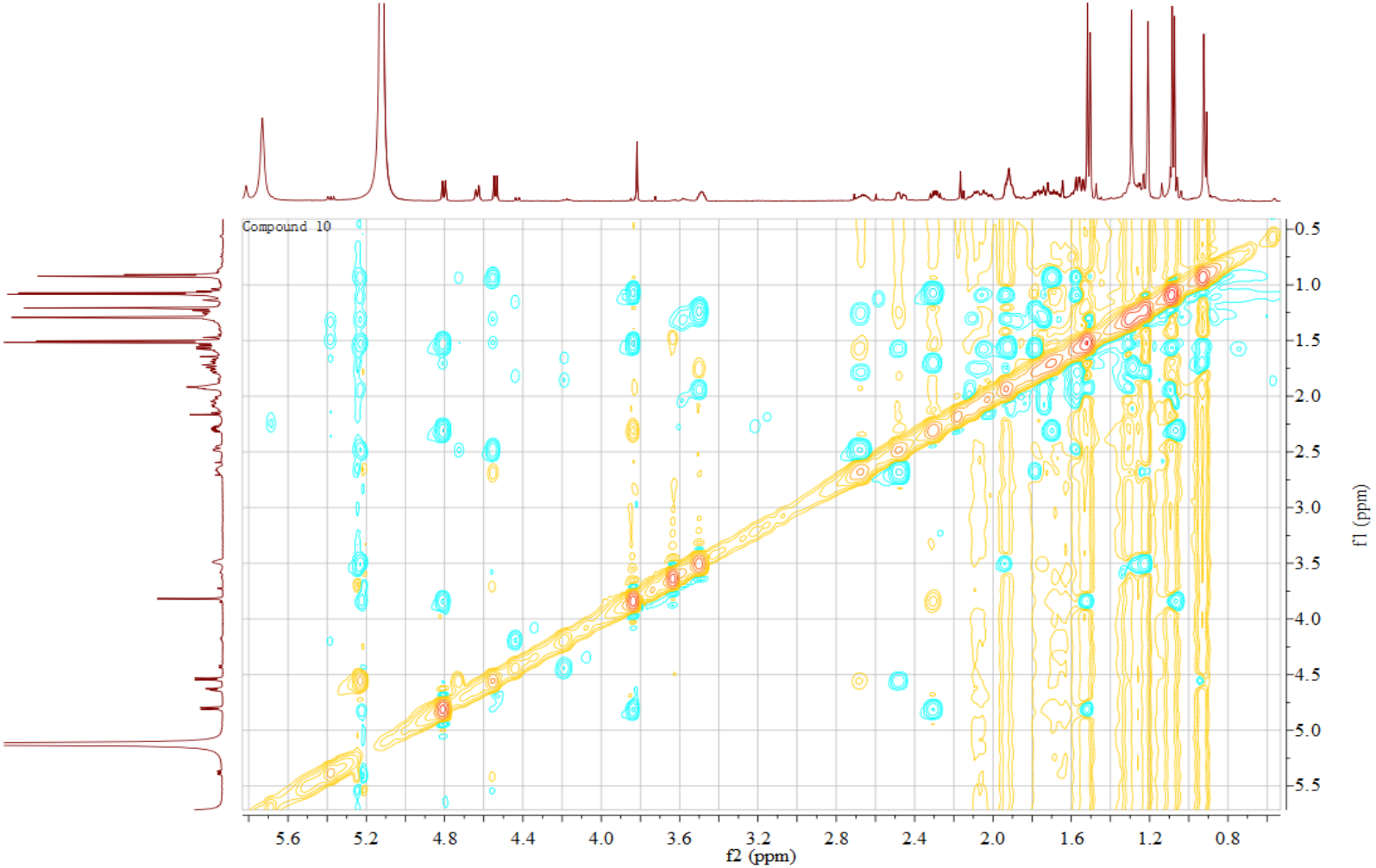


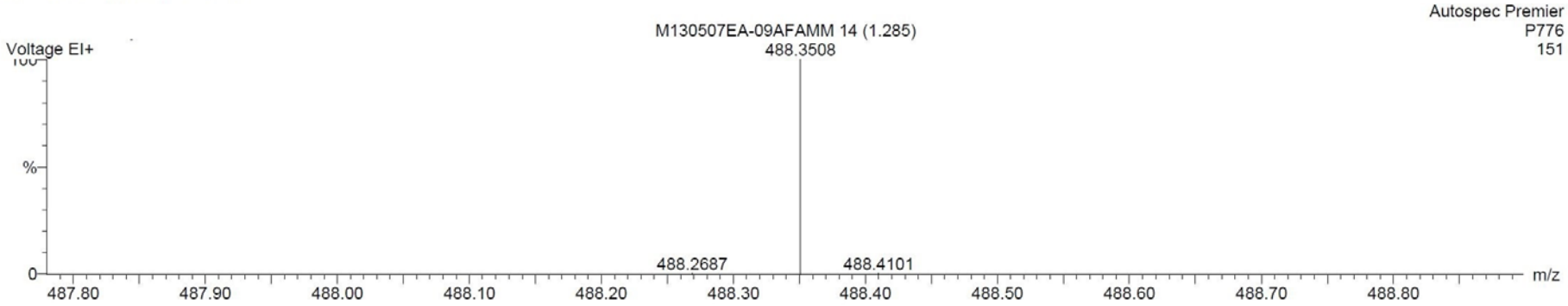
Figure S79. HRESIMS of **10**

Elemental Composition Report

Single Mass Analysis

Tolerance = 10.0 PPM / DBE: min = -10.0, max = 120.0
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ions
21 formula(e) evaluated with 1 results within limits (up to 51 closest results for each mass)
Elements Used:
C: 0-200 H: 0-400 O: 4-6



Minimum:				-10.0		
Maximum:		200.0	10.0	120.0		
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Formula
488.3508	488.3502	0.6	1.2	7.0	5546094.0	C30 H48 O5

Figure S80. IR Spectrum of **10**

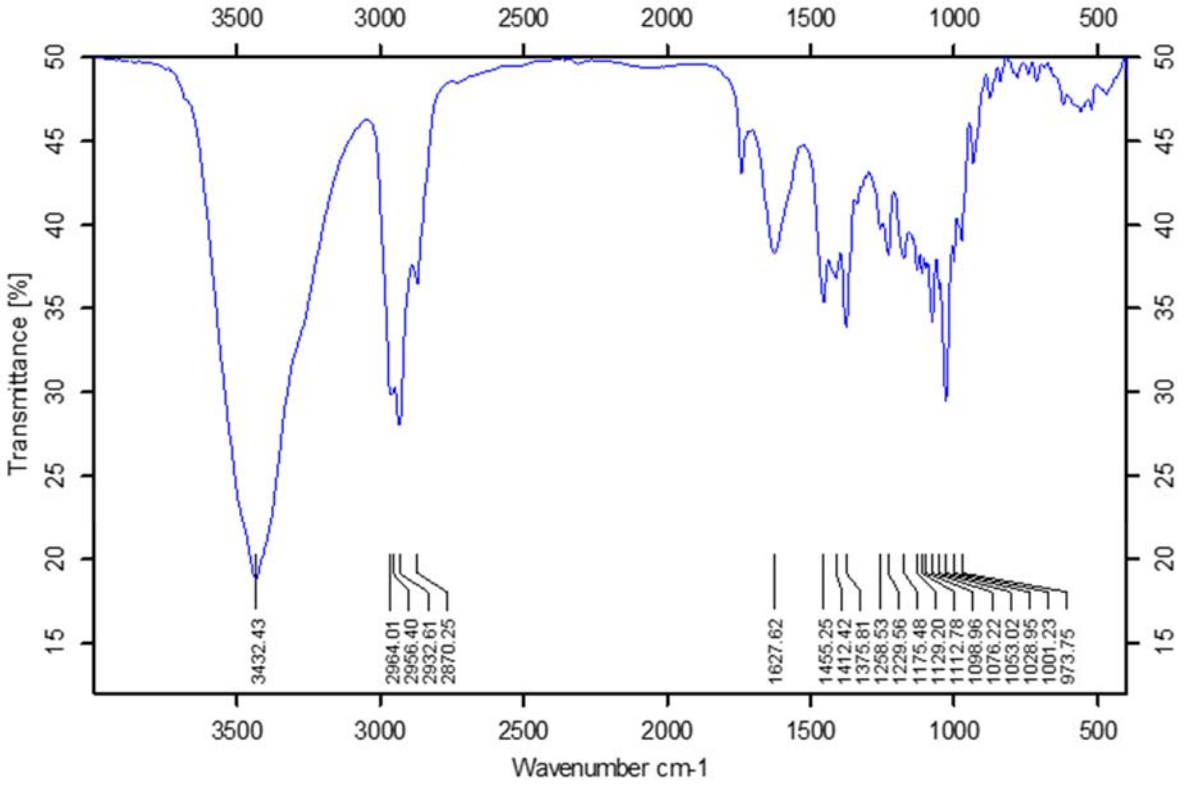


Figure S81. ^{1}H NMR Spectrum of **11** in Pyridine-d_5

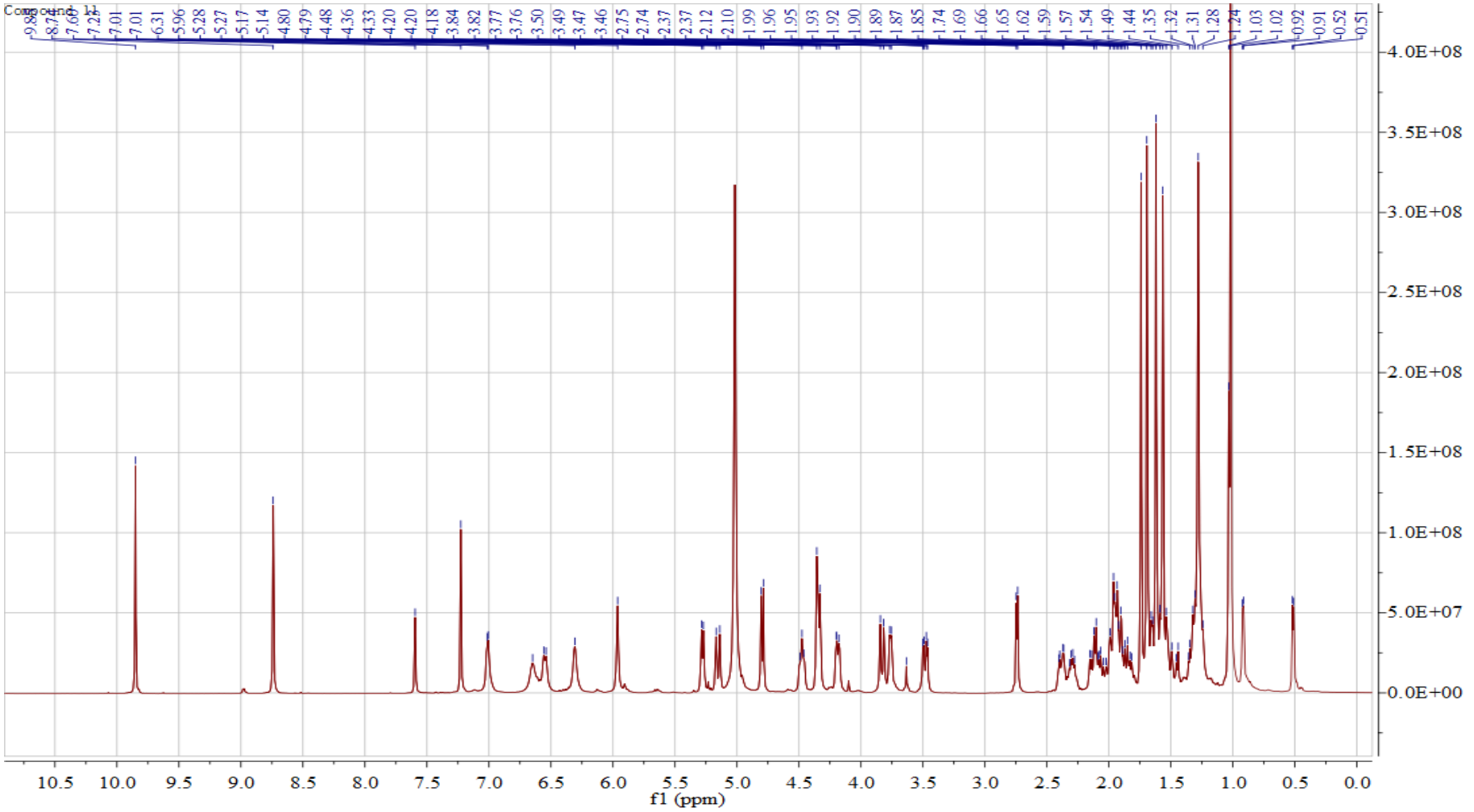


Figure S82 ^{13}C NMR Spectrum of **11** in Pyridine-d_5

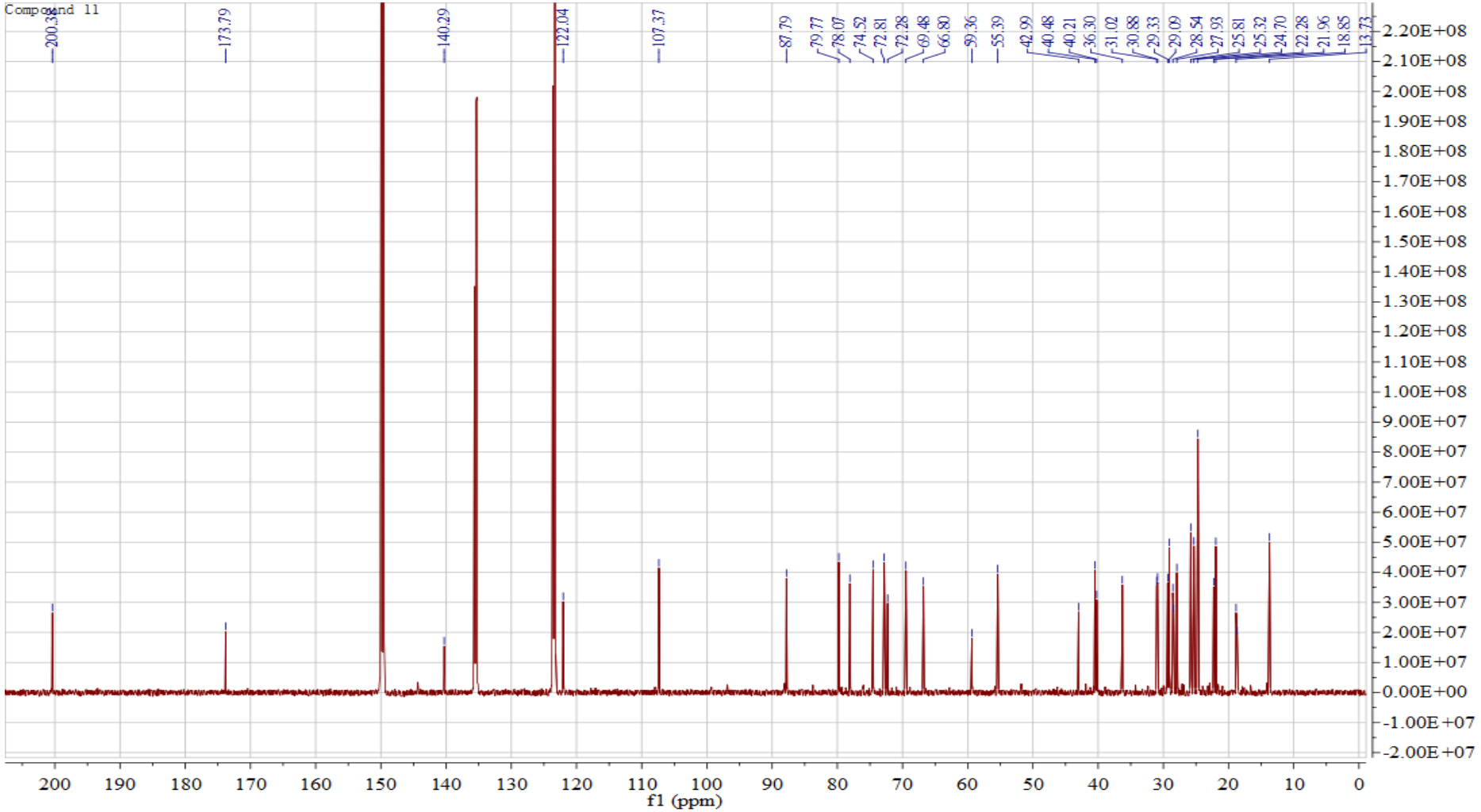


Figure S83. HSQC Spectrum of **11** in Pyridine-d_5

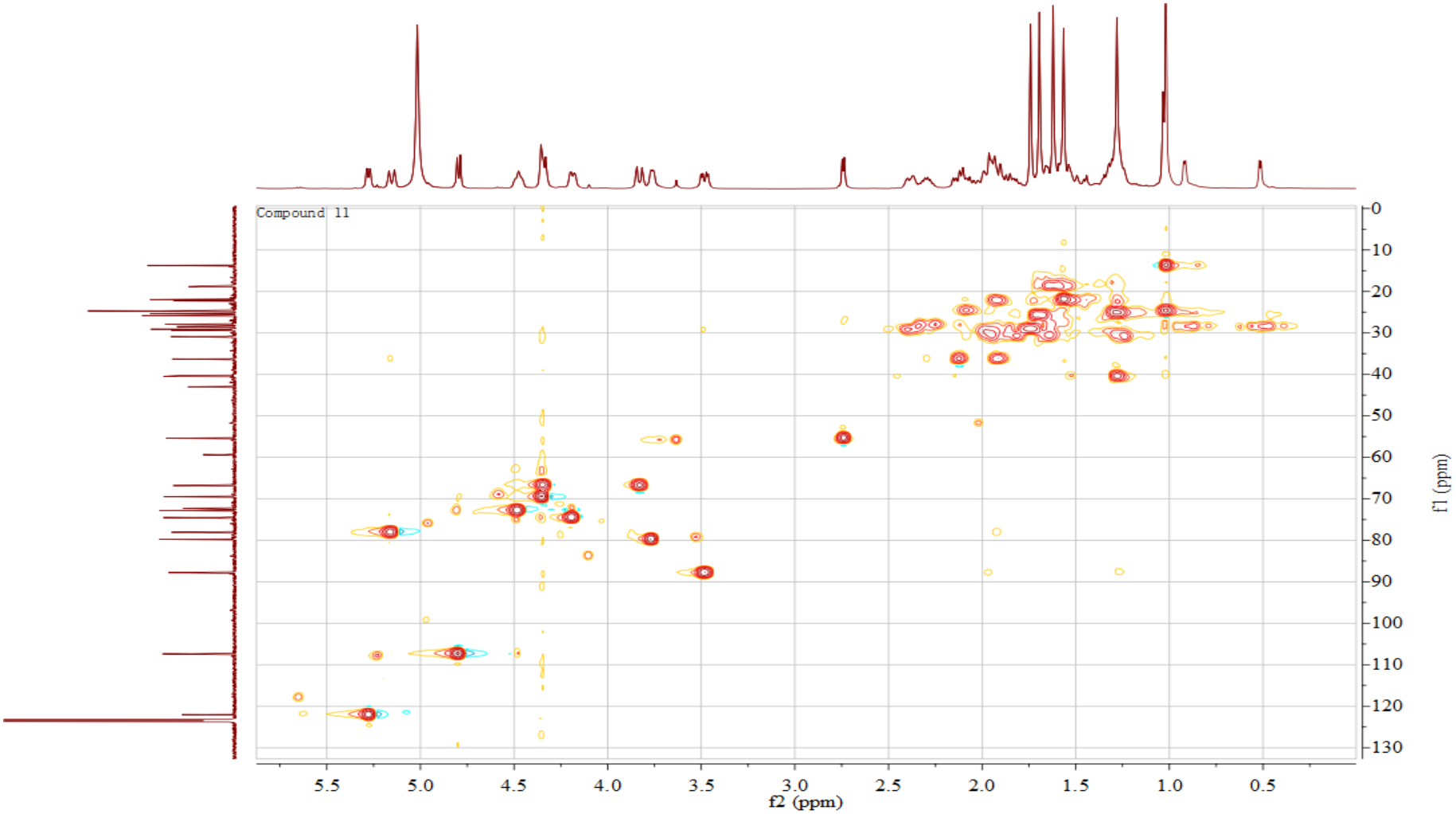


Figure S84. HMBC Spectrum of **11** in Pyridine-d_5

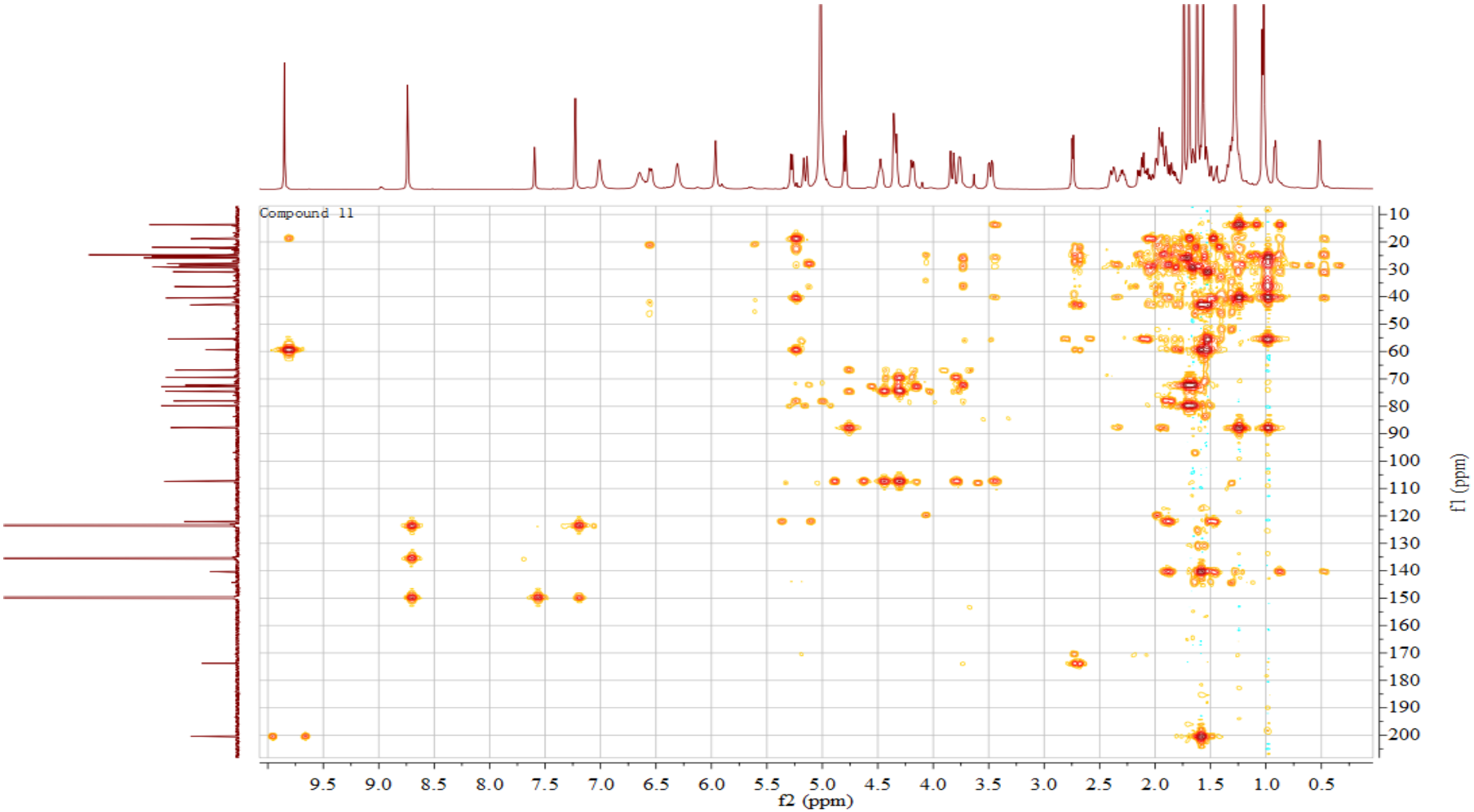


Figure S85. ^{1}H-^{1}H COSY Spectrum of **11** in Pyridine-d_5

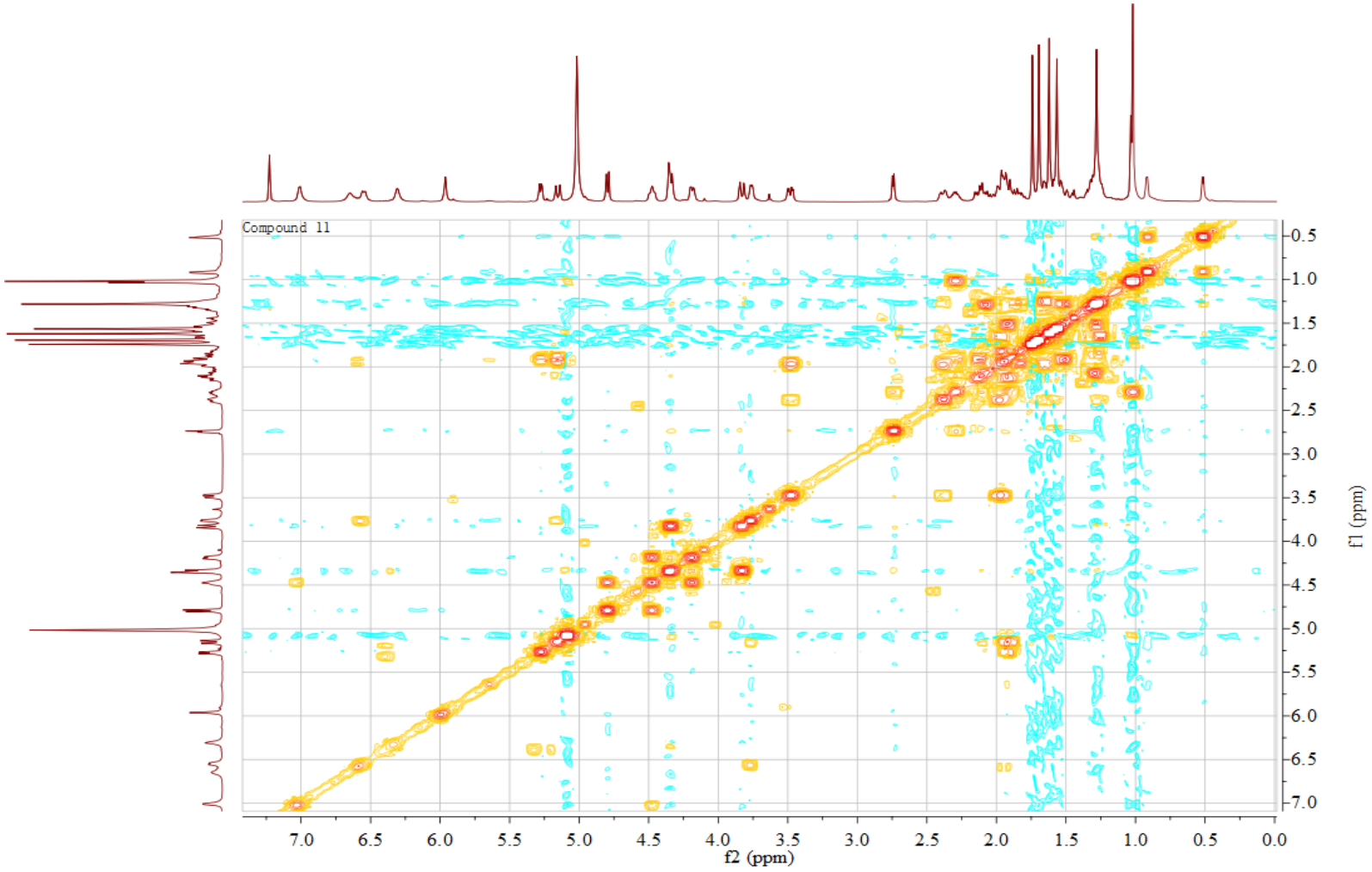


Figure S86. ROESY Spectrum of **11** in Pyridine-d_5

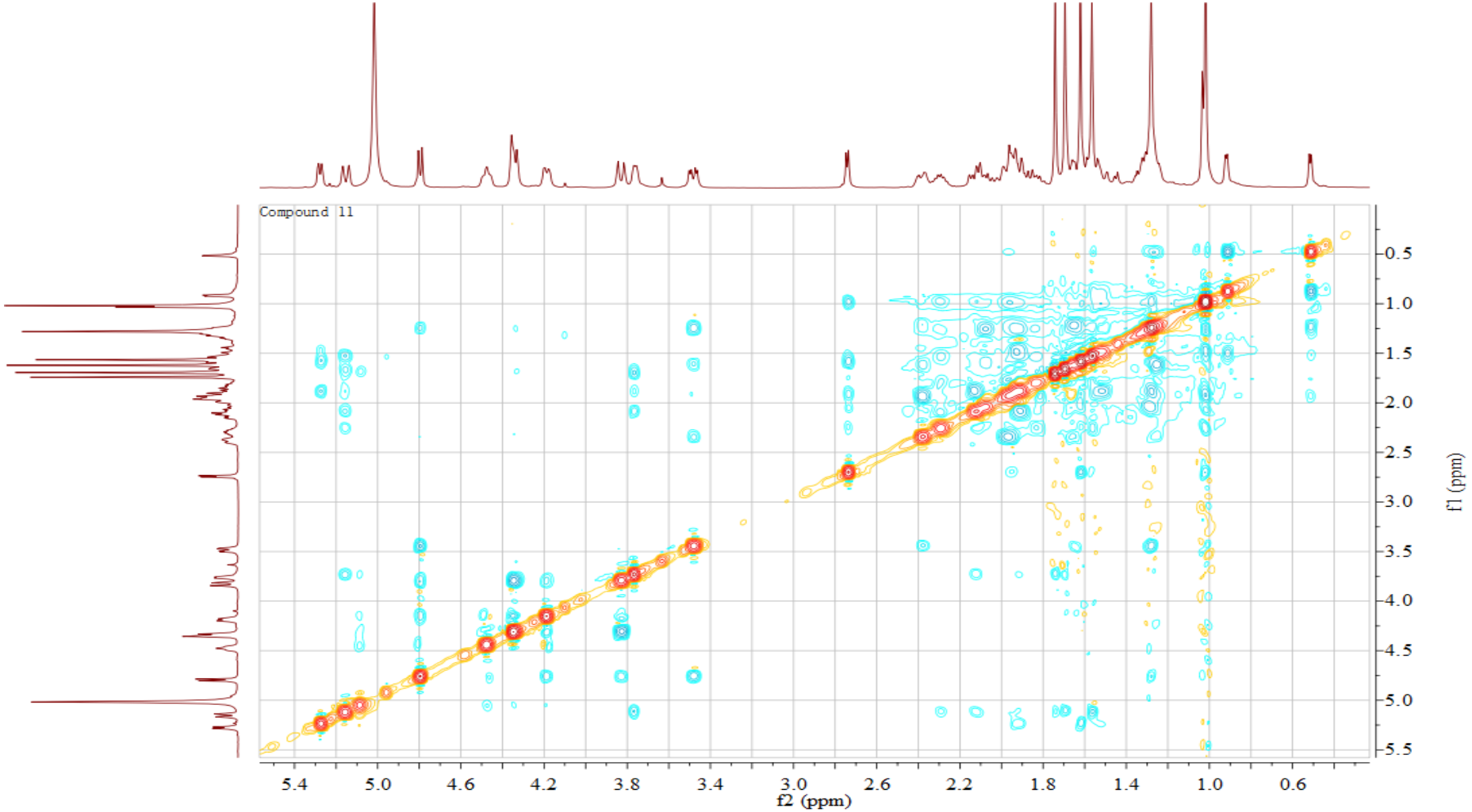
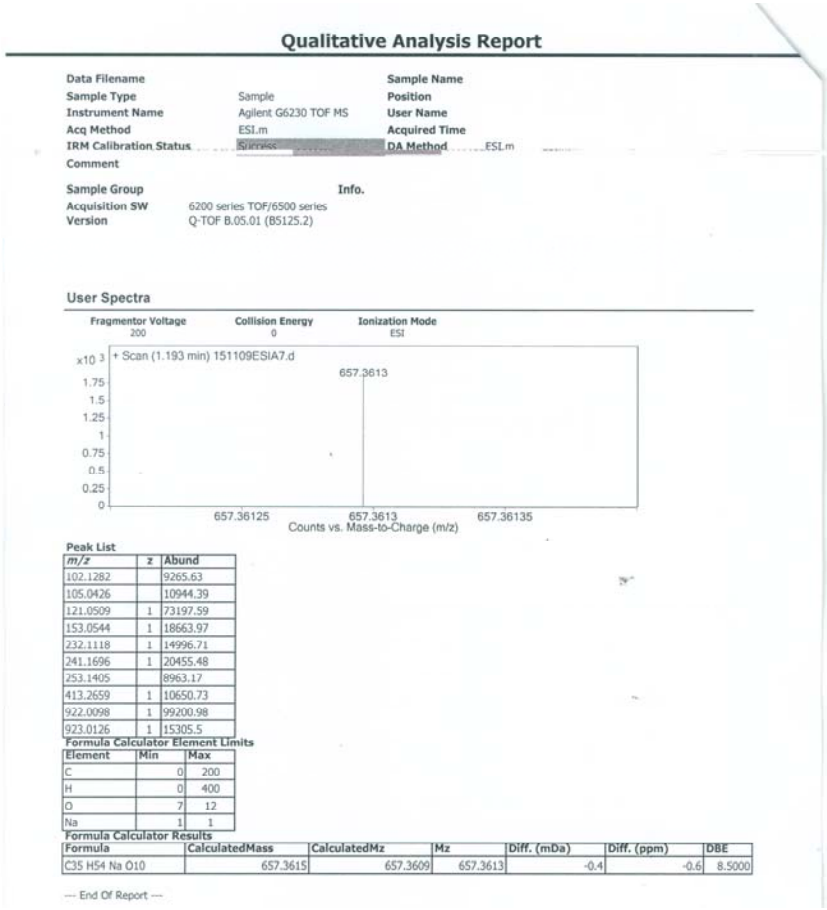


Figure S87. HRESIMS of **11**



Qualitative Analysis Report

Data Filename		Sample Name	
Sample Type	Sample	Position	
Instrument Name	Agilent G6230 TOF MS	User Name	
Acq Method	ESI.m	Acquired Time	
IRM Calibration Status	Success	DA Method	ESI.m
Comment			

Sample Group	Info.
Acquisition SW Version	6200 series TOF/6500 series Q-TOF B.05.01 (B5125.2)

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
200	0	ESI

Peak List

m/z	z	Abund
102.1282		9265.63
105.0426		10944.39
121.0509	1	73197.59
153.0544	1	18663.97
232.1118	1	14996.71
241.1696	1	20455.48
253.1405		8963.17
413.2659	1	10650.73
922.0098	1	99200.98
923.0126	1	15305.5

Formula Calculator Element Limits

Element	Min	Max
C	0	200
H	0	400
O	7	12
Na	1	1

Formula Calculator Results

Formula	CalculatedMass	CalculatedMz	Mz	Diff. (mDa)	Diff. (ppm)	DBE
C35 H54 Na O10	657.3615	657.3609	657.3613	-0.4	-0.6	8.5000

--- End Of Report ---

Figure S88. IR Spectrum of **11**

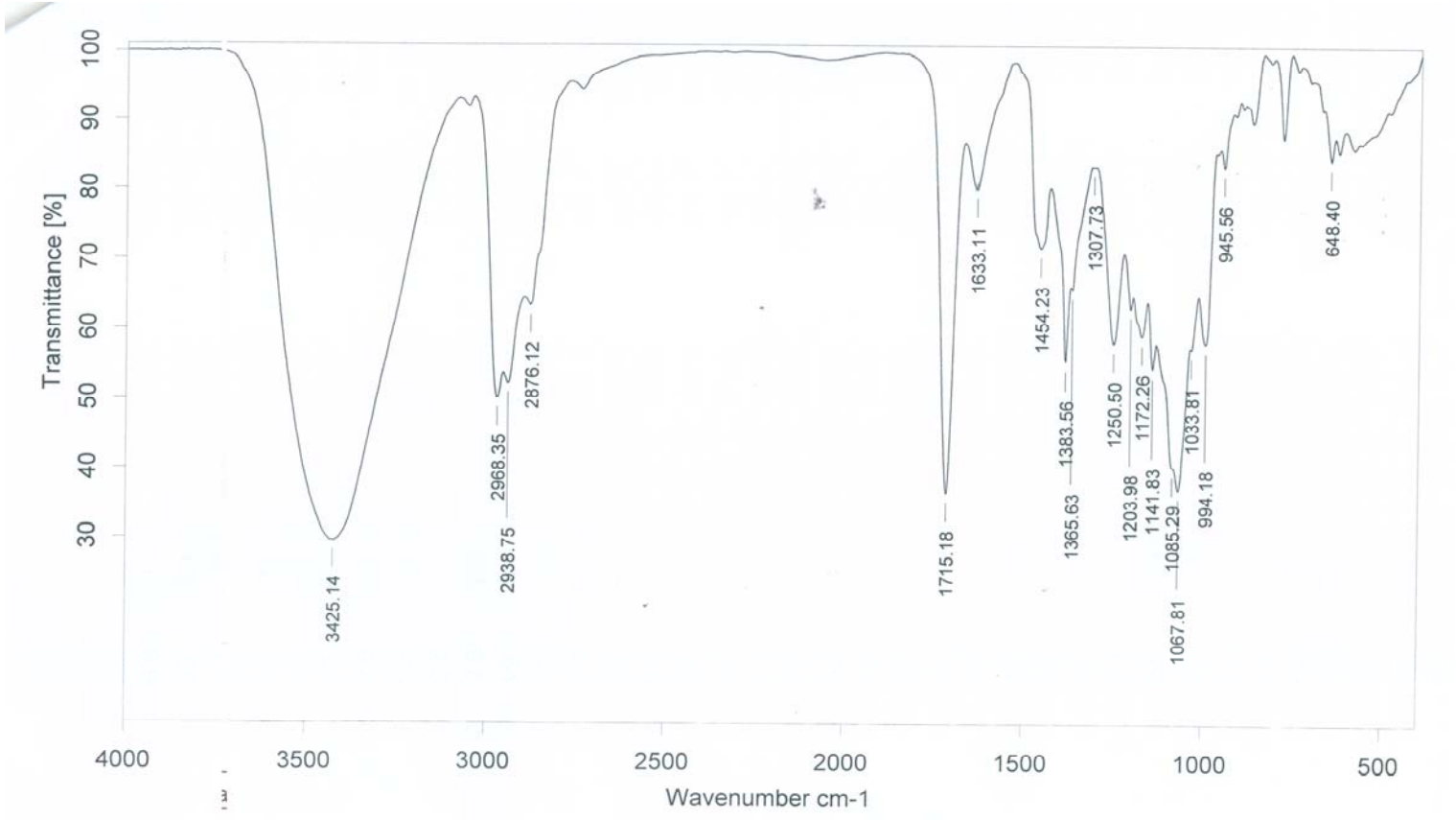


Figure S89. ^{1}H NMR Spectrum of **12** in Pyridine-d_5

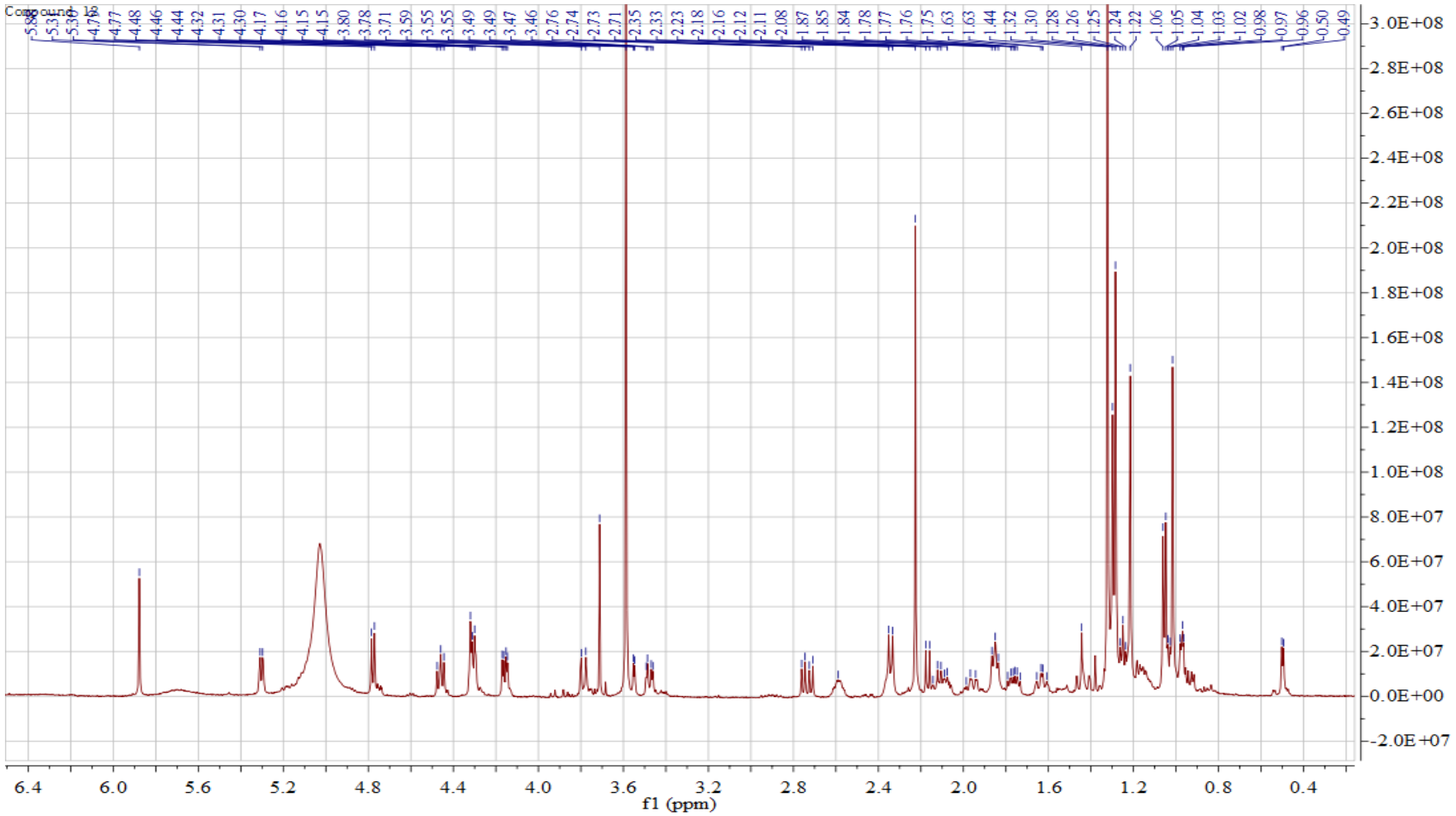


Figure S90 ^{13}C NMR Spectrum of **12** in Pyridine-d_5

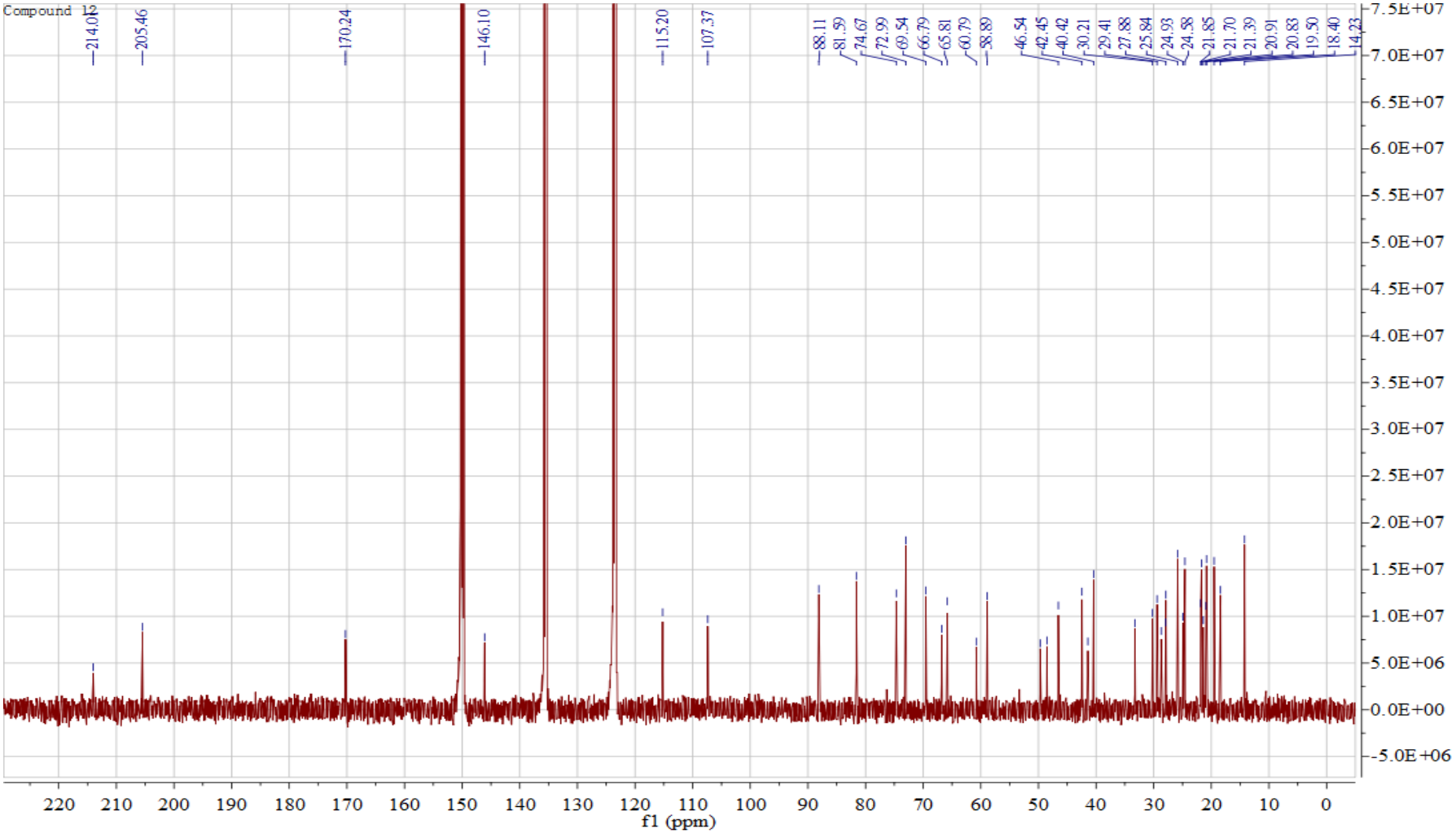


Figure S91. HSQC Spectrum of **12** in Pyridine-d_5

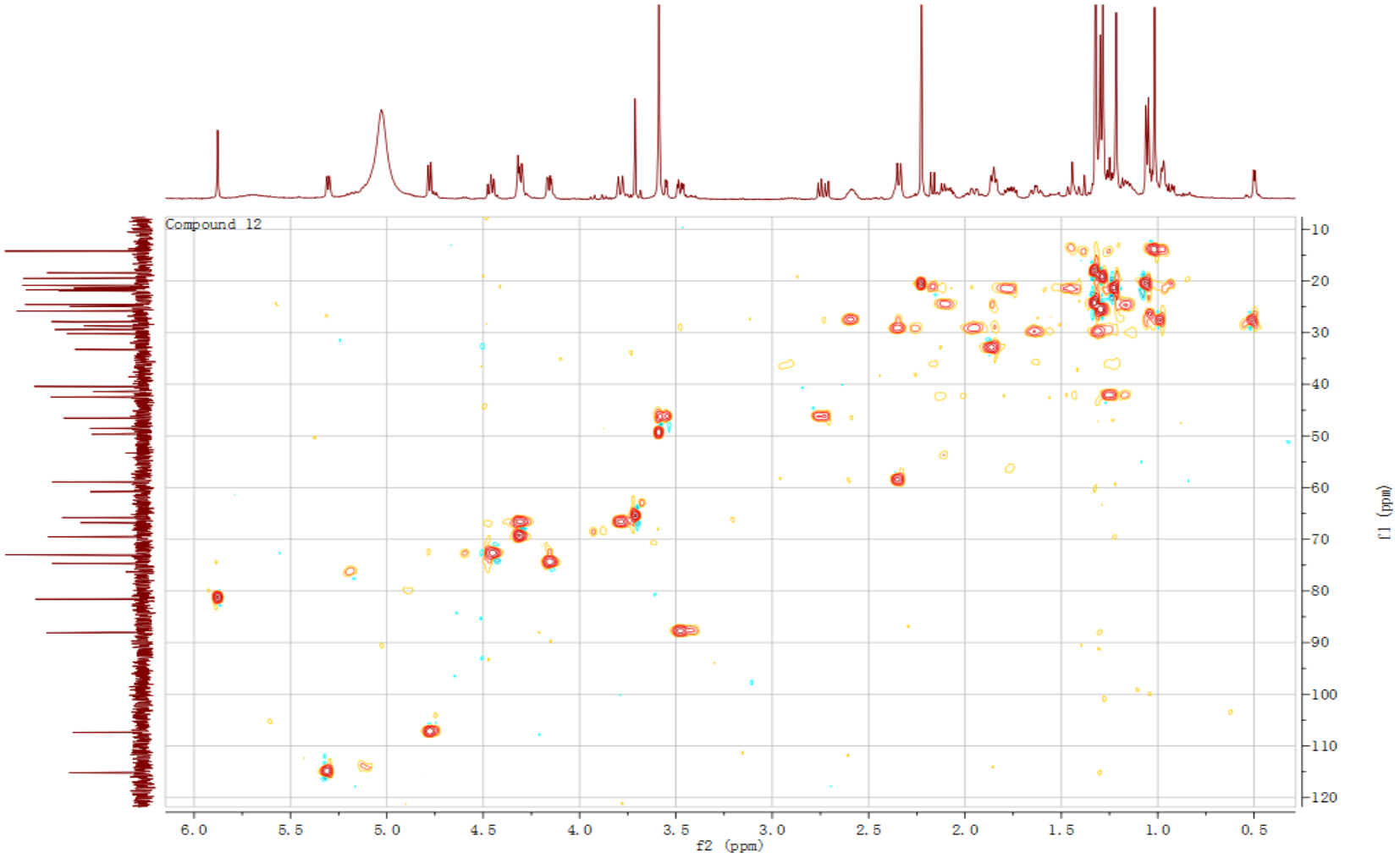


Figure S92. HMBC Spectrum of **12** in Pyridine-d_5

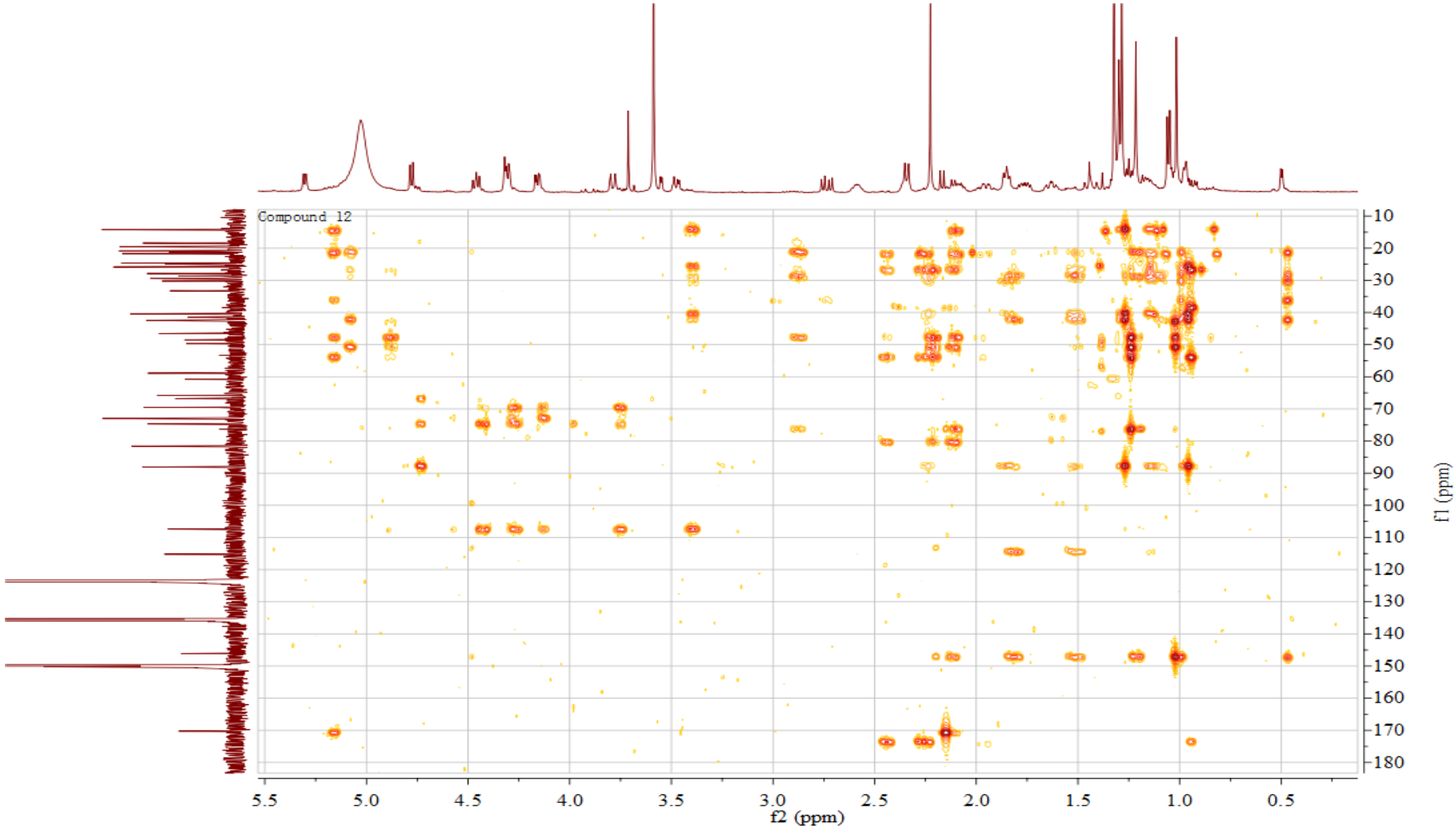


Figure S93. ^{1}H-^{1}H COSY Spectrum of **12** in Pyridine-d_5

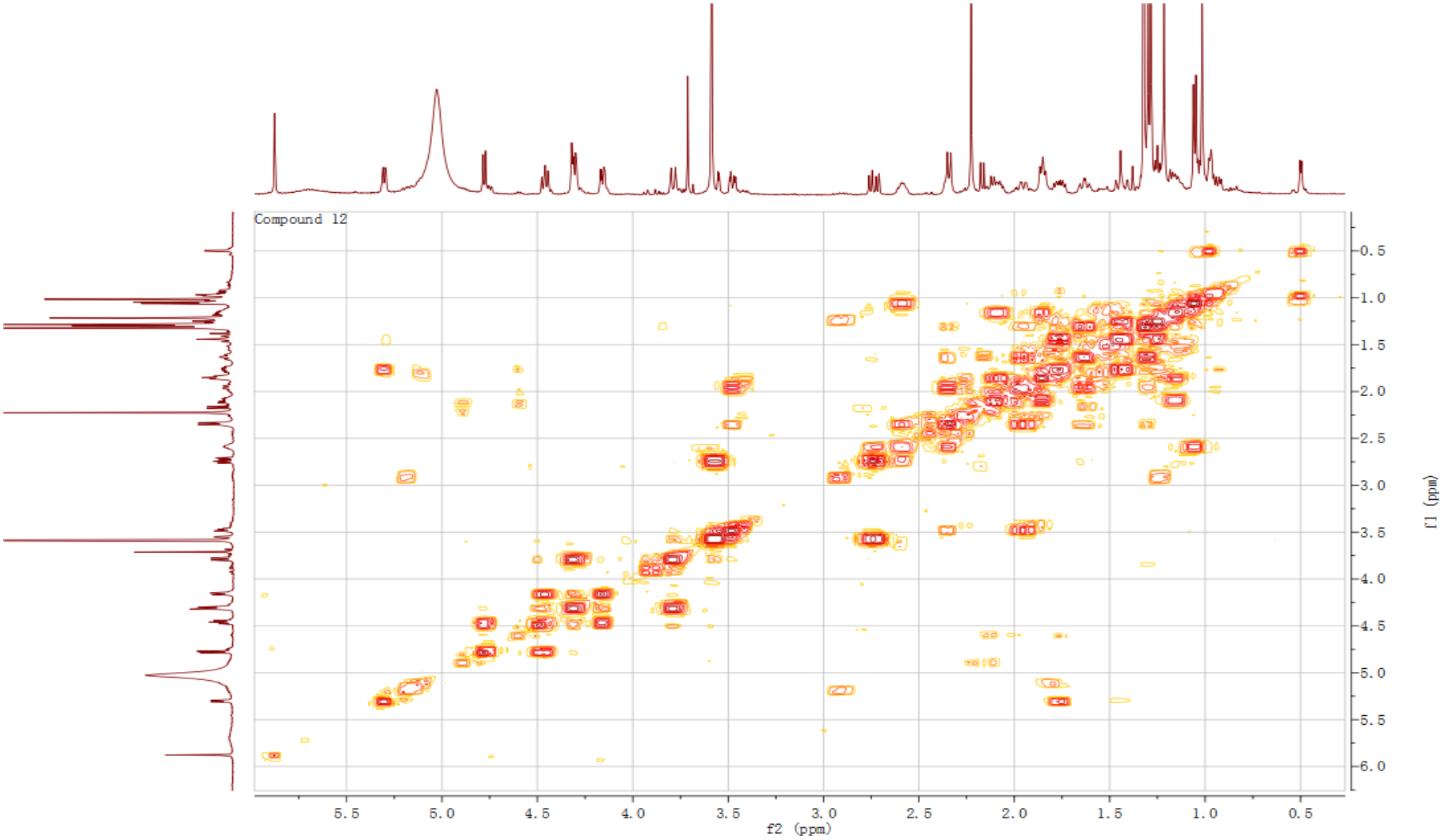


Figure S94. ROESY Spectrum of **12** in Pyridine-d_5

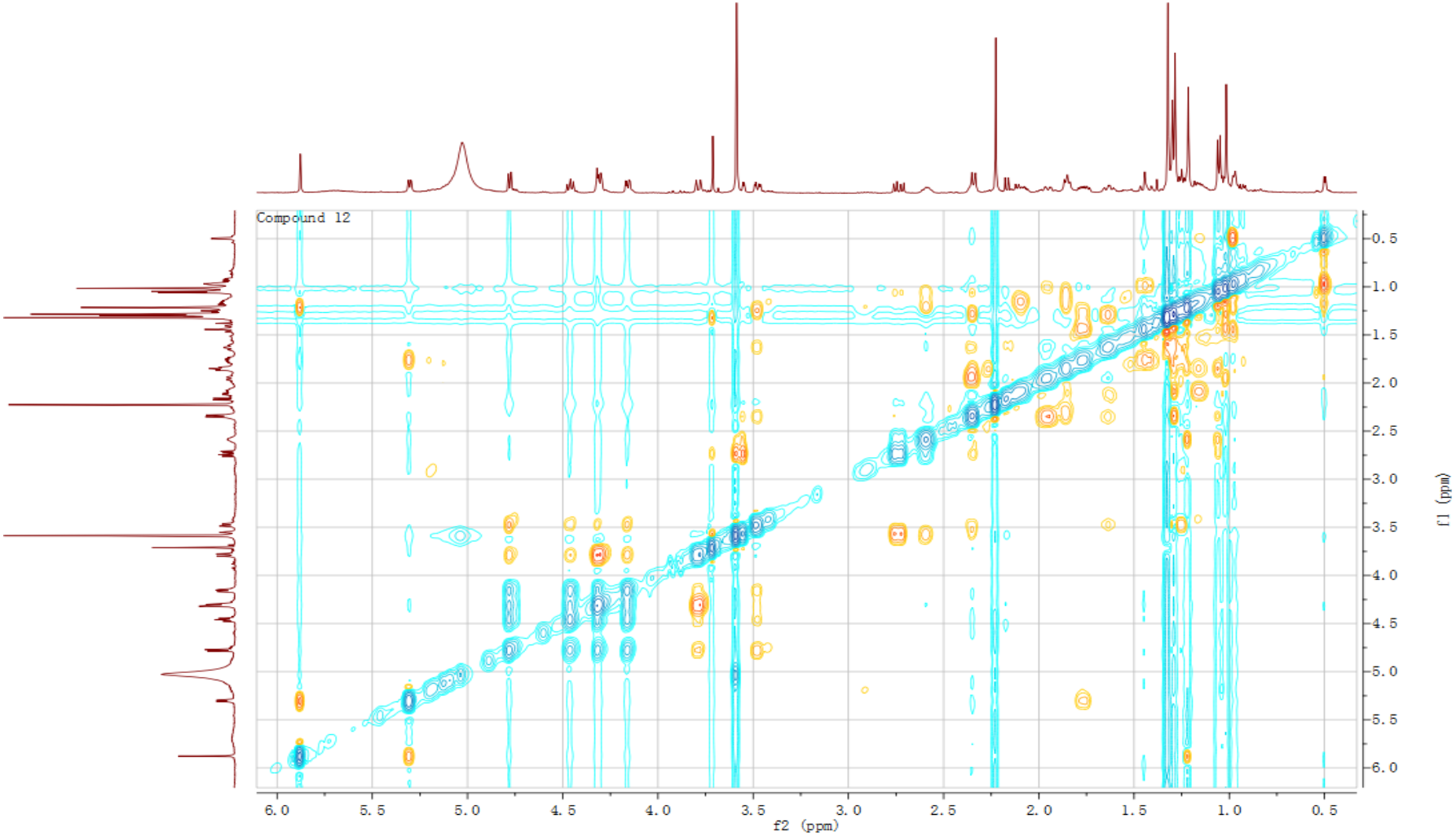


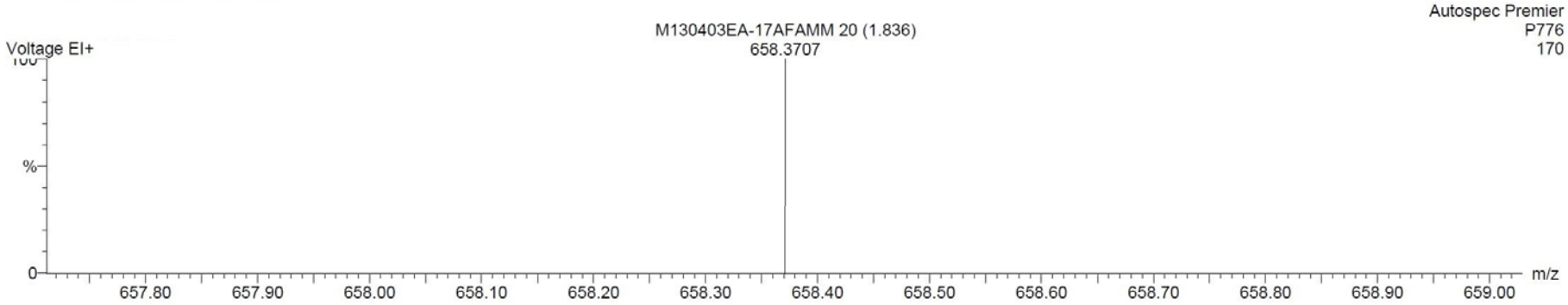
Figure S95. HRESIMS of **12**

Elemental Composition Report

Single Mass Analysis

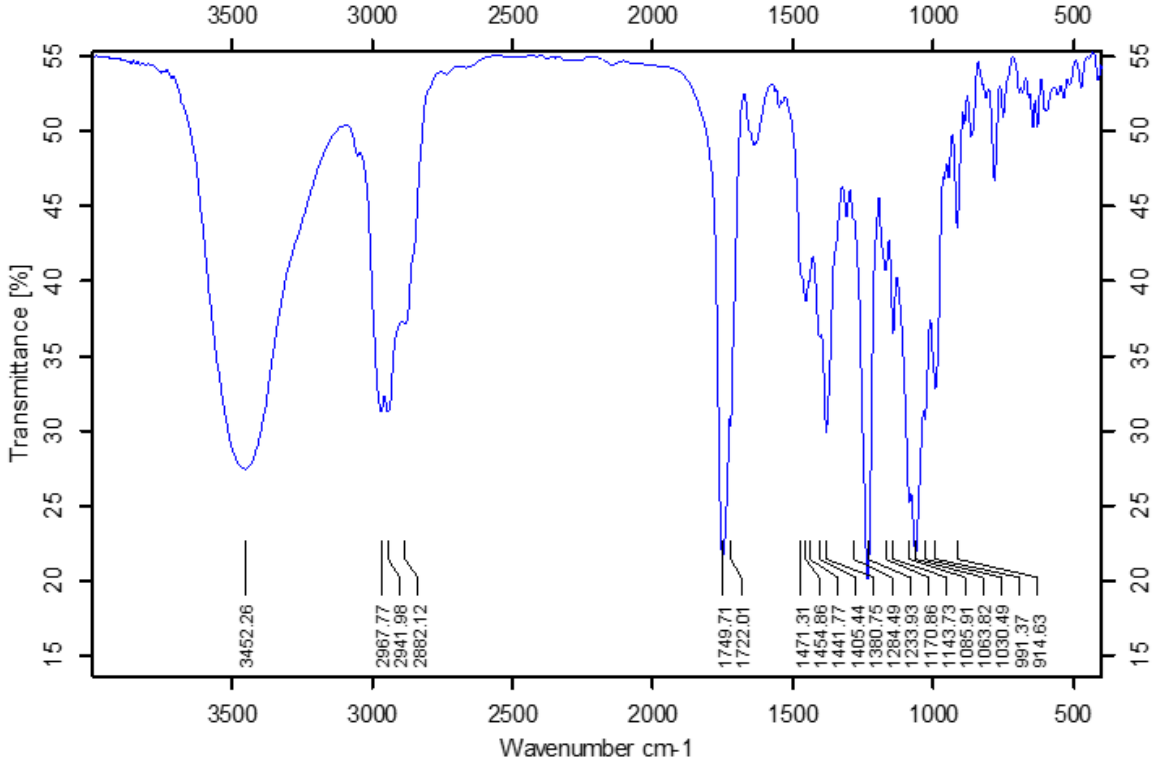
Tolerance = 10.0 PPM / DBE: min = -10.0, max = 120.0
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ions
24 formula(e) evaluated with 1 results within limits (up to 51 closest results for each mass)
Elements Used:
C: 0-200 H: 0-400 O: 9-11



Minimum:				-10.0		
Maximum:		200.0	10.0	120.0		
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Formula
658.3707	658.3717	-1.0	-1.5	11.0	5546105.0	C37 H54 O10

Figure S96. IR Spectrum of **12**



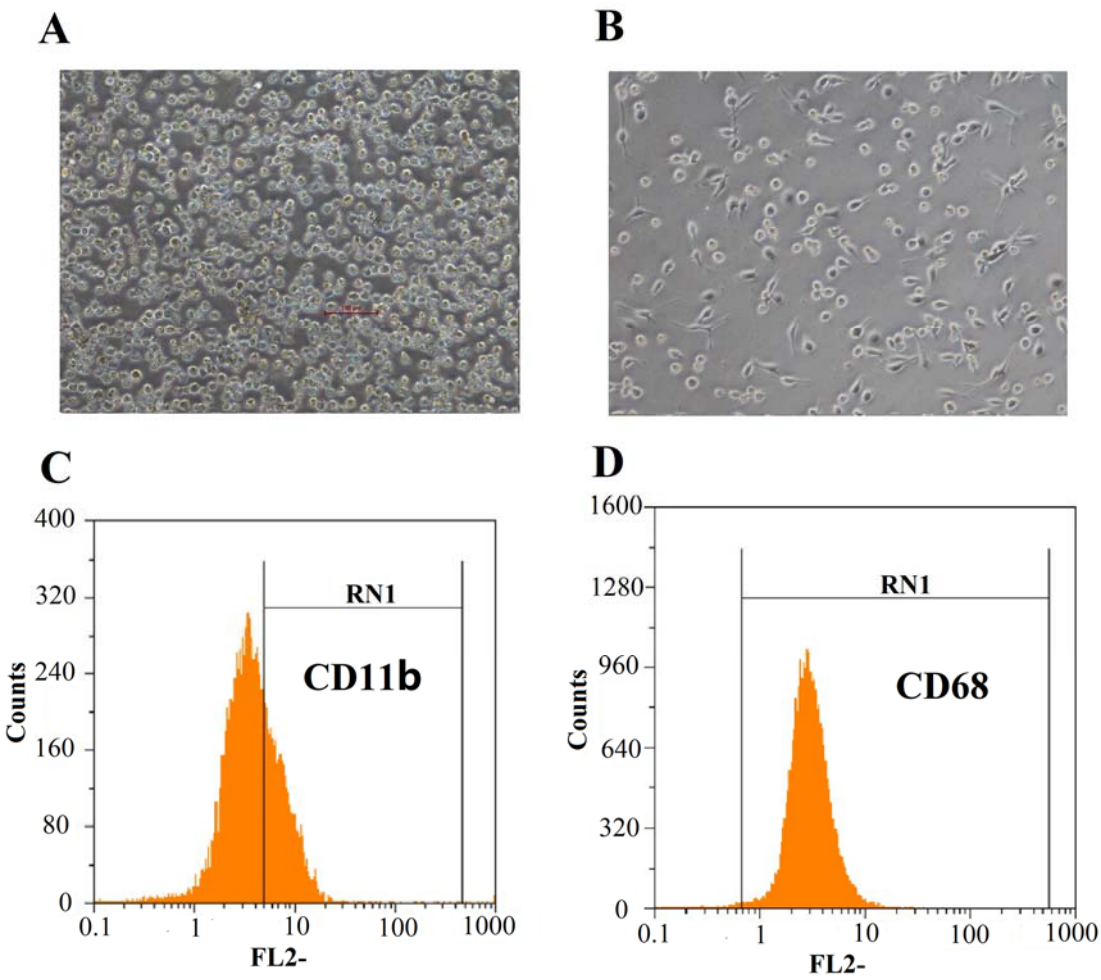


Figure S97. Cell morphology and expression of CD11b and CD68 of differentiated and undifferentiated THP-1 cells. **A.** Undifferentiated THP-1 cells; **B.** Induction of monocyte-macrophage differentiation by 100 nM PMA for 24 h; **C.** CD11b expression of the differentiated cells. **D.** CD68 expression of the differentiated cells; Expressions of CD11b and CD68 were measured by flow cytometry using FITC-labeled anti-CD11b mAb and anti-CD68 mAb. Analyses were conducted on a PARTEC brand flow cytometer.

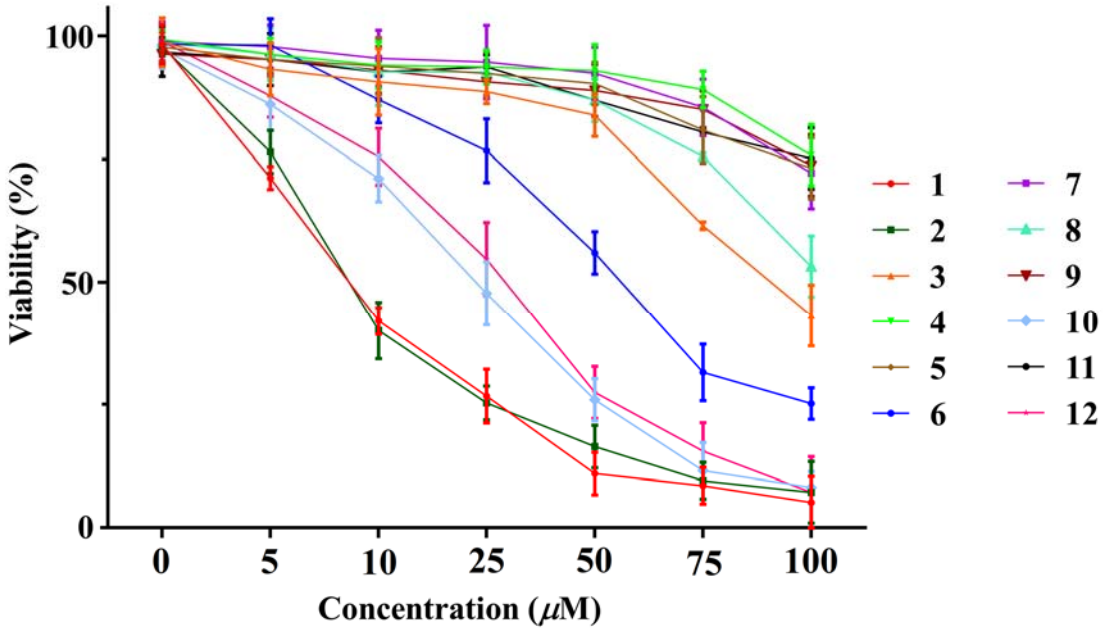


Figure S98. Effects of compounds **1-12** on the viability of PMA-induced THP-1 cells. PMA-induced THP-1 cells were treated with indicated concentrations of compounds **1-12** (0-100 μM) and cell viability was assessed after 48 h using the MTT assay. Data points represent mean ± SD of three measurements.

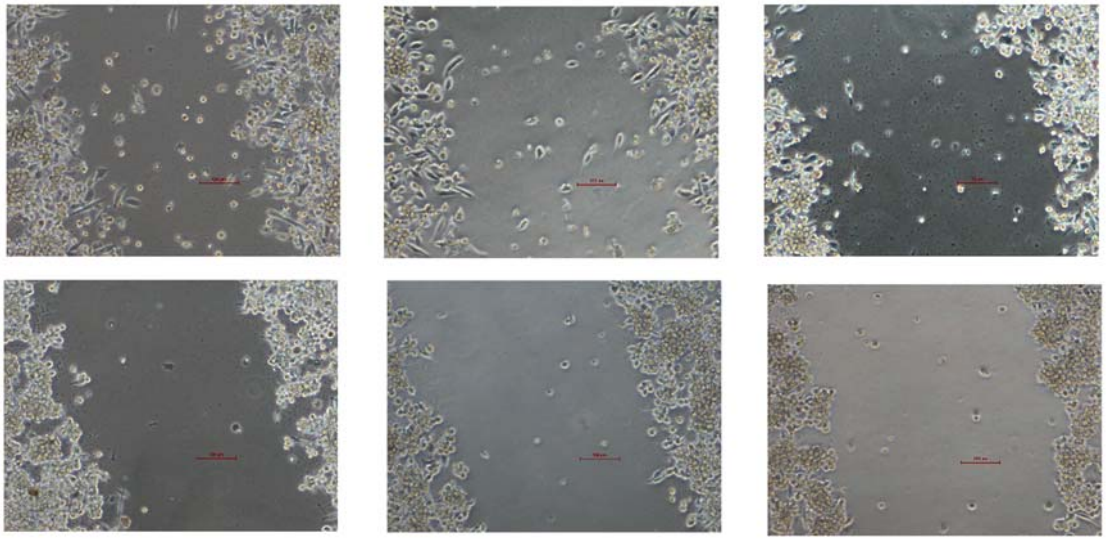


Figure S99. Representative pictures of the migration of PMA-induced THP-1 cells. Up panel: The migration of PMA-induced THP cells without compound **7** (Three parallel experiments); Down panel**:** The migration of PMA-induced THP cells with 50 μM compound **7** (Three parallel experiments).

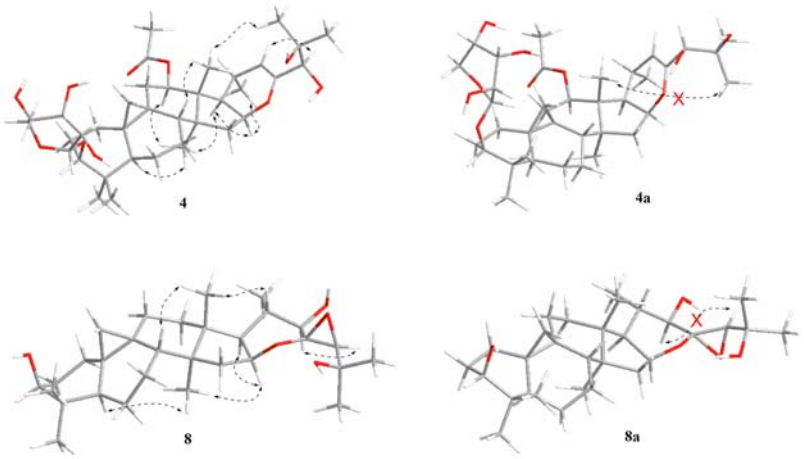


Figure S100. Key ROESY correlations of compounds **4** (**4a**) and **8** (**8a**).

Table S1. Primers' information for CD147 and MMPs in the present study

CTGGTACAAGATCACTGAC	EMMPRIN(H)-F
GAGGAACTCACGAAGAAC	EMMPRIN(H)-R
CTGAAGGACACACTAAAGA	MMP2(H)-F
CGATGGTATTCTGGTCAA	MMP2(H)-R
GGCAGATTCCAAACCTTT	MMP9(H)-F
GCAAGTCTTCCGAGTAGT	MMP9(H)-R
AAAGGGTCATCATCTCTG	GAPDH-F
GCTGTTGTCATACTTCTC	GAPDH-R