

Supporting information

Synthesis of condensed chiral pyranopyran derivatives with antiproliferative activity using domino Knoevenagel-IMHDA sequences

Sándor Balázs Király,[a] * Balázs Buglyó,[a,b] Otieno Michael Ooko,[a,b] Attila Bényei,[c] Erika Lisztes,[d] Balázs István Tóth,[d] Tamás Bíró,[e] Kristóf Borozsnyai,[a] Dávid Oláh,[a] Gábor Vasvári,[f] Dániel Nemes,[f] Miklós Vecsernyés,[g] Ferenc Fenyvesi,[h] and Tibor Kurtán[a] *

[a] Dr. S. B. Király, B. Buglyó, O. M. Ooko, K. Borozsnyai, D. Oláh, Prof. T. Kurtán
Department of Organic Chemistry
University of Debrecen,
P. O. Box 400, 4002 Debrecen, Hungary
E-mail: kiraly.sandor.balazs@science.unideb.hu, kurtan.tibor@science.unideb.hu

[b] B. Buglyó, O. M. Ooko
Doctoral School of Chemistry
University of Debrecen
Egyetem square 1, 4032 Debrecen, Hungary

[c] Dr. A. Bényei
Department of Physical Chemistry
University of Debrecen
4032 Debrecen, Egyetem square 1, Hungary

[d] Dr. E. Lisztes, Dr. B. I. Tóth
Department of Physiology
University of Debrecen
4032 Debrecen, Nagyerdei krt. 98., Hungary

[e] Dr. T. Bíró
Department of Immunology
University of Debrecen
4032 Debrecen, Egyetem square 1, Hungary

[f] Dr. G. Vasvári, Dr. D. Nemes
Department of Pharmaceutical Technology
University of Debrecen
4002 Debrecen, Rex Ferenc street 1.

[g] Prof. M. Vecsernyés
Department Of Pharmaceutical Surveillance and Economics
University of Debrecen
4002 Debrecen, Rex Ferenc street 1.

[h] Prof. F. Fenyvesi
Department of Molecular and Nanopharmaceutics
University of Debrecen
4002 Debrecen, Rex Ferenc street 1.

Table of Contents

Table of Figures	3
List of Tables.....	10
1. Preparation of the starting materials of the domino reaction	11
2. NMR spectra of condensed heterocycles 4-7	12
3. ECD and HPLC-ECD spectra of condensed heterocycles.....	181
3.1. ECD Spectra of 4ba-be , 6ba-be and 5ba-be :	181
3.2. HPLC-ECD spectra of 4aa-ae , 5aa-ae , 6aa-ae and 7aa-ae	187
4. <i>In vitro</i> antiproliferative activity of the products of the domino reactions against A2780 and WM35 human cancer cell lines	200
5. X-Ray diffraction data	206

Table of Figures

Figure S1. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4aa in CDCl ₃ at 400 MHz.....	12
Figure S2. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4aa in CDCl ₃ at 100 MHz.....	13
Figure S3. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4aa in CDCl ₃ at 400 MHz.	14
Figure S4. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6aa and <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 5aa in CDCl ₃ at 400 MHz.	15
Figure S5. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6aa and <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 5aa in CDCl ₃ at 100 MHz.	16
Figure S6. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6aa and <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 5aa in CDCl ₃ at 400 MHz.	17
Figure S7. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 7aa in CDCl ₃ at 400 MHz.	18
Figure S8. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 7aa in CDCl ₃ at 100 MHz.	19
Figure S9. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 7aa in CDCl ₃ at 400 MHz.....	20
Figure S10. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 4ba in CD ₂ Cl ₂ at 400 MHz.	21
Figure S11. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 4ba in CDCl ₃ at 100 MHz.....	22
Figure S12. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 4ba and (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 6ba in CDCl ₃ at 400 MHz.	23
Figure S13. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 4ba and (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 6ba in CDCl ₃ at 100 MHz.	24
Figure S14. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 4ba and (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 6ba in CDCl ₃ at 400 MHz.	25
Figure S15. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>R</i>)- 5ba in CDCl ₃ at 400 MHz.	26
Figure S16. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>R</i>)- 5ba in CDCl ₃ at 100 MHz.	27
Figure S17. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>R</i>)- 5ba in CDCl ₃ at 400 MHz.....	28
Figure S18. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4ca in CDCl ₃ at 400 MHz.....	29
Figure S19. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4ca in CDCl ₃ at 100 MHz.	30
Figure S20. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4ca in CDCl ₃ at 400 MHz.	31
Figure S21. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5ca in CDCl ₃ at 400 MHz.	32
Figure S22. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5ca in CDCl ₃ at 100 MHz.....	33
Figure S23. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5ca in CDCl ₃ at 400 MHz.	34
Figure S24. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6ca in CDCl ₃ at 400 MHz.....	35
Figure S25. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6ca in CDCl ₃ at 100 MHz.	36
Figure S26. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6ca in CDCl ₃ at 400 MHz.	37
Figure S27. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 7ca in CDCl ₃ at 400 MHz.....	38
Figure S28. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 7ca in CDCl ₃ at 90 MHz.....	39
Figure S29. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 7ca in CDCl ₃ at 400 MHz.	40
Figure S30. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4ab in CDCl ₃ at 400 MHz.....	41
Figure S31. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4ab in CDCl ₃ at 100 MHz.	42
Figure S32. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4ab in CDCl ₃ at 400 MHz.	43
Figure S33. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6ab in CDCl ₃ at 500 MHz.....	44
Figure S34. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6ab in CDCl ₃ at 100 MHz.	45
Figure S35. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6ab in CDCl ₃ at 400 MHz.....	46

Figure S36. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 4bb in CDCl ₃ at 400 MHz.....	47
Figure S37. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 4bb in CDCl ₃ at 100 MHz.	48
Figure S38. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 4bb in CDCl ₃ at 400 MHz.	49
Figure S39. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 6bb in CDCl ₃ at 400 MHz.....	50
Figure S40. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 6bb in CDCl ₃ at 100 MHz.	51
Figure S41. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 6bb in CDCl ₃ at 400 MHz.	52
Figure S42. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 5bb in CDCl ₃ at 400 MHz.	53
Figure S43. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 5bb in CDCl ₃ at 100 MHz.	54
Figure S44. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 5bb in CDCl ₃ at 400 MHz.	55
Figure S45. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 4cb in CDCl ₃ at 400 MHz.	56
Figure S46. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 4cb in CDCl ₃ at 100 MHz.	57
Figure S47. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 4cb in CDCl ₃ at 400 MHz.	58
Figure S48. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 6cb in CDCl ₃ at 400 MHz.	59
Figure S49. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 6cb in CDCl ₃ at 100 MHz.	60
Figure S50. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 6cb in CDCl ₃ at 400 MHz.	61
Figure S51. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 5cb in CDCl ₃ at 400 MHz.	62
Figure S52. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 5cb in CDCl ₃ at 100 MHz.	63
Figure S53. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 5cb in CDCl ₃ at 400 MHz.	64
Figure S54. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 4ac in CDCl ₃ at 400 MHz.	65
Figure S55. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 4ac in CDCl ₃ at 100 MHz.	66
Figure S56. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 4ac in CDCl ₃ at 400 MHz.	67
Figure S57. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 6ac in CDCl ₃ at 400 MHz.	68
Figure S58. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 6ac in CDCl ₃ at 100 MHz.	69
Figure S59. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bS</i> *)- 6ac in CDCl ₃ at 400 MHz.	70
Figure S60. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 5ac in CDCl ₃ at 400 MHz.	71
Figure S61. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 5ac in CDCl ₃ at 100 MHz.	72
Figure S62. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 5ac in CDCl ₃ at 400 MHz.	73
Figure S63. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 4bc in CDCl ₃ at 400 MHz.	74
Figure S64. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 4bc in CDCl ₃ at 100 MHz.	75
Figure S65. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 4bc in CDCl ₃ at 400 MHz.	76
Figure S66. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 6bc in CDCl ₃ at 400 MHz.	77
Figure S67. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 6bc in CDCl ₃ at 100 MHz.	78
Figure S68. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bS</i>)- 6bc in CDCl ₃ at 400 MHz.	79
Figure S69. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bR</i>)- 5bc in CDCl ₃ at 400 MHz.	80
Figure S70. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bR</i>)- 5bc in CDCl ₃ at 100 MHz.	81
Figure S71. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12 <i>bR</i> ,19 <i>bR</i>)- 5bc in CDCl ₃ at 400 MHz.	82
Figure S72. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 4cc in CDCl ₃ at 400 MHz.	83
Figure S73. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 4cc in CDCl ₃ at 100 MHz.	84
Figure S74. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 4cc in CDCl ₃ at 400 MHz.	85
Figure S75. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 6cc in CDCl ₃ at 400 MHz.	86
Figure S76. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 6cc in CDCl ₃ at 100 MHz.	87
Figure S77. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12 <i>bR</i> *,19 <i>bR</i> *)- 6cc in CDCl ₃ at 400 MHz.	88

Figure S78. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5cc in CDCl ₃ at 400 MHz.	89
Figure S79. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5cc in CDCl ₃ at 100 MHz.	90
Figure S80. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5cc in CDCl ₃ at 400 MHz.....	91
Figure S81. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4dc in CDCl ₃ at 400 MHz.....	92
Figure S82. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4dc in CDCl ₃ at 100 MHz.....	93
Figure S83. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4dc in CDCl ₃ at 400 MHz.	94
Figure S84. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4ec in CDCl ₃ at 400 MHz.	95
Figure S85. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4ec in CDCl ₃ at 100 MHz.	96
Figure S86. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4ec in CDCl ₃ at 400 MHz.....	97
Figure S87. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4ad , <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6ad and <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5ad in DMSO- <i>d</i> ₆ at 400 MHz.	98
Figure S88. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4ad , <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6ad and <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5ad in DMSO- <i>d</i> ₆ at 400 MHz.	99
Figure S89. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4ad , <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6ad and <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5ad in DMSO- <i>d</i> ₆ at 400 MHz.	100
Figure S90. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4bd in DMSO- <i>d</i> ₆ at 400 MHz.....	101
Figure S91. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4bd in DMSO- <i>d</i> ₆ at 100 MHz.....	102
Figure S92. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4bd in DMSO- <i>d</i> ₆ at 400 MHz.....	103
Figure S93. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5bd in DMSO- <i>d</i> ₆ at 400 MHz.....	104
Figure S94. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5bd in DMSO- <i>d</i> ₆ at 100 MHz.....	105
Figure S95. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 5bd in DMSO- <i>d</i> ₆ at 400 MHz.....	106
Figure S96. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4cd in CDCl ₃ at 400 MHz.	107
Figure S97. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4cd in CDCl ₃ at 100 MHz. ...	108
Figure S98. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4cd in CDCl ₃ at 400 MHz.....	109
Figure S99. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 4ae in CDCl ₃ at 400 MHz.	110
Figure S100. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 4ae in CDCl ₃ at 100 MHz...	111
Figure S101. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 4ae in CDCl ₃ at 400 MHz.	112
Figure S102. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 6ae in CDCl ₃ at 400 MHz. ...	113
Figure S103. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 6ae in CDCl ₃ at 100 MHz...	114
Figure S104. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 6ae in CDCl ₃ at 400 MHz.	115
Figure S105. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 5ae in CDCl ₃ at 400 MHz....	116
Figure S106. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 5ae in CDCl ₃ at 100 MHz...	117
Figure S107. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 5ae in CDCl ₃ at 400 MHz.	118
Figure S108. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 7ae in CDCl ₃ at 400 MHz....	119
Figure S109. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 7ae in CDCl ₃ at 90 MHz.....	120
Figure S110. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 7ae in CDCl ₃ at 400 MHz.	121
Figure S111. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4be in CDCl ₃ at 400 MHz.	122
Figure S112. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4be in CDCl ₃ at 100 MHz.....	123

Figure S113. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4be in CDCl ₃ at 400 MHz.	124
Figure S114. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6be in CDCl ₃ at 400 MHz.	125
Figure S115. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6be in CDCl ₃ at 100 MHz.	126
Figure S116. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6be in CDCl ₃ at 400 MHz.	127
Figure S117. ¹ H-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5be in CDCl ₃ at 400 MHz.	128
Figure S118. ¹³ C-NMR spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5be in CDCl ₃ at 100 MHz.	129
Figure S119. NOESY spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5be in CDCl ₃ at 400 MHz.	130
Figure S120. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 4ce in CDCl ₃ at 400 MHz.	131
Figure S121. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 4ce in CDCl ₃ at 100 MHz.	132
Figure S122. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 4ce in CDCl ₃ at 400 MHz.	133
Figure S123. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 6ce in CDCl ₃ at 400 MHz.	134
Figure S124. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 6ce in CDCl ₃ at 100 MHz.	135
Figure S125. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 6ce in CDCl ₃ at 400 MHz.	136
Figure S126. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 4af in CDCl ₃ at 400 MHz.	137
Figure S127. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 4af in CDCl ₃ at 100 MHz.	138
Figure S128. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 4af in CDCl ₃ at 400 MHz.	139
Figure S129. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 6af in CDCl ₃ at 400 MHz.	140
Figure S130. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 6af in CDCl ₃ at 100 MHz.	141
Figure S131. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 6af in CDCl ₃ at 400 MHz.	142
Figure S132. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 5af in CDCl ₃ at 400 MHz.	143
Figure S133. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 5af in CDCl ₃ at 100 MHz.	144
Figure S134. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 5af in CDCl ₃ at 400 MHz.	145
Figure S135. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 7af in CDCl ₃ at 400 MHz.	146
Figure S136. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 7af in CDCl ₃ at 90 MHz.	147
Figure S137. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 7af in CDCl ₃ at 400 MHz.	148
Figure S138. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4bf in CDCl ₃ at 400 MHz.	149
Figure S139. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4bf in CDCl ₃ at 100 MHz.	150
Figure S140. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 4bf in CDCl ₃ at 400 MHz.	151
Figure S141. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6bf in CDCl ₃ at 400 MHz.	152
Figure S142. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6bf in CDCl ₃ at 100 MHz.	153
Figure S143. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>S</i> *)- 6bf in CDCl ₃ at 400 MHz.	154
Figure S144. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>R</i> *)- 5bf in CDCl ₃ at 400 MHz.	155
Figure S145. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>R</i> *)- 5bf in CDCl ₃ at 100 MHz.	156
Figure S146. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,7 <i>R</i> *,12b <i>R</i> *,19b <i>R</i> *)- 5bf in CDCl ₃ at 400 MHz.	157
Figure S147. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 4cf in CDCl ₃ at 400 MHz.	158

Figure S148. ¹³ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 4cf in CDCl ₃ at 100 MHz...	159
Figure S149. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10aa in CDCl ₃ at 400 MHz. .	160
Figure S150. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10aa in CDCl ₃ at 100 MHz. .	161
Figure S151. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10aa in CDCl ₃ at 400 MHz....	162
Figure S152. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ab in CDCl ₃ at 400 MHz. .	163
Figure S153. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ab in CDCl ₃ at 100 MHz. .	164
Figure S154. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ab in CDCl ₃ at 400 MHz....	165
Figure S155. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ac in CDCl ₃ at 400 MHz... .	166
Figure S156. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ac in CDCl ₃ at 100 MHz..	167
Figure S157. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ac in CDCl ₃ at 400 MHz....	168
Figure S158. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10bc in CDCl ₃ at 400 MHz. .	169
Figure S159. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10bc in CDCl ₃ at 100 MHz. .	170
Figure S160. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10bc in CDCl ₃ at 400 MHz....	171
Figure S161. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10bd in DMSO- <i>d</i> ₆ at 400 MHz.	172
Figure S162. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10bd in DMSO- <i>d</i> ₆ at 100 MHz.	173
Figure S169. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10bd in DMSO- <i>d</i> ₆ at 400 MHz.	174
Figure S164. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ae in CDCl ₃ at 400 MHz... .	175
Figure S165. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ae in CDCl ₃ at 100 MHz..	176
Figure S166. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10ae in CDCl ₃ at 400 MHz....	177
Figure S167. ¹ H-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10be in CDCl ₃ at 400 MHz. .	178
Figure S168. ¹³ C-NMR spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10be in CDCl ₃ at 100 MHz. .	179
Figure S169. NOESY spectrum of <i>rac</i> -(6a <i>S</i> *,10a <i>S</i> *,15b <i>S</i> *)- 10be in CDCl ₃ at 400 MHz....	180
Figure S170. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ba in MeCN.	181
Figure S171. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5ba in MeCN.	181
Figure S172. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4bb in MeCN.	182
Figure S173. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6bb in MeCN.	182
Figure S174. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5bb in MeCN.	183
Figure S175. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4bc in MeCN.	183
Figure S176. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6bc in MeCN.	184
Figure S177. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5bc in MeCN.	184
Figure S178. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4be in MeCN.	185
Figure S179. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6be in MeCN.	185
Figure S180. ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5be in MeCN.	186
Figure S181. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4aa (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4aa (black) in hexane/dichloromethane/methanol 50:45:5.	187
Figure S182. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4aa (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ba (blue) in MeCN.	187
Figure S183. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 5aa in hexane/dichloromethane/methanol 30:63:7.	188

Figure S184. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>S</i> *)- 6aa in hexane/dichloromethane/methanol 30:63:7.	188
Figure S185. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,17b <i>R</i> *)- 7aa in hexane/dichloromethane/methanol 30:63:7.....	189
Figure S186. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ab (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4ab (black) in hexane/dichloromethane/methanol 50:45:5.	189
Figure S187. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ab (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4bb (blue) in MeCN.	190
Figure S188. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 6ab (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 6ab (black) in hexane/dichloromethane/methanol 50:45:5.	190
Figure S189. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 6ab (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6bb (blue) in MeCN.	191
Figure S190. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ac (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4ac (black) in hexane/dichloromethane/methanol 50:45:5.....	191
Figure S191. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ac (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4bc (blue) in MeCN.	192
Figure S192. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 6ac (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 6ac (black) in hexane/dichloromethane/methanol 50:45:5.....	192
Figure S193. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 6ac (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6bc (blue) in MeCN.	193
Figure S194. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>R</i>)- 5ac (black) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>S</i>)- 5ac (red) in hexane/dichloromethane/methanol 30:63:7.....	193
Figure S195. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>R</i>)- 5ac (red) in hexane/dichloromethane/methanol 30:63:7 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5bc (blue) in MeCN.	194
Figure S196. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4dc (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4dc (black) in hexane/dichloromethane/methanol 70:27:3.	194
Figure S197. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ec (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4ec (black) in hexane/dichloromethane/methanol 80:18:2.	195
Figure S198. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ac (red), (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4ec (blue) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4dc (green) (multiplied by 0.2).	195
Figure S199. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ae (black) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 4ae (red) in hexane/dichloromethane/methanol 50:45:5.	196
Figure S200. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 4ae (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 4be (blue) in MeCN.	196
Figure S201. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 6ae (red) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>R</i>)- 6ae (black) in hexane/dichloromethane/methanol 30:63:7.....	197

Figure S202. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>S</i>)- 6ae (red) in hexane/dichloromethane/methanol 30:63:7 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>S</i>)- 6be (blue) in MeCN.	197
Figure S203. On-line HPLC-ECD spectra of (6a <i>S</i> ,12b <i>R</i> ,17b <i>R</i>)- 5ae (black) and (6a <i>R</i> ,12b <i>S</i> ,17b <i>S</i>)- 5ae (red) in hexane/dichloromethane/methanol 30:63:7.....	198
Figure S204. On-line HPLC-ECD spectrum of (6a <i>S</i> ,12b <i>R</i> ,17b <i>R</i>)- 5ae (red) in hexane/dichloromethane/methanol 30:63:7 and ECD spectrum of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,17b <i>R</i>)- 5be (blue) in MeCN.	198
Figure S205. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,17b <i>R</i> [*])- 7ae in hexane/dichloromethane/methanol 30:63:7.....	199
Figure S206. Effect of 4aa-10ad (50 μM) on the viable cell number of A2780 ovarian carcinoma cell line.	200
Figure S207. Effect of 4aa-10ad (50 μM) on the viable cell number of WM35 melanoma cell line.	200
Figure S208. Concentration-dependent effect of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,17b <i>R</i> [*])- 4ce on the viability of A2780 cells.	201
Figure S209. Concentration-dependent effect of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,19b <i>S</i> [*])- 4aa on the viability of CaCo-2 cells.....	201
Figure S210. Concentration-dependent effect of <i>rac</i> -(6a <i>S</i> [*] ,7 <i>R</i> [*] ,12b <i>R</i> [*] ,19b <i>S</i> [*])- 4ba on the viability of CaCo-2 cells.	202
Figure S211. Concentration-dependent effect of (6a <i>S</i> ,7 <i>R</i> ,12b <i>R</i> ,19b <i>S</i>)- 4ba on the viability of CaCo-2 cells.	202
Figure S212. Concentration-dependent effect of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,19b <i>S</i> [*])- 4ac on the viability of CaCo-2 cells.....	203
Figure S213. Concentration-dependent effect of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,19b <i>S</i> [*])- 4ec on the viability of CaCo-2 cells.....	203
Figure S214. Concentration-dependent effect of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,19b <i>R</i> [*])- 4cd on the viability of A2780 cells.	204
Figure S215. Concentration-dependent effect of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,17b <i>S</i> [*])- 6ae on the viability of CaCo-2 cells.....	204
Figure S216. ORTEP view of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,19b <i>R</i> [*])- 4cc with numbering scheme. Red curly arrows represent characteristic NOE correlations for the assignment of relative configuration.	215
Figure S217. ORTEP view of <i>rac</i> -(6a <i>S</i> [*] ,12b <i>R</i> [*] ,19b <i>R</i> [*])- 6cc with numbering scheme. Red curly arrows represent characteristic NOE correlations for the assignment of relative configuration.	221
Figure S218. Overlay of the two molecules in the structure of 6cc showing the conformational differences. Hydrogen atoms are omitted for clarity.....	221

List of Tables

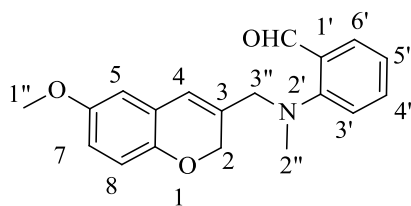
Table S1. Experimental details of single crystal X-ray diffraction study on <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4cc	206
Table S2. Geometric parameters (Å, °) for <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4cc	207
Table S3. Hydrogen-bond geometry (Å, °) for <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 4cc	214
Table S4. Experimental details of single crystal X-ray diffraction study on <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6cc	215
Table S5. Geometric parameters (Å, °) for <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6cc	216
Table S6. Hydrogen-bond geometry (Å, °) for <i>rac</i> -(6a <i>S</i> *,12b <i>R</i> *,19b <i>R</i> *)- 6cc	220

1. Preparation of the starting materials of the domino reaction

Chromenes **1a-d** and pyrans **8ab** were prepared according to published methods.^{1,2}

2-[[[(6-methoxy-2H-chromen-3-yl)methyl](methyl)amino]benzaldehyde (1e):

To a flame-dried, three-necked round-bottom flask, equipped with a reflux condenser and a CaCl₂ drying tube, 1-(6-methoxy-2H-chromen-3-yl)-N-methylmethanamine (300 mg, 1.46 mmol) and 2-fluoro-benzaldehyde (200 ml, 1.3 eq., 1.90 mmol) were added in 5 ml dry DMF. To the stirred solution, oven-dried K₂CO₃ (500 mg, 2.5 eq., 3.65 mmol) was added, and the reaction mixture was refluxed for three days. The mixture was cooled down, poured onto water and extracted with ethyl acetate. The combined organic phase was dried over MgSO₄, filtered, washed with ethyl acetate, and concentrated *in vacuo*. The resulting gum was purified by column chromatography (hexane/ethyl acetate 3:1), affording **1e** as yellow oil (57 mg, 12 %).



¹H NMR (360 MHz, CDCl₃): 2,95 (s, 3 H, 2''-H), 3,82 (s, 3 H, 1''-H), 3,89 (s, 2 H, 3''-H), 4,70 (s, 2 H, 2-H), 6,47 (s, 1 H, 4-H), 6,64 (d *J* = 2,9 Hz, 1 H, 5-H), 6,82-6,73 (m, 2 H, 7-H and 8-H), 7,22-7,14 (m, 2 H, 3'-H and 5'-H), 7,58 (dt *J* = 9.0 and 1,8 Hz, 1 H, 4'-H), 7,88 (dd *J* = 7,6 and 1,4 Hz, 1 H, 6'-H), 10,36 (s, 1 H, CHO). ¹³C NMR (90 MHz, CDCl₃): 43,0 (C-2''), 55,8 (C-1''), 60,3 (C-3''), 67,0 (C-2), 111,8 (C-5), 114,2 (C-8), 116,1 (C-3'), 119,4 (C-7), 122,2 (C-4 and C-5'), 122,9 (C-4a), 130,6 (C-6'), 134,8 (C-4'), 135,4 (C-3), 147,4 (C-8a), 154,3 (C-6), 155,3 (C-2'), 190,9 (CHO).

2. NMR spectra of condensed heterocycles 4-7

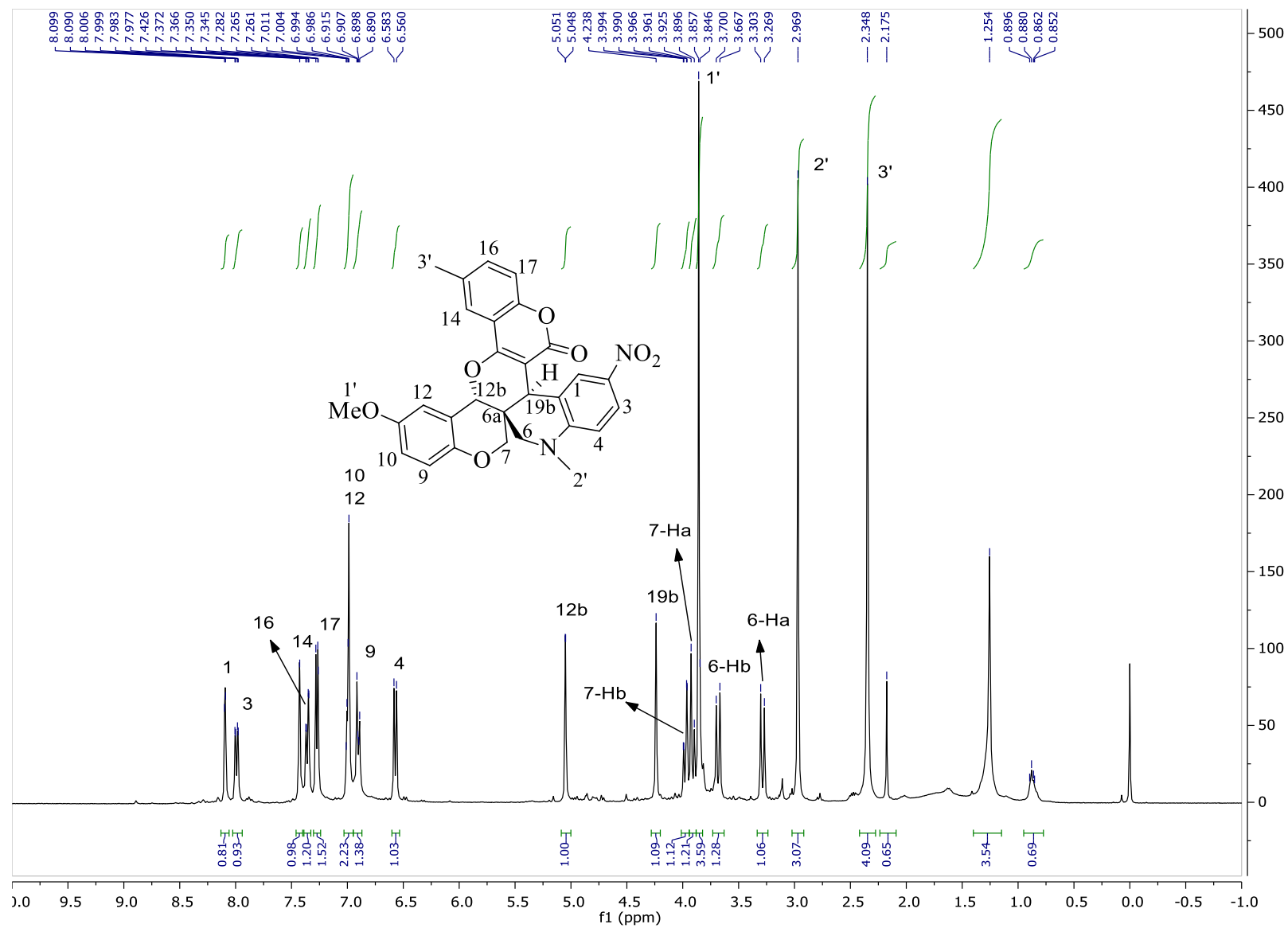


Figure S1. ¹H-NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**4aa** in CDCl₃ at 400 MHz.

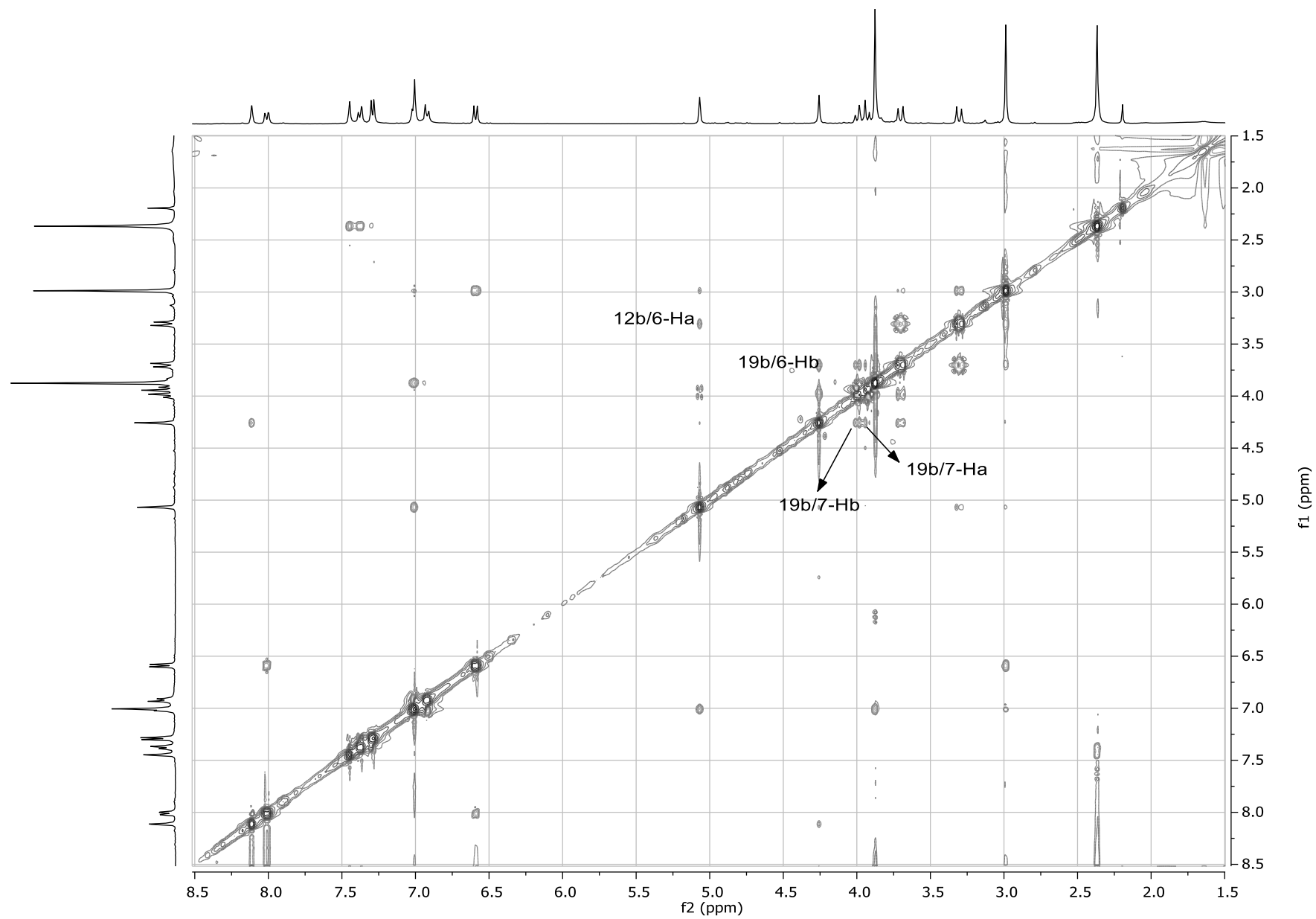


Figure S3. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**4aa** in CDCl₃ at 400 MHz.

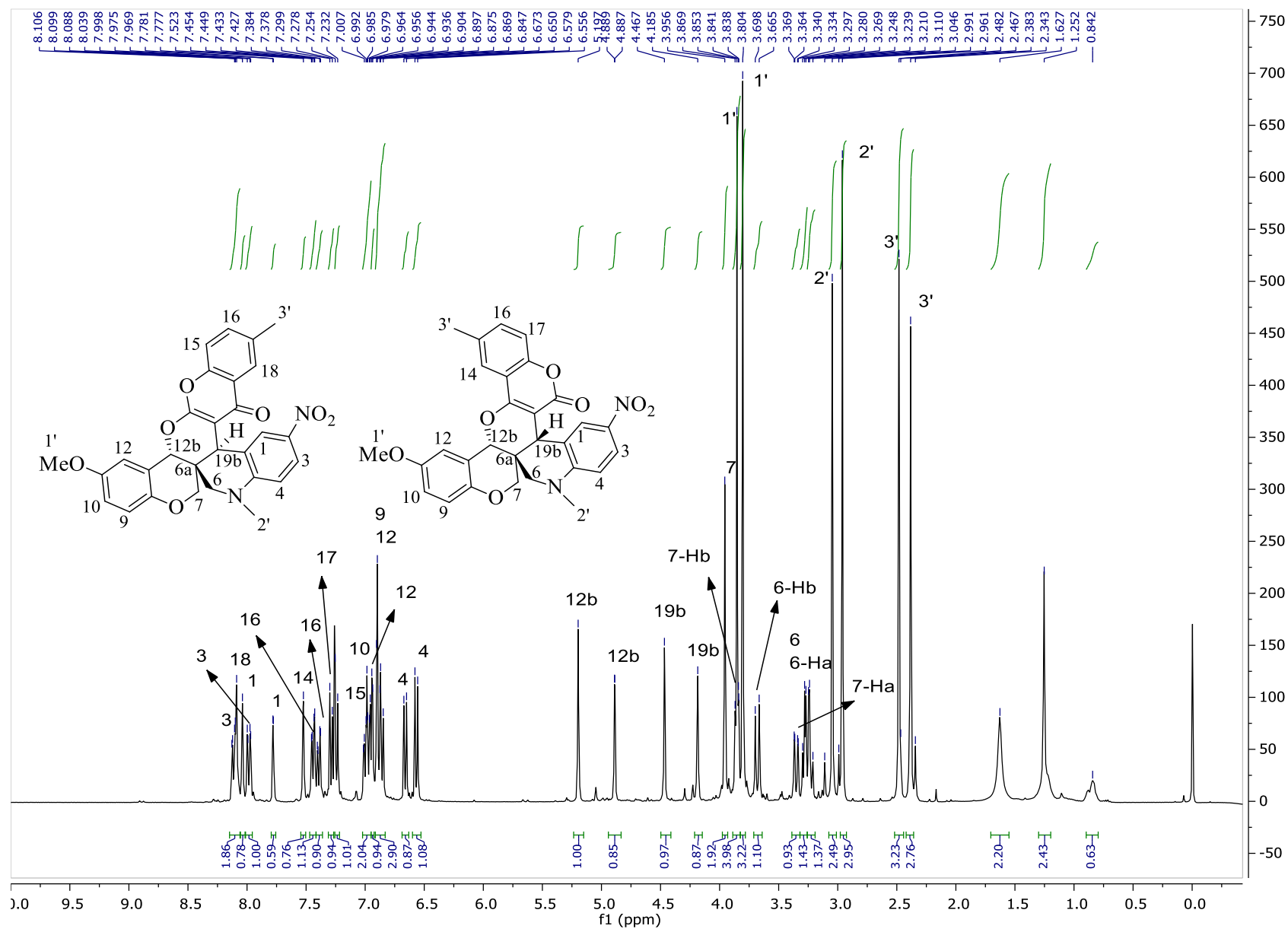


Figure S4. ¹H-NMR spectrum of *rac*-(6aS*,12bR*,19bS*)-6aa and *rac*-(6aS*,12bR*,19bR*)-5aa in CDCl₃ at 400 MHz.

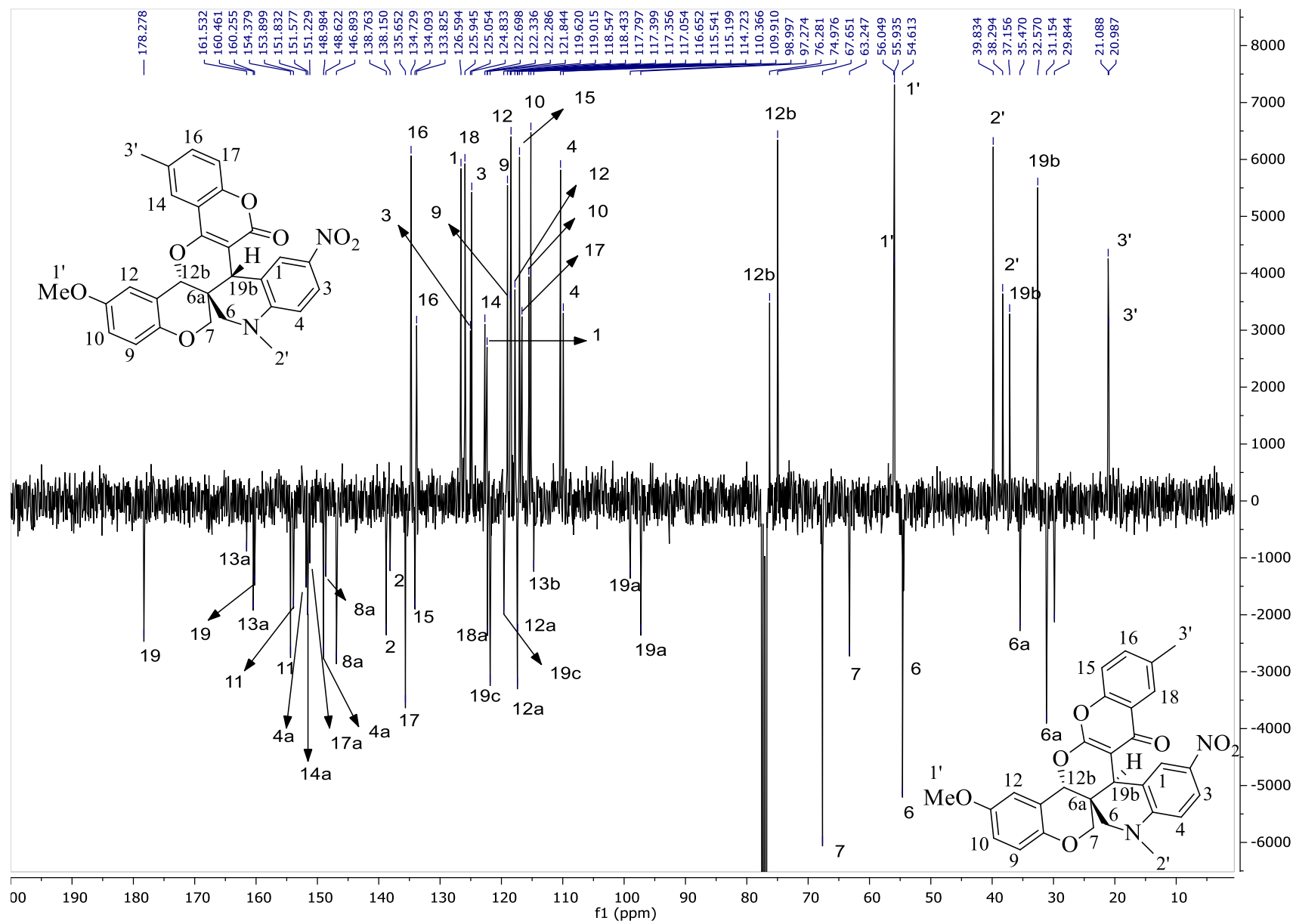


Figure S5. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-6aa and *rac*-(6a*S**,12b*R**,19b*R**)-5aa in CDCl_3 at 100 MHz.

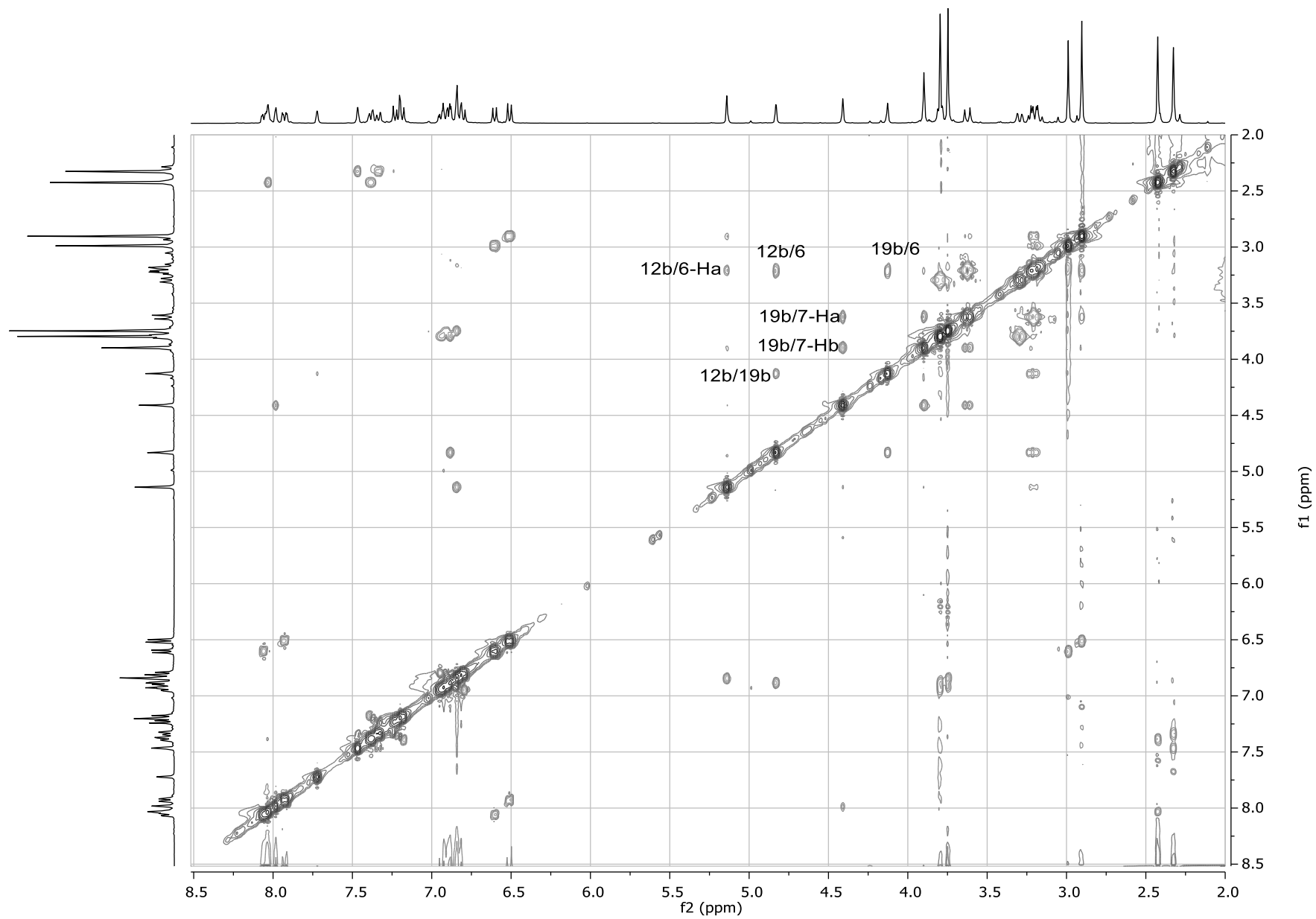


Figure S6. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**6aa** and *rac*-(6a*S*^{*},12b*R*^{*},19b*R*^{*})-**5aa** in CDCl₃ at 400 MHz.

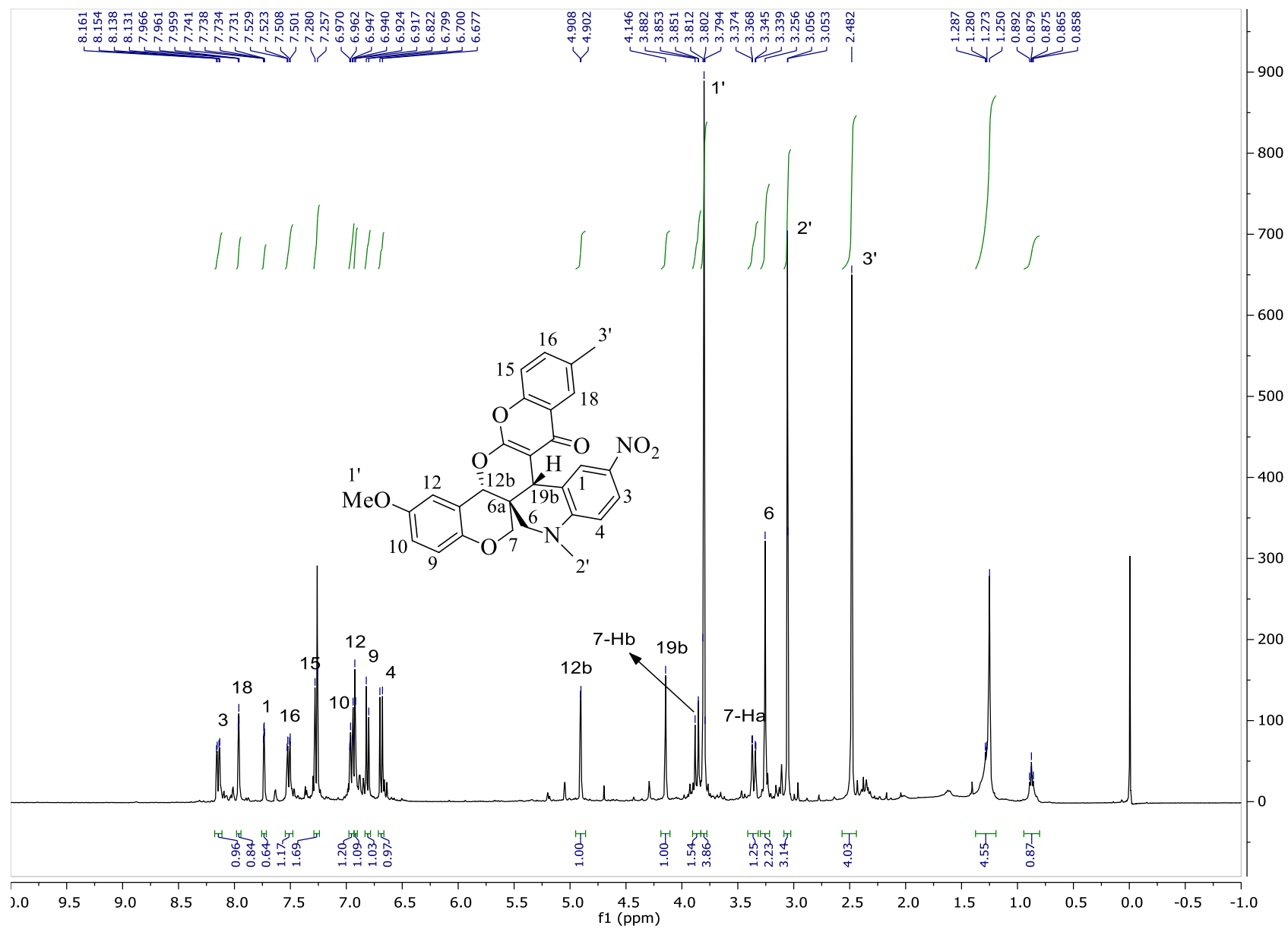


Figure S7. ¹H-NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*R*^{*})-**7aa** in CDCl₃ at 400 MHz.

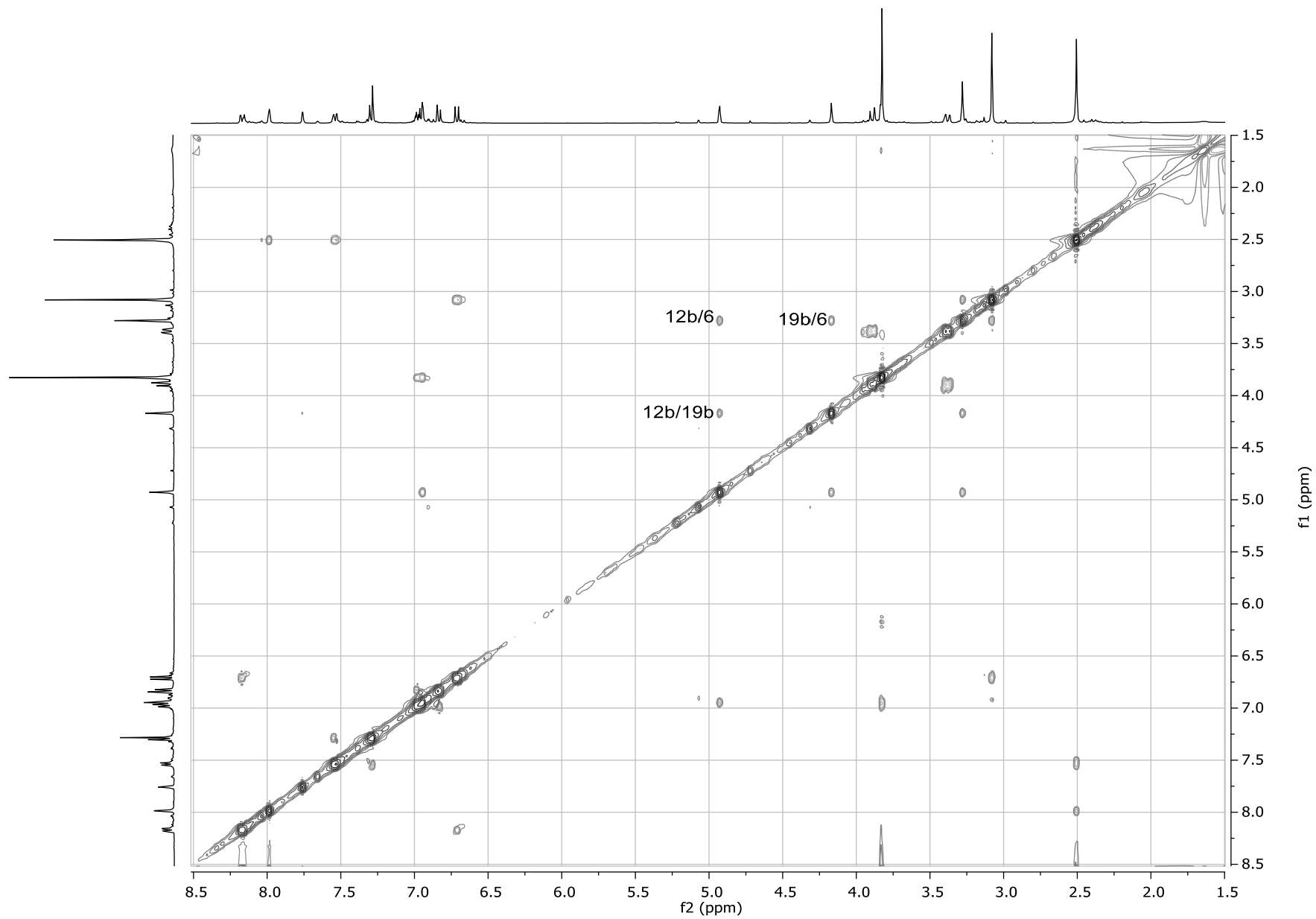


Figure S9. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-**7aa** in CDCl₃ at 400 MHz.

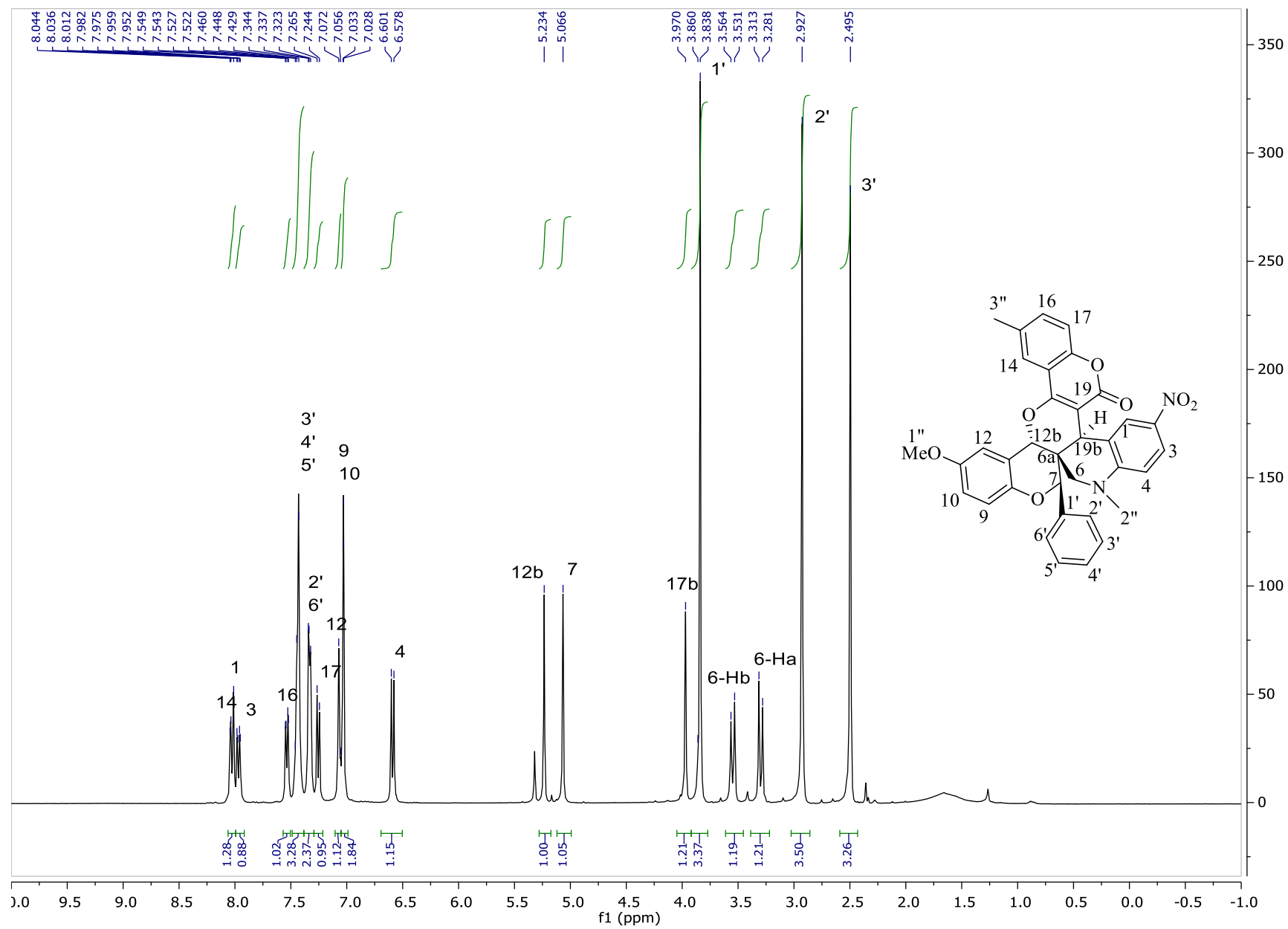


Figure S10. ¹H-NMR spectrum of (6aS,7R,12bR,19bS)-**4ba** in CD₂Cl₂ at 400 MHz.

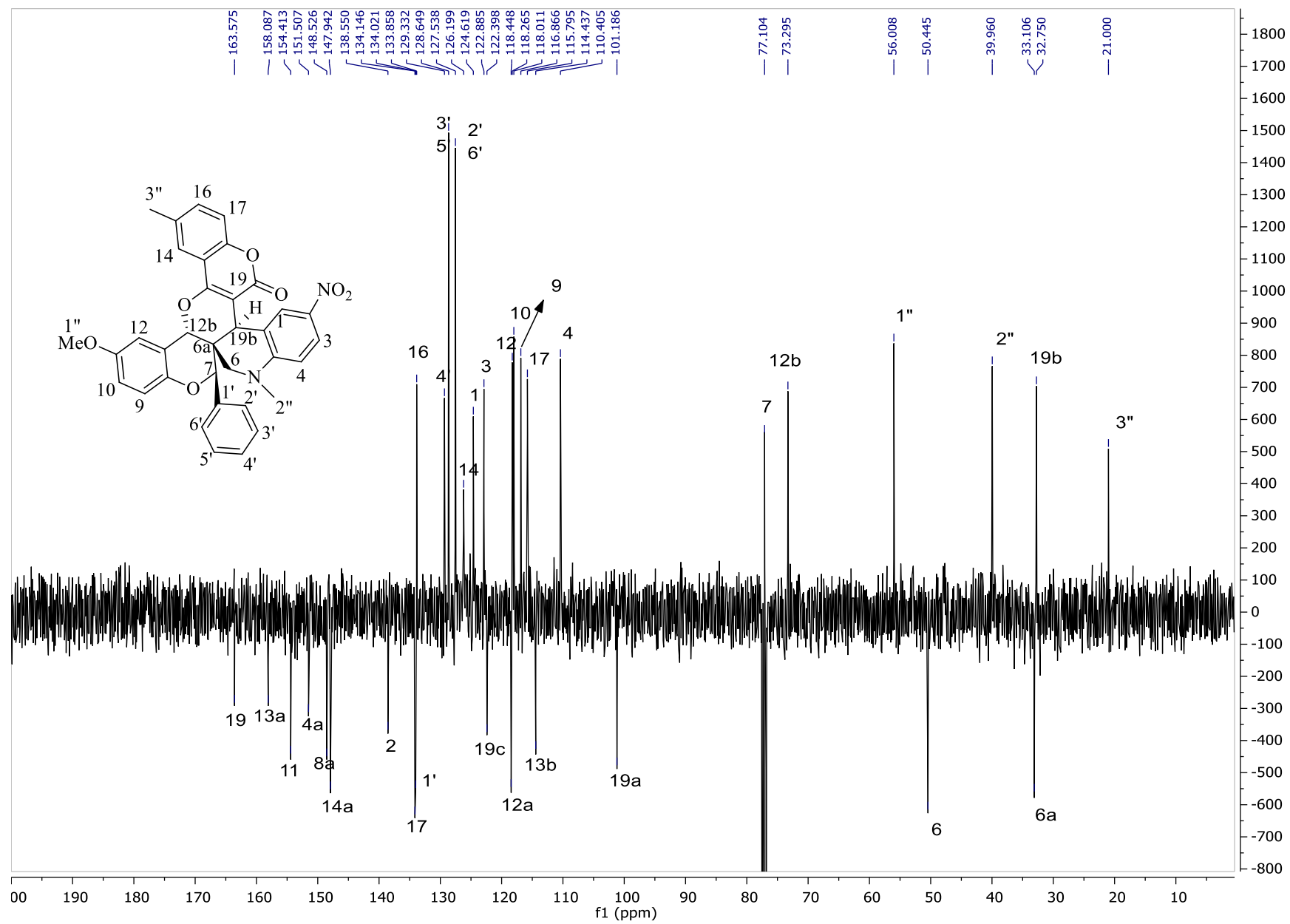


Figure S11. ^{13}C -NMR spectrum of (6a*S*,7*R*,12b*R*,19b*S*)-**4ba** in CDCl_3 at 100 MHz.

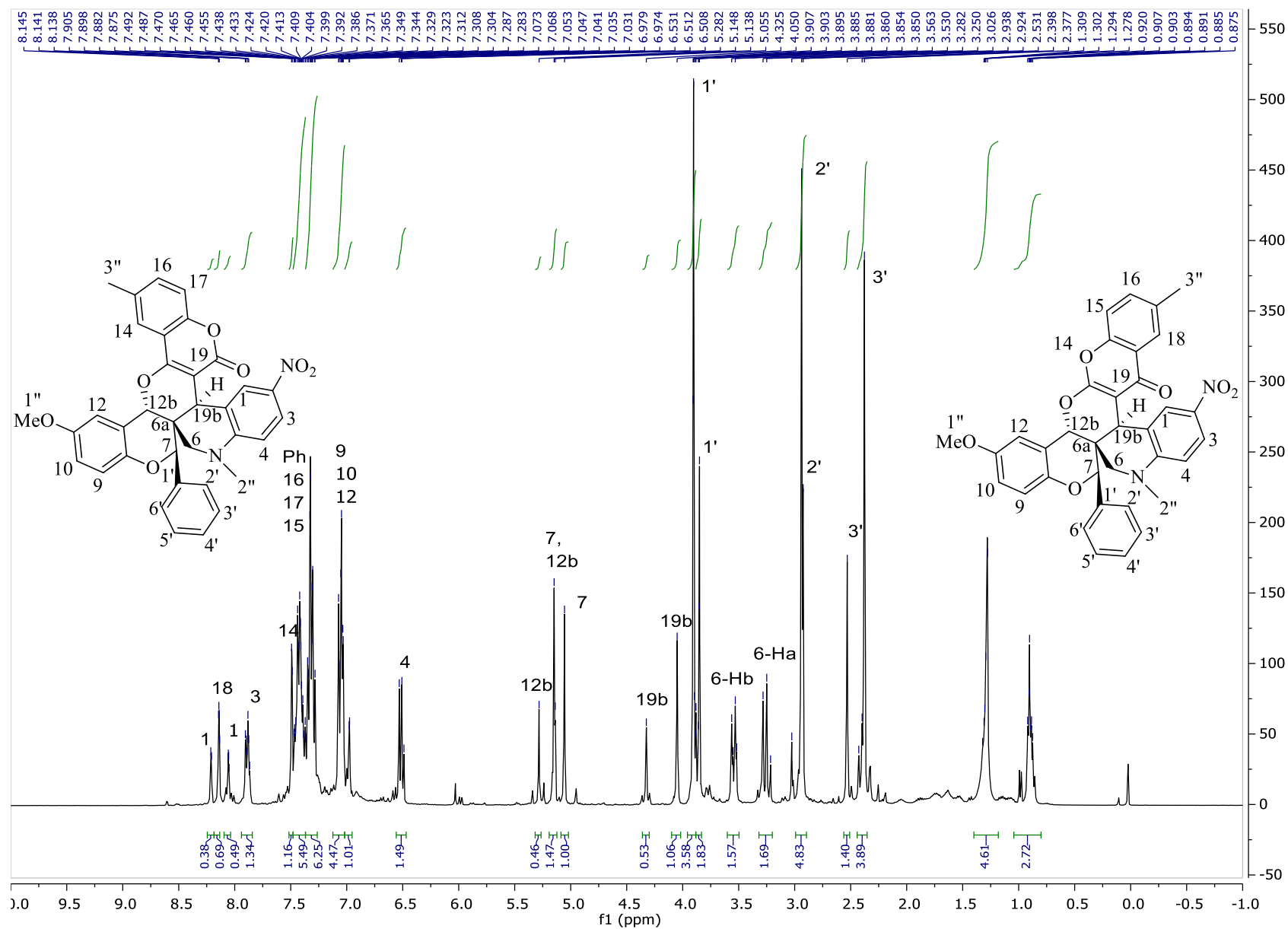


Figure S12. $^1\text{H-NMR}$ spectrum of $(6a_S, 7_R, 12b_R, 19b_S)$ -**4ba** and $(6a_S, 7_R, 12b_R, 19b_S)$ -**6ba** in CDCl_3 at 400 MHz.

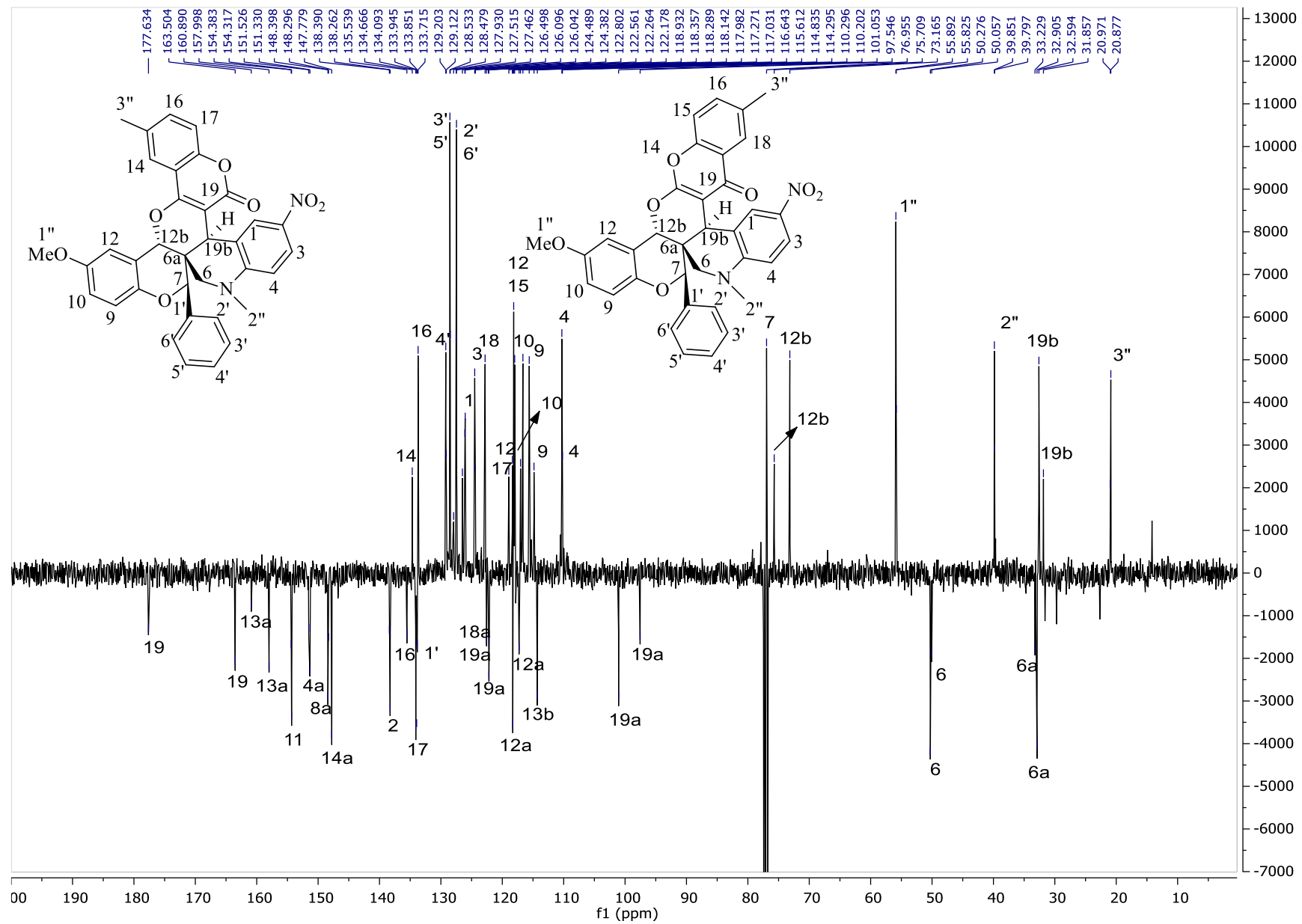


Figure S13. ¹³C-NMR spectrum of (6a*S*,7*R*,12*b**R*,19*b**S*)-**4ba** and (6a*S*,7*R*,12*b**R*,19*b**S*)-**6ba** in CDCl₃ at 100 MHz.

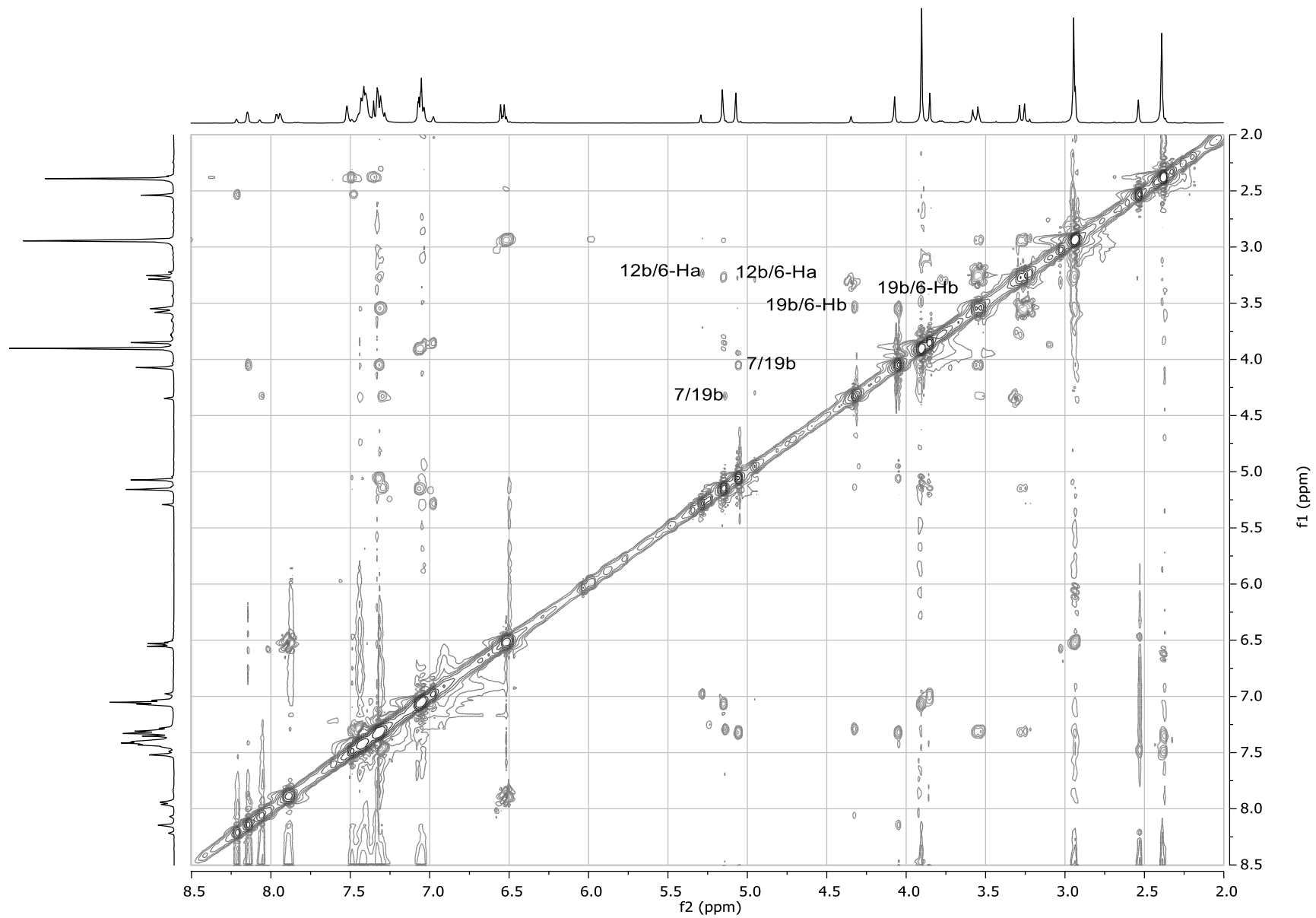


Figure S14. NOESY spectrum of (6a*S*,7*R*,12b*R*,19b*S*)-**4ba** and (6a*S*,7*R*,12b*R*,19b*S*)-**6ba** in CDCl₃ at 400 MHz.

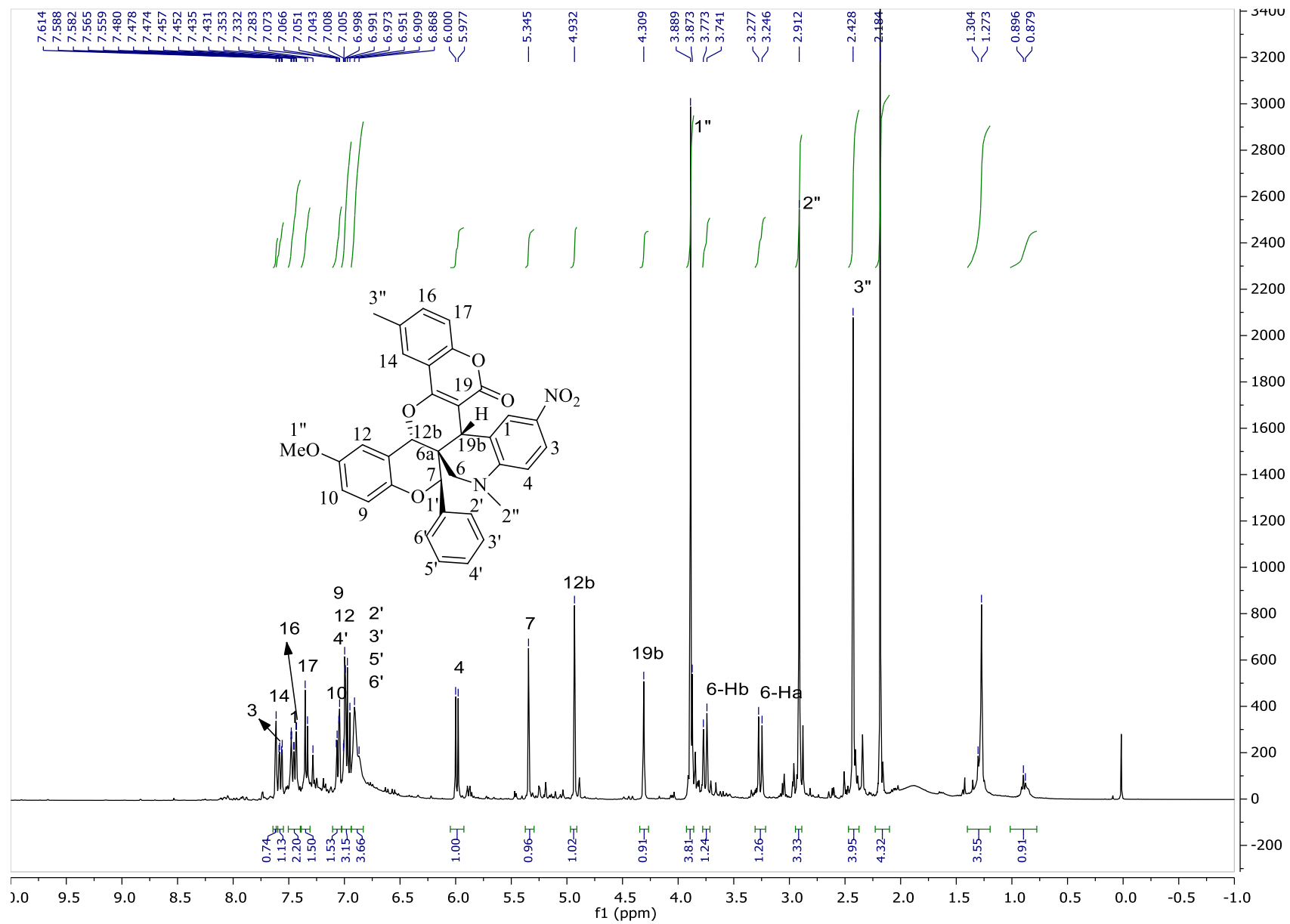


Figure S15. ¹H-NMR spectrum of (6aS,7R,12bR,19bR)-**5ba** in CDCl₃ at 400 MHz.

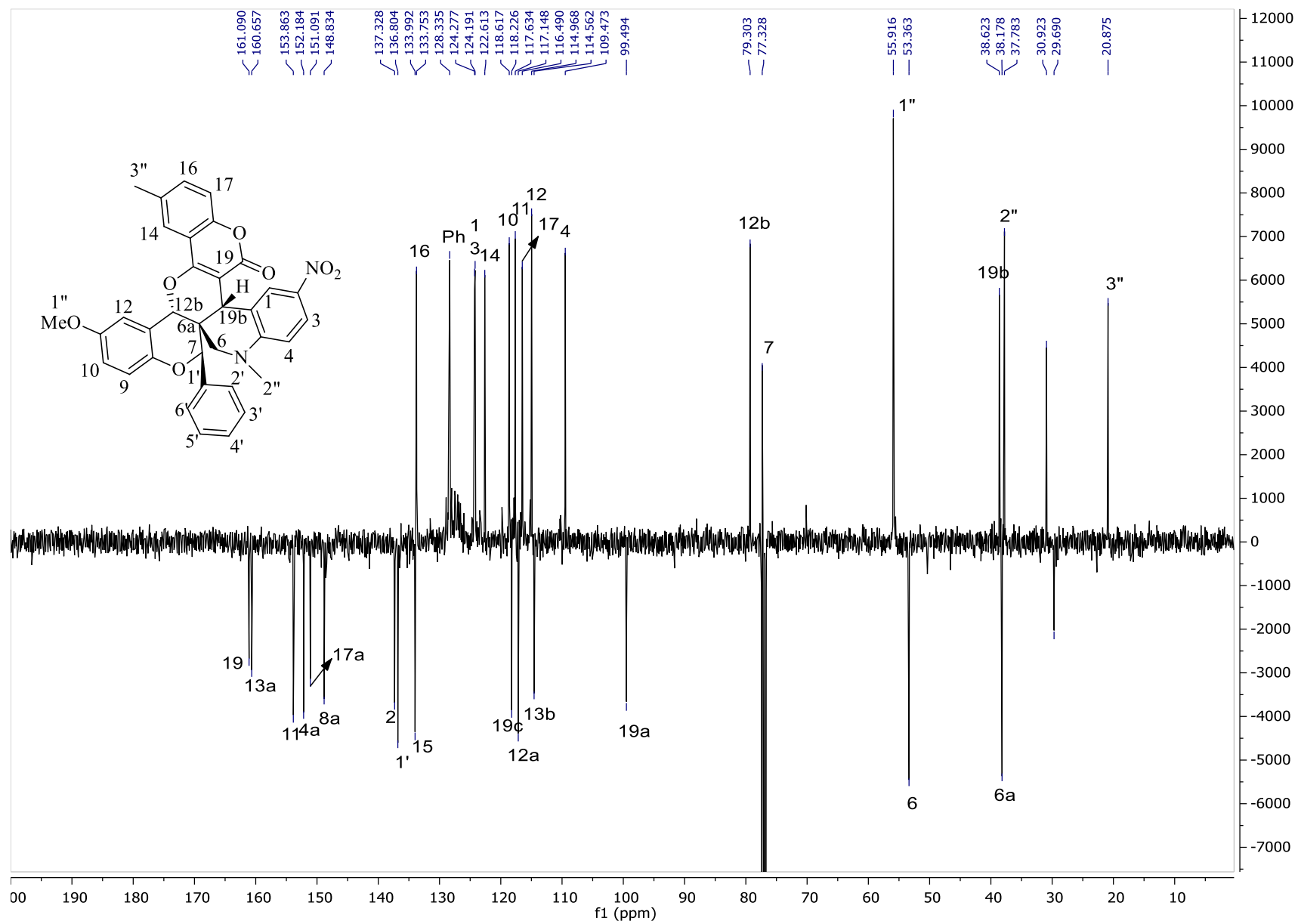


Figure S16. ¹³C-NMR spectrum of (6aS,7R,12bR,19bR)-**5ba** in CDCl₃ at 100 MHz.

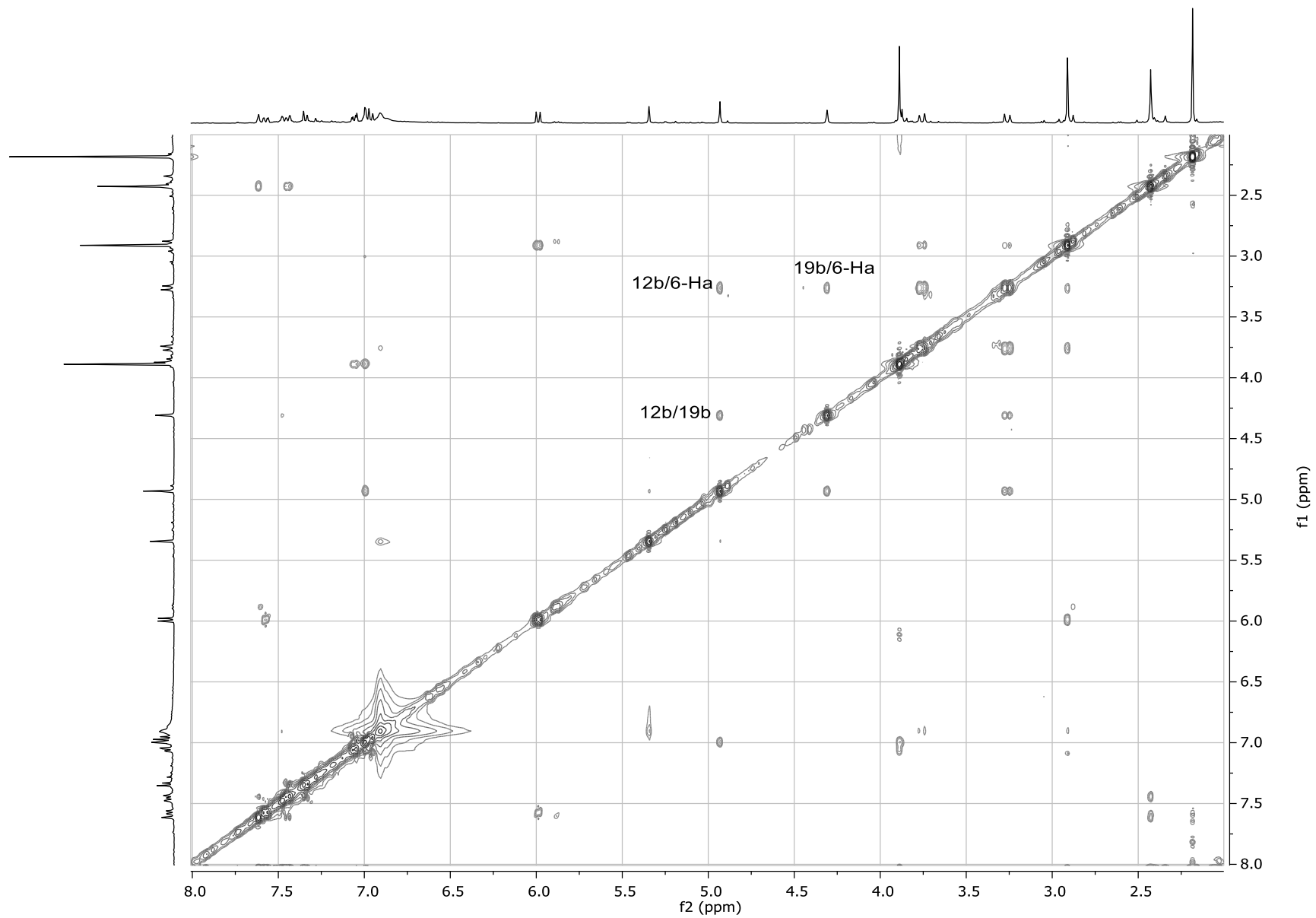


Figure S17. NOESY spectrum of (6*aS*,7*R*,12*bR*,19*bR*)-**5ba** in CDCl₃ at 400 MHz.

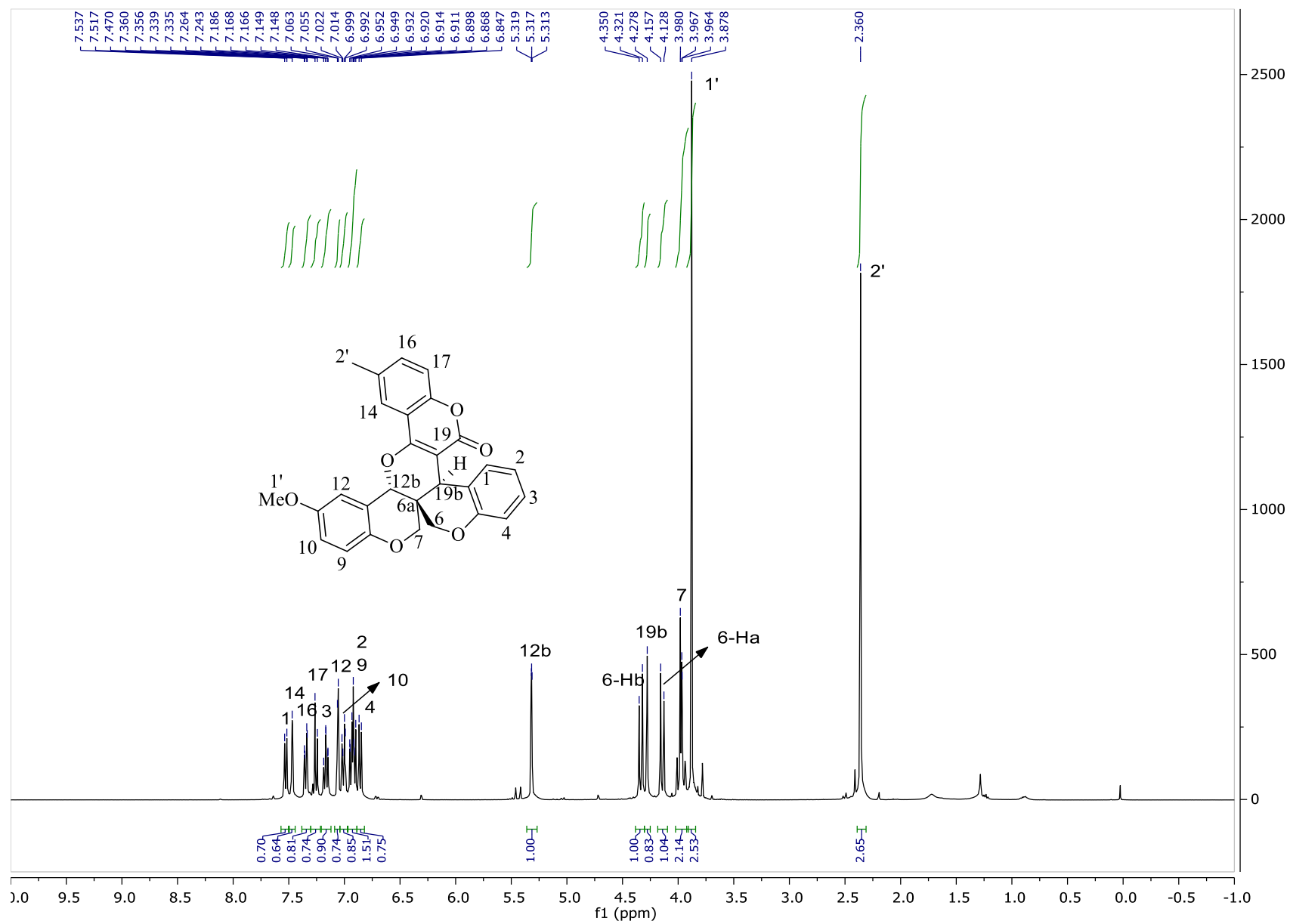


Figure S18. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4ca in CDCl₃ at 400 MHz.

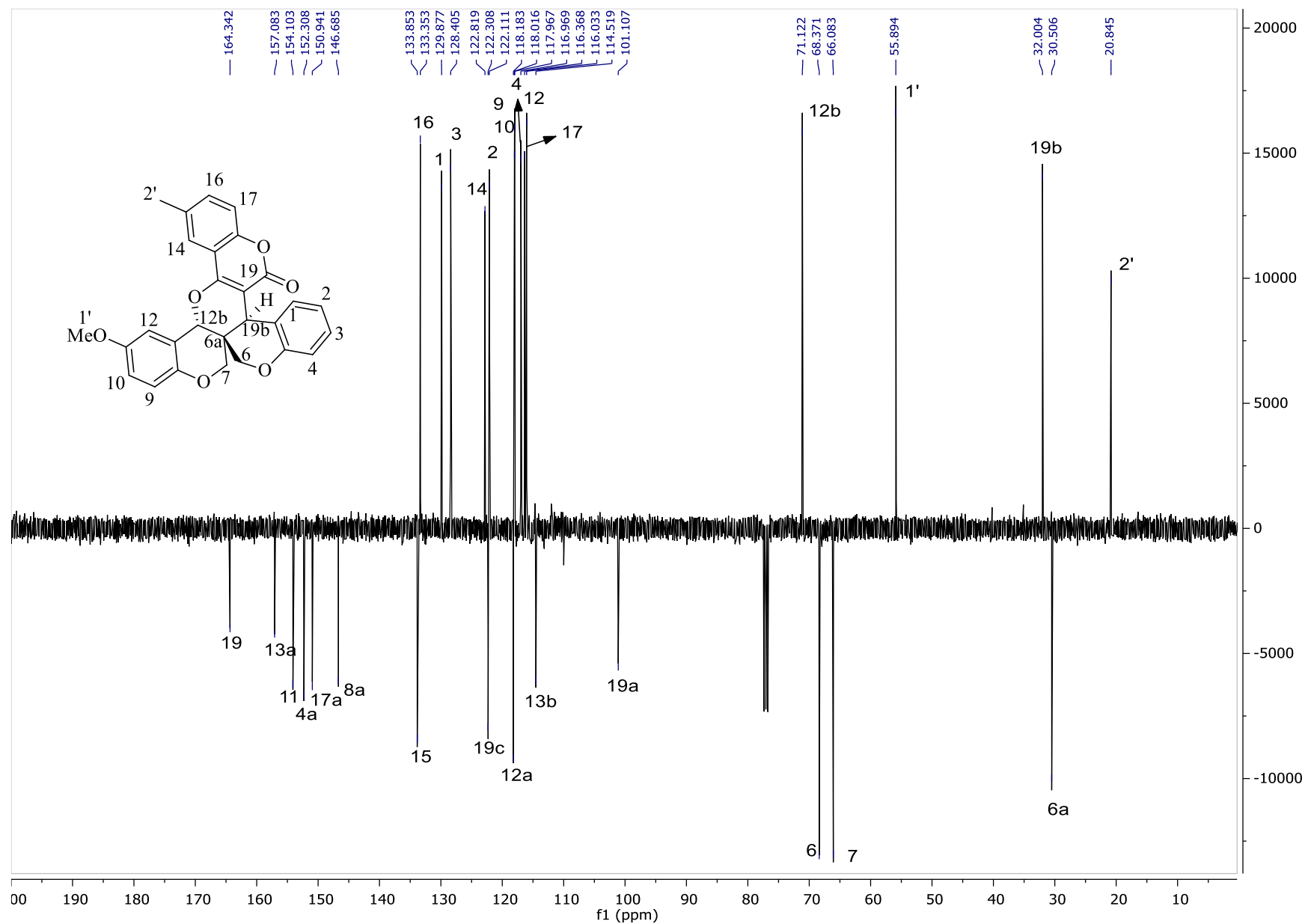


Figure S19. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4ca in CDCl₃ at 100 MHz.

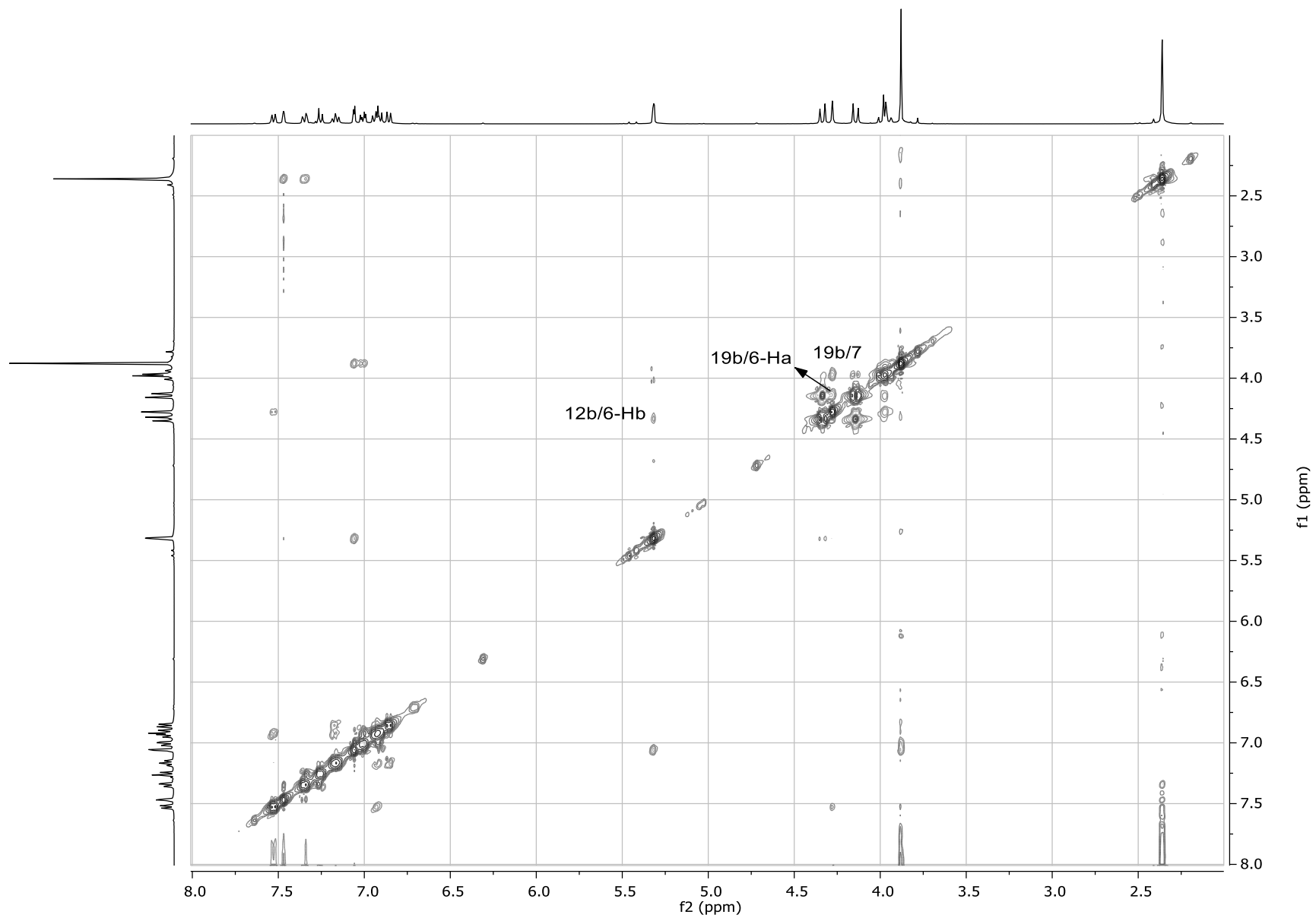


Figure S20. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*R*^{*})-**4ca** in CDCl₃ at 400 MHz.

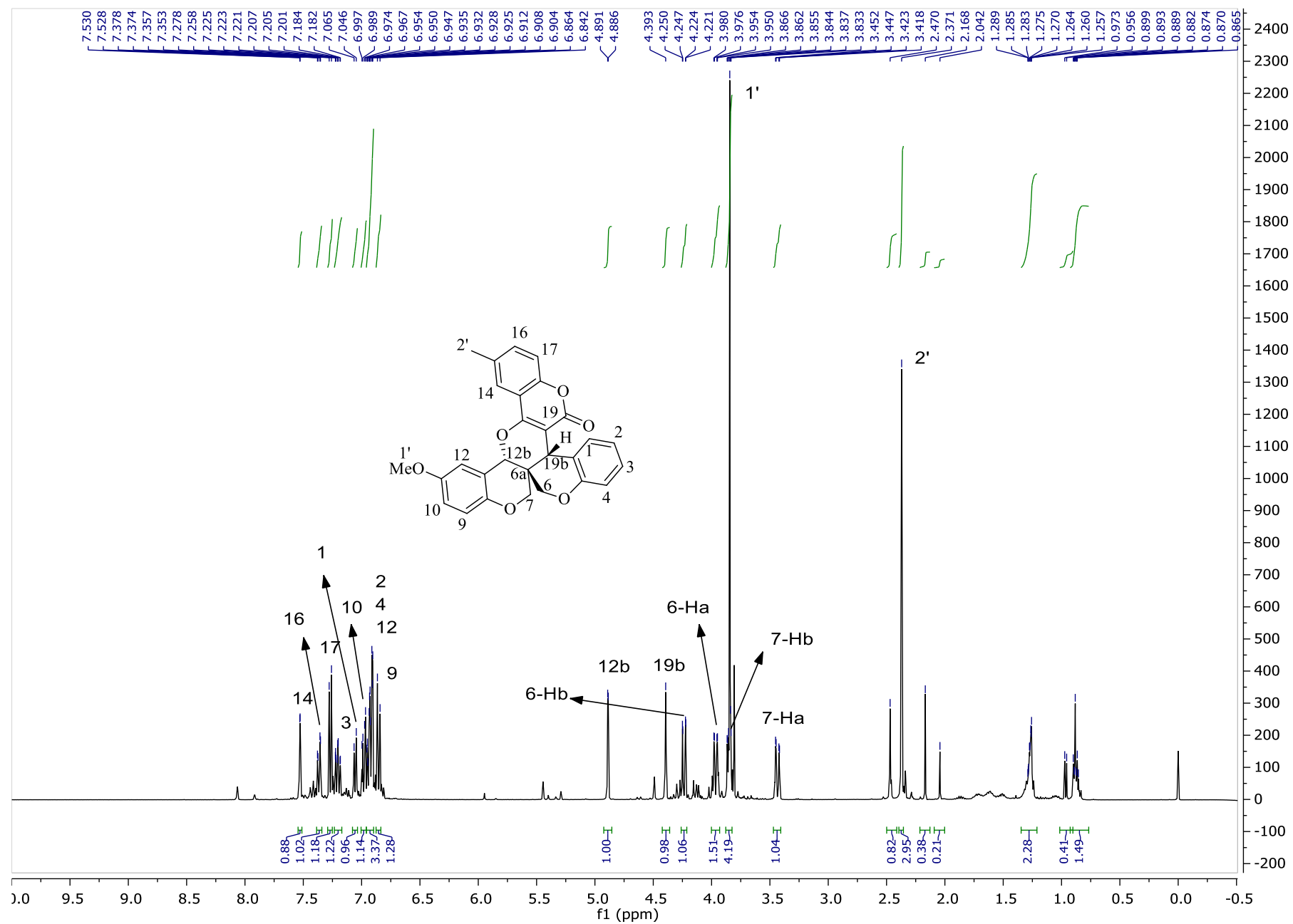


Figure S21. ¹H-NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**5ca** in CDCl₃ at 400 MHz.

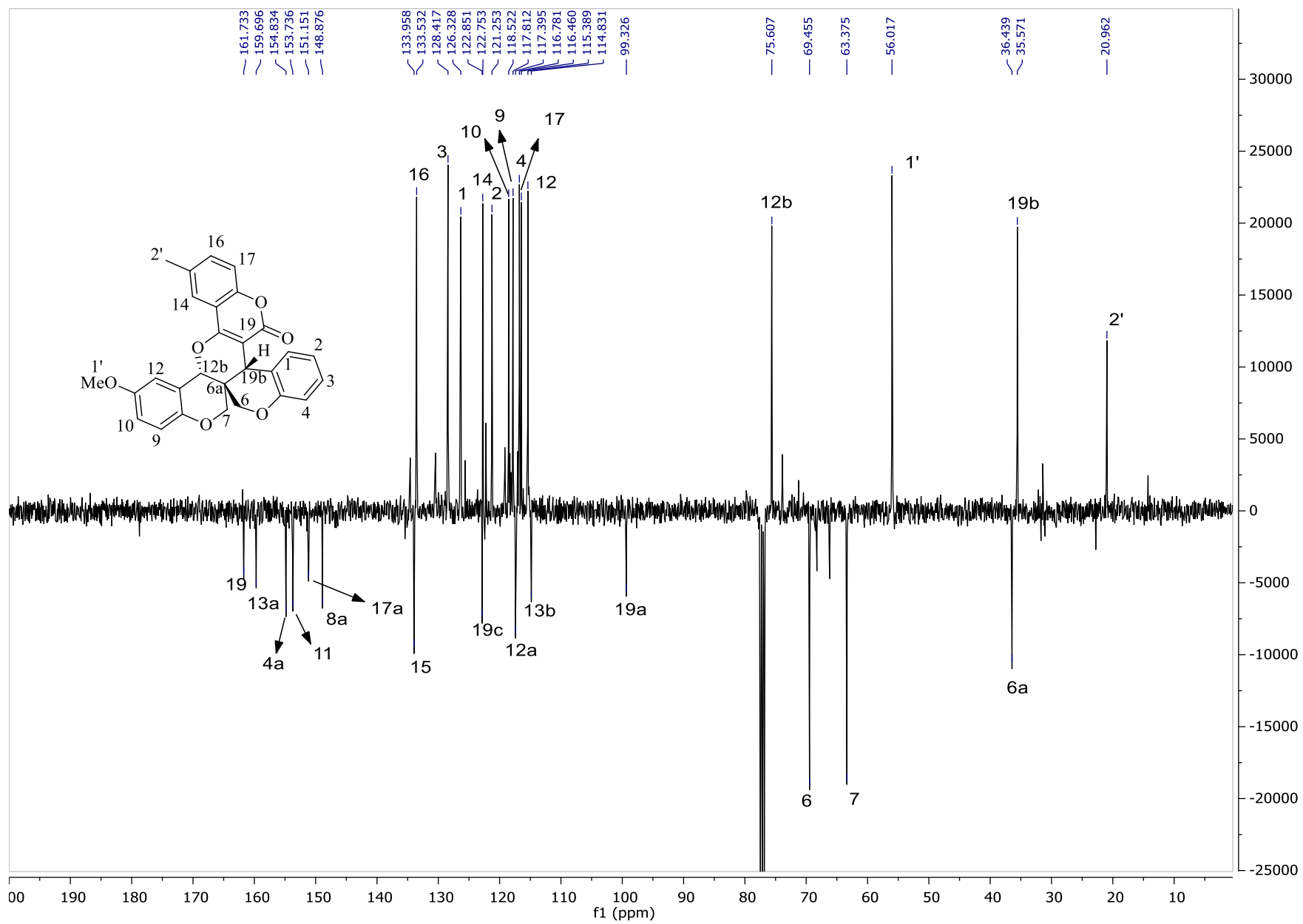


Figure S22. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-5ca in CDCl₃ at 100 MHz.

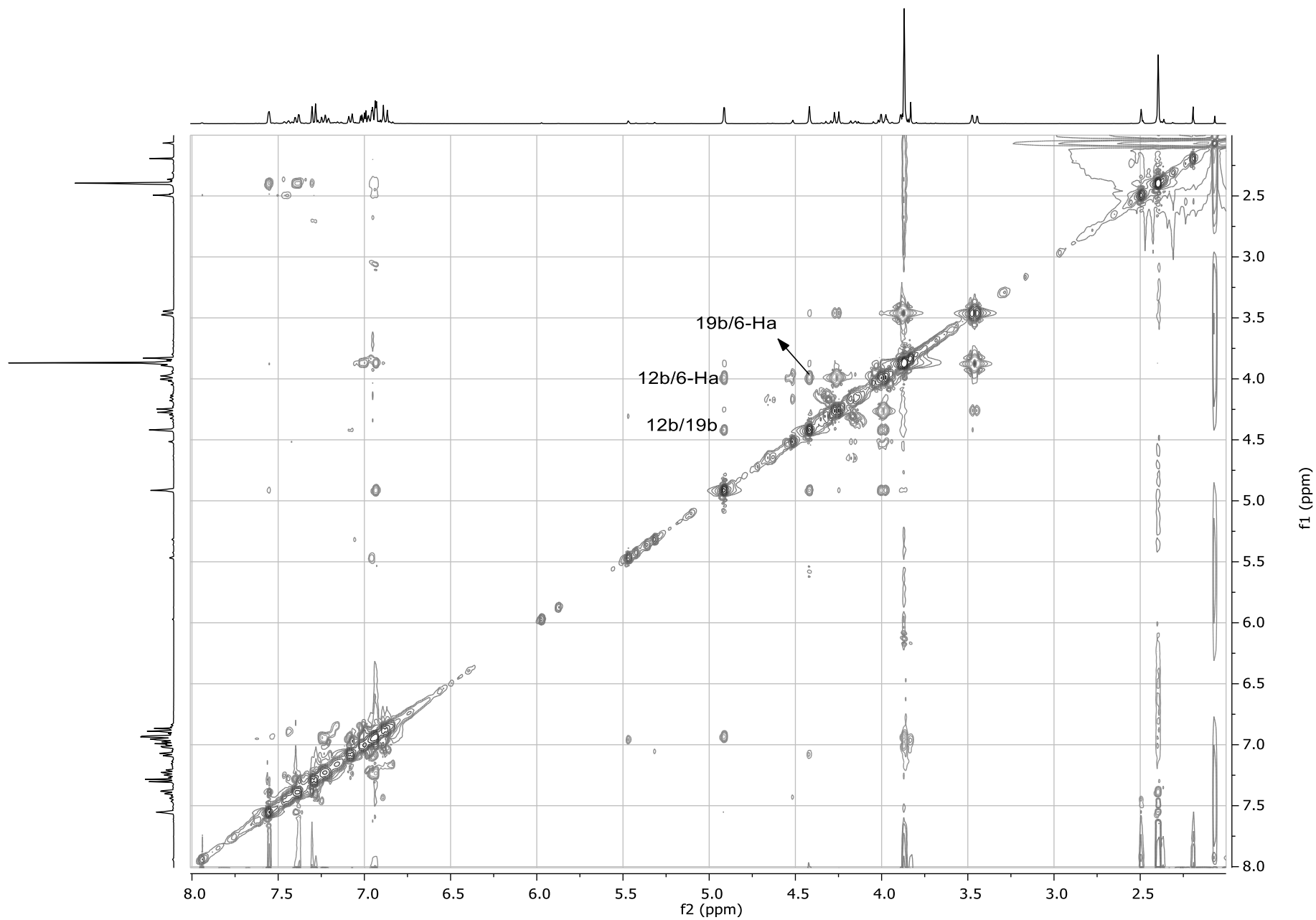


Figure S23. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**5ca** in CDCl₃ at 400 MHz.

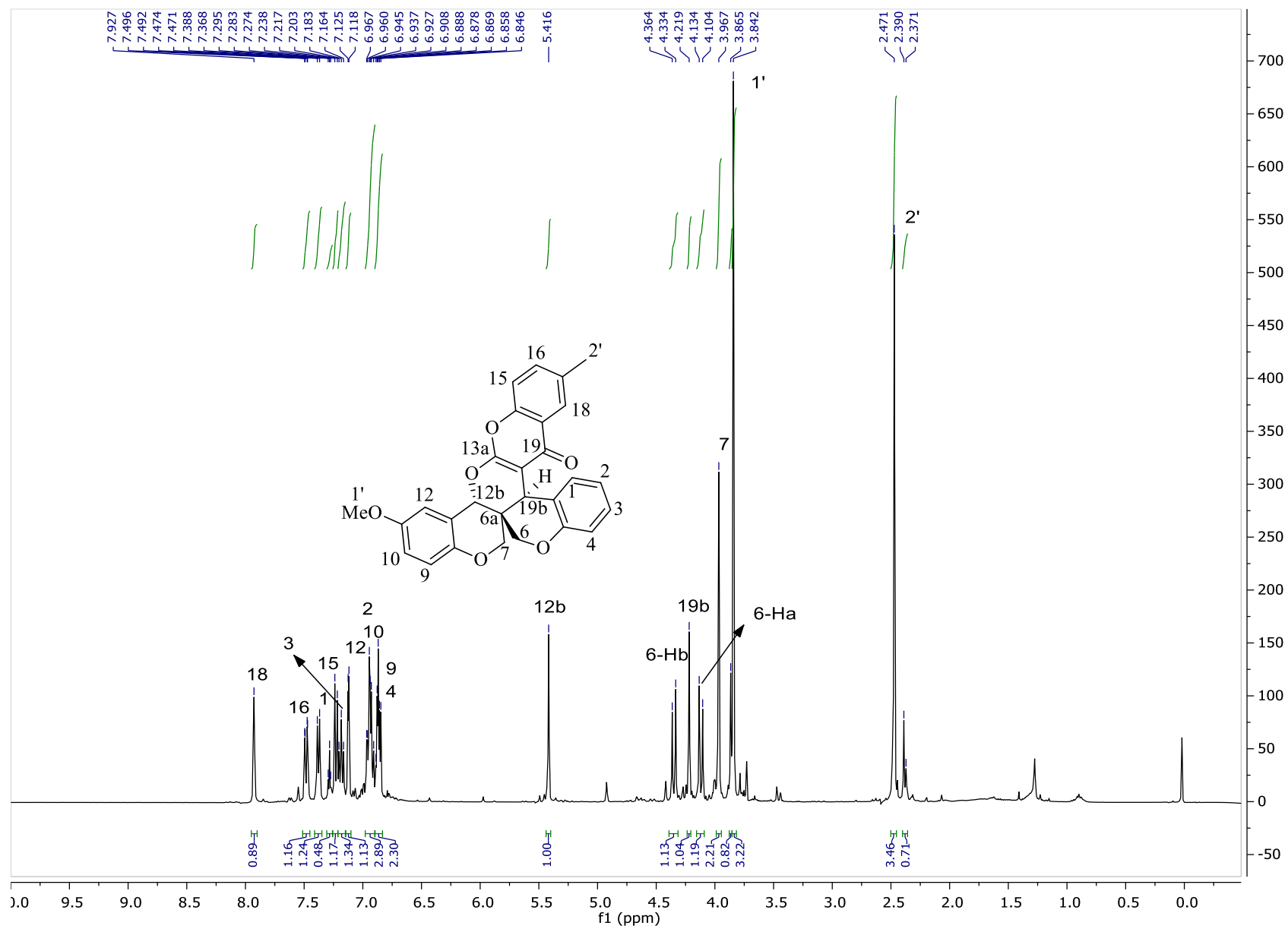


Figure S24. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-6ca in CDCl₃ at 400 MHz.

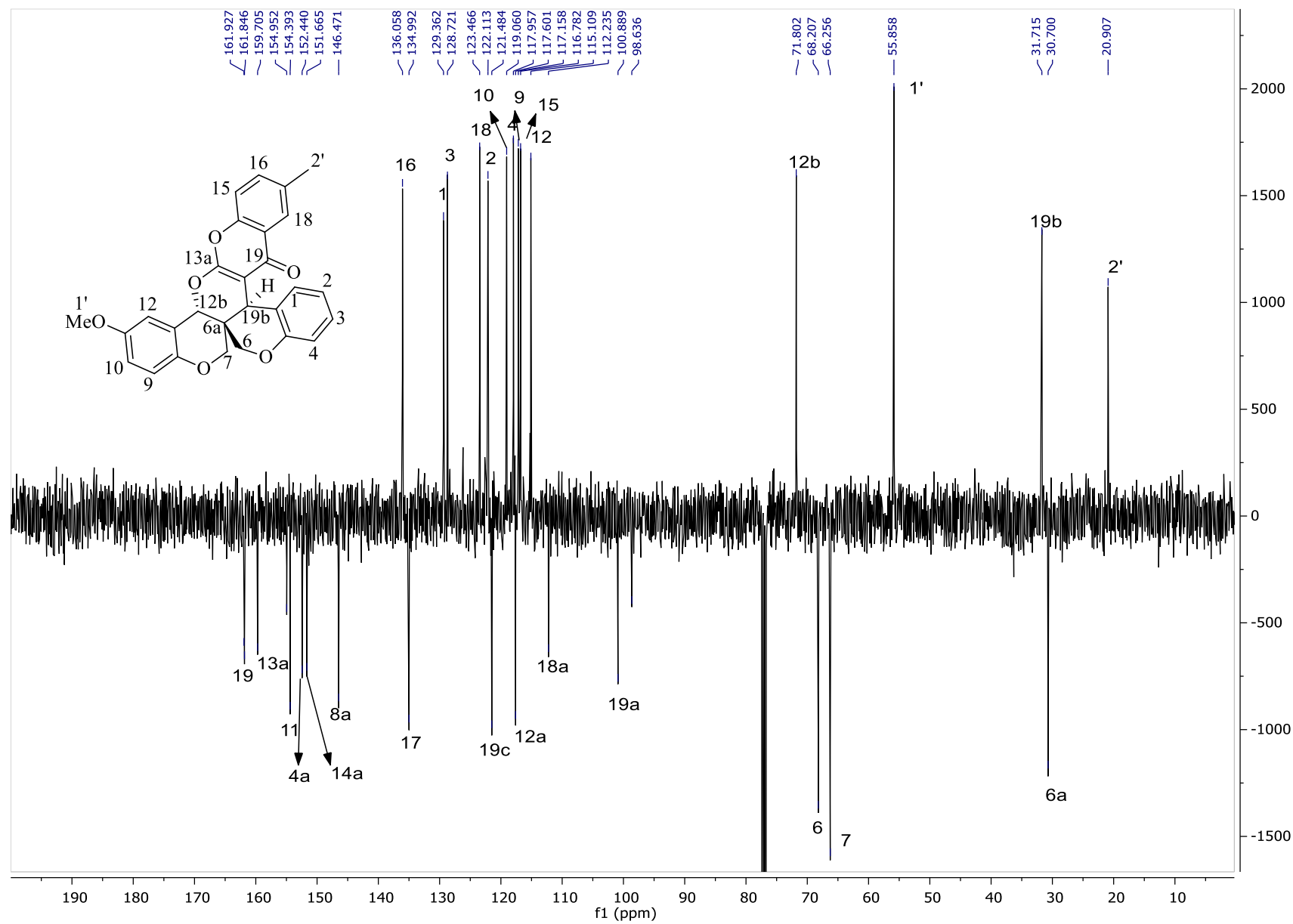


Figure S25. ¹³C-NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*R*^{*})-**6ca** in CDCl₃ at 100 MHz.

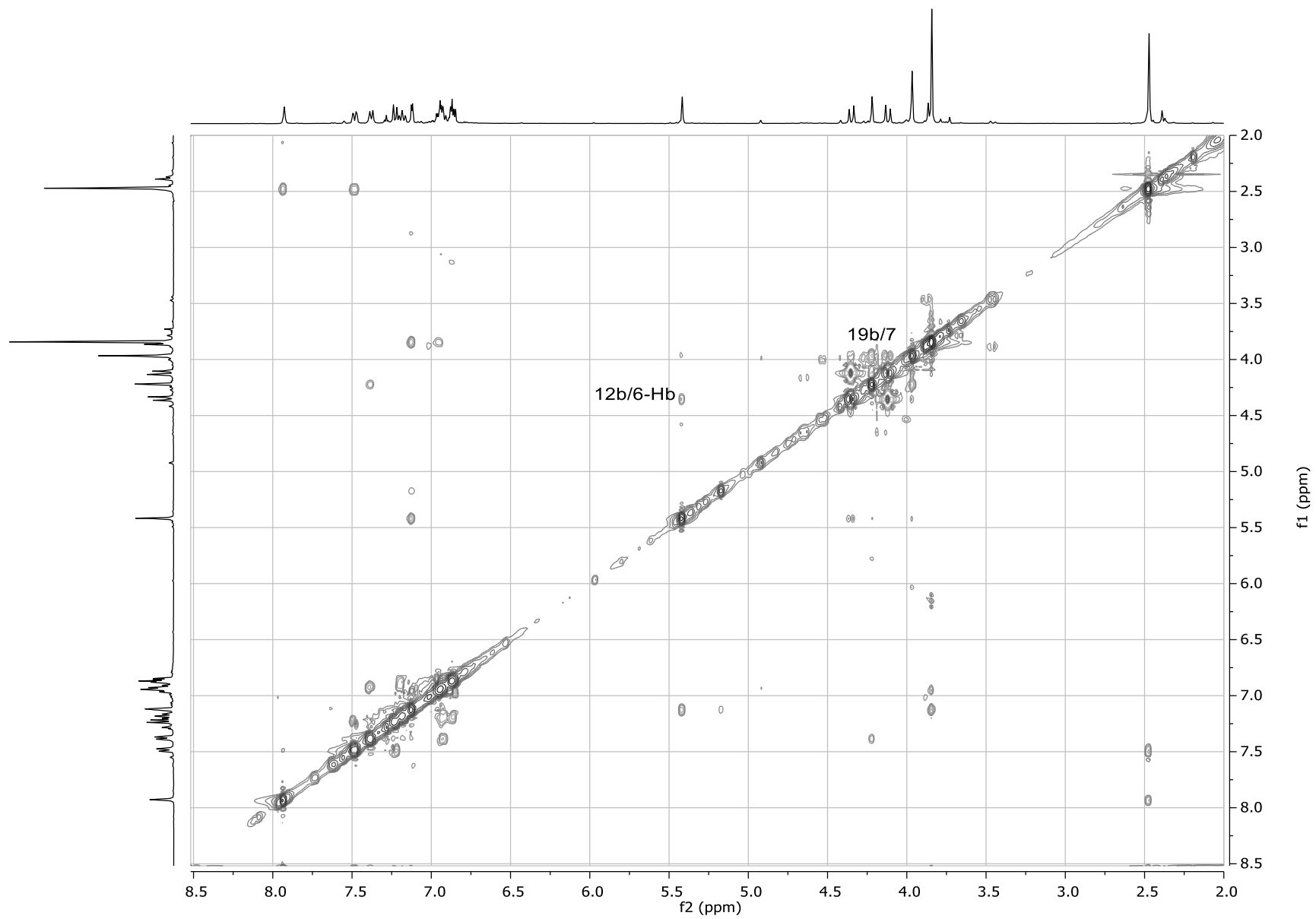


Figure S26. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-**6ca** in CDCl₃ at 400 MHz.

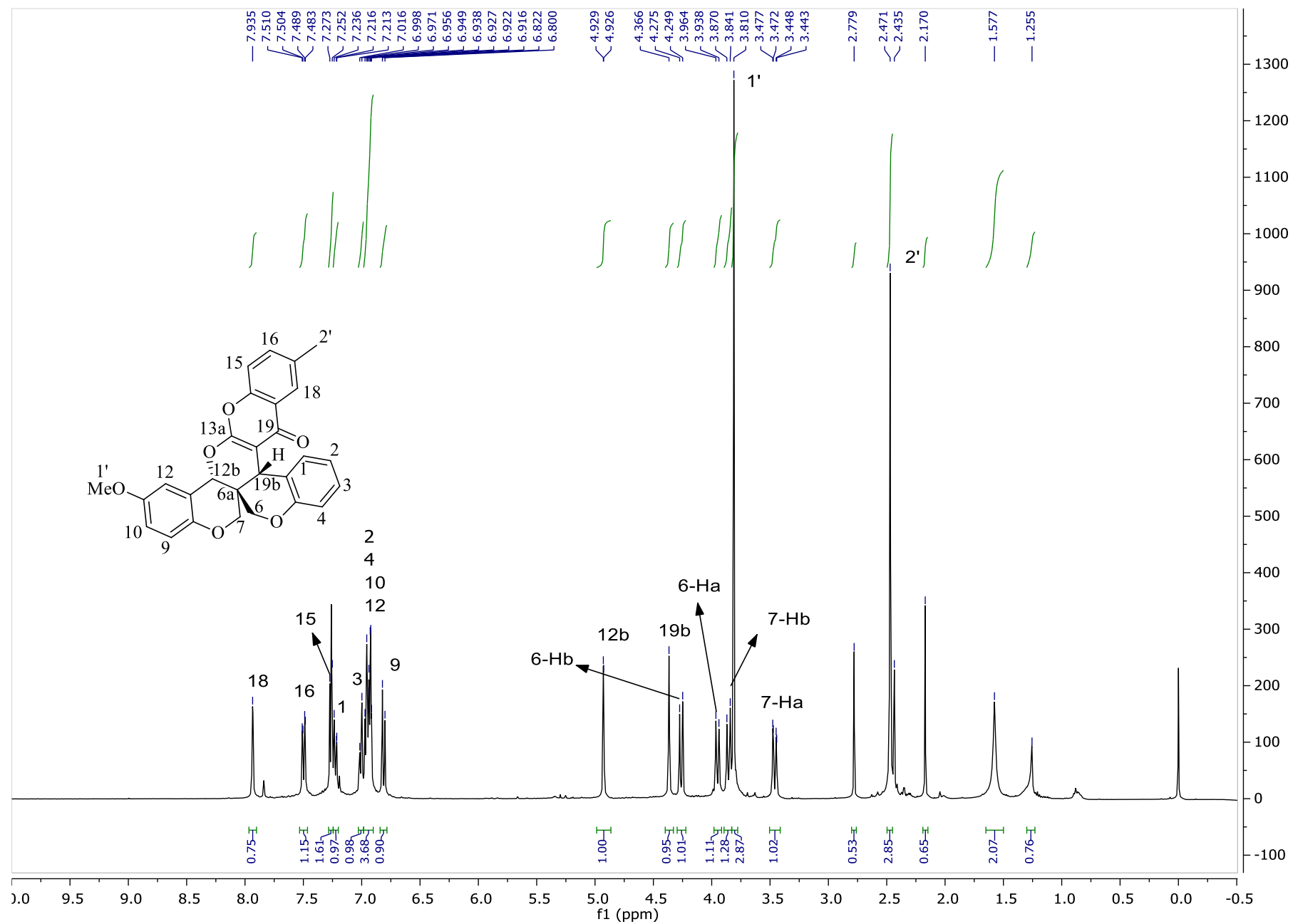


Figure S27. ¹H-NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**7ca** in CDCl₃ at 400 MHz.

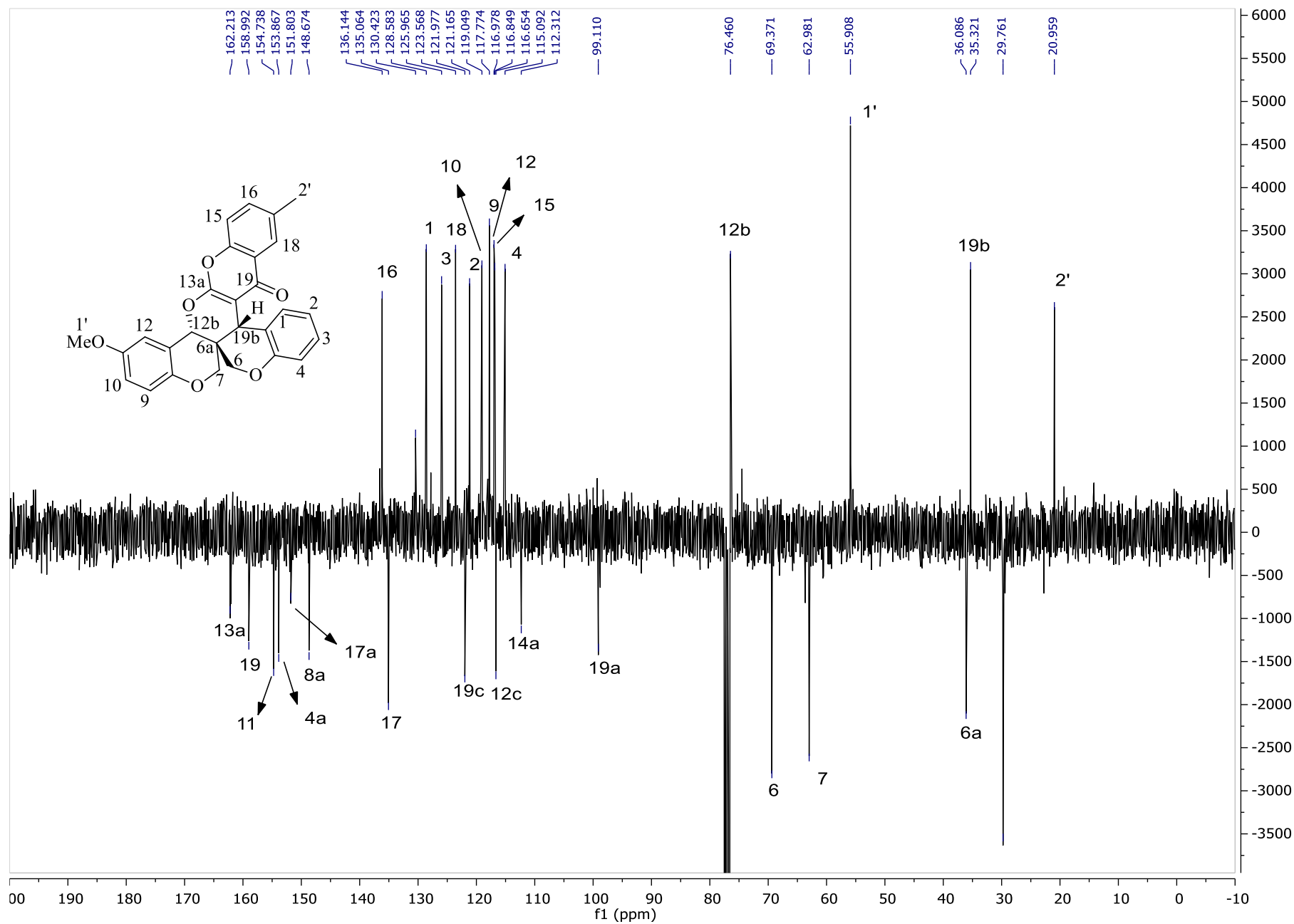


Figure S28. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-7ca in CDCl_3 at 90 MHz.

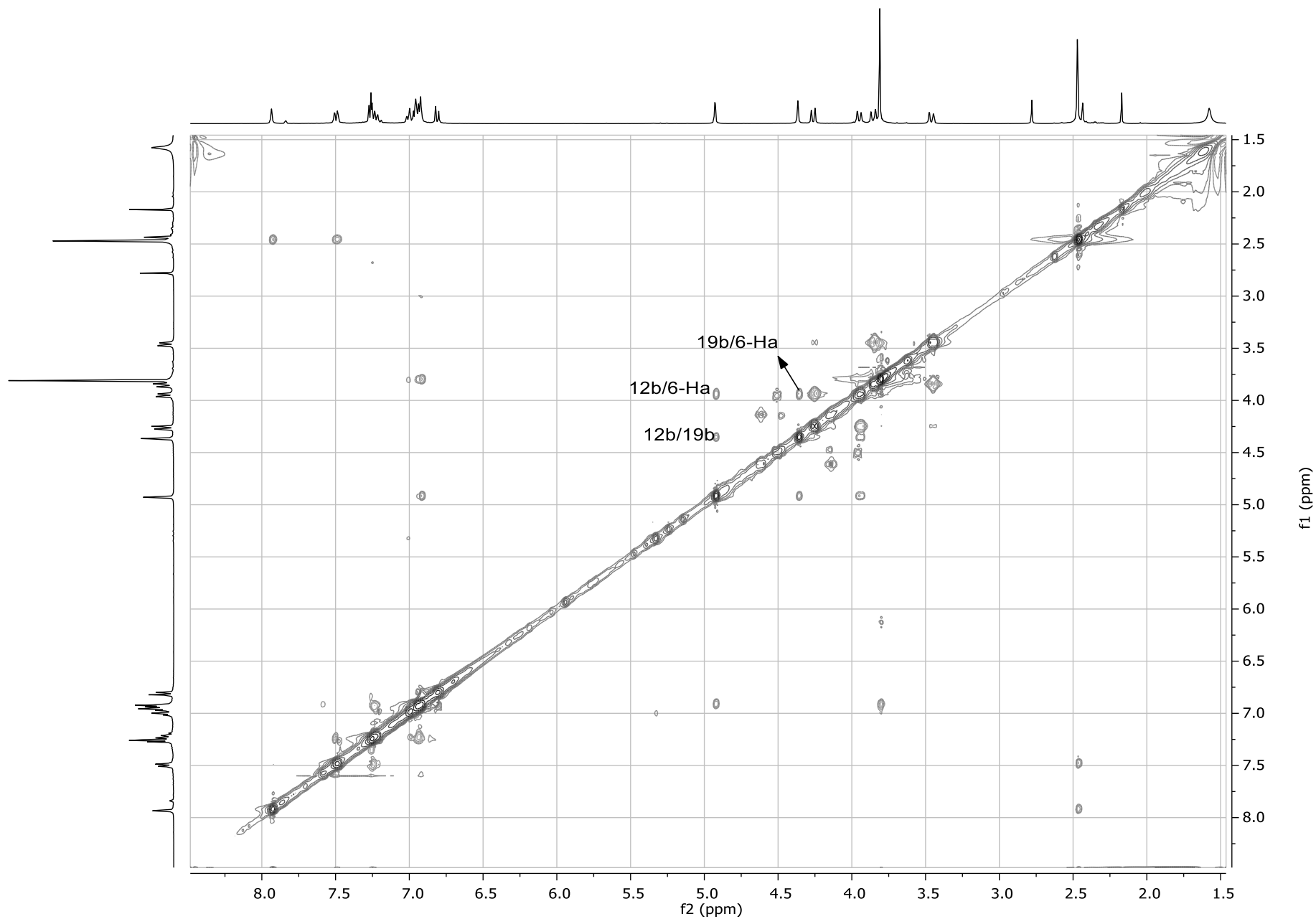


Figure S29. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**7ca** in CDCl_3 at 400 MHz.

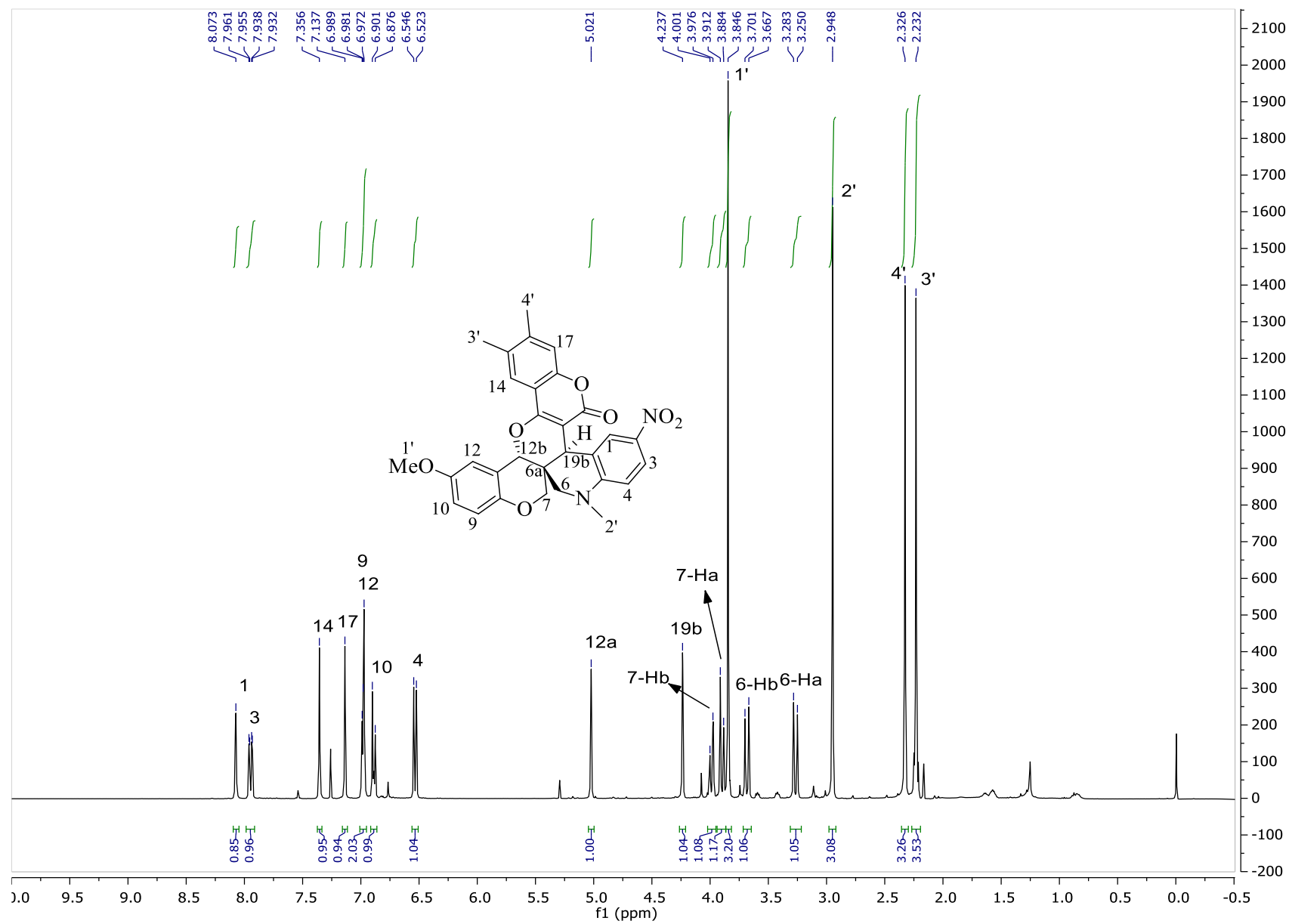


Figure S30. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4ab in CDCl₃ at 400 MHz.

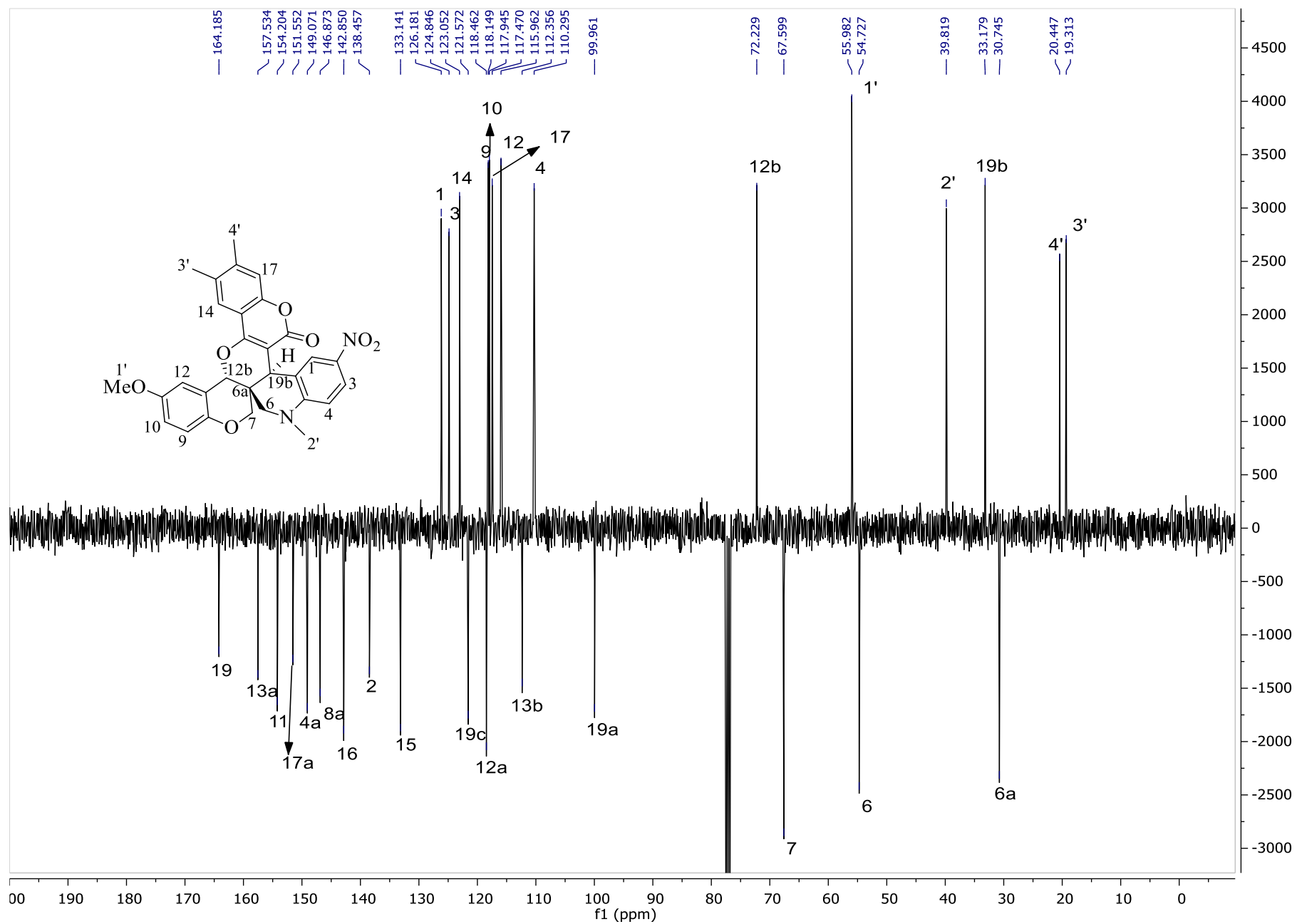


Figure S31. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-**4ab** in CDCl₃ at 100 MHz.

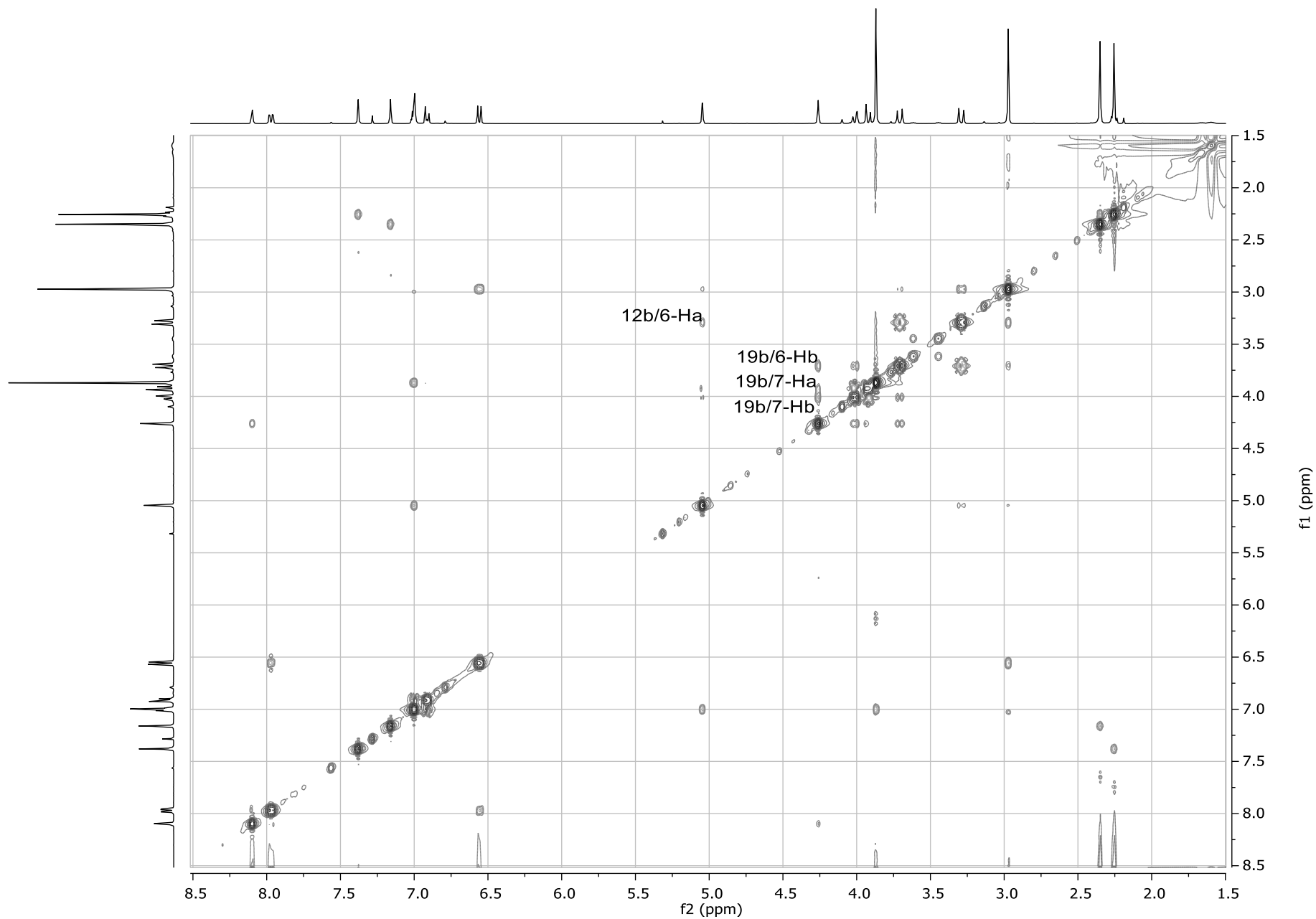


Figure S32. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4ab in CDCl₃ at 400 MHz.

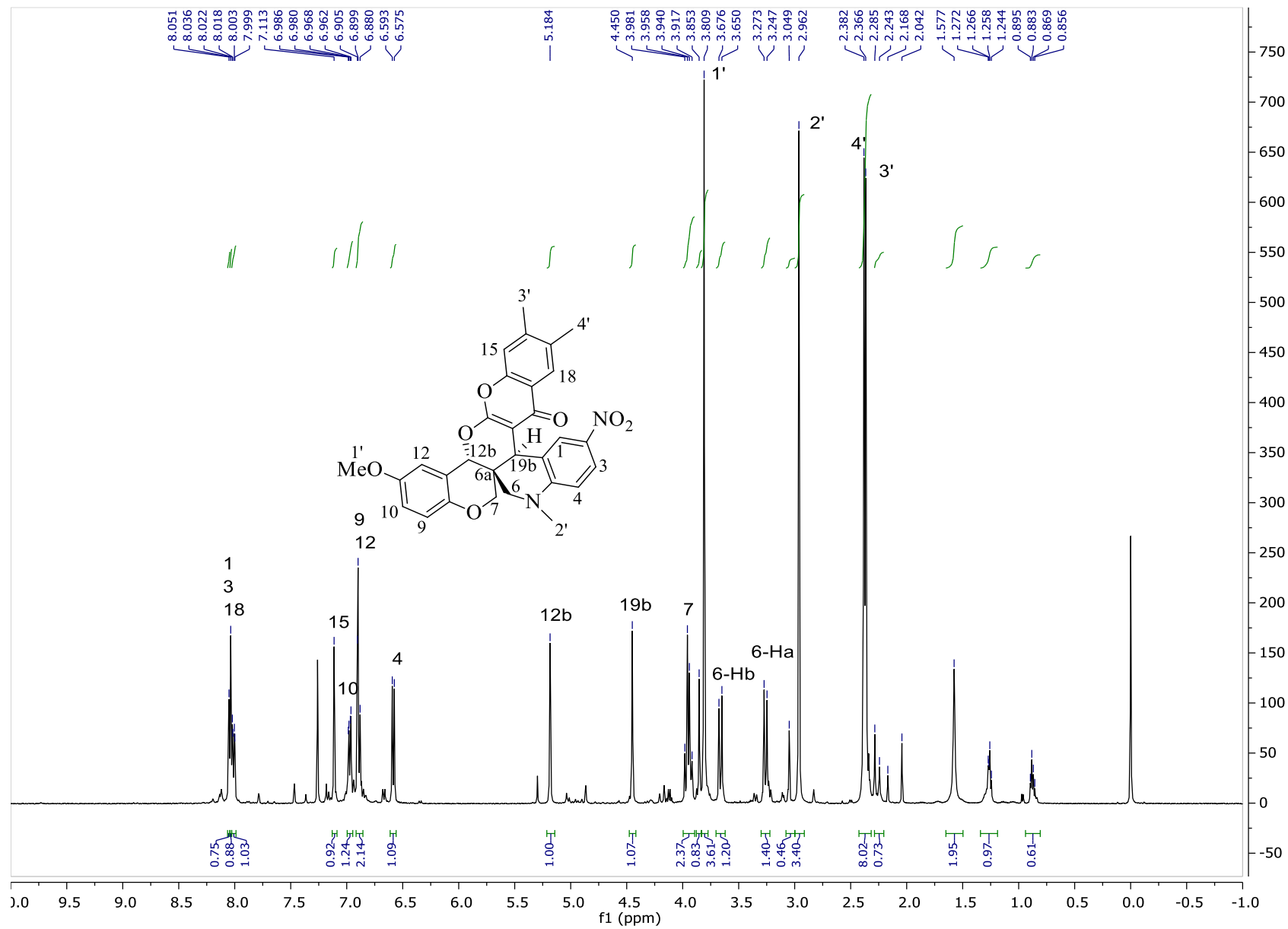


Figure S33. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-6ab in CDCl₃ at 500 MHz.

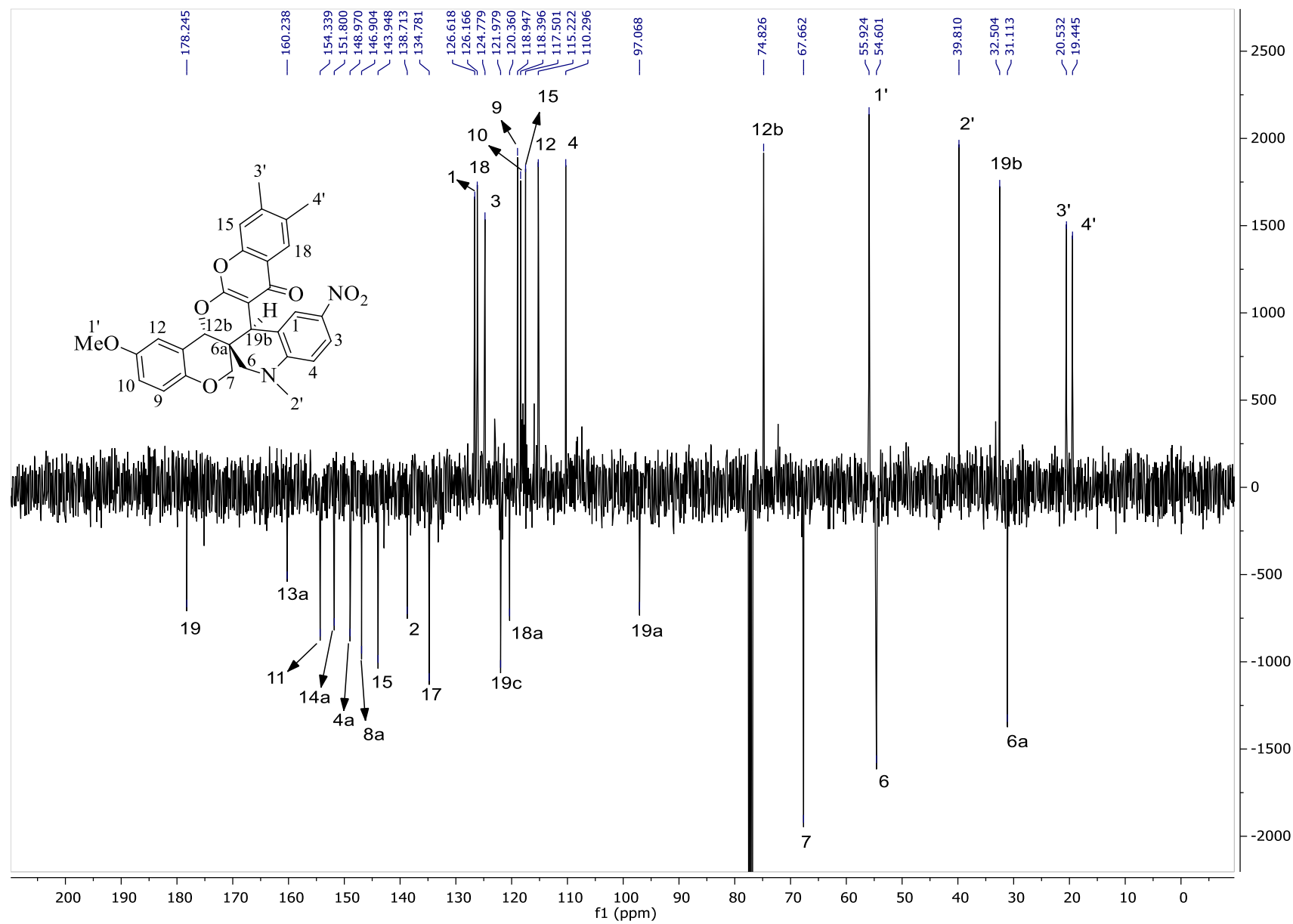


Figure S34. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-6ab in CDCl_3 at 100 MHz.

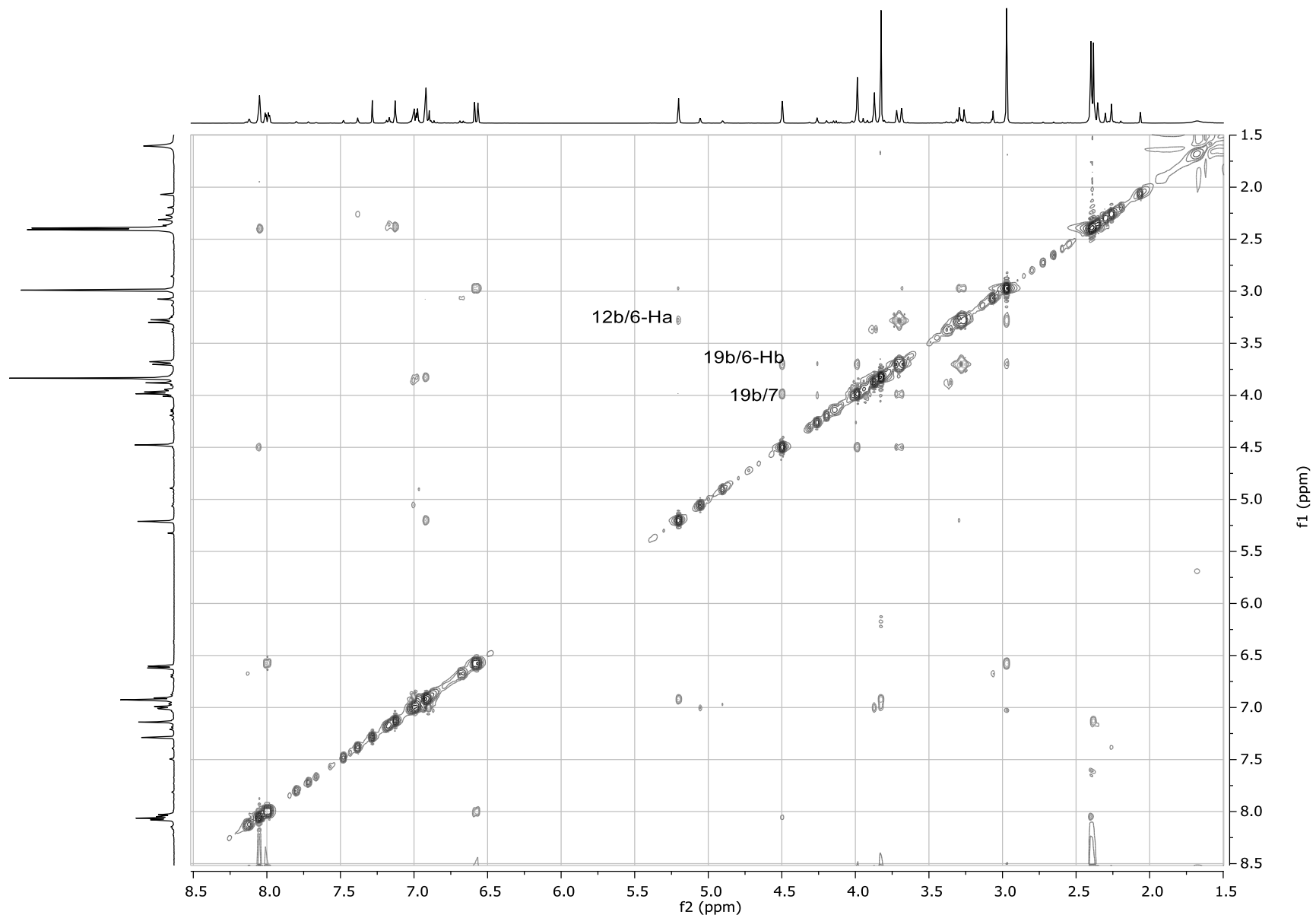


Figure S35. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-**6ab** in CDCl₃ at 400 MHz.

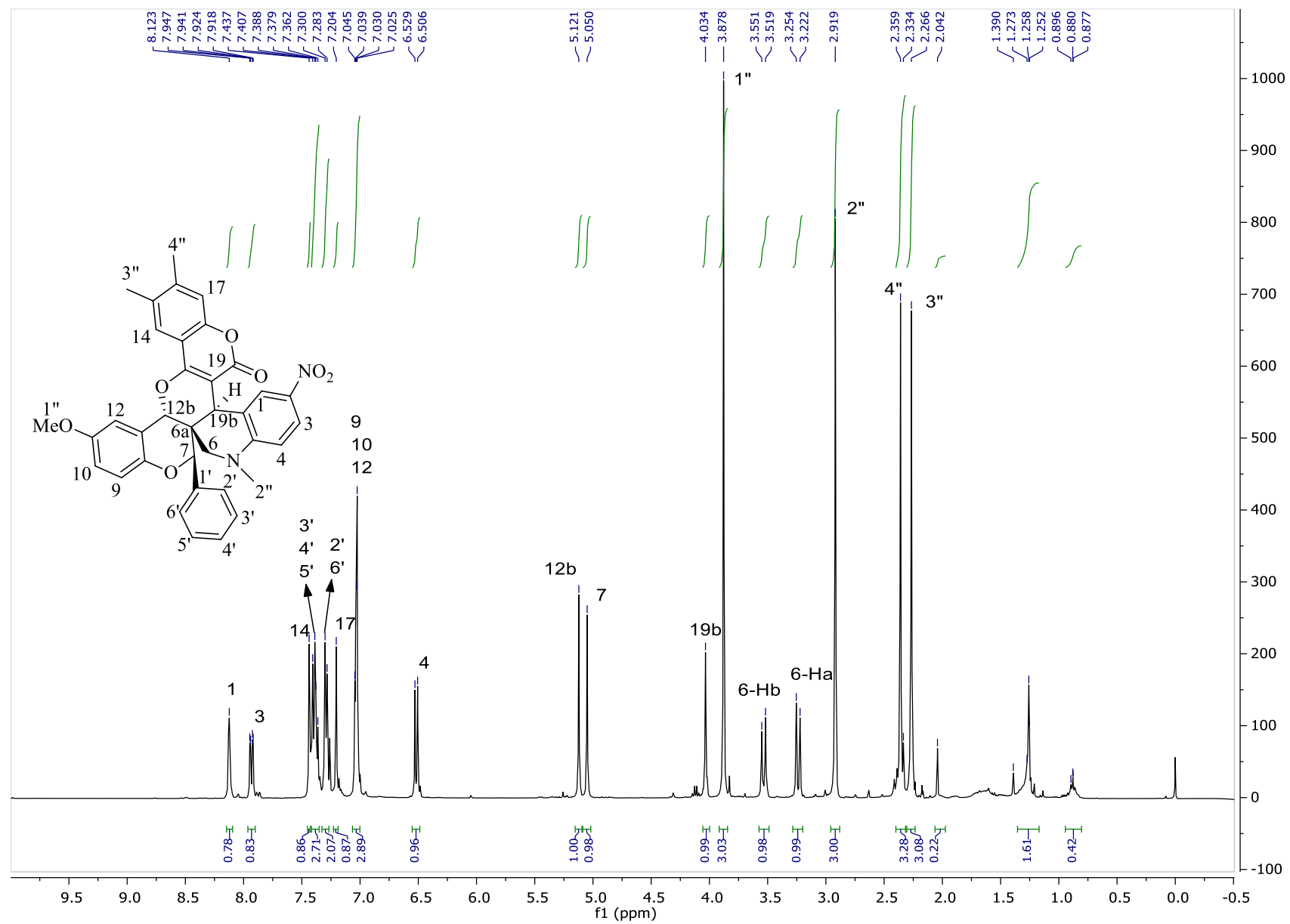


Figure S36. ¹H-NMR spectrum of (6aS,7R,12bR,19bS)-**4bb** in CDCl₃ at 400 MHz.

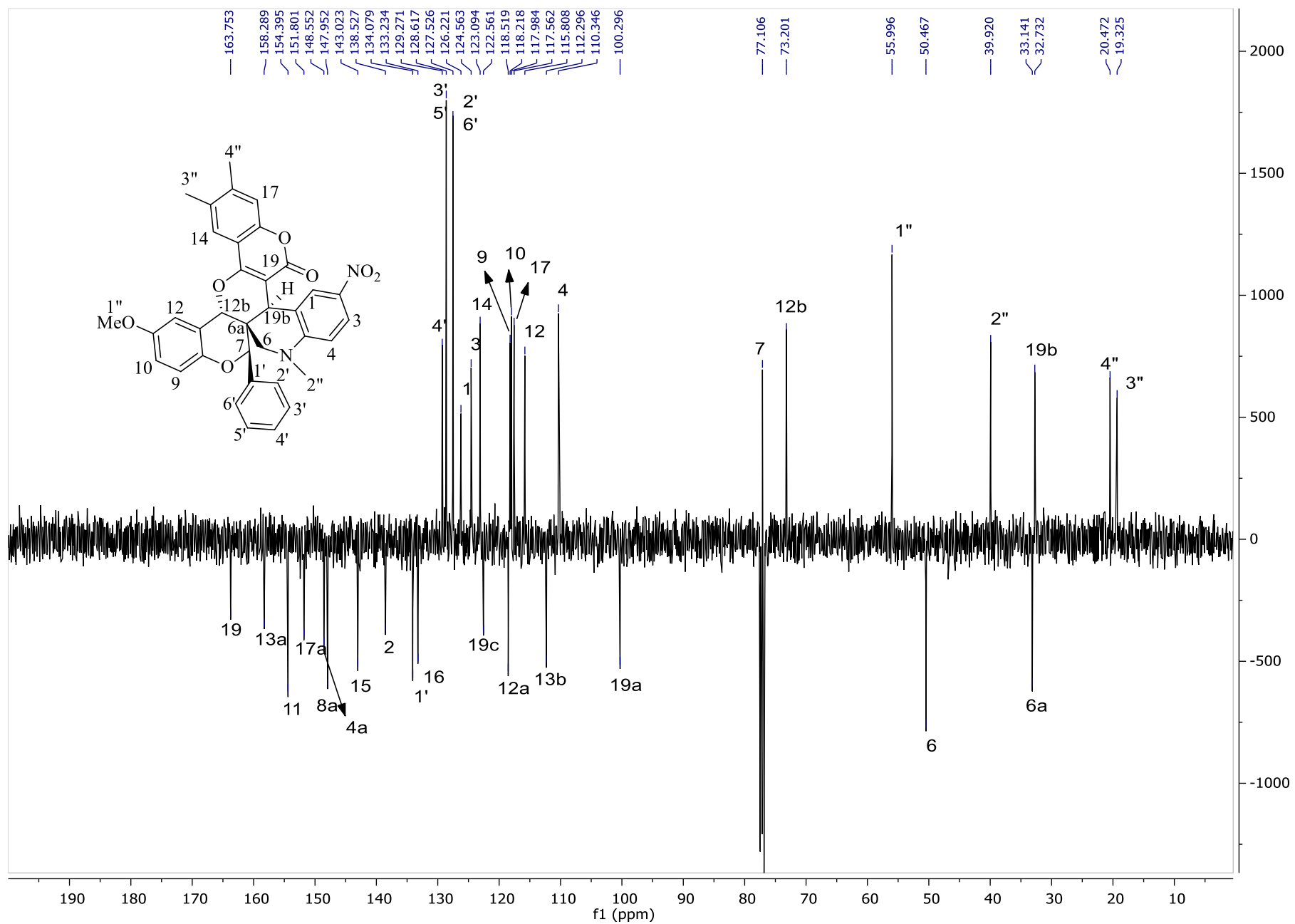


Figure S37. ¹³C-NMR spectrum of (6aS,7R,12bR,19bS)-**4bb** in CDCl₃ at 100 MHz.

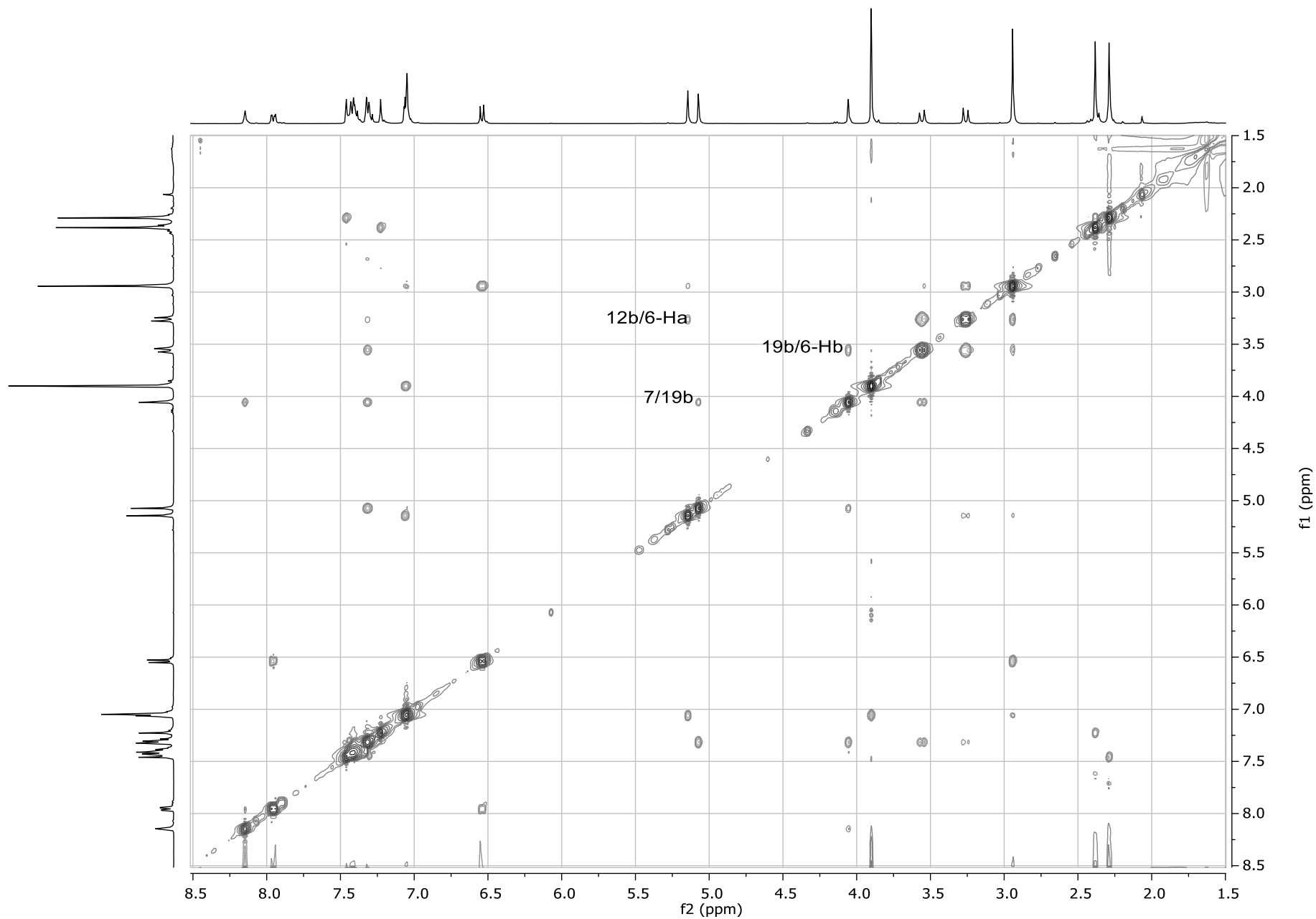


Figure S38. NOESY spectrum of (6a*S*,7*R*,12b*R*,19b*S*)-**4bb** in CDCl₃ at 400 MHz.

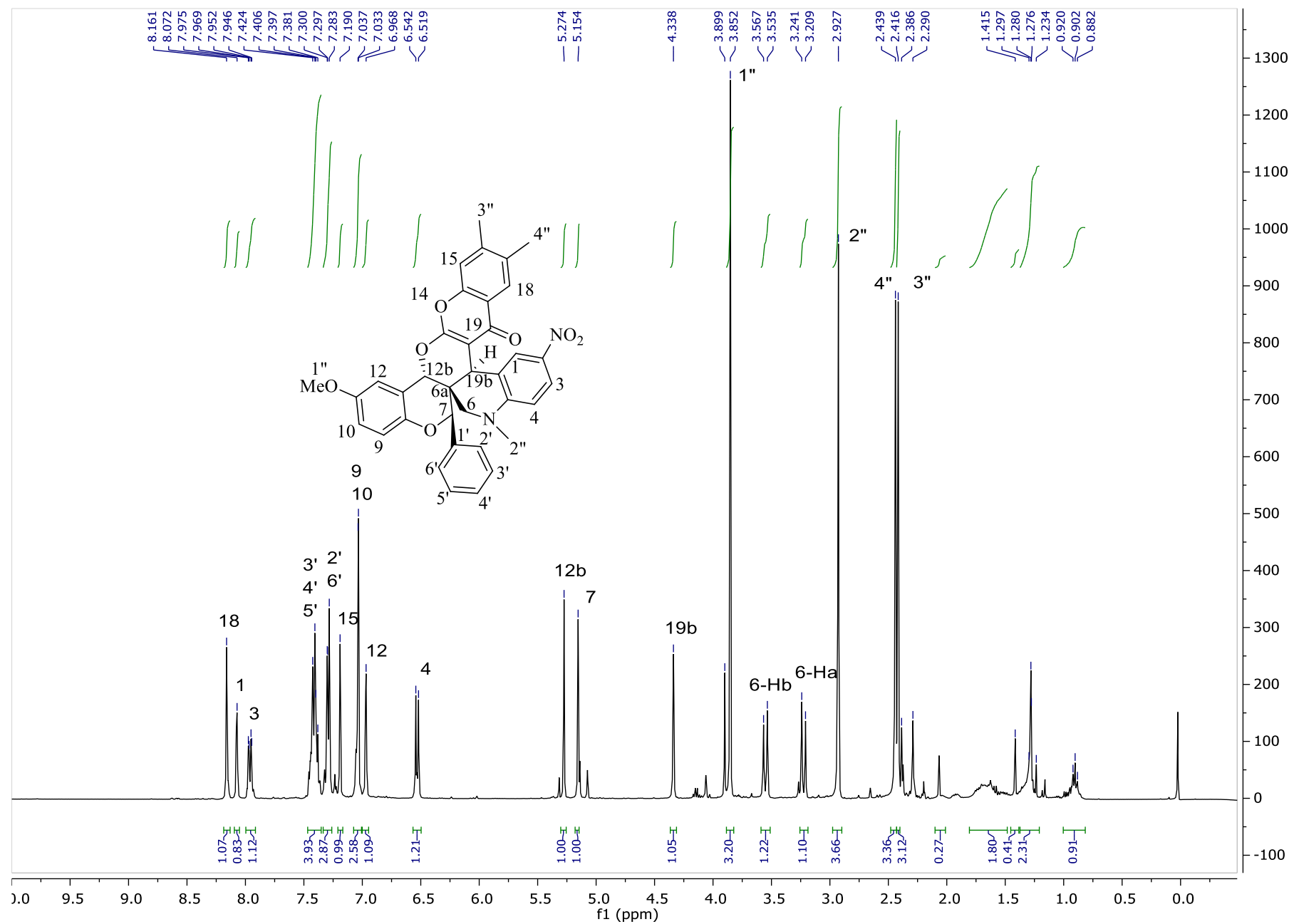


Figure S39. ¹H-NMR spectrum of (6aS,7R,12bR,19bS)-**6bb** in CDCl₃ at 400 MHz.

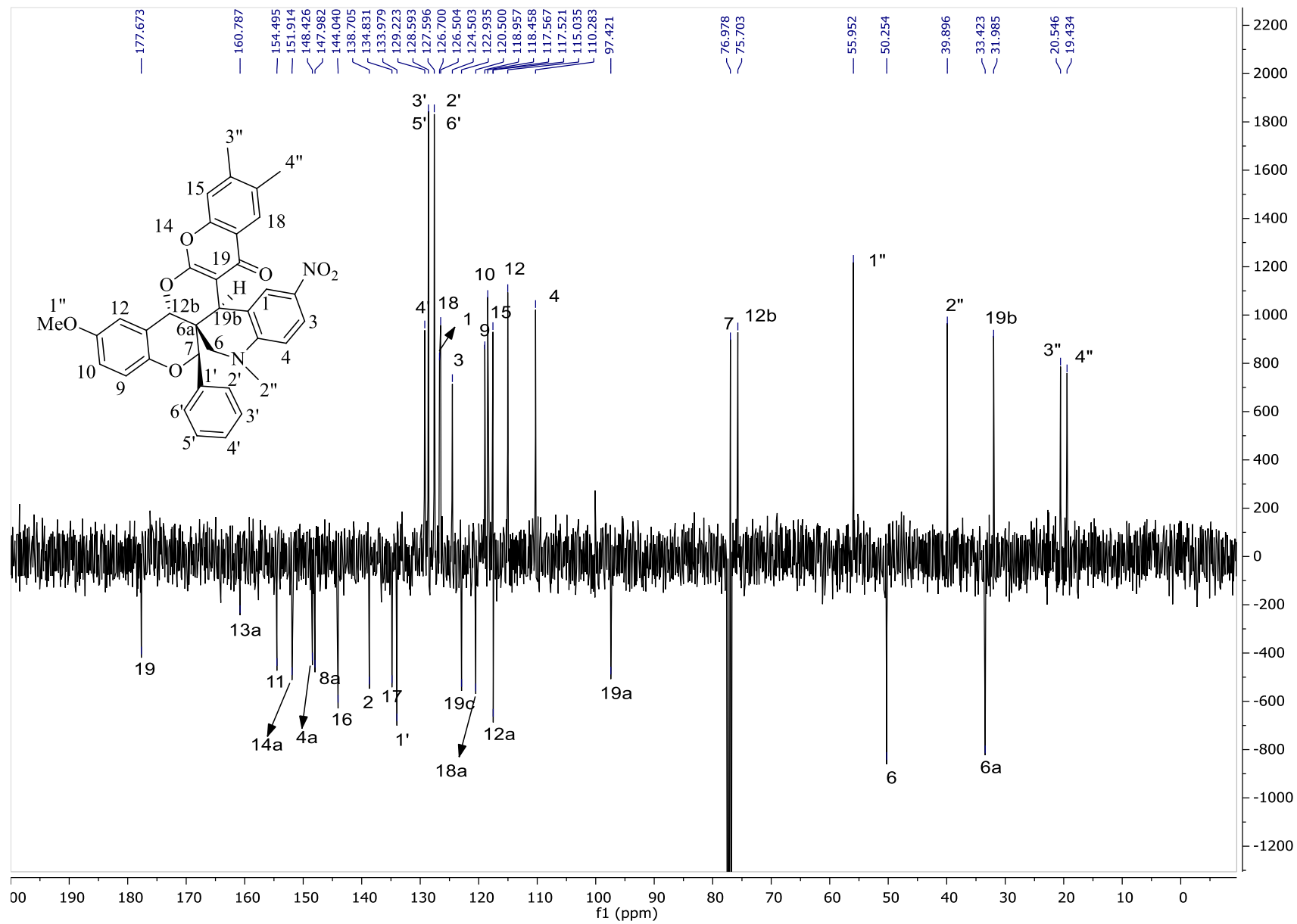


Figure S40. ^{13}C -NMR spectrum of (6aS,7R,12bR,19bS)-**6bb** in CDCl_3 at 100 MHz.

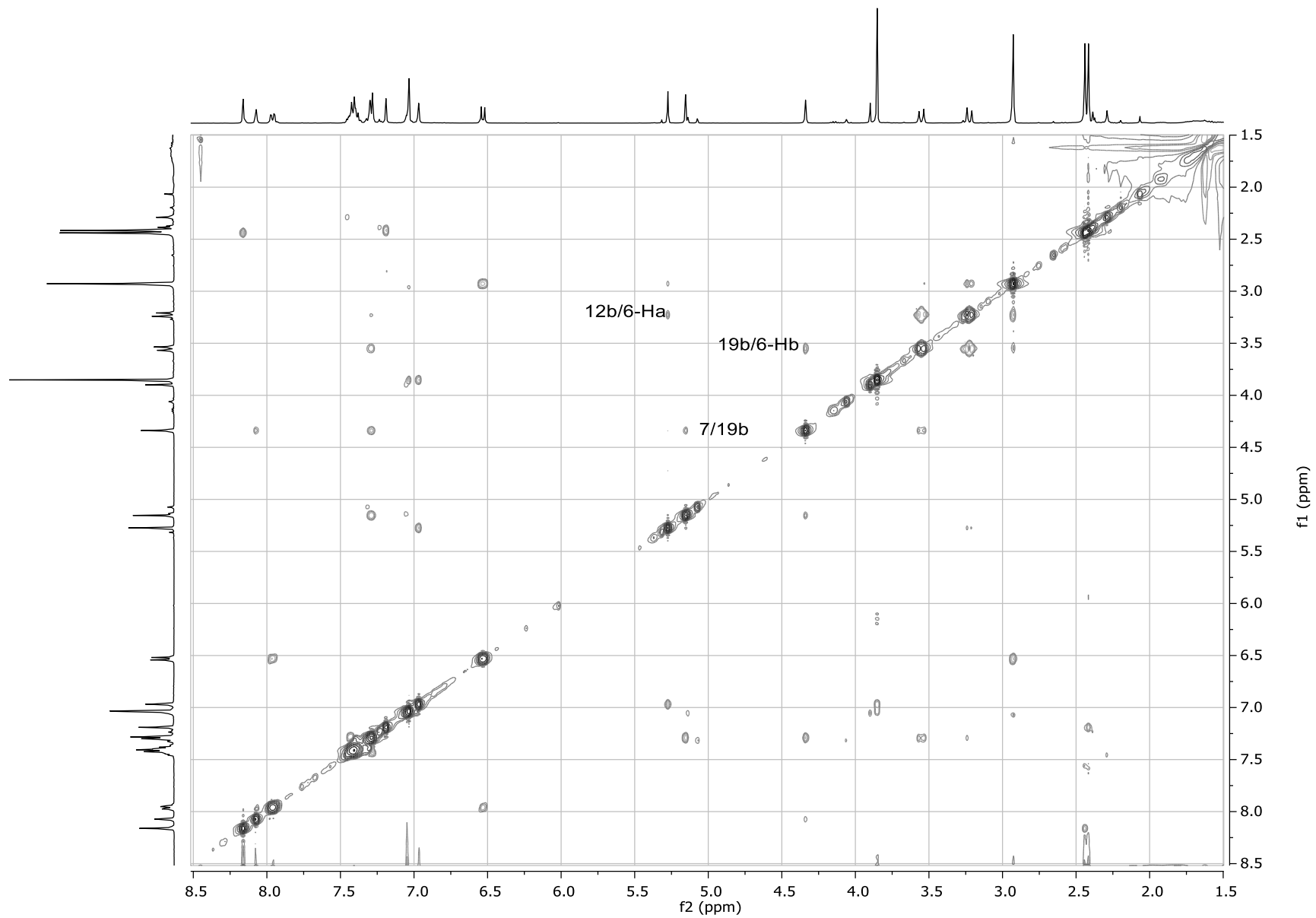


Figure S41. NOESY spectrum of (6aS,7R,12bR,19bS)-6bb in CDCl₃ at 400 MHz.

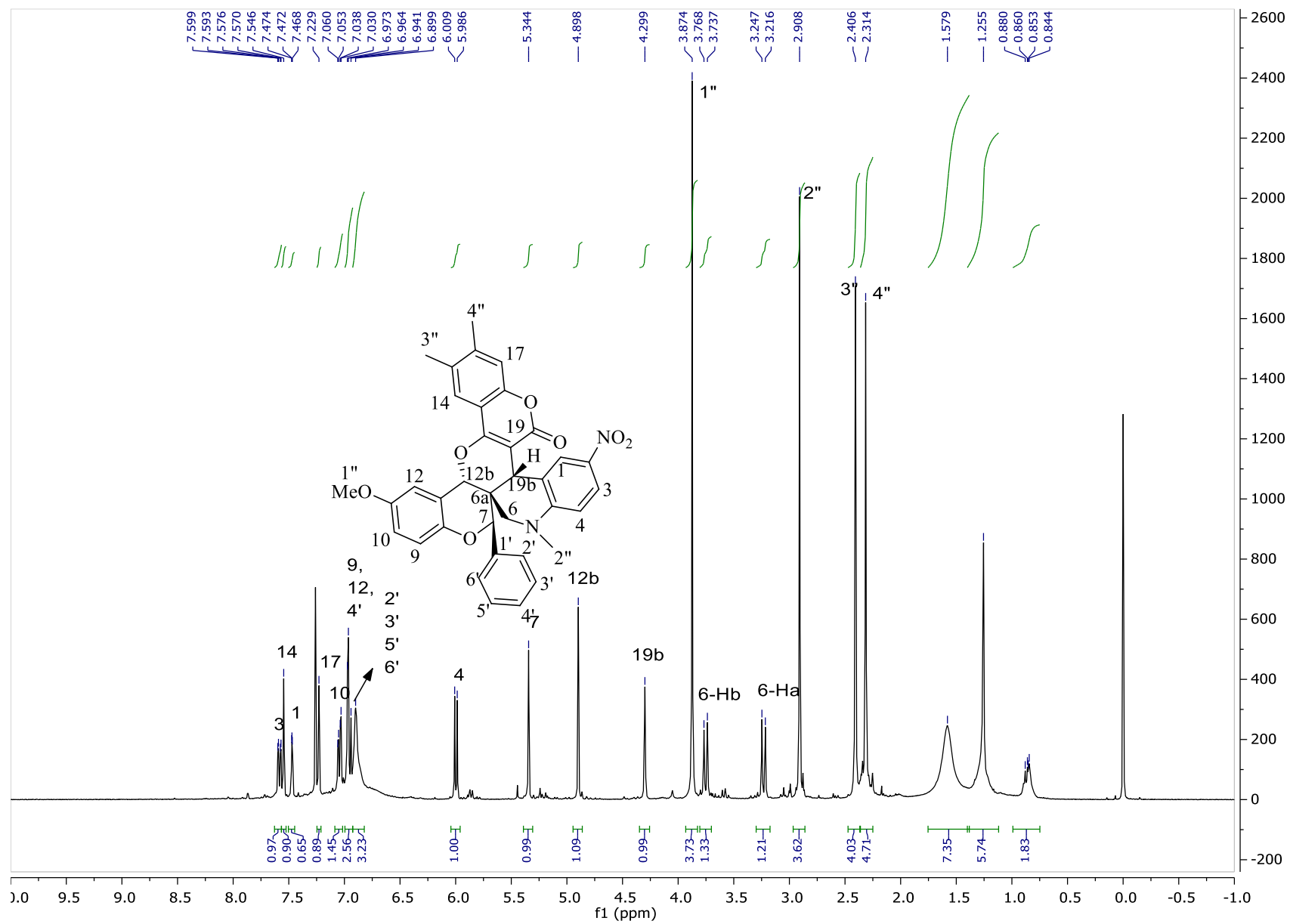


Figure S42. ¹H-NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*R**)-5bb in CDCl₃ at 400 MHz.

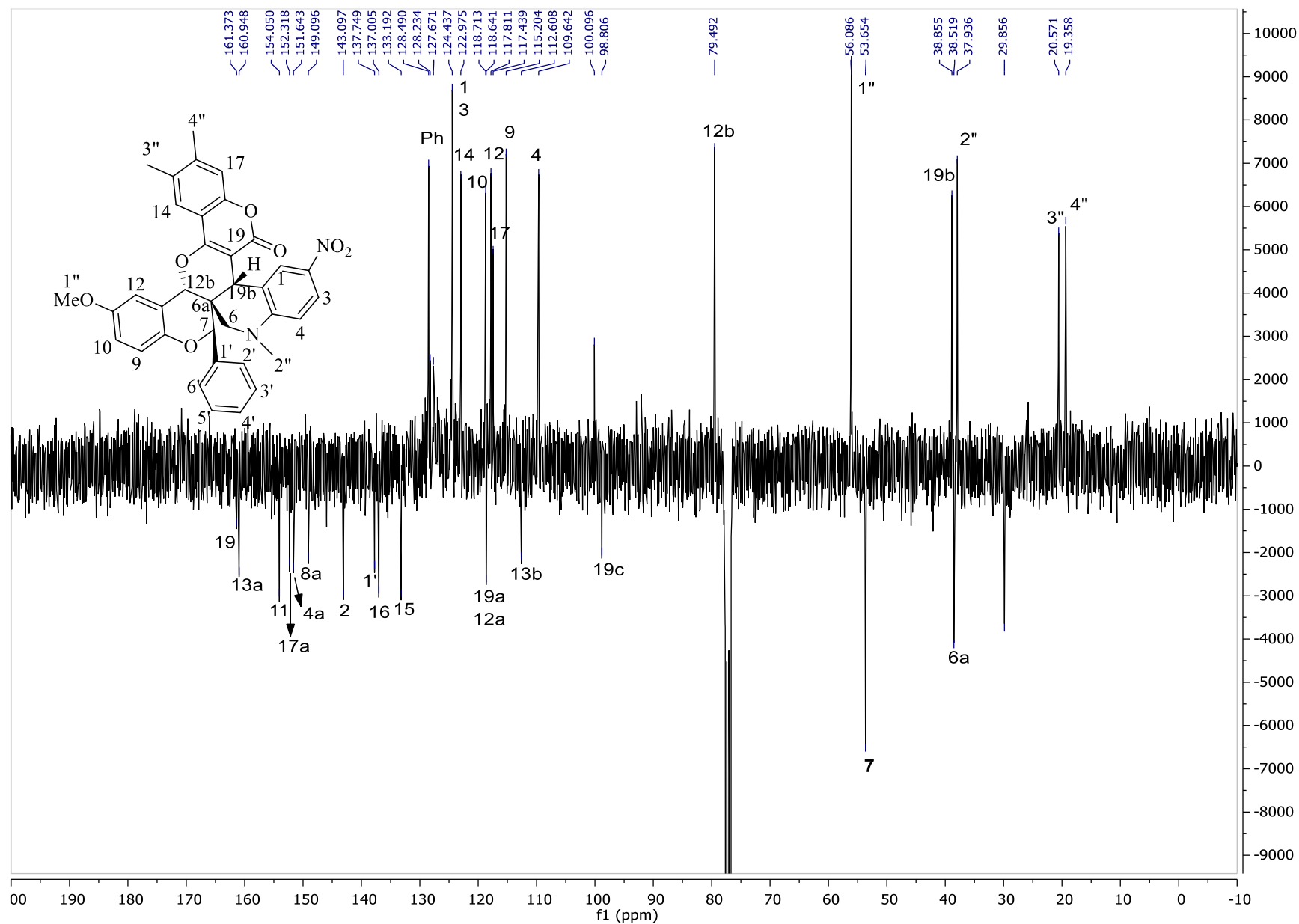


Figure S43. ¹³C-NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*R**)-**5bb** in CDCl₃ at 100 MHz.

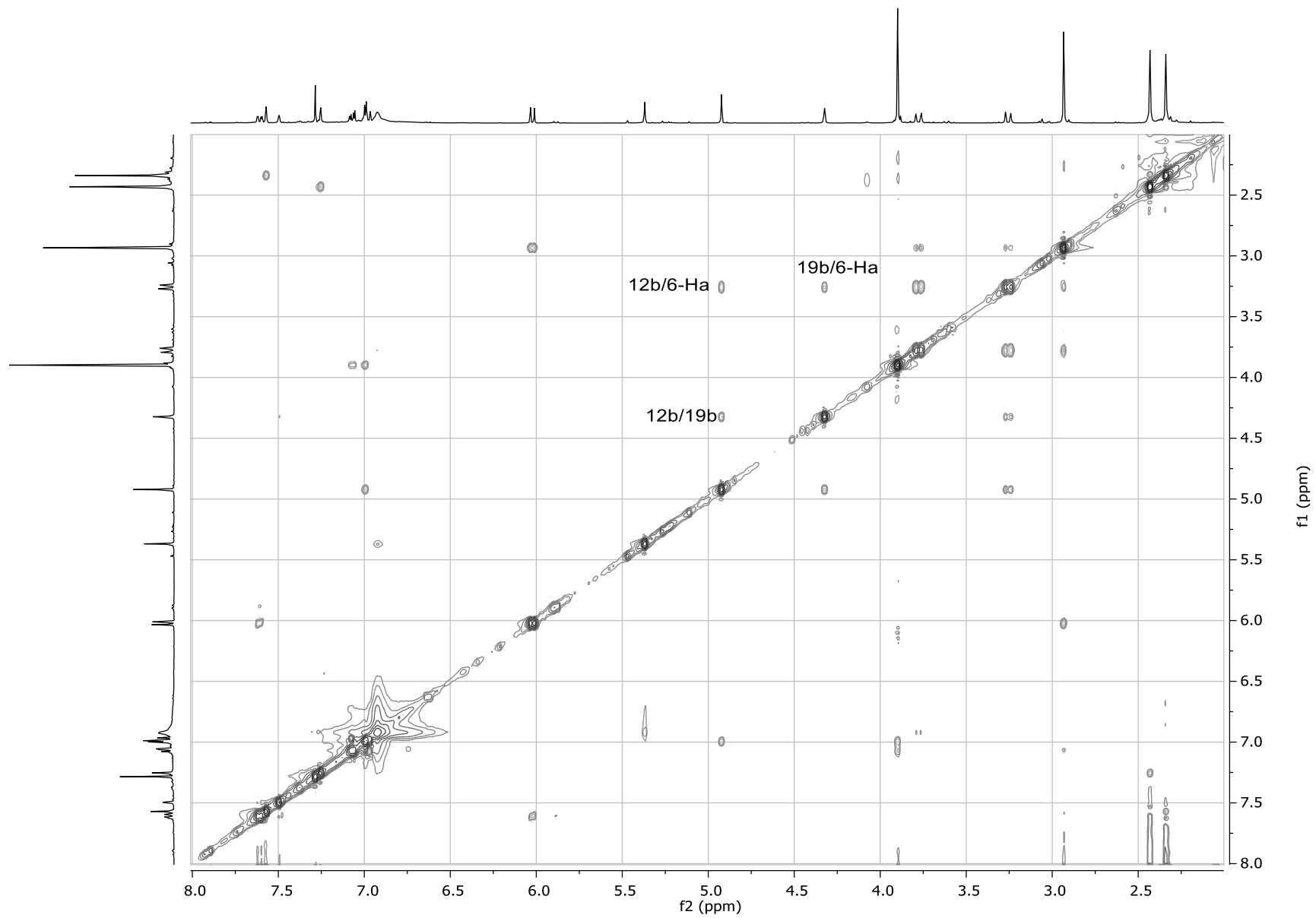


Figure S44. NOESY spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*R**)-**5bb** in CDCl₃ at 400 MHz.

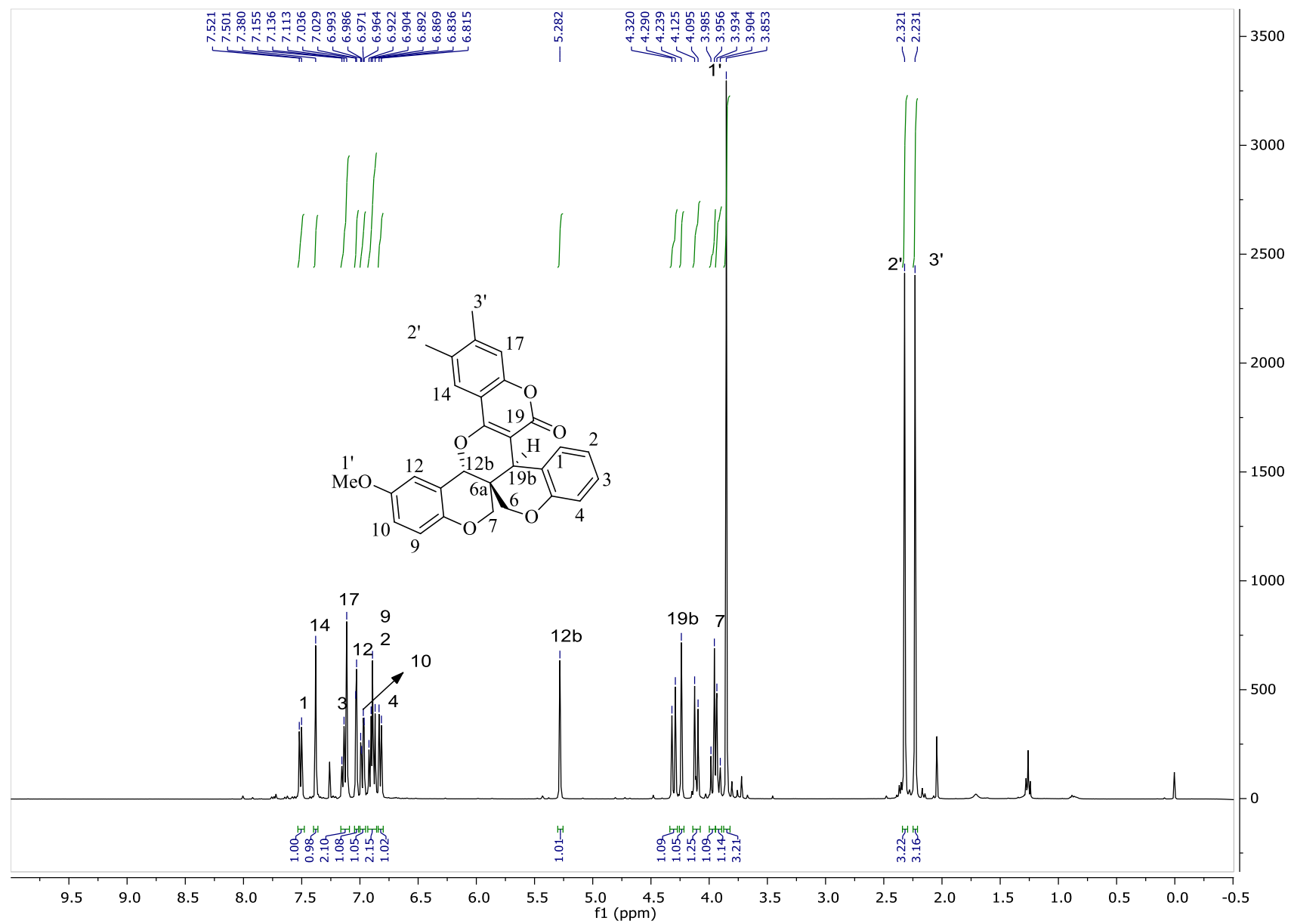


Figure S45. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4**cb** in CDCl₃ at 400 MHz.

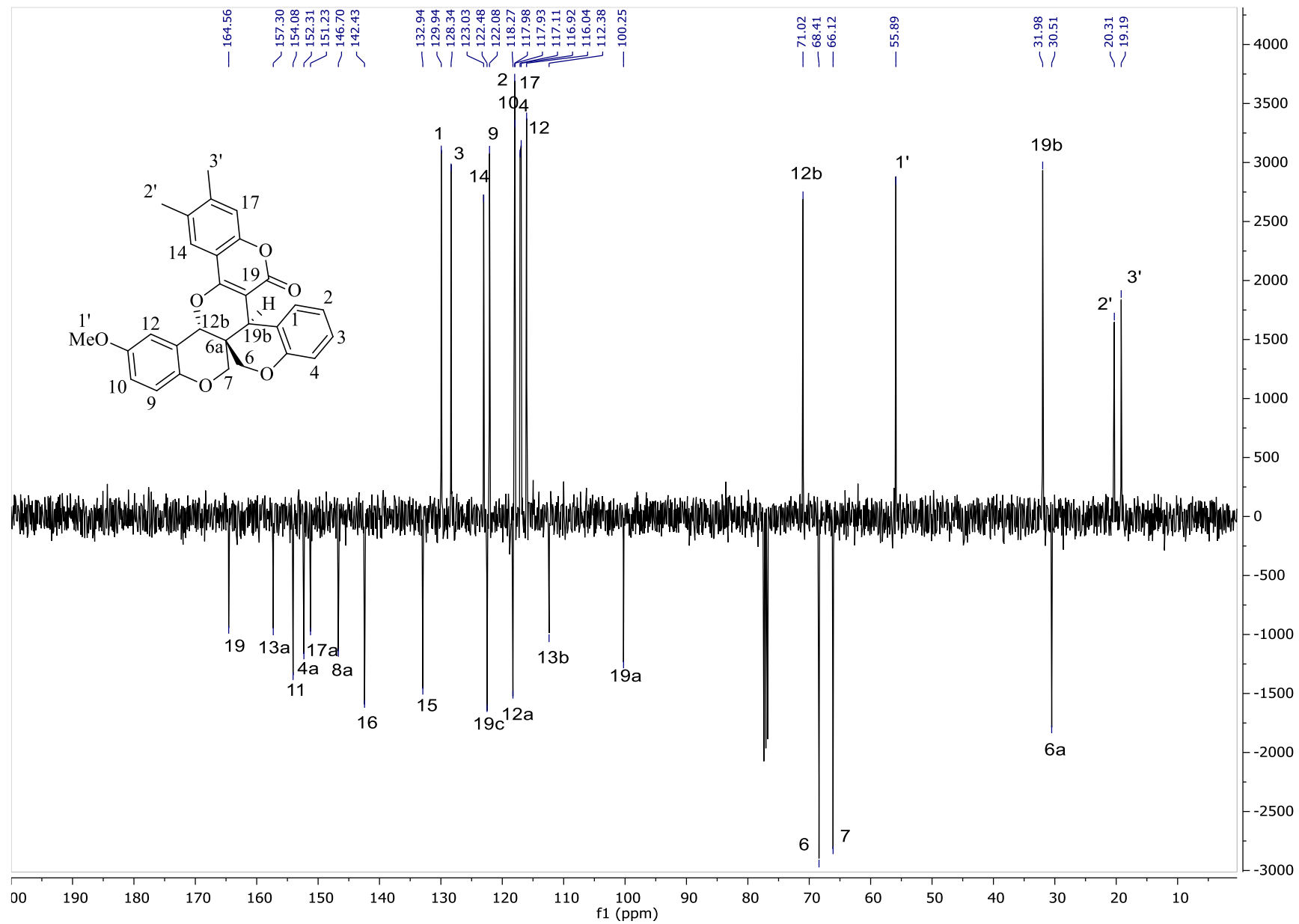


Figure S46. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4**cb** in CDCl₃ at 100 MHz.

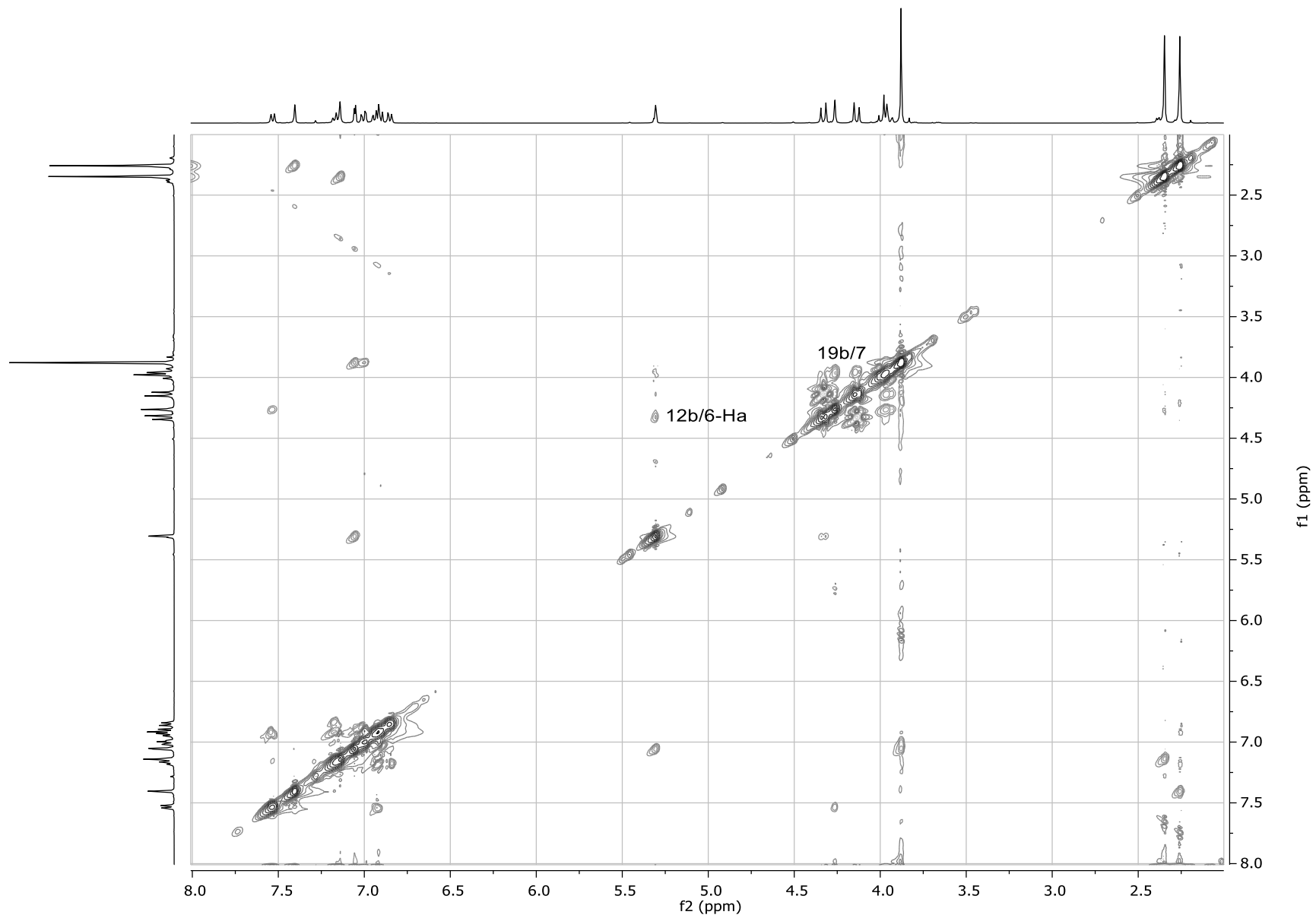


Figure S47. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4**cb** in CDCl₃ at 400 MHz.

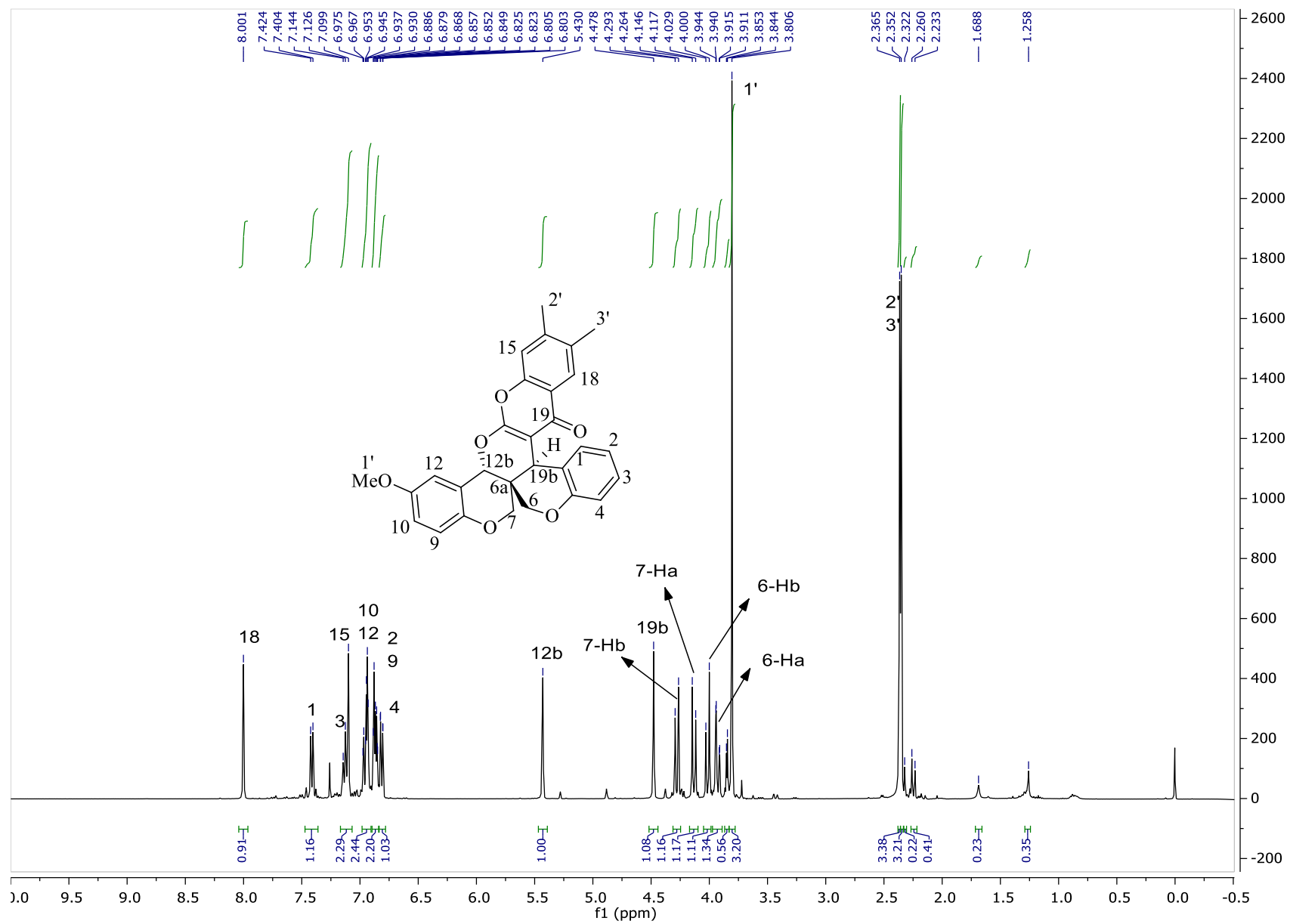


Figure S48. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-6cb in CDCl₃ at 400 MHz.

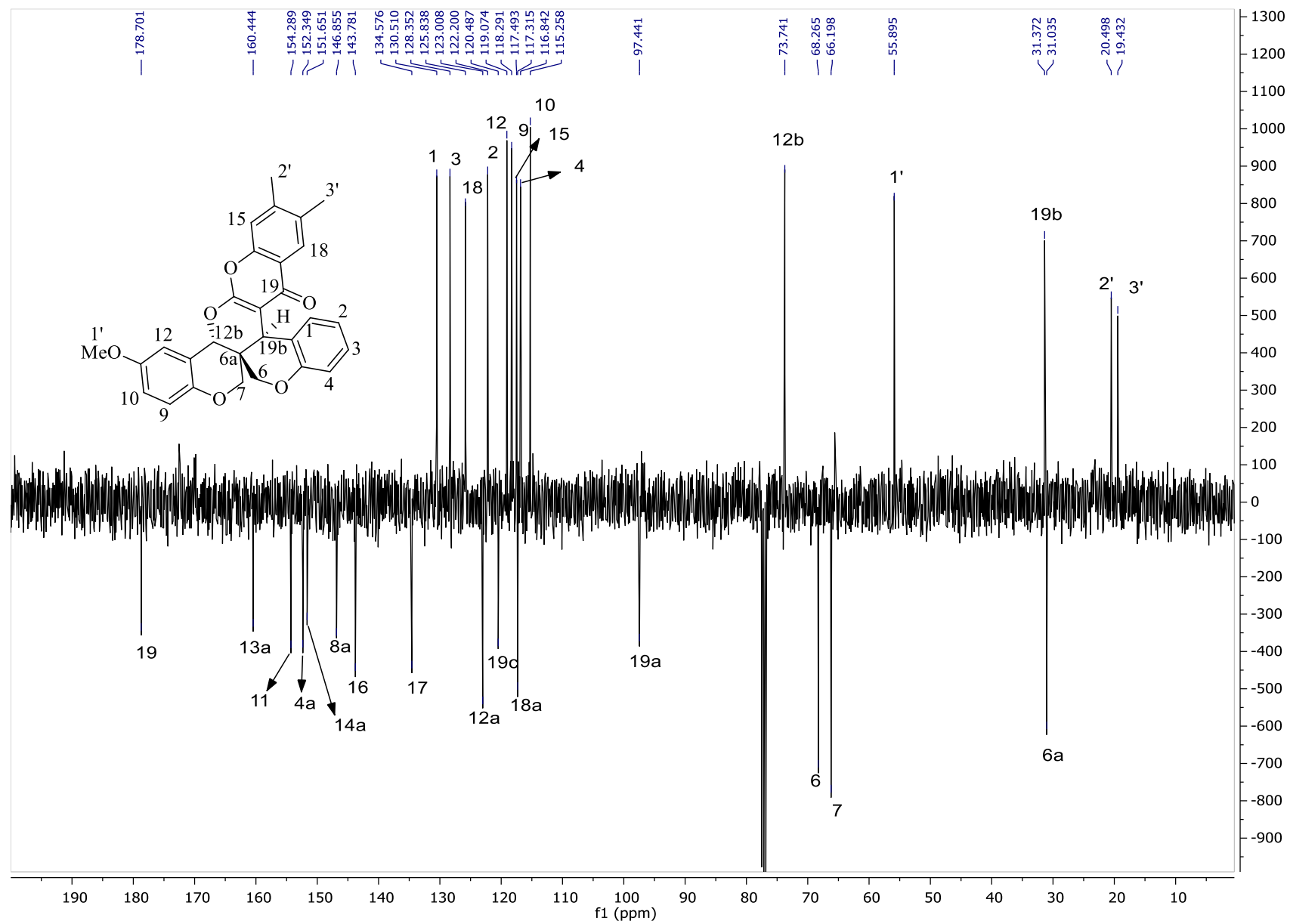


Figure S49. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-6**cb** in CDCl₃ at 100 MHz.

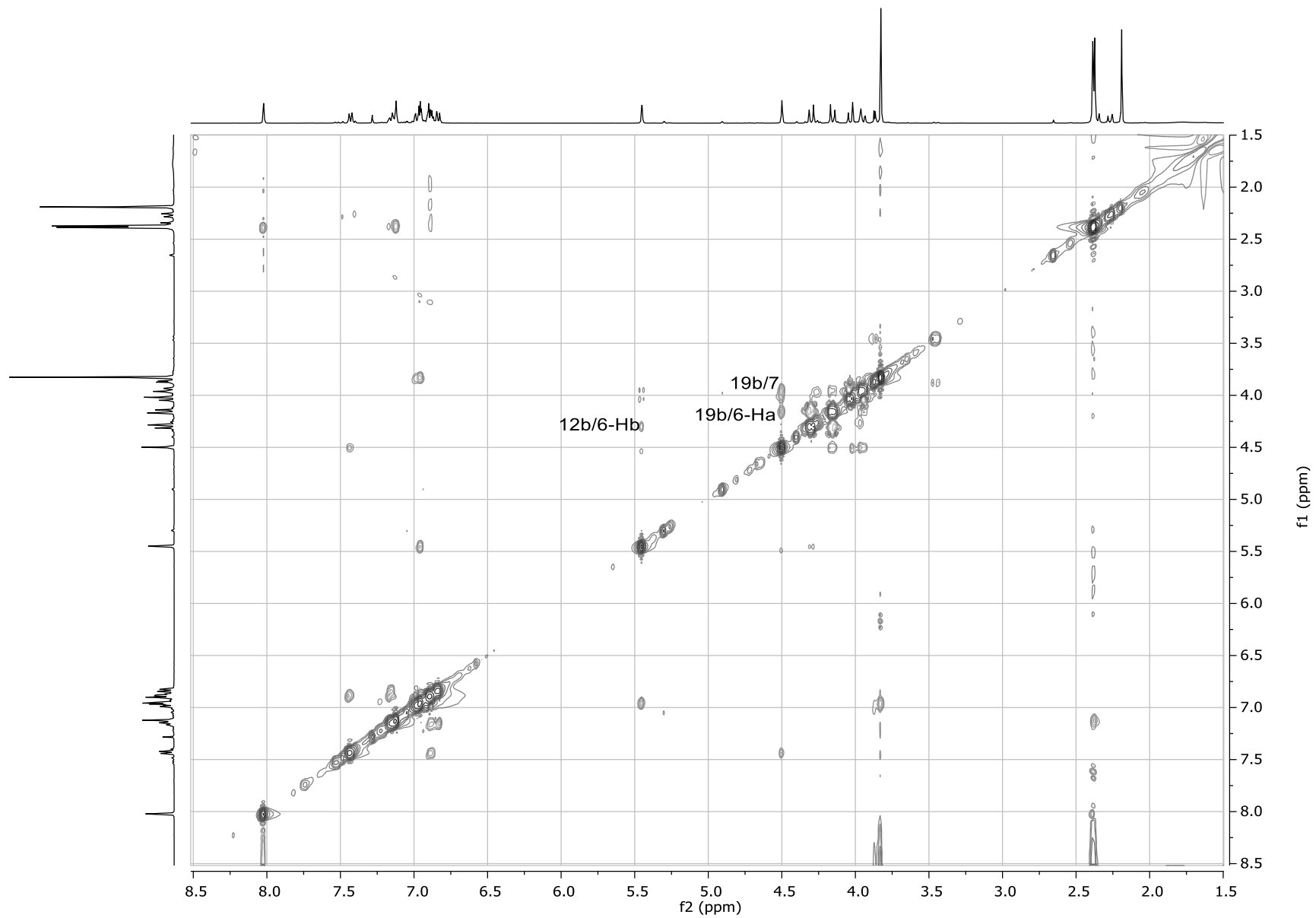


Figure S50. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-6cb in CDCl₃ at 400 MHz.

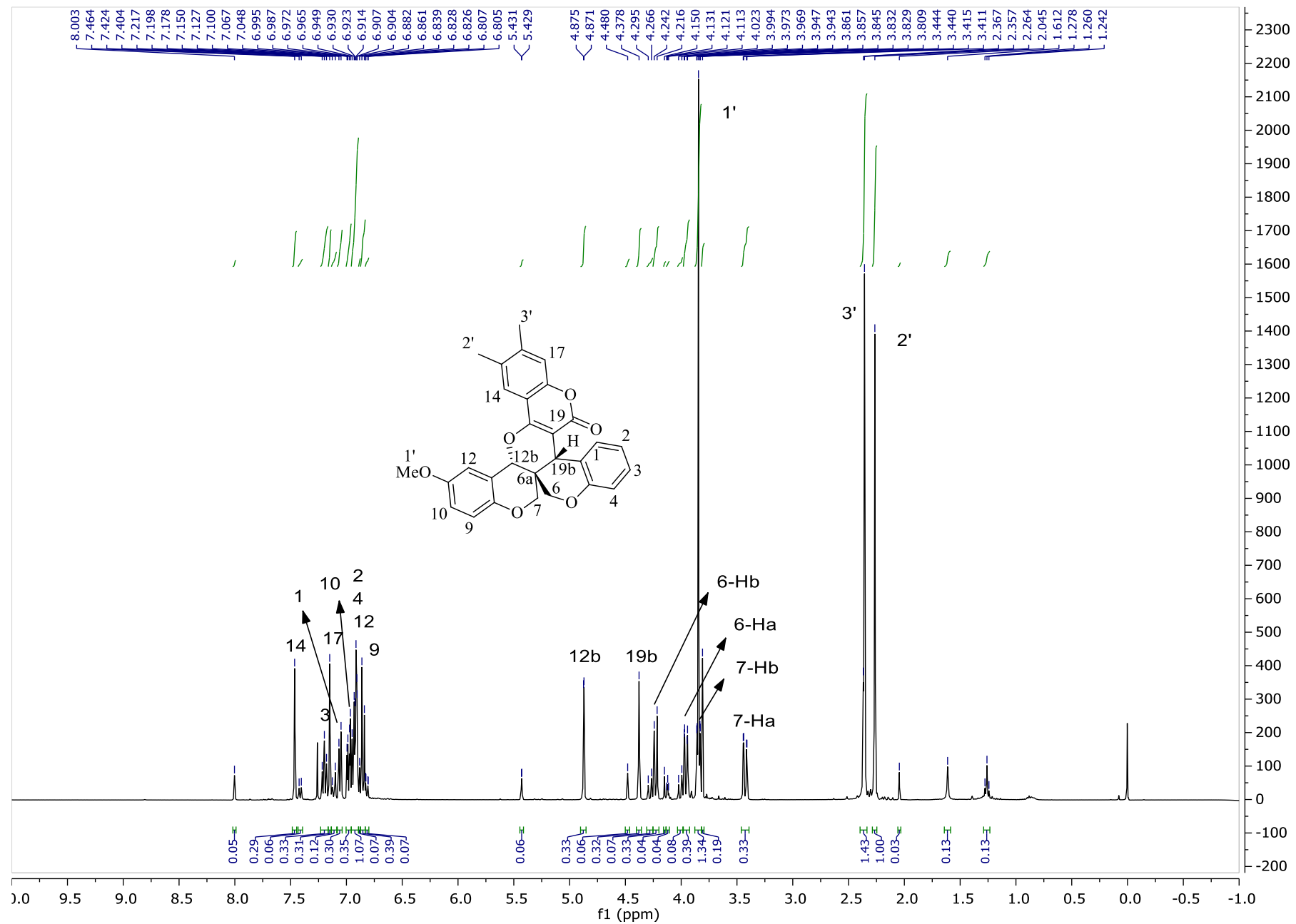


Figure S51. ¹H-NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**5cb** in CDCl₃ at 400 MHz.

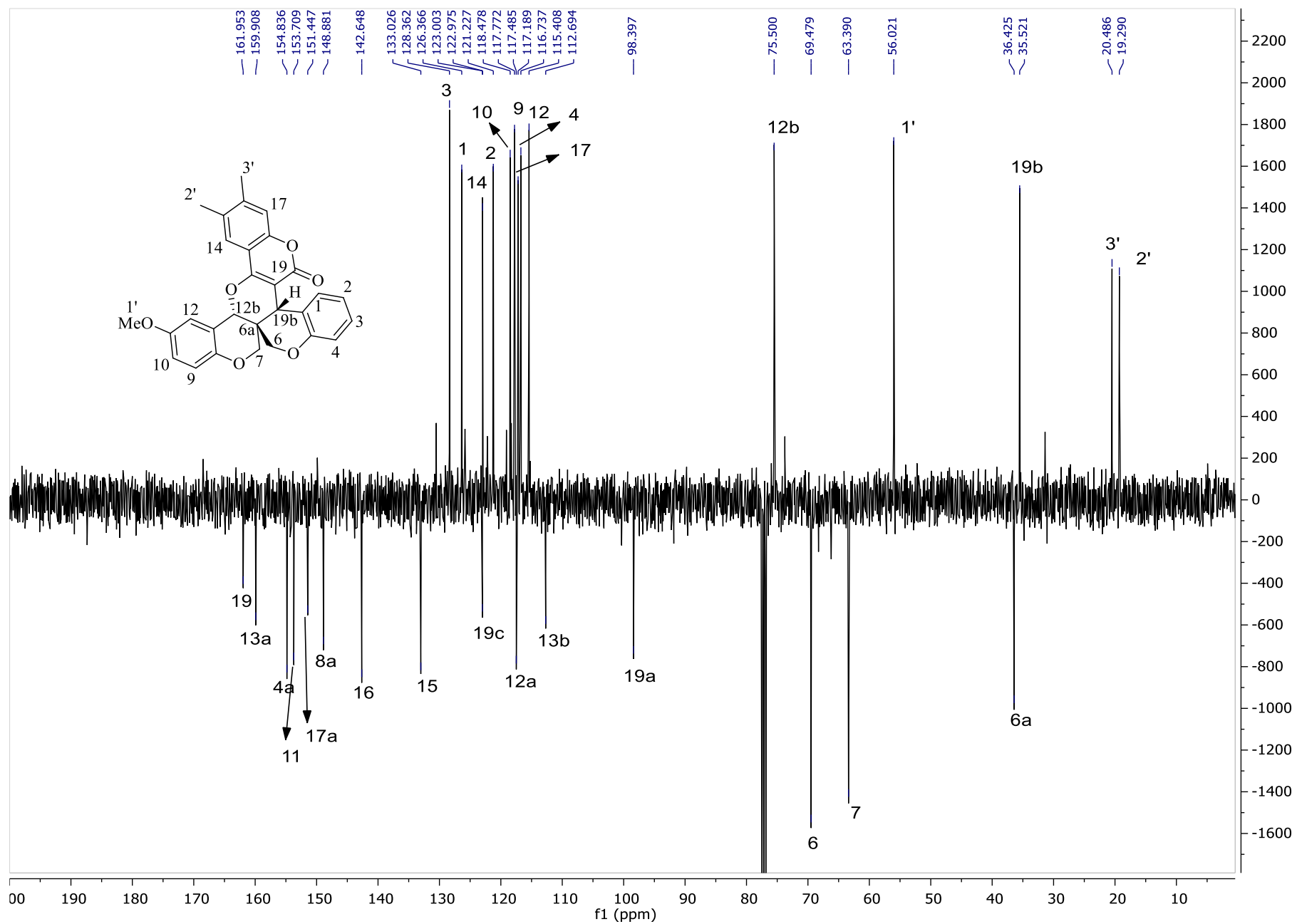


Figure S52. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-5**cb** in CDCl_3 at 100 MHz.

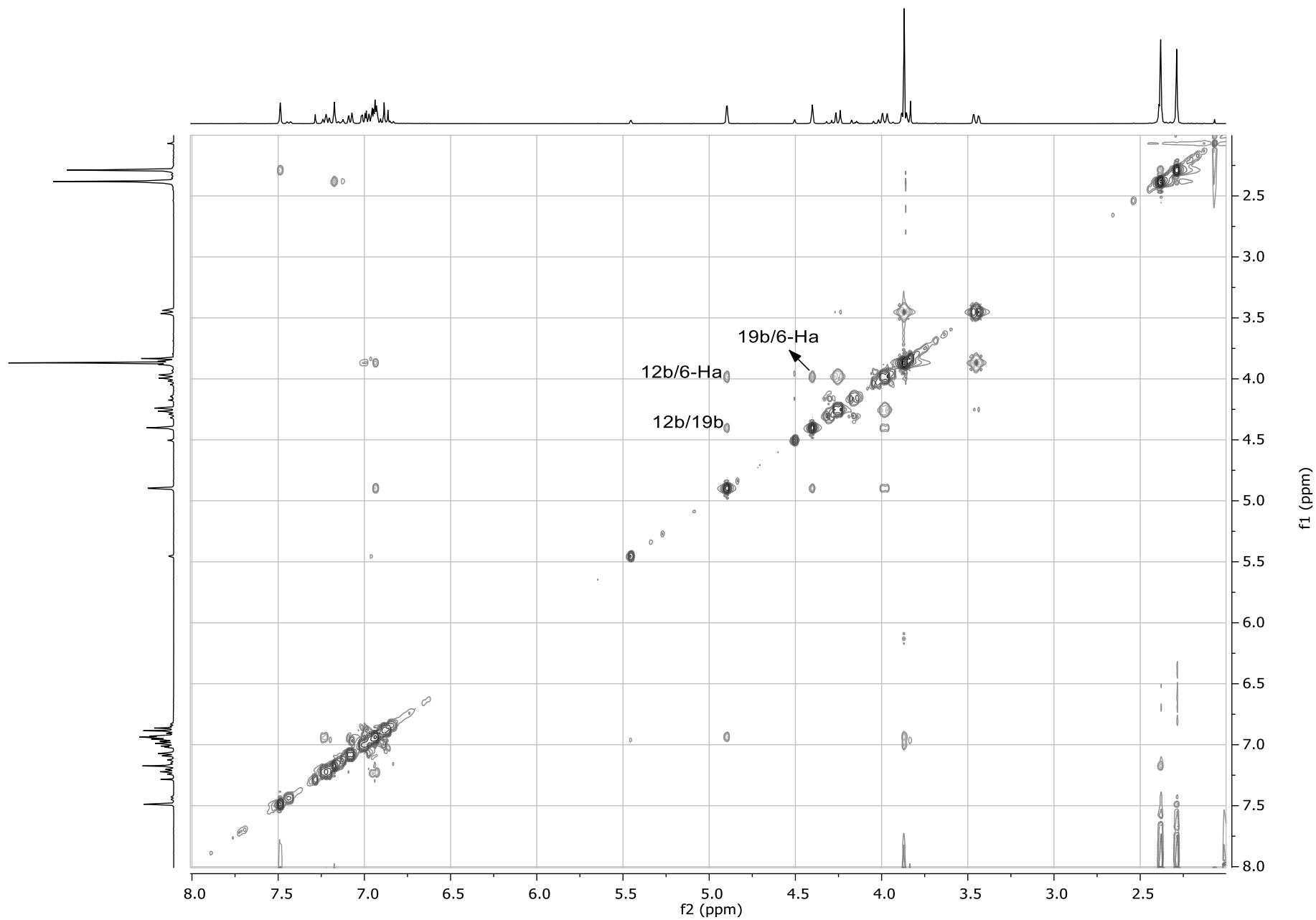


Figure S53. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-5**cb** in CDCl₃ at 400 MHz.

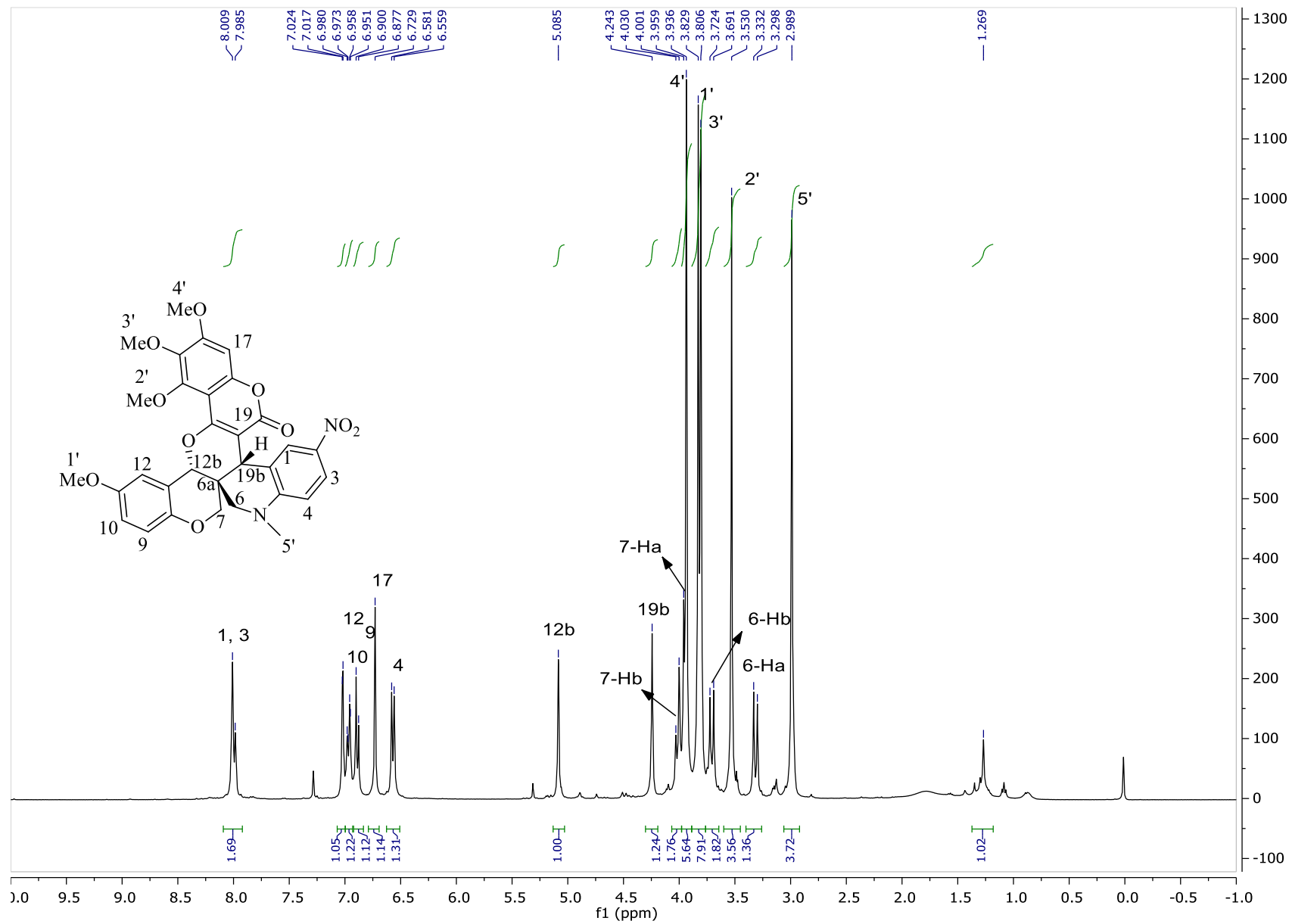


Figure S54. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4ac in CDCl₃ at 400 MHz.

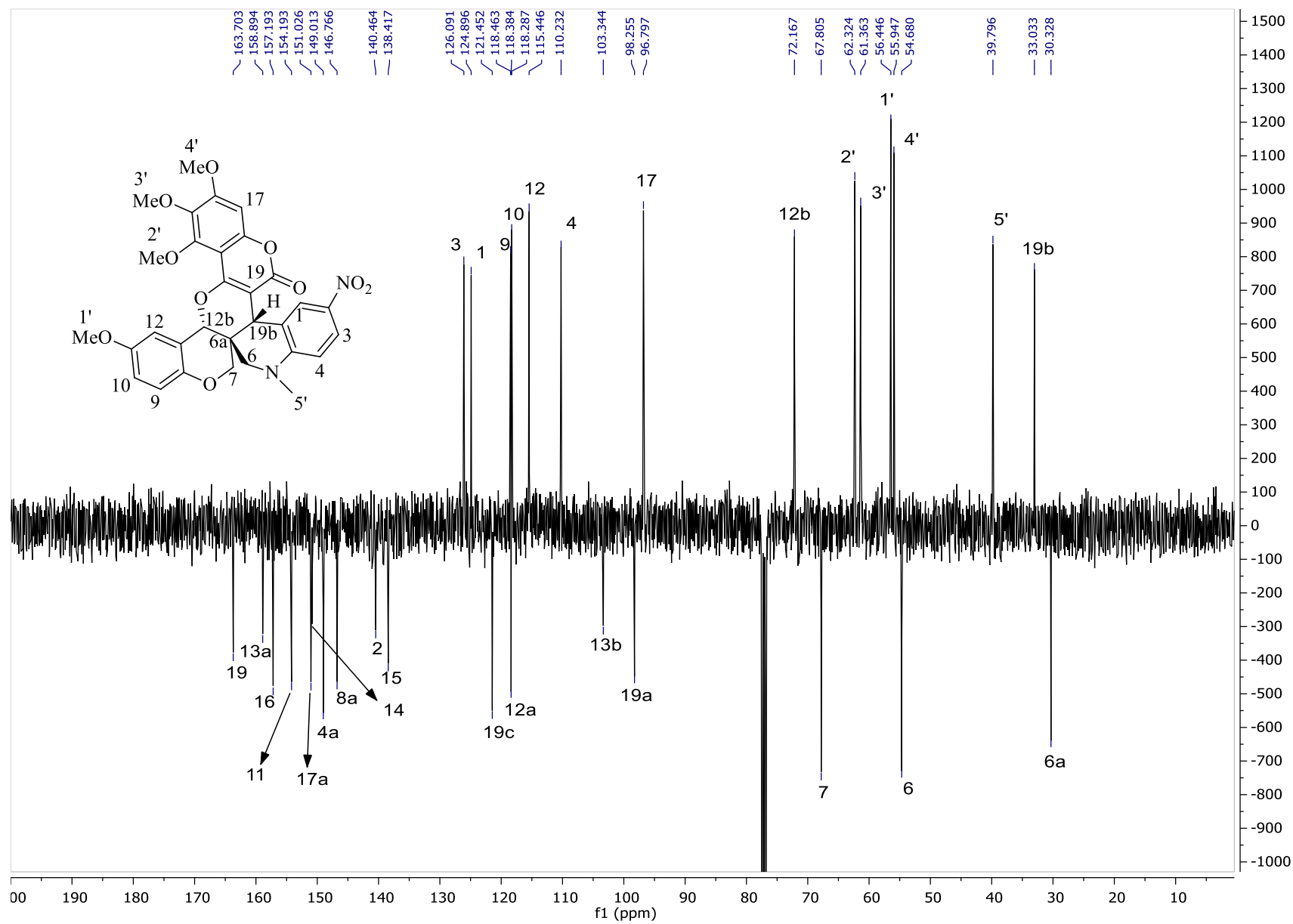


Figure S55. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4ac in CDCl_3 at 100 MHz.

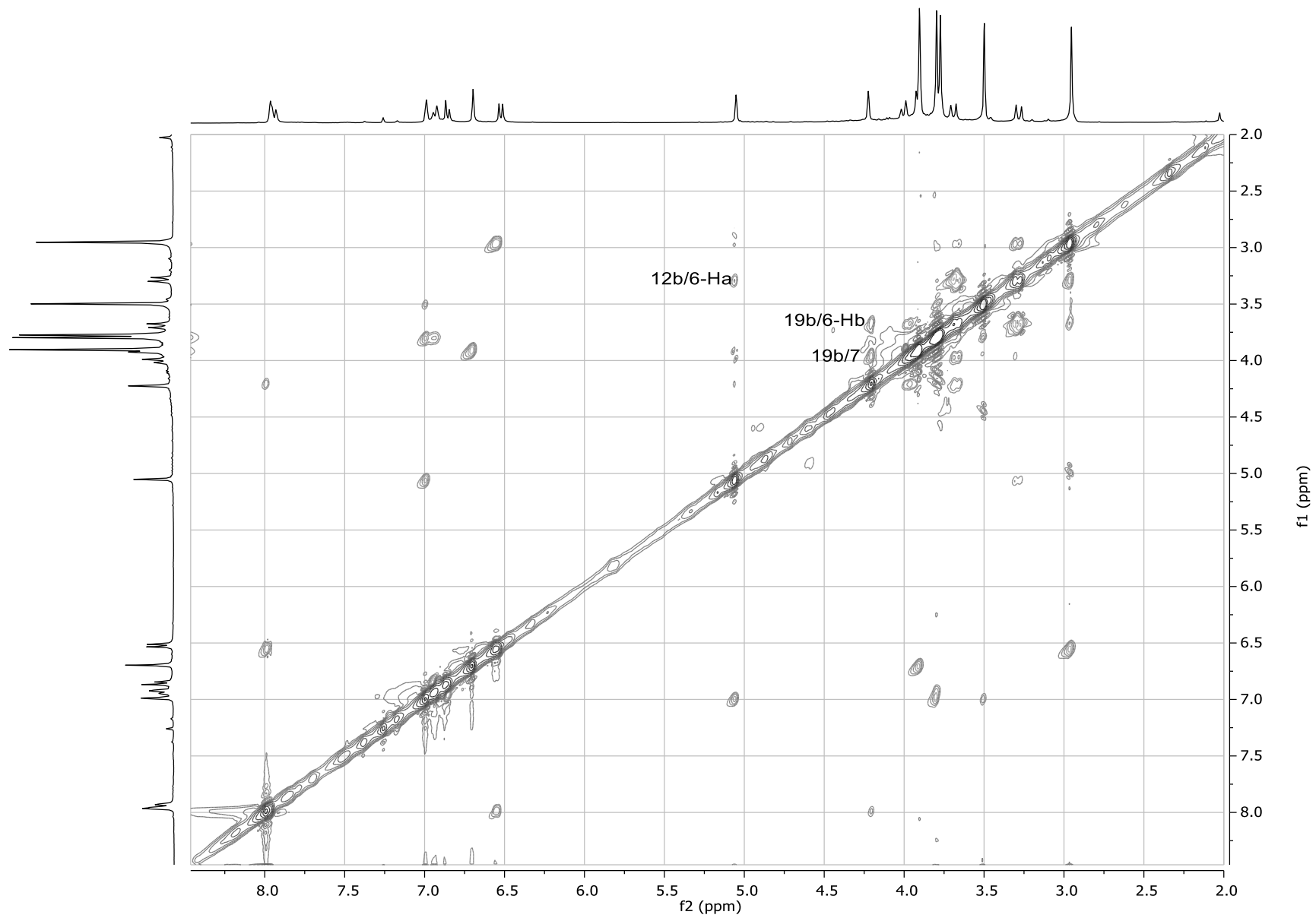


Figure S56. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**4ac** in CDCl₃ at 400 MHz.

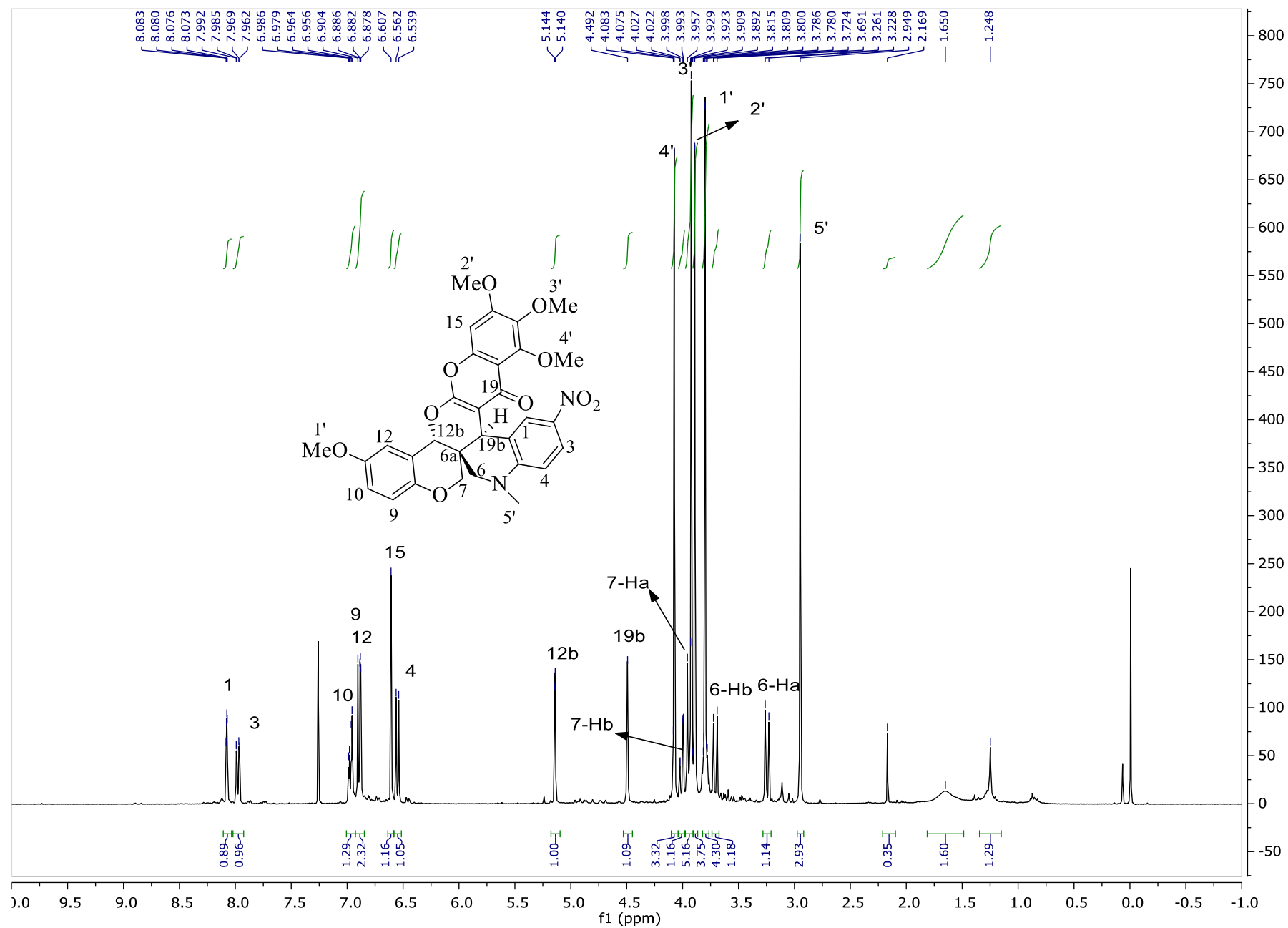


Figure S57. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-6ac in CDCl₃ at 400 MHz.

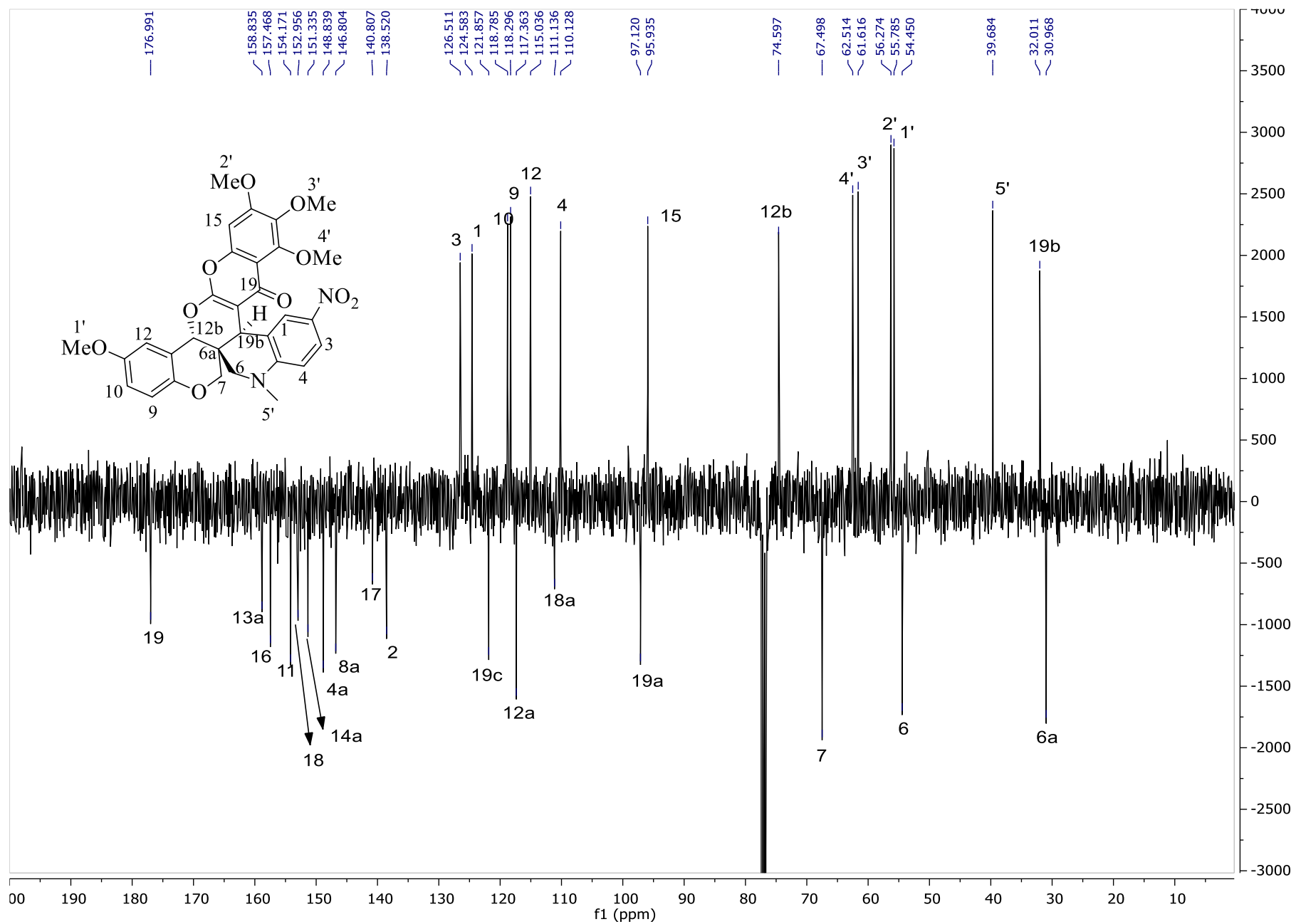


Figure S58. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-6ac in CDCl_3 at 100 MHz.

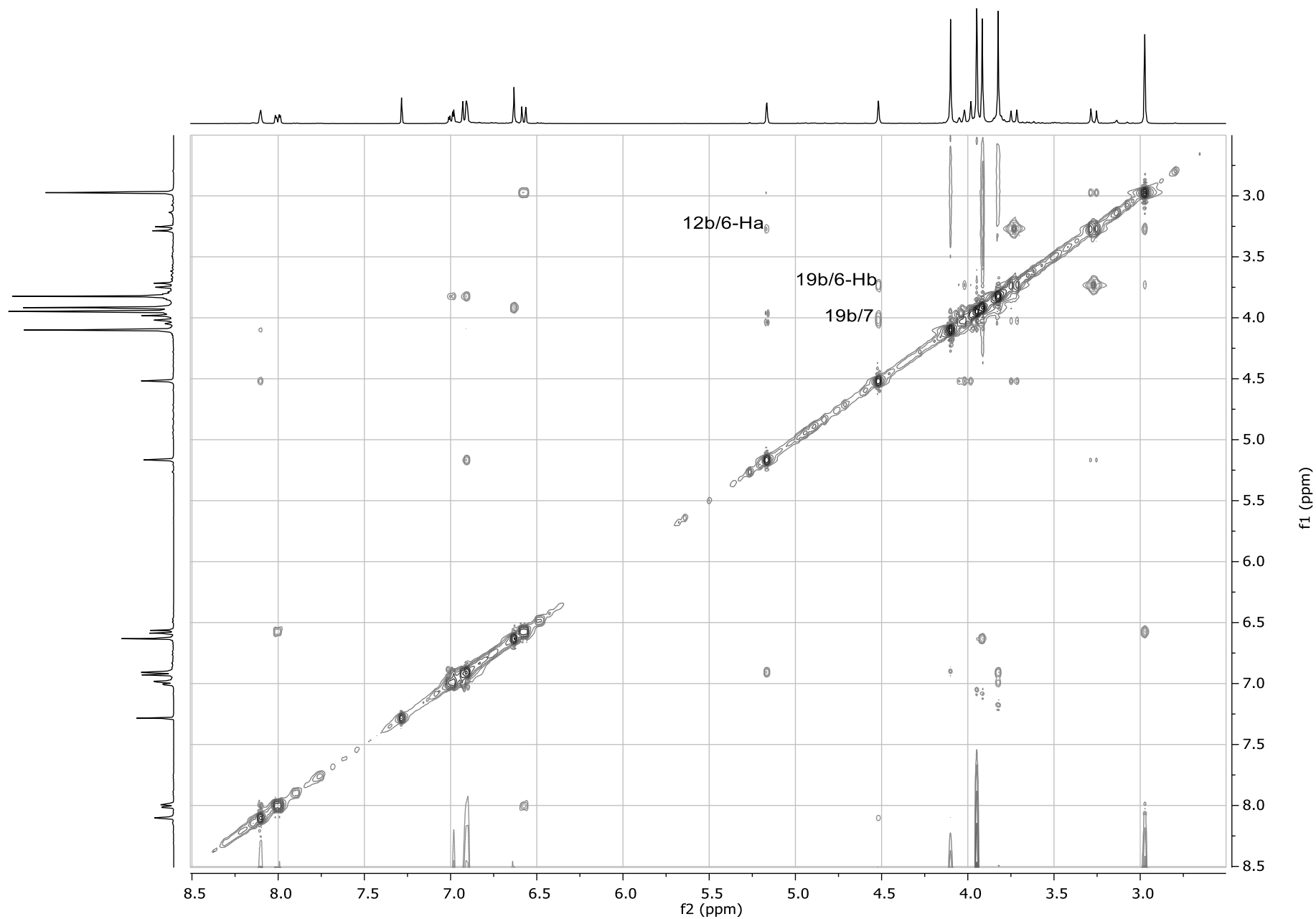


Figure S59. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**6ac** in CDCl₃ at 400 MHz.

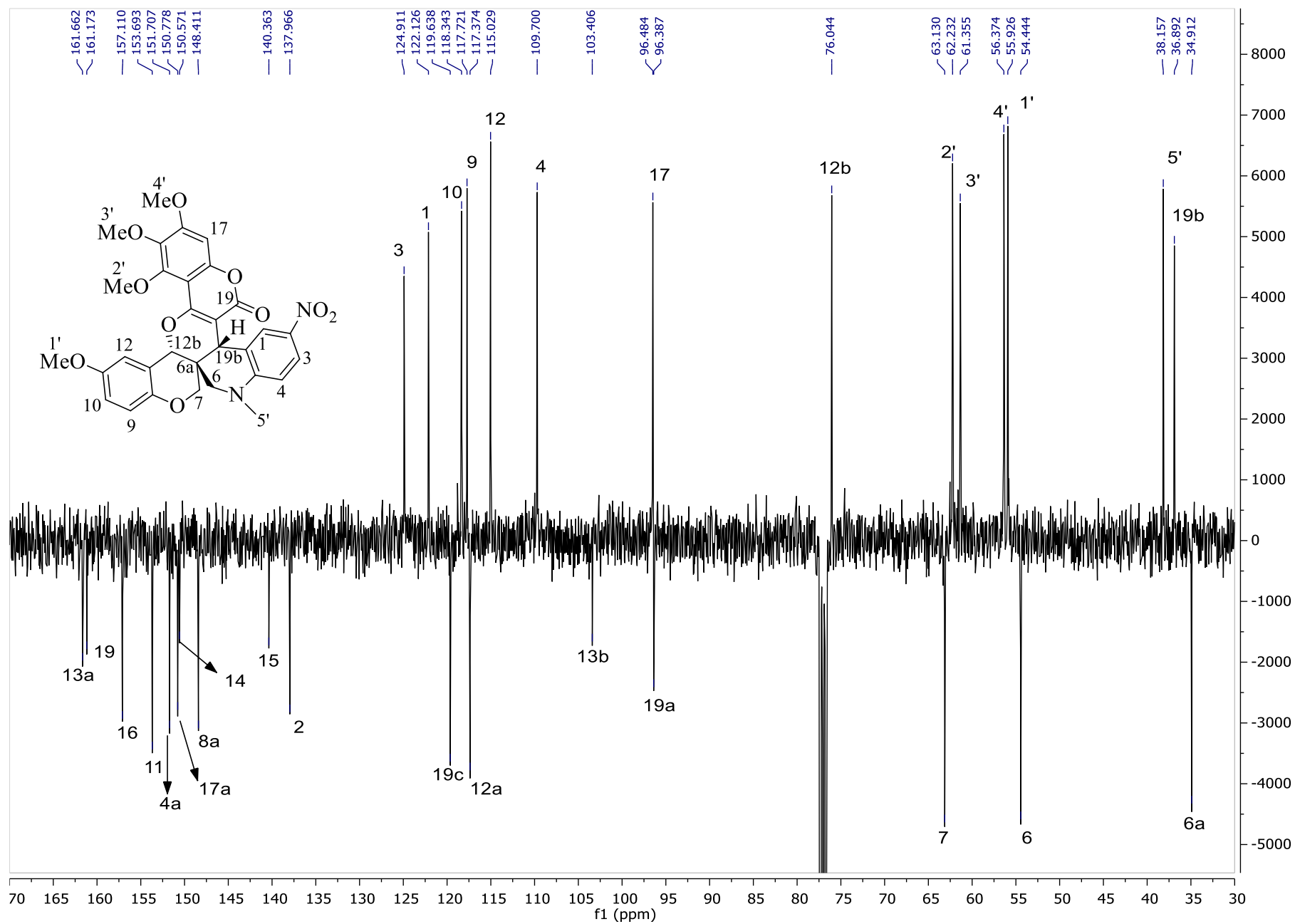


Figure S61. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-5ac in CDCl_3 at 100 MHz.

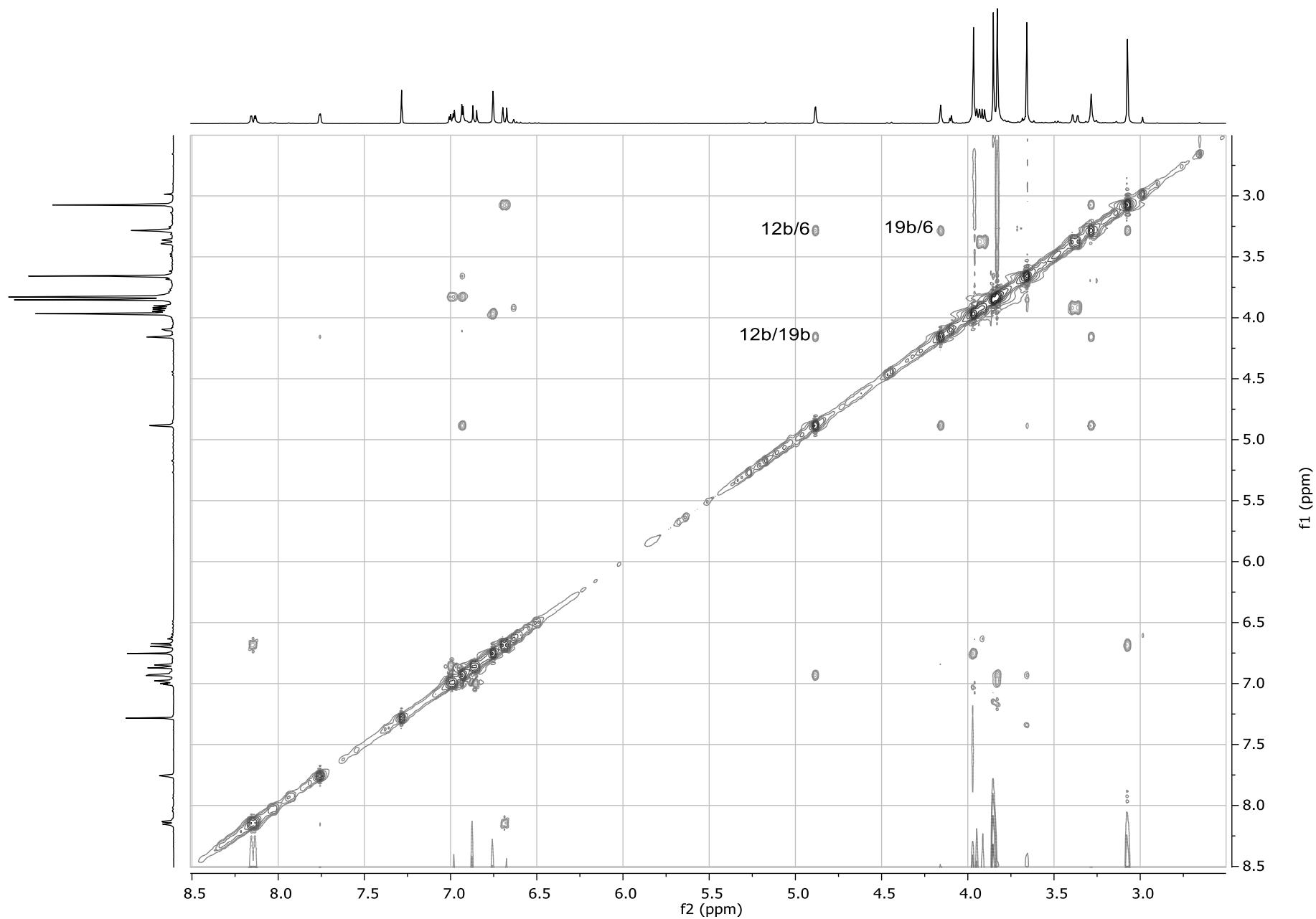


Figure S62. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*R*^{*})-**5ac** in CDCl₃ at 400 MHz.

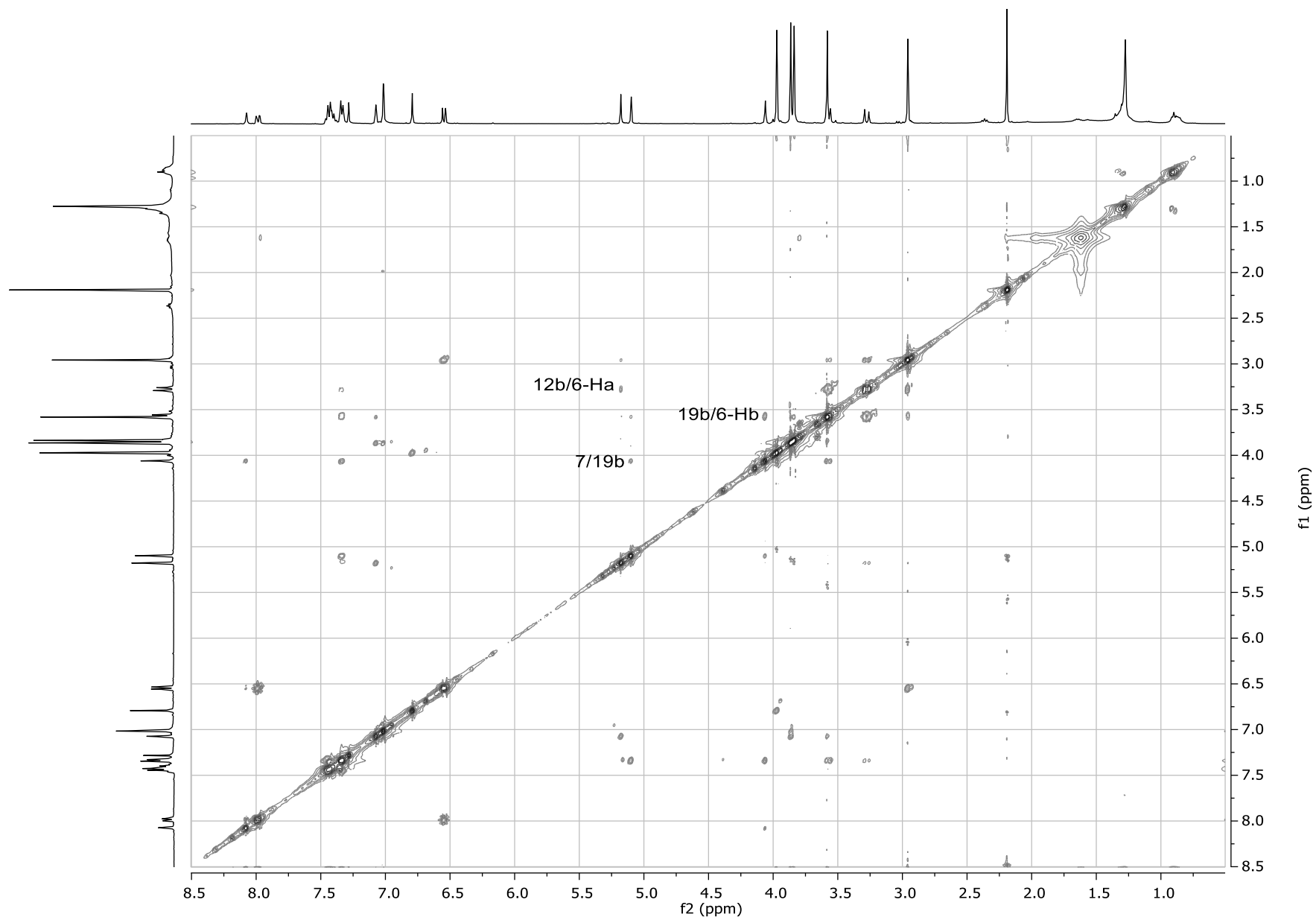


Figure S65. NOESY spectrum of (6a*S*,7*R*,12b*R*,19b*S*)-**4bc** in CDCl₃ at 400 MHz.

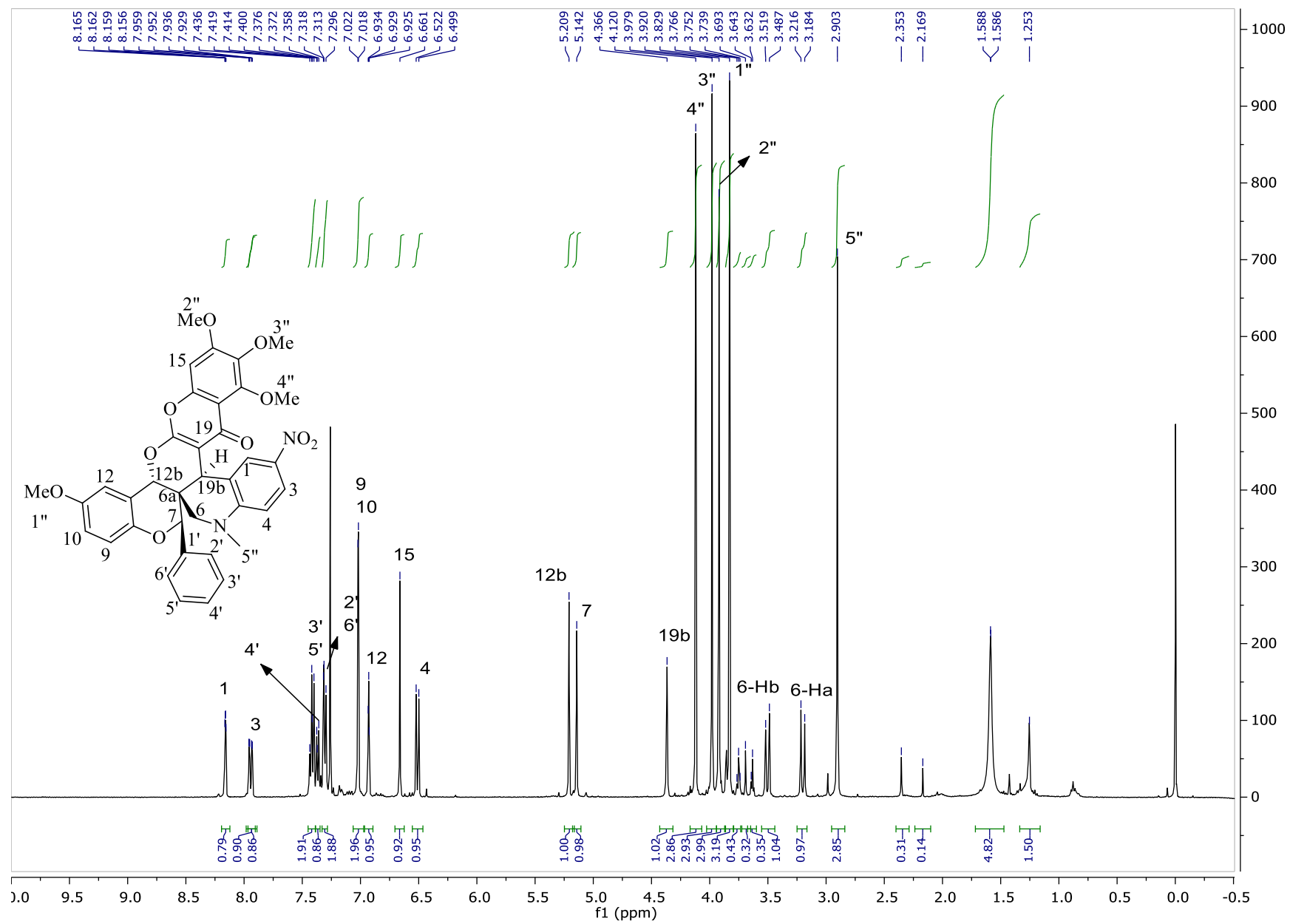


Figure S66. $^1\text{H-NMR}$ spectrum of $(6aS,7R,12bR,19bS)\text{-6bc}$ in CDCl_3 at 400 MHz.

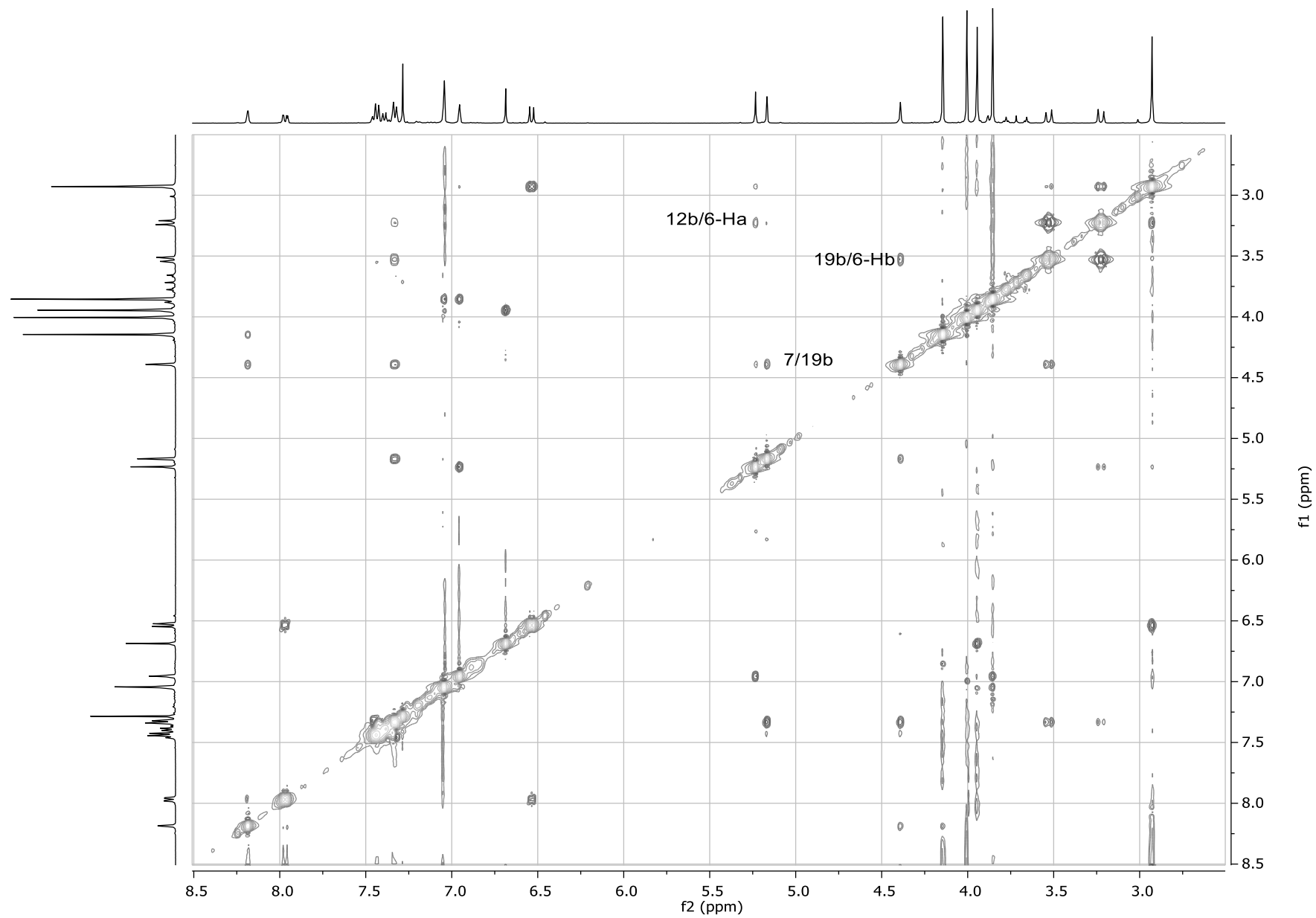


Figure S68. NOESY spectrum of (6a*S*,7*R*,12b*R*,19b*S*)-**6bc** in CDCl₃ at 400 MHz.

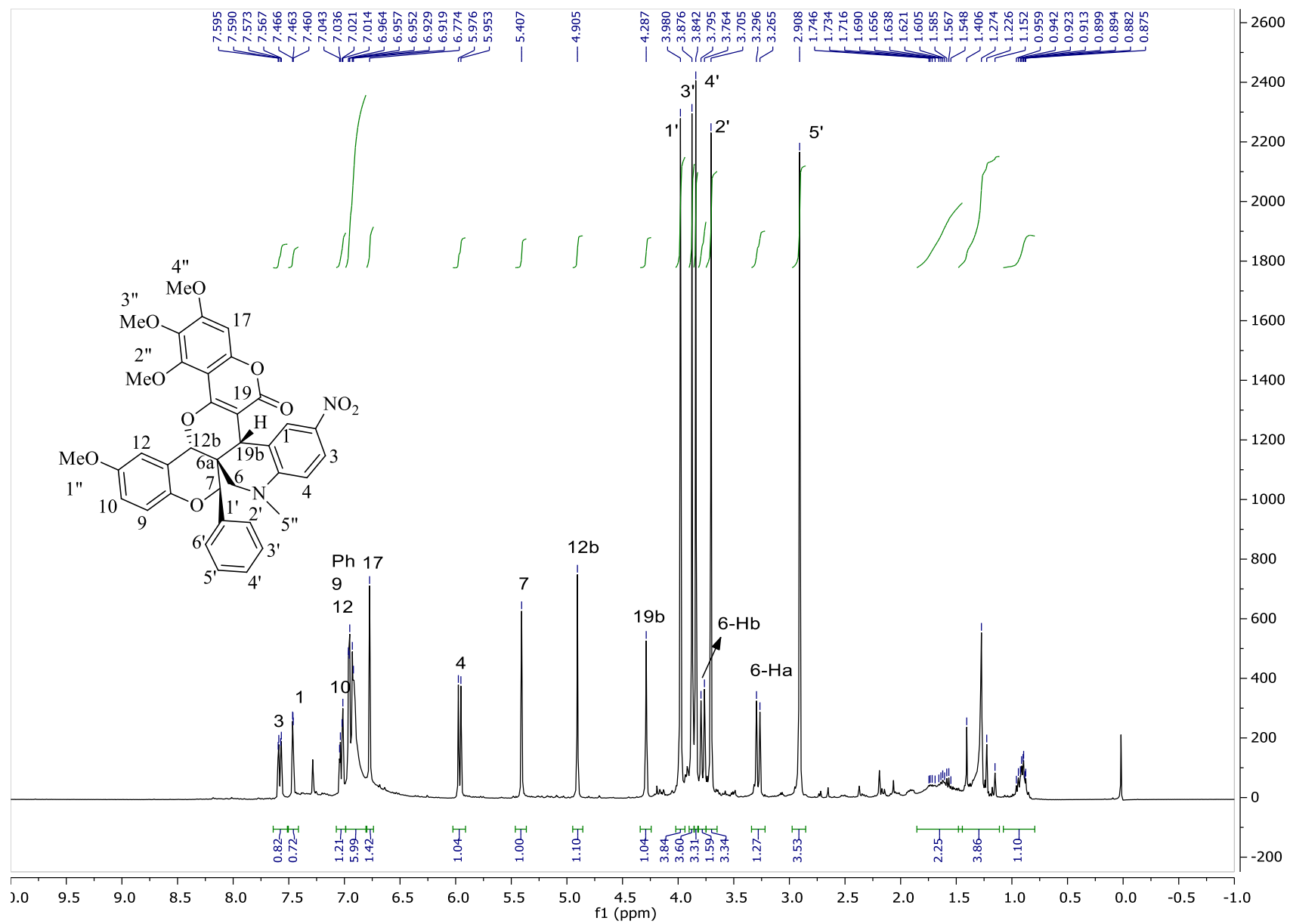


Figure S69. $^1\text{H-NMR}$ spectrum of (6aS,7R,12bR,19bR)-5bc in CDCl_3 at 400 MHz.

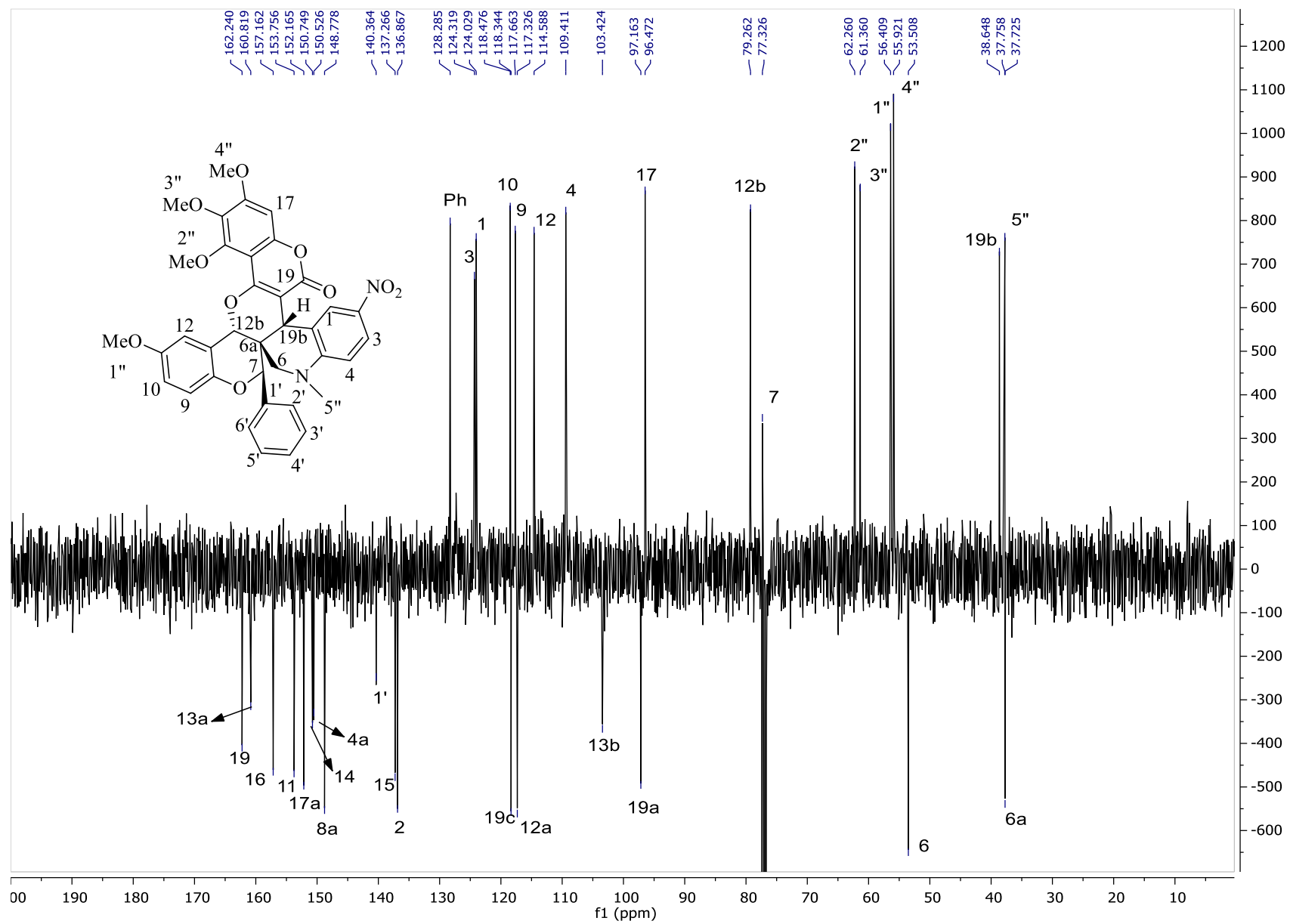


Figure S70. ¹³C-NMR spectrum of (6aS,7R,12bR,19bR)-5bc in CDCl₃ at 100 MHz.

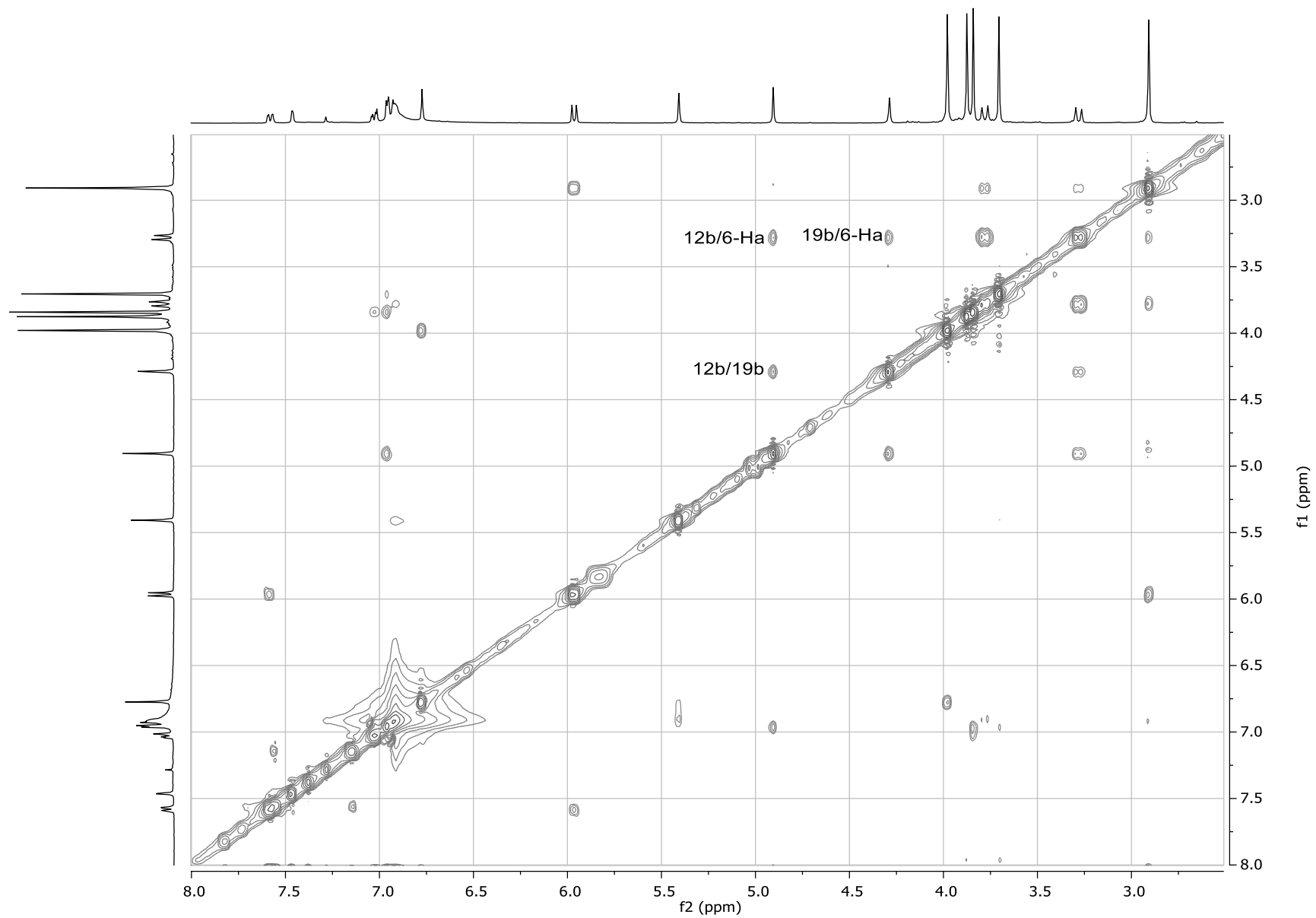


Figure S71. NOESY spectrum of (6a*S*,7*R*,12*bR*,19*bR*)-**5bc** in CDCl₃ at 400 MHz.

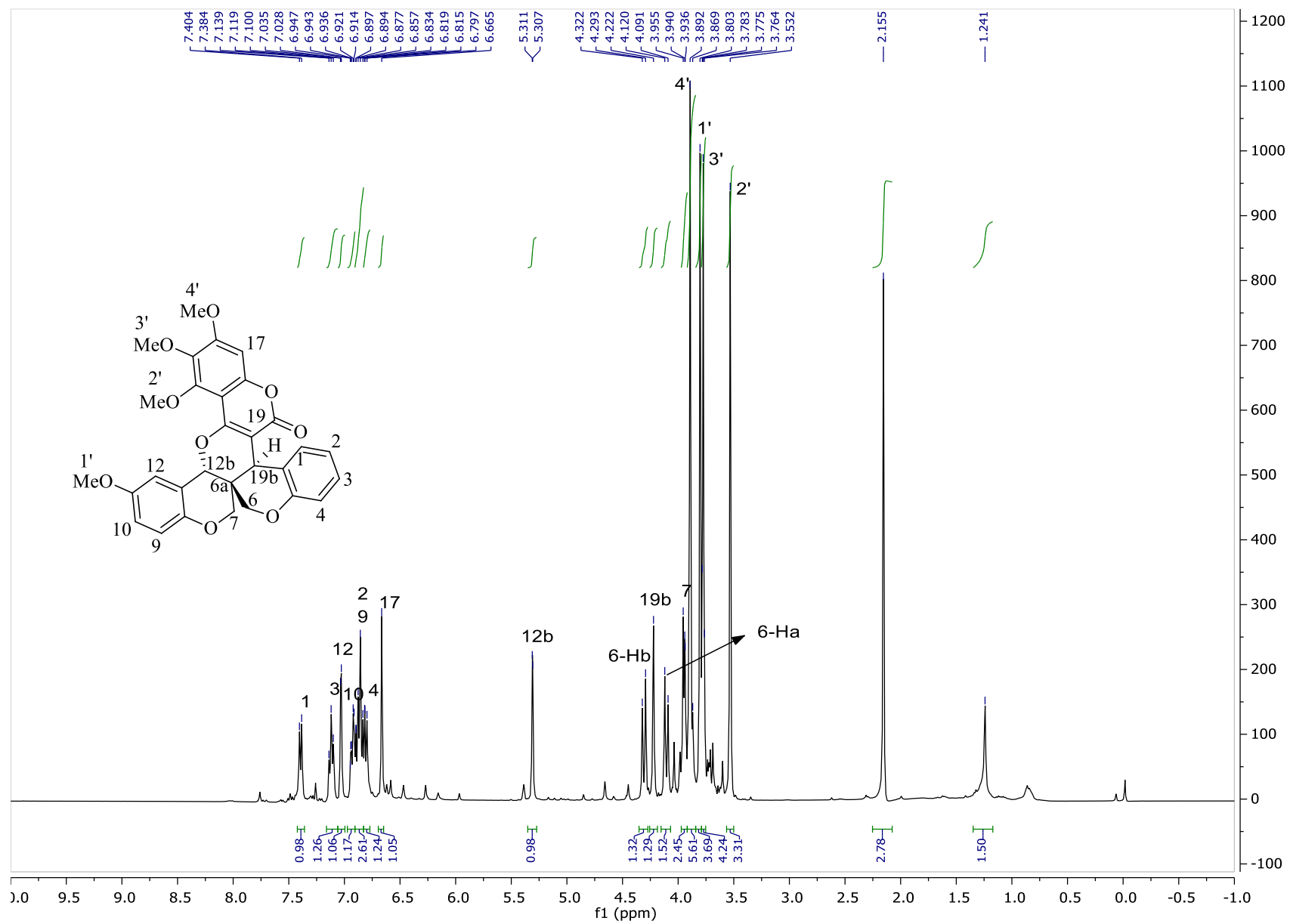


Figure S72. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4cc in CDCl₃ at 400 MHz.

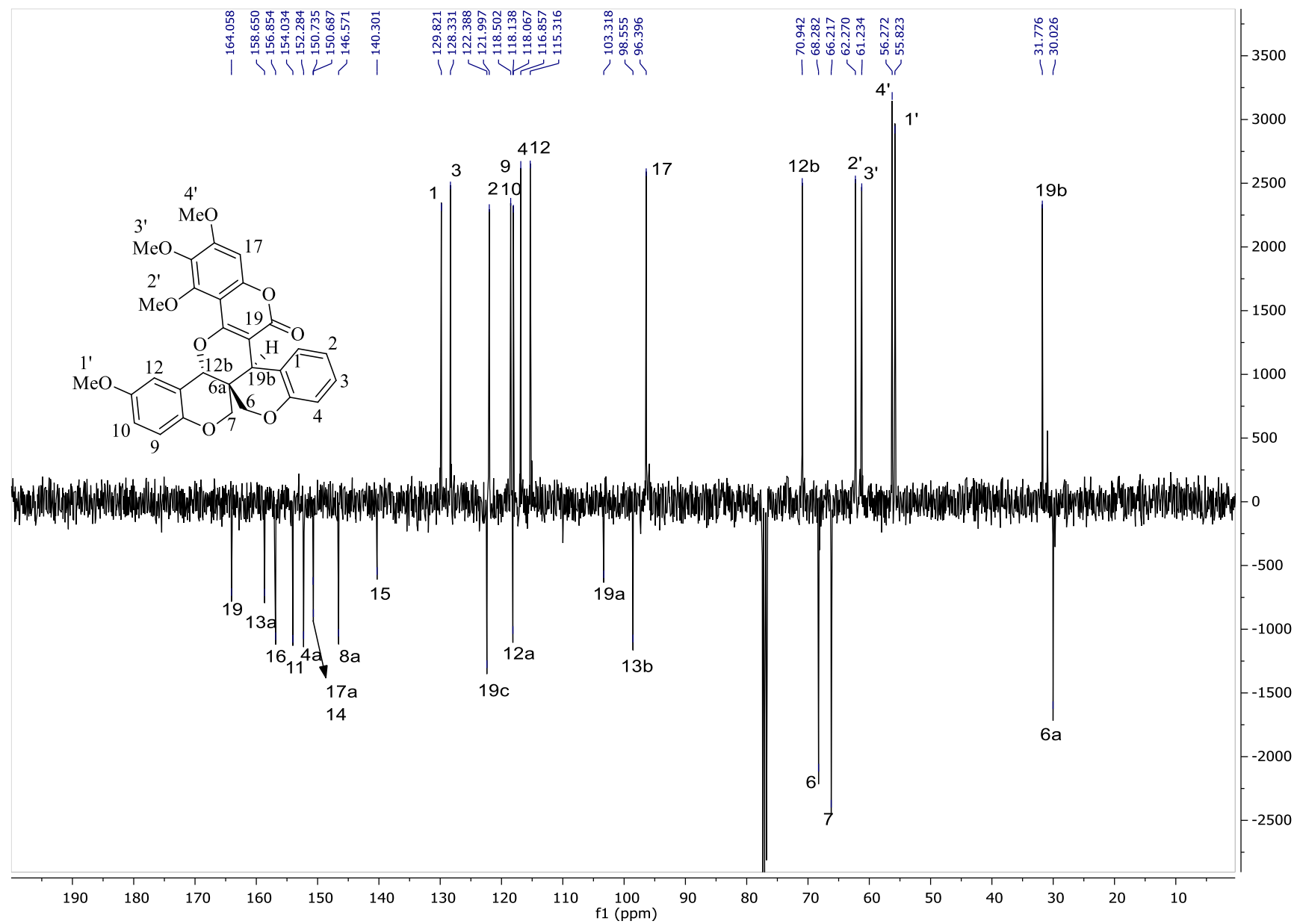


Figure S73. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4cc in CDCl_3 at 100 MHz.

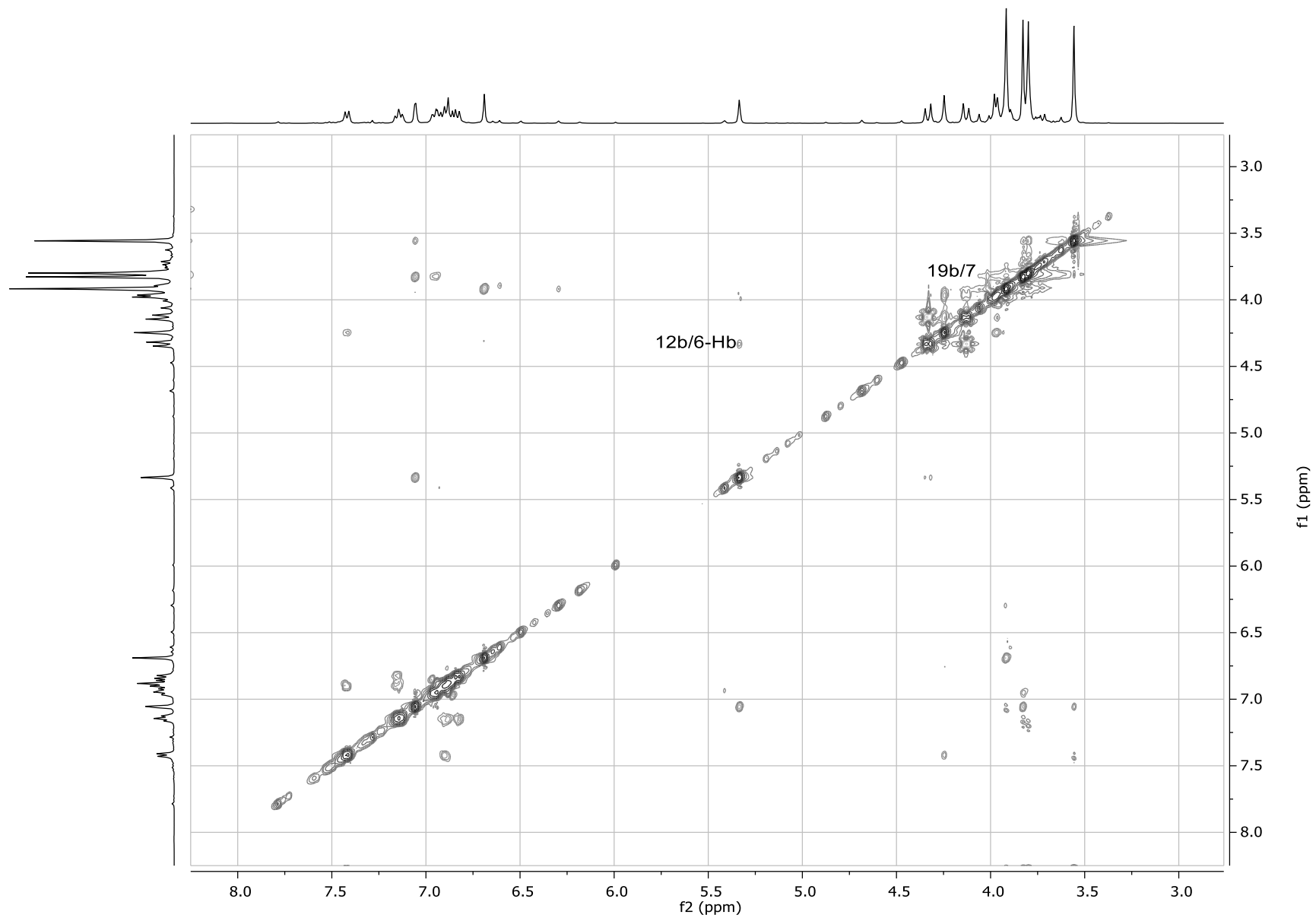


Figure S74. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-**4cc** in CDCl₃ at 400 MHz.

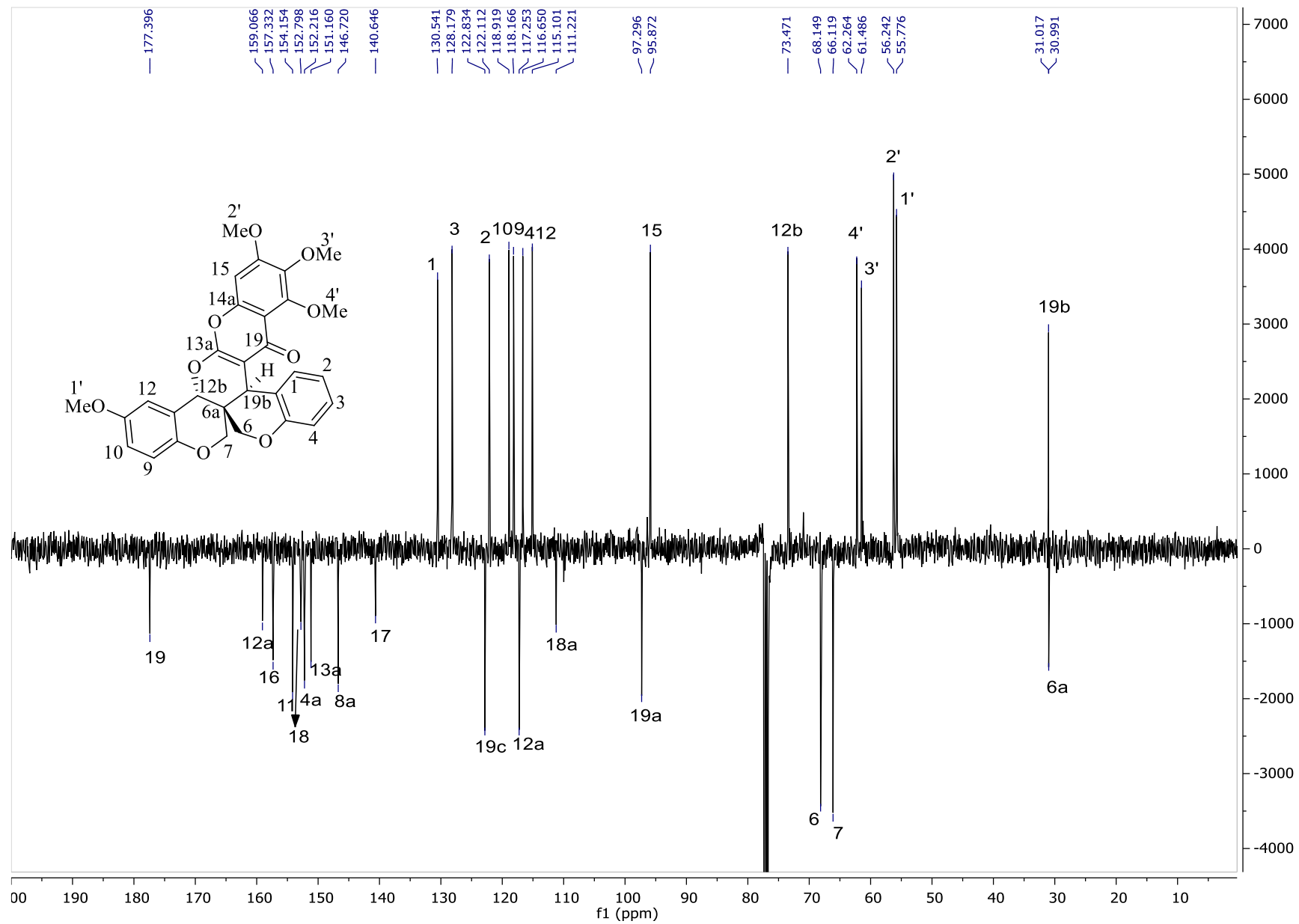


Figure S76. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-6cc in CDCl₃ at 100 MHz.

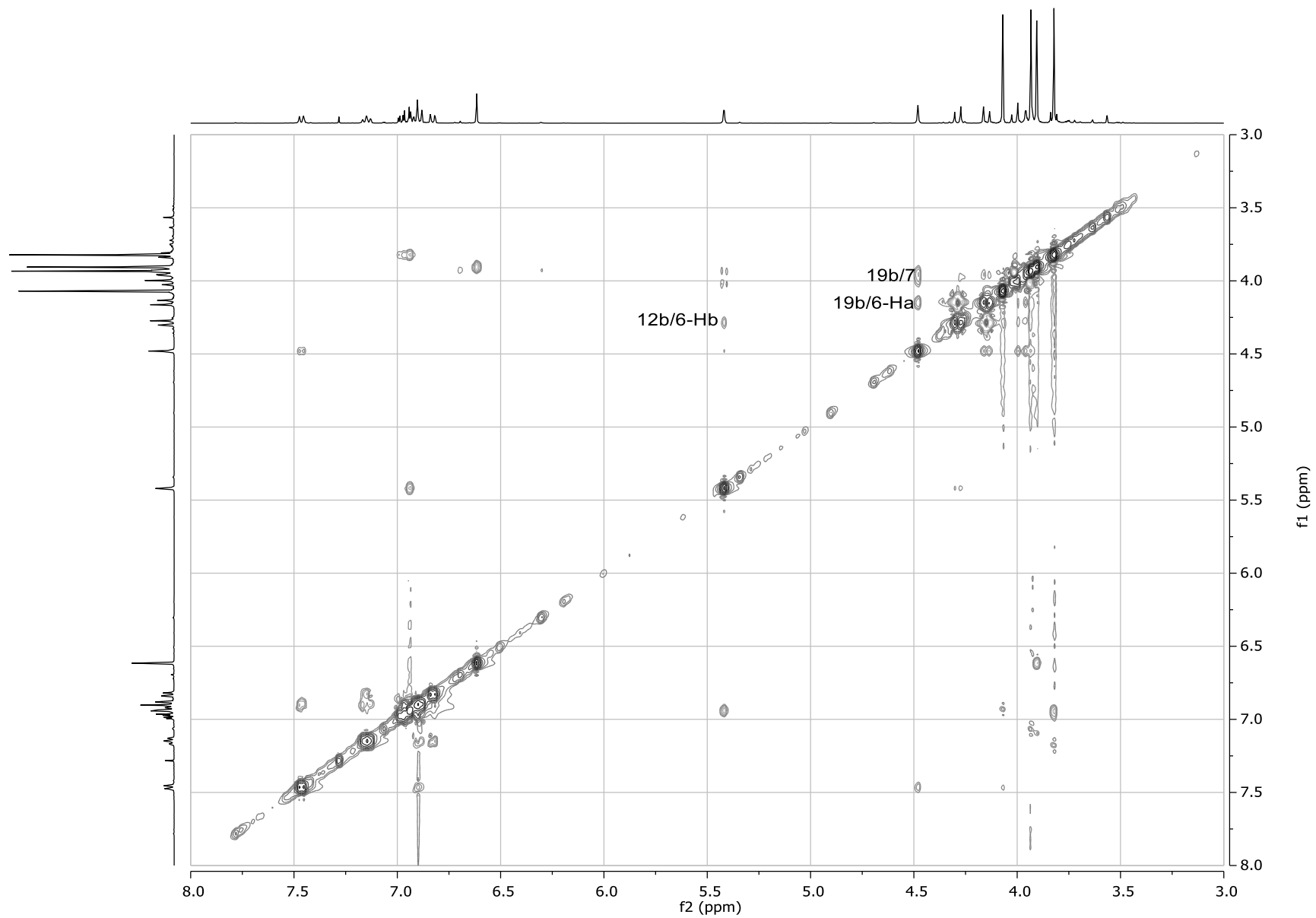


Figure S77. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-**6cc** in CDCl₃ at 400 MHz.

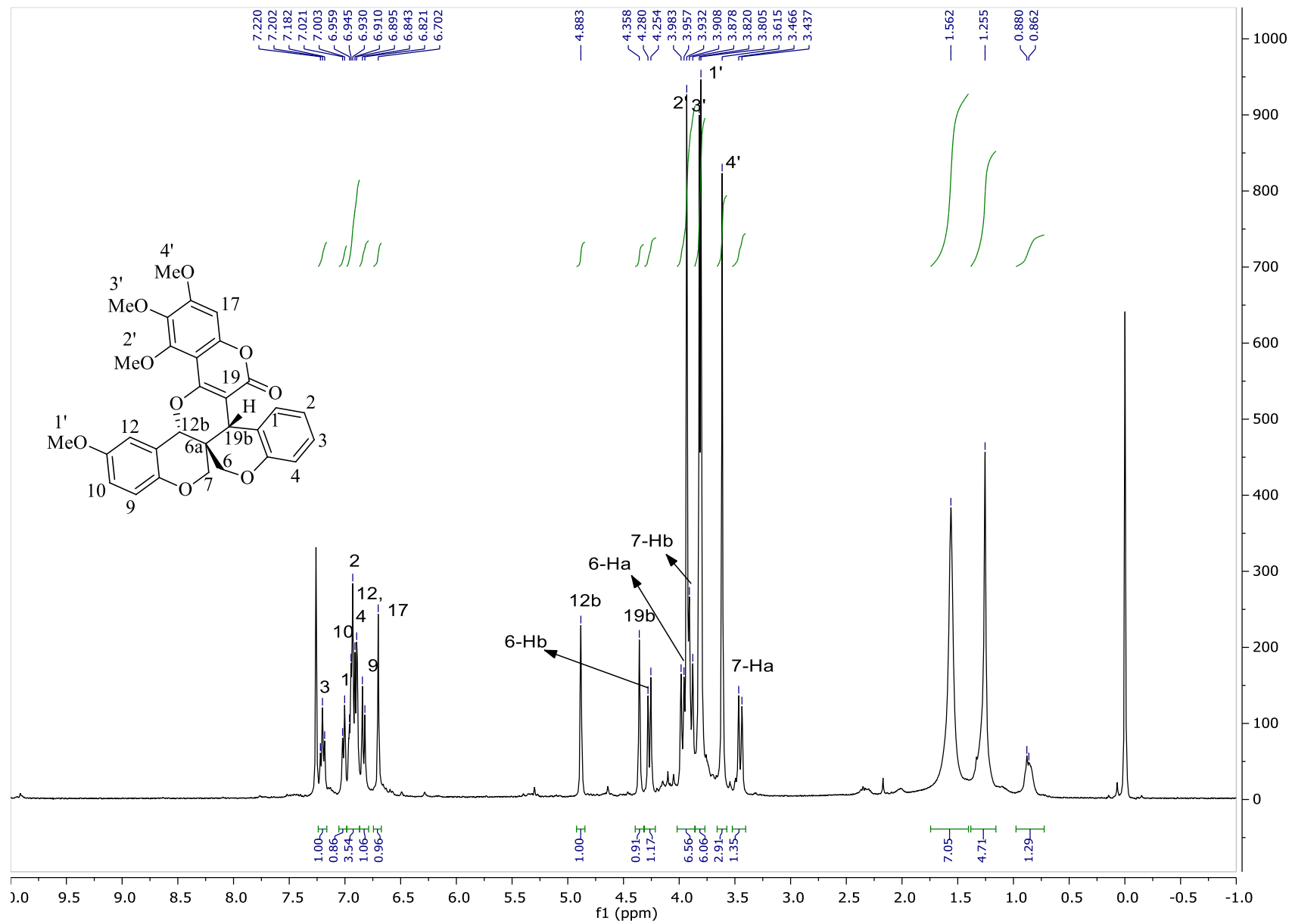


Figure S78. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-5cc in CDCl₃ at 400 MHz.

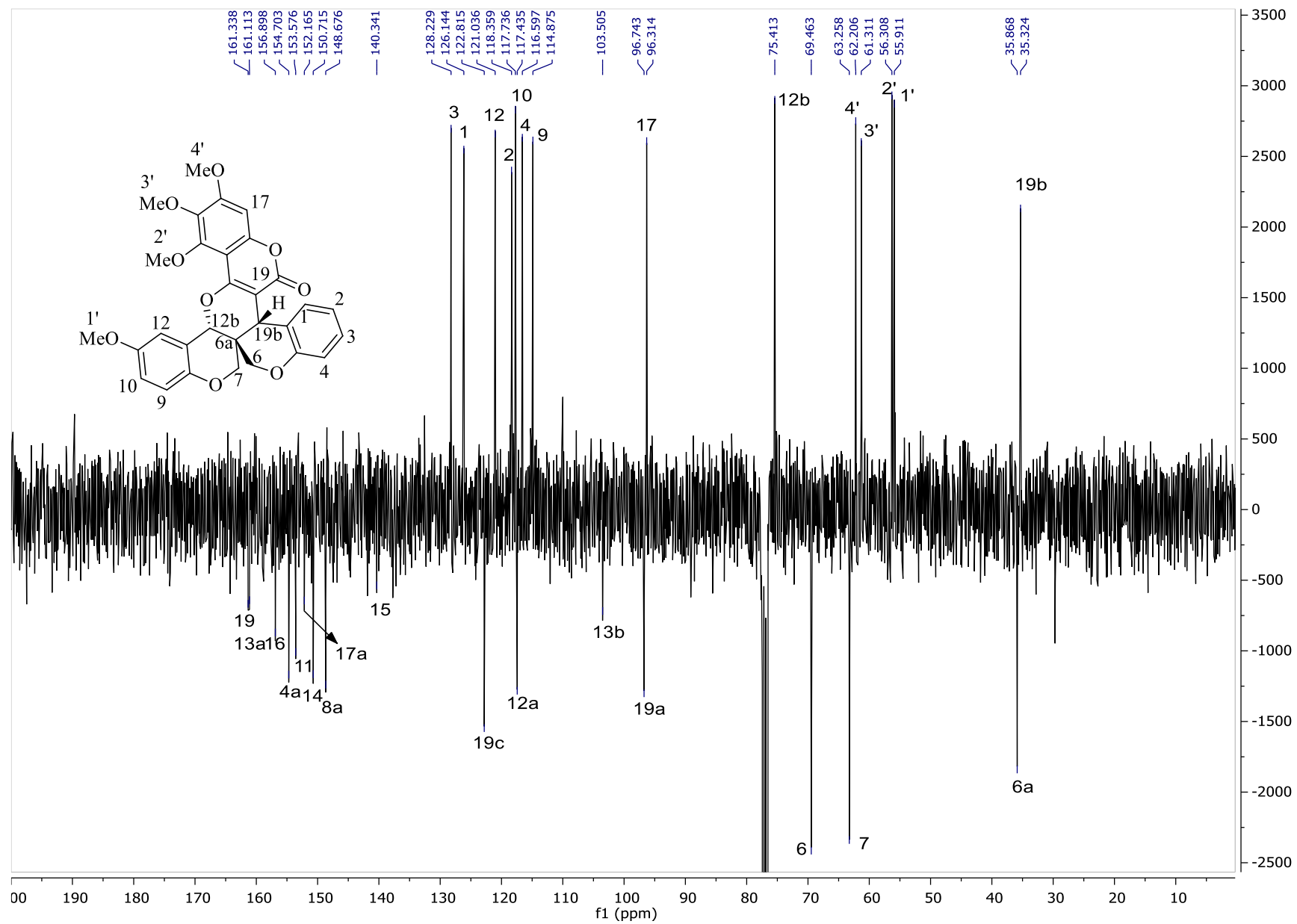


Figure S79. ^{13}C -NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-5cc in CDCl_3 at 100 MHz.

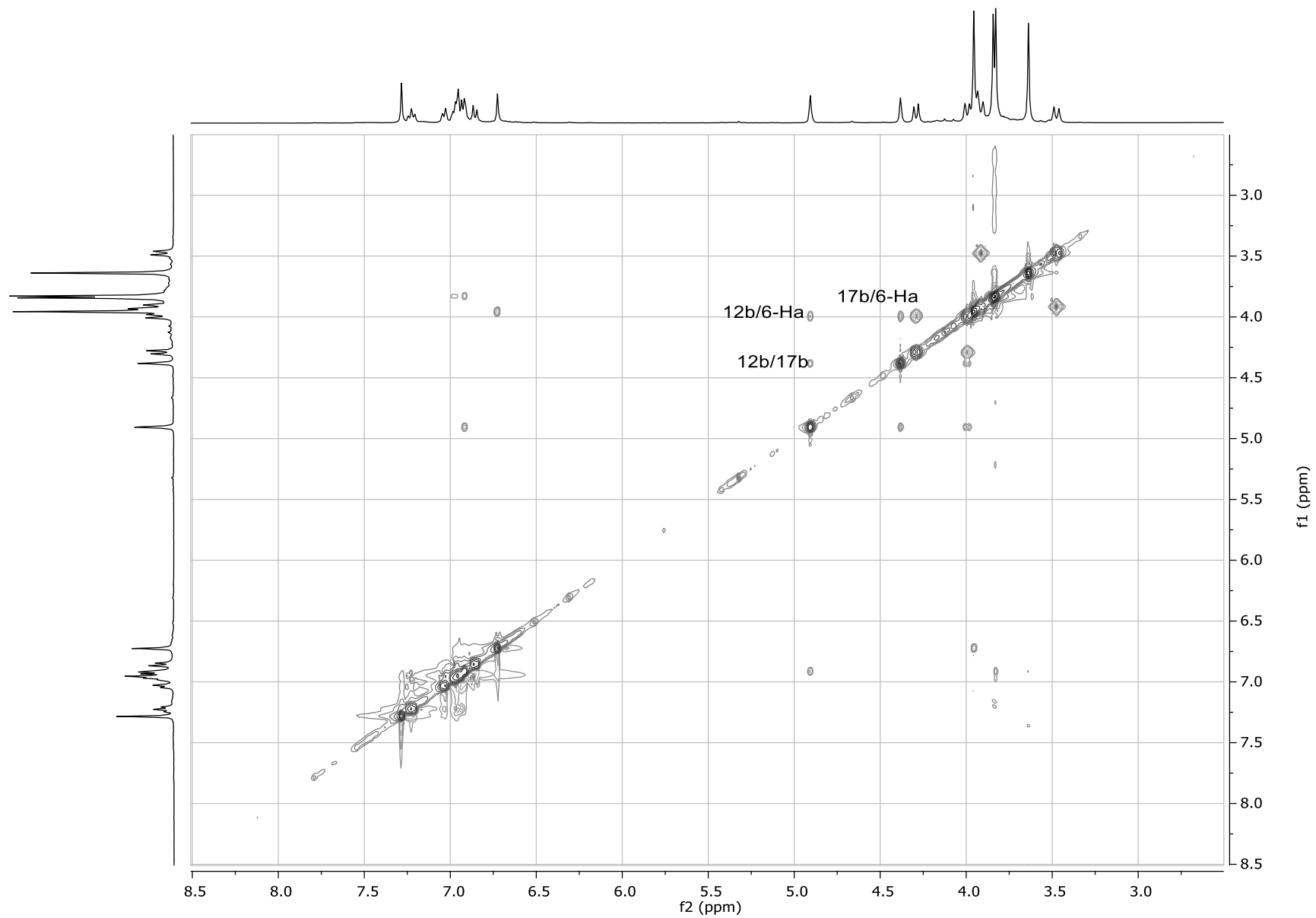


Figure S80. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-5cc in CDCl₃ at 400 MHz.

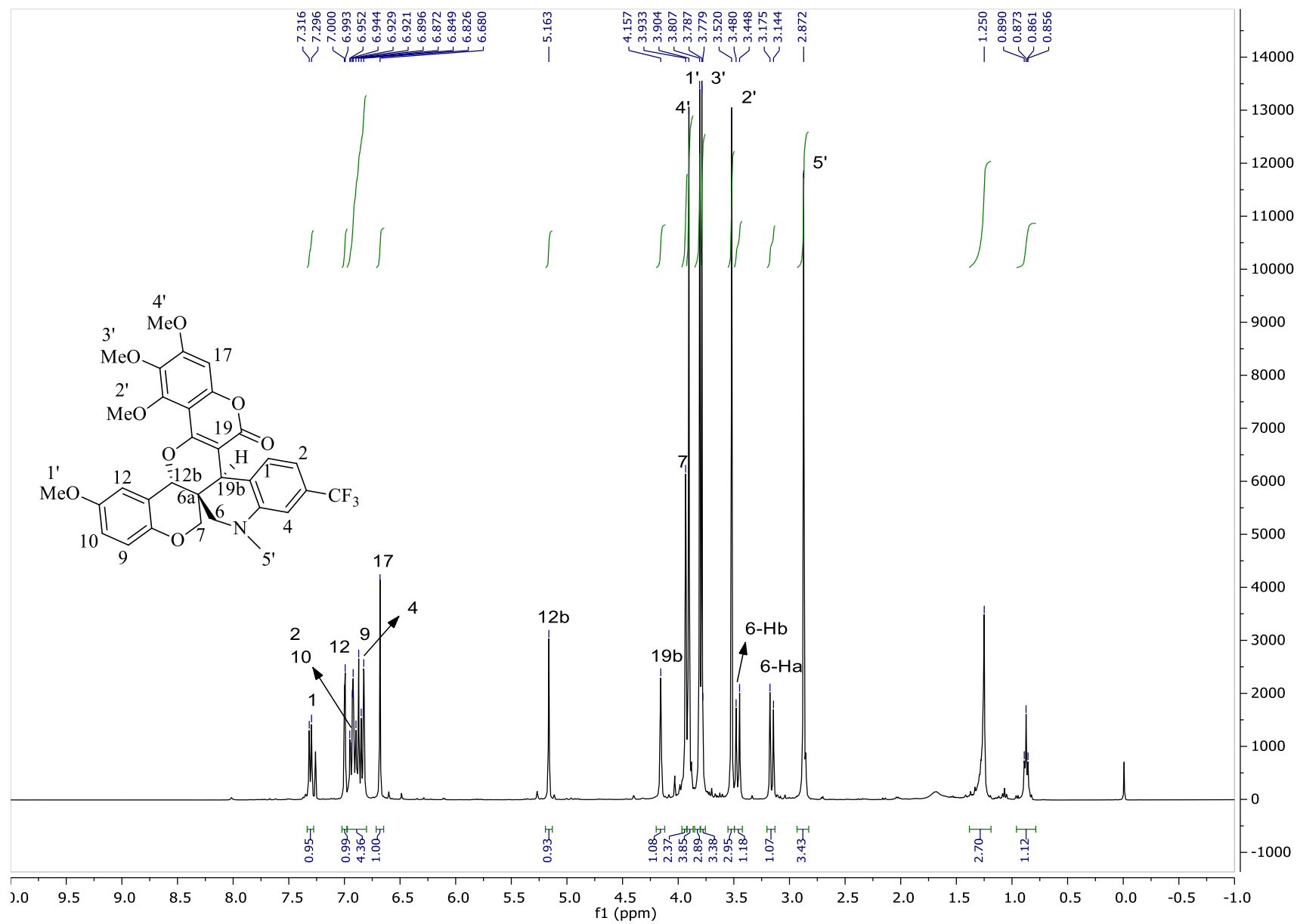


Figure S81. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4dc in CDCl₃ at 400 MHz.

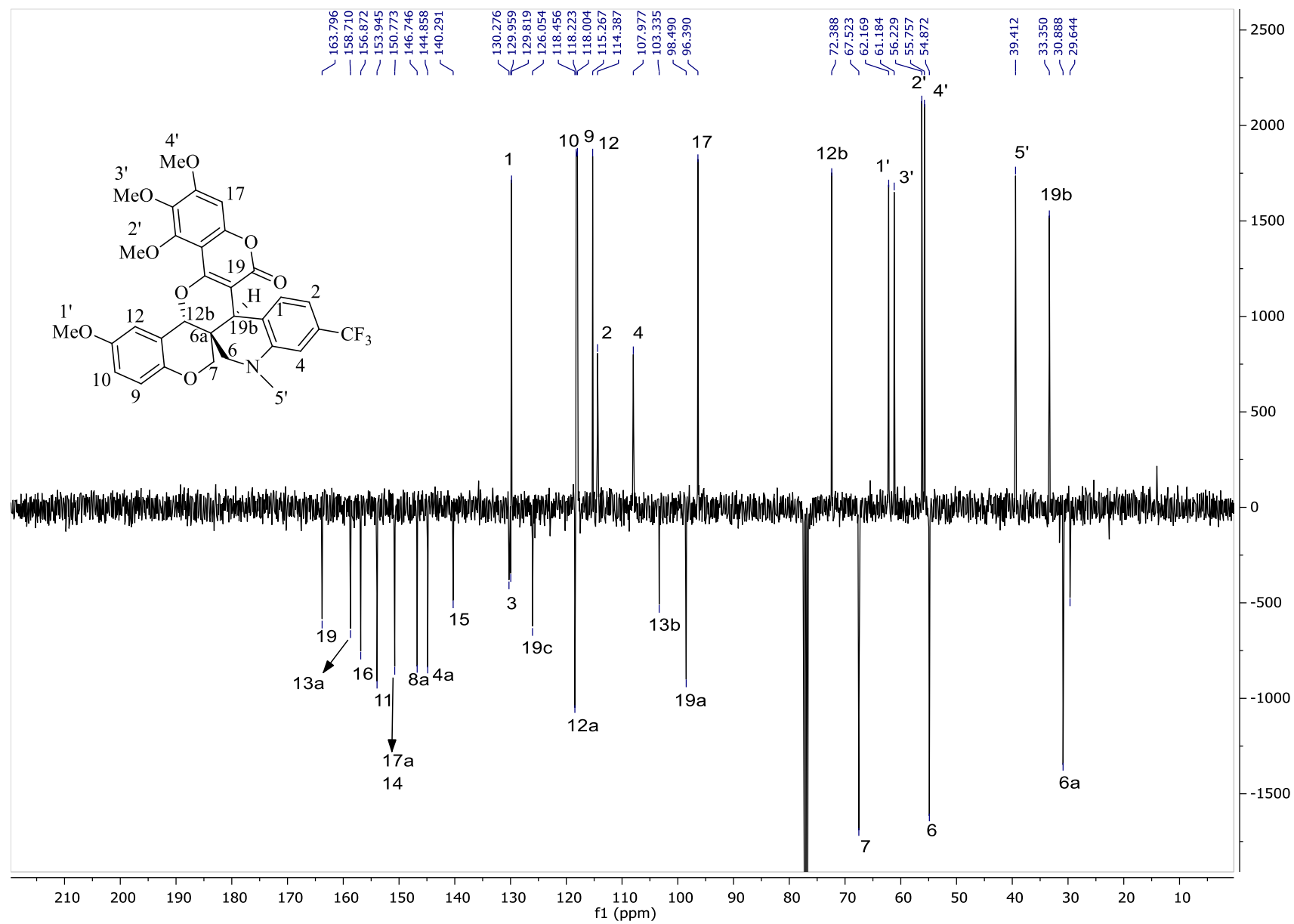


Figure S82. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4dc in CDCl_3 at 100 MHz.

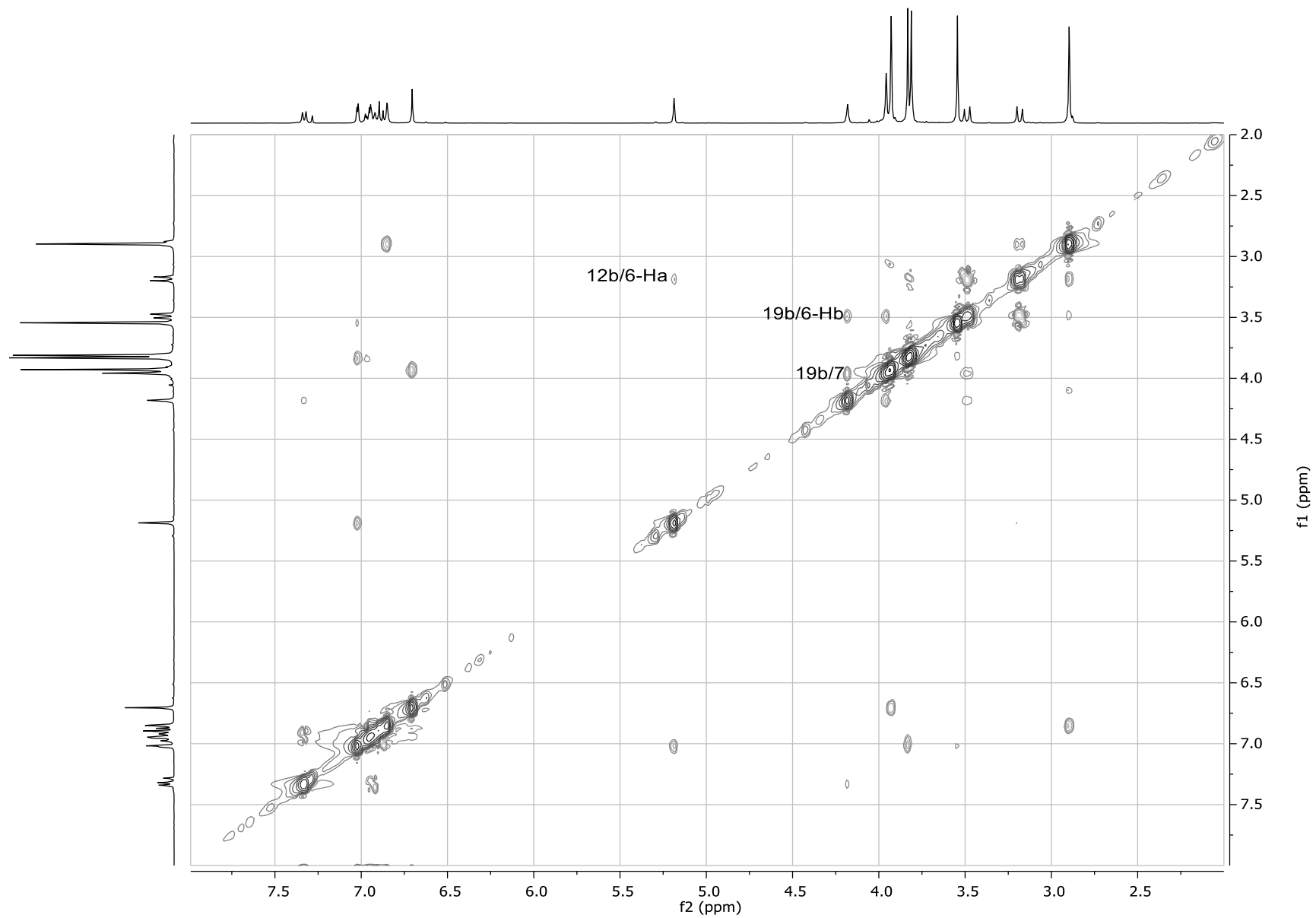


Figure S83. NOESY spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**4dc** in CDCl₃ at 400 MHz.

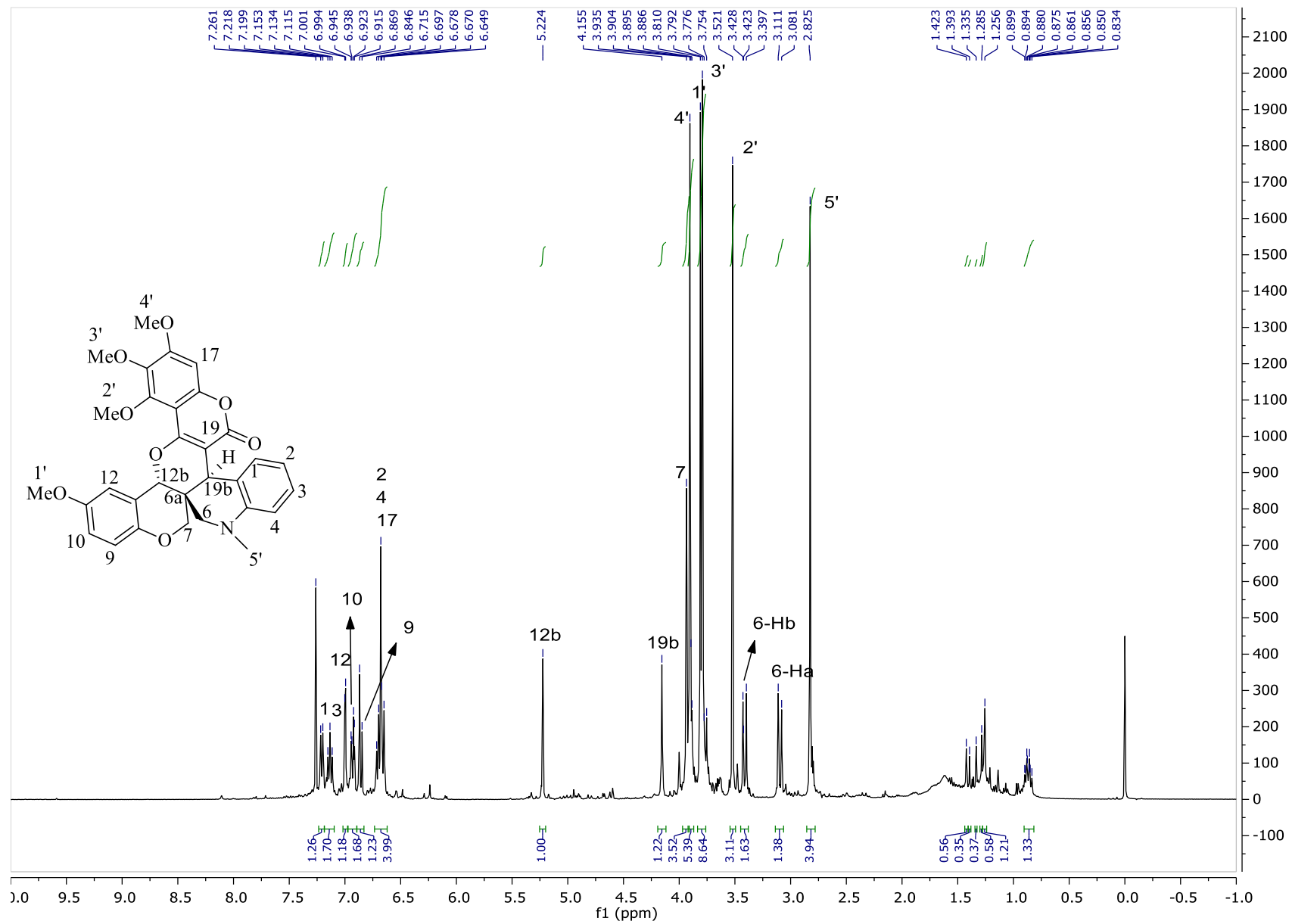


Figure S84. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4ec in CDCl₃ at 400 MHz.

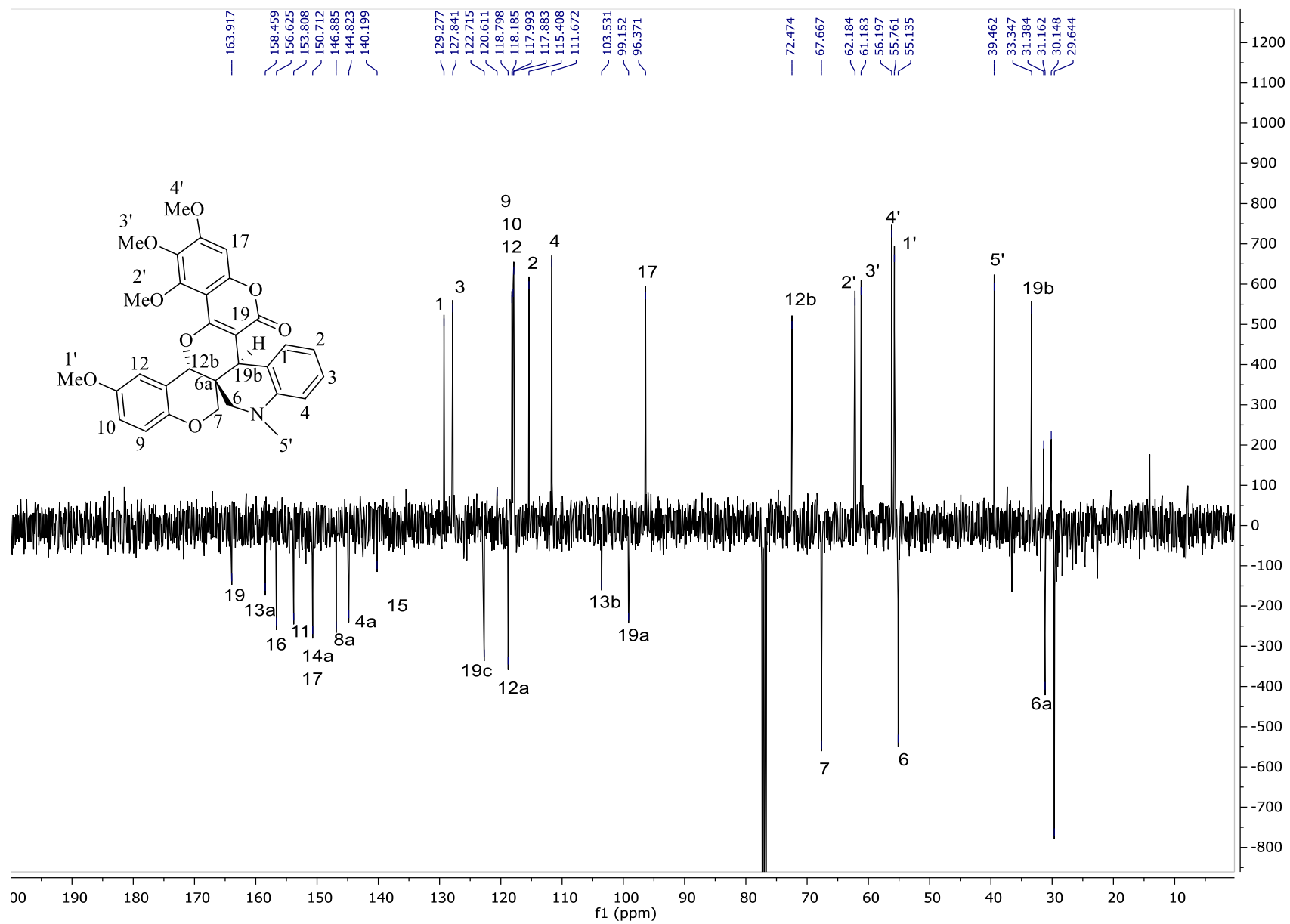


Figure S85. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-4ec in CDCl_3 at 100 MHz.

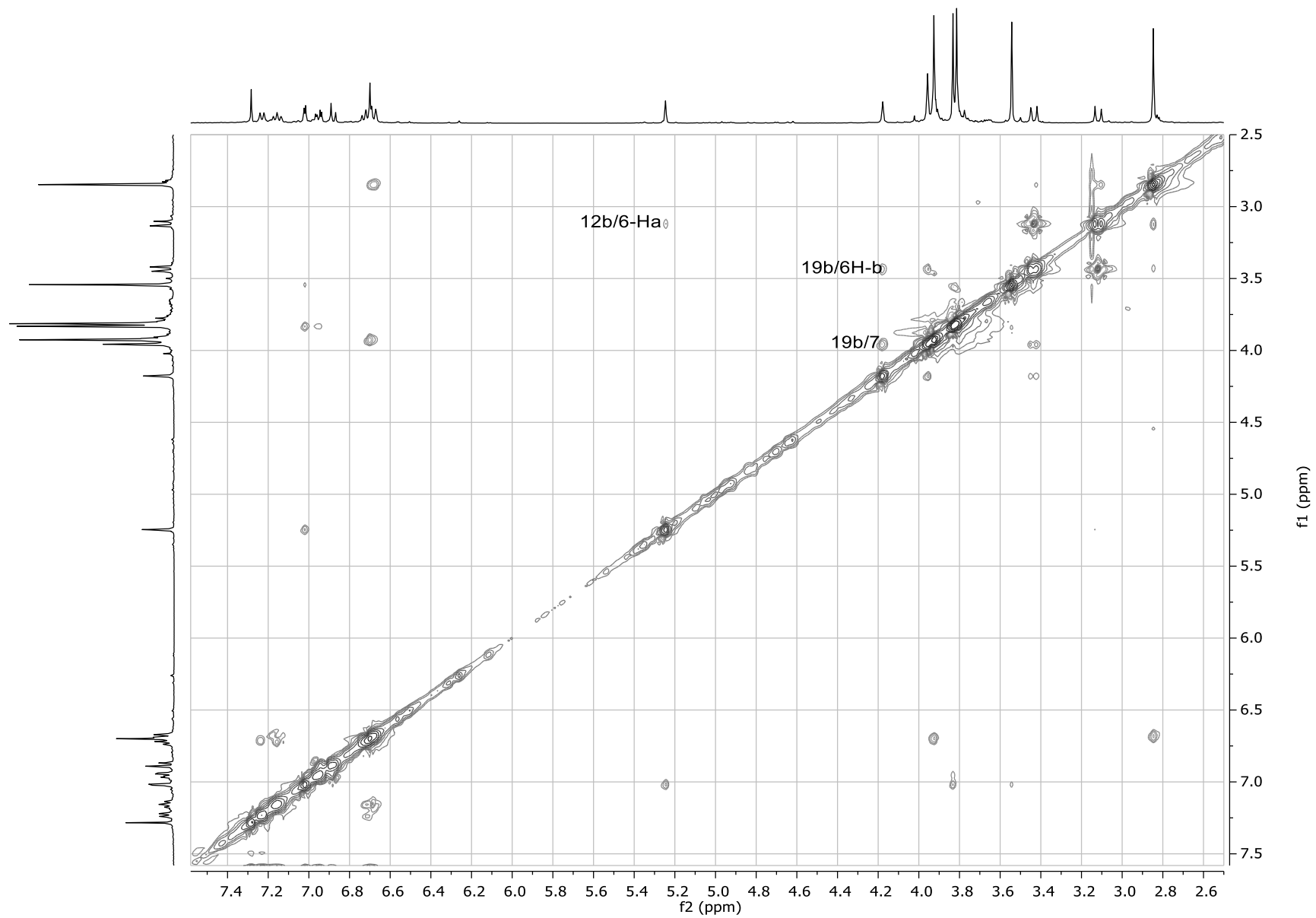


Figure S86. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*S**)-**4ec** in CDCl₃ at 400 MHz.

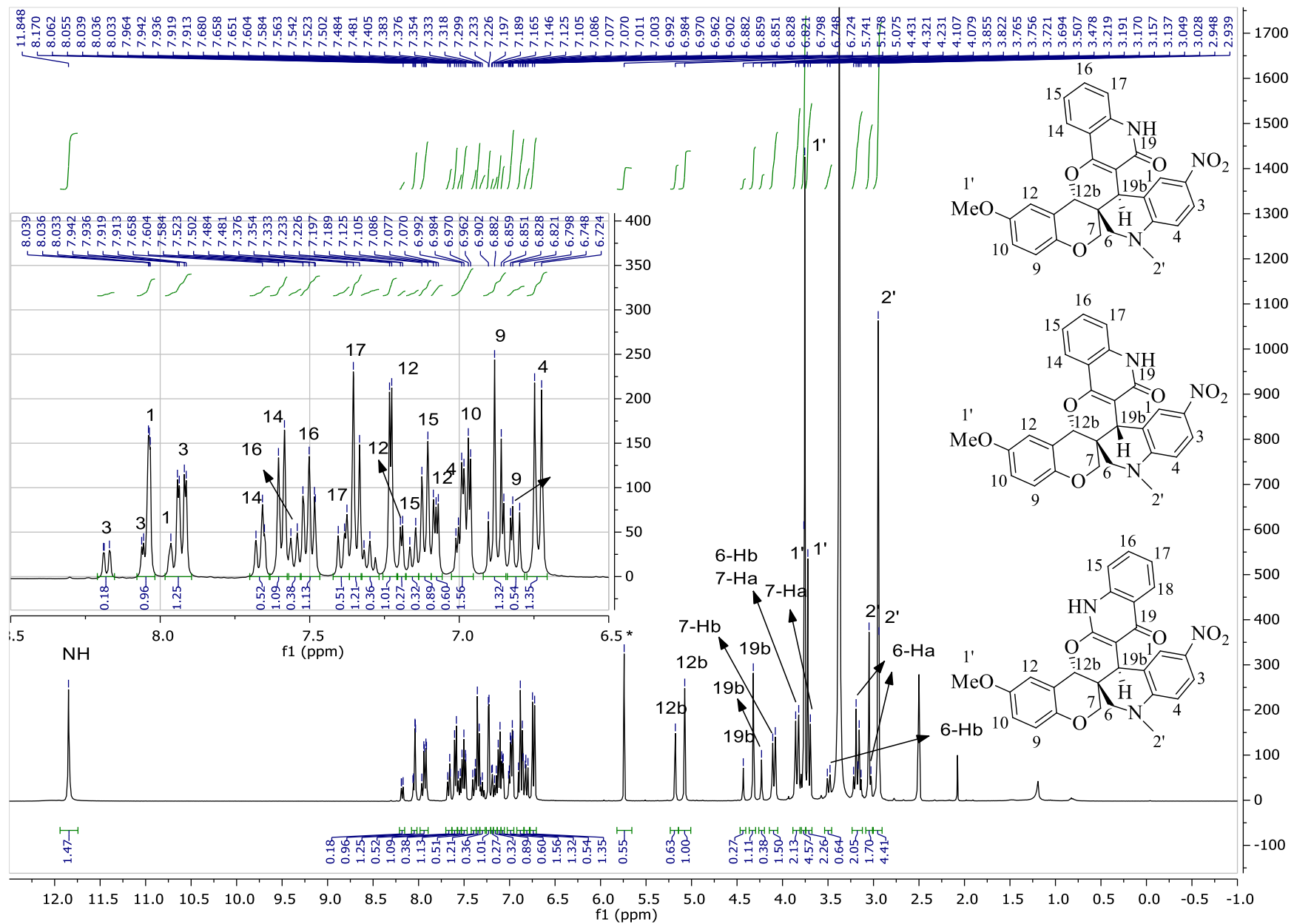


Figure S87. ¹H-NMR spectrum of *rac*-(6aS*,12bR*,19bR*)-4ad, *rac*-(6aS*,12bR*,19bR*)-6ad and *rac*-(6aS*,12bR*,19bS*)-5ad in DMSO-*d*₆ at 400 MHz.

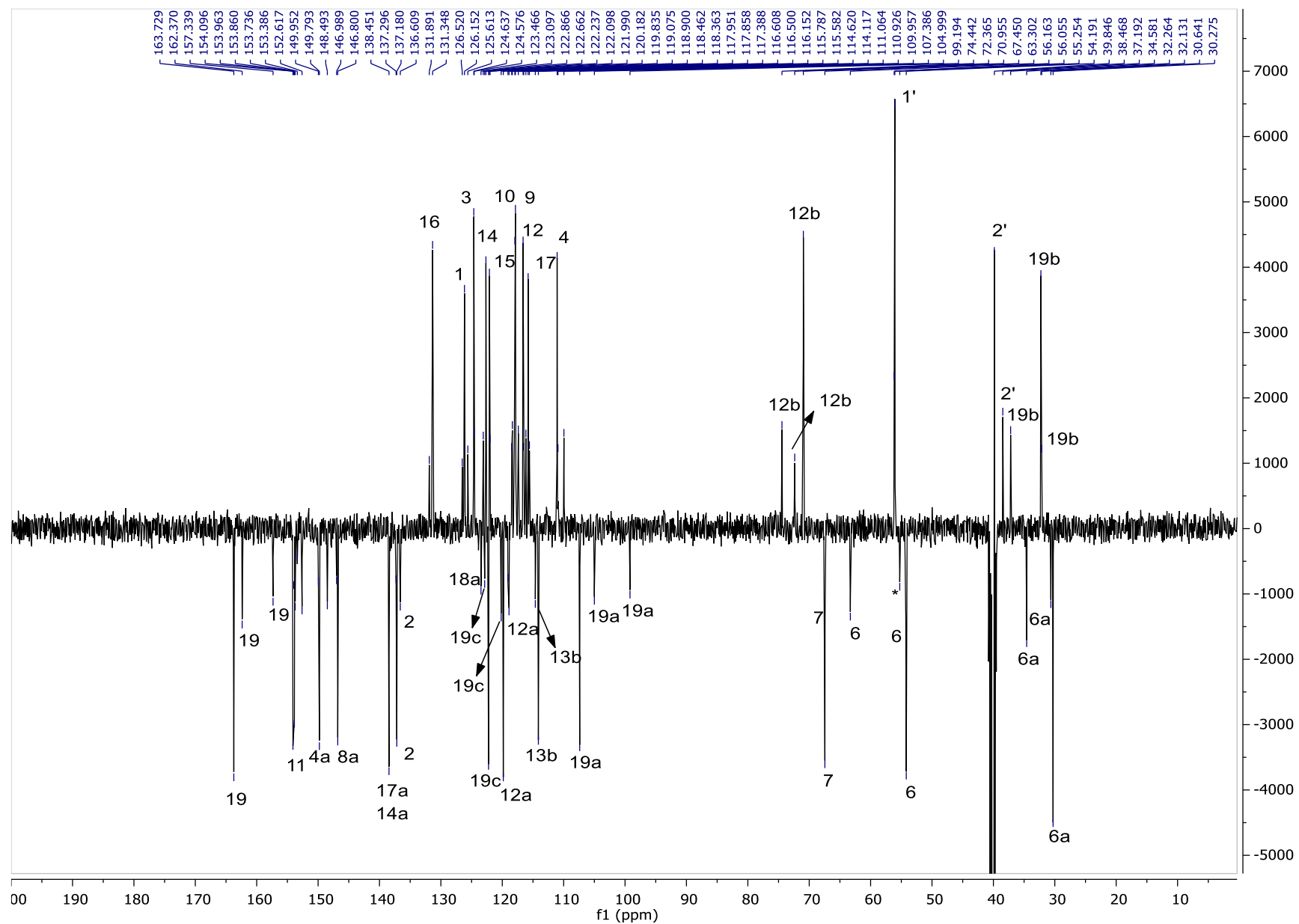


Figure S88. ^1H -NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},19b*R*^{*})-**4ad**, *rac*-(6a*S*^{*},12b*R*^{*},19b*R*^{*})-**6ad** and *rac*-(6a*S*^{*},12b*R*^{*},19b*S*^{*})-**5ad** in DMSO-*d*₆ at 400 MHz.

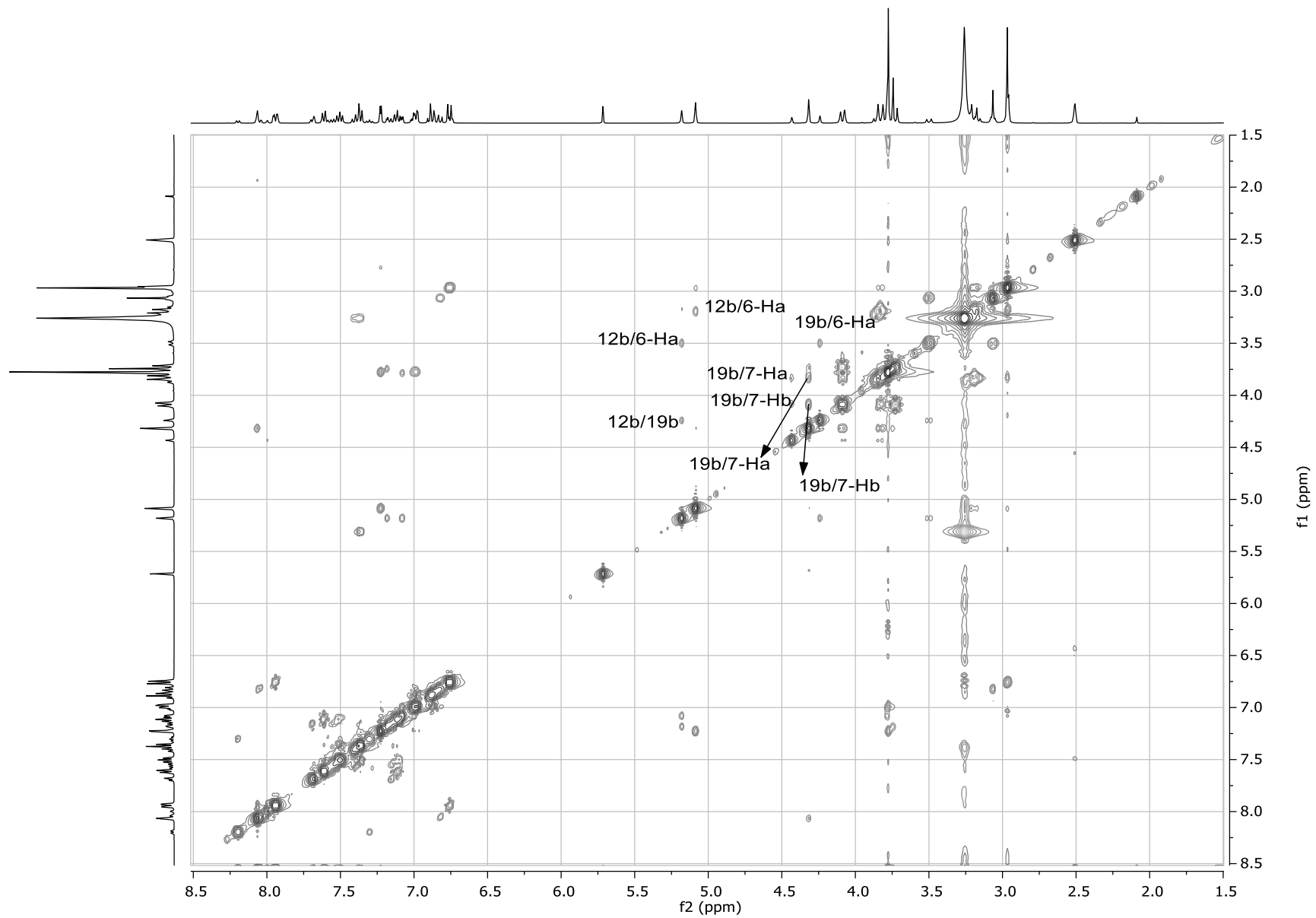


Figure S89. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-**4ad**, *rac*-(6a*S**,12b*R**,19b*R**)-**6ad** and *rac*-(6a*S**,12b*R**,19b*S**)-**5ad** in DMSO-*d*₆ at 400 MHz.

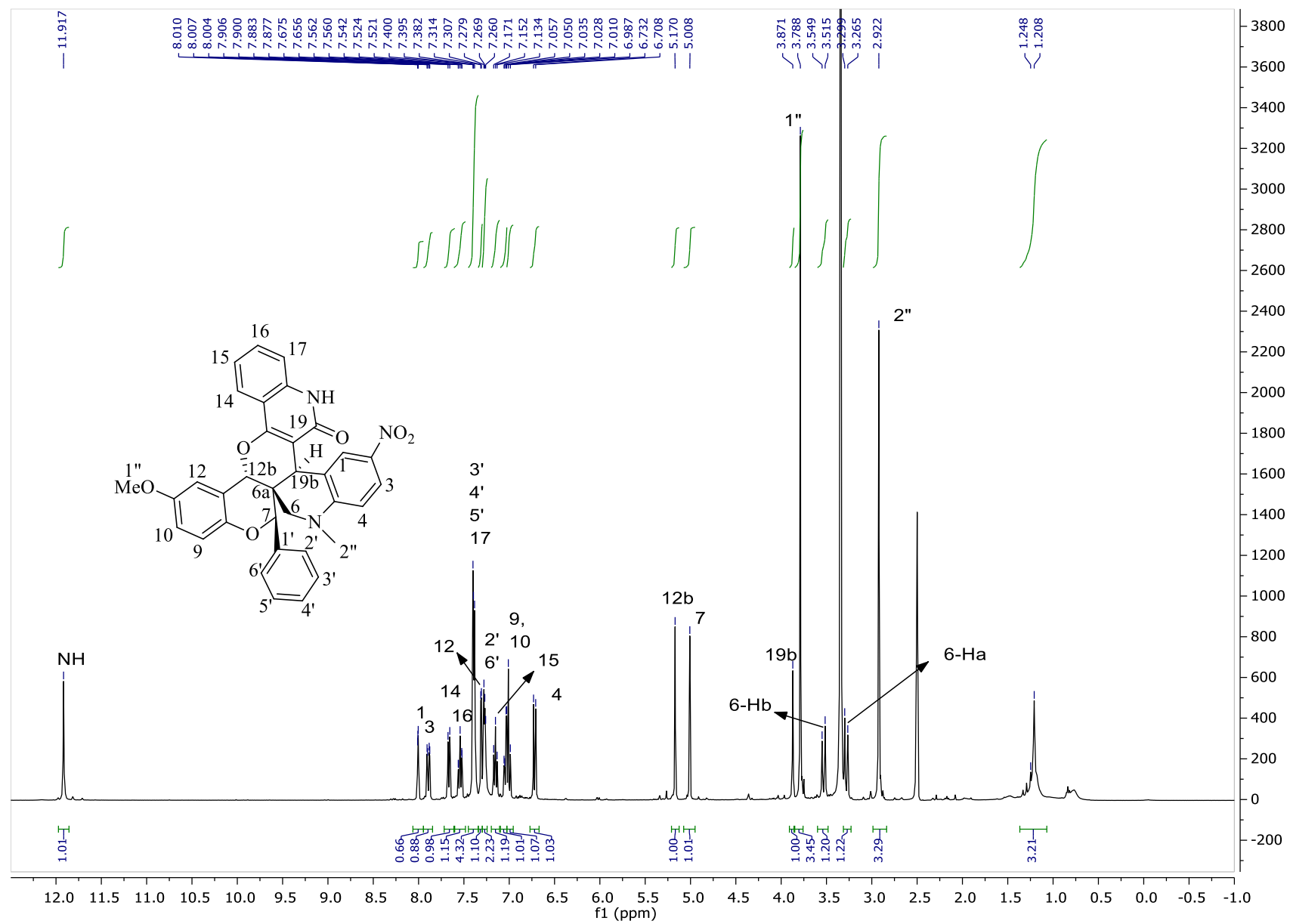


Figure S90. $^1\text{H-NMR}$ spectrum of *rac*-(6a*S*^{*},7*R*^{*},12b*R*^{*},19b*S*^{*})-**4bd** in $\text{DMSO-}d_6$ at 400 MHz.

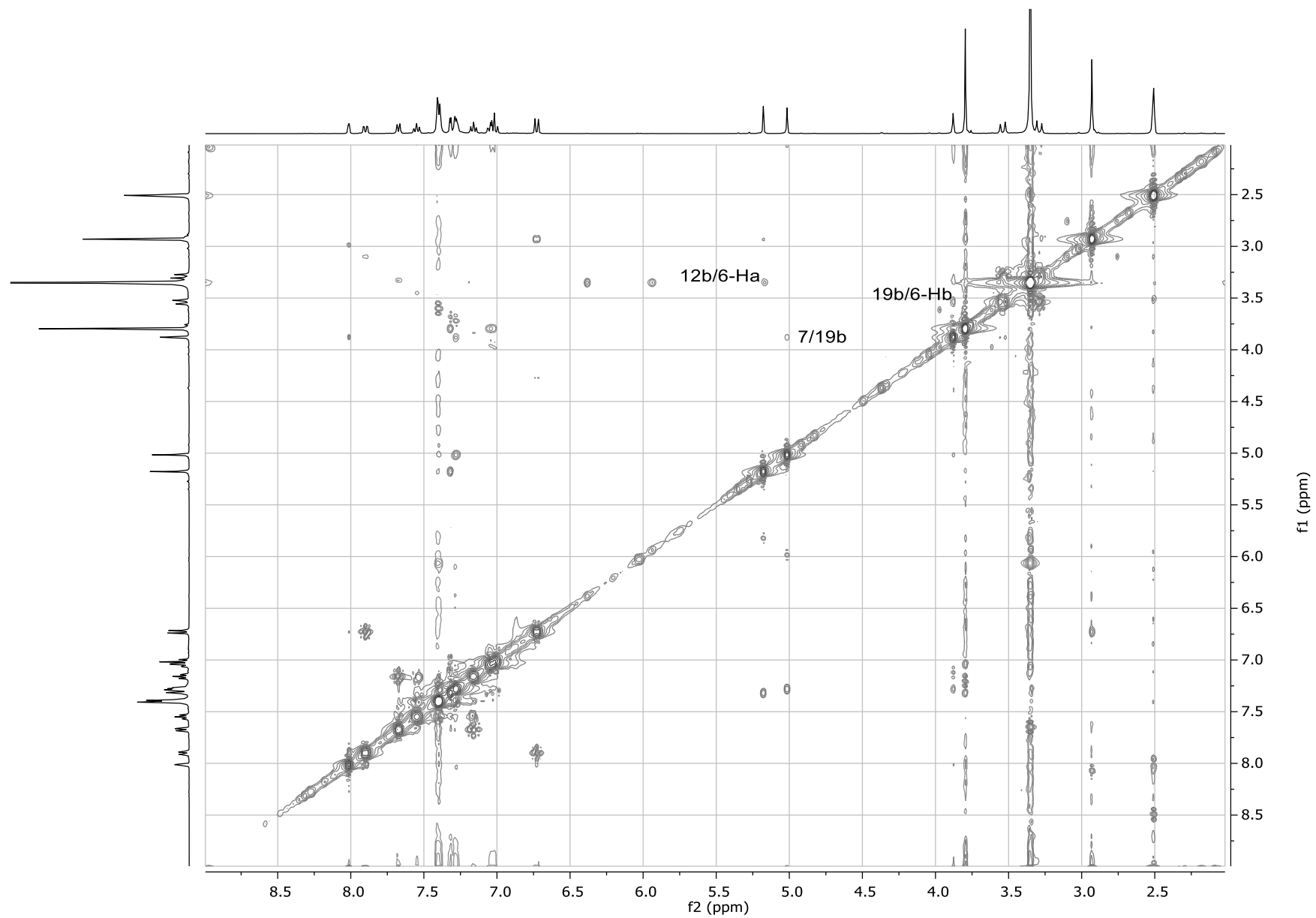


Figure S92. NOESY spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*S**)-**4bd** in DMSO-*d*₆ at 400 MHz.

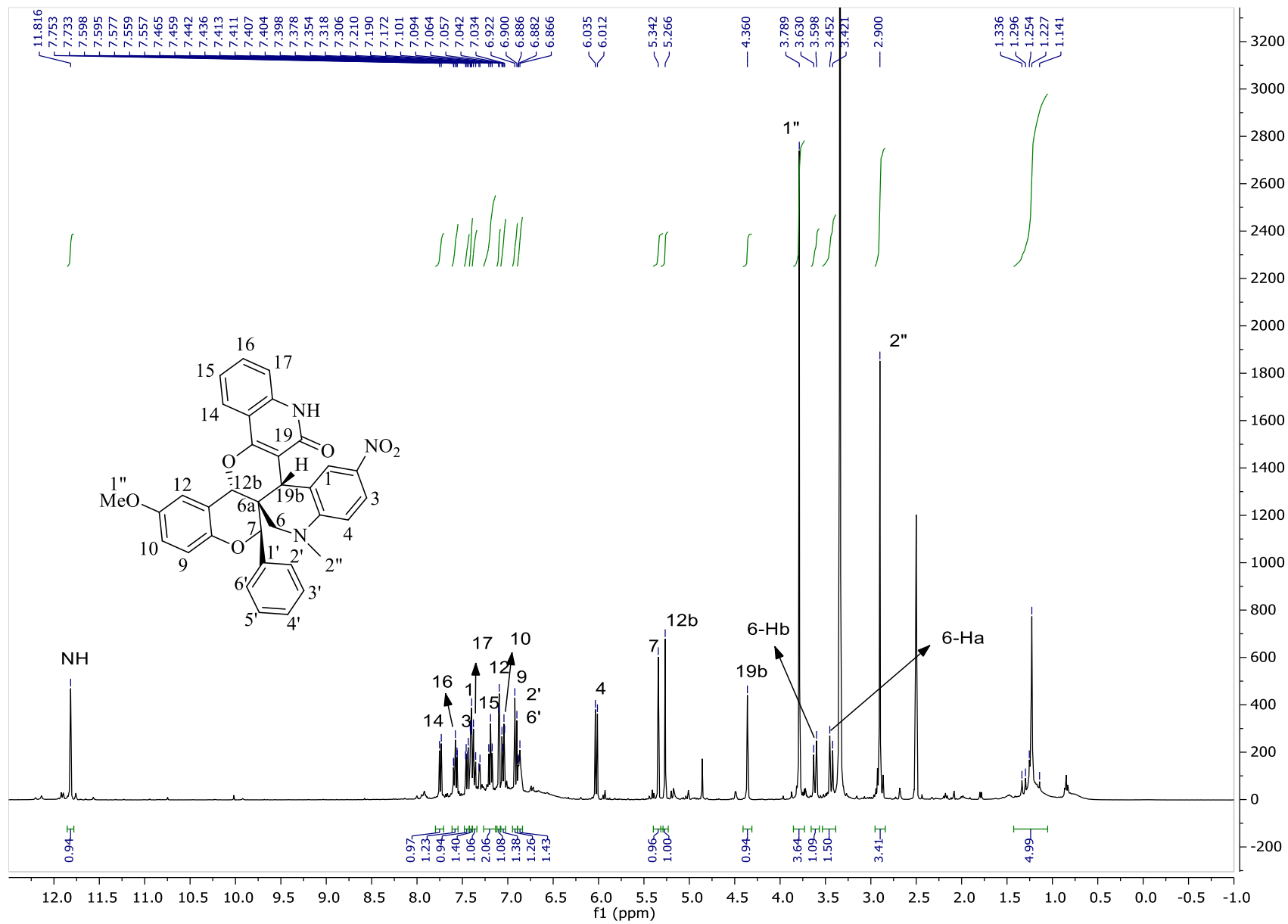


Figure S93. ¹H-NMR spectrum of *rac*-(6aS*,7R*,12bR*,19bS*)-5bd in DMSO-*d*₆ at 400 MHz.

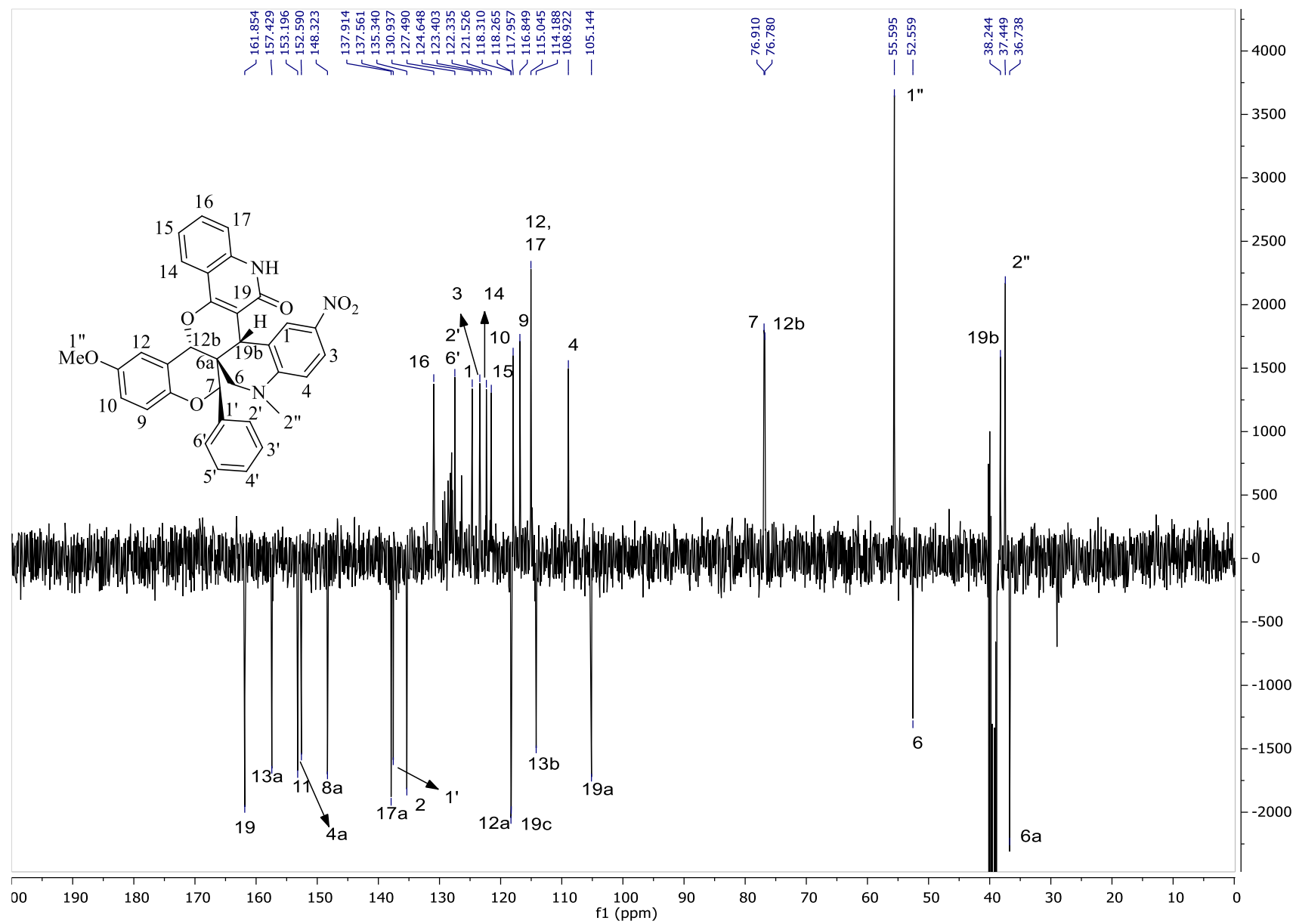


Figure S94. ^{13}C -NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*S**)-5bd in DMSO-*d*₆ at 100 MHz.

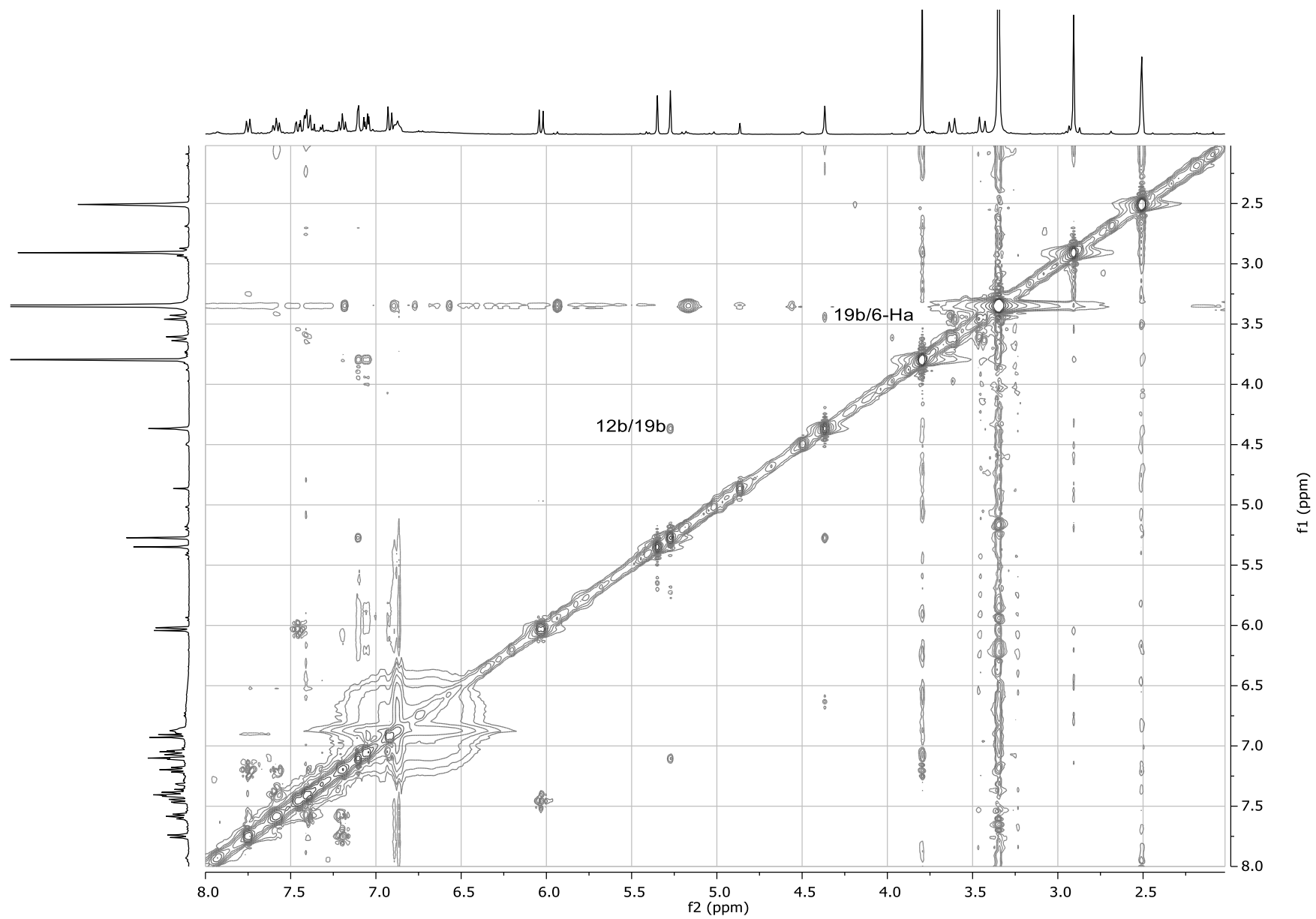


Figure S95. NOESY spectrum of *rac*-(6a*S*^{*},7*R*^{*},12*bR*^{*},19*bS*^{*})-**5bd** in DMSO-*d*₆ at 400 MHz.

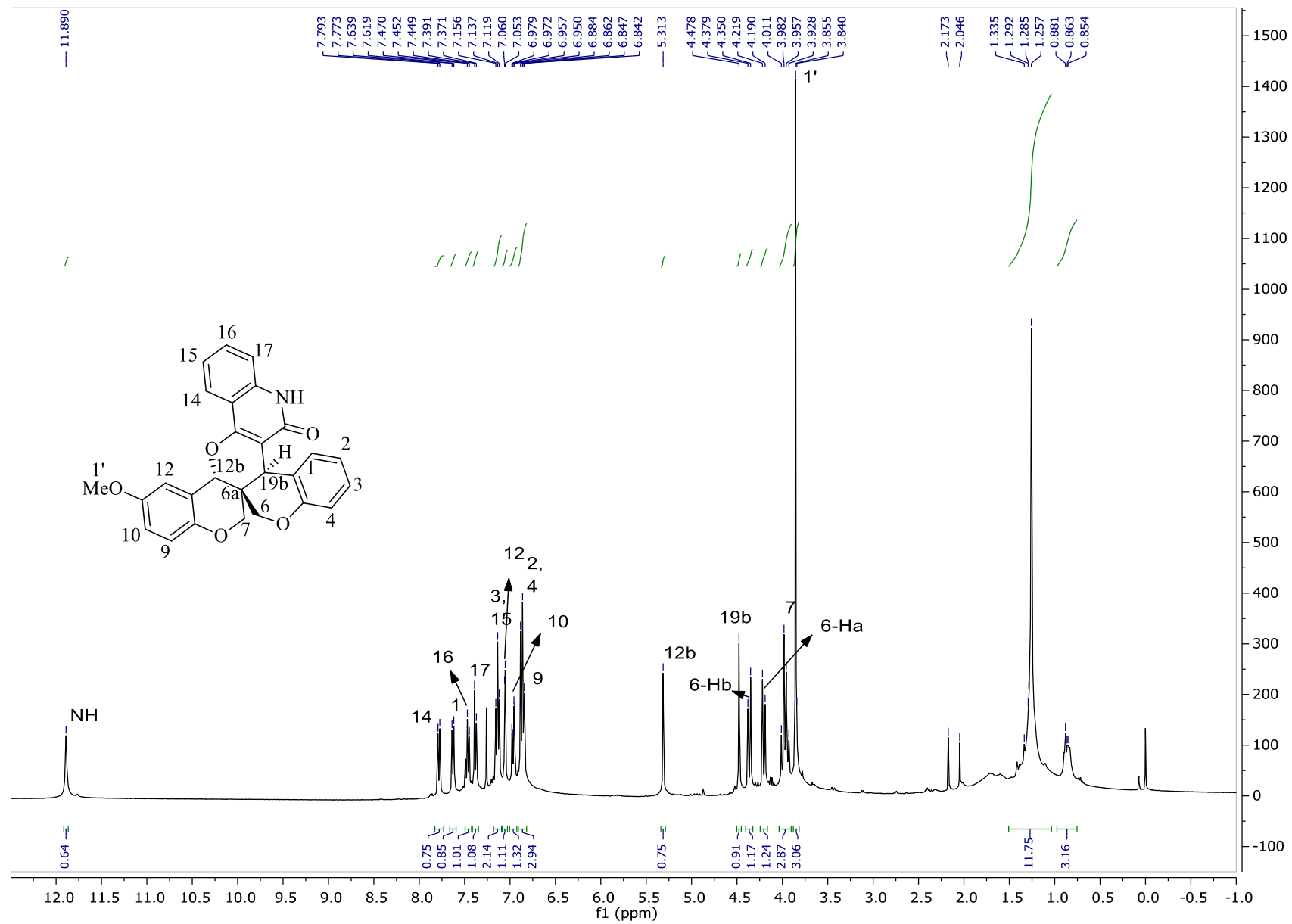


Figure S96. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4cd in CDCl₃ at 400 MHz.

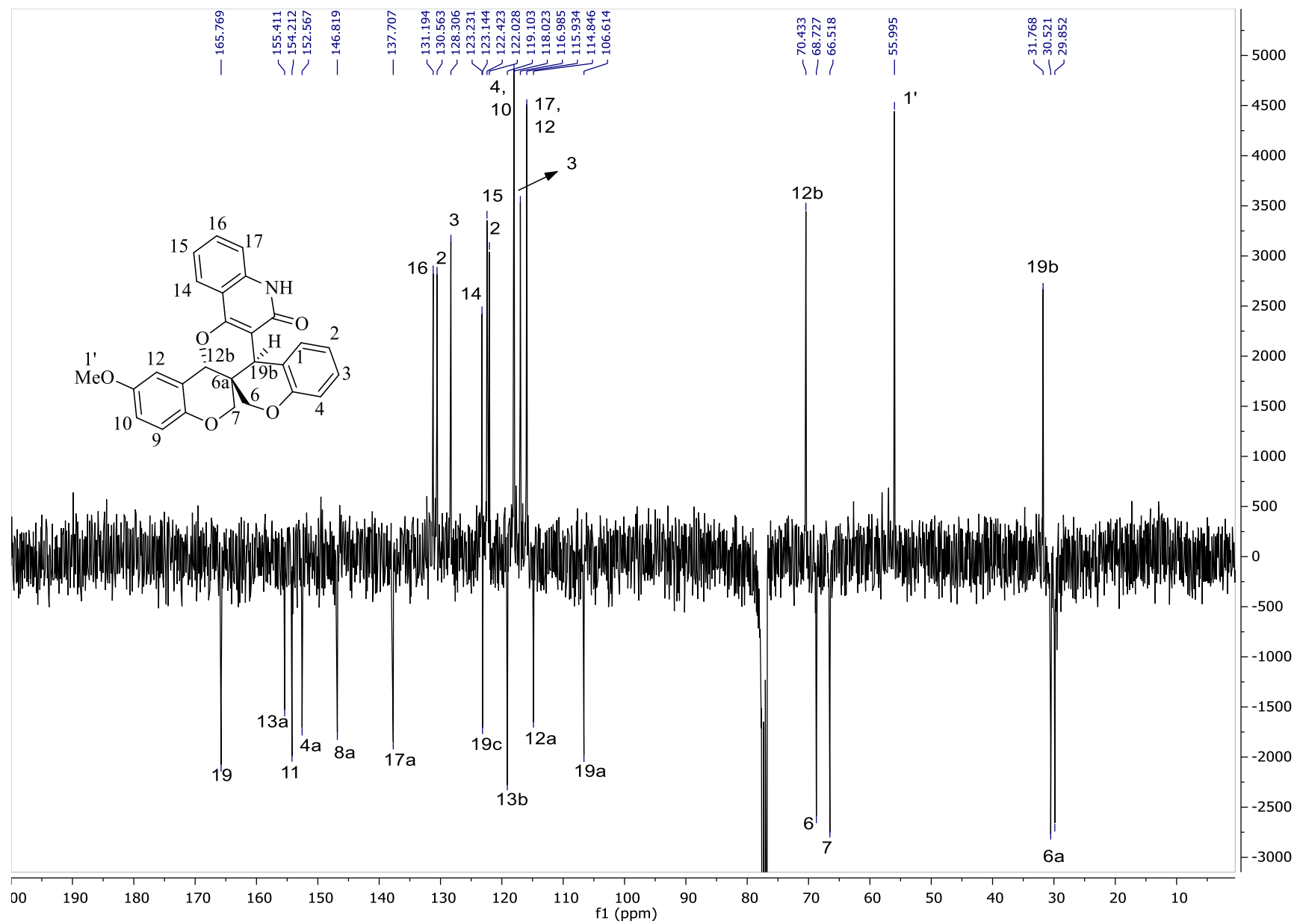


Figure S97. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-4cd in CDCl₃ at 100 MHz.

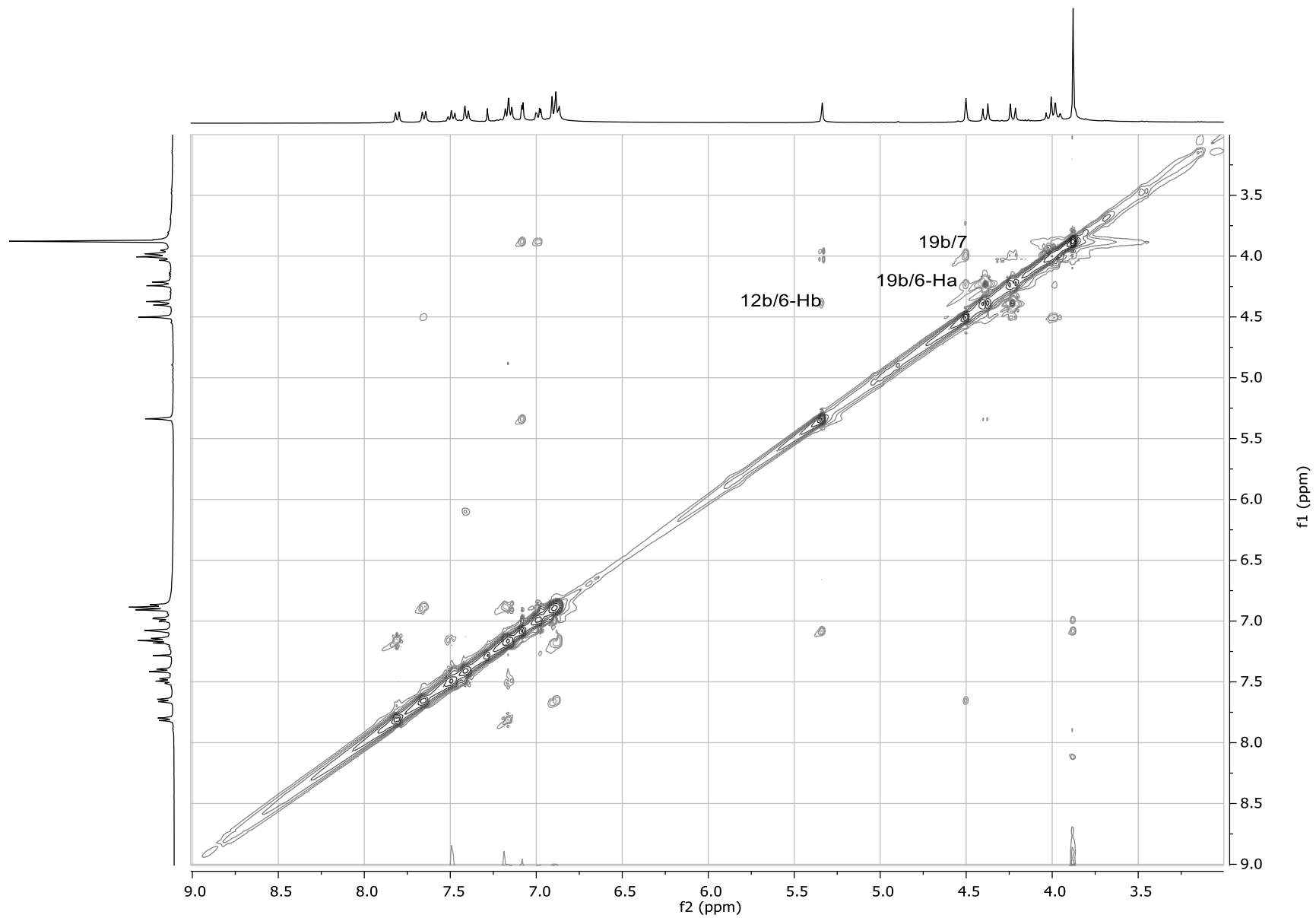


Figure S98. NOESY spectrum of *rac*-(6a*S**,12b*R**,19b*R**)-**4cd** in CDCl₃ at 400 MHz.

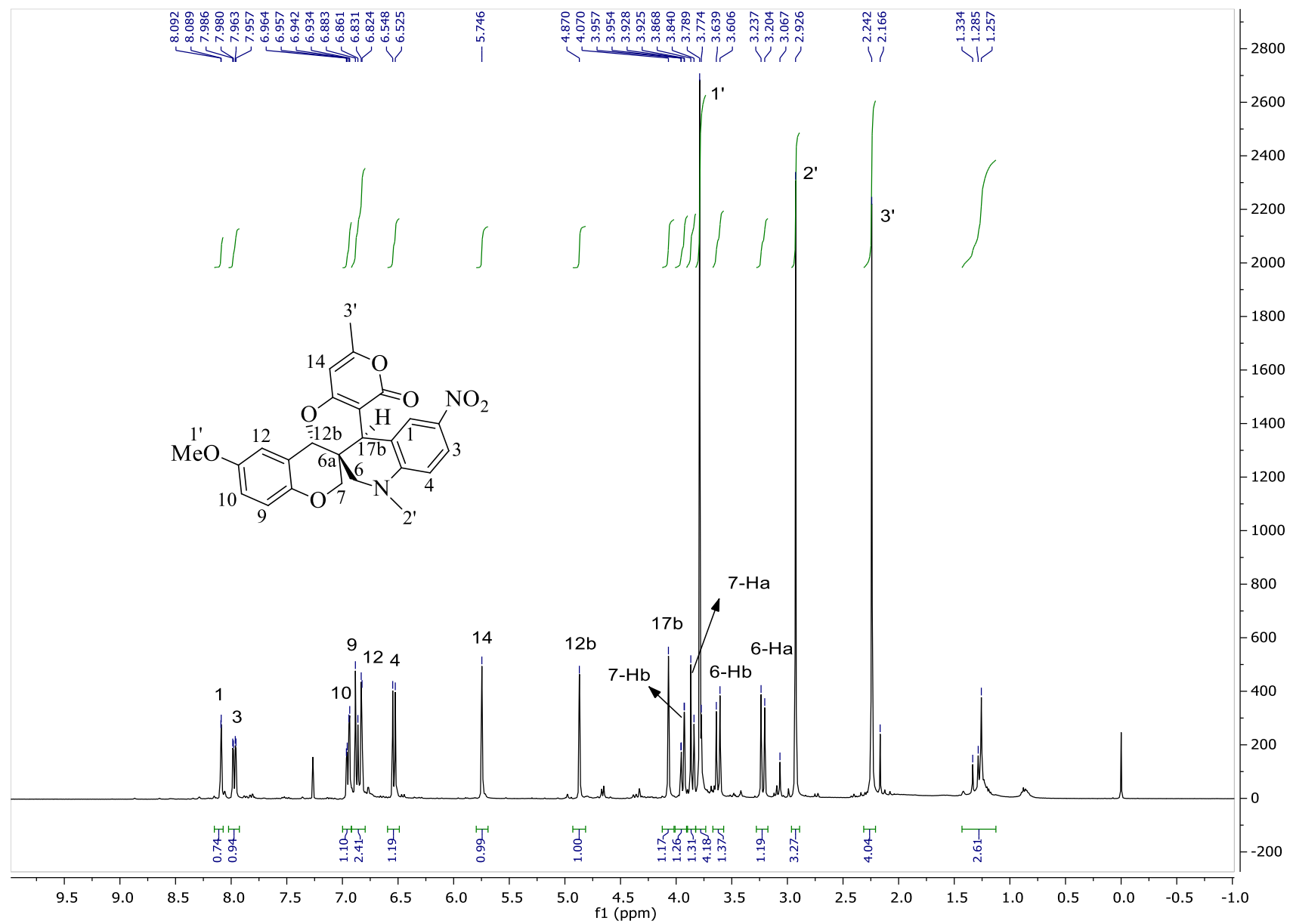


Figure S99. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-4ae in CDCl₃ at 400 MHz.

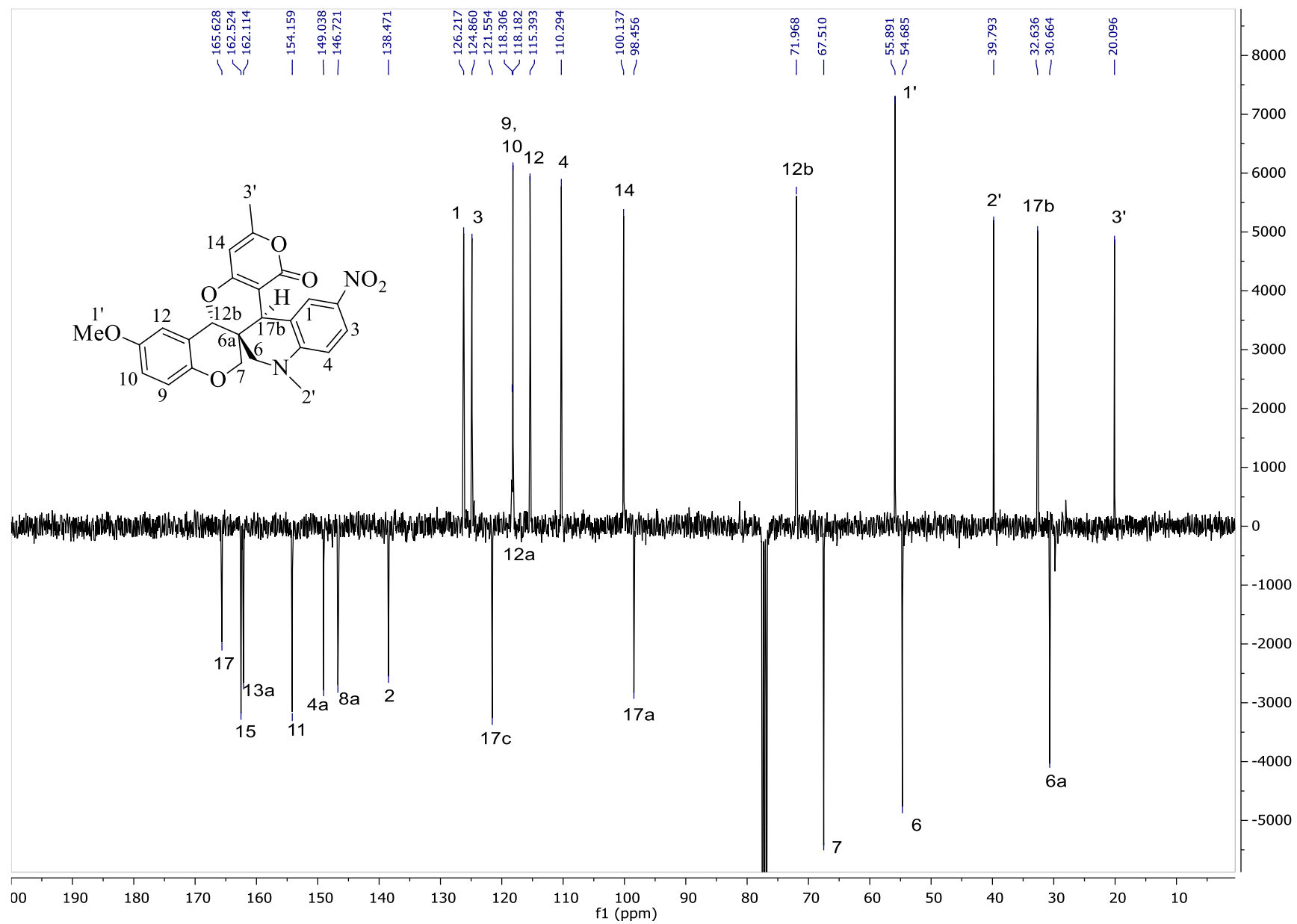


Figure S100. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-4ae in CDCl_3 at 100 MHz.

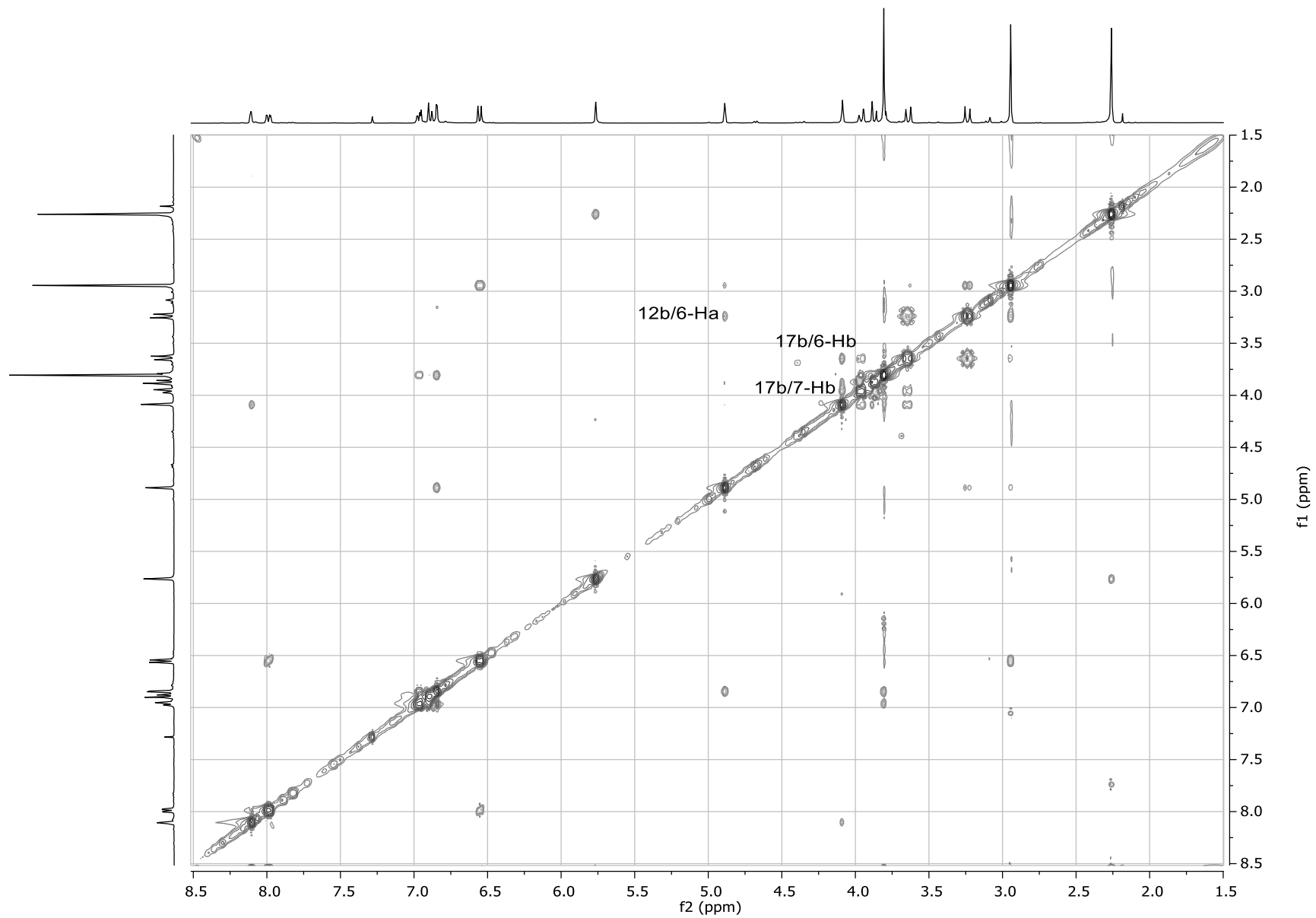


Figure S101. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-4ae in CDCl₃ at 400 MHz.

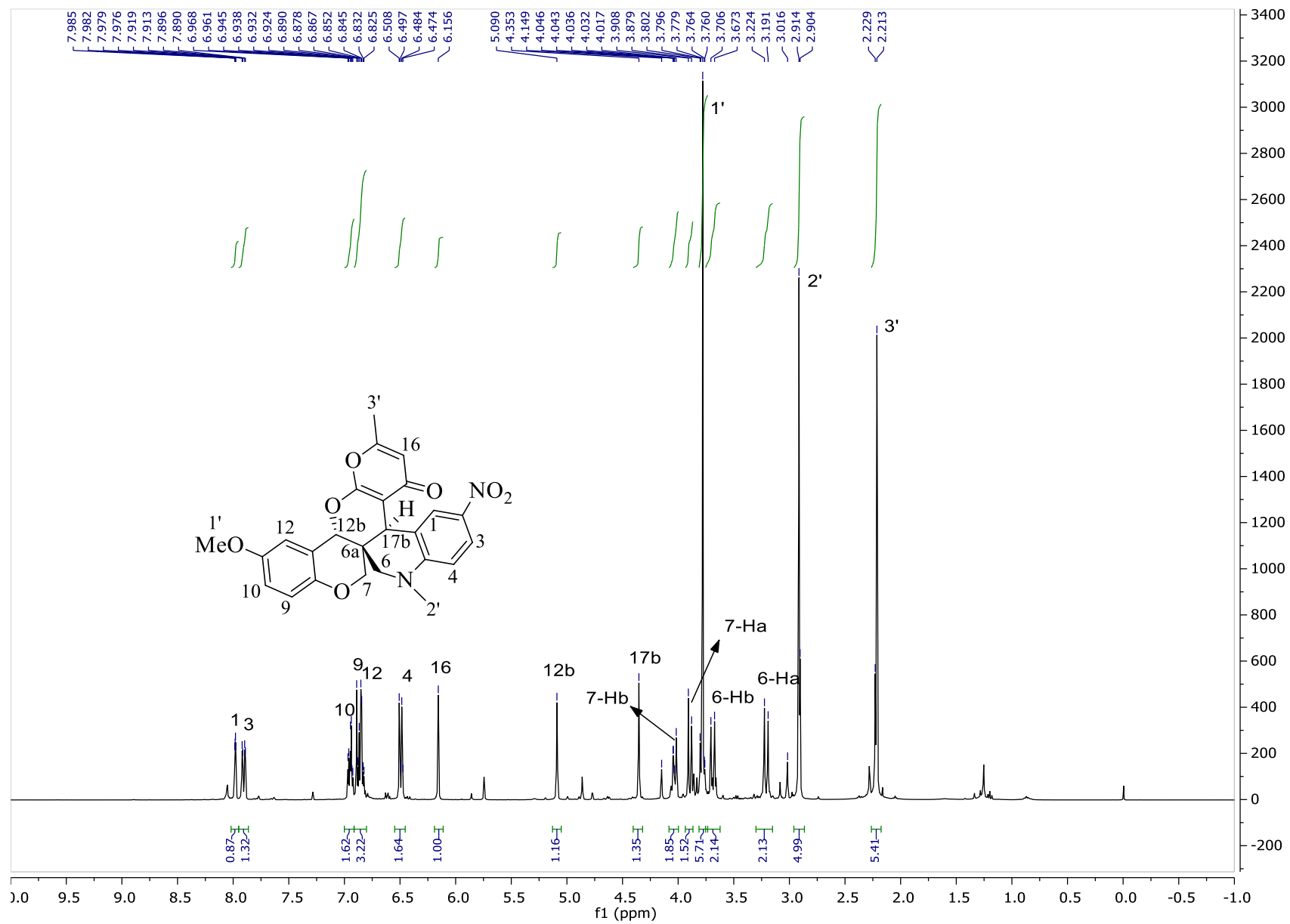


Figure S102. ¹H-NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},17b*S*^{*})-**6ae** in CDCl₃ at 400 MHz.

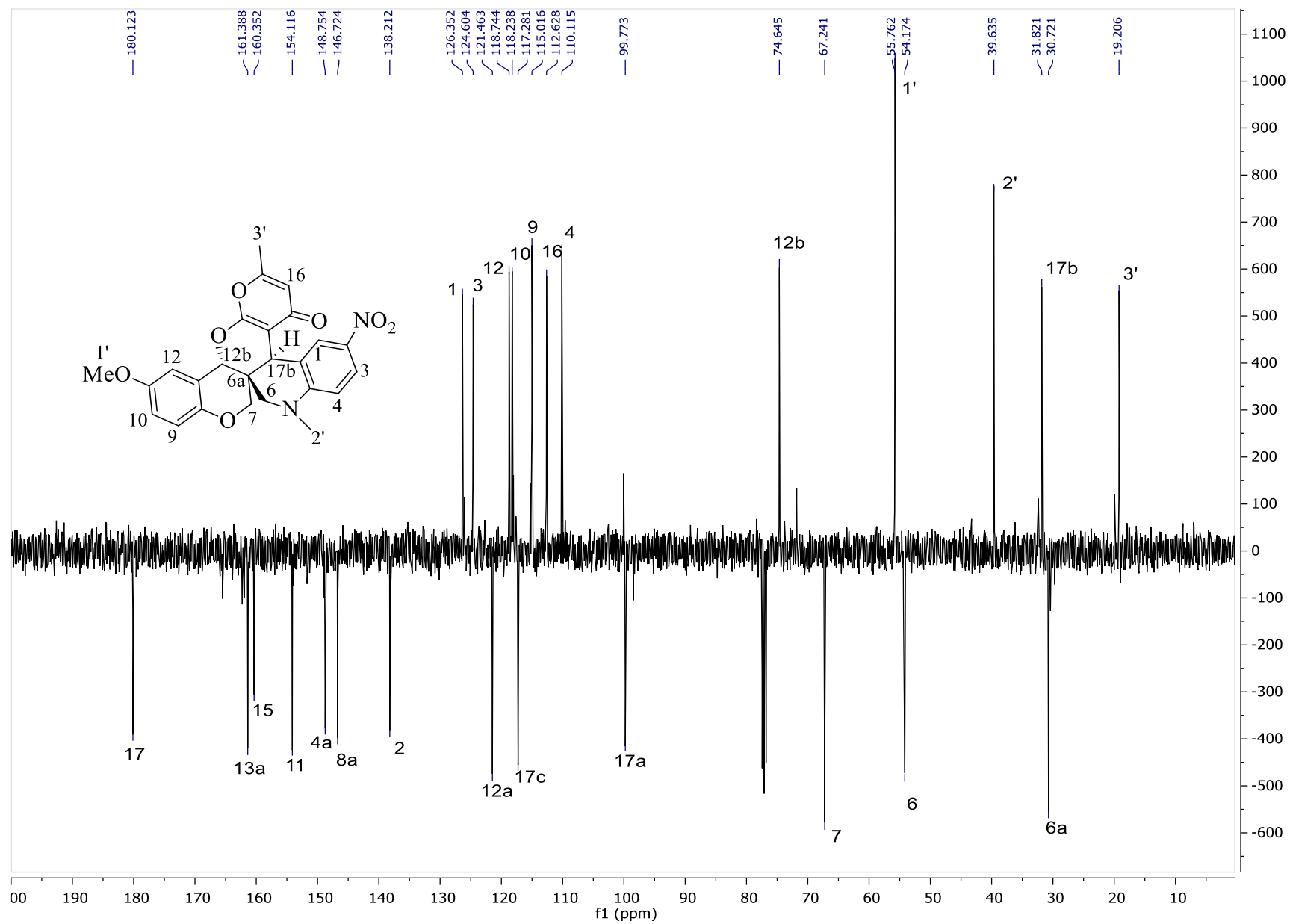


Figure S103. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-6ae in CDCl₃ at 100 MHz.

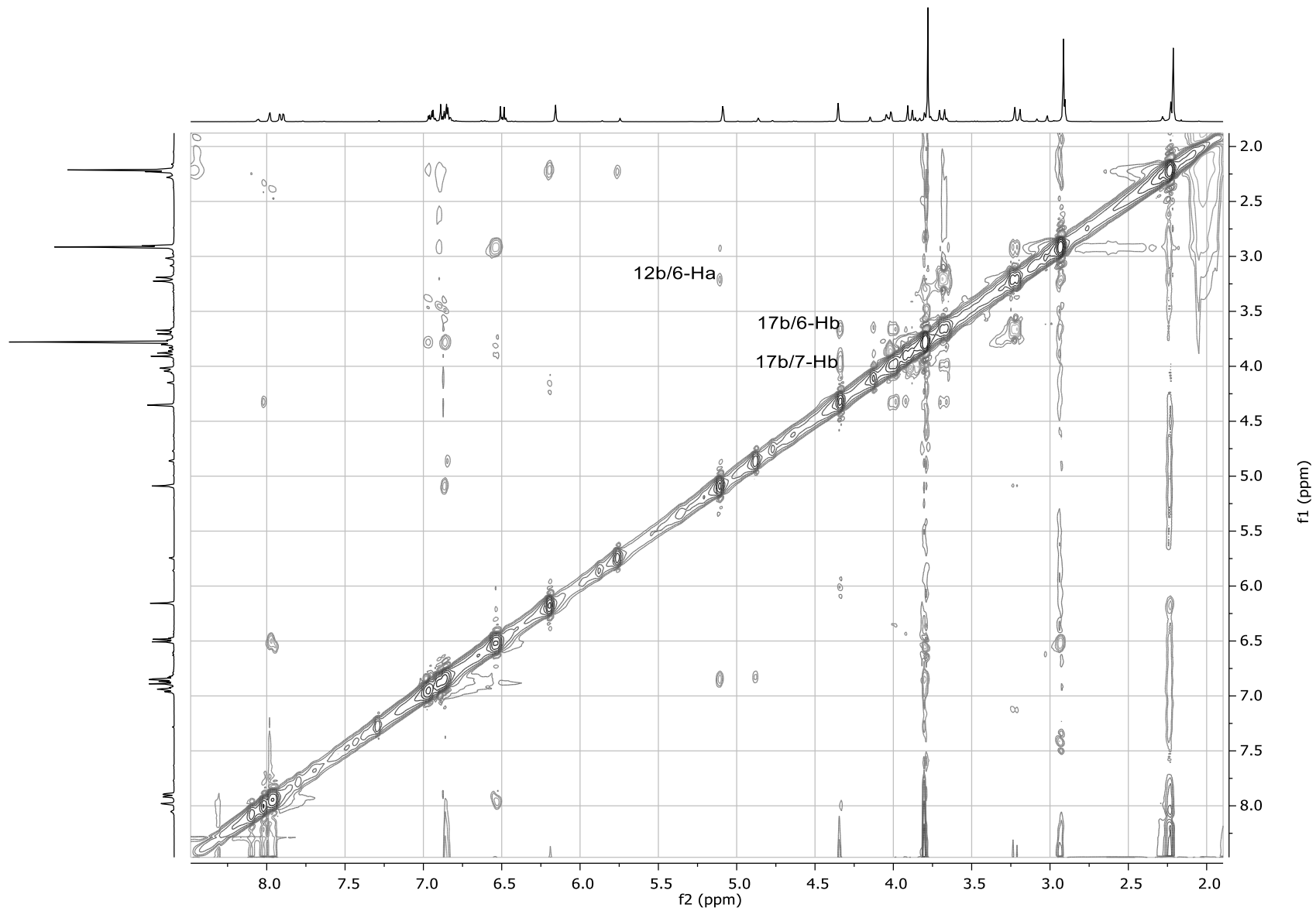


Figure S104. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-6ae in CDCl₃ at 400 MHz.

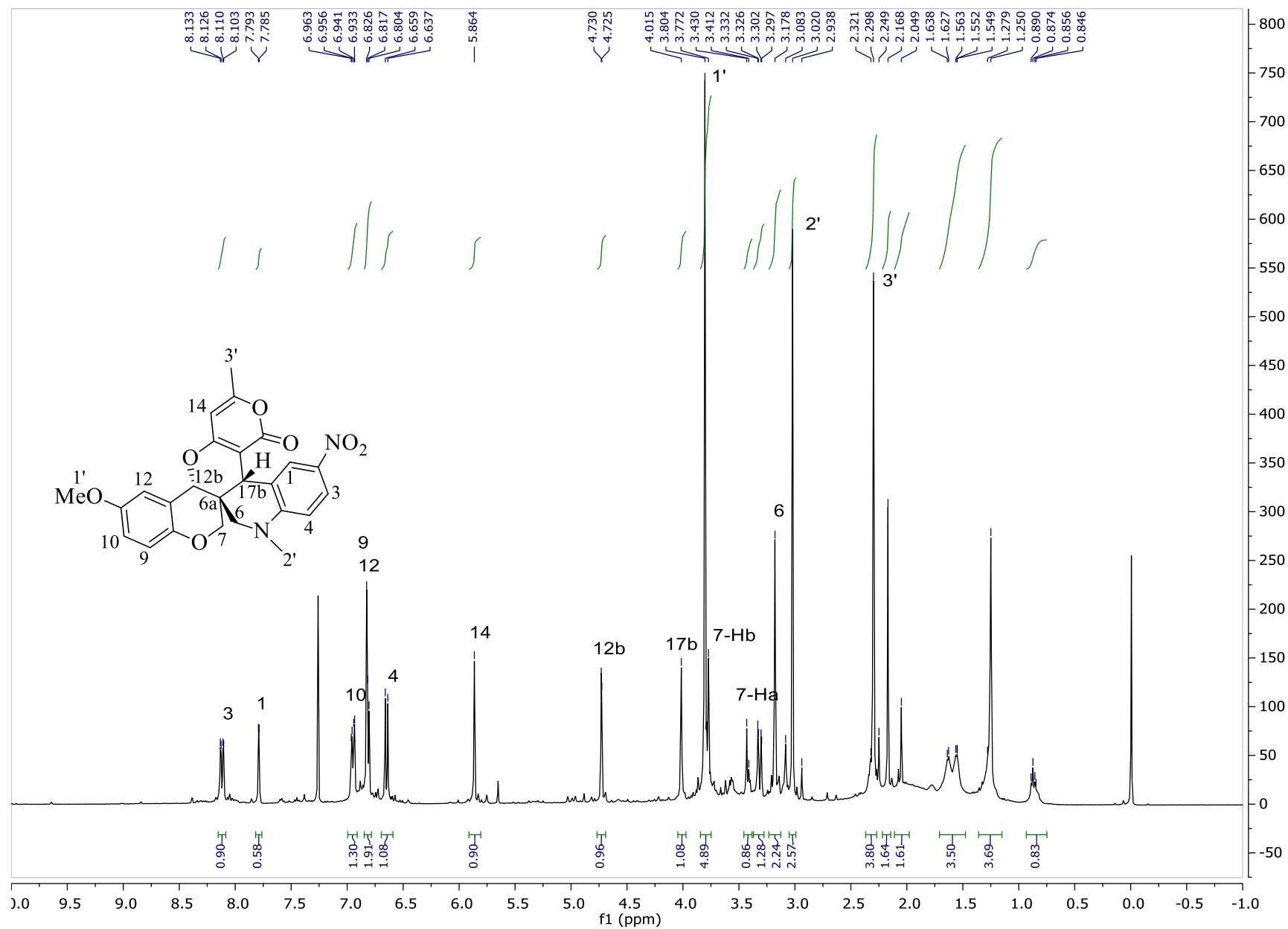


Figure S105. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-5ae in CDCl₃ at 400 MHz.

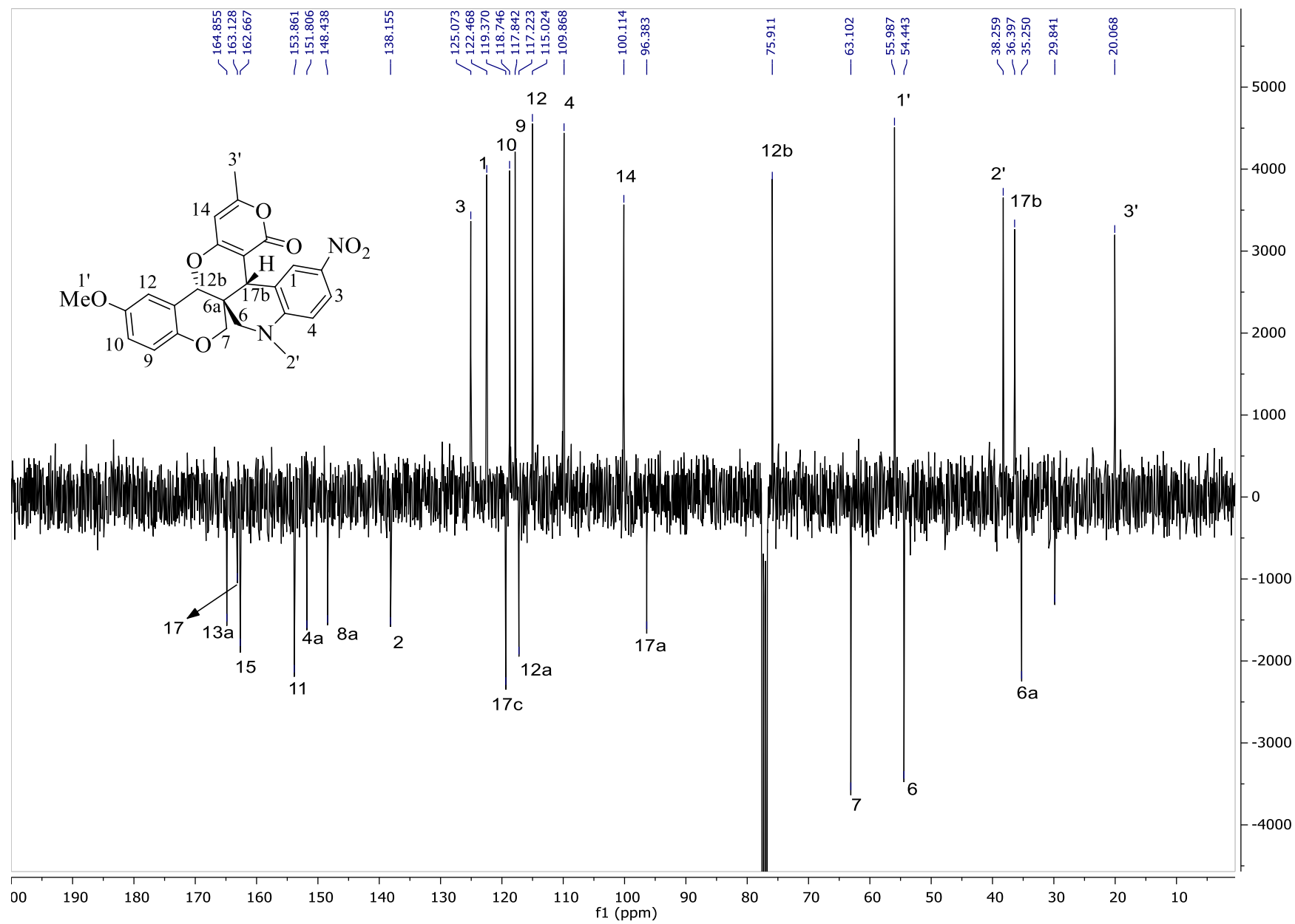


Figure S106. ^{13}C -NMR spectrum of *rac*-(6a*S*^{*},12b*R*^{*},17b*R*^{*})-**5ae** in CDCl_3 at 100 MHz.

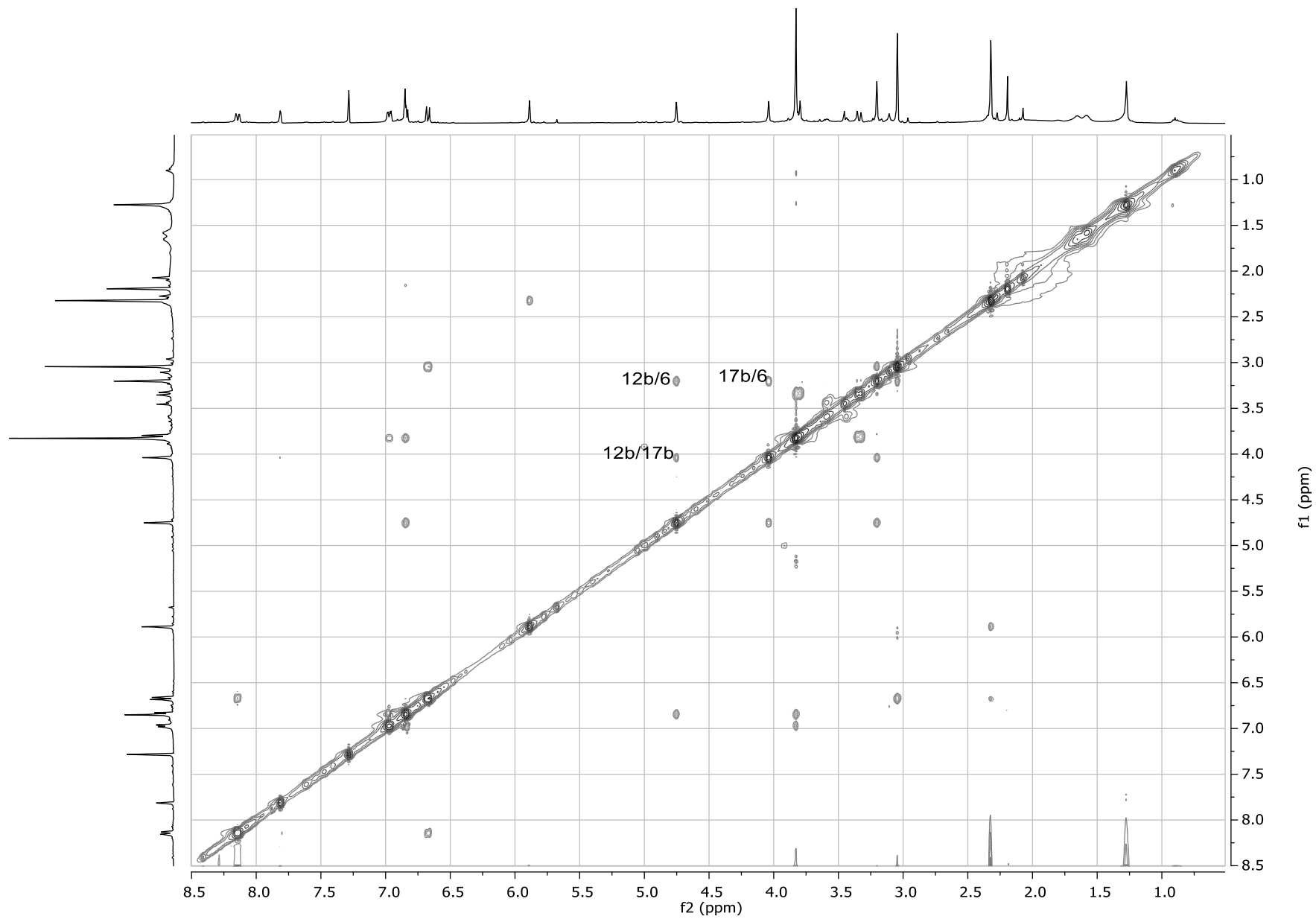


Figure S107. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-5ae in CDCl₃ at 400 MHz.

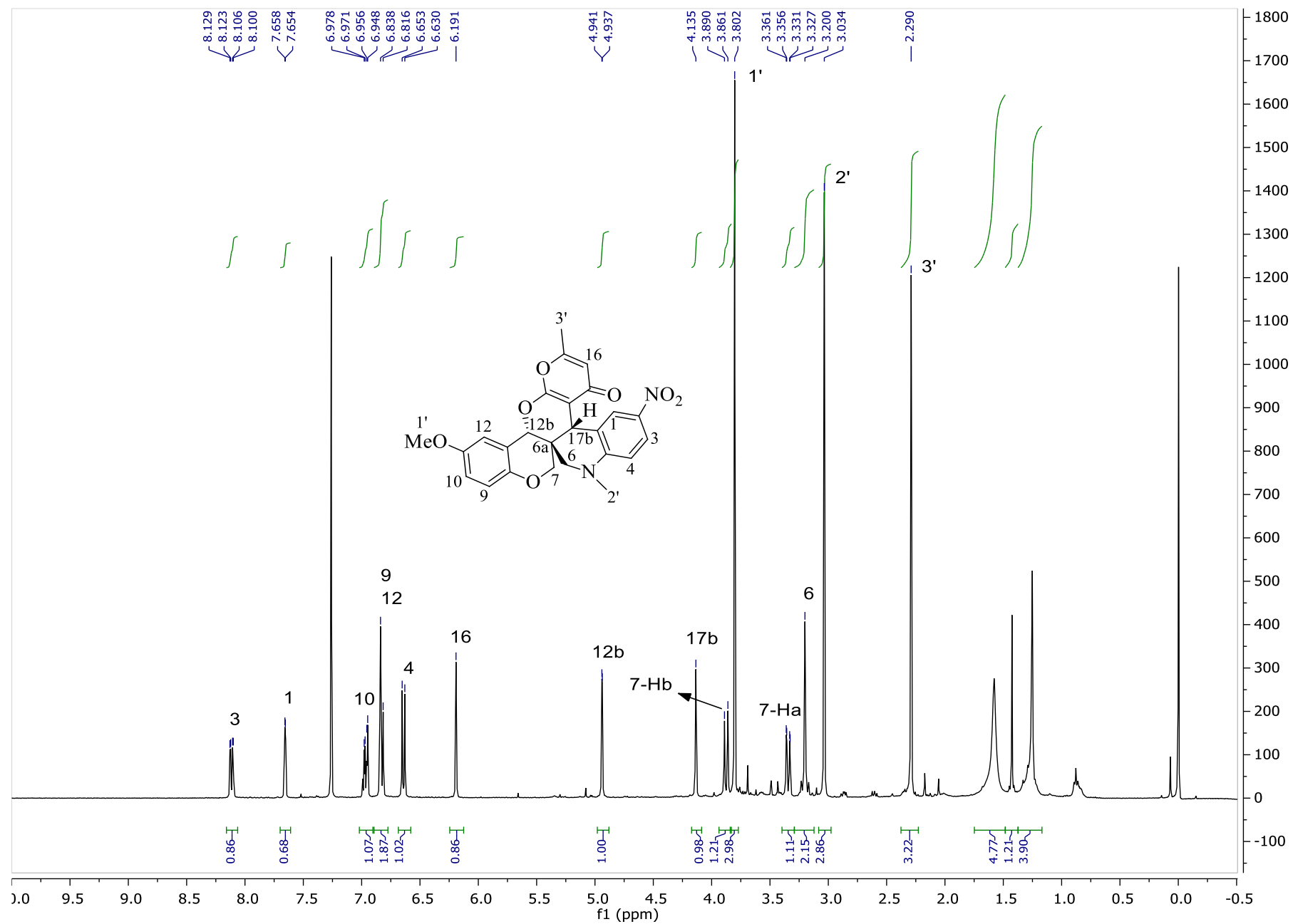


Figure S108. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-7ae in CDCl₃ at 400 MHz.

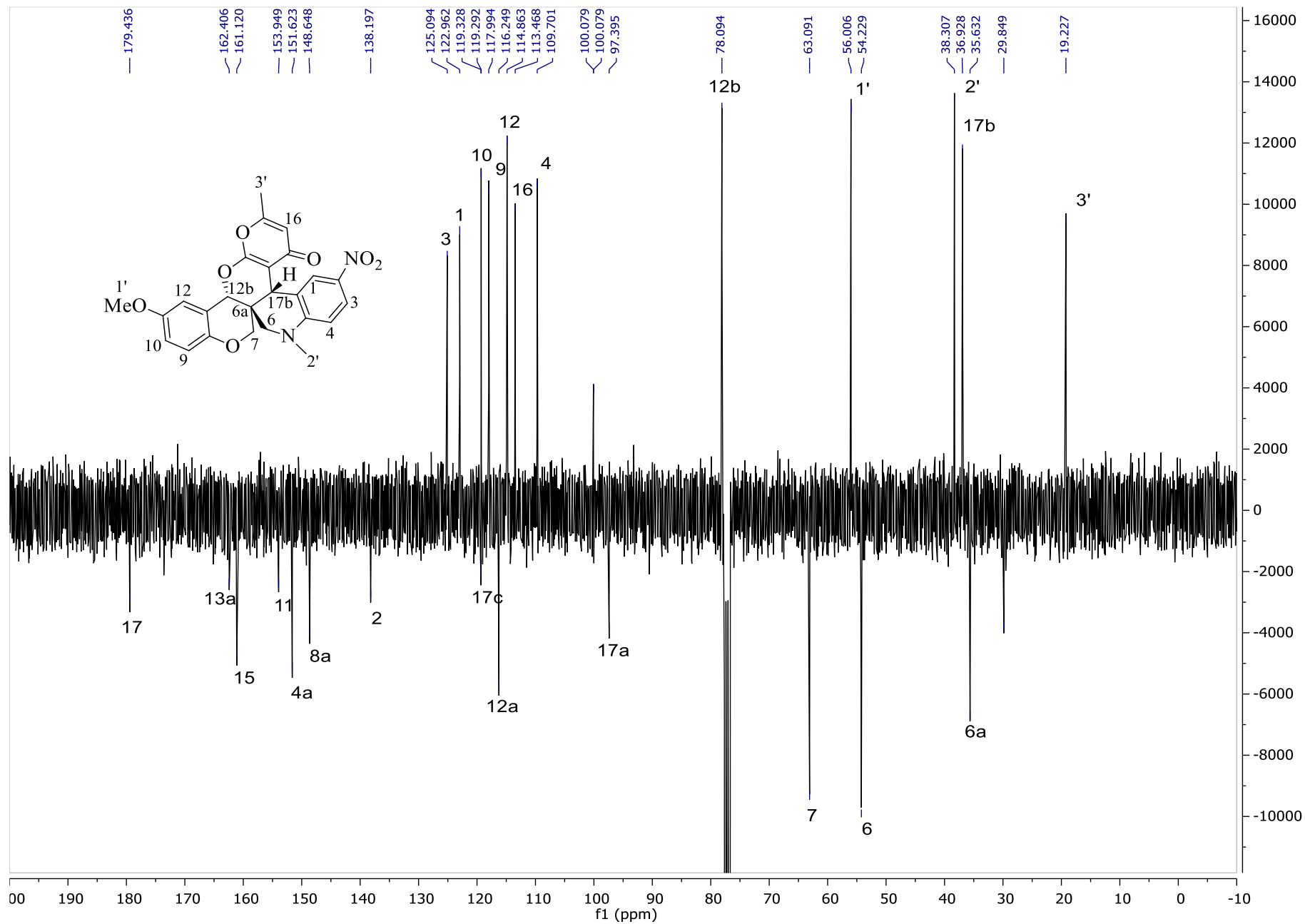


Figure S109. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-7ae in CDCl₃ at 90 MHz.

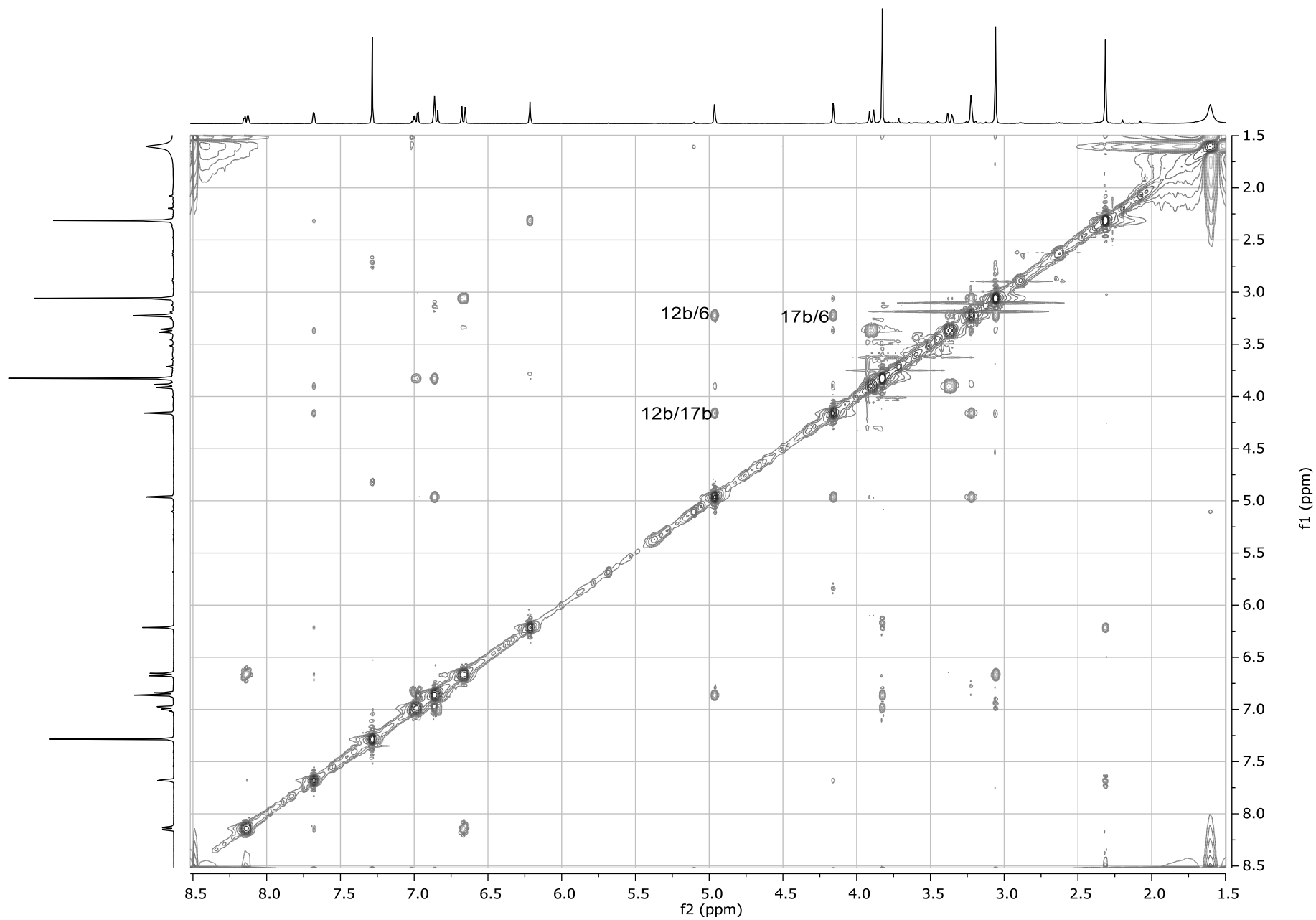


Figure S110. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-7ae in CDCl₃ at 400 MHz.

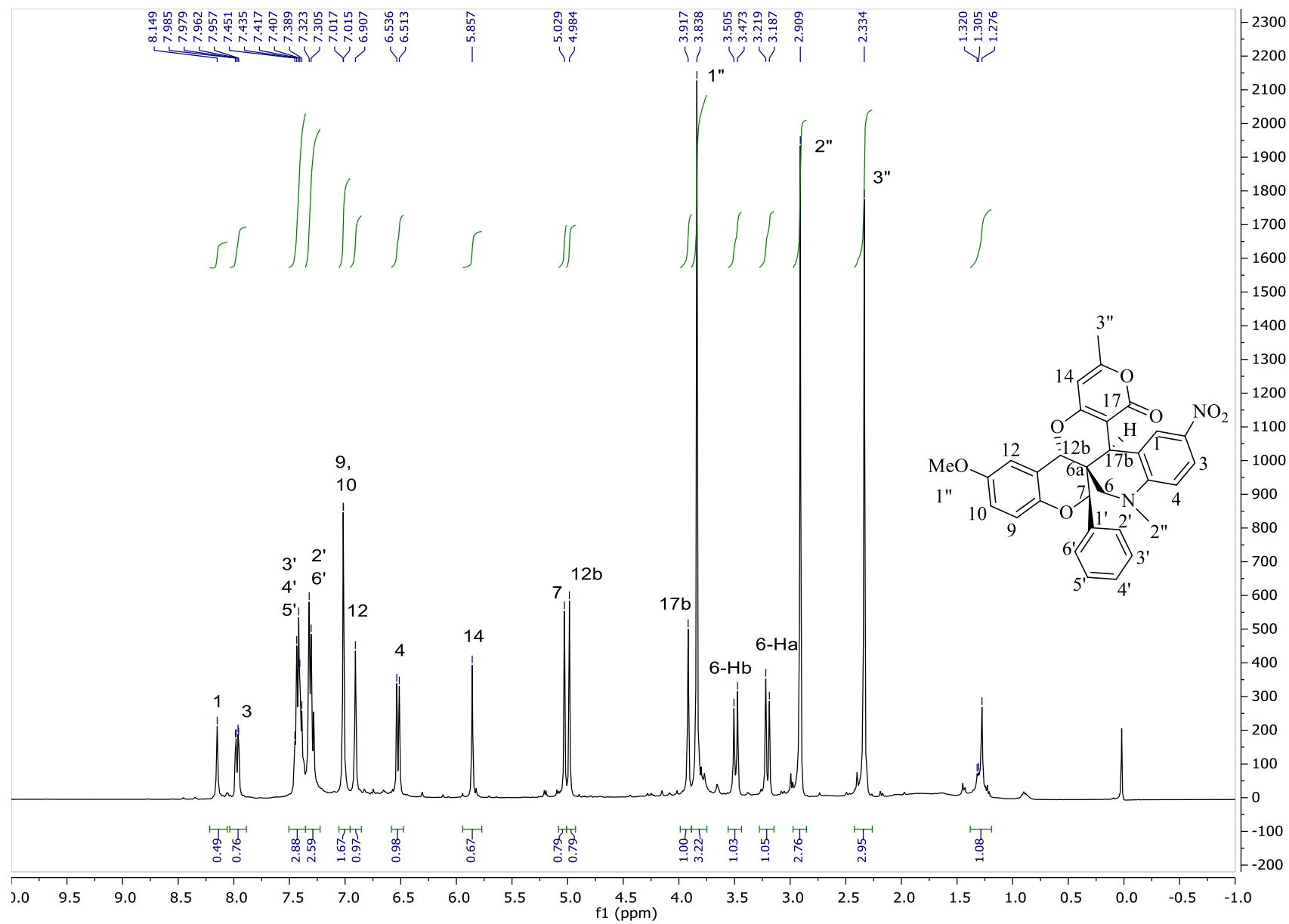


Figure S111. ¹H-NMR spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**4be** in CDCl₃ at 400 MHz.

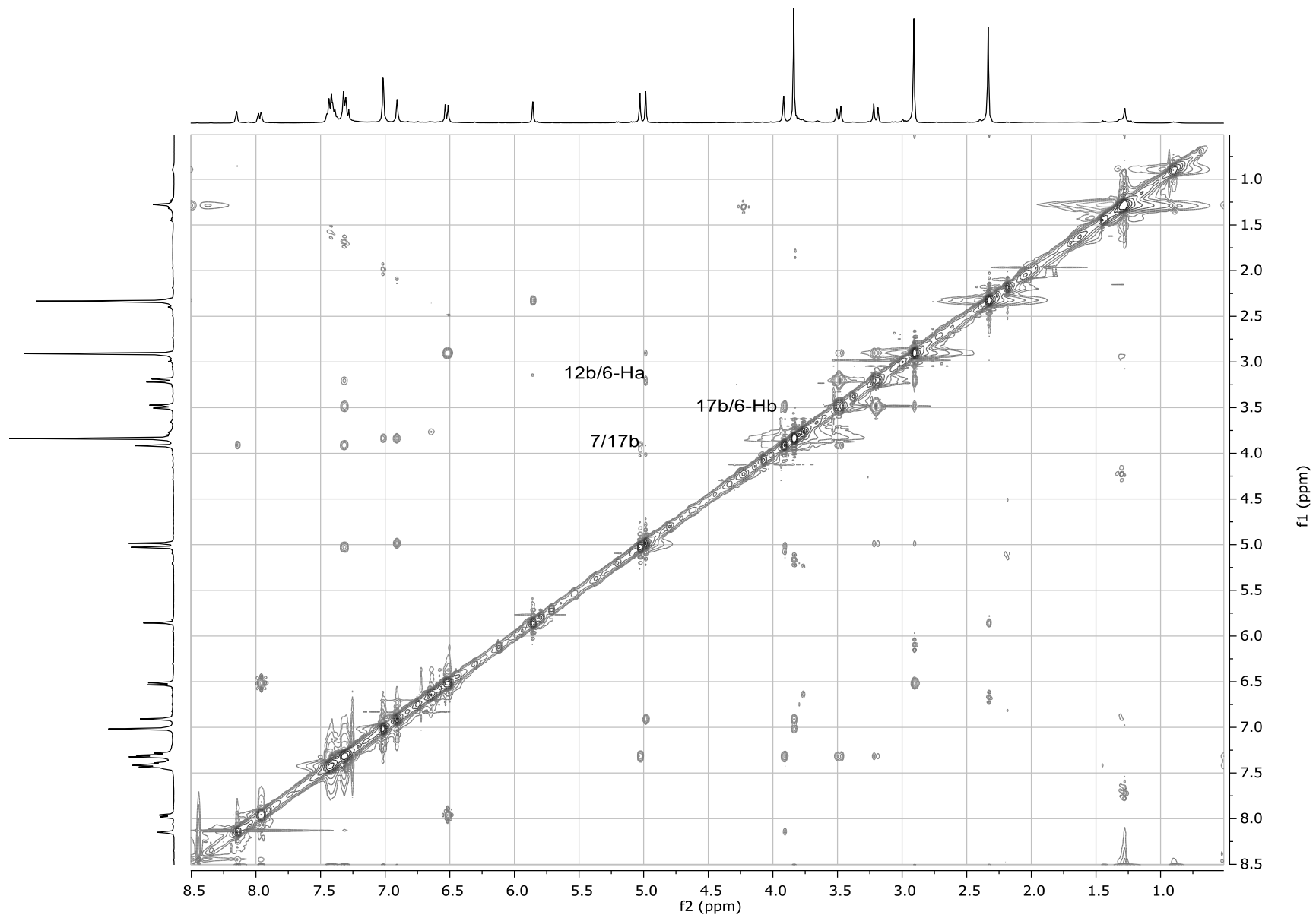


Figure S113. NOESY spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**4be** in CDCl₃ at 400 MHz.

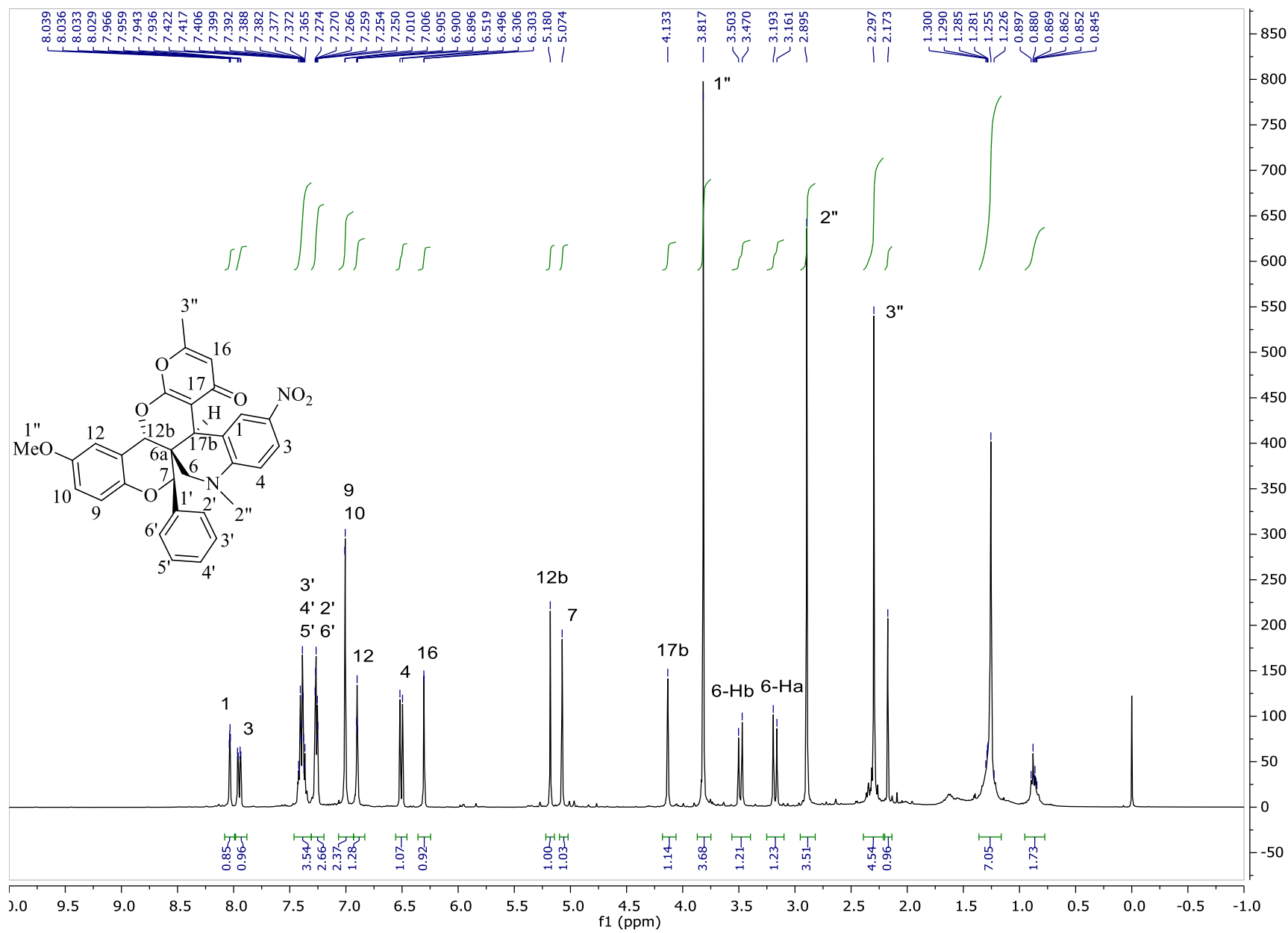


Figure S114. ¹H-NMR spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**6be** in CDCl₃ at 400 MHz.

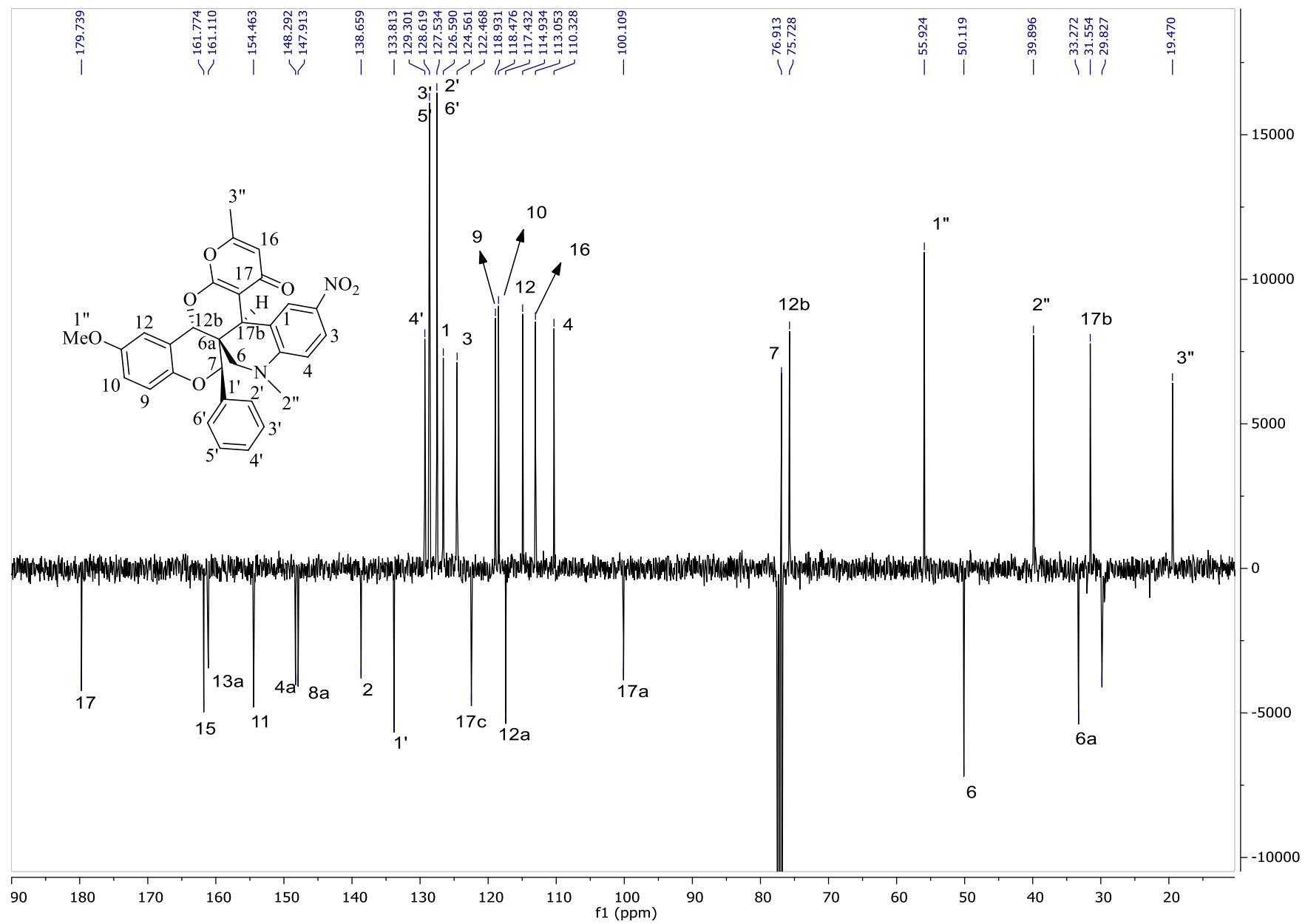


Figure S115. ¹³C-NMR spectrum of (6aS,7R,12bR,17bS)-**6be** in CDCl₃ at 100 MHz.

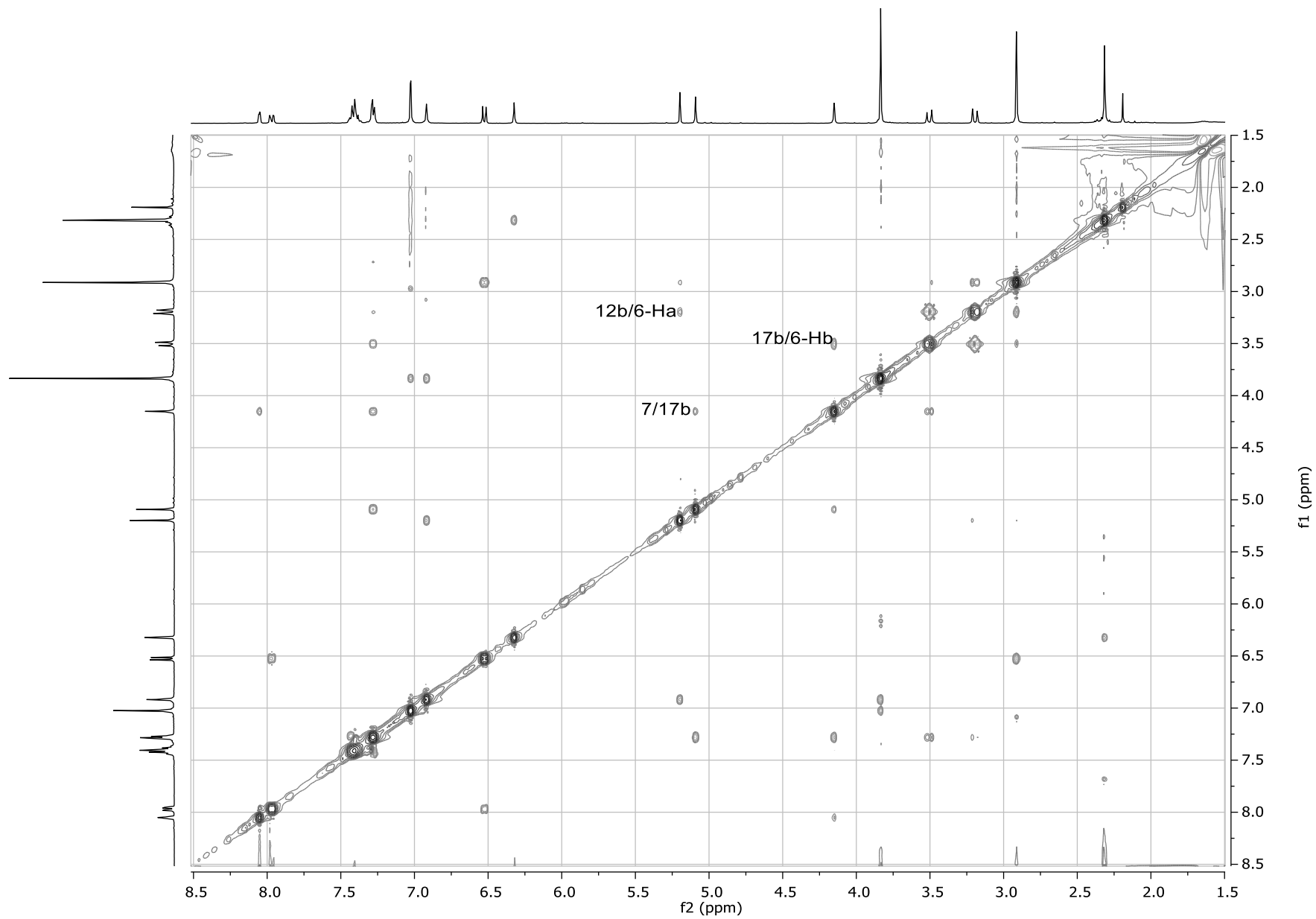


Figure S116. NOESY spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**6be** in CDCl₃ at 400 MHz.

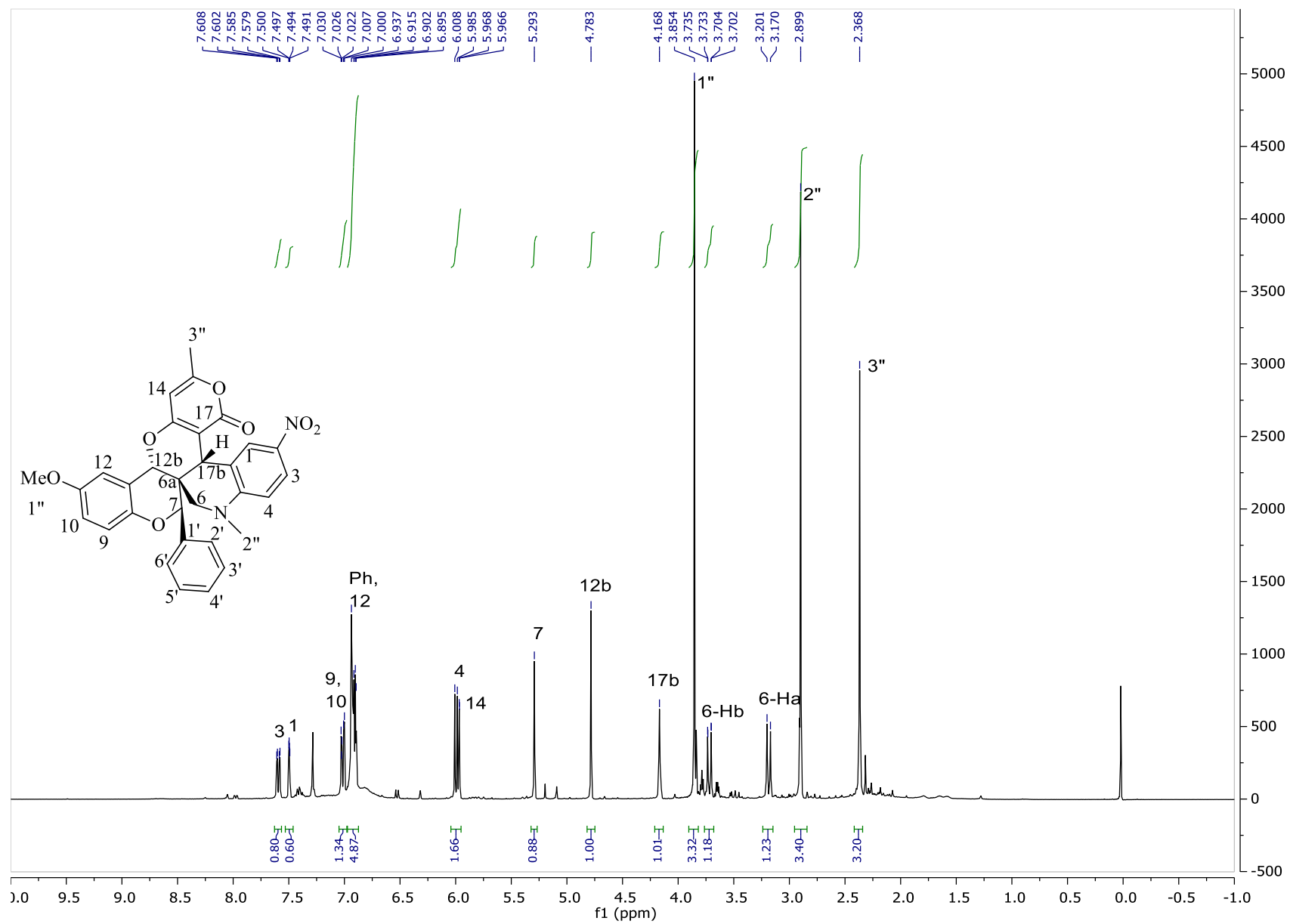


Figure S117. ¹H-NMR spectrum of (6aS,7R,12bR,17bR)-5be in CDCl₃ at 400 MHz.

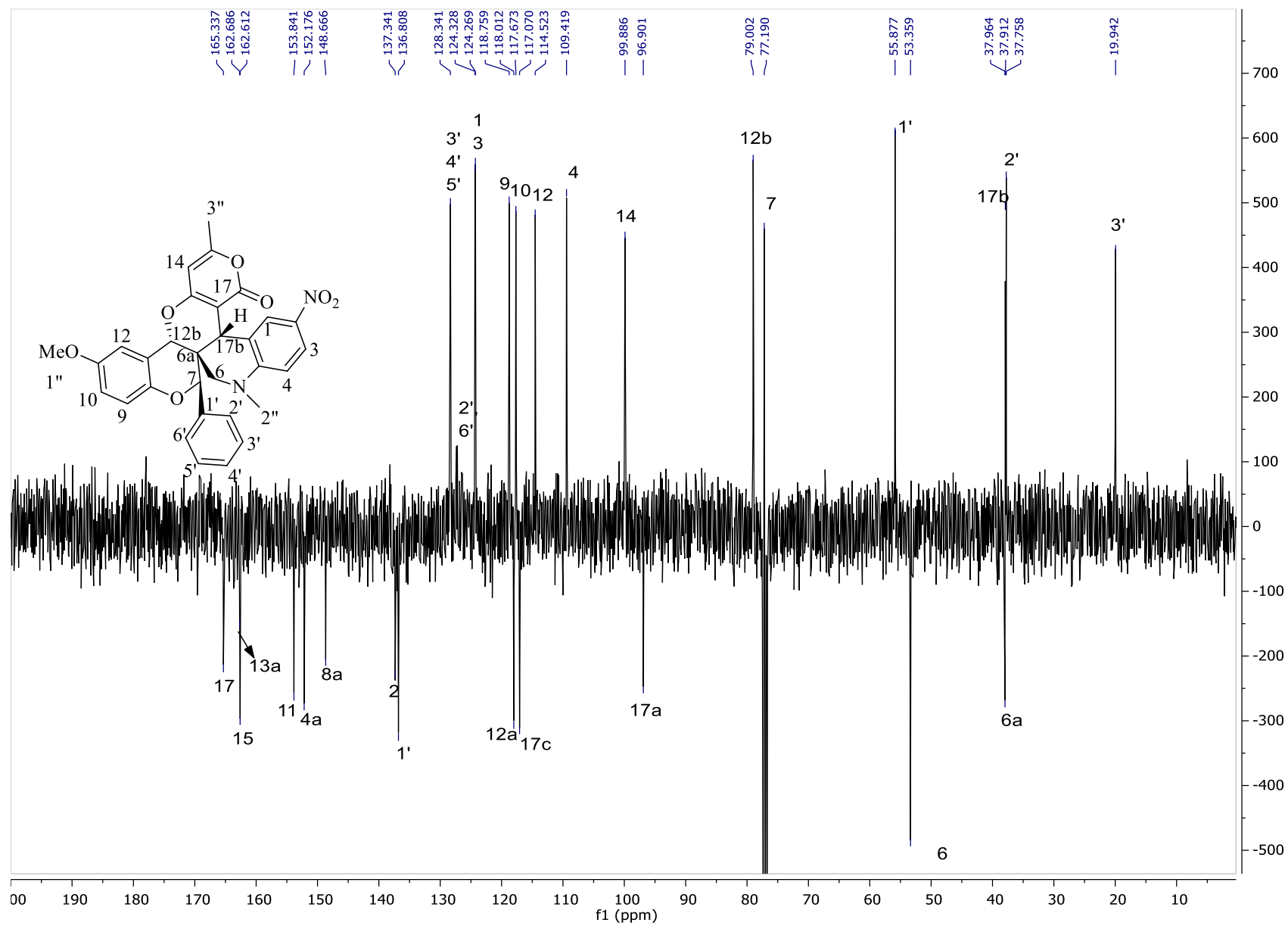


Figure S118. ¹³C-NMR spectrum of (6aS,7R,12bR,17bR)-5be in CDCl₃ at 100 MHz.

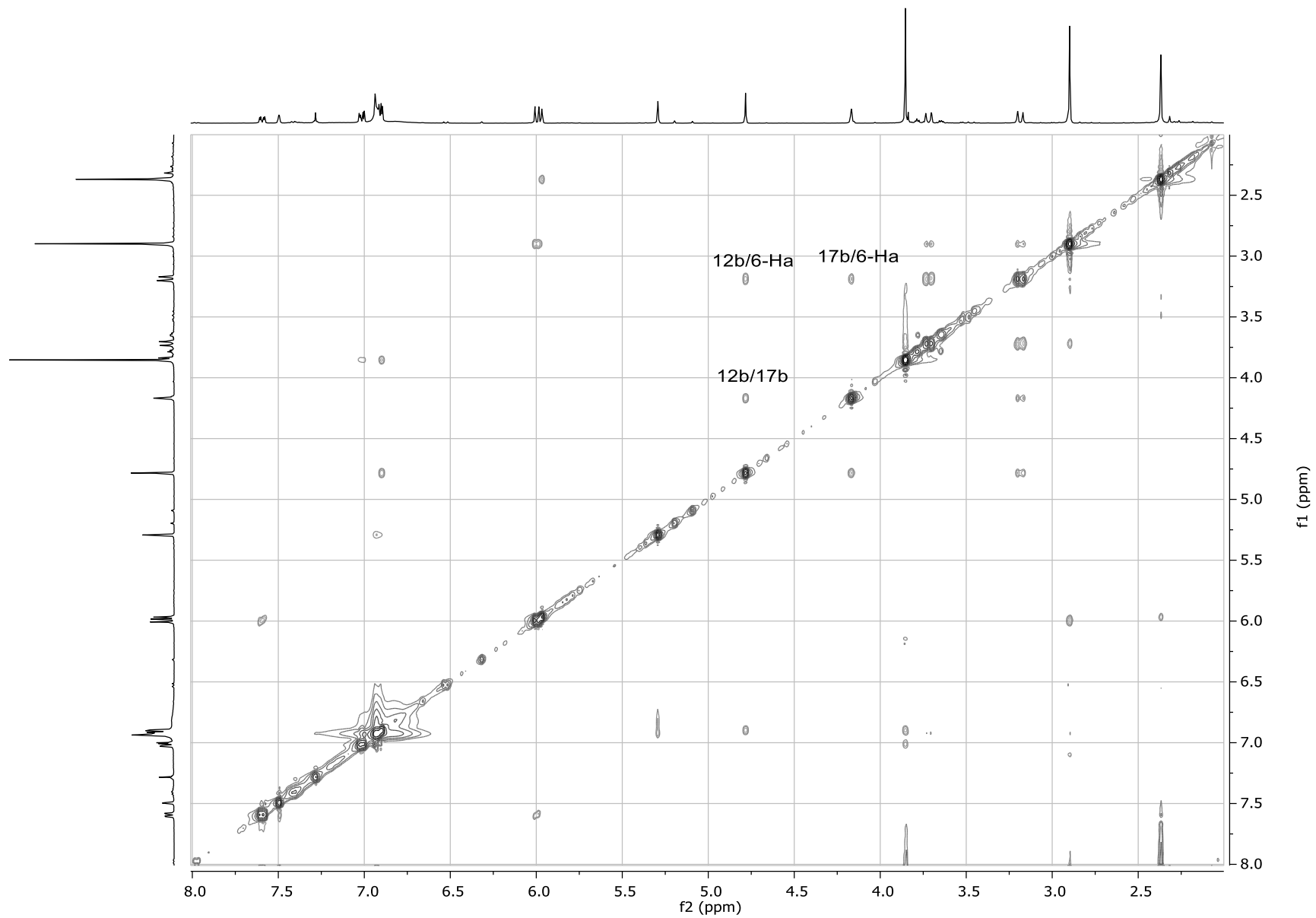


Figure S119. NOESY spectrum of (6a*S*,7*R*,12b*R*,17b*R*)-**5be** in CDCl₃ at 400 MHz.

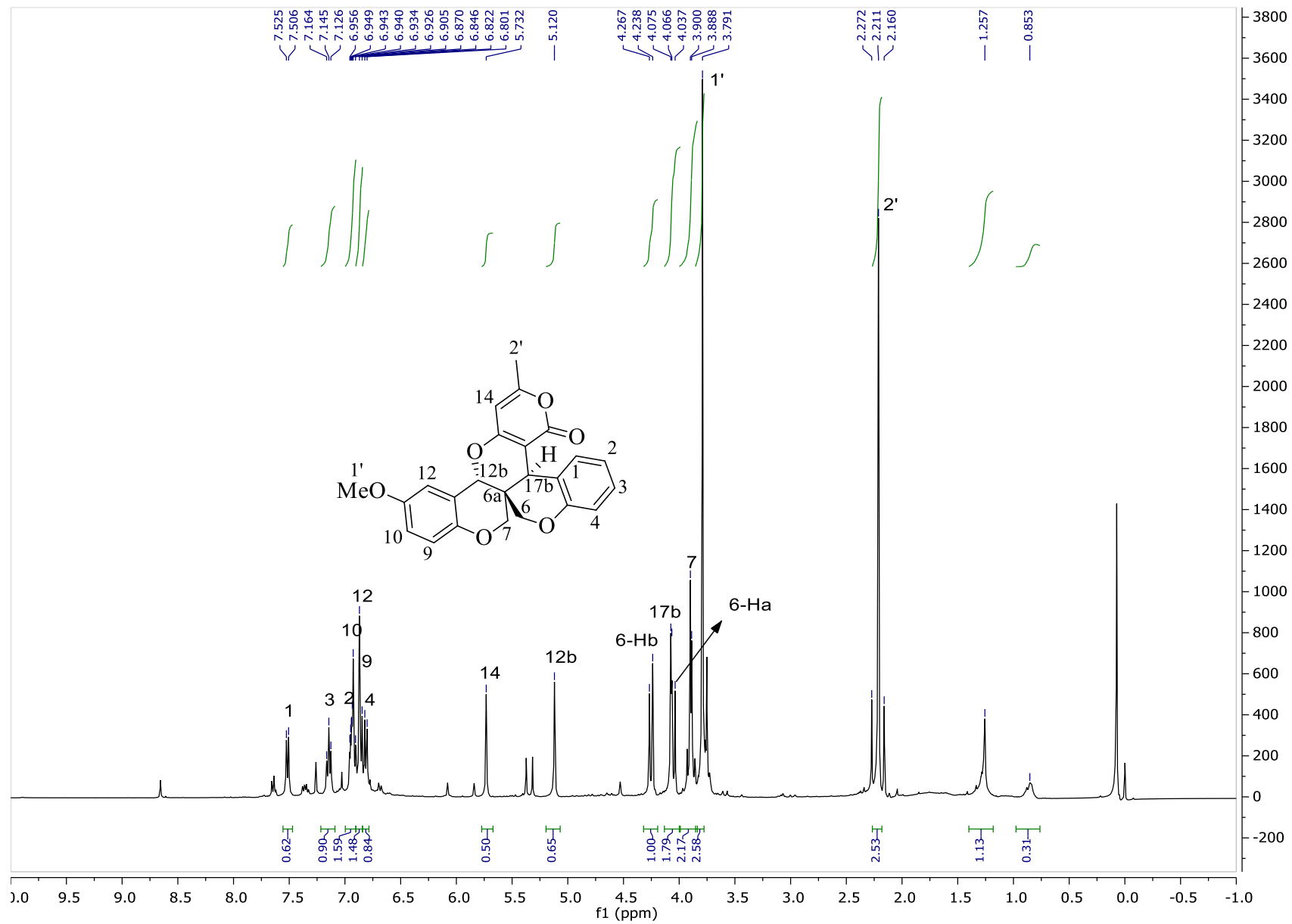


Figure S120. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-4ce in CDCl₃ at 400 MHz.

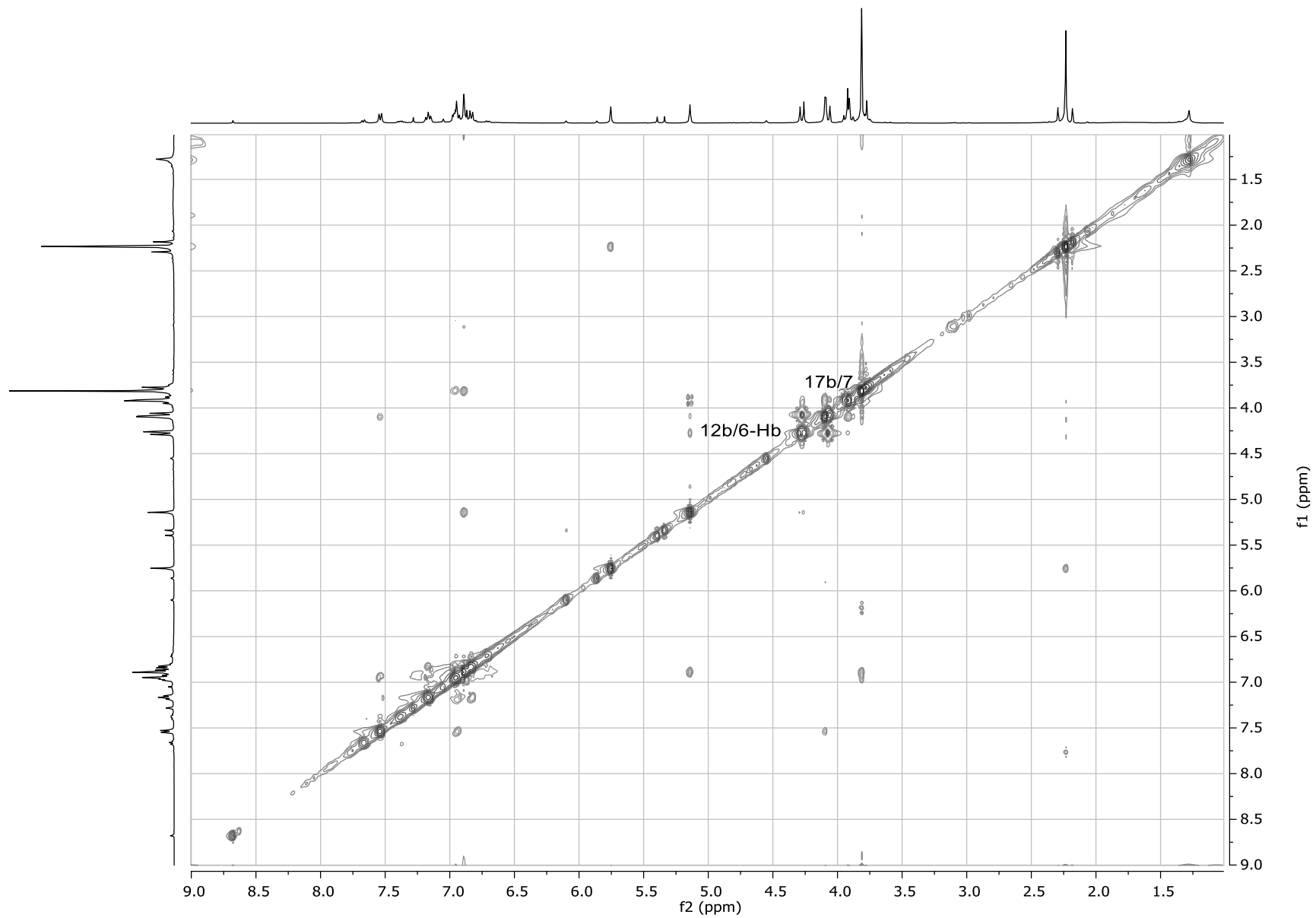


Figure S122. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-4ce in CDCl₃ at 400 MHz.

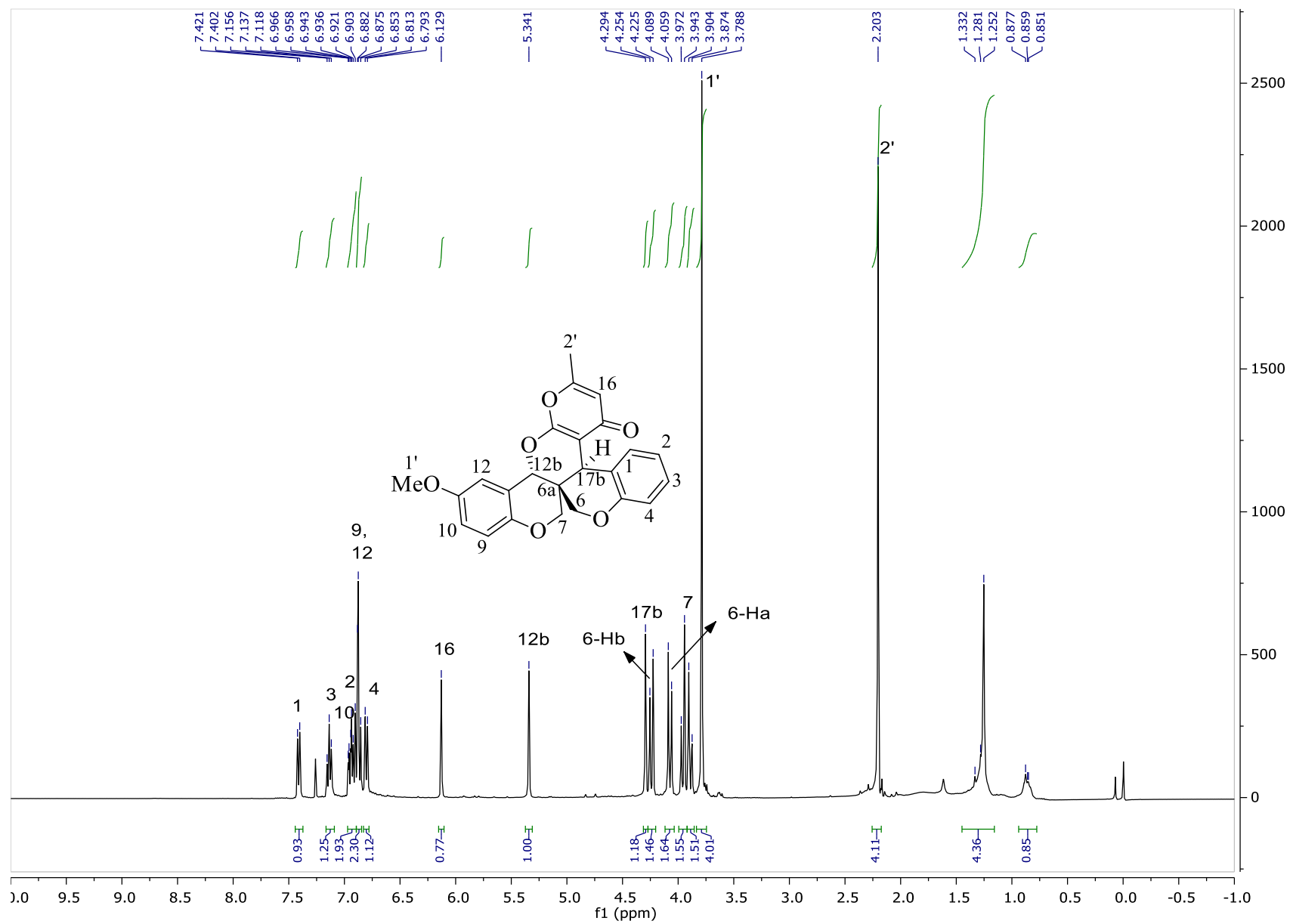


Figure S123. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-6ce in CDCl₃ at 400 MHz.

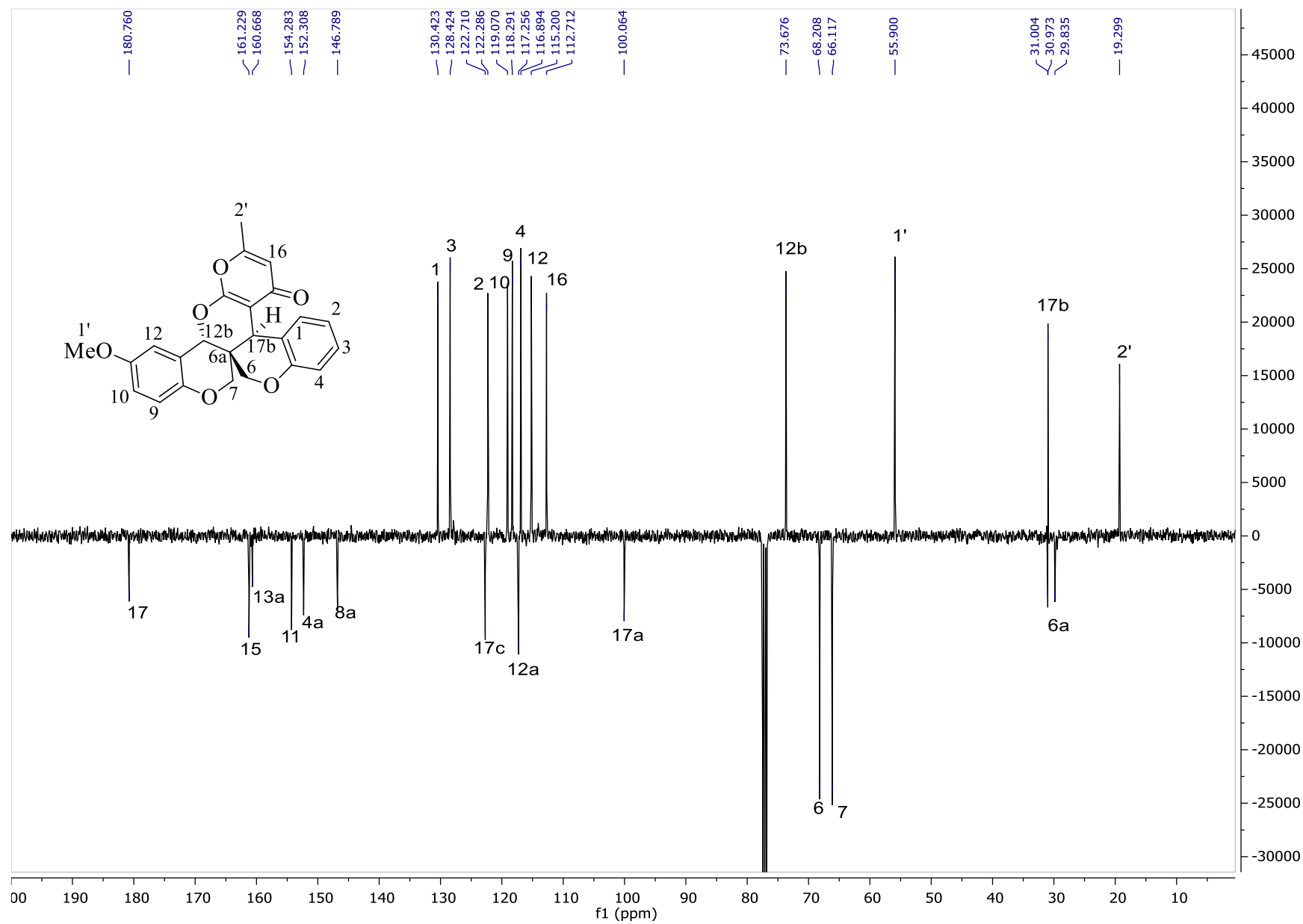


Figure S124. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-**6ce** in CDCl₃ at 100 MHz.

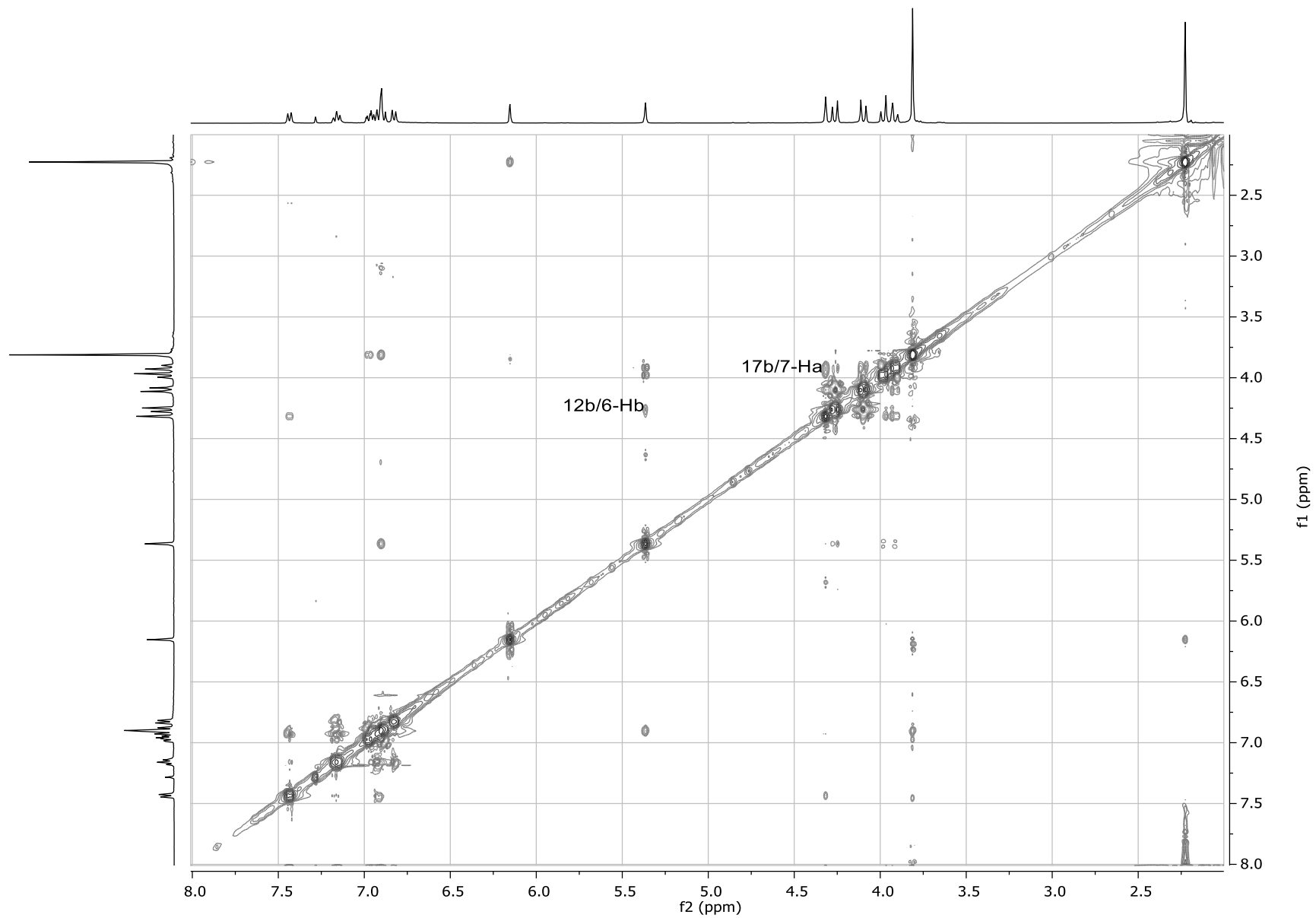


Figure S125. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-6ce in CDCl₃ at 400 MHz.

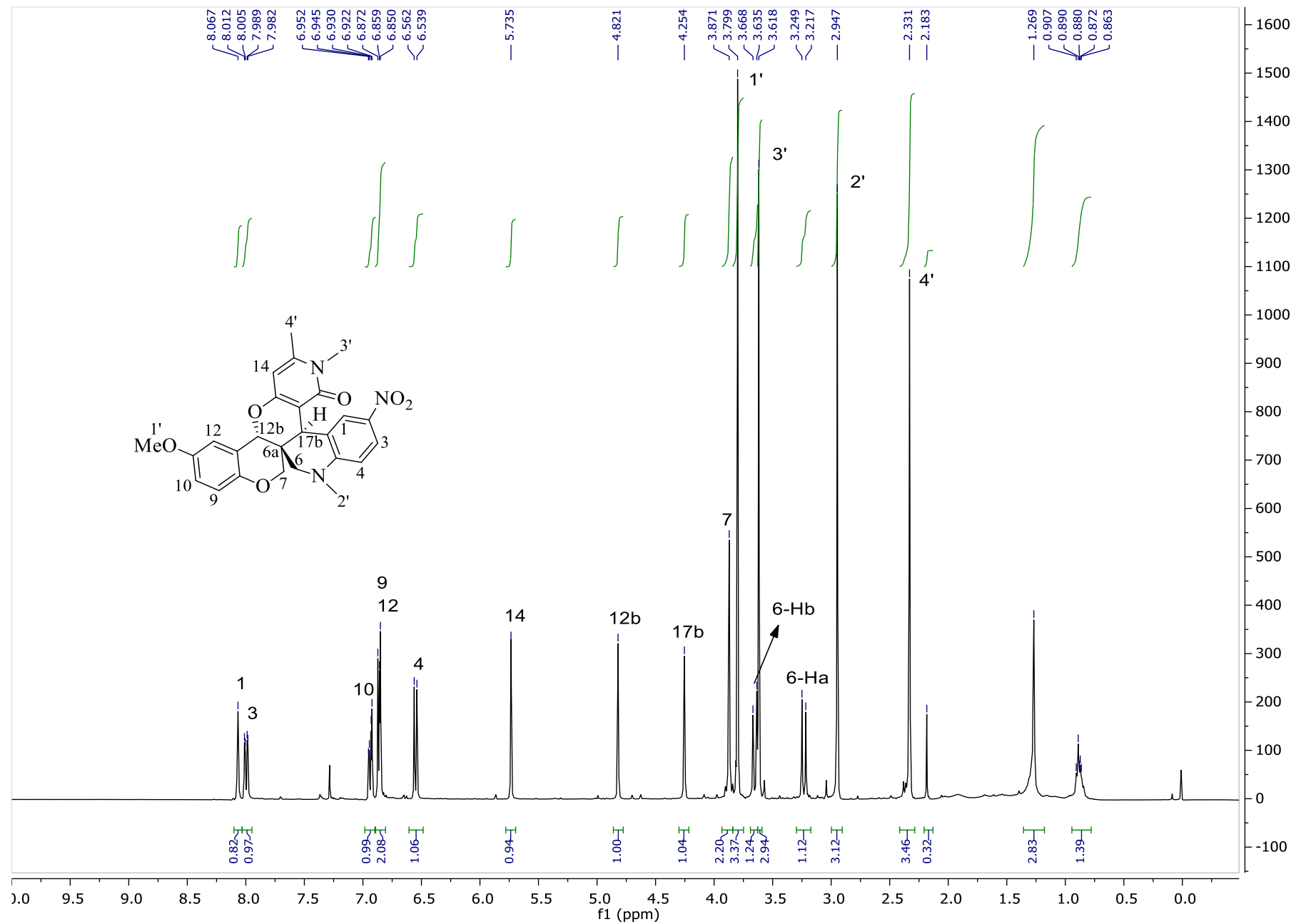


Figure S126. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-4af in CDCl₃ at 400 MHz.

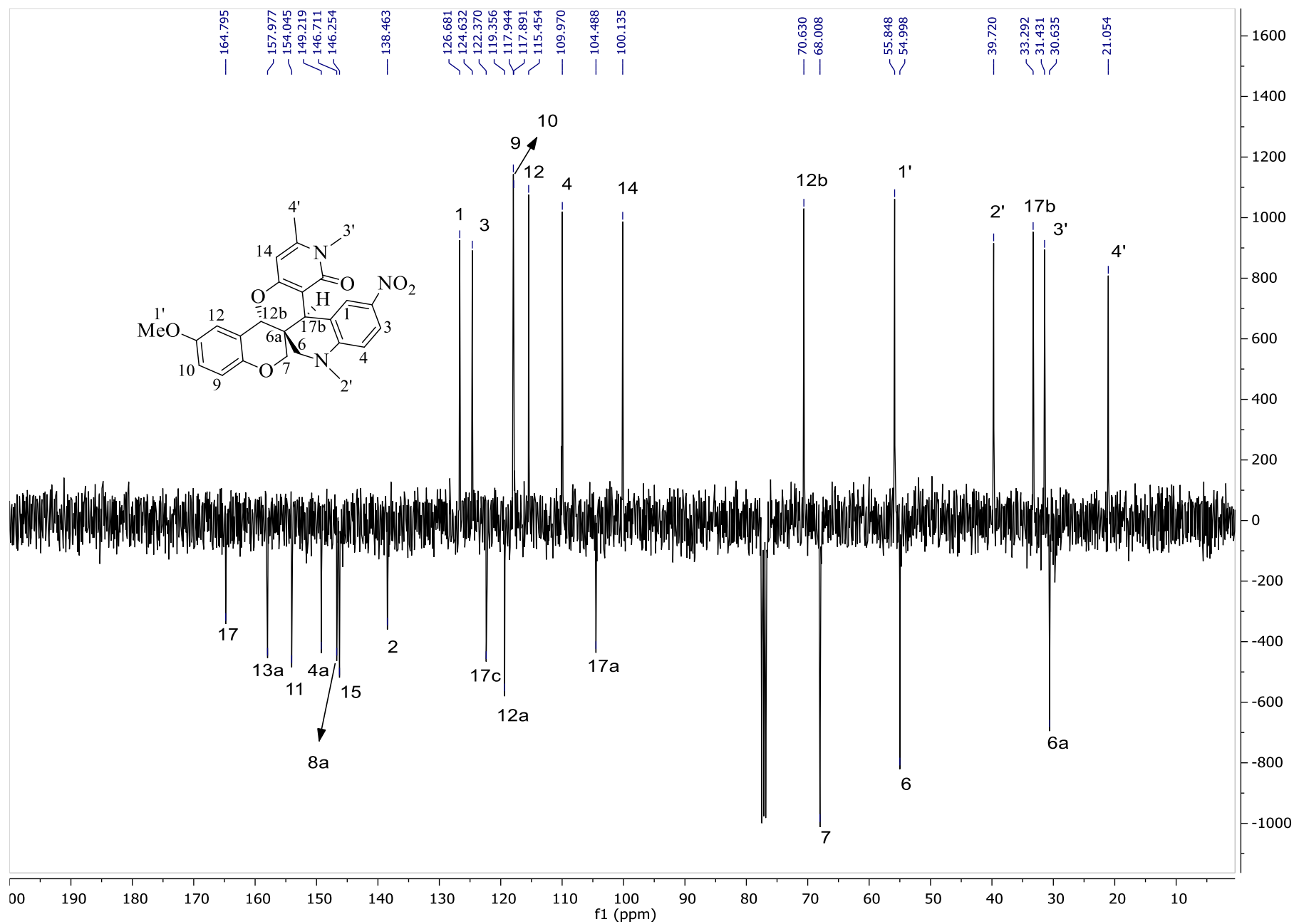


Figure S127. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-4af in CDCl_3 at 100 MHz.

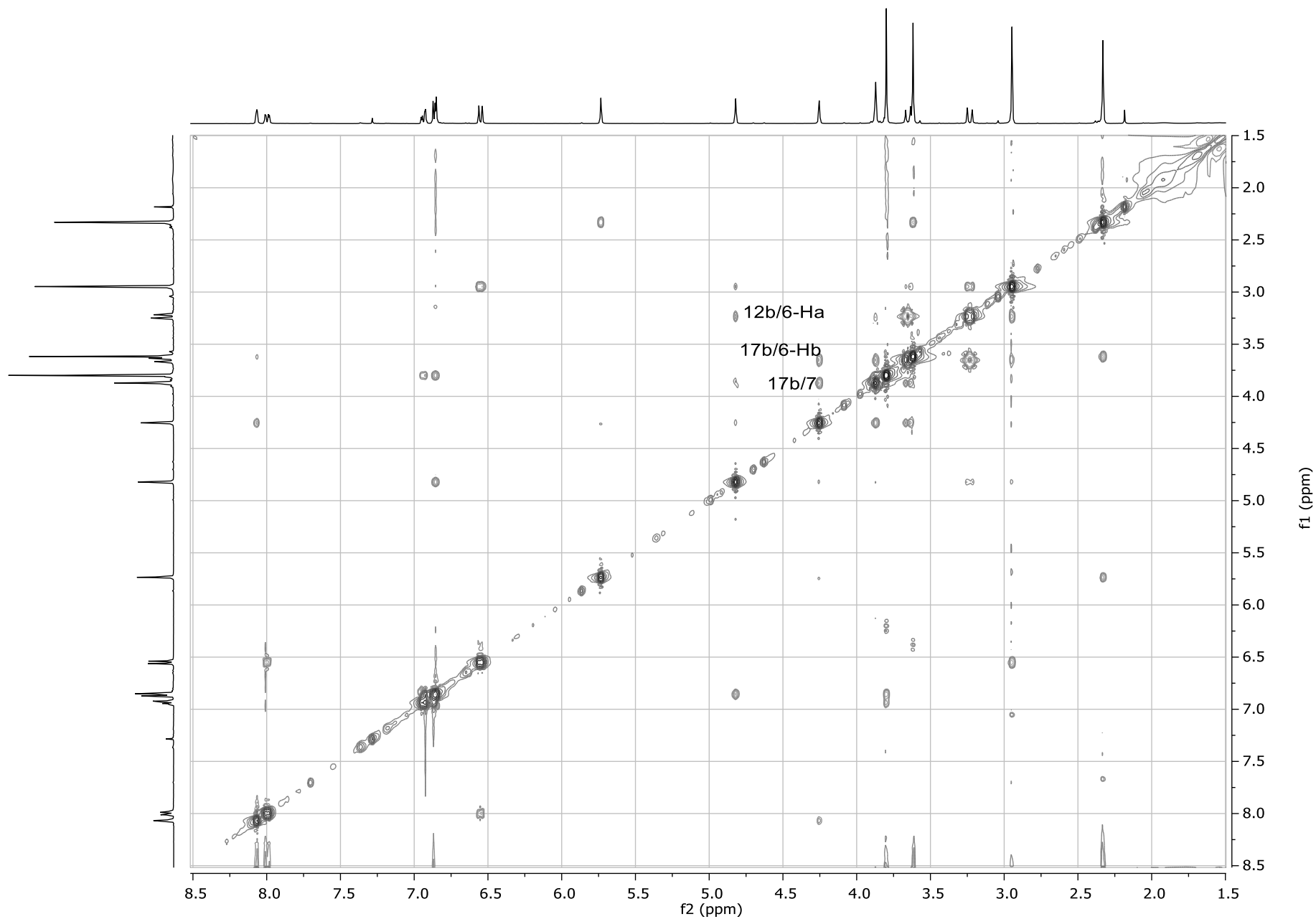


Figure S128. NOESY spectrum of *rac*-(6aS*,12bR*,17bS*)-4af in CDCl₃ at 400 MHz.

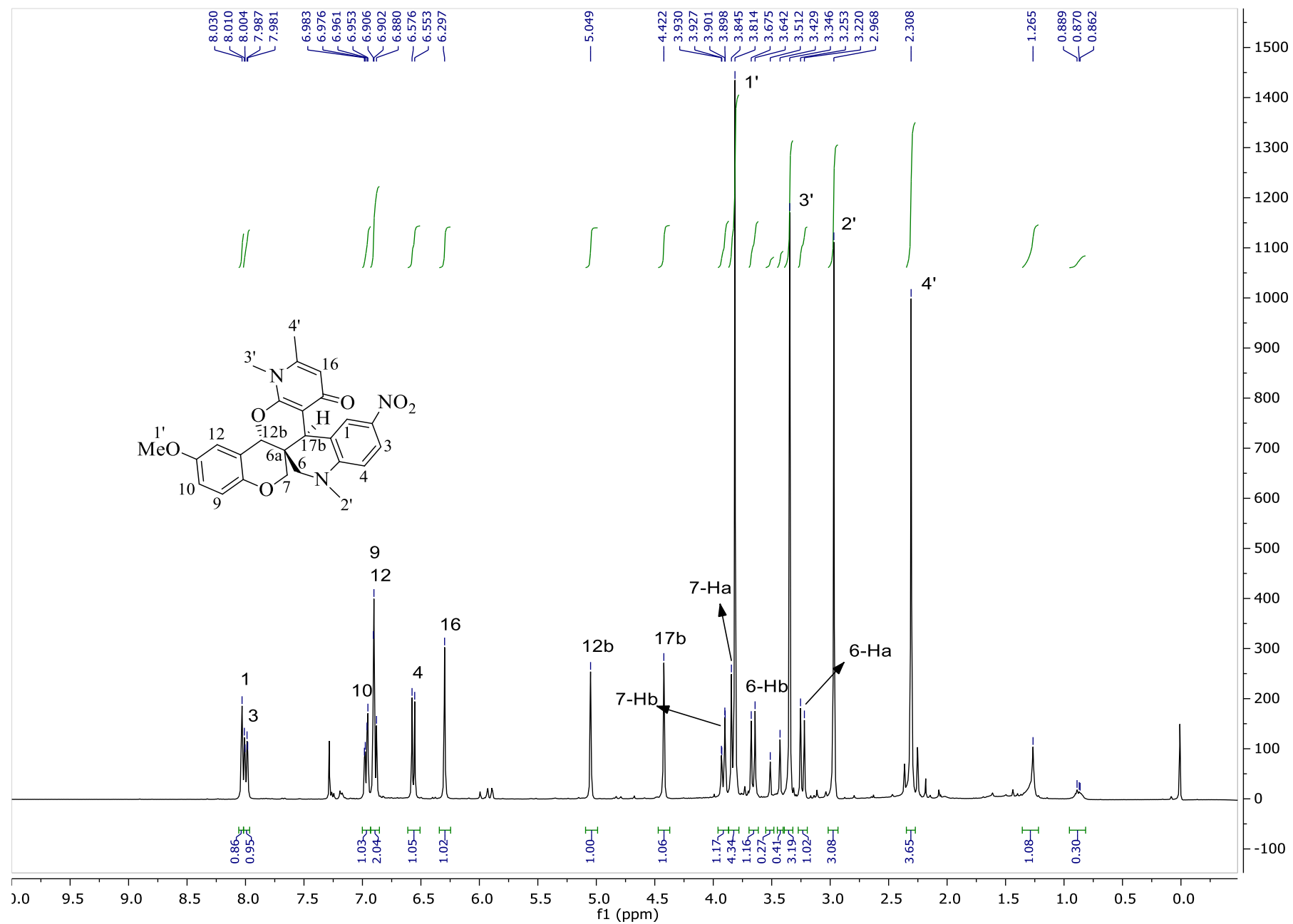


Figure S129. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-**6af** in CDCl₃ at 400 MHz.

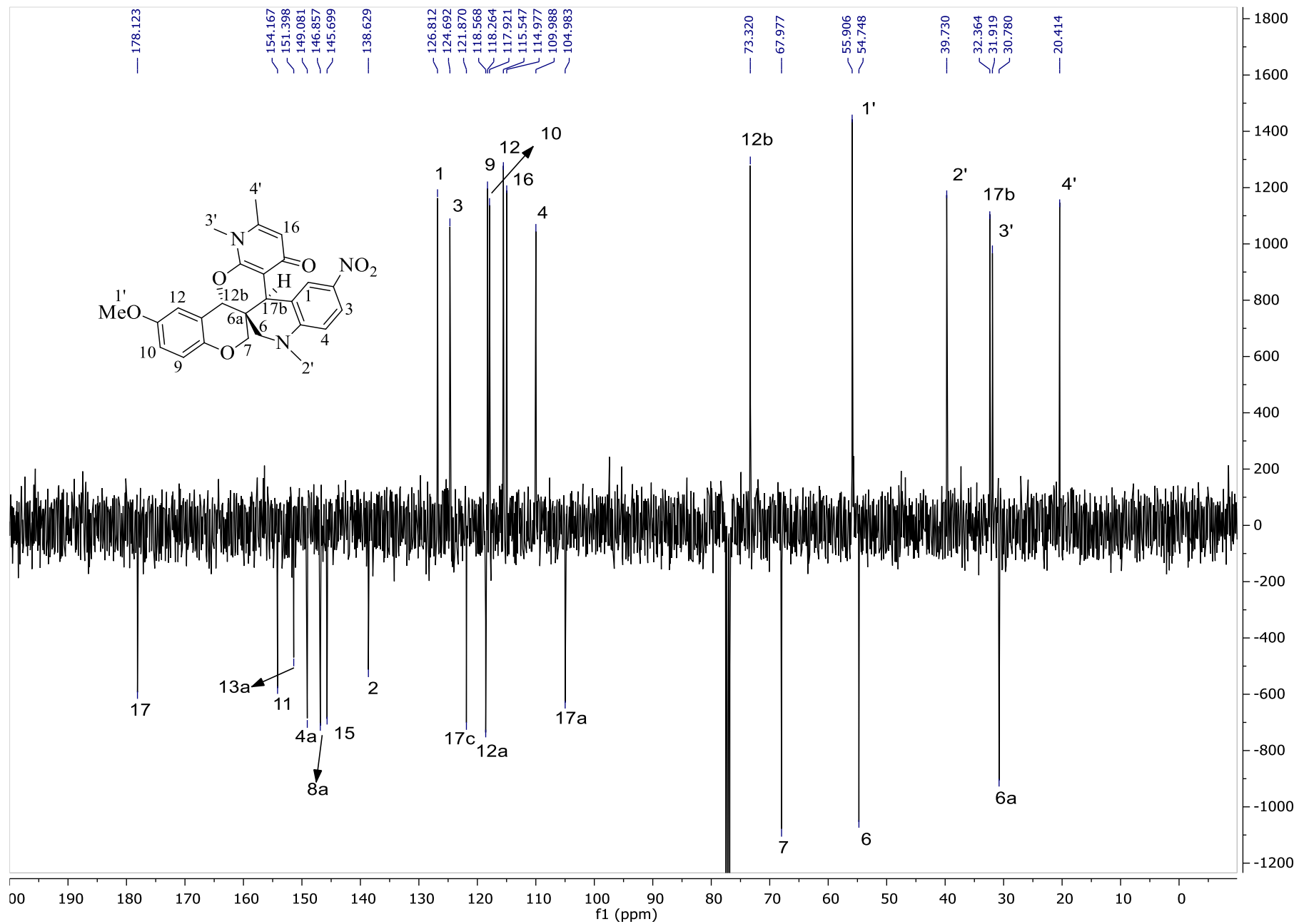


Figure S130. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-6af in CDCl_3 at 100 MHz.

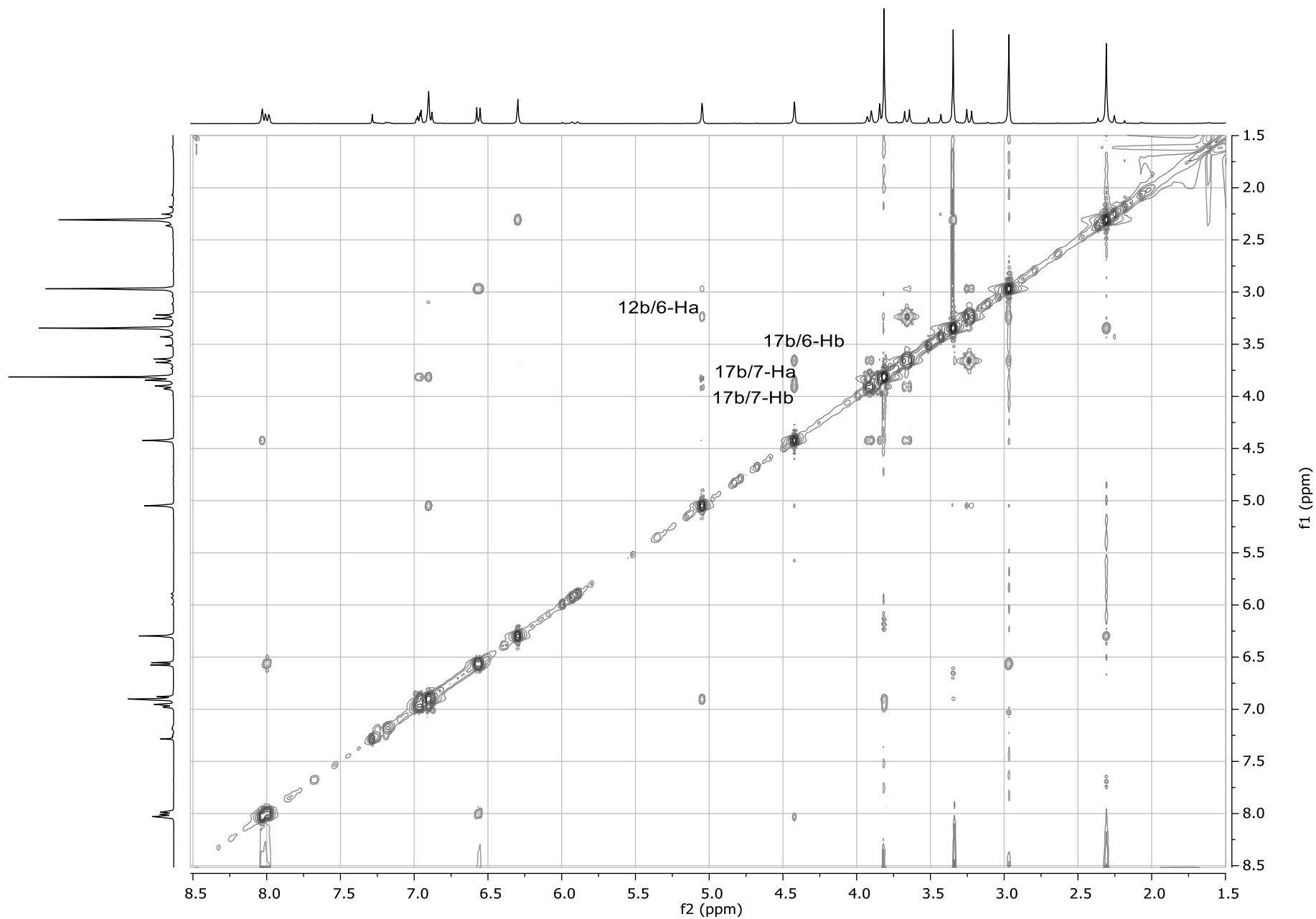


Figure S131. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*S**)-6af in CDCl₃ at 400 MHz.

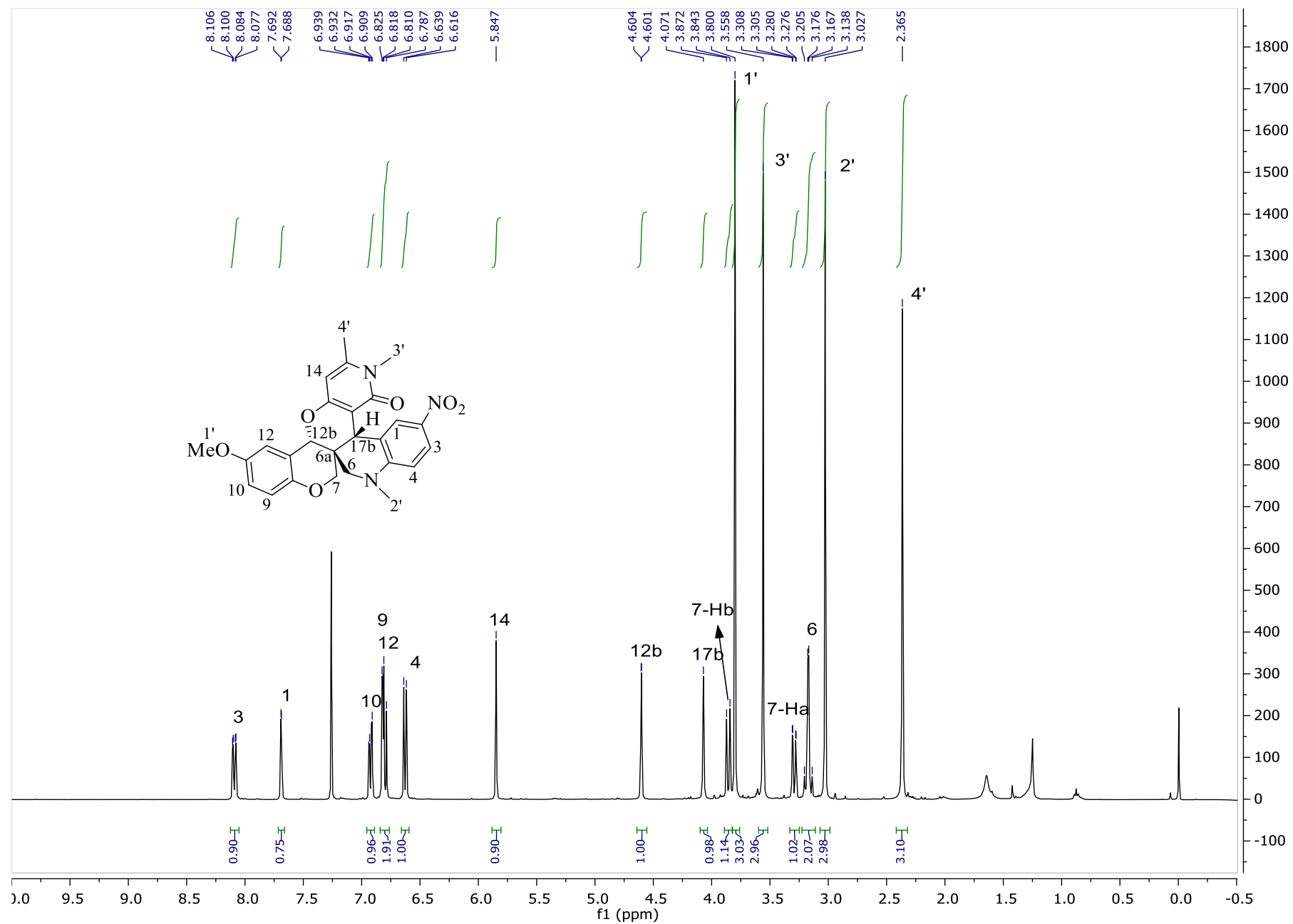


Figure S132. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-**5af** in CDCl₃ at 400 MHz.

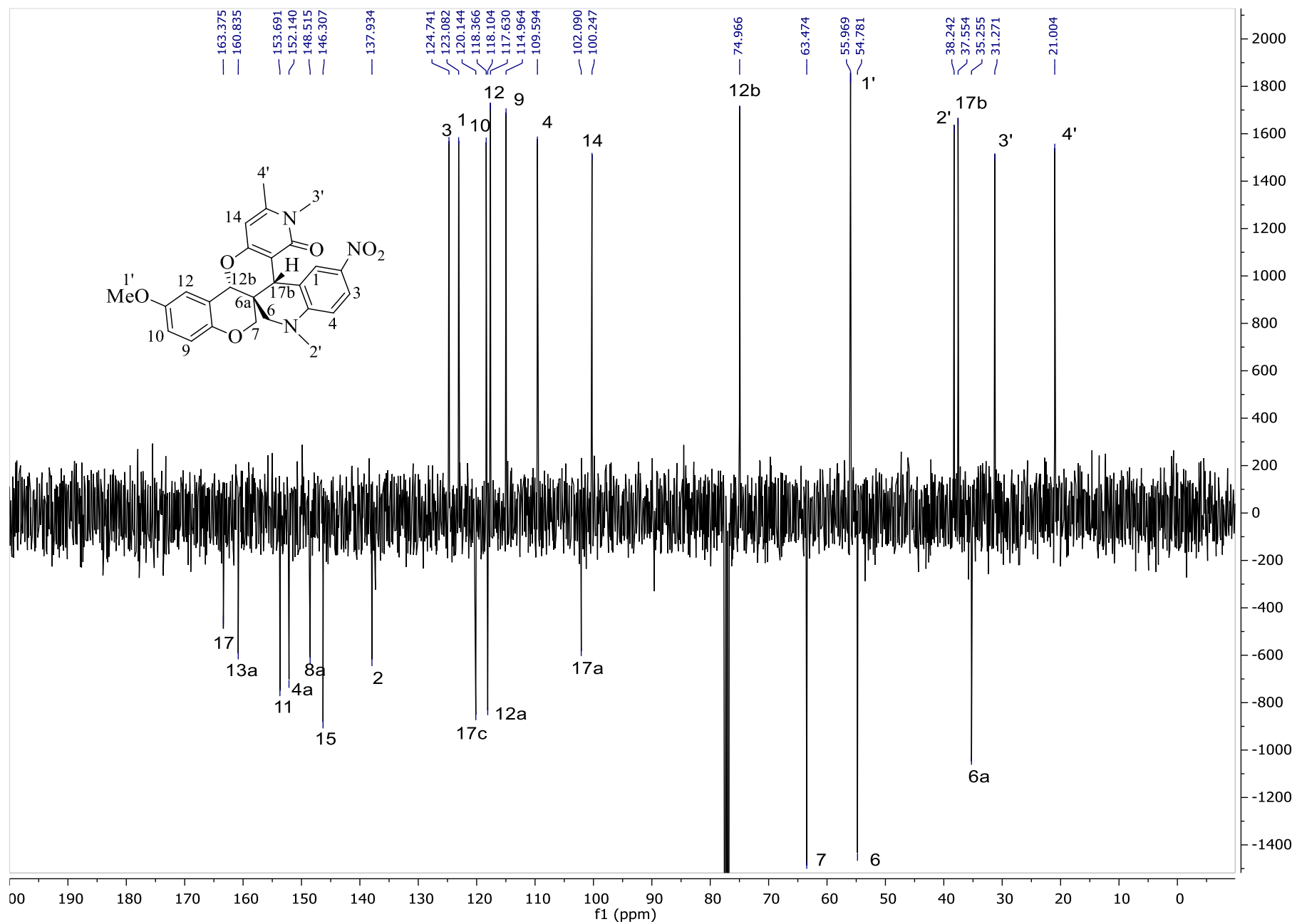


Figure S133. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-5af in CDCl_3 at 100 MHz.

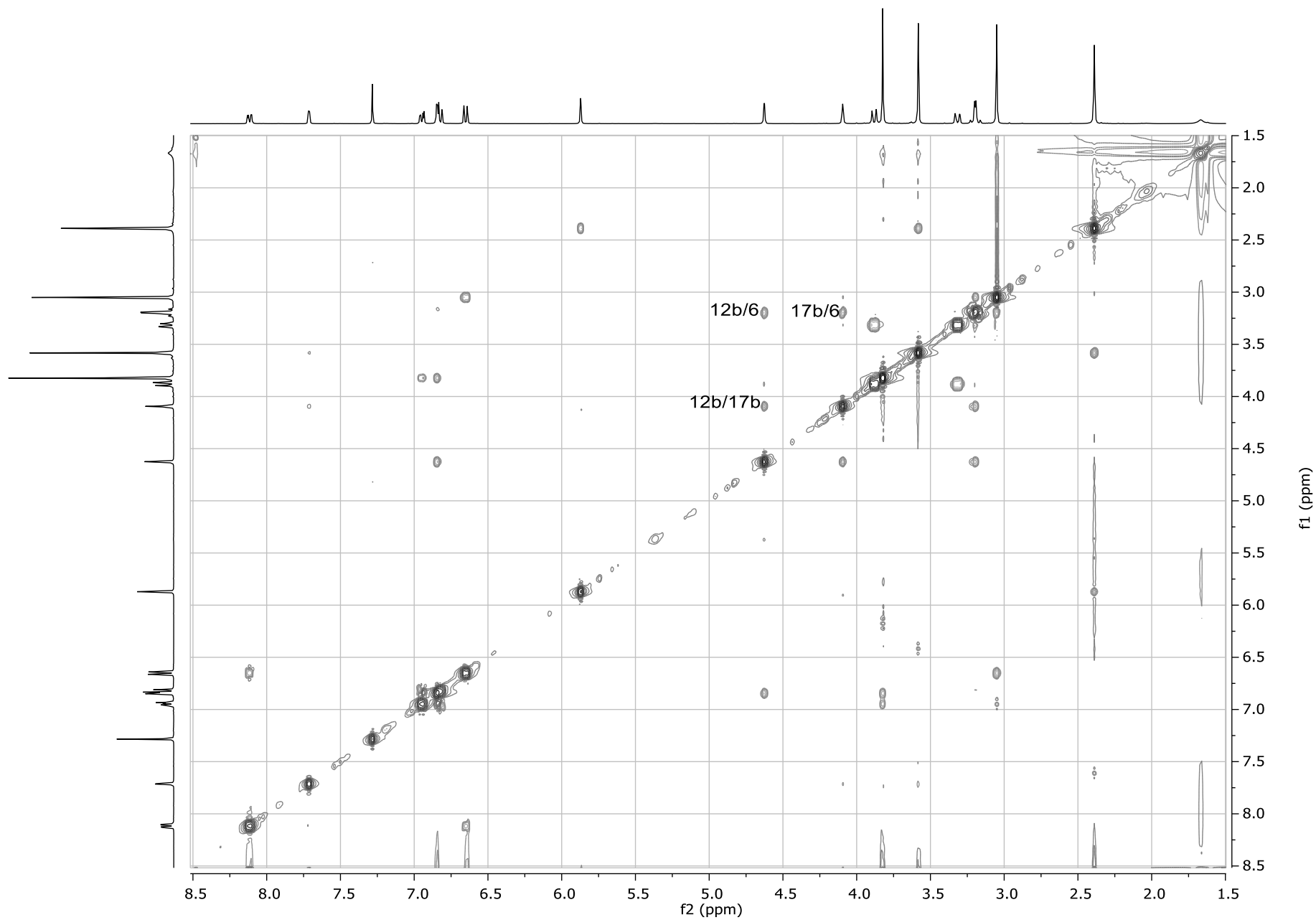


Figure S134. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-5af in CDCl₃ at 400 MHz.

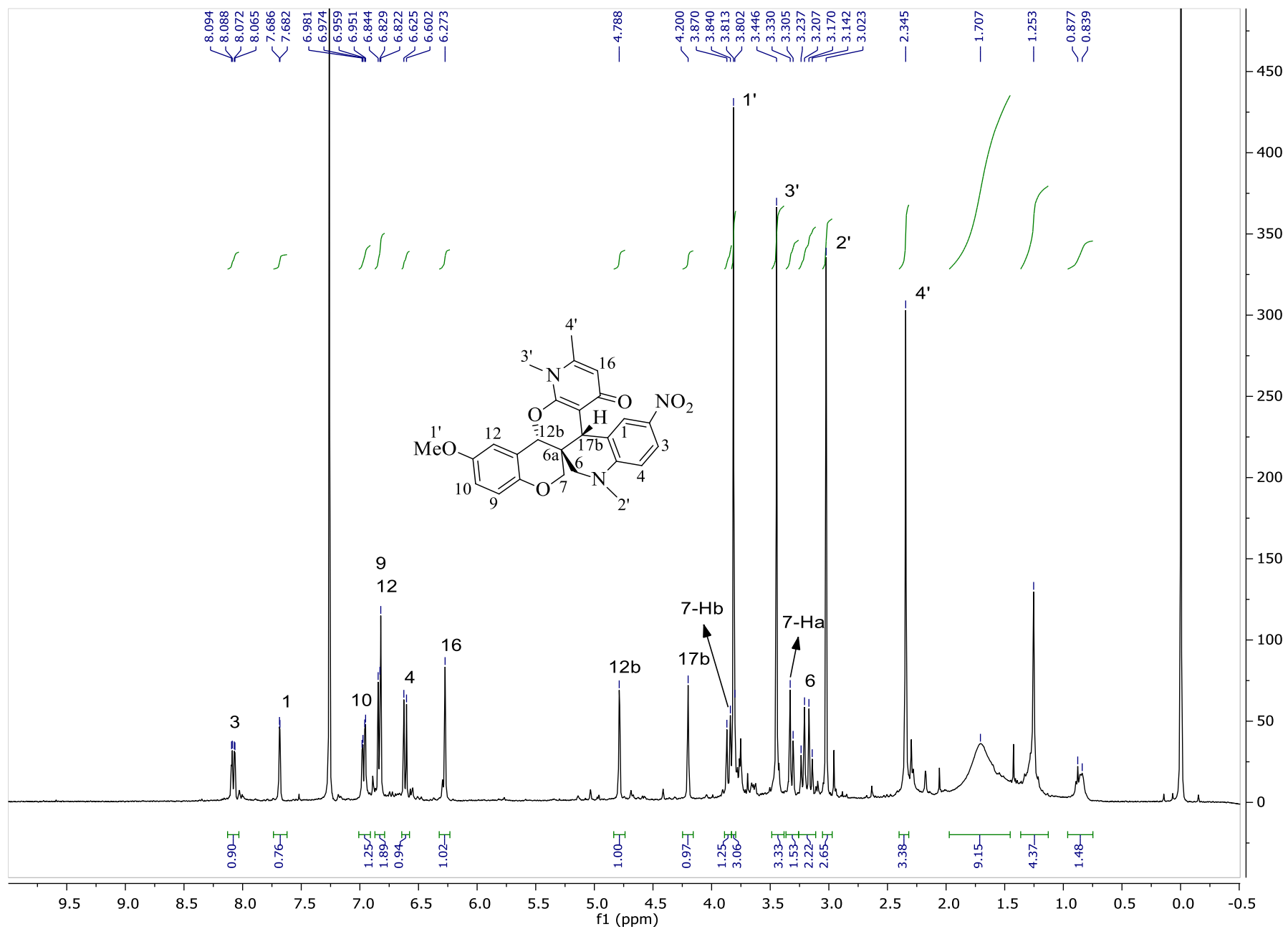


Figure S135. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-7af in CDCl₃ at 400 MHz.

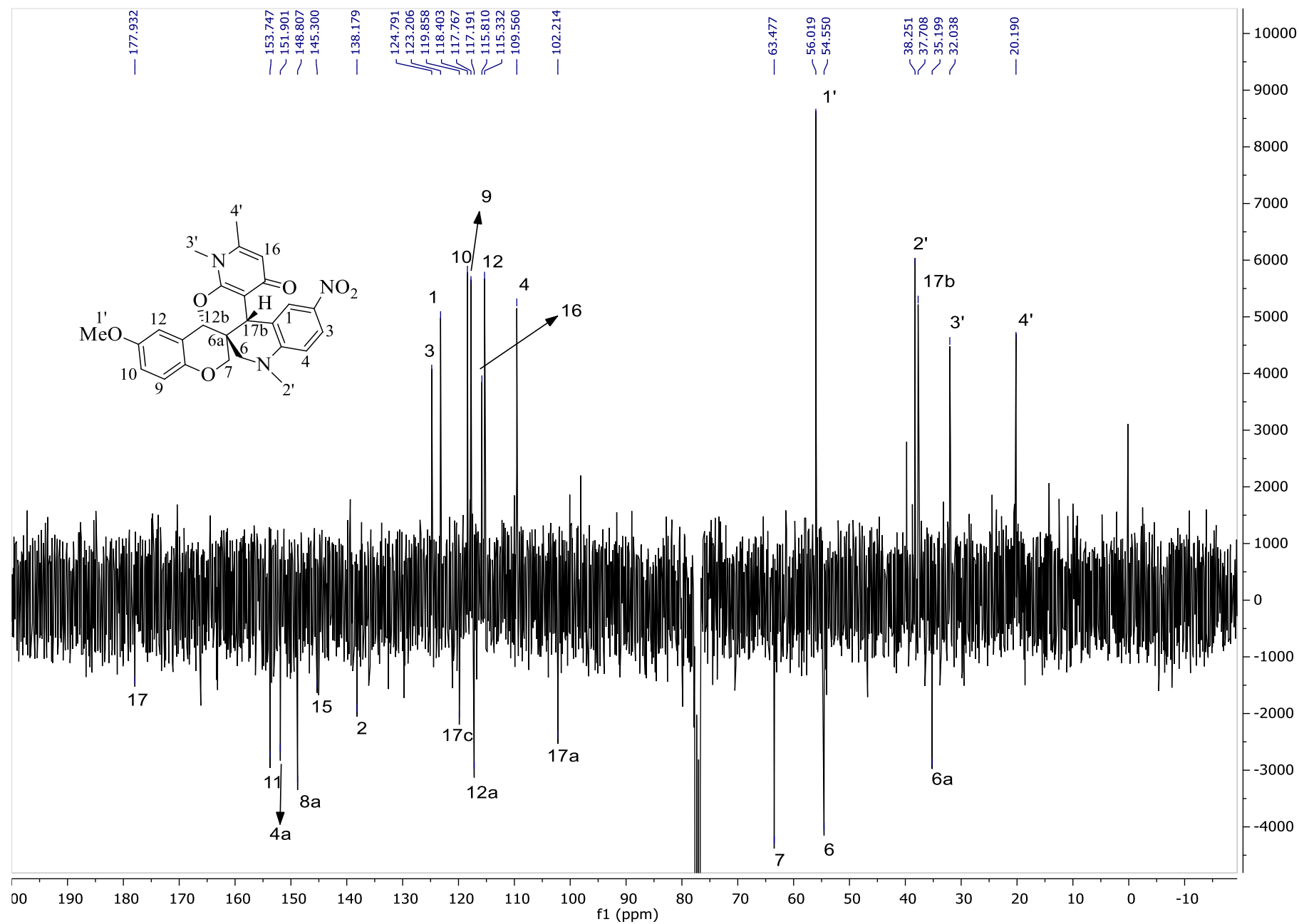


Figure S136. ^{13}C -NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-7af in CDCl₃ at 90 MHz.

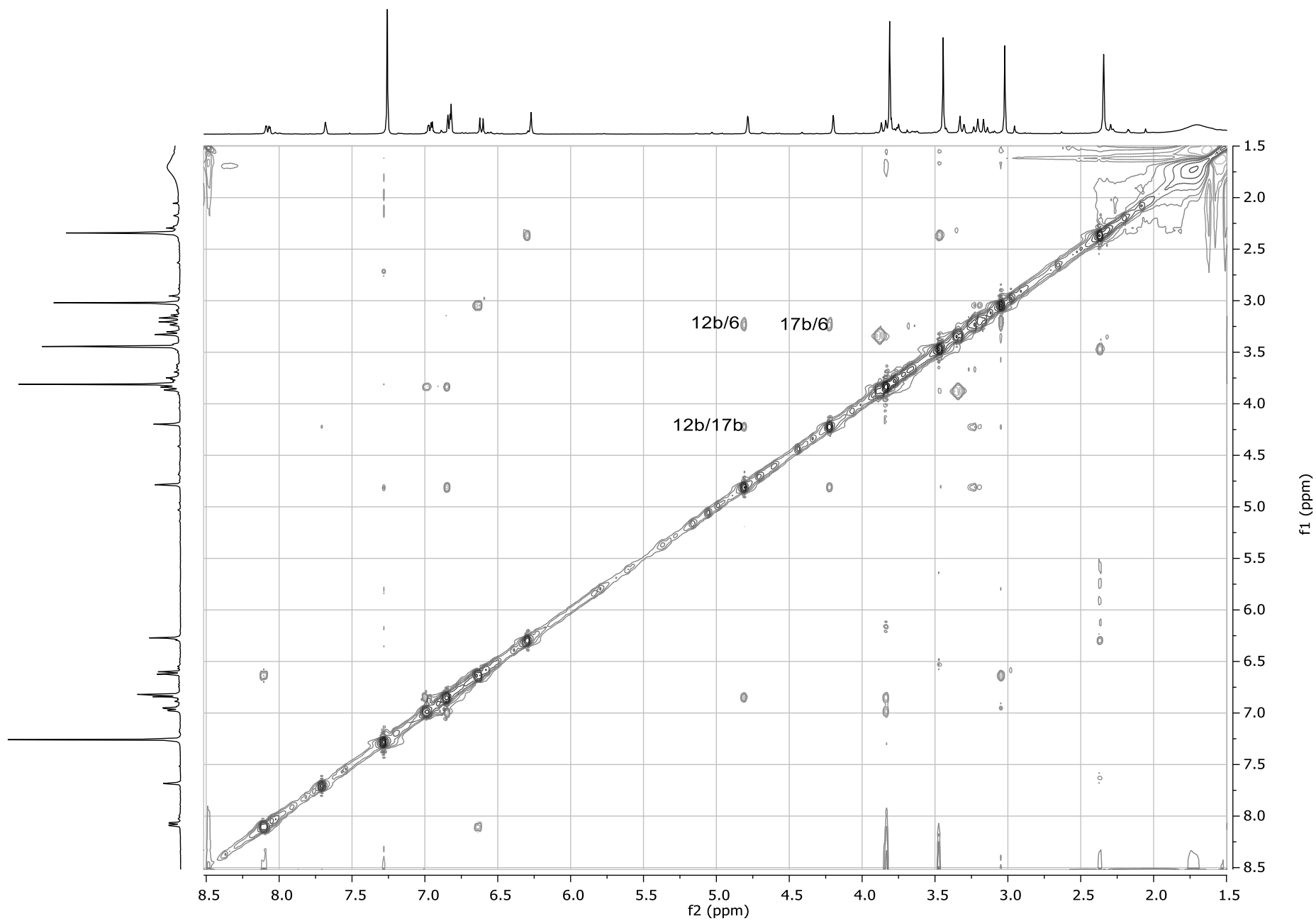


Figure S137. NOESY spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-7af in CDCl₃ at 400 MHz.

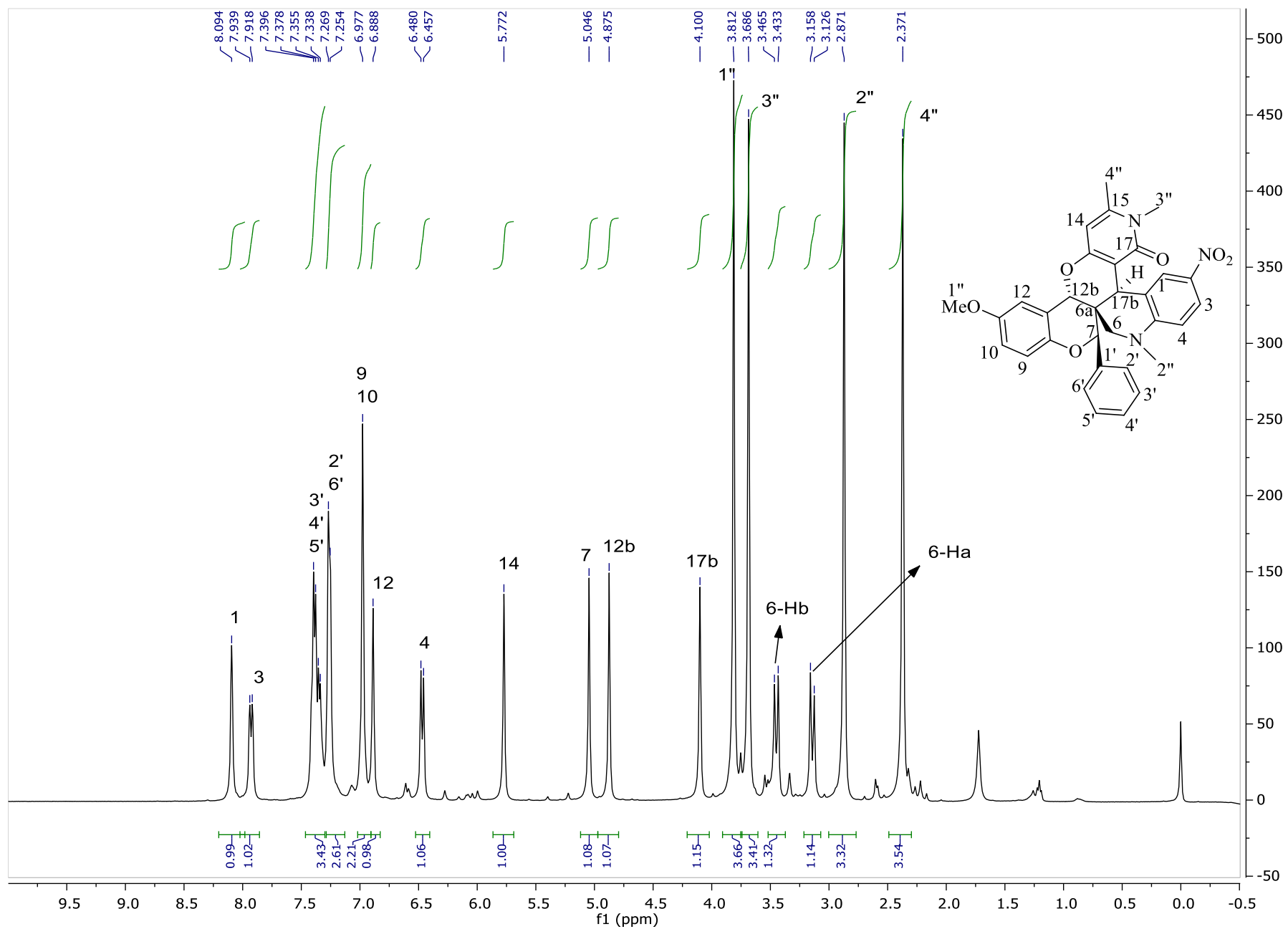


Figure S138. ¹H-NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*S**)-4bf in CDCl₃ at 400 MHz.

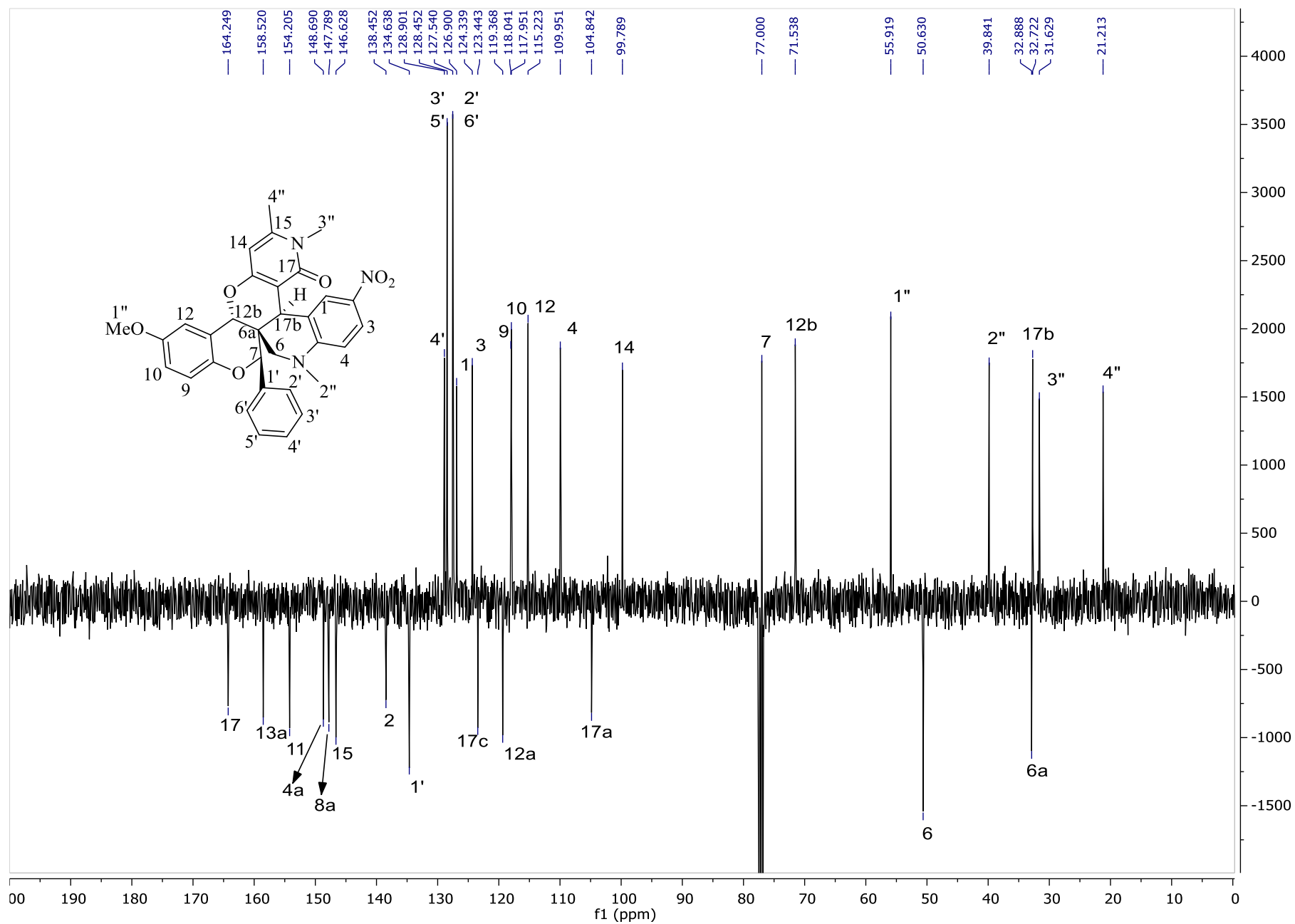


Figure S139. ^{13}C -NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*S**)-4bf in CDCl_3 at 100 MHz.

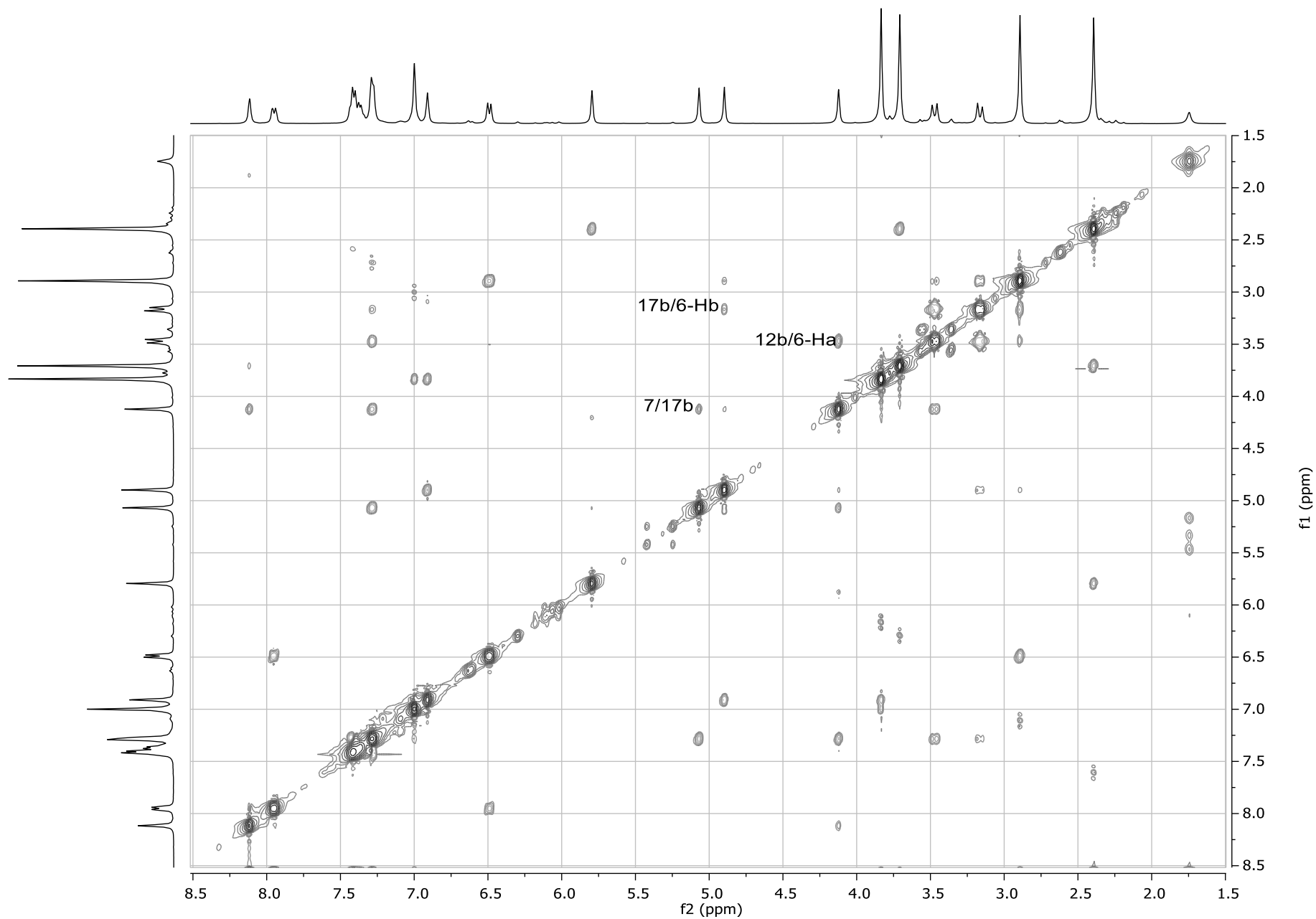


Figure S140. NOESY spectrum of *rac*-(6a*S*^{*},7*R*^{*},12b*R*^{*},19b*S*^{*})-**4bf** in CDCl₃ at 400 MHz.

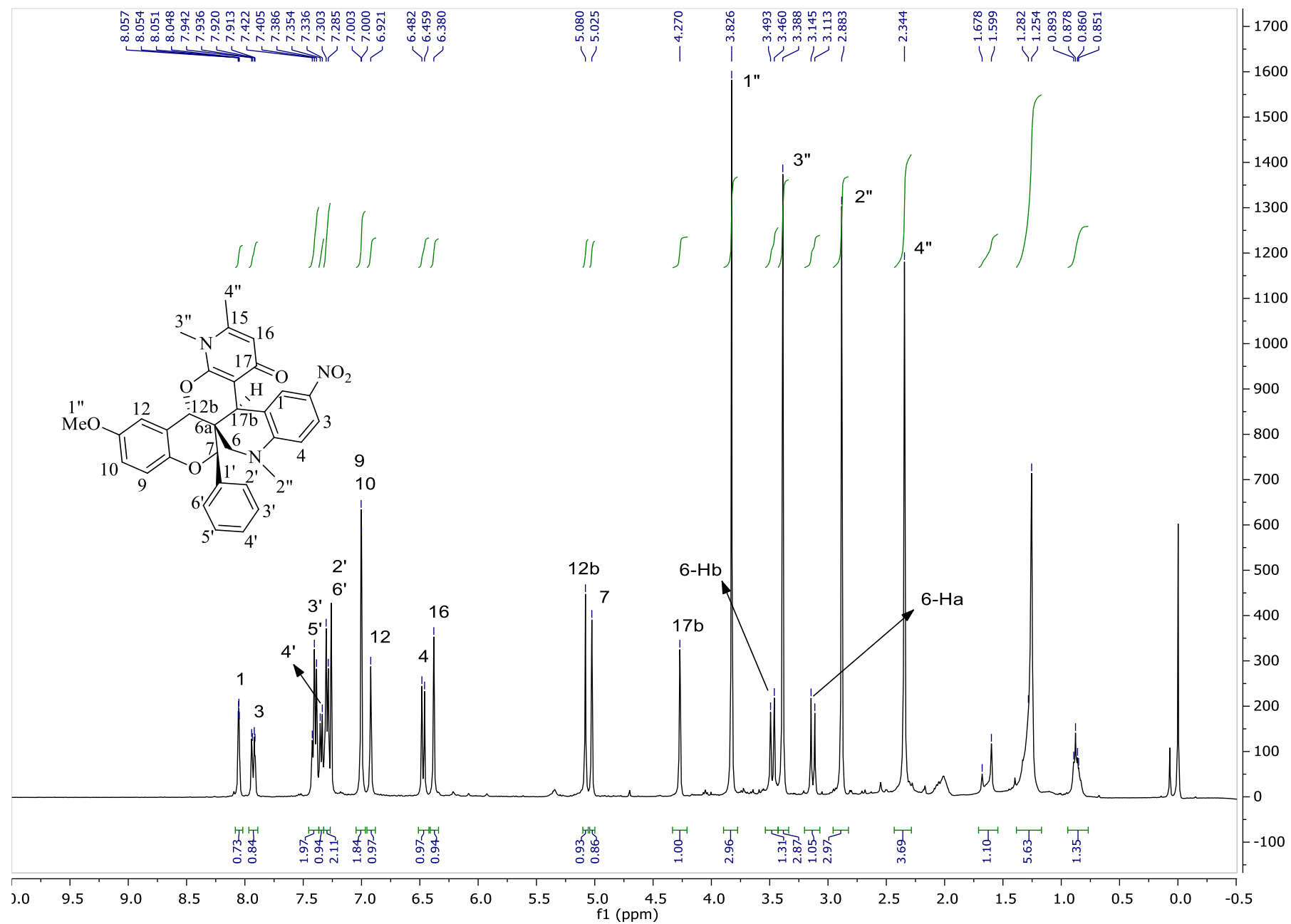


Figure S141. ¹H-NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*S**)-**6bf** in CDCl₃ at 400 MHz.

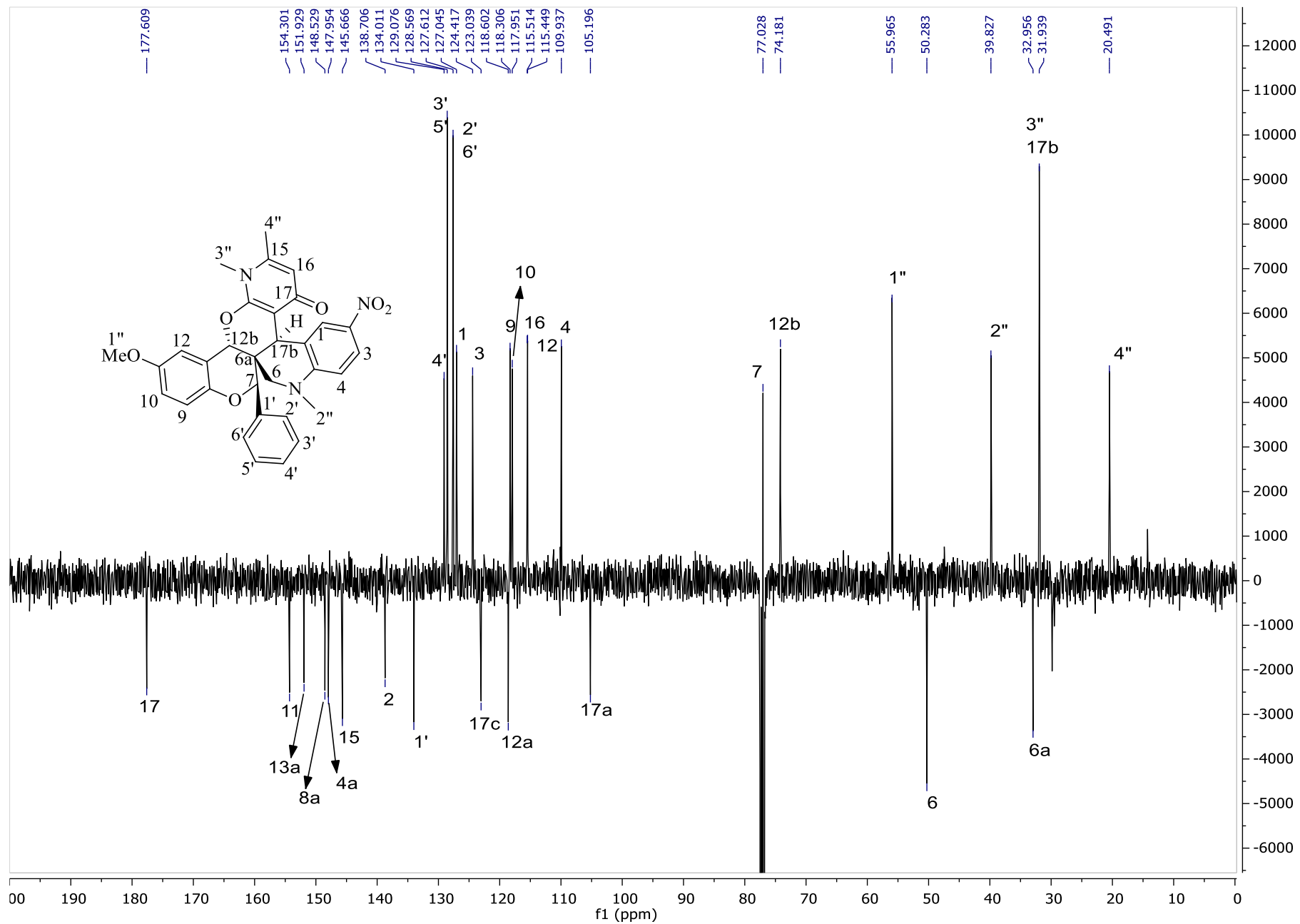


Figure S142. ^{13}C -NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*S**)-6bf in CDCl_3 at 100 MHz.

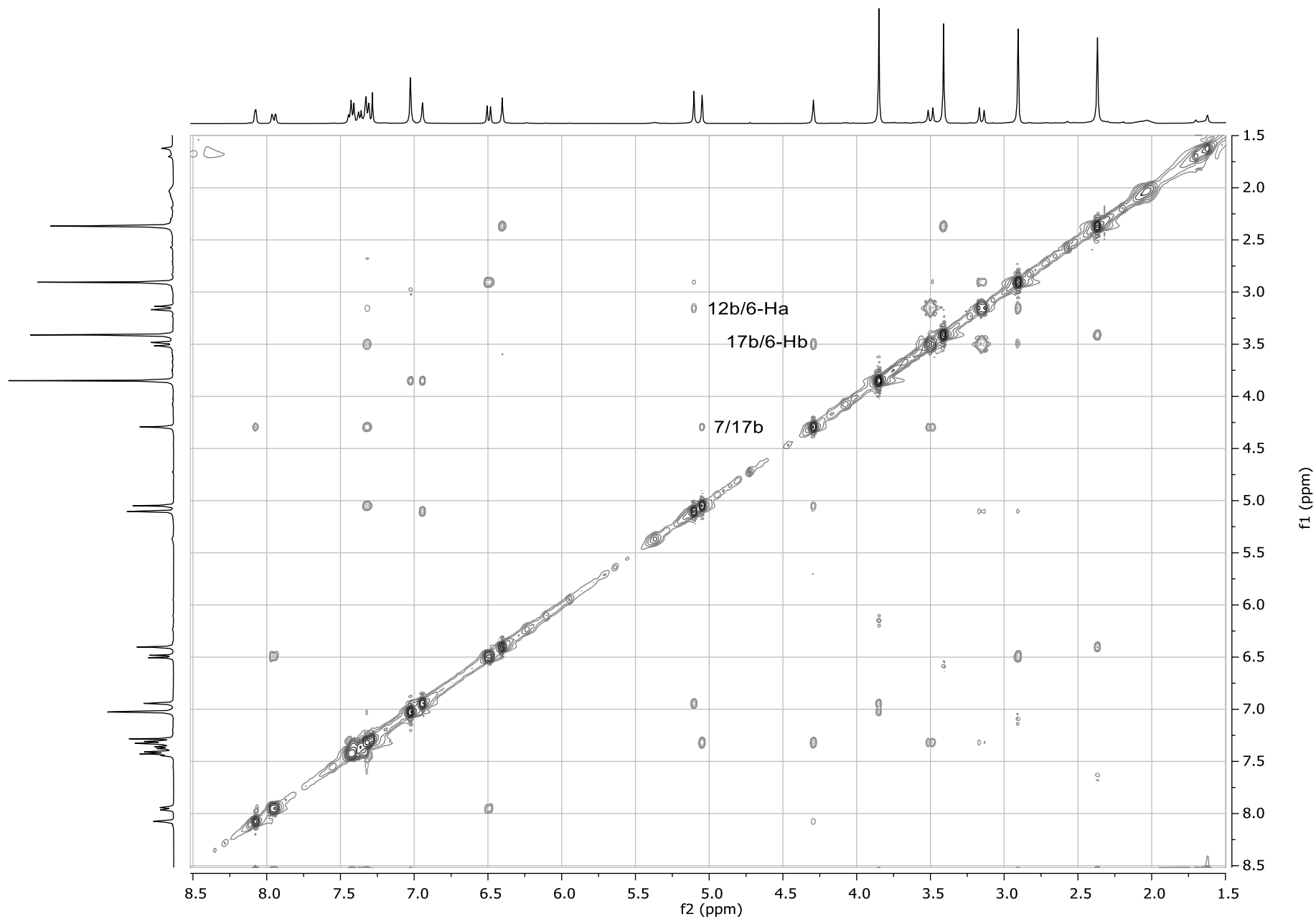


Figure S143. NOESY spectrum of *rac*-(6a*S*^{*},7*R*^{*},12b*R*^{*},19b*S*^{*})-**6bf** in CDCl₃ at 400 MHz.

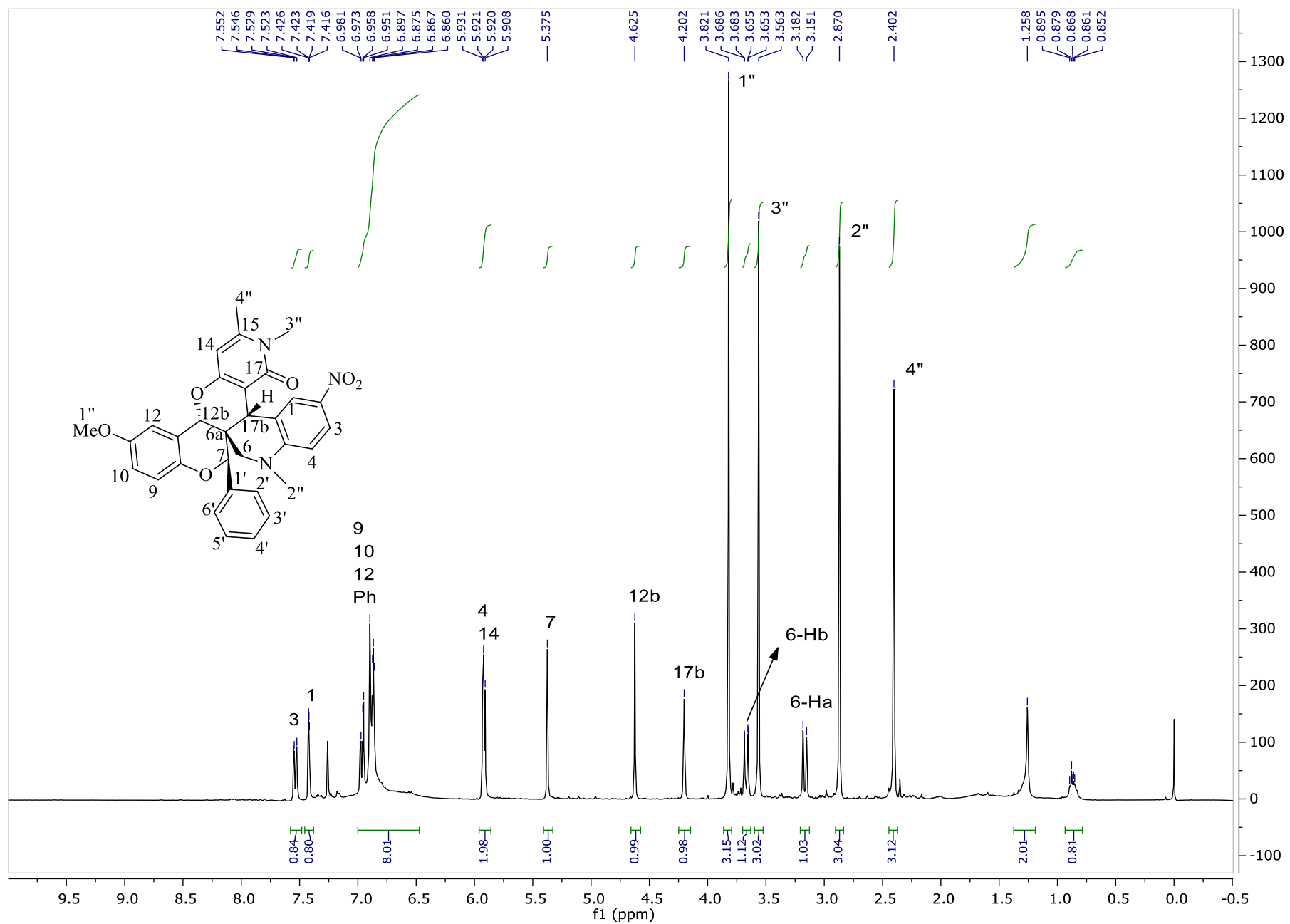


Figure S144. $^1\text{H-NMR}$ spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*R**)-**5bf** in CDCl_3 at 400 MHz.

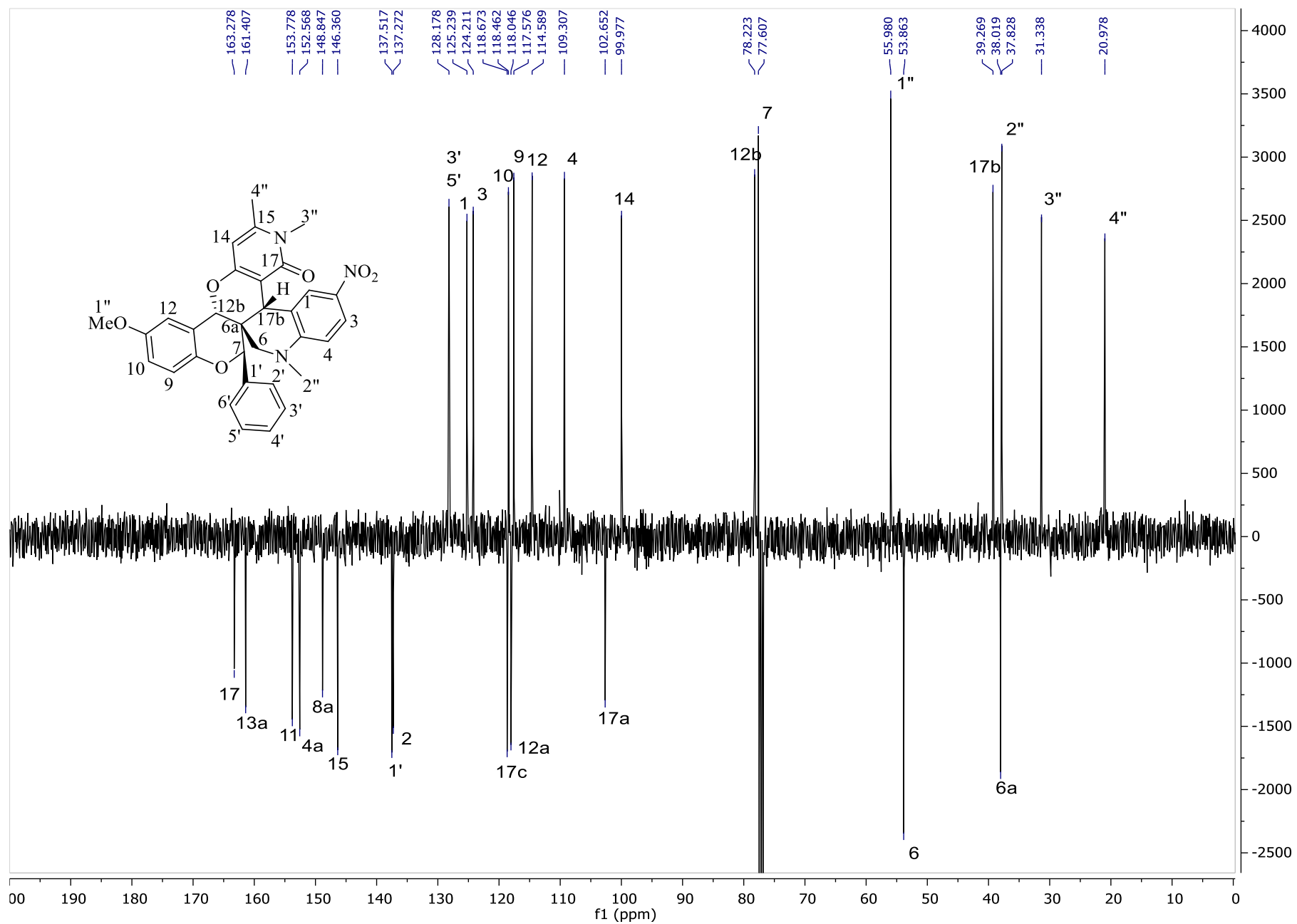


Figure S145. ¹³C-NMR spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*R**)-**5bf** in CDCl₃ at 100 MHz.

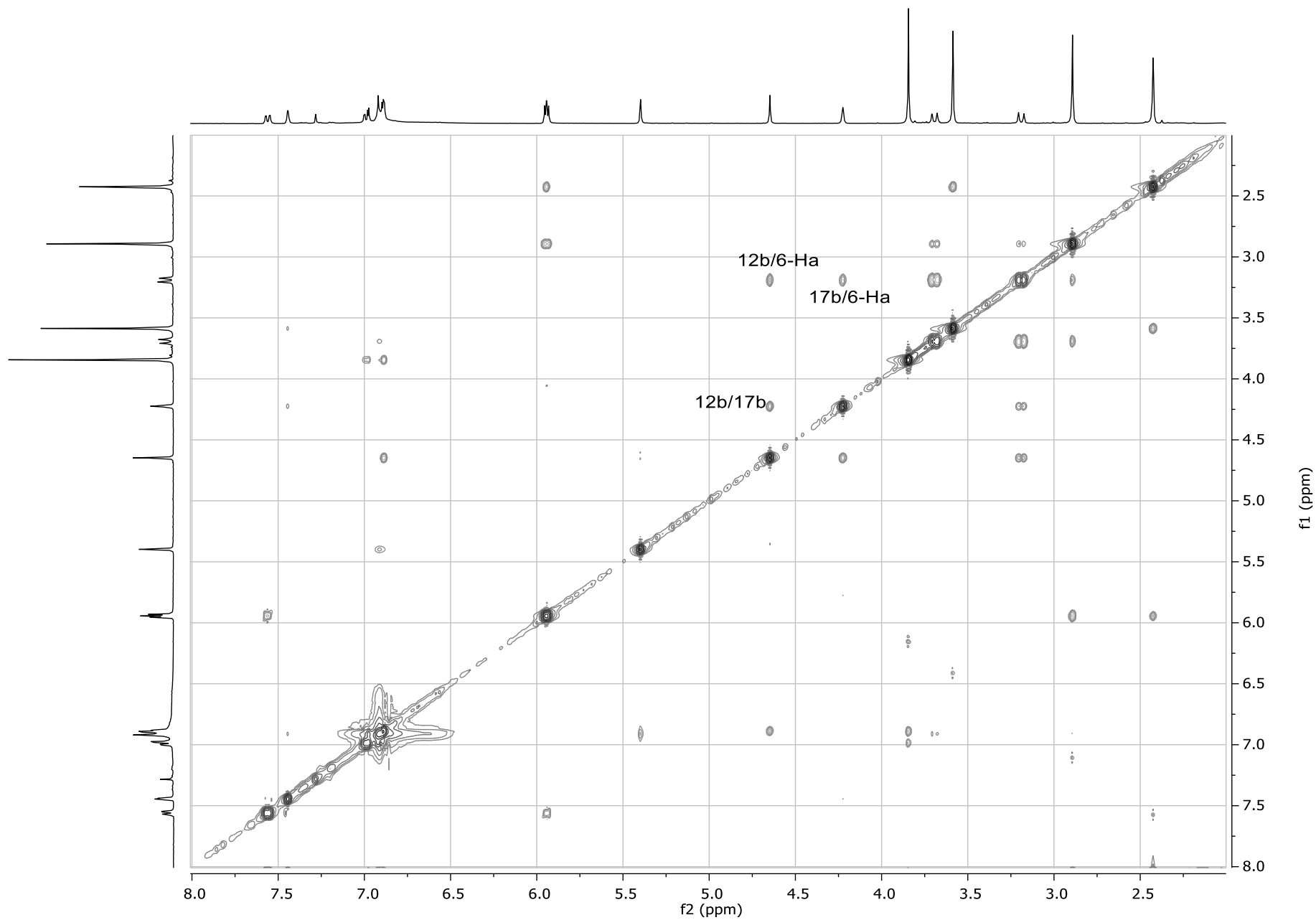


Figure S146. NOESY spectrum of *rac*-(6a*S**,7*R**,12b*R**,19b*R**)-**5bf** in CDCl₃ at 400 MHz.

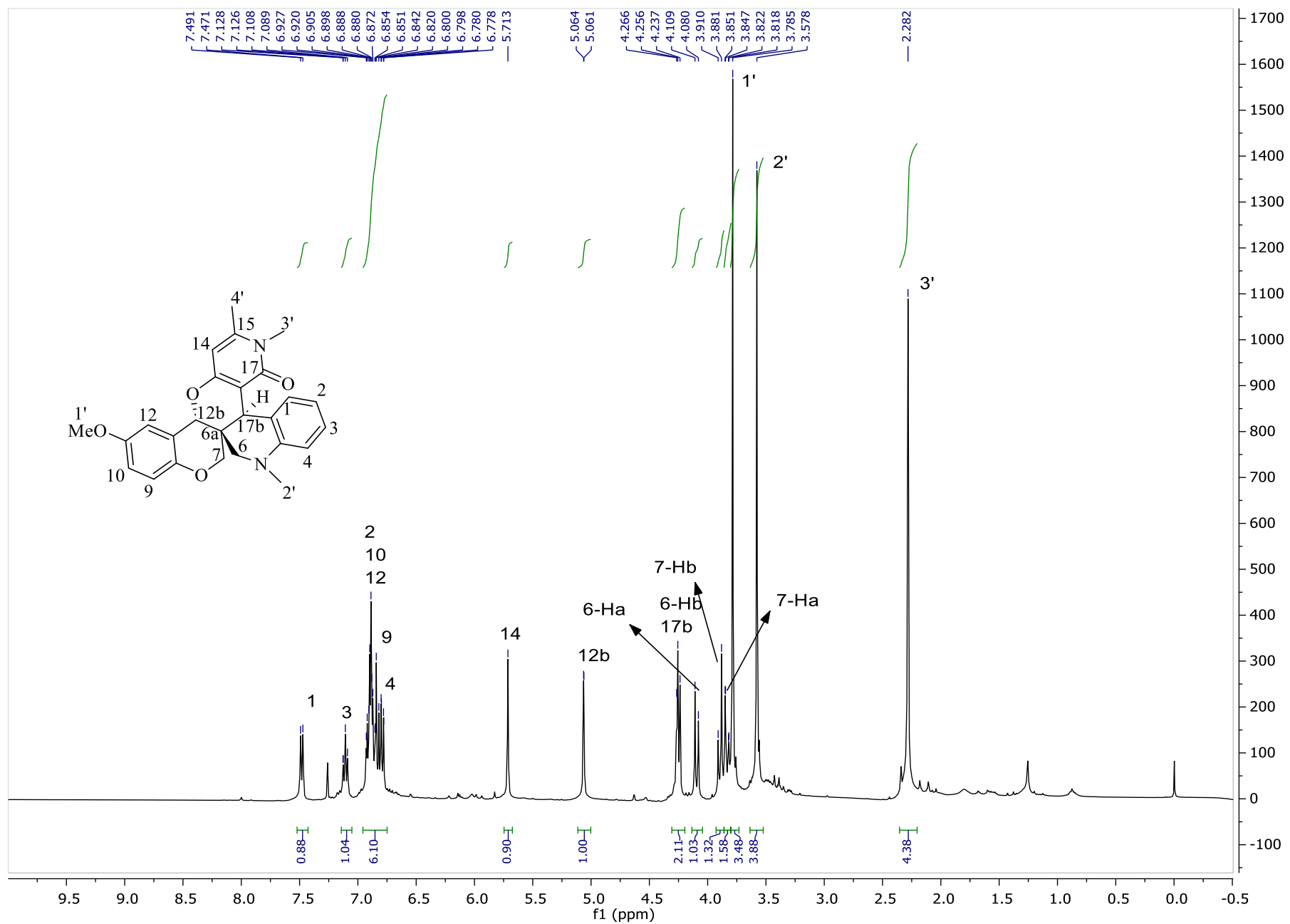


Figure S147. ¹H-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-4cf in CDCl₃ at 400 MHz.

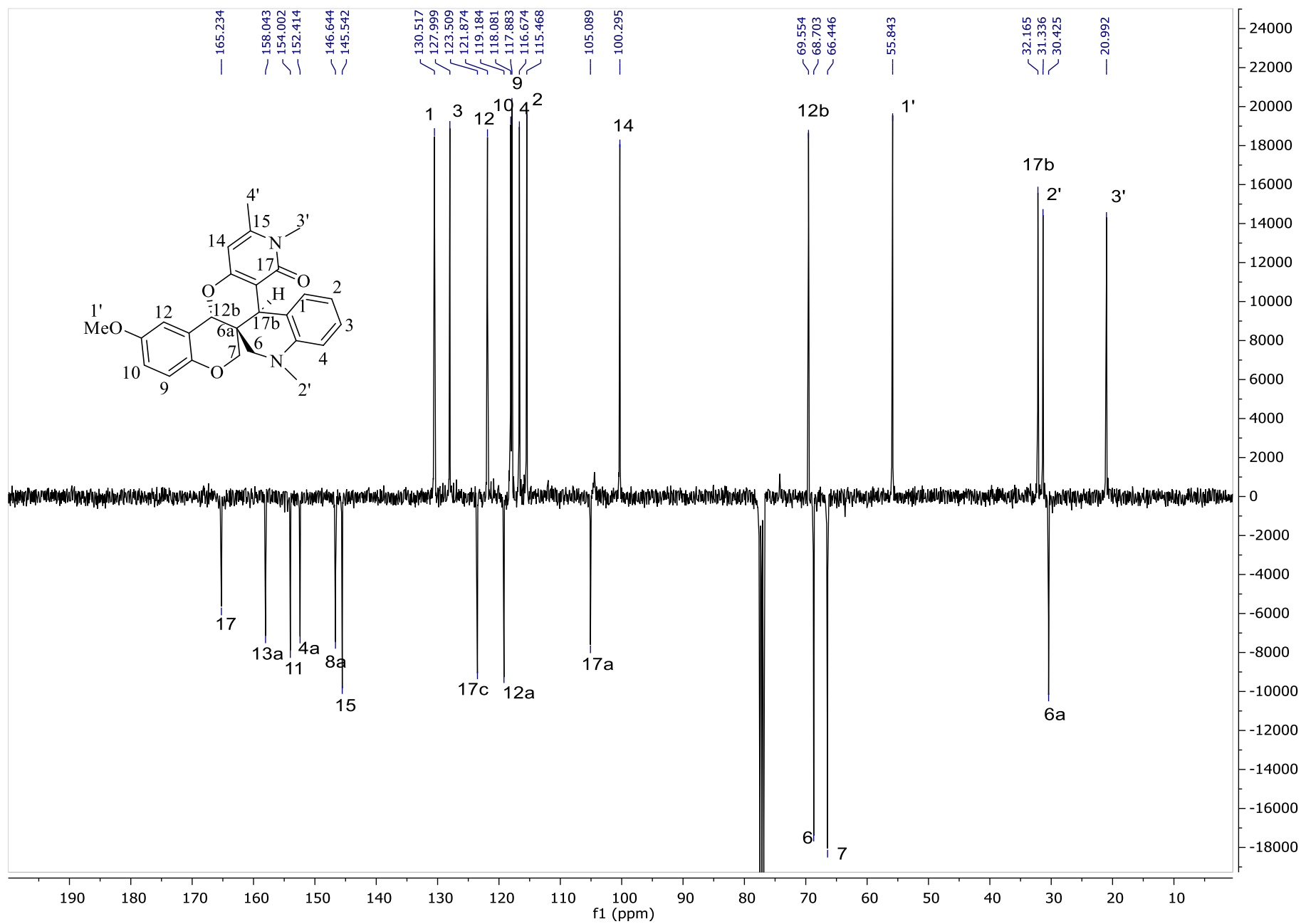


Figure S148. ¹³C-NMR spectrum of *rac*-(6a*S**,12b*R**,17b*R**)-4cf in CDCl₃ at 100 MHz.

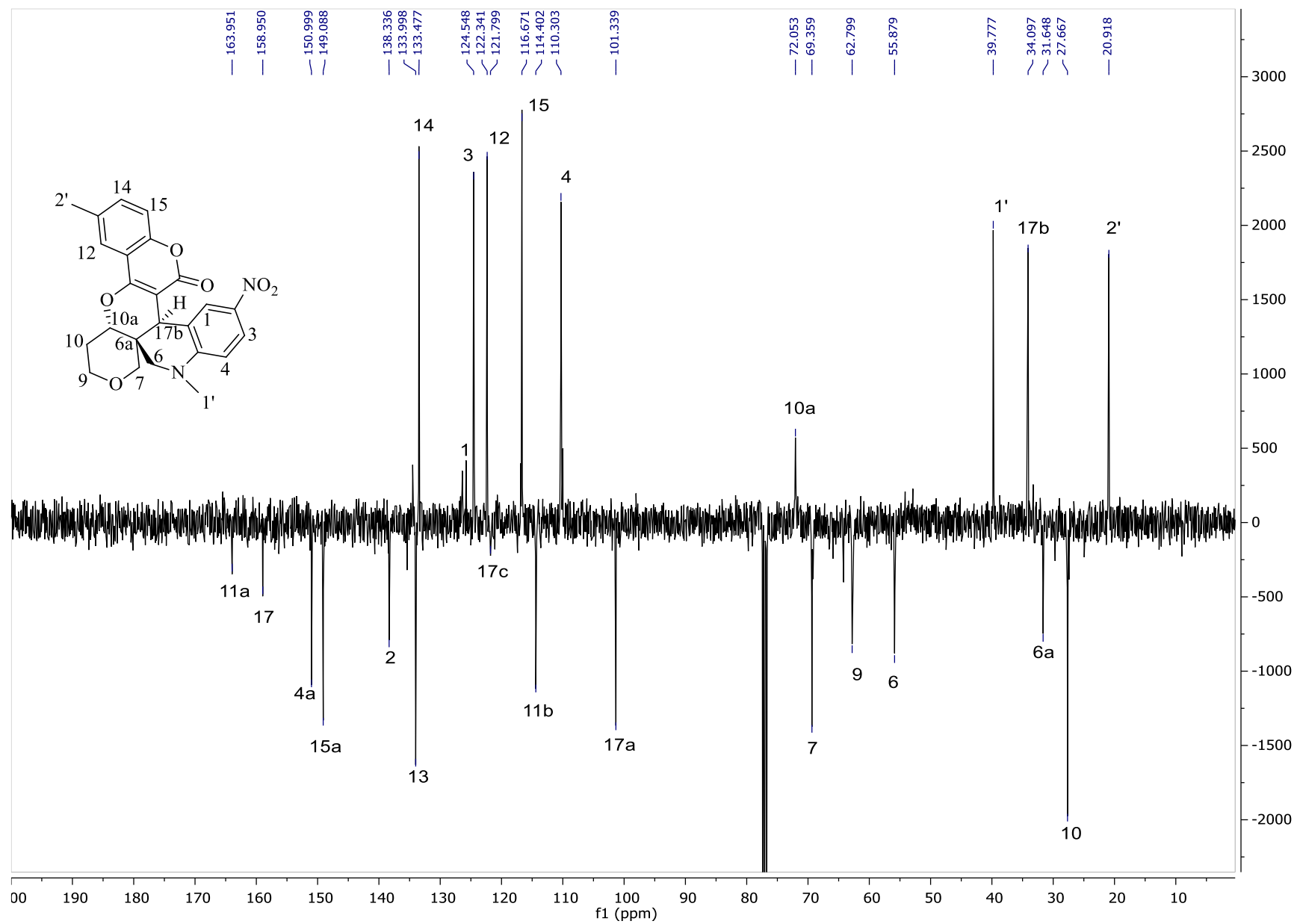


Figure S150. ¹³C-NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10aa** in CDCl₃ at 100 MHz.

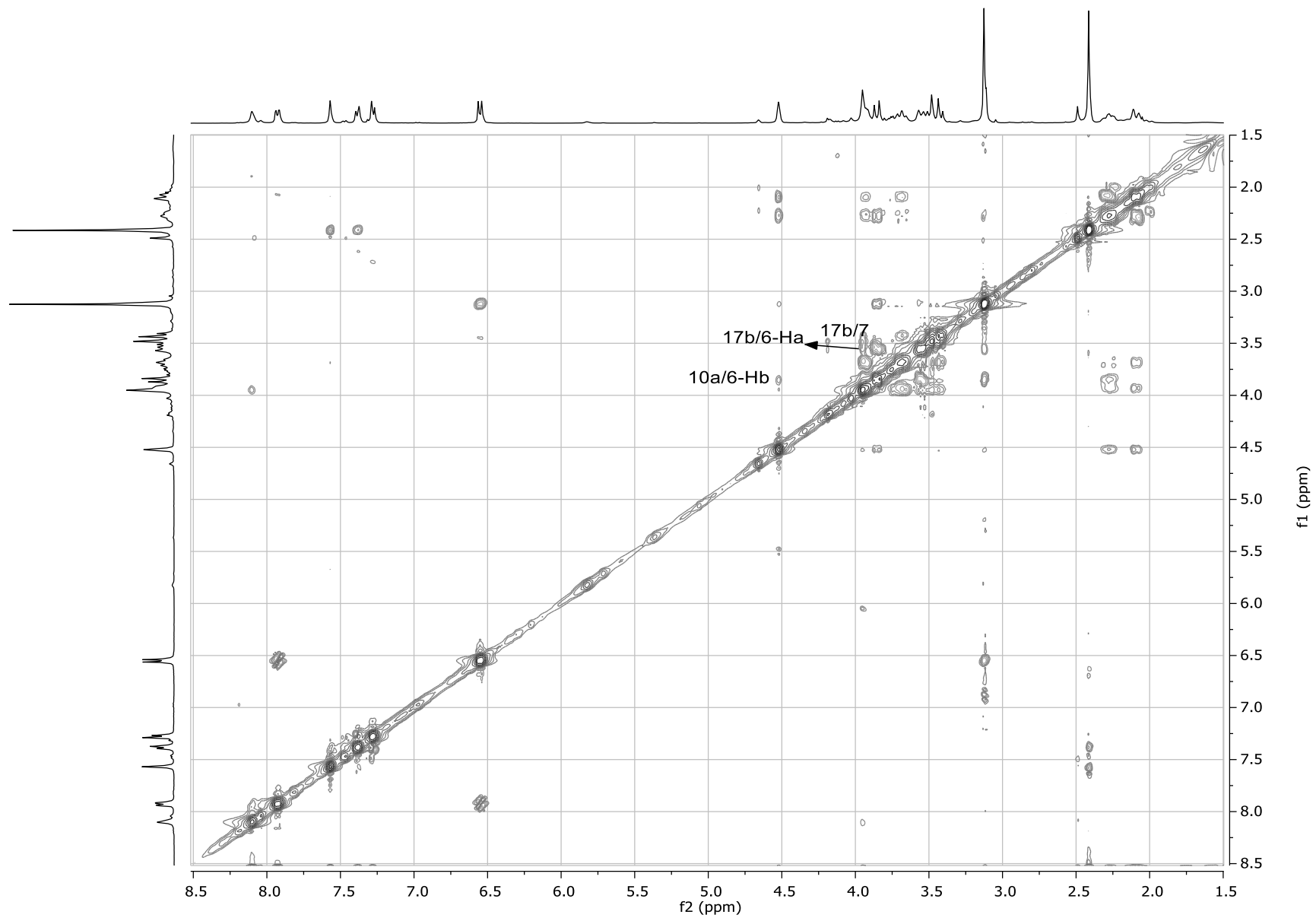


Figure S151. NOESY spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10aa** in CDCl₃ at 400 MHz.

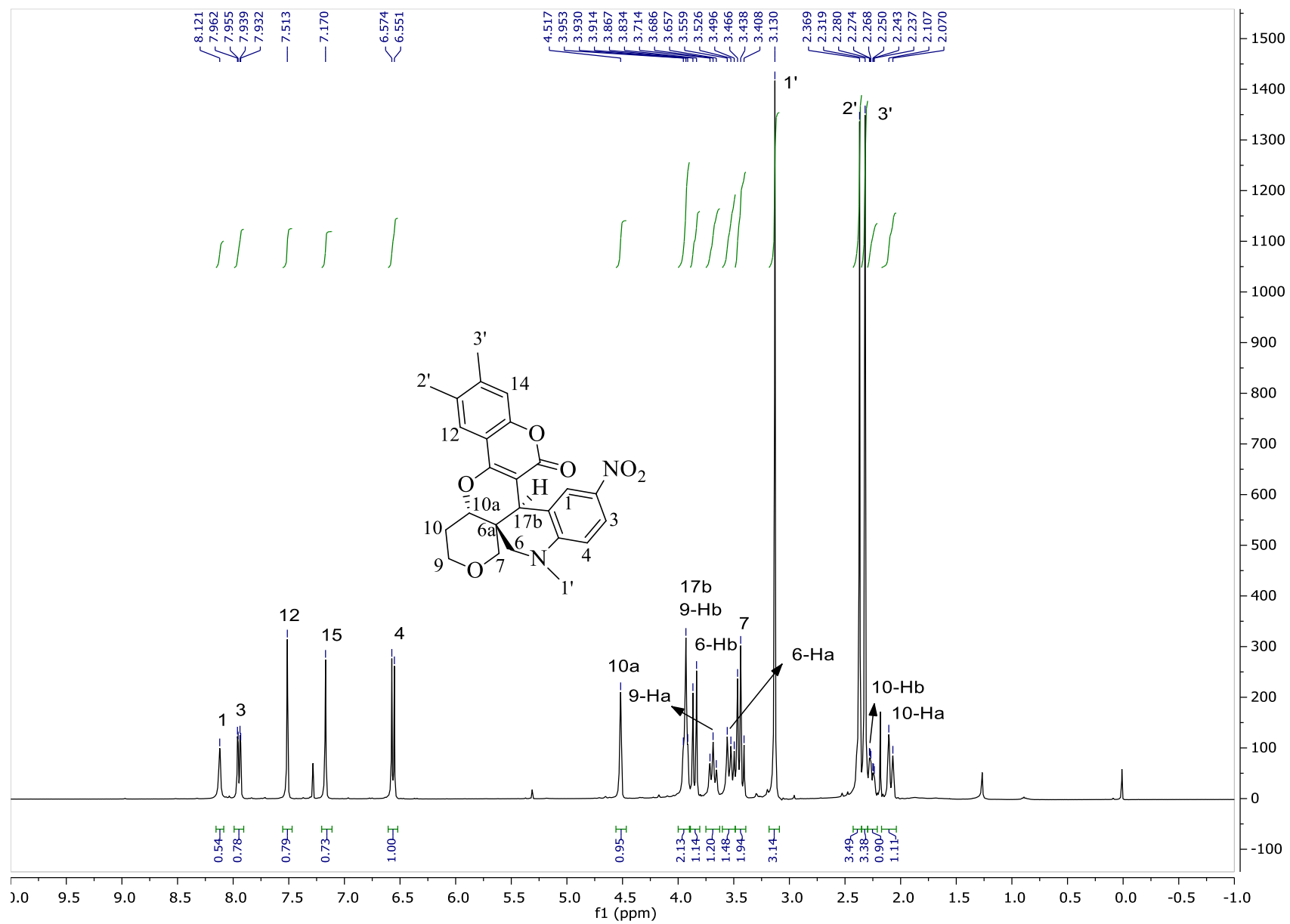


Figure S152. ¹H-NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-10ab in CDCl₃ at 400 MHz.

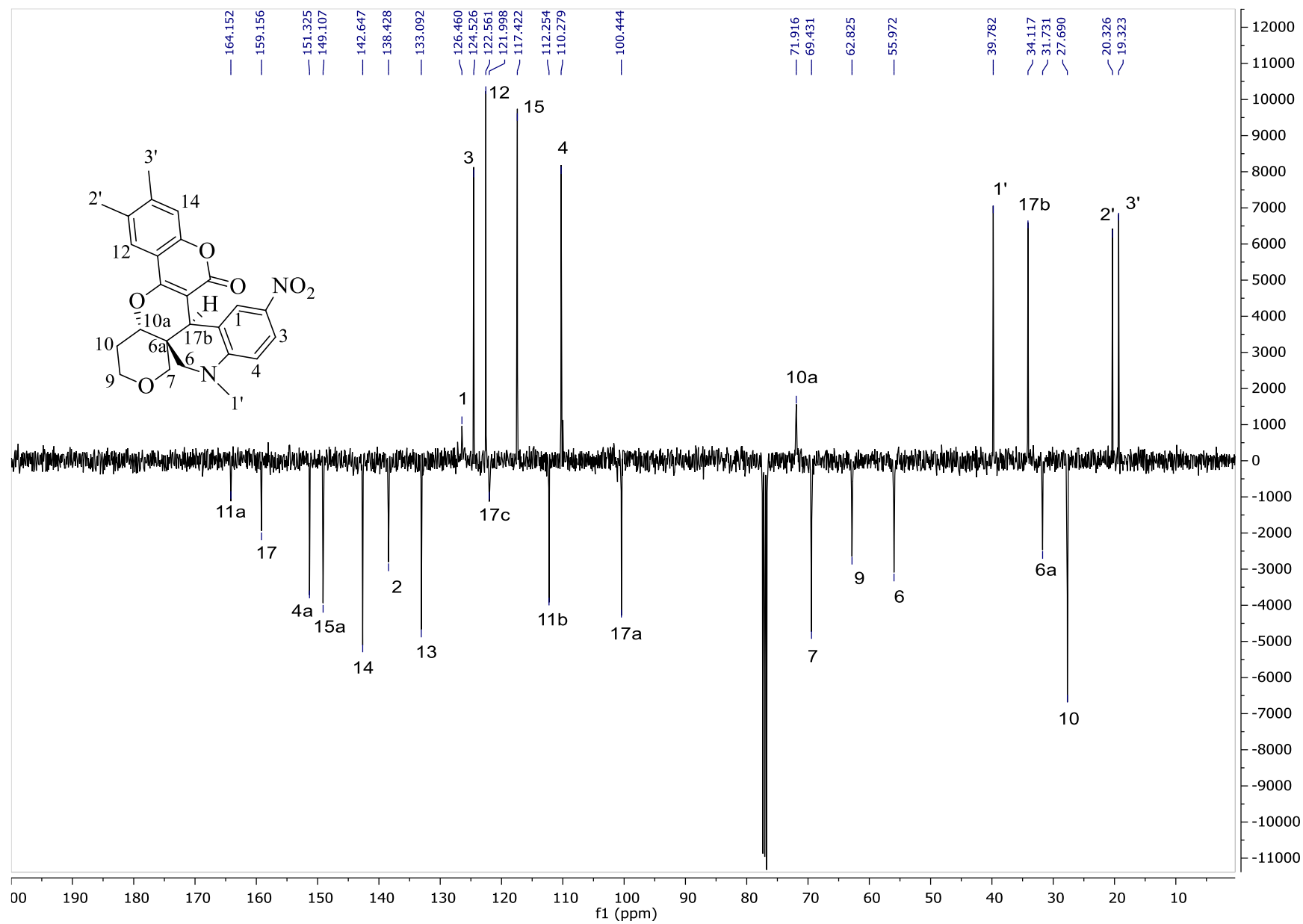


Figure S153. ¹³C-NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10ab** in CDCl₃ at 100 MHz.

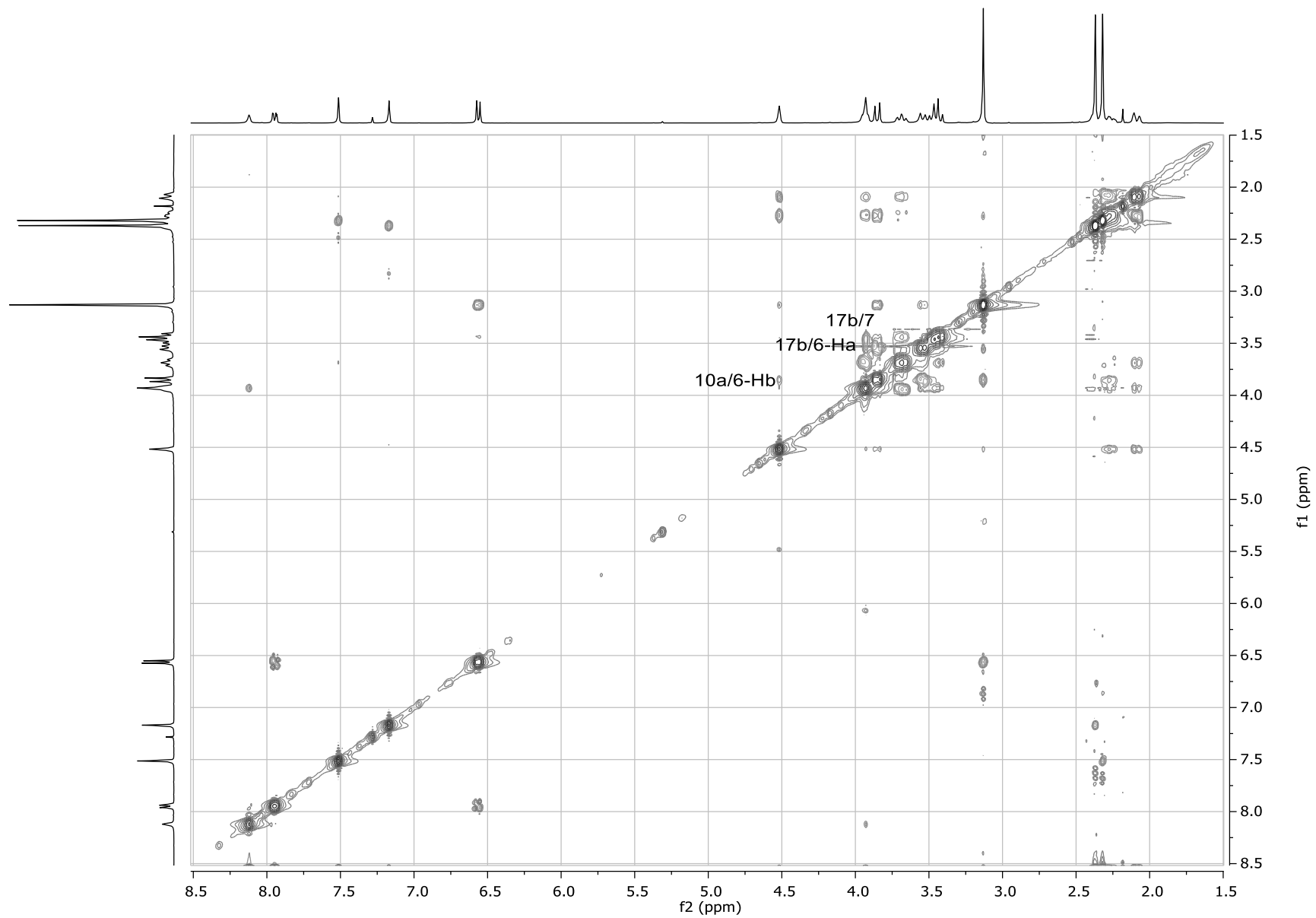


Figure S154. NOESY spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10ab** in CDCl₃ at 400 MHz.

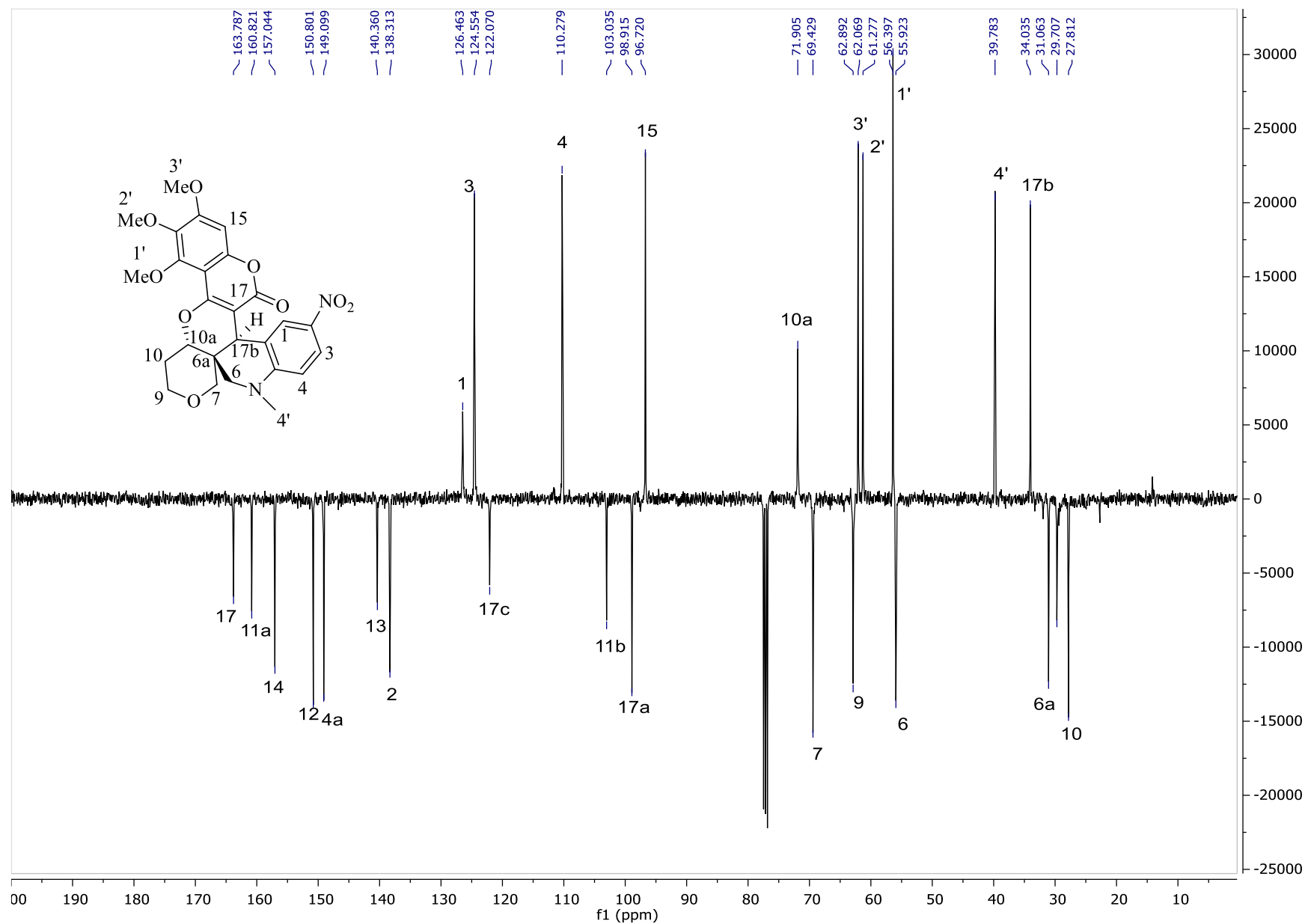


Figure S156. ^{13}C -NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-10ac in CDCl_3 at 100 MHz.

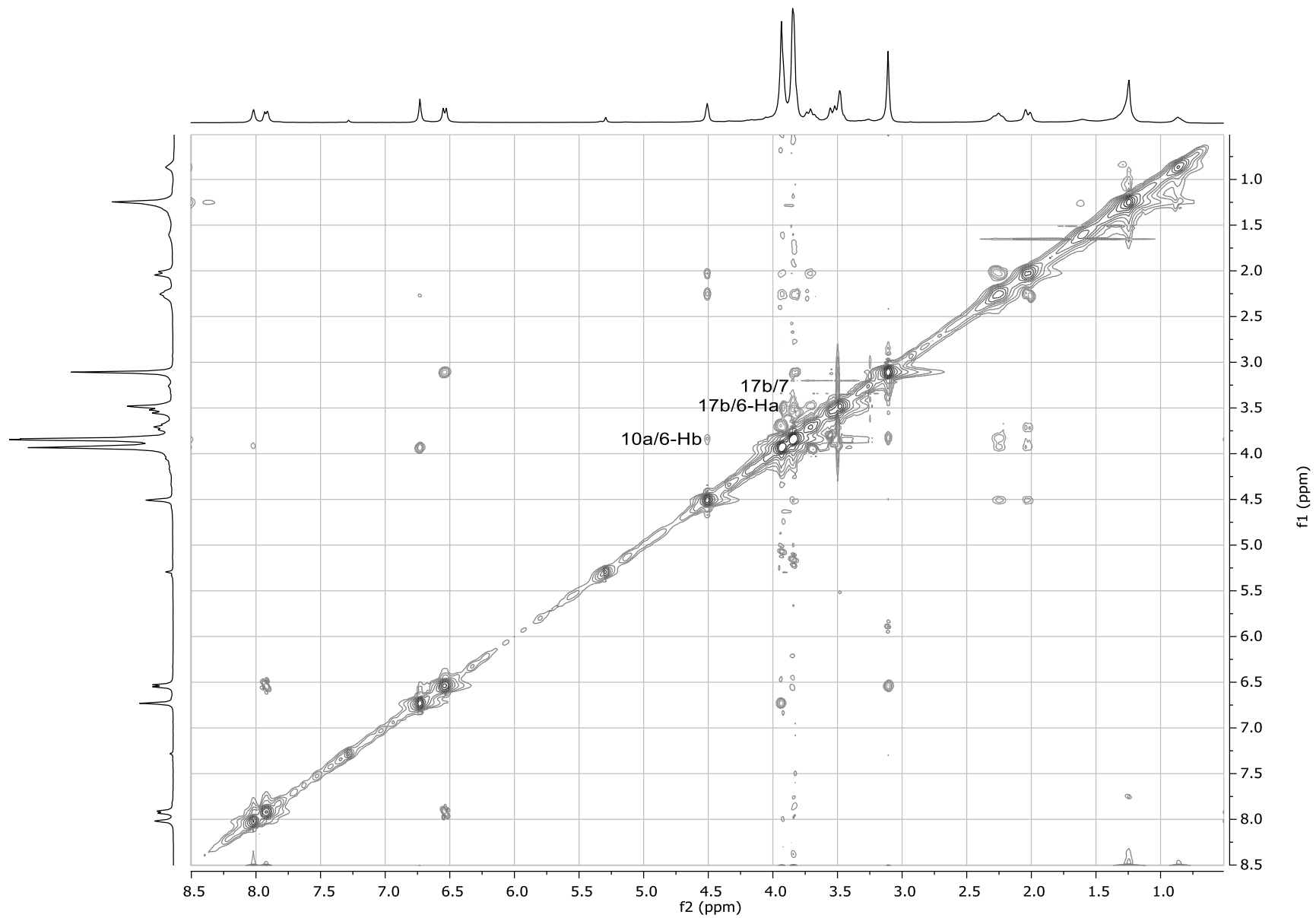


Figure S157. NOESY spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10ac** in CDCl₃ at 400 MHz.

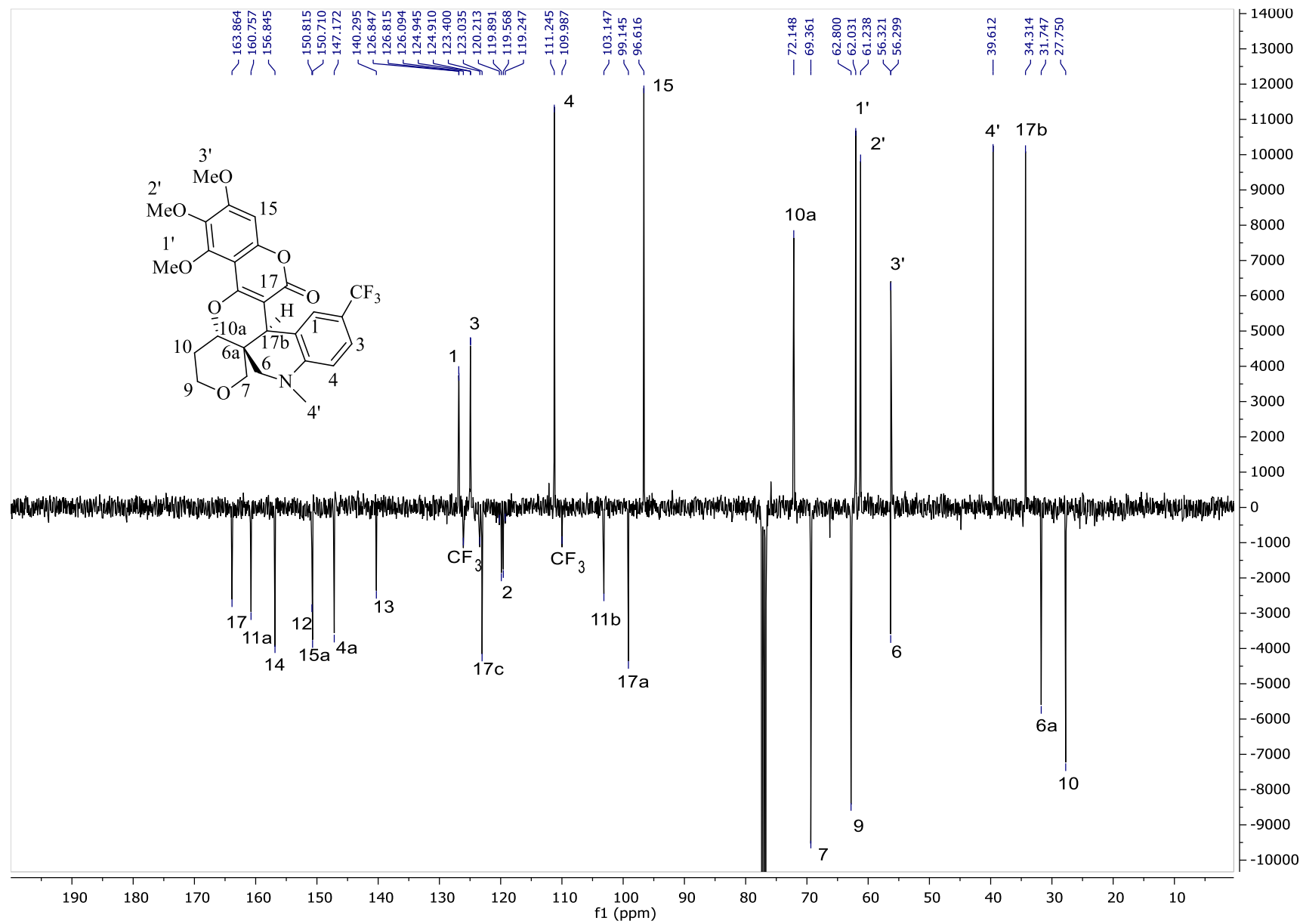


Figure S159. ¹³C-NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10bc** in CDCl₃ at 100 MHz.

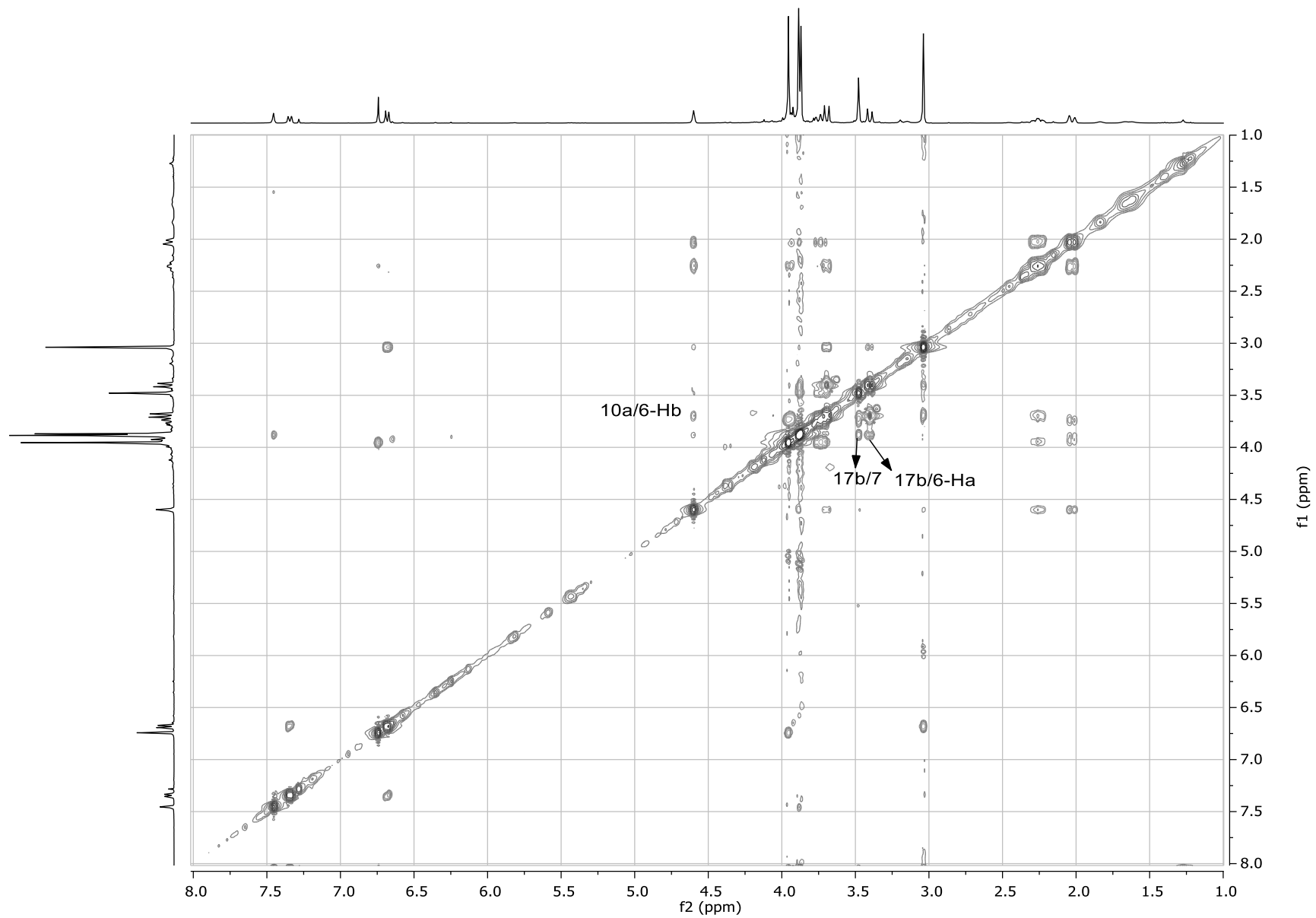


Figure S160. NOESY spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10bc** in CDCl₃ at 400 MHz.

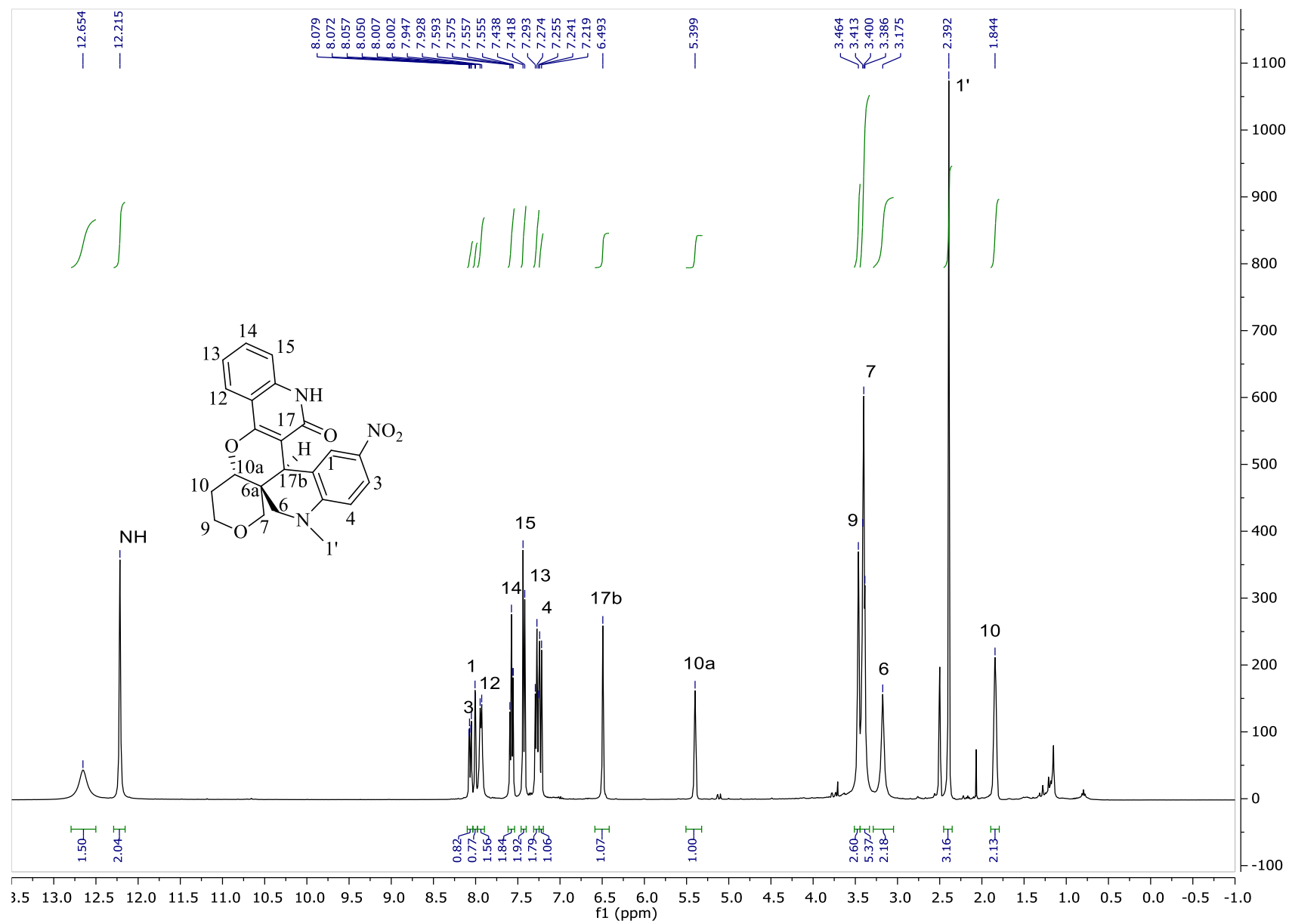


Figure S161. ¹H-NMR spectrum of *rac*-(6aS*,10aS*,15bS*)-**10bd** in DMSO-*d*₆ at 400 MHz.

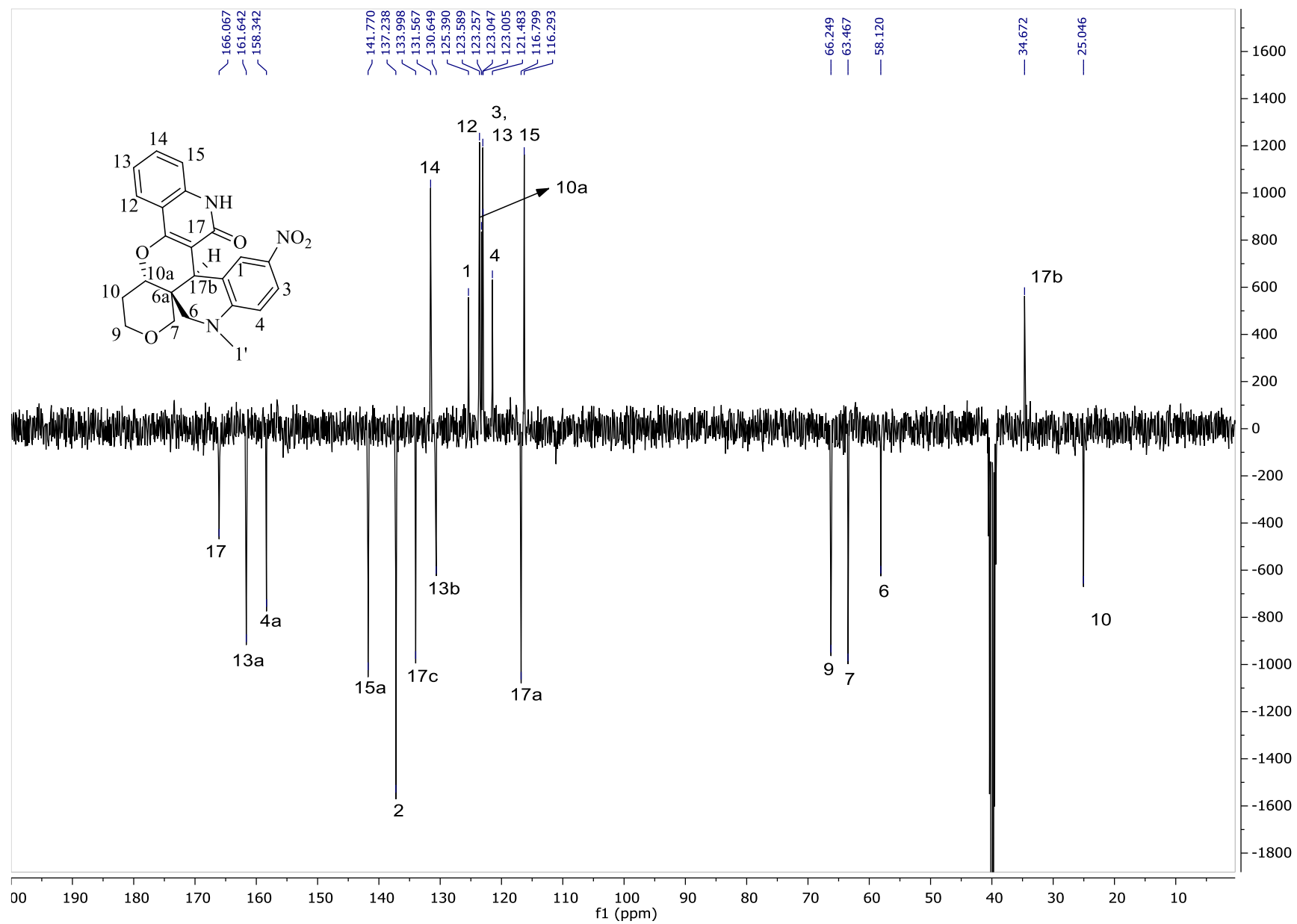


Figure S162. ¹³C-NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-10bd in DMSO-*d*₆ at 100 MHz.

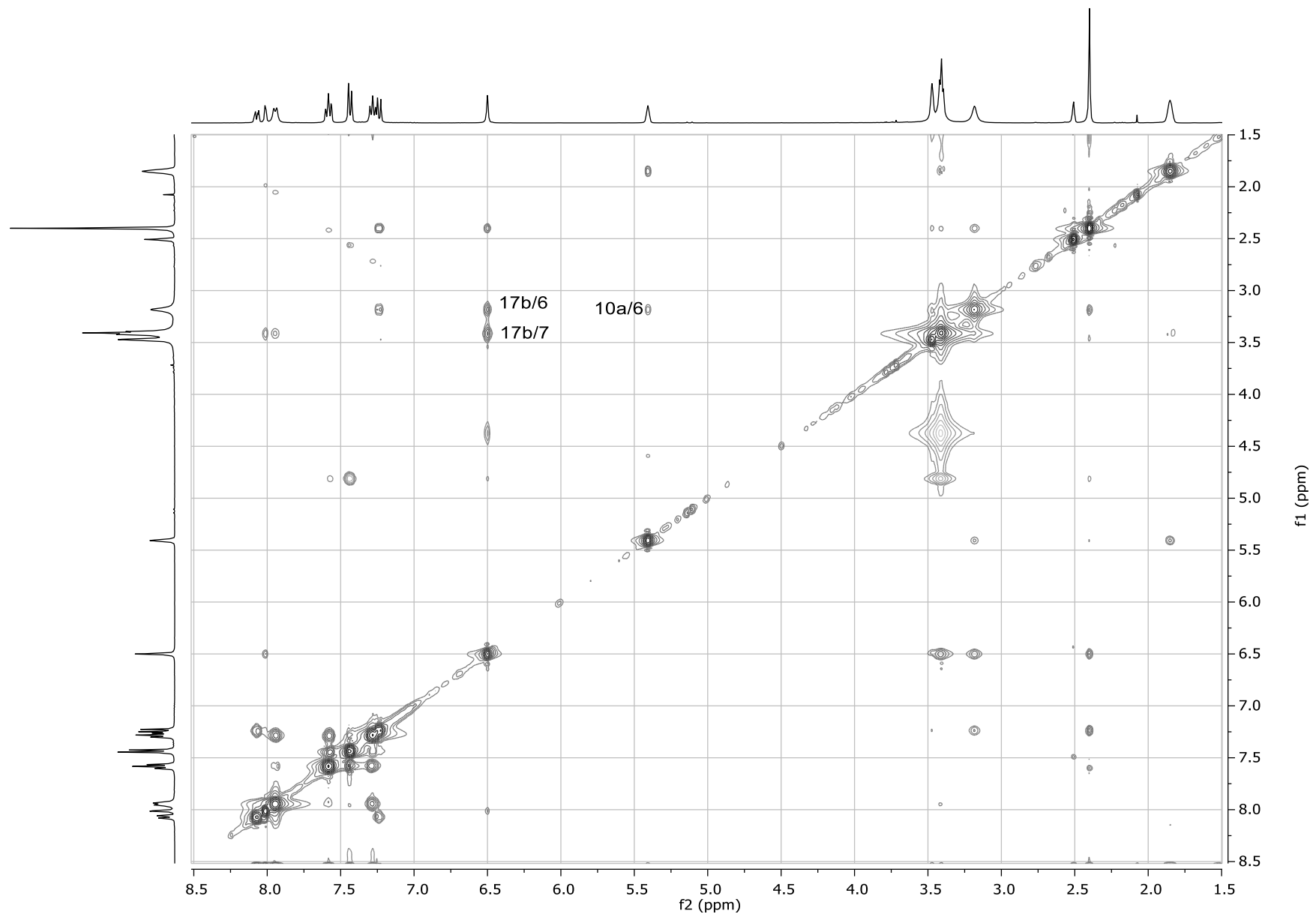


Figure S163. NOESY spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10bd** in DMSO-*d*₆ at 400 MHz.

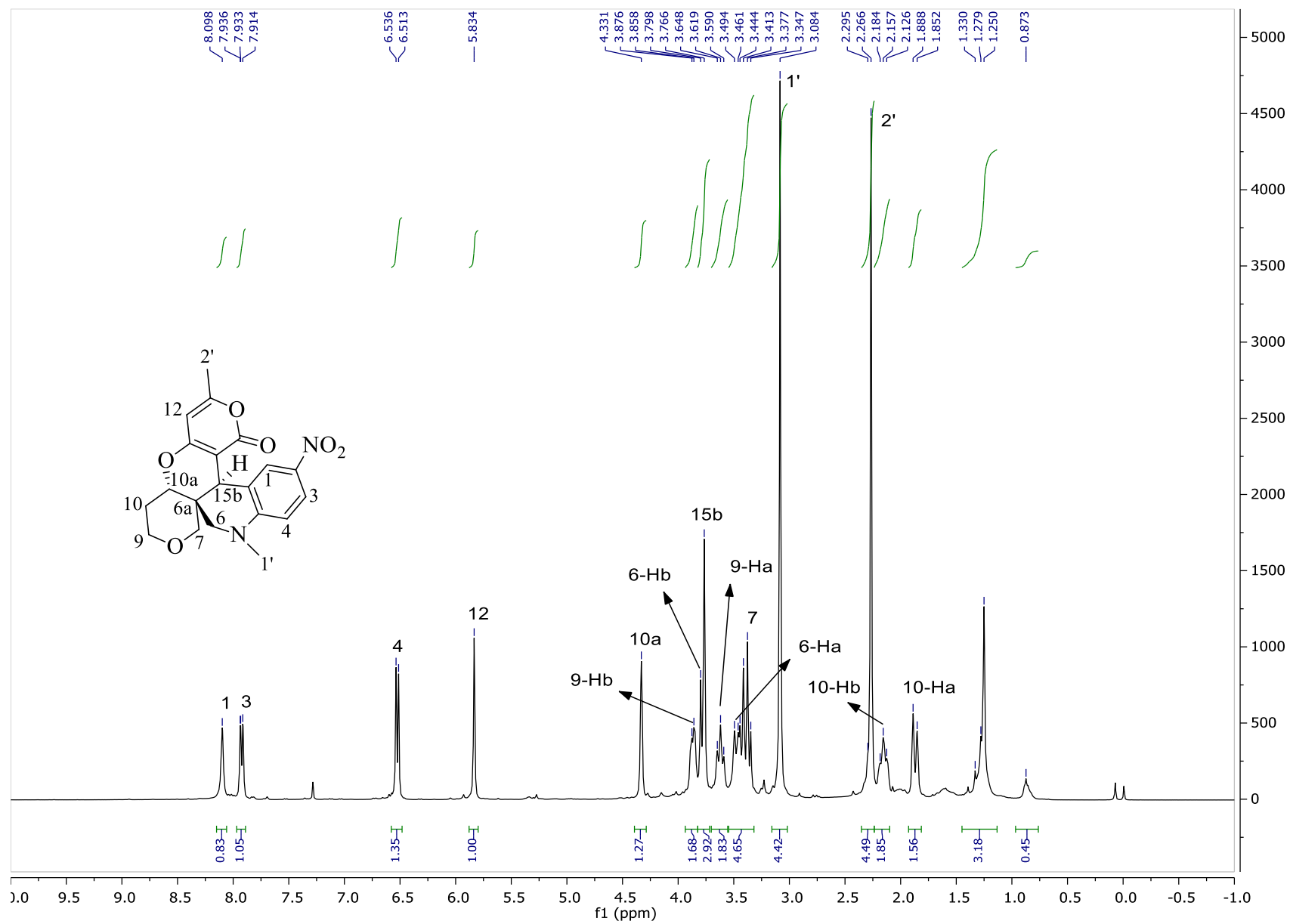


Figure S164. ¹H-NMR spectrum of *rac*-(6aS*,10aS*,15bS*)-10ae in CDCl₃ at 400 MHz.

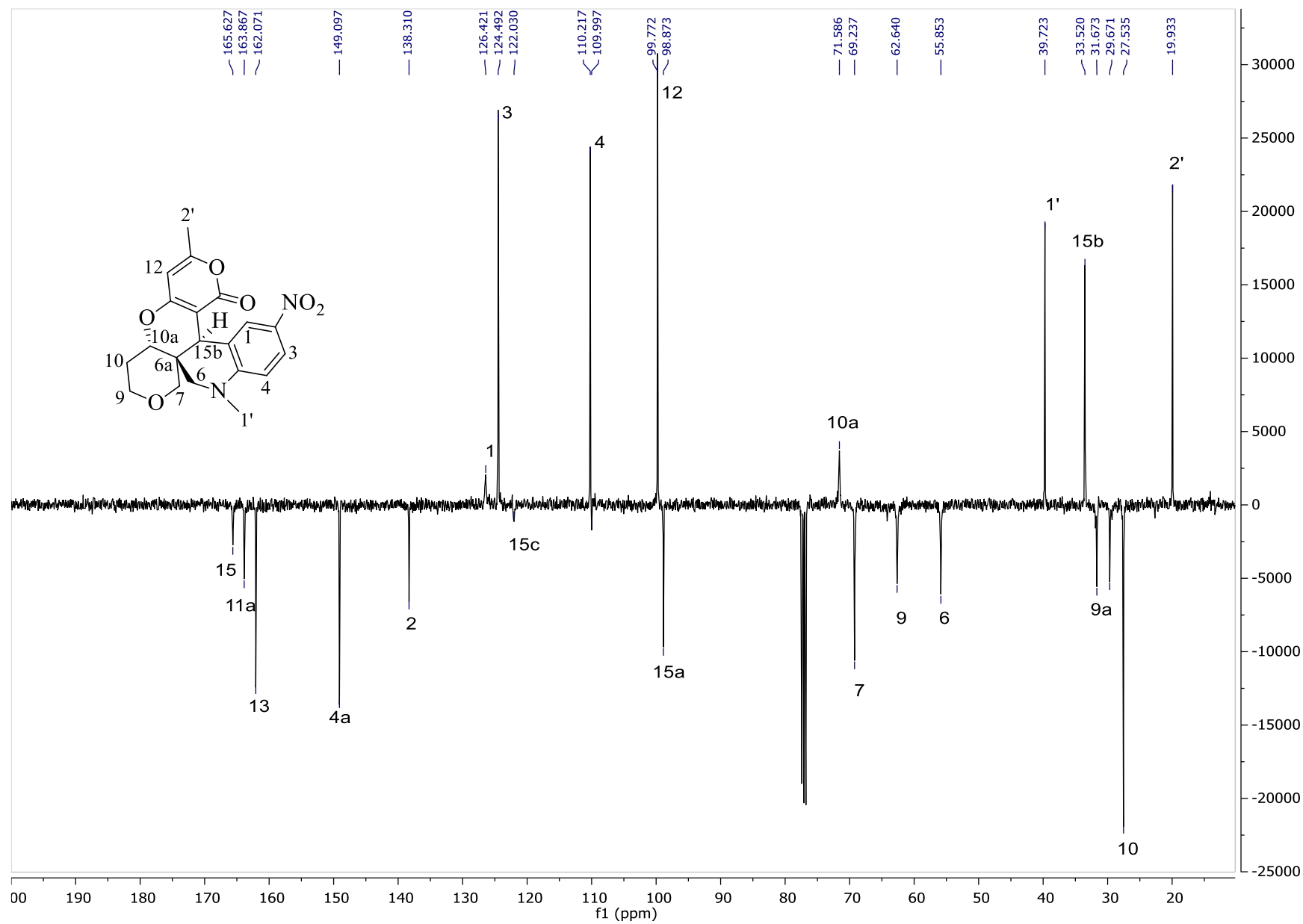


Figure S165. ¹³C-NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-10ae in CDCl₃ at 100 MHz.

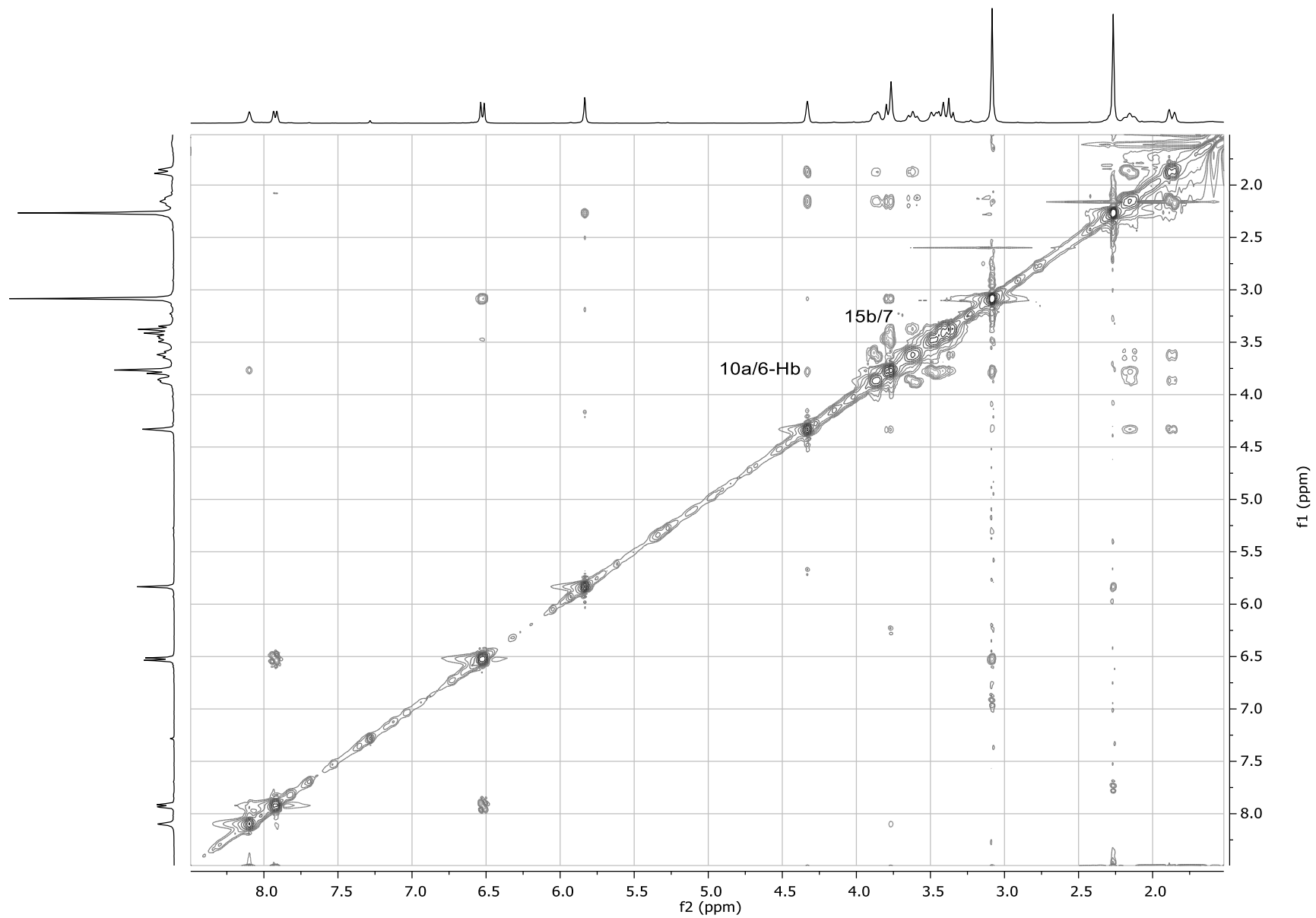


Figure S166. NOESY spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10ae** in CDCl₃ at 400 MHz.

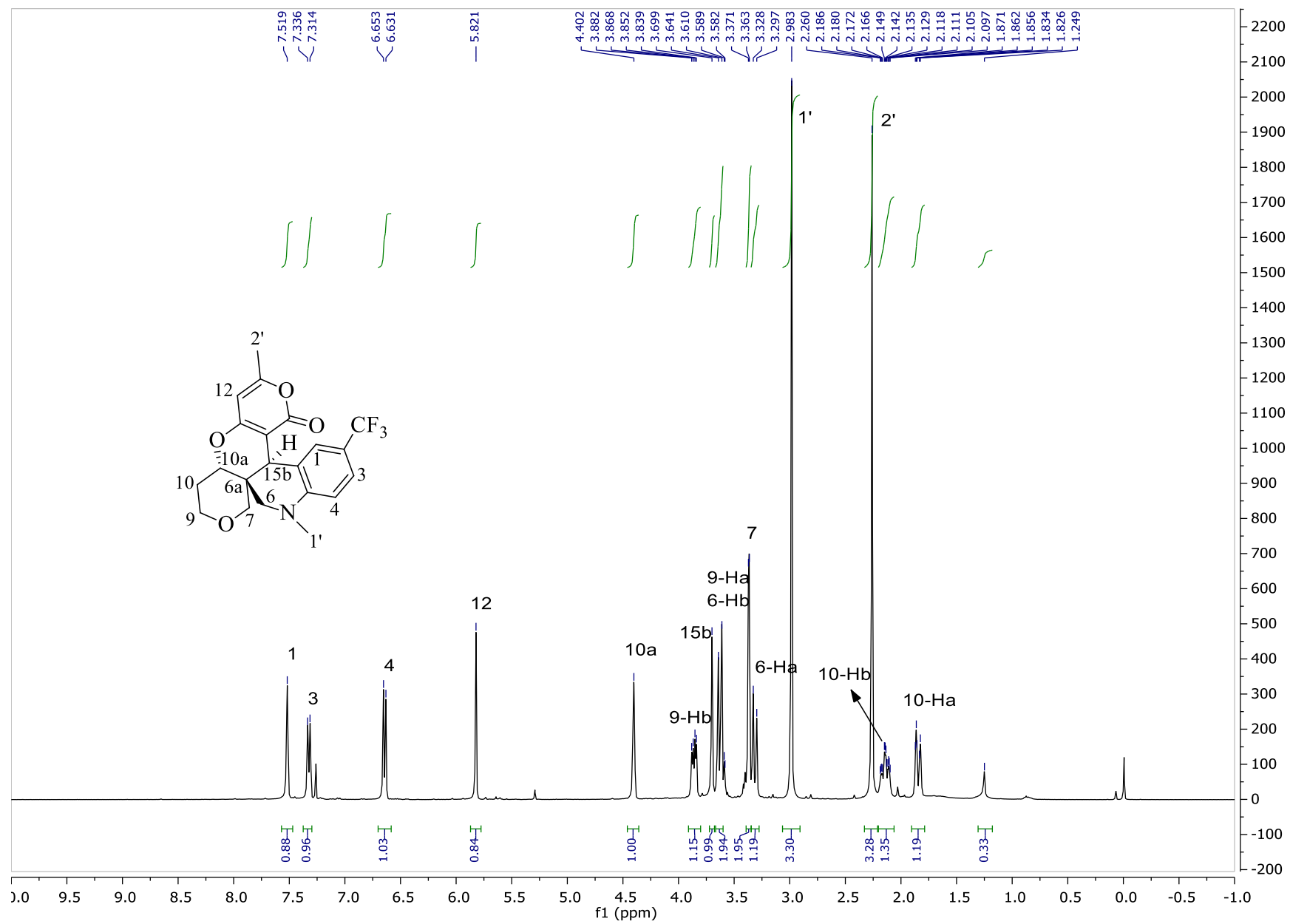


Figure S167. ¹H-NMR spectrum of *rac*-(6a*S*^{*},10a*S*^{*},15b*S*^{*})-**10be** in CDCl₃ at 400 MHz.

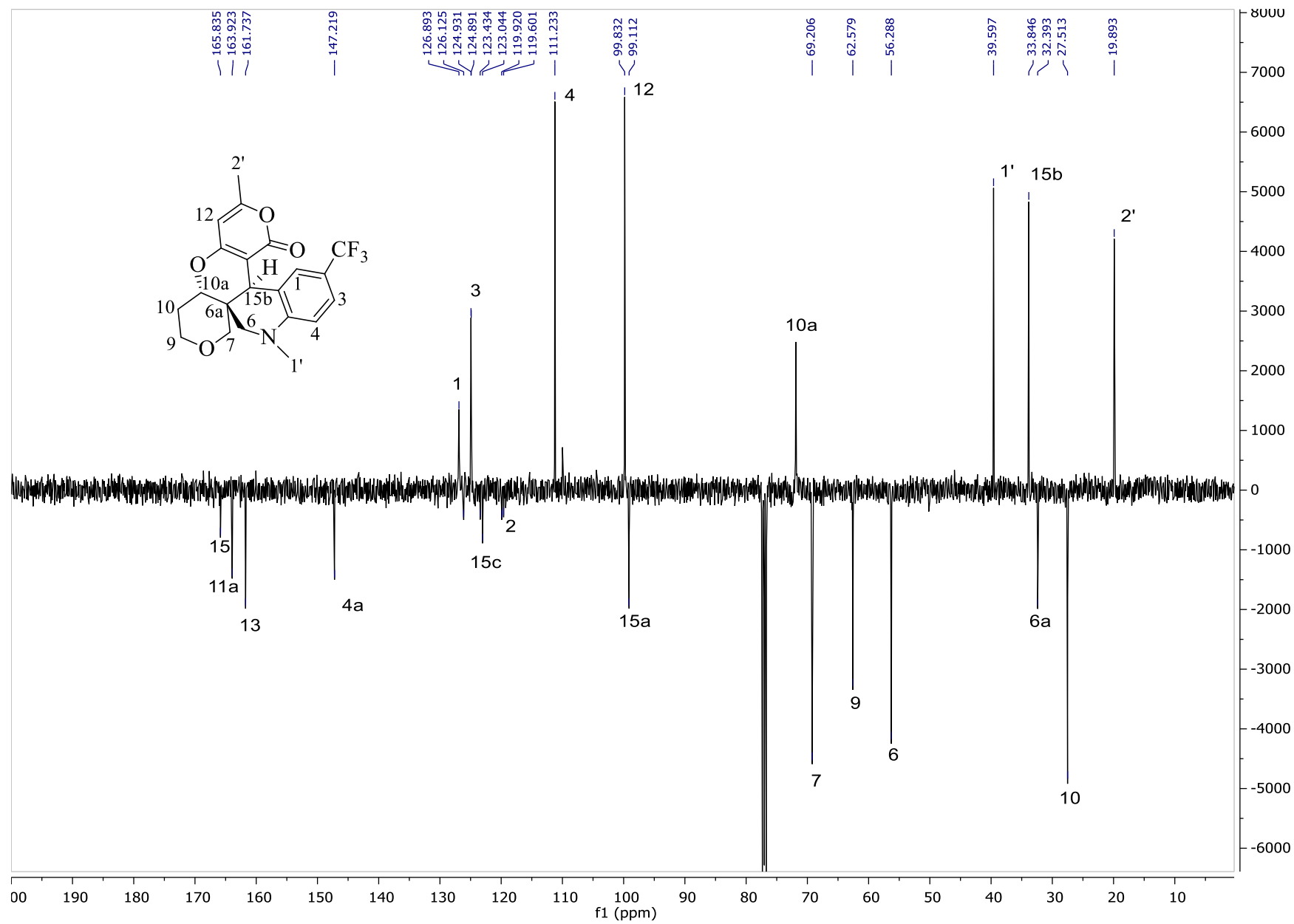


Figure S168. ^{13}C -NMR spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-10b*e* in CDCl_3 at 100 MHz.

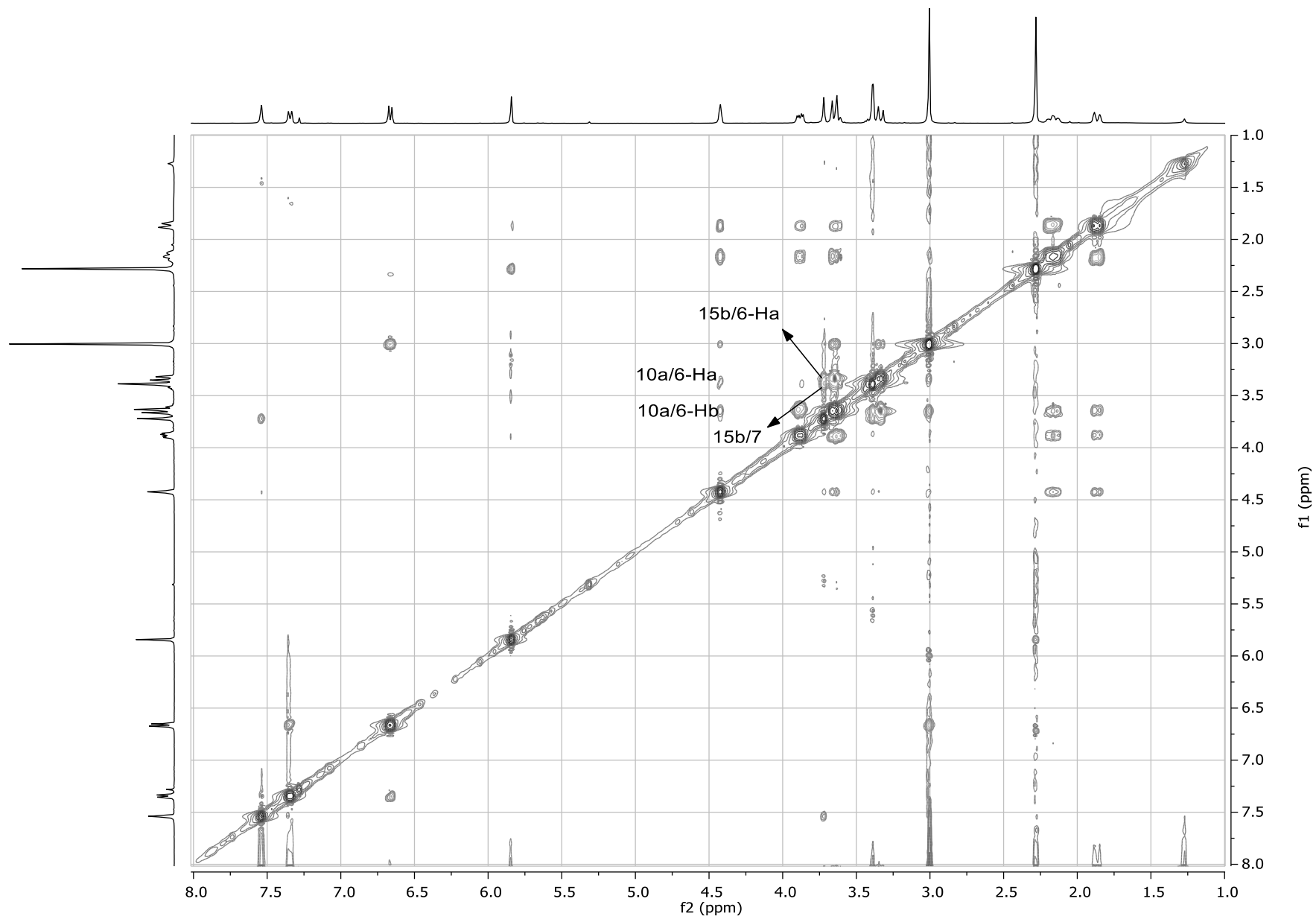


Figure S169. NOESY spectrum of *rac*-(6a*S**,10a*S**,15b*S**)-**10be** in CDCl₃ at 400 MHz.

3. ECD and HPLC-ECD spectra of condensed heterocycles

3.1. ECD Spectra of **4ba-be**, **6ba-be** and **5ba-be**:

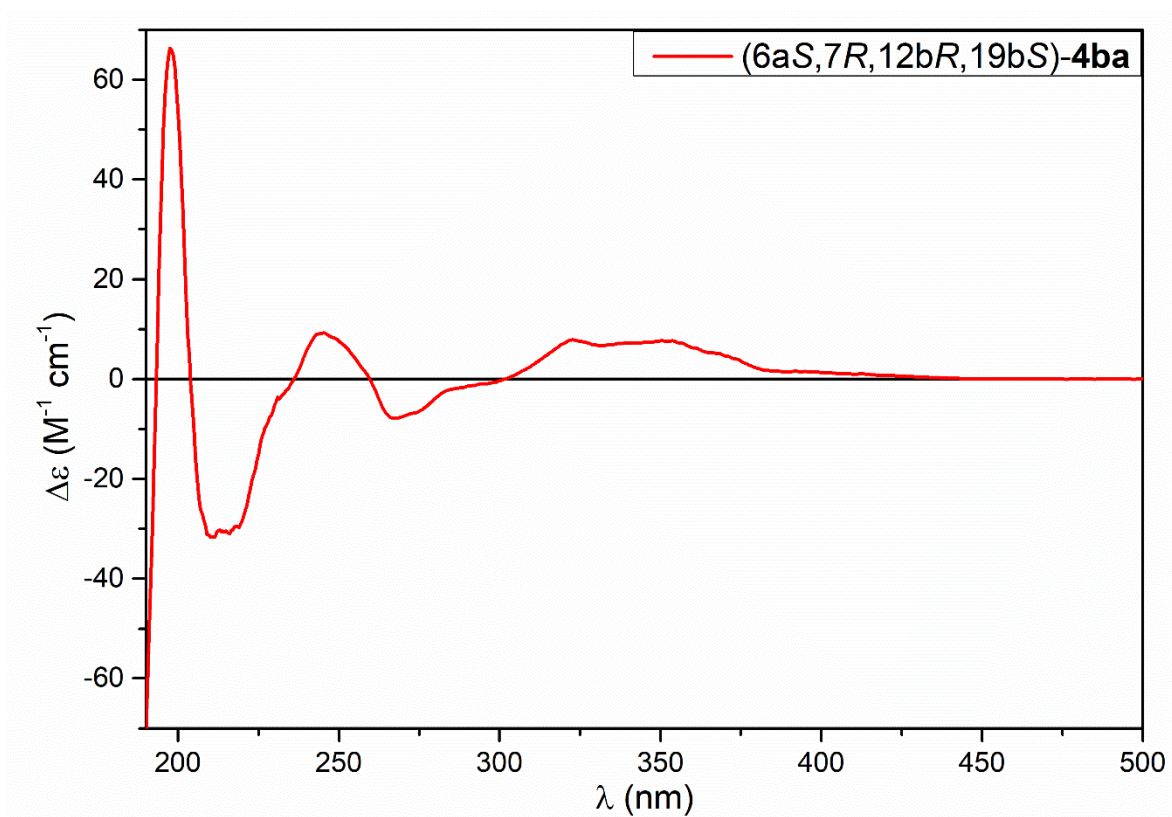


Figure S170. ECD spectrum of (6aS,7R,12bR,17bS)-**4ba** in MeCN.

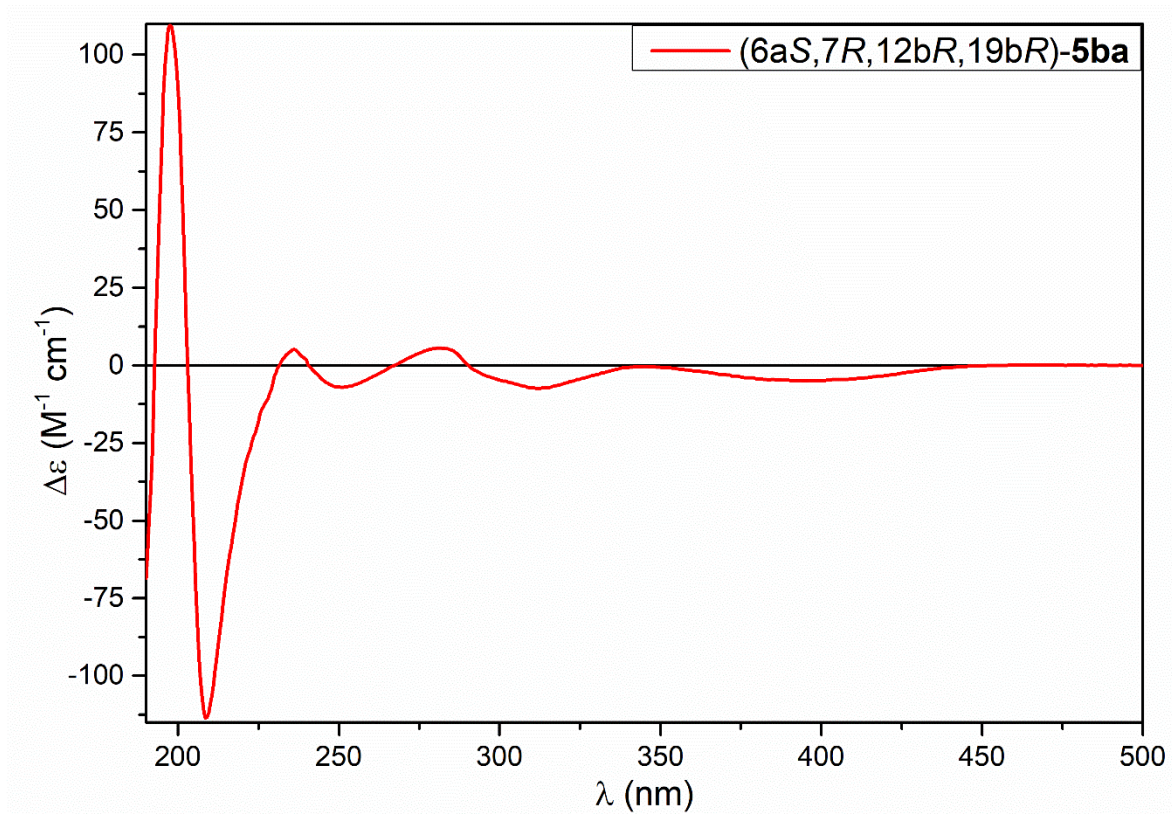


Figure S171. ECD spectrum of (6aS,7R,12bR,17bR)-**5ba** in MeCN.

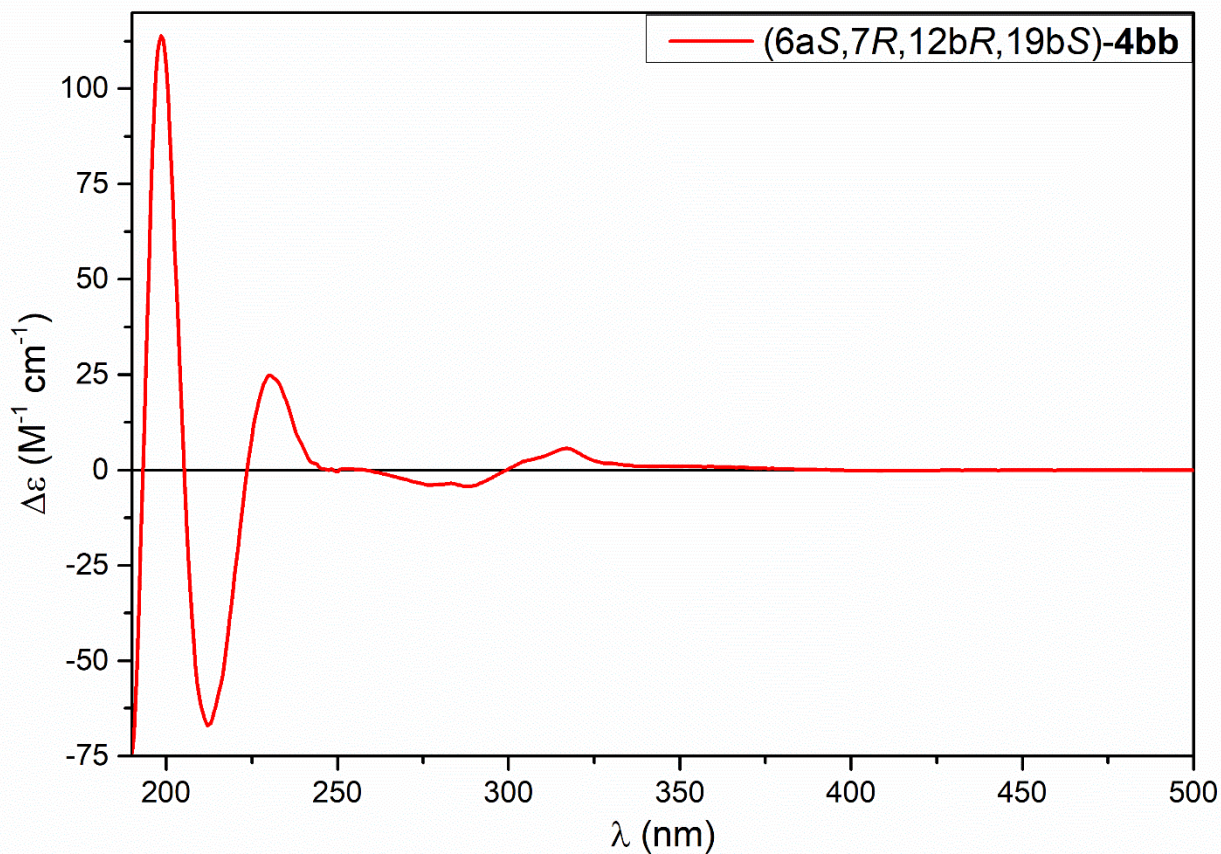


Figure S172. ECD spectrum of (6a*S*,7*R*,12*bR*,17*bS*)-**4bb** in MeCN.

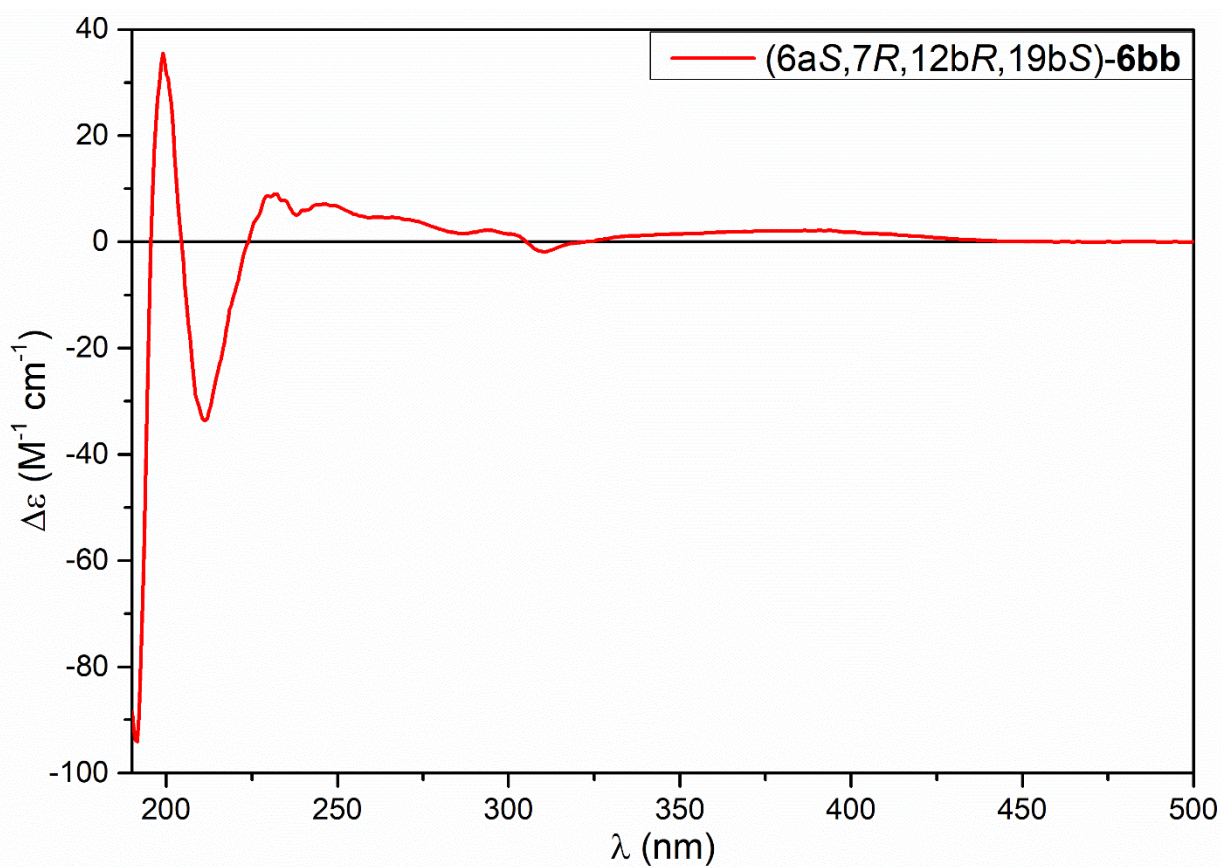


Figure S173. ECD spectrum of (6a*S*,7*R*,12*bR*,17*bS*)-**6bb** in MeCN.

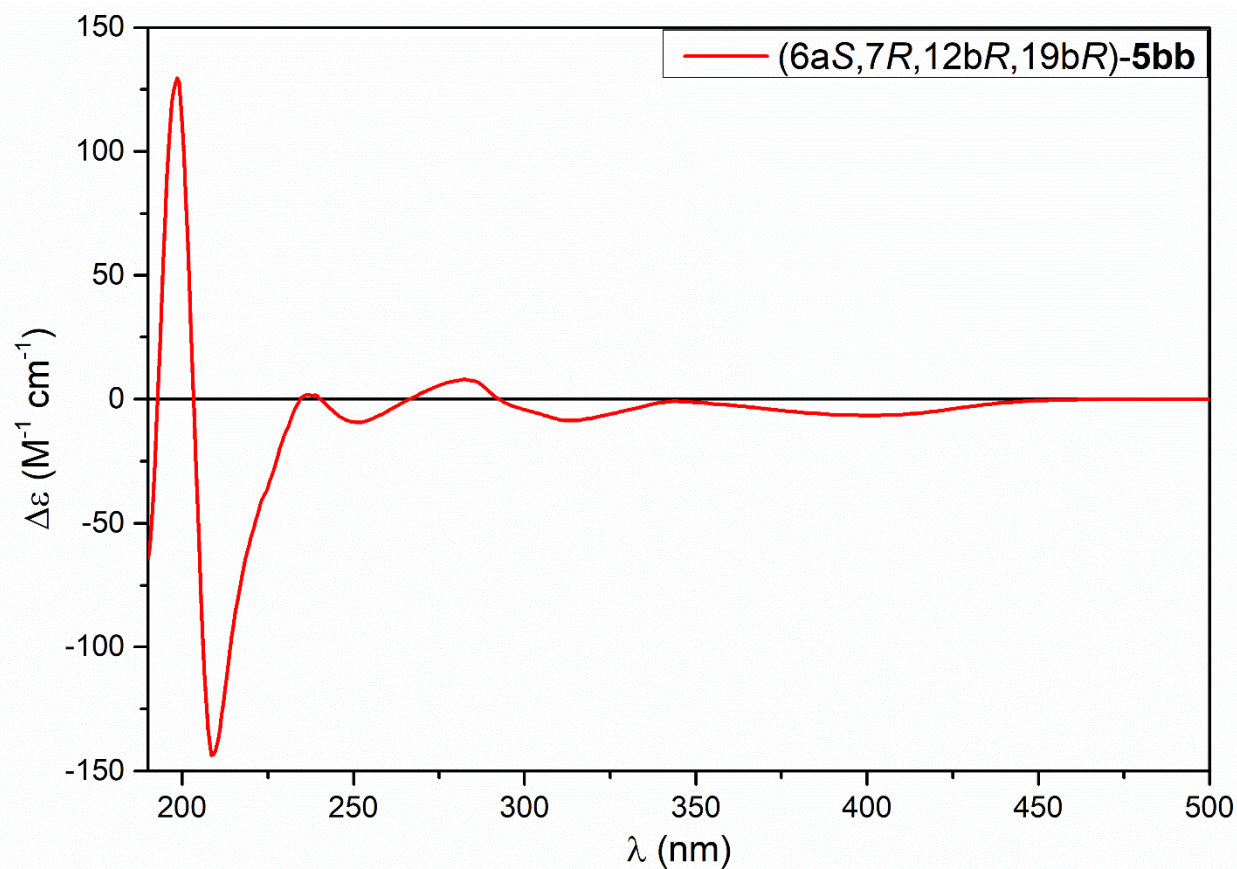


Figure S174. ECD spectrum of (6a*S*,7*R*,12*bR*,17*bR*)-**5bb** in MeCN.

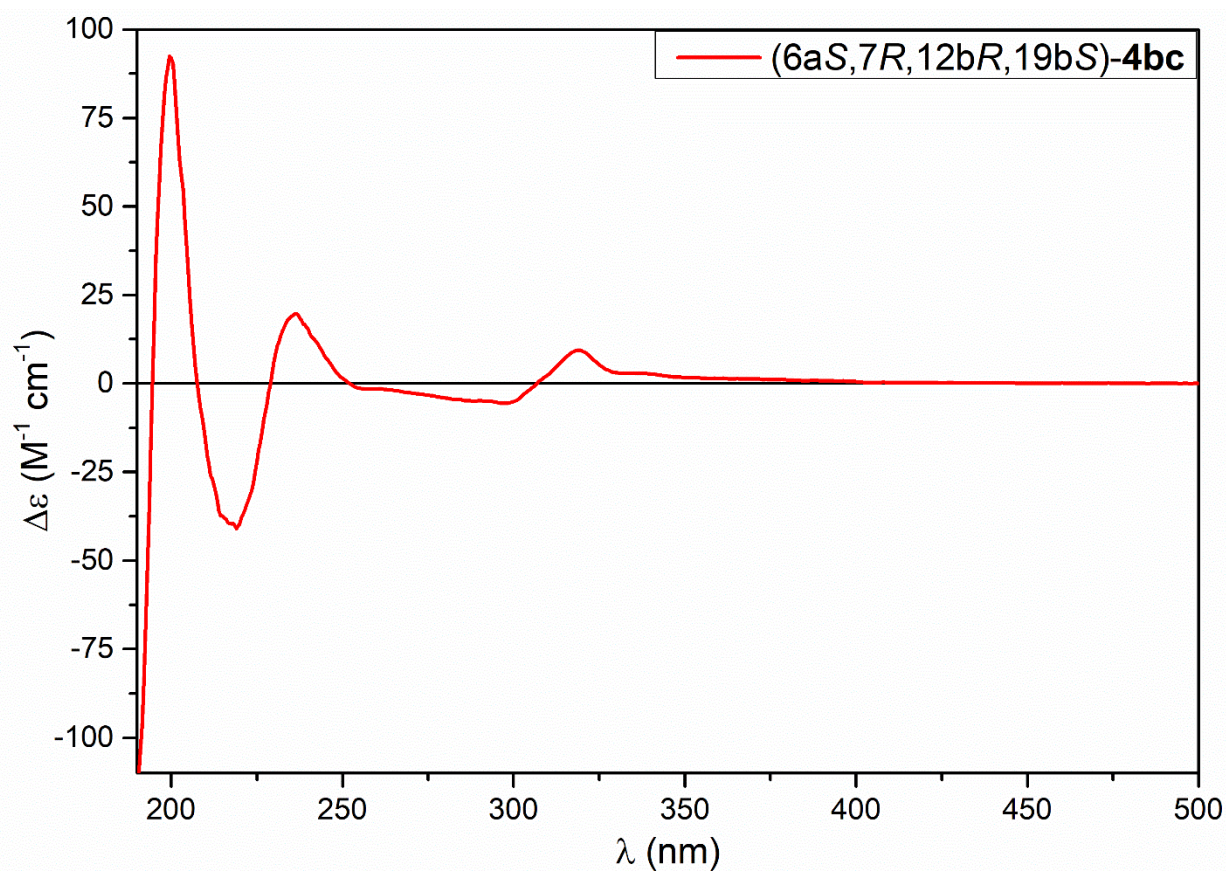


Figure S175. ECD spectrum of (6a*S*,7*R*,12*bR*,17*bS*)-**4bc** in MeCN.

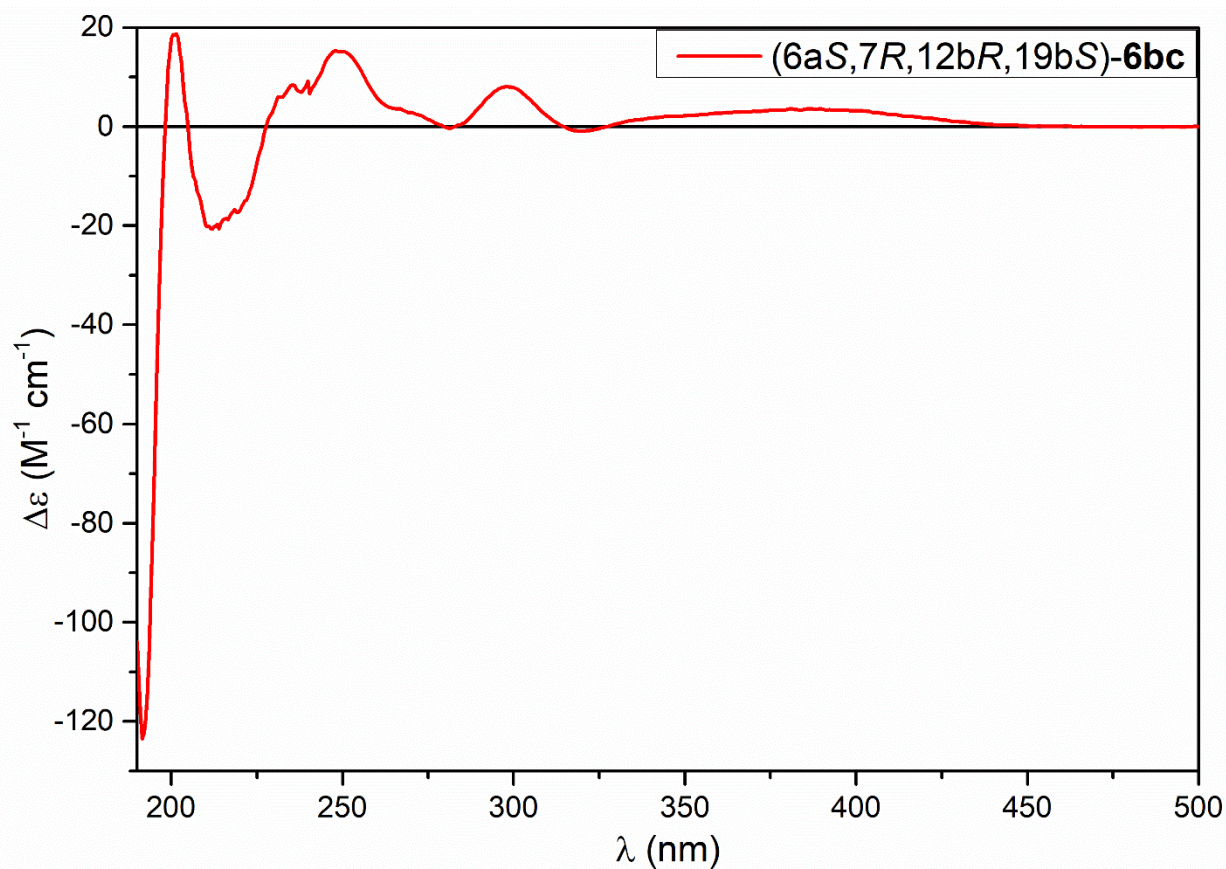


Figure S176. ECD spectrum of (6a*S*,7*R*,12*bR*,17*bS*)-**6bc** in MeCN.

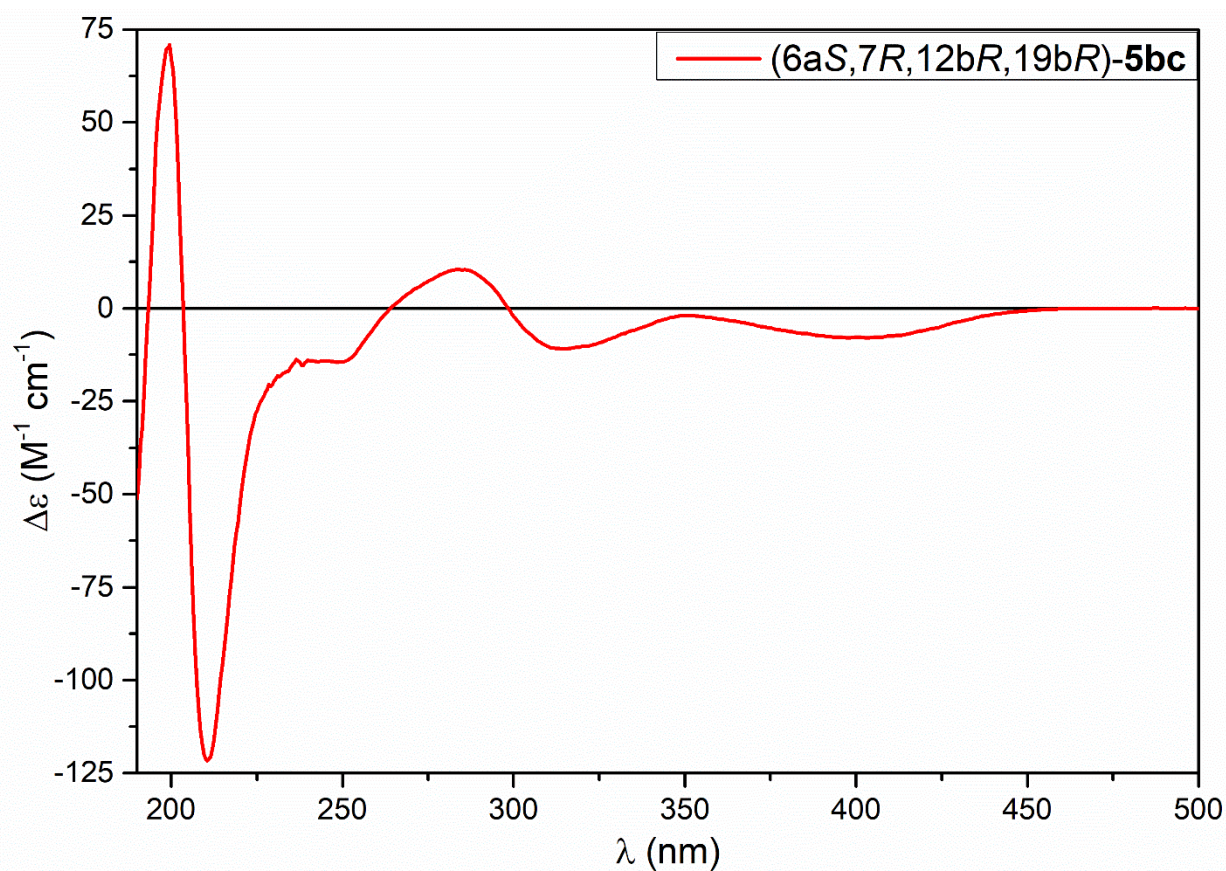


Figure S177. ECD spectrum of (6a*S*,7*R*,12*bR*,17*bR*)-**5bc** in MeCN.

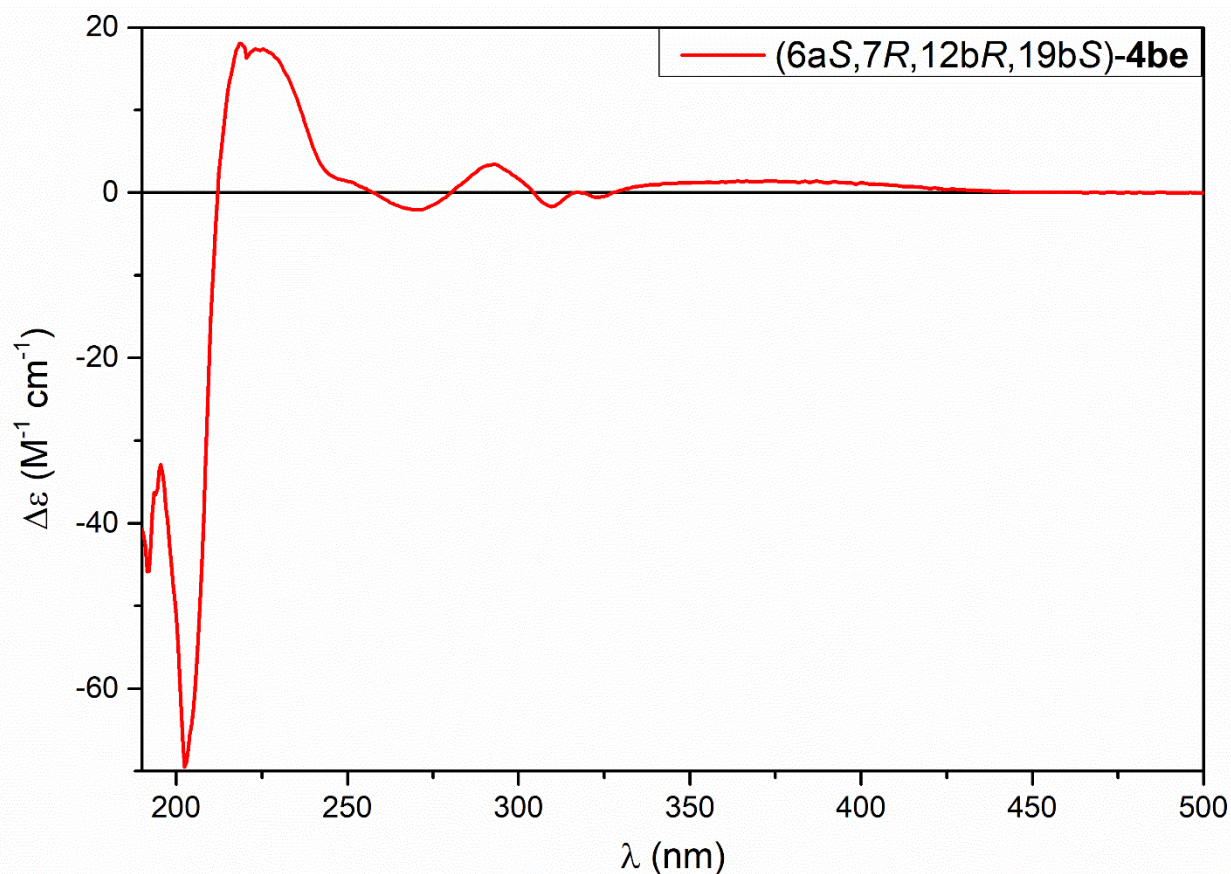


Figure S178. ECD spectrum of (6aS,7R,12bR,17bS)-4be in MeCN.

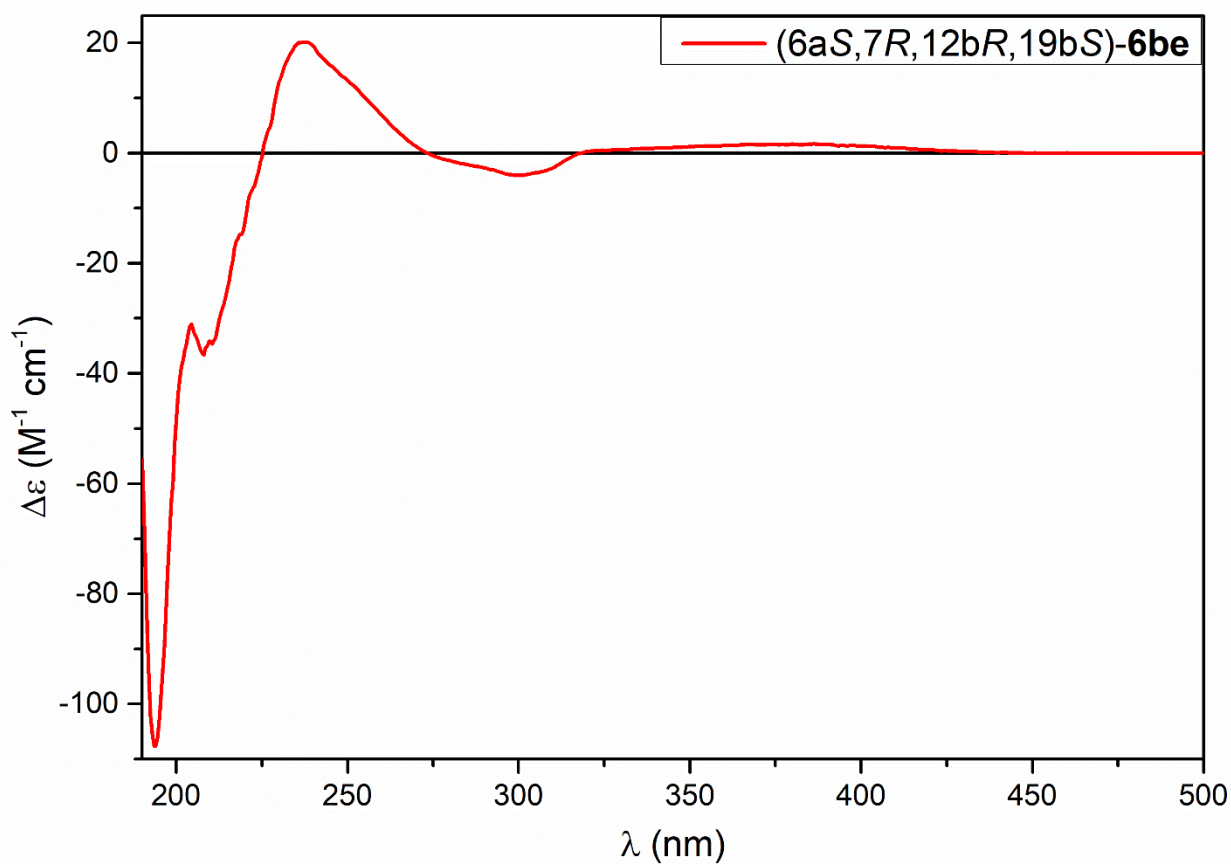


Figure S179. ECD spectrum of (6aS,7R,12bR,17bS)-6be in MeCN.

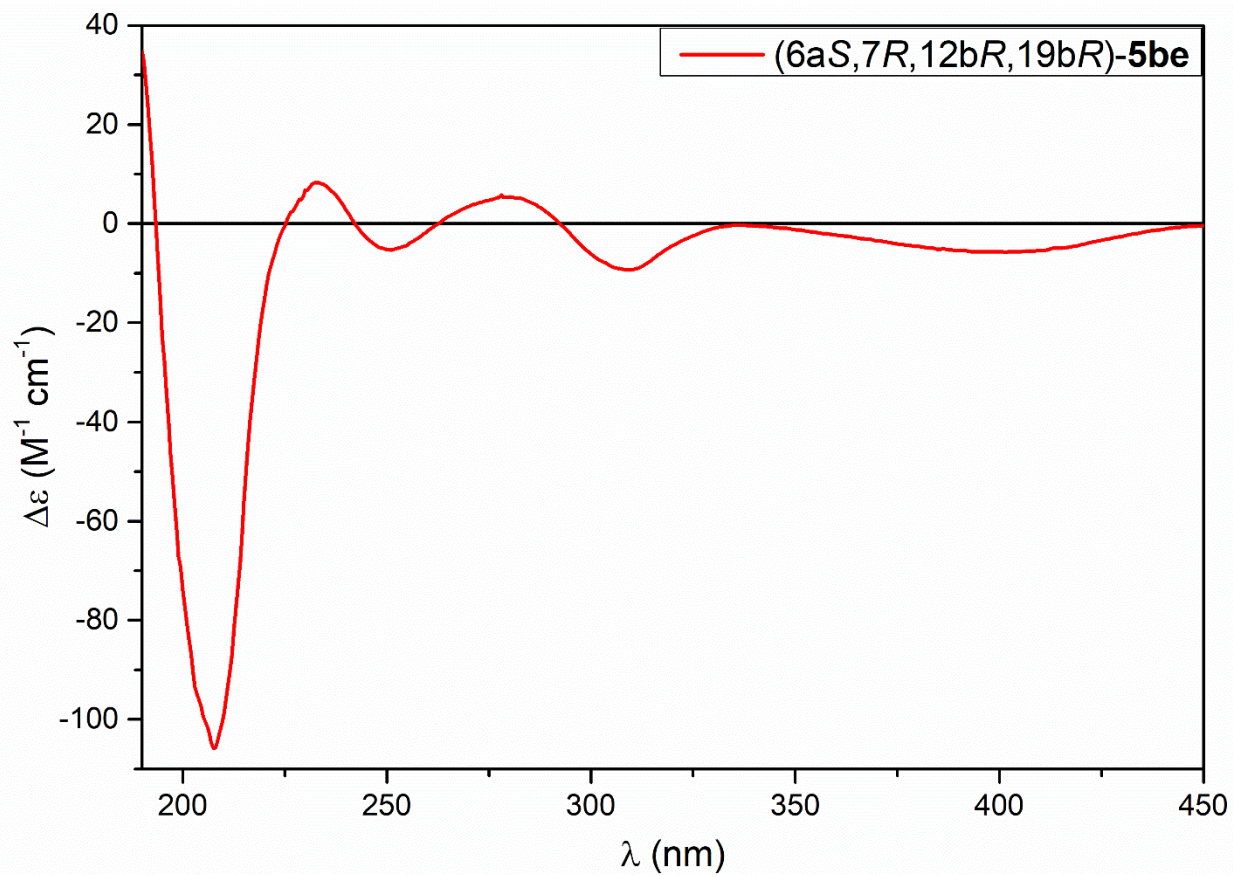


Figure S180. ECD spectrum of (6a*S*,7*R*,12*bR*,17*bR*)-**5be** in MeCN.

3.2.HPLC-ECD spectra of **4aa-ae**, **5aa-ae**, **6aa-ae** and **7aa-ae**

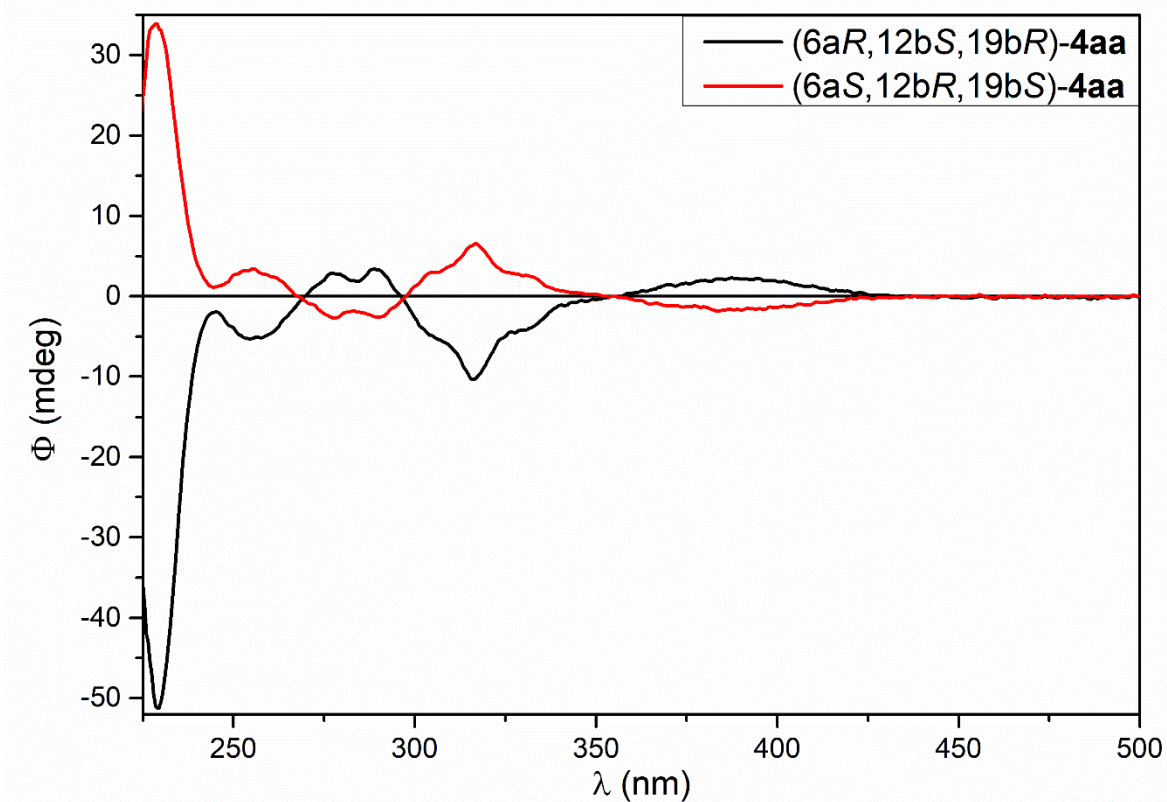


Figure S181. On-line HPLC-ECD spectra of (6aS,12bR,17bS)-**4aa** (red) and (6aR,12bS,17bR)-**4aa** (black) in hexane/dichloromethane/methanol 50:45:5.

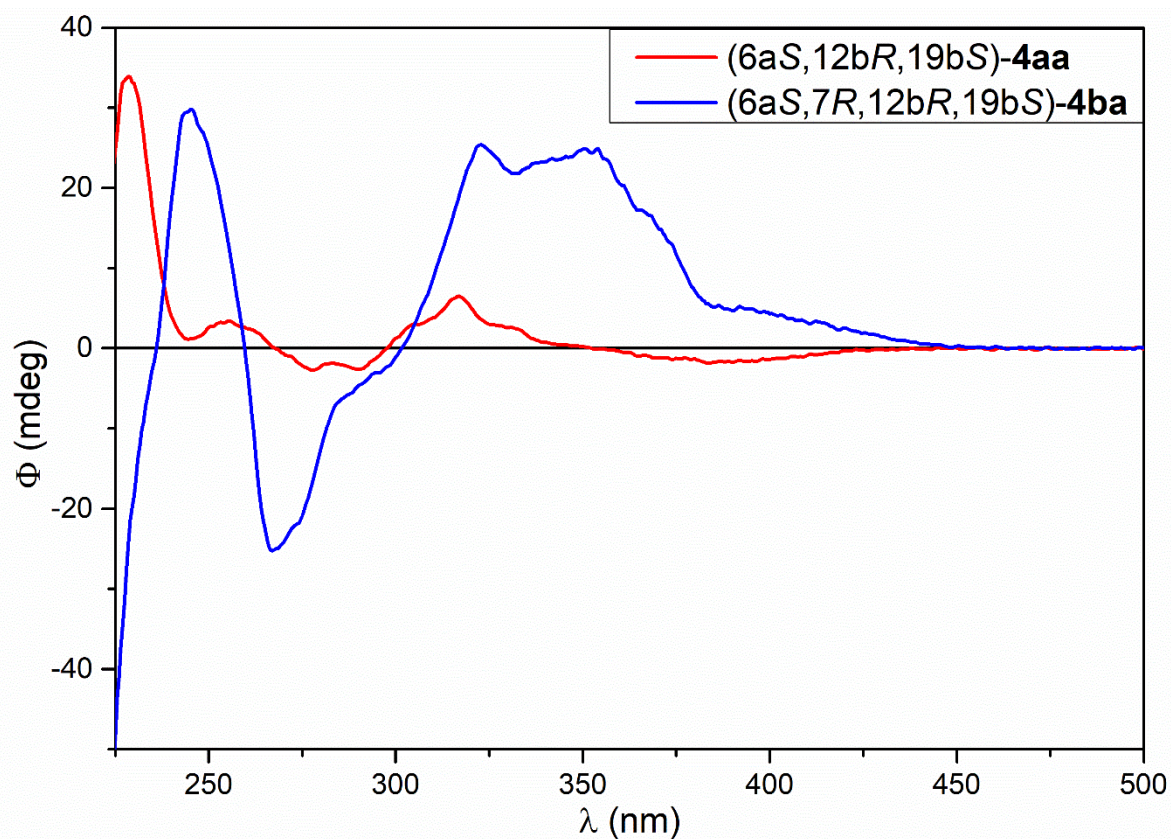


Figure S182. On-line HPLC-ECD spectrum of (6aS,12bR,17bS)-**4aa** (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6aS,7R,12bR,17bS)-**4ba** (blue) in MeCN.

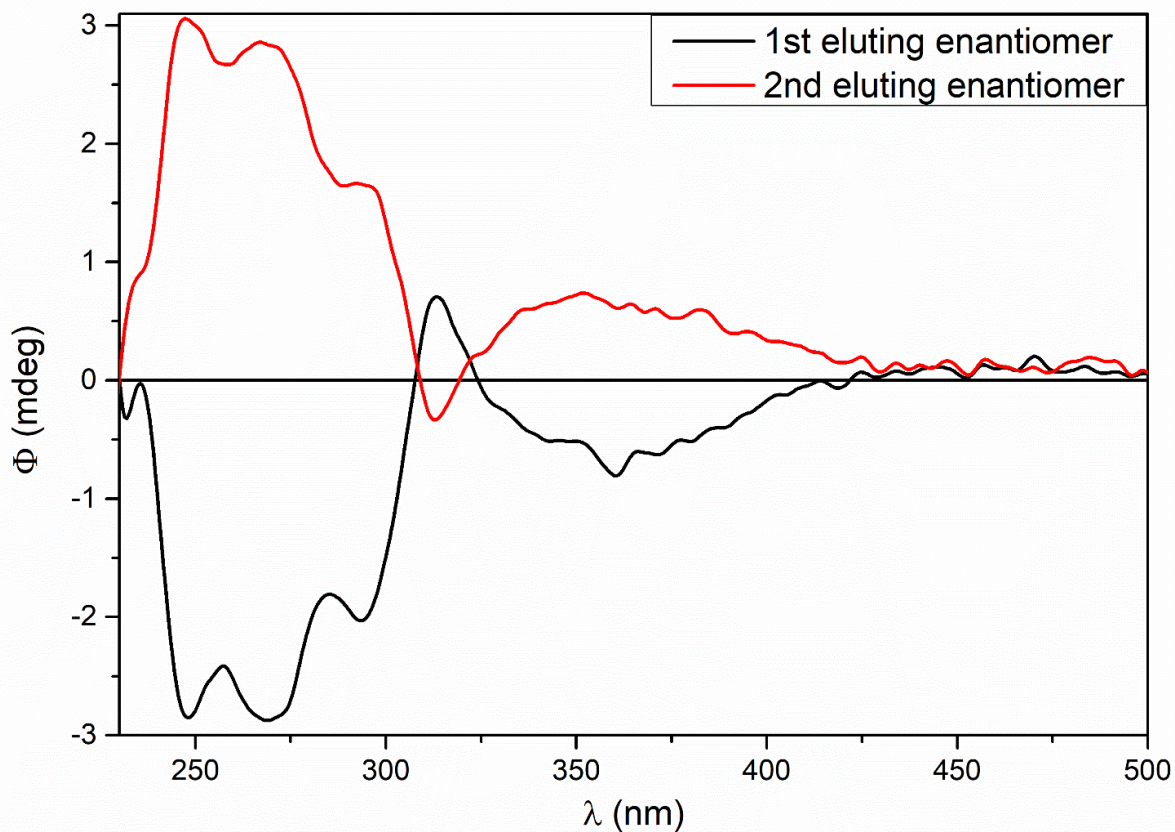


Figure S183. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of *rac*-(6a*S**,12b*R**,17b*R**)-5aa in hexane/dichloromethane/methanol 30:63:7.

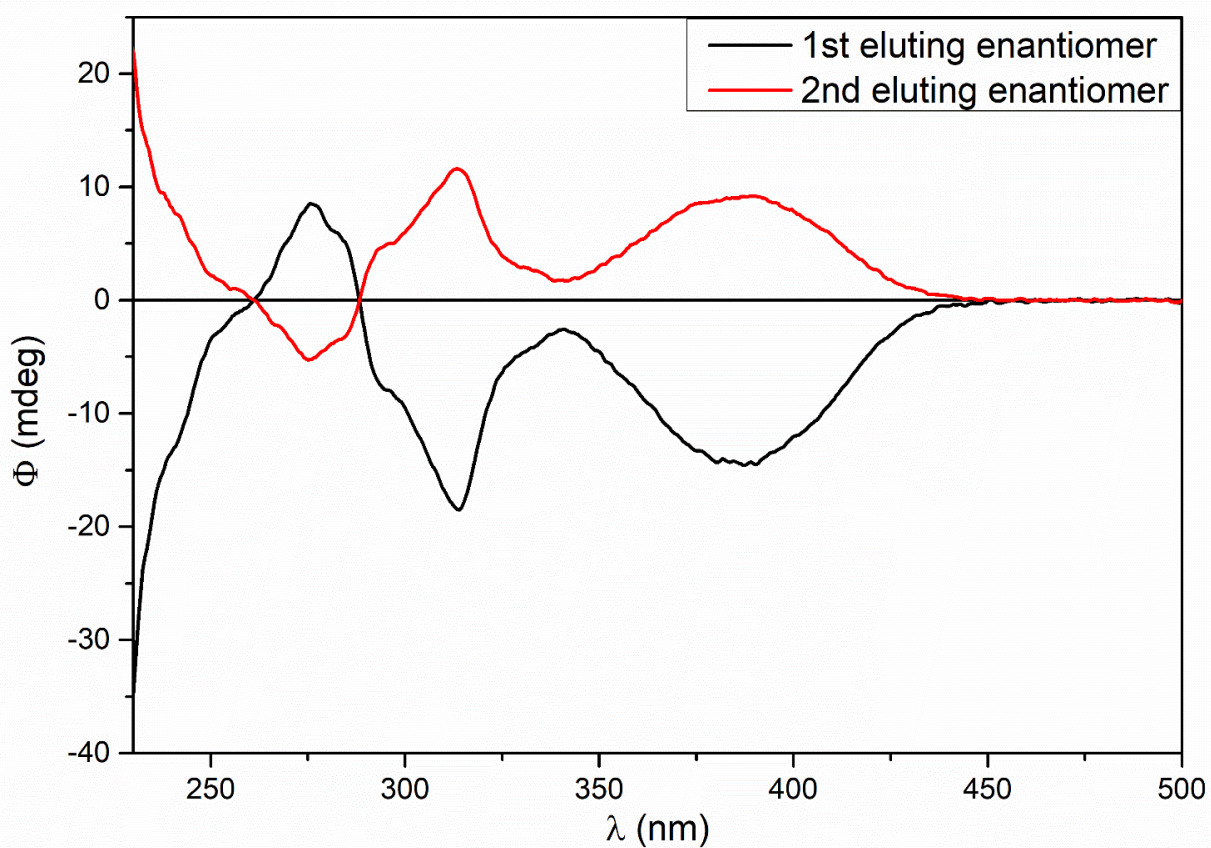


Figure S184. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of *rac*-(6a*S**,12b*R**,17b*S**)-6aa in hexane/dichloromethane/methanol 30:63:7.

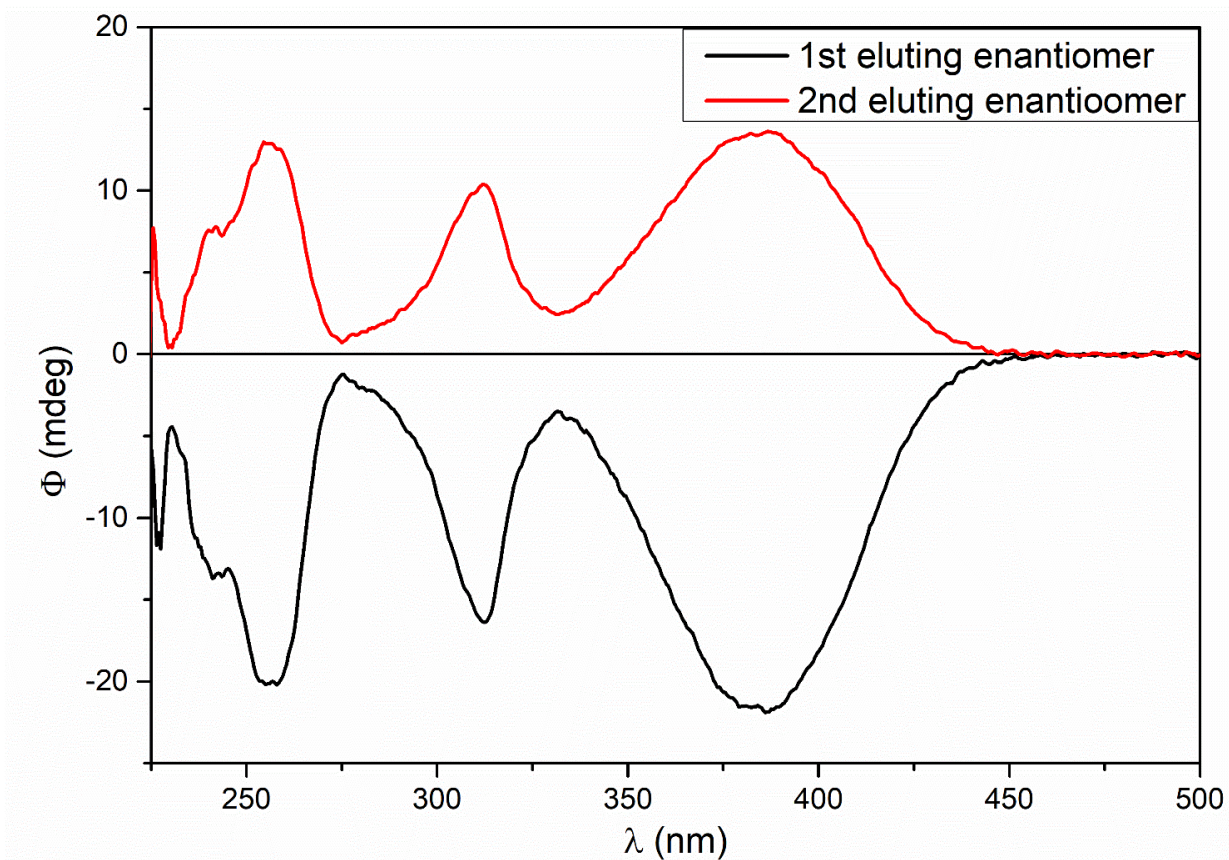


Figure S185. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of *rac*-(6a*S**,12b*R**,17b*R**)-**7aa** in hexane/dichloromethane/methanol 30:63:7.

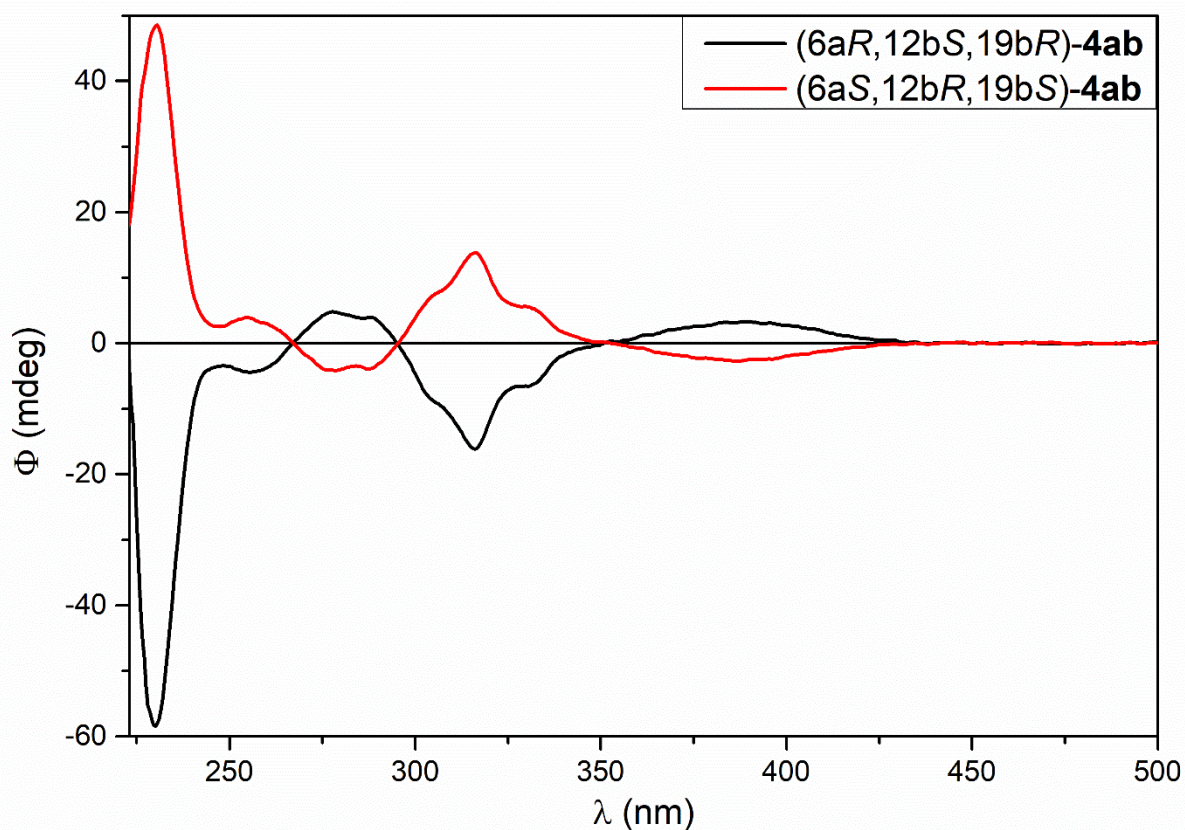


Figure S186. On-line HPLC-ECD spectra of (6a*S*,12b*R*,19b*S*)-**4ab** (red) and (6a*R*,12b*S*,19b*R*)-**4ab** (black) in hexane/dichloromethane/methanol 50:45:5.

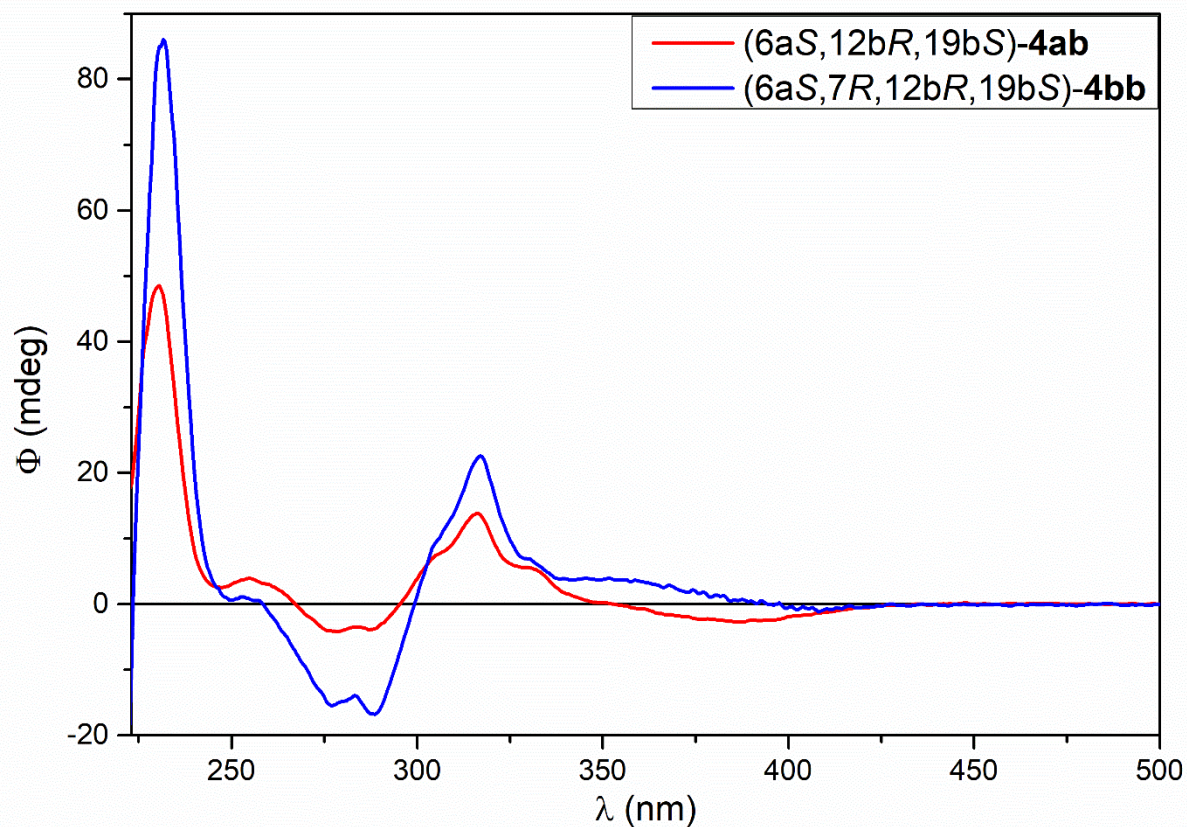


Figure S187. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*S*)-**4ab** (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**4bb** (blue) in MeCN.

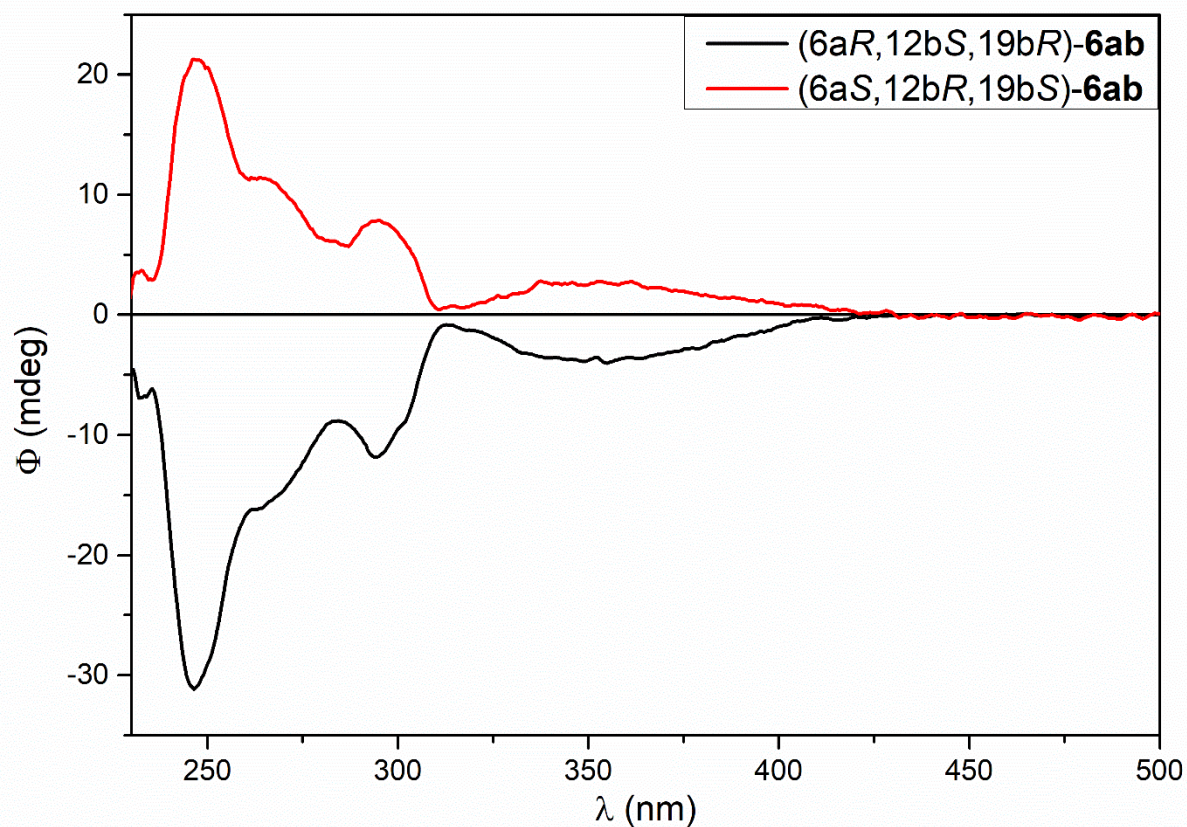


Figure S188. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**6ab** (red) and (6a*R*,12b*S*,17b*R*)-**6ab** (black) in hexane/dichloromethane/methanol 50:45:5.

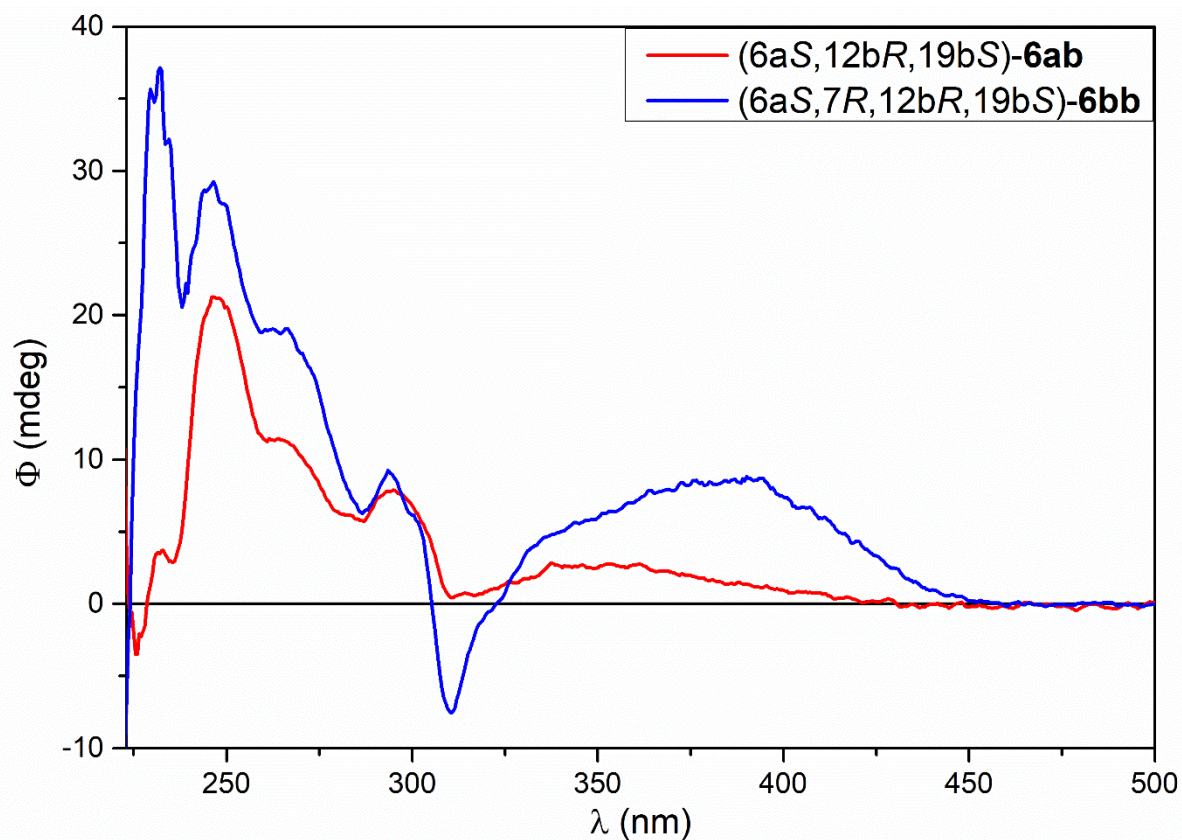


Figure S189. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*S*)-**6ab** (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**6bb** (blue) in MeCN.

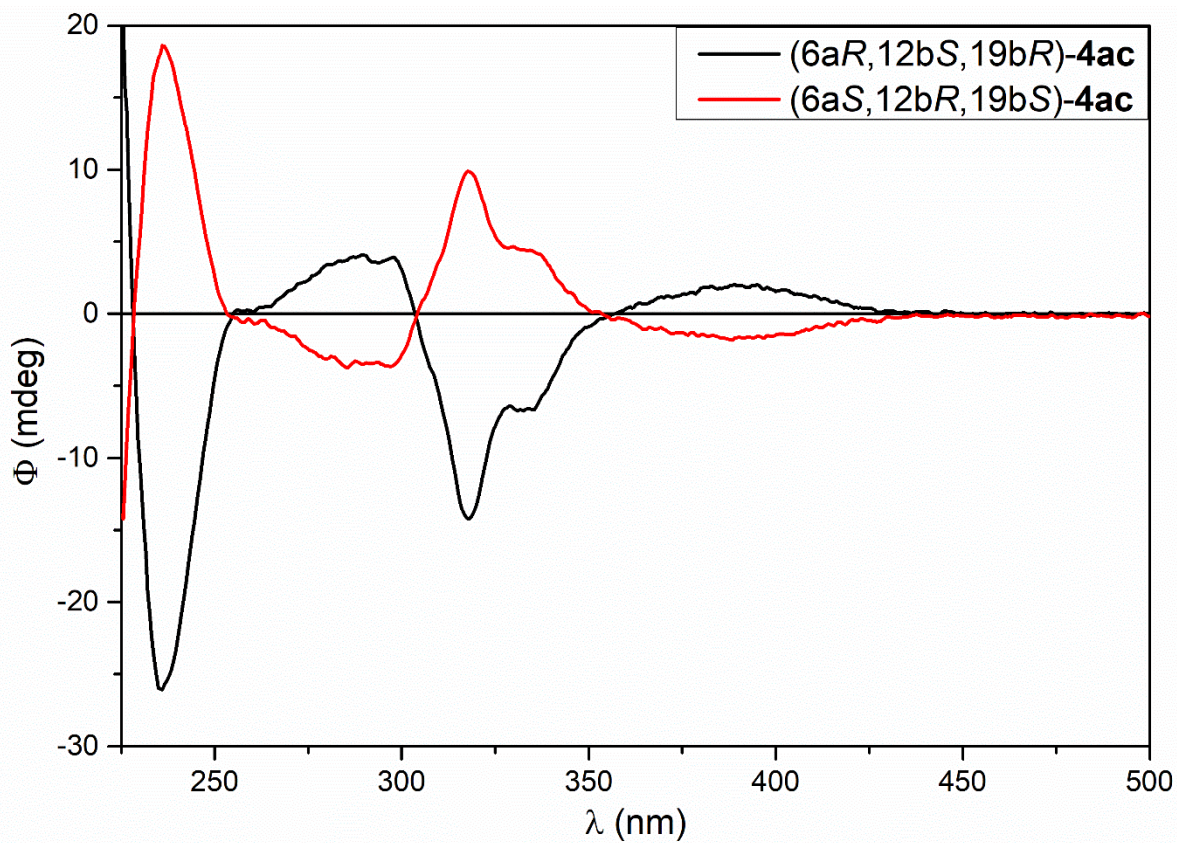


Figure S190. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**4ac** (red) and (6a*R*,12b*S*,17b*R*)-**4ac** (black) in hexane/dichloromethane/methanol 50:45:5.

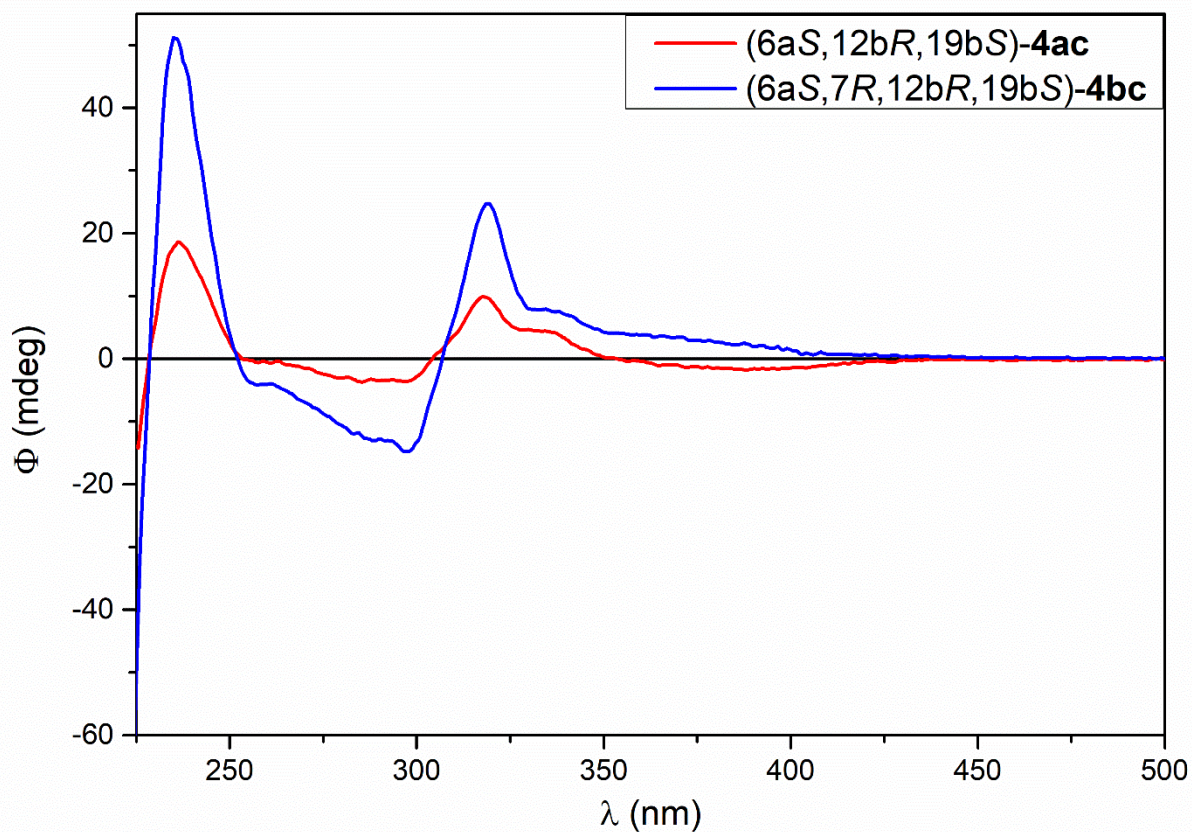


Figure S191. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*S*)-**4ac** (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**4bc** (blue) in MeCN.

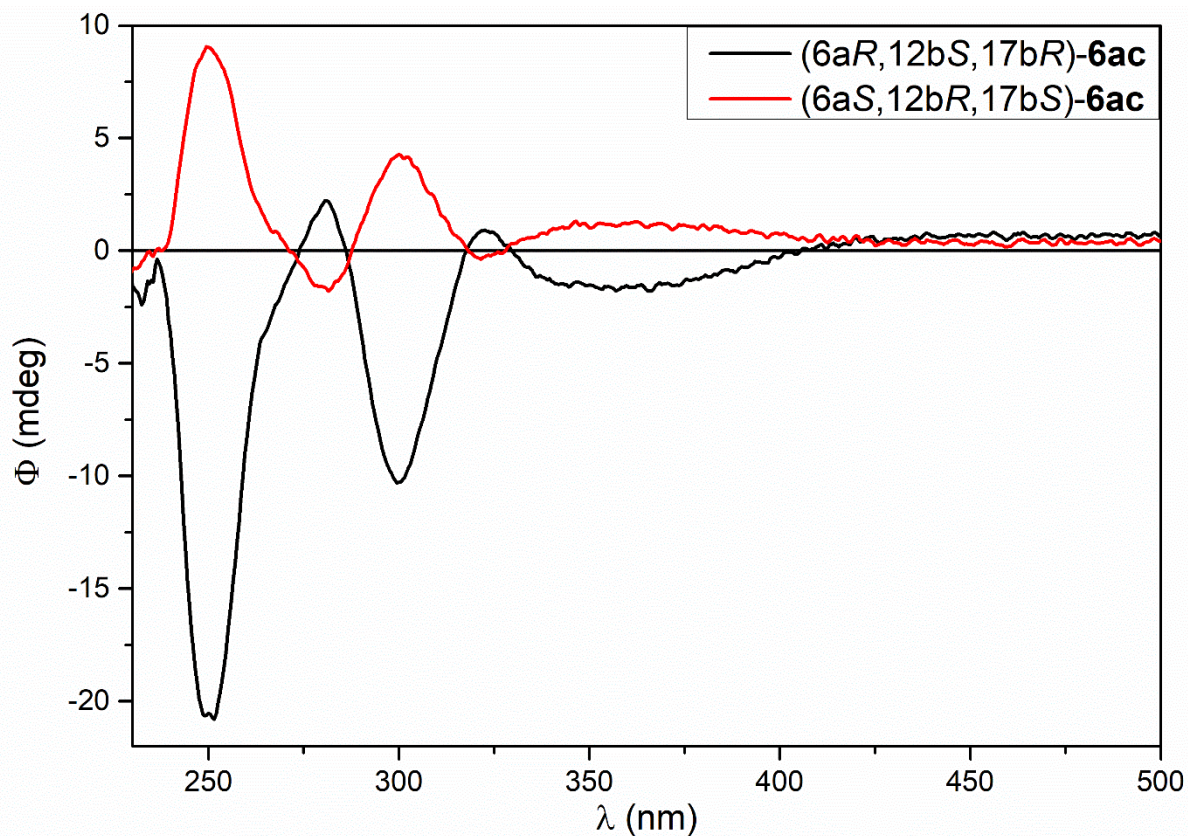


Figure S192. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**6ac** (red) and (6a*R*,12b*S*,17b*R*)-**6ac** (black) in hexane/dichloromethane/methanol 50:45:5.

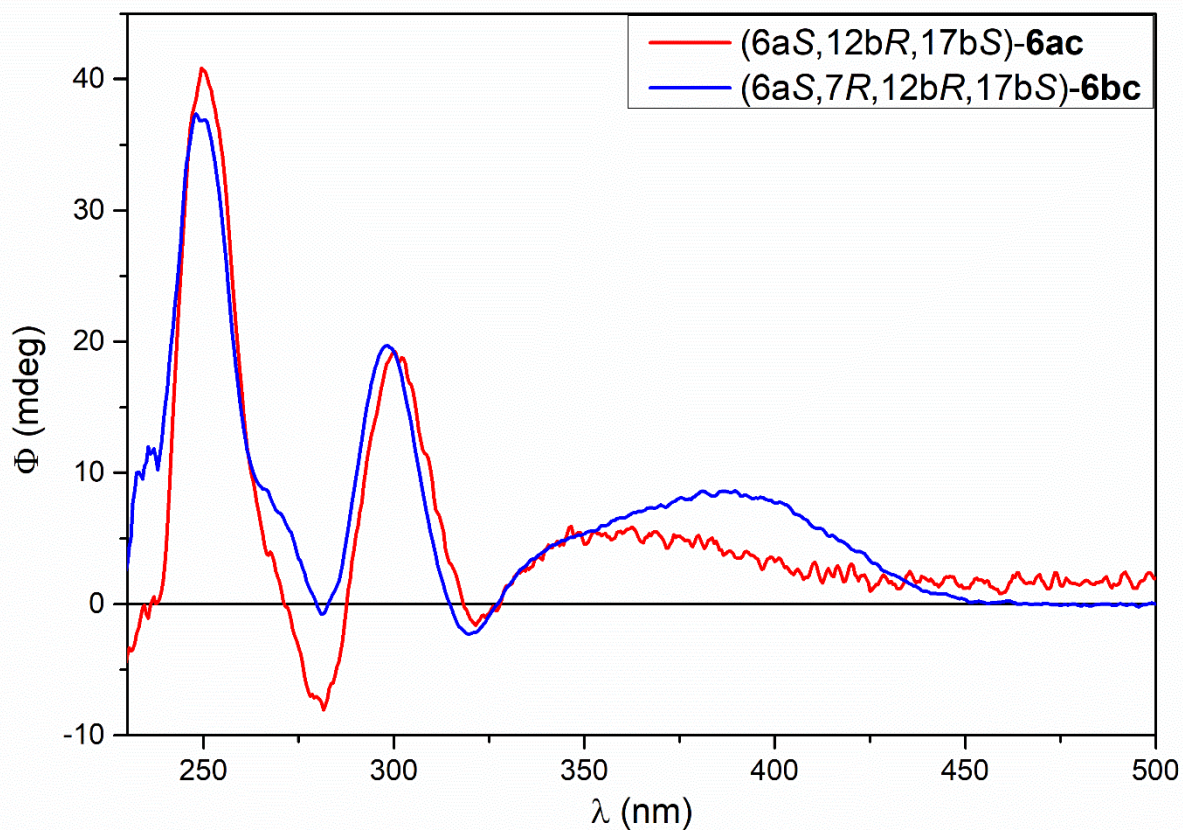


Figure S193. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*S*)-**6ac** (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**6bc** (blue) in MeCN.

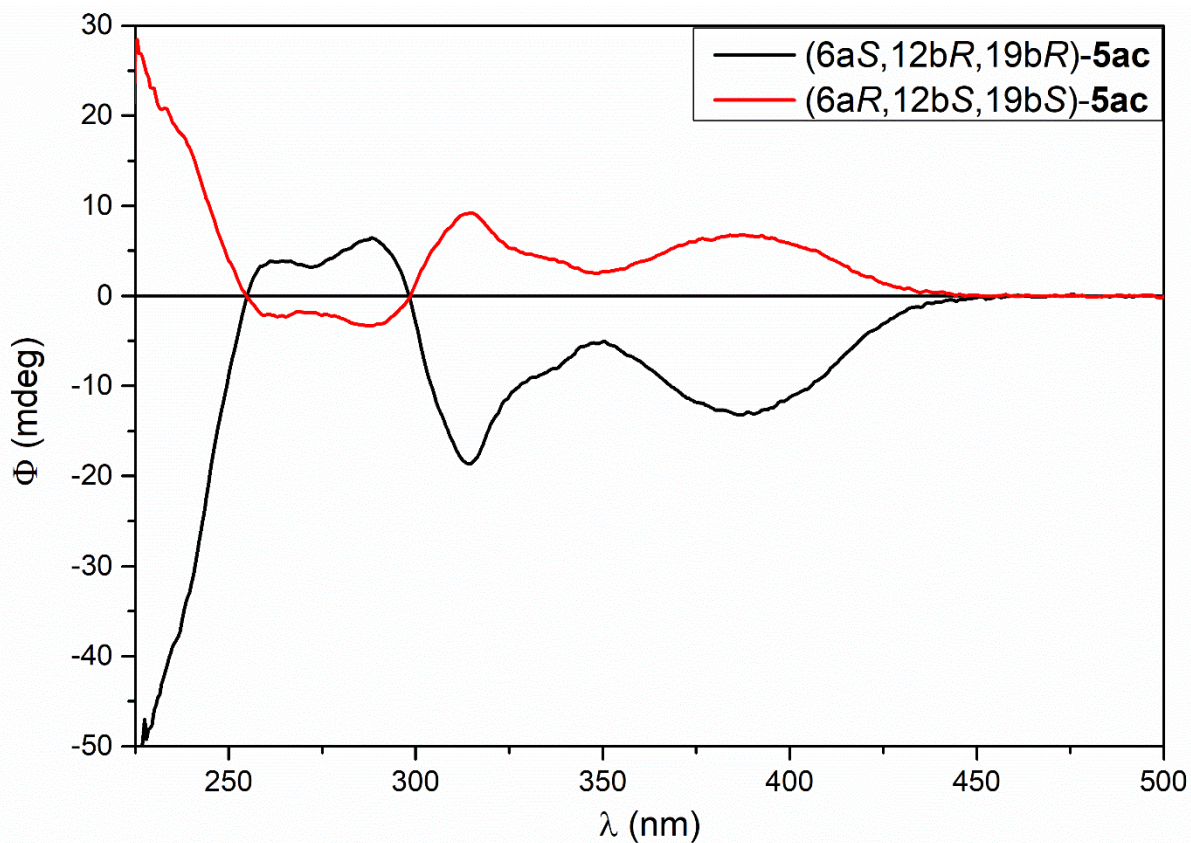


Figure S194. On-line HPLC-ECD spectra of (6a*S*,12b*R*,19b*R*)-**5ac** (black) and (6a*R*,12b*S*,19b*S*)-**5ac** (red) in hexane/dichloromethane/methanol 30:63:7.

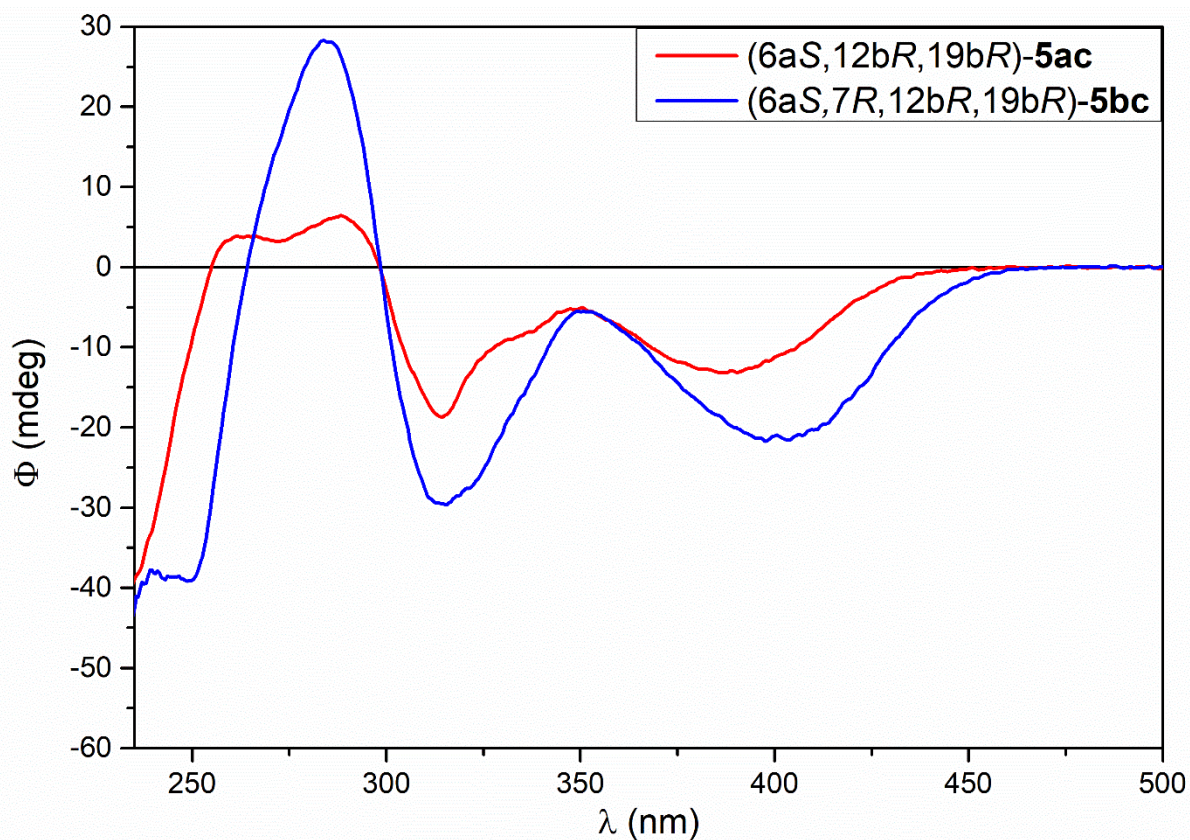


Figure S195. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*R*)-**5ac** (red) in hexane/dichloromethane/methanol 30:63:7 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*R*)-**5bc** (blue) in MeCN.

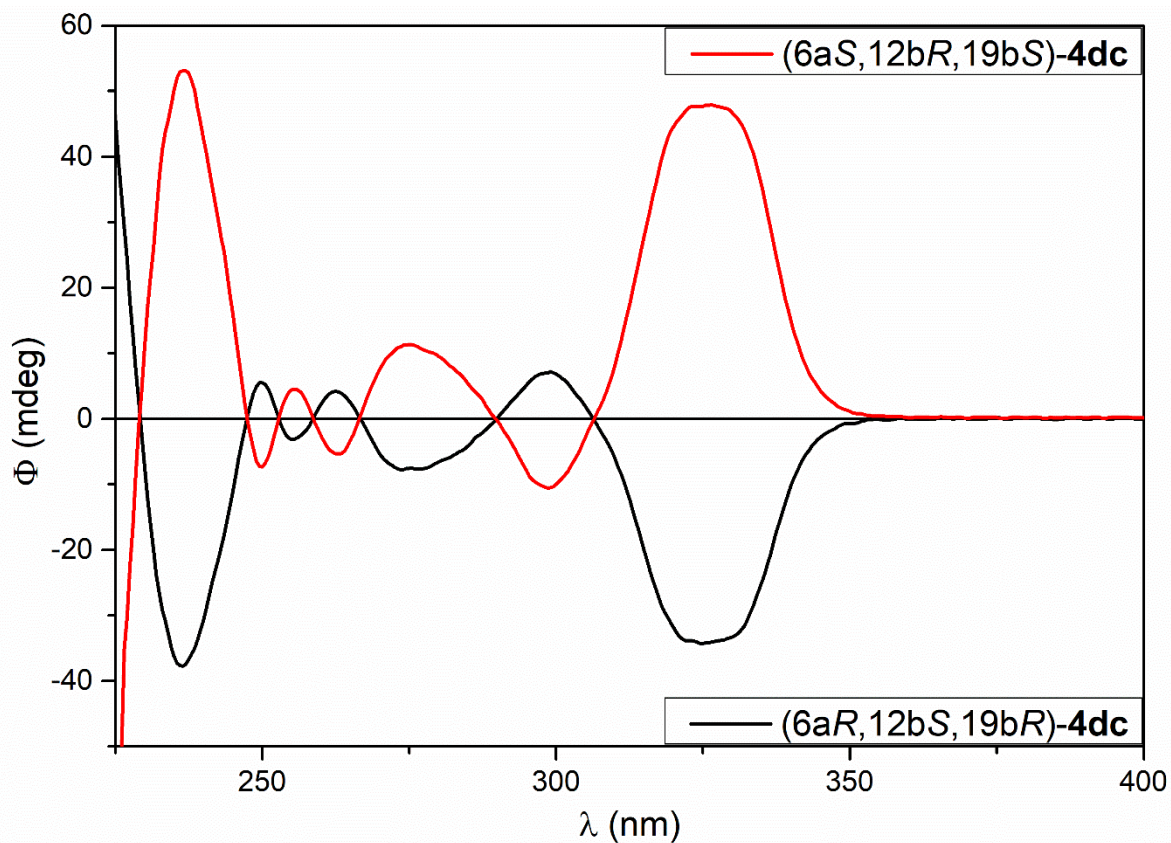


Figure S196. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**4dc** (red) and (6a*R*,12b*S*,17b*R*)-**4dc** (black) in hexane/dichloromethane/methanol 70:27:3.

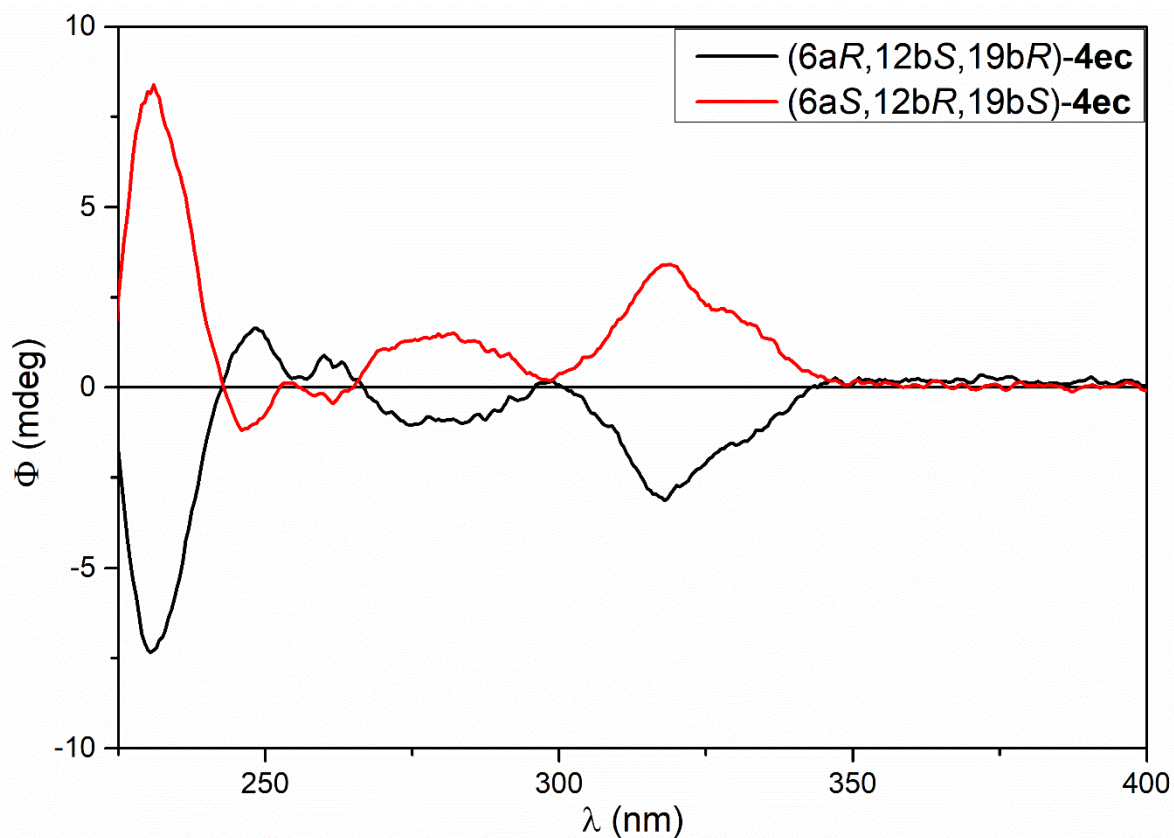


Figure S197. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**4ec** (red) and (6a*R*,12b*S*,17b*R*)-**4ec** (black) in hexane/dichloromethane/methanol 80:18:2.

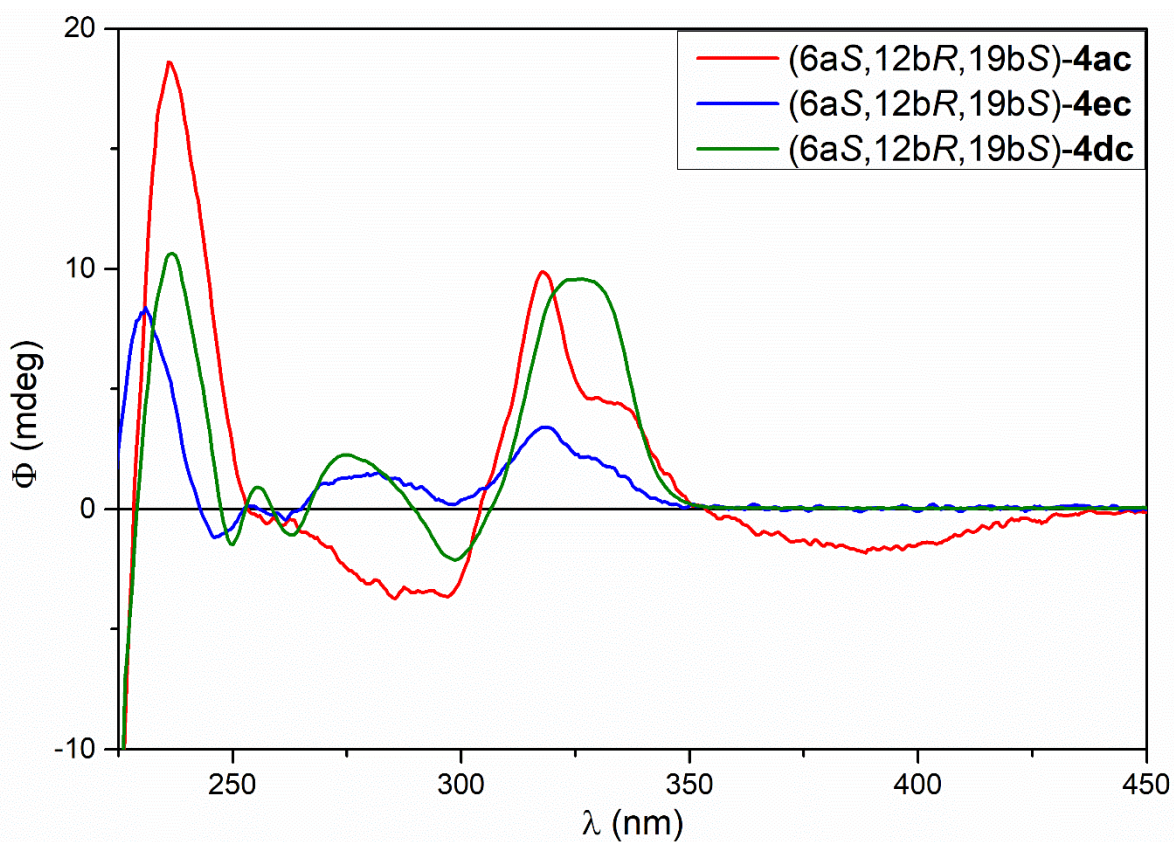


Figure S198. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**4ac** (red), (6a*R*,12b*S*,17b*R*)-**4ec** (blue) and (6a*R*,12b*S*,17b*R*)-**4dc** (green) (multiplied by 0.2).

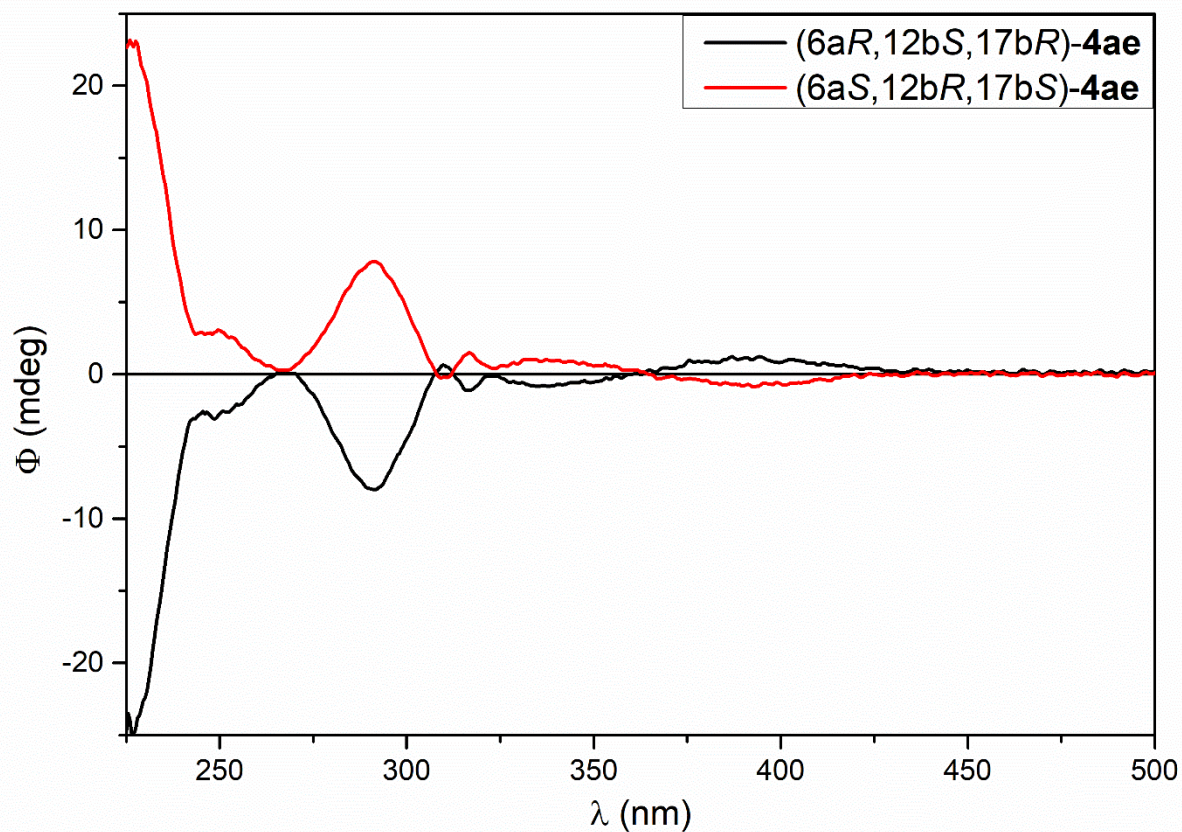


Figure S199. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**4ae** (black) and (6a*R*,12b*S*,17b*R*)-**4ae** (red) in hexane/dichloromethane/methanol 50:45:5.

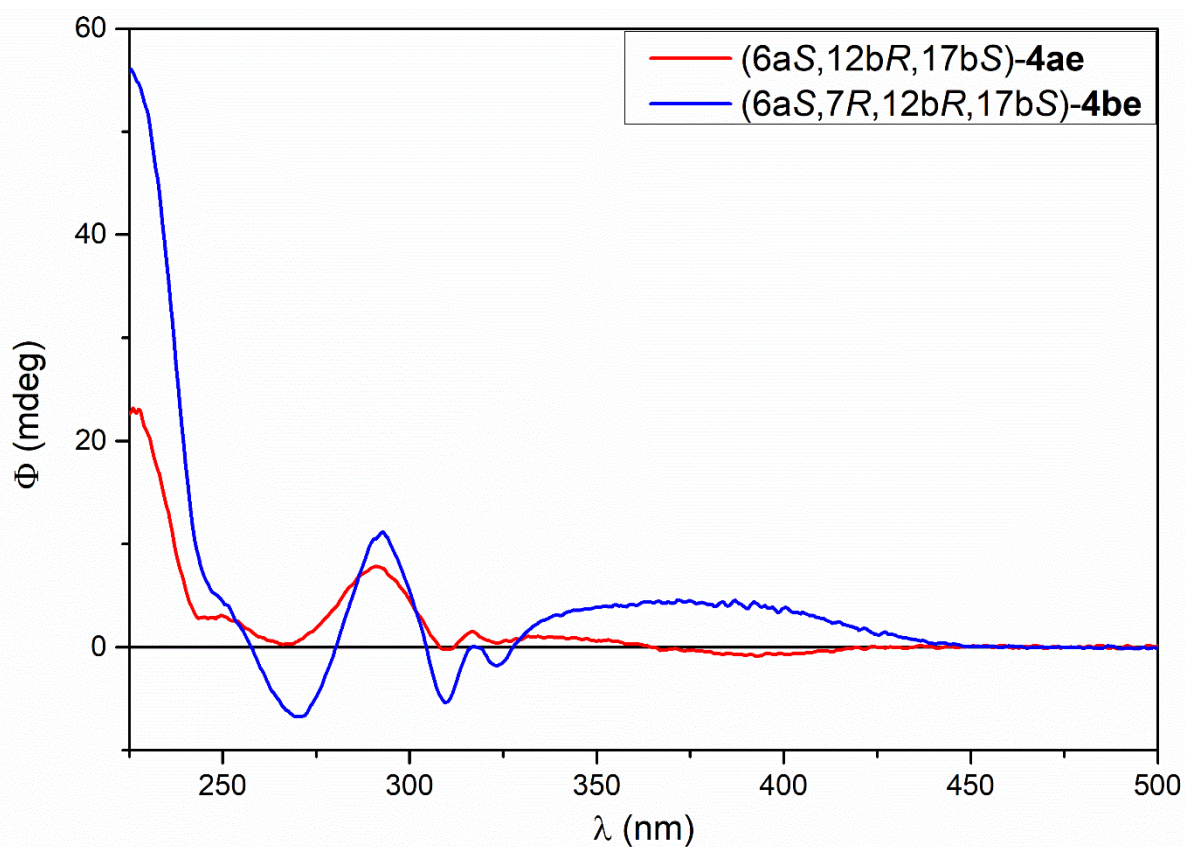


Figure S200. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*S*)-**4ae** (red) in hexane/dichloromethane/methanol 50:45:5 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**4be** (blue) in MeCN.

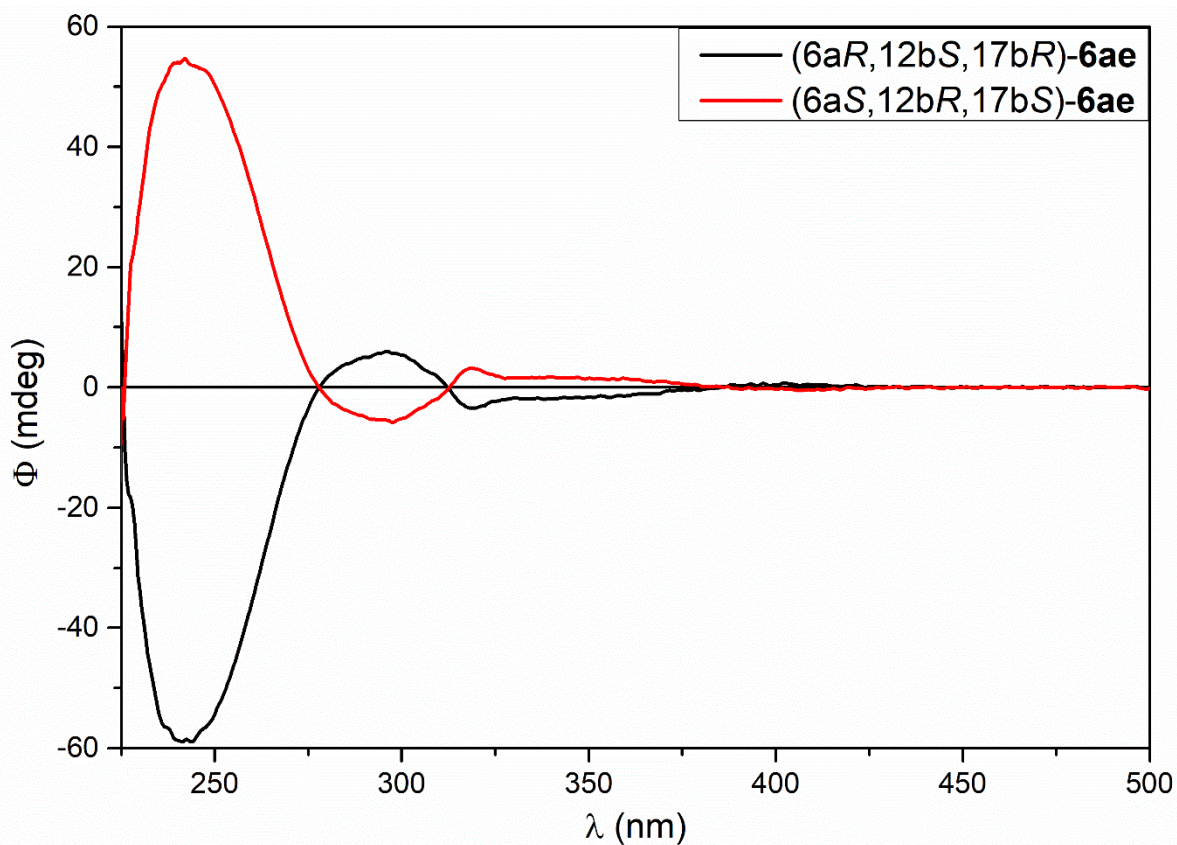


Figure S201. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*S*)-**6ae** (red) and (6a*R*,12b*S*,17b*R*)-**6ae** (black) in hexane/dichloromethane/methanol 30:63:7.

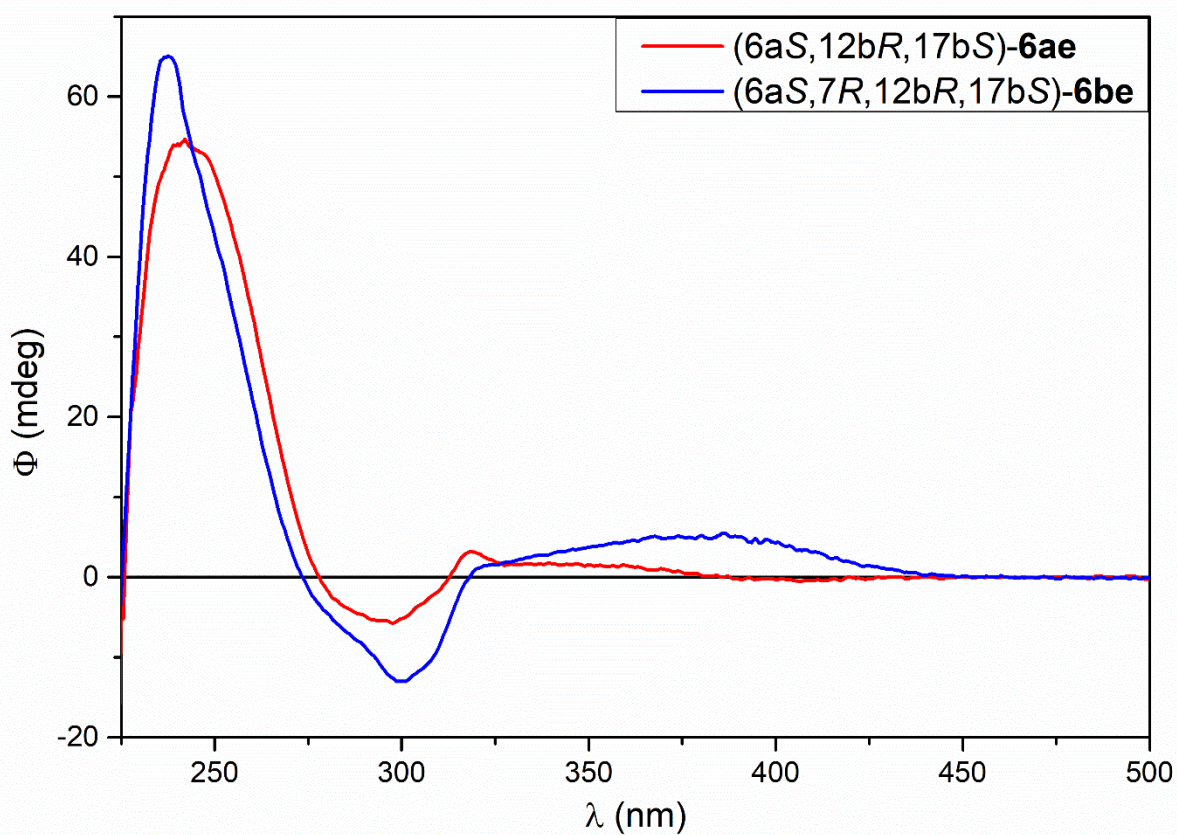


Figure S202. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*S*)-**6ae** (red) in hexane/dichloromethane/methanol 30:63:7 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*S*)-**6be** (blue) in MeCN.

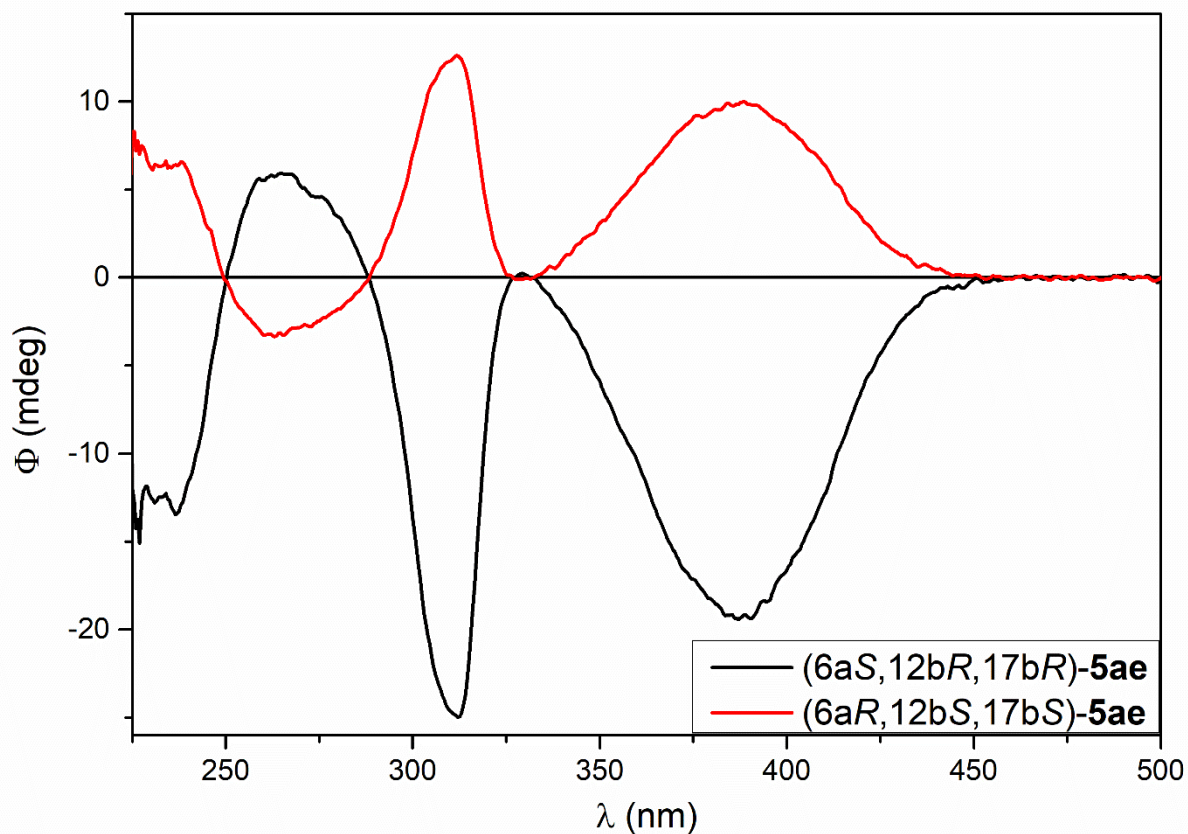


Figure S203. On-line HPLC-ECD spectra of (6a*S*,12b*R*,17b*R*)-**5ae** (black) and (6a*R*,12b*S*,17b*S*)-**5ae** (red) in hexane/dichloromethane/methanol 30:63:7.

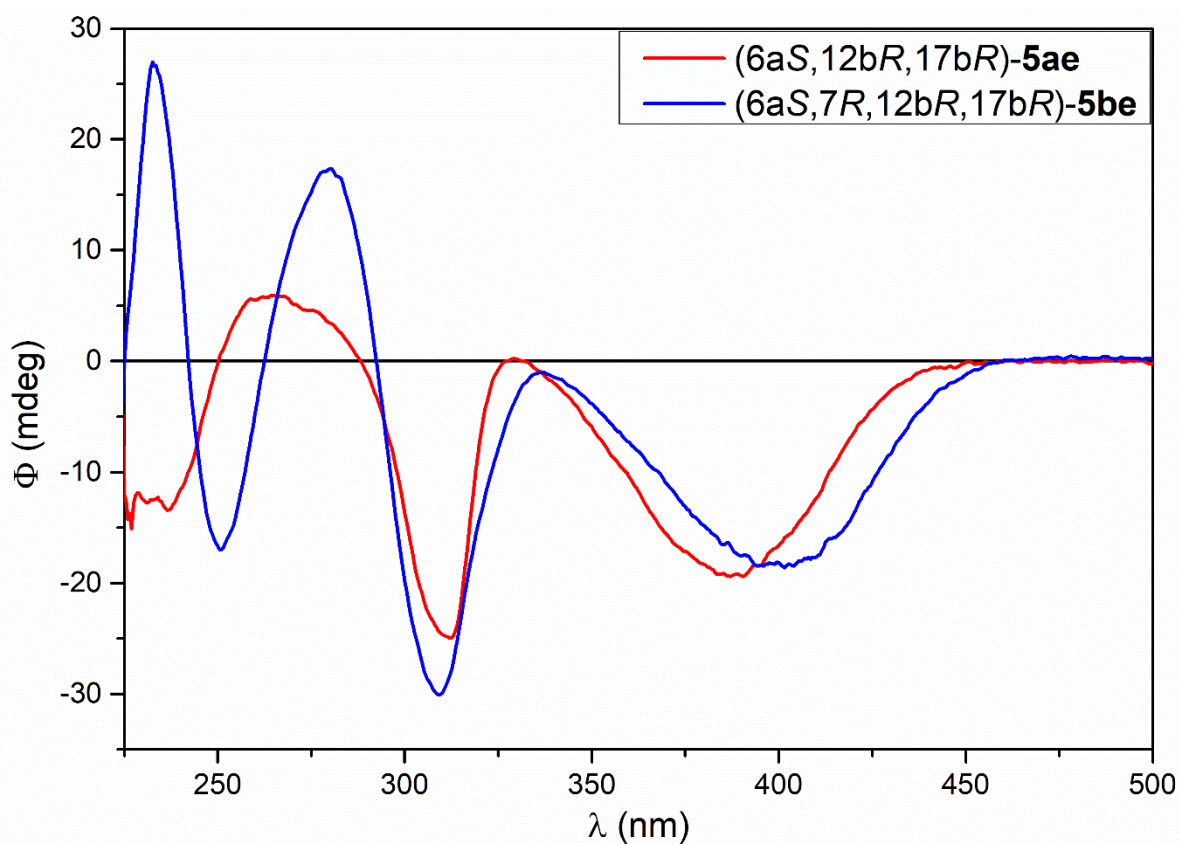


Figure S204. On-line HPLC-ECD spectrum of (6a*S*,12b*R*,17b*R*)-**5ae** (red) in hexane/dichloromethane/methanol 30:63:7 and ECD spectrum of (6a*S*,7*R*,12b*R*,17b*R*)-**5be** (blue) in MeCN.

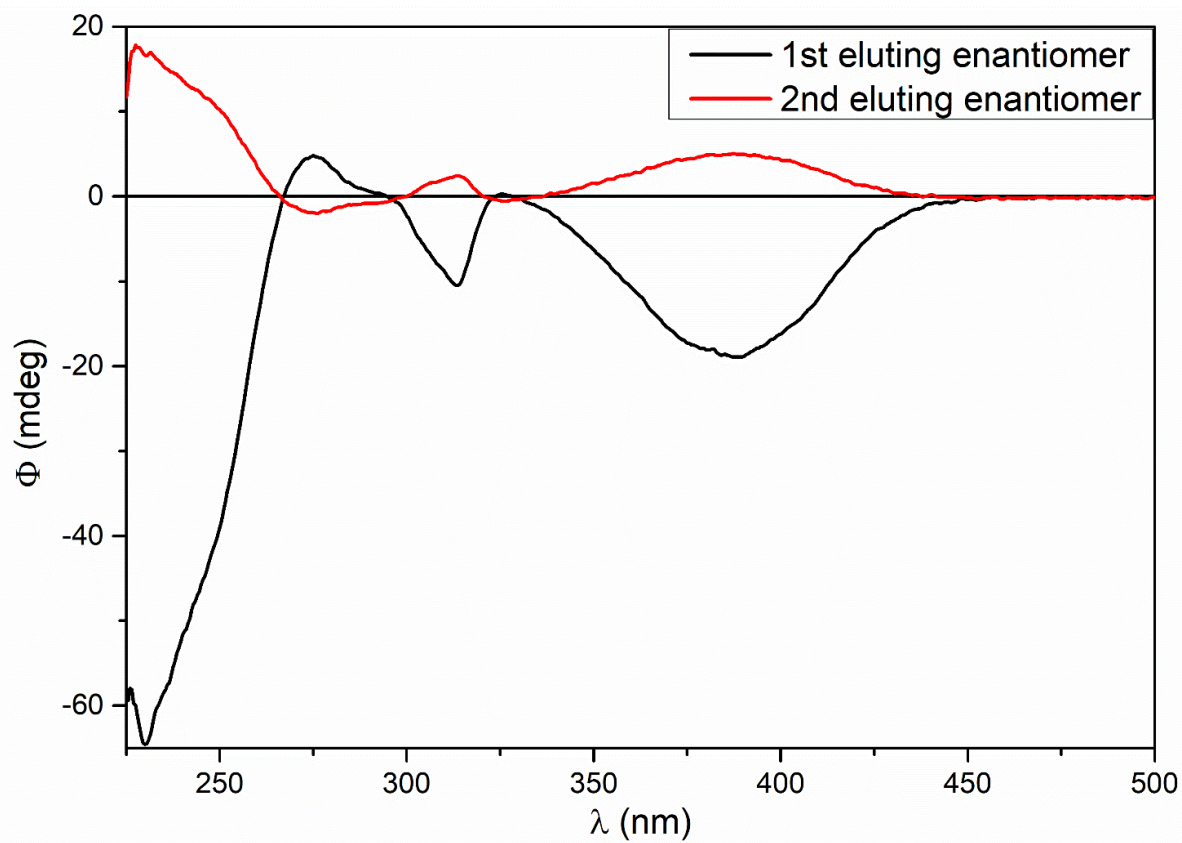


Figure S205. On-line HPLC-ECD spectra of first (black) and second (red) eluting enantiomer of *rac*-(6a*S**,12b*R**,17b*R**)-7ae in hexane/dichloromethane/methanol 30:63:7.

4. *In vitro* antiproliferative activity of the products of the domino reactions against A2780 and WM35 human cancer cell lines

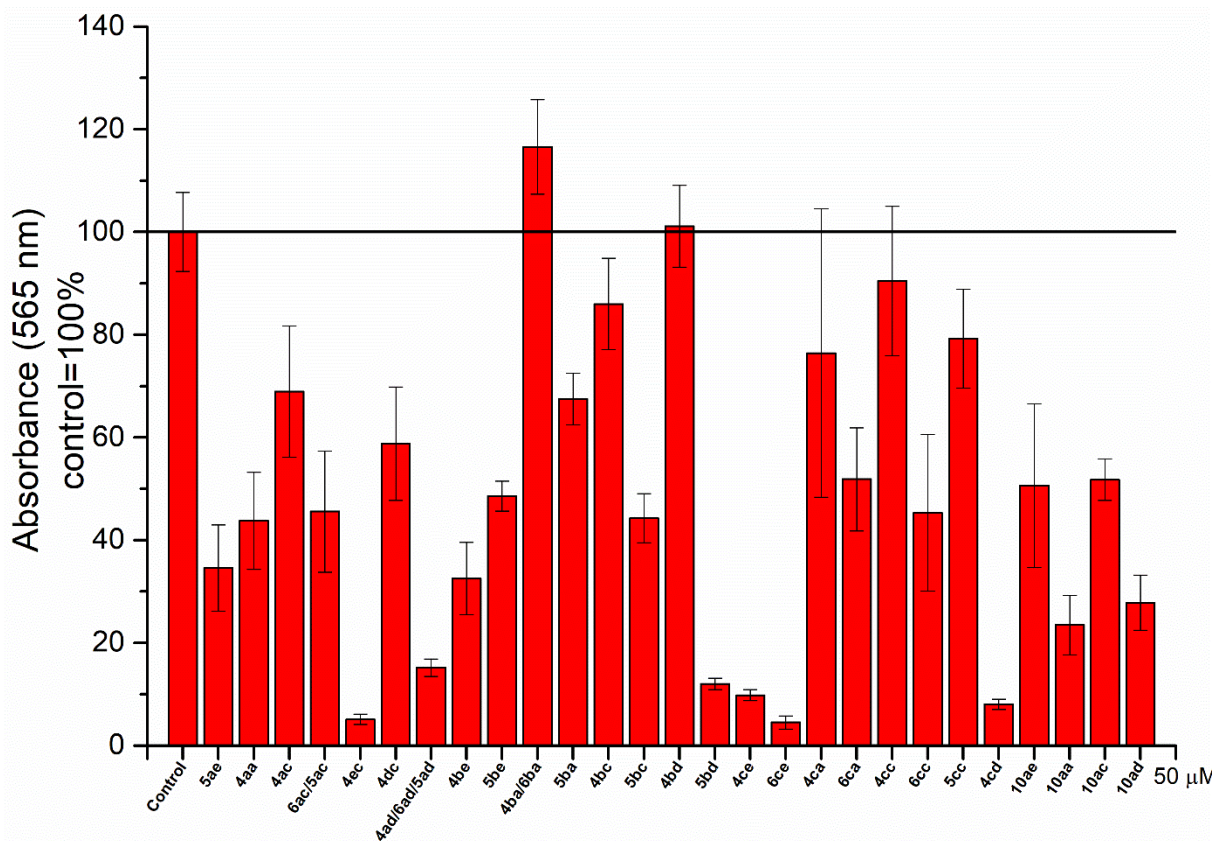


Figure S206. Effect of **4aa-10ad** (50 μ M) on the viable cell number of A2780 ovarian carcinoma cell line.

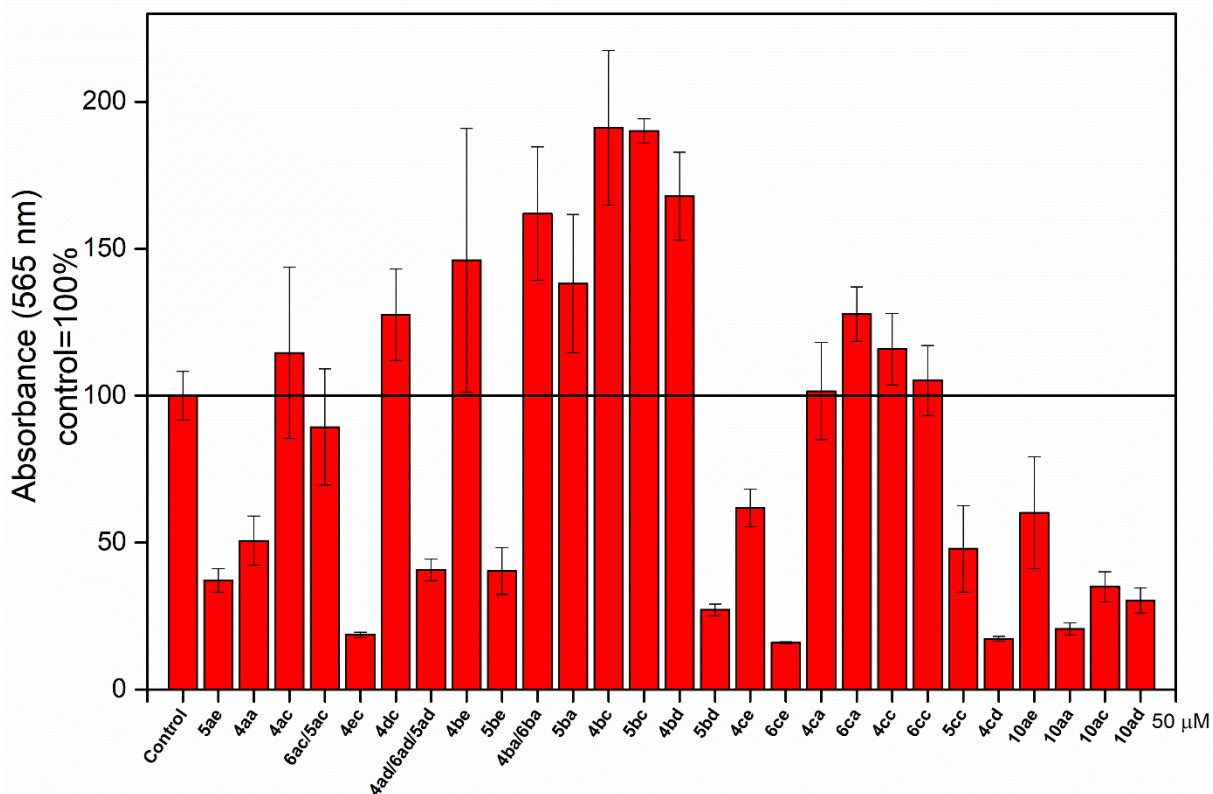


Figure S207. Effect of **4aa-10ad** (50 μ M) on the viable cell number of WM35 melanoma cell line.

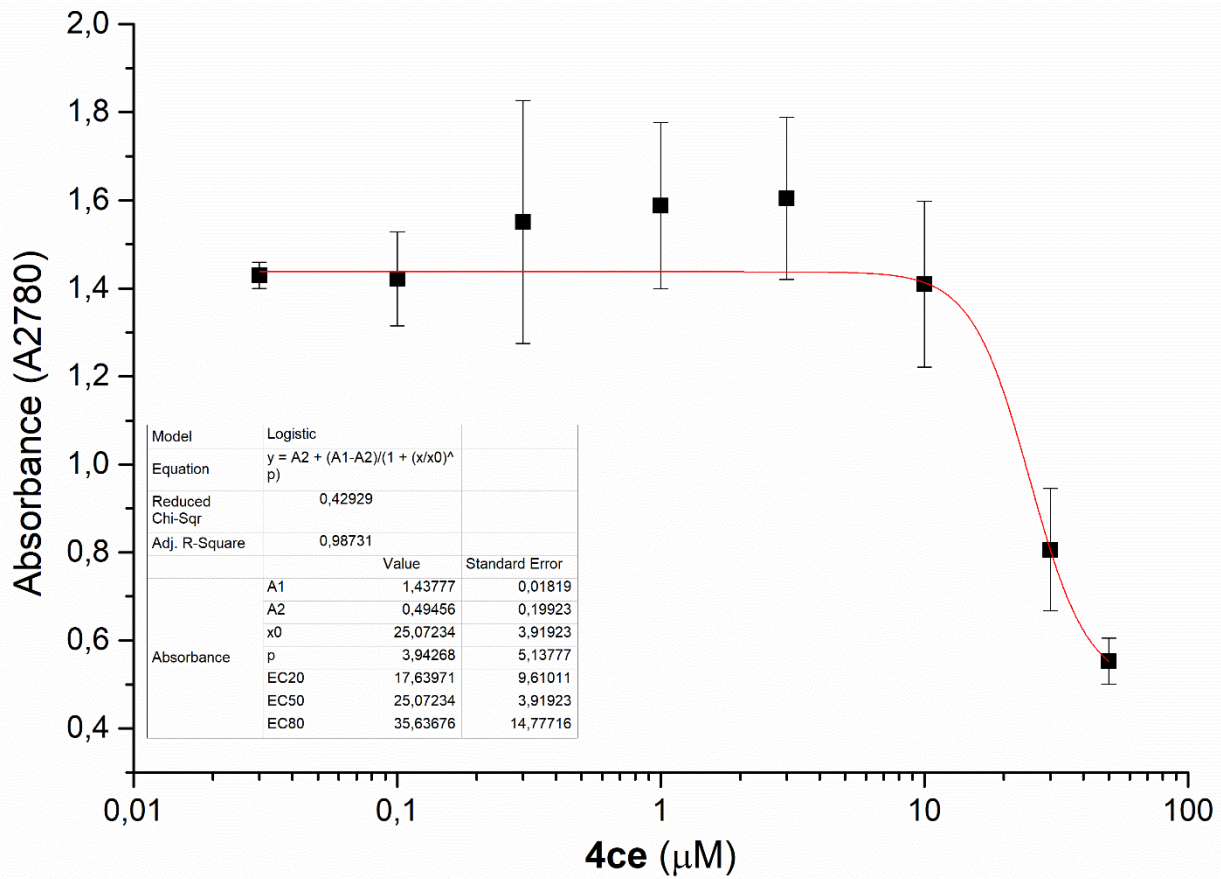


Figure S208. Concentration-dependent effect of *rac*-(6aS*,12bR*,17bR*)-4ce on the viability of A2780 cells.

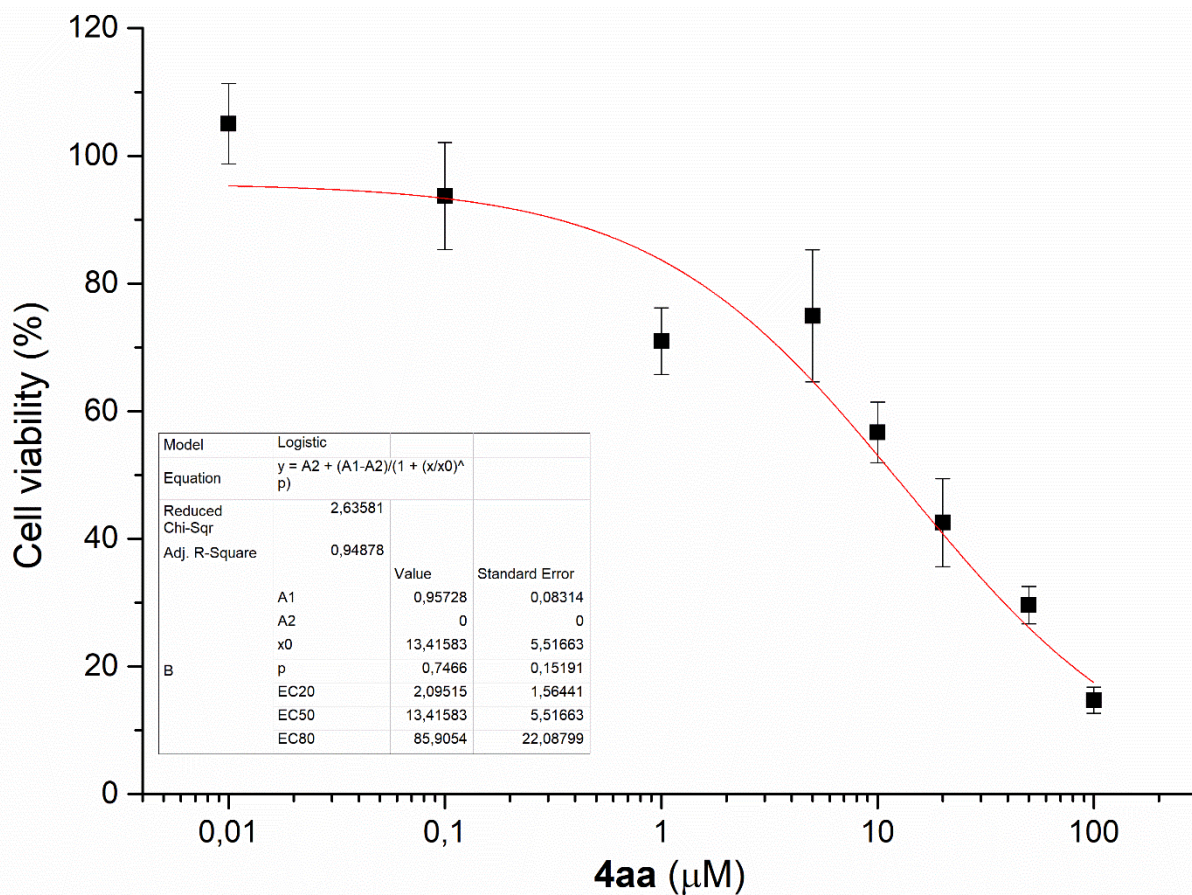


Figure S209. Concentration-dependent effect of *rac*-(6aS*,12bR*,19bS*)-4aa on the viability of CaCo-2 cells.

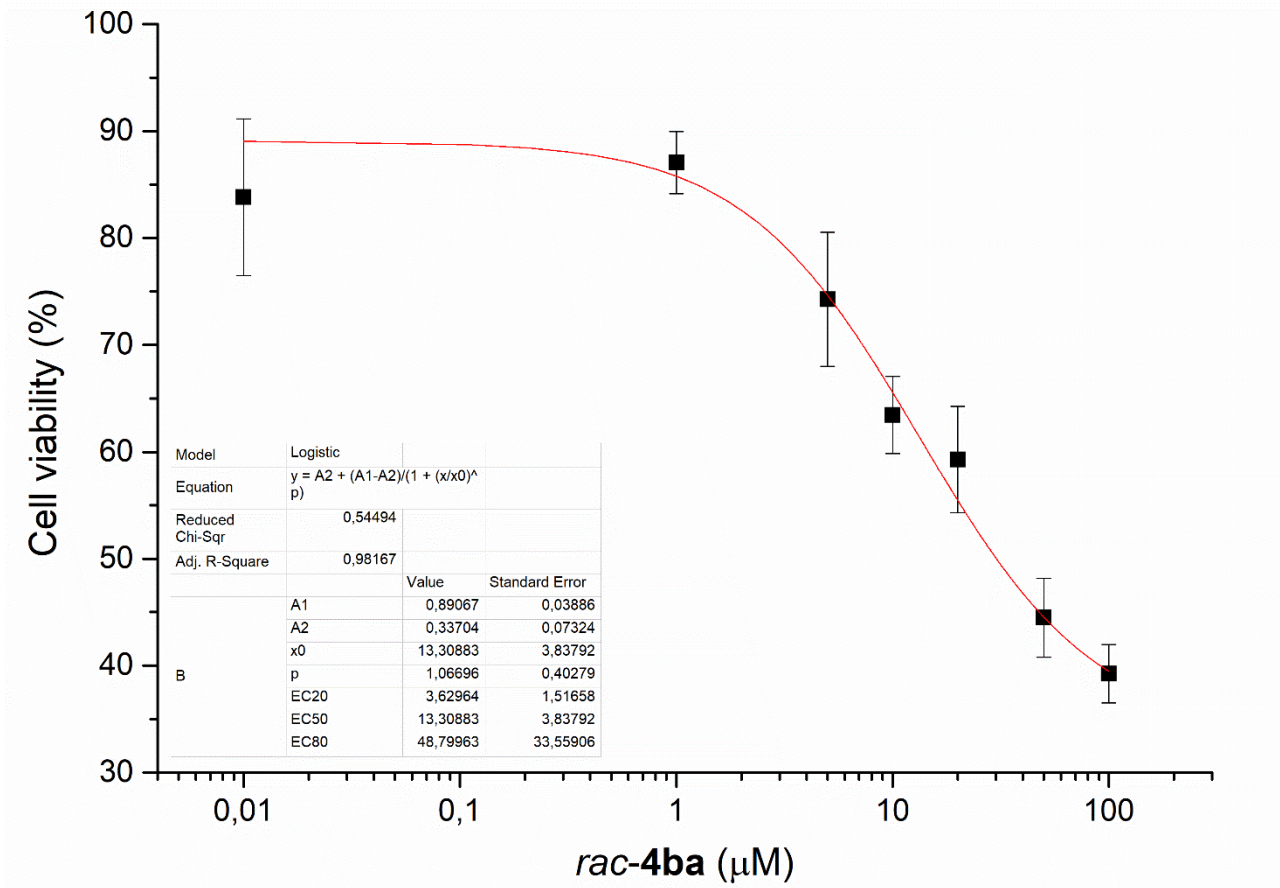


Figure S210. Concentration-dependent effect of *rac*-(6a*S**,7*R**,12b*R**,19b*S**)-4ba on the viability of CaCo-2 cells.

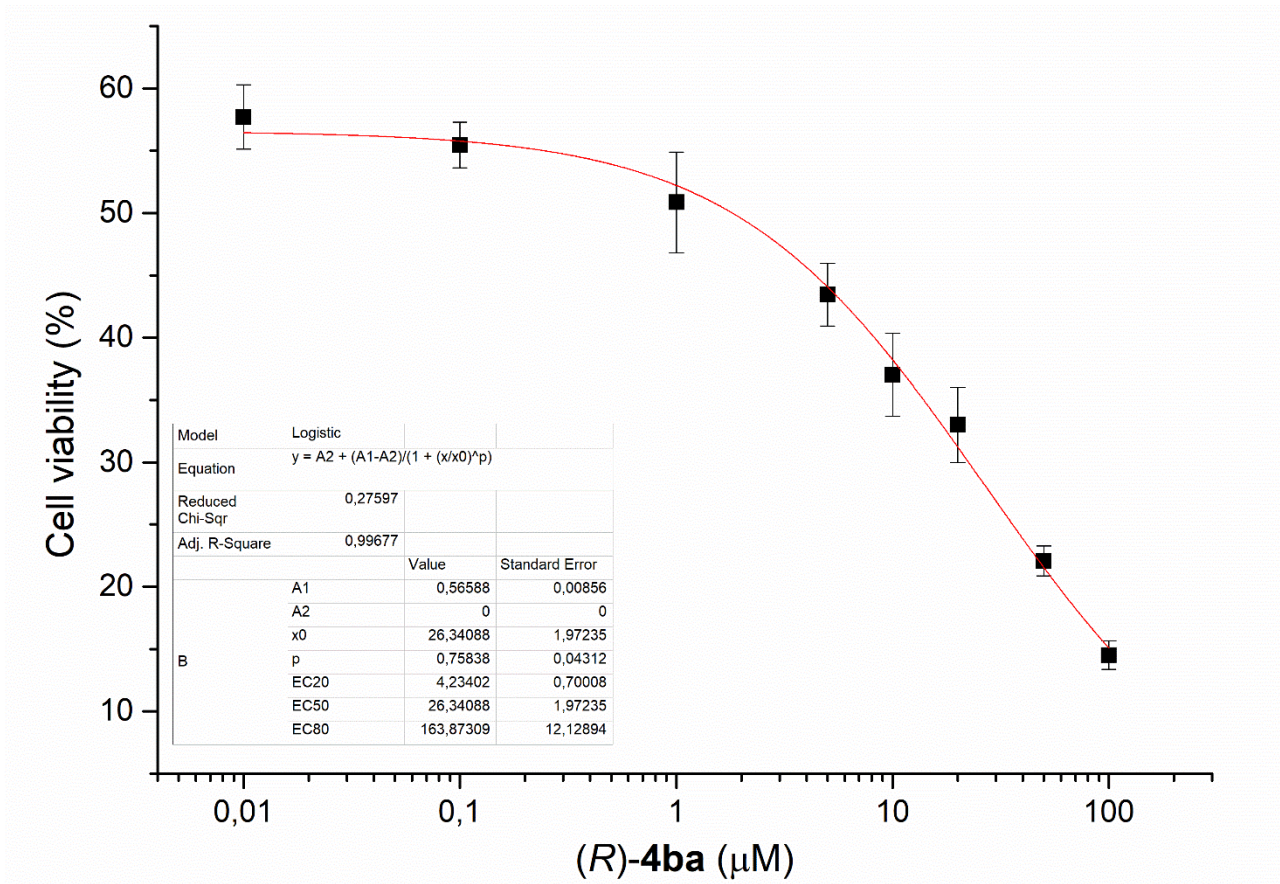


Figure S211. Concentration-dependent effect of (6a*S*,7*R*,12b*R*,19b*S*)-4ba on the viability of CaCo-2 cells.

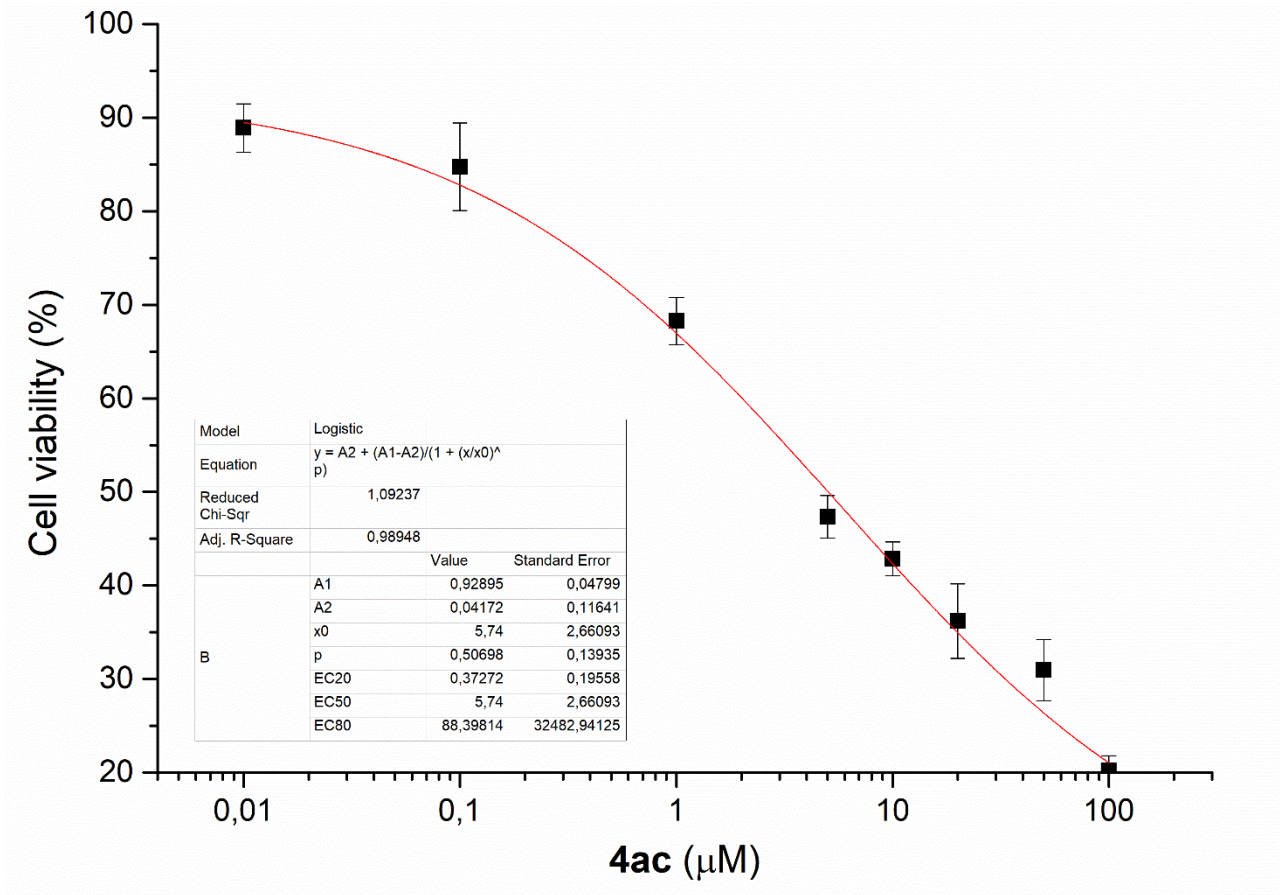


Figure S212. Concentration-dependent effect of *rac*-(6a*S**,12b*R**,19b*S**)-4ac on the viability of CaCo-2 cells.

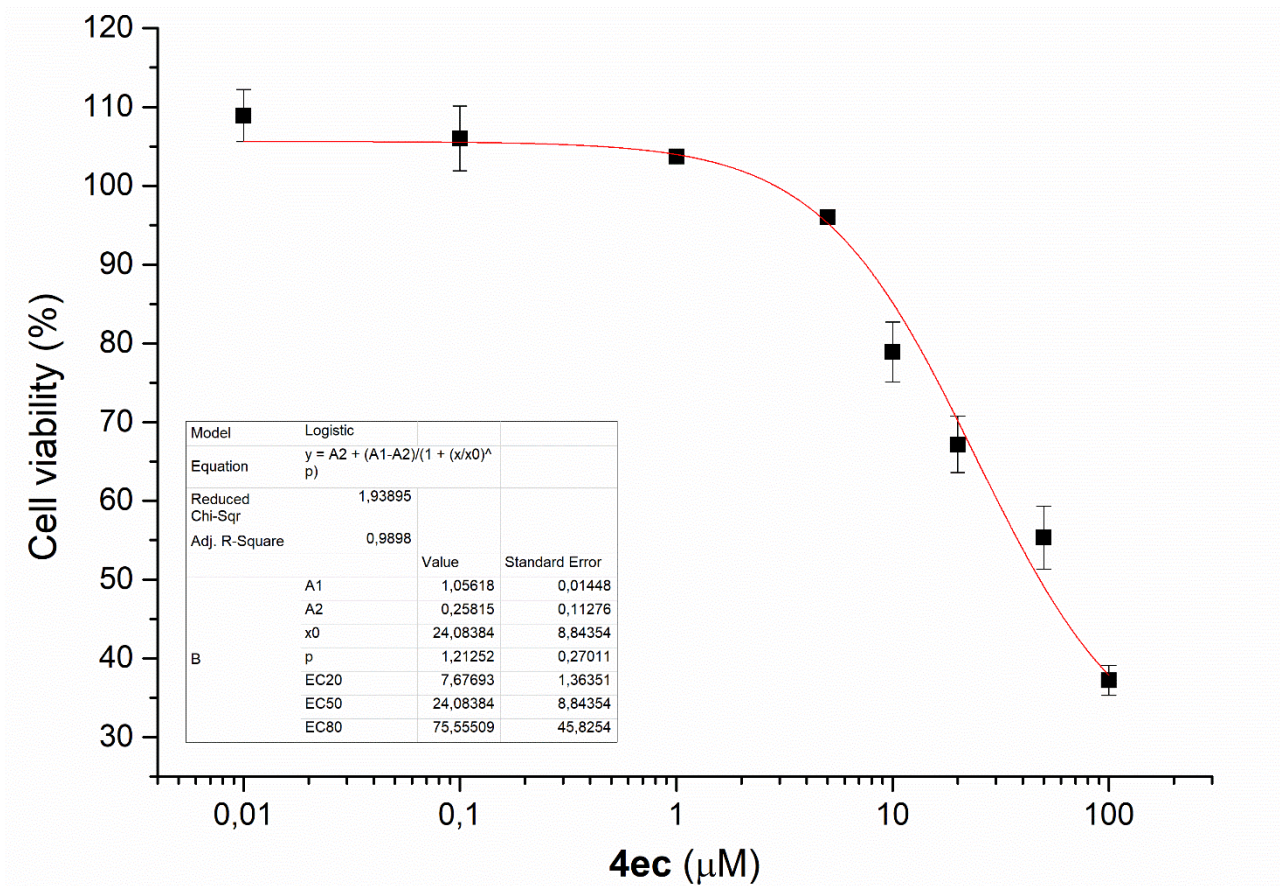


Figure S213. Concentration-dependent effect of *rac*-(6a*S**,12b*R**,19b*S**)-4ec on the viability of CaCo-2 cells.

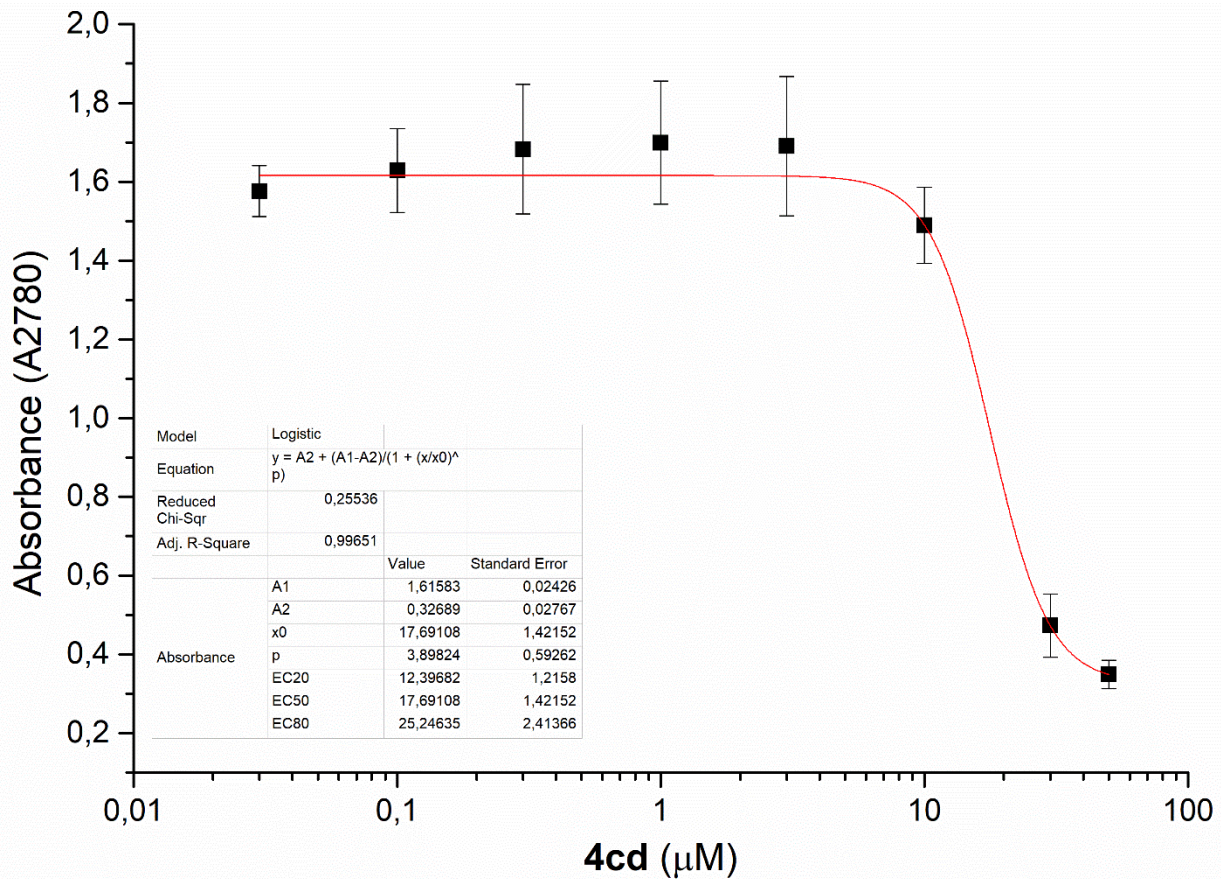


Figure S214. Concentration-dependent effect of *rac*-(6aS*,12bR*,19bR*)-4cd on the viability of A2780 cells.

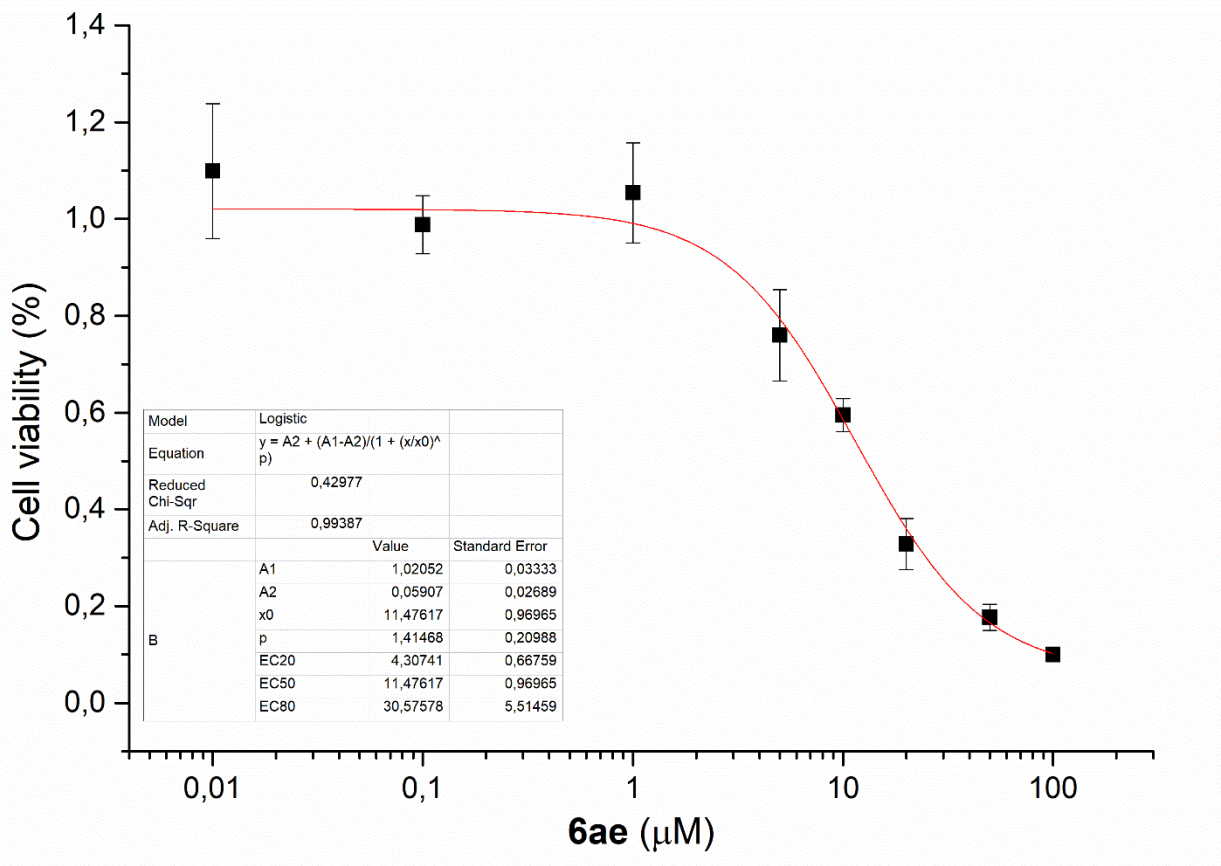


Figure S215. Concentration-dependent effect of *rac*-(6aS*,12bR*,17bS*)-6ae on the viability of CaCo-2 cells.

5. X-Ray diffraction data

Table S1. Experimental details of single crystal X-ray diffraction study on *rac*-(6a*S**,12b*R**,19b*R**)-4cc.

Crystal data	
Chemical formula	C ₃₀ H ₂₆ O ₉
M_r	530.51
Crystal system, space group	Monoclinic, <i>Pn</i>
Temperature (K)	295
a, b, c (Å)	12.3718 (6), 10.9412 (5), 18.5382 (8)
β (°)	92.390 (2)
V (Å ³)	2507.2 (2)
Z	4
Radiation type	Mo $K\alpha$
μ (mm ⁻¹)	0.10
Crystal size (mm)	0.35 × 0.25 × 0.17
Data collection	
Diffractometer	Bruker D8 VENTURE
Absorption correction	Multi-scan SADABS2016/2 - Bruker AXS area detector scaling and absorption correction
T_{\min}, T_{\max}	0.89, 0.98
No. of measured, independent and observed [$I > 2\sigma(I)$] reflections	34424, 9394, 6156
R_{int}	0.053
$(\sin \theta/\lambda)_{\text{max}}$ (Å ⁻¹)	0.610
Refinement	
$R[F^2 > 2\sigma(F^2)], wR(F^2), S$	0.074, 0.216, 1.56
No. of reflections	9394
No. of parameters	712
No. of restraints	687
H-atom treatment	H-atom parameters constrained
$\Delta_{\text{max}}, \Delta_{\text{min}}$ (e Å ⁻³)	0.66, -0.51
Absolute structure	Refined as an inversion twin.
Absolute structure parameter	1 (4)

Table S2. Geometric parameters (Å, °) for *rac*-(6a*S**,12b*R**,19b*R**)-4cc.

C1—C19C	1.39 (2)	C52—H52	0.9300
C1—C2	1.39 (2)	C53—C54	1.33 (3)
C1—H1	0.9300	C53—H53	0.9300
C2—C3	1.36 (3)	C54—C54A	1.40 (2)
C2—H2	0.9300	C54—H54	0.9300
C3—C4	1.38 (3)	C54A—O55	1.366 (19)
C3—H3	0.9300	C54A—C69C	1.37 (2)
C4—C4A	1.38 (2)	C56—O55	1.420 (17)
C4—H4	0.9300	C56—C56A	1.52 (2)
C4A—O5	1.368 (19)	C56—H56A	0.9700
C4A—C19C	1.38 (2)	C56—H56B	0.9700
C6—O5	1.422 (17)	C57—O58	1.453 (17)
C6—C6A	1.52 (2)	C57—C56A	1.52 (2)
C6—H6A	0.9700	C57—H57A	0.9700
C6—H6B	0.9700	C57—H57B	0.9700
C7—O8	1.400 (17)	C56A—C62B	1.53 (2)
C7—C6A	1.530 (19)	C56A—C69B	1.53 (2)
C7—H7A	0.9700	C59—C60	1.37 (2)
C7—H7B	0.9700	C59—C58A	1.402 (19)
C6A—C12B	1.50 (2)	C59—H59	0.9300
C6A—C19B	1.53 (2)	C58A—C62A	1.368 (18)
C9—C8A	1.354 (19)	C58A—O58	1.387 (17)
C9—C10	1.38 (2)	C60—C61	1.38 (2)
C9—H9	0.9300	C60—H60	0.9300
C8A—O8	1.372 (17)	C61—O62	1.391 (19)
C8A—C12A	1.414 (18)	C61—C62	1.39 (2)
C10—C11	1.40 (2)	C62—C62A	1.39 (2)
C10—H10	0.9300	C62—H62	0.9300
C11—C12	1.353 (18)	C62A—C62B	1.49 (2)
C11—O20	1.368 (18)	C62B—O63	1.467 (16)
C12—C12A	1.399 (19)	C62B—H62B	0.9800
C12—H12	0.9300	C64—C65	1.38 (2)
C12A—C12B	1.491 (19)	C64—C63B	1.44 (2)
C12B—O13	1.459 (16)	C64—O72	1.436 (16)
C12B—H12B	0.9800	C63A—O63	1.350 (17)
C14—O22	1.290 (18)	C63A—C69A	1.37 (2)
C14—C15	1.38 (2)	C63A—C63B	1.41 (2)
C14—C13B	1.41 (2)	C63B—C67A	1.38 (2)
C13A—O13	1.336 (17)	C65—O74	1.374 (18)

C13A—C19A	1.34 (2)	C65—C66	1.42 (2)
C13A—C13B	1.49 (2)	C66—C67	1.34 (2)
C13B—C17A	1.39 (2)	C66—O76	1.363 (19)
C15—C16	1.38 (2)	C67—C67A	1.39 (2)
C15—O24	1.42 (2)	C67—H67	0.9300
C16—O26	1.371 (18)	C67A—O68	1.352 (17)
C16—C17	1.39 (2)	C69—O78	1.210 (18)
C17—C17A	1.37 (2)	C69—O68	1.397 (18)
C17—H17	0.9300	C69—C69A	1.45 (2)
C17A—O18	1.394 (17)	C69A—C69B	1.50 (2)
C19—O28	1.212 (18)	C69B—C69C	1.54 (2)
C19—O18	1.376 (18)	C69B—H69B	0.9800
C19—C19A	1.42 (2)	C71—O62	1.432 (19)
C19A—C19B	1.52 (2)	C71—H71A	0.9600
C19B—C19C	1.54 (2)	C71—H71B	0.9600
C19B—H19B	0.9800	C71—H71C	0.9600
C23—O22	1.08 (2)	C73—O72	1.401 (15)
C23—H23A	0.9600	C73—H73A	0.9600
C23—H23B	0.9600	C73—H73B	0.9600
C23—H23C	0.9600	C73—H73C	0.9600
C25—O24	1.35 (2)	C75—O74	1.42 (2)
C25—H25A	0.9600	C75—H75A	0.9600
C25—H25B	0.9600	C75—H75B	0.9600
C25—H25C	0.9600	C75—H75C	0.9600
C27—O26	1.38 (2)	C77—O76	1.46 (2)
C27—H27A	0.9600	C77—H77A	0.9600
C27—H27B	0.9600	C77—H77B	0.9600
C27—H27C	0.9600	C77—H77C	0.9600
C51—C52	1.36 (2)	C121—O20	1.405 (19)
C51—C69C	1.42 (2)	C121—H12A	0.9600
C51—H51	0.9300	C121—H12C	0.9600
C52—C53	1.40 (3)	C121—H12D	0.9600
C19C—C1—C2	120.5 (18)	C69C—C54A—C54	122.5 (16)
C19C—C1—H1	119.8000	O55—C56—C56A	112.7 (12)
C2—C1—H1	119.8000	O55—C56—H56A	109.0000
C3—C2—C1	121.3 (17)	C56A—C56—H56A	109.0000
C3—C2—H2	119.3000	O55—C56—H56B	109.0000
C1—C2—H2	119.3000	C56A—C56—H56B	109.0000
C2—C3—C4	118.4 (17)	H56A—C56—H56B	107.8000

C2—C3—H3	120.8000	O58—C57—C56A	111.1 (12)
C4—C3—H3	120.8000	O58—C57—H57A	109.4000
C4A—C4—C3	120.7 (18)	C56A—C57—H57A	109.4000
C4A—C4—H4	119.6000	O58—C57—H57B	109.4000
C3—C4—H4	119.6000	C56A—C57—H57B	109.4000
O5—C4A—C4	114.6 (16)	H57A—C57—H57B	108.0000
O5—C4A—C19C	124.2 (13)	C57—C56A—C56	107.2 (11)
C4—C4A—C19C	121.2 (16)	C57—C56A—C62B	109.0 (12)
O5—C6—C6A	113.7 (12)	C56—C56A—C62B	109.8 (12)
O5—C6—H6A	108.8000	C57—C56A—C69B	110.4 (12)
C6A—C6—H6A	108.8000	C56—C56A—C69B	110.0 (12)
O5—C6—H6B	108.8000	C62B—C56A—C69B	110.3 (11)
C6A—C6—H6B	108.8000	C60—C59—C58A	118.4 (12)
H6A—C6—H6B	107.7000	C60—C59—H59	120.8000
O8—C7—C6A	112.6 (12)	C58A—C59—H59	120.8000
O8—C7—H7A	109.1000	C62A—C58A—O58	123.7 (12)
C6A—C7—H7A	109.1000	C62A—C58A—C59	120.8 (13)
O8—C7—H7B	109.1000	O58—C58A—C59	115.4 (11)
C6A—C7—H7B	109.1000	C59—C60—C61	121.6 (13)
H7A—C7—H7B	107.8000	C59—C60—H60	119.2000
C12B—C6A—C6	112.3 (12)	C61—C60—H60	119.2000
C12B—C6A—C7	106.5 (12)	C60—C61—O62	115.3 (13)
C6—C6A—C7	108.6 (12)	C60—C61—C62	119.4 (14)
C12B—C6A—C19B	110.1 (11)	O62—C61—C62	125.3 (13)
C6—C6A—C19B	106.7 (12)	C62A—C62—C61	119.5 (13)
C7—C6A—C19B	112.8 (12)	C62A—C62—H62	120.3000
C8A—C9—C10	121.5 (13)	C61—C62—H62	120.3000
C8A—C9—H9	119.3000	C58A—C62A—C62	120.2 (13)
C10—C9—H9	119.3000	C58A—C62A—C62B	121.1 (13)
C9—C8A—O8	118.3 (12)	C62—C62A—C62B	118.7 (12)
C9—C8A—C12A	119.4 (13)	O63—C62B—C62A	106.1 (11)
O8—C8A—C12A	122.3 (12)	O63—C62B—C56A	111.8 (11)
C9—C10—C11	119.8 (13)	C62A—C62B—C56A	110.6 (11)
C9—C10—H10	120.1000	O63—C62B—H62B	109.4000
C11—C10—H10	120.1000	C62A—C62B—H62B	109.4000
C12—C11—O20	124.7 (12)	C56A—C62B—H62B	109.4000
C12—C11—C10	119.2 (13)	C65—C64—C63B	120.7 (13)
O20—C11—C10	116.1 (12)	C65—C64—O72	119.2 (12)
C11—C12—C12A	121.5 (12)	C63B—C64—O72	119.9 (12)
C11—C12—H12	119.3000	O63—C63A—C69A	120.8 (13)
C12A—C12—H12	119.3000	O63—C63A—C63B	116.8 (12)

C12—C12A—C8A	118.5 (12)	C69A—C63A—C63B	122.4 (13)
C12—C12A—C12B	122.4 (11)	C67A—C63B—C63A	117.0 (13)
C8A—C12A—C12B	119.1 (12)	C67A—C63B—C64	116.0 (13)
O13—C12B—C12A	104.7 (11)	C63A—C63B—C64	126.8 (13)
O13—C12B—C6A	114.1 (11)	O74—C65—C64	118.0 (14)
C12A—C12B—C6A	113.0 (11)	O74—C65—C66	121.8 (13)
O13—C12B—H12B	108.3000	C64—C65—C66	120.1 (14)
C12A—C12B—H12B	108.3000	C67—C66—O76	127.0 (15)
C6A—C12B—H12B	108.3000	C67—C66—C65	119.5 (14)
O22—C14—C15	119.3 (14)	O76—C66—C65	113.4 (15)
O22—C14—C13B	120.6 (14)	C66—C67—C67A	120.5 (15)
C15—C14—C13B	120.0 (13)	C66—C67—H67	119.7000
O13—C13A—C19A	125.4 (13)	C67A—C67—H67	119.7000
O13—C13A—C13B	114.5 (12)	O68—C67A—C63B	122.0 (13)
C19A—C13A—C13B	120.0 (13)	O68—C67A—C67	115.0 (13)
C17A—C13B—C14	117.2 (14)	C63B—C67A—C67	123.0 (14)
C17A—C13B—C13A	116.9 (13)	O78—C69—O68	117.8 (14)
C14—C13B—C13A	125.9 (12)	O78—C69—C69A	125.7 (15)
C14—C15—C16	120.6 (15)	O68—C69—C69A	116.5 (14)
C14—C15—O24	117.8 (15)	C63A—C69A—C69	119.3 (14)
C16—C15—O24	120.0 (14)	C63A—C69A—C69B	123.1 (13)
O26—C16—C15	117.8 (15)	C69—C69A—C69B	117.4 (13)
O26—C16—C17	121.8 (15)	C69A—C69B—C56A	110.1 (12)
C15—C16—C17	120.4 (14)	C69A—C69B—C69C	113.5 (12)
C17A—C17—C16	117.9 (14)	C56A—C69B—C69C	109.1 (12)
C17A—C17—H17	121.0000	C69A—C69B—H69B	108.0000
C16—C17—H17	121.0000	C56A—C69B—H69B	108.0000
C17—C17A—C13B	123.8 (14)	C69C—C69B—H69B	108.0000
C17—C17A—O18	115.1 (12)	C54A—C69C—C51	116.5 (13)
C13B—C17A—O18	121.1 (13)	C54A—C69C—C69B	122.2 (13)
O28—C19—O18	114.3 (14)	C51—C69C—C69B	121.0 (14)
O28—C19—C19A	126.9 (15)	O62—C71—H71A	109.5000
O18—C19—C19A	118.8 (14)	O62—C71—H71B	109.5000
C13A—C19A—C19	121.5 (14)	H71A—C71—H71B	109.5000
C13A—C19A—C19B	120.0 (13)	O62—C71—H71C	109.5000
C19—C19A—C19B	118.5 (13)	H71A—C71—H71C	109.5000
C19A—C19B—C6A	109.6 (12)	H71B—C71—H71C	109.5000
C19A—C19B—C19C	112.7 (11)	O72—C73—H73A	109.5000
C6A—C19B—C19C	110.2 (12)	O72—C73—H73B	109.5000
C19A—C19B—H19B	108.1000	H73A—C73—H73B	109.5000
C6A—C19B—H19B	108.1000	O72—C73—H73C	109.5000

C19C—C19B—H19B	108.1000	H73A—C73—H73C	109.5000
C4A—C19C—C1	117.8 (14)	H73B—C73—H73C	109.5000
C4A—C19C—C19B	120.3 (13)	O74—C75—H75A	109.5000
C1—C19C—C19B	121.9 (14)	O74—C75—H75B	109.5000
O22—C23—H23A	109.5000	H75A—C75—H75B	109.5000
O22—C23—H23B	109.5000	O74—C75—H75C	109.5000
H23A—C23—H23B	109.5000	H75A—C75—H75C	109.5000
O22—C23—H23C	109.5000	H75B—C75—H75C	109.5000
H23A—C23—H23C	109.5000	O76—C77—H77A	109.5000
H23B—C23—H23C	109.5000	O76—C77—H77B	109.5000
O24—C25—H25A	109.5000	H77A—C77—H77B	109.5000
O24—C25—H25B	109.5000	O76—C77—H77C	109.5000
H25A—C25—H25B	109.5000	H77A—C77—H77C	109.5000
O24—C25—H25C	109.5000	H77B—C77—H77C	109.5000
H25A—C25—H25C	109.5000	O20—C121—H12A	109.5000
H25B—C25—H25C	109.5000	O20—C121—H12C	109.5000
O26—C27—H27A	109.5000	H12A—C121—H12C	109.5000
O26—C27—H27B	109.5000	O20—C121—H12D	109.5000
H27A—C27—H27B	109.5000	H12A—C121—H12D	109.5000
O26—C27—H27C	109.5000	H12C—C121—H12D	109.5000
H27A—C27—H27C	109.5000	C4A—O5—C6	114.4 (12)
H27B—C27—H27C	109.5000	C8A—O8—C7	116.5 (10)
C52—C51—C69C	121.7 (18)	C13A—O13—C12B	118.7 (11)
C52—C51—H51	119.1000	C19—O18—C17A	121.6 (11)
C69C—C51—H51	119.1000	C11—O20—C121	118.6 (12)
C51—C52—C53	118.7 (18)	C23—O22—C14	146 (2)
C51—C52—H52	120.7000	C25—O24—C15	108.0 (16)
C53—C52—H52	120.7000	C16—O26—C27	120.3 (14)
C54—C53—C52	121.9 (17)	C54A—O55—C56	117.8 (13)
C54—C53—H53	119.1000	C58A—O58—C57	115.9 (10)
C52—C53—H53	119.1000	C61—O62—C71	115.8 (12)
C53—C54—C54A	118.6 (19)	C63A—O63—C62B	121.7 (11)
C53—C54—H54	120.7000	C67A—O68—C69	122.5 (12)
C54A—C54—H54	120.7000	C73—O72—C64	114.1 (10)
O55—C54A—C69C	122.7 (13)	C65—O74—C75	119.7 (13)
O55—C54A—C54	114.8 (16)	C66—O76—C77	114.1 (14)
C19C—C1—C2—C3	1 (3)	C61—C62—C62A—C58A	1 (2)
C1—C2—C3—C4	1 (3)	C61—C62—C62A—C62B	179.3 (11)
C2—C3—C4—C4A	-2 (3)	C58A—C62A—C62B—O63	101.2 (14)

C3—C4—C4A—O5	-176.1 (16)	C62—C62A—C62B—O63	-77.1 (15)
C3—C4—C4A—C19C	1 (3)	C58A—C62A—C62B—C56A	-20.2 (17)
O5—C6—C6A—C12B	-56.9 (17)	C62—C62A—C62B—C56A	161.4 (13)
O5—C6—C6A—C7	-174.3 (13)	C57—C56A—C62B—O63	-69.8 (15)
O5—C6—C6A—C19B	63.8 (15)	C56—C56A—C62B—O63	173.0 (10)
O8—C7—C6A—C12B	-62.8 (15)	C69B—C56A—C62B—O63	51.7 (15)
O8—C7—C6A—C6	58.3 (16)	C57—C56A—C62B—C62A	48.2 (15)
O8—C7—C6A—C19B	176.4 (12)	C56—C56A—C62B—C62A	-69.0 (14)
C10—C9—C8A—O8	178.2 (13)	C69B—C56A—C62B—C62A	169.6 (11)
C10—C9—C8A—C12A	0 (2)	O63—C63A—C63B—C67A	-176.9 (13)
C8A—C9—C10—C11	1 (2)	C69A—C63A—C63B—C67A	4 (2)
C9—C10—C11—C12	-1.2 (19)	O63—C63A—C63B—C64	6 (2)
C9—C10—C11—O20	179.1 (13)	C69A—C63A—C63B—C64	-172.2 (14)
O20—C11—C12—C12A	-179.9 (13)	C65—C64—C63B—C67A	4.8 (19)
C10—C11—C12—C12A	0.5 (19)	O72—C64—C63B—C67A	-169.9 (11)
C11—C12—C12A—C8A	0 (2)	C65—C64—C63B—C63A	-178.6 (13)
C11—C12—C12A—C12B	-178.9 (12)	O72—C64—C63B—C63A	7 (2)
C9—C8A—C12A—C12	-1 (2)	C63B—C64—C65—O74	-177.8 (12)
O8—C8A—C12A—C12	-178.9 (13)	O72—C64—C65—O74	-3.2 (18)
C9—C8A—C12A—C12B	178.7 (13)	C63B—C64—C65—C66	-2 (2)
O8—C8A—C12A—C12B	0.4 (19)	O72—C64—C65—C66	172.4 (12)
C12—C12A—C12B—O13	-75.8 (15)	O74—C65—C66—C67	173.1 (13)
C8A—C12A—C12B—O13	104.9 (13)	C64—C65—C66—C67	-2 (2)
C12—C12A—C12B—C6A	159.5 (13)	O74—C65—C66—O76	-5 (2)
C8A—C12A—C12B—C6A	-19.9 (17)	C64—C65—C66—O76	-179.9 (12)
C6—C6A—C12B—O13	169.7 (11)	O76—C66—C67—C67A	-178.6 (14)
C7—C6A—C12B—O13	-71.7 (14)	C65—C66—C67—C67A	4 (2)
C19B—C6A—C12B—O13	50.9 (15)	C63A—C63B—C67A—O68	-2 (2)
C6—C6A—C12B—C12A	-70.9 (15)	C64—C63B—C67A—O68	174.8 (12)
C7—C6A—C12B—C12A	47.8 (15)	C63A—C63B—C67A—C67	-179.9 (13)
C19B—C6A—C12B—C12A	170.3 (11)	C64—C63B—C67A—C67	-3 (2)
O22—C14—C13B—C17A	-179.9 (18)	C66—C67—C67A—O68	-179.4 (13)
C15—C14—C13B—C17A	0 (3)	C66—C67—C67A—C63B	-1 (2)
O22—C14—C13B—C13A	-1 (3)	O63—C63A—C69A—C69	175.6 (13)
C15—C14—C13B—C13A	178.6 (15)	C63B—C63A—C69A—C69	-6 (2)
O13—C13A—C13B—C17A	-177.3 (13)	O63—C63A—C69A—C69B	1 (2)
C19A—C13A—C13B—C17A	-2 (2)	C63B—C63A—C69A—C69B	179.2 (13)
O13—C13A—C13B—C14	4 (2)	O78—C69—C69A—C63A	-176.9 (15)
C19A—C13A—C13B—C14	179.2 (16)	O68—C69—C69A—C63A	5 (2)
O22—C14—C15—C16	179.1 (19)	O78—C69—C69A—C69B	-2 (2)
C13B—C14—C15—C16	0 (3)	O68—C69—C69A—C69B	-180.0 (12)

O22—C14—C15—O24	14 (3)	C63A—C69A—C69B—C56A	23.5 (18)
C13B—C14—C15—O24	-165.8 (16)	C69—C69A—C69B—C56A	-151.6 (13)
C14—C15—C16—O26	-177.7 (16)	C63A—C69A—C69B—C69C	-99.1 (16)
O24—C15—C16—O26	-13 (3)	C69—C69A—C69B—C69C	85.8 (16)
C14—C15—C16—C17	1 (3)	C57—C56A—C69B—C69A	72.5 (15)
O24—C15—C16—C17	166.6 (14)	C56—C56A—C69B—C69A	-169.4 (11)
O26—C16—C17—C17A	177.5 (14)	C62B—C56A—C69B—C69A	-48.1 (15)
C15—C16—C17—C17A	-2 (2)	C57—C56A—C69B—C69C	-162.3 (11)
C16—C17—C17A—C13B	1 (2)	C56—C56A—C69B—C69C	-44.2 (15)
C16—C17—C17A—O18	-178.9 (13)	C62B—C56A—C69B—C69C	77.1 (14)
C14—C13B—C17A—C17	0 (2)	O55—C54A—C69C—C51	178.3 (14)
C13A—C13B—C17A—C17	-179.0 (13)	C54—C54A—C69C—C51	0 (2)
C14—C13B—C17A—O18	179.9 (14)	O55—C54A—C69C—C69B	4 (2)
C13A—C13B—C17A—O18	1 (2)	C54—C54A—C69C—C69B	-175.0 (15)
O13—C13A—C19A—C19	175.8 (13)	C52—C51—C69C—C54A	2 (2)
C13B—C13A—C19A—C19	1 (2)	C52—C51—C69C—C69B	177.0 (14)
O13—C13A—C19A—C19B	-5 (2)	C69A—C69B—C69C—C54A	138.7 (14)
C13B—C13A—C19A—C19B	-179.6 (12)	C56A—C69B—C69C—C54A	15.5 (19)
O28—C19—C19A—C13A	-177.4 (16)	C69A—C69B—C69C—C51	-35.7 (19)
O18—C19—C19A—C13A	1 (2)	C56A—C69B—C69C—C51	-158.8 (13)
O28—C19—C19A—C19B	3 (3)	C4—C4A—O5—C6	-167.7 (14)
O18—C19—C19A—C19B	-178.5 (12)	C19C—C4A—O5—C6	16 (2)
C13A—C19A—C19B—C6A	28.1 (18)	C6A—C6—O5—C4A	-47.4 (18)
C19—C19A—C19B—C6A	-152.3 (13)	C9—C8A—O8—C7	167.7 (13)
C13A—C19A—C19B—C19C	-95.1 (16)	C12A—C8A—O8—C7	-14 (2)
C19—C19A—C19B—C19C	84.6 (16)	C6A—C7—O8—C8A	46.1 (18)
C12B—C6A—C19B—C19A	-49.4 (15)	C19A—C13A—O13—C12B	4 (2)
C6—C6A—C19B—C19A	-171.5 (11)	C13B—C13A—O13—C12B	179.0 (11)
C7—C6A—C19B—C19A	69.4 (15)	C12A—C12B—O13—C13A	-152.0 (12)
C12B—C6A—C19B—C19C	75.2 (14)	C6A—C12B—O13—C13A	-27.9 (16)
C6—C6A—C19B—C19C	-46.9 (15)	O28—C19—O18—C17A	176.6 (13)
C7—C6A—C19B—C19C	-166.0 (12)	C19A—C19—O18—C17A	-2 (2)
O5—C4A—C19C—C1	177.7 (14)	C17—C17A—O18—C19	-179.1 (13)
C4—C4A—C19C—C1	1 (2)	C13B—C17A—O18—C19	1 (2)
O5—C4A—C19C—C19B	-2 (2)	C12—C11—O20—C121	14 (2)
C4—C4A—C19C—C19B	-179.0 (14)	C10—C11—O20—C121	-166.2 (14)
C2—C1—C19C—C4A	-2 (2)	C15—C14—O22—C23	49 (5)
C2—C1—C19C—C19B	178.3 (14)	C13B—C14—O22—C23	-131 (4)
C19A—C19B—C19C—C4A	142.9 (14)	C14—C15—O24—C25	-119.1 (18)
C6A—C19B—C19C—C4A	20.1 (19)	C16—C15—O24—C25	75 (2)
C19A—C19B—C19C—C1	-37.3 (19)	C15—C16—O26—C27	177.0 (16)

C6A—C19B—C19C—C1	-160.0 (14)	C17—C16—O26—C27	-2 (2)
C69C—C51—C52—C53	-3 (3)	C69C—C54A—O55—C56	9 (2)
C51—C52—C53—C54	1 (3)	C54—C54A—O55—C56	-172.0 (14)
C52—C53—C54—C54A	1 (3)	C56A—C56—O55—C54A	-40.9 (18)
C53—C54—C54A—O55	-179.9 (17)	C62A—C58A—O58—C57	-13.6 (19)
C53—C54—C54A—C69C	-1 (3)	C59—C58A—O58—C57	169.0 (11)
O58—C57—C56A—C56	57.7 (16)	C56A—C57—O58—C58A	43.4 (16)
O58—C57—C56A—C62B	-61.1 (15)	C60—C61—O62—C71	-167.0 (14)
O58—C57—C56A—C69B	177.5 (11)	C62—C61—O62—C71	13 (2)
O55—C56—C56A—C57	179.2 (13)	C69A—C63A—O63—C62B	2 (2)
O55—C56—C56A—C62B	-62.5 (16)	C63B—C63A—O63—C62B	-176.5 (11)
O55—C56—C56A—C69B	59.2 (16)	C62A—C62B—O63—C63A	-149.8 (12)
C60—C59—C58A—C62A	2 (2)	C56A—C62B—O63—C63A	-29.1 (16)
C60—C59—C58A—O58	179.9 (12)	C63B—C67A—O68—C69	2 (2)
C58A—C59—C60—C61	-1 (2)	C67—C67A—O68—C69	179.5 (13)
C59—C60—C61—O62	179.1 (13)	O78—C69—O68—C67A	178.7 (14)
C59—C60—C61—C62	-1 (2)	C69A—C69—O68—C67A	-3 (2)
C60—C61—C62—C62A	1 (2)	C65—C64—O72—C73	80.6 (15)
O62—C61—C62—C62A	-179.2 (13)	C63B—C64—O72—C73	-104.7 (15)
O58—C58A—C62A—C62	-179.9 (13)	C64—C65—O74—C75	-117.2 (17)
C59—C58A—C62A—C62	-3 (2)	C66—C65—O74—C75	67 (2)
O58—C58A—C62A—C62B	2 (2)	C67—C66—O76—C77	-4 (2)
C59—C58A—C62A—C62B	179.0 (13)	C65—C66—O76—C77	173.7 (14)

Table S3. Hydrogen-bond geometry (Å, °) for *rac*-(6a*S**,12b*R**,19b*R**)-4cc.

<i>D</i> —H... <i>A</i>	<i>D</i> —H	H... <i>A</i>	<i>D</i> ... <i>A</i>	<i>D</i> —H... <i>A</i>
C6—H6 <i>B</i> ...O78 ⁱ	0.97	2.55	3.398 (18)	146
C7—H7 <i>B</i> ...O78 ⁱ	0.97	2.61	3.451 (19)	145
C9—H9...O24 ⁱⁱ	0.93	2.51	3.423 (19)	169
C23—H23 <i>A</i> ...O55	0.96	2.41	3.24 (3)	145
C56—H56 <i>B</i> ...O28 ⁱⁱⁱ	0.97	2.52	3.410 (19)	153
C57—H57 <i>B</i> ...O28 ⁱⁱⁱ	0.97	2.58	3.428 (19)	146
C59—H59...O74 ⁱⁱ	0.93	2.45	3.371 (18)	169
C71—H71 <i>A</i> ...O78 ^{iv}	0.96	2.59	3.29 (2)	130
C73—H73 <i>B</i> ...O74	0.96	2.61	3.136 (19)	115
C75—H75 <i>A</i> ...O76	0.96	2.36	2.95 (3)	119
C121—H12 <i>A</i> ...O28 ⁱⁱⁱ	0.96	2.60	3.28 (2)	128

Symmetry codes: (i) $x-1, y-1, z$; (ii) $x, y-1, z$; (iii) $x+1, y, z$; (iv) $x-1, y, z$.

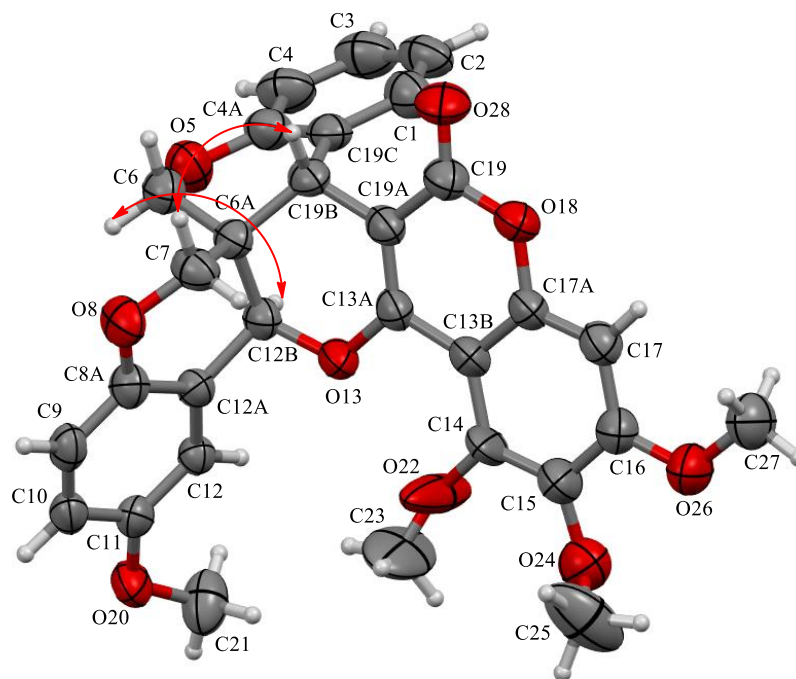


Figure S216. ORTEP view of *rac*-(6a*S**,12b*R**,19b*R**)-4cc with numbering scheme. Red curly arrows represent characteristic NOE correlations for the assignment of relative configuration.

Table S4. Experimental details of single crystal X-ray diffraction study on *rac*-(6a*S**,12b*R**,19b*R**)-6cc.

Crystal data	
Chemical formula	C ₃₀ H ₂₆ O ₉
M_r	530.51
Crystal system, space group	Monoclinic, $C2/c$
Temperature (K)	293
a, b, c (Å)	18.716 (4), 11.780 (3), 23.874 (6)
β (°)	106.521 (7)
V (Å ³)	5046 (2)
Z	8
Radiation type	Mo $K\alpha$
μ (mm ⁻¹)	0.10
Crystal size (mm)	0.26 × 0.15 × 0.05
Data collection	
Diffractometer	Bruker D8 VENTURE
Absorption correction	Multi-scan <i>SADABS2016/2</i> - Bruker AXS area detector scaling and absorption correction
T_{\min}, T_{\max}	0.62, 0.99
No. of measured, independent and observed [$I > 2\sigma(I)$] reflections	45396, 4842, 2895

R_{int}	0.190
$(\sin \theta/\lambda)_{\text{max}}$ (\AA^{-1})	0.615
Refinement	
$R[F^2 > 2\sigma(F^2)], wR(F^2), S$	0.105, 0.278, 1.10
No. of reflections	4842
No. of parameters	357
H-atom treatment	H-atom parameters constrained
	$w = 1/[\sigma^2(F_o^2) + (0.0919P)^2 + 21.912P]$ where $P = (F_o^2 + 2F_c^2)/3$
$\Delta\rho_{\text{max}}, \Delta\rho_{\text{min}}$ ($e \text{\AA}^{-3}$)	0.66, -0.37

Table S5. Geometric parameters (\AA , $^\circ$) for *rac*-(6aS*,12bR*,19bR*)-6cc.

Bond length (\AA)			
C1—C2	1.383 (8)	C13A—C19A	1.350 (6)
C1—C19C	1.398 (7)	C13A—O14	1.350 (5)
C1—H1	0.9300	C15—C14A	1.374 (7)
C2—C3	1.380 (9)	C15—C16	1.376 (7)
C2—H2	0.9300	C15—H15	0.9300
C3—C4	1.370 (9)	C14A—O14	1.379 (6)
C3—H3	0.9300	C14A—C18A	1.390 (6)
C4—C4A	1.383 (7)	C16—O22	1.365 (6)
C4—H4	0.9300	C16—C17	1.398 (7)
C4A—O5	1.376 (6)	C17—C18	1.389 (7)
C4A—C19C	1.388 (7)	C17—O24	1.392 (7)
C6—O5	1.435 (6)	C18—O26	1.376 (6)
C6—C6A	1.514 (7)	C18—C18A	1.412 (7)
C6—H6A	0.9700	C19—O28	1.250 (5)
C6—H6B	0.9700	C19—C19A	1.438 (6)
C7—O8	1.434 (6)	C19—C18A	1.463 (7)
C7—C6A	1.513 (7)	C19A—C19B	1.501 (6)
C7—H7A	0.9700	C19B—C19C	1.527 (7)
C7—H7B	0.9700	C19B—H19B	0.9800
C6A—C19B	1.532 (7)	C21—O20	1.409 (9)
C6A—C12B	1.537 (6)	C21—H21A	0.9600
C9—C10	1.363 (8)	C21—H21B	0.9600
C9—C8A	1.372 (7)	C21—H21C	0.9600
C9—H9	0.9300	C23—O22	1.430 (6)

C8A—O8	1.379 (6)	C23—H23A	0.9600
C8A—C12A	1.390 (7)	C23—H23B	0.9600
C10—C11	1.377 (8)	C23—H23C	0.9600
C10—H10	0.9300	C25—O24	1.295 (9)
C11—C12	1.369 (8)	C25—H25A	0.9600
C11—O20	1.381 (7)	C25—H25B	0.9600
C12—C12A	1.390 (7)	C25—H25C	0.9600
C12—H12	0.9300	C27—O26	1.418 (9)
C12A—C12B	1.491 (7)	C27—H27A	0.9600
C12B—O13	1.475 (6)	C27—H27B	0.9600
C12B—H12B	0.9800	C27—H27C	0.9600
C13A—O13	1.317 (5)		
Bond angle (°)			
C2—C1—C19C	121.5 (5)	C15—C14A—O14	113.9 (4)
C2—C1—H1	119.3000	C15—C14A—C18A	124.3 (5)
C19C—C1—H1	119.3000	O14—C14A—C18A	121.7 (4)
C3—C2—C1	119.8 (6)	O22—C16—C15	123.4 (5)
C3—C2—H2	120.1000	O22—C16—C17	116.0 (5)
C1—C2—H2	120.1000	C15—C16—C17	120.6 (5)
C4—C3—C2	119.8 (6)	C18—C17—O24	118.1 (5)
C4—C3—H3	120.1000	C18—C17—C16	119.2 (5)
C2—C3—H3	120.1000	O24—C17—C16	122.0 (5)
C3—C4—C4A	120.3 (6)	O26—C18—C17	118.2 (5)
C3—C4—H4	119.8000	O26—C18—C18A	120.1 (4)
C4A—C4—H4	119.8000	C17—C18—C18A	121.8 (4)
O5—C4A—C4	116.1 (5)	O28—C19—C19A	120.2 (4)
O5—C4A—C19C	122.5 (5)	O28—C19—C18A	123.4 (4)
C4—C4A—C19C	121.4 (5)	C19A—C19—C18A	116.3 (4)
O5—C6—C6A	112.3 (4)	C14A—C18A—C18	115.5 (4)
O5—C6—H6A	109.1000	C14A—C18A—C19	119.0 (4)
C6A—C6—H6A	109.1000	C18—C18A—C19	125.5 (4)
O5—C6—H6B	109.1000	C13A—C19A—C19	119.3 (4)
C6A—C6—H6B	109.1000	C13A—C19A—C19B	118.1 (4)
H6A—C6—H6B	107.9000	C19—C19A—C19B	122.6 (4)
O8—C7—C6A	112.4 (4)	C19A—C19B—C19C	113.6 (4)
O8—C7—H7A	109.1000	C19A—C19B—C6A	110.8 (4)
C6A—C7—H7A	109.1000	C19C—C19B—C6A	110.8 (4)
O8—C7—H7B	109.1000	C19A—C19B—H19B	107.1000

C6A—C7—H7B	109.1000	C19C—C19B—H19B	107.1000
H7A—C7—H7B	107.9000	C6A—C19B—H19B	107.1000
C7—C6A—C6	109.0 (4)	C4A—C19C—C1	117.2 (5)
C7—C6A—C19B	110.8 (4)	C4A—C19C—C19B	121.7 (5)
C6—C6A—C19B	108.6 (4)	C1—C19C—C19B	121.1 (4)
C7—C6A—C12B	108.1 (4)	O20—C21—H21A	109.5000
C6—C6A—C12B	108.9 (4)	O20—C21—H21B	109.5000
C19B—C6A—C12B	111.4 (4)	H21A—C21—H21B	109.5000
C10—C9—C8A	121.2 (5)	O20—C21—H21C	109.5000
C10—C9—H9	119.4000	H21A—C21—H21C	109.5000
C8A—C9—H9	119.4000	H21B—C21—H21C	109.5000
C9—C8A—O8	117.5 (5)	O22—C23—H23A	109.5000
C9—C8A—C12A	120.3 (5)	O22—C23—H23B	109.5000
O8—C8A—C12A	122.2 (5)	H23A—C23—H23B	109.5000
C9—C10—C11	119.7 (6)	O22—C23—H23C	109.5000
C9—C10—H10	120.1000	H23A—C23—H23C	109.5000
C11—C10—H10	120.1000	H23B—C23—H23C	109.5000
C12—C11—C10	119.3 (5)	O24—C25—H25A	109.5000
C12—C11—O20	115.7 (5)	O24—C25—H25B	109.5000
C10—C11—O20	124.9 (6)	H25A—C25—H25B	109.5000
C11—C12—C12A	121.9 (5)	O24—C25—H25C	109.5000
C11—C12—H12	119.0000	H25A—C25—H25C	109.5000
C12A—C12—H12	119.0000	H25B—C25—H25C	109.5000
C12—C12A—C8A	117.5 (5)	O26—C27—H27A	109.5000
C12—C12A—C12B	121.0 (4)	O26—C27—H27B	109.5000
C8A—C12A—C12B	121.3 (4)	H27A—C27—H27B	109.5000
O13—C12B—C12A	104.8 (4)	O26—C27—H27C	109.5000
O13—C12B—C6A	113.5 (4)	H27A—C27—H27C	109.5000
C12A—C12B—C6A	112.7 (4)	H27B—C27—H27C	109.5000
O13—C12B—H12B	108.6000	C4A—O5—C6	114.8 (4)
C12A—C12B—H12B	108.6000	C8A—O8—C7	114.6 (4)
C6A—C12B—H12B	108.6000	C13A—O13—C12B	119.2 (4)
O13—C13A—C19A	127.9 (4)	C13A—O14—C14A	118.5 (3)
O13—C13A—O14	107.5 (4)	C11—O20—C21	117.9 (6)
C19A—C13A—O14	124.6 (4)	C16—O22—C23	117.7 (4)
C14A—C15—C16	118.5 (5)	C25—O24—C17	119.4 (7)
C14A—C15—H15	120.8000	C18—O26—C27	114.8 (5)
C16—C15—H15	120.8000		

Torsional angle (°)			
C19C—C1—C2—C3	0.6 (8)	O28—C19—C18A—C14A	-175.0 (5)
C1—C2—C3—C4	-0.9 (9)	C19A—C19—C18A—C14A	4.6 (7)
C2—C3—C4—C4A	0.1 (9)	O28—C19—C18A—C18	7.7 (8)
C3—C4—C4A—O5	178.6 (5)	C19A—C19—C18A—C18	-172.6 (5)
C3—C4—C4A—C19C	0.9 (8)	O13—C13A—C19A—C19	-174.8 (5)
O8—C7—C6A—C6	-57.6 (5)	O14—C13A—C19A—C19	3.8 (7)
O8—C7—C6A—C19B	-177.0 (4)	O13—C13A—C19A—C19B	2.6 (7)
O8—C7—C6A—C12B	60.7 (5)	O14—C13A—C19A—C19B	-178.7 (4)
O5—C6—C6A—C7	176.5 (4)	O28—C19—C19A—C13A	172.2 (5)
O5—C6—C6A—C19B	-62.7 (5)	C18A—C19—C19A—C13A	-7.5 (7)
O5—C6—C6A—C12B	58.7 (5)	O28—C19—C19A—C19B	-5.2 (7)
C10—C9—C8A—O8	179.9 (6)	C18A—C19—C19A—C19B	175.1 (4)
C10—C9—C8A—C12A	-1.6 (9)	C13A—C19A—C19B—C19C	95.7 (5)
C8A—C9—C10—C11	-0.1 (10)	C19—C19A—C19B—C19C	-86.9 (5)
C9—C10—C11—C12	1.4 (10)	C13A—C19A—C19B—C6A	-29.7 (6)
C9—C10—C11—O20	-177.3 (6)	C19—C19A—C19B—C6A	147.8 (4)
C10—C11—C12—C12A	-1.1 (9)	C7—C6A—C19B—C19A	-71.5 (5)
O20—C11—C12—C12A	177.7 (5)	C6—C6A—C19B—C19A	168.8 (4)
C11—C12—C12A—C8A	-0.5 (8)	C12B—C6A—C19B—C19A	48.9 (5)
C11—C12—C12A—C12B	-175.5 (5)	C7—C6A—C19B—C19C	161.6 (4)
C9—C8A—C12A—C12	1.8 (8)	C6—C6A—C19B—C19C	41.9 (5)
O8—C8A—C12A—C12	-179.8 (5)	C12B—C6A—C19B—C19C	-78.0 (5)
C9—C8A—C12A—C12B	176.8 (5)	O5—C4A—C19C—C1	-178.7 (4)
O8—C8A—C12A—C12B	-4.8 (8)	C4—C4A—C19C—C1	-1.2 (7)
C12—C12A—C12B—O13	66.1 (5)	O5—C4A—C19C—C19B	-0.3 (7)
C8A—C12A—C12B—O13	-108.7 (5)	C4—C4A—C19C—C19B	177.2 (4)
C12—C12A—C12B—C6A	-170.0 (4)	C2—C1—C19C—C4A	0.4 (7)
C8A—C12A—C12B—C6A	15.2 (6)	C2—C1—C19C—C19B	-178.0 (5)
C7—C6A—C12B—O13	78.0 (5)	C19A—C19B—C19C—C4A	-138.5 (4)
C6—C6A—C12B—O13	-163.7 (4)	C6A—C19B—C19C—C4A	-13.1 (6)
C19B—C6A—C12B—O13	-43.9 (5)	C19A—C19B—C19C—C1	39.9 (6)
C7—C6A—C12B—C12A	-40.9 (5)	C6A—C19B—C19C—C1	165.2 (4)
C6—C6A—C12B—C12A	77.4 (5)	C4—C4A—O5—C6	164.1 (4)
C19B—C6A—C12B—C12A	-162.8 (4)	C19C—C4A—O5—C6	-18.2 (6)
C16—C15—C14A—O14	-178.8 (4)	C6A—C6—O5—C4A	50.4 (5)
C16—C15—C14A—C18A	2.3 (8)	C9—C8A—O8—C7	-158.6 (5)
C14A—C15—C16—O22	178.9 (5)	C12A—C8A—O8—C7	23.0 (7)

C14A—C15—C16—C17	-0.1 (8)	C6A—C7—O8—C8A	-52.0 (6)
O22—C16—C17—C18	178.3 (5)	C19A—C13A—O13—C12B	3.8 (7)
C15—C16—C17—C18	-2.7 (9)	O14—C13A—O13—C12B	-175.1 (4)
O22—C16—C17—O24	-11.0 (9)	C12A—C12B—O13—C13A	141.3 (4)
C15—C16—C17—O24	168.0 (6)	C6A—C12B—O13—C13A	18.0 (6)
O24—C17—C18—O26	13.8 (9)	O13—C13A—O14—C14A	-177.9 (4)
C16—C17—C18—O26	-175.1 (5)	C19A—C13A—O14—C14A	3.1 (7)
O24—C17—C18—C18A	-167.6 (6)	C15—C14A—O14—C13A	175.0 (4)
C16—C17—C18—C18A	3.4 (9)	C18A—C14A—O14—C13A	-6.1 (7)
C15—C14A—C18A—C18	-1.6 (8)	C12—C11—O20—C21	-169.1 (7)
O14—C14A—C18A—C18	179.6 (4)	C10—C11—O20—C21	9.7 (11)
C15—C14A—C18A—C19	-179.1 (5)	C15—C16—O22—C23	1.0 (8)
O14—C14A—C18A—C19	2.1 (7)	C17—C16—O22—C23	-180.0 (5)
O26—C18—C18A—C14A	177.2 (5)	C18—C17—O24—C25	-121.6 (8)
C17—C18—C18A—C14A	-1.3 (8)	C16—C17—O24—C25	67.6 (9)
O26—C18—C18A—C19	-5.5 (8)	C17—C18—O26—C27	-92.1 (7)
C17—C18—C18A—C19	176.0 (5)	C18A—C18—O26—C27	89.3 (7)

Table S6. Hydrogen-bond geometry (Å, °) for *rac*-(6a*S**,12b*R**,19b*R**)-6cc.

<i>D</i> —H... <i>A</i>	<i>D</i> —H	H... <i>A</i>	<i>D</i> ... <i>A</i>	<i>D</i> —H... <i>A</i>
C7—H7A...O28 ⁱ	0.97	2.29	3.190 (6)	154
C9—H9...O8 ⁱⁱ	0.93	2.52	3.424 (7)	163
C12 <i>B</i> —H12 <i>B</i> ...O14 ⁱⁱⁱ	0.98	2.53	3.436 (6)	153

Symmetry codes: (i) $-x+1, -y, -z+1$; (ii) $-x+1, y, -z+1/2$; (iii) $-x+3/2, -y+1/2, -z+1$.

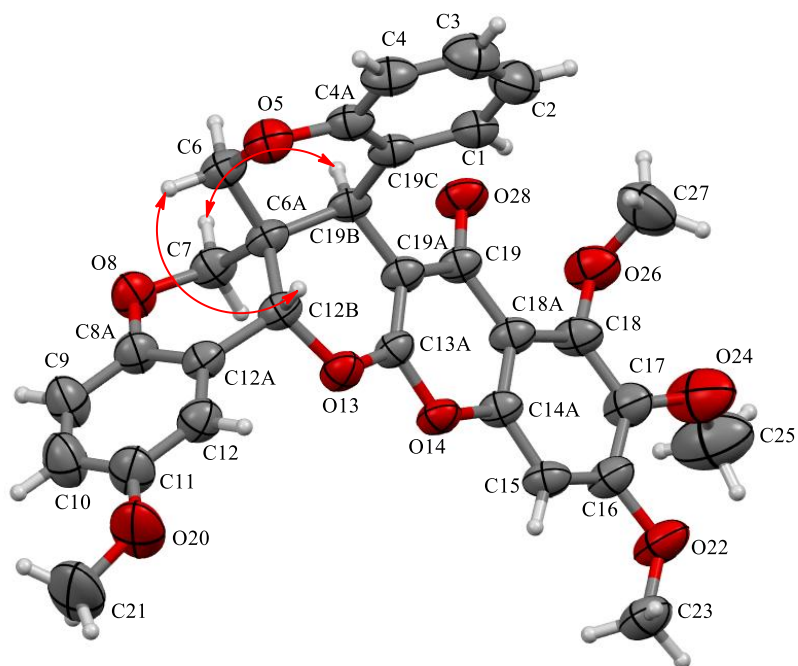


Figure S217. ORTEP view of *rac*-(6a*S**,12b*R**,19b*R**)-**6cc** with numbering scheme. Red curly arrows represent characteristic NOE correlations for the assignment of relative configuration.

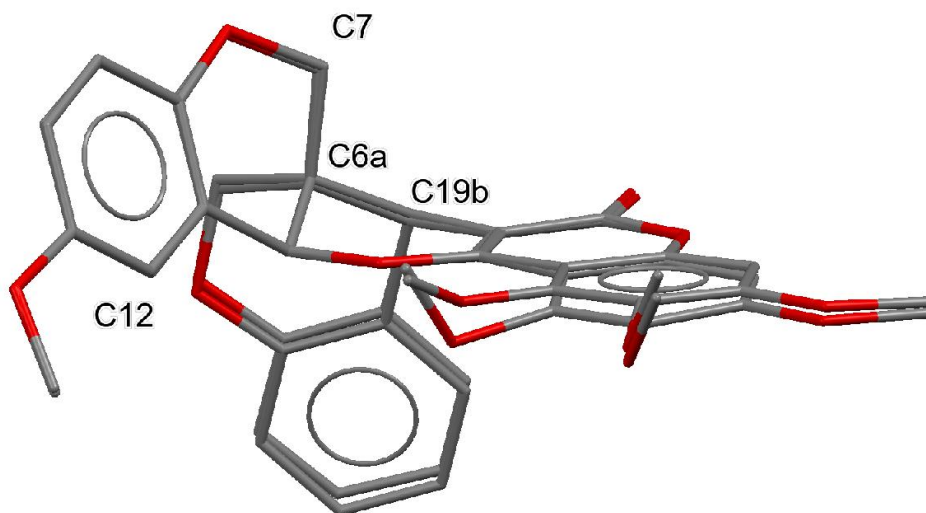


Figure S218. Overlay of the two molecules in the structure of **6cc** showing the conformational differences. Hydrogen atoms are omitted for clarity.

1. S. Balázs Király, L. Tóth, T. Kovács, A. Bényei, E. Lisztes, B. István Tóth, T. Bíró, A. Kiss-Szikszai, K. E. Kövér, A. Mándi and T. Kurtán, *Adv. Synth. Catal.*, 2023, 365, 3301-3319.
2. S. B. Király, A. Bényei, E. Lisztes, T. Bíró, B. I. Tóth and T. Kurtán, *Eur. J. Org. Chem.*, 2021, 2021, 6161-6170.