

Supporting Information

Bonnevillamides, Linear Heptapeptides Isolated from a Great Salt Lake-Derived Streptomyces sp.

Guangwei Wu ¹, Jason R. Nielson ², Randall T. Peterson ², and Jaclyn M. Winter ^{1,*}

¹Department of Medicinal Chemistry, University of Utah, Salt Lake City, UT 84112, USA; Guangwei.Wu@utah.edu

²Department of Pharmacology and Toxicology, University of Utah, Salt Lake City, UT 84112, USA; Jason.Nielson@pharm.utah.edu (J. R. N); Randall.Peterson@pharm.utah.edu (R. T. P.)

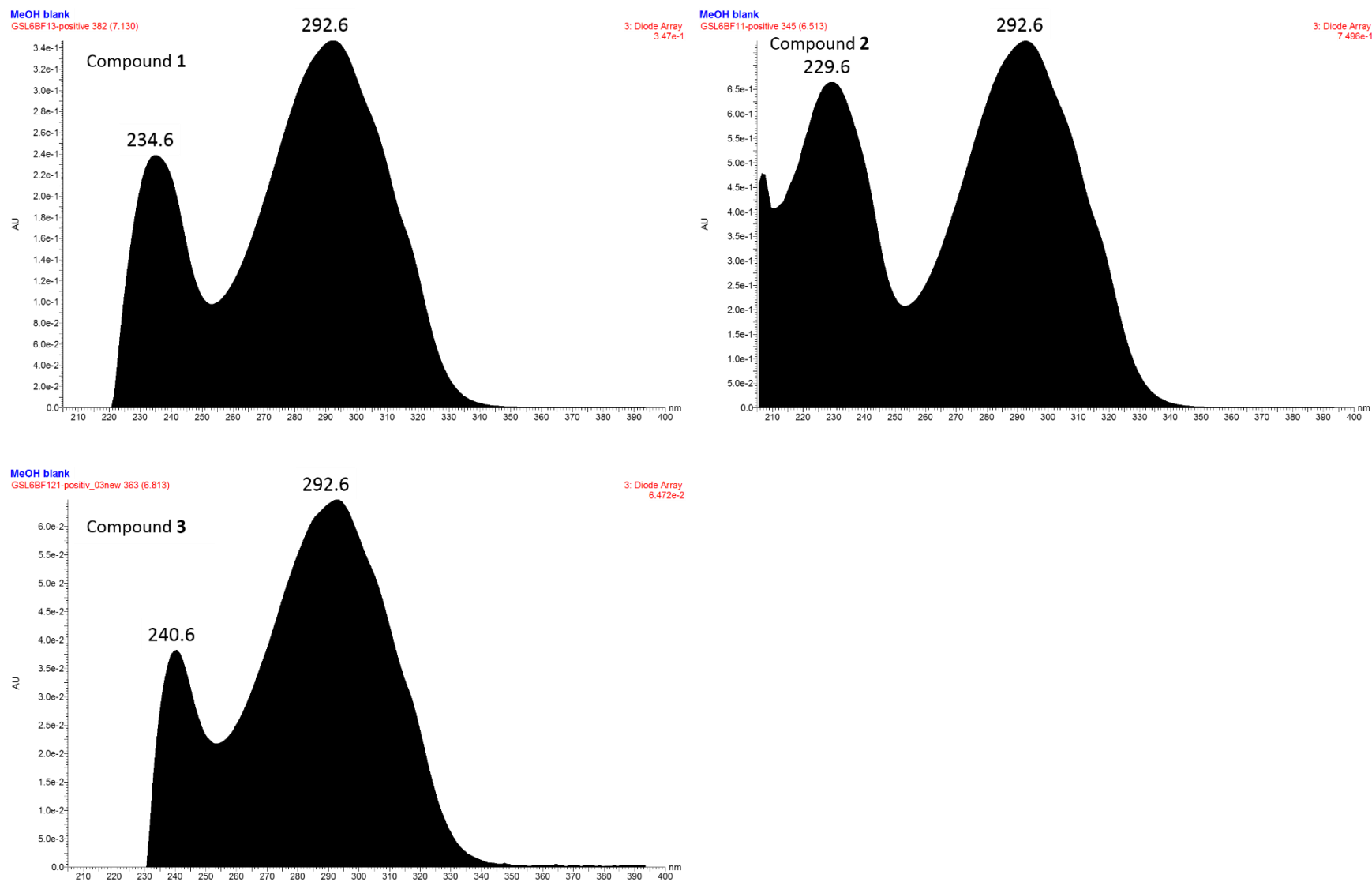
*Correspondence: Jaclyn.Winter@utah.edu; Tel.: +1-801-585-7117

List of Supporting Information

➤ Figure S1. UV spectra of compounds 1–3	S3
➤ Figure S2-S5. ¹ H, ¹³ C, gHSQCAD, gHMBCAD spectra of compound 1	S4-S7
➤ Figure S6-S7. TOCSY and COSY spectra of compound 1	S8-S9
➤ Figure S8-S11. ROESY, NOESY and 1D NOE spectra of compound 1	S10-S13
➤ Figure S12-S13. LC-MS/MS and HR(+)ESIMS spectra of compound 1	S14-S15
➤ Figure S14-S17. ¹ H, ¹³ C, gHSQCAD, gHMBCAD spectra of compound 2	S16-S19
➤ Figure S18-S19. TOCSY and COSY spectra of compound 2	S20-S21
➤ Figure S20-S22. ROESY, NOESY and 1D NOE spectra of compound 2	S22-S24
➤ Figure S23-S24. LC-MS/MS and HR(+)ESIMS spectra of compound 2	S25-S26
➤ Figure S25-S27. ¹ H, gHSQCAD, gHMBCAD spectra of compound 3	S27-S29
➤ Figure S28-S29. TOCSY and COSY spectra of compound 3	S30-S31
➤ Figure S30-S31. ROESY, NOESY spectra of compound 3	S32-S33
➤ Figure S32. HR(+)ESIMS spectra of compound 3	S34
➤ Figure S33. Advanced Marfey's analysis of acid hydrolysate of 1	S35-S38
➤ Figure S34. Advanced Marfey's analysis of acid hydrolysate of 2	S39-S44
➤ Figure S35. Advanced Marfey's analysis of acid hydrolysate of 3	S45-S49
➤ Table S1. Corresponding retention times between D,L-FDLA derivatives of amino acids.....	S50

54 **Figure S1.** UV spectra of compounds 1–3.

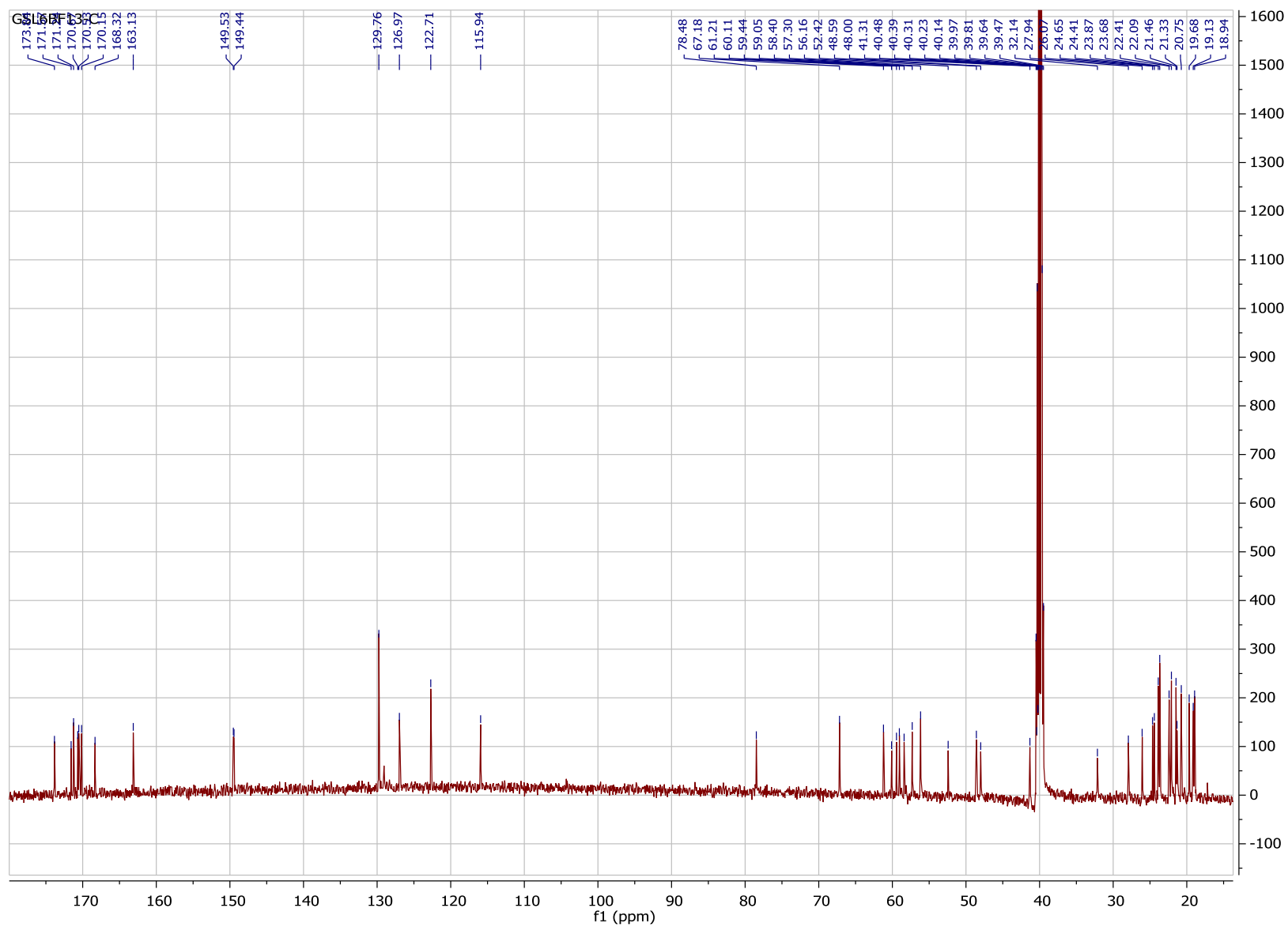
55



56
57

60 **Figure S3.** ^{13}C NMR spectrum of compound **1** in $\text{DMSO-}d_6$

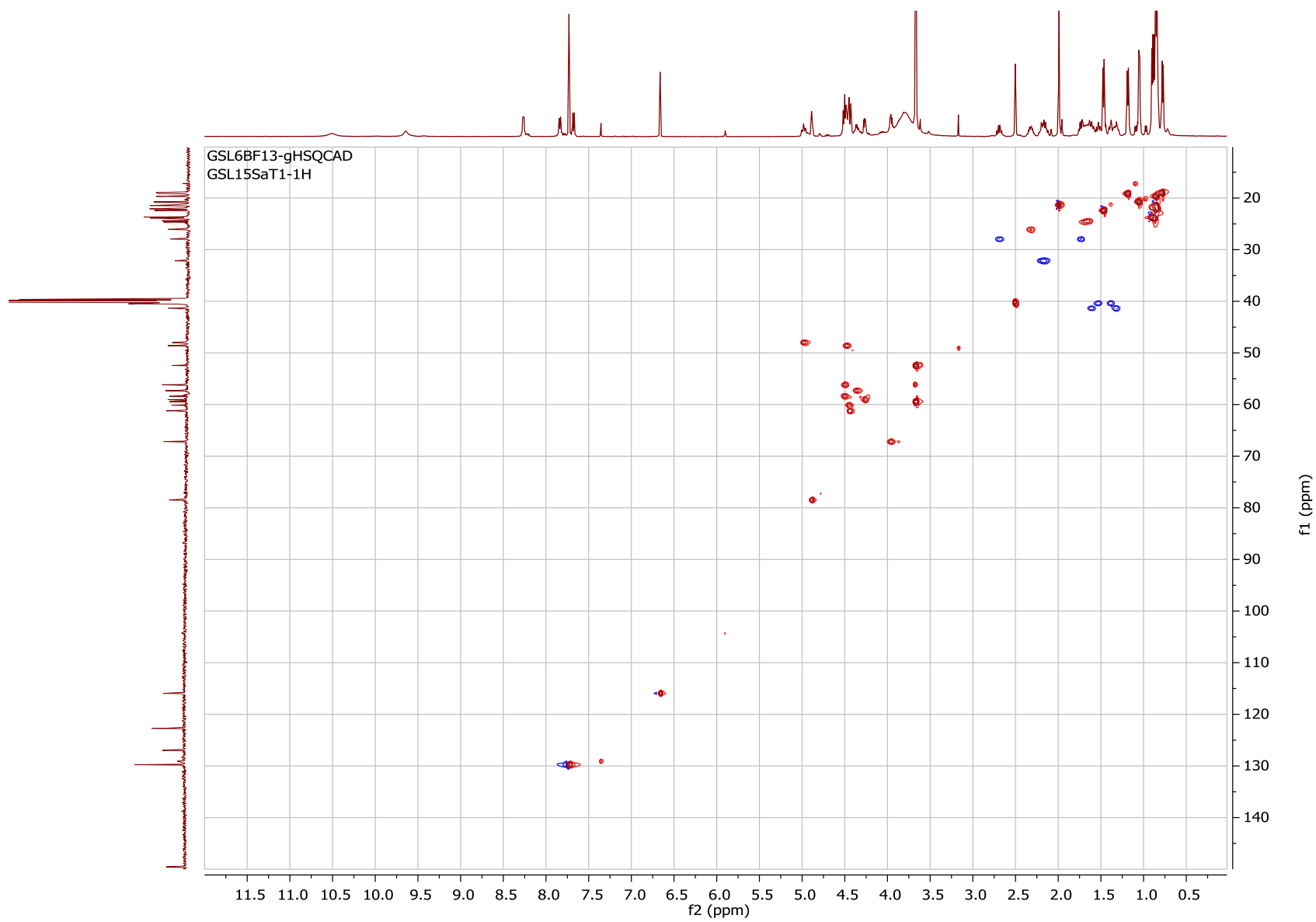
61



62

63 **Figure S4.**gHSQCAD spectrum of compound **1** in DMSO- d_6

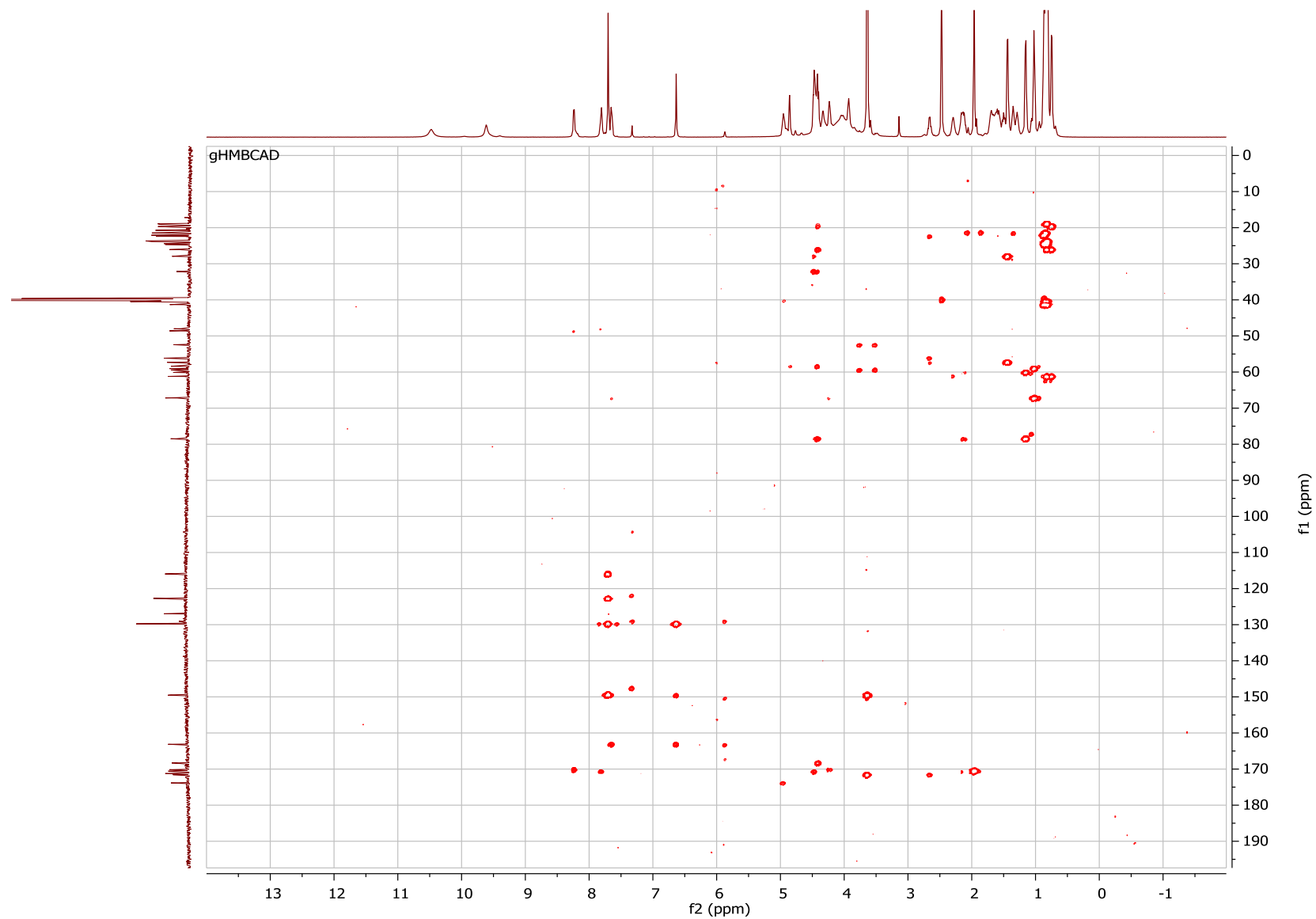
64



65

66 **Figure S5.**gHMBCAD spectrum of compound **1** in DMSO- d_6

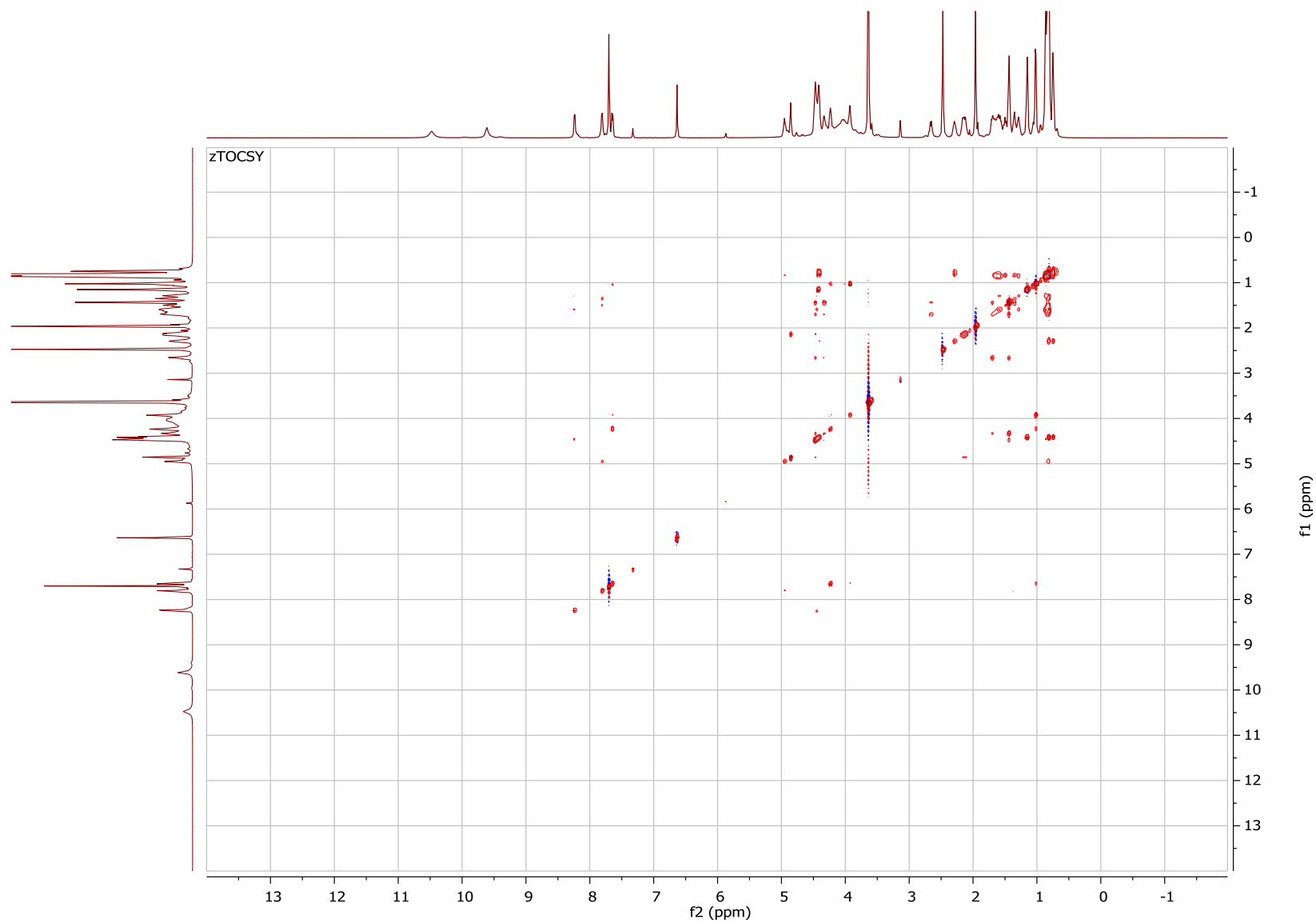
67



68

69 **Figure S6.** TOCSY spectrum of compound **1** in DMSO- d_6

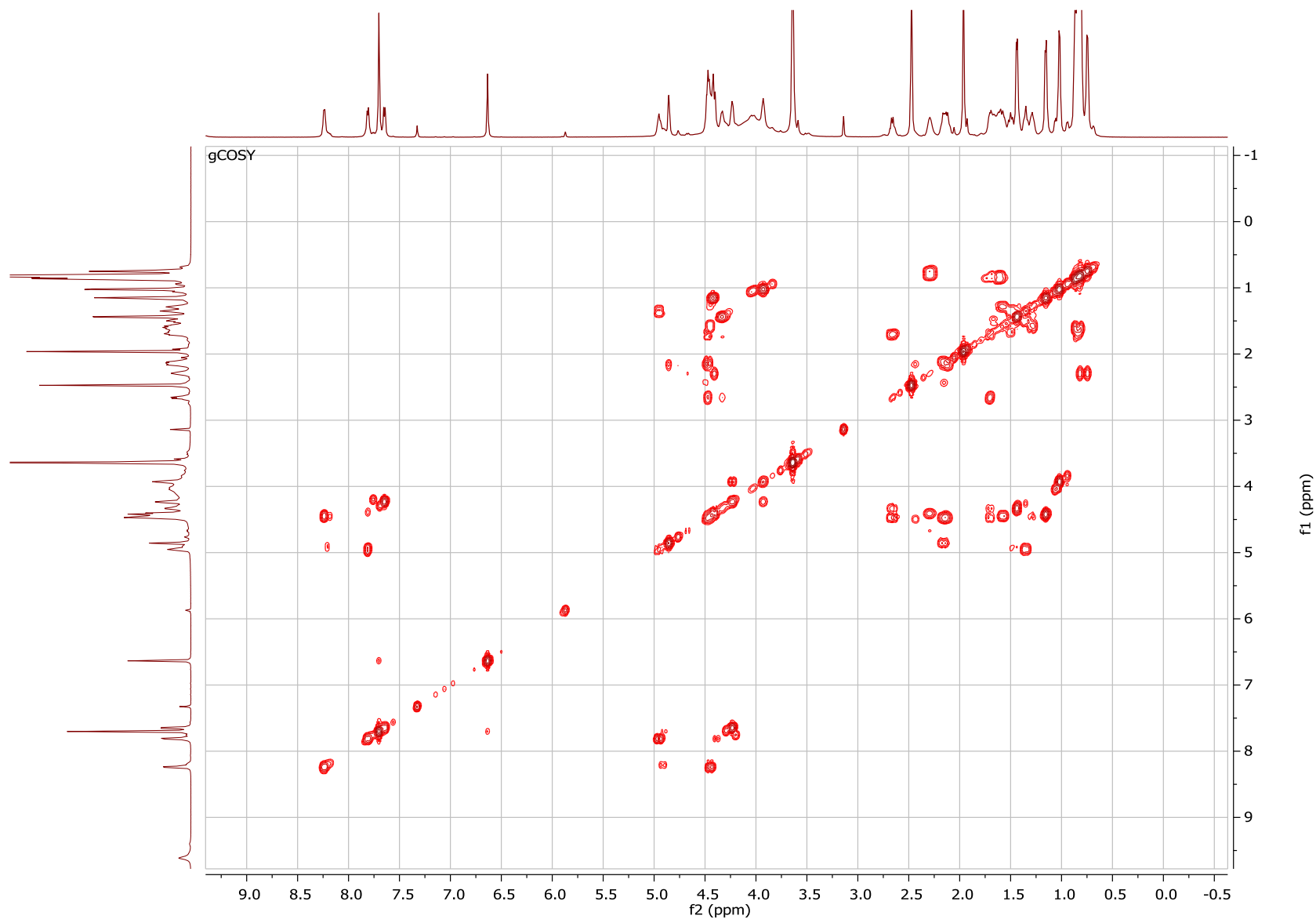
70



71
72

73 **Figure S7.** COSY spectrum of compound **1** in DMSO- d_6

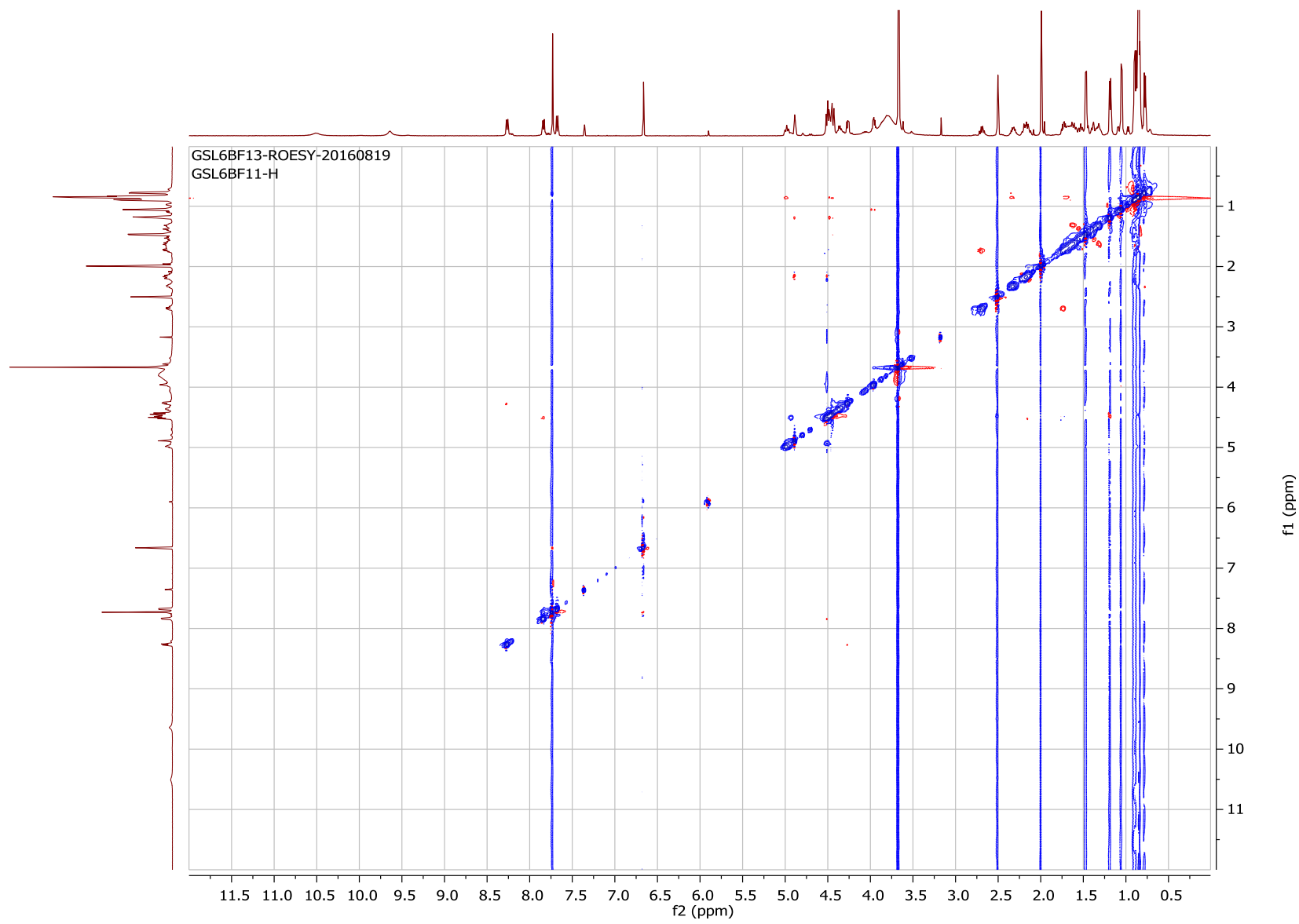
74



75

76 **Figure S8.** ROESY spectrum of compound **1** in DMSO- d_6

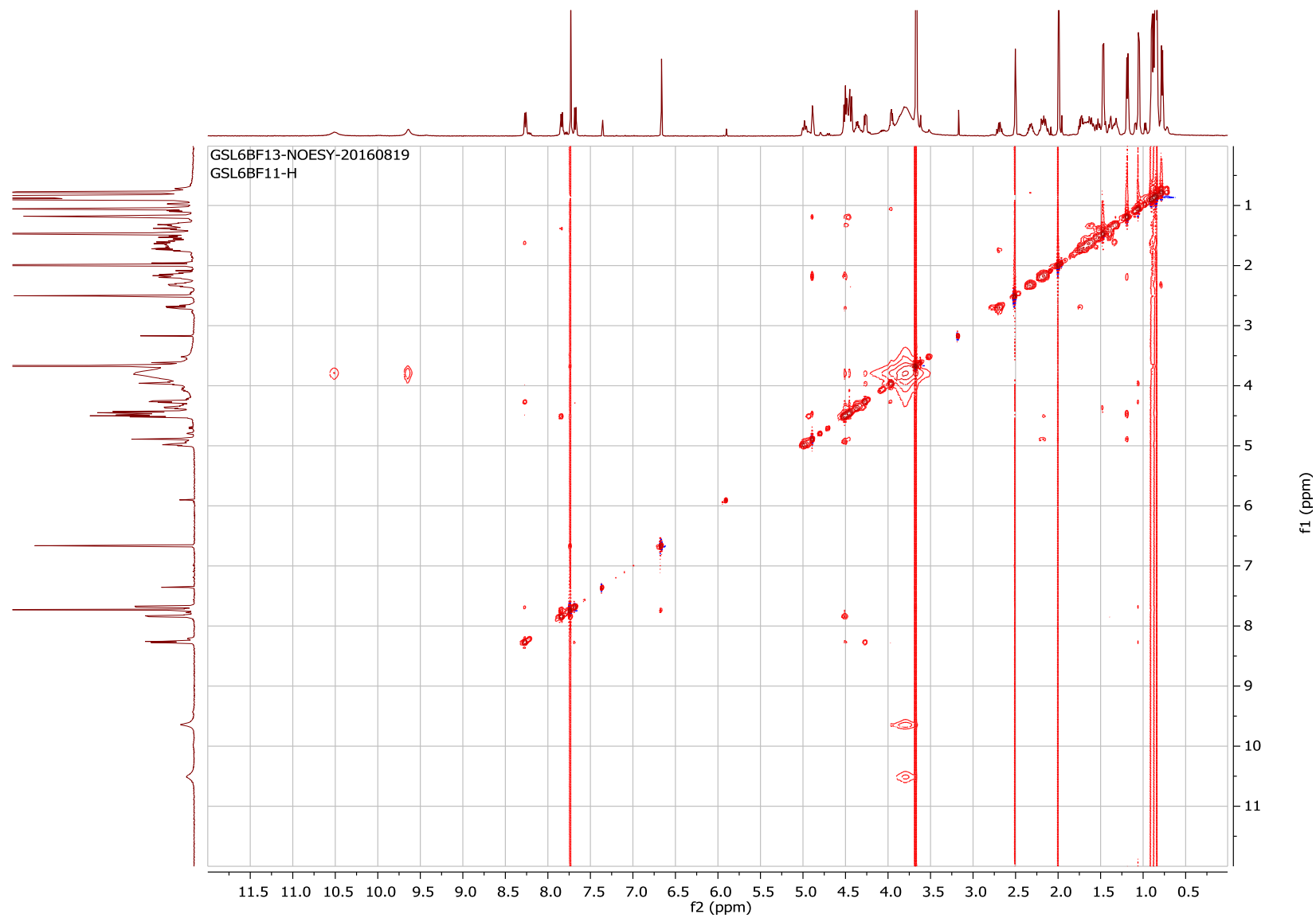
77



78

79 **Figure S9.** NOESY spectrum of compound **1** in DMSO- d_6

80



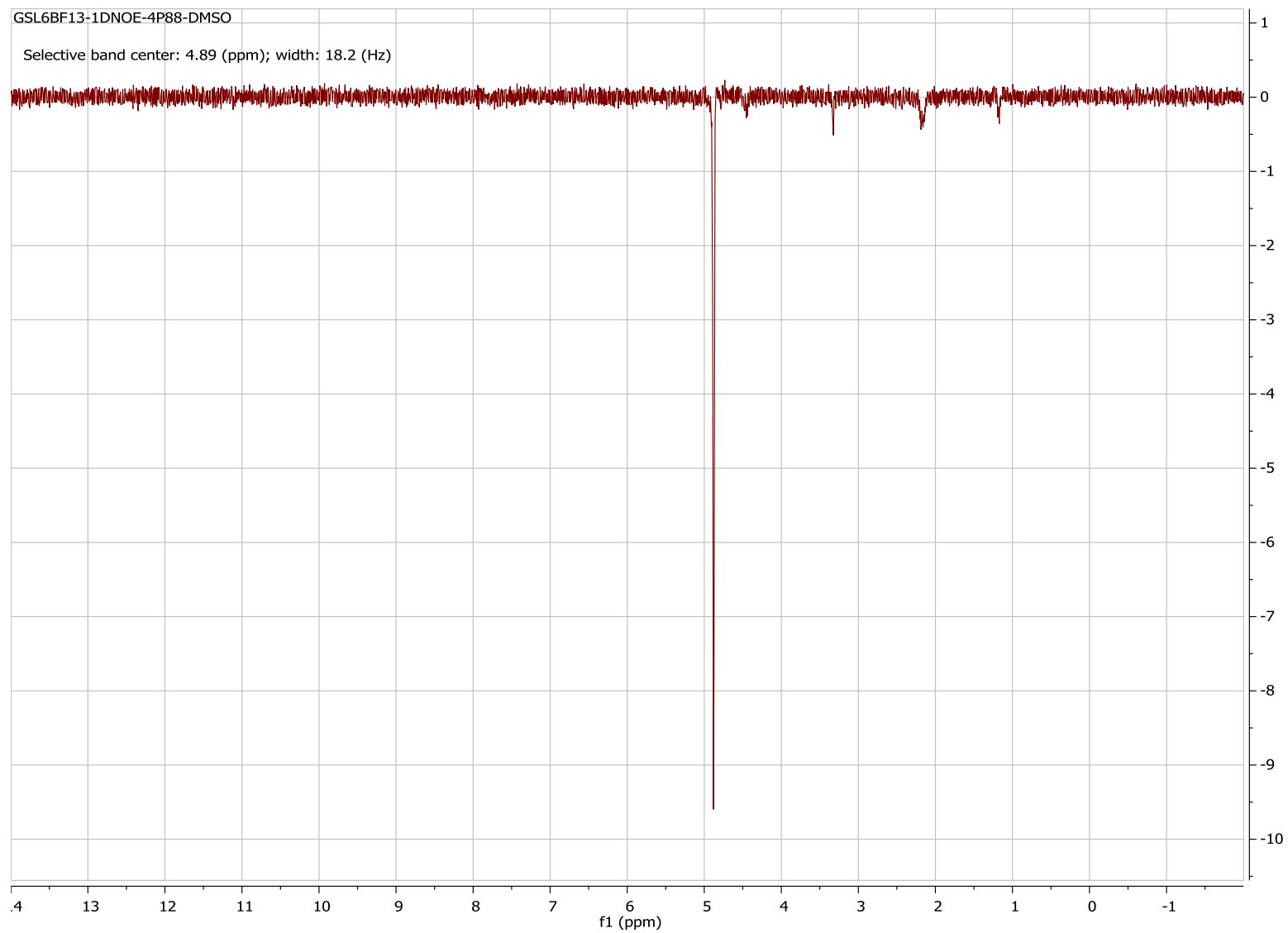
81

82

83 **Figure S10.1D** NOE spectrum of compound **1** at 4.88 ppm DMSO- d_6

84

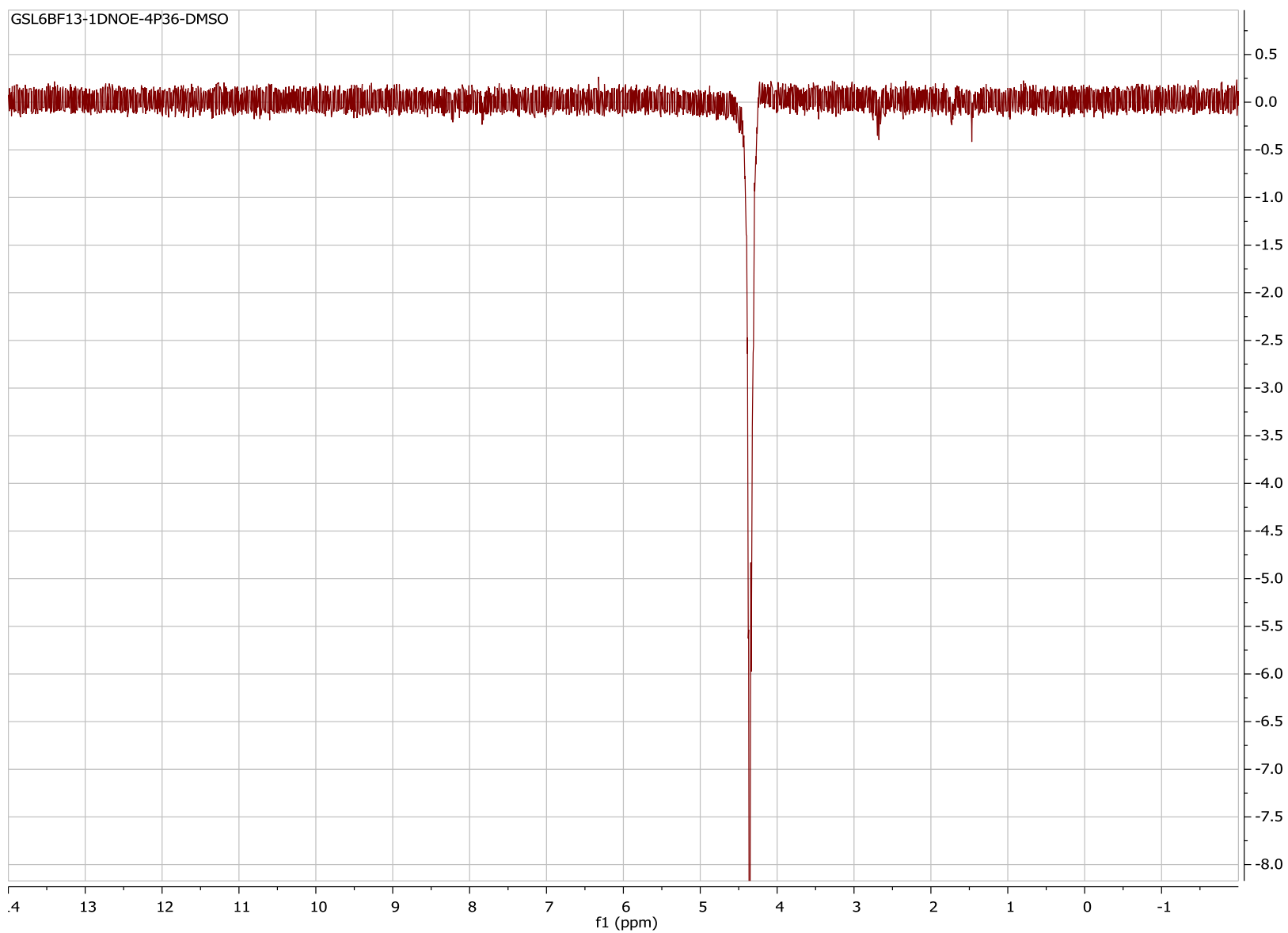
85



86

87 **Figure S11.1D** NOE spectrum of compound **1** at 4.36 ppm DMSO-*d*₆

88



89

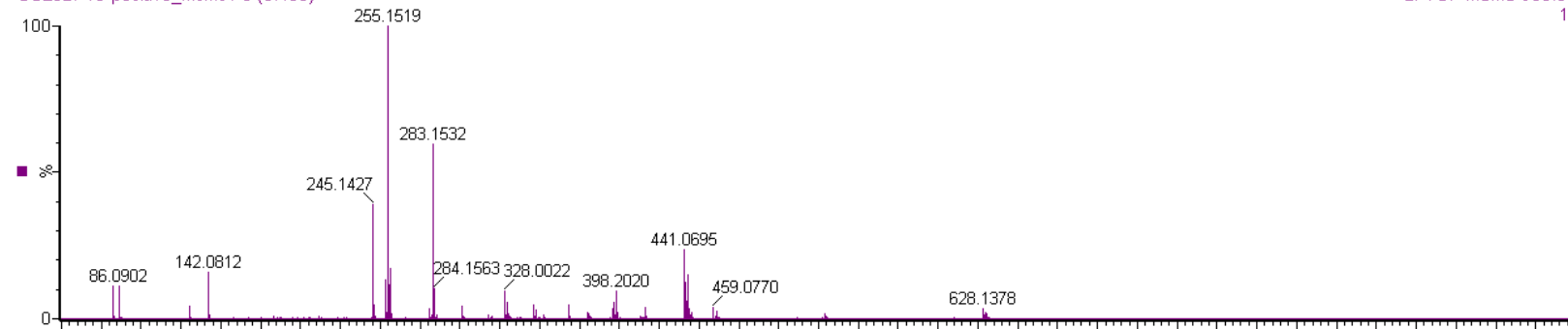
S13

90 **Figure S12.** Main Fragment Ions Observed in the HRESIMS/MS Spectrum of compound **1**

MeOH blank

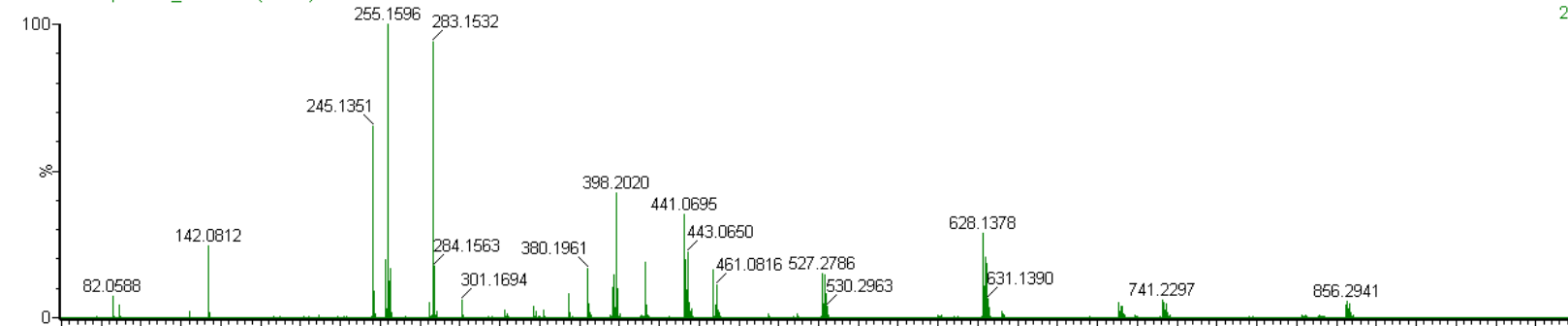
GSL6BF13-positive_msms1 3 (8.400)

2: TOF MSMS 985.30ES+
1.34e4



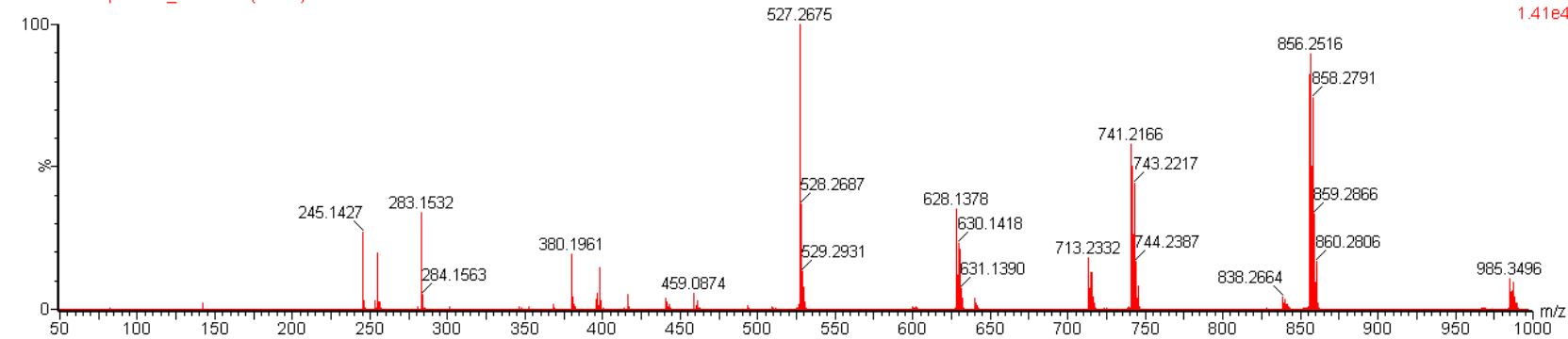
GSL6BF13-positive_msms1 3 (8.569)

3: TOF MSMS 985.30ES+
2.09e4

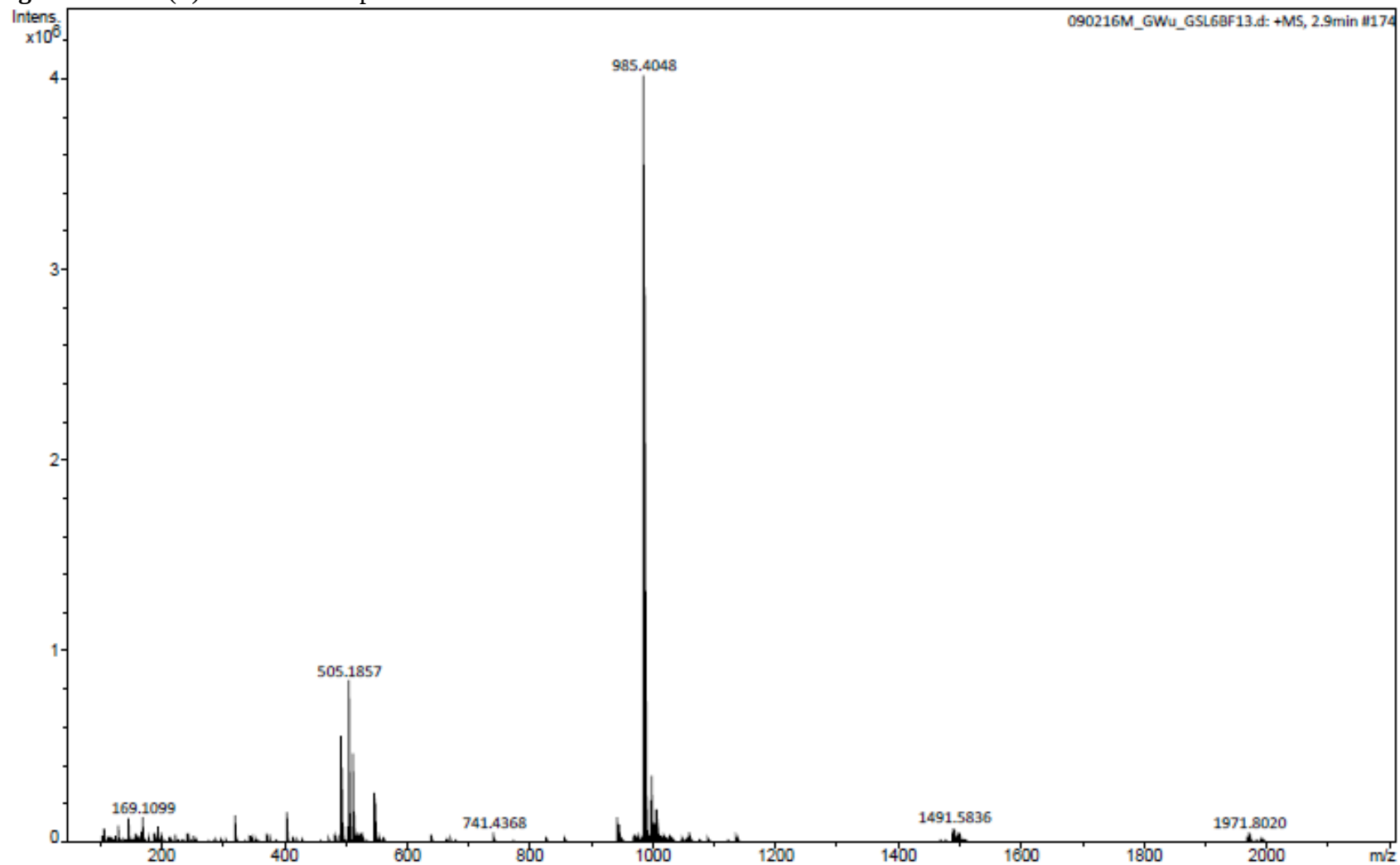


GSL6BF13-positive_msms1 3 (8.737)

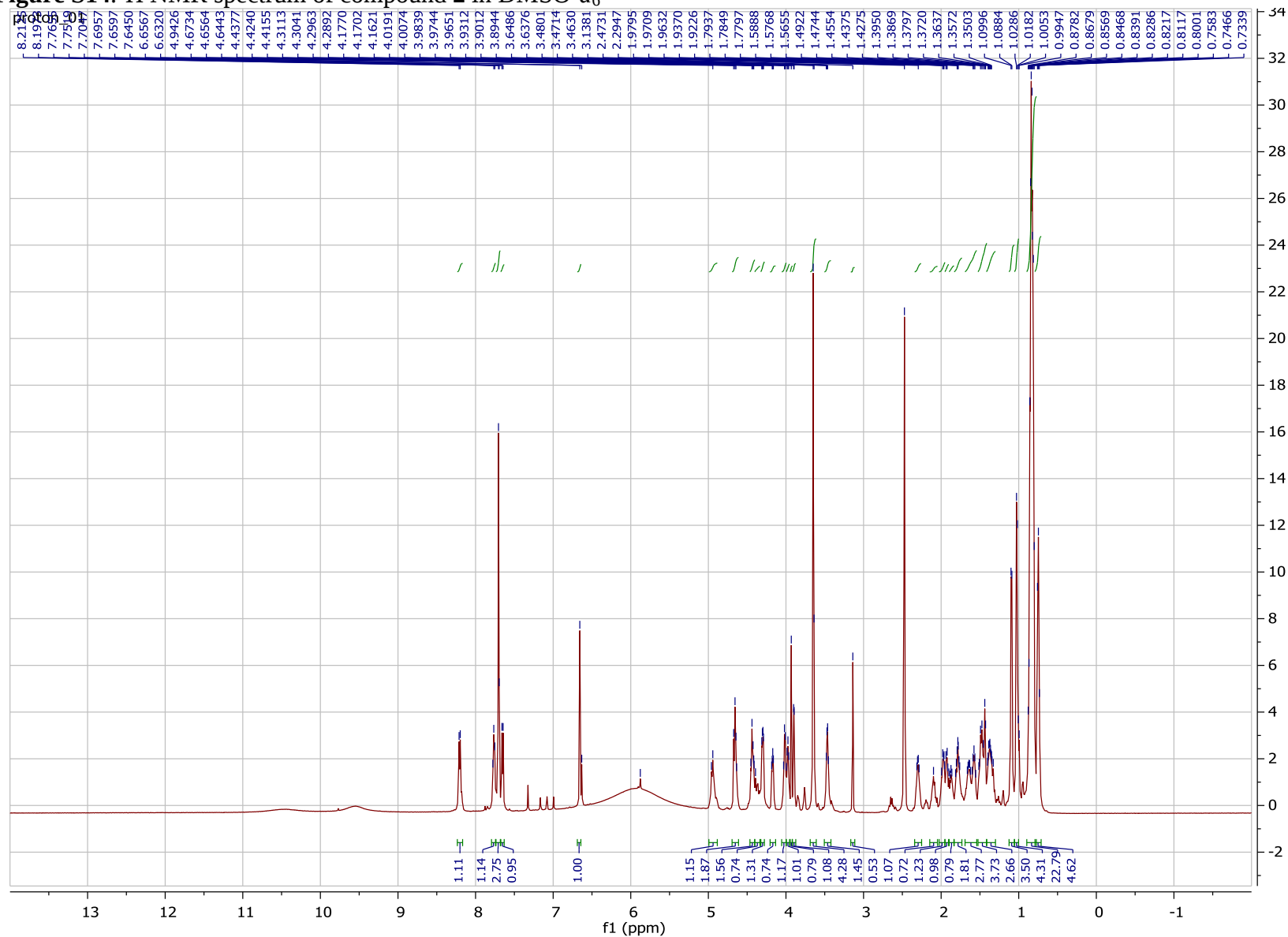
4: TOF MSMS 985.30ES+
1.41e4



93 **Figure S13.** HR(+)^{ESI}MS of compound **1**

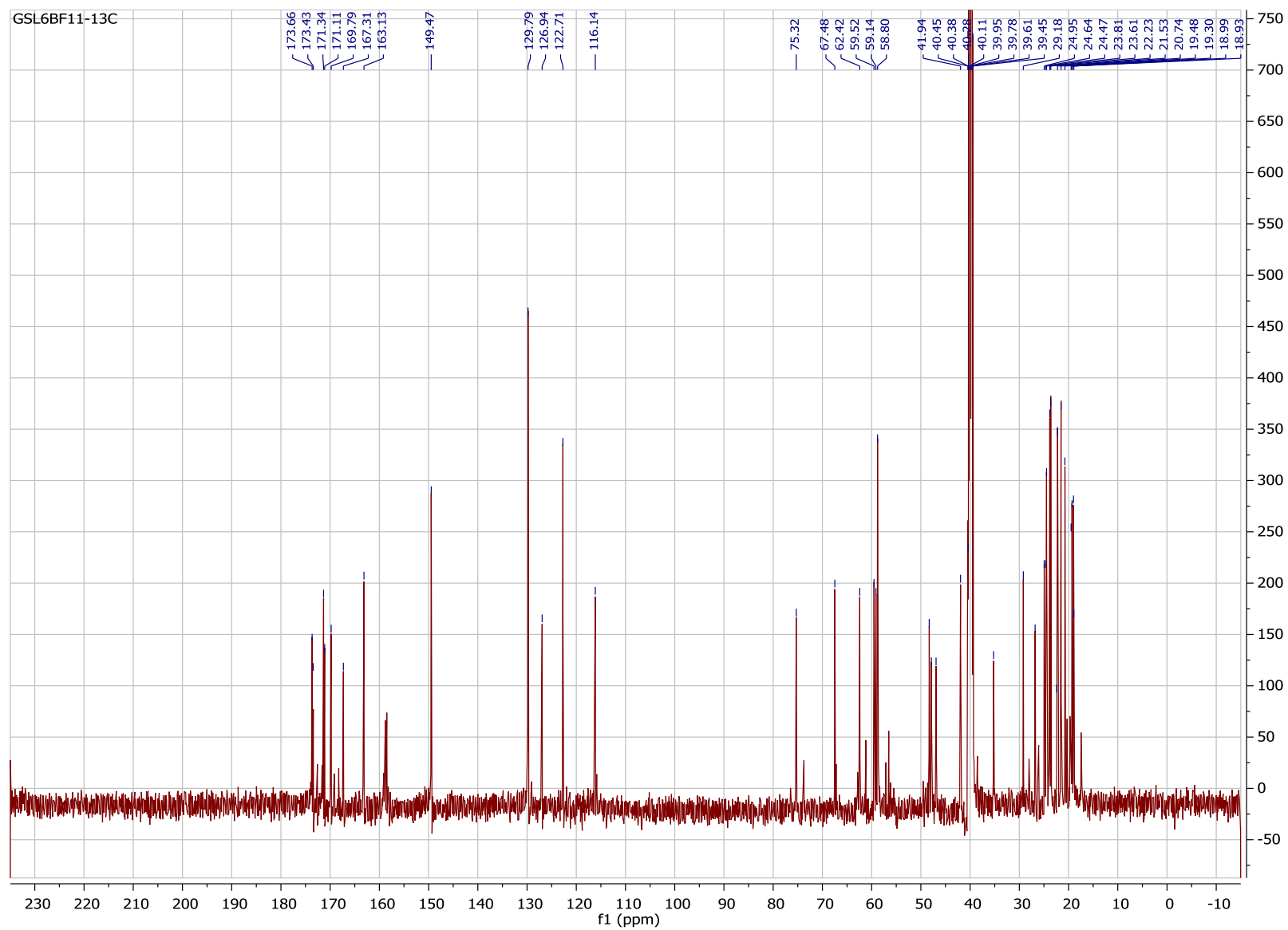


99 **Figure S14.** ^1H NMR spectrum of compound **2** in $\text{DMSO}-d_6$



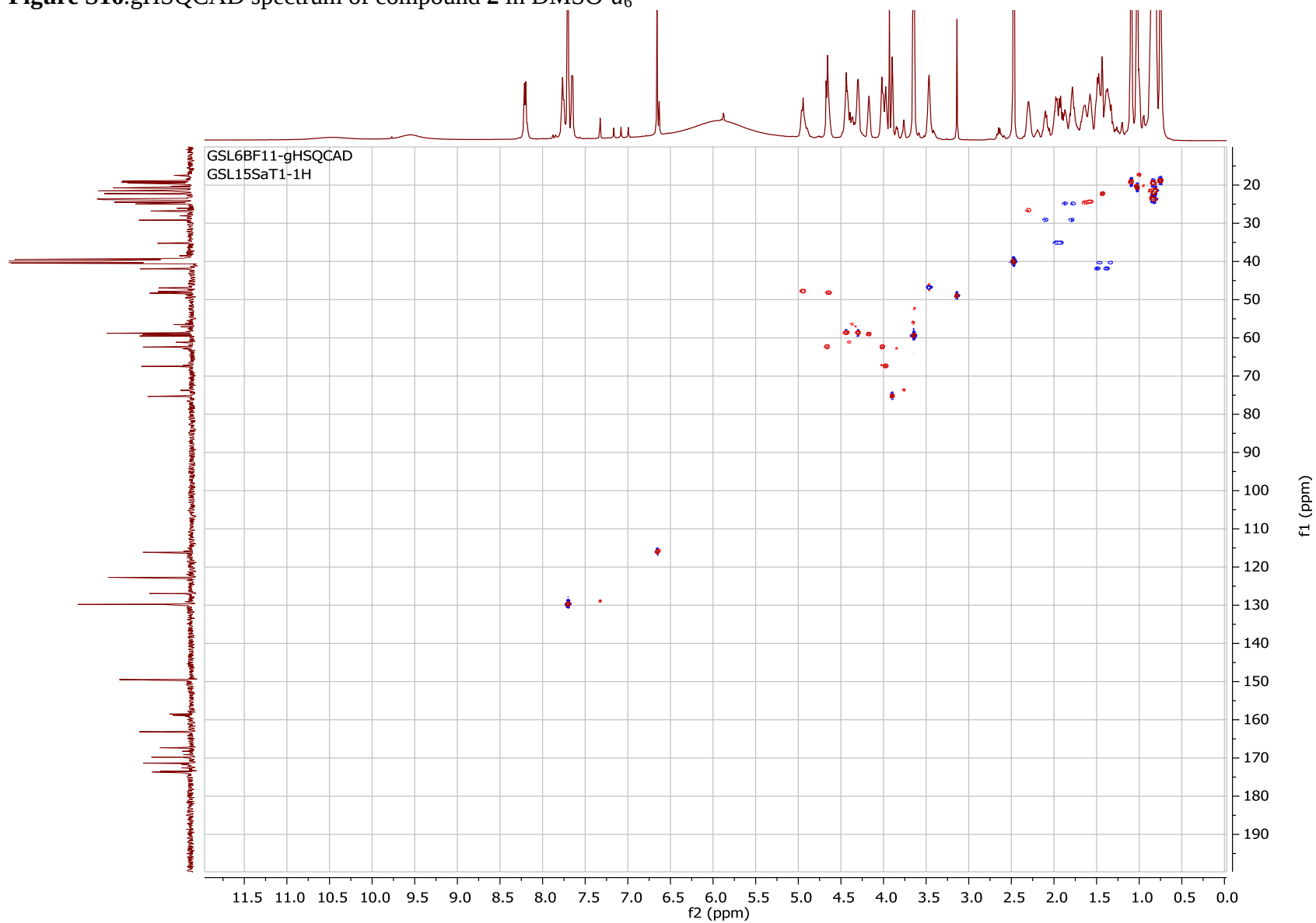
101 **Figure S15.** ^{13}C NMR spectrum of compound 2 in $\text{DMSO-}d_6$

102

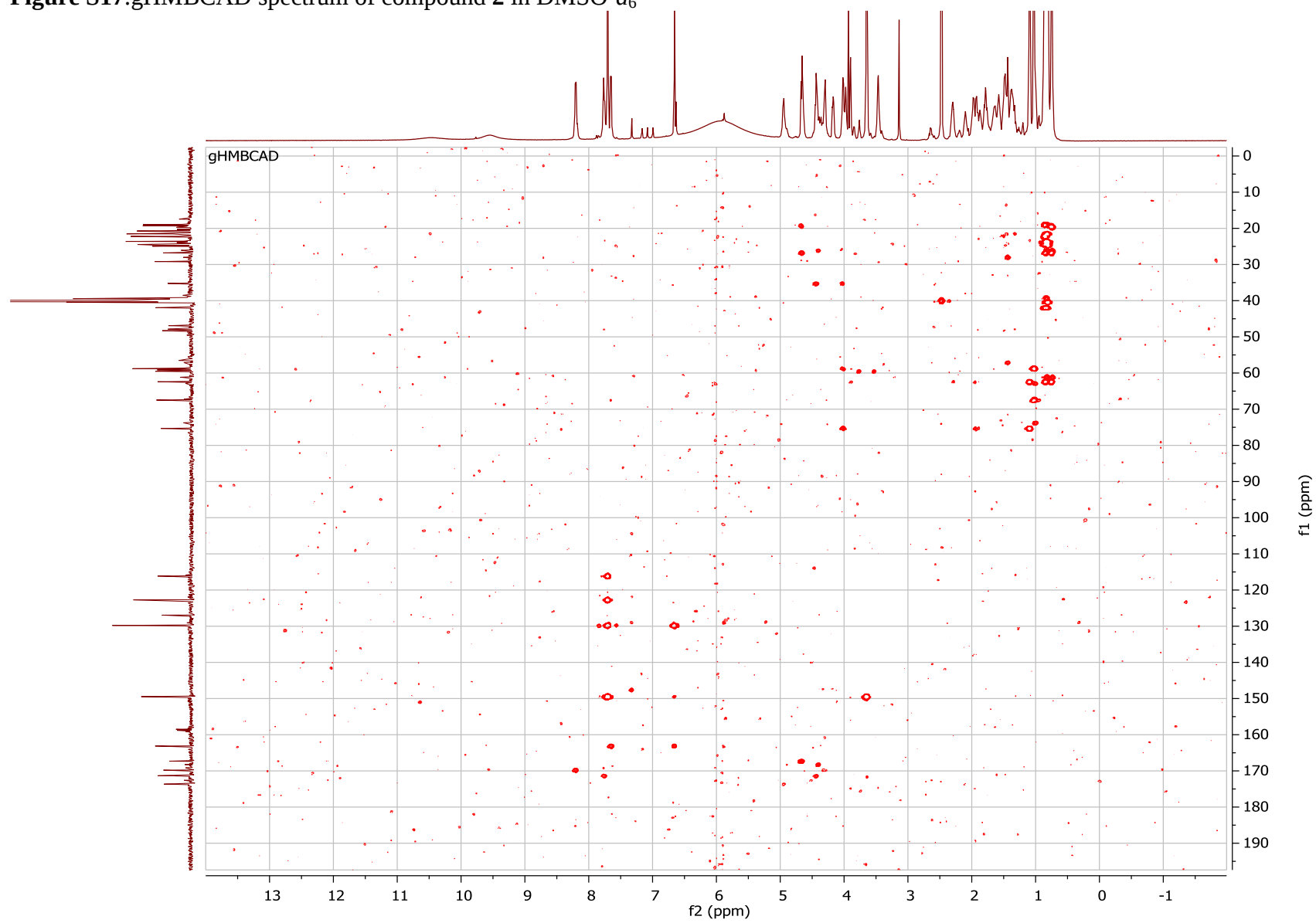


103

104 **Figure S16.**gHSQCAD spectrum of compound 2 in DMSO- d_6



107 **Figure S17.**gHMBCAD spectrum of compound 2 in DMSO- d_6



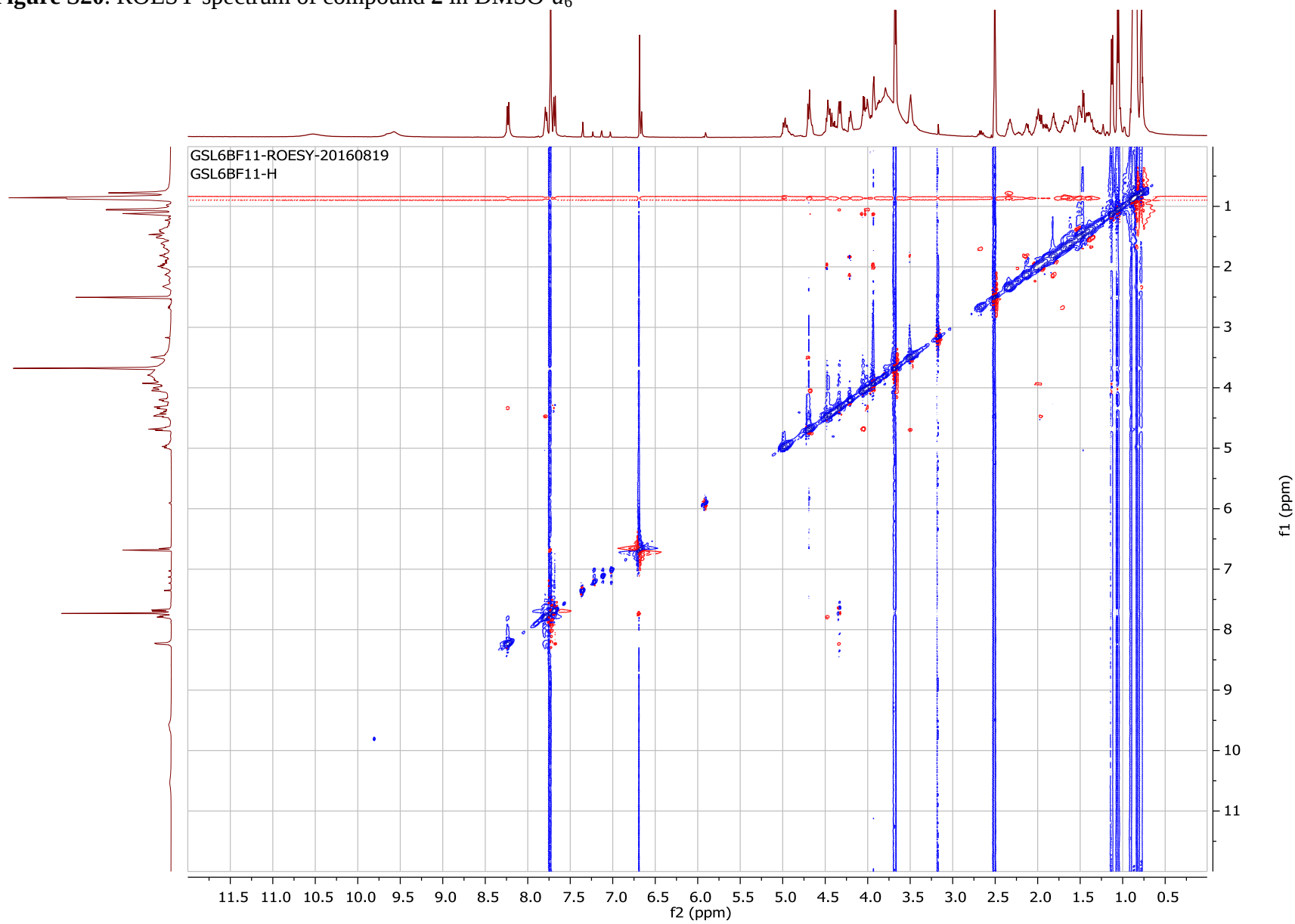
108



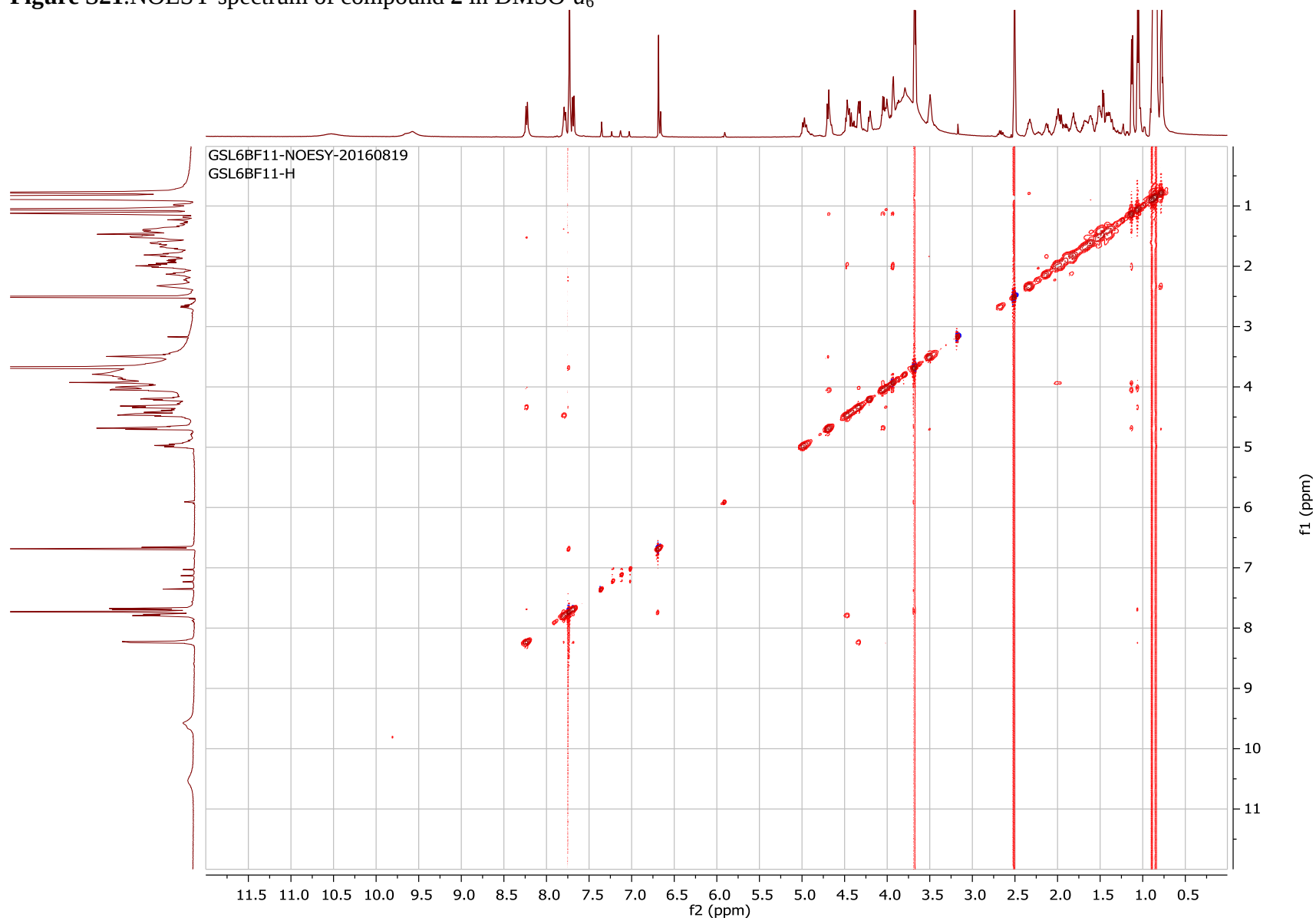
112



113 **Figure S20.** ROESY spectrum of compound 2 in DMSO- d_6



115 **Figure S21.**NOESY spectrum of compound 2 in DMSO- d_6

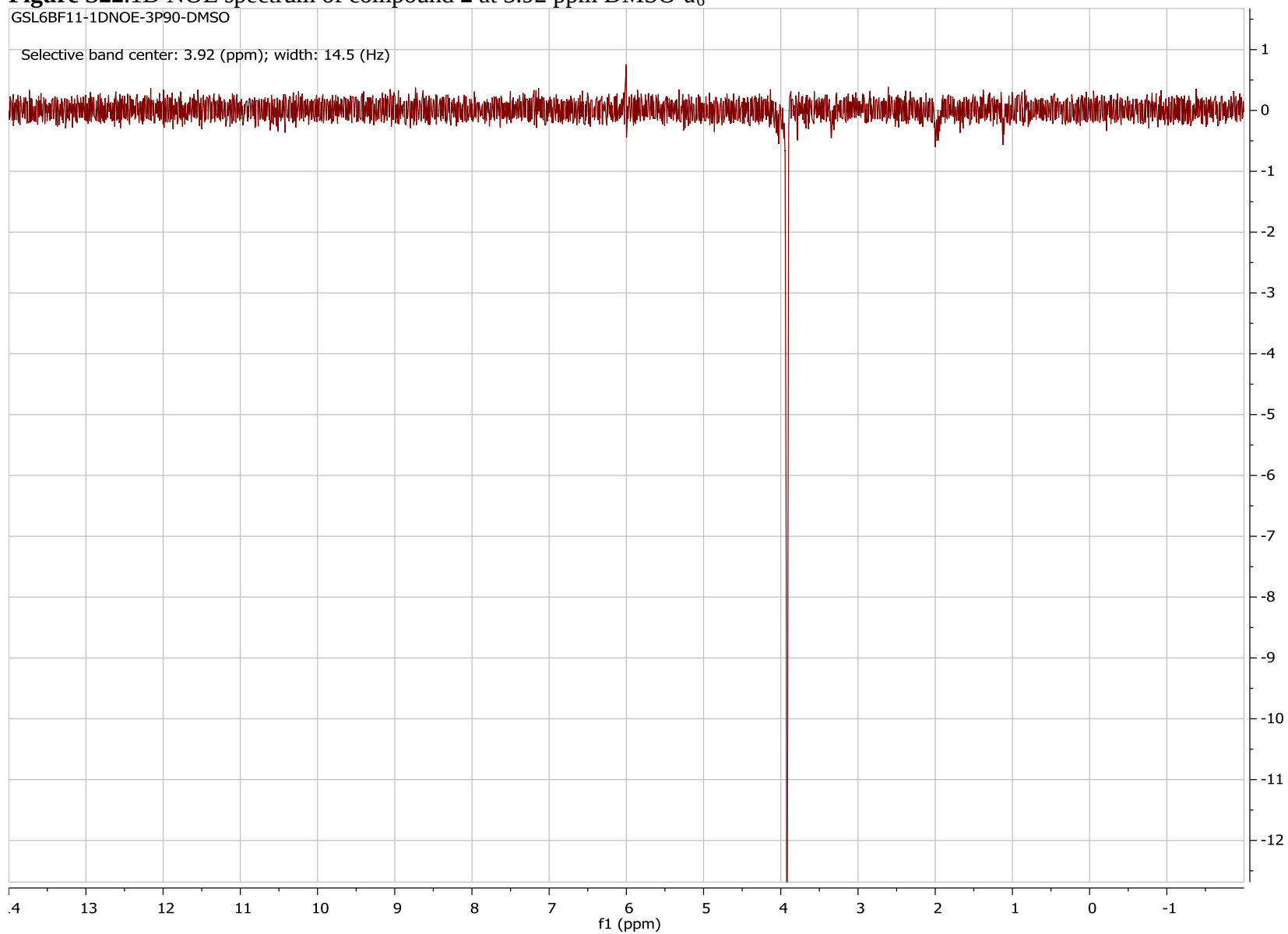


116

117 **Figure S22.1D** NOE spectrum of compound 2 at 3.92 ppm DMSO- d_6

GSL6BF11-1DNOE-3P90-DMSO

Selective band center: 3.92 (ppm); width: 14.5 (Hz)



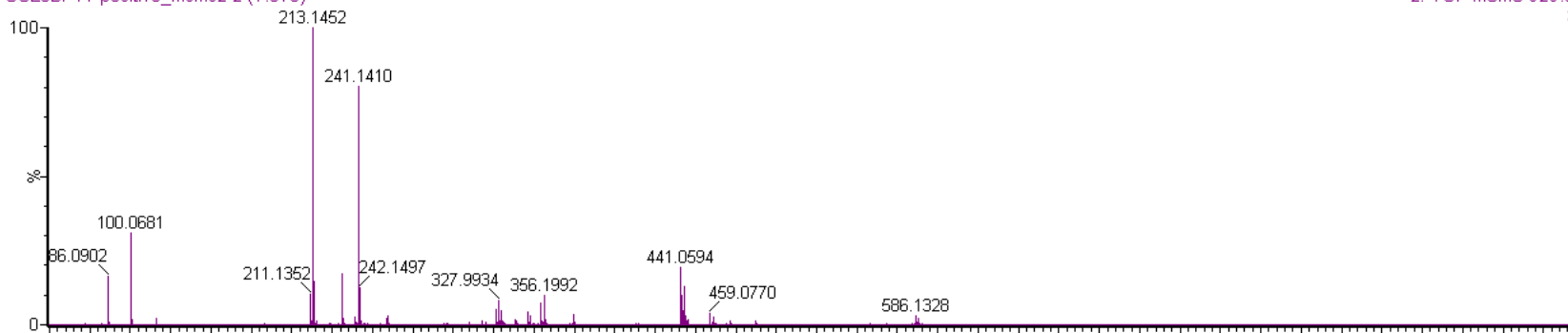
118

119 **Figure S23.** Main fragment ions observed in the HRESIMS/MS Spectrum of compound 2

MeOH blank

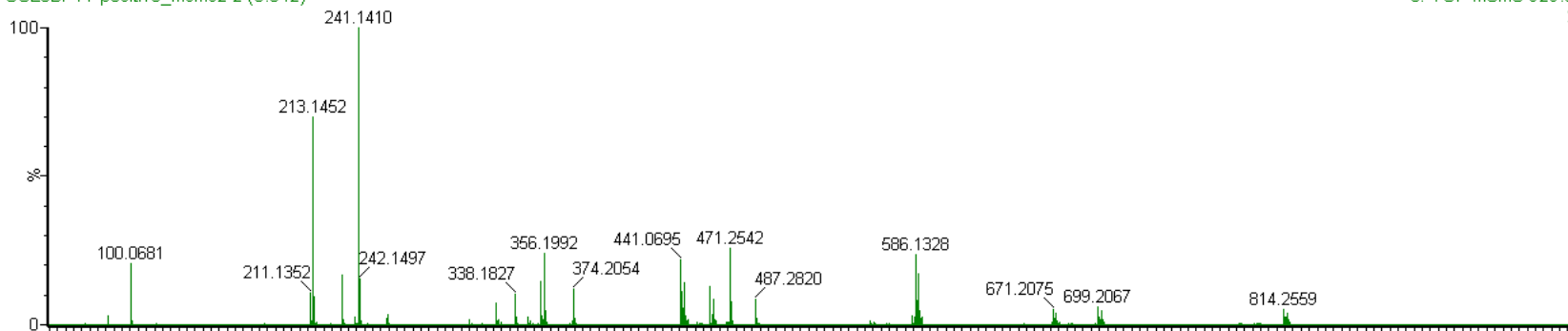
GSL6BF11-positive_msms2 2 (7.873)

2: TOF MSMS 929.30ES+
3.11e4



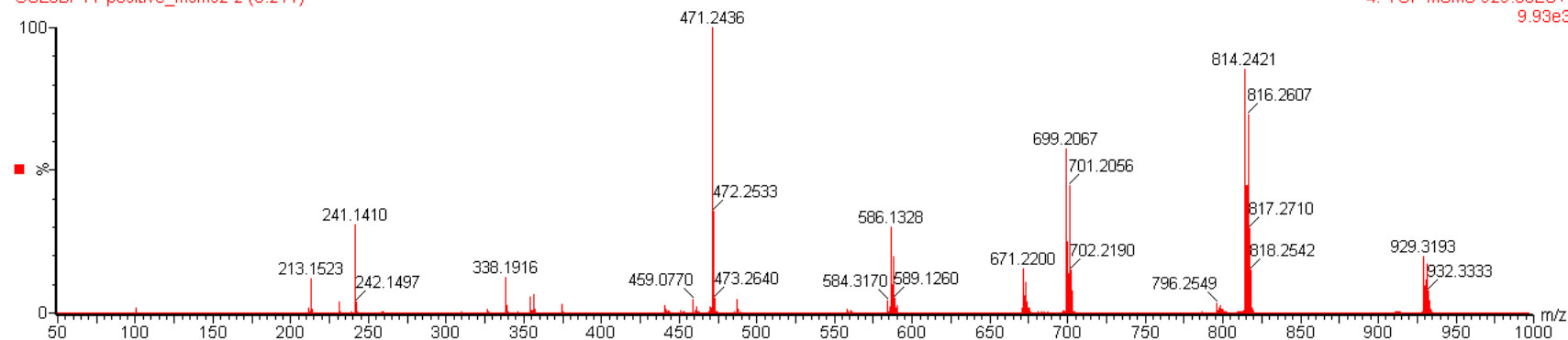
GSL6BF11-positive_msms2 2 (8.042)

3: TOF MSMS 929.30ES+
2.28e4



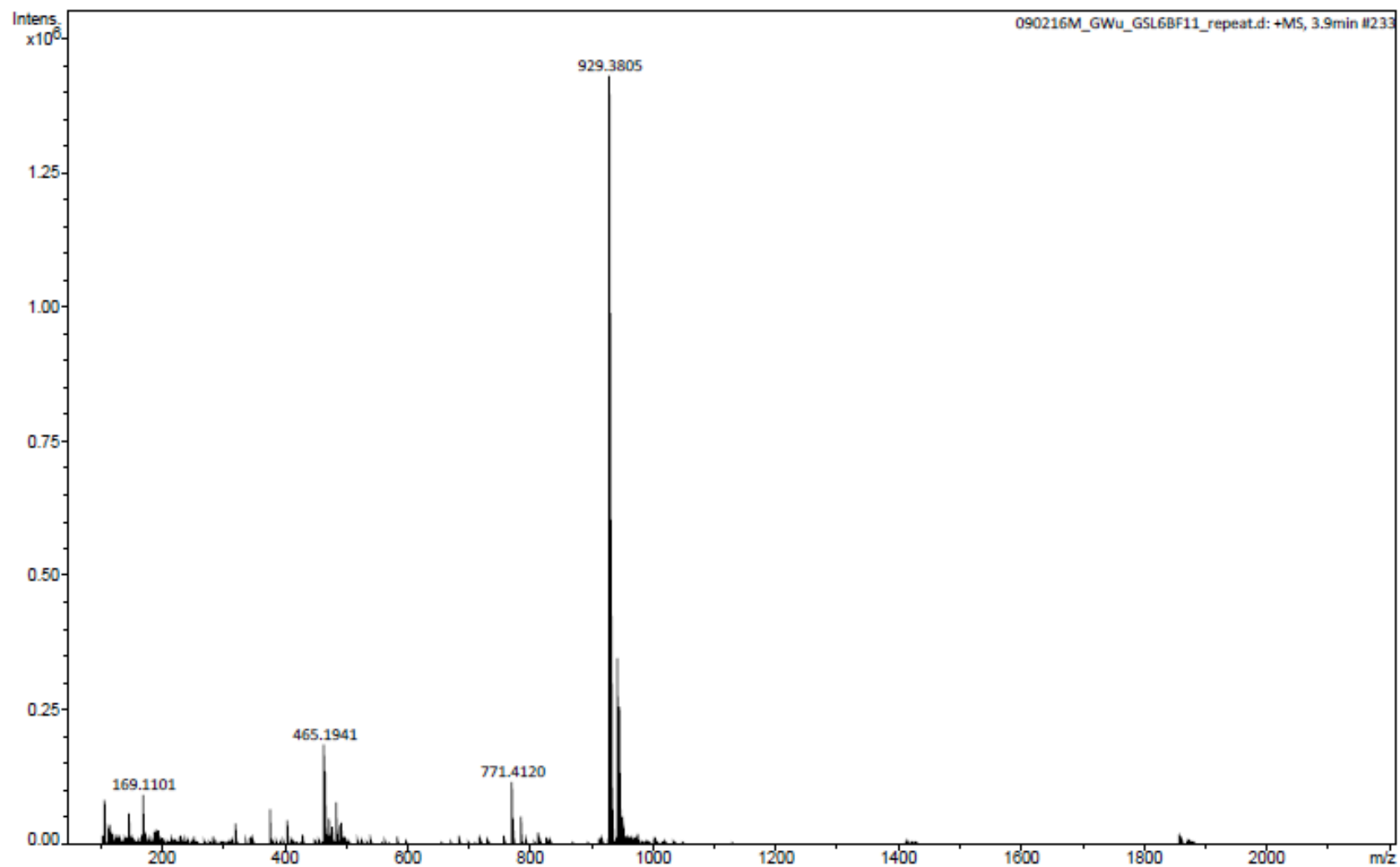
GSL6BF11-positive_msms2 2 (8.211)

4: TOF MSMS 929.30ES+
9.93e3



121 **Figure S24.** HR(+)⁺ESIMS of compound 2

122



123

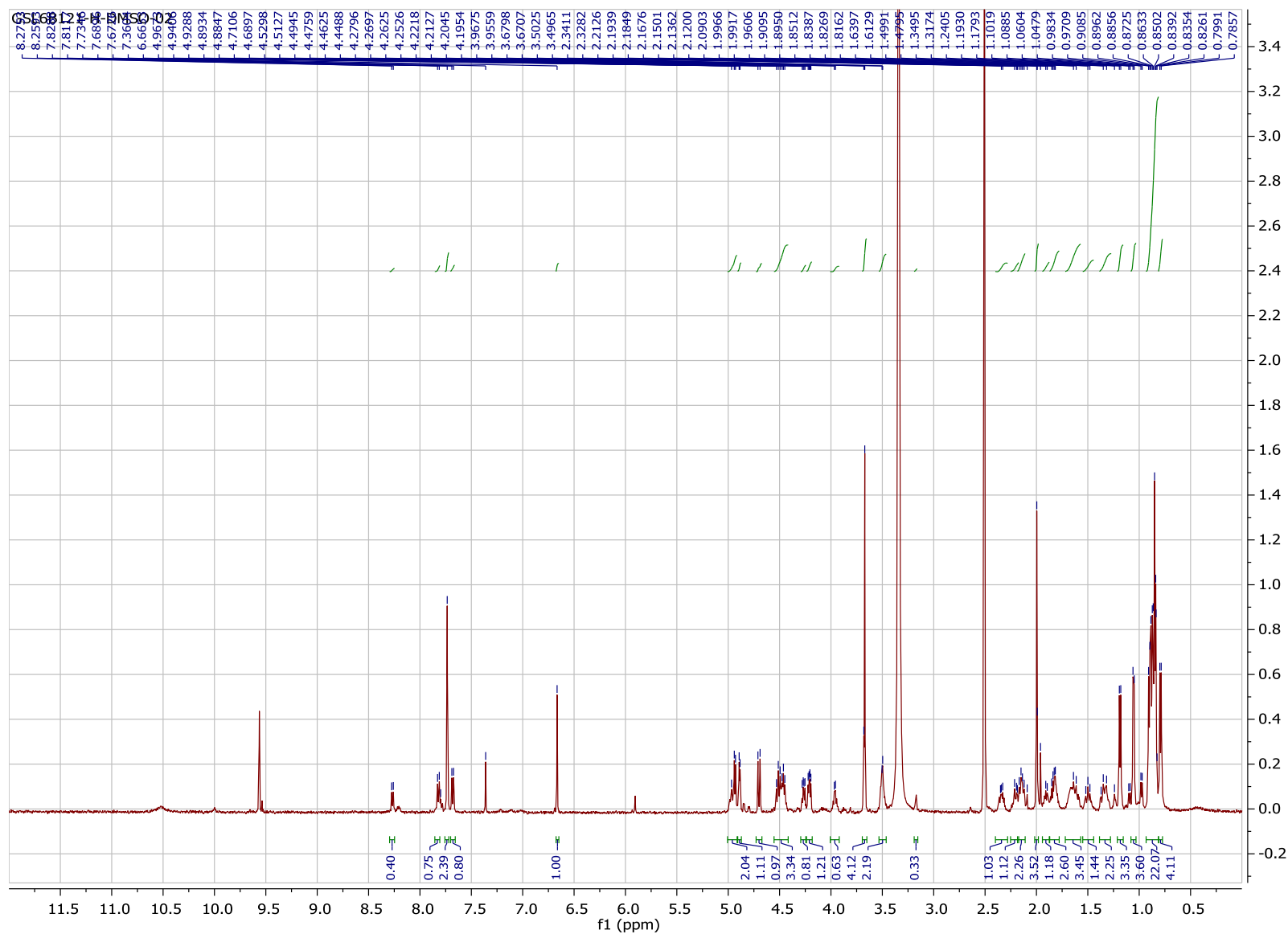
124

125

126

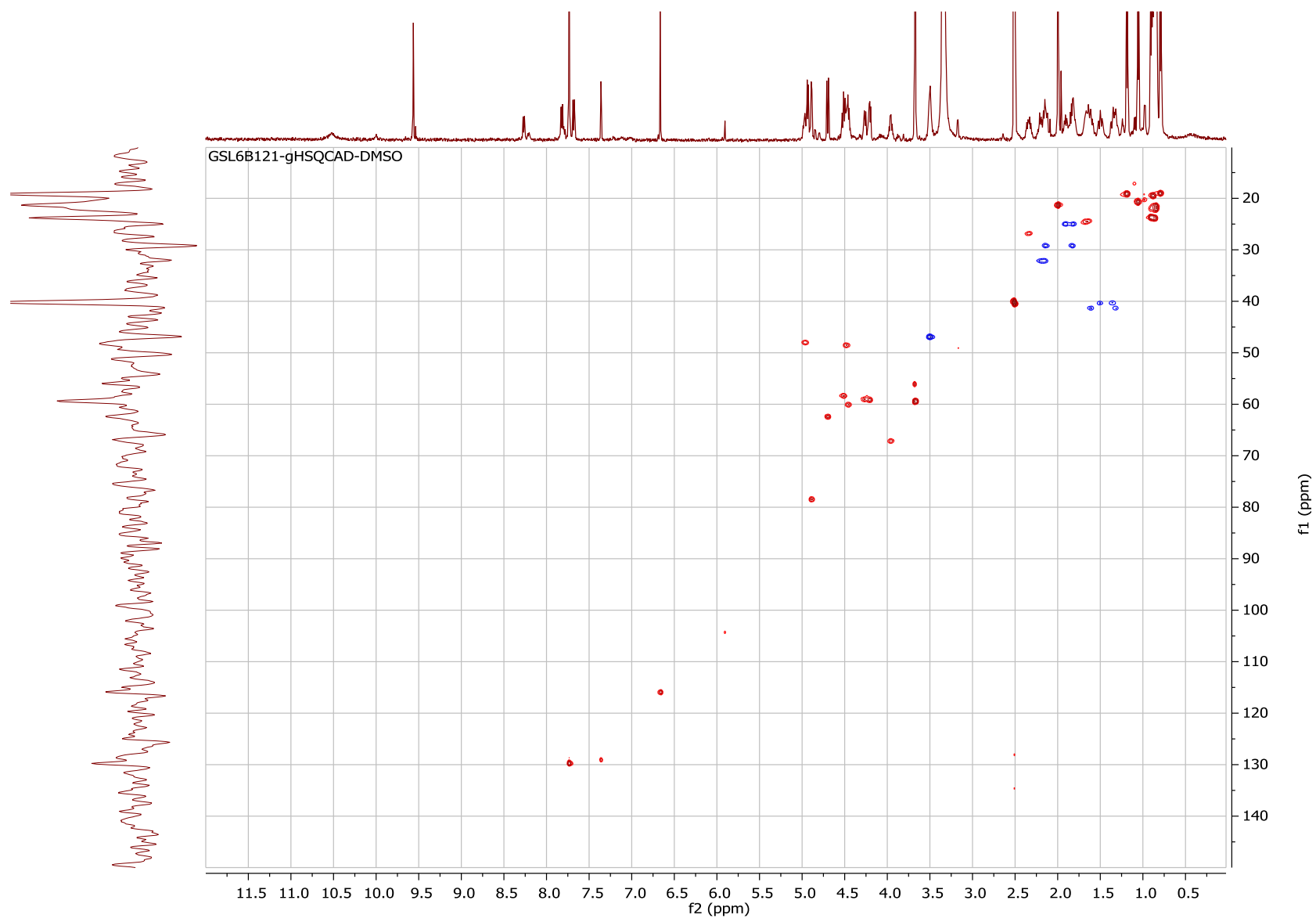
127 **Figure S25.** ^1H NMR spectrum of compound **3** in $\text{DMSO}-d_6$

128

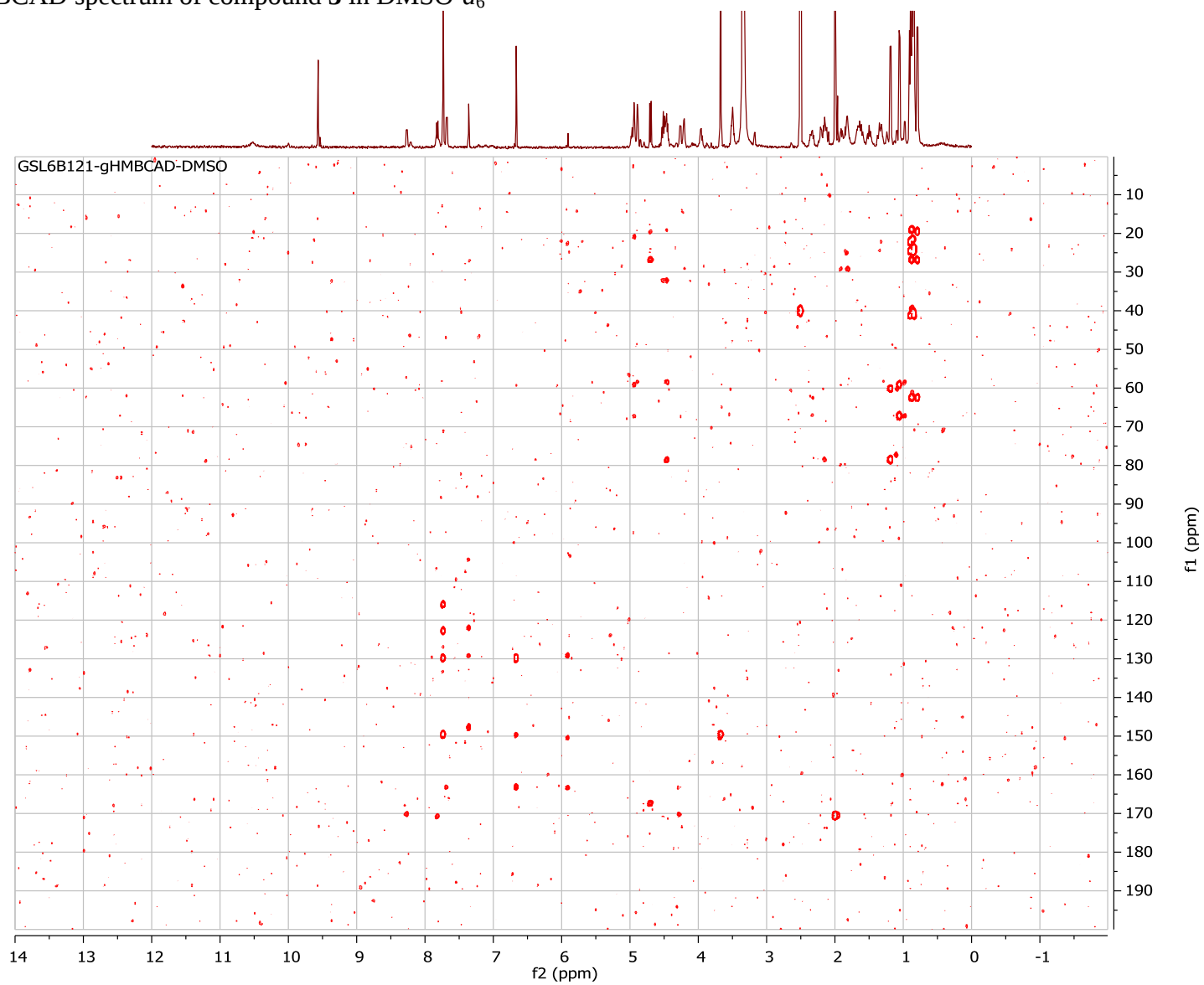


129

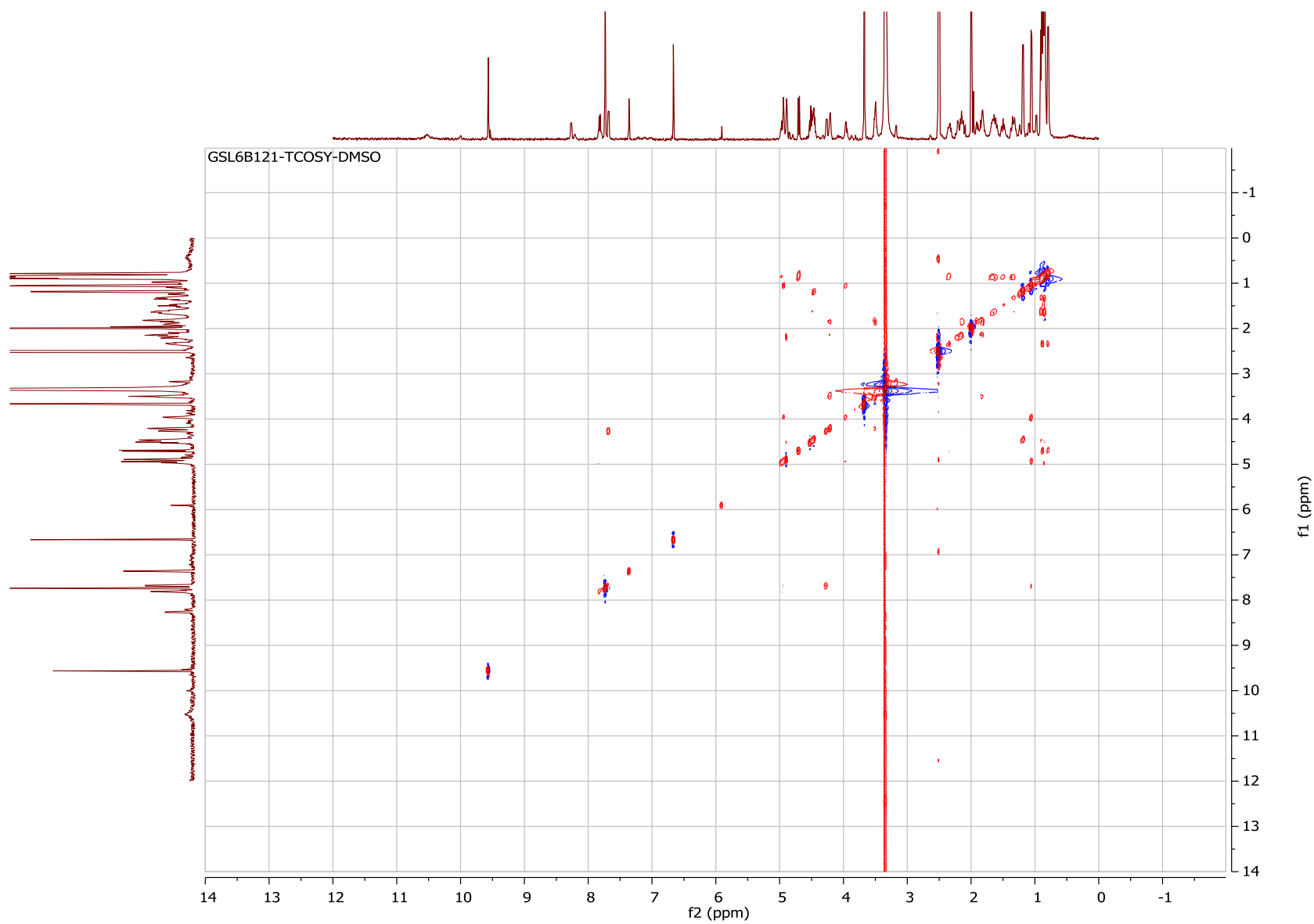
130 **Figure S26.** gHSQCAD spectrum of compound **3** in DMSO-*d*₆
131



133 **Figure S27.**gHMBCAD spectrum of compound **3** in DMSO-*d*₆



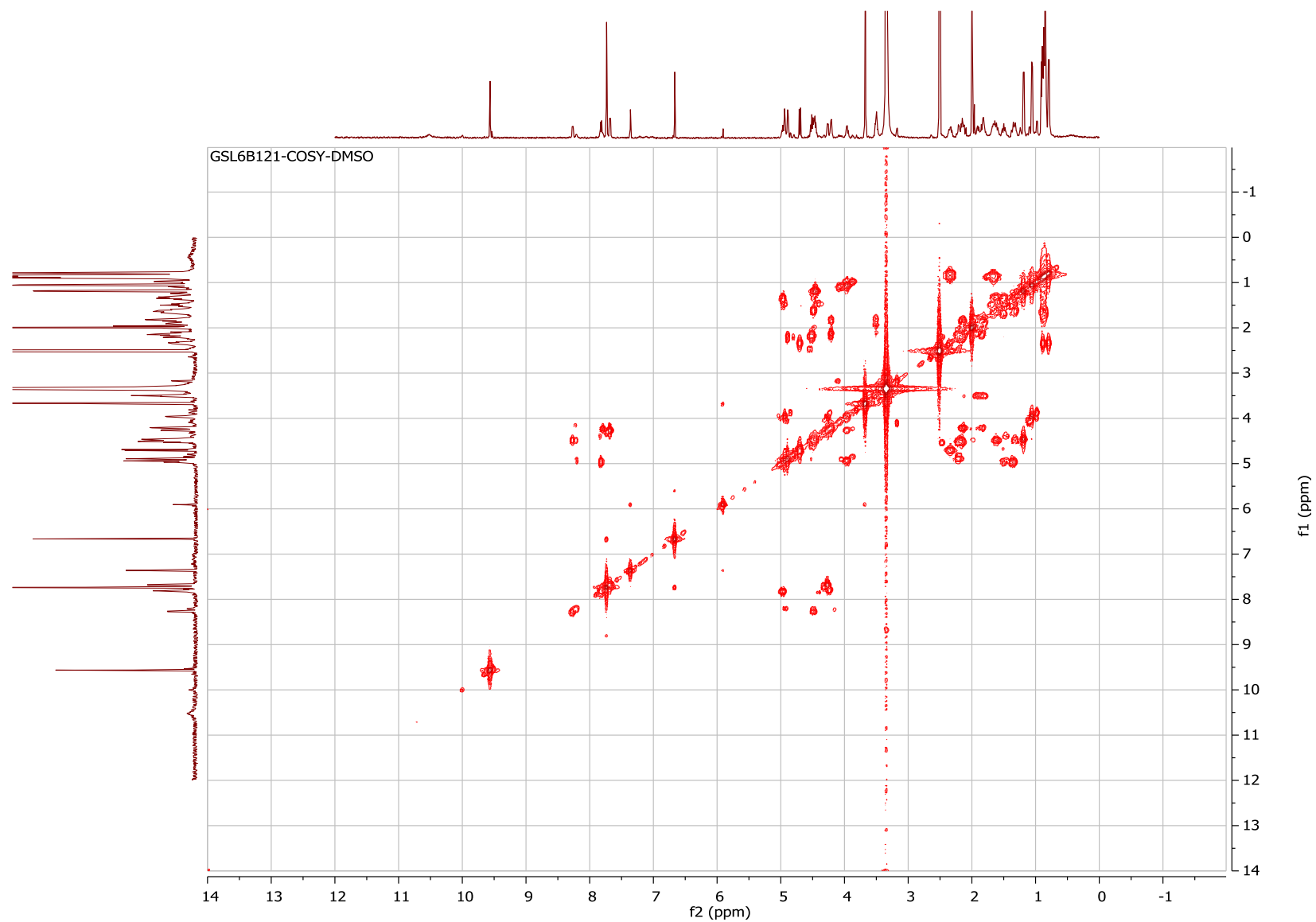
136 **Figure S28.** TOCSY spectrum of compound **3** in DMSO- d_6
137



138

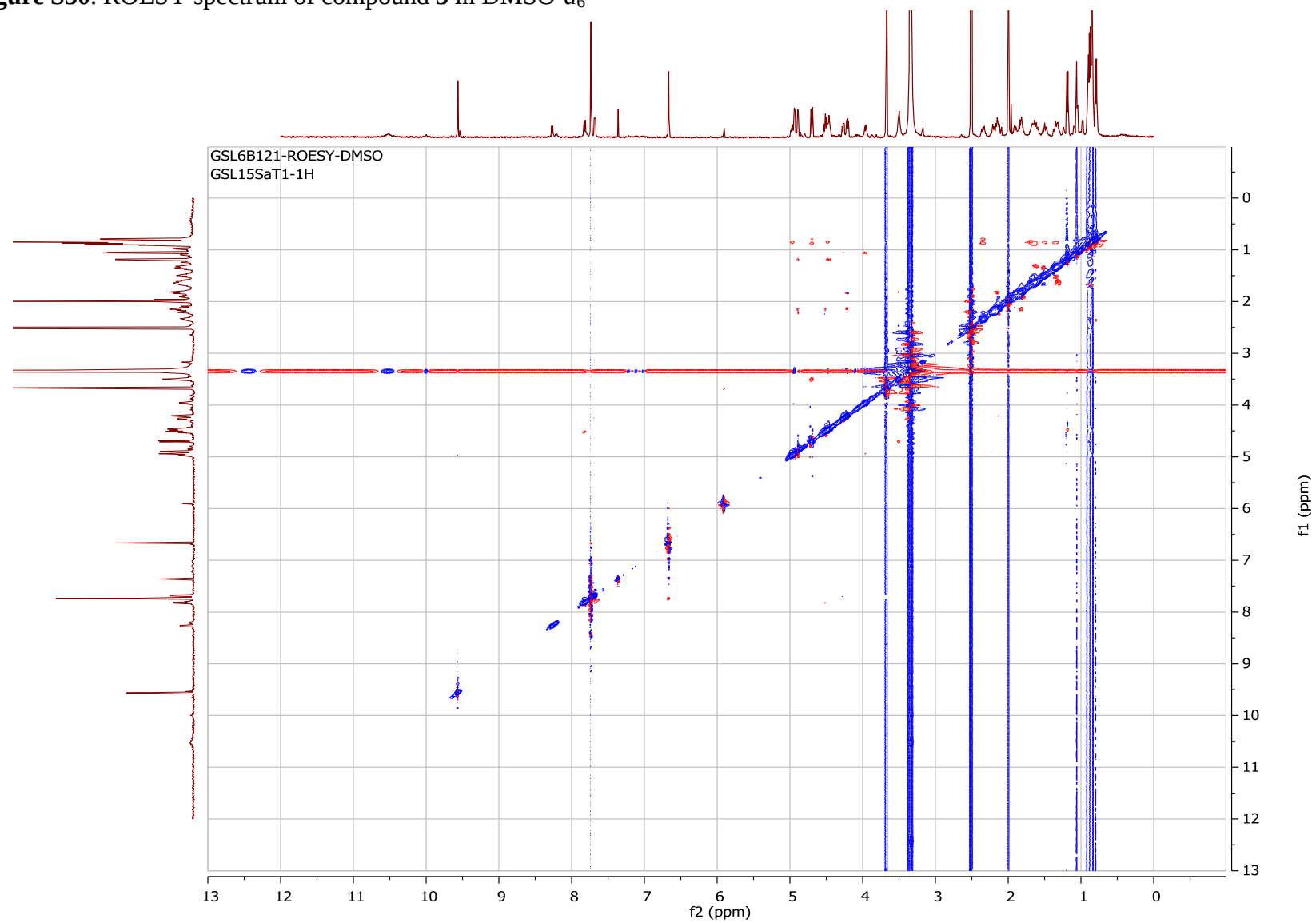
139 **Figure S29.** COSY spectrum of compound **3** in DMSO- d_6

140



141

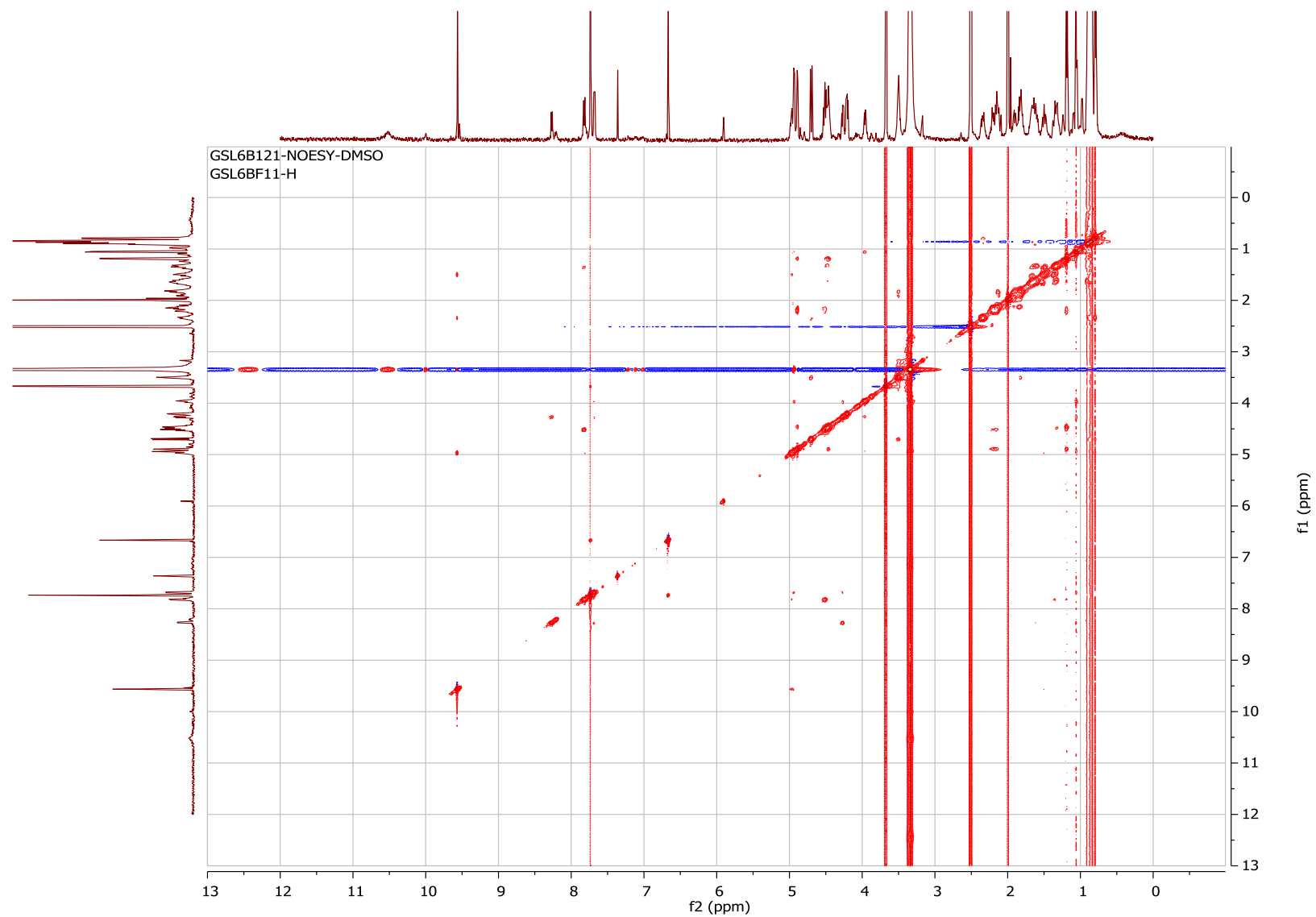
142 **Figure S30.** ROESY spectrum of compound **3** in DMSO- d_6



143
144

145 **Figure S31.**NOESY spectrum of compound **3** in DMSO-*d*₆

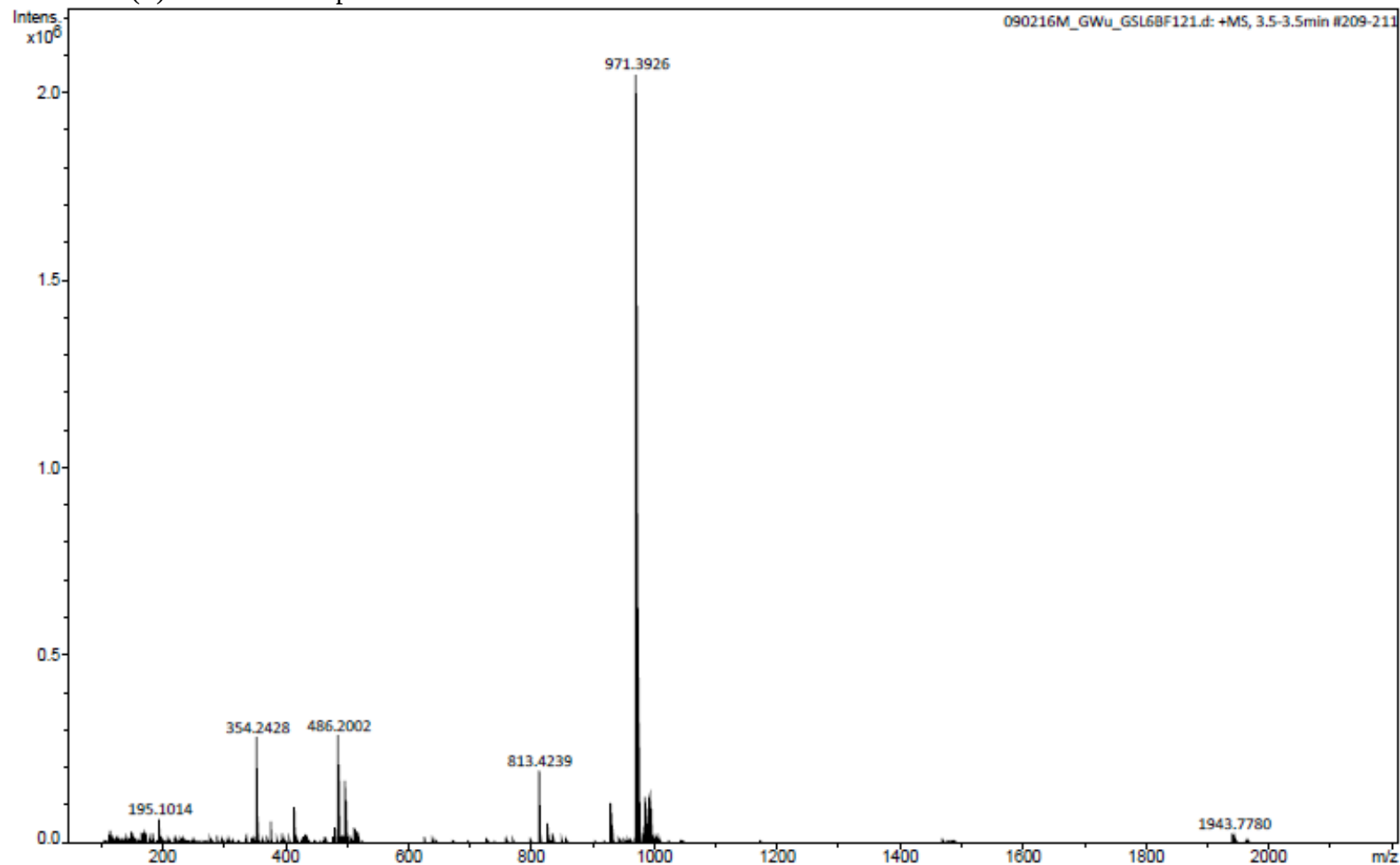
146



147

148

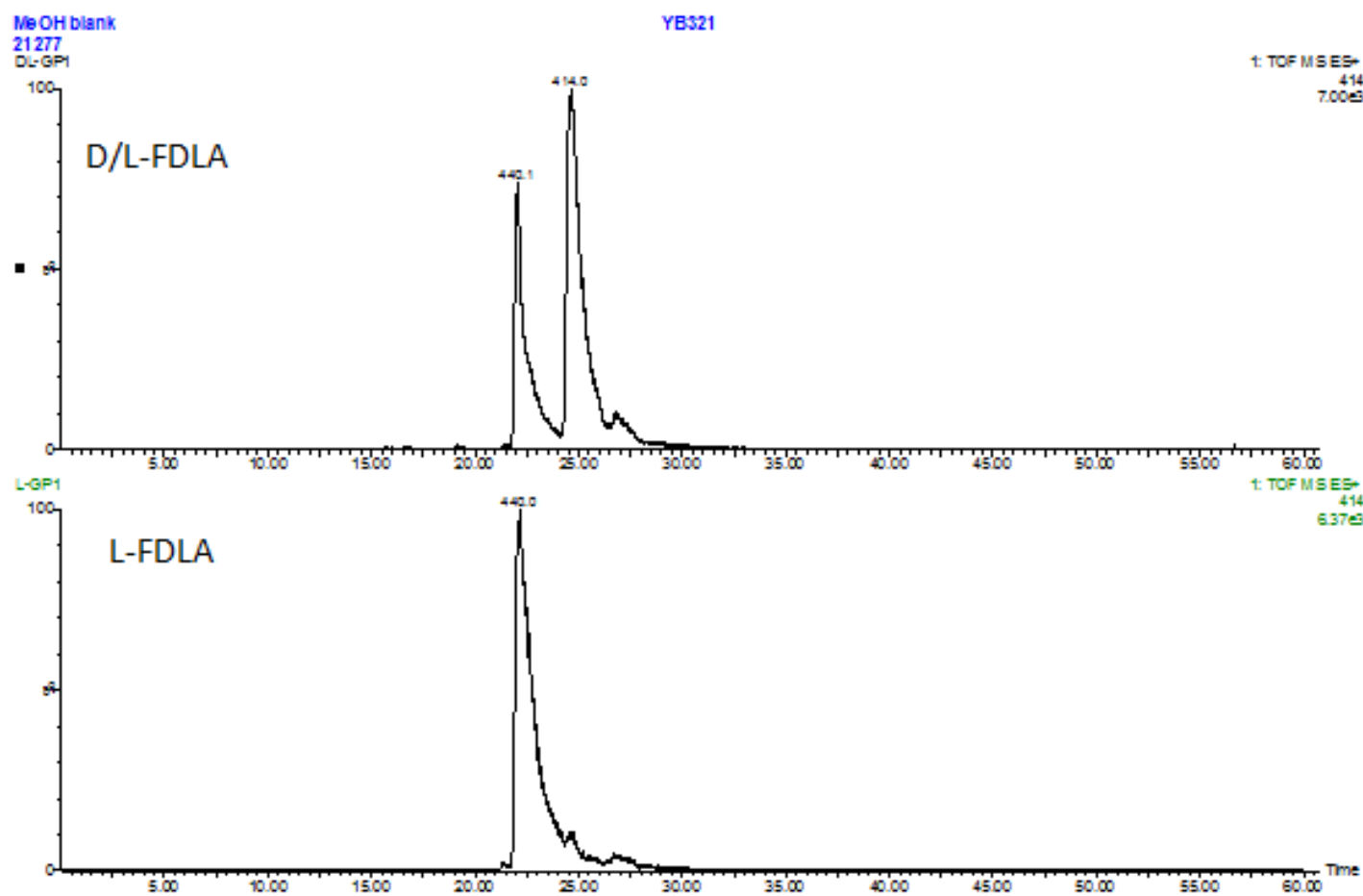
149 **Figure S32.** HR(+)^{ESI}MS of compound **3**



150
151
152
153
154
155
156

157 **Figure S33.**Advanced Marfey's analysis of acid hydrolysate of **1**

158 A)D,L-FDLA-Threonine derivatives in **1**: 414 [M+H]⁺



159

160

161

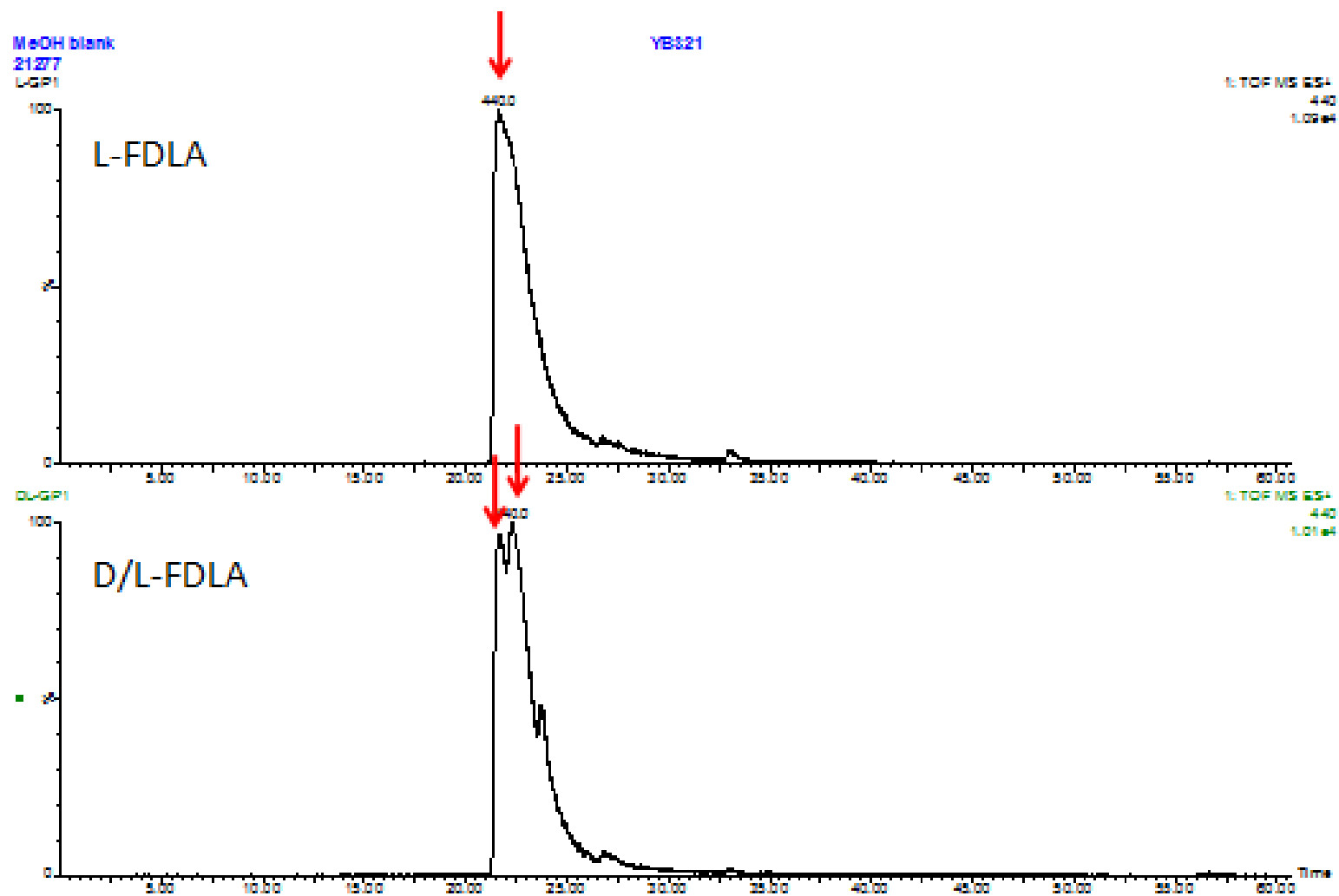
163

164

165



166 C)D,L-FDLA-HMP derivatives in 1: 440 [M+H]⁺

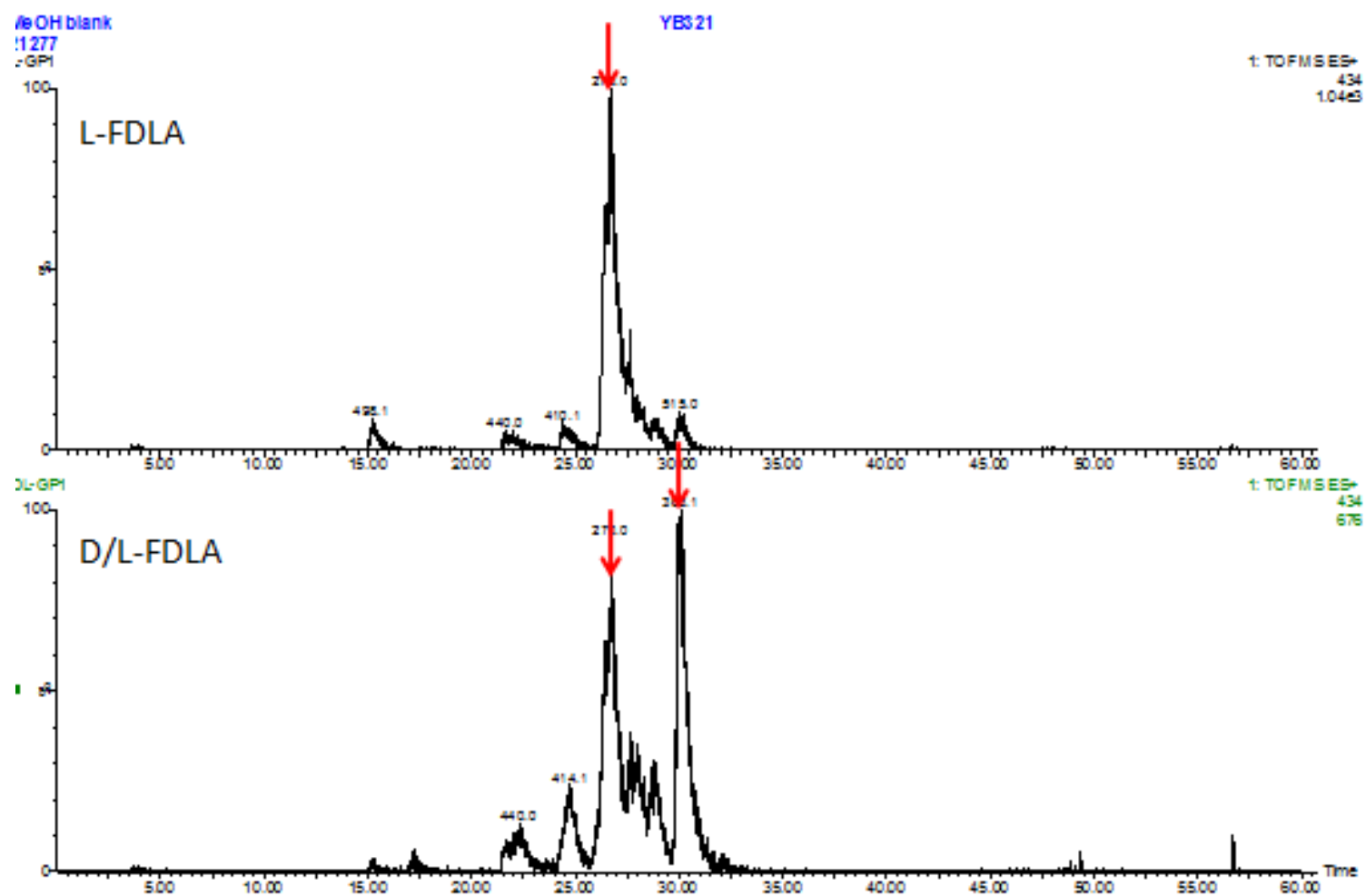


167

168

169 D)D,L-FDLA-Valine derivatives in 1: 434 [M+Na]⁺

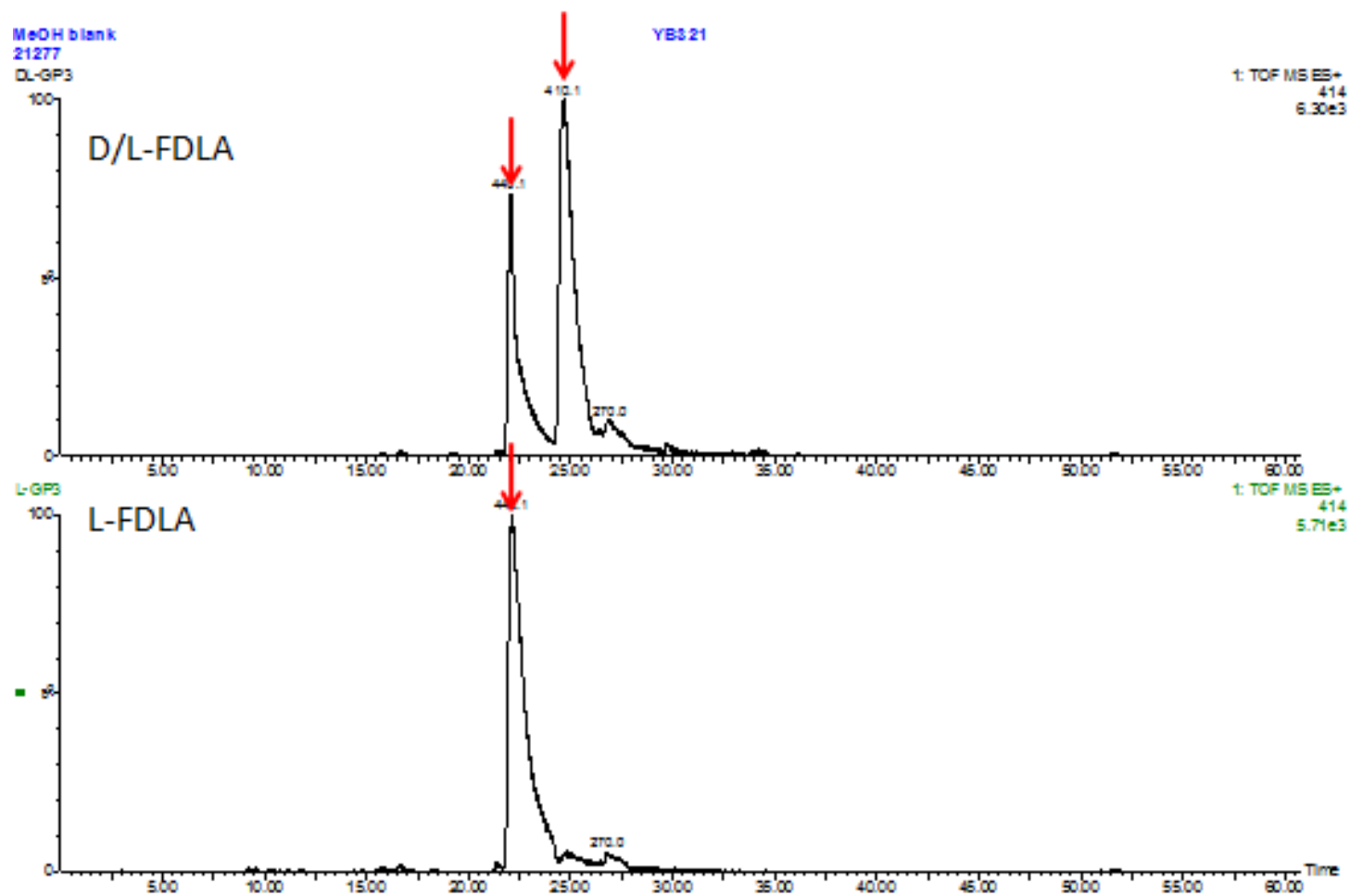
170



171

172 **Figure S34.**Advanced Marfey's analysis of acid hydrolysate of 2

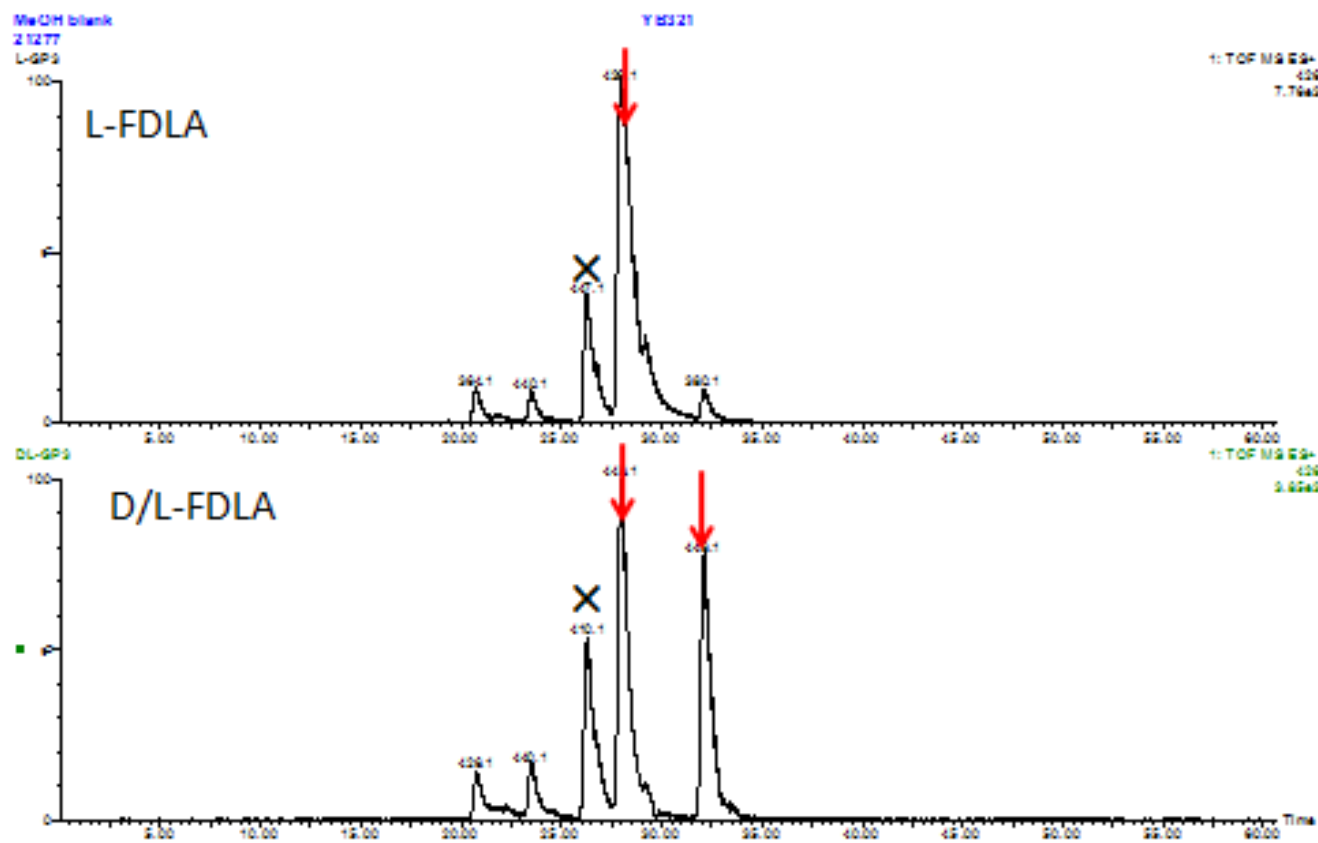
173 A)D,L-FDLA-Threonine derivatives in 2: 414 [M+H]⁺



174

175

176 B)D,L-FDLA-Leucine derivatives in 2: 426 [M+H]⁺



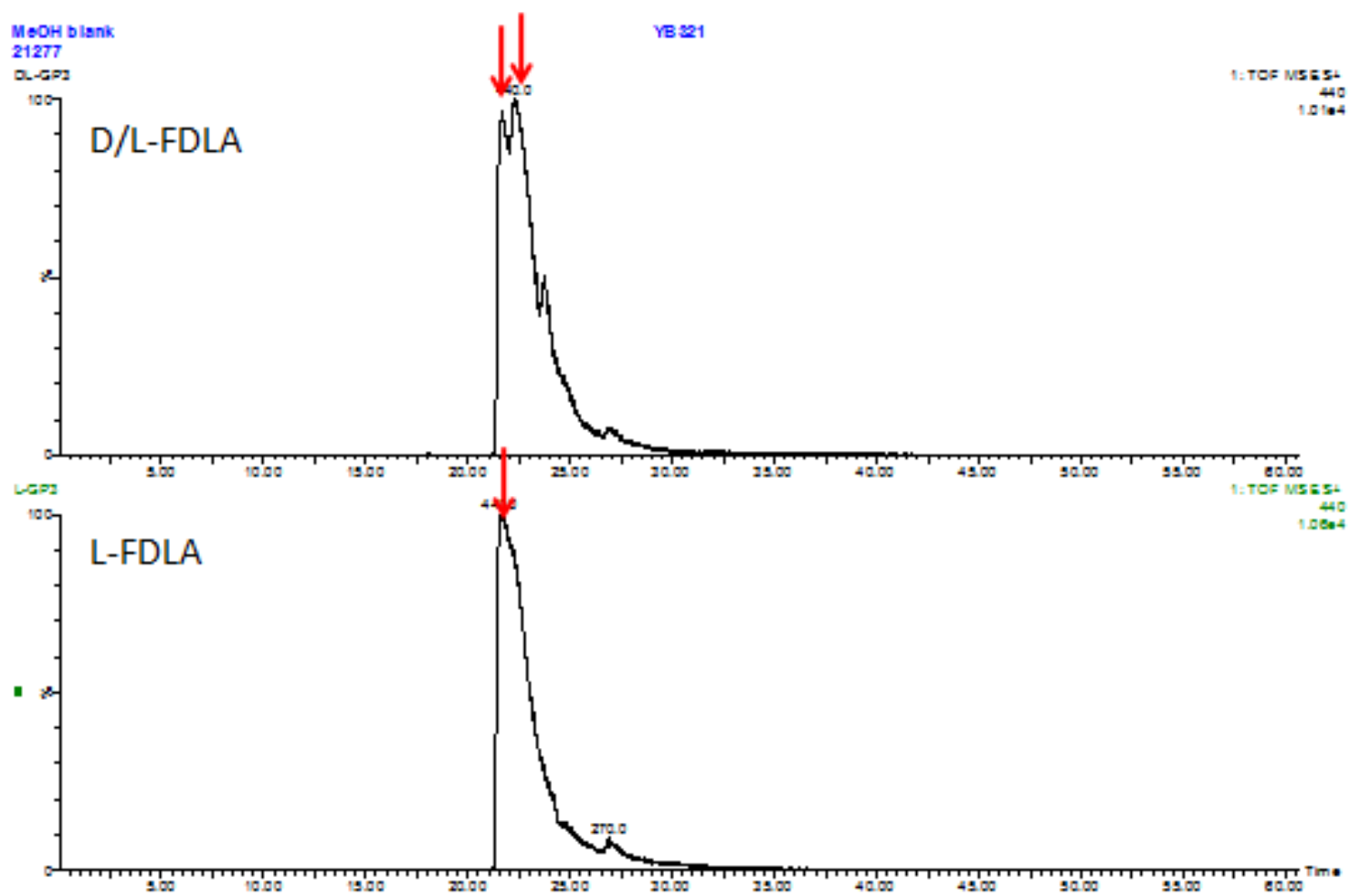
177

178

179

180

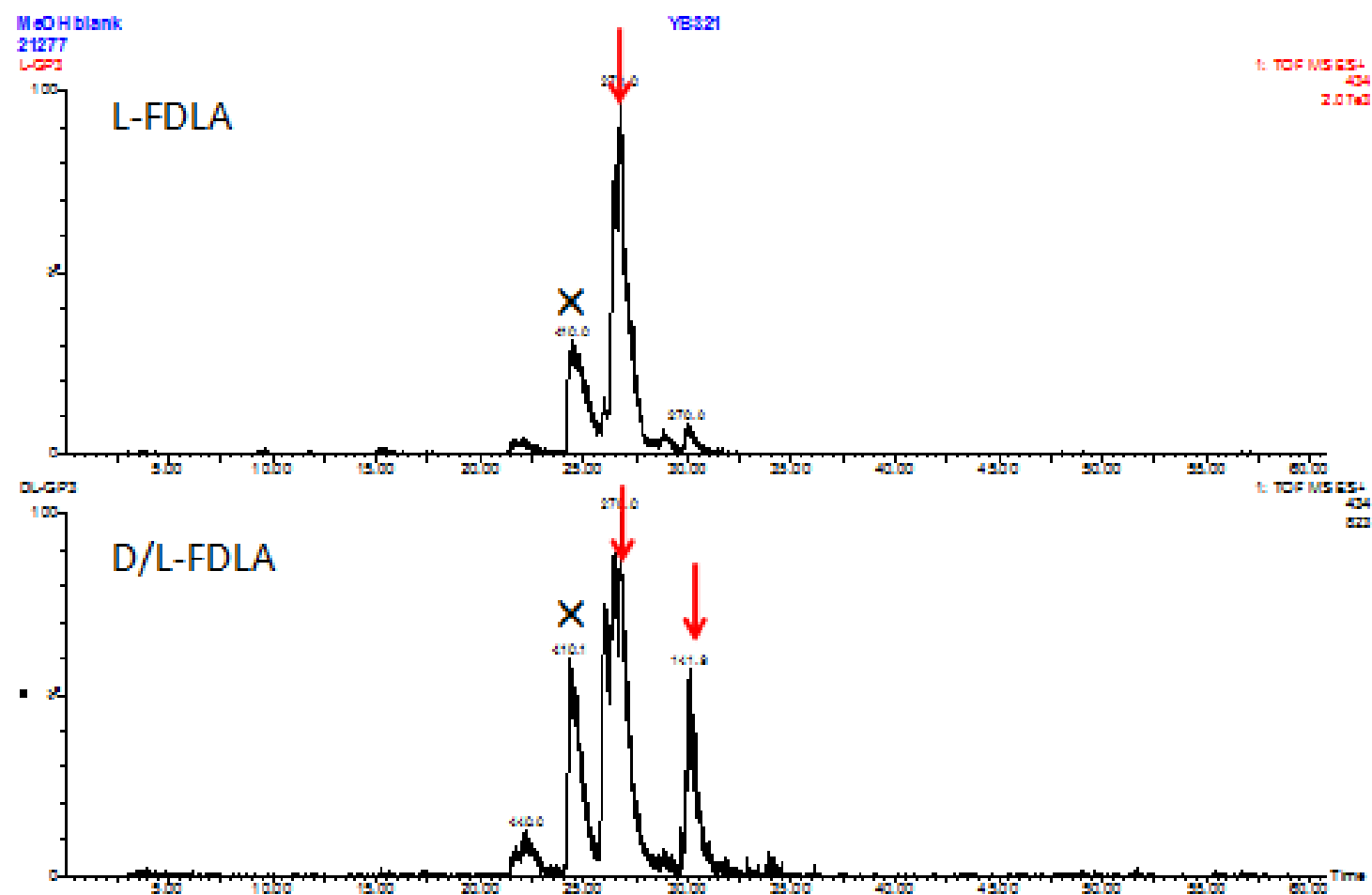
181 C)D,L-FDLA-HMP derivatives in 2: 440 [M+H]⁺



182

183

184 D)D,L-FDLA-Valine derivatives in 2: 434 [M+Na]⁺

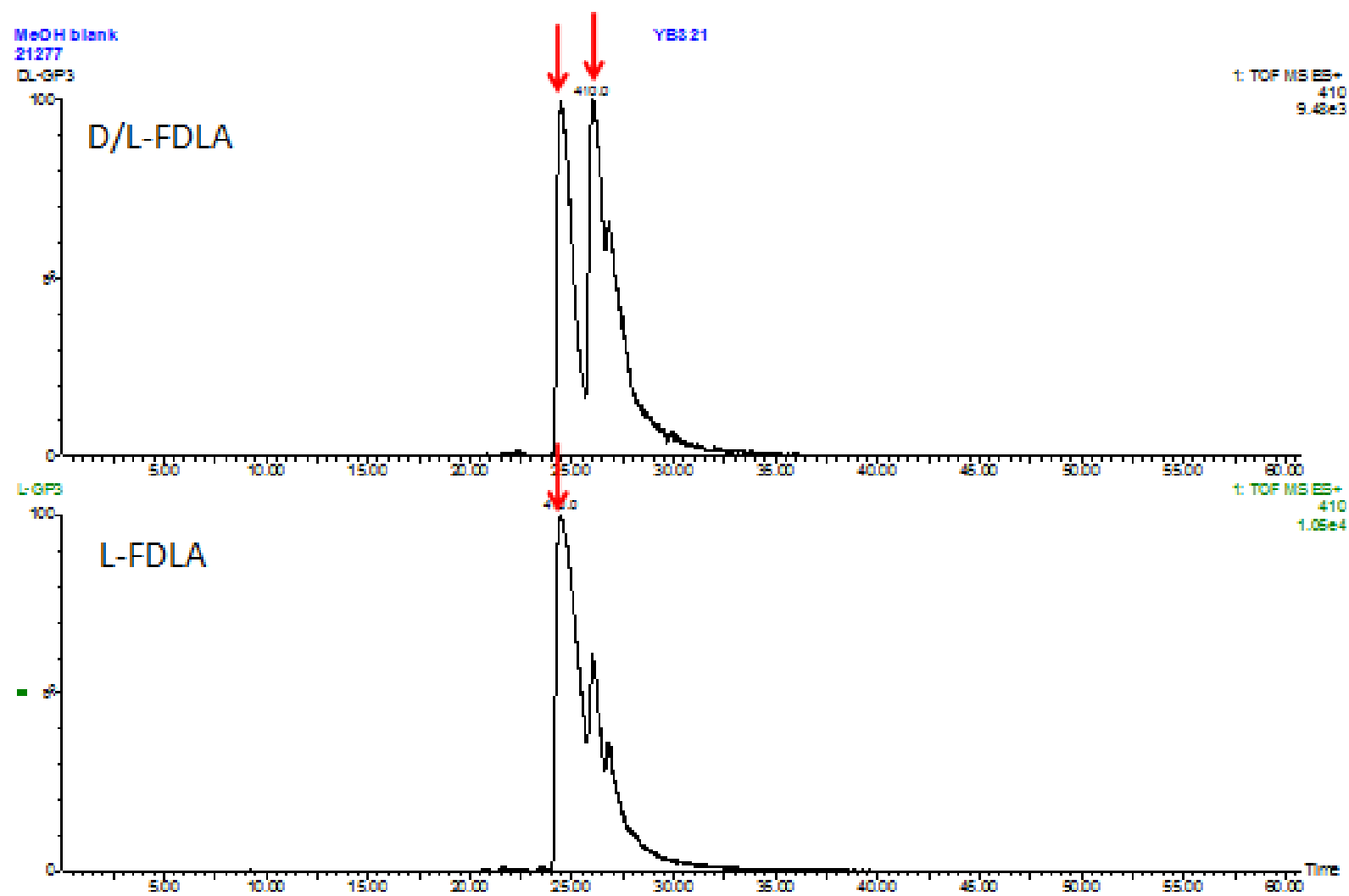


185

186

187

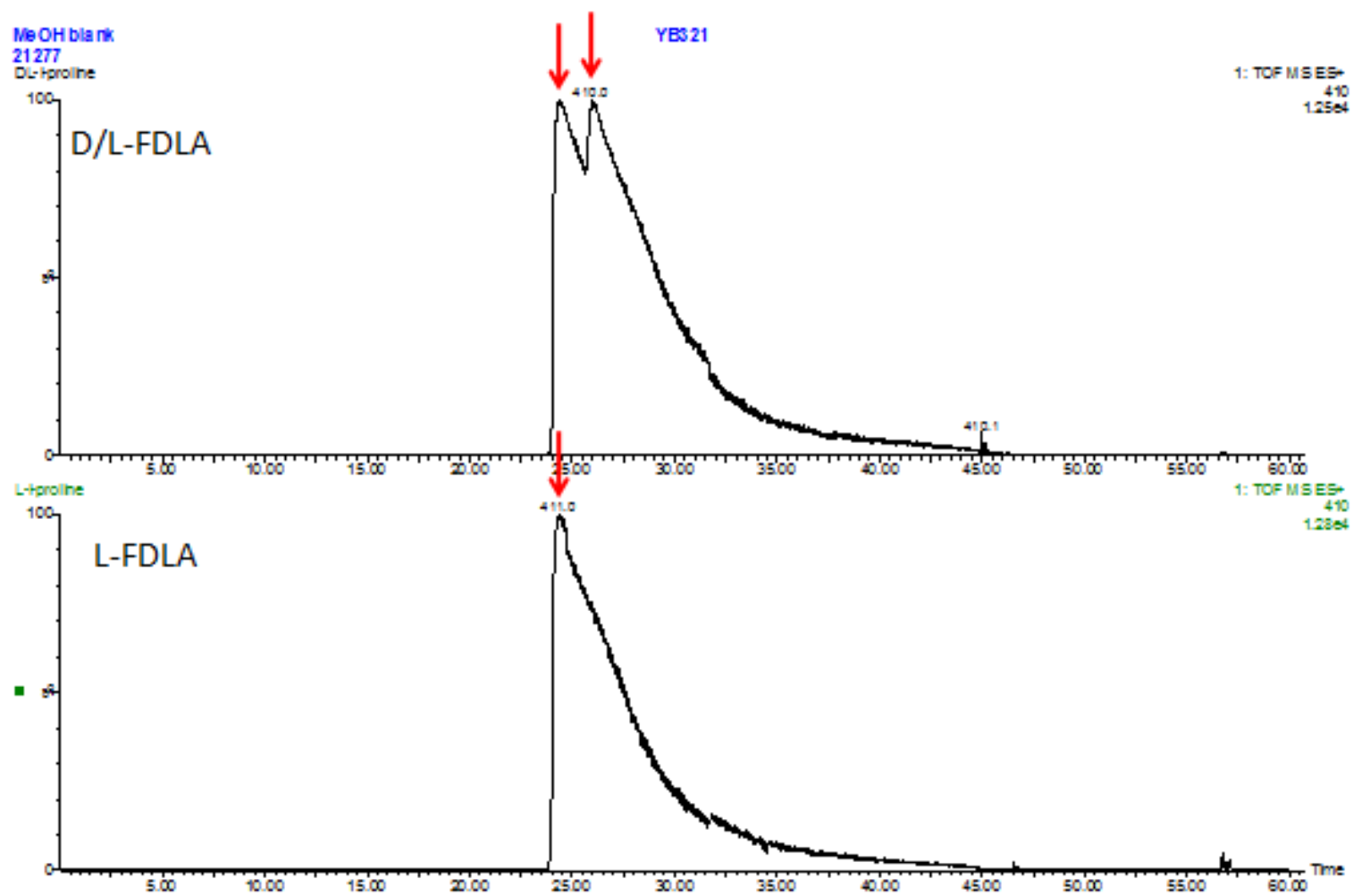
188 E)D,L-FDLA-Proline derivatives in 2: 410 [M+H]⁺



189

190

191 F)D,L-FDLA-Proline standard: 410 [M+H]⁺

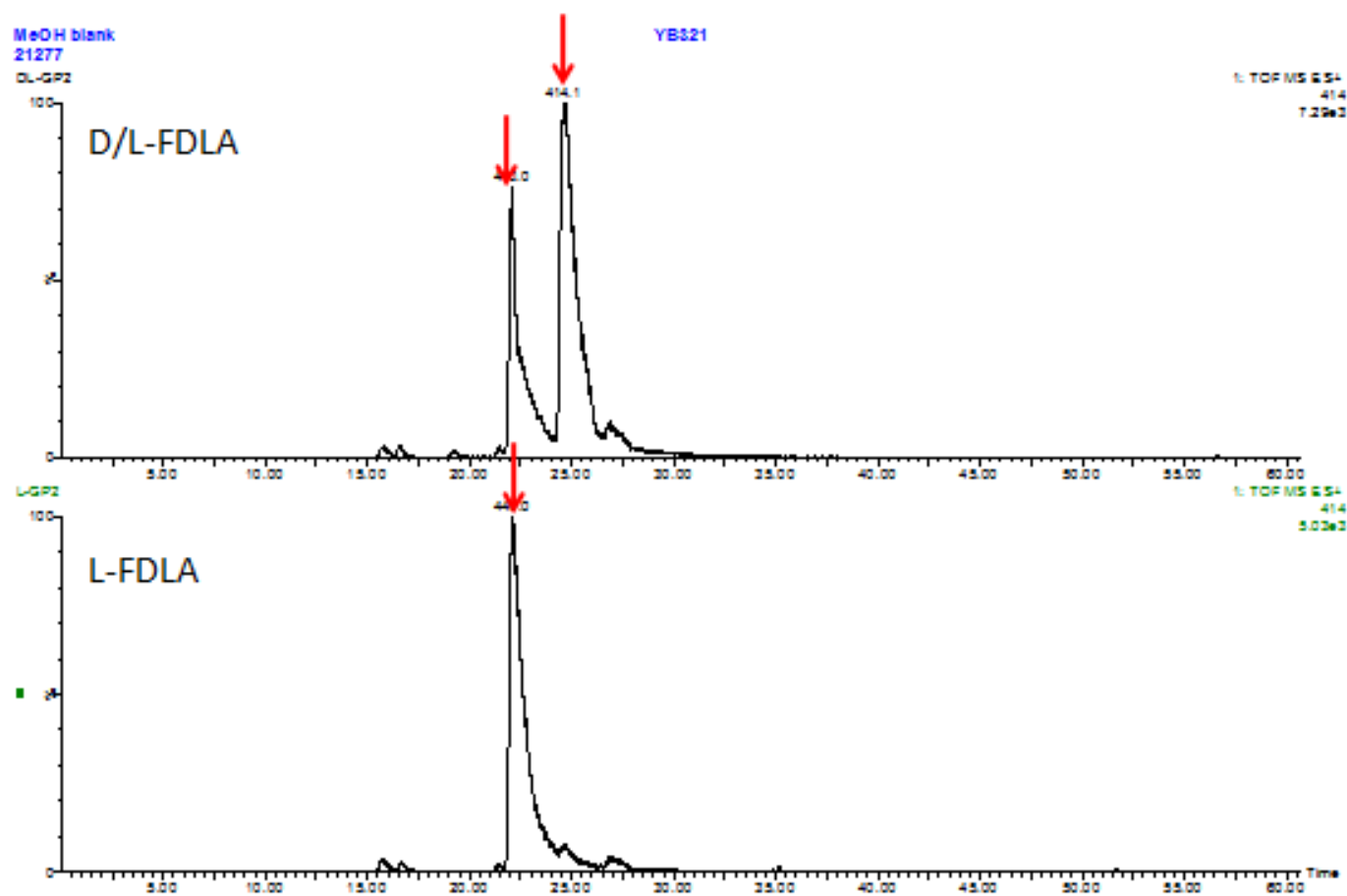


192

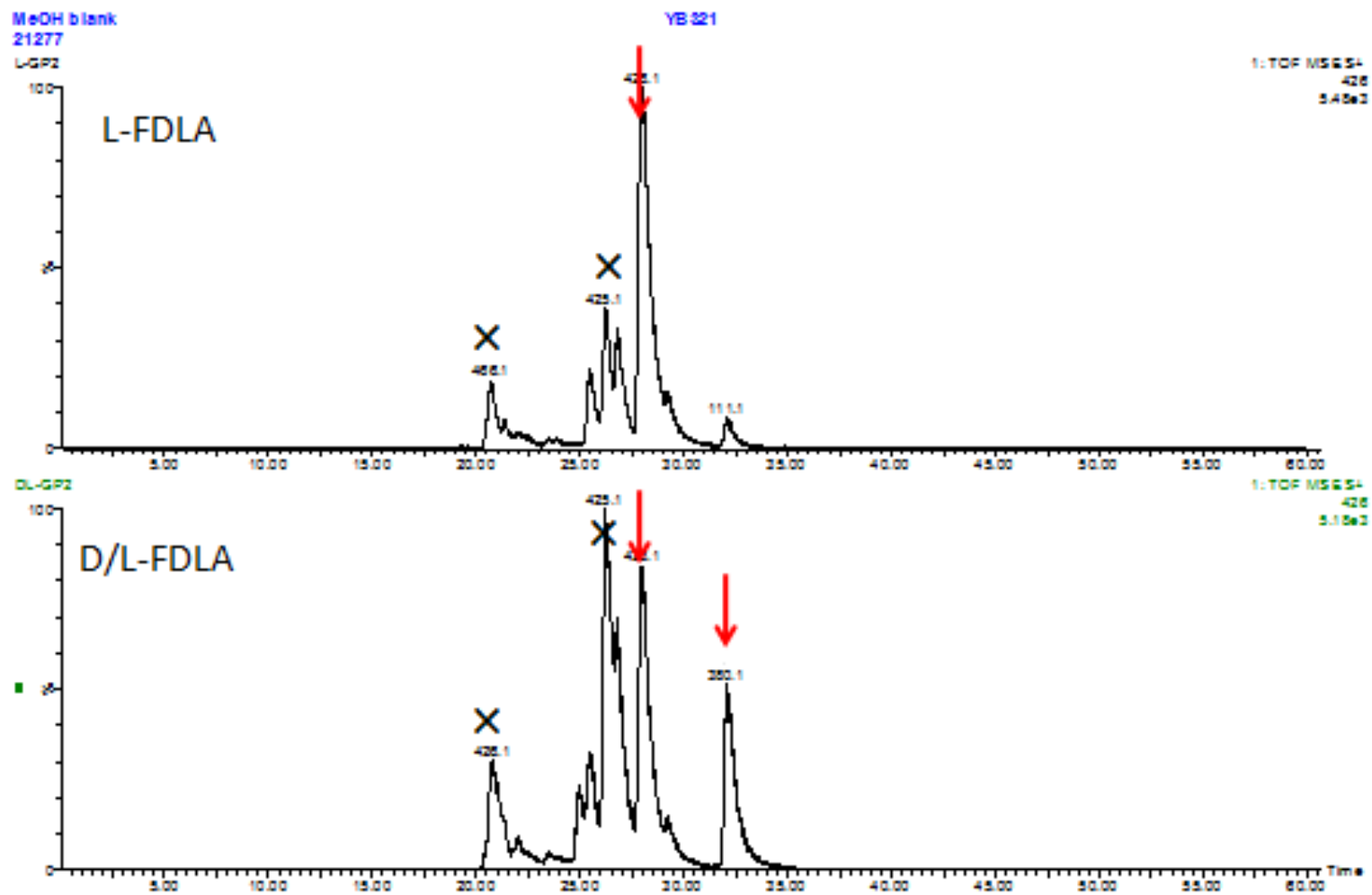
193

194 **Figure S35.** Advanced Marfey's analysis of acid hydrolysate of **3**

195 A) D,L-FDLA-Threonine derivatives in **3**: 414 [M+H]⁺



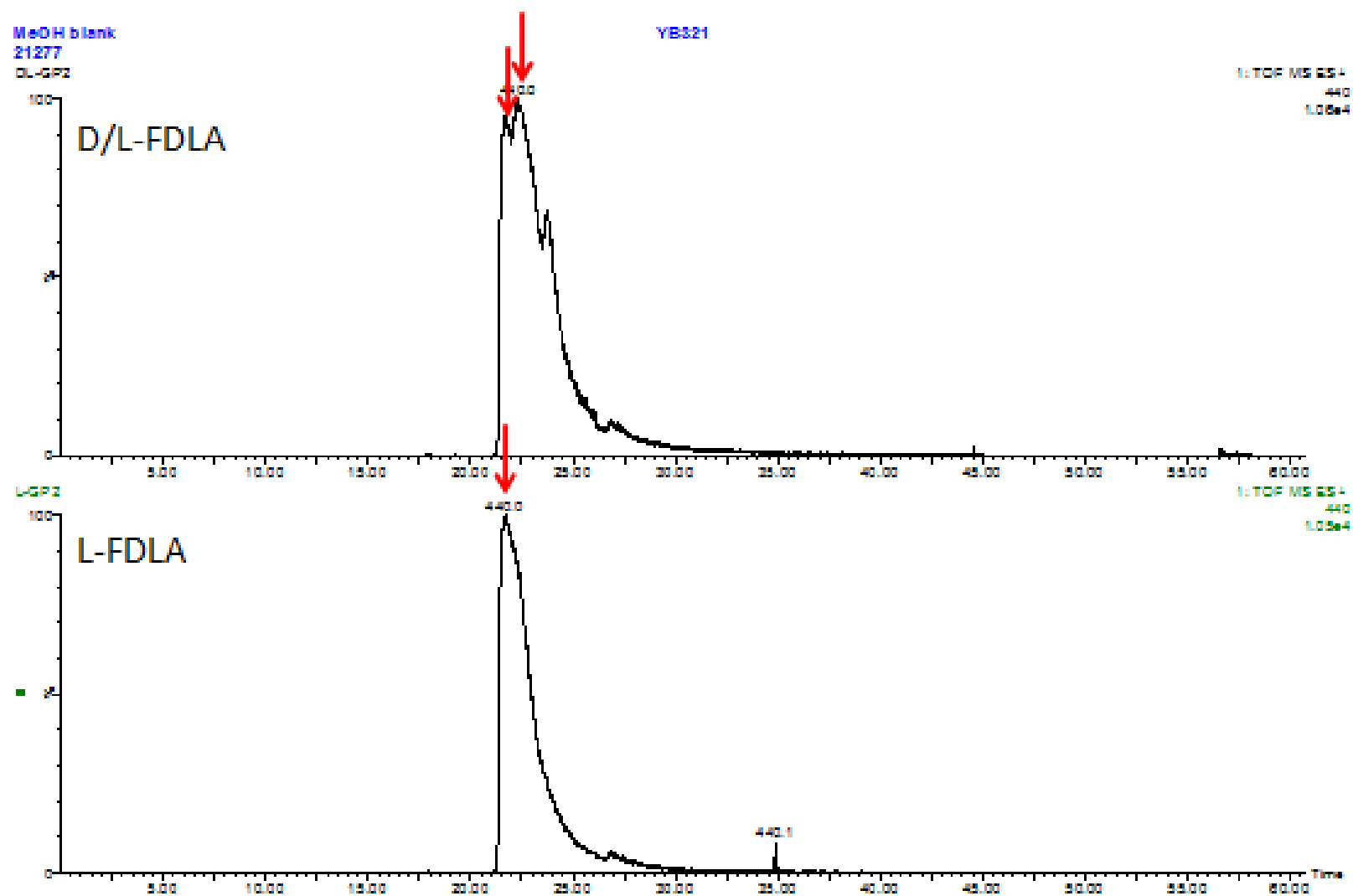
199 B)D,L-FDLA-Leucine derivatives in 3: 426 [M+H]⁺



200

201

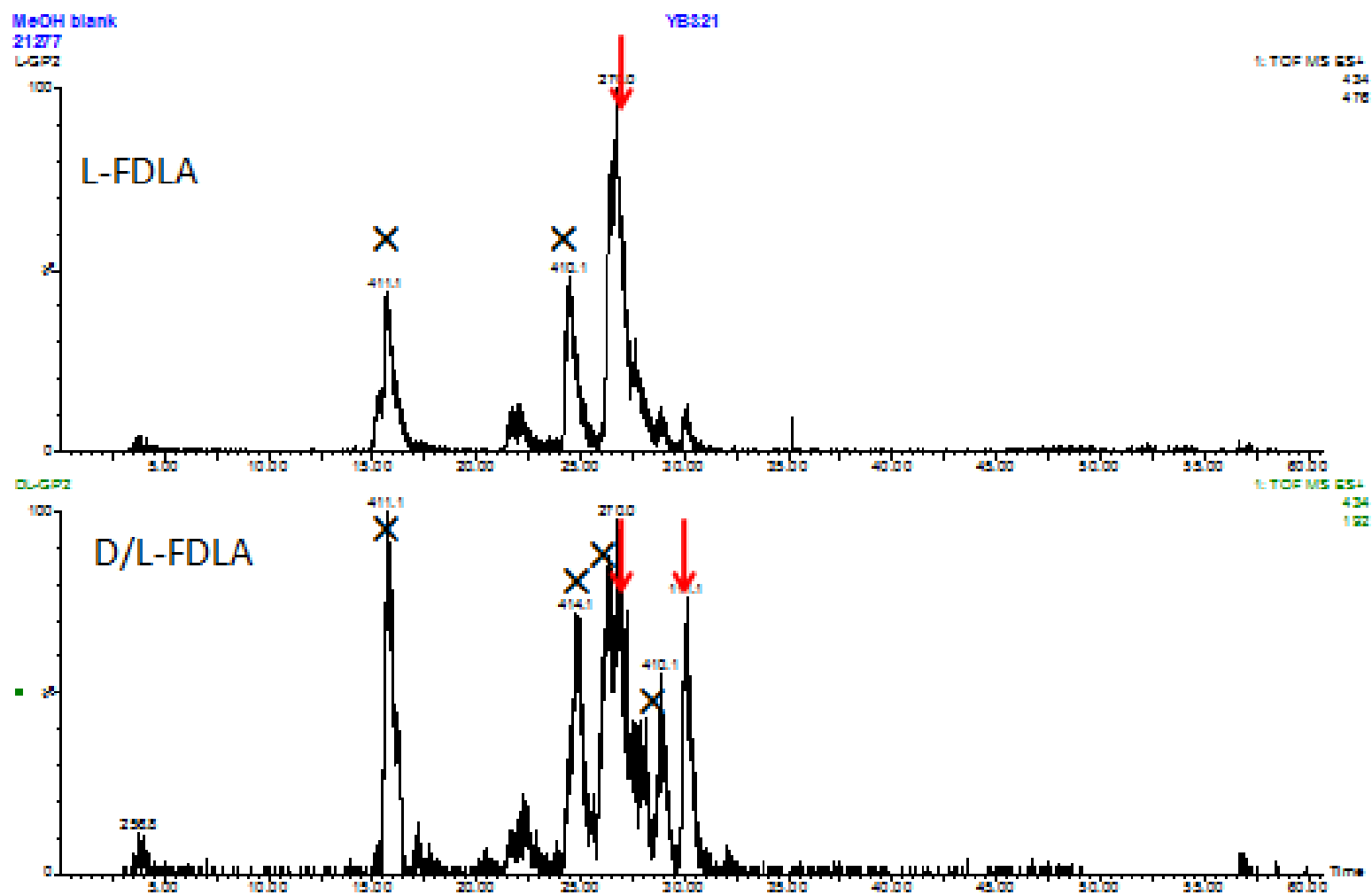
202 C)D,L-FDLA-HMP derivatives in 3: 440 [M+H]⁺



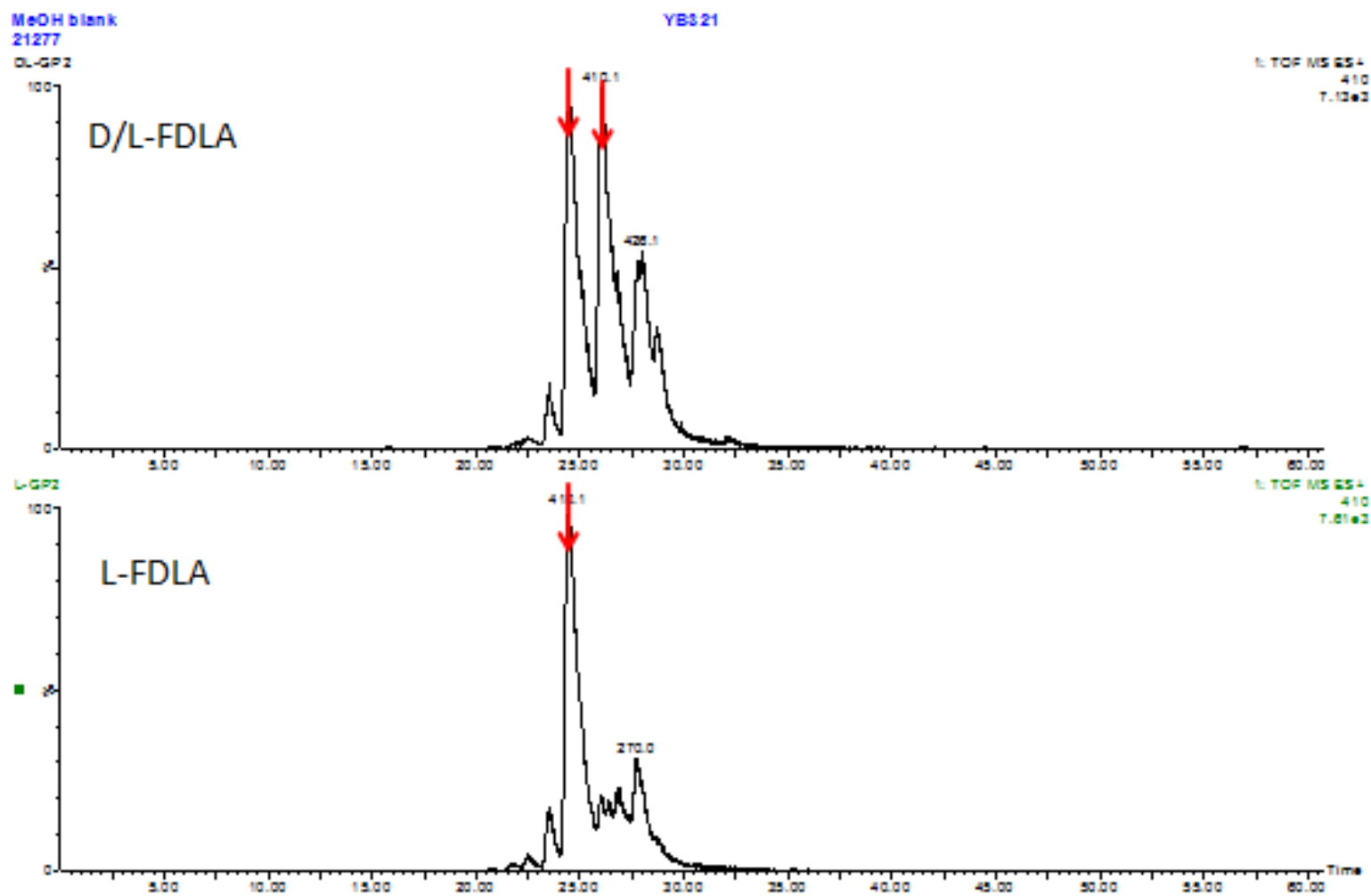
203

204

205 D)D,L-FDLA-Valine derivatives in 3: 434 [M+Na]⁺



208 E)D,L-FDLA-Proline derivatives in 3: 410 [M+H]⁺



209

210

211 **Table S1:** Corresponding Retention times between D/L-FDLA derivatives of amino acids

Amino acids	Structure of FDLA-derivatives	m/z [M+H] ⁺	Retention time of D/L-FDLA derivatives (min)	Retention time of L-FDLA derivatives (min)
L-Threonine		414	22.03, 24.57	22.08
L-Leucine		426	27.94, 32.03	28.03
		440.1	21.61, 22.22	21.59
L-Valine		412, 434[M+Na] ⁺	26.69, 29.95	26.69
L-Proline		410	24.41, 26.00	24.35
L-Proline (standard)		410	24.43, 26.05	24.39

212

213 **Analysis condition:**

214 **HPLC-MS method:** the analysis of the L- and D-FDLA derivatives was carried out by an Agilent Eclipse XDB-C18 column
 215 (150×4.6 mm, 5 μm) employing a linear gradient of from 5% to 100% CH₃CN in 0.1%formic acid at 0.5 mL/min over 45 min.