

## Barrigenol triterpenes from the husks of *Xanthoceras sorbifolia* Bunge and their antitumor activities

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Figure S1. <sup>1</sup>H-NMR Spectrum of 3-O-(3'-O-angeloyl)-β-D-glucopyranosyl-28-O-[α-L-rhamnopyranosyl(1→2)]-β-D-glucopyranosyl-3β, 21β, 22α, 28-tetrahydroxy-olean-12-ene (1) in C<sub>5</sub>D<sub>5</sub>N.

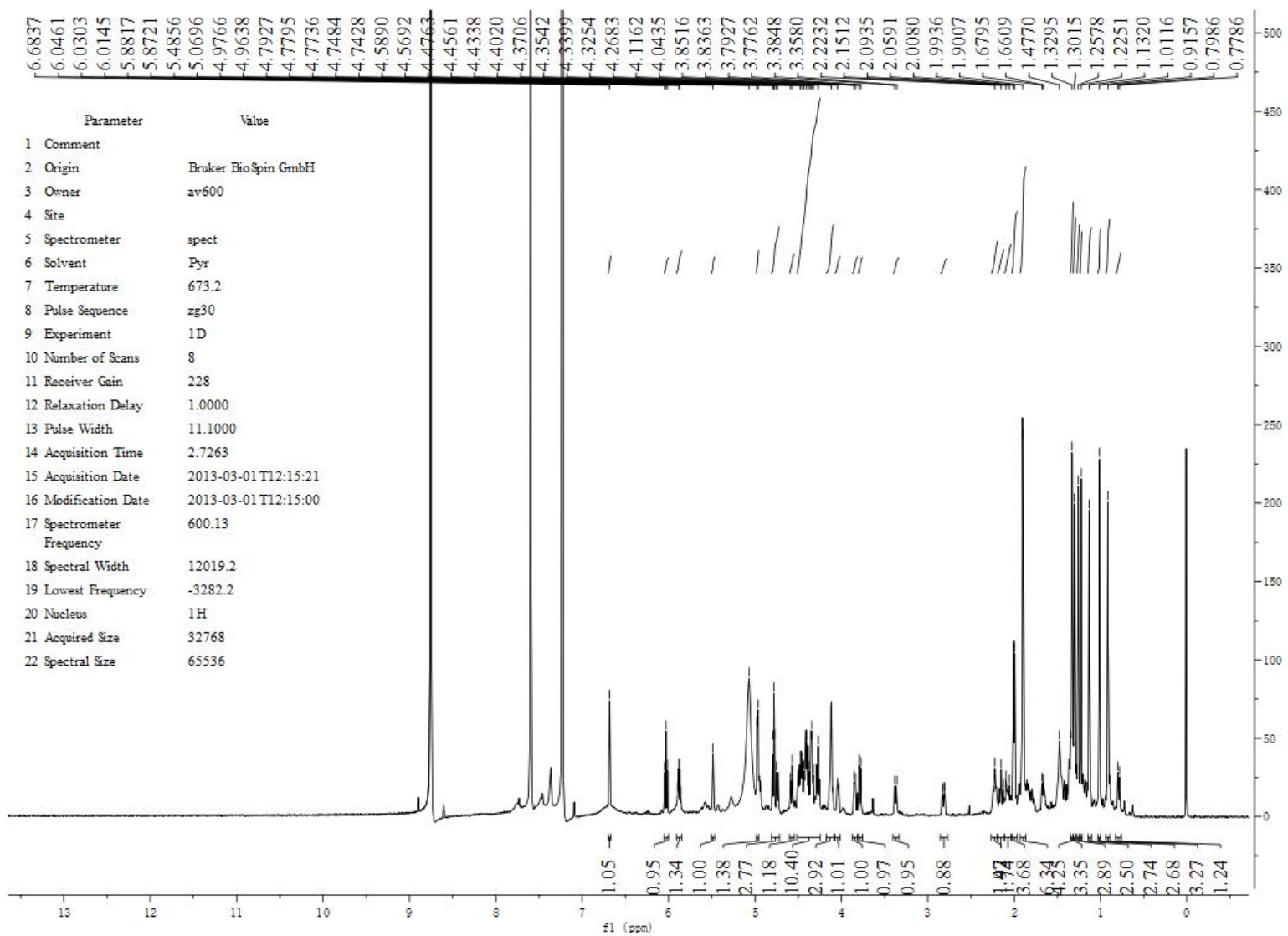


Figure S2.  $^{13}\text{C}$ -NMR Spectrum of 3-*O*-(3'-*O*-angeloyl)- $\beta$ -*D*-glucopyranosyl-28-*O*-[ $\alpha$ -*L*-rhamnopyranosyl(1 $\rightarrow$ 2)]- $\beta$ -*D*-glucopyranosyl-3 $\beta$ , 21 $\beta$ , 22 $\alpha$ , 28-tetrahydroxy-olean-12-ene (1) in  $\text{C}_5\text{D}_5\text{N}$ .

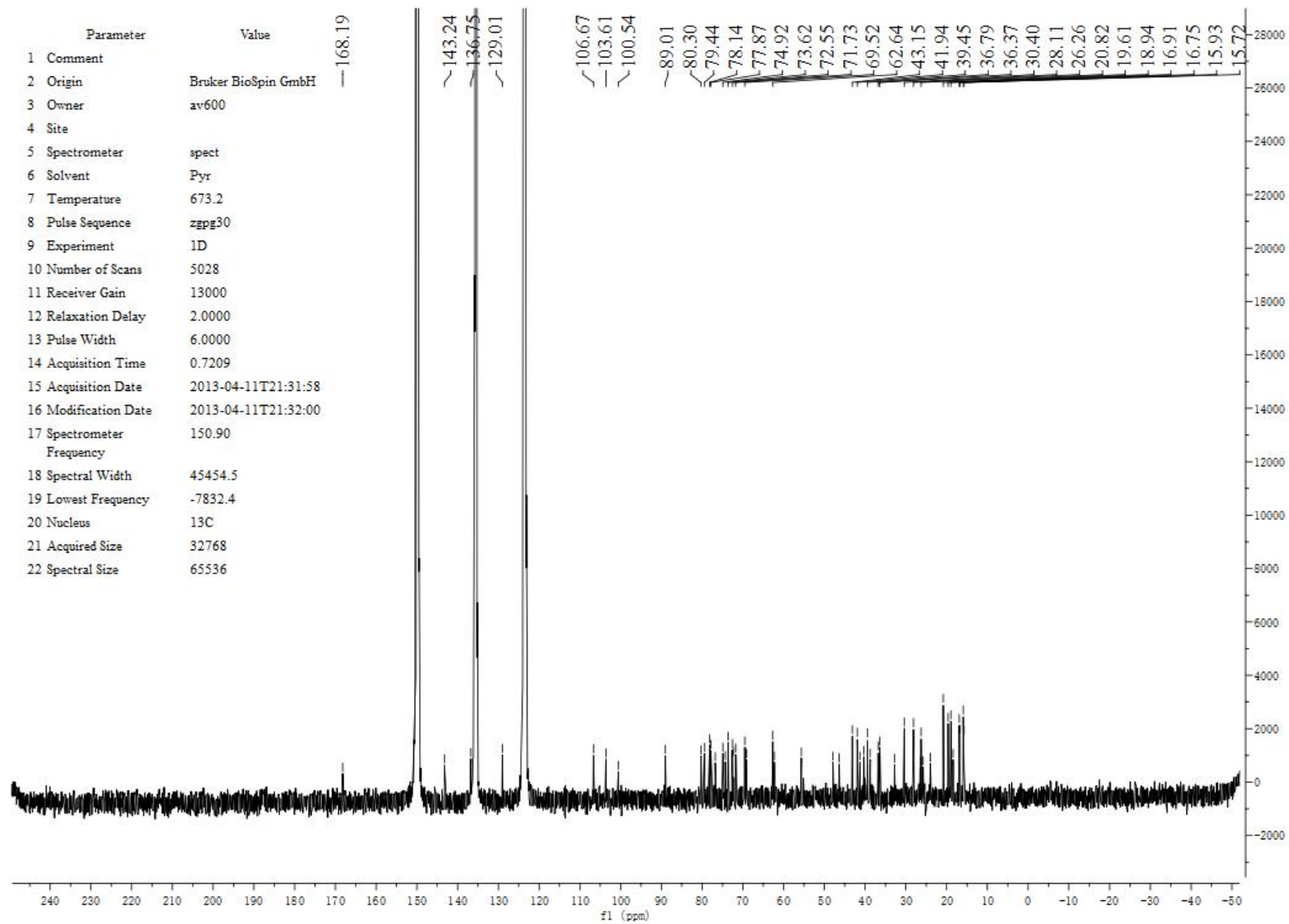


Figure S3. HR-ESI-MS Spectrum of 3-O-(3'-O-angeloyl)- $\beta$ -D-glucopyranosyl-28-O- $[\alpha$ -L-rhamnopyranosyl(1 $\rightarrow$ 2)]- $\beta$ -D-glucopyranosyl-3 $\beta$ , 21 $\beta$ , 22 $\alpha$ , 28-tetrahydro-olean-12-ene (1).

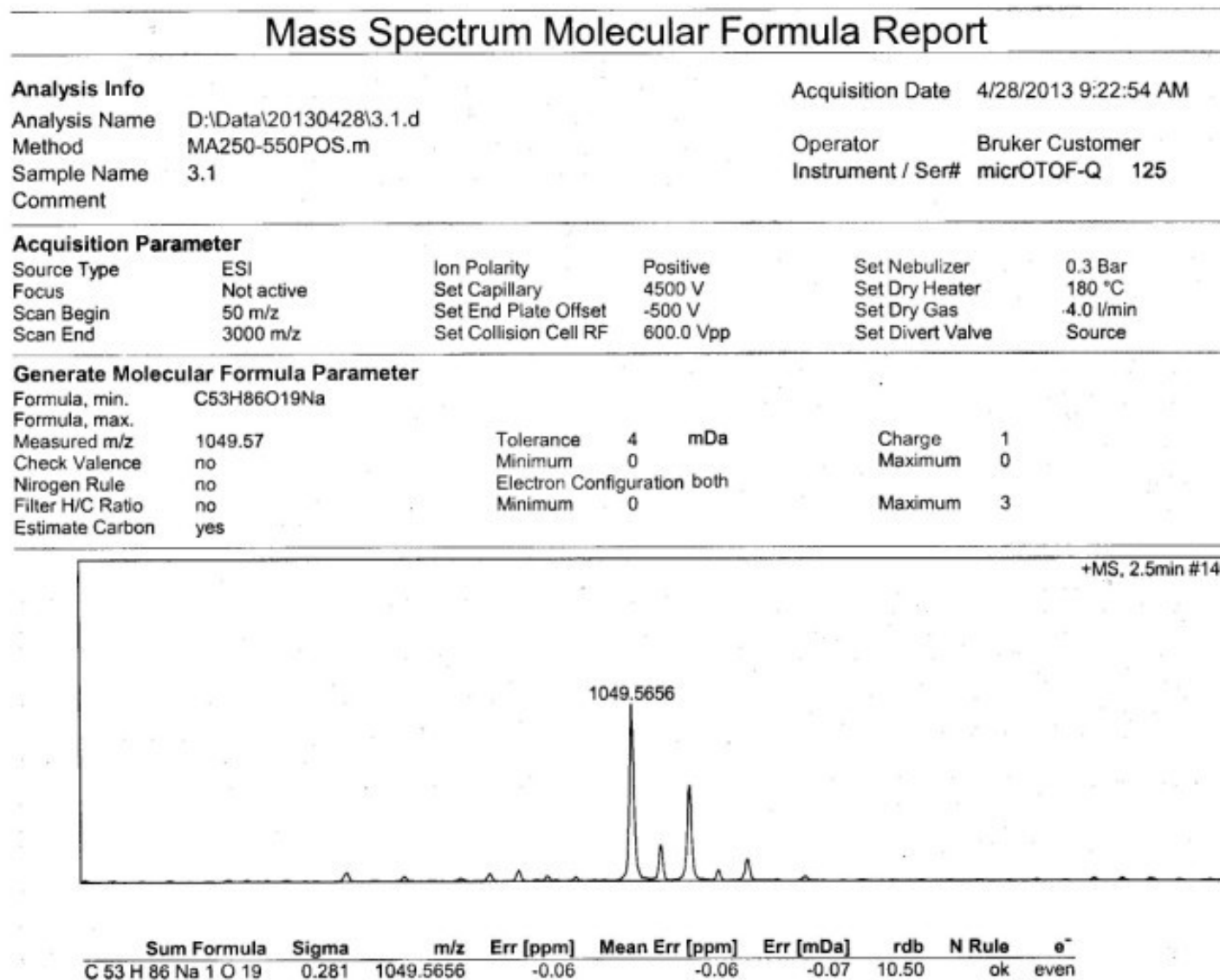


Figure S4. HMBC Spectrum of 3-*O*-(3'-*O*-angeloyl)- $\beta$ -*D*-glucopyranosyl-28-*O*-[ $\alpha$ -*L*-rhamnopyranosyl(1 $\rightarrow$ 2)]- $\beta$ -*D*-glucopyranosyl-3 $\beta$ , 21 $\beta$ , 22 $\alpha$ , 28-tetrahydroxy-olean-12-ene (1) in C<sub>5</sub>D<sub>5</sub>N.

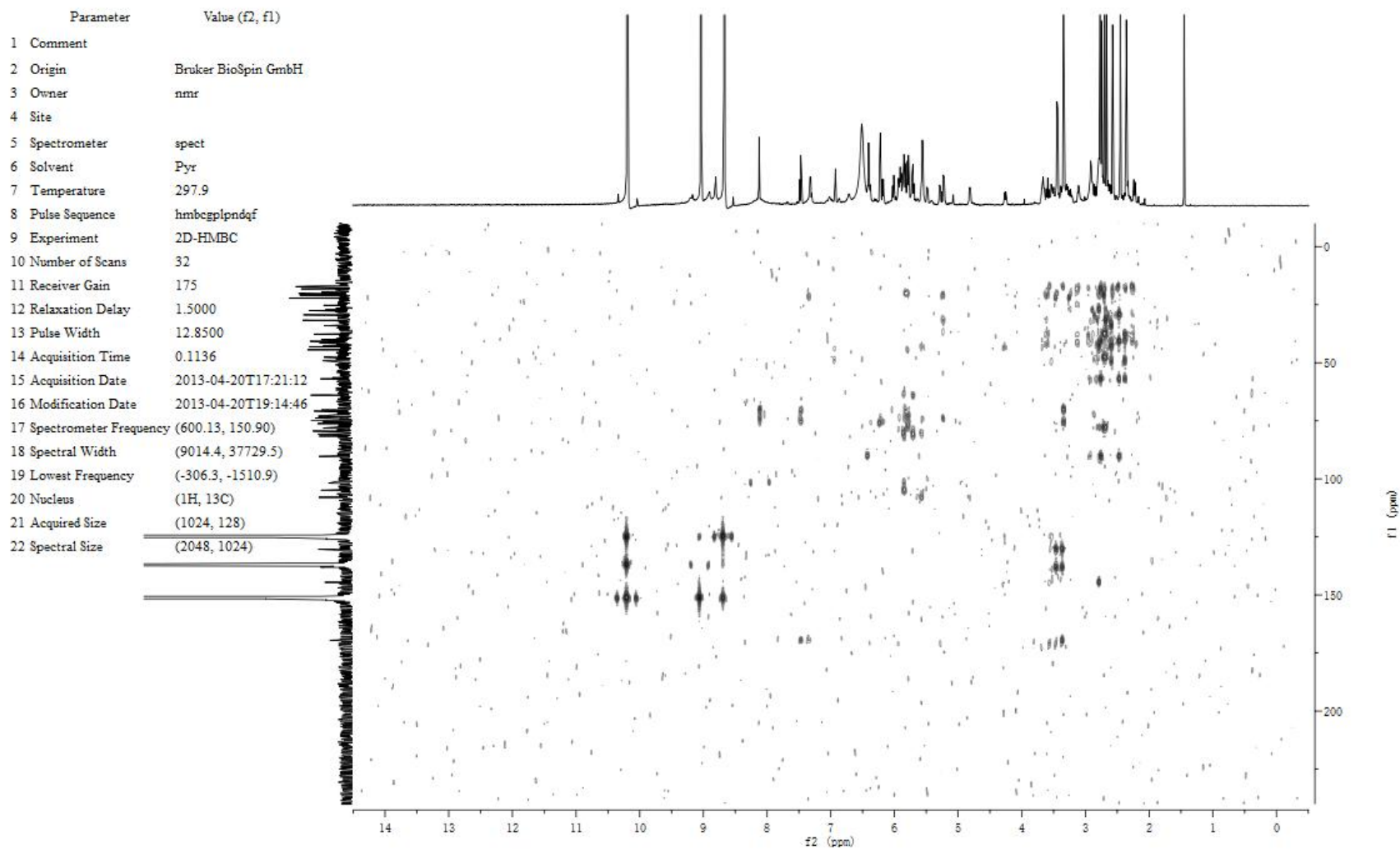




Figure S5. HSQC Spectrum of 3-*O*-(3'-*O*-angeloyl)- $\beta$ -*D*-glucopyranosyl-28-*O*-[ $\alpha$ -*L*-rhamnopyranosyl(1 $\rightarrow$ 2)]- $\beta$ -*D*-glucopyranosyl-3 $\beta$ , 21 $\beta$ , 22 $\alpha$ , 28-tetrahydroxy-olean-12-ene (1) in C<sub>5</sub>D<sub>5</sub>N.

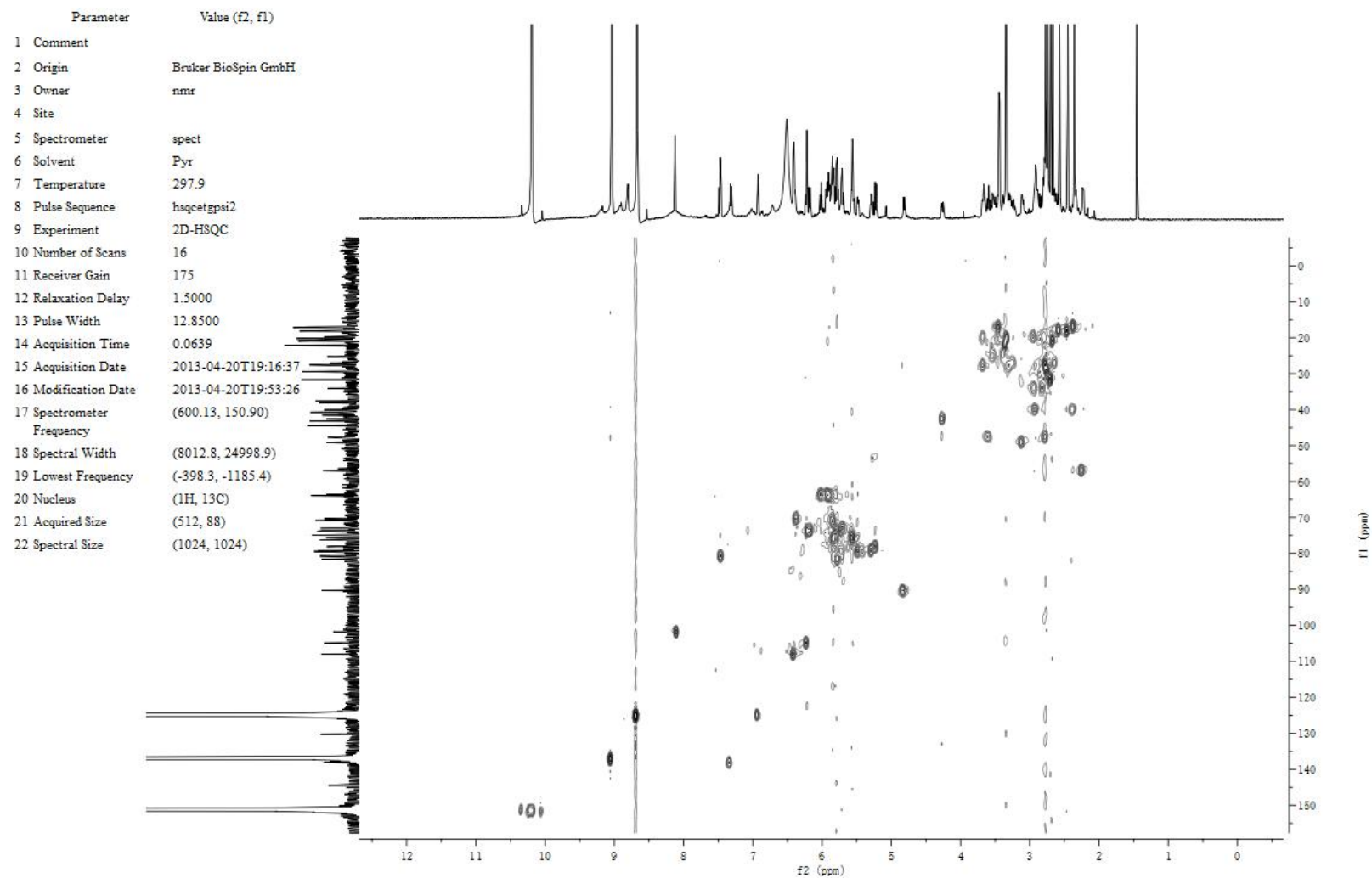


Figure S6. NOESY Spectrum of 3-*O*-(3'-*O*-angeloyl)- $\beta$ -*D*-glucopyranosyl-28-*O*- [ $\alpha$ -*L*-rhamnopyranosyl(1 $\rightarrow$ 2)]- $\beta$ -*D*-glucopyranosyl-3 $\beta$ , 21 $\beta$ , 22 $\alpha$ , 28-tetrahydroxy-olean-12-ene (1) in C<sub>5</sub>D<sub>5</sub>N.

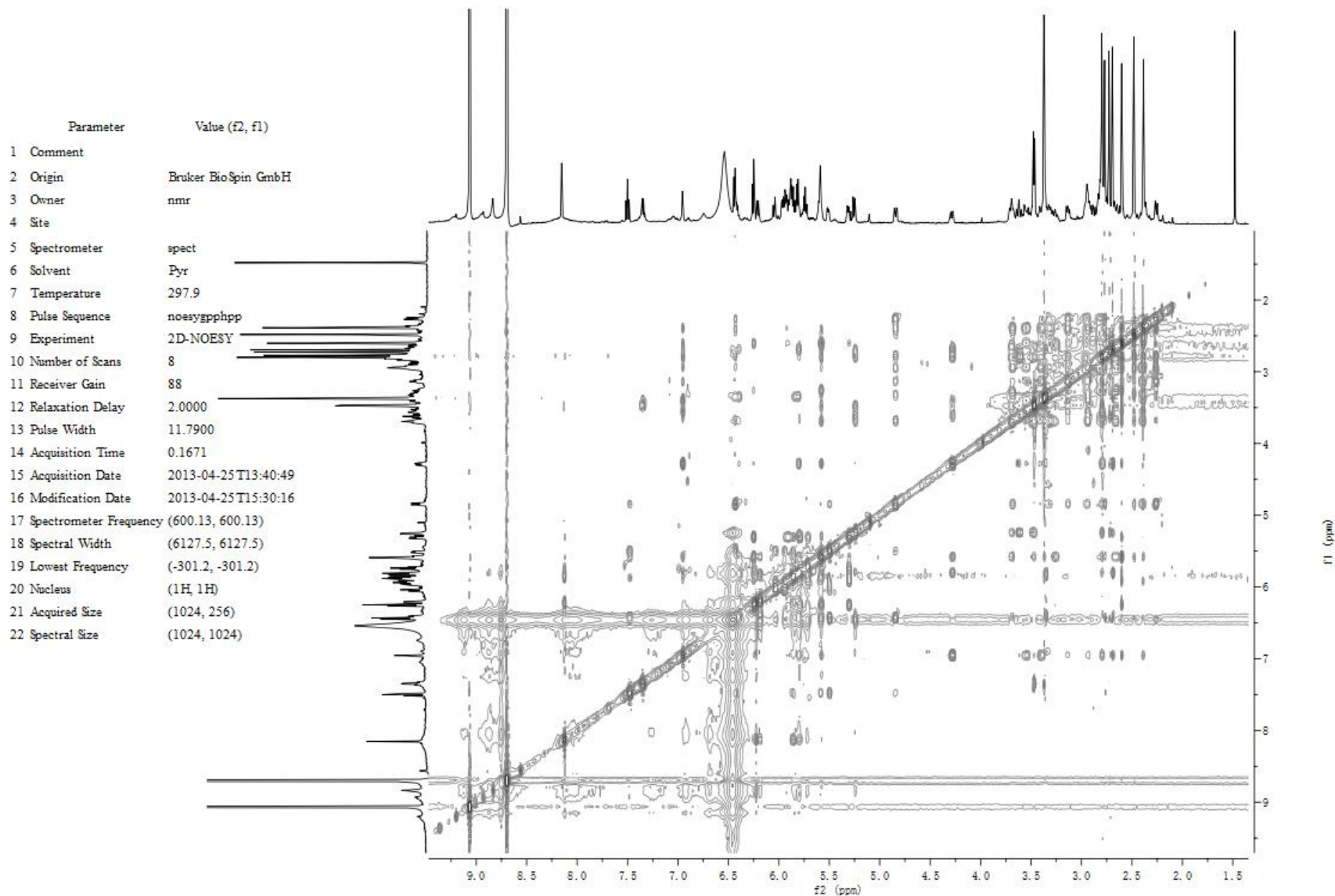


Figure S7. IR Spectrum of 3-O-(3'-O-angeloyl)- $\beta$ -D-glucopyranosyl-28-O- [ $\alpha$ -L-rhamnopyranosyl(1 $\rightarrow$ 2)]- $\beta$ -D-glucopyranosyl-3 $\beta$ , 21 $\beta$ , 22 $\alpha$ , 28-tetrahydro-olean-12-ene (1).

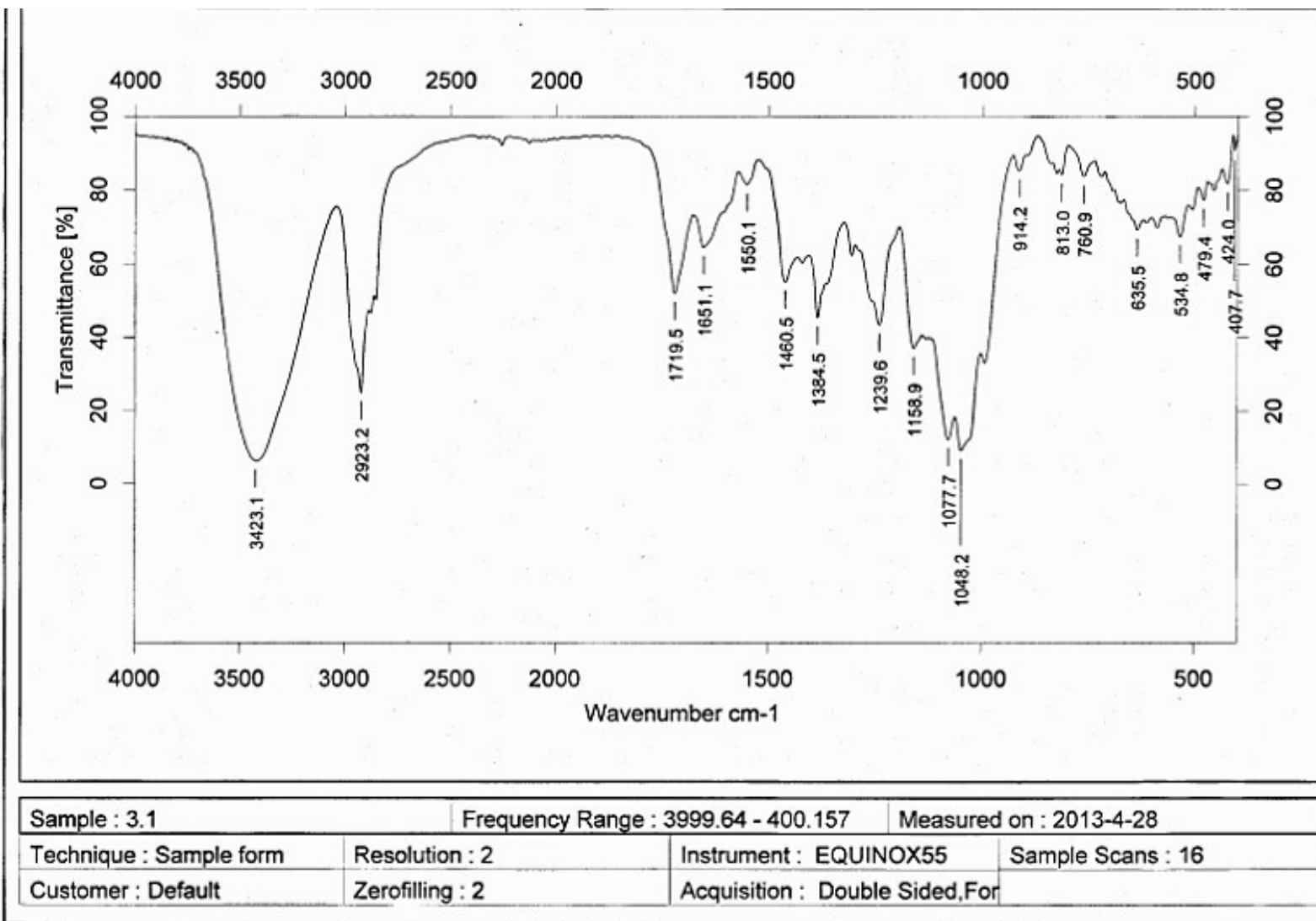


Figure S8. <sup>1</sup>H-NMR Spectrum of 3-*O*-[ $\alpha$ -*L*-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -*D*-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -*D*-6'-*n*-butyl-glucuronic acid-21-*O*-epoxyangeloyl-22-*O*-angeloyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (2) in C<sub>5</sub>D<sub>5</sub>N.

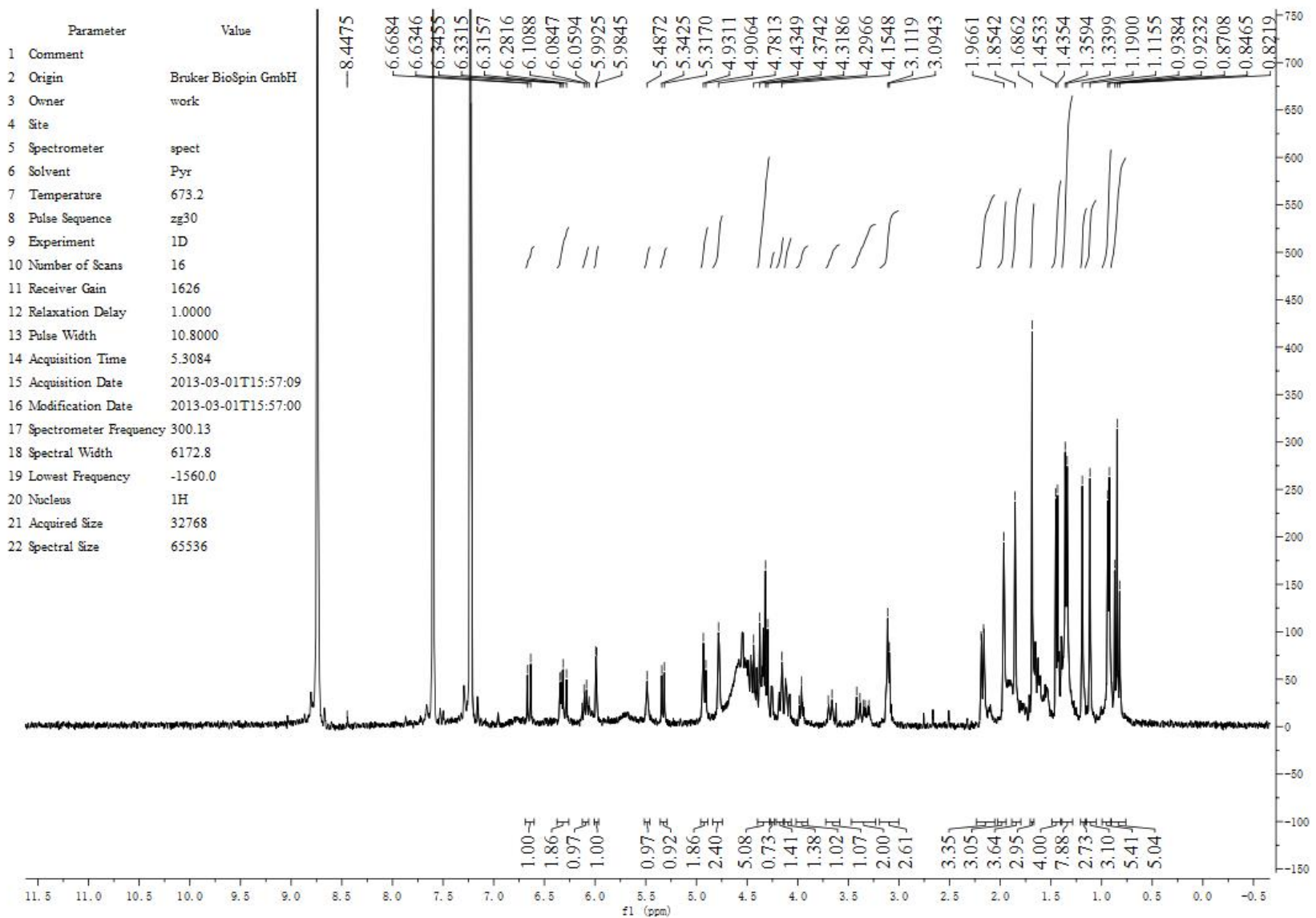


Figure S9.  $^{13}\text{C}$ -NMR Spectrum of 3-*O*-[ $\alpha$ -*L*-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -*D*-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -*D*-6'-*n*-butyl-glucuronic acid-21-*O*-epoxyangeloyl-22-*O*-angeloyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (2) in  $\text{C}_5\text{D}_5\text{N}$ .

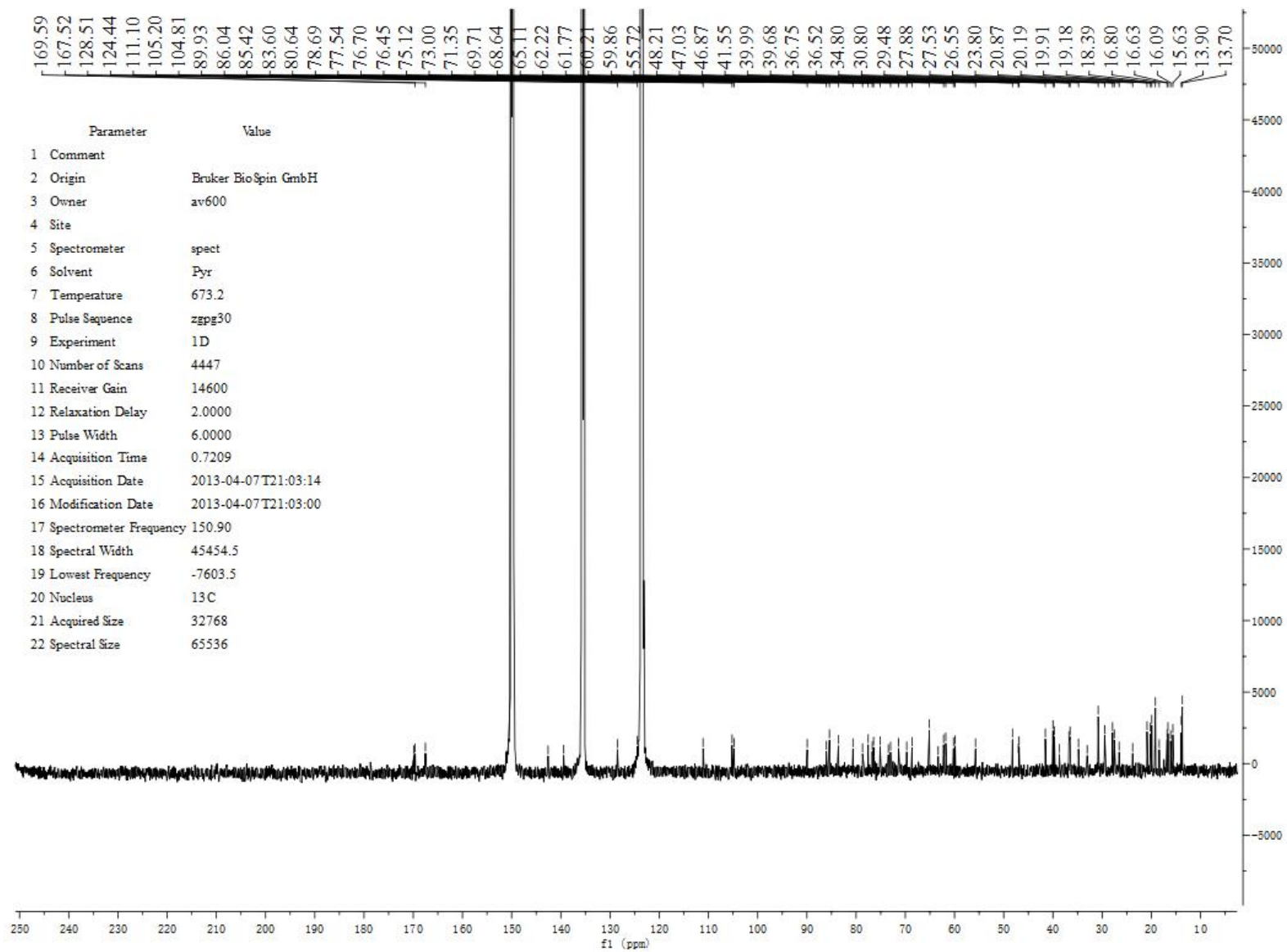


Figure S10. HR-ESI-MS Spectrum of 3-O-[ $\alpha$ -L-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -D-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -D-6'-n-butyl-glucuronic acid-21-O-epoxyangeloyl-22-O-angeloyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (2).

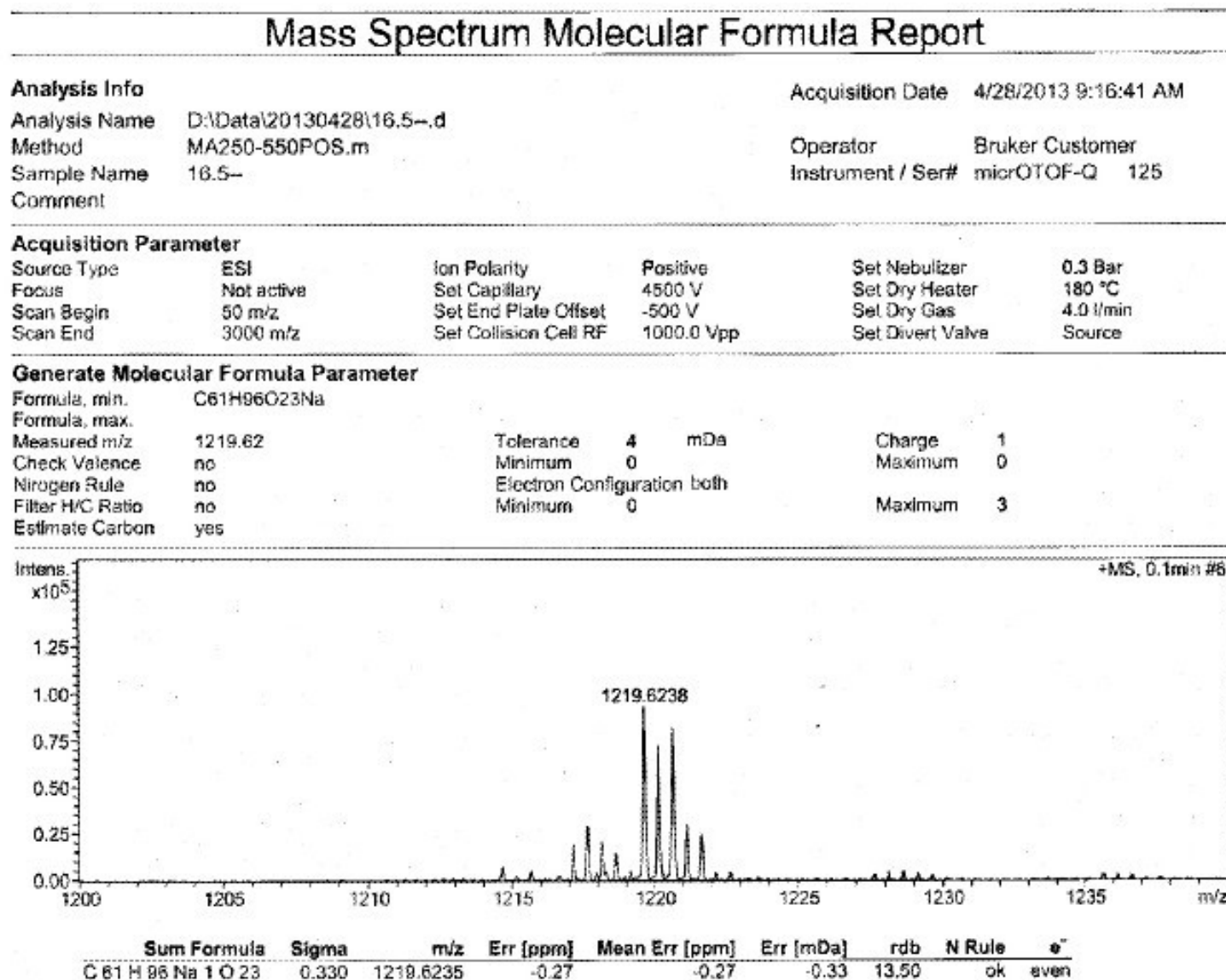




Figure S11. HMBC Spectrum of 3-*O*-[ $\alpha$ -*L*-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -*D*-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -*D*-6'-*n*-butyl-glucuronic acid-21-*O*-epoxyangeloyl-22-*O*-angeloyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (2) in C<sub>5</sub>D<sub>5</sub>N.

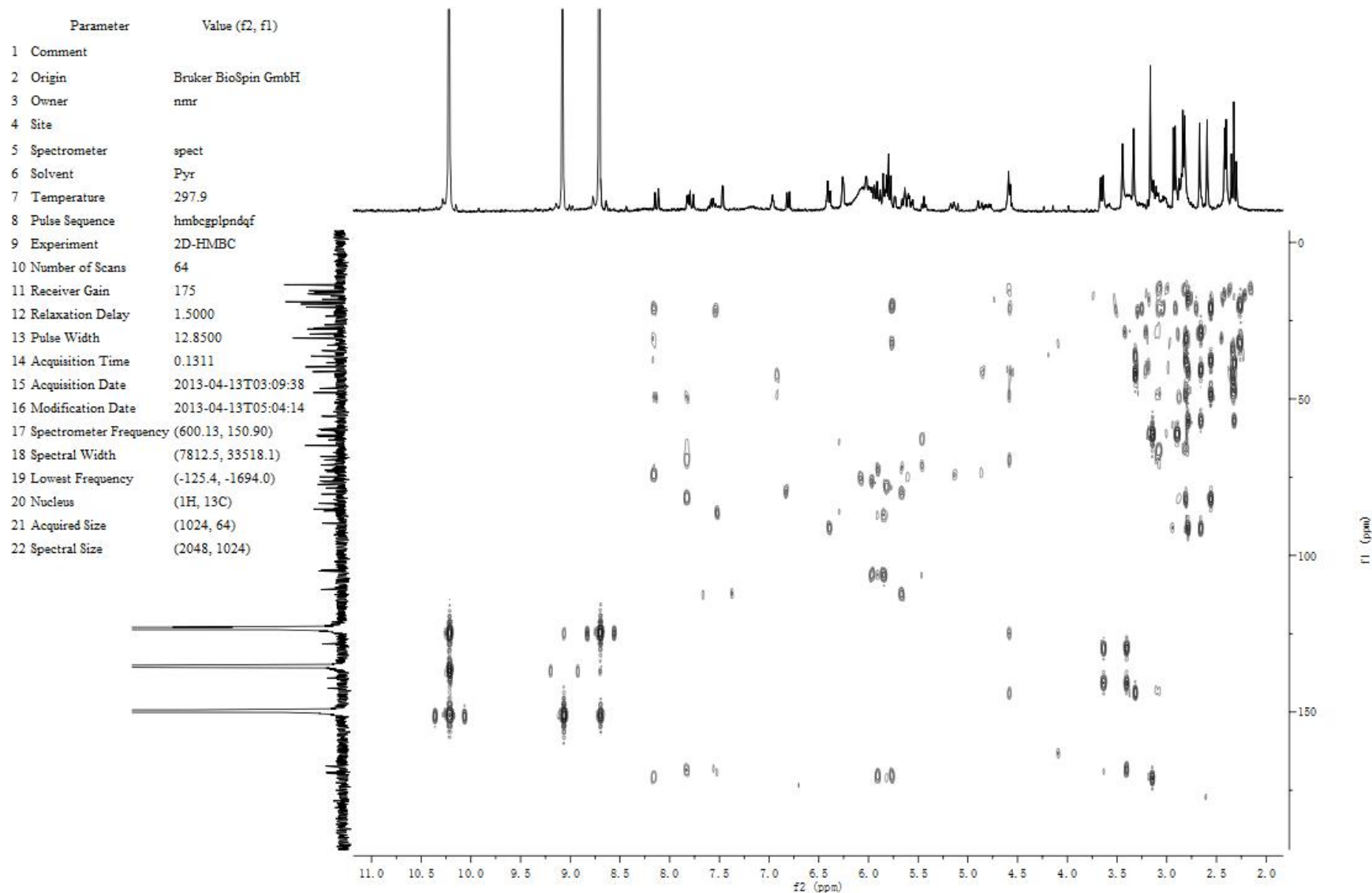


Figure S12. HSQC Spectrum of 3-*O*-[ $\alpha$ -*L*-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -*D*-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -*D*-6'-*n*-butyl-glucuronic acid-21-*O*-epoxyangeloyl-22-*O*-angeloyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (2) in C<sub>5</sub>D<sub>5</sub>N.

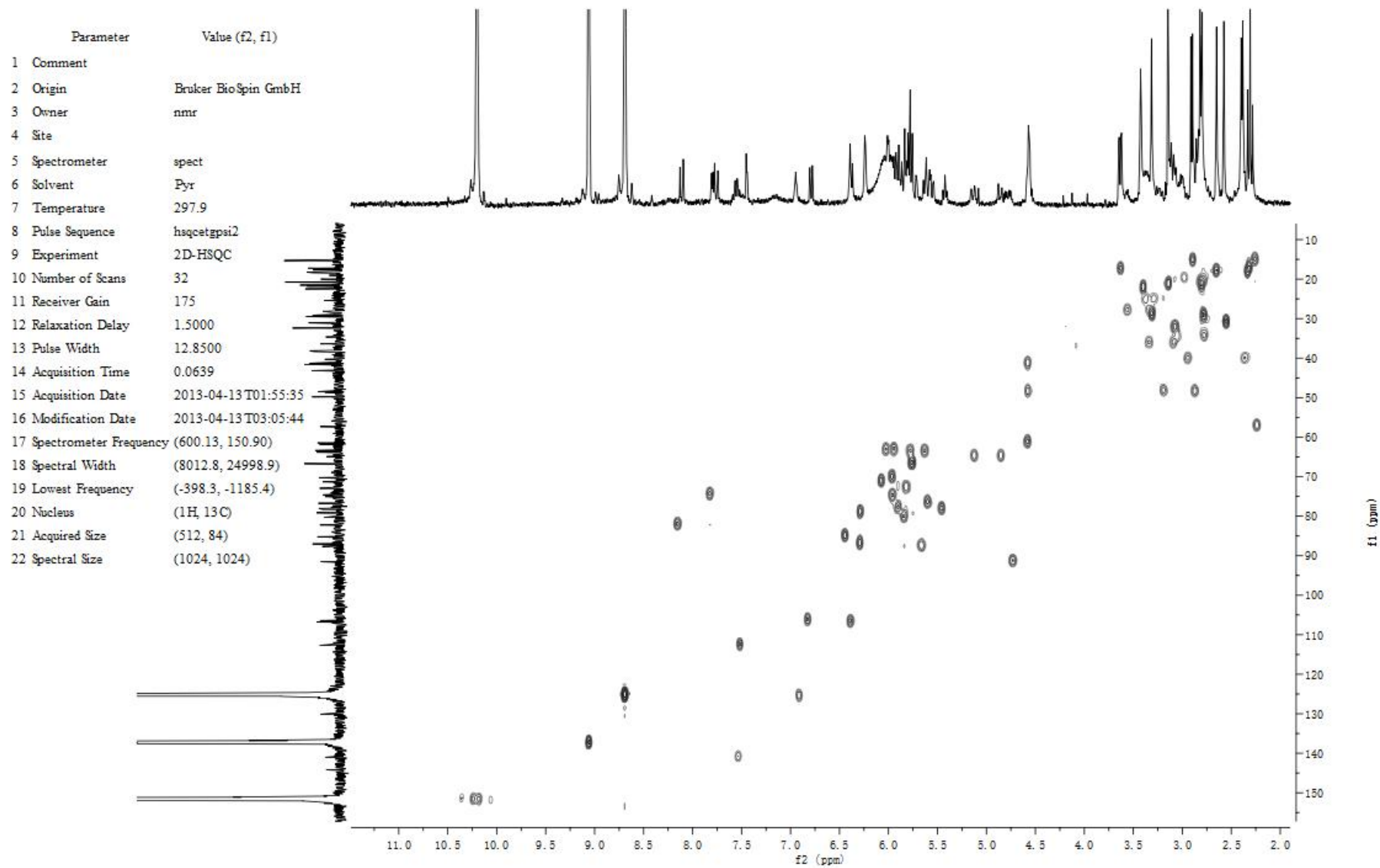




Figure S13. NOESY Spectrum of 3-*O*-[ $\alpha$ -*L*-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -*D*-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -*D*-6'-*n*-butyl-glucuronic acid-21-*O*-epoxyangeloyl-22-*O*-angeloyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (2) in C<sub>5</sub>D<sub>5</sub>N.

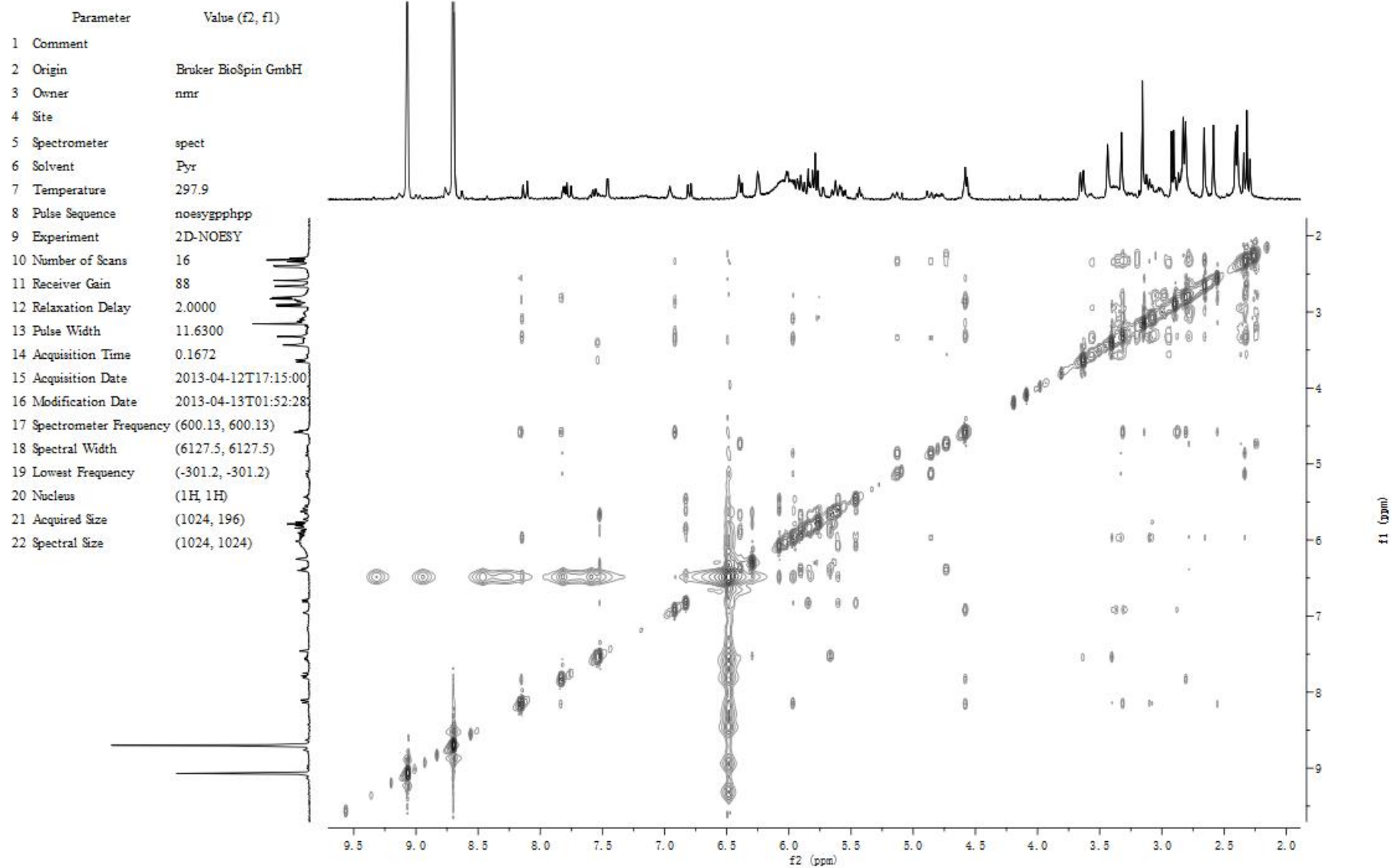


Figure S14. IR Spectrum of 3-O-[ $\alpha$ -L-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -D-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -D-6'-n-butyl-glucuronic acid-21-O-epoxyangeloyl-22-O-angeloyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (2).

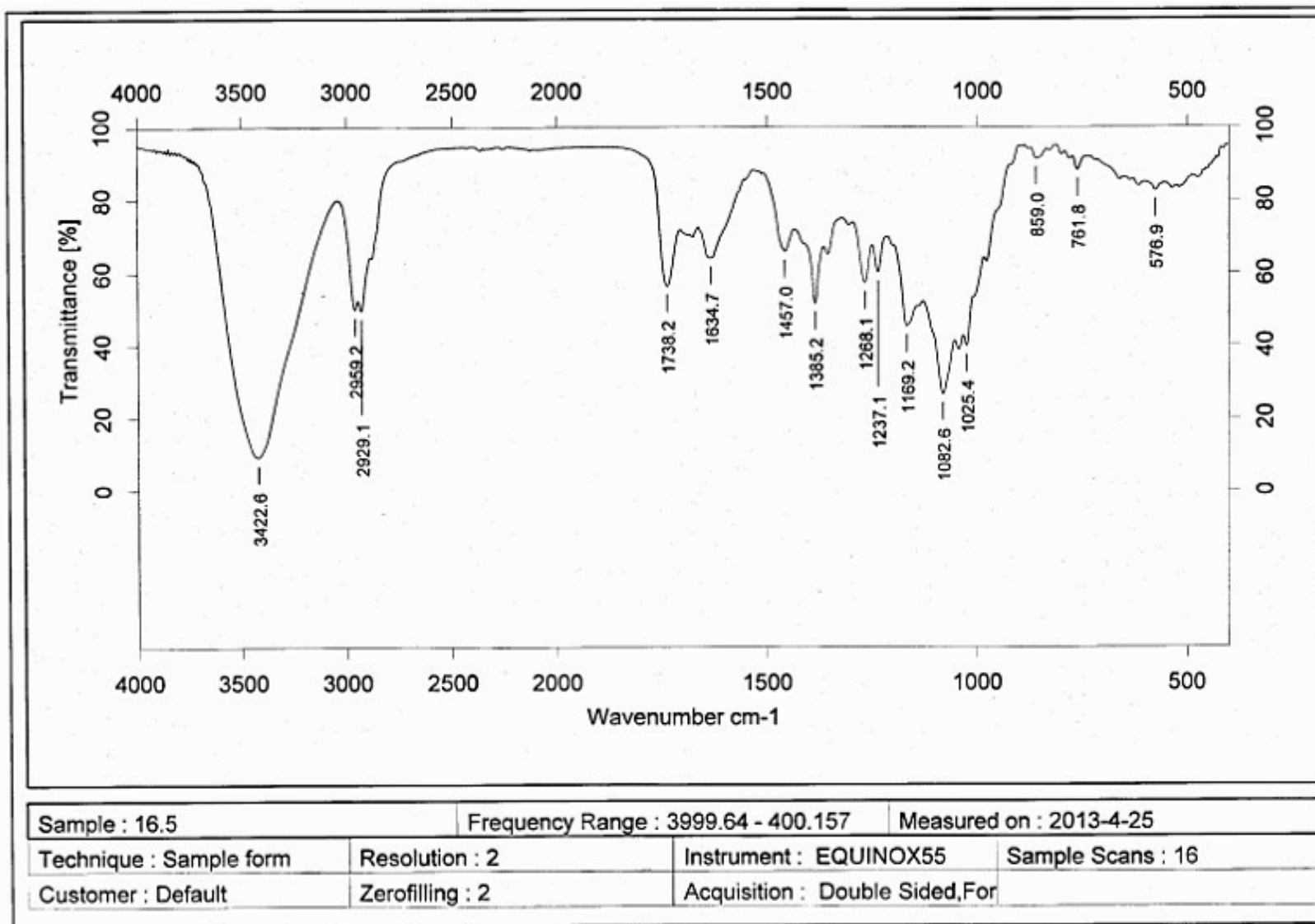


Figure S15. <sup>1</sup>H-NMR Spectrum of 6'-methylster-O-Xanifolia-Y5 (3) in C<sub>6</sub>D<sub>5</sub>N.

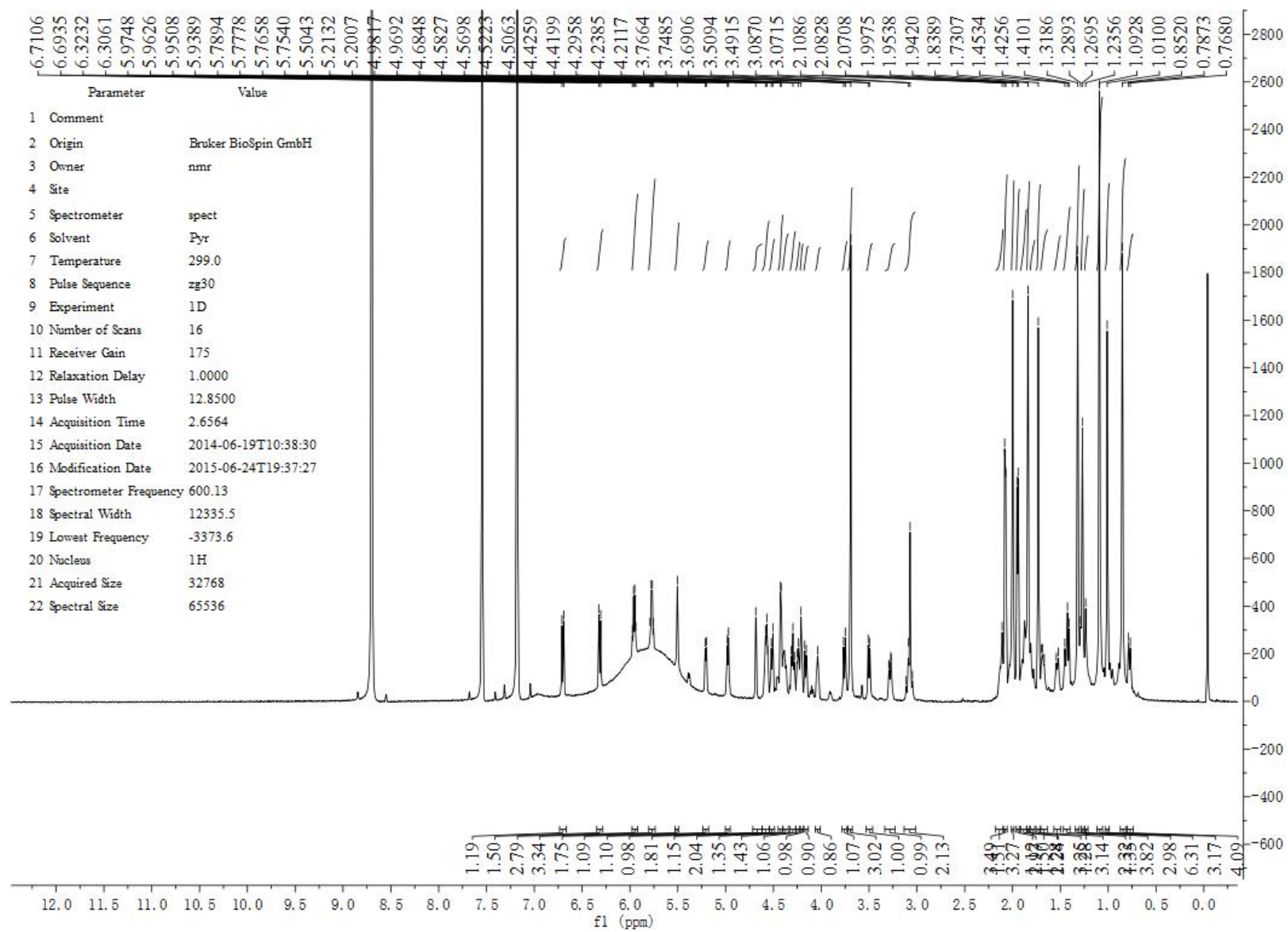


Figure S16.  $^{13}\text{C}$ -NMR Spectrum of 6'-methylster-O-Xanifolia-Y5 (3) in  $\text{C}_5\text{D}_5\text{N}$ .

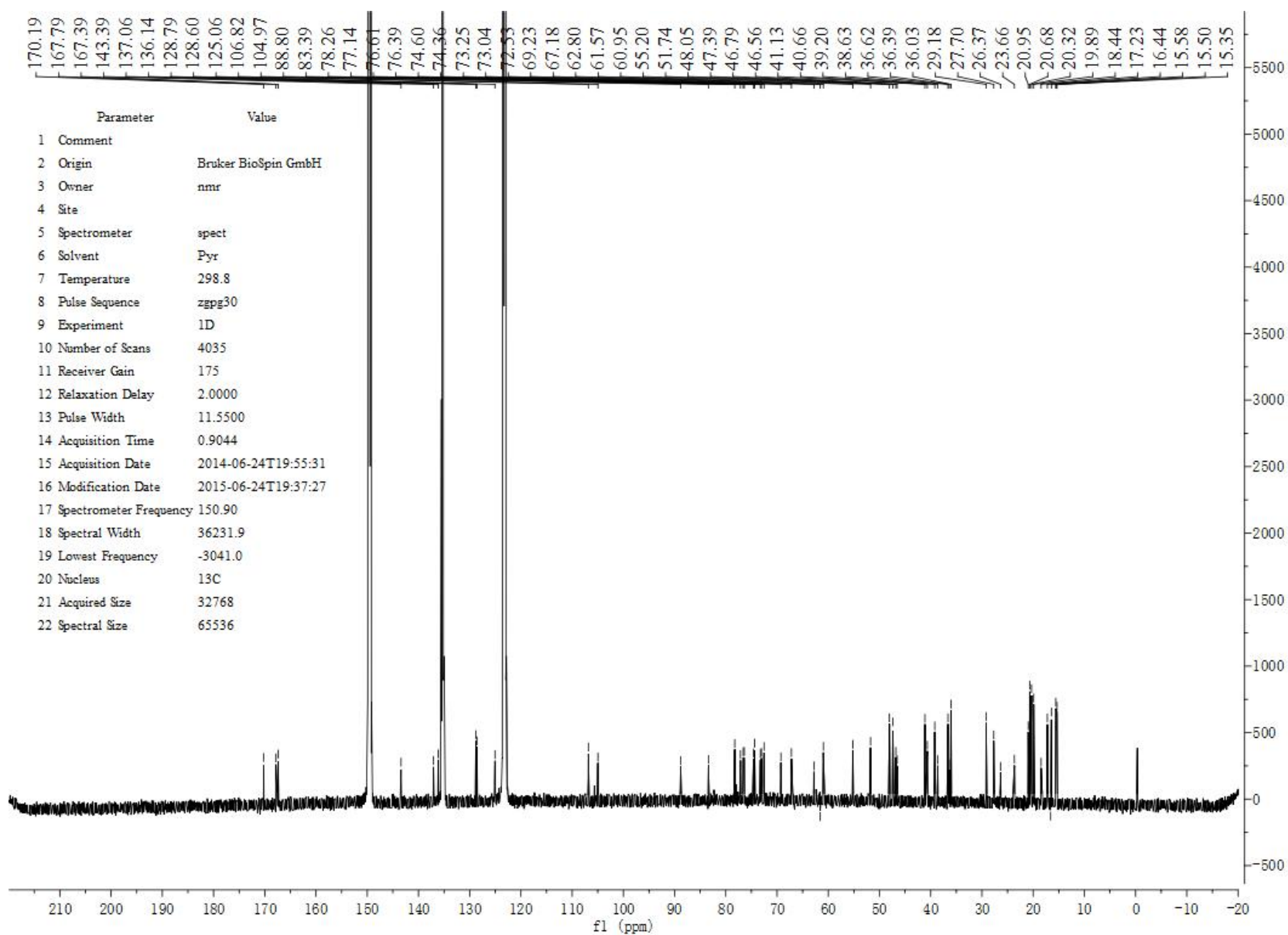


Figure S17. HR-ESI-MS Spectrum of 6'-methylester-O-Xanifolia-Y5 (3).

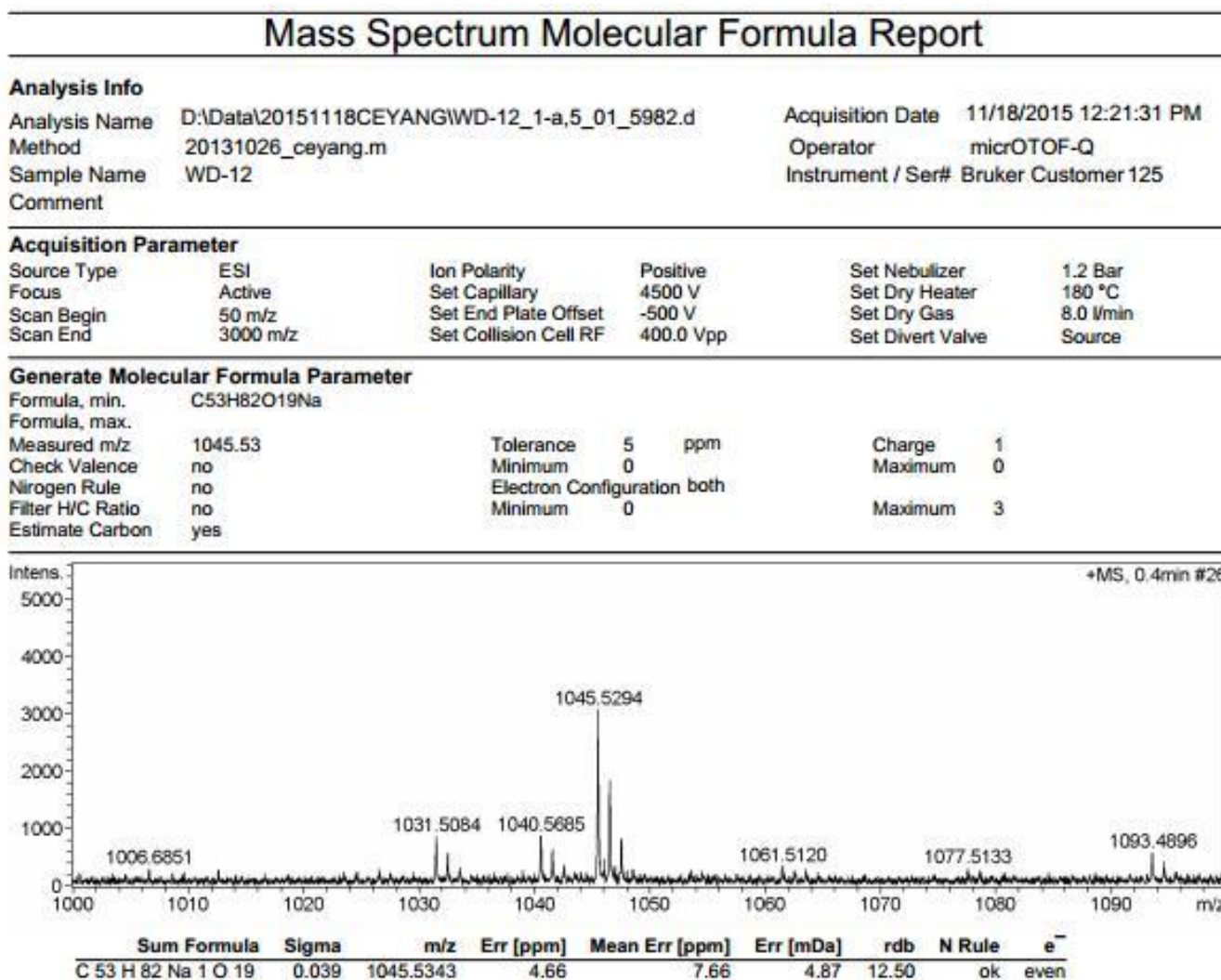




Figure S18. HMBC Spectrum of 6'-methylester-O-Xanifolia-Y5 (3) in C<sub>5</sub>D<sub>5</sub>N.

Parameter	Value (f2, f1)
1 Comment	
2 Origin	Bruker BioSpin GmbH
3 Owner	av600
4 Site	
5 Spectrometer	spect
6 Solvent	Pyr
7 Temperature	292.2
8 Pulse Sequence	hmbcgpndqf
9 Experiment	2D-HMBC
10 Number of Scans	180
11 Receiver Gain	29100
12 Relaxation Delay	1.5000
13 Pulse Width	11.1000
14 Acquisition Time	0.0713
15 Acquisition Date	2013-03-30T11:15:47
16 Modification Date	2015-06-24T19:41:02
17 Spectrometer Frequency	(600.13, 150.90)
18 Spectral Width	(7183.9, 30183.6)
19 Lowest Frequency	(-582.7, -4.3)
20 Nucleus	(1H, 13C)
21 Acquired Size	(512, 256)
22 Spectral Size	(512, 512)

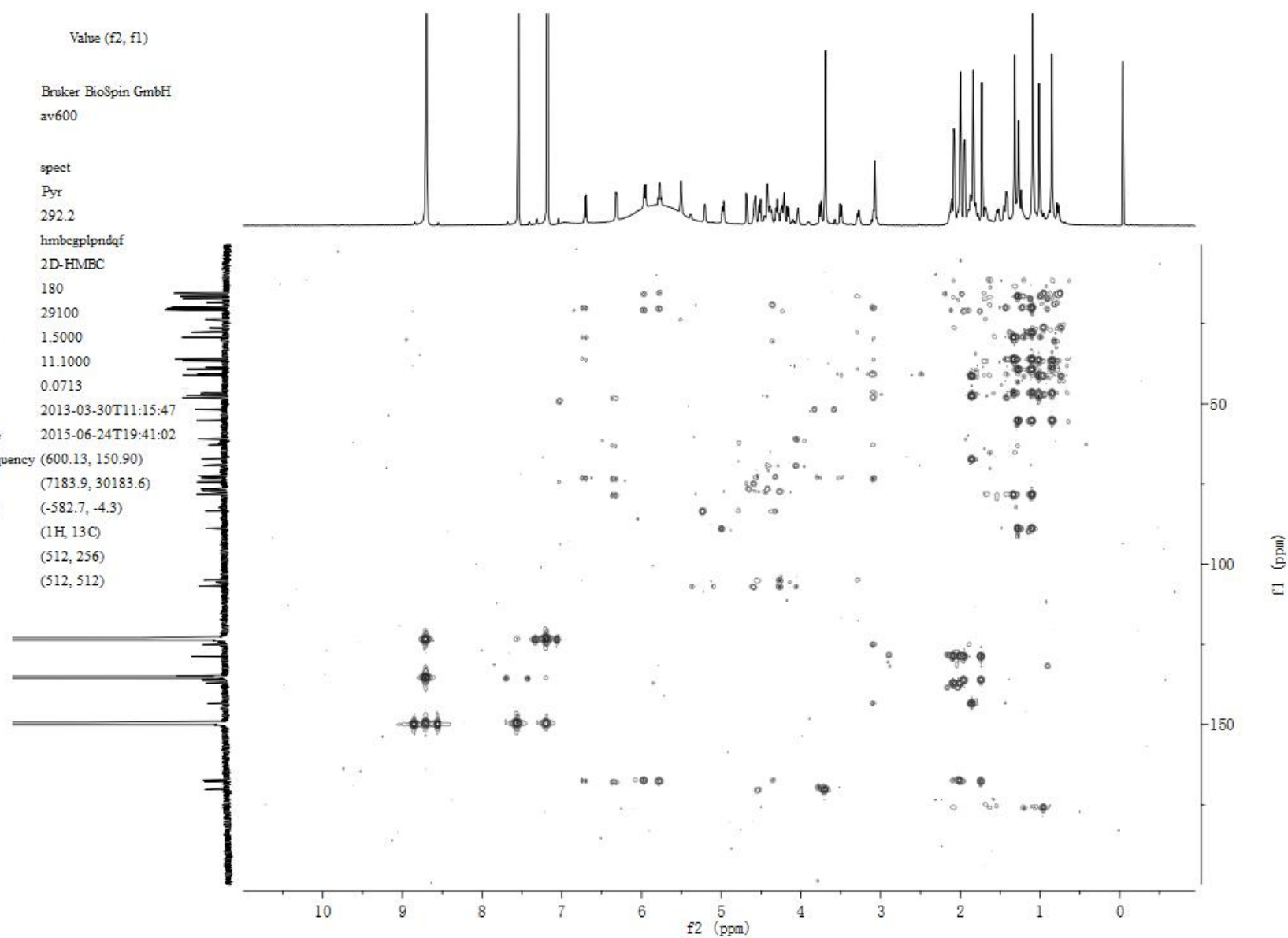


Figure S19. HSQC Spectrum of 6'-methylene-O-Xanifolia-Y5 (3) in C<sub>5</sub>D<sub>5</sub>N.

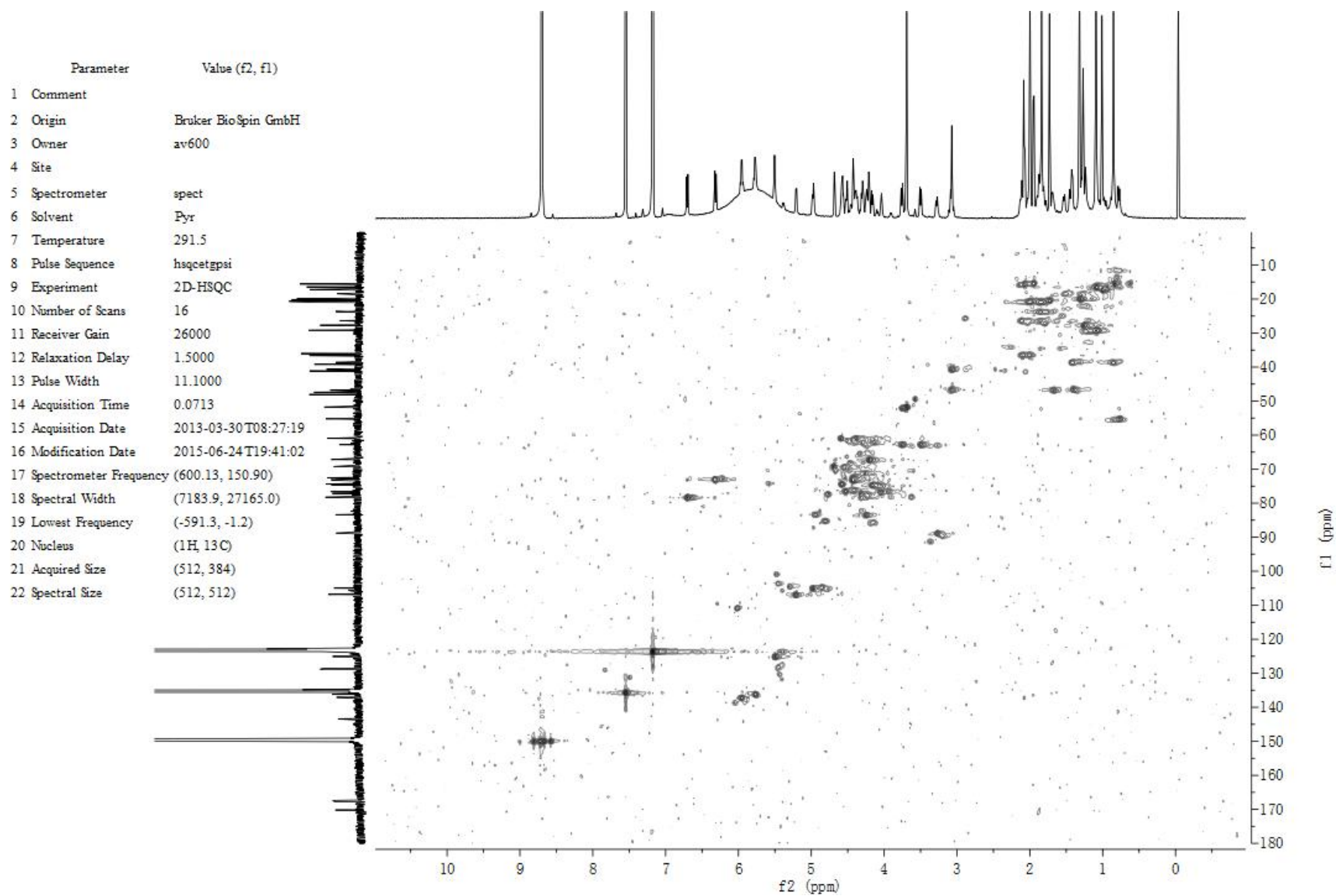


Figure S20. IR Spectrum of 6'-methylester-O-Xanifolia-Y5 (3).

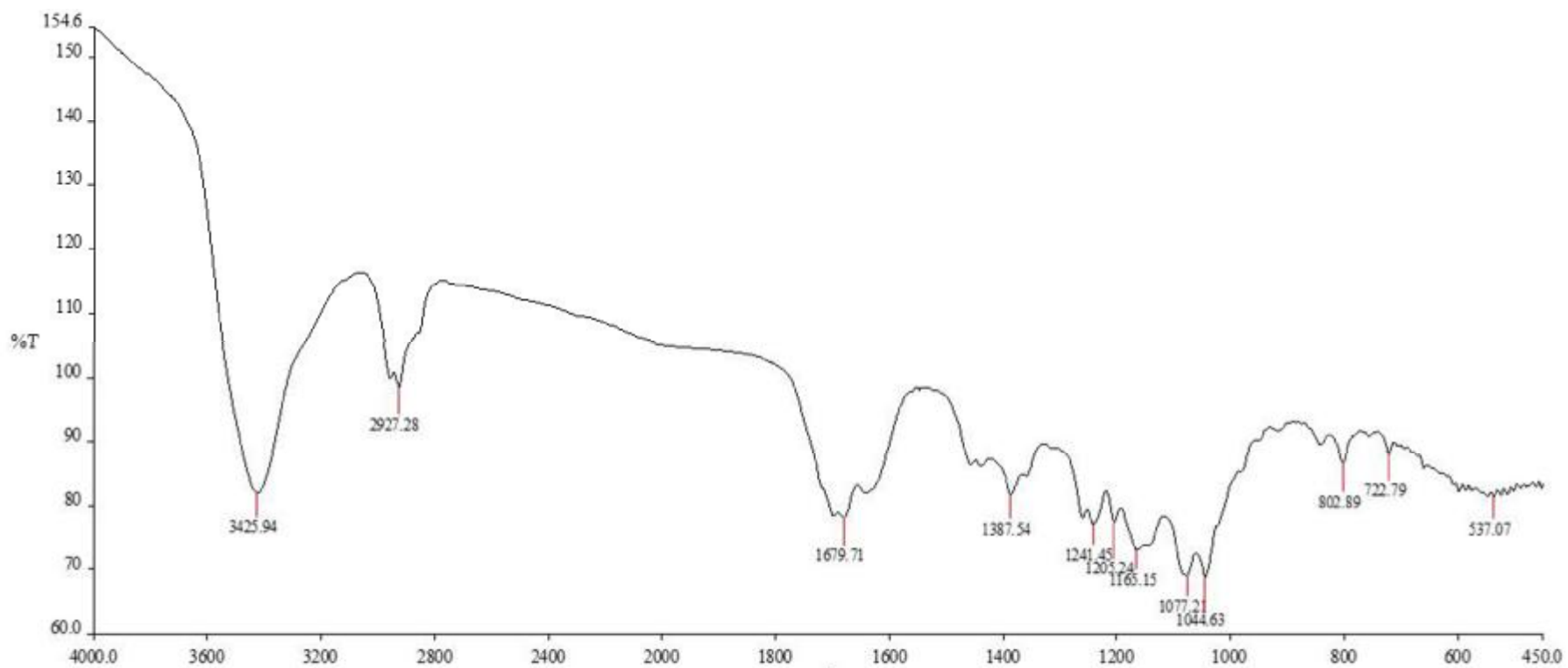




Figure S21. <sup>1</sup>H-NMR Spectrum of 16-*O*-acetyl-aesculoside G12 (4) in C<sub>5</sub>D<sub>5</sub>N.

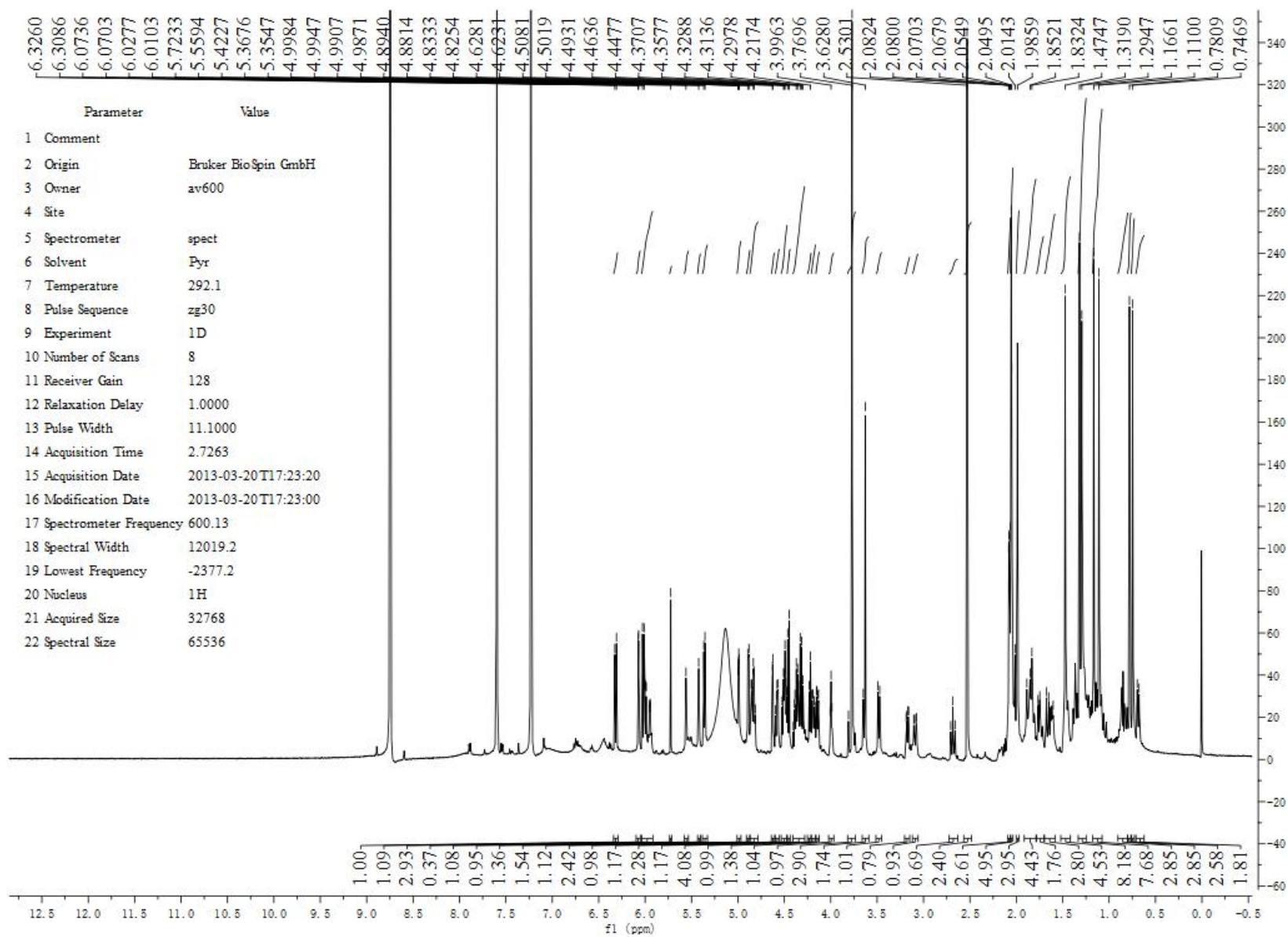


Figure S22.  $^{13}\text{C}$ -NMR Spectrum of 16-*O*-acetyl-aesculoside G12 (4) in  $\text{C}_5\text{D}_5\text{N}$ .

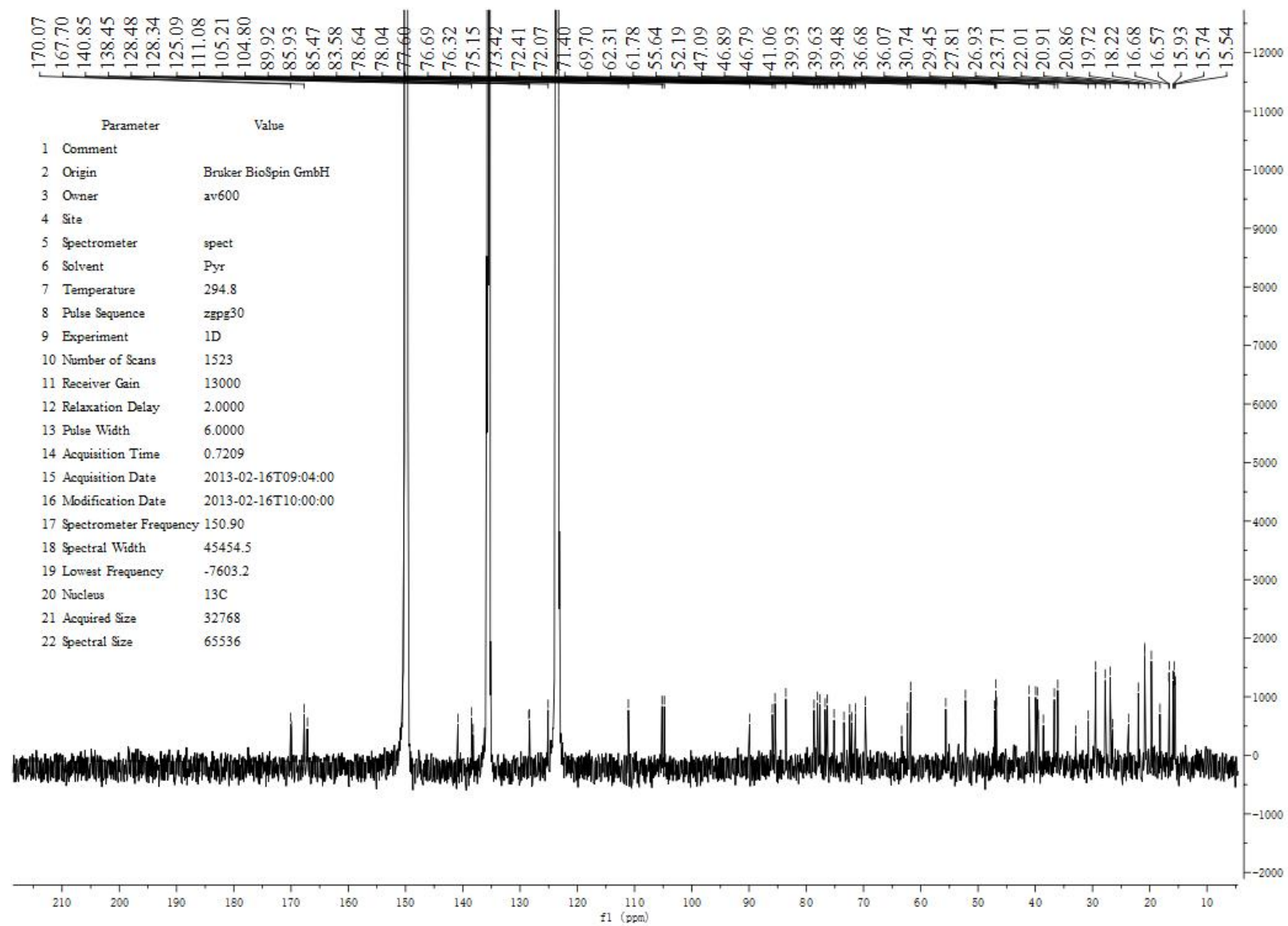


Figure S23. HR-ESI-MS Spectrum of 16-O-acetyl-aesculoside G12 (4).

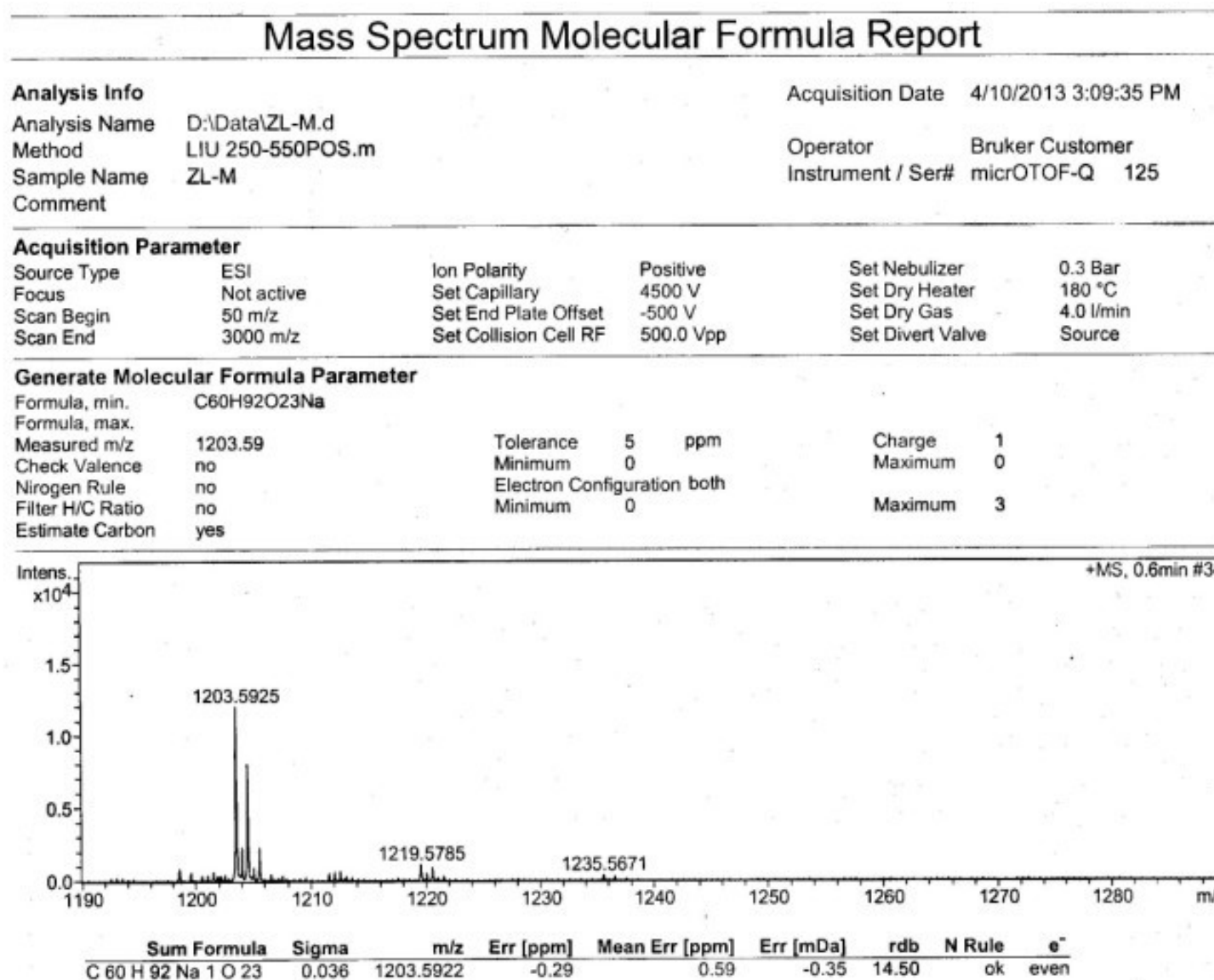


Figure S24. HMBC Spectrum of 16-*O*-acetyl-aesculoside G12 (4) in C<sub>5</sub>D<sub>5</sub>N.

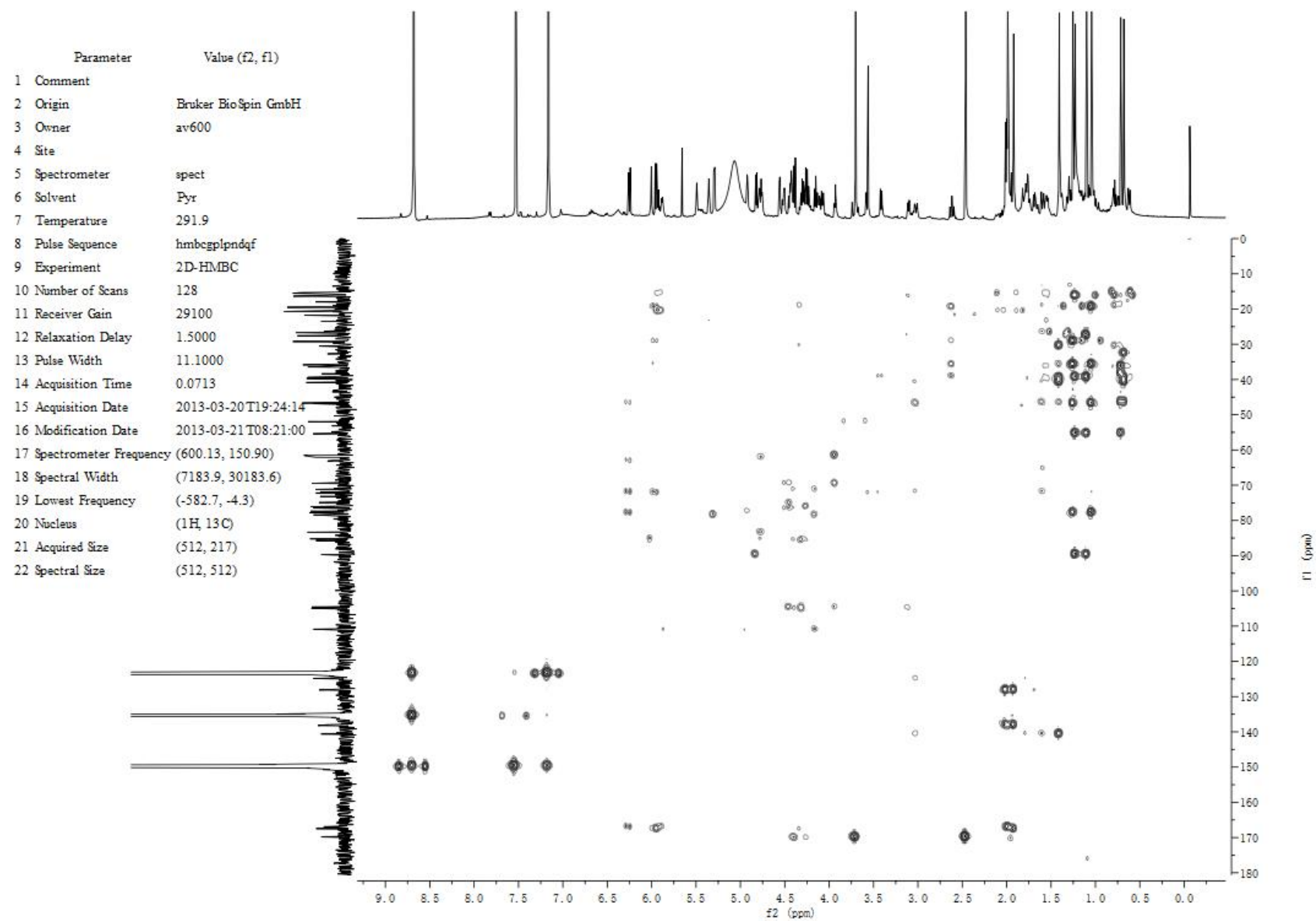


Figure S25. HSQC Spectrum of 16-*O*-acetyl-aesculioside G12 (4) in C<sub>5</sub>D<sub>5</sub>N.

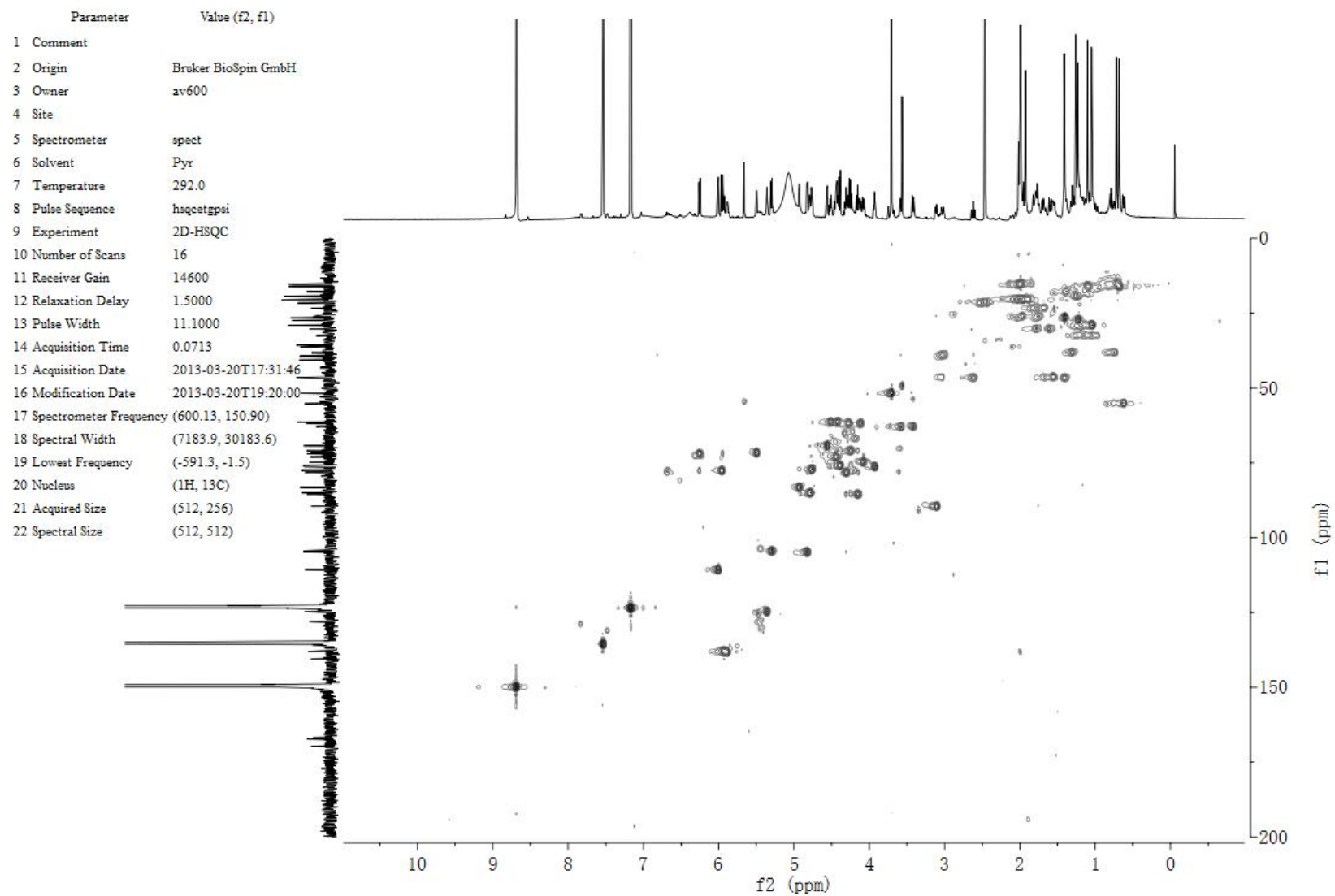


Figure S26. NOESY spectrum of 16-*O*-acetyl-aesculoside G12 (4) in C<sub>5</sub>D<sub>5</sub>N.

Parameter	Value (f2, f1)
1 Comment	
2 Origin	Bruker BioSpin GmbH
3 Owner	nmr
4 Site	
5 Spectrometer	spect
6 Solvent	Pyr
7 Temperature	297.9
8 Pulse Sequence	noesygpqhpp
9 Experiment	2D-NOESY
10 Number of Scans	8
11 Receiver Gain	88
12 Relaxation Delay	2.0000
13 Pulse Width	11.7300
14 Acquisition Time	0.1671
15 Acquisition Date	2013-04-16T16:23:22
16 Modification Date	2013-04-16T18:12:48
17 Spectrometer Frequency	(600.13, 600.13)
18 Spectral Width	(6127.5, 6127.5)
19 Lowest Frequency	(-301.2, -301.2)
20 Nucleus	(1H, 1H)
21 Acquired Size	(1024, 256)
22 Spectral Size	(1024, 1024)

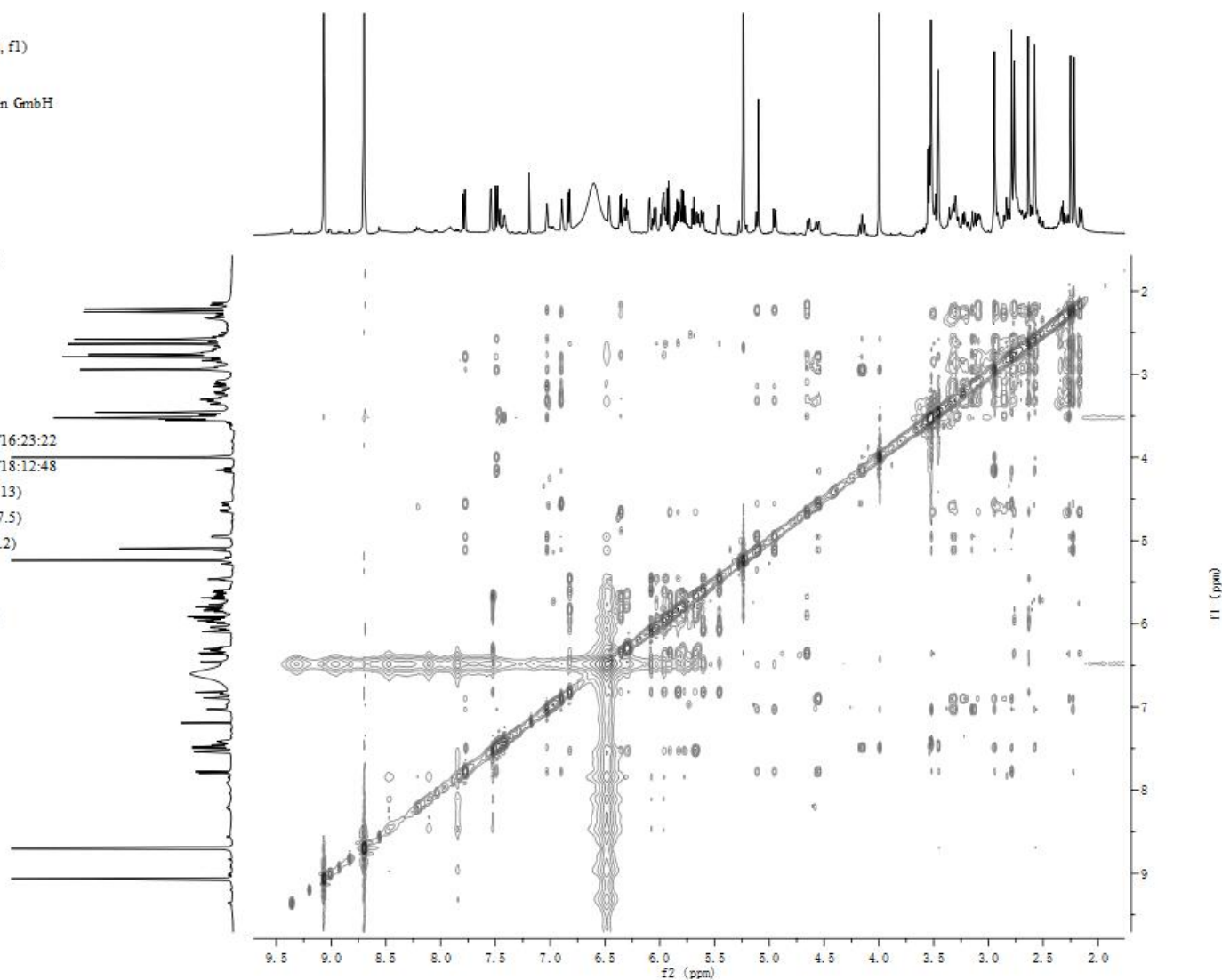




Figure S27. IR Spectrum of 16-O-acetyl-aesculoside G12 (4).

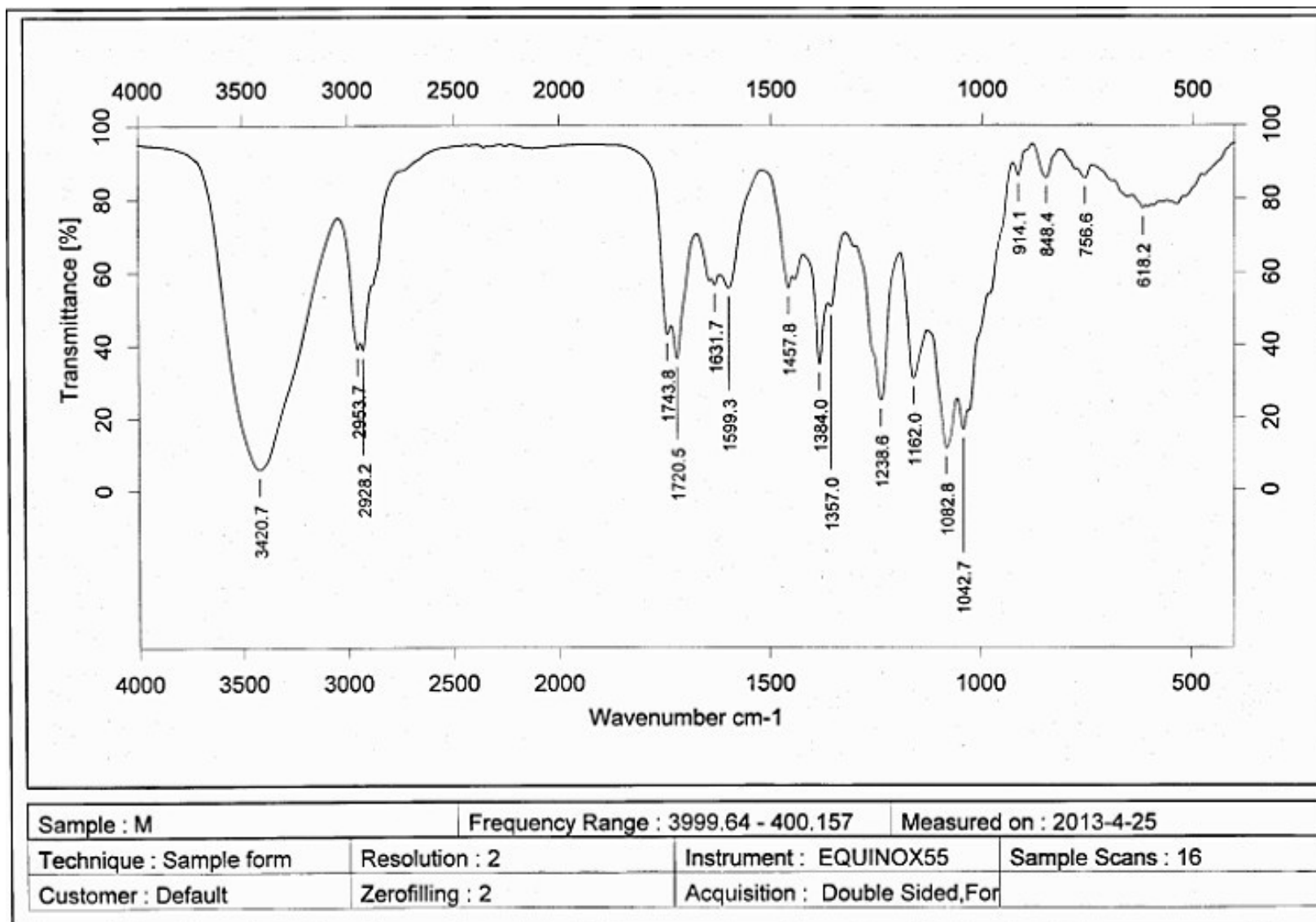


Figure S28. <sup>1</sup>H-NMR Spectrum of 3-O-[α-L-arabinofuranosyl(1→3)]-β-D-galactopyranosyl(1→2)-β-D-6'-methyl-glucuronic acid-21-O-(3''',4''''-O-diangeloyl)-β-D-fucopyranosyl-28-O-acetyl-3β, 16α, 21β, 22α, 28-pentahydroxy-olean-12-ene (5) in C<sub>5</sub>D<sub>5</sub>N.

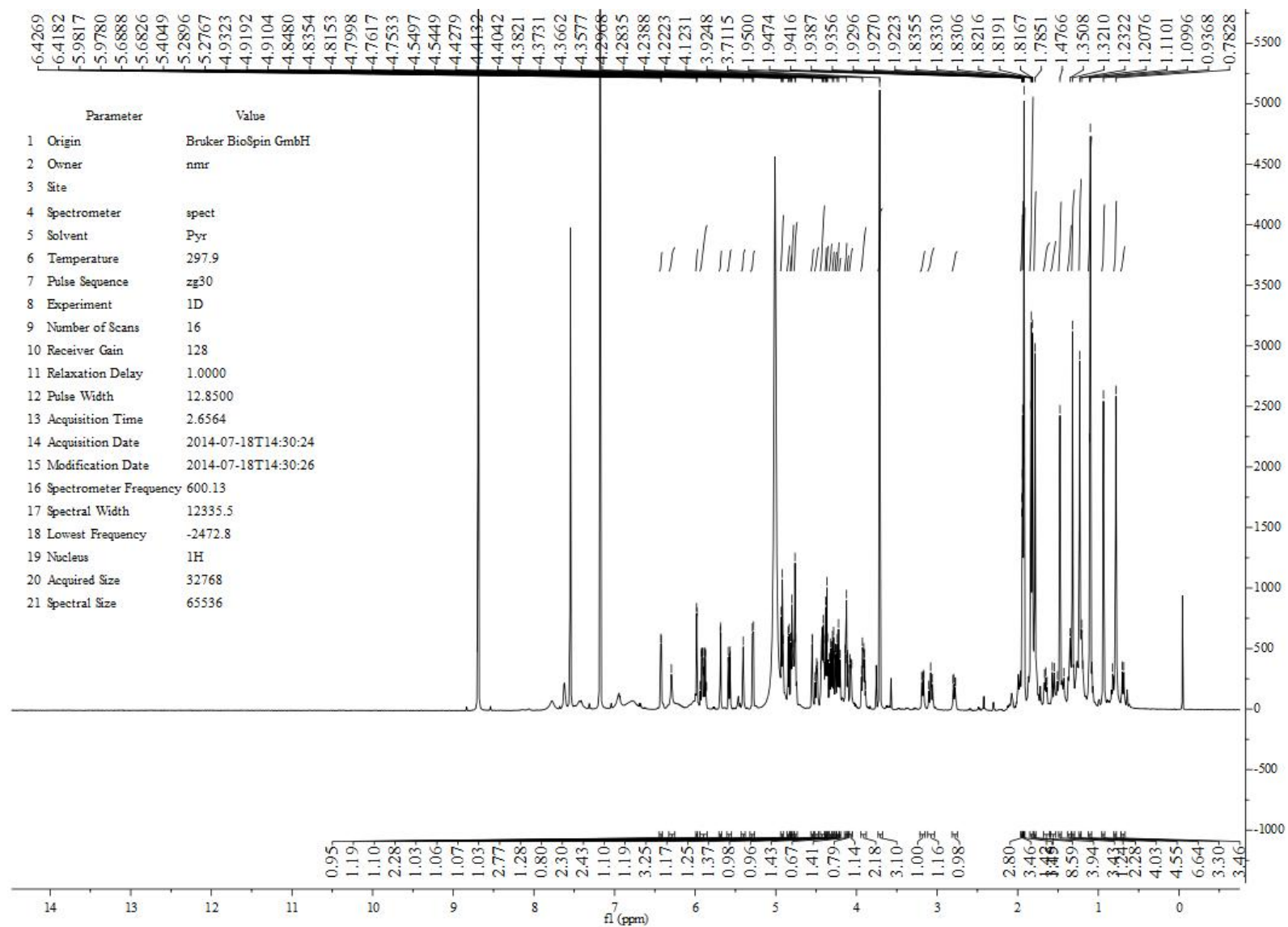




Figure S29.  $^{13}\text{C}$ -NMR Spectrum of 3-O-[ $\alpha$ -L-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -D-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -D-6'-methyl-glucuronic acid-21-O-(3''',4''''-O-diangeloyl)- $\beta$ -D-fucopyranosyl-28-O-acetyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (5) in  $\text{C}_5\text{D}_5\text{N}$ .

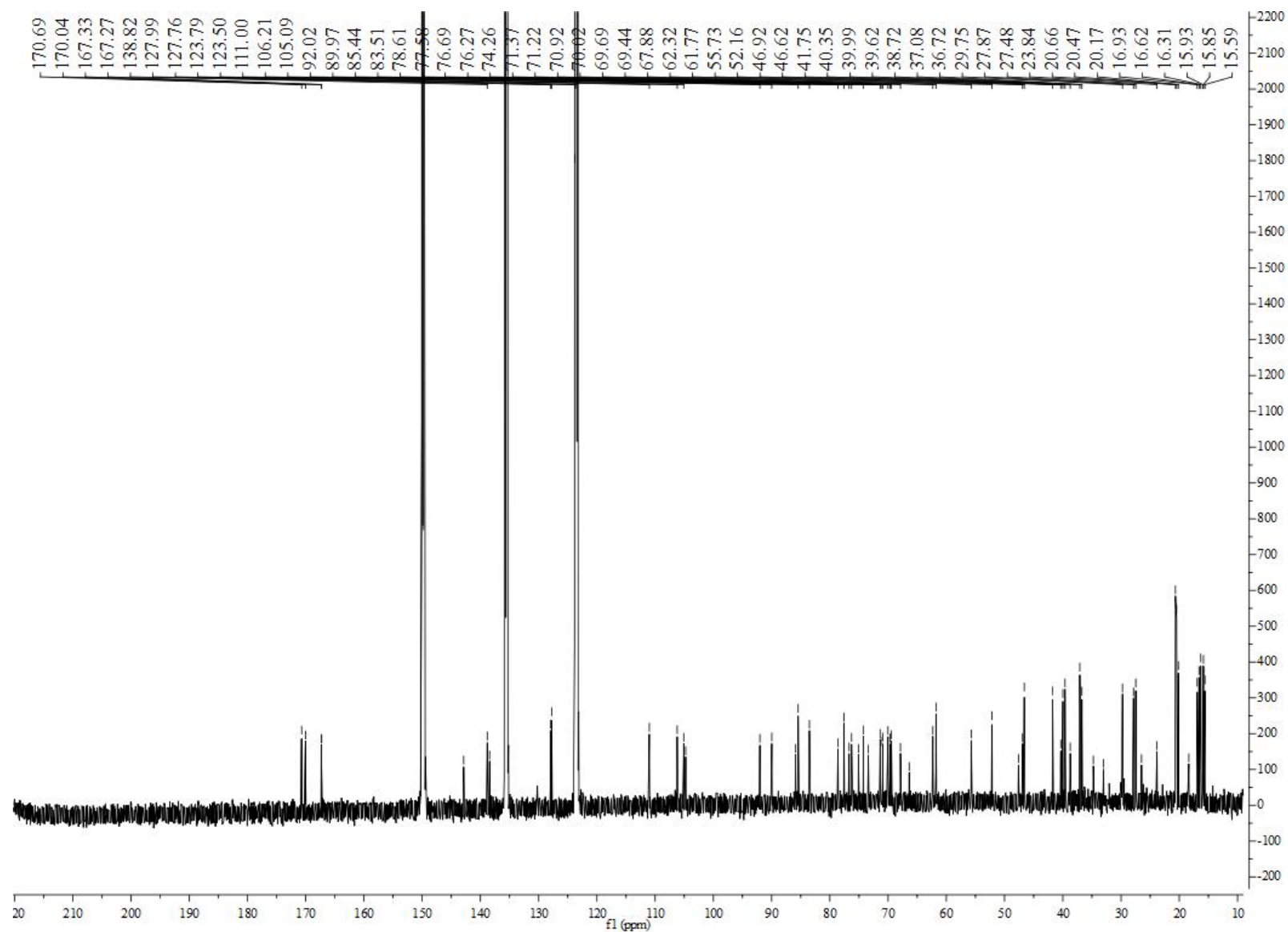


Figure S30. HR-ESI-MS Spectrum of 3-O-[ $\alpha$ -L-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -D-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -D-6'-methyl-glucuronic acid-21-O-(3''',4'''-O-diangeloyl)- $\beta$ -D-fucopyranosyl-28-O-acetyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (5).

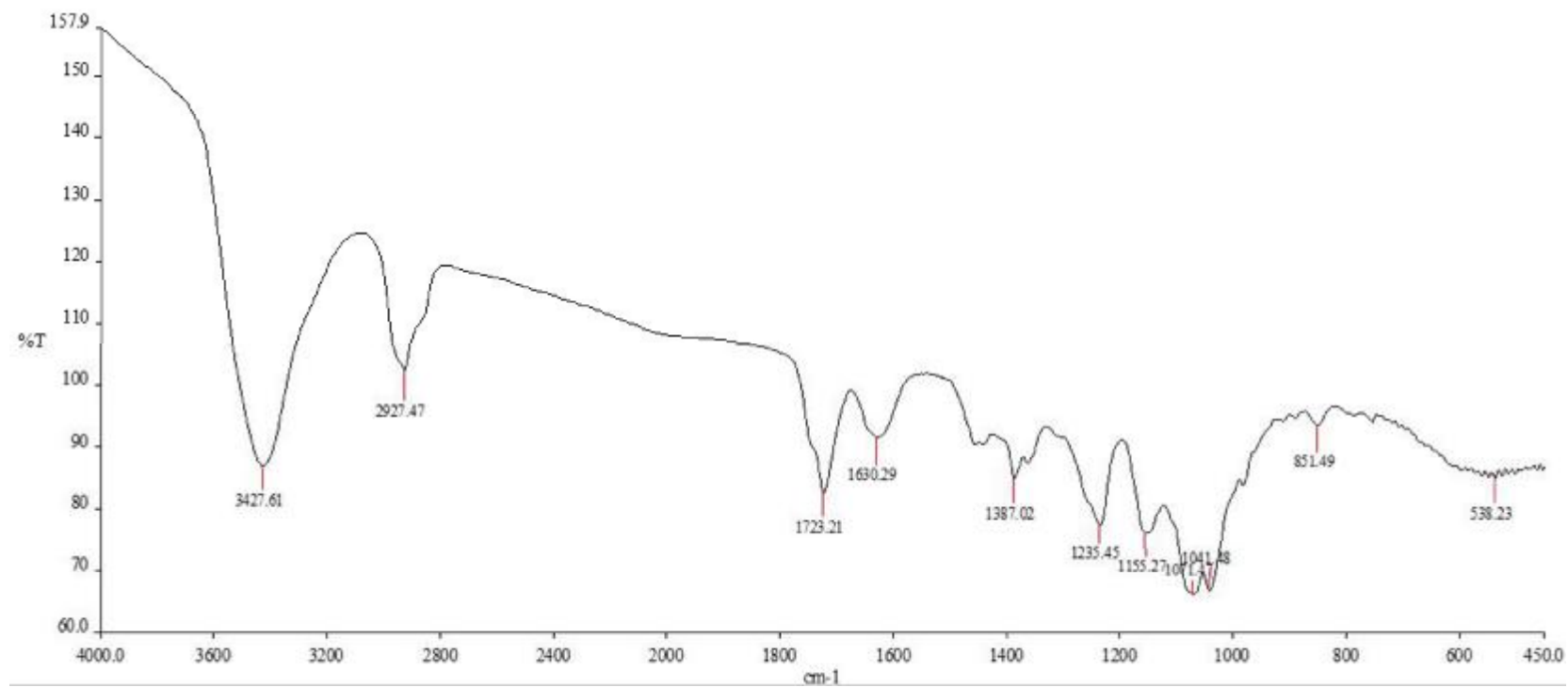


Figure S31. HMBC Spectrum of 3-O-[ $\alpha$ -L-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -D-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -D-6'-methyl-glucuronic acid-21-O-(3''',4''''-O-diangeloyl)- $\beta$ -D-fucopyranosyl-28-O-acetyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (5) in C<sub>5</sub>D<sub>5</sub>N.

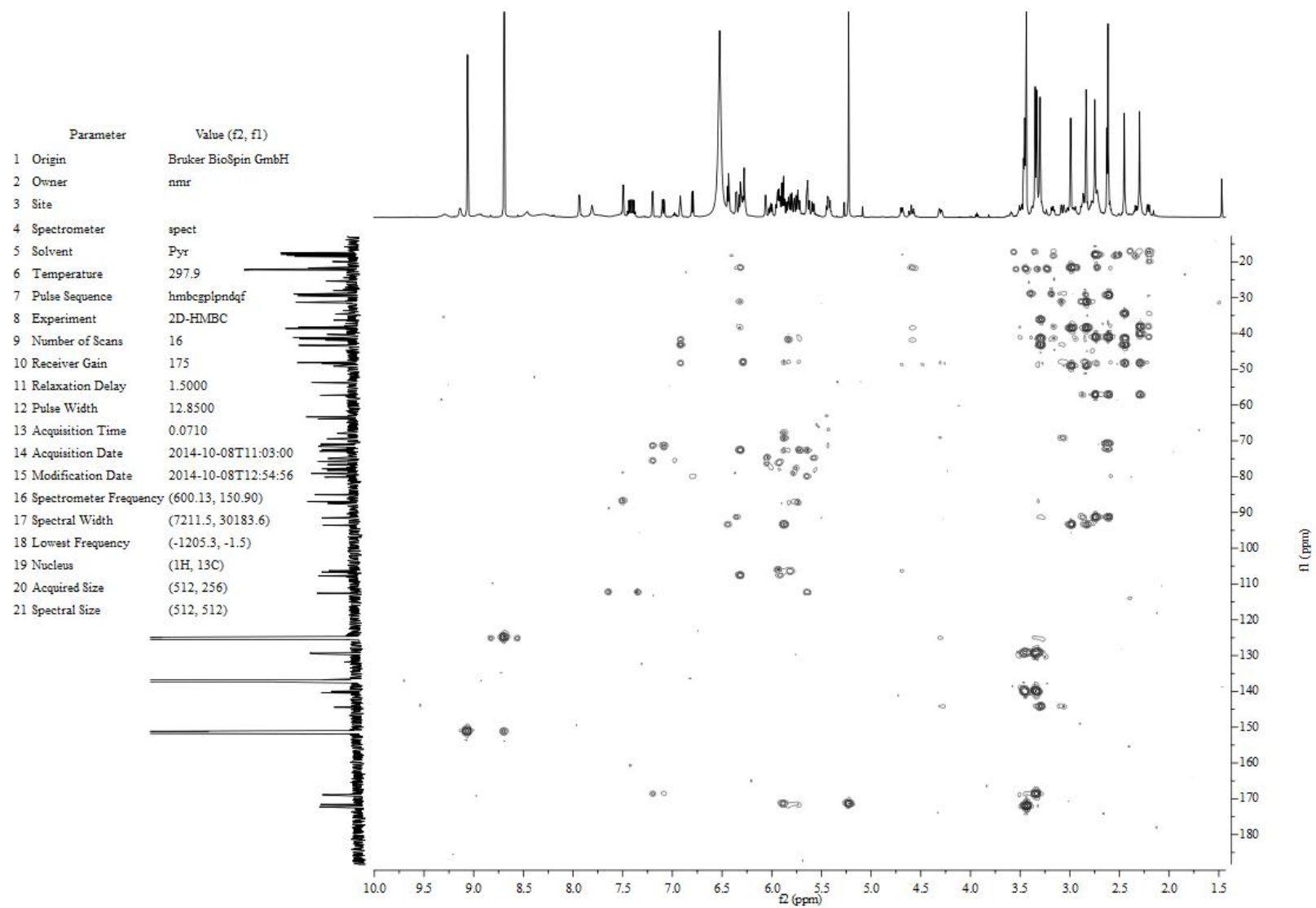


Figure S32. HSQC Spectrum of 3-O-[ $\alpha$ -L-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -D-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -D-6'-methyl-glucuronic acid-21-O-(3''',4''''-O-diangeloyl)- $\beta$ -D-fucopyranosyl-28-O-acetyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (5) in C<sub>5</sub>D<sub>5</sub>N.

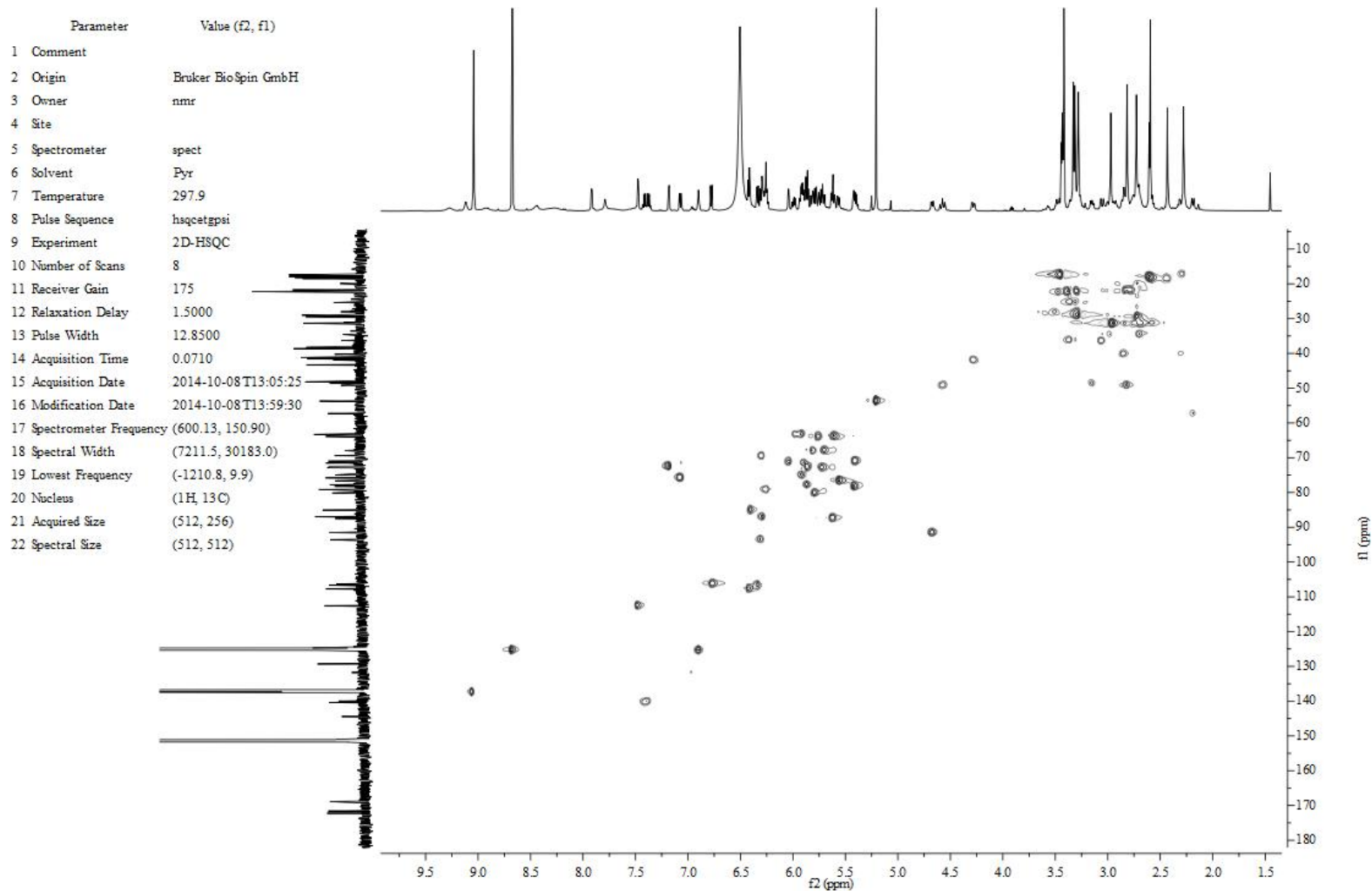


Figure S33. IR Spectrum of 3-O-[ $\alpha$ -L-arabinofuranosyl(1 $\rightarrow$ 3)]- $\beta$ -D-galactopyranosyl(1 $\rightarrow$ 2)- $\beta$ -D-6'-methyl-glucuronic acid-21-O-(3''',4''''-O-diangeloyl)- $\beta$ -D-fucopyranosyl-28-O-acetyl-3 $\beta$ , 16 $\alpha$ , 21 $\beta$ , 22 $\alpha$ , 28-pentahydroxy-olean-12-ene (5) in C<sub>5</sub>D<sub>5</sub>N.

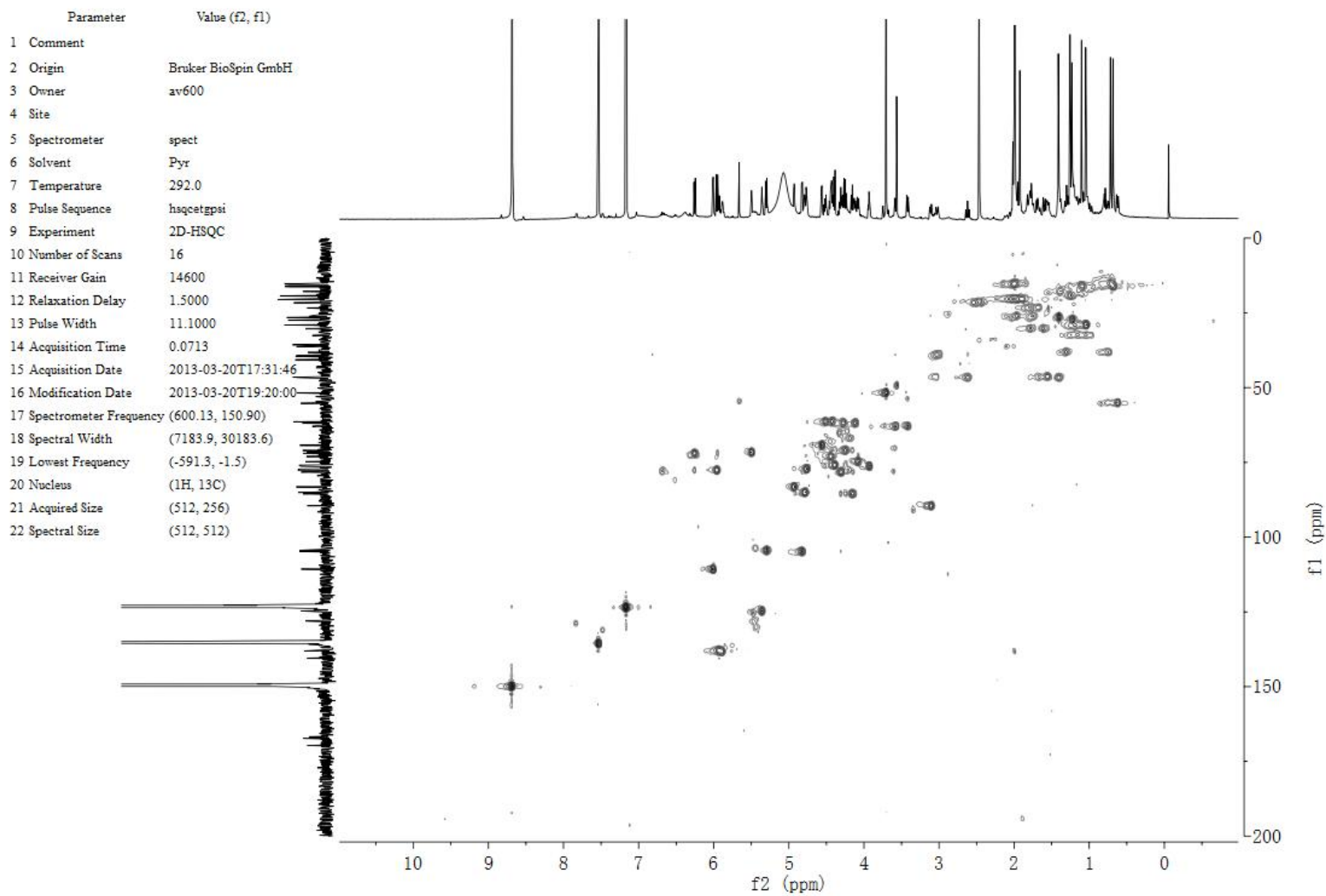


Figure S34. <sup>1</sup>H-NMR Spectrum of 6'-methyl ester-O-Xanifolia-Y2 (6) in C<sub>5</sub>D<sub>5</sub>N.

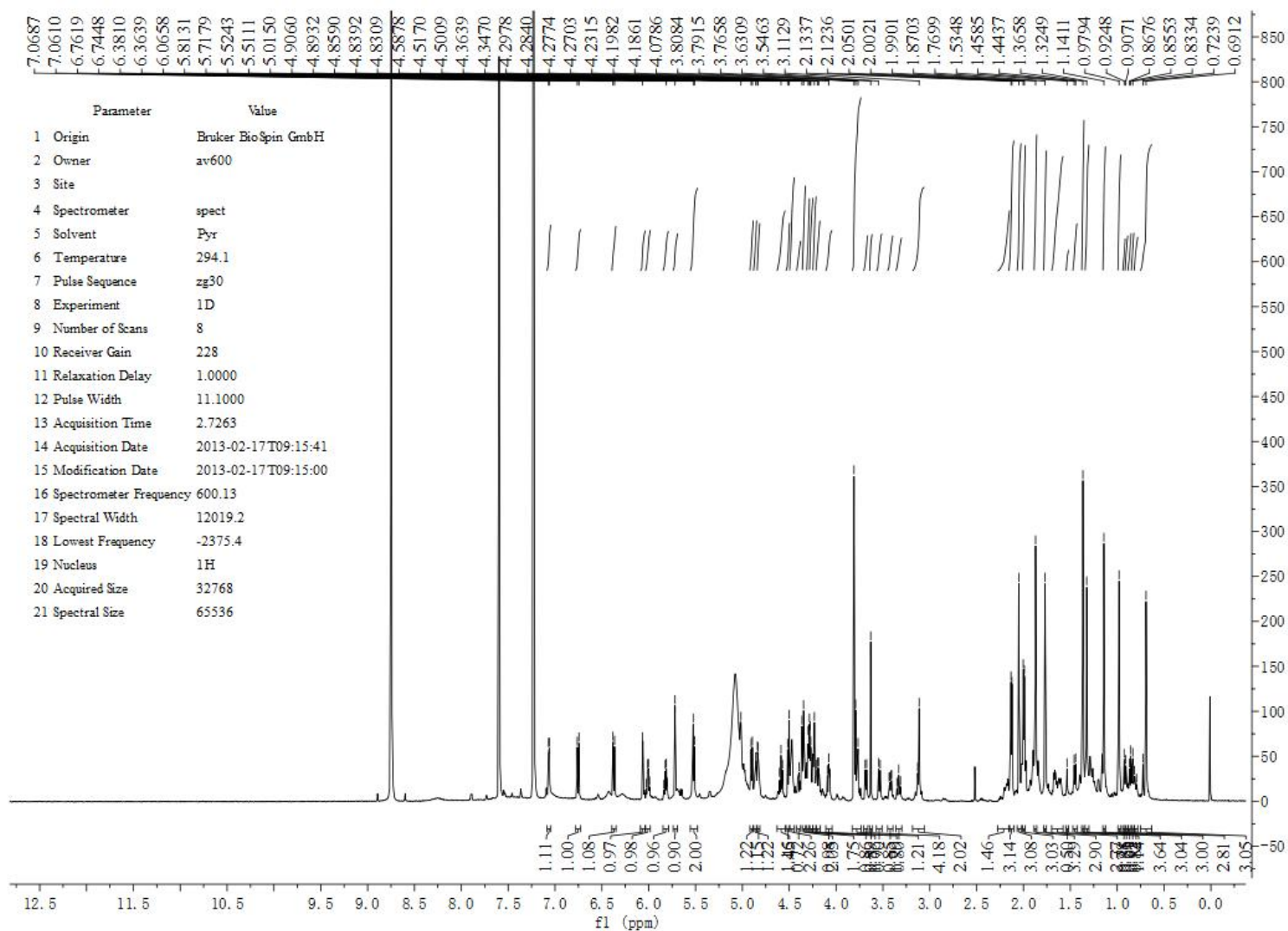


Figure S35.  $^{13}\text{C}$ -NMR Spectrum of 6'-methylster-O-Xanifolia-Y2 (6) in  $\text{C}_5\text{D}_5\text{N}$ .

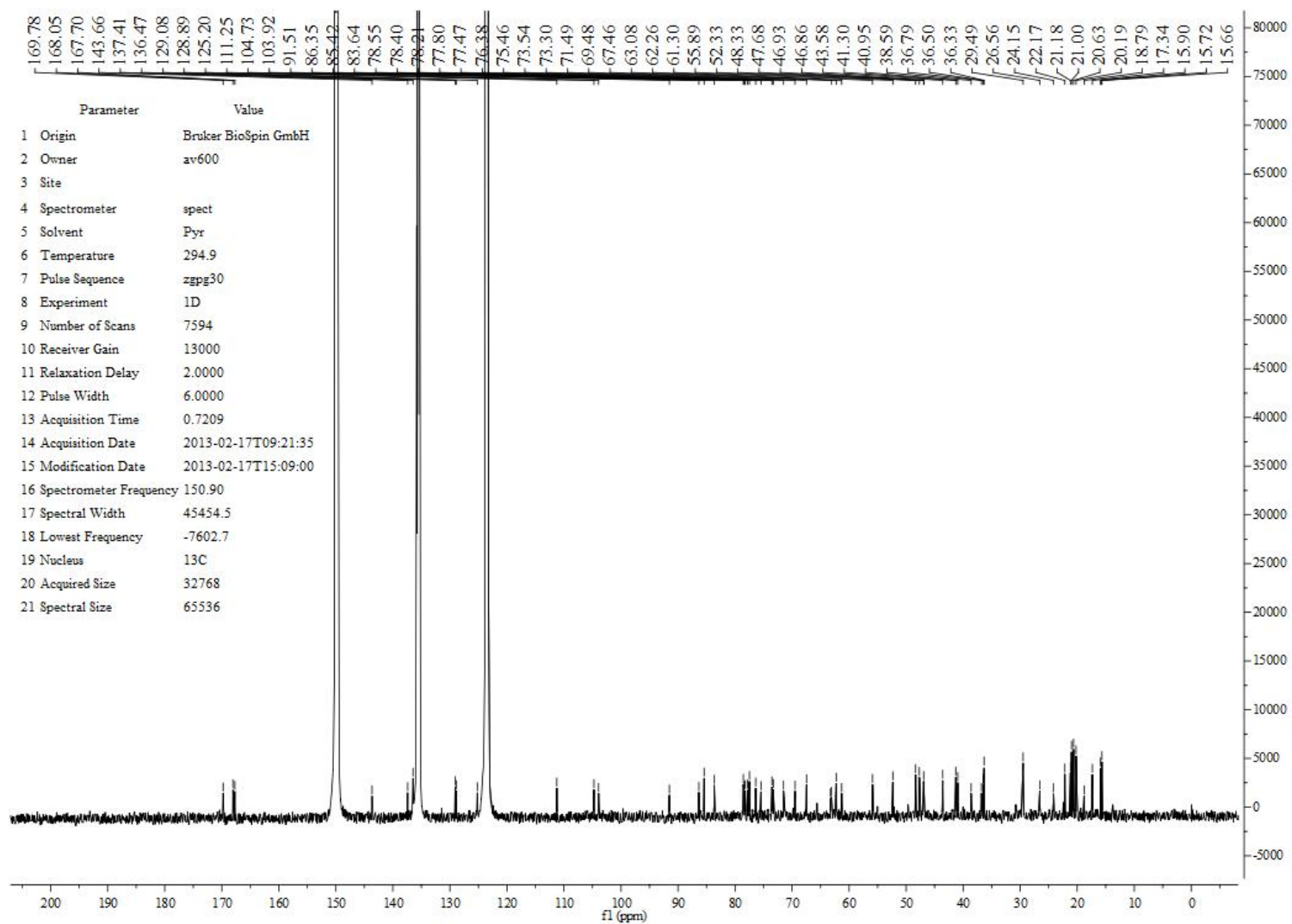




Figure S36. HR-ESI-MS Spectrum of 6'-methylester-O-Xanifolia-Y2 (6).

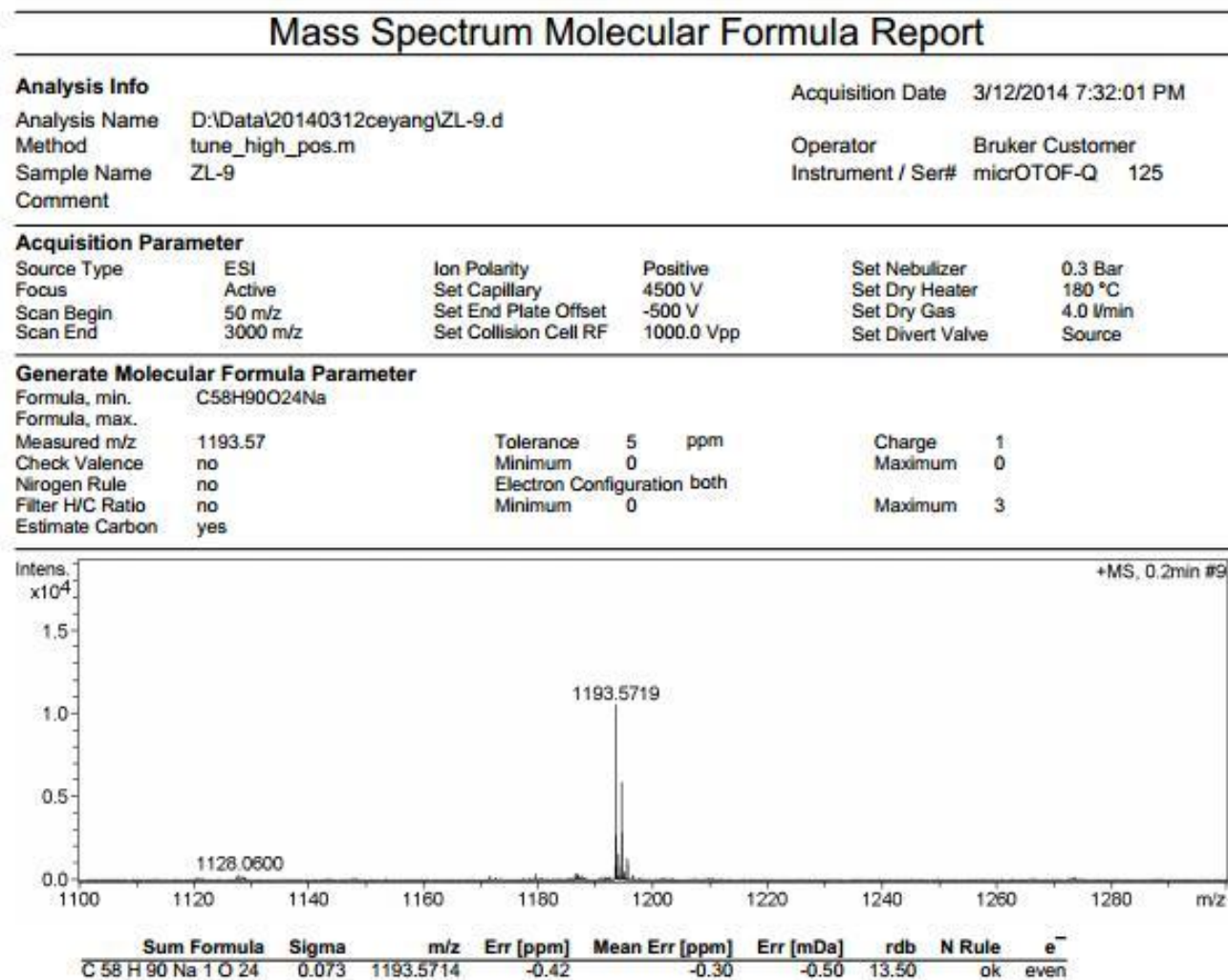




Figure S37. HMBC Spectrum of 6'-methylester-O-Xanifolia-Y2 (6) in C<sub>5</sub>D<sub>5</sub>N.

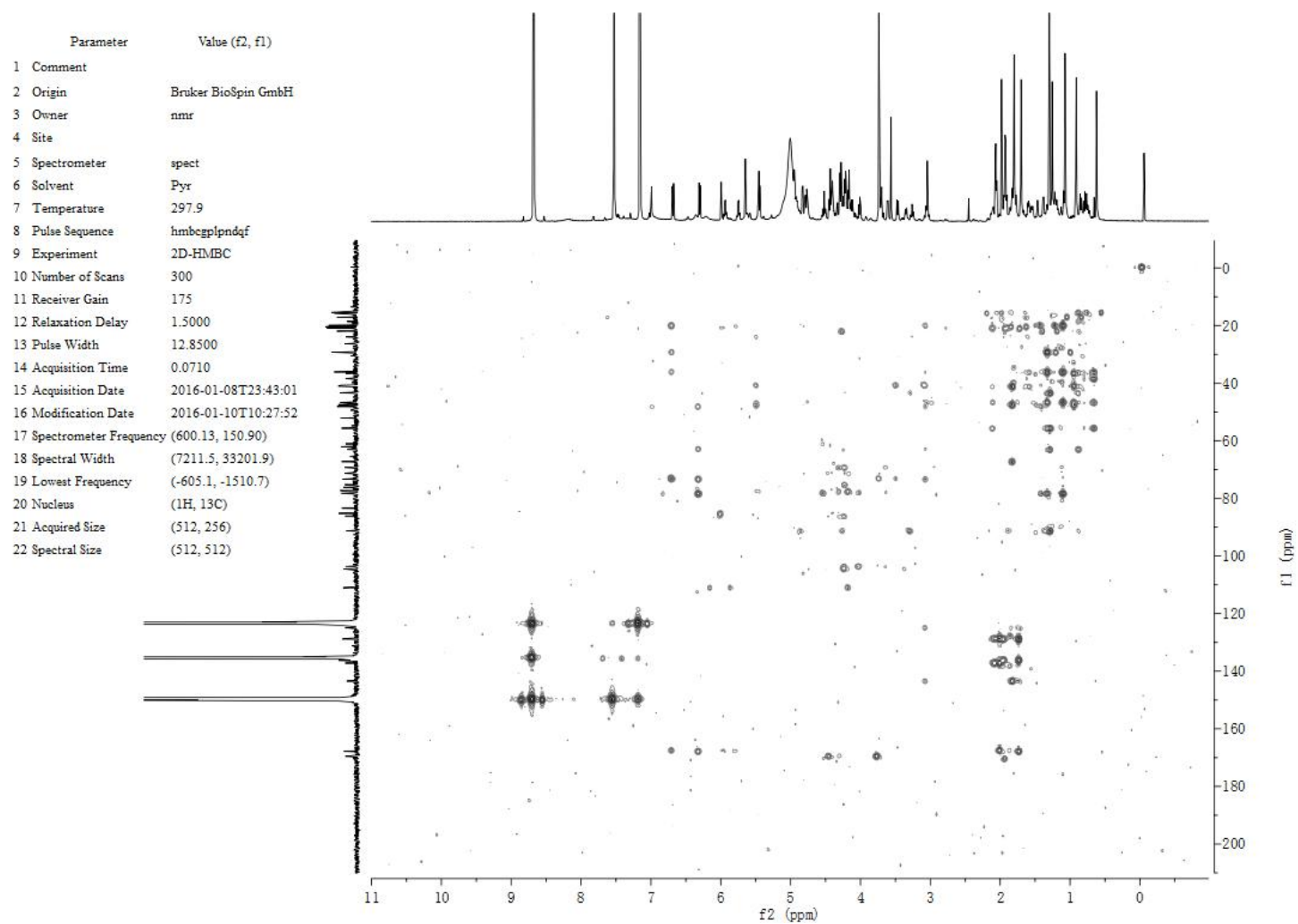


Figure S38. HSQC Spectrum of 6'-methylene-O-Xanifolia-Y2 (6) in C<sub>5</sub>D<sub>5</sub>N.

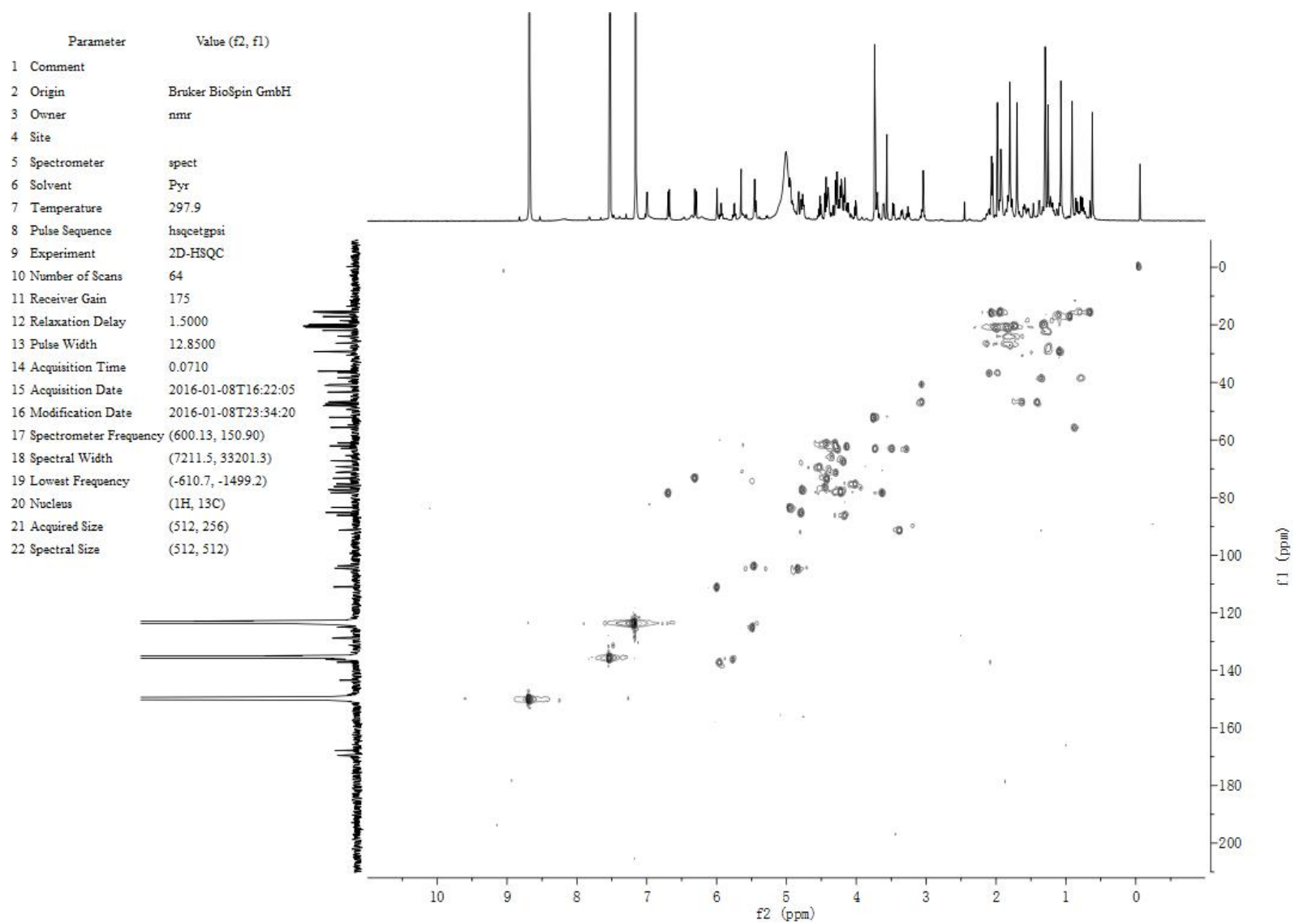


Figure S39. IR Spectrum of 6'-methylster-O-Xanifolia-Y2 (6).

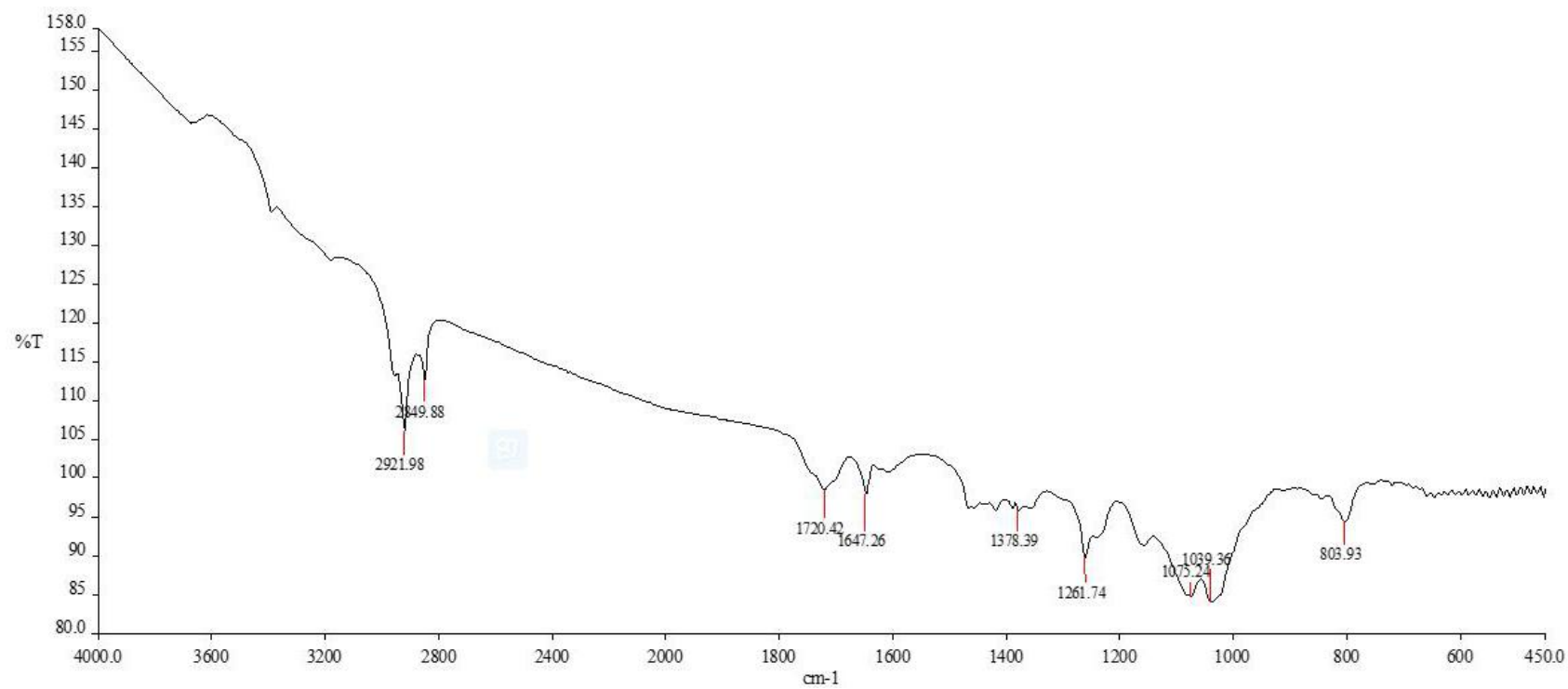


Figure S40. <sup>1</sup>H-NMR Spectrum of 6'-methylester-O-Xanifolia-Y8 (7) in C<sub>5</sub>D<sub>5</sub>N.

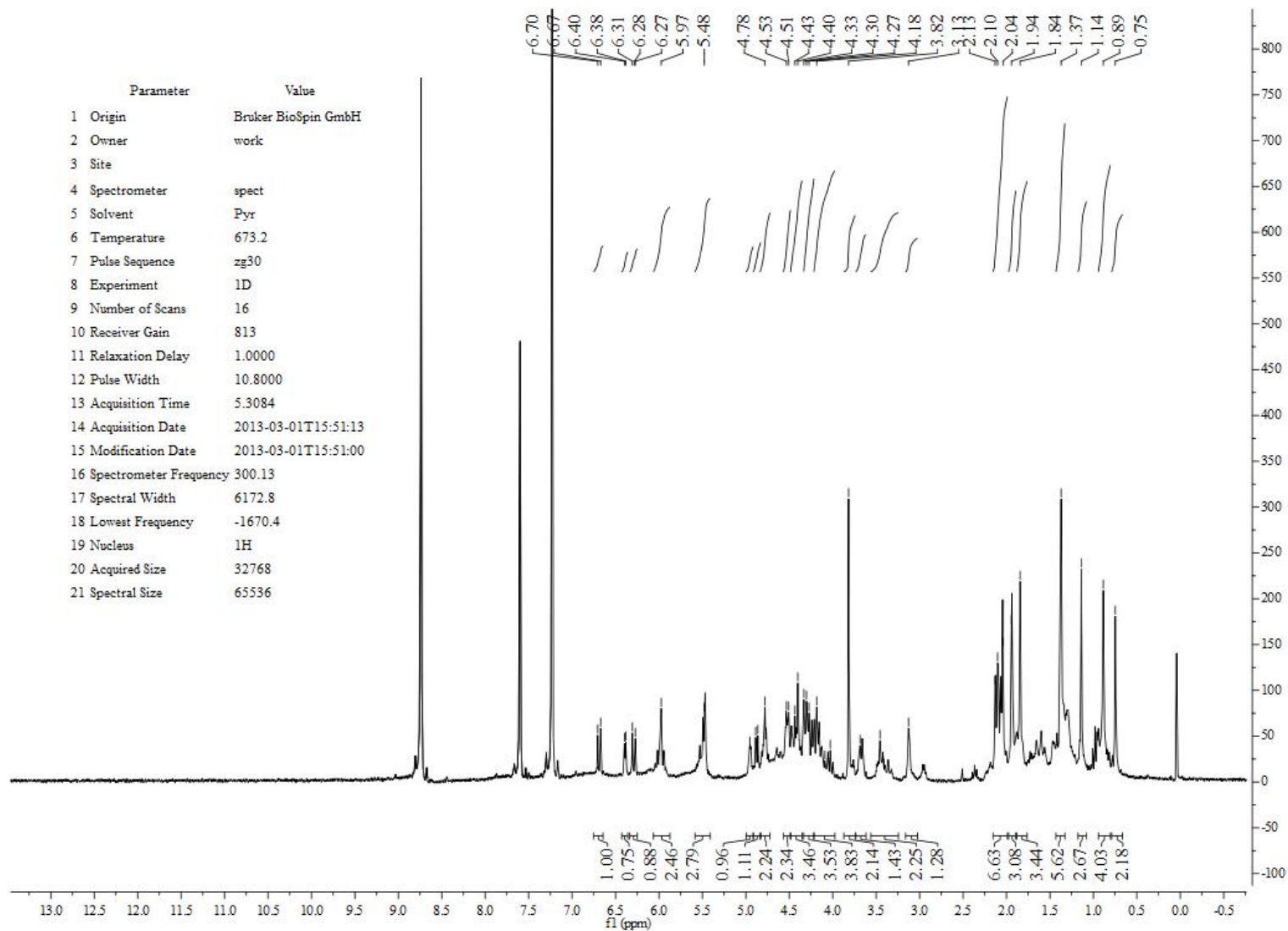


Figure S41.  $^{13}\text{C}$ -NMR Spectrum of 6'-methylster-O-Xanifolia-Y8 (7) in  $\text{C}_5\text{D}_5\text{N}$ .

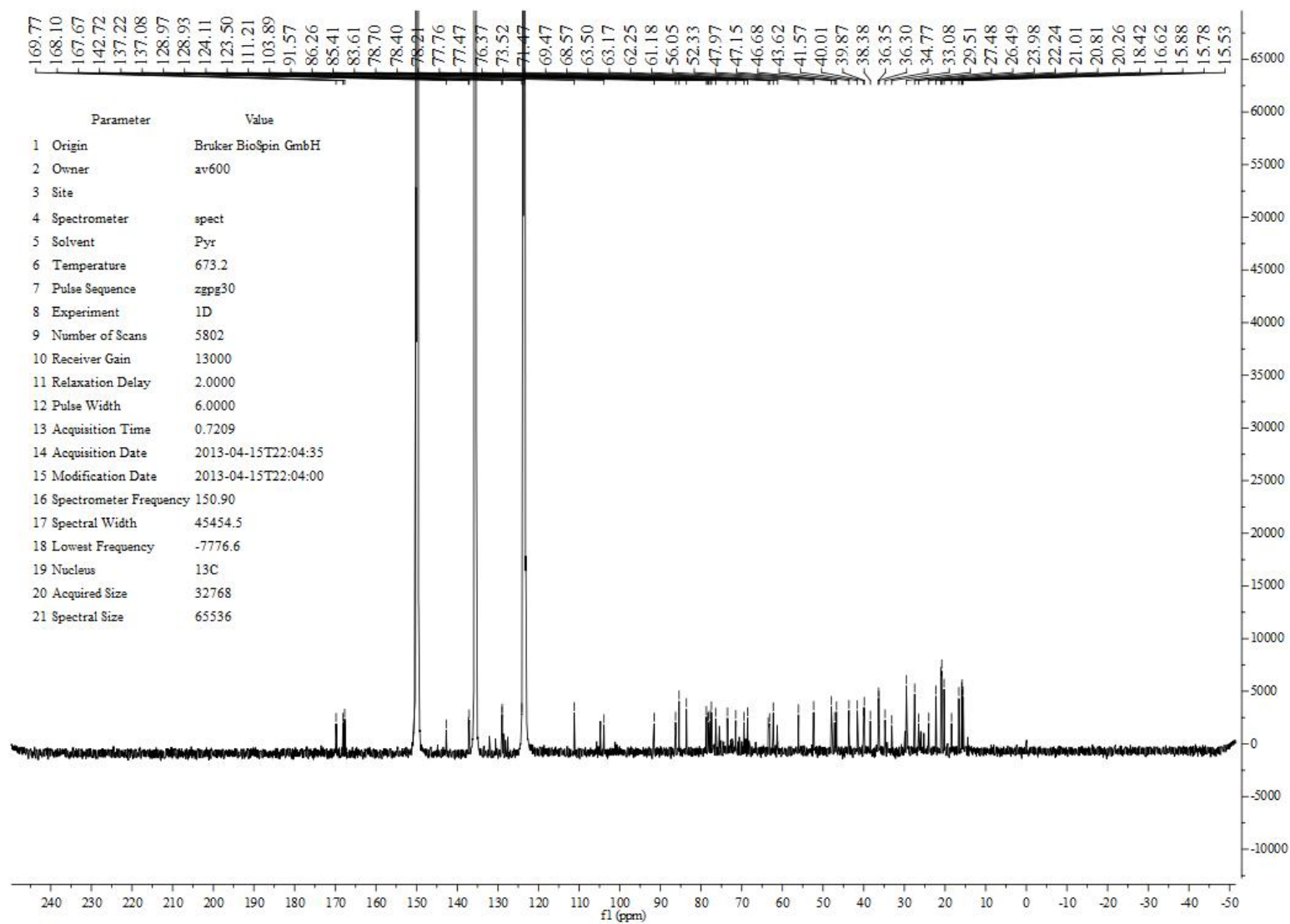


Figure S42. HR-ESI-MS Spectrum of 6'-methylester-O-Xanifolia-Y8 (7).

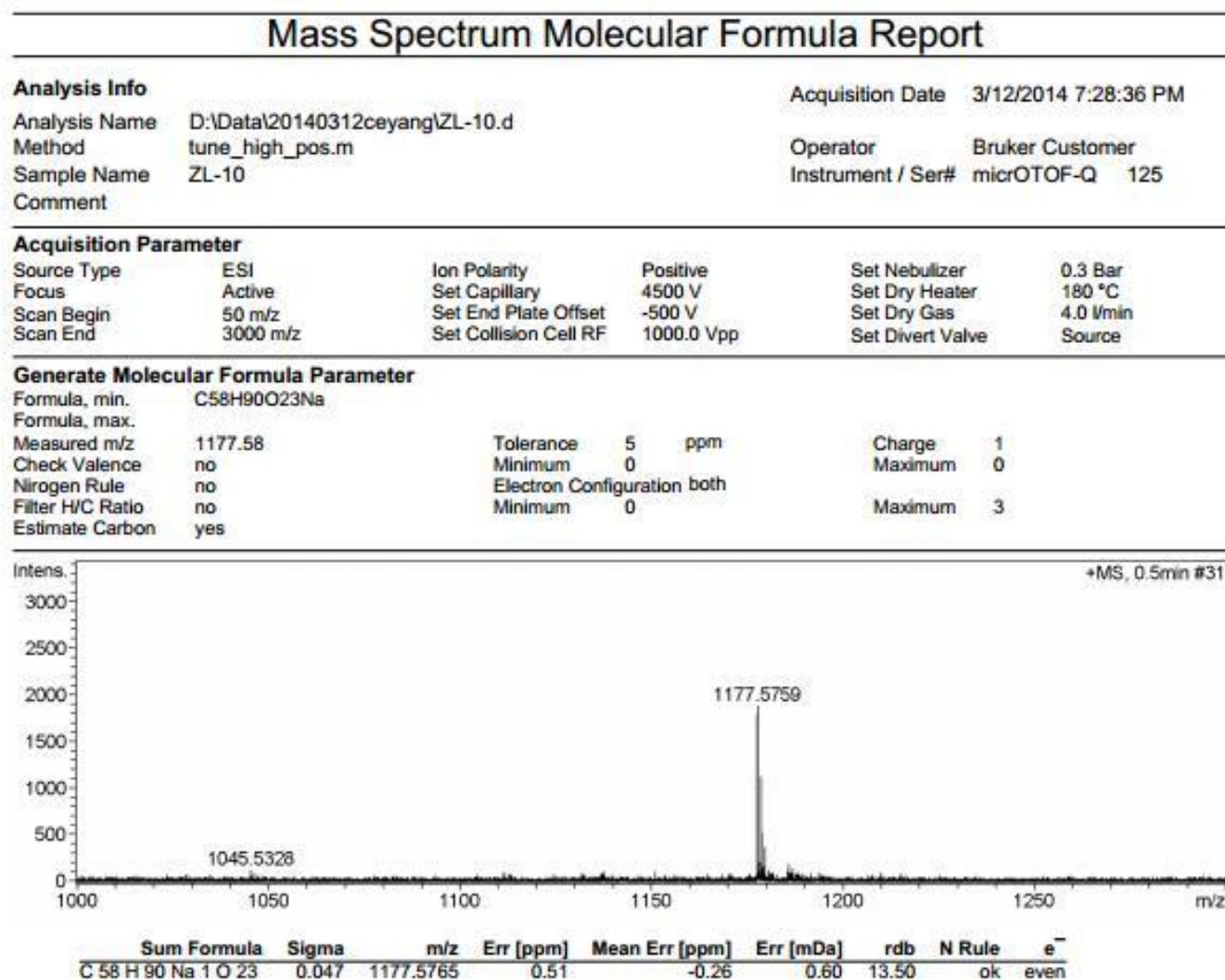


Figure S43. HMBC Spectrum of 6'-methylester-O-Xanifolia-Y8 (7) in C<sub>5</sub>D<sub>5</sub>N.

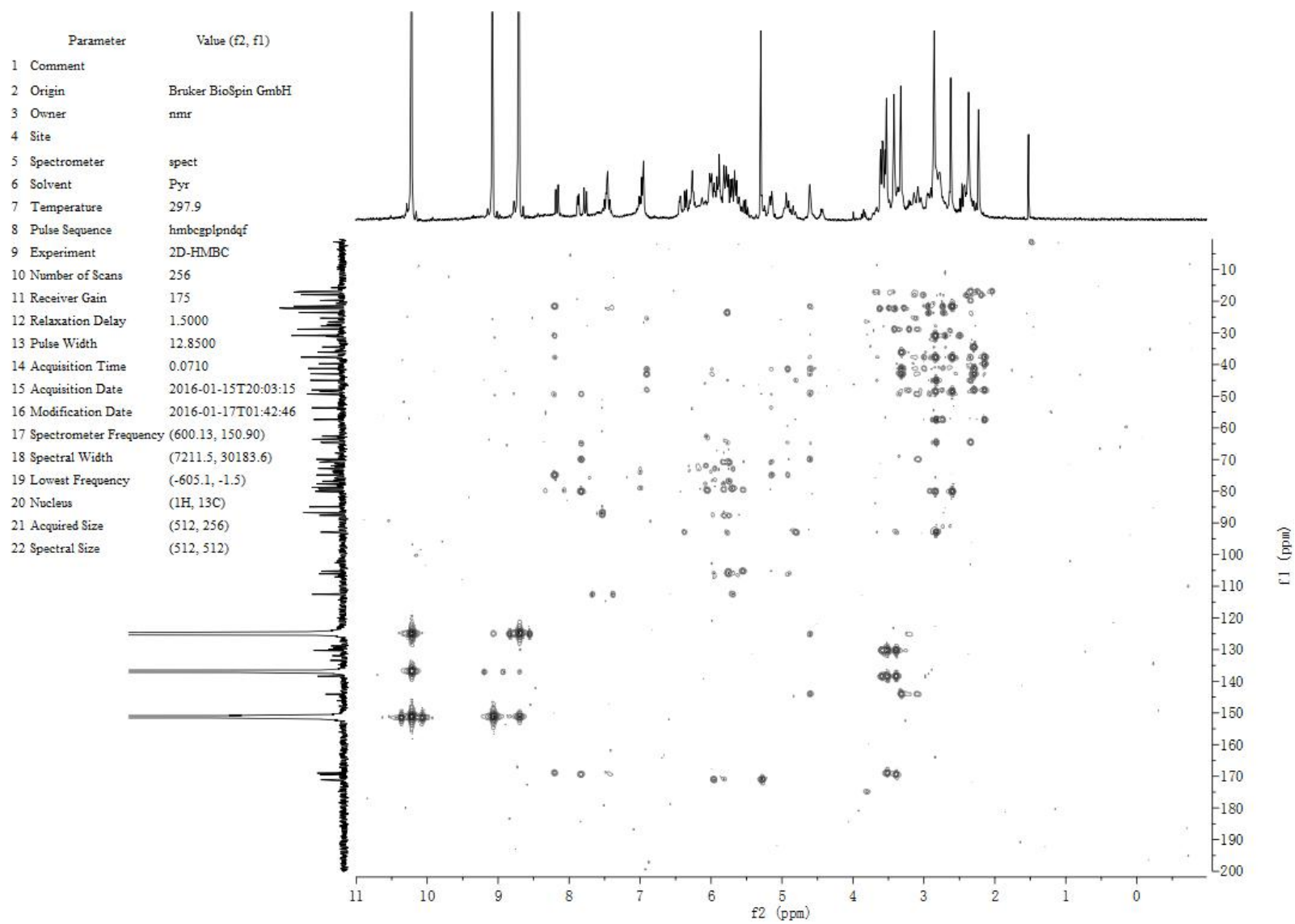




Figure S44. HSQC Spectrum of 6'-methylene-O-Xanifolia-Y8 (7) in C<sub>5</sub>D<sub>5</sub>N.

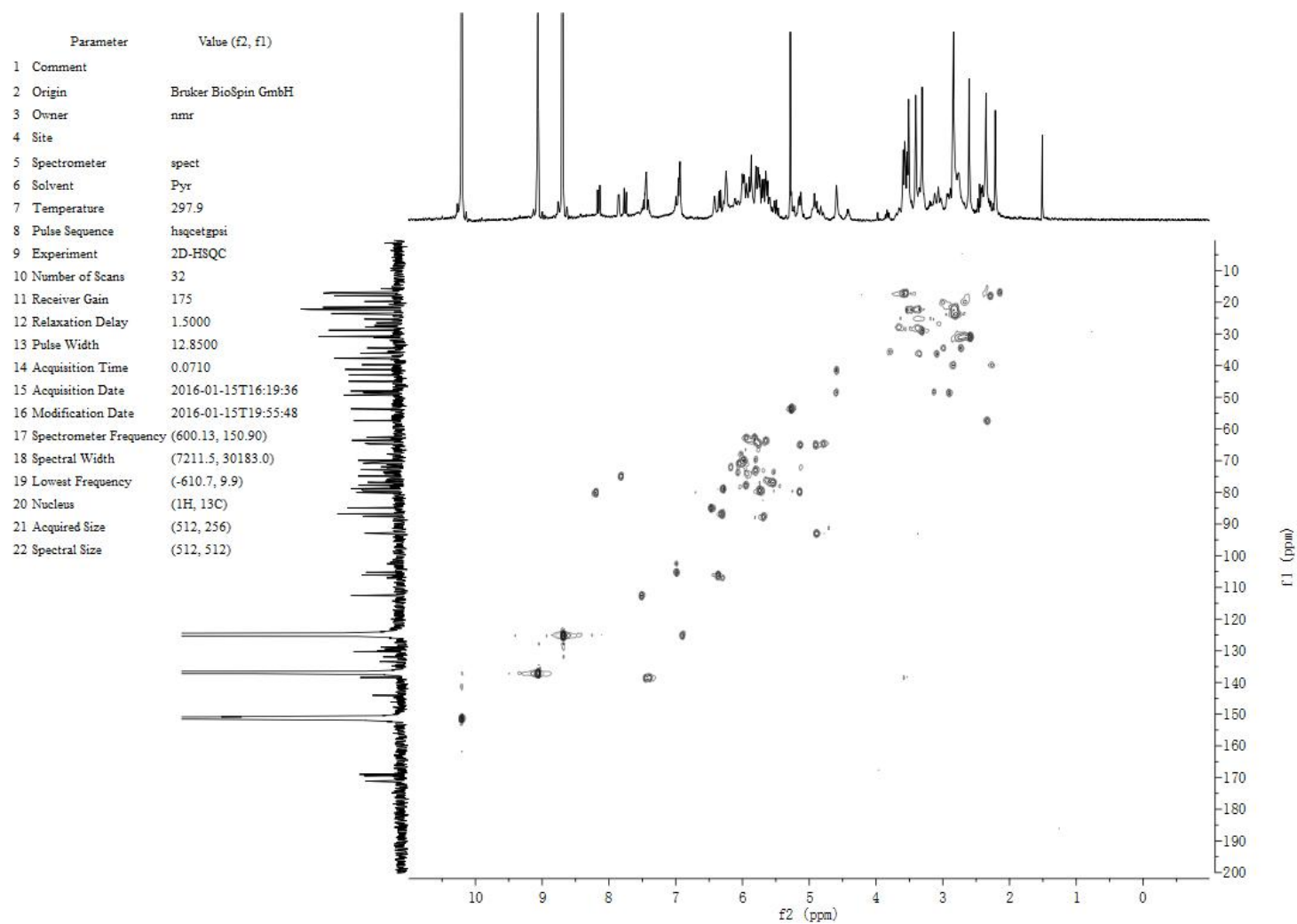


Figure S45. IR Spectrum of 6'-methylester-O-Xanifolia-Y8 (7).

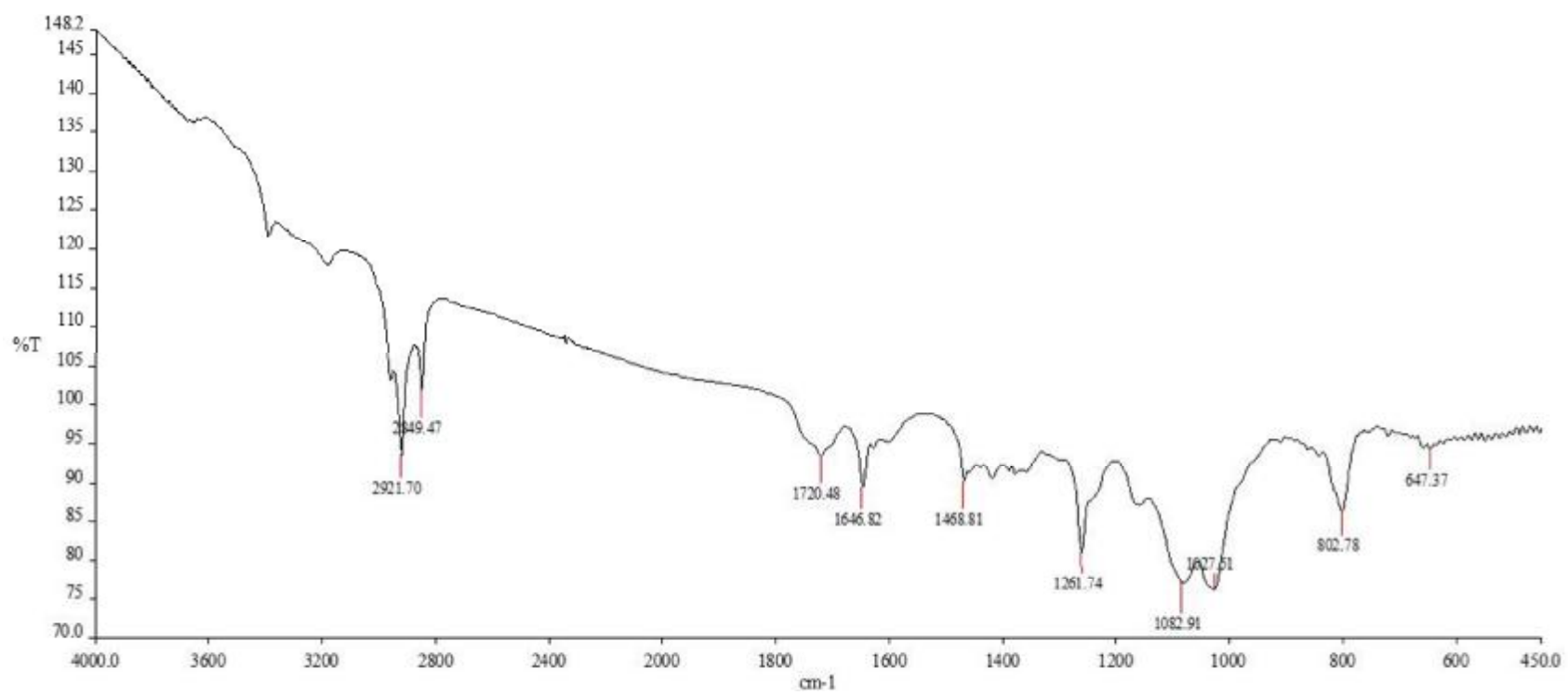


Figure S46. <sup>1</sup>H-NMR Spectrum of Xanifolia Y (8) in C<sub>5</sub>D<sub>5</sub>N.

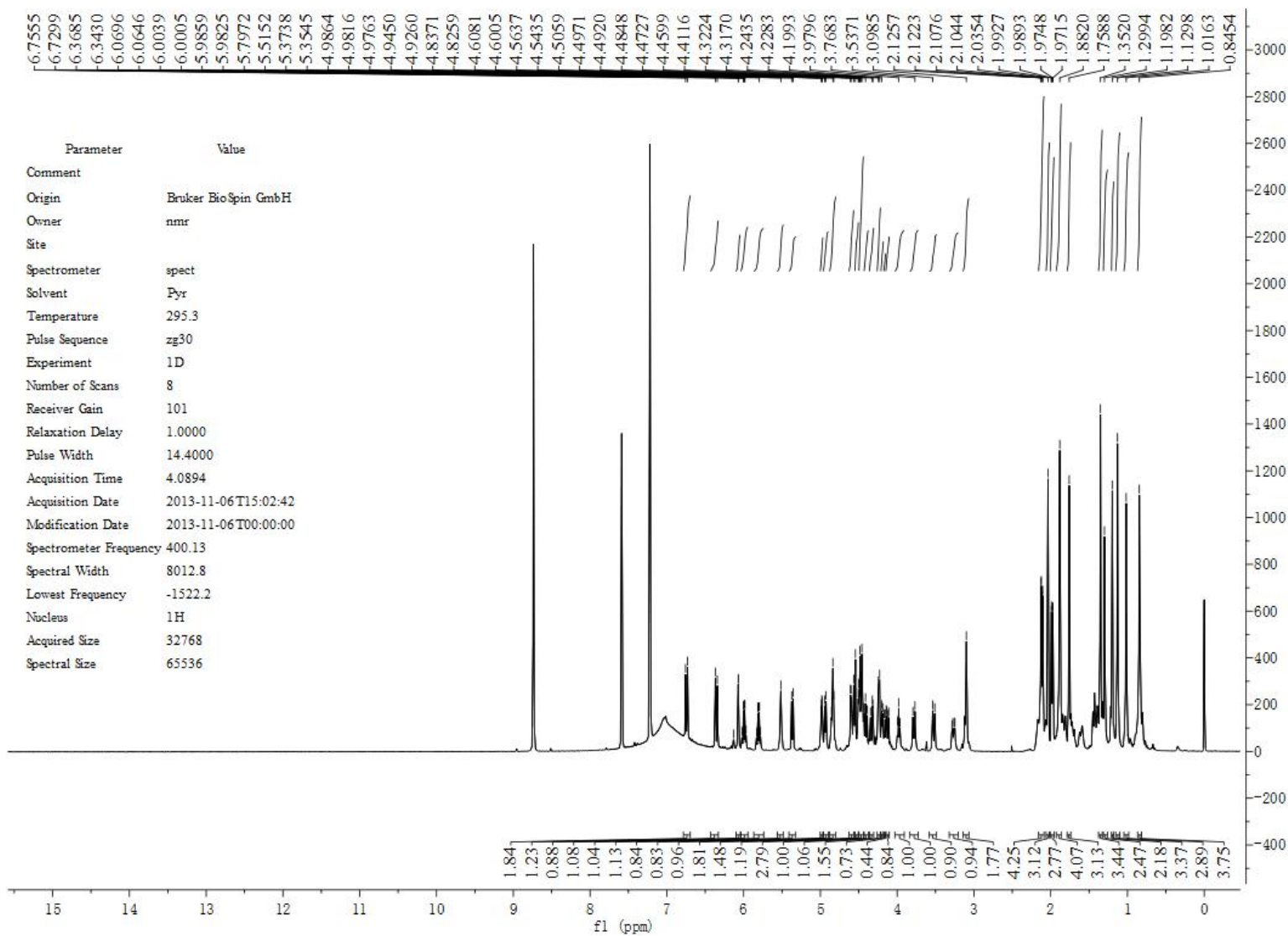


Figure S47.  $^{13}\text{C}$ -NMR Spectrum of Xanifolia Y (8) in  $\text{C}_5\text{D}_5\text{N}$ .

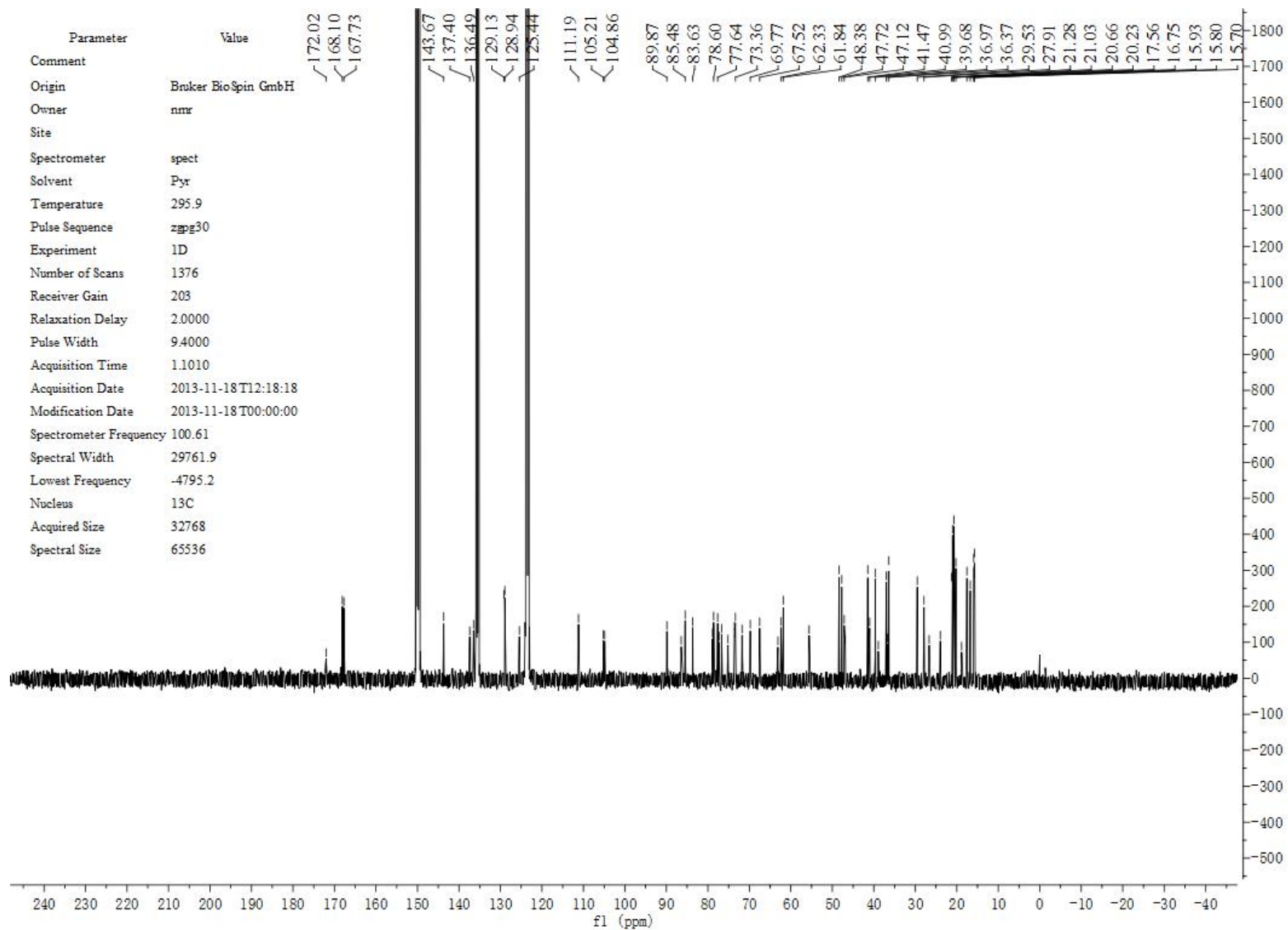


Figure S48. <sup>1</sup>H-NMR Spectrum of Xanifolia ACH-Y (9) in C<sub>5</sub>D<sub>5</sub>N.

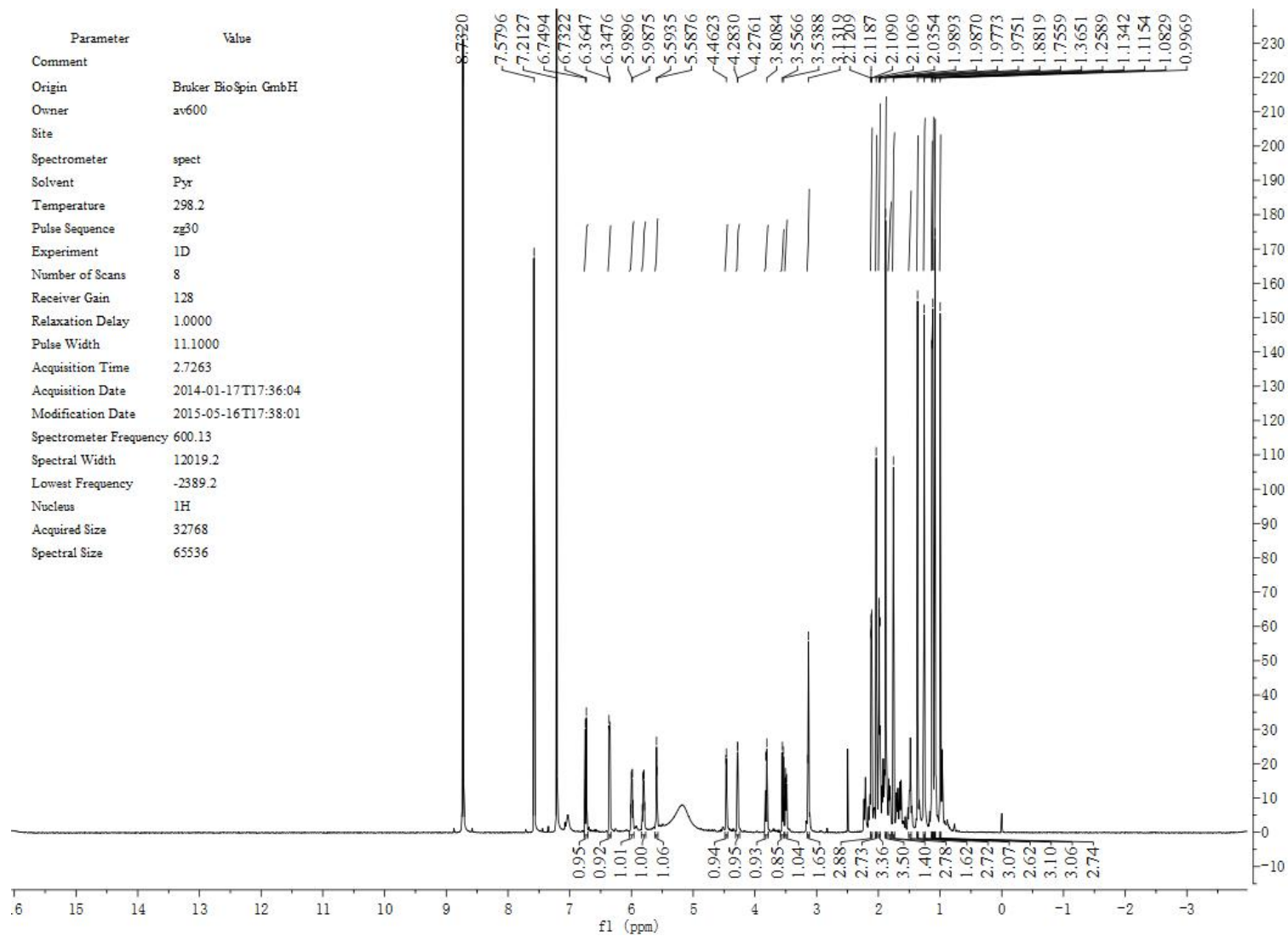


Figure S49.  $^{13}\text{C}$ -NMR Spectrum of Xanifolia ACH-Y (9) in  $\text{C}_5\text{D}_5\text{N}$ .

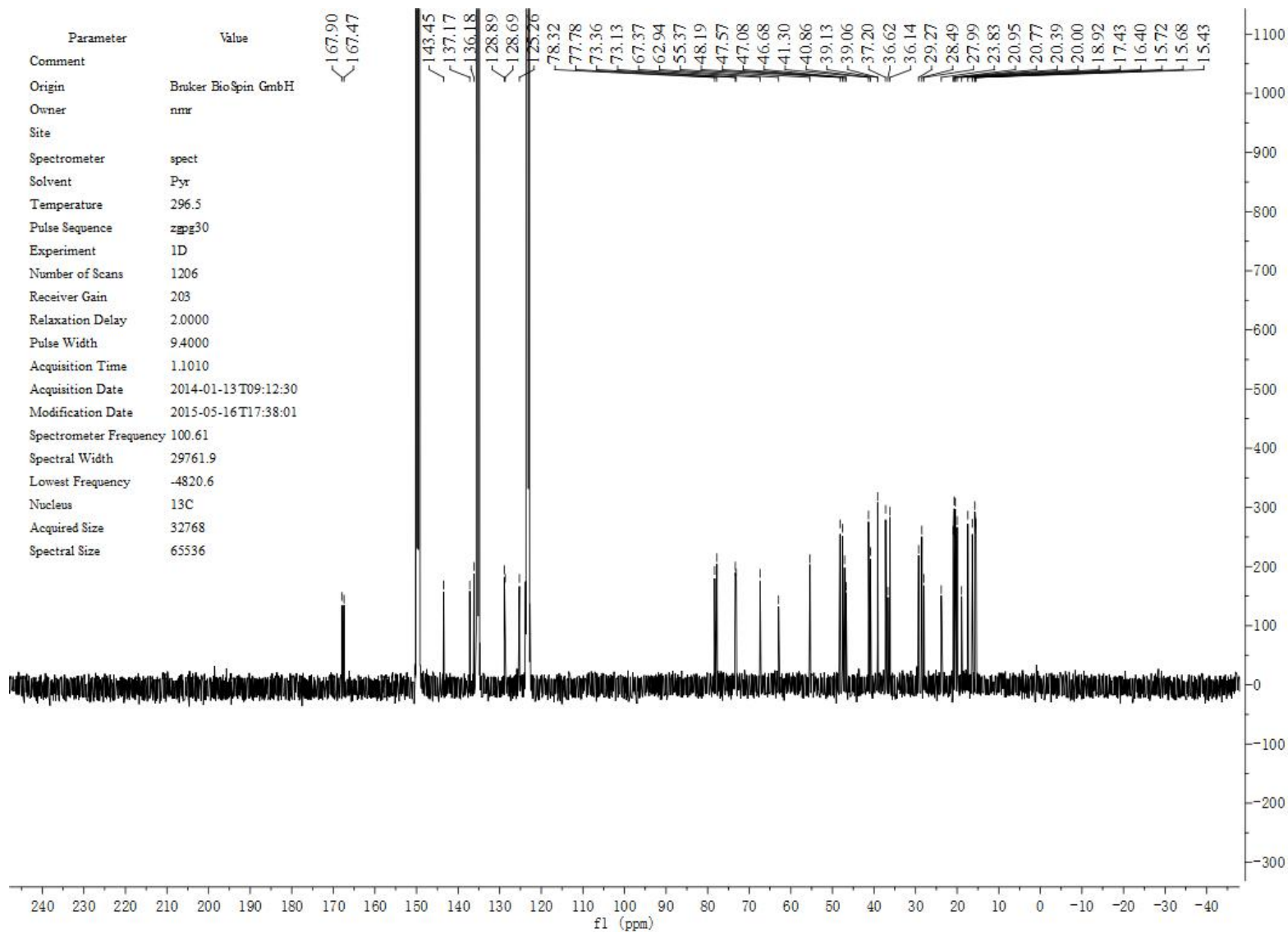


Figure S50. <sup>1</sup>H-NMR Spectrum of Xanifolia Y2 (10) in C<sub>5</sub>D<sub>5</sub>N.

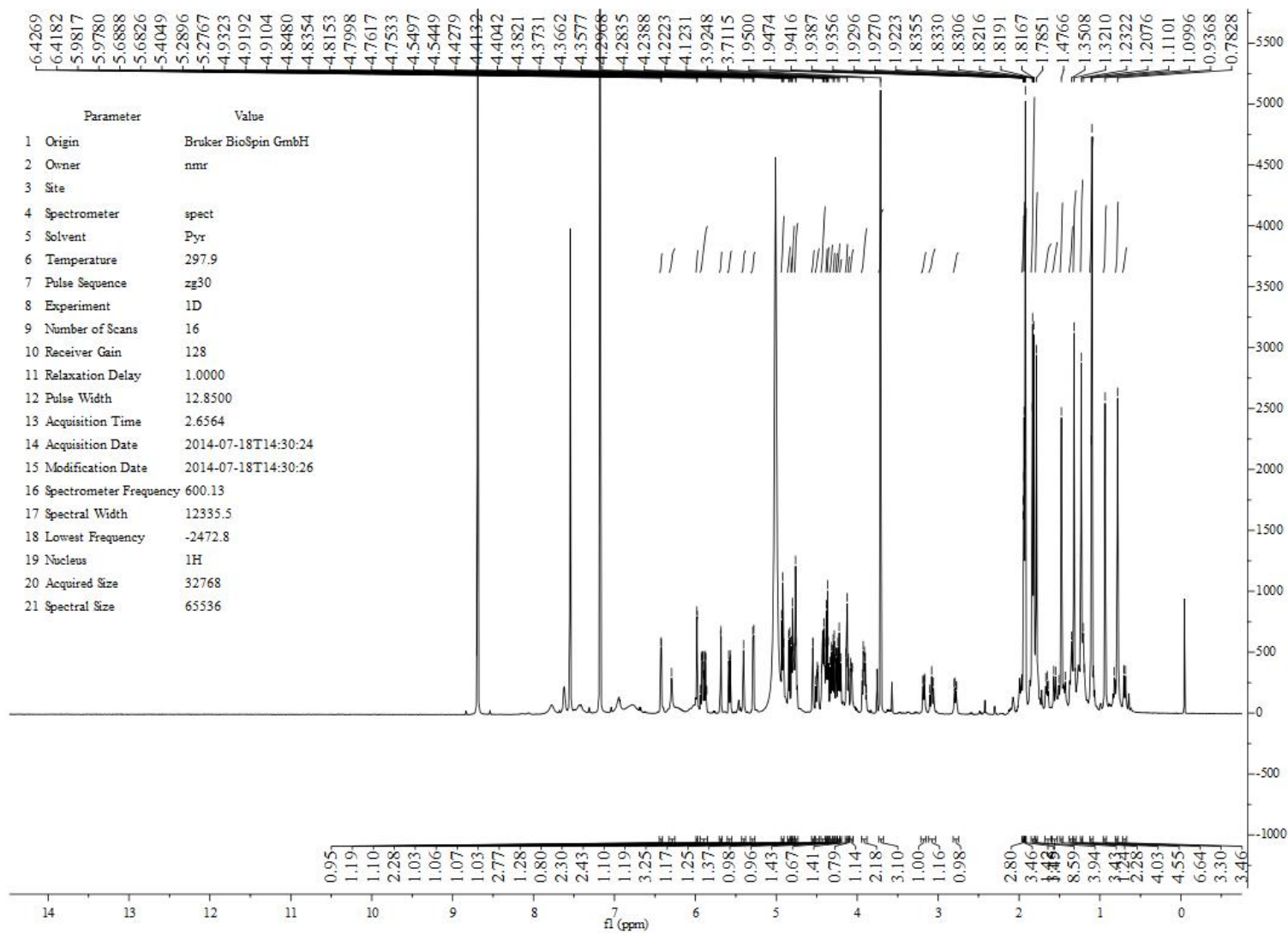




Figure S51.  $^{13}\text{C}$ -NMR Spectrum of Xanifolia Y2 (10) in  $\text{C}_5\text{D}_5\text{N}$ .

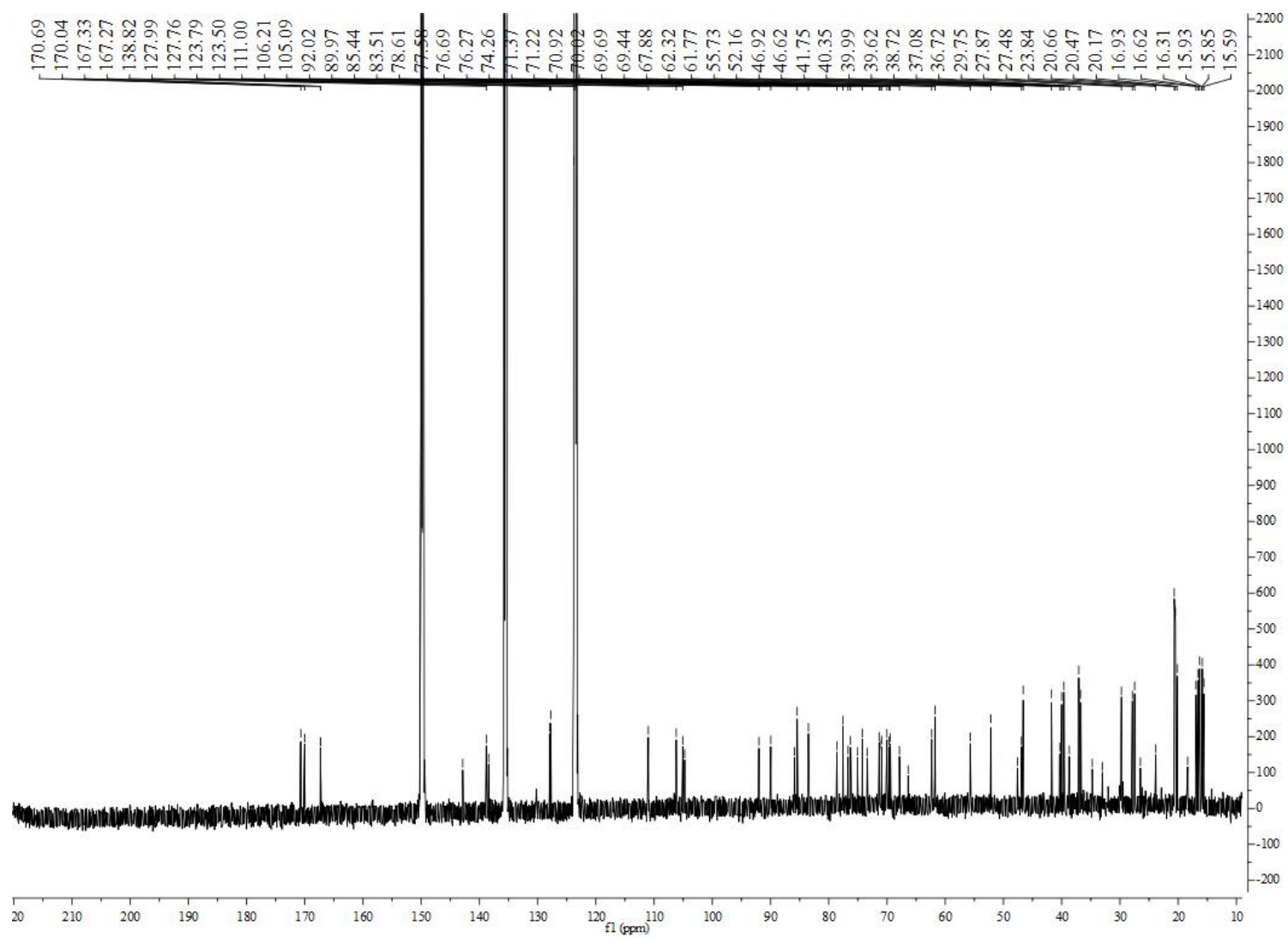


Figure S52. HR-ESI-MSSpectrum of Xanifolia Y2 (10) in C<sub>5</sub>D<sub>5</sub>N.

