

## ***Appendix 3***

*Spectra Relevant to Chapter 5:*

*Formal Synthesis of (-)-Cylindrocyclophane F*

17

Origin Varian  
 Solvent cdc13  
 Temperature 3.0  
 Number of Scans 8  
 Receiver Gain 52  
 Relaxation Delay 1.0000  
 Pulse Width 5.6500  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.60  
 Spectral Width 8000.0  
 Nucleus <sup>1</sup>H

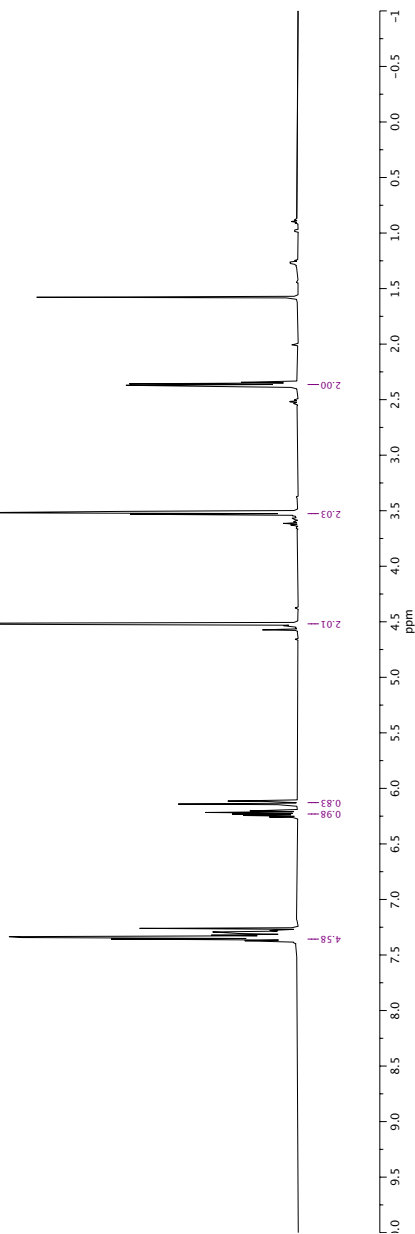
E (dt) 6.23  
 J(14.00, 7.10)  
 D (dt) 6.13  
 J(13.59, 1.52)

F (m) 7.34

C (s) 4.32

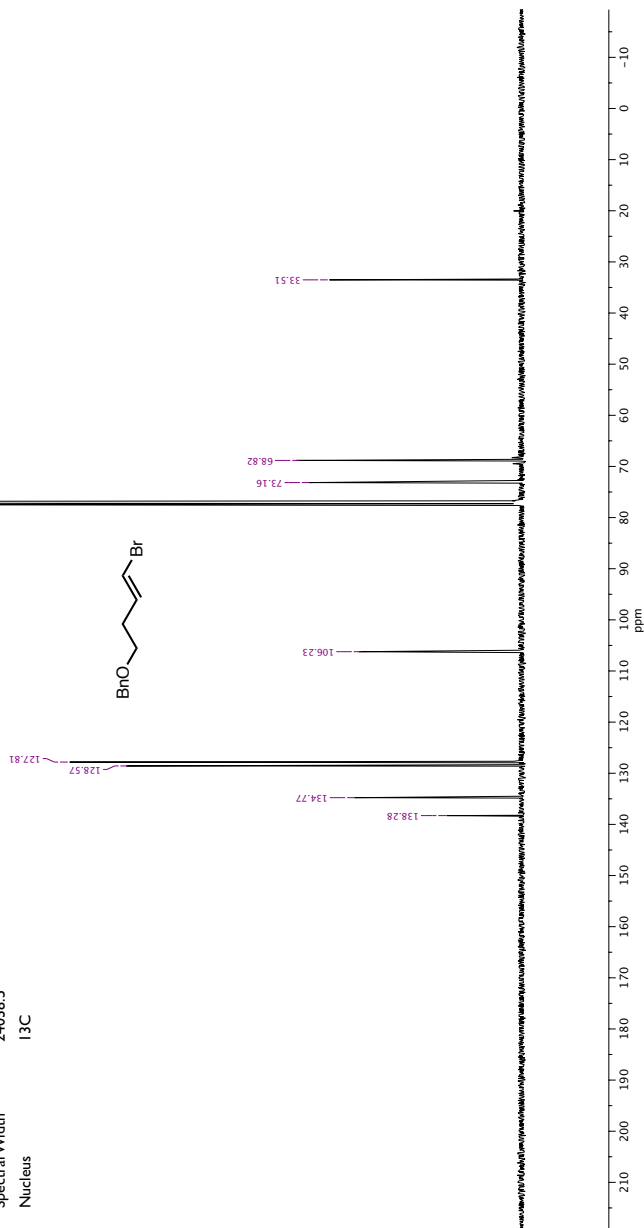
B (t) 3.52  
 J(6.48)

A (dd) 2.36  
 J(6.75, 1.31)



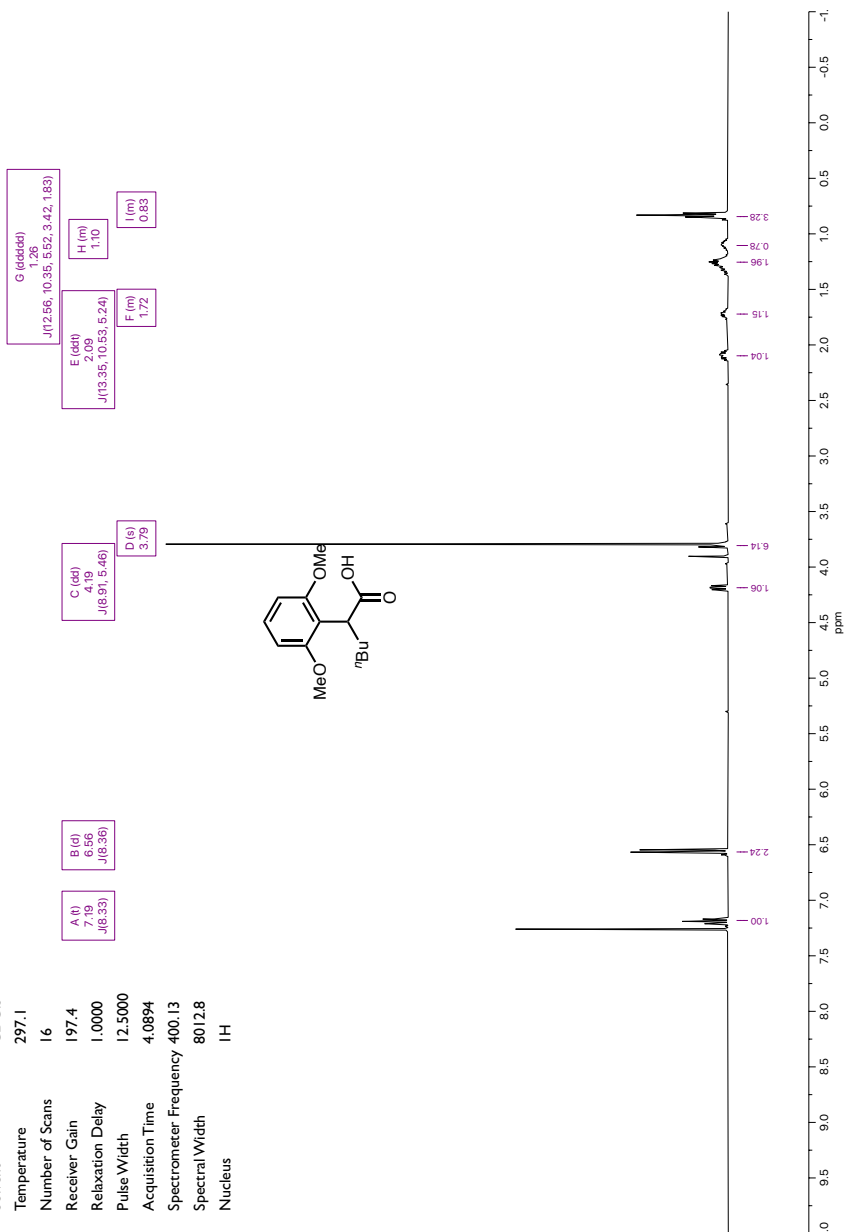
17

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 512  
 Receiver Gain 50.3  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



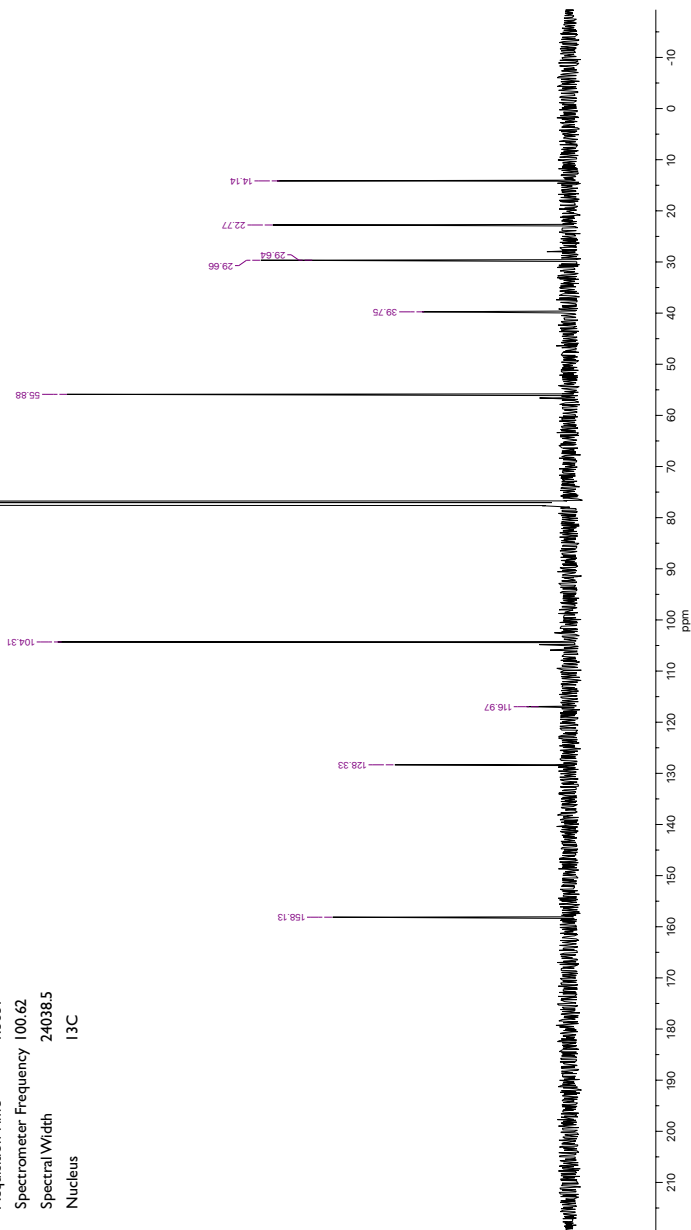
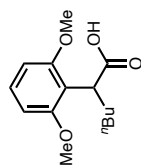
23

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 197.4  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H



23

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 512  
 Receiver Gain 50.3  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



18

Origin Bruker-BioSpin GmbH

Solvent CDCl<sub>3</sub>

Temperature 298.0

Number of Scans 16

Receiver Gain 101.0

Relaxation Delay 1.0000

Pulse Width 9.7500

Acquisition Time 3.9977

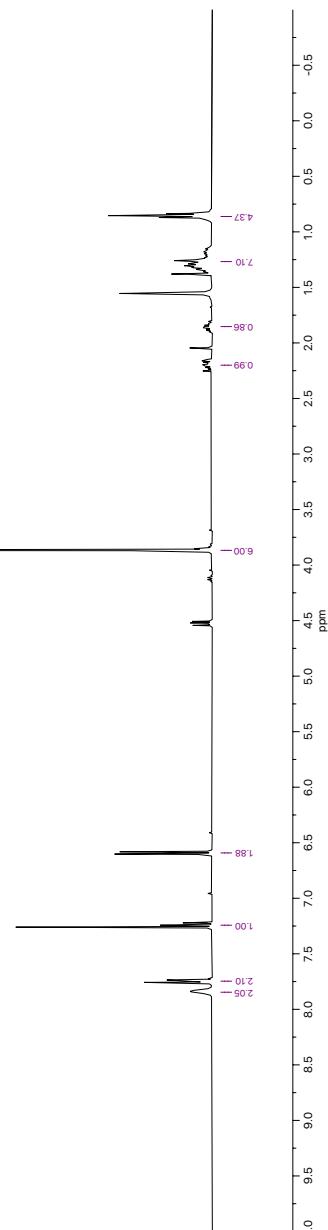
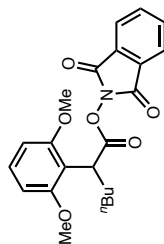
Spectrometer Frequency 400.15

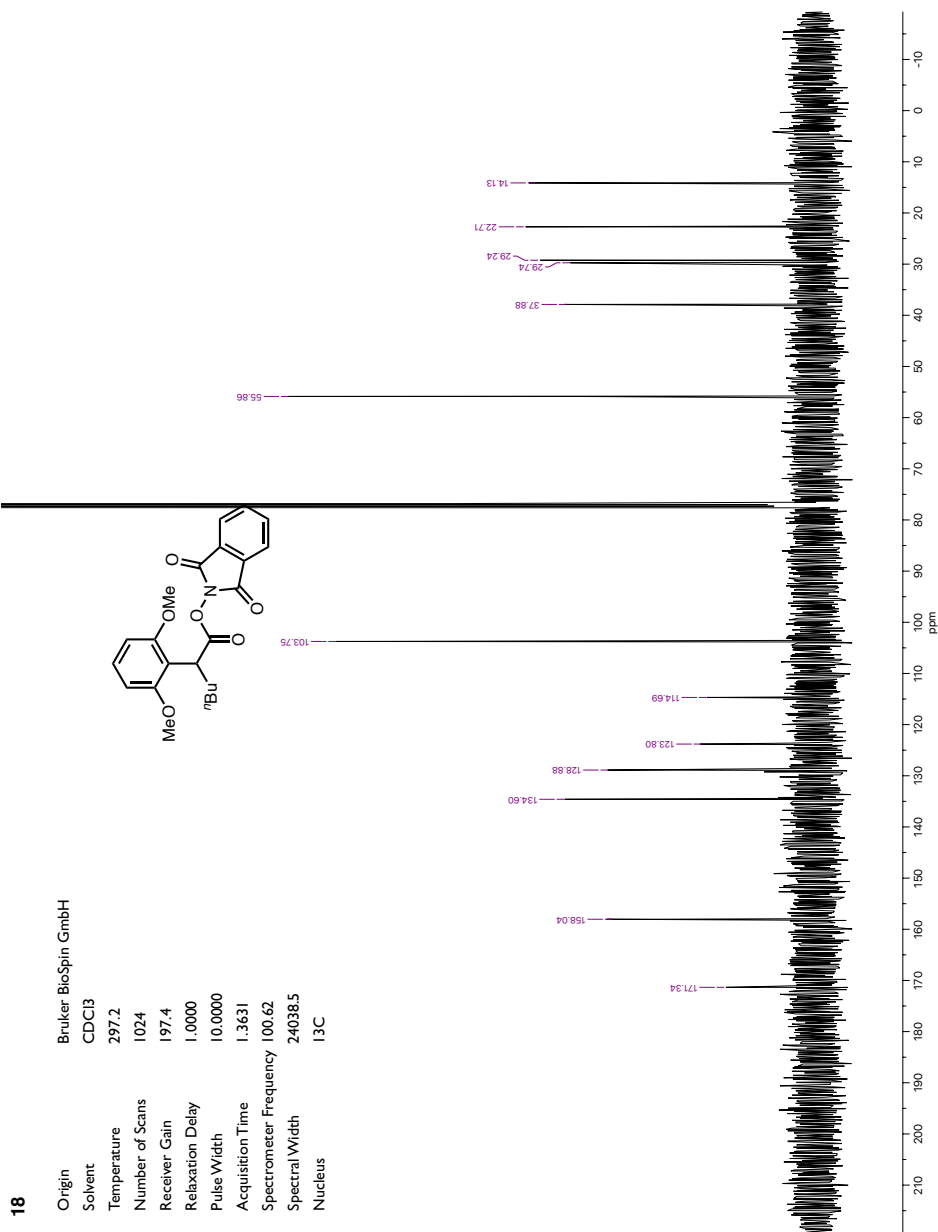
Spectral Width 8196.7

Nucleus <sup>1</sup>H

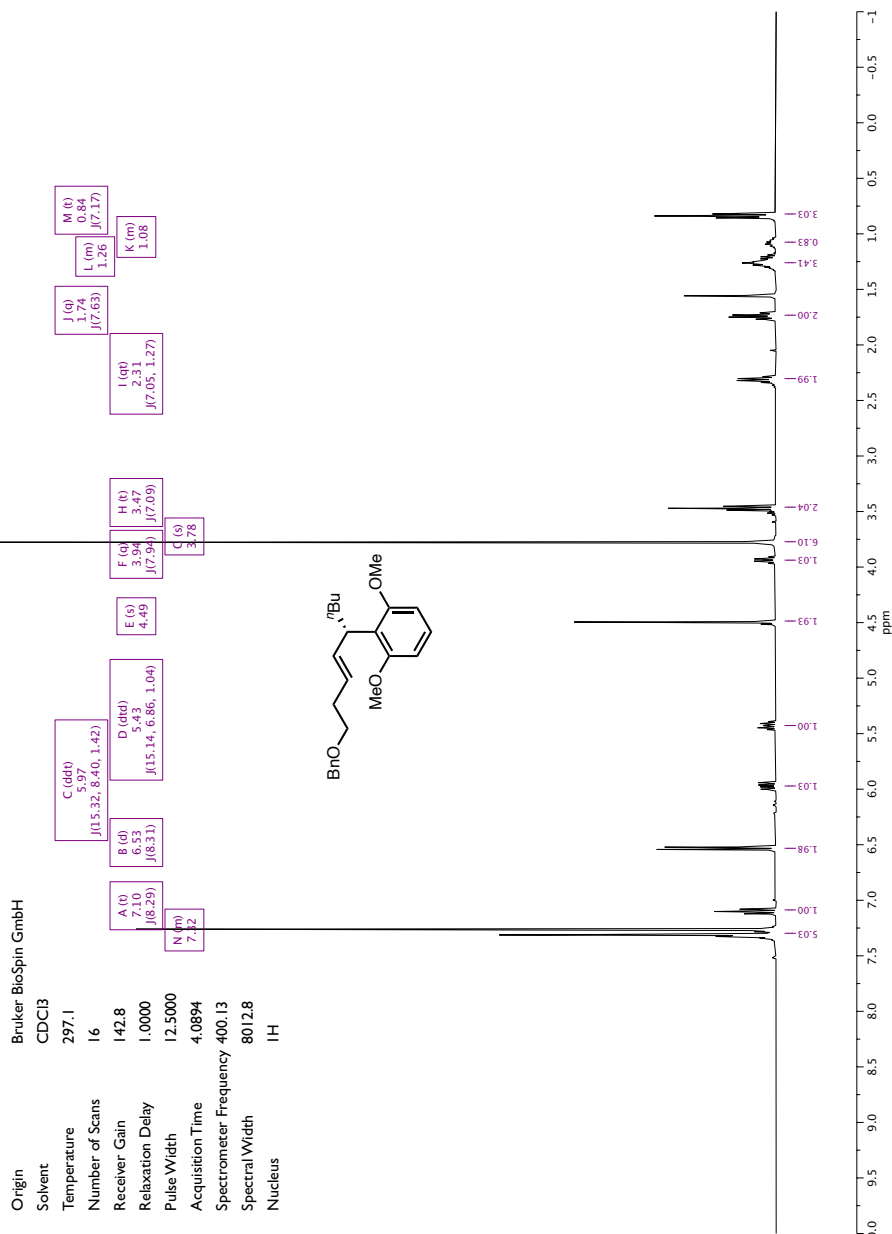
H (m) 2.20  
 G (m) 1.86  
 F (m) 1.28  
 E (t) 0.85  
 J(7.09)

C (q) 6.59  
 D (t) 7.24  
 J(8.32)





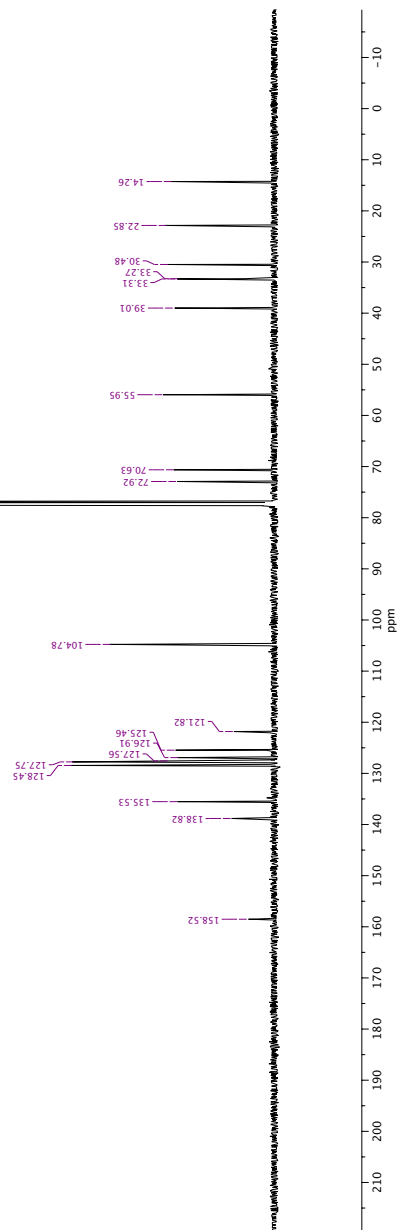
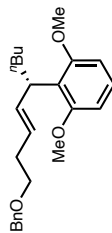
19





19

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 512  
 Receiver Gain 35.5  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



20

Origin Varian  
 Solvent cdcl3  
 Temperature 3.0  
 Number of Scans 8  
 Receiver Gain 60  
 Relaxation Delay 1.0000  
 Pulse Width 5.8000  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.61  
 Spectral Width 8000.0  
 Nucleus 1H

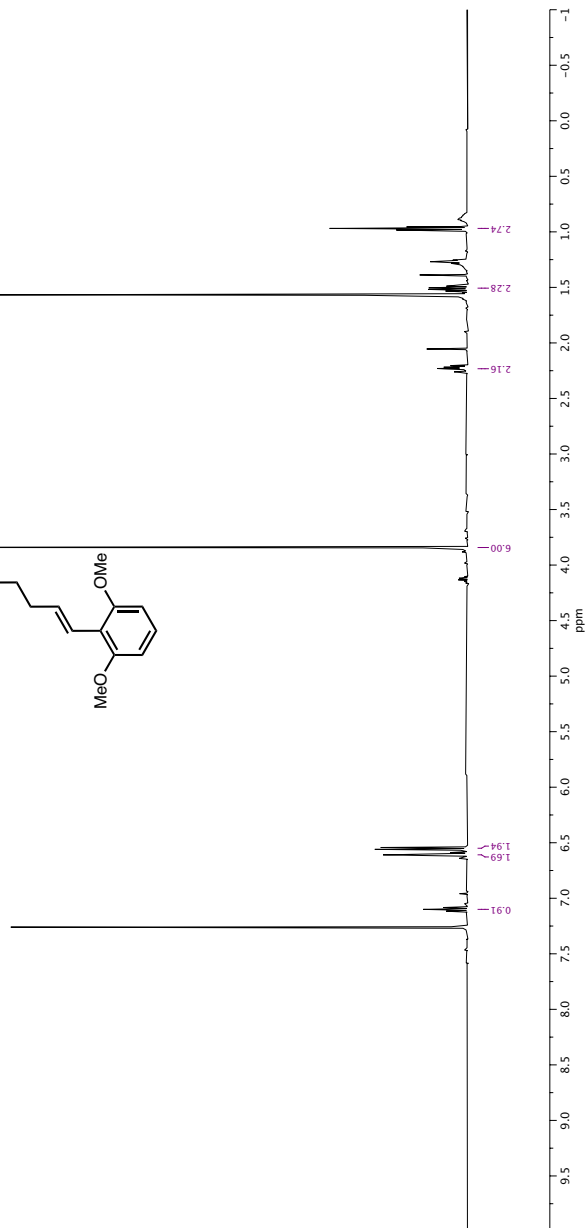
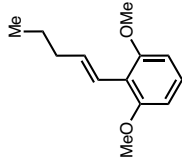
E (t) 7.10  
 J(8.32)  
 F (d) 6.55  
 J(8.29)  
 C (m) 6.60

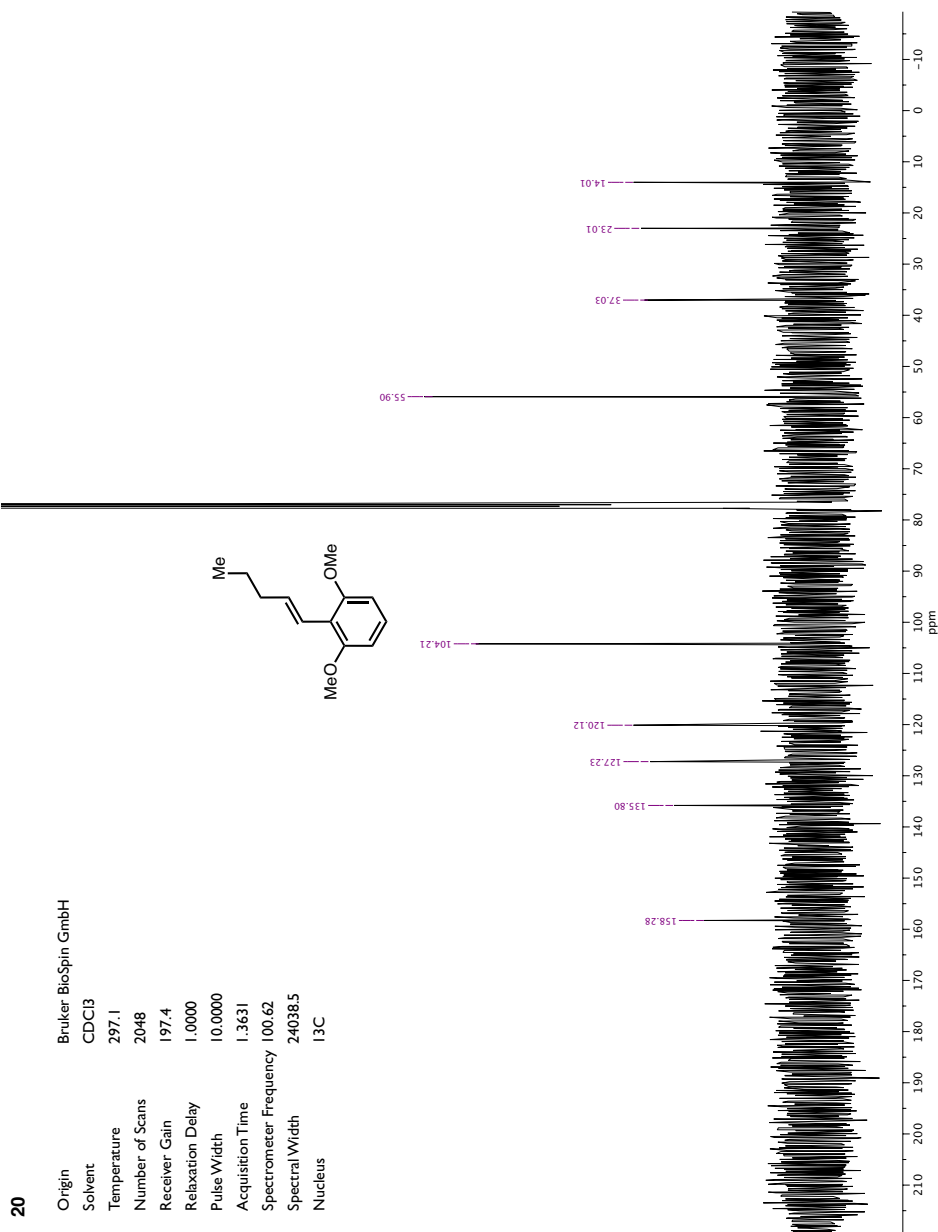
A (d) 3.84  
 J(0.66)

B (m) 2.23

C (m) 1.51  
 J(7.40)

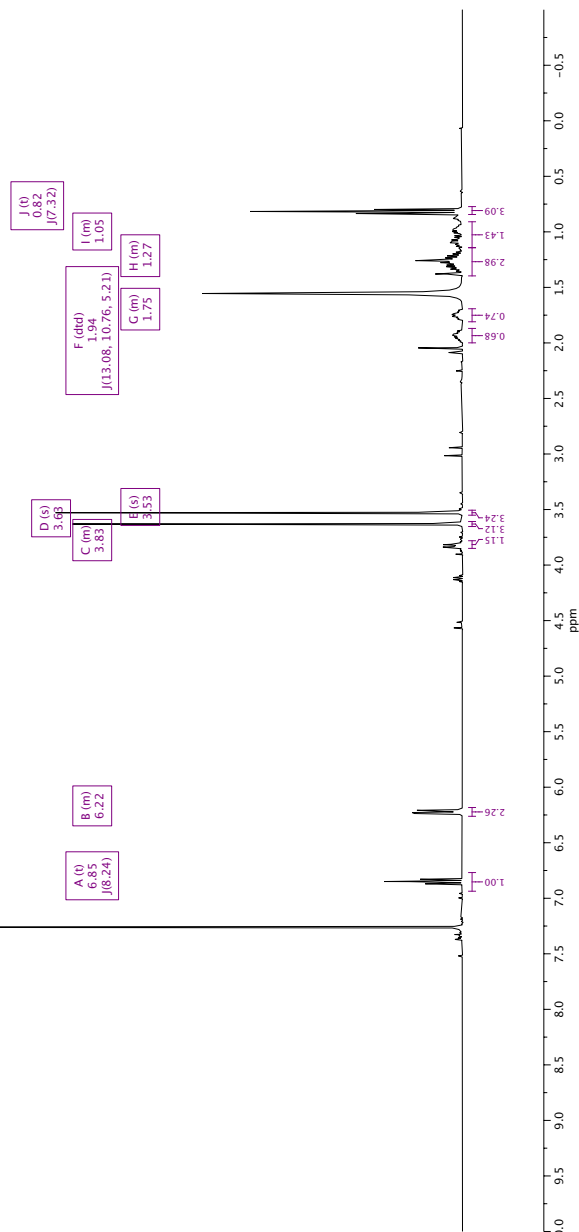
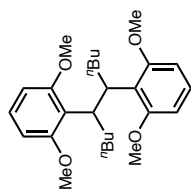
D (t) 0.97  
 J(7.35)

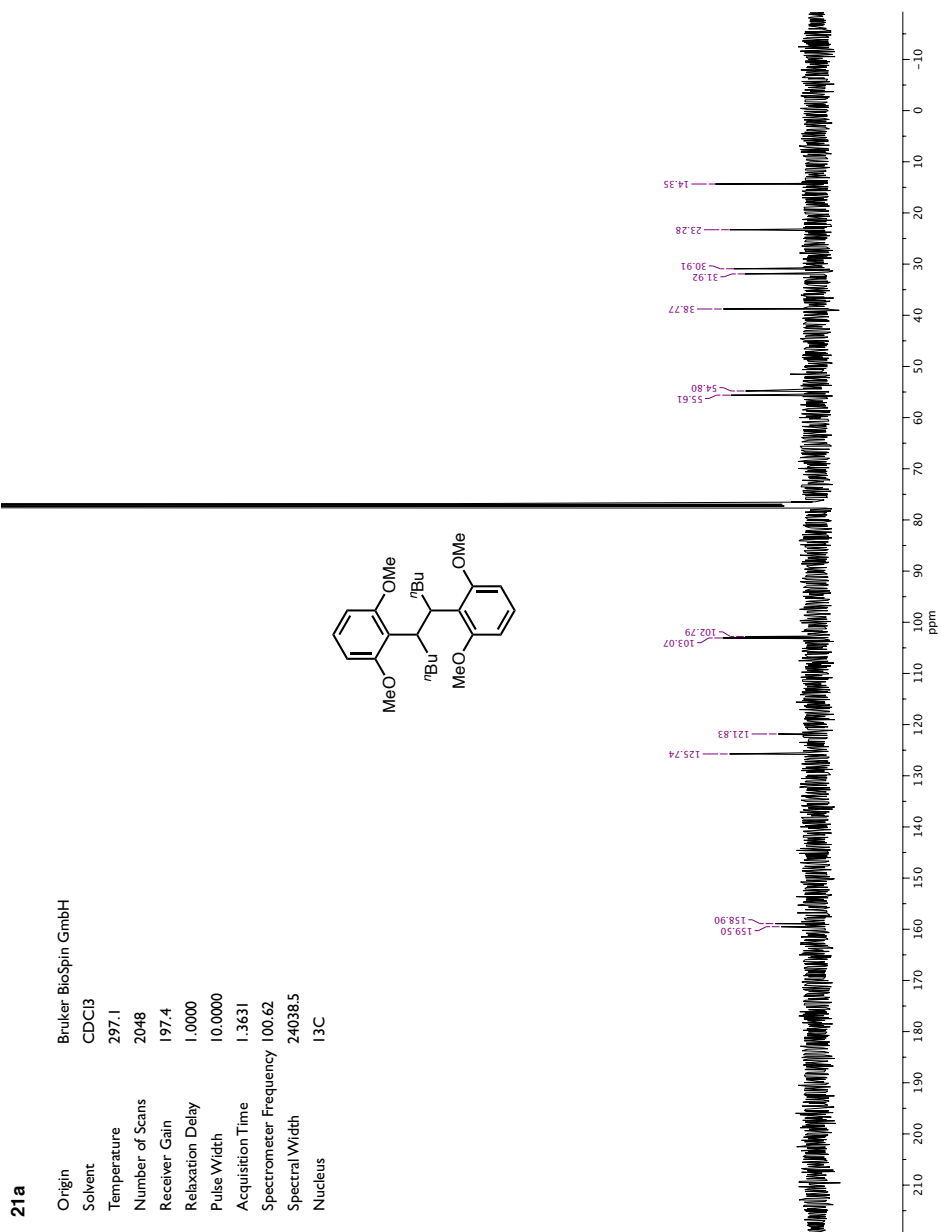




21a

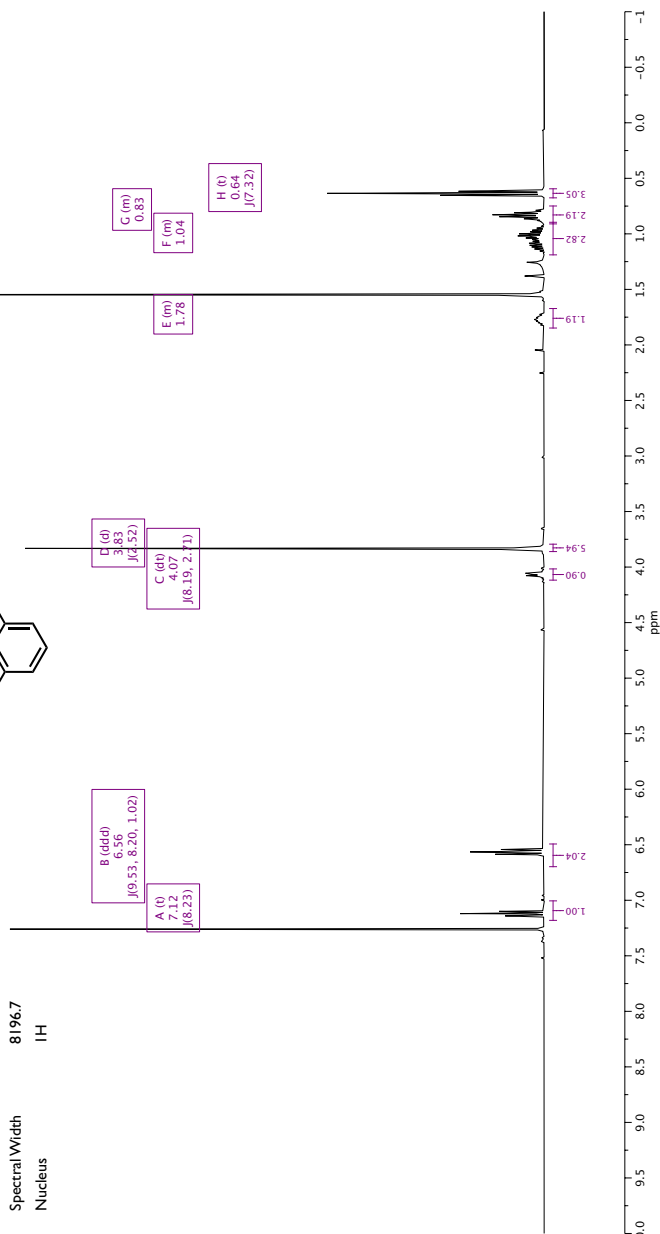
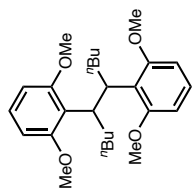
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 298.2  
 Number of Scans 16  
 Receiver Gain 101.0  
 Relaxation Delay 1.0000  
 Pulse Width 9.7500  
 Acquisition Time 3.9977  
 Spectrometer Frequency 400.15  
 Spectral Width 8196.7  
 Nucleus <sup>1</sup>H

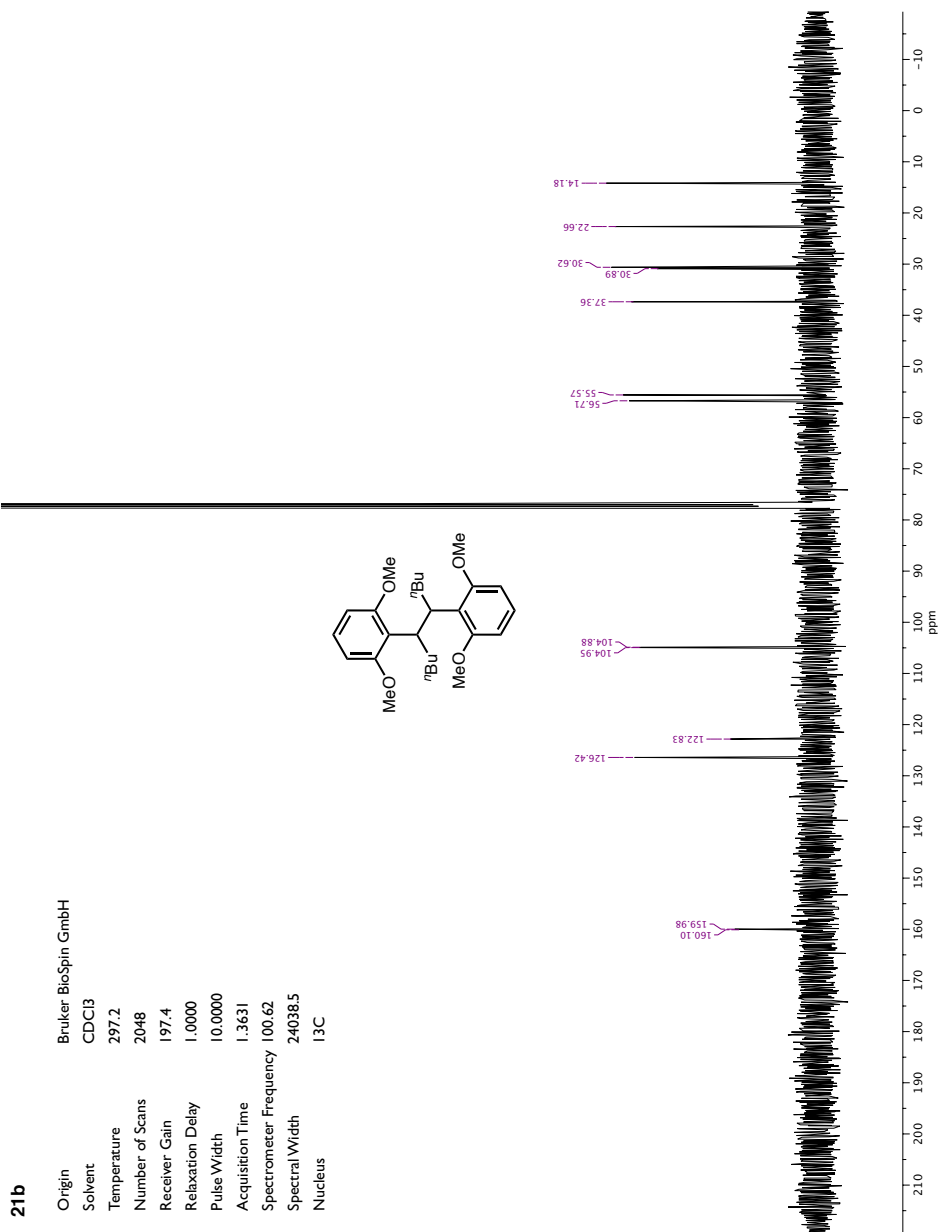


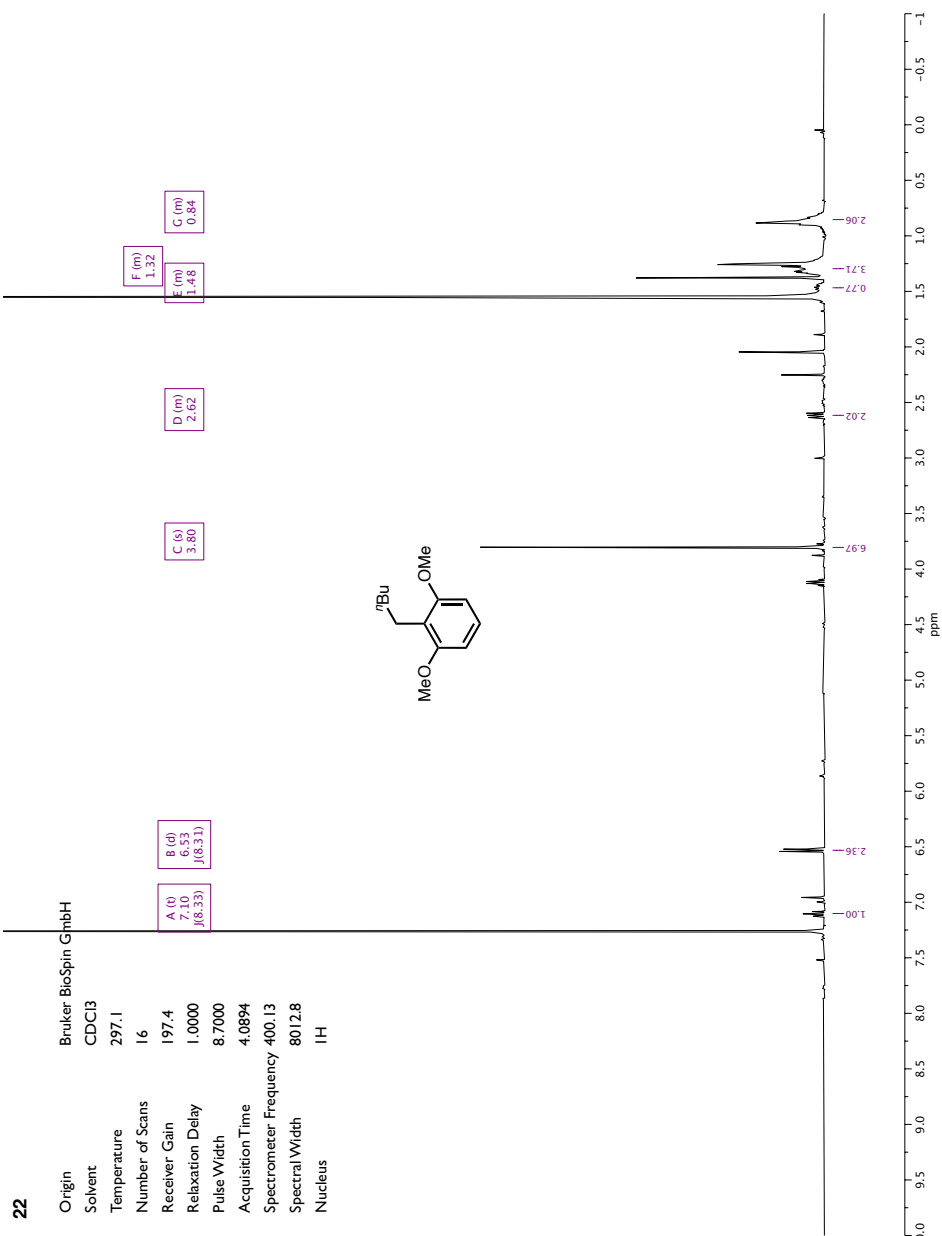


21b

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 298.1  
 Number of Scans 16  
 Receiver Gain 101.0  
 Relaxation Delay 1.0000  
 Pulse Width 9.7500  
 Acquisition Time 3.9977  
 Spectrometer Frequency 400.15  
 Spectral Width 8196.7  
 Nucleus <sup>1</sup>H

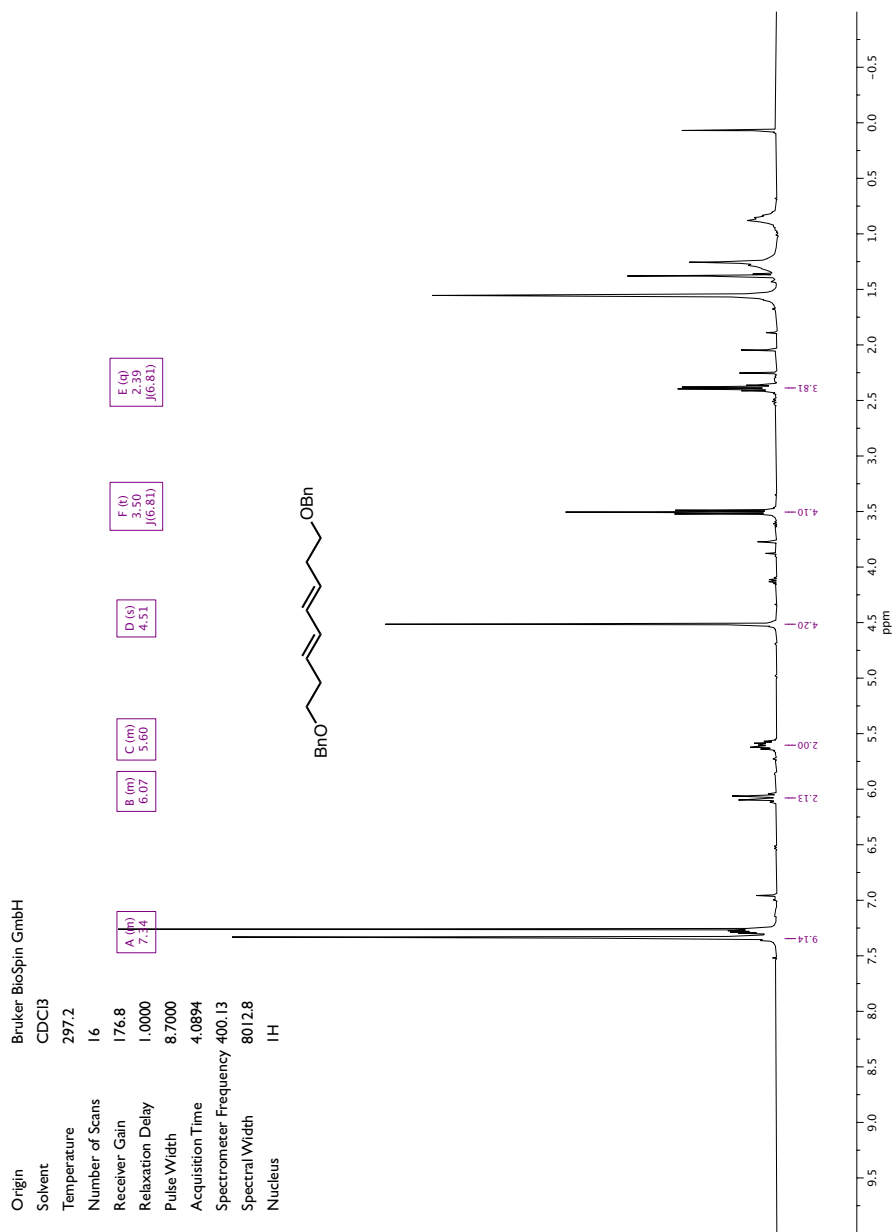


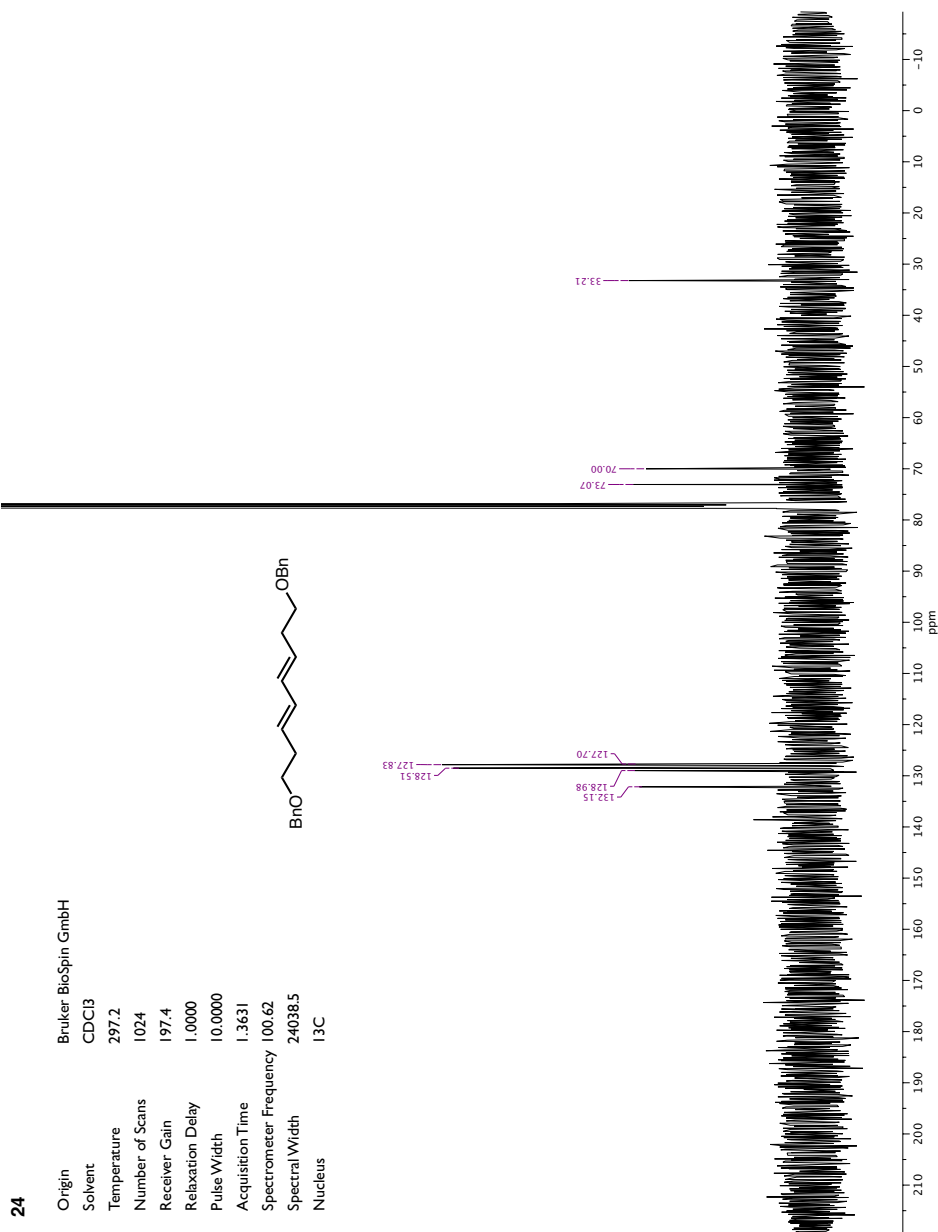


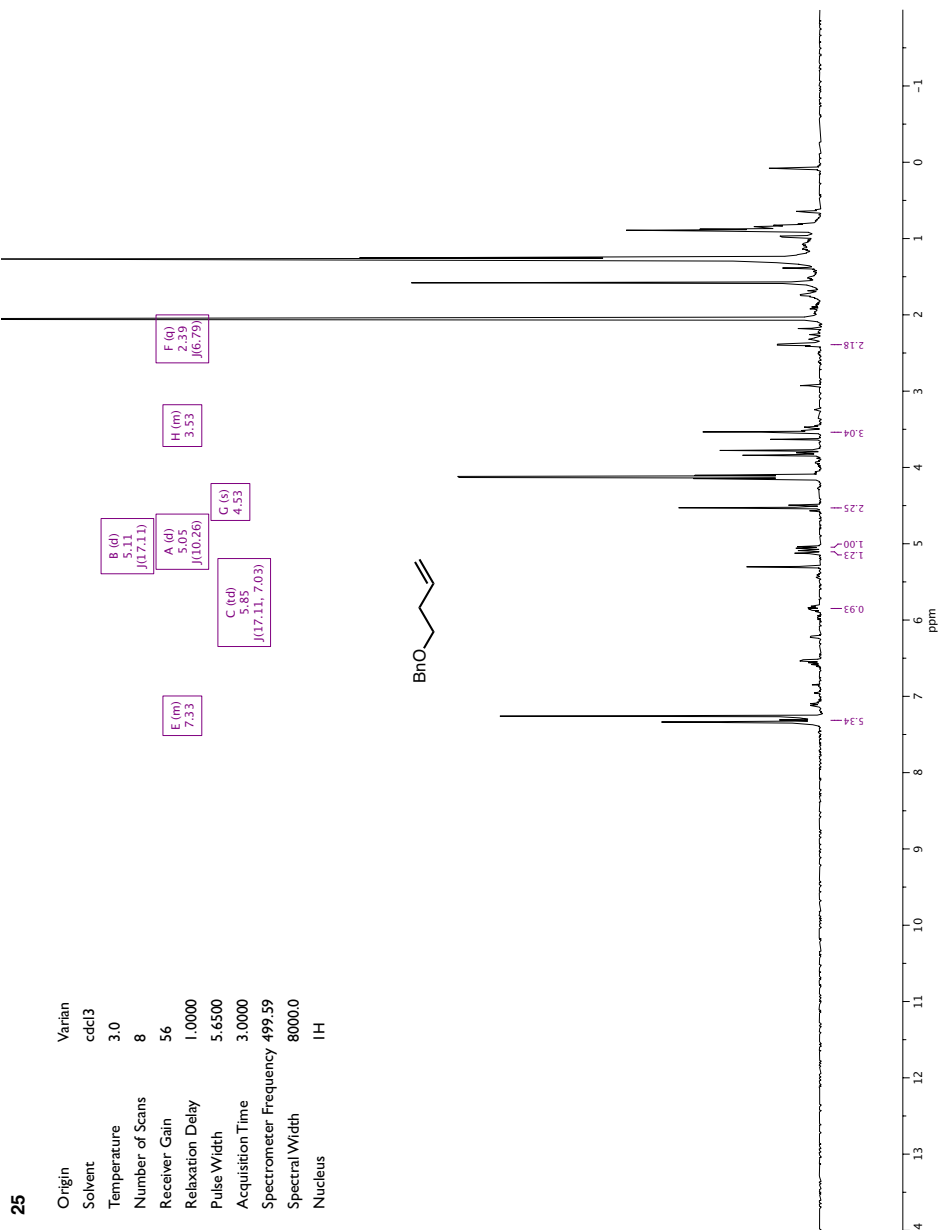


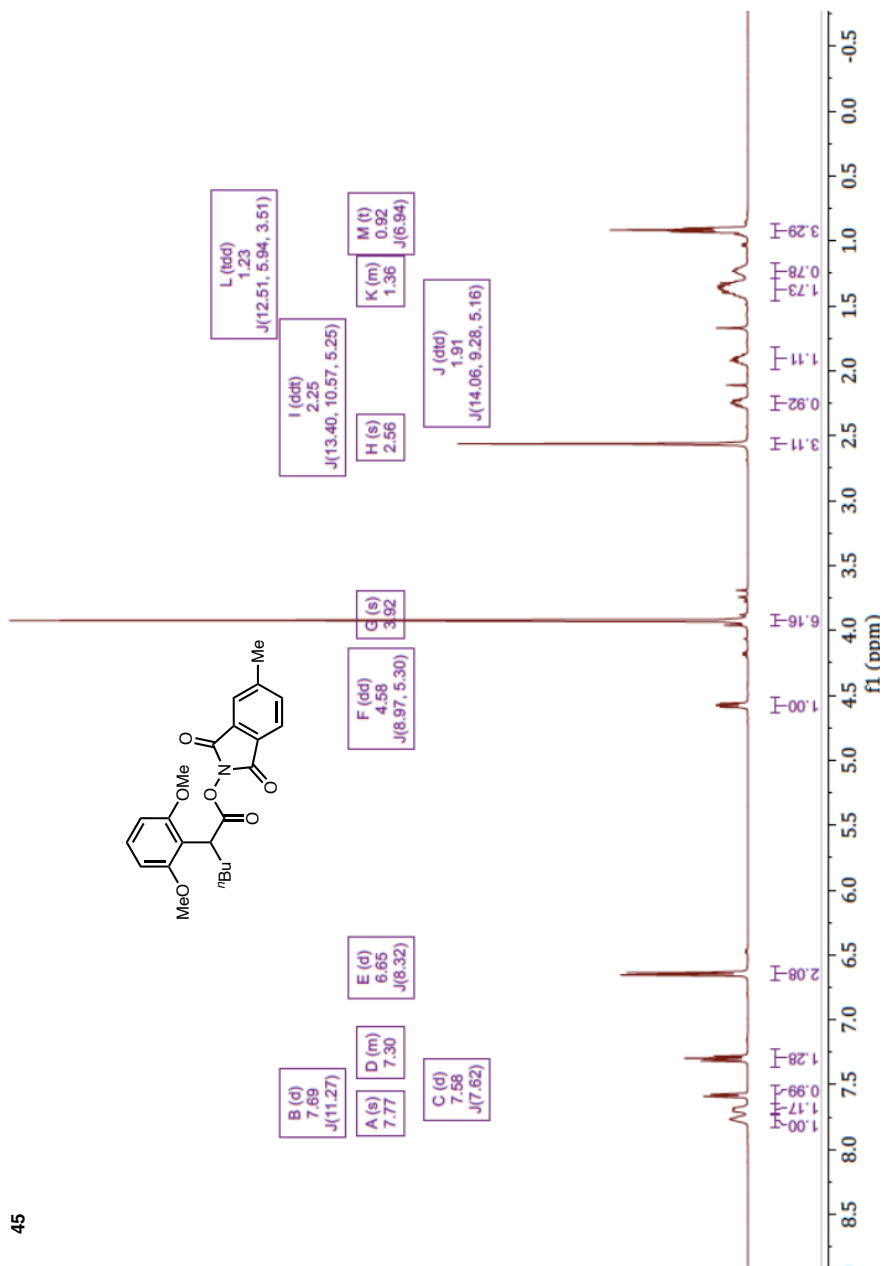


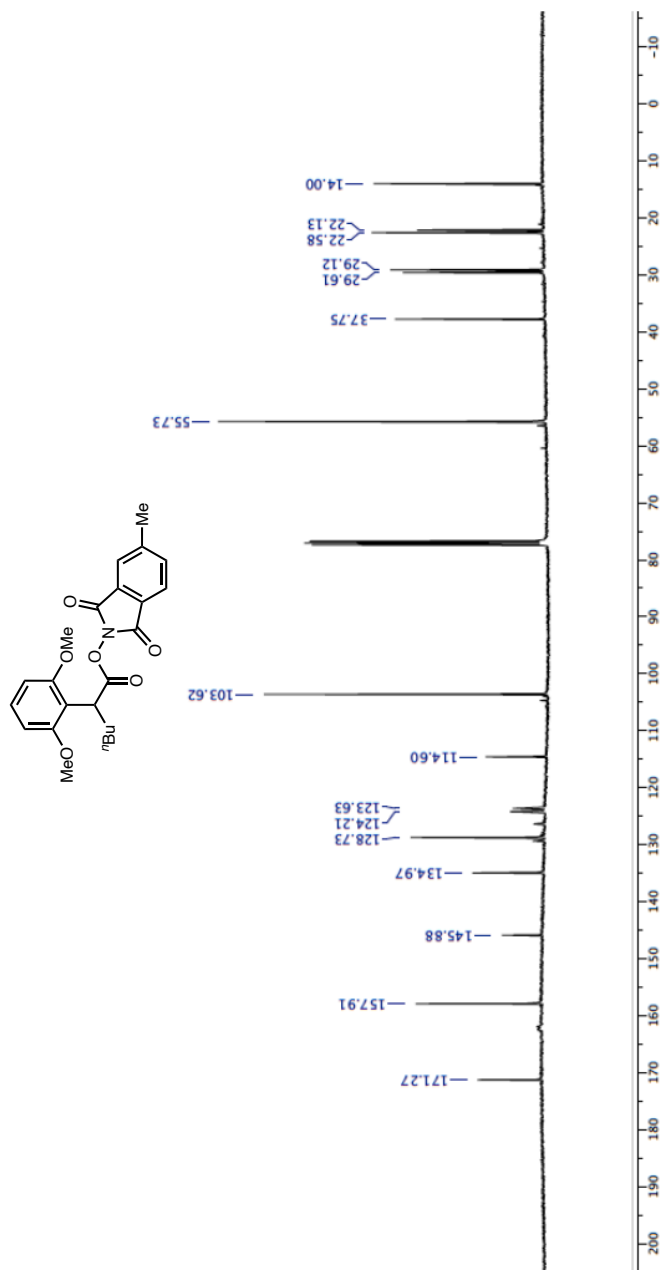
24

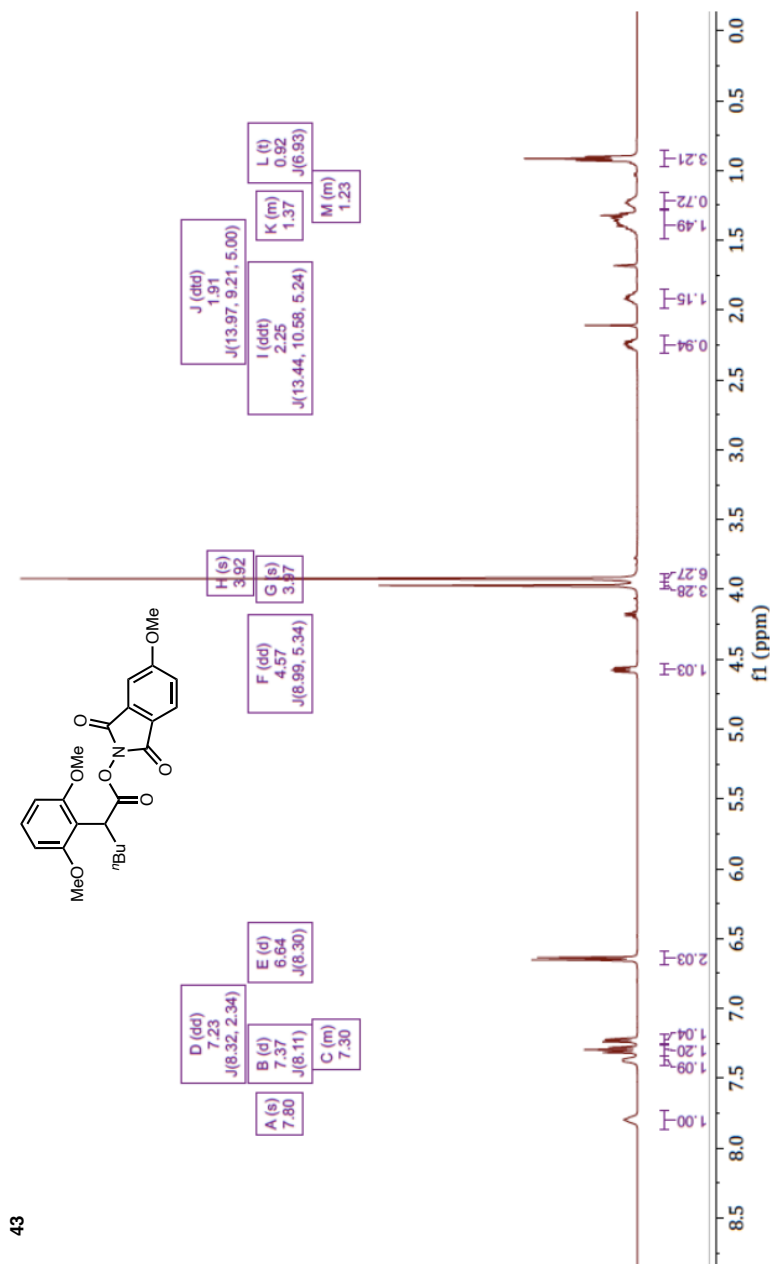




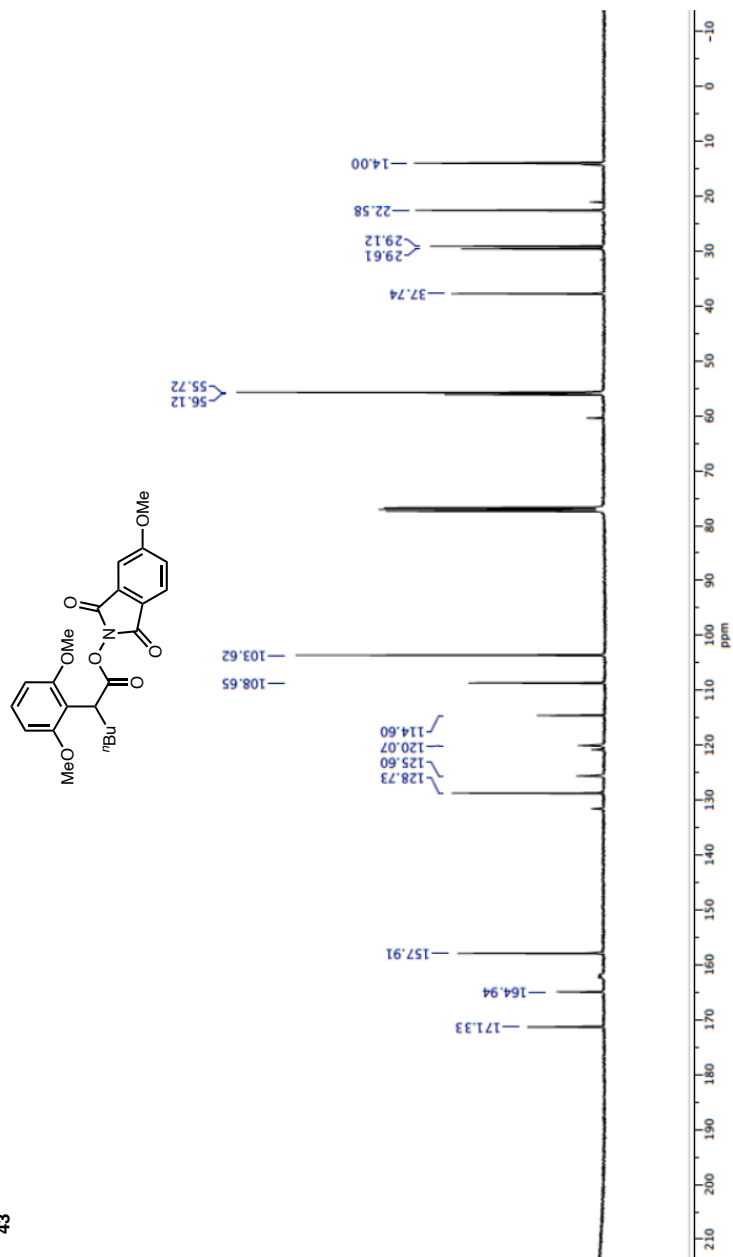


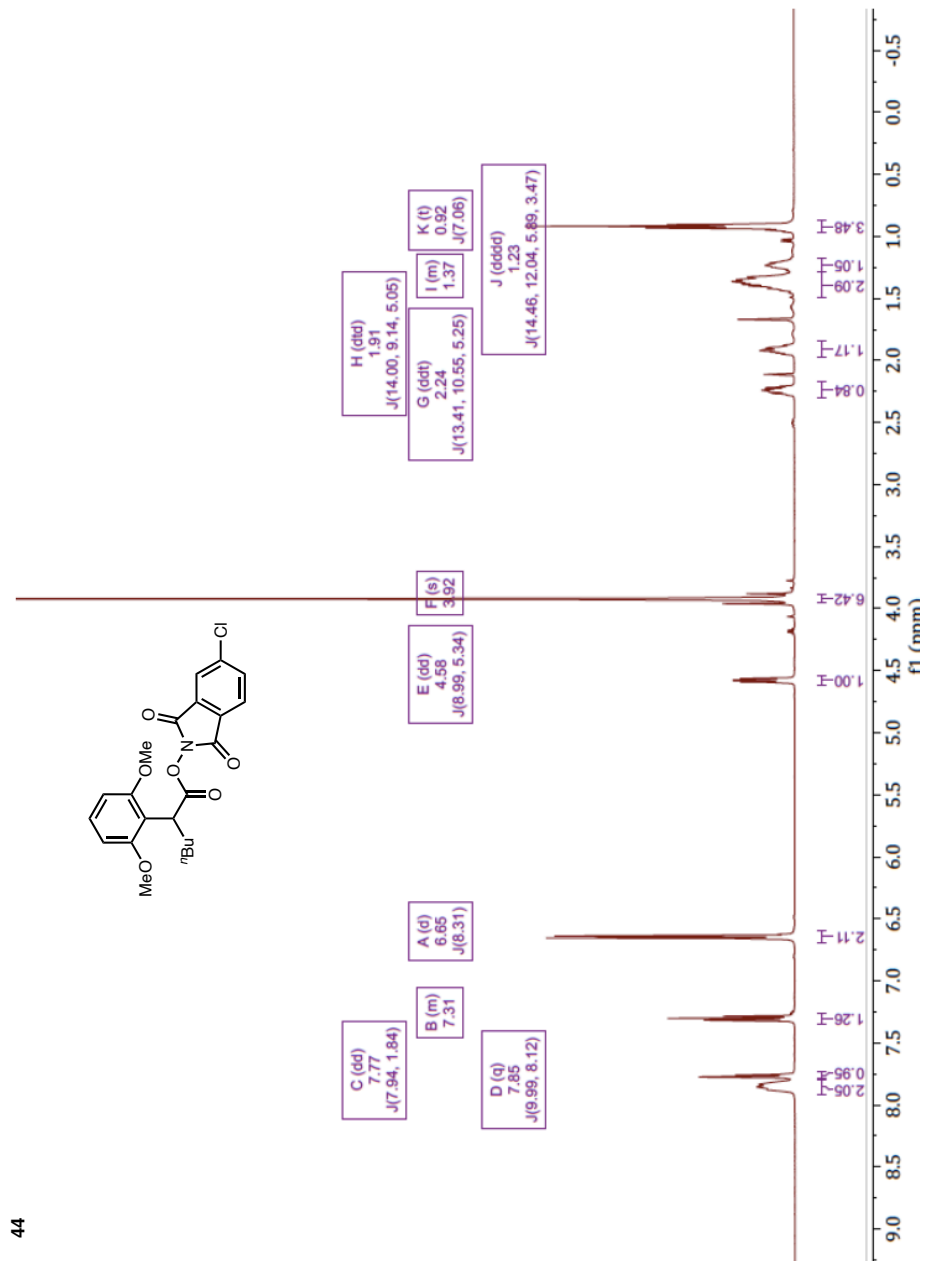




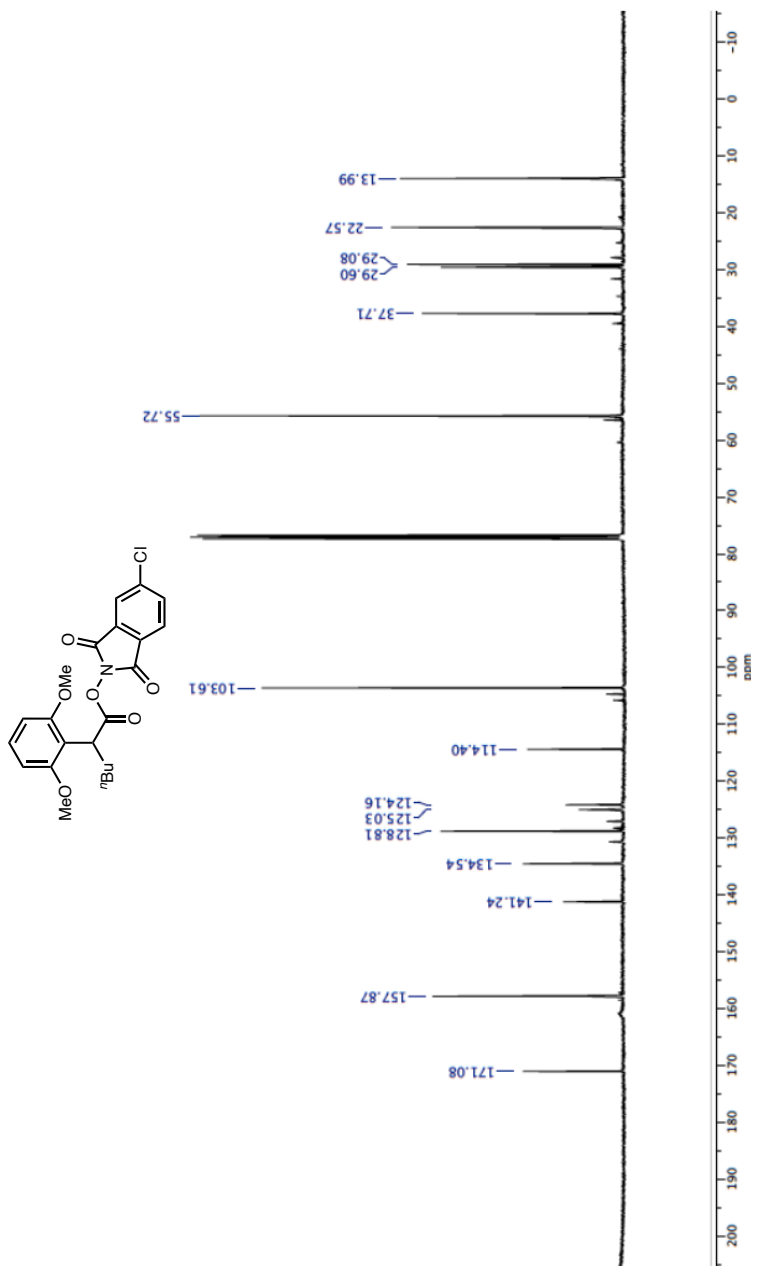


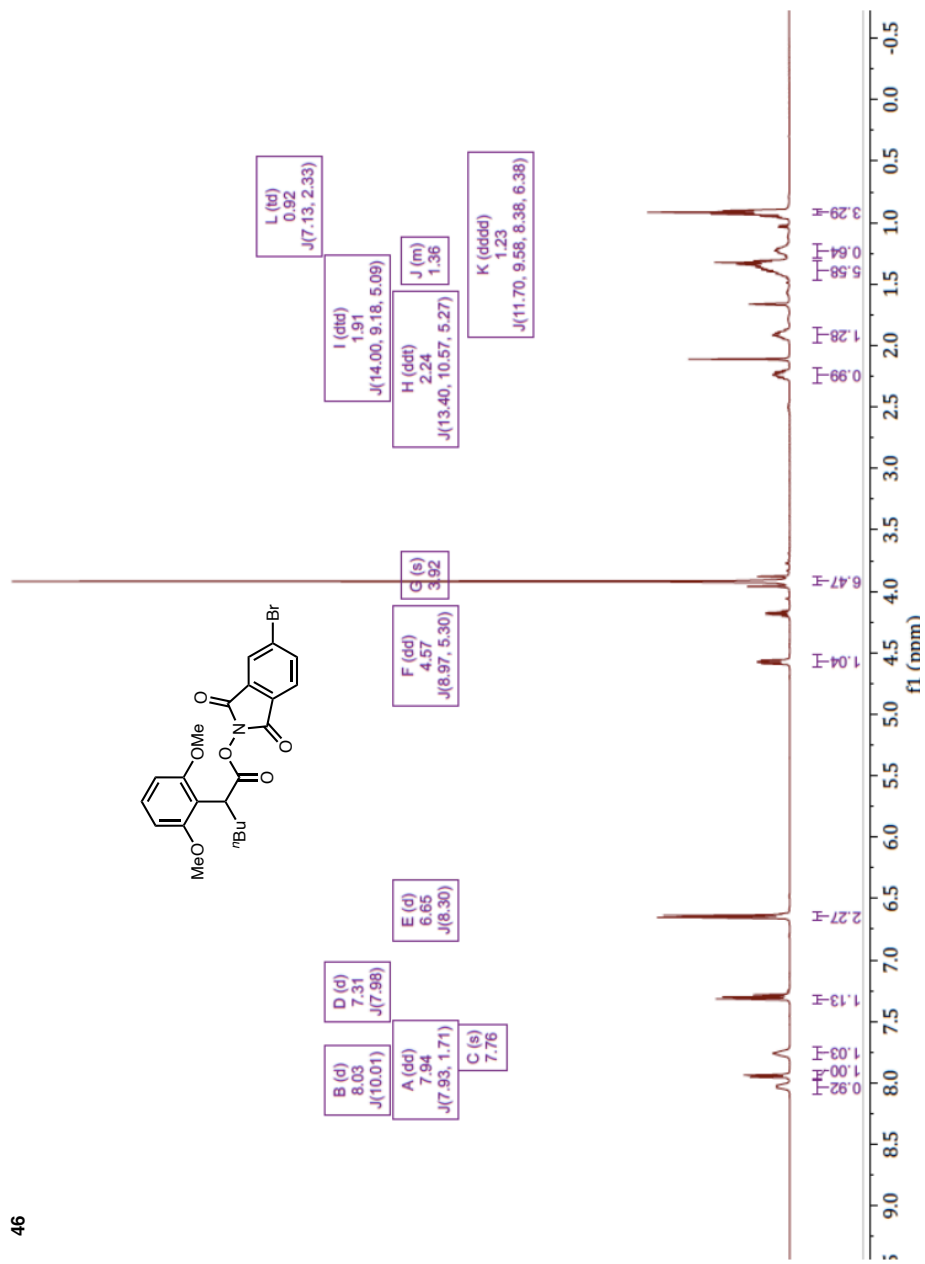
43

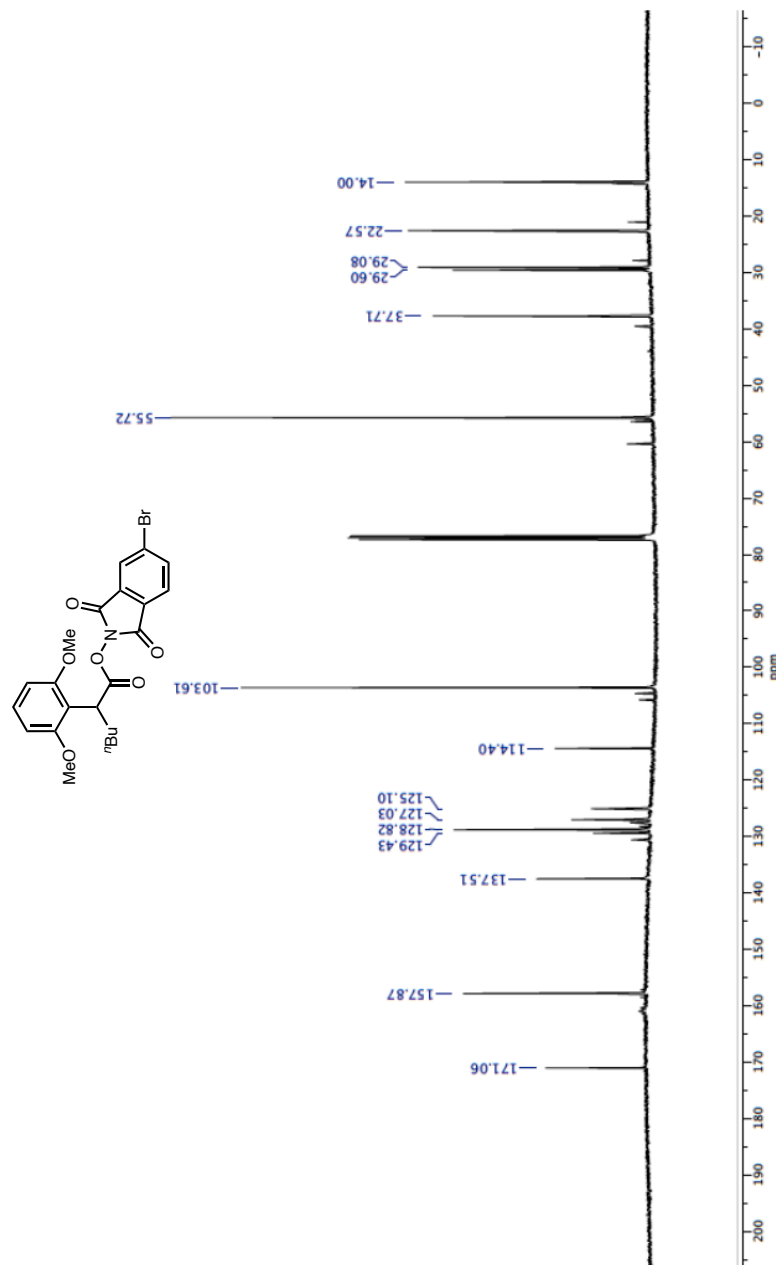






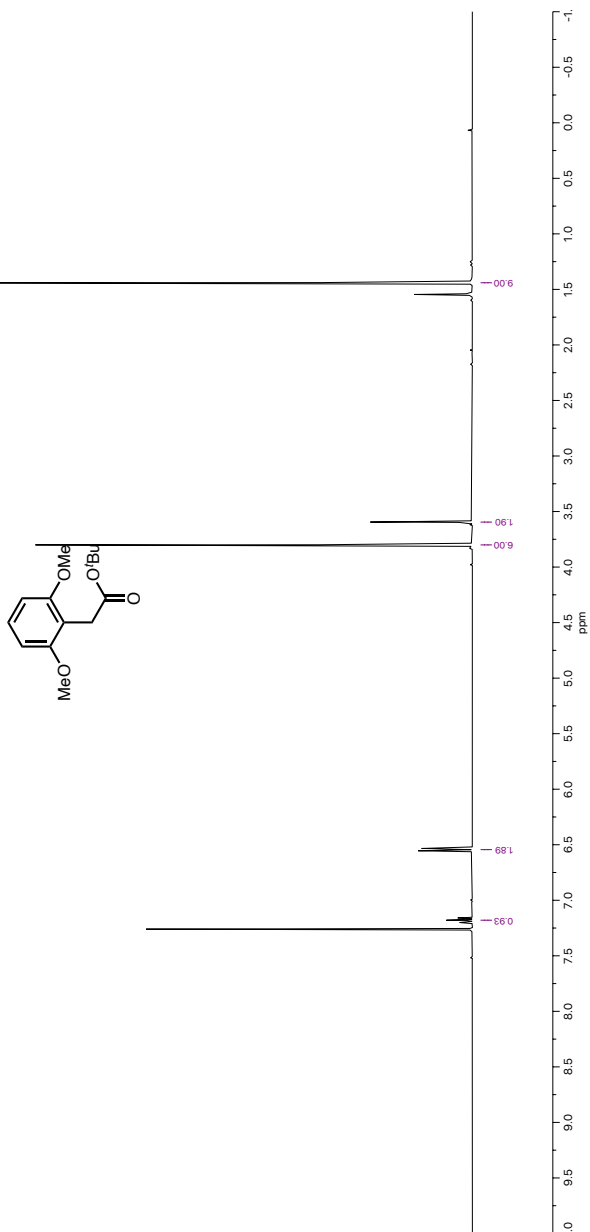


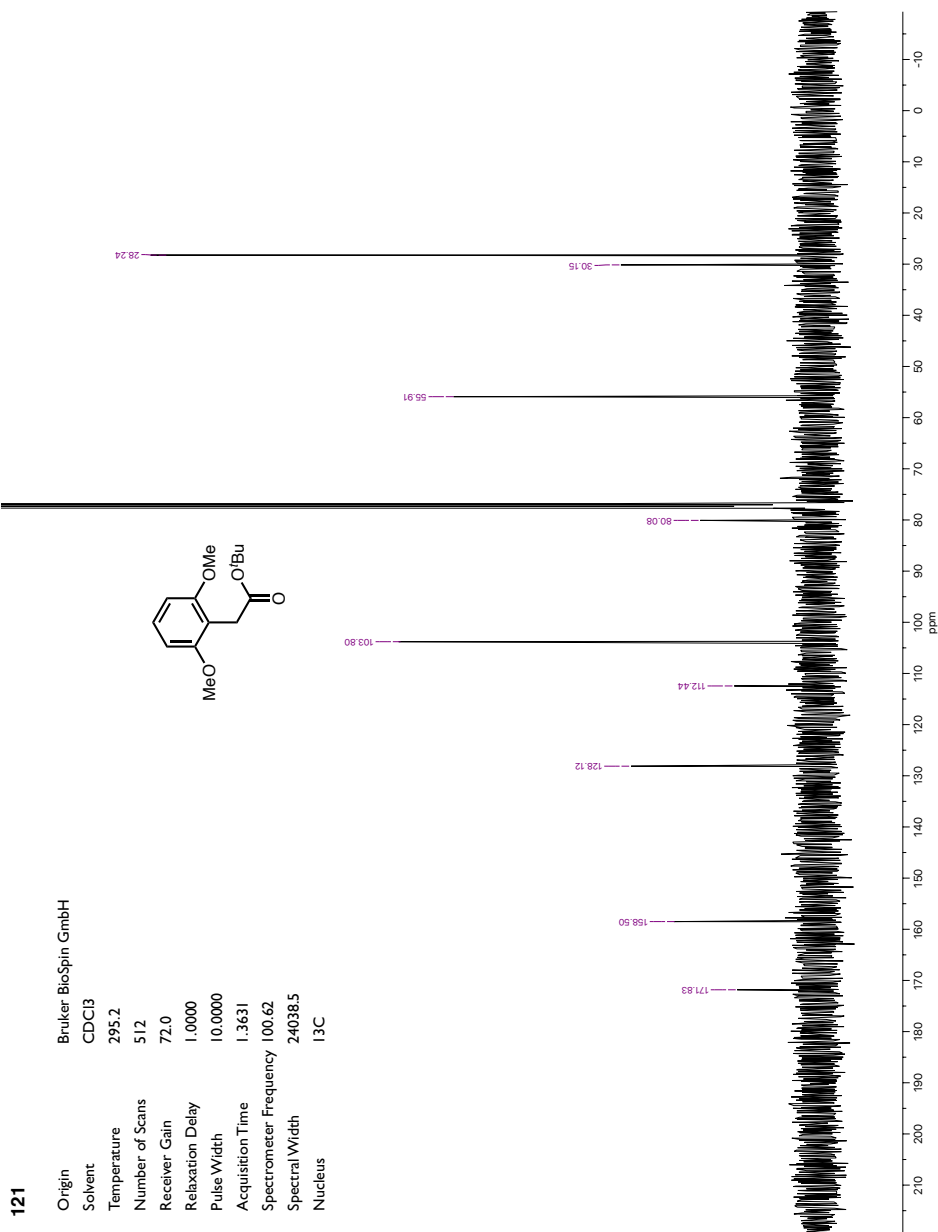




121

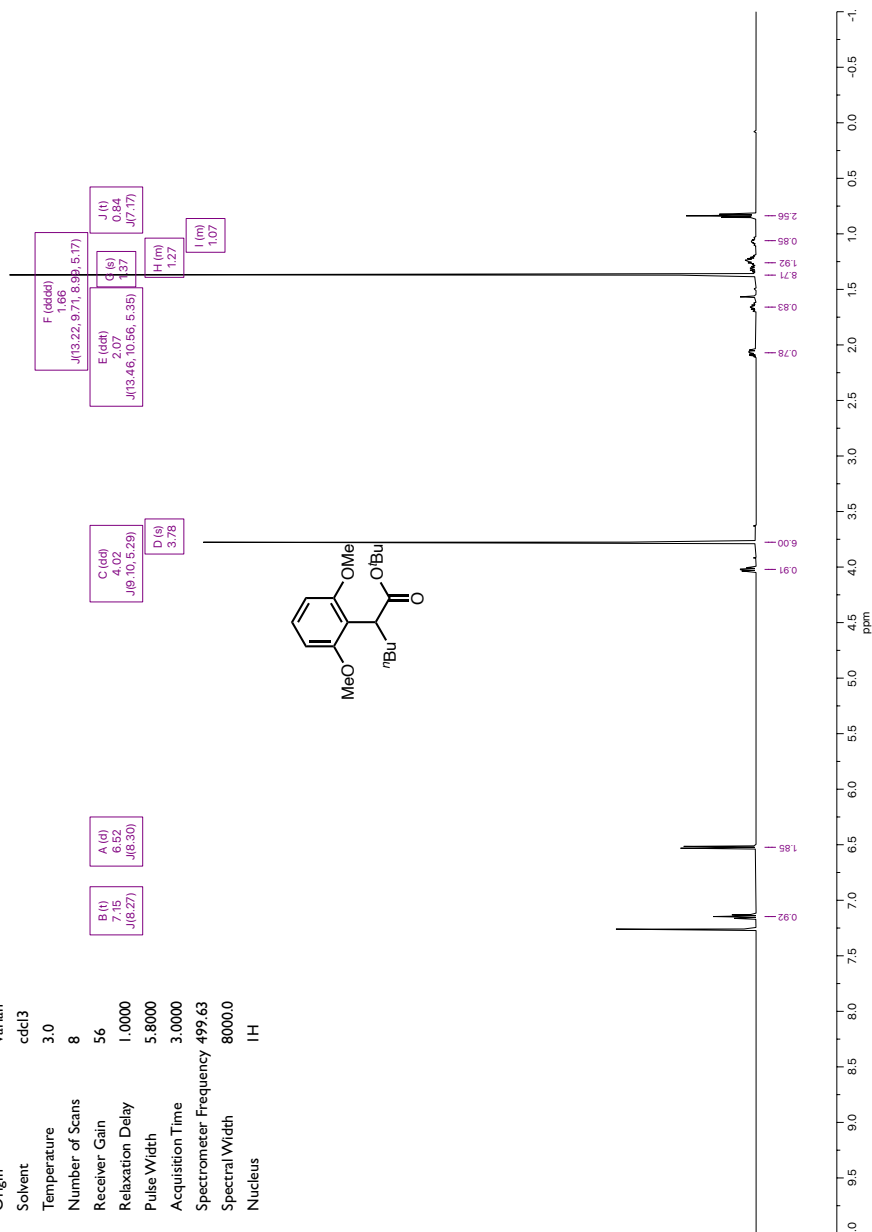
Origin Bruker-BioSpin GmbH  
Solvent CDCl<sub>3</sub>  
Temperature 295.1  
Number of Scans 16  
Receiver Gain 197.4  
Relaxation Delay 1.0000  
Pulse Width 11.7000  
Acquisition Time 4.0894  
Spectrometer Frequency 400.13  
Spectral Width 8012.8  
Nucleus <sup>1</sup>H

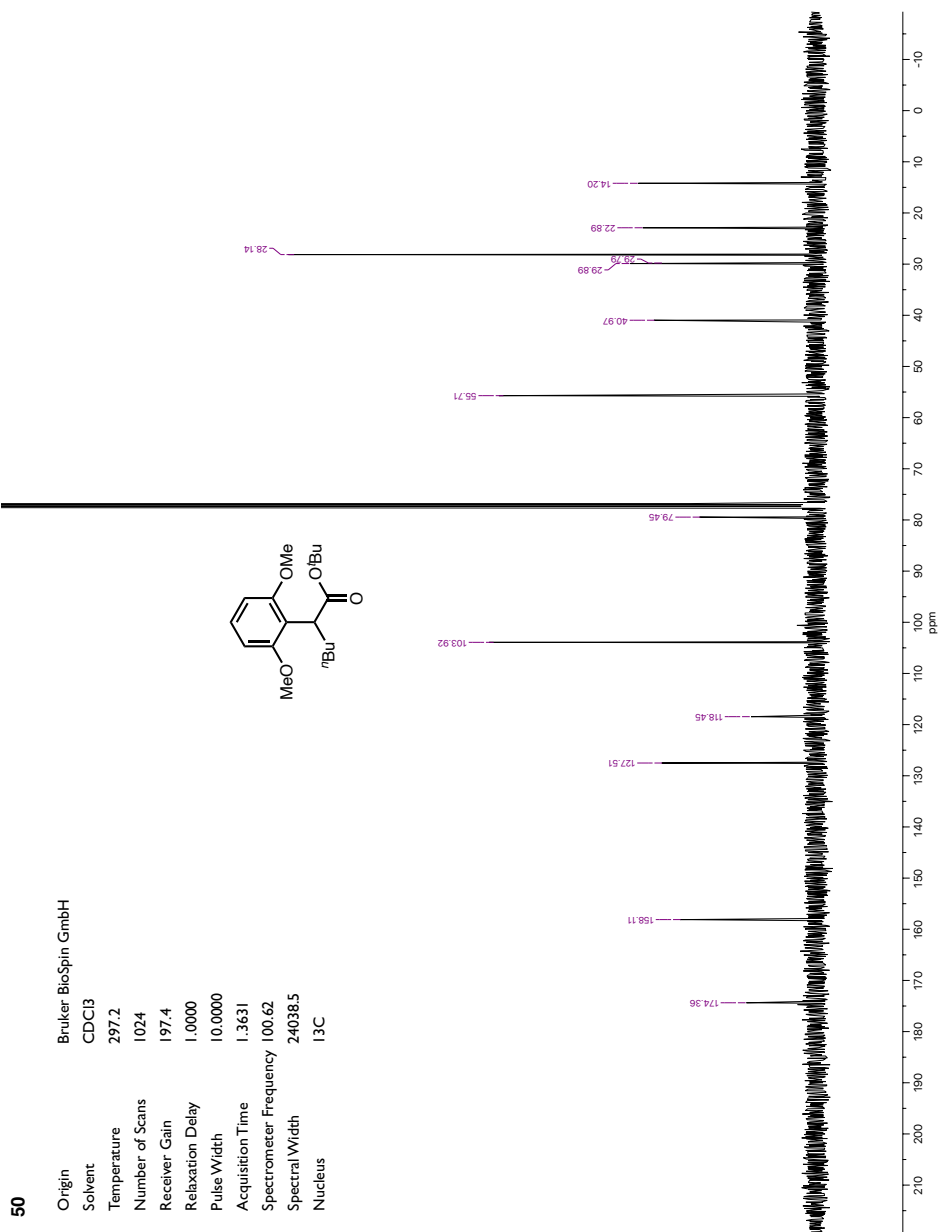




50

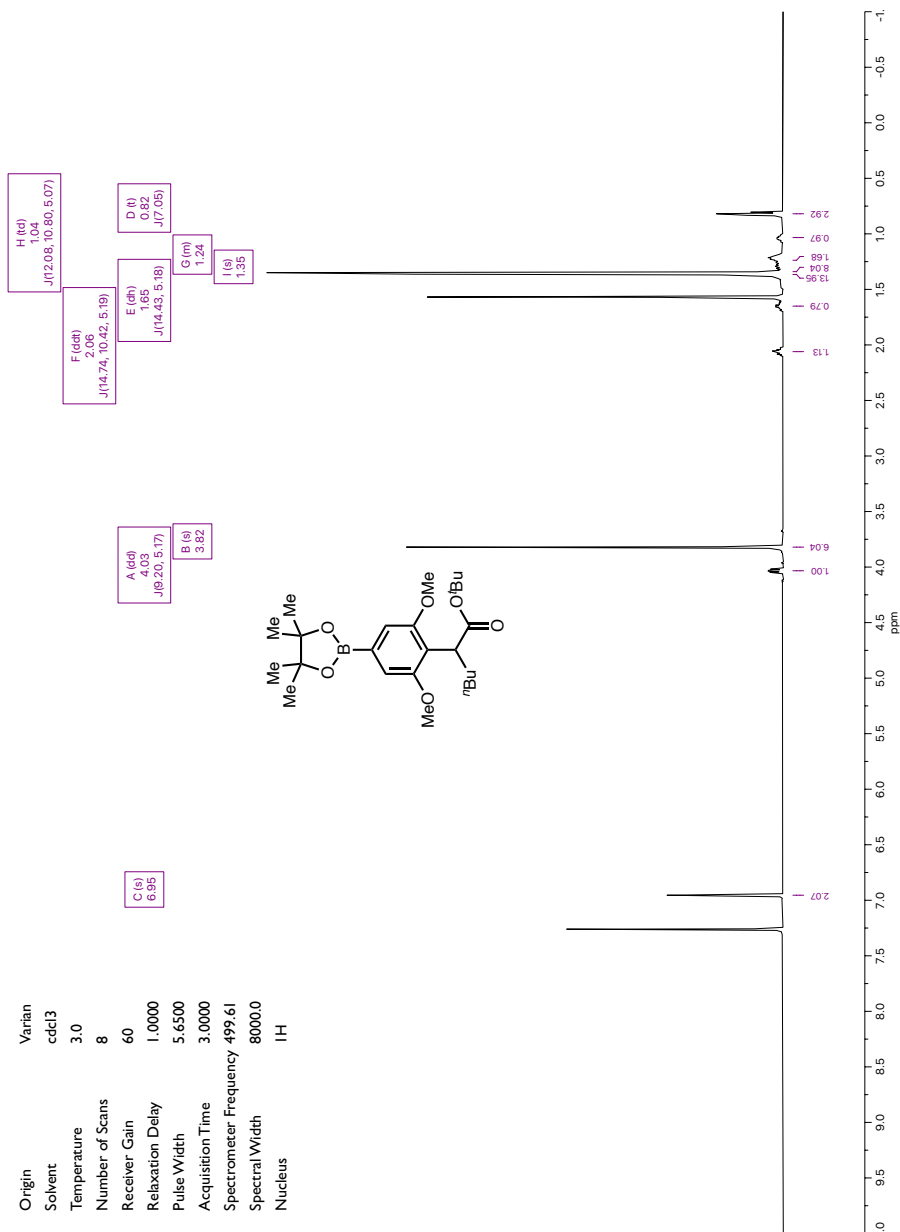
Origin Varian  
 Solvent cdcl3  
 Temperature 3.0  
 Number of Scans 8  
 Receiver Gain 56  
 Relaxation Delay 1.0000  
 Pulse Width 5.8000  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.63  
 Spectral Width 8000.0  
 Nucleus 1H



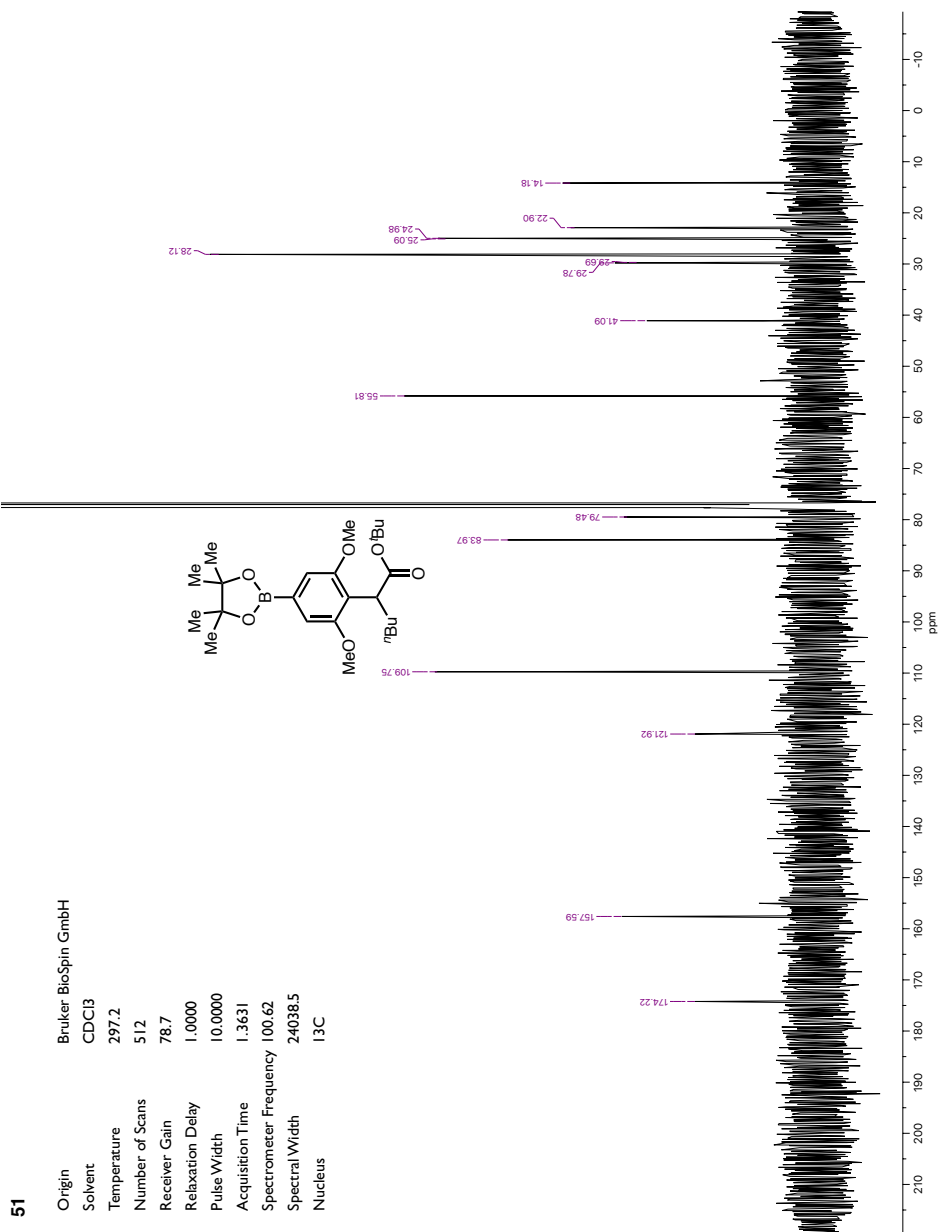


51

Origin Varian  
 Solvent cdcl3  
 Temperature 3.0  
 Number of Scans 8  
 Receiver Gain 60  
 Relaxation Delay 1.0000  
 Pulse Width 5.6500  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.61  
 Spectral Width 8000.0  
 Nucleus 1H

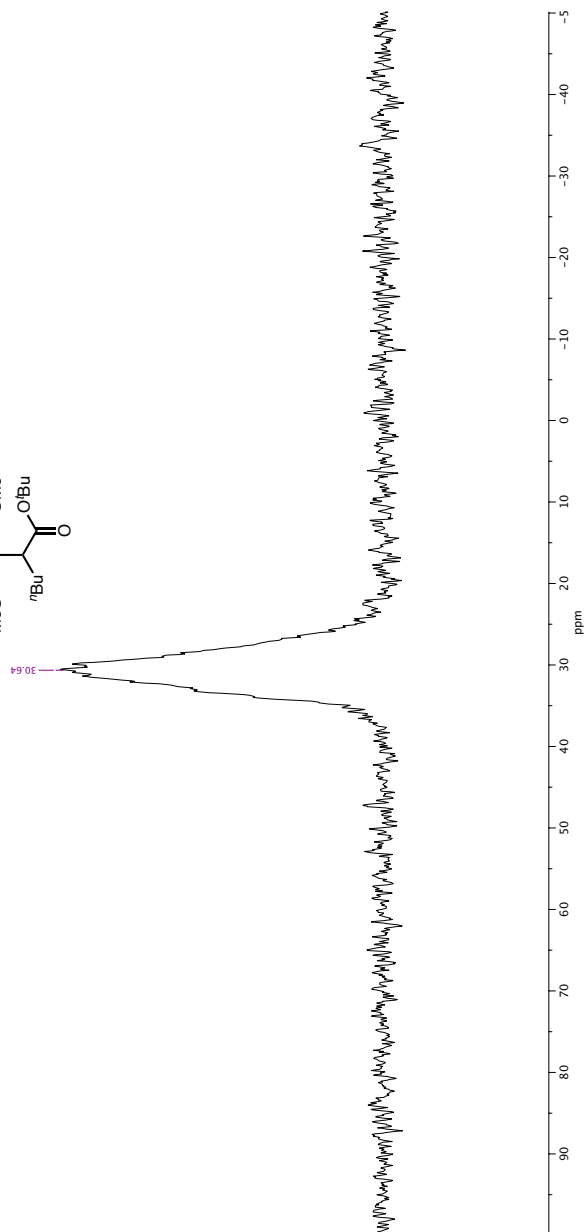
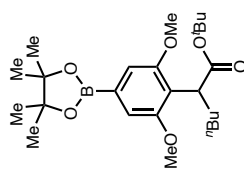




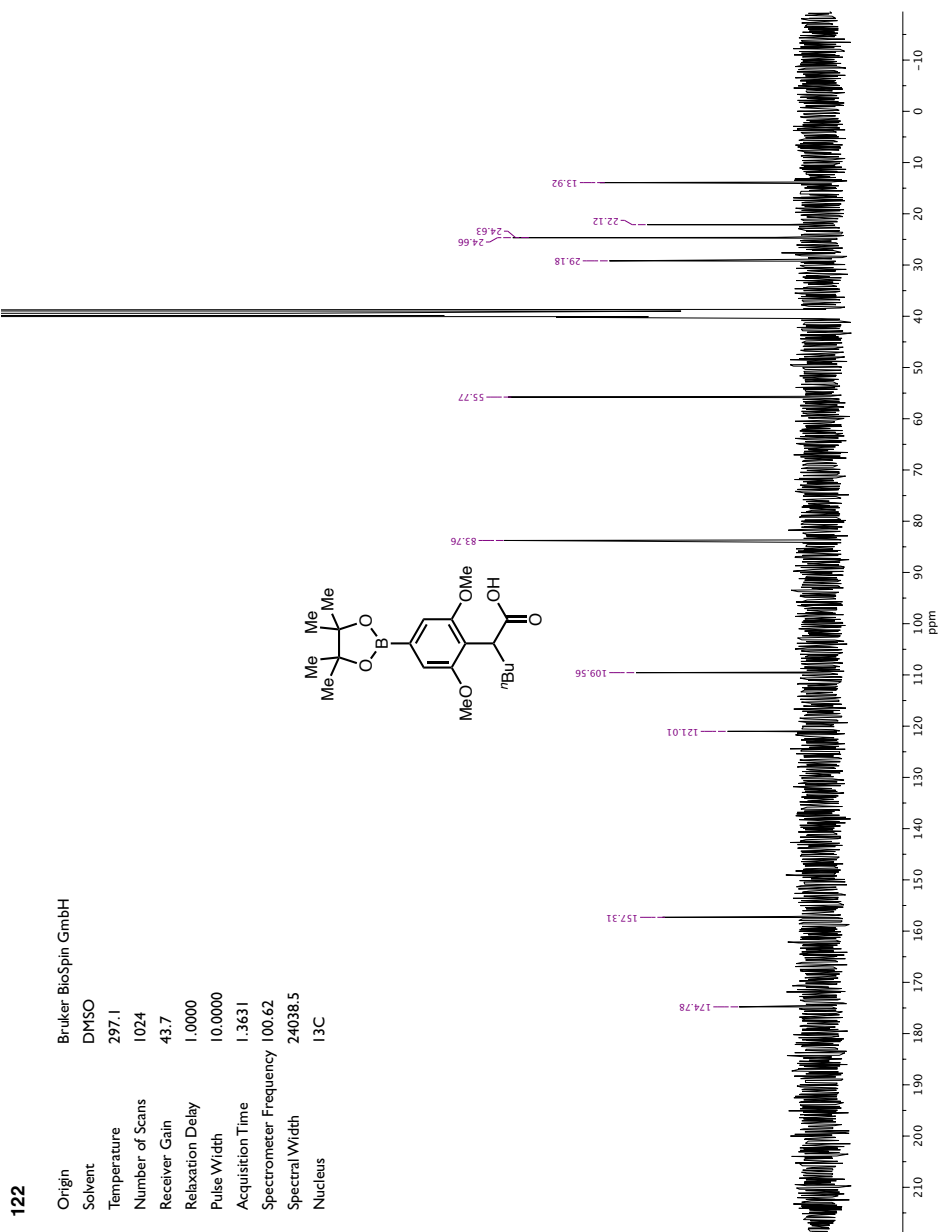


51

Origin Varian  
Solvent cdcl3  
Temperature 100.0  
Number of Scans 1000  
Receiver Gain 30  
Relaxation Delay 0.1000  
Pulse Width 11.0000  
Acquisition Time 0.0532  
Spectrometer Frequency 128.27  
Spectral Width 19230.8  
Nucleus <sup>1</sup>H

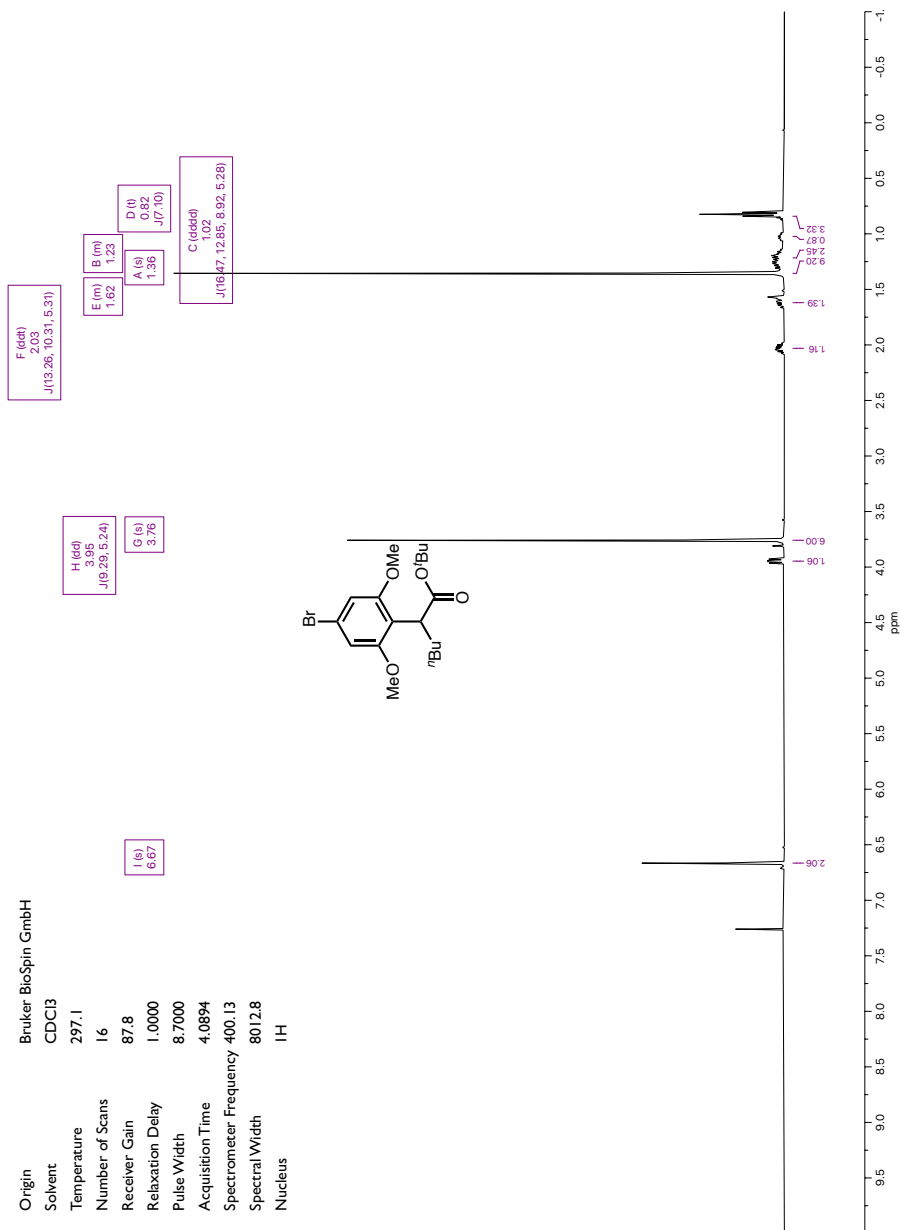


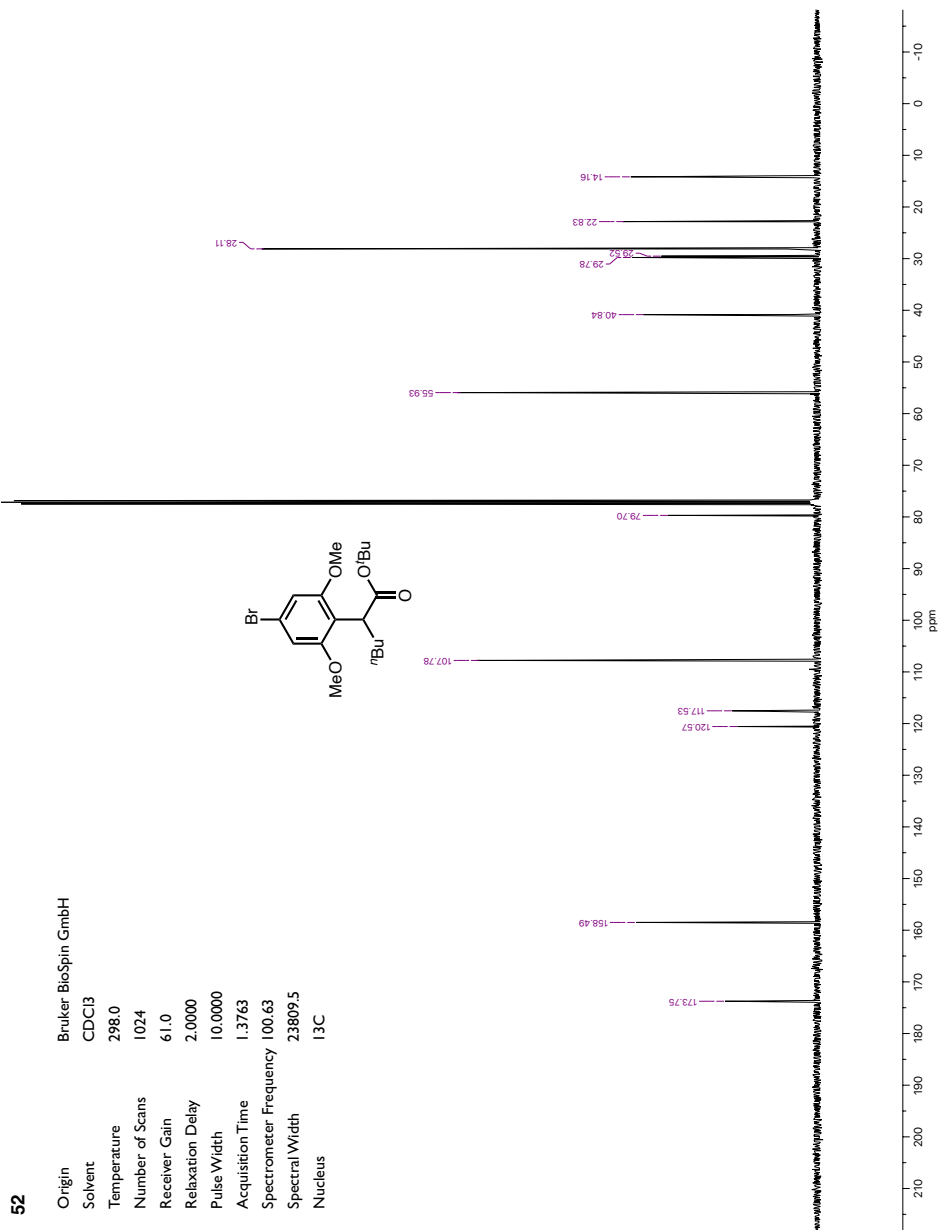




52

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 87.8  
 Relaxation Delay 1.0000  
 Pulse Width 8.7000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

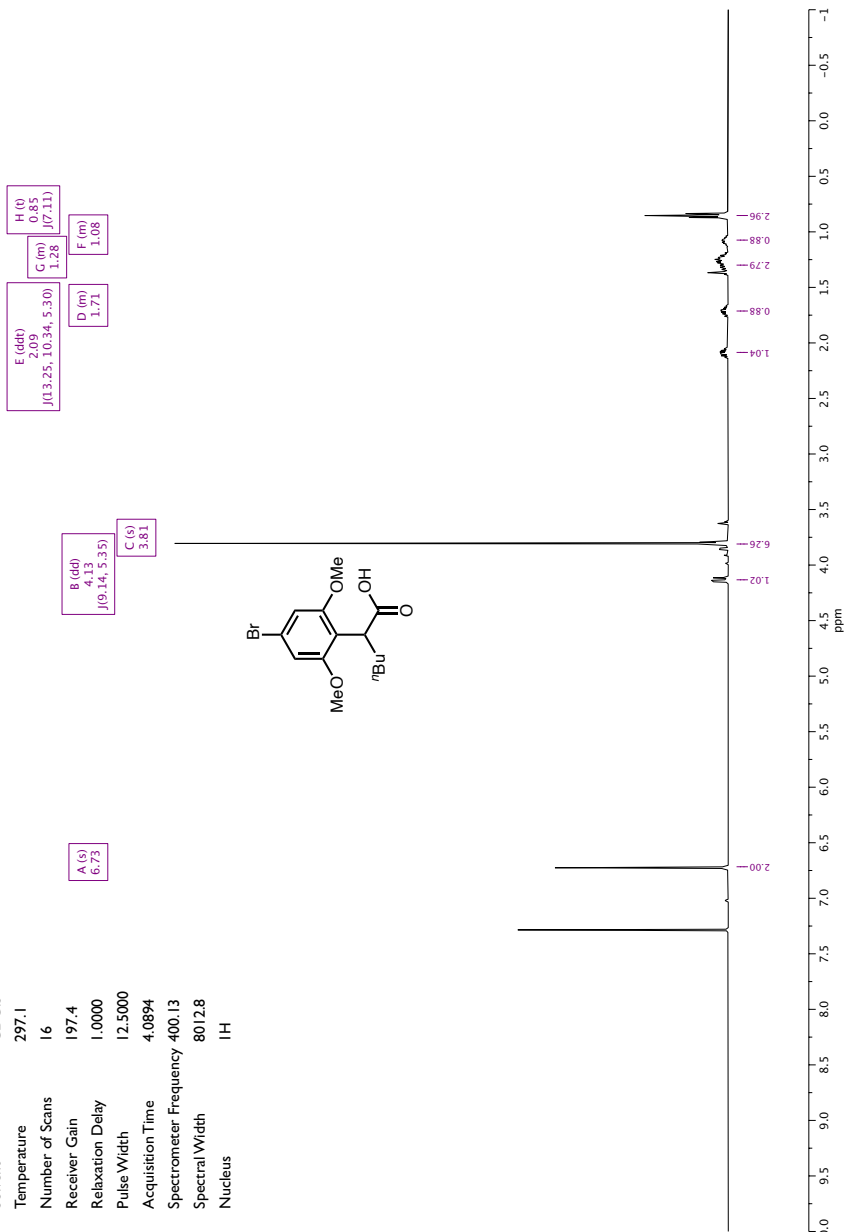


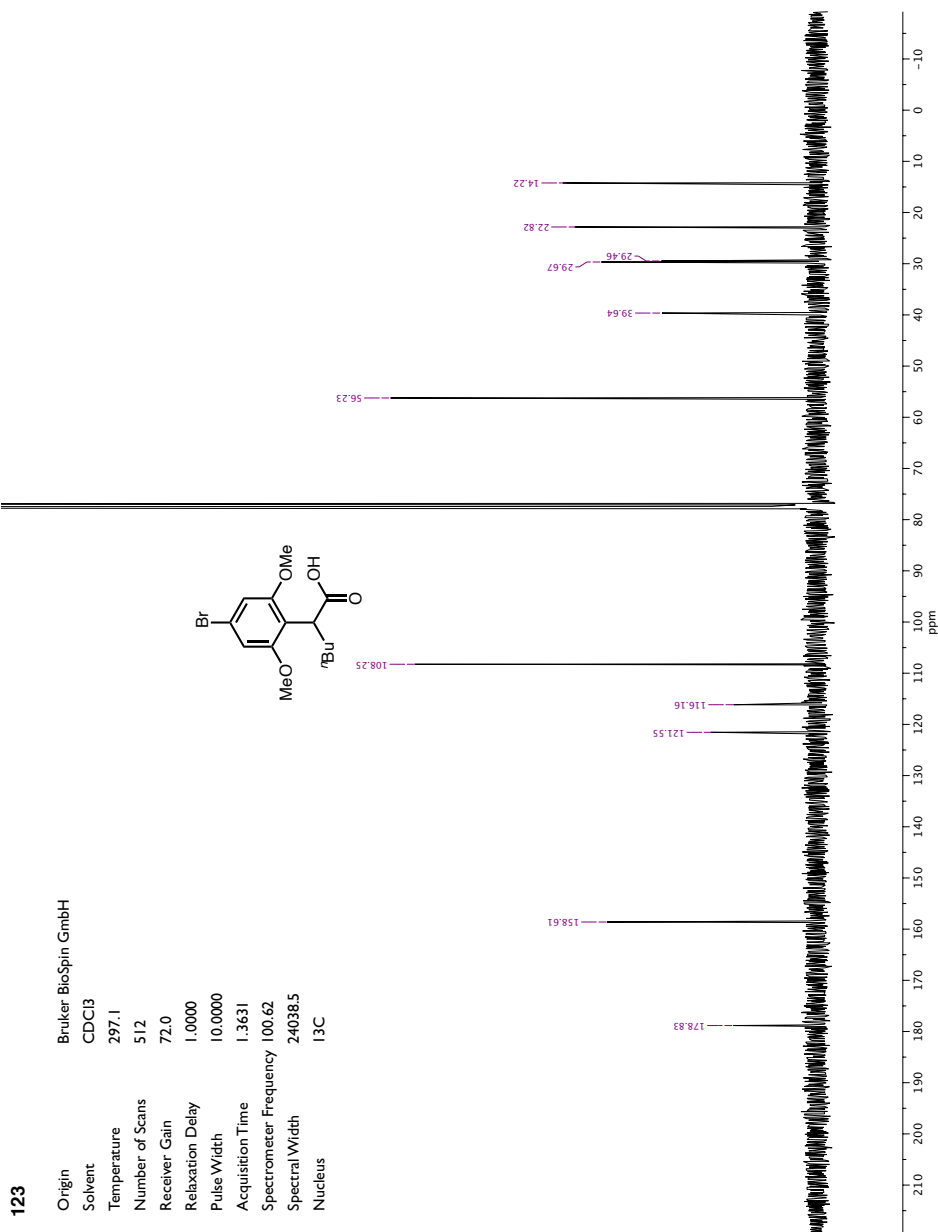


123

Origin Bruker-BioSpin GmbH

Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 197.4  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

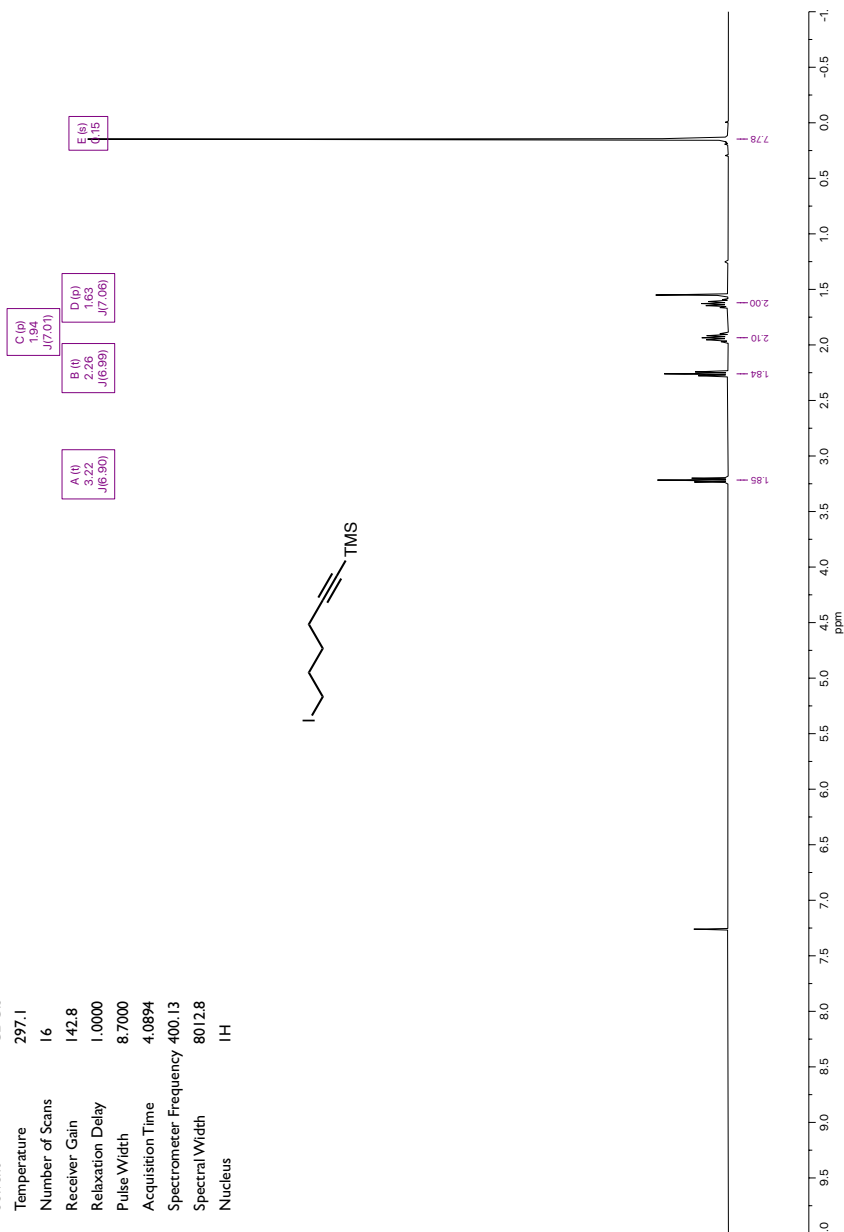


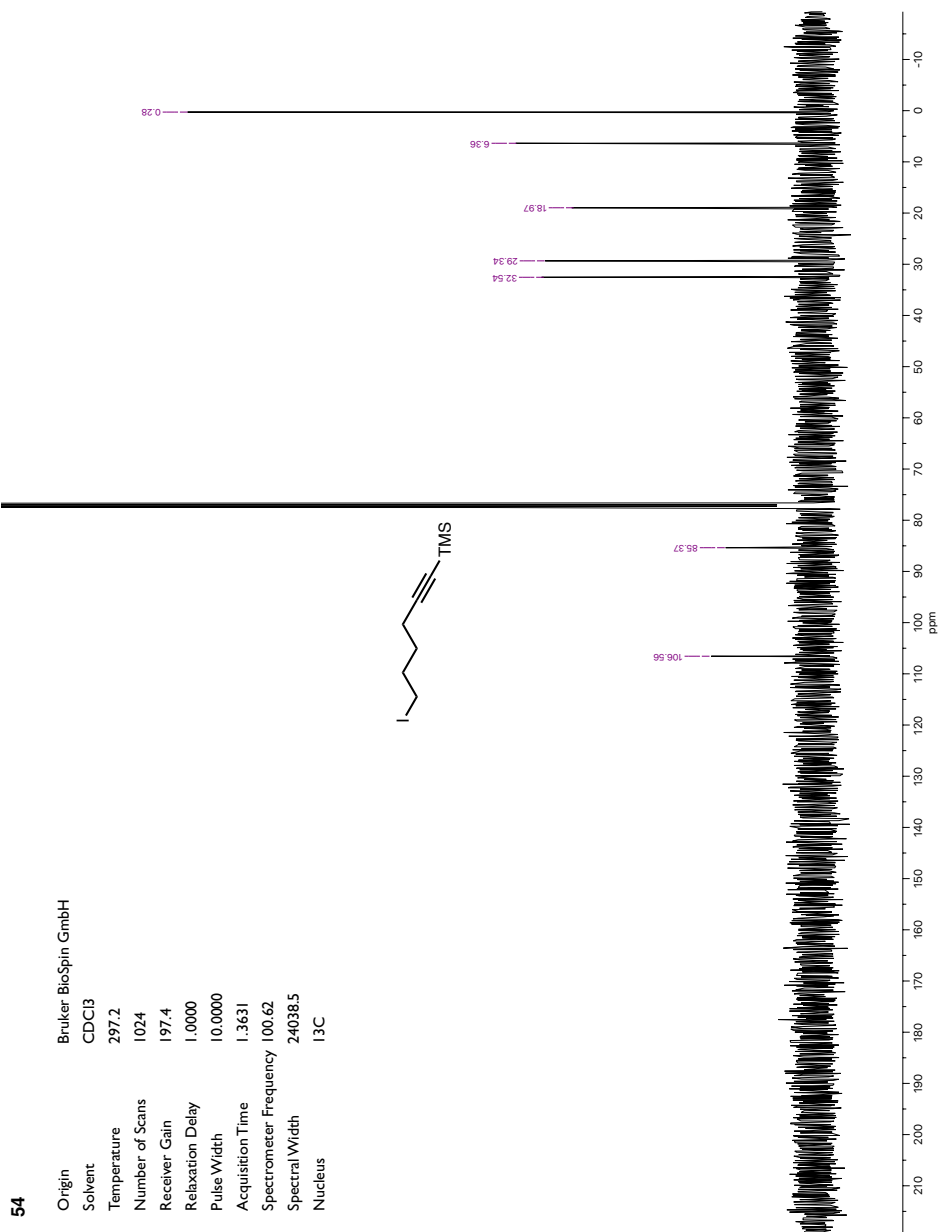




54

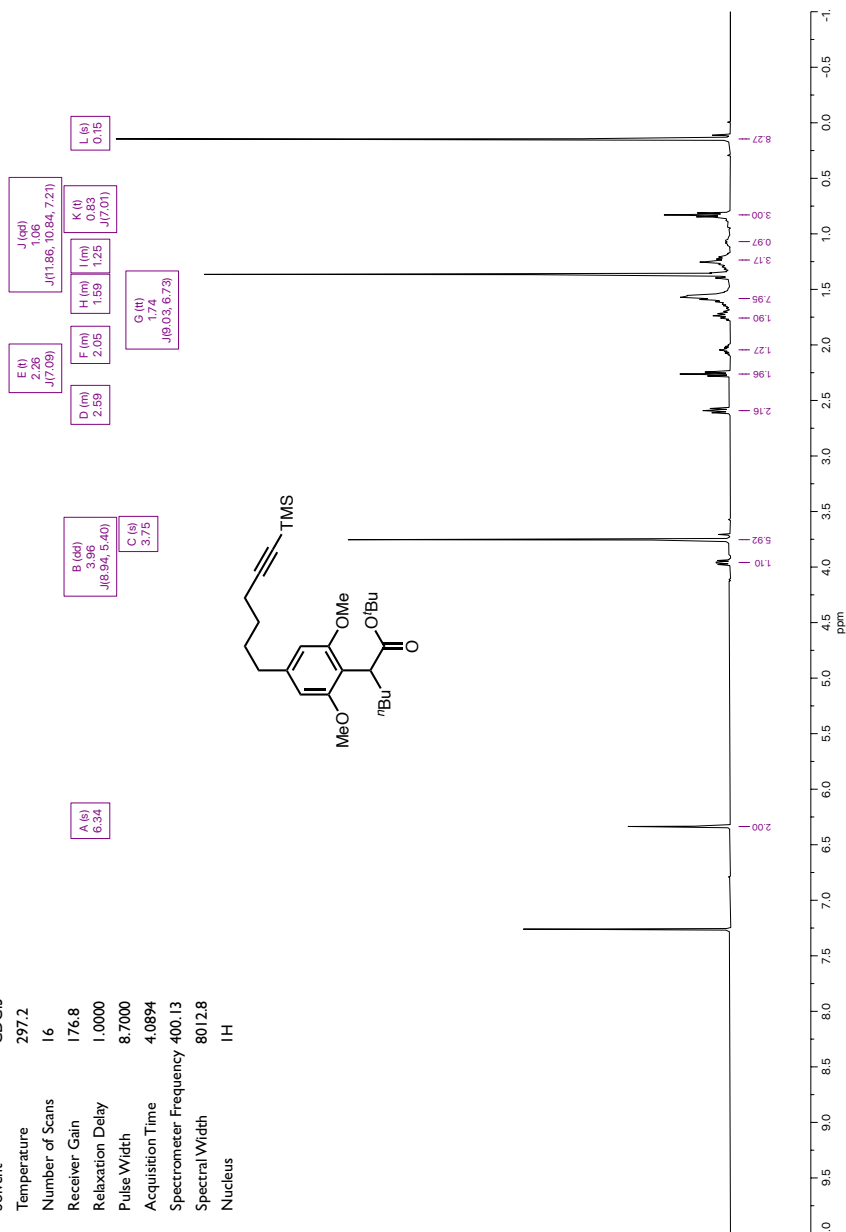
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 142.8  
 Relaxation Delay 1.0000  
 Pulse Width 8.7000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

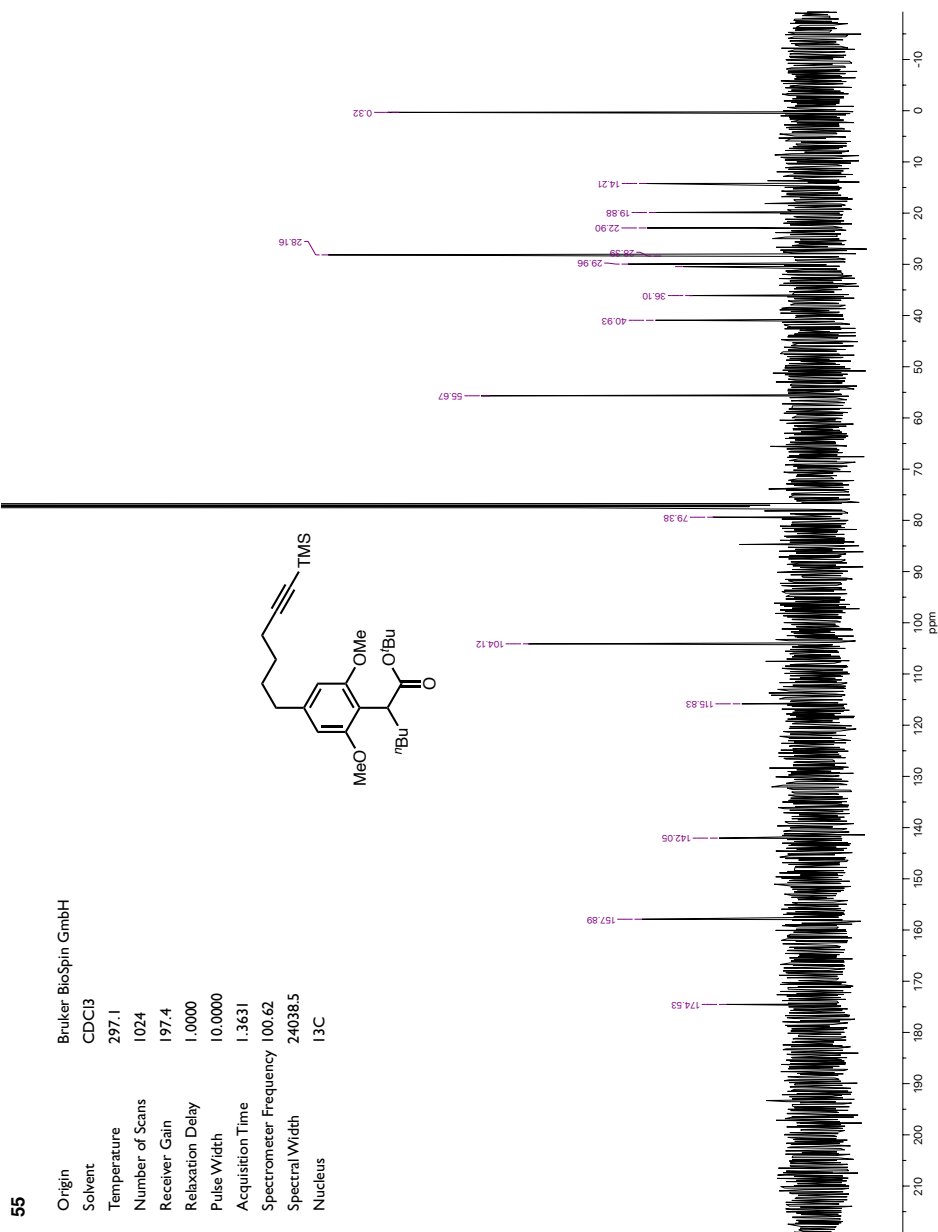




55

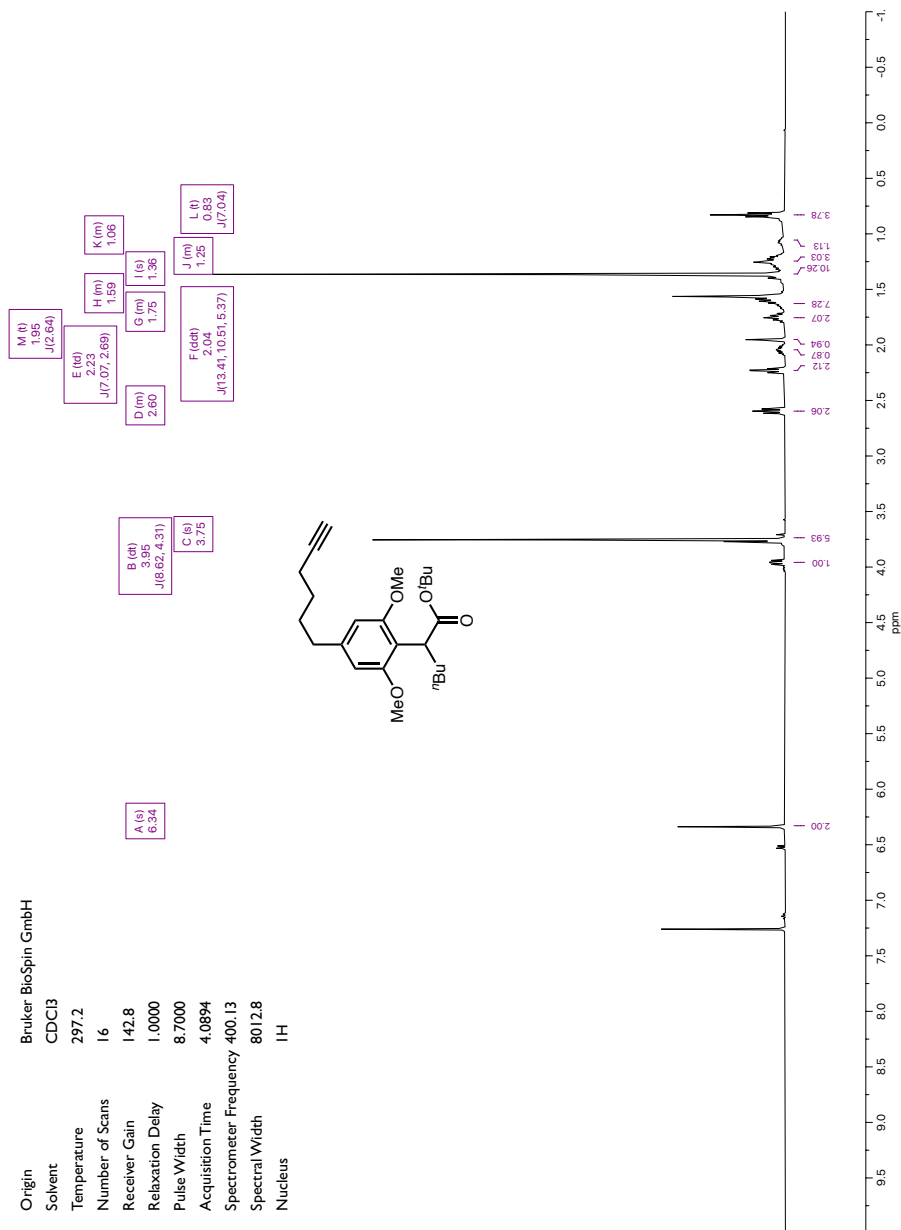
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 176.8  
 Relaxation Delay 1.0000  
 Pulse Width 8.7000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

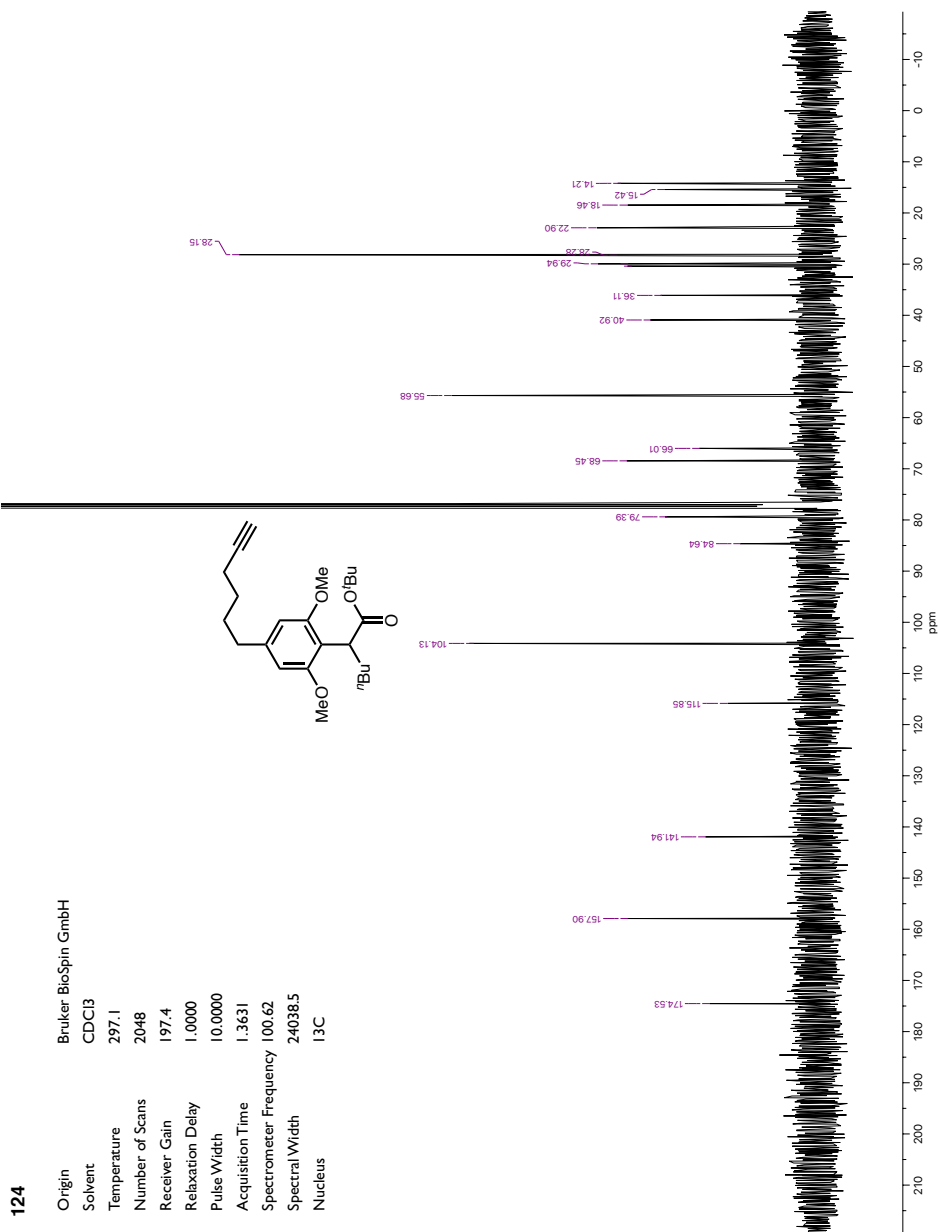




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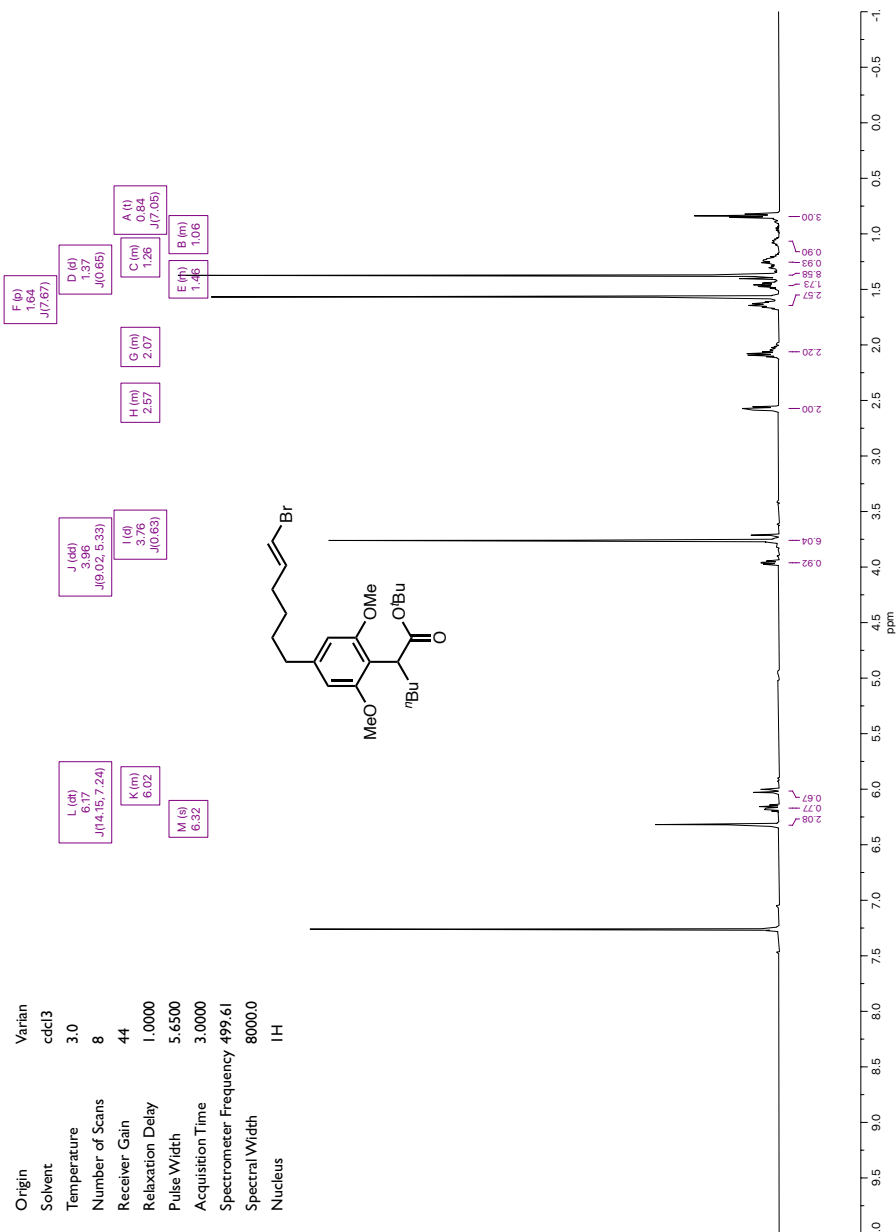
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 142.8  
 Relaxation Delay 1.0000  
 Pulse Width 8.7000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

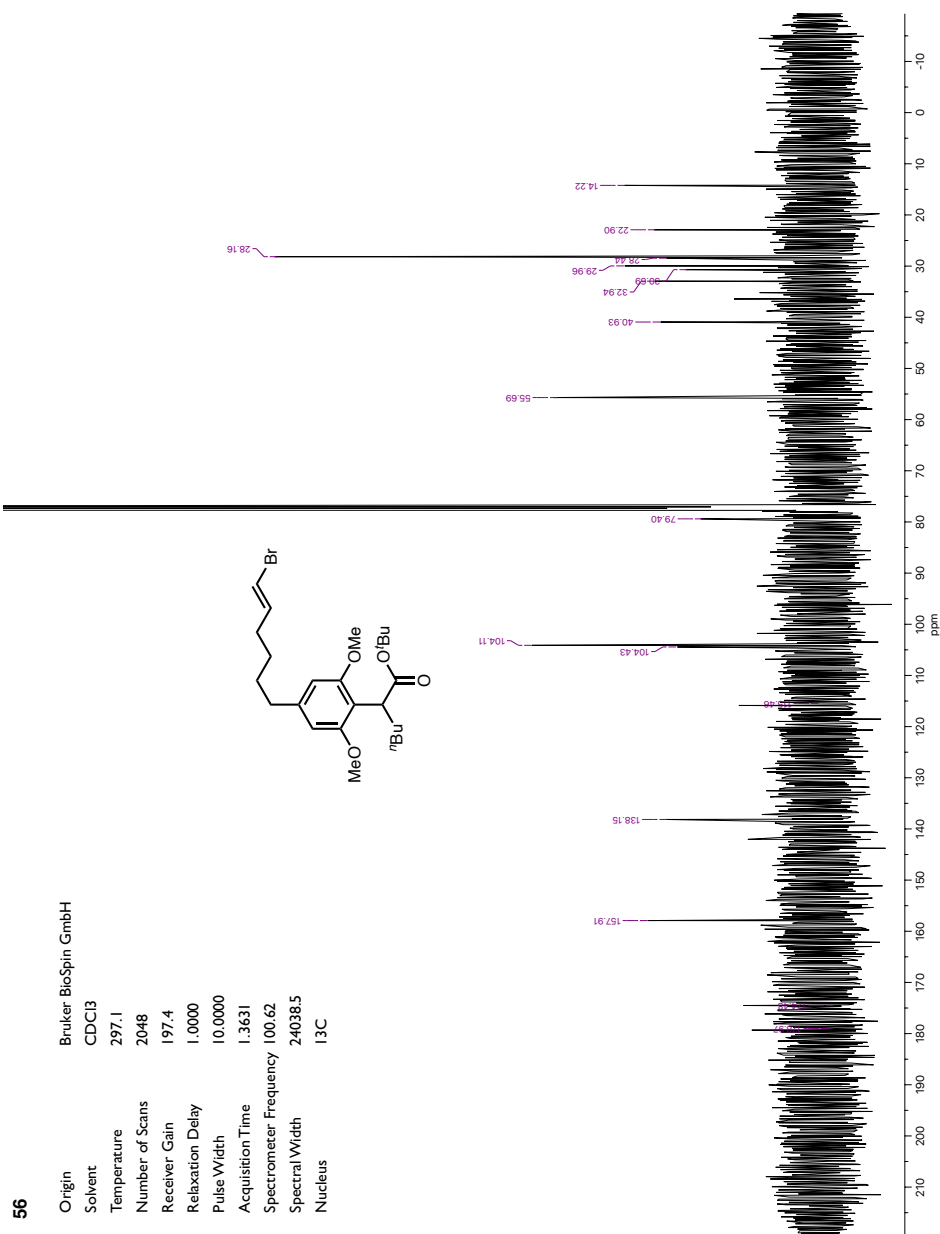




56

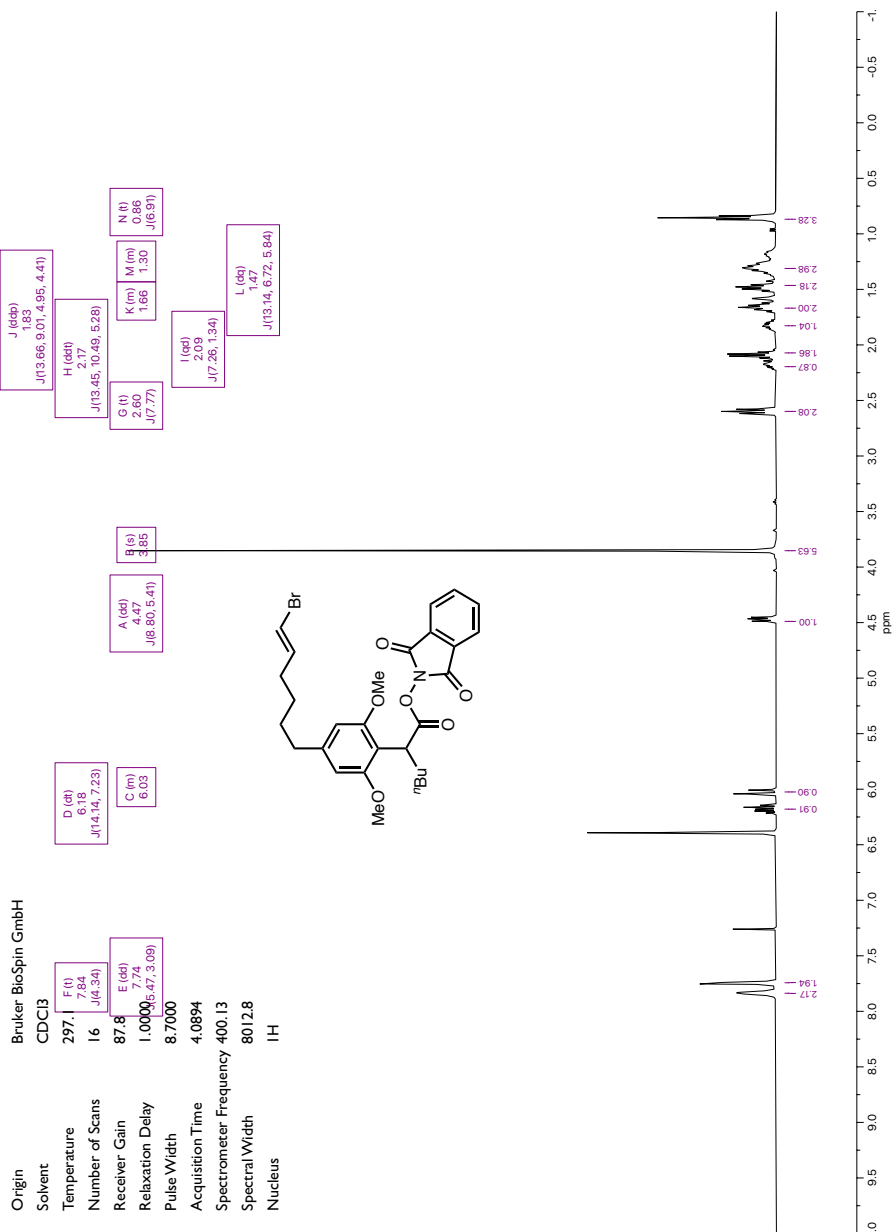
Origin Varian  
 Solvent cdcl3  
 Temperature 3.0  
 Number of Scans 8  
 Receiver Gain 44  
 Relaxation Delay 1.0000  
 Pulse Width 5.6500  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.61  
 Spectral Width 8000.0  
 Nucleus 1H

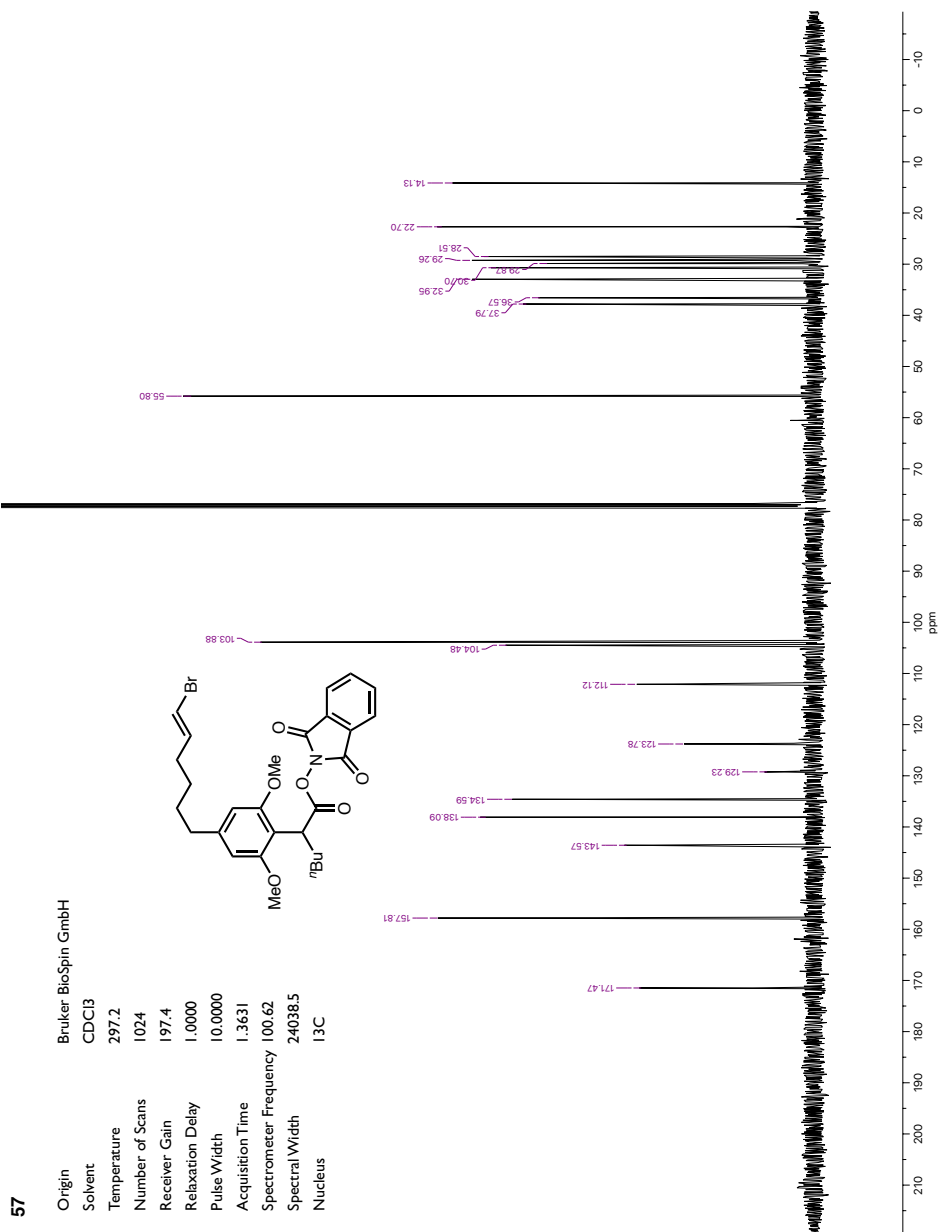






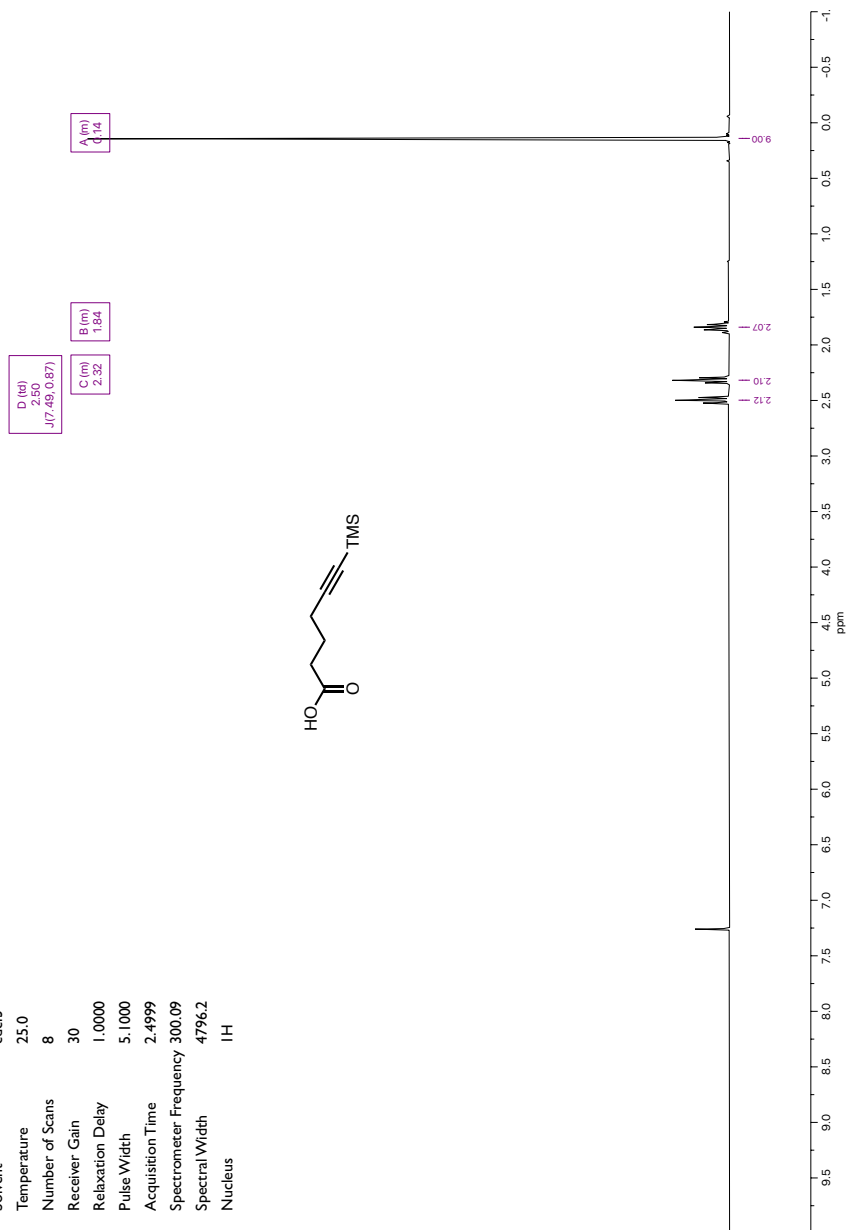
57

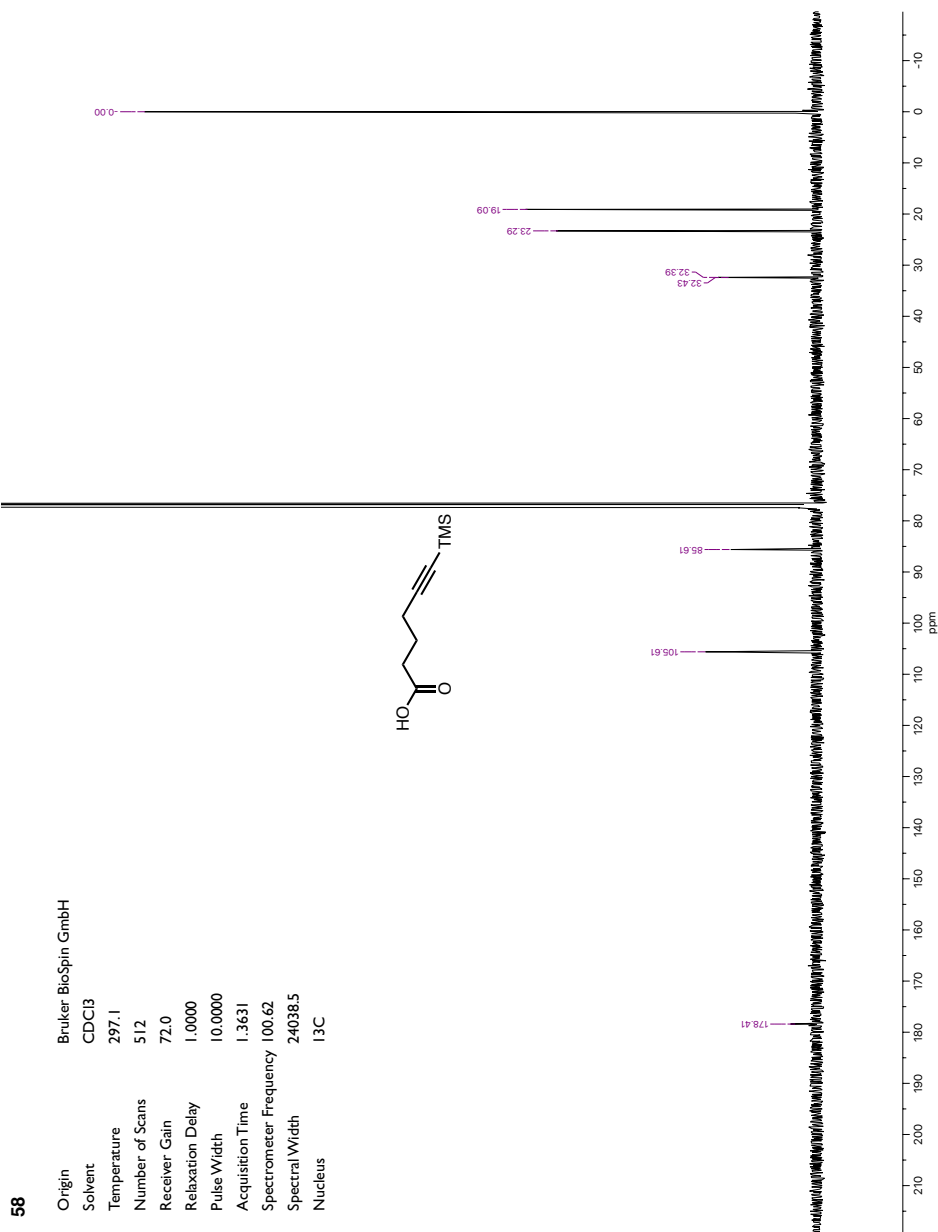




58

Origin Varian  
 Solvent cdcl3  
 Temperature 25.0  
 Number of Scans 8  
 Receiver Gain 30  
 Relaxation Delay 1.0000  
 Pulse Width 5.1000  
 Acquisition Time 2.4999  
 Spectrometer Frequency 300.09  
 Spectral Width 4796.2  
 Nucleus 1H

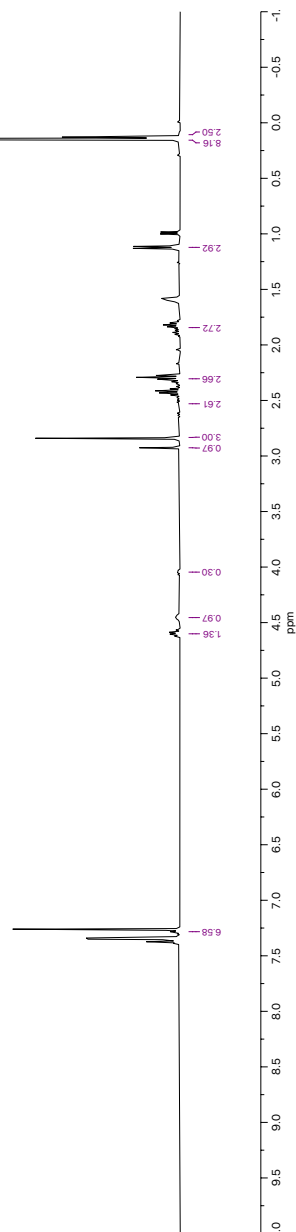
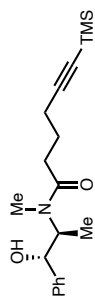


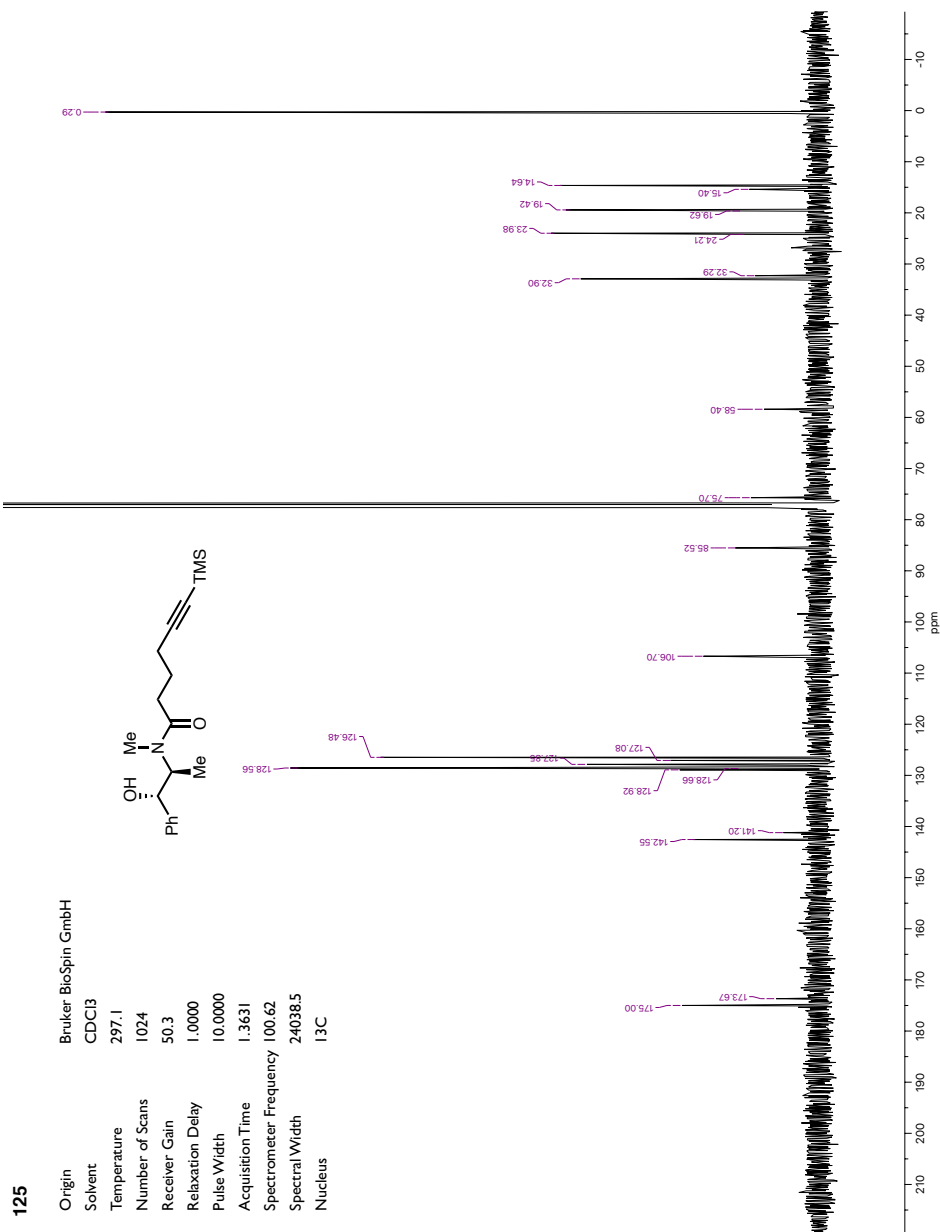


125

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 197.4  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

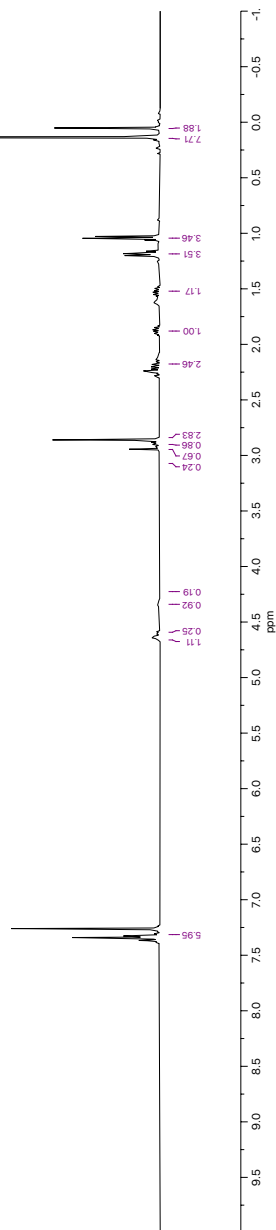
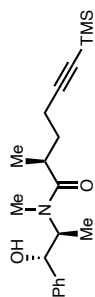
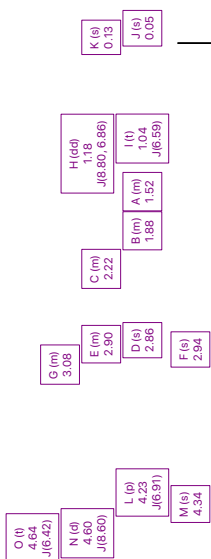
F (d) 4.59 J(7.62)  
 E (m) 4.45 D (m) 4.04  
 C (s) 2.83 B (s) 2.84 J (m) 2.46  
 L (m) 2.30 K (m) 2.46  
 I (d) 1.12 J(7.01)  
 H (s) 0.14 G (s) 0.13

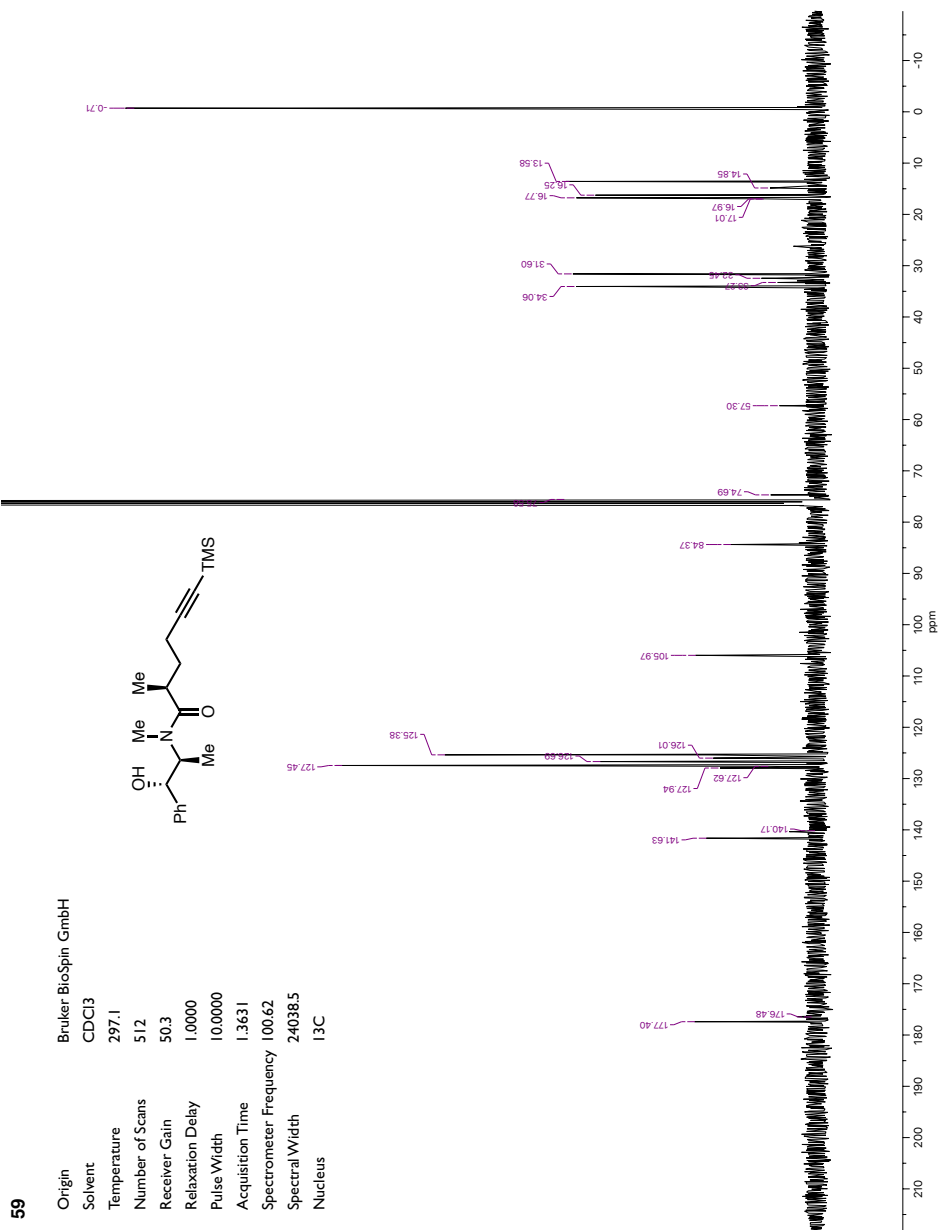




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Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 156.2  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

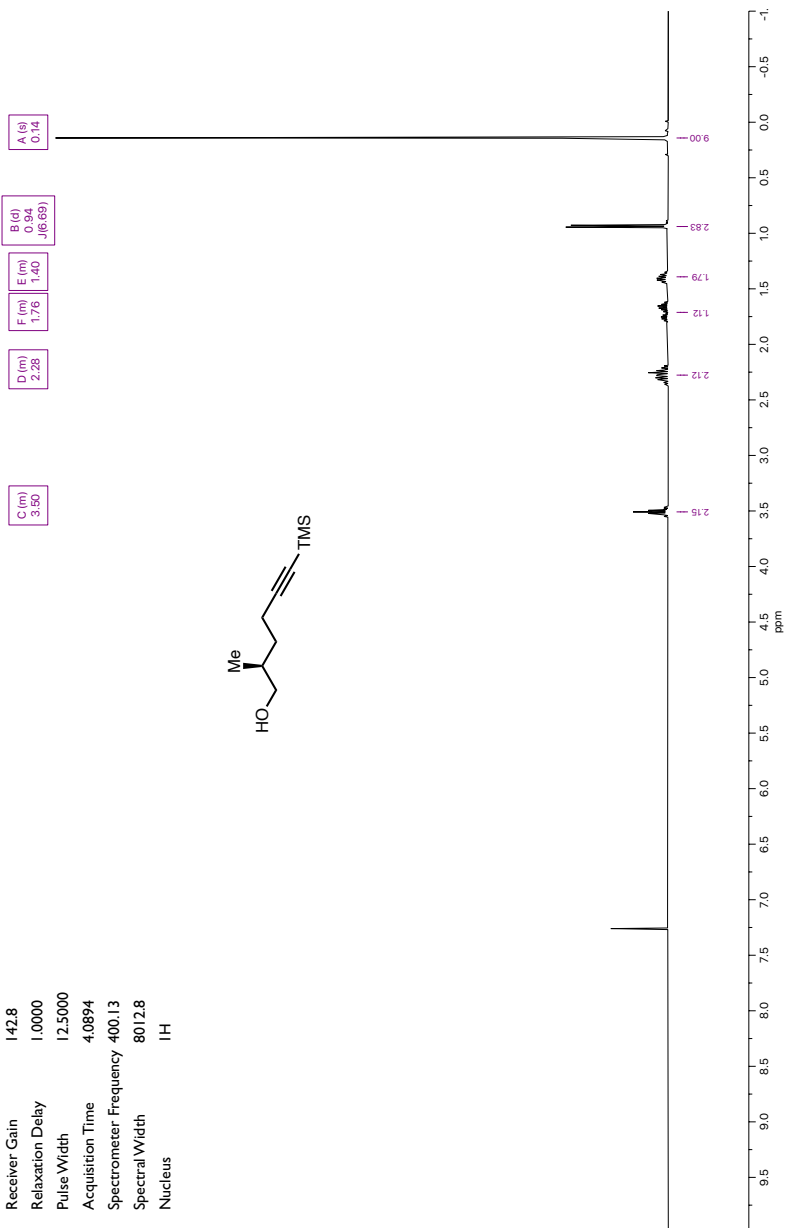
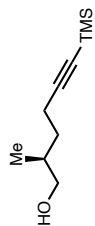


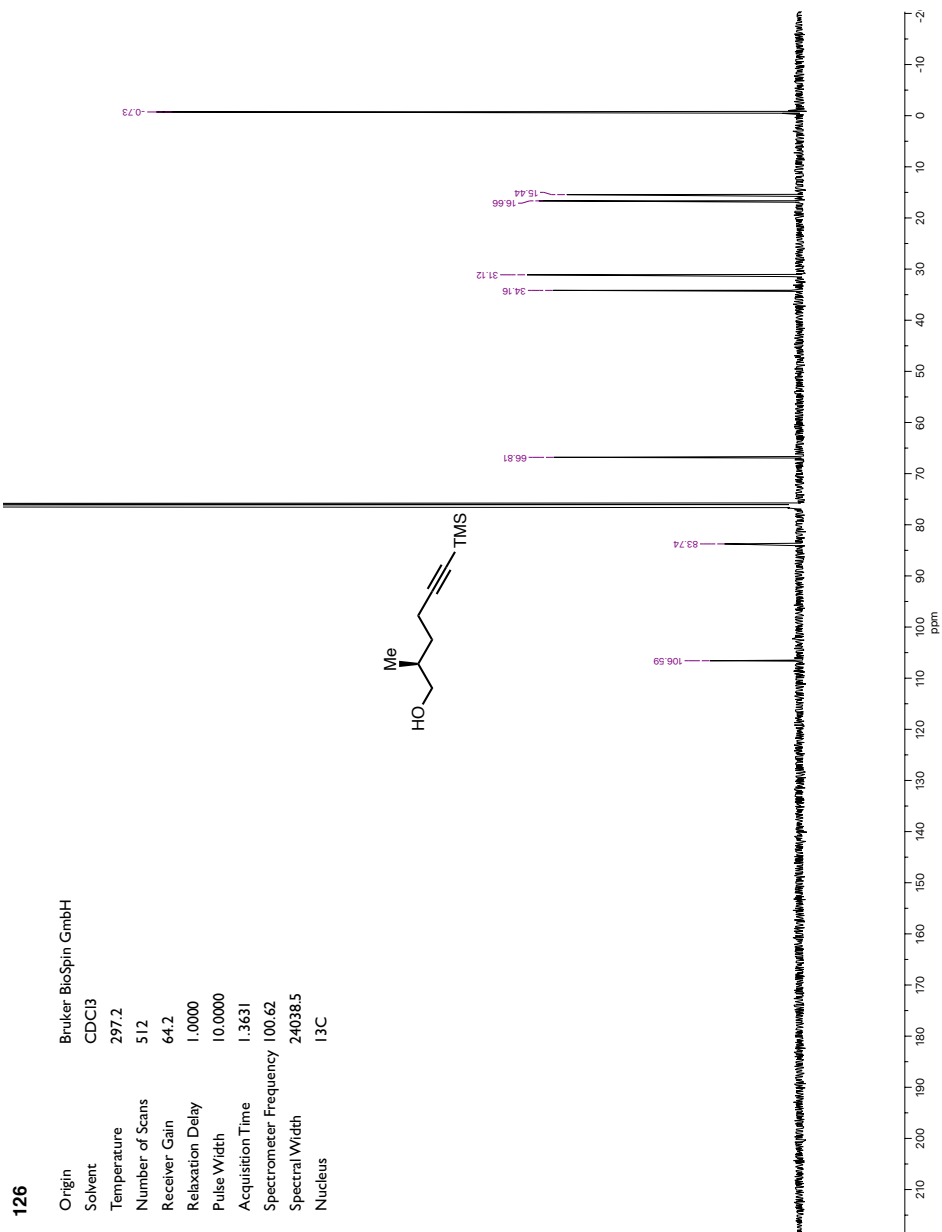




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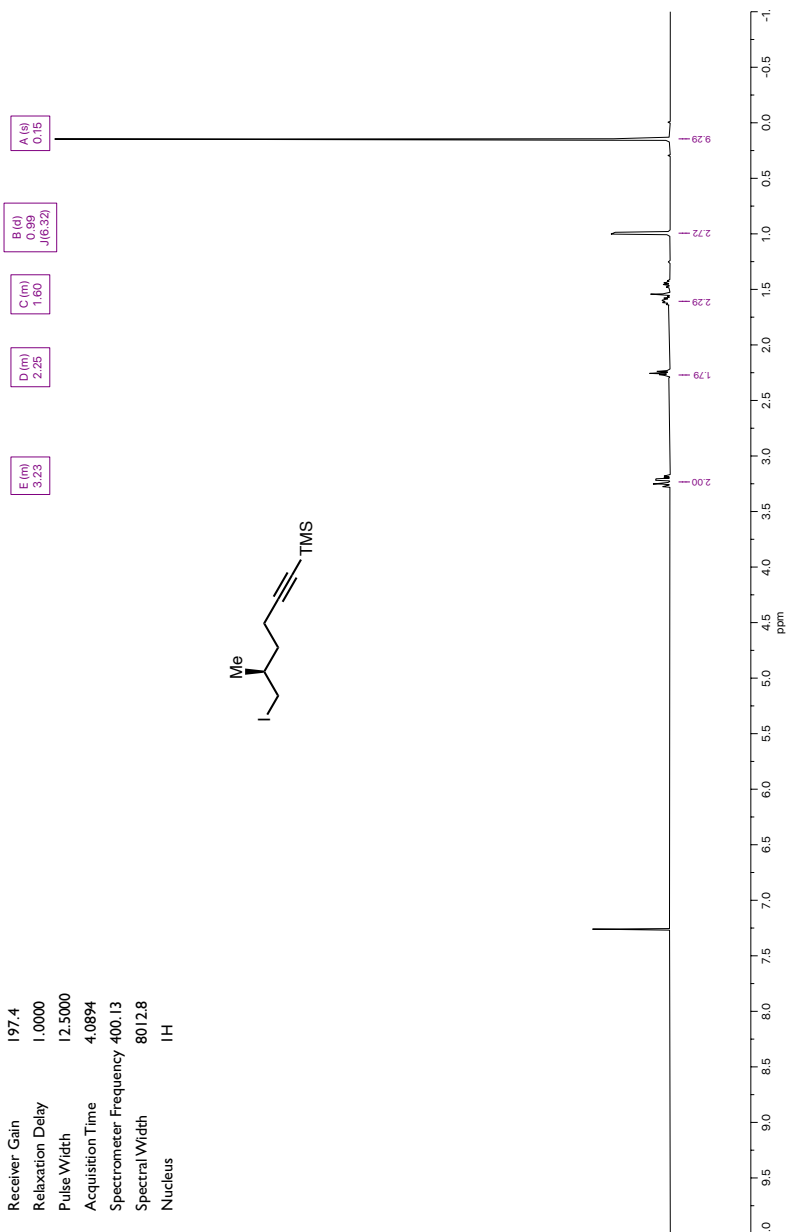
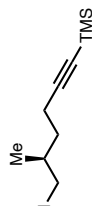
Origin Bruker BioSpin GmbH  
Solvent CDCl<sub>3</sub>  
Temperature 297.2  
Number of Scans 16  
Receiver Gain 142.8  
Relaxation Delay 1.0000  
Pulse Width 12.5000  
Acquisition Time 4.0894  
Spectrometer Frequency 400.13  
Spectral Width 8012.8  
Nucleus <sup>1</sup>H

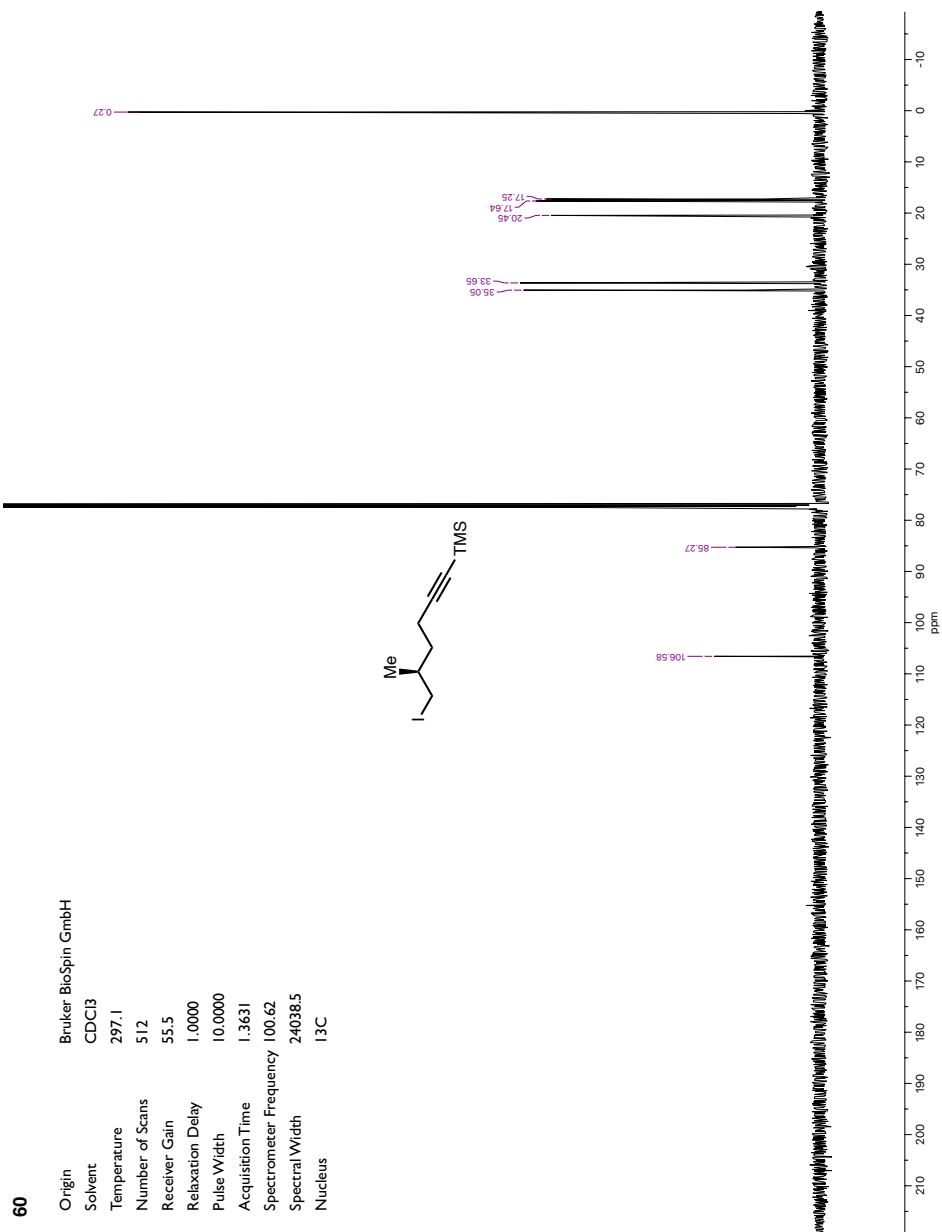




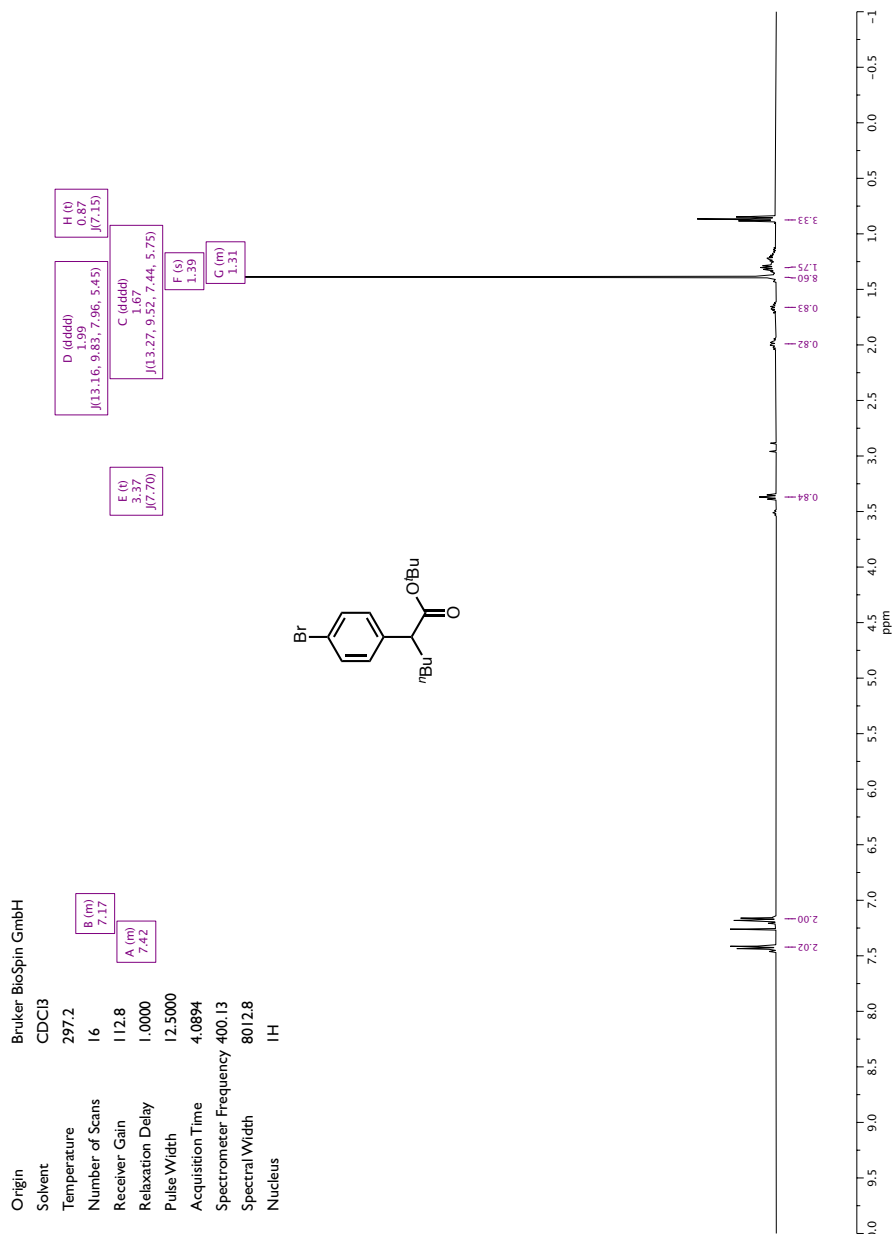
60

Origin Bruker-BioSpin GmbH  
Solvent CDCl<sub>3</sub>  
Temperature 297.1  
Number of Scans 16  
Receiver Gain 197.4  
Relaxation Delay 1.0000  
Pulse Width 12.5000  
Acquisition Time 4.0894  
Spectrometer Frequency 400.13  
Spectral Width 8012.8  
Nucleus <sup>1</sup>H



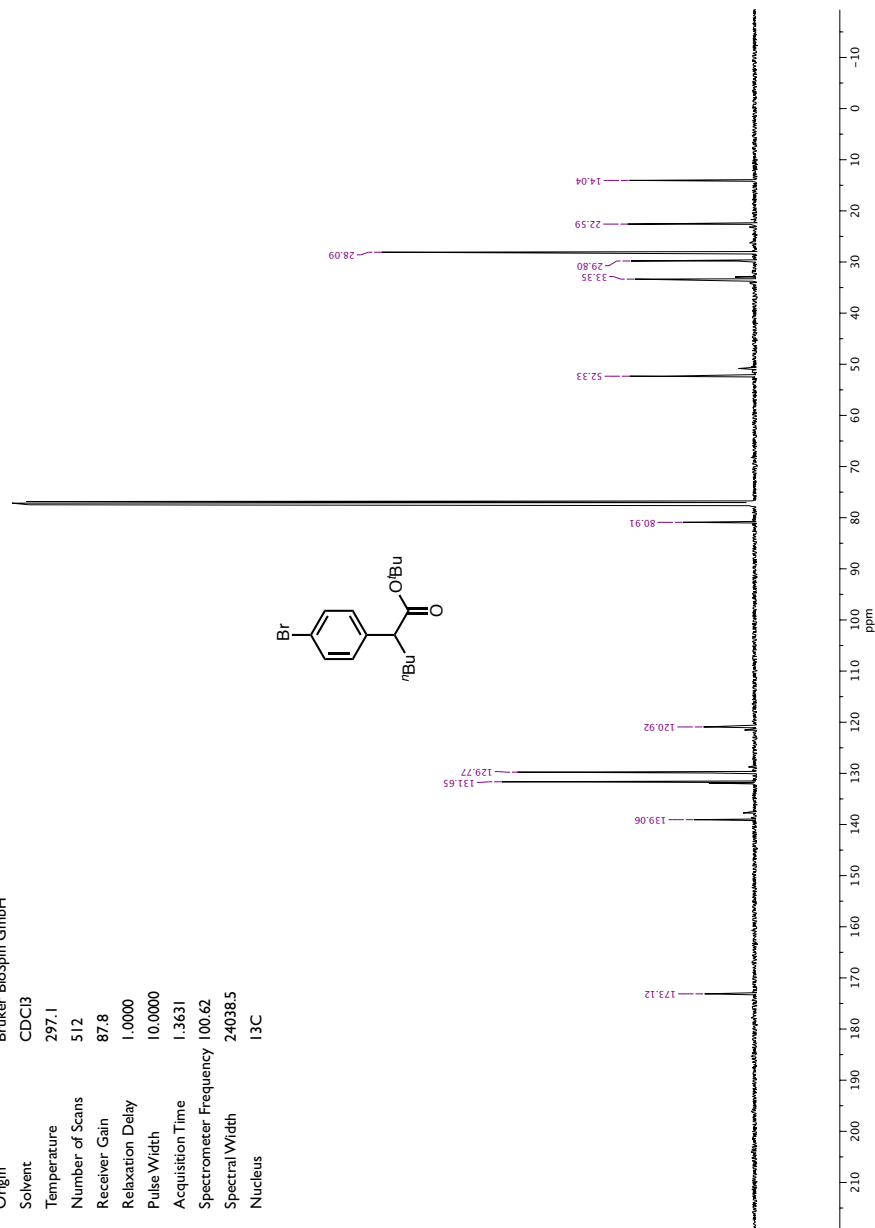
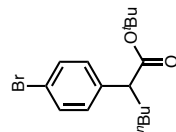


77



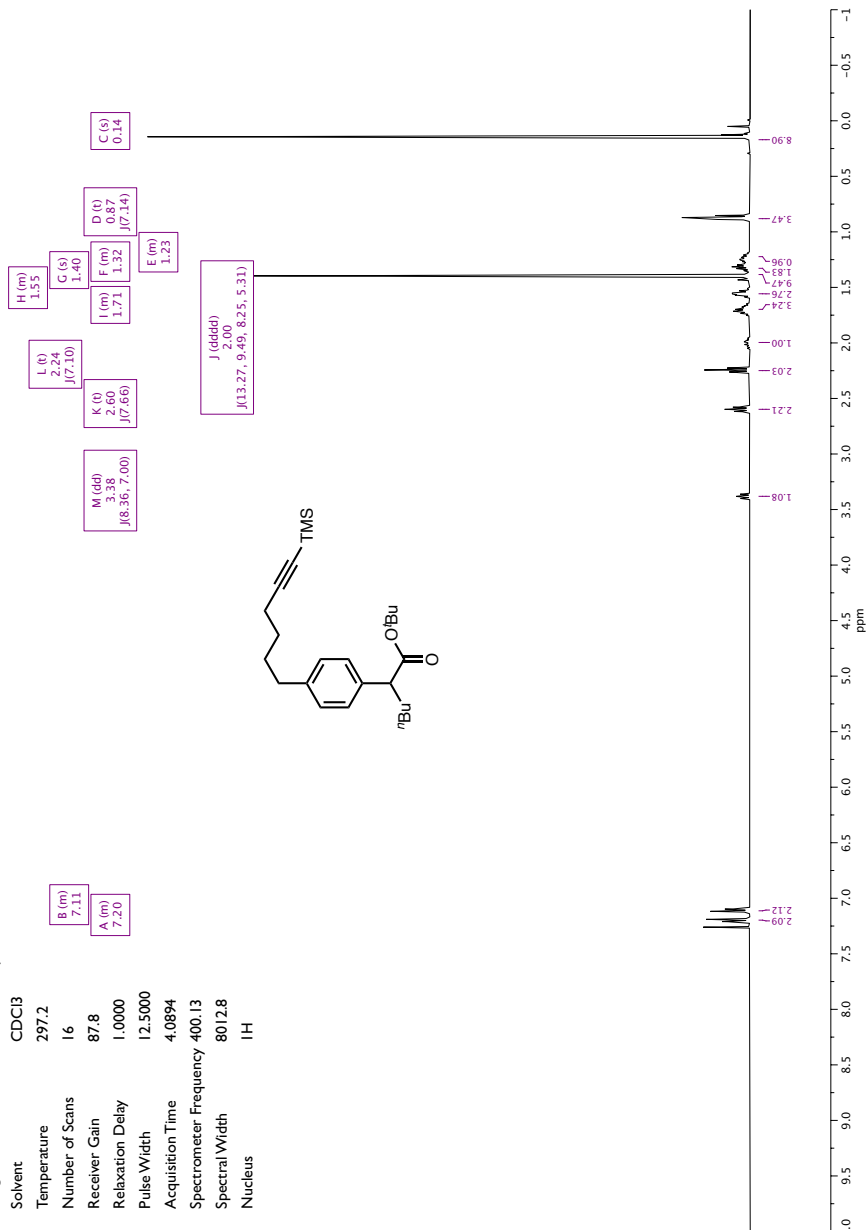
77

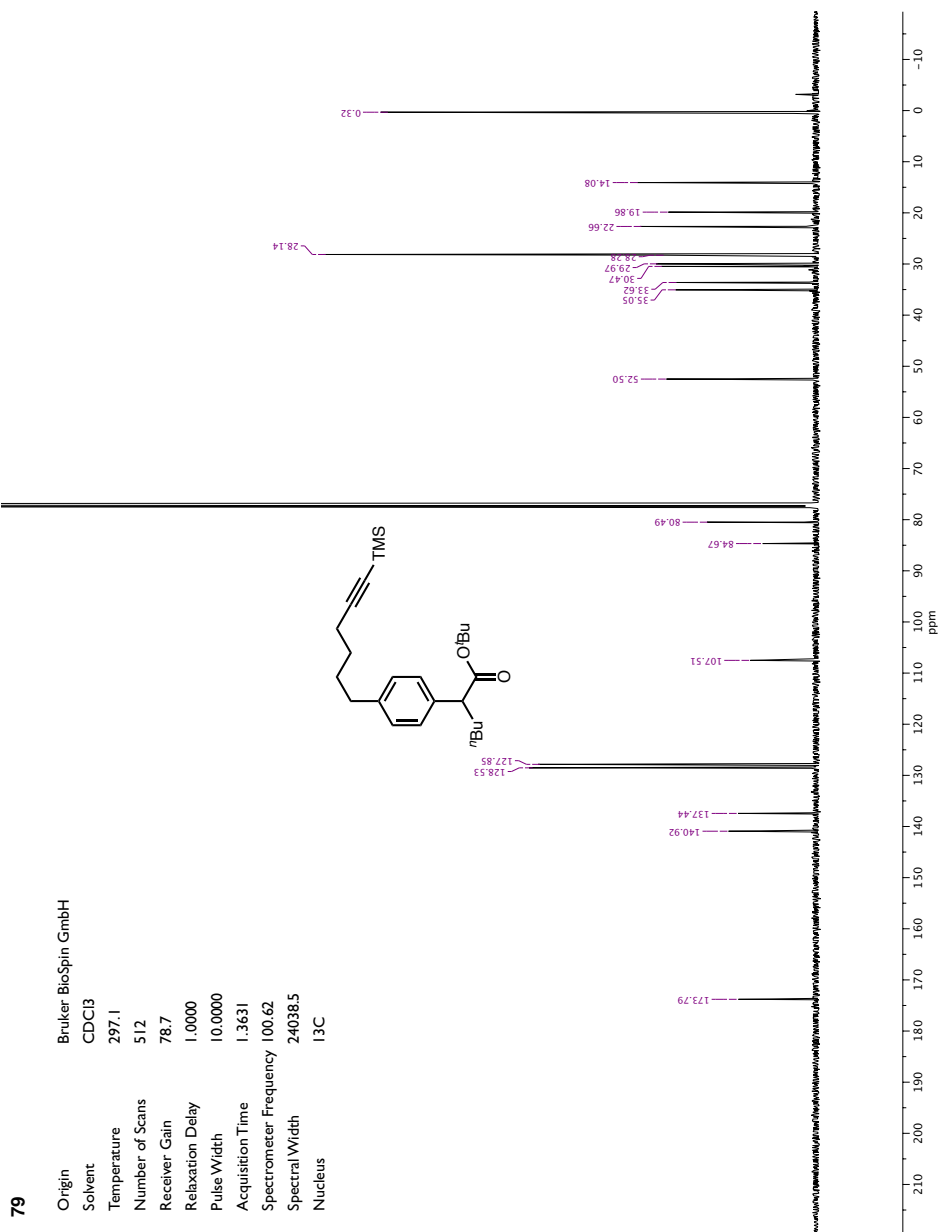
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 512  
 Receiver Gain 87.8  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



79

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 87.8  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H





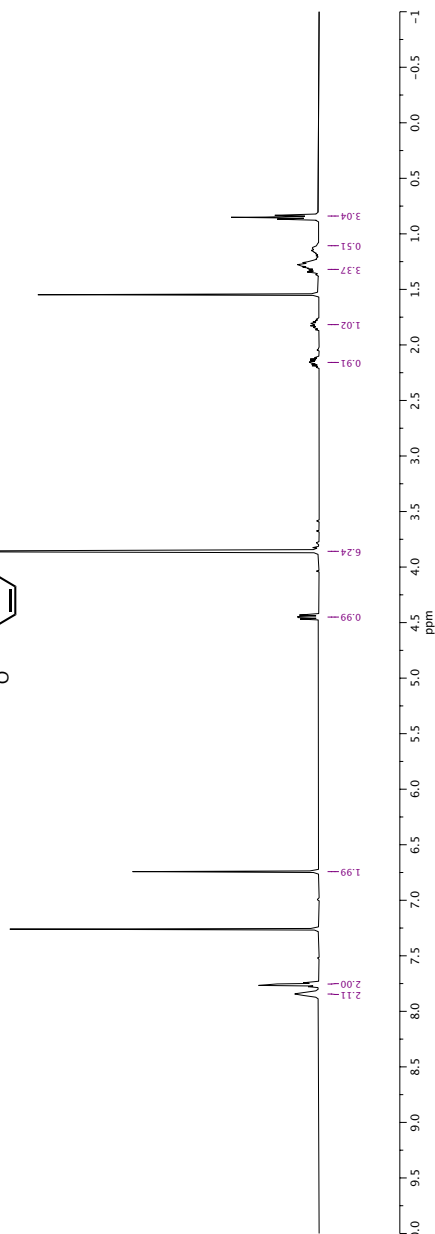
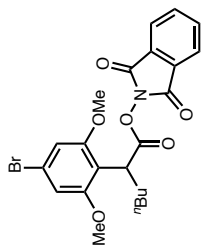


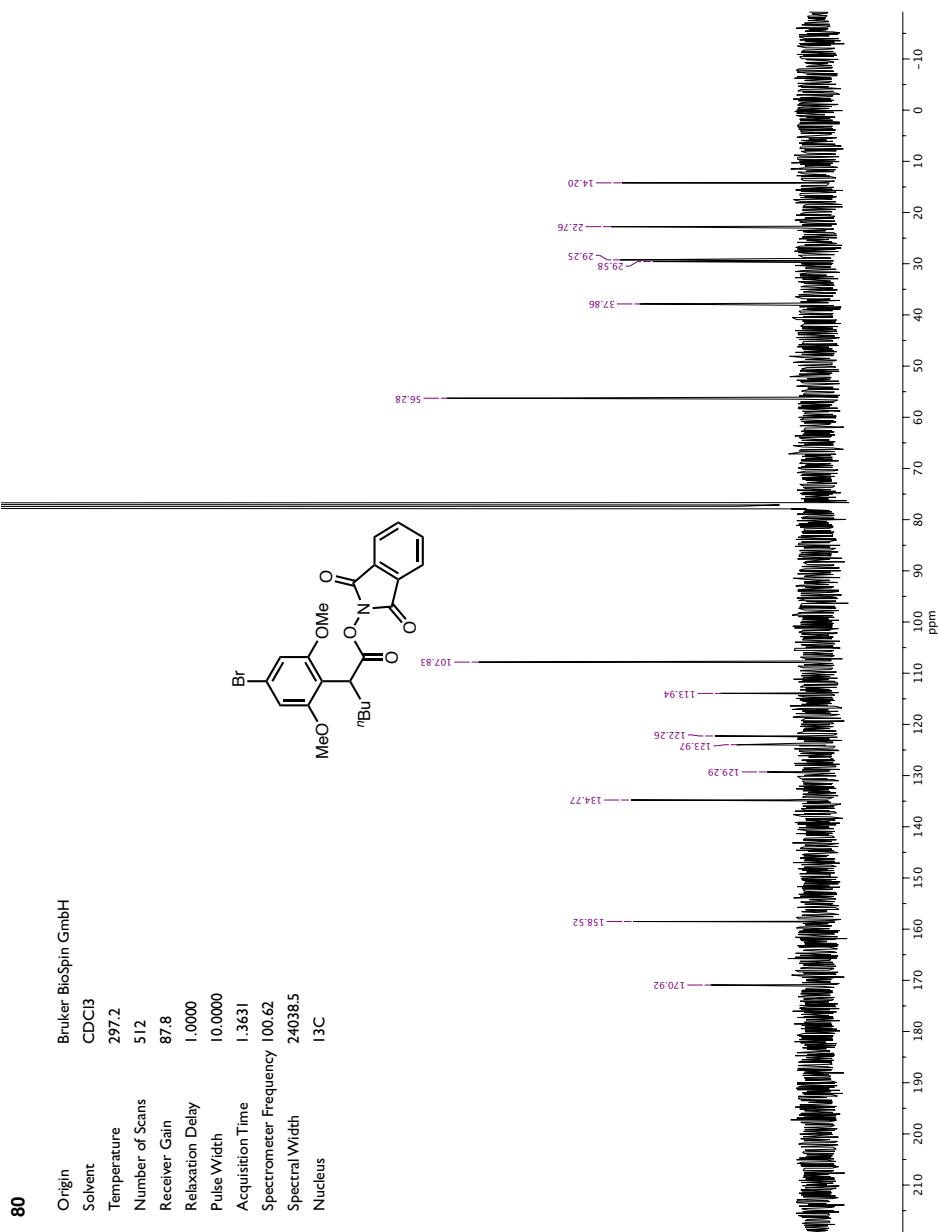
80

Origin Bruker-BioSpin GmbH

Solvent CDCl<sub>3</sub>  
 Temperature 297.1 B (dd) 7.76  
 Number of Scans 16 J(5.50, 3.10)  
 Receiver Gain 197.4 A (s) 7.84  
 Relaxation Delay 1.000 J(7.84)  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 80128  
 Nucleus <sup>1</sup>H

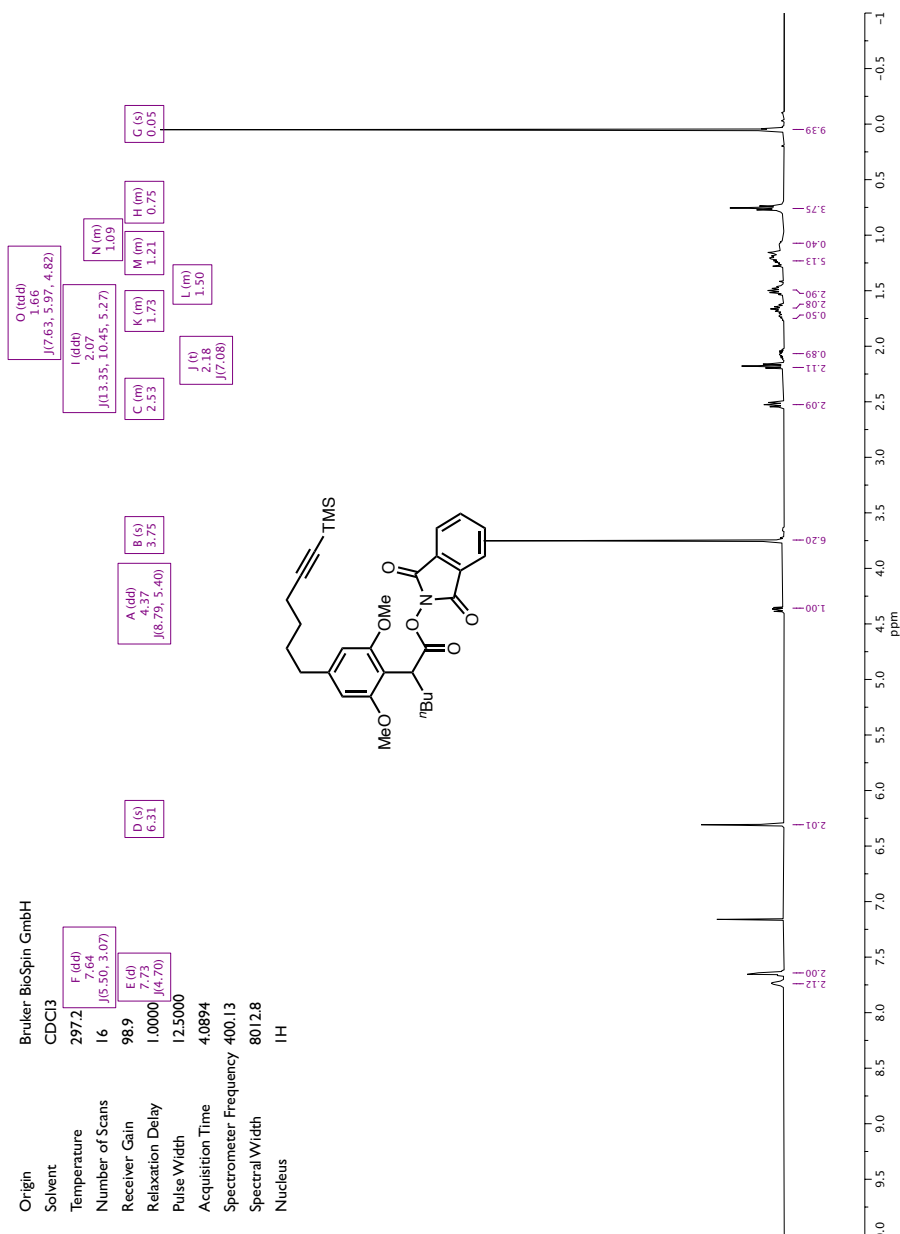
C (s) 6.74  
 D (dd) 4.45 J(9.09, 5.31)  
 E (s) 5.86  
 F (dd) 2.16 J(13.29, 10.45, 5.24)  
 G (dd) 1.82 J(14.32, 9.34, 5.18)  
 I (m) 1.15  
 J (m) 1.29  
 K (t) 0.85 J(7.01)

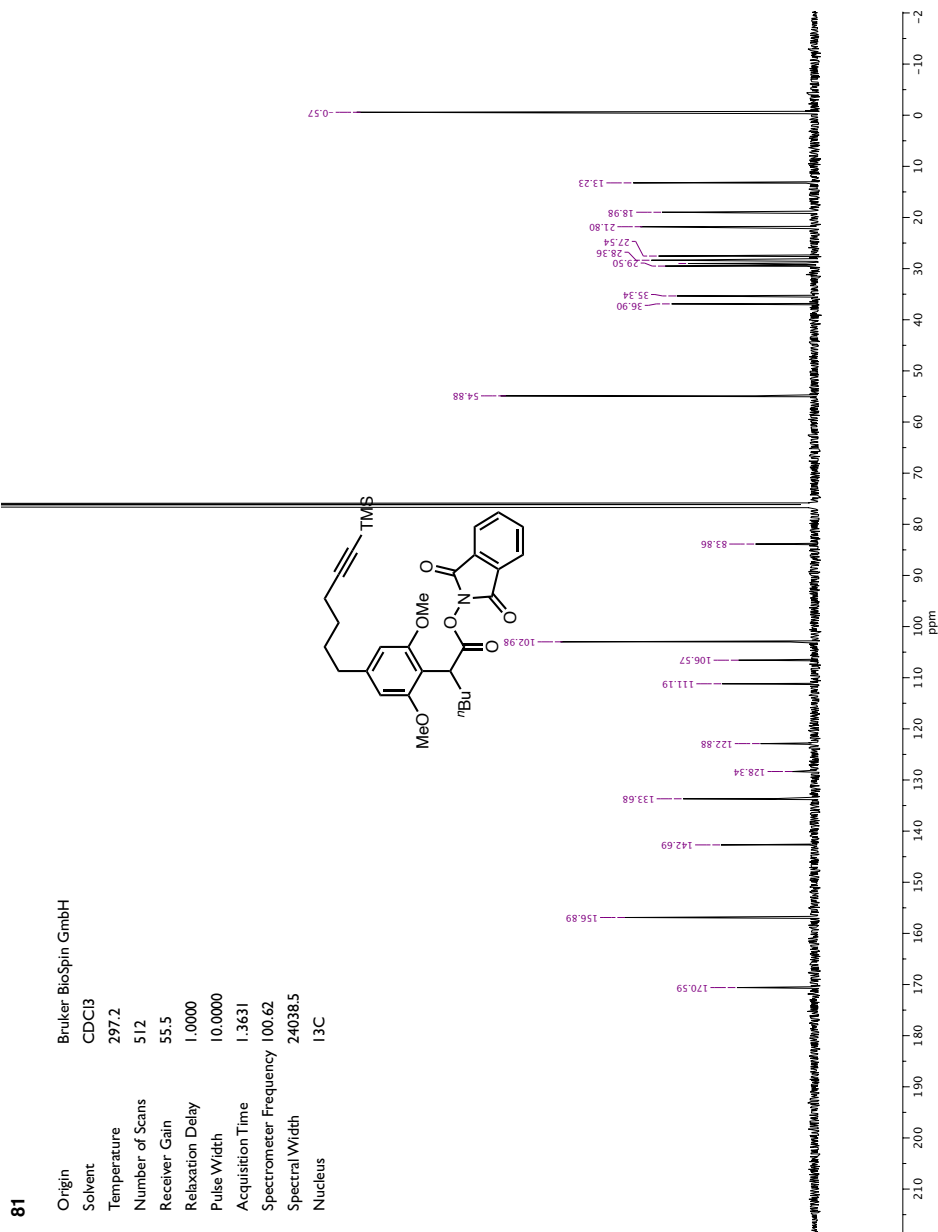




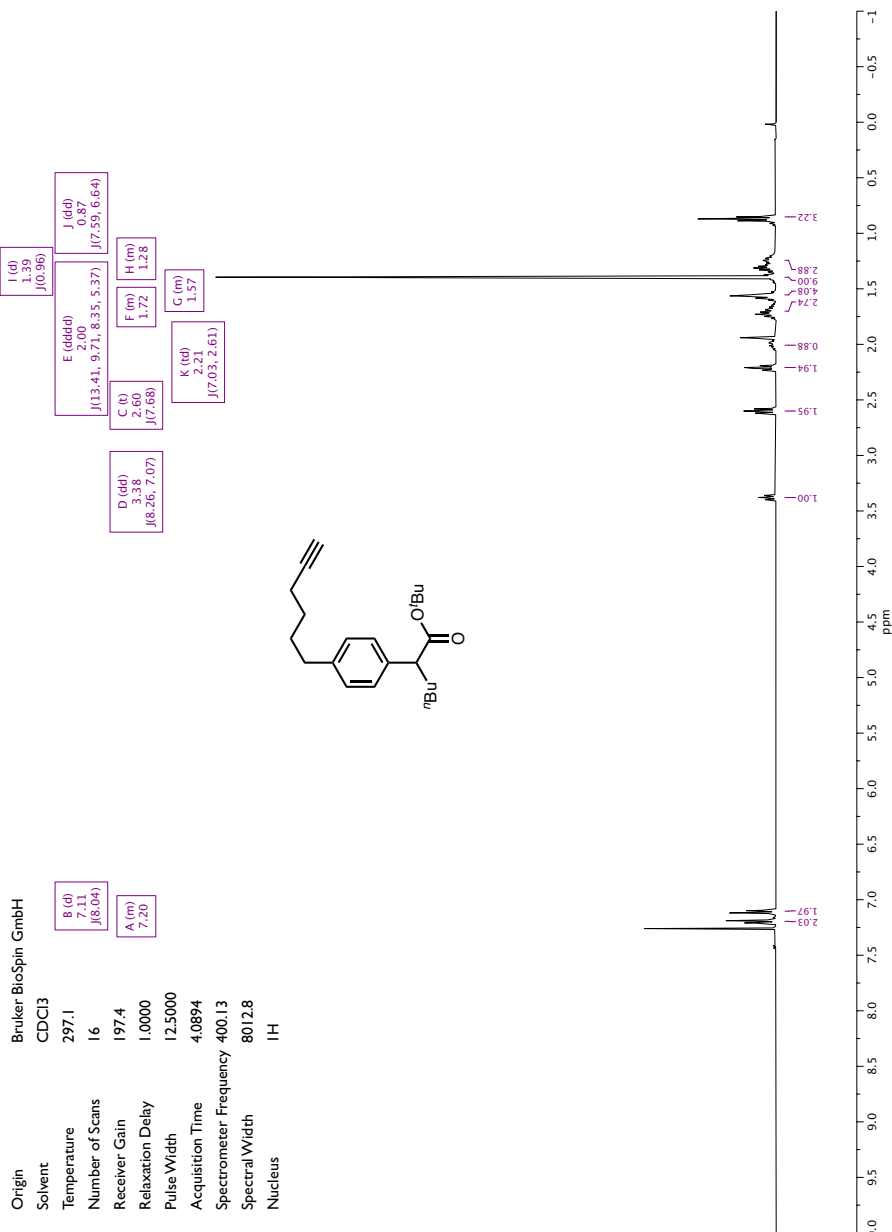
81

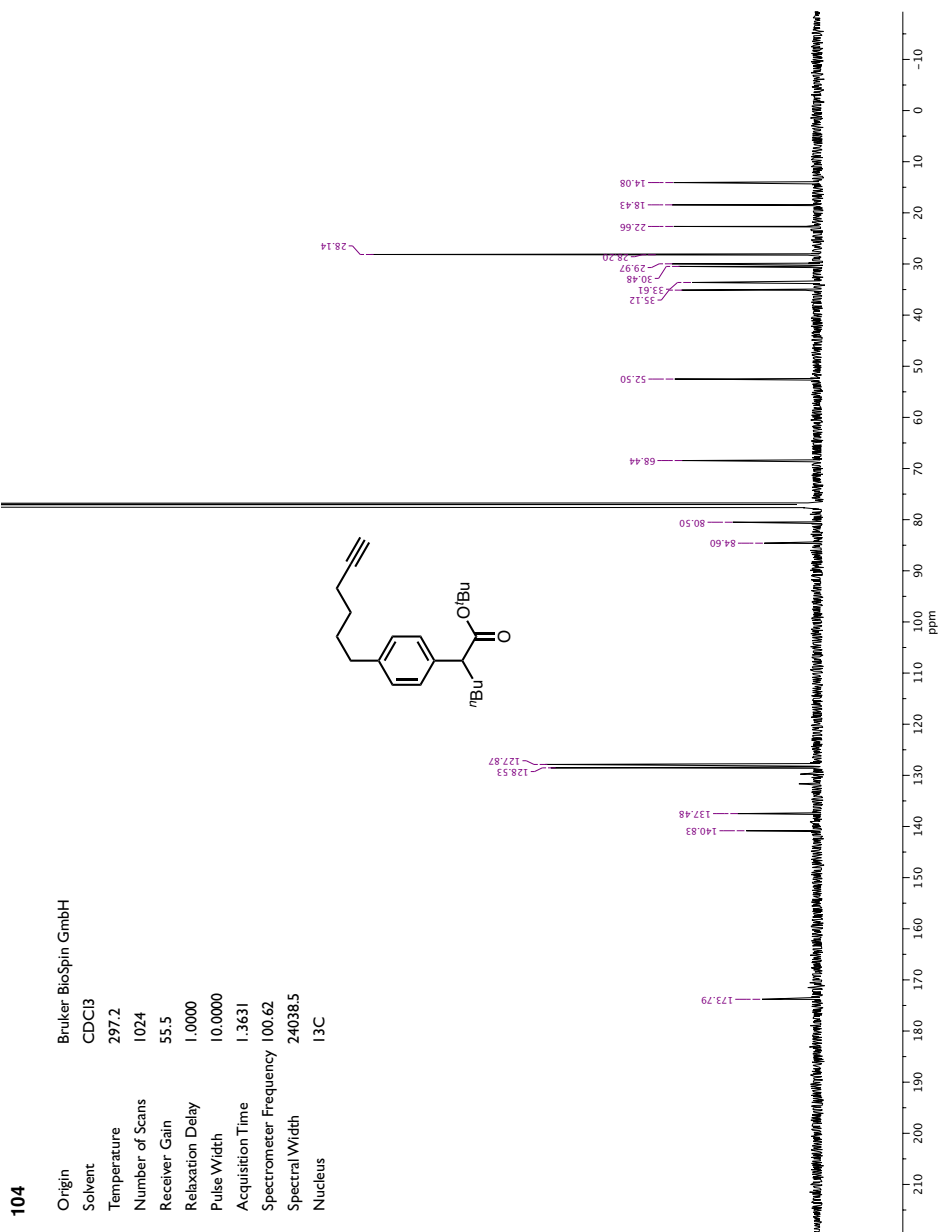
Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 98.9  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

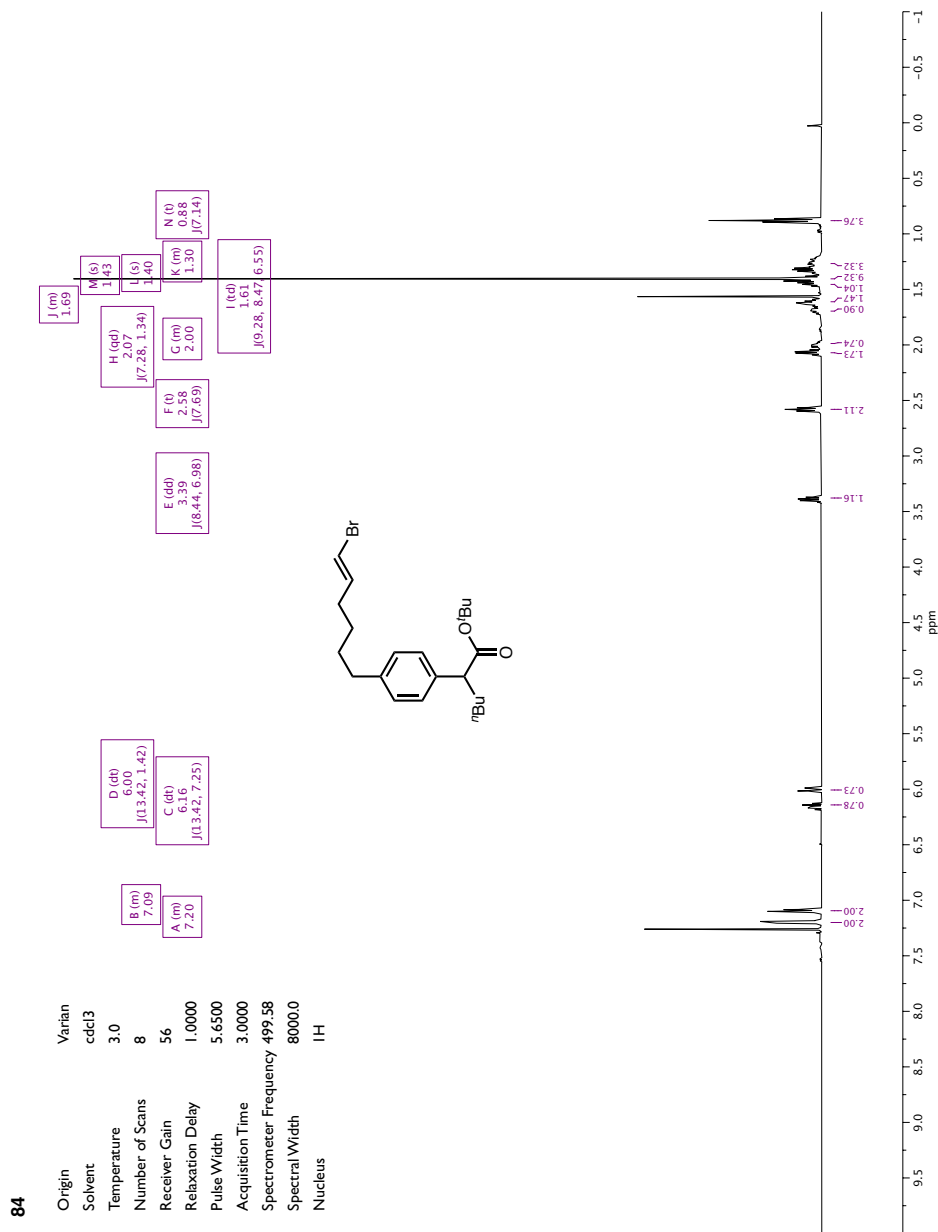


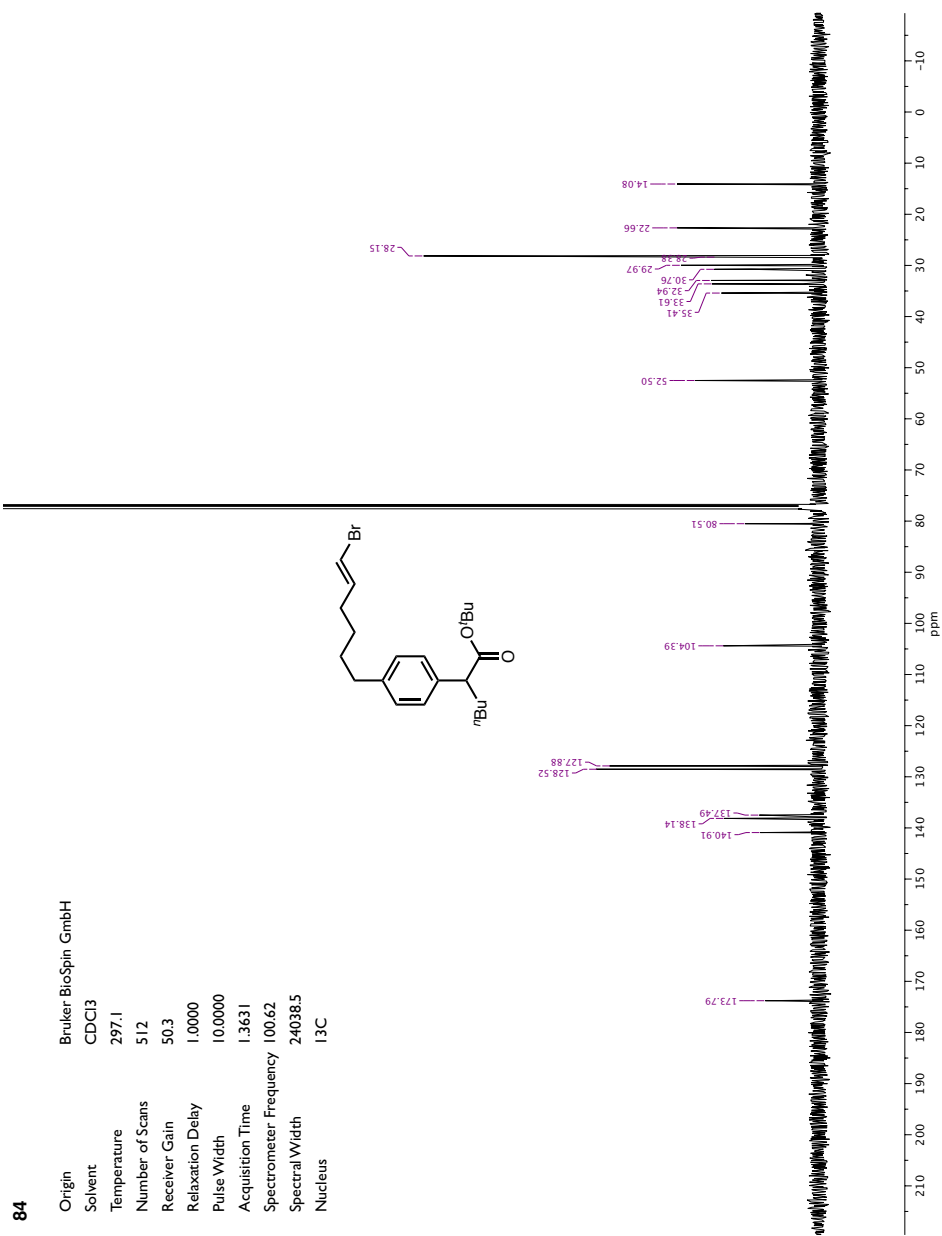


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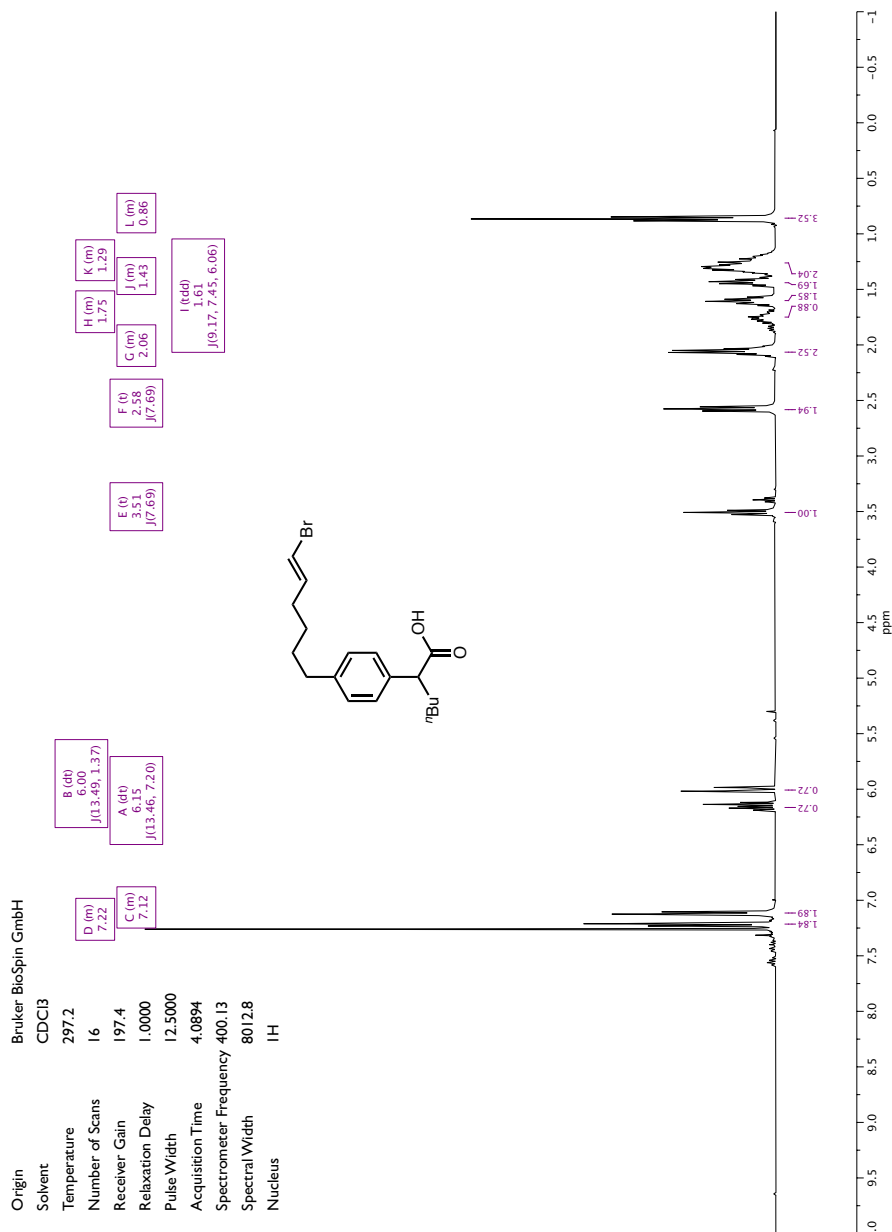


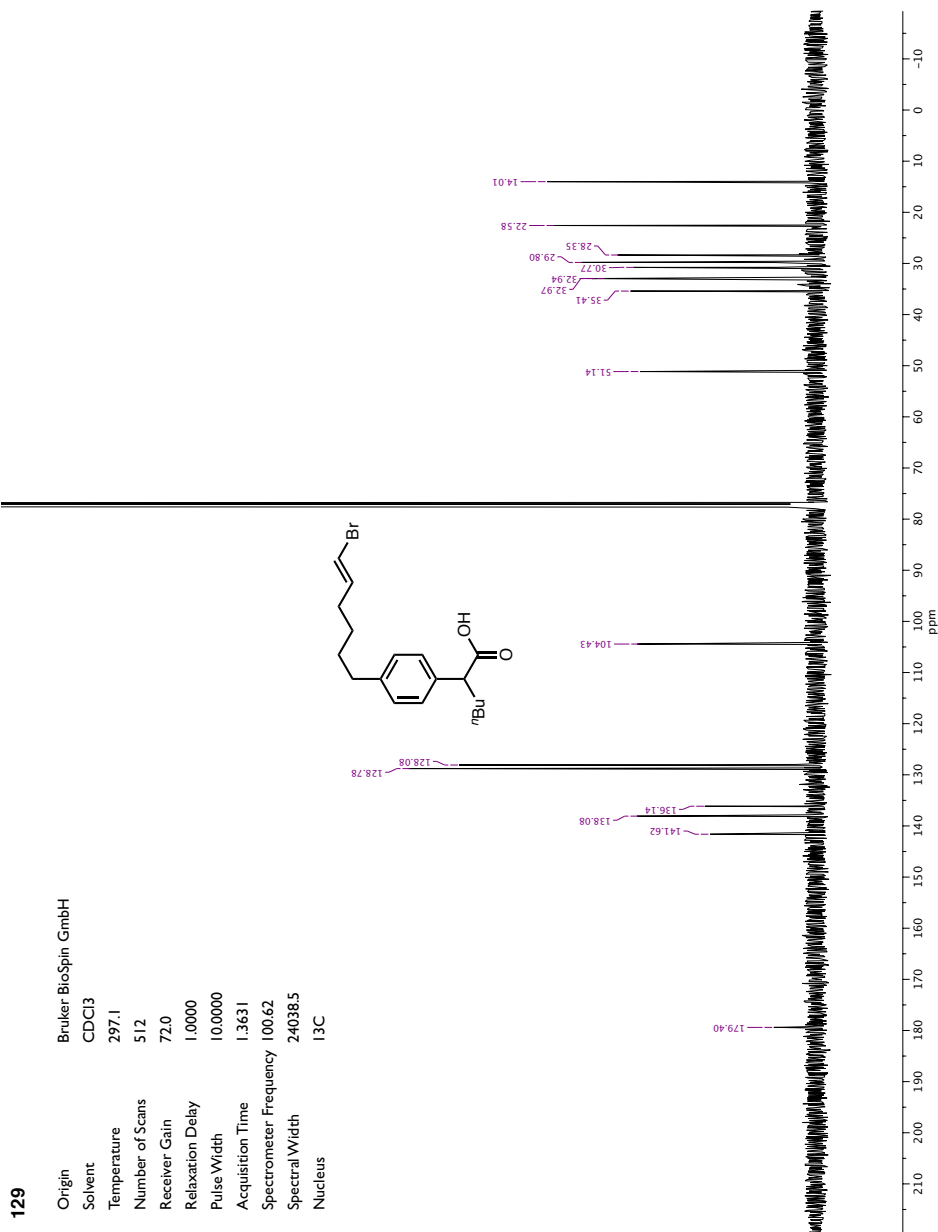




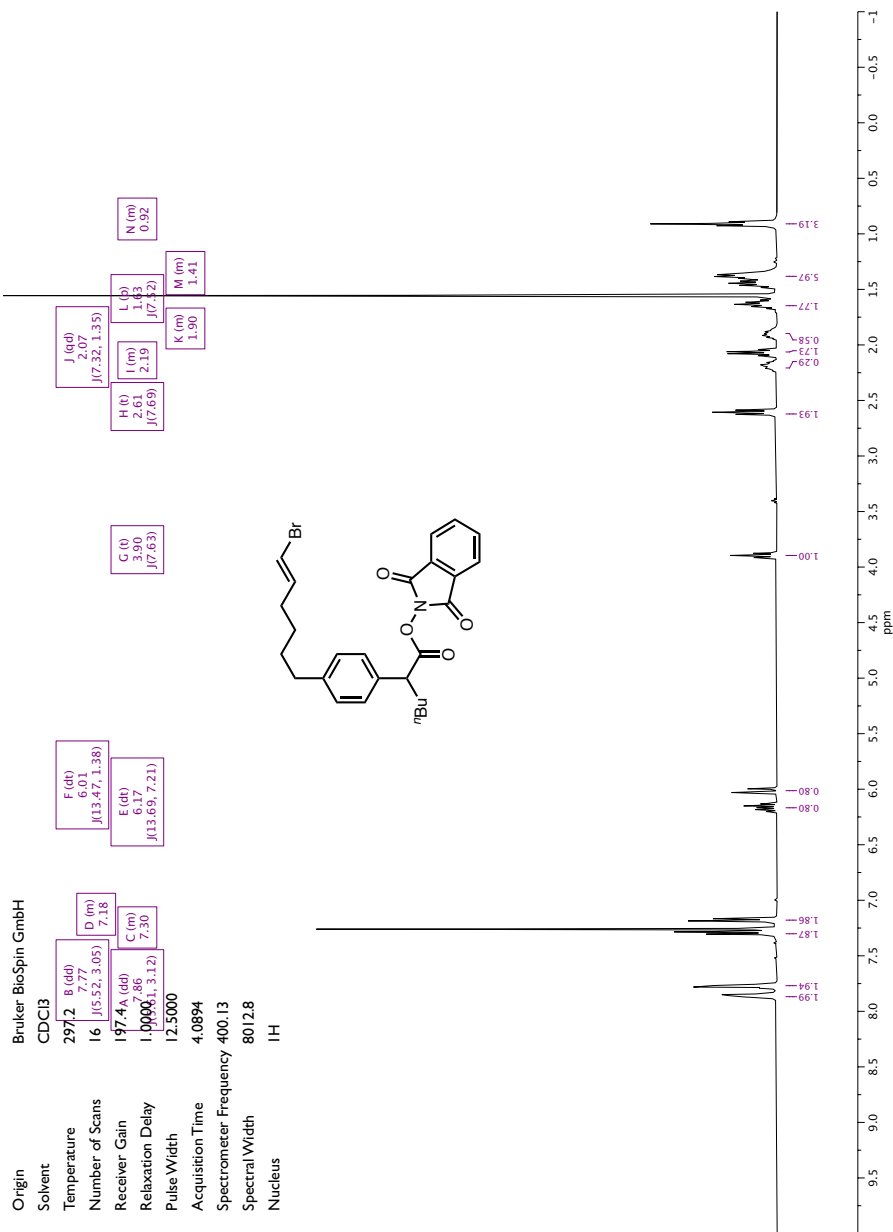


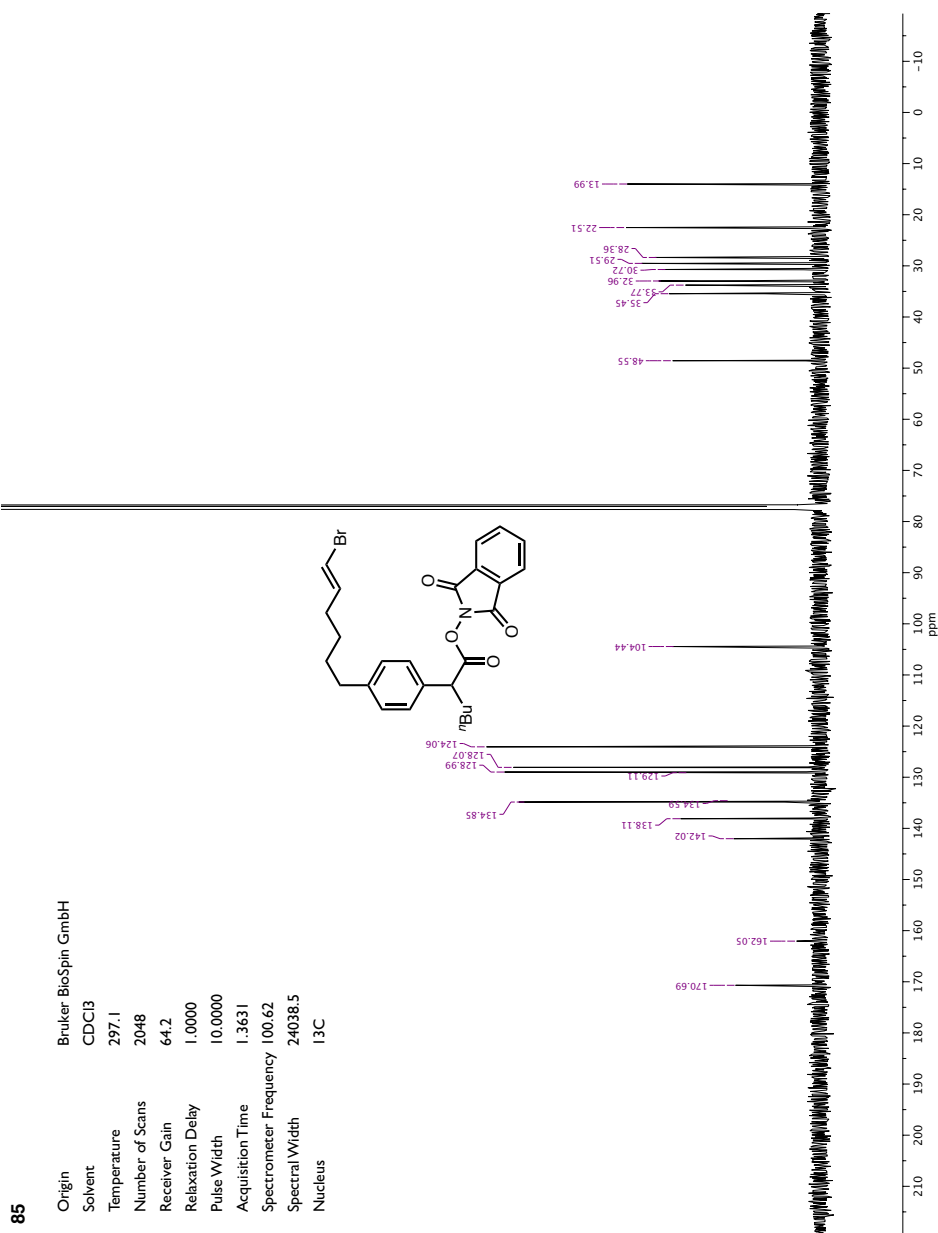
129





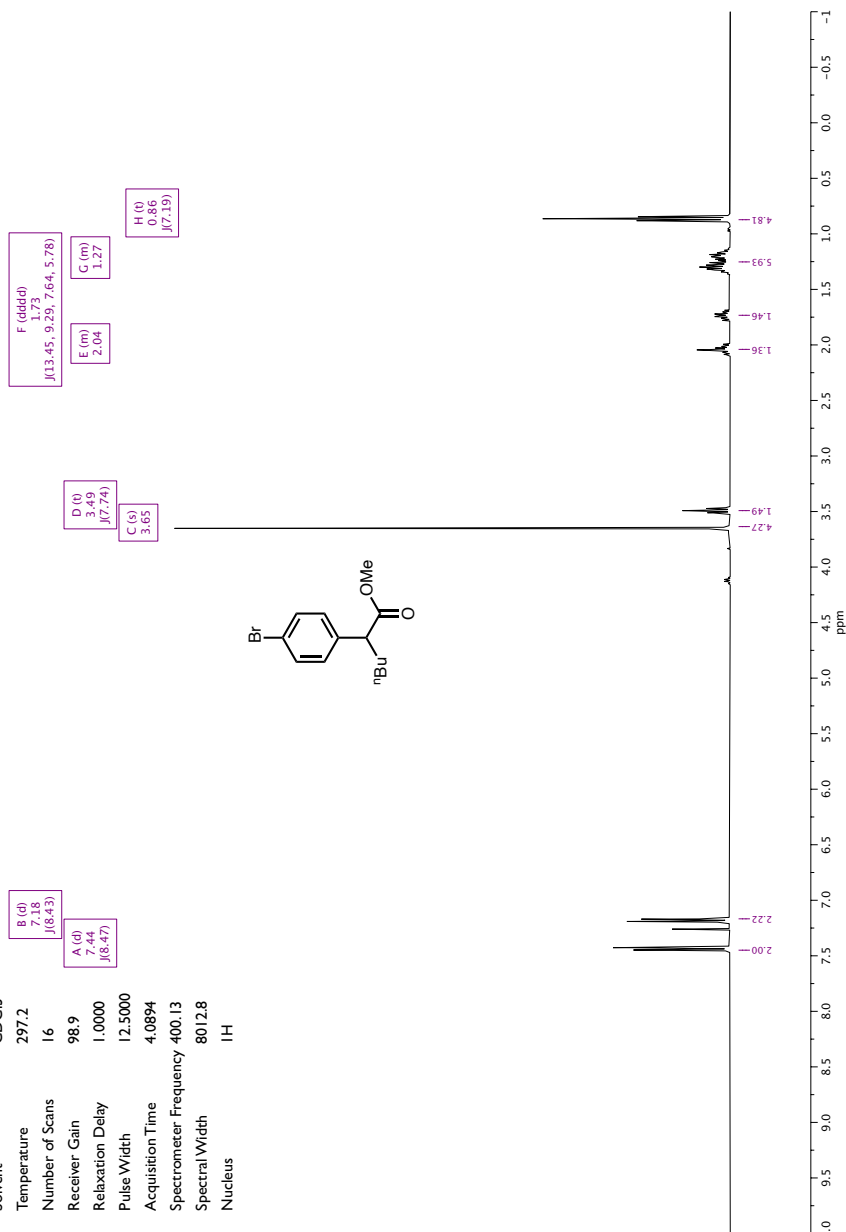
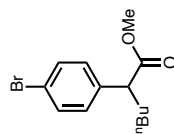
85





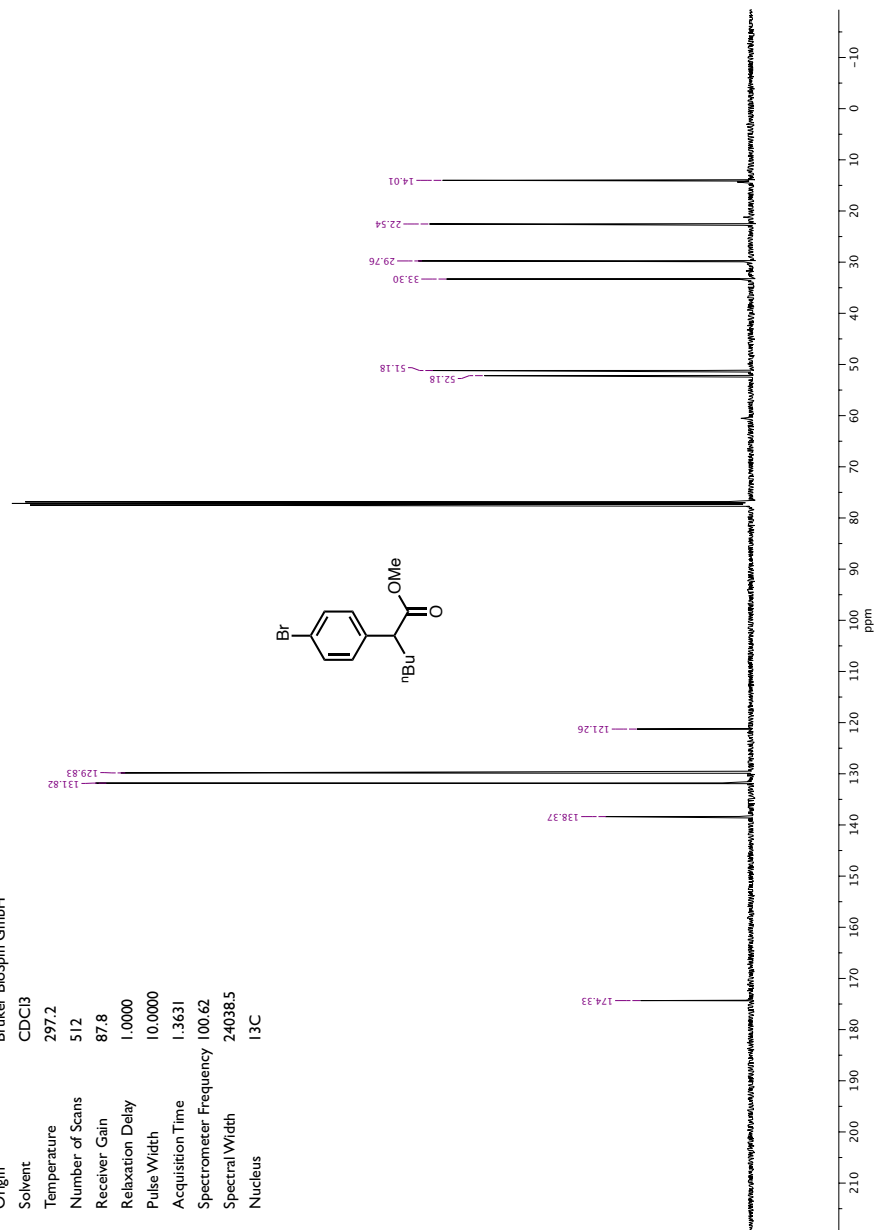
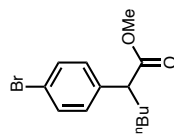
130

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 98.9  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H



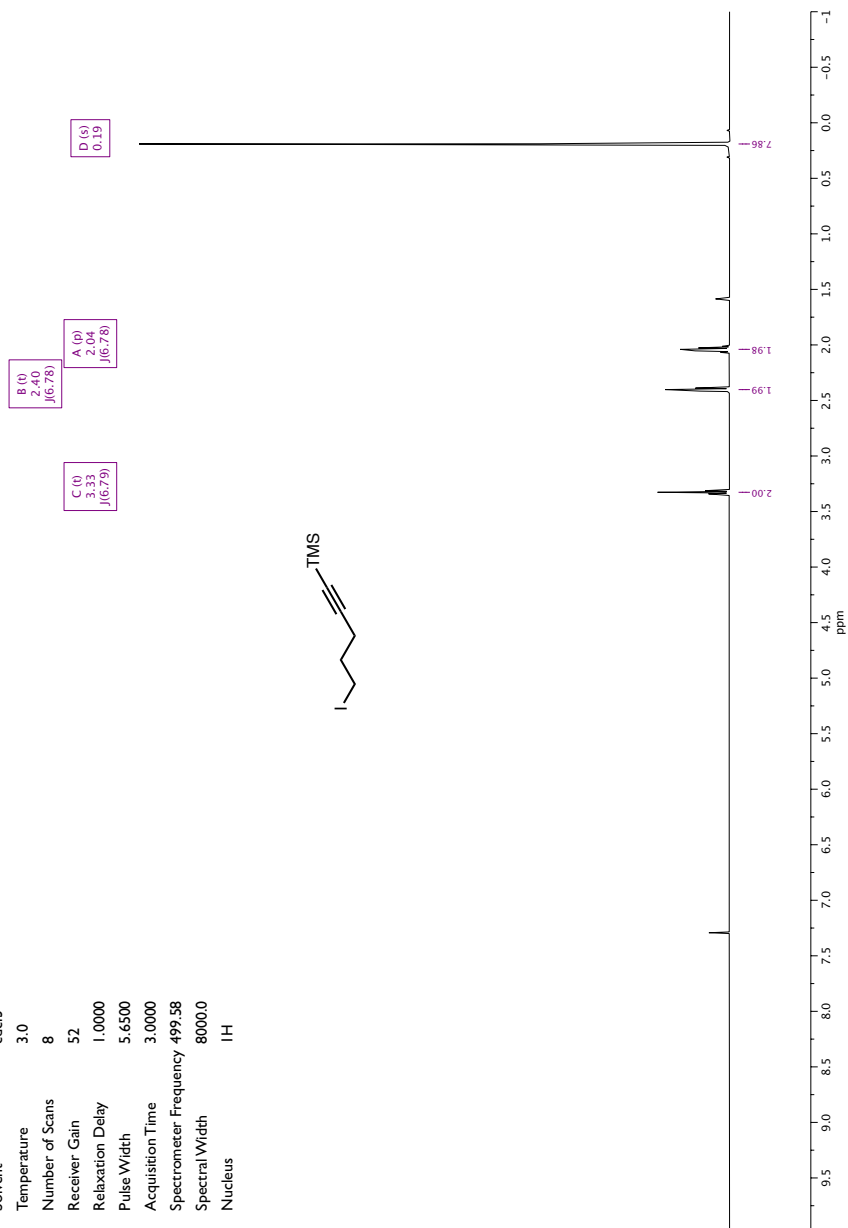
130

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 512  
 Receiver Gain 87.8  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



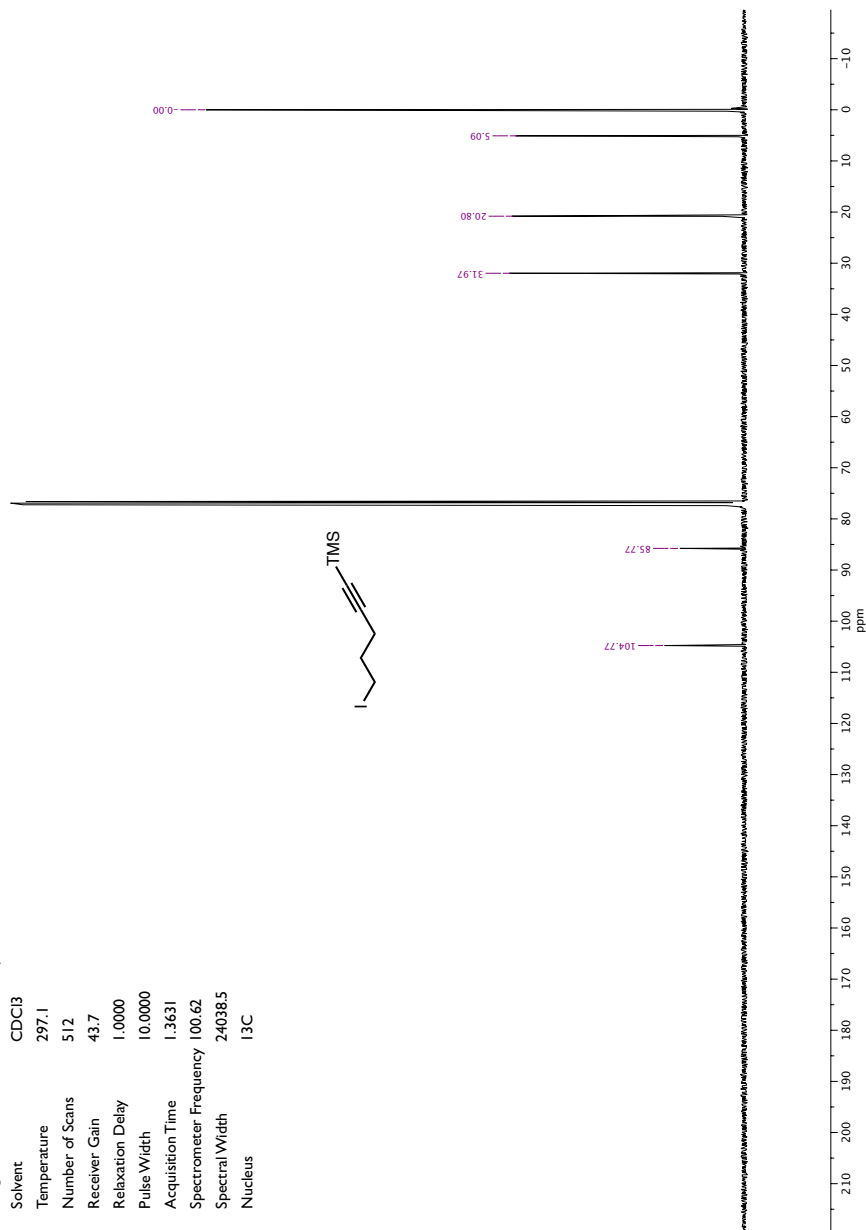
131

Origin Varian  
Solvent cdcl3  
Temperature 3.0  
Number of Scans 8  
Receiver Gain 52  
Relaxation Delay 1.0000  
Pulse Width 5.6500  
Acquisition Time 3.0000  
Spectrometer Frequency 499.58  
Spectral Width 8000.0  
Nucleus 1H



131

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 512  
 Receiver Gain 43.7  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C





132

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 127.1  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

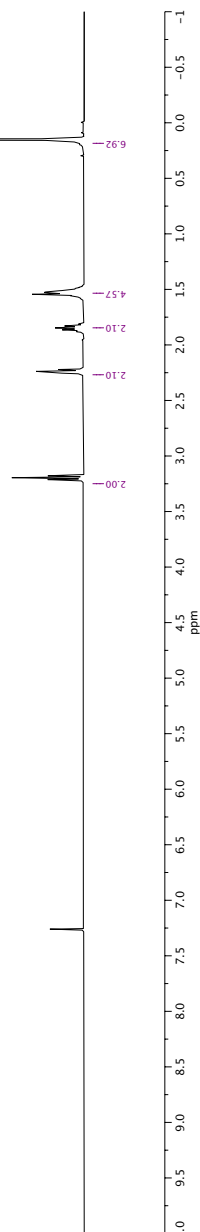
A (t) 3.20 J(6.95)

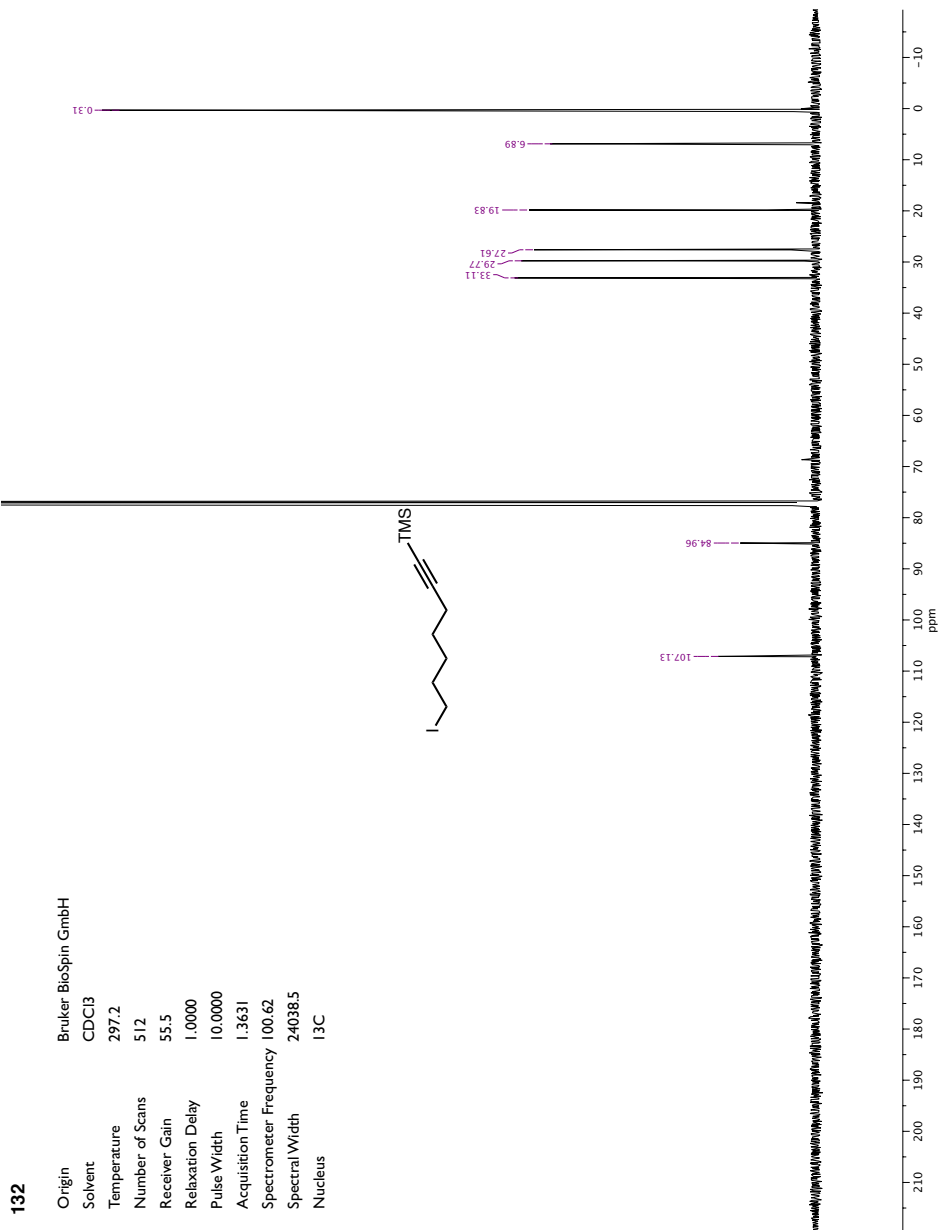
B (t) 2.24 J(6.56)

D (m) 1.33

C (m) 1.85

E (d) 0.15 J(0.74)

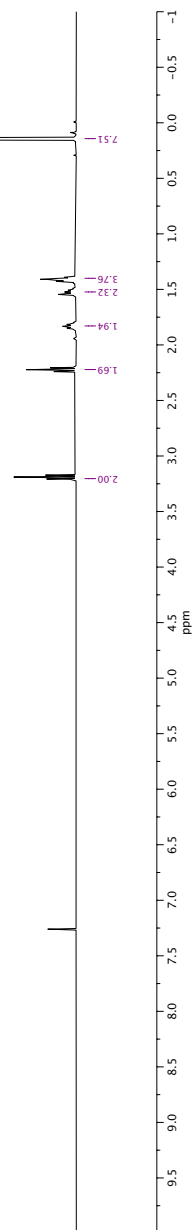




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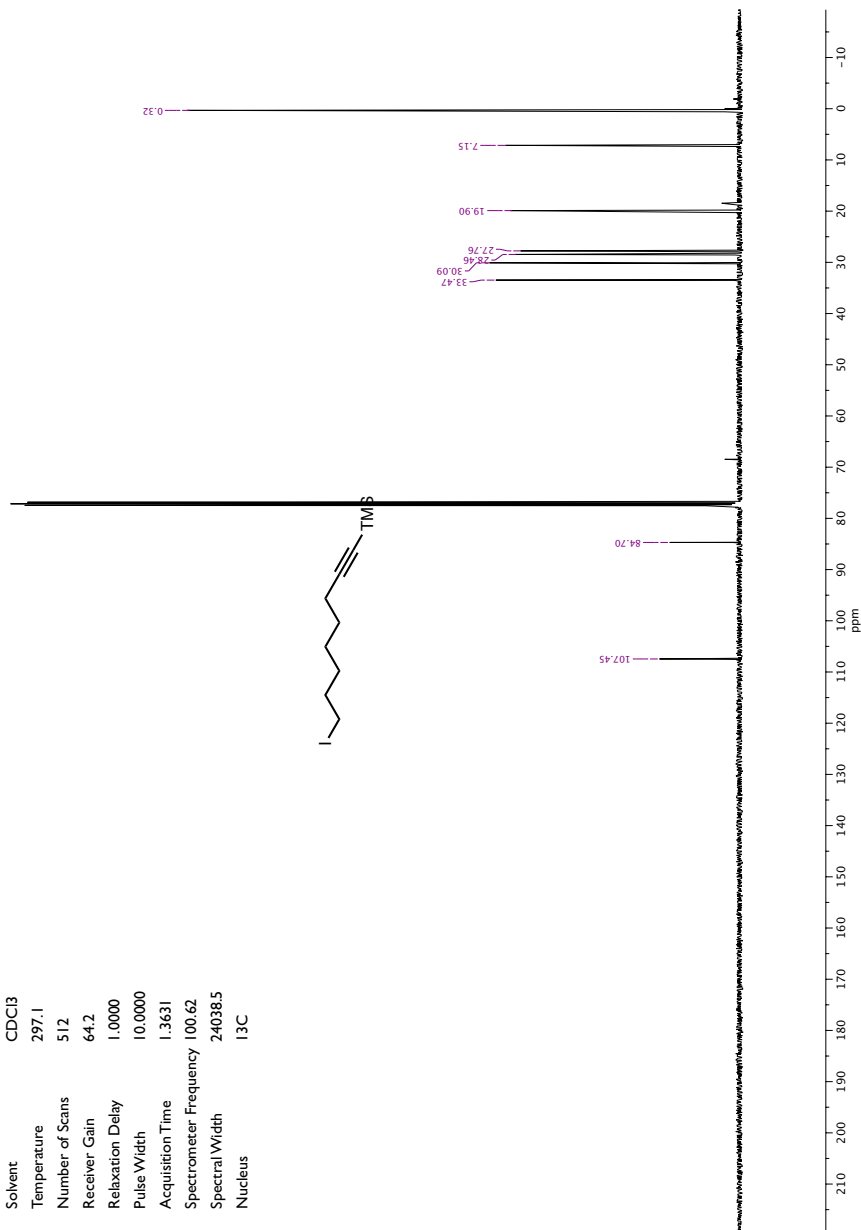
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 98.9  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

E (t) 2.22 J(7.03)  
 C (m) 1.52  
 D (m) 1.83  
 F (t) 3.19 J(7.03)  
 A (s) 0.14  
 B (m) 1.41



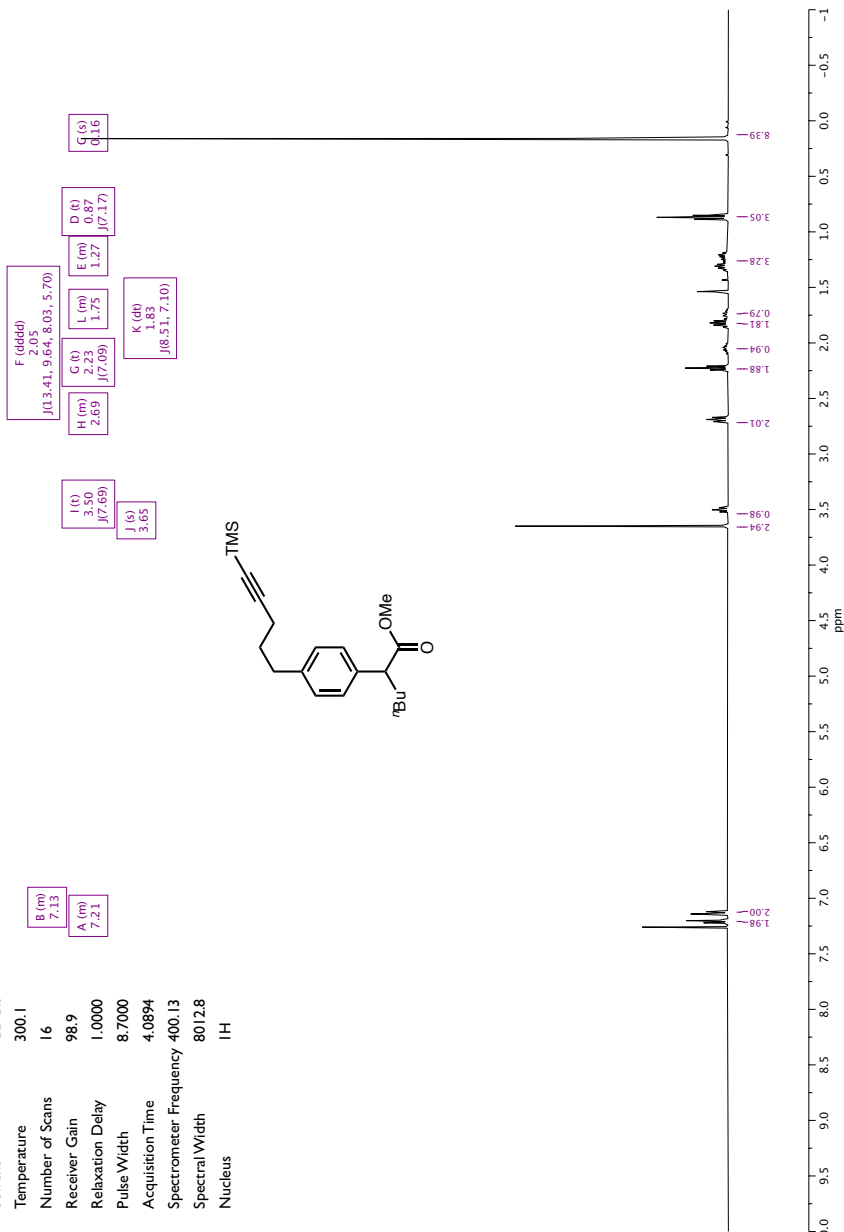
133

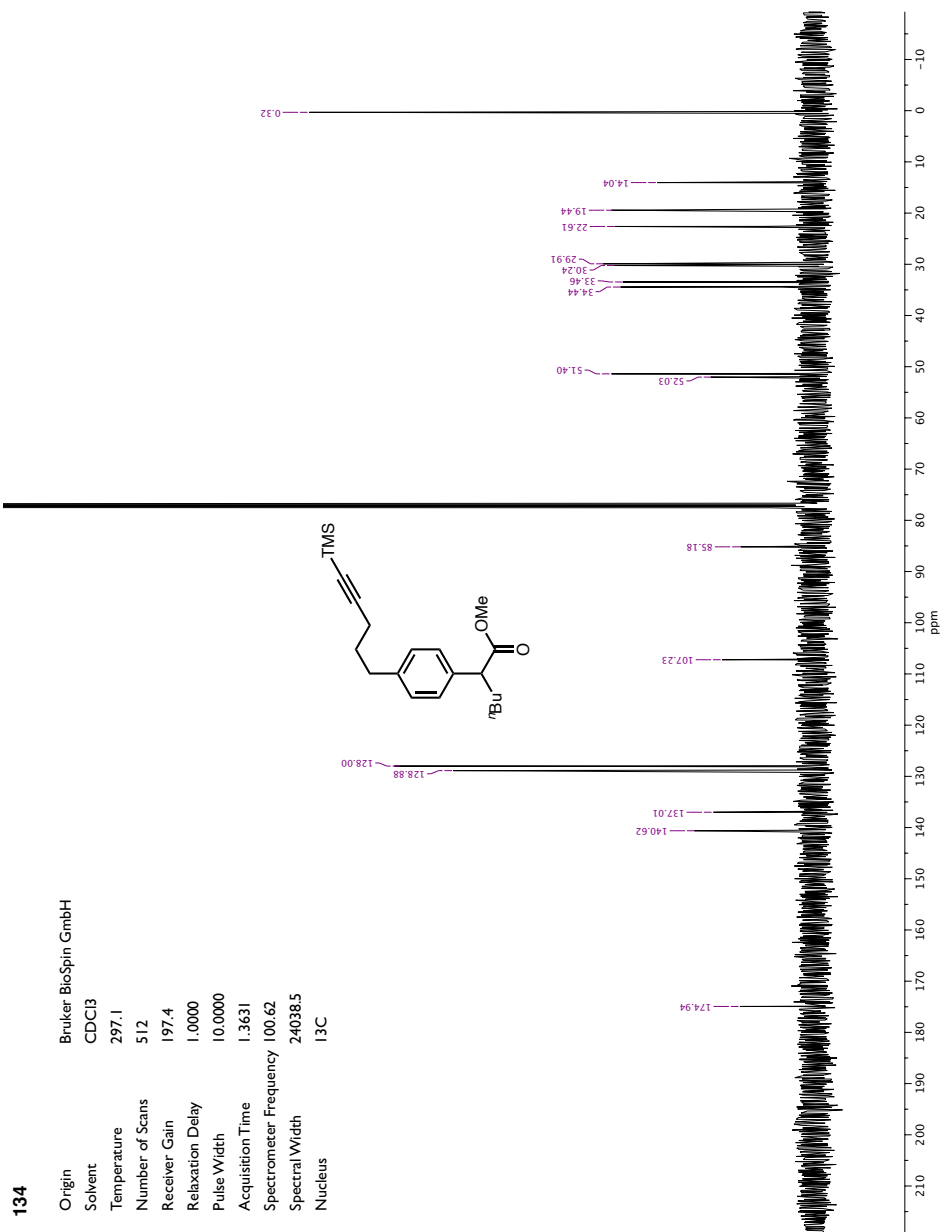
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 512  
 Receiver Gain 64.2  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



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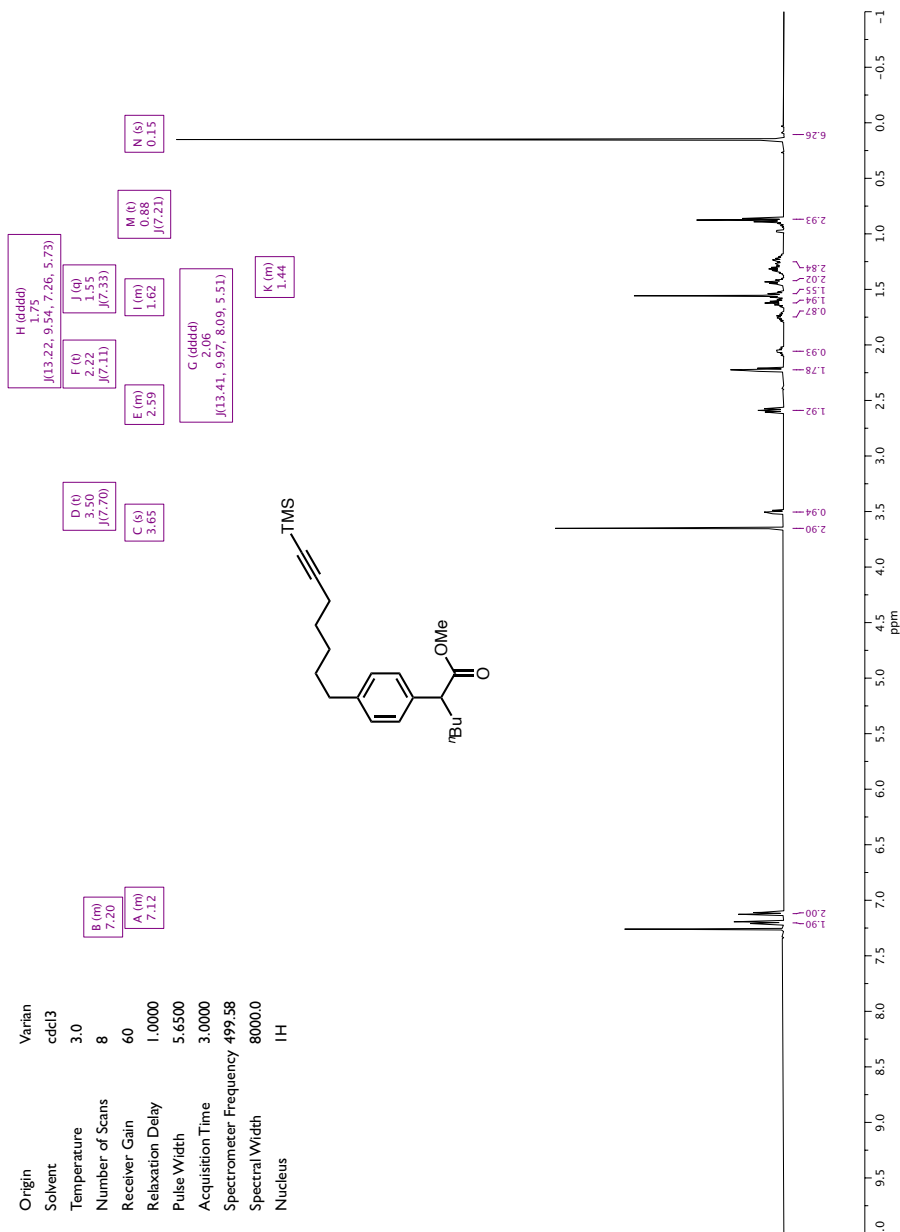
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 300.1  
 Number of Scans 16  
 Receiver Gain 98.9  
 Relaxation Delay 1.0000  
 Pulse Width 8.7000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

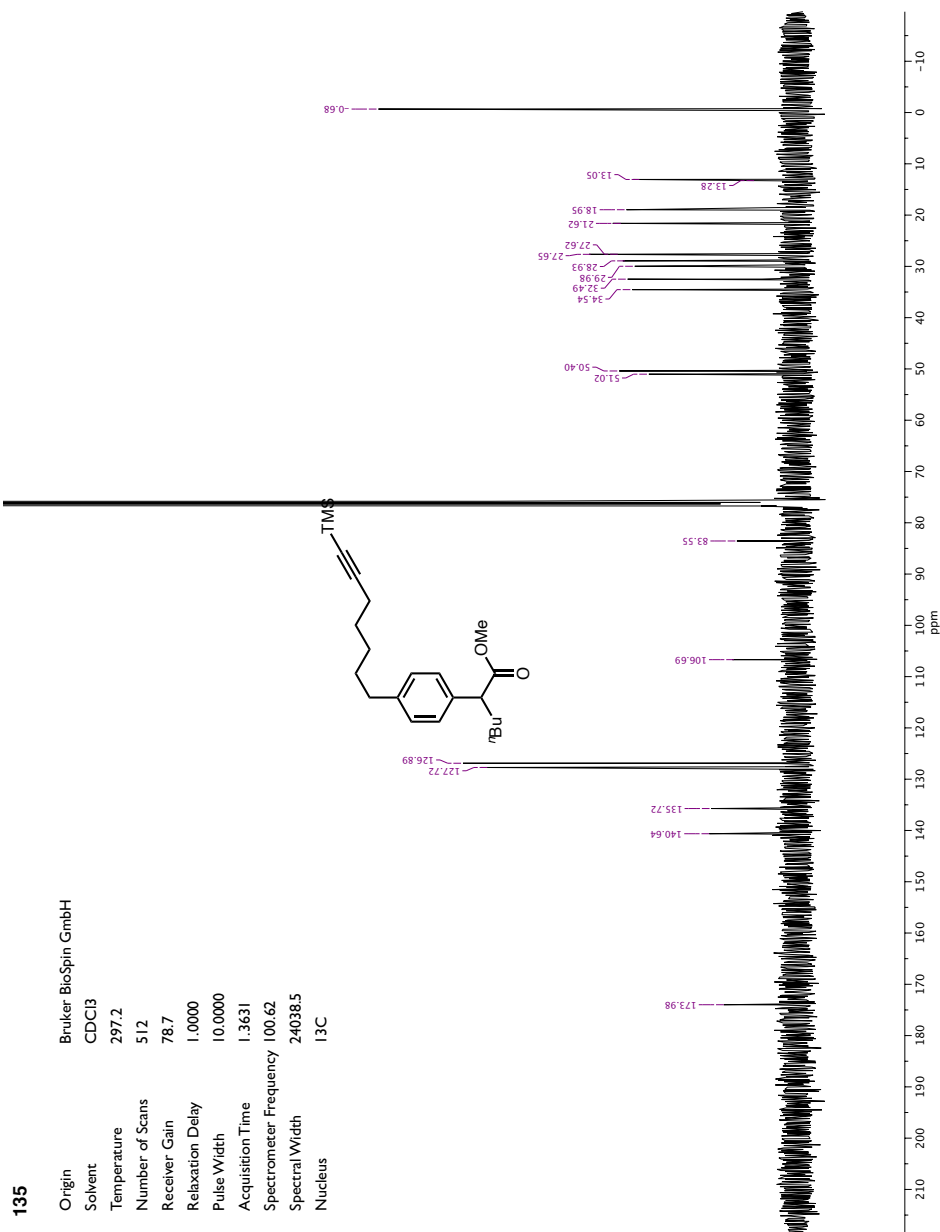




135

Origin Varian  
 Solvent cdcl3  
 Temperature 3.0  
 Number of Scans 8  
 Receiver Gain 60  
 Relaxation Delay 1.0000  
 Pulse Width 5.6500  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.58  
 Spectral Width 8000.0  
 Nucleus 1H

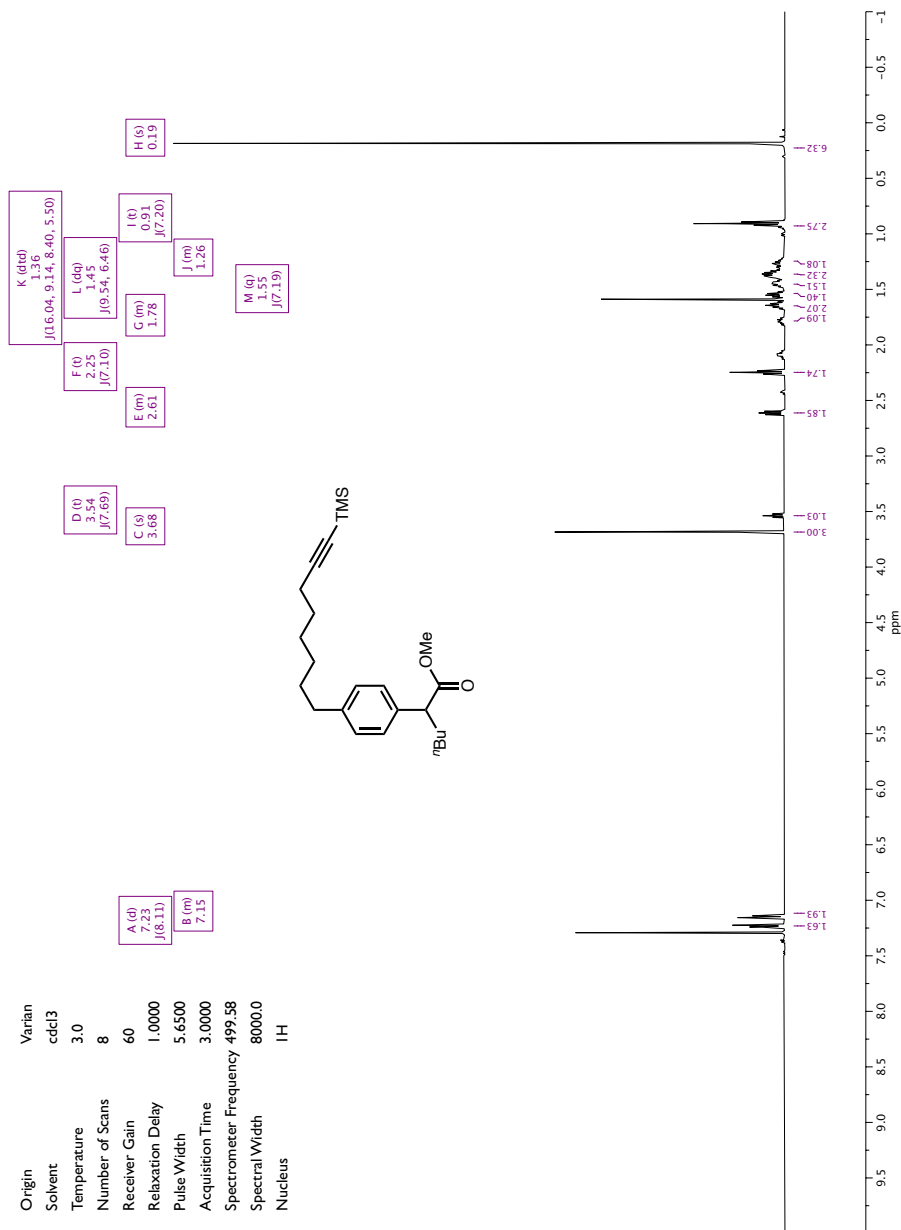


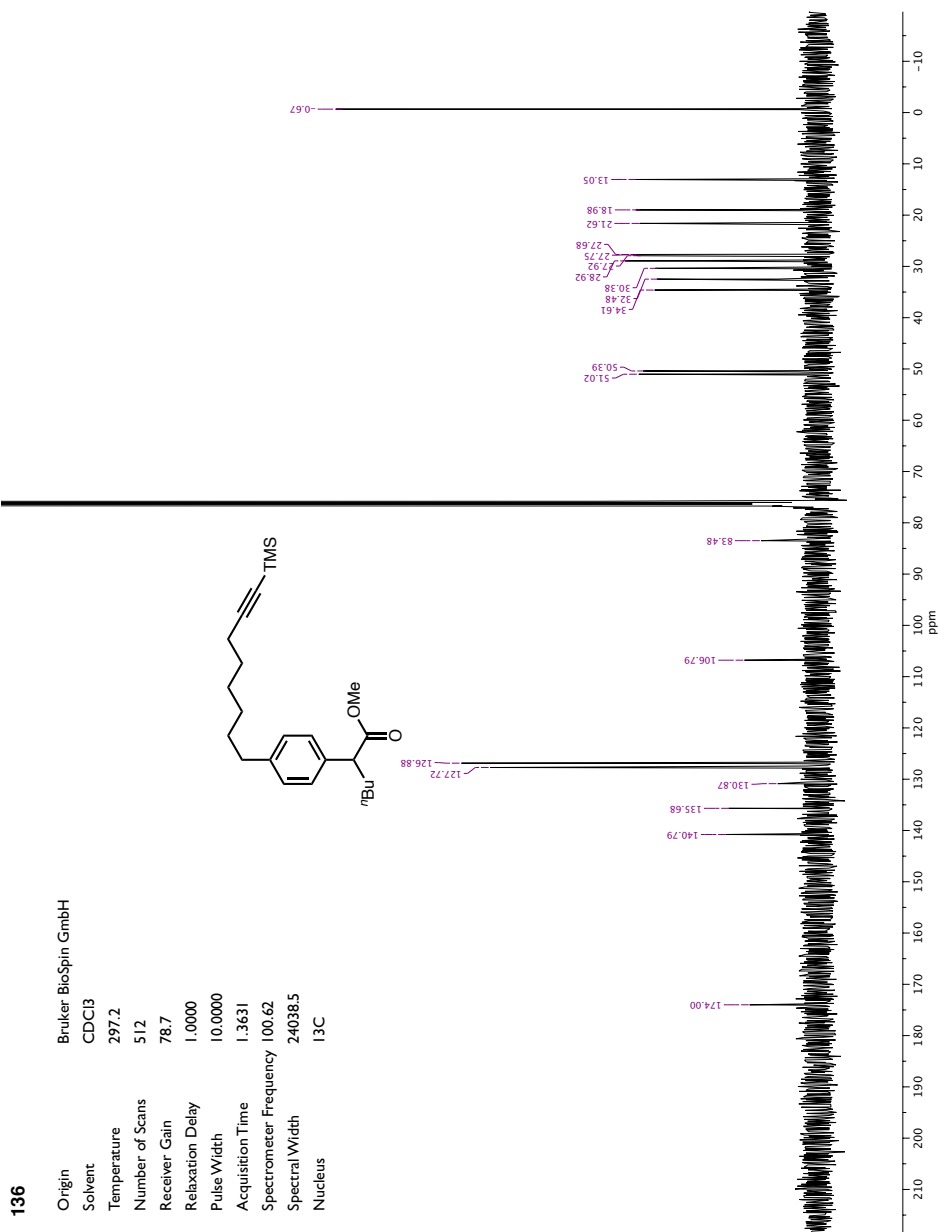




136

Origin Varian  
 Solvent cdcl3  
 Temperature 3.0  
 Number of Scans 8  
 Receiver Gain 60  
 Relaxation Delay 1.0000  
 Pulse Width 5.6500  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.58  
 Spectral Width 8000.0  
 Nucleus 1H

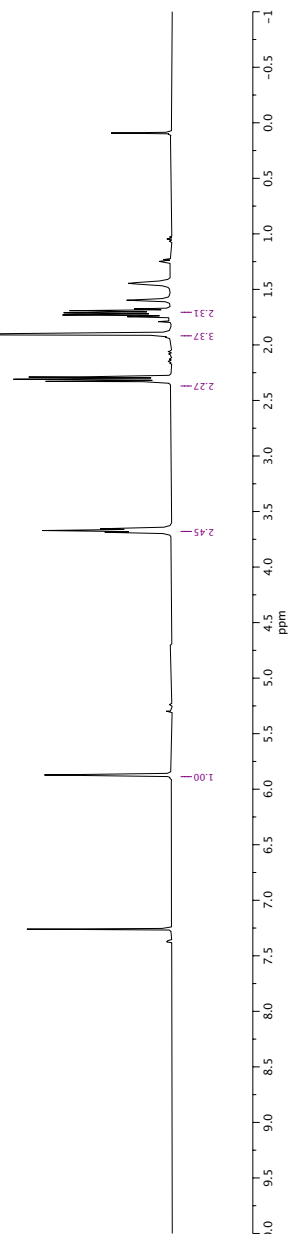
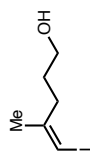


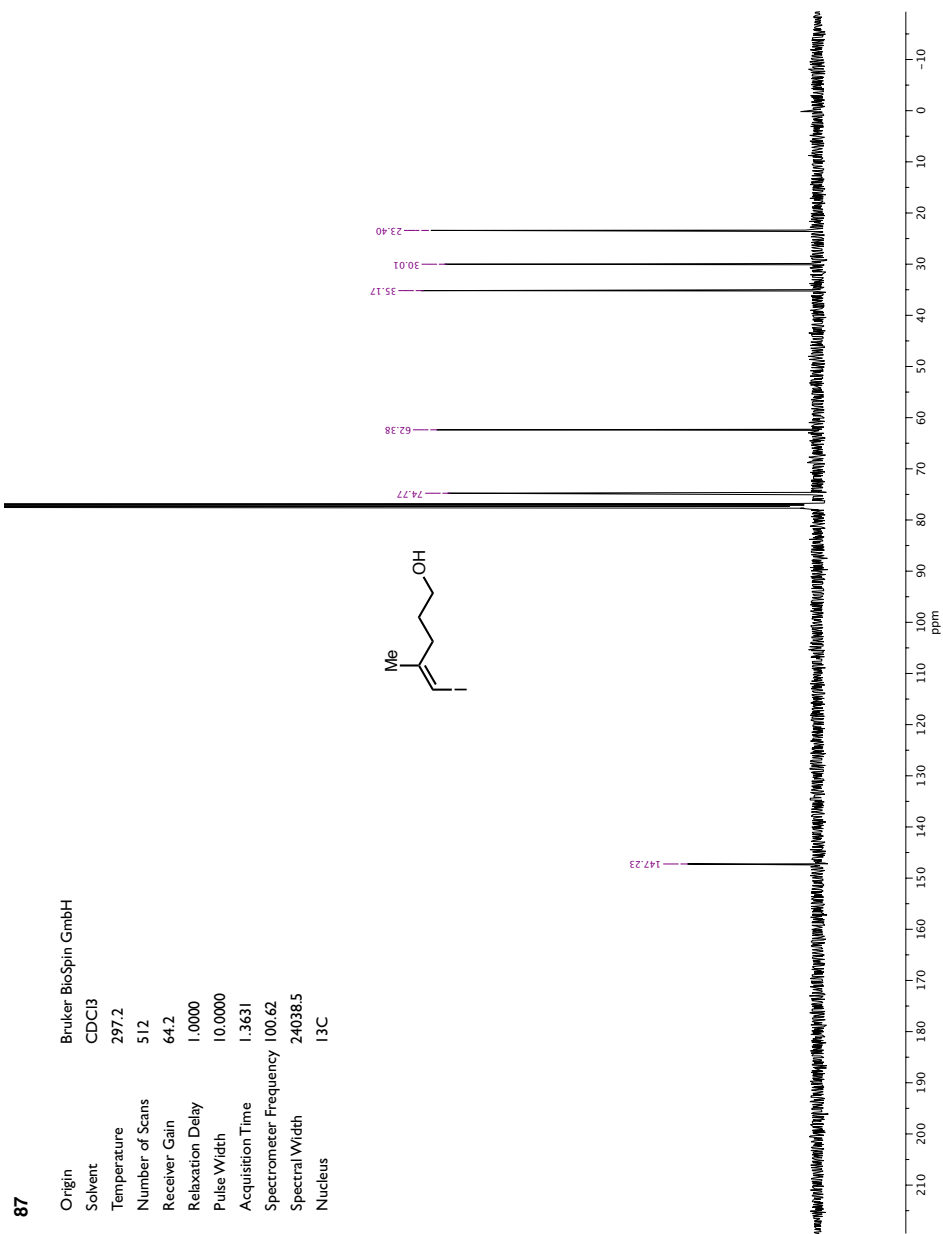


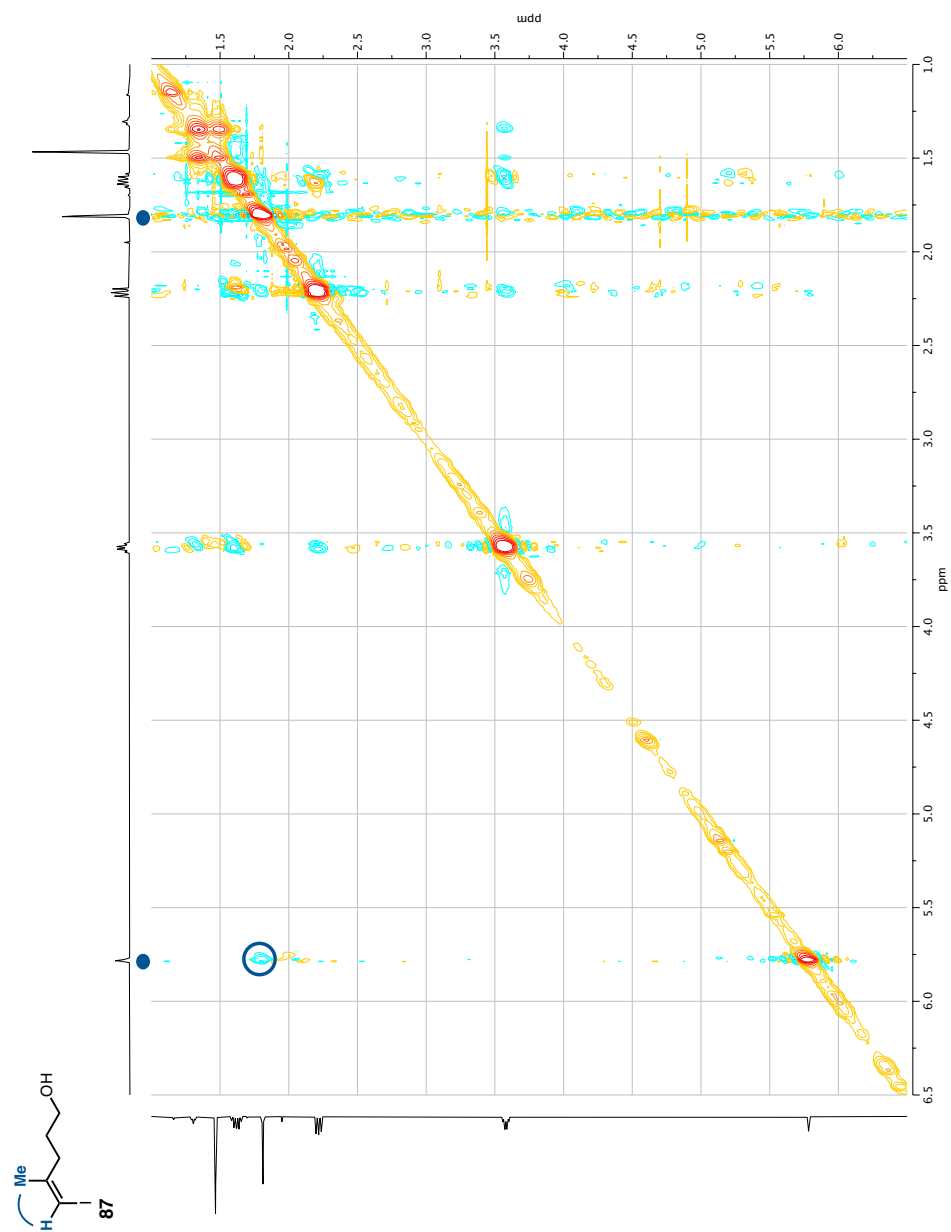
87

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 127.1  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

A (d) 5.87 J(1.54)  
 B (t) 3.67 J(6.41)  
 C (m) 2.31 J(1.45)  
 D (d) 1.90 J(1.45)  
 E (m) 1.71







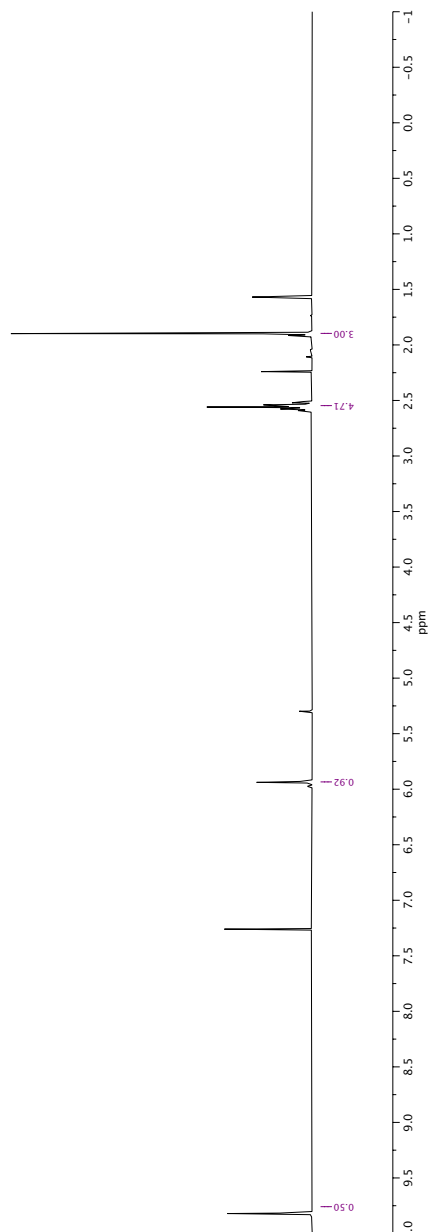
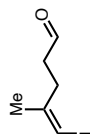
137

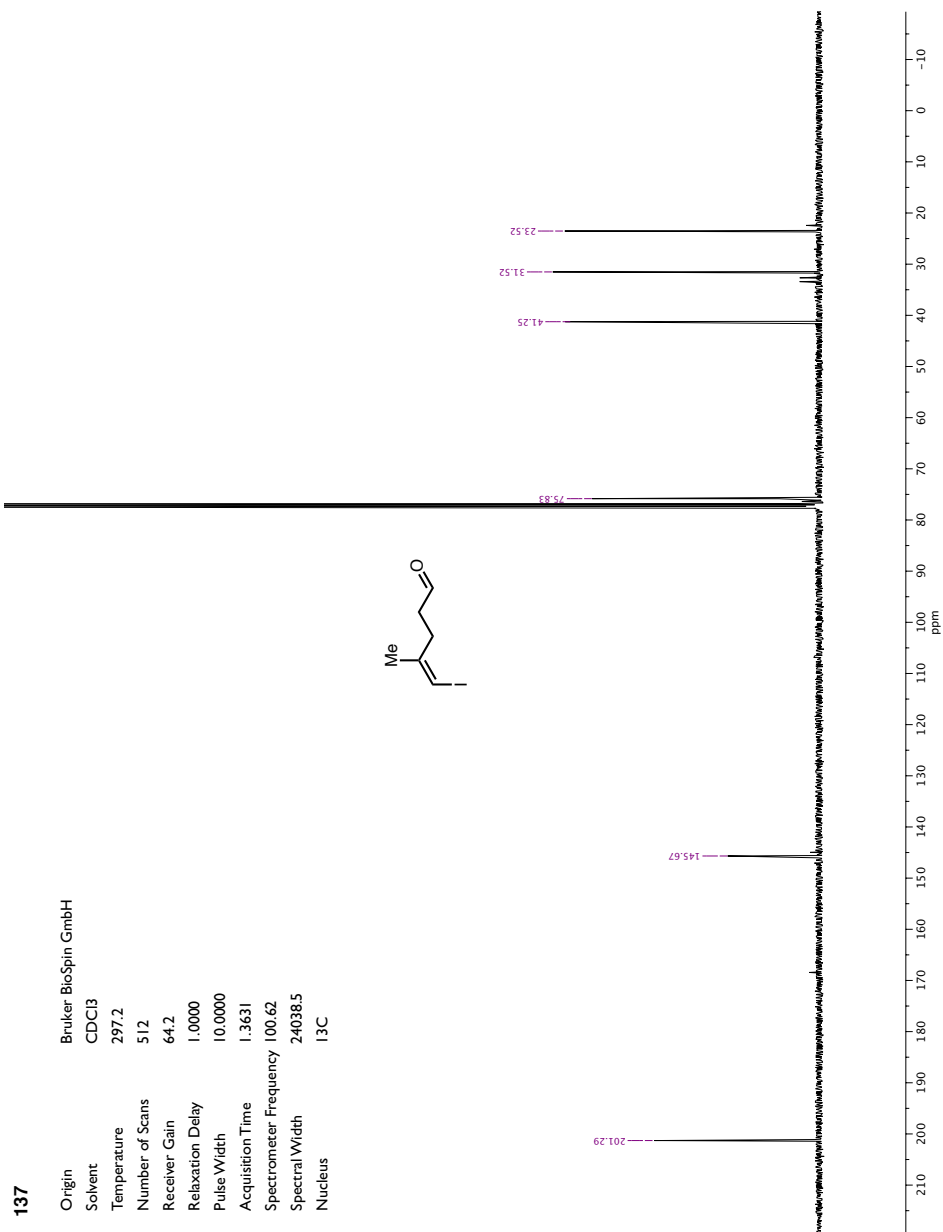
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 176.8  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

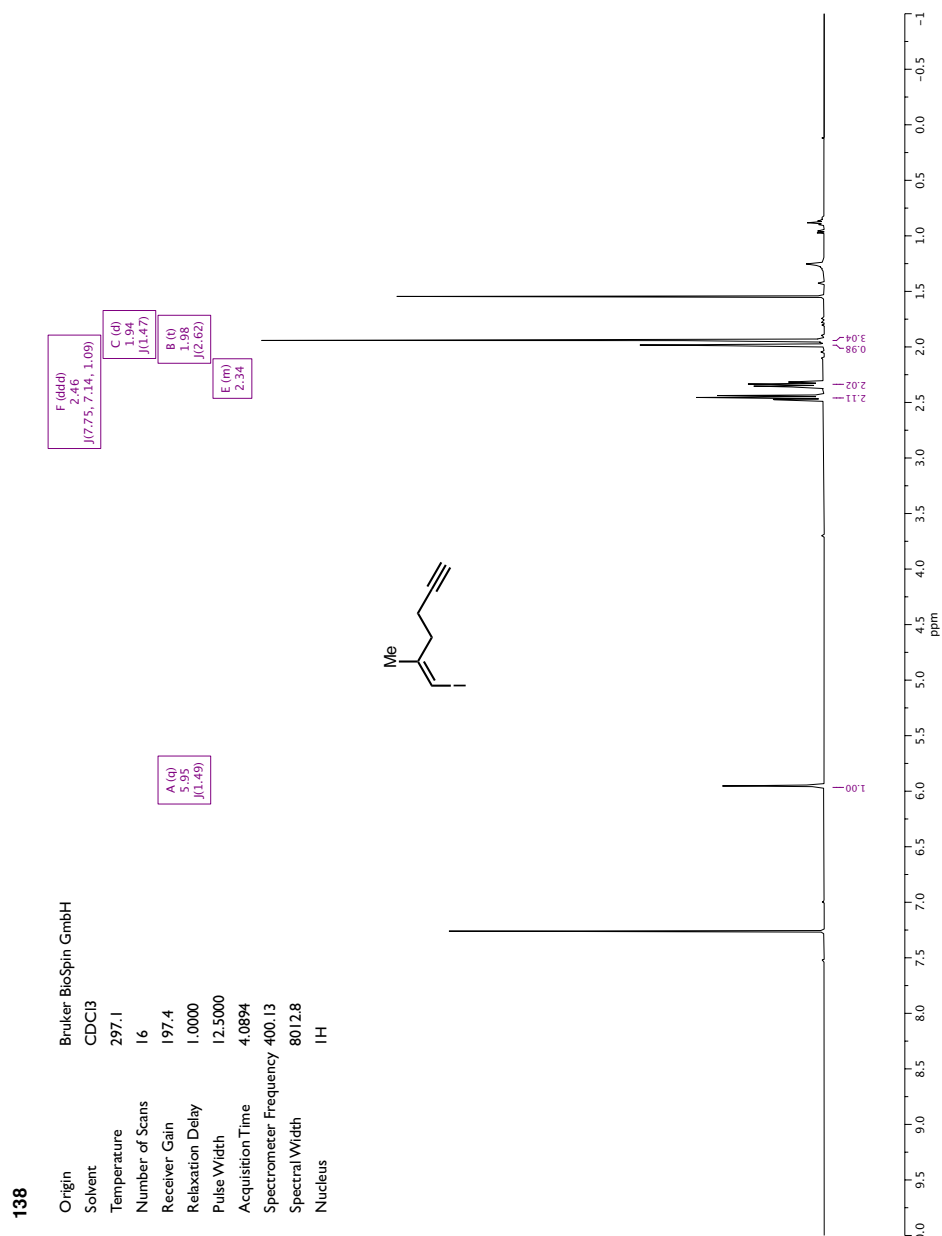
C (d)  
1.90  
J(1.47)

D (m)  
2.33

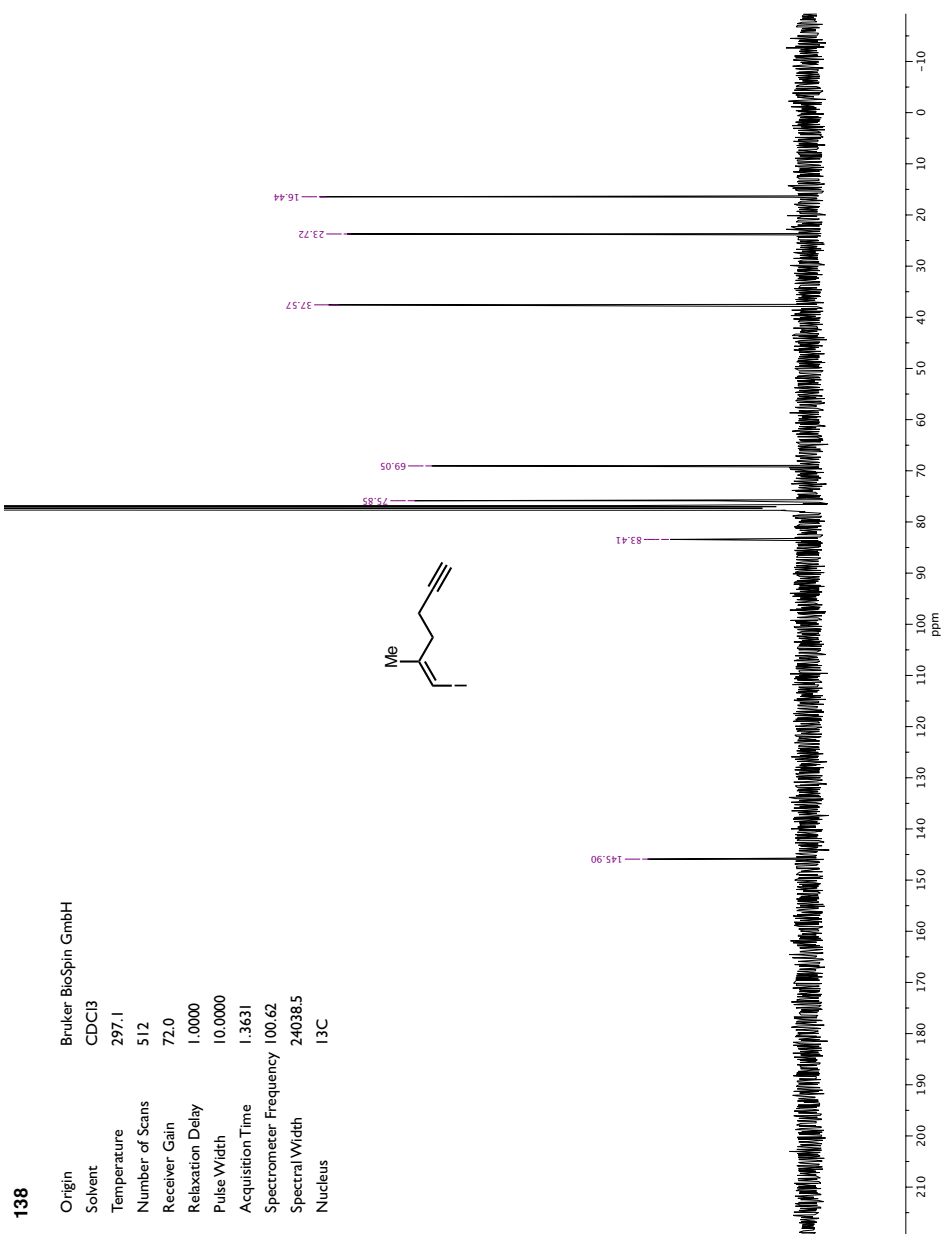
B (q)  
5.94  
J(1.46)

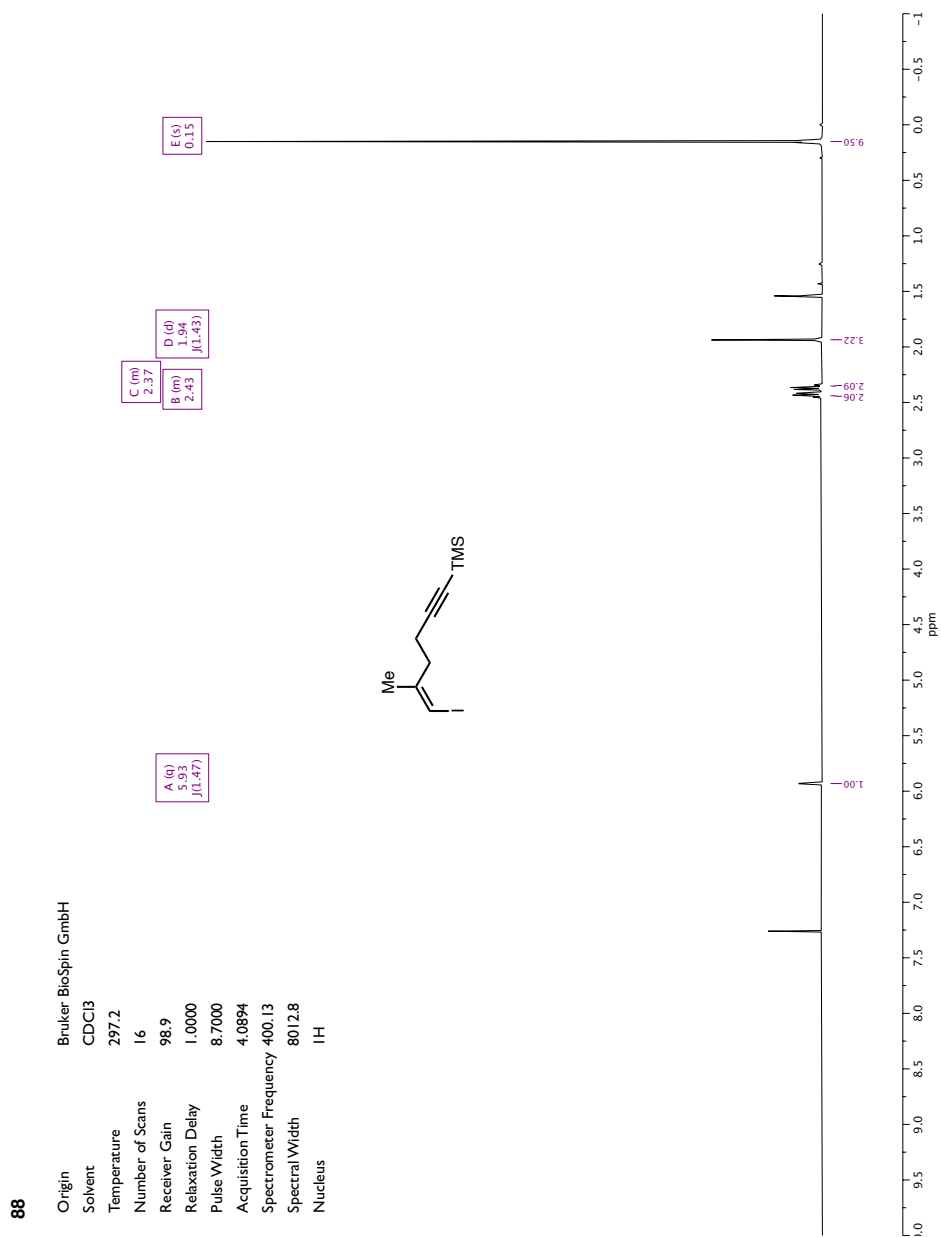


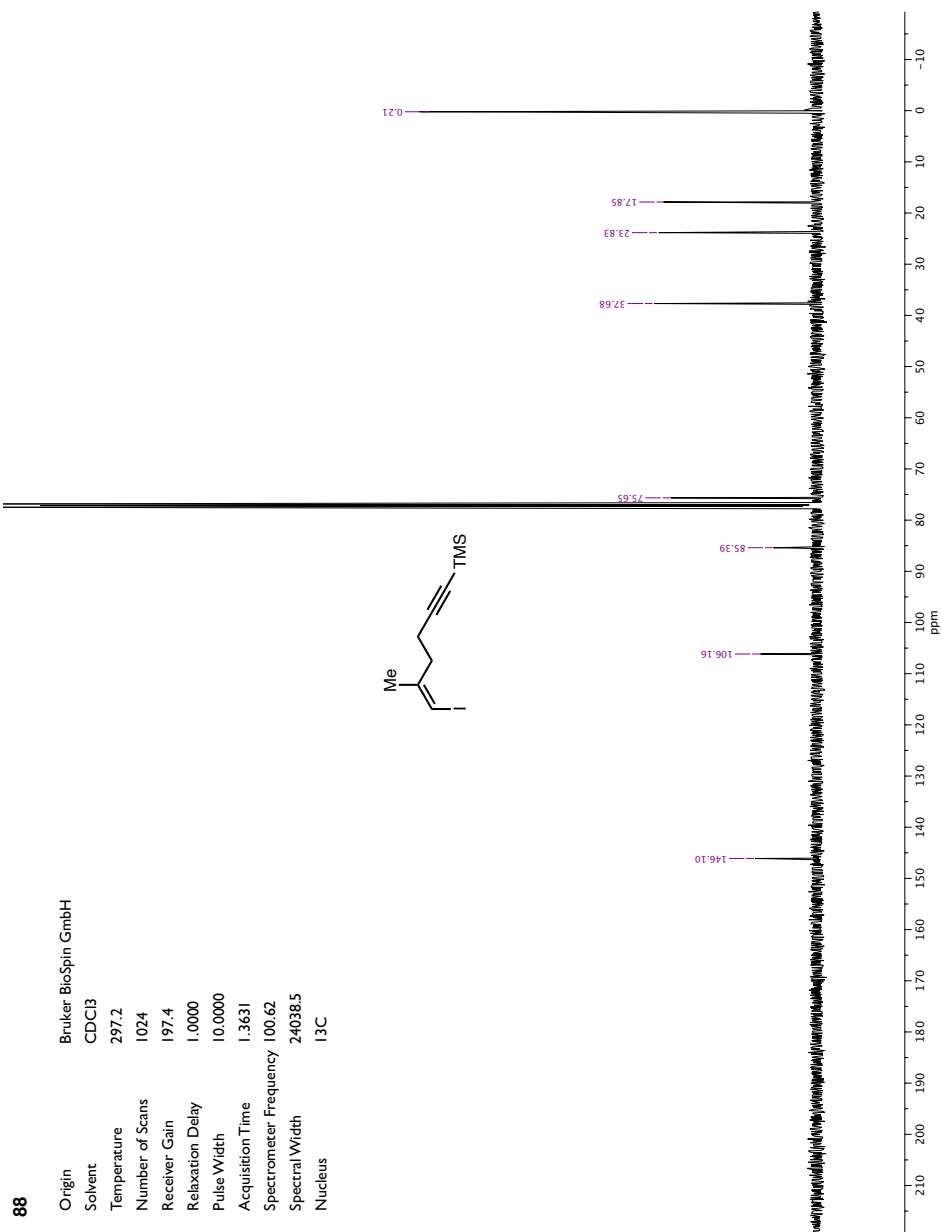








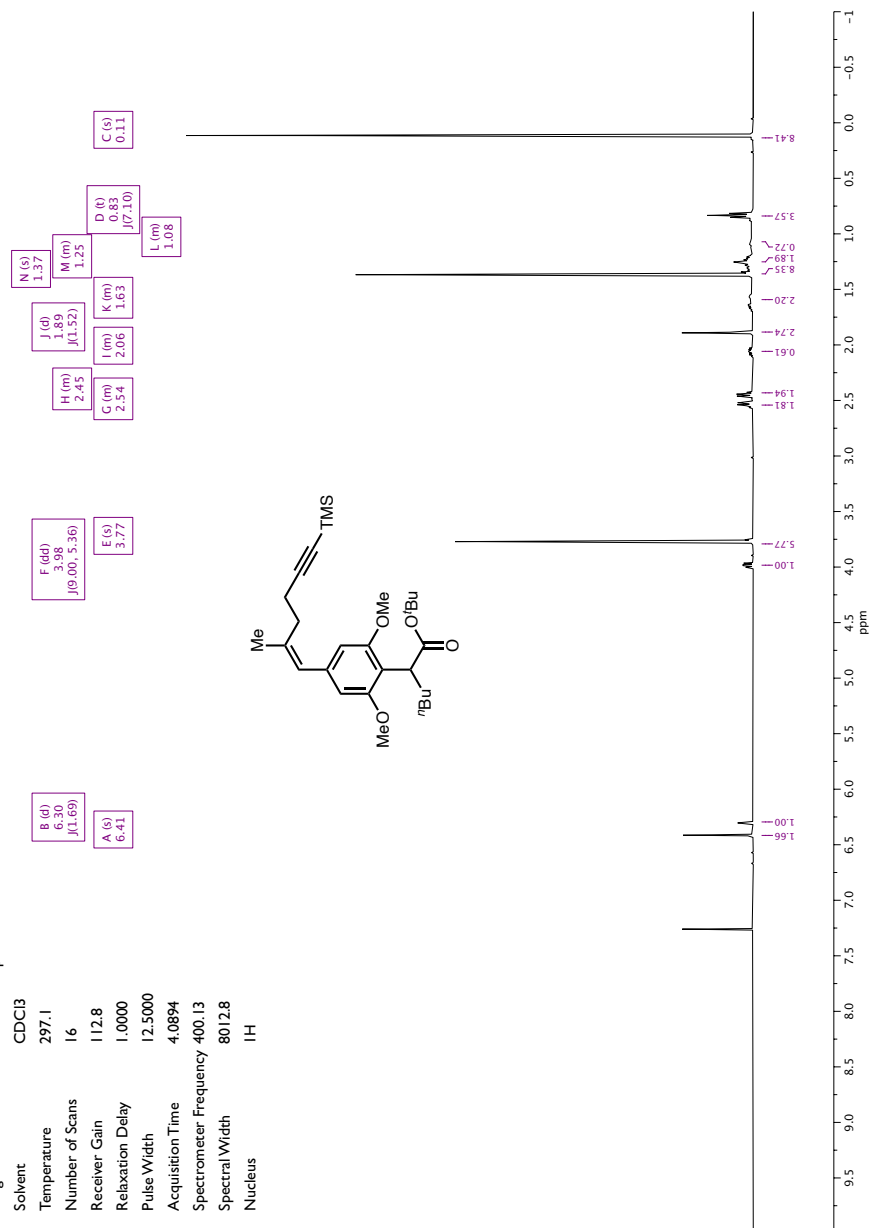


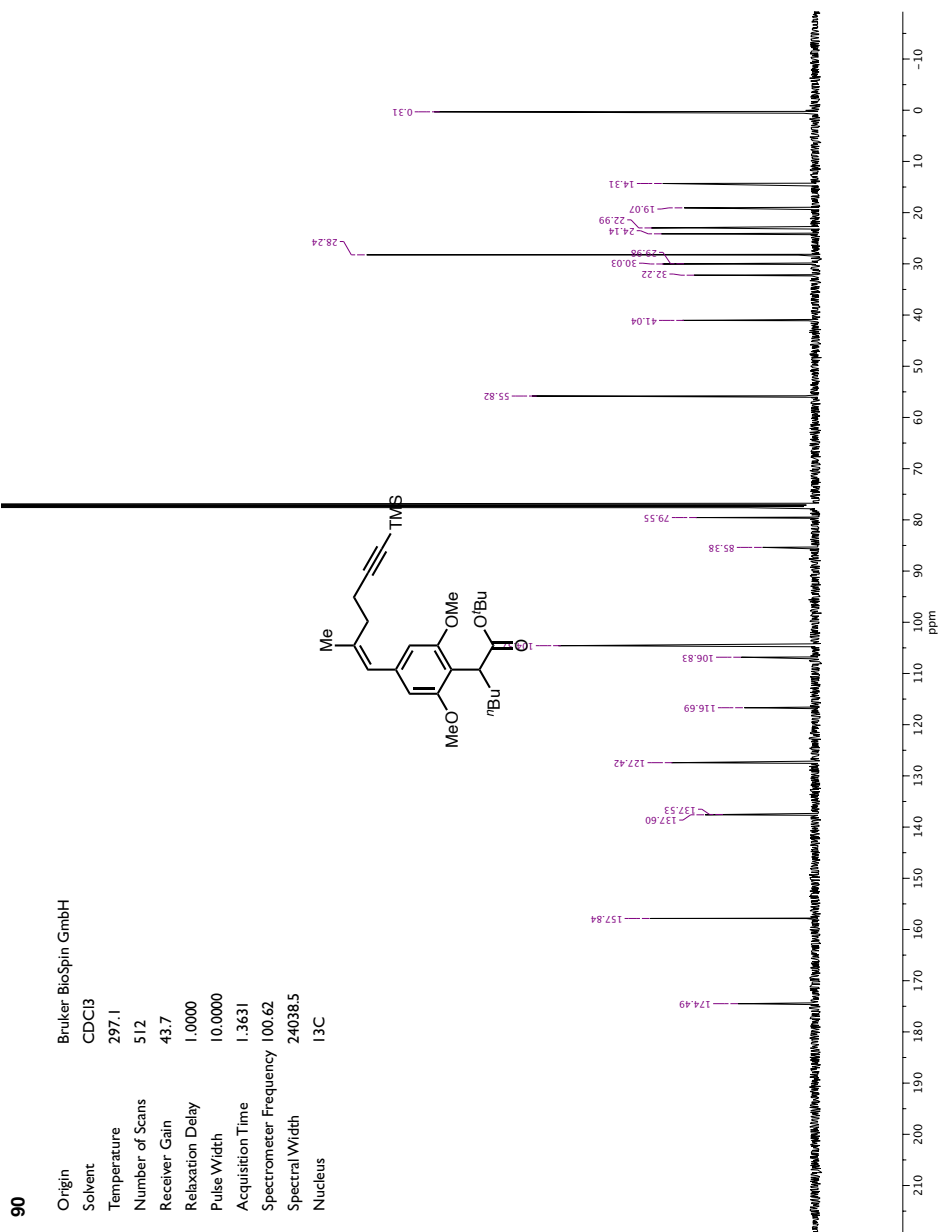


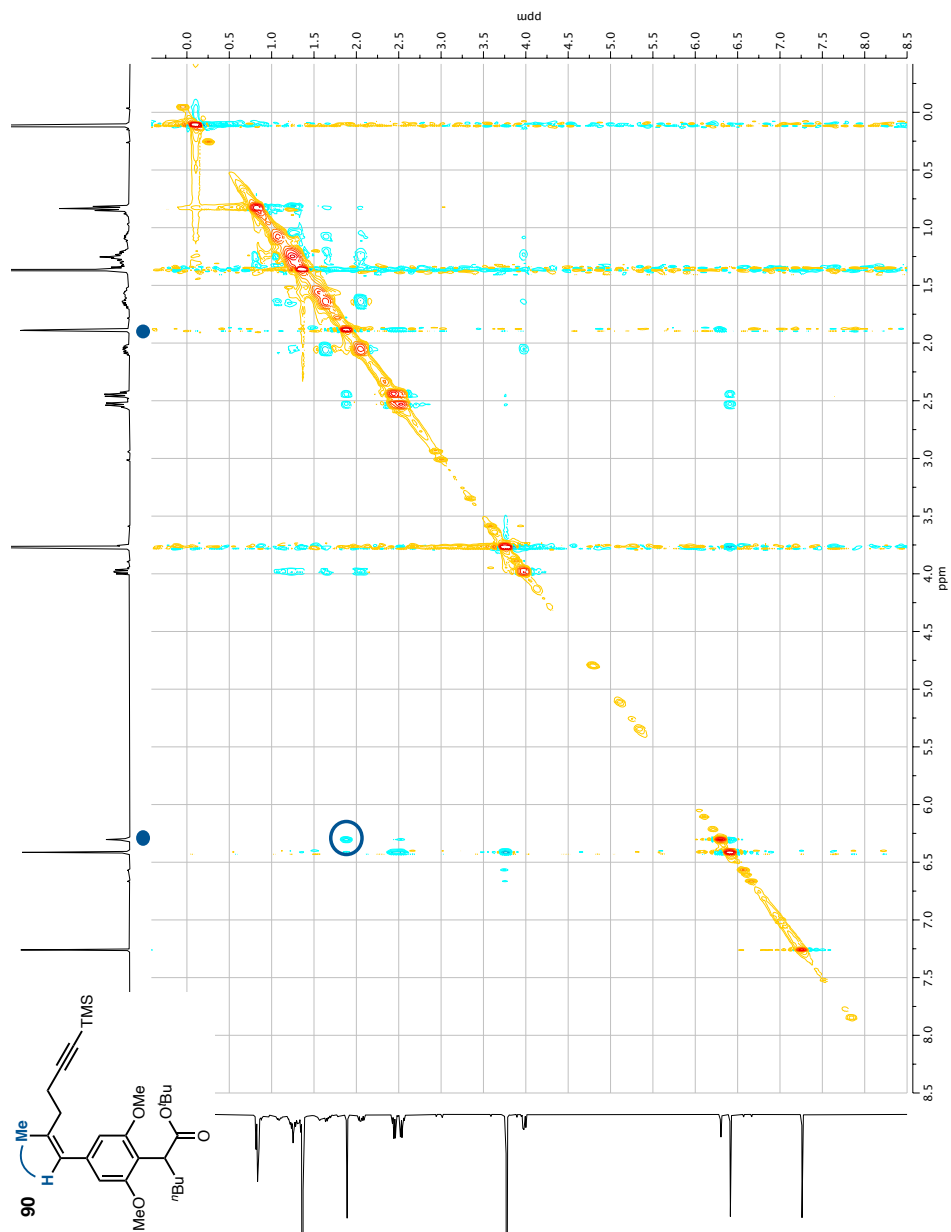
90

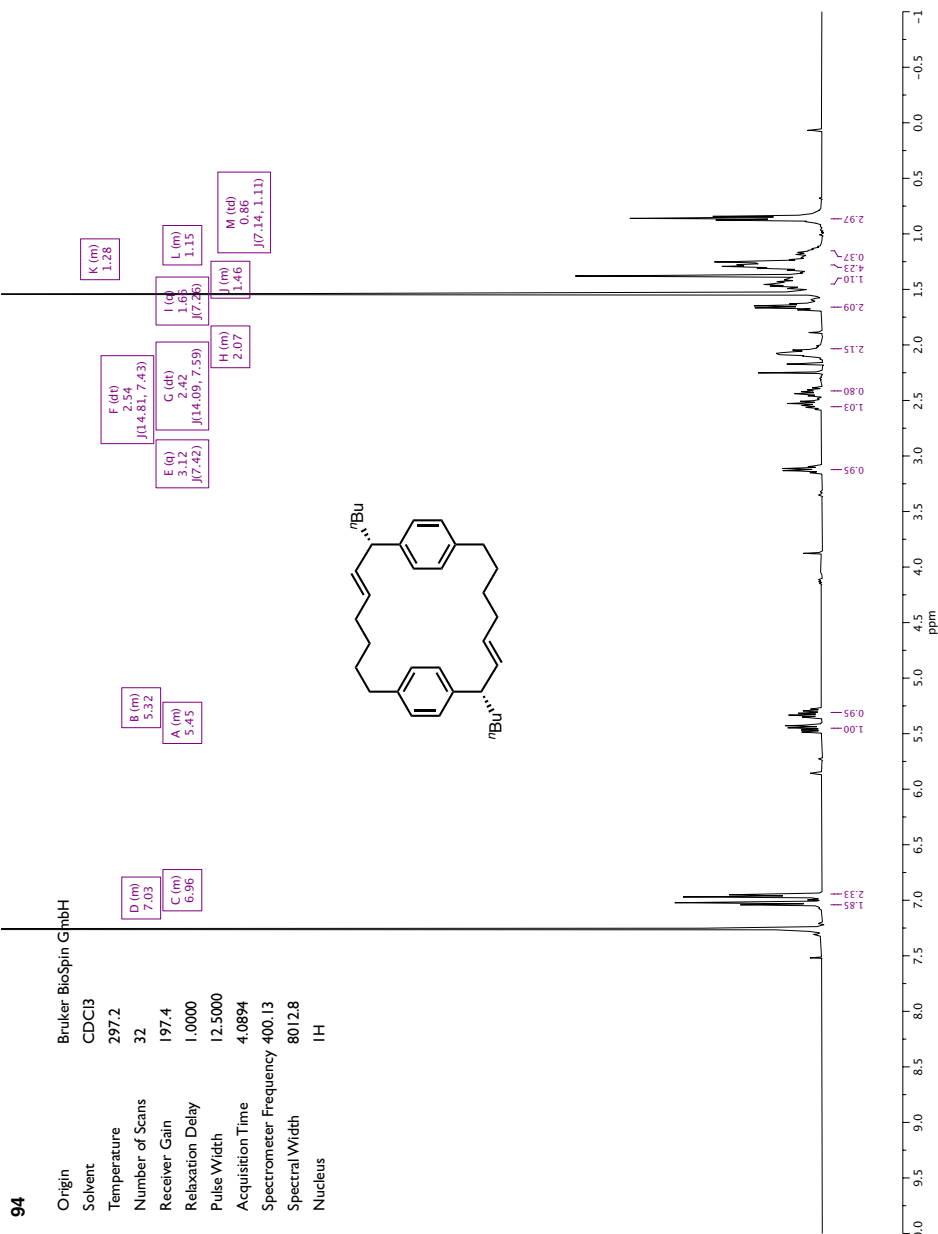
Origin Bruker-BioSpin GmbH

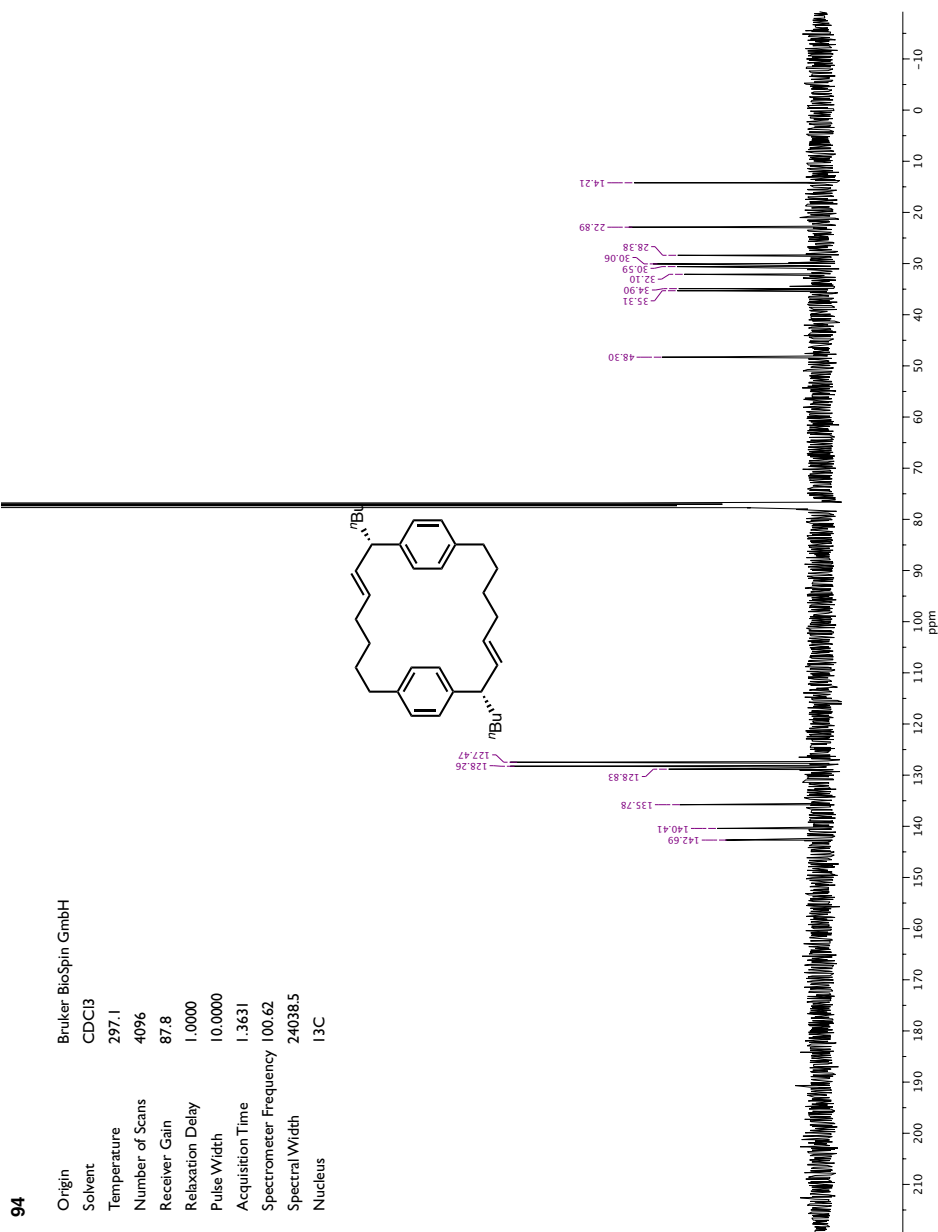
Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 112.8  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H



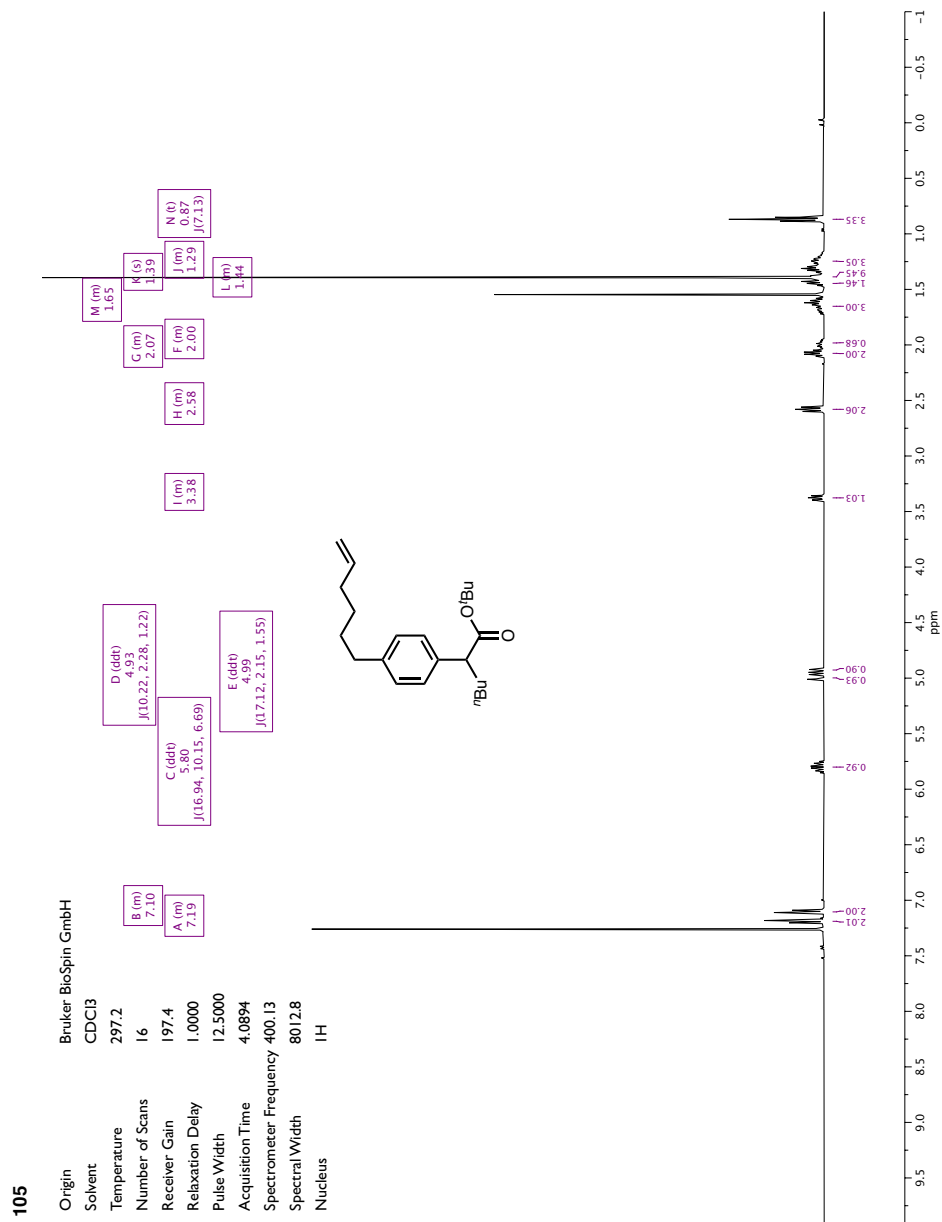


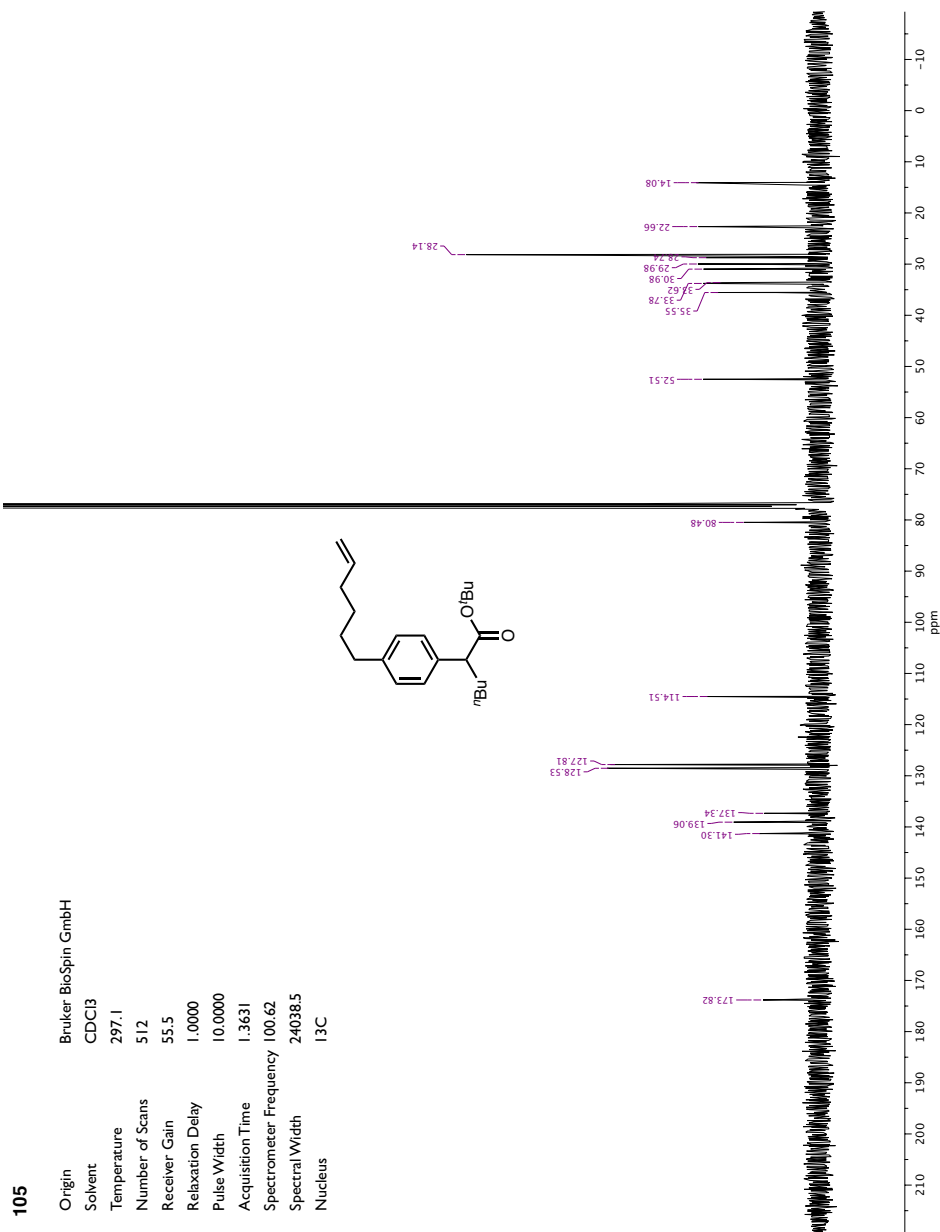






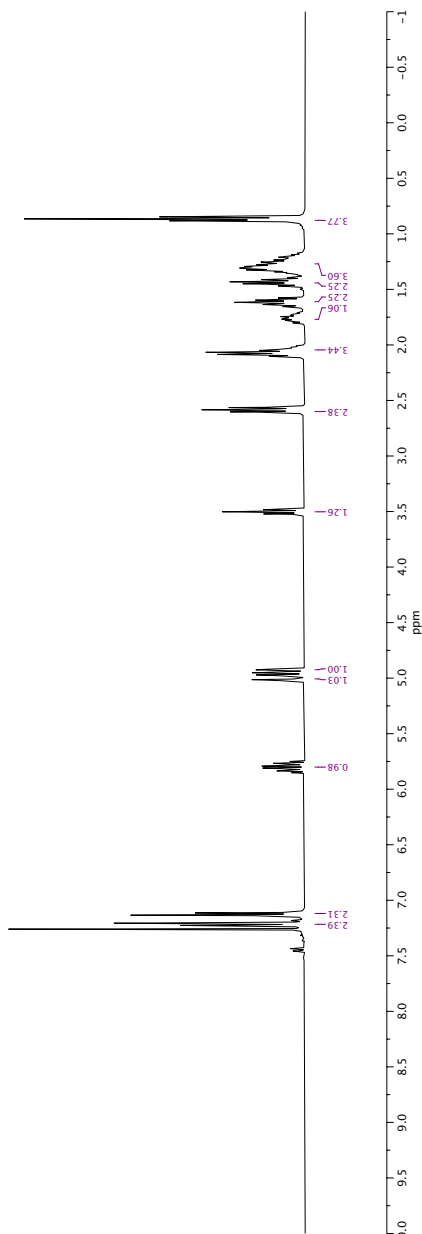
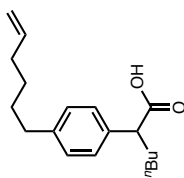
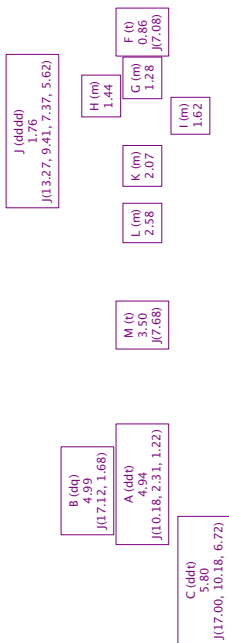


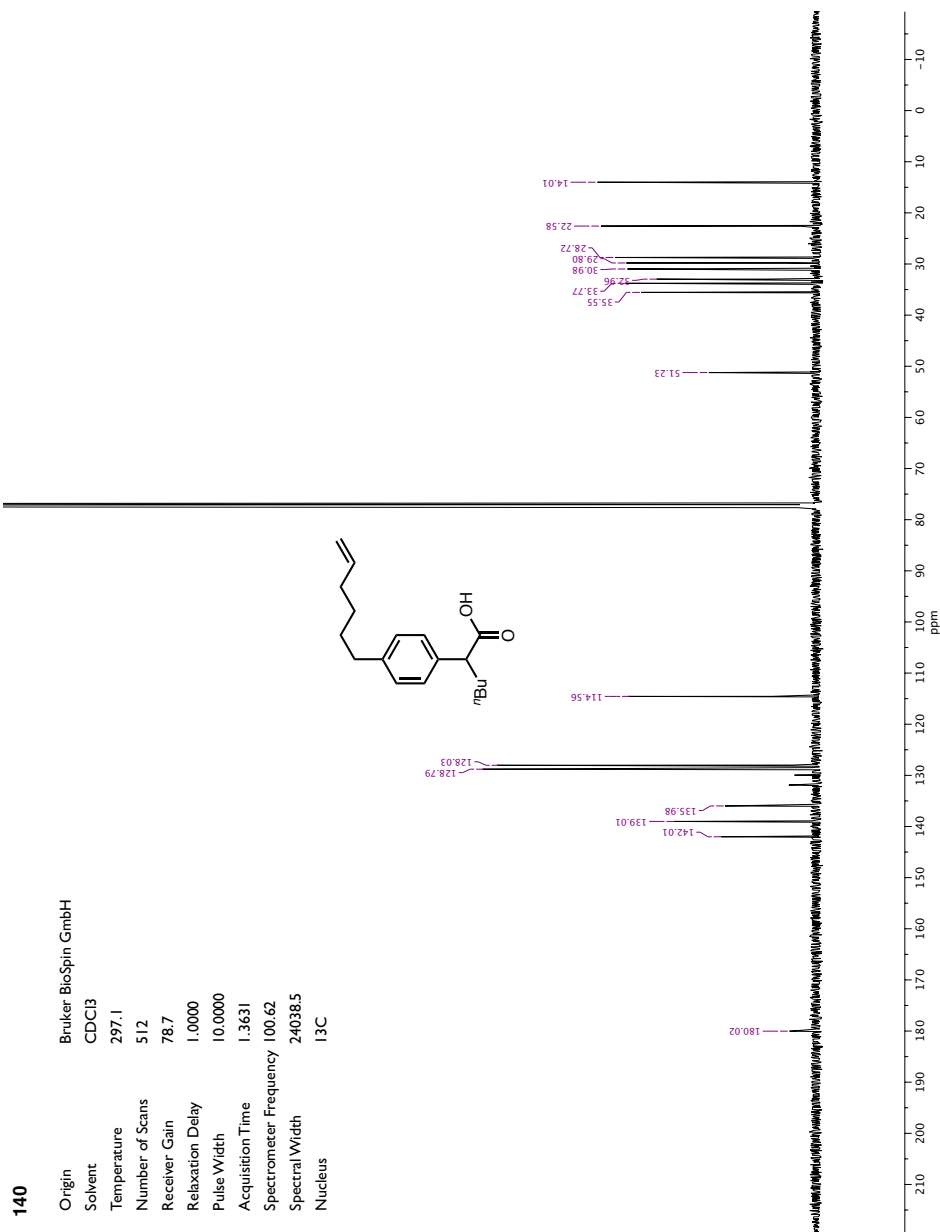


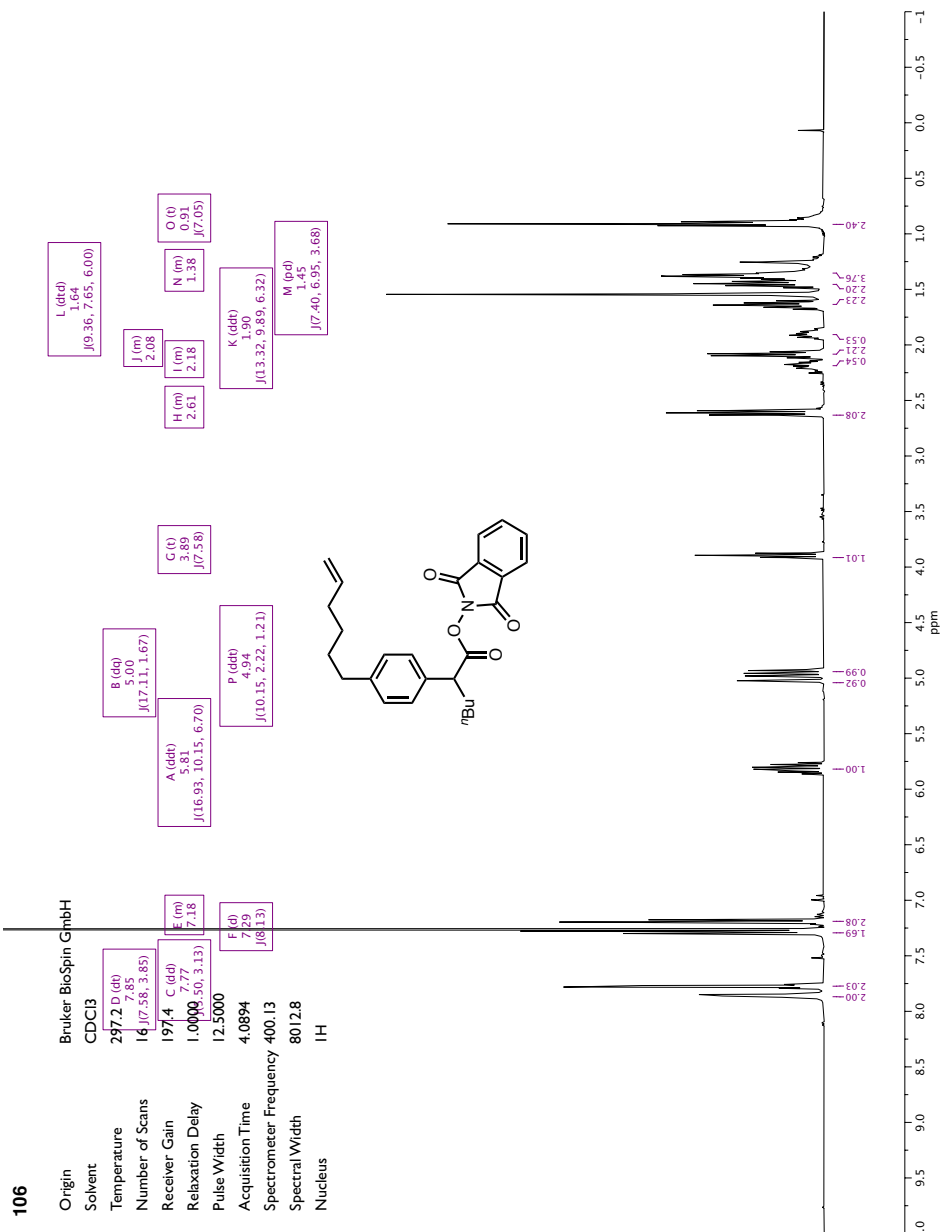


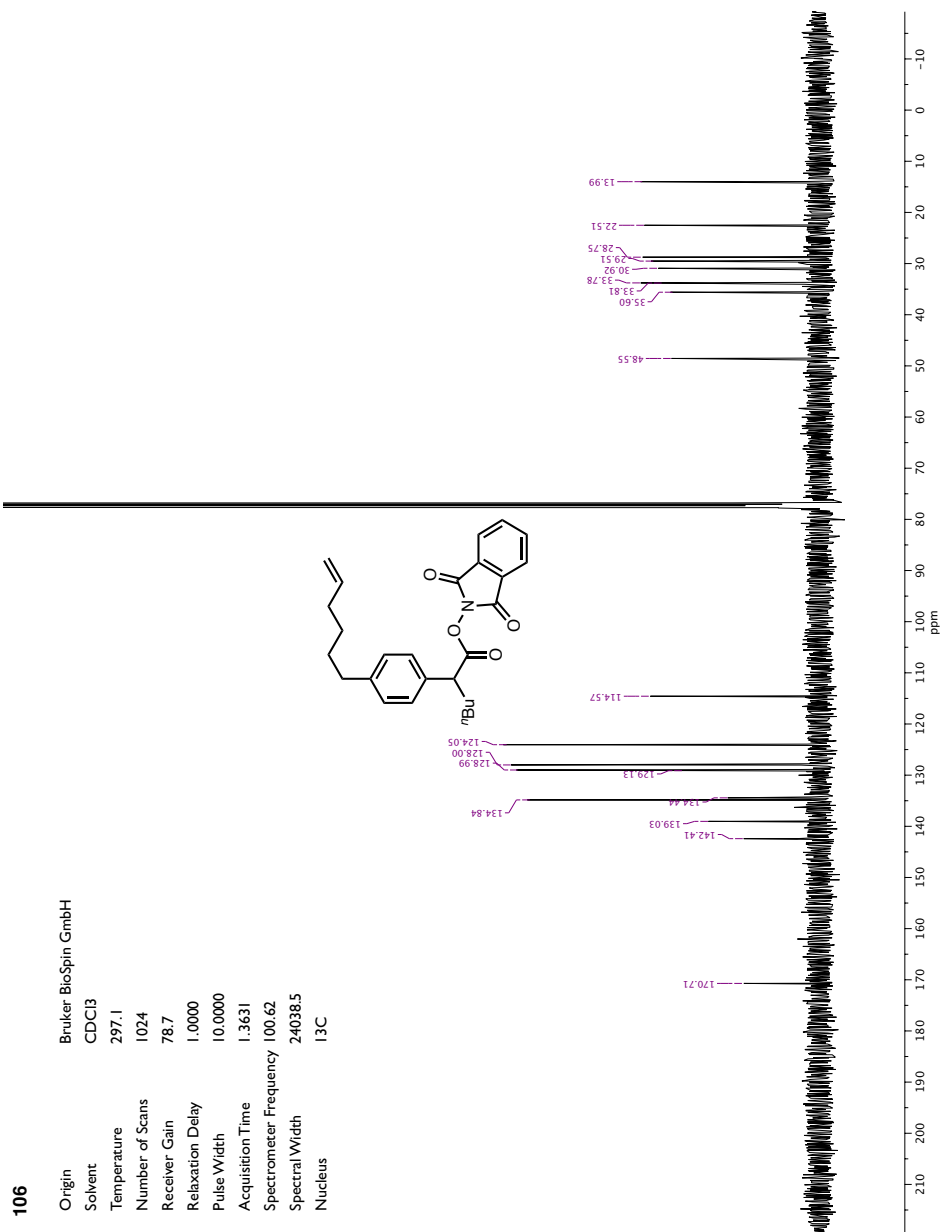
140

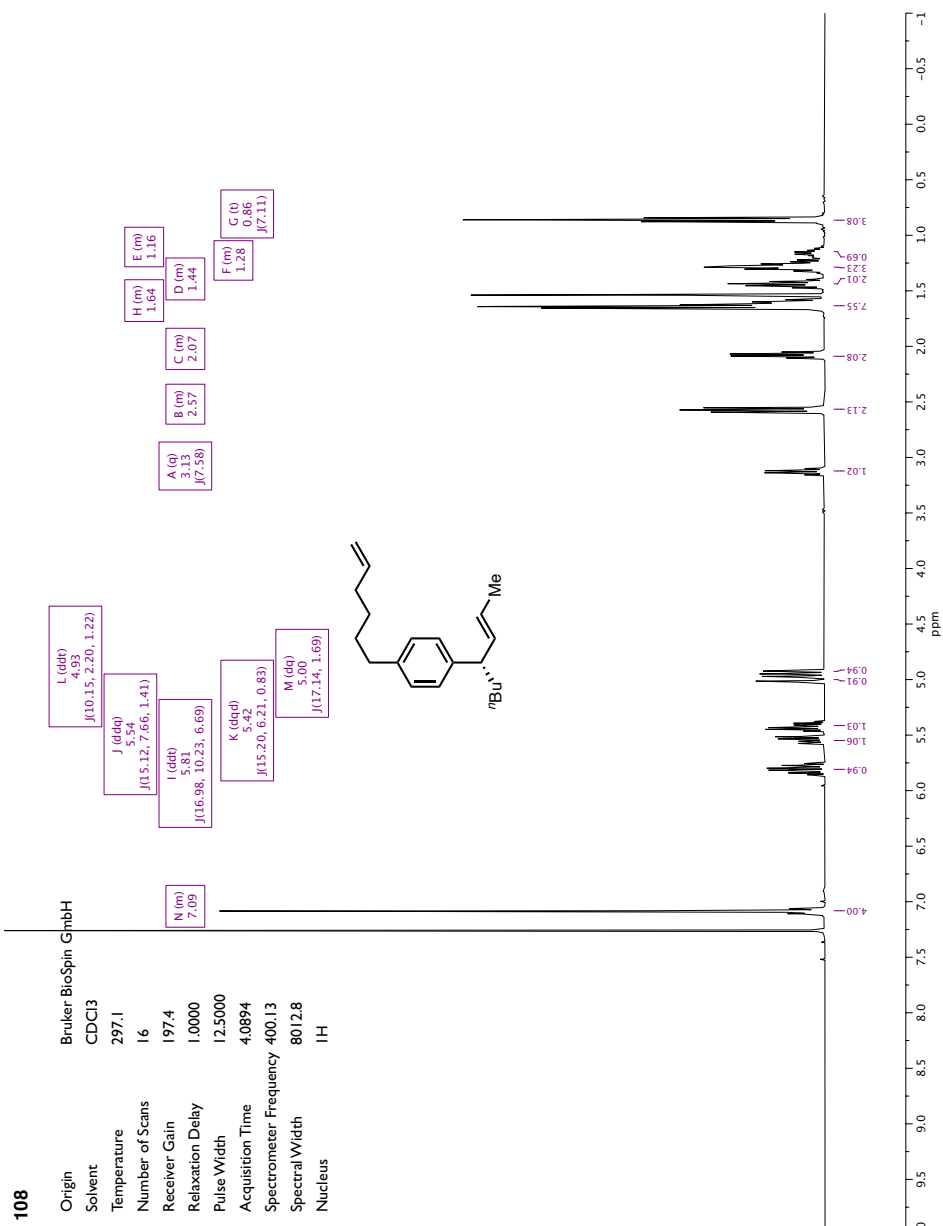
Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 142.8  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

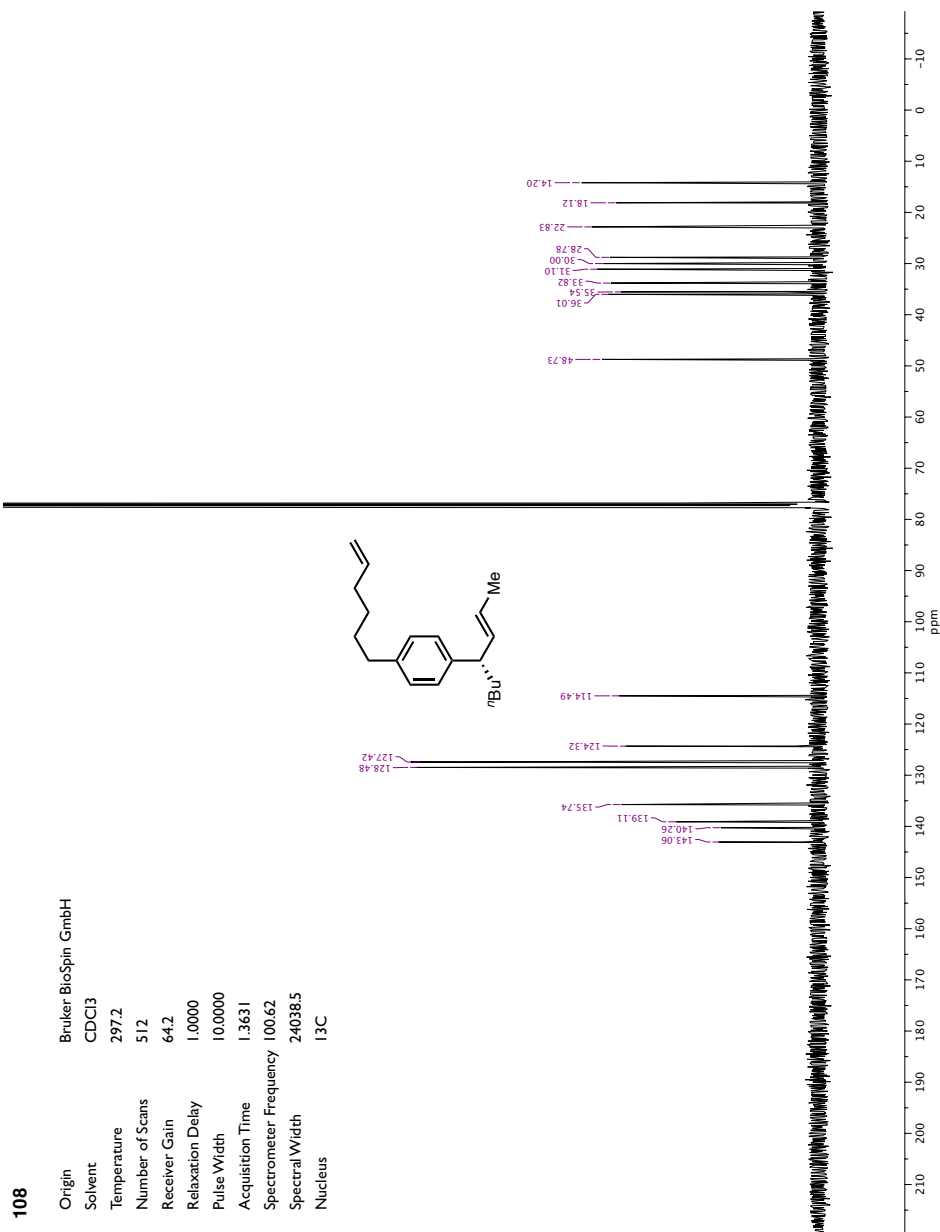








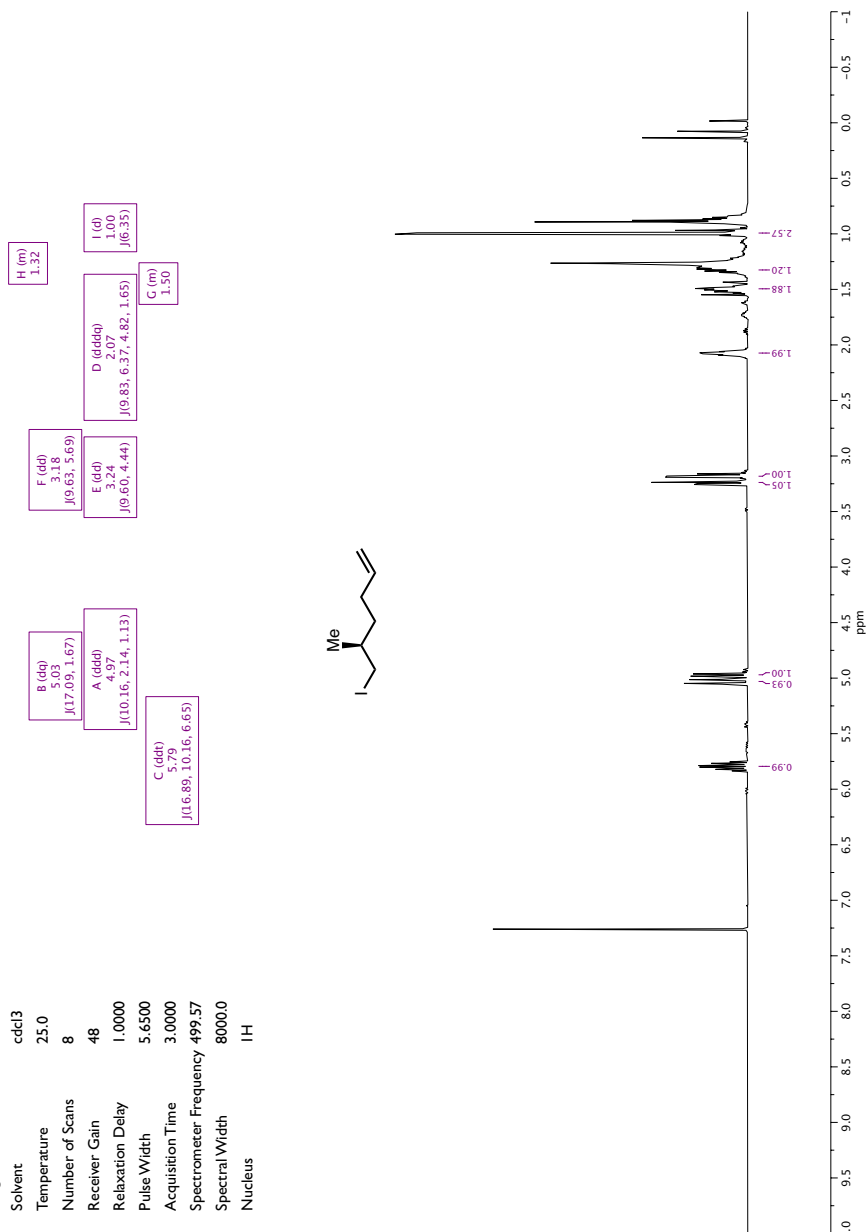


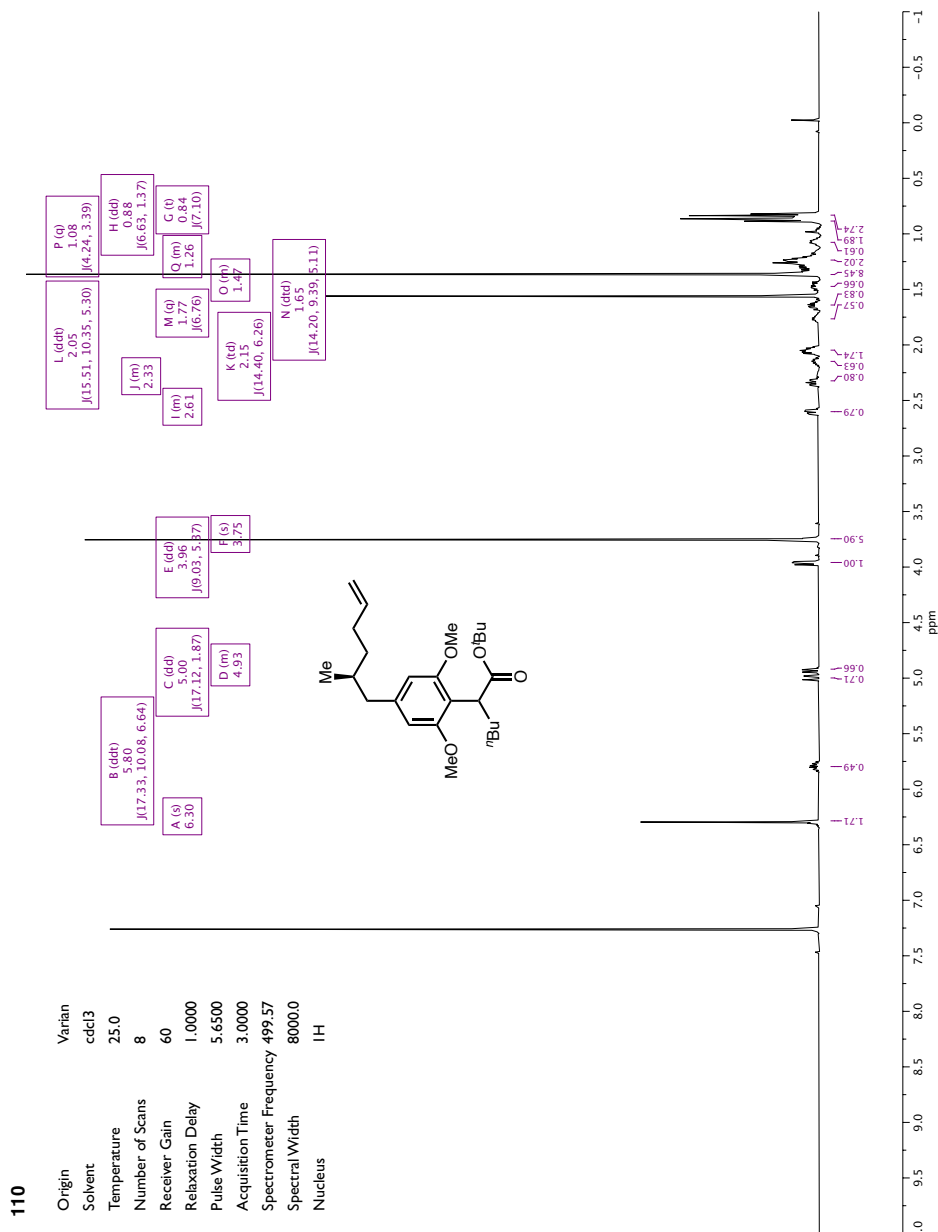


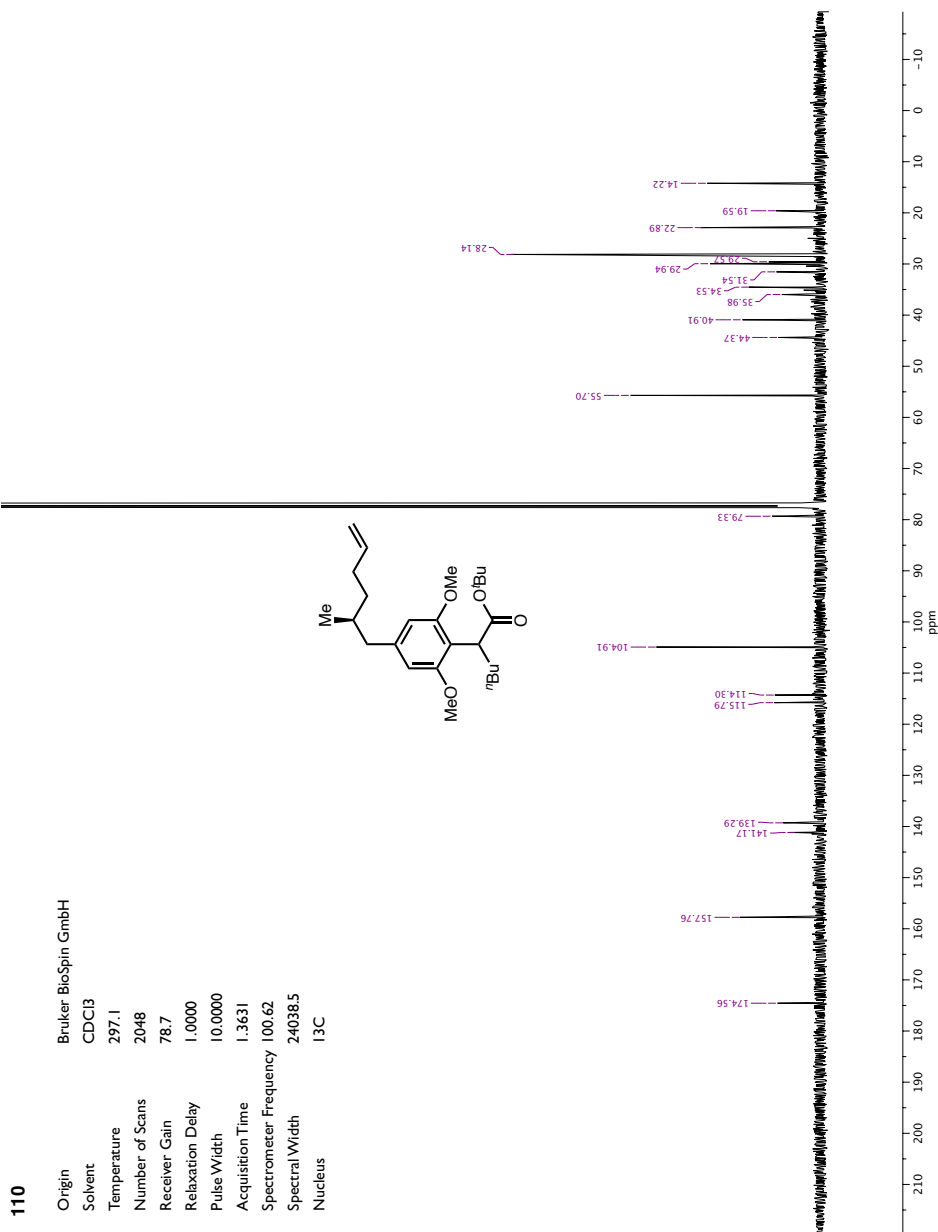


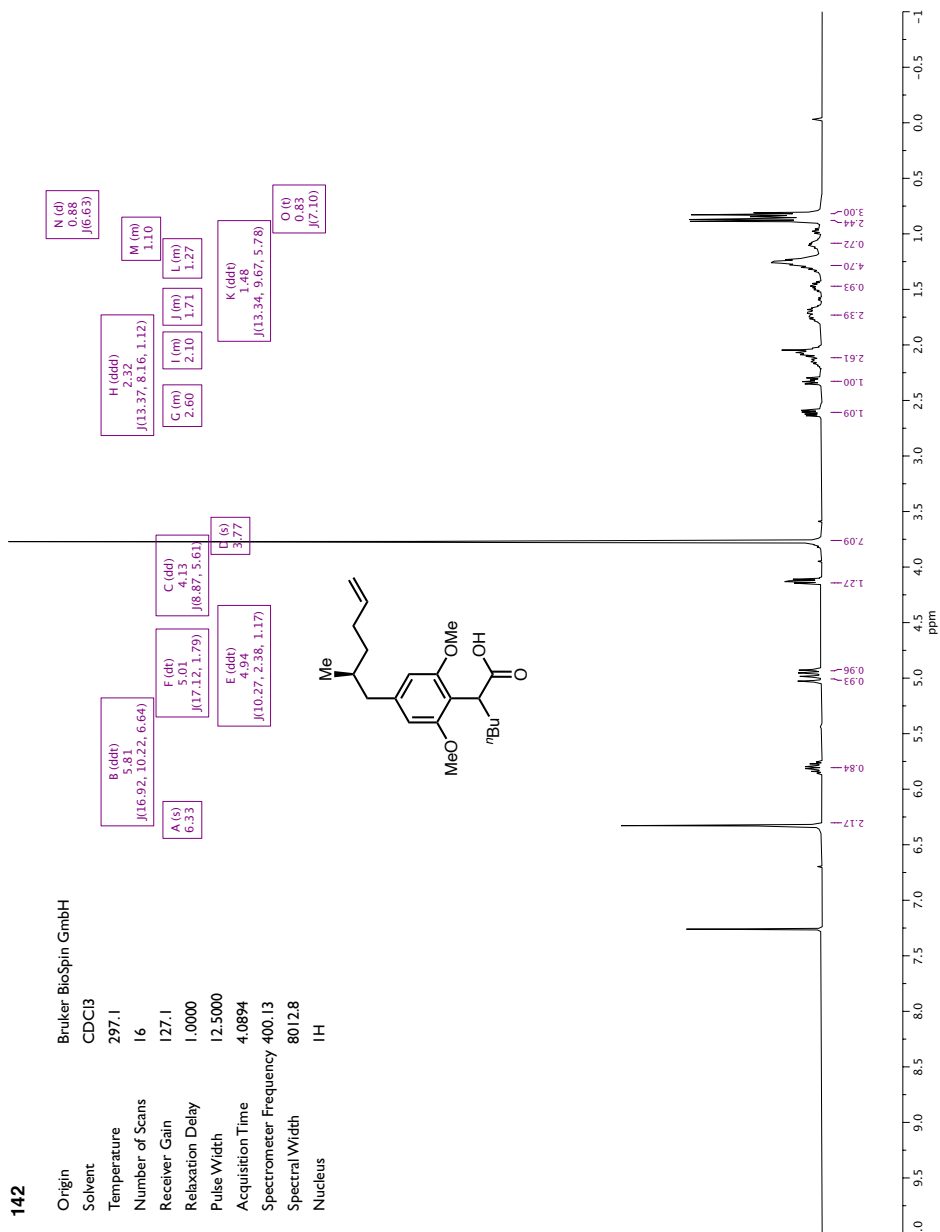
141

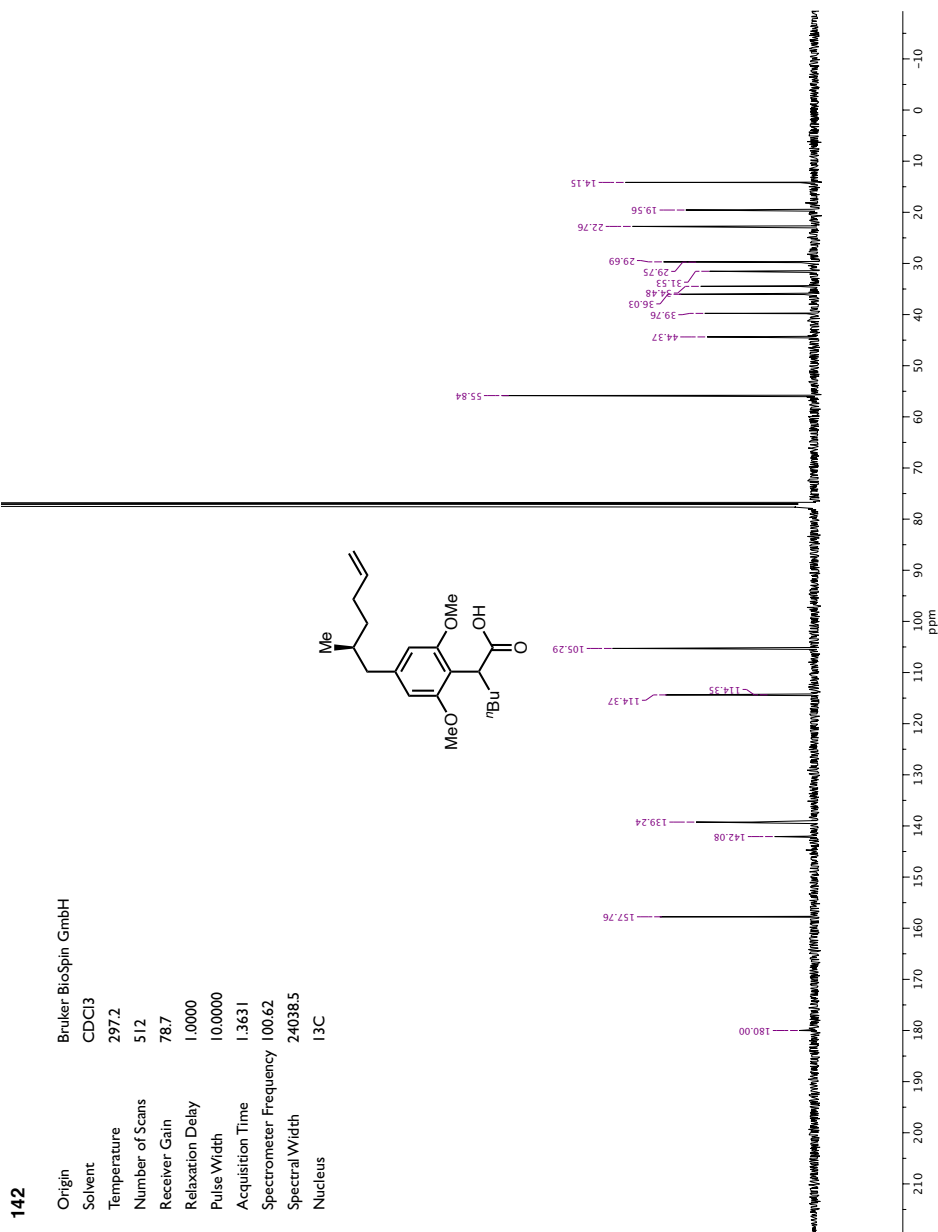
Origin Varian  
 Solvent cdcl3  
 Temperature 25.0  
 Number of Scans 8  
 Receiver Gain 48  
 Relaxation Delay 1.0000  
 Pulse Width 5.6500  
 Acquisition Time 3.0000  
 Spectrometer Frequency 499.57  
 Spectral Width 8000.0  
 Nucleus 1H

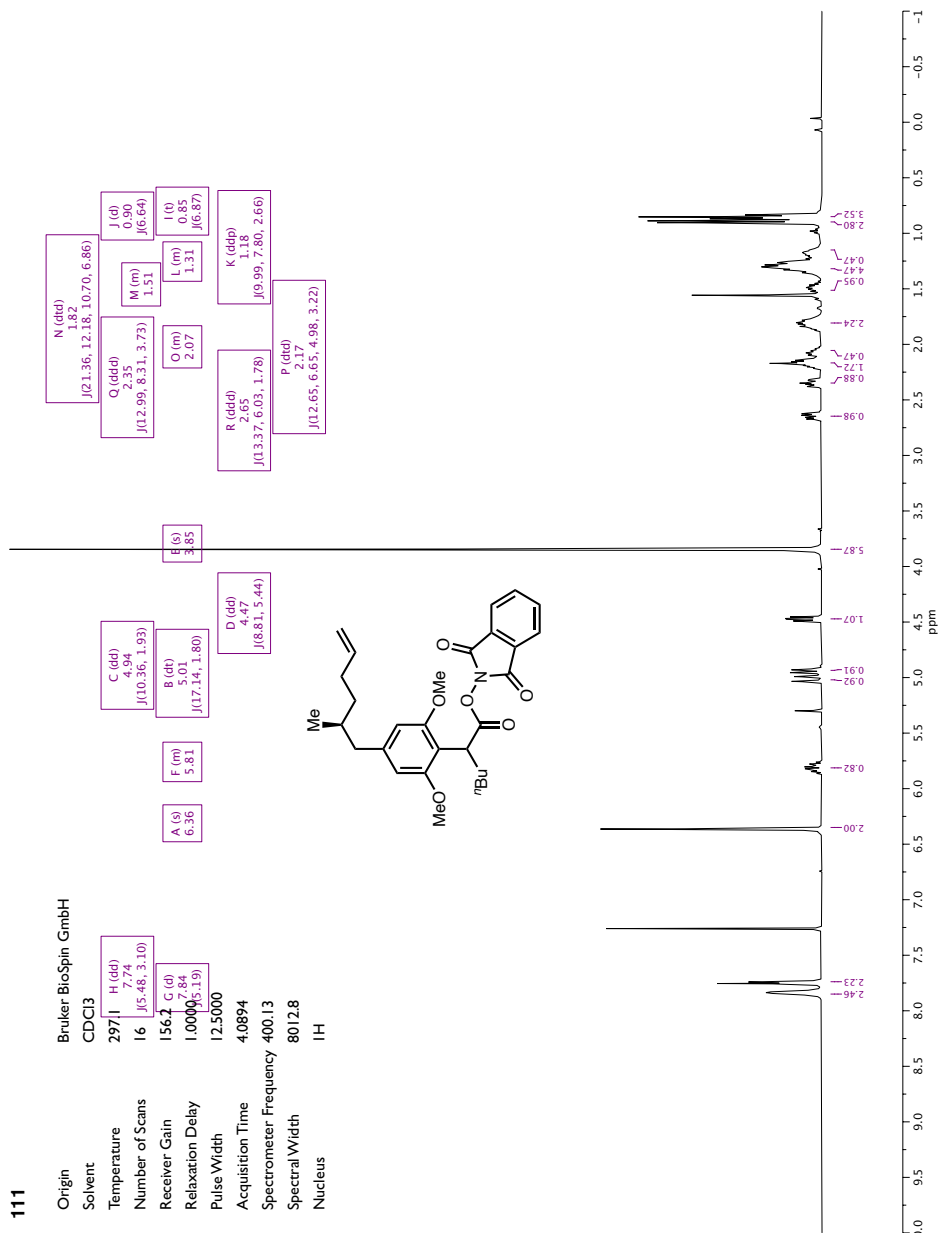






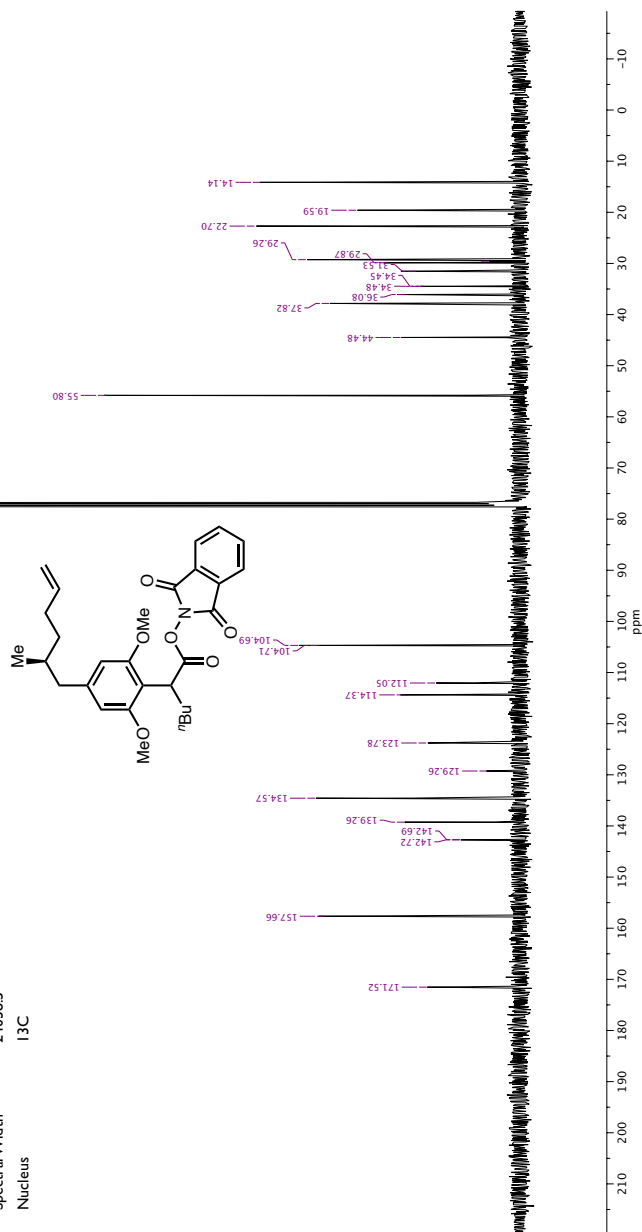


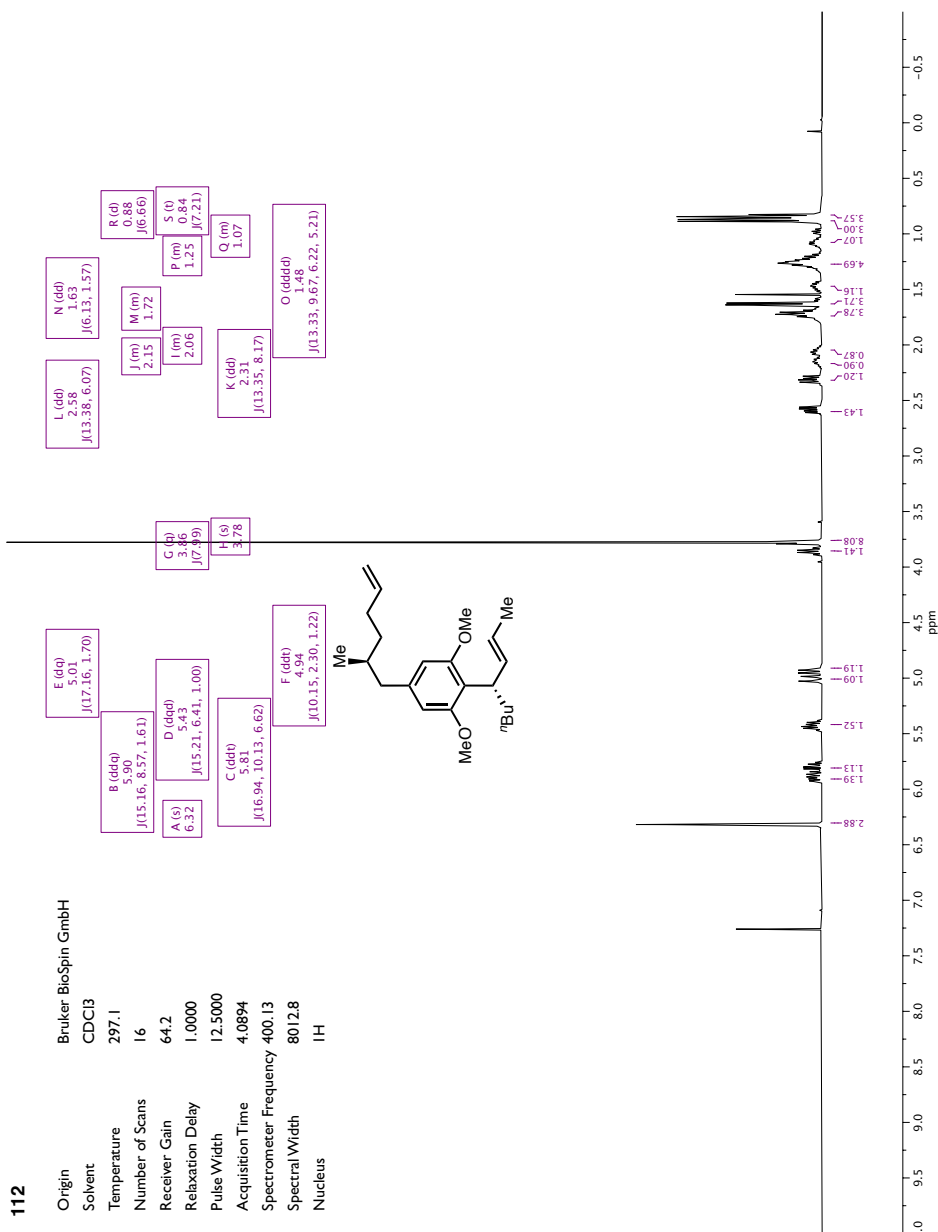




111

Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 512  
 Receiver Gain 78.7  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C

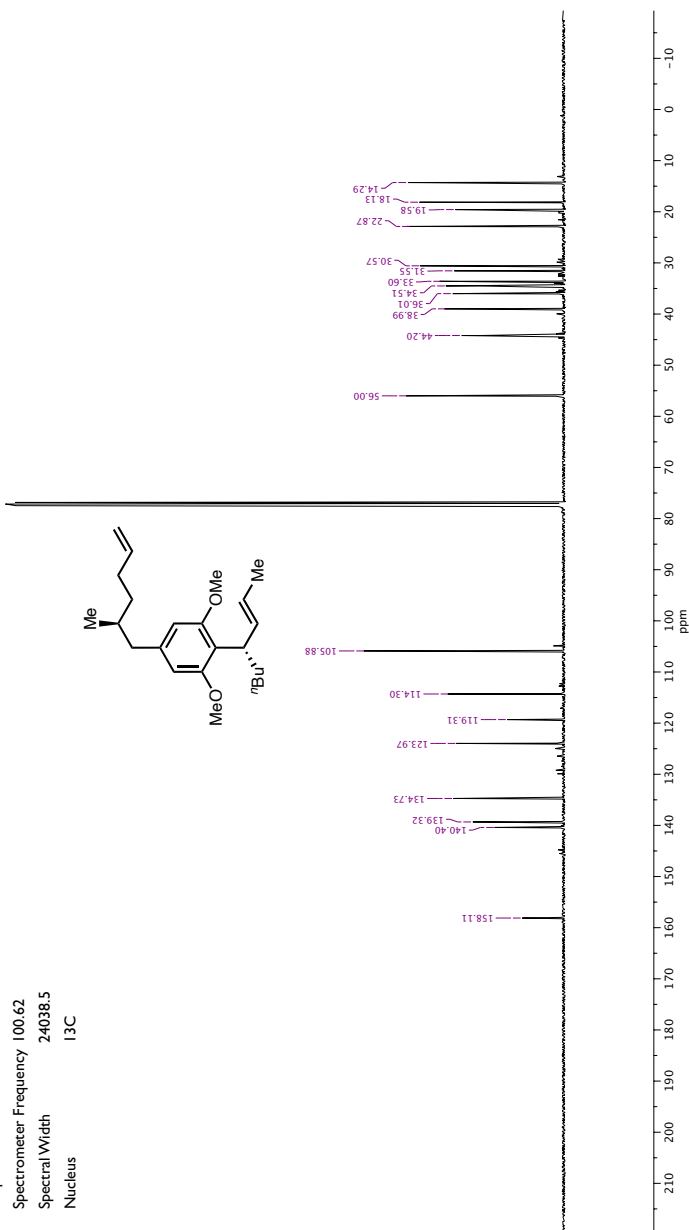






112

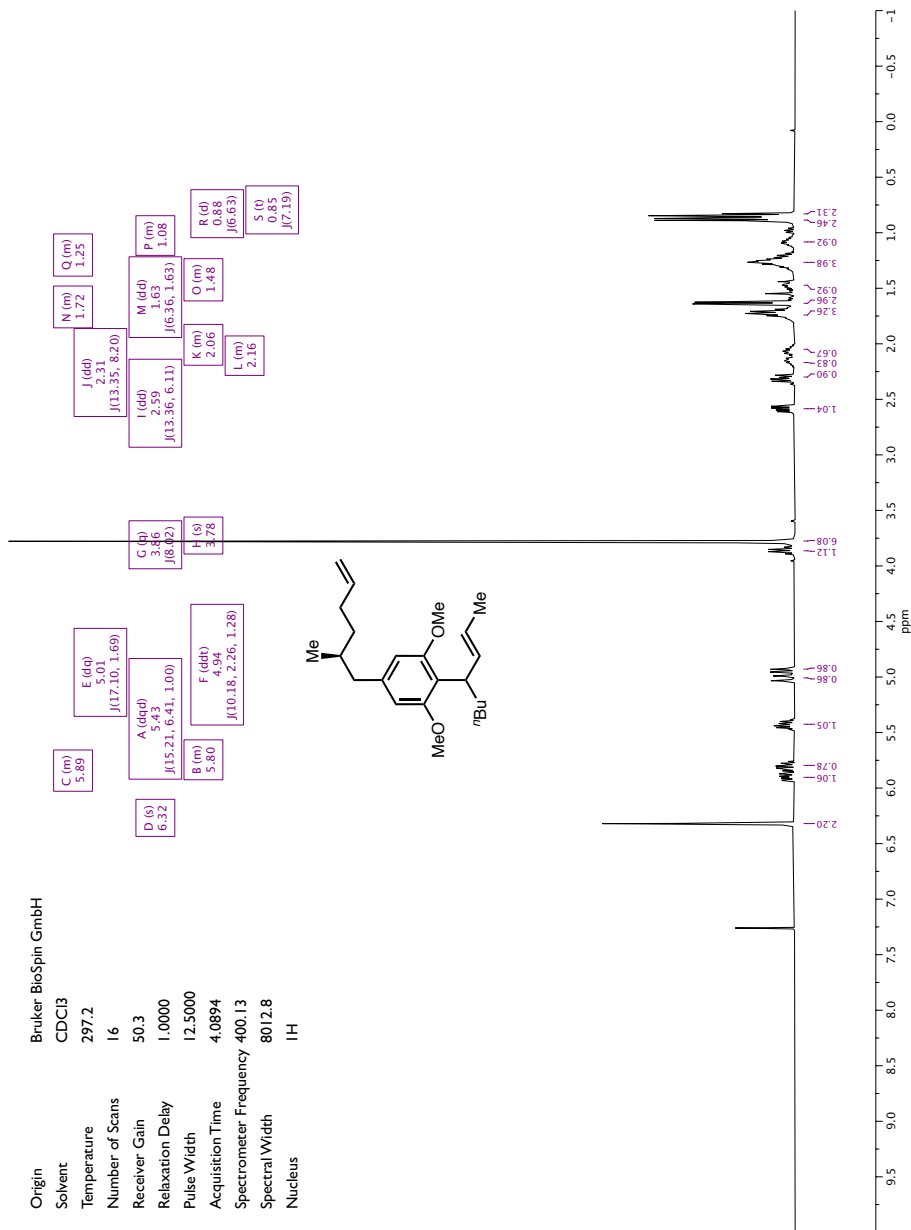
Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 1024  
 Receiver Gain 87.8  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



143

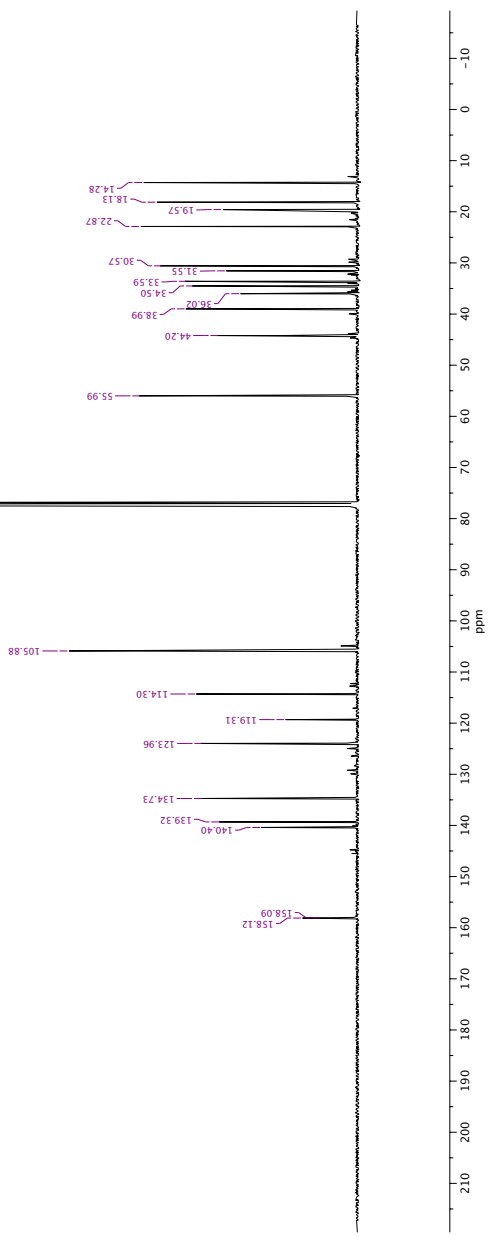
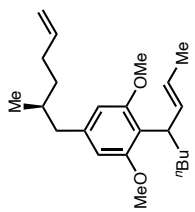
Origin  
 Solvent  
 Temperature  
 Number of Scans  
 Receiver Gain  
 Relaxation Delay  
 Pulse Width  
 Acquisition Time  
 Spectrometer Frequency  
 Spectral Width  
 Nucleus

Bruker BioSpin GmbH  
 CDC13  
 297.2  
 16  
 50.3  
 1.0000  
 12.5000  
 4.0894  
 400.13  
 8012.8  
 1H



143

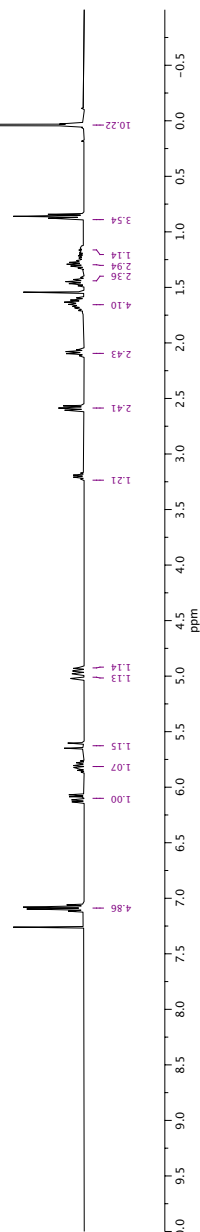
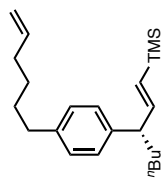
Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 1024  
 Receiver Gain 64.2  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C

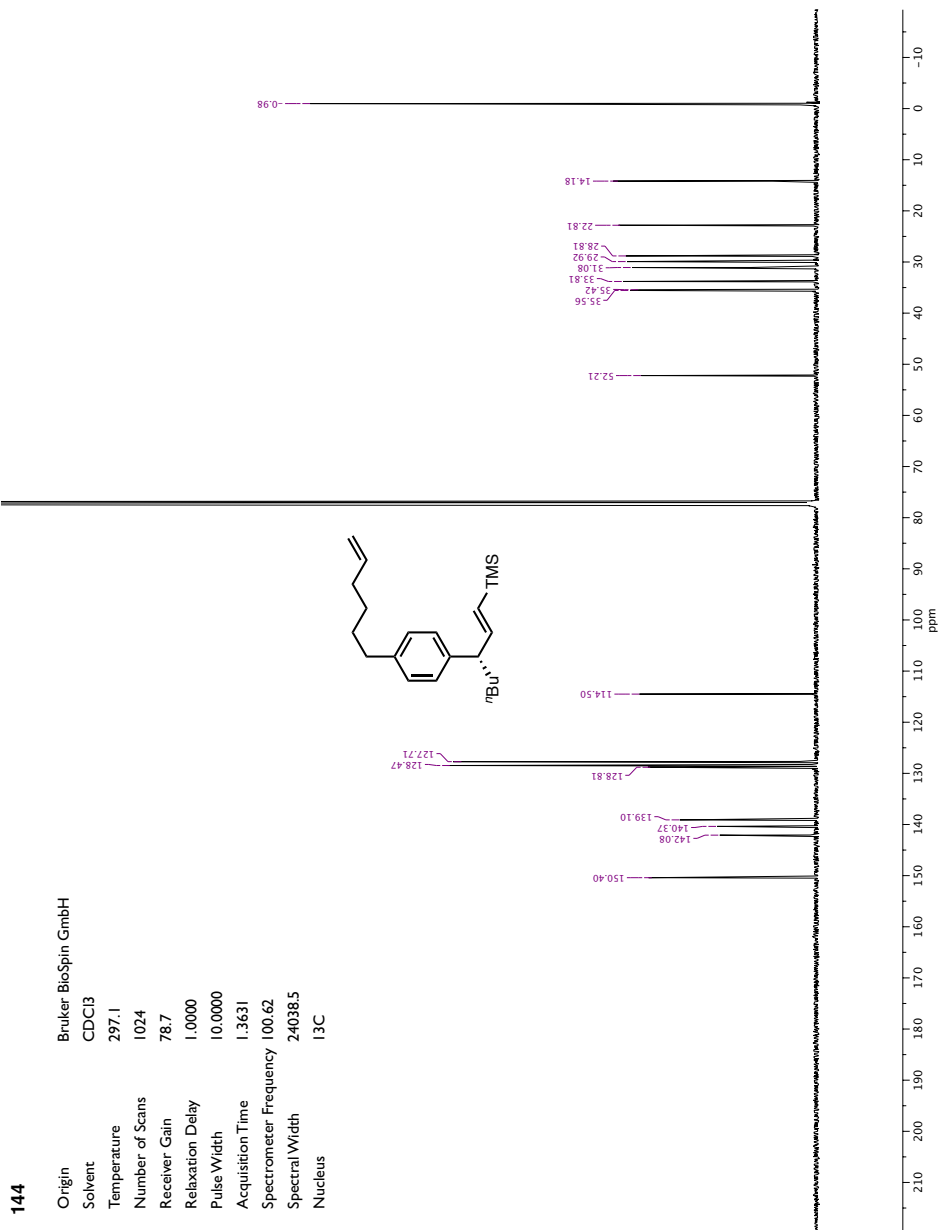


144

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 98.9  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

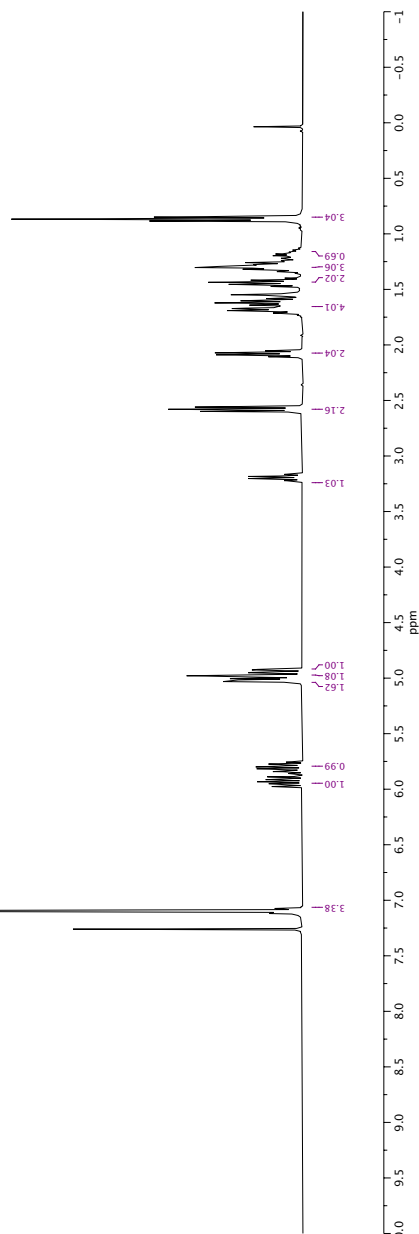
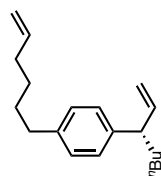
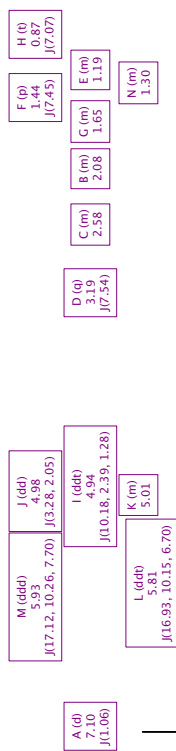
N (m) 7.09  
 K (dt) J(16.53, 0.93)  
 M (dd) J(18.57, 7.10)  
 L (dd) J(16.92, 10.20, 6.68)  
 O (m) 3.20  
 E (m) 2.39  
 D (m) 2.08  
 C (m) 1.05  
 F (m) 1.45  
 H (m) 1.30  
 I (dd) J(10.19, 2.21, 1.19)  
 J (m) 5.00  
 A (d) 0.04 J(0.73)  
 B (t) 0.86 J(7.13)  
 G (m) 1.18





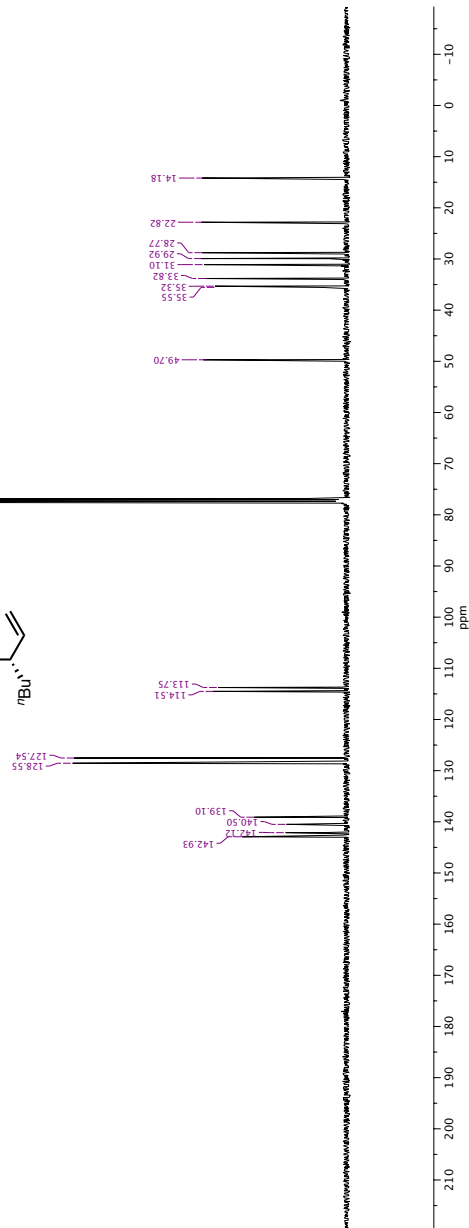
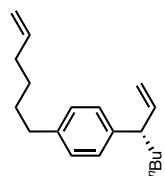
119

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 127.1  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H



119

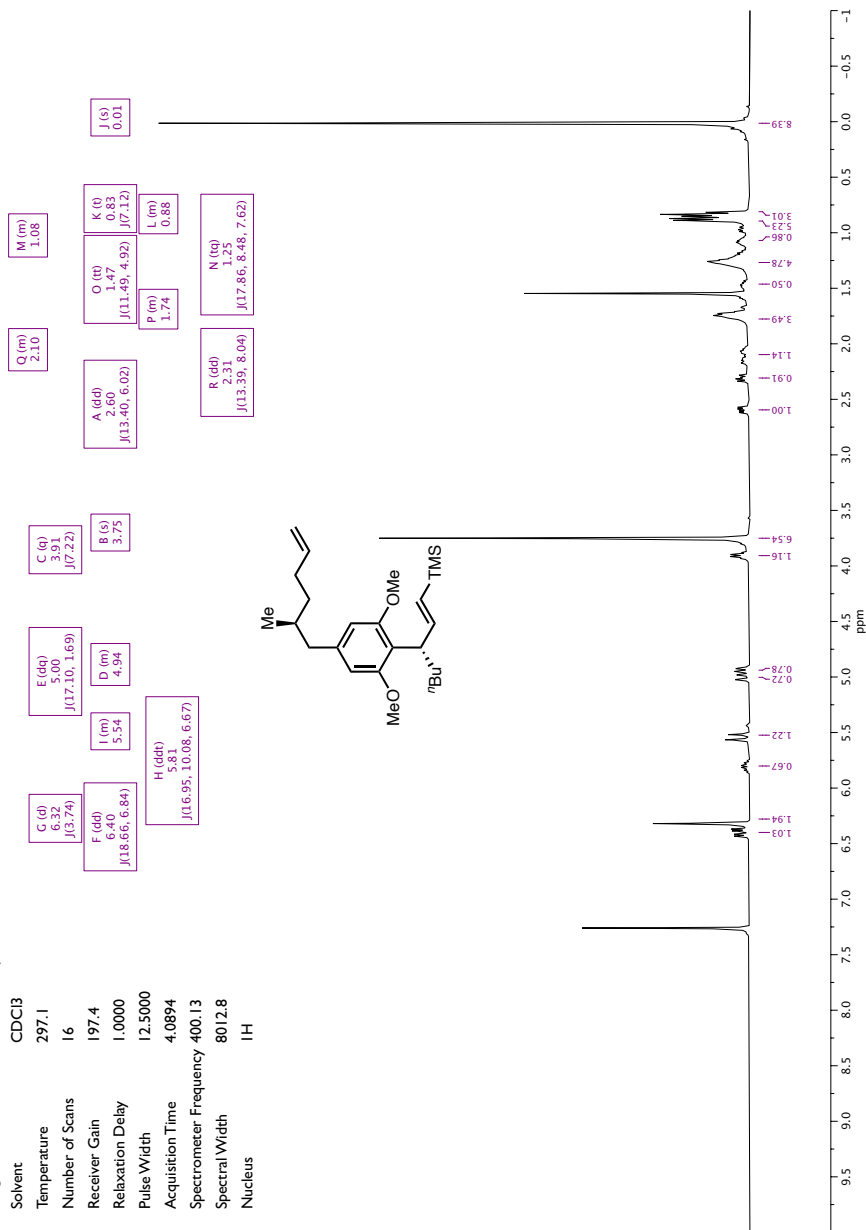
Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 512  
 Receiver Gain 64.2  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



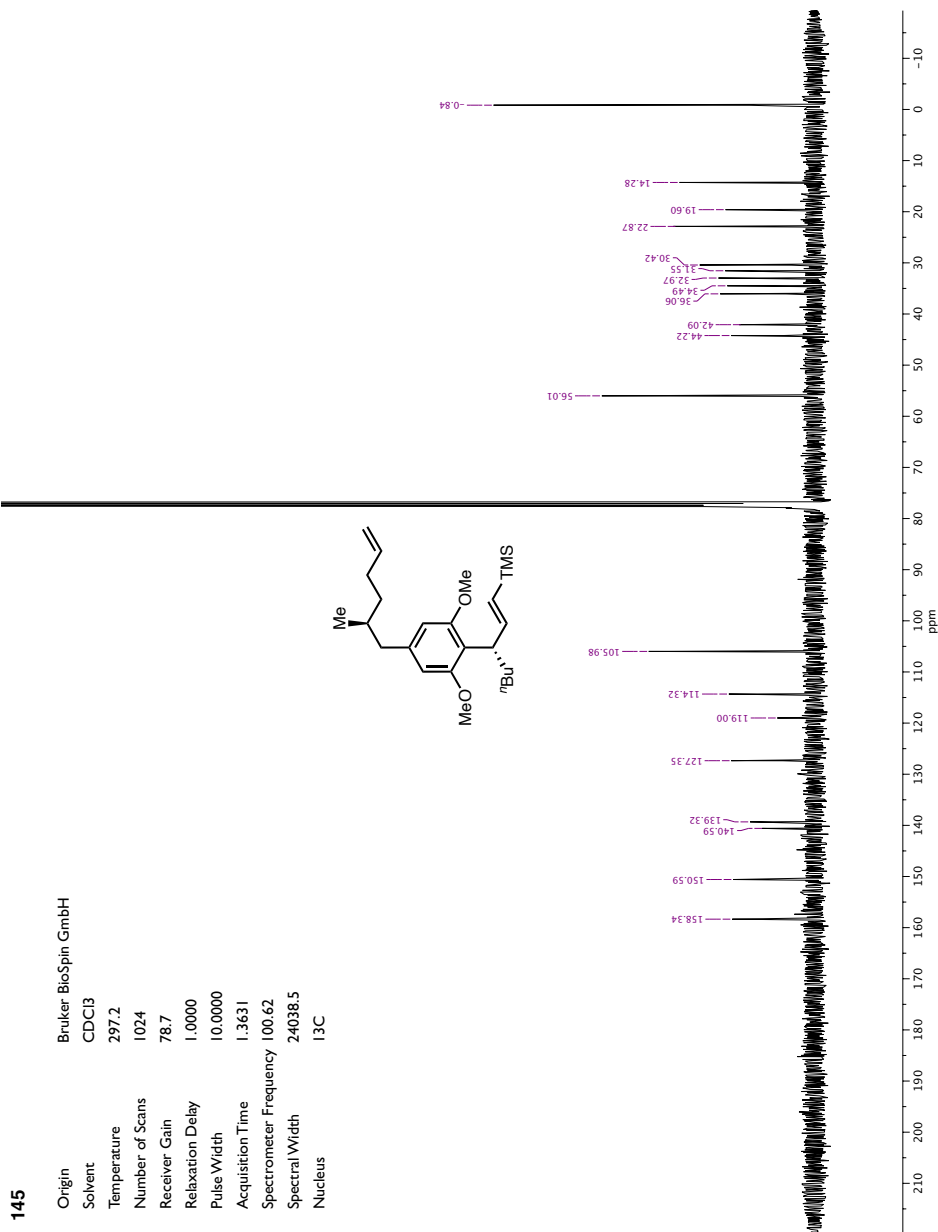
145

Origin Bruker BioSpin GmbH

Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 197.4  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

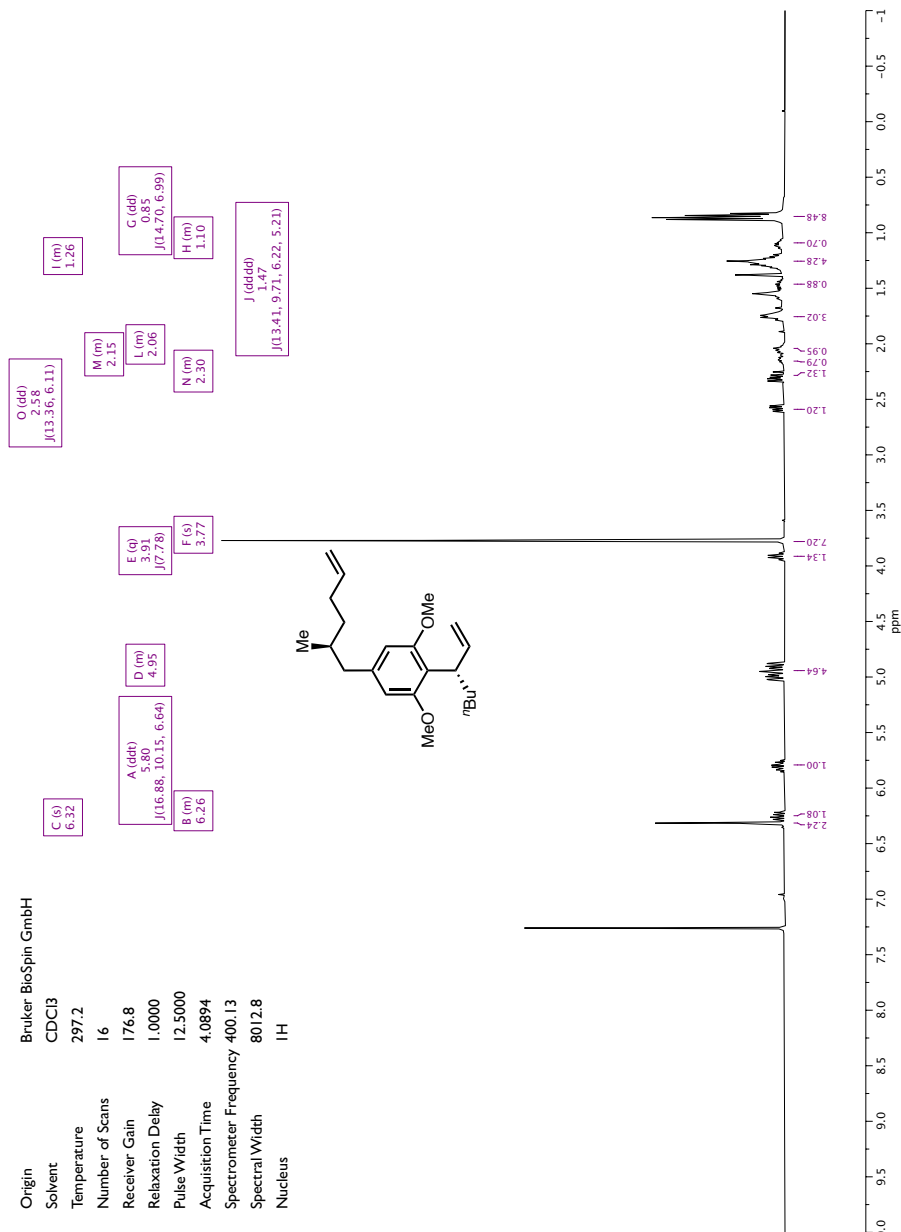


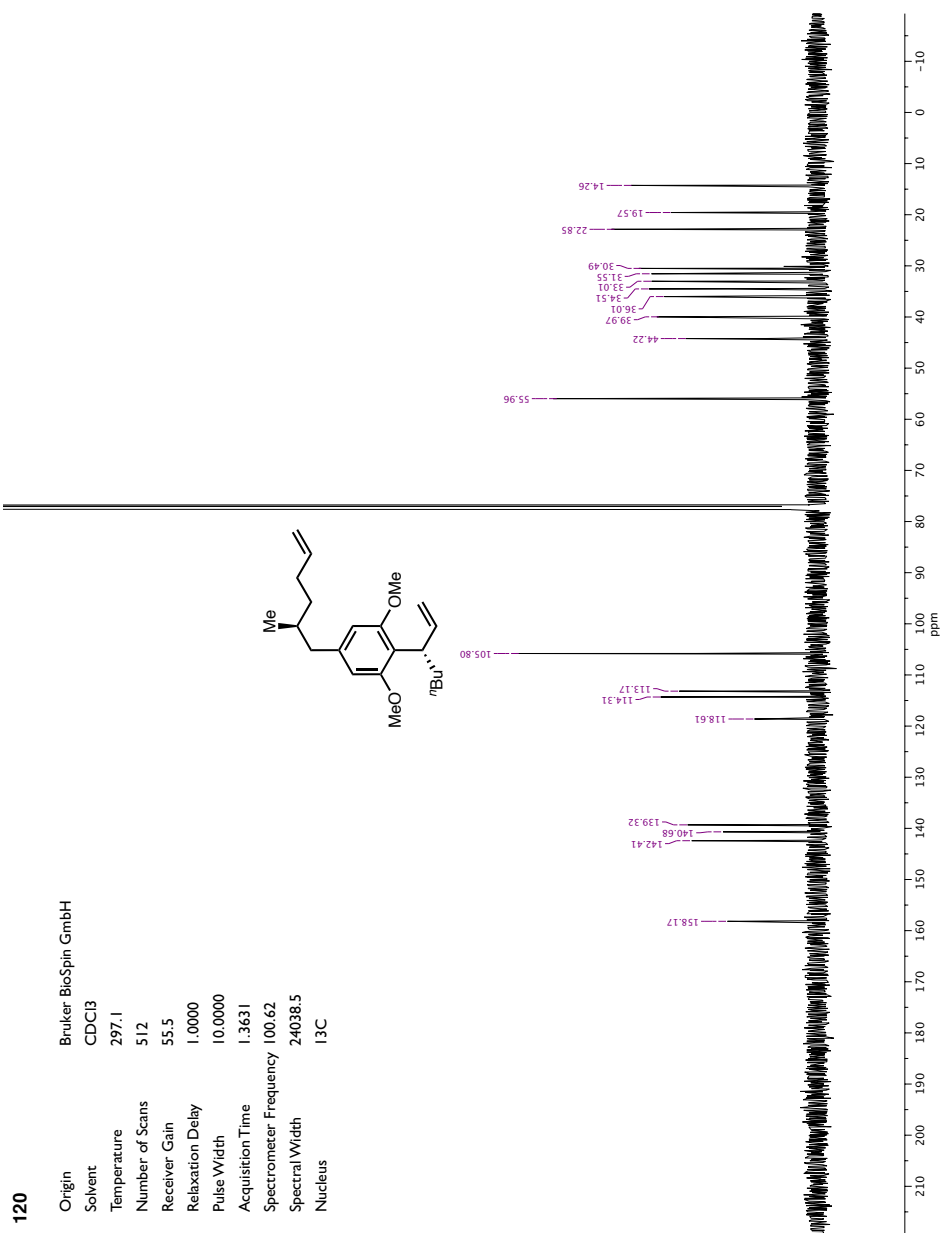


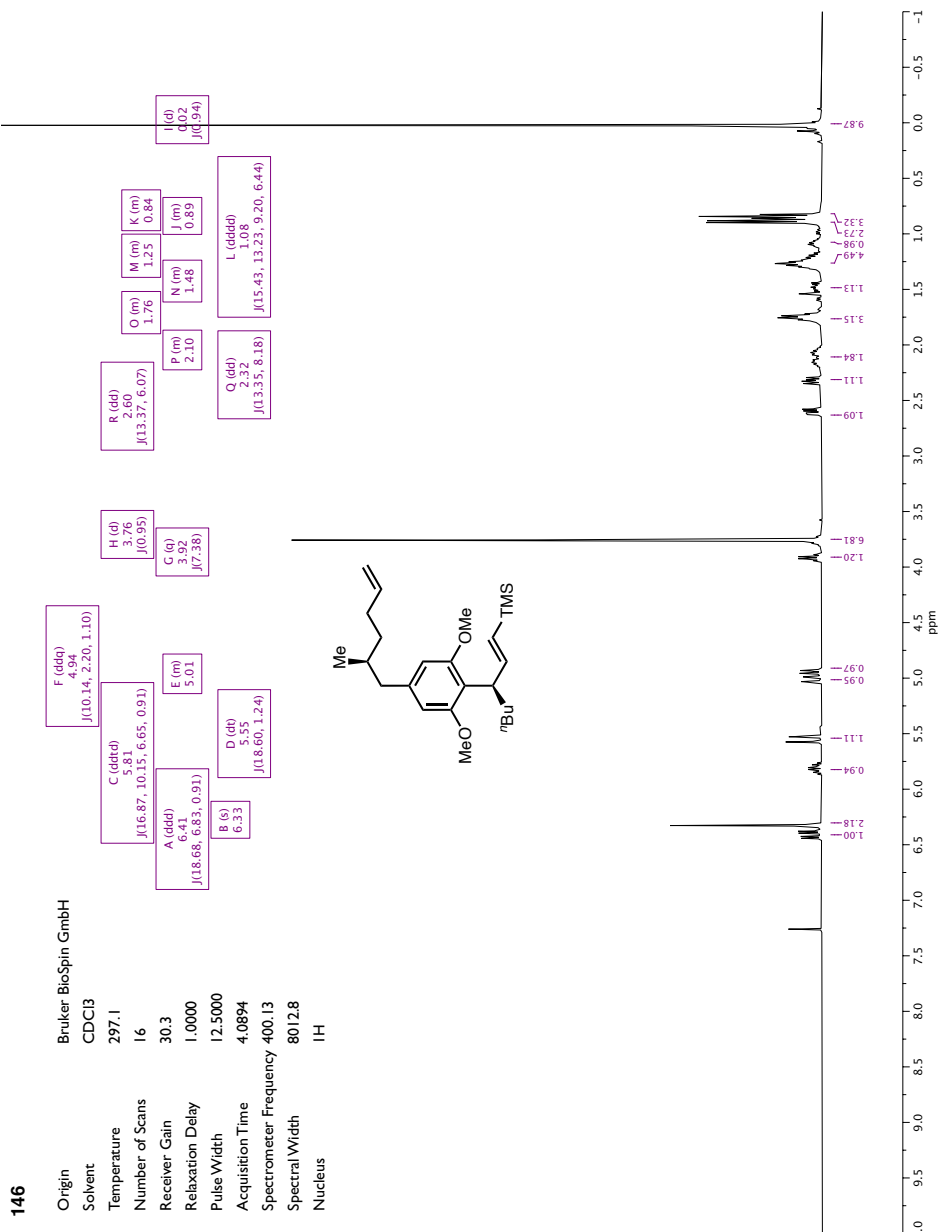


120

Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 16  
 Receiver Gain 176.8  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

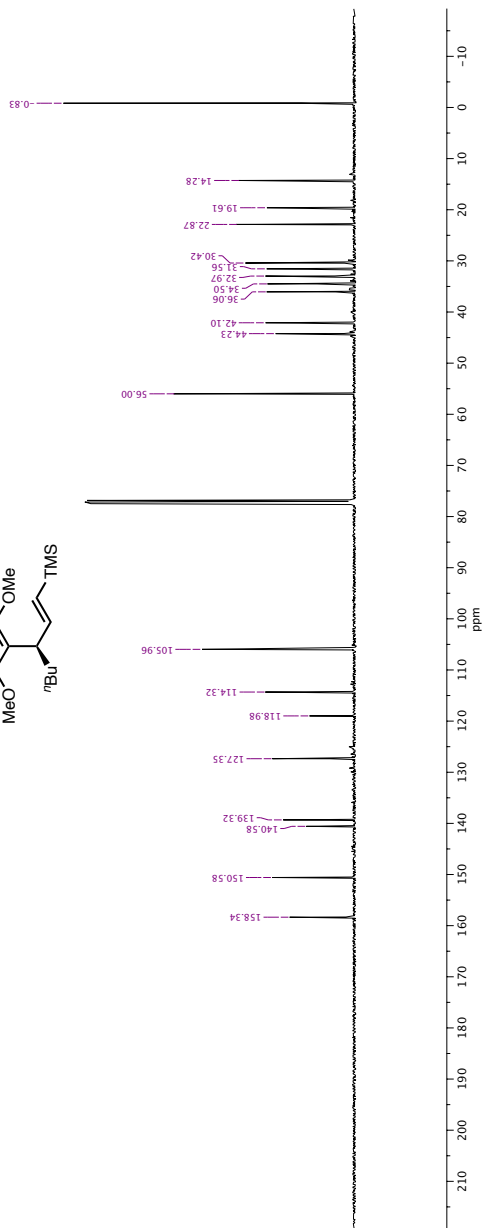
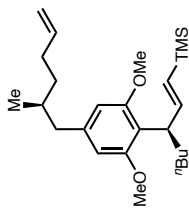


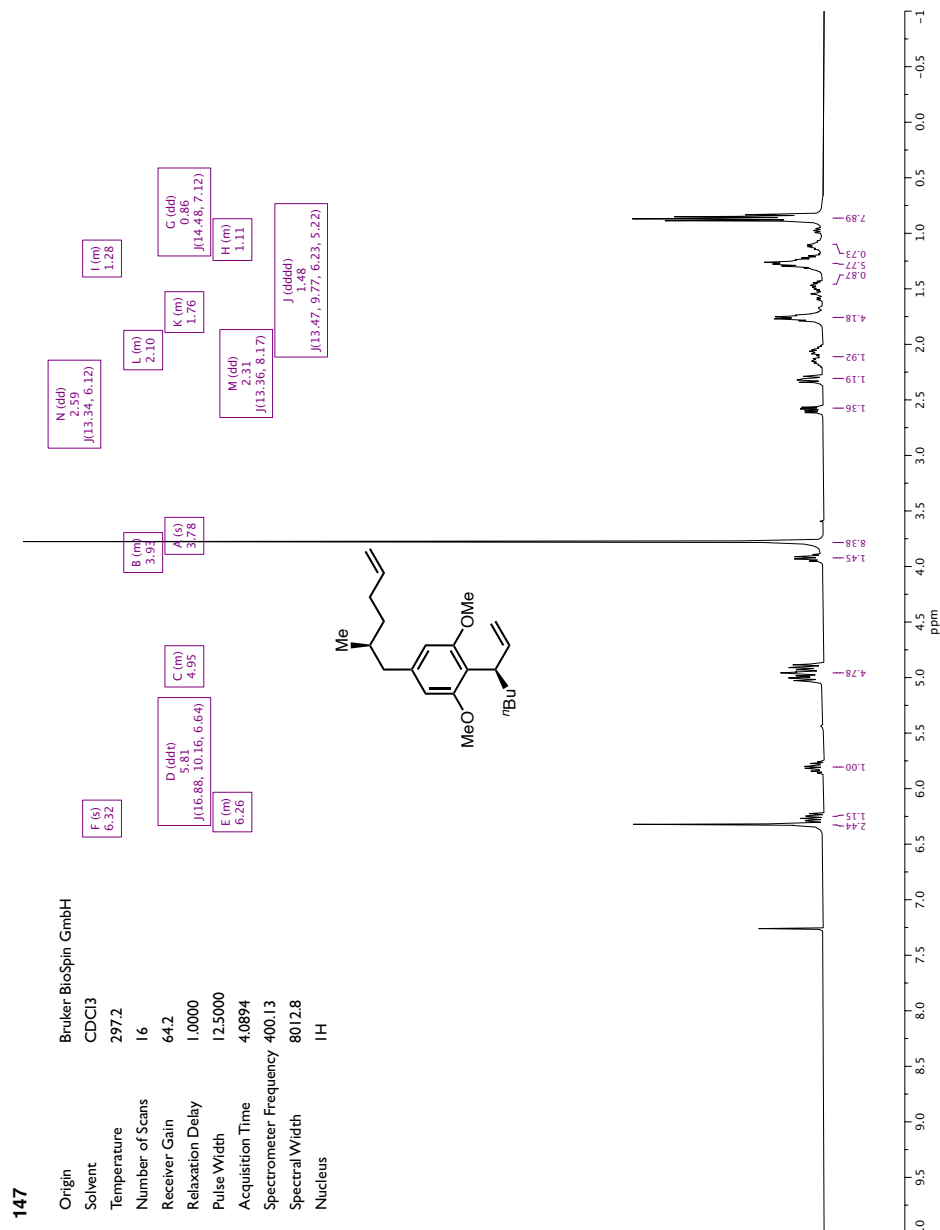




146

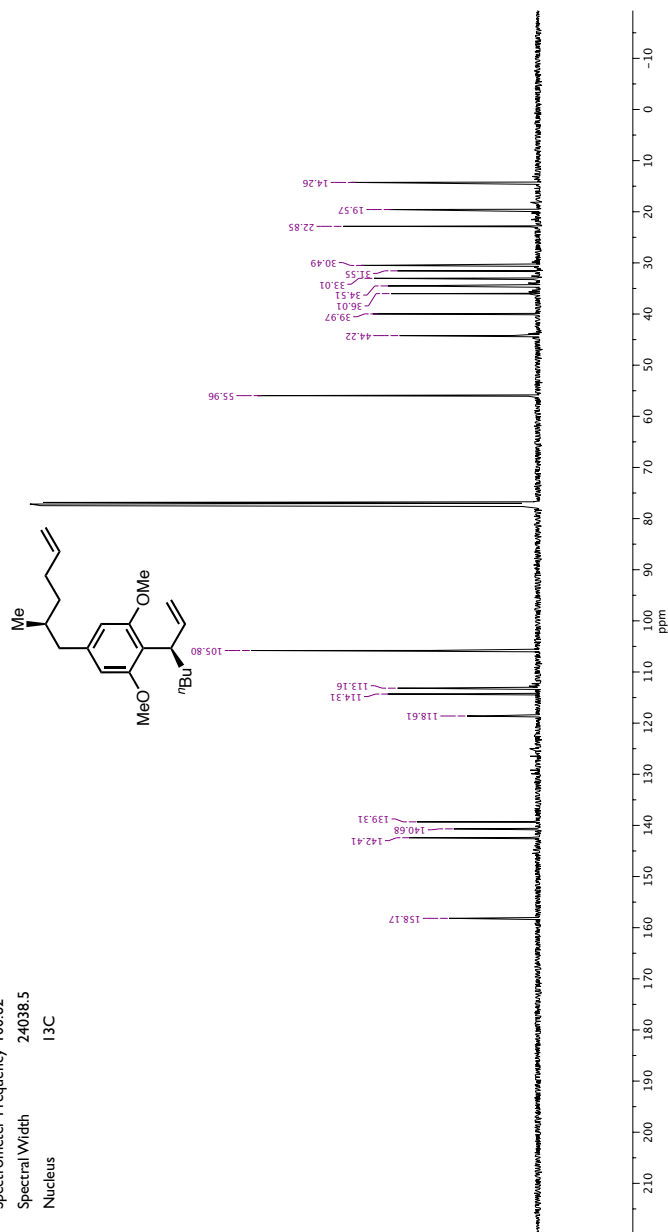
Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 512  
 Receiver Gain 38.0  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C





147

Origin Bruker BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 512  
 Receiver Gain 78.7  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C

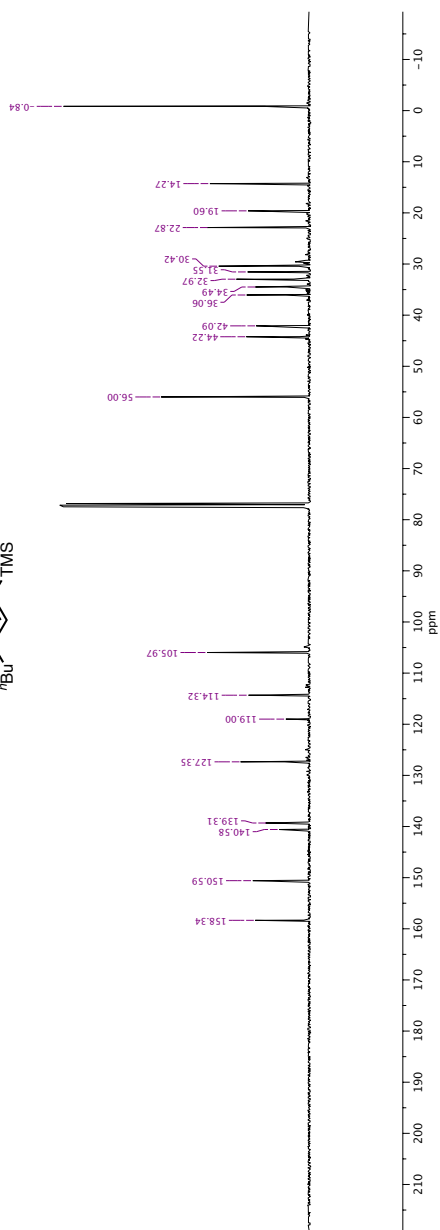
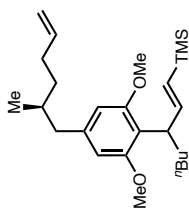






148

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.2  
 Number of Scans 512  
 Receiver Gain 64.2  
 Relaxation Delay 1.0000  
 Pulse Width 10.0000  
 Acquisition Time 1.3631  
 Spectrometer Frequency 100.62  
 Spectral Width 24038.5  
 Nucleus <sup>13</sup>C



149

Origin Bruker-BioSpin GmbH  
 Solvent CDCl<sub>3</sub>  
 Temperature 297.1  
 Number of Scans 16  
 Receiver Gain 87.8  
 Relaxation Delay 1.0000  
 Pulse Width 12.5000  
 Acquisition Time 4.0894  
 Spectrometer Frequency 400.13  
 Spectral Width 8012.8  
 Nucleus <sup>1</sup>H

