

SUPPORTING INFORMATION FOR:

The Palladium-Catalyzed Intramolecular Alder-ene Reactions of *O*- and *N*-Linked 1,6-Enynes Incorporating Triethylsilyl Capping Groups

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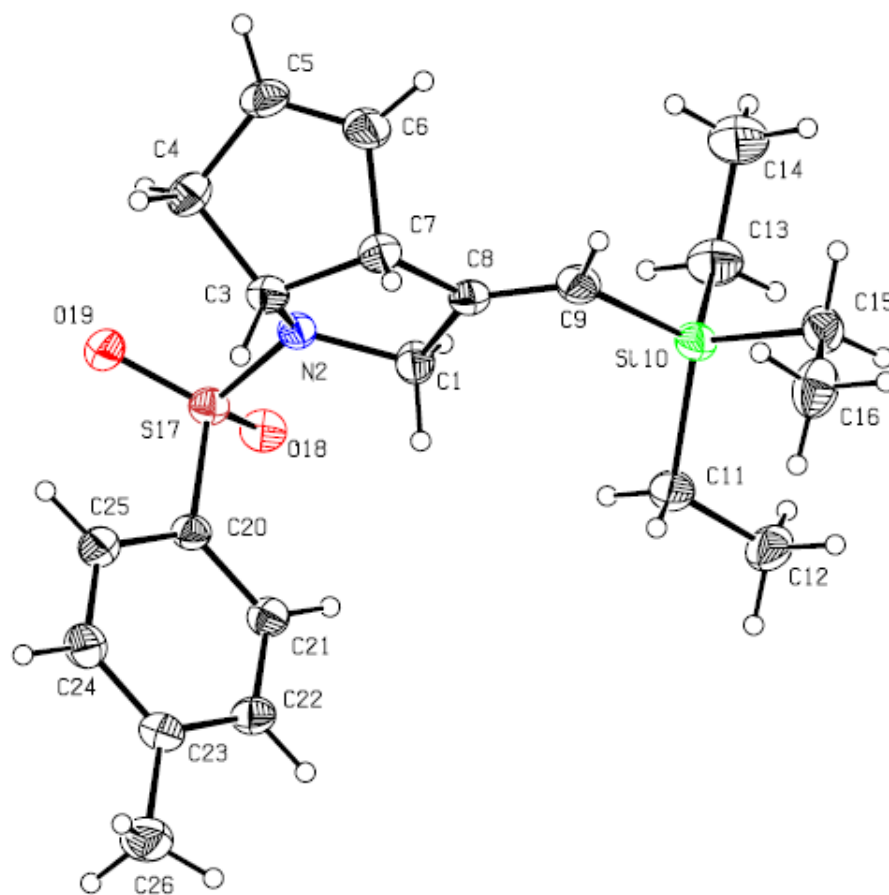
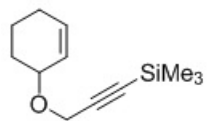
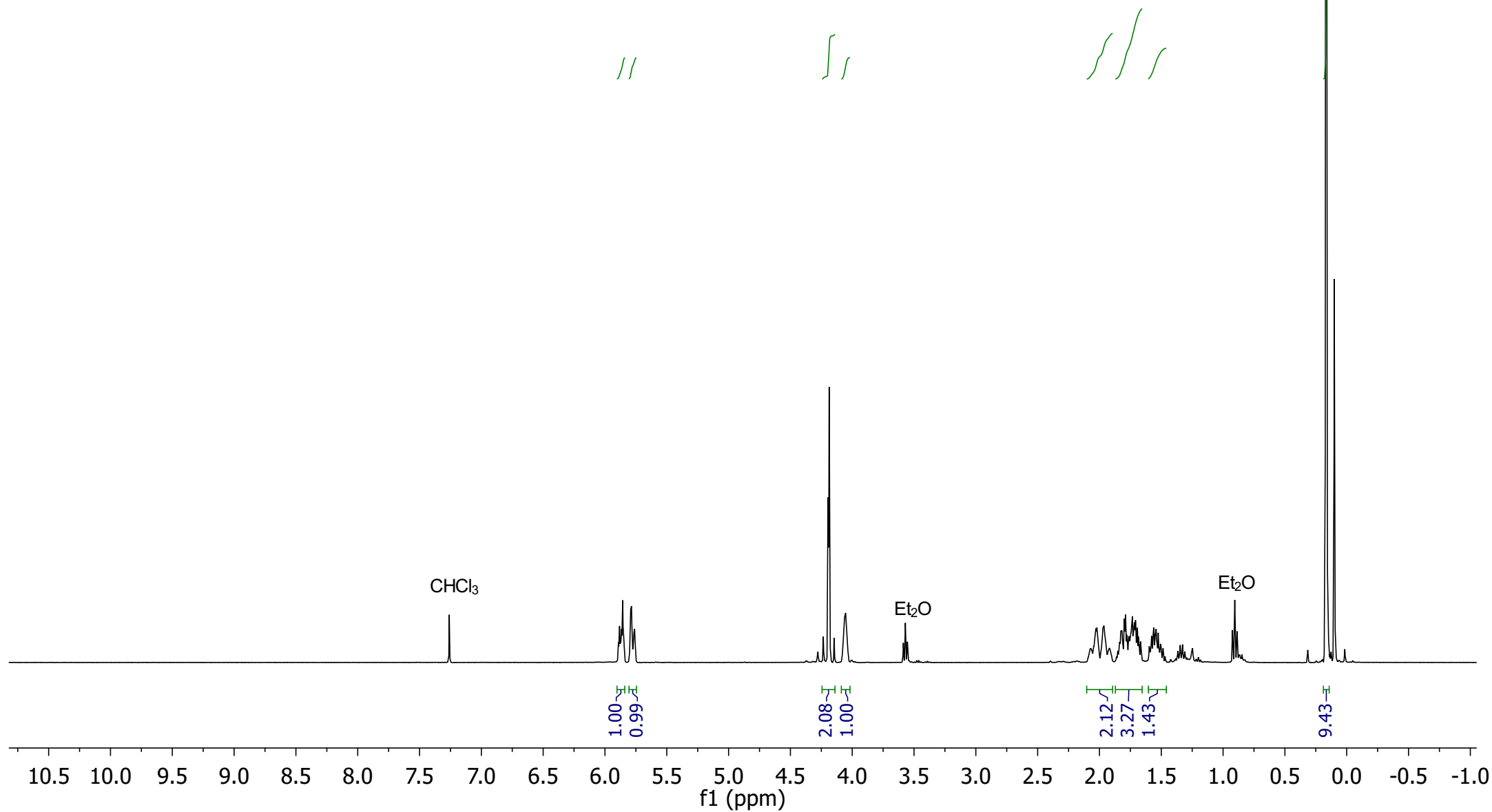
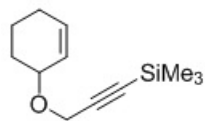


Figure S1: Structure of compound **20** (CCDC 1572856) with labeling of selected atoms. Anisotropic displacement ellipsoids show 30% probability levels. Hydrogen atoms are drawn as circles with small radii.

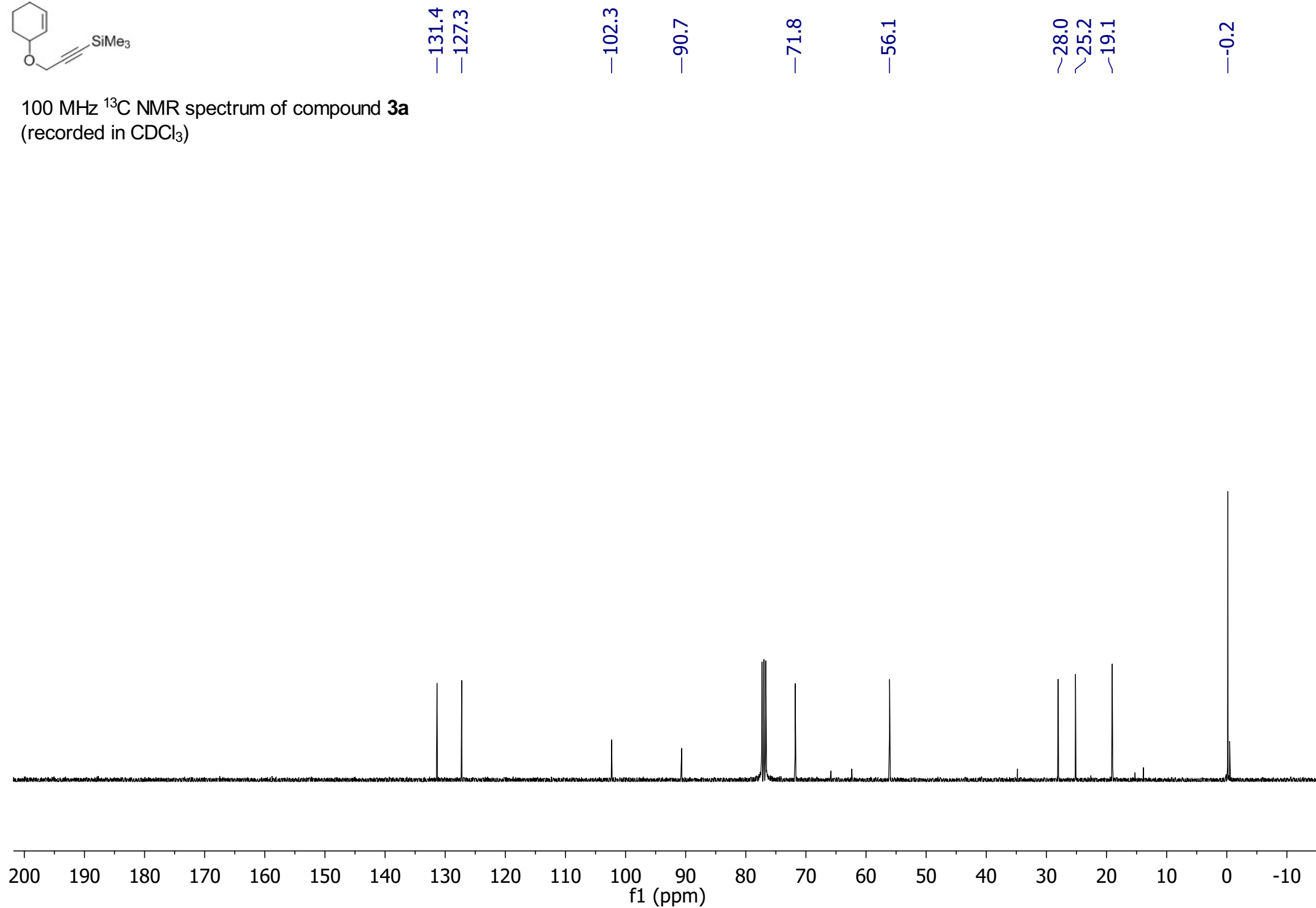


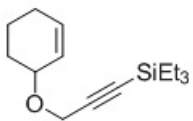
400 MHz ^1H NMR spectrum of compound **3a**
(recorded in CDCl_3)



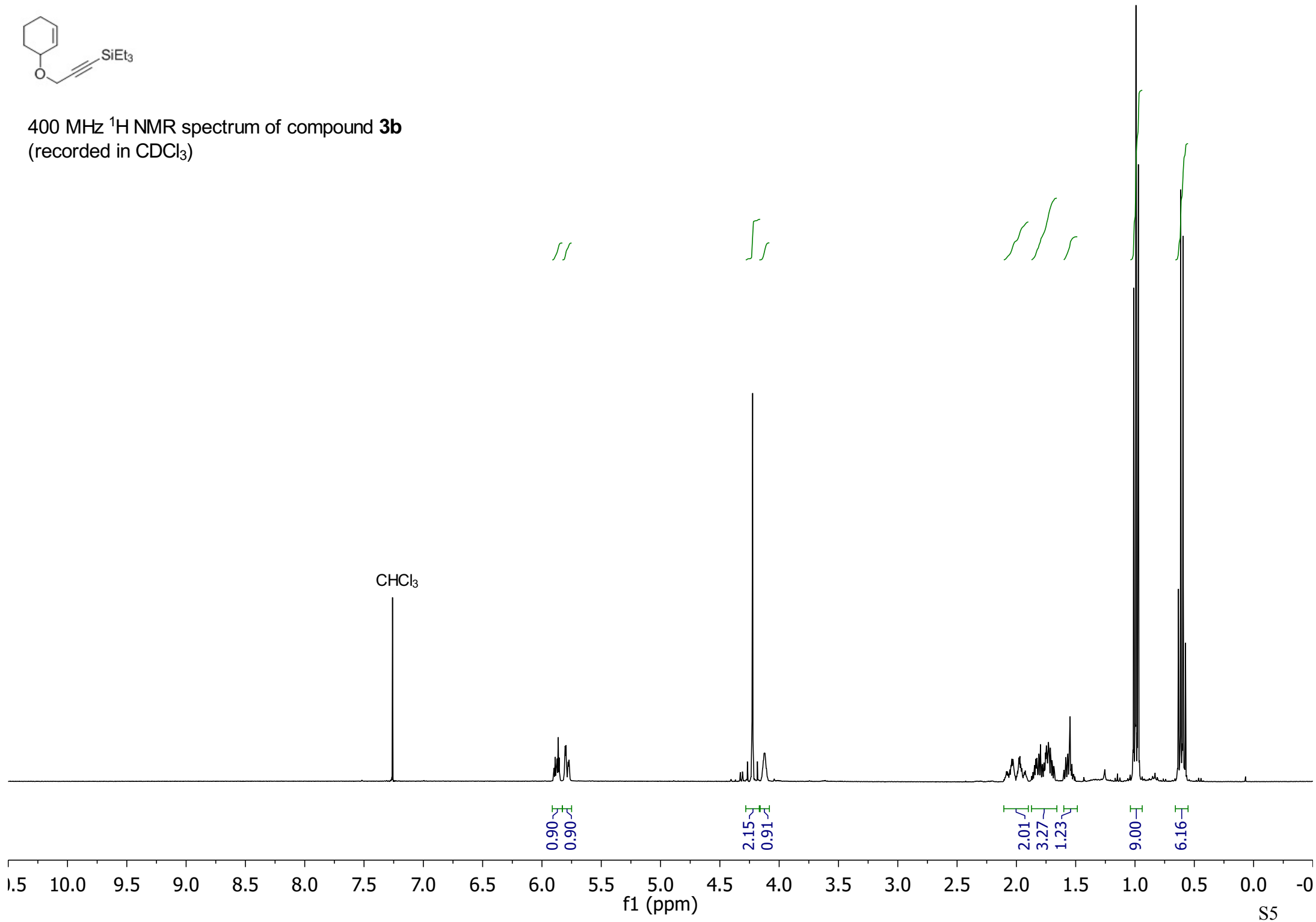


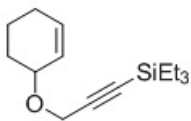
100 MHz ^{13}C NMR spectrum of compound **3a**
(recorded in CDCl_3)



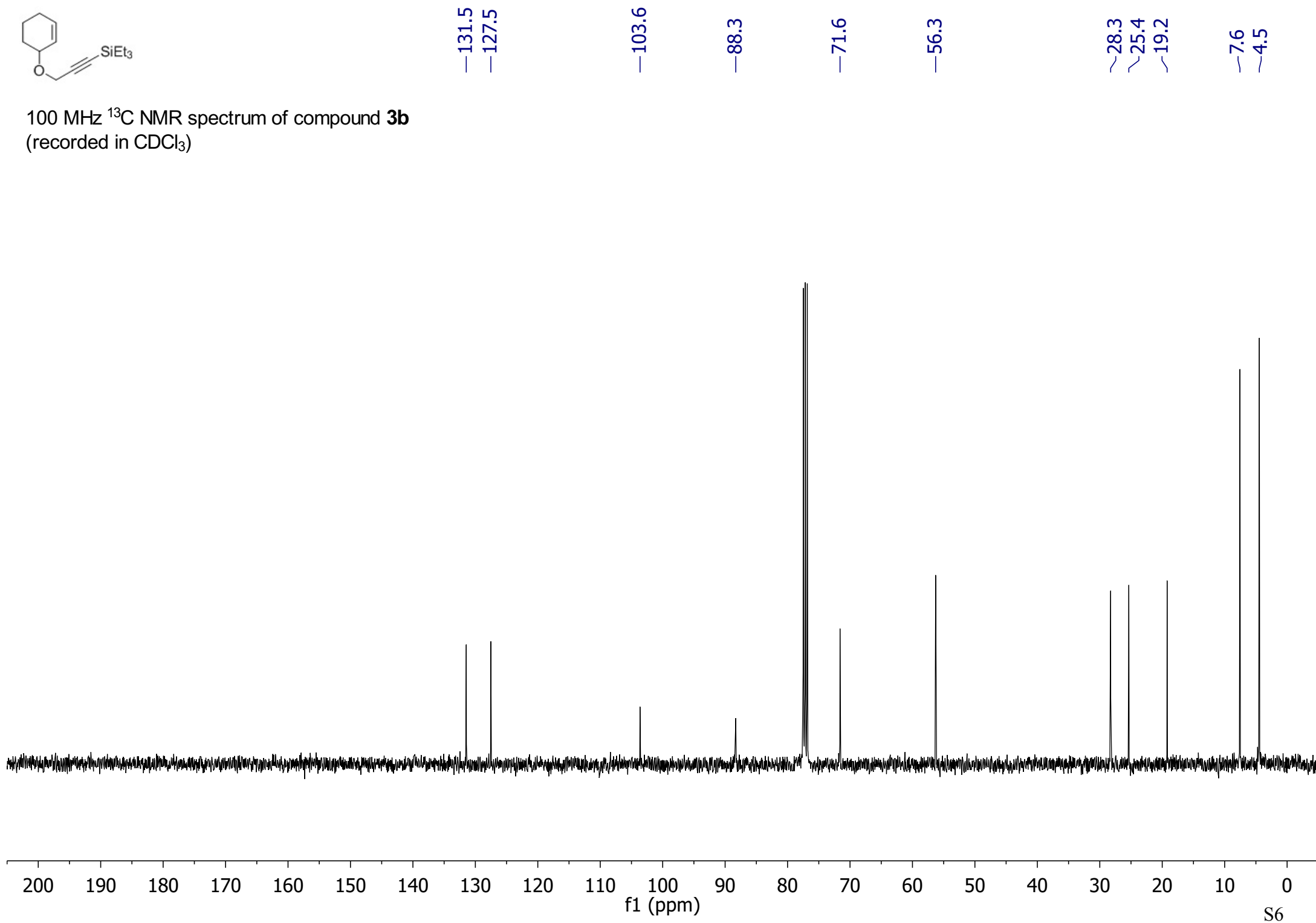


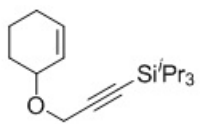
400 MHz ^1H NMR spectrum of compound **3b**
(recorded in CDCl_3)



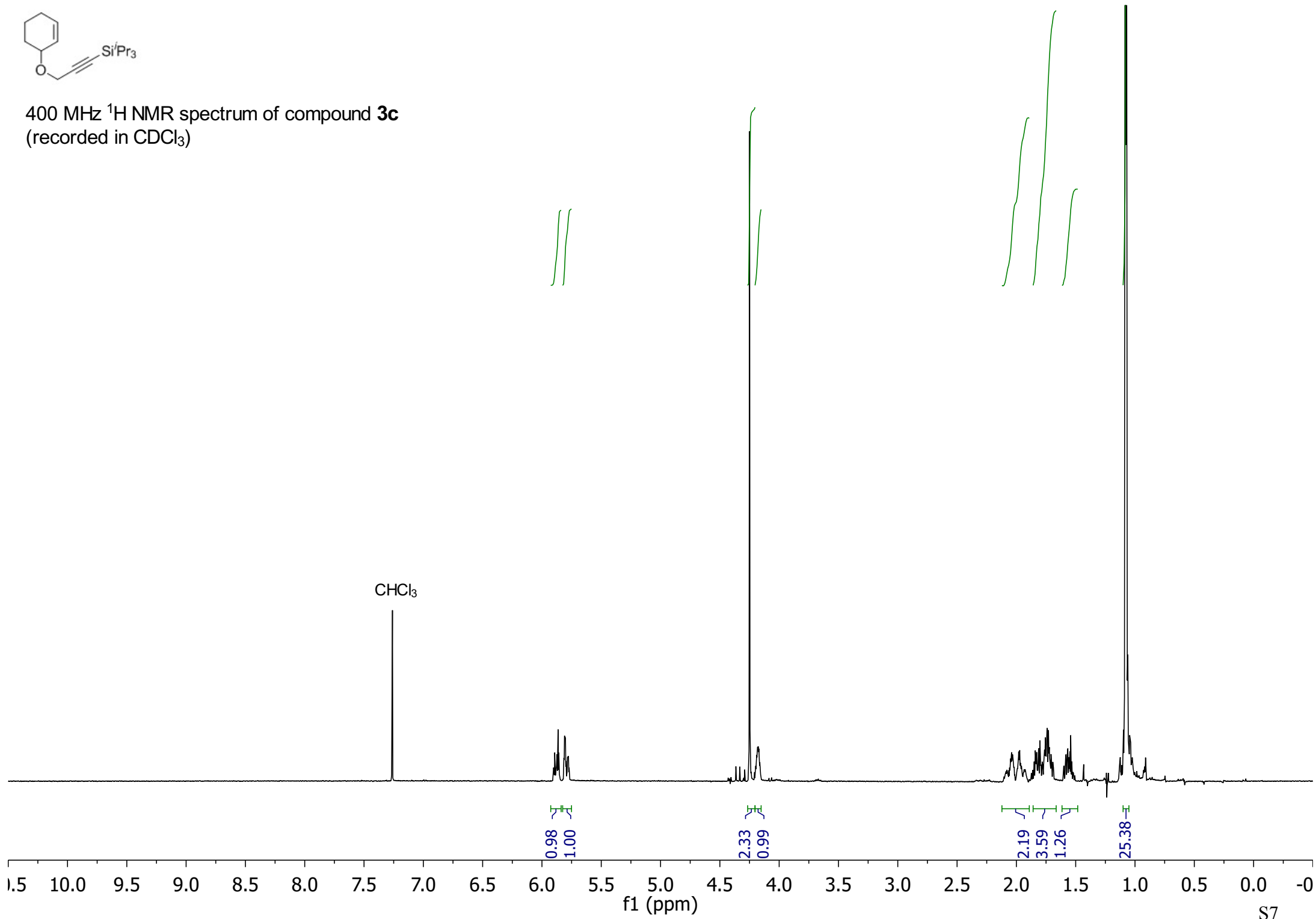


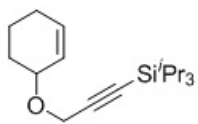
100 MHz ^{13}C NMR spectrum of compound **3b**
(recorded in CDCl_3)



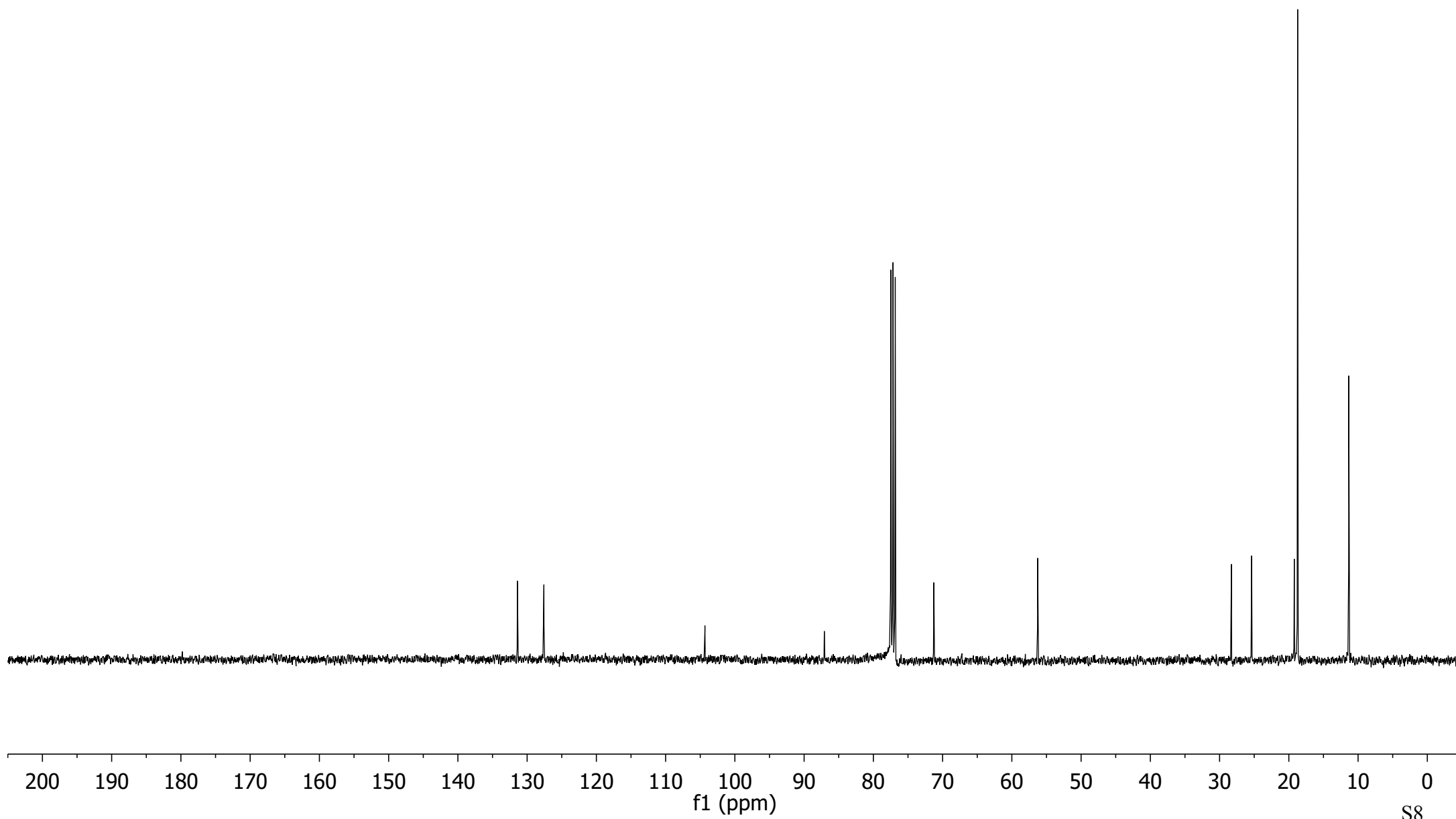


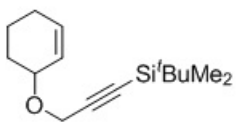
400 MHz ^1H NMR spectrum of compound **3c**
(recorded in CDCl_3)



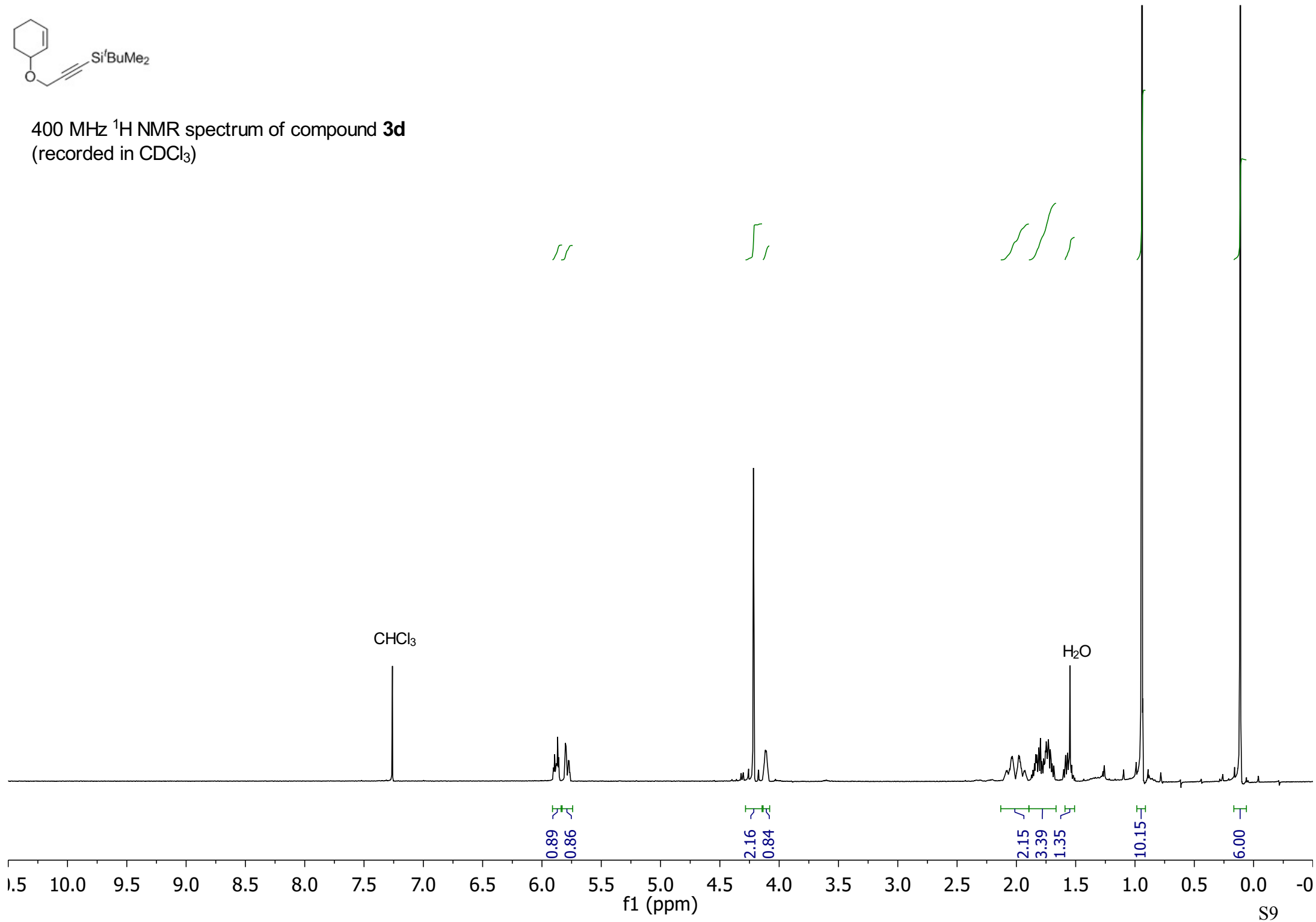


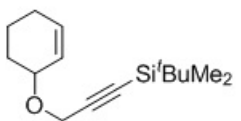
100 MHz ^{13}C NMR spectrum of compound **3c**
(recorded in CDCl_3)



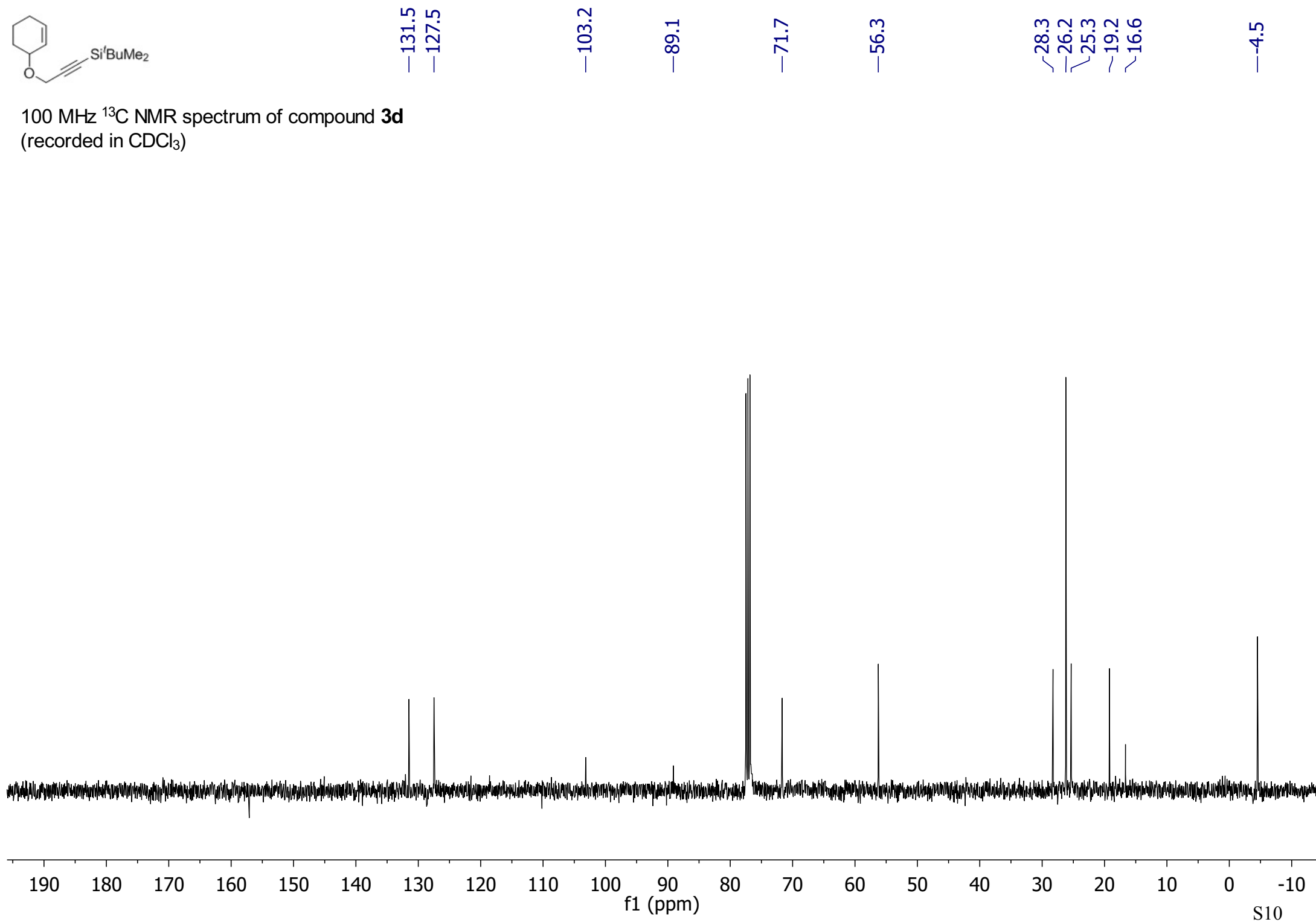


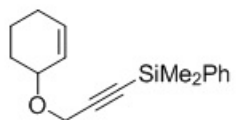
400 MHz ^1H NMR spectrum of compound **3d**
(recorded in CDCl_3)



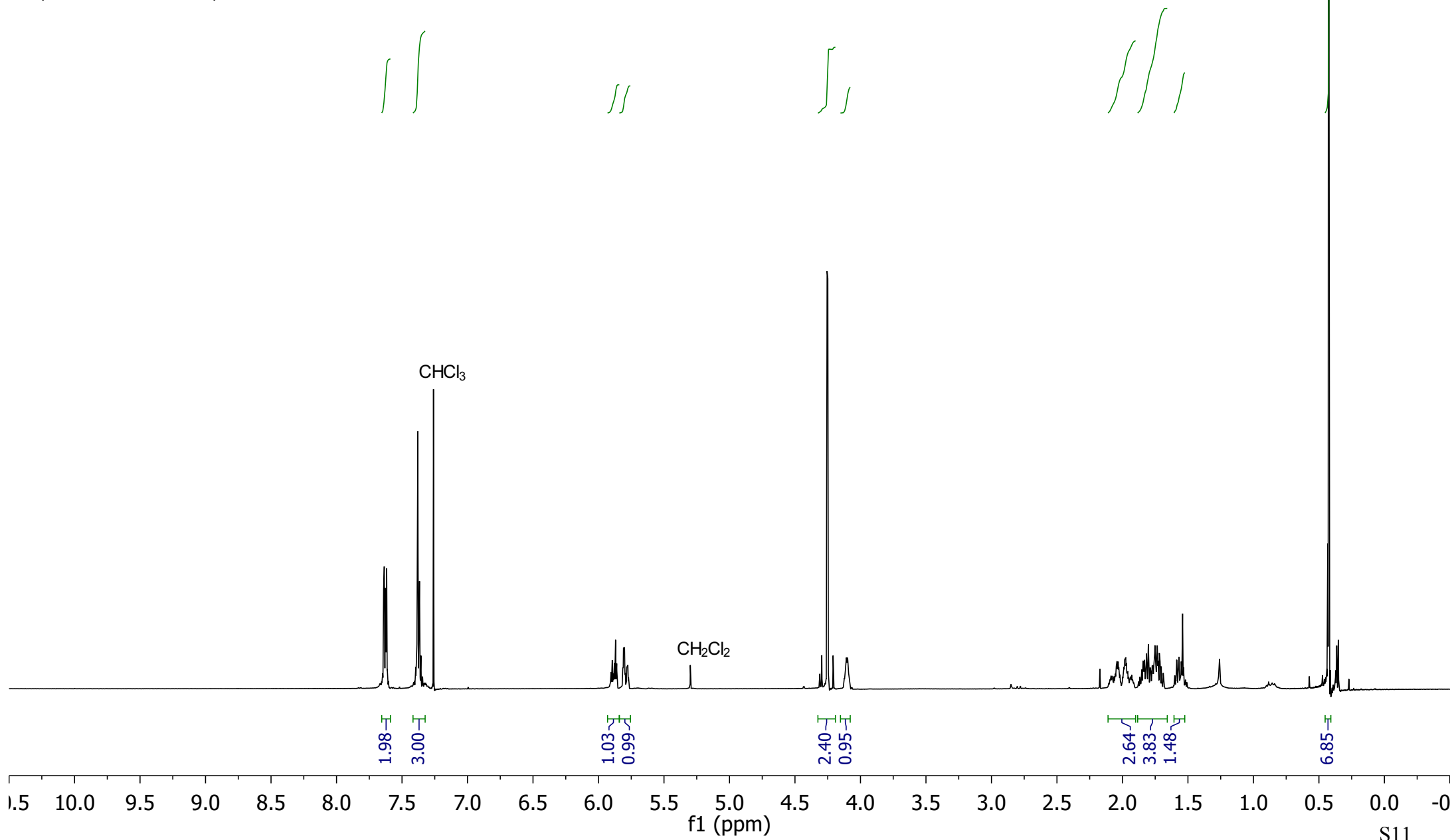


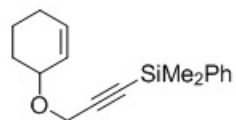
100 MHz ^{13}C NMR spectrum of compound **3d**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **3e**
(recorded in CDCl_3)





136.9
133.8
131.6
129.6
128.0
127.4

104.3

88.9

72.0

56.3

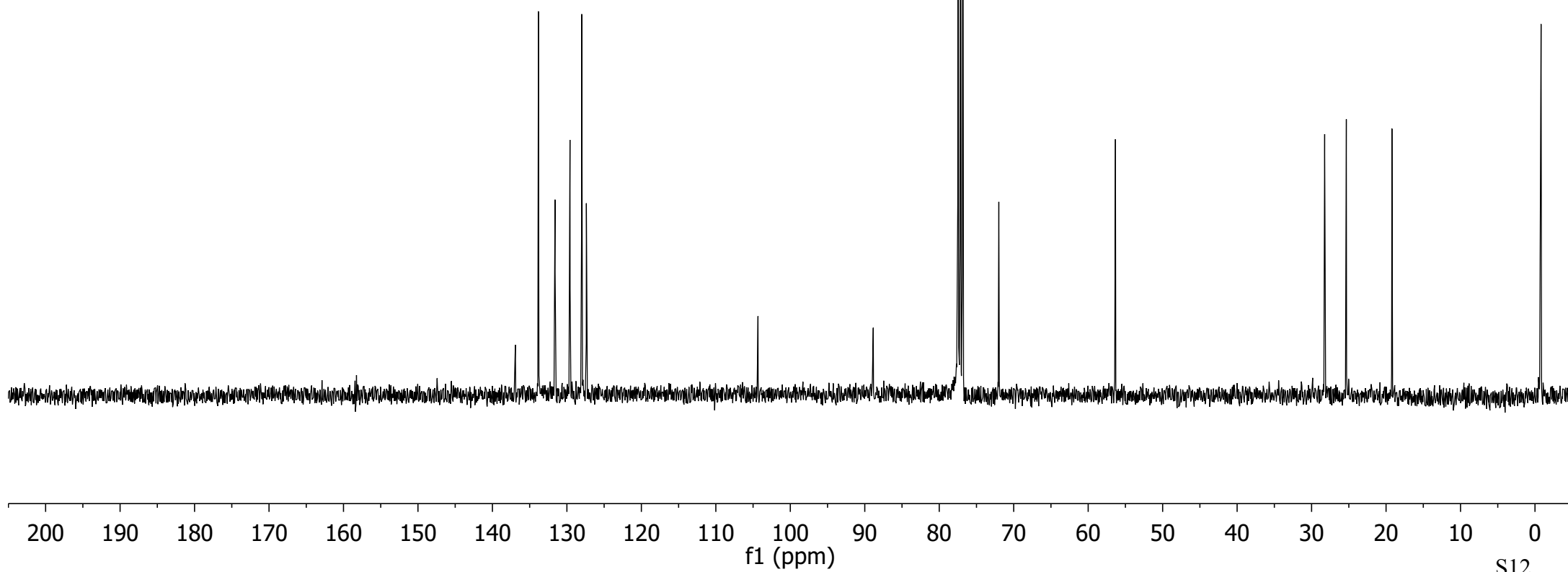
28.2

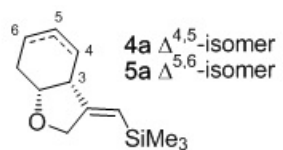
25.3

19.2

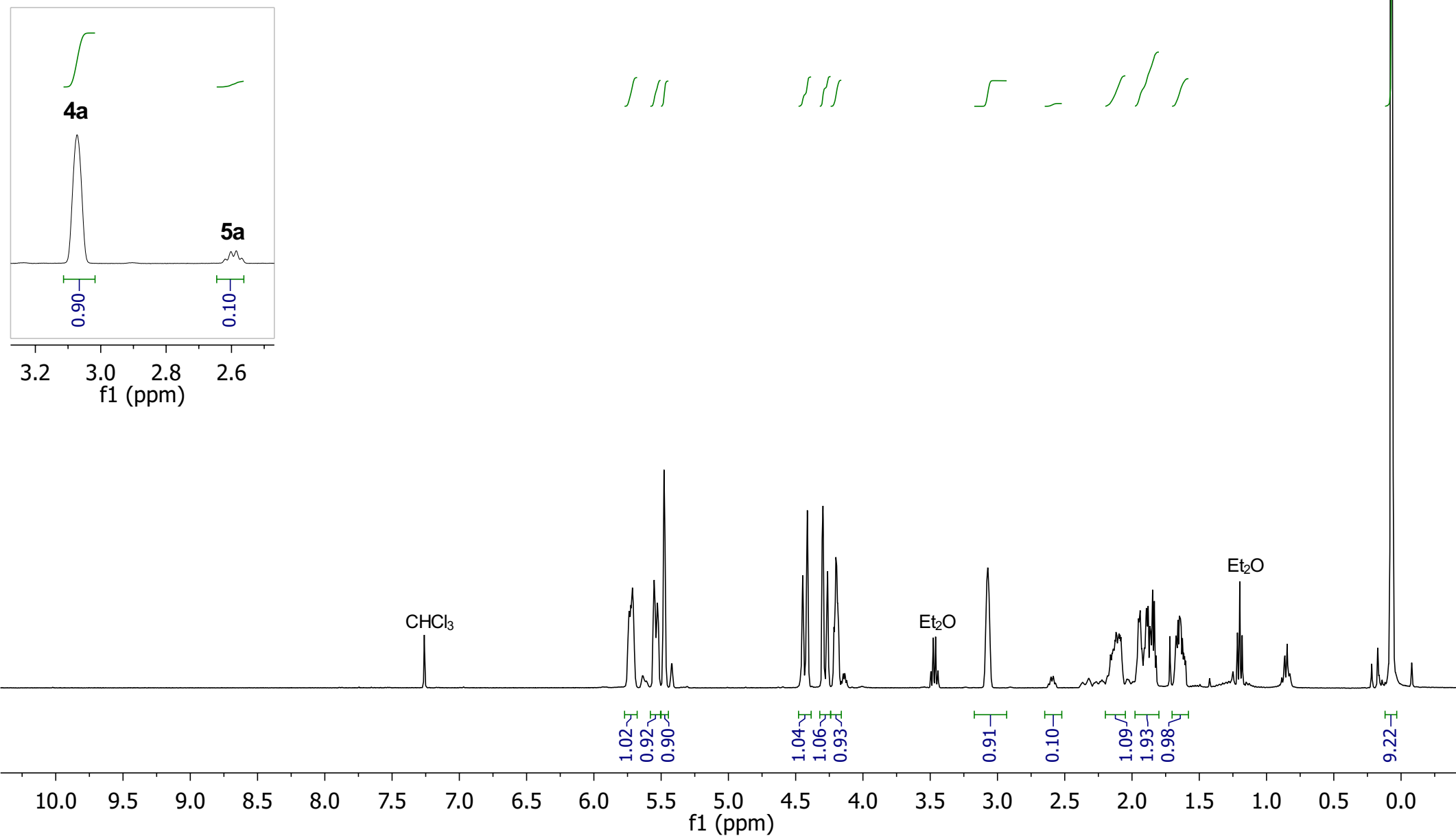
-0.8

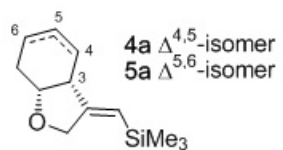
100 MHz ^{13}C NMR spectrum of compound **3e**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of a ca 9:1 mixture of compounds **4a** and **5a**
 (recorded in CDCl_3)





—160.1

126.7
126.5
—118.8

—76.1

—69.5

—46.5

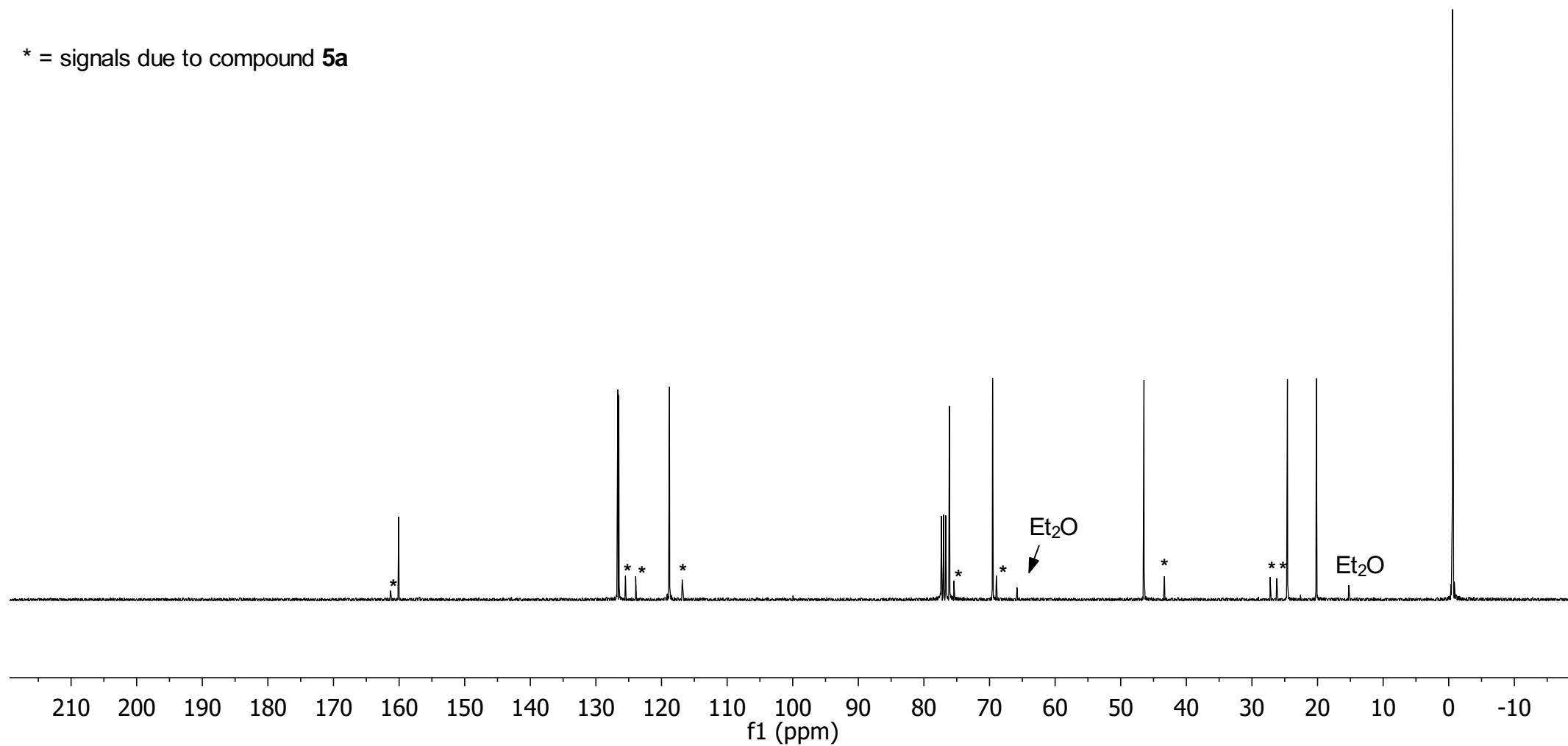
—24.6

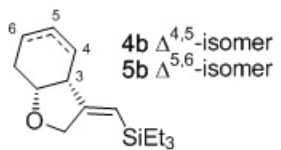
—20.2

—0.6

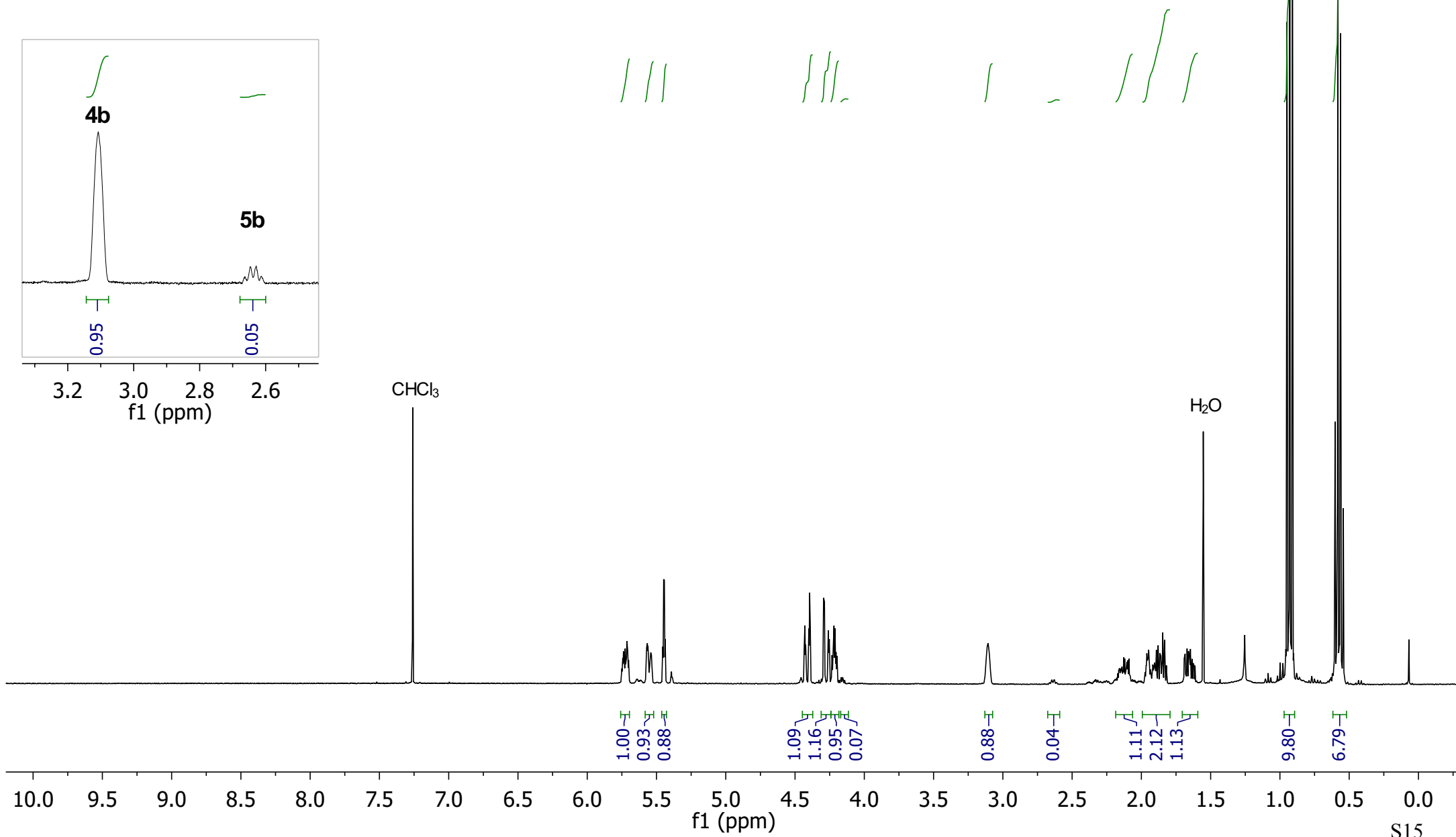
100 MHz ^{13}C NMR spectrum of a ca 9:1 mixture of compounds **4a** and **5a**
(recorded in CDCl_3)

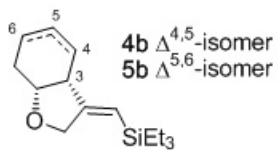
* = signals due to compound **5a**



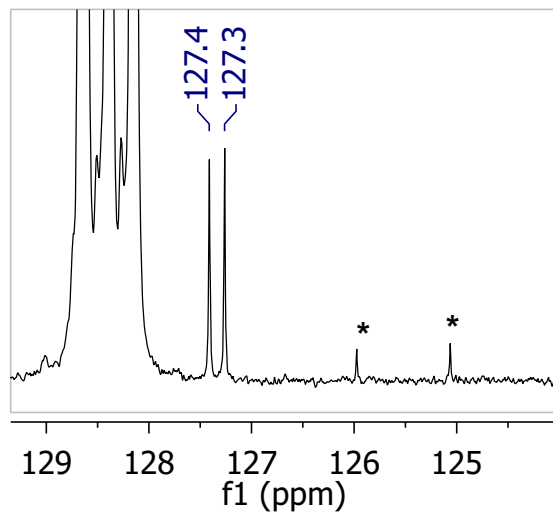


400 MHz ^1H NMR spectrum of a ca 95:5 mixture of compounds **4b** and **5b**
 (recorded in CDCl_3)

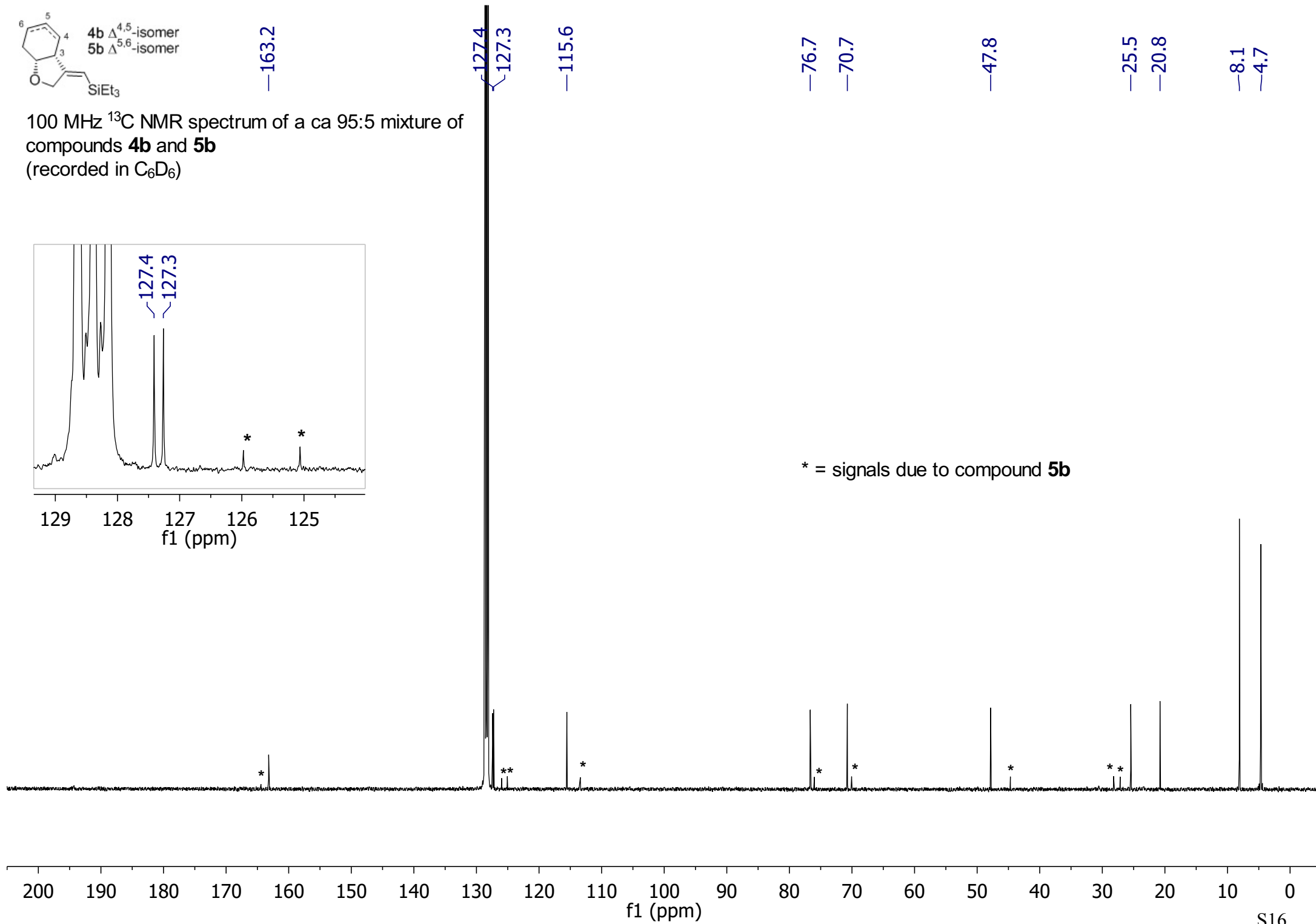


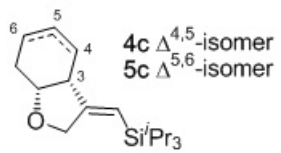


100 MHz ^{13}C NMR spectrum of a ca 95:5 mixture of compounds **4b** and **5b**
 (recorded in C_6D_6)

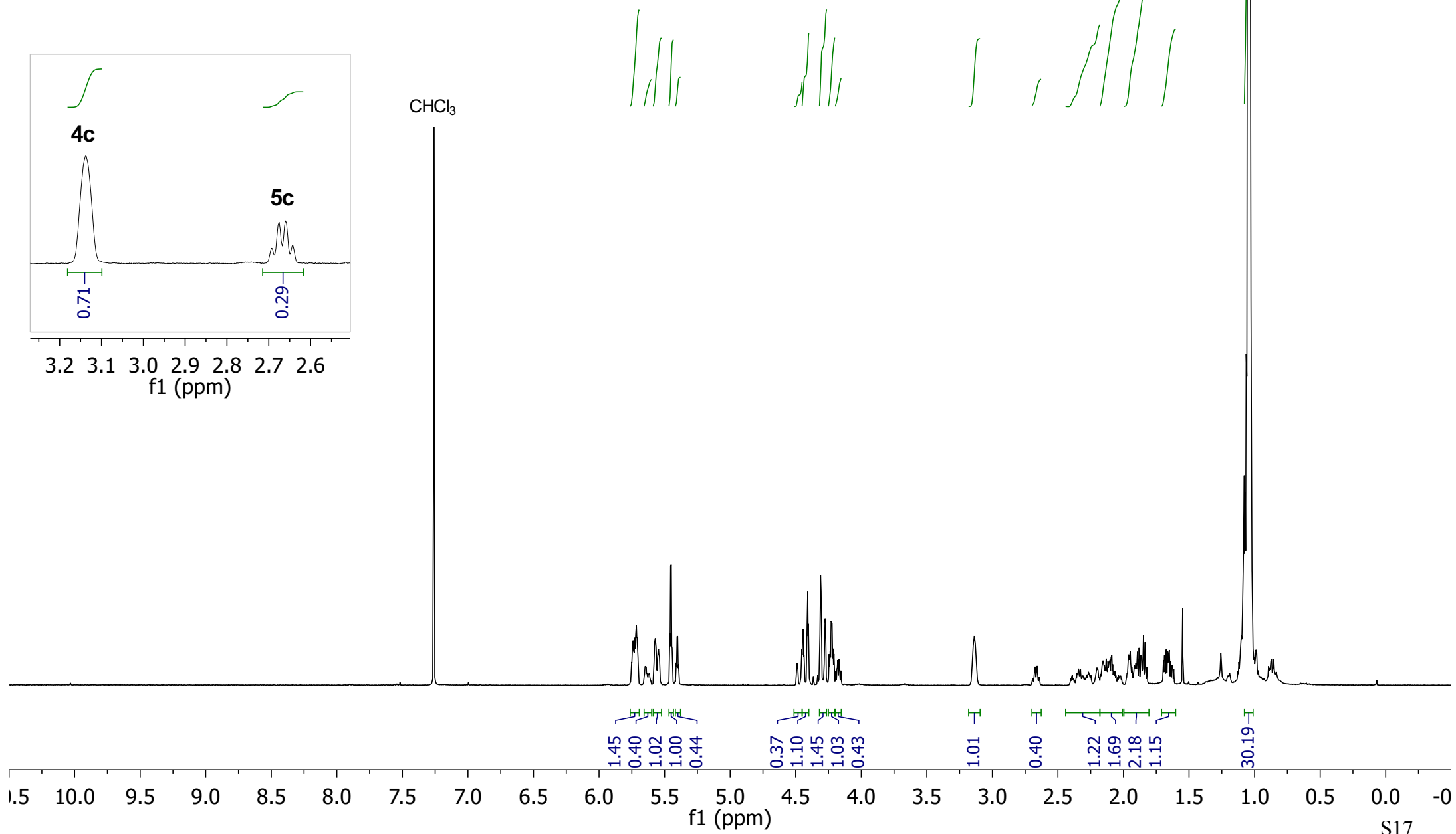


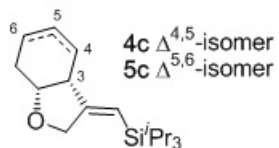
* = signals due to compound **5b**





400 MHz ^1H NMR spectrum of a ca 7:3 mixture of compounds **4c** and **5c**
(recorded in CDCl_3)





100 MHz ^{13}C NMR spectrum of a ca 7:3 mixture of compounds **4c** and **5c**
(recorded in CDCl_3)

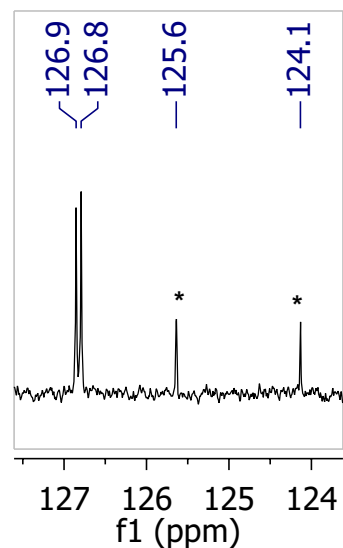
162.9
161.7

126.9
126.8
125.6
124.1
114.4
112.4

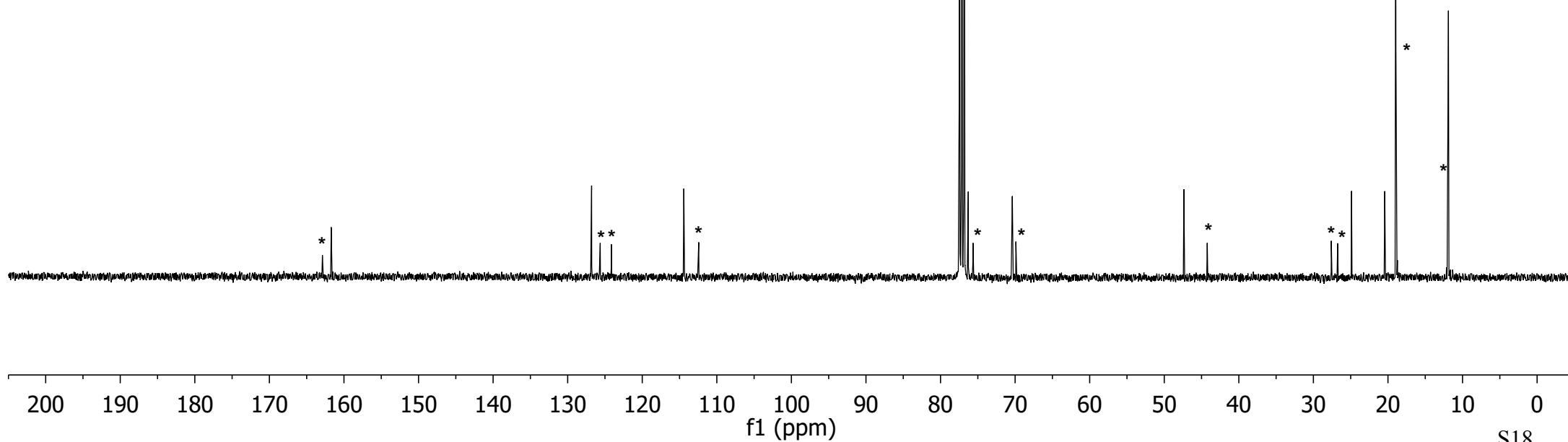
76.3
75.6
70.4
69.9

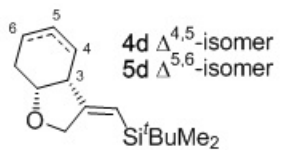
47.4
44.2

27.6
26.7
24.9
20.4
19.0
18.9
11.9
11.9

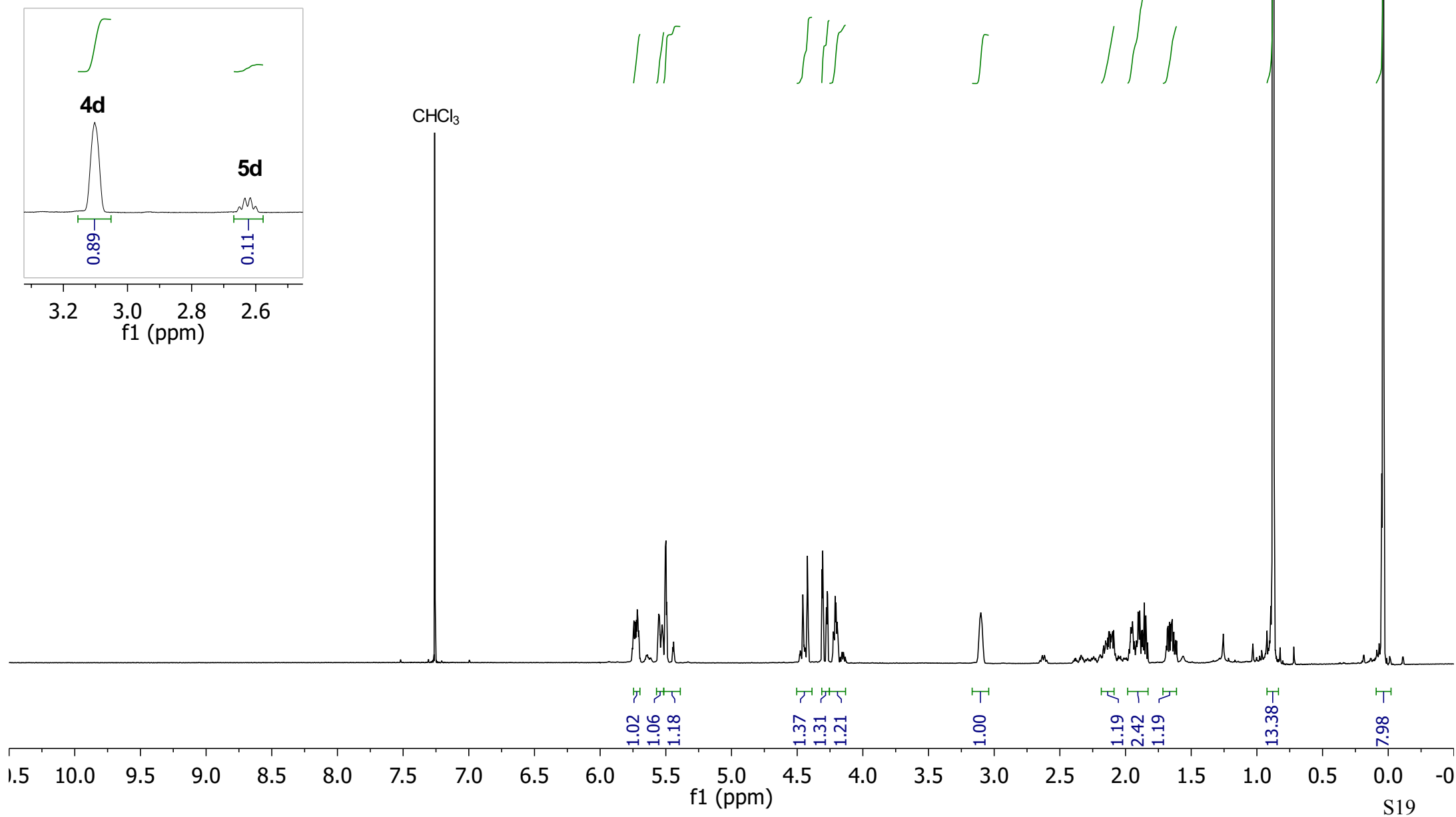


* = signals due to compound **5c**





400 MHz ^1H NMR spectrum of a ca 9:1 mixture of compounds **4d** and **5d**
(recorded in CDCl_3)





126.8
126.8

—116.3

—76.2

—70.1

—47.0

26.5

24.8

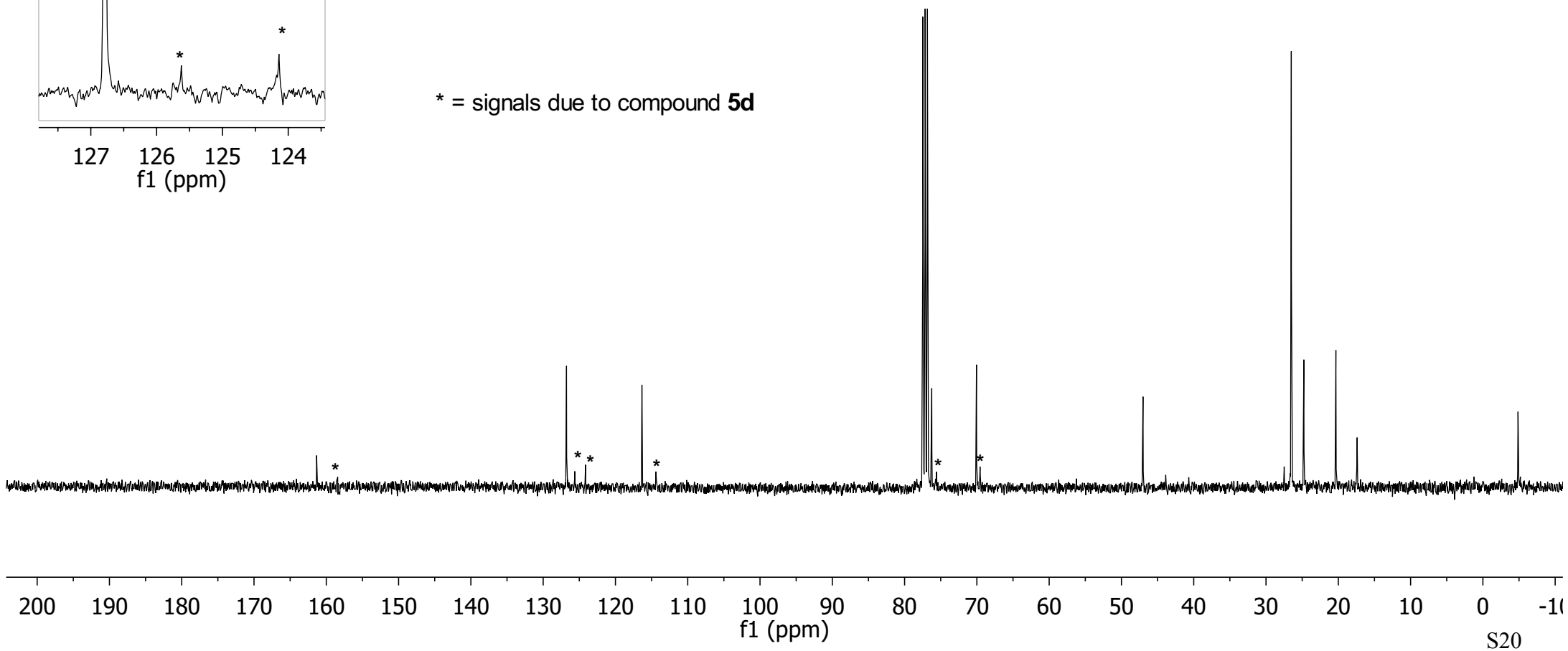
20.3

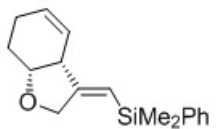
17.4

4.9

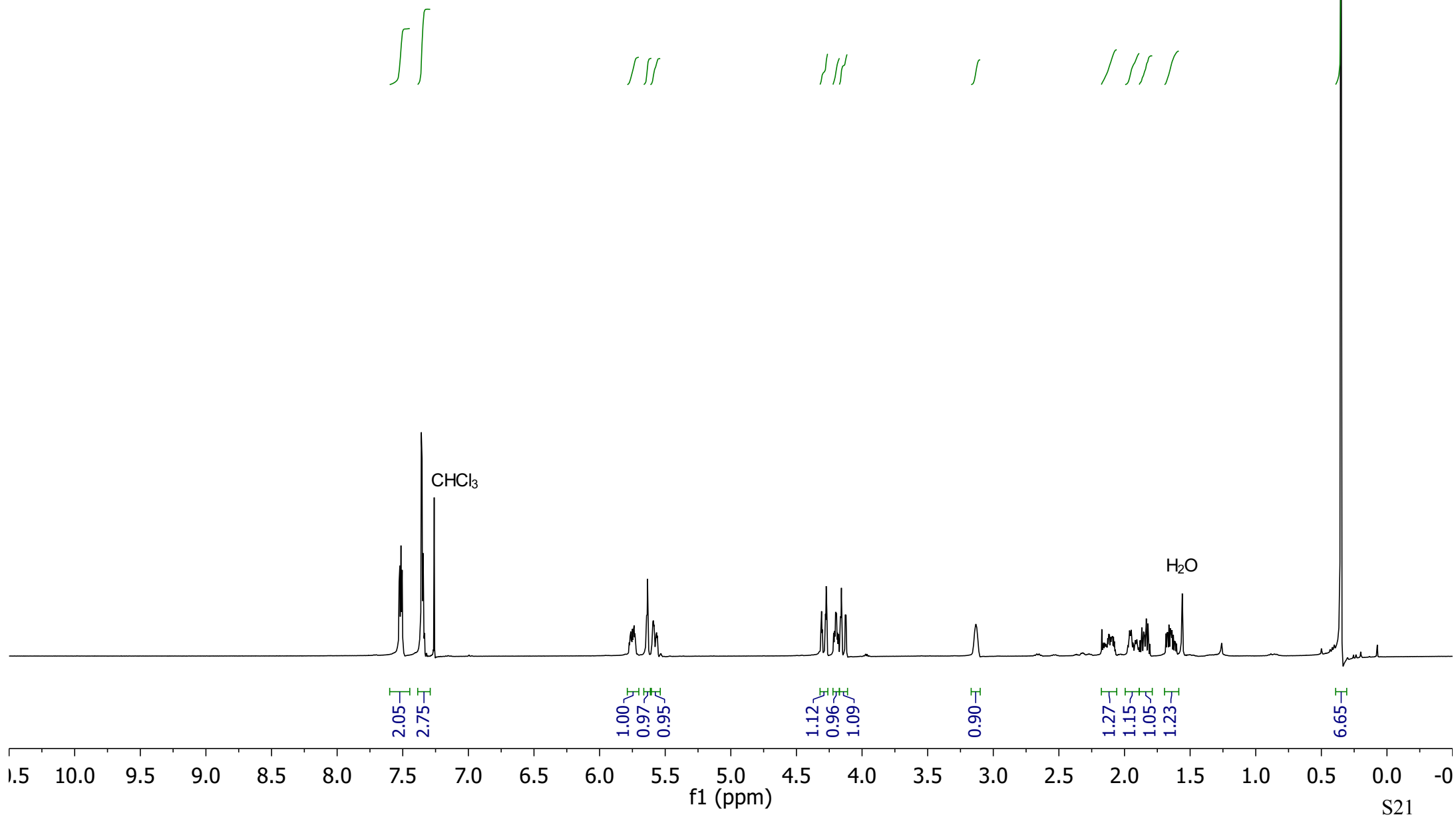
4.9

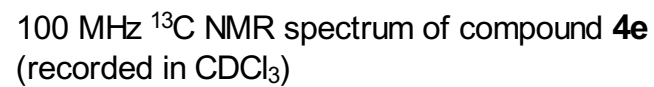
* = signals due to compound **5d**

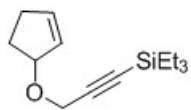




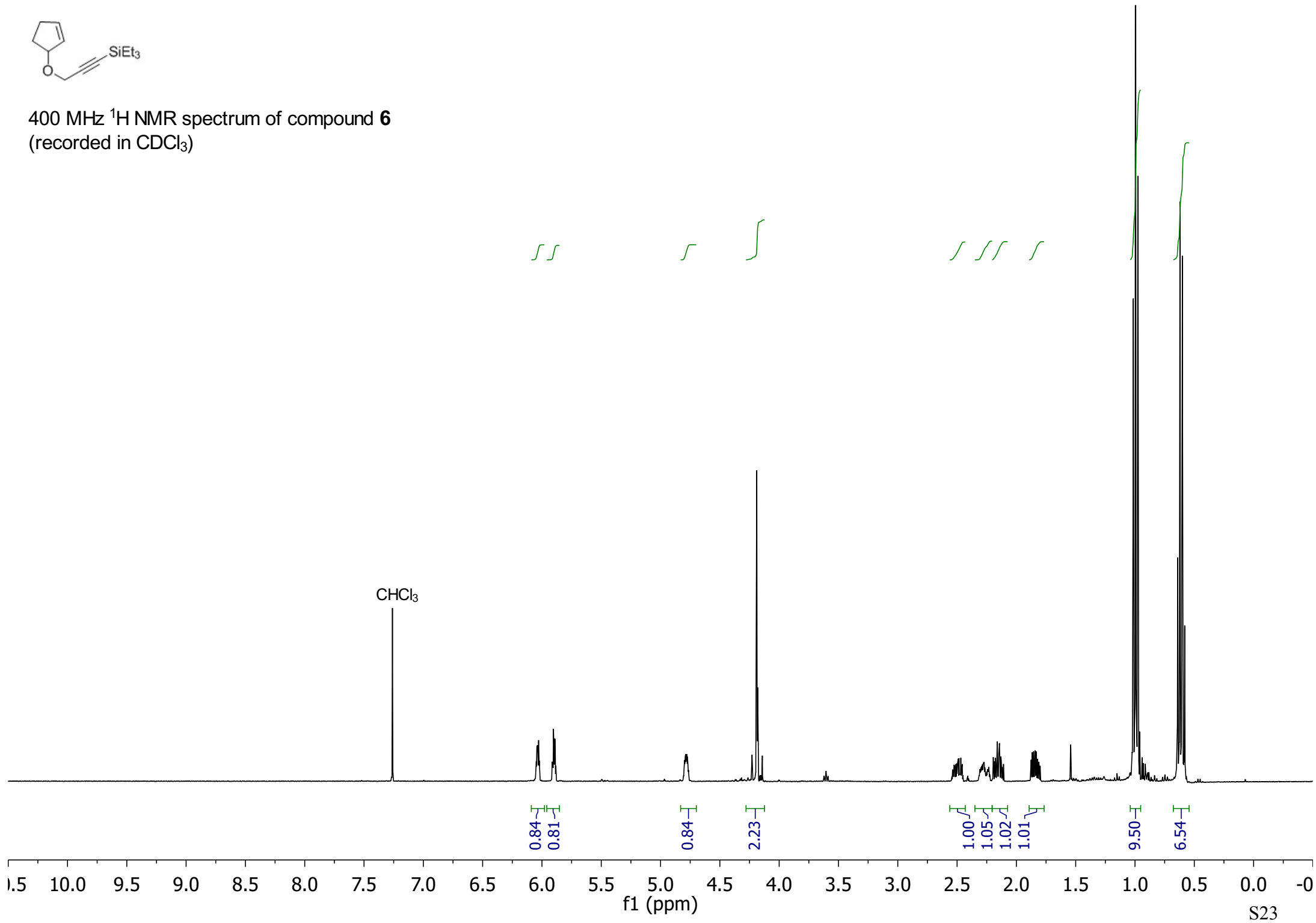
400 MHz ^1H NMR spectrum of compound **4e**
(recorded in CDCl_3)

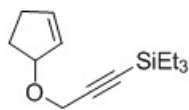






400 MHz ^1H NMR spectrum of compound **6**
(recorded in CDCl_3)





—136.3

—130.6

—103.6

—88.3

—84.3

—56.8

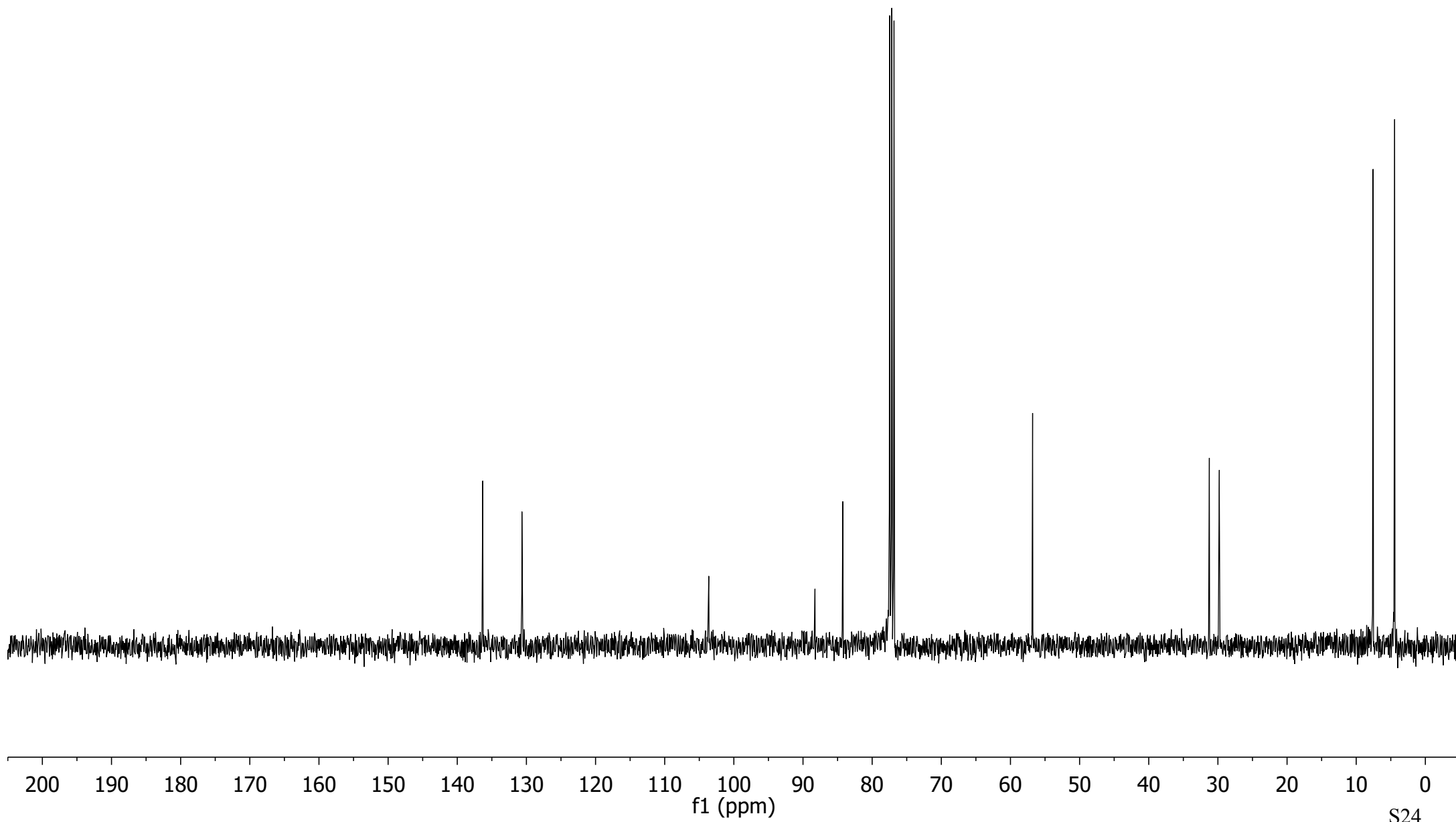
~31.2

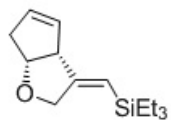
~29.8

~7.6

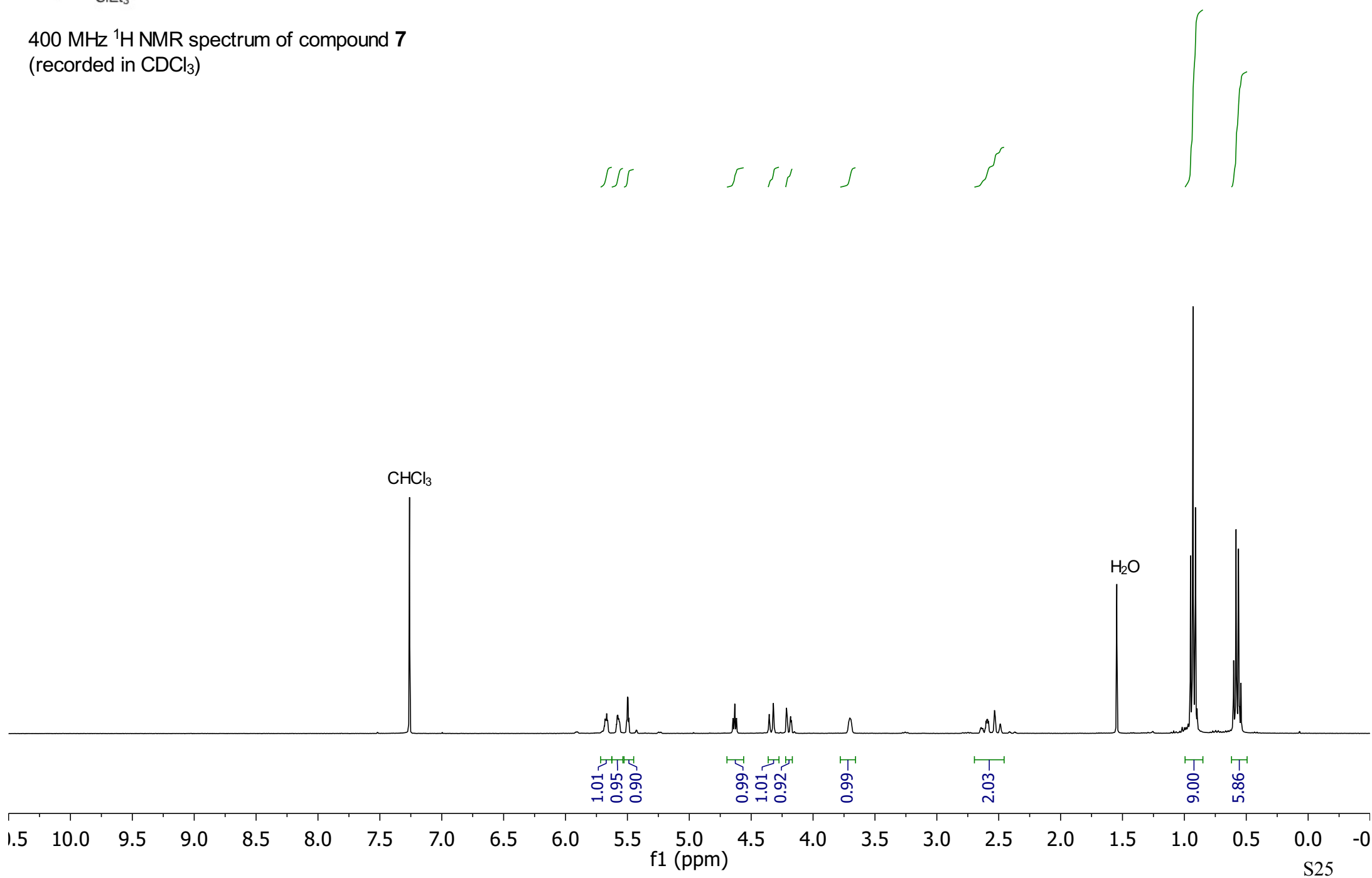
~4.4

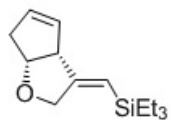
100 MHz ^{13}C NMR spectrum of compound **6**
(recorded in CDCl_3)



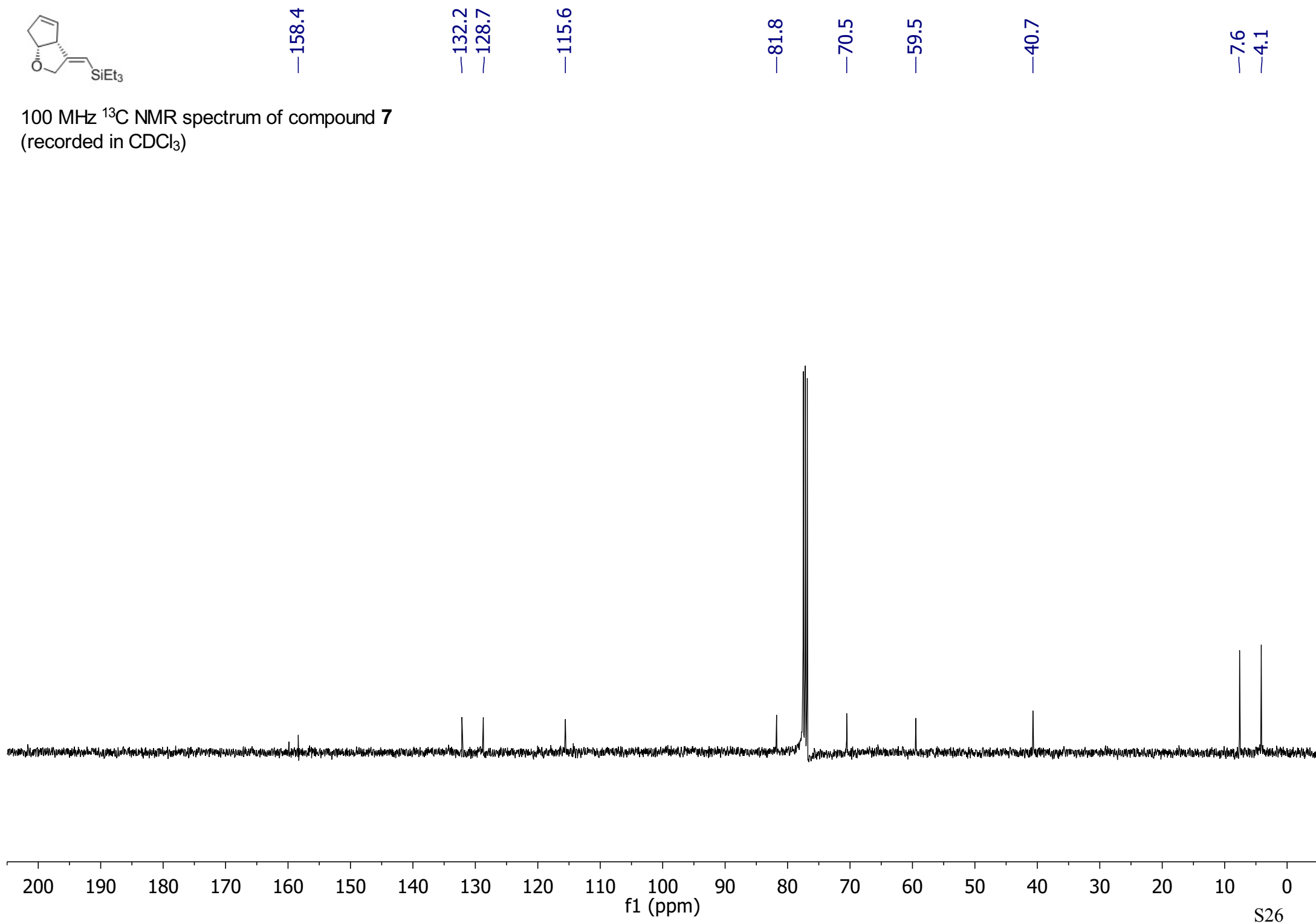


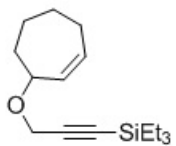
400 MHz ^1H NMR spectrum of compound **7**
(recorded in CDCl_3)



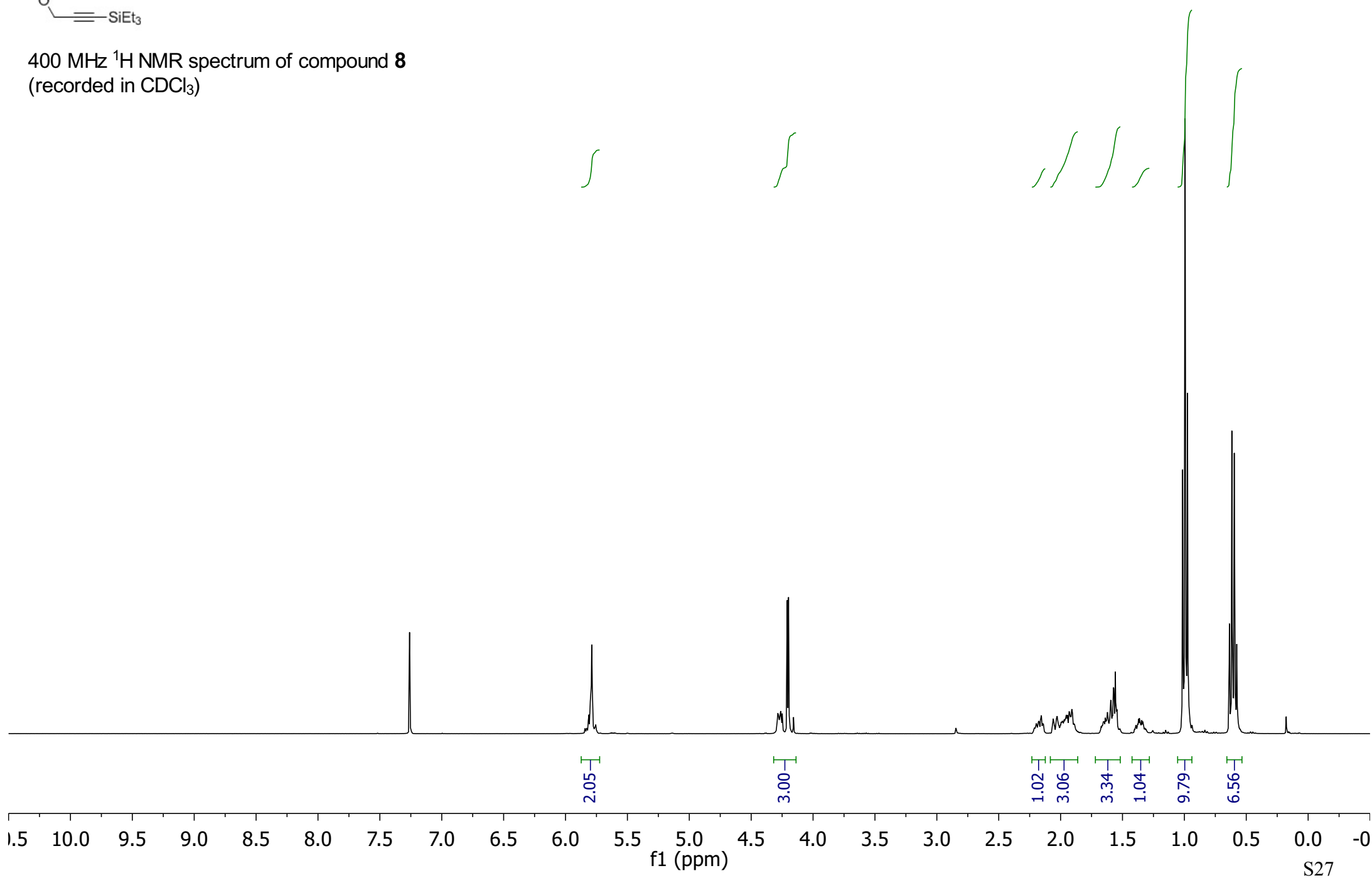


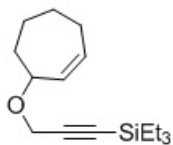
100 MHz ^{13}C NMR spectrum of compound **7**
(recorded in CDCl_3)



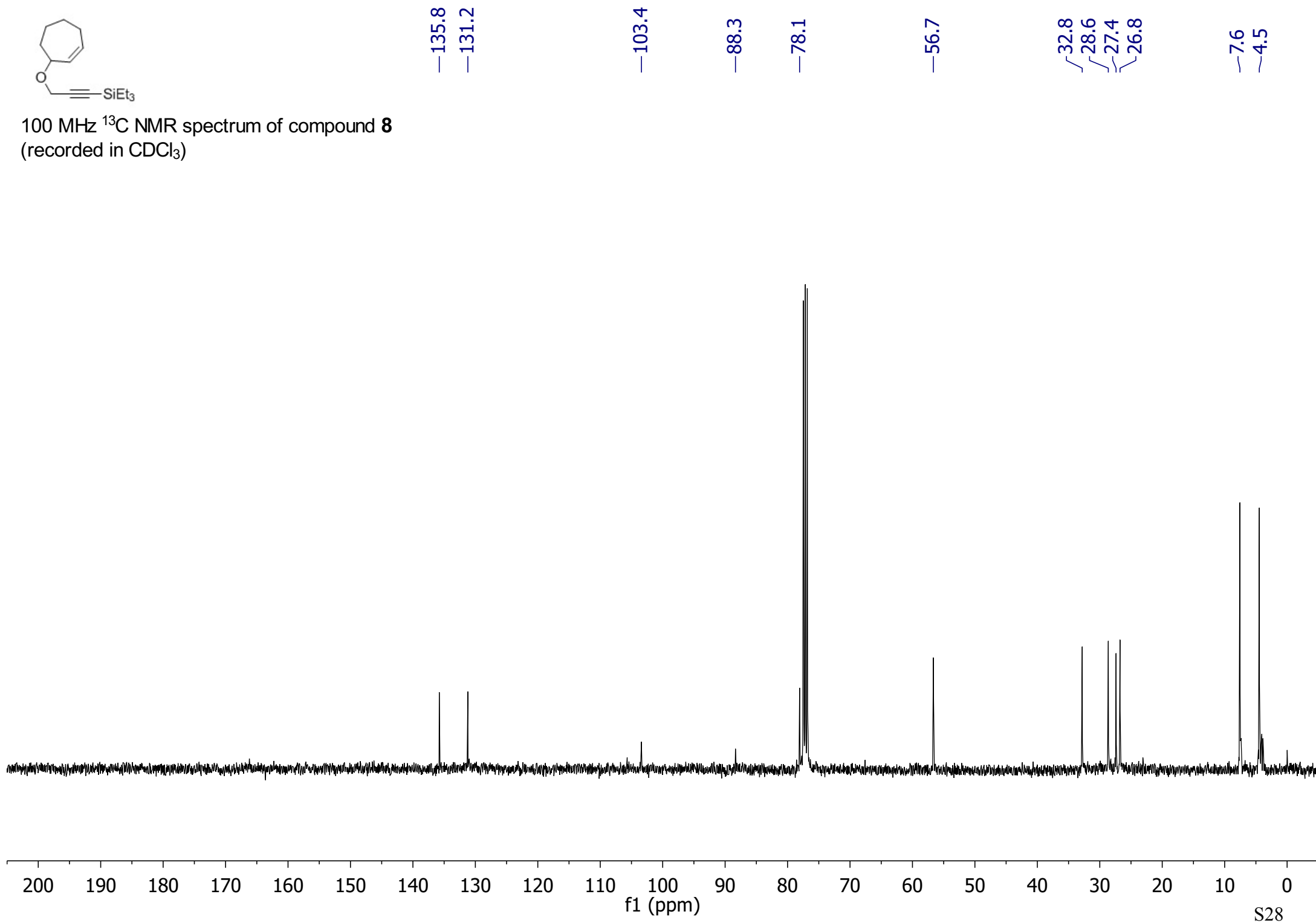


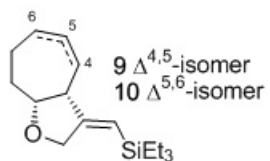
400 MHz ^1H NMR spectrum of compound **8**
(recorded in CDCl_3)



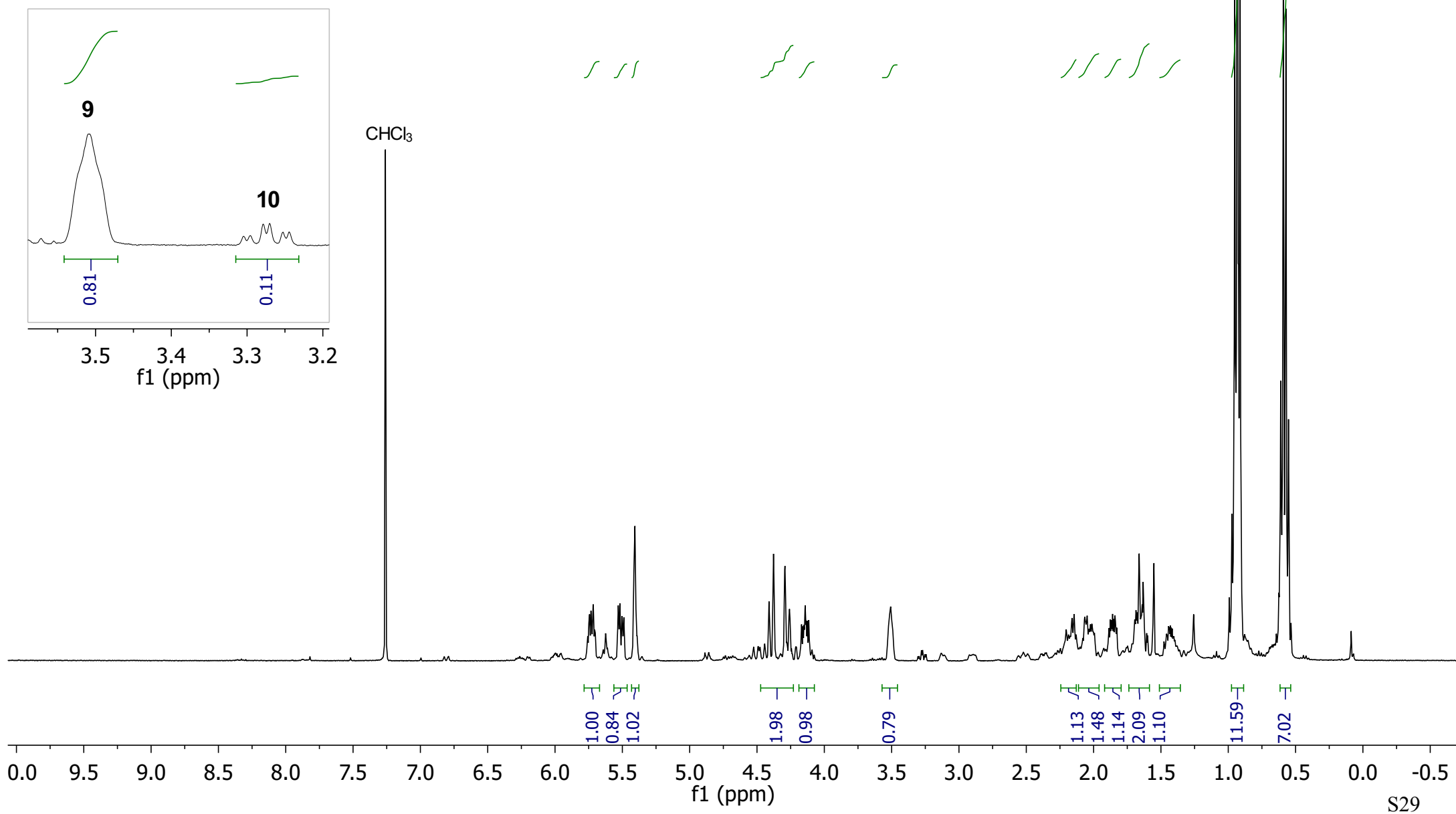


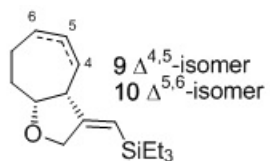
100 MHz ^{13}C NMR spectrum of compound **8**
(recorded in CDCl_3)



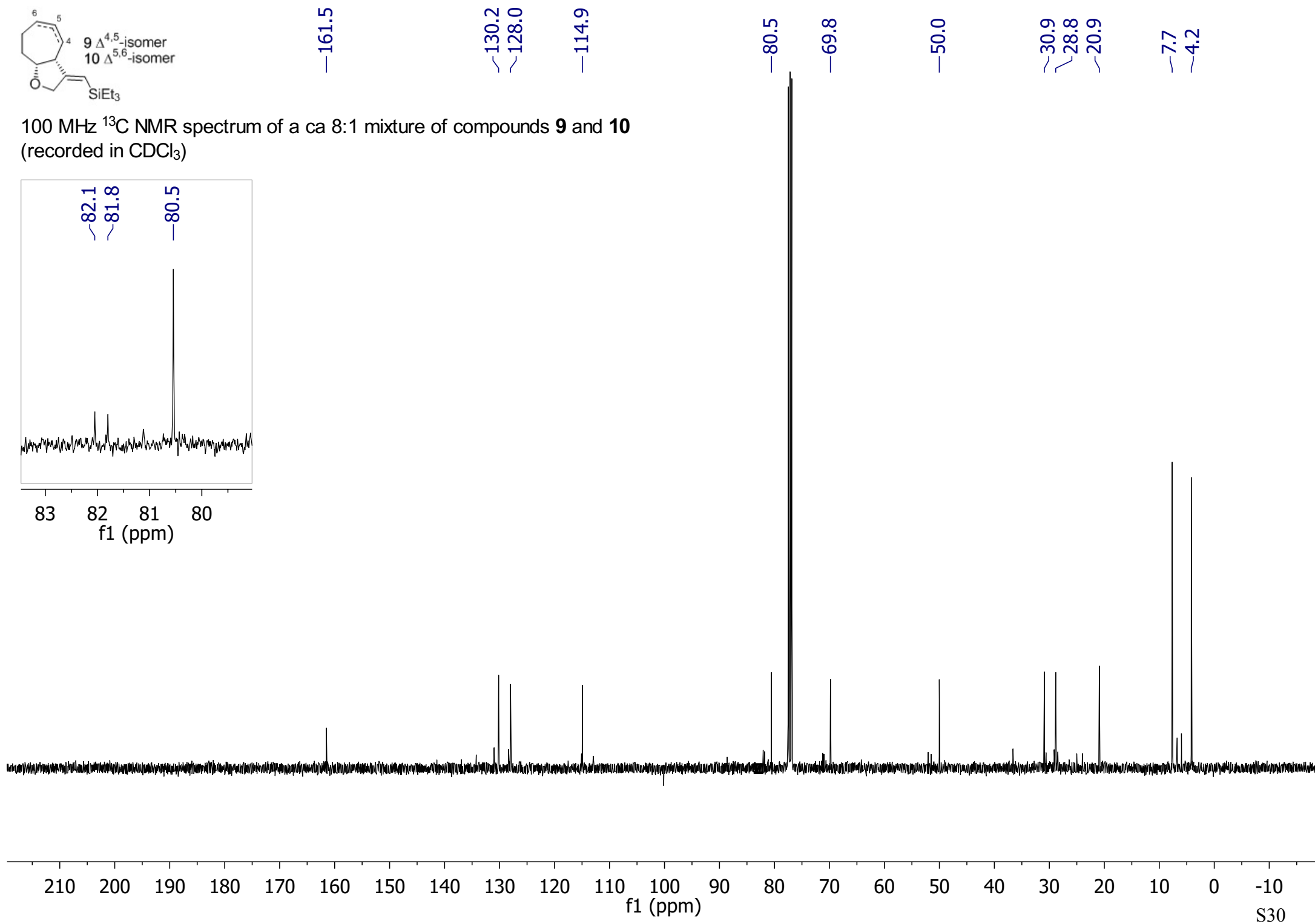
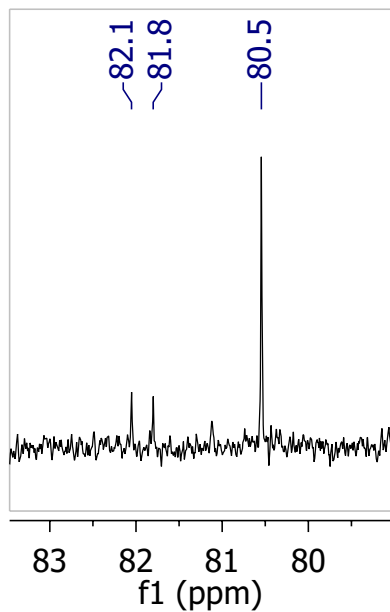


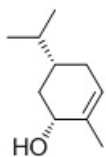
400 MHz ^1H NMR spectrum of a ca 8:1 mixture of compounds **9** and **10**
(recorded in CDCl_3)



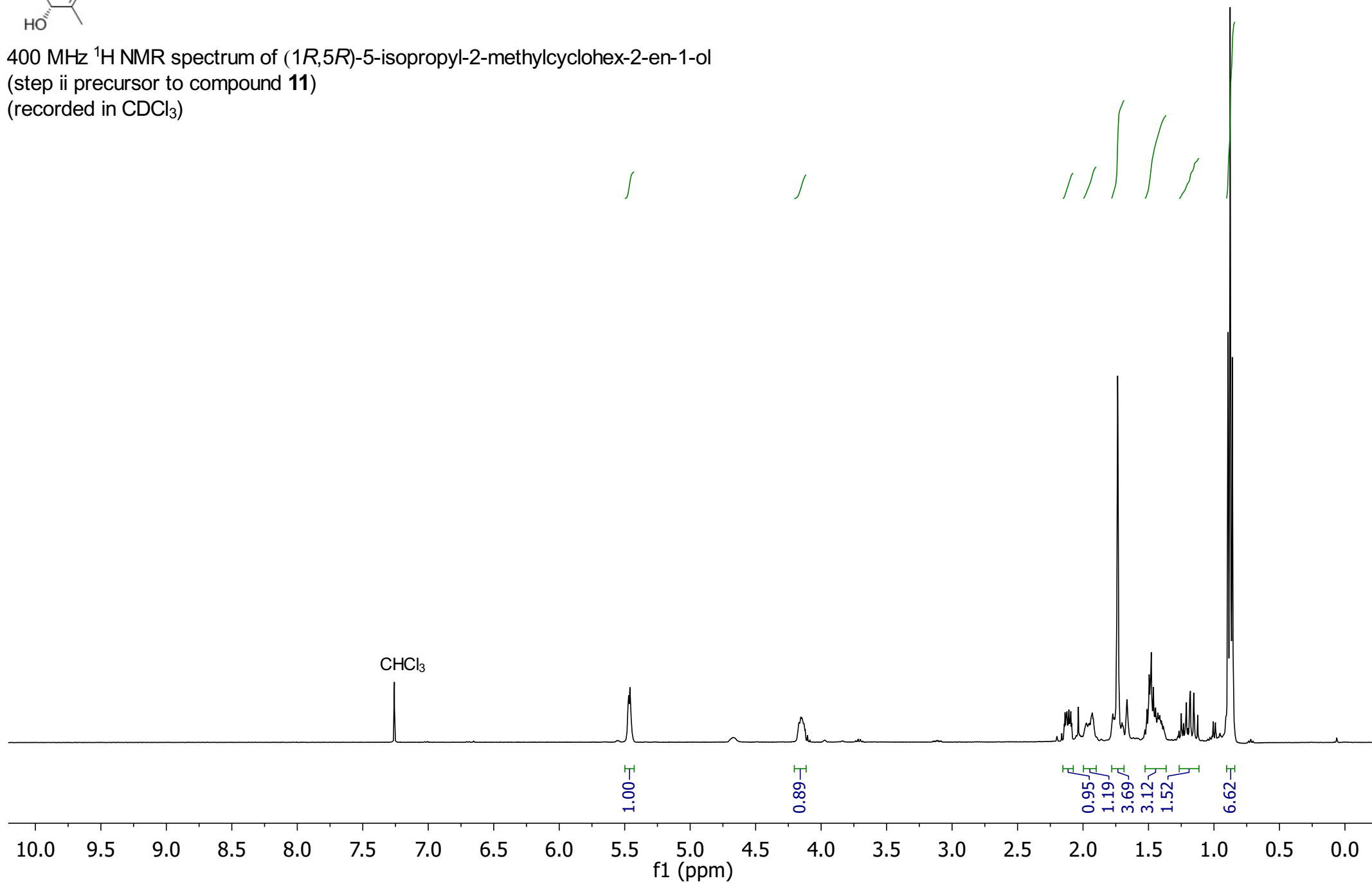


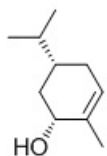
100 MHz ^{13}C NMR spectrum of a ca 8:1 mixture of compounds **9** and **10**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of (1*R*,5*R*)-5-isopropyl-2-methylcyclohex-2-en-1-ol
(step ii precursor to compound **11**)
(recorded in CDCl_3)





—136.3

—124.3

—71.3

—39.7

—37.1

—32.2

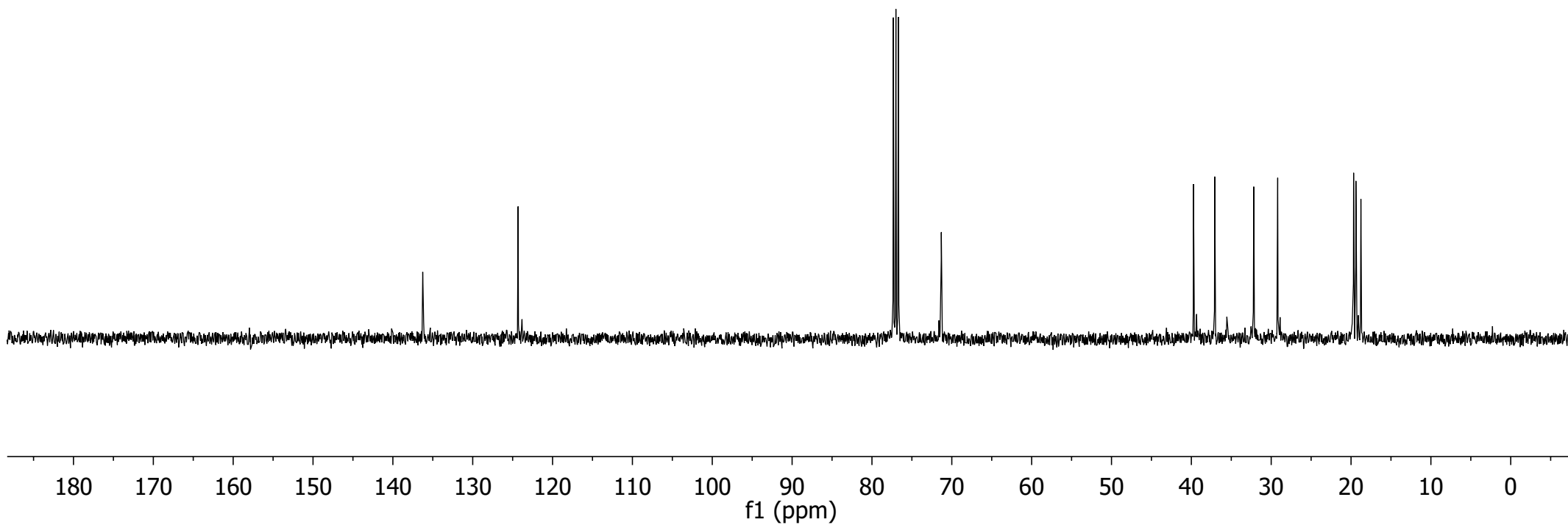
—29.2

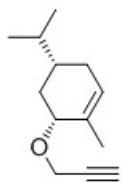
—19.7

—19.4

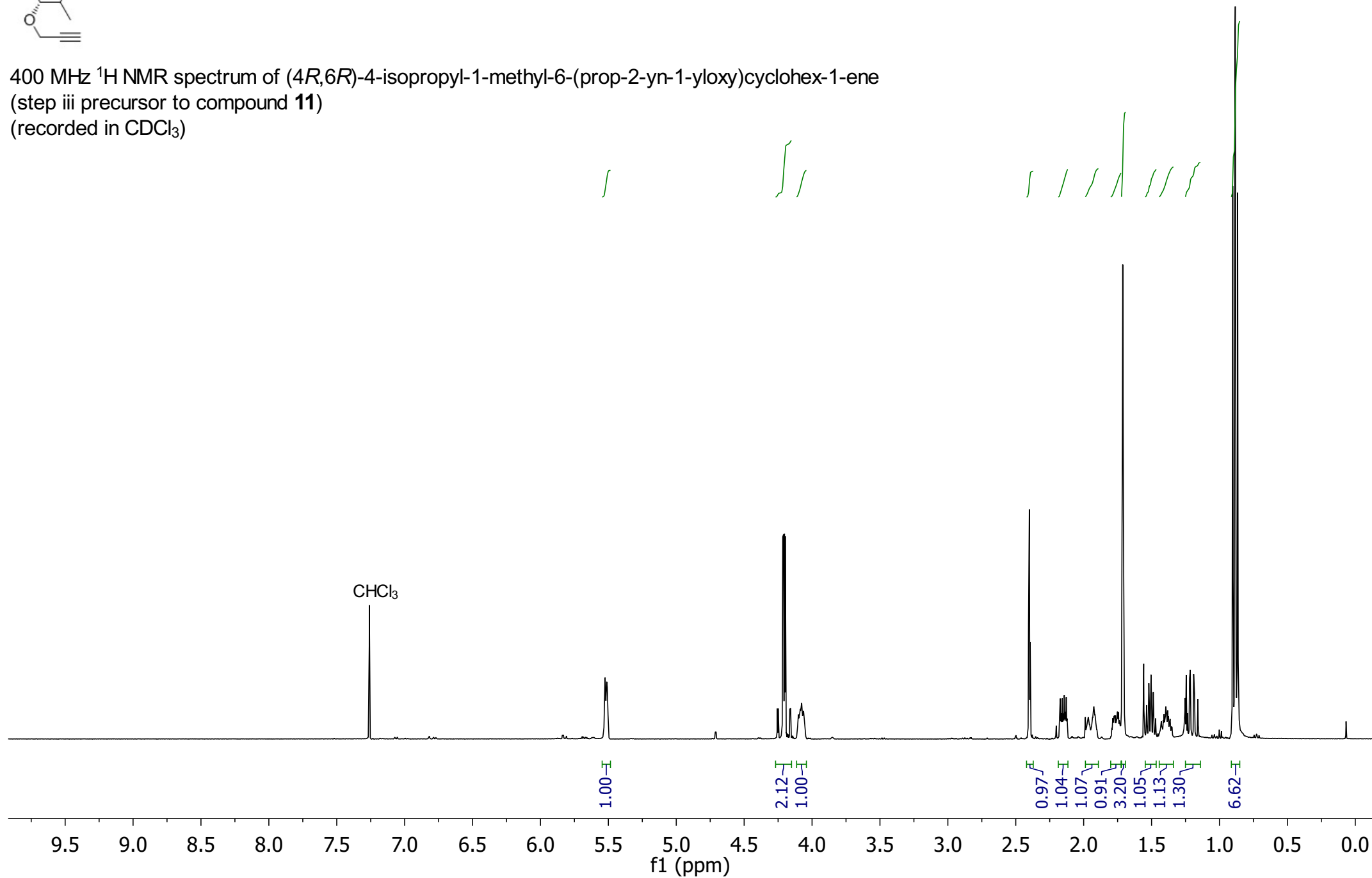
—18.8

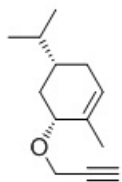
100 MHz ^{13}C NMR spectrum of (1*R*,5*R*)-5-isopropyl-2-methylcyclohex-2-en-1-ol
(step ii precursor to compound **11**)
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of (4*R*,6*R*)-4-isopropyl-1-methyl-6-(prop-2-yn-1-yloxy)cyclohex-1-ene
(step iii precursor to compound **11**)
(recorded in CDCl_3)





—134.9

—125.4

—80.7

—77.8

—73.6

—55.6

—39.5

—32.4

—32.2

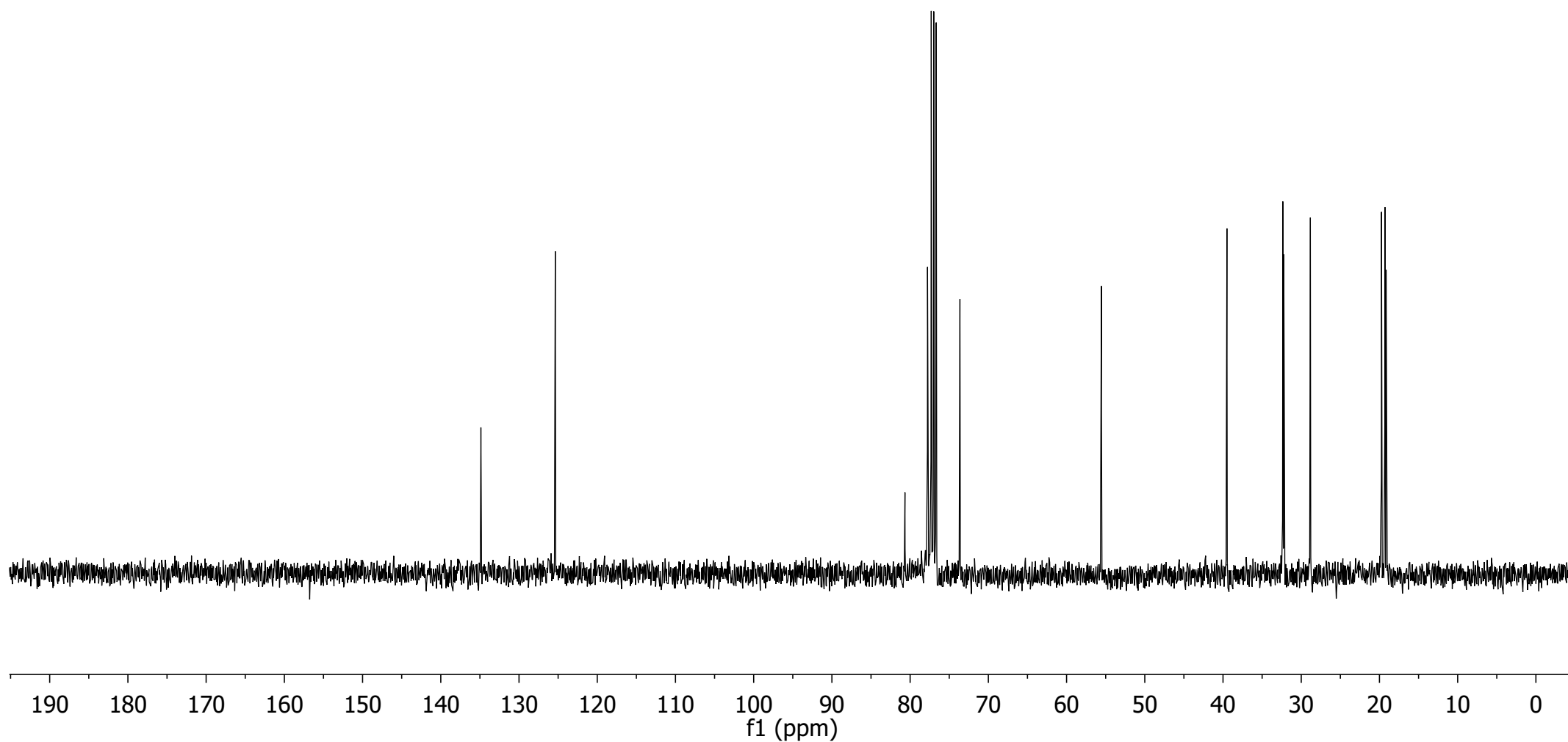
—28.8

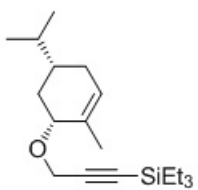
—19.7

—19.3

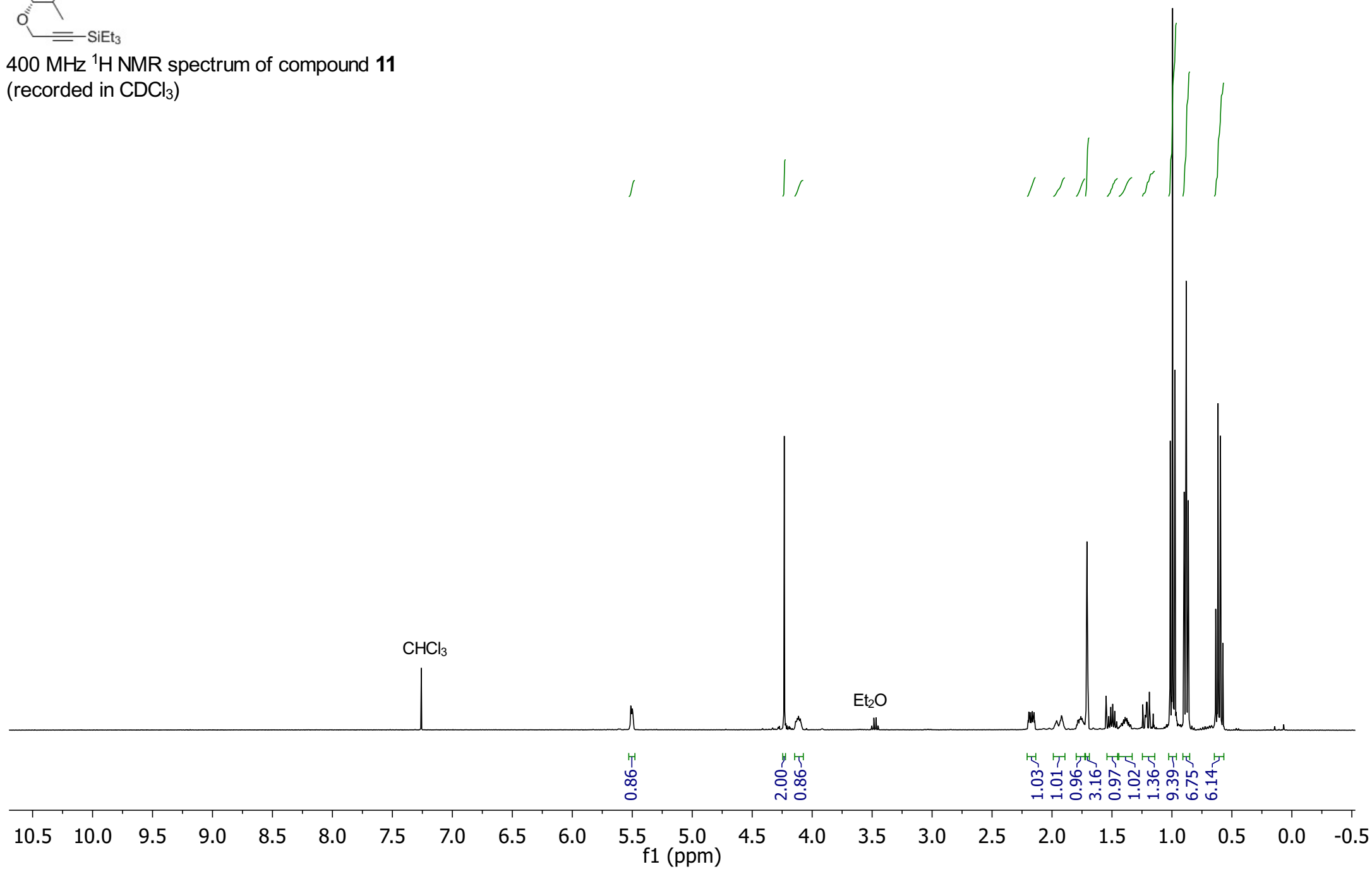
—19.2

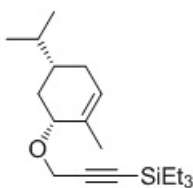
100 MHz ^{13}C NMR spectrum of (4*R*,6*R*)-4-isopropyl-1-methyl-6-(prop-2-yn-1-yloxy)cyclohex-1-ene
(step ii precursor to compound **11**)
(recorded in CDCl_3)



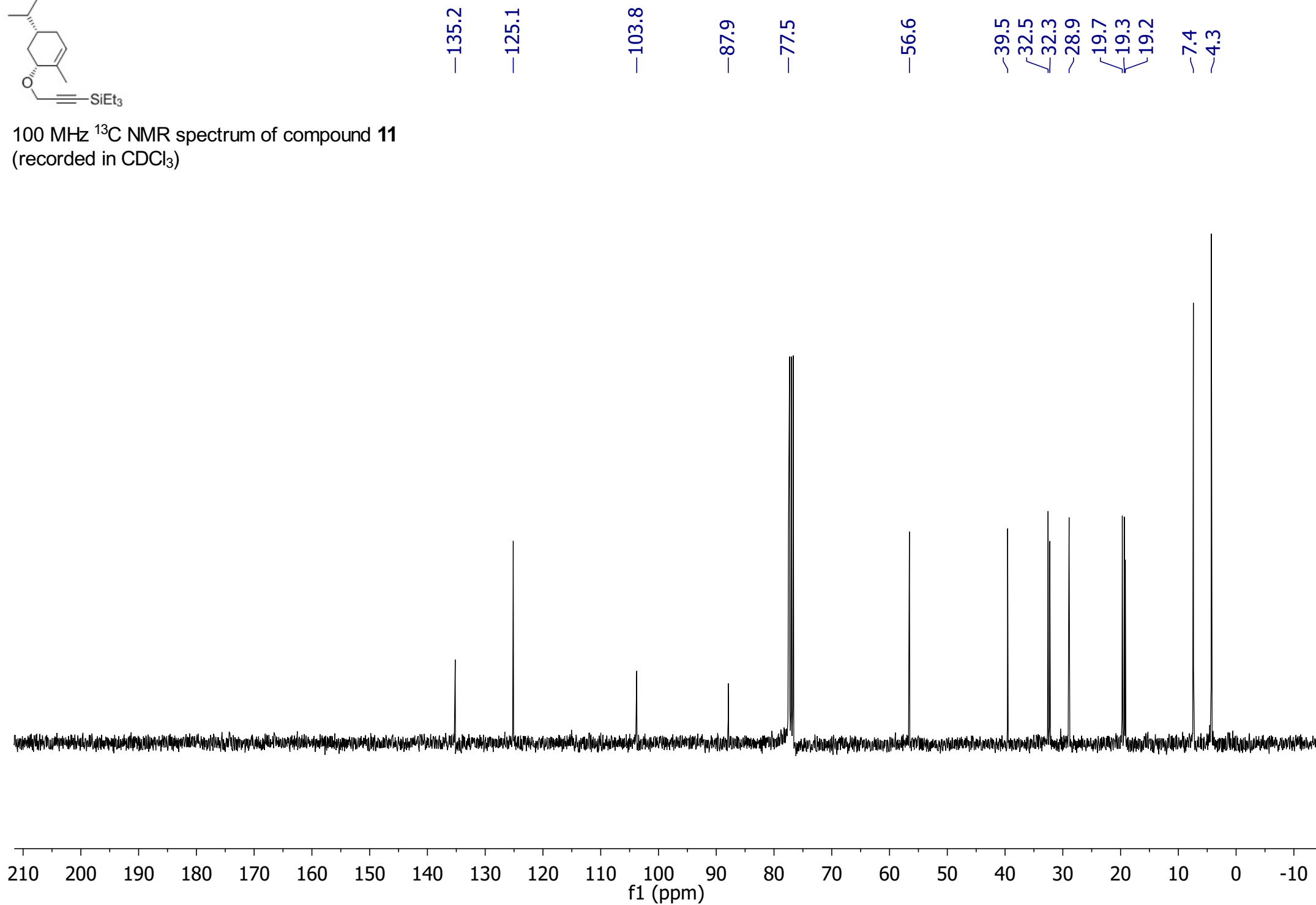


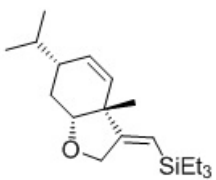
400 MHz ^1H NMR spectrum of compound **11**
(recorded in CDCl_3)



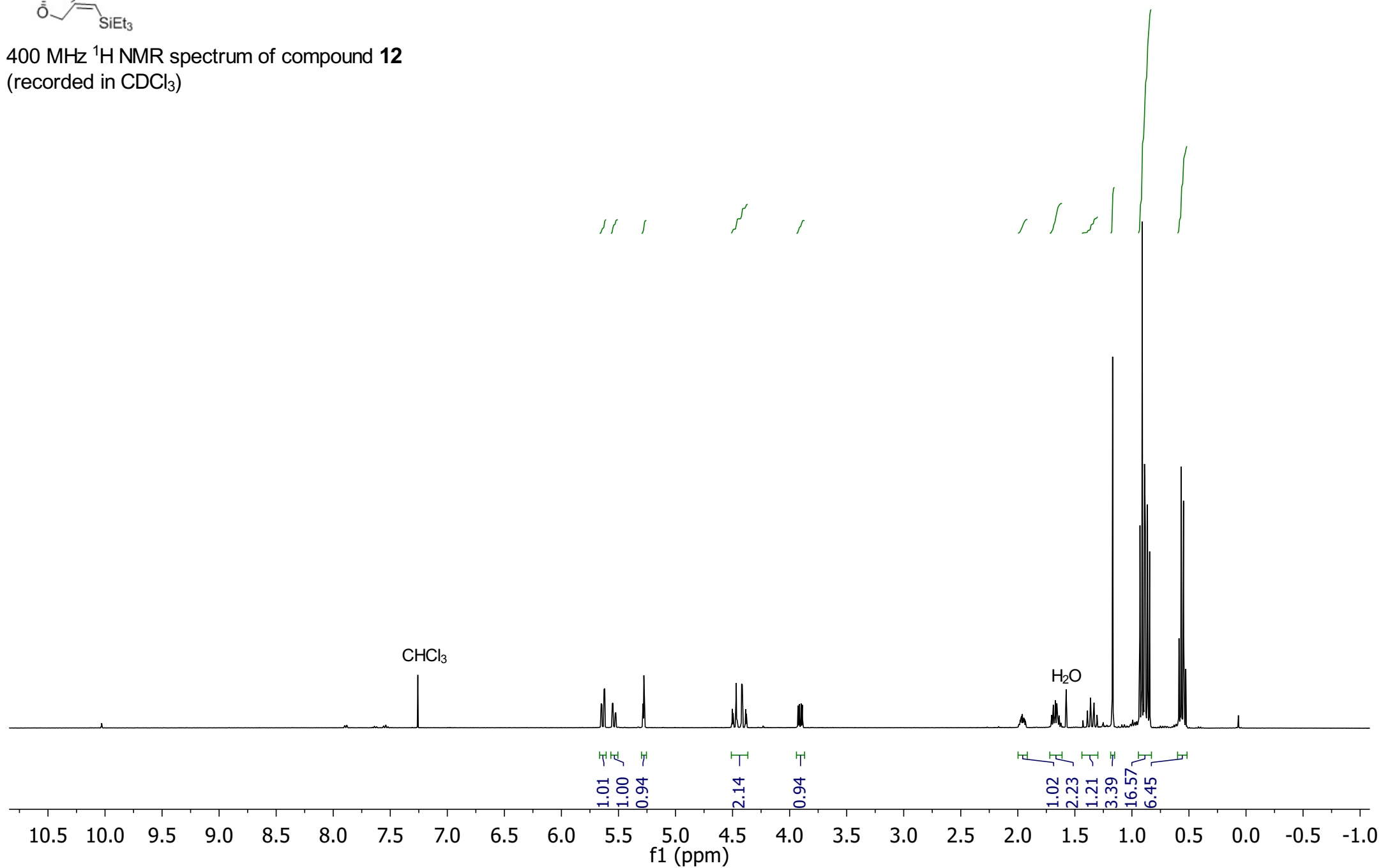


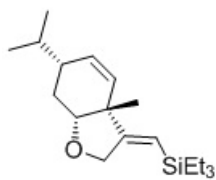
100 MHz ^{13}C NMR spectrum of compound **11**
(recorded in CDCl_3)



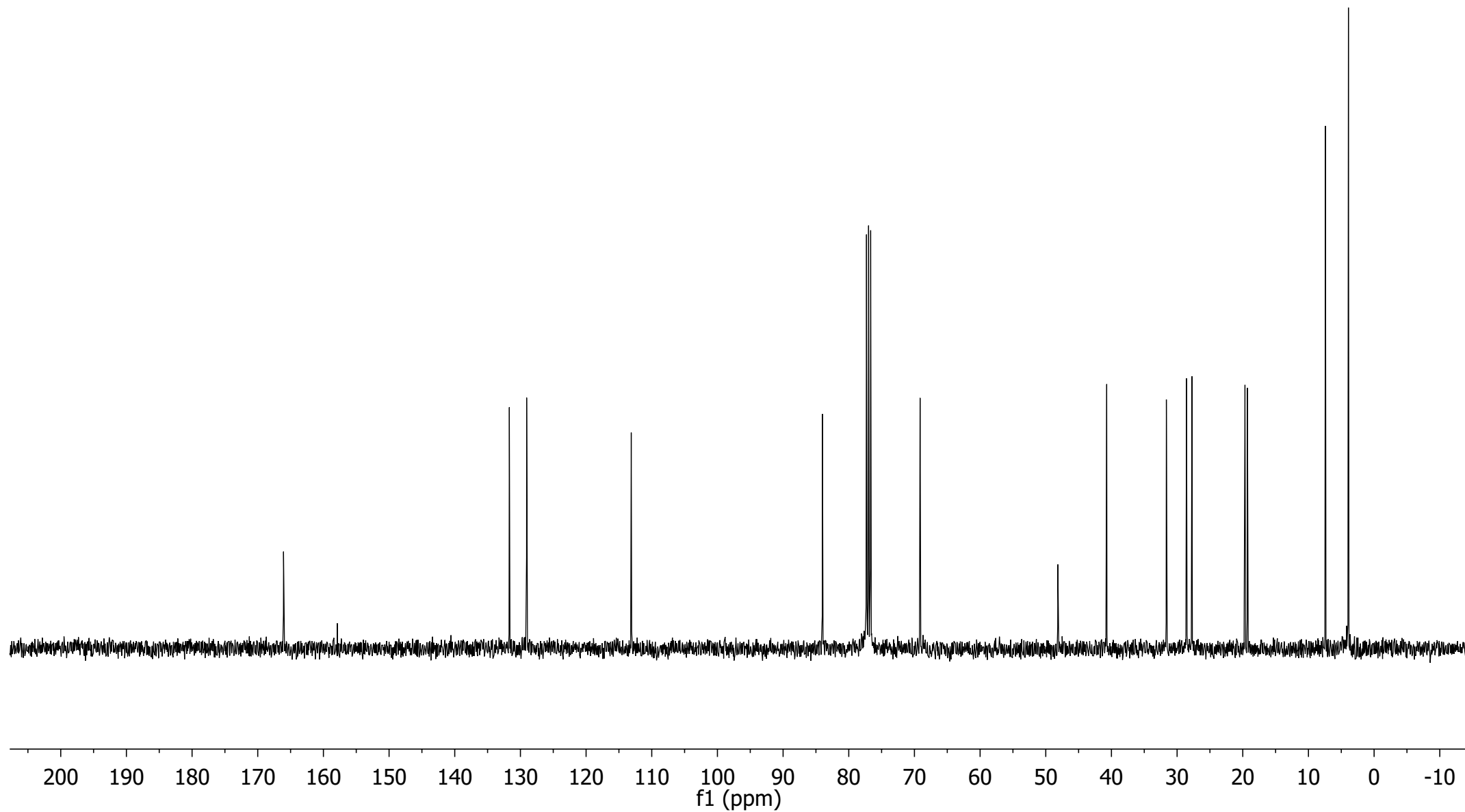


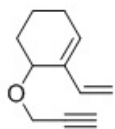
400 MHz ^1H NMR spectrum of compound **12**
(recorded in CDCl_3)



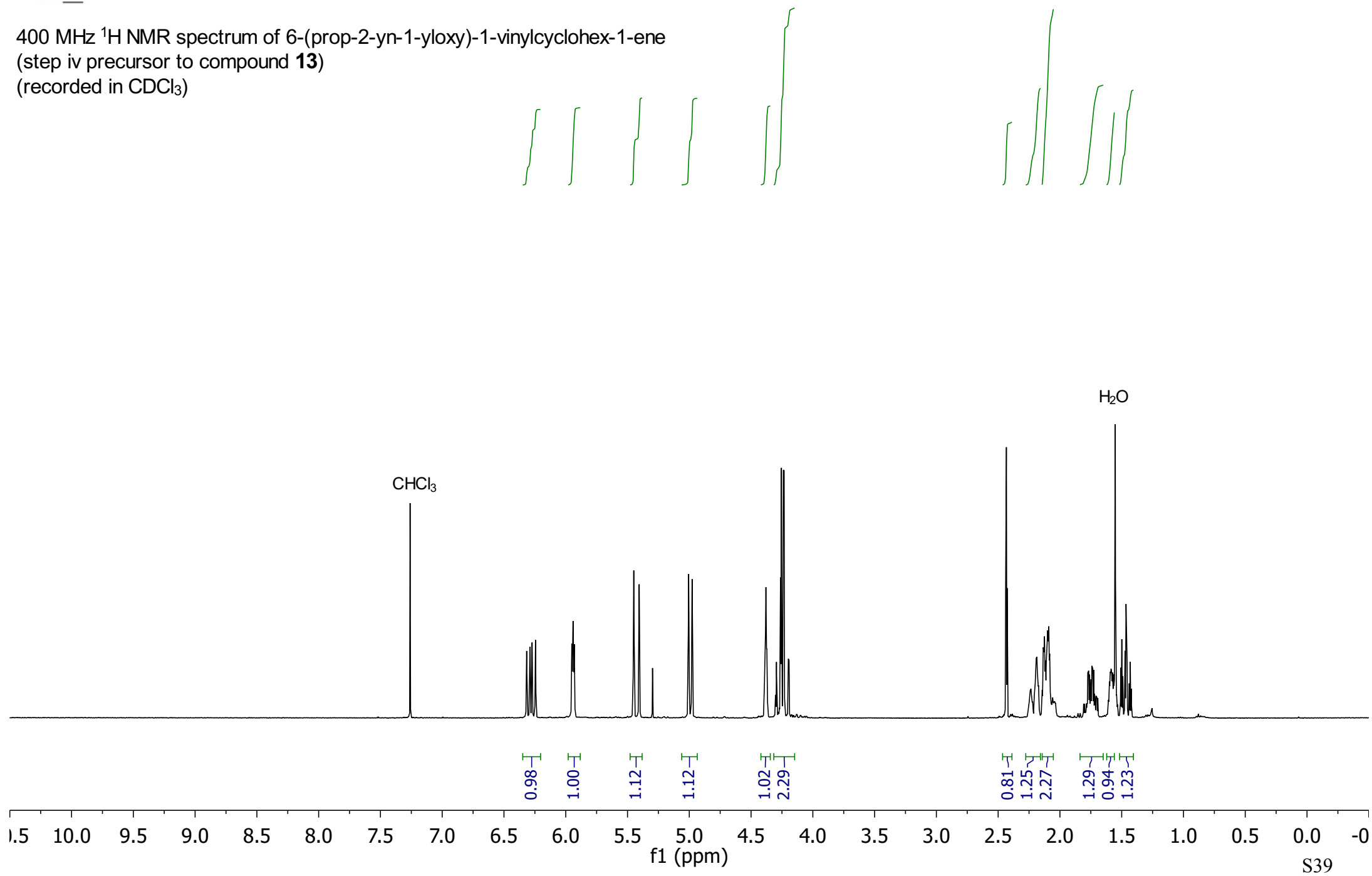


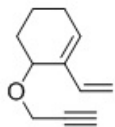
100 MHz ^{13}C NMR spectrum of compound **12**
(recorded in CDCl_3)



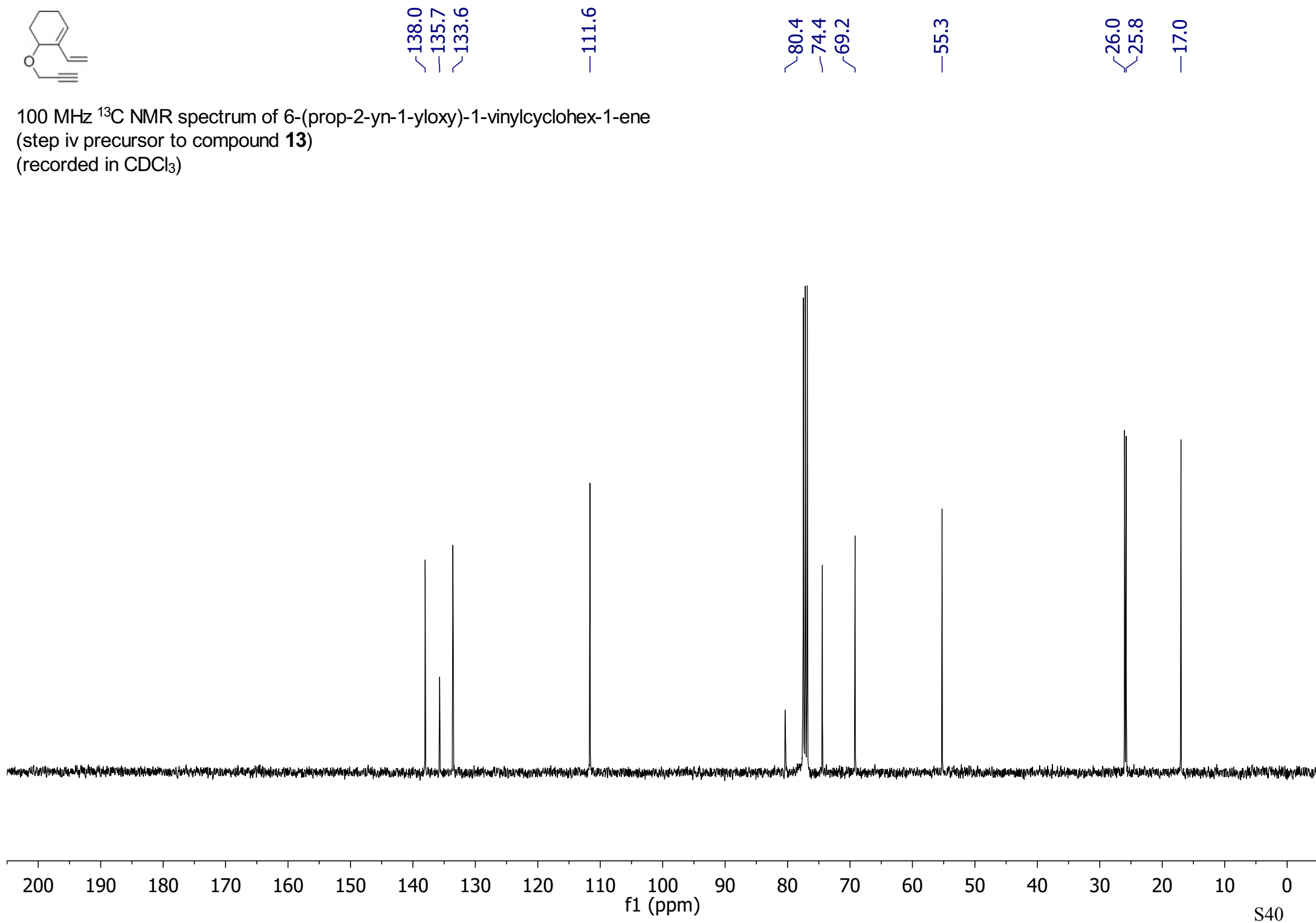


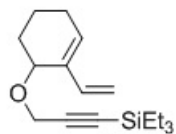
400 MHz ^1H NMR spectrum of 6-(prop-2-yn-1-yloxy)-1-vinylcyclohex-1-ene
(step iv precursor to compound **13**)
(recorded in CDCl_3)



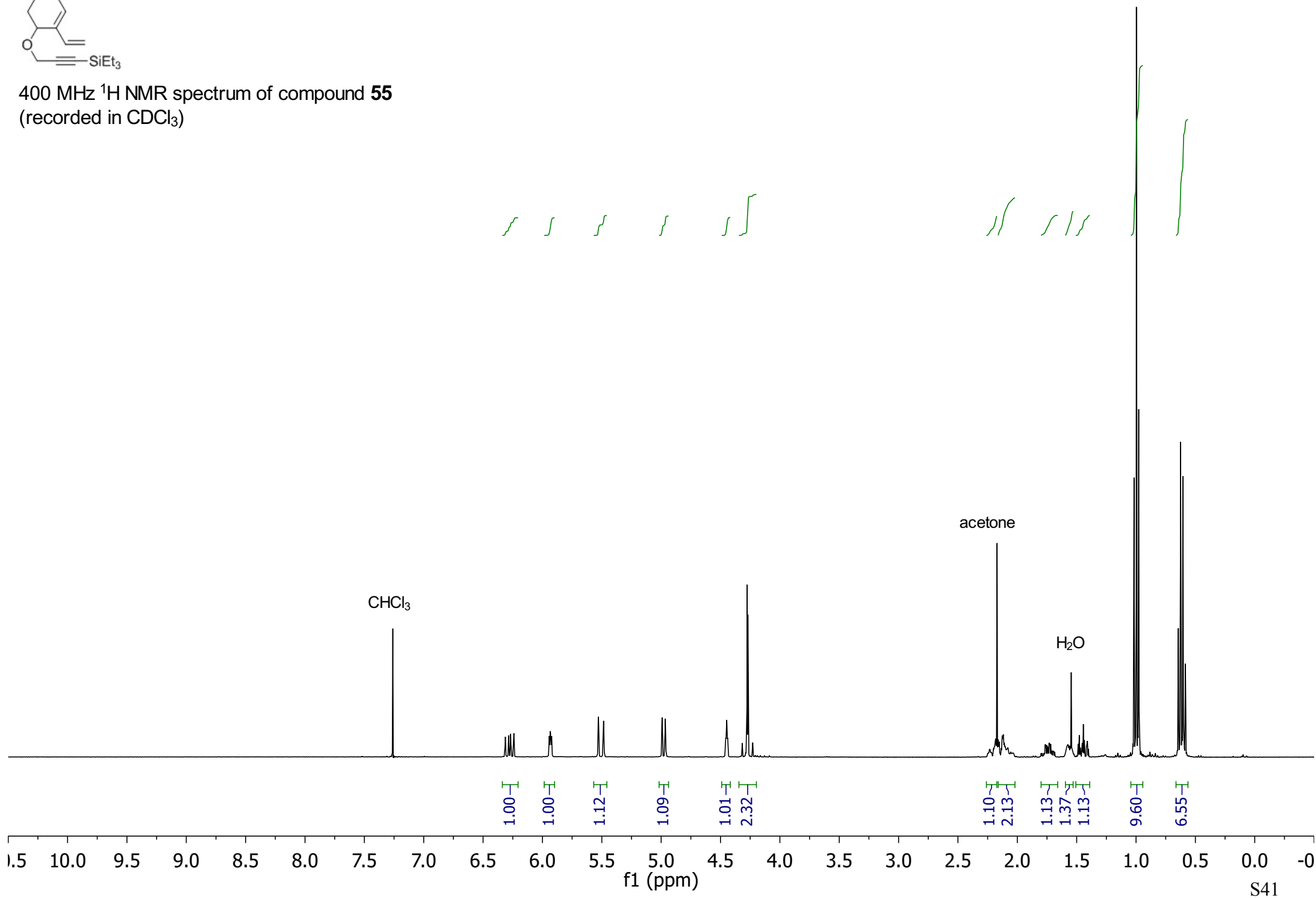


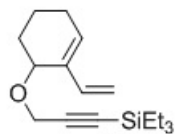
100 MHz ^{13}C NMR spectrum of 6-(prop-2-yn-1-yloxy)-1-vinylcyclohex-1-ene
(step iv precursor to compound **13**)
(recorded in CDCl_3)



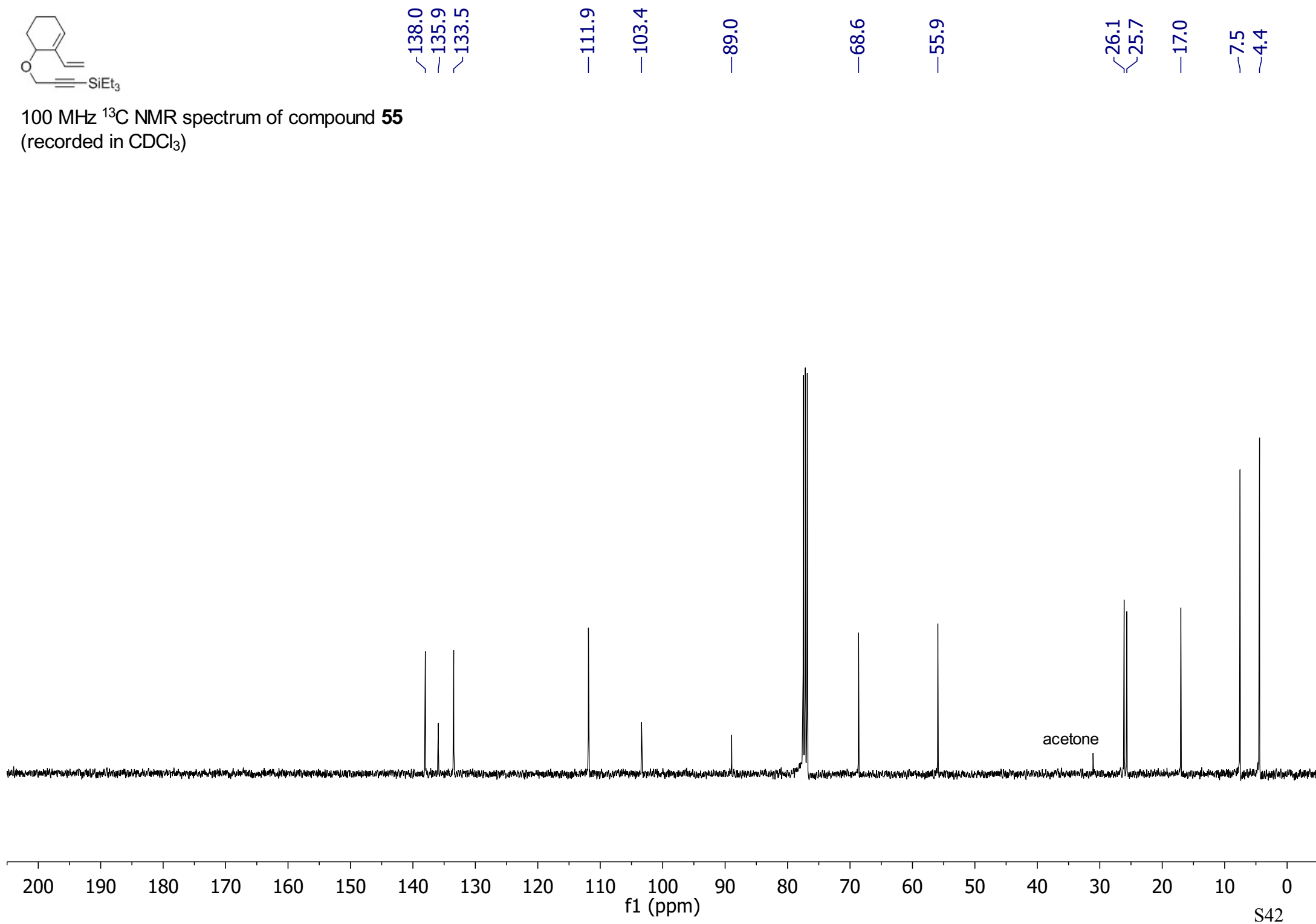


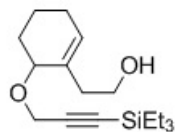
400 MHz ^1H NMR spectrum of compound **55**
(recorded in CDCl_3)



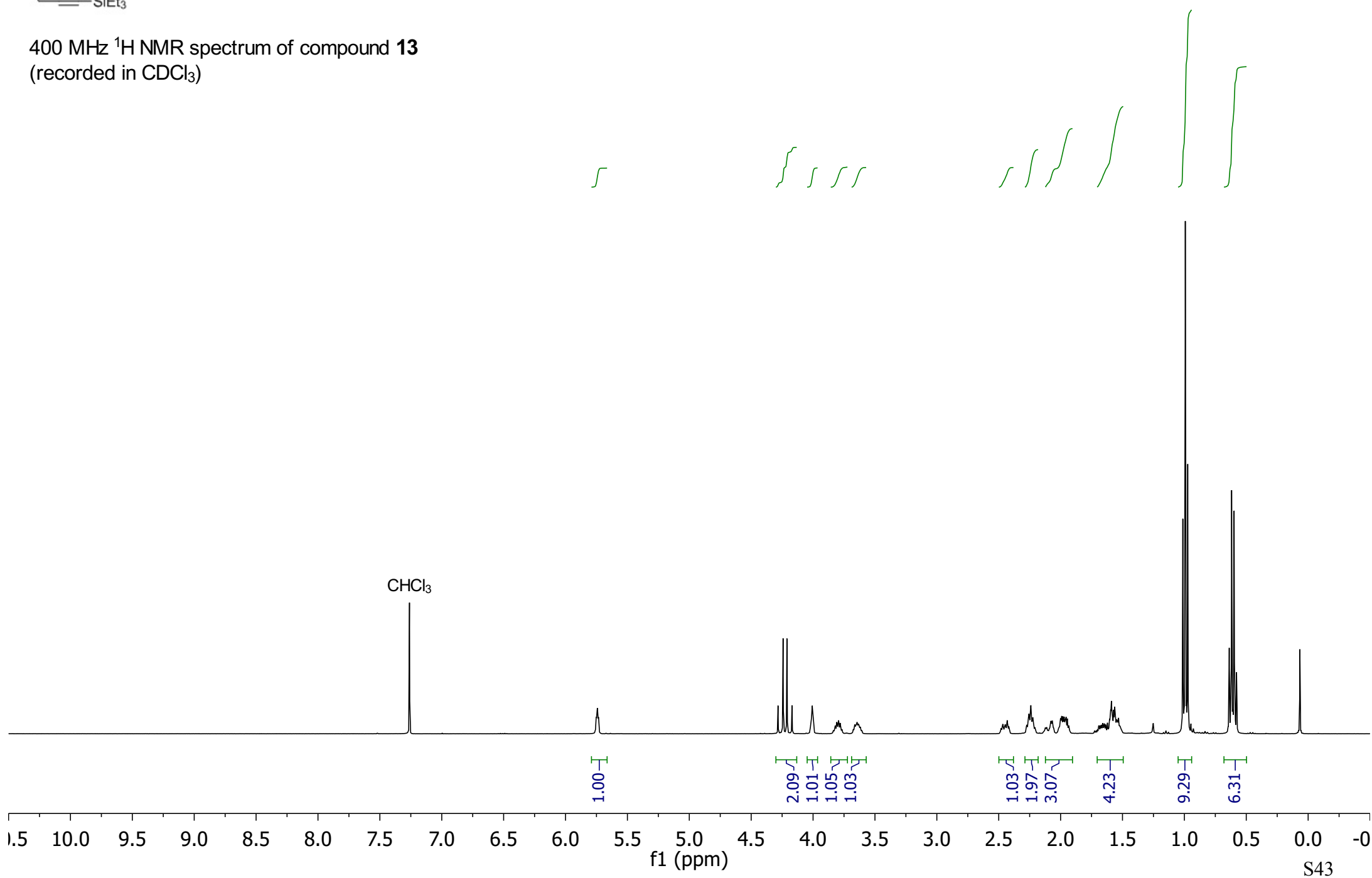


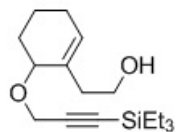
100 MHz ^{13}C NMR spectrum of compound **55**
(recorded in CDCl_3)



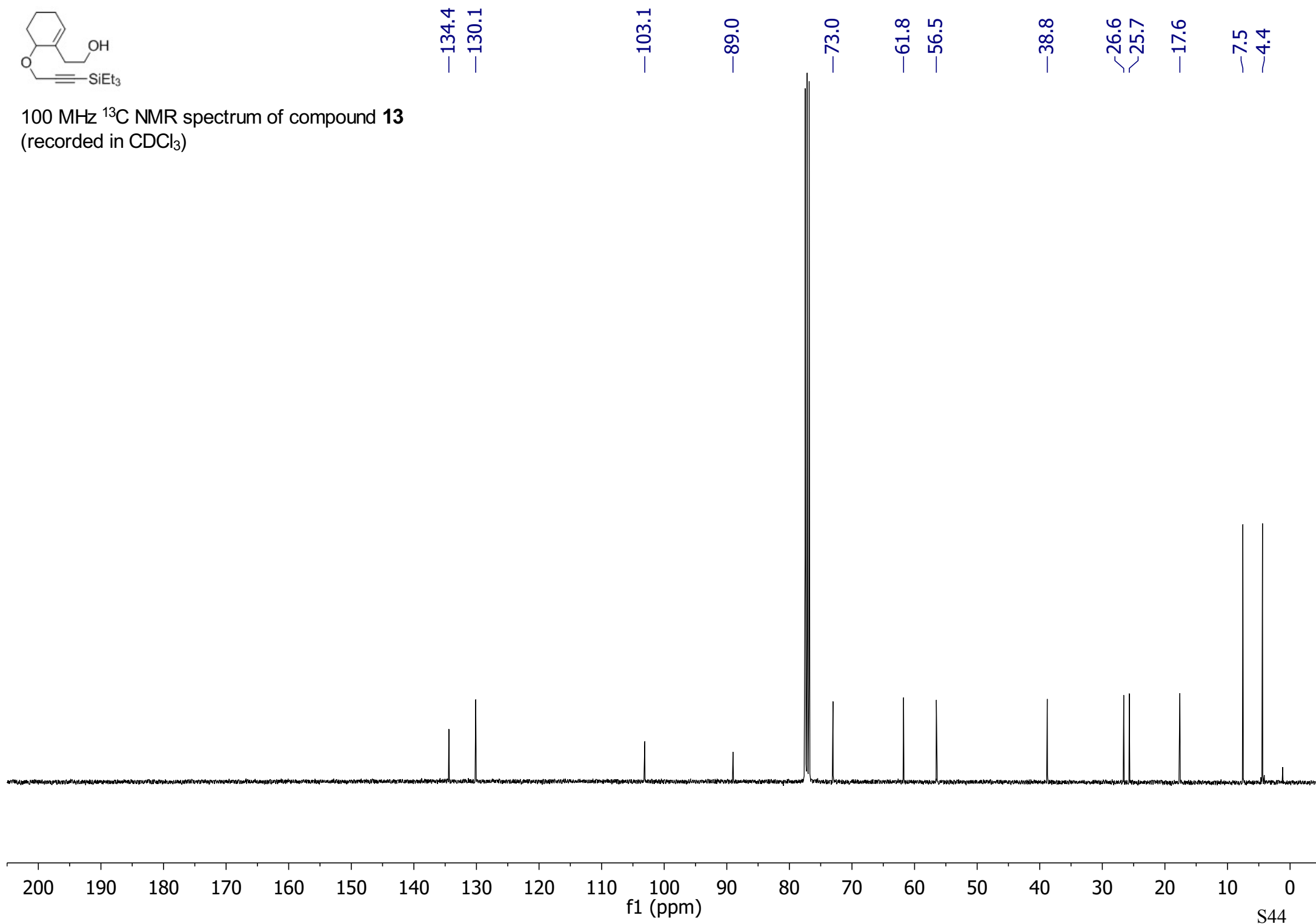


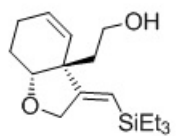
400 MHz ^1H NMR spectrum of compound **13**
(recorded in CDCl_3)



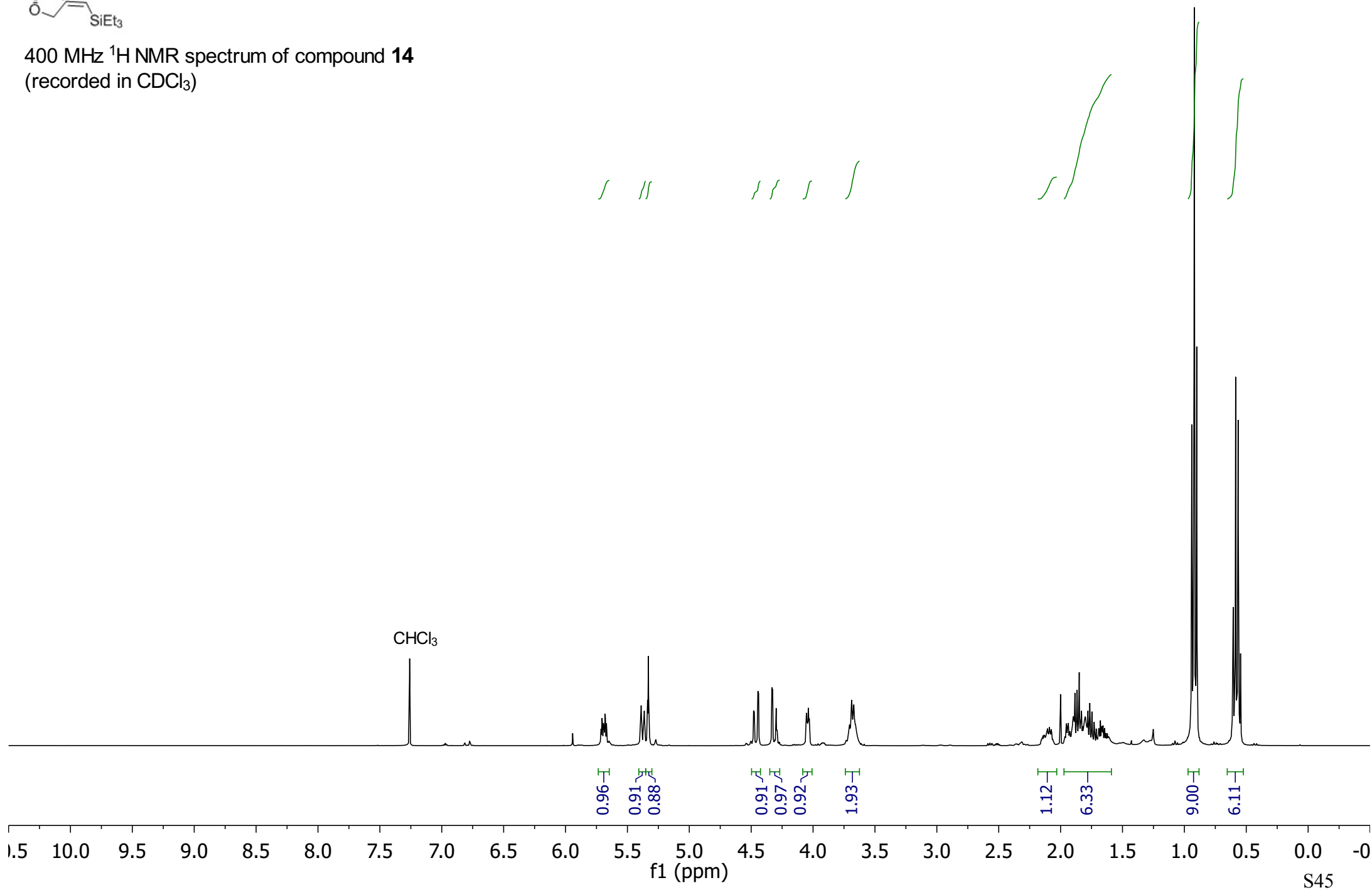


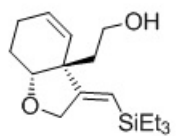
100 MHz ^{13}C NMR spectrum of compound **13**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **14**
(recorded in CDCl_3)





—164.4

—131.5

—126.1

—114.4

—80.7

—70.2

—60.0

—49.7

—41.6

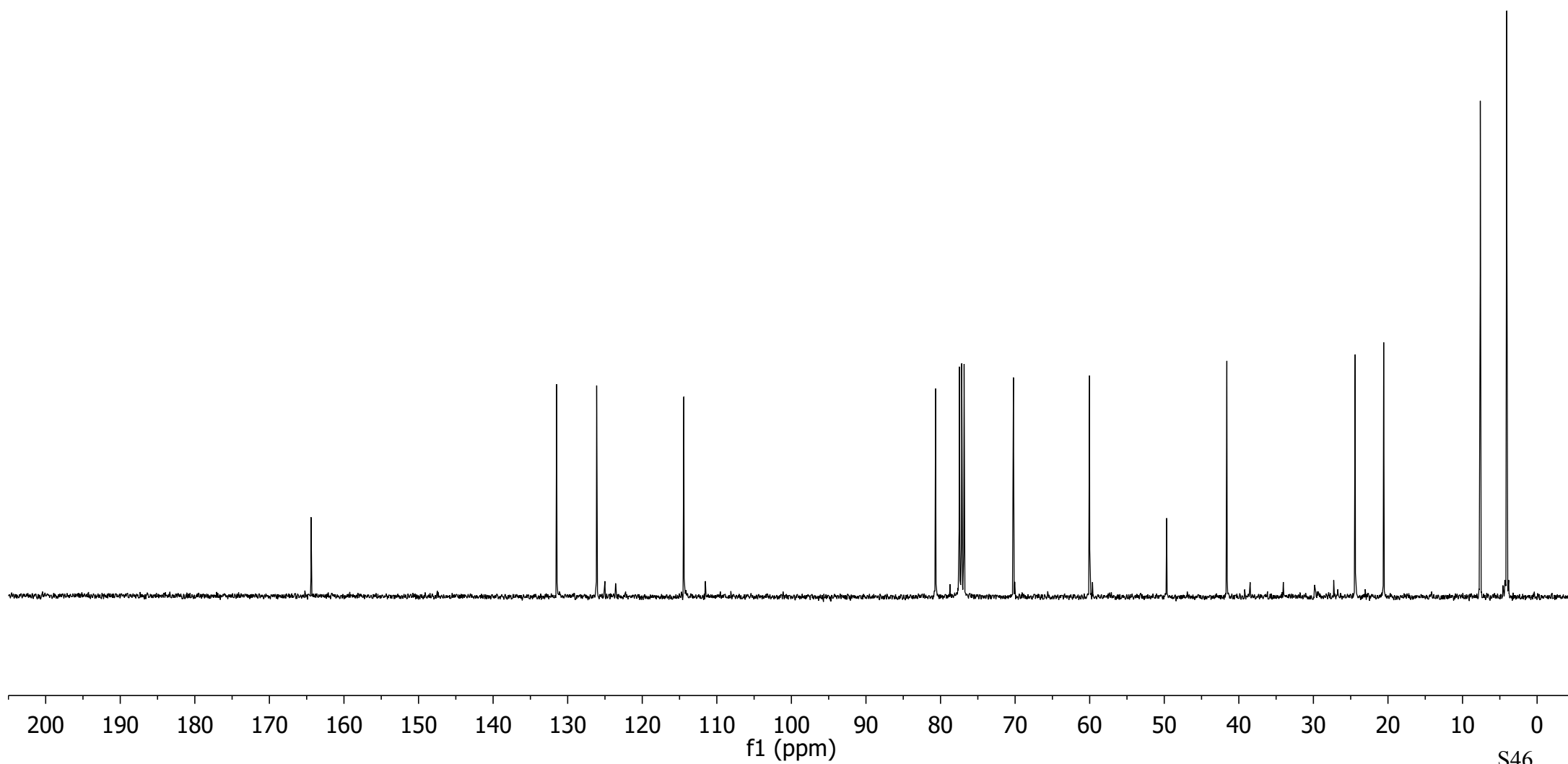
—24.4

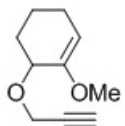
—20.6

—7.6

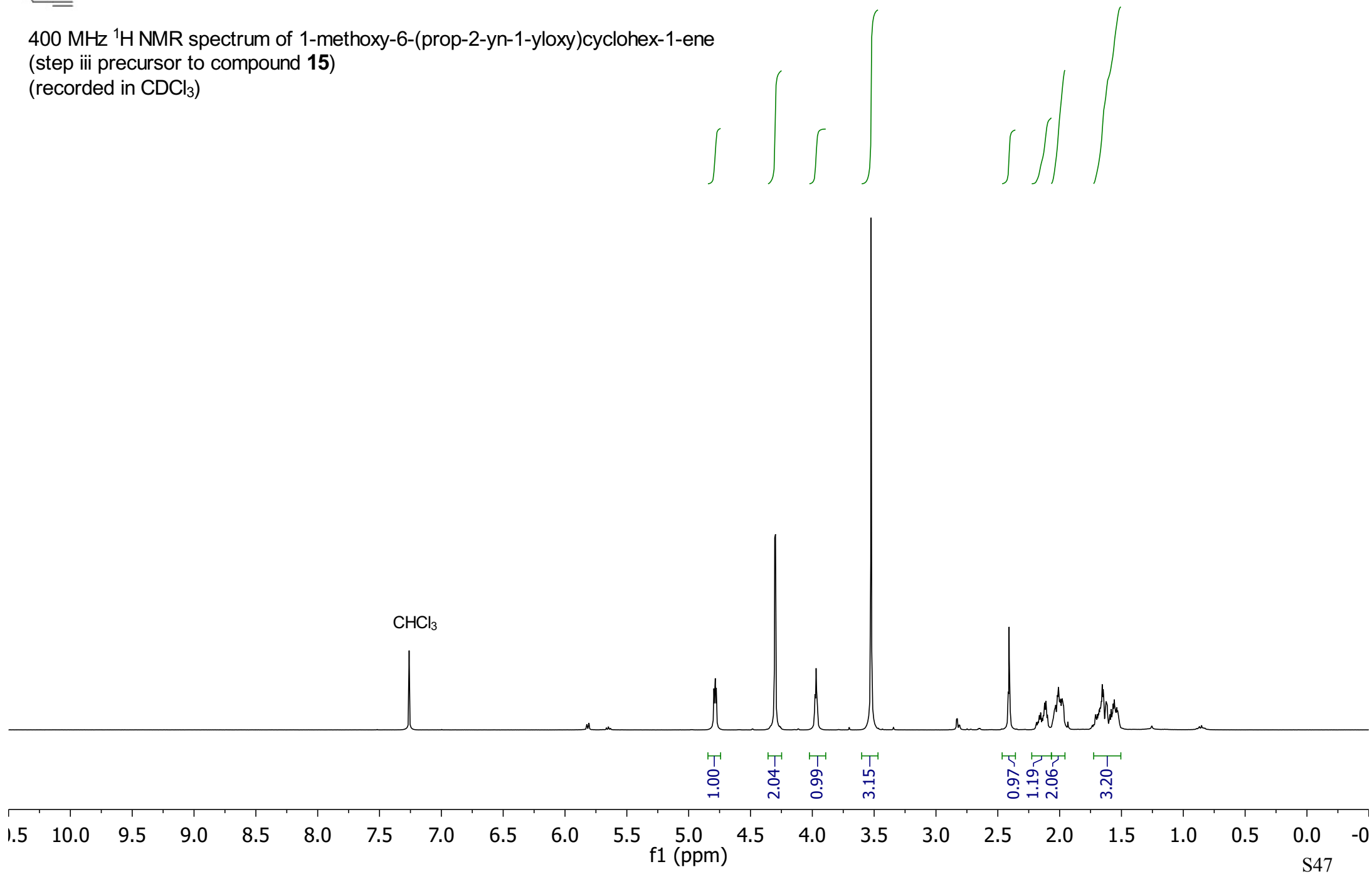
—4.1

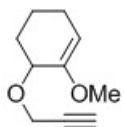
100 MHz ^{13}C NMR spectrum of compound **14**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of 1-methoxy-6-(prop-2-yn-1-yloxy)cyclohex-1-ene
(step iii precursor to compound **15**)
(recorded in CDCl_3)





—154.7

—98.0

—80.7

—74.0

—72.9

—57.1

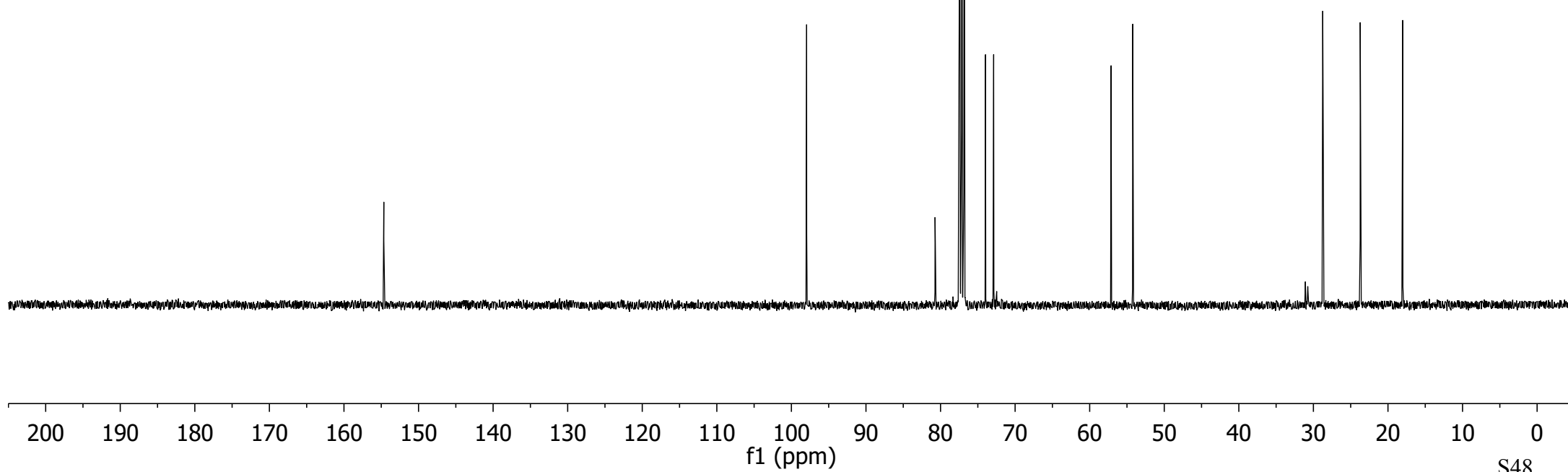
—54.2

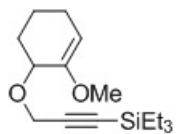
—28.7

—23.7

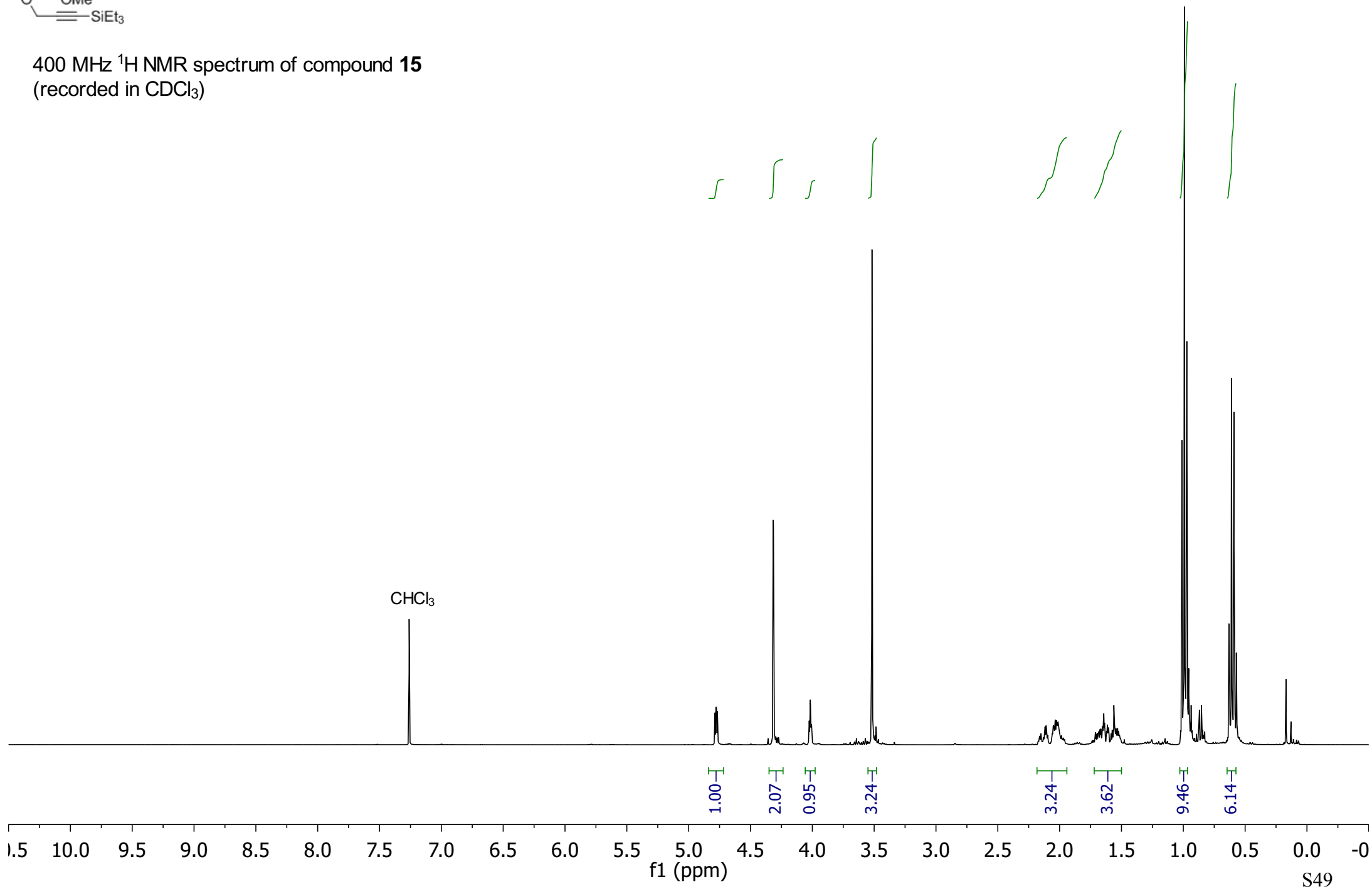
—18.0

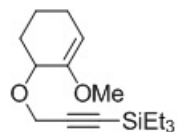
100 MHz ^{13}C NMR spectrum of 1-methoxy-6-(prop-2-yn-1-yloxy)cyclohex-1-ene
(step iii precursor to compound **15**)
(recorded in CDCl_3)



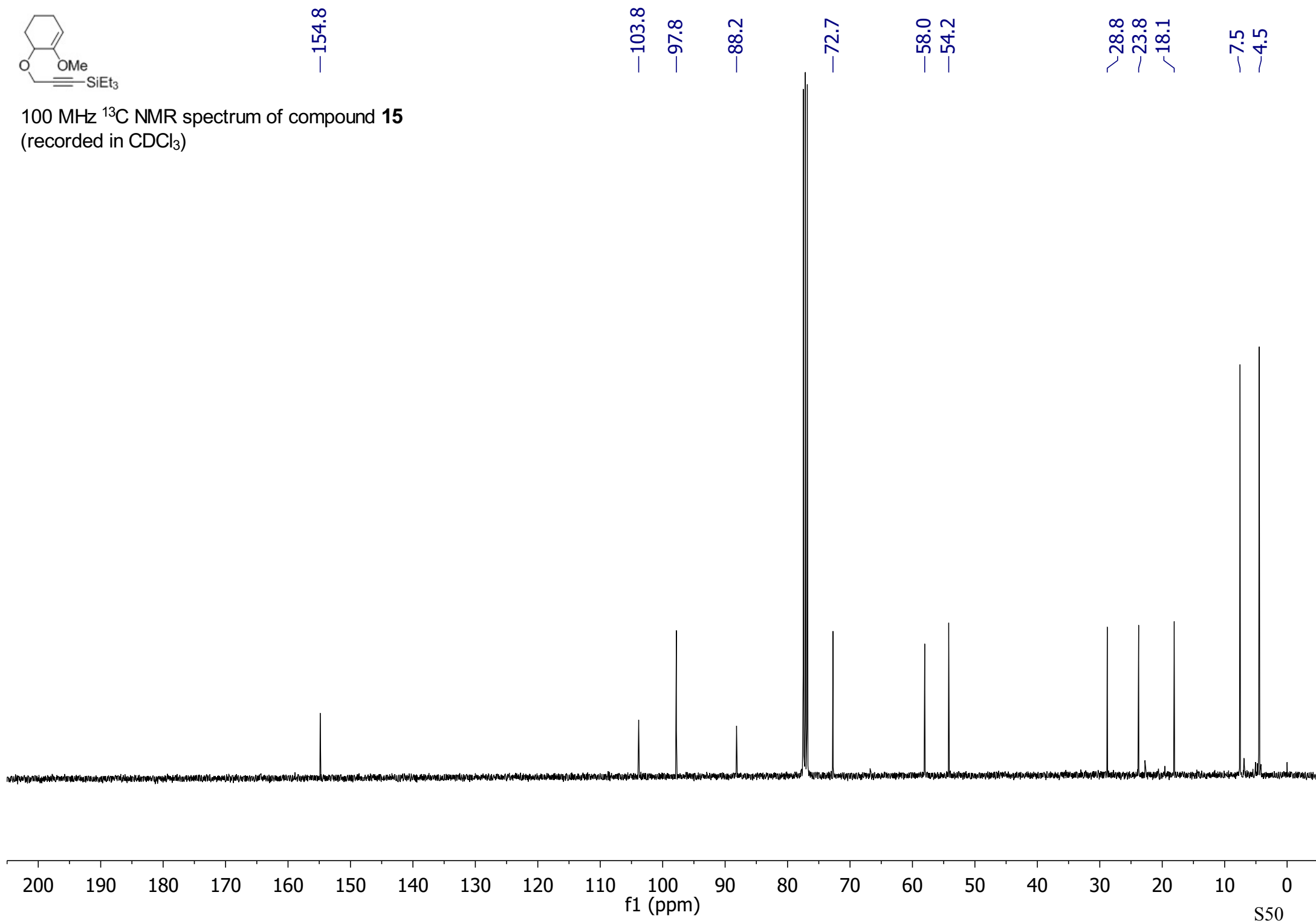


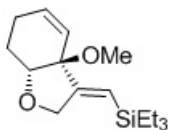
400 MHz ^1H NMR spectrum of compound **15**
(recorded in CDCl_3)



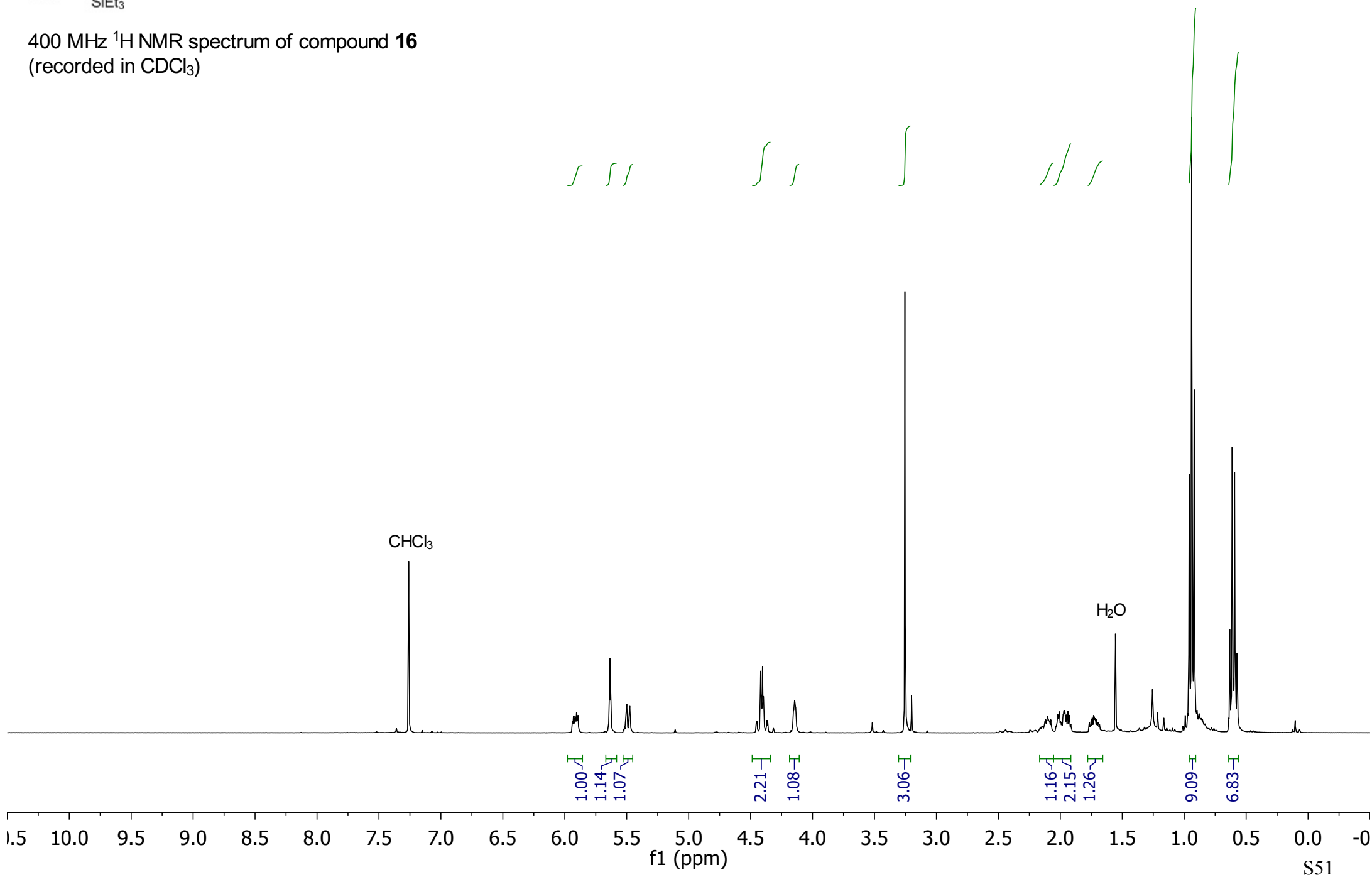


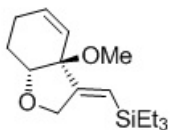
100 MHz ^{13}C NMR spectrum of compound **15**
(recorded in CDCl_3)



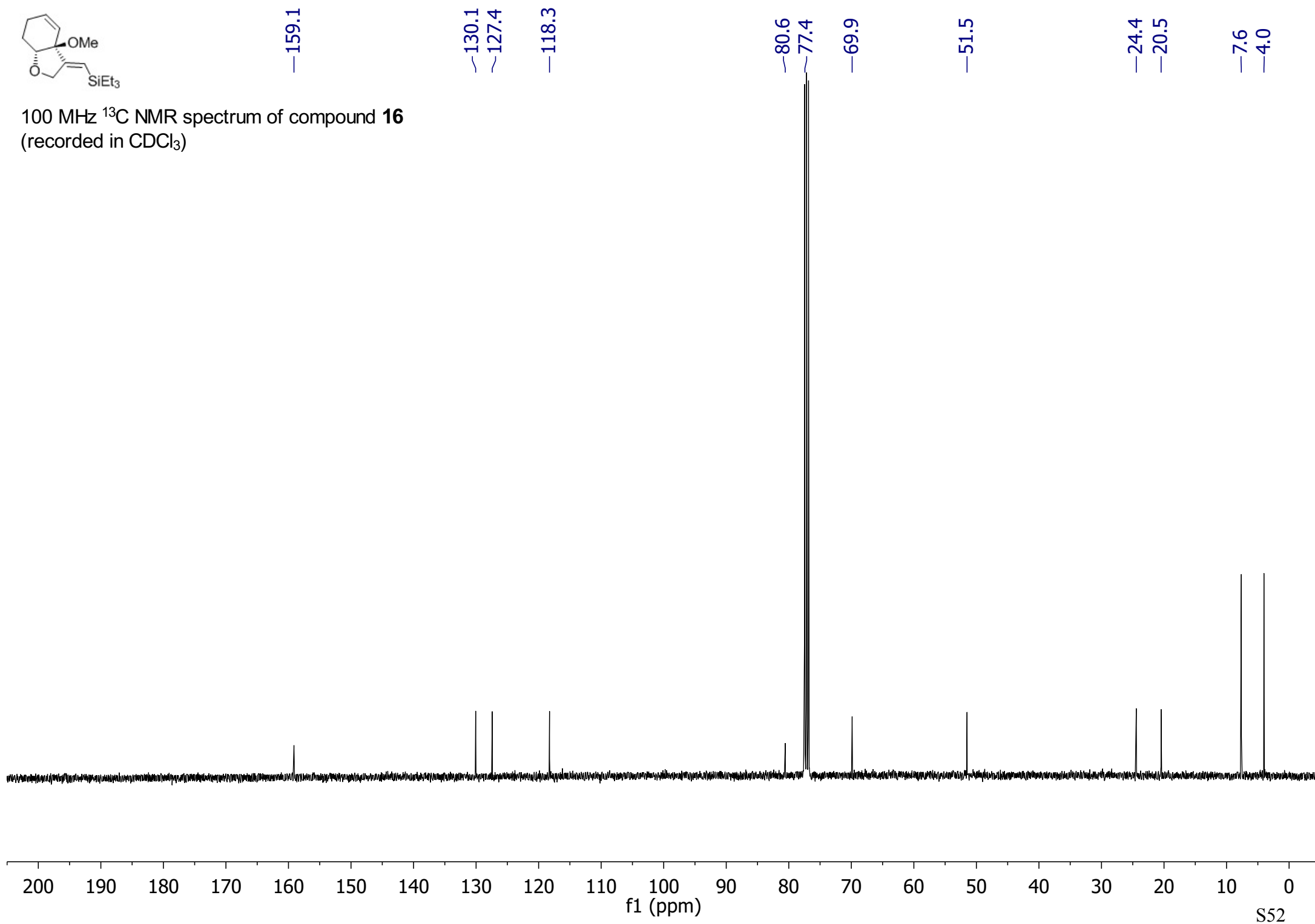


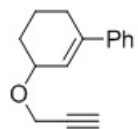
400 MHz ^1H NMR spectrum of compound **16**
(recorded in CDCl_3)



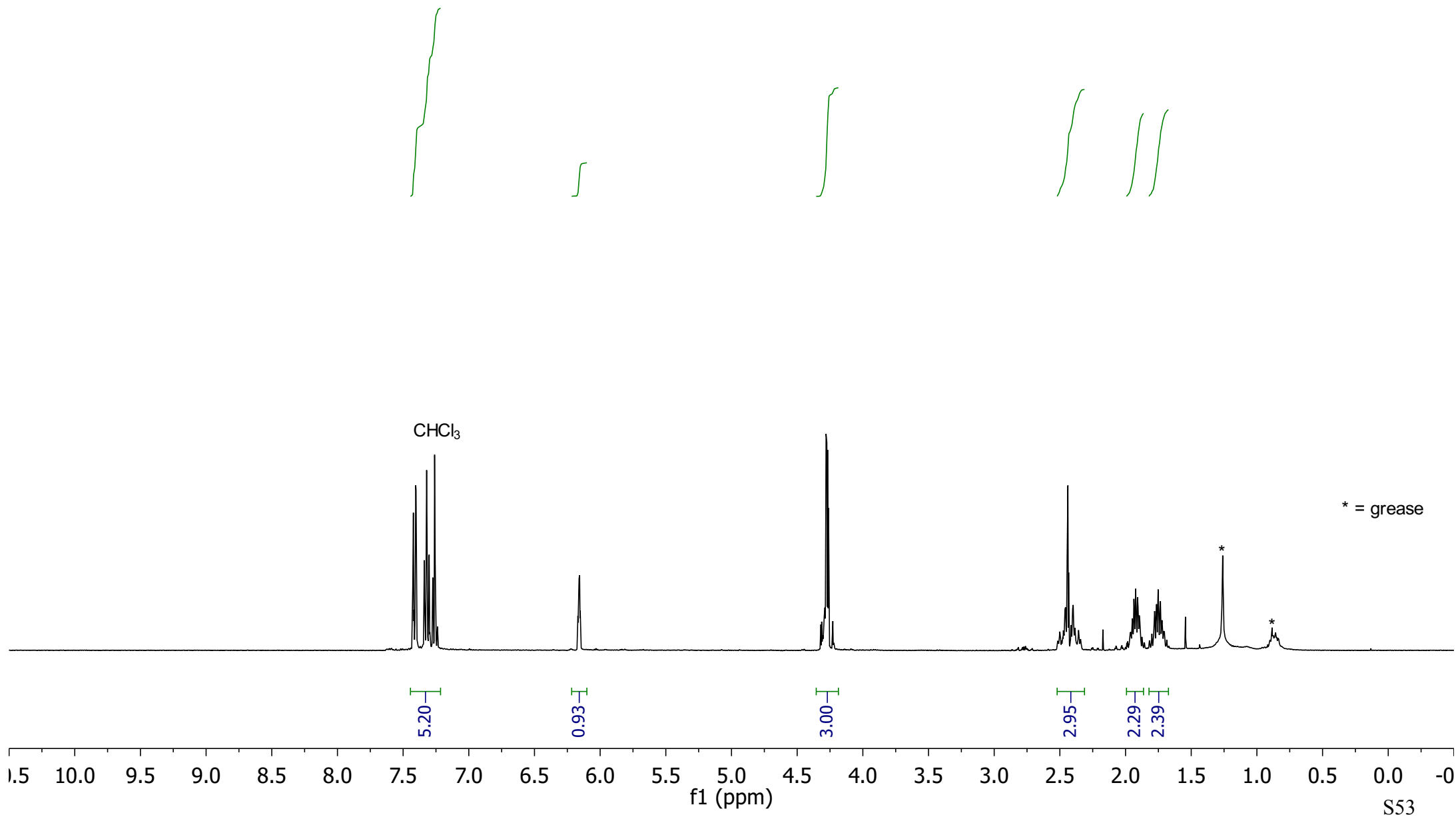


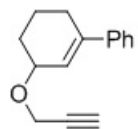
100 MHz ^{13}C NMR spectrum of compound **16**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of 5-(prop-2-yn-1-yloxy)-2,3,4,5-tetrahydro-1,1'-biphenyl
(step iii precursor to compound **17**)
(recorded in CDCl_3)





141.6
141.3

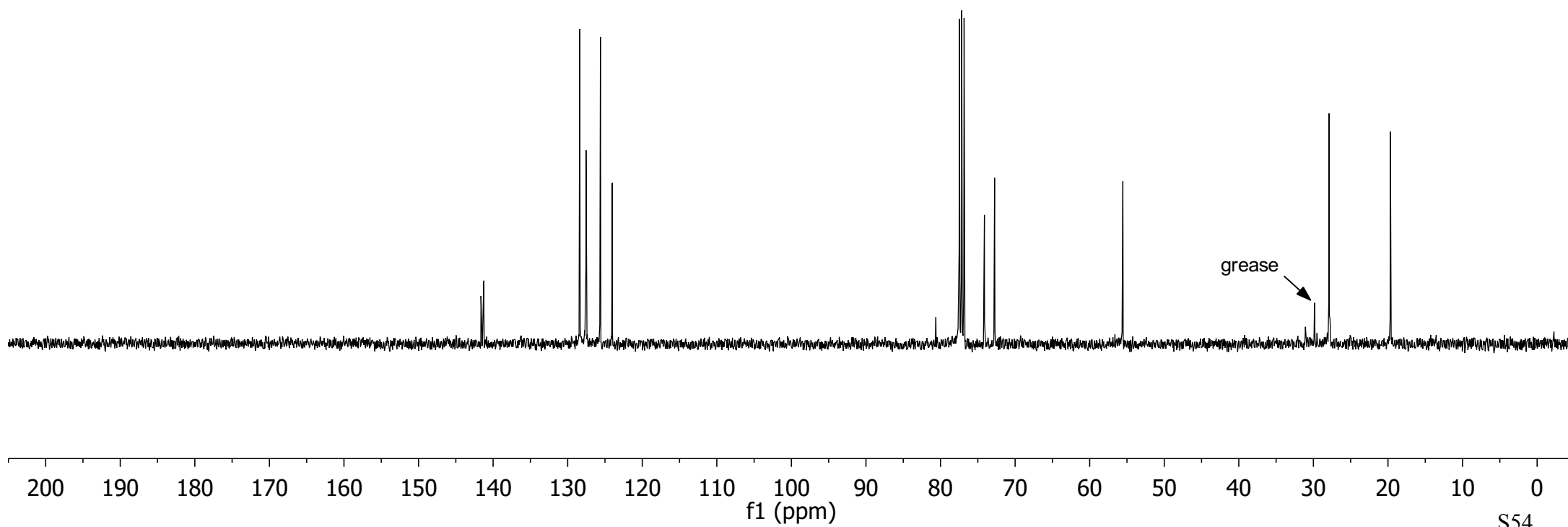
128.4
127.5
125.6
124.0

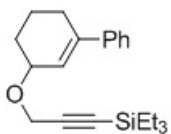
80.6
74.1
72.8

55.5

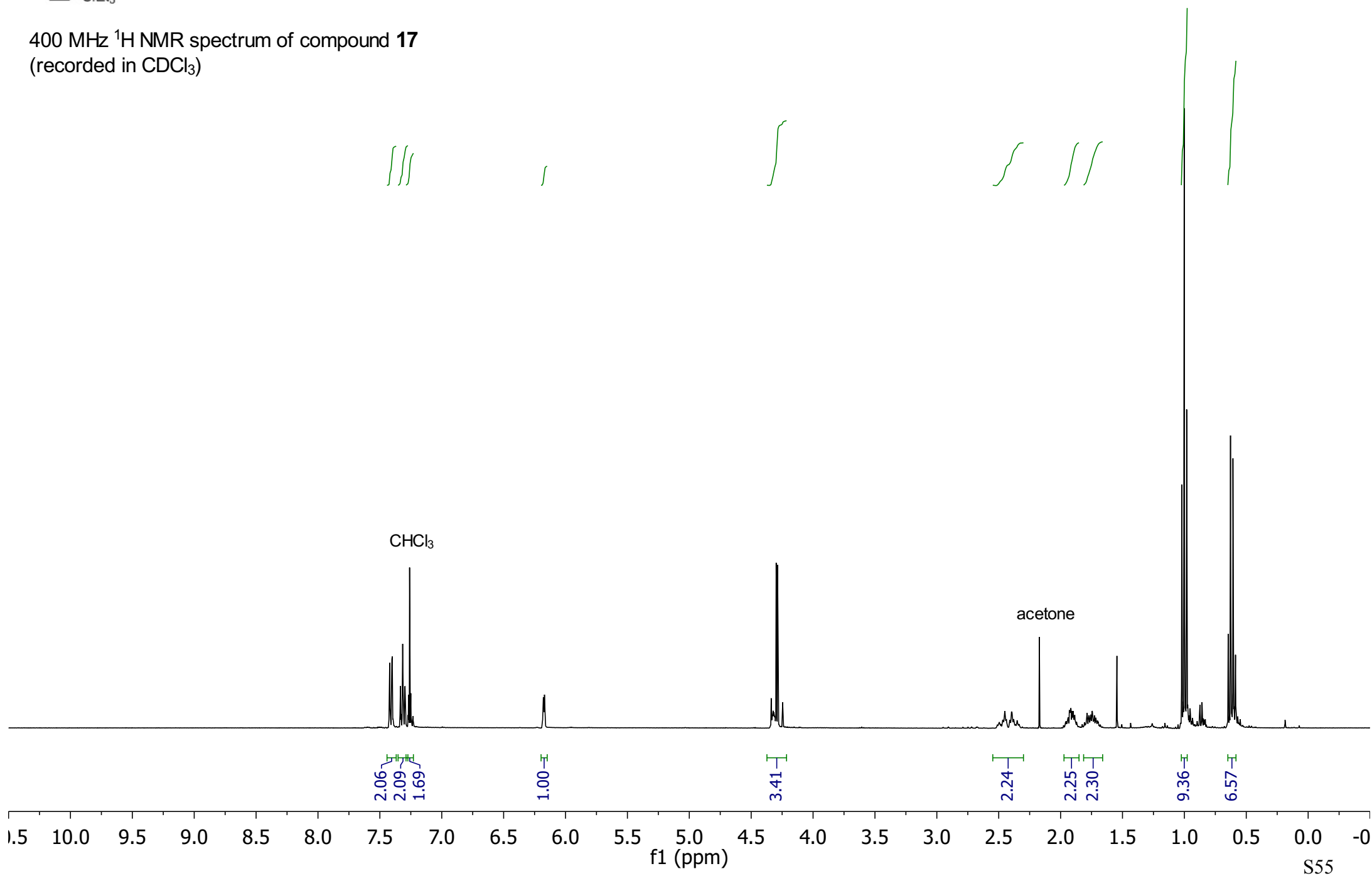
27.9
27.8
19.7

100 MHz ^{13}C NMR spectrum of 5-(prop-2-yn-1-yloxy)-2,3,4,5-tetrahydro-1,1'-biphenyl
(step iii precursor to compound **17**)
(recorded in CDCl_3)



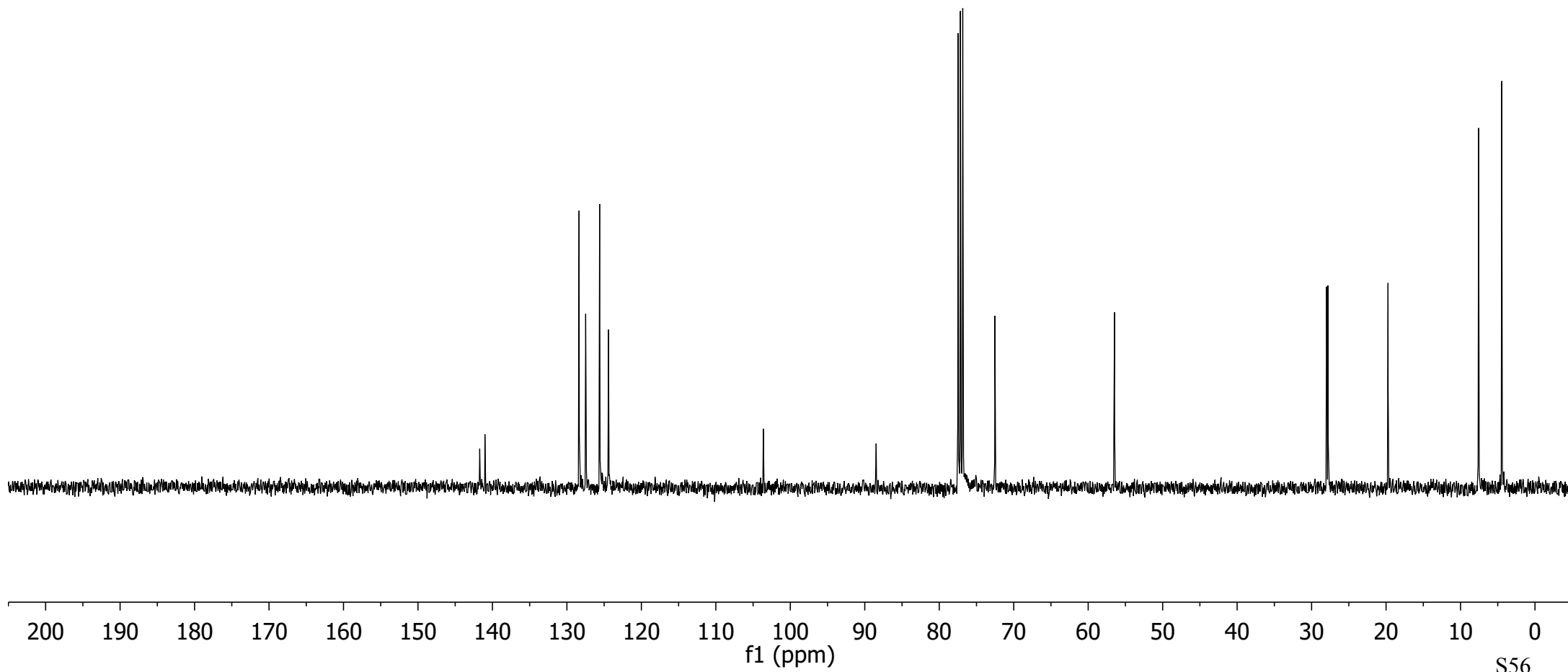


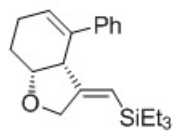
400 MHz ^1H NMR spectrum of compound **17**
(recorded in CDCl_3)



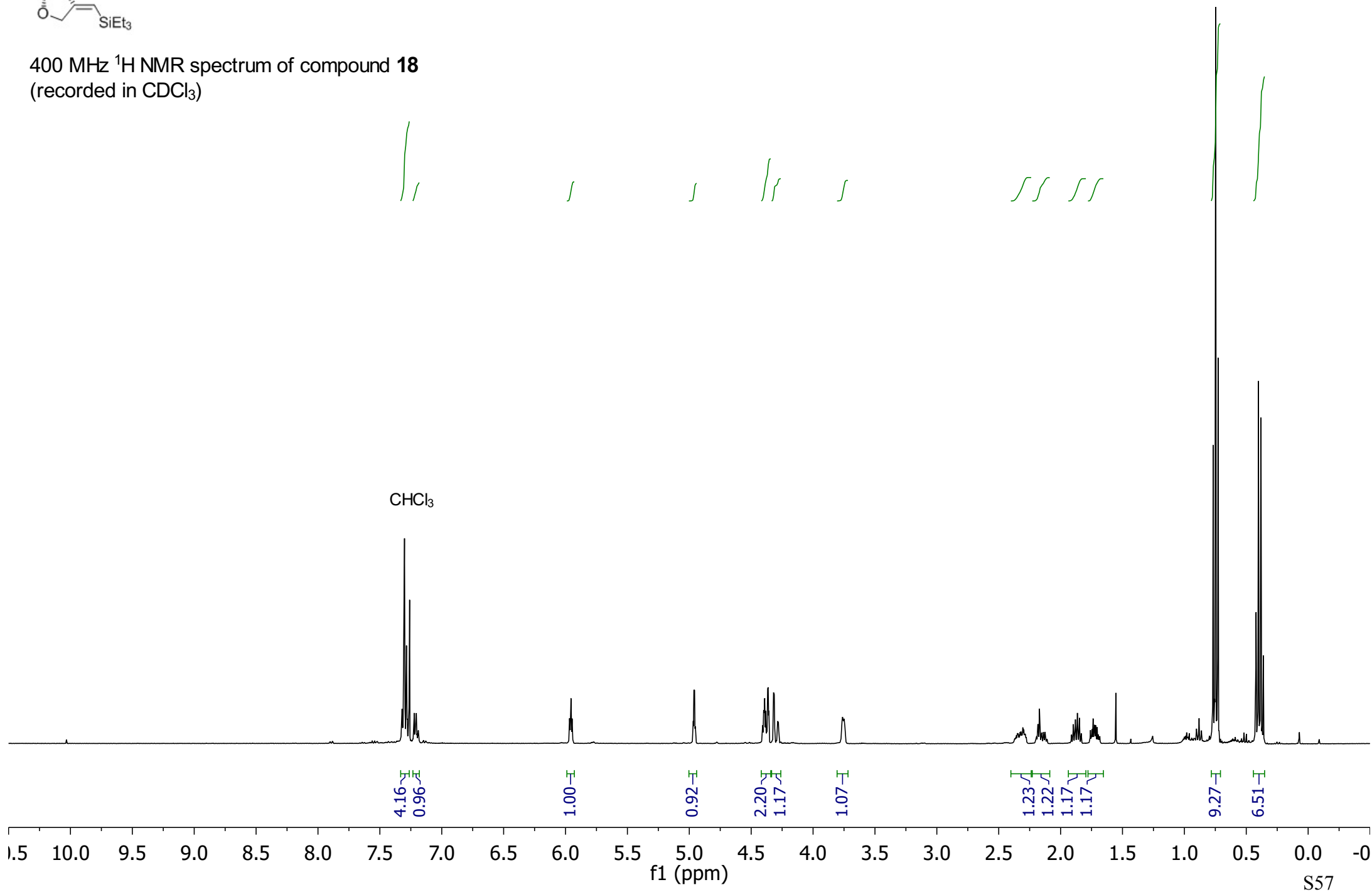


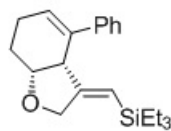
100 MHz ^{13}C NMR spectrum of compound **17**
(recorded in CDCl_3)



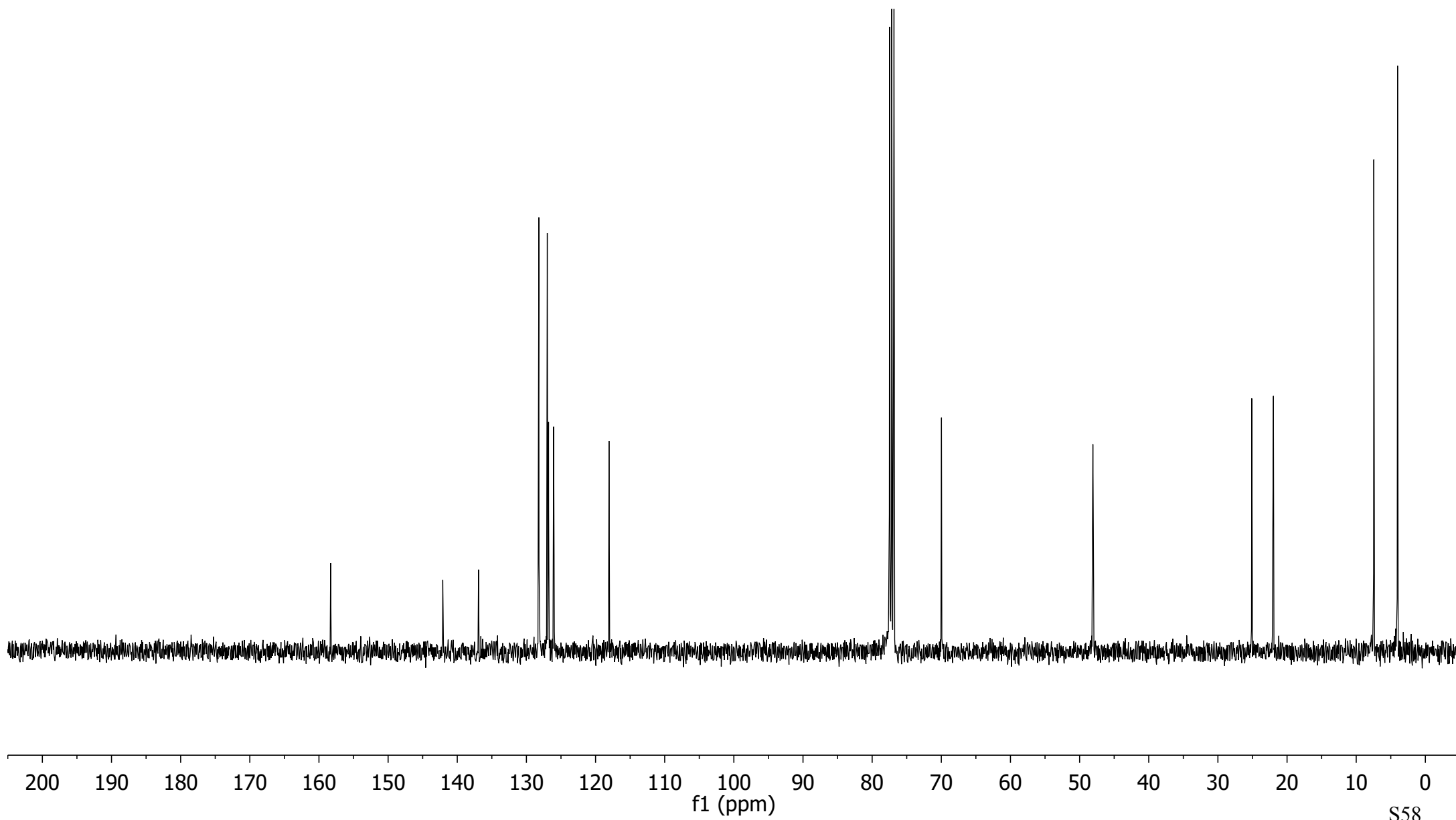


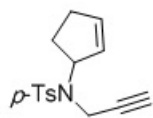
400 MHz ^1H NMR spectrum of compound **18**
(recorded in CDCl_3)



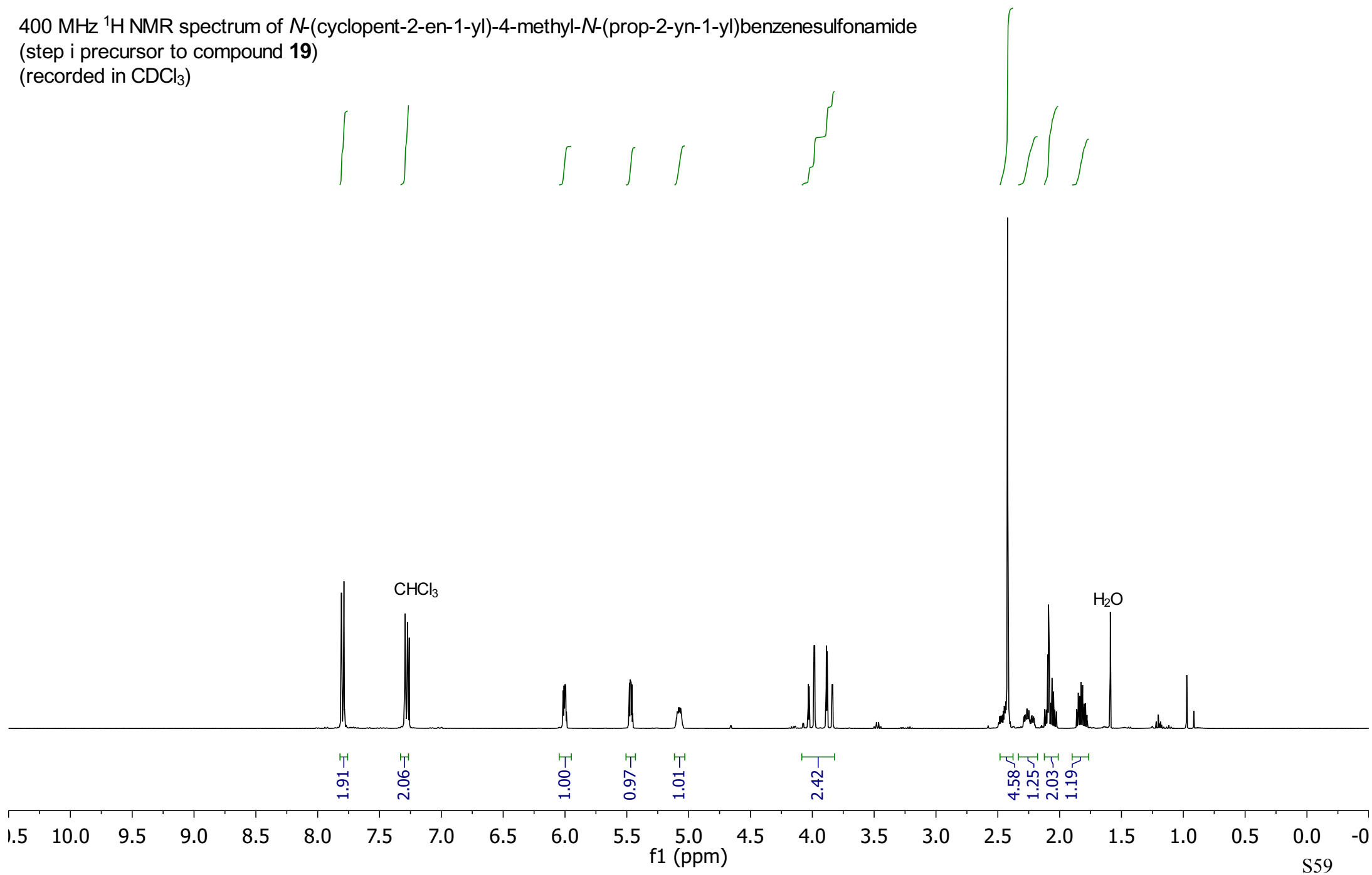


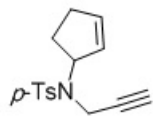
100 MHz ^{13}C NMR spectrum of compound **18**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of *N*-(cyclopent-2-en-1-yl)-4-methyl-*N*-(prop-2-yn-1-yl)benzenesulfonamide
(step i precursor to compound **19**)
(recorded in CDCl_3)



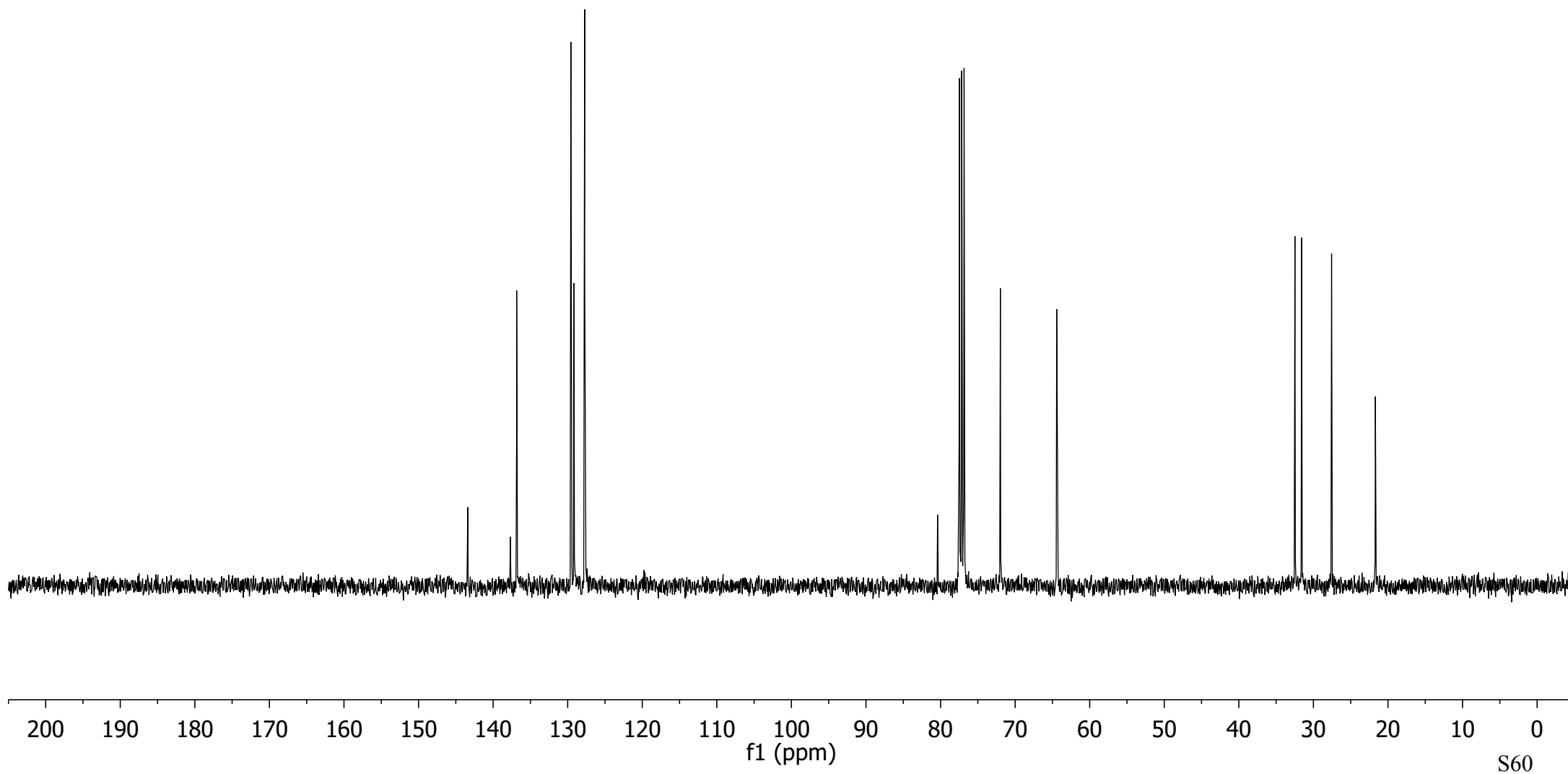


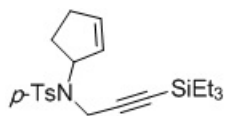
143.4
137.7
136.8
129.6
129.1
127.7

80.4
72.0
64.4

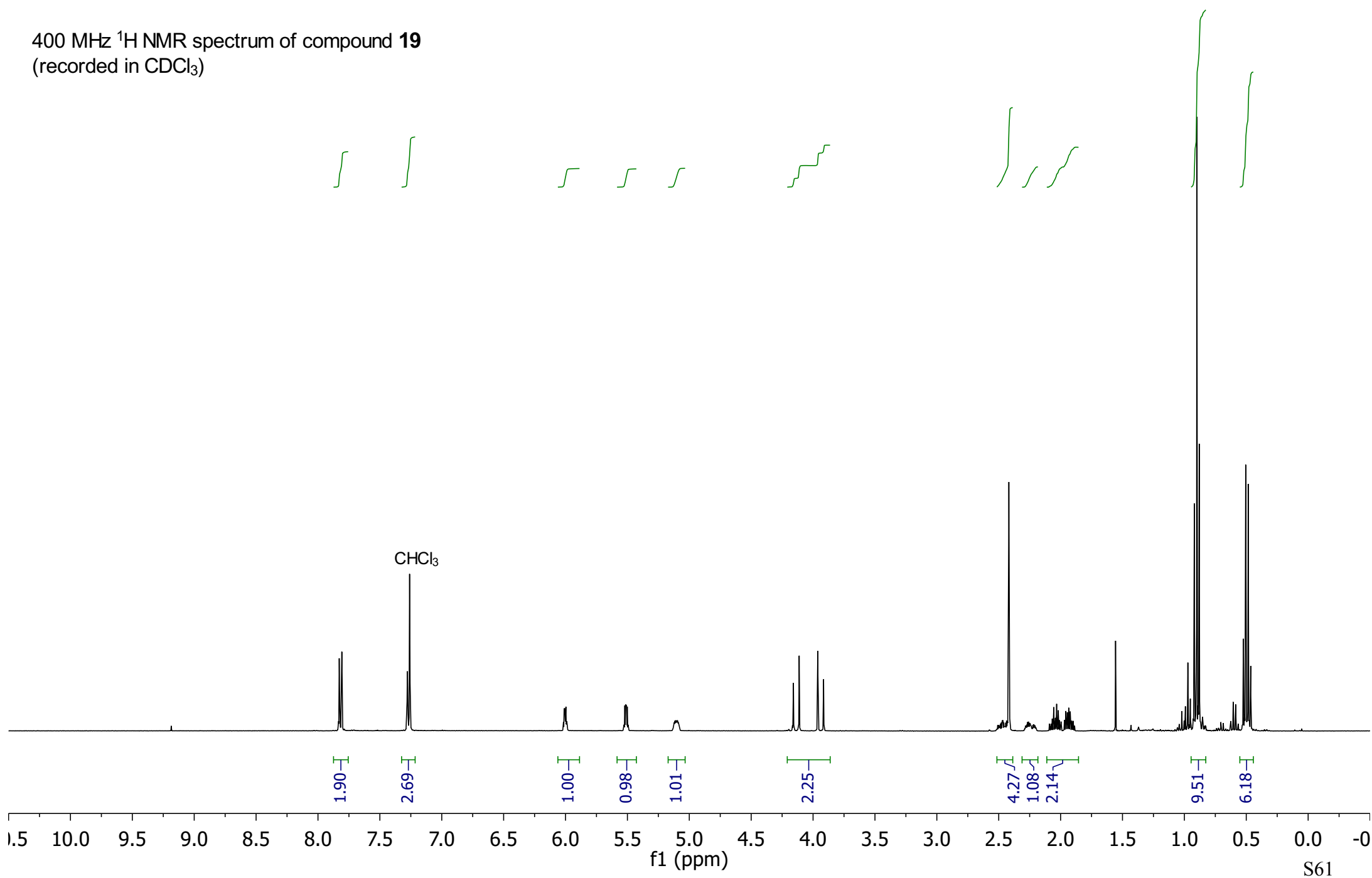
32.5
31.6
27.6
21.7

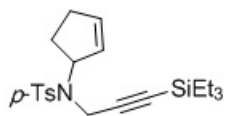
100 MHz ^{13}C NMR spectrum of *N*-(cyclopent-2-en-1-yl)-4-methyl-*N*-(prop-2-yn-1-yl)benzenesulfonamide
(step i precursor to compound **19**)
(recorded in CDCl_3)



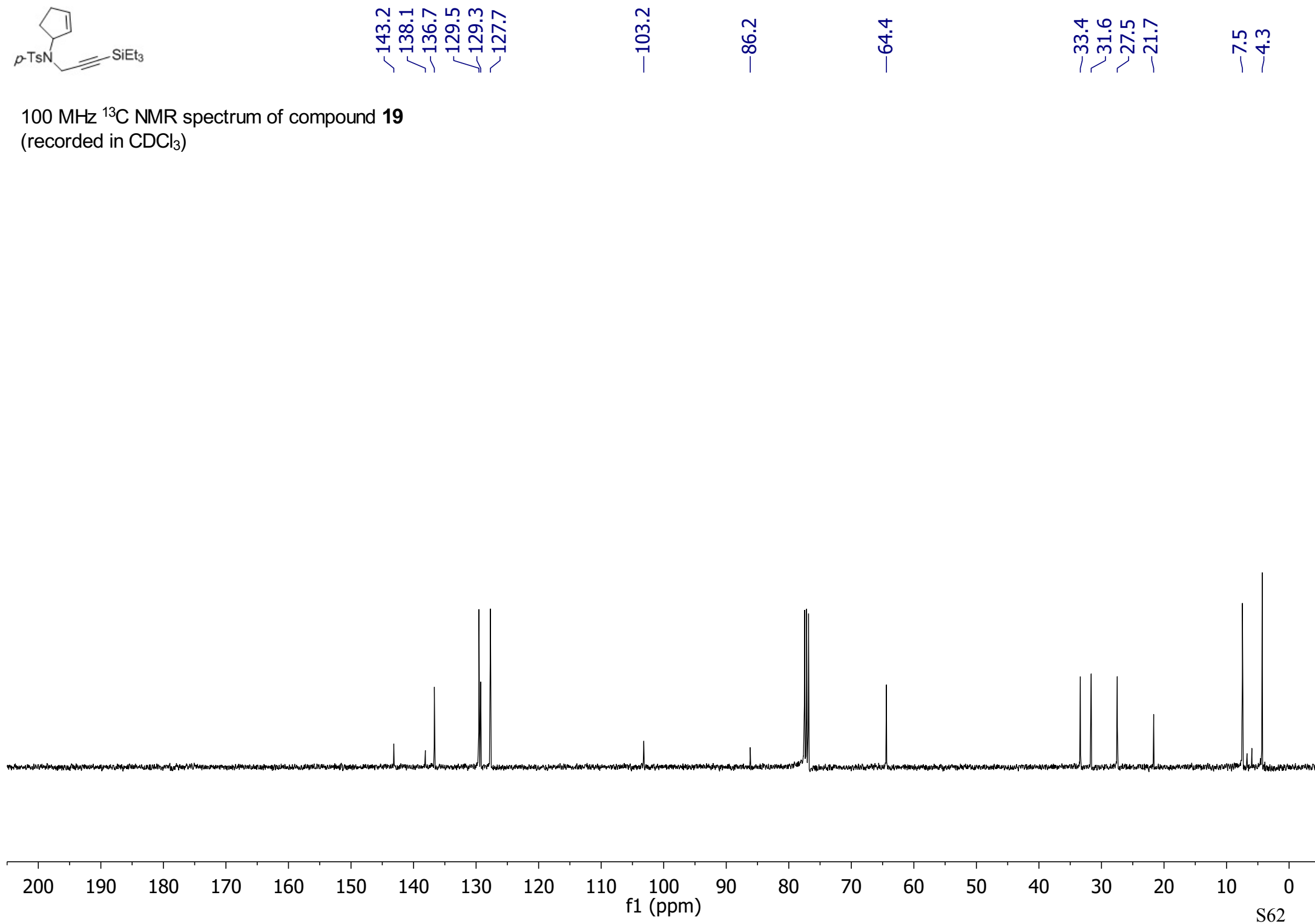


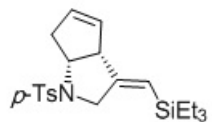
400 MHz ^1H NMR spectrum of compound **19**
(recorded in CDCl_3)



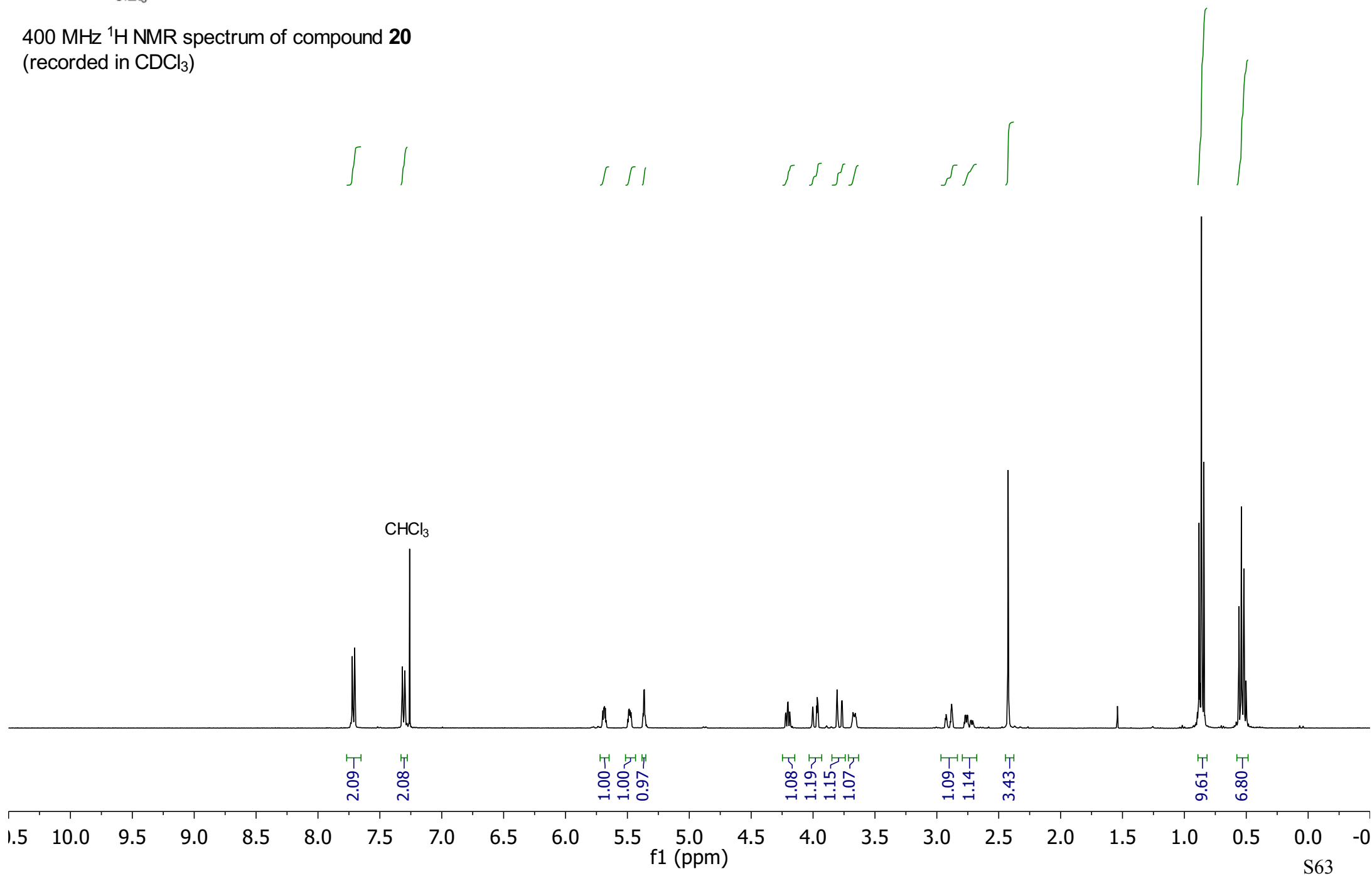


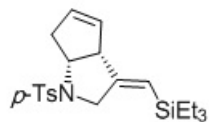
100 MHz ^{13}C NMR spectrum of compound **19**
(recorded in CDCl_3)



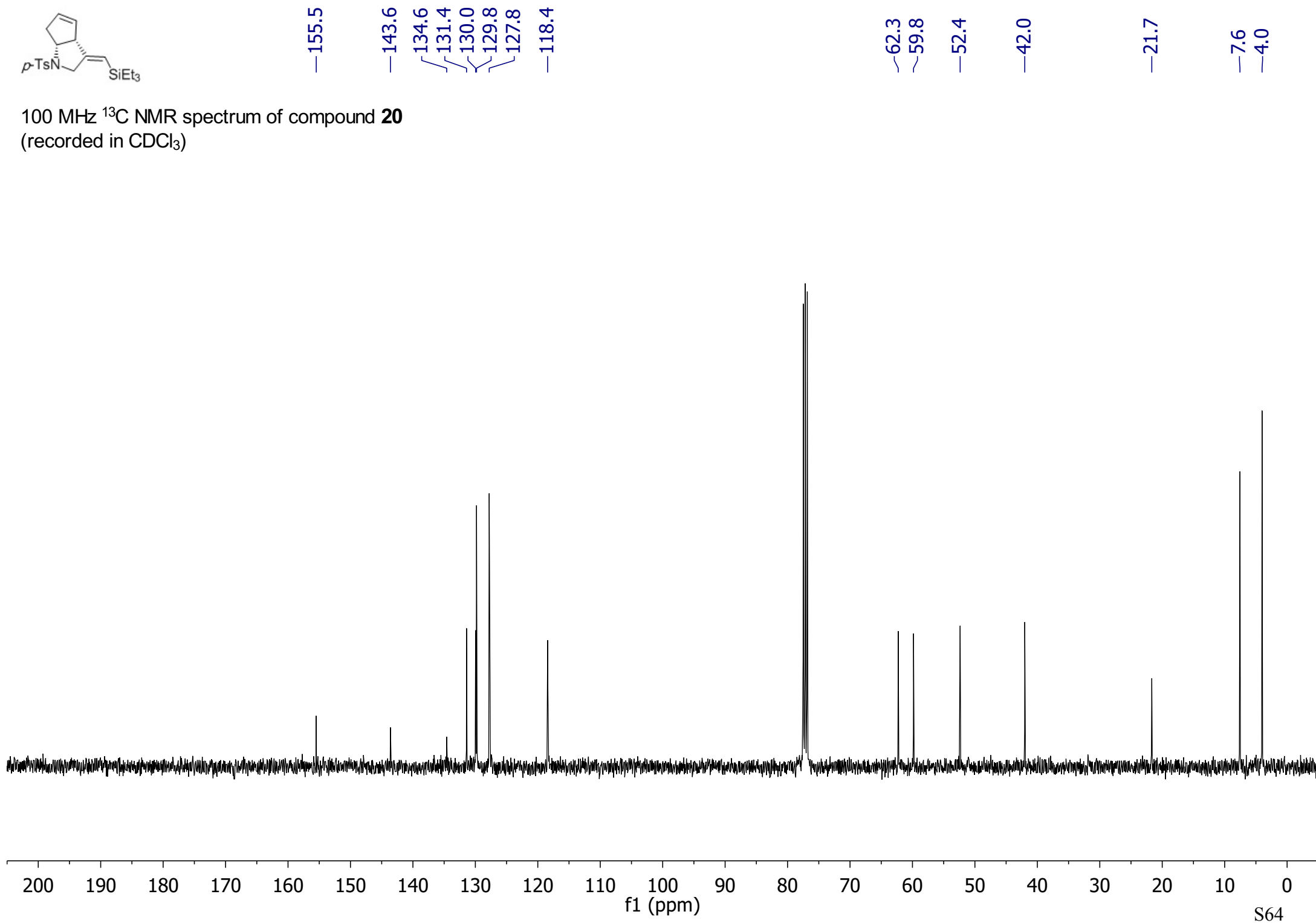


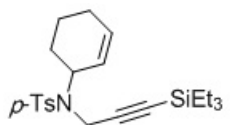
400 MHz ^1H NMR spectrum of compound **20**
(recorded in CDCl_3)



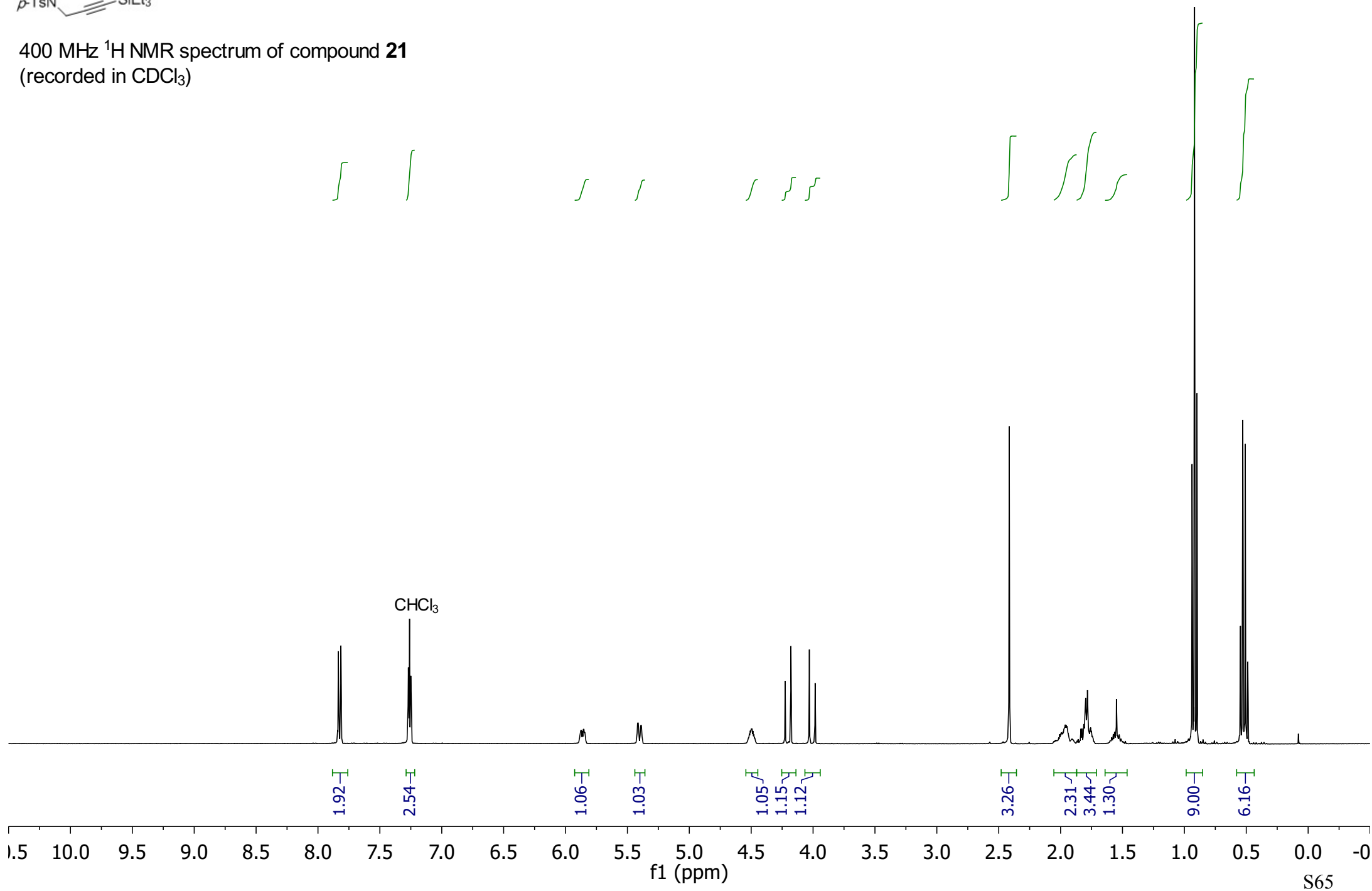


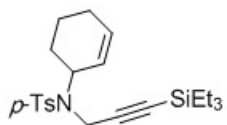
100 MHz ^{13}C NMR spectrum of compound **20**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **21**
(recorded in CDCl_3)





~143.1
~138.5
/132.9
/129.5
~127.6

—103.6

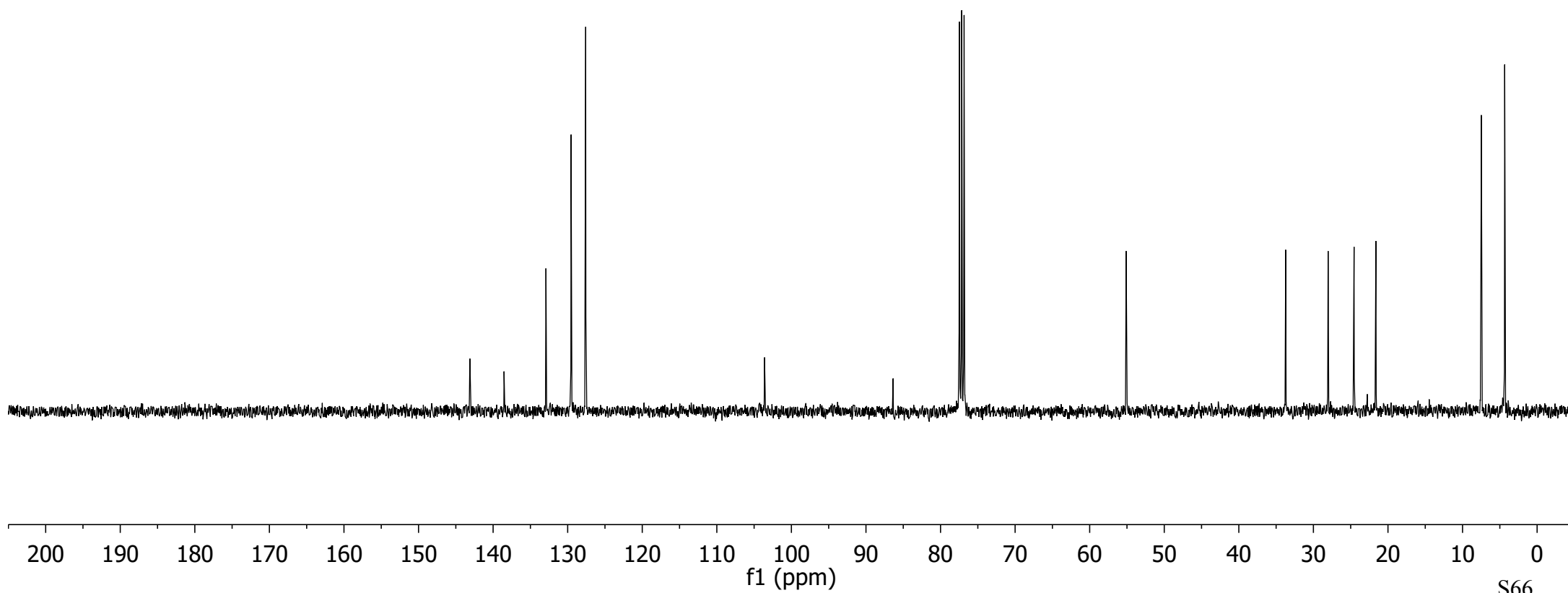
—86.4

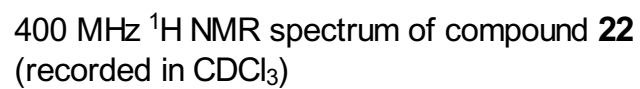
—55.1

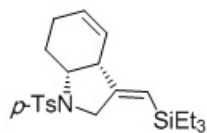
/33.7
/28.0
/24.5
/21.7
/21.6

~7.5
~4.3

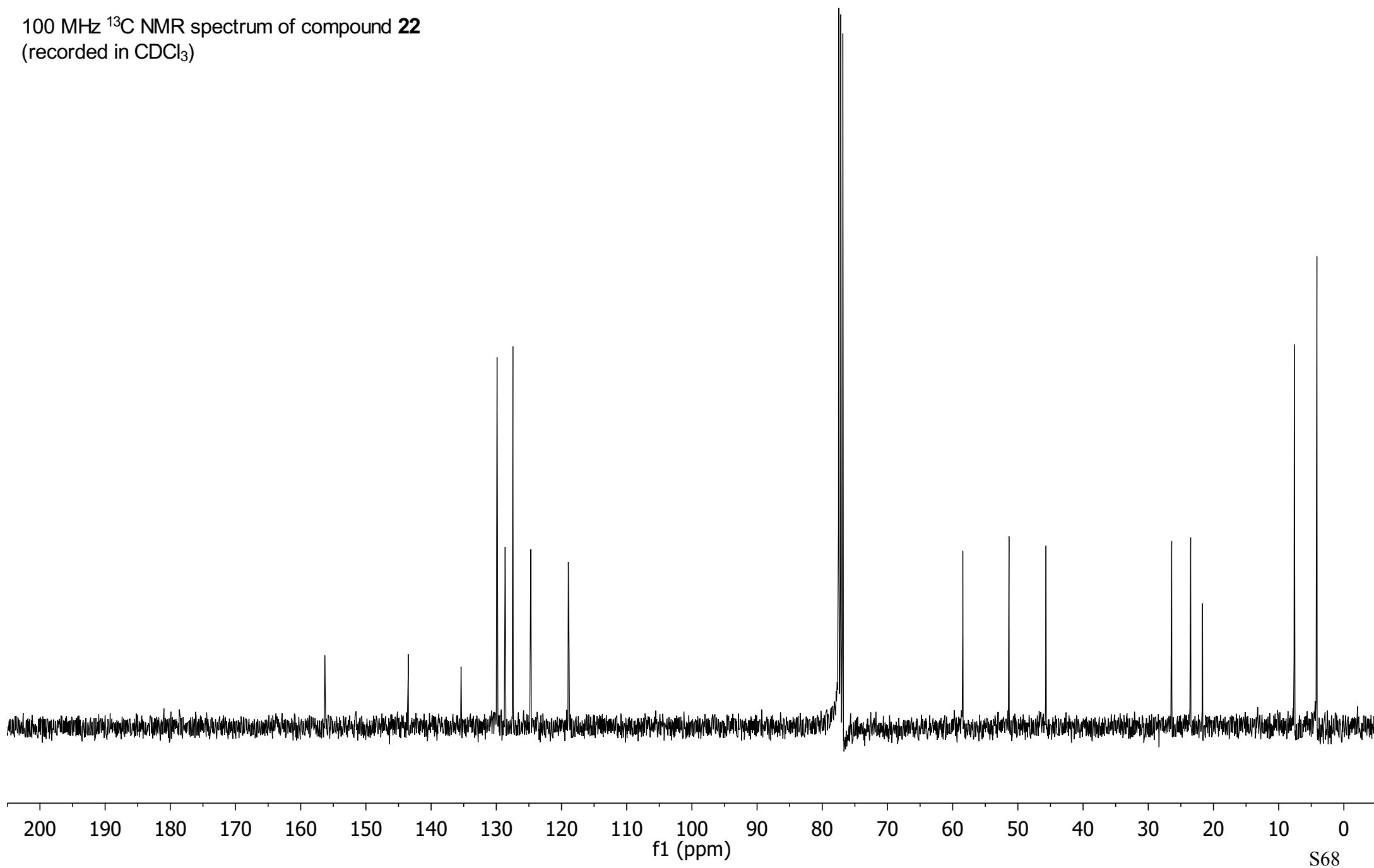
100 MHz ^{13}C NMR spectrum of compound **21**
(recorded in CDCl_3)

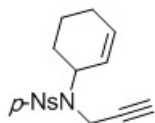




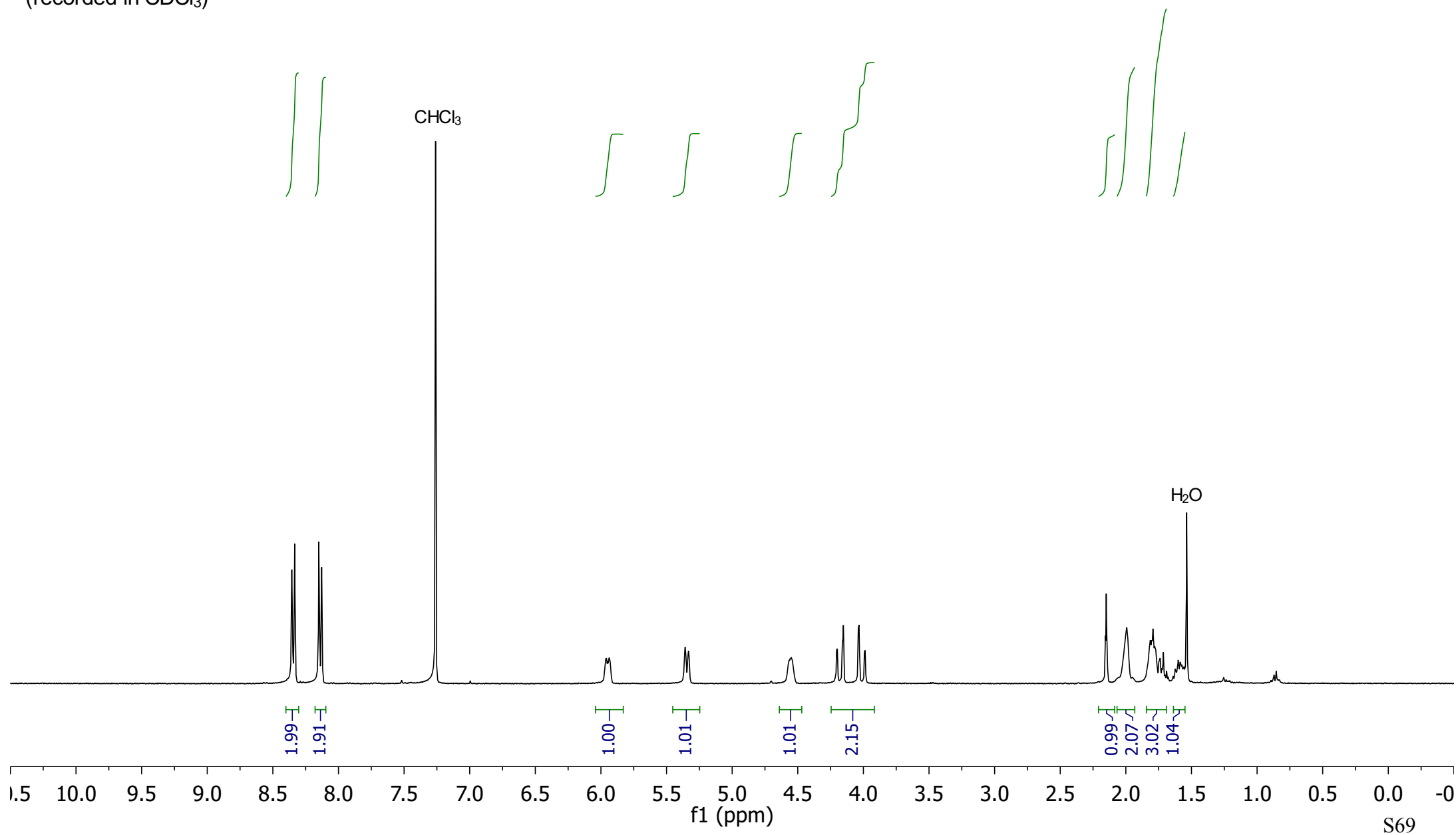


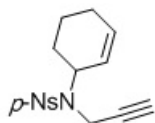
100 MHz ¹³C NMR spectrum of compound **22**
(recorded in CDCl₃)



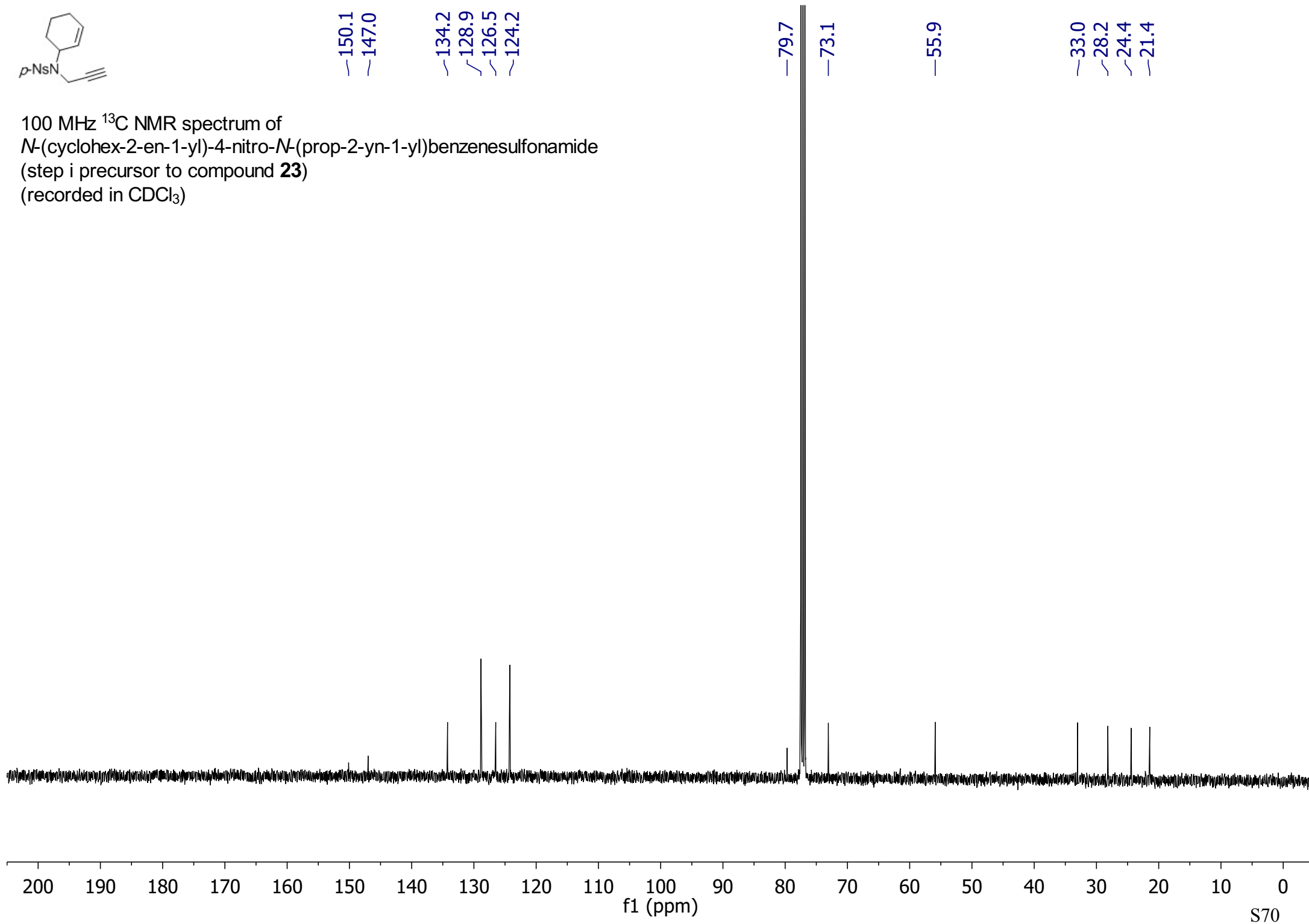


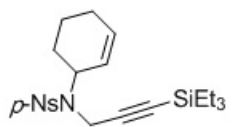
400 MHz ^1H NMR spectrum of *N*-(cyclohex-2-en-1-yl)-4-nitro-*N*-(prop-2-yn-1-yl)benzenesulfonamide
(step i precursor to compound **23**)
(recorded in CDCl_3)



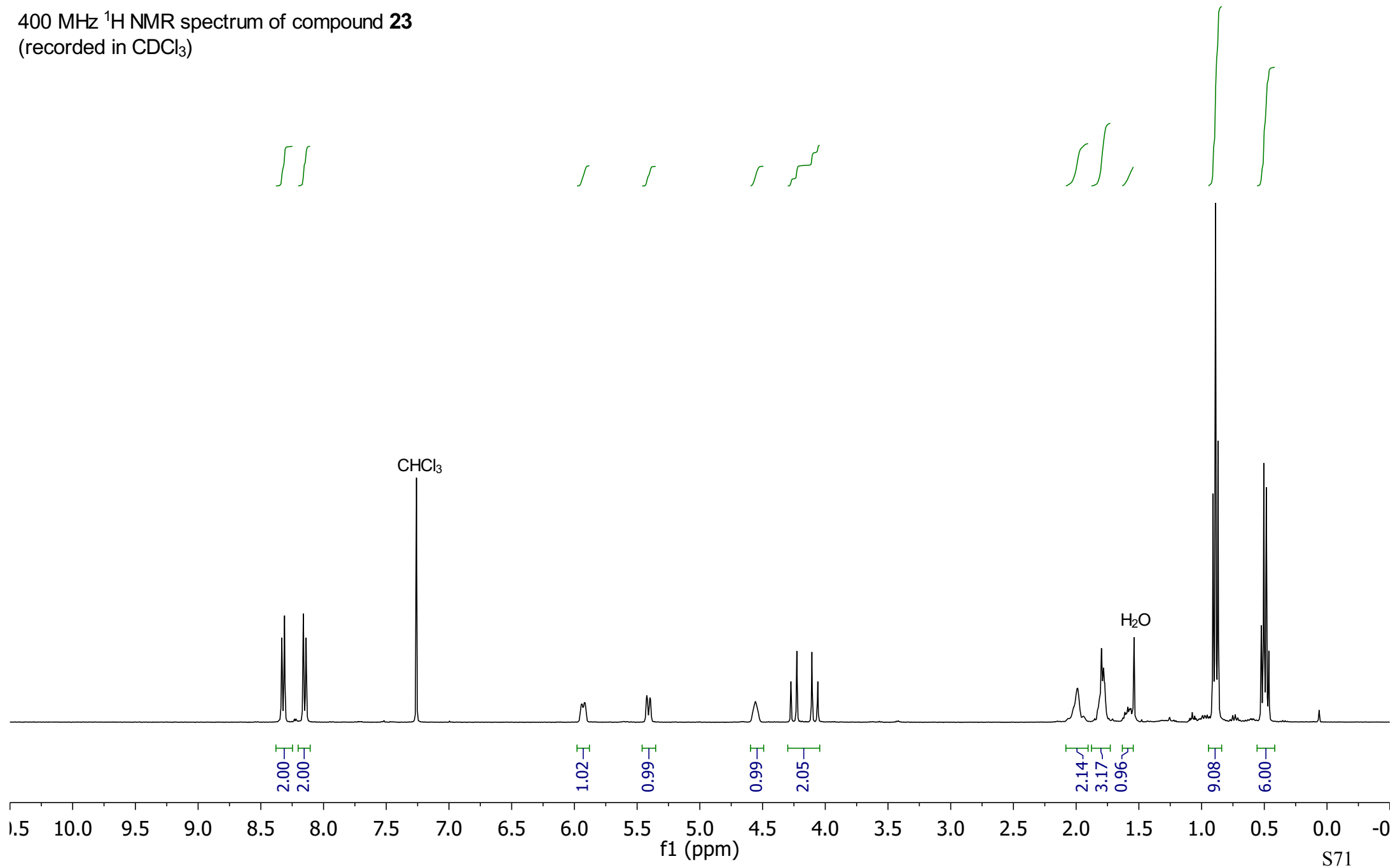


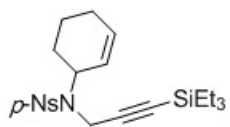
100 MHz ^{13}C NMR spectrum of
N-(cyclohex-2-en-1-yl)-4-nitro-*N*-(prop-2-yn-1-yl)benzenesulfonamide
 (step i precursor to compound **23**)
 (recorded in CDCl_3)



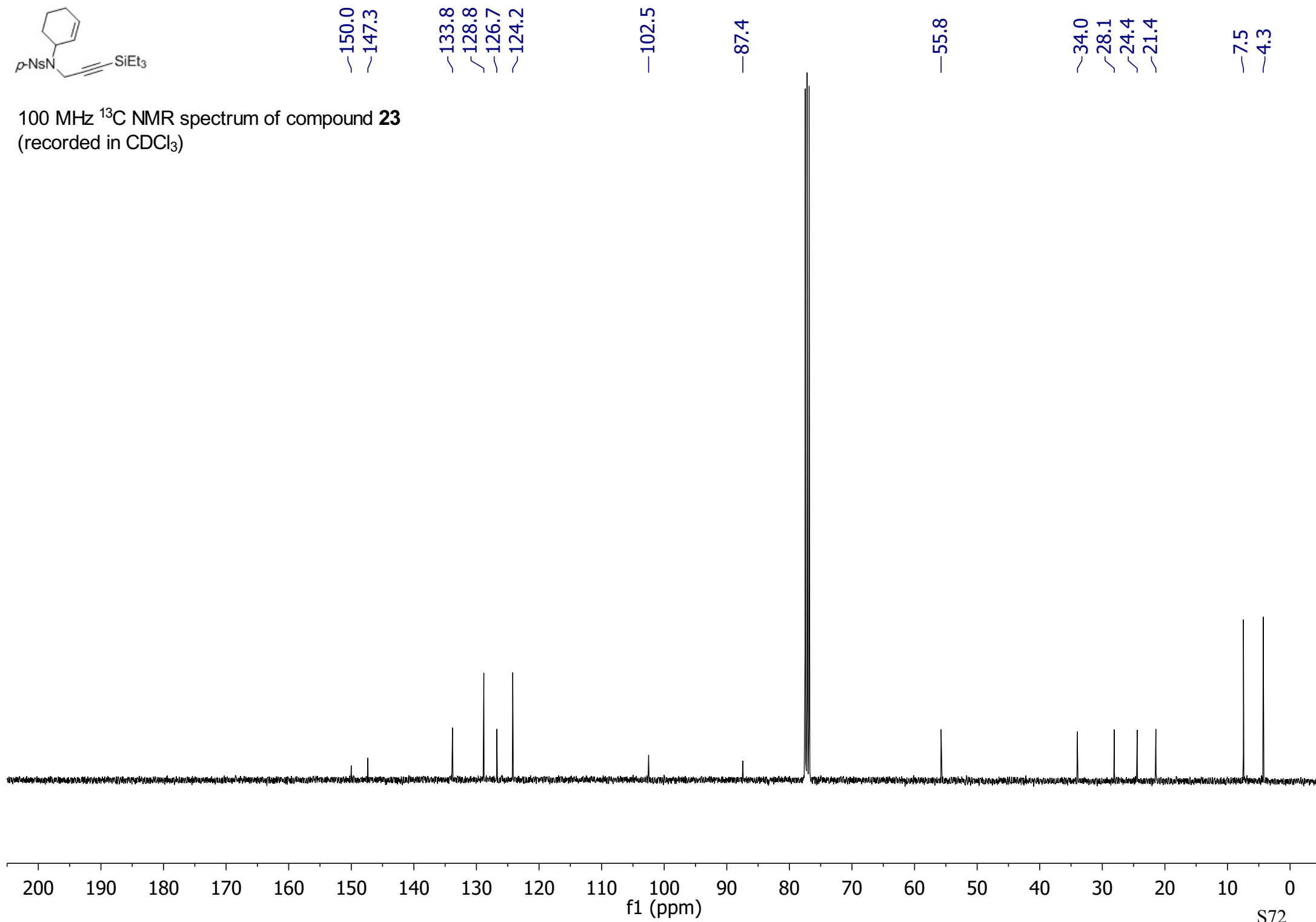


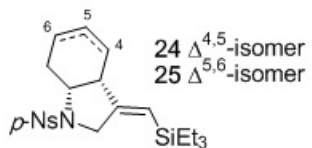
400 MHz ^1H NMR spectrum of compound **23**
(recorded in CDCl_3)



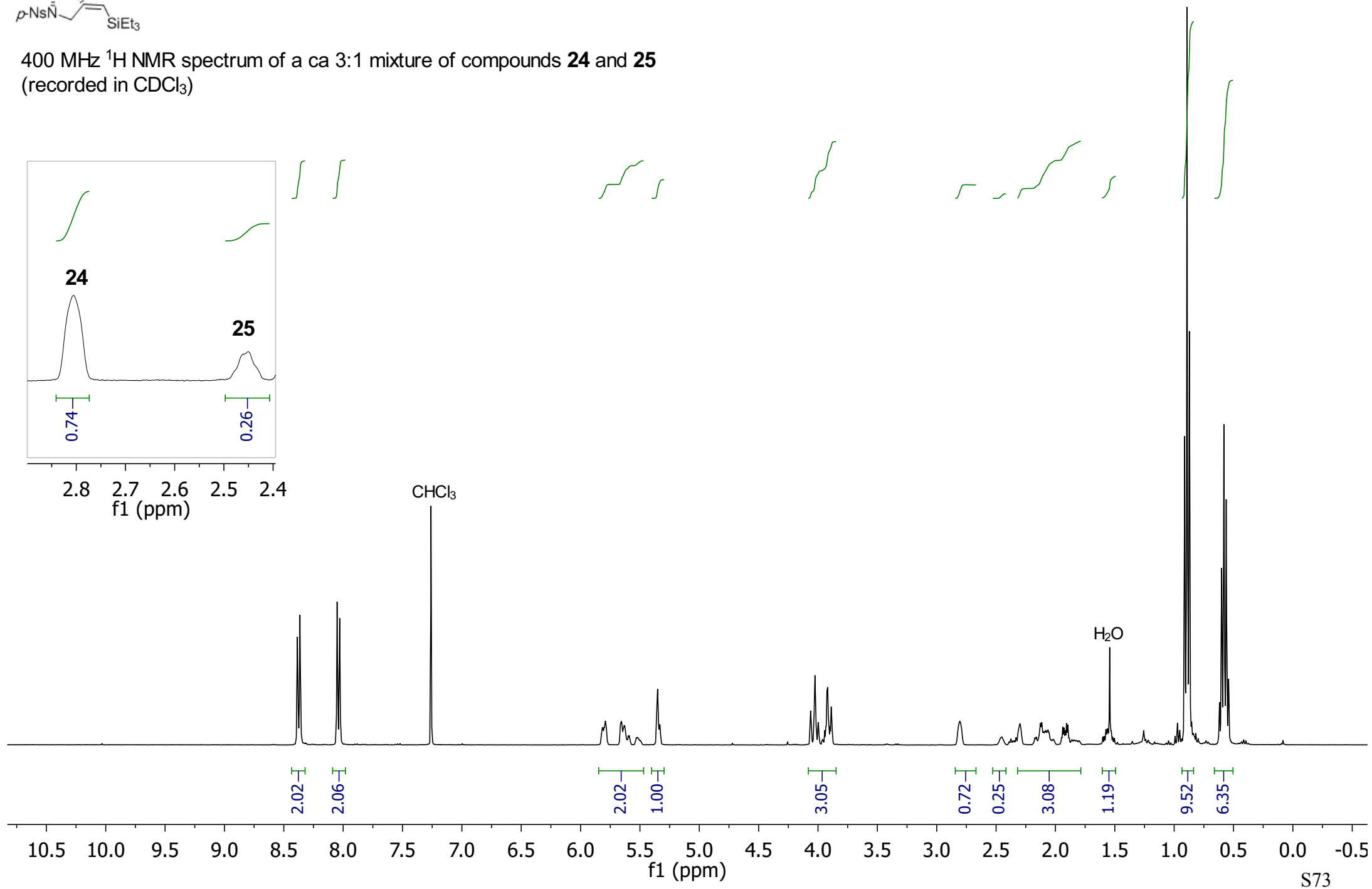


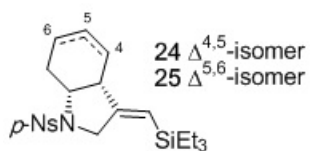
100 MHz ¹³C NMR spectrum of compound **23**
(recorded in CDCl₃)





400 MHz ^1H NMR spectrum of a ca 3:1 mixture of compounds **24** and **25**
 (recorded in CDCl_3)





154.9
 150.2
 144.5
 128.8
 128.5
 124.6
 124.3
 120.2

58.8

51.2

45.7

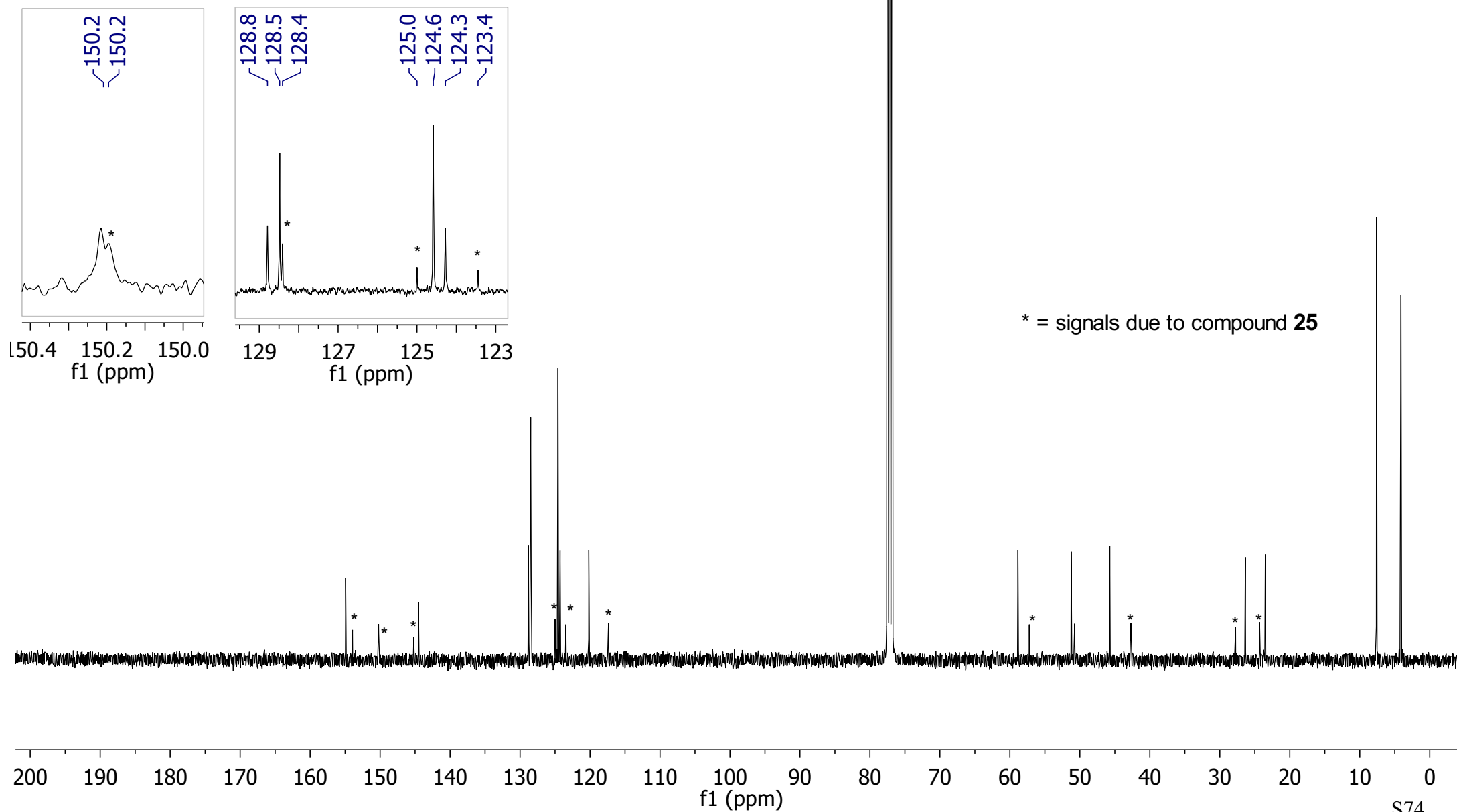
26.4

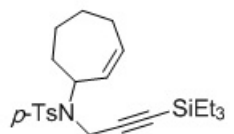
23.5

7.6

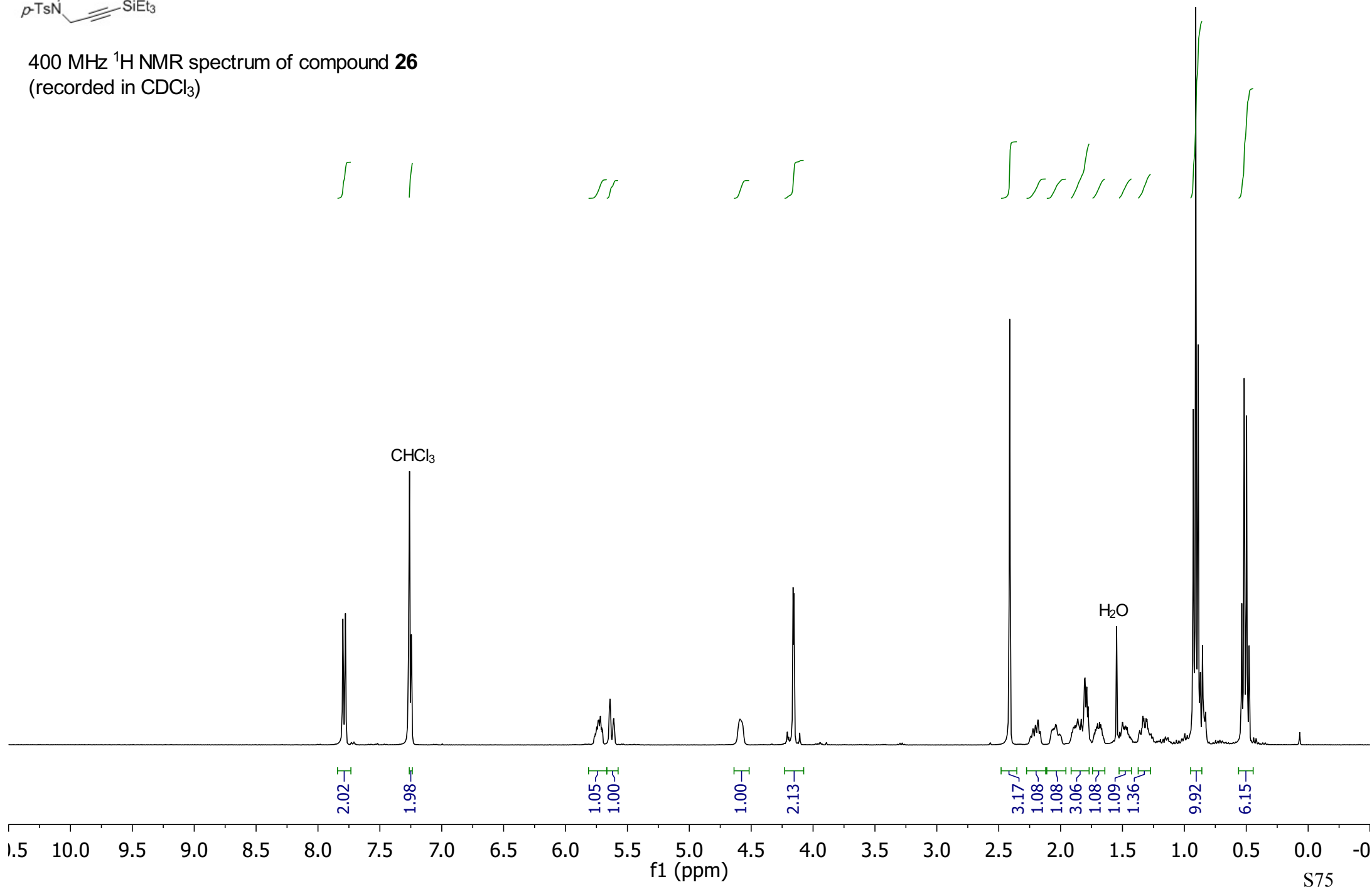
4.1

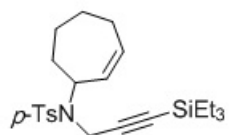
100 MHz ^{13}C NMR spectrum of a ca 3:1 mixture of compounds **24** and **25**
 (recorded in CDCl_3)



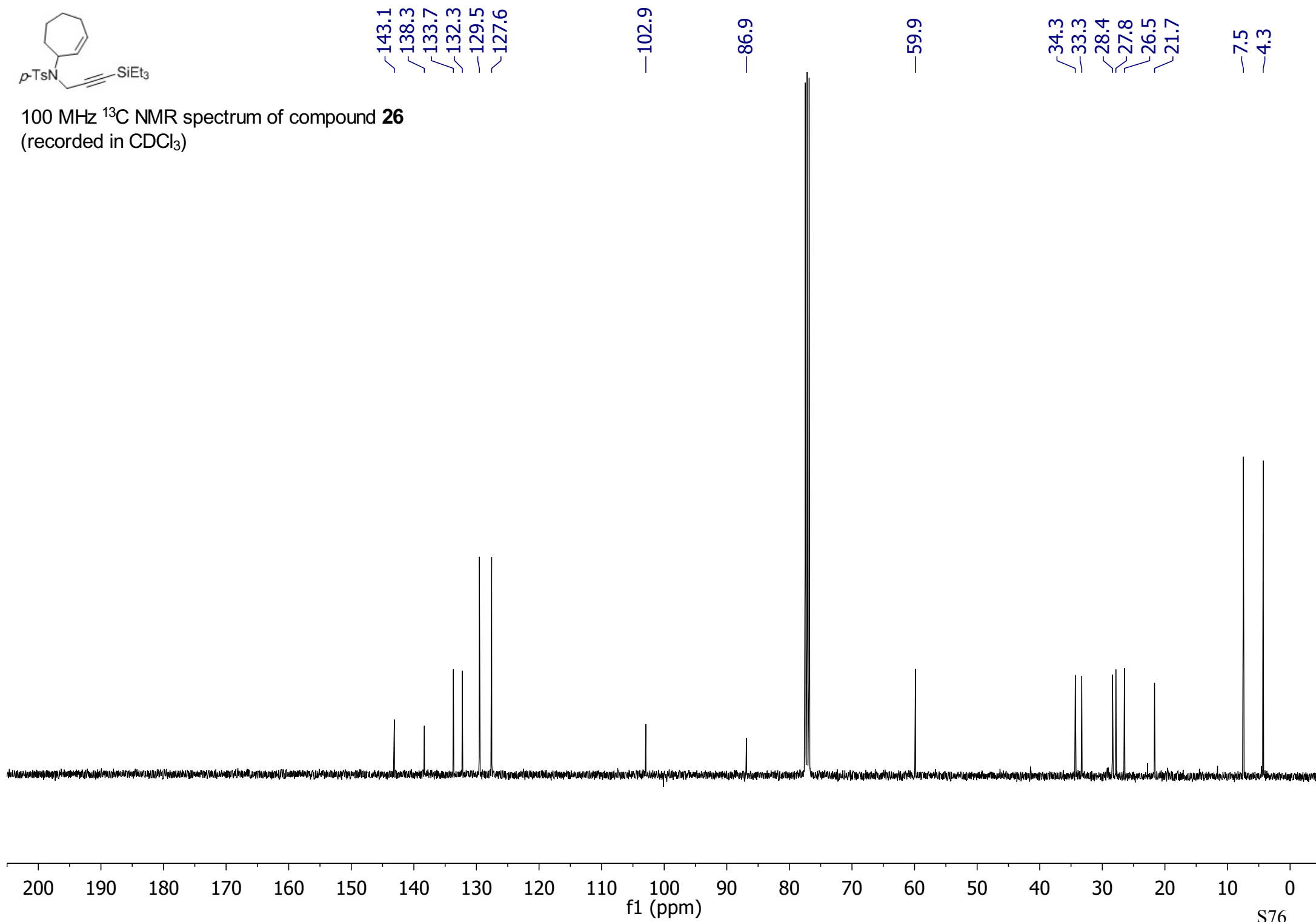


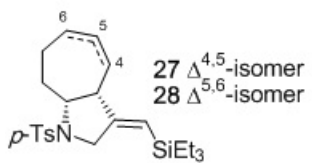
400 MHz ^1H NMR spectrum of compound **26**
(recorded in CDCl_3)



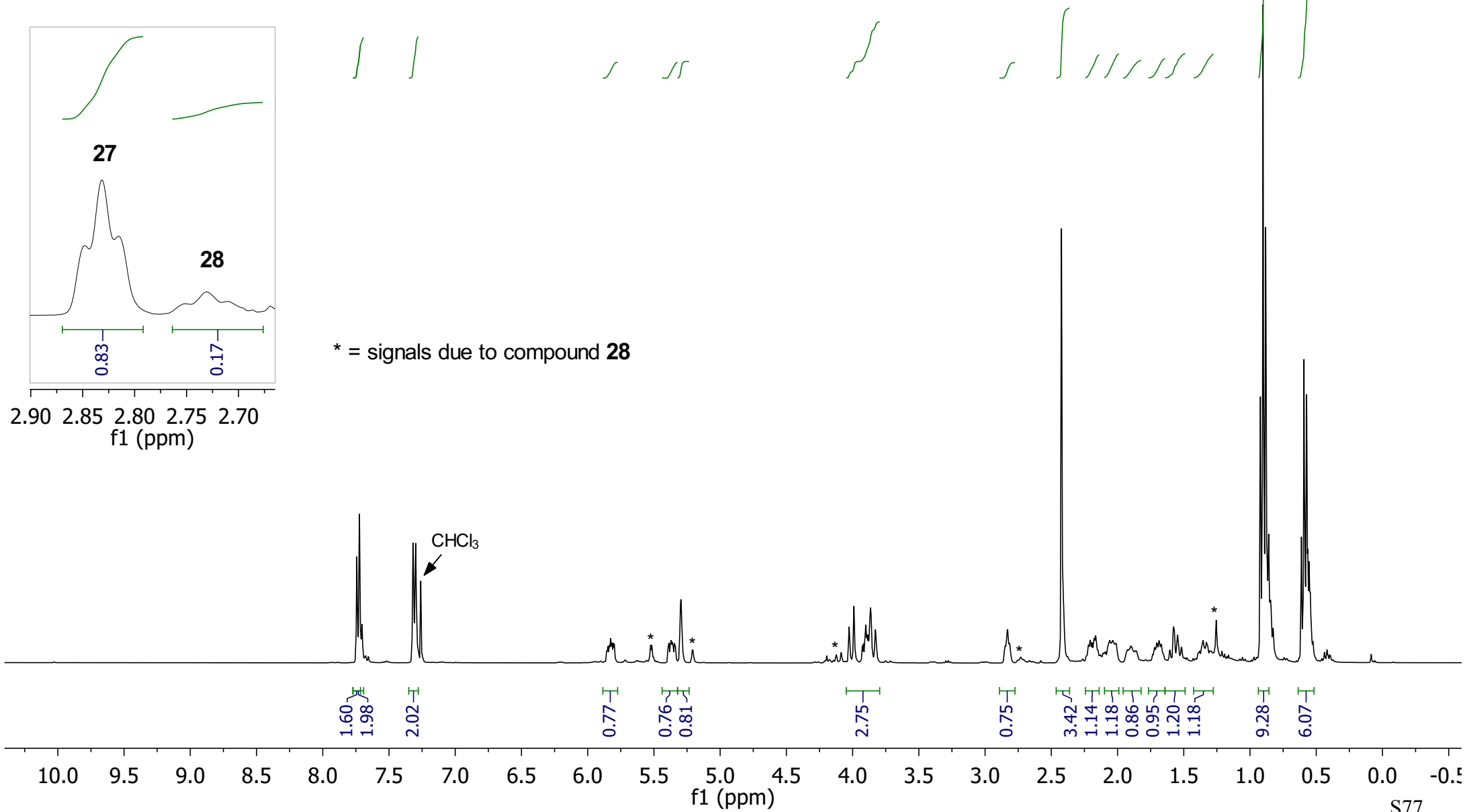


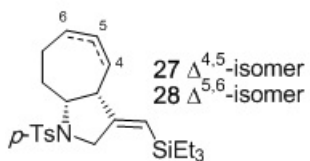
100 MHz ¹³C NMR spectrum of compound **26**
(recorded in CDCl₃)





400 MHz ^1H NMR spectrum of a ca 4:1 mixture of compounds **27** and **28**
(recorded in CDCl_3)





100 MHz ^{13}C NMR spectrum of a ca 4:1 mixture of compounds **27** and **28**
 (recorded in CDCl_3)

—155.4

—143.5

~135.7

~133.2

~129.9

~127.3

~124.3

~118.2

—62.4

50.7

50.4

~34.2

—29.7

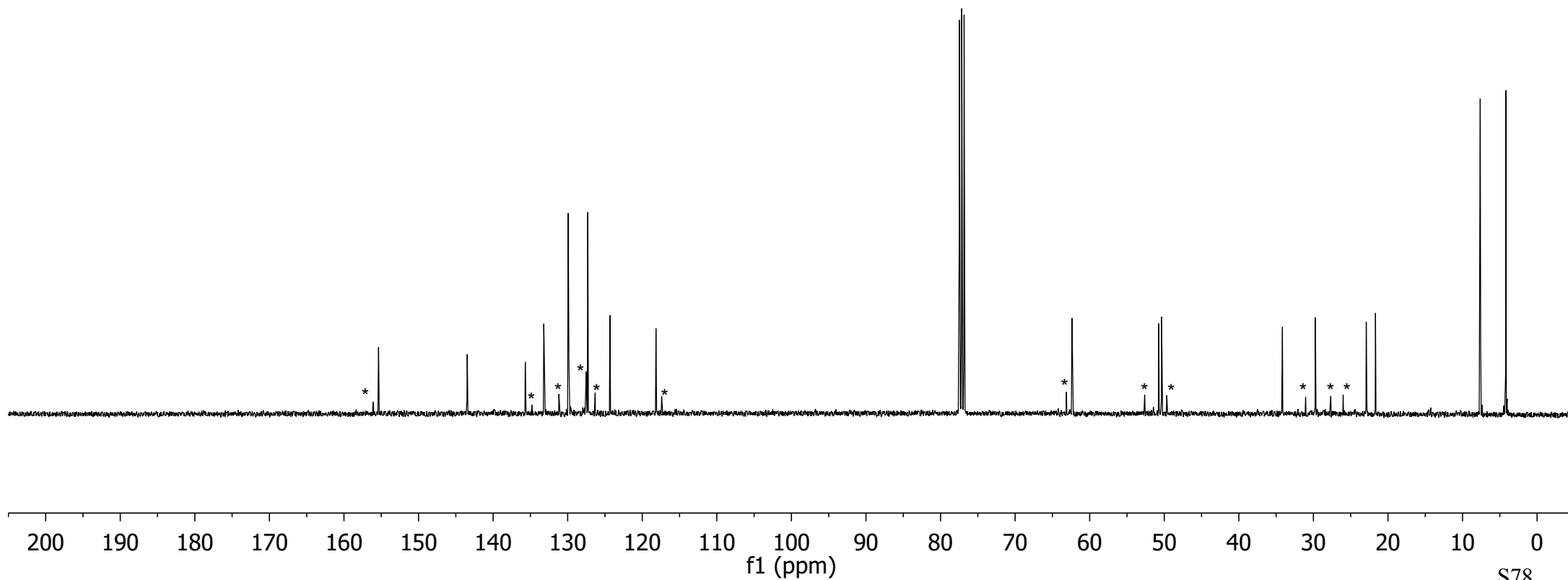
~22.9

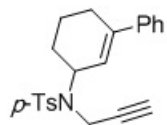
~21.7

—7.6

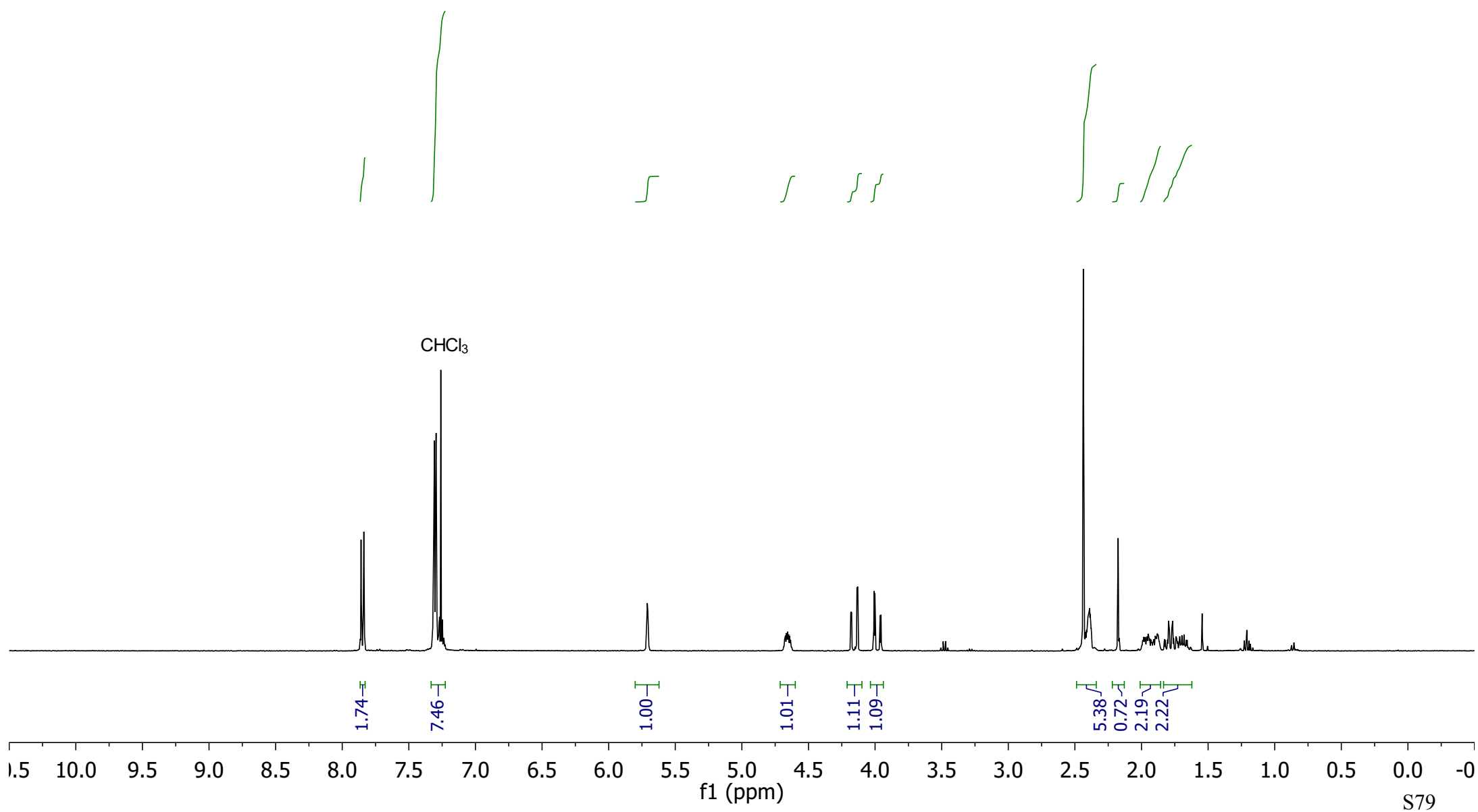
—4.2

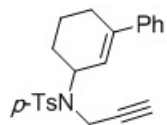
* = signals due to compound **28**





400 MHz ^1H NMR spectrum of 4-methyl-*N*-(prop-2-yn-1-yl)-*N*-(3,4,5,6-tetrahydro-[1,1'-biphenyl]-3-yl)benzenesulfonamide
(step i precursor to compound **29**)
(recorded in CDCl_3)





143.5
142.6
141.0
138.1
129.6
128.5
127.7
127.6
125.3
124.1

80.7

72.3

56.1

33.0

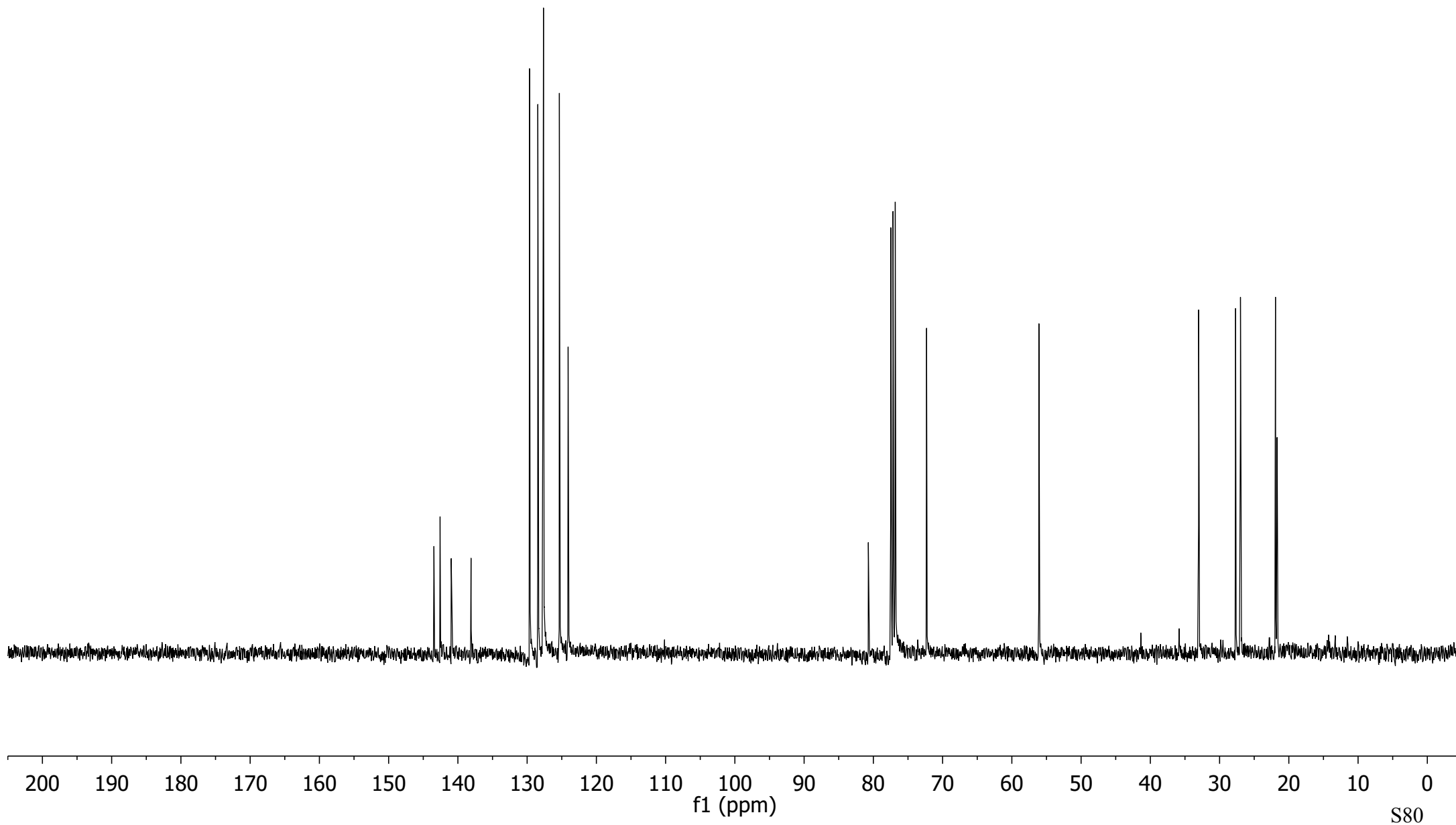
27.7

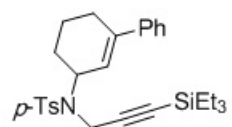
27.0

21.9

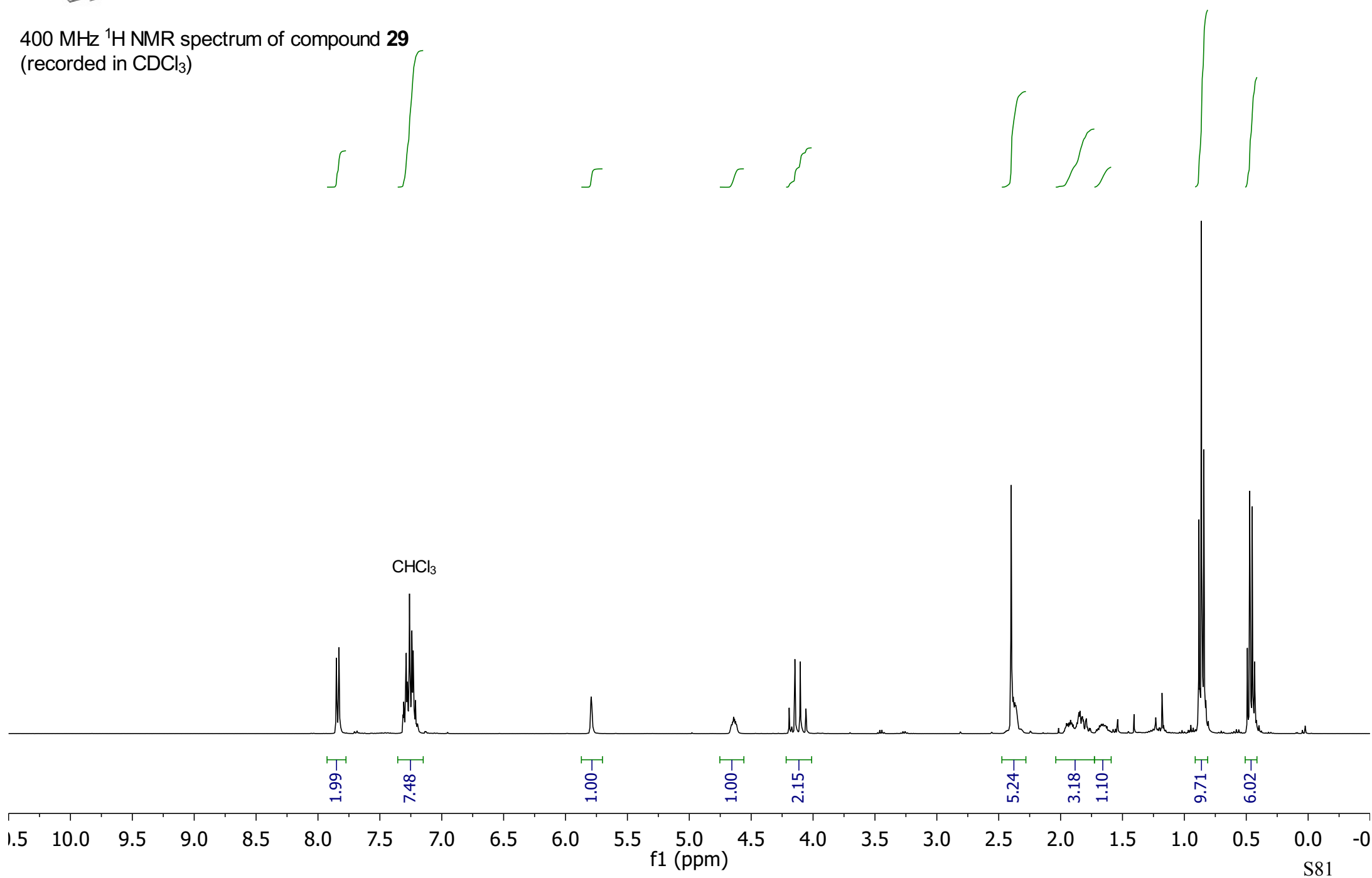
21.7

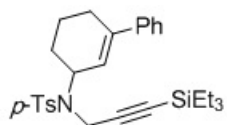
100 MHz ^{13}C NMR spectrum of 4-methyl-*N*-(prop-2-yn-1-yl)-*N*-(3,4,5,6-tetrahydro-[1,1'-biphenyl]-3-yl)benzenesulfonamide
(step i precursor to compound **29**)
(recorded in CDCl_3)



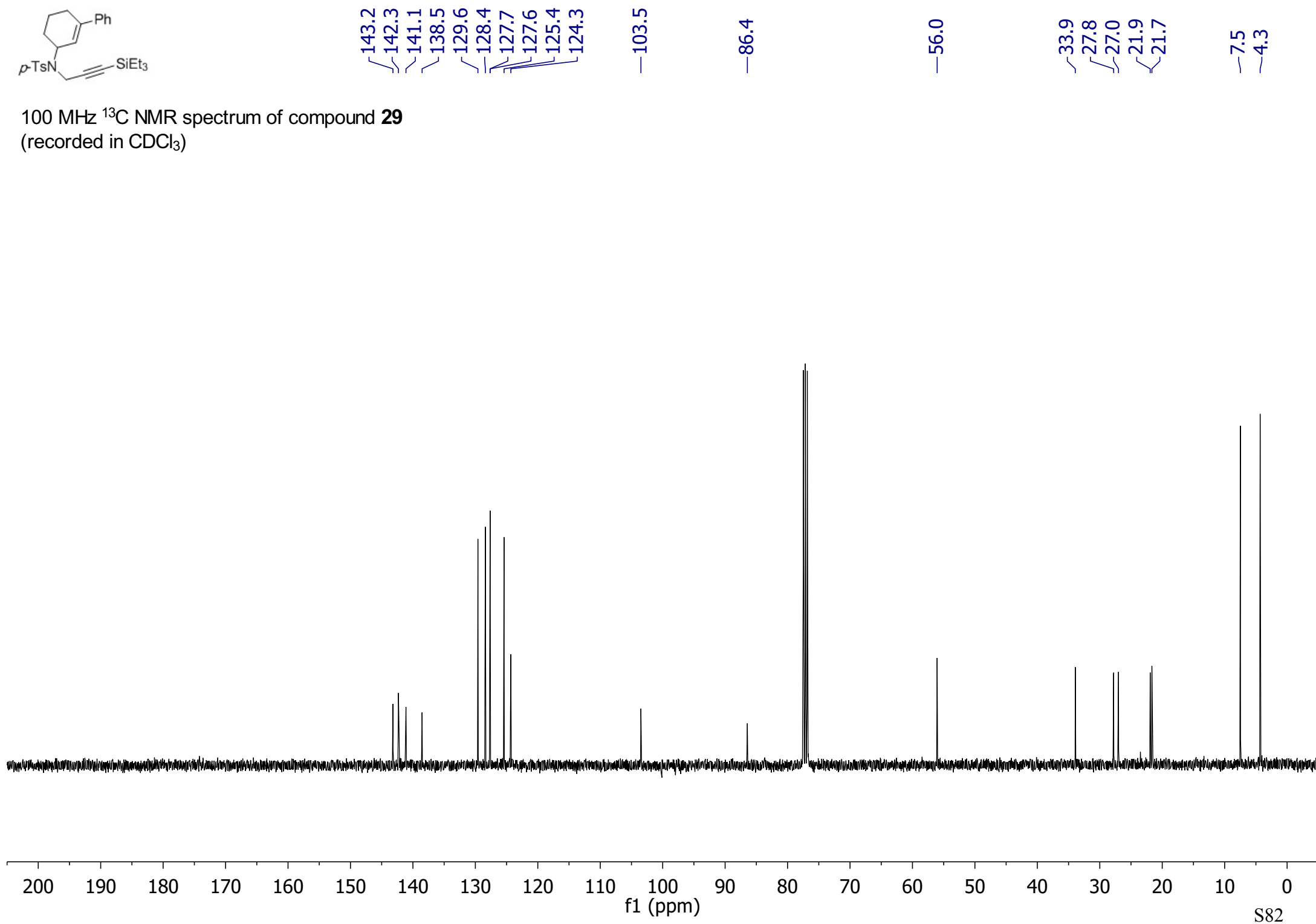


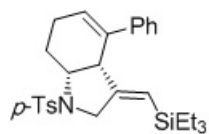
400 MHz ^1H NMR spectrum of compound **29**
(recorded in CDCl_3)



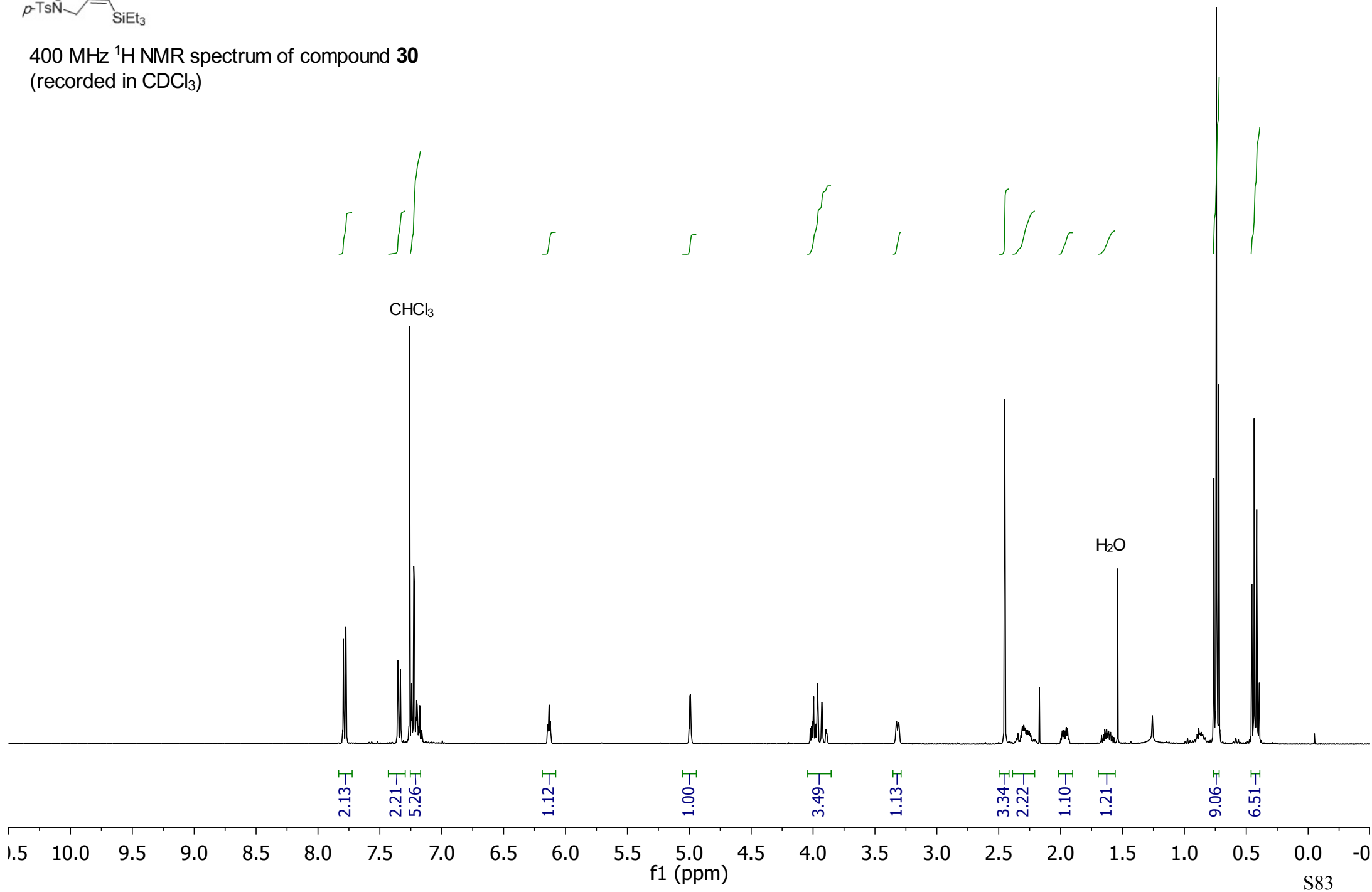


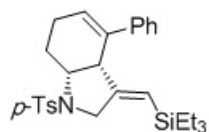
100 MHz ^{13}C NMR spectrum of compound **29**
(recorded in CDCl_3)



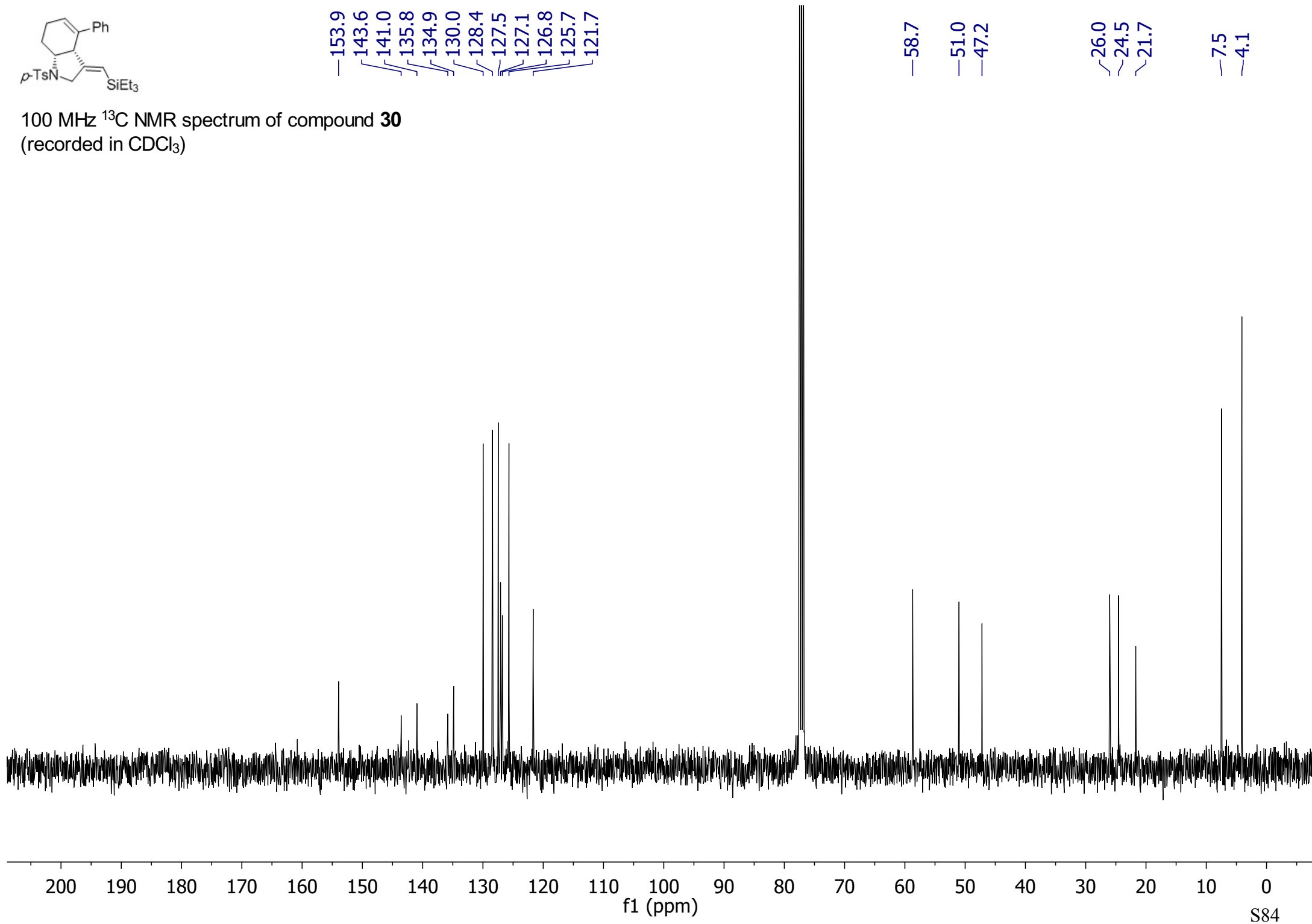


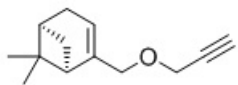
400 MHz ^1H NMR spectrum of compound **30**
(recorded in CDCl_3)



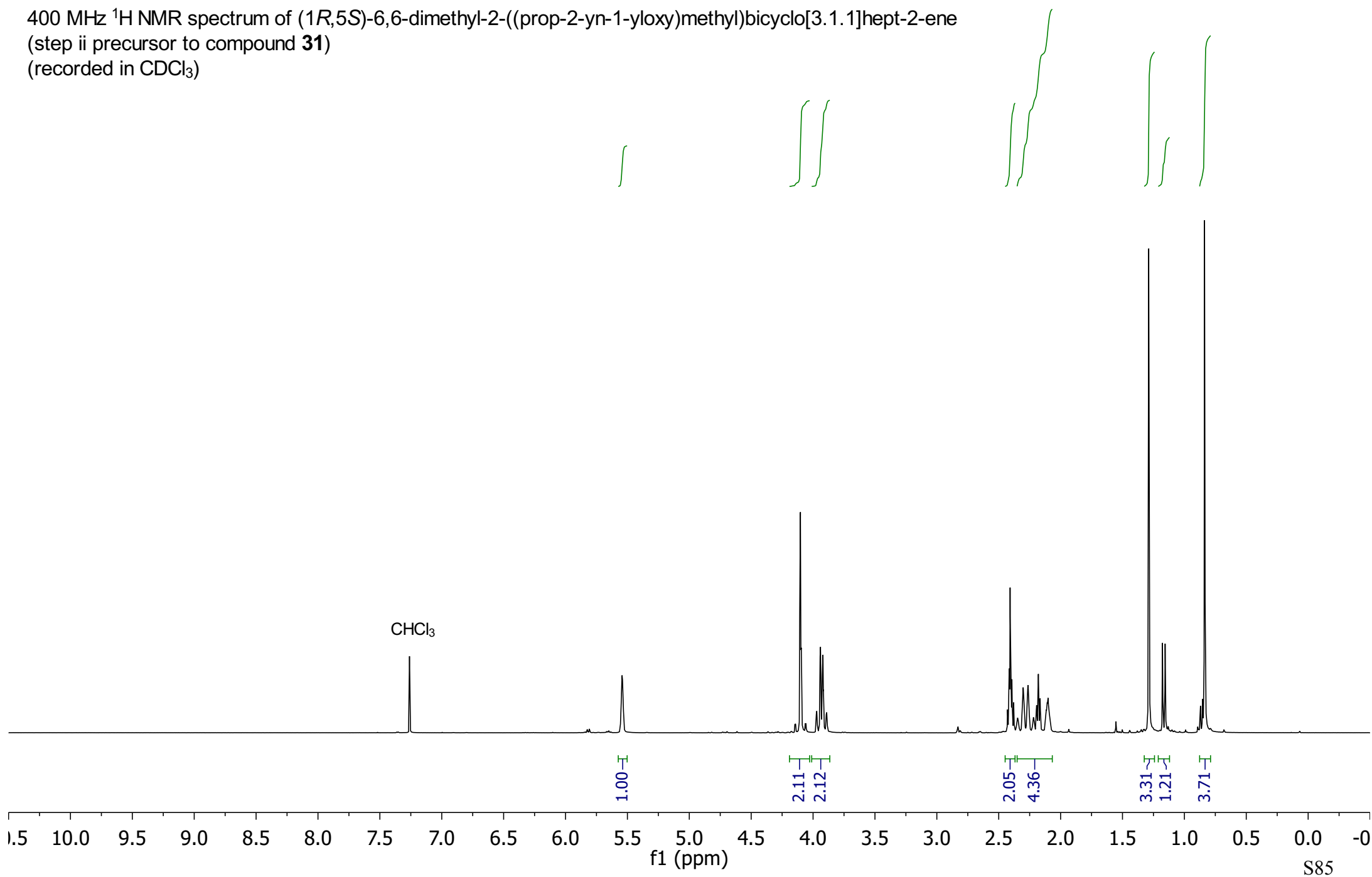


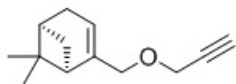
100 MHz ^{13}C NMR spectrum of compound **30**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of (1*R*,5*S*)-6,6-dimethyl-2-((prop-2-yn-1-yloxy)methyl)bicyclo[3.1.1]hept-2-ene
(step ii precursor to compound **31**)
(recorded in CDCl_3)





—144.7

—121.3

—80.2

74.3

—72.7

—56.8

—43.6

41.0

38.2

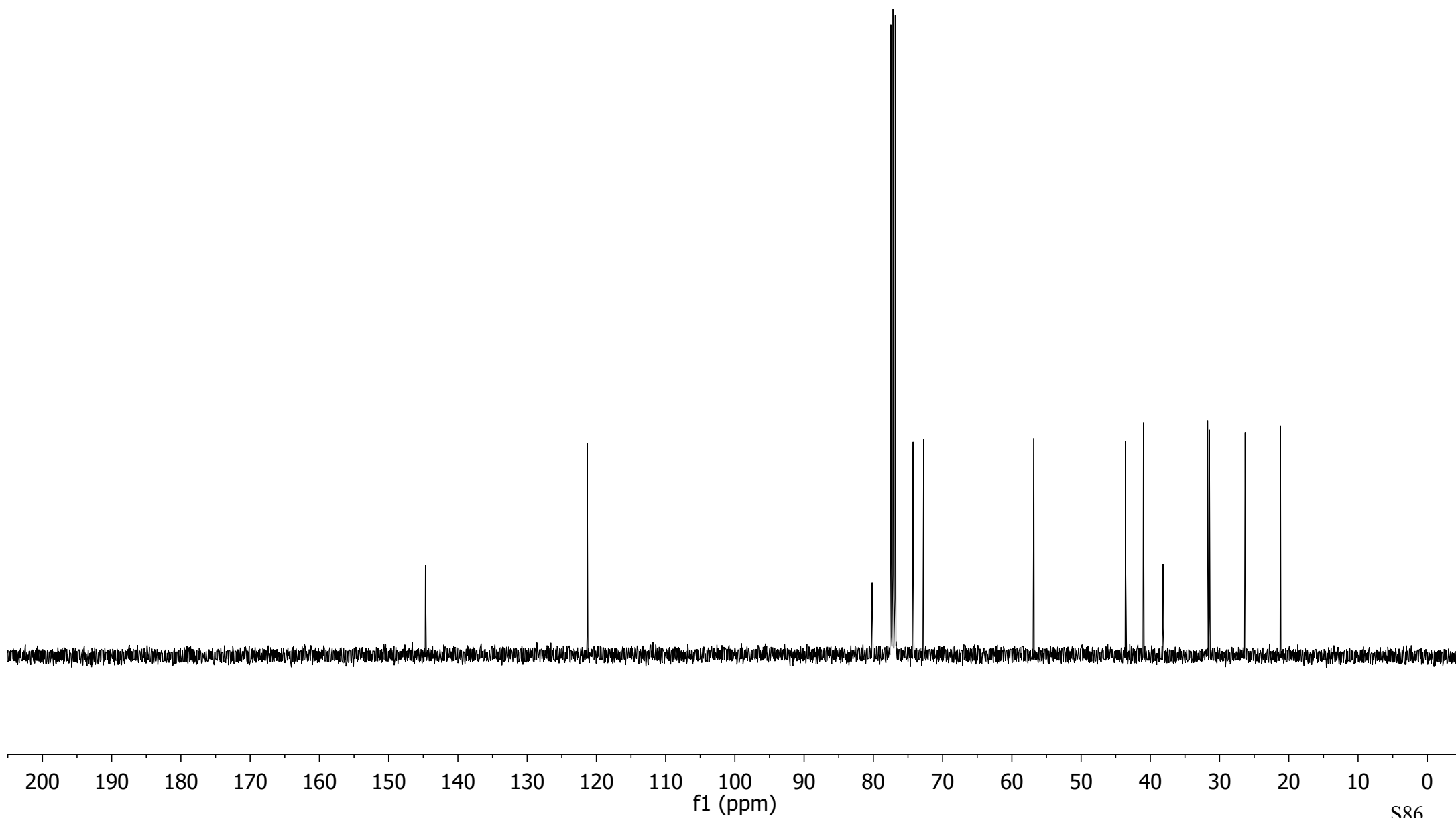
31.7

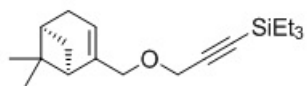
31.5

26.3

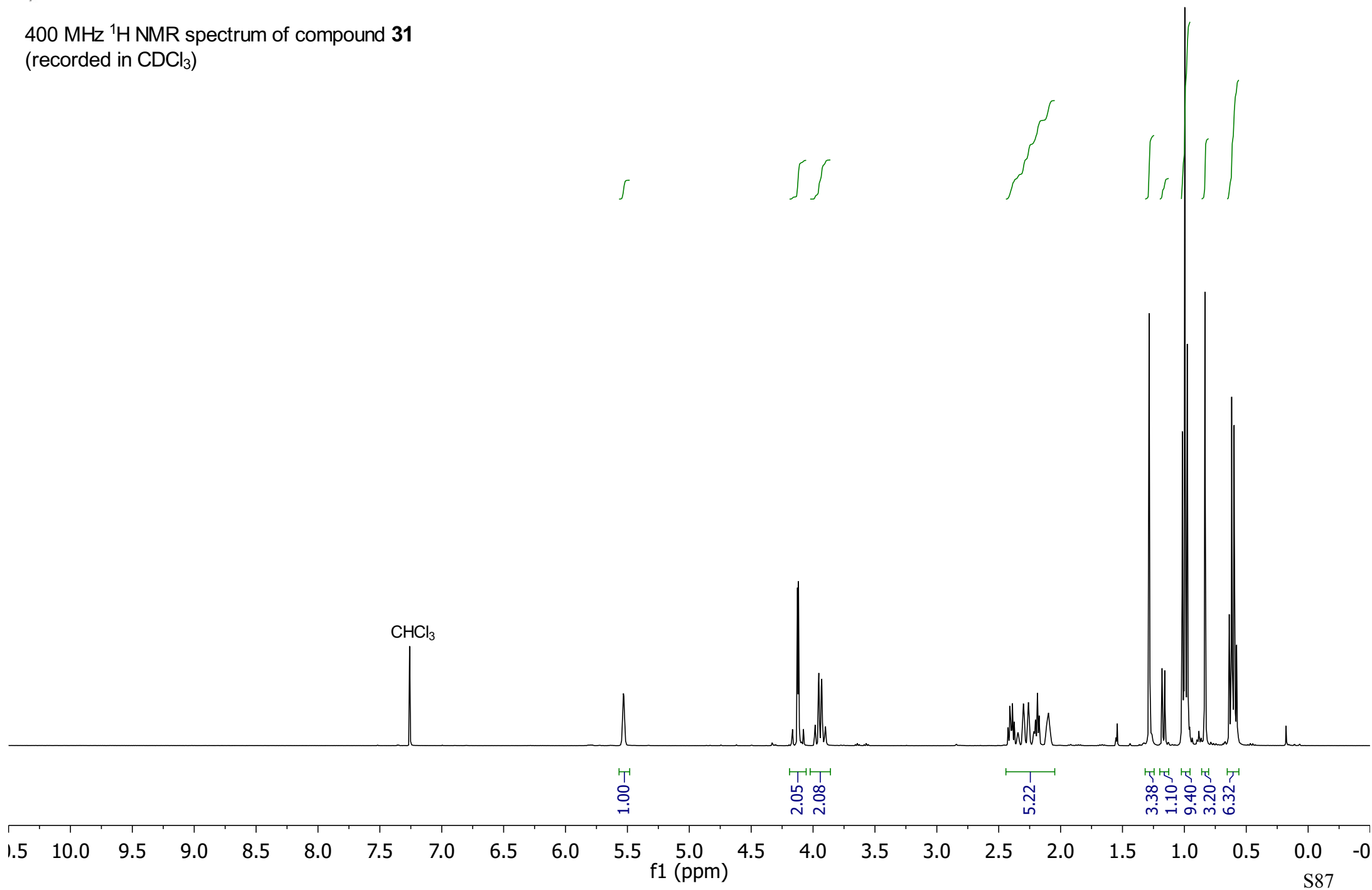
—21.2

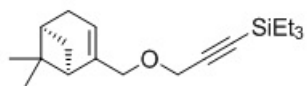
100 MHz ^{13}C NMR spectrum of (1*R*,5*S*)-6,6-dimethyl-2-((prop-2-yn-1-yloxy)methyl)bicyclo[3.1.1]hept-2-ene
(step ii precursor to compound **31**)
(recorded in CDCl_3)



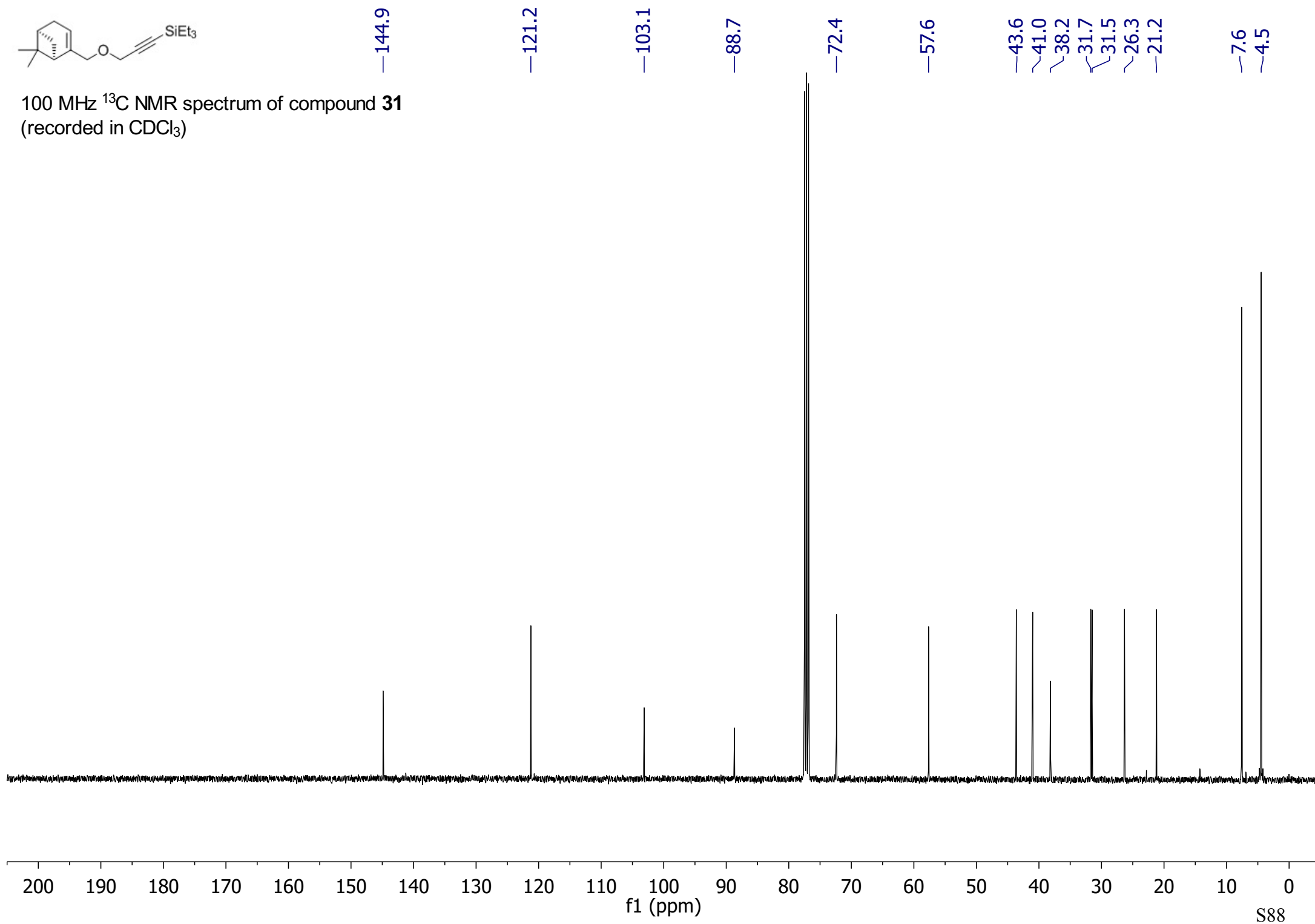


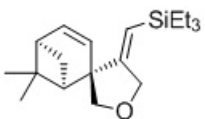
400 MHz ^1H NMR spectrum of compound **31**
(recorded in CDCl_3)



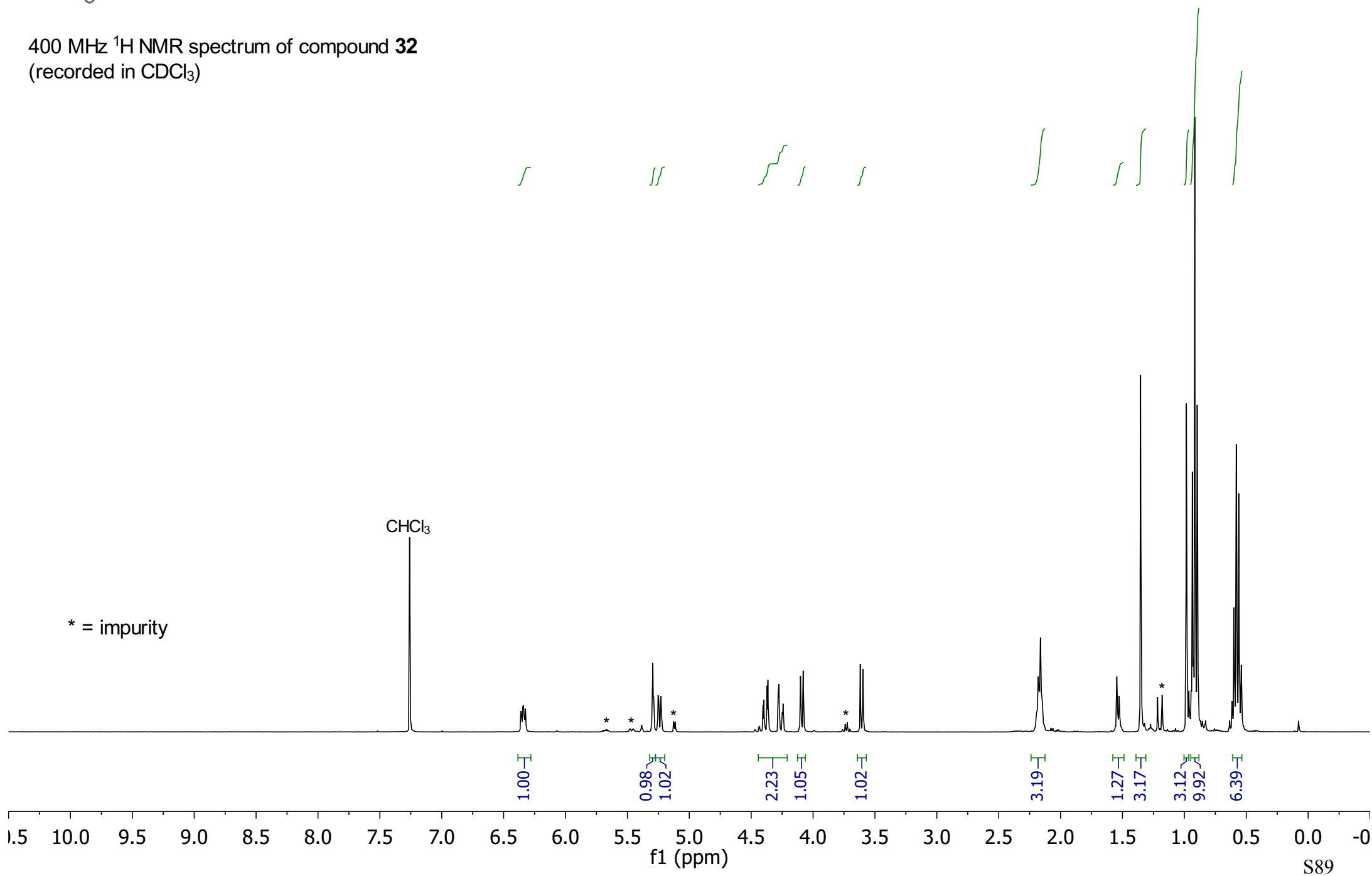


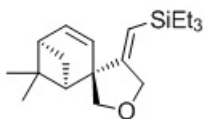
100 MHz ^{13}C NMR spectrum of compound **31**
(recorded in CDCl_3)



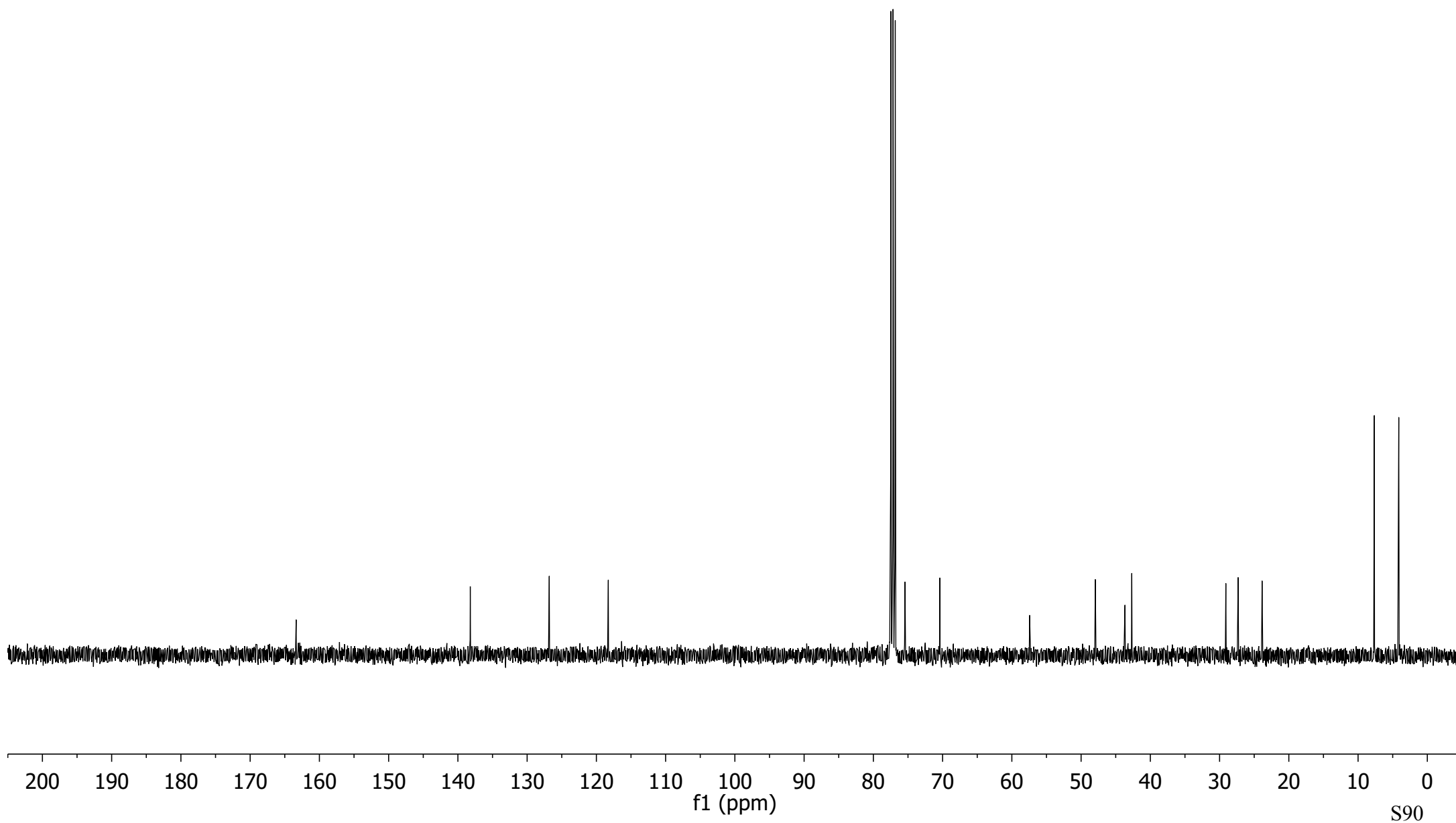


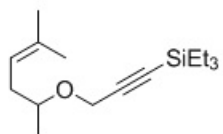
400 MHz ^1H NMR spectrum of compound **32**
(recorded in CDCl_3)



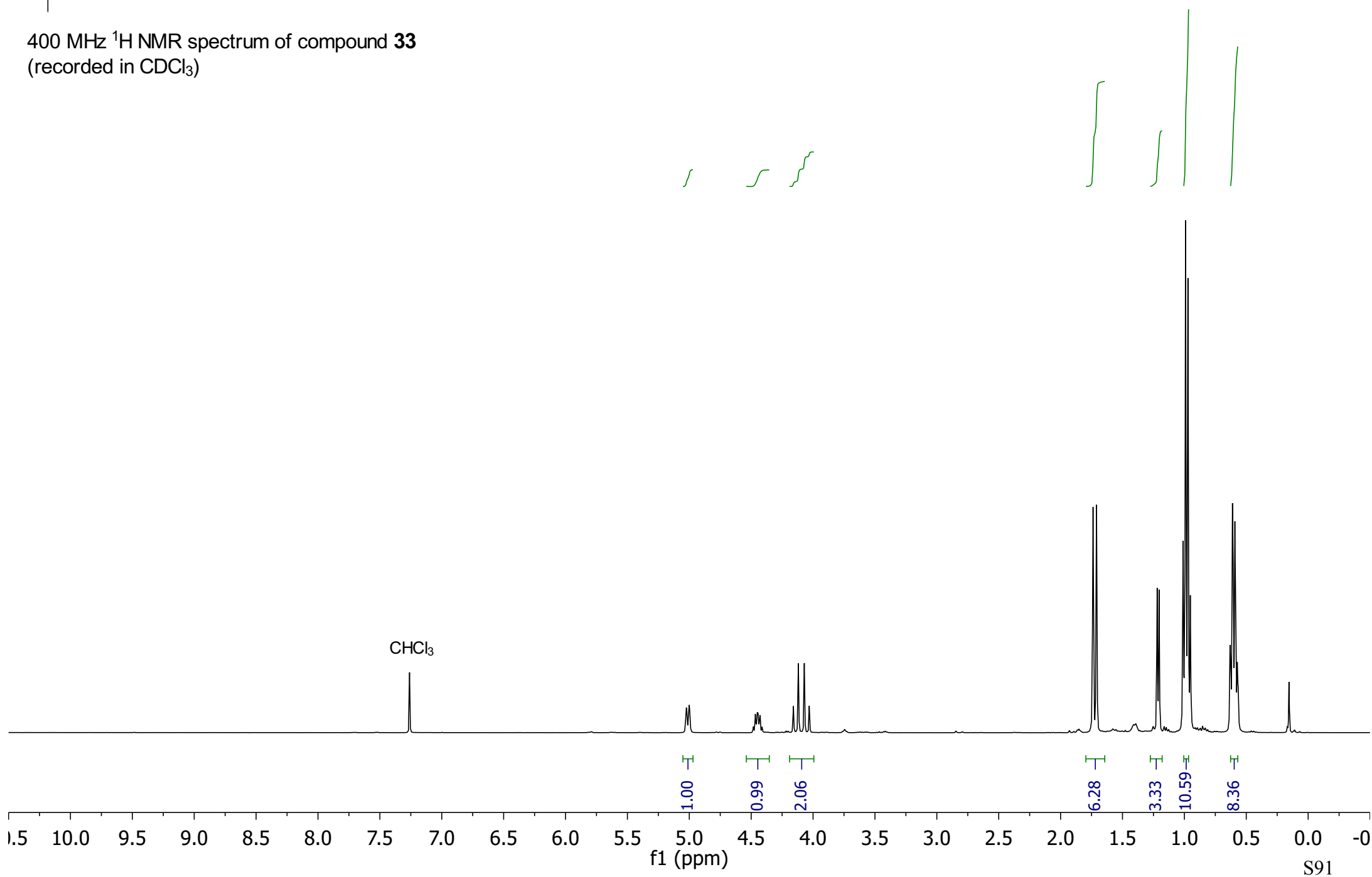


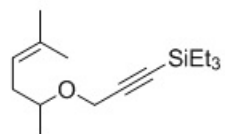
100 MHz ^{13}C NMR spectrum of compound **32**
(recorded in CDCl_3)



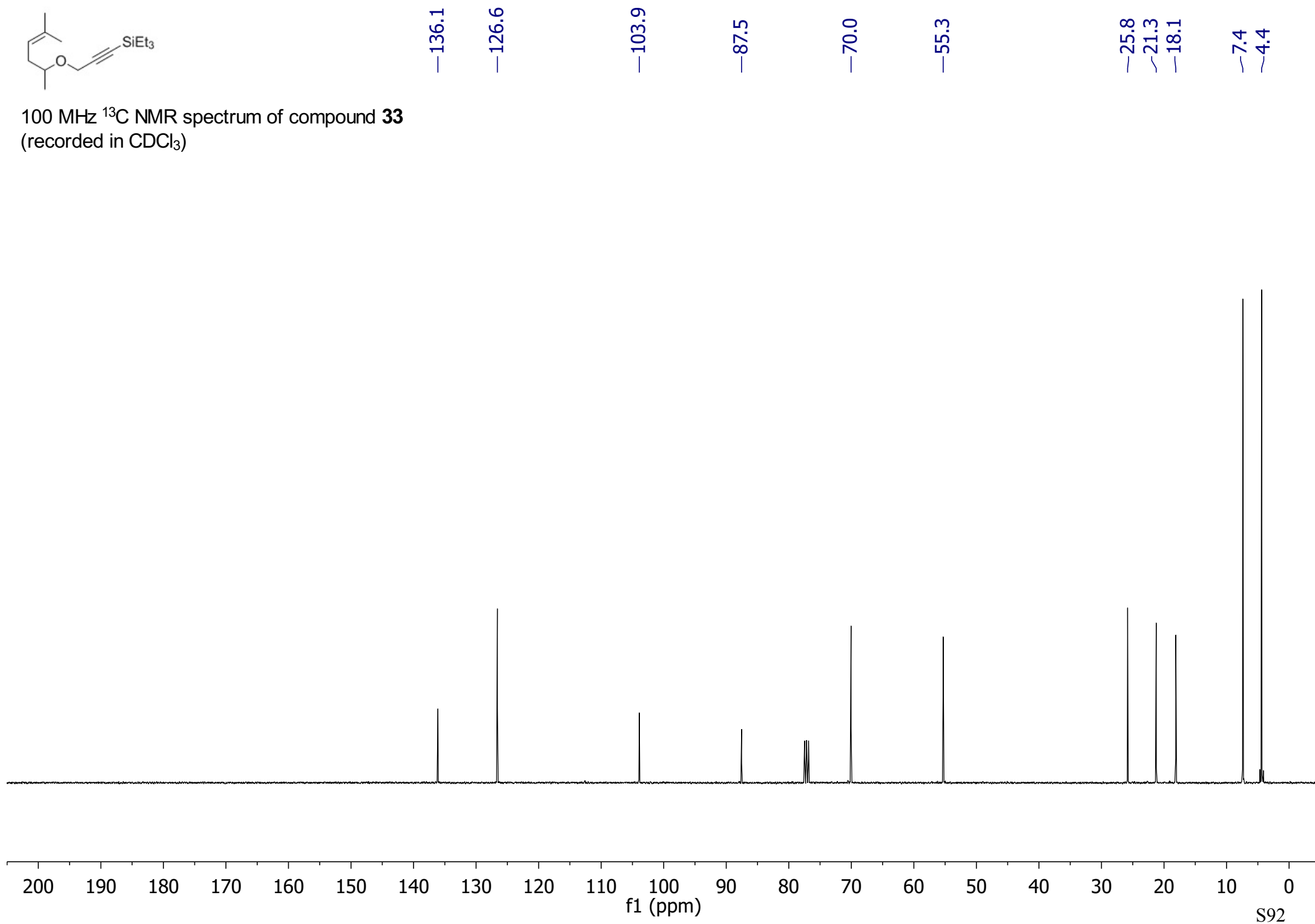


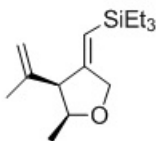
400 MHz ^1H NMR spectrum of compound **33**
(recorded in CDCl_3)



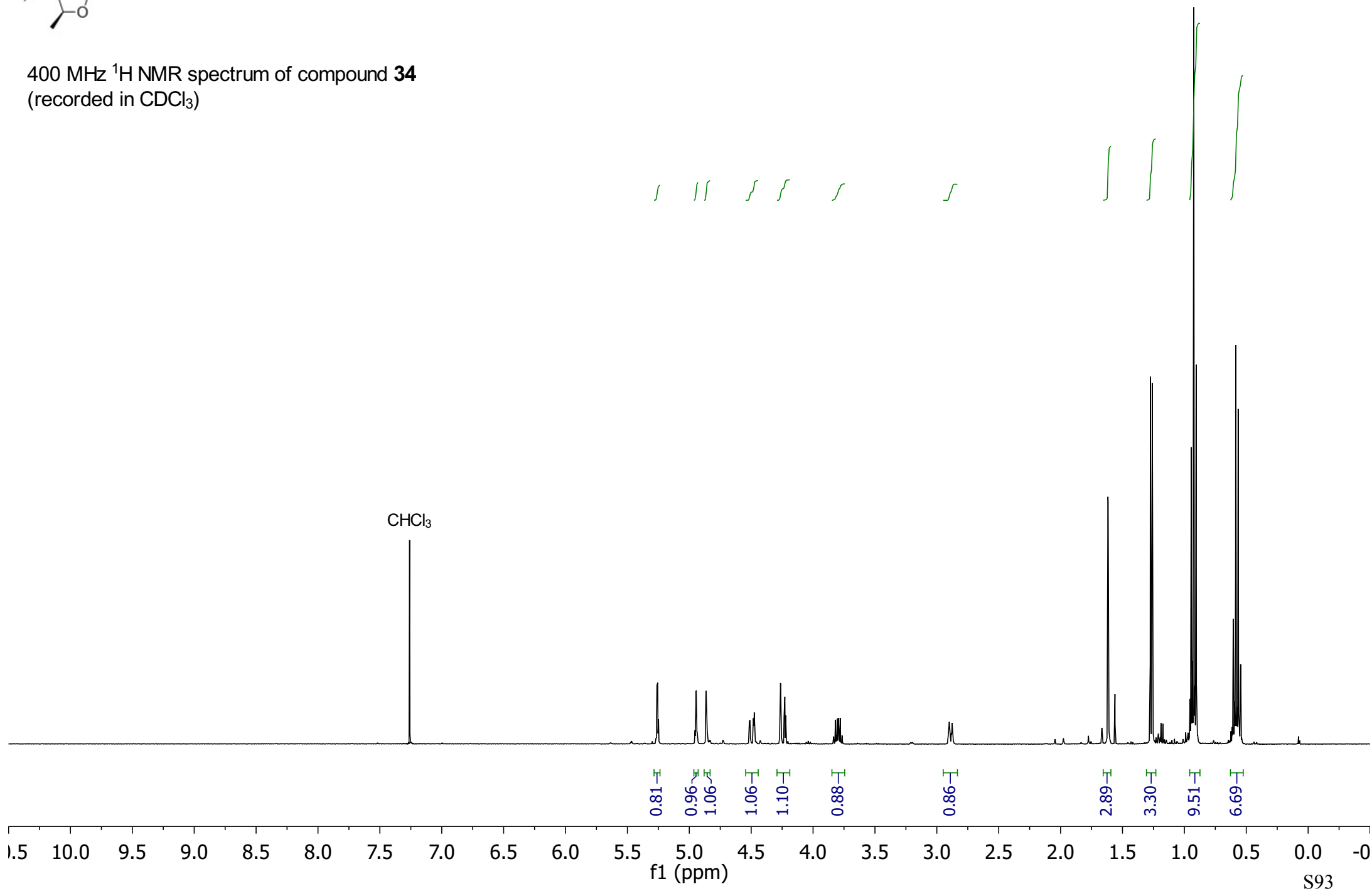


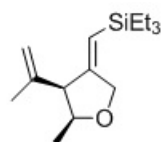
100 MHz ^{13}C NMR spectrum of compound **33**
(recorded in CDCl_3)



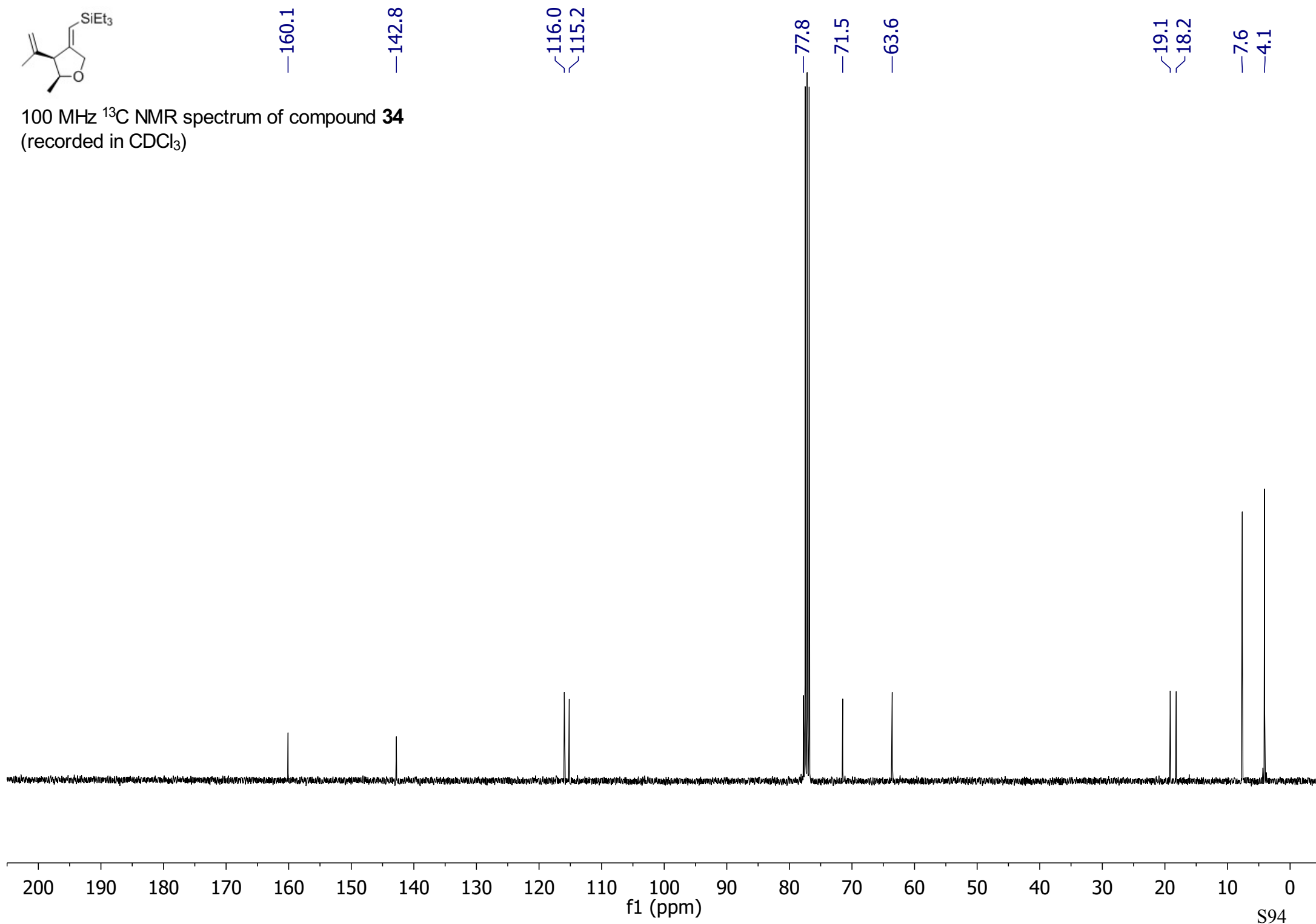


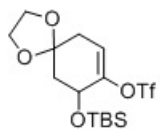
400 MHz ^1H NMR spectrum of compound **34**
(recorded in CDCl_3)



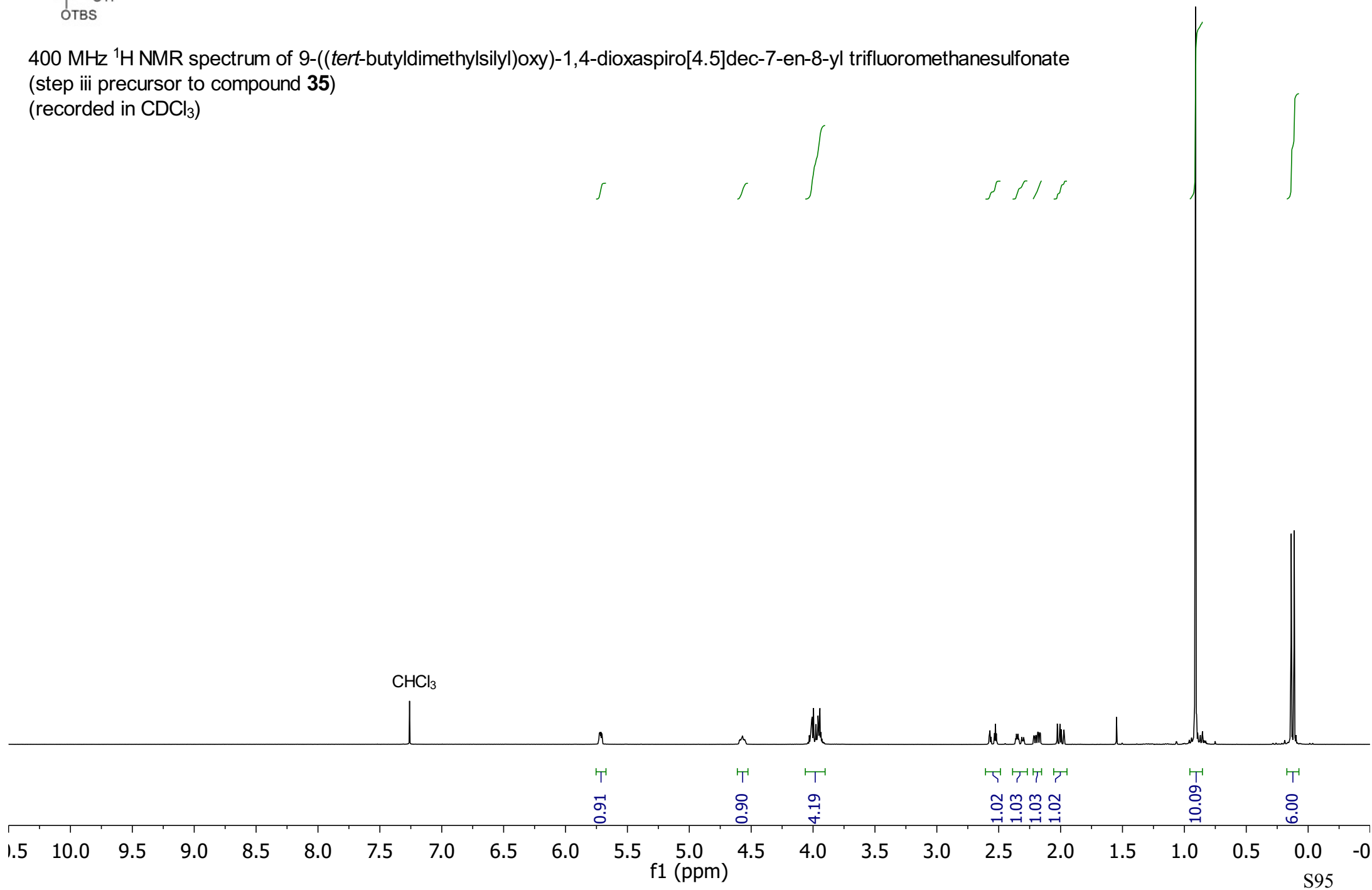


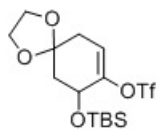
100 MHz ^{13}C NMR spectrum of compound **34**
(recorded in CDCl_3)



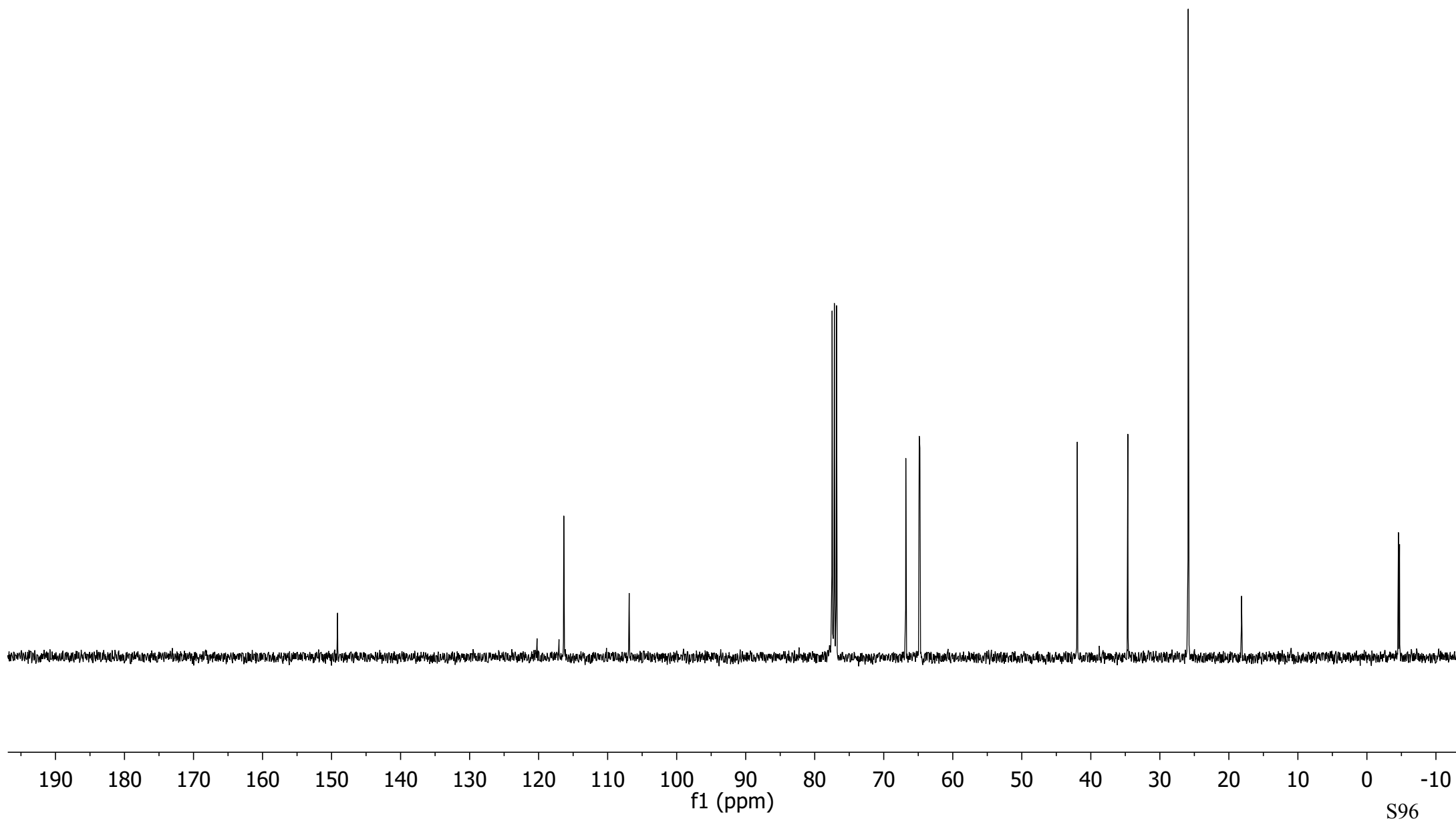


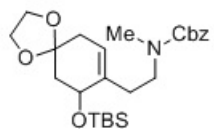
400 MHz ^1H NMR spectrum of 9-((*tert*-butyldimethylsilyl)oxy)-1,4-dioxaspiro[4.5]dec-7-en-8-yl trifluoromethanesulfonate
(step iii precursor to compound **35**)
(recorded in CDCl_3)



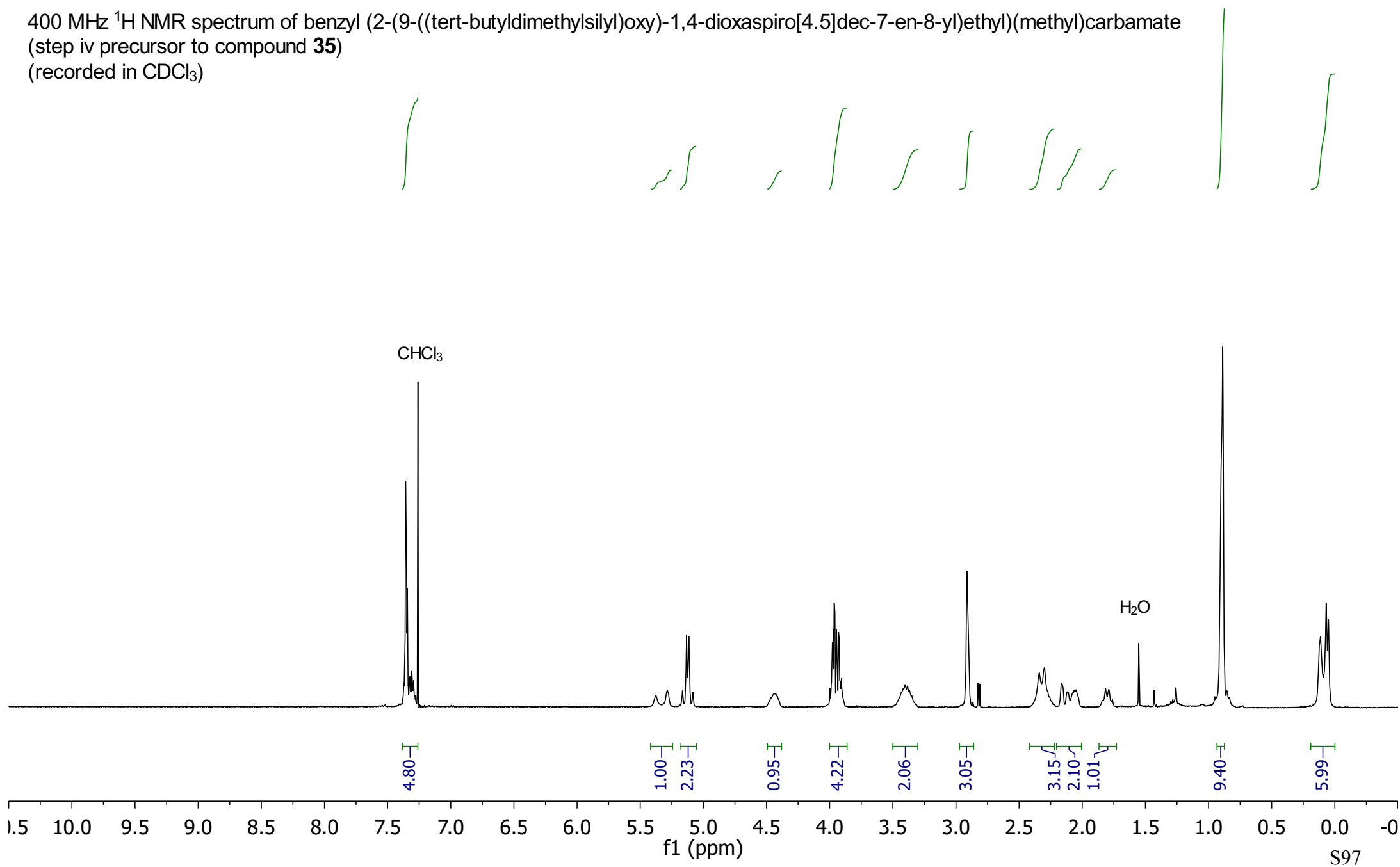


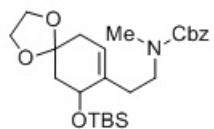
100 MHz ^{13}C NMR spectrum of 9-((tert-butyldimethylsilyl)oxy)-1,4-dioxaspiro[4.5]dec-7-en-8-yl trifluoromethanesulfonate
(step iii precursor to compound **35**)
(recorded in CDCl_3)



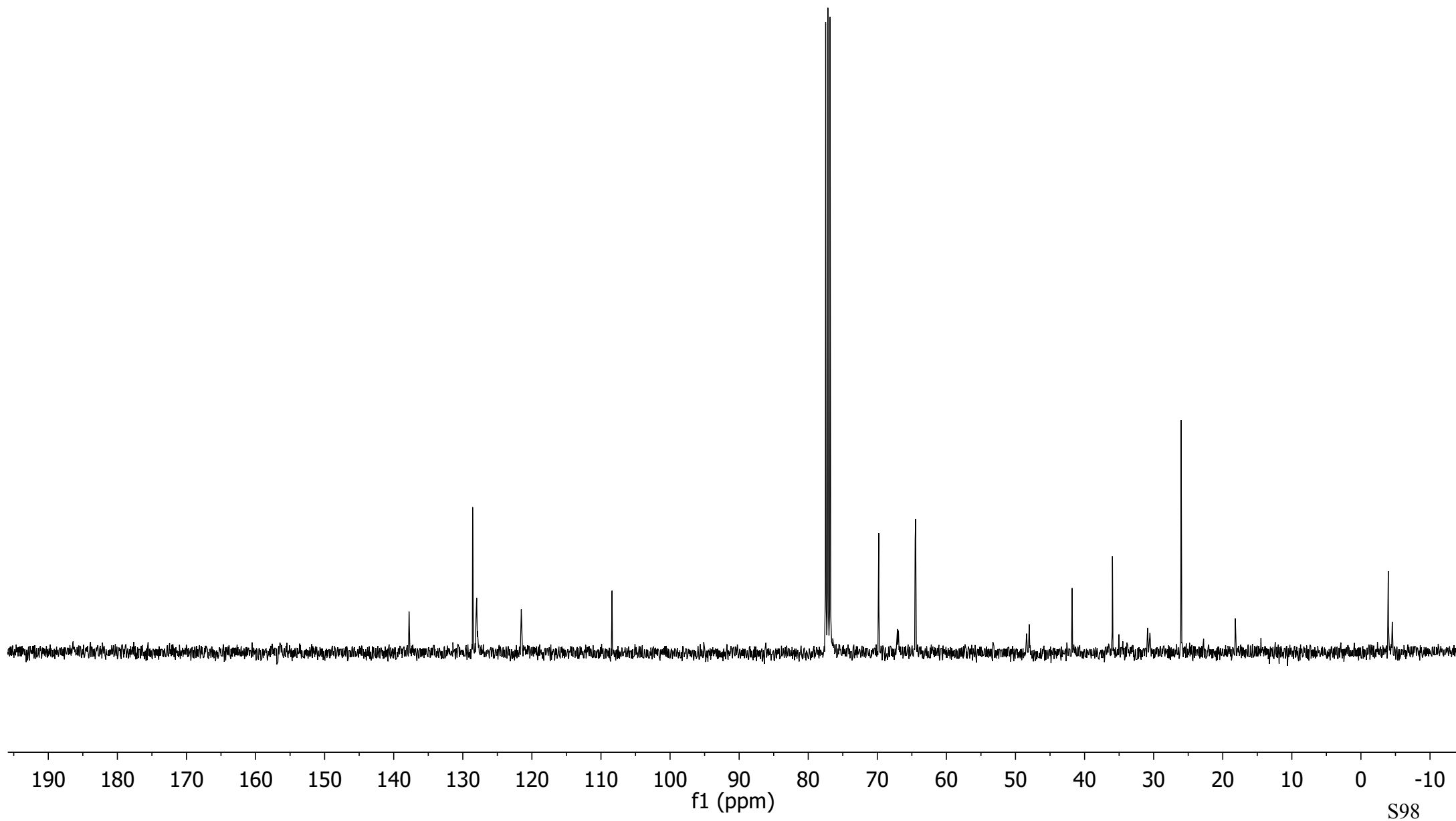


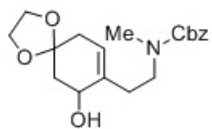
400 MHz ^1H NMR spectrum of benzyl (2-(9-((tert-butyldimethylsilyl)oxy)-1,4-dioxaspiro[4.5]dec-7-en-8-yl)ethyl)(methyl)carbamate (step iv precursor to compound **35**) (recorded in CDCl_3)



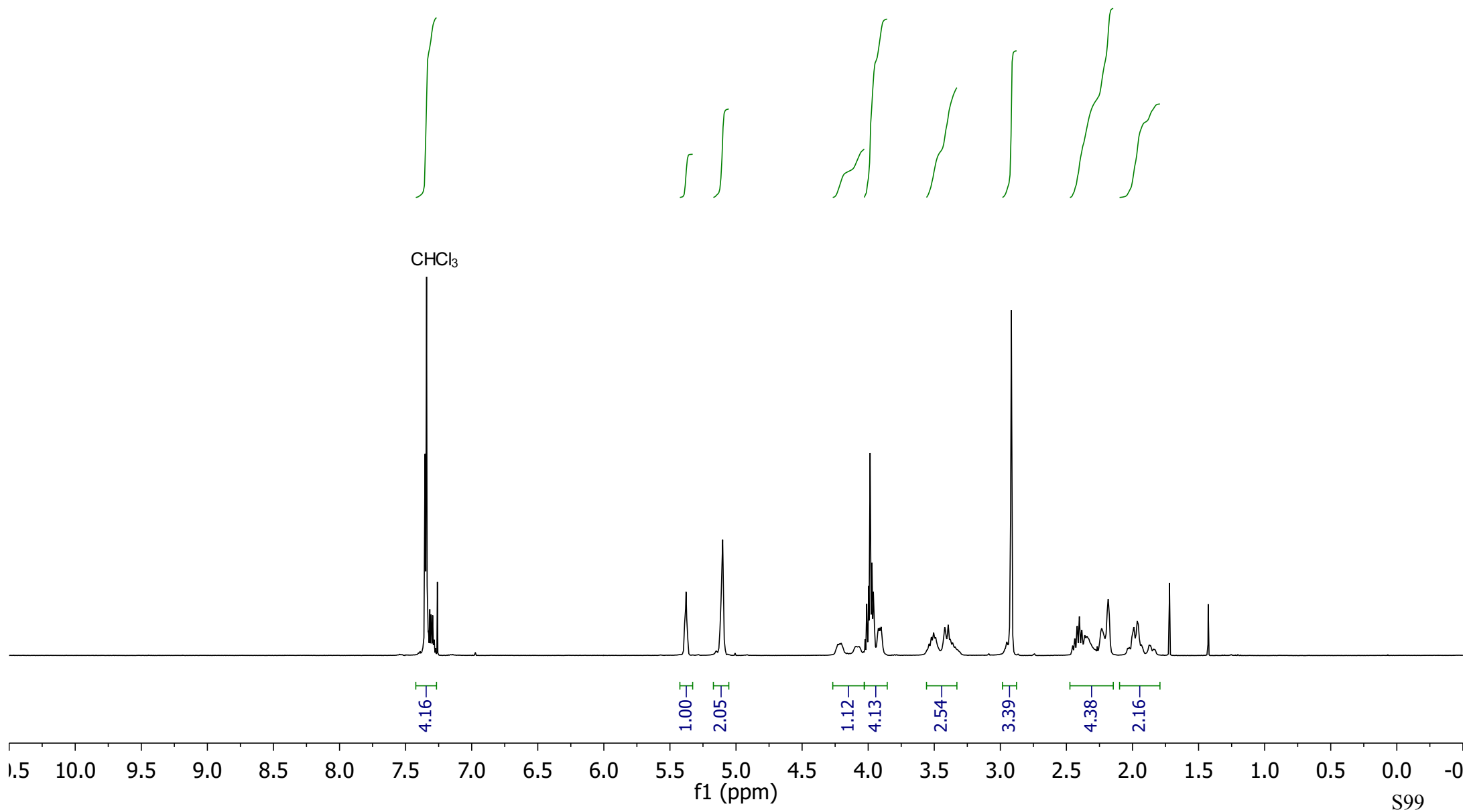


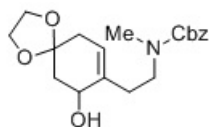
100 MHz ^{13}C NMR spectrum of benzyl (2-(9-((tert-butyldimethylsilyl)oxy)-1,4-dioxaspiro[4.5]dec-7-en-8-yl)ethyl)(methyl)carbamate
(step iv precursor to compound **35**)
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of benzyl (2-(9-hydroxy-1,4-dioxaspiro[4.5]dec-7-en-8-yl)ethyl)(methyl)carbamate
(step v precursor to compound **35**)
(recorded in CDCl_3)





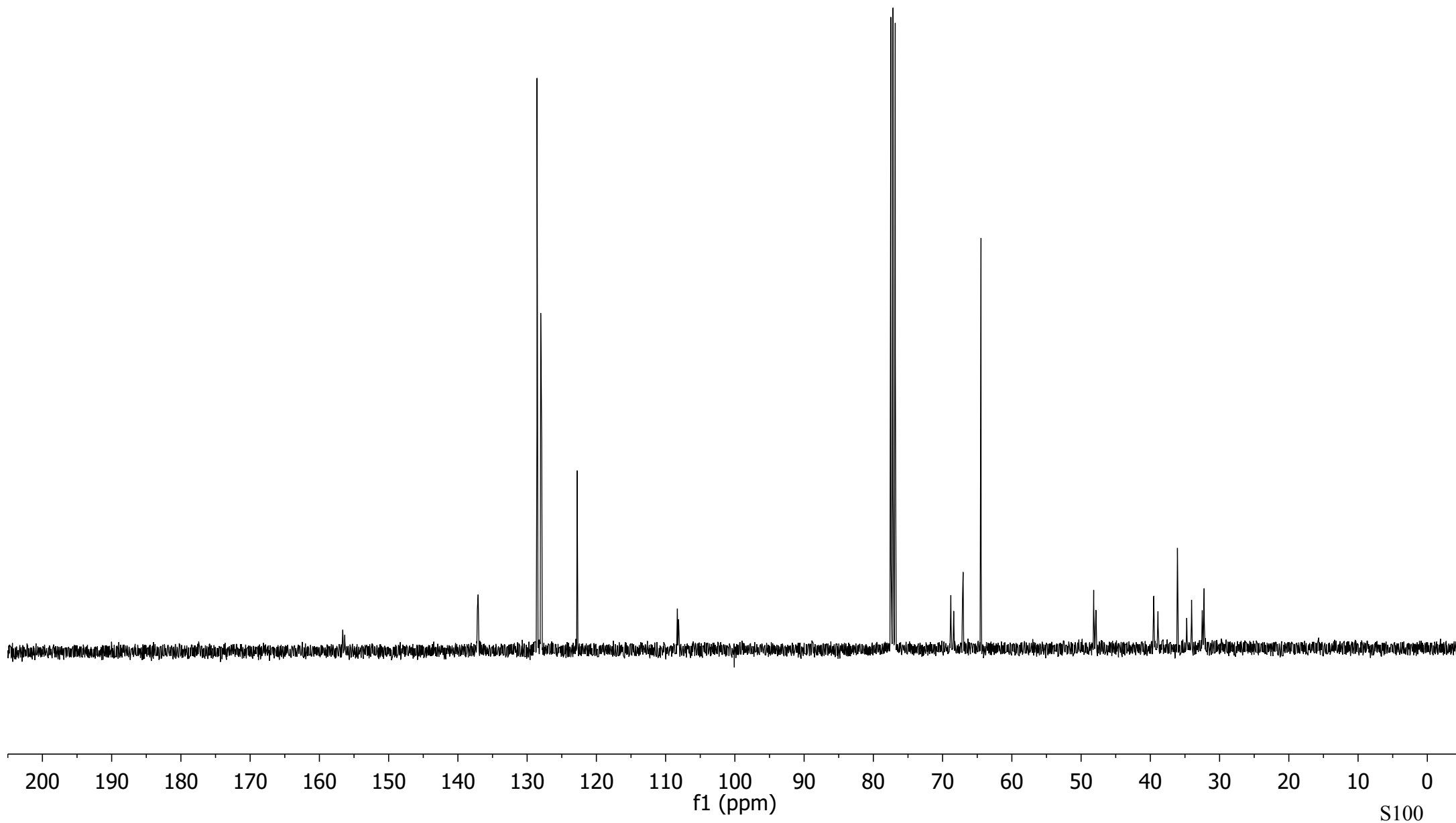
156.6
156.3

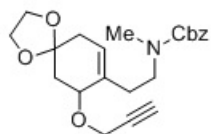
137.2
137.1
128.6
128.0
127.9
127.9
122.8
108.3
108.1

68.8
68.4
67.1
67.0
64.5

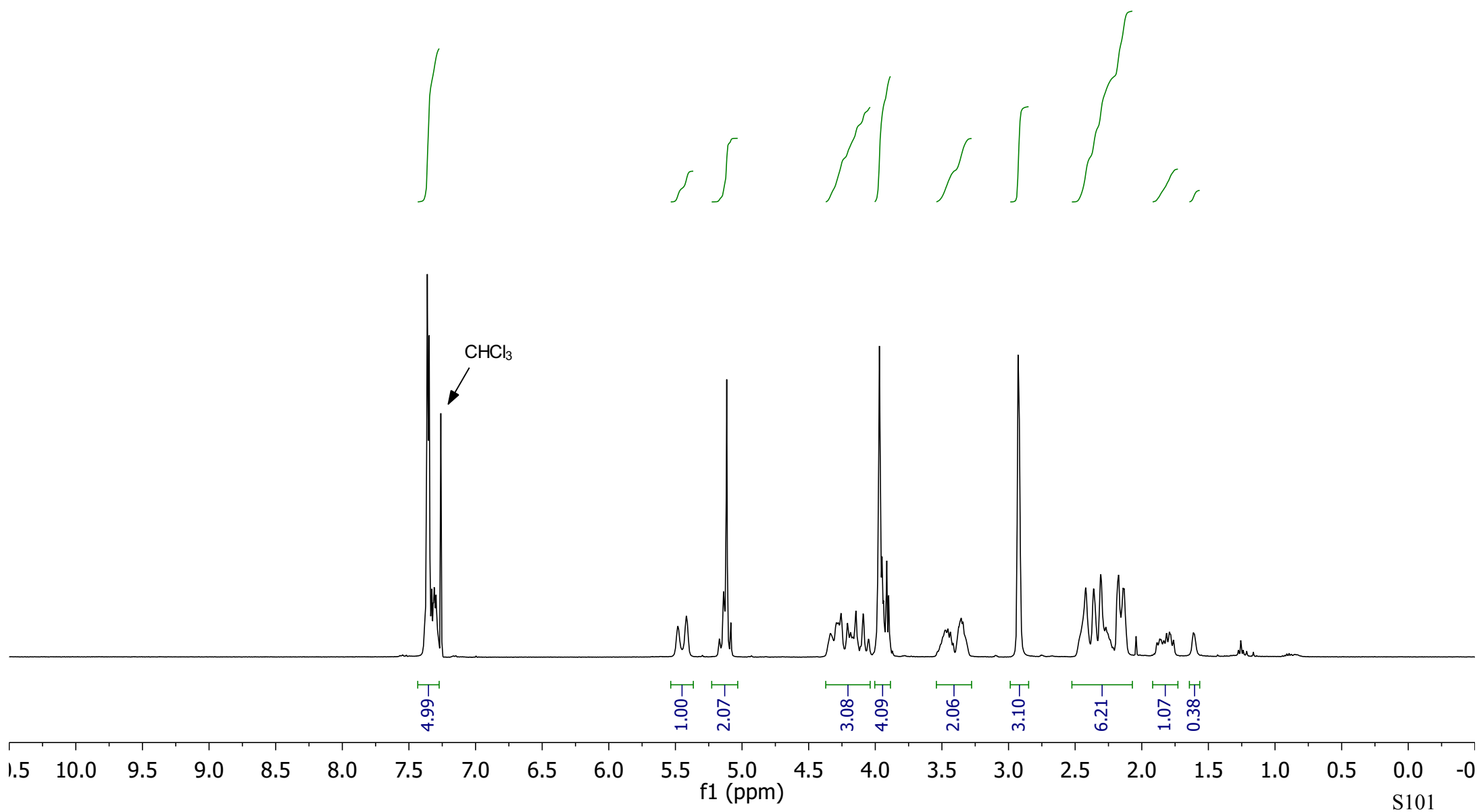
48.2
47.9
39.5
38.9
36.1
34.7
34.0
32.5
32.2

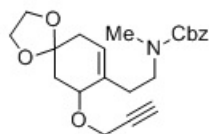
100 MHz ^{13}C NMR spectrum of benzyl (2-(9-hydroxy-1,4-dioxaspiro[4.5]dec-7-en-8-yl)ethyl)(methyl)carbamate
(step v precursor to compound **35**)
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of benzyl methyl(2-(9-(prop-2-yn-1-yloxy)-1,4-dioxaspiro[4.5]dec-7-en-8-yl)ethyl)carbamate
(step vi precursor to compound **35**)
(recorded in CDCl_3)





100 MHz ^{13}C NMR spectrum of benzyl methyl(2-(9-(prop-2-yn-1-yloxy)-1,4-dioxaspiro[4.5]dec-7-en-8-yl)ethyl)carbamate
(step vi precursor to compound **35**)
(recorded in CDCl_3)

156.2
156.1

137.1
135.3

128.4
127.9

127.8
127.7

123.5
123.5

107.8

80.3
80.1

74.8
74.7

74.4
66.9

66.8
64.4

64.3
56.0

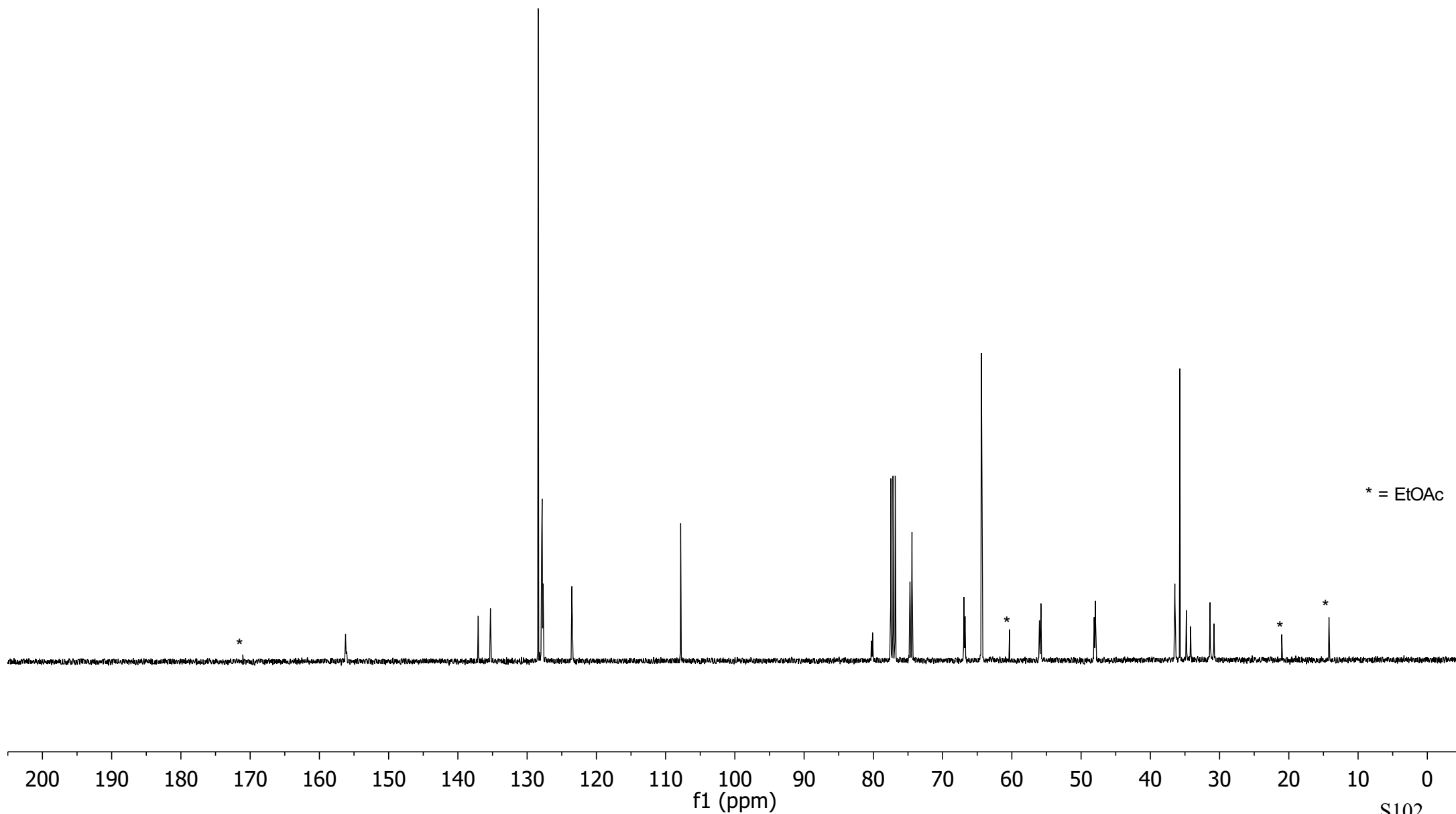
55.8
48.1

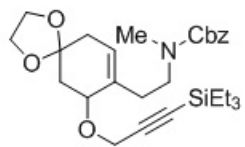
47.9
36.5

36.4
35.7

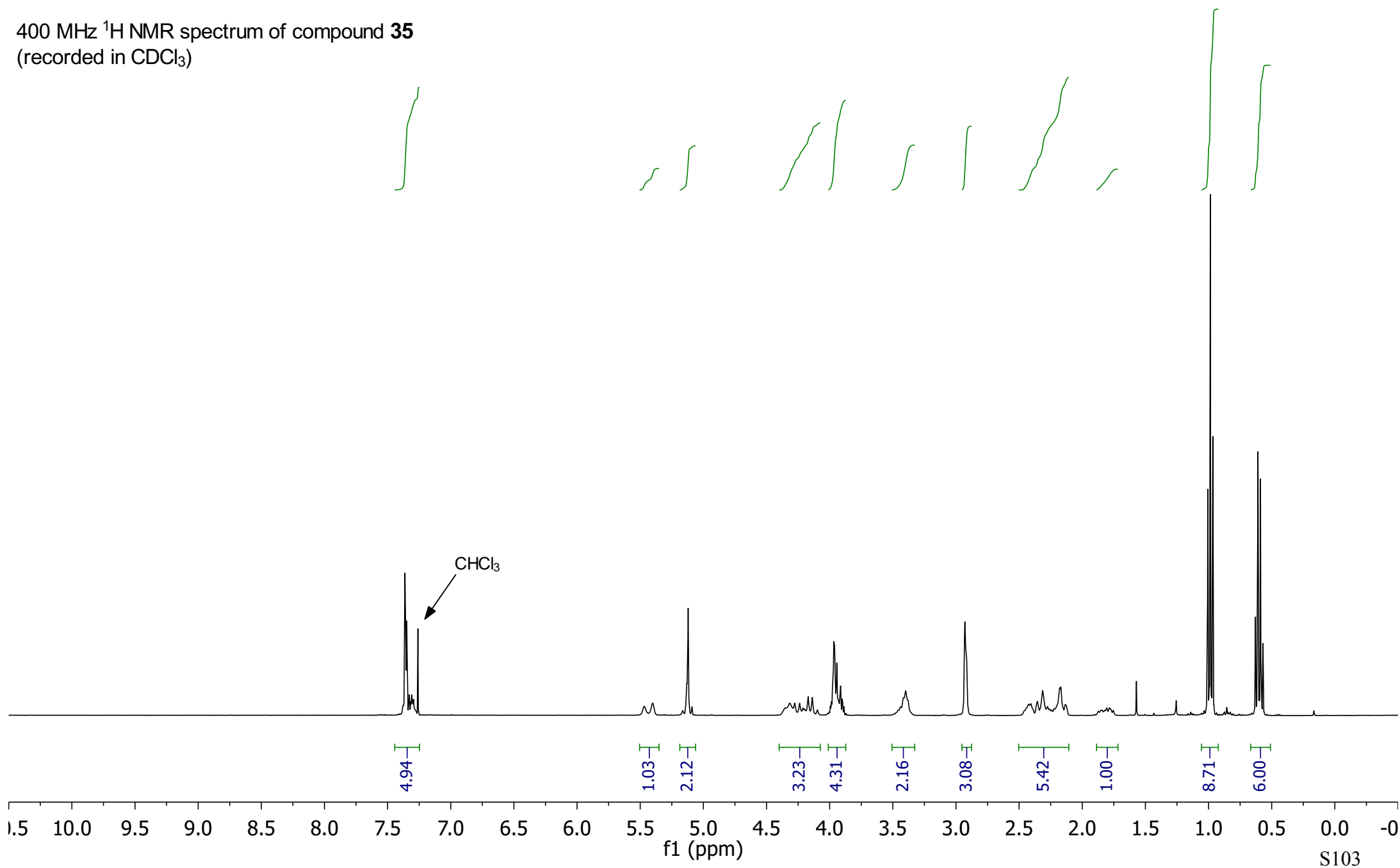
34.8
34.2

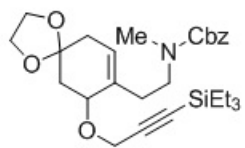
31.4
30.8



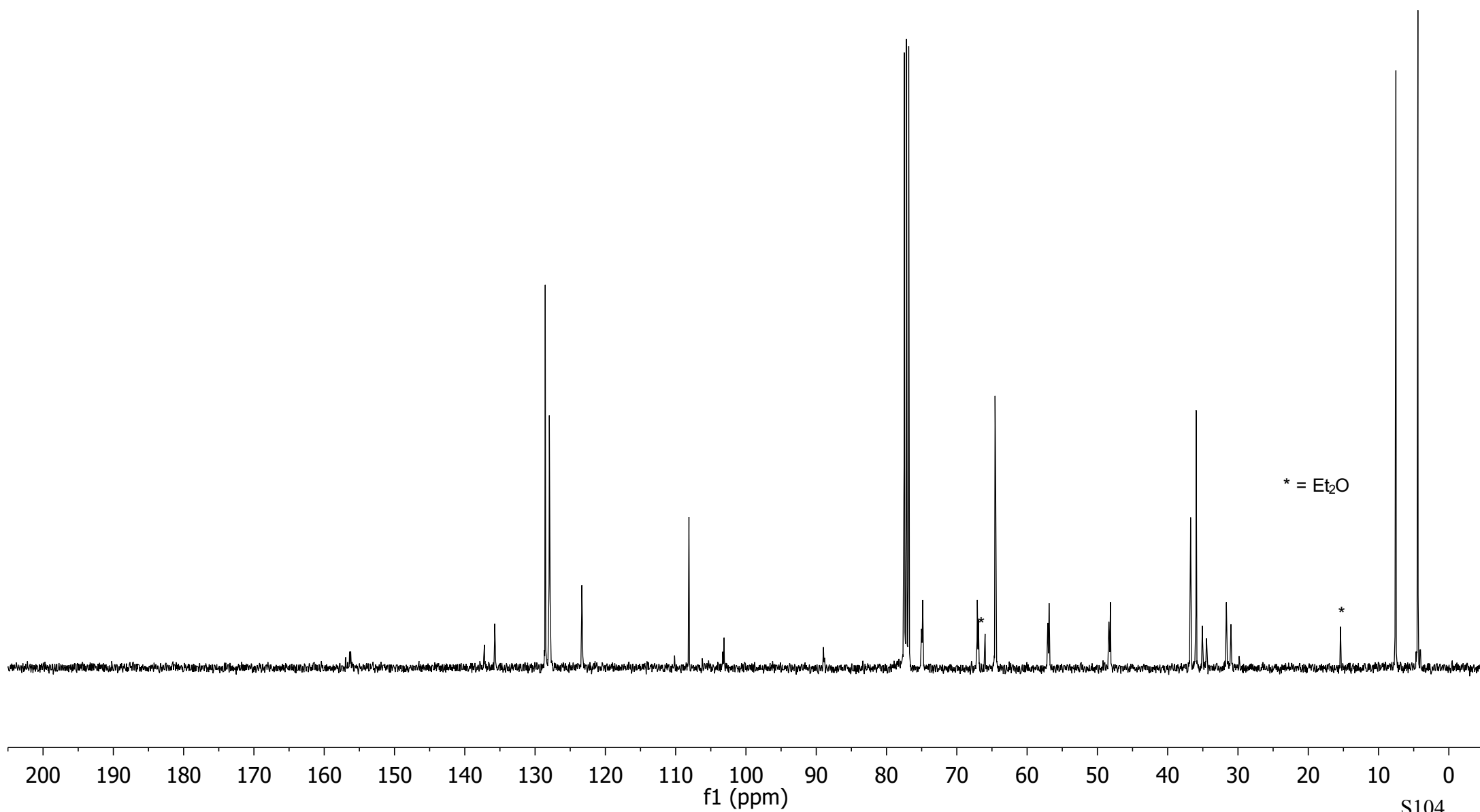


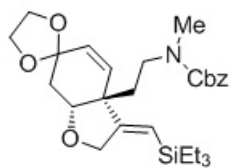
400 MHz ^1H NMR spectrum of compound **35**
(recorded in CDCl_3)



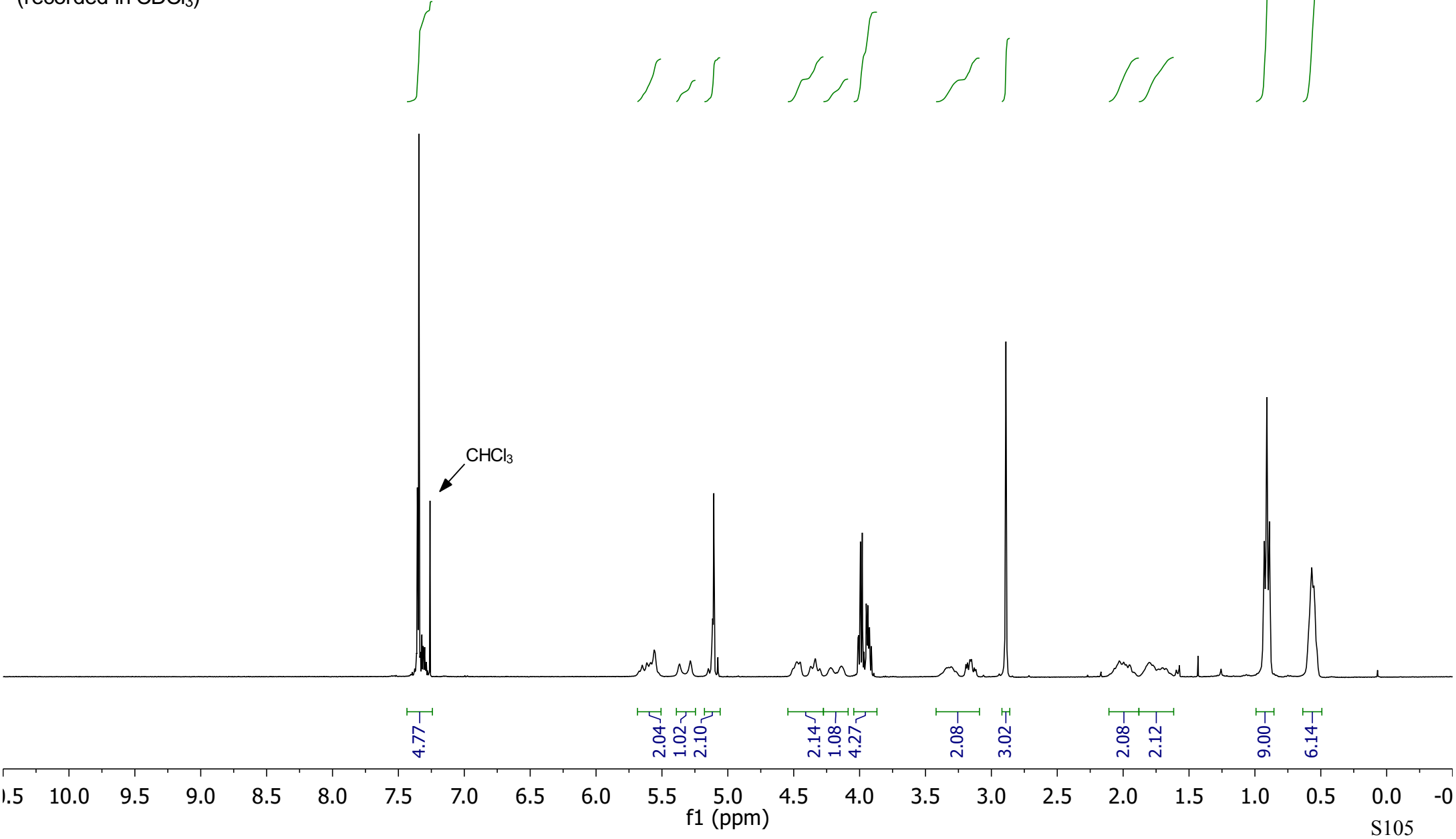


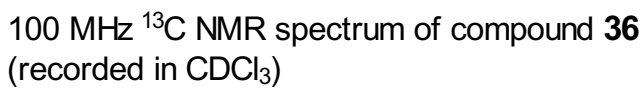
100 MHz ^{13}C NMR spectrum of compound **35**
(recorded in CDCl_3)

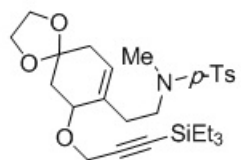




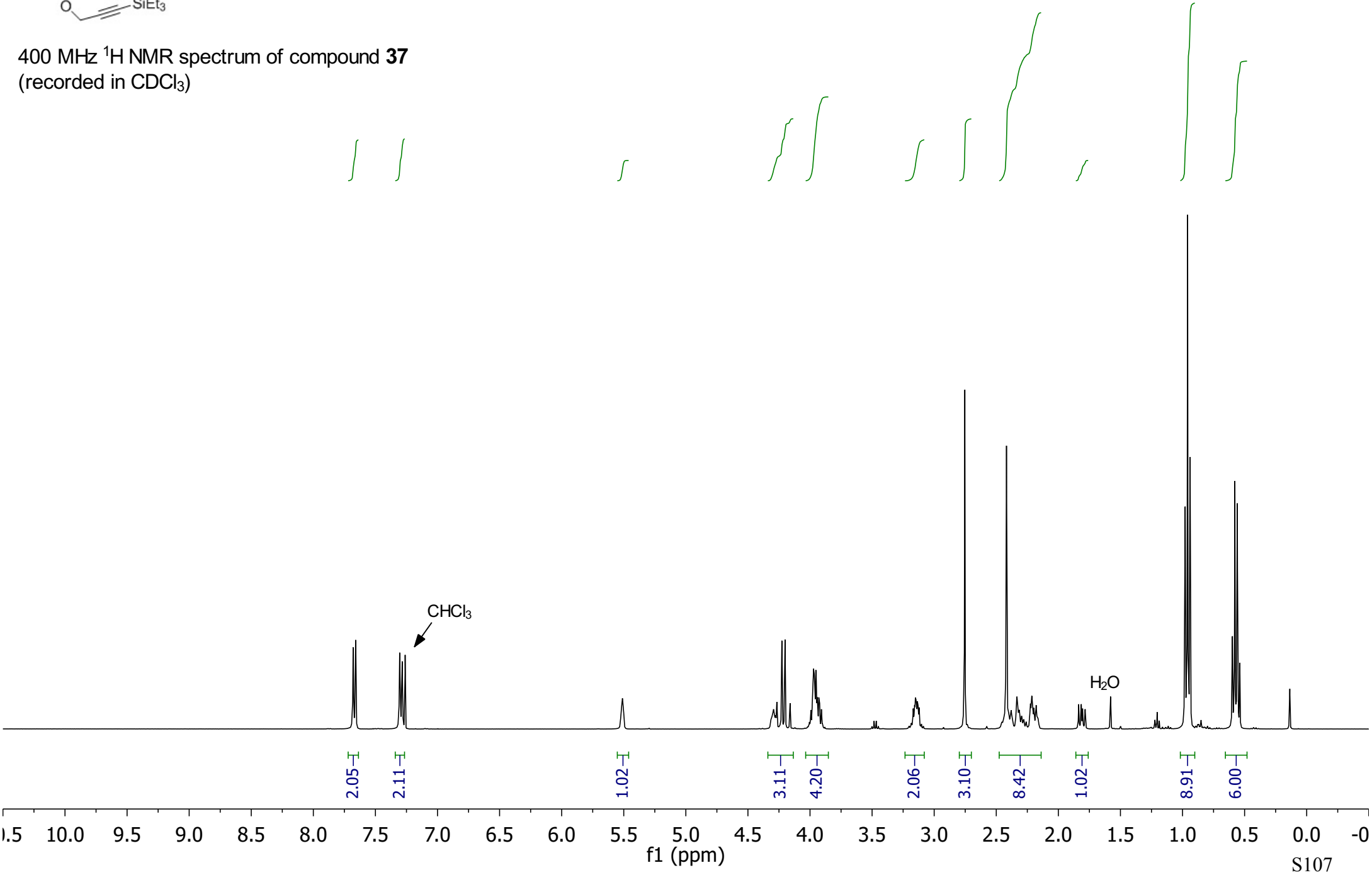
400 MHz ^1H NMR spectrum of compound **36**
(recorded in CDCl_3)

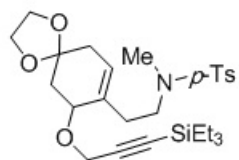




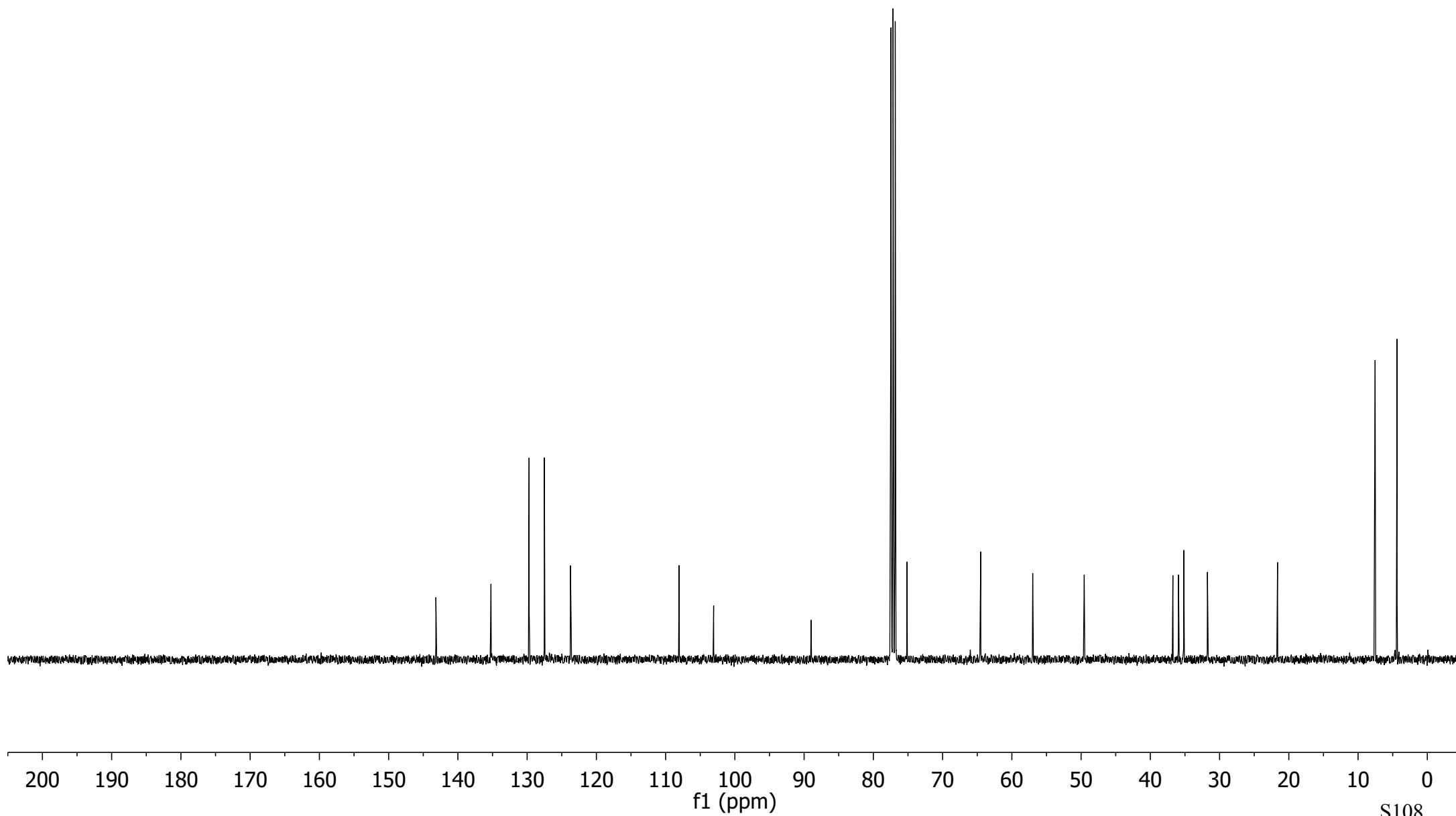


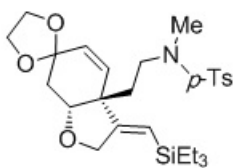
400 MHz ¹H NMR spectrum of compound **37**
(recorded in CDCl₃)



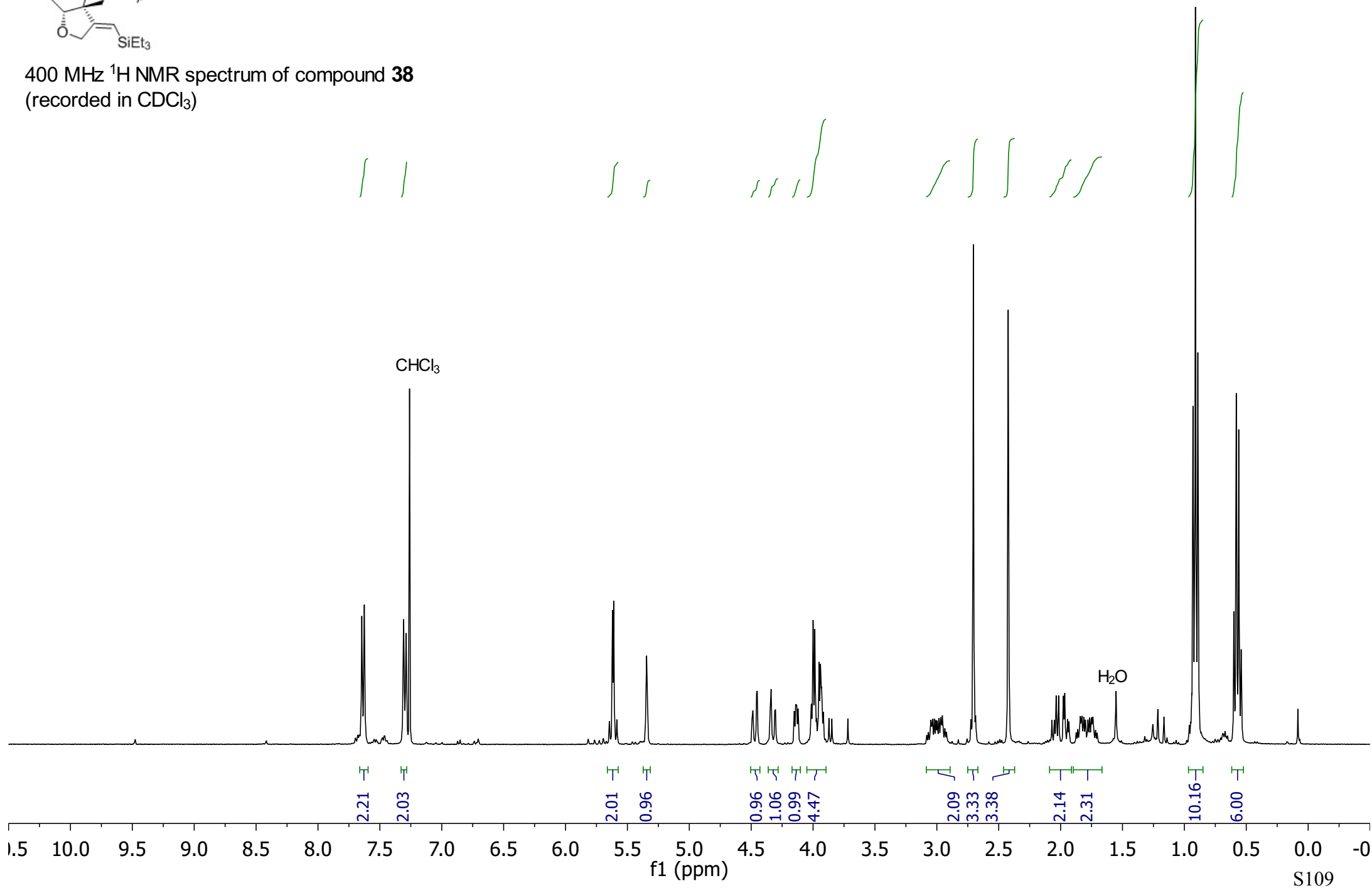


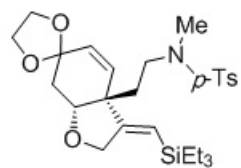
100 MHz ^{13}C NMR spectrum of compound **37**
(recorded in CDCl_3)



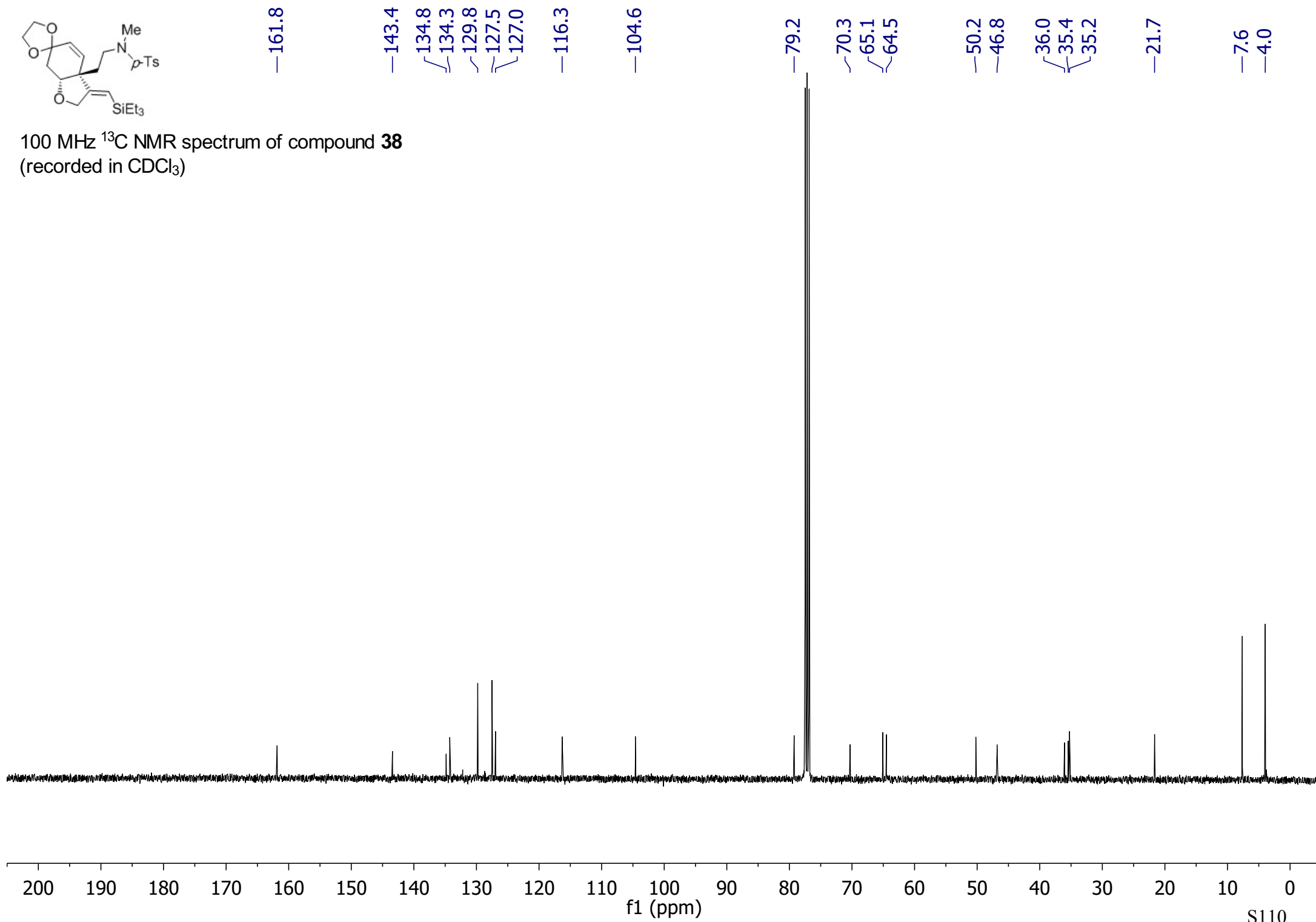


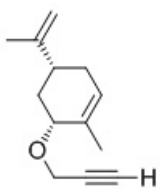
400 MHz ^1H NMR spectrum of compound **38**
(recorded in CDCl_3)



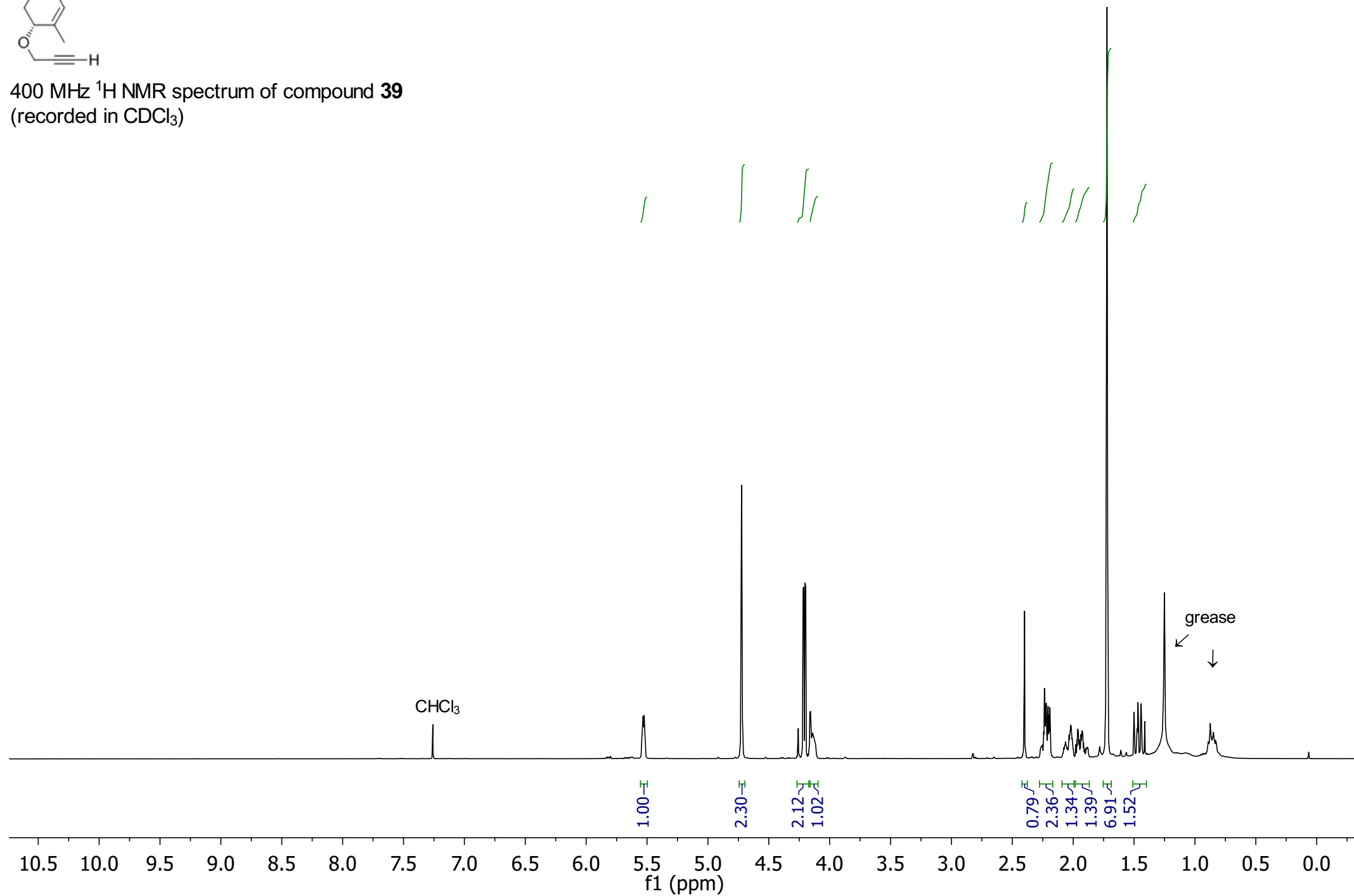


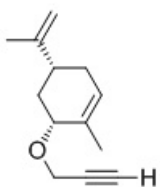
100 MHz ^{13}C NMR spectrum of compound **38**
(recorded in CDCl_3)



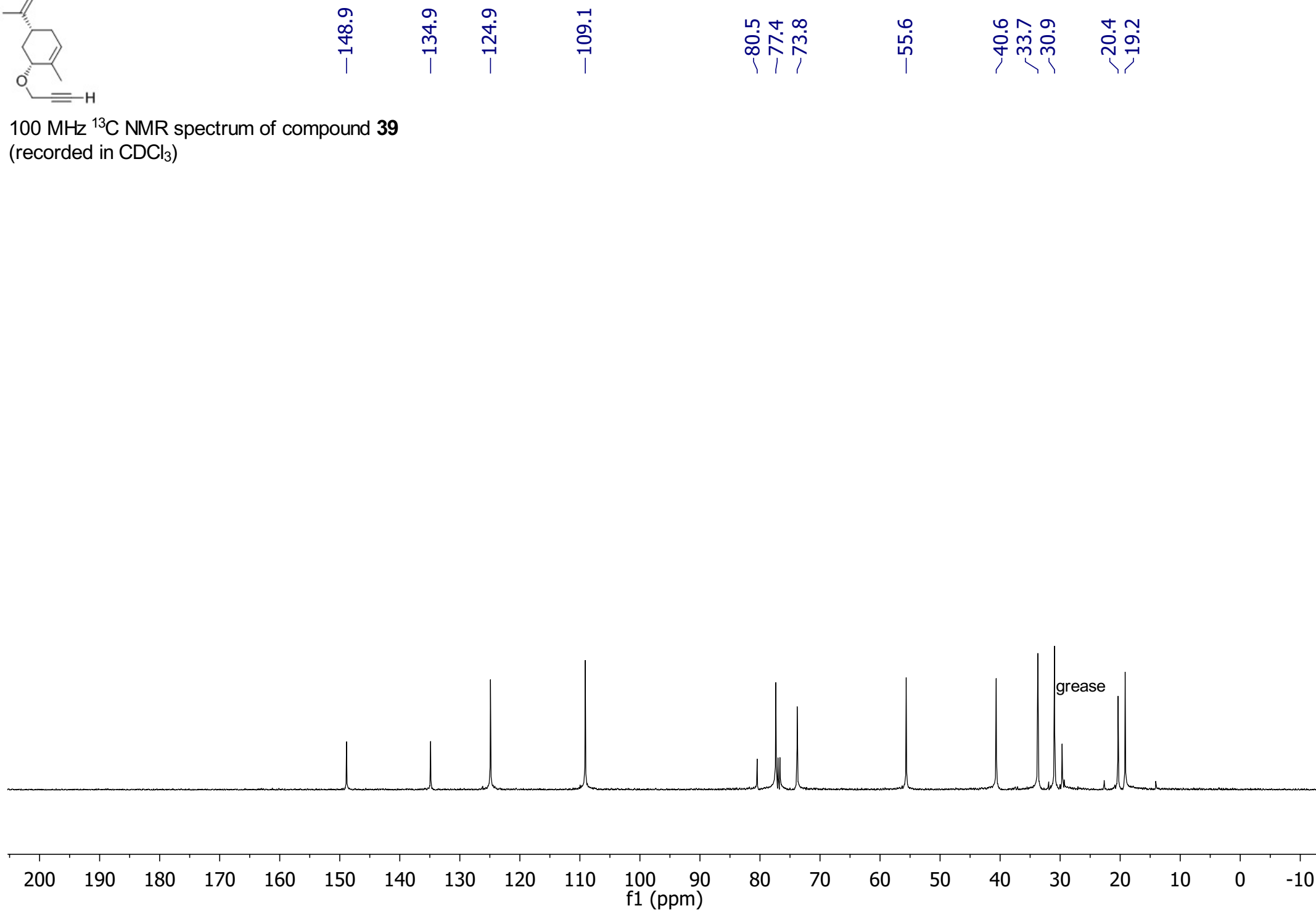


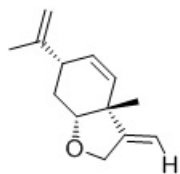
400 MHz ^1H NMR spectrum of compound **39**
(recorded in CDCl_3)



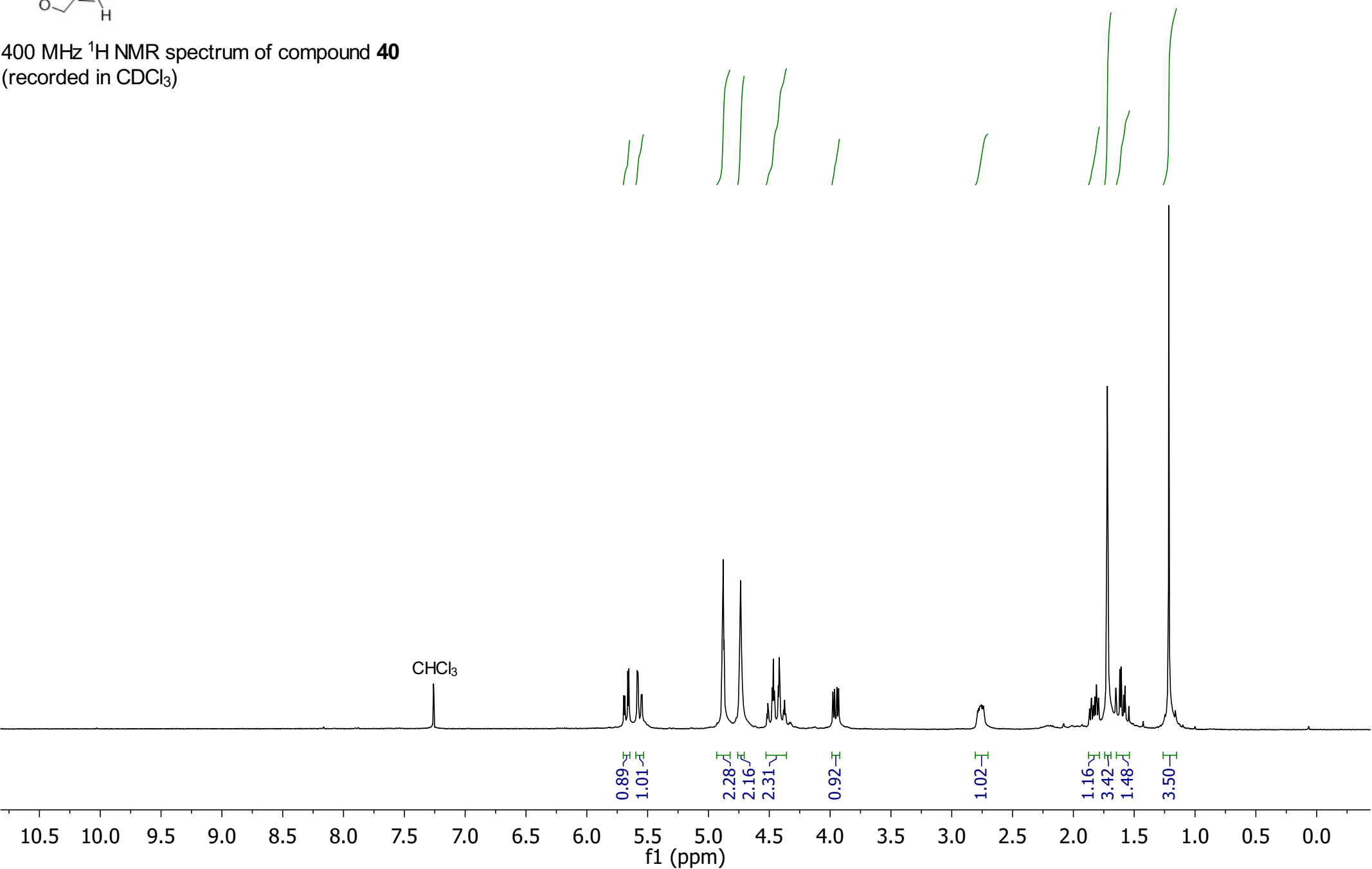


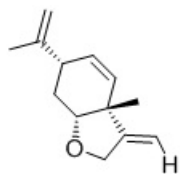
100 MHz ^{13}C NMR spectrum of compound **39**
(recorded in CDCl_3)



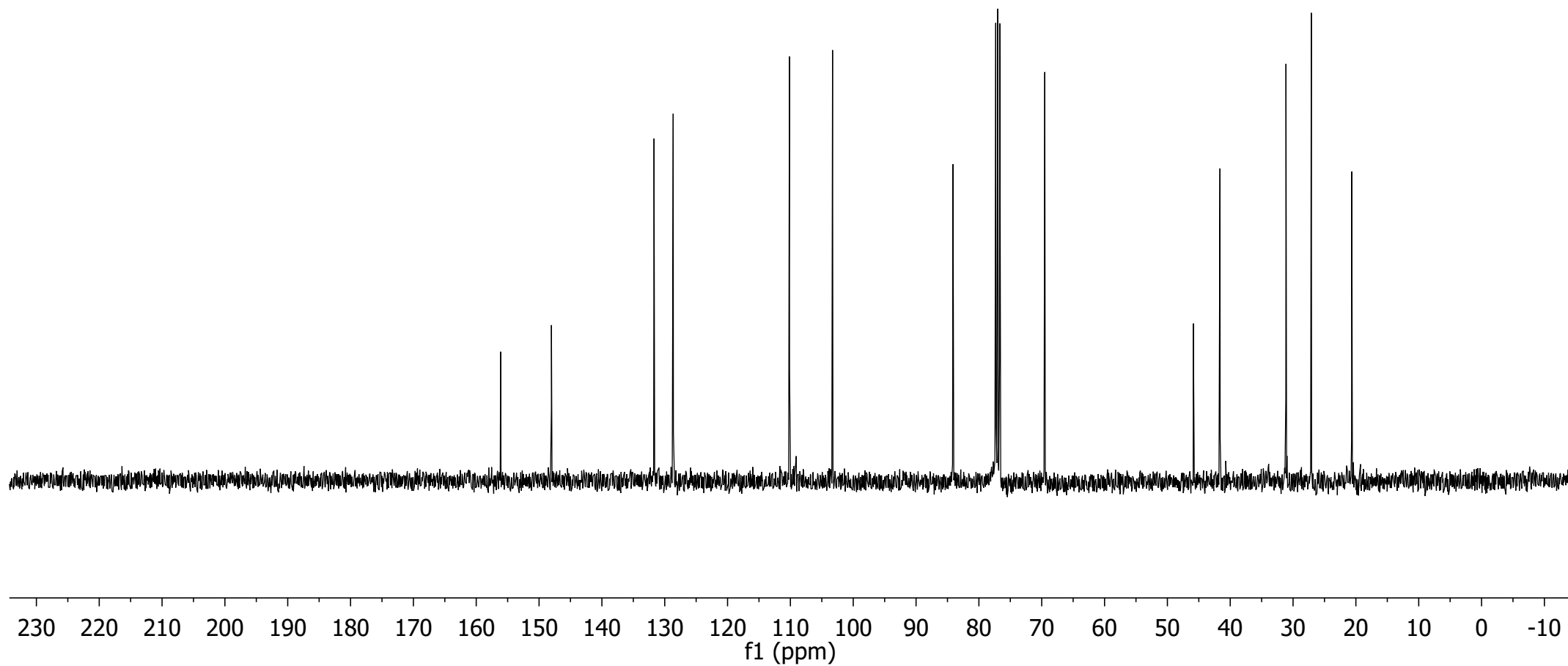


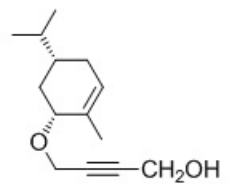
400 MHz ¹H NMR spectrum of compound **40**
(recorded in CDCl₃)



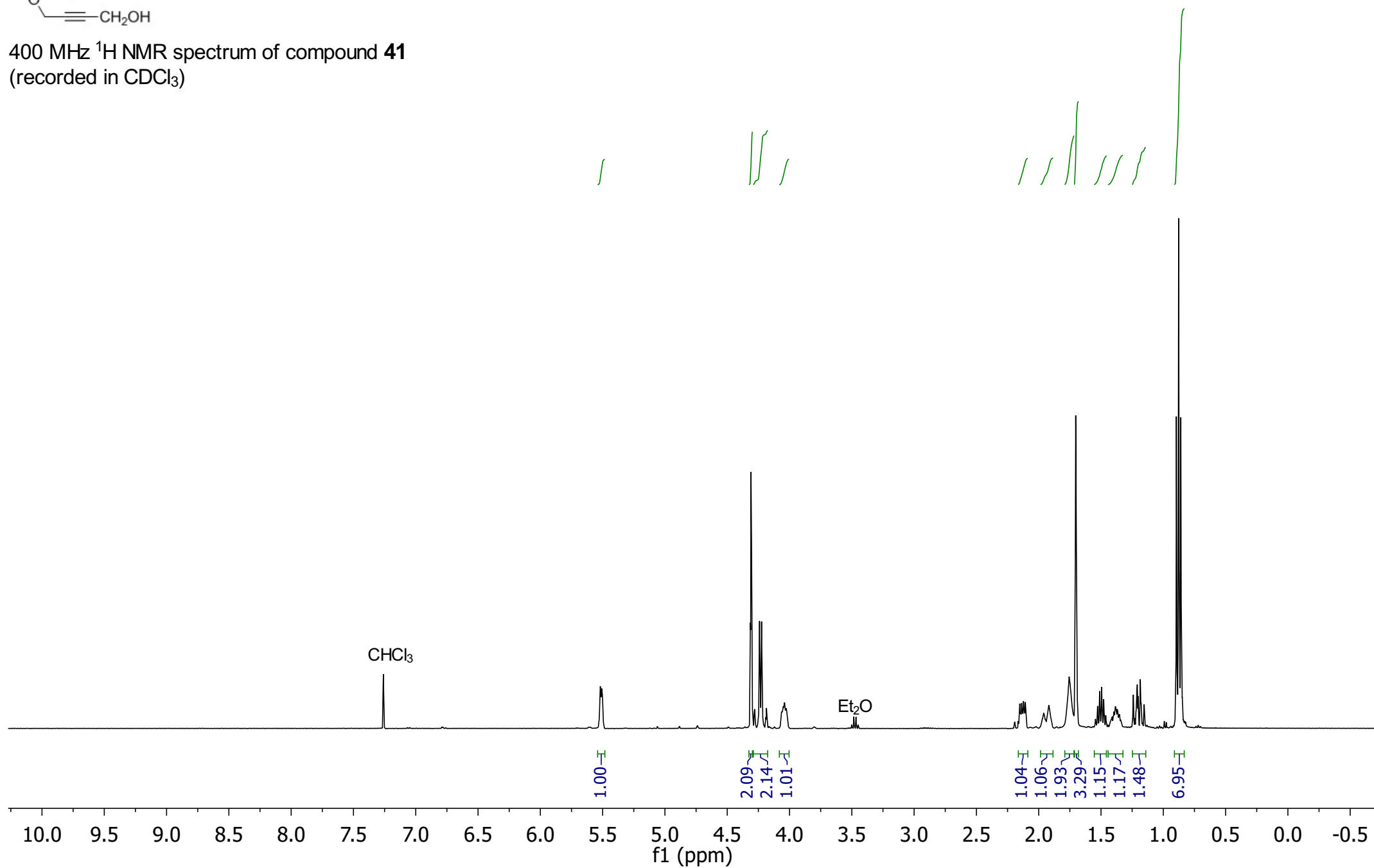


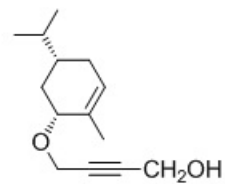
100 MHz ^{13}C NMR spectrum of compound **40**
(recorded in CDCl_3)



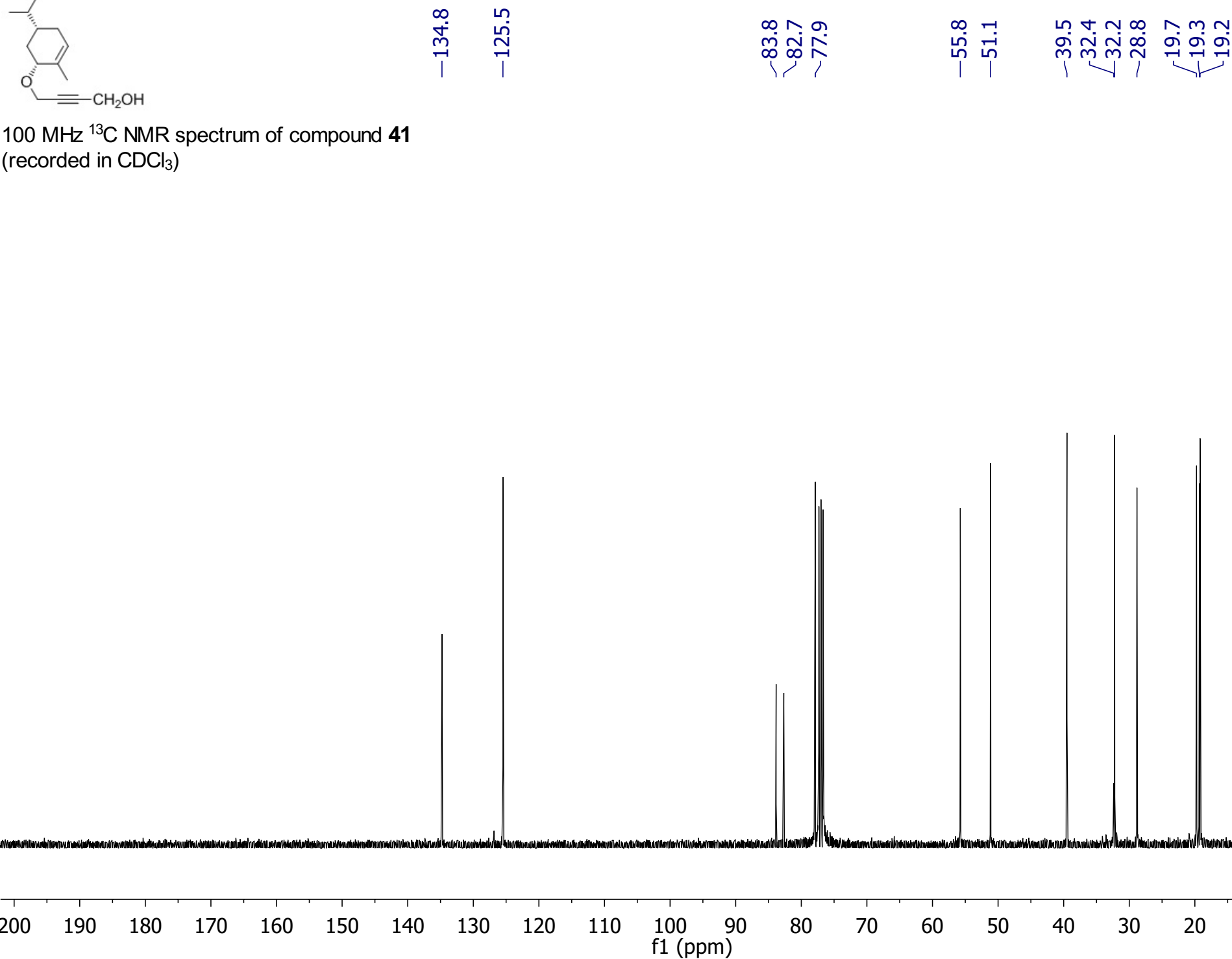


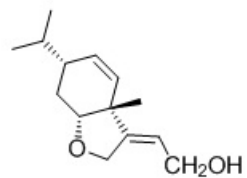
400 MHz ^1H NMR spectrum of compound **41**
(recorded in CDCl_3)



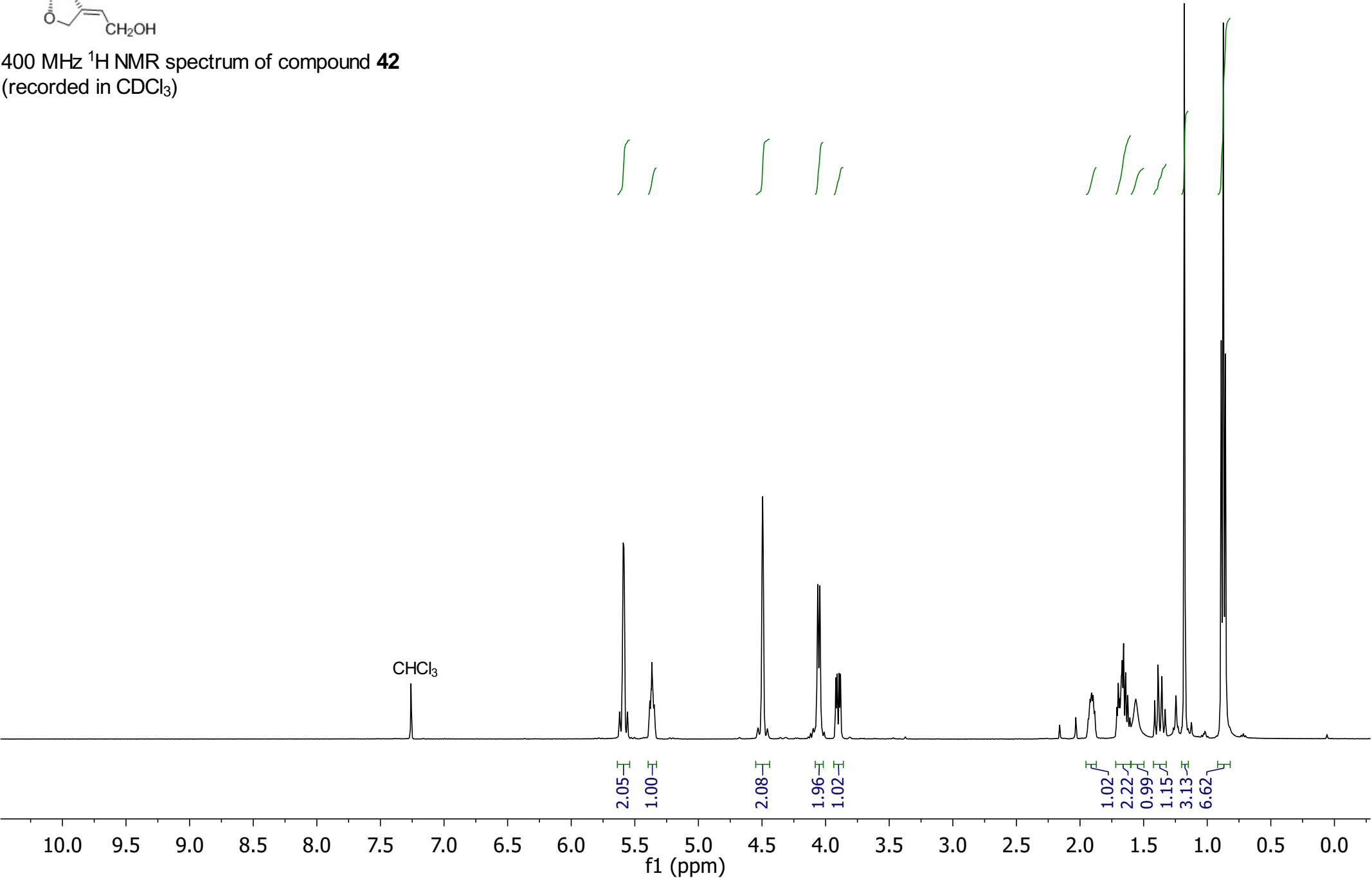


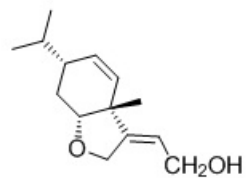
100 MHz ¹³C NMR spectrum of compound **41**
(recorded in CDCl₃)



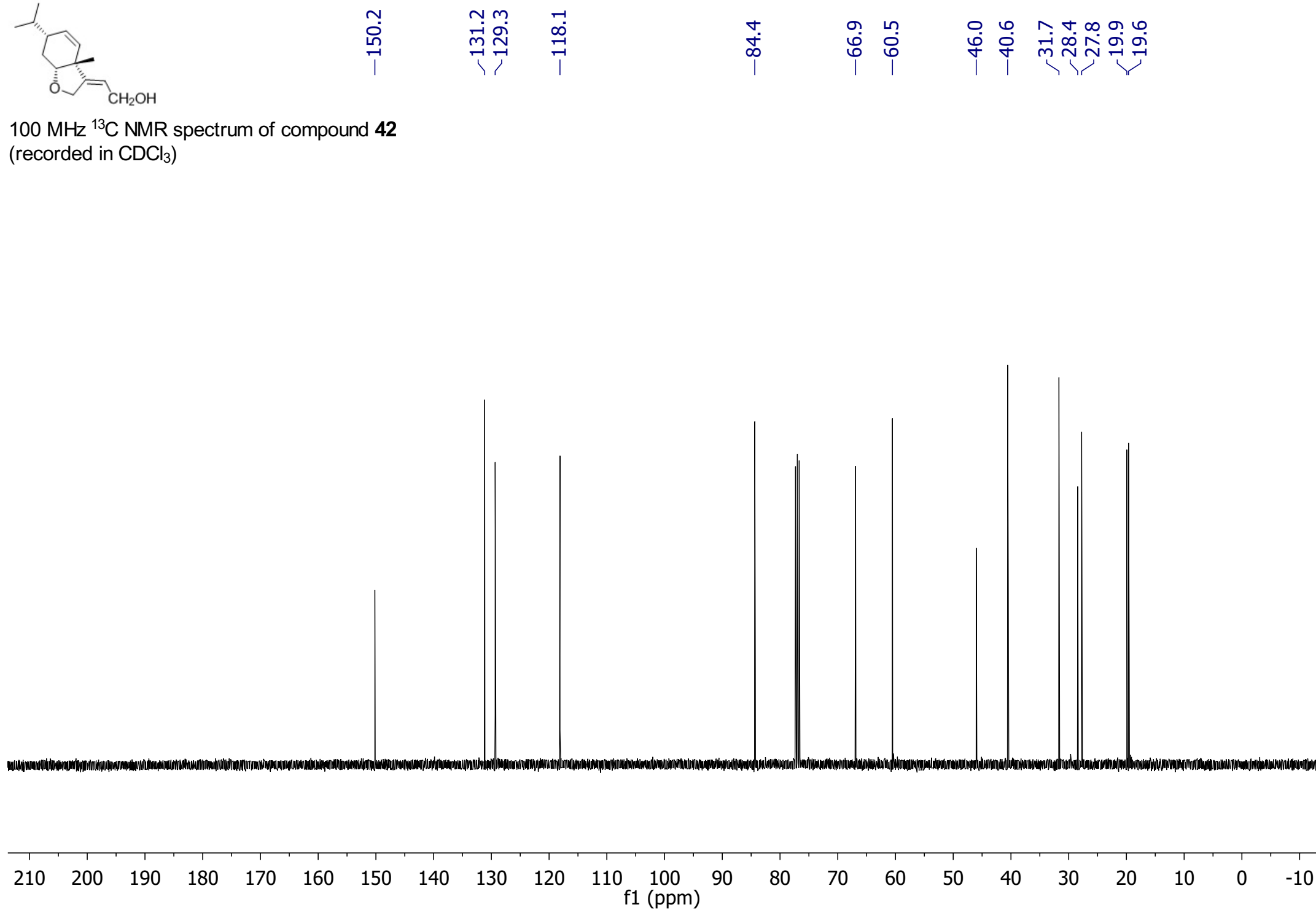


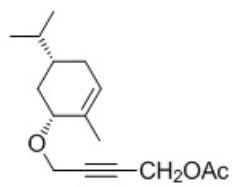
400 MHz ¹H NMR spectrum of compound **42**
(recorded in CDCl₃)



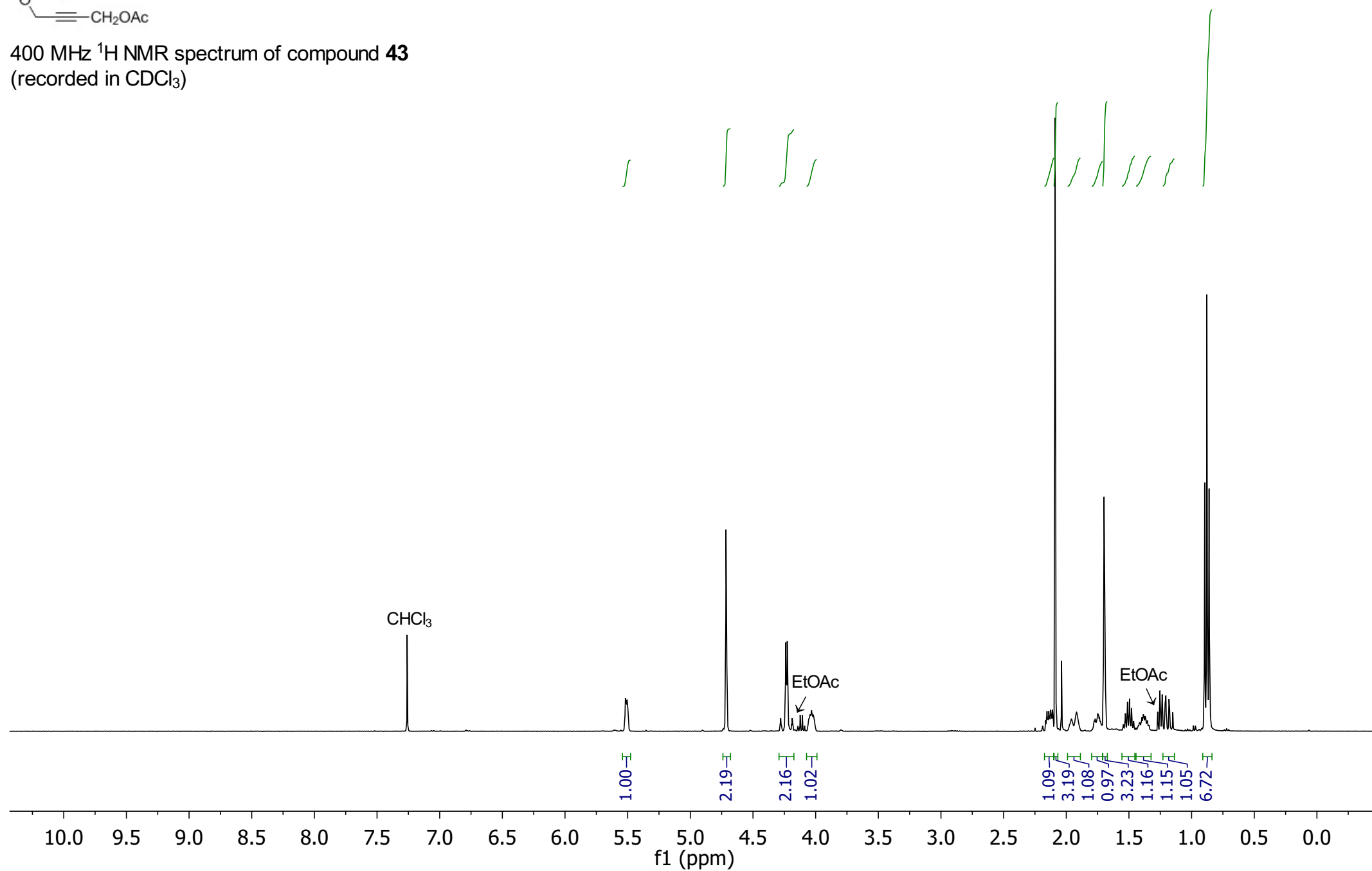


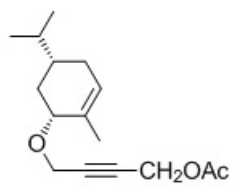
100 MHz ^{13}C NMR spectrum of compound **42**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **43**
(recorded in CDCl_3)





—170.2

—125.4

~83.8

~79.5

~77.9

—55.8

—52.3

~39.5

~32.4

~32.2

~28.8

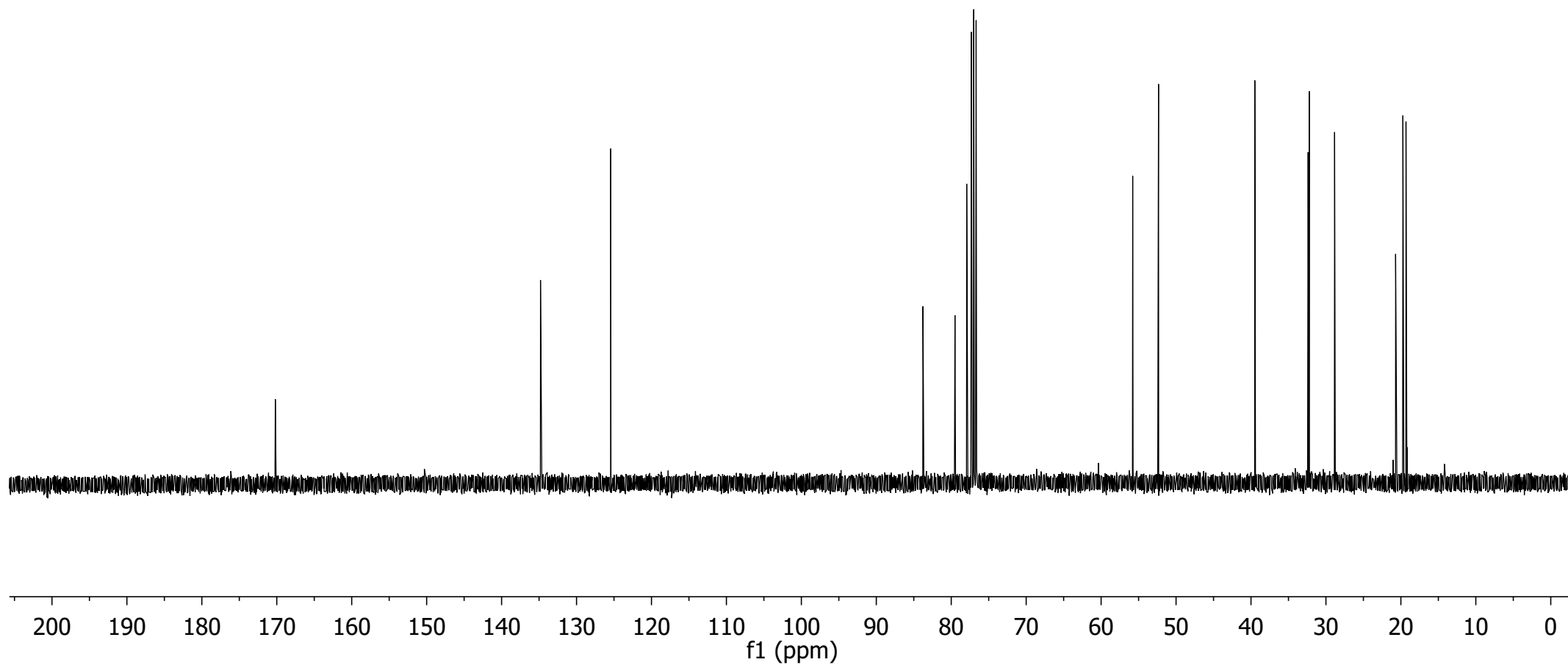
~20.7

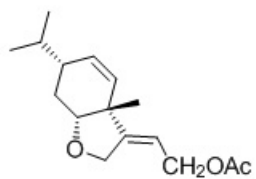
~19.7

~19.3

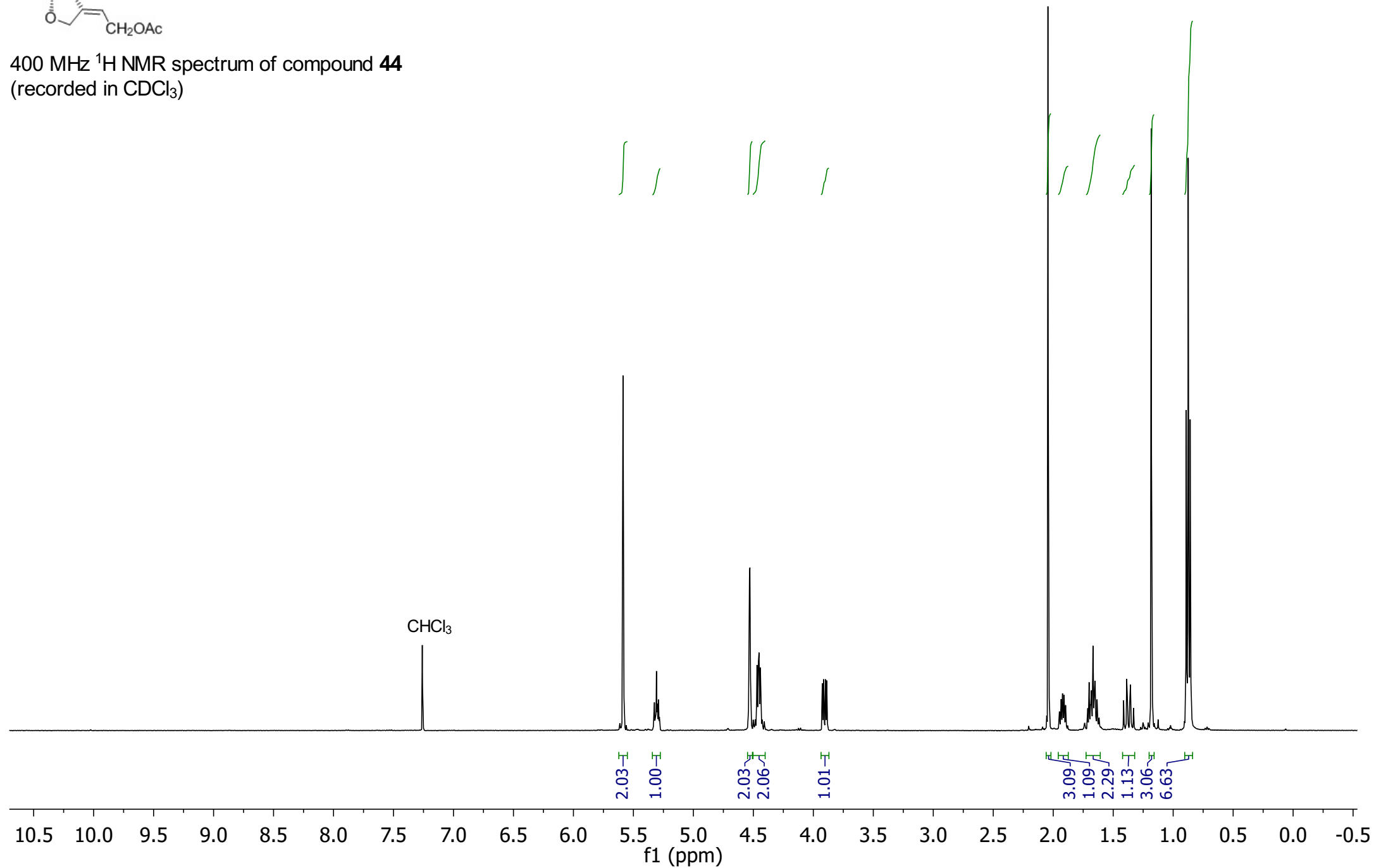
~19.2

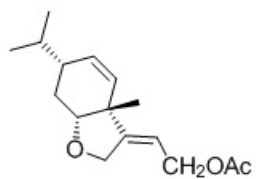
100 MHz ^{13}C NMR spectrum of compound **43**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **44**
(recorded in CDCl_3)





—170.8

—152.8

—130.9
—129.6

—113.3

—84.4

—66.9
—61.9

—46.2

—40.6

—31.7

—28.3

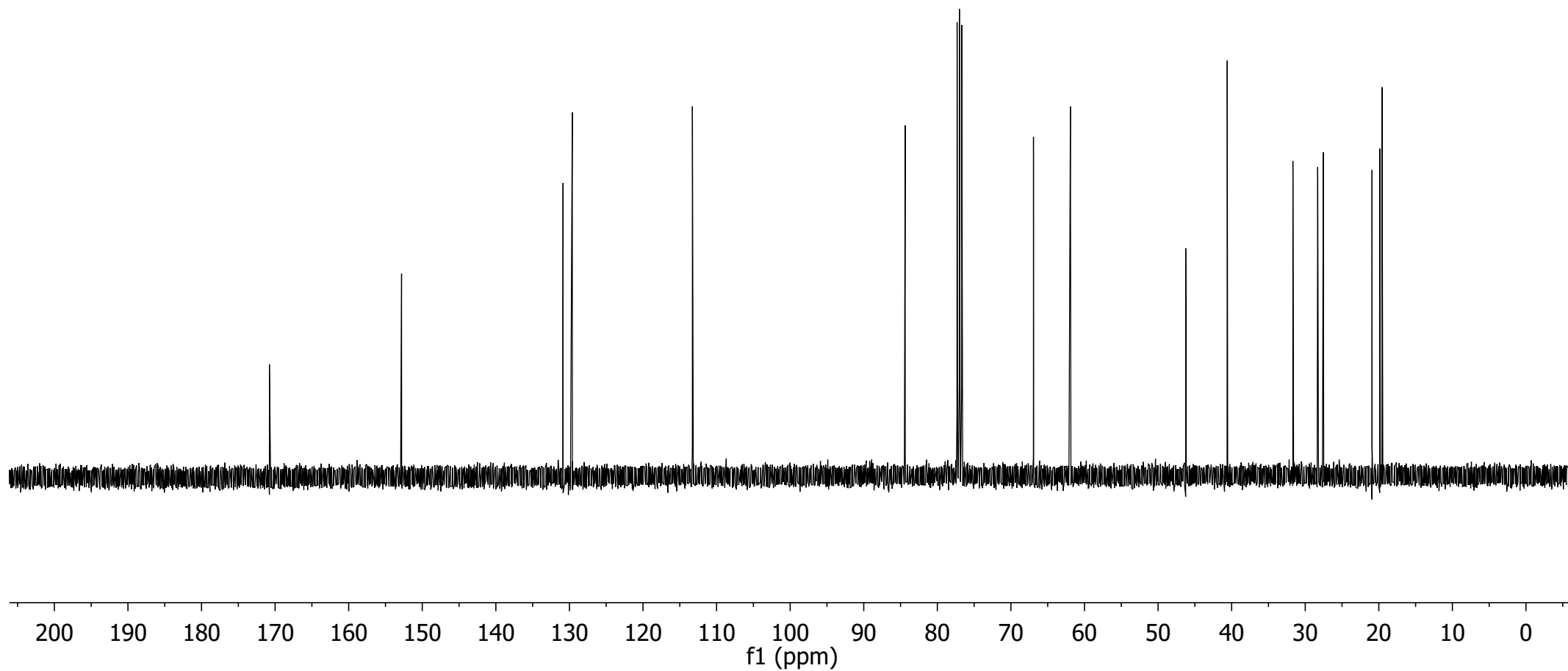
—27.5

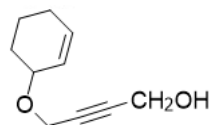
—20.9

—19.9

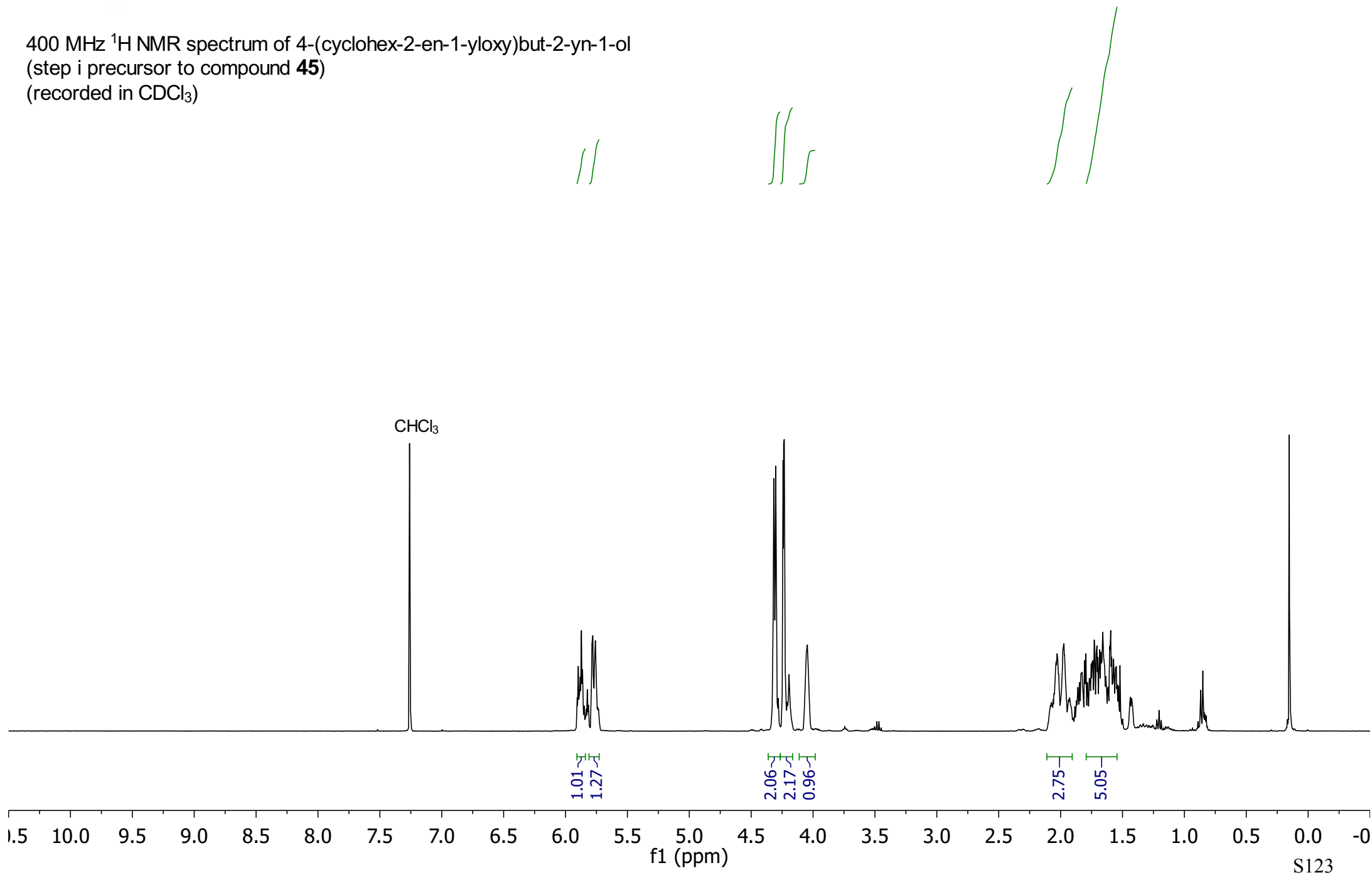
—19.6

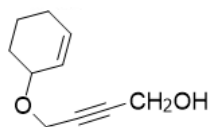
100 MHz ^{13}C NMR spectrum of compound **44**
(recorded in CDCl_3)



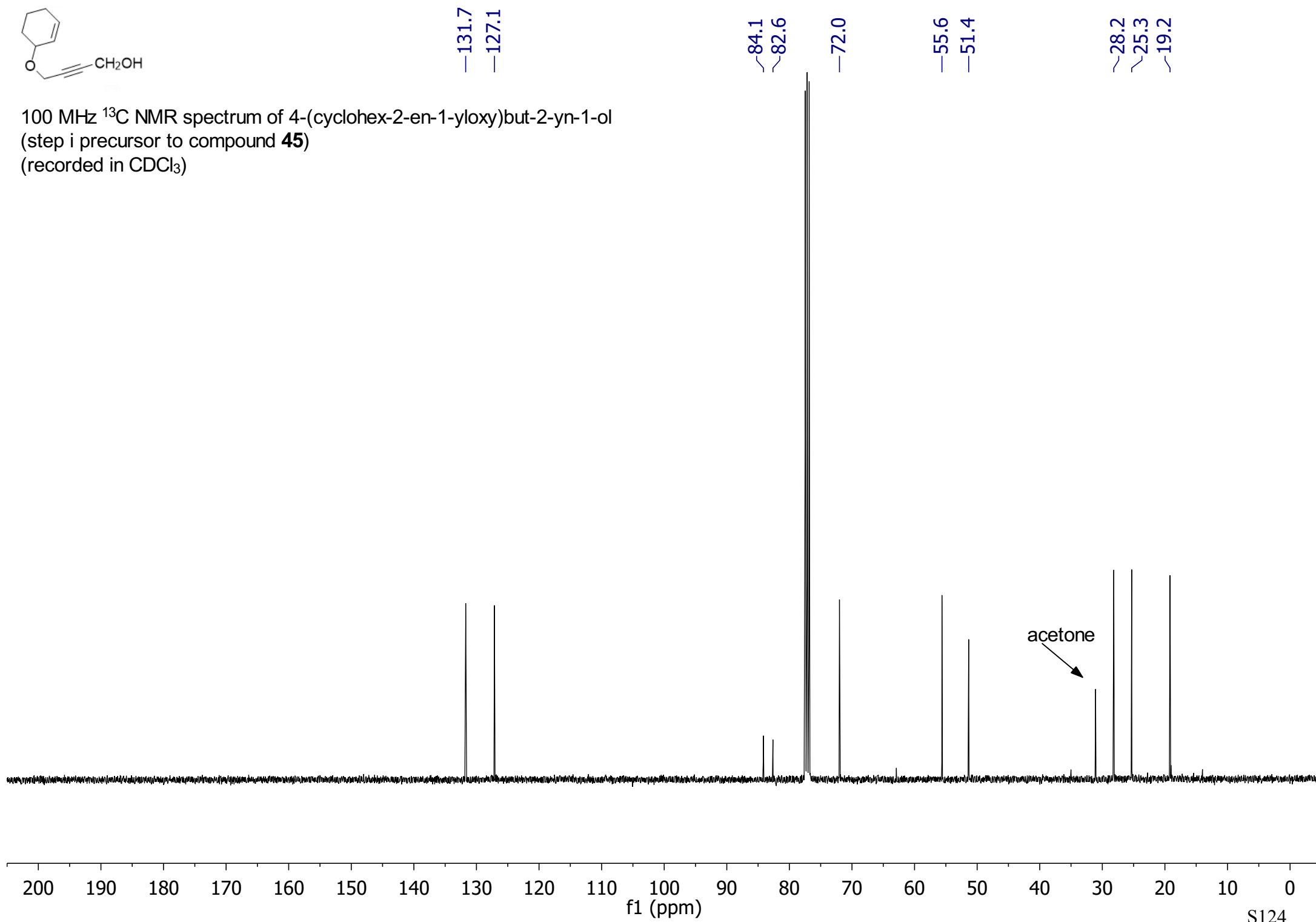


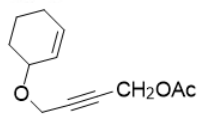
400 MHz ^1H NMR spectrum of 4-(cyclohex-2-en-1-yloxy)but-2-yn-1-ol
(step i precursor to compound **45**)
(recorded in CDCl_3)



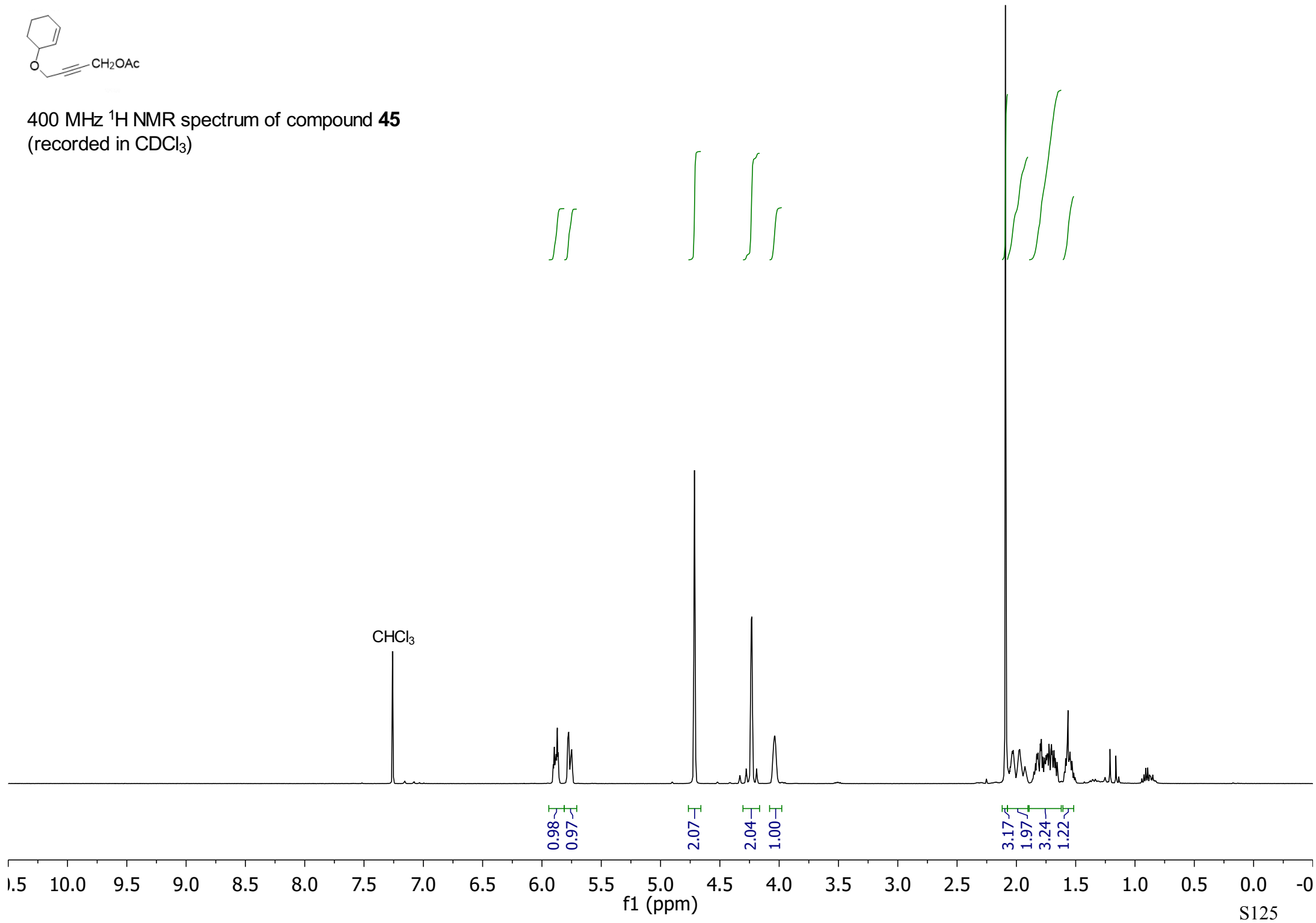


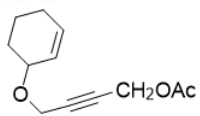
100 MHz ^{13}C NMR spectrum of 4-(cyclohex-2-en-1-yloxy)but-2-yn-1-ol
(step i precursor to compound **45**)
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **45**
(recorded in CDCl_3)





—170.4

—131.7

—127.1

—83.7

—79.8

—72.0

—55.6

—52.5

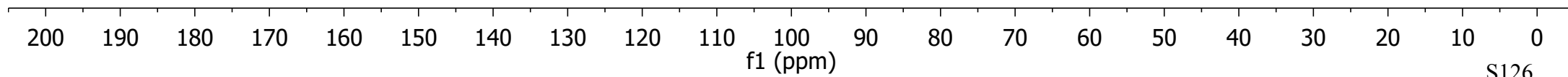
~28.2

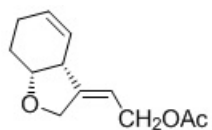
~25.3

~20.9

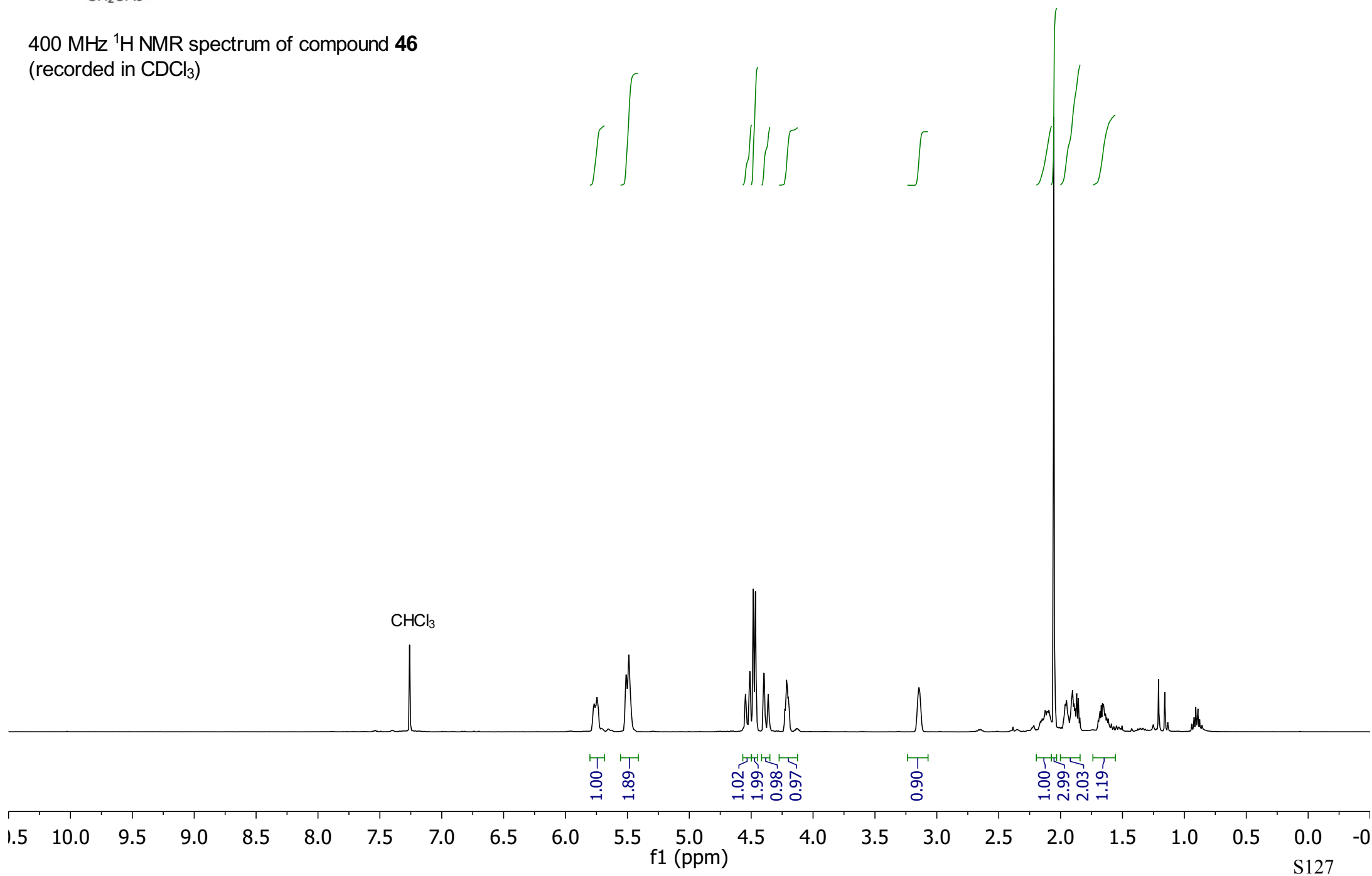
~19.2

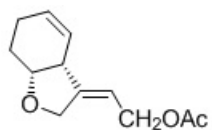
100 MHz ^{13}C NMR spectrum of compound **45**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **46**
(recorded in CDCl_3)





—171.0

—148.6

~127.5

~126.0

—114.8

—76.6

—67.8

—62.0

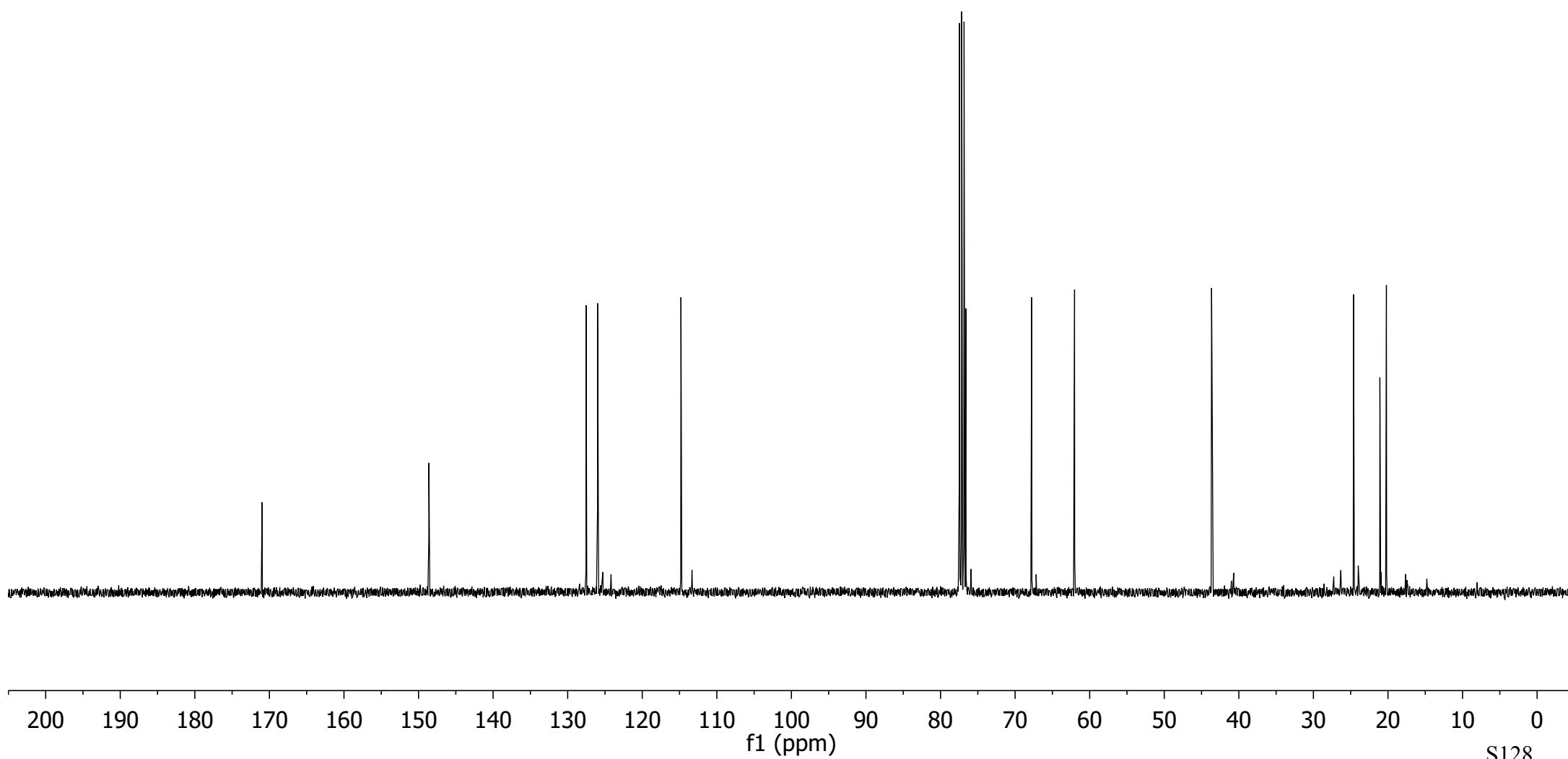
—43.7

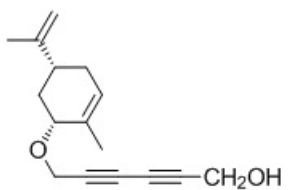
~24.6

~21.1

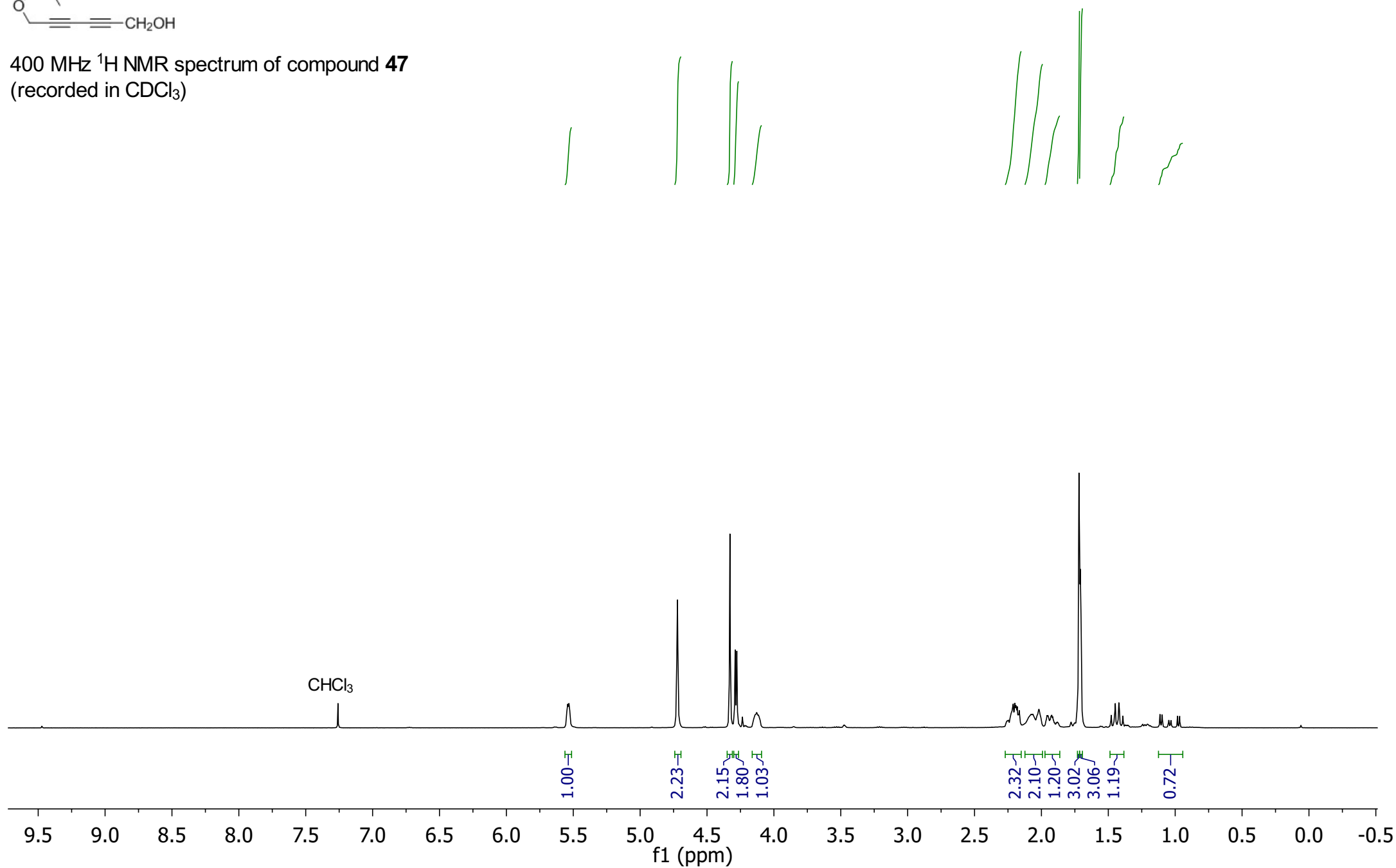
~20.2

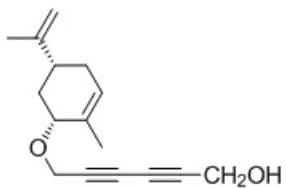
100 MHz ^{13}C NMR spectrum of compound **46**
(recorded in CDCl_3)



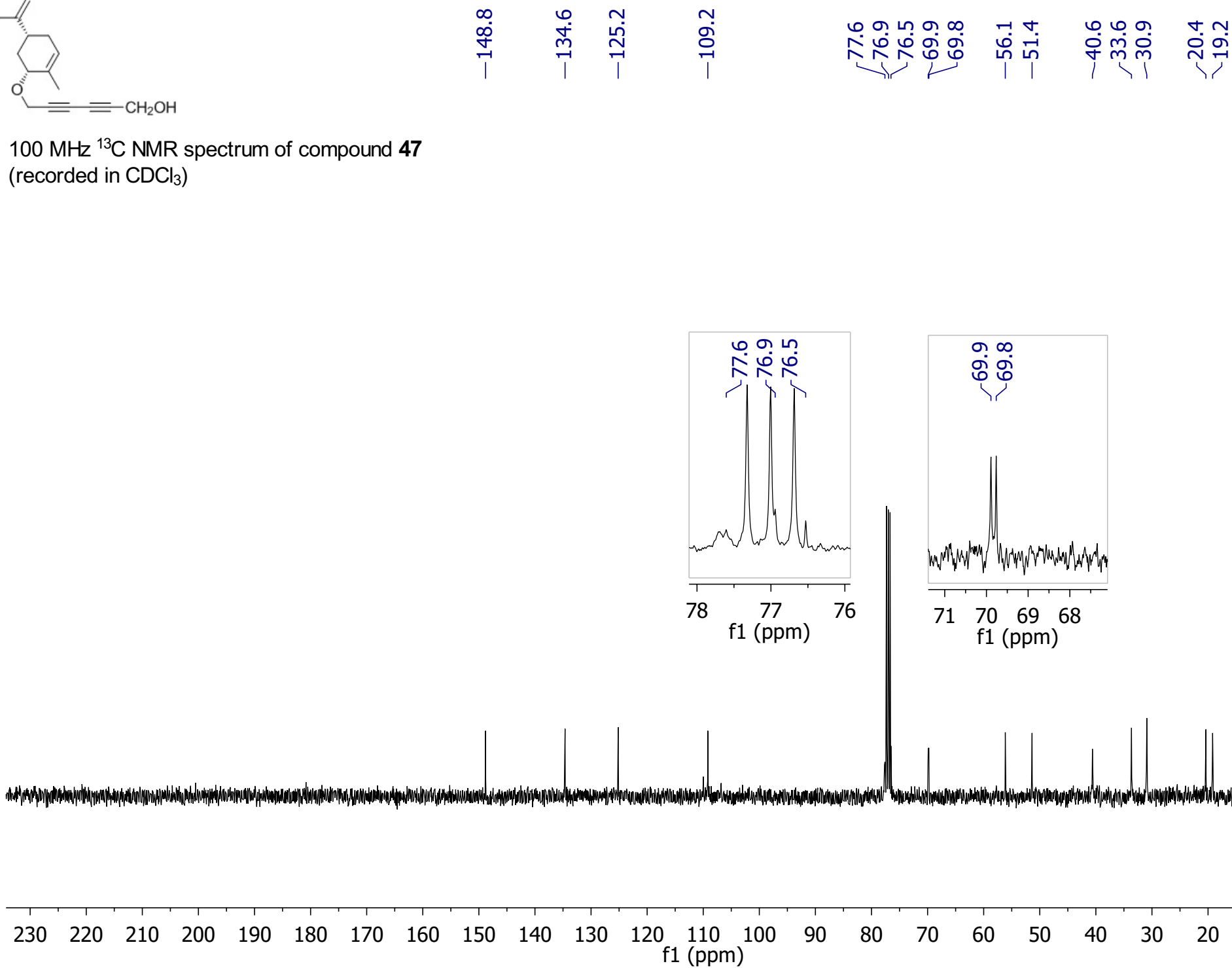


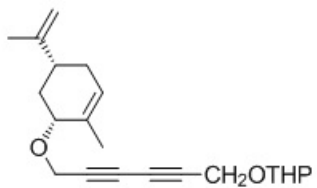
400 MHz ^1H NMR spectrum of compound **47**
(recorded in CDCl_3)



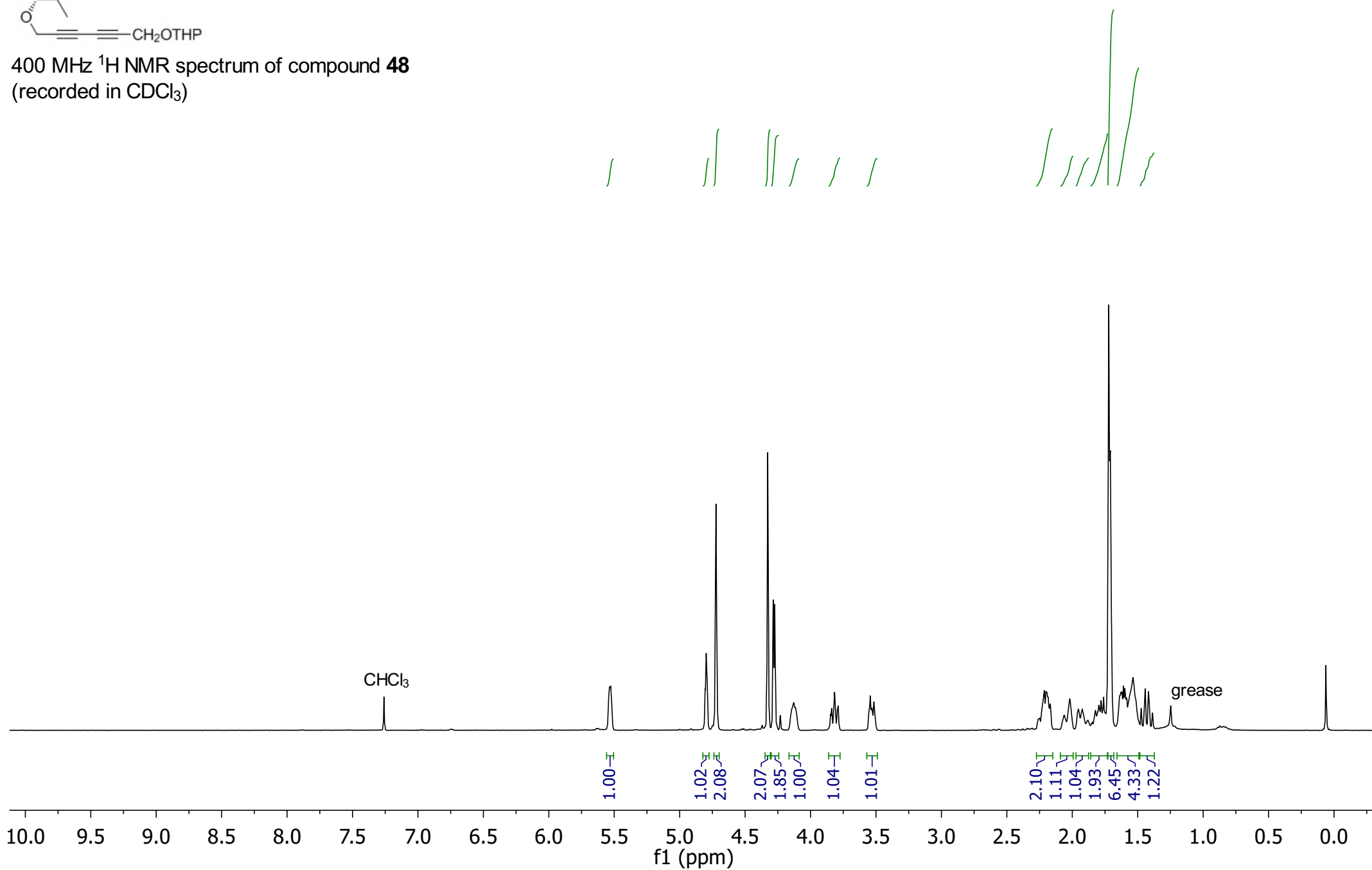


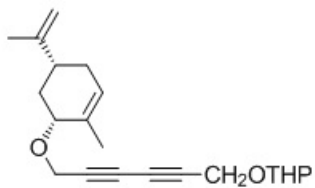
100 MHz ^{13}C NMR spectrum of compound **47**
(recorded in CDCl_3)



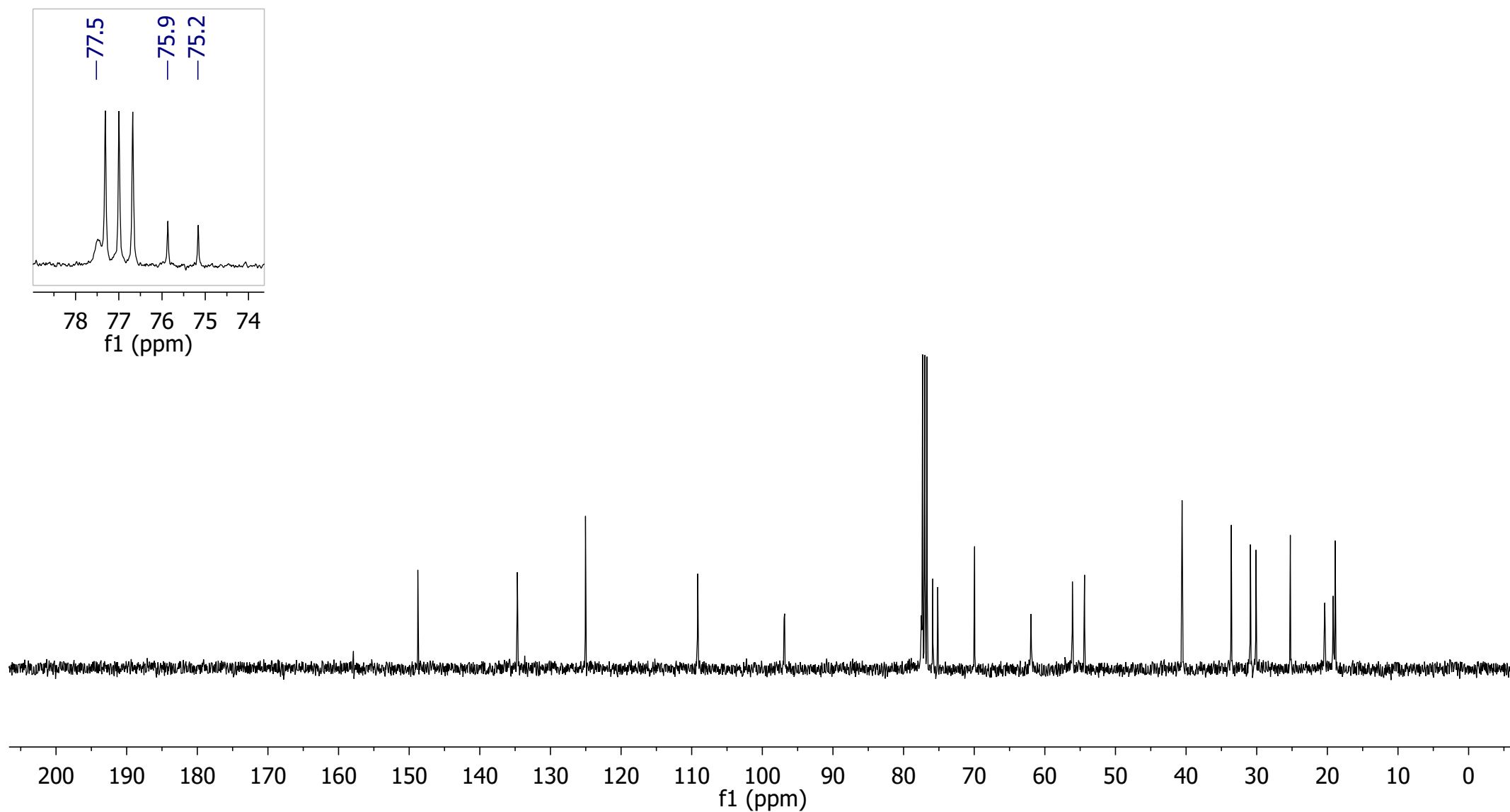


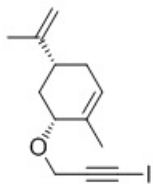
400 MHz ^1H NMR spectrum of compound **48**
(recorded in CDCl_3)



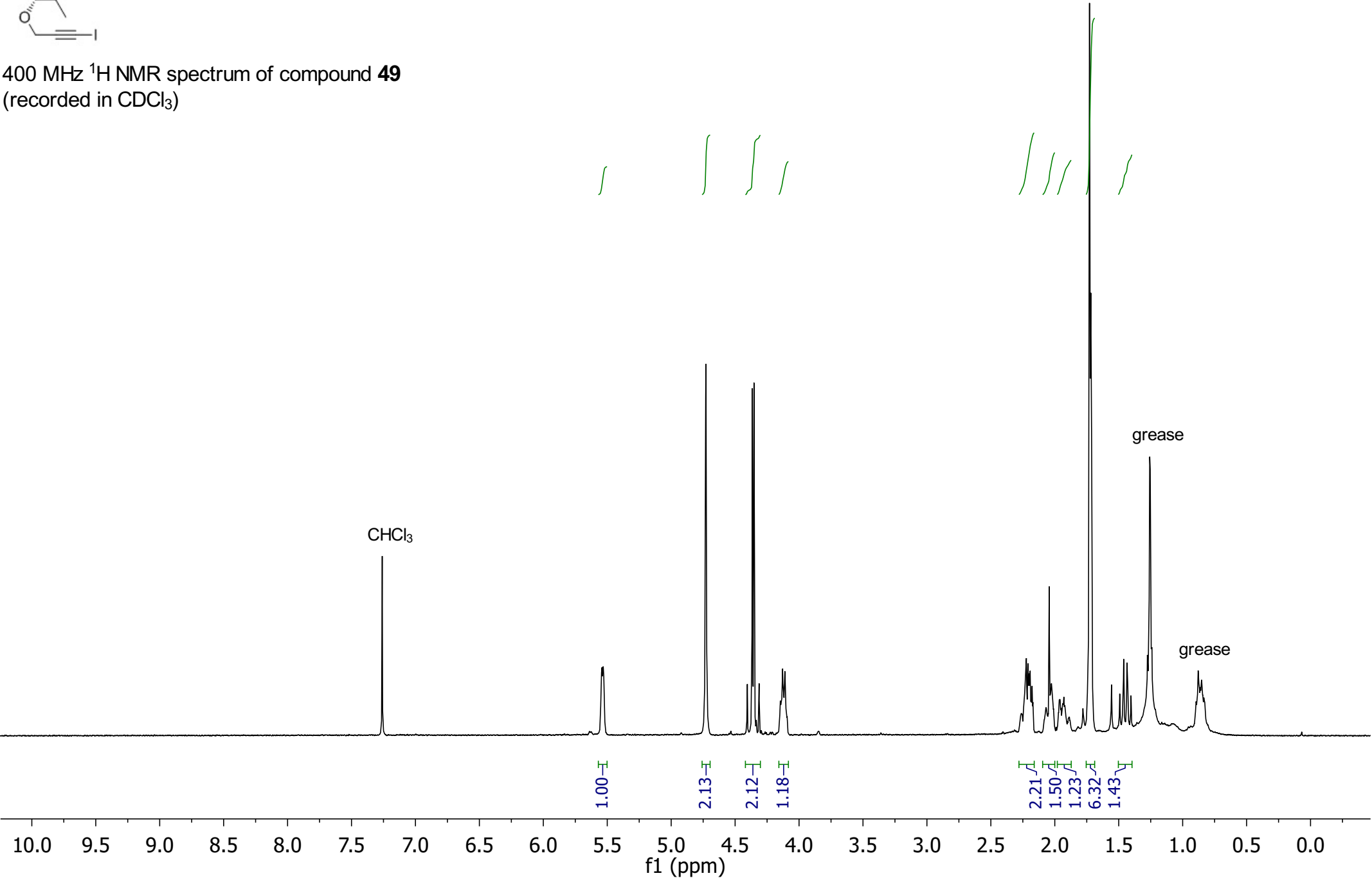


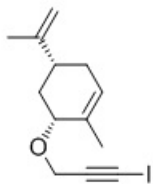
100 MHz ^{13}C NMR spectrum of compound **48**
(recorded in CDCl_3)



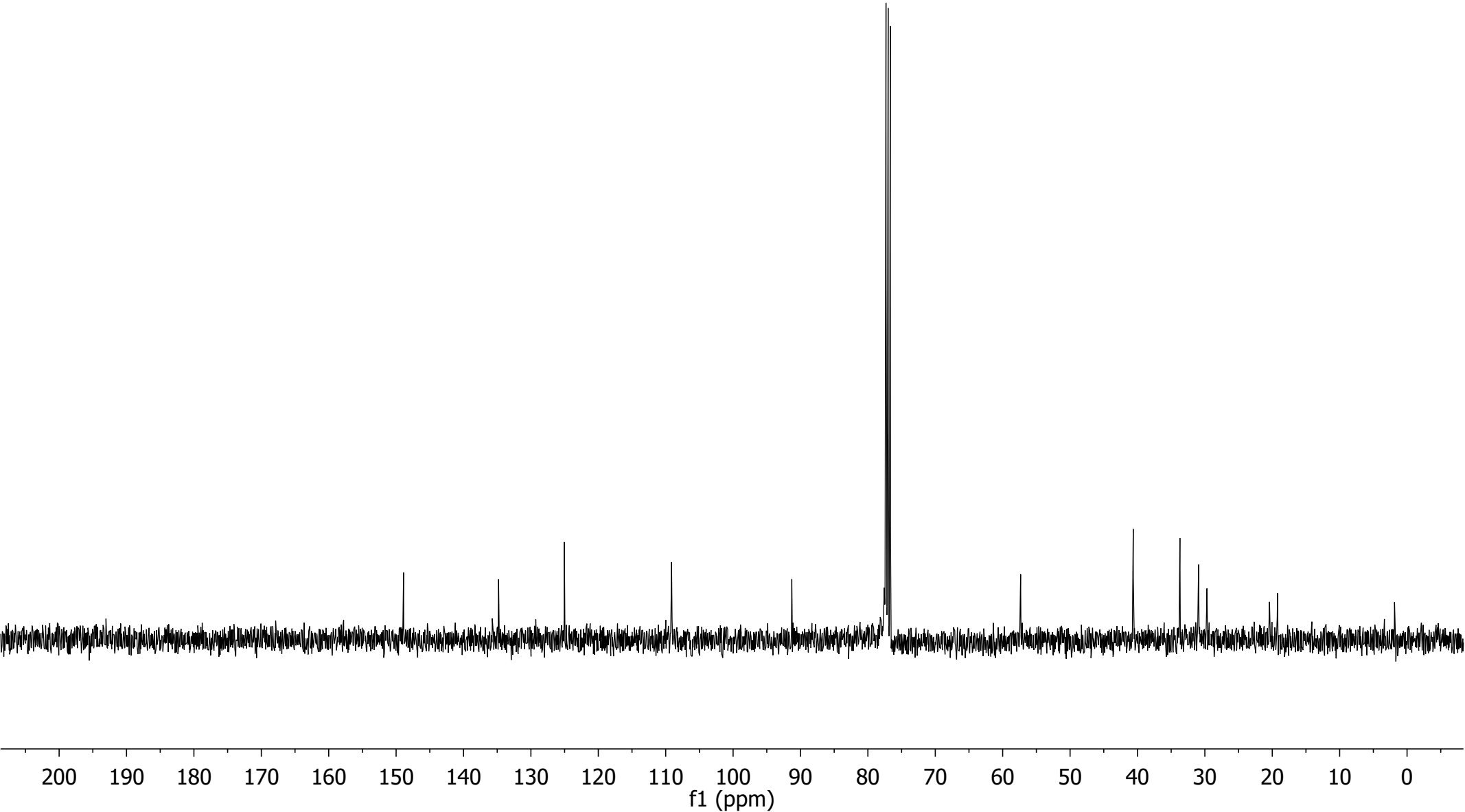


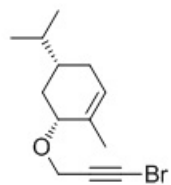
400 MHz ^1H NMR spectrum of compound **49**
(recorded in CDCl_3)



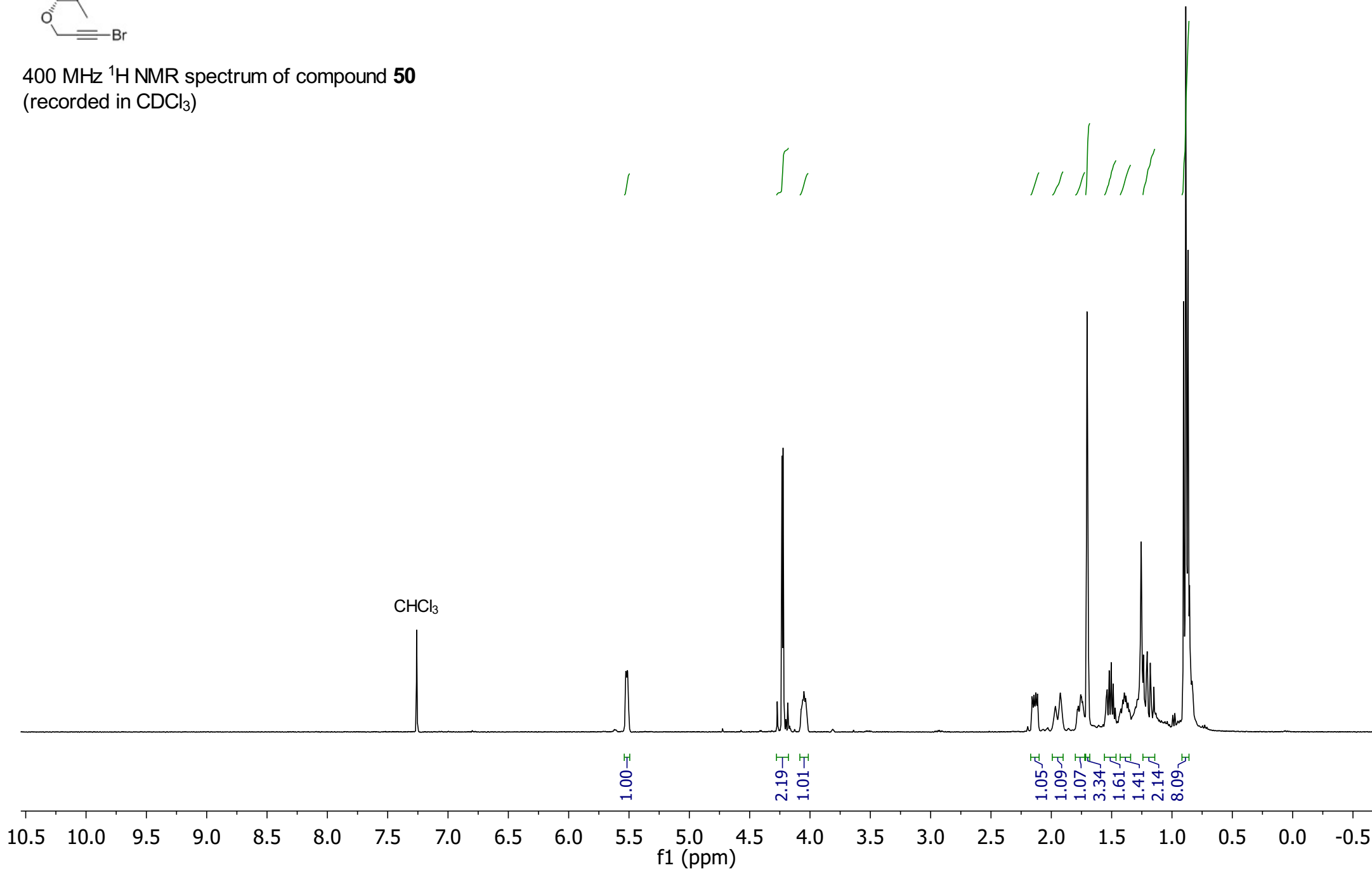


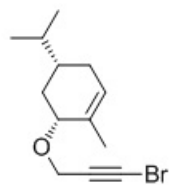
100 MHz ^{13}C NMR spectrum of compound **49**
(recorded in CDCl_3)



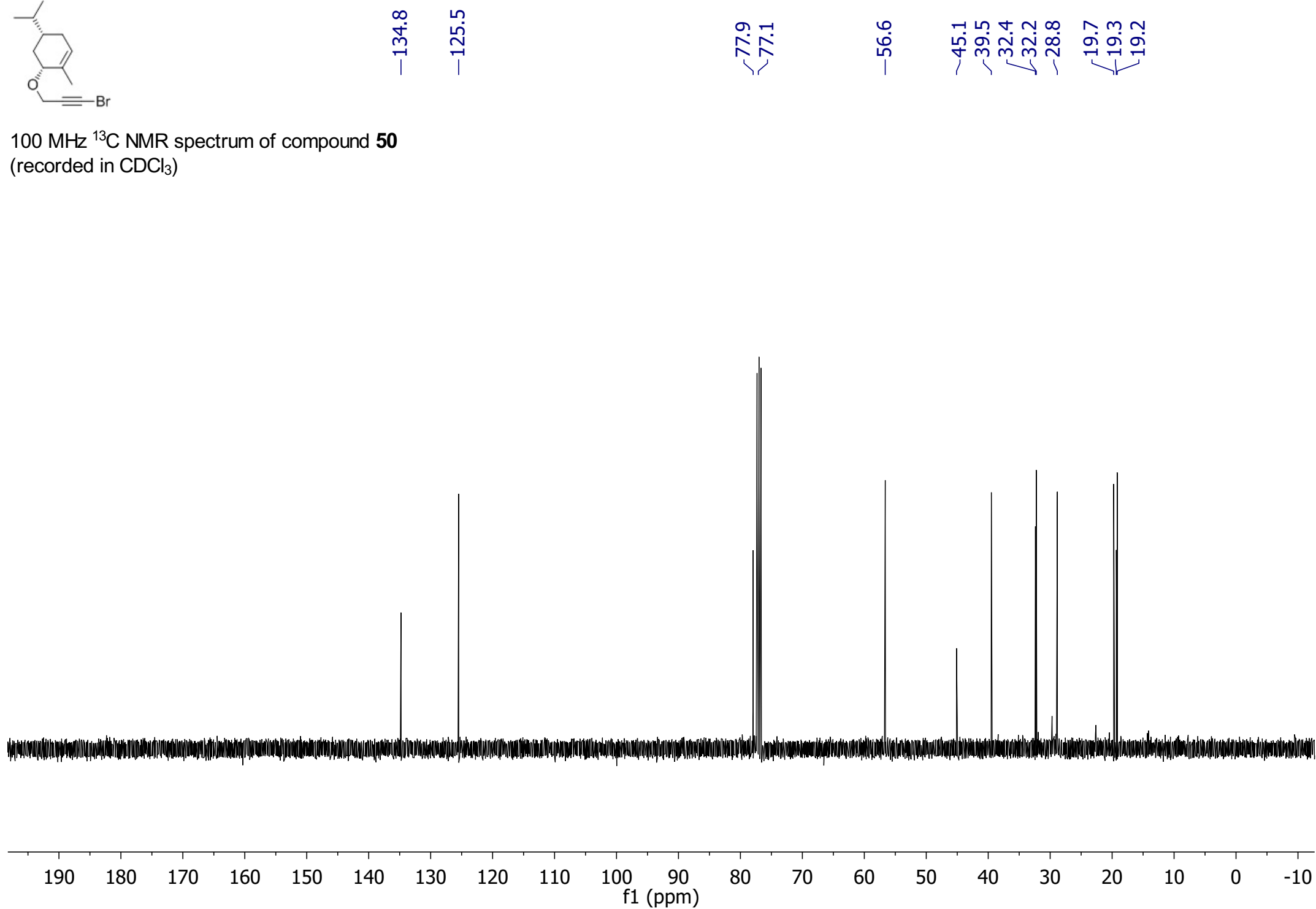


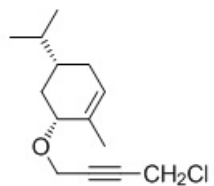
400 MHz ^1H NMR spectrum of compound **50**
(recorded in CDCl_3)



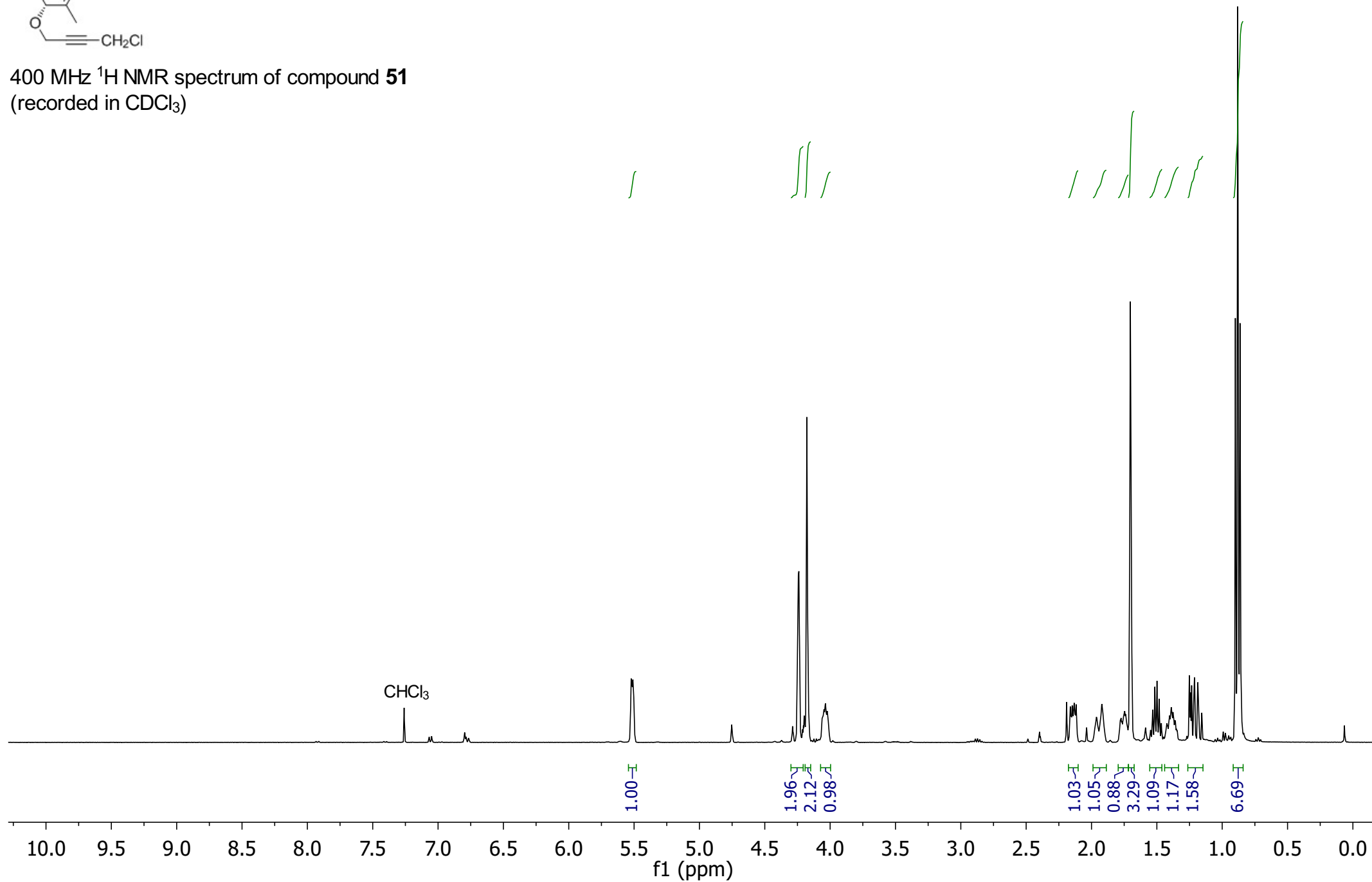


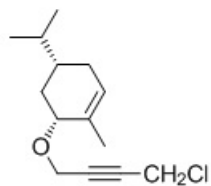
100 MHz ^{13}C NMR spectrum of compound **50**
(recorded in CDCl_3)



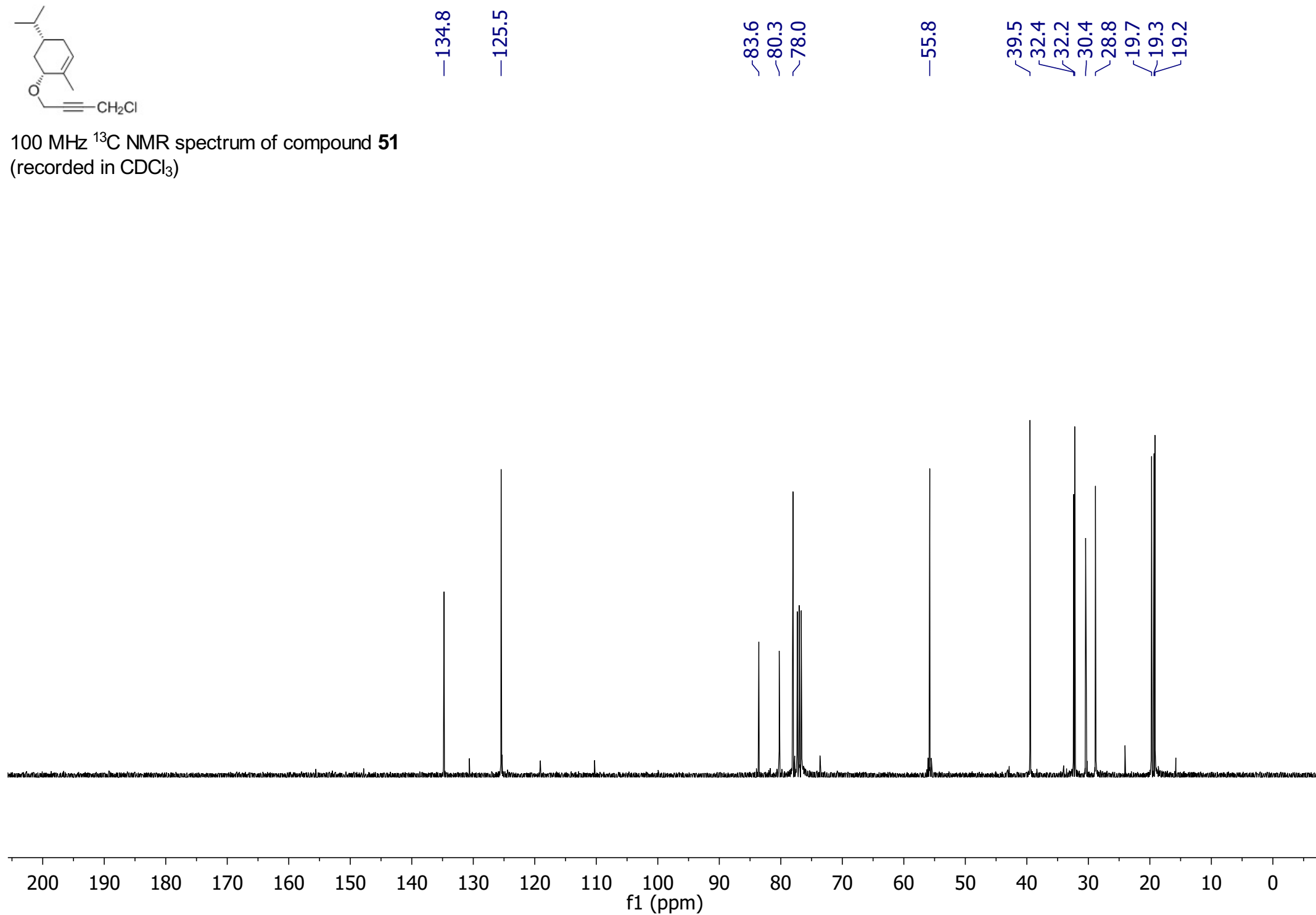


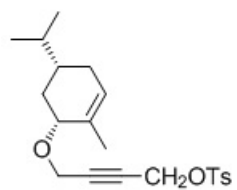
400 MHz ^1H NMR spectrum of compound **51**
(recorded in CDCl_3)



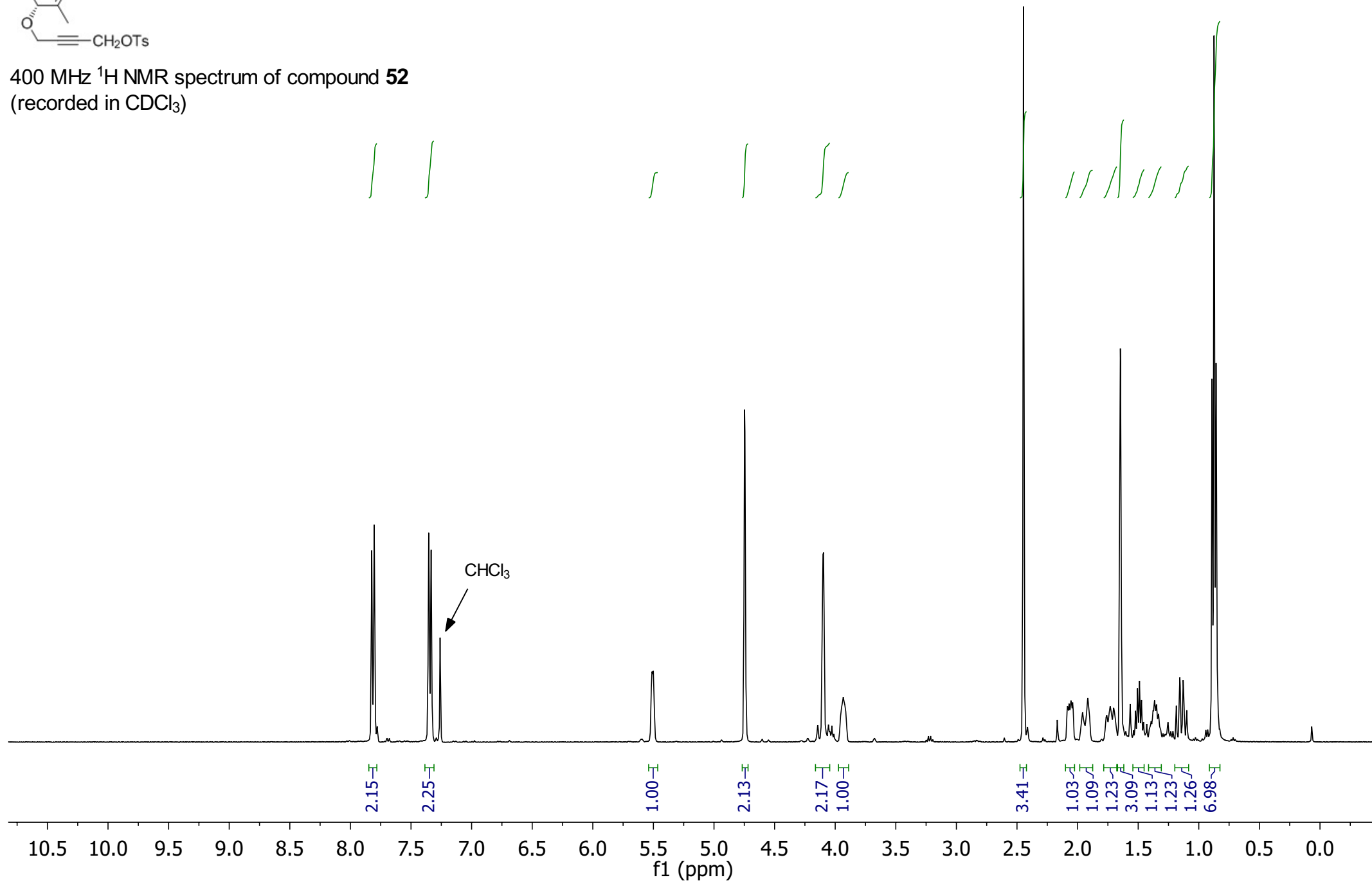


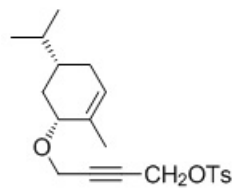
100 MHz ^{13}C NMR spectrum of compound **51**
(recorded in CDCl_3)





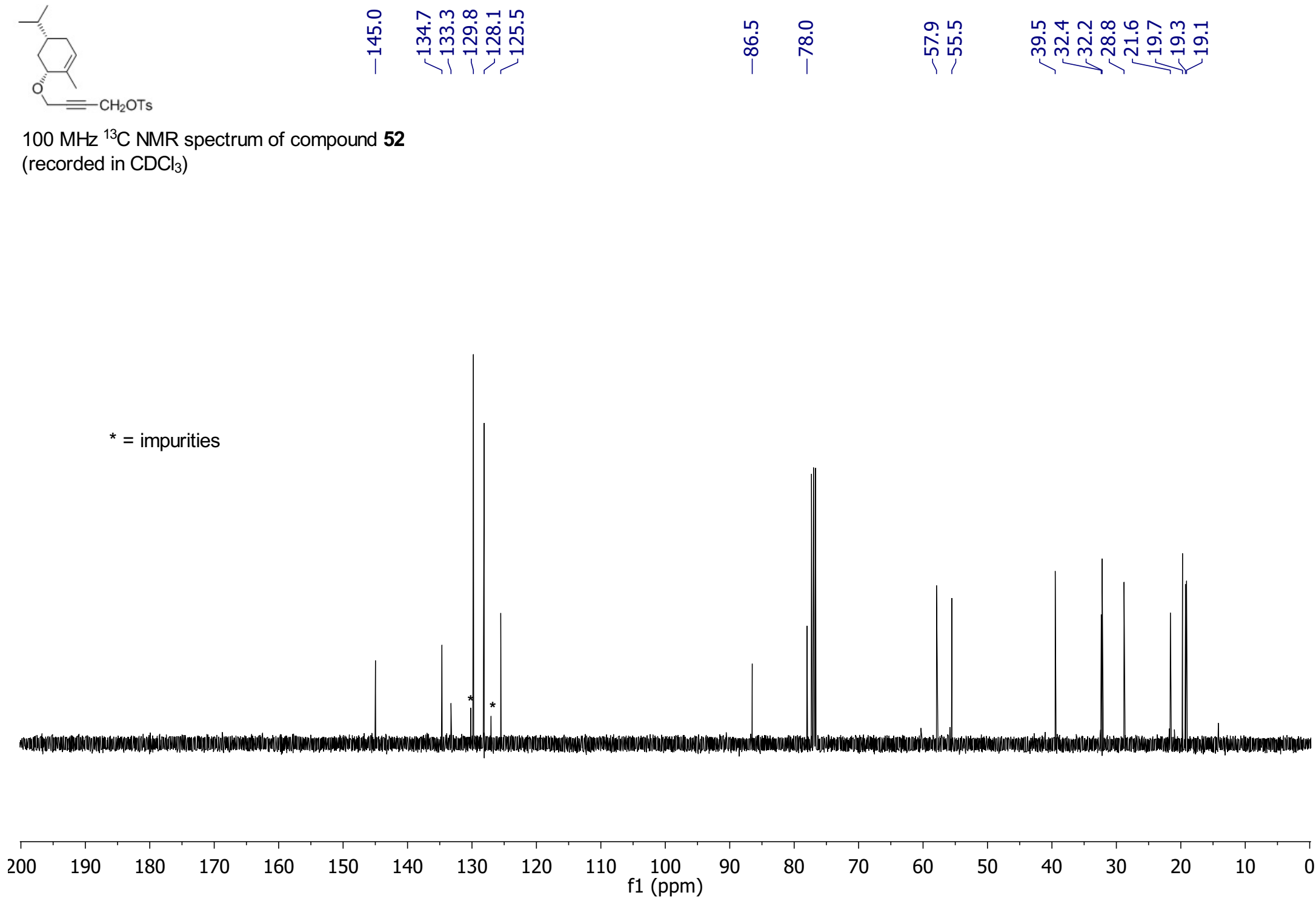
400 MHz ^1H NMR spectrum of compound **52**
(recorded in CDCl_3)

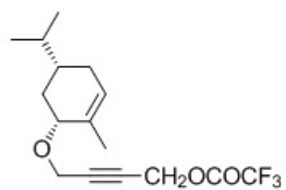




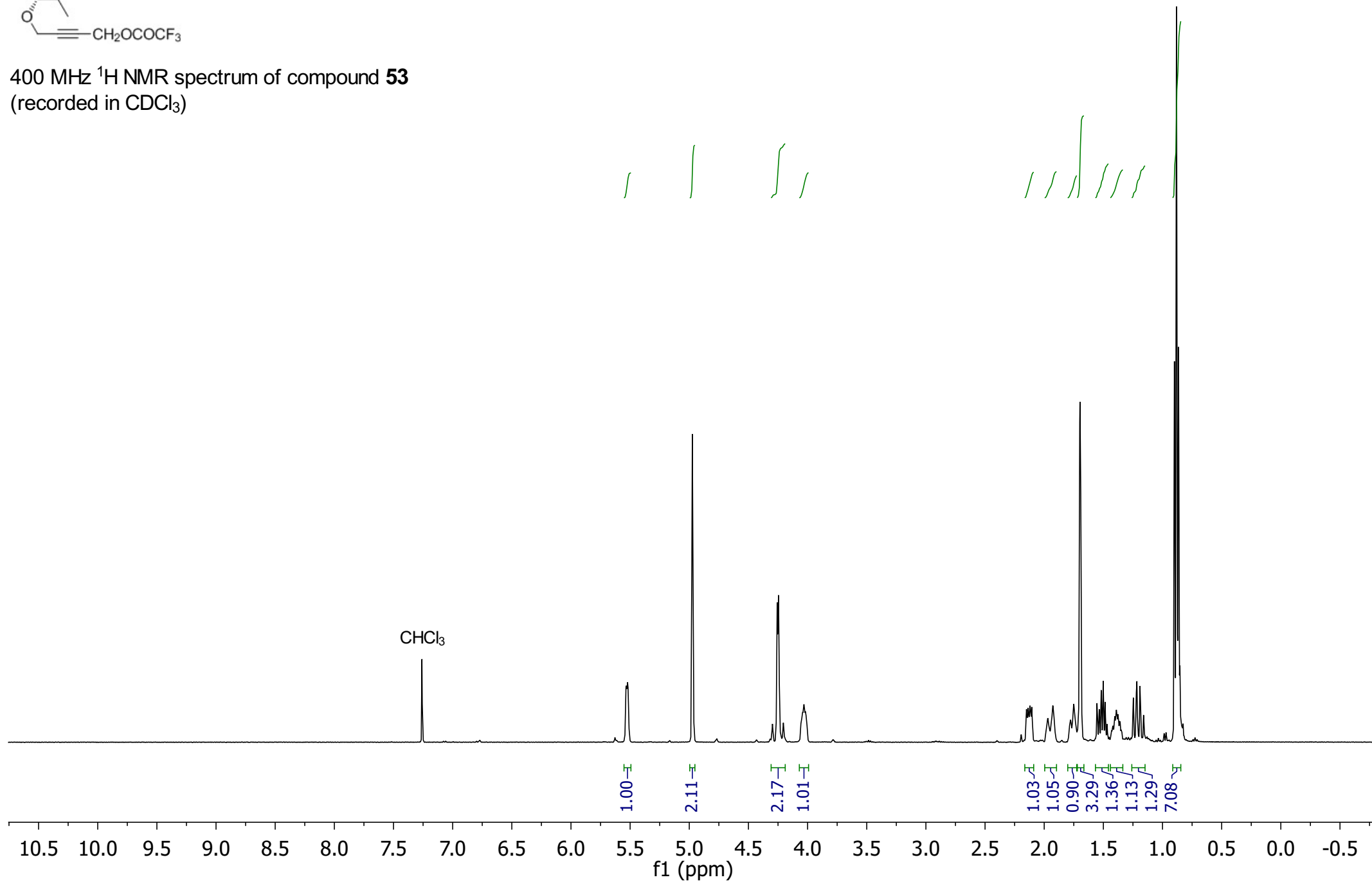
100 MHz ^{13}C NMR spectrum of compound **52**
(recorded in CDCl_3)

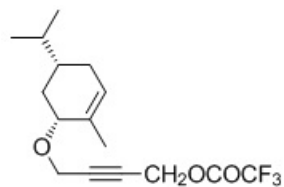
* = impurities



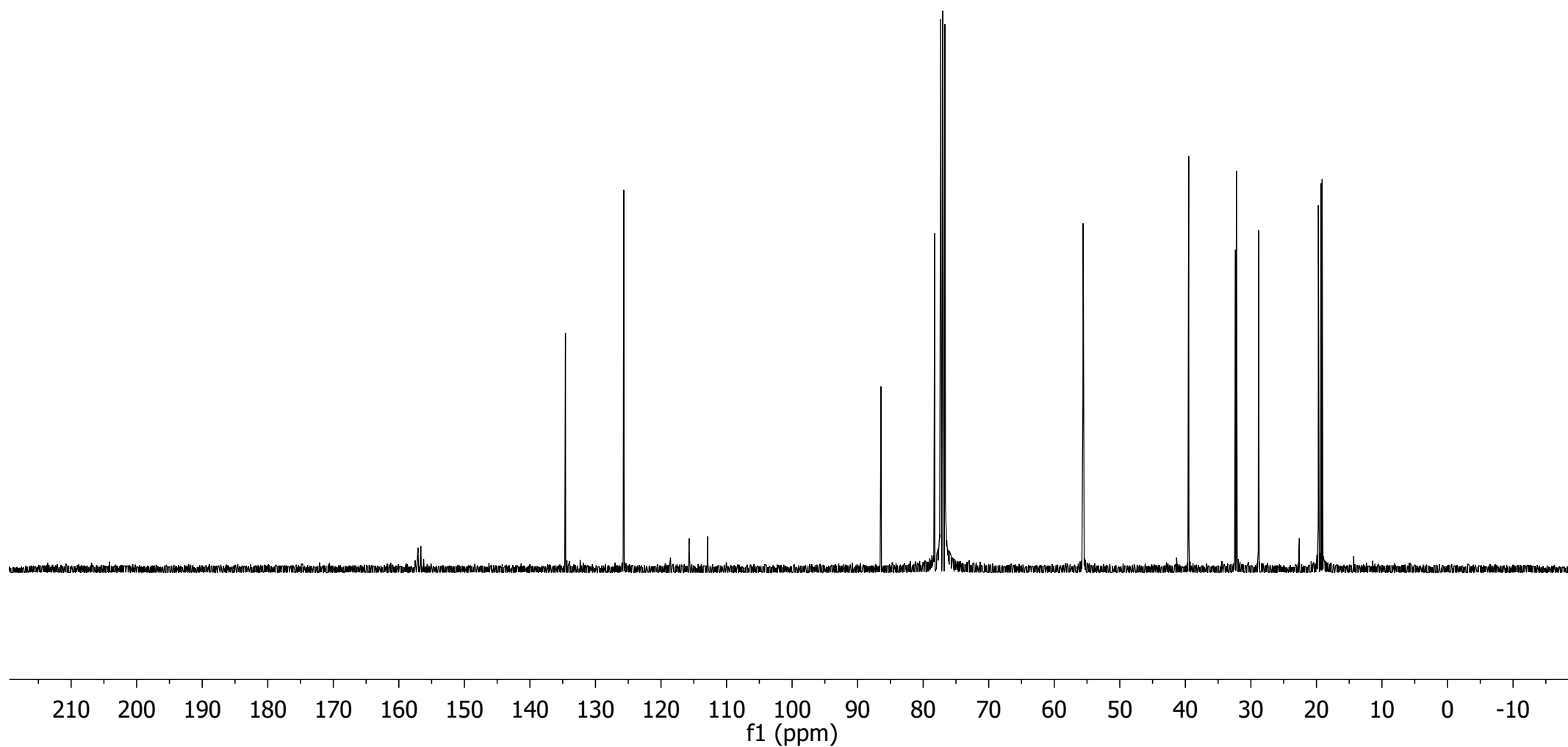


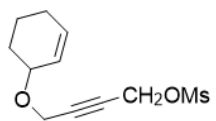
400 MHz ^1H NMR spectrum of compound **53**
(recorded in CDCl_3)



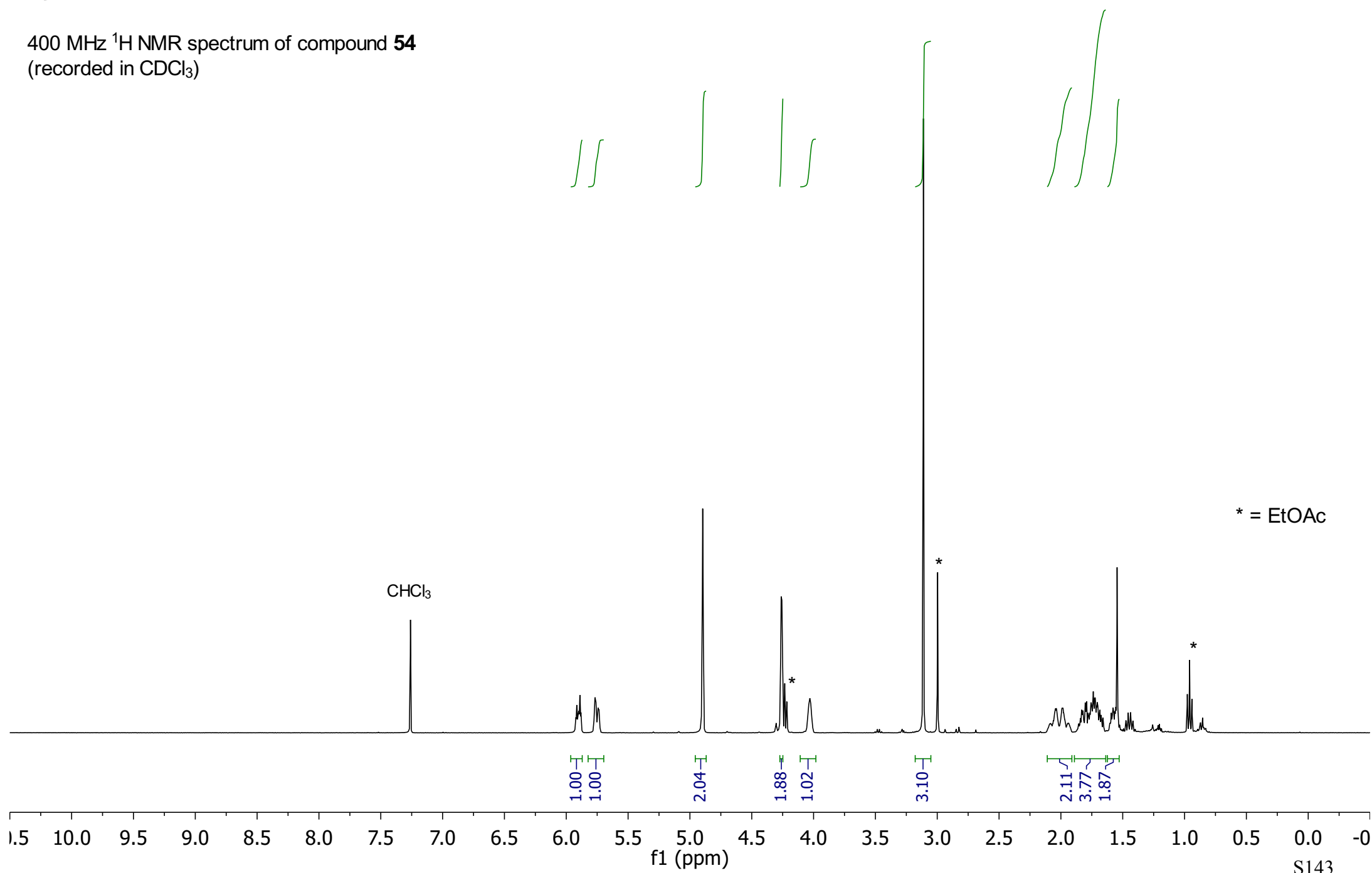


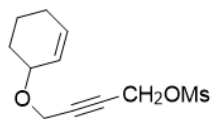
100 MHz ^{13}C NMR spectrum of compound **53**
(recorded in CDCl_3)



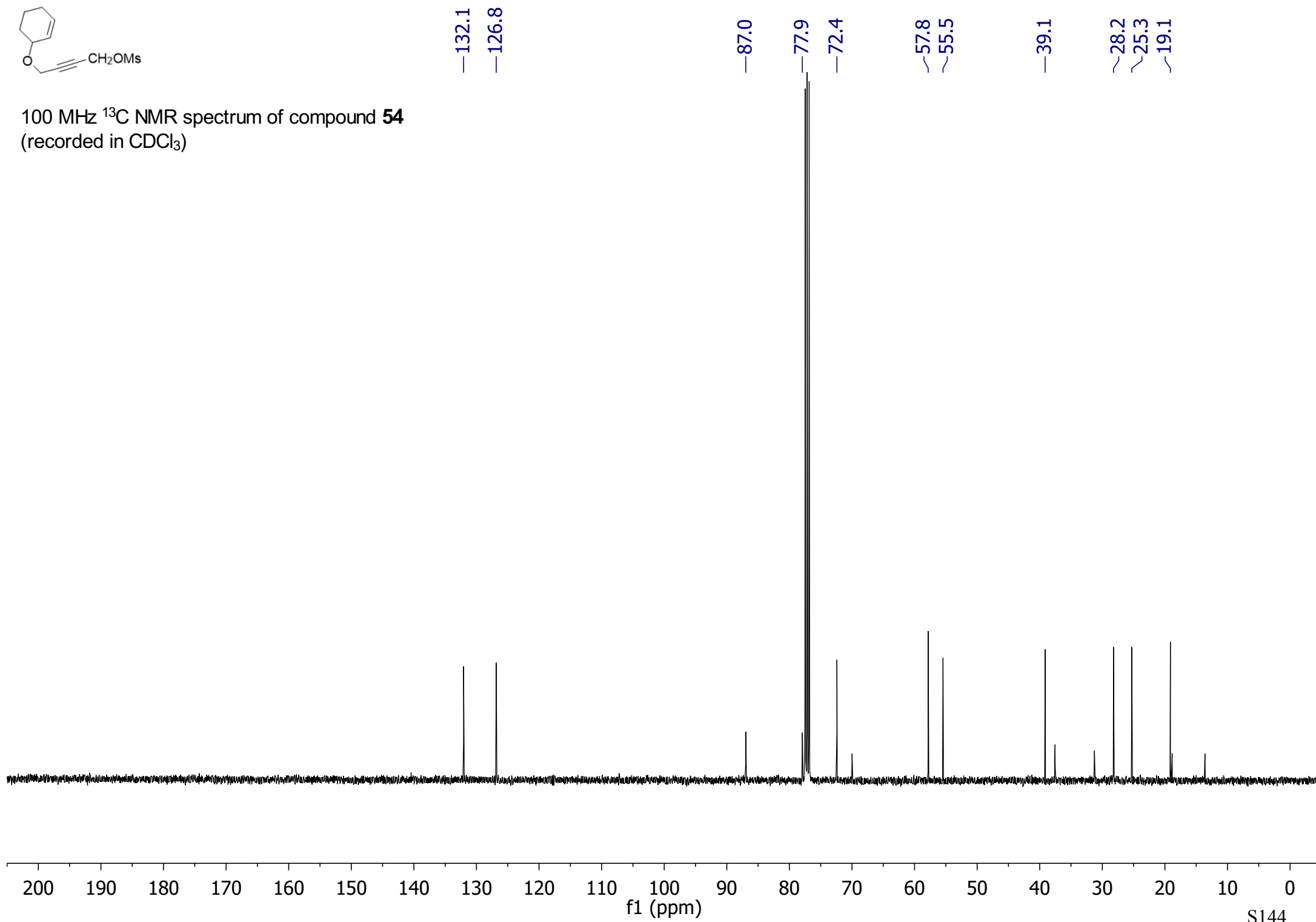


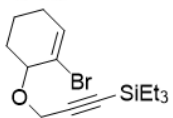
400 MHz ^1H NMR spectrum of compound **54**
(recorded in CDCl_3)



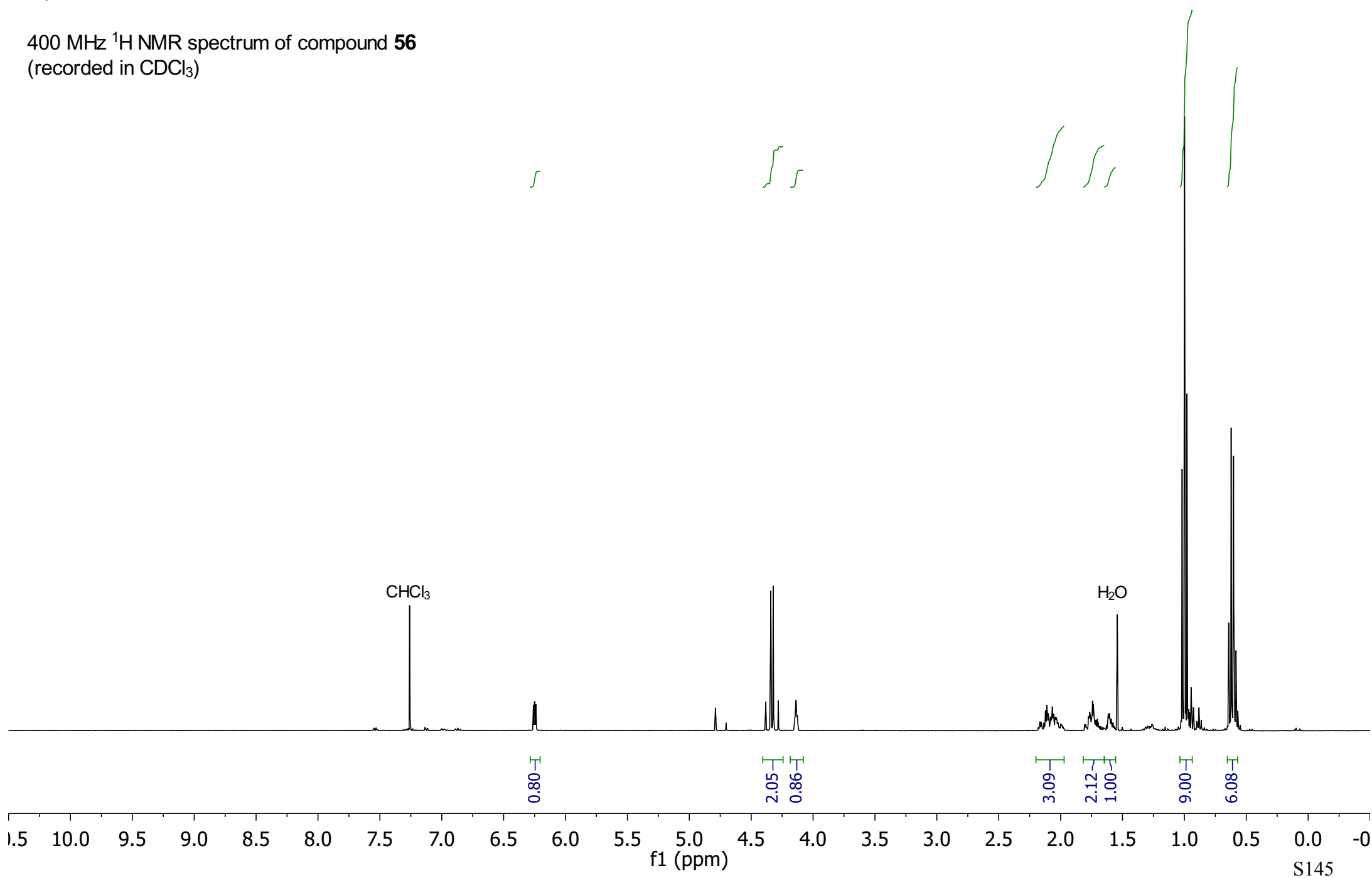


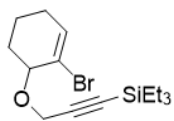
100 MHz ^{13}C NMR spectrum of compound **54**
(recorded in CDCl_3)



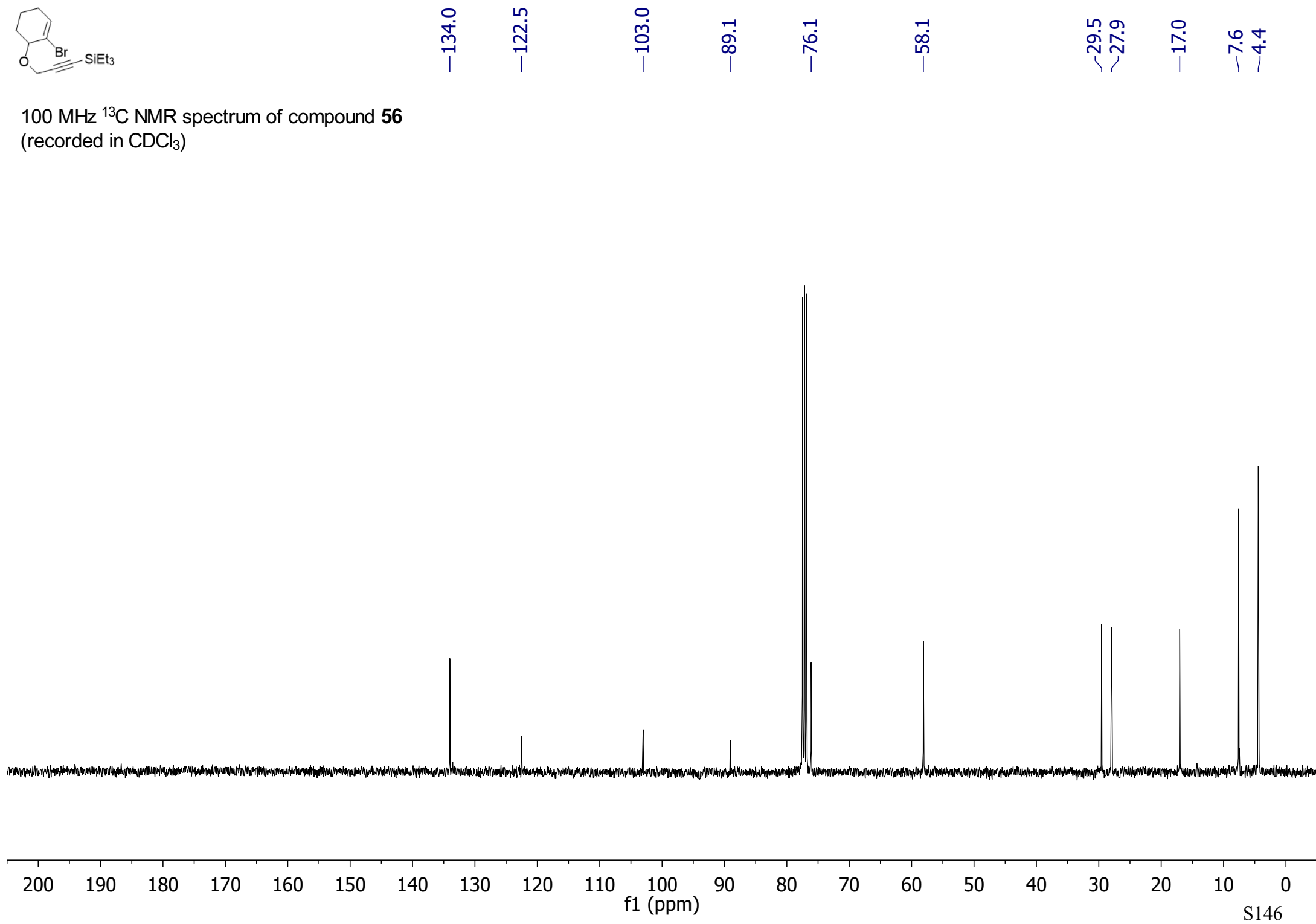


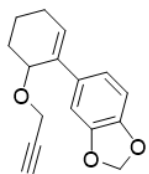
400 MHz ^1H NMR spectrum of compound **56**
(recorded in CDCl_3)



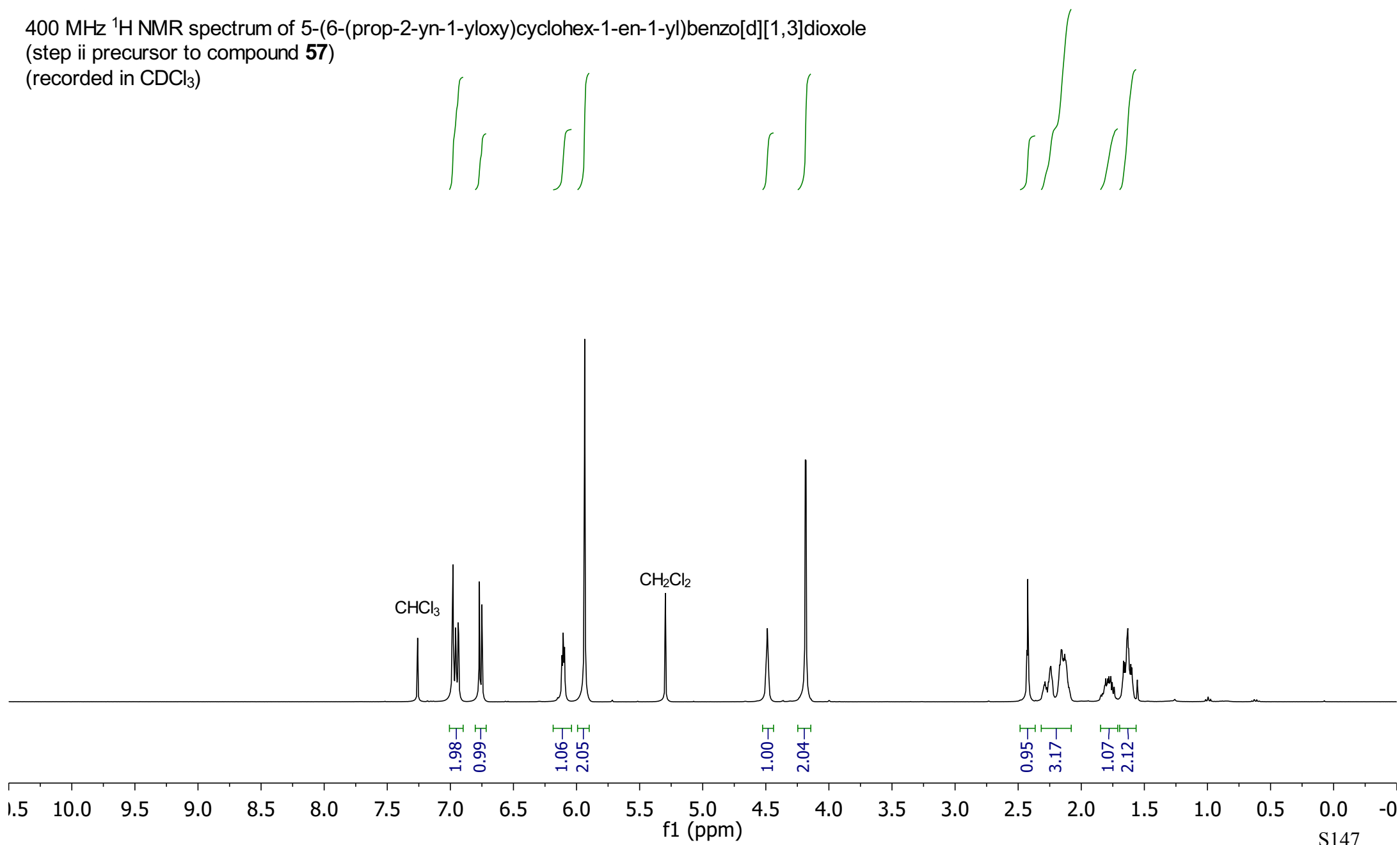


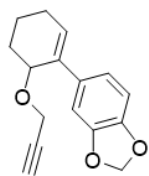
100 MHz ^{13}C NMR spectrum of compound **56**
(recorded in CDCl_3)





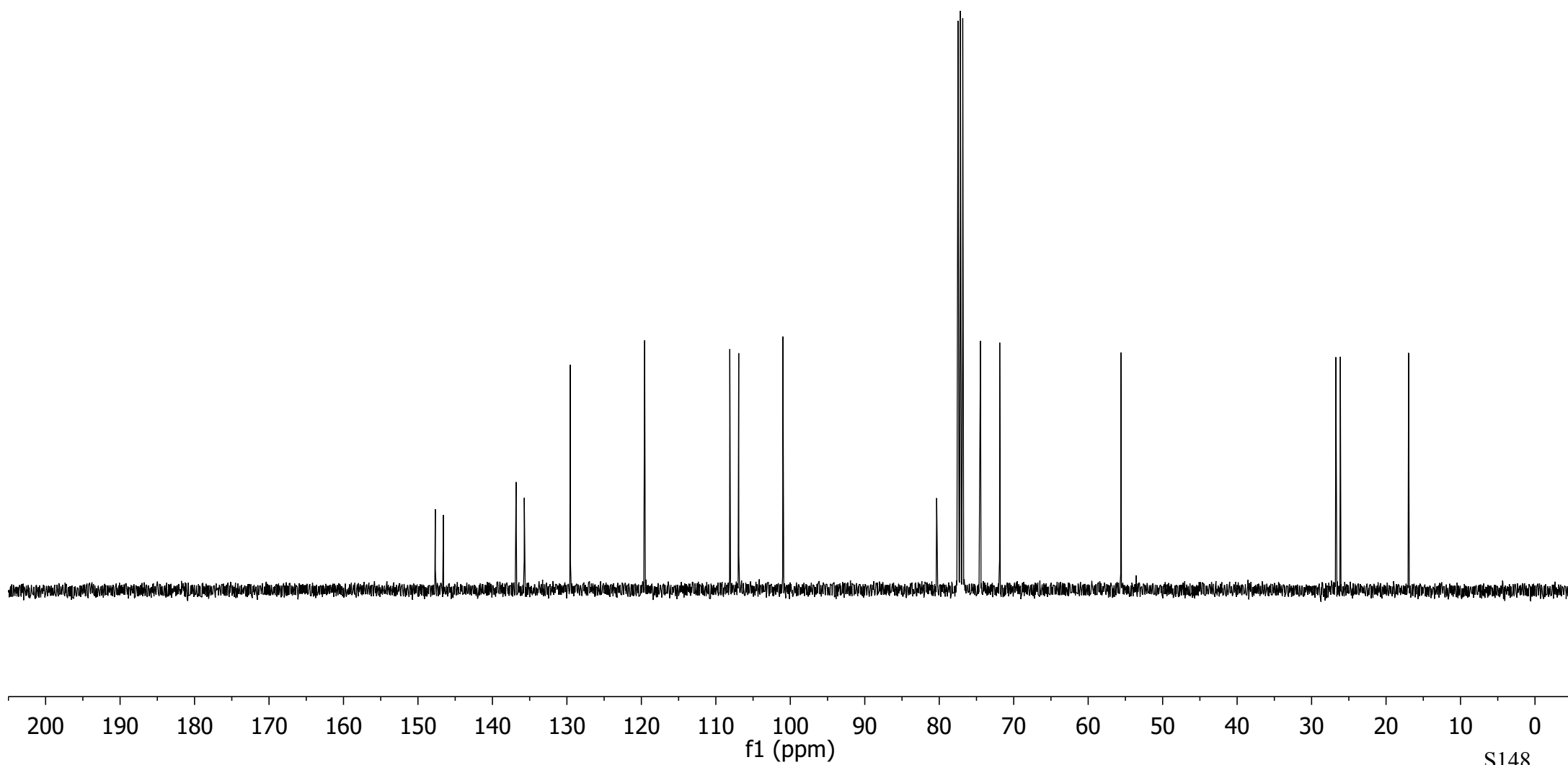
400 MHz ^1H NMR spectrum of 5-(6-(prop-2-yn-1-yloxy)cyclohex-1-en-1-yl)benzo[d][1,3]dioxole
(step ii precursor to compound **57**)
(recorded in CDCl_3)

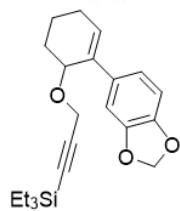




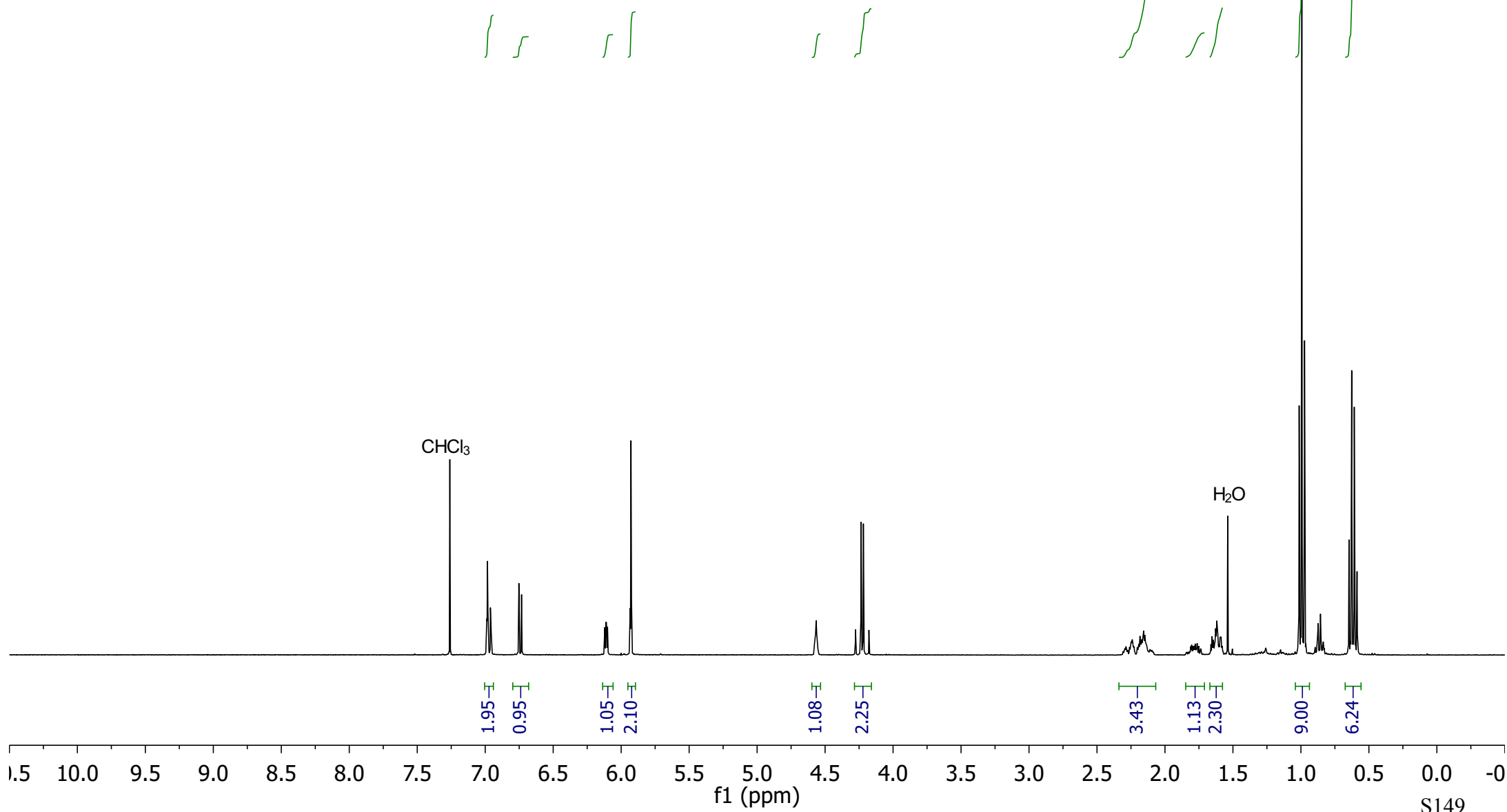
100 MHz ^{13}C NMR spectrum of 5-(6-(prop-2-yn-1-yloxy)cyclohex-1-en-1-yl)benzo[d][1,3]dioxole
(step ii precursor to compound **57**)
(recorded in CDCl_3)

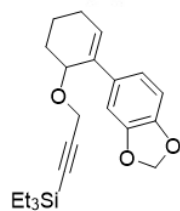
~ 147.7
 ~ 146.6
 ~ 136.8
 ~ 135.7
 ~ 129.6
 ~ 119.6
 ~ 108.1
 ~ 106.9
 ~ 101.0
 ~ 80.3
 ~ 74.5
 ~ 71.9
 ~ 55.6
 ~ 26.7
 ~ 26.1
 ~ 17.0



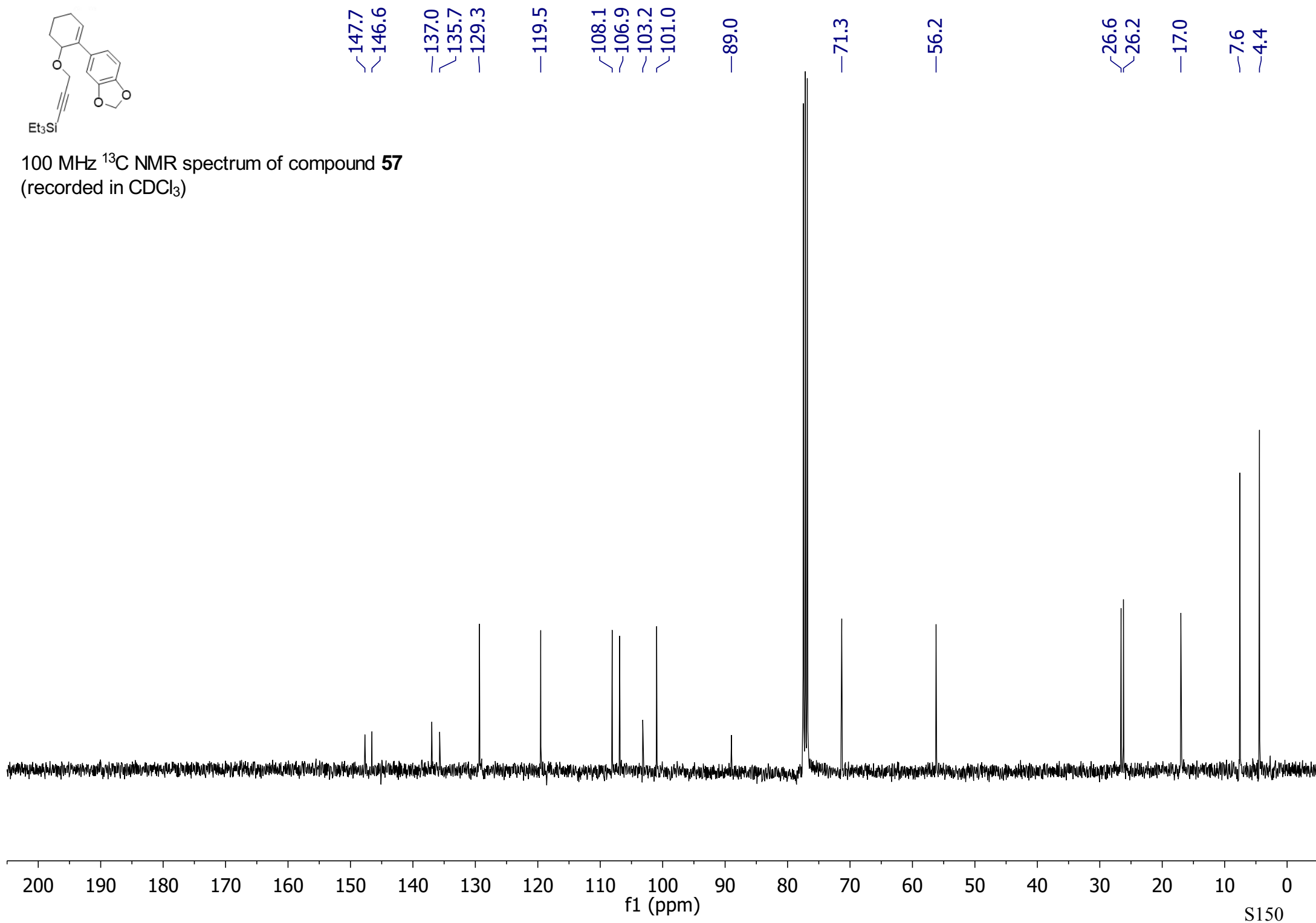


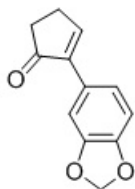
400 MHz ¹H NMR spectrum of compound **57**
(recorded in CDCl₃)



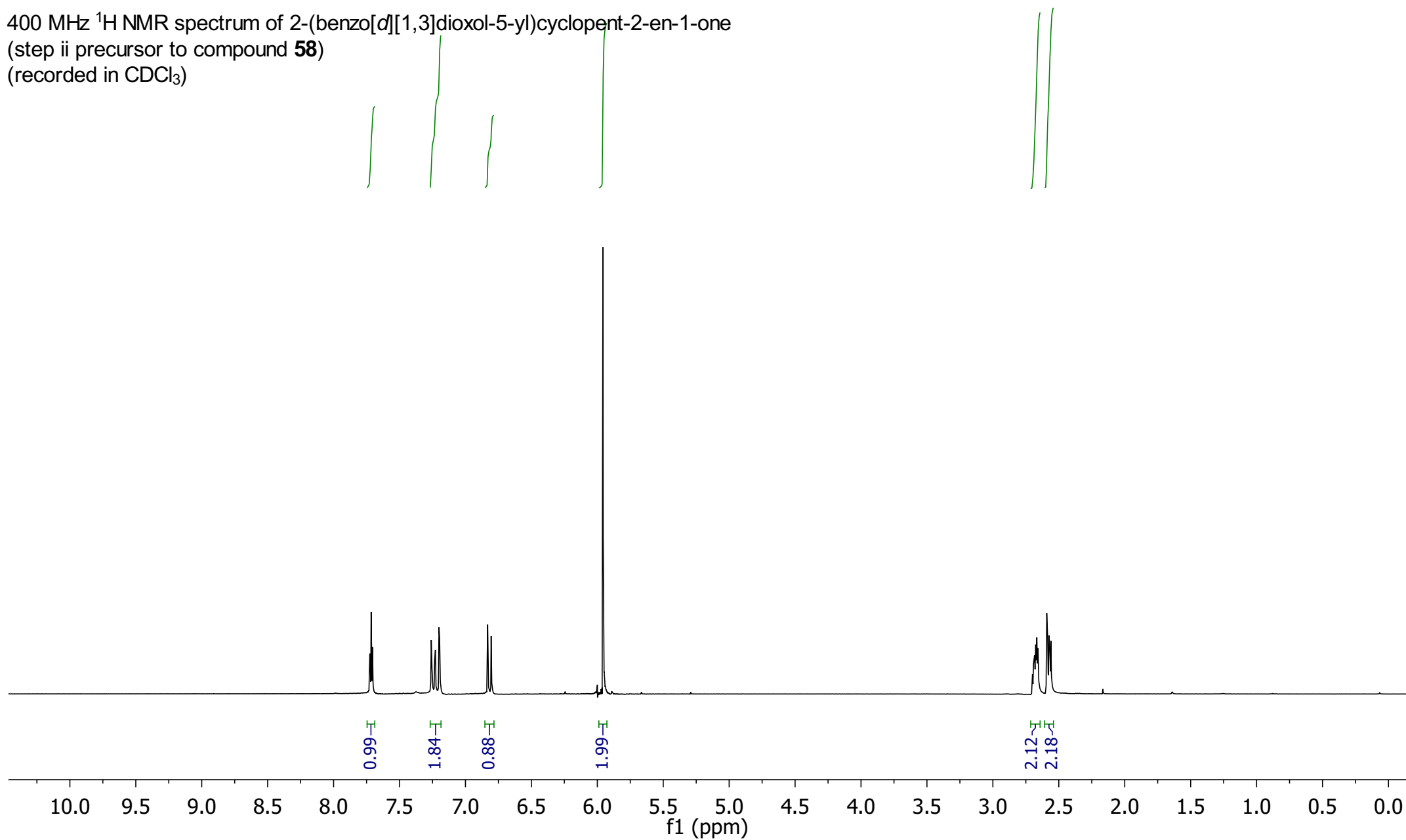


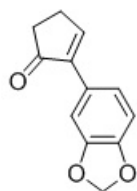
100 MHz ^{13}C NMR spectrum of compound **57**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of 2-(benzo[d][1,3]dioxol-5-yl)cyclopent-2-en-1-one
(step ii precursor to compound **58**)
(recorded in CDCl_3)





—207.5

—157.6

—147.6

—142.8

—125.6

—120.9

—108.3

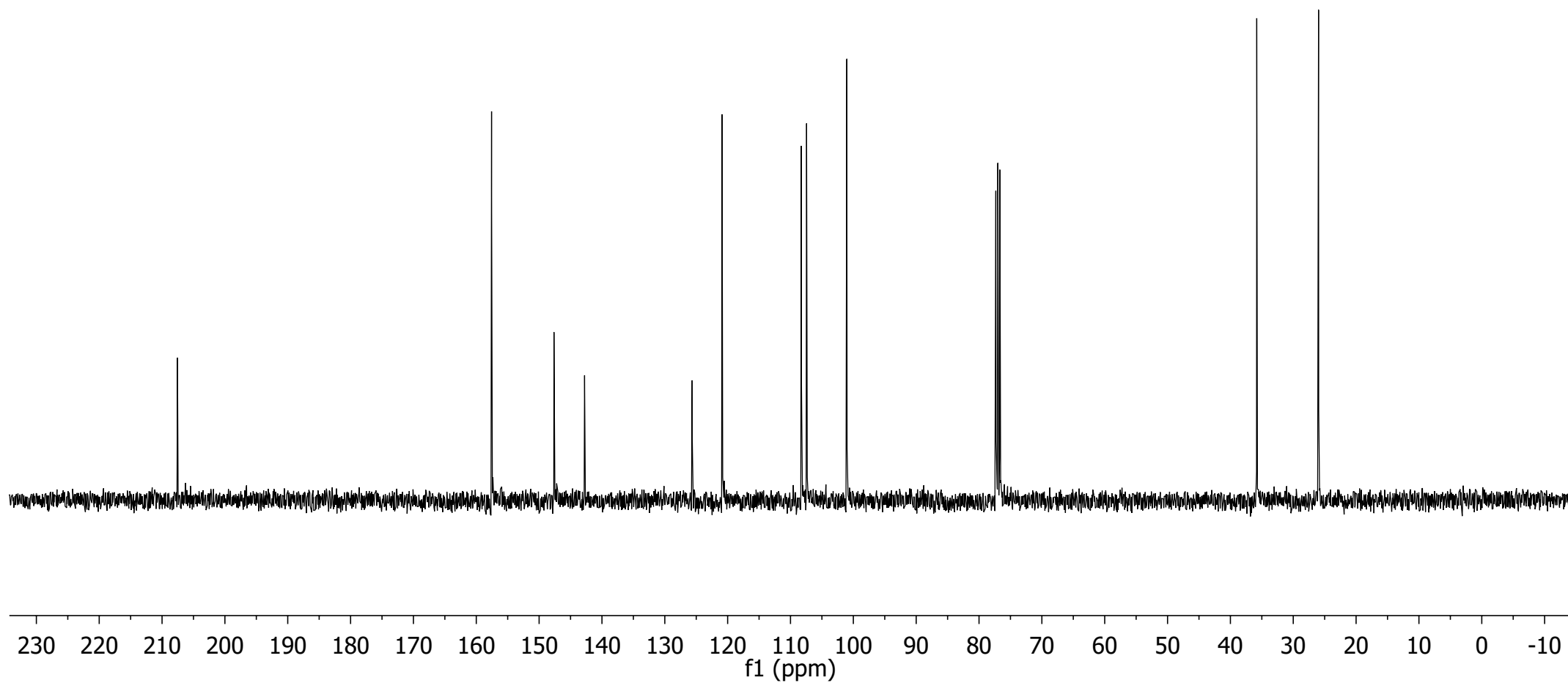
—107.4

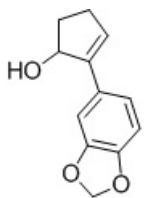
—101.0

—35.8

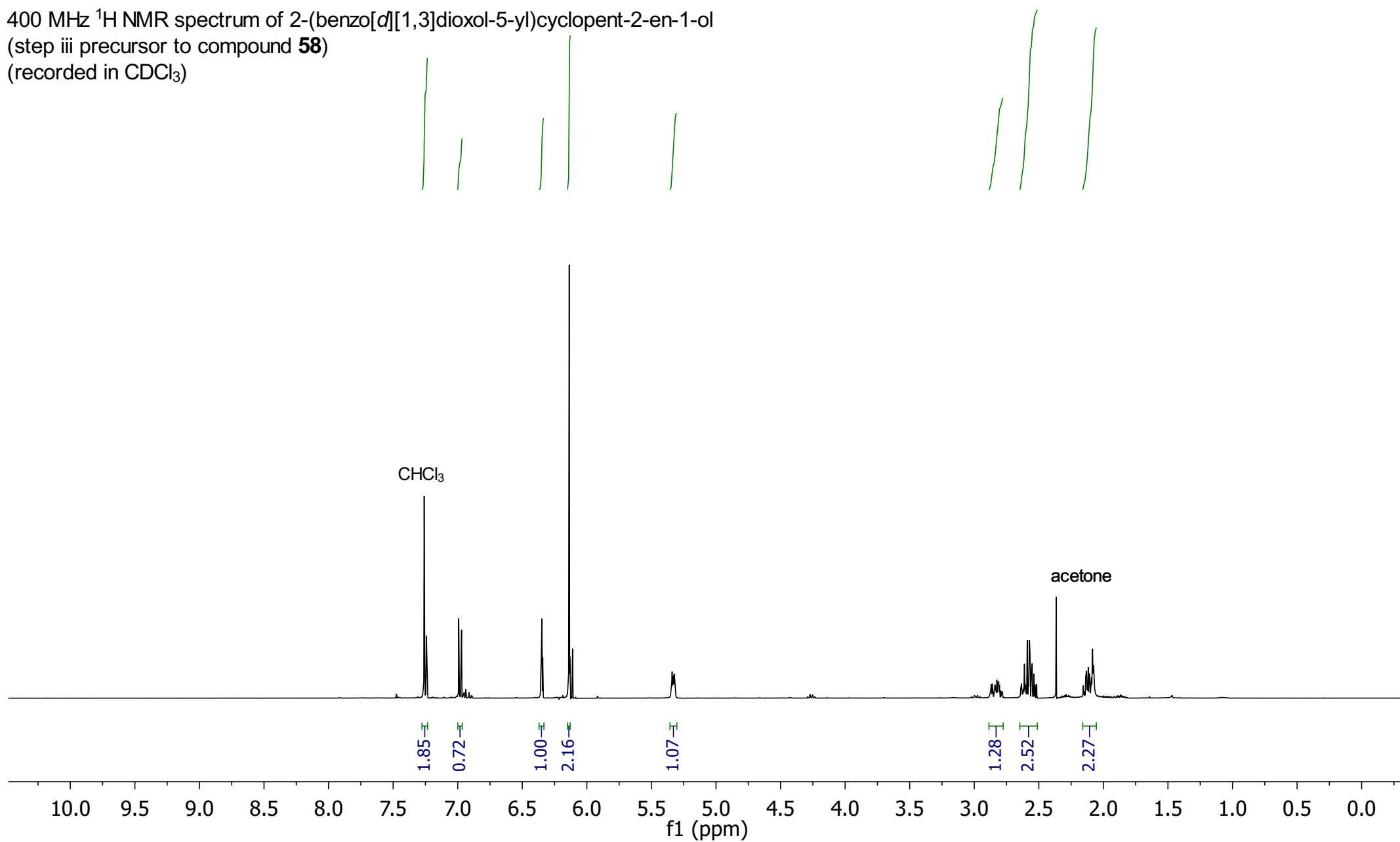
—26.0

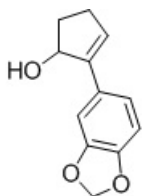
100 MHz ^{13}C NMR spectrum of 2-(benzo[d][1,3]dioxol-5-yl)cyclopent-2-en-1-one
(step ii precursor to compound **58**)
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of 2-(benzo[d][1,3]dioxol-5-yl)cyclopent-2-en-1-ol
(step iii precursor to compound **58**)
(recorded in CDCl_3)





100 MHz ^{13}C NMR spectrum of 2-(benzo[d][1,3]dioxol-5-yl)cyclopent-2-en-1-ol
(step iii precursor to compound **58**)
(recorded in CDCl_3)

$\swarrow$ 147.9
 $\swarrow$ 146.9
 $\swarrow$ 144.1

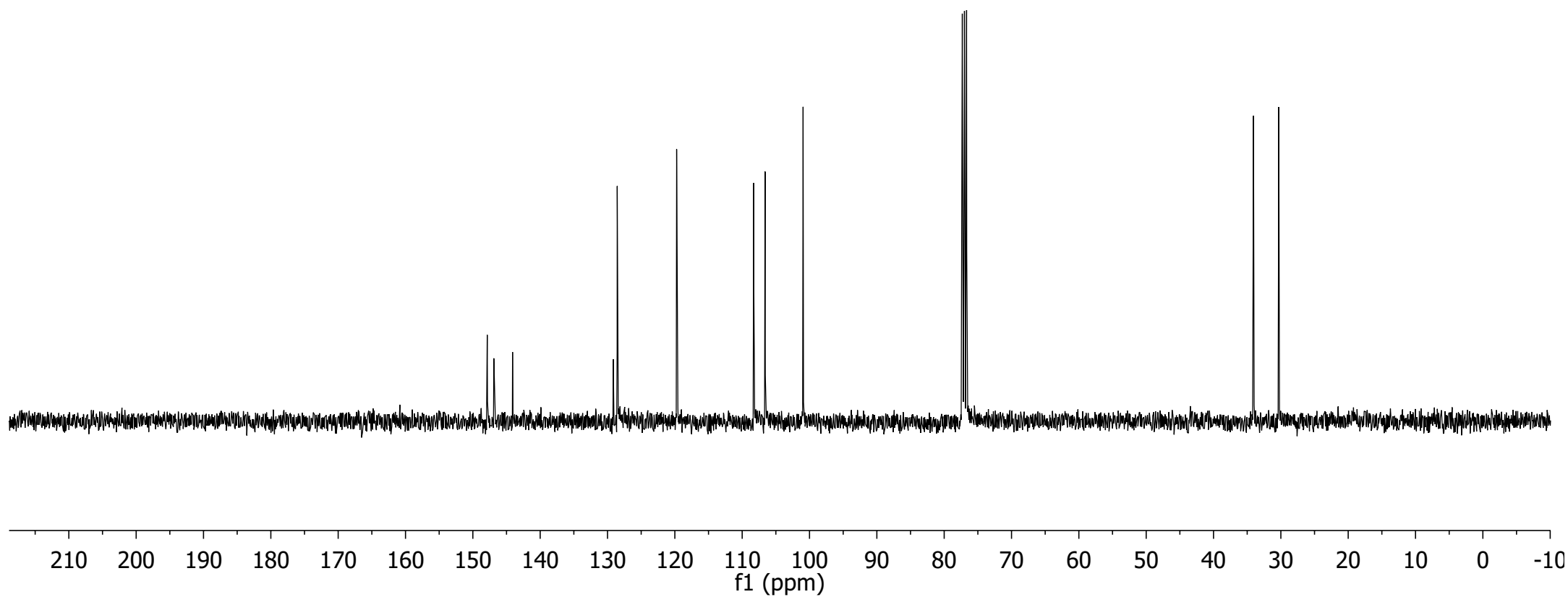
 $\swarrow$ 129.2
 $\swarrow$ 128.6

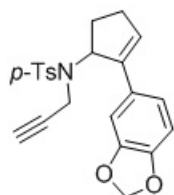
 — 119.7

 $\swarrow$ 108.3
 $\swarrow$ 106.6
 $\swarrow$ 101.0

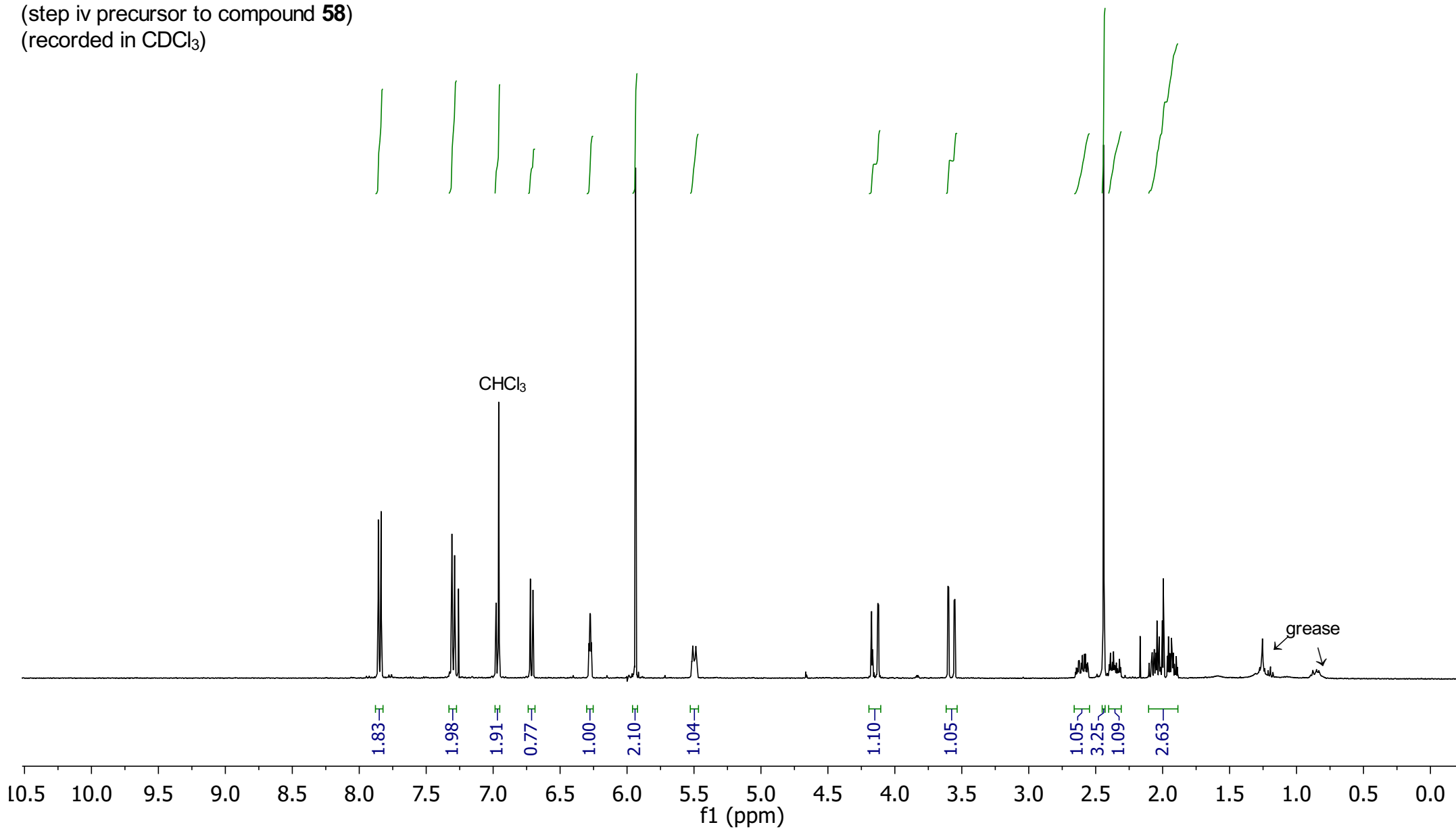
 — 77.4

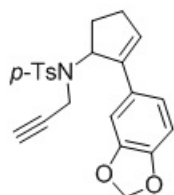
 $\swarrow$ 34.1
 $\swarrow$ 30.3





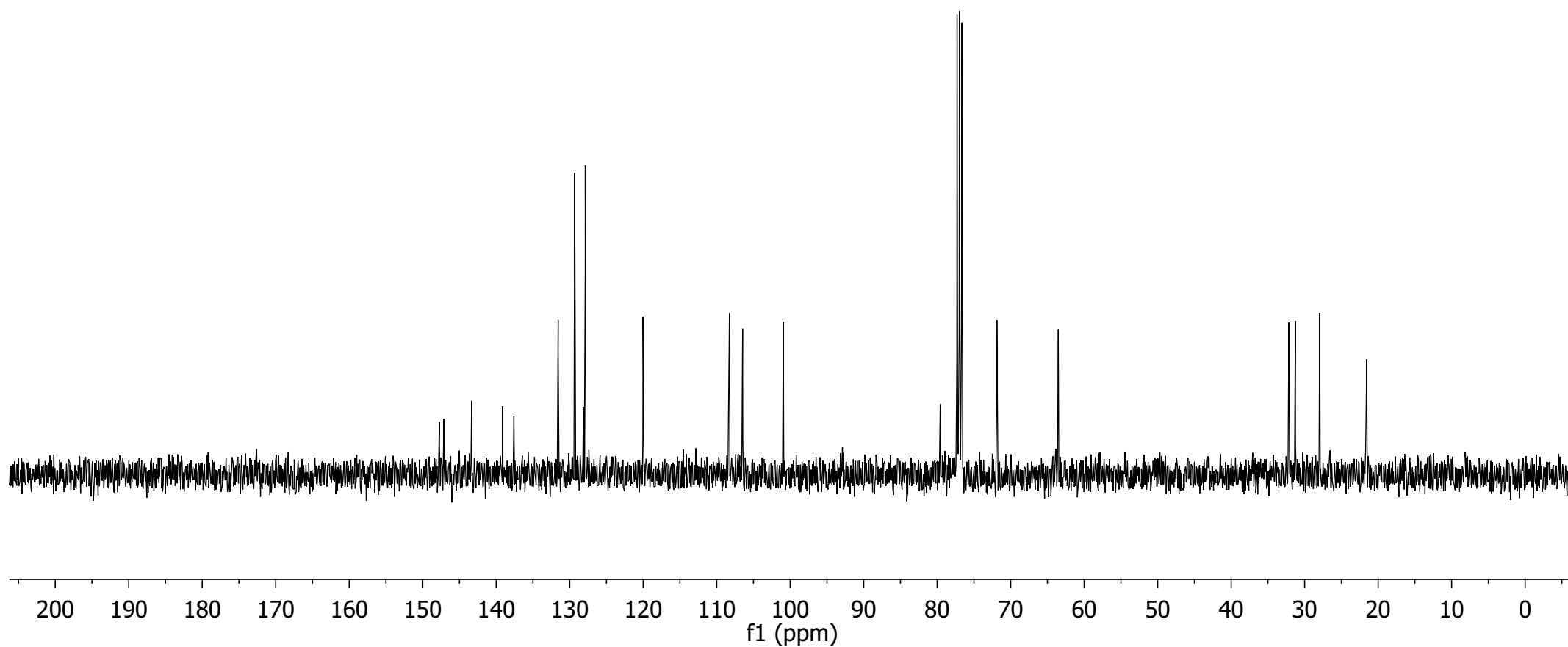
400 MHz ^1H NMR spectrum of *N*-(2-(benzo[*d*][1,3]dioxol-5-yl)cyclopent-2-en-1-yl)-4-methyl-*N*-(prop-2-yn-1-yl)benzenesulfonamide (step iv precursor to compound **58**) (recorded in CDCl_3)

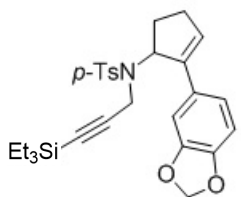




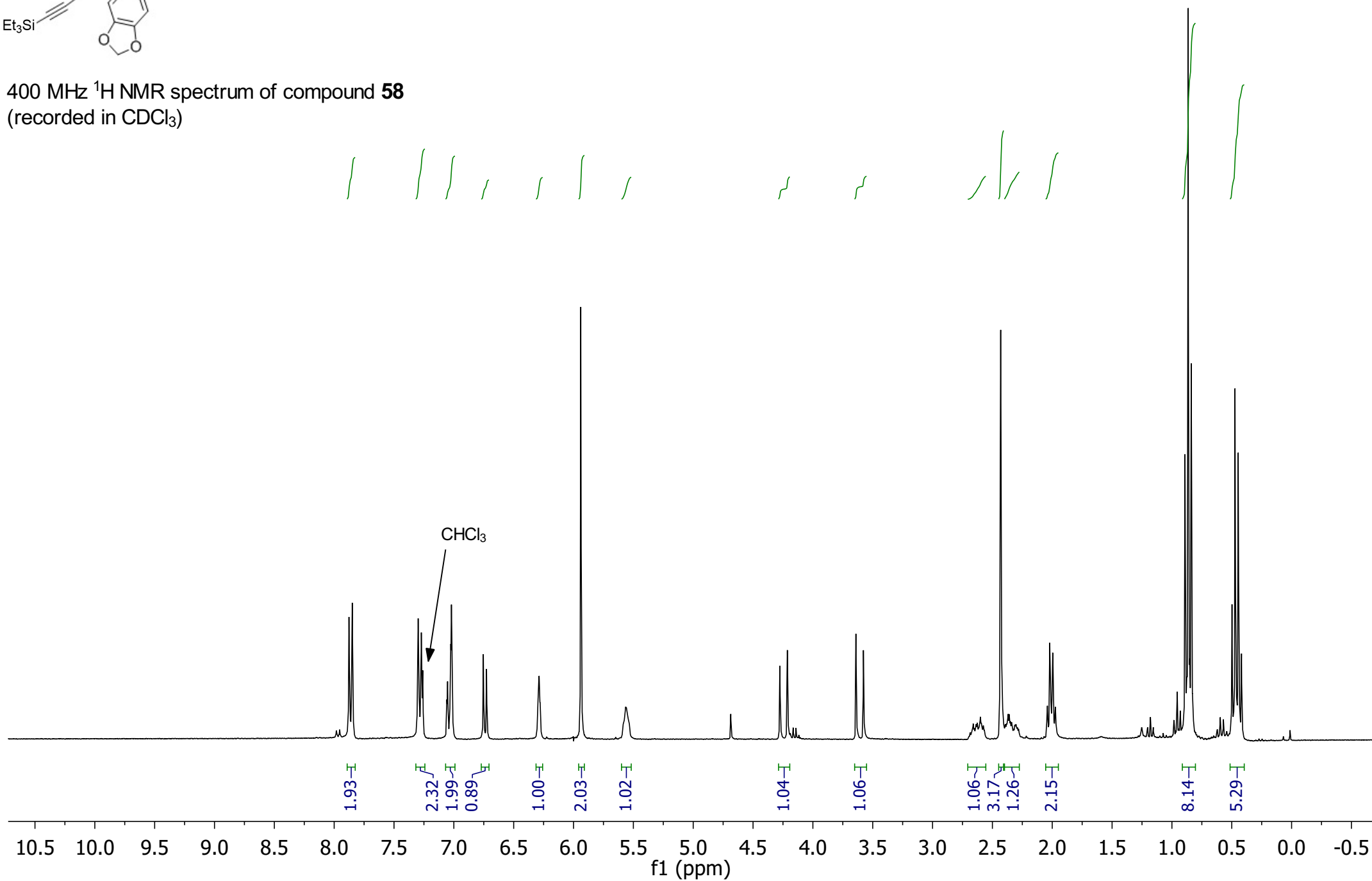
100 MHz ^{13}C NMR spectrum of *N*-(2-(benzo[*d*][1,3]dioxol-5-yl)cyclopent-2-en-1-yl)-4-methyl-*N*-(prop-2-yn-1-yl)benzenesulfonamide
(step iv precursor to compound **58**)
(recorded in CDCl_3)

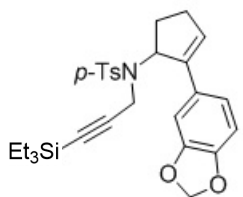
147.7
147.1
143.3
139.1
137.6
131.6
129.3
128.1
127.9
120.0
108.3
106.5
100.9
79.6
71.9
63.5
32.2
31.3
28.0
21.6





400 MHz ^1H NMR spectrum of compound **58**
(recorded in CDCl_3)





147.7
147.1
143.1
139.0
138.0
131.5
129.4
128.1
127.9
120.0
108.3
106.5
102.4
101.0

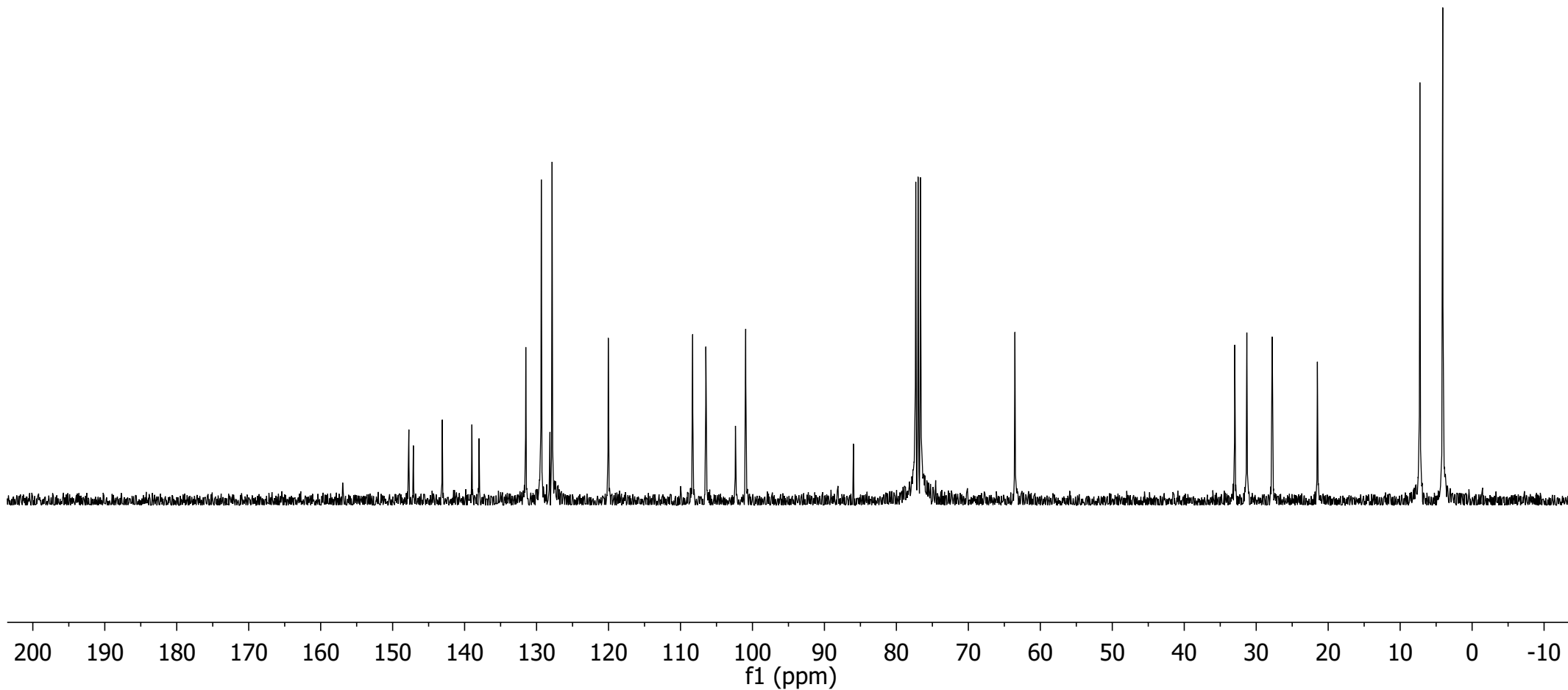
86.0

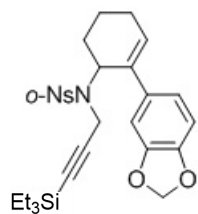
63.5

33.0
31.3
27.8
21.5

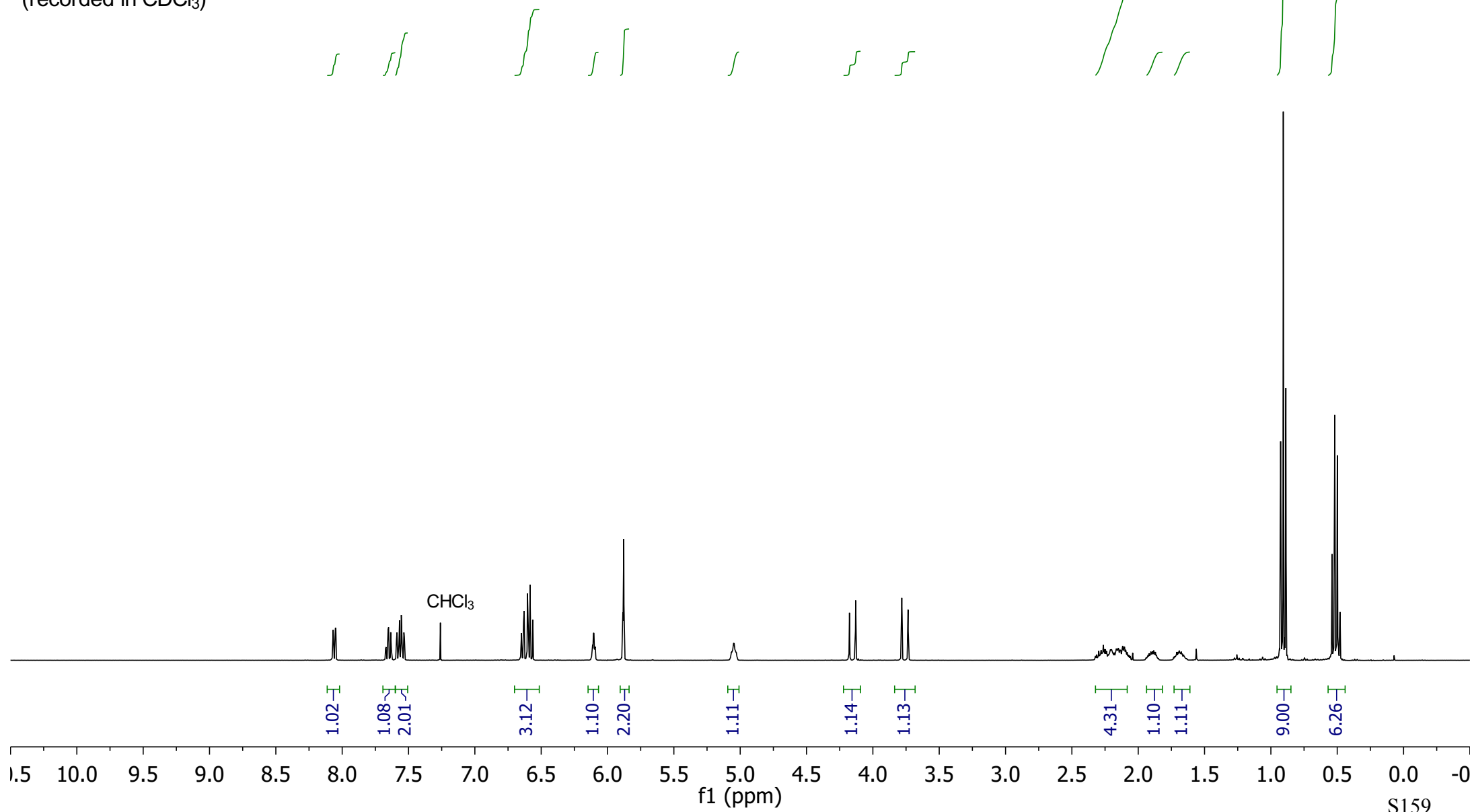
7.3
4.1

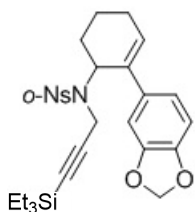
100 MHz ^{13}C NMR spectrum of compound **58**
(recorded in CDCl_3)





400 MHz ¹H NMR spectrum of compound **59**
(recorded in CDCl₃)





148.3
147.3
146.8
136.6
134.3
134.2
134.1
133.3
131.4
131.3
123.9
120.4

108.0
107.6
103.2
101.0

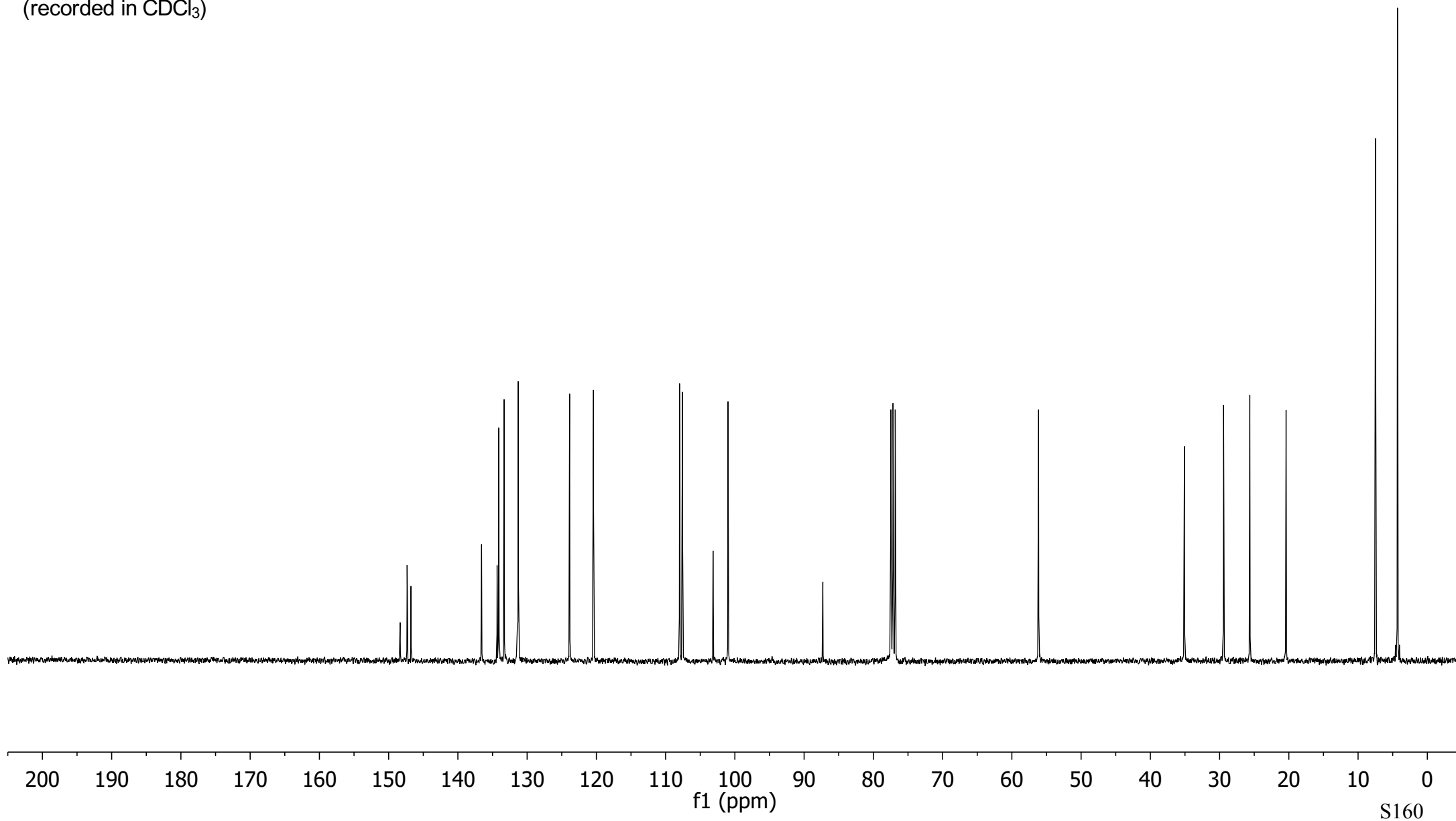
87.3

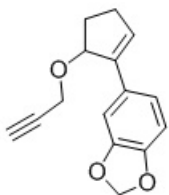
56.1

35.1
29.4
25.6
20.4

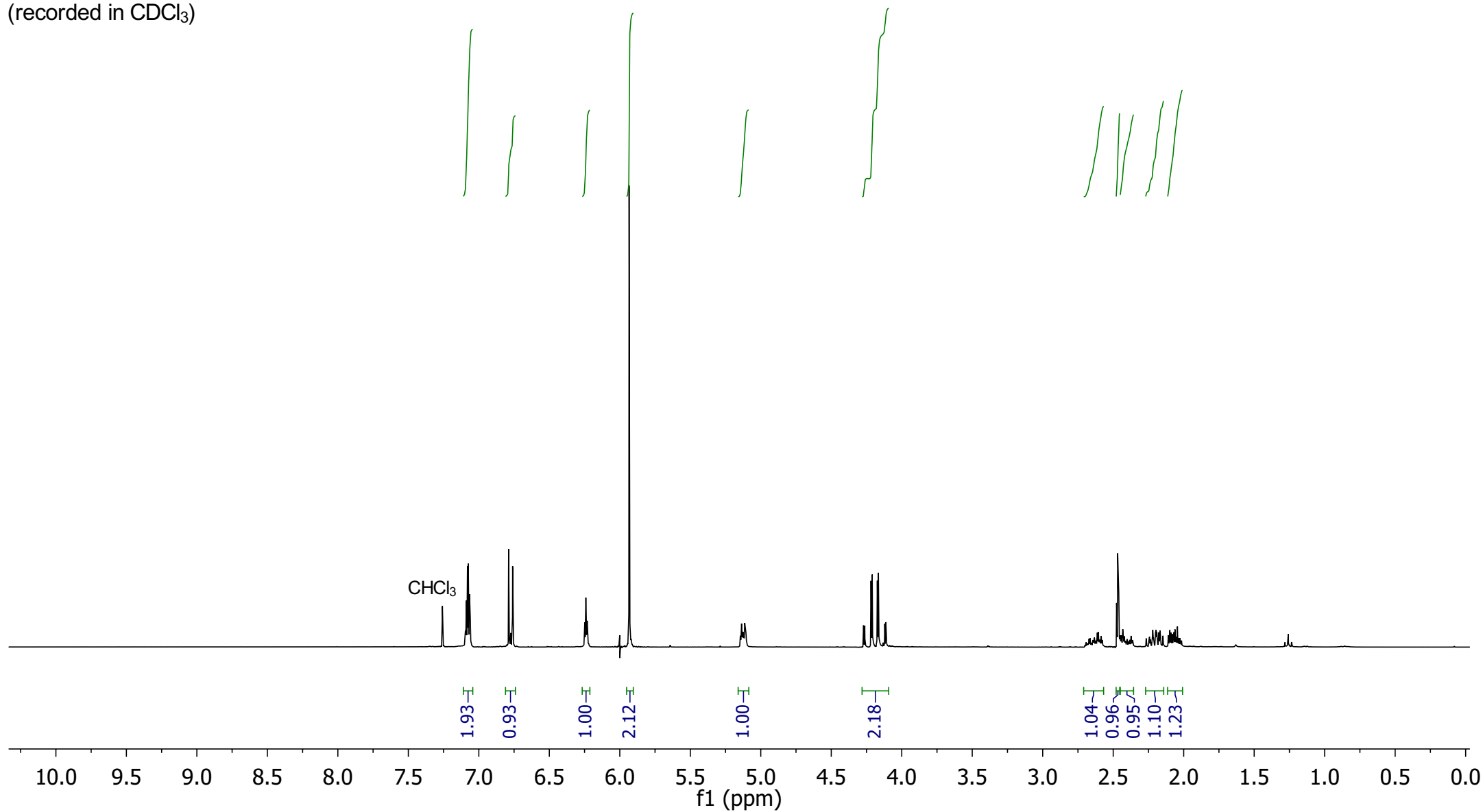
7.5
4.3

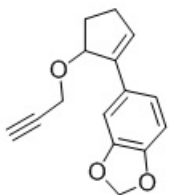
100 MHz ^{13}C NMR spectrum of compound **59**
(recorded in CDCl_3)





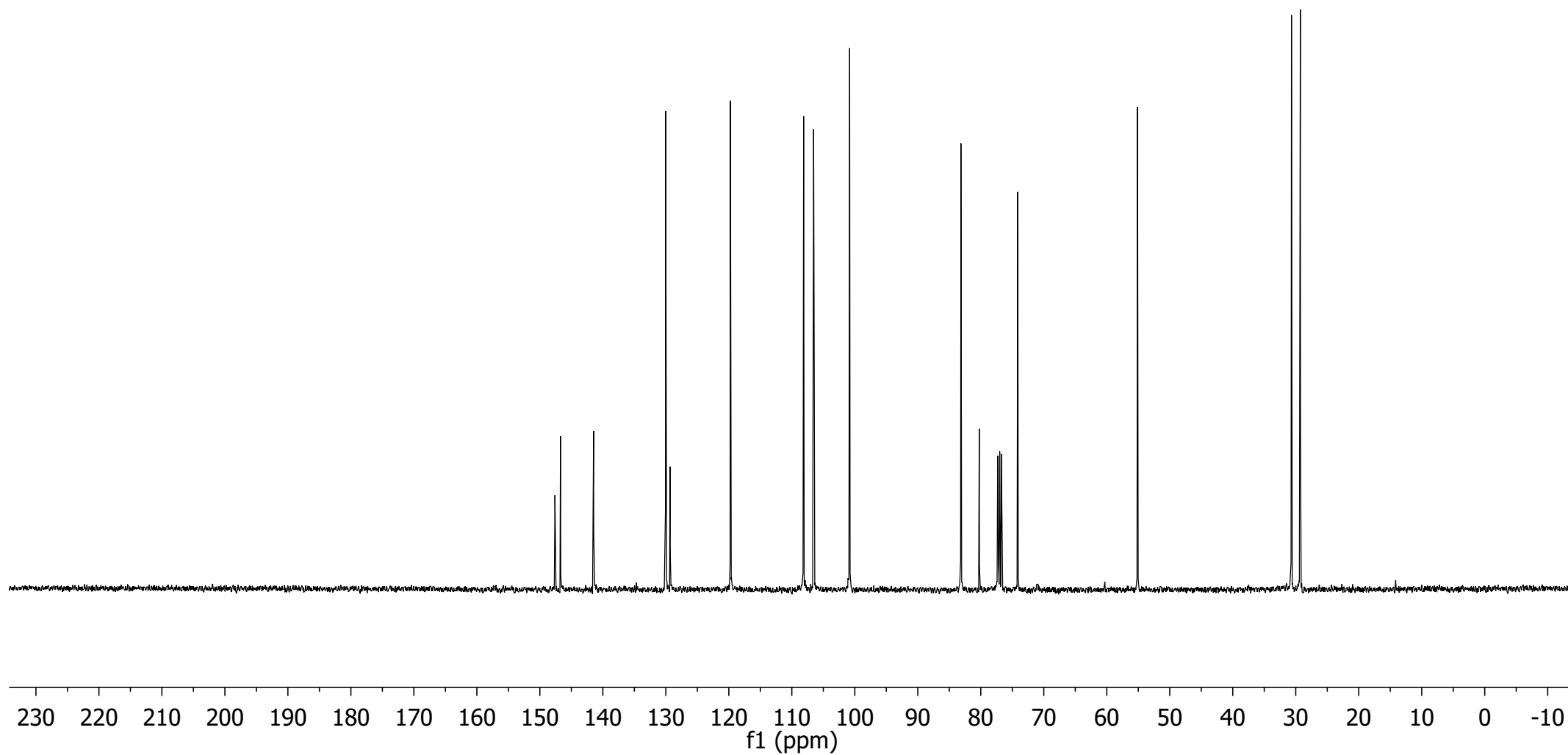
400 MHz ^1H NMR spectrum of 5-(5-(prop-2-yn-1-yloxy)cyclopent-1-en-1-yl)benzo[d][1,3]dioxole
(step i precursor to compound **60**)
(recorded in CDCl_3)

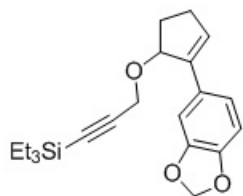




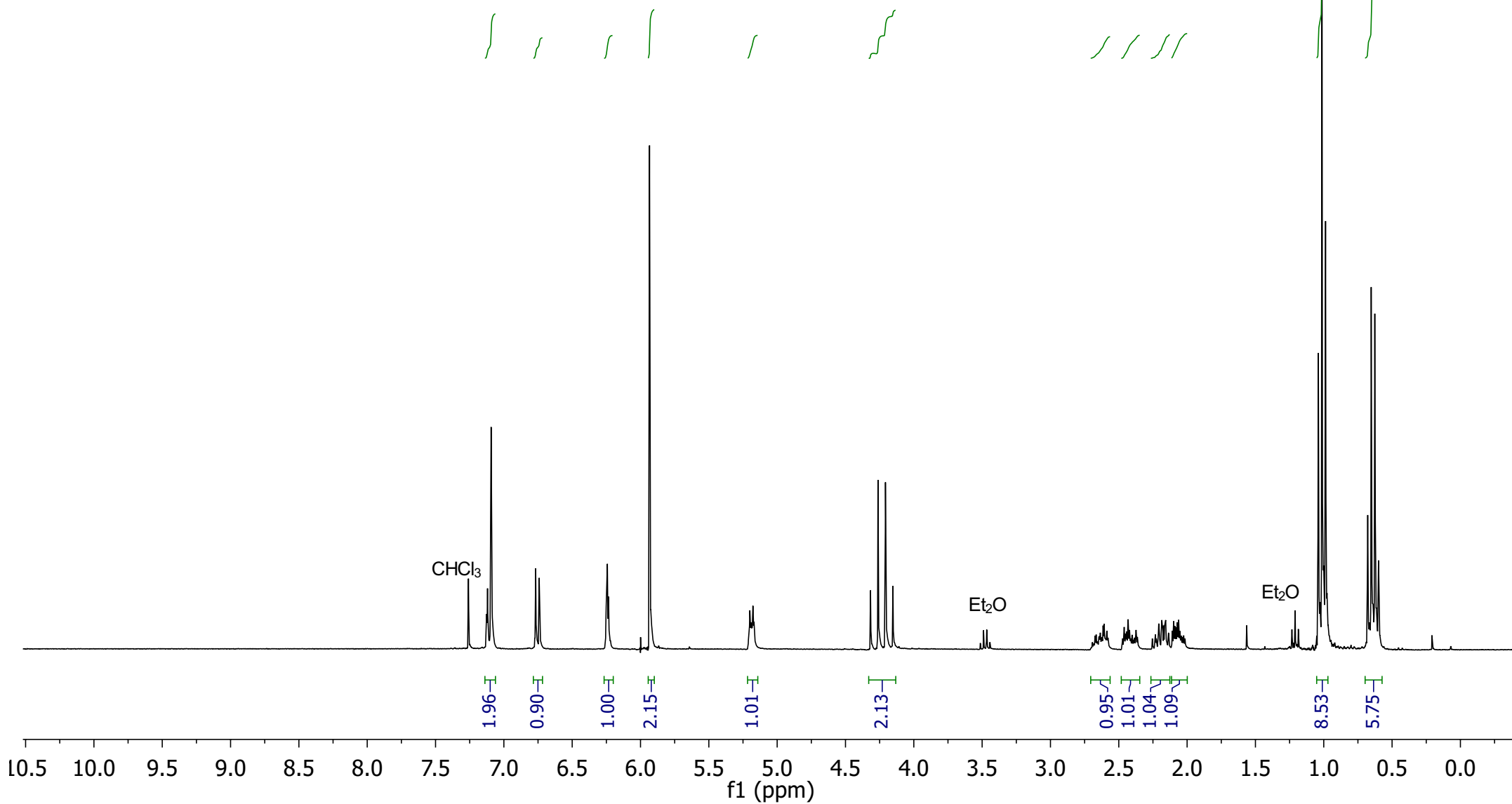
~ 147.6
 ~ 146.7
 ~ 141.5
 ~ 130.0
 ~ 129.3
 ~ 119.8
 ~ 108.1
 ~ 106.5
 ~ 100.8
 ~ 83.2
 ~ 80.2
 ~ 74.1
 ~ 55.1
 ~ 30.7
 ~ 29.3

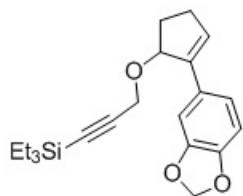
100 MHz ^{13}C NMR spectrum of 5-(5-(prop-2-yn-1-yloxy)cyclopent-1-en-1-yl)benzo[d][1,3]dioxole
 (step i precursor to compound **60**)
 (recorded in CDCl_3)



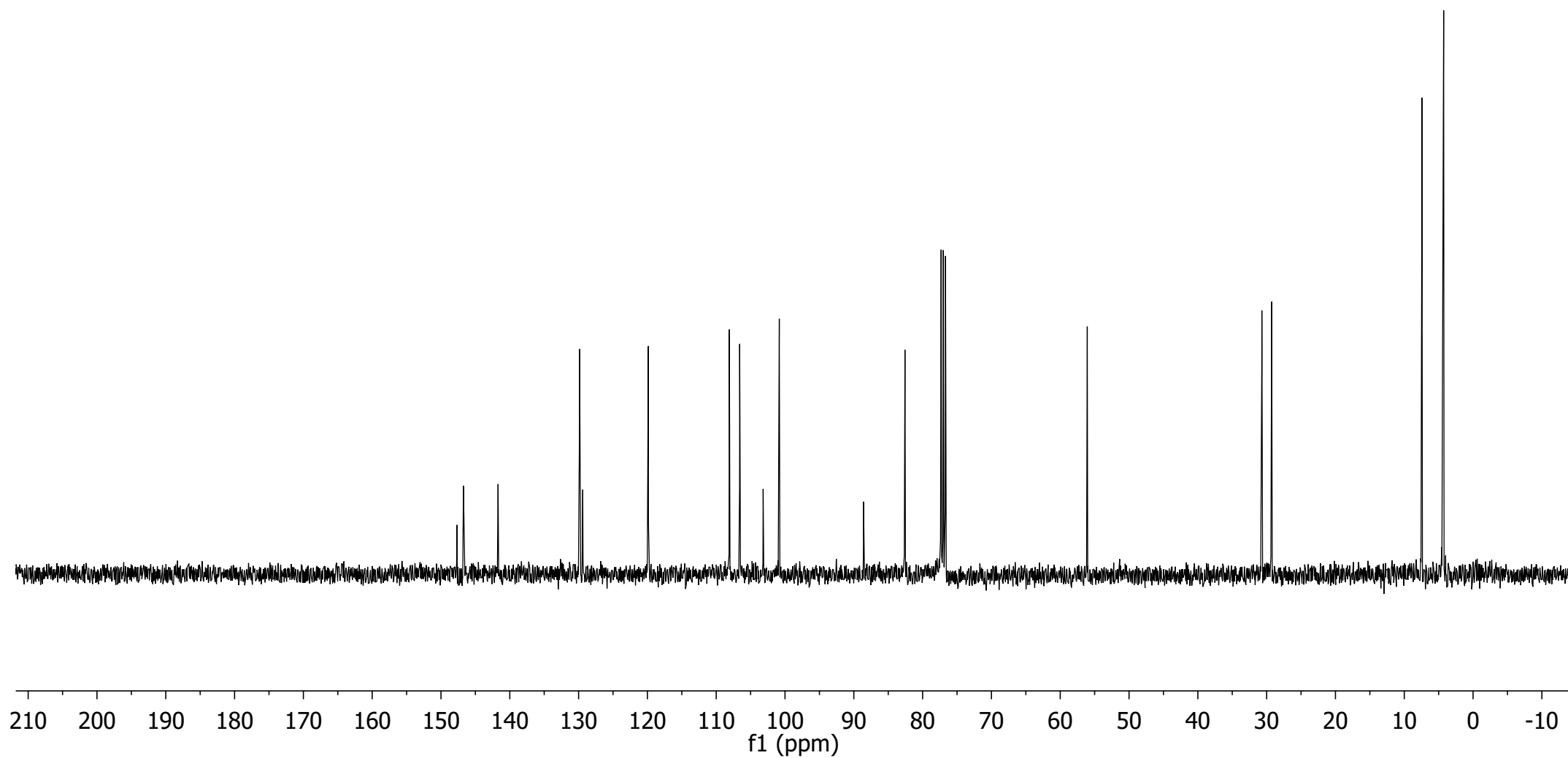


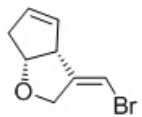
400 MHz ^1H NMR spectrum of compound **60**
(recorded in CDCl_3)



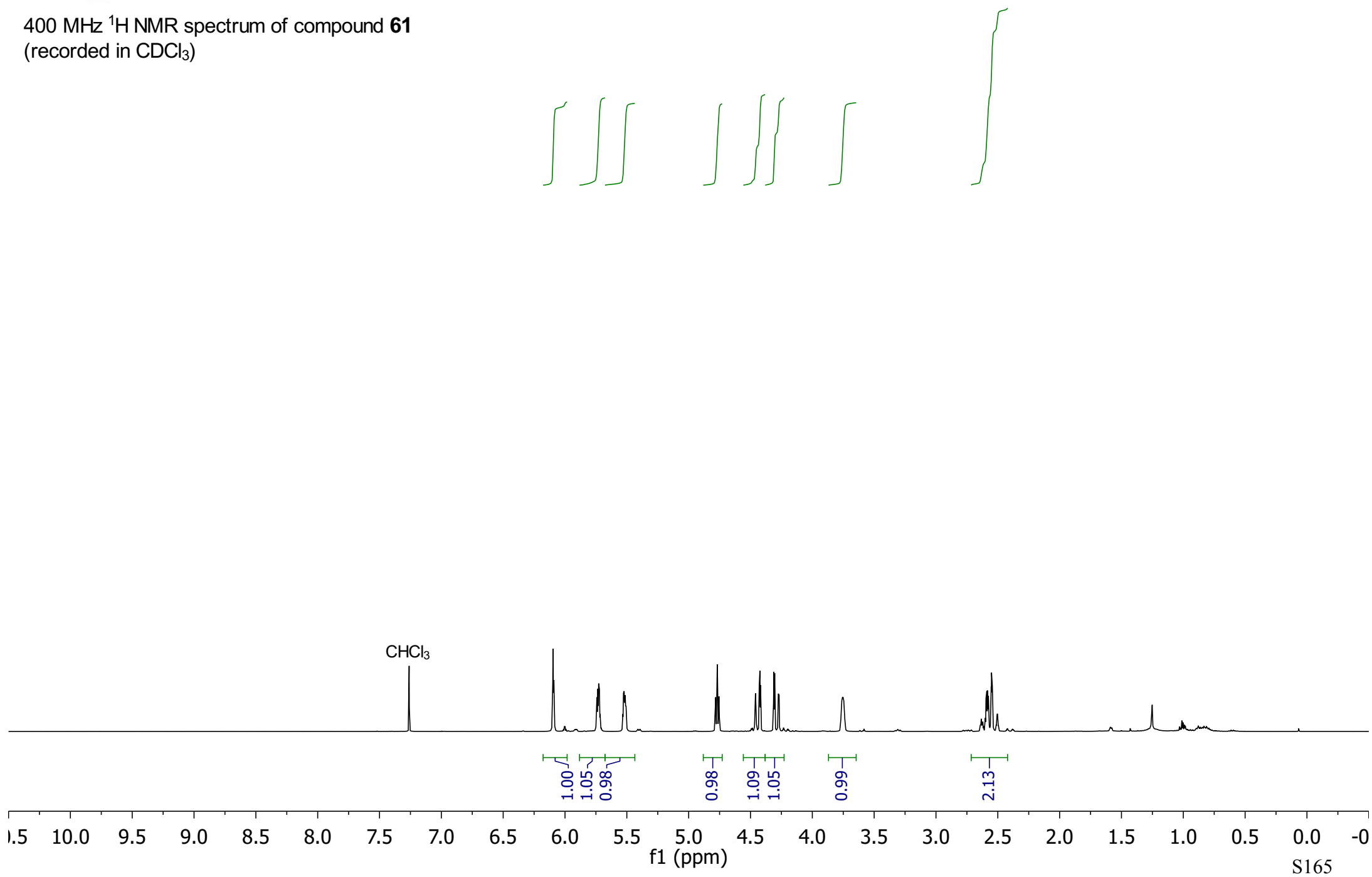


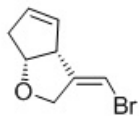
100 MHz ^{13}C NMR spectrum of compound **60**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **61**
(recorded in CDCl_3)





—147.5

130.2
130.1

—96.7

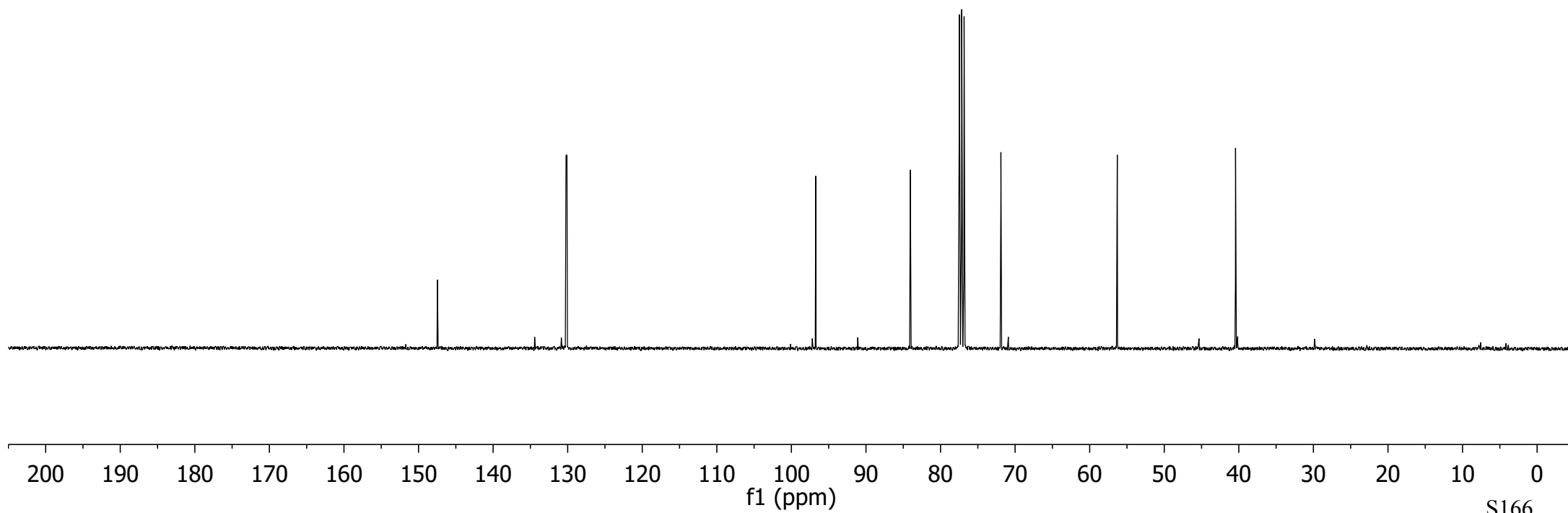
—84.1

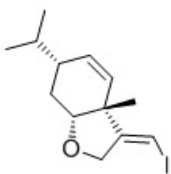
—71.9

—56.3

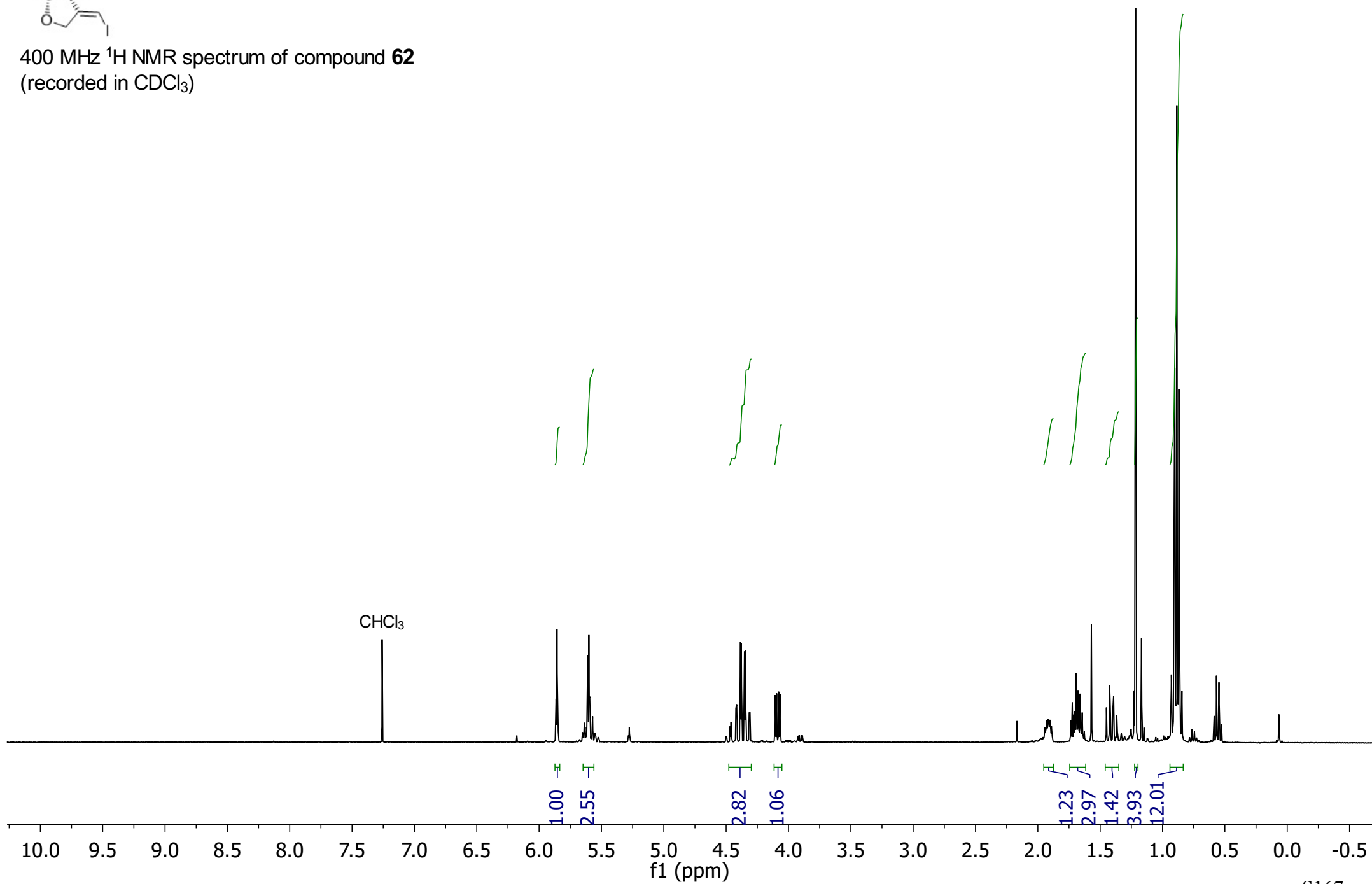
—40.4

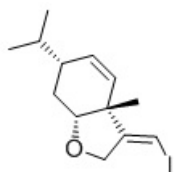
100 MHz ^{13}C NMR spectrum of compound **61**
(recorded in CDCl_3)



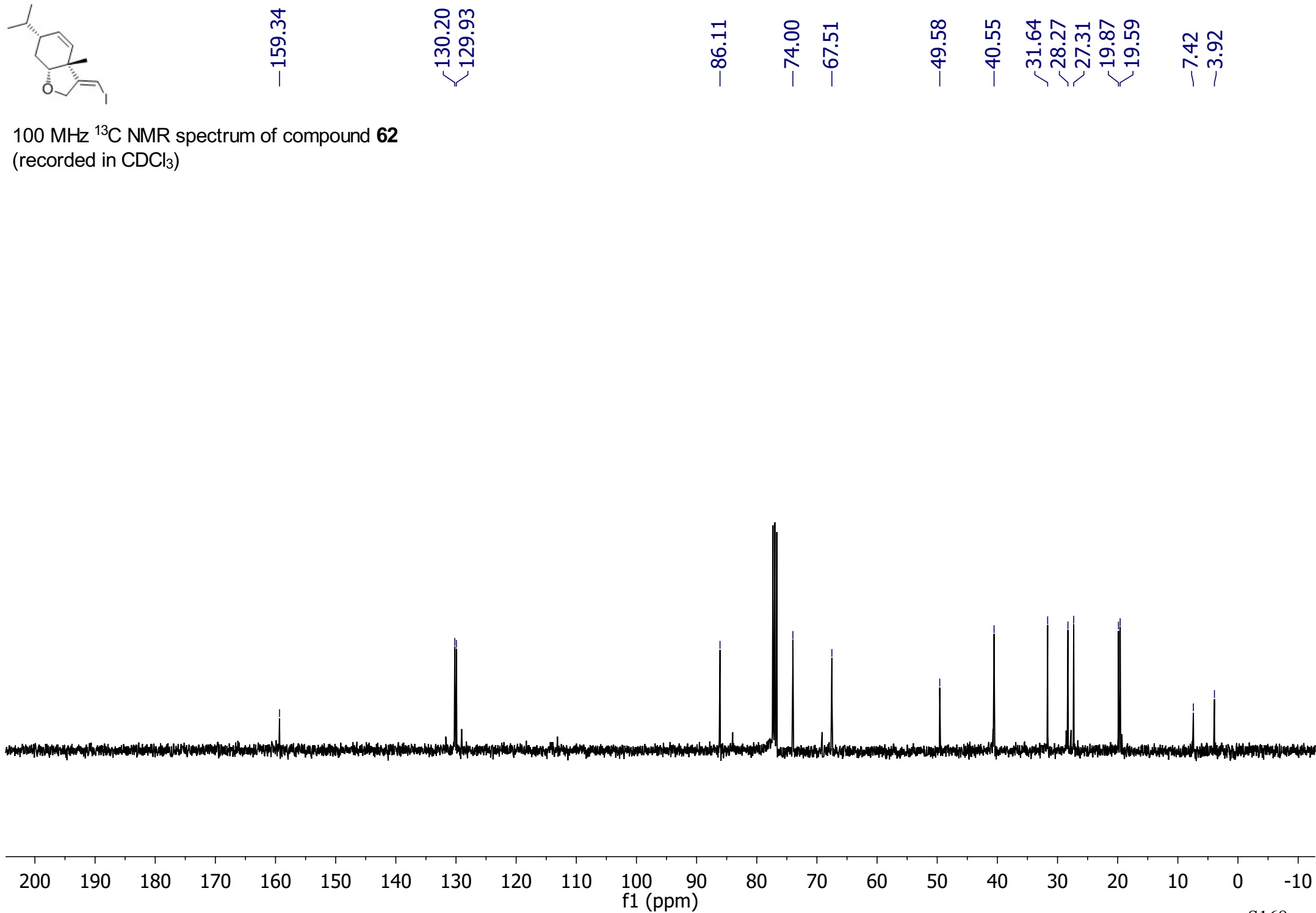


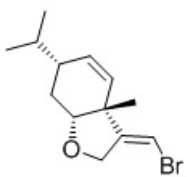
400 MHz ^1H NMR spectrum of compound **62**
(recorded in CDCl_3)



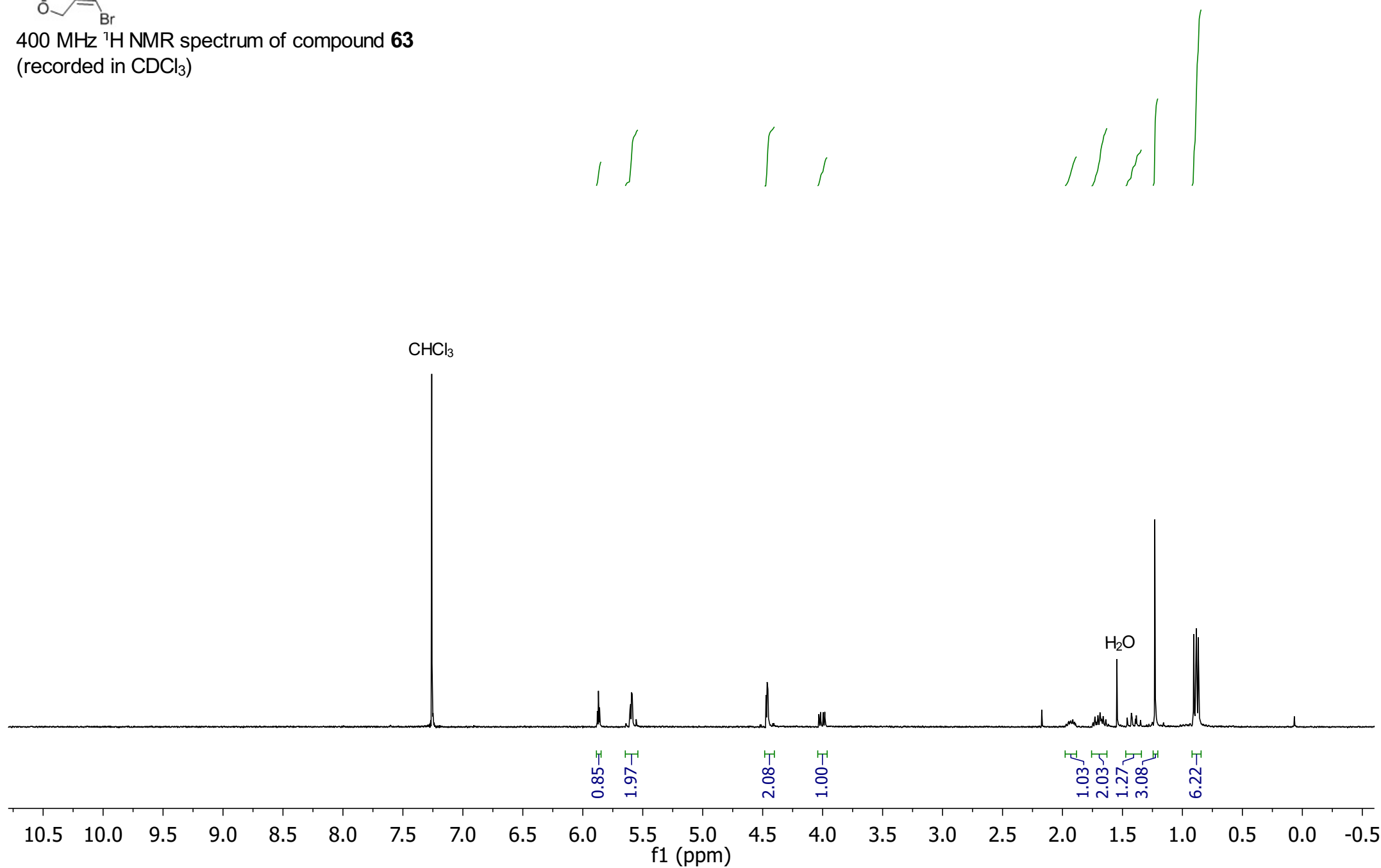


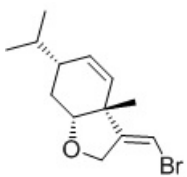
100 MHz ^{13}C NMR spectrum of compound **62**
(recorded in CDCl_3)



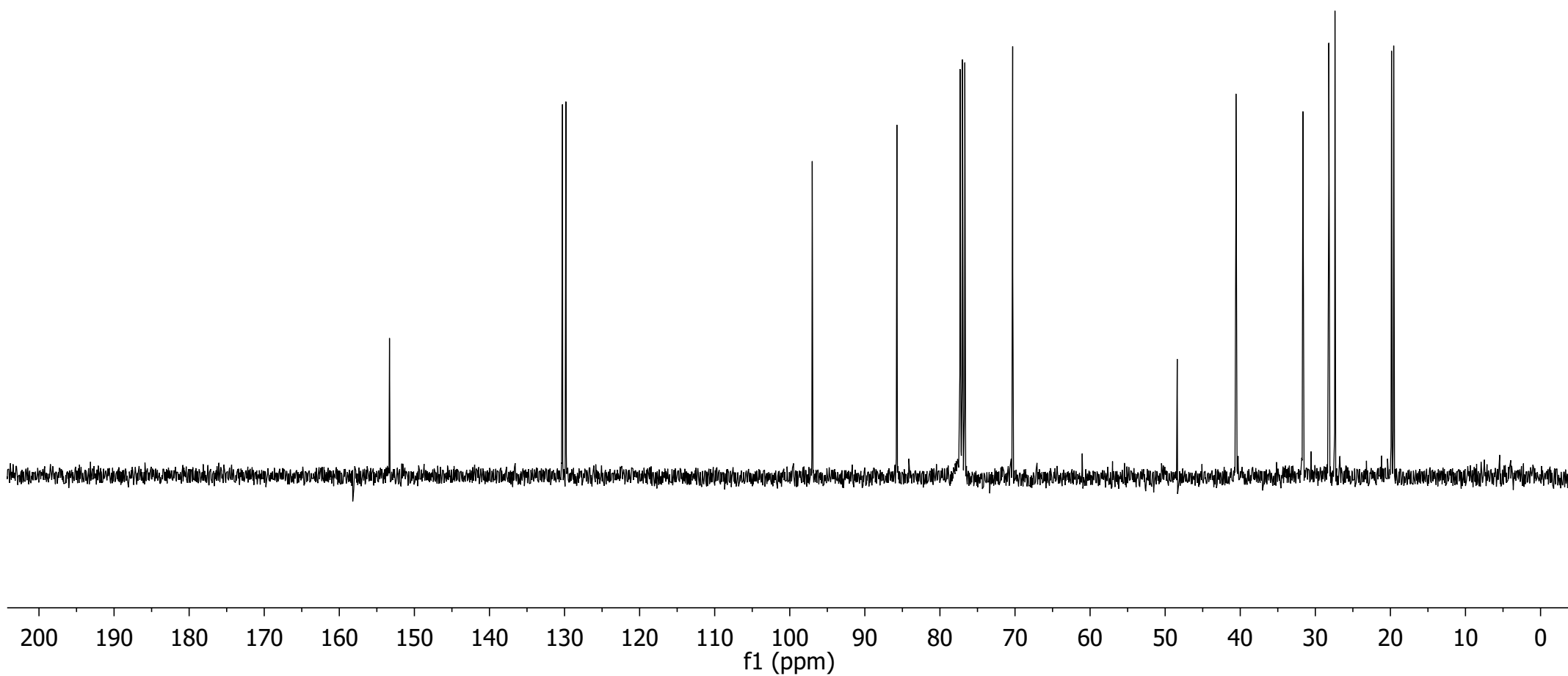


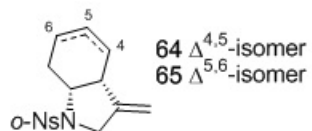
400 MHz ^1H NMR spectrum of compound **63**
(recorded in CDCl_3)



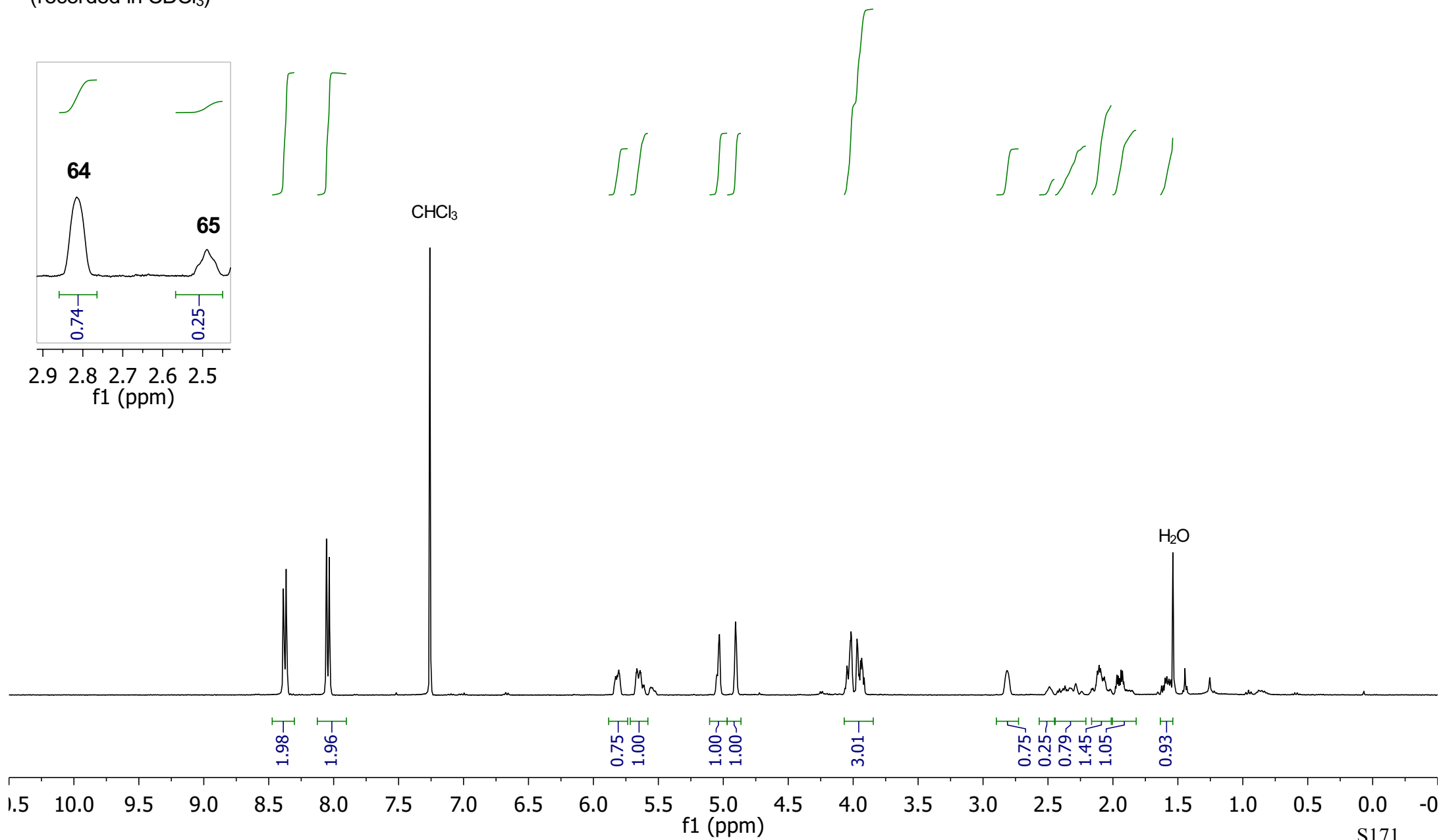


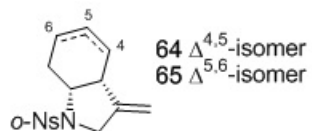
100 MHz ^{13}C NMR spectrum of compound **63**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of a ca 3:1 mixture of compounds **64** and **65**
 (recorded in CDCl_3)





~146.3
 ~144.5
 129.0
 128.5
 128.5
 124.9
 124.6
 123.6
 123.6
 —109.0

—59.5

—51.7

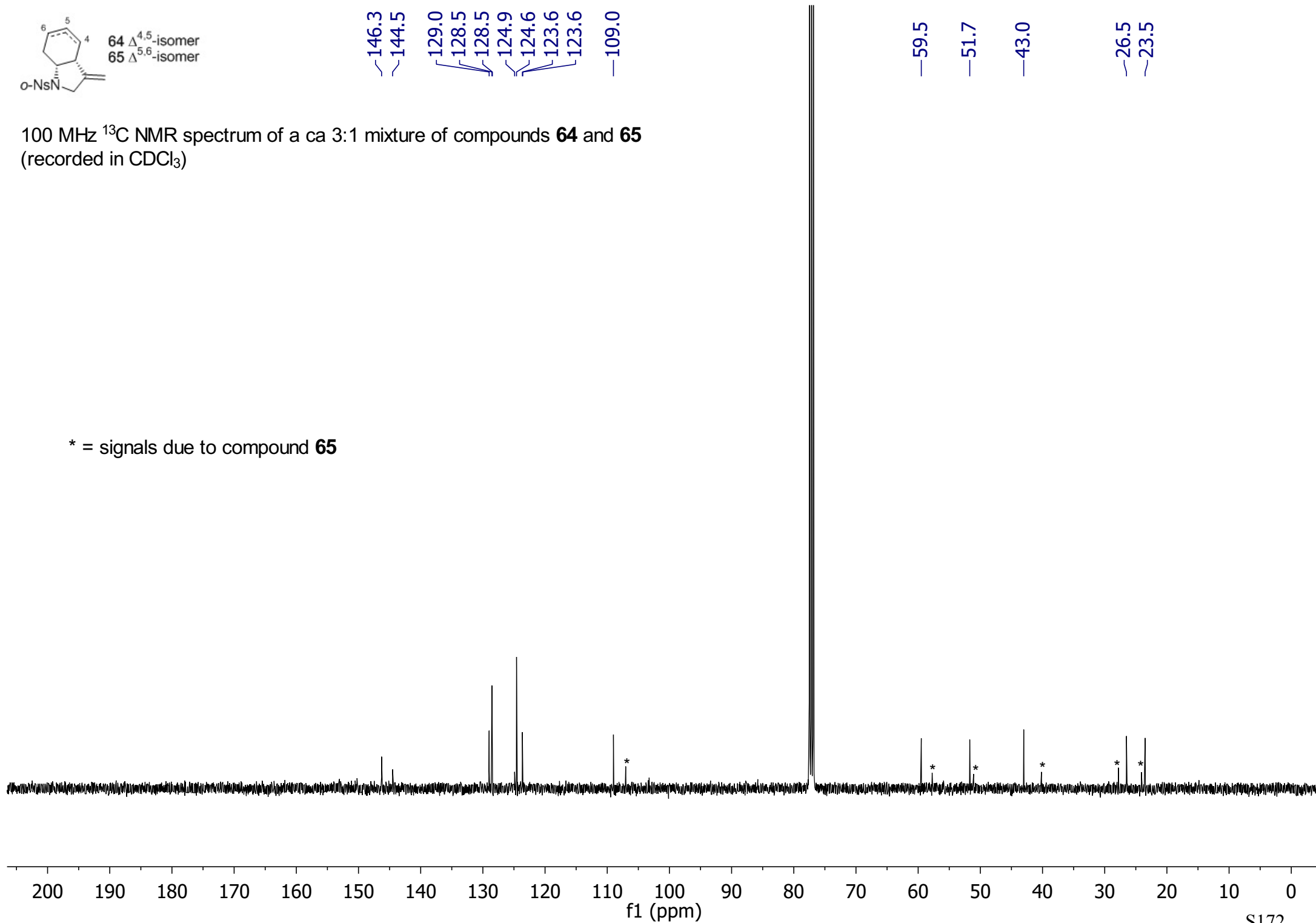
—43.0

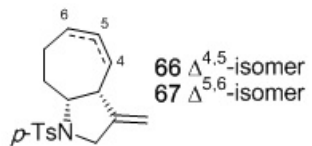
~26.5

~23.5

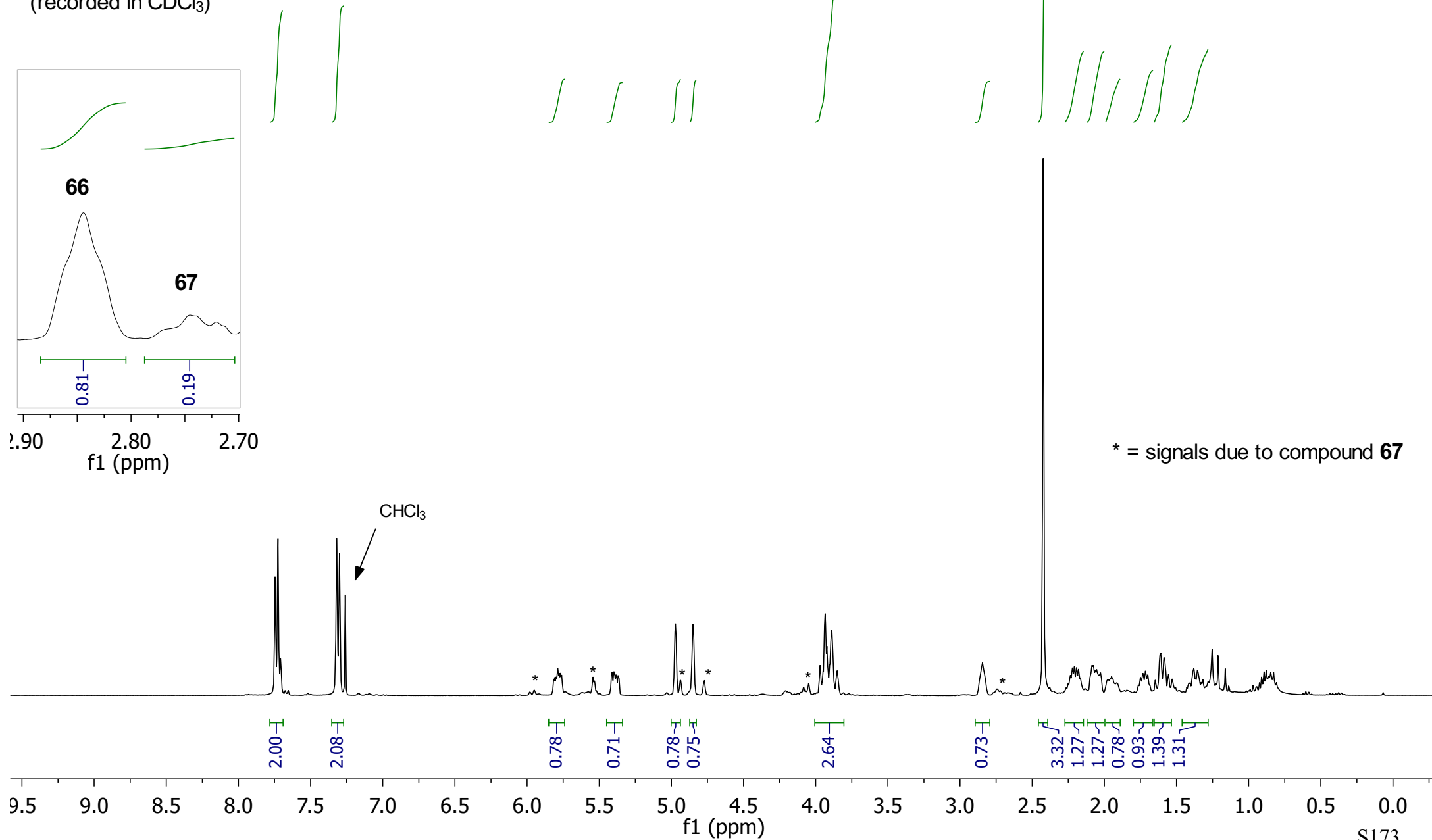
100 MHz ^{13}C NMR spectrum of a ca 3:1 mixture of compounds **64** and **65**
 (recorded in CDCl_3)

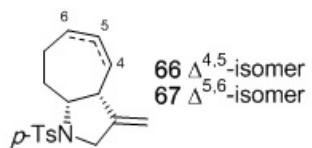
* = signals due to compound **65**





400 MHz ^1H NMR spectrum of a ca 4:1 mixture of compounds **66** and **67**
(recorded in CDCl_3)

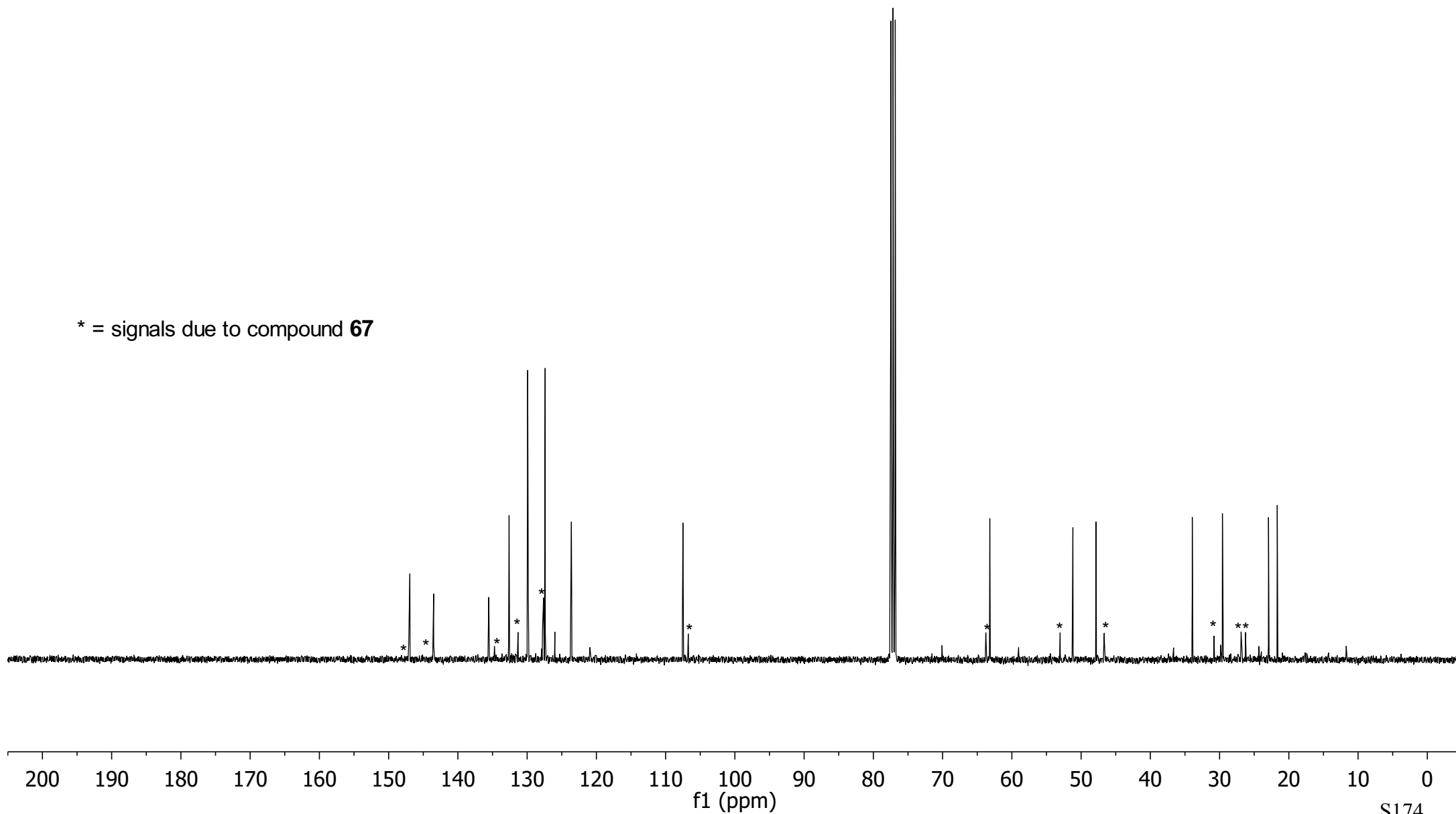


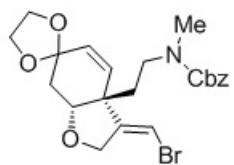


100 MHz ^{13}C NMR spectrum of a ca 7:1 mixture of compounds **66** and **67**
(recorded in CDCl_3)

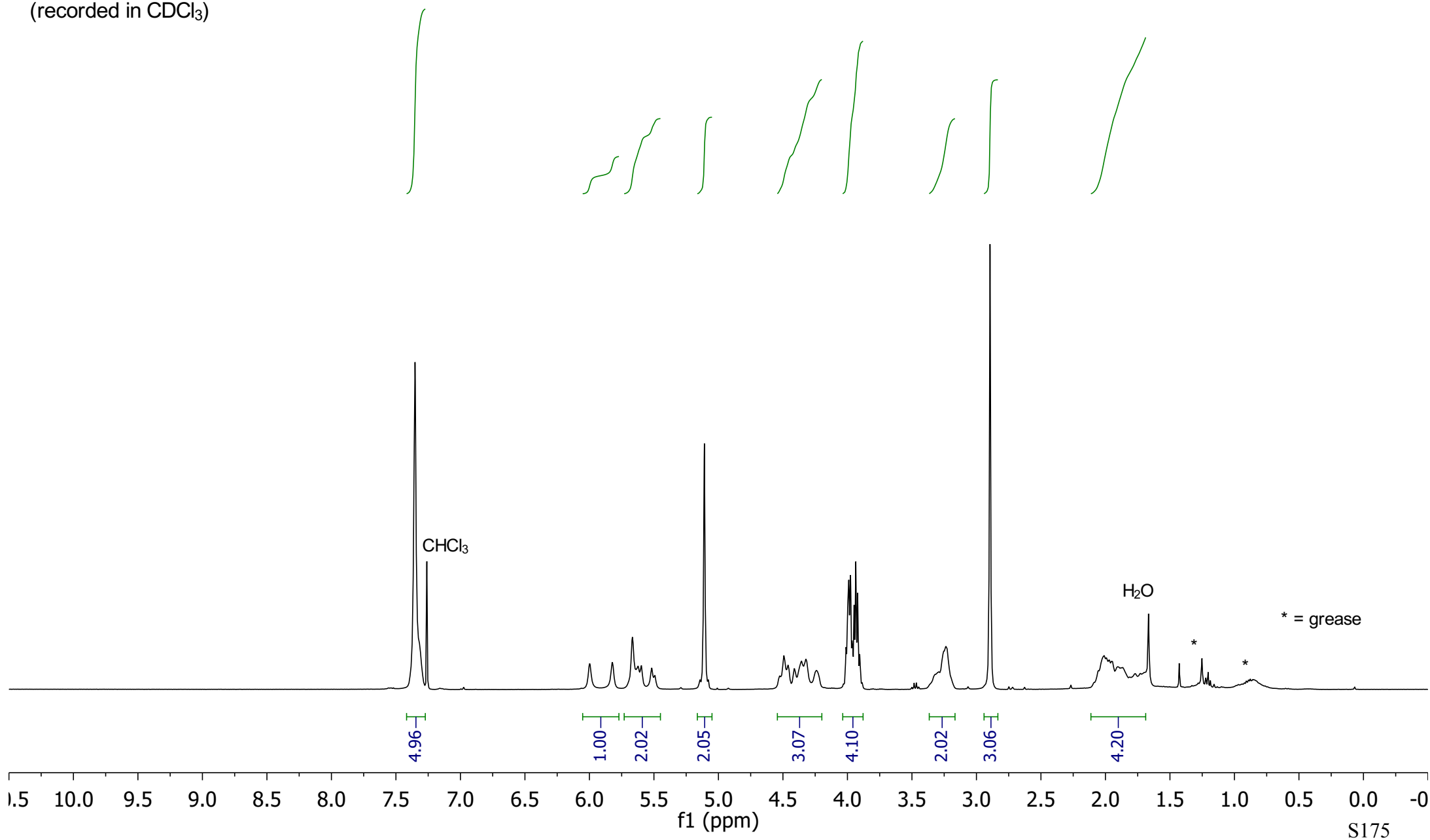
~ 146.9
 ~ 143.5
 ~ 135.5
 ~ 132.6
 ~ 129.9
 ~ 127.4
 ~ 123.6
 ~ 107.5
 ~ 63.2
 ~ 51.2
 ~ 47.8
 ~ 33.9
 ~ 29.6
 ~ 22.9
 ~ 21.7

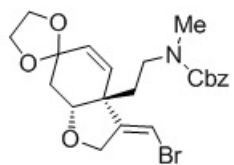
* = signals due to compound **67**



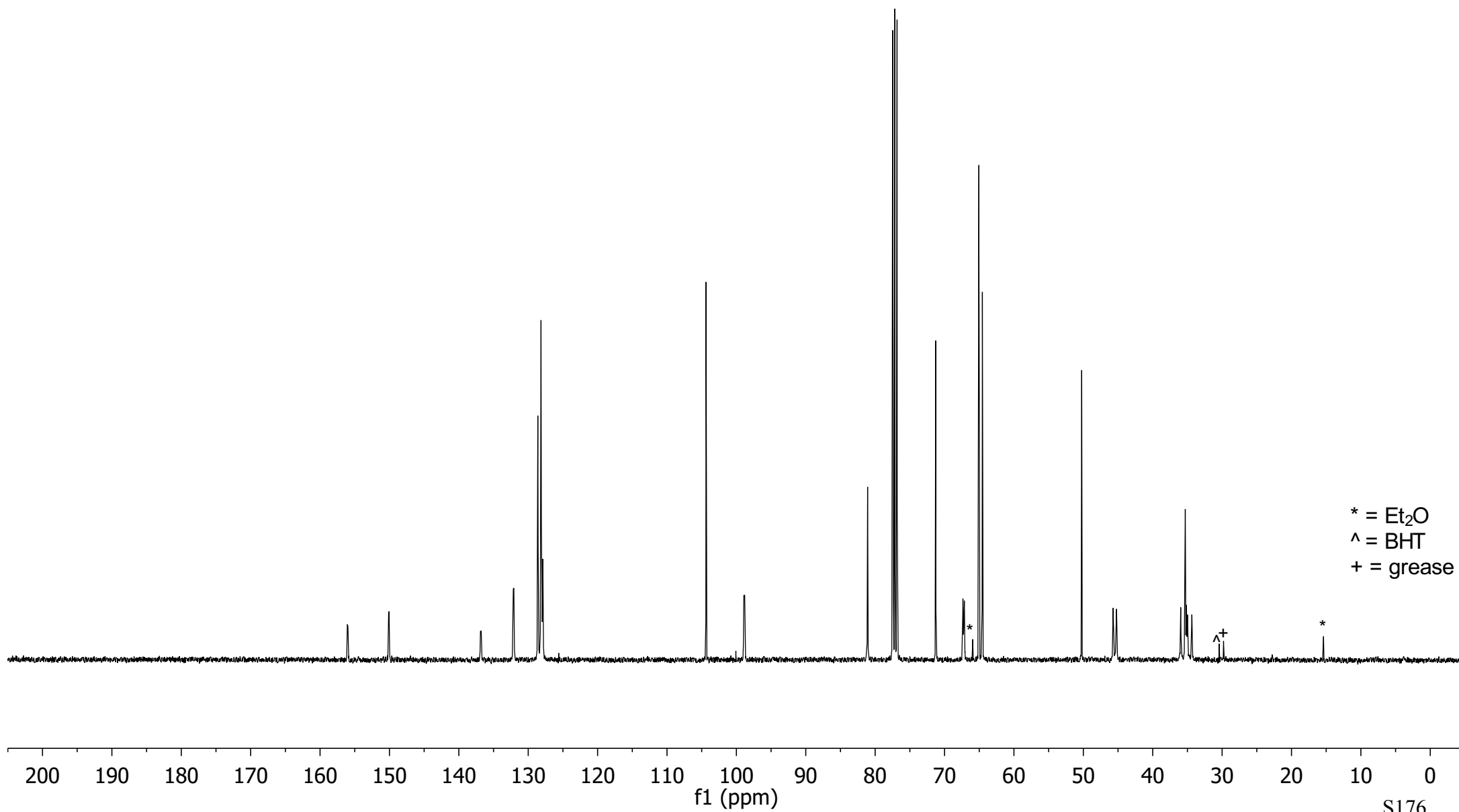


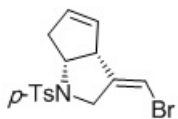
400 MHz ^1H NMR spectrum of compound **68**
(recorded in CDCl_3)



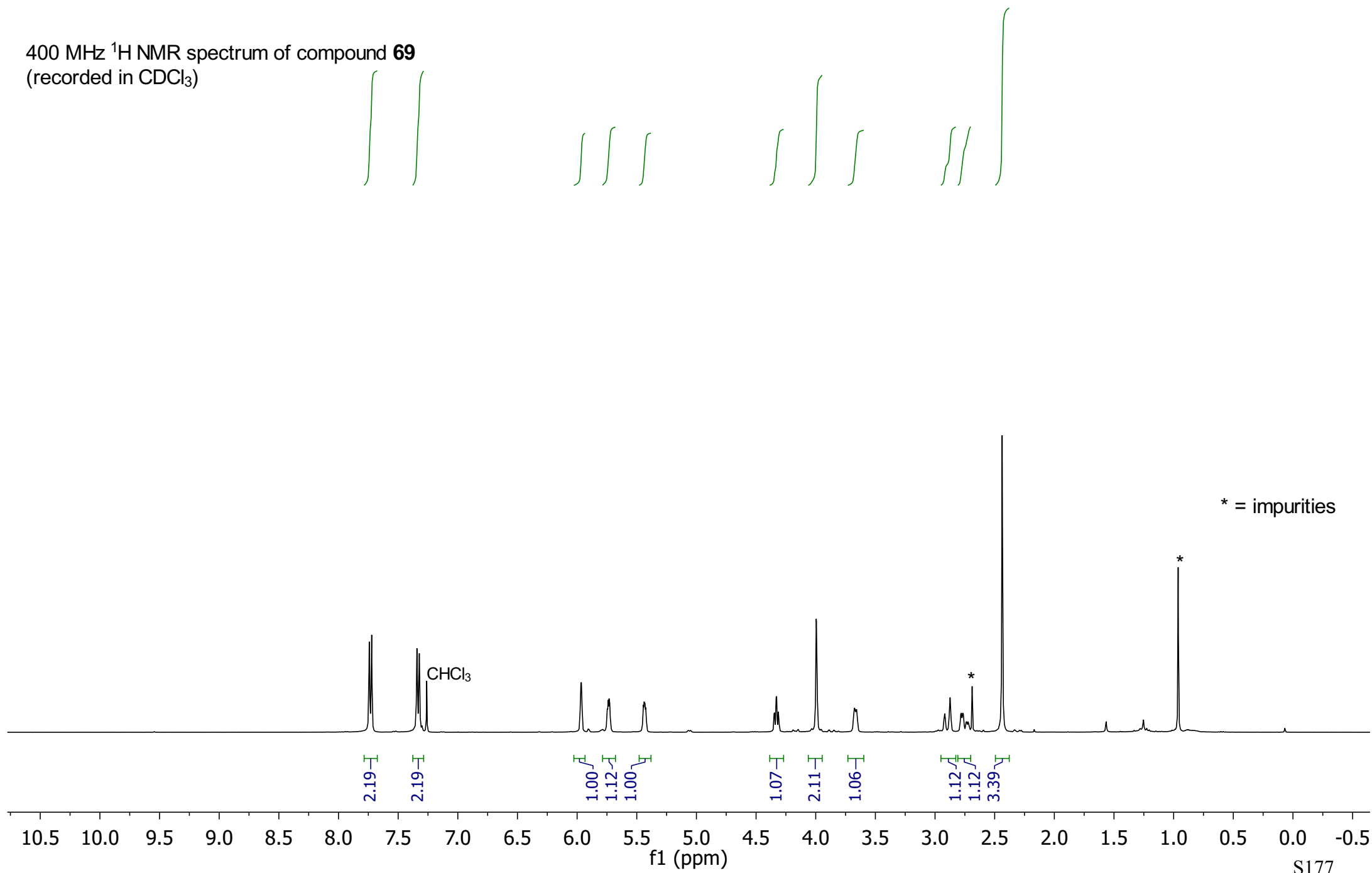


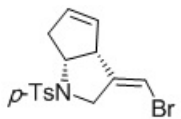
100 MHz ^{13}C NMR spectrum of compound **68**
(recorded in CDCl_3)





400 MHz ^1H NMR spectrum of compound **69**
(recorded in CDCl_3)





143.9
143.8
134.1
131.1
129.9
129.6
127.8

99.1

64.0

55.7

53.5

41.5

21.7

100 MHz ^{13}C NMR spectrum of compound **69**
(recorded in CDCl_3)

