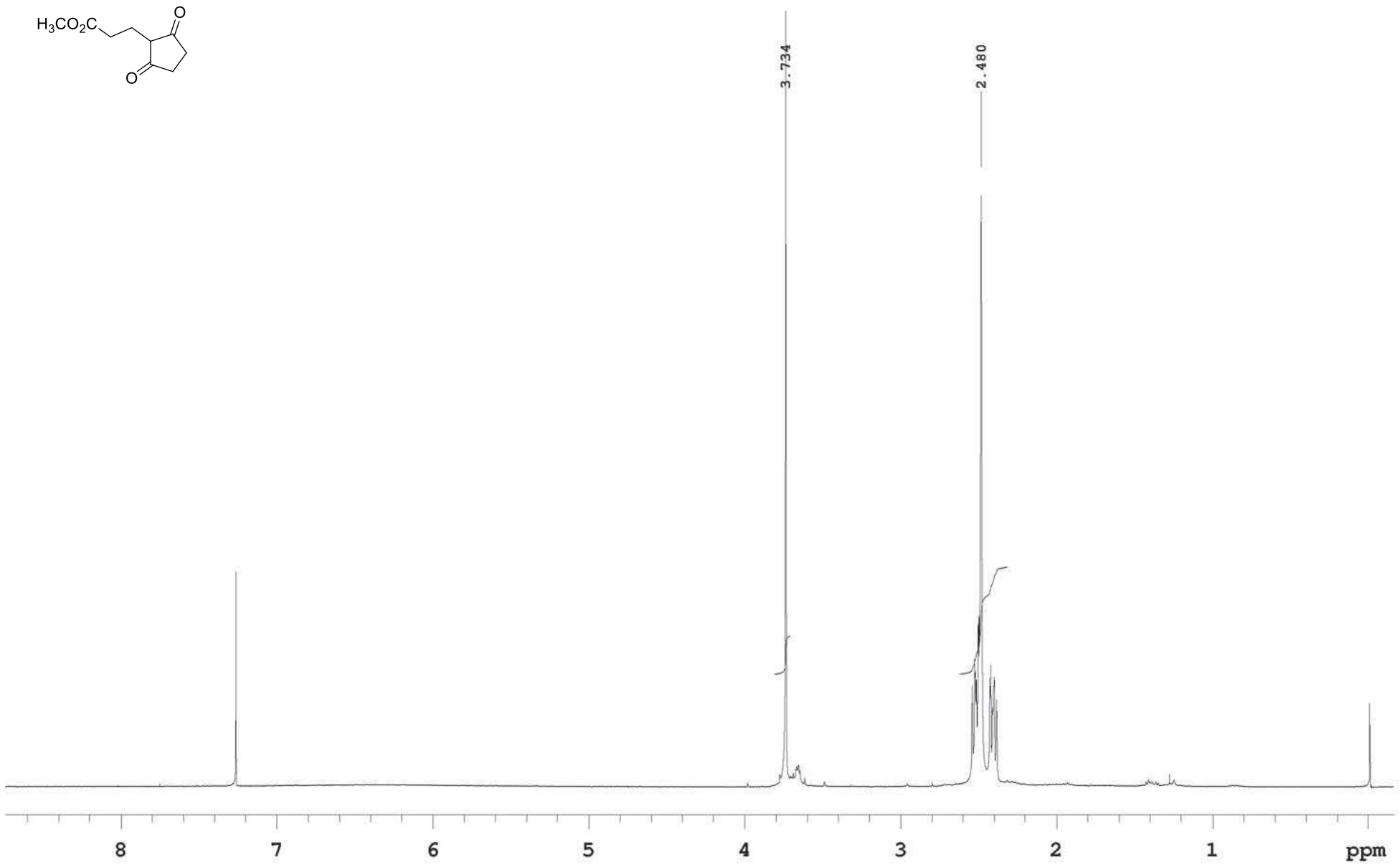
UNIVERSITAT DE BARCELONA

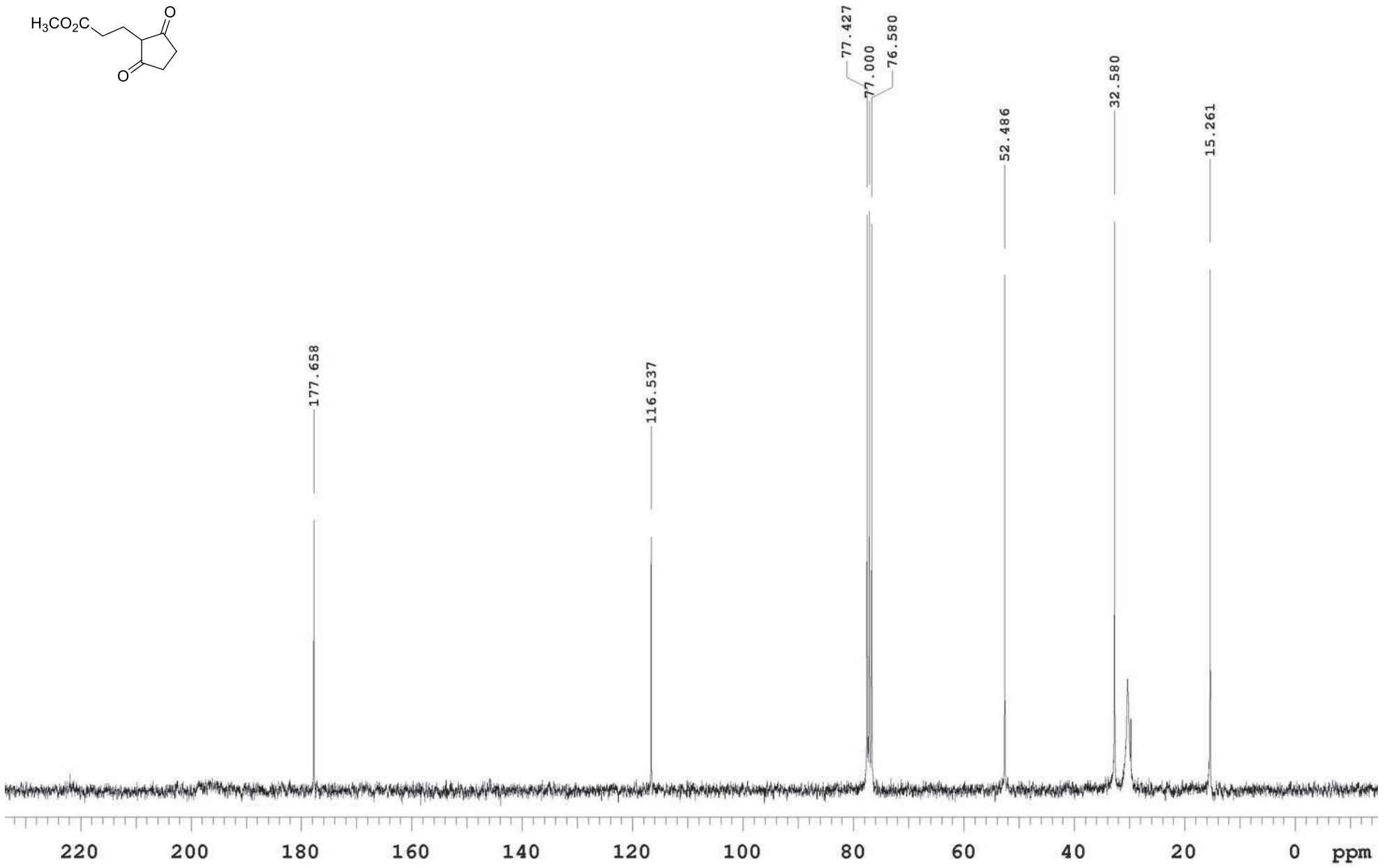
Enantio- and Diastereoselective Cyclocondensation Reactions. Stereocontrolled Access to Azabicycles and Application to Natural Product Synthesis

Elena Ghirardi

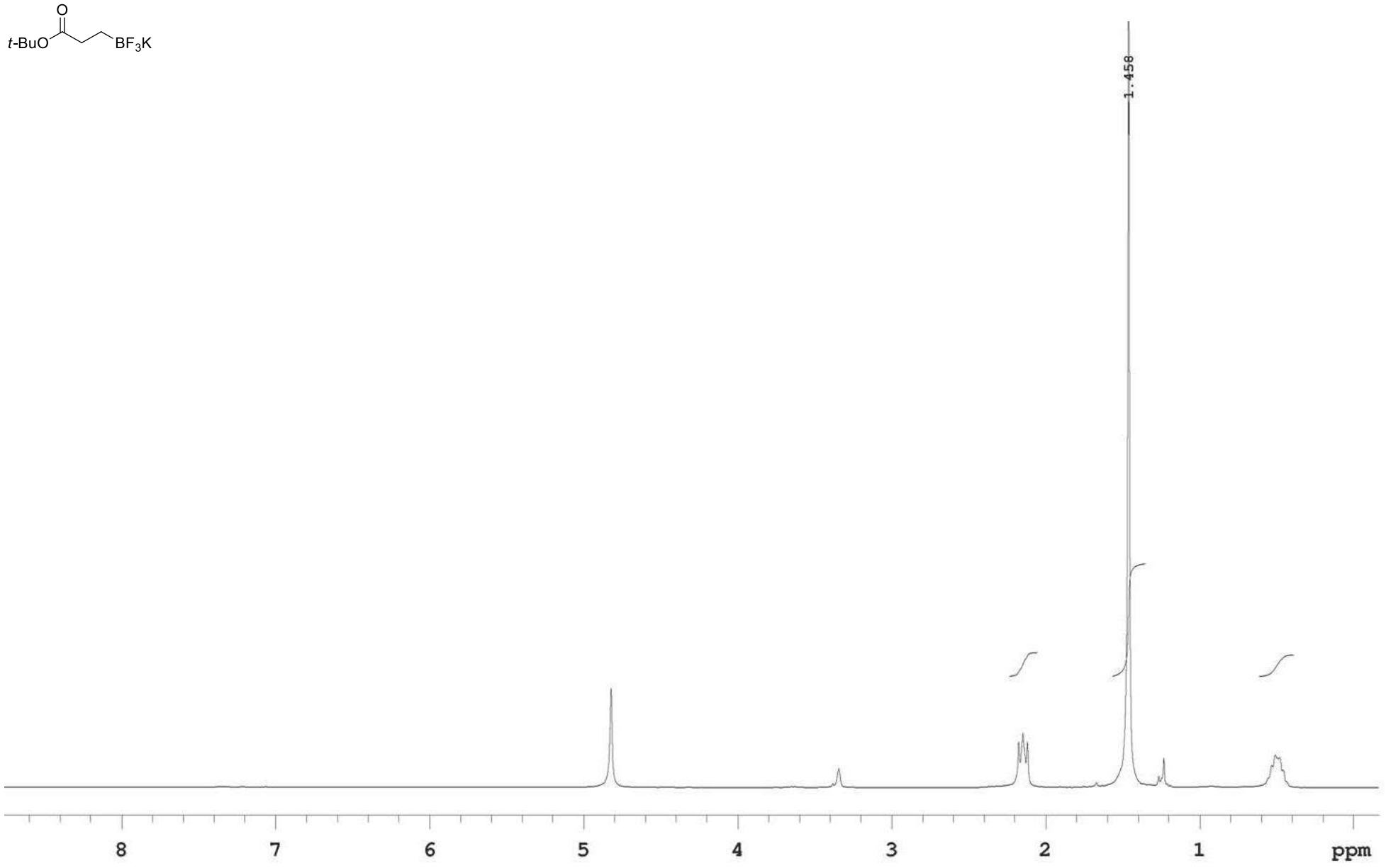
^{1}H and ^{13}C SPECTRA CHAPTER 2



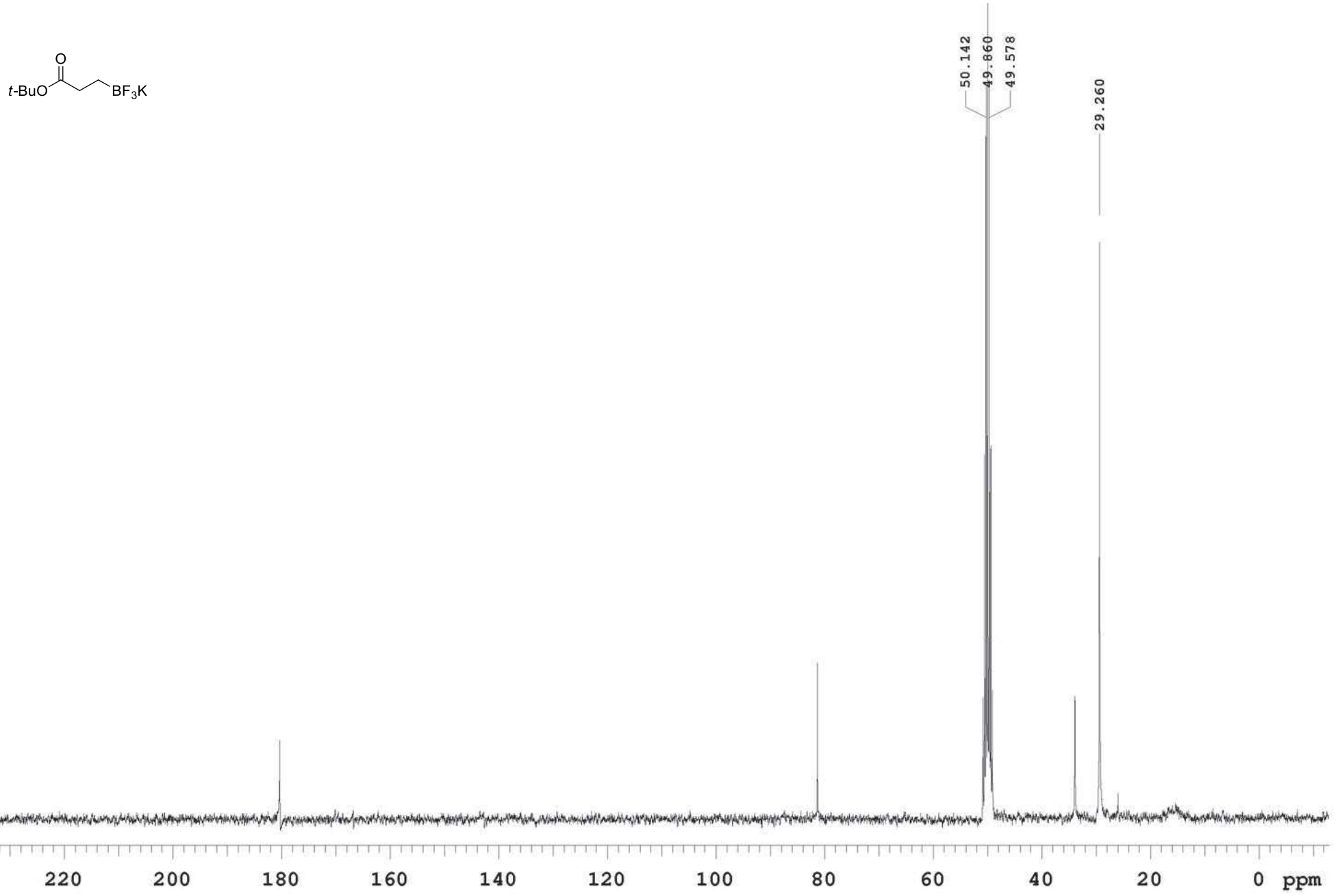
Methyl 2,5-dioxocyclopentanepropionate (2)- ^{1}H-NMR, $CDCl_3$, 300 MHz, 25 °C



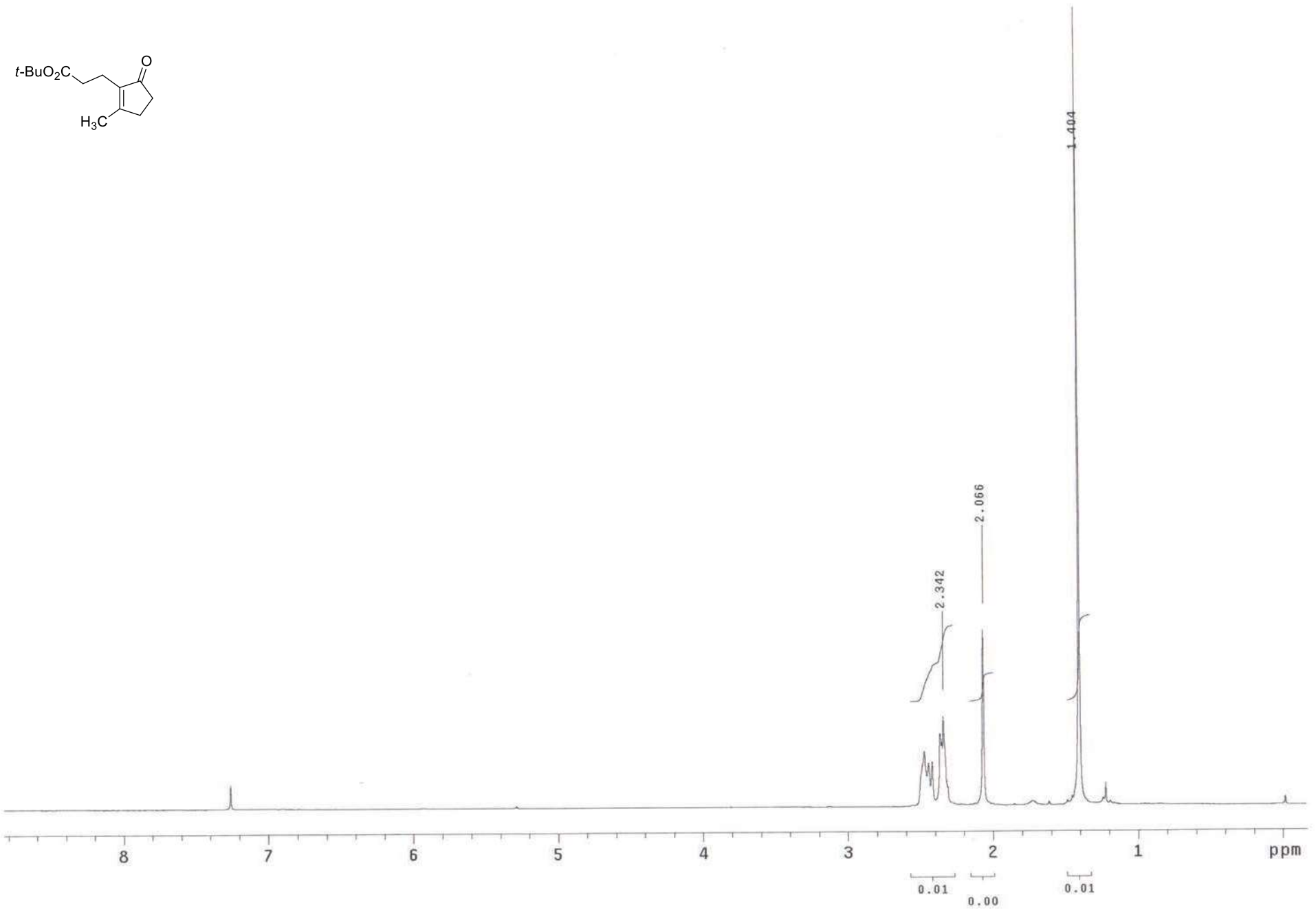
Methyl 2,5-dioxocyclopentanepropionate (2)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C



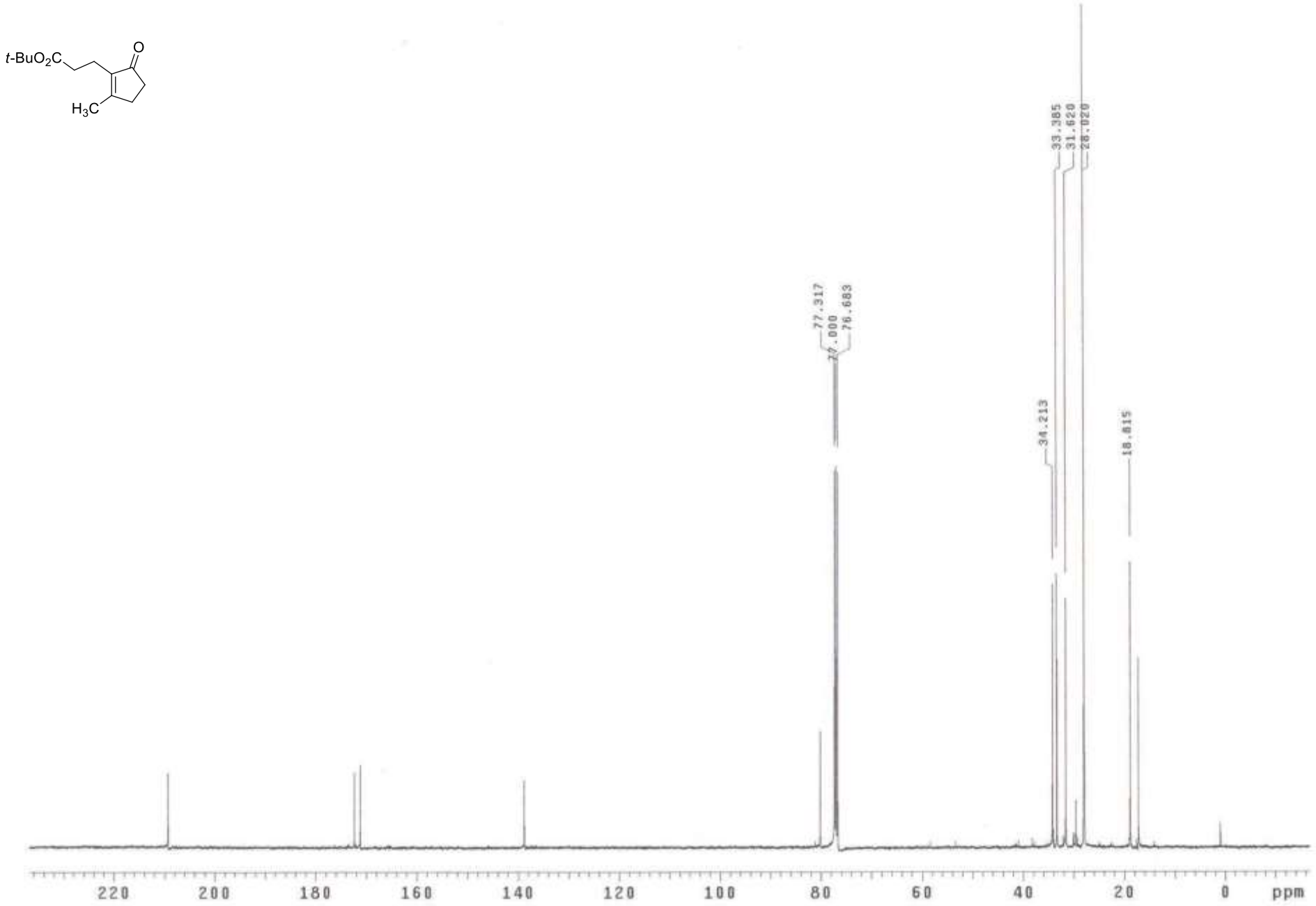
Potassium 2-(*tert*-butoxycarbonyl)ethyltrifluoroborate (6)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C



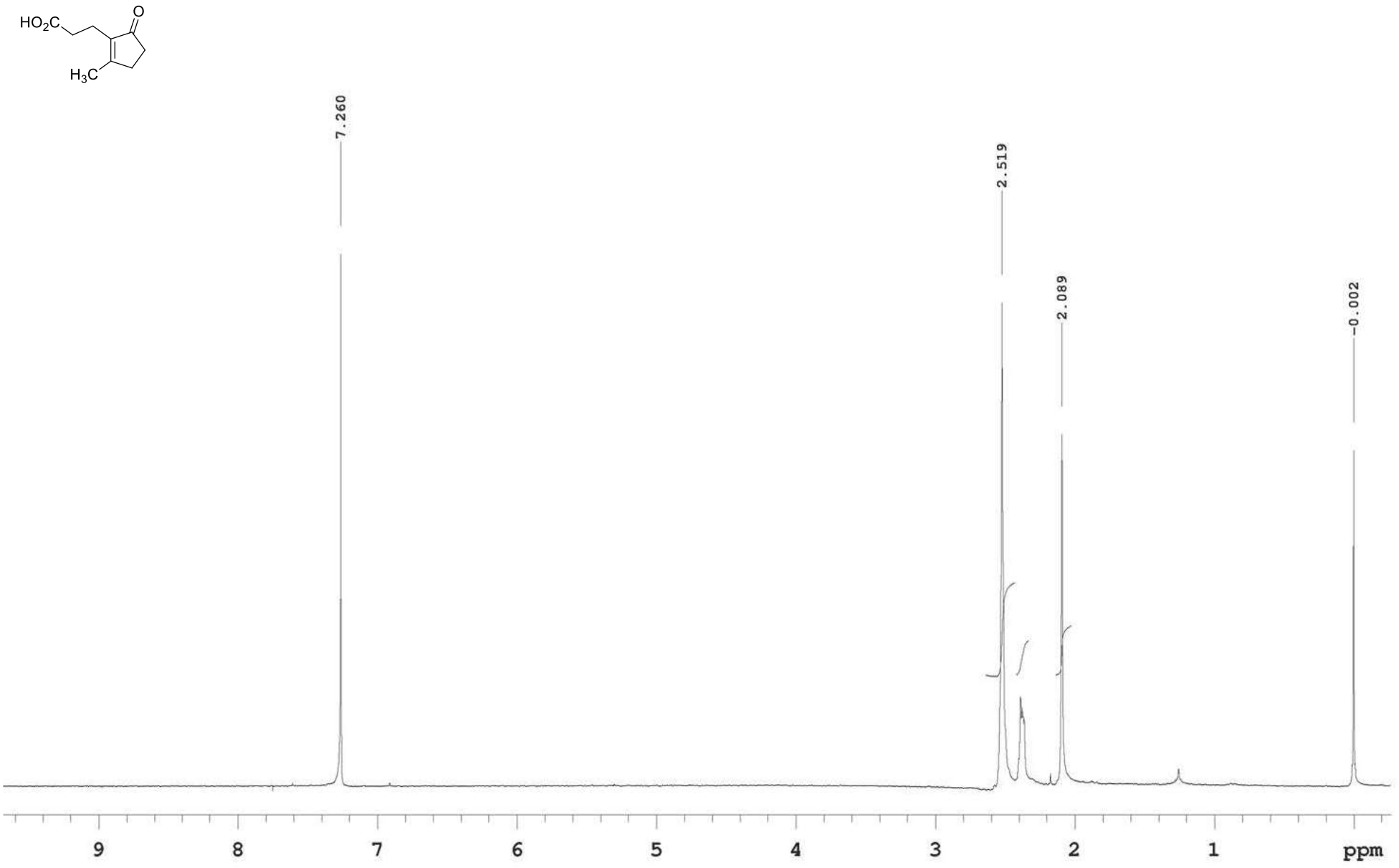
Potassium 2-(*tert*-butoxycarbonyl)ethyltrifluoroborate (6)- ^{13}C- NMR, CD_3OD, 75.4 MHz, 25 °C



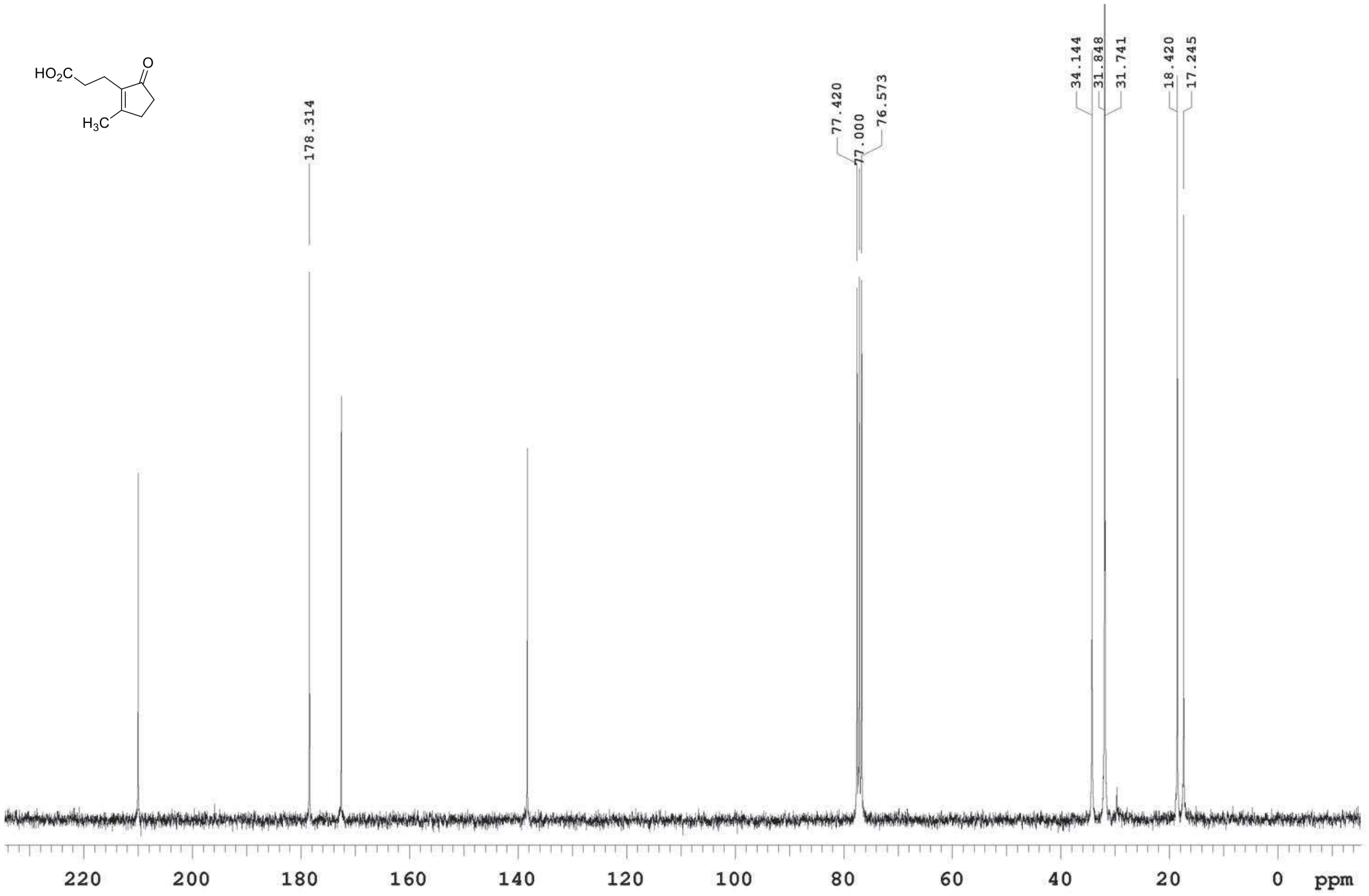
***tert*-Butyl 3-methyl-2-oxocyclopentenepropionate (4)- ^{1}H- NMR, CD_3OD, 300 MHz, 25 °C**



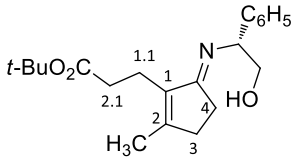
***tert*-Butyl 3-methyl-2-oxocyclopentenepropionate (4)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C**

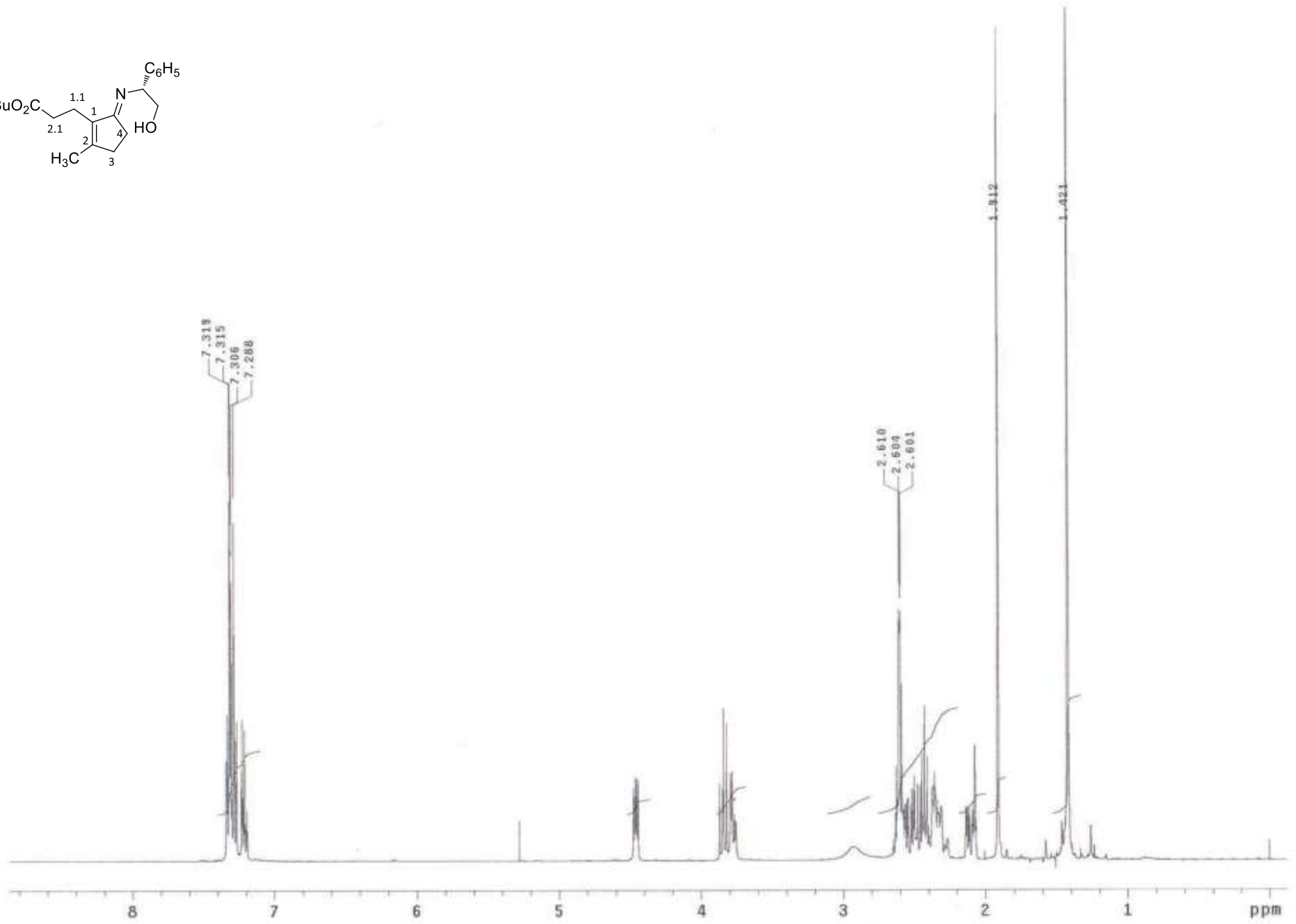


3-Methyl-5-oxo-2-cyclopentenepropionic acid (7)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C

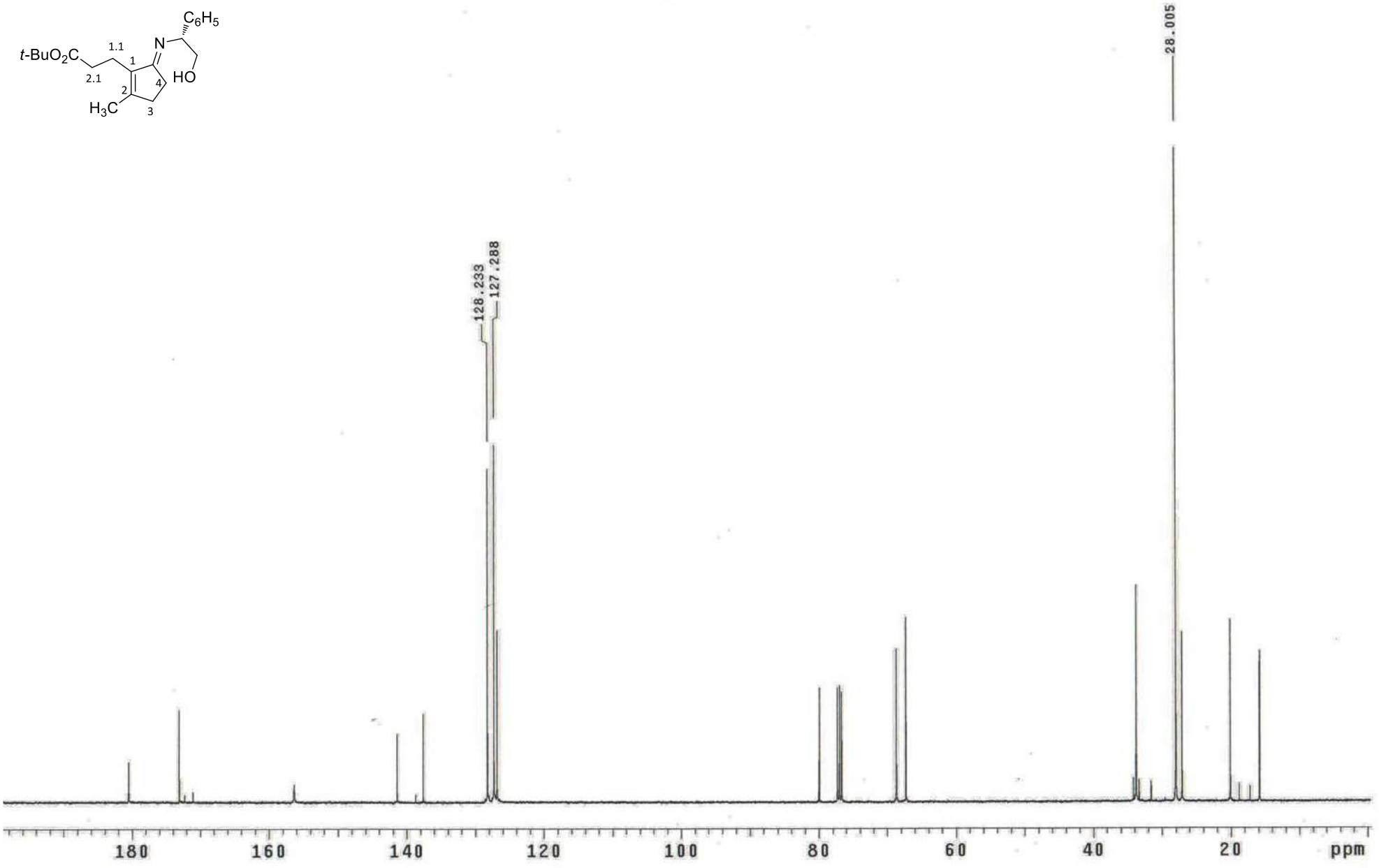


3-Methyl-5-oxo-2-cyclopentenepropionic acid (7)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C

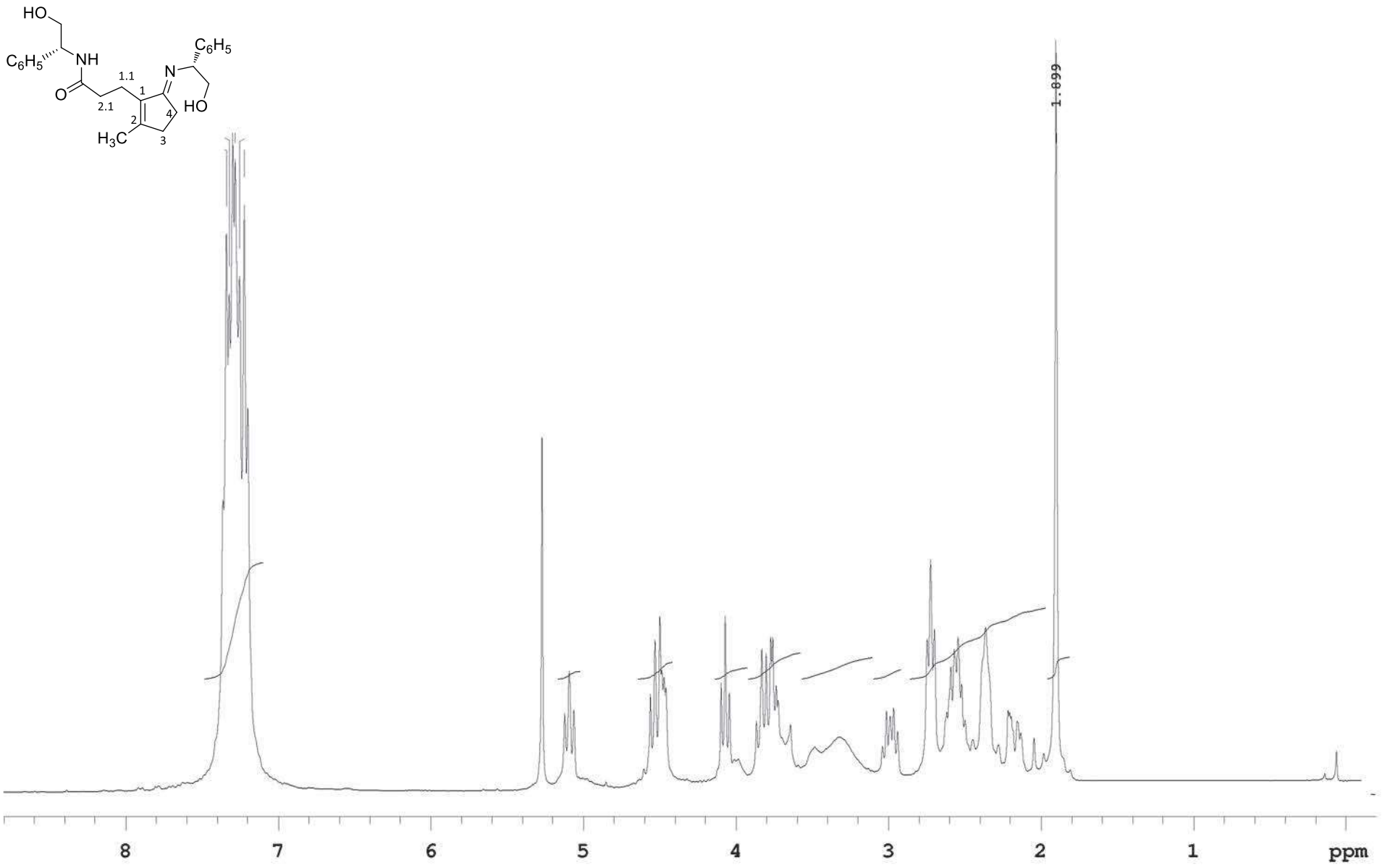




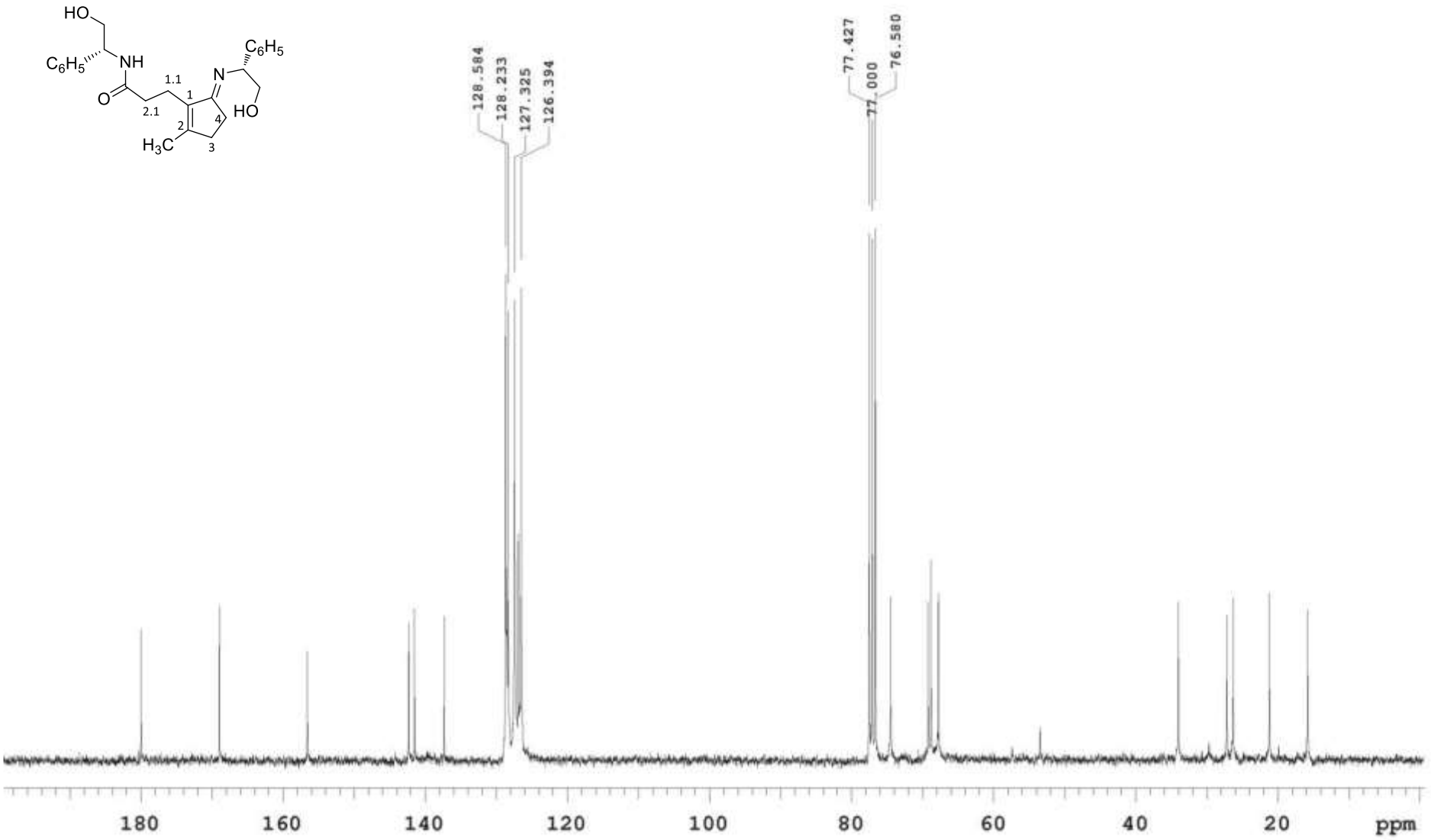
***tert*-Butyl (*R*)-5-[*N*-(2-hydroxy-1-phenylethyl)imino]-2-methyl-1-cyclopentenepropionate (8)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C**



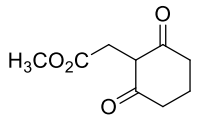
***tert*-Butyl (*R*)-5-[*N*-(2-hydroxy-1-phenylethyl)imino]-2-methyl-1-cyclopentenepropionate (8)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C**

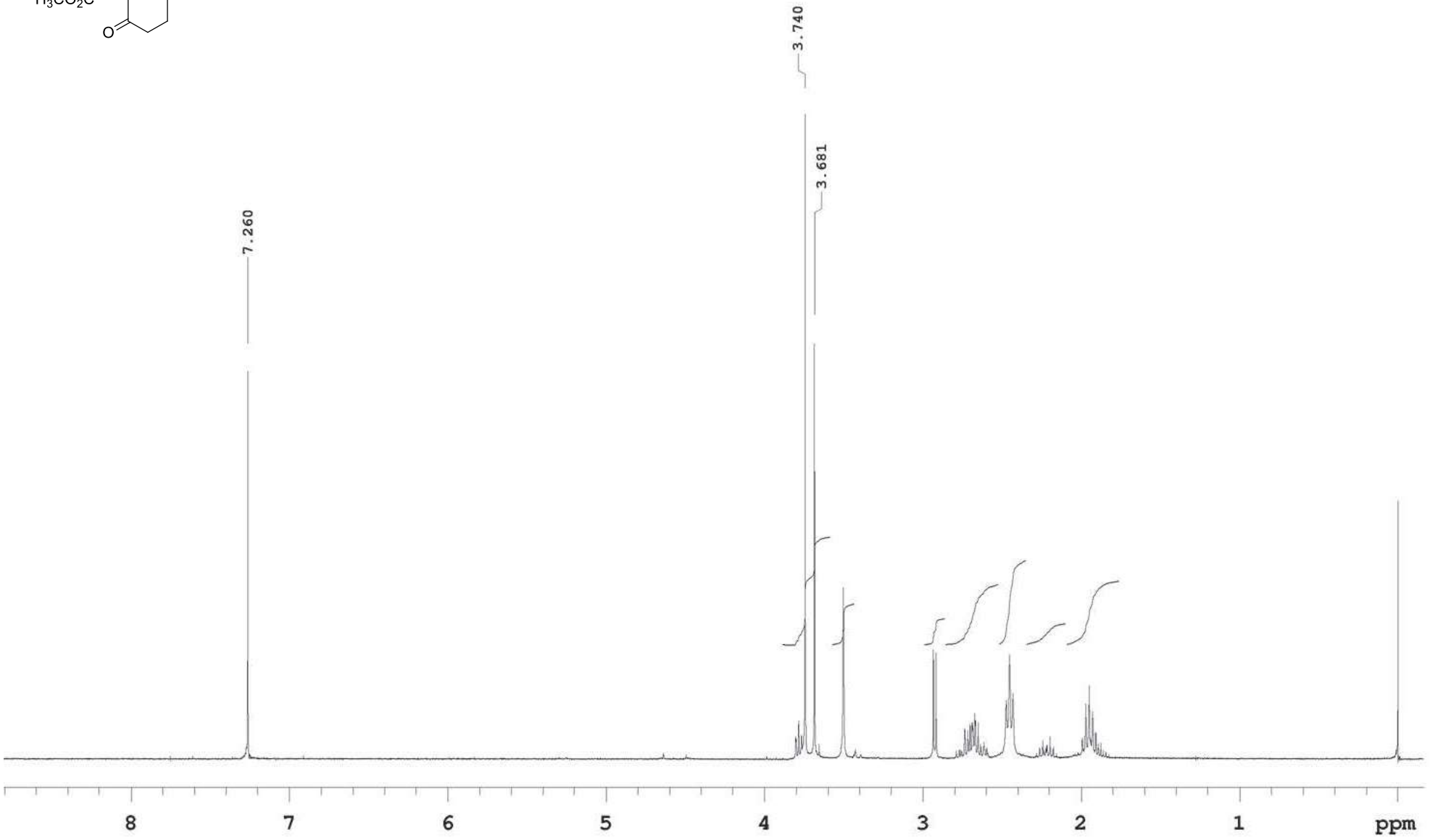


N-[(1*R*)-2-hydroxy-1-phenylethyl]-5-{[(1*R*)-*N*-(2-hydroxy-1-phenylethyl)imino]}-2-methyl-1-cyclopentenepropionamide (9)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C

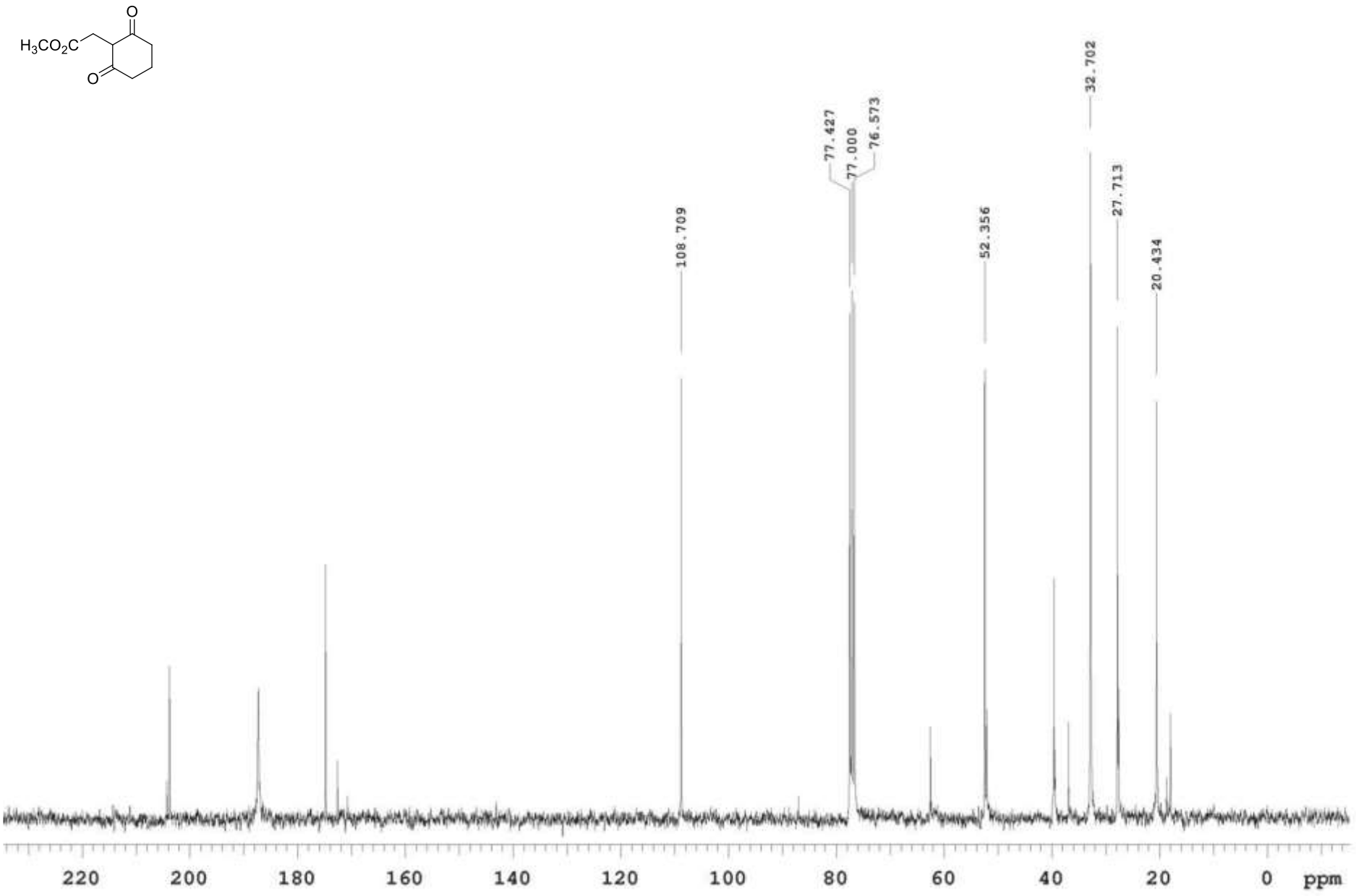


N-[(1*R*)-2-hydroxy-1-phenylethyl]-5-{[(1*R*)-*N*-(2-hydroxy-1-phenylethyl)imino]}-2-methyl-1-cyclopentenepropionamide (9)-^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C

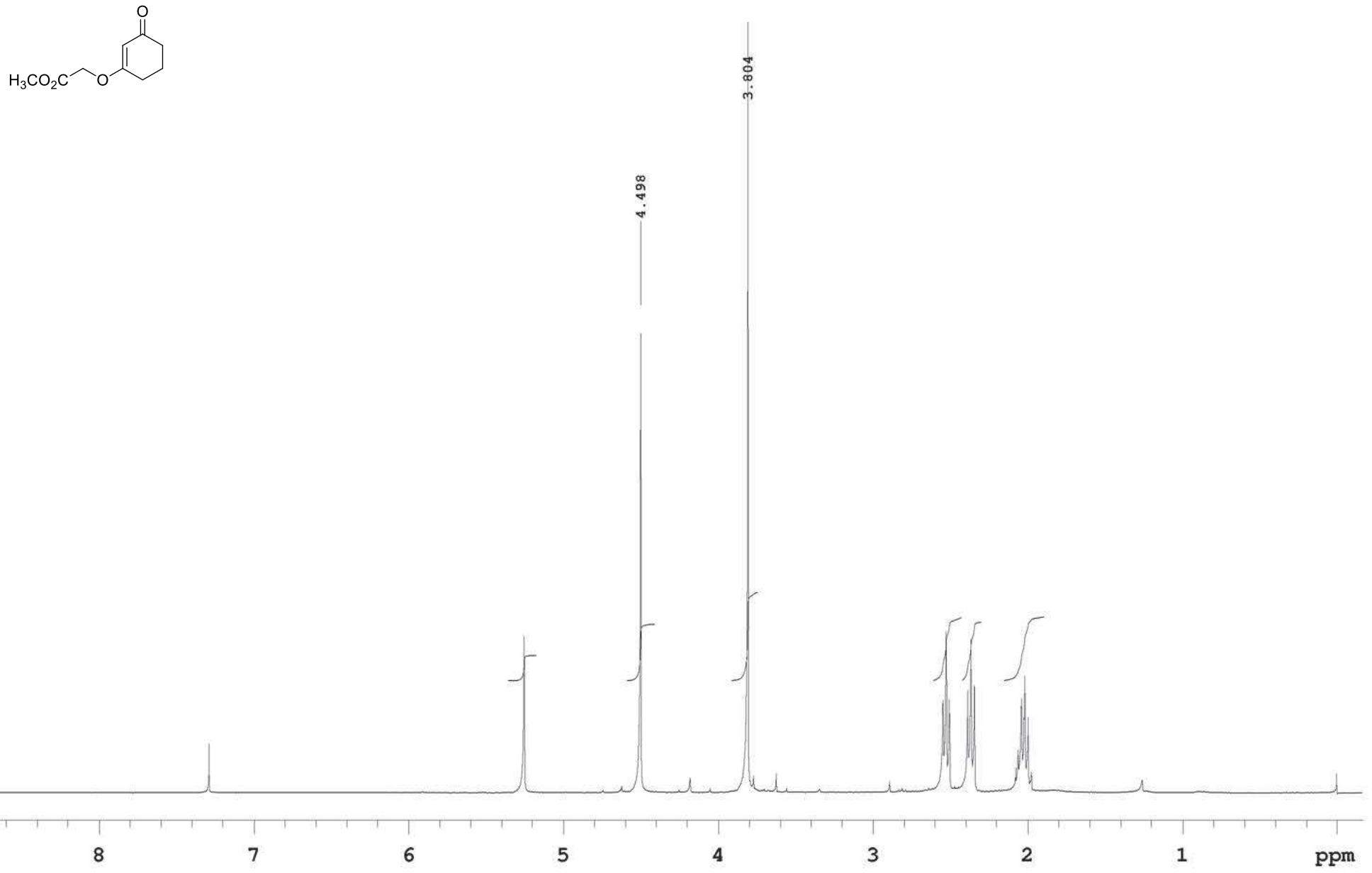




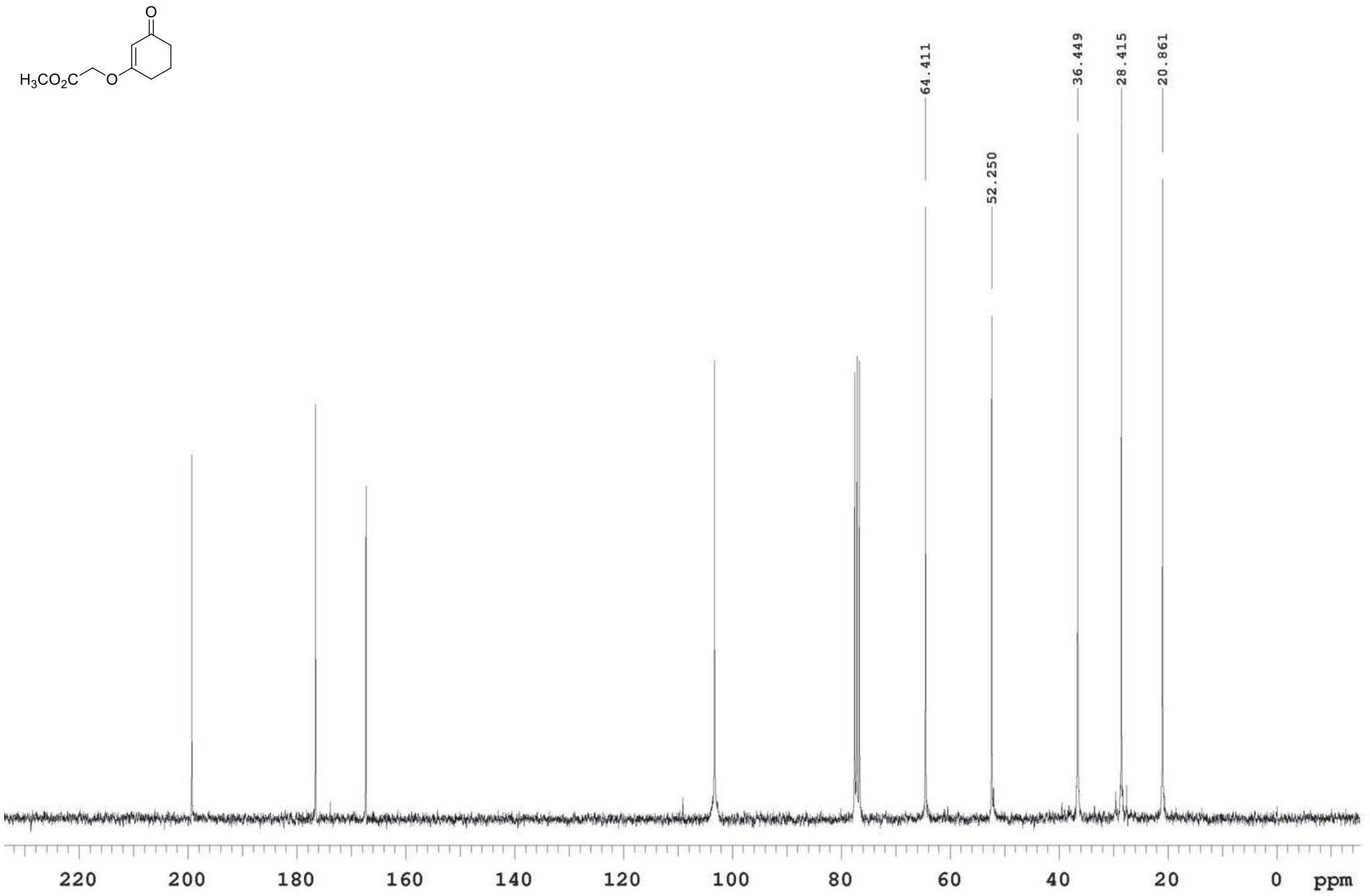
Methyl 2,6-dioxocyclohexaneacetate (12)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C



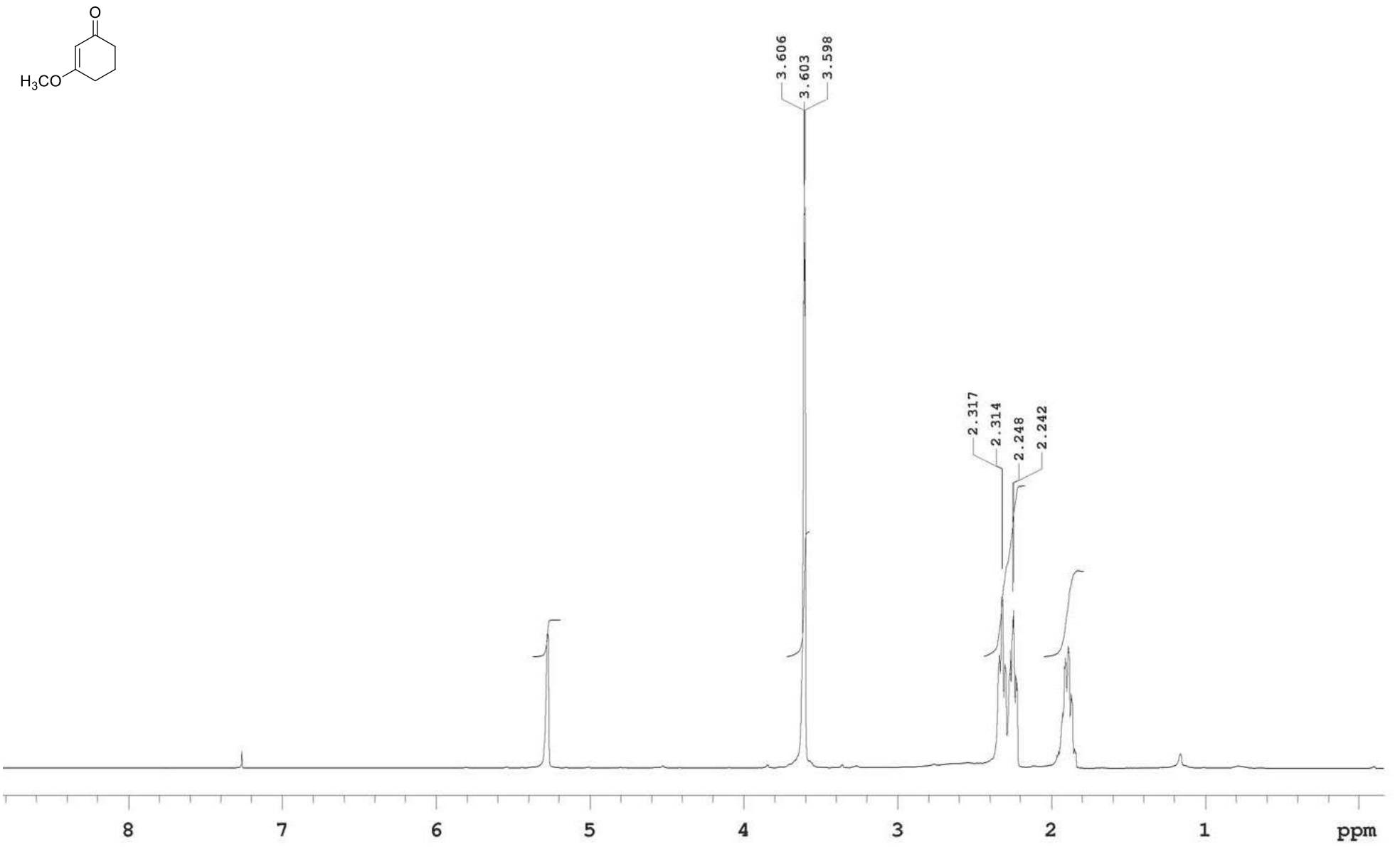
Methyl 2,6-dioxocyclohexaneacetate (12)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C



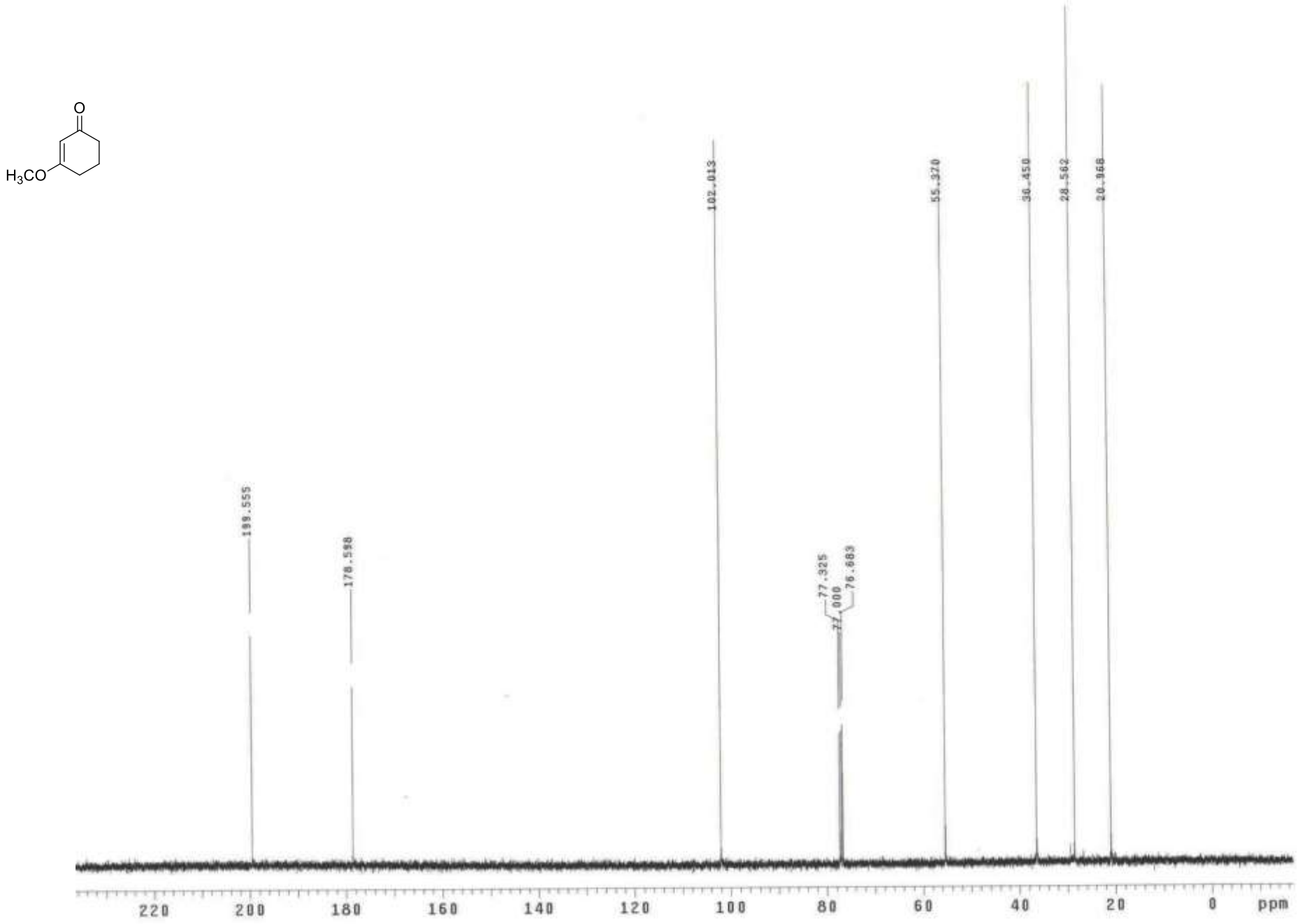
Methyl (3-oxycyclohex-1-enyloxy)acetate (13)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C



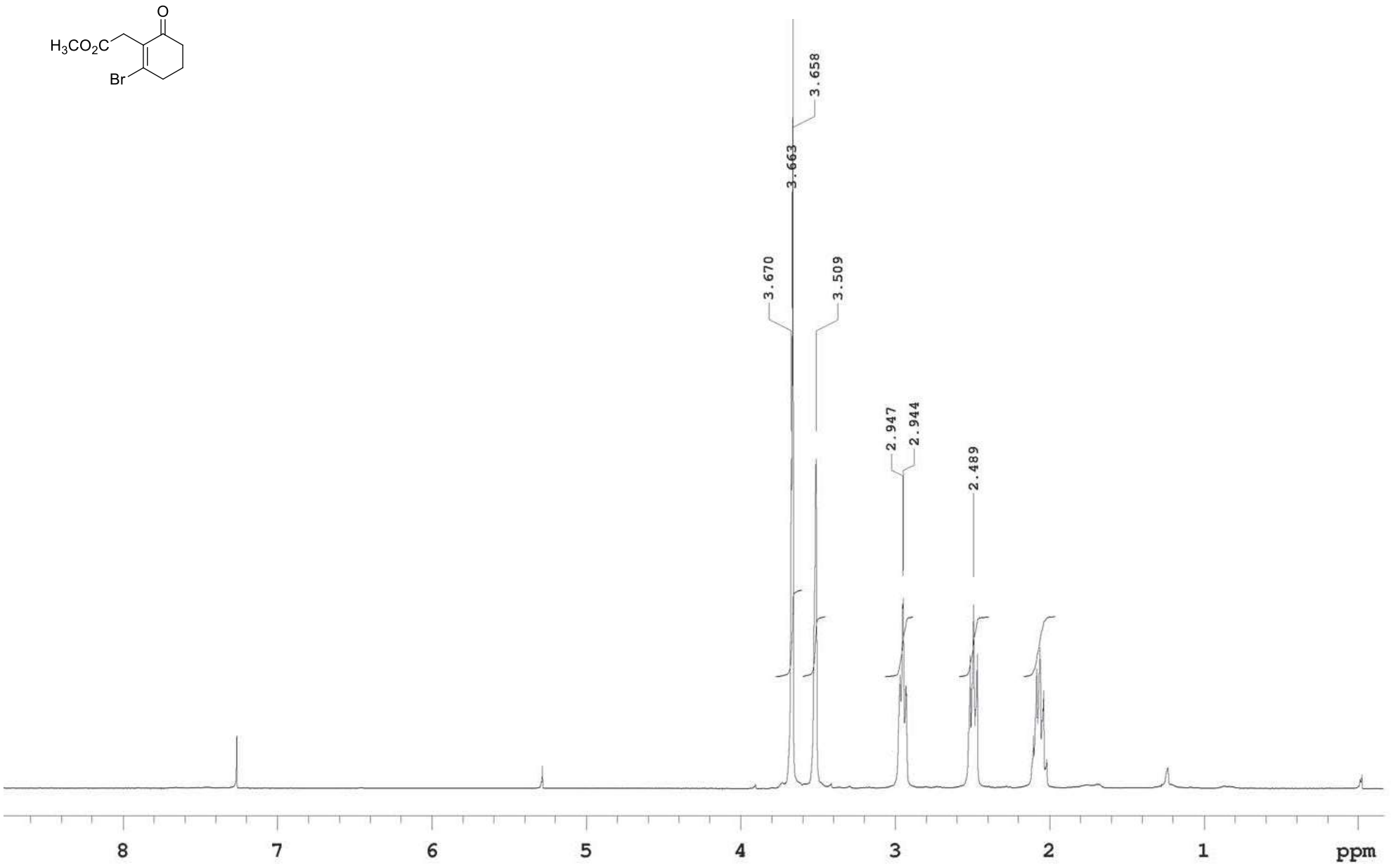
Methyl (3-oxycyclohex-1-enyloxy)acetate (13)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C



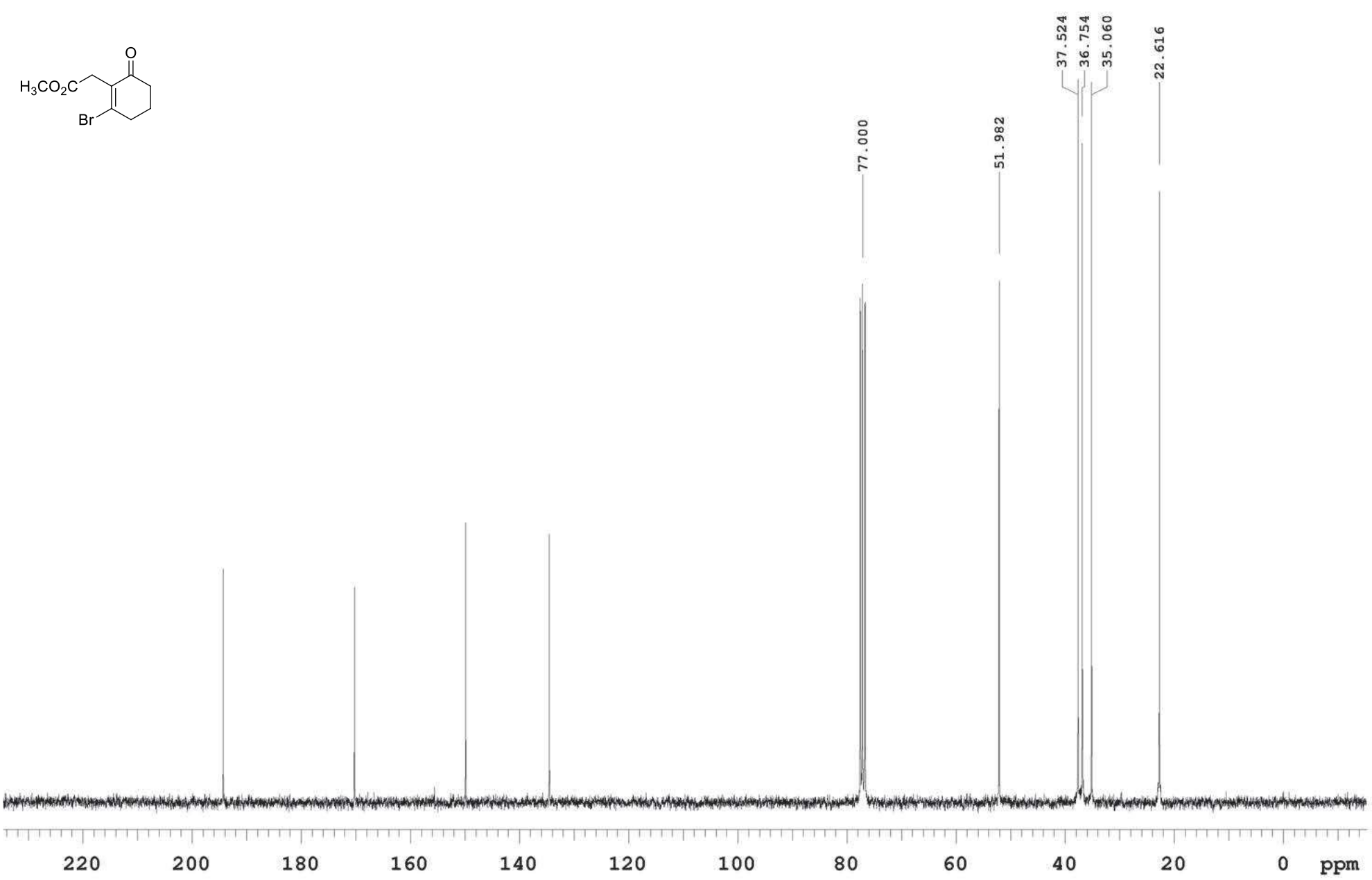
3-Methoxycyclohex-2-enone (14)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C



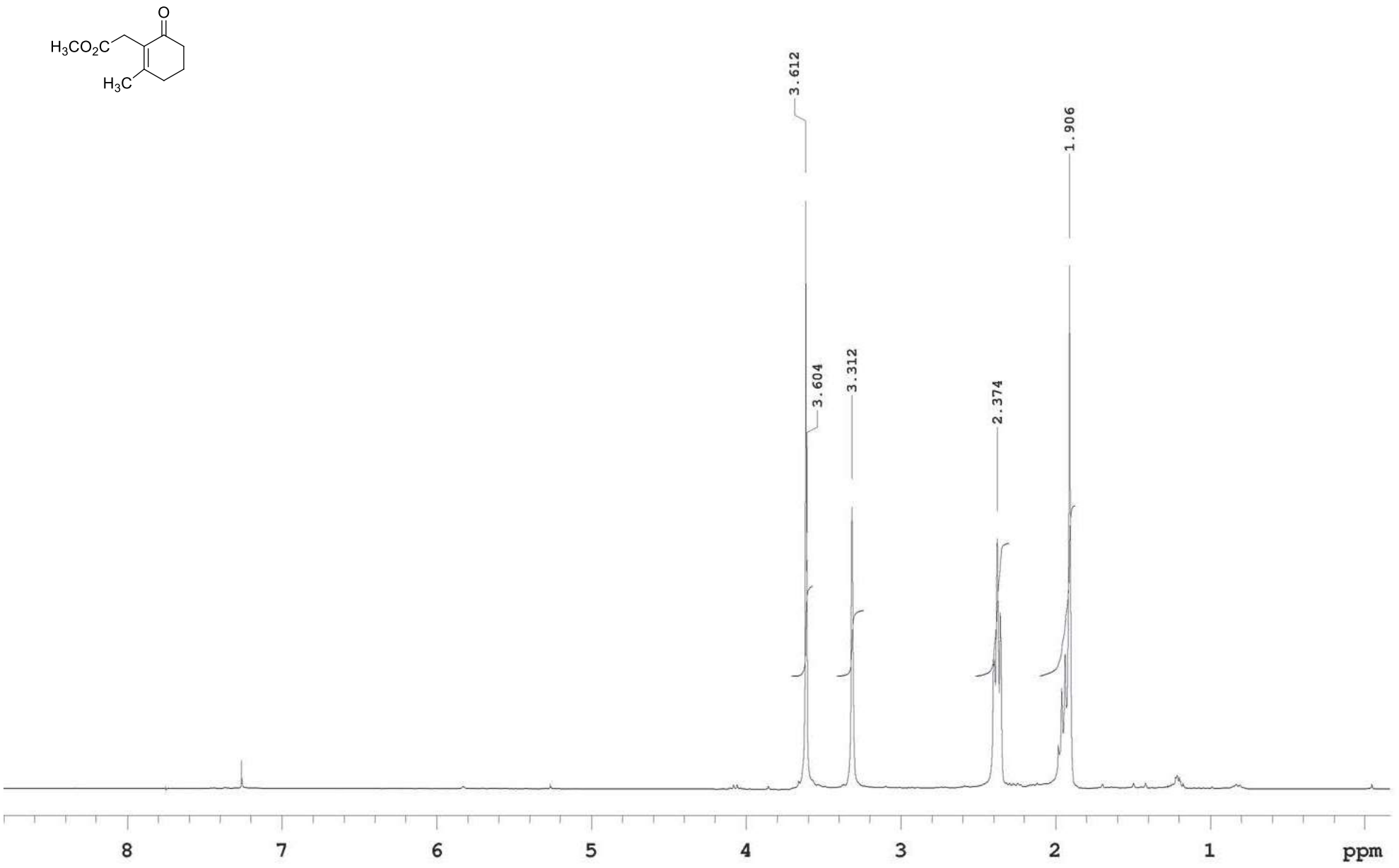
3-Methoxycyclohex-2-enone (14)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C



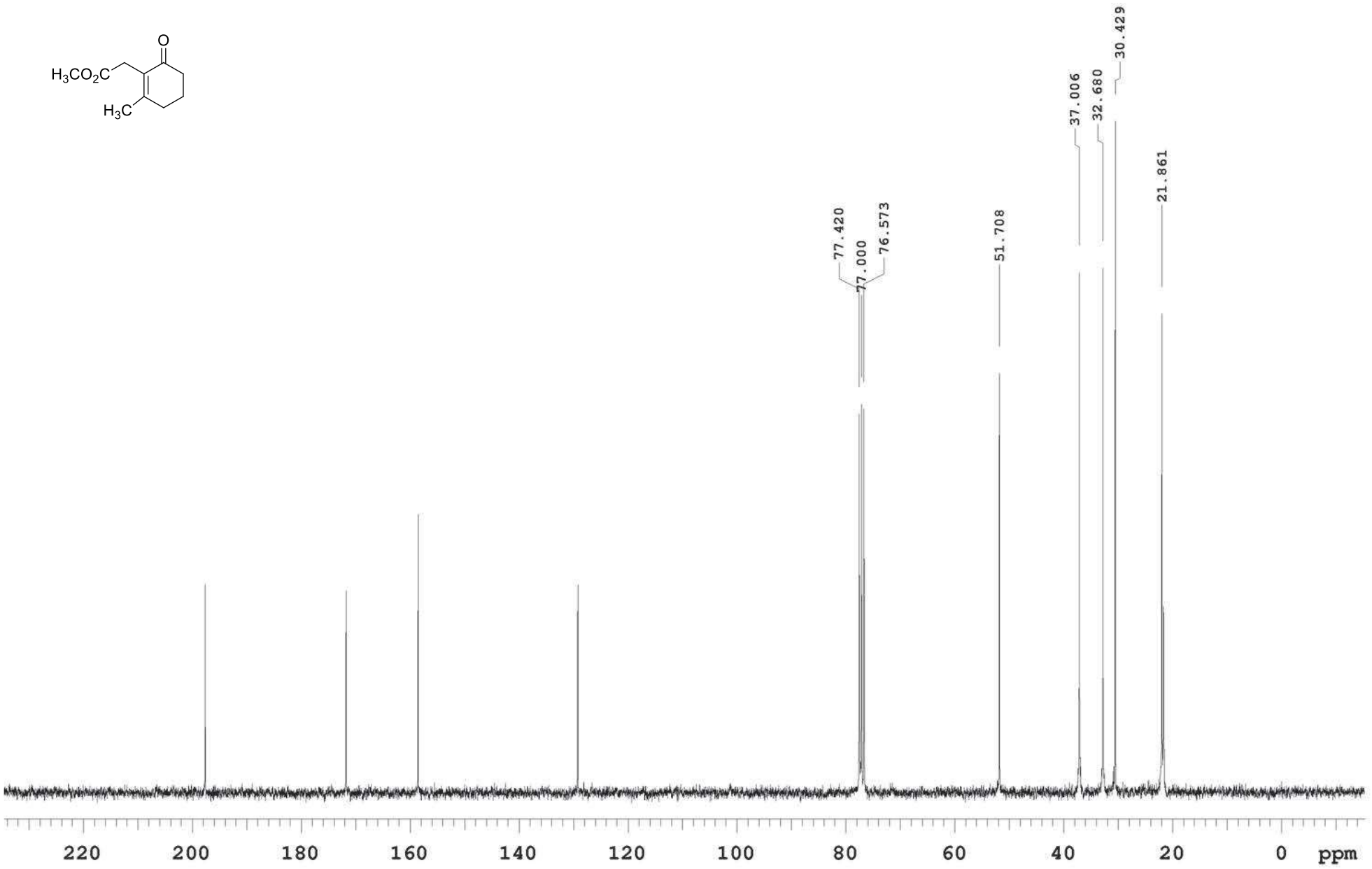
Methyl 2-bromo-6-oxocyclohexeneacetate (15)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C



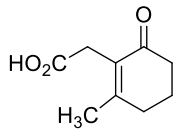
Methyl 2-bromo-6-oxocyclohexeneacetate (15)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C

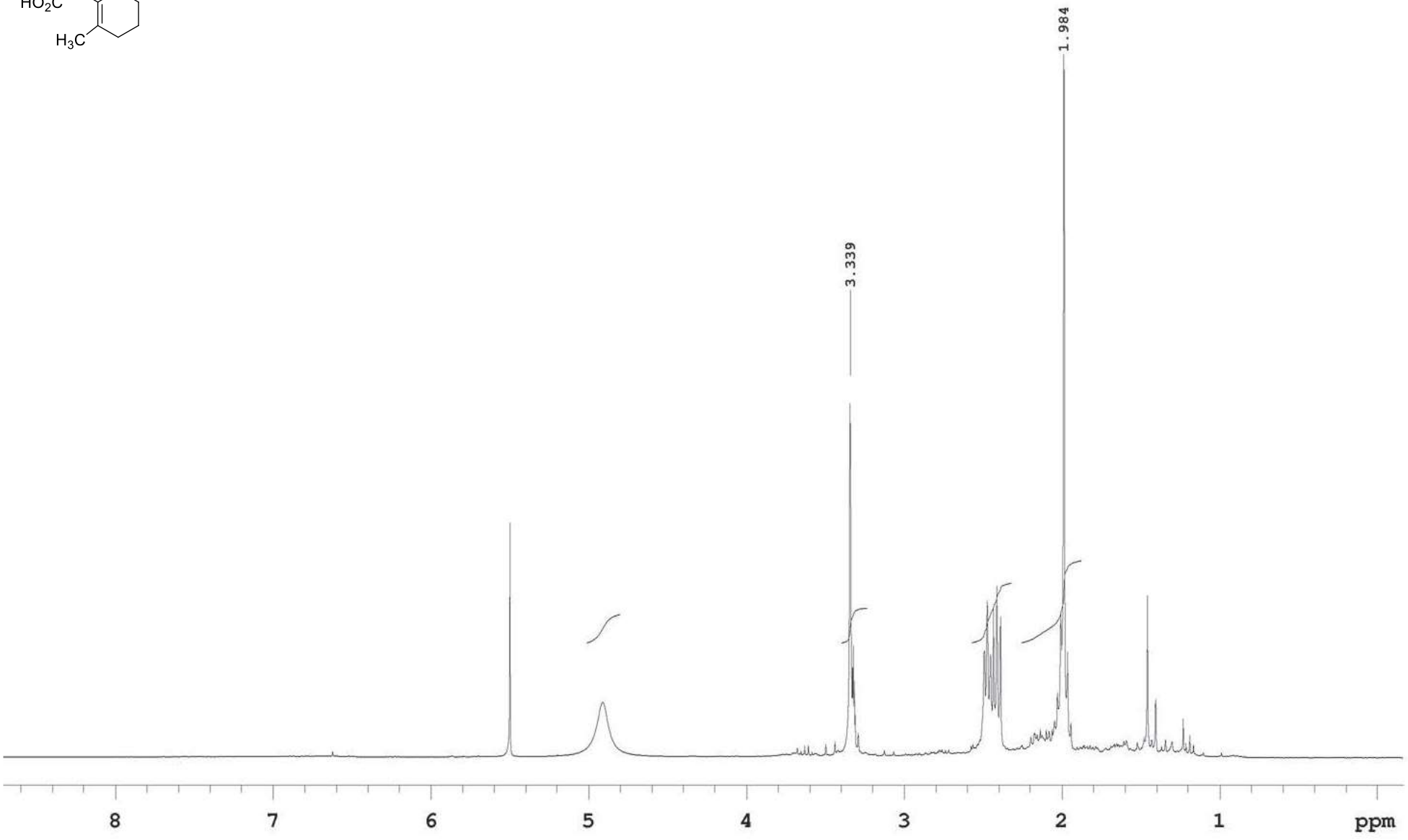


Methyl 2-methyl-6-oxocyclohexeneacetate (16)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C

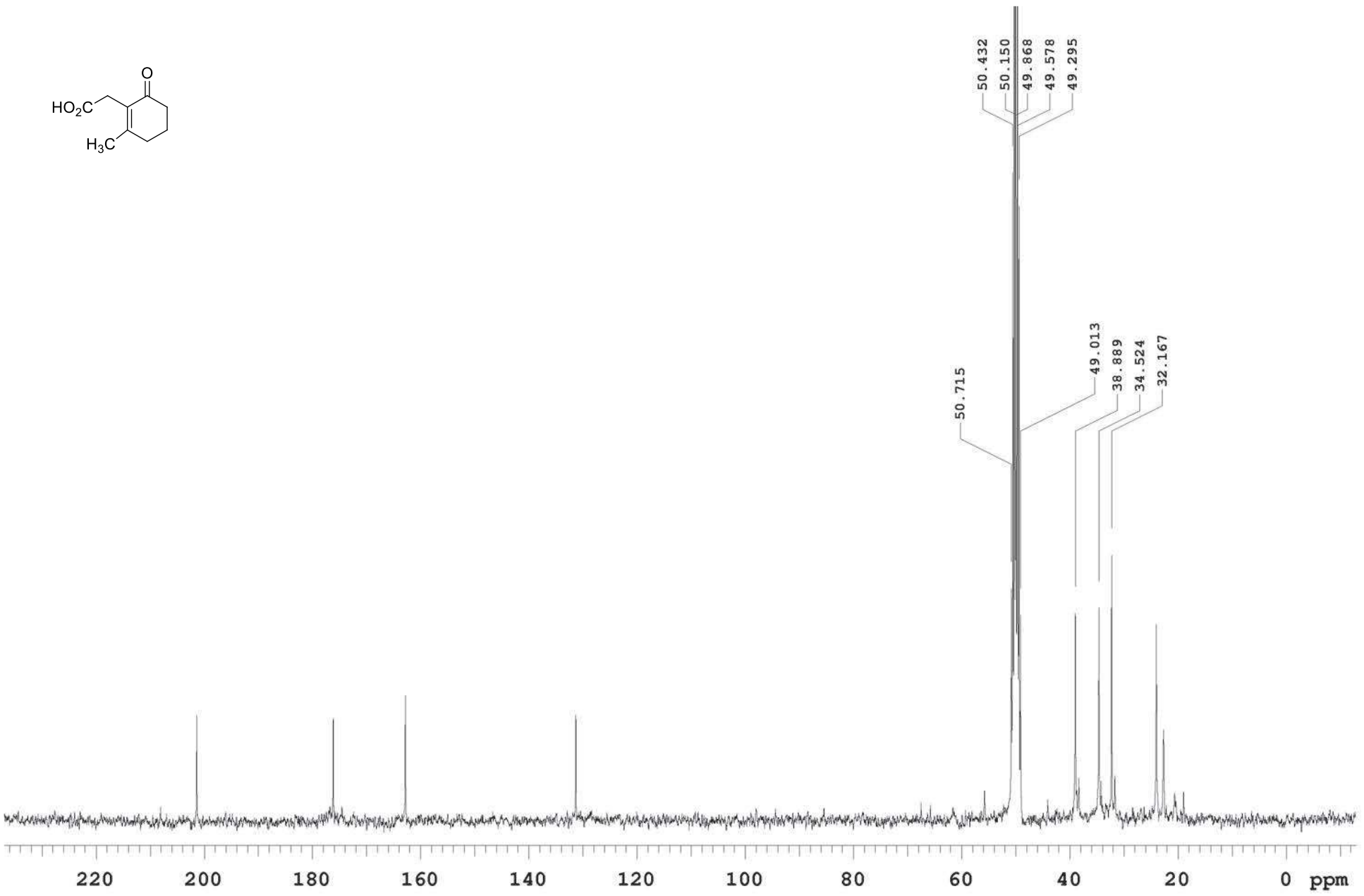


Methyl 2-methyl-6-oxocyclohexeneacetate (16)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C

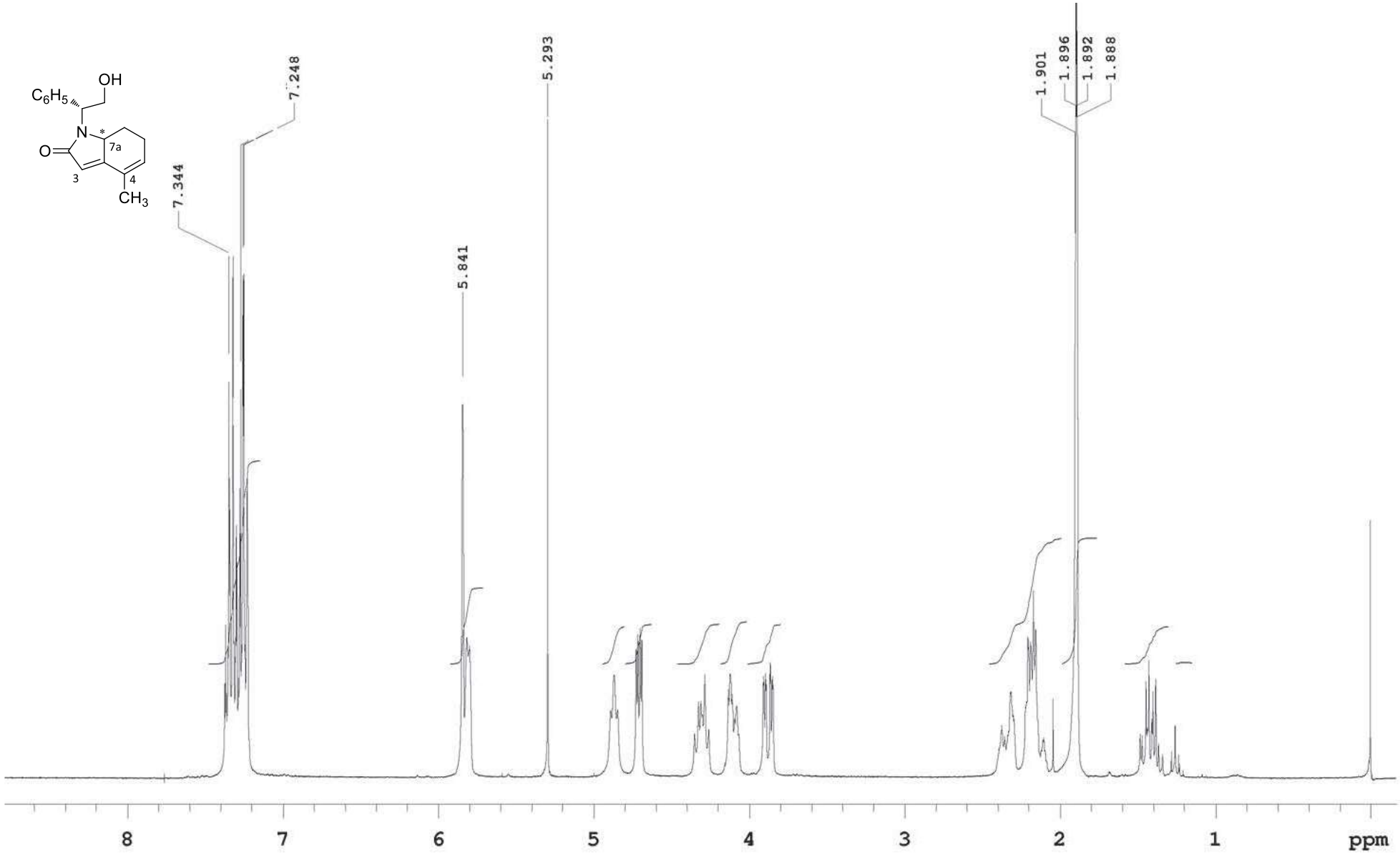




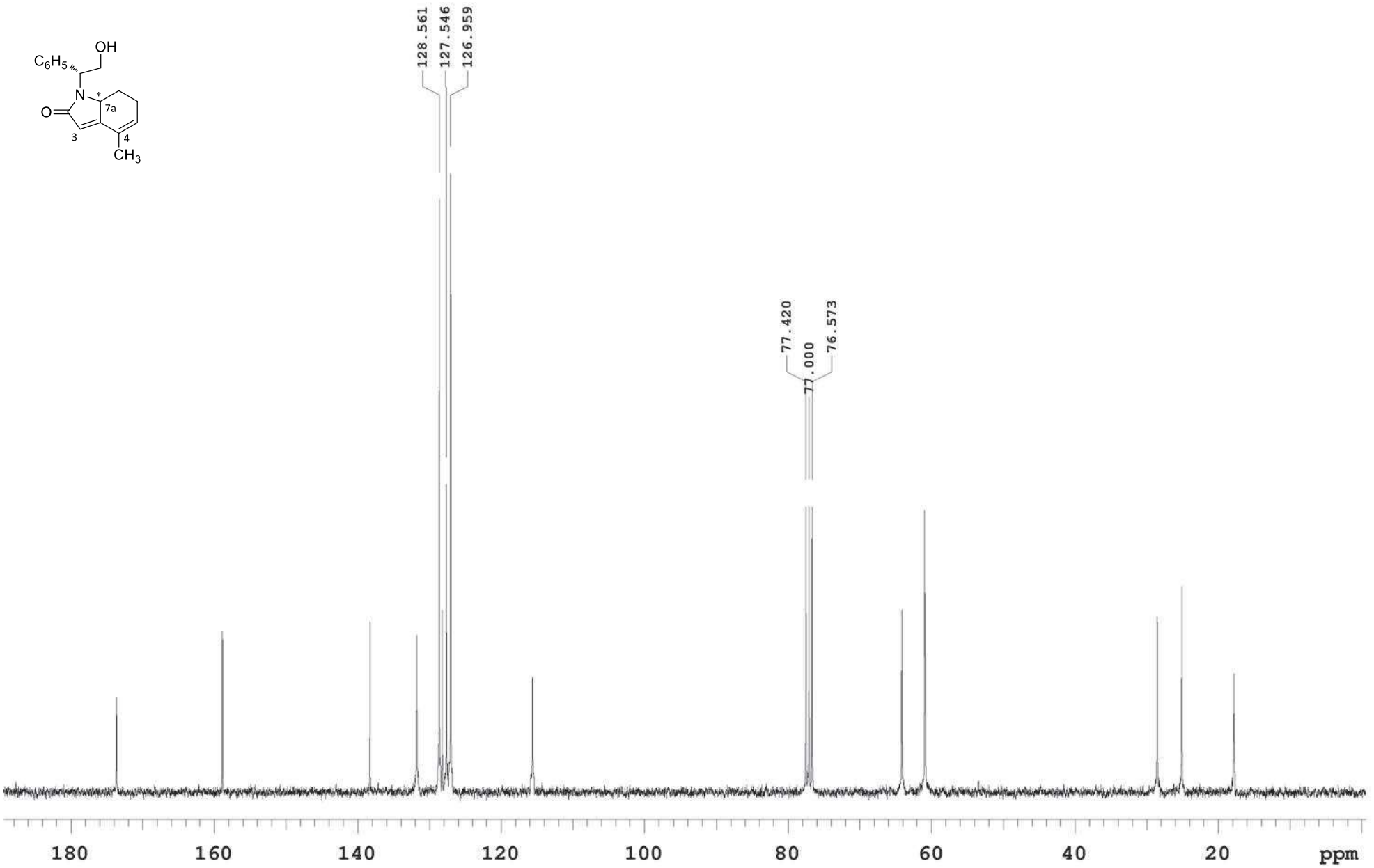
2-Methyl-6-oxocyclohexeneacetic acid (17)- ^{1}H- NMR, CD_3OD, 300 MHz, 25 °C



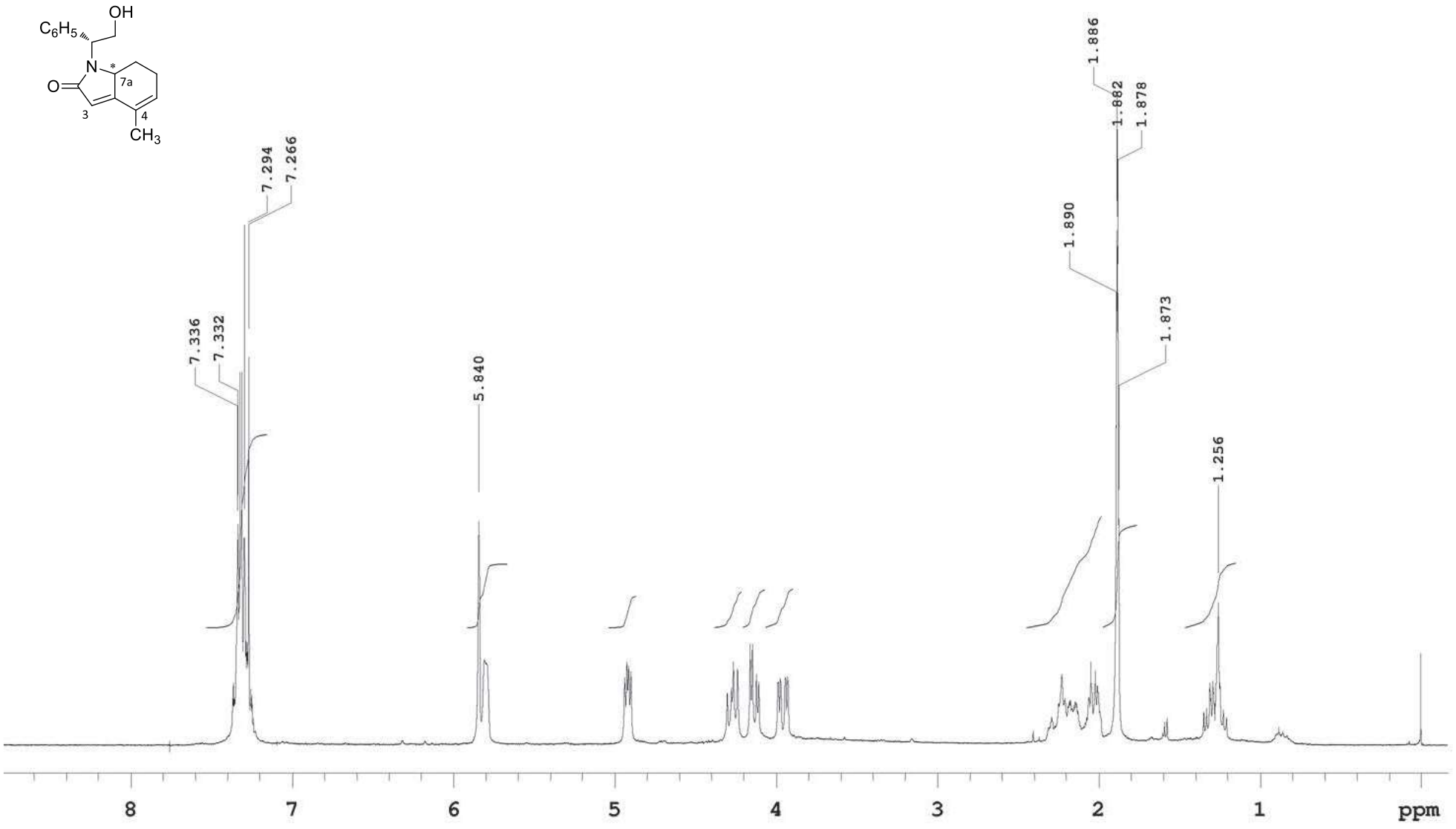
2-Methyl-6-oxocyclohexeneacetic acid (17)- ^{13}C- NMR, CD_3OD, 75.4 MHz, 25 °C



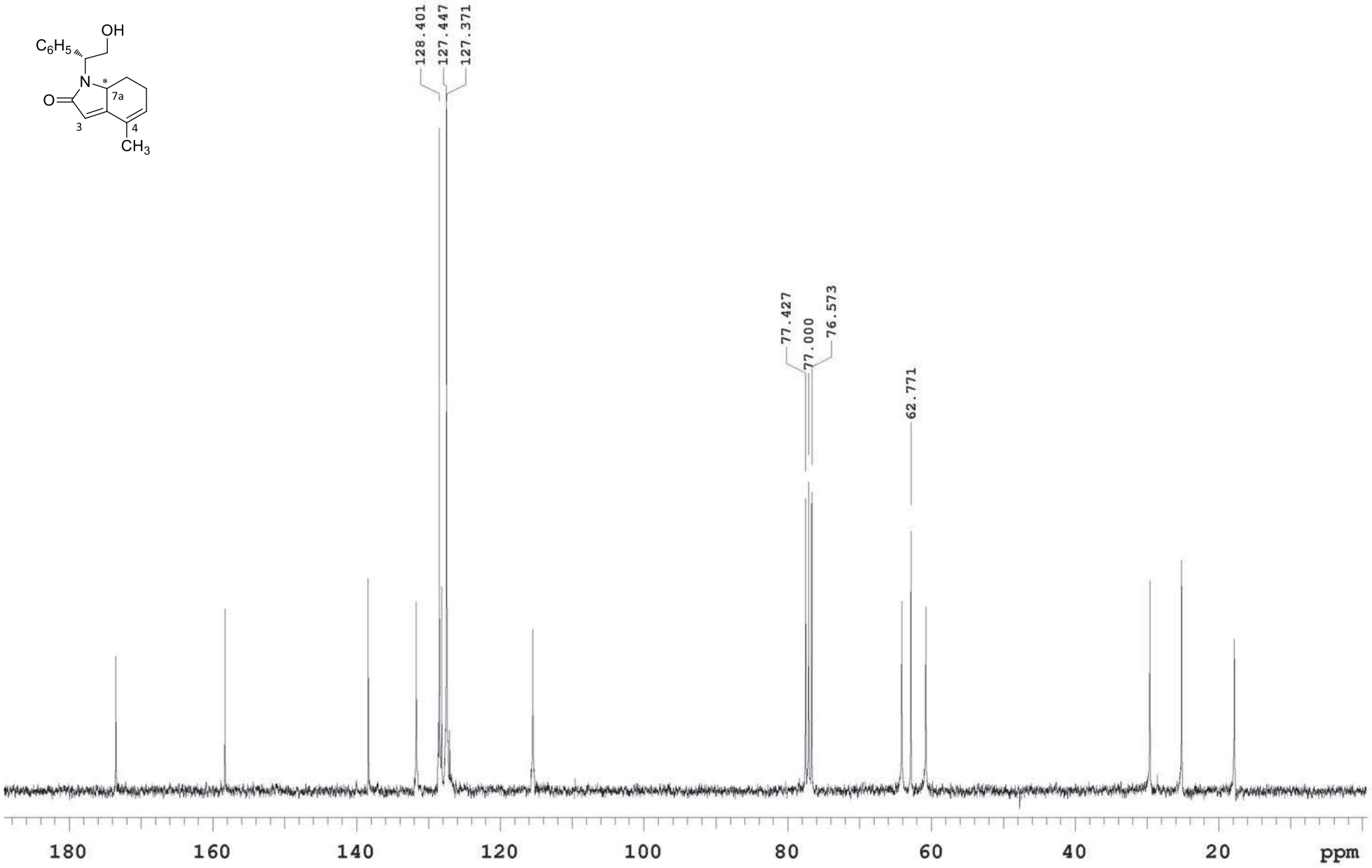
1-[(1*R*)-2-Hydroxy-1-phenylethyl]-4-methyl-2-oxo-2,6,7,7a-tetrahydroindole (18a)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C



1-[(1*R*)-2-Hydroxy-1-phenylethyl]-4-methyl-2-oxo-2,6,7,7a-tetrahydroindole (18a)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C

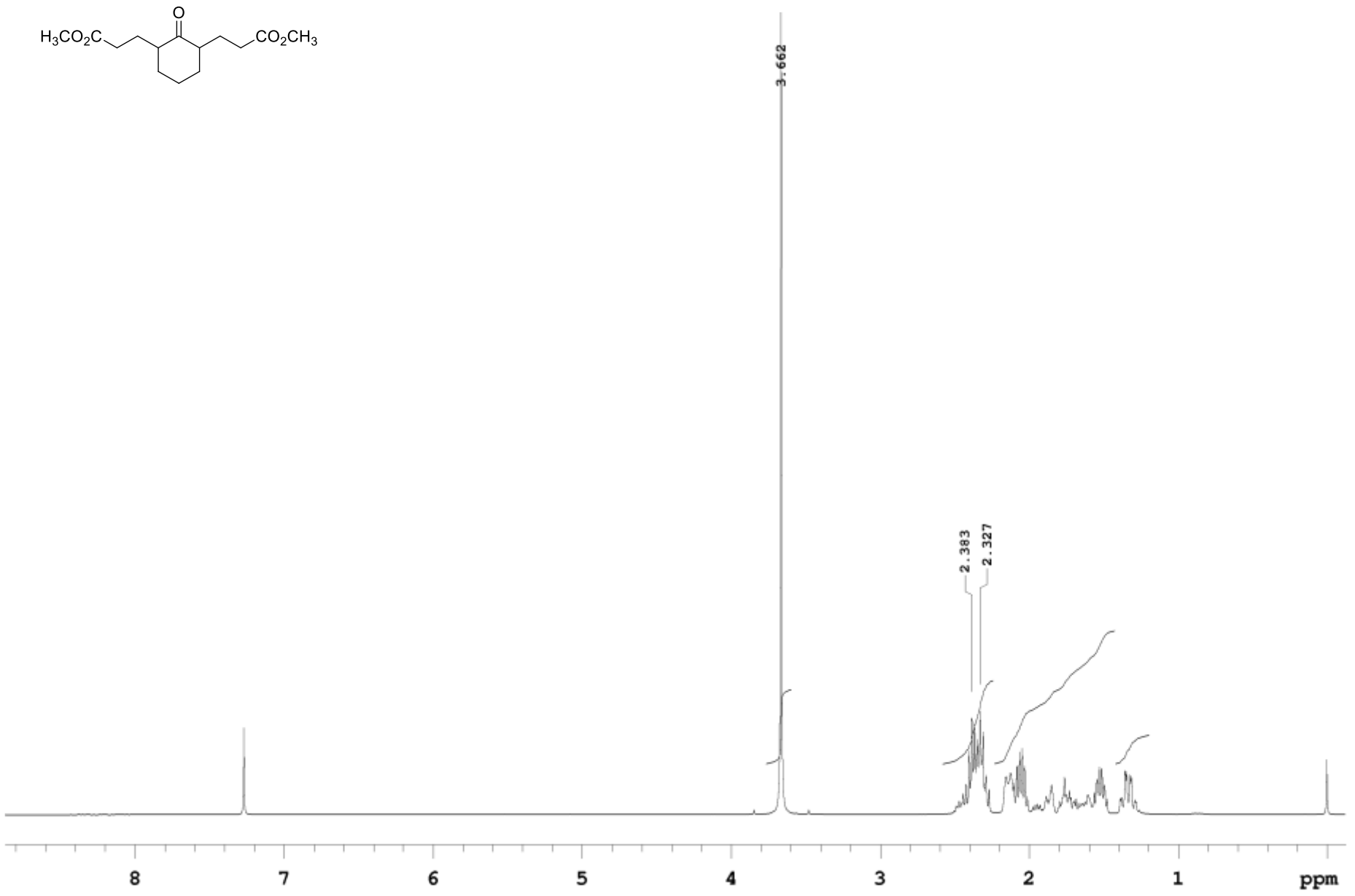


1-[(1*R*)-2-Hydroxy-1-phenylethyl]-4-methyl-2-oxo-2,6,7,7a-tetrahydroindole (18b)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C

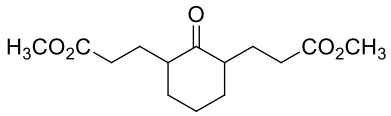


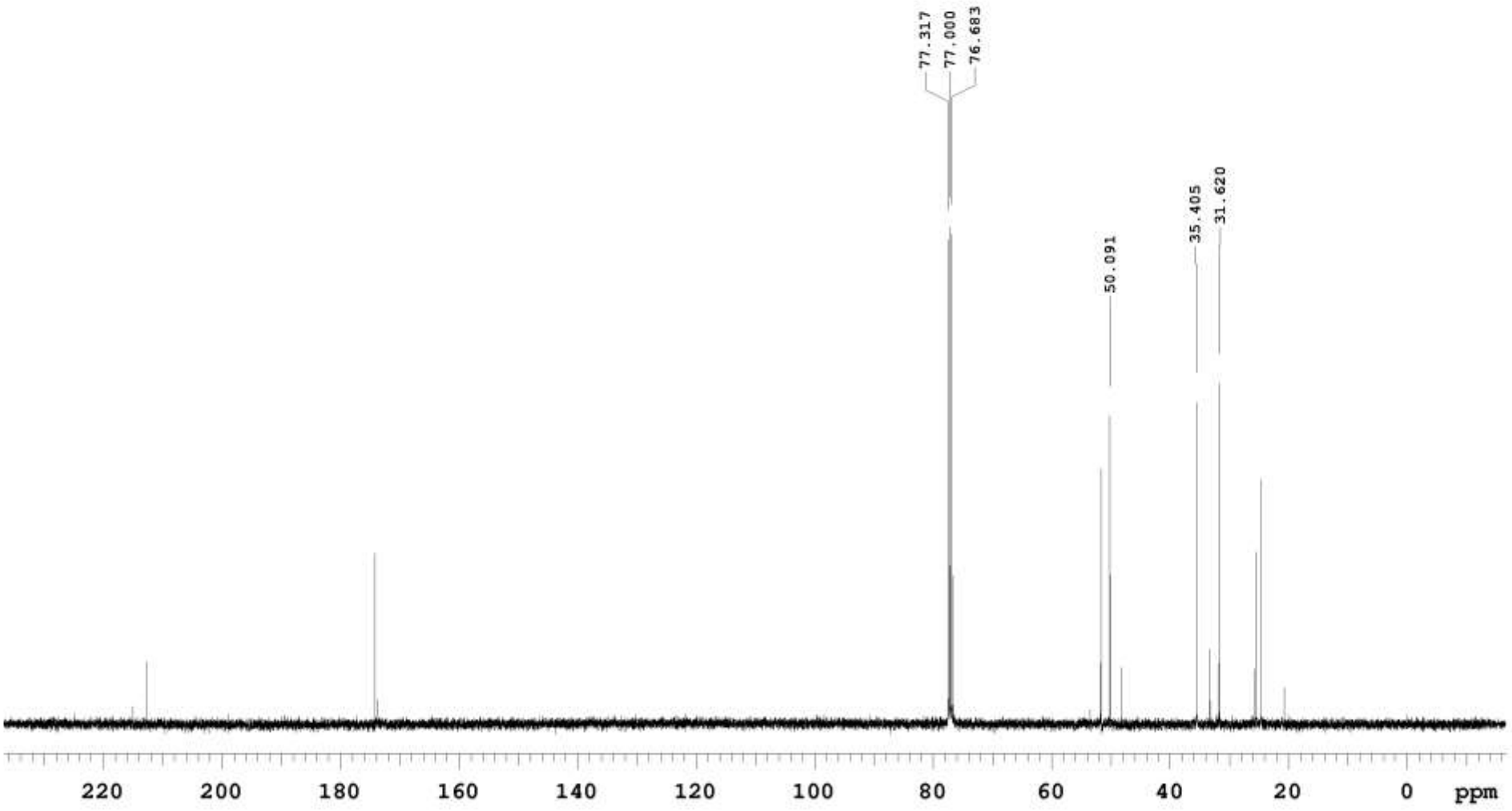
1-[(1*R*)-2-Hydroxy-1-phenylethyl]-4-methyl-2-oxo-2,6,7,7a-tetrahydroindole (18a)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C

^{1}H and ^{13}C SPECTRA CHAPTER 3

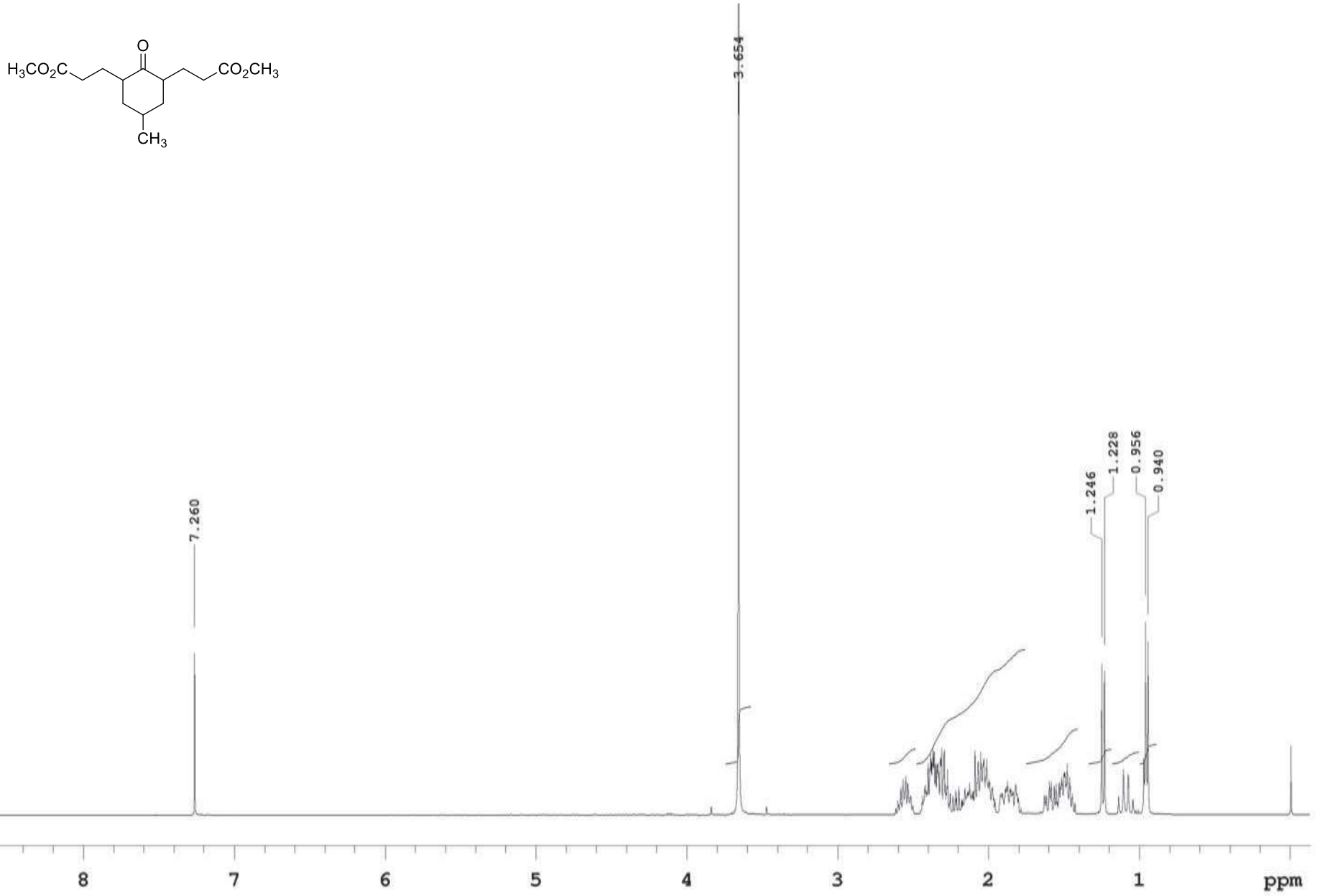


Dimethyl 2-oxo-1,3-cyclohexanedipropionate (20)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

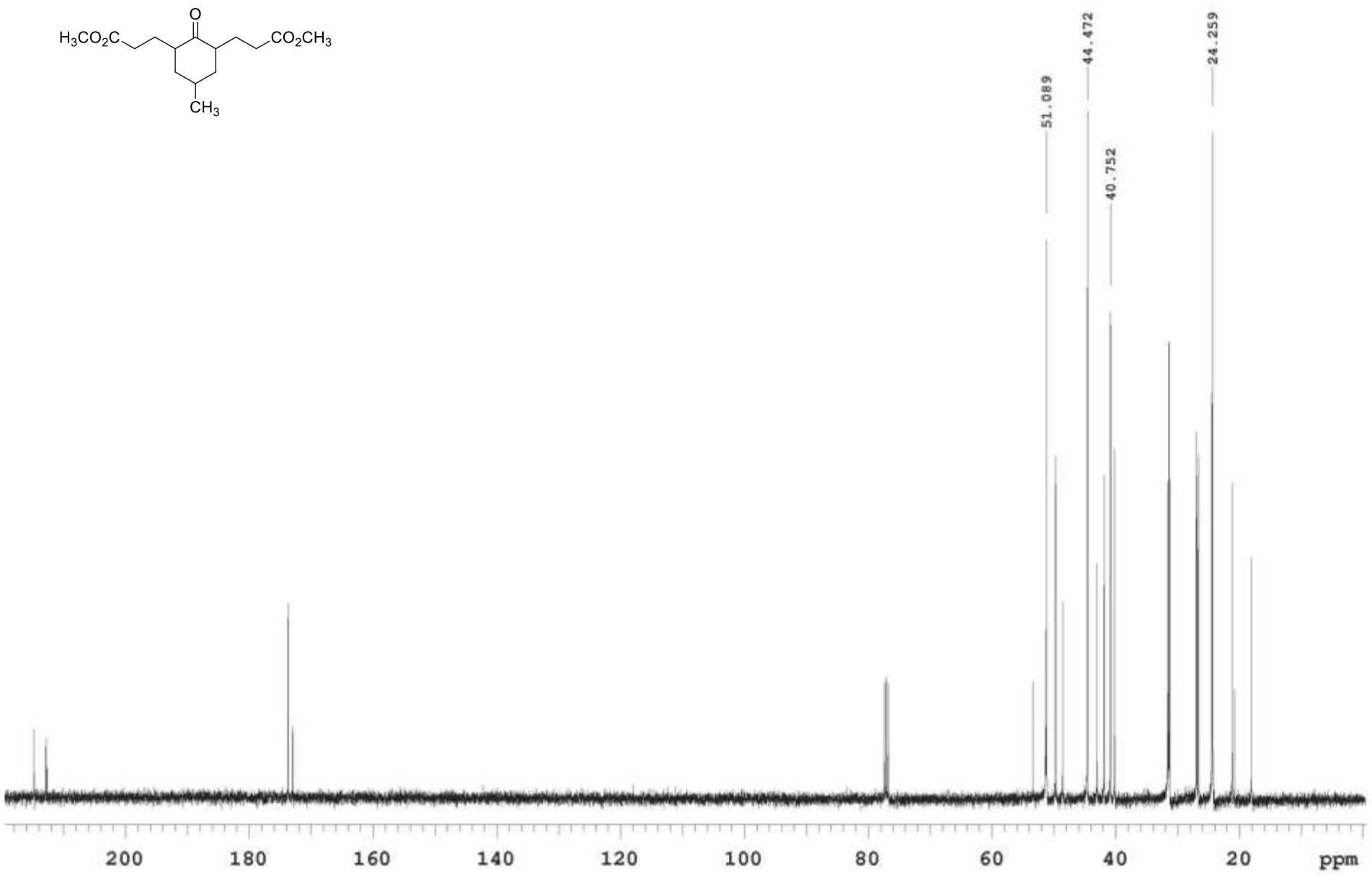




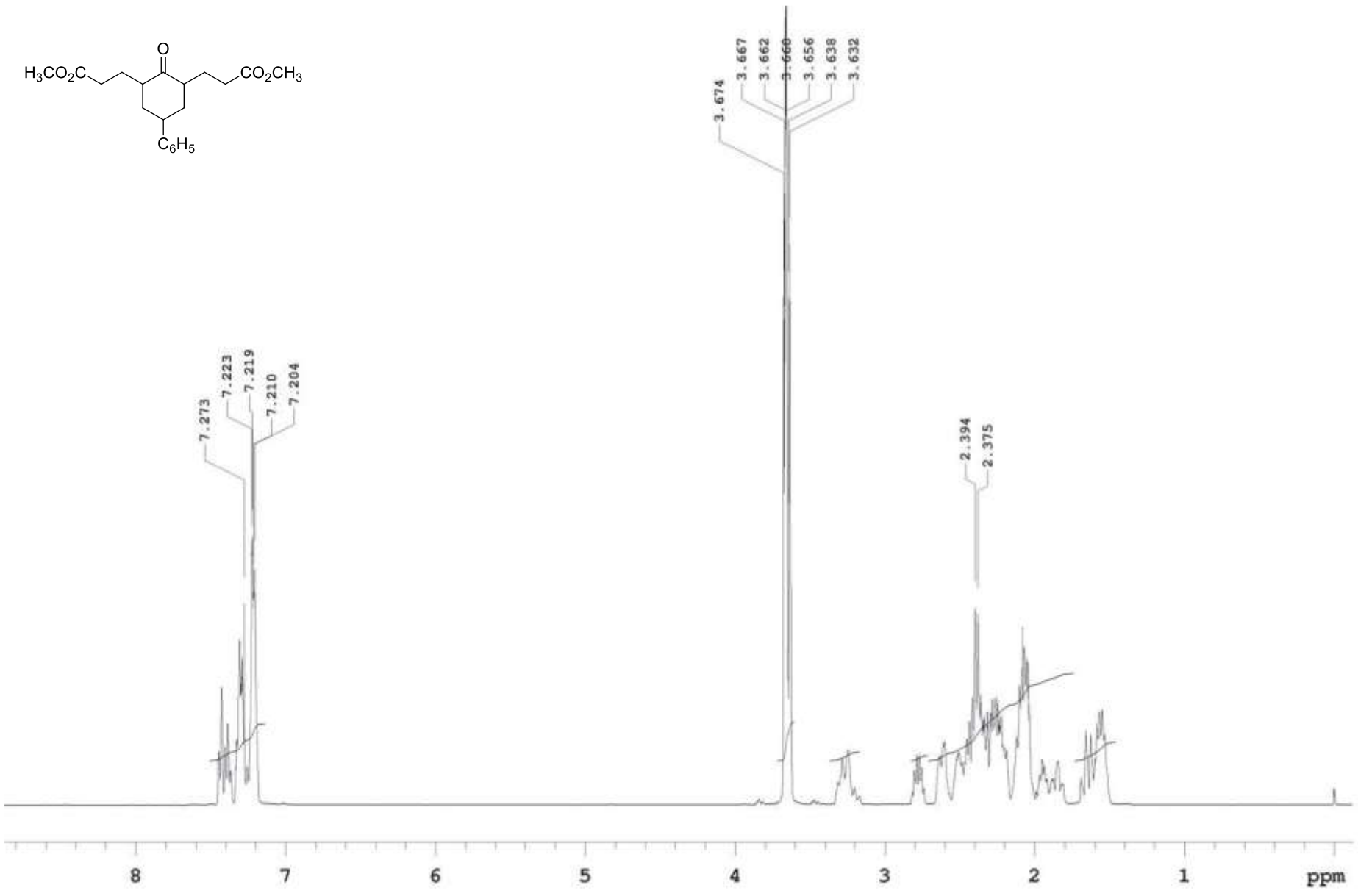
Dimethyl 2-oxo-1,3-cyclohexanedipropionate (20)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



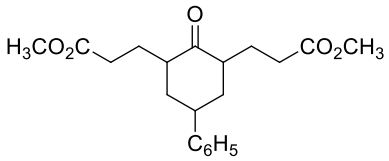
Dimethyl 5-methyl-2-oxo-1,3-cyclohexanedipropionate (21)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

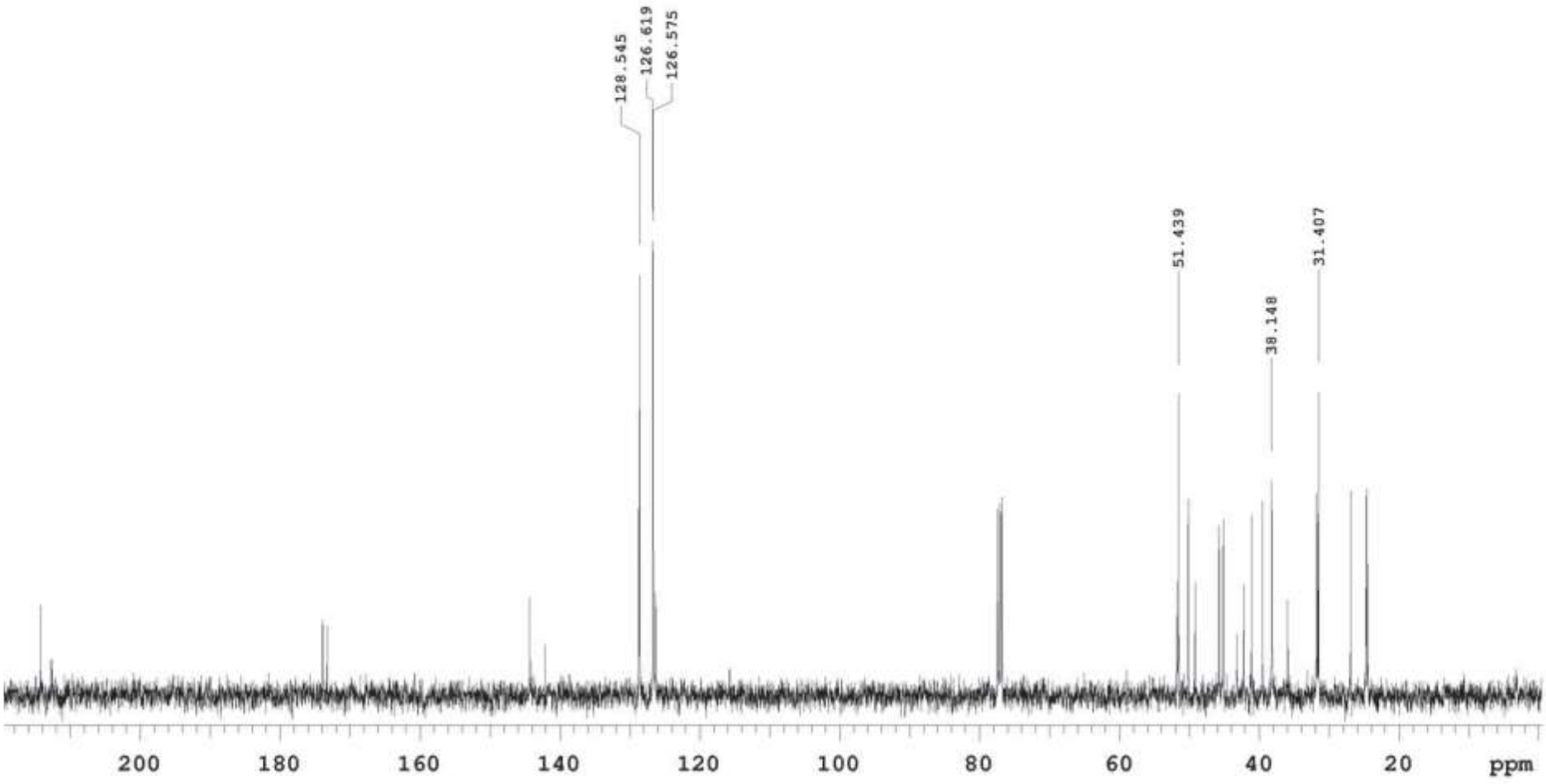


Dimethyl 5-methyl-2-oxo-1,3-cyclohexanedipropionate (21)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

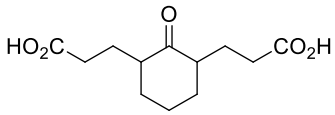


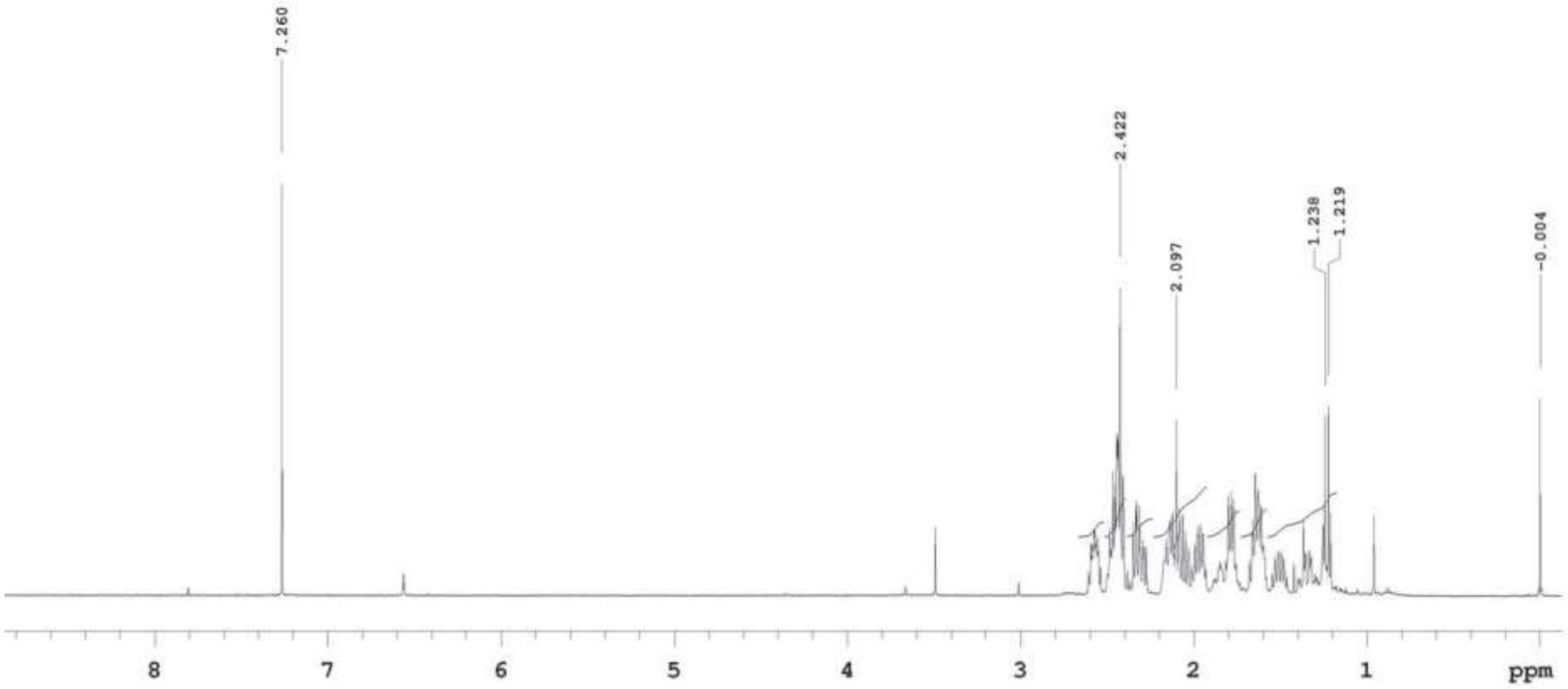
Dimethyl 2-oxo-5-phenyl-1,3-cyclohexanedipropionate (22)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



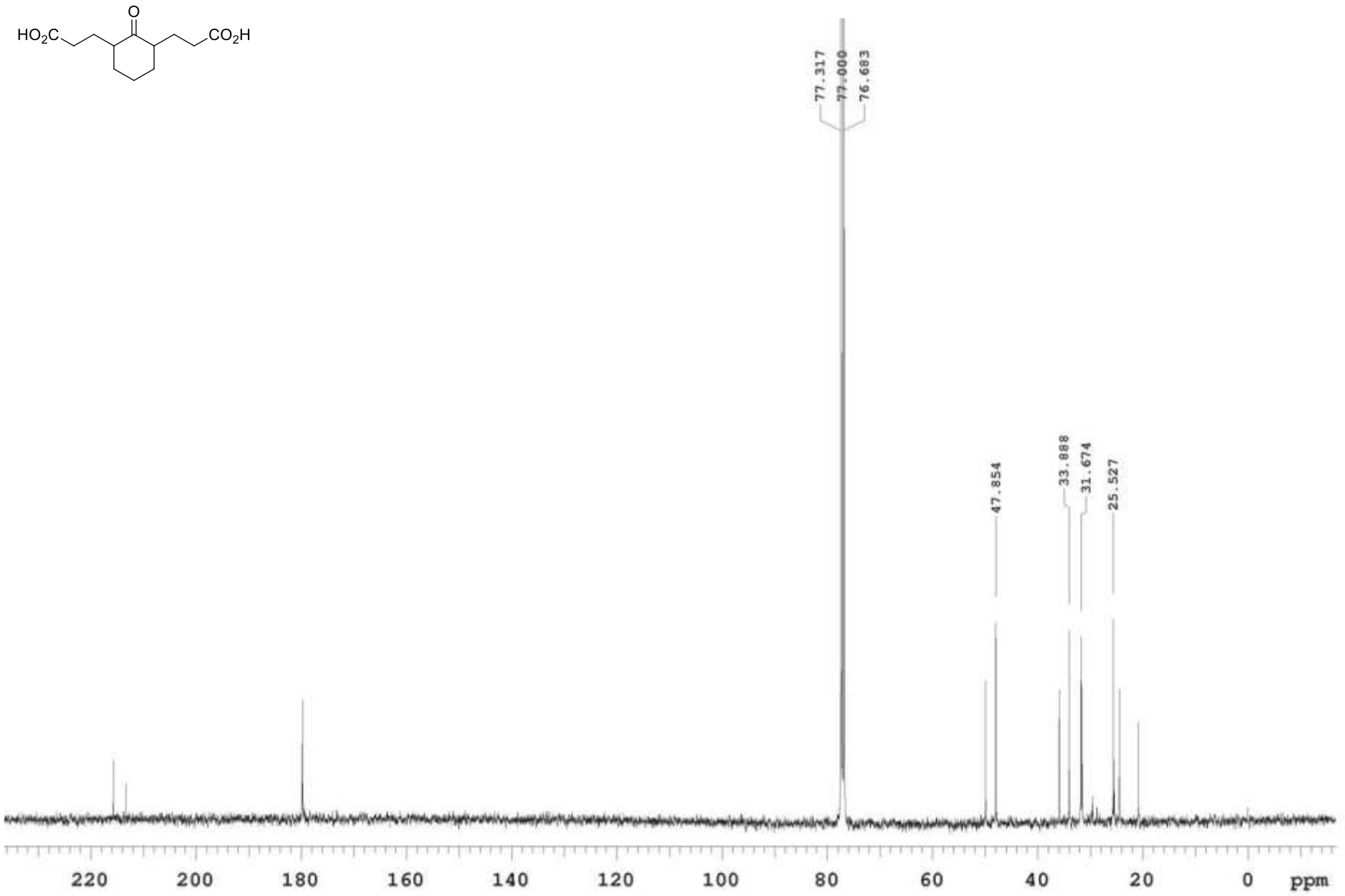


Dimethyl 2-oxo-5-phenyl-1,3-cyclohexanepropionate (22)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

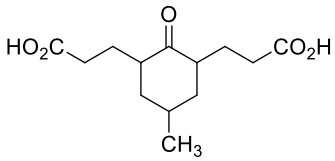


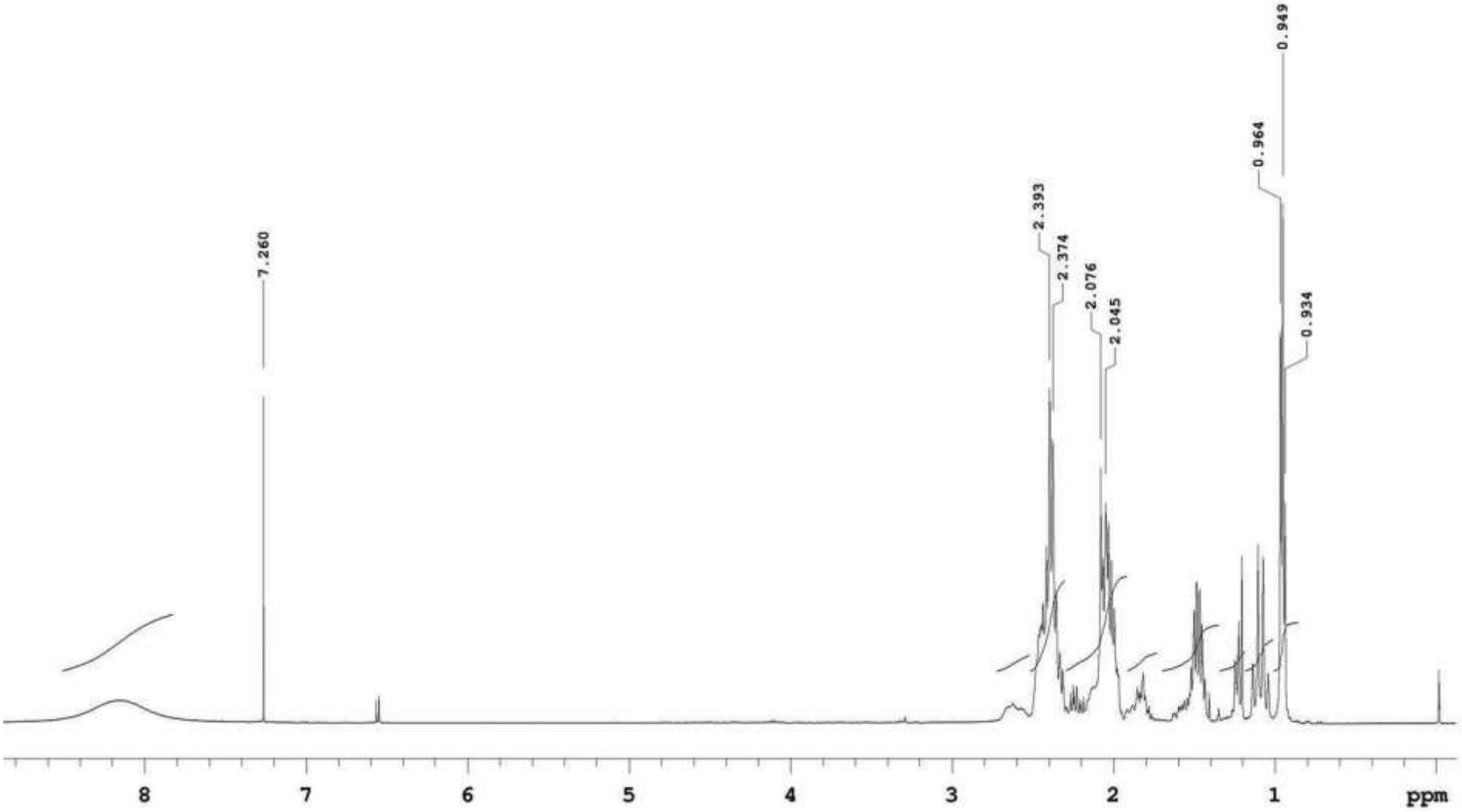


2-Oxo-1,3-cyclohexanedipropionic acid (26)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

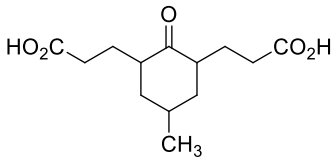


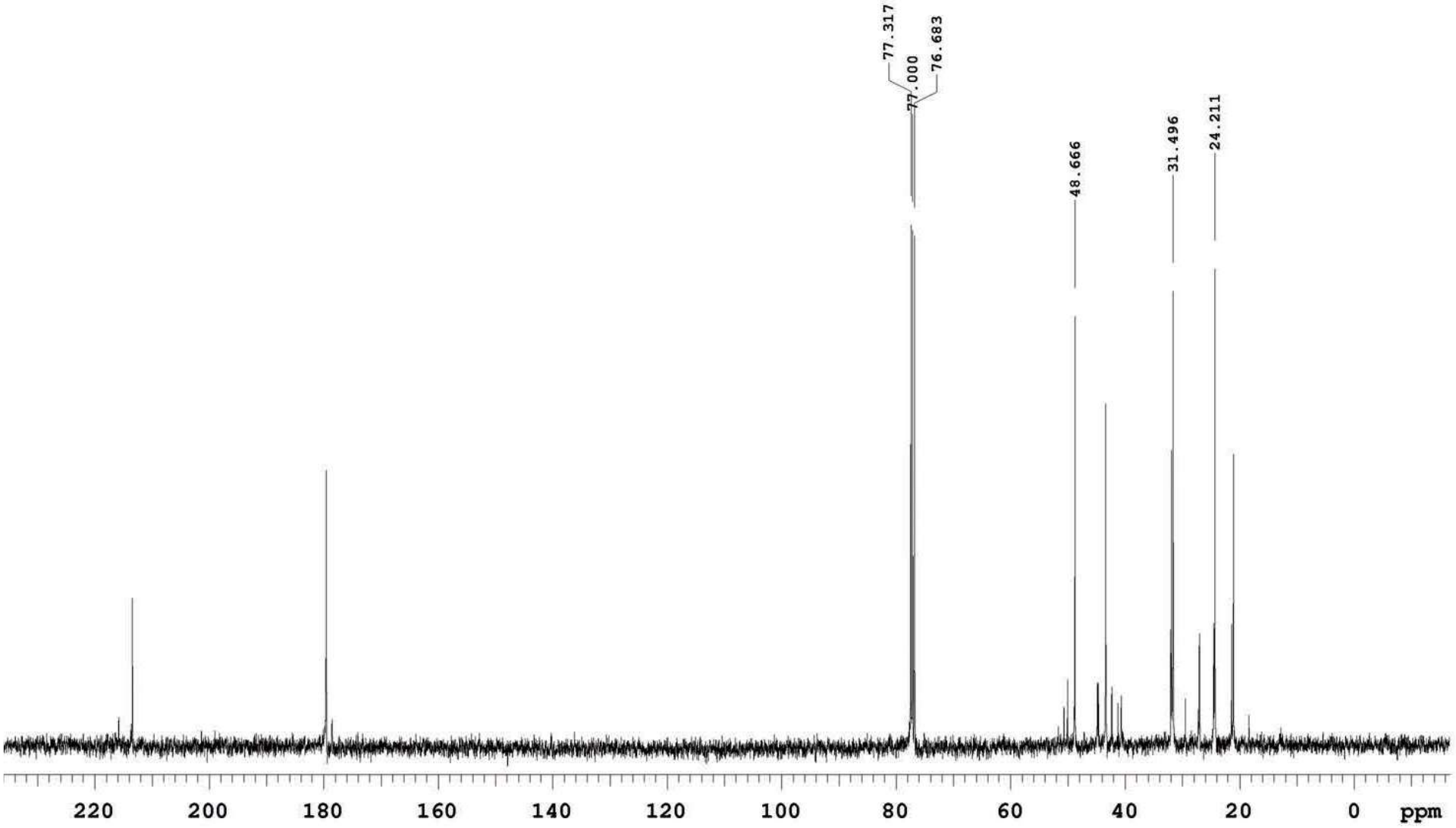
2-Oxo-1,3-cyclohexanedipropionic acid (26)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



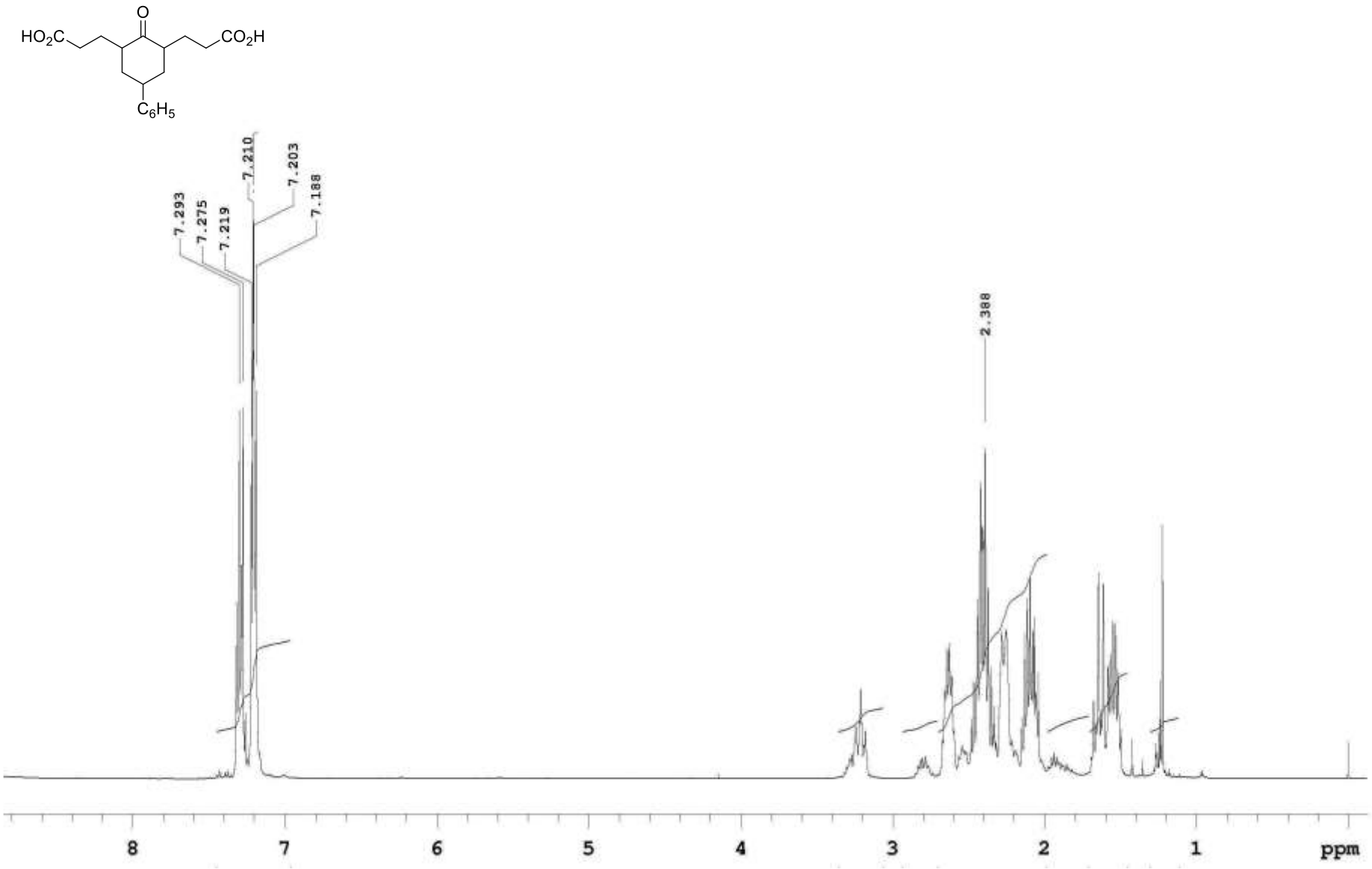


5-Methyl-2-oxo-1,3-cyclohexanedipropionic acid (27)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

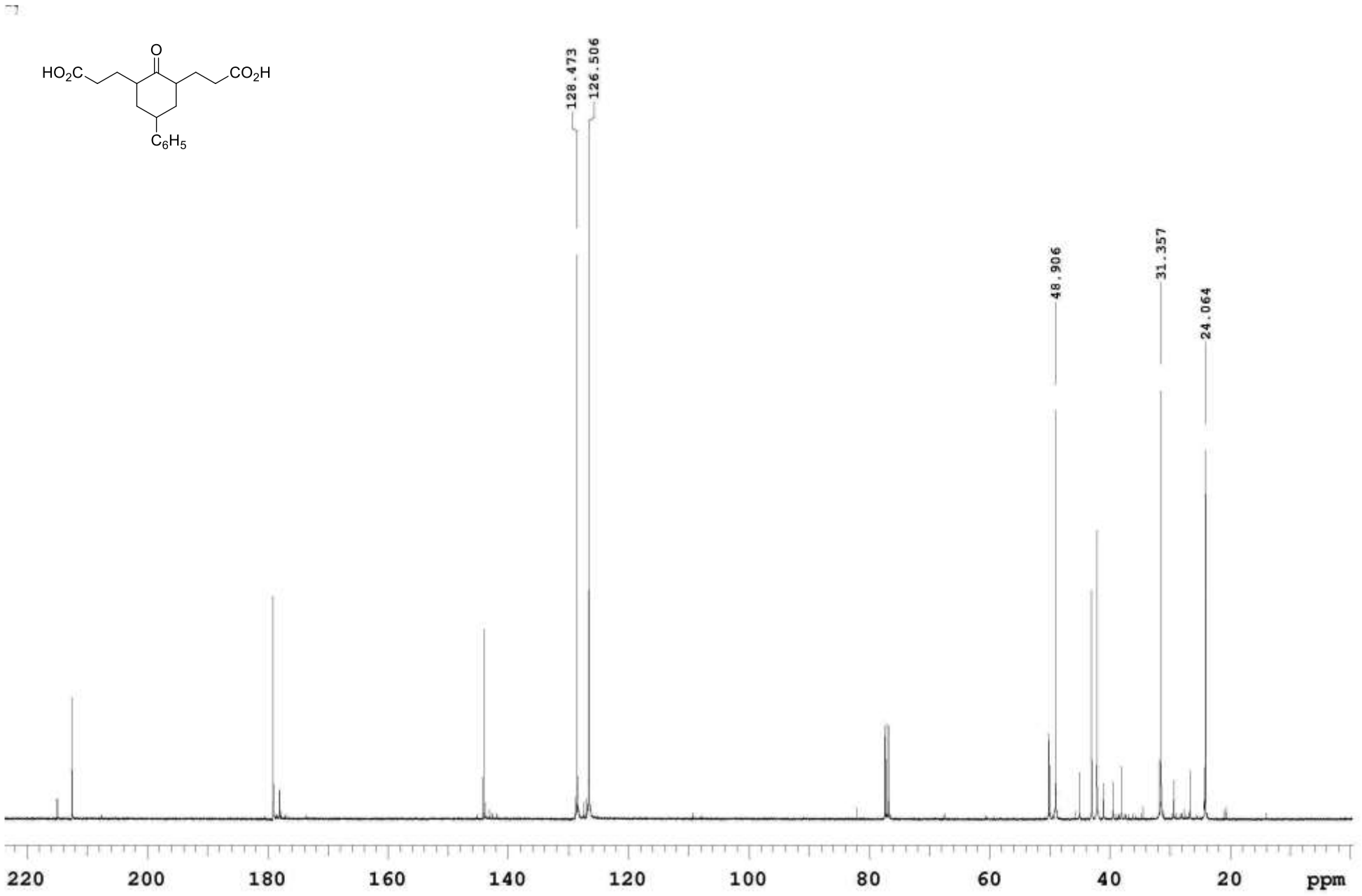




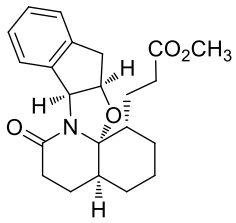
5-Methyl-2-oxo-1,3-cyclohexanedipropionic acid (27)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

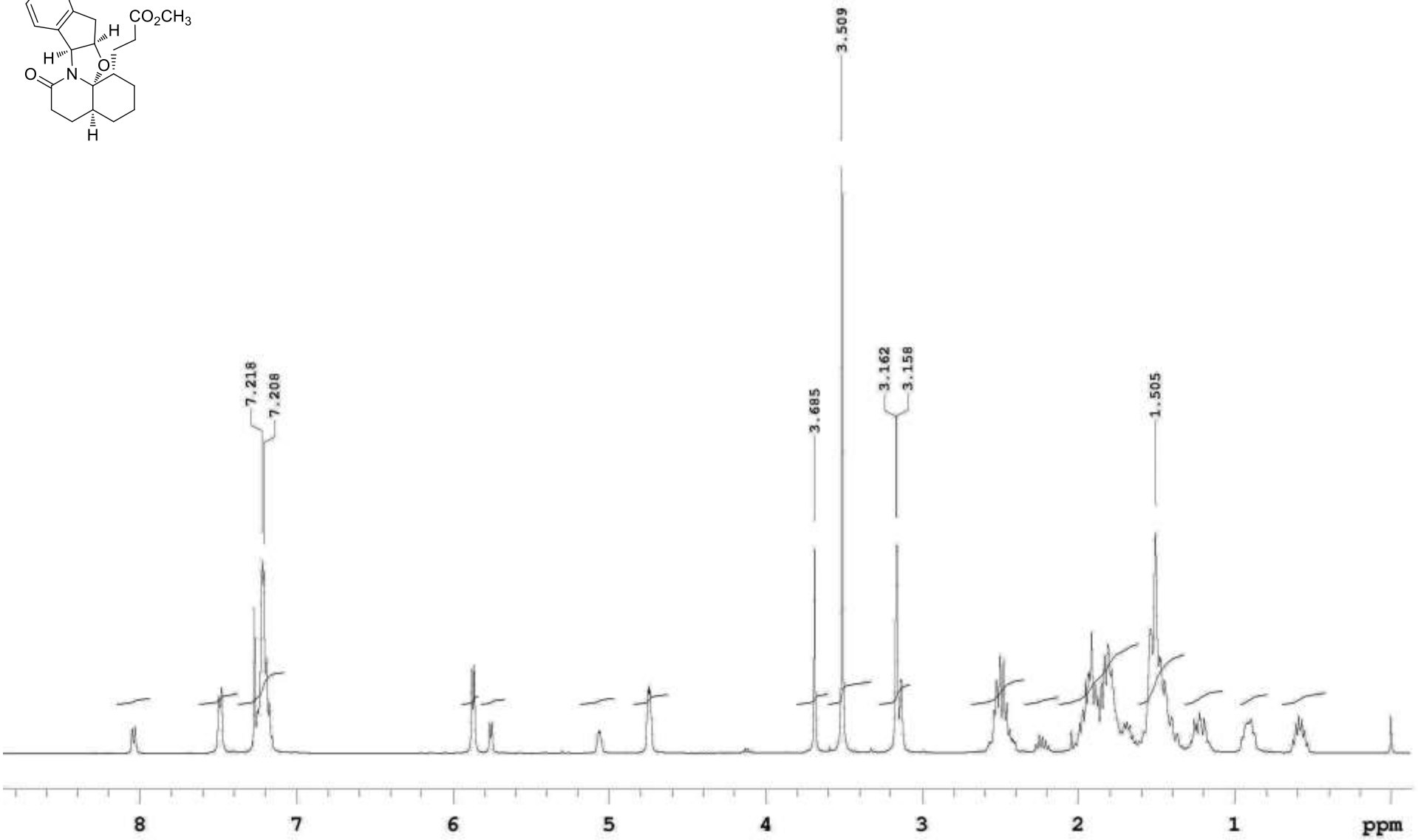


2-Oxo-5-phenyl-1,3-cyclohexanedipropionic acid (28)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

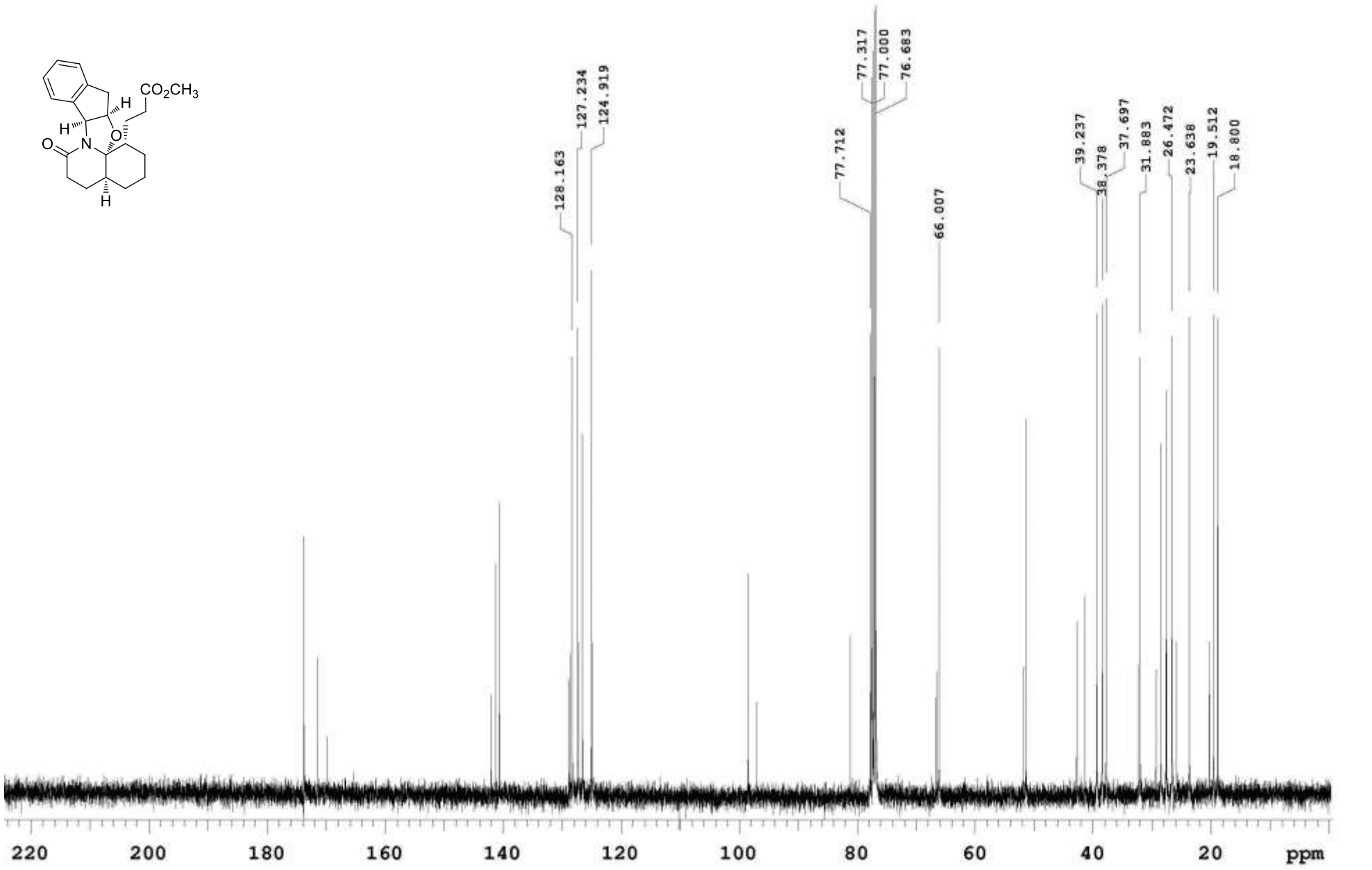


2-Oxo-5-phenyl-1,3-cyclohexanedipropionic acid (28)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

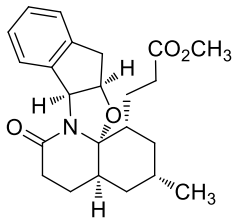


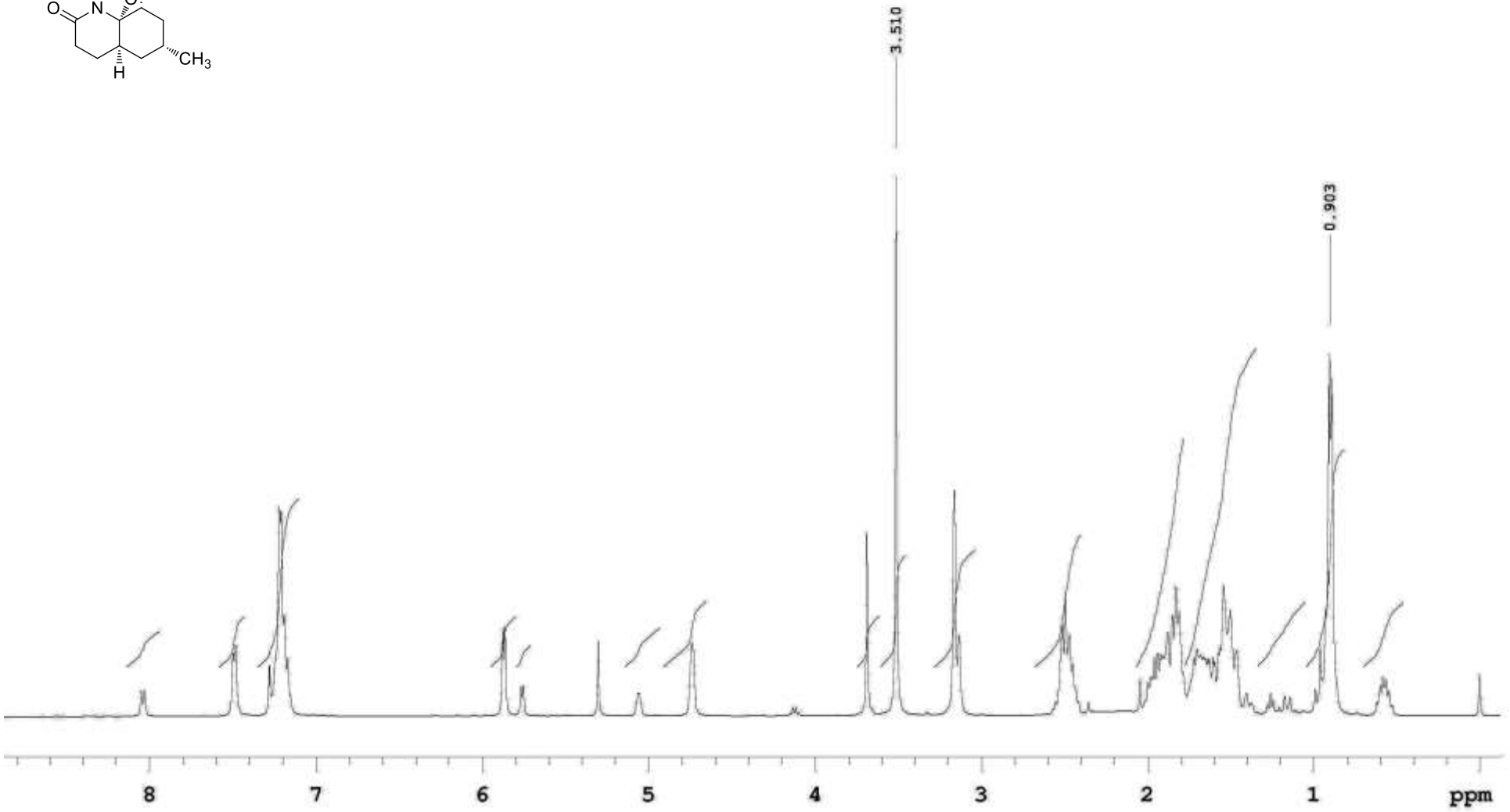


Methyl (1*S*,4a*S*,8a*S*,13a*R*,14a*S*)-7-oxo-1,2,3,4,4a,5,6,7,8,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline-1-propionate (29)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

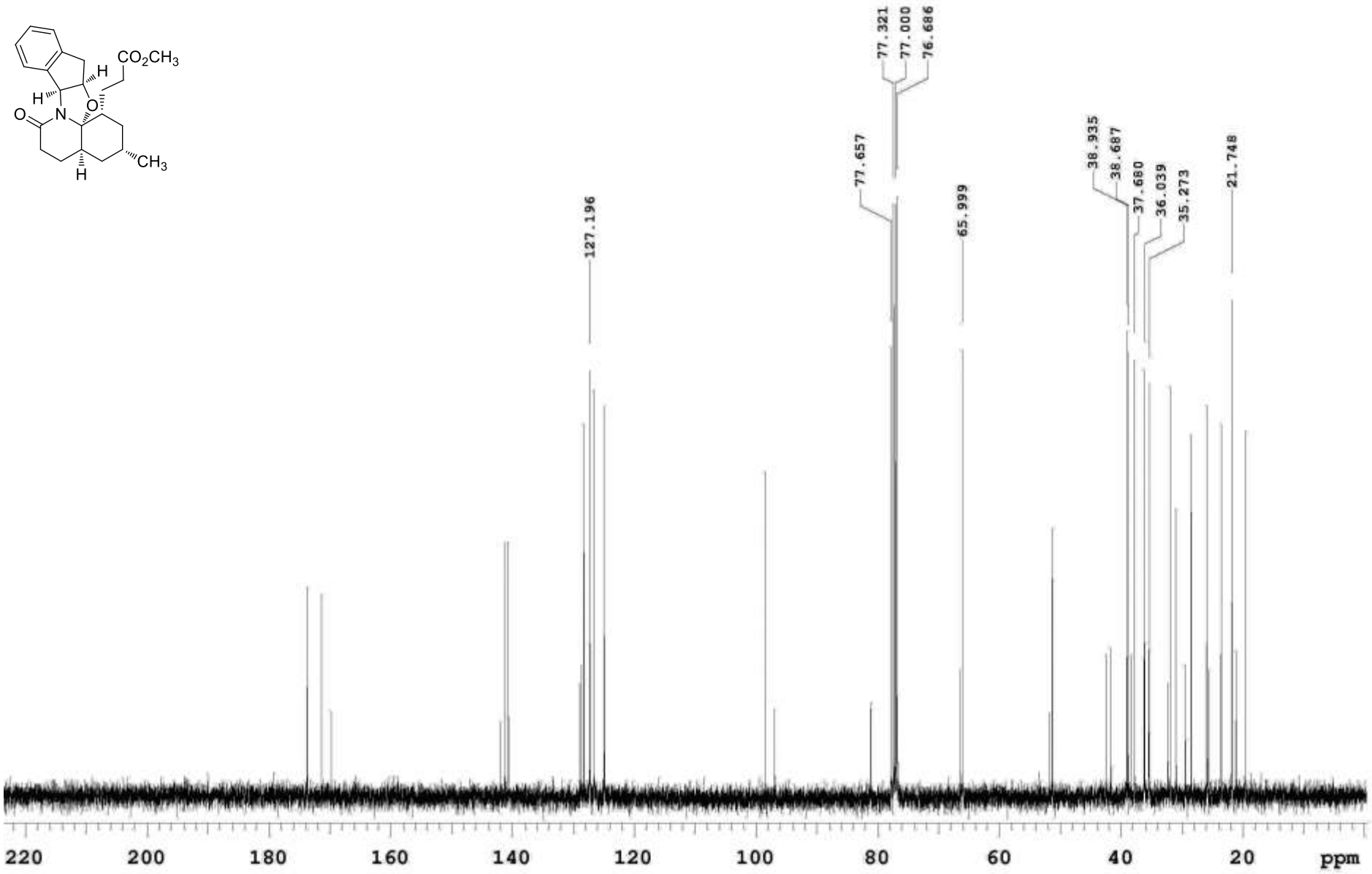


Methyl (1*S*,4a*S*,8a*S*,13a*R*,14a*S*)-7-oxo-1,2,3,4,4a,5,6,7,8,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline-1-propionate (29)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

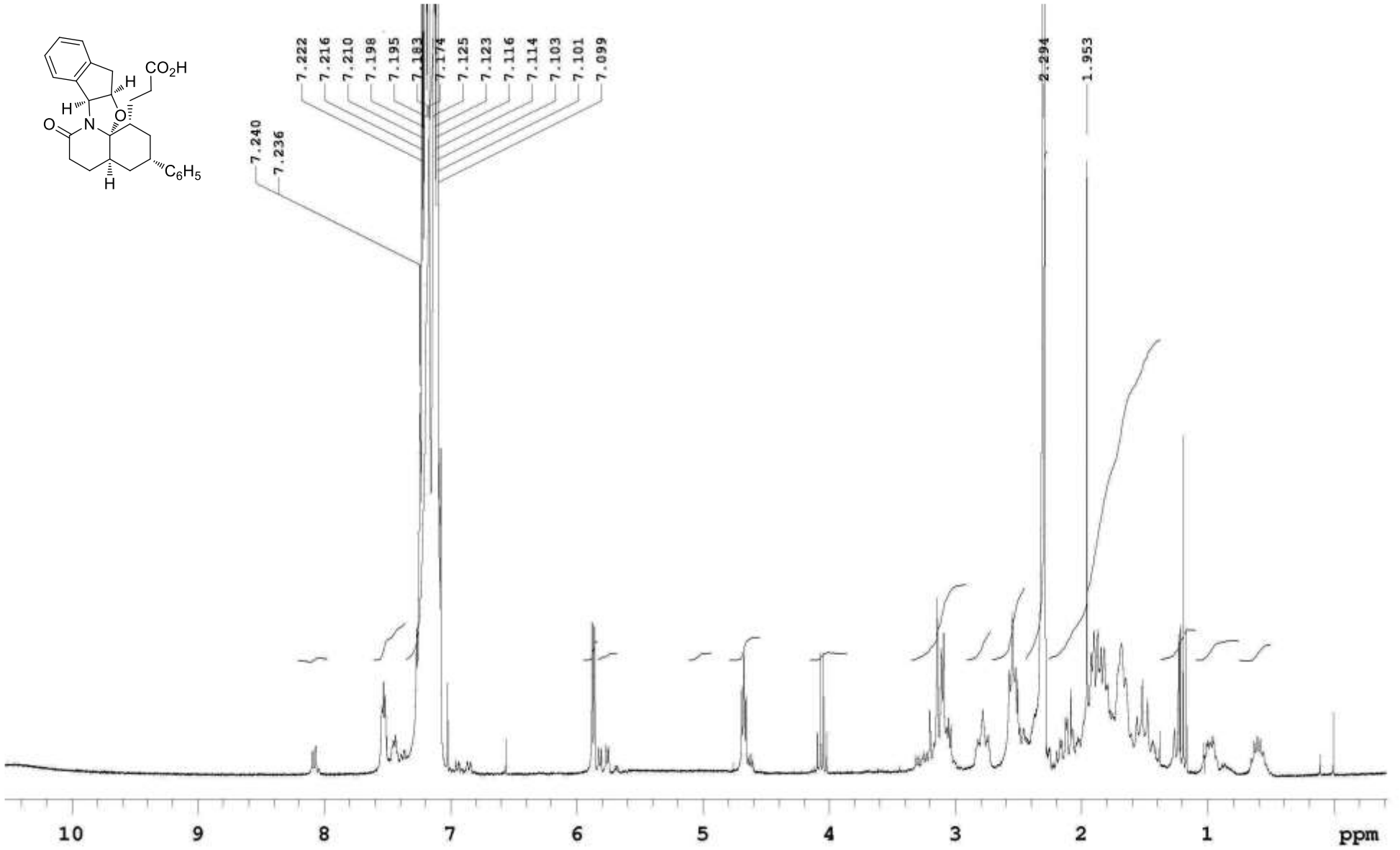




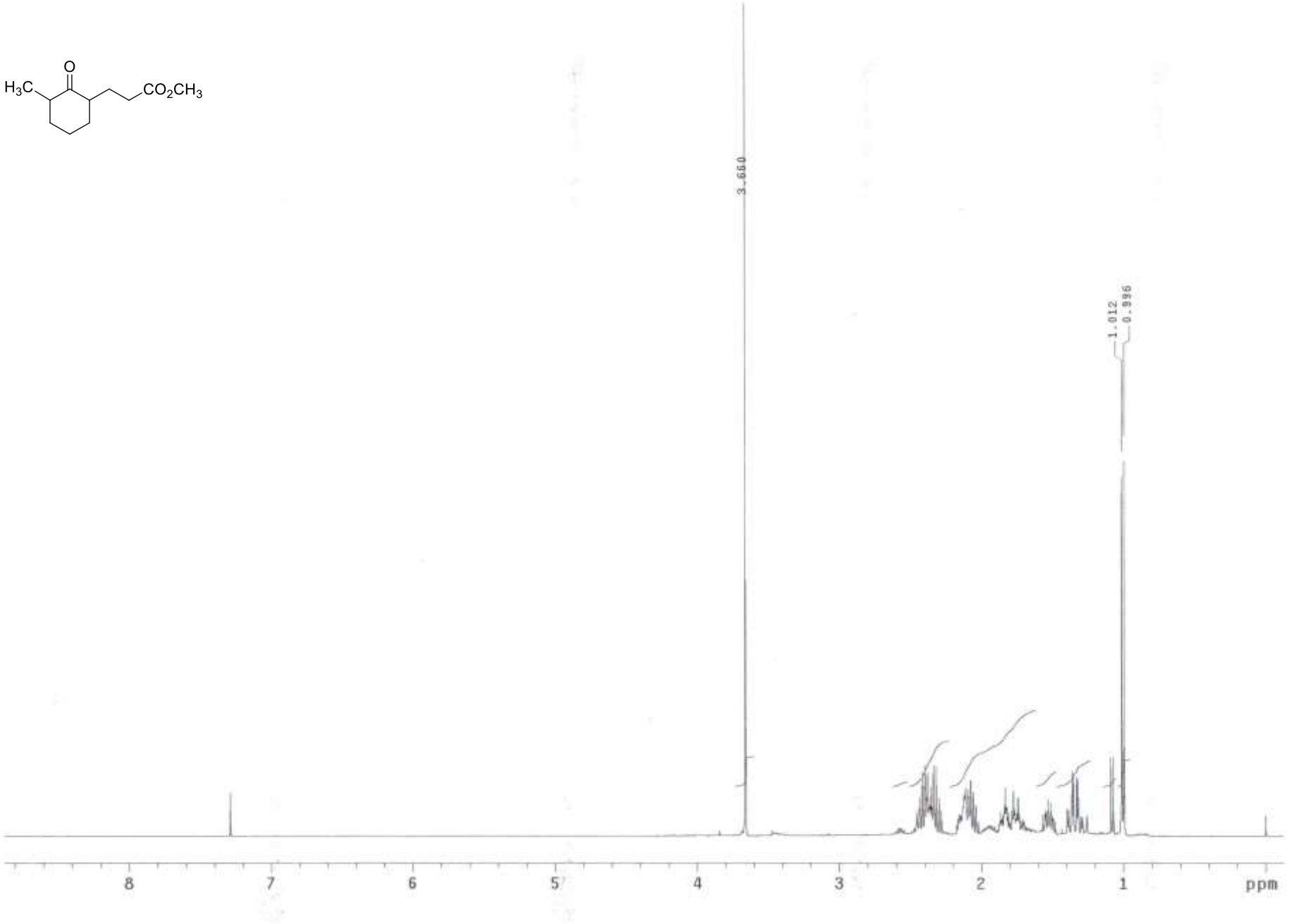
Methyl (1*R*,3*R*,4a*R*,8a*S*,13a*R*,14a*S*)-3-Methyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline-1-propionate (31a)-
^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



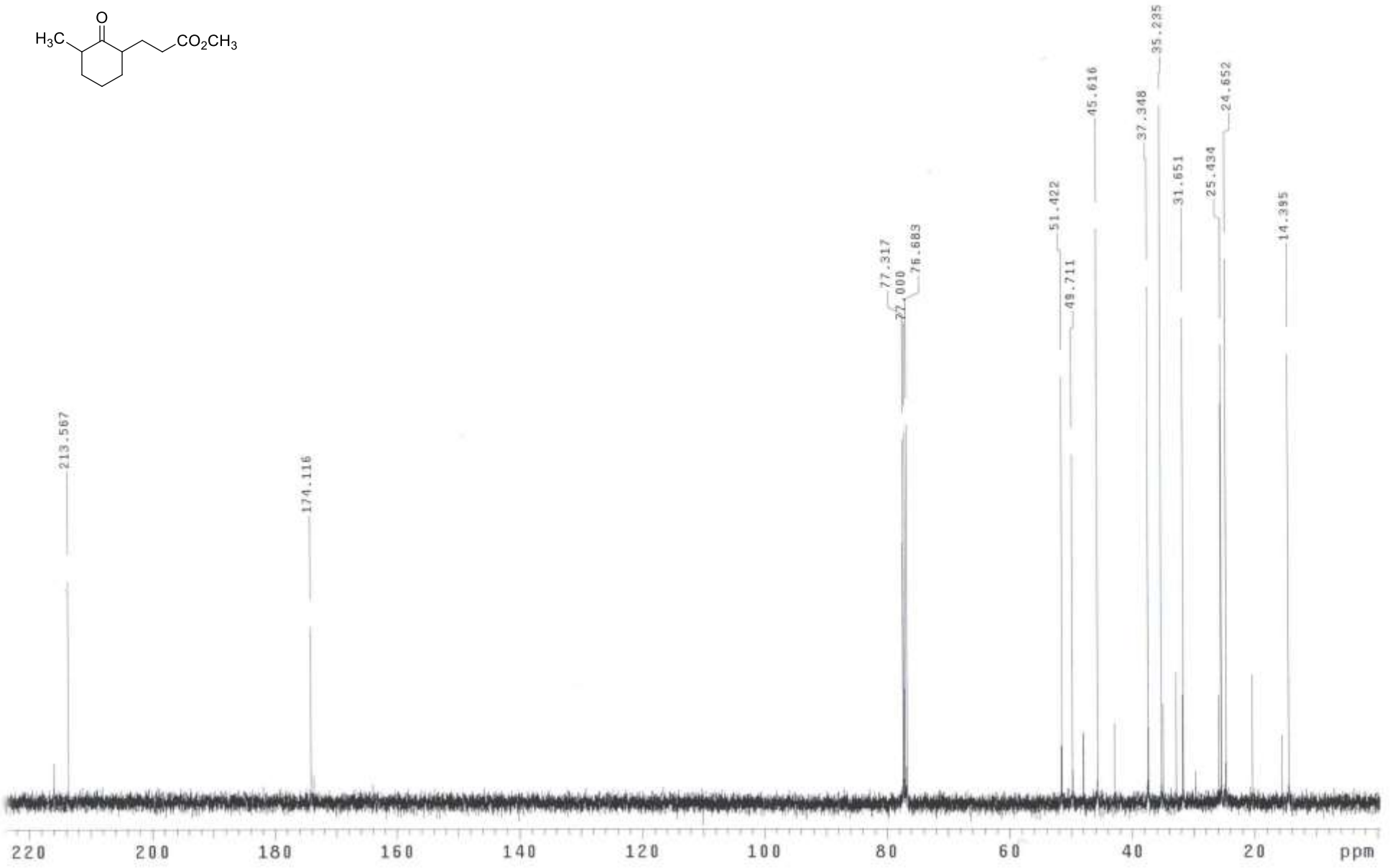
Methyl (1*R*,3*R*,4a*R*,8a*S*,13a*R*,14a*S*)-3-Methyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline-1-propionate (31a)-
^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



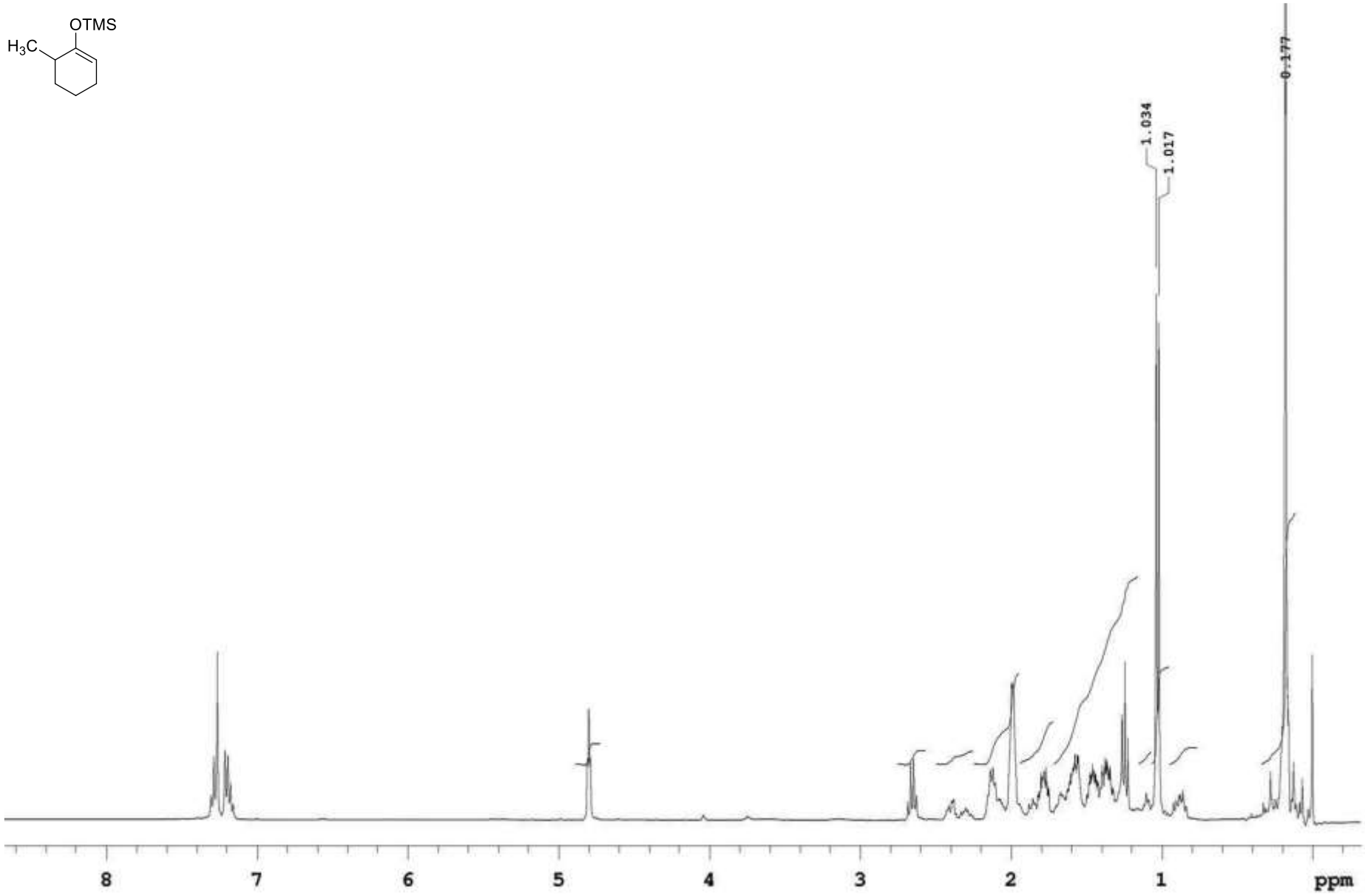
(1*R*,3*R*,4a*R*,8a*S*,13a*R*,14a*S*)-7-Oxo-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1',2':4,5]oxazolo[2,3-*j*]quinoline-1-propanoic acid (33a)- ^{1}H-NMR, $CDCl_3$, 300 MHz, 25 °C



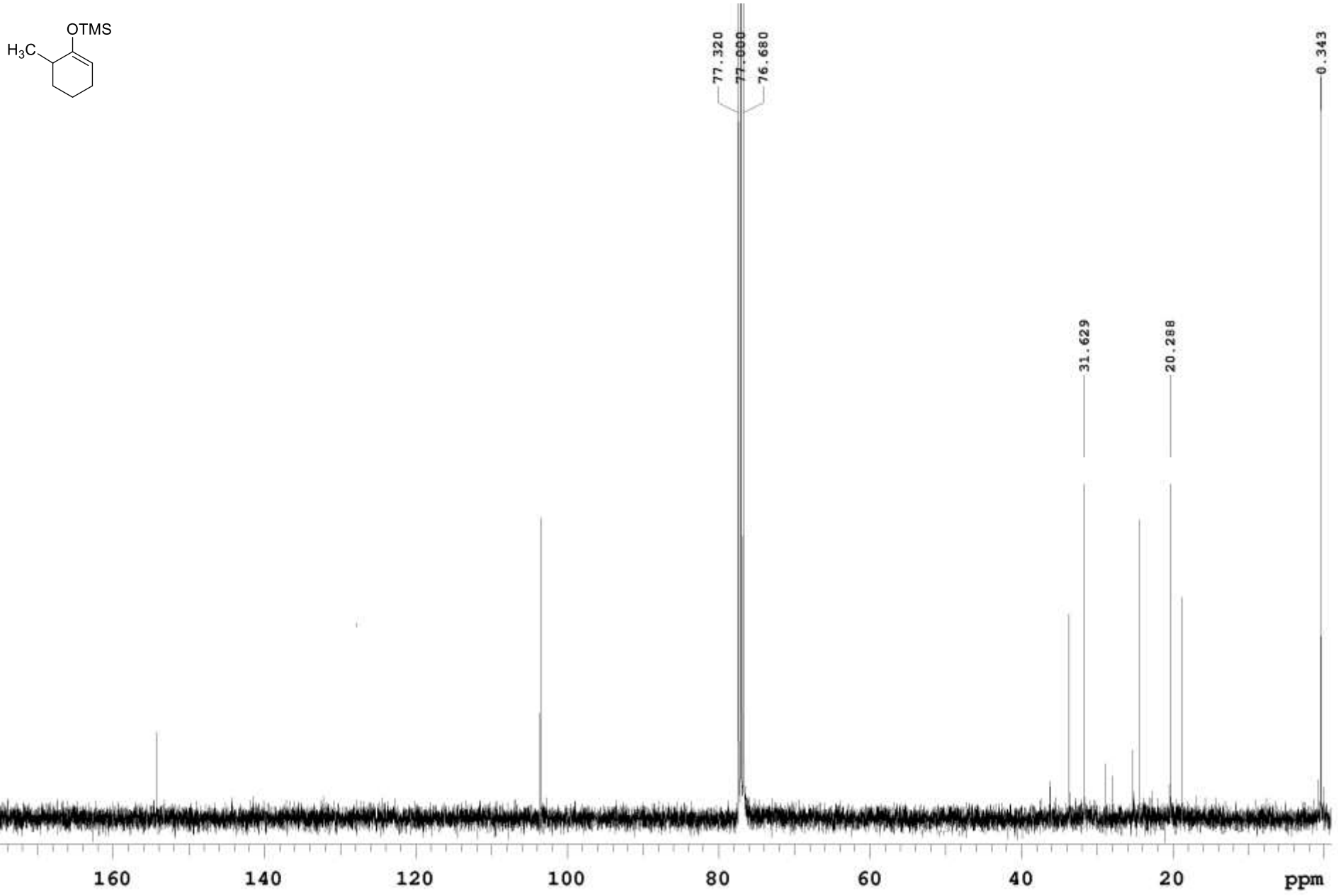
Methyl 3-(3-methyl-2-oxocyclohexyl)propionate ester (36)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



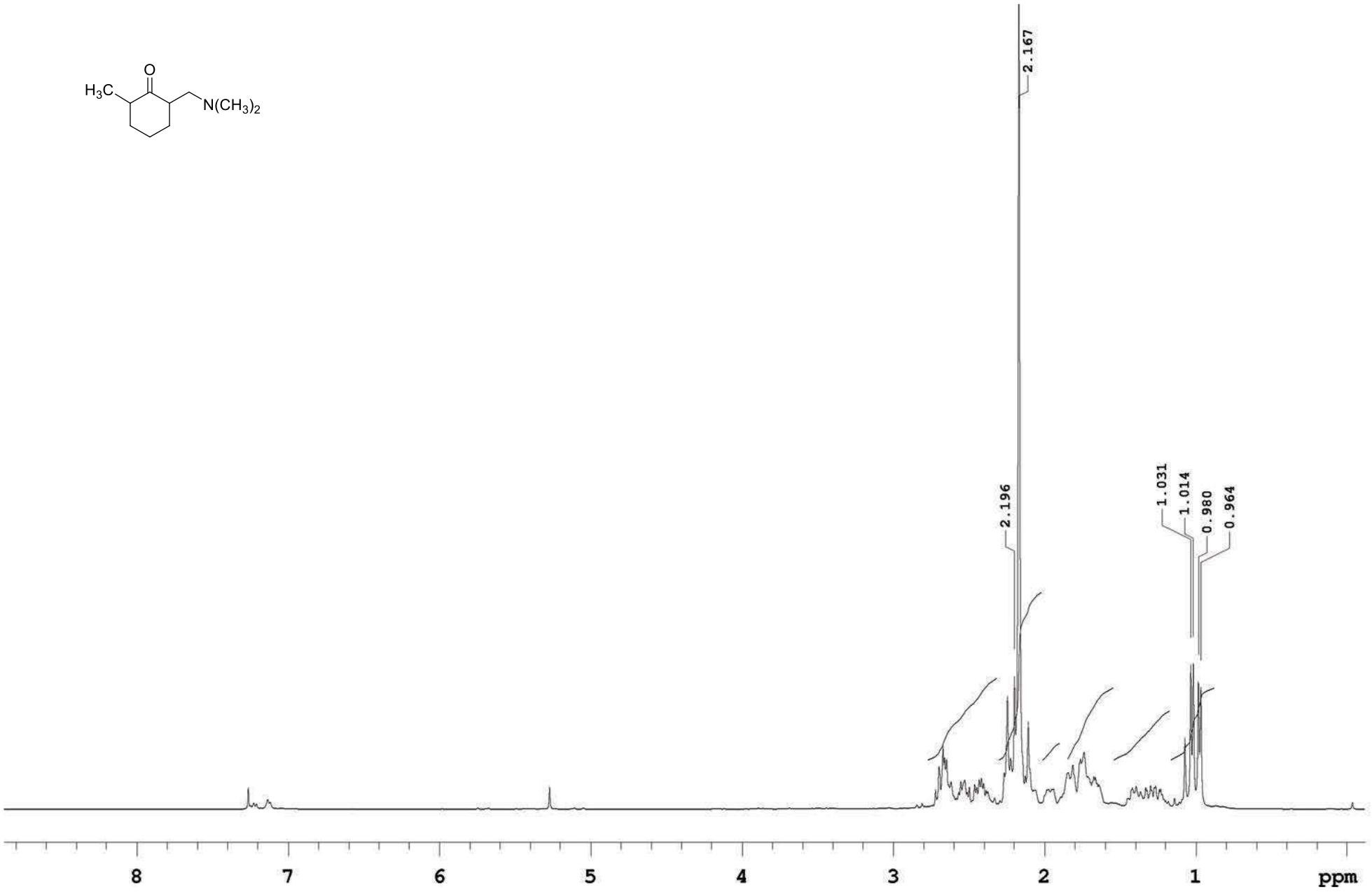
Methyl 3-(3-methyl-2-oxocyclohexyl)propionate ester (36)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



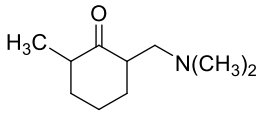
(48)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C

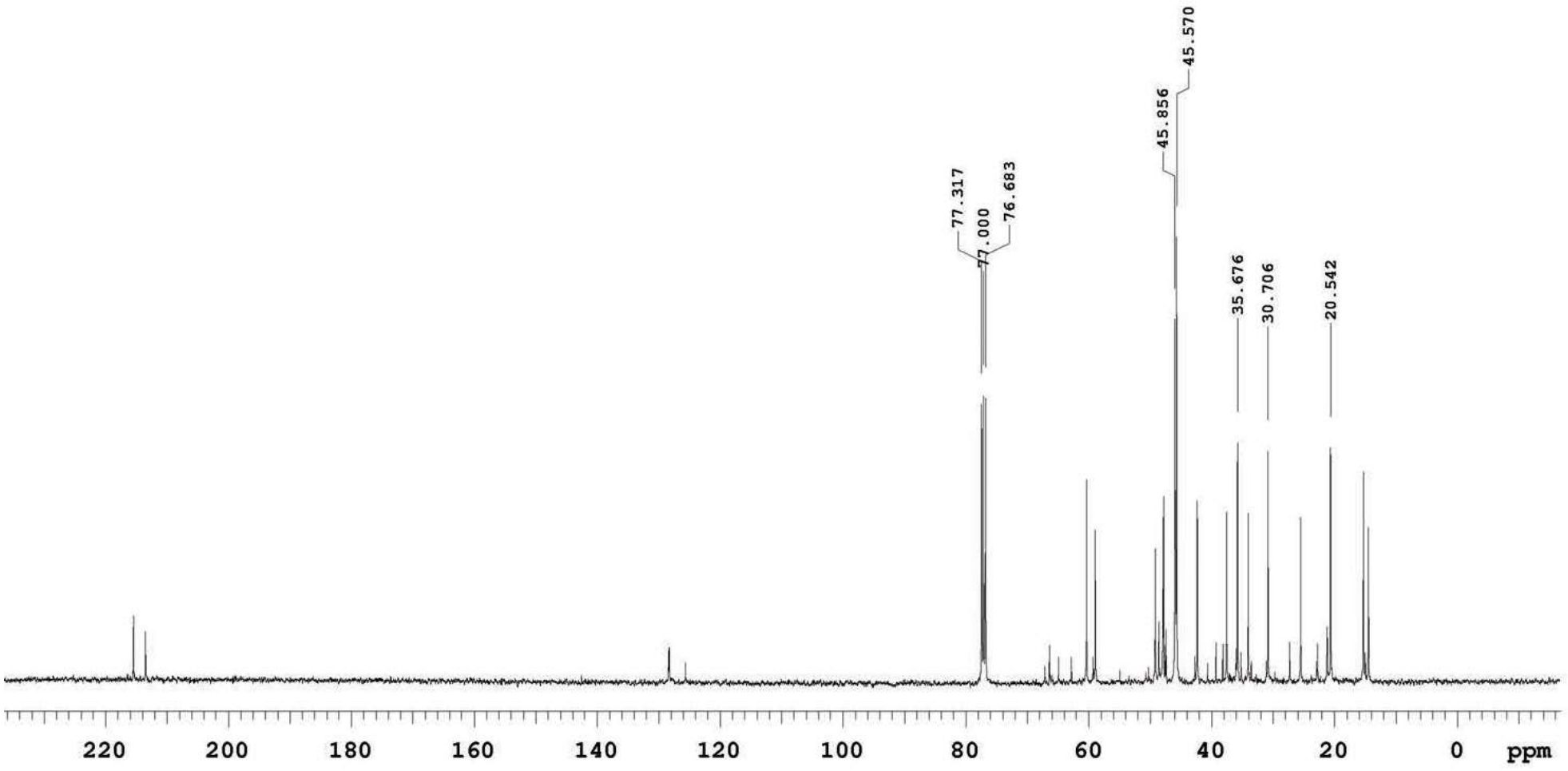


(48)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C

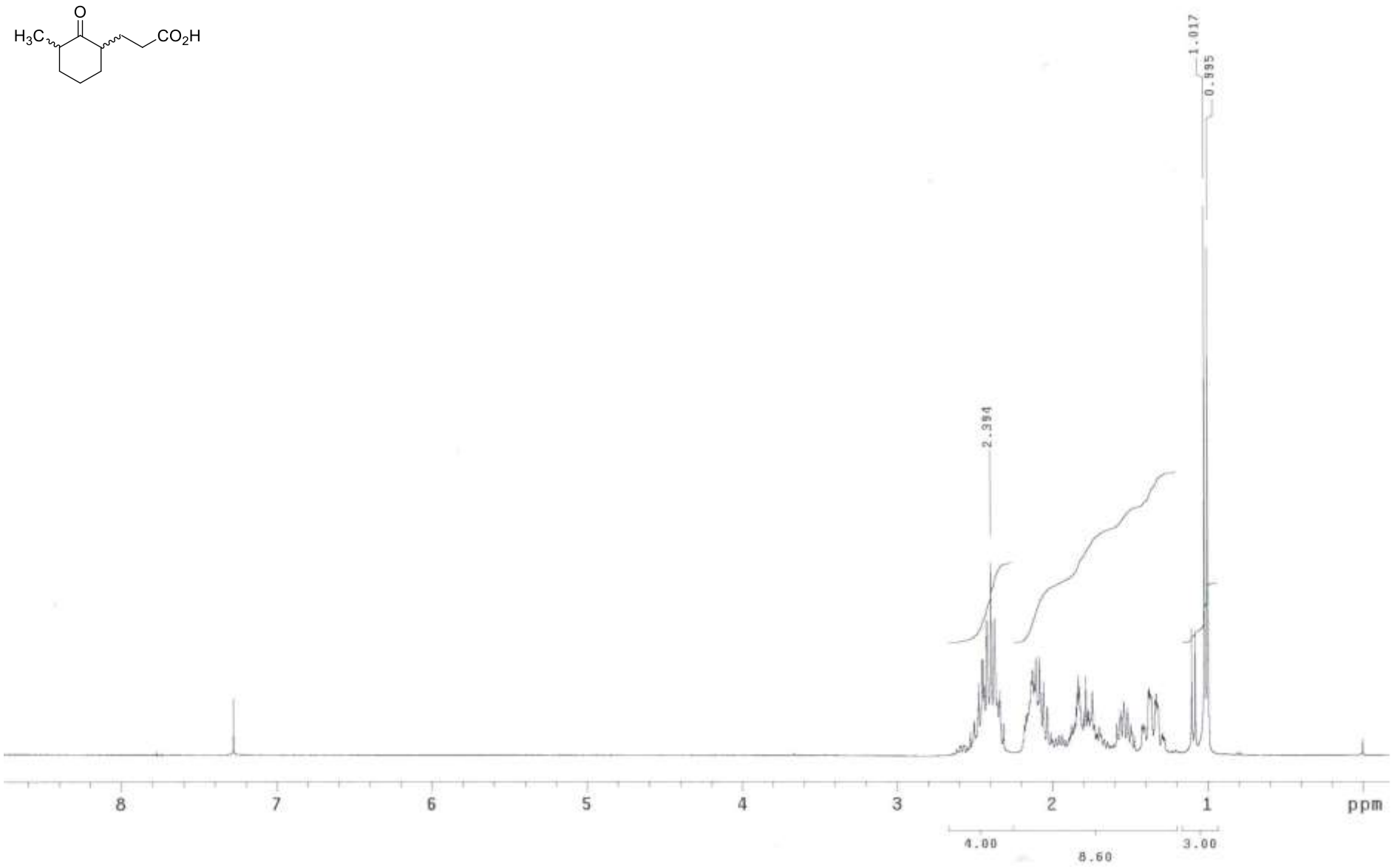


(44)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

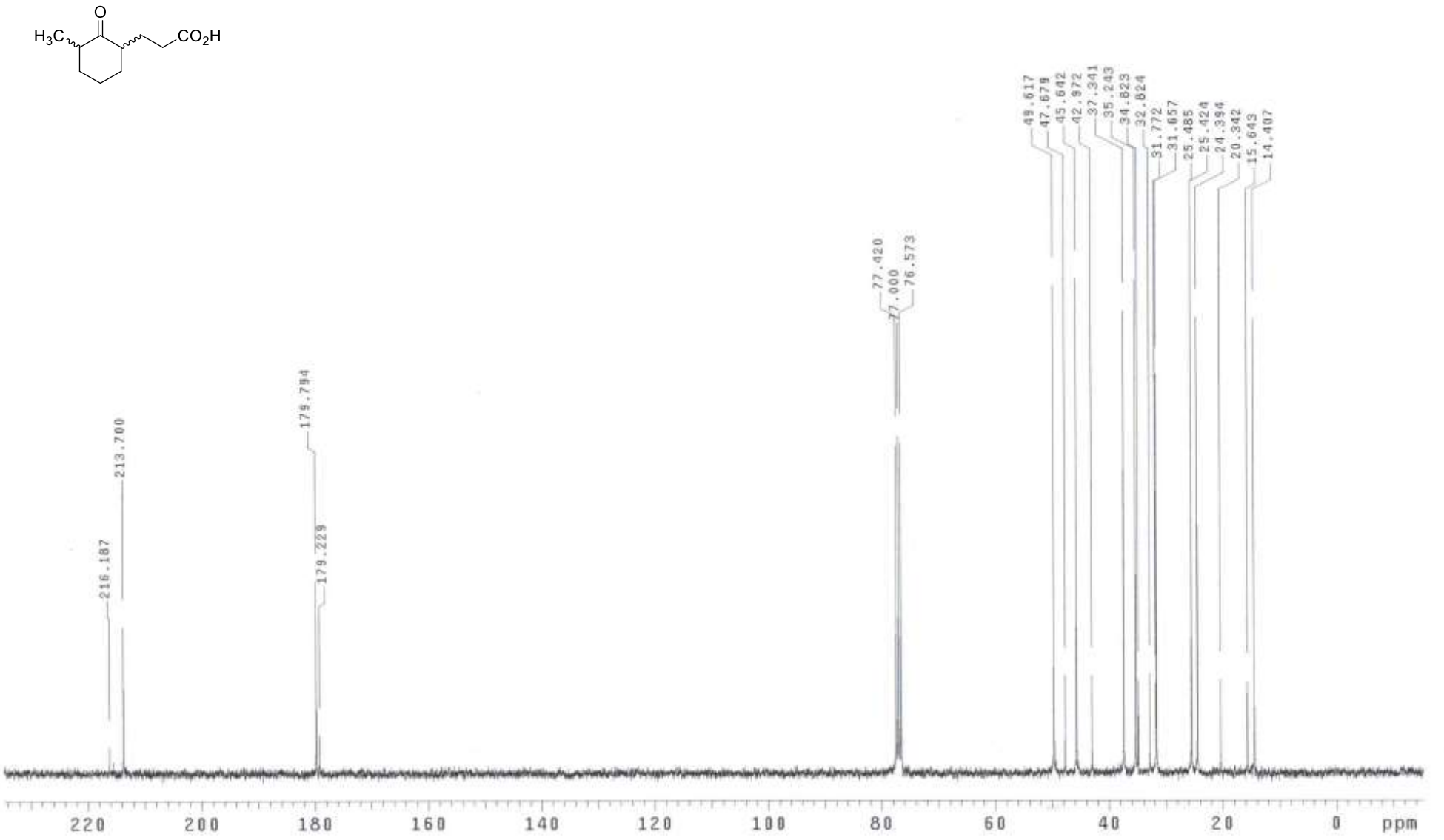




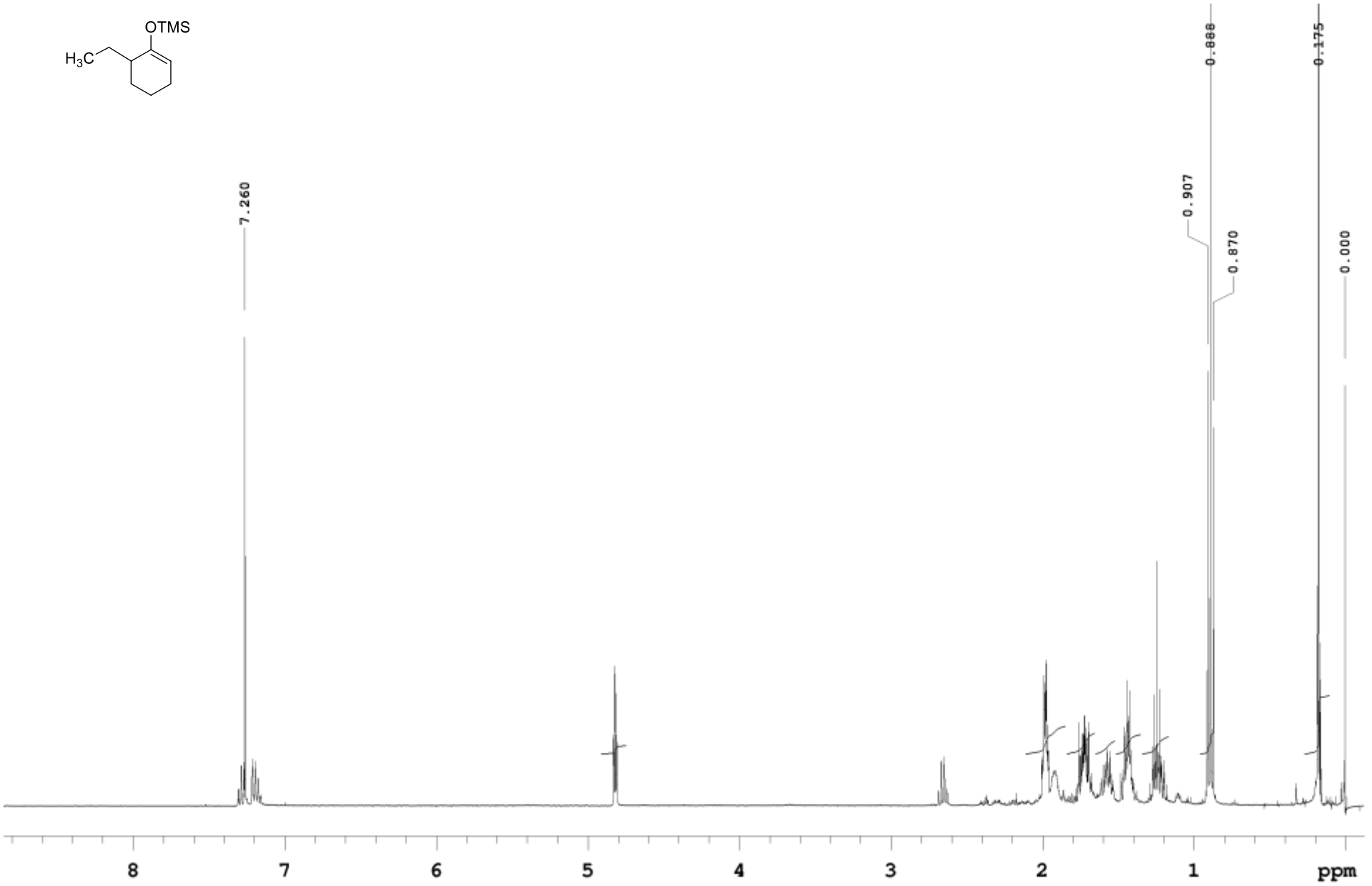
(44)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



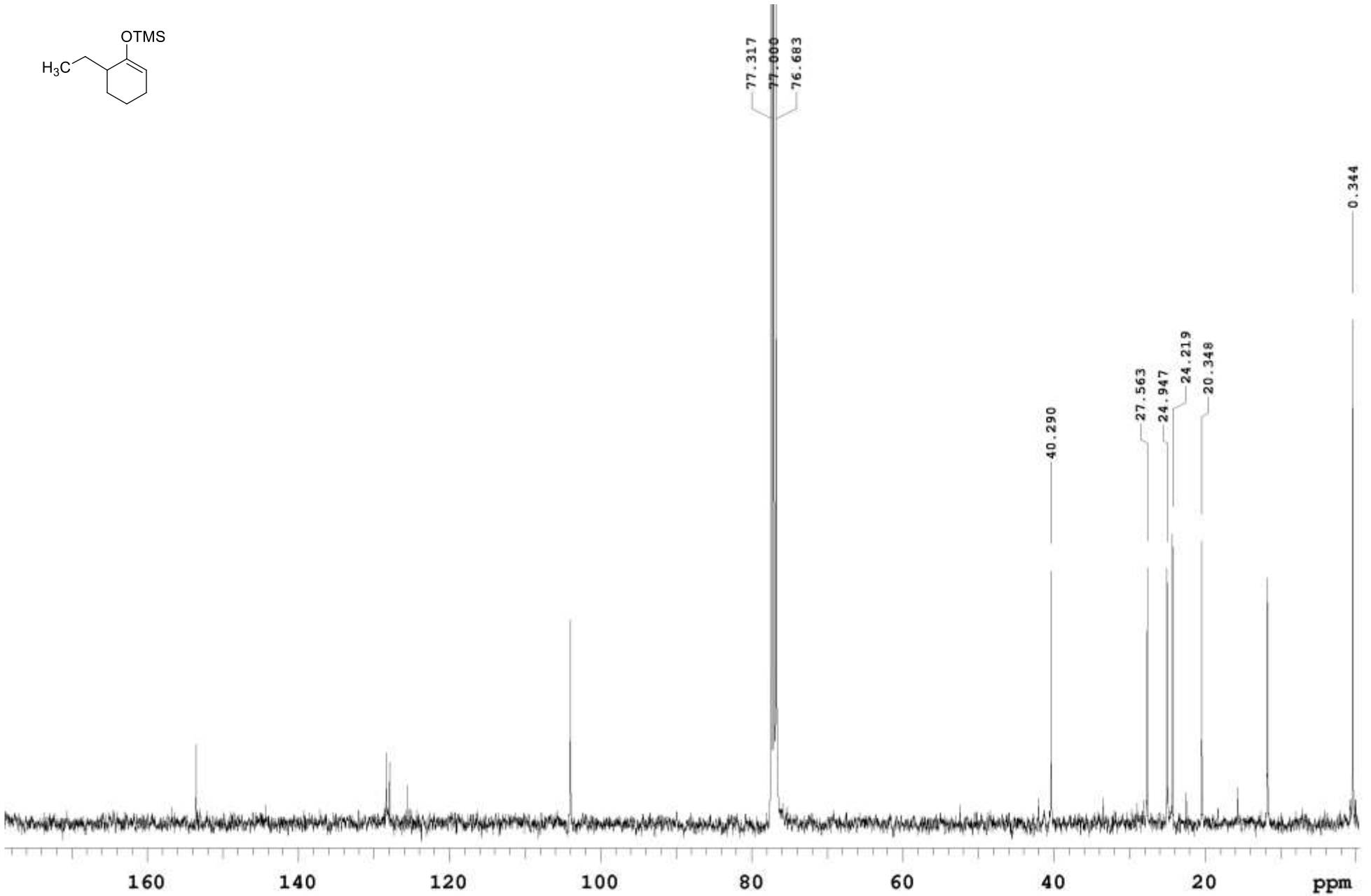
(3-Methyl-2-oxocyclohexyl)propionic acid (49)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C



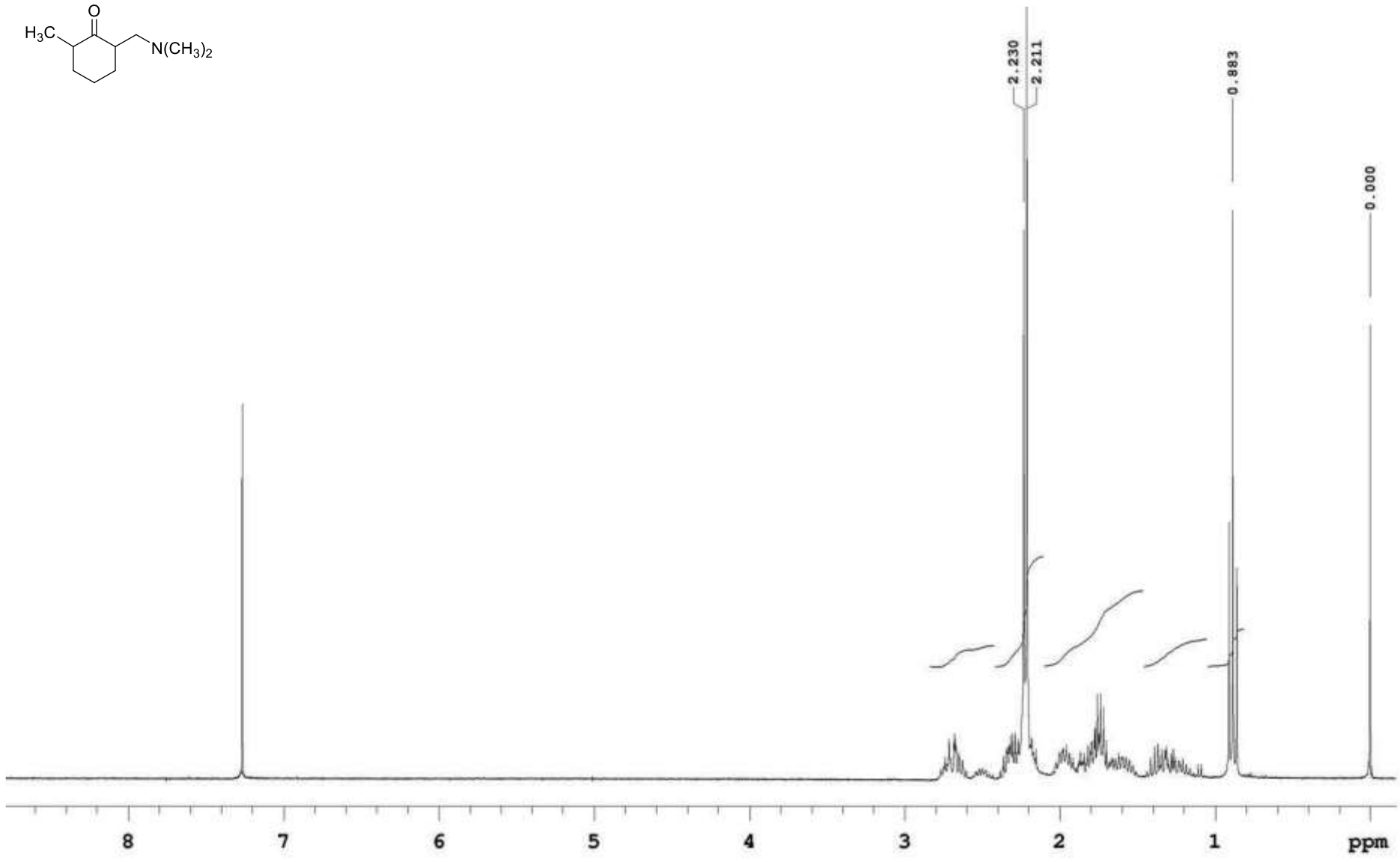
(3-Methyl-2-oxocyclohexyl)propionic acid (49)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



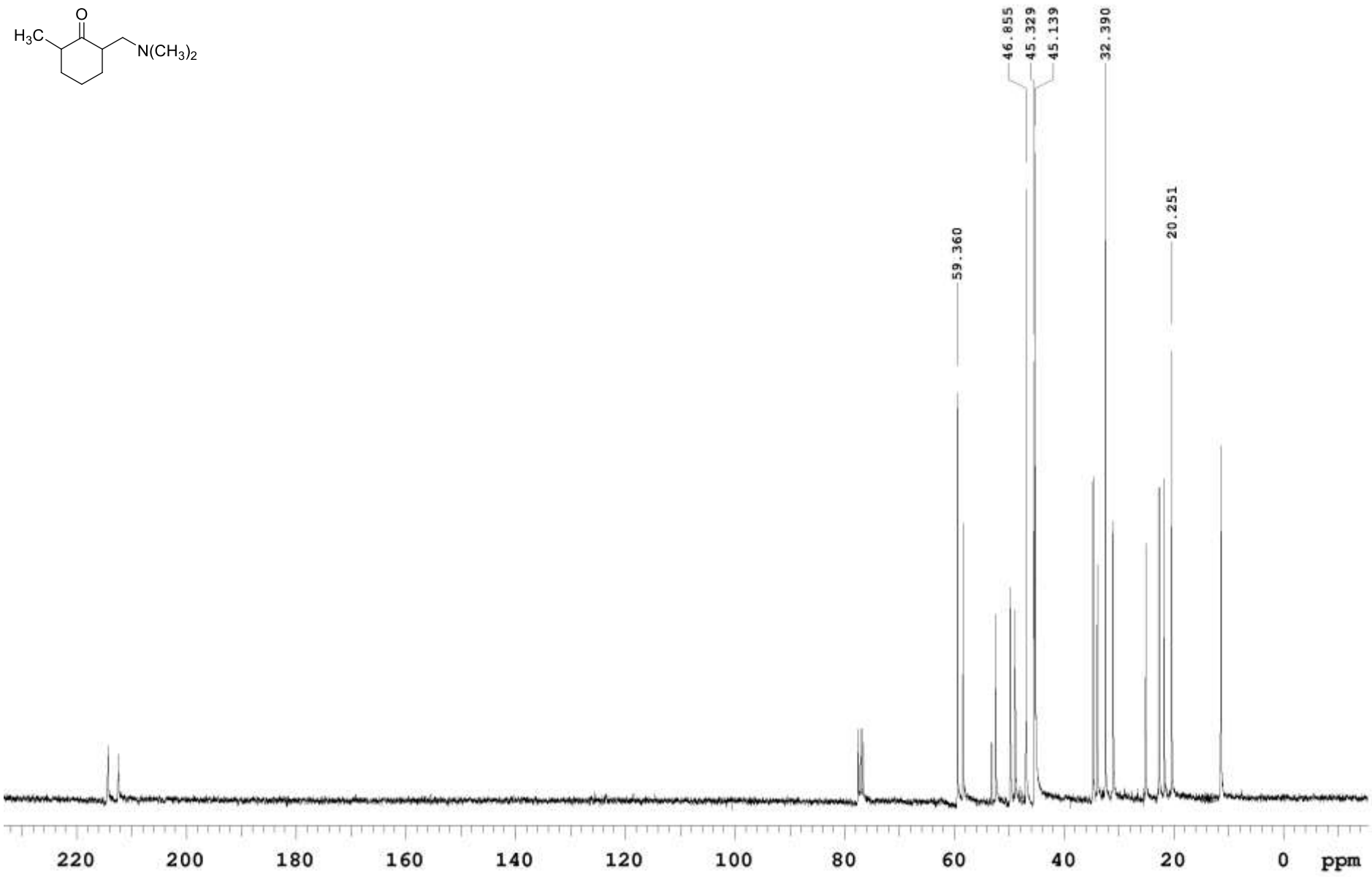
(50)- ^{1}H- NMR, $CDCl_3$, 400 MHZ, 25 °C



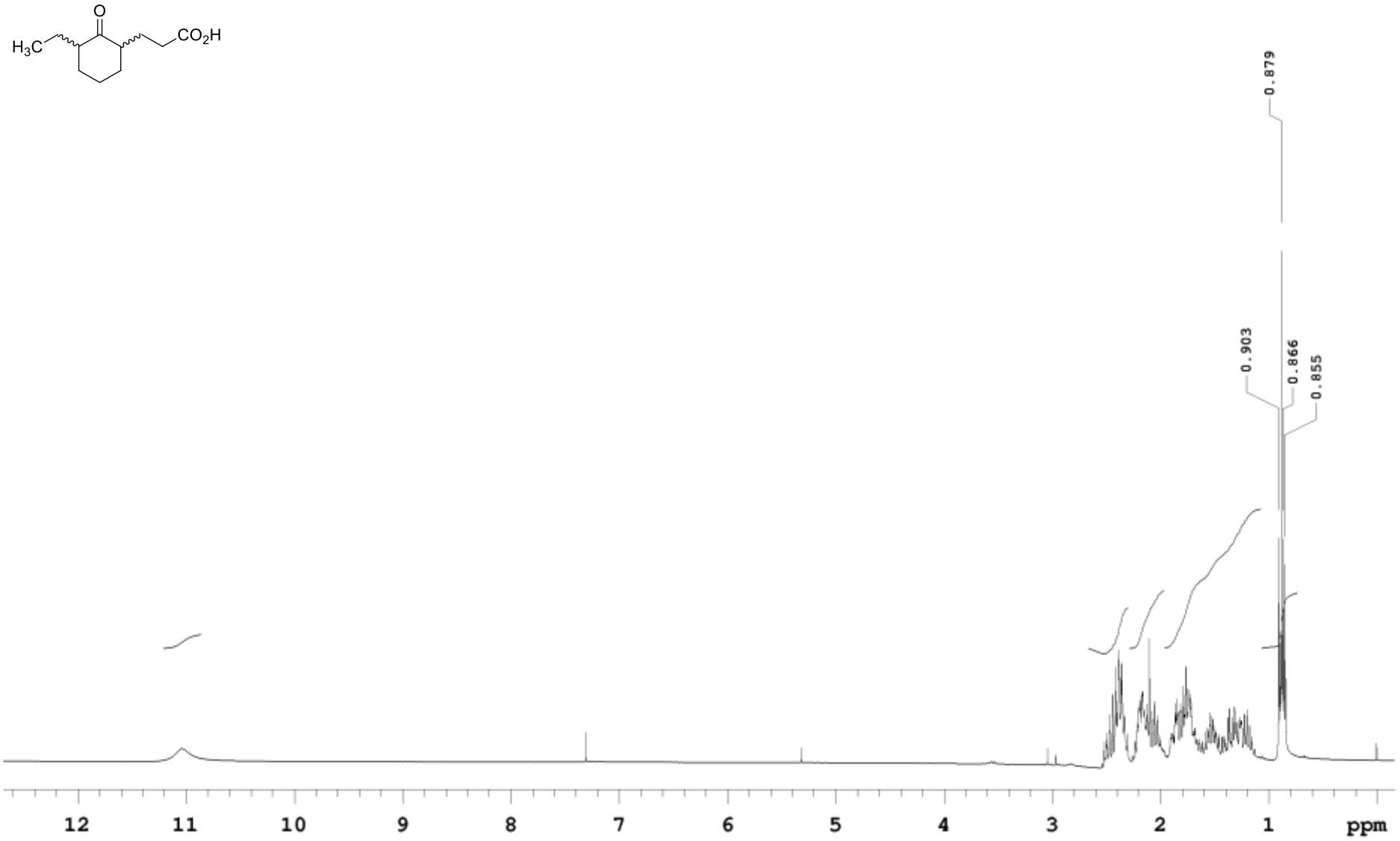
(50)- ^{13}C- NMR, $CDCl_3$, 100.6 MHZ, 25 °C



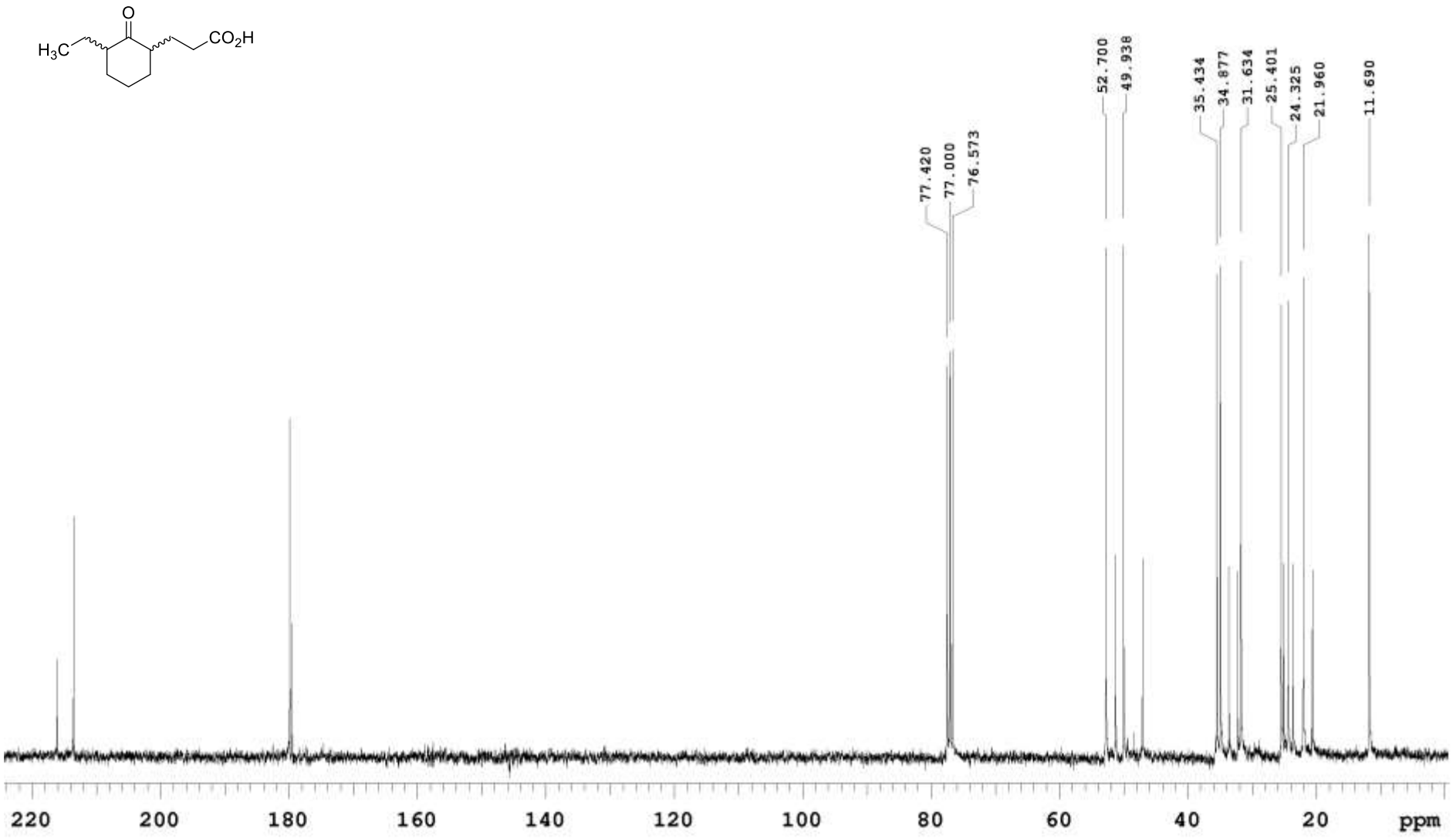
(46)- ^{1}H- NMR, $CDCl_3$, 300 MHZ, 25 °C



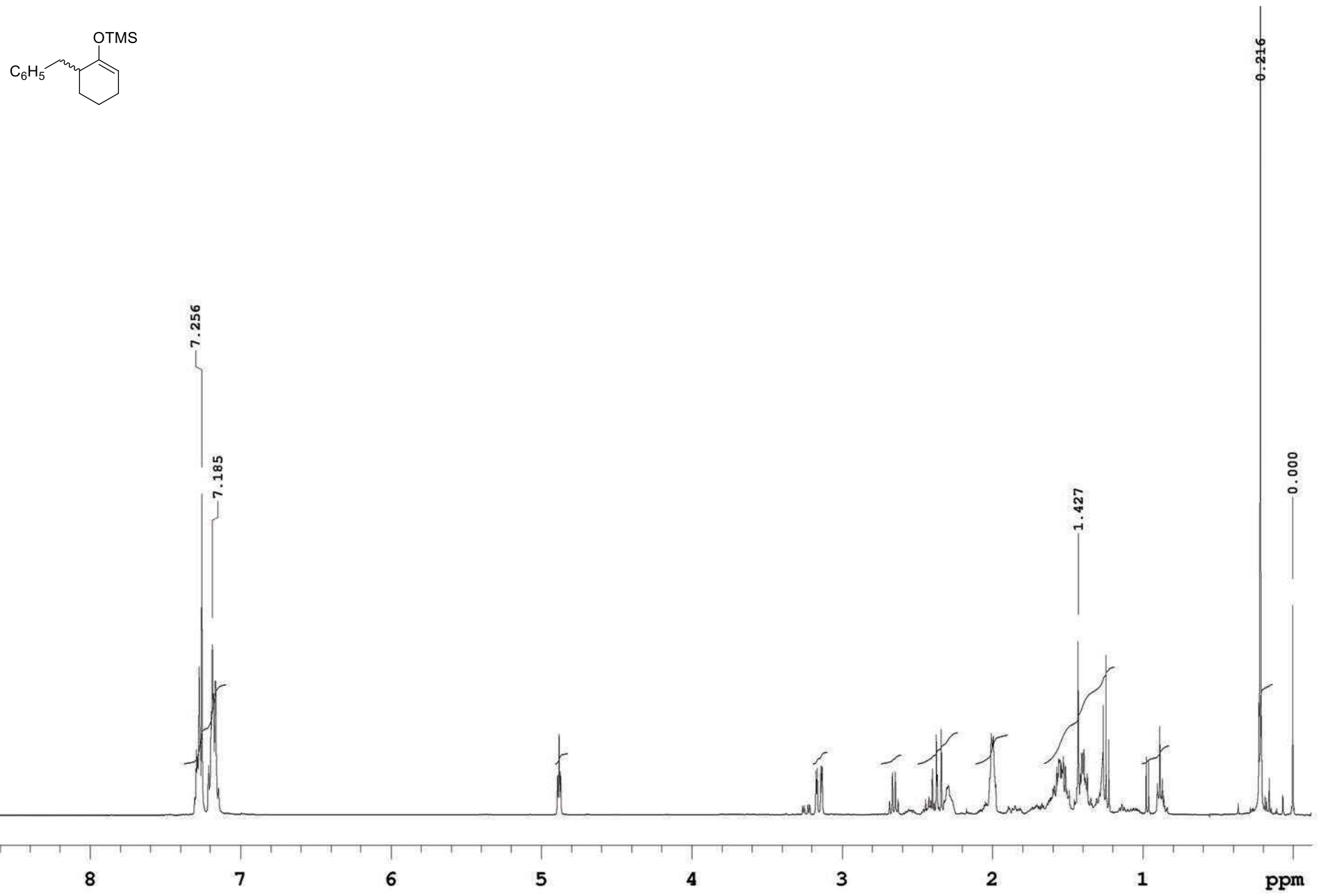
(46)- ^{13}C- NMR, $CDCl_3$, 75.4 MHZ, 25 °C



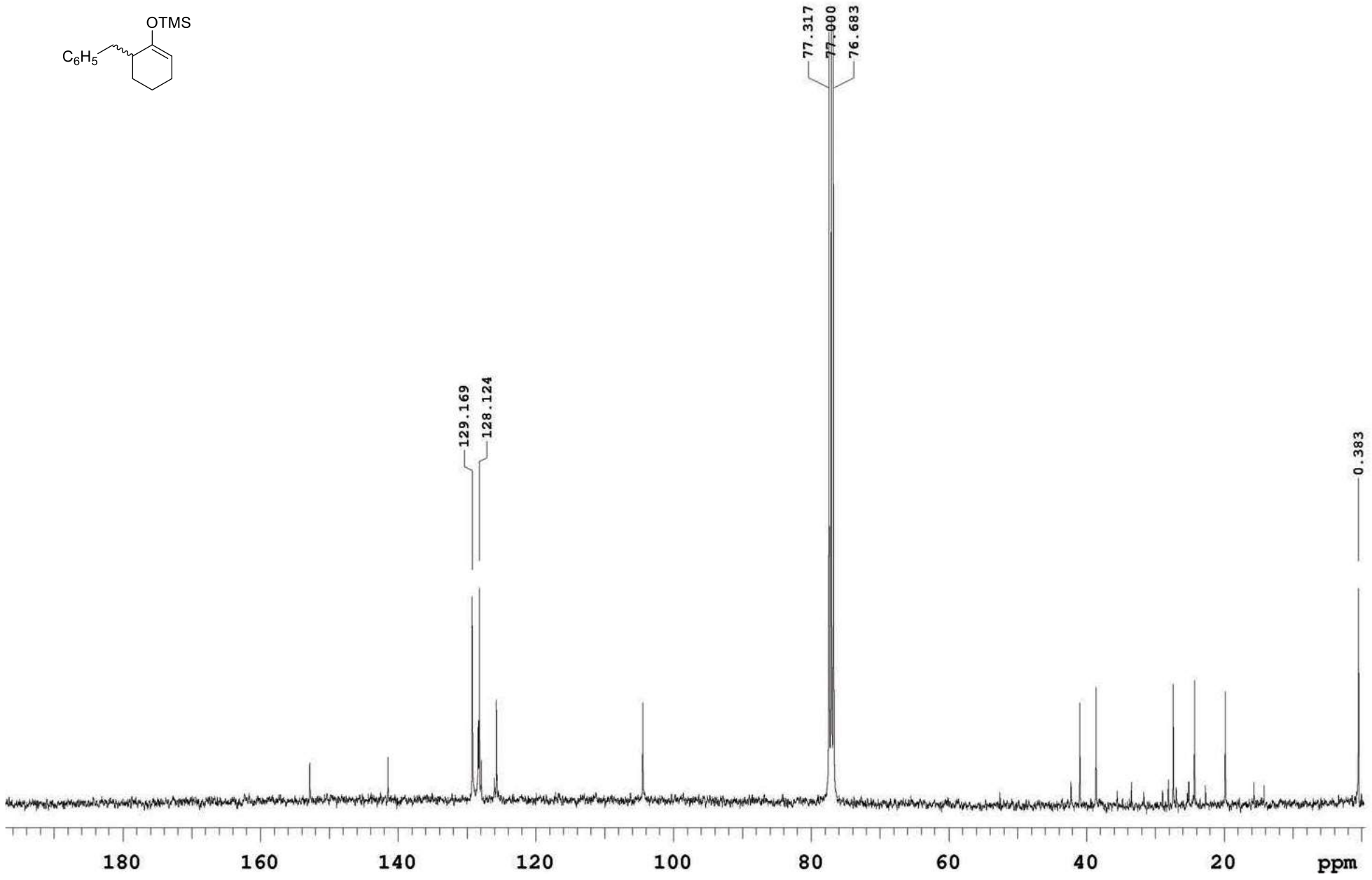
(3-Ethyl-2-oxocyclohexyl)propionic acid (53)- ^{1}H- NMR, $CDCl_3$, 300 MHZ, 25 °C



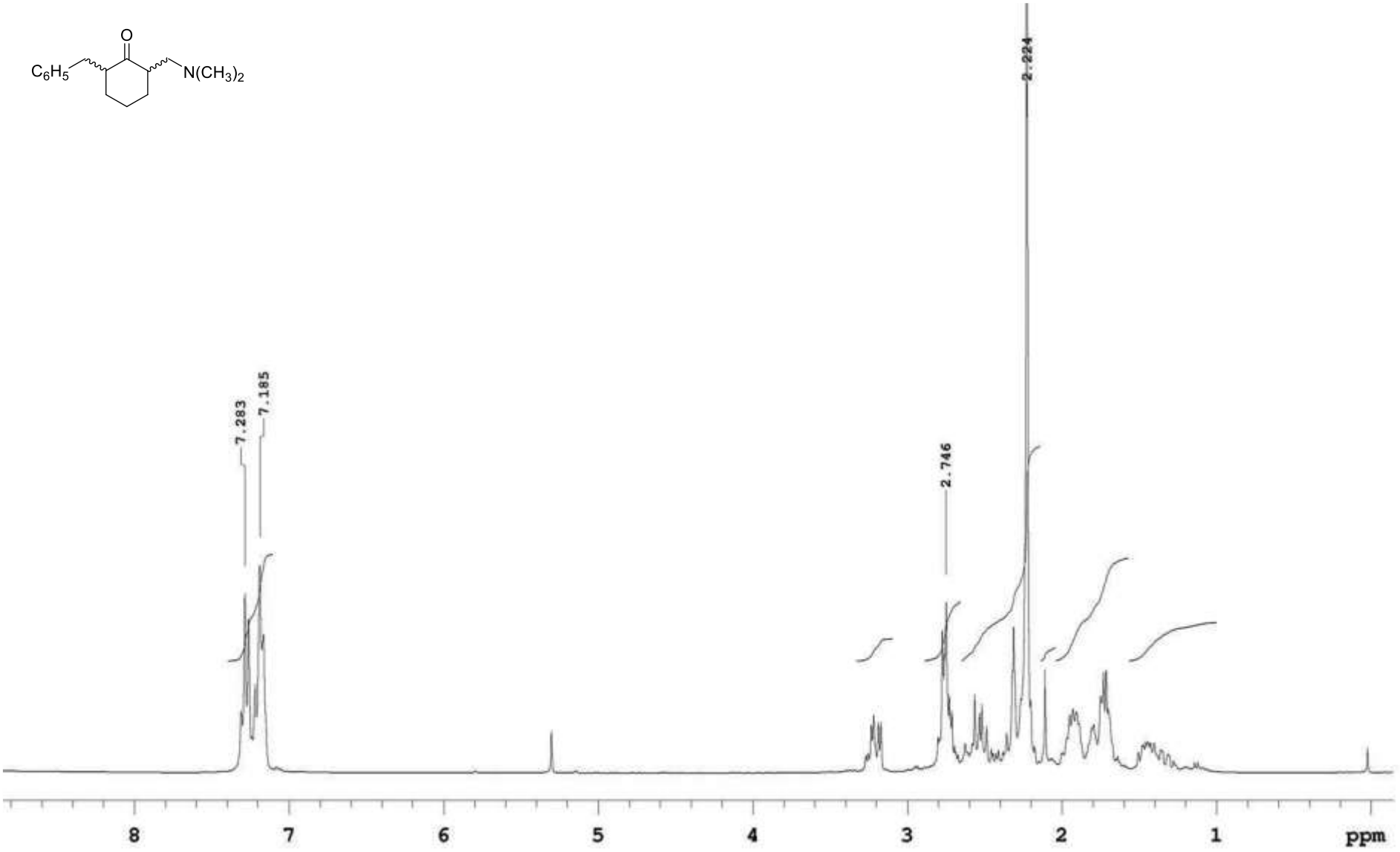
(3-Ethyl-2-oxocyclohexyl)propionic acid (53)- ^{13}C- NMR, $CDCl_3$, 75.4 MHZ, 25 °C



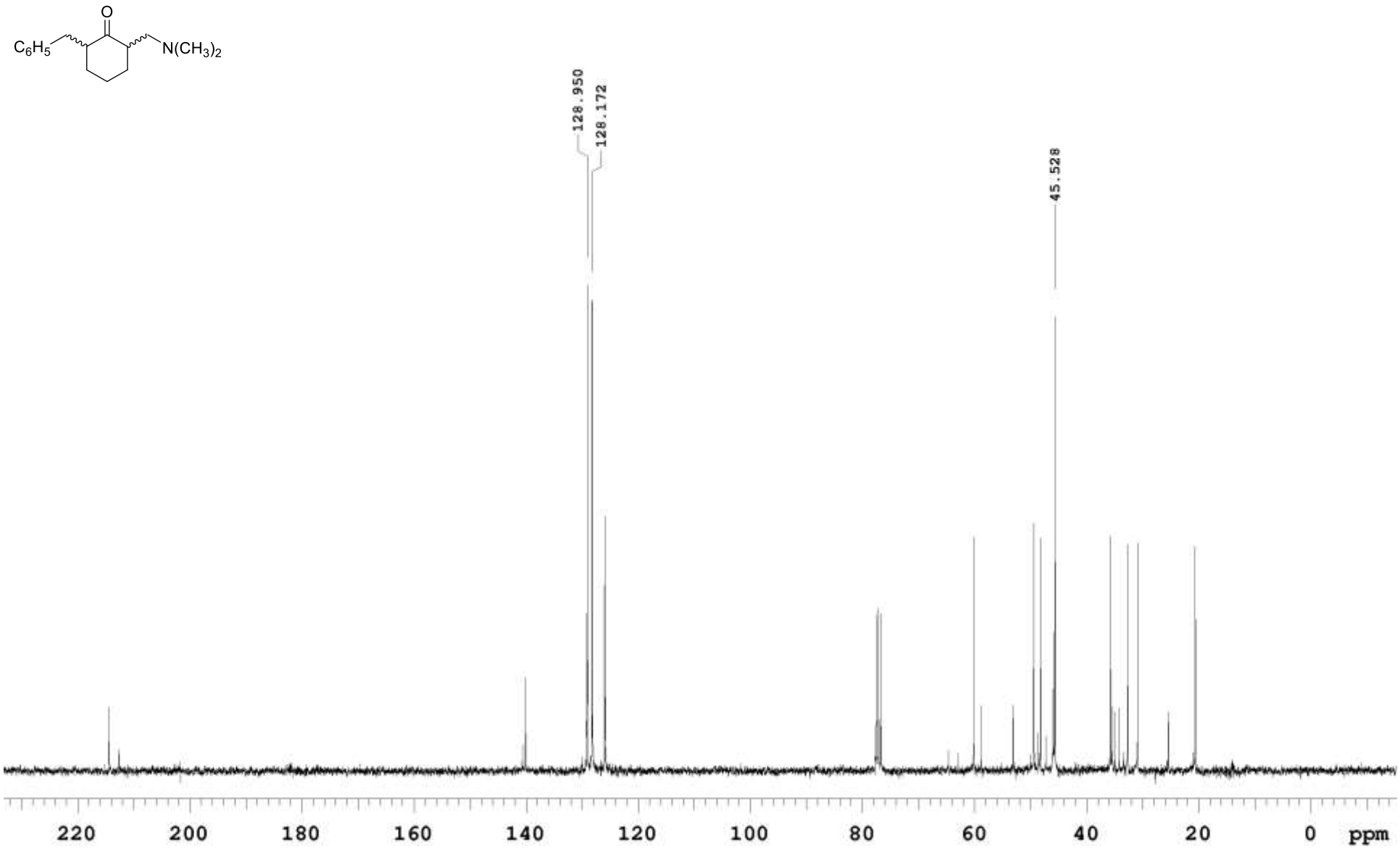
(51)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



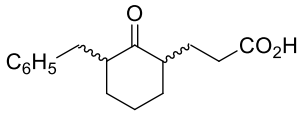
(51)- ^{1}H- NMR, $CDCl_3$, 100.6 MHz, 25 °C

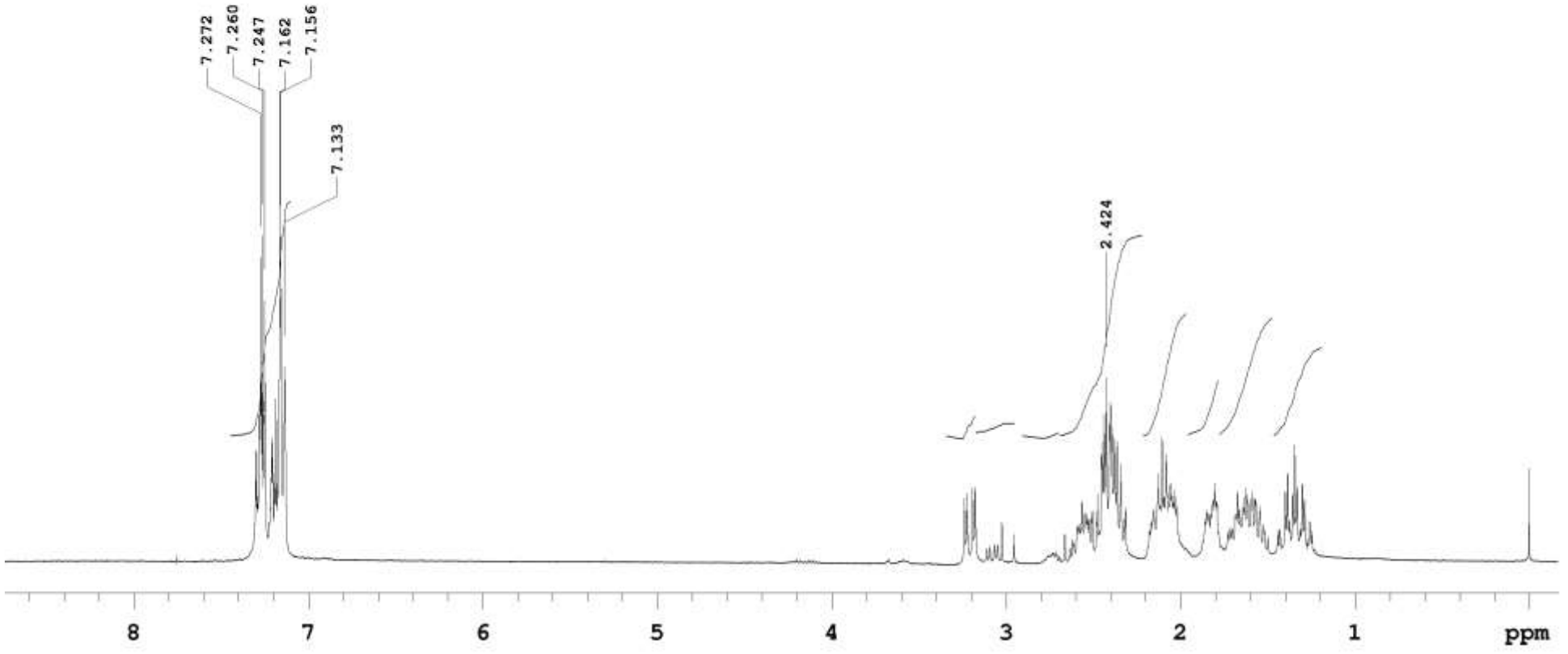


(52)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C

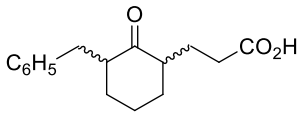


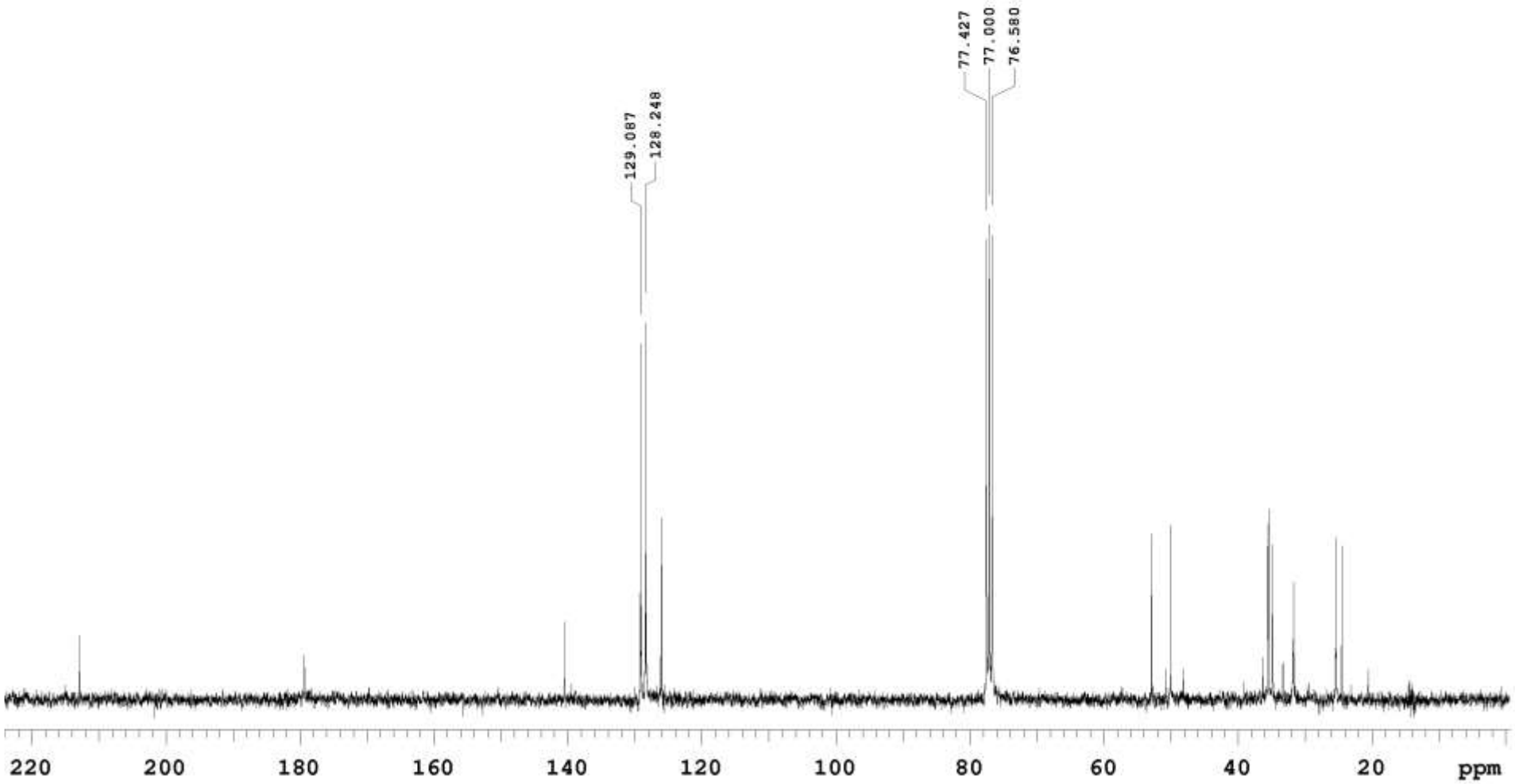
(52)- ^{1}H- NMR, $CDCl_3$, 75.4 MHz, 25 °C



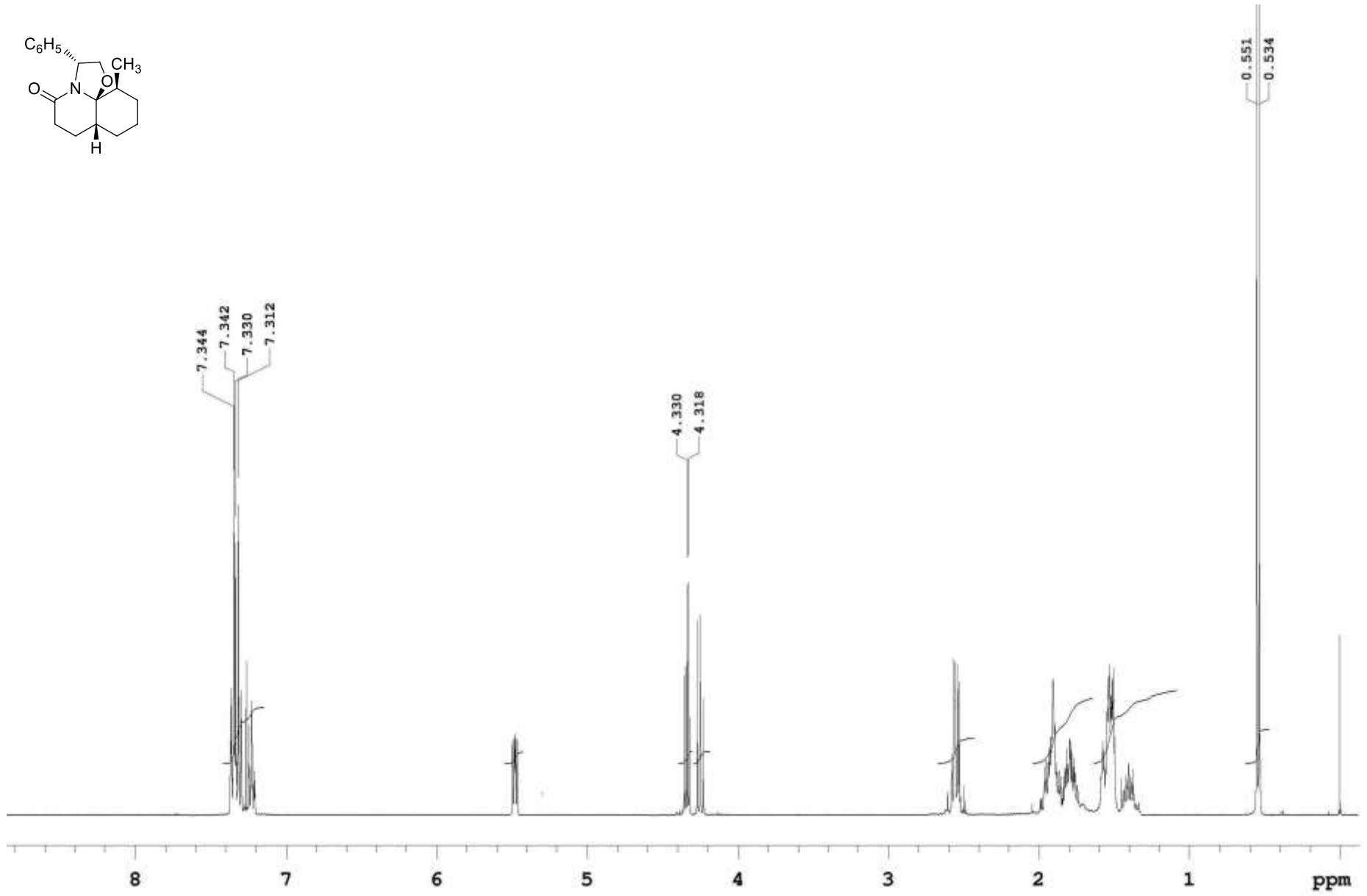


(3-Benzyl-2-oxocyclohexyl)propionic acid (54)- ^{1}H- NMR, $CDCl_3$, 300 MHz, 25 °C

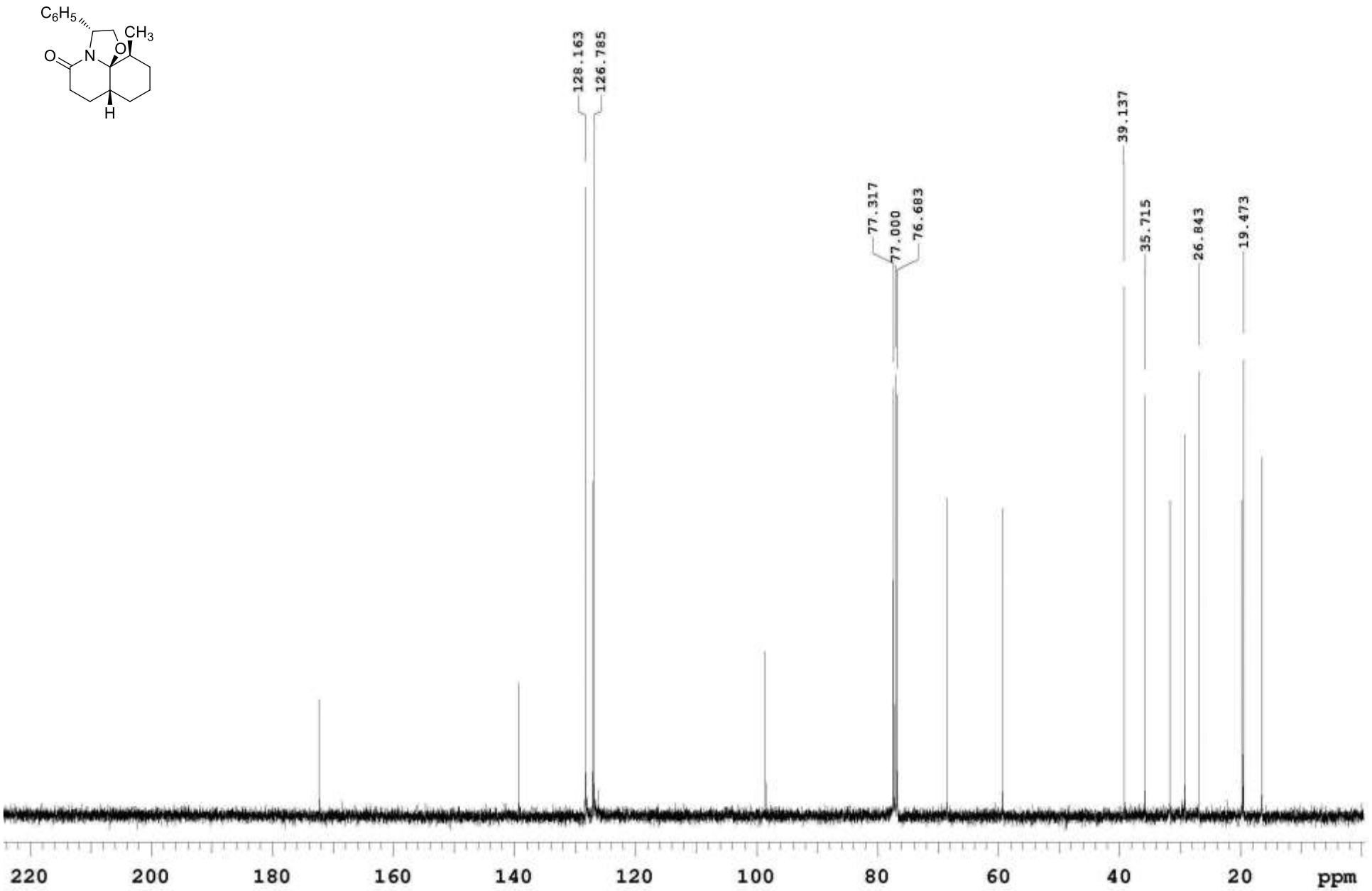




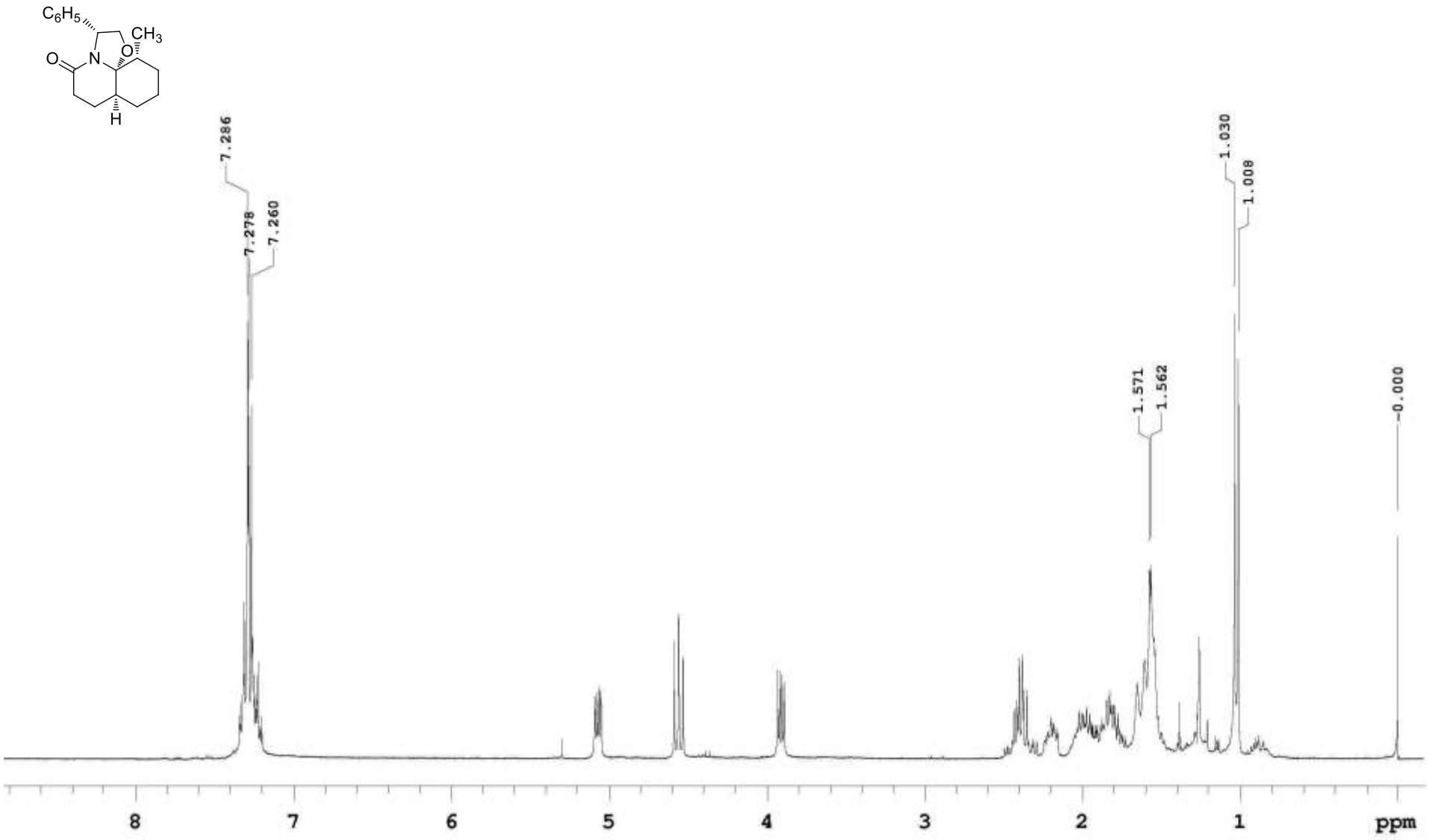
(3-Benzyl-2-oxocyclohexyl)propionic acid (54)- ^{13}C- NMR, $CDCl_3$, 75.4 MHz, 25 °C



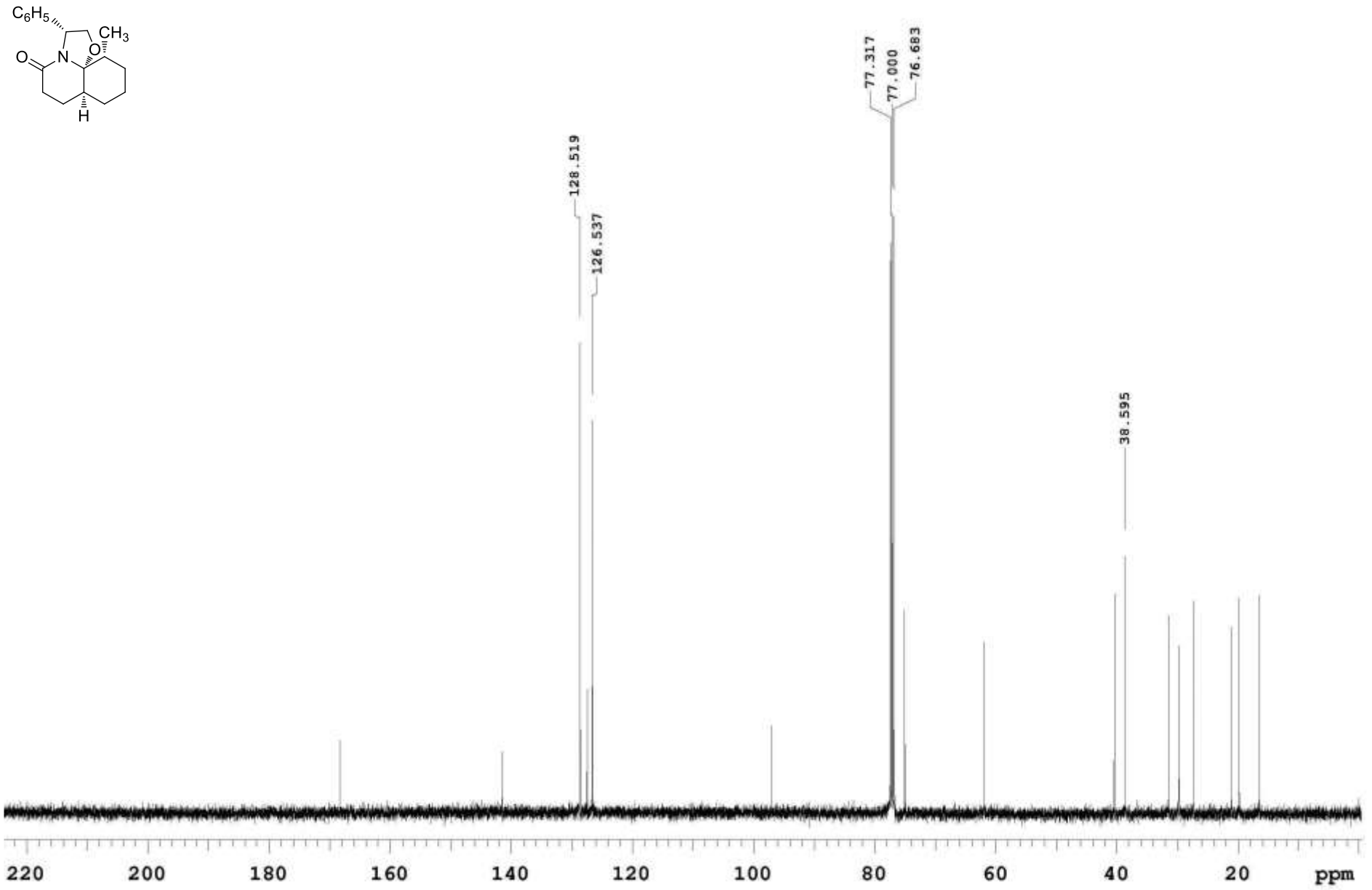
(3*R*,7a*R*,11*S*,11a*S*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55a)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



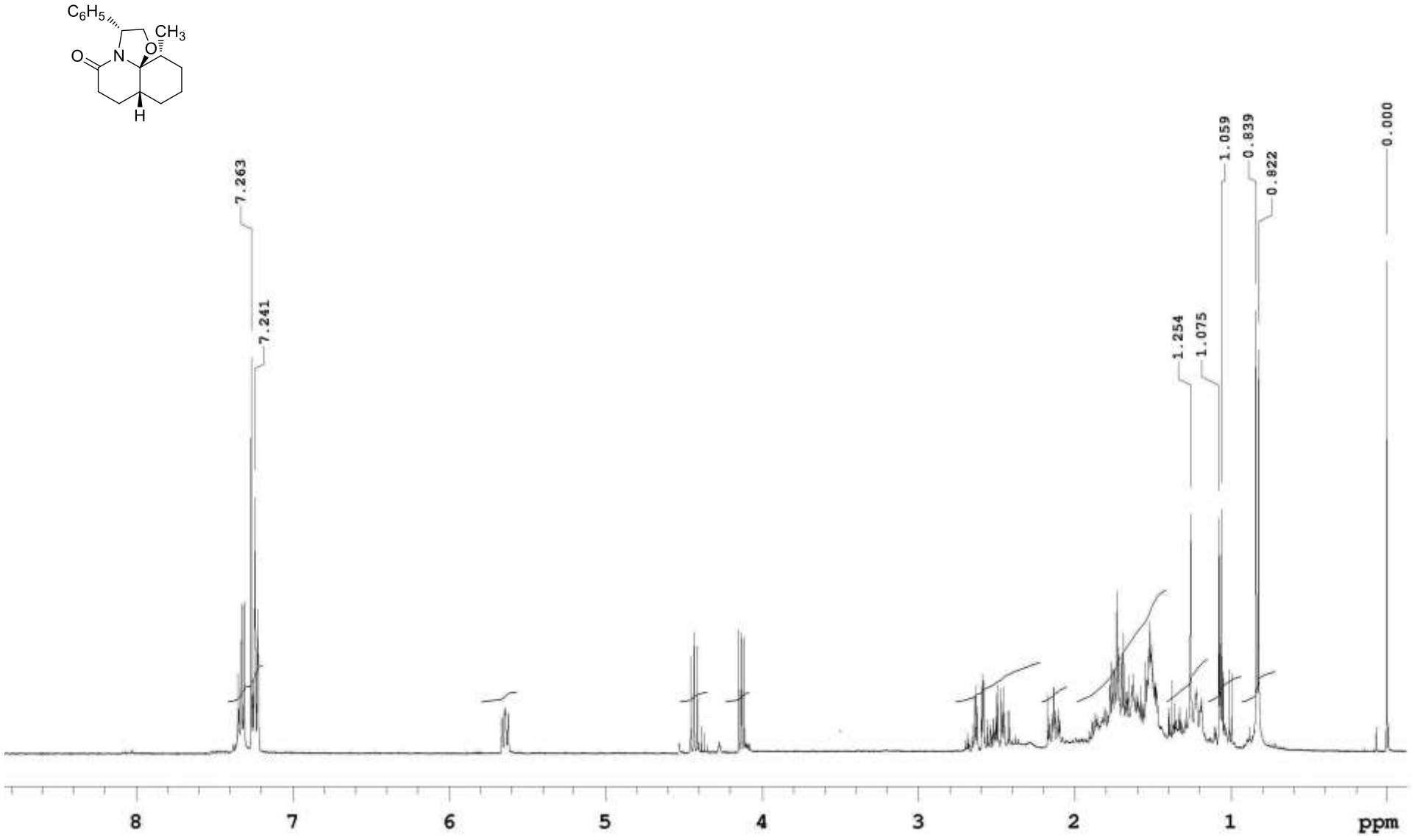
(3*R*,7a*R*,11*S*,11a*S*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55a)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



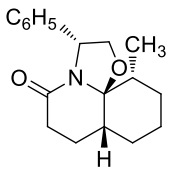
(3*R*,7a*S*,11*R*,11a*R*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55b)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

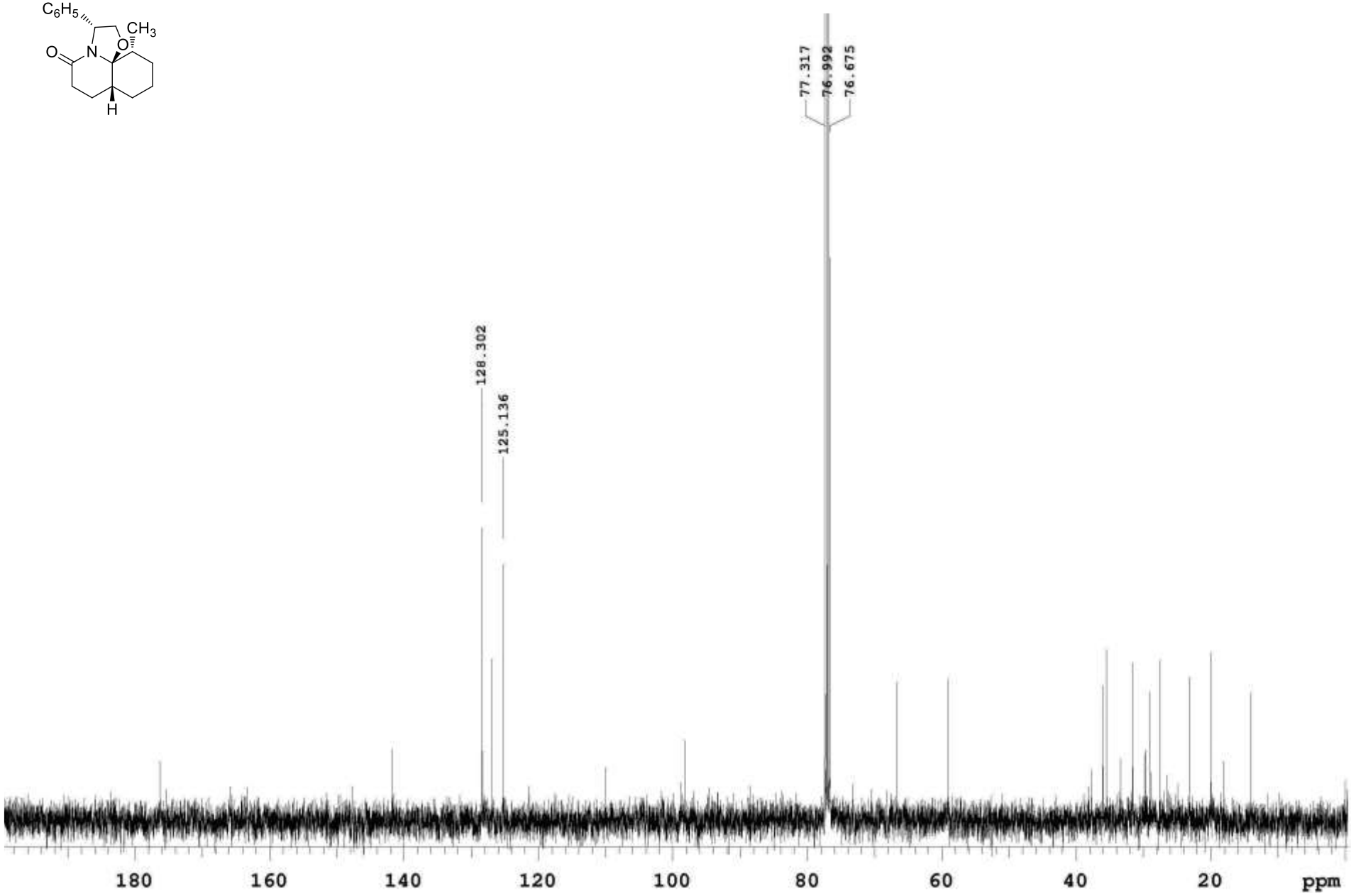


(3*R*,7a*S*,11*R*,11a*R*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55b)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

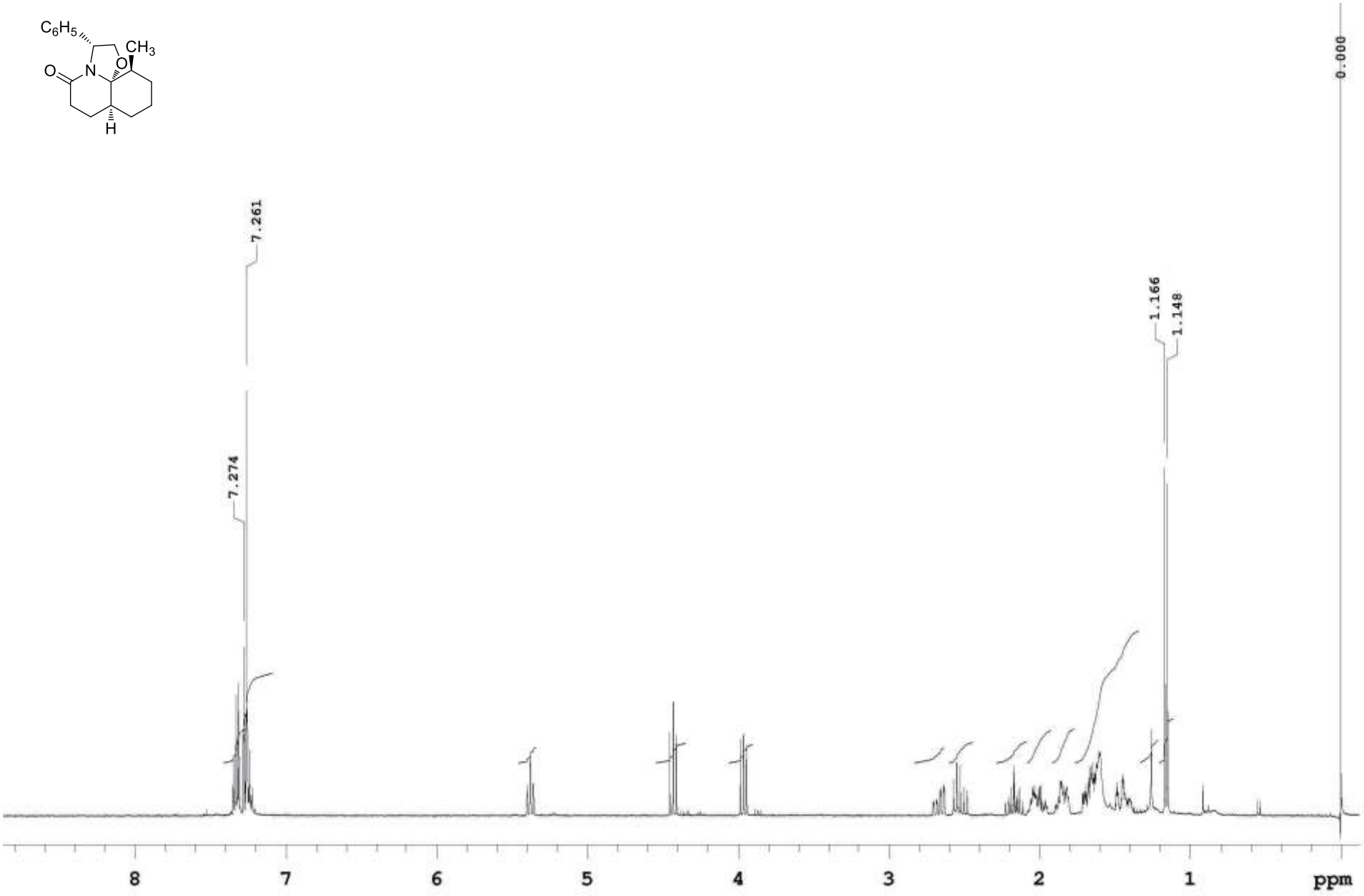


(3*R*,7a*R*,11*R*,11a*S*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55c)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

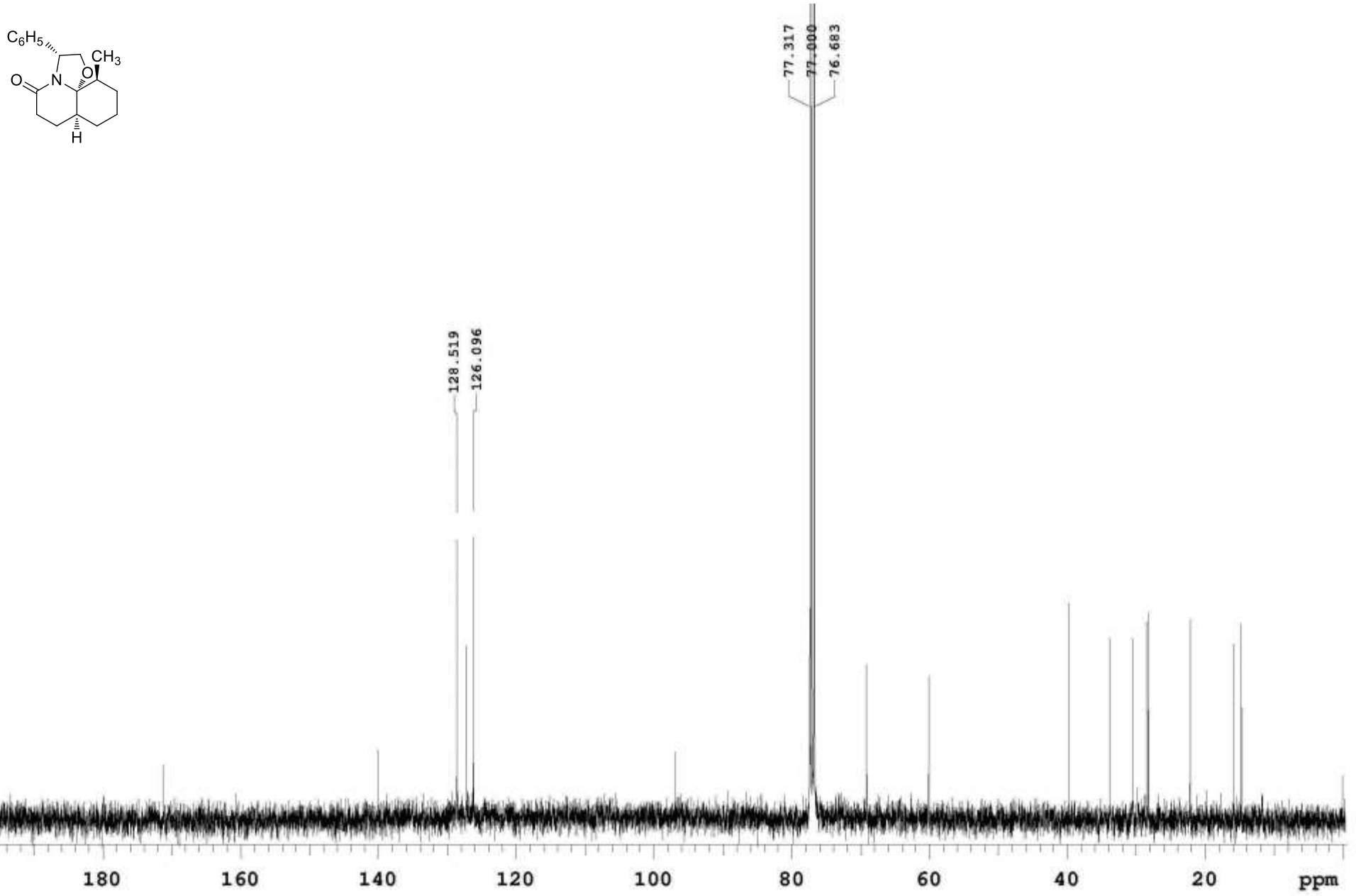




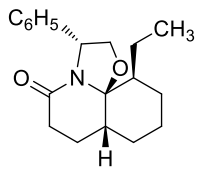
(3*R*,7a*R*,11*R*,11a*S*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55c)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

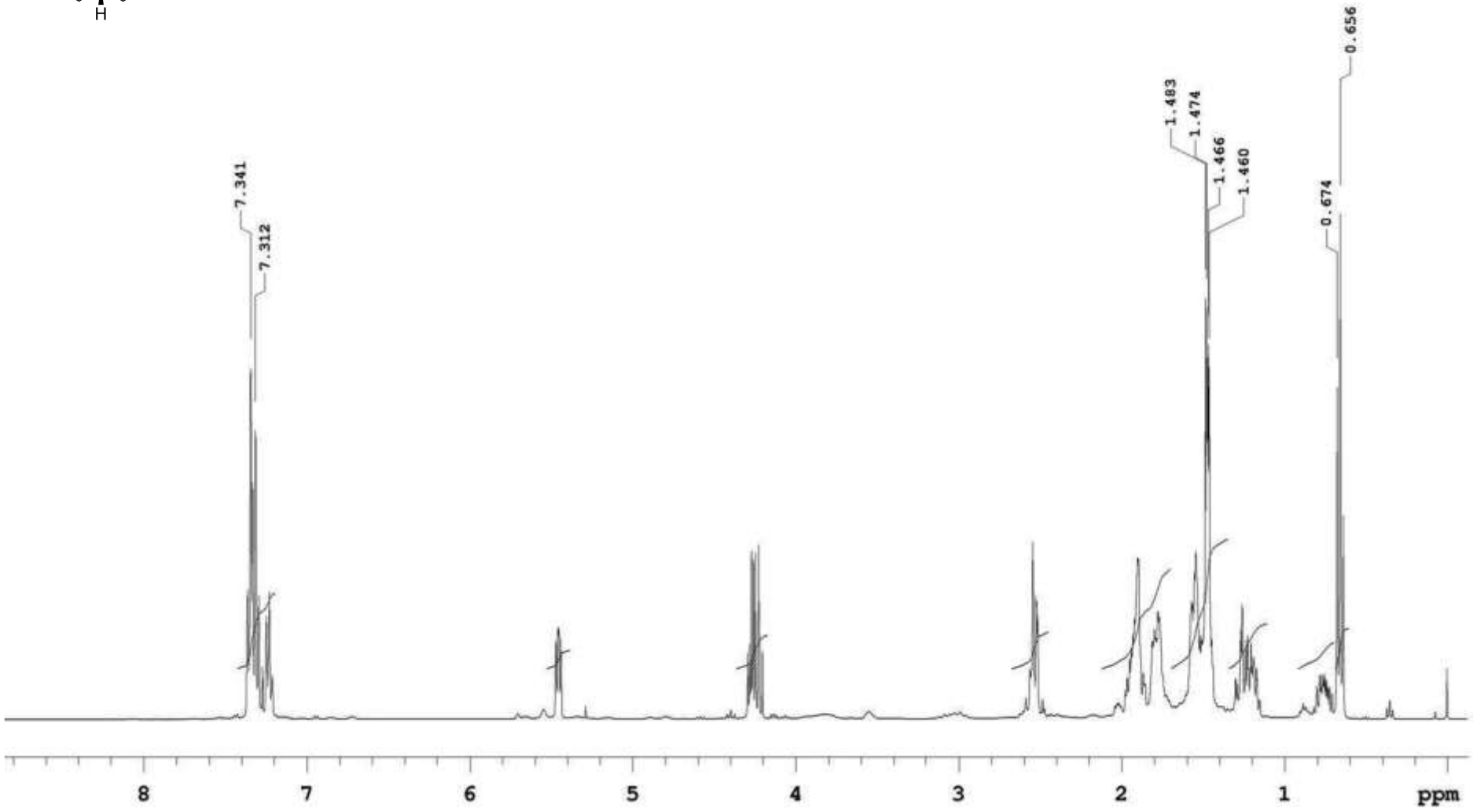


(3*R*,7a*S*,11*S*,11a*R*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55d)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

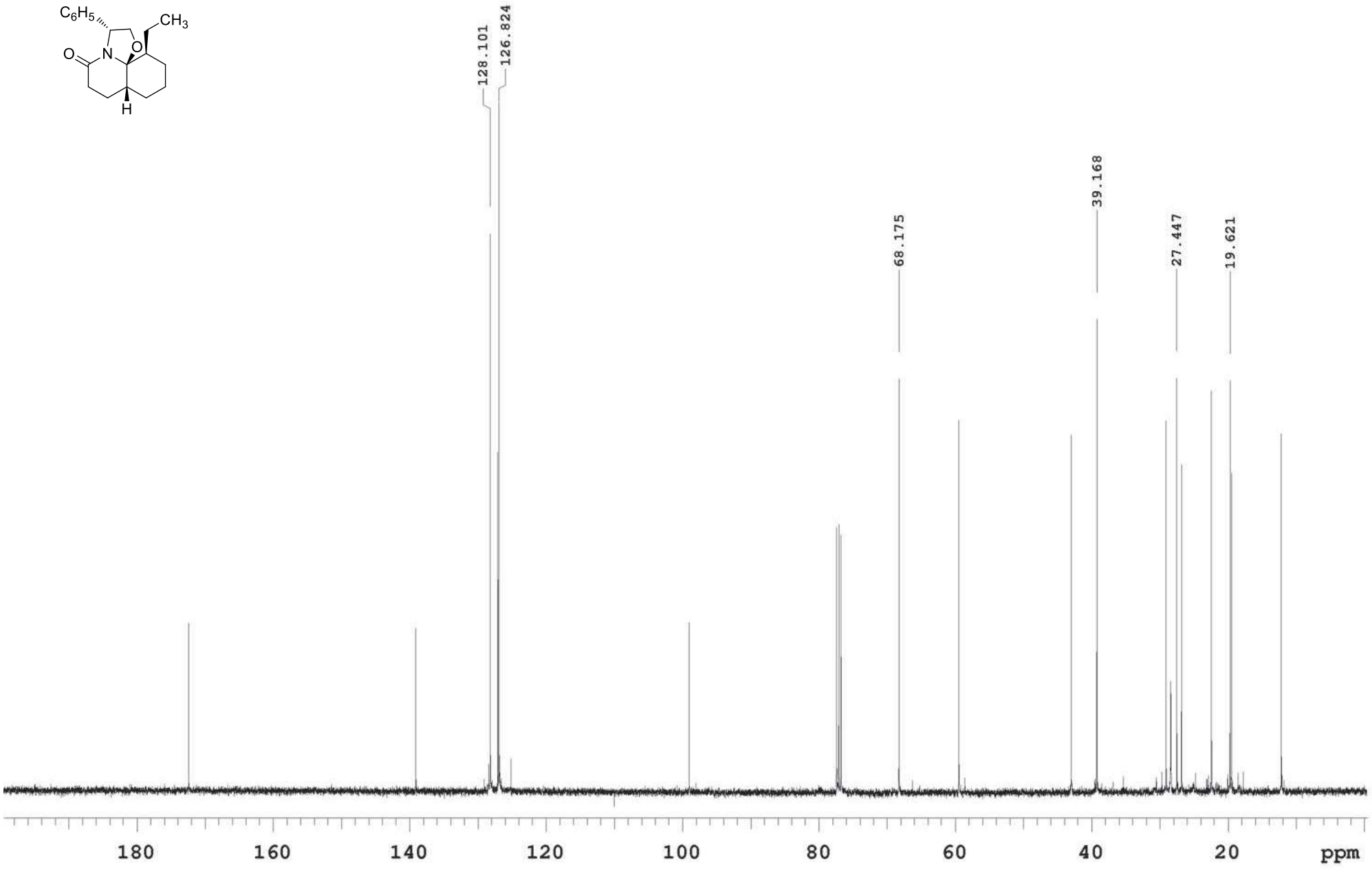


(3*R*,7a*S*,11*S*,11a*R*)-11-Methyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (55d)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

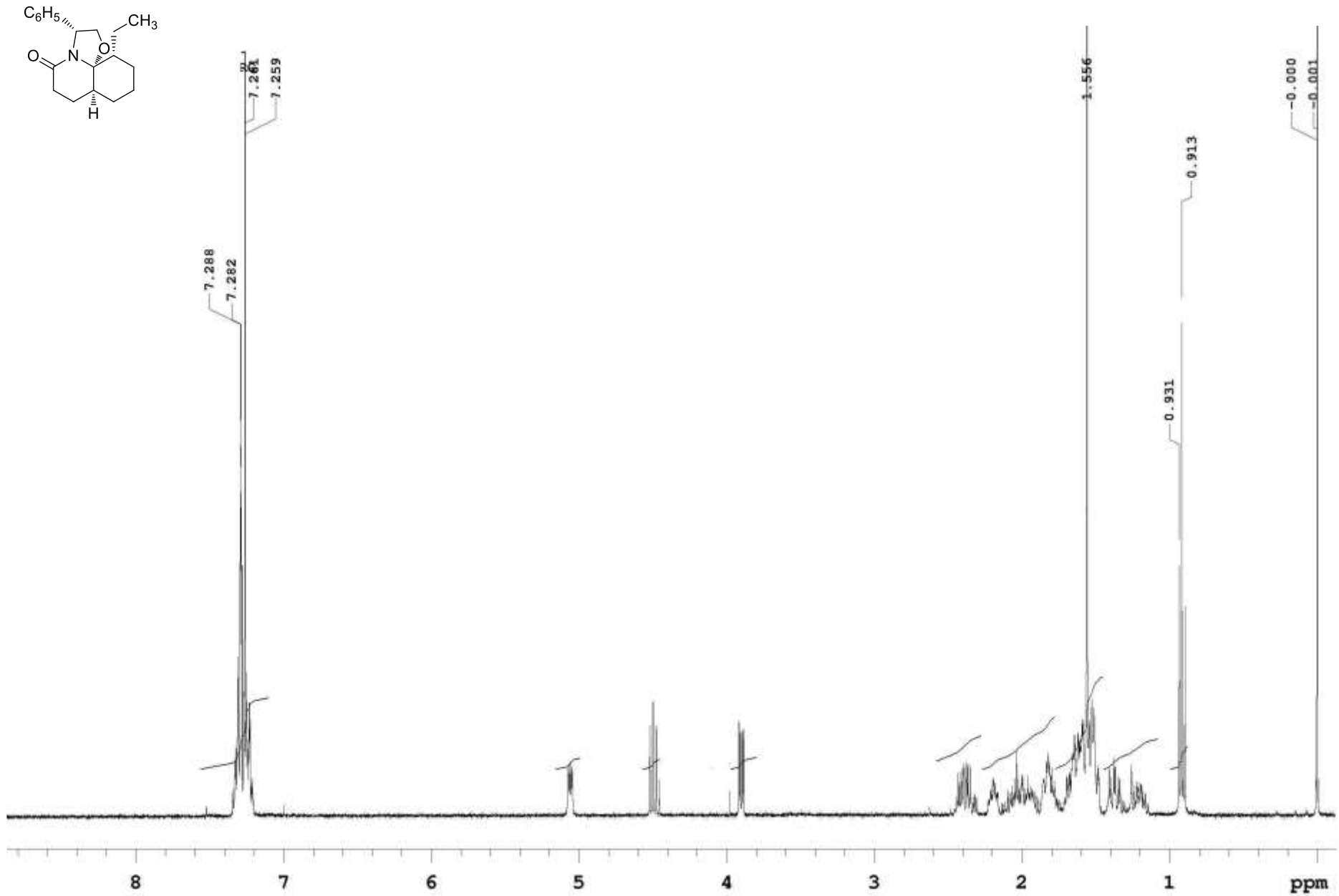




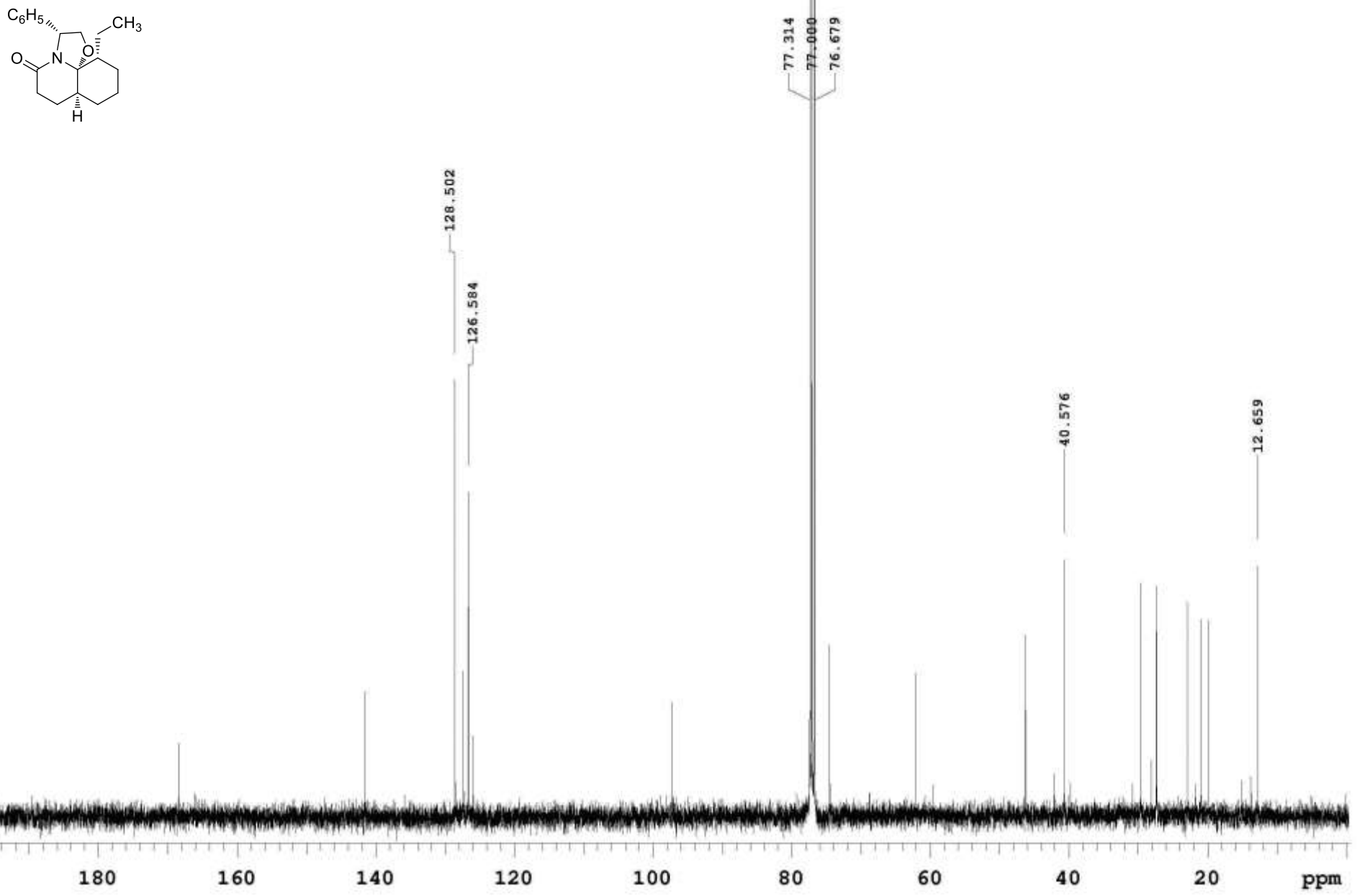
(3*R*,7a*R*,11*S*,11a*S*)-11-Ethyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (56a)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



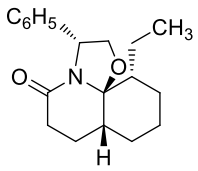
(3*R*,7a*R*,11*S*,11a*S*)-11-Ethyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (56a)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

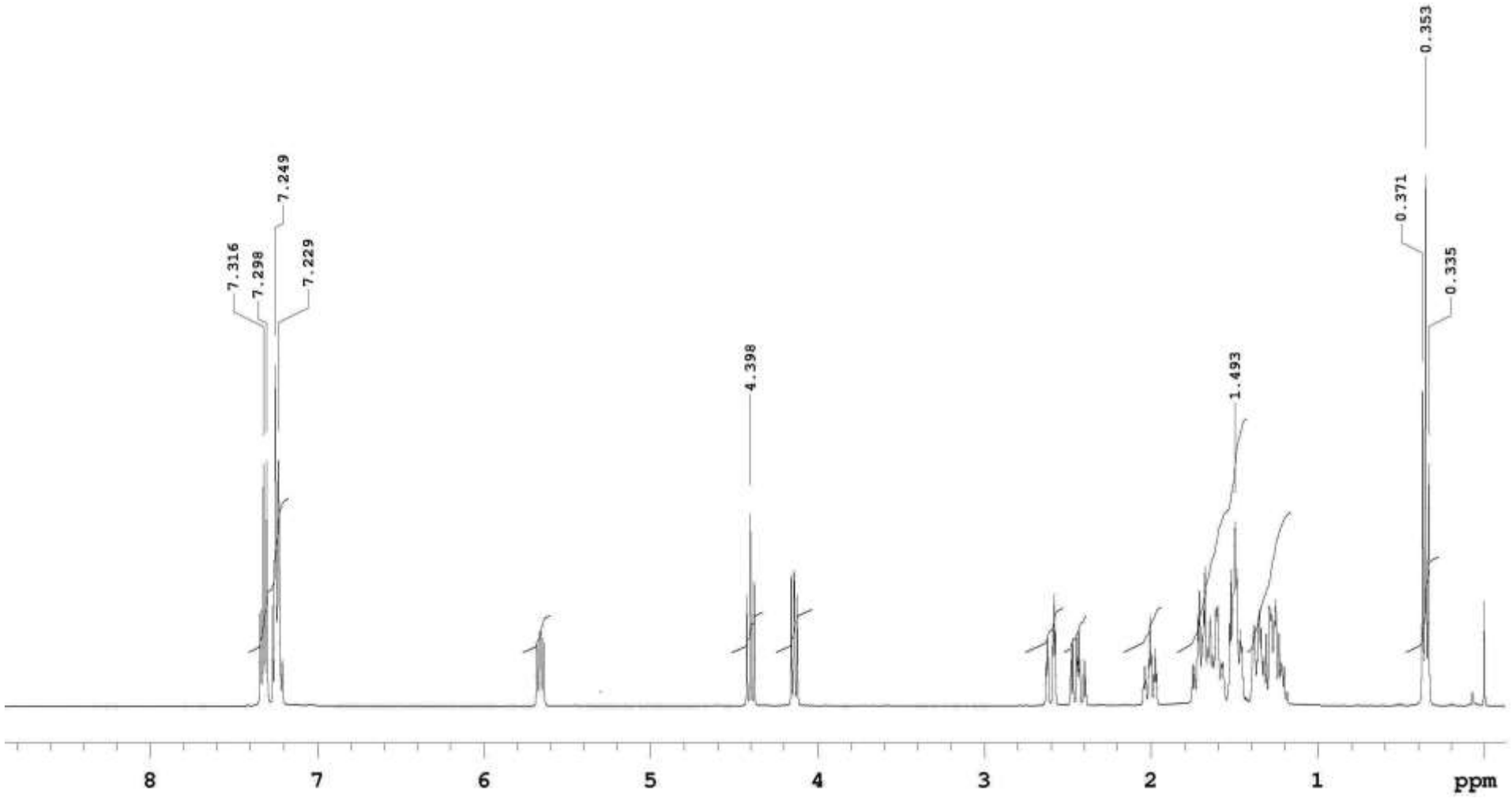


(3*R*,7a*S*,11*R*,11a*R*)-11-Ethyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (56b)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

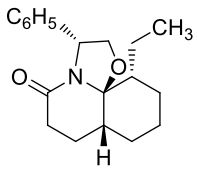


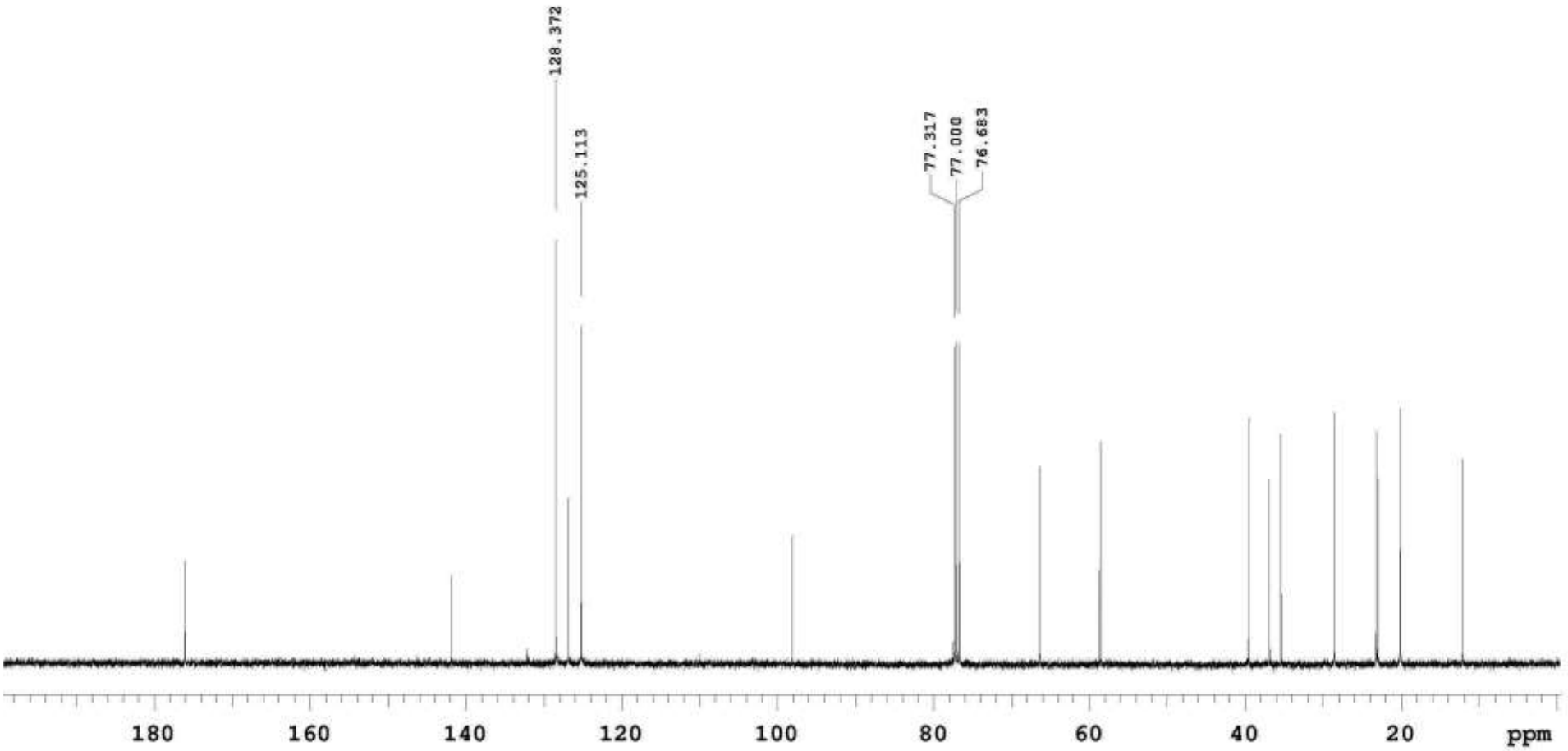
(3*R*,7a*S*,11*R*,11a*R*)-11-Ethyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (56b)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



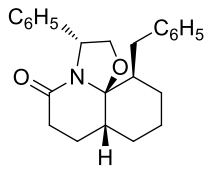


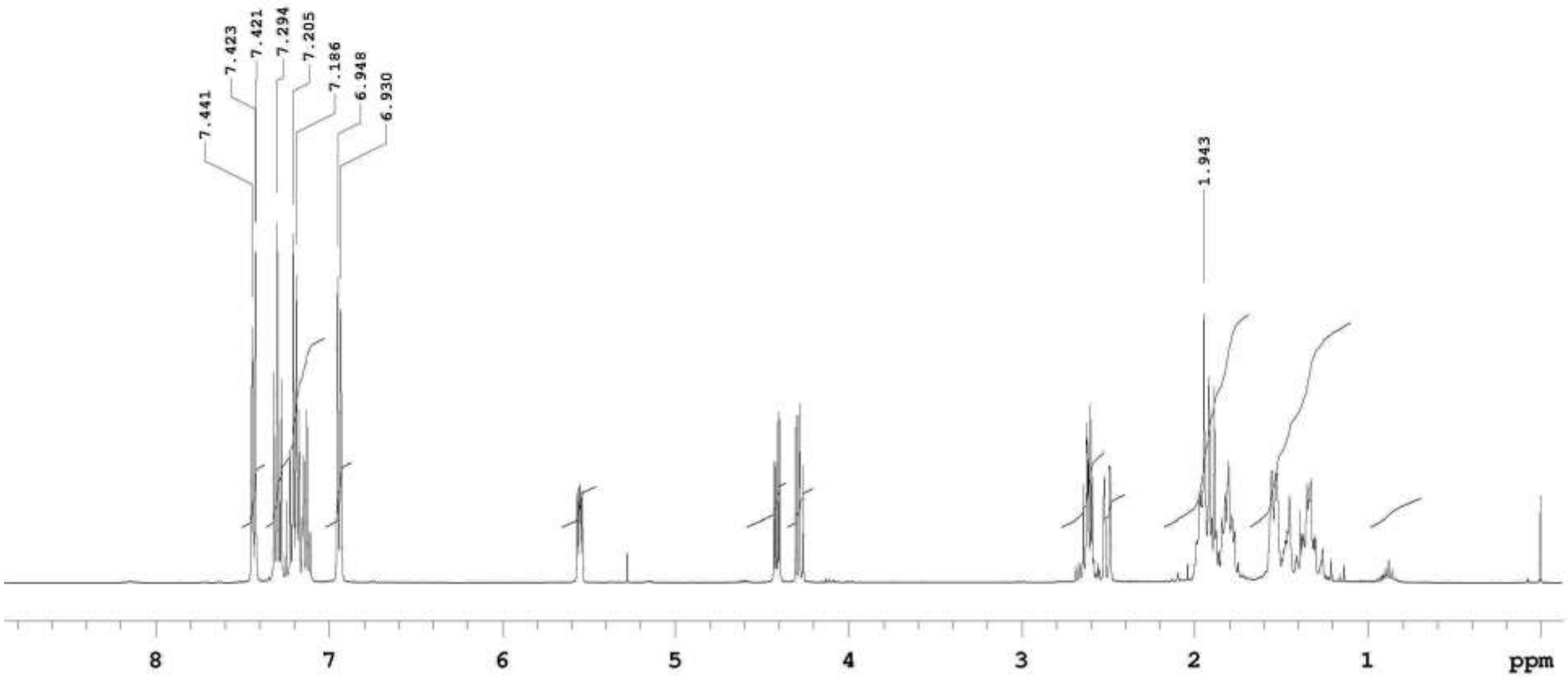
(3*R*,7a*R*,11*R*,11a*S*)-11-Ethyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (56c)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



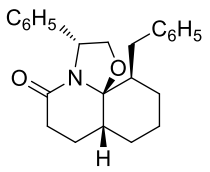


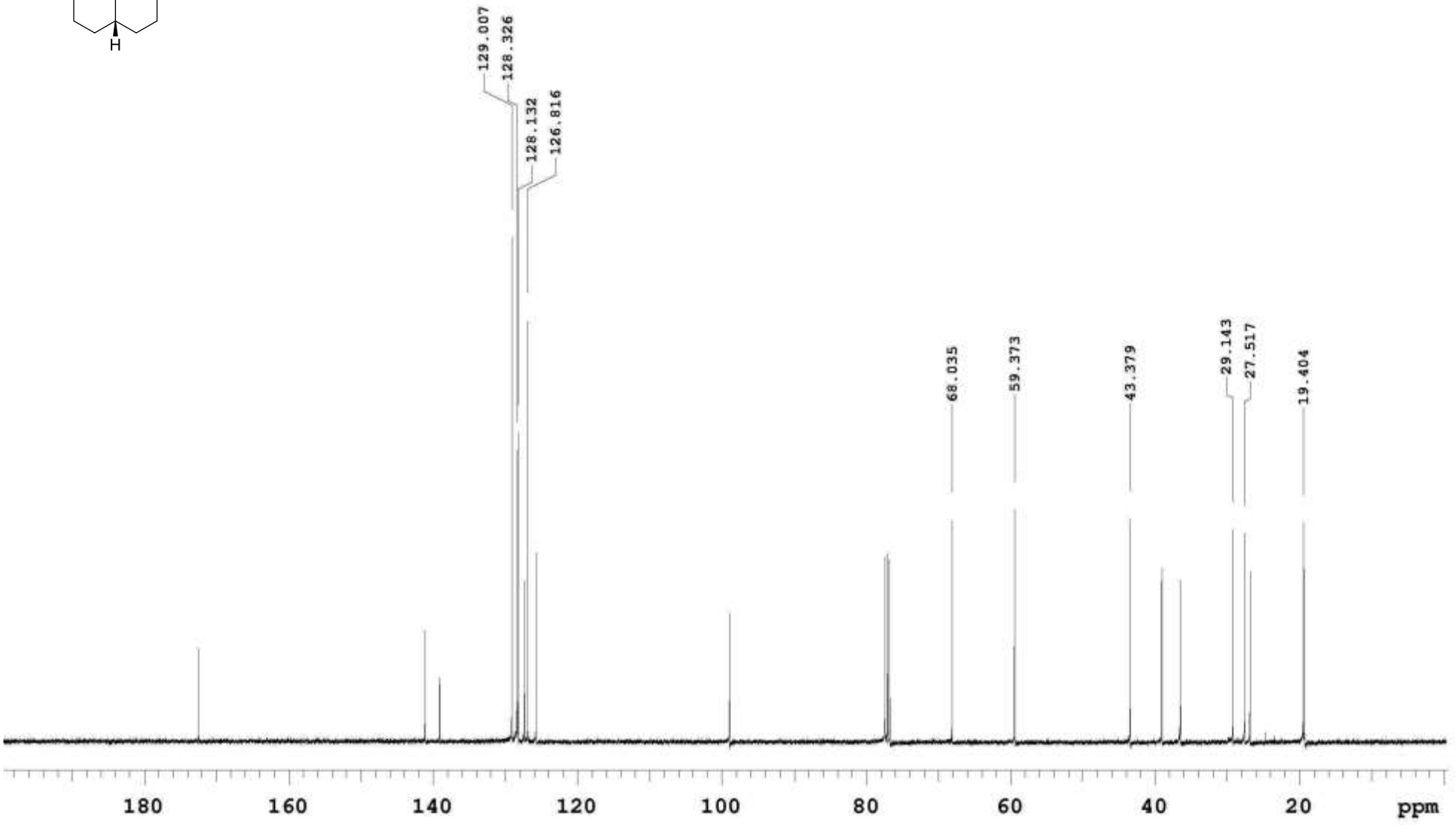
(3*R*,7a*R*,11*R*,11a*S*)-11-Ethyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (56c)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



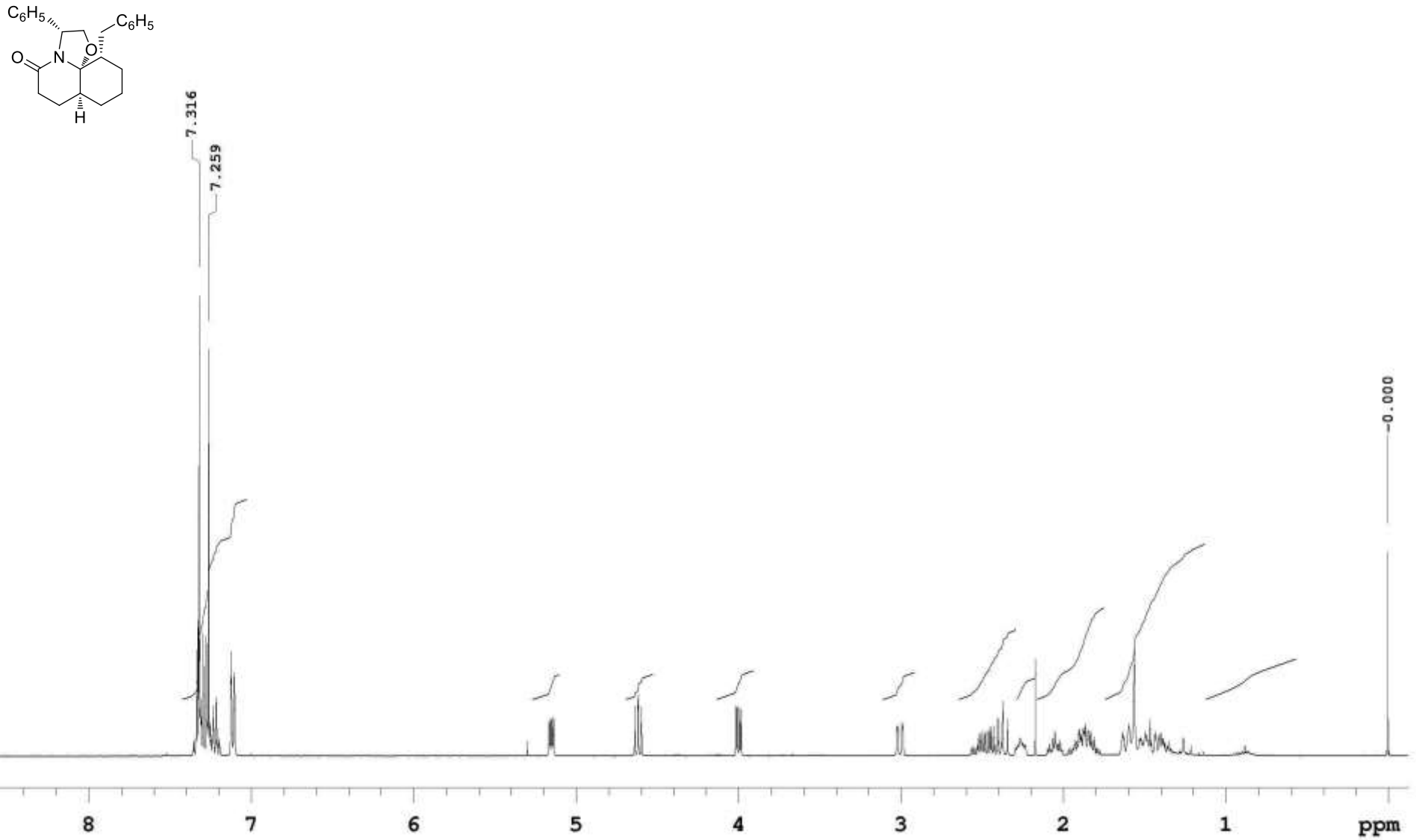


(3*R*,7a*R*,11*R*,11a*R*)-11-Benzyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (57a)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

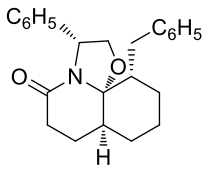


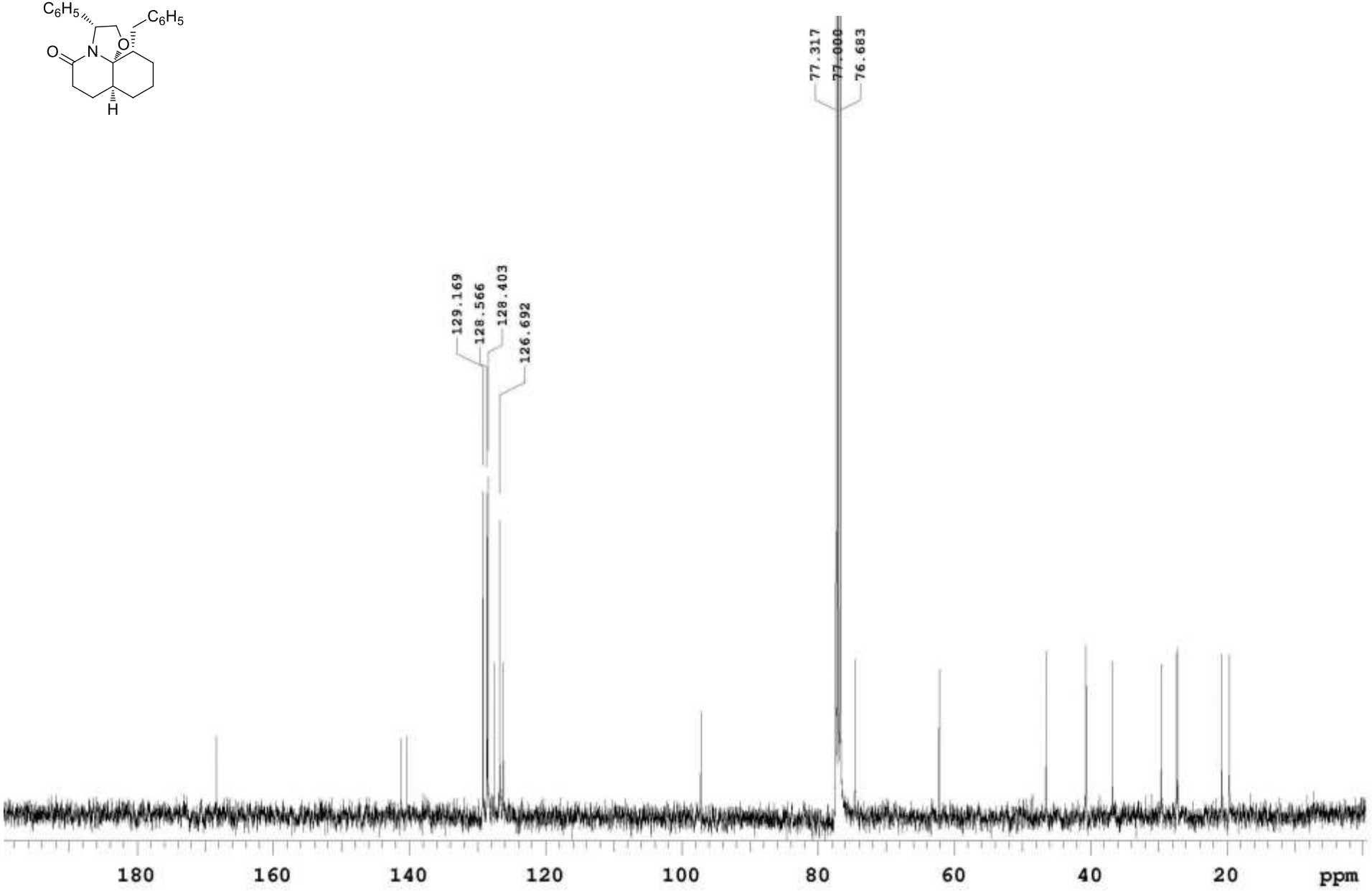


(3*R*,7a*R*,11*R*,11a*R*)-11-Benzyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (57a)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

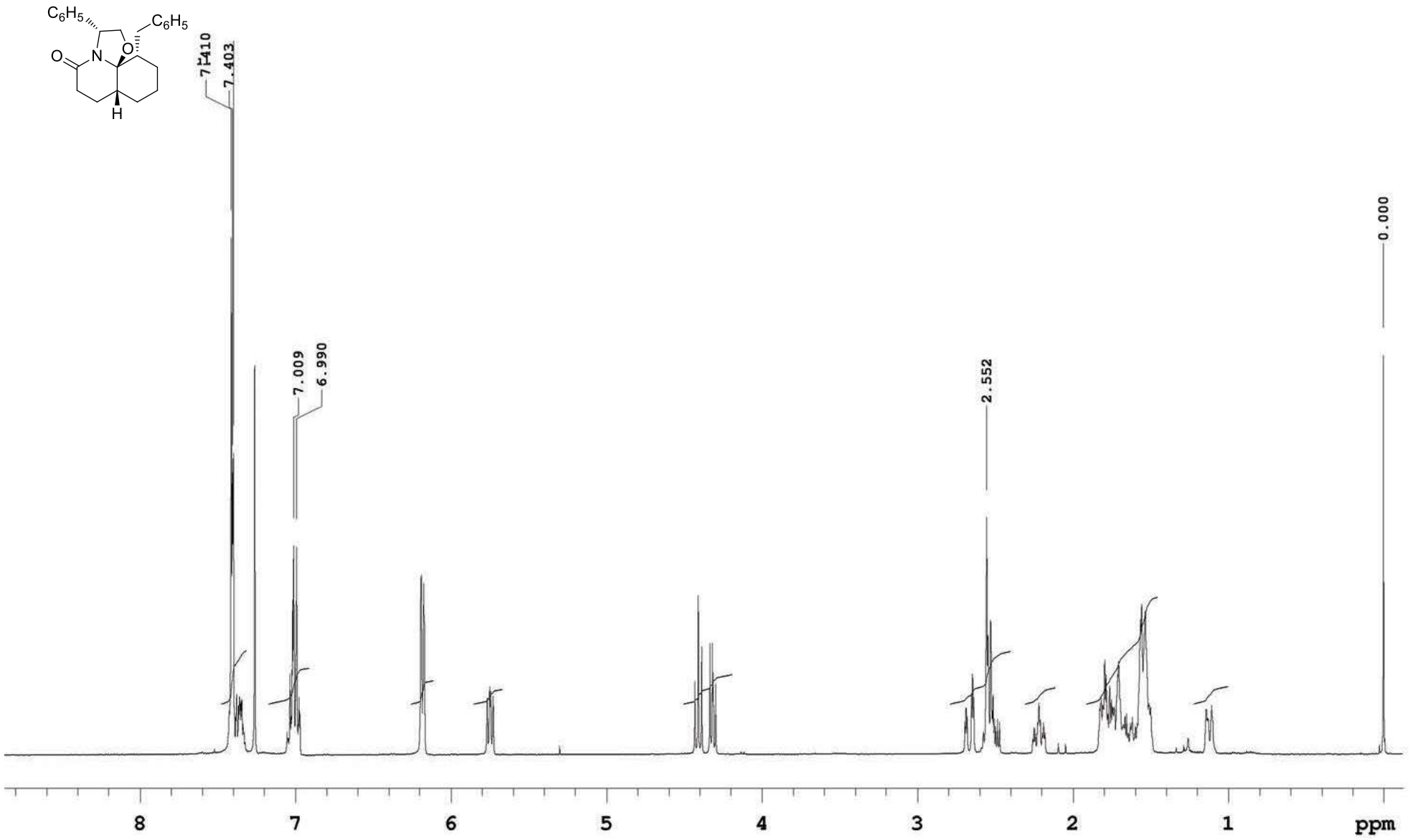


(3*R*,7a*S*,11*S*,11a*S*)-11-Benzyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (57b)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

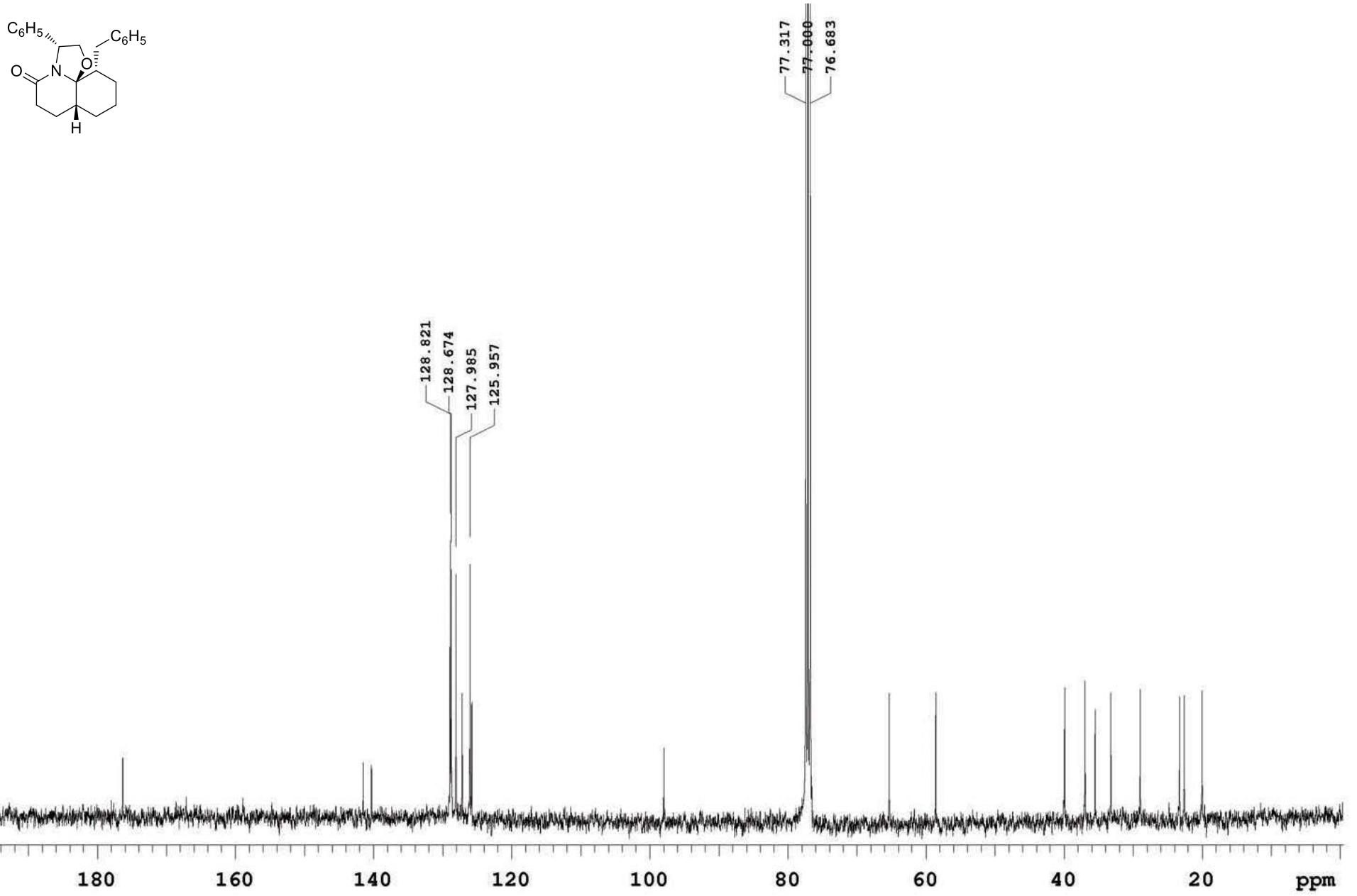




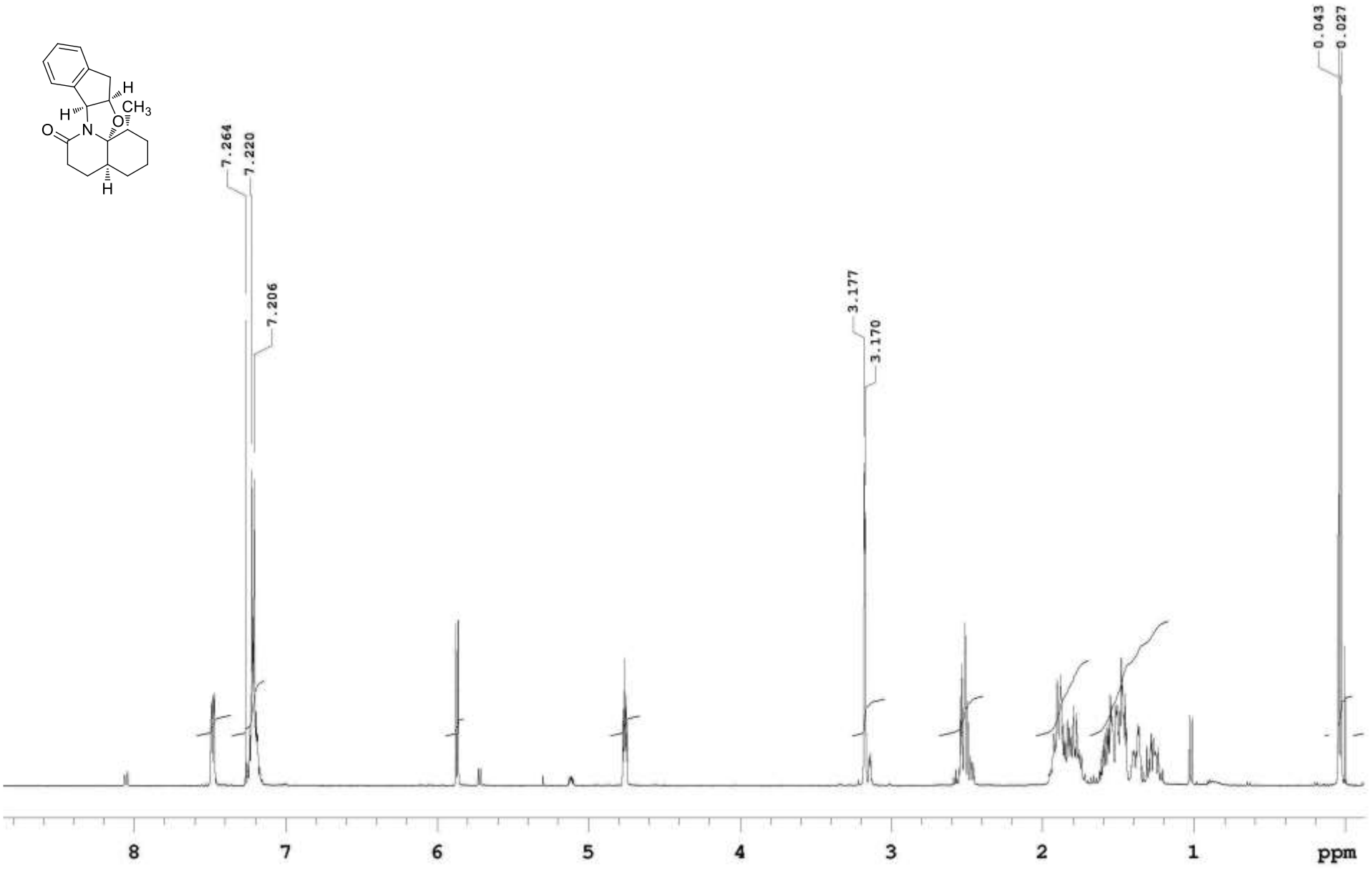
(3*R*,7a*S*,11*S*,11a*S*)-11-Benzyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (57b)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



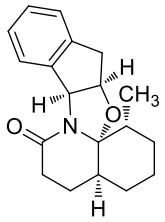
(3*R*,7a*R*,11*S*,11a*R*)-11-Benzyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (57c)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

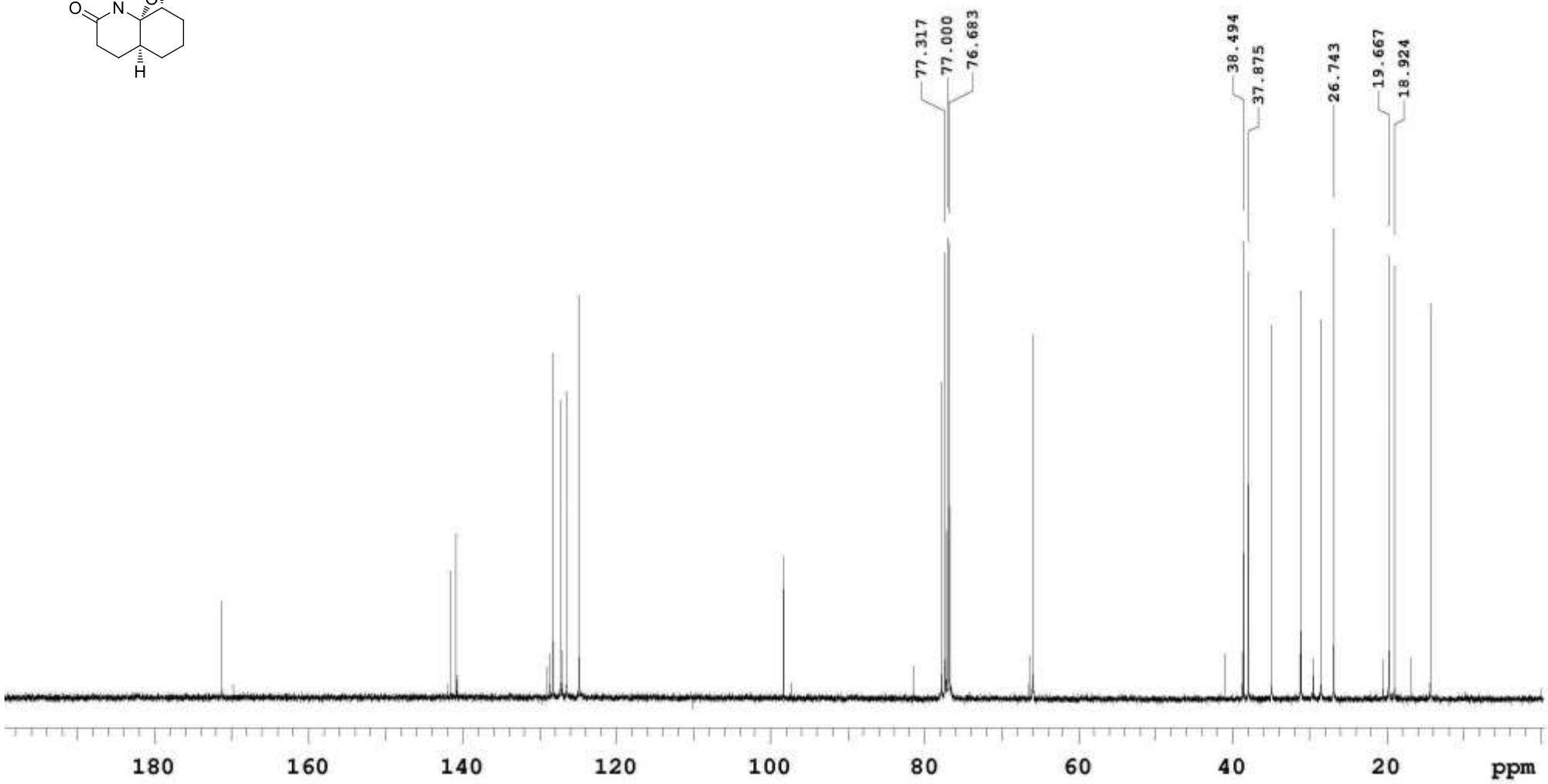


(3*R*,7a*R*,11*S*,11a*R*)-11-Benzyl-5-oxo-3-phenyldecahydrooxazolo[2,3-*j*]quinoline (57c)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

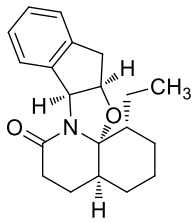


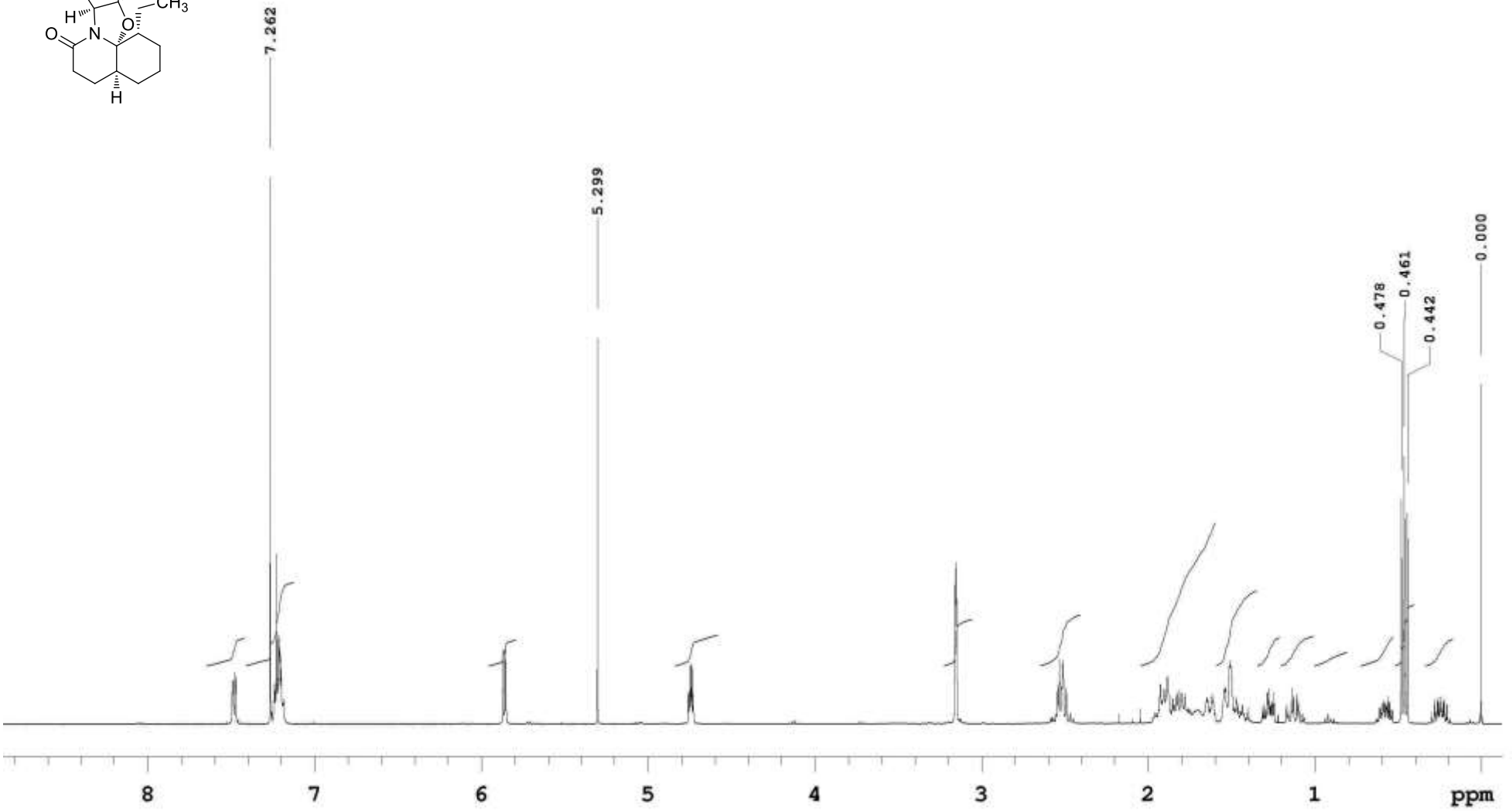
(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-Methyl-7-oxo-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (58a)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



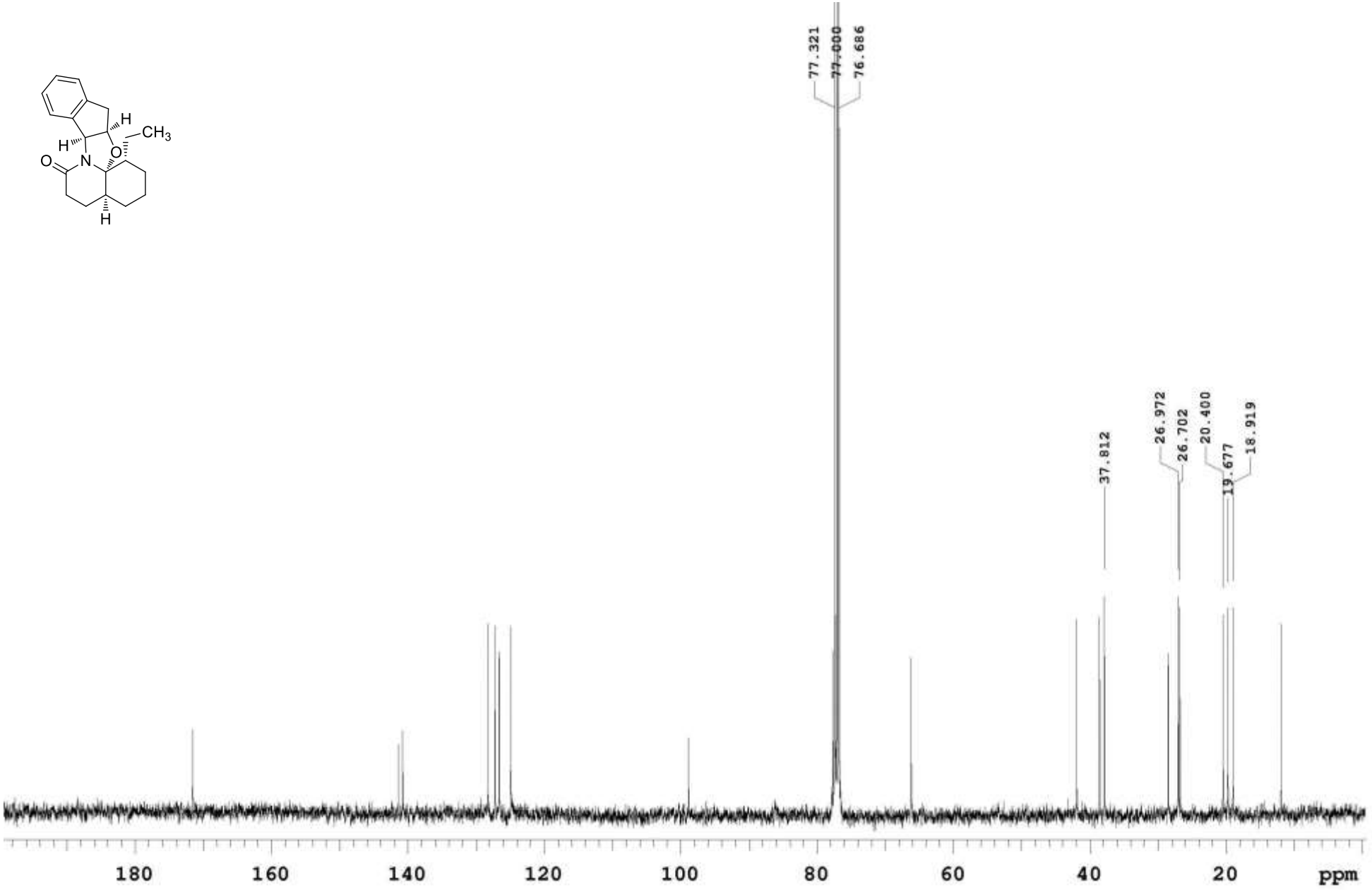


(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-Methyl-7-oxo-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (58a)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C

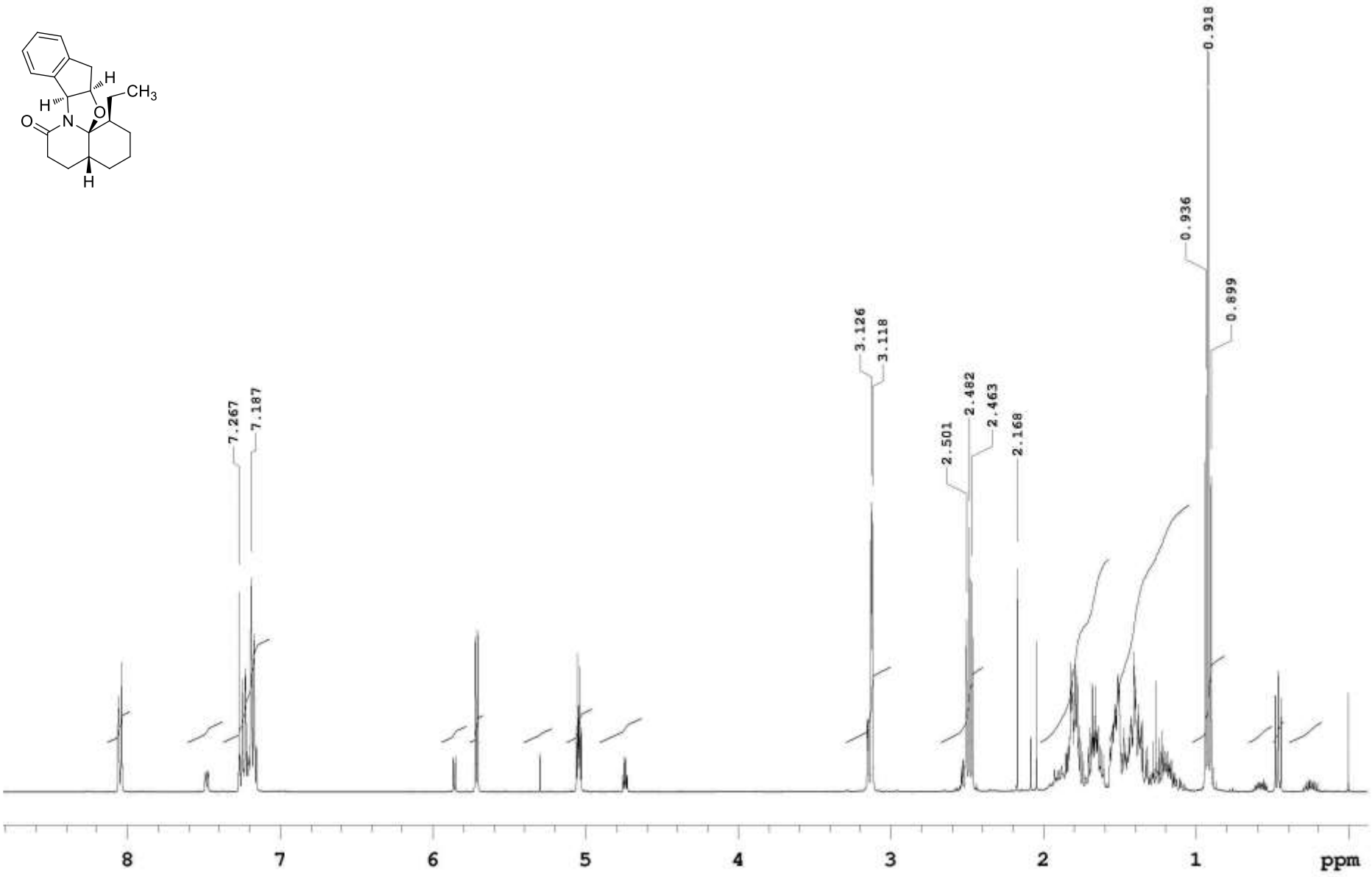




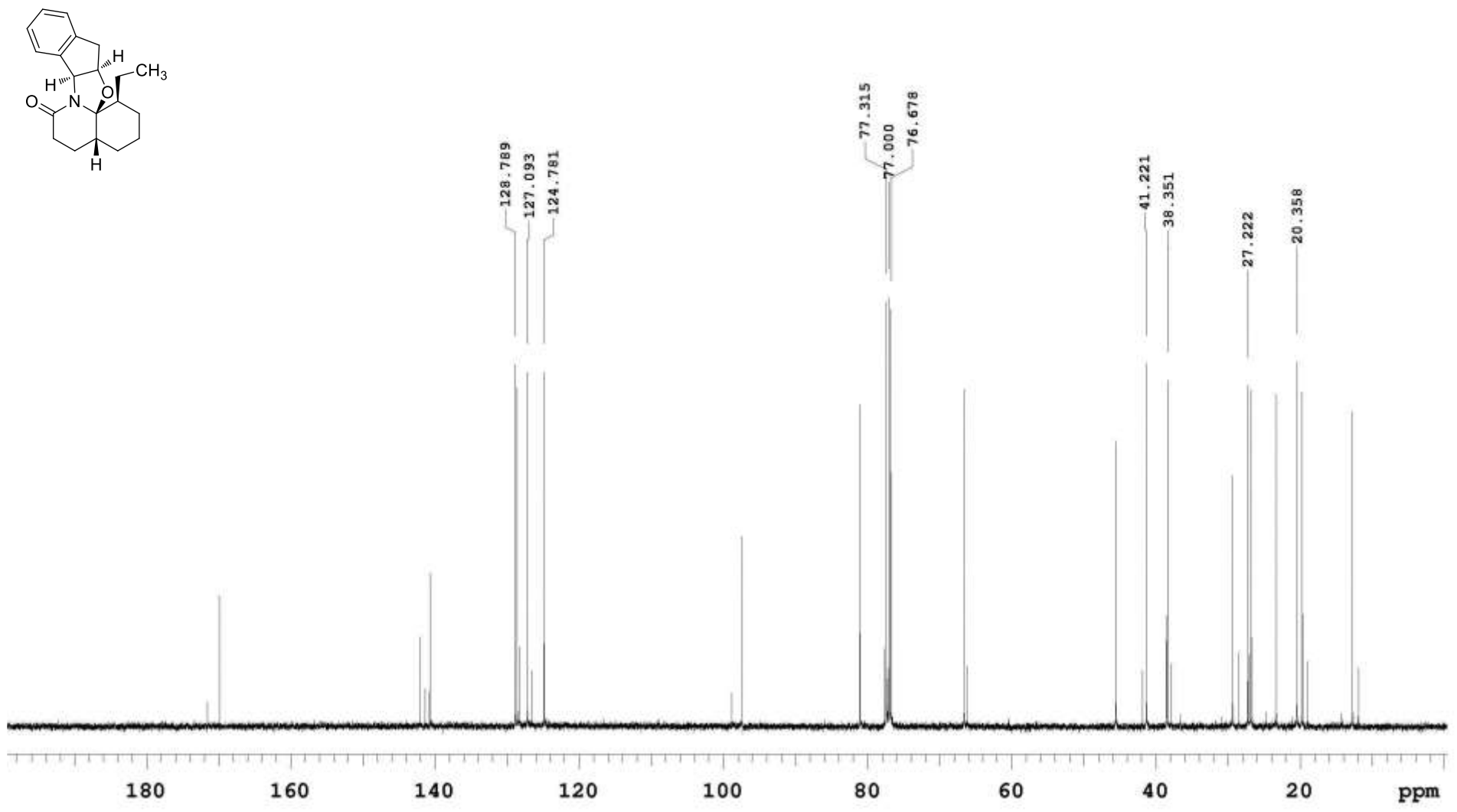
(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-Ethyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (59a)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



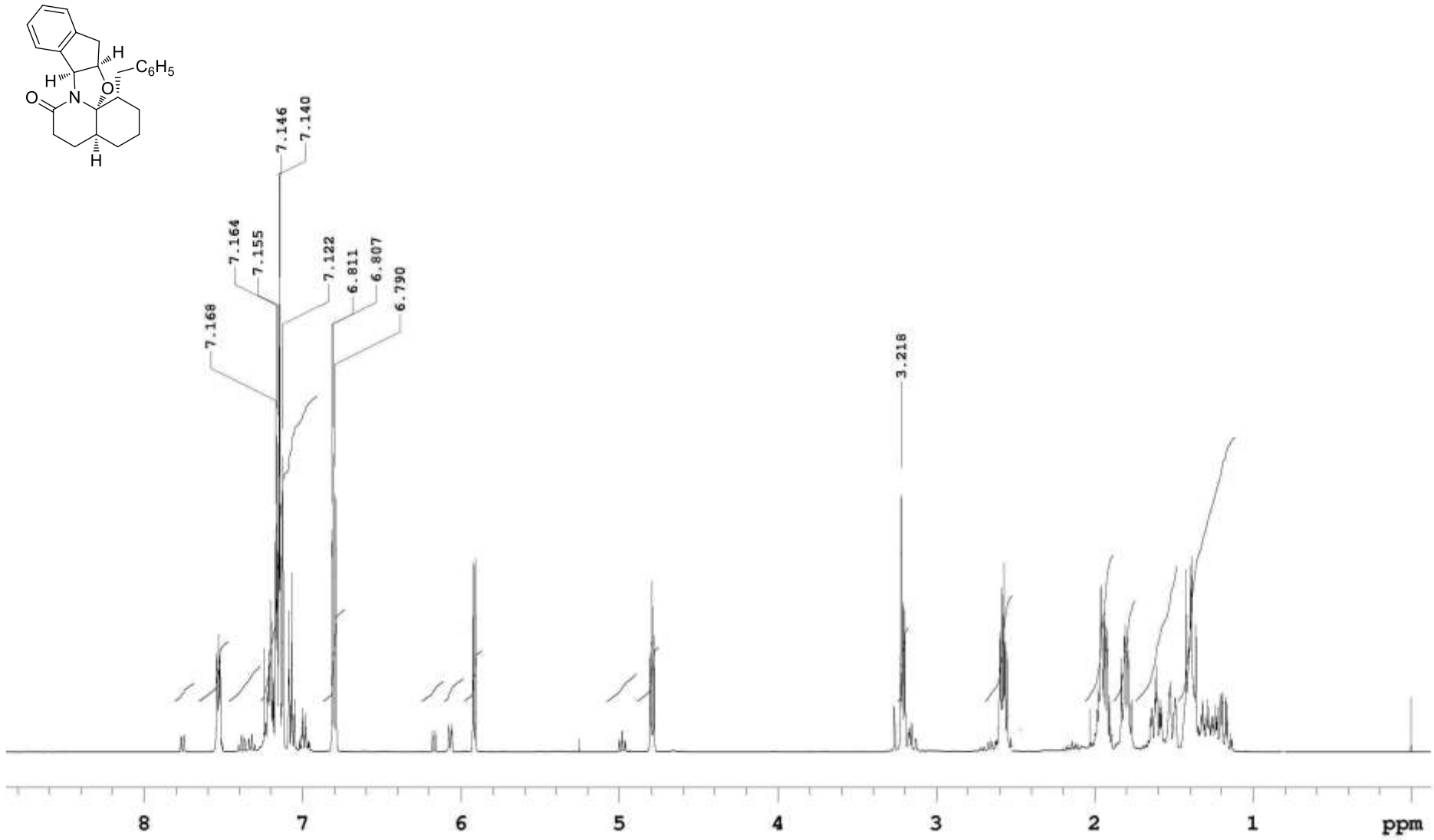
(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-Ethyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (59a)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



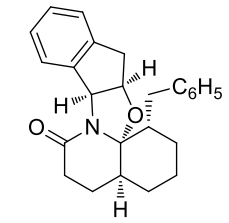
(1*S*,4a*R*,8a*S*,13a*R*,14a*S*)-1-Ethyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (59b)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C

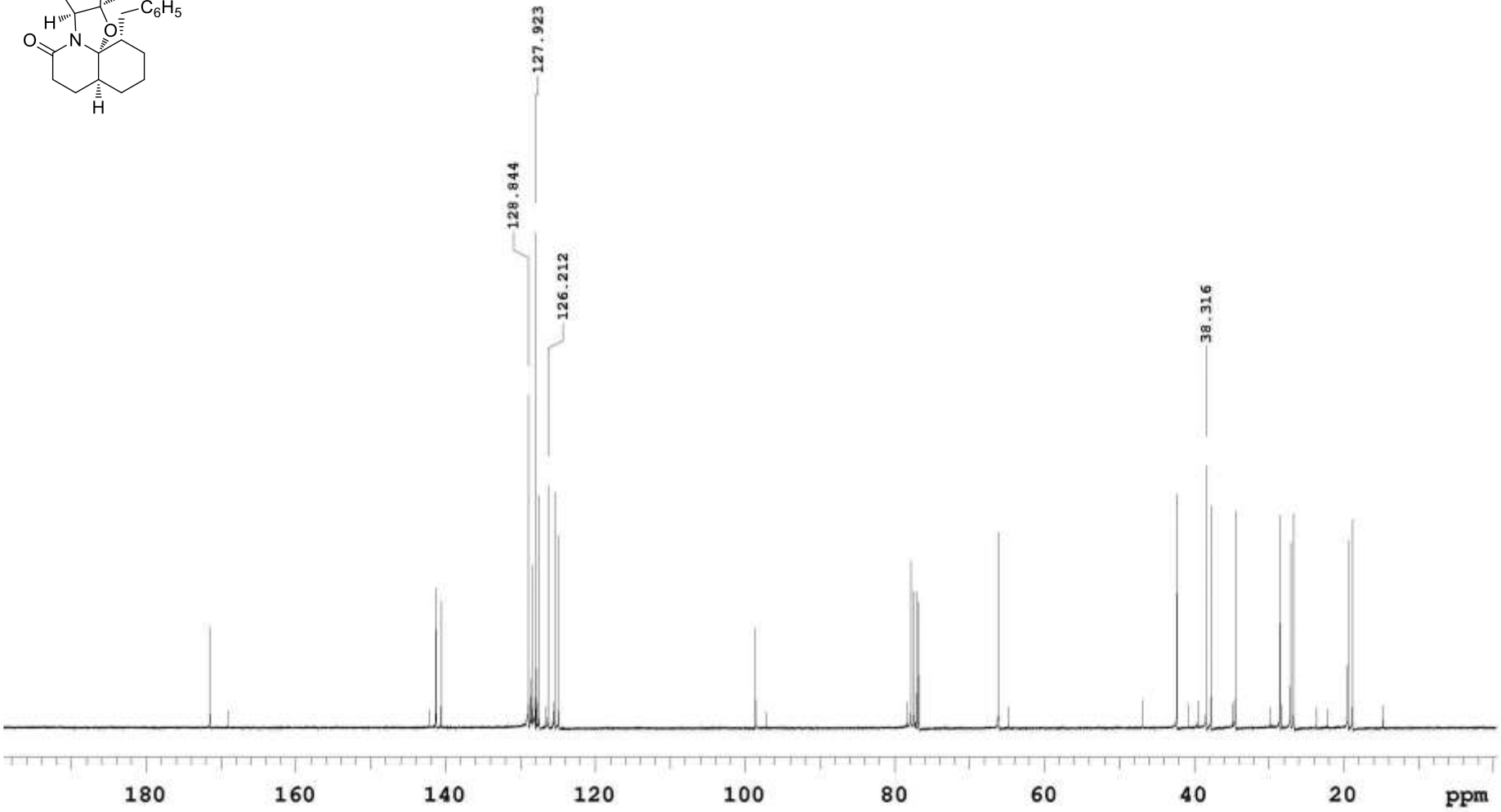


(1*S*,4a*R*,8a*S*,13a*R*,14a*S*)-1-Ethyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (59b)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



(1*S*,4a*S*,8a*S*,13a*R*,14a*S*)-1-Benzyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1.1,2':4,5]oxazolo[2,3-*j*]quinoline (60a)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C





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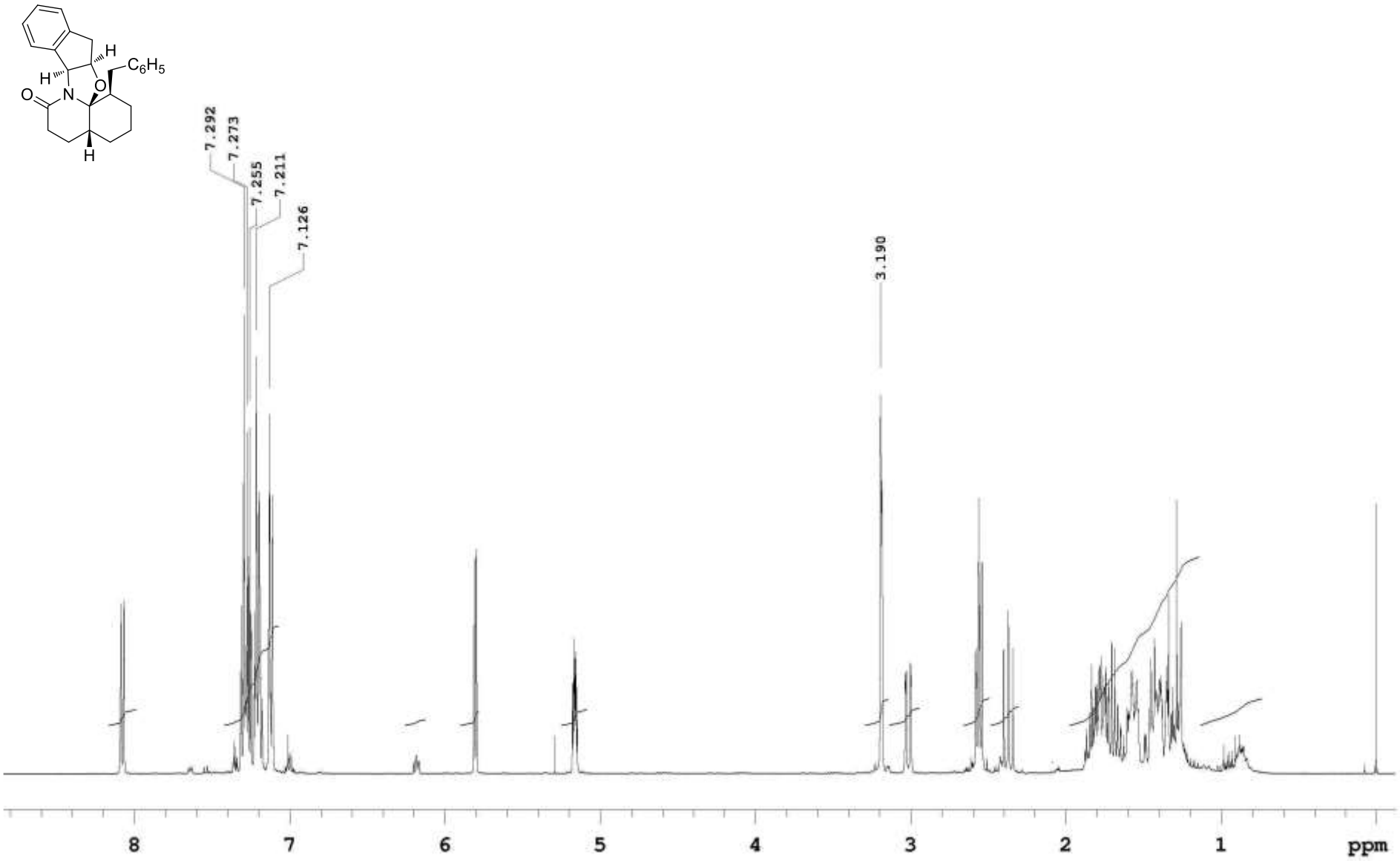
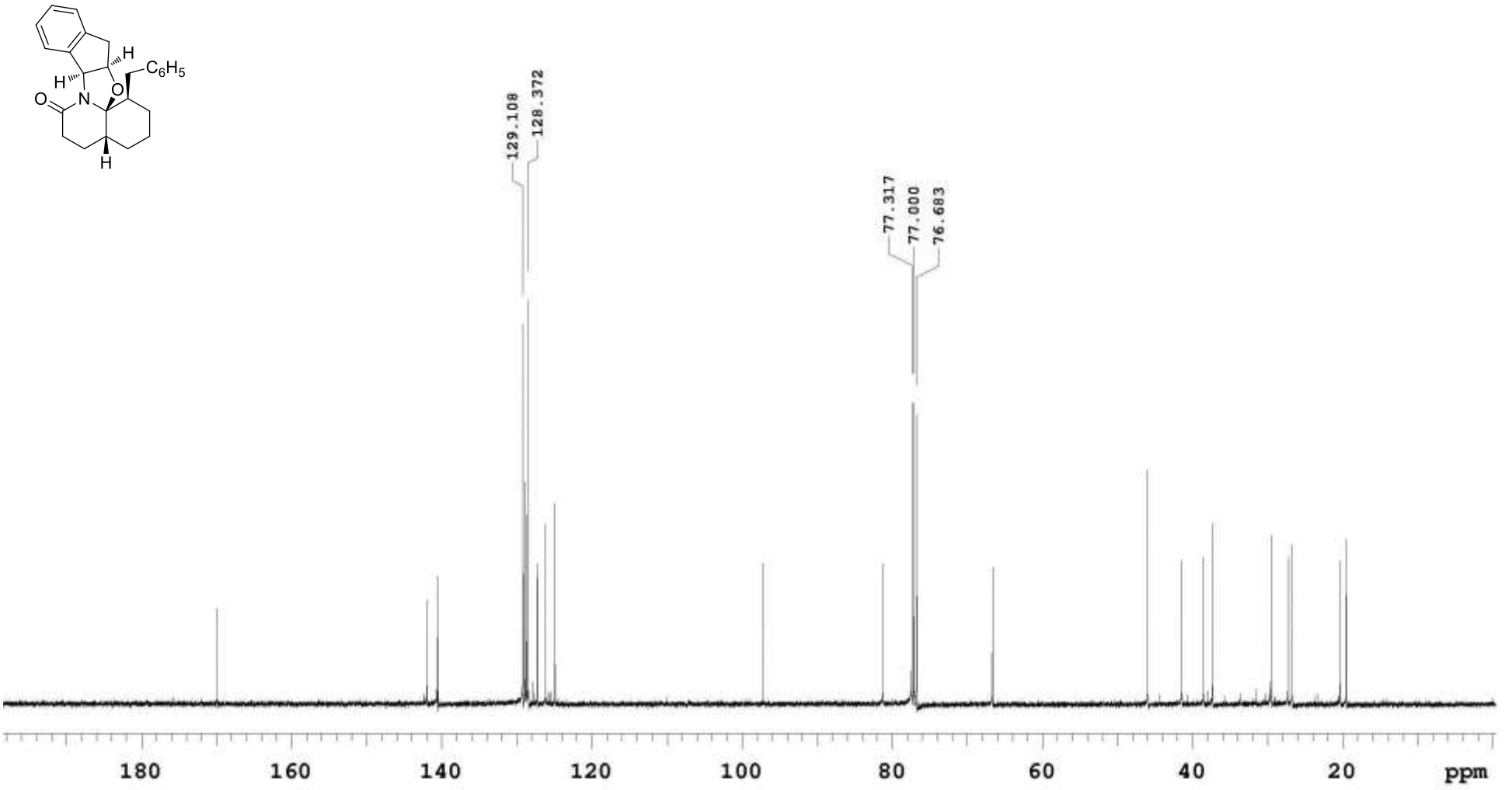
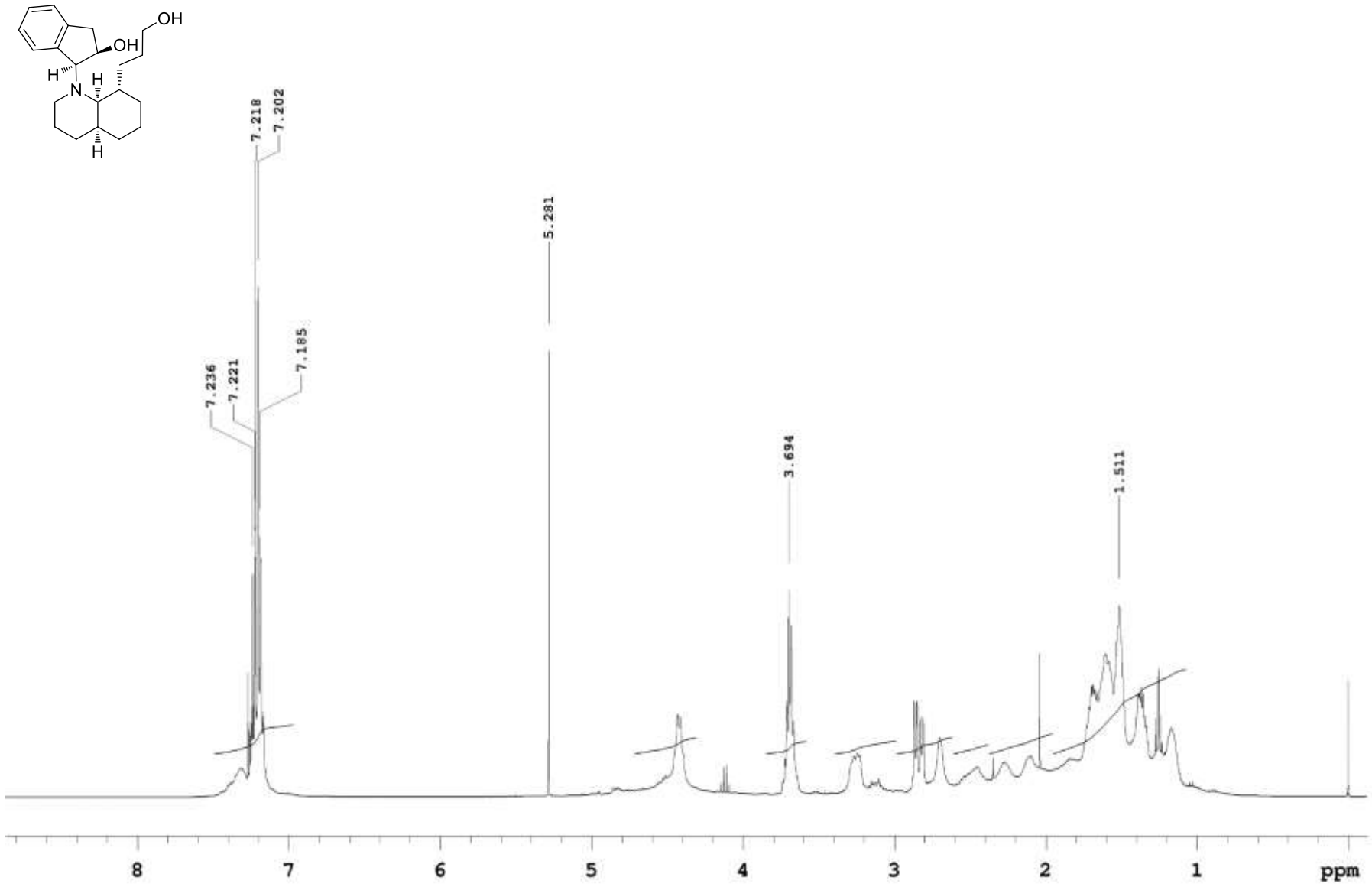


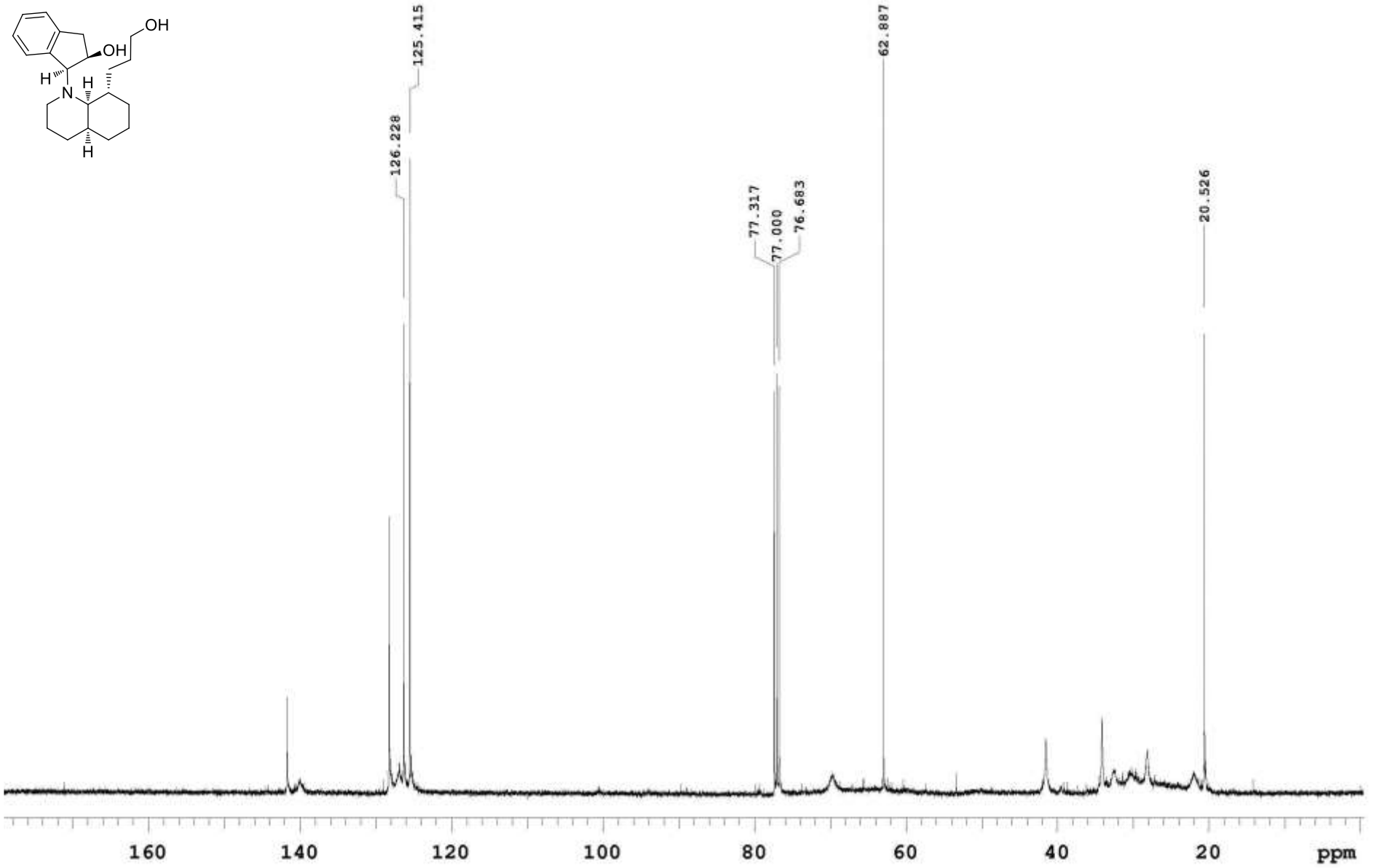
(1*R*,4a*R*,8a*S*,13a*R*,14a*R*)-1-Benzyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1.1,2':4,5]oxazolo[2,3-*j*]quinoline (60b)- ^{1}H- NMR, $CDCl_3$, 400 MHz, 25 °C



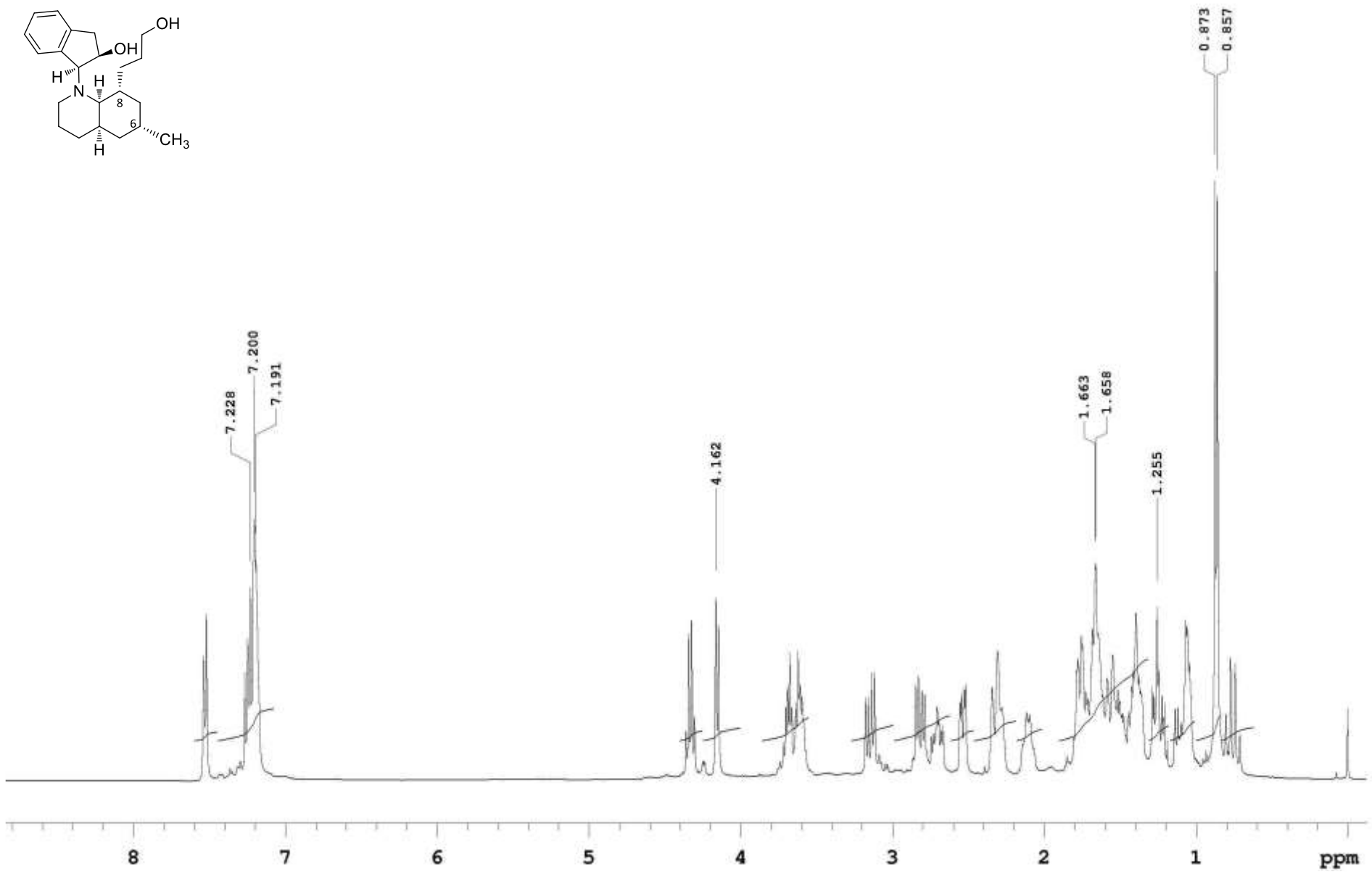
(1*R*,4a*R*,8a*S*,13a*R*,14a*R*)-1-Benzyl-7-oxo-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1.1,2':4,5]oxazolo[2,3-*j*]quinoline (60b)- ^{13}C- NMR, $CDCl_3$, 100.6 MHz, 25 °C



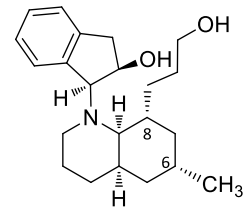
(4a*S*,8*S*,8a*R*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(3-hydroxypropyl)decahydroquinoline (62a)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C

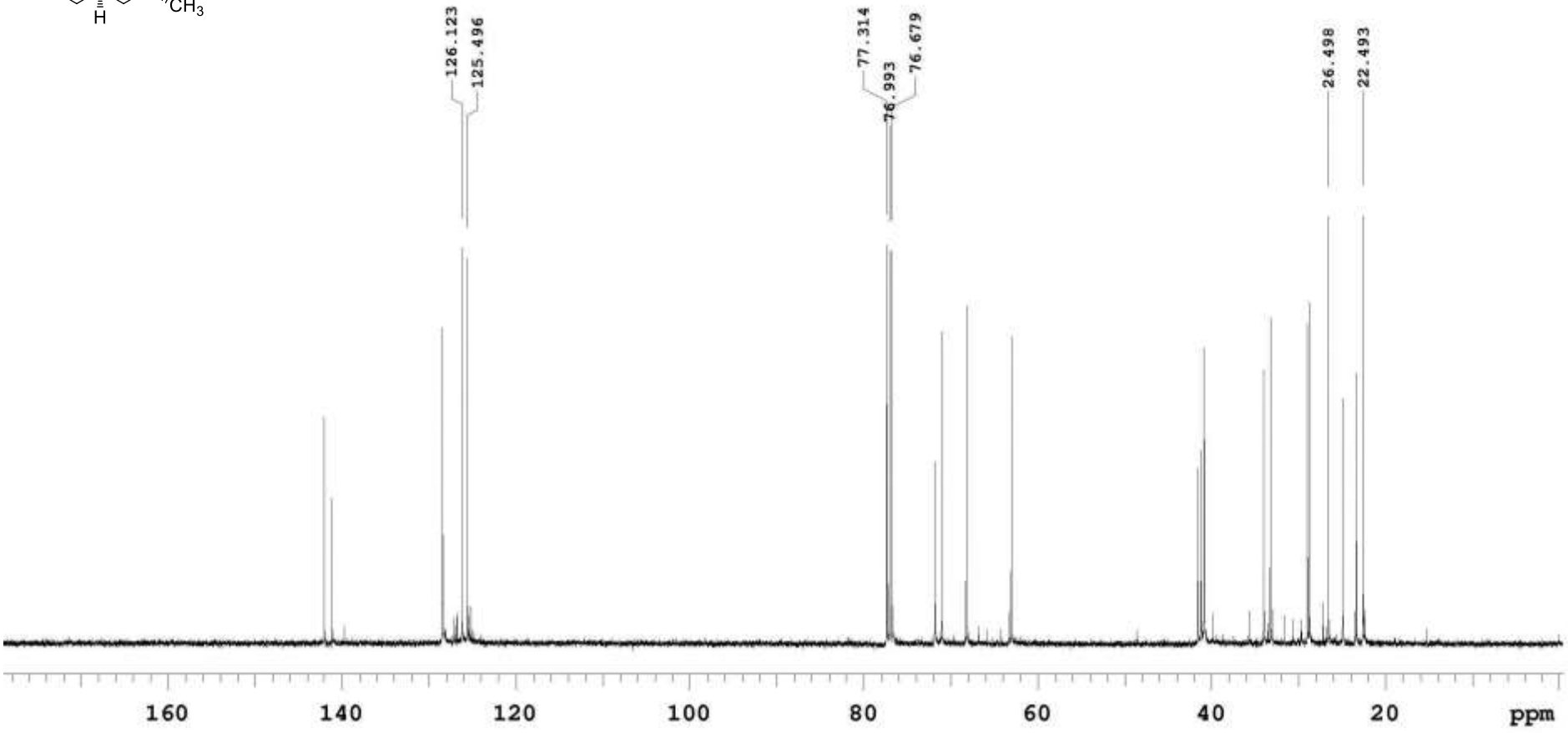


(4a*S*,8*S*,8a*R*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(3-hydroxypropyl)decahydroquinoline (62a)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

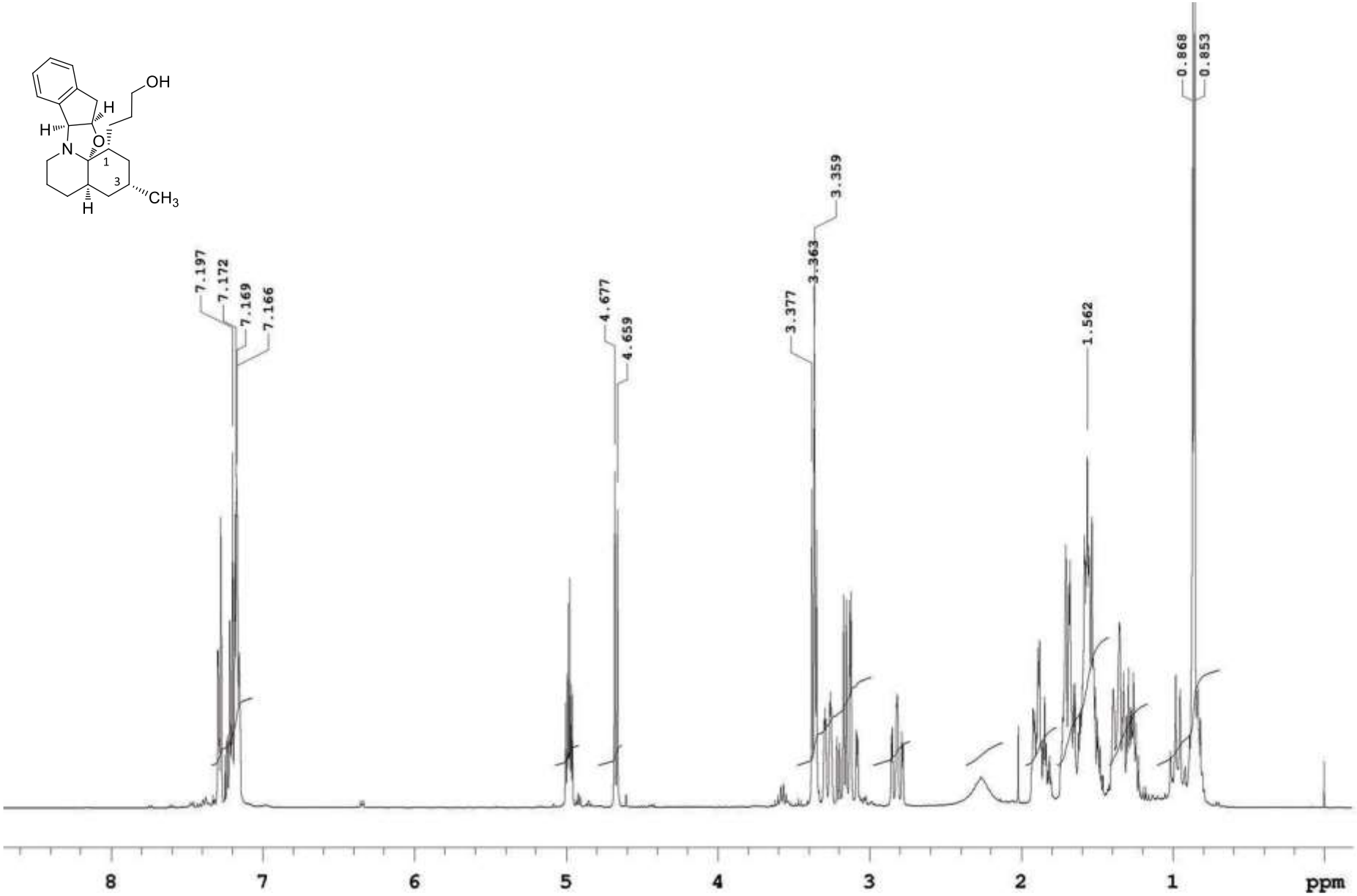


(4a*R*,6*R*,8*R*,8a*R*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(3-hydroxypropyl)-6-methyldecahydroquinoline (64a)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C

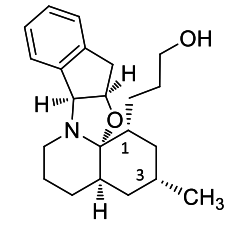


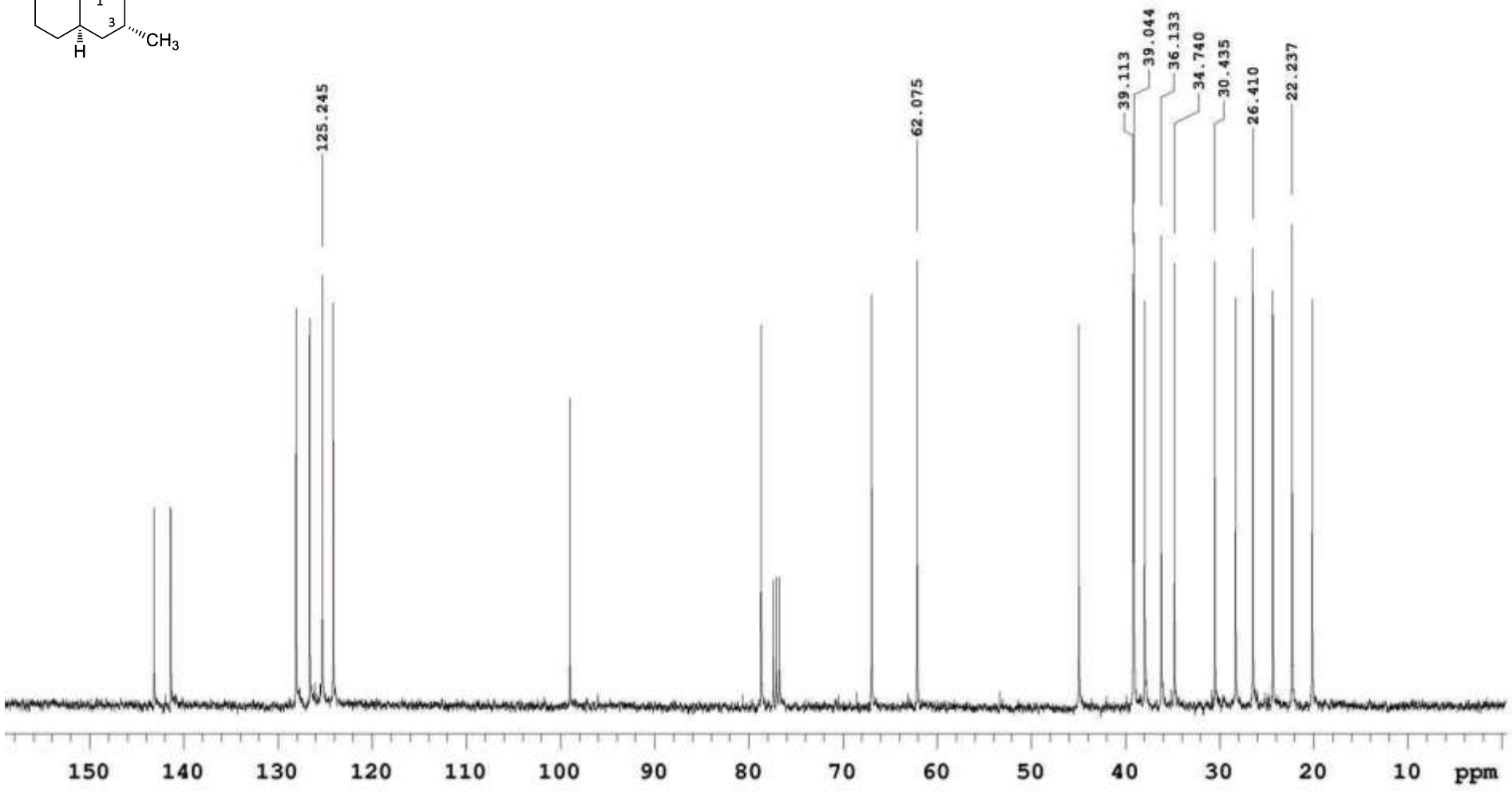


(4a*R*,6*R*,8*R*,8a*R*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(3-hydroxypropyl)-6-methyldecahydroquinoline (64a)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

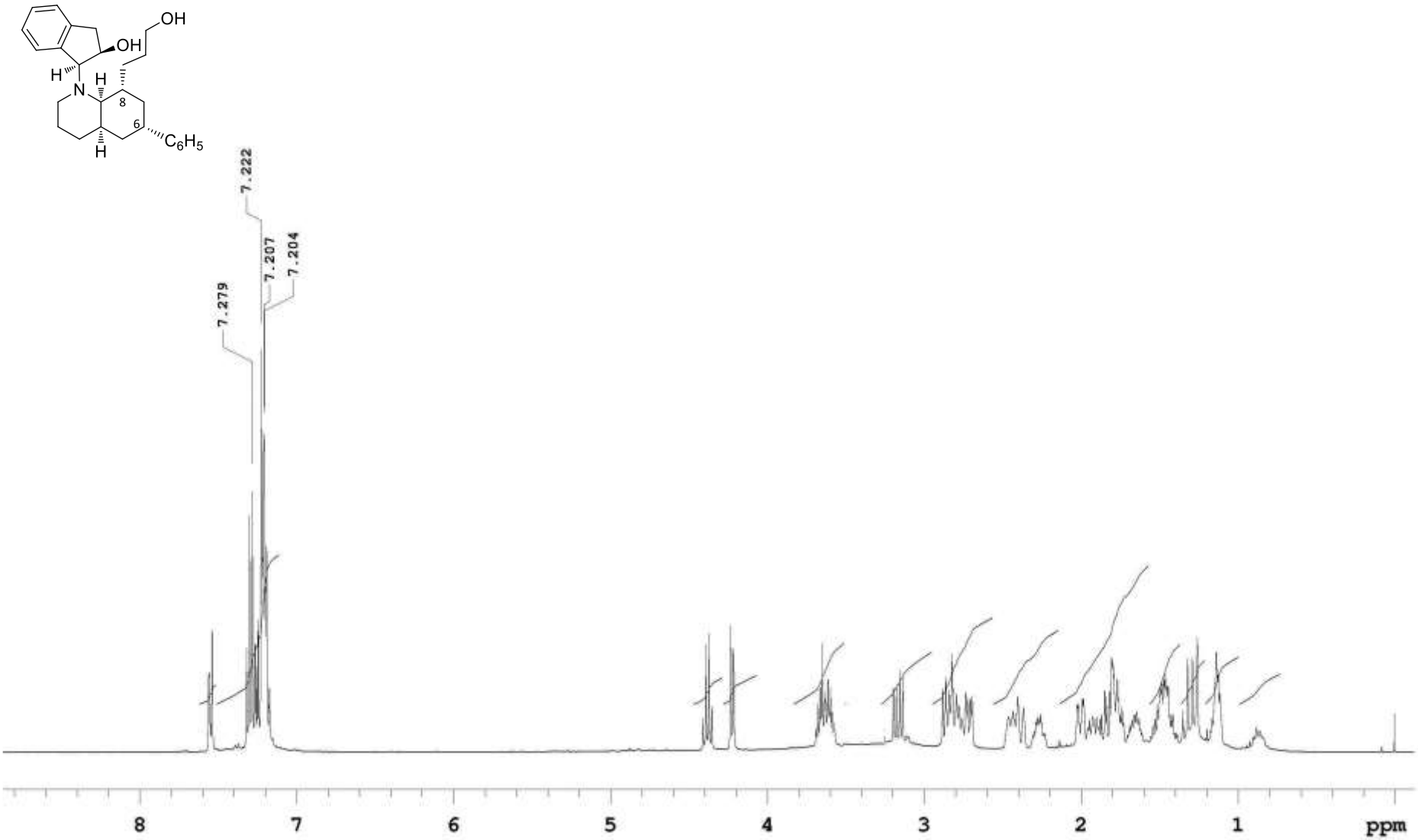


(1*R*,3*R*,4a*R*,8a*S*,13a*R*,14a*S*)-1-(3 -Hydroxypropyl)-3-methyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (63)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C

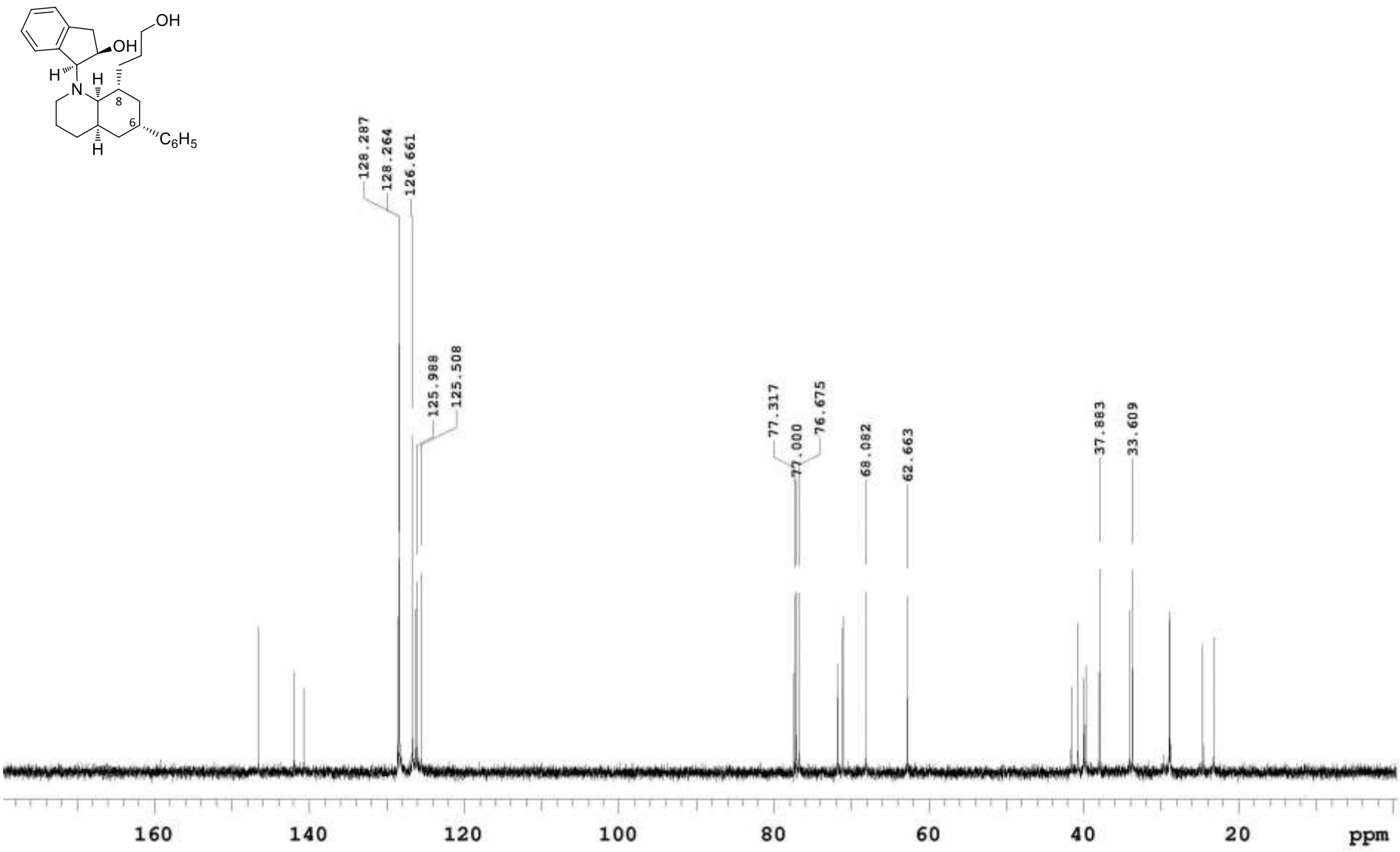




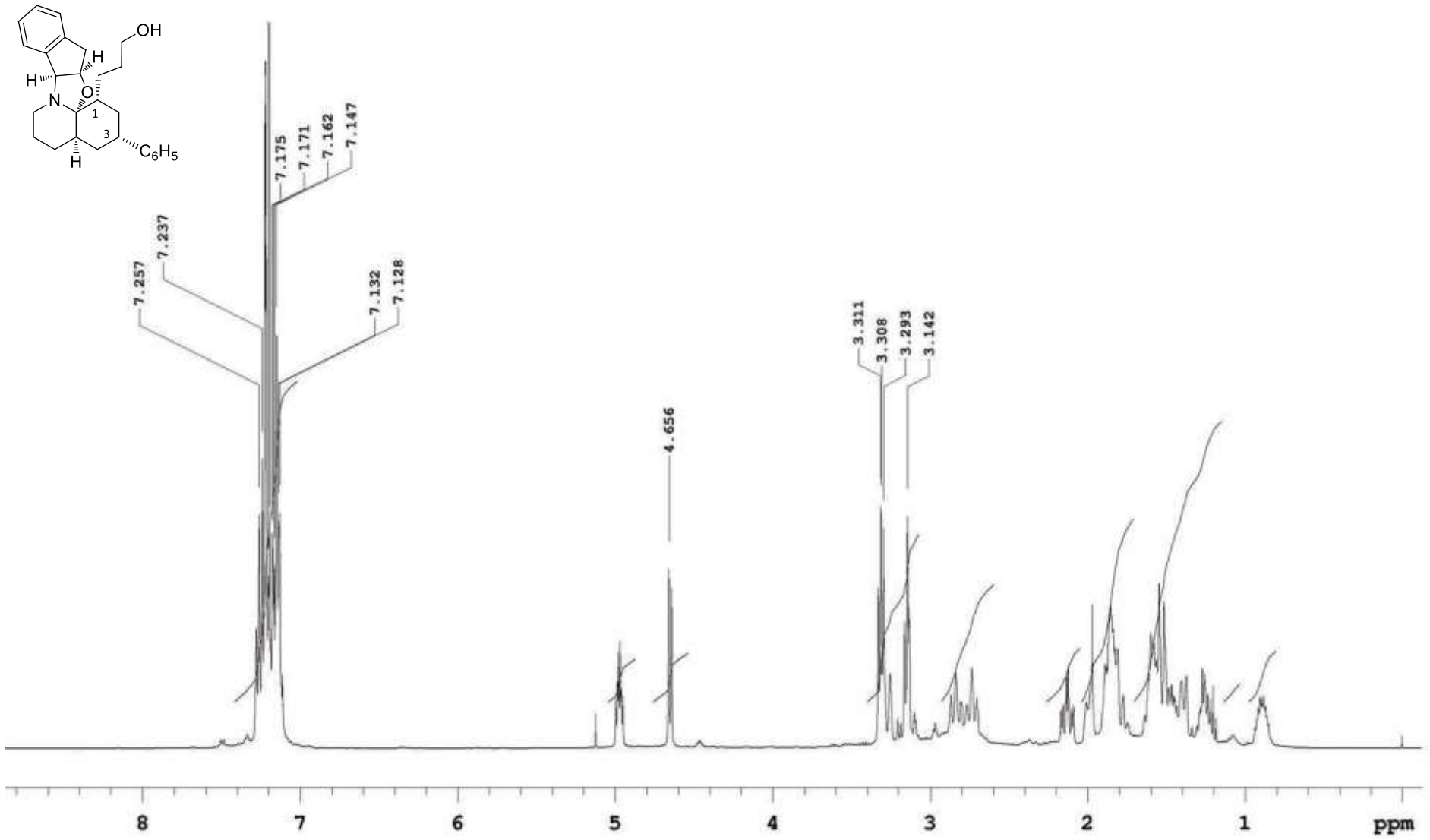
(1*R*,3*R*,4a*R*,8a*S*,13a*R*,14a*S*)-1-(3 -Hydroxypropyl)-3-methyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydro-indeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (63)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



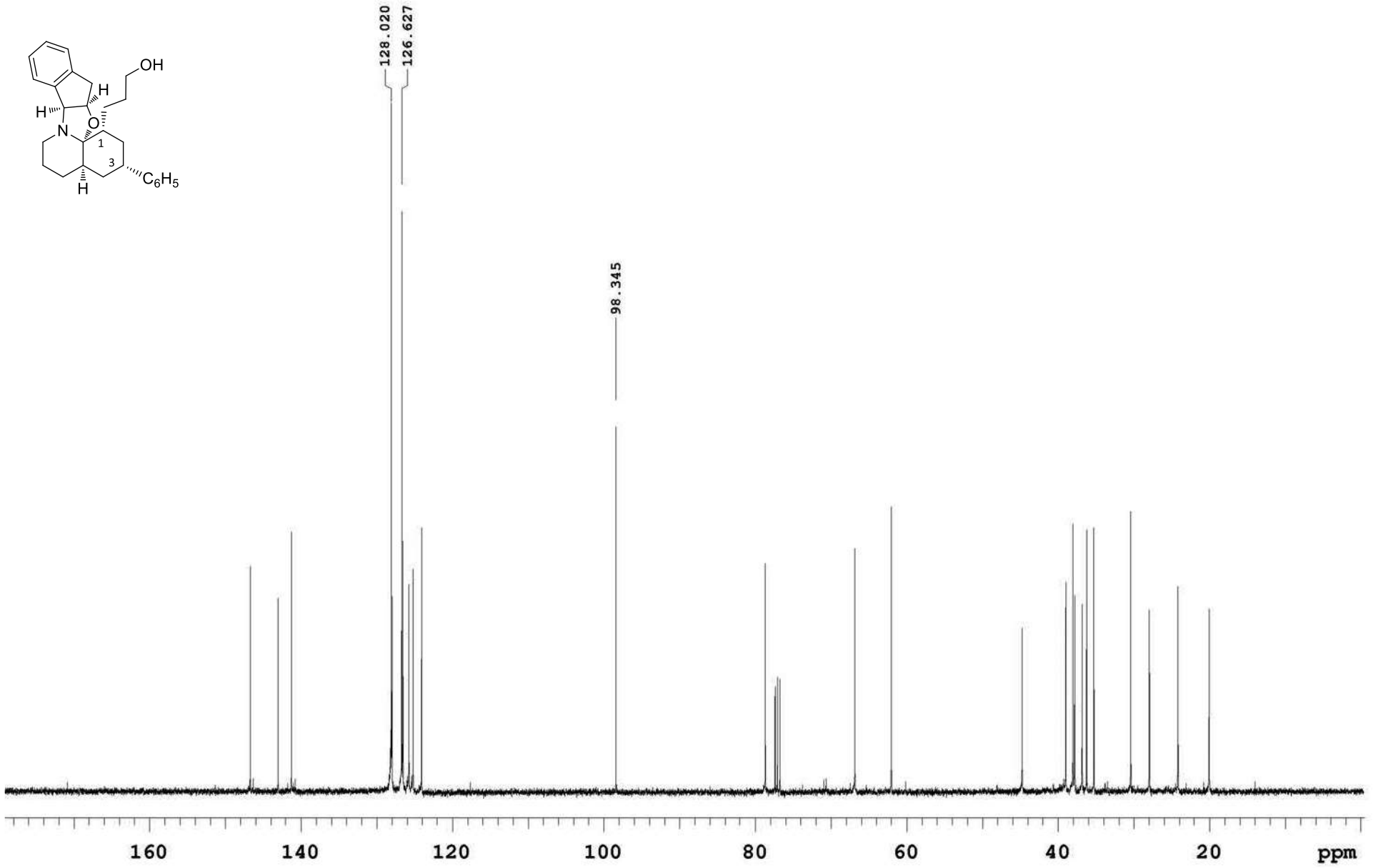
(4a*R*,6*R*,8*R*,8a*R*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(3-hydroxypropyl)-6-phenyldecahydroquinoline (66a)- ^{1}H-NMR, $CDCl_3$, 400MHz, 25 °C



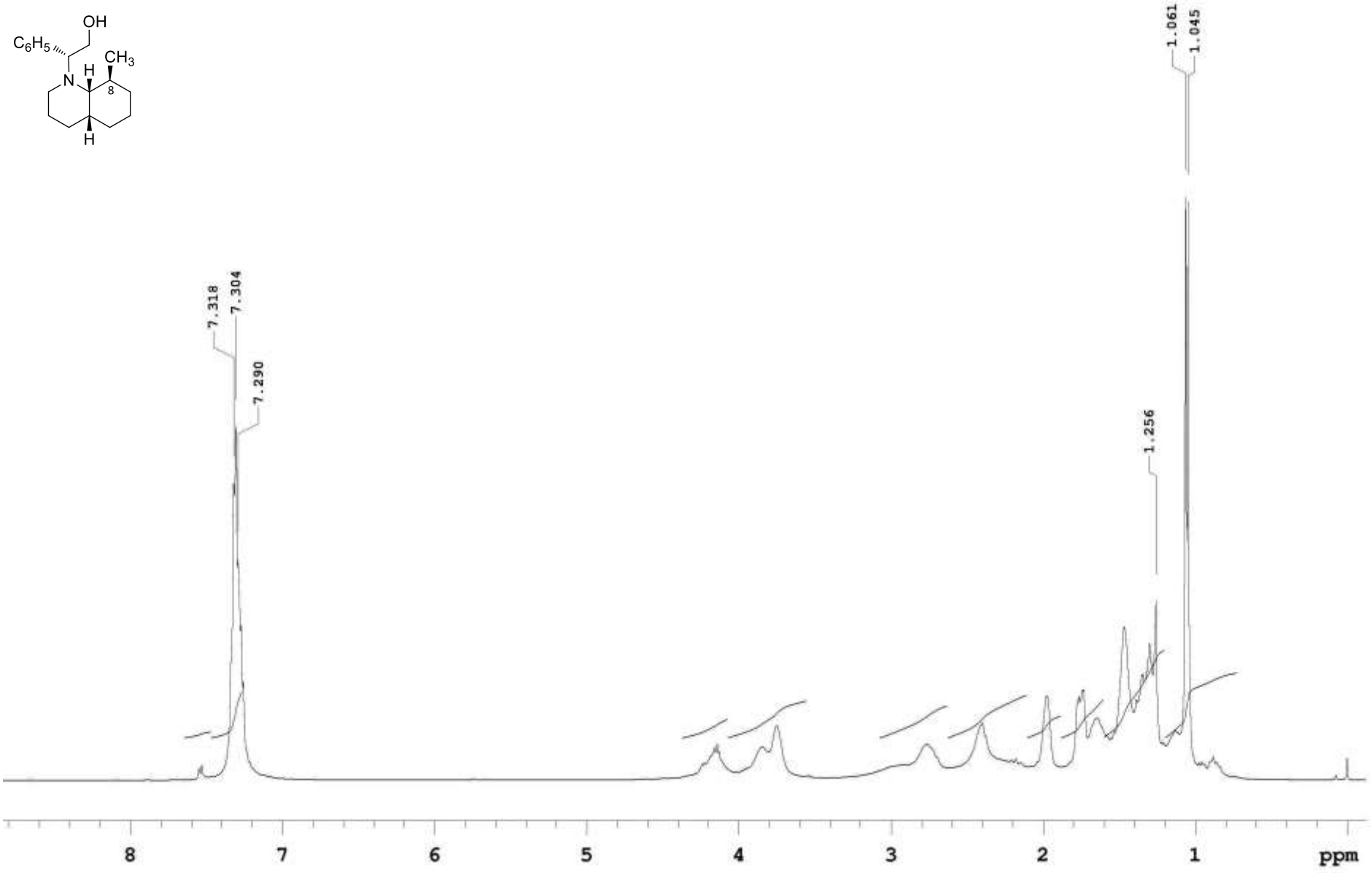
(4a*R*,6*R*,8*R*,8a*R*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(3-hydroxypropyl)-6-phenyldecahydroquinoline (66a)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



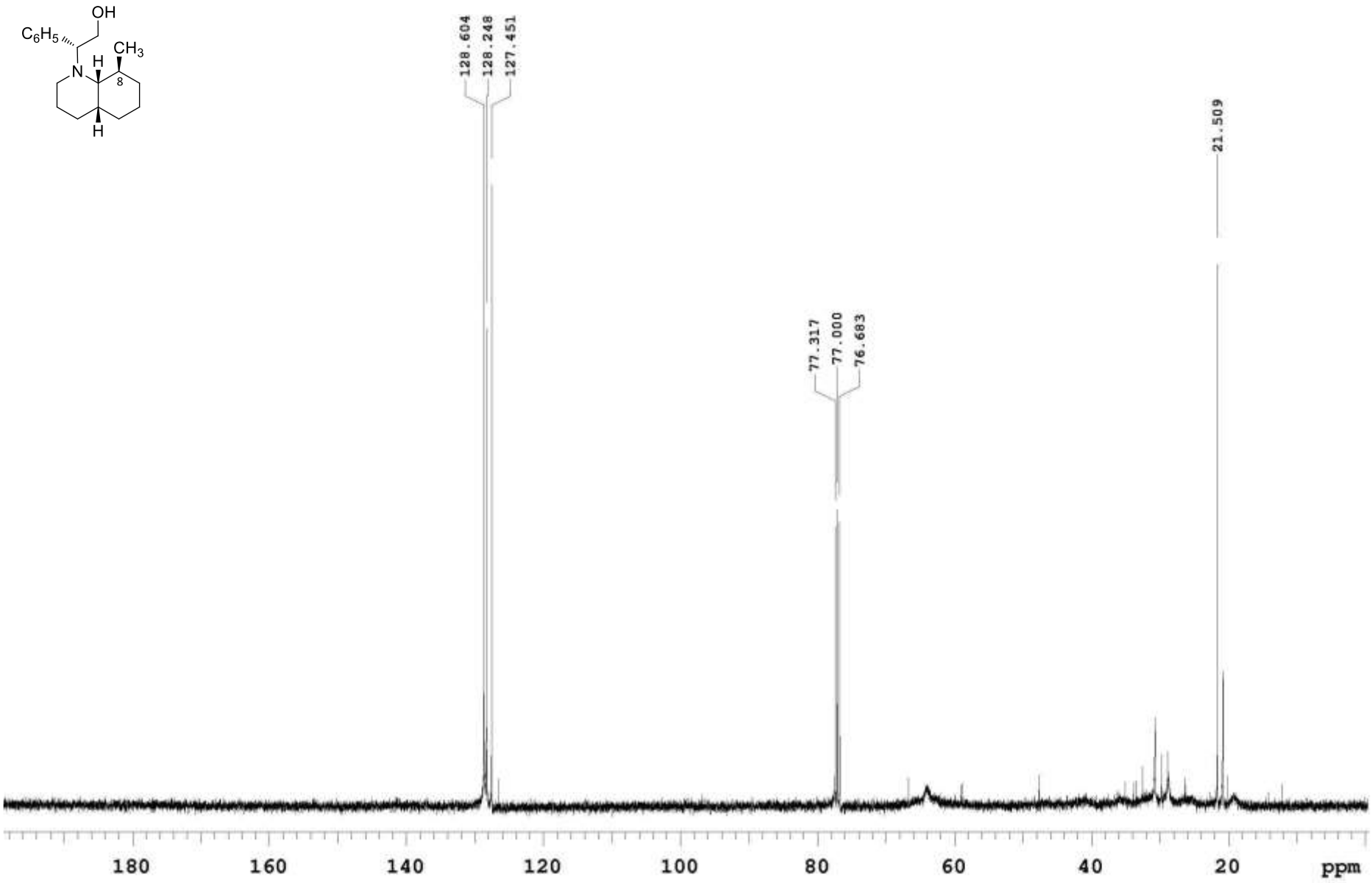
(1*R*,3*R*,4a*R*,8a*S*,13a*R*,14a*S*)-11-(3-Hydroxypropyl)-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (65)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



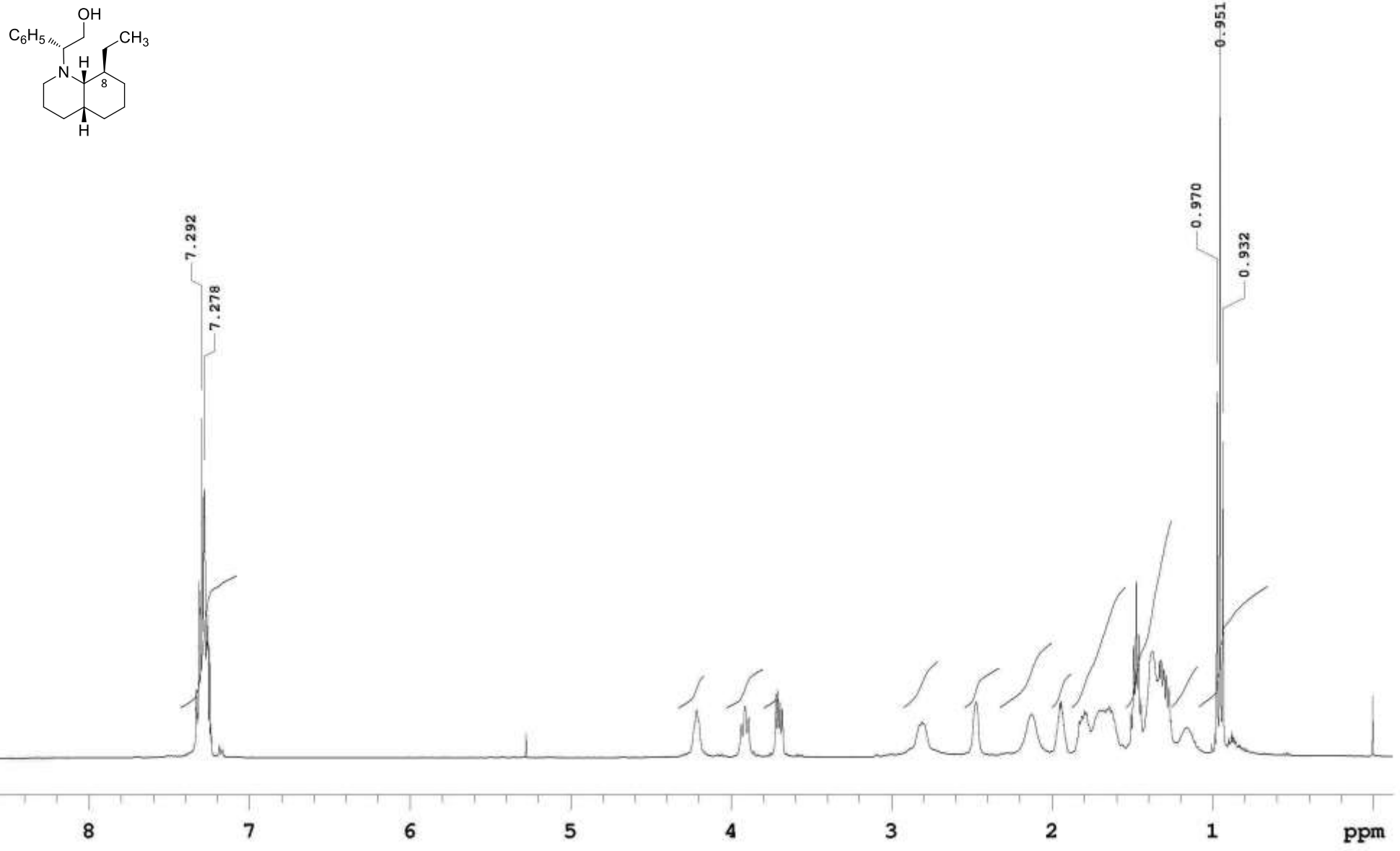
(1*R*,3*R*,4a*R*,8a*S*,13a*R*,14a*S*)-11-(3-Hydroxypropyl)-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindeno[1',2':4,5]oxazolo[2,3-*j*]quinoline (65)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



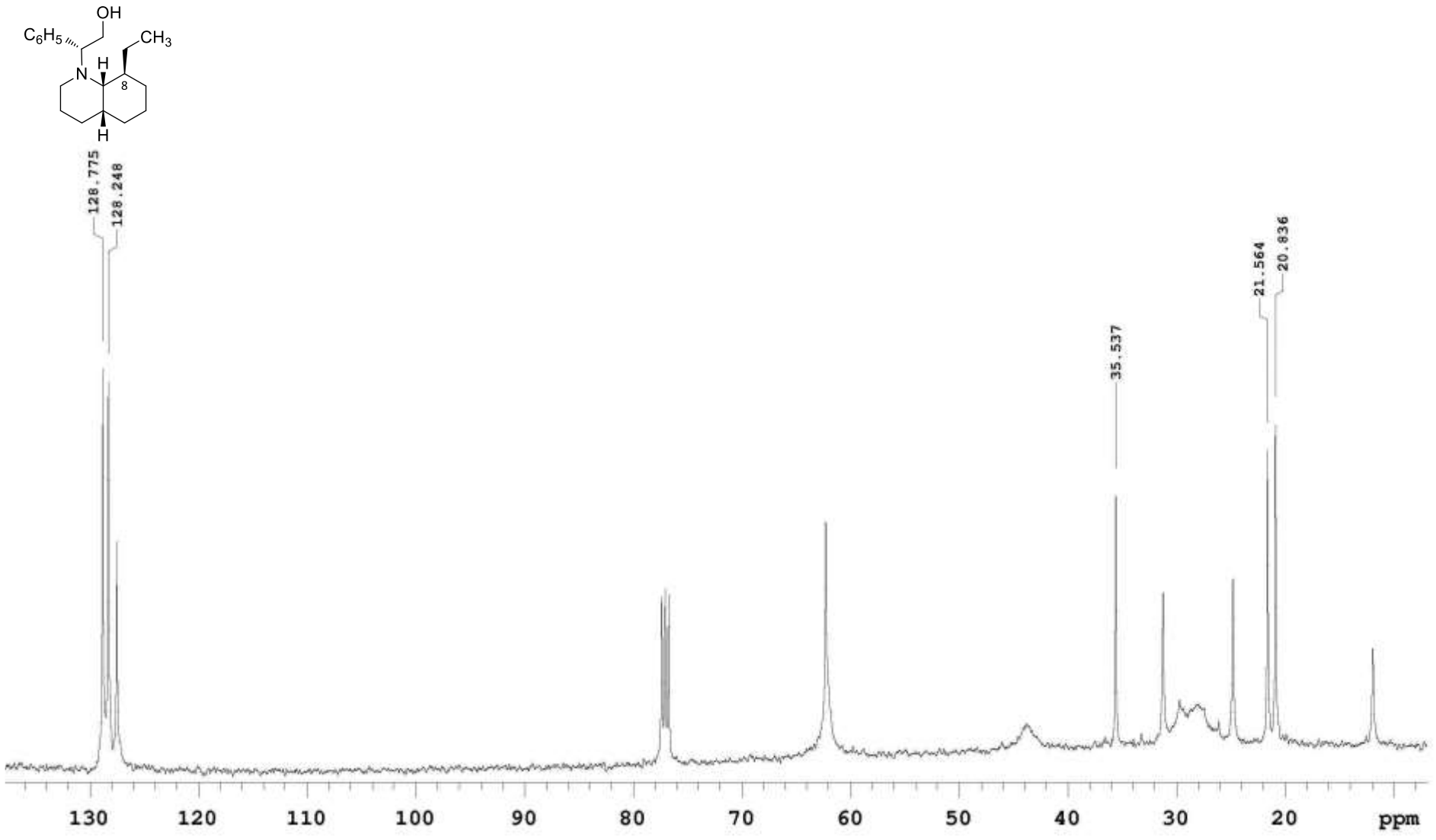
(4a*R*,8*S*,8a*R*)-1-[(1*R*)-2-Hydroxy-1-phenylethyl]-8-methyldecahydroquinoline (67)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



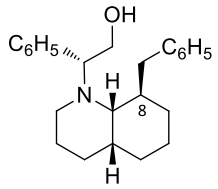
(4a*R*,8*S*,8a*R*)-1-[(1*R*)-2-Hydroxy-1-phenylethyl]-8-methyldecahydroquinoline (67)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

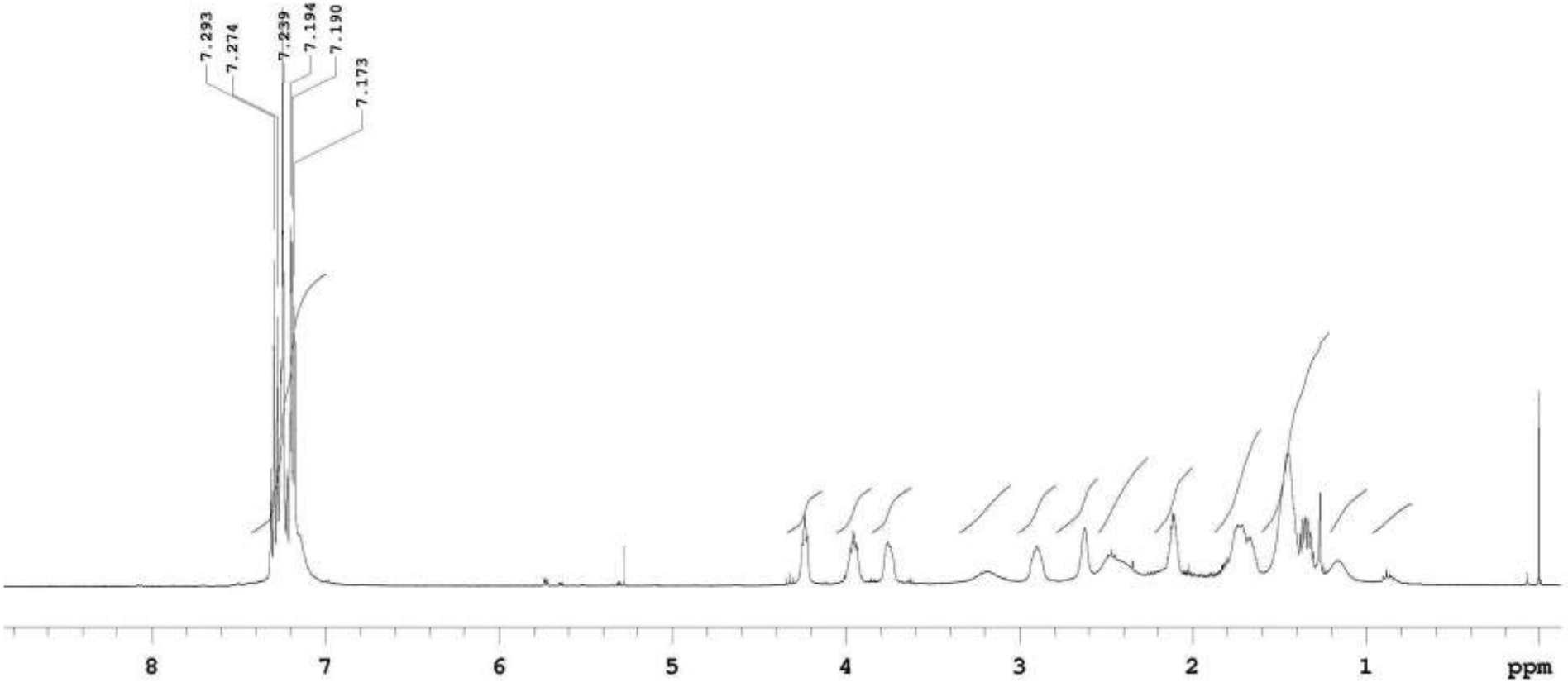


(4a*R*,8*S*,8a*R*)-8-Ethyl-1-[(1*R*)-2-hydroxy-1-phenylethyl]decahydroquinoline (68)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 52 °C

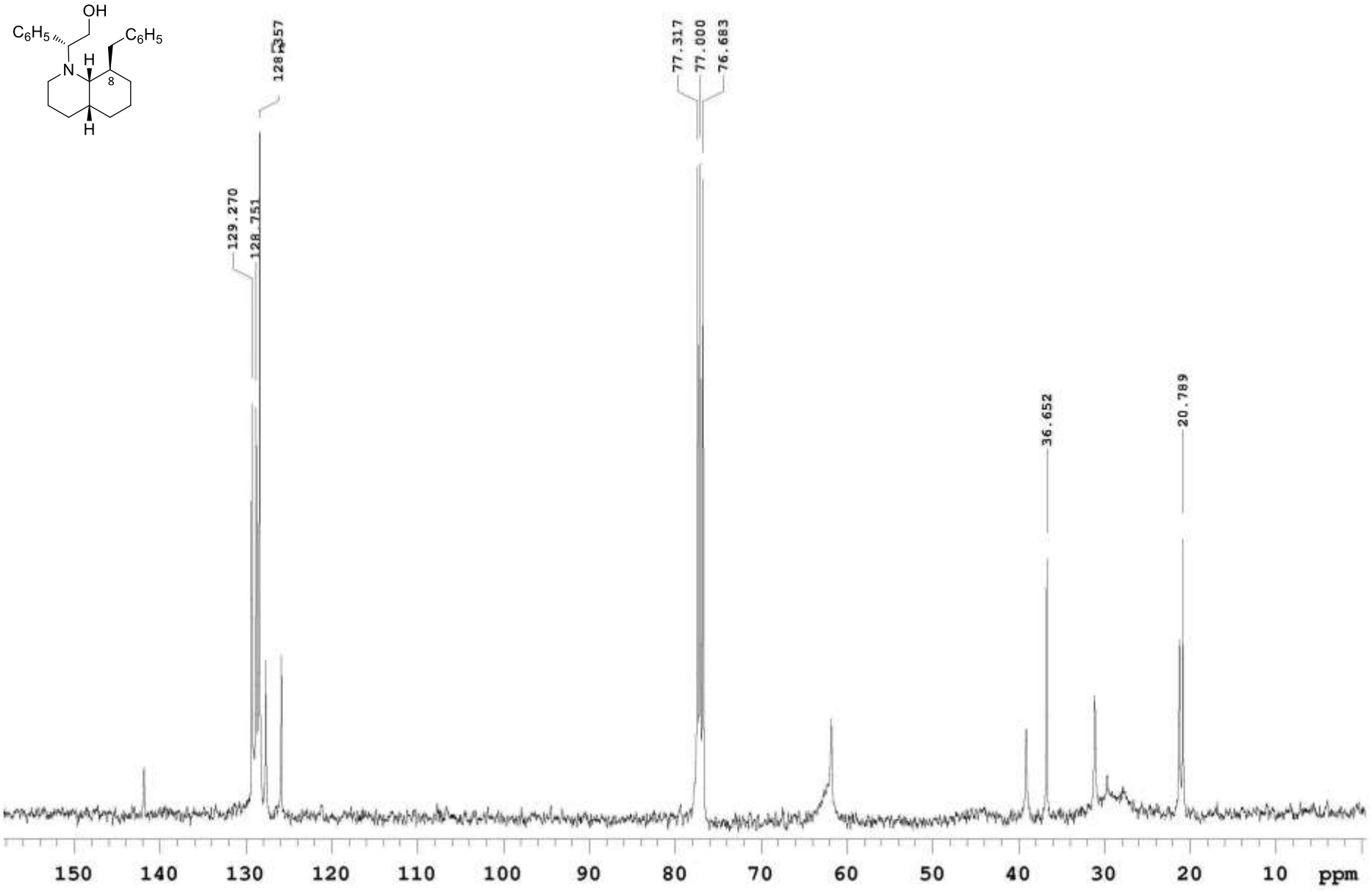


(4a*R*,8*S*,8a*R*)-8-Ethyl-1-[(1*R*)-2-hydroxy-1-phenylethyl]decahydroquinoline (68)- ^{13}C-MMR, $CDCl_3$, 100.6 MHz, 52 °C

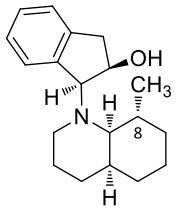


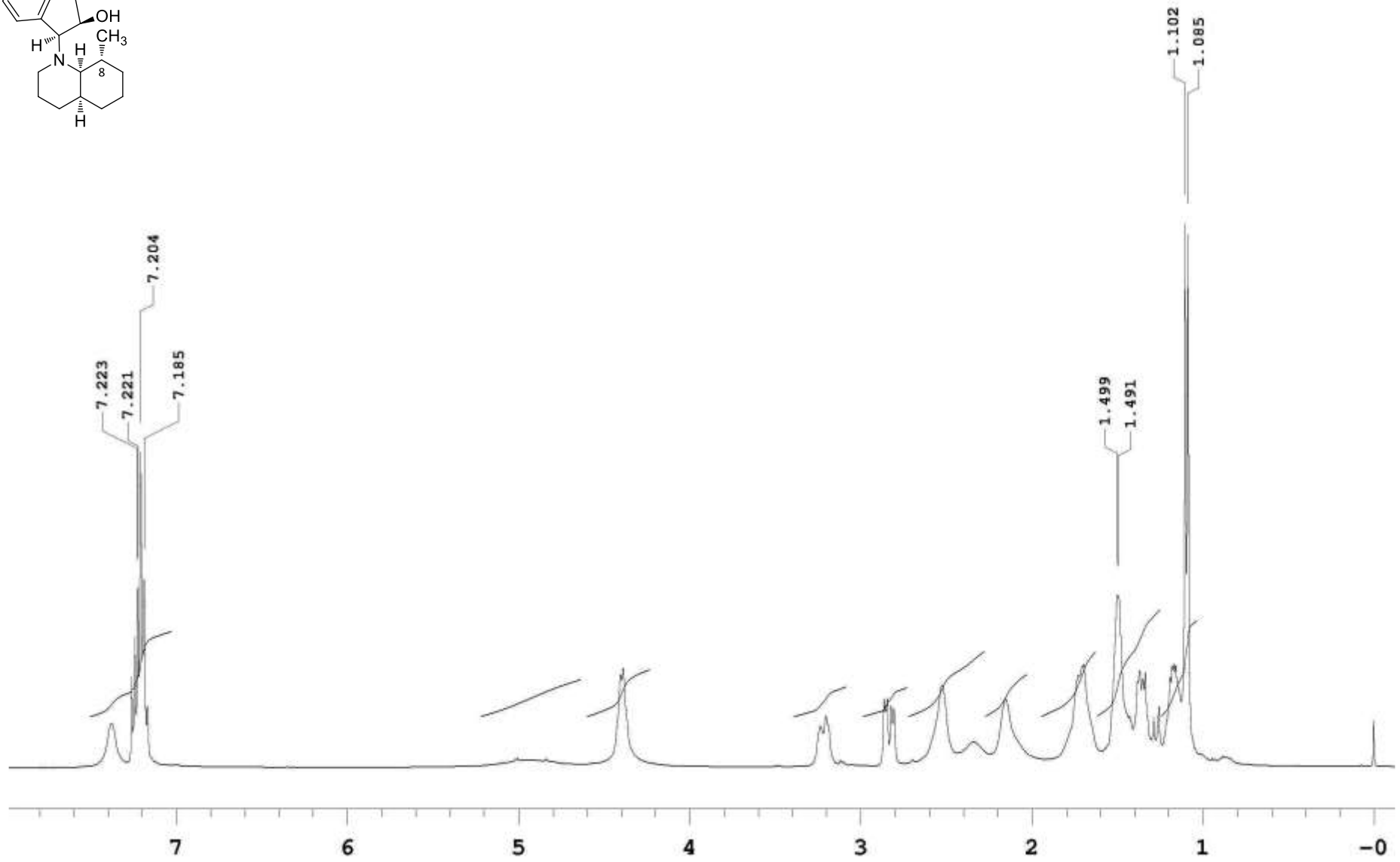


(4a*R*,8*R*,8a*S*)-8-Benzyl-1-[(1*R*)-2-hydroxy-1-phenylethyl]decahydroquinoline (69)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 52 °C

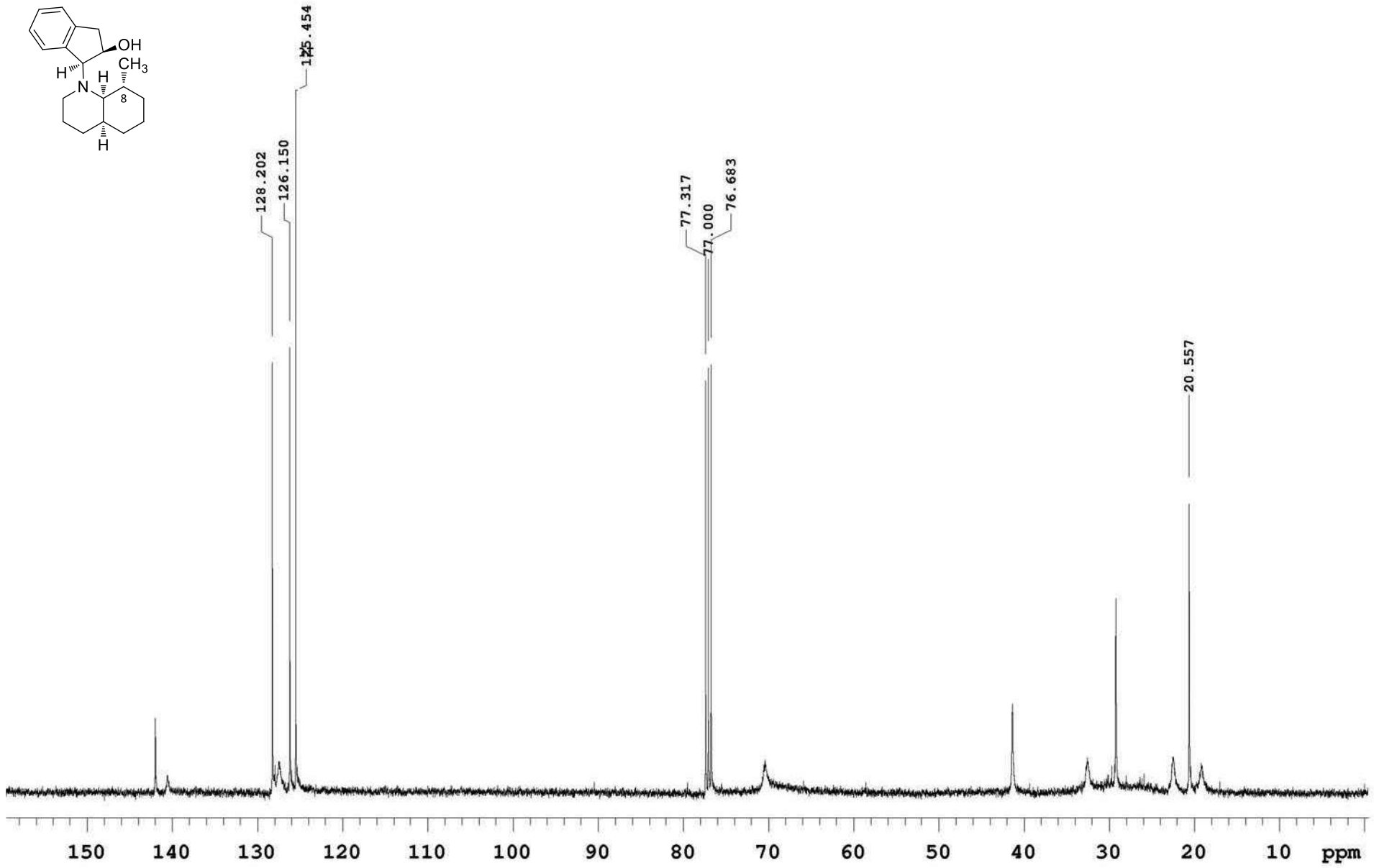


(4a*R*,8*R*,8a*S*)-8-Benzyl-1-[(1*R*)-2-hydroxy-1-phenylethyl]decahydroquinoline (69)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 52 °C

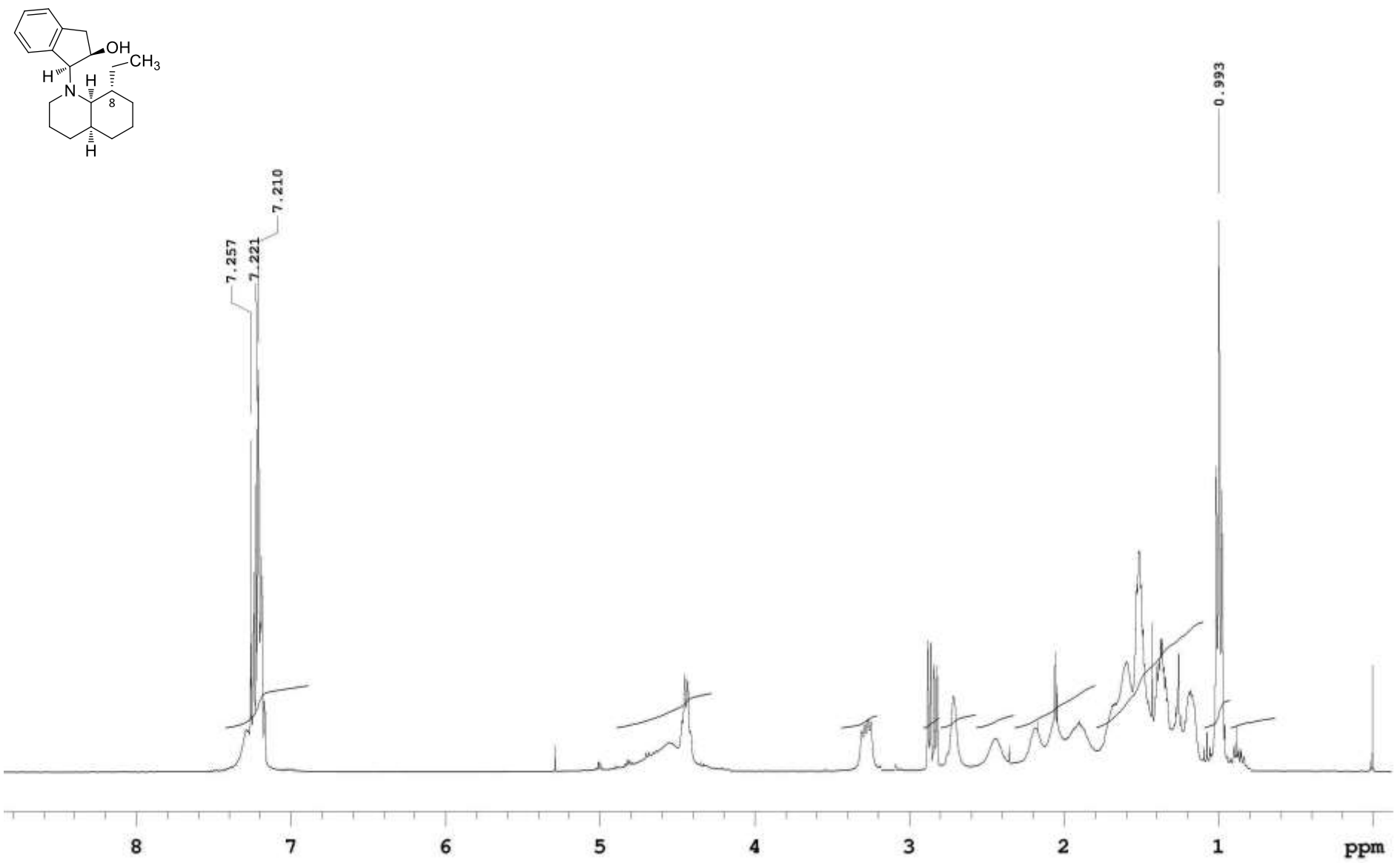




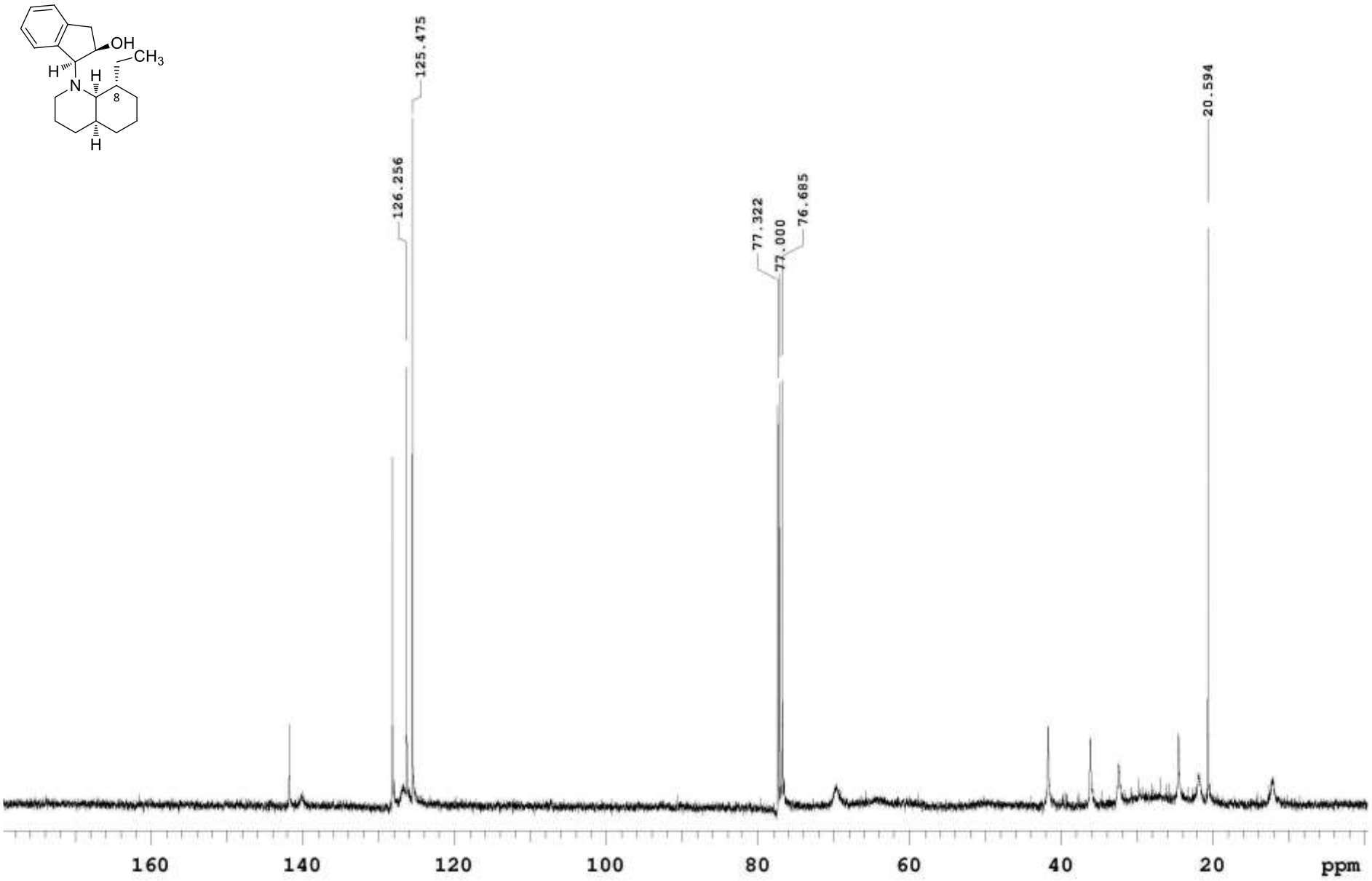
(4aS,8*R*,8a*S*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-methyldecahydroquinoline (70a)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



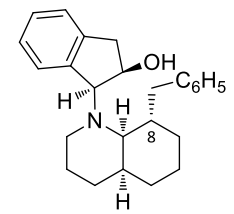
(4aS,8*R*,8a*S*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-methyldecahydroquinoline (70a)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

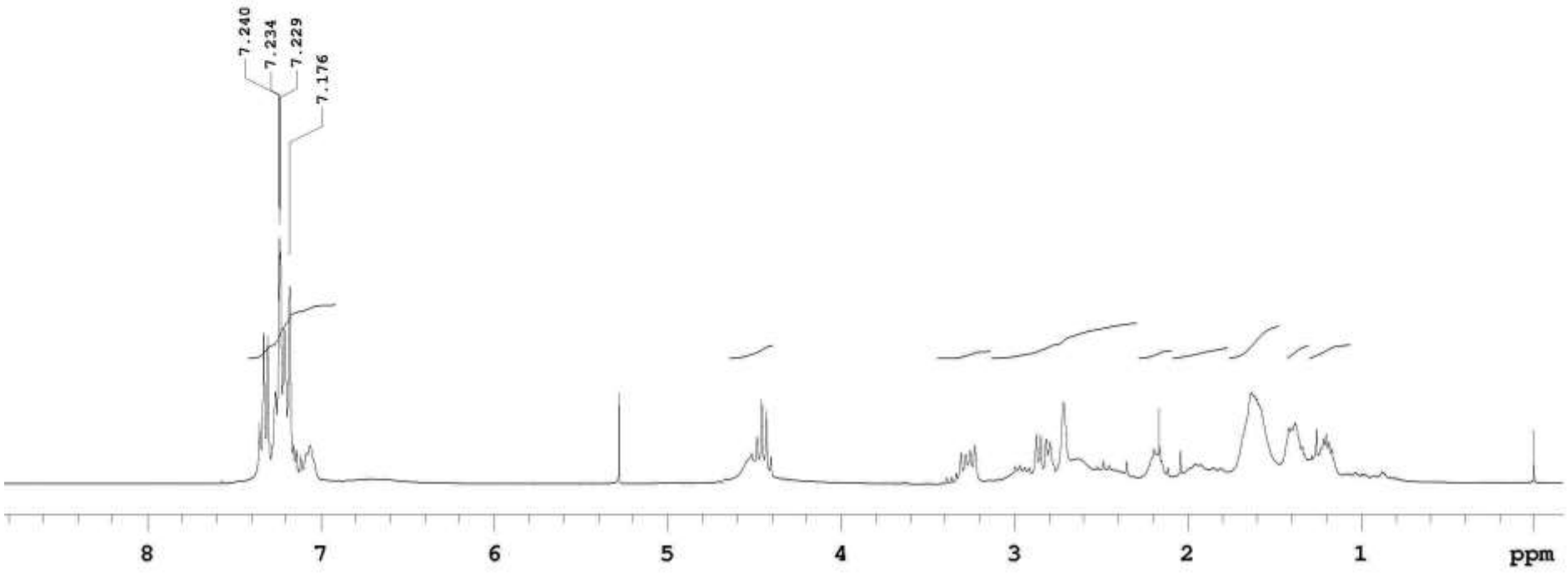


(4aS,8*R*,8a*S*)-8-Ethyl-1-[(1*S*,2*R*)-2-hydroxy-1-indanyl]decahydroquinoline (71a)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 ¨C

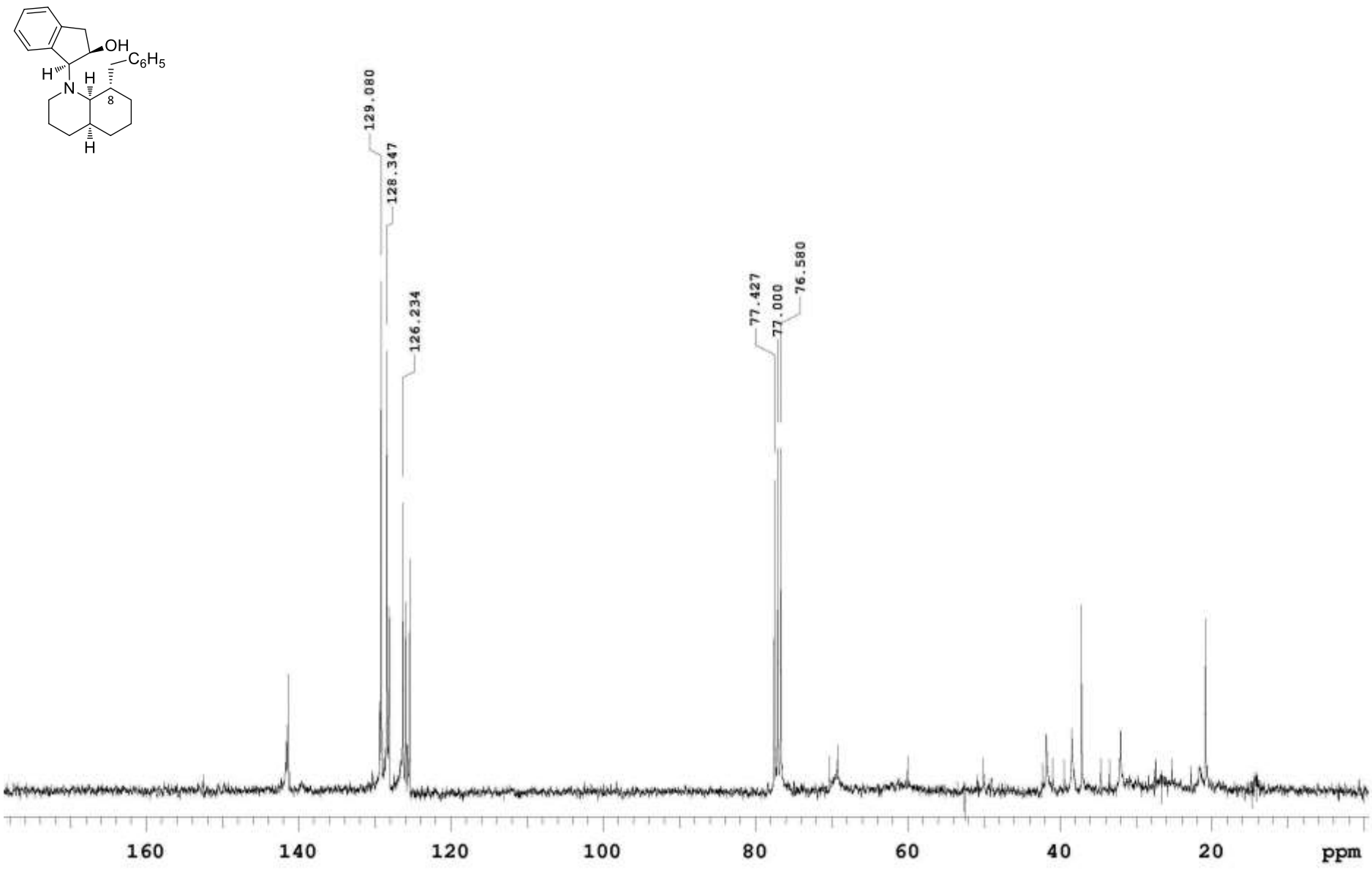


(4aS,8*R*,8a*S*)-8-Ethyl-1-[(1*S*,2*R*)-2-hydroxy-1-indanyl]decahydroquinoline (71a)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

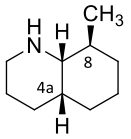


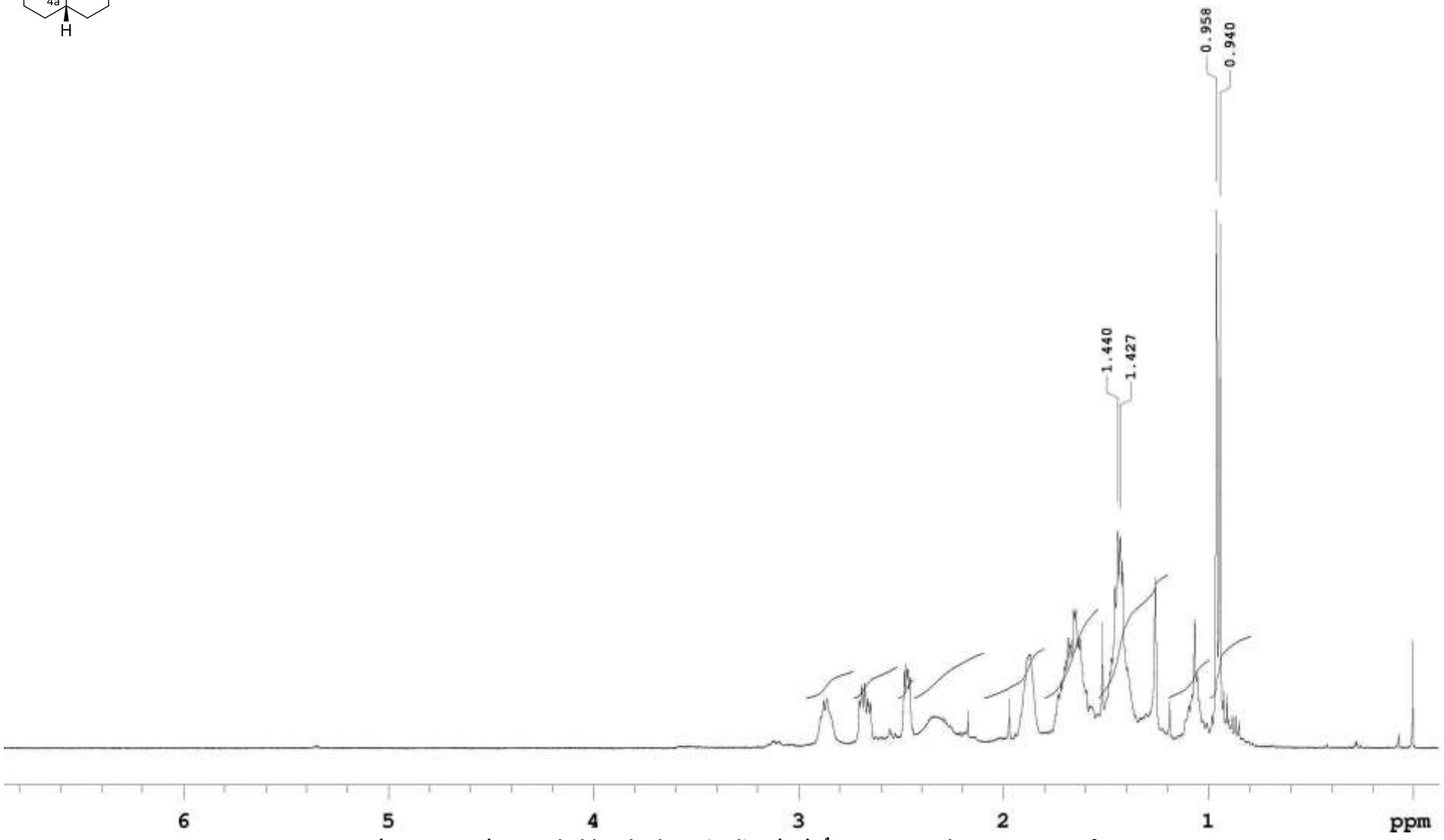


(4aS,8*S*,8a*R*)-8-Benzyl-1-[(1*S*,2*R*)-2-hydroxy-1-indanyl]decahydroquinoline (72a)- ^{1}H-NMR, $CDCl_3$, 300 MHz, 25 °C

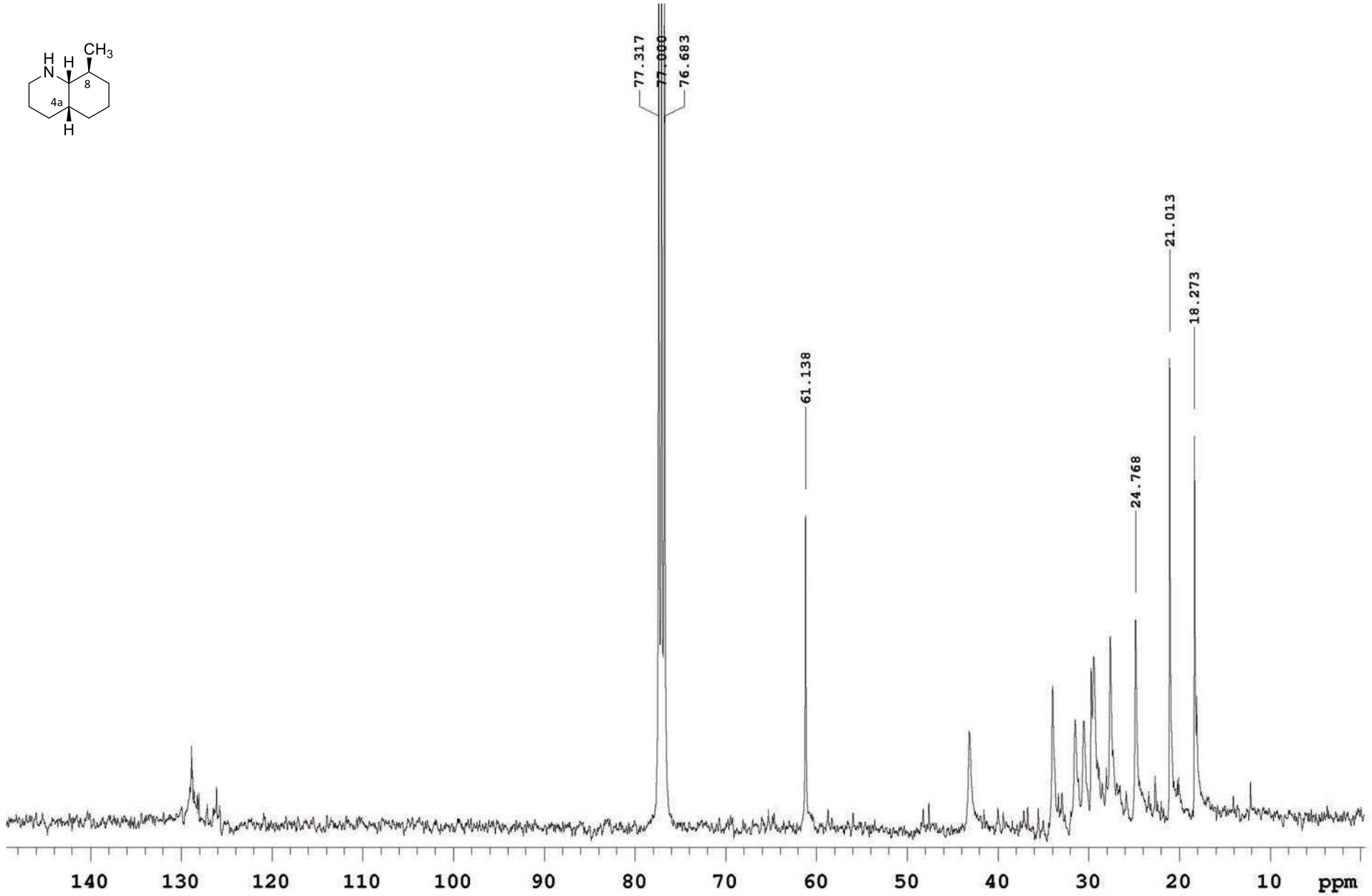


(4aS,8*S*,8a*R*)-8-Benzyl-1-[(1*S*,2*R*)-2-hydroxy-1-indanyl]decahydroquinoline (72a)- ^{13}C-NMR, $CDCl_3$, 75.4 MHz, 25 °C

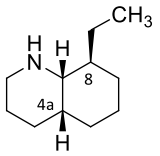


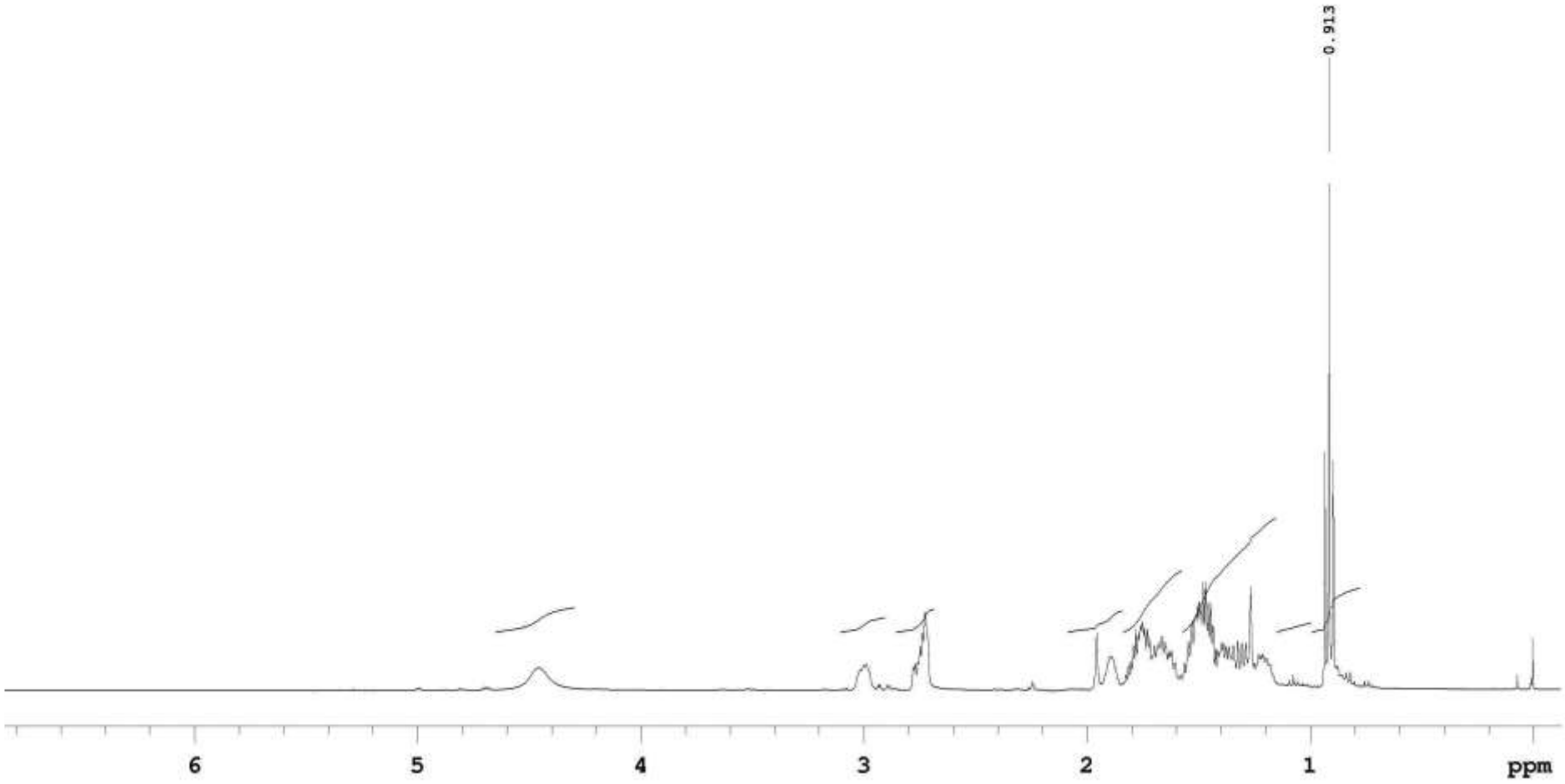


(4a*R*,8*S*,8a*R*)-8-Methyldecahydroquinoline (73)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C

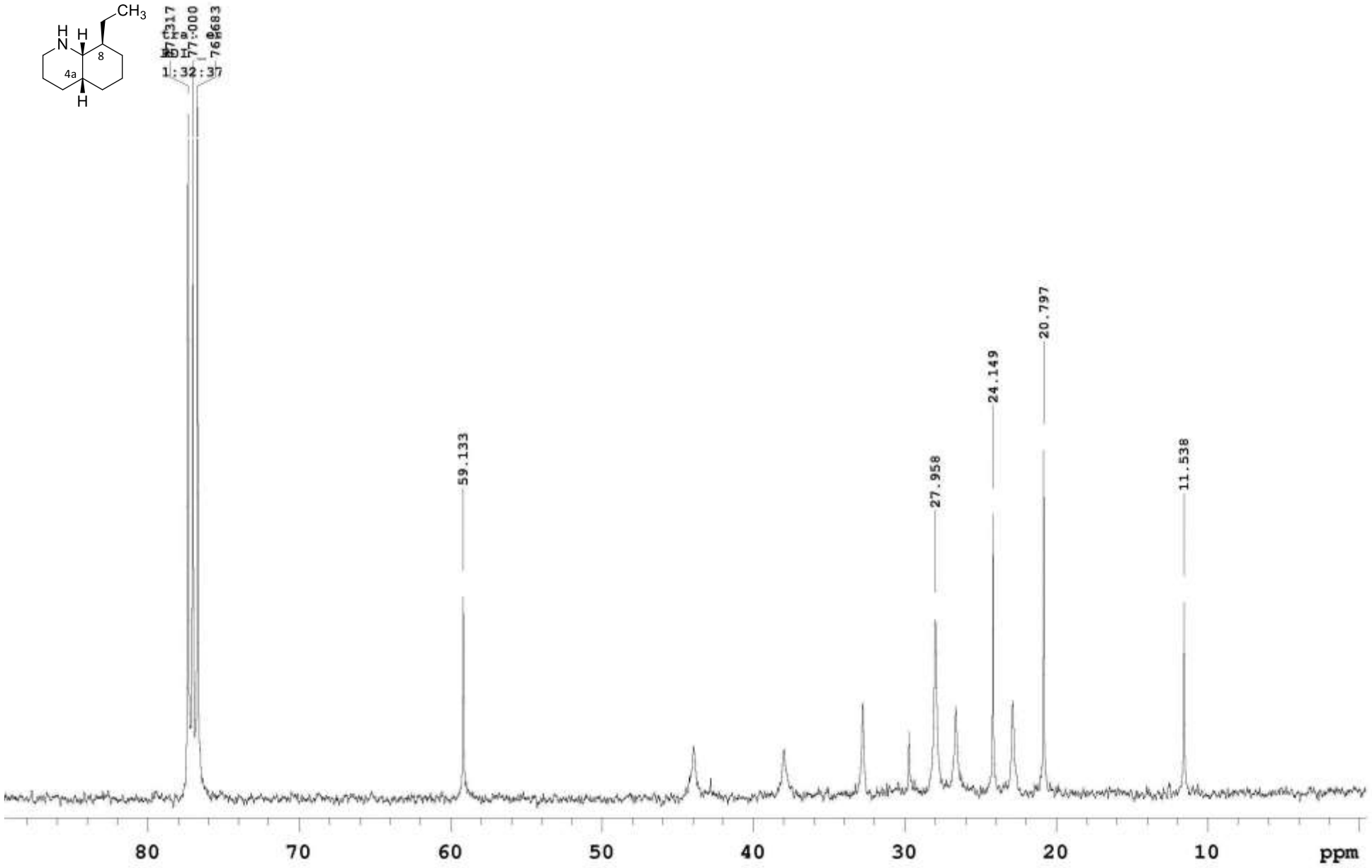


(4a*R*,8*S*,8a*R*)-8-Methyldecahydroquinoline (73)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 52 °C

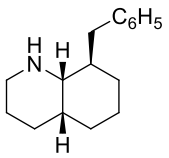


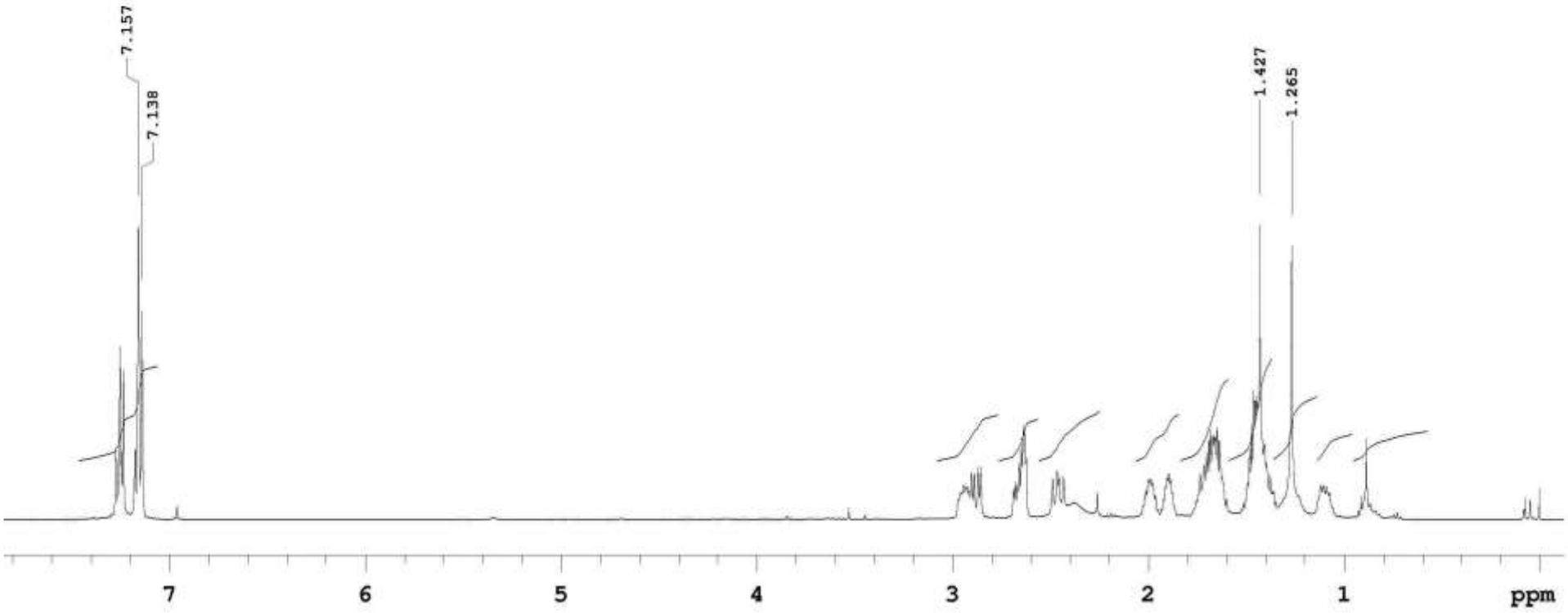


(4a*R*,8*S*,8a*R*)-8-Ethyldecahydroquinoline (74)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 52 °C

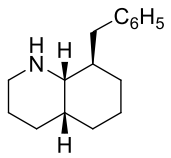


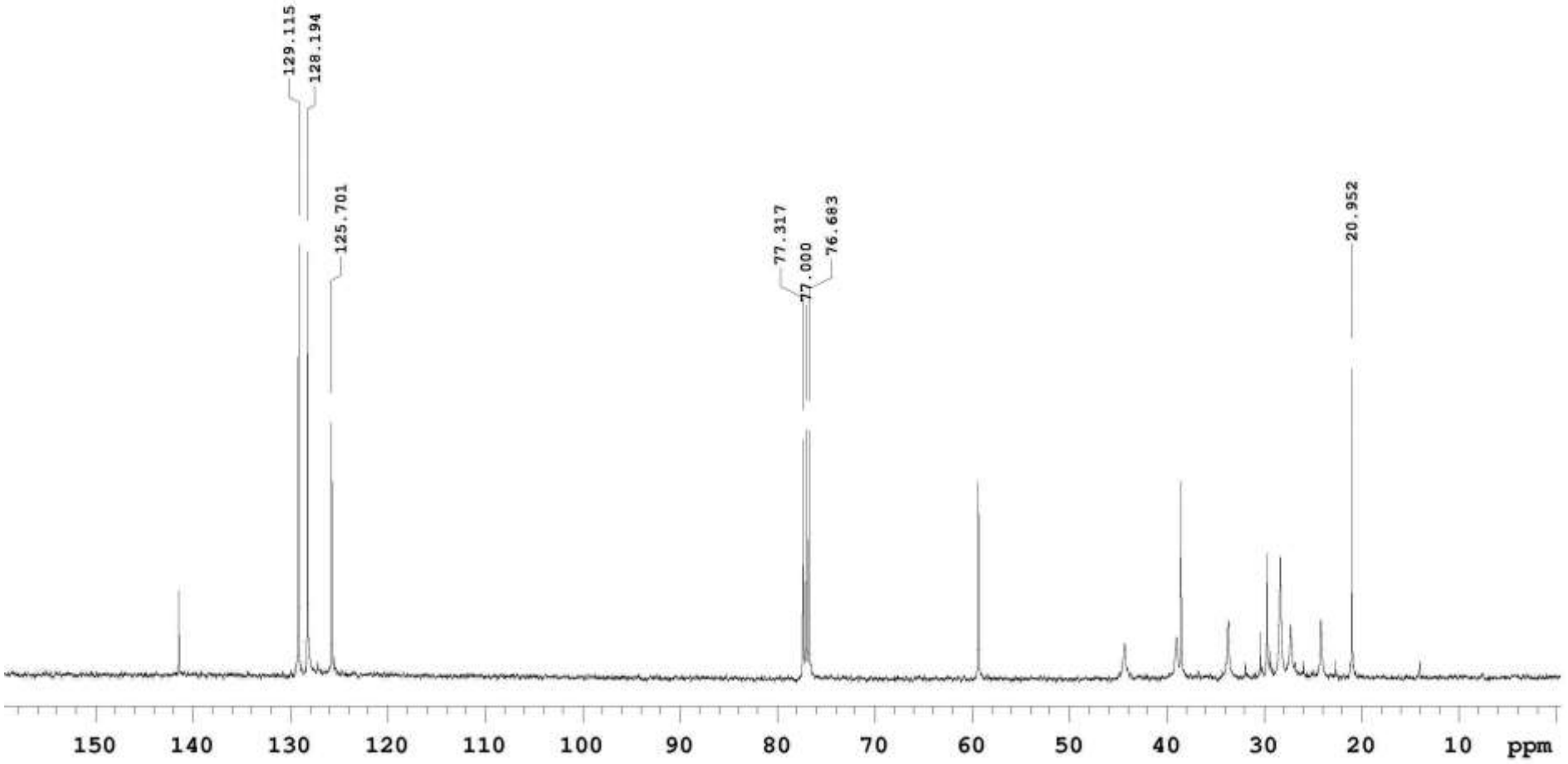
(4a*R*,8*S*,8a*R*)-8-Ethyldecahydroquinoline (74)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 52 °C



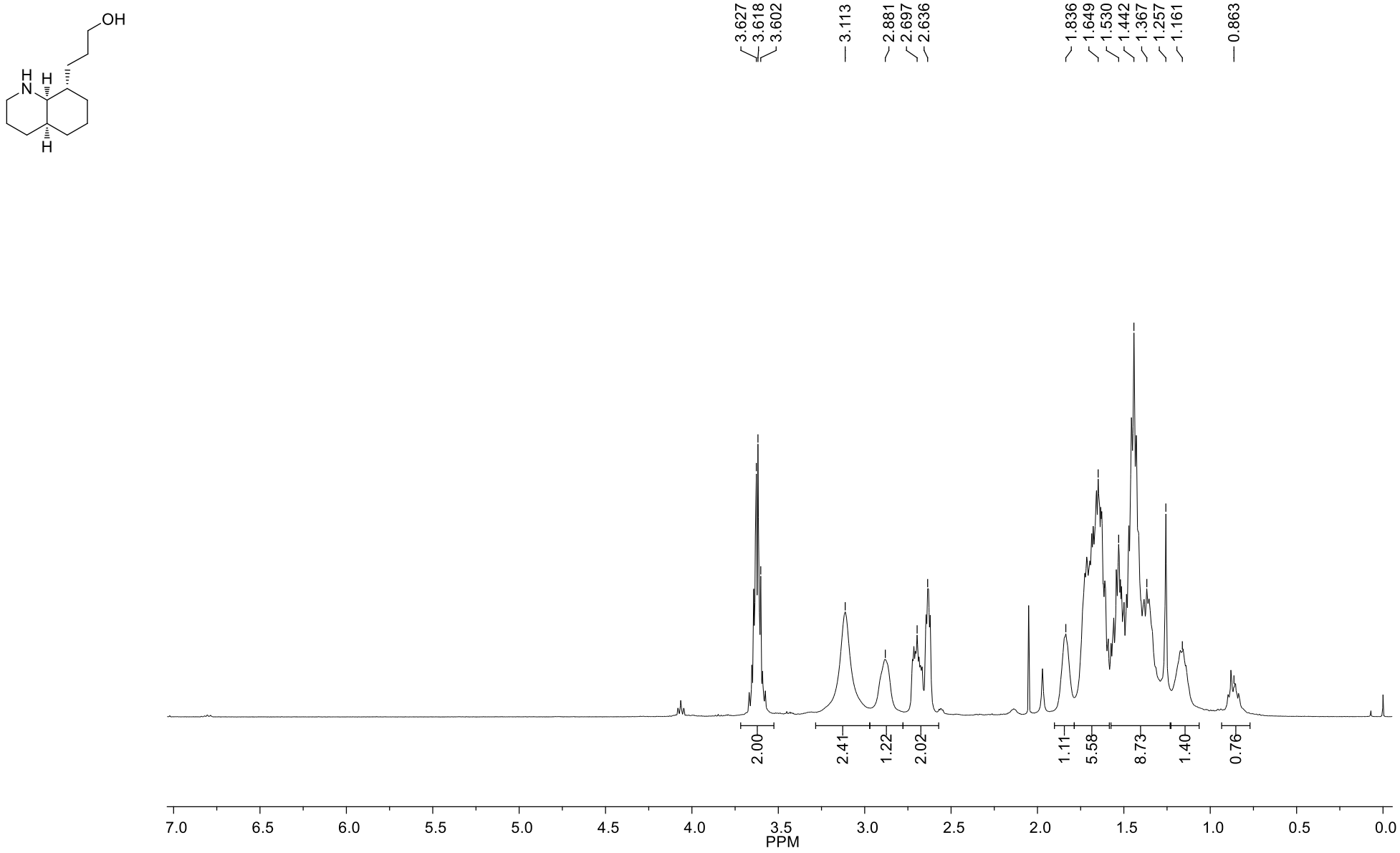


(4a*R*,8*R*,8a*S*)-8-Benzyldecahydroquinoline (75)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 52 °C

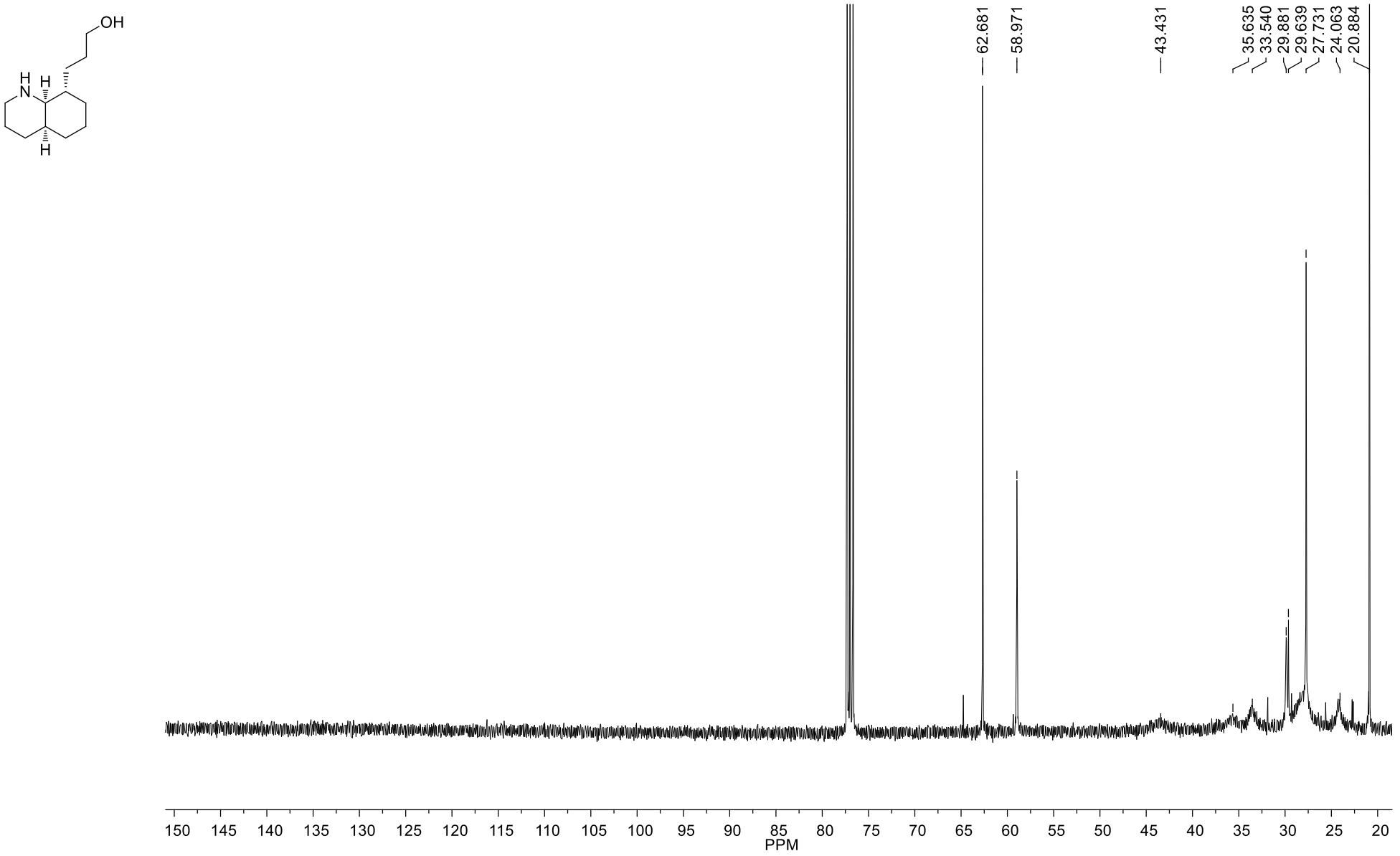




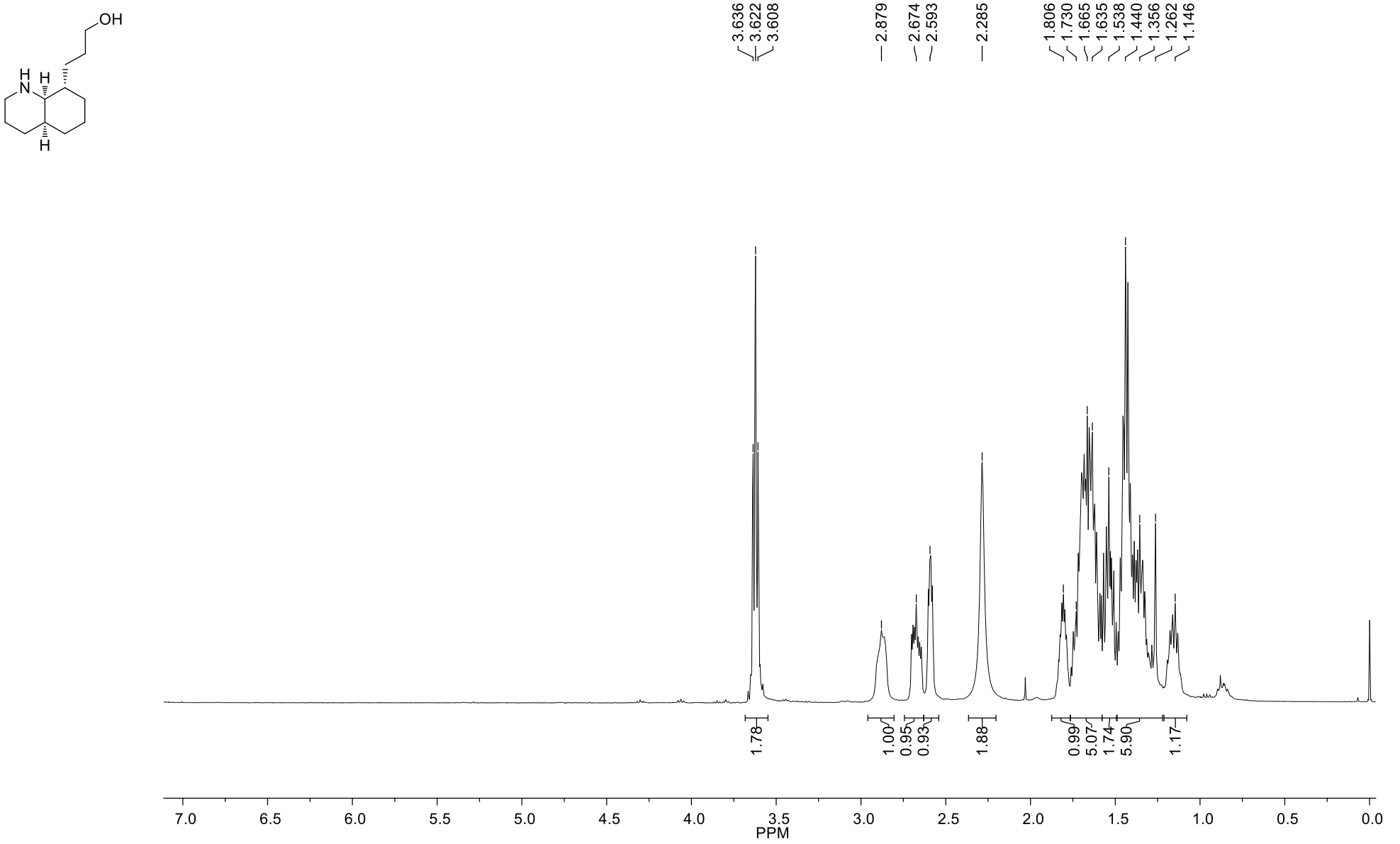
(4a*R*,8*R*,8a*S*)-8-Benzyldecahydroquinoline (75)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



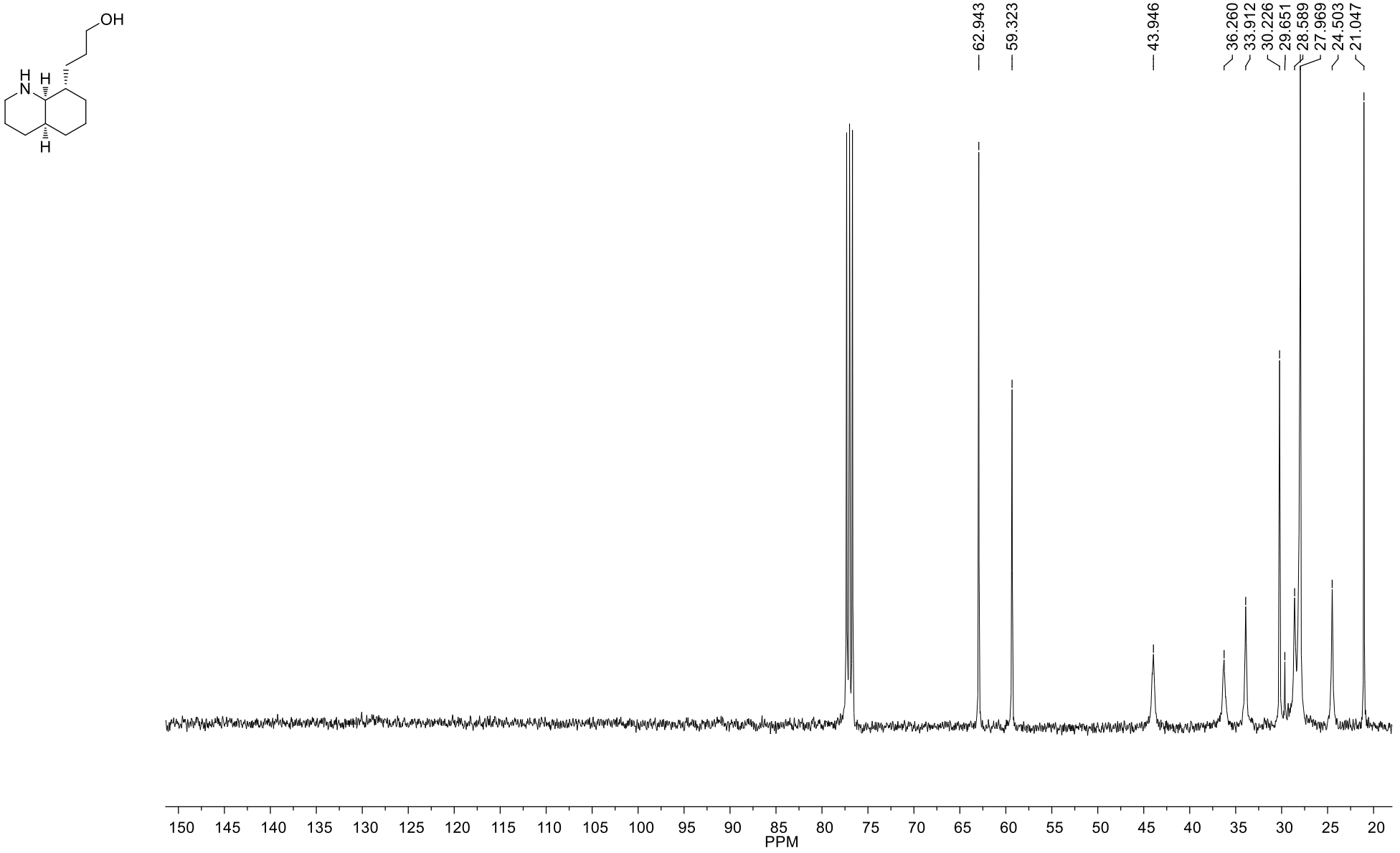
(4a*S*,8*R*,8a*S*)-8-(3-Hydroxypropyl)decahydroquinoline (76)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



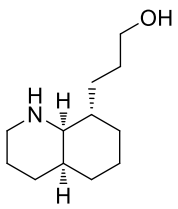
(4a*S*,8*R*,8a*S*)-8-(3-Hydroxypropyl)decahydroquinoline (76)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

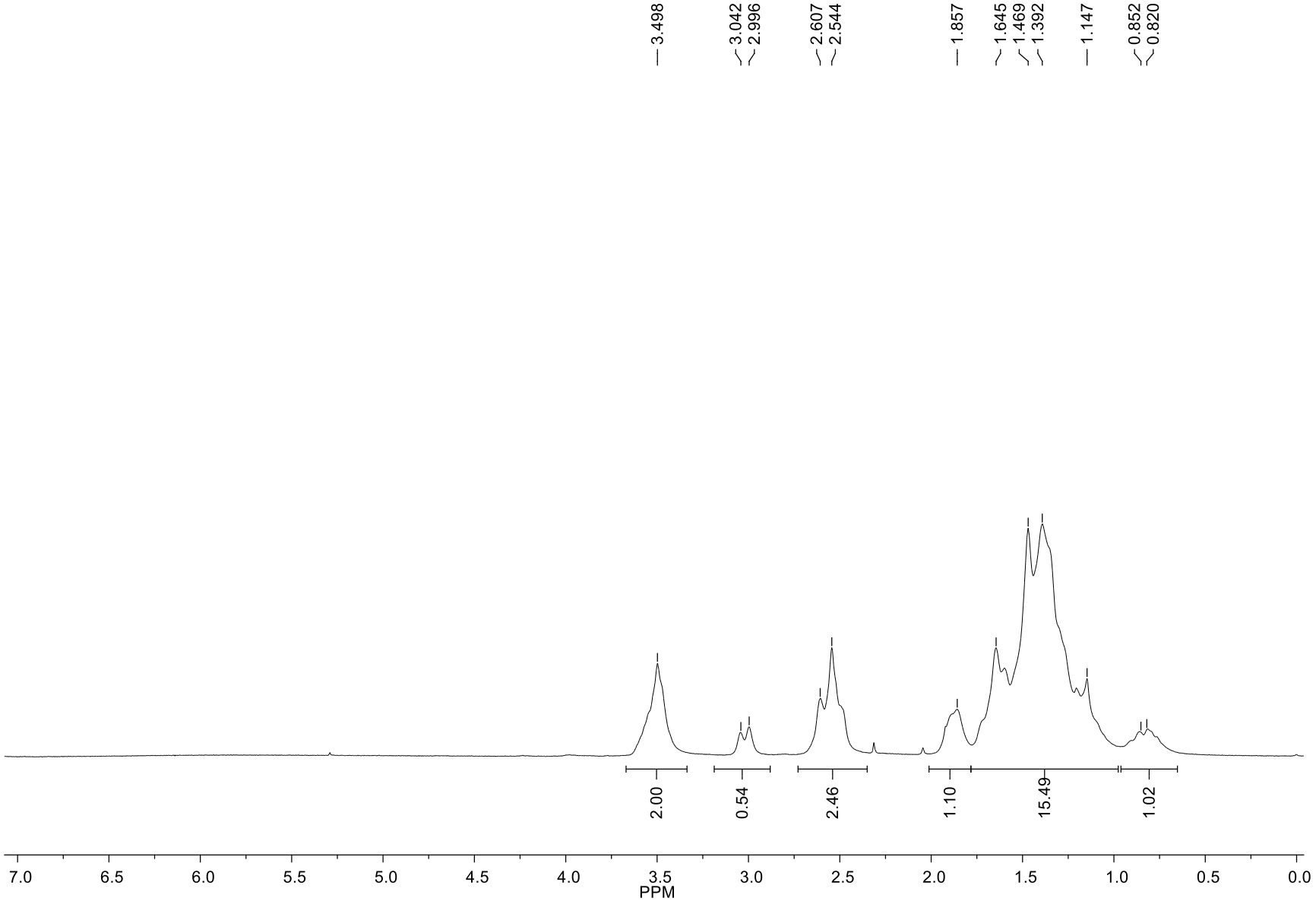


(4a*S*,8*R*,8a*S*)-8-(3-Hydroxypropyl)decahydroquinoline (76)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 50 °C

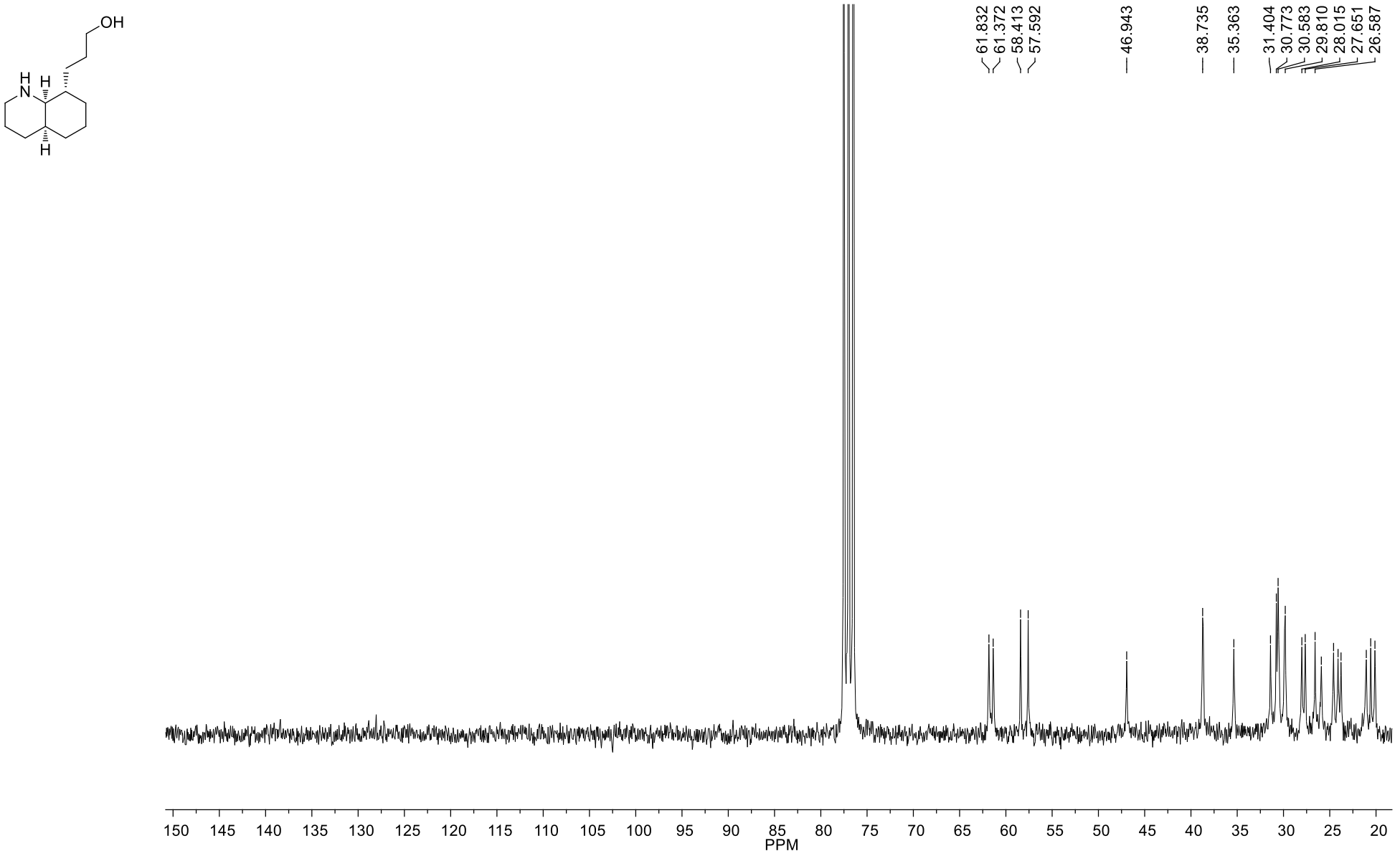


(4a*S*,8*R*,8a*S*)-8-(3-Hydroxypropyl)decahydroquinoline (76)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 50 °C

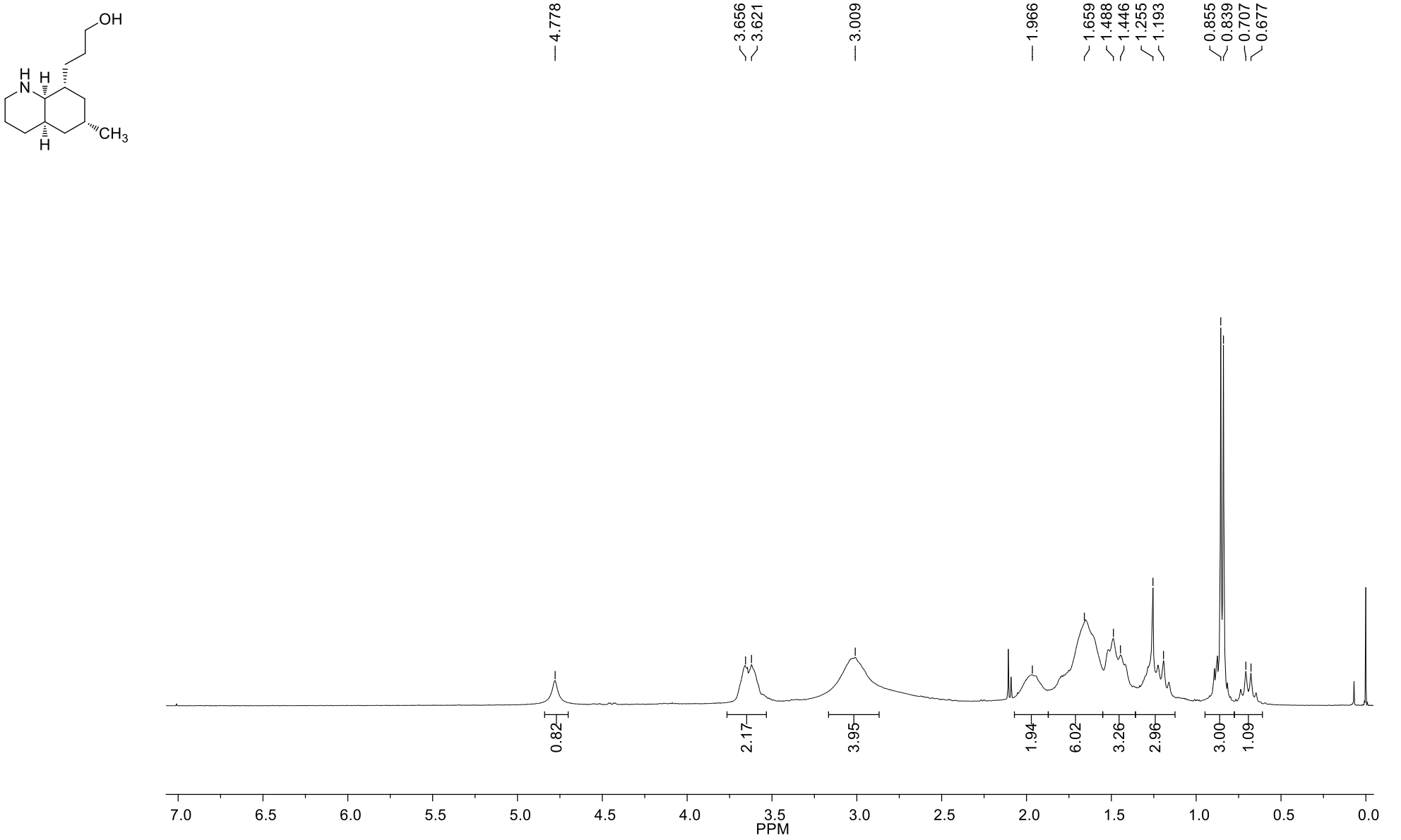




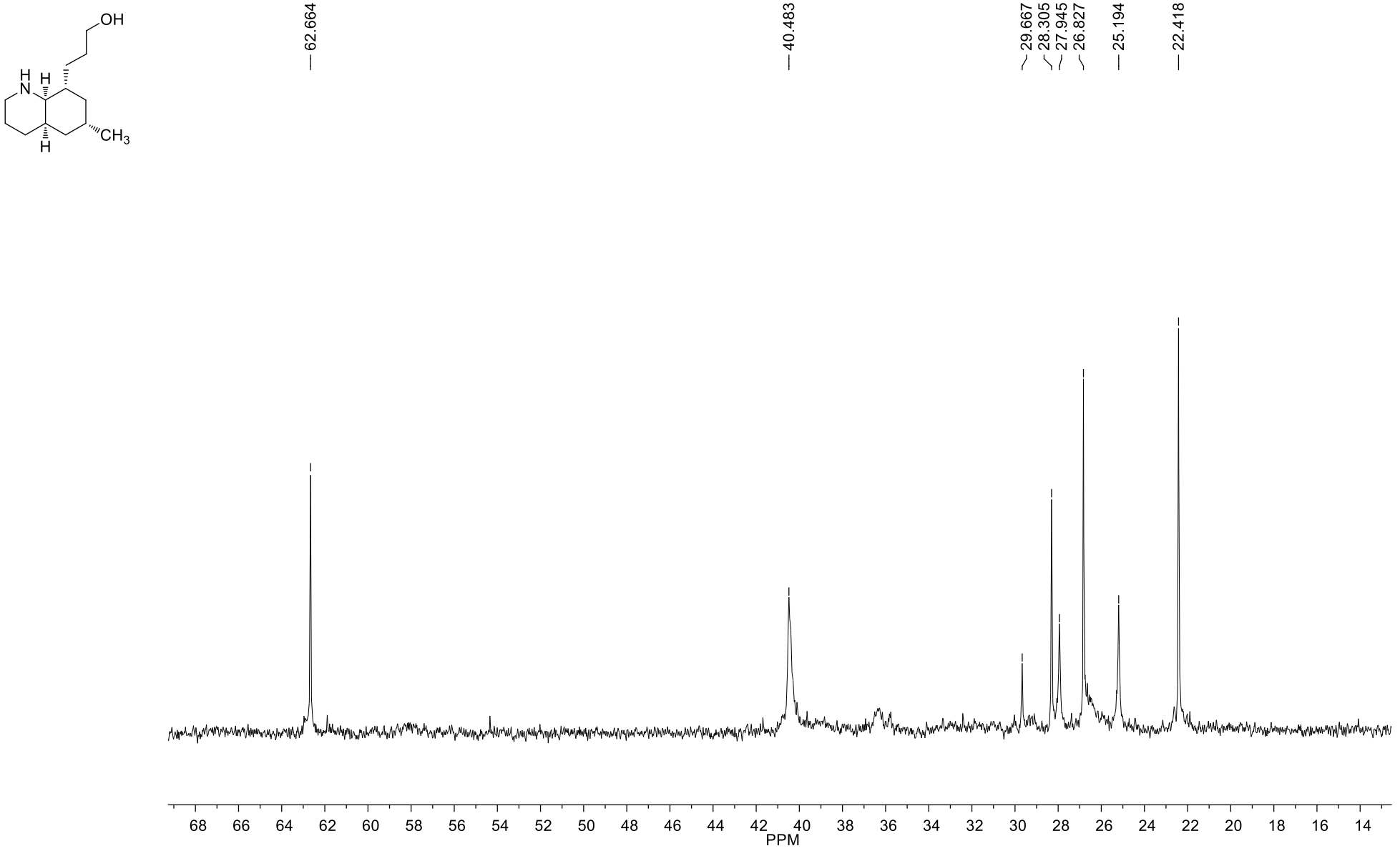
(4a*S*,8*R*,8a*S*)-8-(3-Hydroxypropyl)decahydroquinoline (76)- ^{1}H-NMR, $CDCl_3$, 400 MHz, – 23 °C



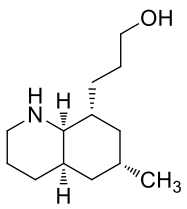
(4a*S*,8*R*,8a*S*)-8-(3-Hydroxypropyl)decahydroquinoline (76)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, –23 °C

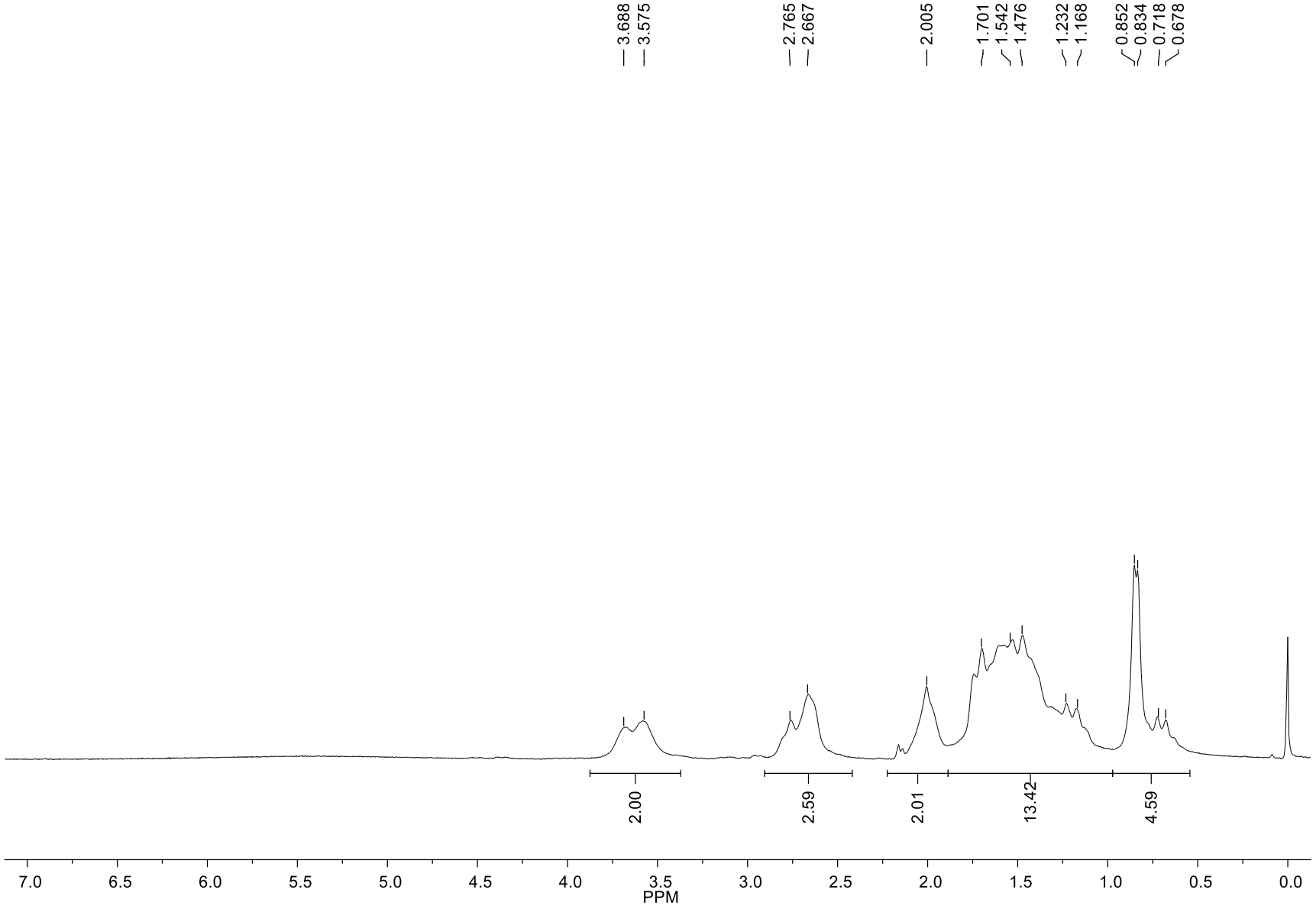


(4*R*,6*R*,8*R*,8a*R*)-8-(3-Hydroxypropyl)-6-methyldecahydroquinoline (77)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C

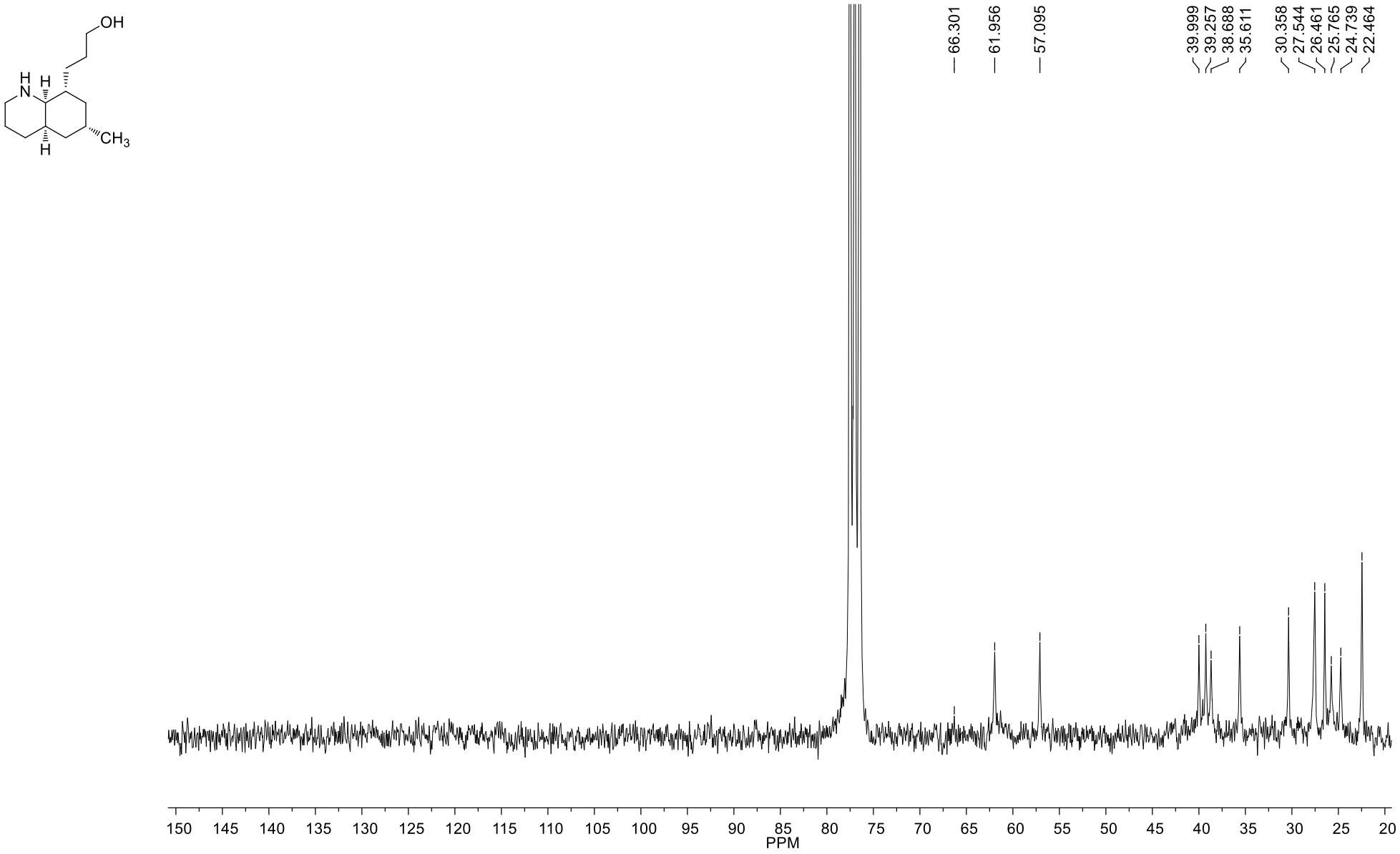


(4*R*,6*R*,8*R*,8a*R*)-8-(3-Hydroxypropyl)-6-methyldecahydroquinoline (77)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

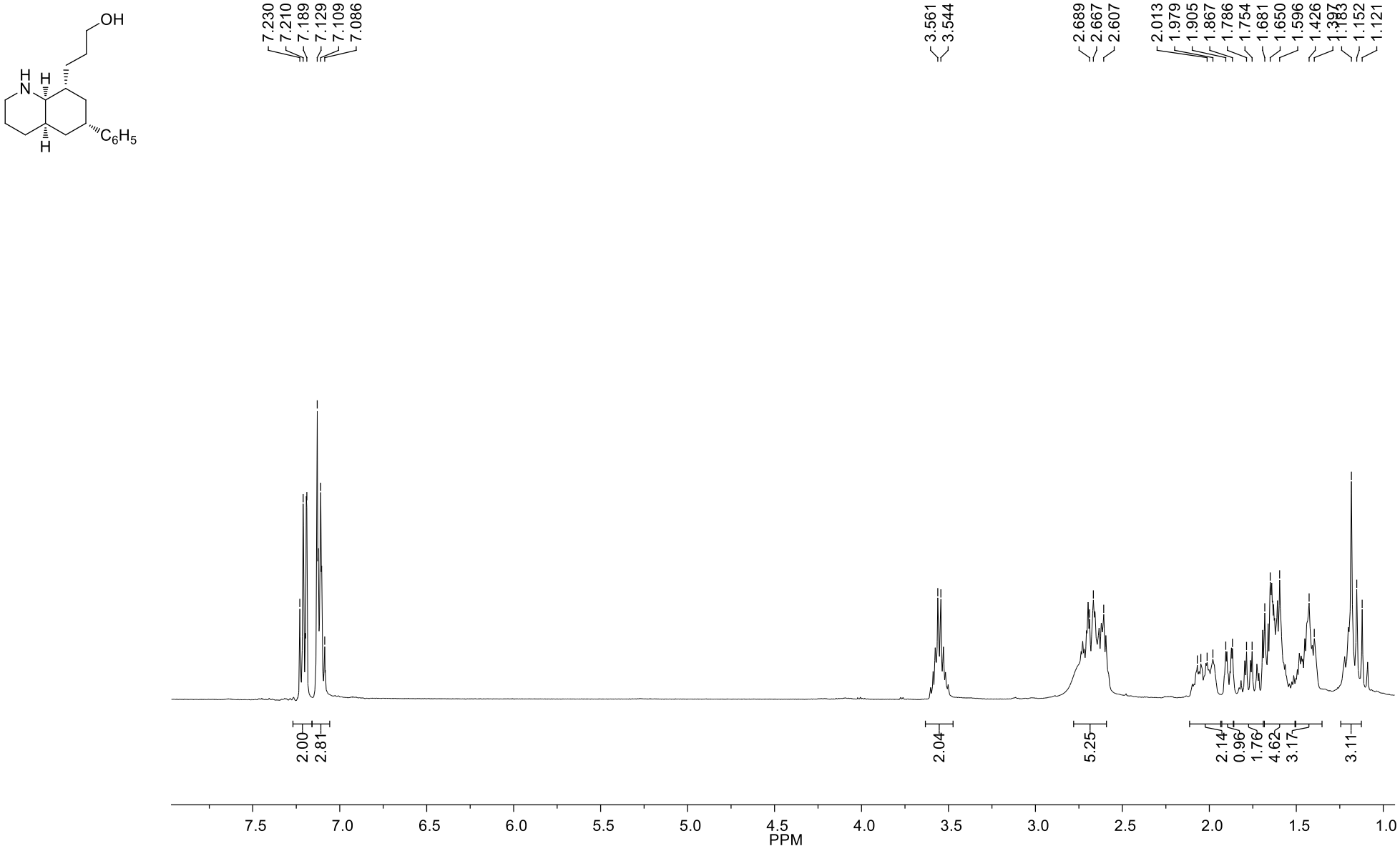




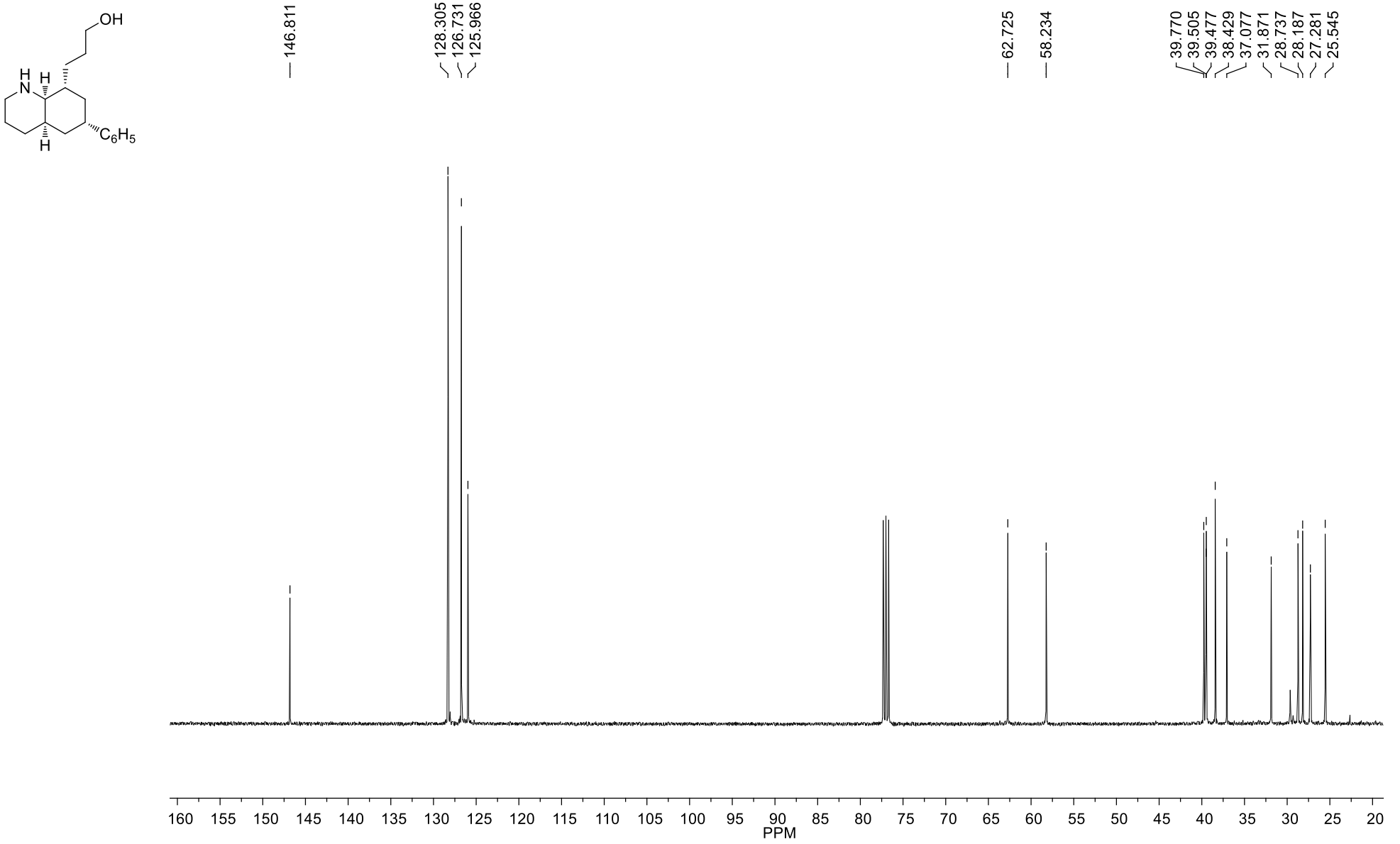
(4*R*,6*R*,8*R*,8a*R*)-8-(3-Hydroxypropyl)-6-methyldecahydroquinoline (77)- ^{1}H-NMR, $CDCl_3$, 400 MHz, – 23 °C



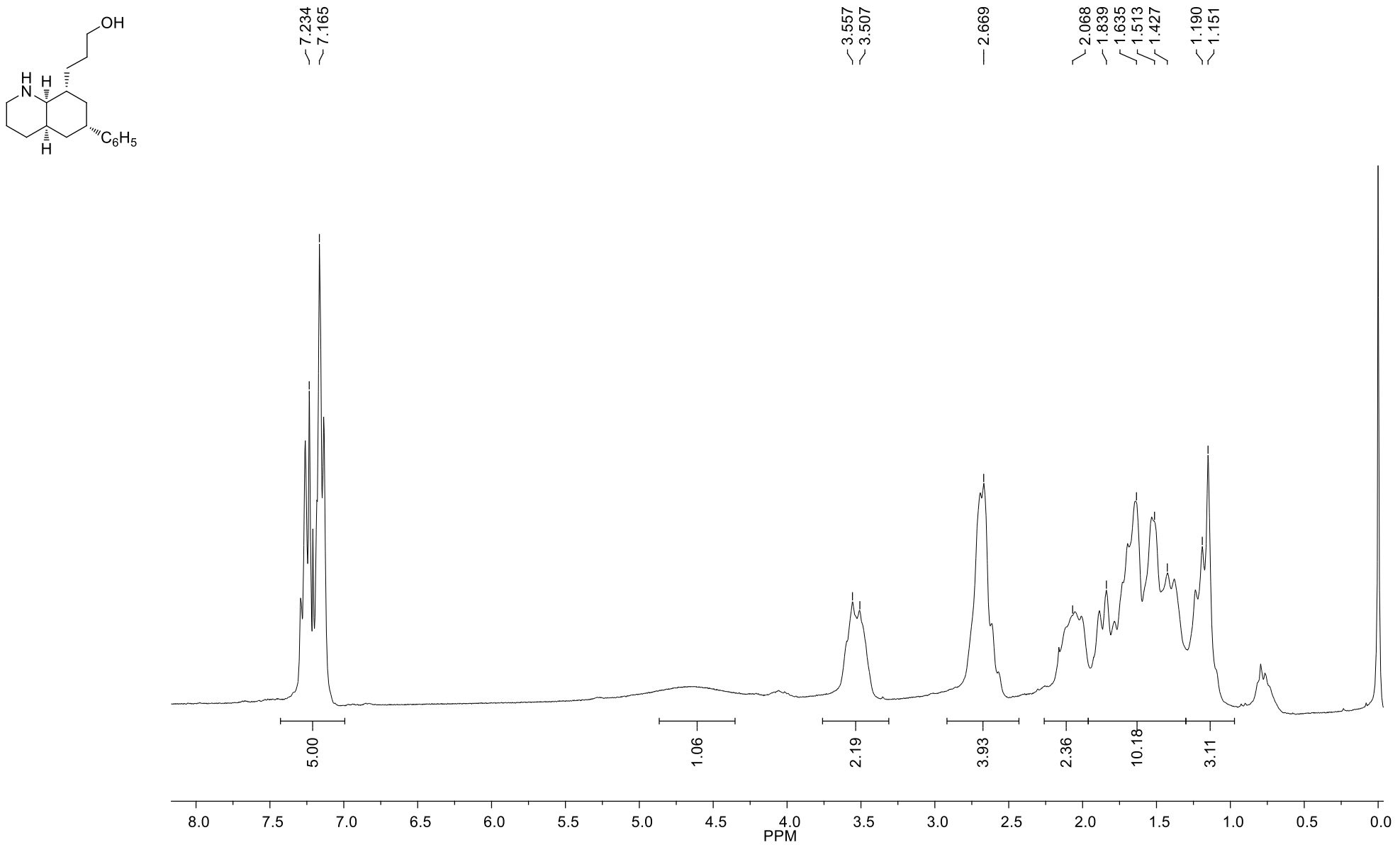
(4*R*,6*R*,8*R*,8a*R*)-8-(3-Hydroxypropyl)-6-methyldecahydroquinoline (77)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, – 23 °C



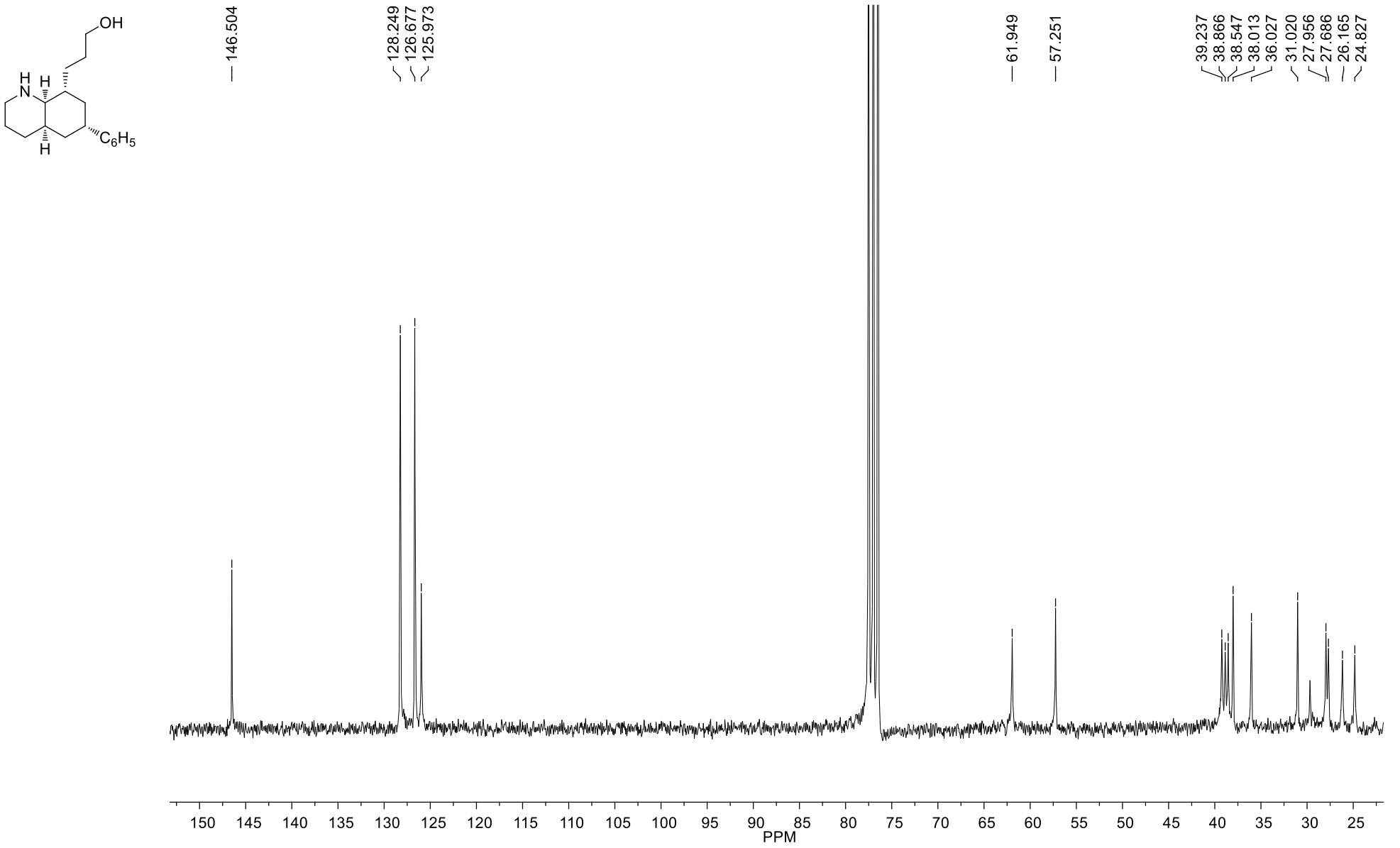
(4*R*,6*R*,8*R*,8a*R*)-8-(Hydroxypropyl)-6-phenyldecahydroquinoline (78)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



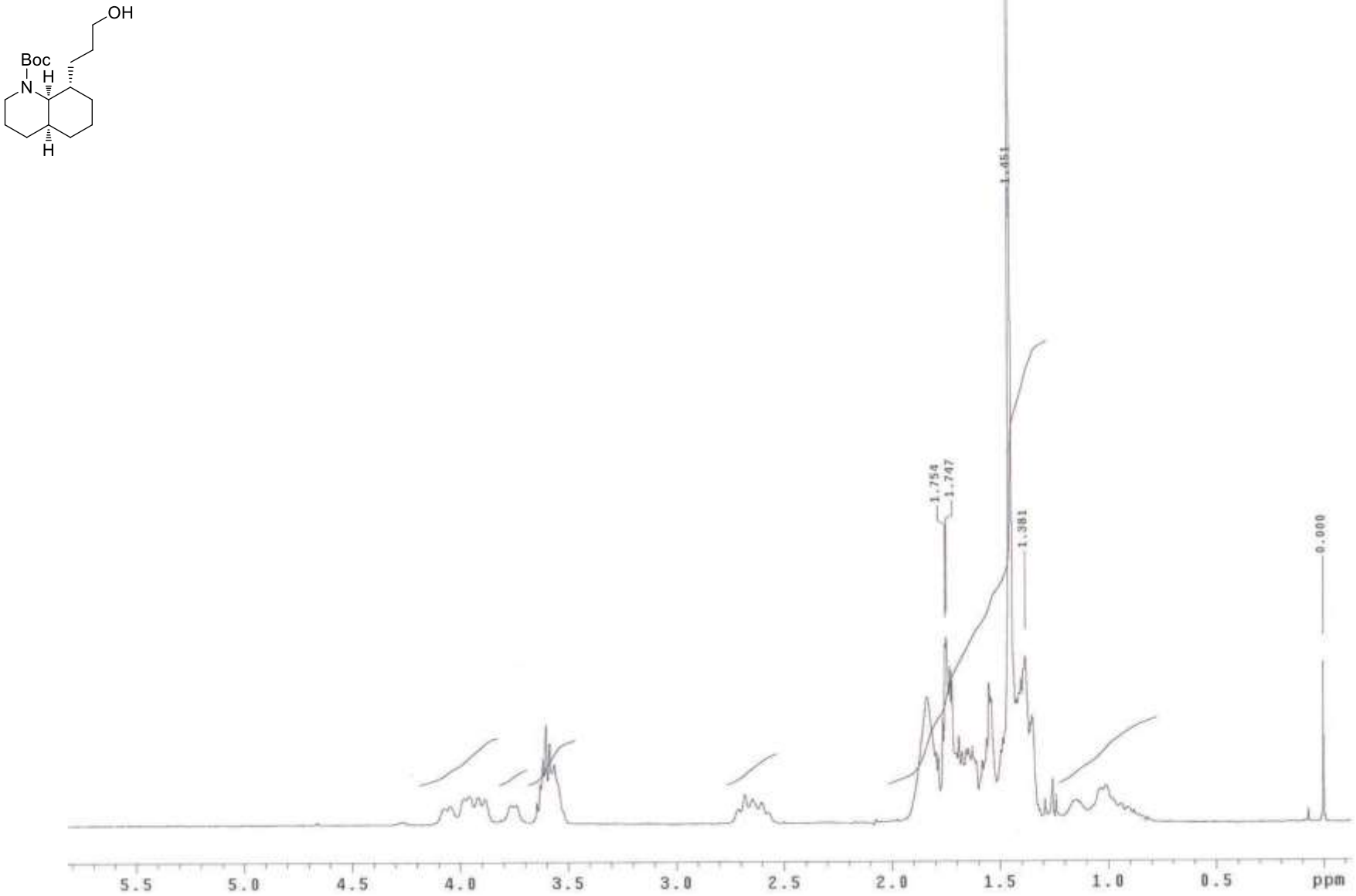
(4*R*,6*R*,8*R*,8a*R*)-8-(Hydroxypropyl)-6-phenyldecahydroquinoline (78)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



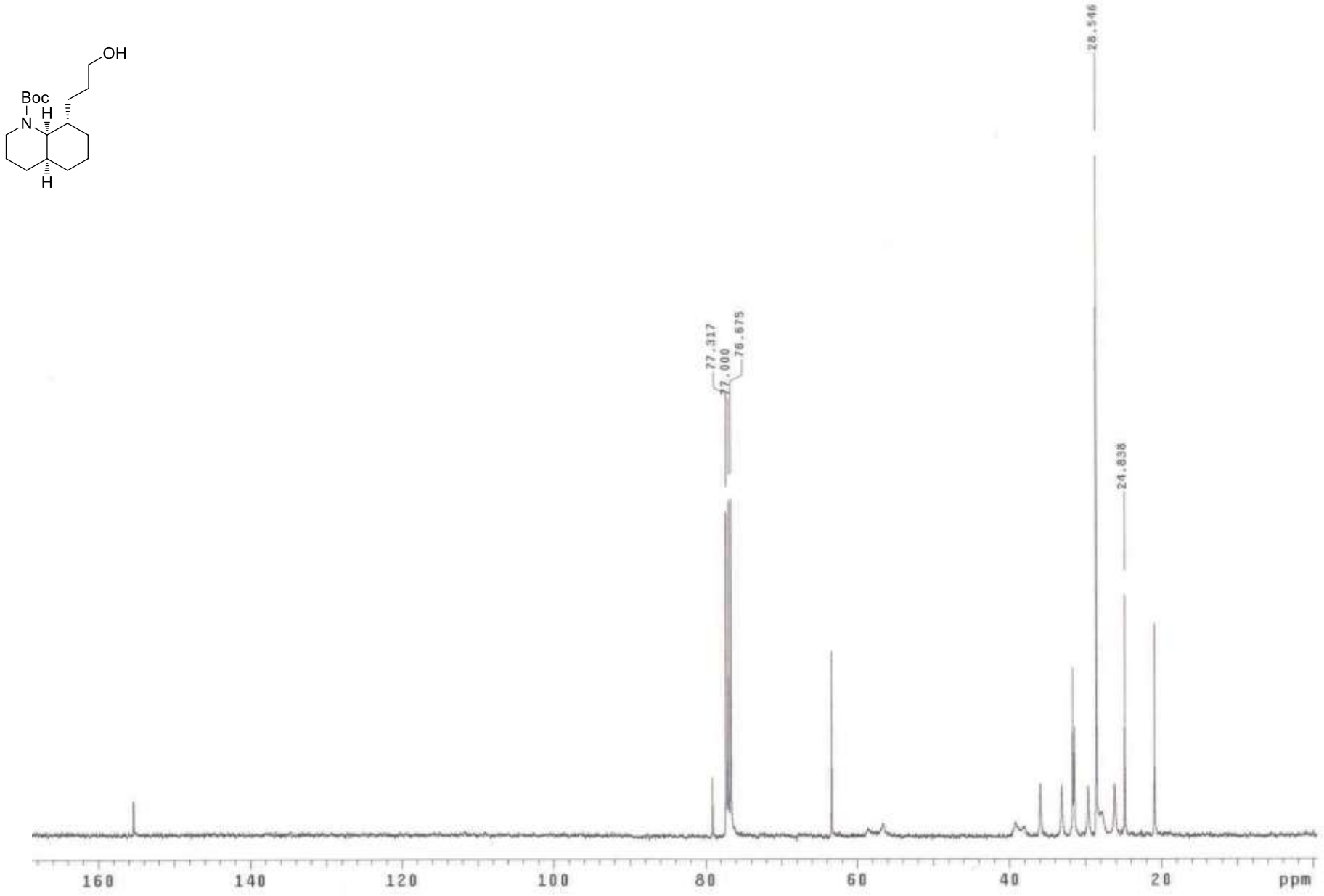
(4*R*,6*R*,8*R*,8a*R*)-8-(Hydroxypropyl)-6-phenyldecahydroquinoline (78)- ^{1}H-NMR, $CDCl_3$, 400 MHz, –23 °C



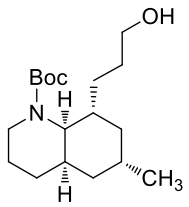
(4*R*,6*R*,8*R*,8a*R*)-8-(Hydroxypropyl)-6-phenyldecahydroquinoline (78)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, –23 °C

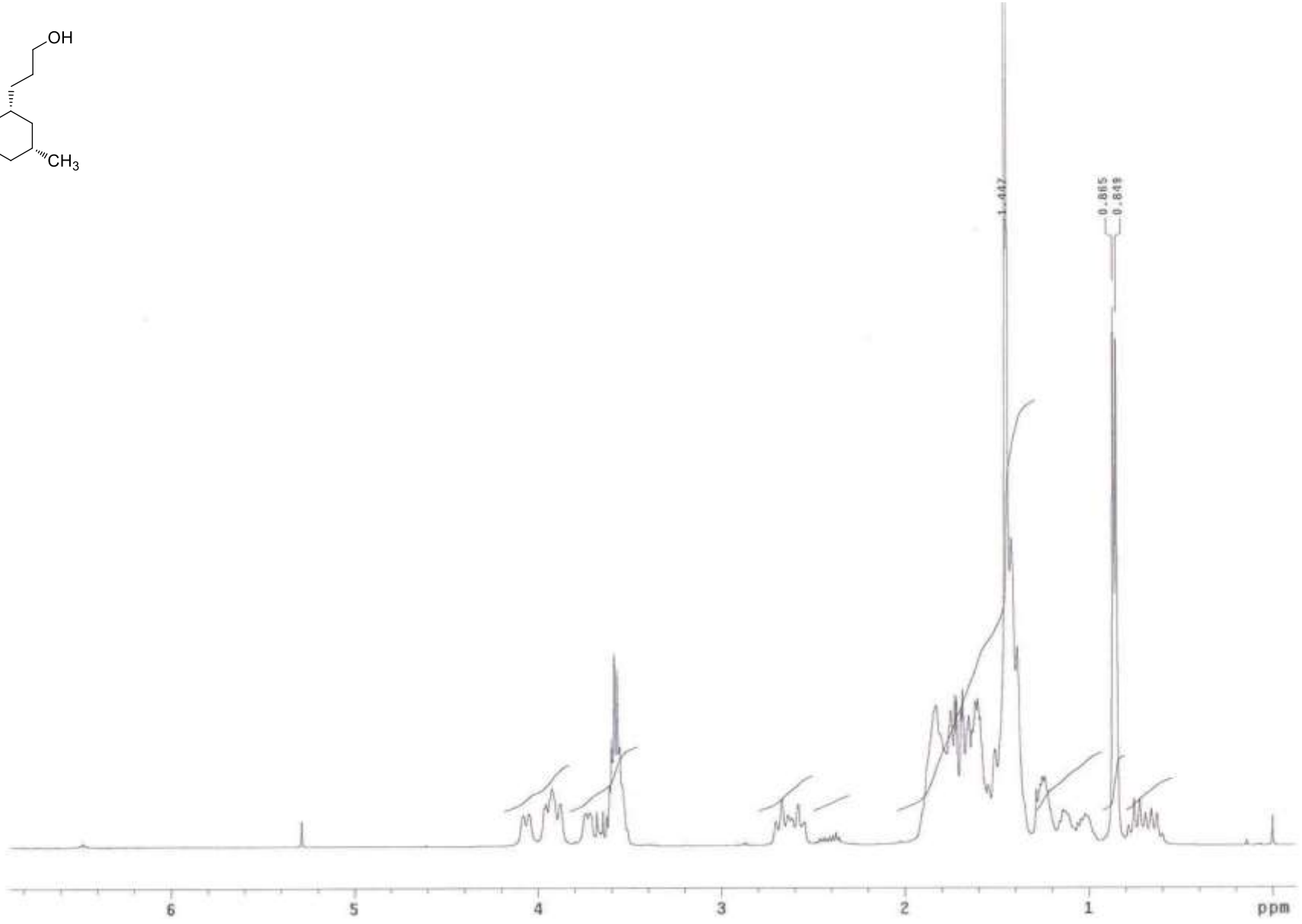


(4a*S*,8*S*,8a*R*)-1-(*tert*-Butoxycarbonyl)-8-(3-hydroxypropyl)decahydroquinoline (79)- ^{1}H-NMR, $CDCl_3$ 400 MHz, 25 °C

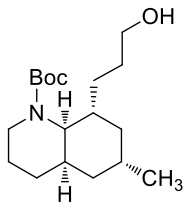


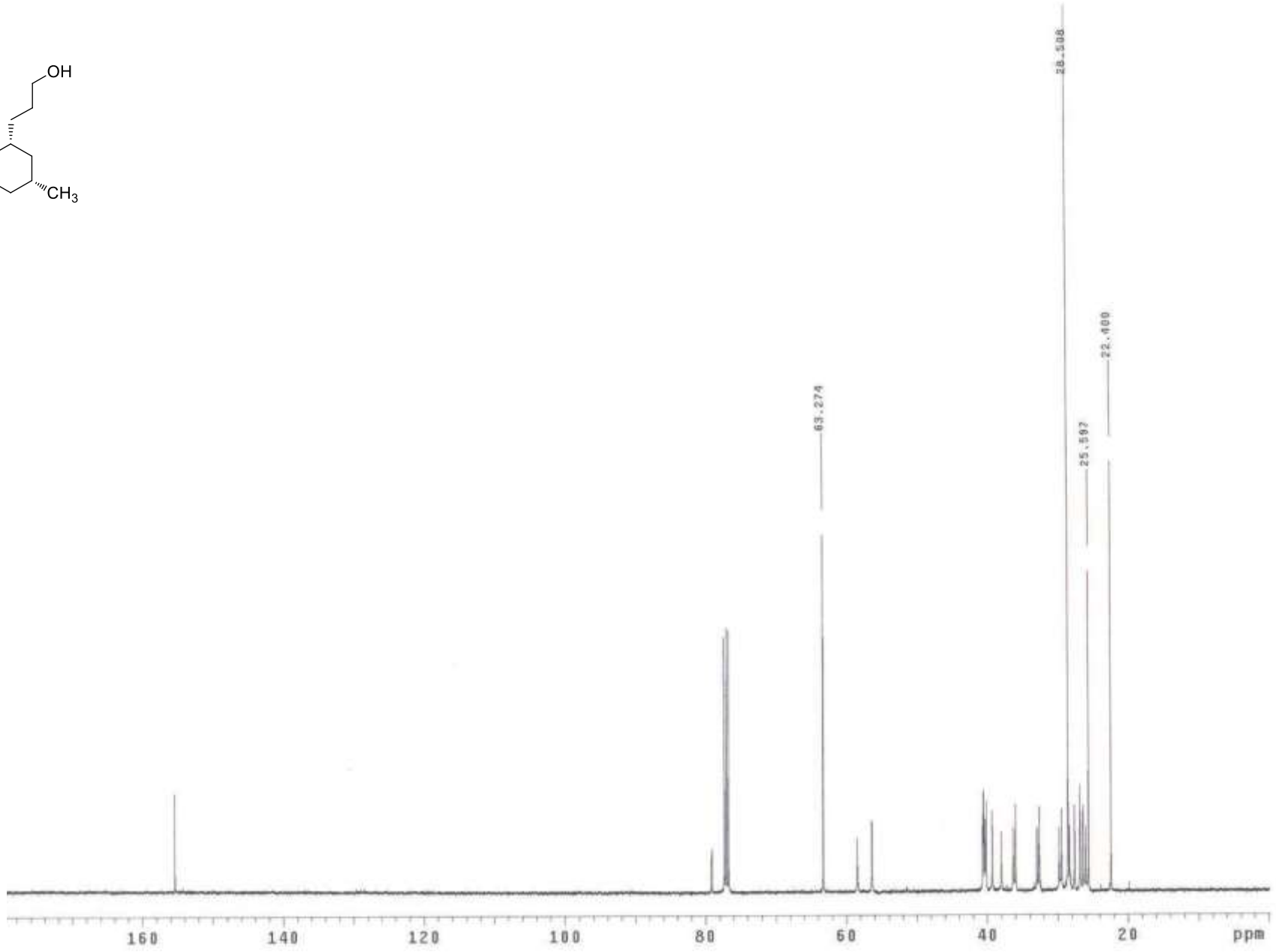
(4a*S*,8*S*,8a*R*)-1-(*tert*-Butoxycarbonyl)-8-(3-hydroxypropyl)decahydroquinoline (79)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 52 °C



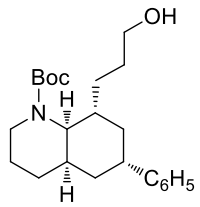


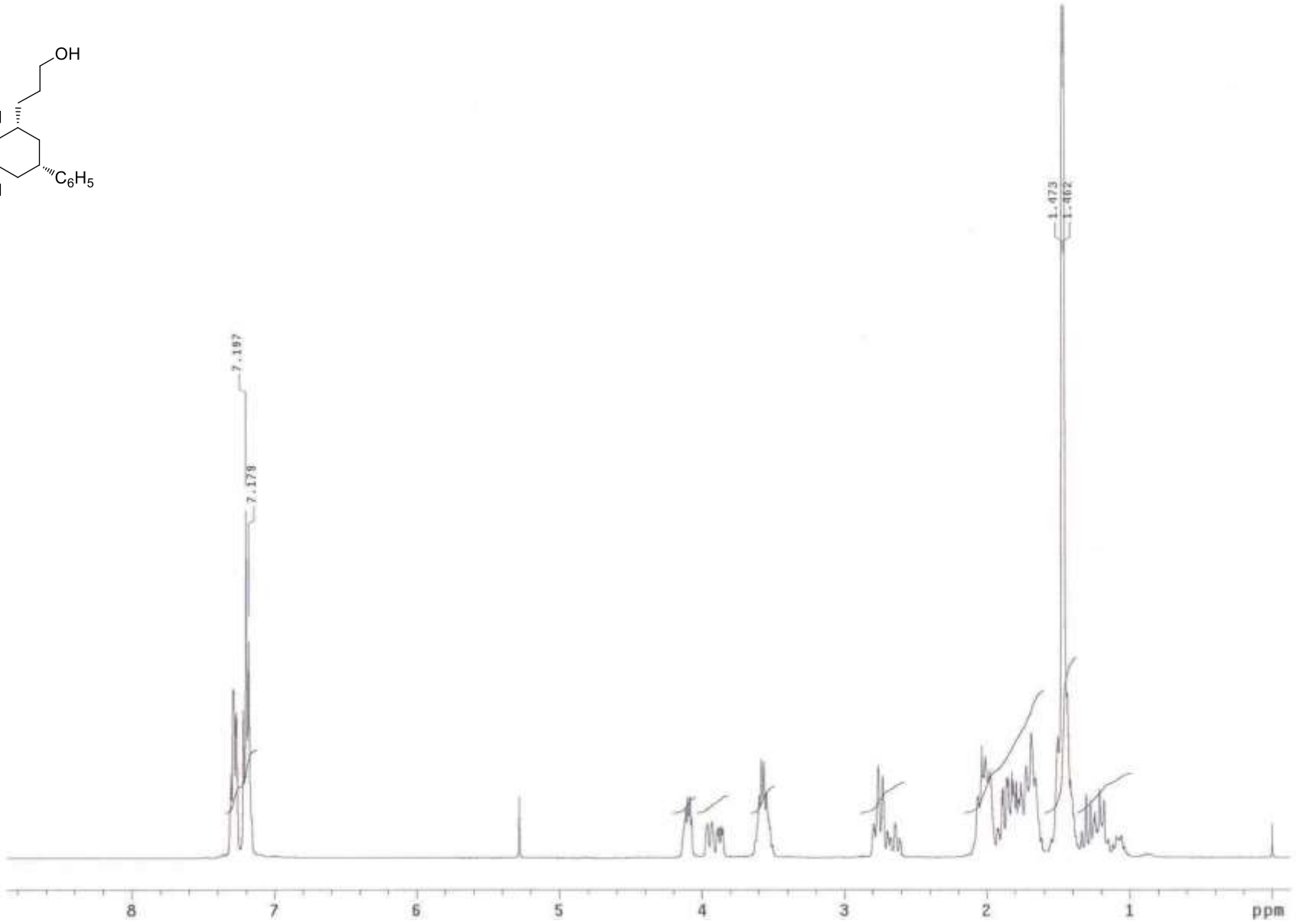
(4a*R*,6*R*,8*R*,8a*R*)-1-(*tert*-Butoxycarbonyl)-8-(3-hydroxypropyl)-6-methyldecahydroquinoline (80)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 50 °C



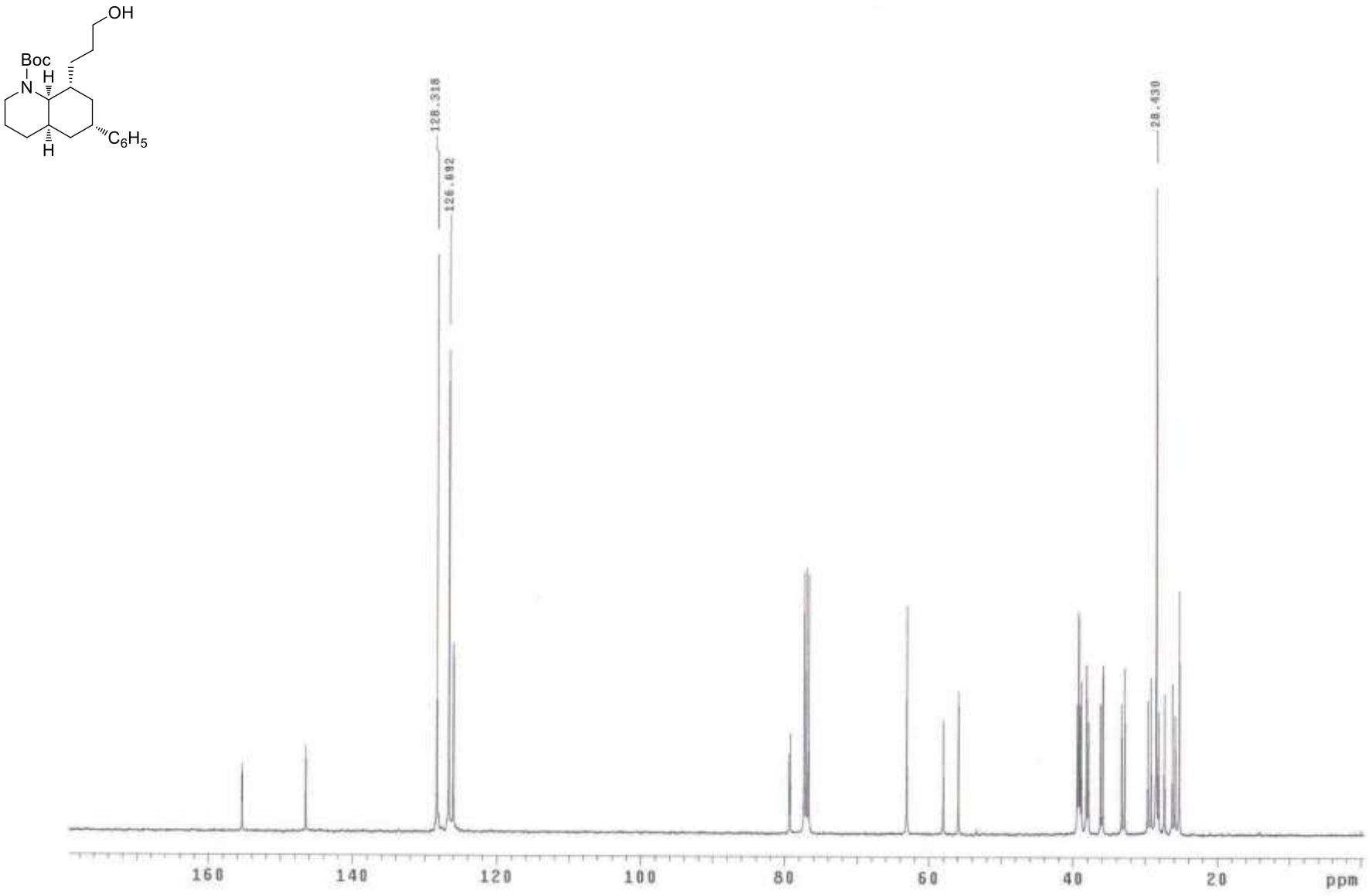


(4a*R*,6*R*,8*R*,8a*R*)-1-(*tert*-Butoxycarbonyl)-8-(3-hydroxypropyl)-6-methyldecahydroquinoline (80)- ^{13}C, $CDCl_3$, 100.6 MHz, 50 °C

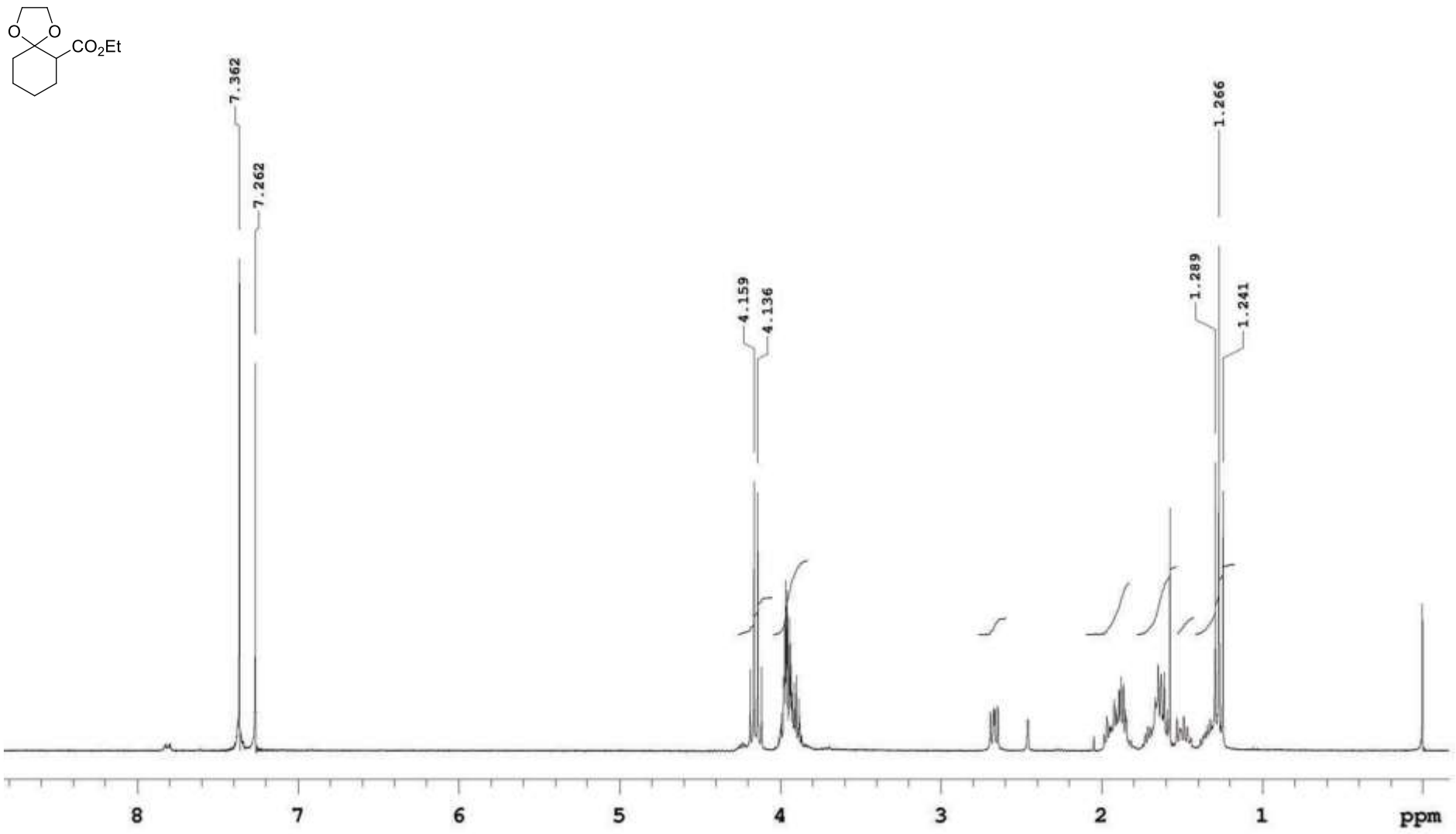




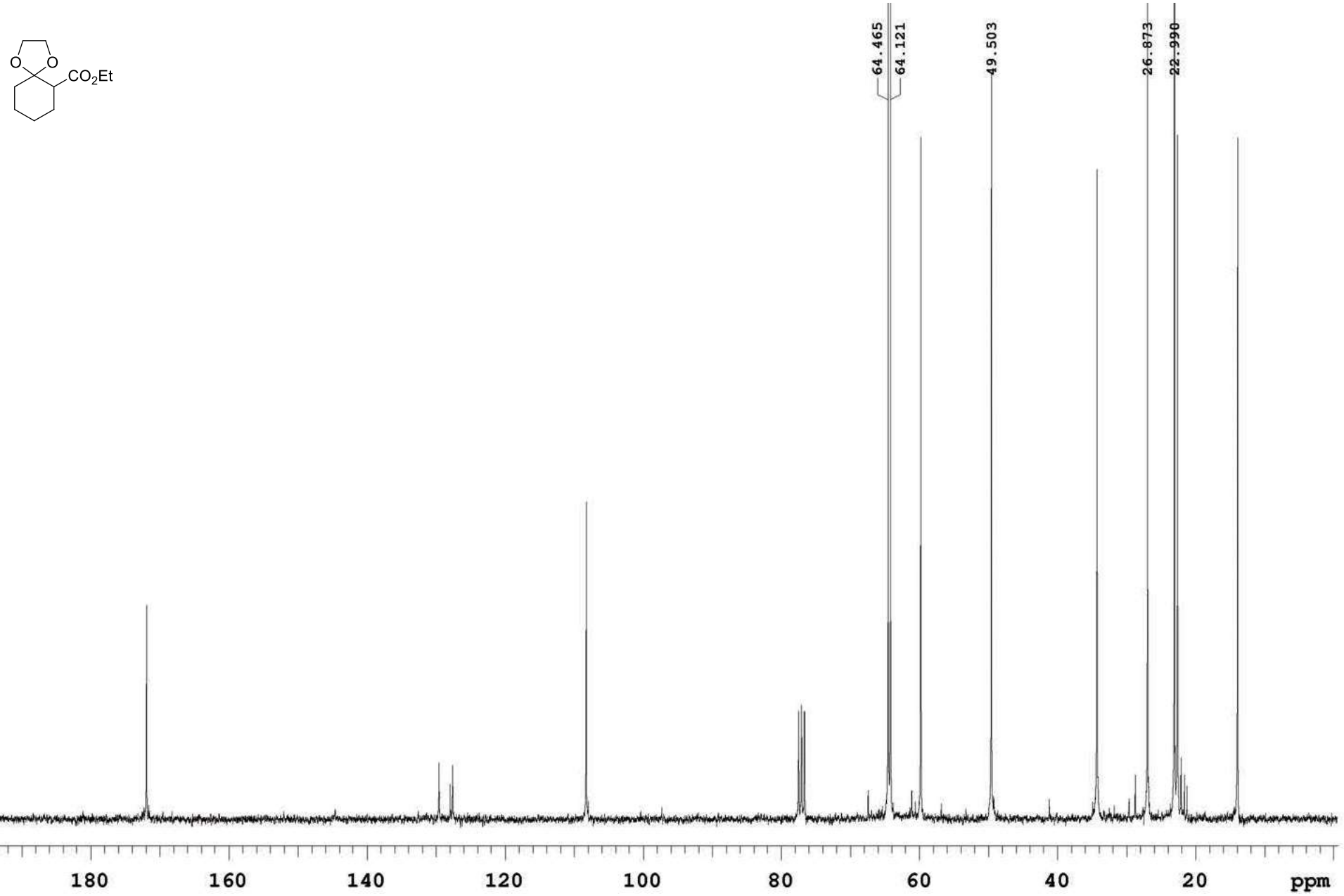
(4a*R*,6*R*,8*R*,8a*R*)-1-(*tert*-Butoxycarbonyl)-8-(3-hydroxypropyl)-6-phenyldecahydroquinoline (81)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



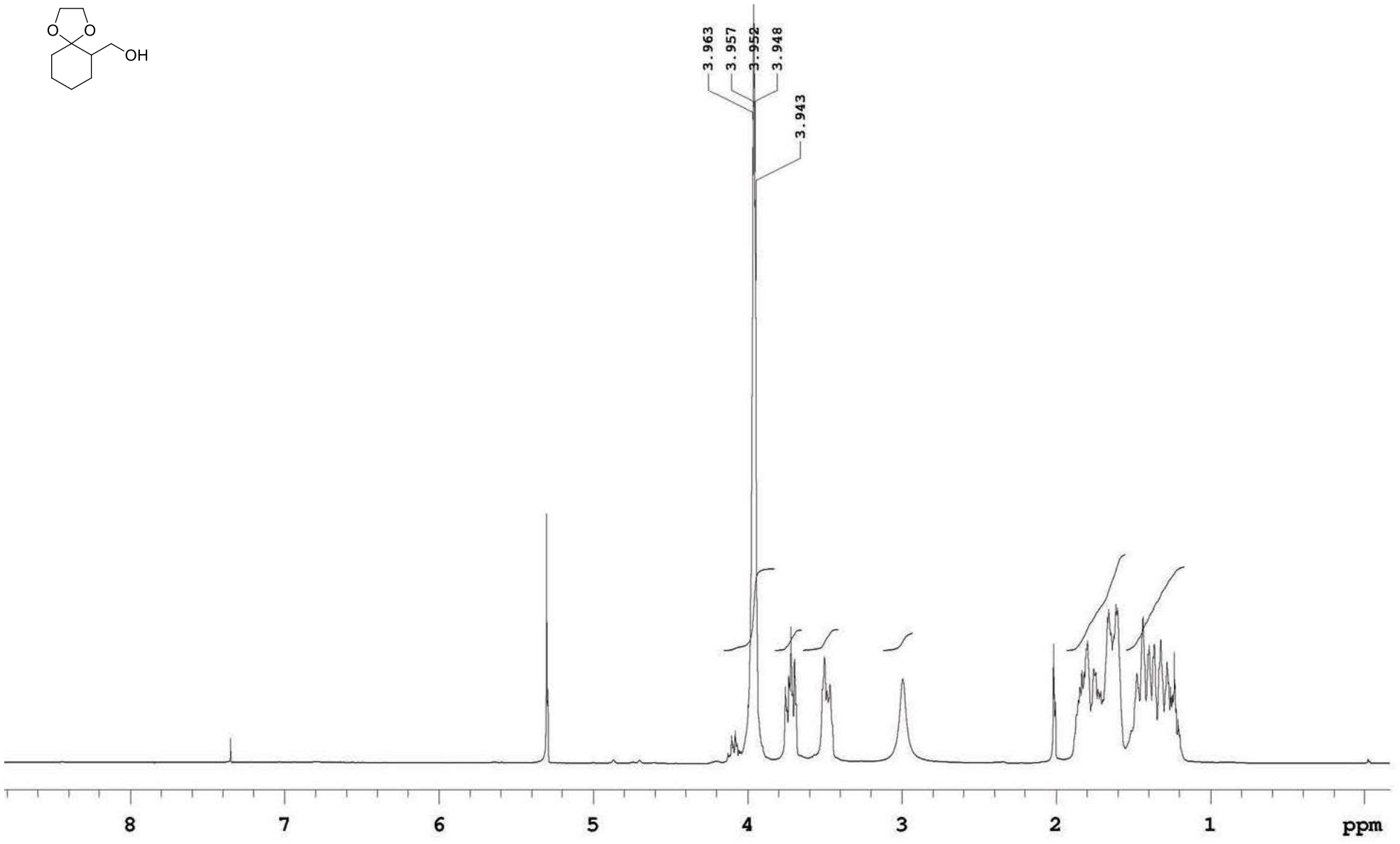
(4a*R*,6*R*,8*R*,8a*R*)-1-(*tert*-Butoxycarbonyl)-8-(3-hydroxypropyl)-6-phenyldecahydroquinoline (81)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



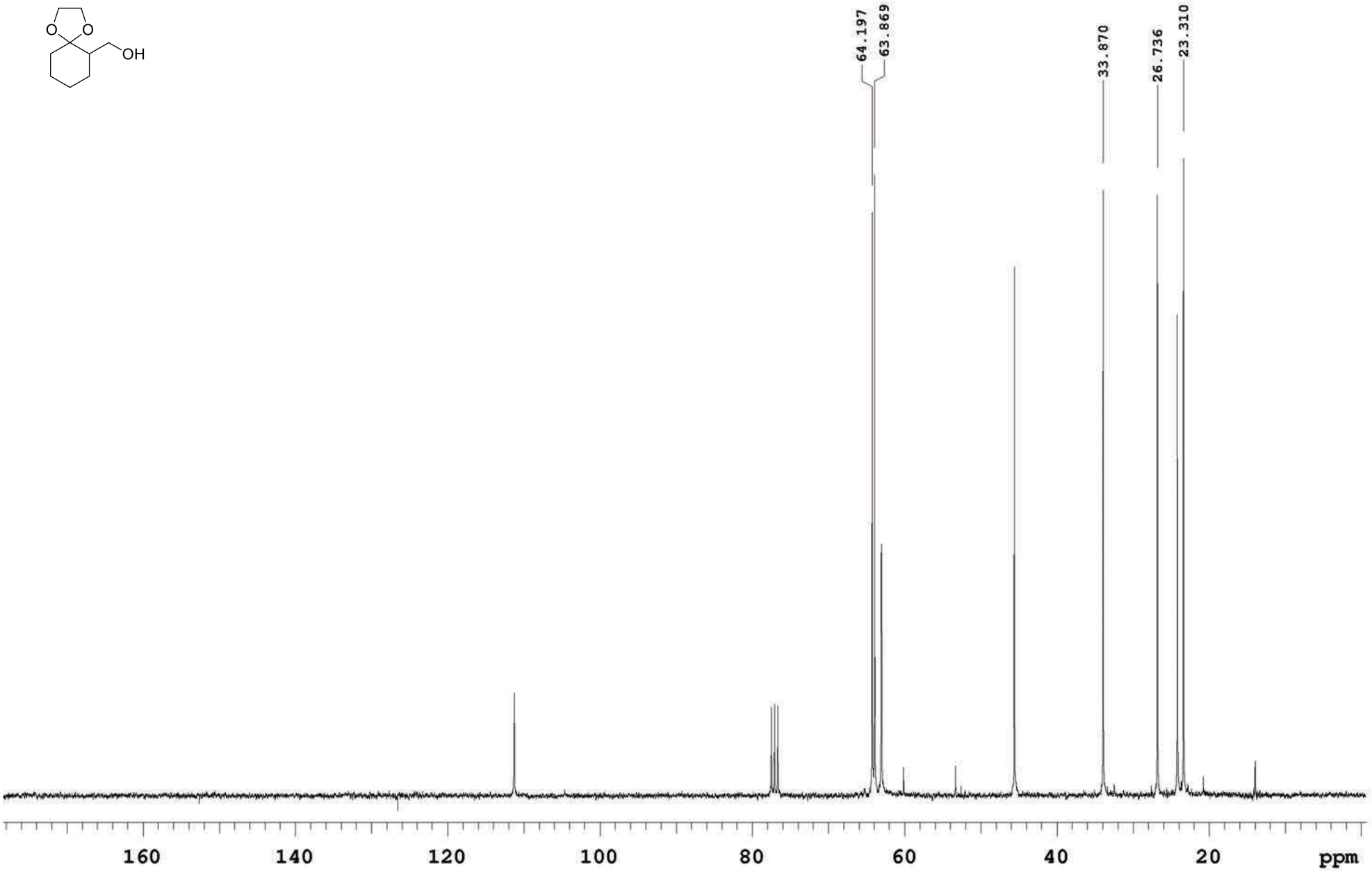
2-Ethoxycarbonylcyclohexanone ethylene acetal (84)- ^{1}H-NMR, $CDCl_3$, 300 MHz, 25 °C



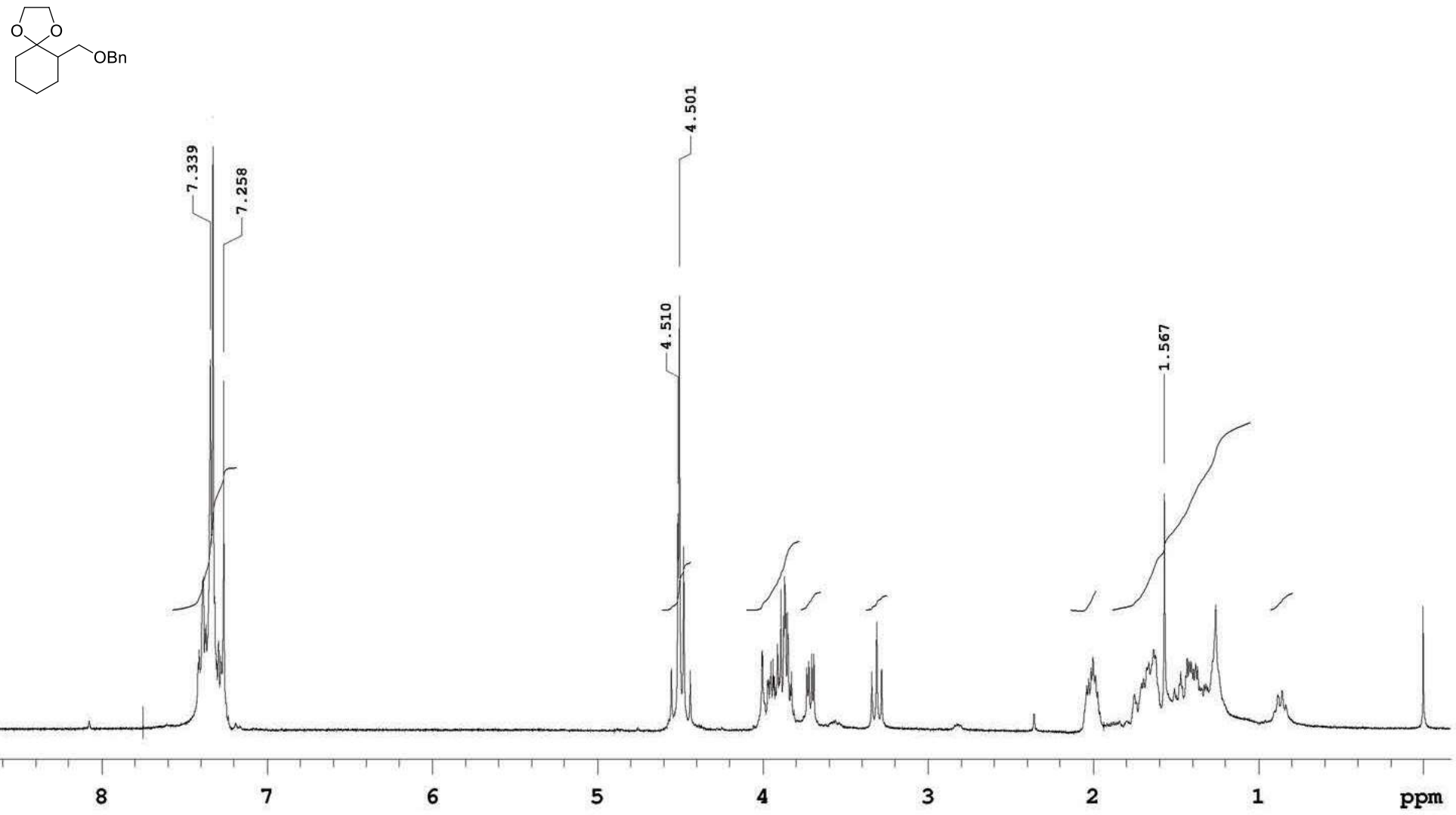
2-Ethoxycarbonylcyclohexanone ethylene acetal (84)- ^{13}C-NMR, $CDCl_3$, 75.4 MHz, 25 °C



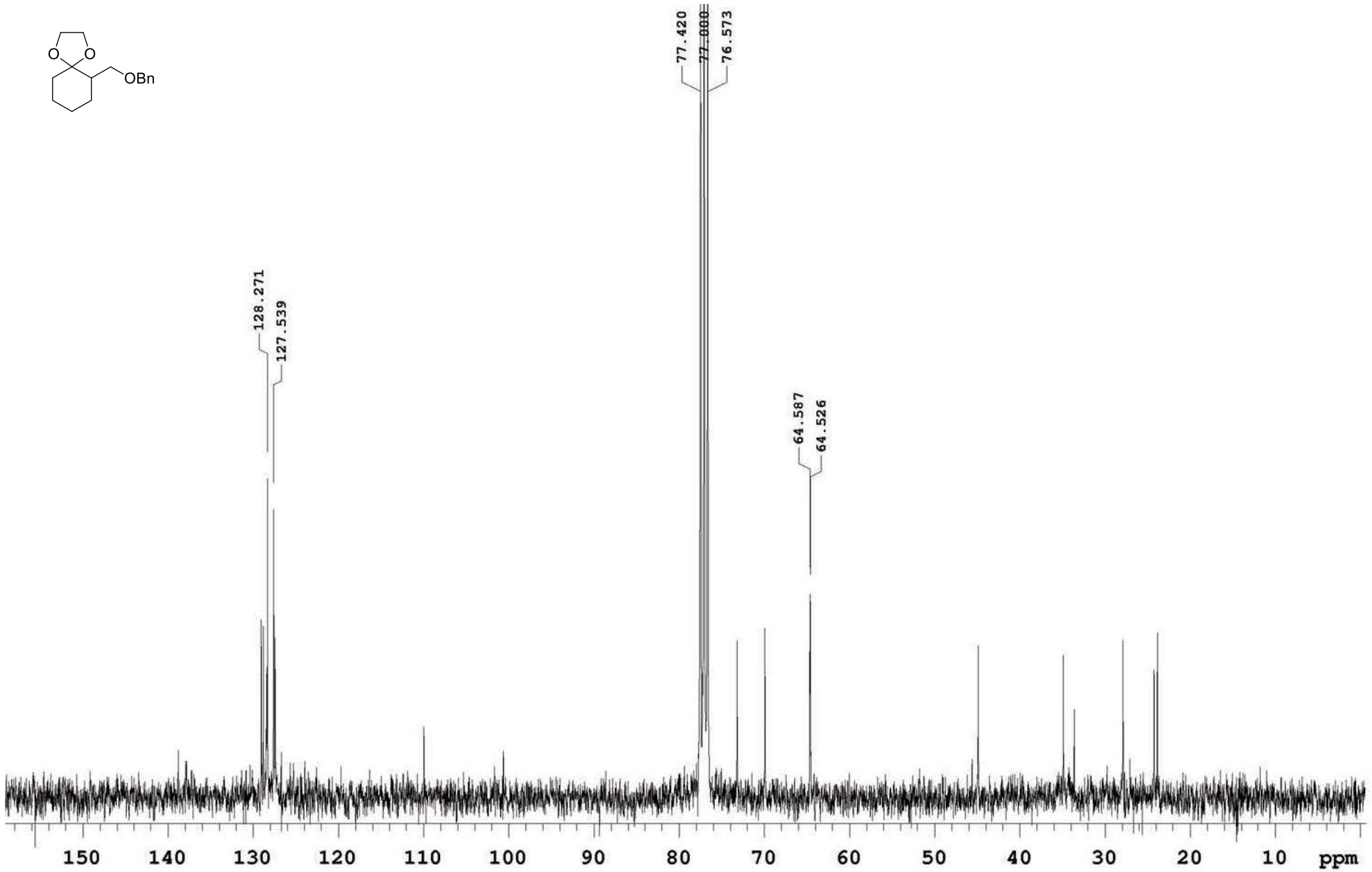
2-Hydroxymethylcyclohexanonethylene acetal (85)- ^{1}H-NMR, $CDCl_3$, 300 MHZ, 25 °C



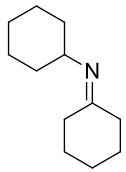
2-Hydroxymethylcyclohexanonethylene acetal (85)- ^{13}C-NMR, $CDCl_3$, 75.4 MHz, 25 °C

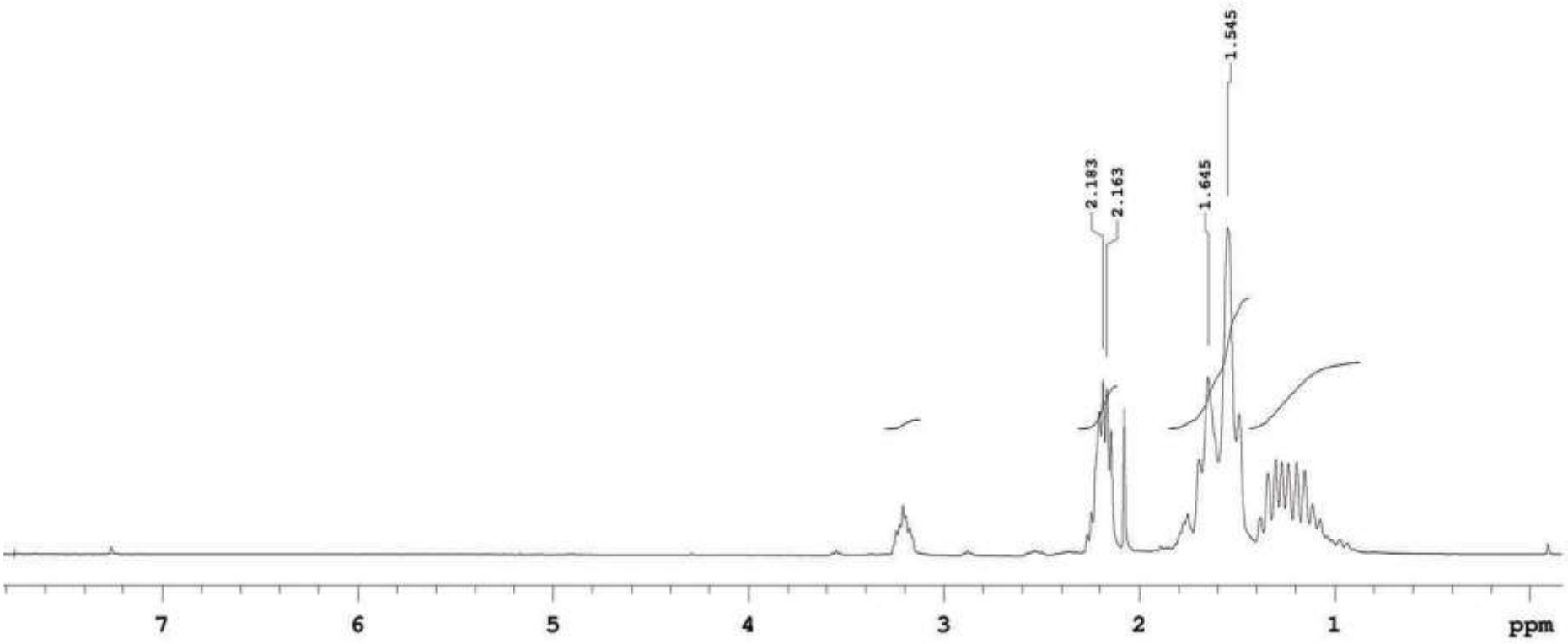


2-[(Benzyloxy)methyl]cyclohexanone ethylene acetal (86)- ^{1}H-NMR, $CDCl_3$, 300 MHz, 25 °C

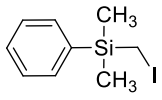


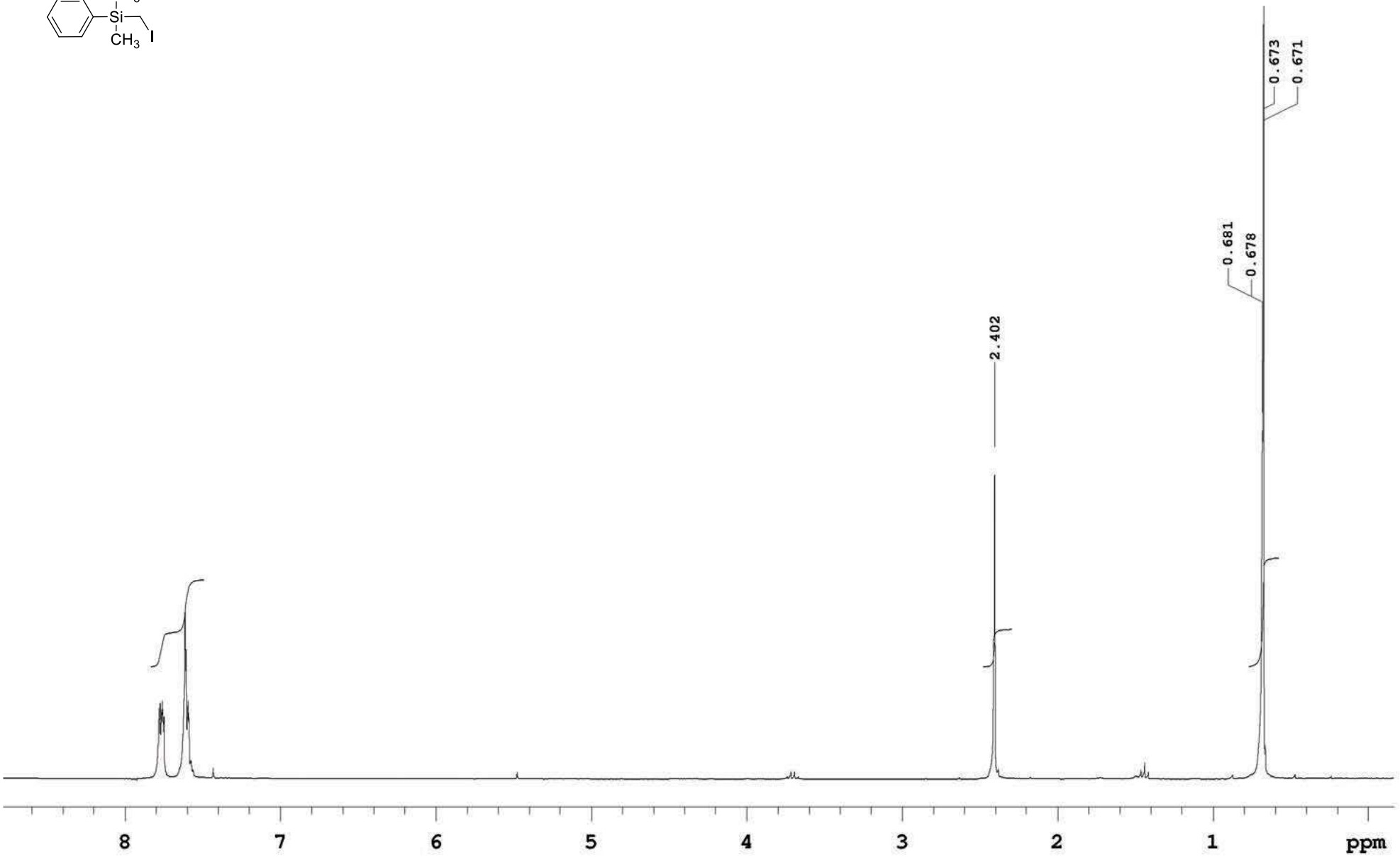
2-[(Benzyloxy)methyl]cyclohexanone ethylene acetal (86)- ^{13}C-NMR, $CDCl_3$, 75.4 MHZ, 25 °C



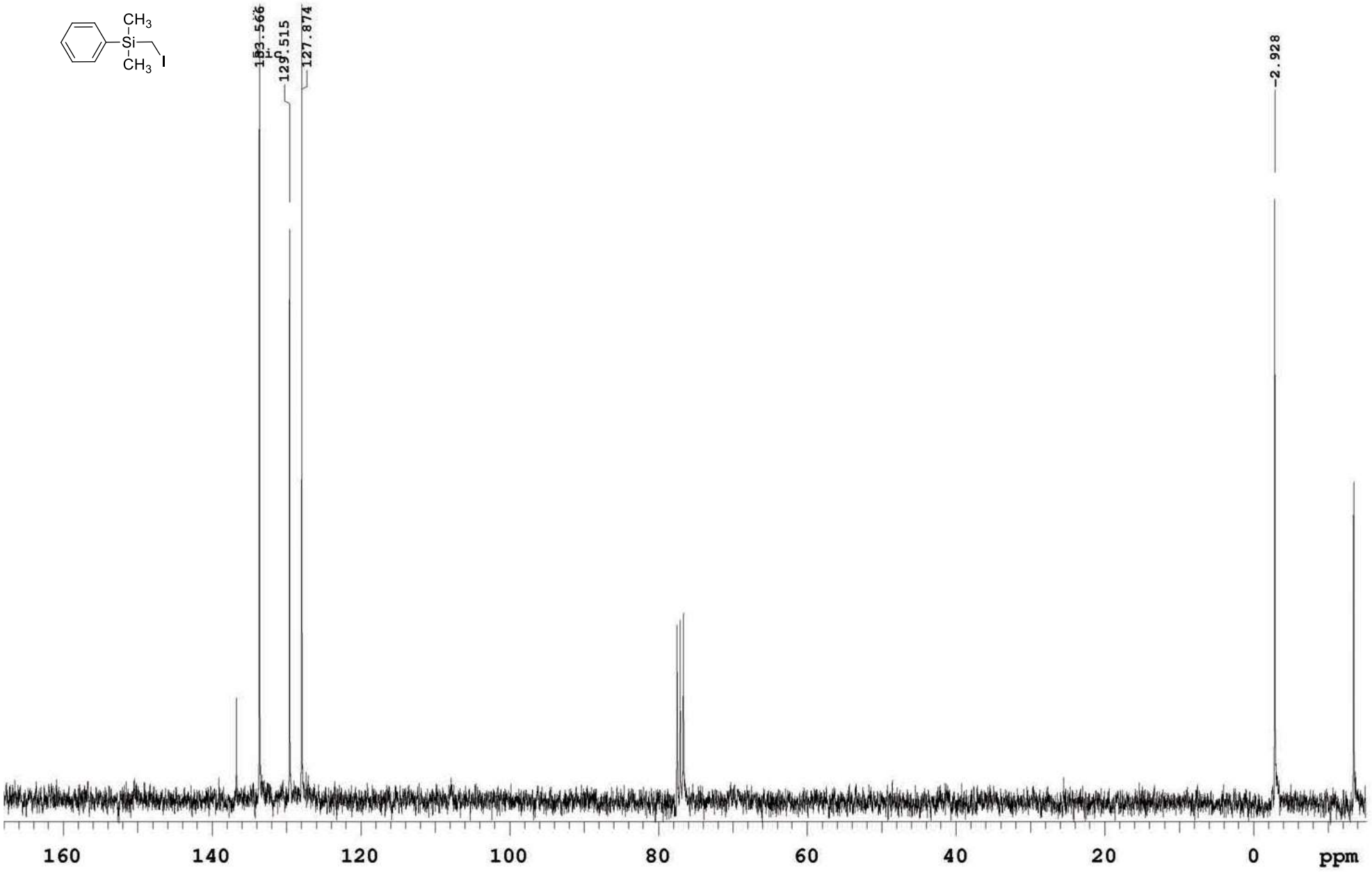


***N*-Cyclohexylidenecyclohexylamine (88)- ^{1}H-NMR, $CDCl_3$, 300 MHz, 25 °C**

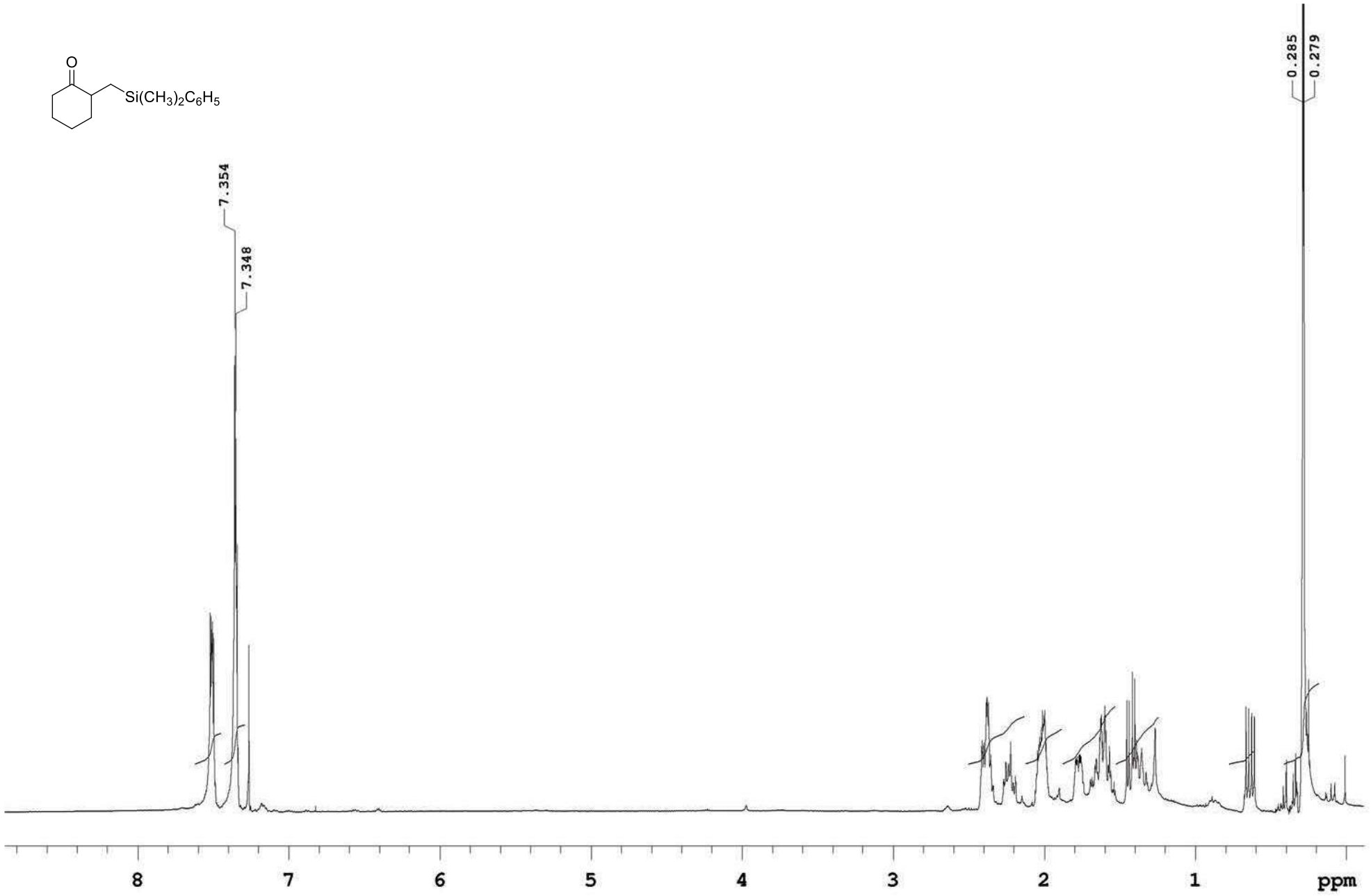




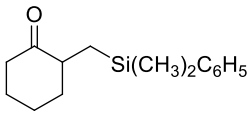
(Iodomethyl)dimethylphenylsilane- ^{1}H-NMR, $CDCl_3$, 300 MHz, 25 °C

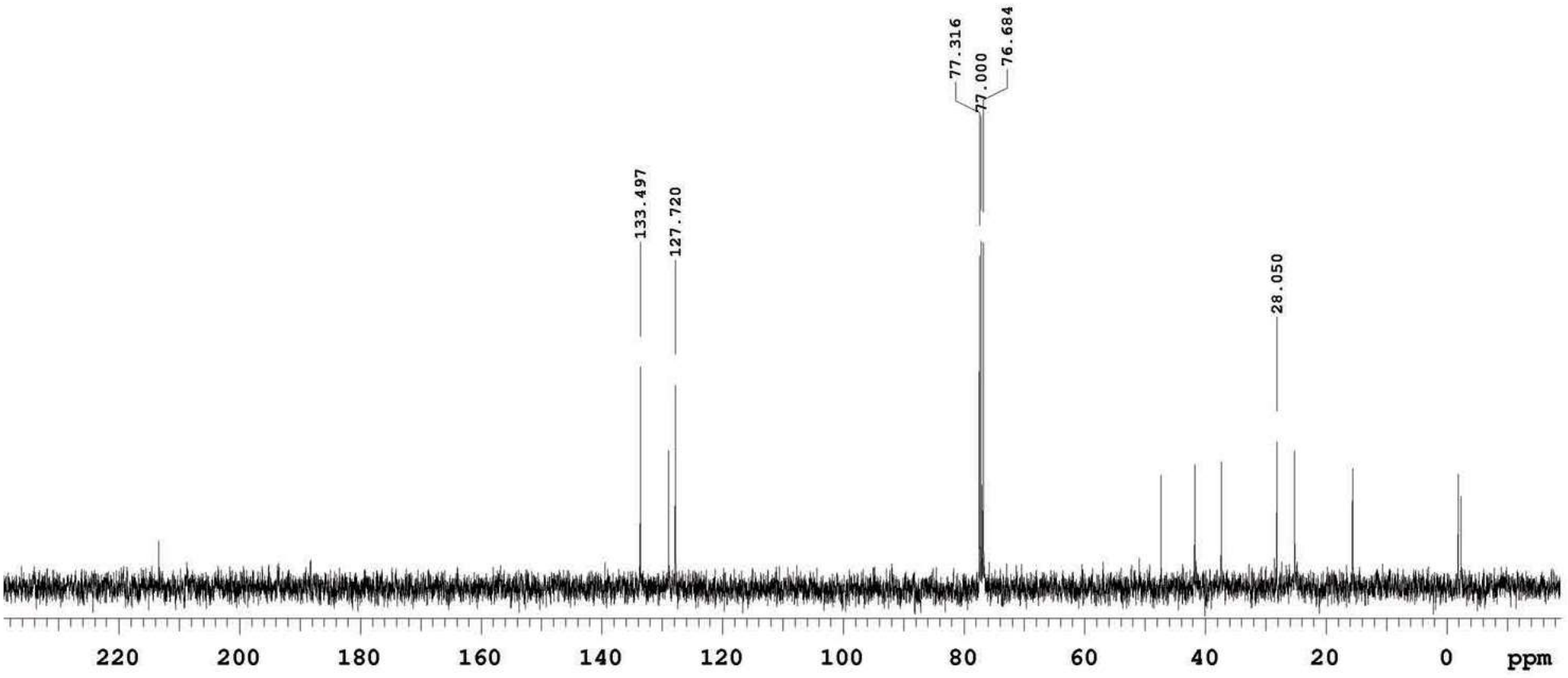


(Iodomethyl)dimethylphenylsilane- ^{13}C-NMR, $CDCl_3$, 75.4 MHz, 25 °C

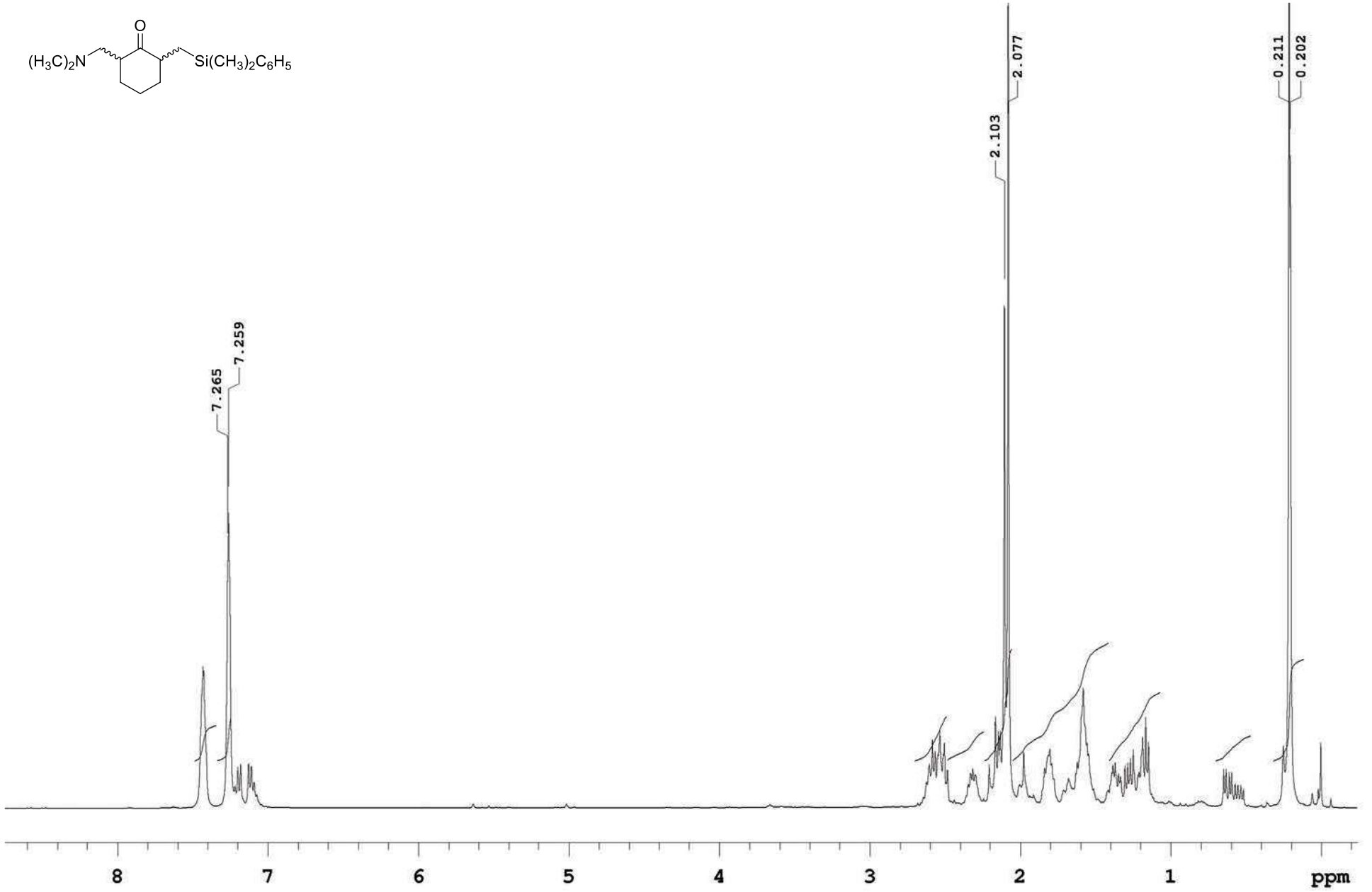


2-(Dimethylphenylsilylmethyl)cyclohexanone (89)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C

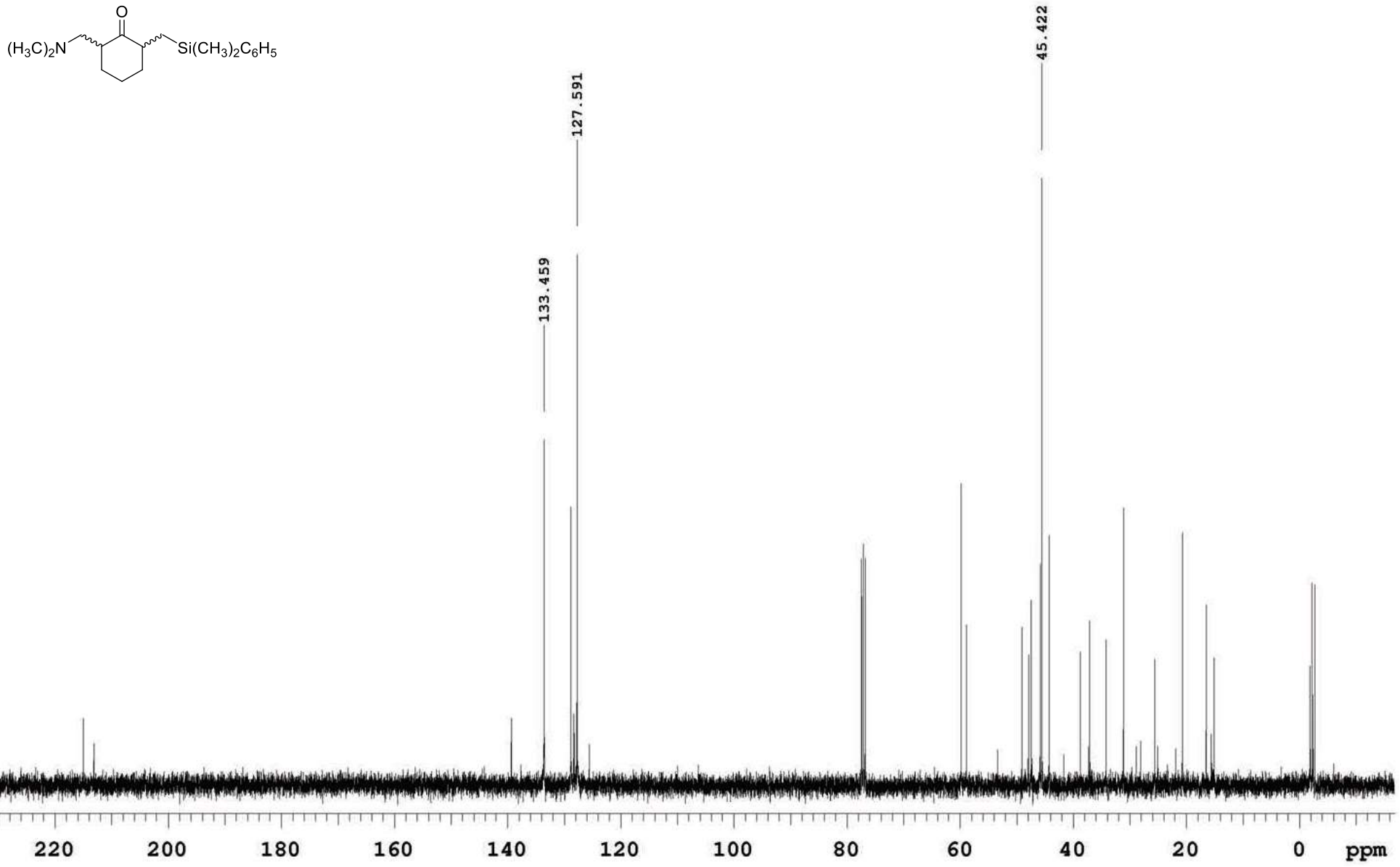




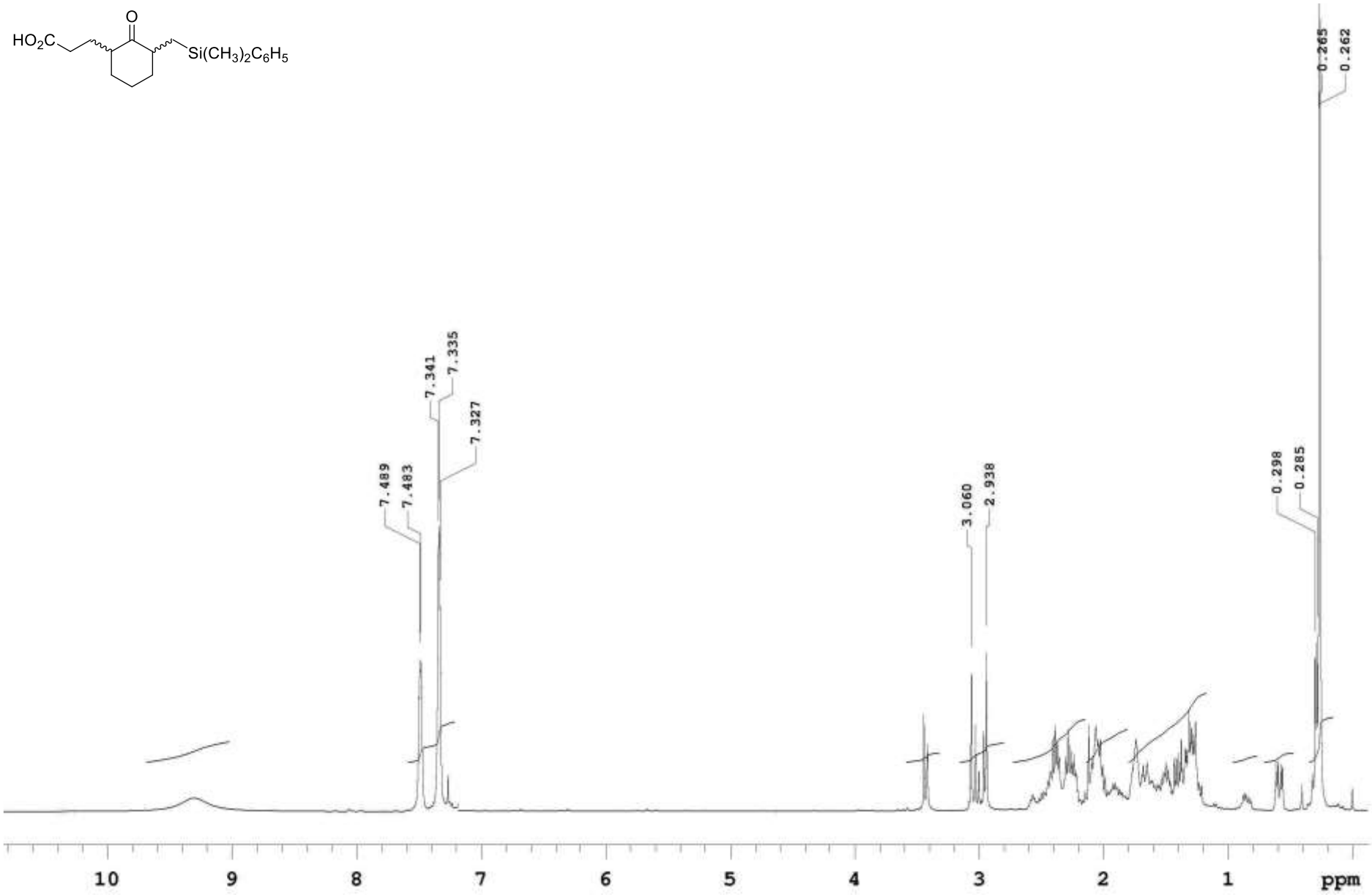
2-(Dimethylphenylsilylmethyl)cyclohexanone (89)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



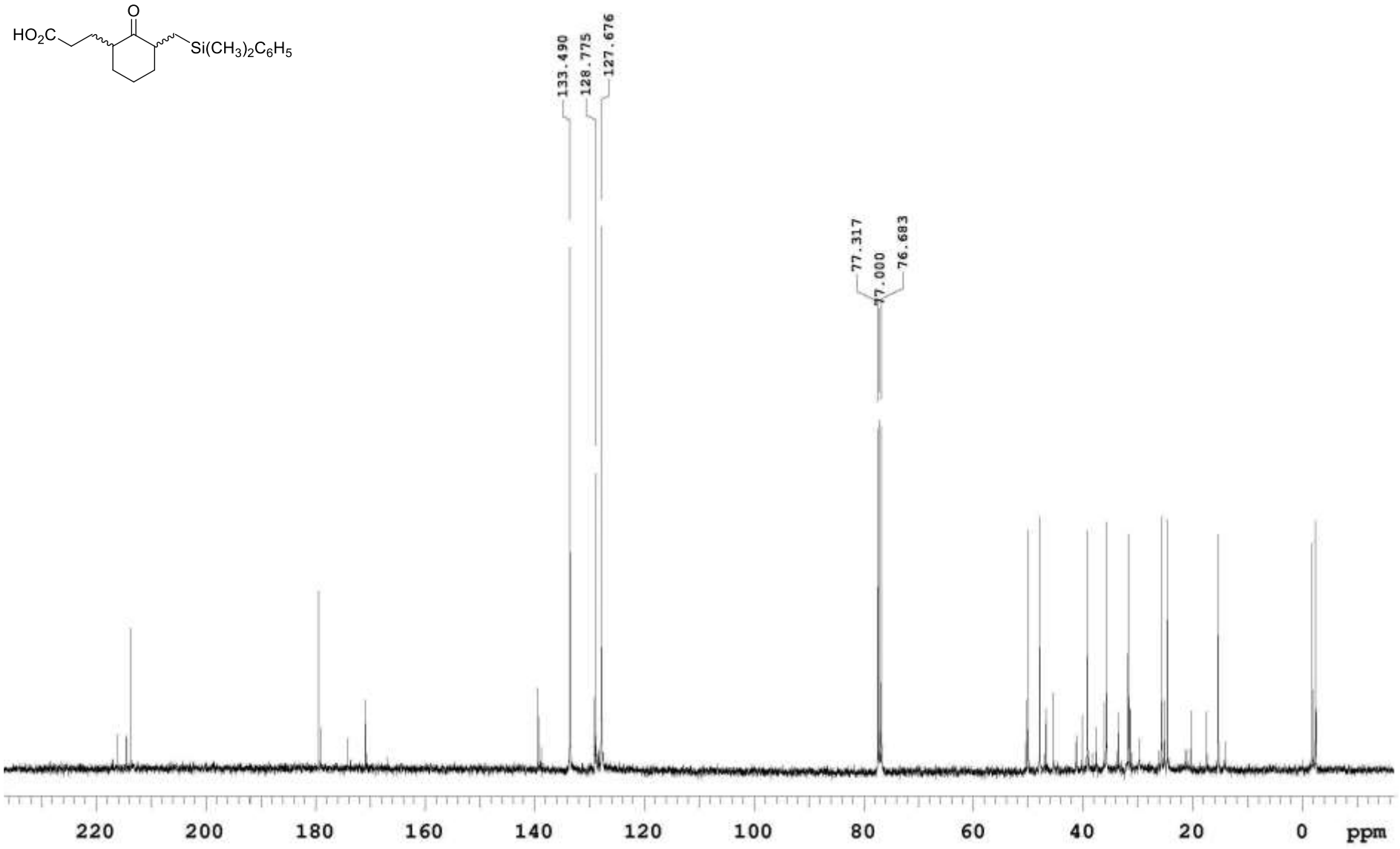
(90)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



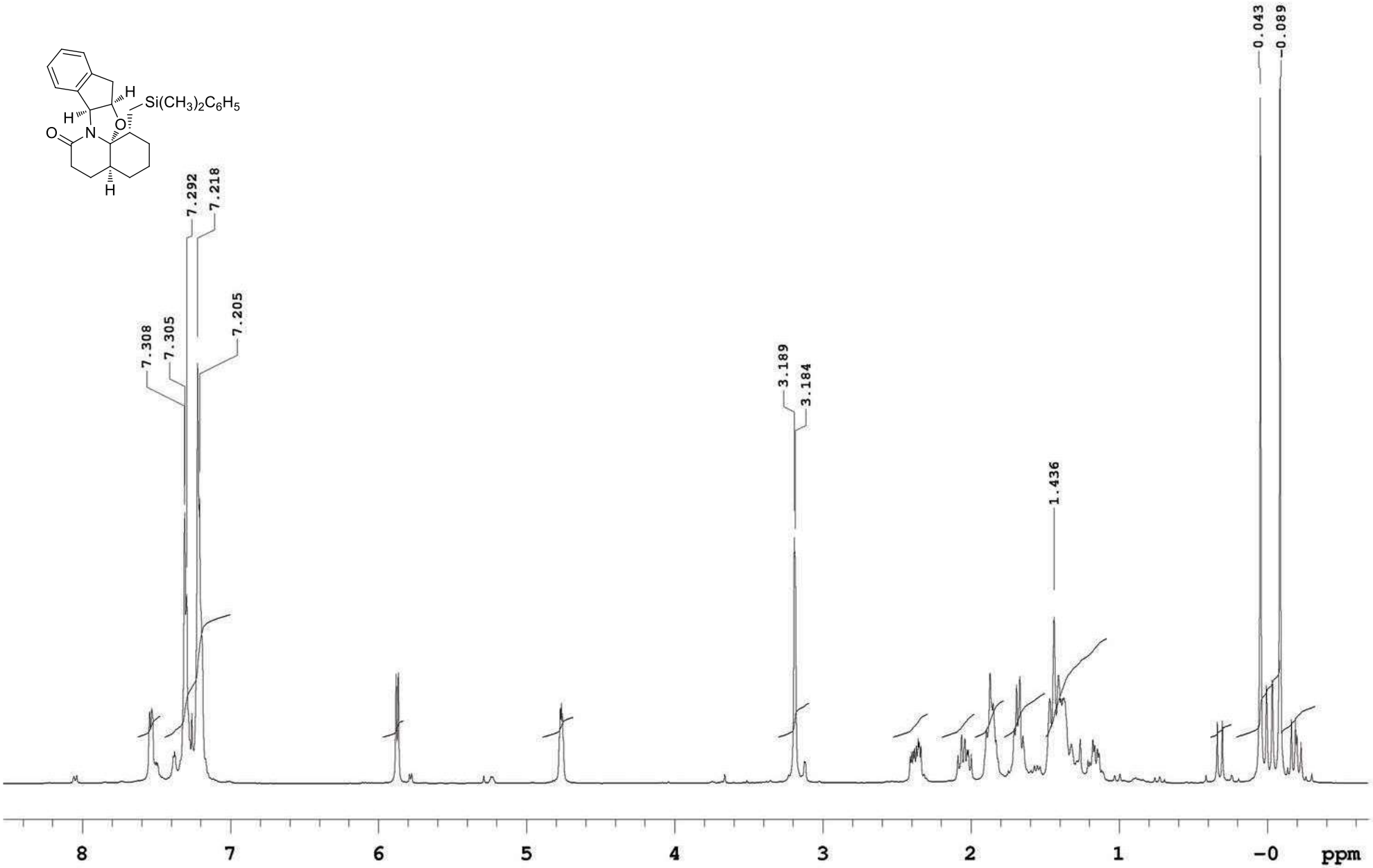
(90)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



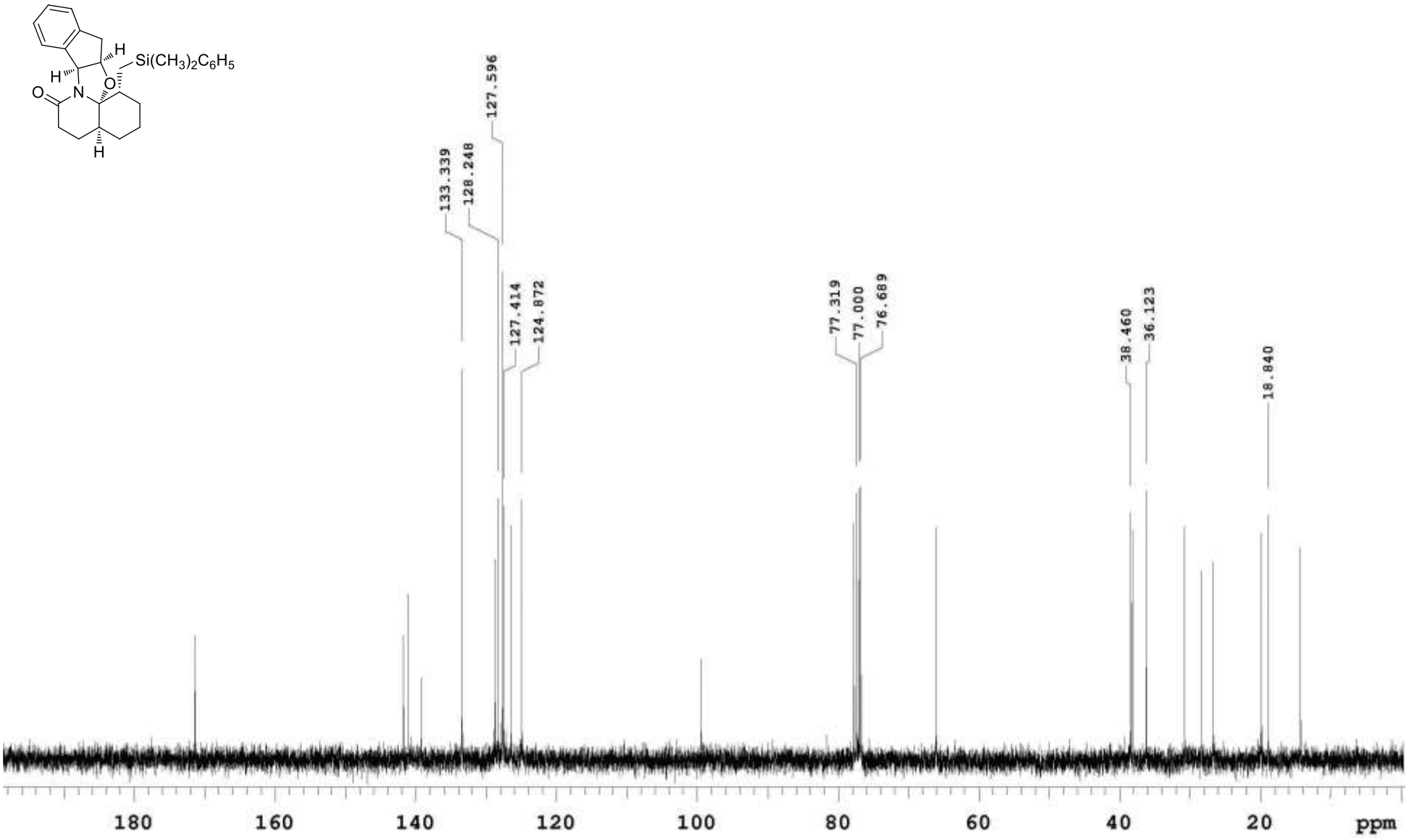
[3-(2-Dimethylphenylsilylmethyl)-2-oxocyclohexyl]propionic acid (91)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



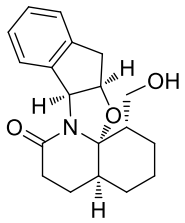
[3-(2-Dimethylphenylsilylmethyl)-2-oxocyclohexyl]propionic acid (91)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

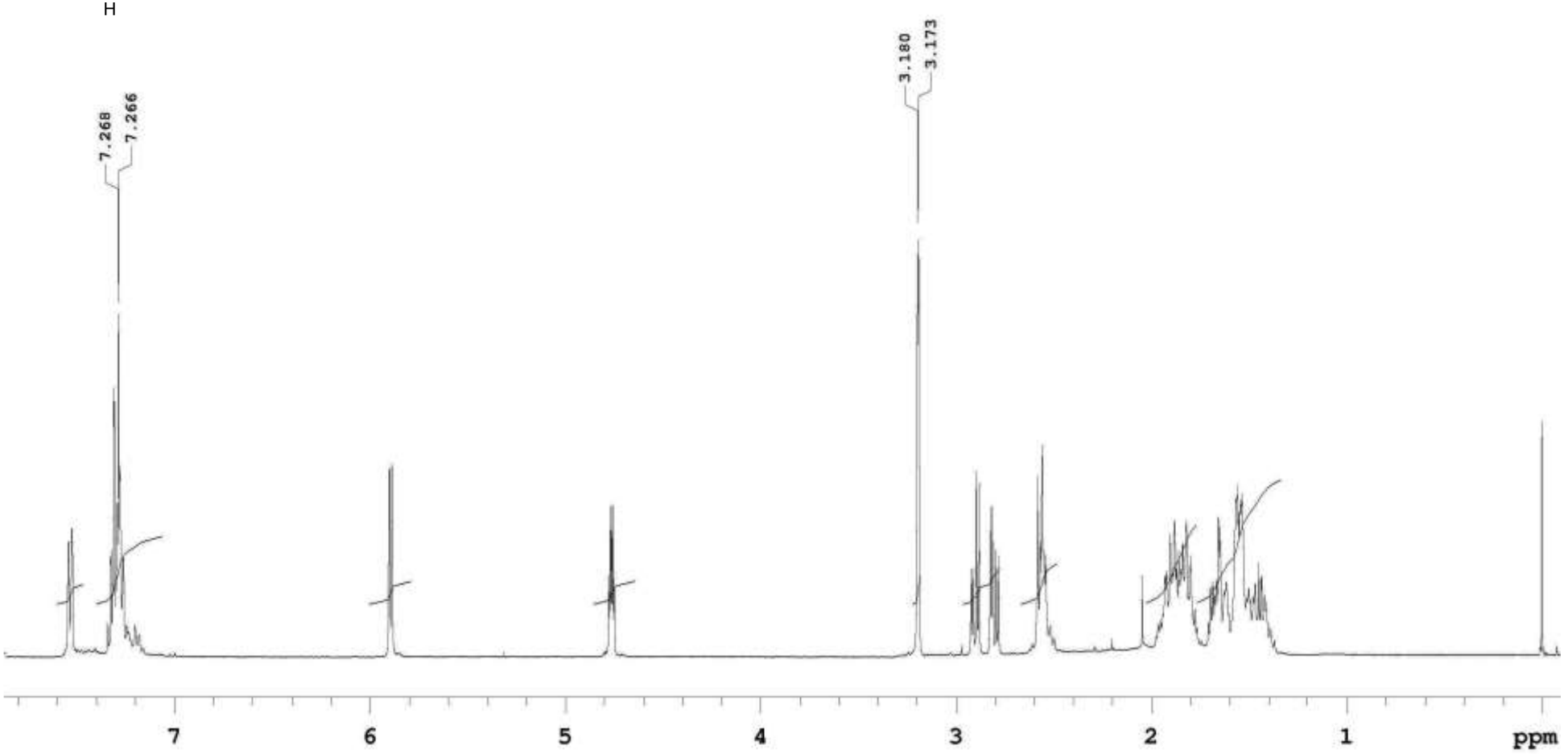


(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-[(Dimethylphenylsilyl)methyl]-7-oxo-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindenol[1',2':4,5]oxazolo-[2,3-j]quinolone (93a)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C

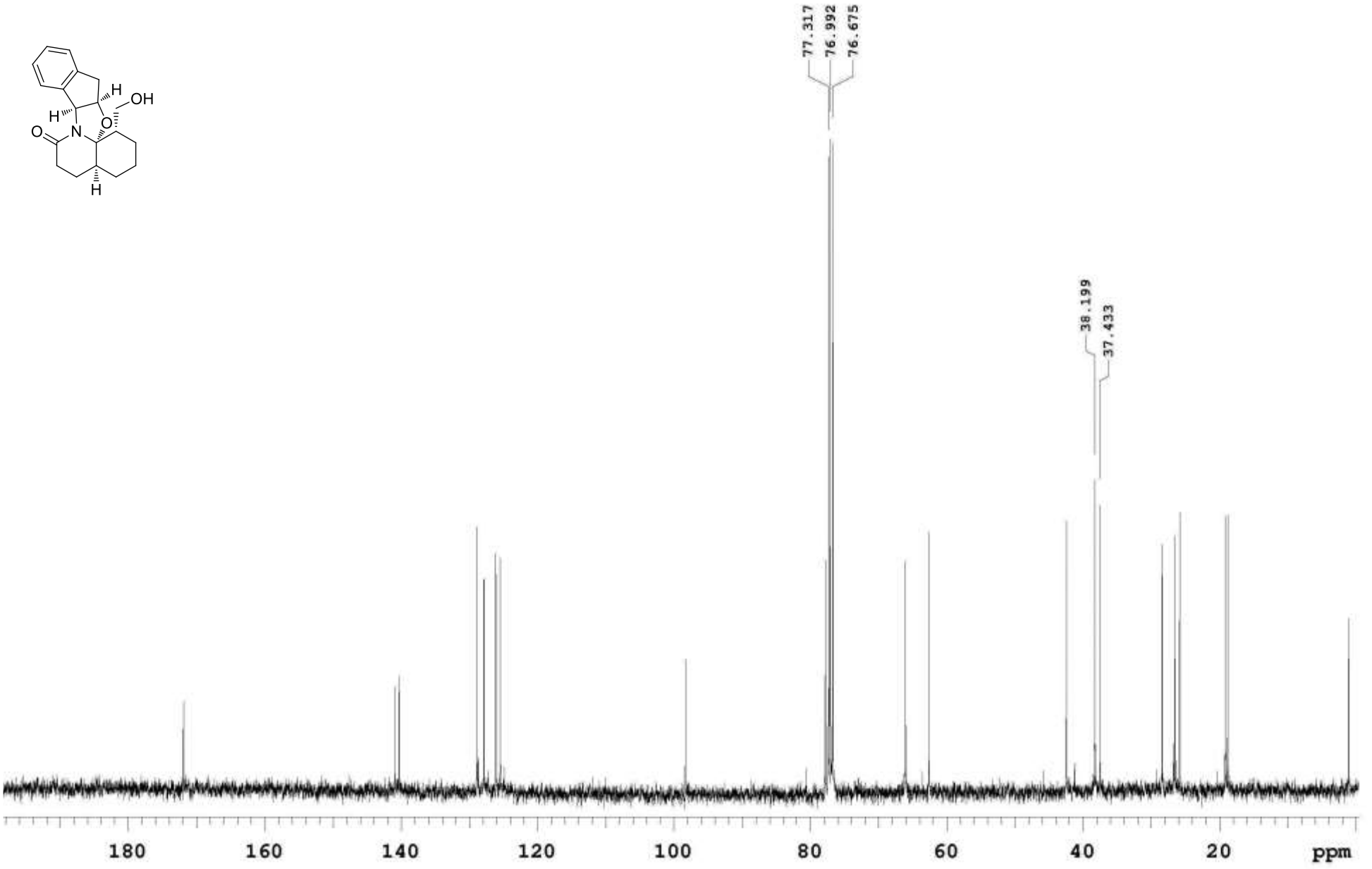


(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-[(Dimethylphenylsilyl)methyl]-7-oxo-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindenol[1',2':4,5]oxazolo-[2,3-j]quinolone (93a)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C

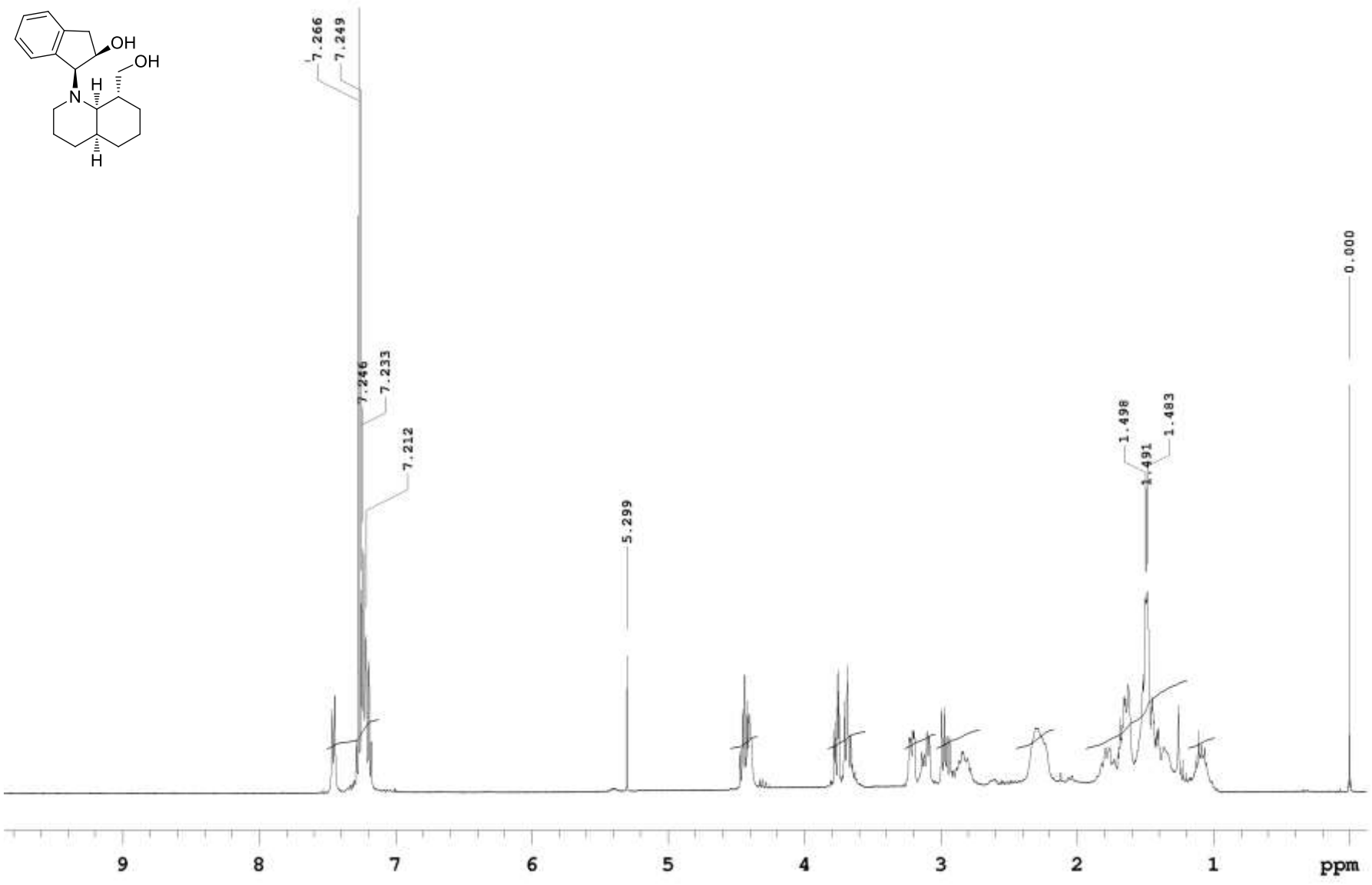




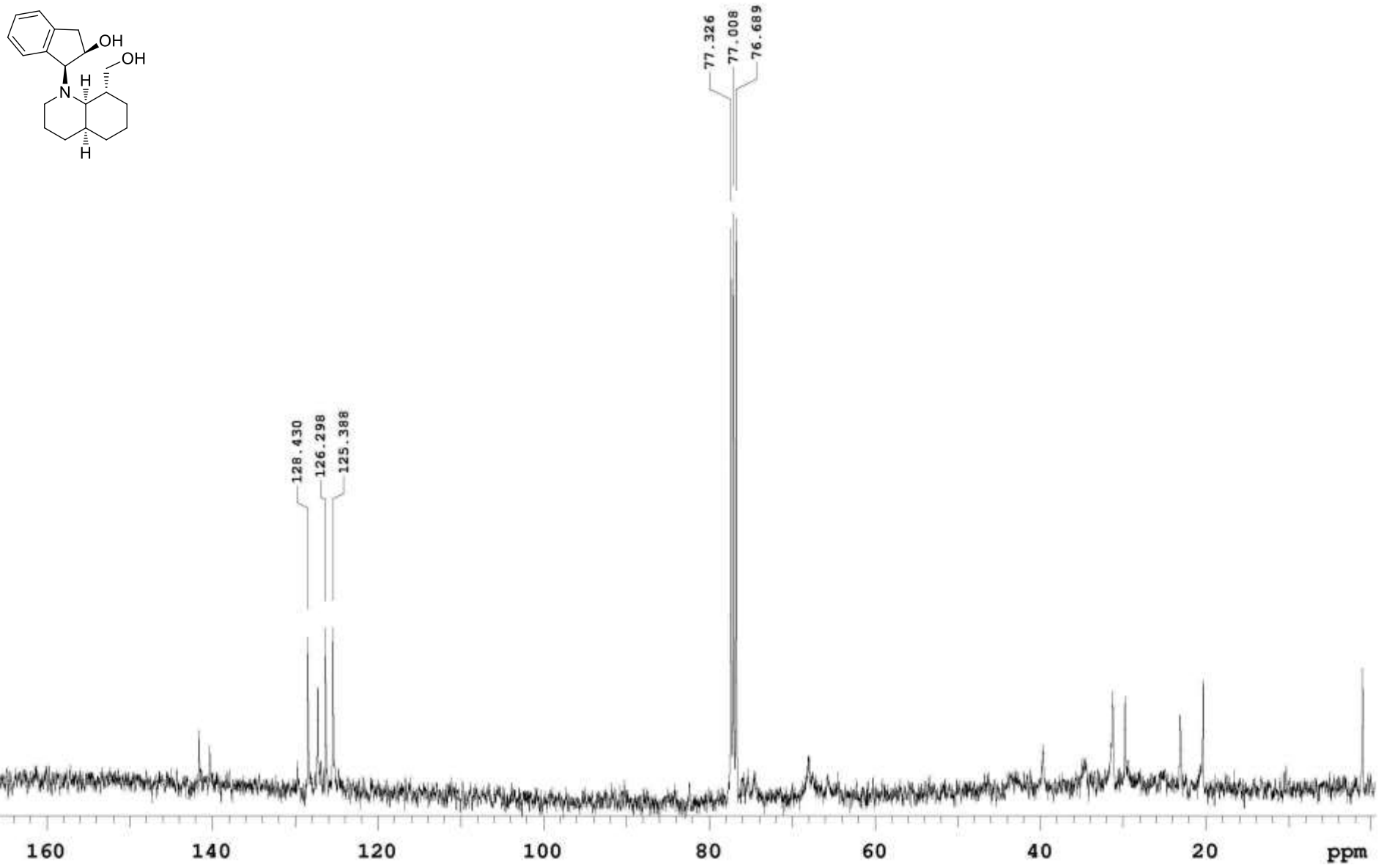
(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-(Hydroxymethil)-7-oxo-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindenol[1',2':4,5]oxazolo-[2,3-j]quinolone (94)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



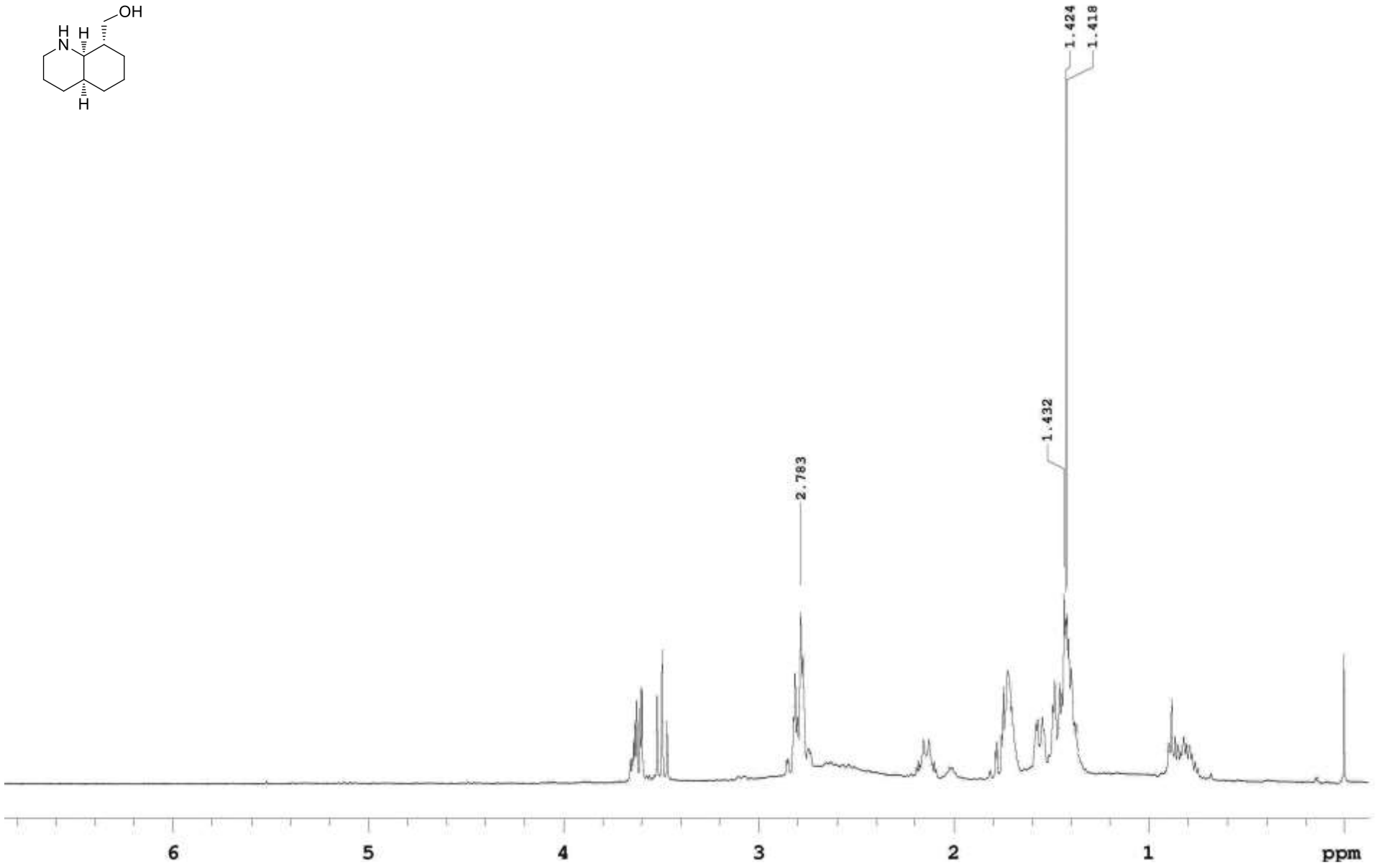
(1*R*,4a*S*,8a*S*,13a*R*,14a*R*)-1-(Hydroxymethil)-7-oxo-3-phenyl-1,2,3,4,4a,5,6,7,8a,13,13a,14a-dodecahydroindenol[1',2':4,5]oxazolo-[2,3-j]quinolone (94)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



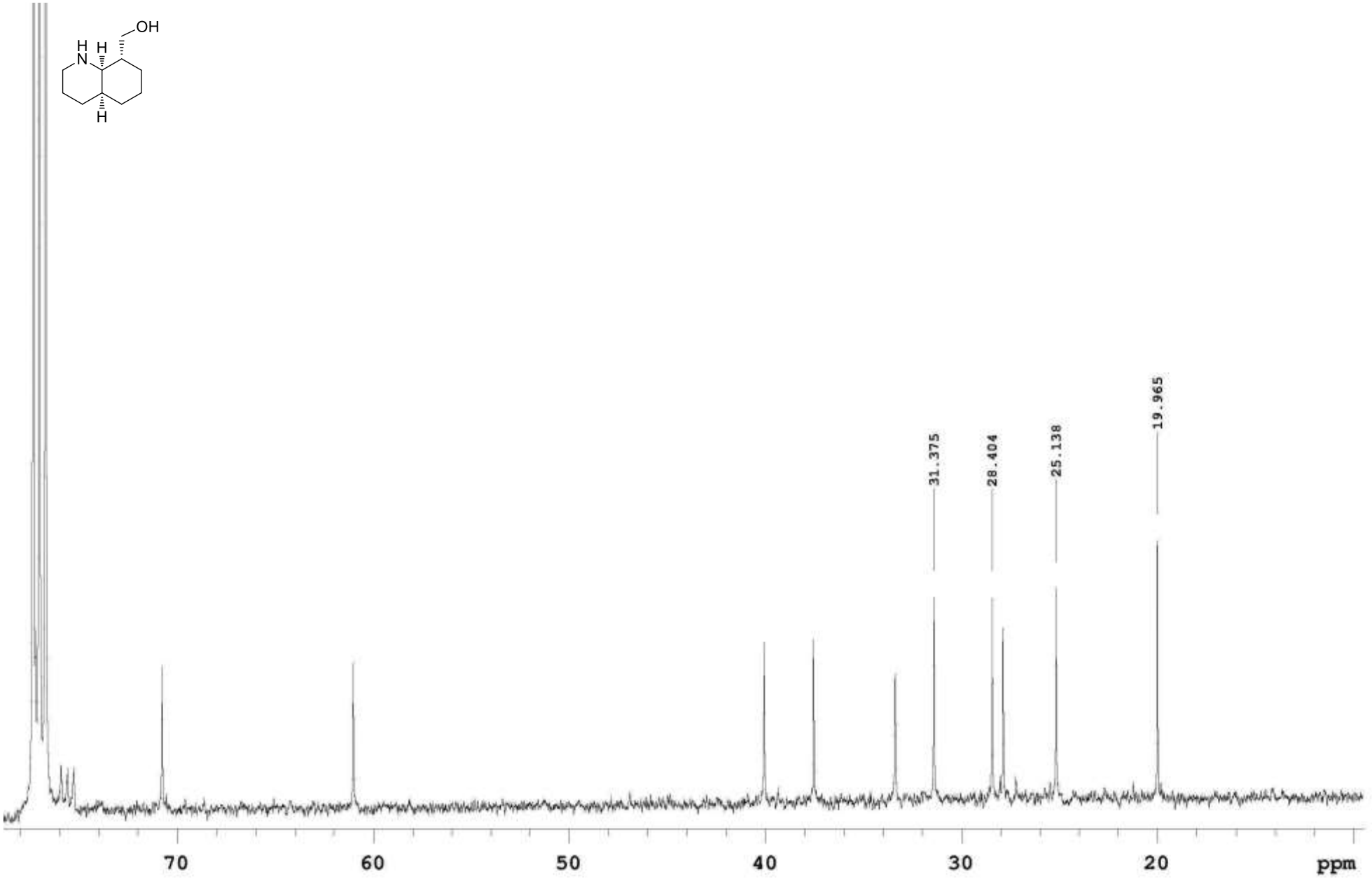
(4a*S*,8*R*,8a*S*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(hydroxymethyl)decahydroquinoline (95)- ^{1}H-NMR, $CDCl_3$ 400 MHz, 25 °C



(4a*S*,8*R*,8a*S*)-1-[(1*S*,2*R*)-2-Hydroxy-1-indanyl]-8-(hydroxymethyl)decahydroquinoline (95)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C



(4a*S*,8*S*,8a*R*)-8-(Hydroxymethyl)decahydroquinoline (82)- ^{1}H-NMR, $CDCl_3$, 400 MHz, 25 °C



(4a*S*,8*S*,8a*R*)-8-(Hydroxymethyl)decahydroquinoline (82)- ^{13}C-NMR, $CDCl_3$, 100.6 MHz, 25 °C