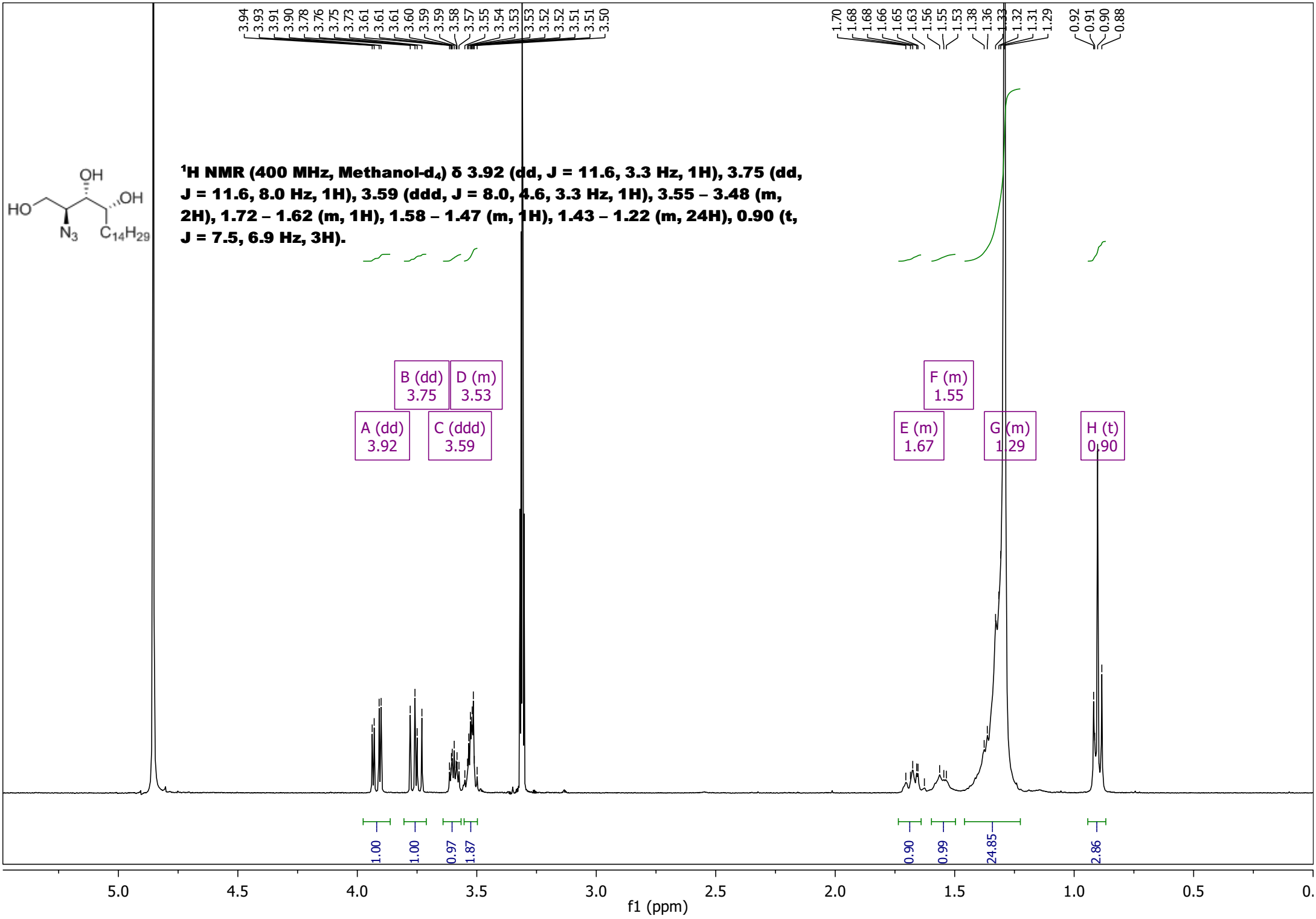
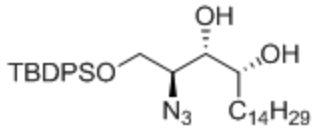
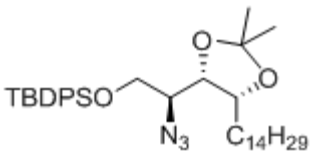
Non-glycosidic analogues of alpha-galactosylceramide: Design, synthesis and biological activity

Roser Borràs Tudurí

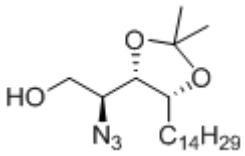

OH
HO
OH
N3
C14H29
¹H NMR (400 MHz, Methanol-d4) δ 3.92 (dd, J = 11.6, 3.3 Hz, 1H), 3.75 (dd, J = 11.6, 8.0 Hz, 1H), 3.59 (ddd, J = 8.0, 4.6, 3.3 Hz, 1H), 3.55 – 3.48 (m, 2H), 1.72 – 1.62 (m, 1H), 1.58 – 1.47 (m, 1H), 1.43 – 1.22 (m, 24H), 0.90 (t, J = 7.5, 6.9 Hz, 3H).
A (dd) 3.92
B (dd) 3.75
C (ddd) 3.59
D (m) 3.53
E (m) 1.67
F (m) 1.55
G (m) 1.29
H (t) 0.90
1.00
1.00
0.97
1.87
0.90
0.99
24.85
2.86
f1 (ppm)



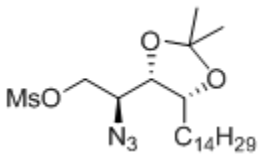
^{1}H NMR (400 MHz, Chloroform-d) δ 7.73 – 7.67 (m, 4H), 7.50 – 7.35 (m, 6H), 4.03 (dd, J = 10.9, 4.2 Hz, 1H), 3.91 (dd, J = 11.0, 5.7 Hz, 1H), 3.71 – 3.64 (m, 2H), 3.61 – 3.54 (m, 1H), 1.59 – 1.51 (m, 2H), 1.31 – 1.23 (m, 24H), 1.08 (s, 9H), 0.88 (t, J = 10.5 Hz, 3H).



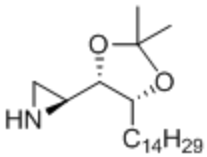
^{1}H NMR (400 MHz, Chloroform-d) δ 7.71 (ddt, J = 9.6, 6.2, 1.6 Hz, 4H), 7.46 – 7.35 (m, 6H), 4.12 (ddd, J = 9.0, 5.6, 3.1 Hz, 1H), 4.02 (dd, J = 10.8, 2.6 Hz, 1H), 3.93 (dd, J = 9.7, 5.5 Hz, 1H), 3.83 (dd, J = 10.8, 7.0 Hz, 1H), 3.41 (ddd, J = 9.7, 7.1, 2.6 Hz, 1H), 1.61 – 1.46 (m, 2H), 1.41 – 1.19 (m, 30H), 1.07 (s, 9H), 0.87 (t, J = 7.5 Hz, 3H).



^{1}H NMR (400 MHz, Chloroform-d) δ 4.17 (dt, J = 9.2, 4.4 Hz, 1H), 4.01 – 3.93 (m, 2H), 3.88 – 3.82 (m, 1H), 3.46 (ddd, J = 9.6, 5.6, 4.1 Hz, 1H), 1.62 – 1.50 (m, 2H), 1.42 (s, 3H), 1.39 – 1.20 (m, 27H), 0.87 (d, J = 6.4 Hz, 3H).

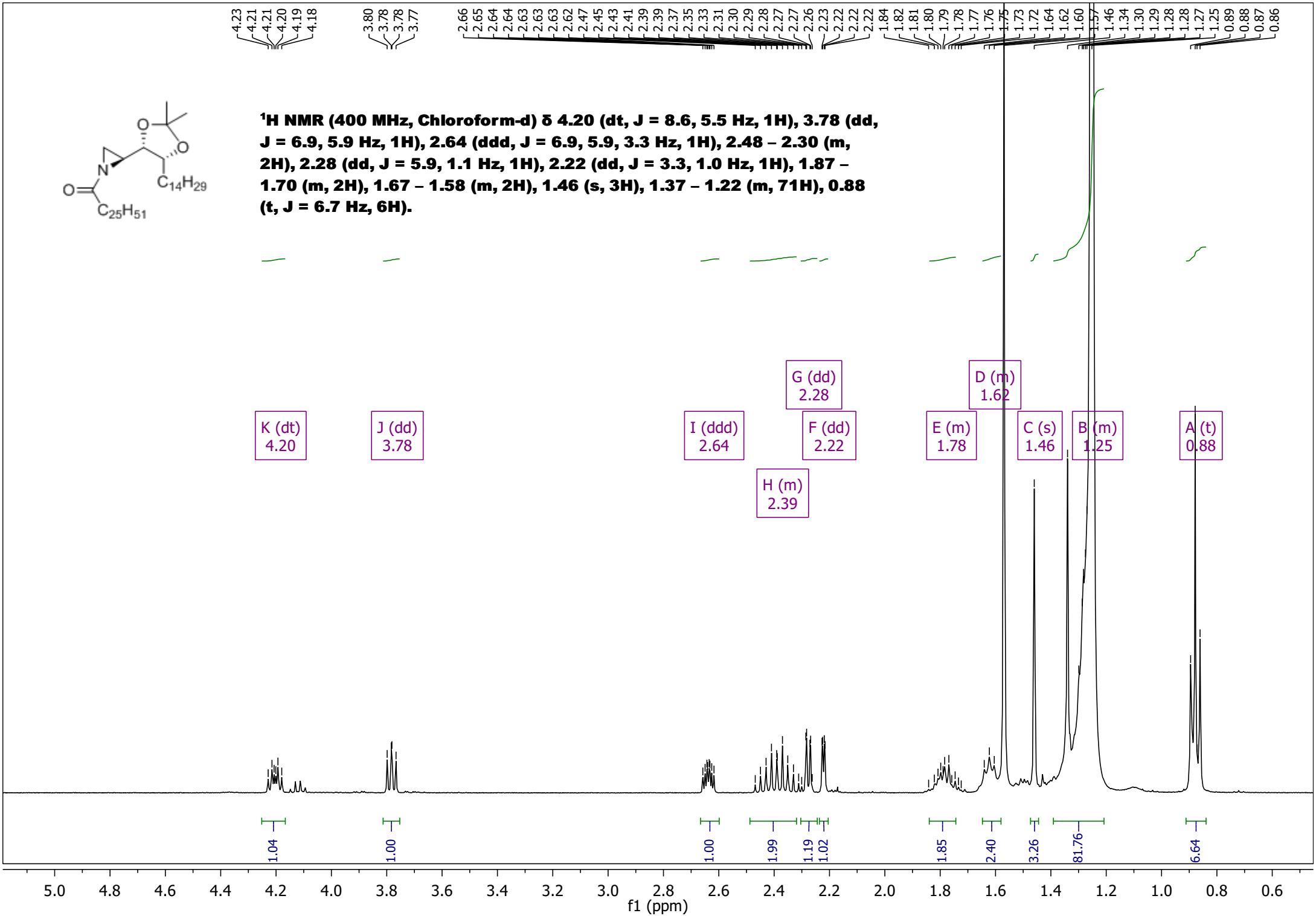


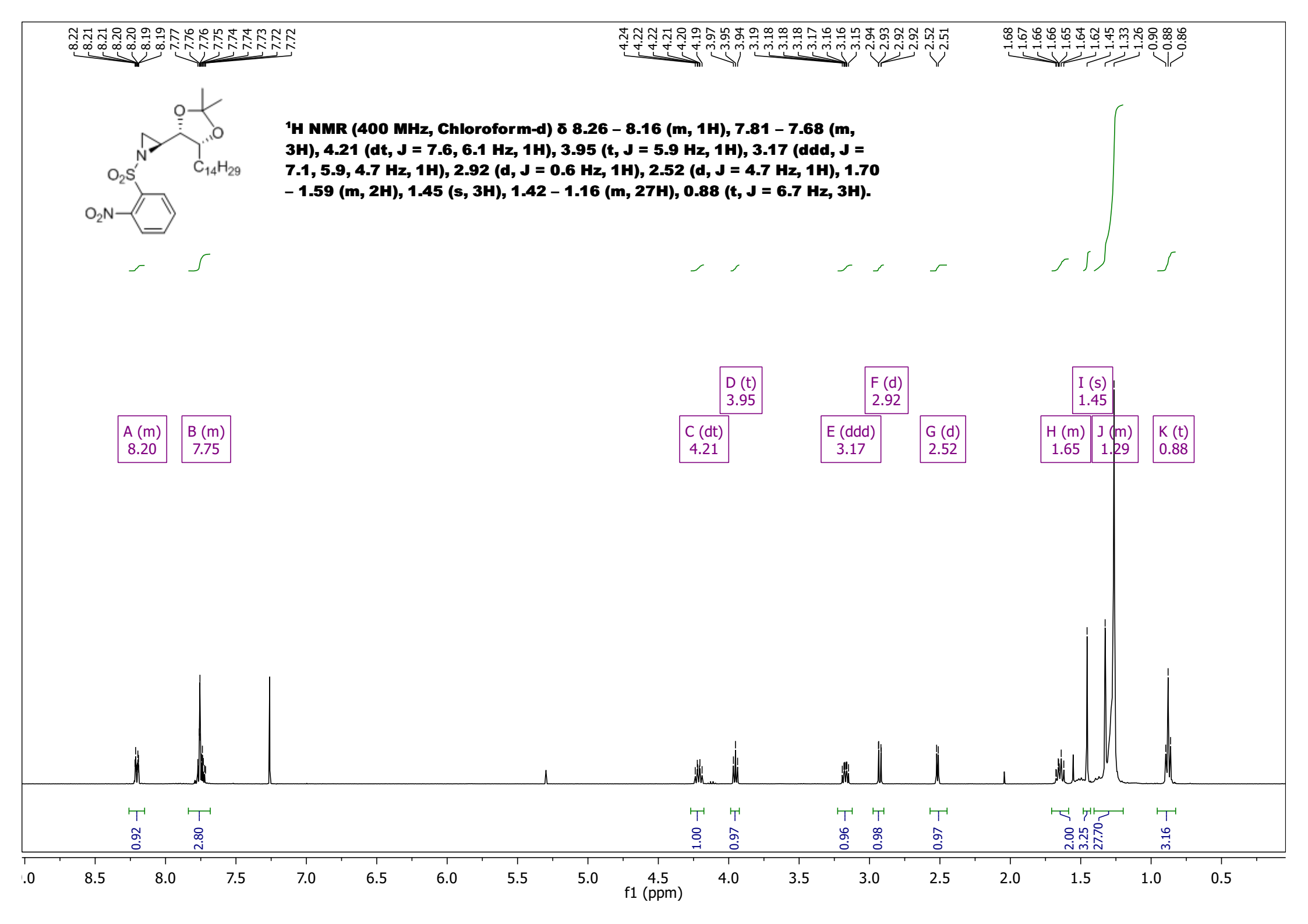
^{1}H NMR (400 MHz, Chloroform-d) δ 4.66 (dd, J = 10.8, 2.6 Hz, 1H), 4.30 (dd, J = 10.8, 7.7 Hz, 1H), 4.23 – 4.16 (m, 1H), 3.85 (dd, J = 9.3, 5.5 Hz, 1H), 3.71 (ddd, J = 9.3, 7.7, 2.6 Hz, 1H), 3.08 (s, 3H), 1.66 – 1.51 (m, 2H), 1.42 (s, 3H), 1.39 – 1.21 (m, 27H), 0.88 (t, J = 6.5 Hz, 3H).

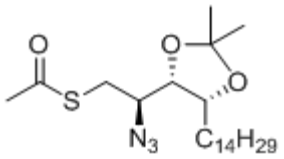


^{1}H NMR (400 MHz, Chloroform-d) δ 4.20 (dt, J = 8.3, 5.9 Hz, 1H), 3.56 (t, J = 6.8 Hz, 1H), 2.08 (ddd, J = 7.6, 5.7, 3.4 Hz, 1H), 1.85 (d, J = 5.7 Hz, 1H), 1.73 – 1.65 (m, 2H), 1.57 (d, J = 3.4 Hz, 1H), 1.47 (s, 3H), 1.46 – 1.15 (m, 27H), 0.88 (t, J = 7.3 Hz, 3H).

^{1}H NMR (400 MHz, Chloroform-d) δ 4.20 (dt, J = 8.6, 5.5 Hz, 1H), 3.78 (dd, J = 6.9, 5.9 Hz, 1H), 2.64 (ddd, J = 6.9, 5.9, 3.3 Hz, 1H), 2.48 – 2.30 (m, 2H), 2.28 (dd, J = 5.9, 1.1 Hz, 1H), 2.22 (dd, J = 3.3, 1.0 Hz, 1H), 1.87 – 1.70 (m, 2H), 1.67 – 1.58 (m, 2H), 1.46 (s, 3H), 1.37 – 1.22 (m, 71H), 0.88 (t, J = 6.7 Hz, 6H).

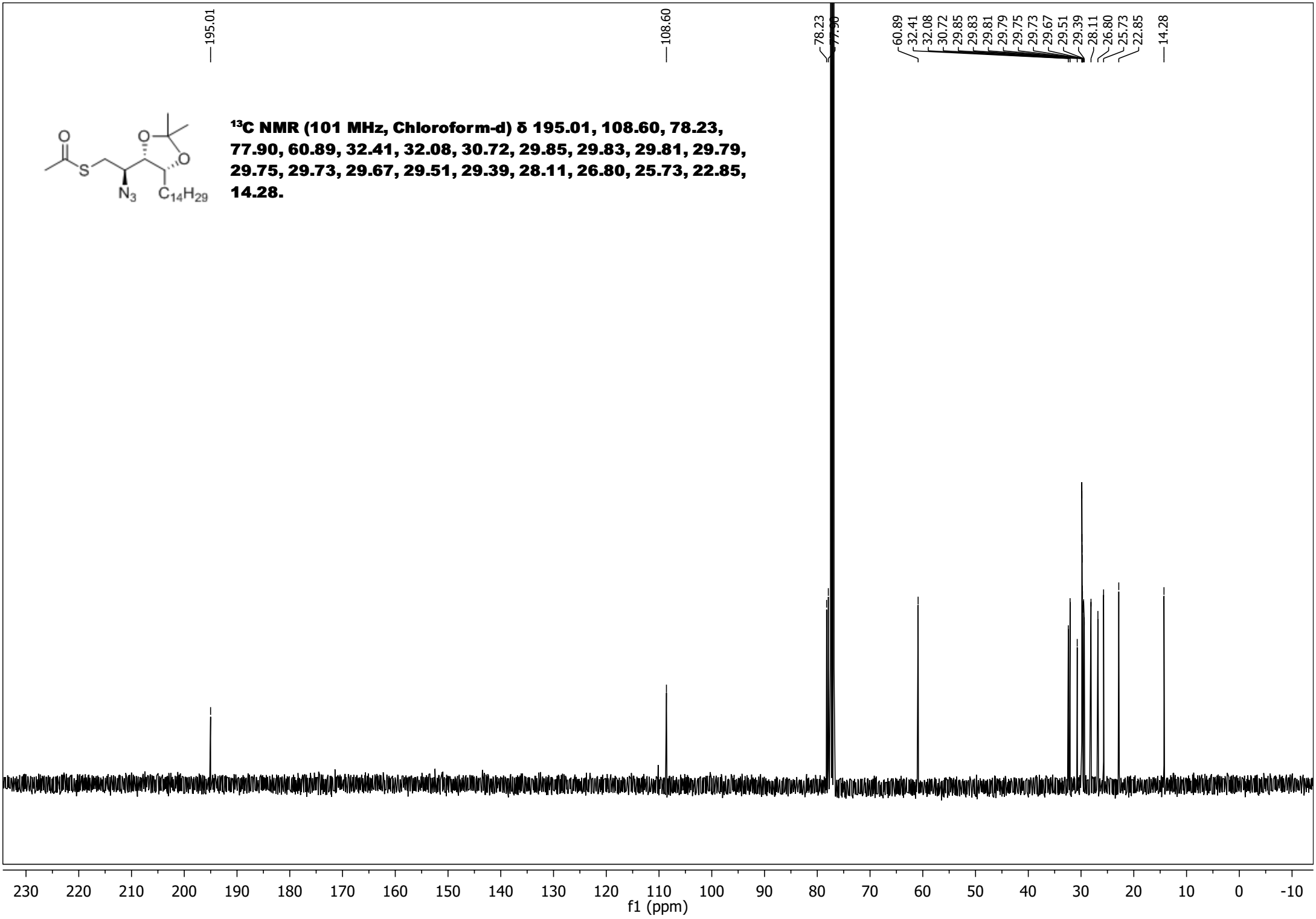


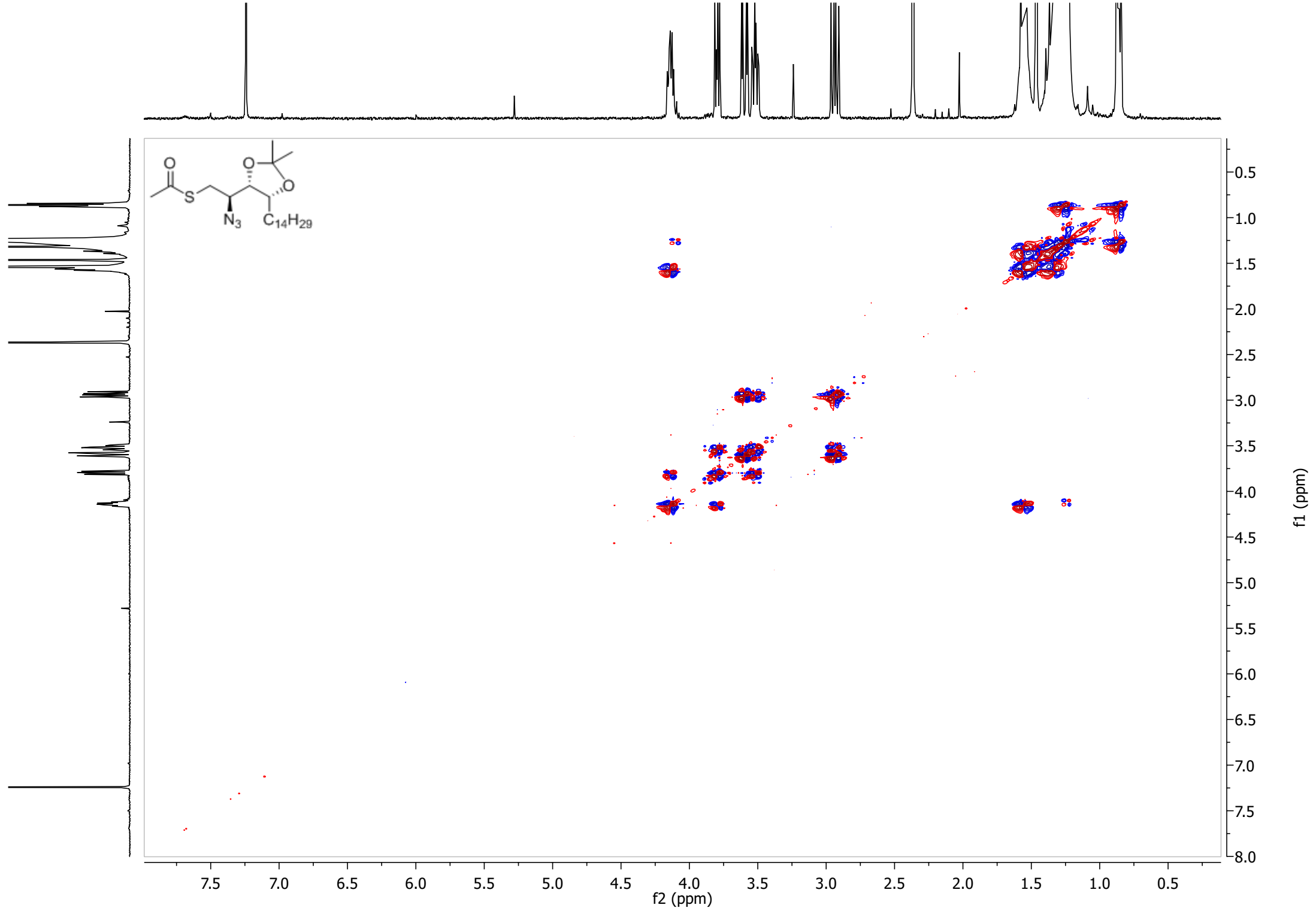

8.22 8.21 8.21 8.20 8.20 8.19 8.19 7.77 7.76 7.76 7.75 7.74 7.74 7.73 7.72 7.72
4.24 4.22 4.22 4.21 4.20 4.19 3.97 3.95 3.94 3.19 3.18 3.18 3.18 3.17 3.16 3.16 3.15 2.94 2.93 2.92 2.92 2.52 2.51
1.68 1.67 1.66 1.66 1.65 1.64 1.62 1.45 1.33 1.26 0.90 0.88 0.86
O
O
N
O2S
C14H29
O2N
¹H NMR (400 MHz, Chloroform-d) δ 8.26 – 8.16 (m, 1H), 7.81 – 7.68 (m, 3H), 4.21 (dt, J = 7.6, 6.1 Hz, 1H), 3.95 (t, J = 5.9 Hz, 1H), 3.17 (ddd, J = 7.1, 5.9, 4.7 Hz, 1H), 2.92 (d, J = 0.6 Hz, 1H), 2.52 (d, J = 4.7 Hz, 1H), 1.70 – 1.59 (m, 2H), 1.45 (s, 3H), 1.42 – 1.16 (m, 27H), 0.88 (t, J = 6.7 Hz, 3H).
A (m) 8.20
B (m) 7.75
C (dt) 4.21
D (t) 3.95
E (ddd) 3.17
F (d) 2.92
G (d) 2.52
H (m) 1.65
I (s) 1.45
J (m) 1.29
K (t) 0.88
0.92
2.80
1.00
0.97
0.96
0.98
0.97
2.00
3.25
27.70
3.16
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)

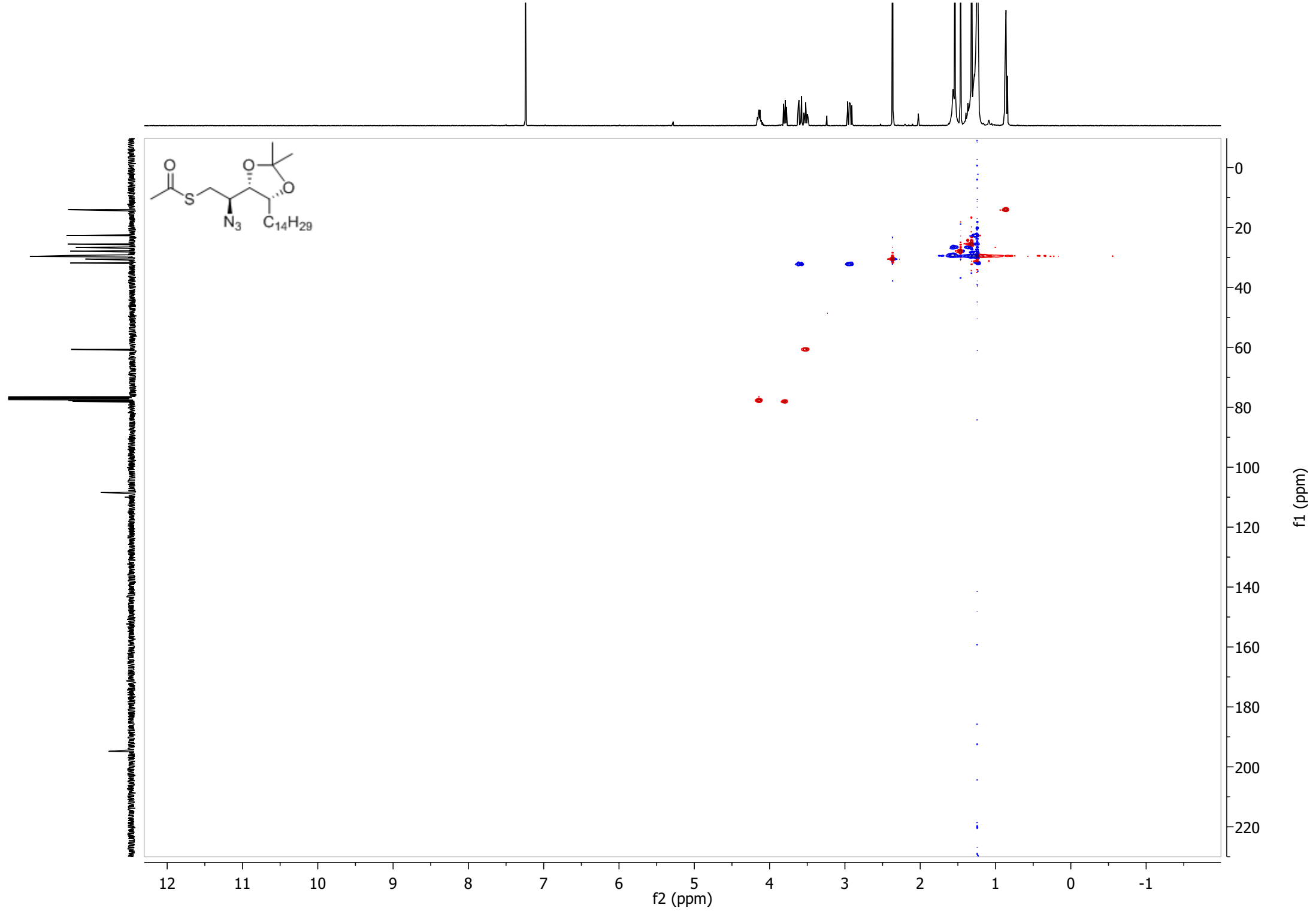


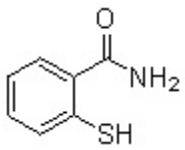
^{1}H NMR (400 MHz, Chloroform-d) δ 4.18 – 4.10 (m, 1H), 3.80 (dd, J = 8.8, 5.5 Hz, 1H), 3.60 (dd, J = 14.1, 3.1 Hz, 1H), 3.52 (td, J = 8.8, 3.1 Hz, 1H), 2.94 (dd, J = 14.1, 8.7 Hz, 1H), 2.37 (s, 3H), 1.60 – 1.53 (m, 2H), 1.46 (s, 3H), 1.42 – 1.18 (m, 27H), 0.86 (t, J = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-d) δ 195.01, 108.60, 78.23, 77.90, 60.89, 32.41, 32.08, 30.72, 29.85, 29.83, 29.81, 29.79, 29.75, 29.73, 29.67, 29.51, 29.39, 28.11, 26.80, 25.73, 22.85, 14.28.



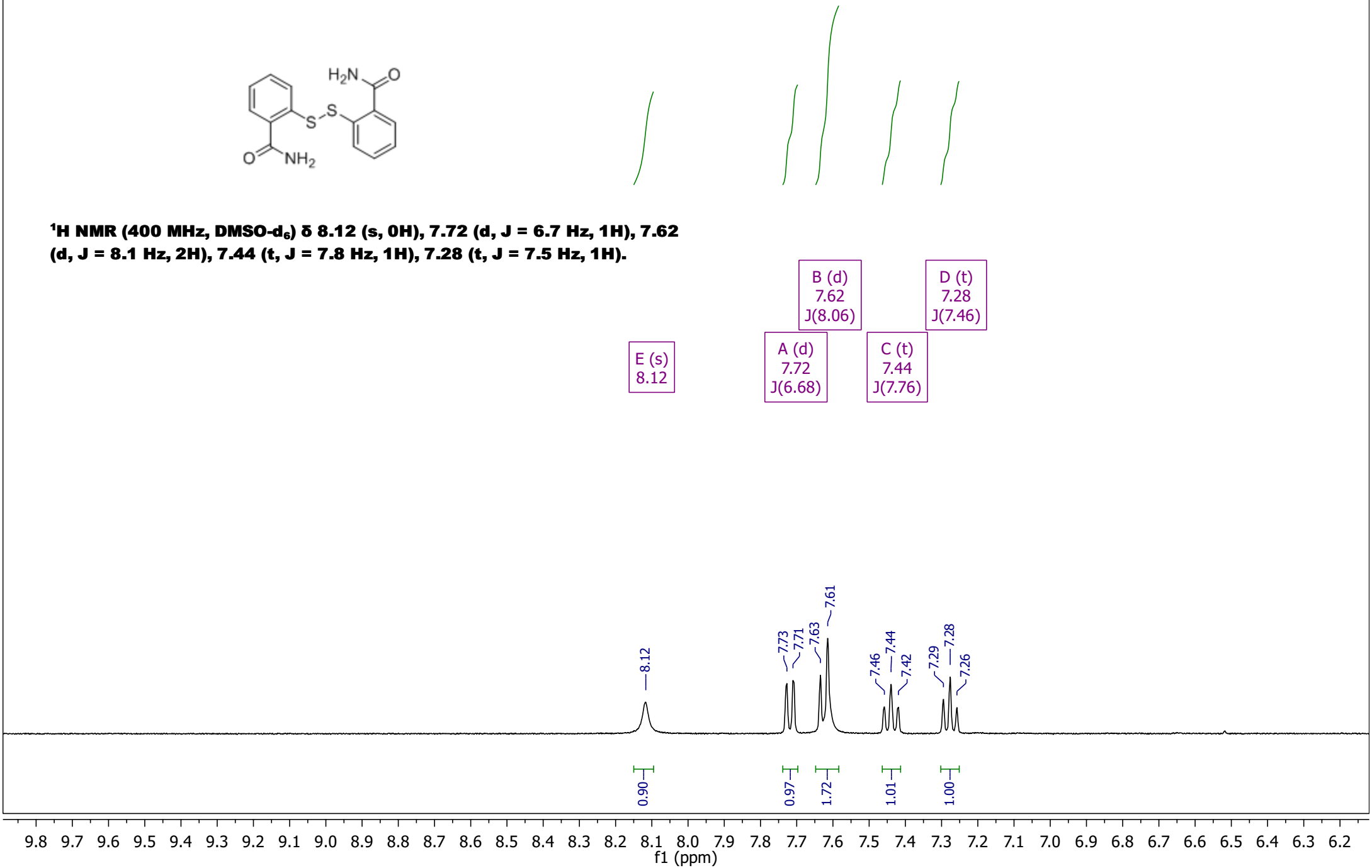

O
S
O
O
N3
C14H29
f2 (ppm)
f1 (ppm)

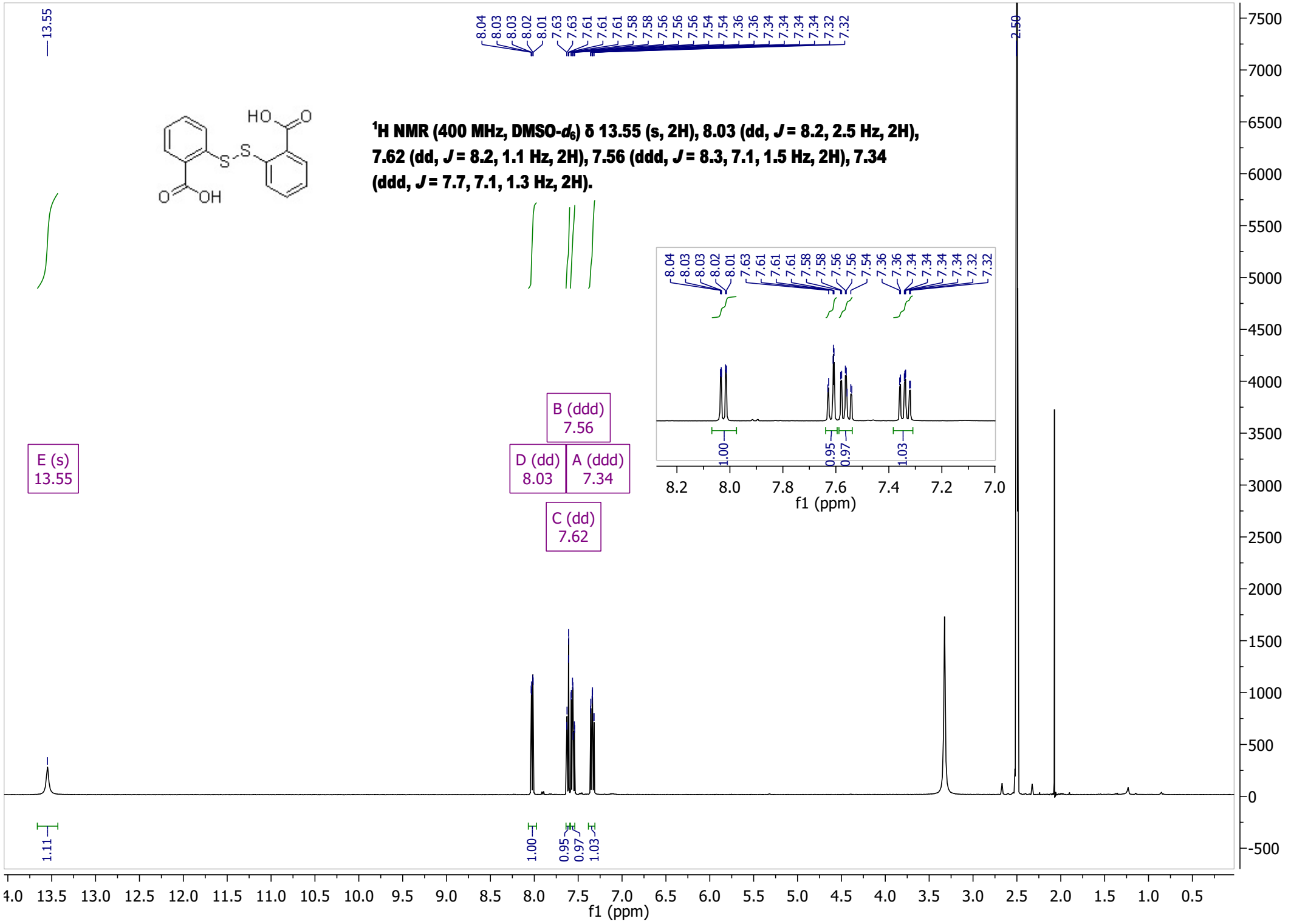

O
S
O
O
N3
C14H29
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
20
40
60
80
100
120
140
160
180
200
220
f1 (ppm)

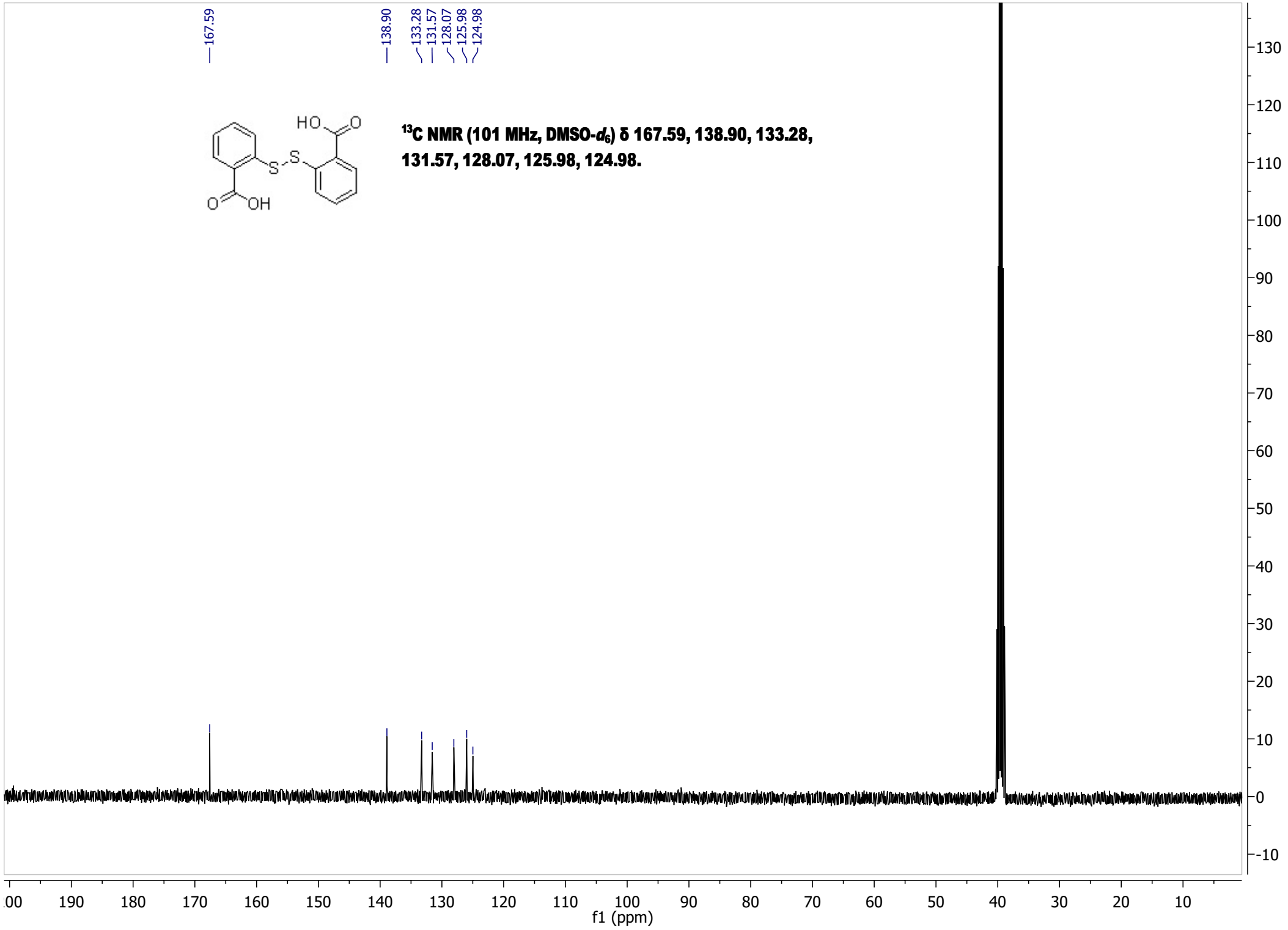


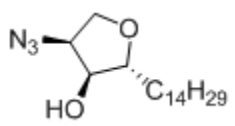
^{1}H NMR (400 MHz, DMSO-d_6) δ 7.92 (s, 1H), 7.57 (dd, *J* = 7.7, 1.5 Hz, 1H), 7.45 (s, 1H), 7.40 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.28 (td, *J* = 7.6, 1.5 Hz, 1H), 7.15 (td, *J* = 7.5, 1.3 Hz, 1H), 5.47 (s, 1H).

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.12 (s, 0H), 7.72 (d, J = 6.7 Hz, 1H), 7.62 (d, J = 8.1 Hz, 2H), 7.44 (t, J = 7.8 Hz, 1H), 7.28 (t, J = 7.5 Hz, 1H).

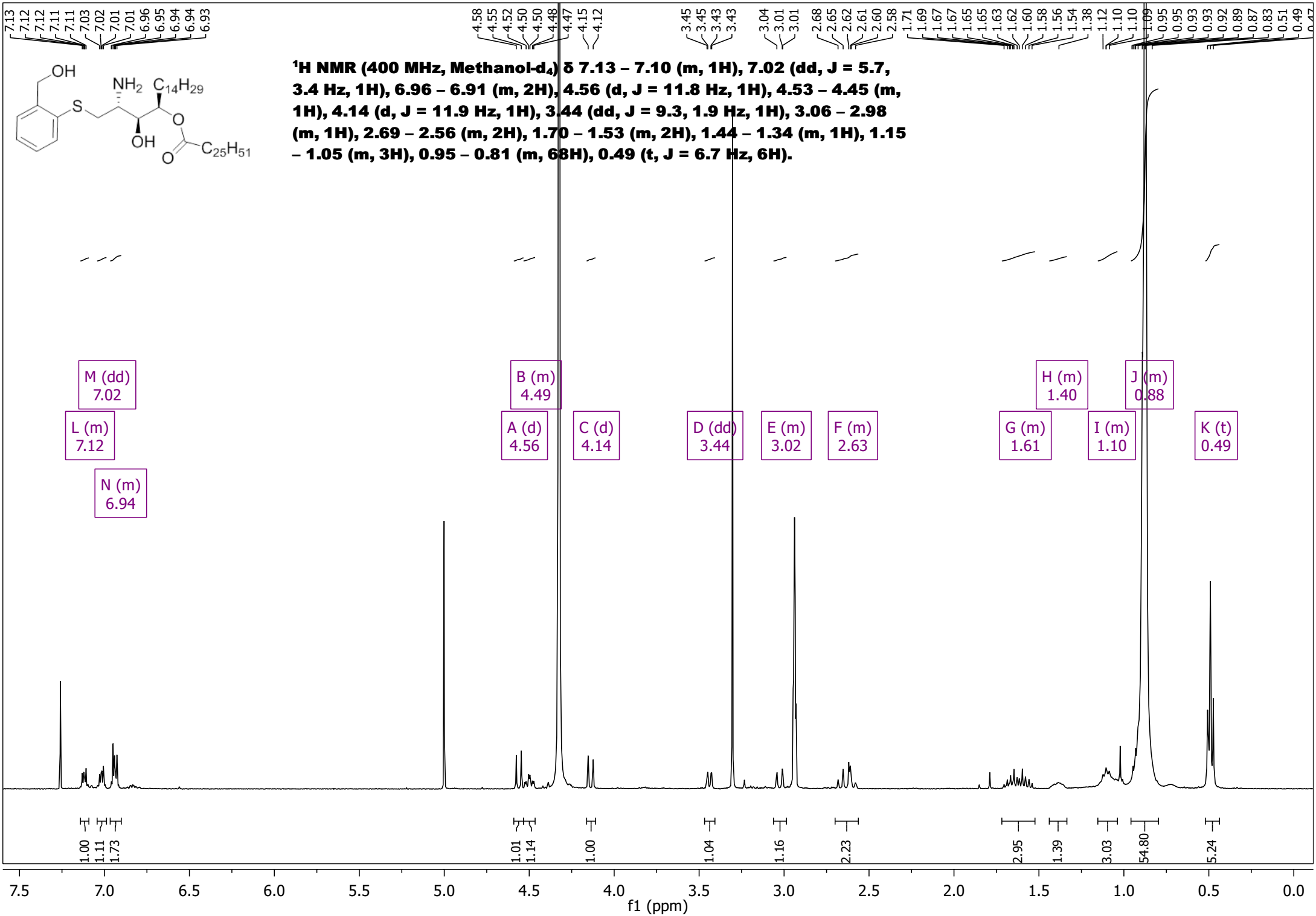


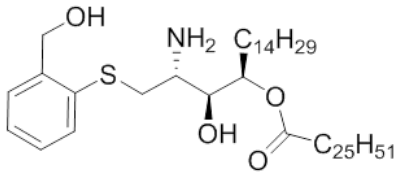

13.55
8.04 8.03 8.03 8.02 8.01 7.63 7.63 7.61 7.61 7.61 7.58 7.58 7.56 7.56 7.56 7.54 7.54 7.36 7.36 7.34 7.34 7.34 7.34 7.32 7.32
2.50
HO
O
S
S
O
OH
¹H NMR (400 MHz, DMSO-d6) δ 13.55 (s, 2H), 8.03 (dd, J = 8.2, 2.5 Hz, 2H), 7.62 (dd, J = 8.2, 1.1 Hz, 2H), 7.56 (ddd, J = 8.3, 7.1, 1.5 Hz, 2H), 7.34 (ddd, J = 7.7, 7.1, 1.3 Hz, 2H).
E (s) 13.55
B (ddd) 7.56
D (dd) 8.03
A (ddd) 7.34
C (dd) 7.62
1.00
0.95
0.97
1.03
f1 (ppm)
1.11
f1 (ppm)


167.59
138.90
133.28
131.57
128.07
125.98
124.98
HO
O
S
S
O
OH
^{13}C NMR (101 MHz, DMSO-d_6) δ 167.59, 138.90, 133.28, 131.57, 128.07, 125.98, 124.98.
f1 (ppm)

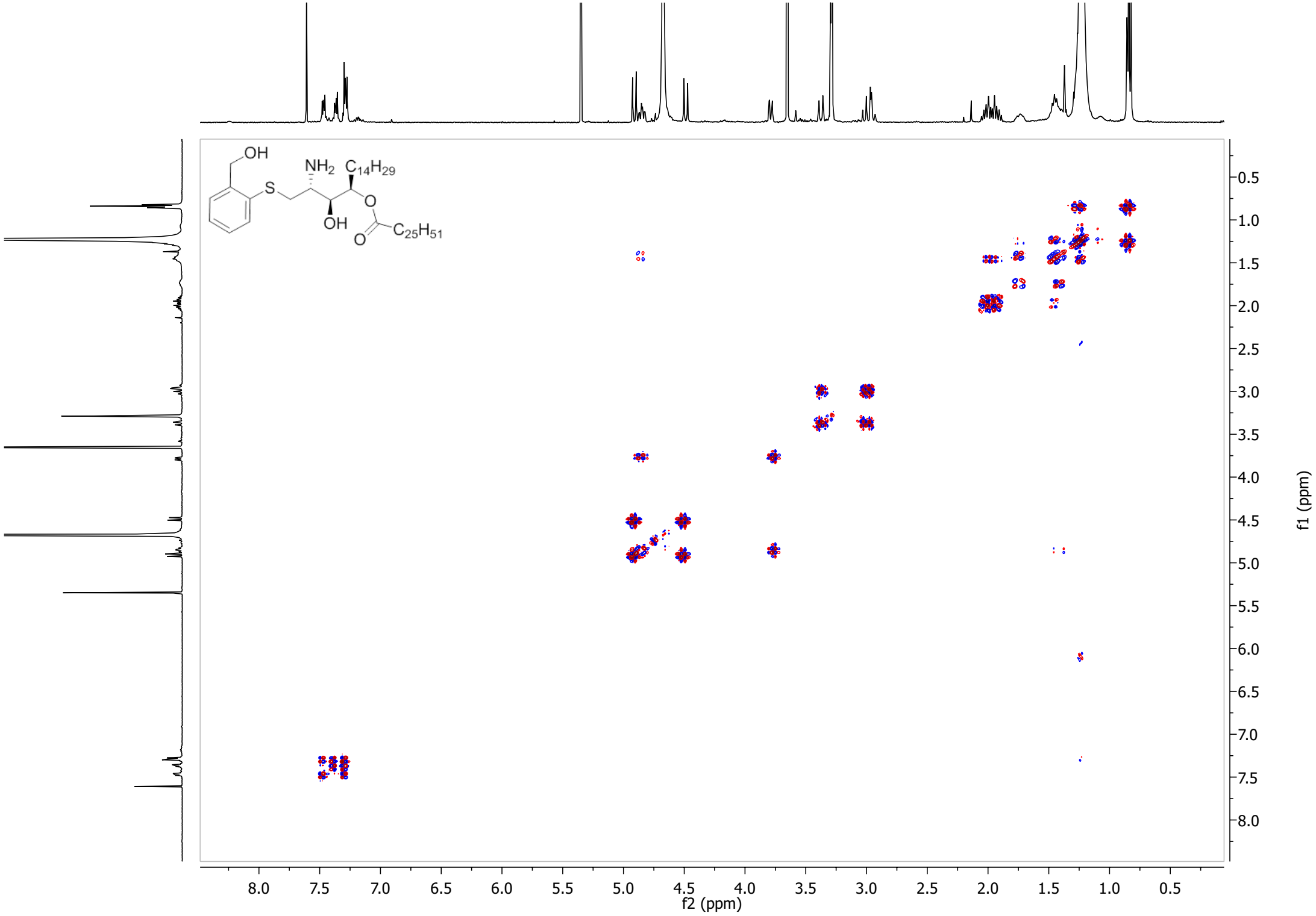


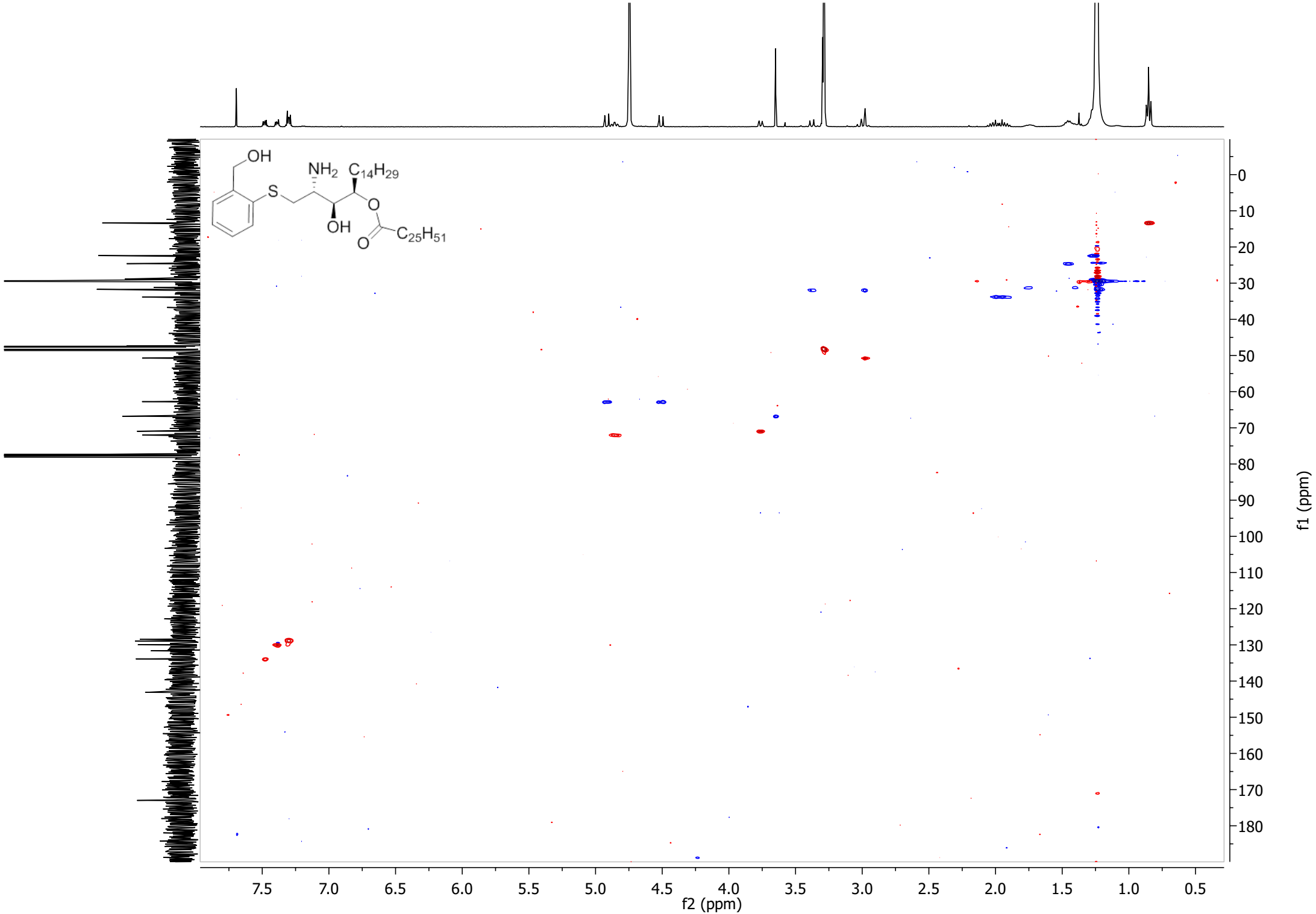
^{1}H NMR (400 MHz, Chloroform-*d*) δ 4.14 (dd, *J* = 9.8, 5.9 Hz, 1H), 4.05 (td, *J* = 5.8, 4.6 Hz, 1H), 3.90 (q, *J* = 6.3 Hz, 1H), 3.81 (dd, *J* = 9.7, 4.6 Hz, 1H), 3.61 (ddd, *J* = 7.7, 6.4, 4.8 Hz, 1H), 2.05 (d, *J* = 7.5 Hz, 1H), 1.68 – 1.57 (m, 2H), 1.37 – 1.23 (m, 24H), 0.96 – 0.82 (m, 3H).

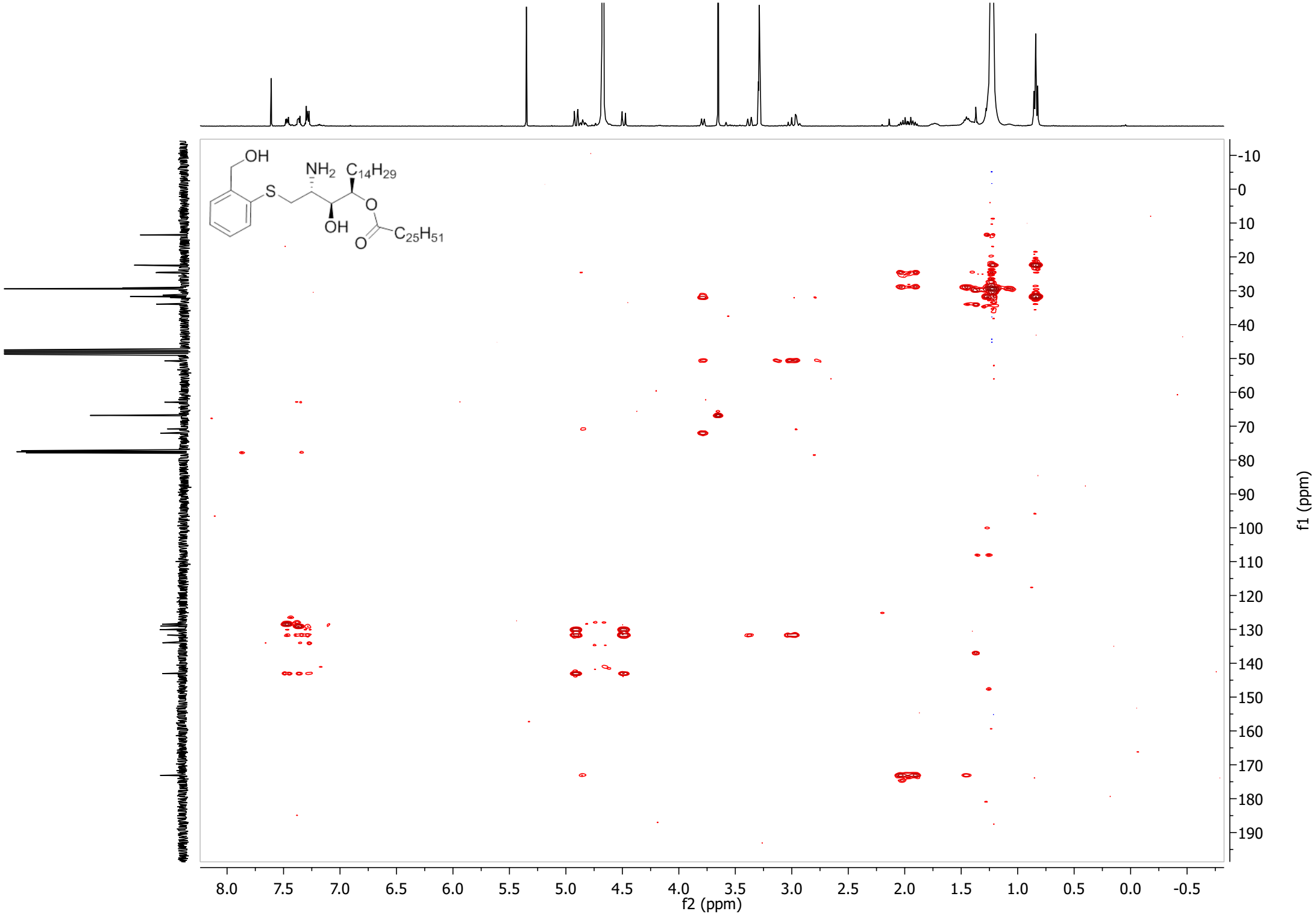

OH
NH2
C14H29
S
O
OH
O
C25H51
¹H NMR (400 MHz, Methanol-d4) δ 7.13 – 7.10 (m, 1H), 7.02 (dd, J = 5.7, 3.4 Hz, 1H), 6.96 – 6.91 (m, 2H), 4.56 (d, J = 11.8 Hz, 1H), 4.53 – 4.45 (m, 1H), 4.14 (d, J = 11.9 Hz, 1H), 3.44 (dd, J = 9.3, 1.9 Hz, 1H), 3.06 – 2.98 (m, 1H), 2.69 – 2.56 (m, 2H), 1.70 – 1.53 (m, 2H), 1.44 – 1.34 (m, 1H), 1.15 – 1.05 (m, 3H), 0.95 – 0.81 (m, 68H), 0.49 (t, J = 6.7 Hz, 6H).
M (dd) 7.02
L (m) 7.12
N (m) 6.94
B (m) 4.49
A (d) 4.56
C (d) 4.14
D (dd) 3.44
E (m) 3.02
F (m) 2.63
H (m) 1.40
G (m) 1.61
I (m) 1.10
J (m) 0.88
K (t) 0.49
1.00
1.11
1.73
1.01
1.14
1.00
1.04
1.16
2.23
2.95
1.39
3.03
54.80
5.24
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

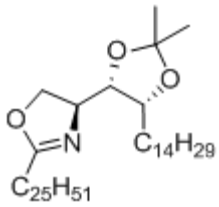


^{13}C NMR (101 MHz, cd$_3$od) δ 173.11, 143.04, 133.94, 130.12, 129.05, 128.47, 72.06, 70.79, 66.82, 62.91, 50.67, 33.94, 31.74, 31.73, 29.50, 29.46, 29.44, 29.42, 29.32, 29.17, 29.15, 29.14, 29.11, 28.89, 24.65, 22.45, 22.43, 13.51, 13.49.

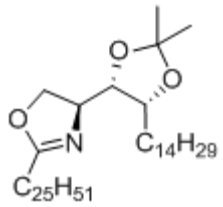

OH
NH2
C14H29
S
O
OH
O
C25H51
f2 (ppm)
f1 (ppm)


OH
NH2
C14H29
S
O
OH
O
C25H51
f2 (ppm)
f1 (ppm)

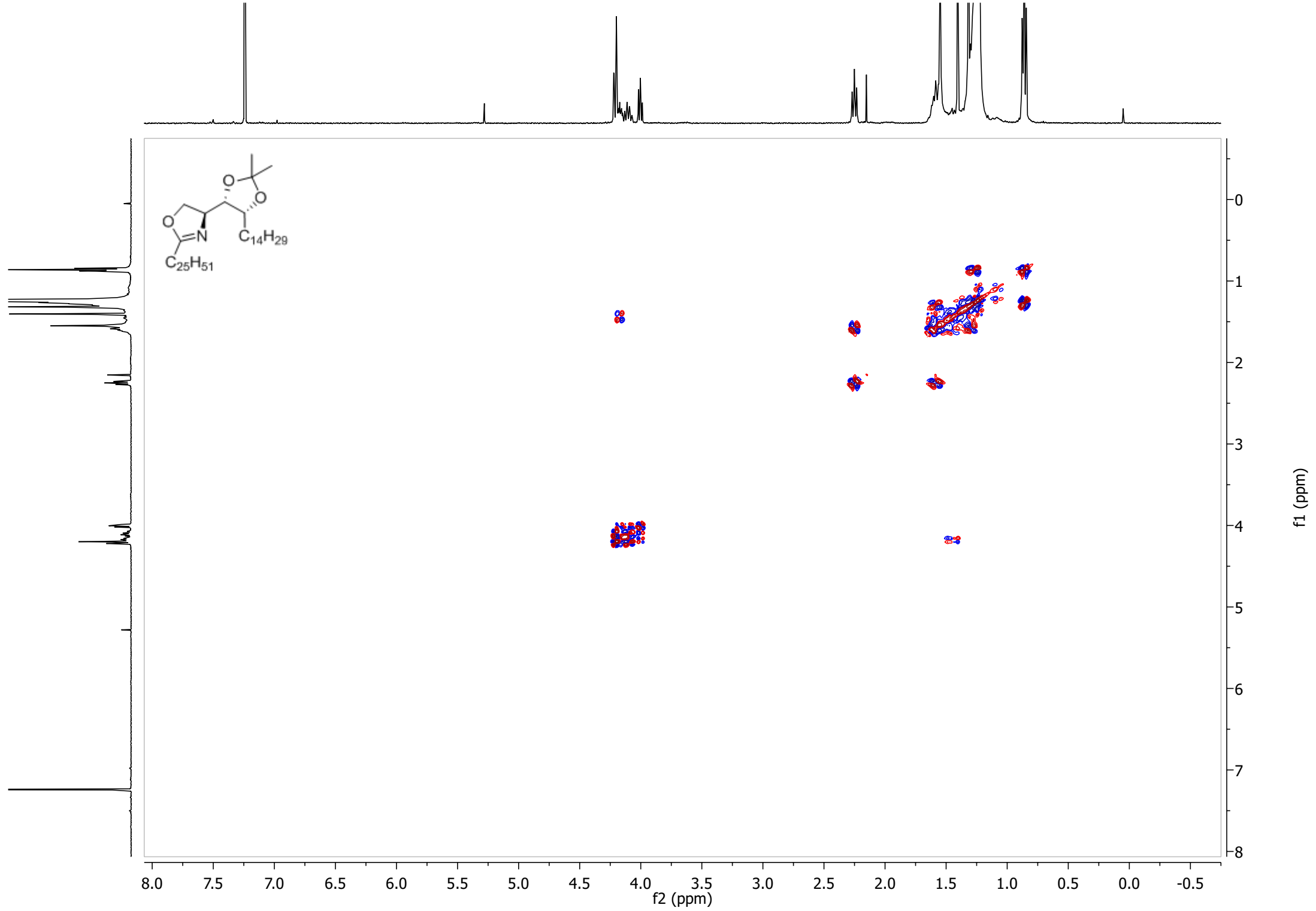

OH
NH2
C14H29
S
O
OH
O
C25H51
f2 (ppm)
f1 (ppm)

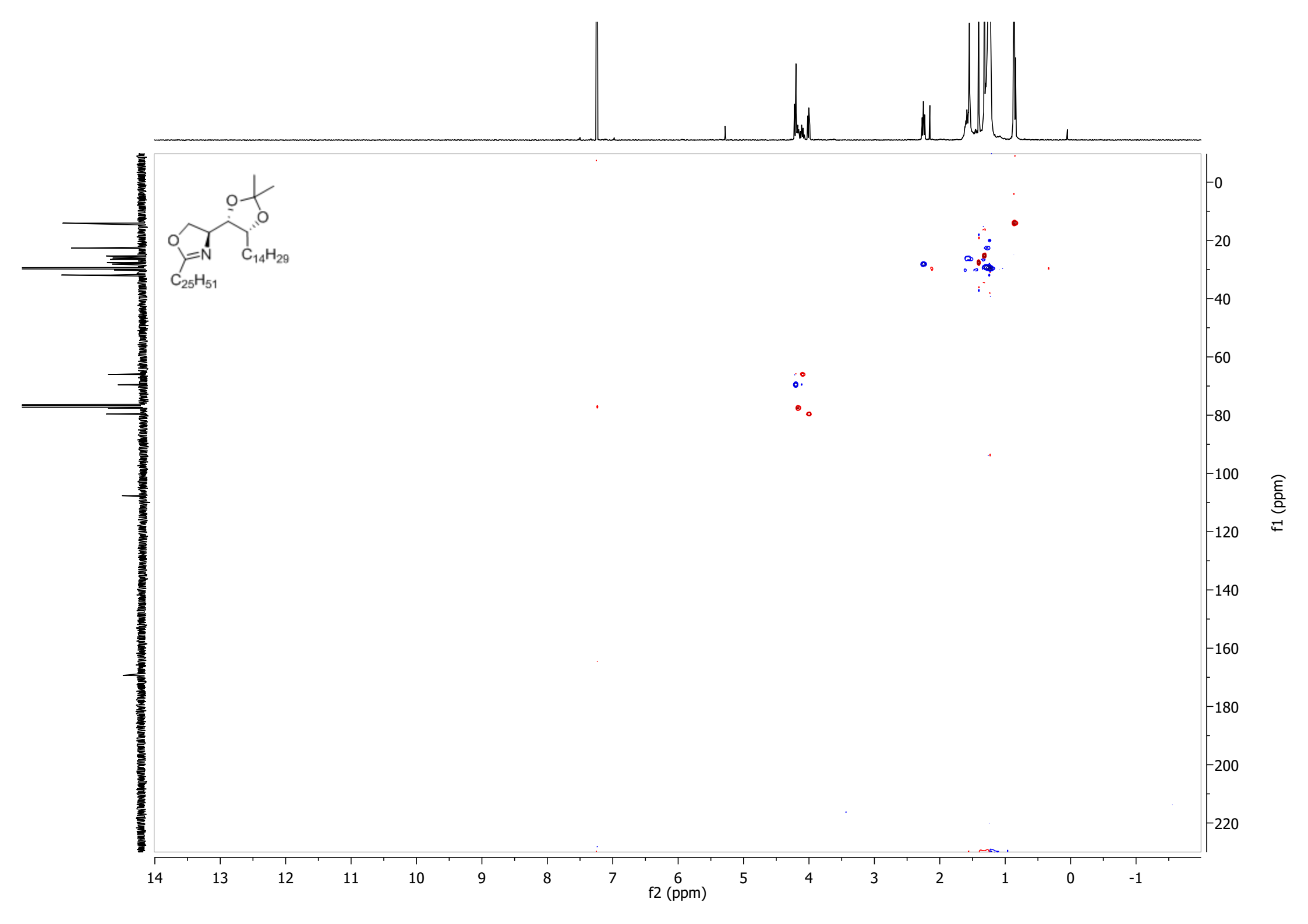


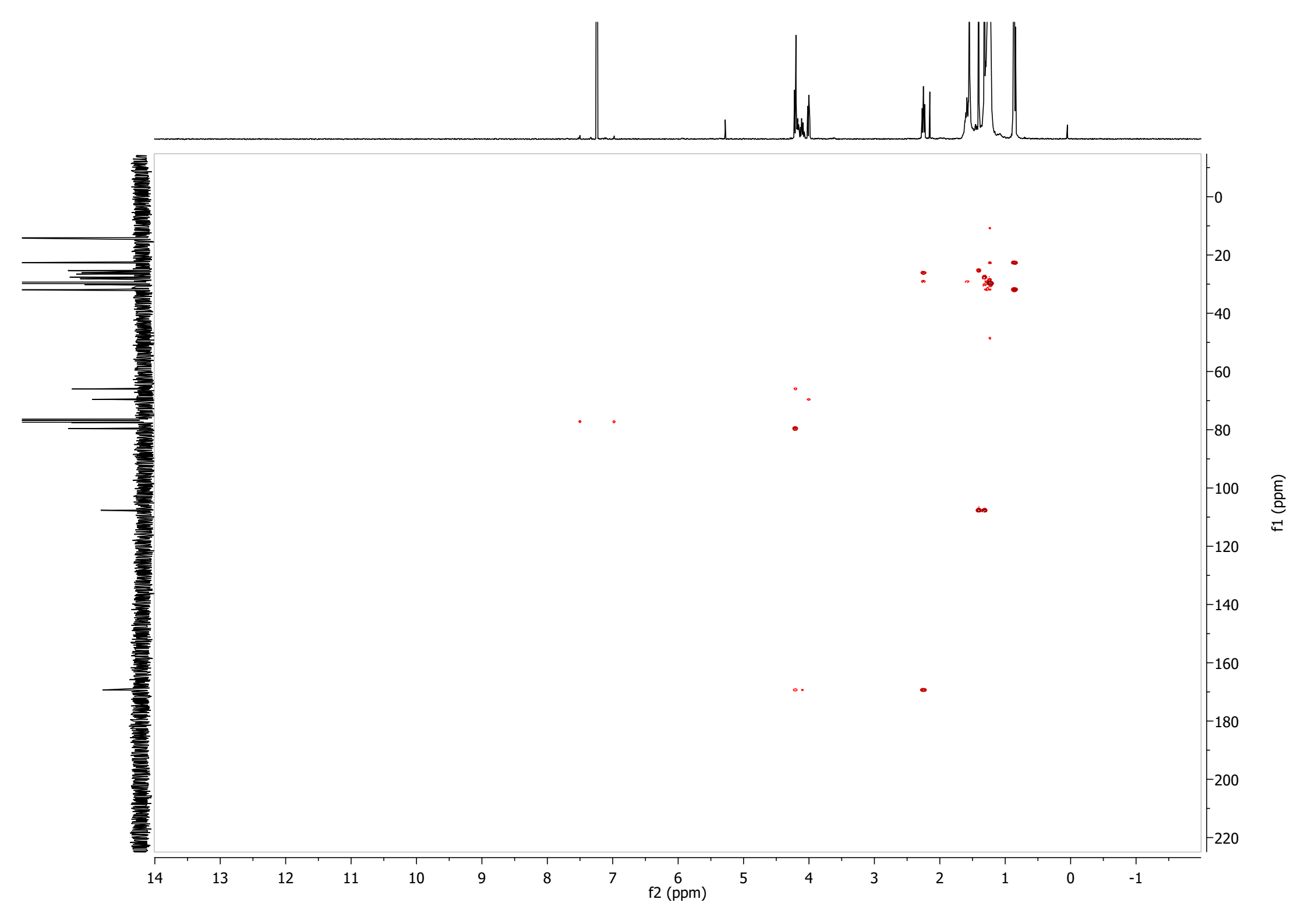
^{1}H NMR (400 MHz, Chloroform-d) δ 4.26 – 4.16 (m, 3H), 4.13 (t, J = 7.5 Hz, 1H), 4.02 (t, J = 6.4 Hz, 1H), 2.27 (t, J = 7.7 Hz, 2H), 1.68 – 1.56 (m, 4H), 1.42 (s, 3H), 1.41 – 1.17 (m, 71H), 0.88 (t, J = 6.7 Hz, 6H).



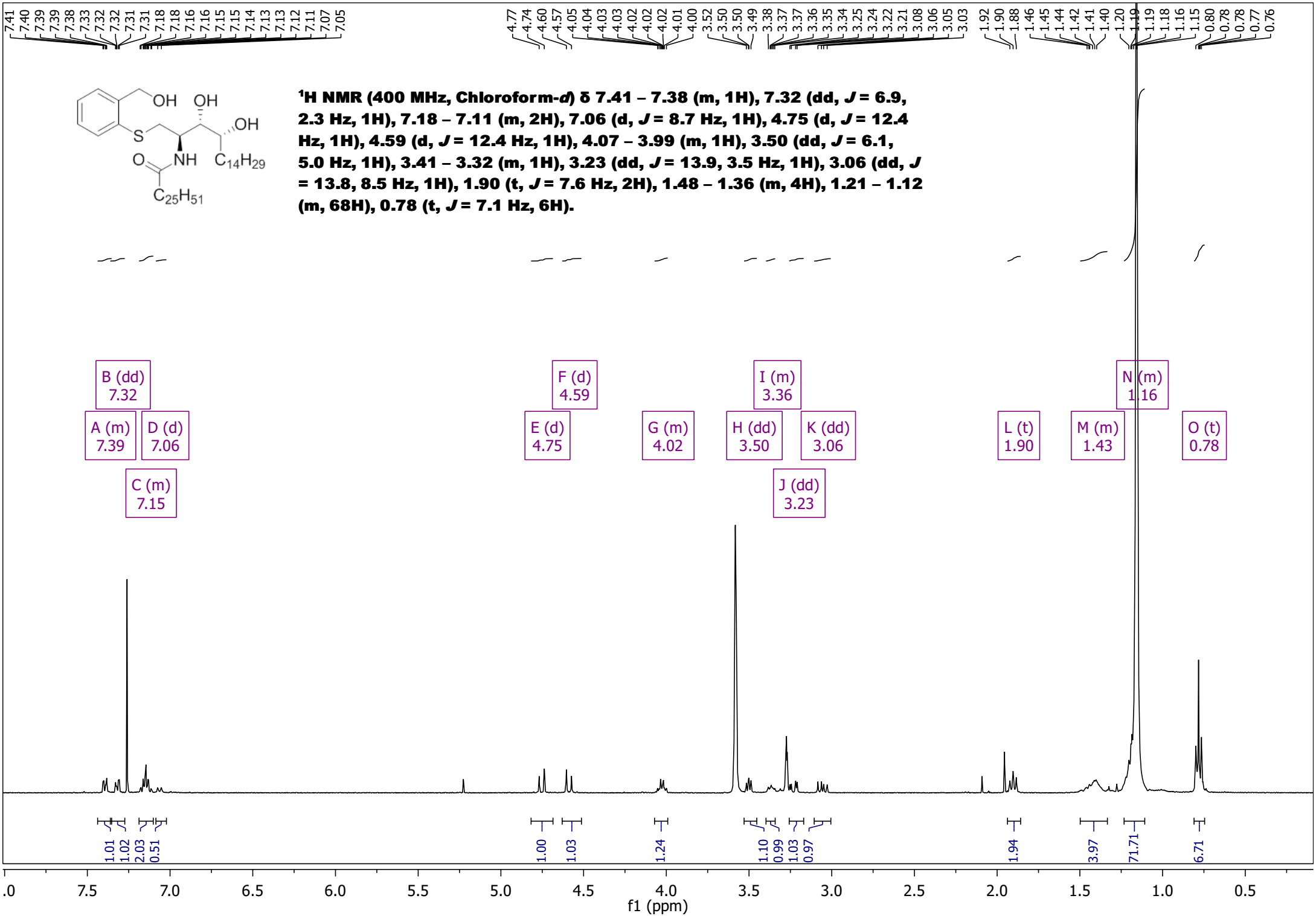
^{13}C NMR (101 MHz, cdcl$_3$) δ 169.52, 107.83, 79.81, 77.73, 69.74, 66.21, 32.09, 29.86, 29.82, 29.78, 29.66, 29.52, 29.43, 29.33, 28.33, 27.85, 26.73, 26.28, 25.53, 22.85, 14.28.


O
O
O
N
$C_{14}H_{29}$
$C_{25}H_{51}$
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f2 (ppm)
0
1
2
3
4
5
6
7
8
f1 (ppm)

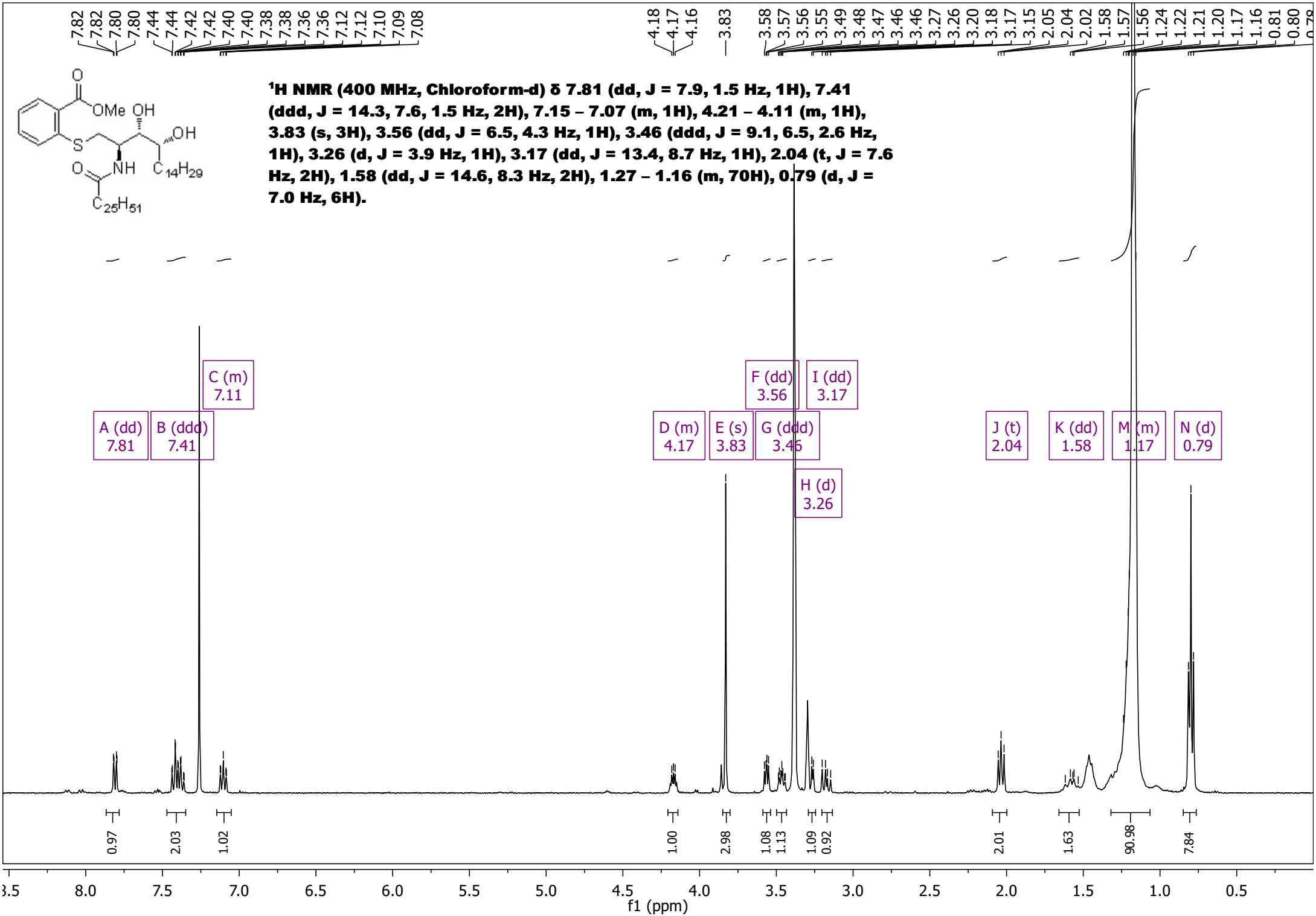

O
O
O
N
$C_{14}H_{29}$
$C_{25}H_{51}$
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
20
40
60
80
100
120
140
160
180
200
220
f1 (ppm)

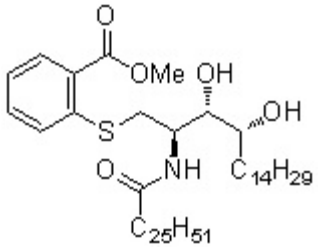

14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
20
40
60
80
100
120
140
160
180
200
220
f1 (ppm)

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.41 – 7.38 (m, 1H), 7.32 (dd, *J* = 6.9, 2.3 Hz, 1H), 7.18 – 7.11 (m, 2H), 7.06 (d, *J* = 8.7 Hz, 1H), 4.75 (d, *J* = 12.4 Hz, 1H), 4.59 (d, *J* = 12.4 Hz, 1H), 4.07 – 3.99 (m, 1H), 3.50 (dd, *J* = 6.1, 5.0 Hz, 1H), 3.41 – 3.32 (m, 1H), 3.23 (dd, *J* = 13.9, 3.5 Hz, 1H), 3.06 (dd, *J* = 13.8, 8.5 Hz, 1H), 1.90 (t, *J* = 7.6 Hz, 2H), 1.48 – 1.36 (m, 4H), 1.21 – 1.12 (m, 68H), 0.78 (t, *J* = 7.1 Hz, 6H).

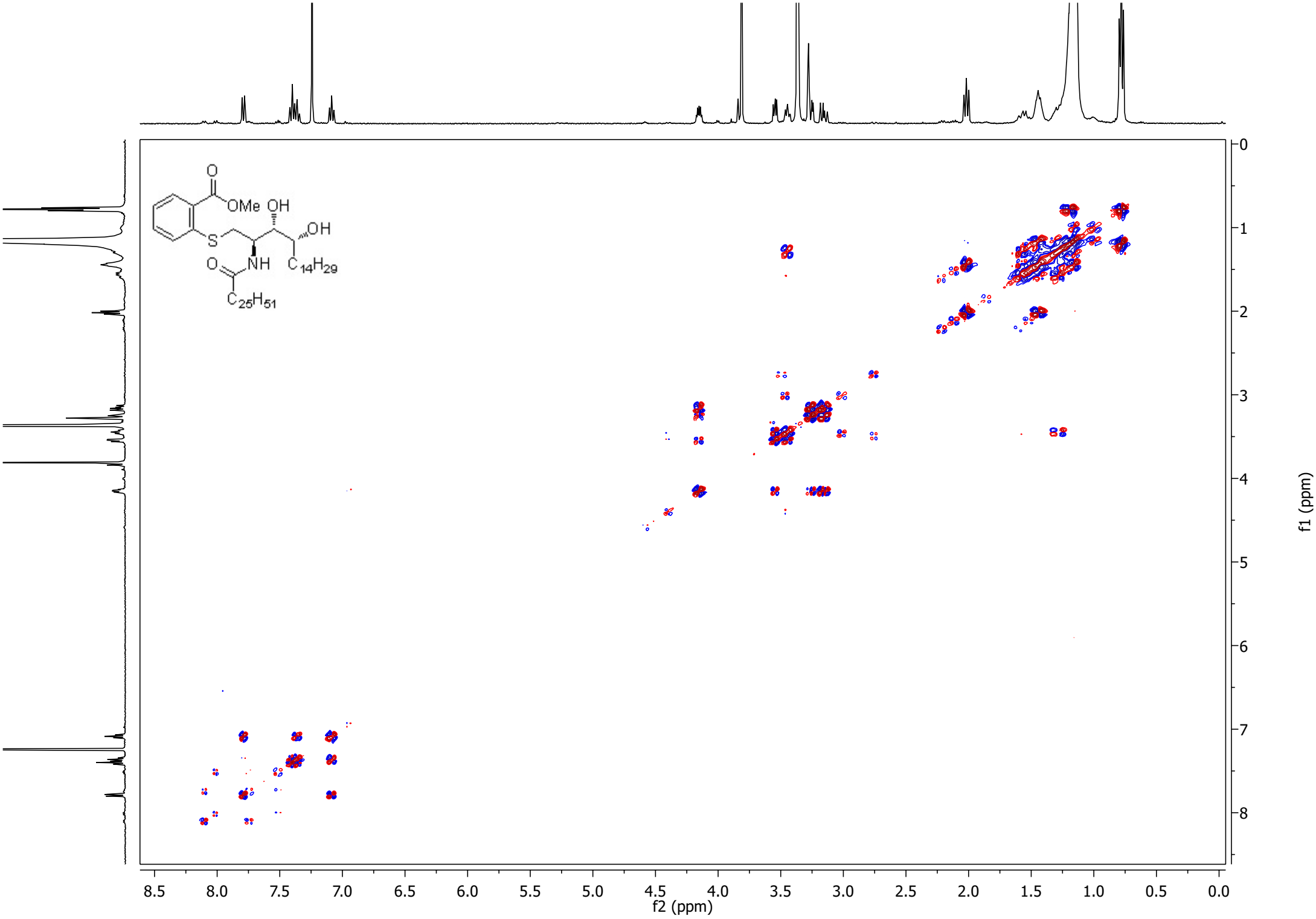


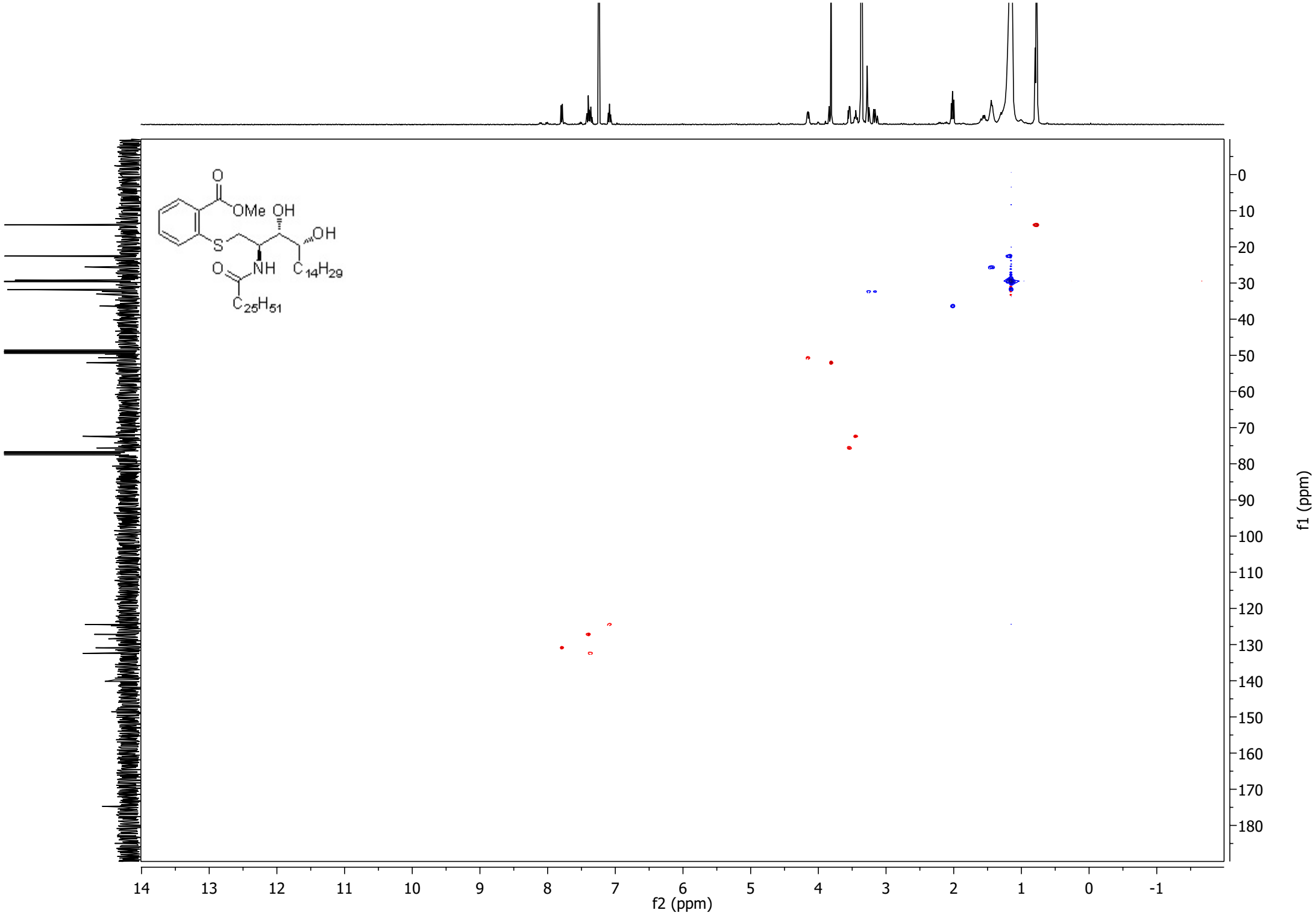
^{1}H NMR (400 MHz, Chloroform-d) δ 7.81 (dd, J = 7.9, 1.5 Hz, 1H), 7.41 (ddd, J = 14.3, 7.6, 1.5 Hz, 2H), 7.15 – 7.07 (m, 1H), 4.21 – 4.11 (m, 1H), 3.83 (s, 3H), 3.56 (dd, J = 6.5, 4.3 Hz, 1H), 3.46 (ddd, J = 9.1, 6.5, 2.6 Hz, 1H), 3.26 (d, J = 3.9 Hz, 1H), 3.17 (dd, J = 13.4, 8.7 Hz, 1H), 2.04 (t, J = 7.6 Hz, 2H), 1.58 (dd, J = 14.6, 8.3 Hz, 2H), 1.27 – 1.16 (m, 70H), 0.79 (d, J = 7.0 Hz, 6H).



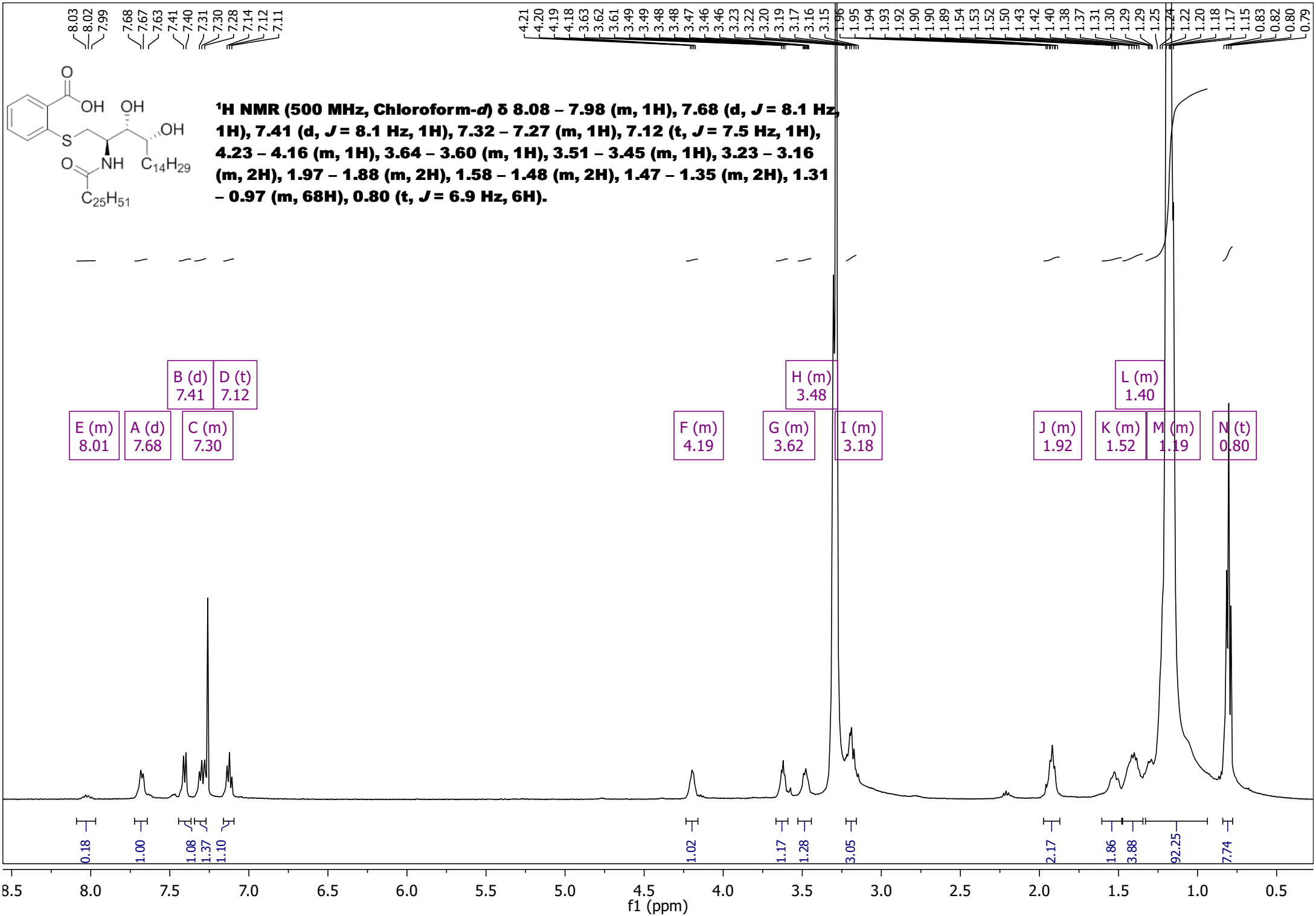


^{13}C NMR (101 MHz, cdcl$_3$) δ 174.85, 148.66, 140.30, 132.54, 130.99, 128.51, 127.30, 124.55, 75.73, 72.50, 52.18, 50.79, 36.48, 33.17, 32.49, 31.92, 29.73, 29.70, 29.69, 29.64, 29.50, 29.35, 29.27, 25.79, 25.69, 22.67, 14.04.

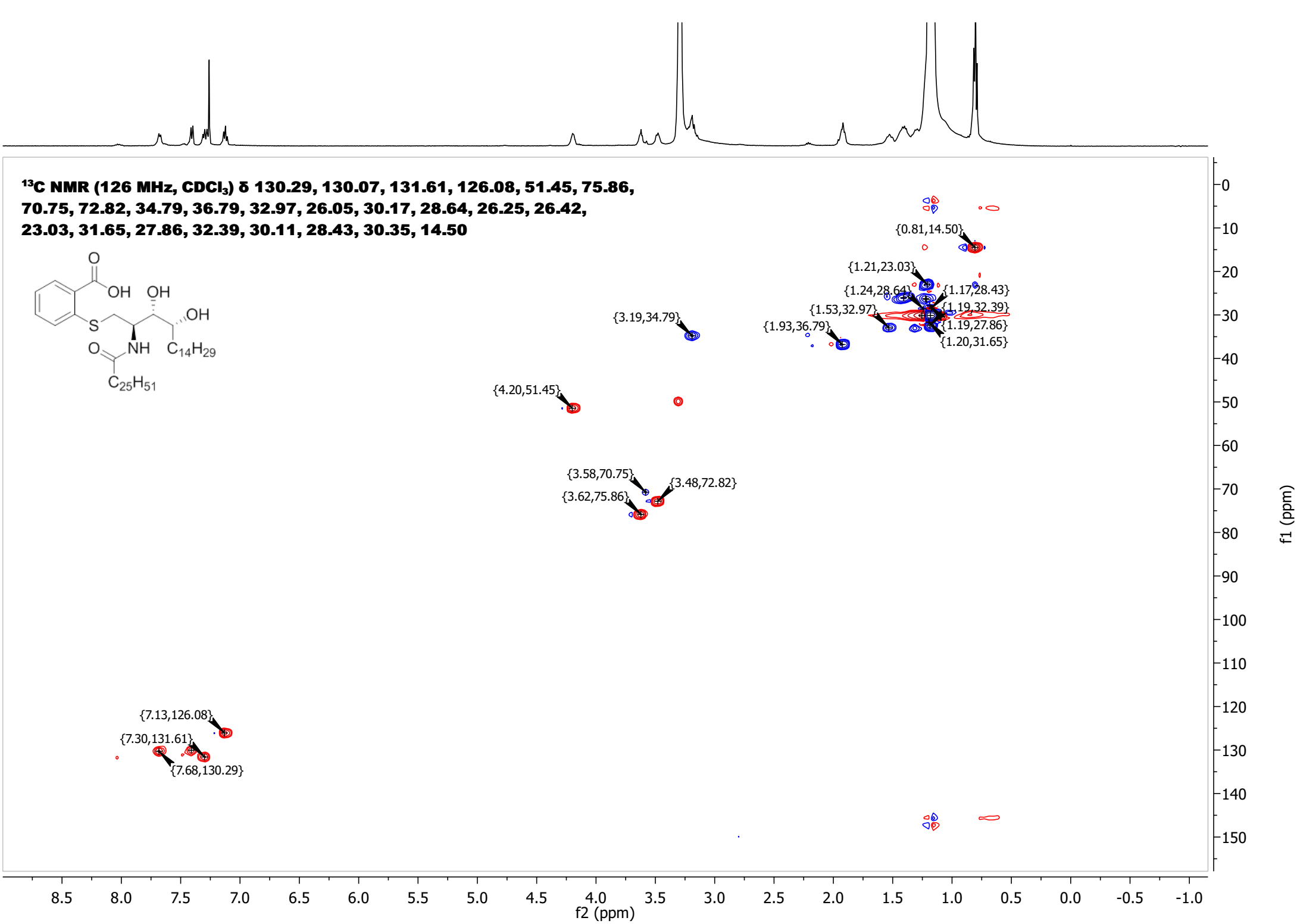

O
OMe
OH
OH
S
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
1
2
3
4
5
6
7
8
f1 (ppm)


O
OMe
OH
OH
S
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
f2 (ppm)
f1 (ppm)

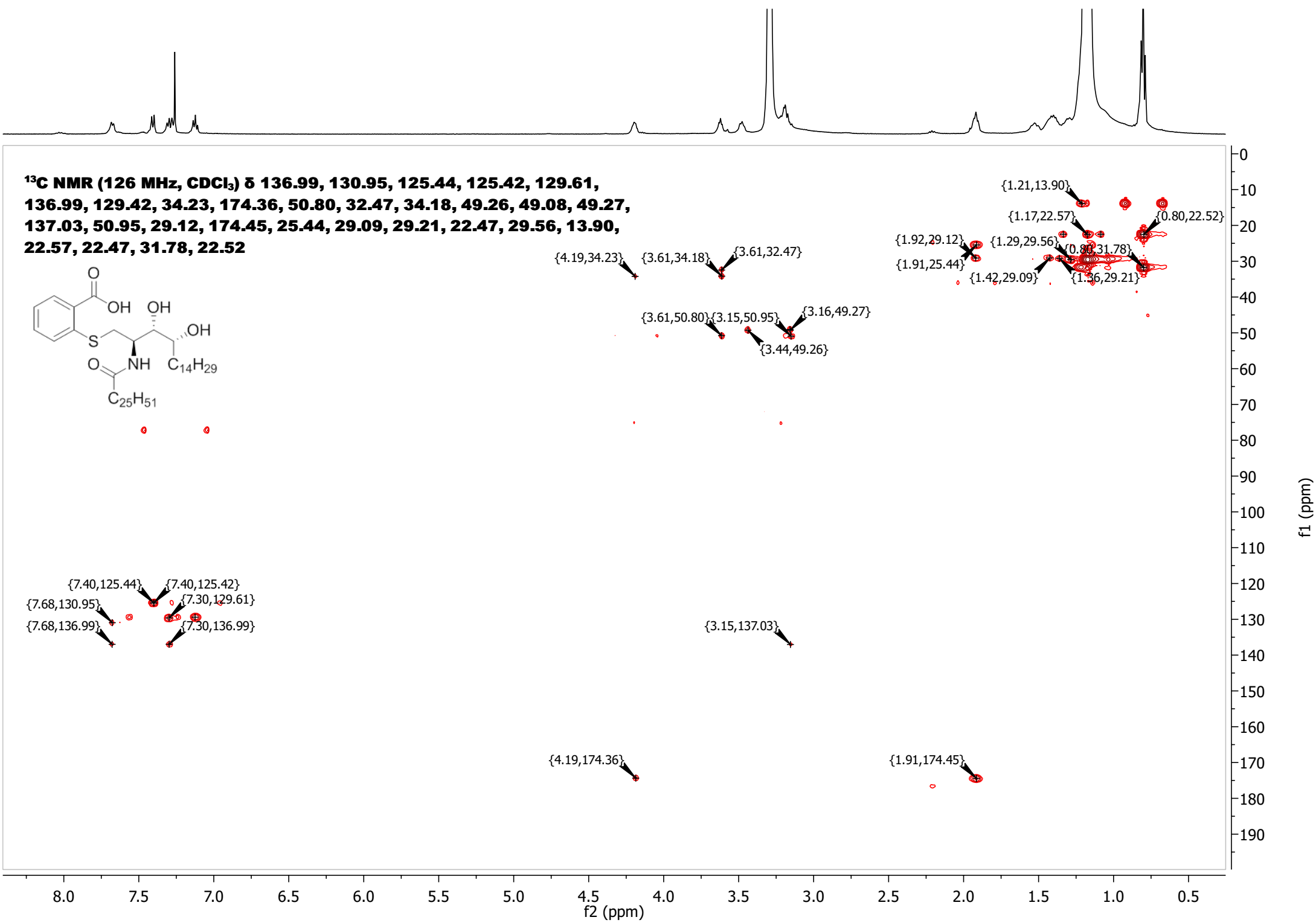
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.08 – 7.98 (m, 1H), 7.68 (d, *J* = 8.1 Hz, 1H), 7.41 (d, *J* = 8.1 Hz, 1H), 7.32 – 7.27 (m, 1H), 7.12 (t, *J* = 7.5 Hz, 1H), 4.23 – 4.16 (m, 1H), 3.64 – 3.60 (m, 1H), 3.51 – 3.45 (m, 1H), 3.23 – 3.16 (m, 2H), 1.97 – 1.88 (m, 2H), 1.58 – 1.48 (m, 2H), 1.47 – 1.35 (m, 2H), 1.31 – 0.97 (m, 68H), 0.80 (t, *J* = 6.9 Hz, 6H).



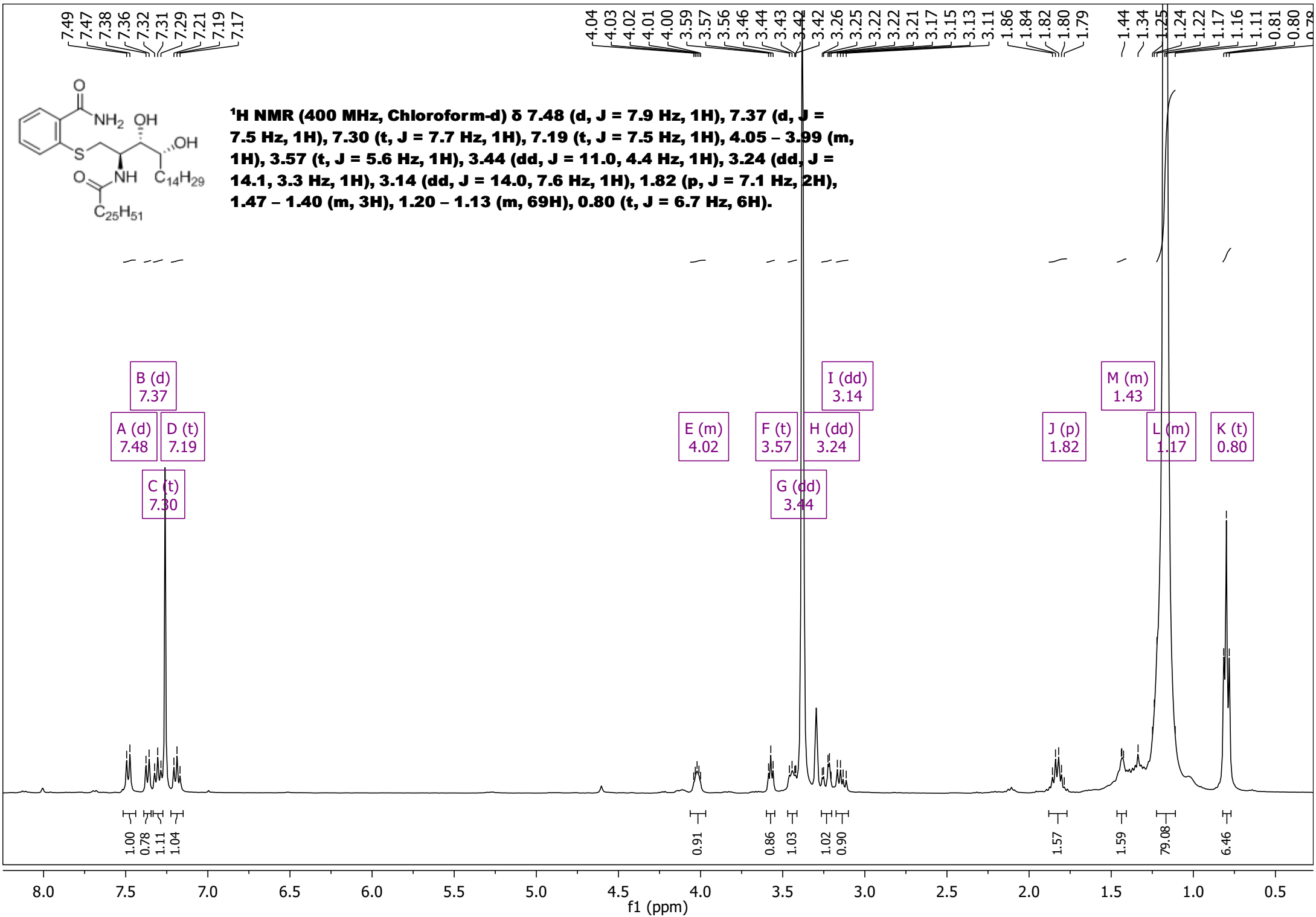
^{13}C NMR (126 MHz, $CDCl_3$) δ 130.29, 130.07, 131.61, 126.08, 51.45, 75.86, 70.75, 72.82, 34.79, 36.79, 32.97, 26.05, 30.17, 28.64, 26.25, 26.42, 23.03, 31.65, 27.86, 32.39, 30.11, 28.43, 30.35, 14.50



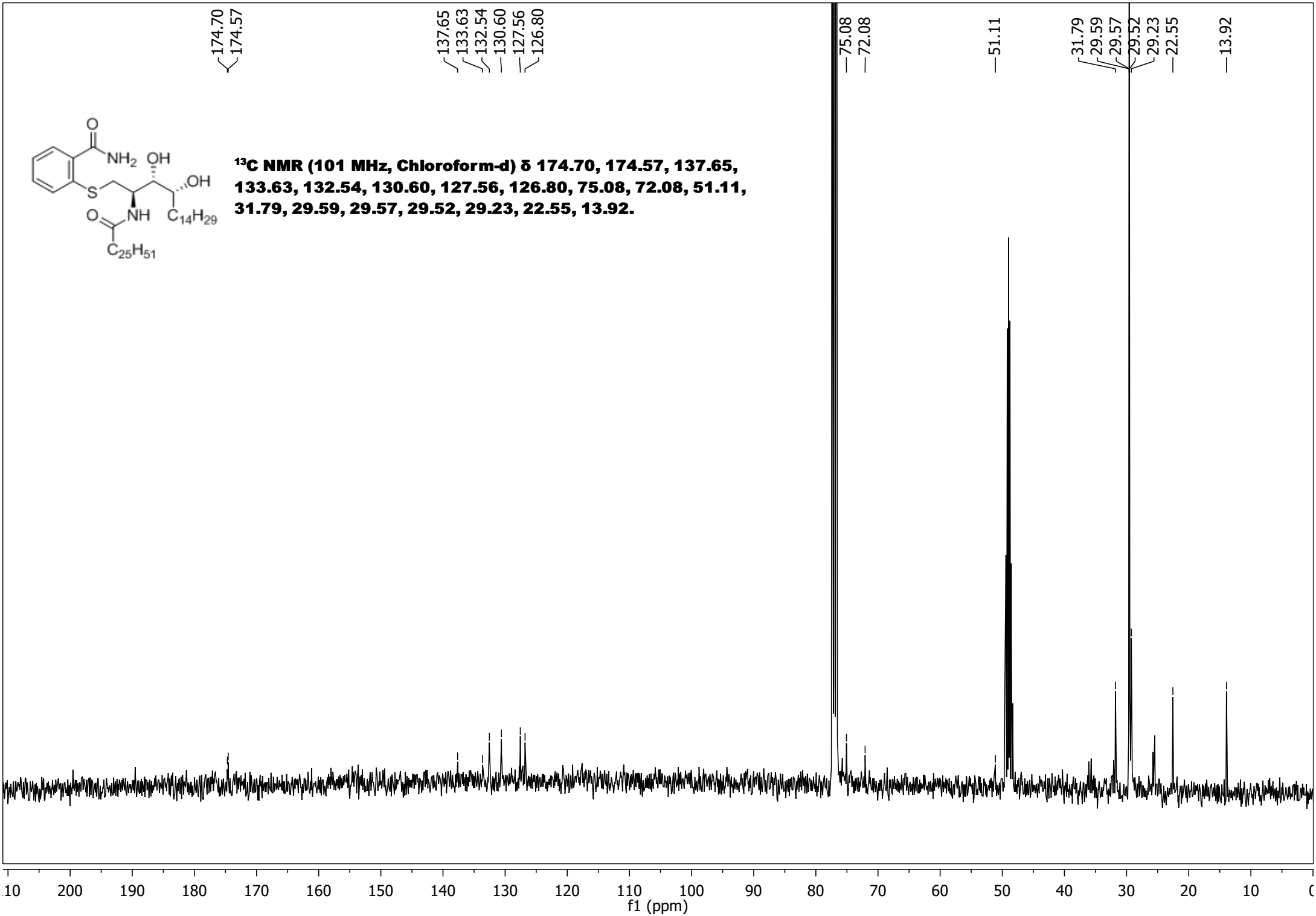
^{13}C NMR (126 MHz, $CDCl_3$) δ 136.99, 130.95, 125.44, 125.42, 129.61, 136.99, 129.42, 34.23, 174.36, 50.80, 32.47, 34.18, 49.26, 49.08, 49.27, 137.03, 50.95, 29.12, 174.45, 25.44, 29.09, 29.21, 22.47, 29.56, 13.90, 22.57, 22.47, 31.78, 22.52

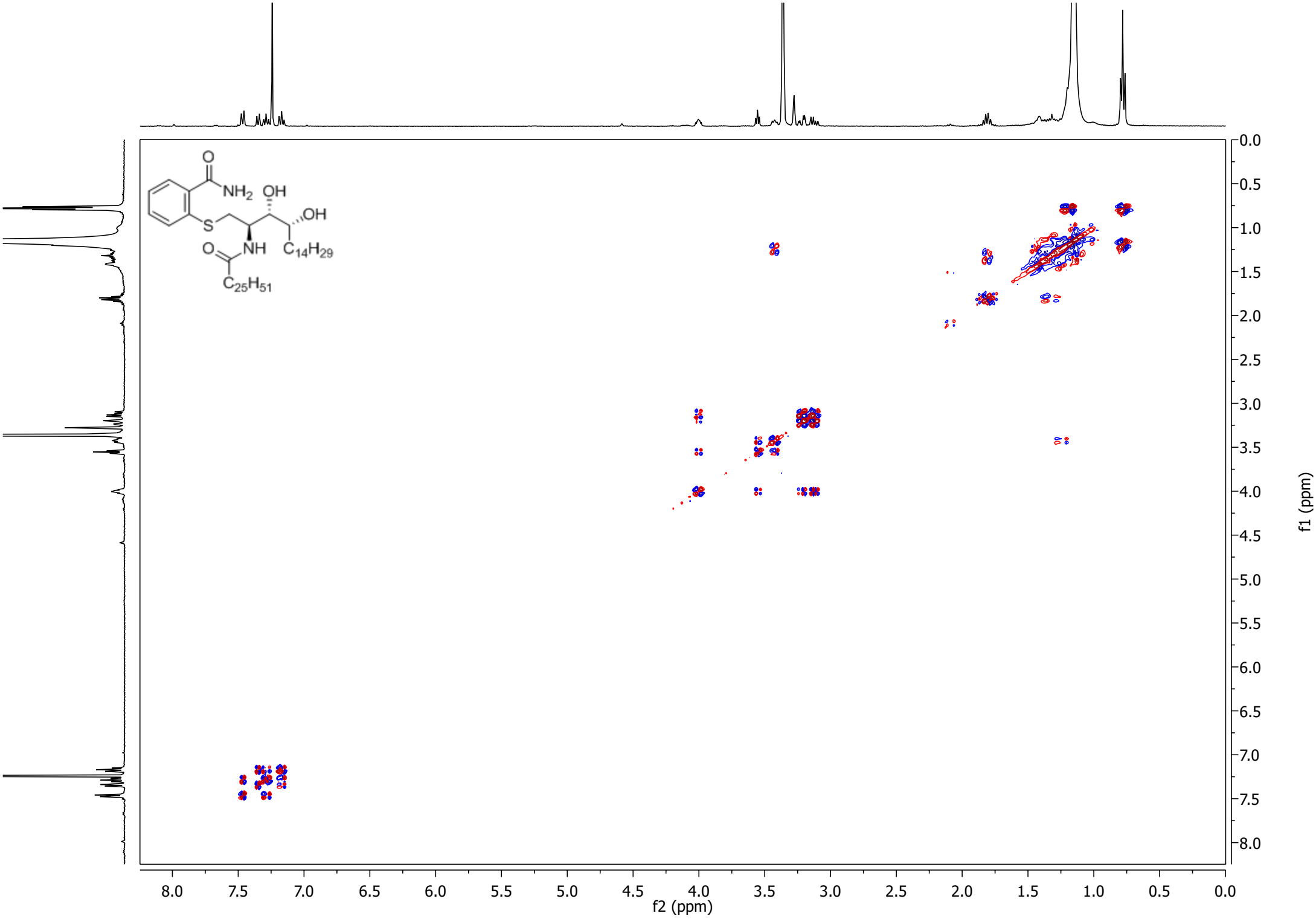


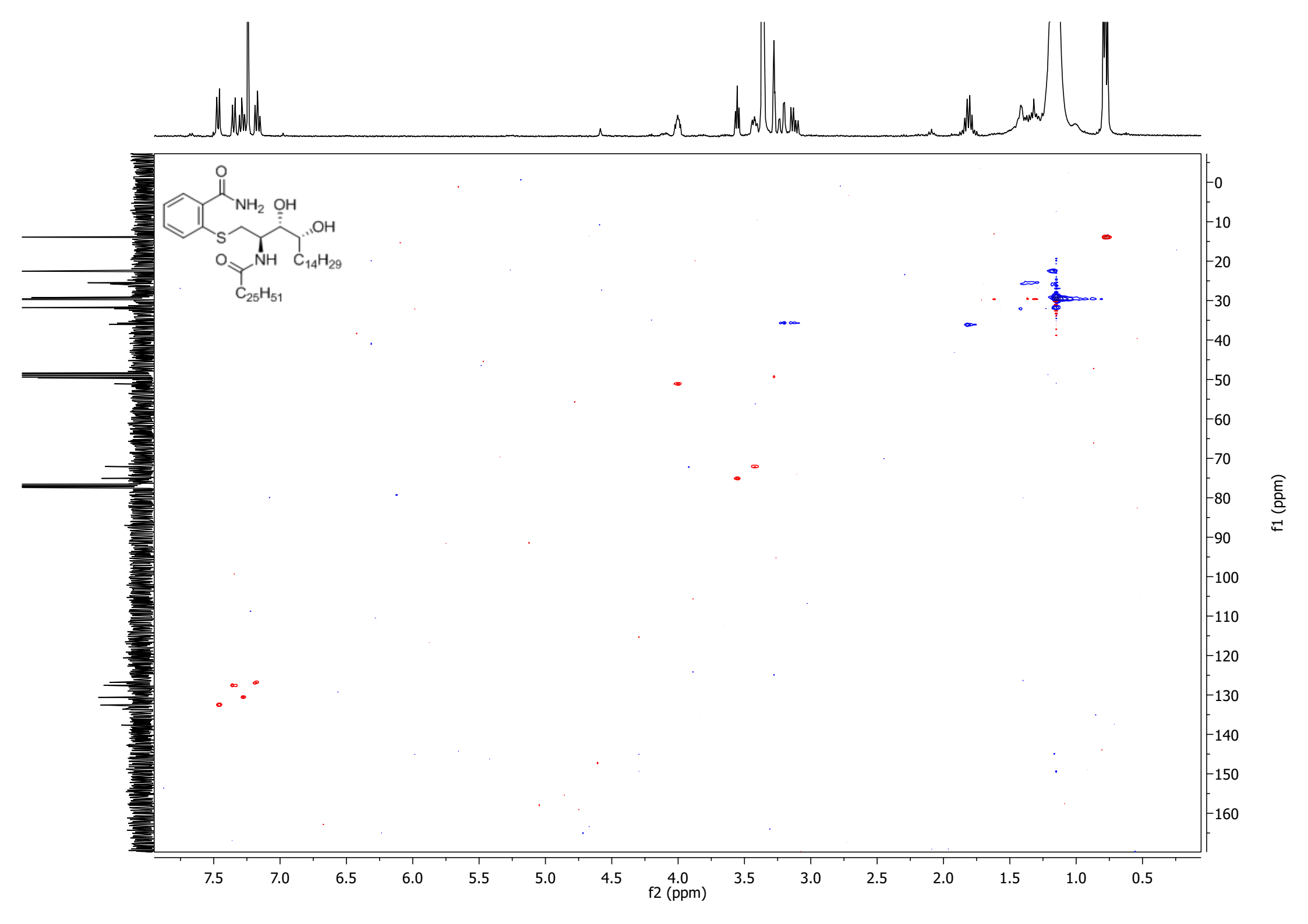
^{1}H NMR (400 MHz, Chloroform-d) δ 7.48 (d, J = 7.9 Hz, 1H), 7.37 (d, J = 7.5 Hz, 1H), 7.30 (t, J = 7.7 Hz, 1H), 7.19 (t, J = 7.5 Hz, 1H), 4.05 – 3.99 (m, 1H), 3.57 (t, J = 5.6 Hz, 1H), 3.44 (dd, J = 11.0, 4.4 Hz, 1H), 3.24 (dd, J = 14.1, 3.3 Hz, 1H), 3.14 (dd, J = 14.0, 7.6 Hz, 1H), 1.82 (p, J = 7.1 Hz, 2H), 1.47 – 1.40 (m, 3H), 1.20 – 1.13 (m, 69H), 0.80 (t, J = 6.7 Hz, 6H).



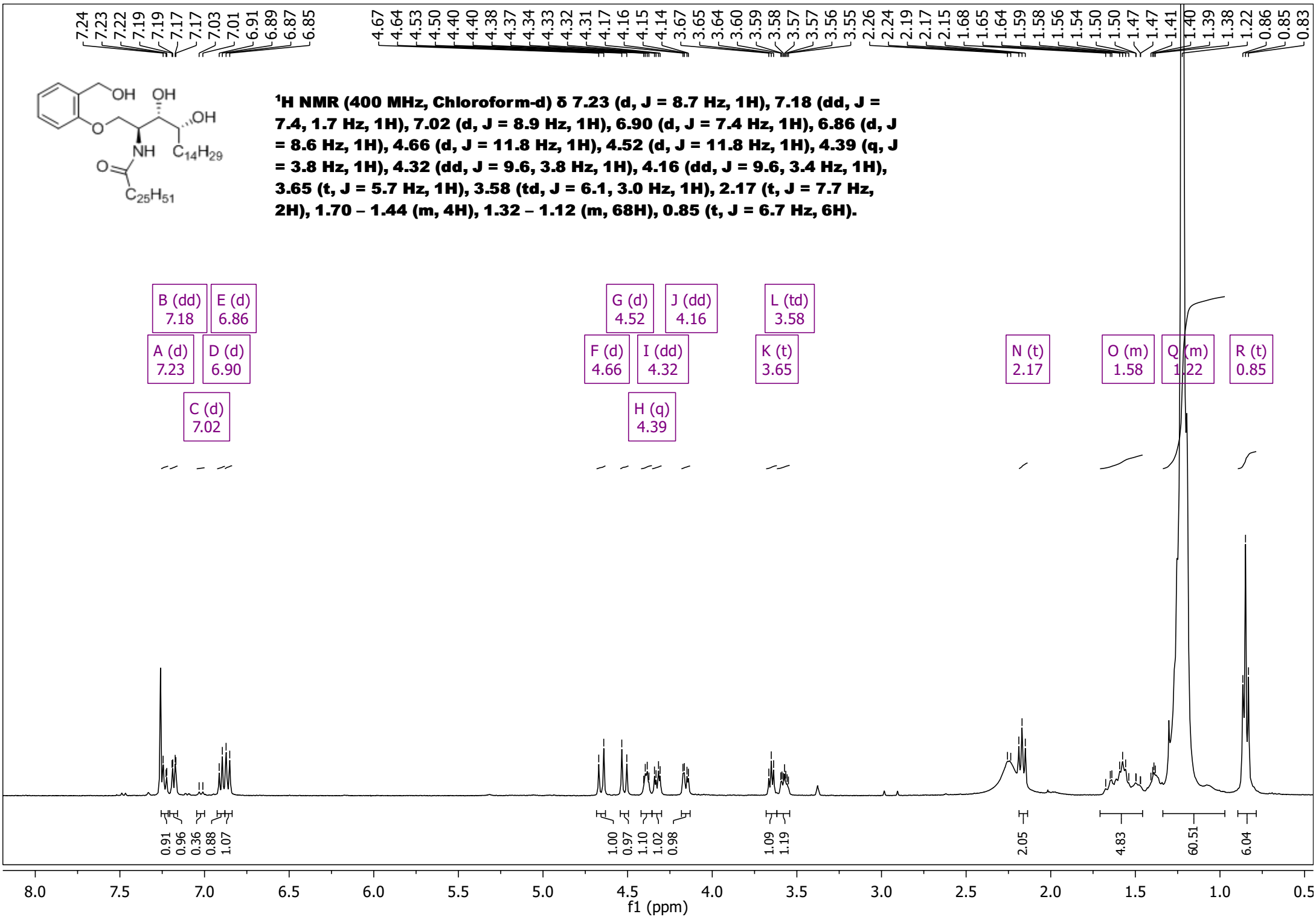
^{13}C NMR (101 MHz, Chloroform-d) δ 174.70, 174.57, 137.65, 133.63, 132.54, 130.60, 127.56, 126.80, 75.08, 72.08, 51.11, 31.79, 29.59, 29.57, 29.52, 29.23, 22.55, 13.92.

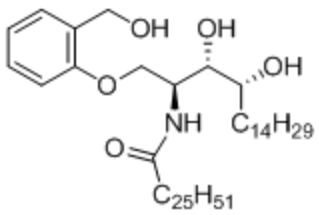



O
NH2
OH
OH
S
O
NH
C14H29
C25H51
f2 (ppm)
f1 (ppm)

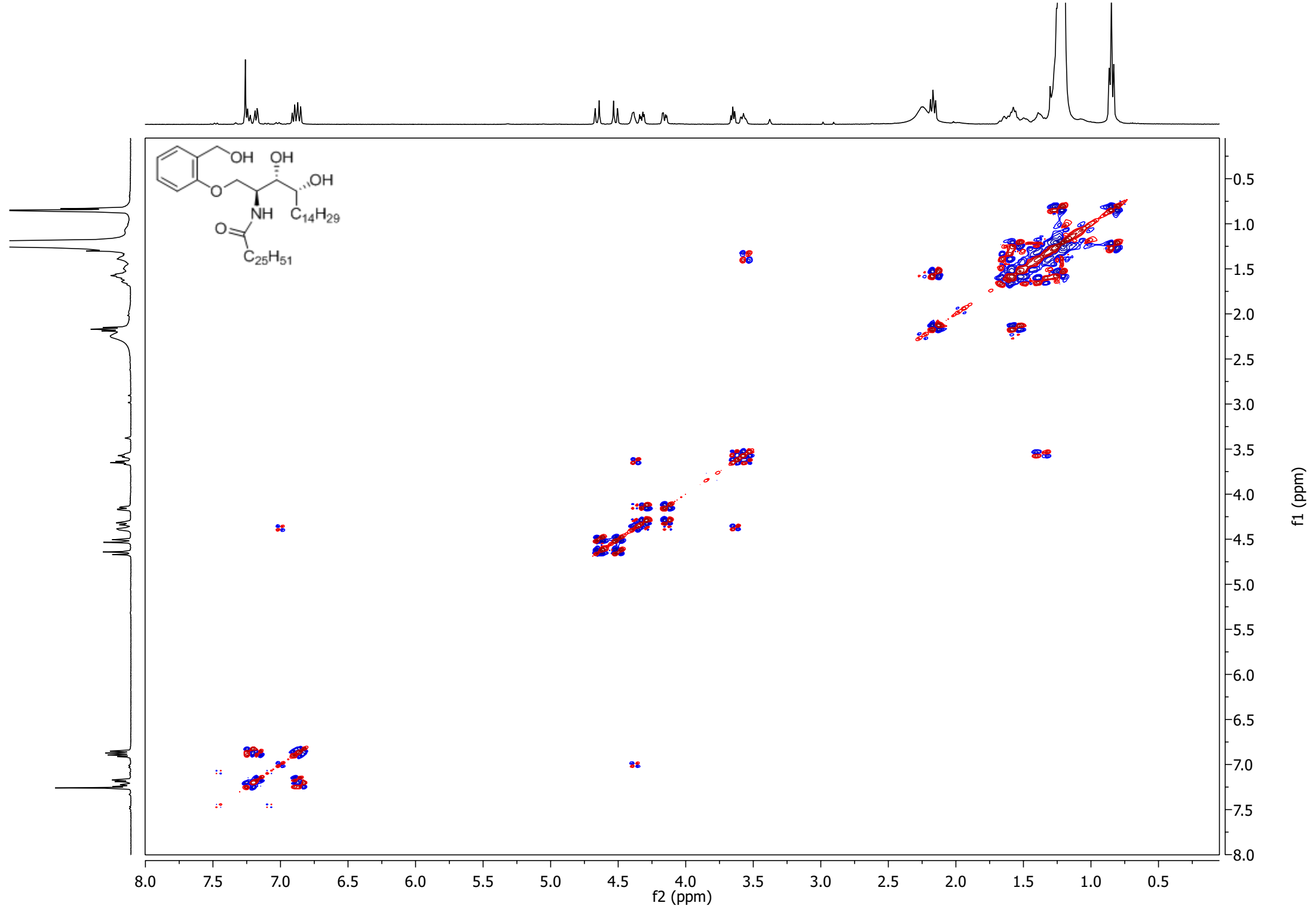

O
NH2
OH
OH
S
O
NH
C14H29
C25H51
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
f1 (ppm)

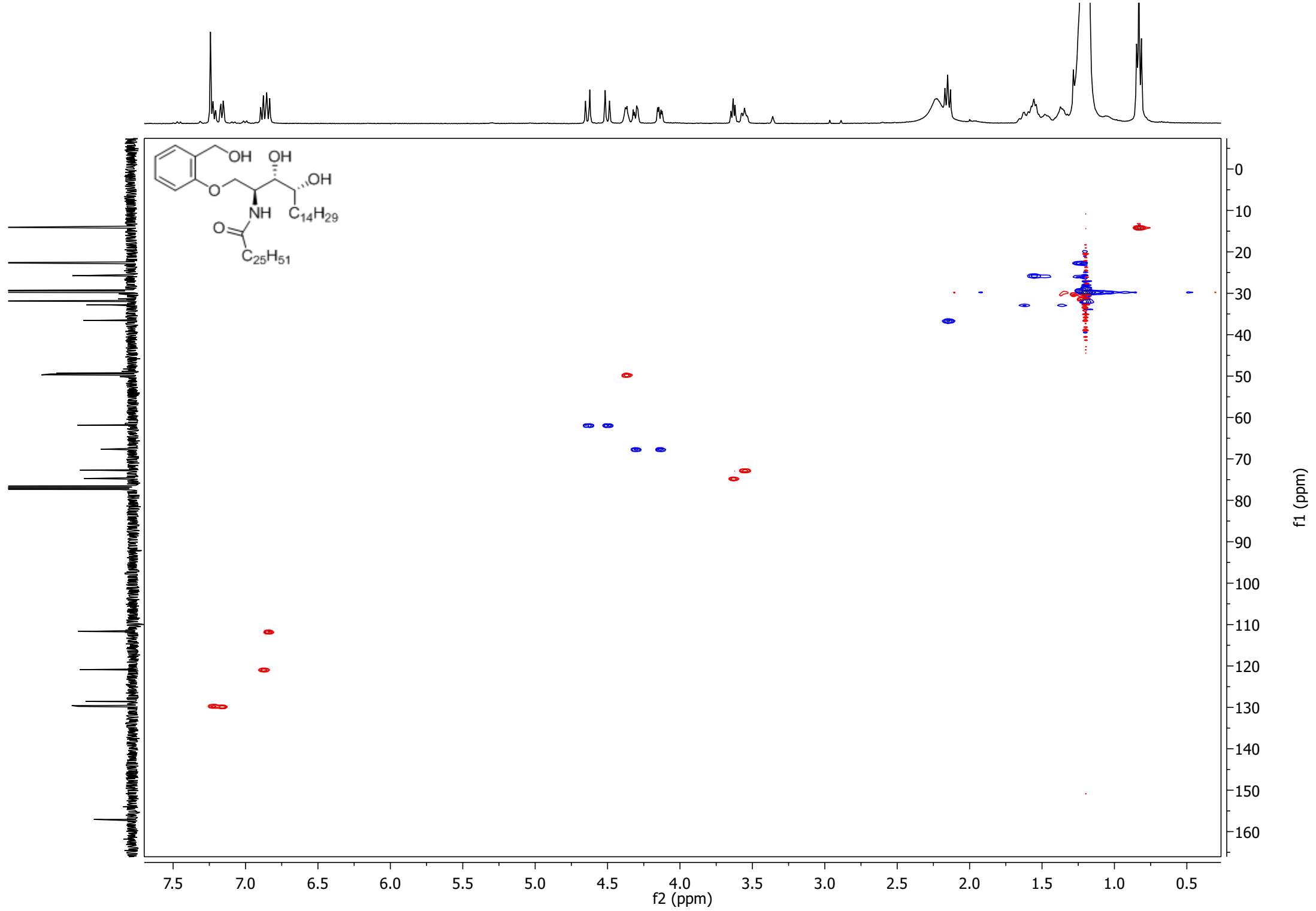
^{1}H NMR (400 MHz, Chloroform-d) δ 7.23 (d, J = 8.7 Hz, 1H), 7.18 (dd, J = 7.4, 1.7 Hz, 1H), 7.02 (d, J = 8.9 Hz, 1H), 6.90 (d, J = 7.4 Hz, 1H), 6.86 (d, J = 8.6 Hz, 1H), 4.66 (d, J = 11.8 Hz, 1H), 4.52 (d, J = 11.8 Hz, 1H), 4.39 (q, J = 3.8 Hz, 1H), 4.32 (dd, J = 9.6, 3.8 Hz, 1H), 4.16 (dd, J = 9.6, 3.4 Hz, 1H), 3.65 (t, J = 5.7 Hz, 1H), 3.58 (td, J = 6.1, 3.0 Hz, 1H), 2.17 (t, J = 7.7 Hz, 2H), 1.70 – 1.44 (m, 4H), 1.32 – 1.12 (m, 68H), 0.85 (t, J = 6.7 Hz, 6H).

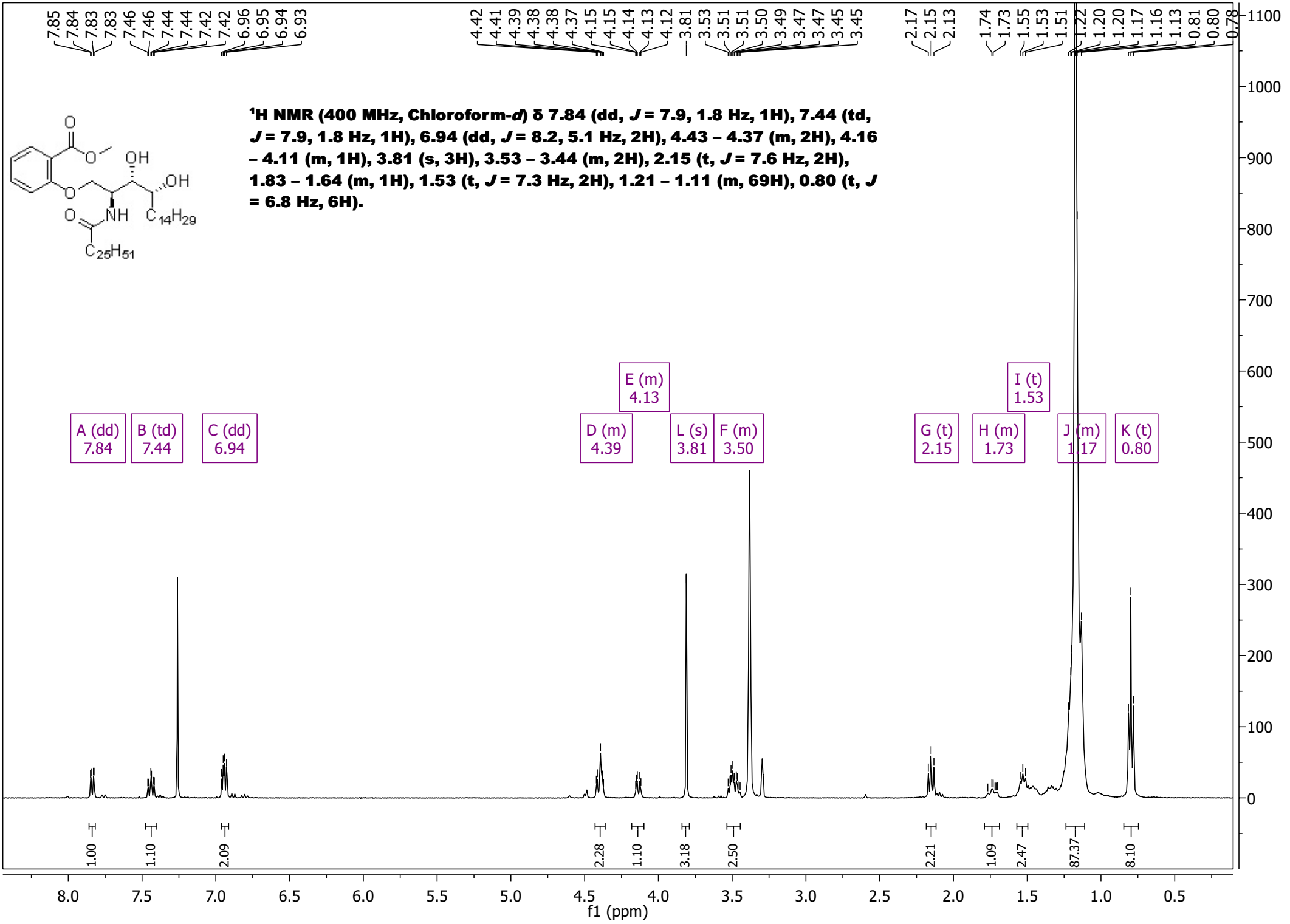


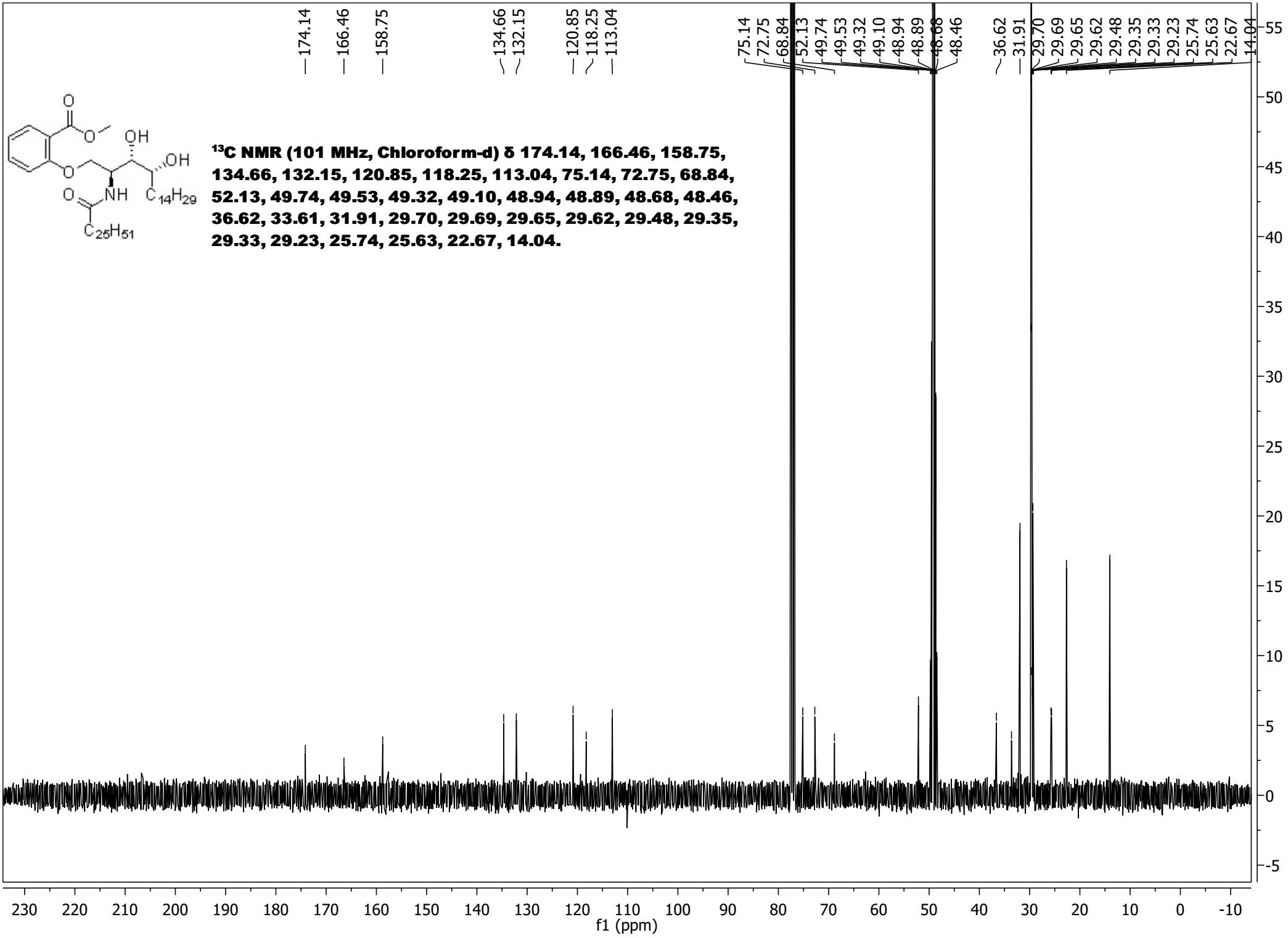


^{13}C NMR (101 MHz, Chloroform-d) δ 174.10, 157.22, 129.93, 129.73, 128.72, 121.03, 111.81, 74.89, 72.84, 67.80, 61.99, 49.84, 36.73, 32.98, 32.01, 29.79, 25.92, 25.85, 22.78, 14.19.

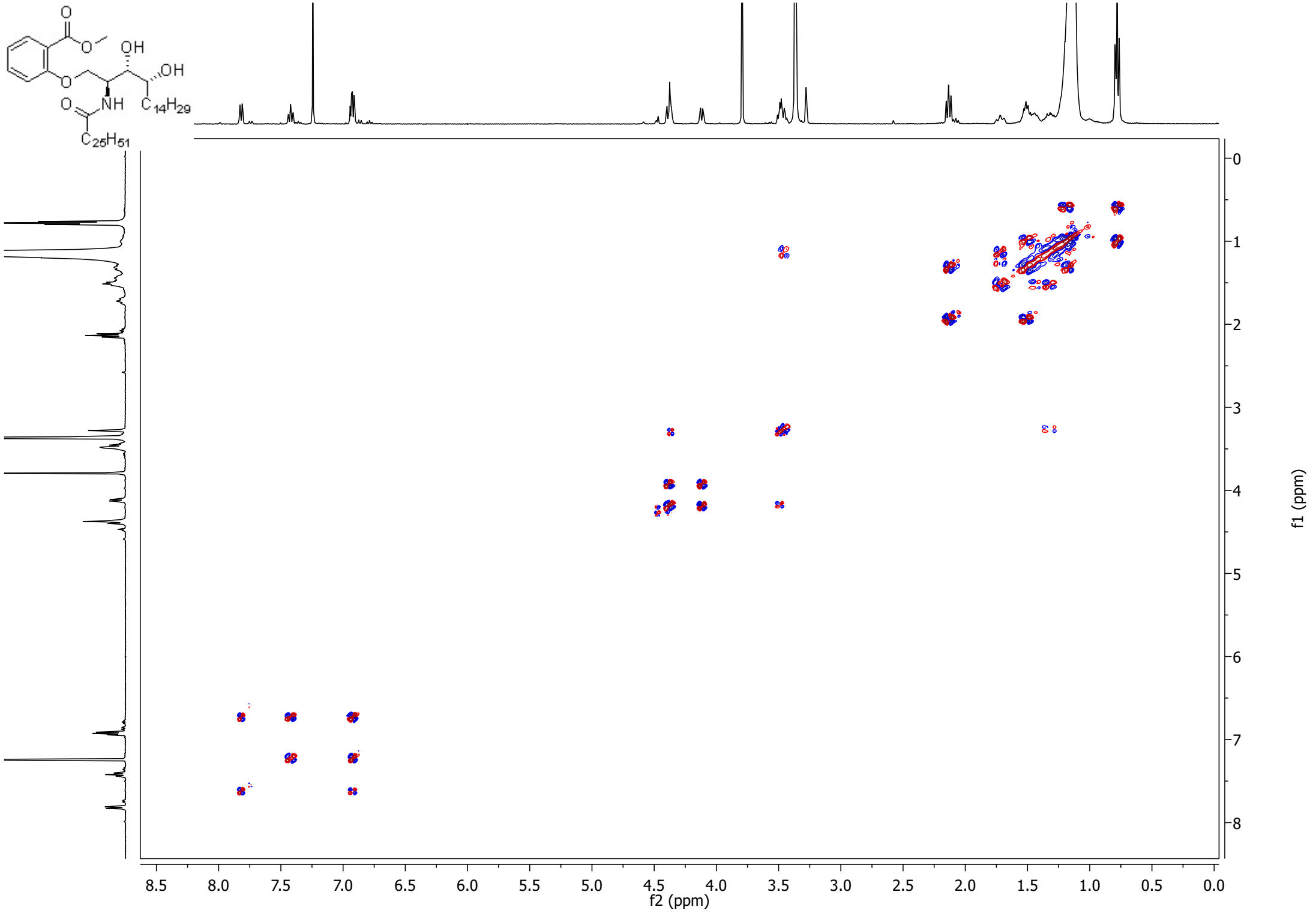

OH
OH
OH
O
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
f2 (ppm)
f1 (ppm)

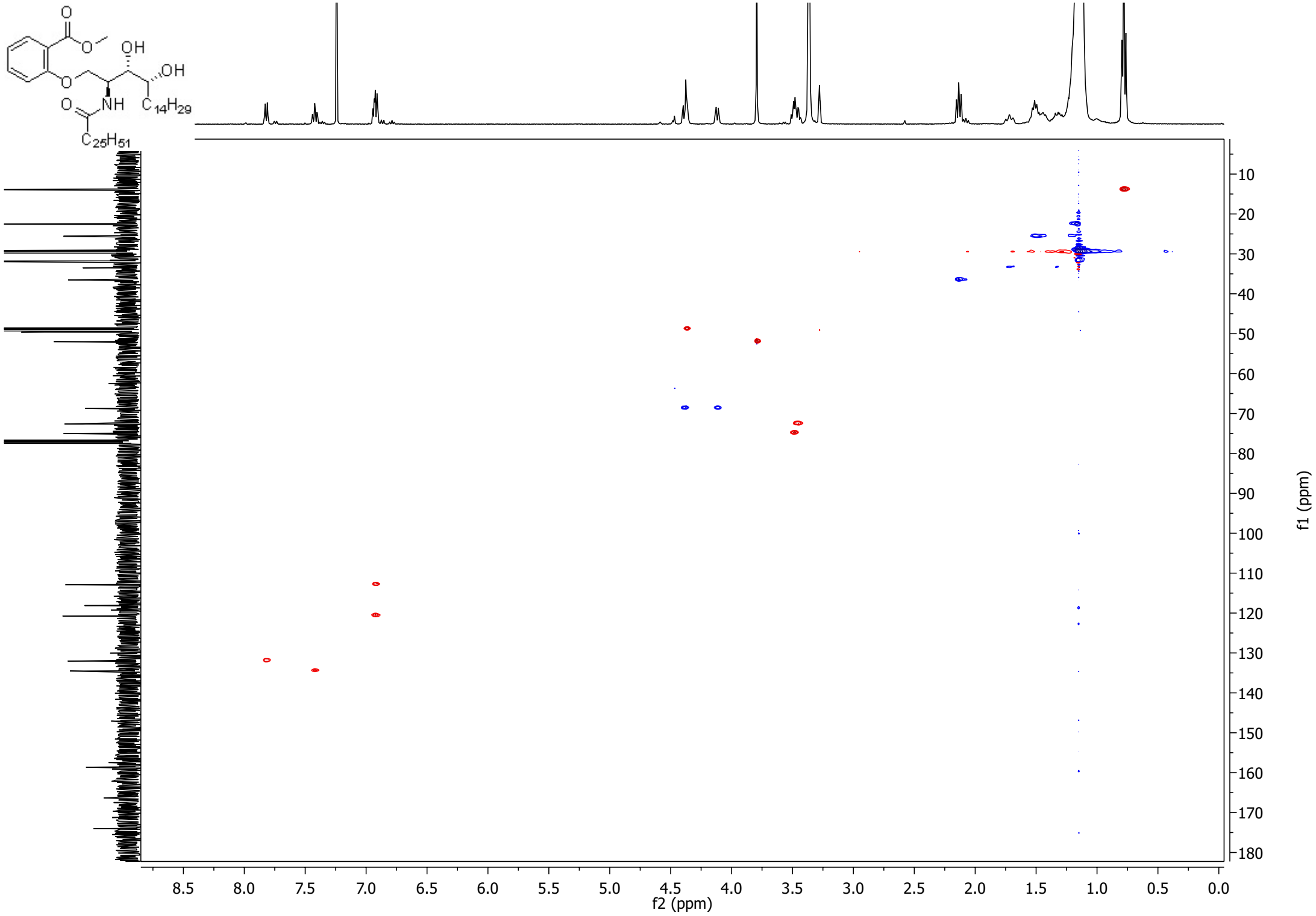

OH
OH
OH
O
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
f1 (ppm)

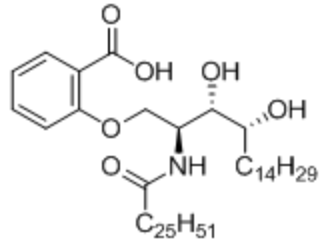

7.85 7.84 7.83 7.83 7.46 7.46 7.44 7.44 7.42 7.42 6.96 6.95 6.94 6.93
4.42 4.41 4.39 4.38 4.38 4.37 4.15 4.15 4.14 4.13 4.12 3.81 3.53 3.51 3.51 3.50 3.49 3.47 3.47 3.45 3.45
2.17 2.15 2.13 1.74 1.73 1.55 1.53 1.51 1.22 1.20 1.20 1.17 1.16 1.13 0.81 0.80 0.78
¹H NMR (400 MHz, Chloroform-d) δ 7.84 (dd, J = 7.9, 1.8 Hz, 1H), 7.44 (td, J = 7.9, 1.8 Hz, 1H), 6.94 (dd, J = 8.2, 5.1 Hz, 2H), 4.43 – 4.37 (m, 2H), 4.16 – 4.11 (m, 1H), 3.81 (s, 3H), 3.53 – 3.44 (m, 2H), 2.15 (t, J = 7.6 Hz, 2H), 1.83 – 1.64 (m, 1H), 1.53 (t, J = 7.3 Hz, 2H), 1.21 – 1.11 (m, 69H), 0.80 (t, J = 6.8 Hz, 6H).
O
O
OH
OH
O
O
NH
C14H29
C25H51
A (dd) 7.84
B (td) 7.44
C (dd) 6.94
E (m) 4.13
D (m) 4.39
L (s) 3.81
F (m) 3.50
I (t) 1.53
G (t) 2.15
H (m) 1.73
J (m) 1.17
K (t) 0.80
1.00
1.10
2.09
2.28
1.10
3.18
2.50
2.21
1.09
2.47
87.37
8.10
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)
1100 1000 900 800 700 600 500 400 300 200 100 0



^{13}C NMR (101 MHz, Chloroform-d) δ 174.14, 166.46, 158.75, 134.66, 132.15, 120.85, 118.25, 113.04, 75.14, 72.75, 68.84, 52.13, 49.74, 49.53, 49.32, 49.10, 48.94, 48.89, 48.68, 48.46, 36.62, 33.61, 31.91, 29.70, 29.69, 29.65, 29.62, 29.48, 29.35, 29.33, 29.23, 25.74, 25.63, 22.67, 14.04.

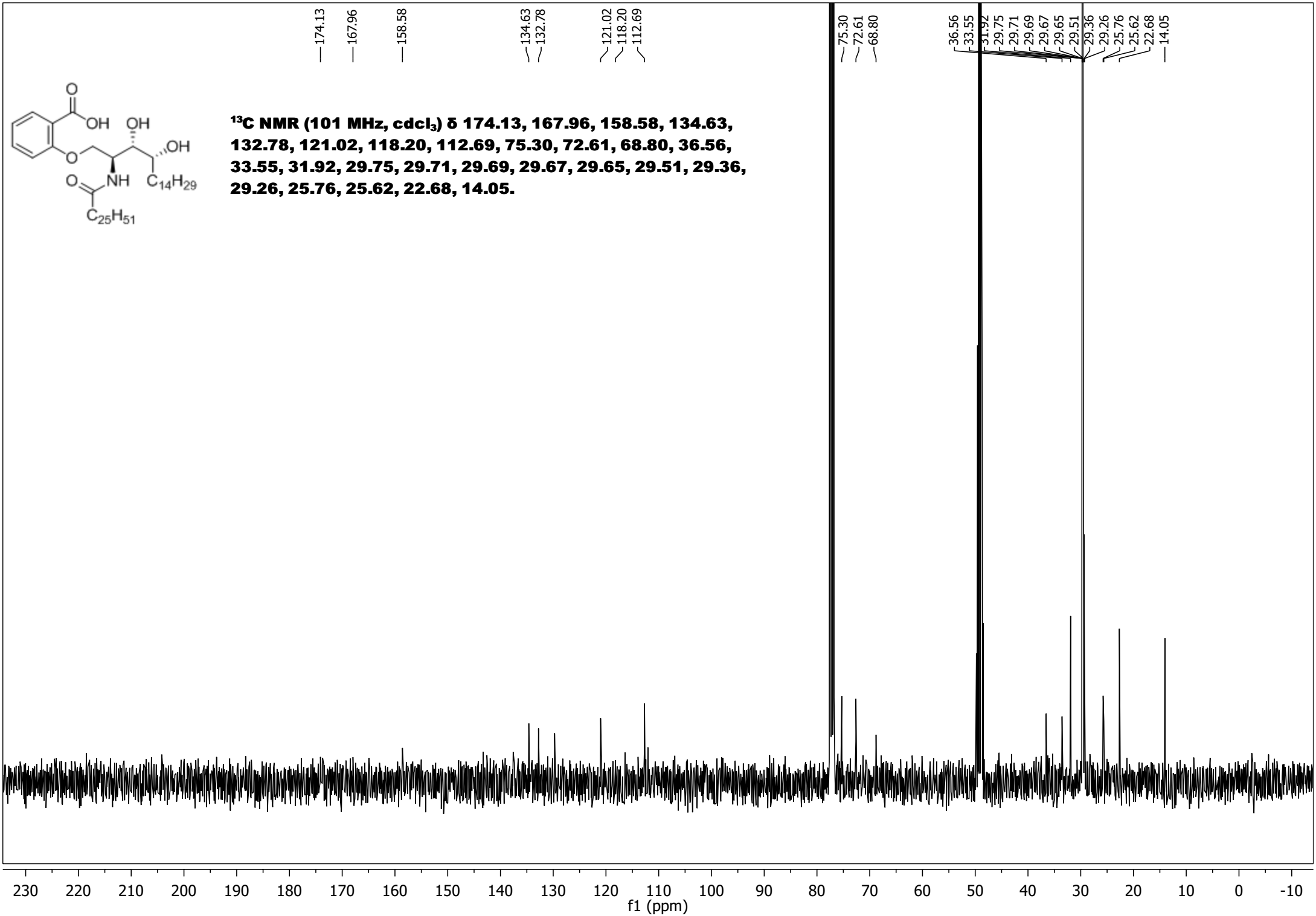

O
O
OH
OH
O
NH
C14H29
O
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
1
2
3
4
5
6
7
8
f1 (ppm)

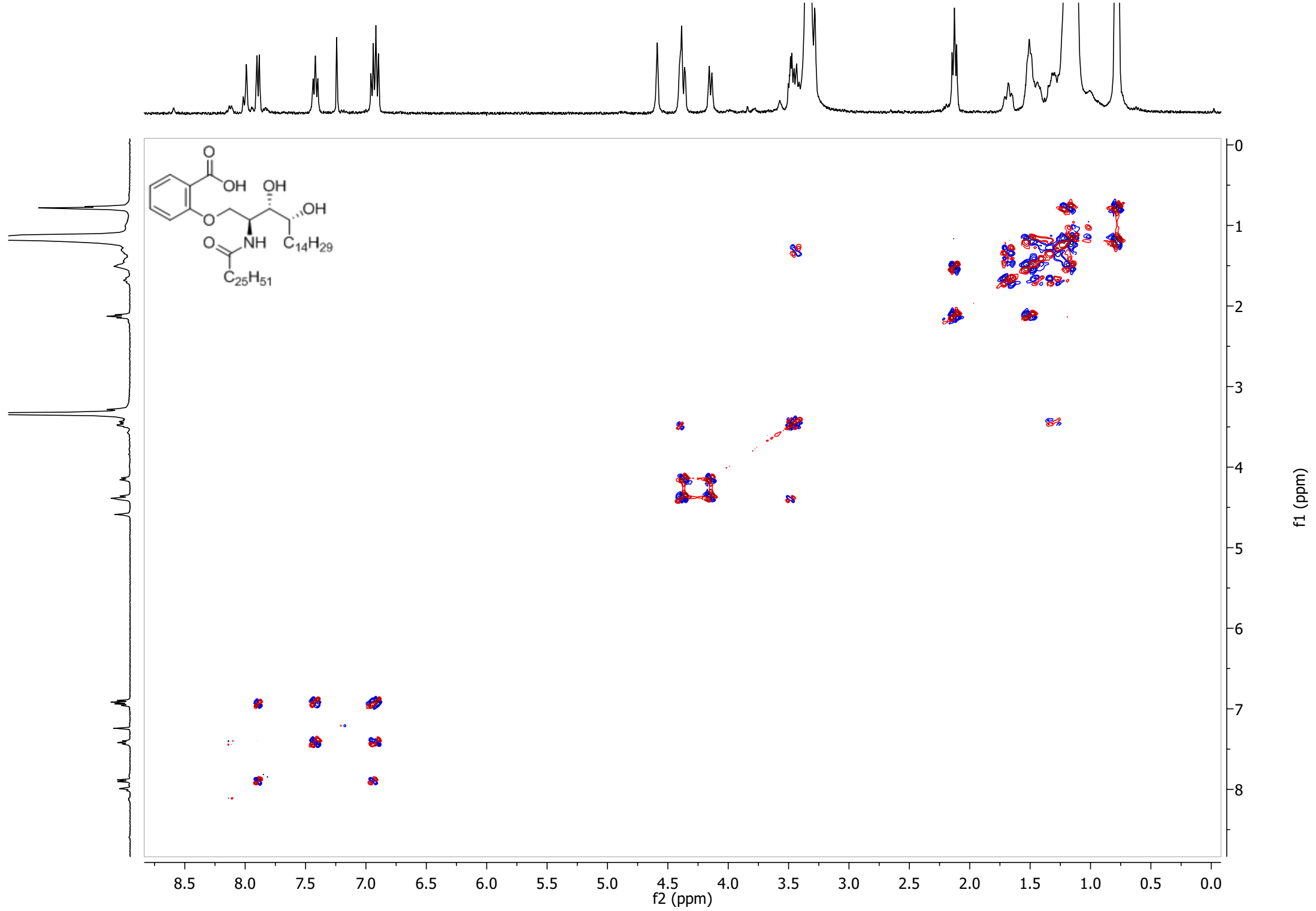

O
O
OH
OH
O
NH
C14H29
O
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
f1 (ppm)

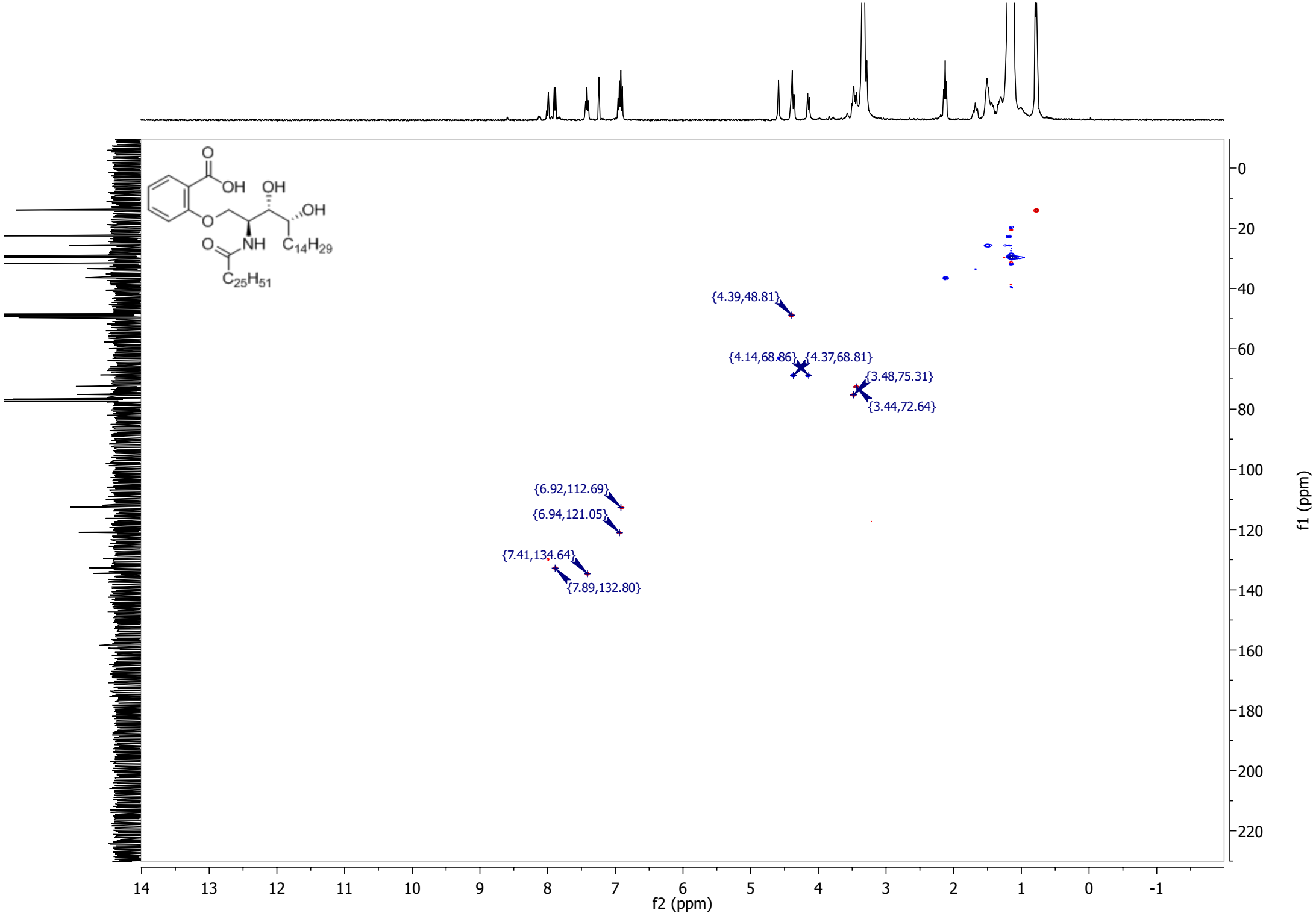


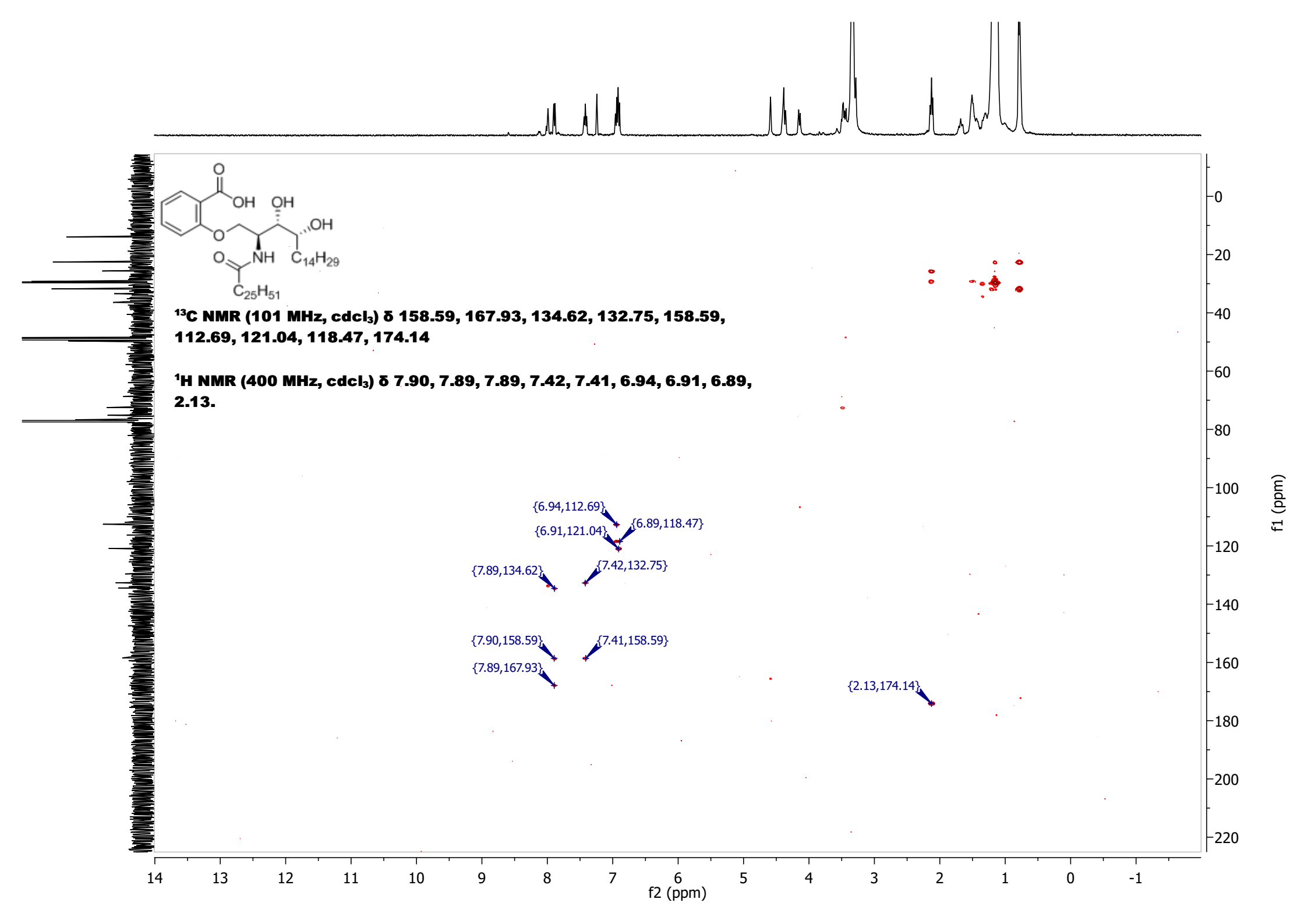
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.91 (dd, *J* = 7.8, 2.0 Hz, 1H), 7.43 (t, *J* = 7.9 Hz, 1H), 7.03 – 6.86 (m, 2H), 4.47 – 4.32 (m, 2H), 4.17 (dd, *J* = 9.3, 2.6 Hz, 1H), 3.49 (ddd, *J* = 15.3, 8.8, 5.9 Hz, 2H), 2.14 (t, *J* = 7.6 Hz, 2H), 1.57 – 1.42 (m, 4H), 1.37 – 1.00 (m, 68H), 0.80 (t, *J* = 6.7 Hz, 6H).

^{13}C NMR (101 MHz, cdcl$_3$) δ 174.13, 167.96, 158.58, 134.63, 132.78, 121.02, 118.20, 112.69, 75.30, 72.61, 68.80, 36.56, 33.55, 31.92, 29.75, 29.71, 29.69, 29.67, 29.65, 29.51, 29.36, 29.26, 25.76, 25.62, 22.68, 14.05.

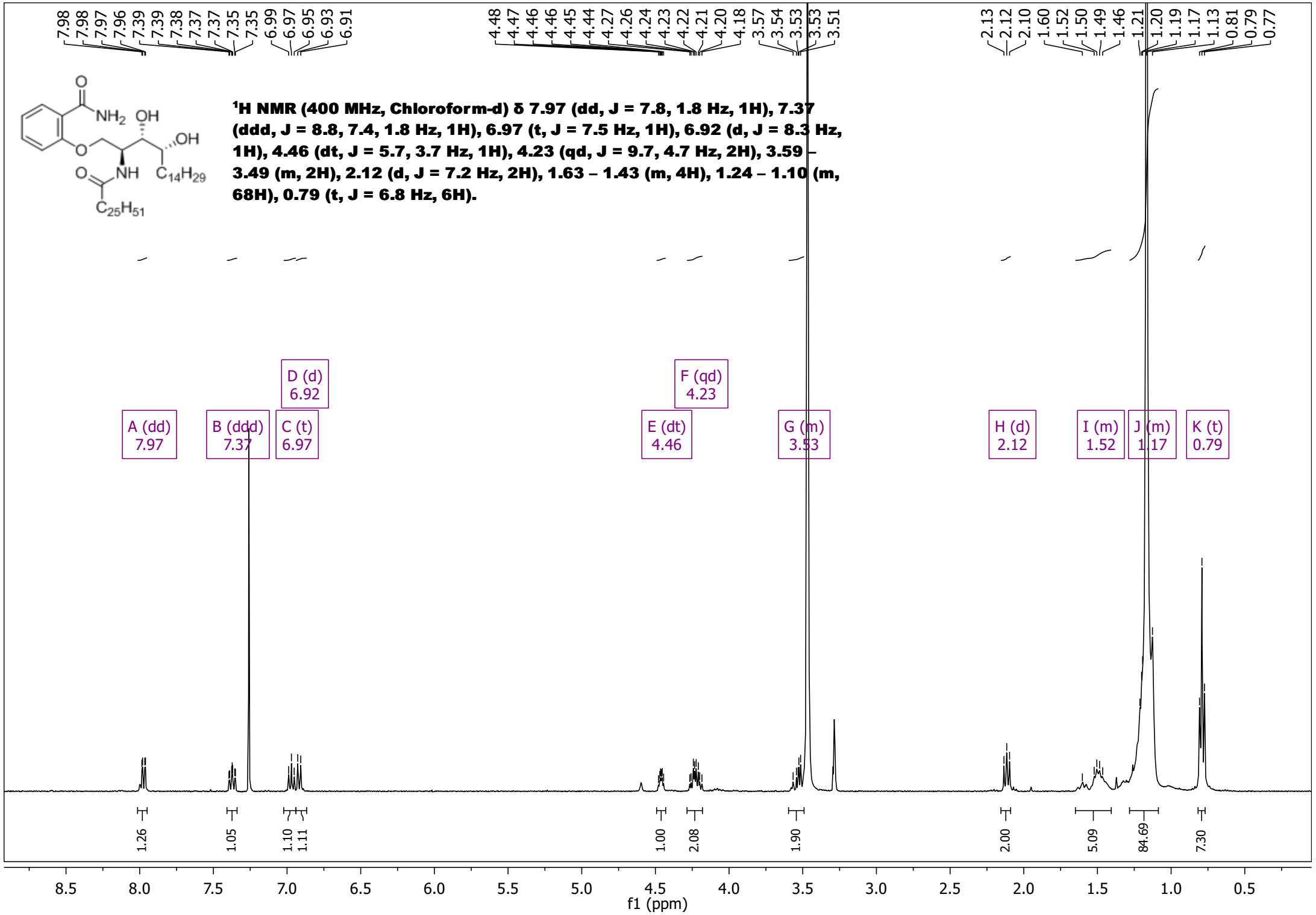


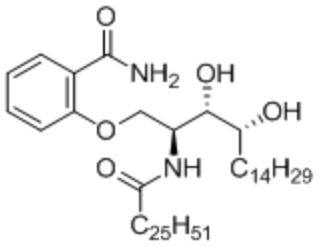

O
OH
OH
OH
O
NH
O
$C_{14}H_{29}$
$C_{25}H_{51}$
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
1
2
3
4
5
6
7
8
f1 (ppm)


{4.39,48.81}
{4.14,68.86}
{4.37,68.81}
{3.48,75.31}
{3.44,72.64}
{6.92,112.69}
{6.94,121.05}
{7.41,134.64}
{7.89,132.80}
f2 (ppm)
f1 (ppm)

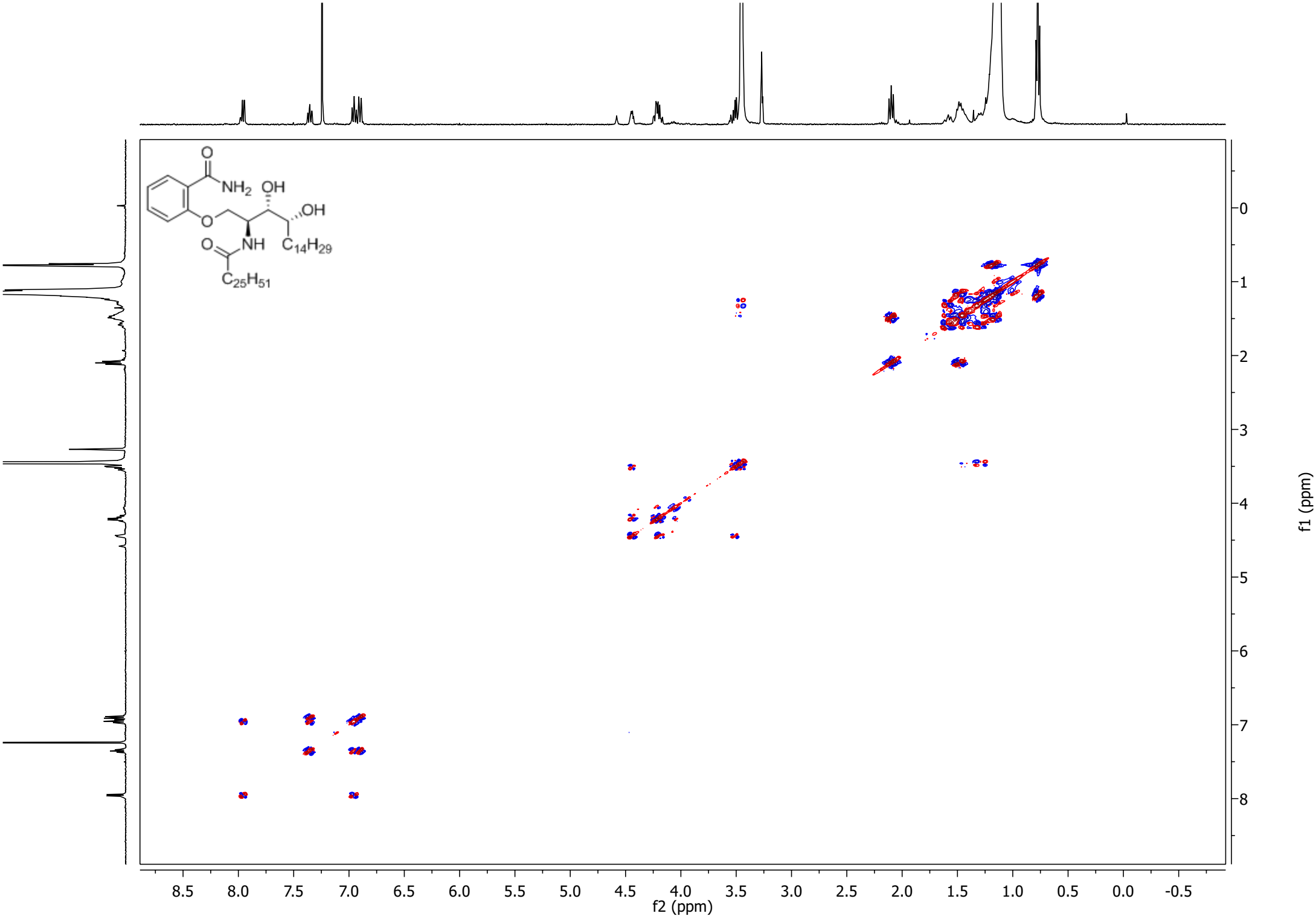

OH
OH
OH
O
NH
$C_{14}H_{29}$
$C_{25}H_{51}$
^{13}C NMR (101 MHz, cdcl$_3$) δ 158.59, 167.93, 134.62, 132.75, 158.59, 112.69, 121.04, 118.47, 174.14
^{1}H NMR (400 MHz, cdcl$_3$) δ 7.90, 7.89, 7.89, 7.42, 7.41, 6.94, 6.91, 6.89, 2.13.
{6.94,112.69}
{6.89,118.47}
{6.91,121.04}
{7.89,134.62}
{7.42,132.75}
{7.90,158.59}
{7.41,158.59}
{7.89,167.93}
{2.13,174.14}
f2 (ppm)
f1 (ppm)

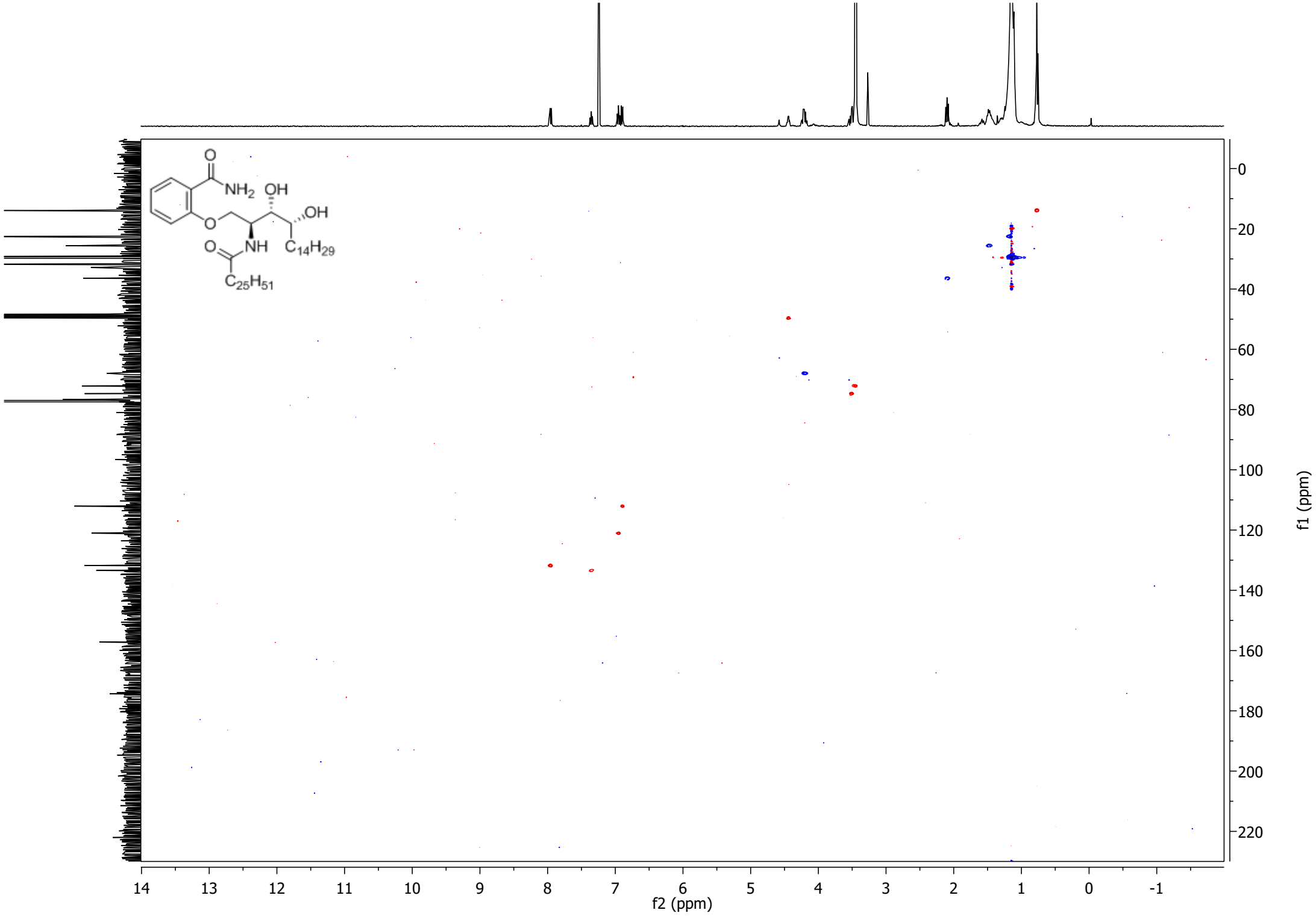
^{1}H NMR (400 MHz, Chloroform-d) δ 7.97 (dd, J = 7.8, 1.8 Hz, 1H), 7.37 (ddd, J = 8.8, 7.4, 1.8 Hz, 1H), 6.97 (t, J = 7.5 Hz, 1H), 6.92 (d, J = 8.3 Hz, 1H), 4.46 (dt, J = 5.7, 3.7 Hz, 1H), 4.23 (qd, J = 9.7, 4.7 Hz, 2H), 3.59 – 3.49 (m, 2H), 2.12 (d, J = 7.2 Hz, 2H), 1.63 – 1.43 (m, 4H), 1.24 – 1.10 (m, 68H), 0.79 (t, J = 6.8 Hz, 6H).



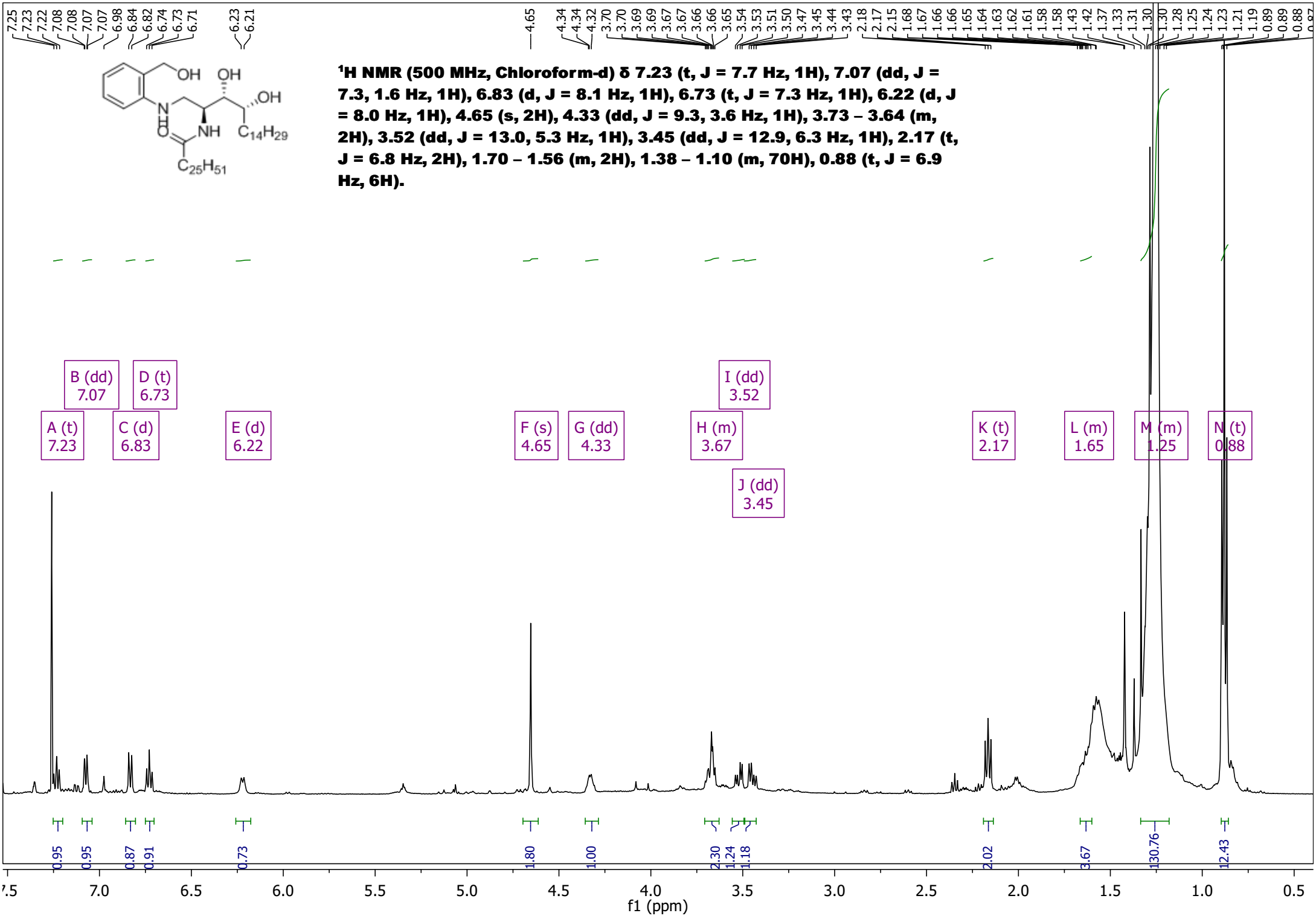


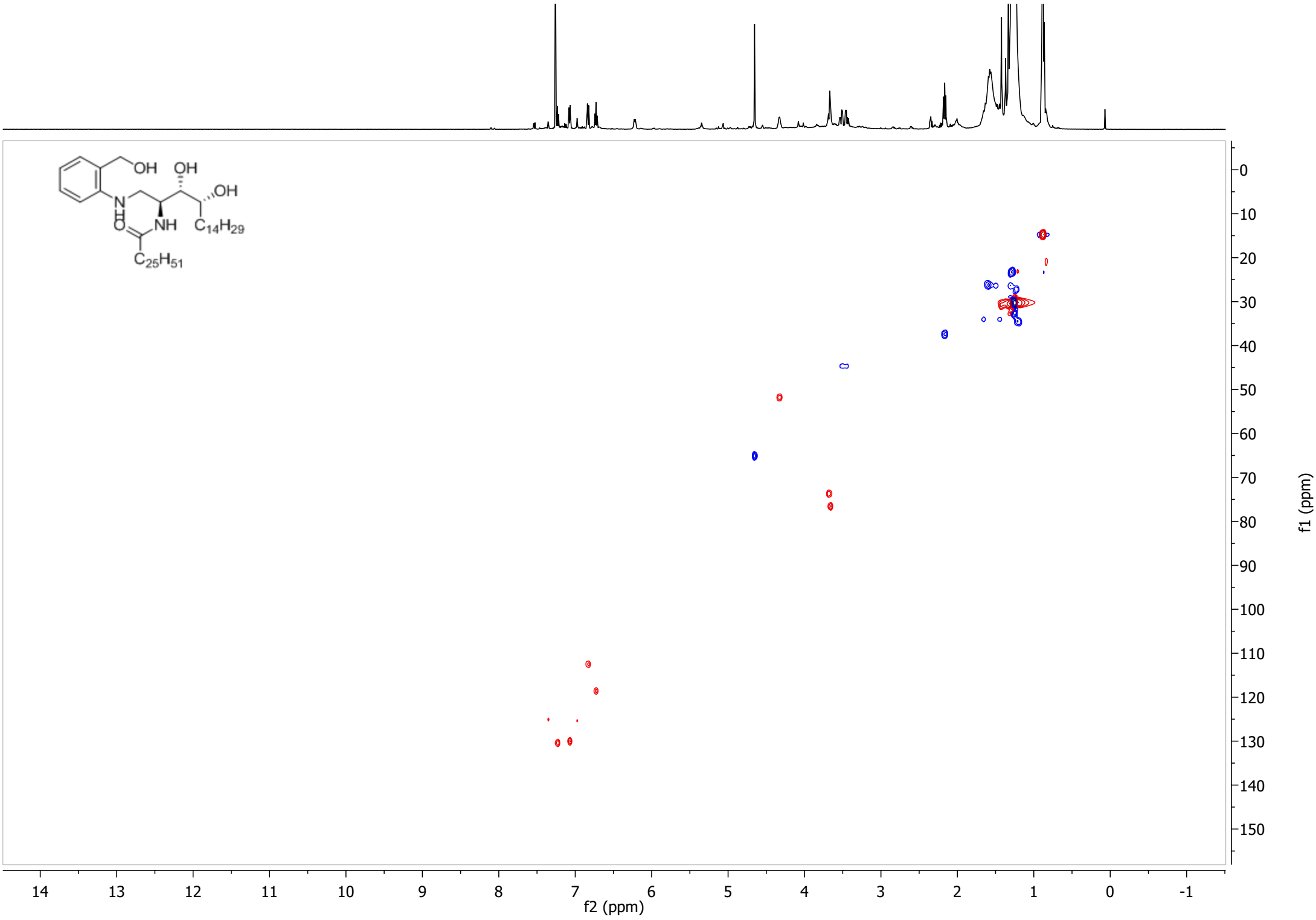
^{13}C NMR (101 MHz, Chloroform-d) δ 174.47, 174.07, 157.30, 133.53, 131.89, 121.15, 112.17, 74.83, 72.27, 68.08, 49.70, 36.54, 32.99, 31.90, 29.70, 29.67, 29.63, 29.50, 29.36, 29.34, 29.27, 25.77, 25.72, 22.66, 14.02.


O
NH2
OH
OH
O
NH
C14H29
O
C25H51
f2 (ppm)
f1 (ppm)


O
NH2
OH
OH
O
NH
C14H29
O
C25H51
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
20
40
60
80
100
120
140
160
180
200
220
f1 (ppm)

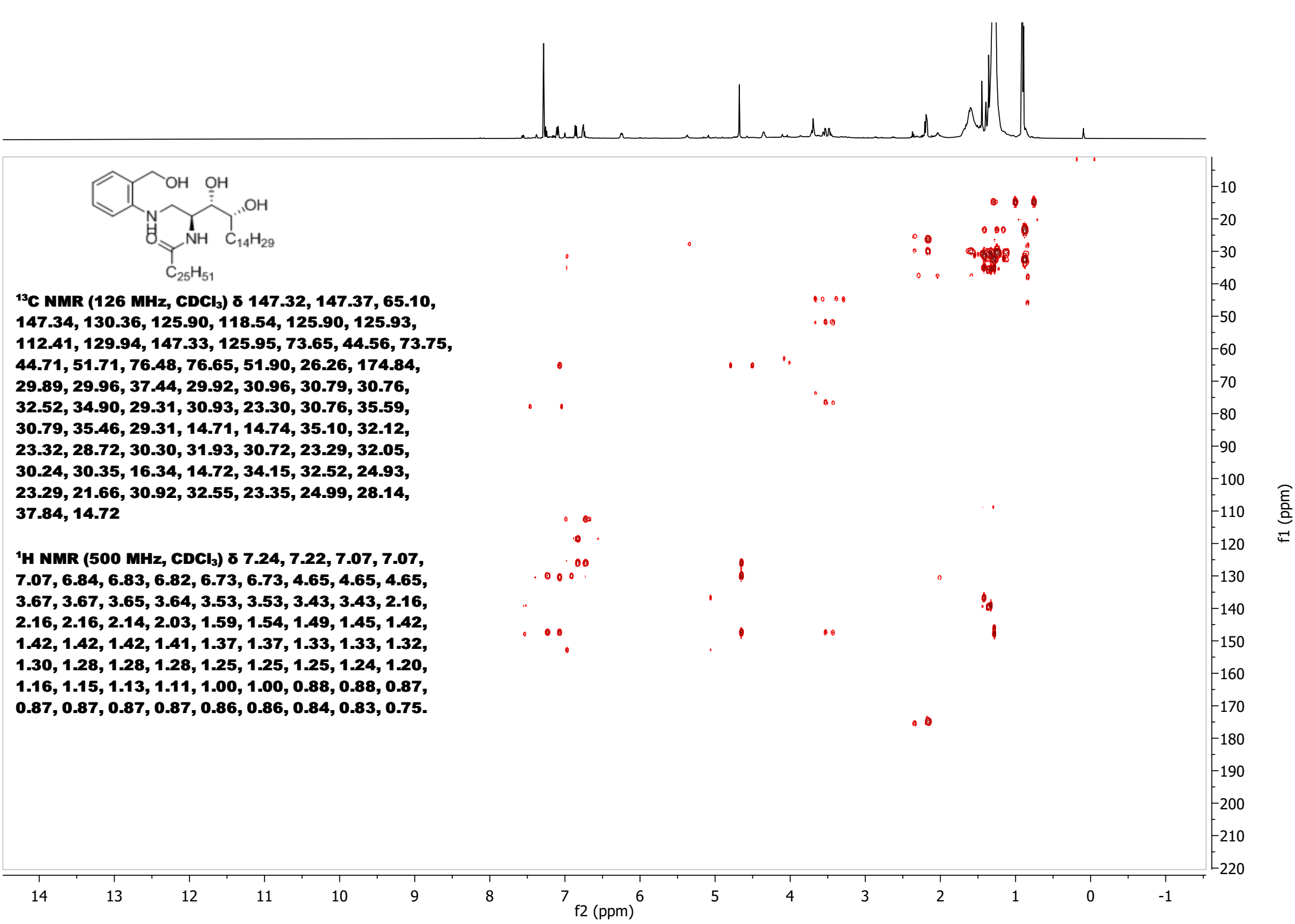
^{1}H NMR (500 MHz, Chloroform-d) δ 7.23 (t, J = 7.7 Hz, 1H), 7.07 (dd, J = 7.3, 1.6 Hz, 1H), 6.83 (d, J = 8.1 Hz, 1H), 6.73 (t, J = 7.3 Hz, 1H), 6.22 (d, J = 8.0 Hz, 1H), 4.65 (s, 2H), 4.33 (dd, J = 9.3, 3.6 Hz, 1H), 3.73 – 3.64 (m, 2H), 3.52 (dd, J = 13.0, 5.3 Hz, 1H), 3.45 (dd, J = 12.9, 6.3 Hz, 1H), 2.17 (t, J = 6.8 Hz, 2H), 1.70 – 1.56 (m, 2H), 1.38 – 1.10 (m, 70H), 0.88 (t, J = 6.9 Hz, 6H).



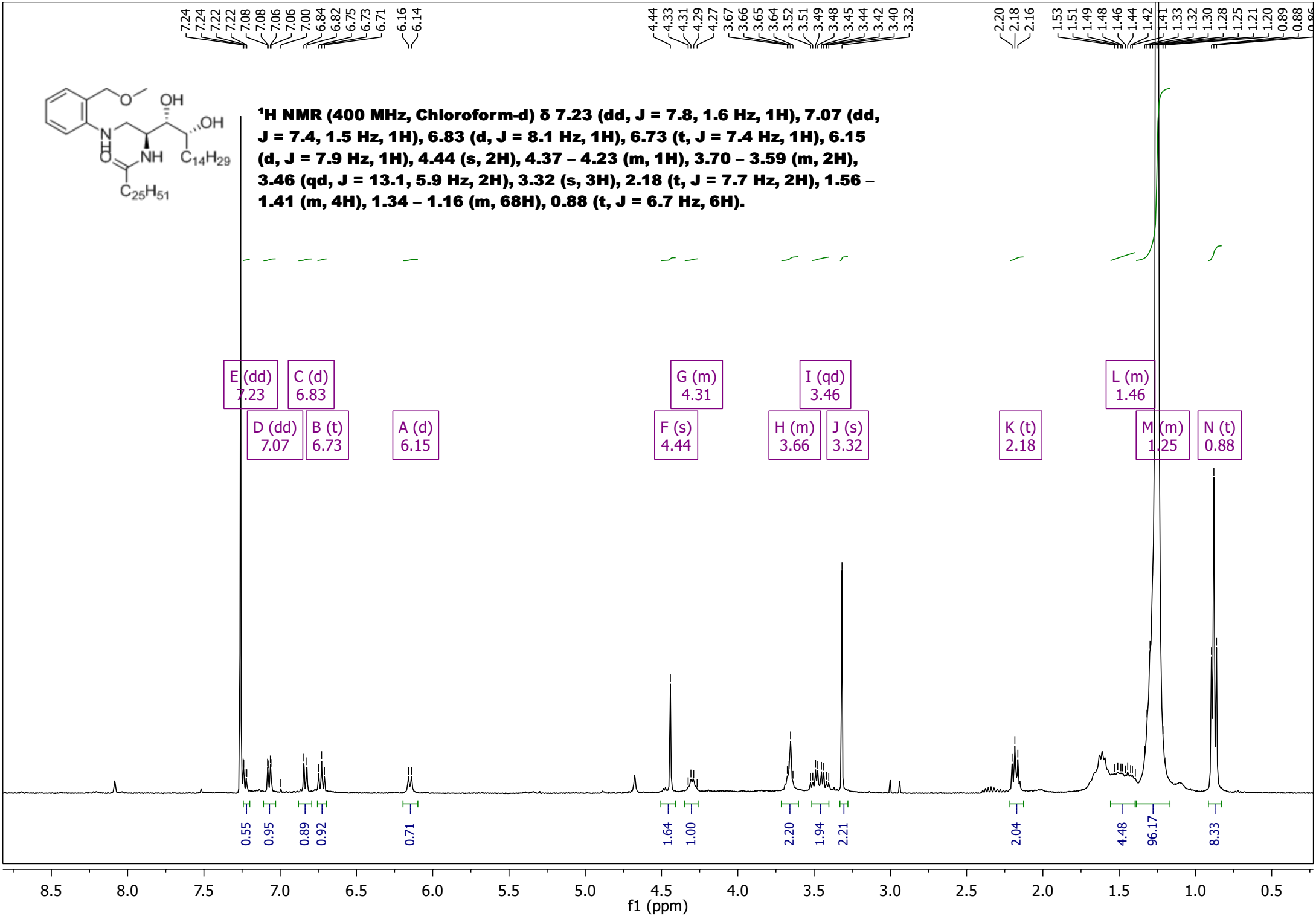

OH
OH
OH
N
H
O
NH
$C_{14}H_{29}$
$C_{25}H_{51}$
f2 (ppm)
f1 (ppm)

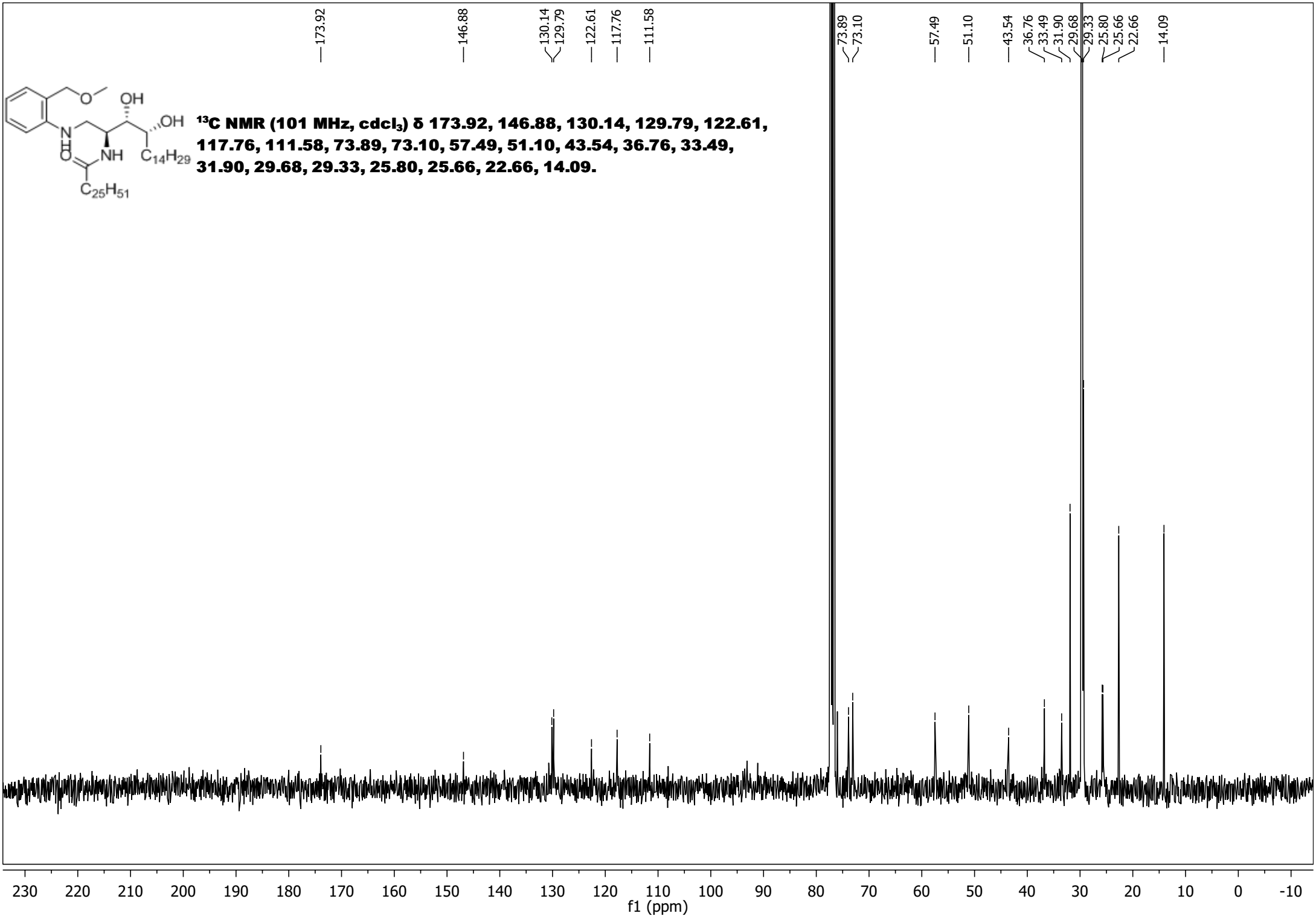
^{13}C NMR (126 MHz, $CDCl_3$) δ 147.32, 147.37, 65.10, 147.34, 130.36, 125.90, 118.54, 125.90, 125.93, 112.41, 129.94, 147.33, 125.95, 73.65, 44.56, 73.75, 44.71, 51.71, 76.48, 76.65, 51.90, 26.26, 174.84, 29.89, 29.96, 37.44, 29.92, 30.96, 30.79, 30.76, 32.52, 34.90, 29.31, 30.93, 23.30, 30.76, 35.59, 30.79, 35.46, 29.31, 14.71, 14.74, 35.10, 32.12, 23.32, 28.72, 30.30, 31.93, 30.72, 23.29, 32.05, 30.24, 30.35, 16.34, 14.72, 34.15, 32.52, 24.93, 23.29, 21.66, 30.92, 32.55, 23.35, 24.99, 28.14, 37.84, 14.72

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.24, 7.22, 7.07, 7.07, 7.07, 6.84, 6.83, 6.82, 6.73, 6.73, 4.65, 4.65, 4.65, 3.67, 3.67, 3.65, 3.64, 3.53, 3.53, 3.43, 3.43, 2.16, 2.16, 2.16, 2.14, 2.03, 1.59, 1.54, 1.49, 1.45, 1.42, 1.42, 1.42, 1.42, 1.41, 1.37, 1.37, 1.33, 1.33, 1.32, 1.30, 1.28, 1.28, 1.28, 1.25, 1.25, 1.25, 1.24, 1.20, 1.16, 1.15, 1.13, 1.11, 1.00, 1.00, 0.88, 0.88, 0.87, 0.87, 0.87, 0.87, 0.87, 0.86, 0.86, 0.84, 0.83, 0.75.

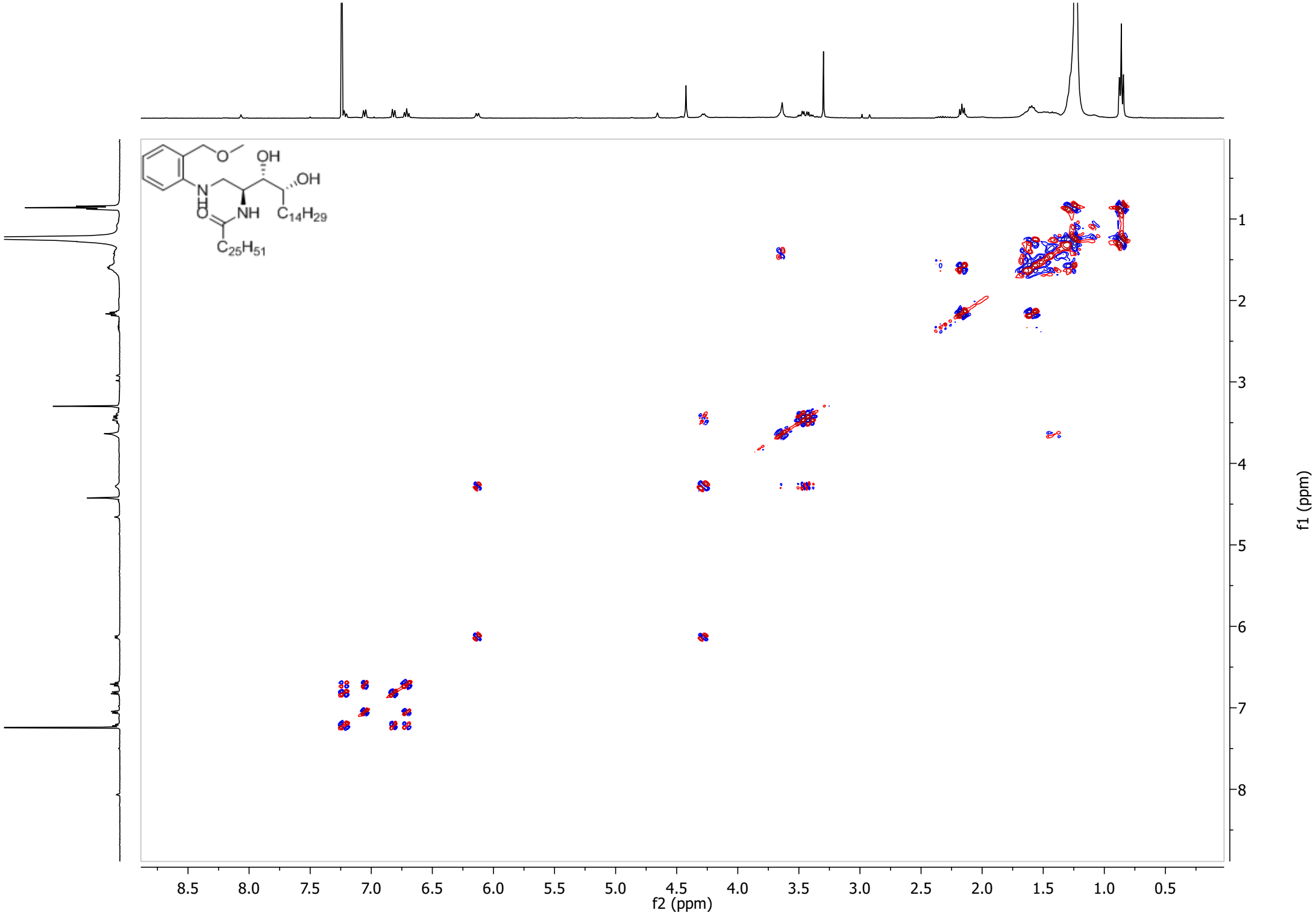


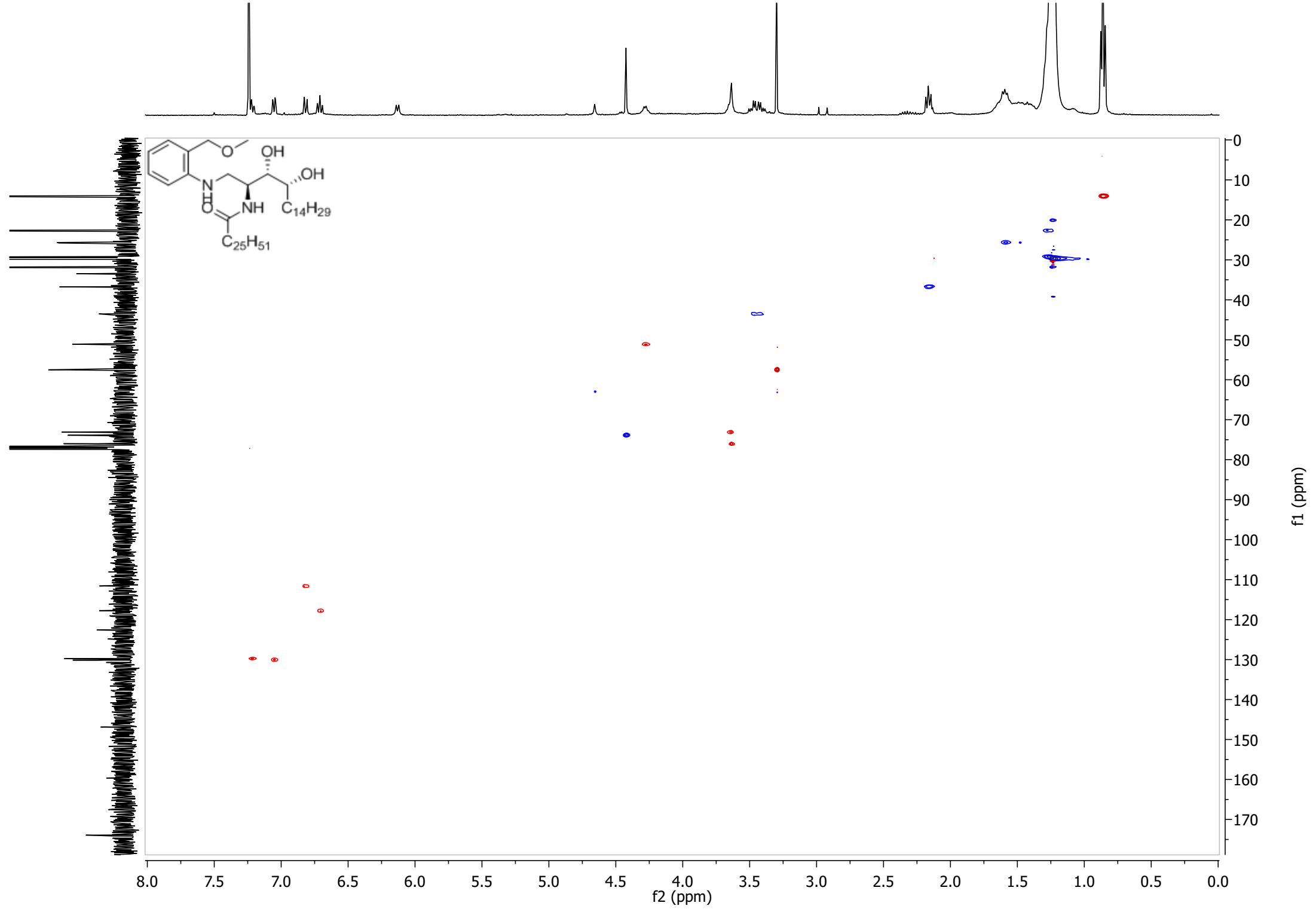
^{1}H NMR (400 MHz, Chloroform-d) δ 7.23 (dd, J = 7.8, 1.6 Hz, 1H), 7.07 (dd, J = 7.4, 1.5 Hz, 1H), 6.83 (d, J = 8.1 Hz, 1H), 6.73 (t, J = 7.4 Hz, 1H), 6.15 (d, J = 7.9 Hz, 1H), 4.44 (s, 2H), 4.37 – 4.23 (m, 1H), 3.70 – 3.59 (m, 2H), 3.46 (qd, J = 13.1, 5.9 Hz, 2H), 3.32 (s, 3H), 2.18 (t, J = 7.7 Hz, 2H), 1.56 – 1.41 (m, 4H), 1.34 – 1.16 (m, 68H), 0.88 (t, J = 6.7 Hz, 6H).

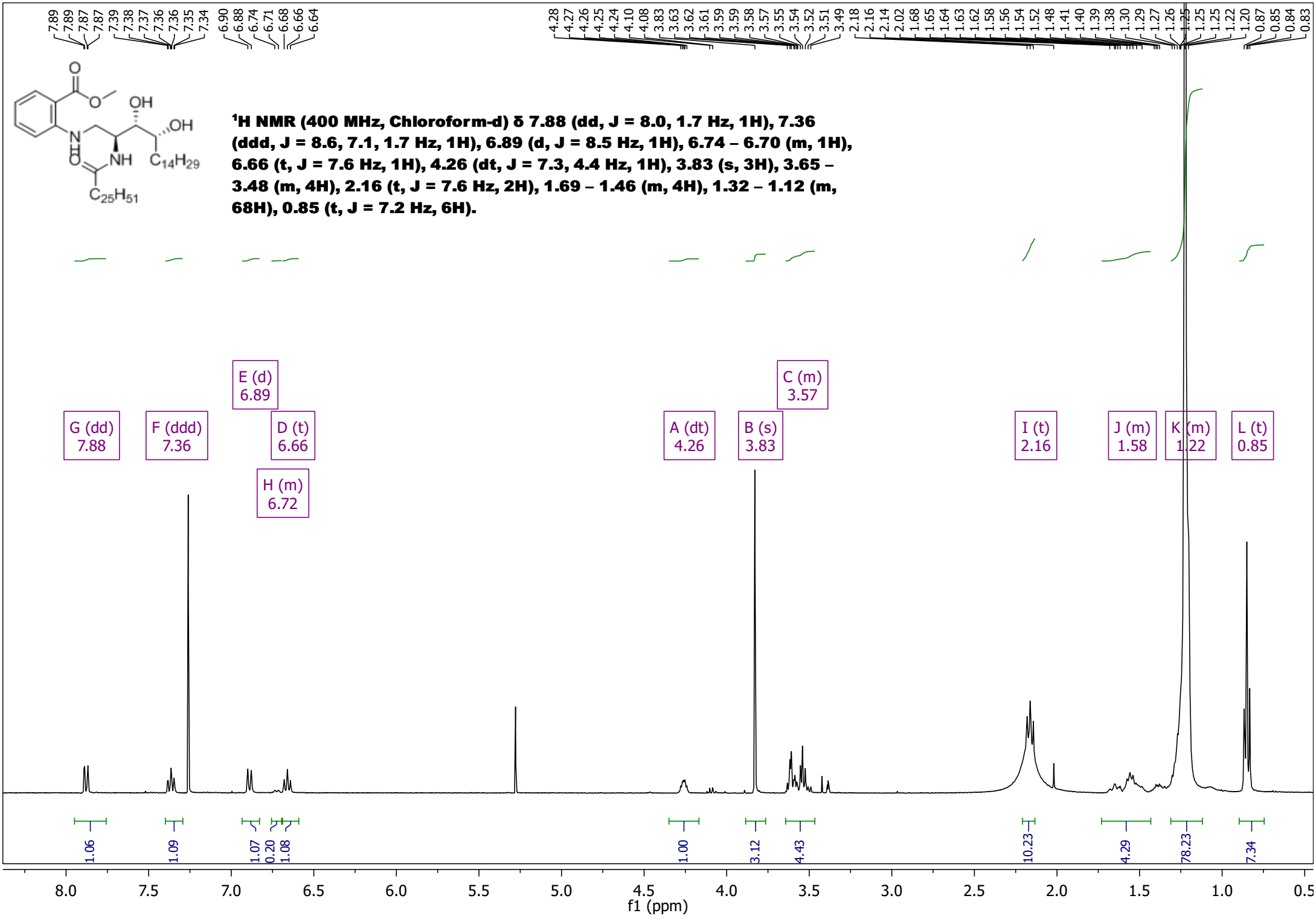




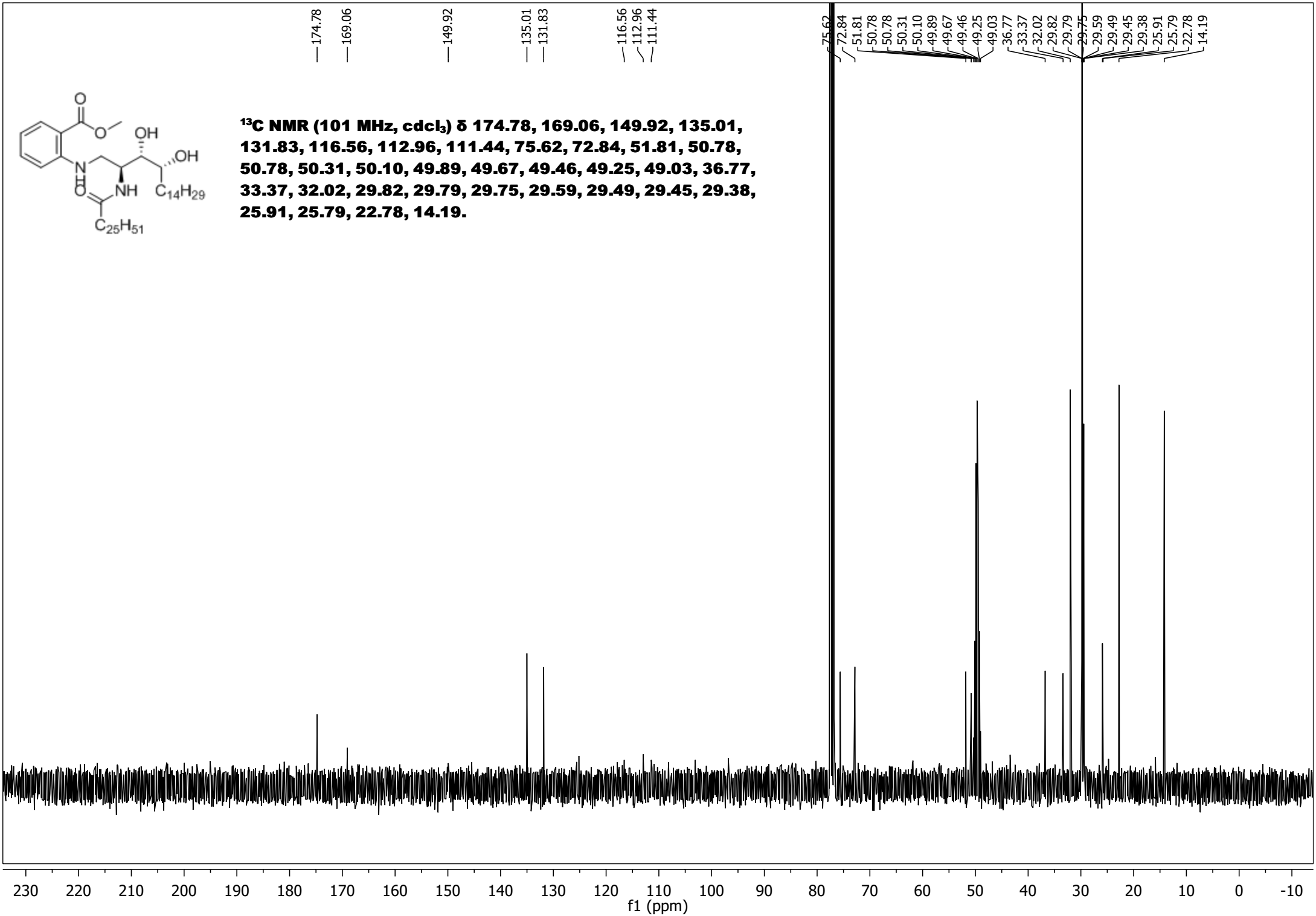
^{13}C NMR (101 MHz, cdcl$_3$) δ 173.92, 146.88, 130.14, 129.79, 122.61, 117.76, 111.58, 73.89, 73.10, 57.49, 51.10, 43.54, 36.76, 33.49, 31.90, 29.68, 29.33, 25.80, 25.66, 22.66, 14.09.

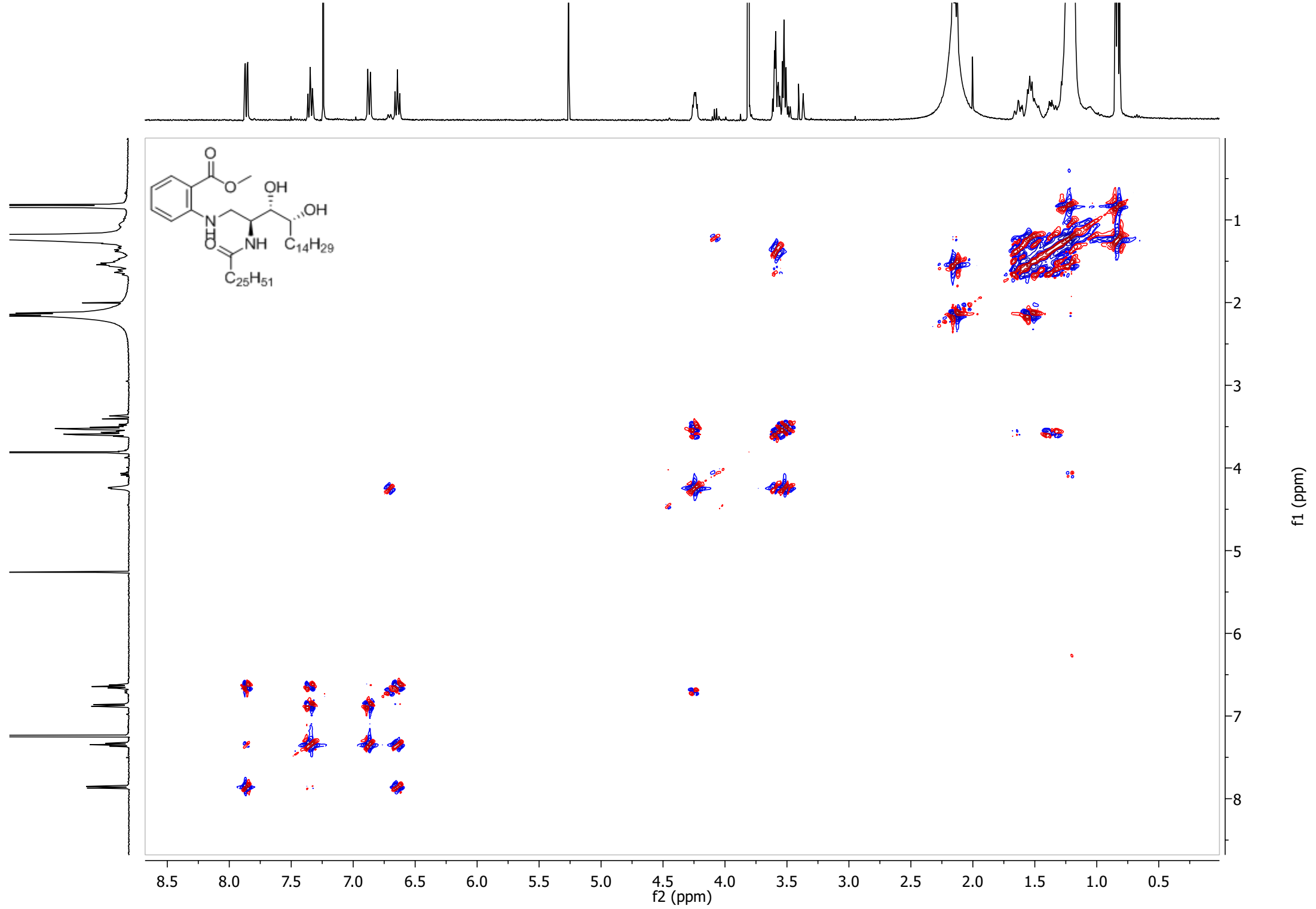

OH
OH
O
N
H
O
NH
C14H29
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

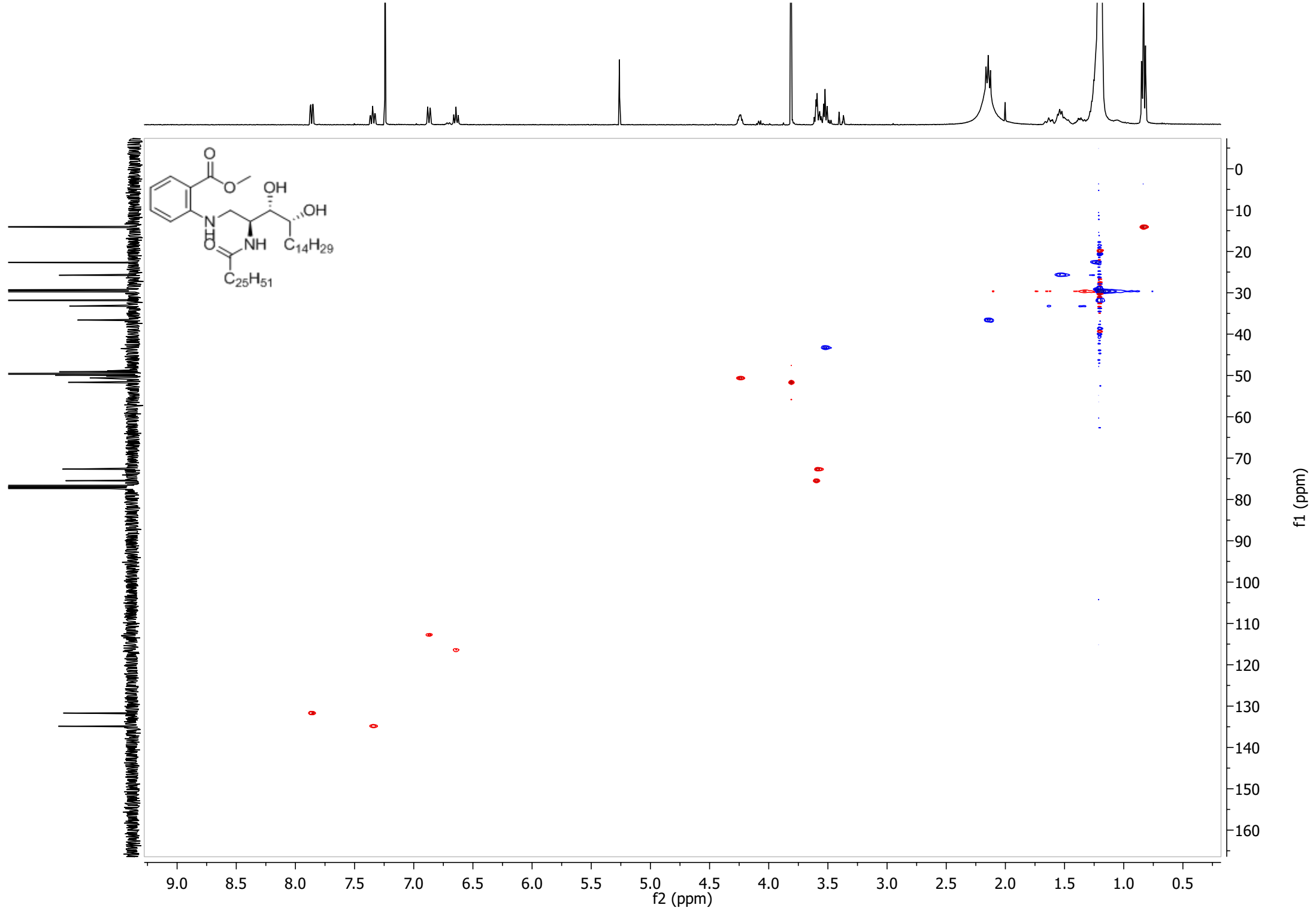

OH
OH
O
N
H
O
NH
C14H29
C25H51
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
f1 (ppm)

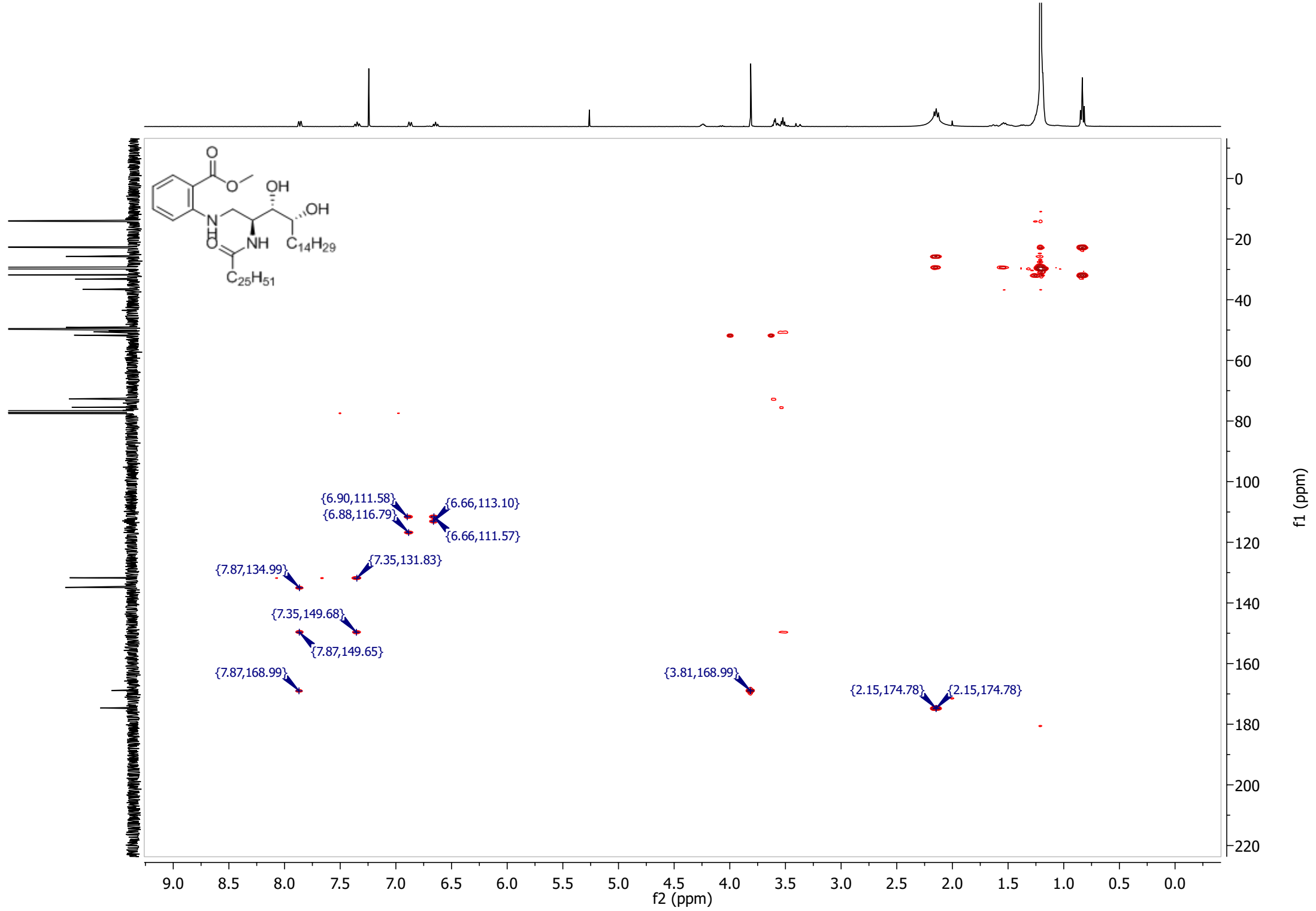

7.89 7.89 7.87 7.87 7.39 7.38 7.37 7.36 7.36 7.35 7.34 6.90 6.88 6.74 6.71 6.68 6.66 6.64
4.28 4.27 4.26 4.25 4.24 4.10 4.08 3.83 3.63 3.62 3.61 3.59 3.59 3.58 3.57 3.55 3.54 3.52 3.51 3.49 2.18 2.16 2.14 2.02 1.68 1.65 1.64 1.63 1.62 1.58 1.56 1.54 1.52 1.48 1.41 1.40 1.39 1.38 1.30 1.29 1.27 1.26 1.25 1.25 1.25 1.22 1.20 0.87 0.85 0.84 0.83
O
OH
OH
N
H
O
NH
C14H29
C25H51
¹H NMR (400 MHz, Chloroform-d) δ 7.88 (dd, J = 8.0, 1.7 Hz, 1H), 7.36 (ddd, J = 8.6, 7.1, 1.7 Hz, 1H), 6.89 (d, J = 8.5 Hz, 1H), 6.74 – 6.70 (m, 1H), 6.66 (t, J = 7.6 Hz, 1H), 4.26 (dt, J = 7.3, 4.4 Hz, 1H), 3.83 (s, 3H), 3.65 – 3.48 (m, 4H), 2.16 (t, J = 7.6 Hz, 2H), 1.69 – 1.46 (m, 4H), 1.32 – 1.12 (m, 68H), 0.85 (t, J = 7.2 Hz, 6H).
E (d) 6.89
C (m) 3.57
G (dd) 7.88
F (ddd) 7.36
D (t) 6.66
A (dt) 4.26
B (s) 3.83
I (t) 2.16
J (m) 1.58
K (m) 1.22
L (t) 0.85
H (m) 6.72
1.06
1.09
1.07
0.20
1.08
1.00
3.12
4.43
10.23
4.29
78.23
7.34
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

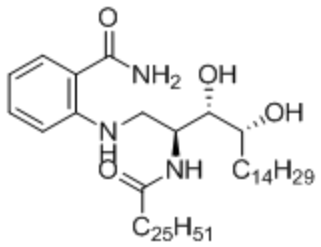
^{13}C NMR (101 MHz, cdcl$_3$) δ 174.78, 169.06, 149.92, 135.01, 131.83, 116.56, 112.96, 111.44, 75.62, 72.84, 51.81, 50.78, 50.78, 50.31, 50.10, 49.89, 49.67, 49.46, 49.25, 49.03, 36.77, 33.37, 32.02, 29.82, 29.79, 29.75, 29.59, 29.49, 29.45, 29.38, 25.91, 25.79, 22.78, 14.19.



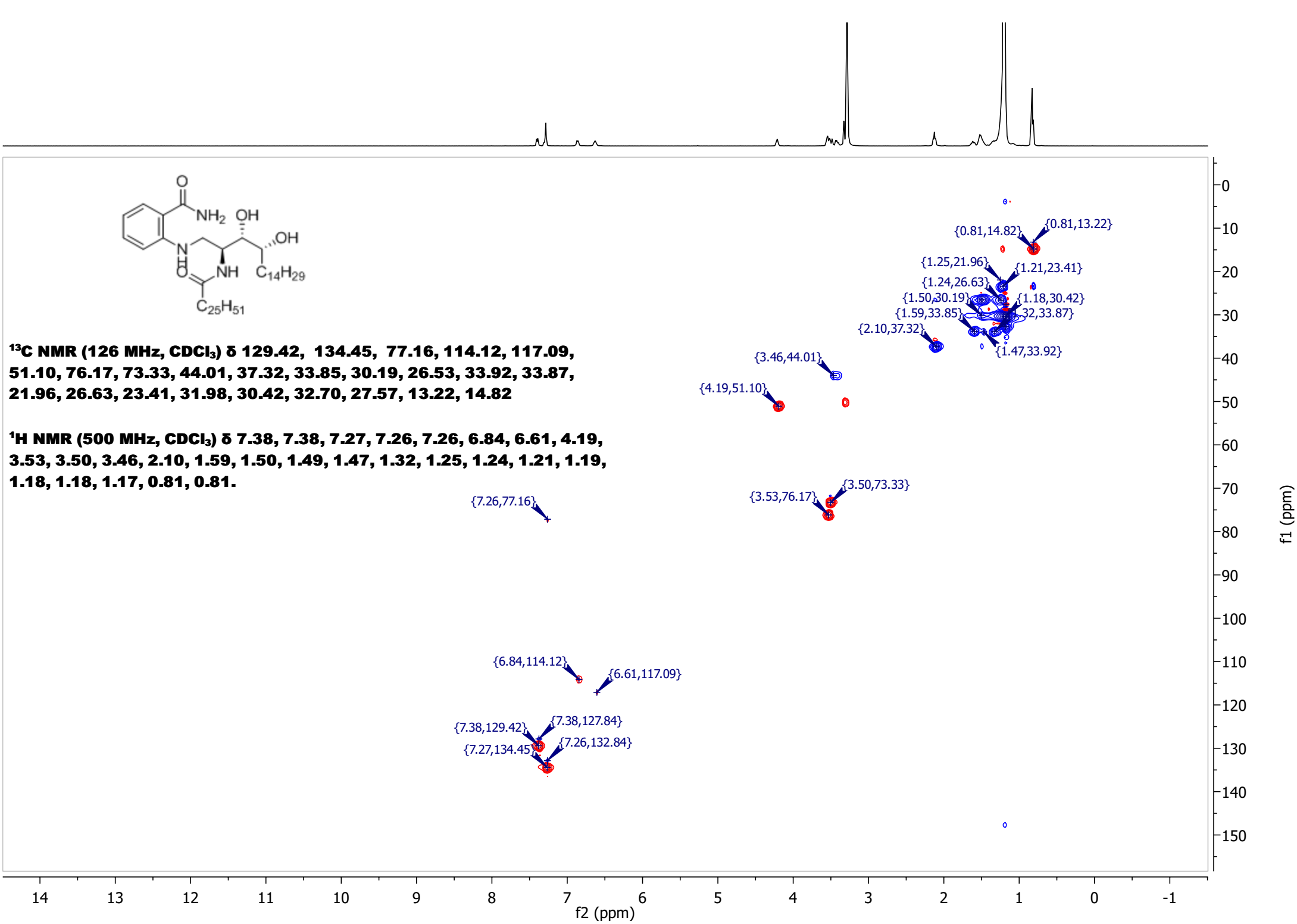

O
O
OH
OH
N
H
O
NH
C14H29
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

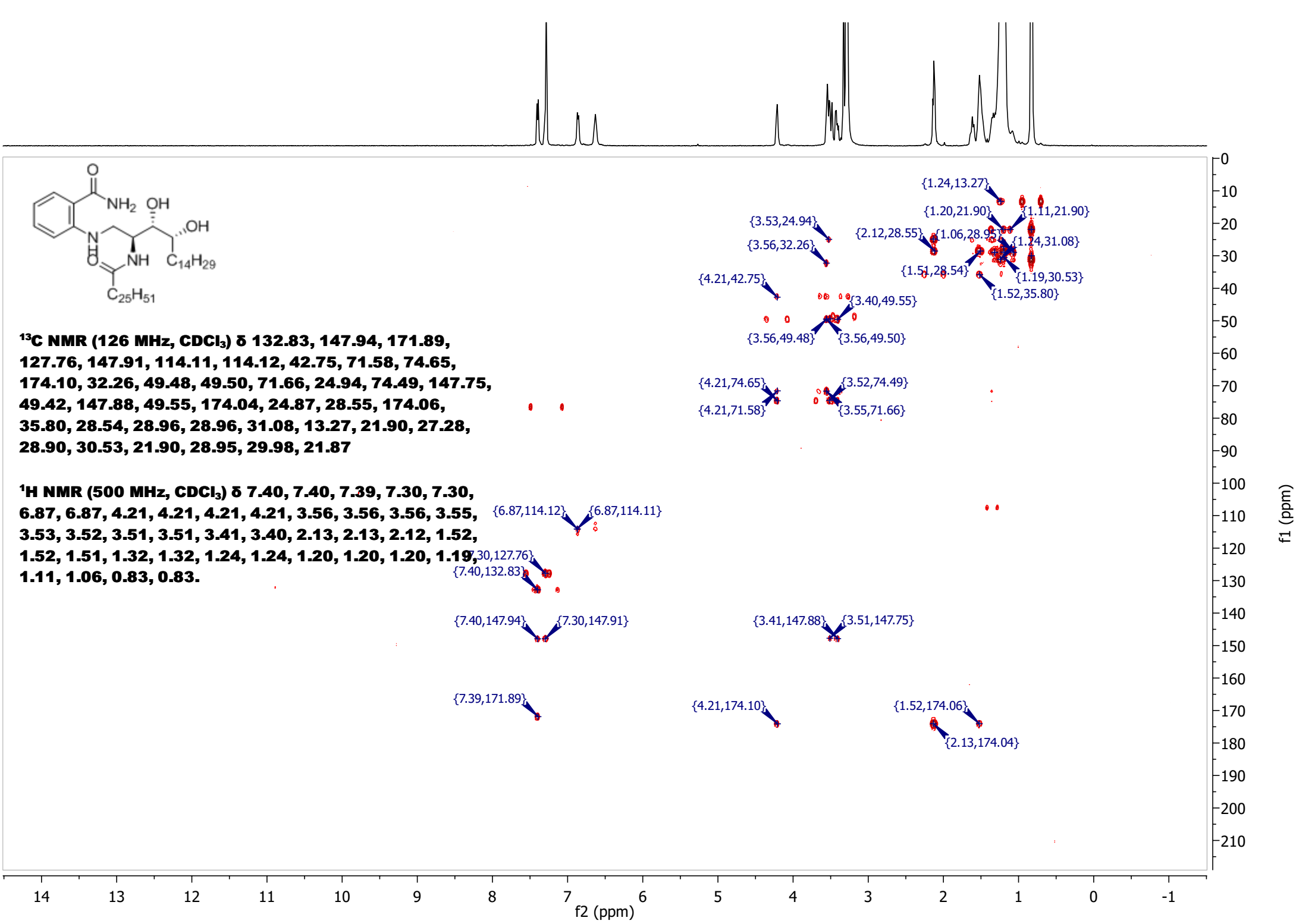

O
O
OH
OH
N
H
O
NH
C14H29
C25H51
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
f1 (ppm)


{6.90,111.58}
{6.88,116.79}
{6.66,113.10}
{6.66,111.57}
{7.87,134.99}
{7.35,131.83}
{7.35,149.68}
{7.87,149.65}
{7.87,168.99}
{3.81,168.99}
{2.15,174.78}
{2.15,174.78}
f2 (ppm)
f1 (ppm)



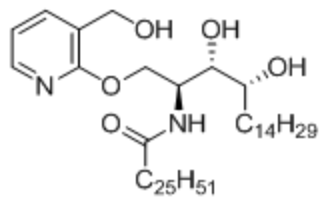
^{1}H NMR (500 MHz, Chloroform-d) δ 7.37 (d, J = 7.9 Hz, 1H), 7.31 – 7.24 (m, 1H), 6.84 (d, J = 8.4 Hz, 1H), 6.61 (d, J = 7.7 Hz, 1H), 4.19 (q, J = 5.0 Hz, 1H), 3.59 – 3.35 (m, 4H), 2.10 (t, J = 7.8 Hz, 2H), 1.64 – 1.41 (m, 4H), 1.37 – 1.02 (m, 68H), 0.80 (t, J = 6.8 Hz, 6H).


NH2
OH
OH
N
H
O
NH
C14H29
C25H51
13C NMR (126 MHz, CDCl3) δ 129.42, 134.45, 77.16, 114.12, 117.09, 51.10, 76.17, 73.33, 44.01, 37.32, 33.85, 30.19, 26.53, 33.92, 33.87, 21.96, 26.63, 23.41, 31.98, 30.42, 32.70, 27.57, 13.22, 14.82
1H NMR (500 MHz, CDCl3) δ 7.38, 7.38, 7.27, 7.26, 7.26, 6.84, 6.61, 4.19, 3.53, 3.50, 3.46, 2.10, 1.59, 1.50, 1.49, 1.47, 1.32, 1.25, 1.24, 1.21, 1.19, 1.18, 1.18, 1.17, 0.81, 0.81.
{0.81,14.82}
{0.81,13.22}
{1.25,21.96}
{1.21,23.41}
{1.24,26.63}
{1.50,30.19}
{1.18,30.42}
{1.59,33.85}
{2.10,37.32}
{1.47,33.92}
{3.46,44.01}
{4.19,51.10}
{3.50,73.33}
{3.53,76.17}
{7.26,77.16}
{6.84,114.12}
{6.61,117.09}
{7.38,129.42}
{7.38,127.84}
{7.27,134.45}
{7.26,132.84}
f2 (ppm)
f1 (ppm)



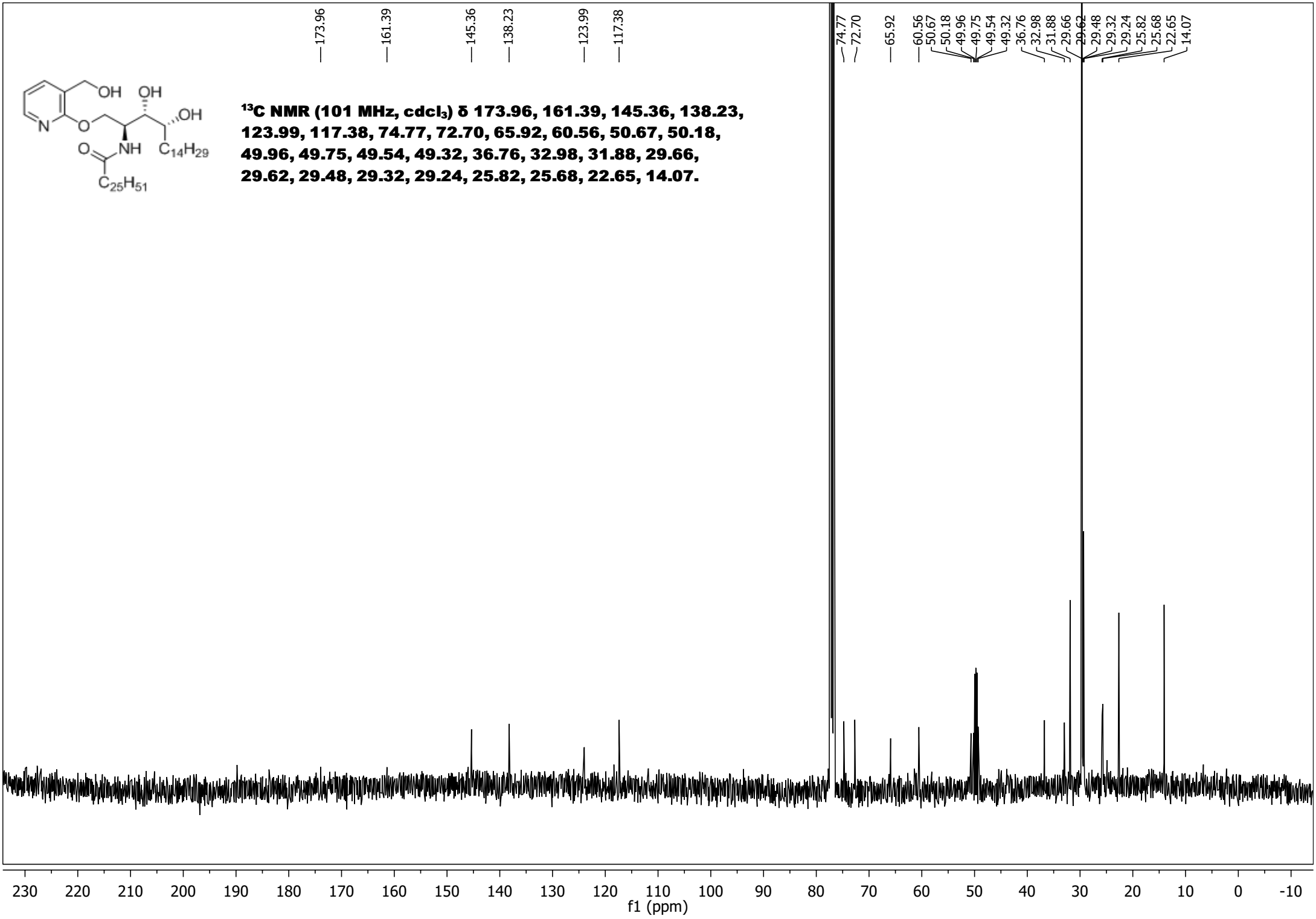
^{13}C NMR (126 MHz, $CDCl_3$) δ 132.83, 147.94, 171.89, 127.76, 147.91, 114.11, 114.12, 42.75, 71.58, 74.65, 174.10, 32.26, 49.48, 49.50, 71.66, 24.94, 74.49, 147.75, 49.42, 147.88, 49.55, 174.04, 24.87, 28.55, 174.06, 35.80, 28.54, 28.96, 28.96, 31.08, 13.27, 21.90, 27.28, 28.90, 30.53, 21.90, 28.95, 29.98, 21.87

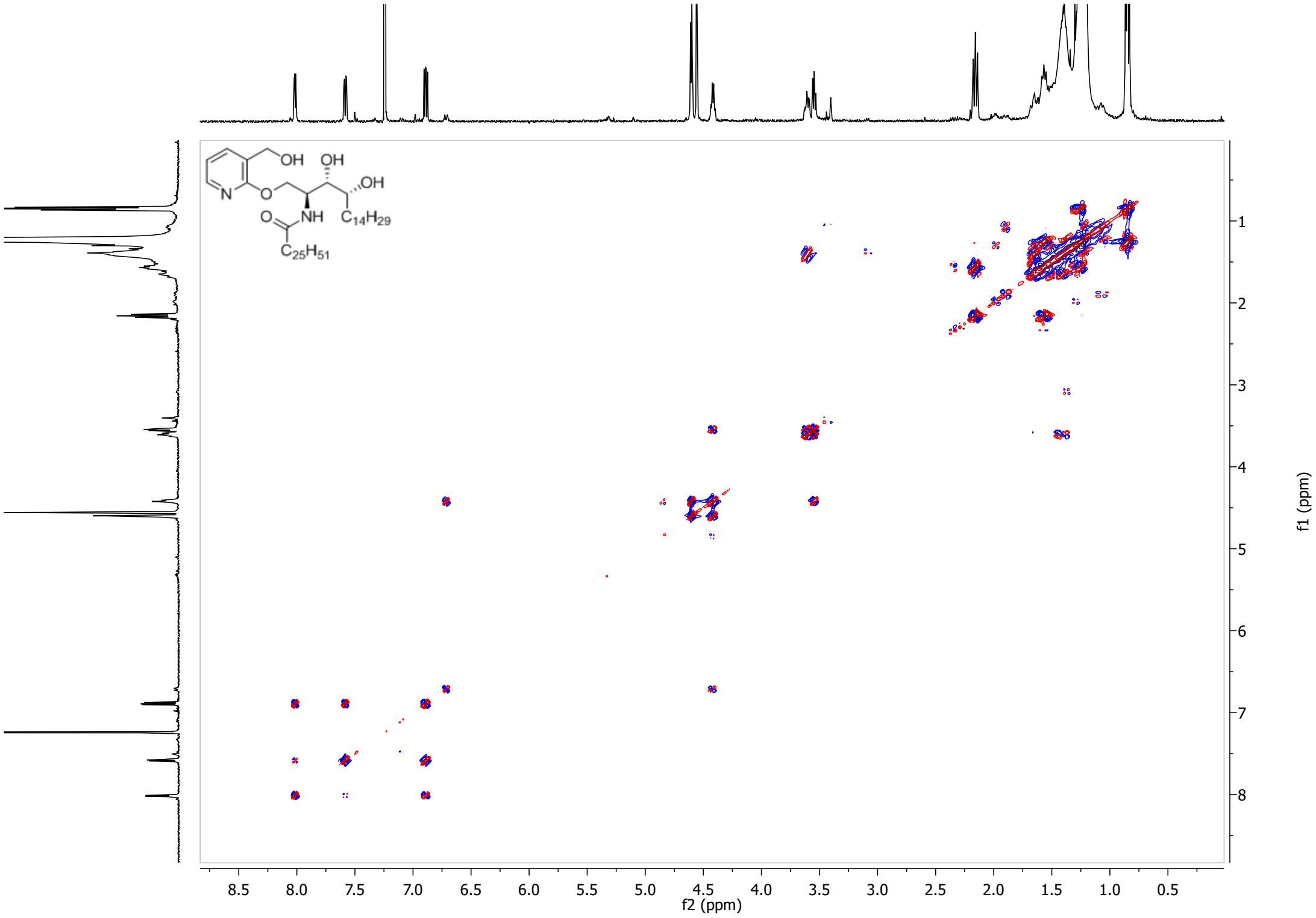
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.40, 7.40, 7.39, 7.30, 7.30, 6.87, 6.87, 4.21, 4.21, 4.21, 4.21, 3.56, 3.56, 3.56, 3.55, 3.53, 3.52, 3.51, 3.51, 3.41, 3.40, 2.13, 2.13, 2.12, 1.52, 1.52, 1.51, 1.32, 1.32, 1.24, 1.24, 1.20, 1.20, 1.20, 1.19, 1.11, 1.06, 0.83, 0.83.

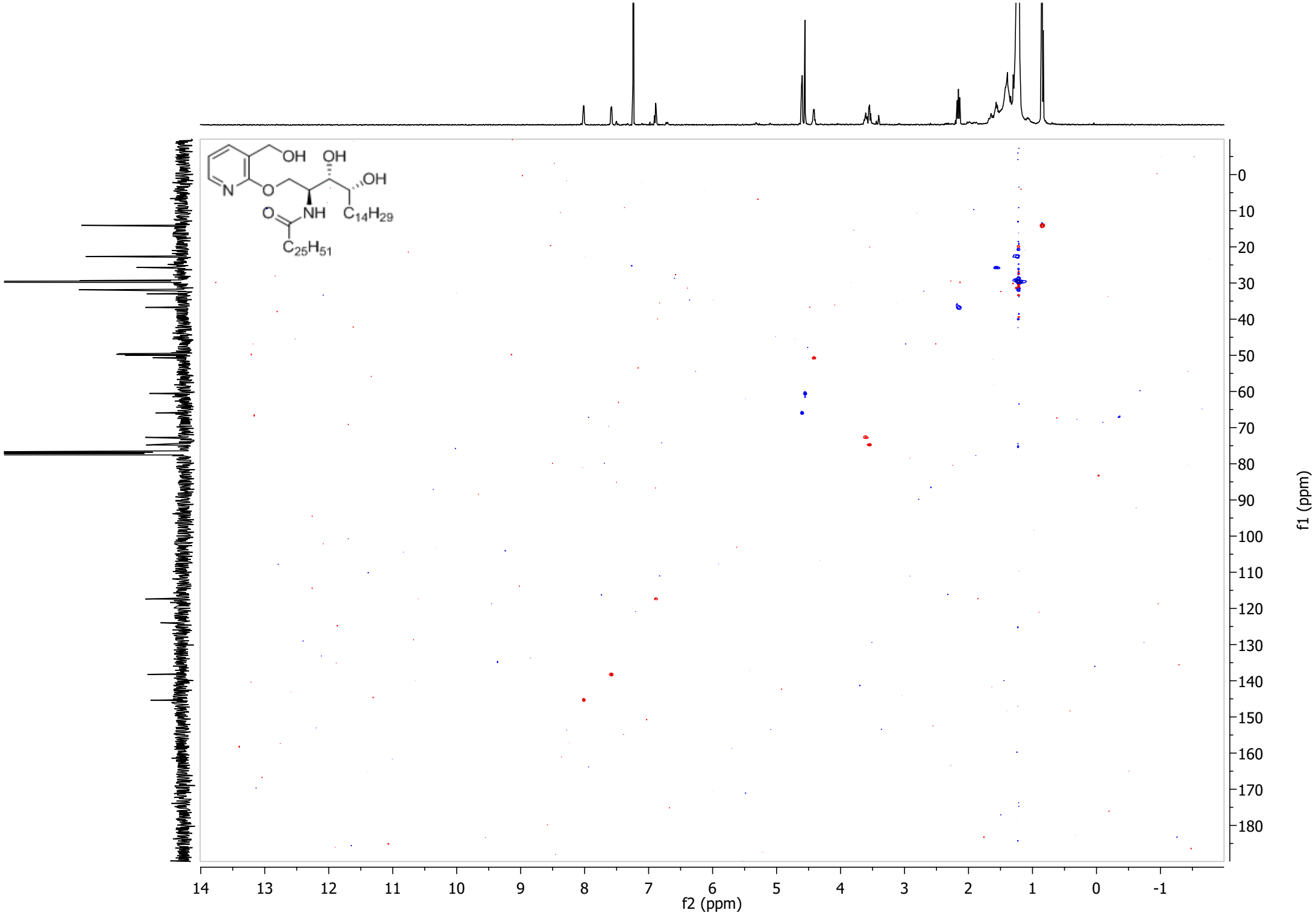


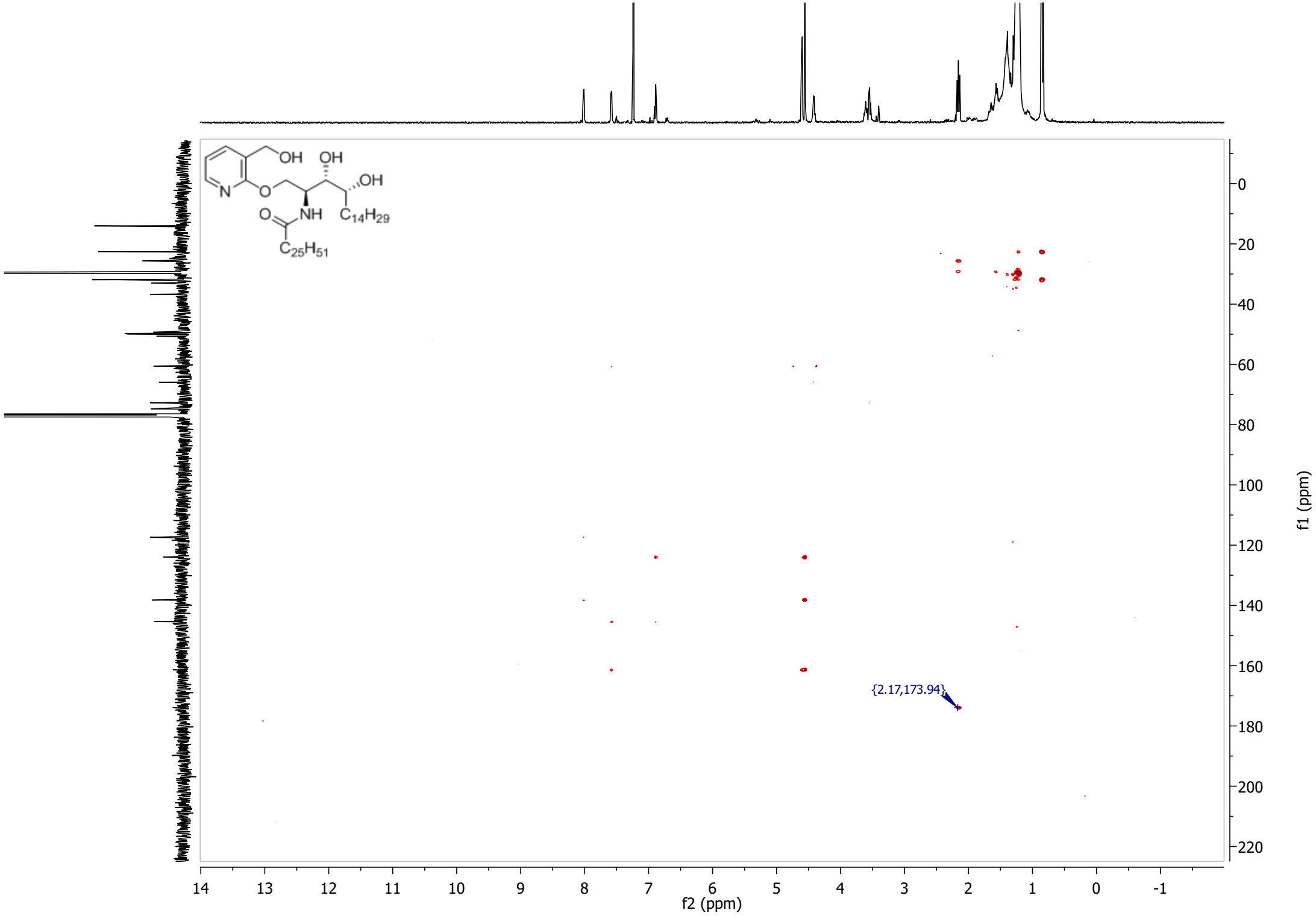
^{1}H NMR (400 MHz, Chloroform-d) δ 8.01 (dd, J = 5.1, 1.9 Hz, 1H), 7.58 (dd, J = 7.2, 1.9 Hz, 1H), 6.89 (dd, J = 7.2, 5.1 Hz, 1H), 6.72 (d, J = 8.8 Hz, 1H), 4.60 (d, J = 4.6 Hz, 2H), 4.56 (s, 2H), 4.42 (d, J = 4.7 Hz, 1H), 3.65 – 3.48 (m, 2H), 2.16 (d, J = 7.8 Hz, 2H), 1.73 – 1.48 (m, 4H), 1.36 – 1.14 (m, 68H), 0.85 (t, J = 7.1 Hz, 6H).

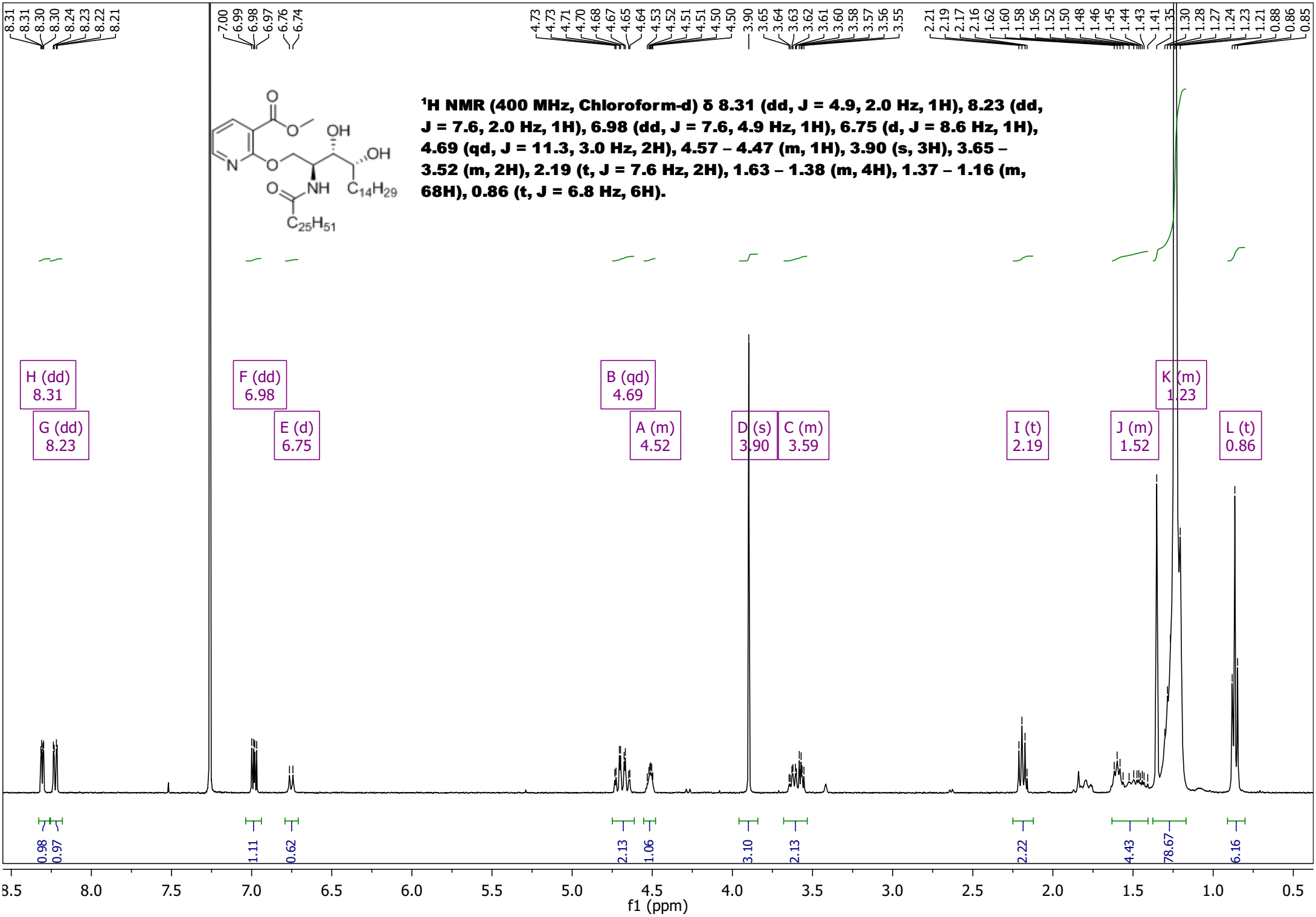
^{13}C NMR (101 MHz, cdcl$_3$) δ 173.96, 161.39, 145.36, 138.23, 123.99, 117.38, 74.77, 72.70, 65.92, 60.56, 50.67, 50.18, 49.96, 49.75, 49.54, 49.32, 36.76, 32.98, 31.88, 29.66, 29.62, 29.48, 29.32, 29.24, 25.82, 25.68, 22.65, 14.07.



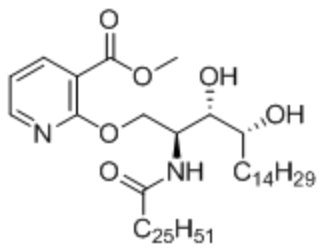

OH
OH
OH
N
O
NH
O
C14H29
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)


OH
OH
OH
N
O
NH
O
C14H29
C25H51
f2 (ppm)
f1 (ppm)

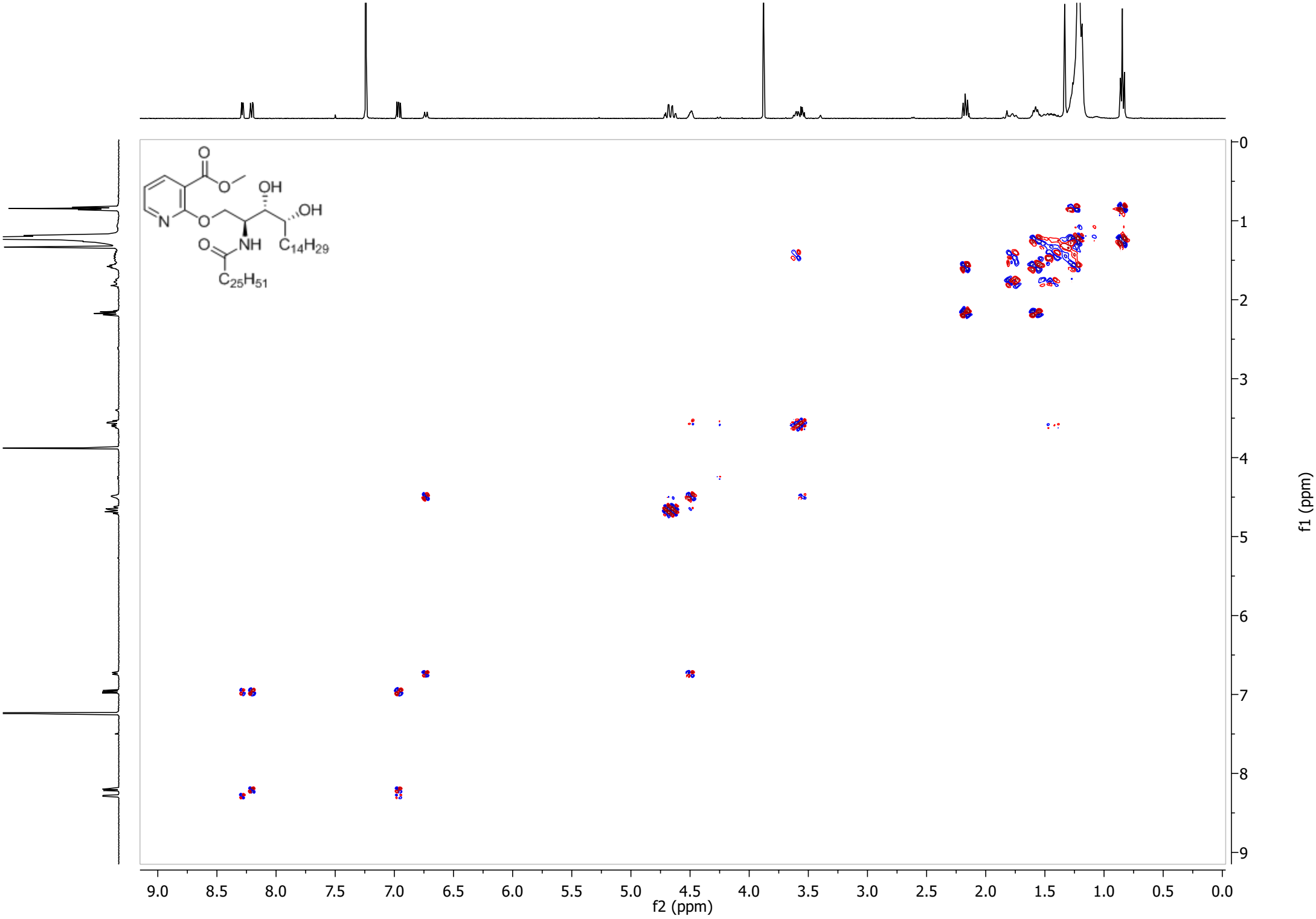

OH
OH
OH
N
O
NH
O
$C_{14}H_{29}$
$C_{25}H_{51}$
{2.17,173.94}
f2 (ppm)
f1 (ppm)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
0
20
40
60
80
100
120
140
160
180
200
220

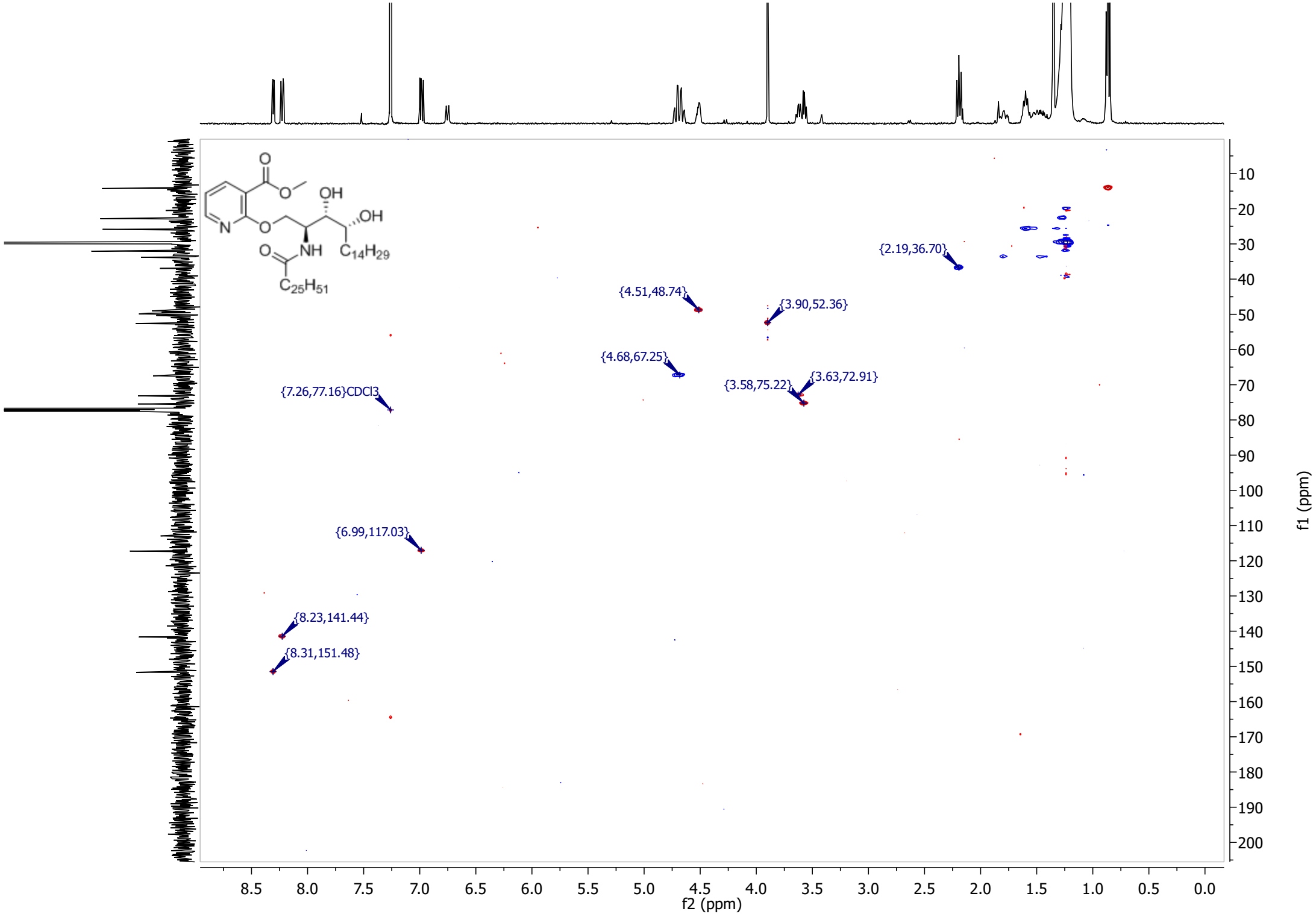


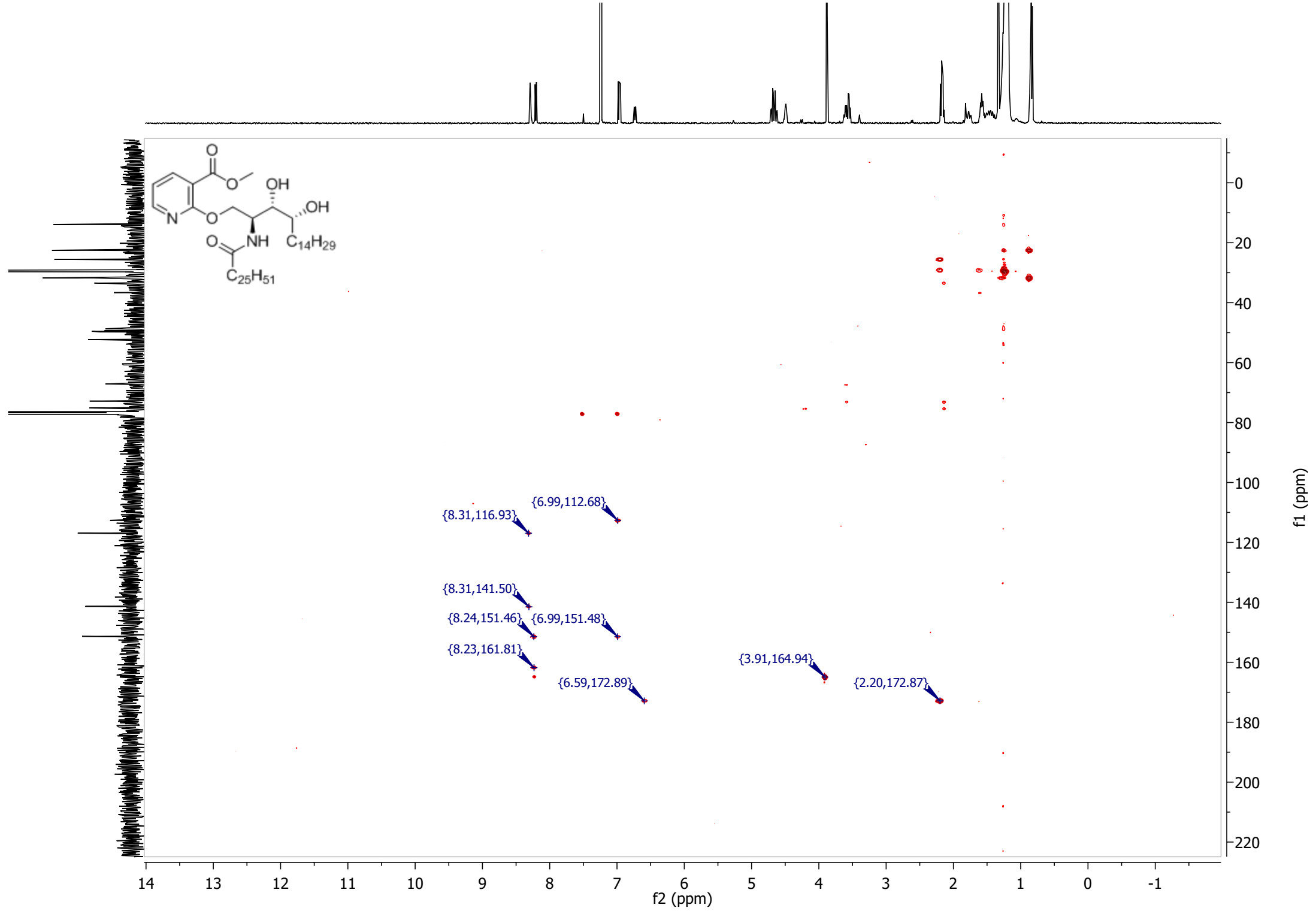
^{1}H NMR (400 MHz, Chloroform-d) δ 8.31 (dd, J = 4.9, 2.0 Hz, 1H), 8.23 (dd, J = 7.6, 2.0 Hz, 1H), 6.98 (dd, J = 7.6, 4.9 Hz, 1H), 6.75 (d, J = 8.6 Hz, 1H), 4.69 (qd, J = 11.3, 3.0 Hz, 2H), 4.57 – 4.47 (m, 1H), 3.90 (s, 3H), 3.65 – 3.52 (m, 2H), 2.19 (t, J = 7.6 Hz, 2H), 1.63 – 1.38 (m, 4H), 1.37 – 1.16 (m, 68H), 0.86 (t, J = 6.8 Hz, 6H).

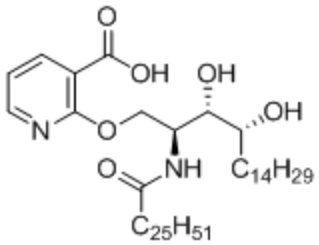


^{13}C NMR (101 MHz, cdcl$_3$) δ 164.64, 161.21, 151.67, 141.67, 117.25, 112.95, 75.47, 73.15, 52.61, 49.02, 36.95, 33.77, 32.05, 29.83, 29.62, 29.49, 29.39, 25.84, 22.82, 14.24.


O
O
OH
OH
N
O
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
f2 (ppm)
f1 (ppm)

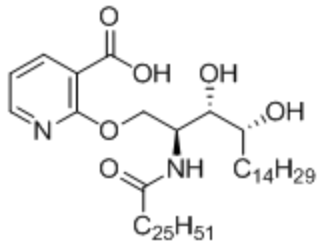

{2.19,36.70}
{4.51,48.74}
{3.90,52.36}
{4.68,67.25}
{3.58,75.22}
{3.63,72.91}
{7.26,77.16}CDCl3
{6.99,117.03}
{8.23,141.44}
{8.31,151.48}
f2 (ppm)
f1 (ppm)


{8.31,116.93}
{6.99,112.68}
{8.31,141.50}
{8.24,151.46}
{6.99,151.48}
{8.23,161.81}
{6.59,172.89}
{3.91,164.94}
{2.20,172.87}
f2 (ppm)
f1 (ppm)



^{1}H NMR (500 MHz, Chloroform-d) δ 7.96 – 7.84 (m, 2H), 6.72 (ddd, J = 7.1, 4.9, 1.8 Hz, 1H), 4.40 – 4.33 (m, 1H), 4.30 (d, J = 11.3 Hz, 1H), 4.21 – 4.16 (m, 1H), 3.41 (t, J = 7.9, 5.6 Hz, 1H), 3.33 (t, J = 8.0 Hz, 1H), 1.94 (t, J = 7.7 Hz, 2H), 1.51 – 1.22 (m, 4H), 1.08 – 0.94 (m, 68H), 0.62 (t, J = 6.7 Hz, 6H).

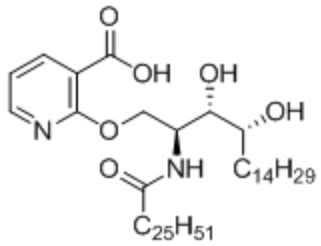
^{13}C NMR (126 MHz, $CDCl_3$) δ 149.34, 141.03, 117.31, 66.57, 49.44, 74.65, 72.41, 36.60, 32.67, 26.05, 32.04, 29.78, 25.93, 22.70, 32.02, 29.77, 28.15, 26.81, 22.73, 29.75, 32.19, 13.98



{0.62,13.98}
{0.93,22.73}
{1.02,22.70}
{0.97,26.81}
{0.98,28.15}
{1.45,32.67}
{0.92,32.19}
{0.99,32.02}
{1.94,36.60}
{1.07,32.04}
{4.18,49.44}
{4.32,66.57}
{3.40,74.65}
{3.32,72.41}
{6.72,117.31}
{7.89,141.03}
{7.93,149.34}

f2 (ppm)
f1 (ppm)

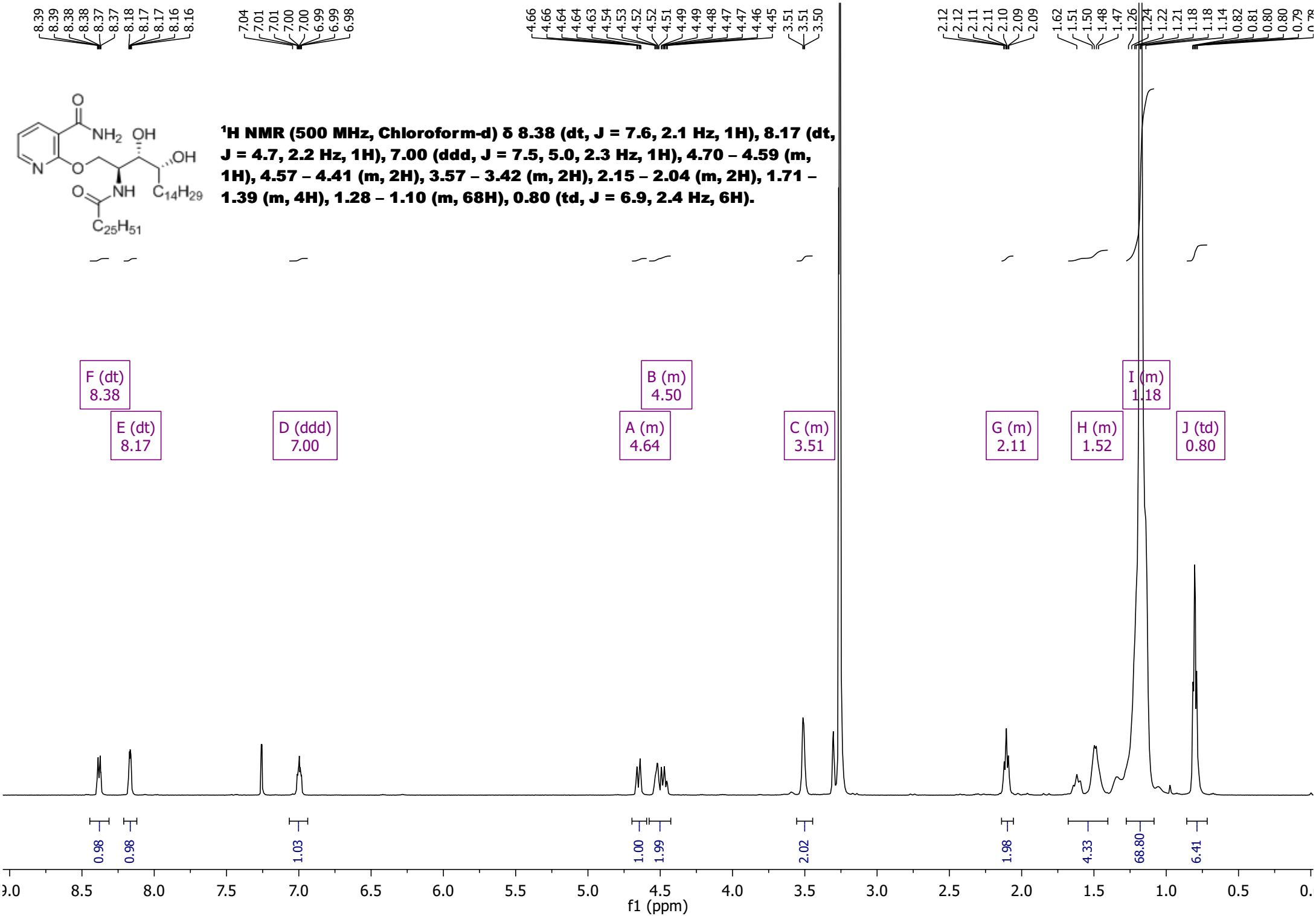
^{13}C NMR (126 MHz, $CDCl_3$) δ 140.28, 116.67, 161.00, 168.90, 148.67, 77.16, 148.76, 49.02, 73.76, 66.05, 65.90, 48.74, 71.71, 32.01, 25.33, 173.89, 28.73, 28.75, 22.05, 29.24, 13.31, 22.15, 29.17, 31.43, 29.17, 31.38, 22.27



{1.02,13.31}
{0.61,22.27}
{1.94,25.33}
{1.93,28.73}
{0.99,31.43}
{1.32,28.75}
{0.61,31.38}
{3.40,32.01}
{4.30,49.02}
{3.40,48.74}
{4.20,66.05}
{3.40,65.90}
{4.30,73.76}
{3.40,71.71}
{7.04,77.16}
{7.92,116.67}
{7.93,140.28}
{7.89,148.67}
{6.71,148.76}
{7.90,161.00}
{7.89,168.90}
{1.94,173.89}

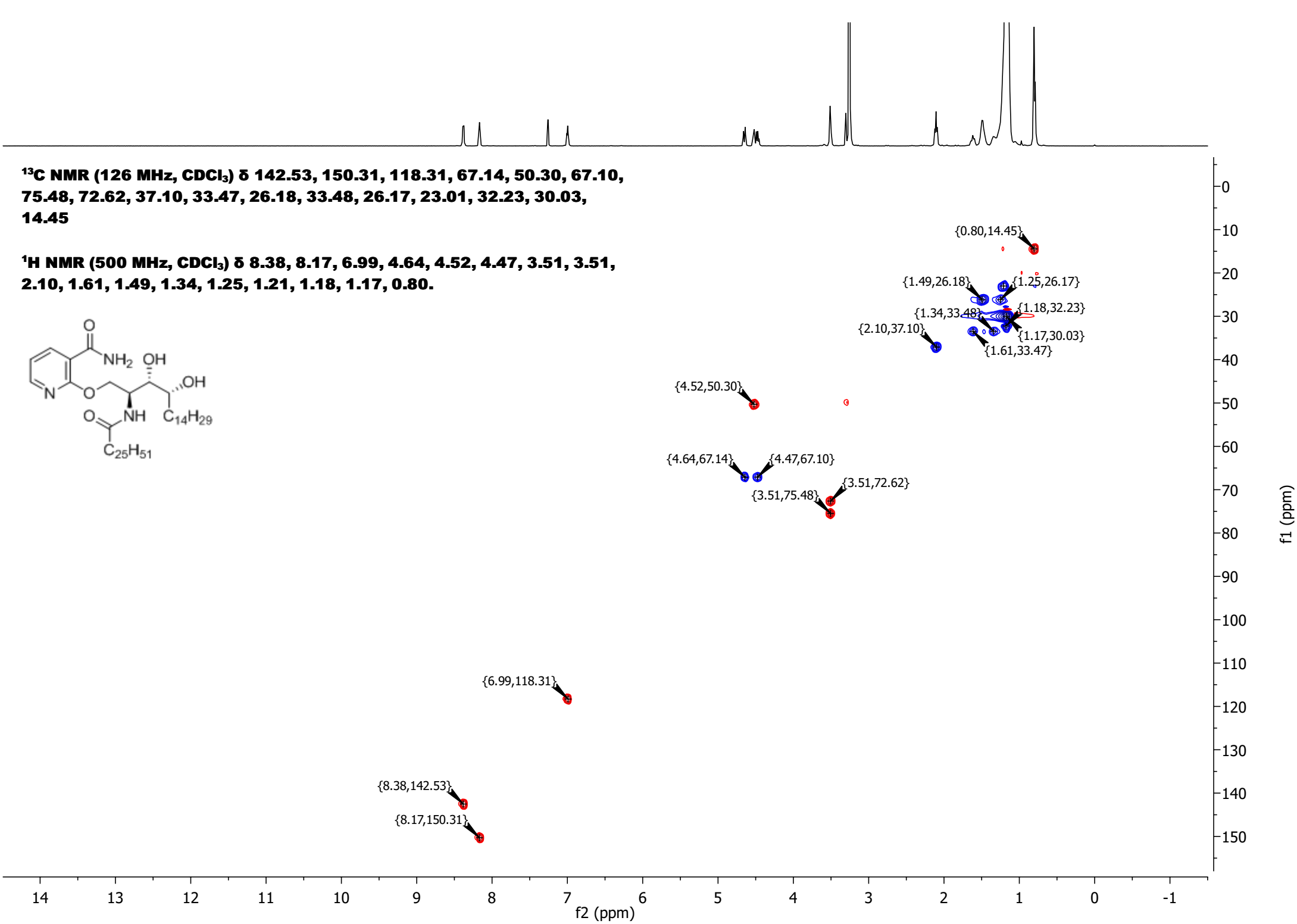
f2 (ppm)
f1 (ppm)

^{1}H NMR (500 MHz, Chloroform-d) δ 8.38 (dt, J = 7.6, 2.1 Hz, 1H), 8.17 (dt, J = 4.7, 2.2 Hz, 1H), 7.00 (ddd, J = 7.5, 5.0, 2.3 Hz, 1H), 4.70 – 4.59 (m, 1H), 4.57 – 4.41 (m, 2H), 3.57 – 3.42 (m, 2H), 2.15 – 2.04 (m, 2H), 1.71 – 1.39 (m, 4H), 1.28 – 1.10 (m, 68H), 0.80 (td, J = 6.9, 2.4 Hz, 6H).



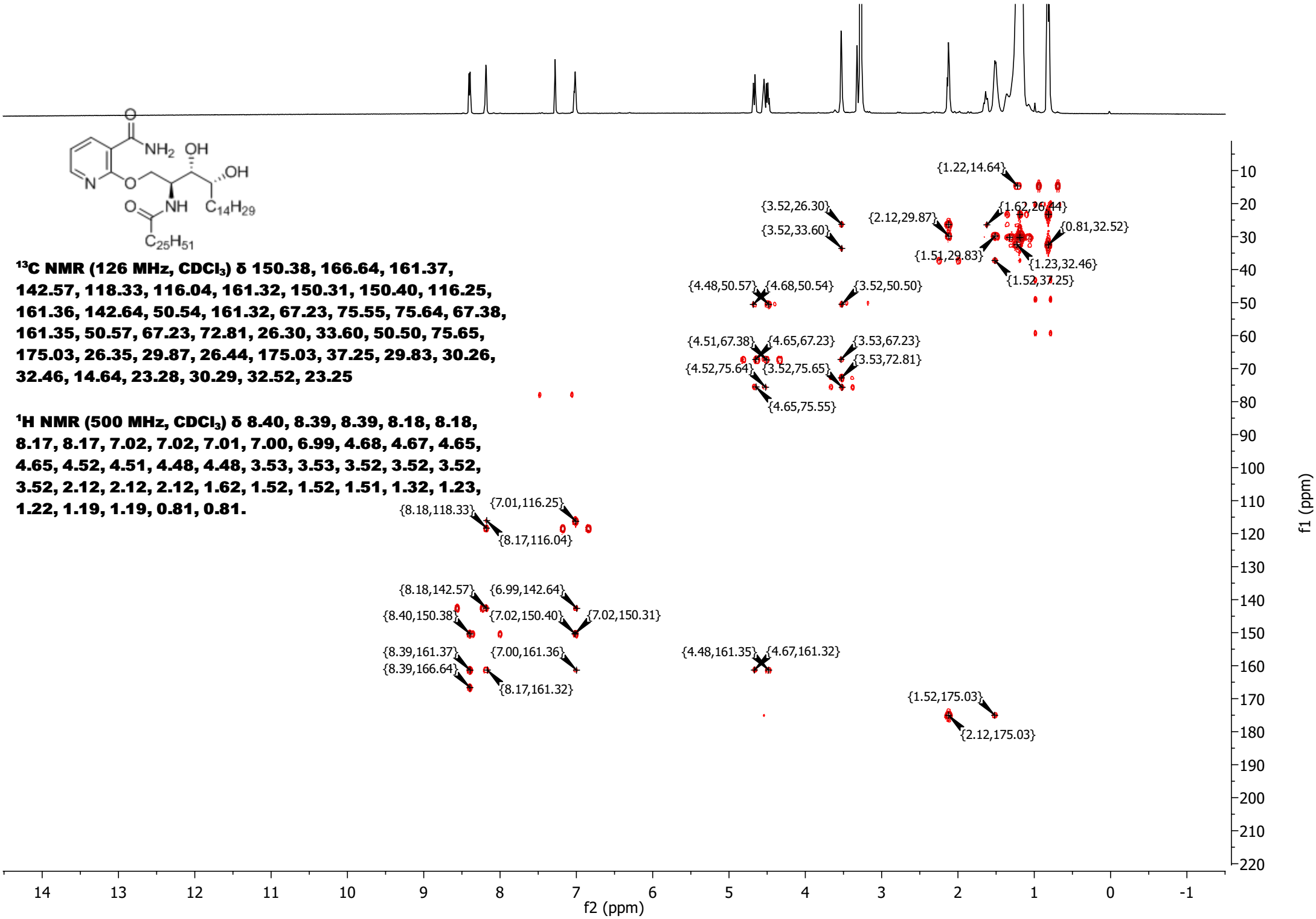
^{13}C NMR (126 MHz, $CDCl_3$) δ 142.53, 150.31, 118.31, 67.14, 50.30, 67.10, 75.48, 72.62, 37.10, 33.47, 26.18, 33.48, 26.17, 23.01, 32.23, 30.03, 14.45

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.38, 8.17, 6.99, 4.64, 4.52, 4.47, 3.51, 3.51, 2.10, 1.61, 1.49, 1.34, 1.25, 1.21, 1.18, 1.17, 0.80.

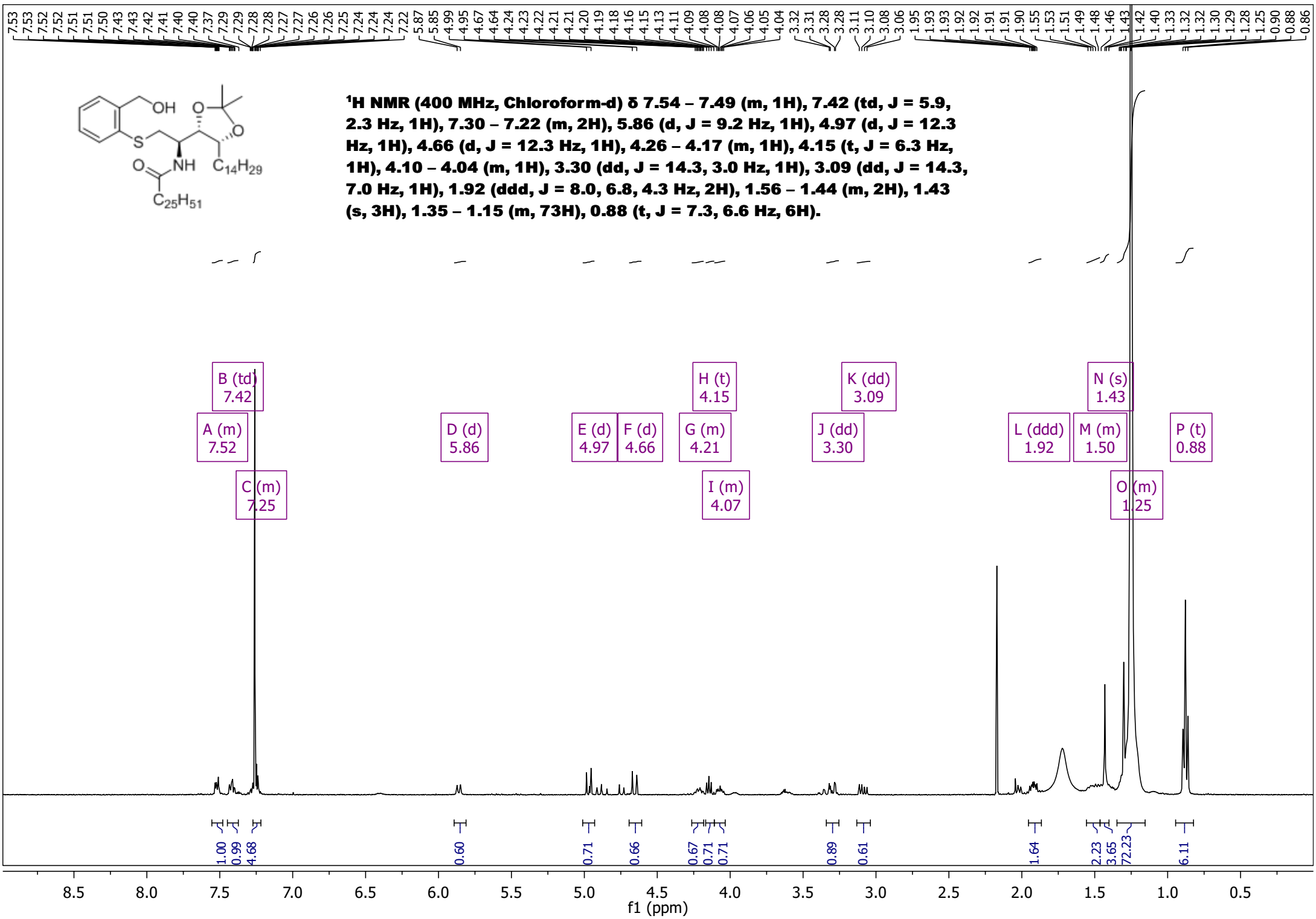


^{13}C NMR (126 MHz, $CDCl_3$) δ 150.38, 166.64, 161.37, 142.57, 118.33, 116.04, 161.32, 150.31, 150.40, 116.25, 161.36, 142.64, 50.54, 161.32, 67.23, 75.55, 75.64, 67.38, 161.35, 50.57, 67.23, 72.81, 26.30, 33.60, 50.50, 75.65, 175.03, 26.35, 29.87, 26.44, 175.03, 37.25, 29.83, 30.26, 32.46, 14.64, 23.28, 30.29, 32.52, 23.25

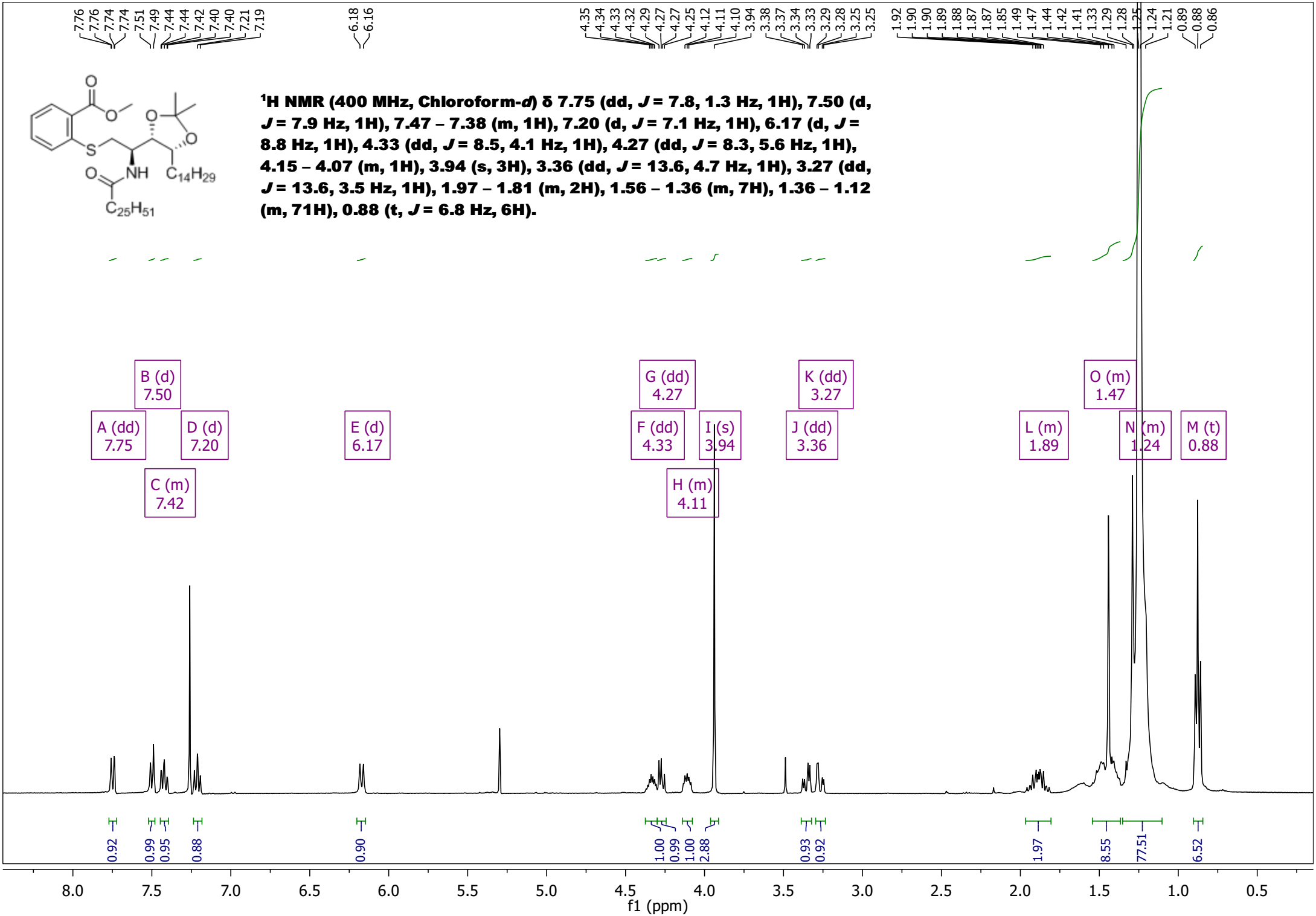
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.40, 8.39, 8.39, 8.18, 8.18, 8.17, 8.17, 7.02, 7.02, 7.01, 7.00, 6.99, 4.68, 4.67, 4.65, 4.65, 4.52, 4.51, 4.48, 4.48, 3.53, 3.53, 3.52, 3.52, 3.52, 3.52, 2.12, 2.12, 2.12, 1.62, 1.52, 1.52, 1.51, 1.32, 1.23, 1.22, 1.19, 1.19, 0.81, 0.81.

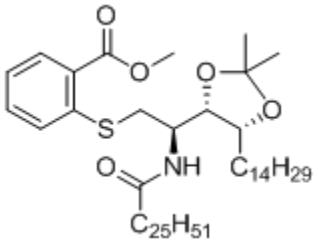


^{1}H NMR (400 MHz, Chloroform-d) δ 7.54 – 7.49 (m, 1H), 7.42 (td, J = 5.9, 2.3 Hz, 1H), 7.30 – 7.22 (m, 2H), 5.86 (d, J = 9.2 Hz, 1H), 4.97 (d, J = 12.3 Hz, 1H), 4.66 (d, J = 12.3 Hz, 1H), 4.26 – 4.17 (m, 1H), 4.15 (t, J = 6.3 Hz, 1H), 4.10 – 4.04 (m, 1H), 3.30 (dd, J = 14.3, 3.0 Hz, 1H), 3.09 (dd, J = 14.3, 7.0 Hz, 1H), 1.92 (ddd, J = 8.0, 6.8, 4.3 Hz, 2H), 1.56 – 1.44 (m, 2H), 1.43 (s, 3H), 1.35 – 1.15 (m, 73H), 0.88 (t, J = 7.3, 6.6 Hz, 6H).

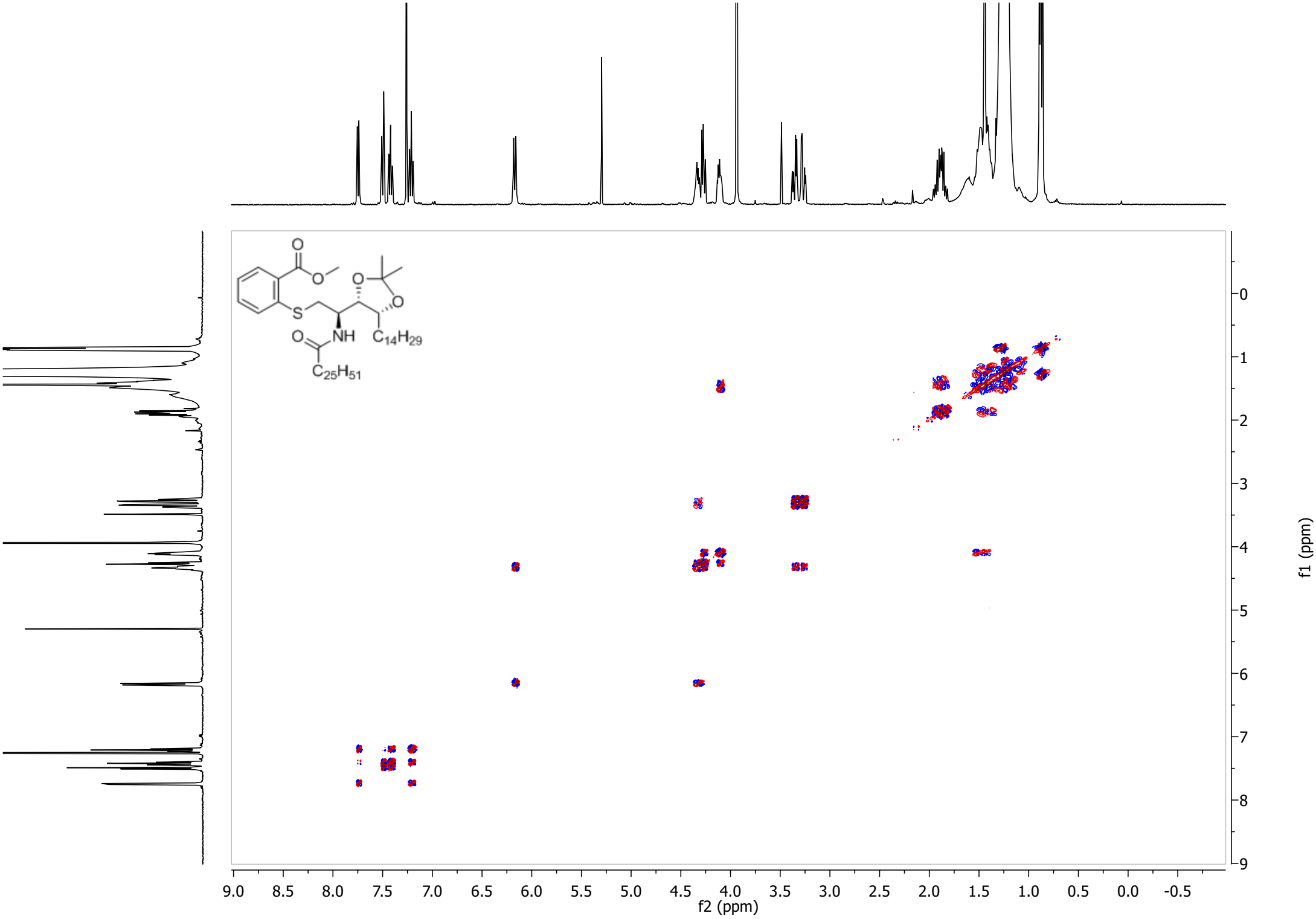


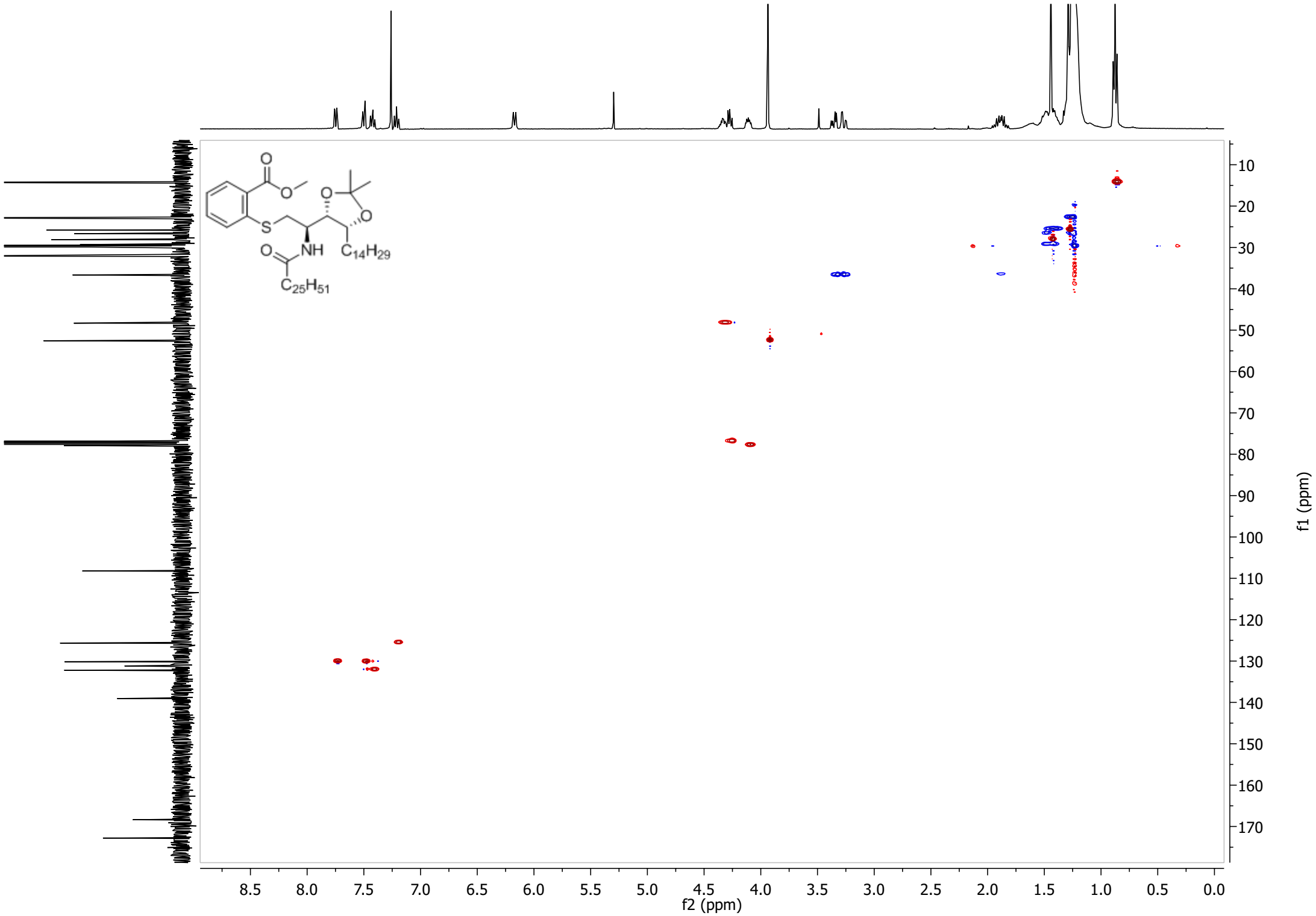
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.75 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.50 (d, *J* = 7.9 Hz, 1H), 7.47 – 7.38 (m, 1H), 7.20 (d, *J* = 7.1 Hz, 1H), 6.17 (d, *J* = 8.8 Hz, 1H), 4.33 (dd, *J* = 8.5, 4.1 Hz, 1H), 4.27 (dd, *J* = 8.3, 5.6 Hz, 1H), 4.15 – 4.07 (m, 1H), 3.94 (s, 3H), 3.36 (dd, *J* = 13.6, 4.7 Hz, 1H), 3.27 (dd, *J* = 13.6, 3.5 Hz, 1H), 1.97 – 1.81 (m, 2H), 1.56 – 1.36 (m, 7H), 1.36 – 1.12 (m, 71H), 0.88 (t, *J* = 6.8 Hz, 6H).



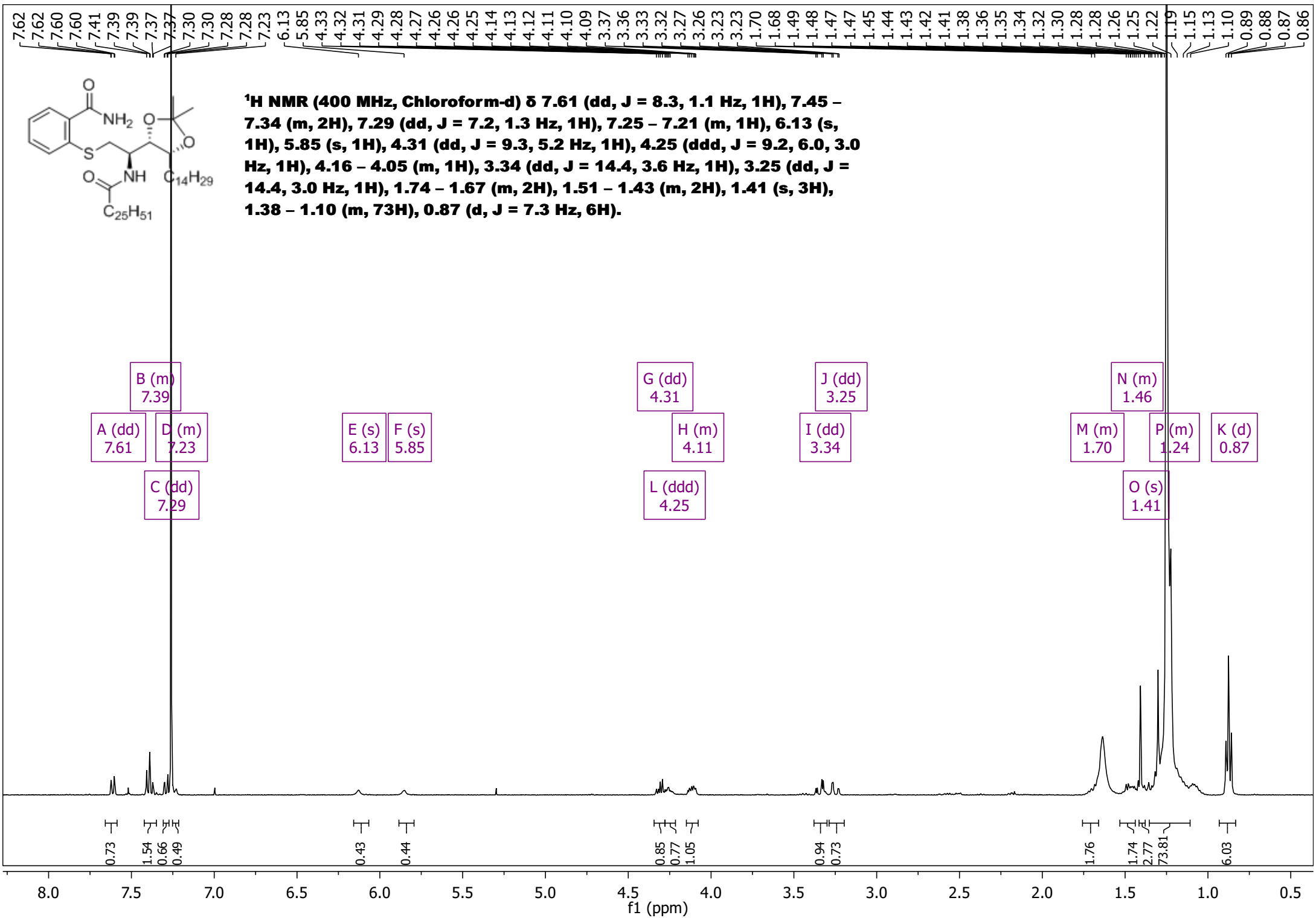


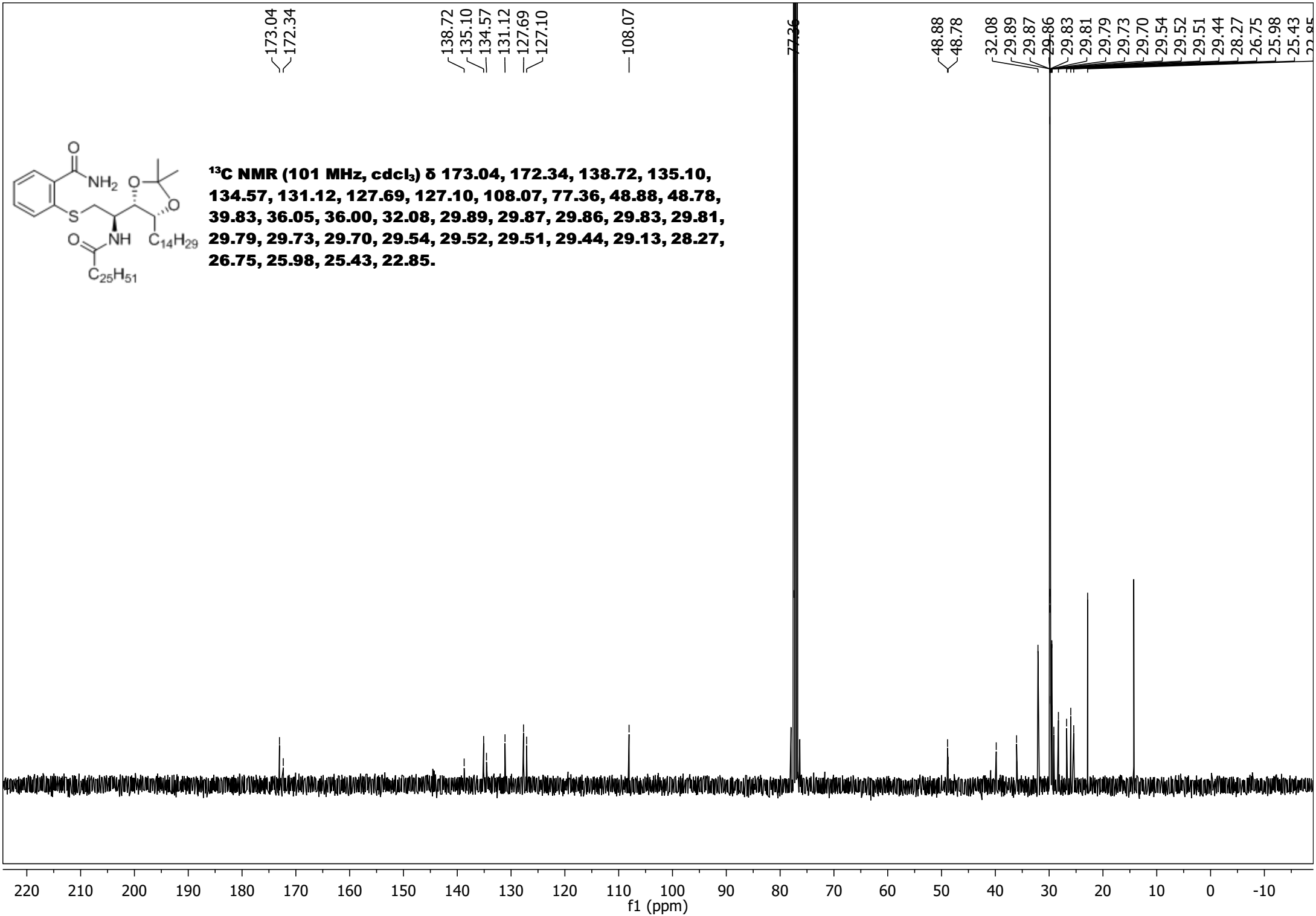
^{13}C NMR (101 MHz, Chloroform-d) δ 172.80, 168.37, 139.06, 132.21, 131.18, 130.20, 130.15, 125.65, 108.22, 77.90, 76.94, 52.56, 48.31, 36.73, 36.65, 32.09, 29.86, 29.82, 29.78, 29.77, 29.71, 29.67, 29.53, 29.43, 29.31, 28.13, 26.69, 25.81, 25.58, 22.85, 14.28.


O
O
O
O
S
NH
O
$C_{14}H_{29}$
$C_{25}H_{51}$
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f2 (ppm)
0
1
2
3
4
5
6
7
8
9
f1 (ppm)

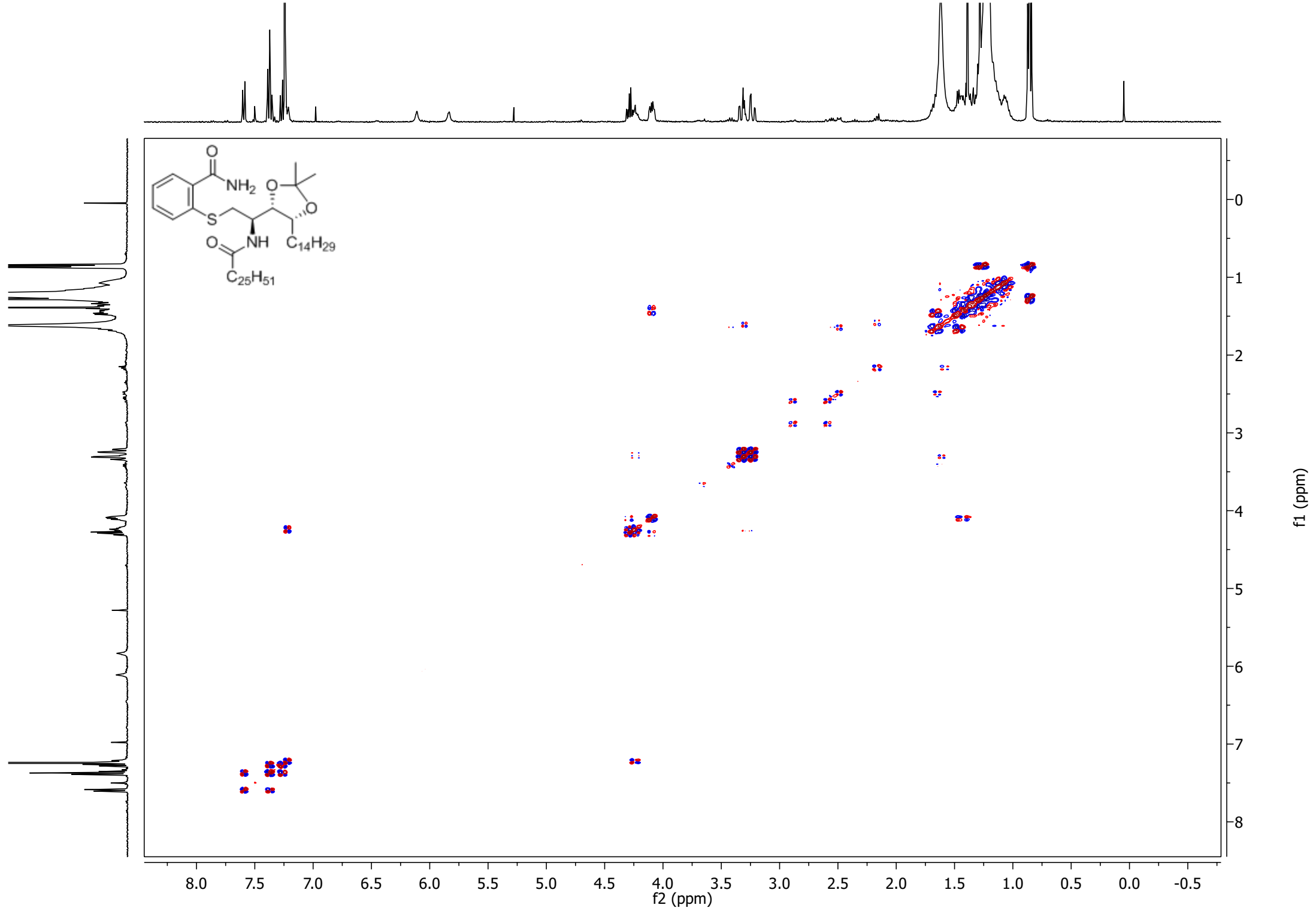

O
O
O
O
S
NH
O
$C_{14}H_{29}$
$C_{25}H_{51}$
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
f1 (ppm)

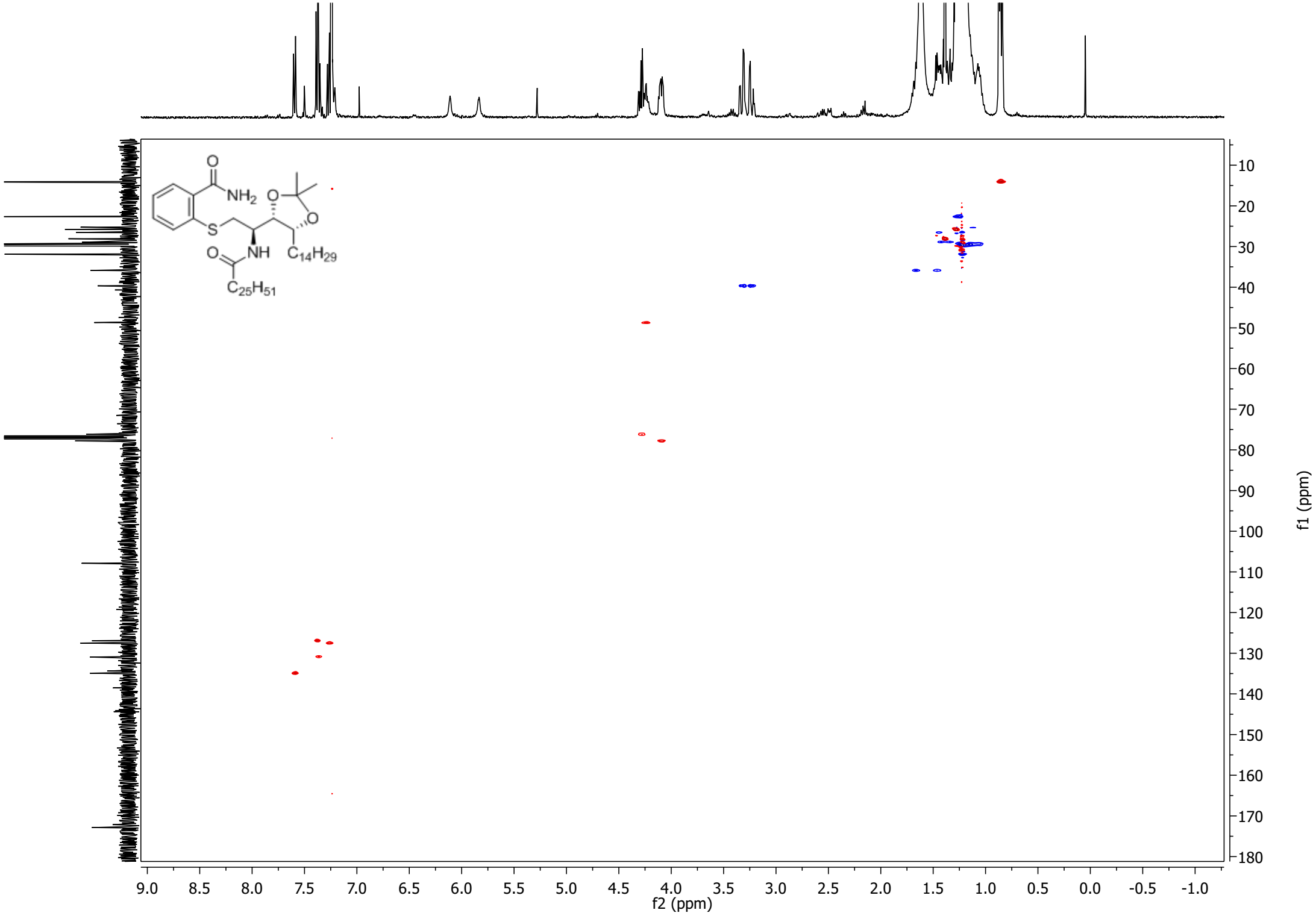
^{1}H NMR (400 MHz, Chloroform-d) δ 7.61 (dd, J = 8.3, 1.1 Hz, 1H), 7.45 – 7.34 (m, 2H), 7.29 (dd, J = 7.2, 1.3 Hz, 1H), 7.25 – 7.21 (m, 1H), 6.13 (s, 1H), 5.85 (s, 1H), 4.31 (dd, J = 9.3, 5.2 Hz, 1H), 4.25 (ddd, J = 9.2, 6.0, 3.0 Hz, 1H), 4.16 – 4.05 (m, 1H), 3.34 (dd, J = 14.4, 3.6 Hz, 1H), 3.25 (dd, J = 14.4, 3.0 Hz, 1H), 1.74 – 1.67 (m, 2H), 1.51 – 1.43 (m, 2H), 1.41 (s, 3H), 1.38 – 1.10 (m, 73H), 0.87 (d, J = 7.3 Hz, 6H).

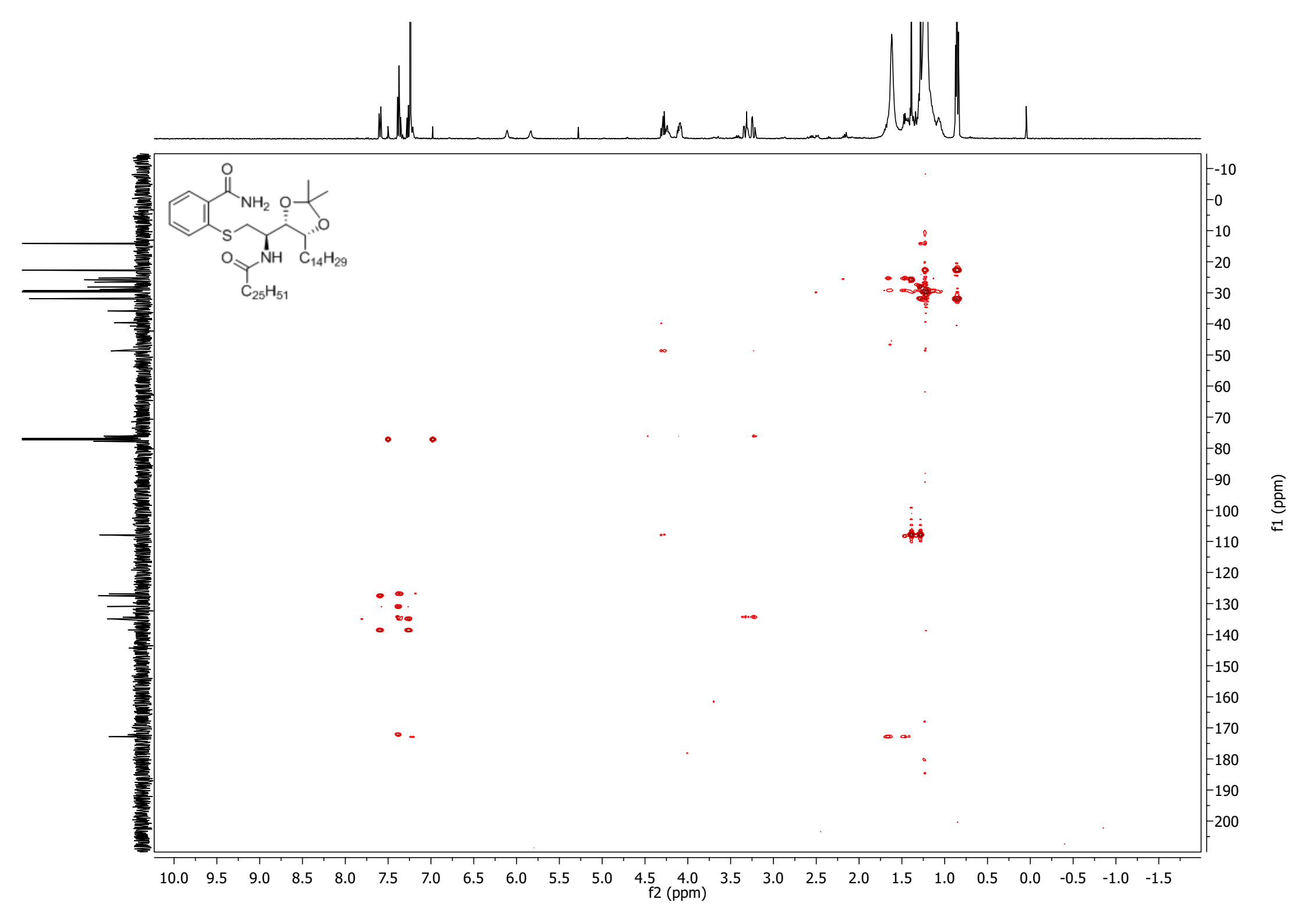




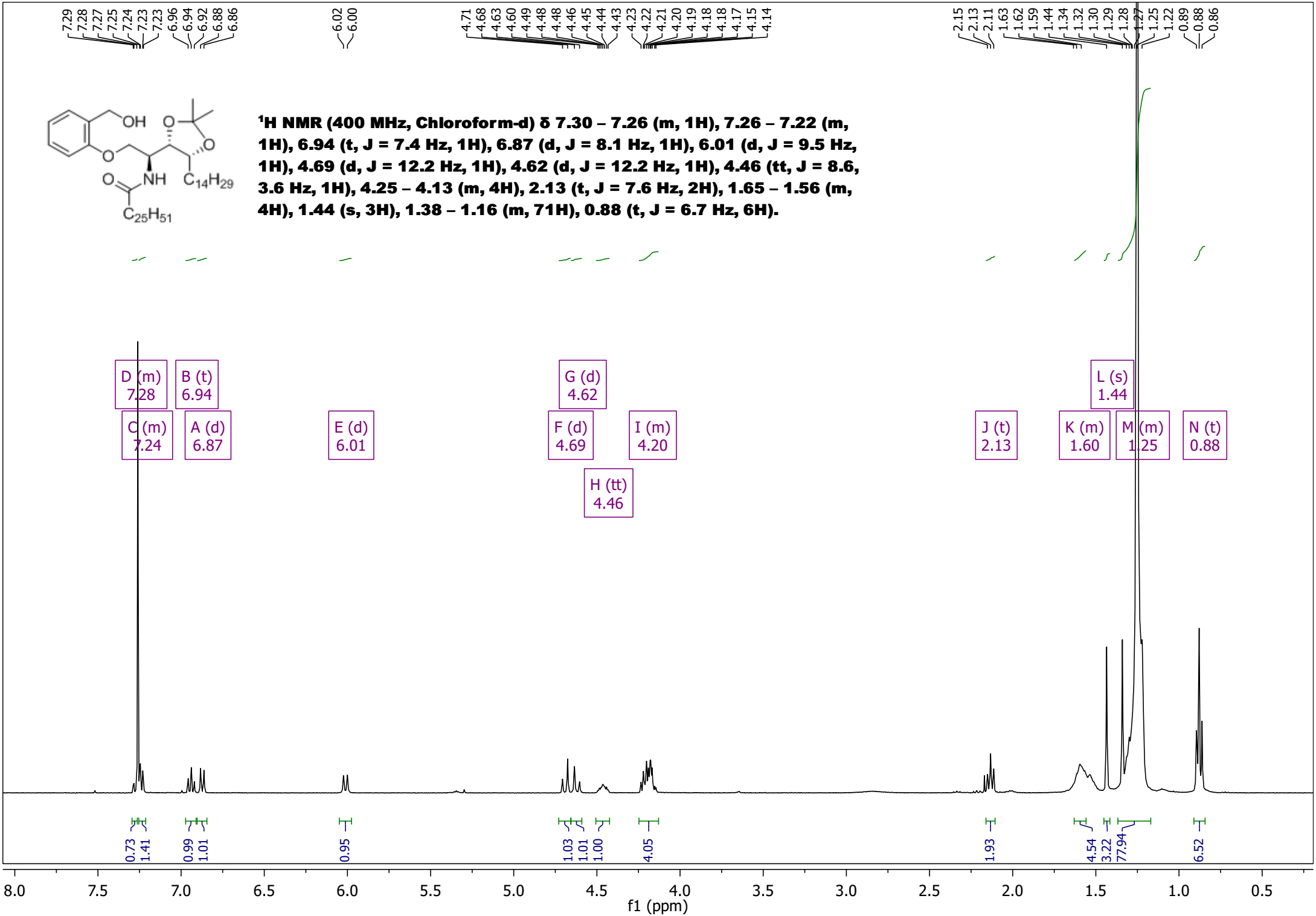
^{13}C NMR (101 MHz, cdcl$_3$) δ 173.04, 172.34, 138.72, 135.10, 134.57, 131.12, 127.69, 127.10, 108.07, 77.36, 48.88, 48.78, 39.83, 36.05, 36.00, 32.08, 29.89, 29.87, 29.86, 29.83, 29.81, 29.79, 29.73, 29.70, 29.54, 29.52, 29.51, 29.44, 29.13, 28.27, 26.75, 25.98, 25.43, 22.85.

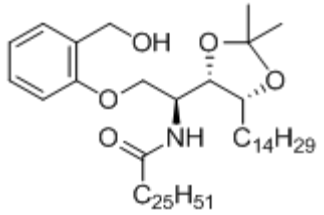

O
NH2
O
O
S
NH
C14H29
O
C25H51
f2 (ppm)
f1 (ppm)


O
NH2
O
O
S
NH
C14H29
O
C25H51
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f2 (ppm)
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
f1 (ppm)

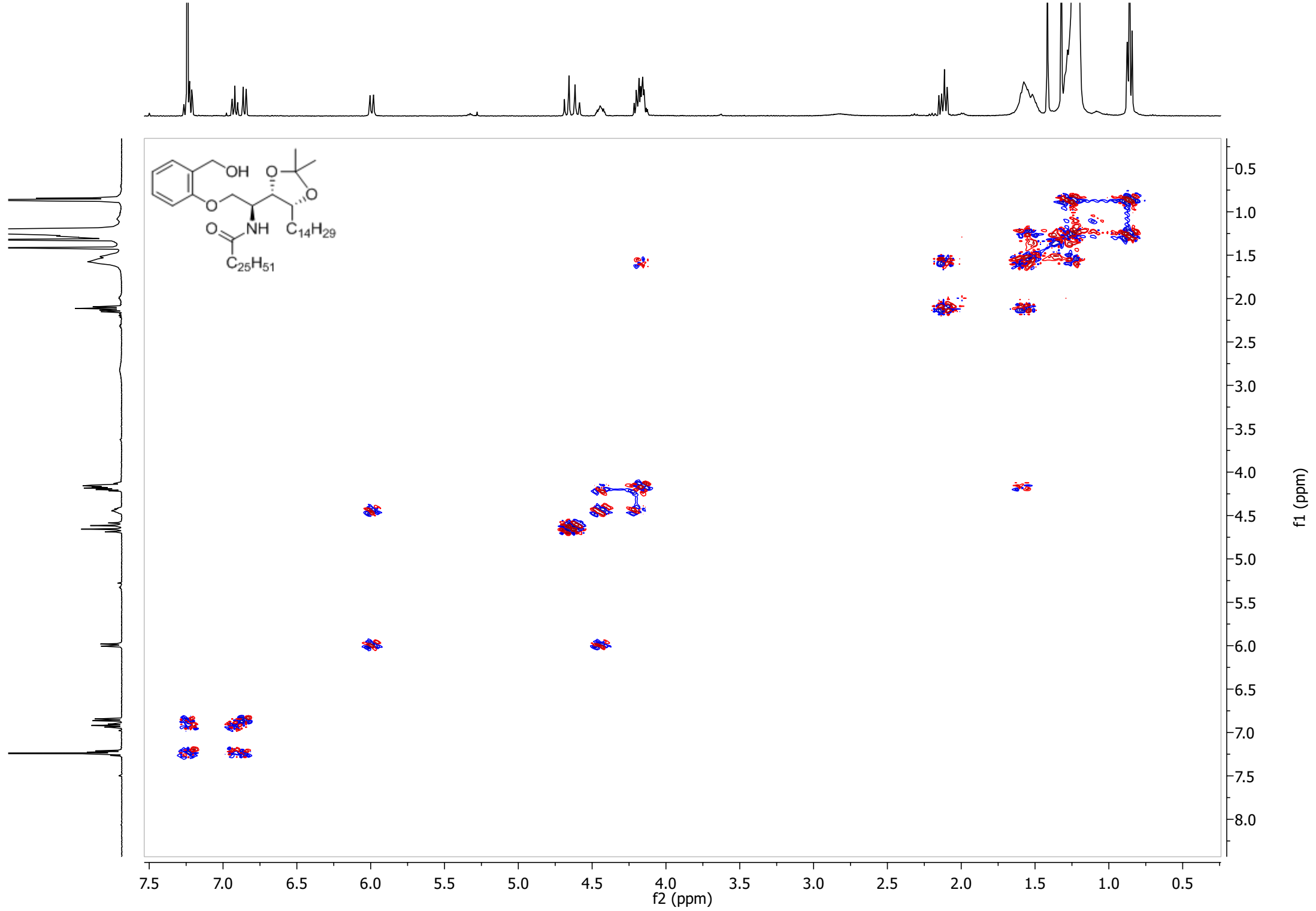

O
NH2
O
O
S
NH
C14H29
O
C25H51
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
f2 (ppm)
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
f1 (ppm)

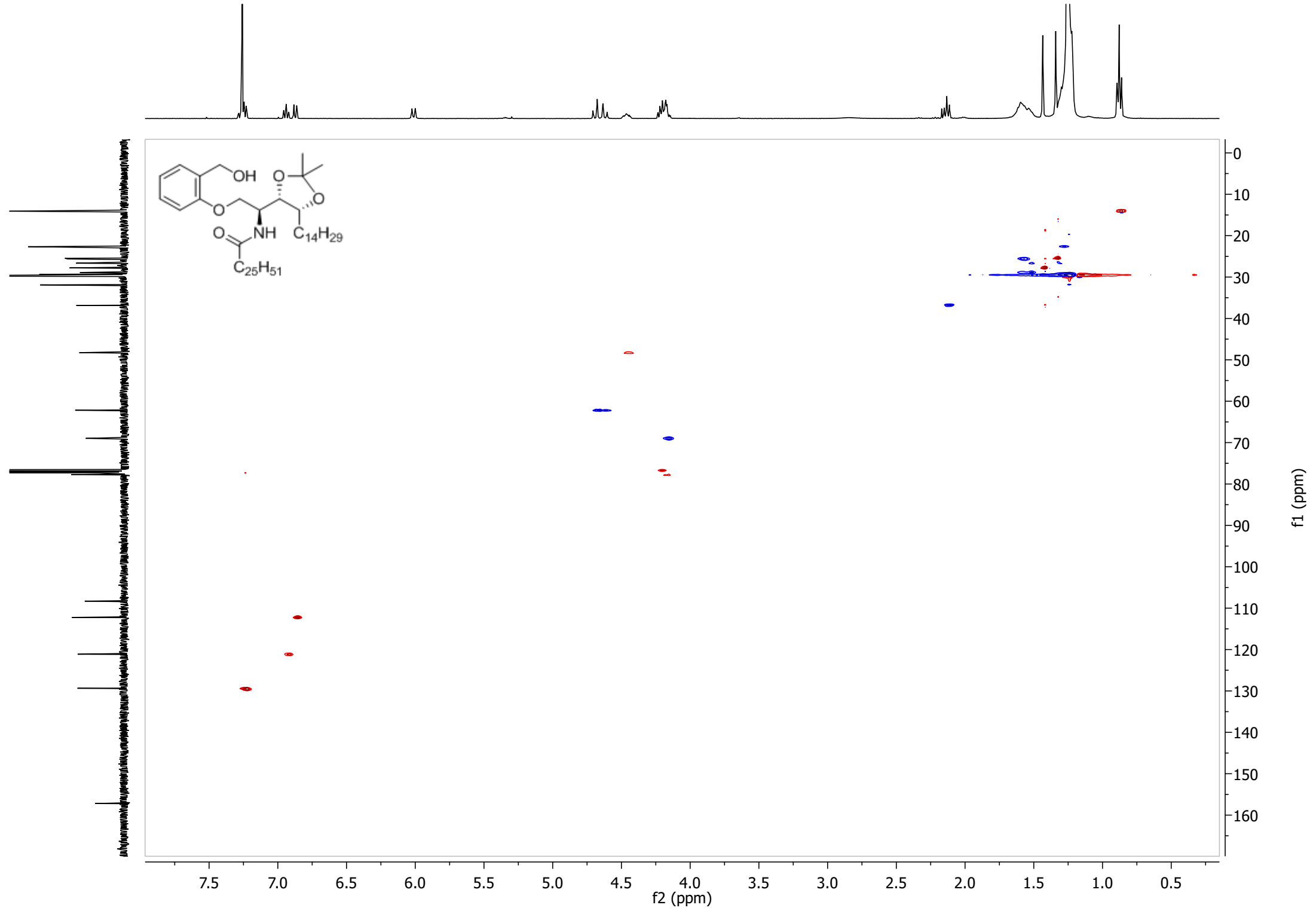
^{1}H NMR (400 MHz, Chloroform-d) δ 7.30 – 7.26 (m, 1H), 7.26 – 7.22 (m, 1H), 6.94 (t, J = 7.4 Hz, 1H), 6.87 (d, J = 8.1 Hz, 1H), 6.01 (d, J = 9.5 Hz, 1H), 4.69 (d, J = 12.2 Hz, 1H), 4.62 (d, J = 12.2 Hz, 1H), 4.46 (tt, J = 8.6, 3.6 Hz, 1H), 4.25 – 4.13 (m, 4H), 2.13 (t, J = 7.6 Hz, 2H), 1.65 – 1.56 (m, 4H), 1.44 (s, 3H), 1.38 – 1.16 (m, 71H), 0.88 (t, J = 6.7 Hz, 6H).

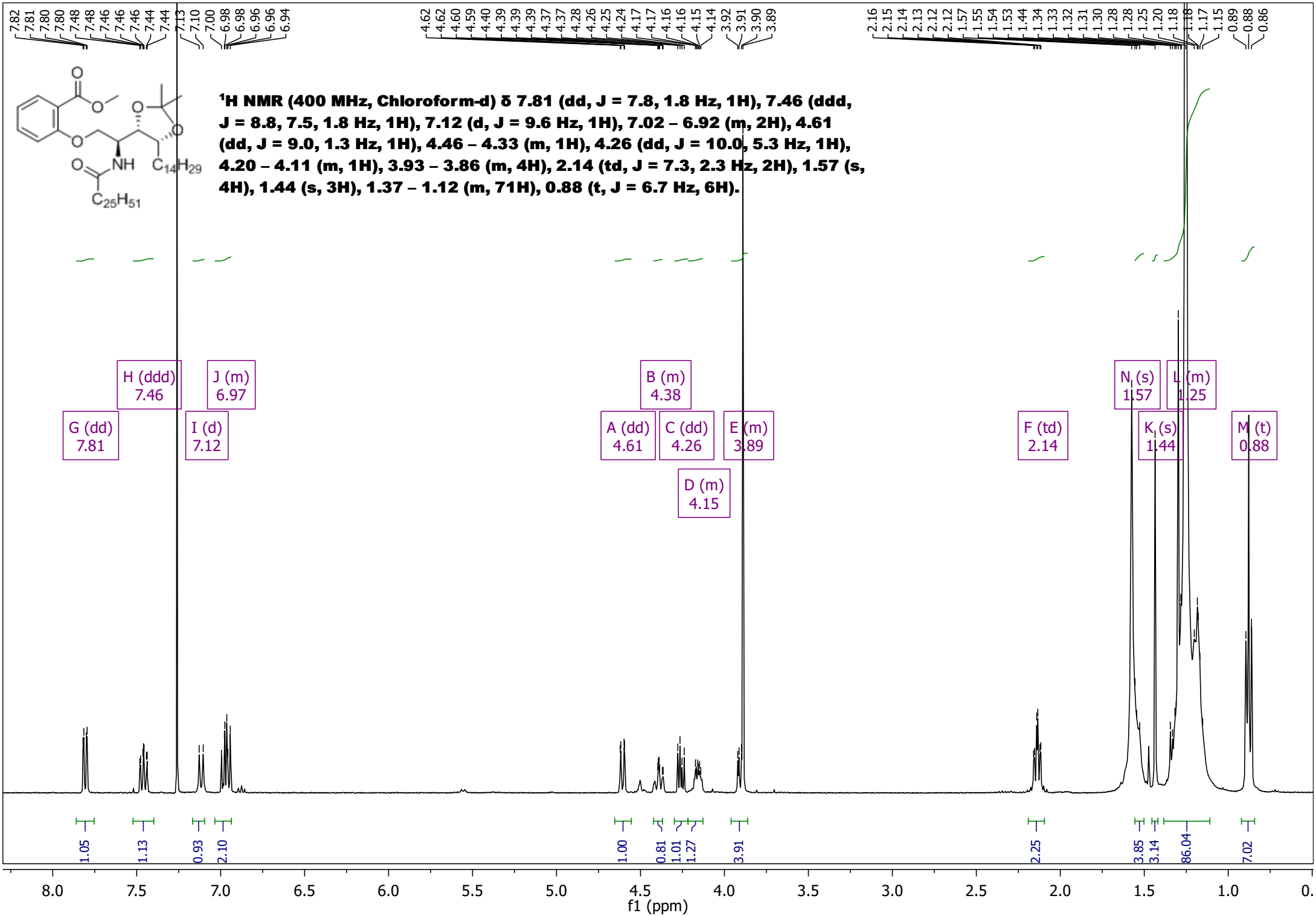


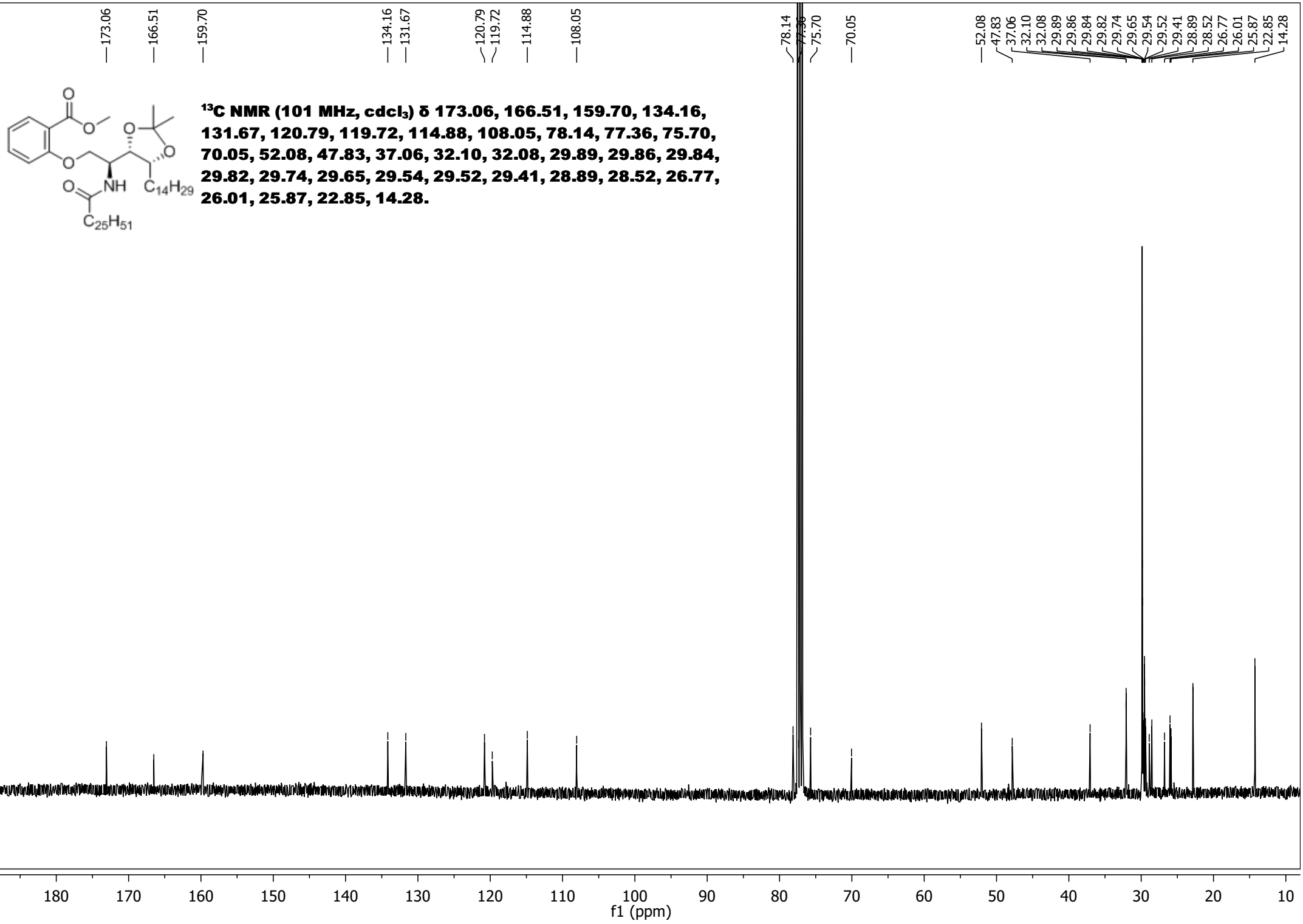


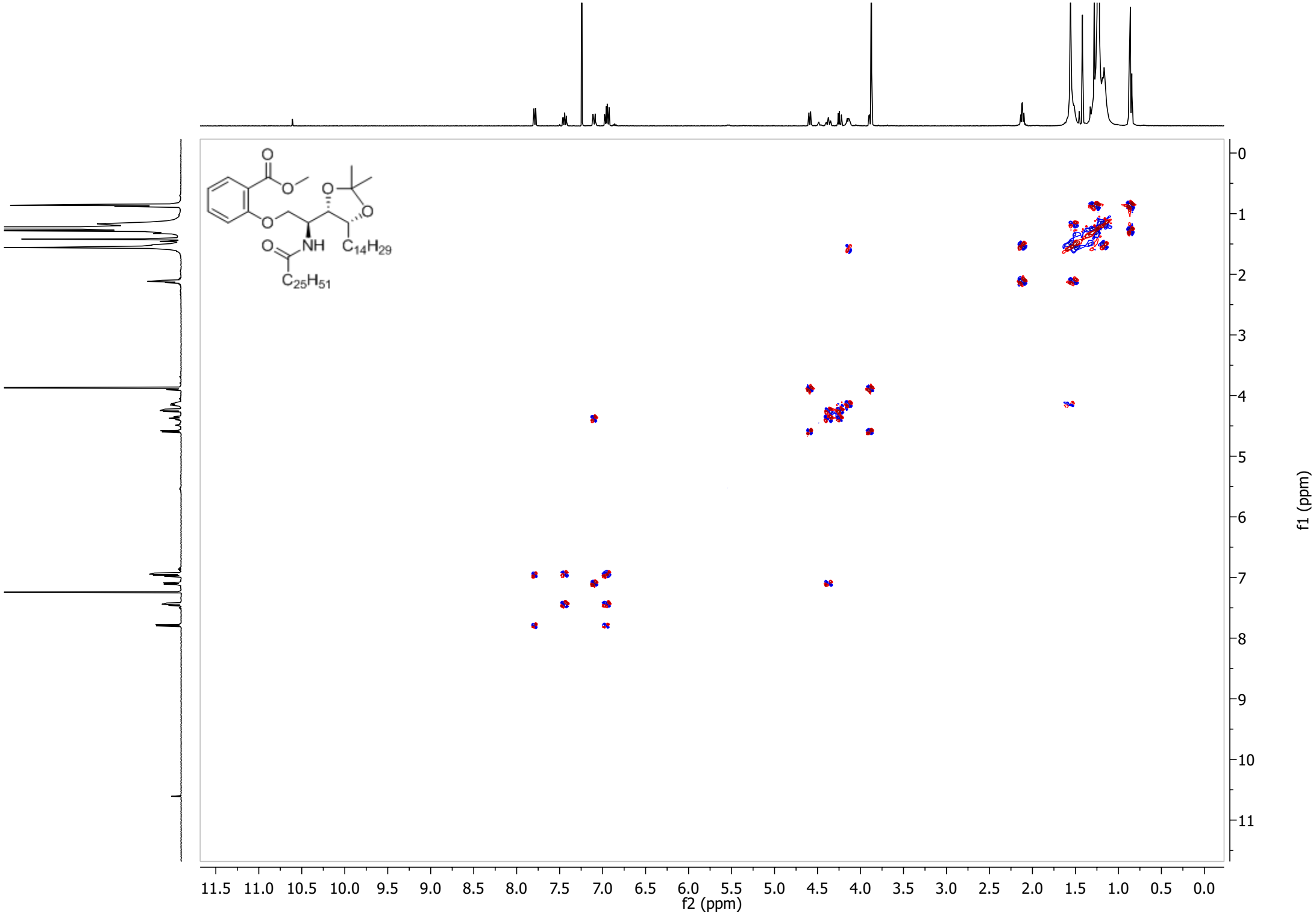
^{13}C NMR (101 MHz, Chloroform-d) δ 173.04, 157.39, 129.76, 129.71, 129.54, 121.32, 112.42, 108.49, 77.94, 76.91, 62.38, 48.46, 37.04, 32.09, 29.88, 29.86, 29.83, 29.81, 29.79, 29.76, 29.71, 29.67, 29.54, 29.52, 29.47, 29.09, 27.97, 26.85, 25.83, 25.66, 22.85, 14.28.

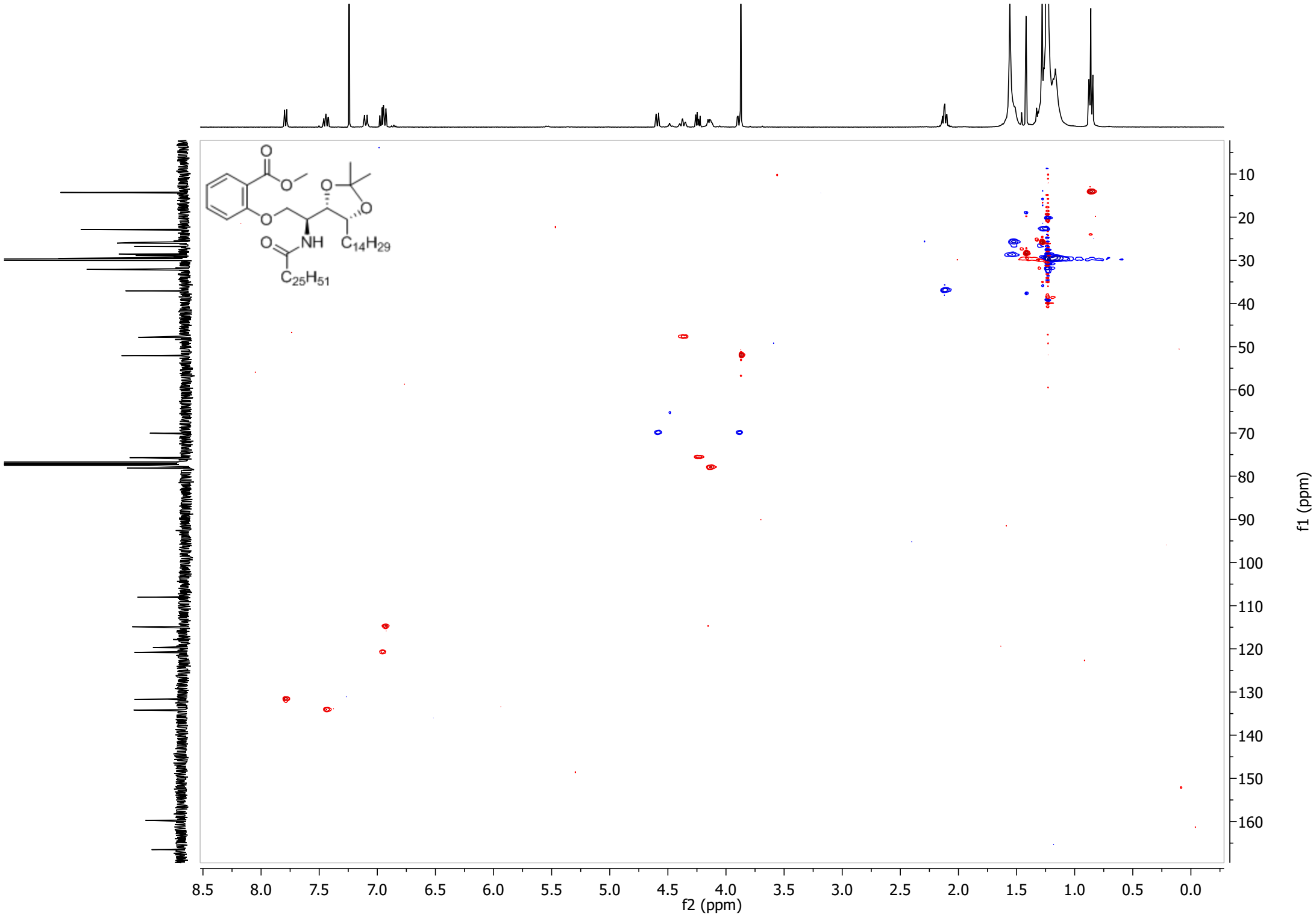

OH
O
O
O
NH
$C_{14}H_{29}$
$C_{25}H_{51}$
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
f1 (ppm)

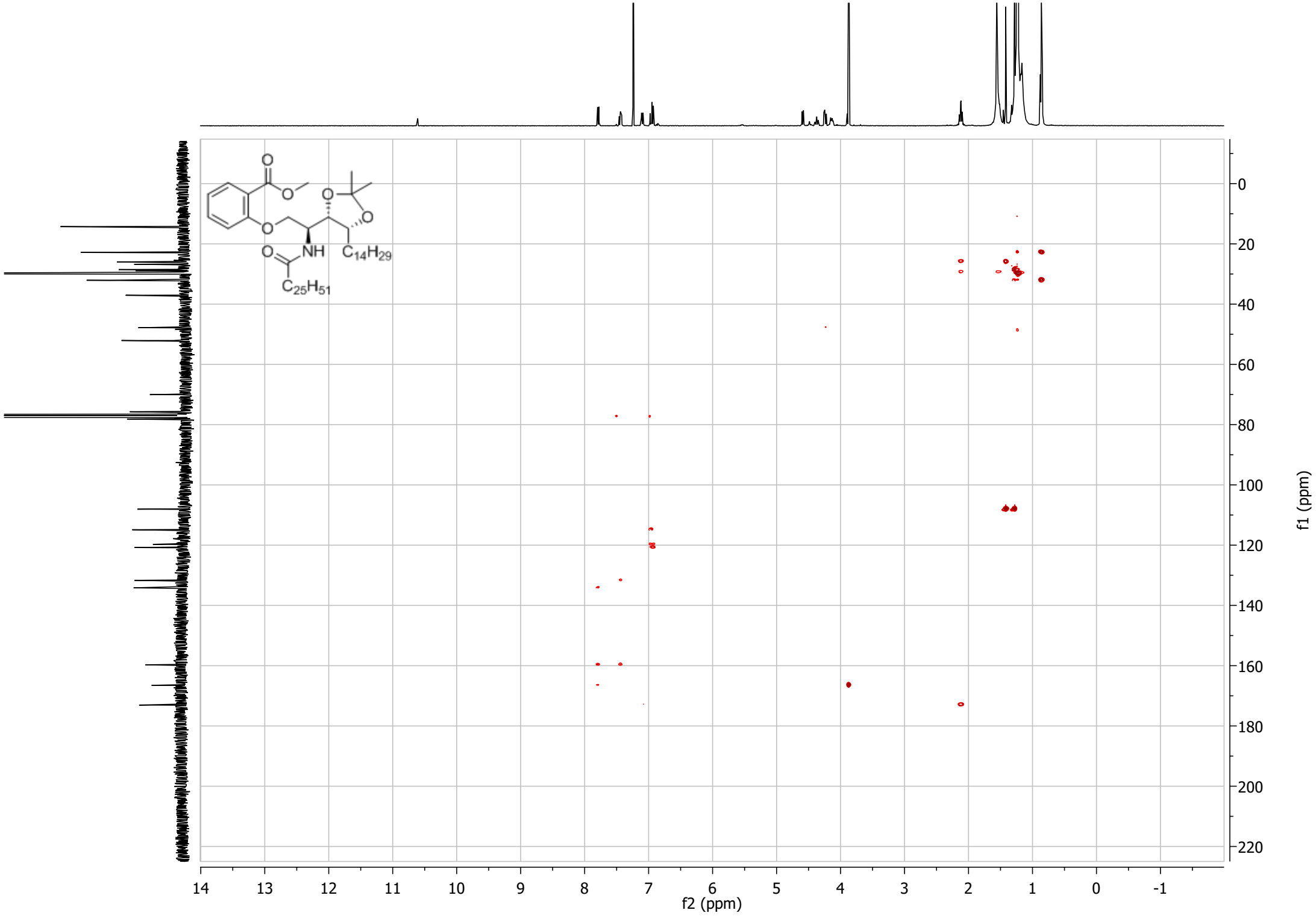

OH
O
O
O
NH
O
$C_{14}H_{29}$
$C_{25}H_{51}$
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
f1 (ppm)

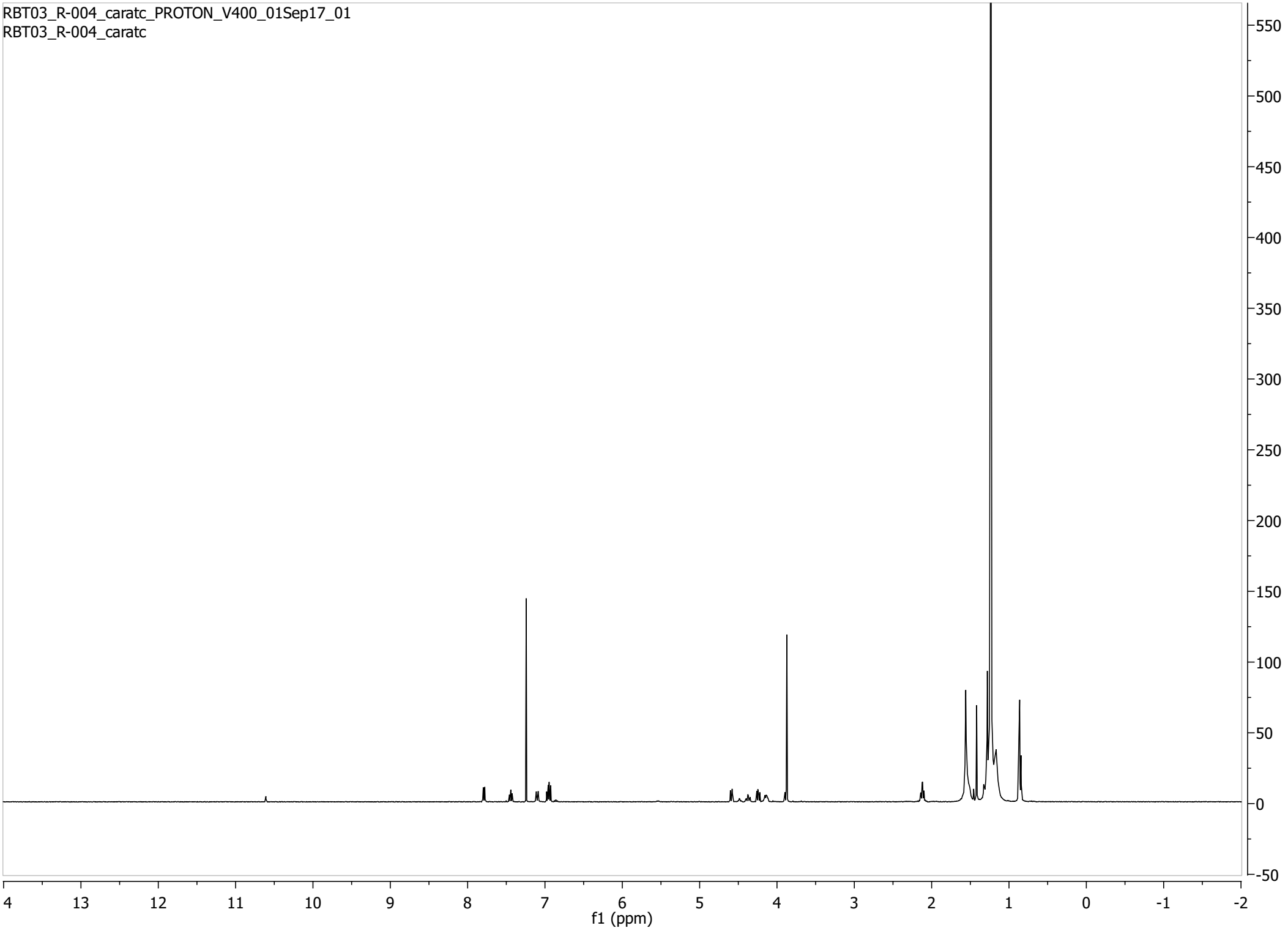

7.82 7.81 7.80 7.80 7.48 7.48 7.46 7.46 7.46 7.44 7.44 7.13 7.10 7.00 6.98 6.98 6.96 6.96 6.94
4.62 4.62 4.60 4.59 4.40 4.39 4.39 4.39 4.37 4.37 4.28 4.26 4.25 4.24 4.17 4.17 4.16 4.16 4.15 4.14 3.92 3.91 3.90 3.89
2.16 2.15 2.14 2.13 2.12 2.12 1.57 1.55 1.54 1.53 1.44 1.34 1.33 1.32 1.31 1.30 1.28 1.28 1.25 1.20 1.18 1.18 1.17 1.15 0.89 0.88 0.86
O
O
O
O
O
NH
C14H29
O
C25H51
¹H NMR (400 MHz, Chloroform-d) δ 7.81 (dd, J = 7.8, 1.8 Hz, 1H), 7.46 (ddd, J = 8.8, 7.5, 1.8 Hz, 1H), 7.12 (d, J = 9.6 Hz, 1H), 7.02 – 6.92 (m, 2H), 4.61 (dd, J = 9.0, 1.3 Hz, 1H), 4.46 – 4.33 (m, 1H), 4.26 (dd, J = 10.0, 5.3 Hz, 1H), 4.20 – 4.11 (m, 1H), 3.93 – 3.86 (m, 4H), 2.14 (td, J = 7.3, 2.3 Hz, 2H), 1.57 (s, 4H), 1.44 (s, 3H), 1.37 – 1.12 (m, 71H), 0.88 (t, J = 6.7 Hz, 6H).
H (ddd) 7.46
J (m) 6.97
B (m) 4.38
N (s) 1.57
L (m) 1.25
G (dd) 7.81
I (d) 7.12
A (dd) 4.61
C (dd) 4.26
E (m) 3.89
F (td) 2.14
K (s) 1.44
M (t) 0.88
D (m) 4.15
1.05
1.13
0.93
2.10
1.00
0.81
1.01
1.27
3.91
2.25
3.85
3.14
86.04
7.02
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.
f1 (ppm)


173.06
166.51
159.70
134.16
131.67
120.79
119.72
114.88
108.05
78.14
77.36
75.70
70.05
52.08
47.83
37.06
32.10
32.08
29.89
29.86
29.84
29.82
29.74
29.65
29.54
29.52
29.41
28.89
28.52
26.77
26.01
25.87
22.85
14.28
O
O
O
O
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
^{13}C NMR (101 MHz, cdcl$_3$) δ 173.06, 166.51, 159.70, 134.16, 131.67, 120.79, 119.72, 114.88, 108.05, 78.14, 77.36, 75.70, 70.05, 52.08, 47.83, 37.06, 32.10, 32.08, 29.89, 29.86, 29.84, 29.82, 29.74, 29.65, 29.54, 29.52, 29.41, 28.89, 28.52, 26.77, 26.01, 25.87, 22.85, 14.28.
90
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

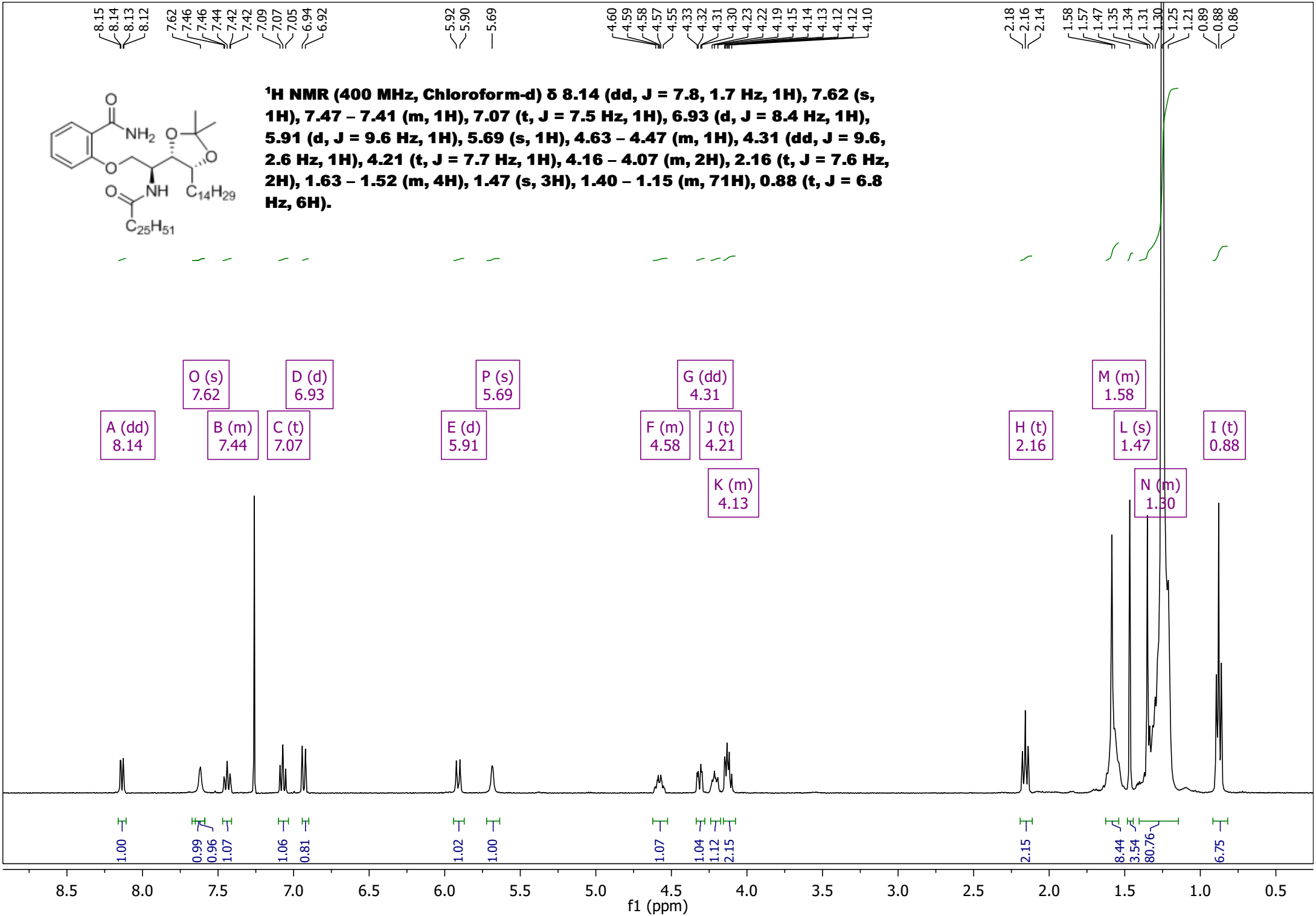

O
O
O
O
O
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f2 (ppm)
0 1 2 3 4 5 6 7 8 9 10 11
f1 (ppm)

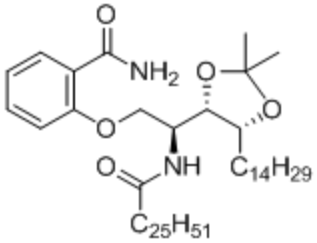

O
O
O
O
O
NH
C14H29
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
f1 (ppm)


O
O
O
O
O
NH
C14H29
C25H51
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
20
40
60
80
100
120
140
160
180
200
220
f1 (ppm)

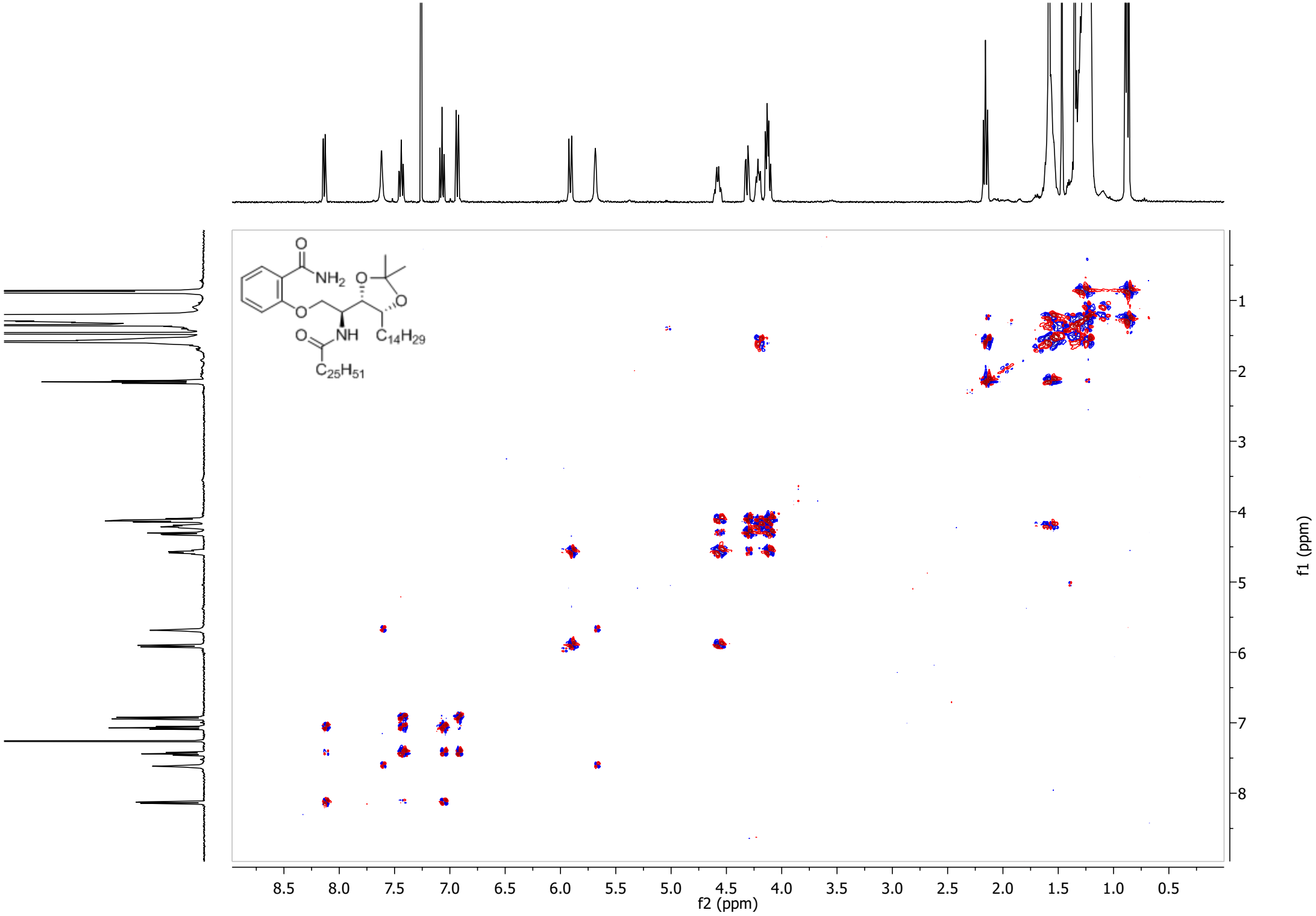

RBT03_R-004_caratc_PROTON_V400_01Sep17_01
RBT03_R-004_caratc
550
500
450
400
350
300
250
200
150
100
50
0
-50
4
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
f1 (ppm)

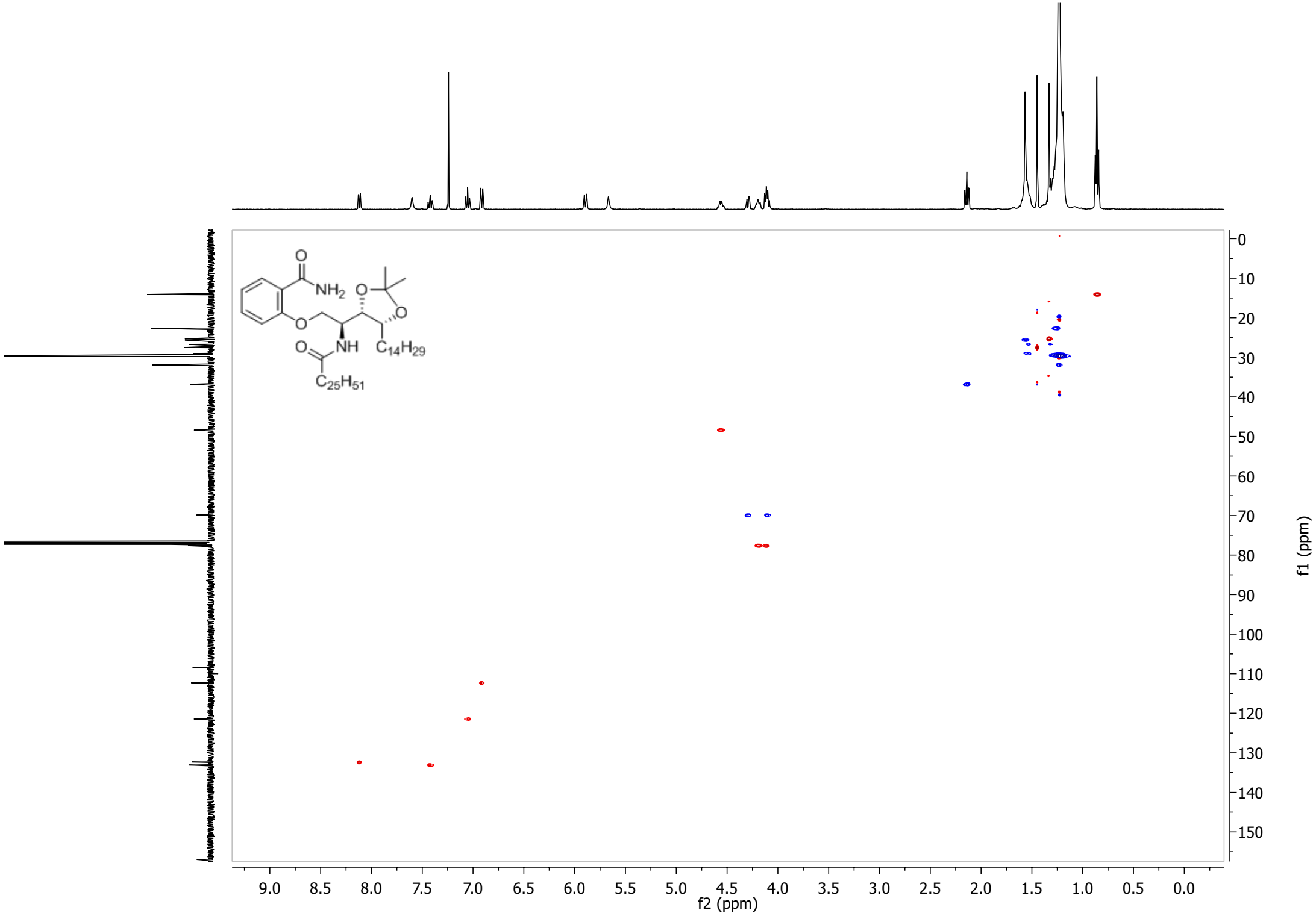
^{1}H NMR (400 MHz, Chloroform-d) δ 8.14 (dd, J = 7.8, 1.7 Hz, 1H), 7.62 (s, 1H), 7.47 – 7.41 (m, 1H), 7.07 (t, J = 7.5 Hz, 1H), 6.93 (d, J = 8.4 Hz, 1H), 5.91 (d, J = 9.6 Hz, 1H), 5.69 (s, 1H), 4.63 – 4.47 (m, 1H), 4.31 (dd, J = 9.6, 2.6 Hz, 1H), 4.21 (t, J = 7.7 Hz, 1H), 4.16 – 4.07 (m, 2H), 2.16 (t, J = 7.6 Hz, 2H), 1.63 – 1.52 (m, 4H), 1.47 (s, 3H), 1.40 – 1.15 (m, 71H), 0.88 (t, J = 6.8 Hz, 6H).

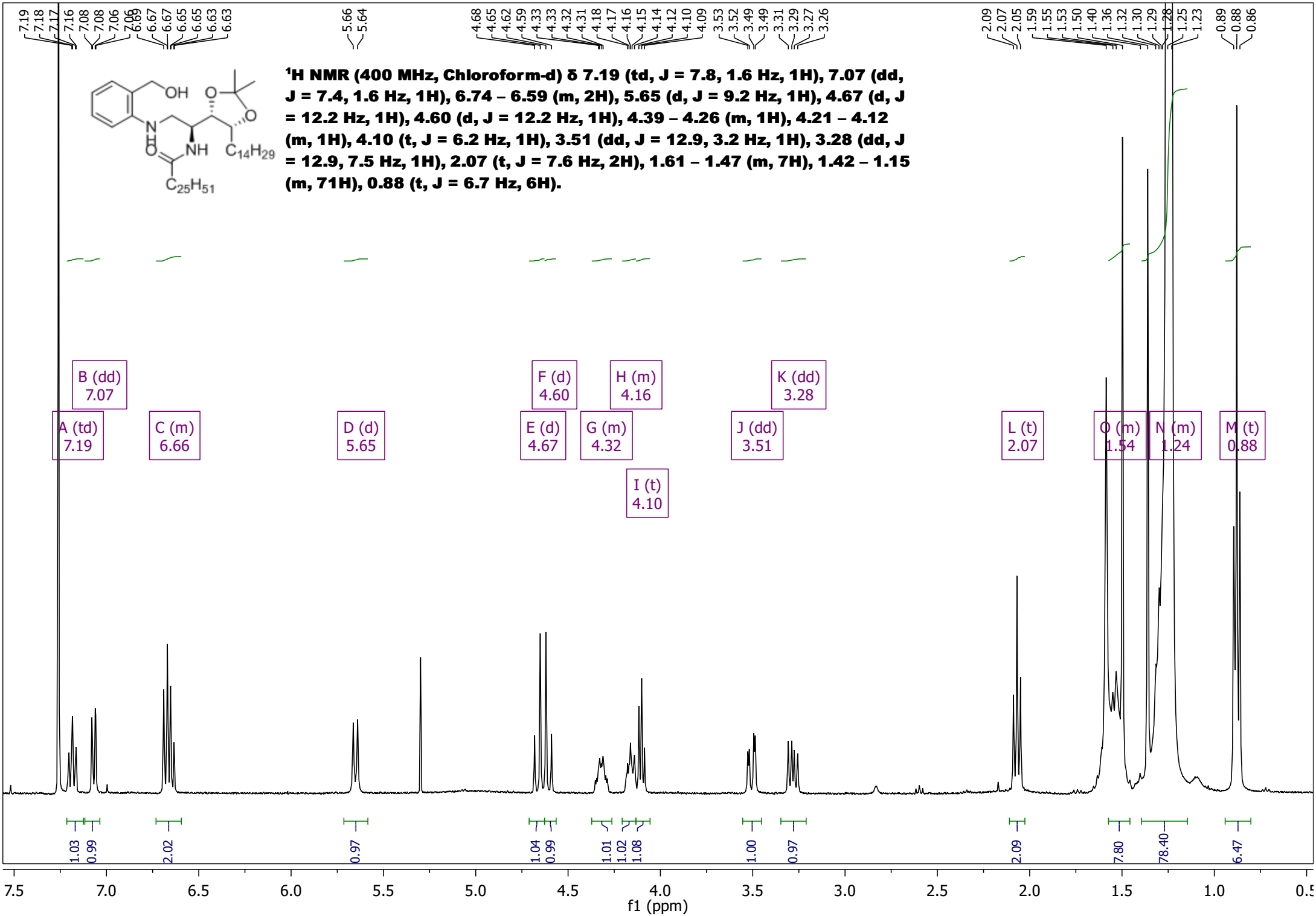




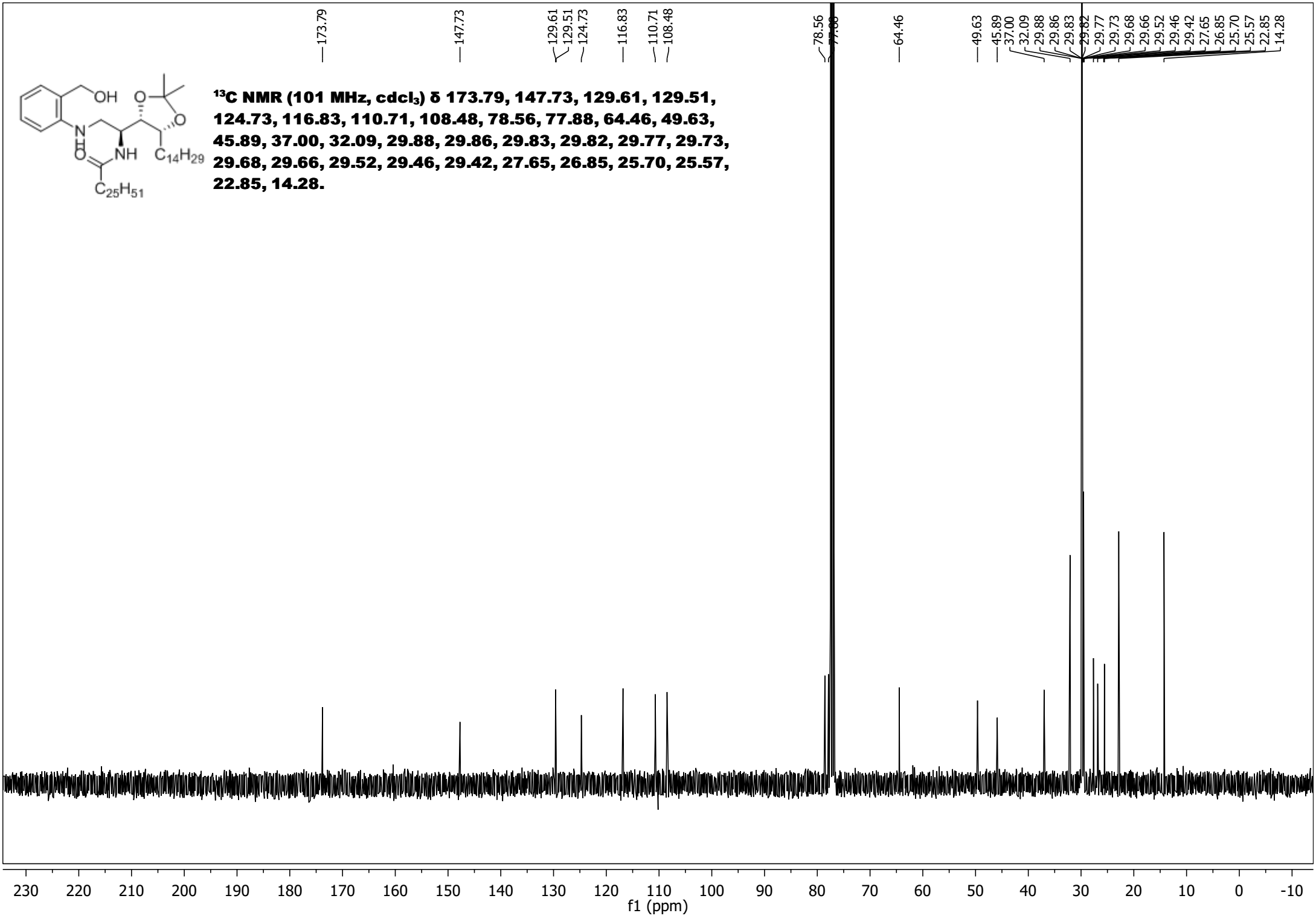
^{13}C NMR (101 MHz, Chloroform-d) δ 173.23, 167.15, 157.18, 133.29, 132.52, 121.73, 121.62, 112.50, 108.63, 77.91, 77.81, 77.48, 77.36, 77.16, 76.84, 70.05, 48.60, 37.01, 32.09, 29.88, 29.86, 29.82, 29.79, 29.75, 29.72, 29.67, 29.52, 29.44, 29.21, 27.70, 26.91, 25.81, 25.49, 22.85, 14.28.

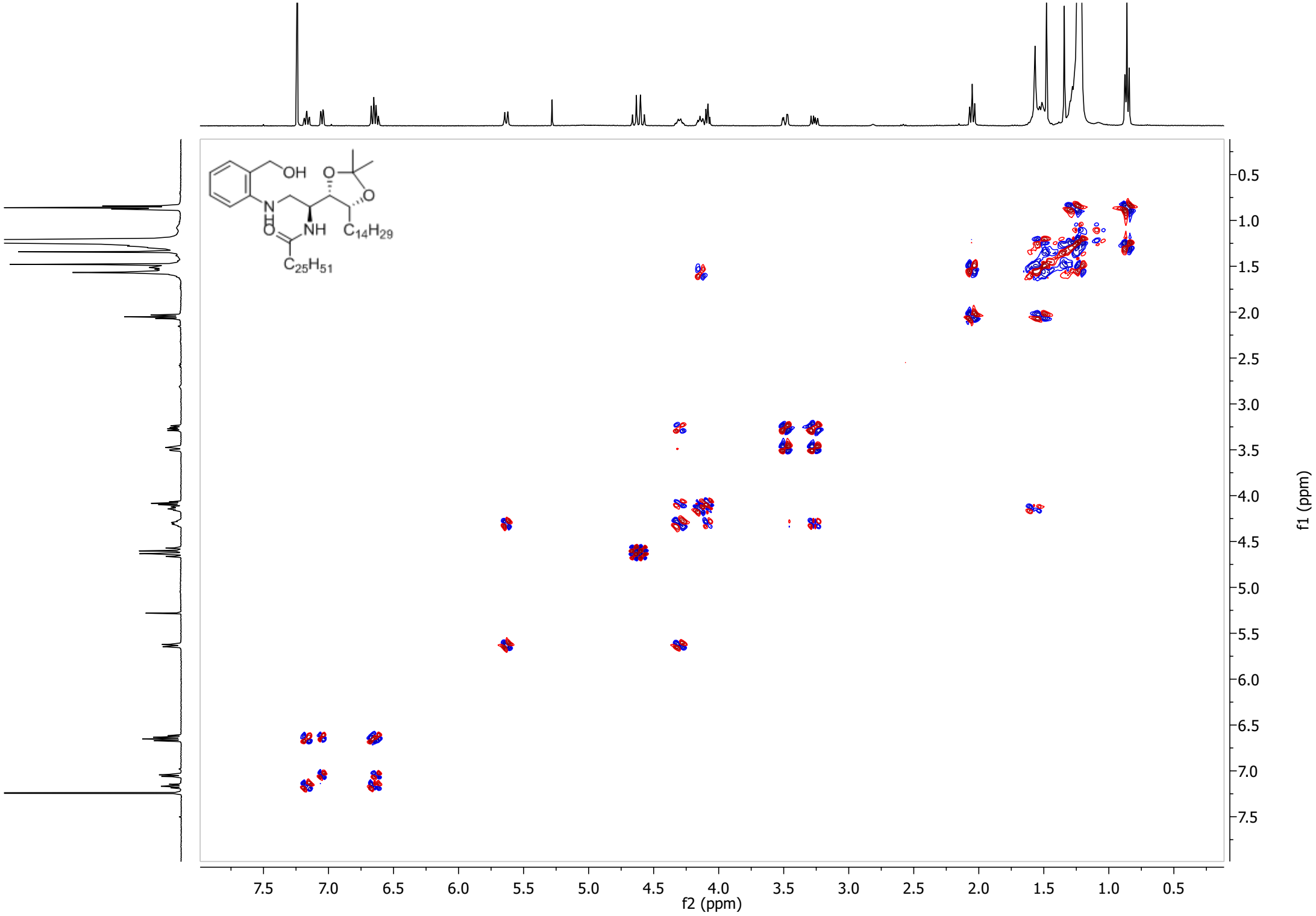

NH2
O
NH
C14H29
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

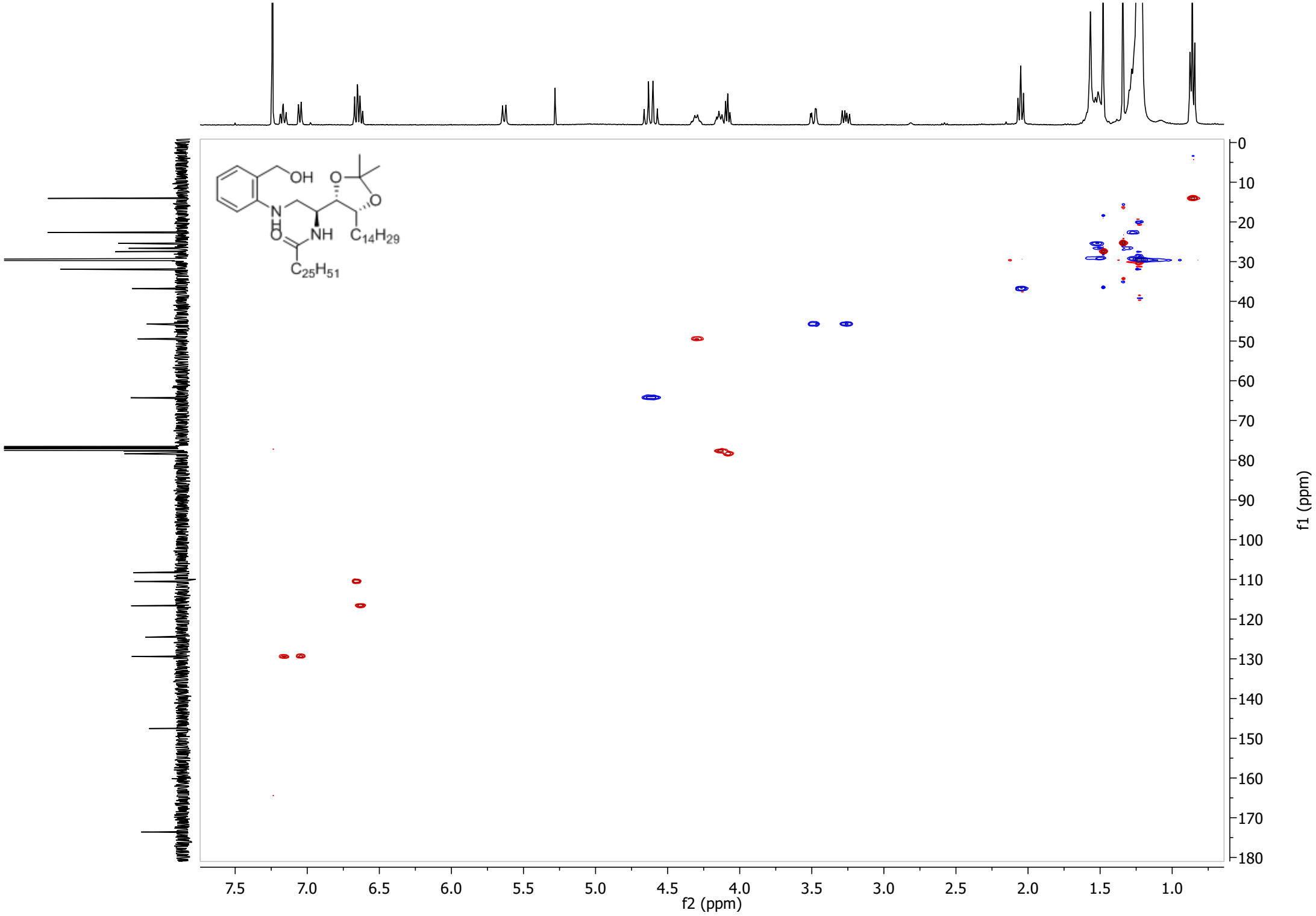

O
NH2
O
O
O
NH
C14H29
O
C25H51
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
f1 (ppm)

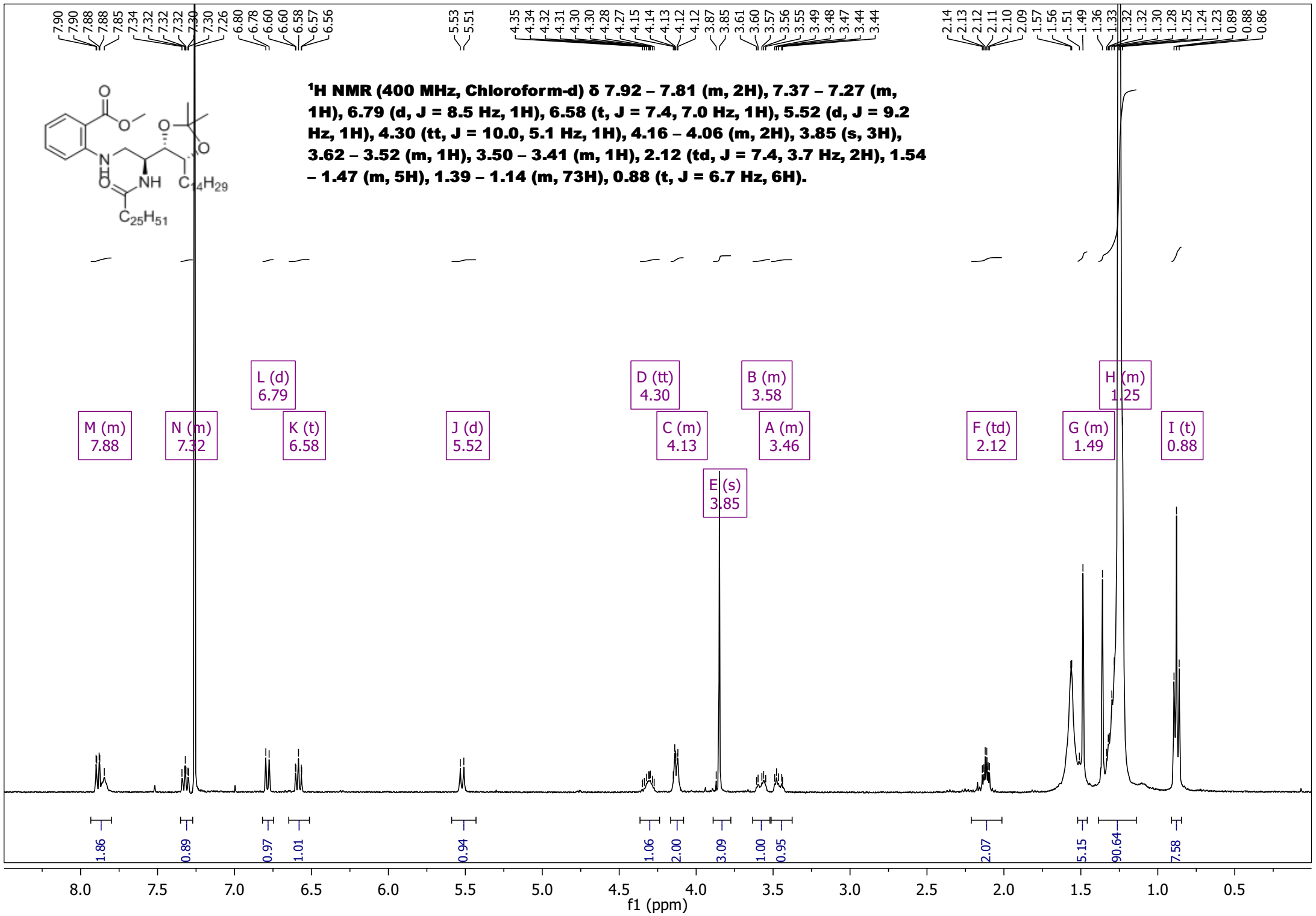

7.19 7.18 7.17 7.16 7.08 7.08 7.06 7.06 6.69 6.67 6.67 6.65 6.65 6.63 6.63
5.66 5.64
4.68 4.65 4.62 4.59 4.33 4.33 4.32 4.31 4.18 4.17 4.16 4.15 4.14 4.12 4.10 4.09
3.53 3.52 3.49 3.49 3.31 3.29 3.27 3.26
2.09 2.07 2.05 1.59 1.55 1.53 1.50 1.40 1.36 1.32 1.30 1.29 1.28 1.25 1.23
0.89 0.88 0.86
OH
O
O
N
H
O
NH
$C_{14}H_{29}$
$C_{25}H_{51}$
¹H NMR (400 MHz, Chloroform-d) δ 7.19 (td, J = 7.8, 1.6 Hz, 1H), 7.07 (dd, J = 7.4, 1.6 Hz, 1H), 6.74 – 6.59 (m, 2H), 5.65 (d, J = 9.2 Hz, 1H), 4.67 (d, J = 12.2 Hz, 1H), 4.60 (d, J = 12.2 Hz, 1H), 4.39 – 4.26 (m, 1H), 4.21 – 4.12 (m, 1H), 4.10 (t, J = 6.2 Hz, 1H), 3.51 (dd, J = 12.9, 3.2 Hz, 1H), 3.28 (dd, J = 12.9, 7.5 Hz, 1H), 2.07 (t, J = 7.6 Hz, 2H), 1.61 – 1.47 (m, 7H), 1.42 – 1.15 (m, 71H), 0.88 (t, J = 6.7 Hz, 6H).
A (td) 7.19
B (dd) 7.07
C (m) 6.66
D (d) 5.65
E (d) 4.67
F (d) 4.60
G (m) 4.32
H (m) 4.16
I (t) 4.10
J (dd) 3.51
K (dd) 3.28
L (t) 2.07
O (m) 1.54
N (m) 1.24
M (t) 0.88
1.03 0.99 2.02 0.97 1.04 0.99 1.01 1.02 1.08 1.00 0.97 2.09 7.80 78.40 6.47
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)

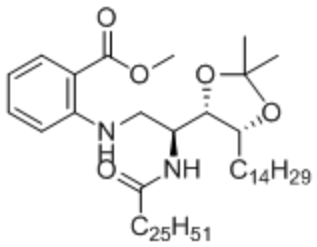
^{13}C NMR (101 MHz, cdcl$_3$) δ 173.79, 147.73, 129.61, 129.51, 124.73, 116.83, 110.71, 108.48, 78.56, 77.88, 64.46, 49.63, 45.89, 37.00, 32.09, 29.88, 29.86, 29.83, 29.82, 29.77, 29.73, 29.68, 29.66, 29.52, 29.46, 29.42, 27.65, 26.85, 25.70, 25.57, 22.85, 14.28.



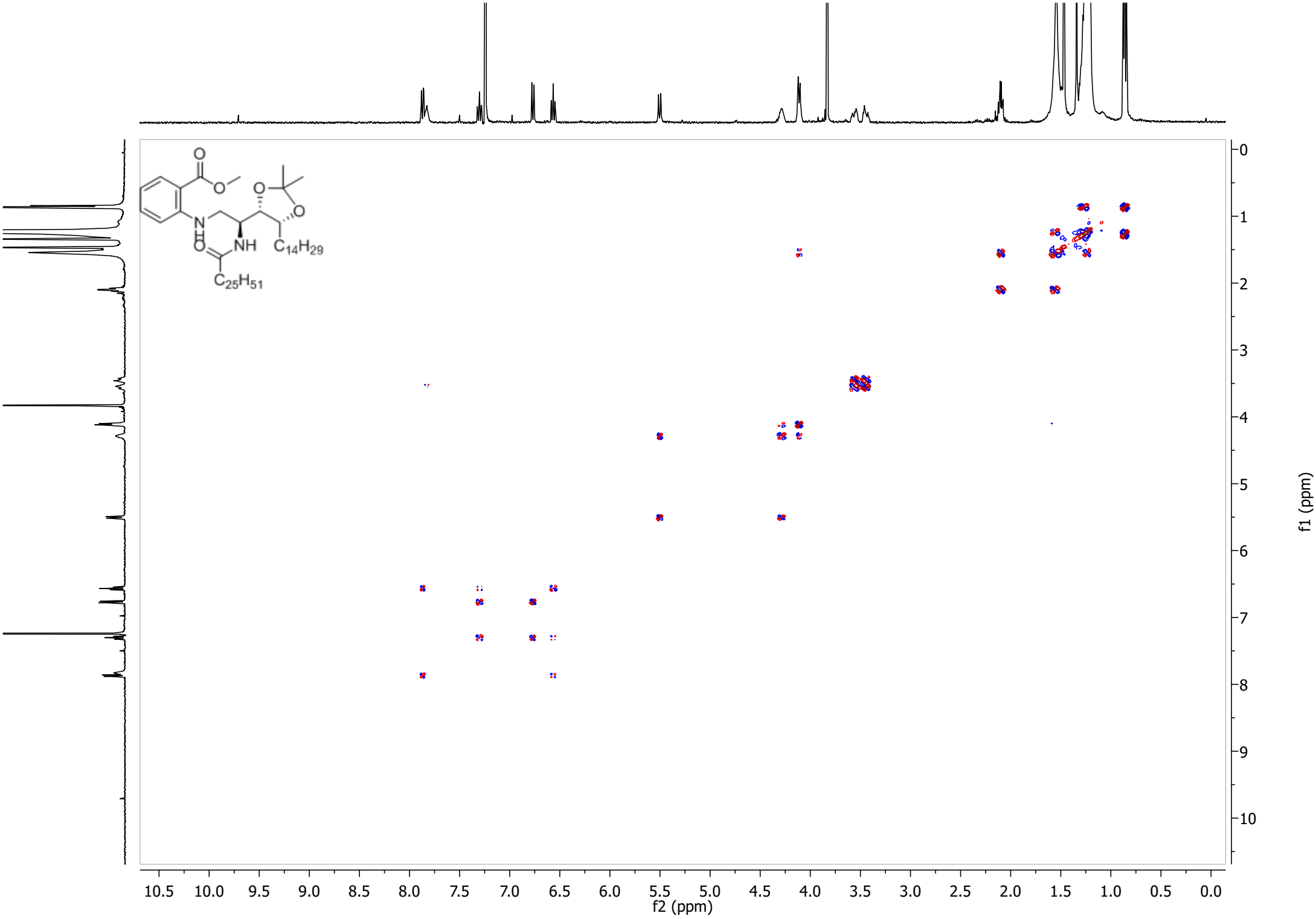

OH
O
O
N
H
O
NH
$C_{14}H_{29}$
$C_{25}H_{51}$
f2 (ppm)
f1 (ppm)

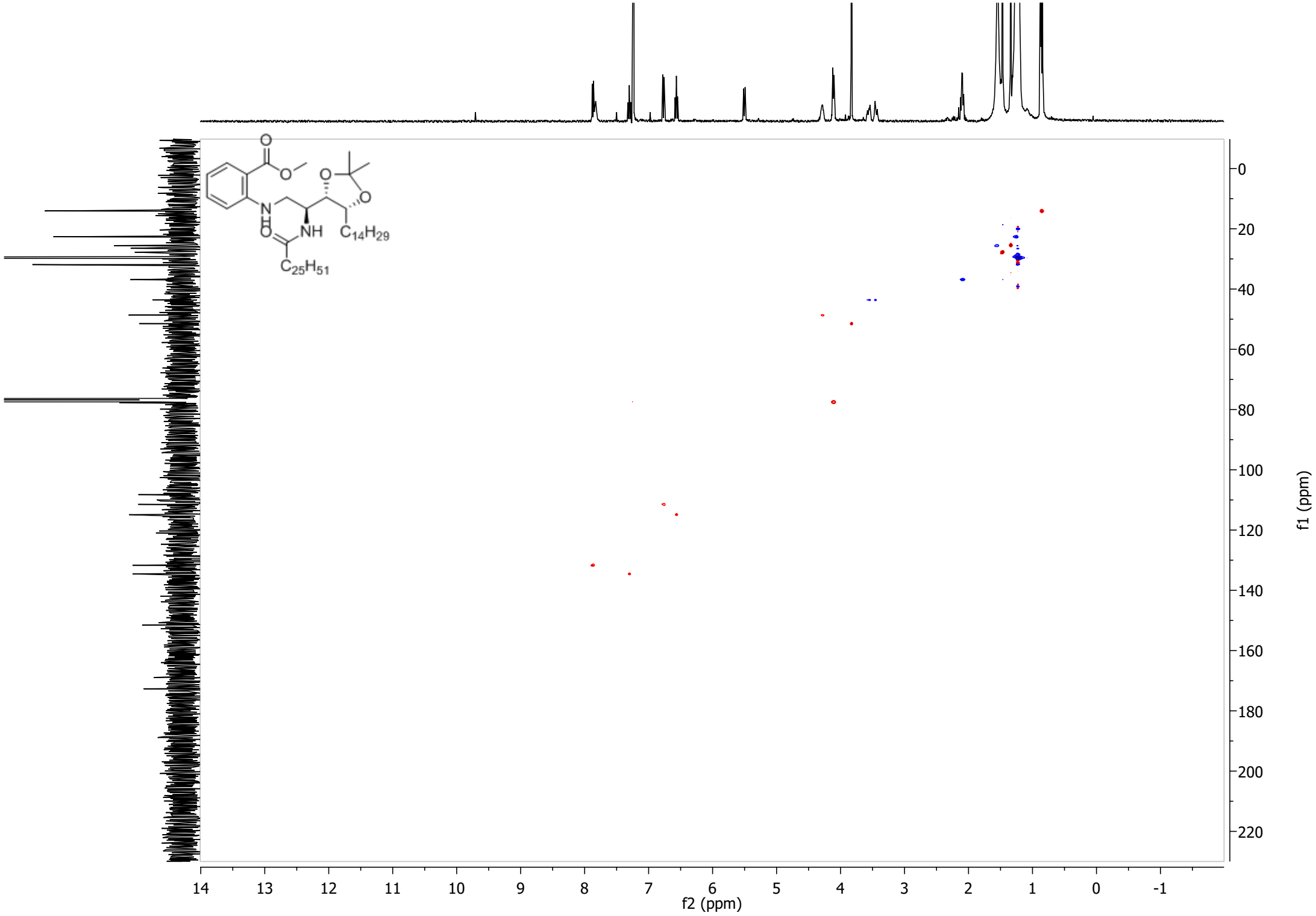

OH
O
O
N
H
NH
O
C14H29
C25H51
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
f1 (ppm)


7.90 7.90 7.88 7.88 7.85 7.34 7.32 7.32 7.32 7.30 7.30 7.26 6.80 6.78 6.60 6.60 6.58 6.57 6.56
5.53 5.51
4.35 4.34 4.32 4.31 4.30 4.30 4.28 4.27 4.15 4.14 4.13 4.12 4.12 3.87 3.85 3.61 3.60 3.57 3.56 3.55 3.49 3.48 3.47 3.44 3.44
2.14 2.13 2.12 2.11 2.10 2.09 1.57 1.56 1.51 1.49 1.36 1.33 1.32 1.32 1.30 1.28 1.25 1.24 1.23 0.89 0.88 0.86
O
O
O
O
N
H
O
NH
C14H29
C25H51
¹H NMR (400 MHz, Chloroform-d) δ 7.92 – 7.81 (m, 2H), 7.37 – 7.27 (m, 1H), 6.79 (d, J = 8.5 Hz, 1H), 6.58 (t, J = 7.4, 7.0 Hz, 1H), 5.52 (d, J = 9.2 Hz, 1H), 4.30 (tt, J = 10.0, 5.1 Hz, 1H), 4.16 – 4.06 (m, 2H), 3.85 (s, 3H), 3.62 – 3.52 (m, 1H), 3.50 – 3.41 (m, 1H), 2.12 (td, J = 7.4, 3.7 Hz, 2H), 1.54 – 1.47 (m, 5H), 1.39 – 1.14 (m, 73H), 0.88 (t, J = 6.7 Hz, 6H).
M (m) 7.88
N (m) 7.32
L (d) 6.79
K (t) 6.58
J (d) 5.52
D (tt) 4.30
C (m) 4.13
E (s) 3.85
B (m) 3.58
A (m) 3.46
F (td) 2.12
H (m) 1.25
G (m) 1.49
I (t) 0.88
1.86
0.89
0.97
1.01
0.94
1.06
2.00
3.09
1.00
0.95
2.07
5.15
90.64
7.58
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)

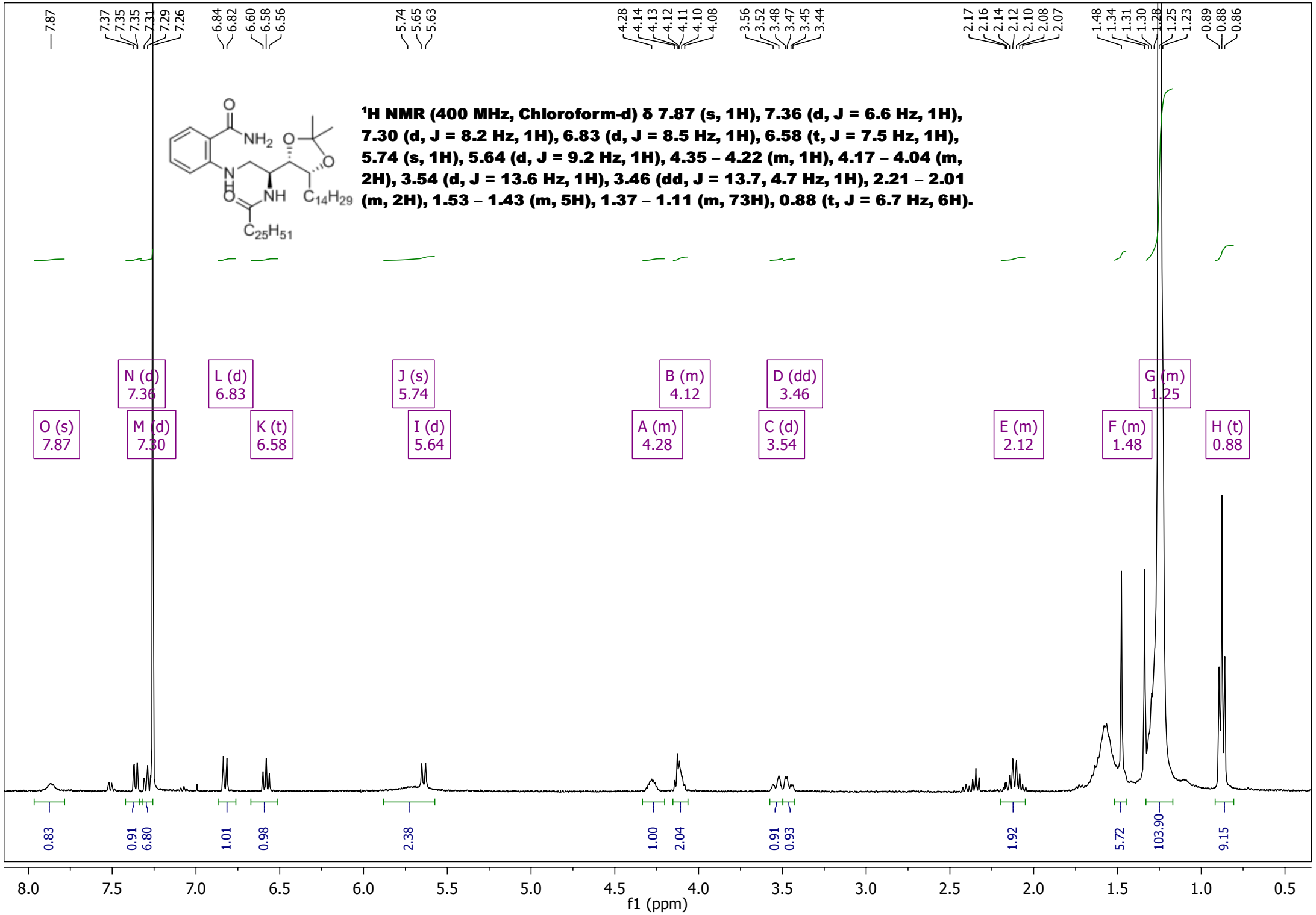


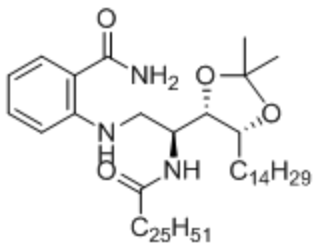
^{13}C NMR (101 MHz, cdcl$_3$) δ 172.67, 168.91, 151.49, 134.53, 131.67, 114.88, 111.47, 110.37, 109.99, 108.25, 77.69, 51.49, 48.67, 36.89, 31.90, 29.67, 29.55, 29.33, 27.77, 26.49, 25.58, 22.66, 14.09.


O
O
O
O
N
H
NH
O
C14H29
C25H51
f2 (ppm)
f1 (ppm)

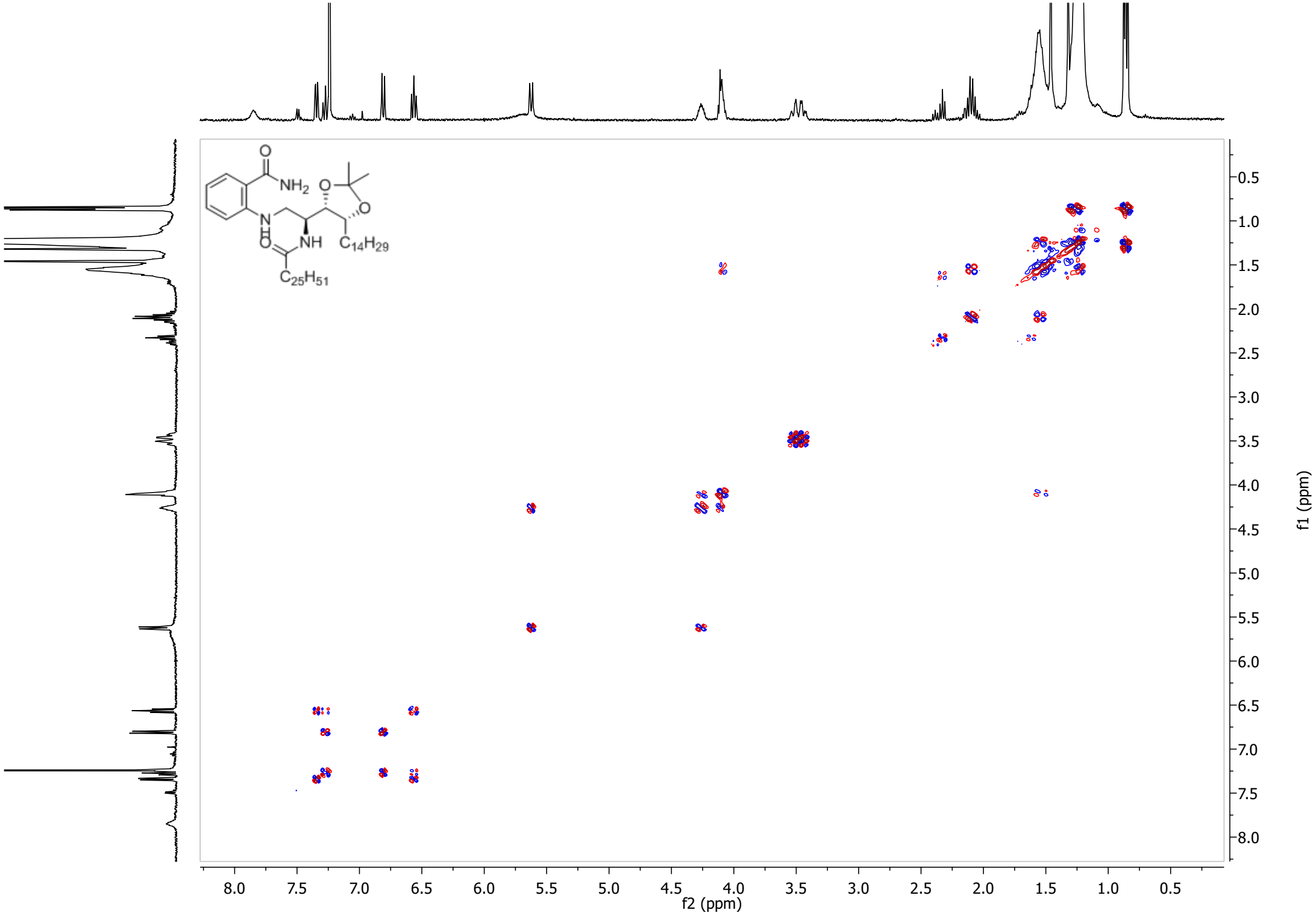

O
O
O
O
N
H
O
NH
C14H29
C25H51
f2 (ppm)
f1 (ppm)

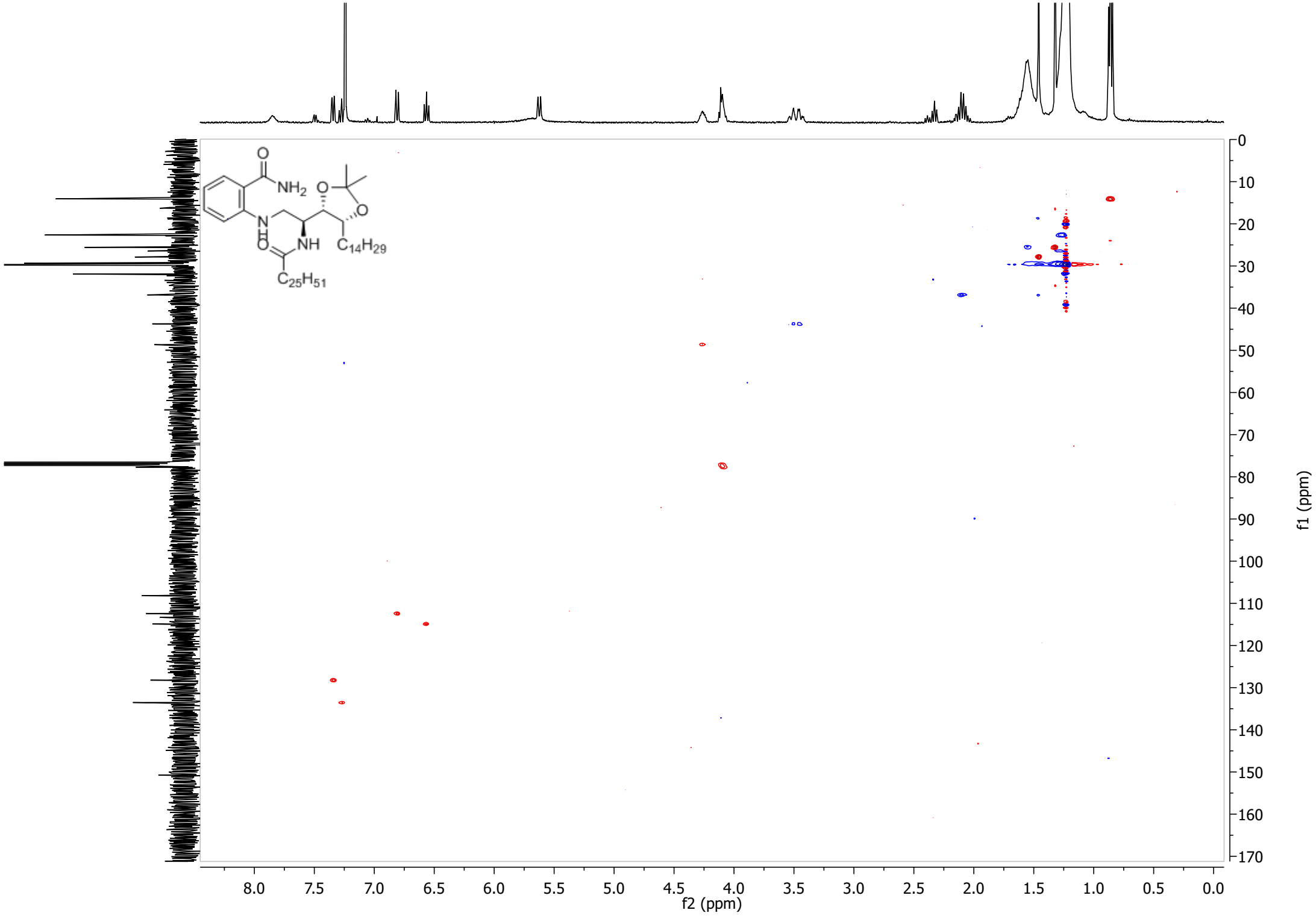
^{1}H NMR (400 MHz, Chloroform-d) δ 7.87 (s, 1H), 7.36 (d, J = 6.6 Hz, 1H), 7.30 (d, J = 8.2 Hz, 1H), 6.83 (d, J = 8.5 Hz, 1H), 6.58 (t, J = 7.5 Hz, 1H), 5.74 (s, 1H), 5.64 (d, J = 9.2 Hz, 1H), 4.35 – 4.22 (m, 1H), 4.17 – 4.04 (m, 2H), 3.54 (d, J = 13.6 Hz, 1H), 3.46 (dd, J = 13.7, 4.7 Hz, 1H), 2.21 – 2.01 (m, 2H), 1.53 – 1.43 (m, 5H), 1.37 – 1.11 (m, 73H), 0.88 (t, J = 6.7 Hz, 6H).

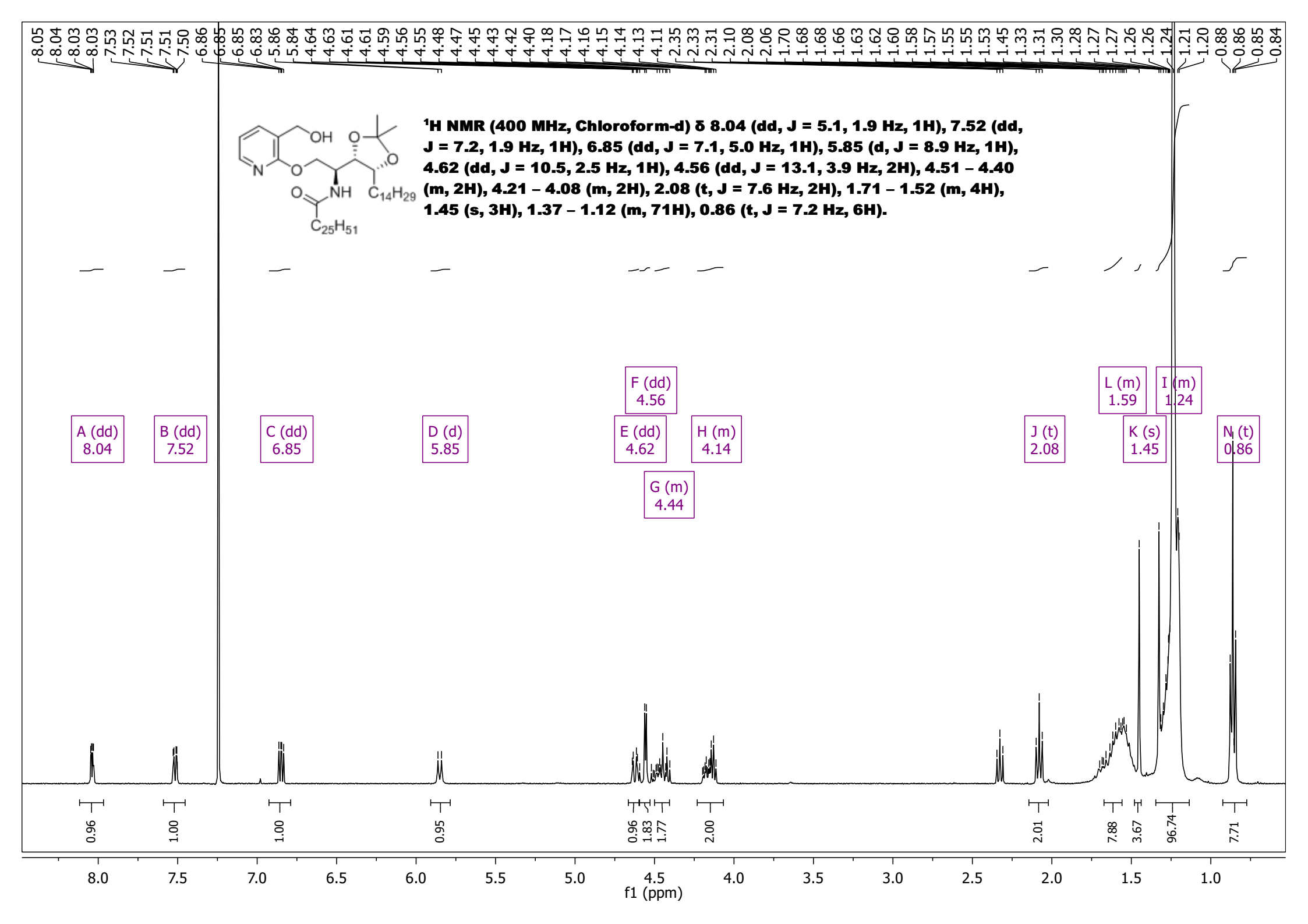


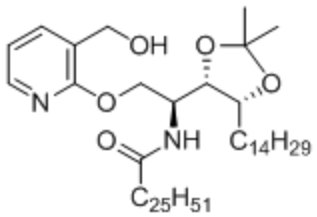


^{13}C NMR (101 MHz, cdcl$_3$) δ 172.70, 171.20, 150.78, 133.53, 128.23, 114.92, 113.34, 112.41, 108.21, 77.71, 77.29, 48.66, 43.71, 36.86, 31.90, 29.69, 29.67, 29.64, 29.63, 29.60, 29.57, 29.51, 29.49, 29.37, 29.33, 29.27, 27.87, 27.87, 26.43, 26.43, 25.58, 22.66, 14.09.

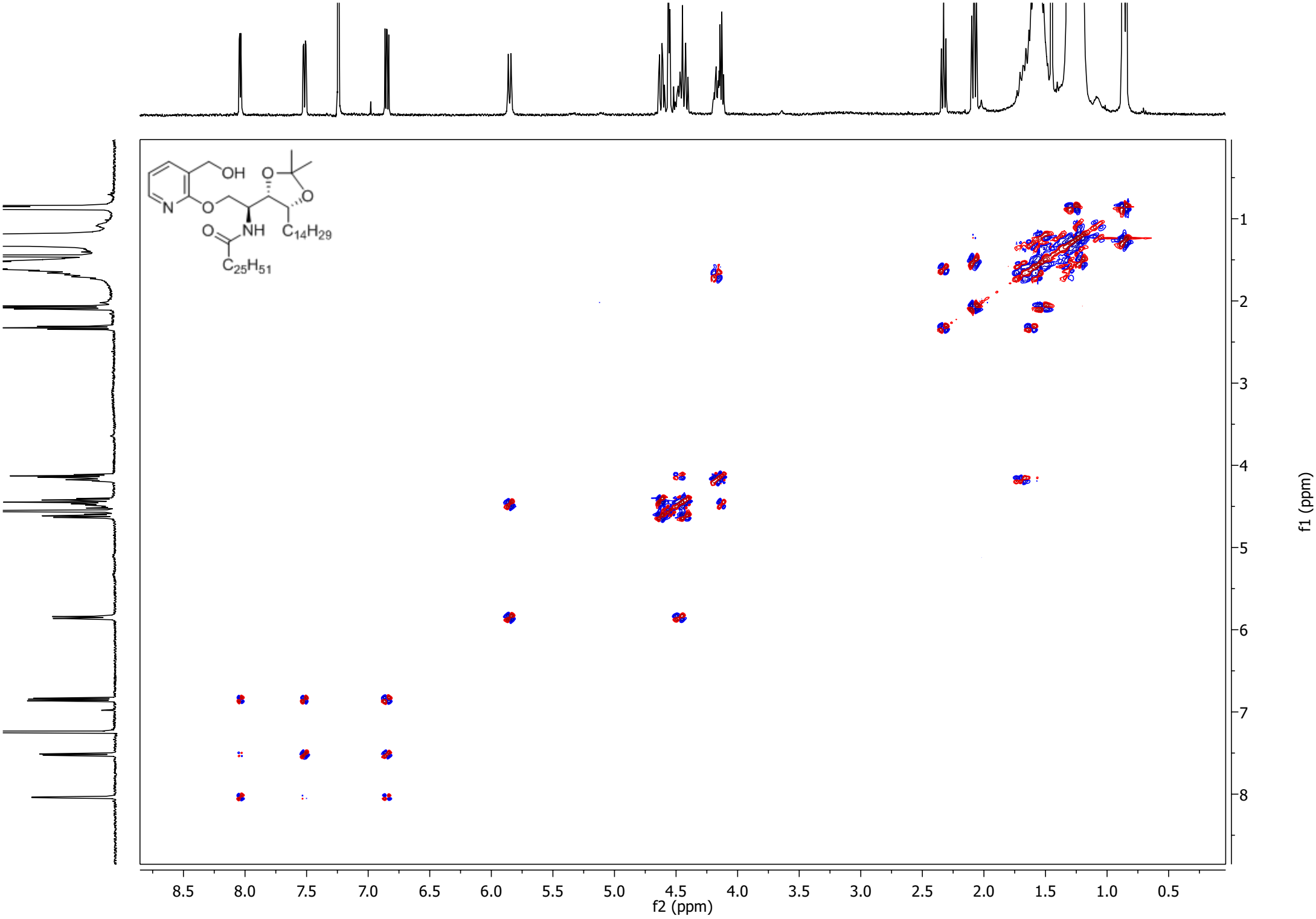

NH2
O
O
O
N
H
O
NH
C14H29
C25H51
f2 (ppm)
f1 (ppm)

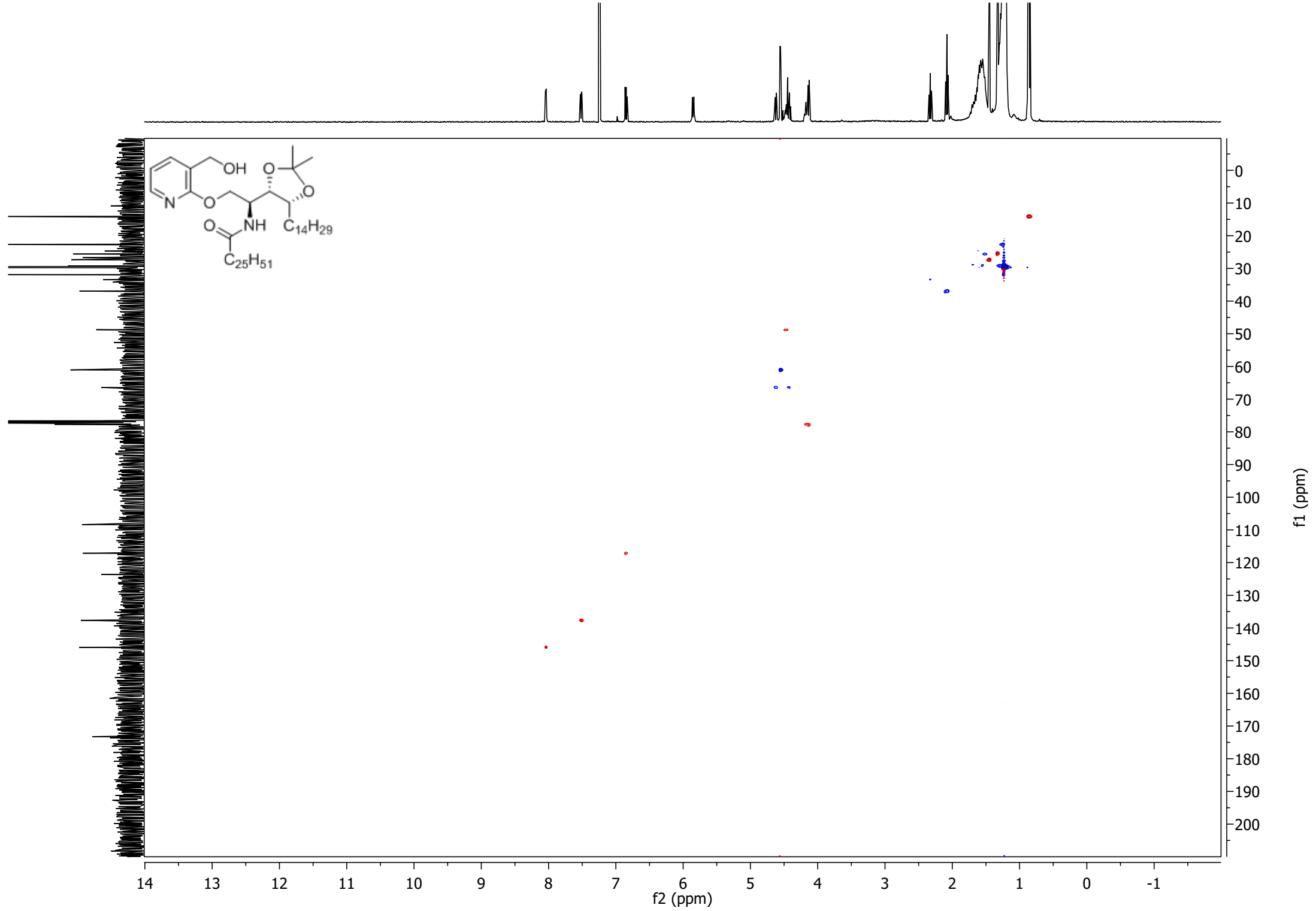

O
NH2
O
O
N
H
O
NH
C14H29
C25H51
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
f1 (ppm)


8.05 8.04 8.03 8.03 7.53 7.52 7.51 7.51 7.50 6.86 6.85 6.85 6.83 5.86 5.84 4.64 4.63 4.61 4.61 4.59 4.56 4.55 4.48 4.47 4.45 4.43 4.42 4.40 4.18 4.17 4.16 4.15 4.14 4.13 4.11 2.35 2.33 2.31 2.10 2.08 2.06 1.70 1.68 1.68 1.66 1.63 1.62 1.60 1.58 1.57 1.55 1.55 1.53 1.45 1.33 1.31 1.30 1.28 1.27 1.27 1.26 1.26 1.24 1.21 1.20 0.88 0.86 0.85 0.84
OH
O
O
N
O
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
¹H NMR (400 MHz, Chloroform-d) δ 8.04 (dd, J = 5.1, 1.9 Hz, 1H), 7.52 (dd, J = 7.2, 1.9 Hz, 1H), 6.85 (dd, J = 7.1, 5.0 Hz, 1H), 5.85 (d, J = 8.9 Hz, 1H), 4.62 (dd, J = 10.5, 2.5 Hz, 1H), 4.56 (dd, J = 13.1, 3.9 Hz, 2H), 4.51 – 4.40 (m, 2H), 4.21 – 4.08 (m, 2H), 2.08 (t, J = 7.6 Hz, 2H), 1.71 – 1.52 (m, 4H), 1.45 (s, 3H), 1.37 – 1.12 (m, 71H), 0.86 (t, J = 7.2 Hz, 6H).
A (dd) 8.04
B (dd) 7.52
C (dd) 6.85
D (d) 5.85
F (dd) 4.56
E (dd) 4.62
G (m) 4.44
H (m) 4.14
J (t) 2.08
L (m) 1.59
K (s) 1.45
I (m) 1.24
N (t) 0.86
0.96
1.00
1.00
0.95
0.96
1.83
1.77
2.00
2.01
7.88
3.67
96.74
7.71
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
f1 (ppm)

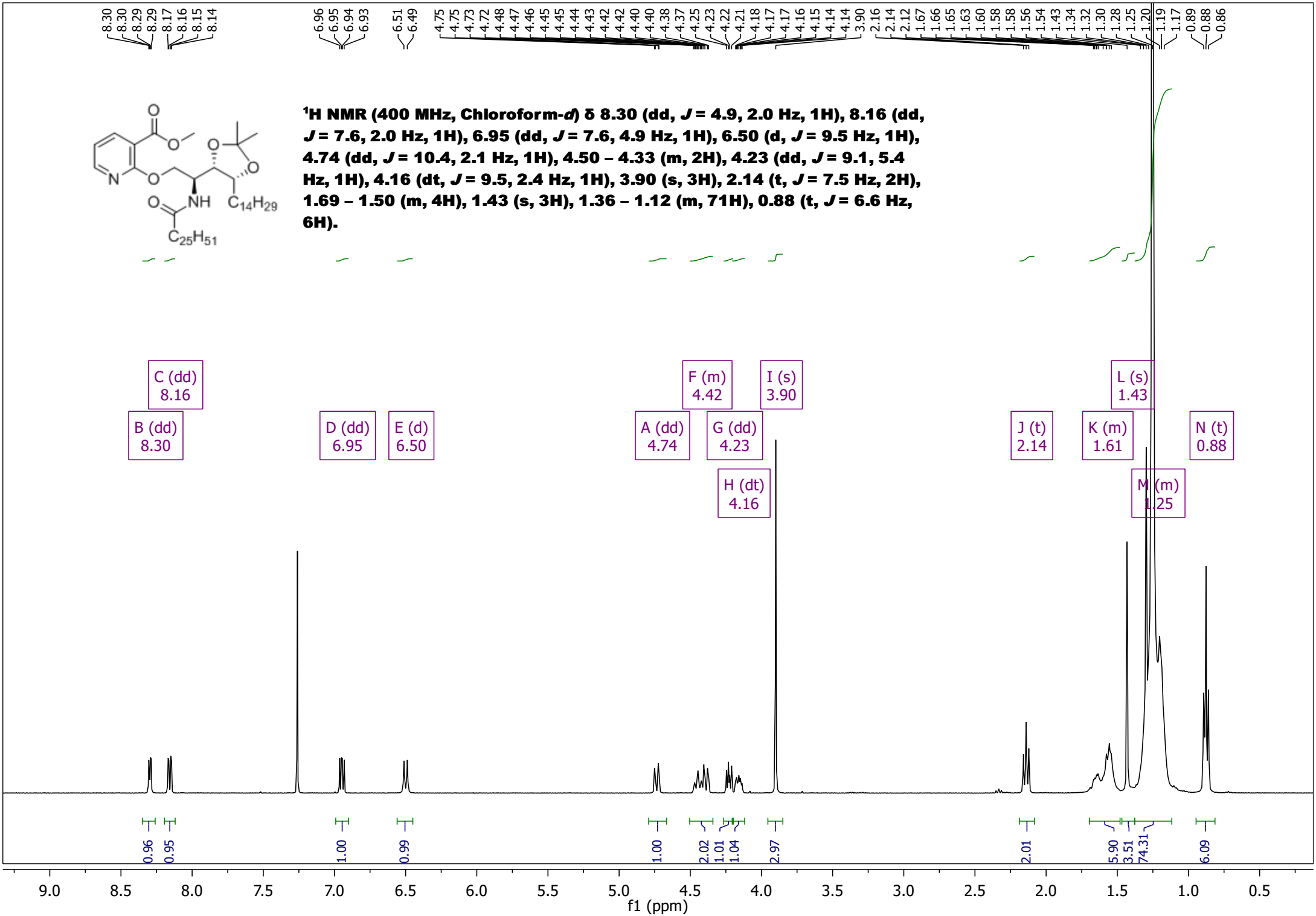


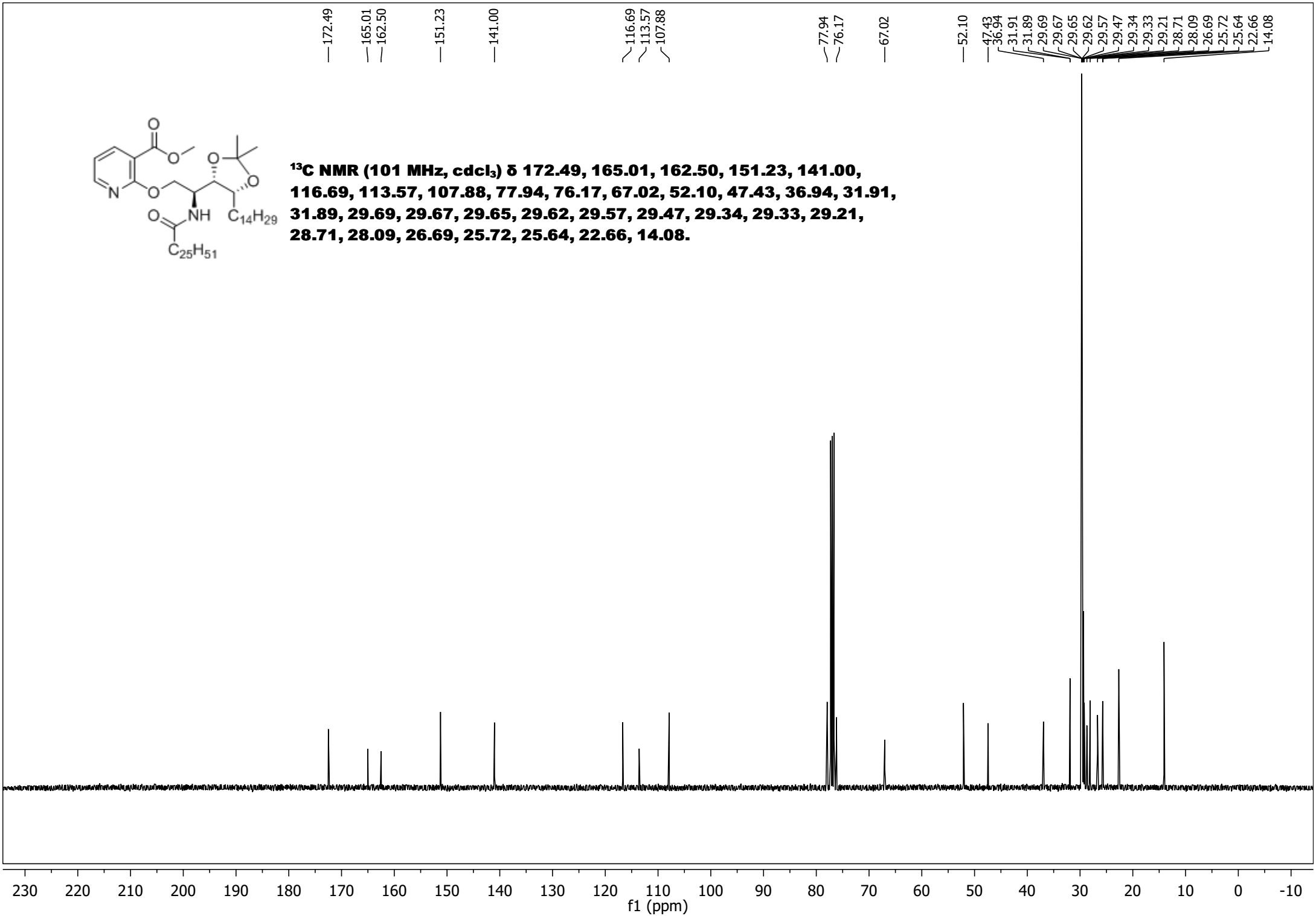
^{13}C NMR (101 MHz, Chloroform-d) δ 173.43, 161.73, 146.10, 137.85, 123.85, 117.31, 108.56, 78.16, 77.90, 66.63, 61.24, 48.94, 37.11, 33.60, 32.09, 29.88, 29.86, 29.83, 29.82, 29.80, 29.74, 29.66, 29.61, 29.52, 29.42, 29.22, 27.53, 26.90, 25.75, 25.53, 24.91, 22.85, 14.28.

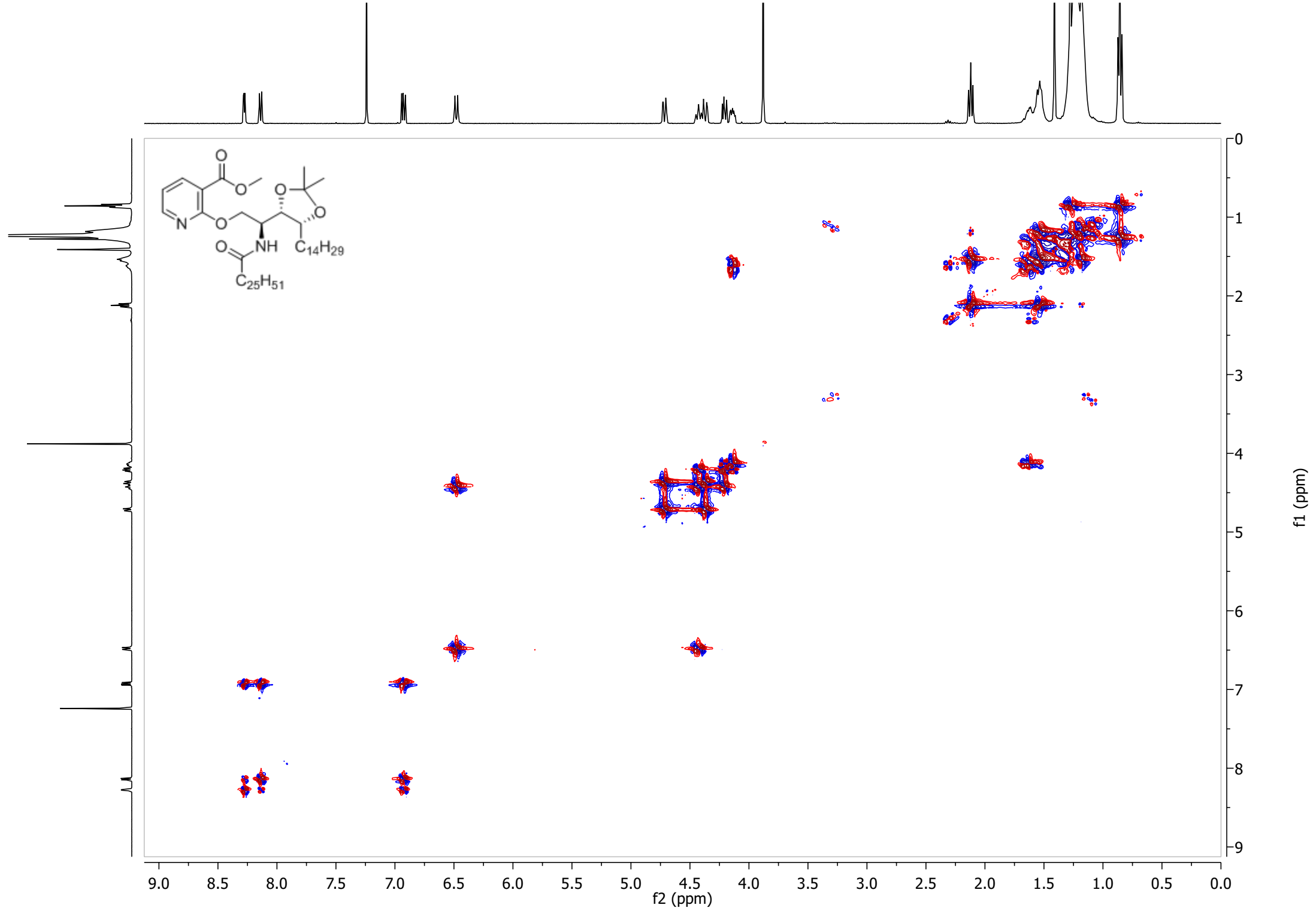

OH
O
N
O
NH
O
$C_{14}H_{29}$
$C_{25}H_{51}$
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

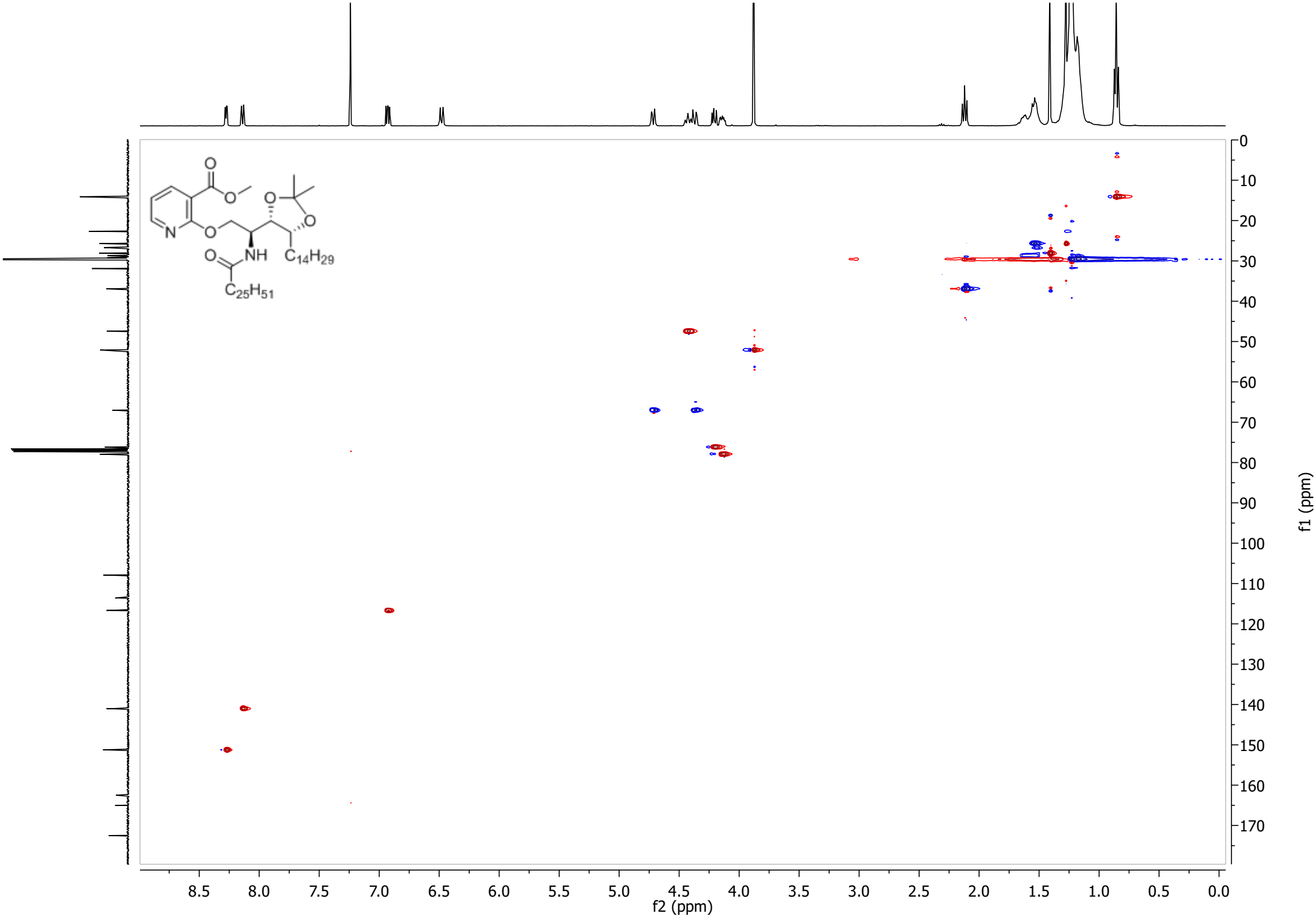

OH
O
O
N
O
NH
O
$C_{14}H_{29}$
$C_{25}H_{51}$
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
f1 (ppm)

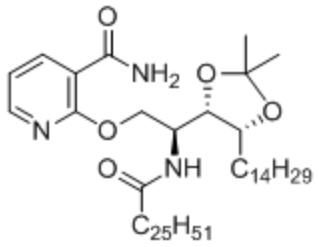
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.30 (dd, *J* = 4.9, 2.0 Hz, 1H), 8.16 (dd, *J* = 7.6, 2.0 Hz, 1H), 6.95 (dd, *J* = 7.6, 4.9 Hz, 1H), 6.50 (d, *J* = 9.5 Hz, 1H), 4.74 (dd, *J* = 10.4, 2.1 Hz, 1H), 4.50 – 4.33 (m, 2H), 4.23 (dd, *J* = 9.1, 5.4 Hz, 1H), 4.16 (dt, *J* = 9.5, 2.4 Hz, 1H), 3.90 (s, 3H), 2.14 (t, *J* = 7.5 Hz, 2H), 1.69 – 1.50 (m, 4H), 1.43 (s, 3H), 1.36 – 1.12 (m, 71H), 0.88 (t, *J* = 6.6 Hz, 6H).



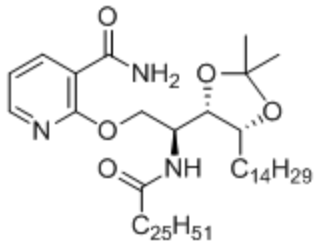

172.49
165.01
162.50
151.23
141.00
116.69
113.57
107.88
77.94
76.17
67.02
52.10
47.43
36.94
31.91
31.89
29.69
29.67
29.65
29.62
29.57
29.47
29.34
29.33
29.21
28.71
28.09
26.69
25.72
25.64
22.66
14.08
O
O
N
O
O
O
NH
$C_{14}H_{29}$
$C_{25}H_{51}$
^{13}C NMR (101 MHz, cdcl$_3$) δ 172.49, 165.01, 162.50, 151.23, 141.00, 116.69, 113.57, 107.88, 77.94, 76.17, 67.02, 52.10, 47.43, 36.94, 31.91, 31.89, 29.69, 29.67, 29.65, 29.62, 29.57, 29.47, 29.34, 29.33, 29.21, 28.71, 28.09, 26.69, 25.72, 25.64, 22.66, 14.08.
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


O
O
O
O
N
O
NH
$C_{14}H_{29}$
O
$C_{25}H_{51}$
f2 (ppm)
f1 (ppm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9

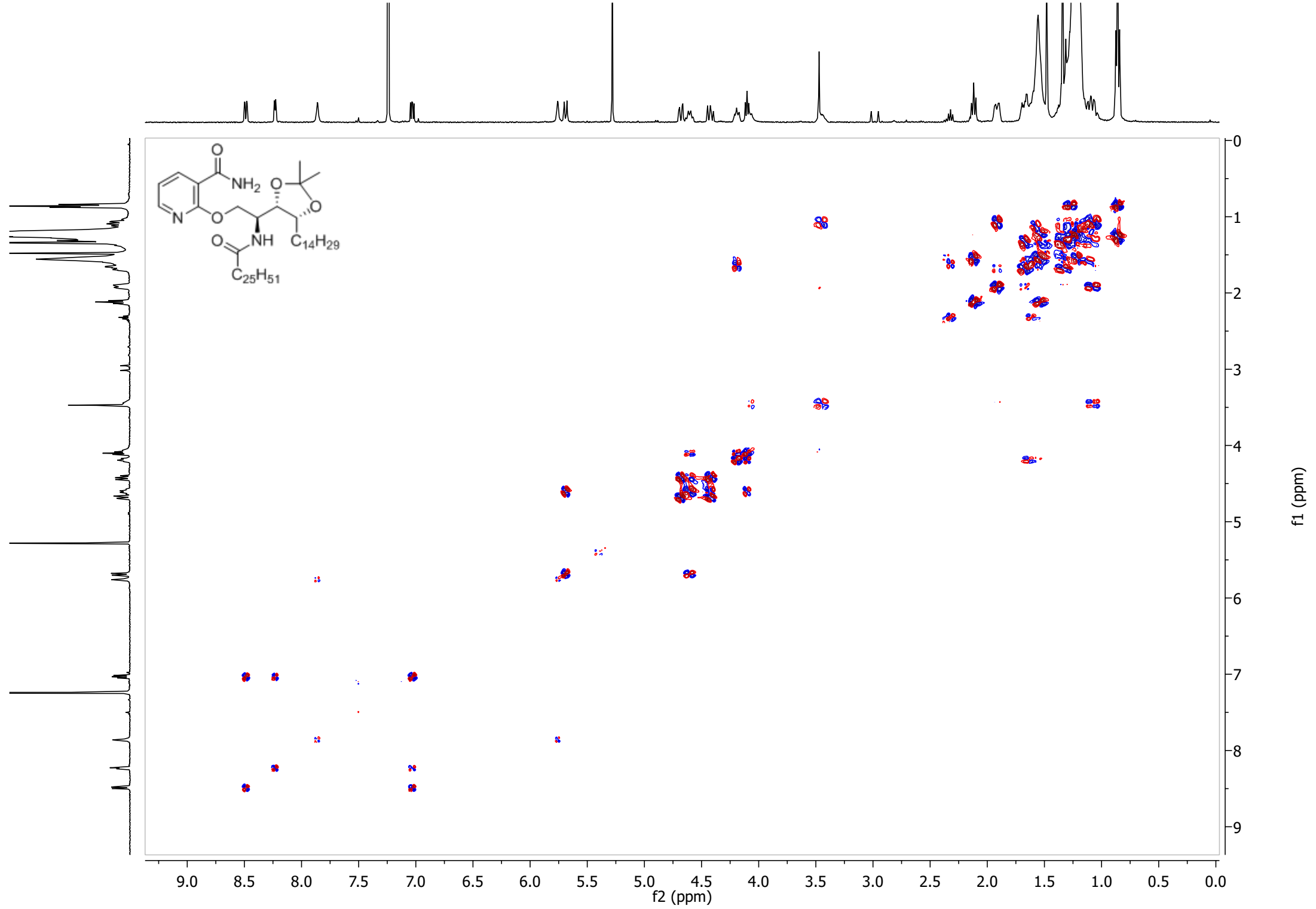

O
O
O
N
O
O
NH
C14H29
O
C25H51
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
f1 (ppm)

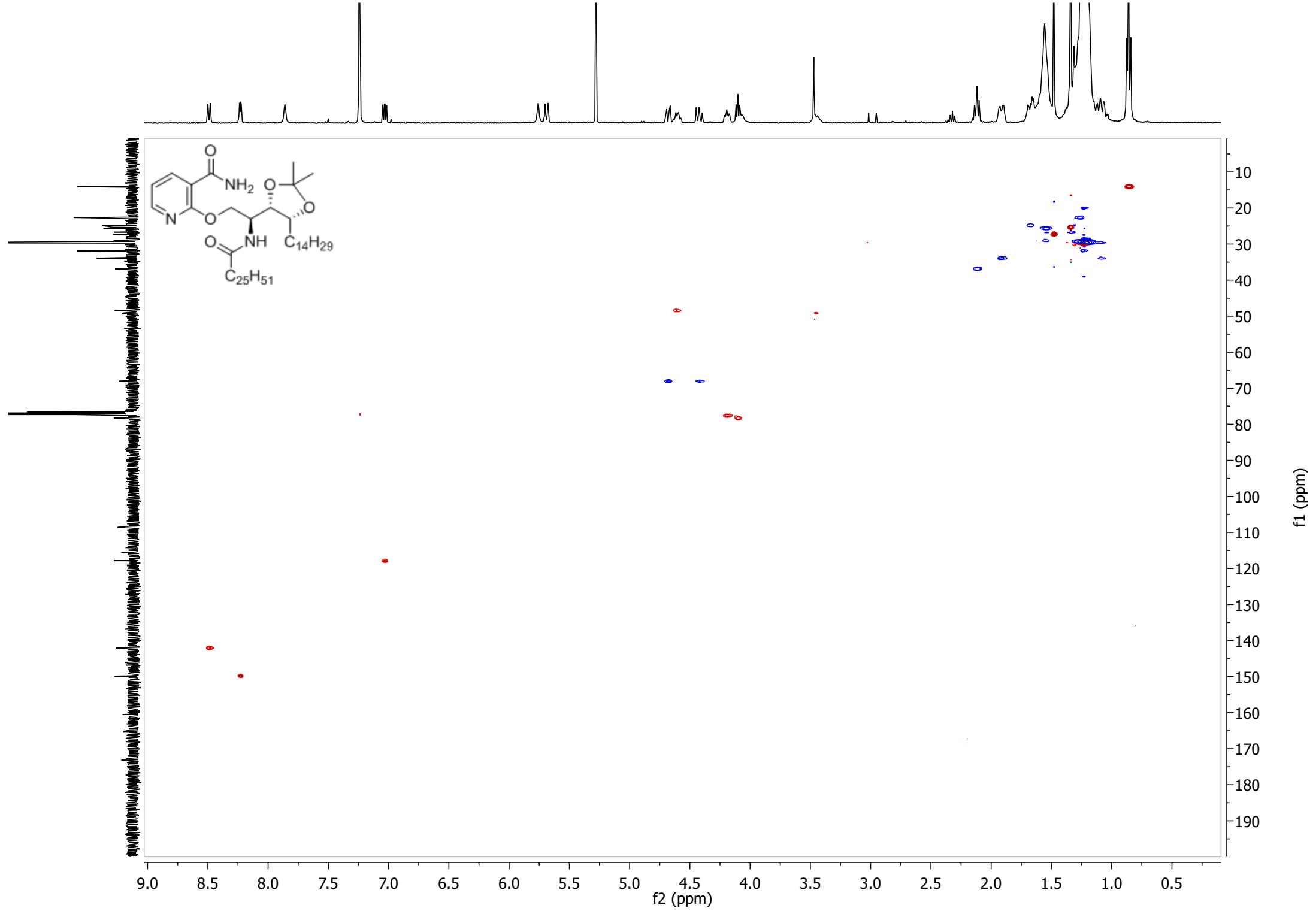


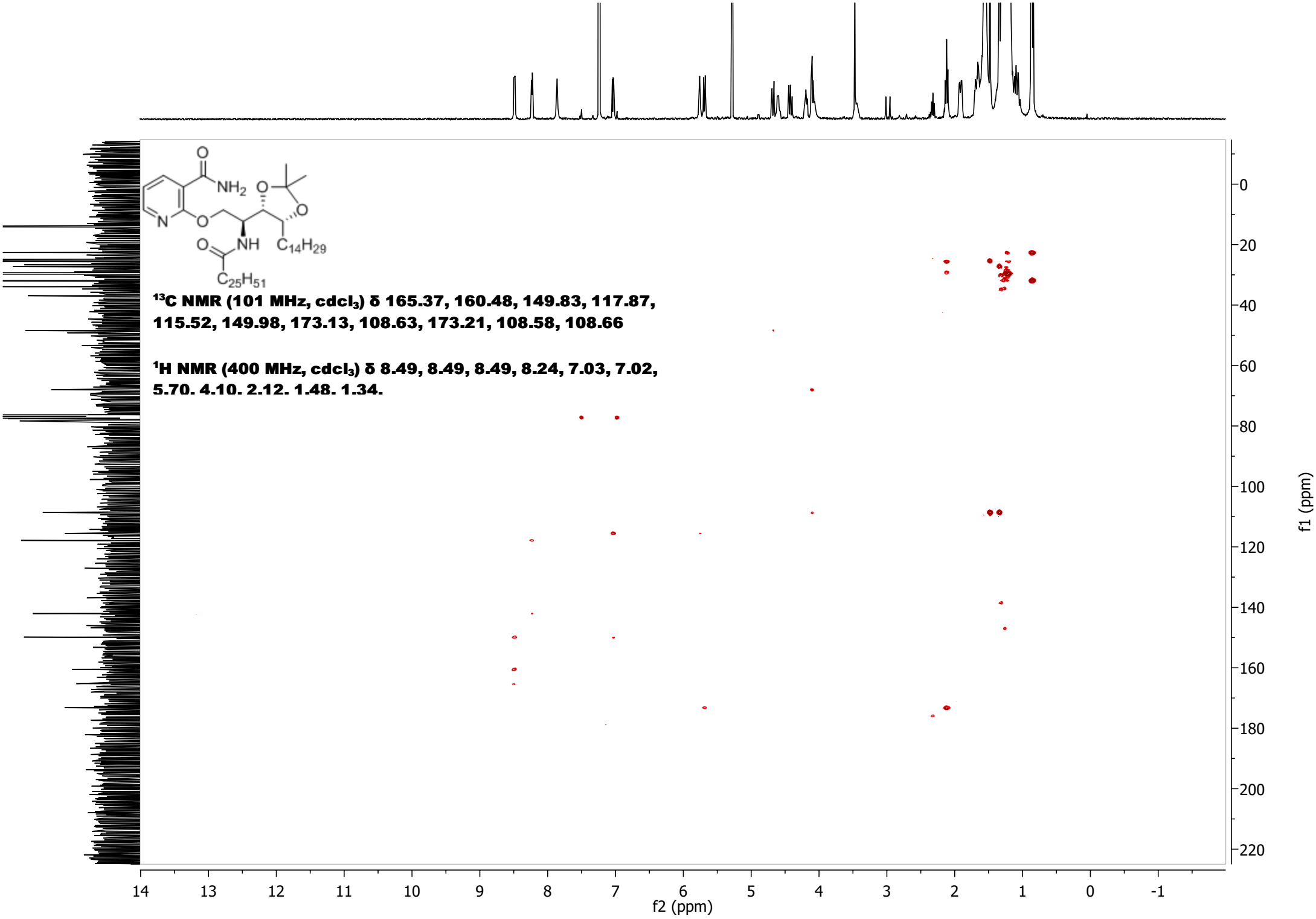
^{1}H NMR (400 MHz, Chloroform-d) δ 8.51 (dd, J = 7.5, 2.0 Hz, 1H), 8.25 (dd, J = 4.9, 2.0 Hz, 1H), 7.88 (s, 1H), 7.05 (dd, J = 7.6, 4.9 Hz, 1H), 5.78 (s, 1H), 5.71 (d, J = 9.5 Hz, 1H), 4.70 (dd, J = 11.1, 2.7 Hz, 1H), 4.62 (dd, J = 9.2, 6.3 Hz, 1H), 4.44 (dd, J = 11.1, 8.9 Hz, 1H), 4.26 – 4.15 (m, 1H), 4.12 (t, J = 6.1 Hz, 1H), 2.14 (t, J = 7.9 Hz, 2H), 1.75 – 1.57 (m, 4H), 1.50 (s, 3H), 1.43 – 1.16 (m, 71H), 0.88 (t, J = 6.7 Hz, 6H).



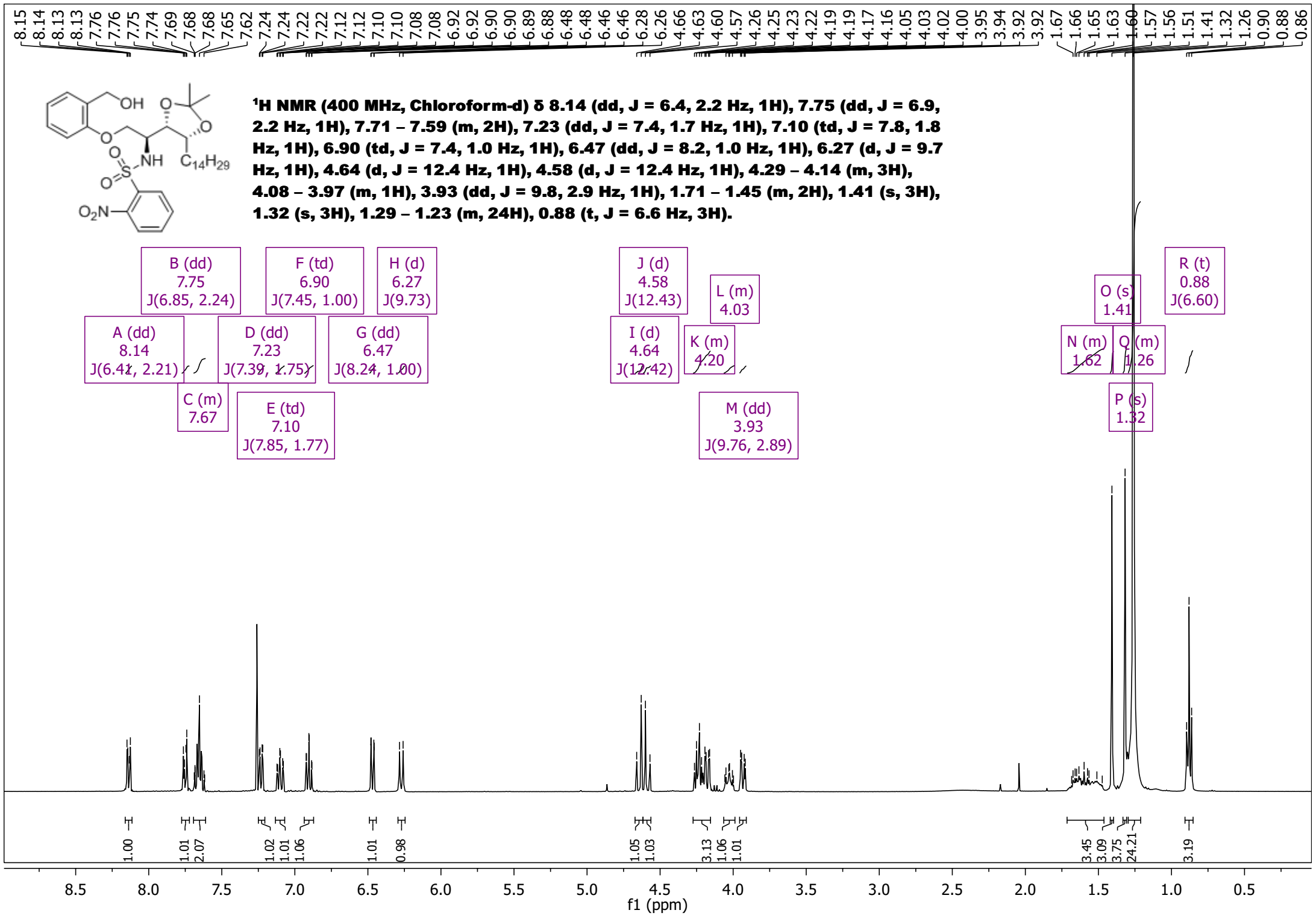
^{13}C NMR (101 MHz, cdcl$_3$) δ 173.38, 165.44, 160.69, 150.04, 142.25, 118.05, 115.75, 108.77, 78.50, 77.79, 68.23, 48.62, 37.09, 34.10, 32.08, 29.88, 29.86, 29.82, 29.76, 29.72, 29.67, 29.52, 29.41, 29.32, 27.47, 26.89, 25.77, 25.52, 25.09, 22.85, 14.28.

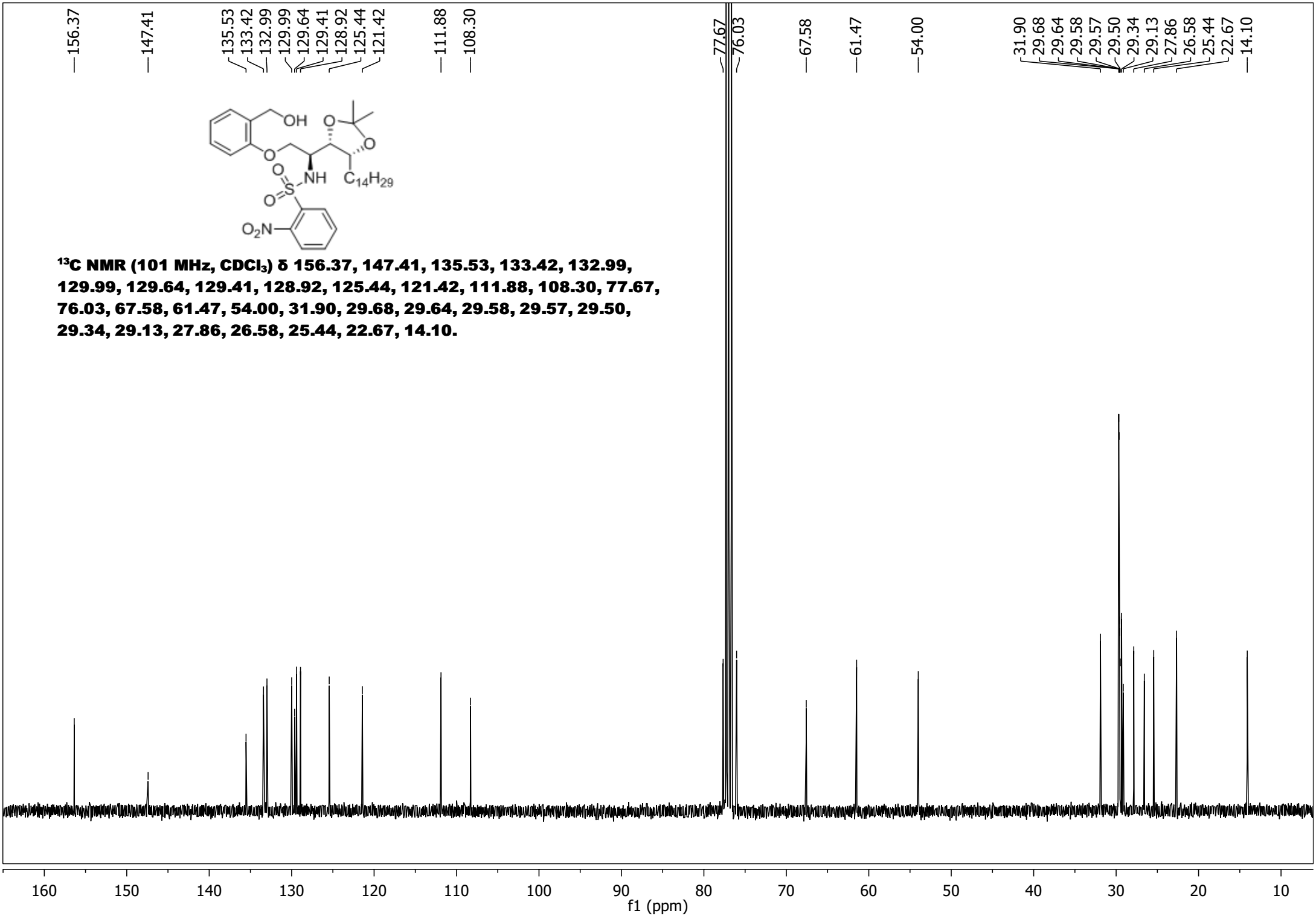

O
NH2
O
N
O
O
NH
C14H29
O
C25H51
f2 (ppm)
f1 (ppm)


O
NH2
O
O
N
O
NH
C14H29
O
C25H51
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
f1 (ppm)

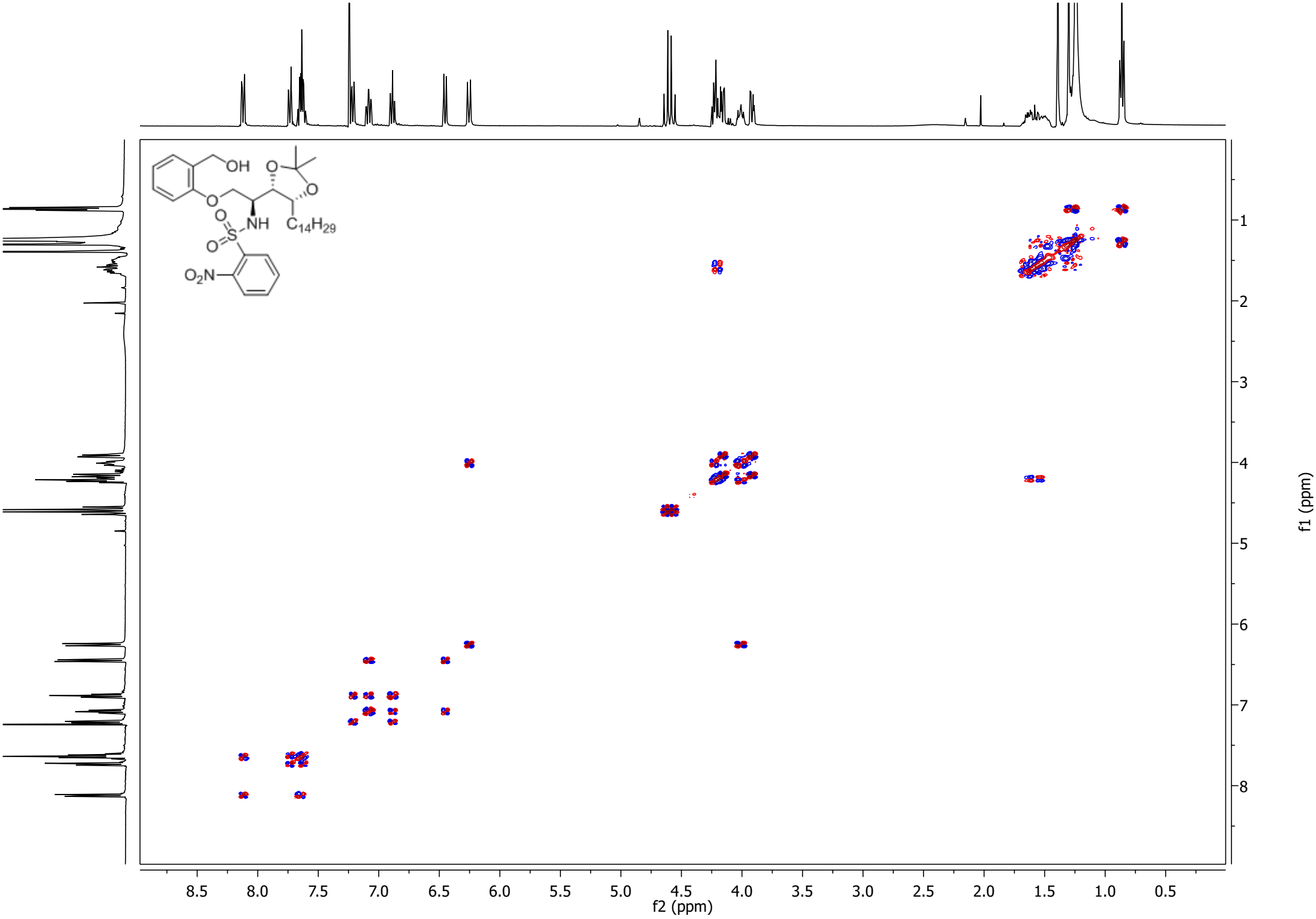

NH2
O
N
NH
C14H29
C25H51
13C NMR (101 MHz, cdcl3) δ 165.37, 160.48, 149.83, 117.87, 115.52, 149.98, 173.13, 108.63, 173.21, 108.58, 108.66
1H NMR (400 MHz, cdcl3) δ 8.49, 8.49, 8.49, 8.24, 7.03, 7.02, 5.70. 4.10. 2.12. 1.48. 1.34.
f2 (ppm)
f1 (ppm)

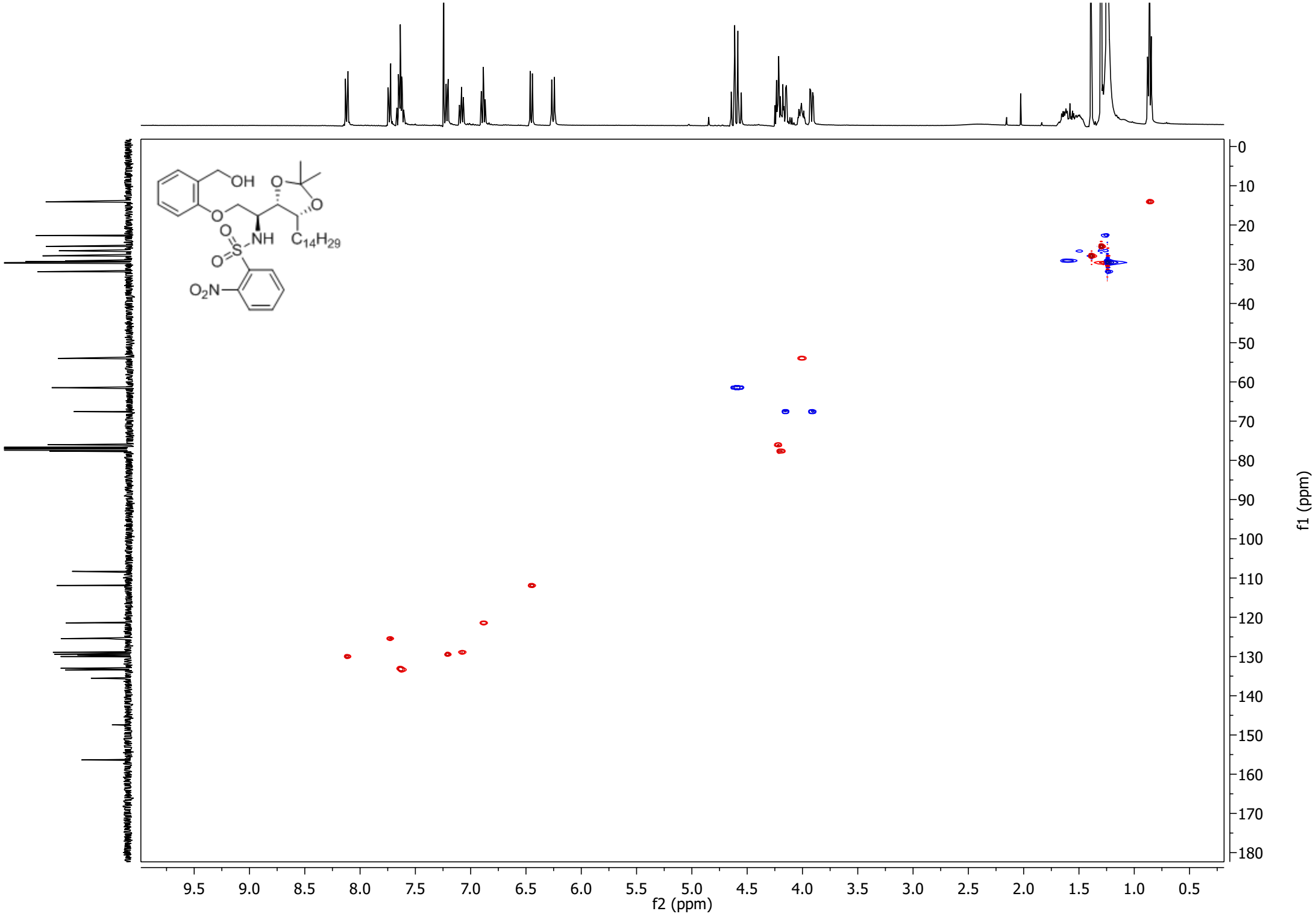
^{1}H NMR (400 MHz, Chloroform-d) δ 8.14 (dd, J = 6.4, 2.2 Hz, 1H), 7.75 (dd, J = 6.9, 2.2 Hz, 1H), 7.71 – 7.59 (m, 2H), 7.23 (dd, J = 7.4, 1.7 Hz, 1H), 7.10 (td, J = 7.8, 1.8 Hz, 1H), 6.90 (td, J = 7.4, 1.0 Hz, 1H), 6.47 (dd, J = 8.2, 1.0 Hz, 1H), 6.27 (d, J = 9.7 Hz, 1H), 4.64 (d, J = 12.4 Hz, 1H), 4.58 (d, J = 12.4 Hz, 1H), 4.29 – 4.14 (m, 3H), 4.08 – 3.97 (m, 1H), 3.93 (dd, J = 9.8, 2.9 Hz, 1H), 1.71 – 1.45 (m, 2H), 1.41 (s, 3H), 1.32 (s, 3H), 1.29 – 1.23 (m, 24H), 0.88 (t, J = 6.6 Hz, 3H).



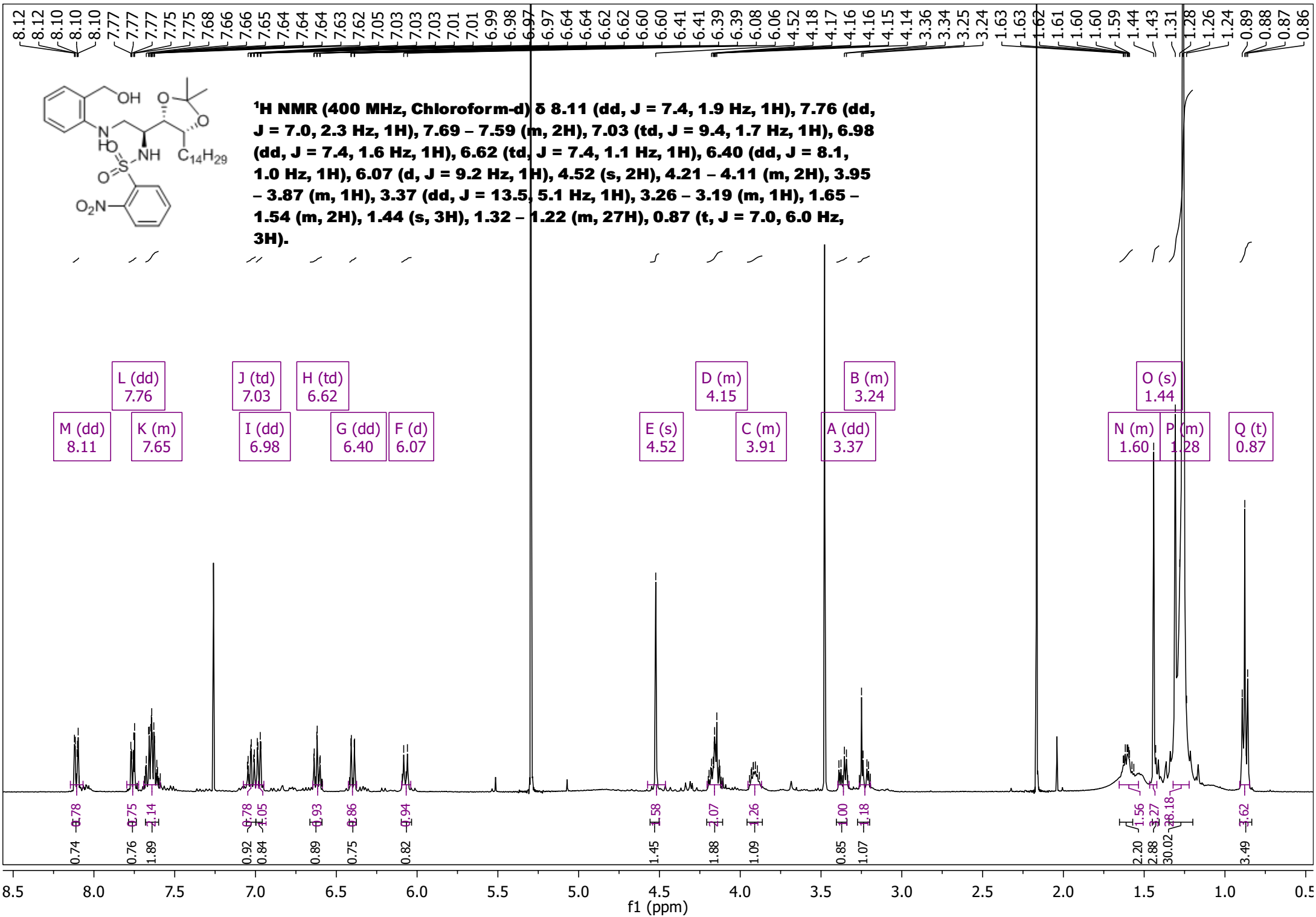


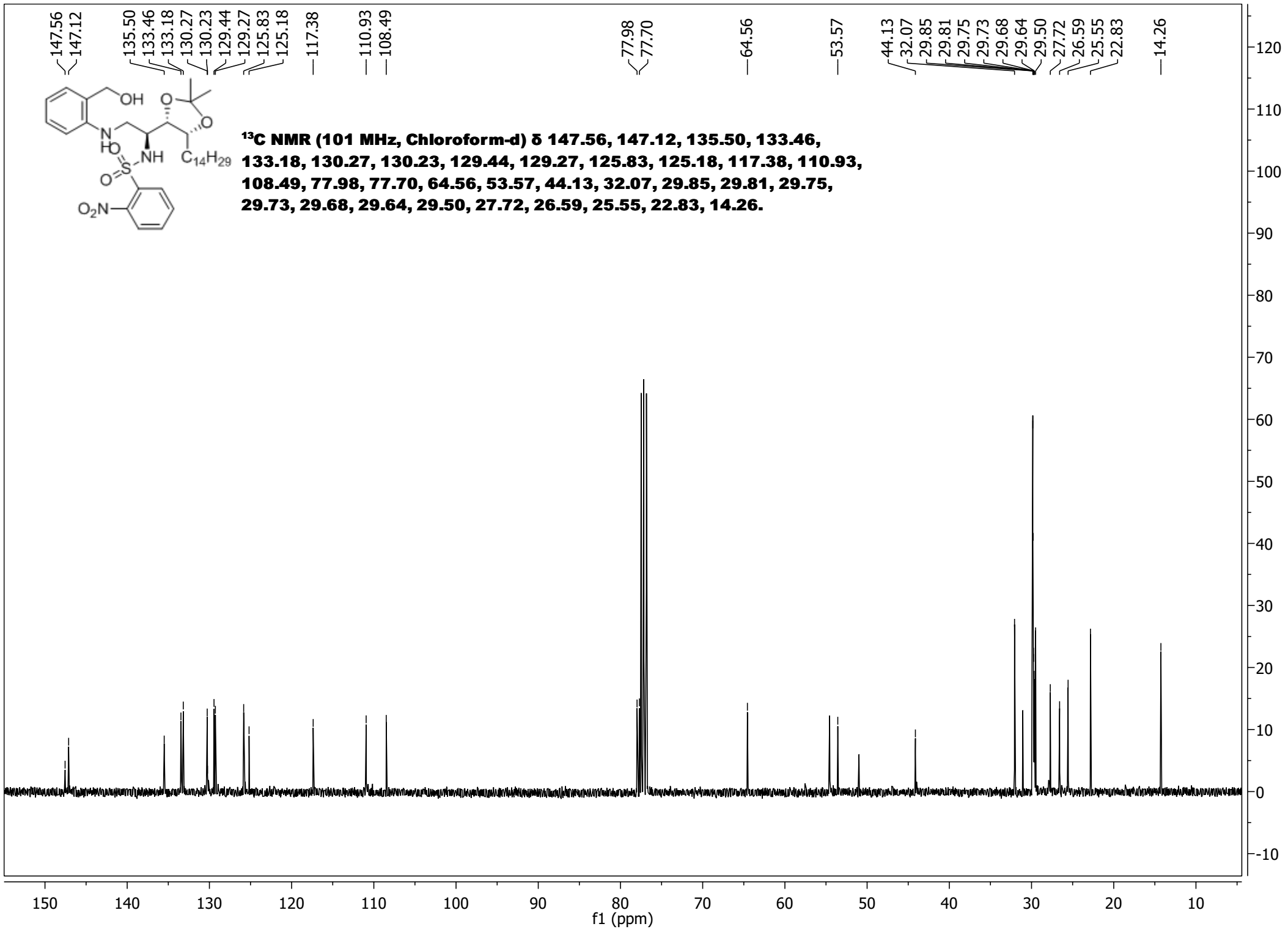
^{13}C NMR (101 MHz, $CDCl_3$) δ 156.37, 147.41, 135.53, 133.42, 132.99, 129.99, 129.64, 129.41, 128.92, 125.44, 121.42, 111.88, 108.30, 77.67, 76.03, 67.58, 61.47, 54.00, 31.90, 29.68, 29.64, 29.58, 29.57, 29.50, 29.34, 29.13, 27.86, 26.58, 25.44, 22.67, 14.10.


OH
O
O
O
NH
$C_{14}H_{29}$
O
S
O
O_2N
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

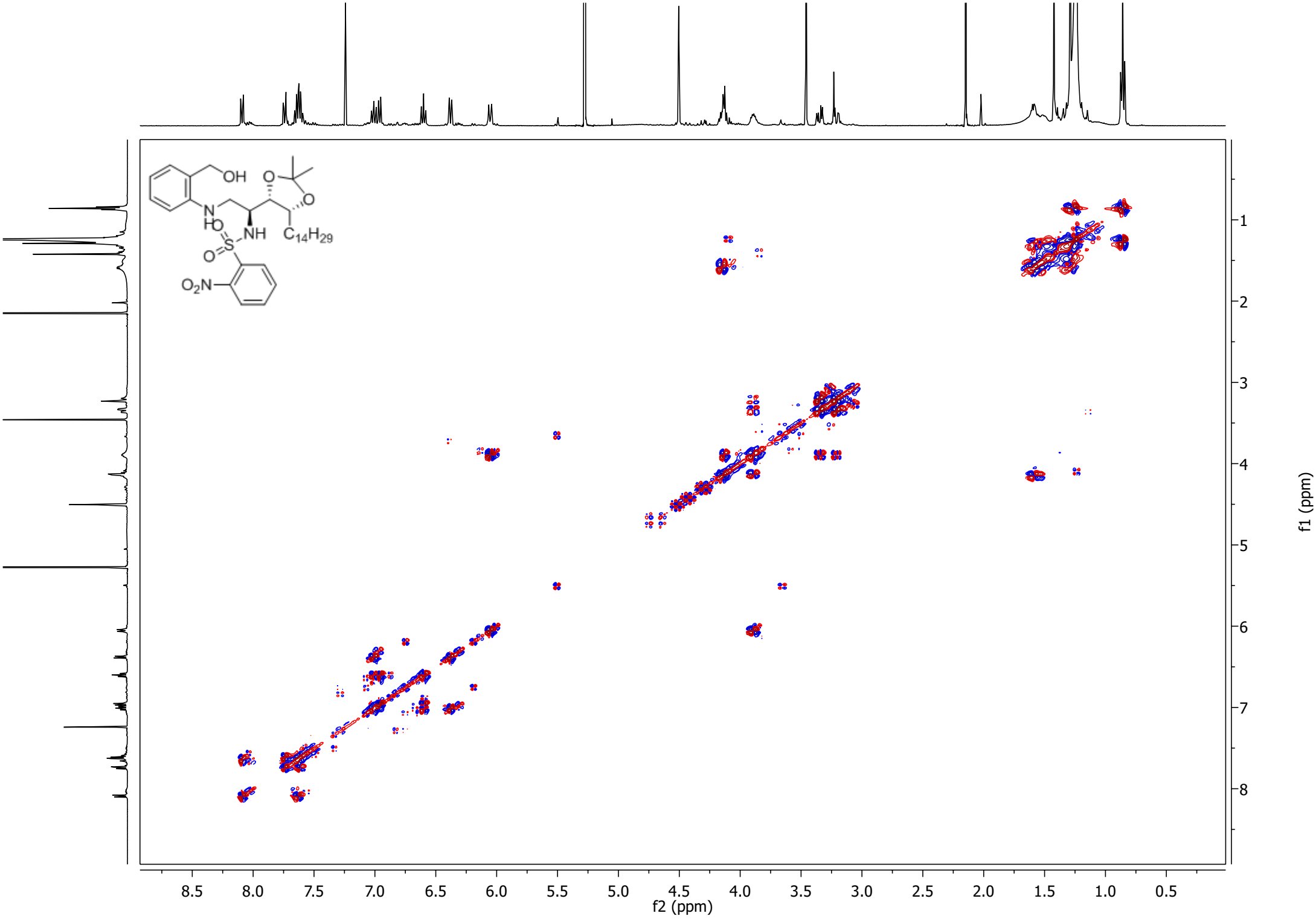

OH
O
O
O
NH
$C_{14}H_{29}$
O
S
O
O_2N
f2 (ppm)
f1 (ppm)

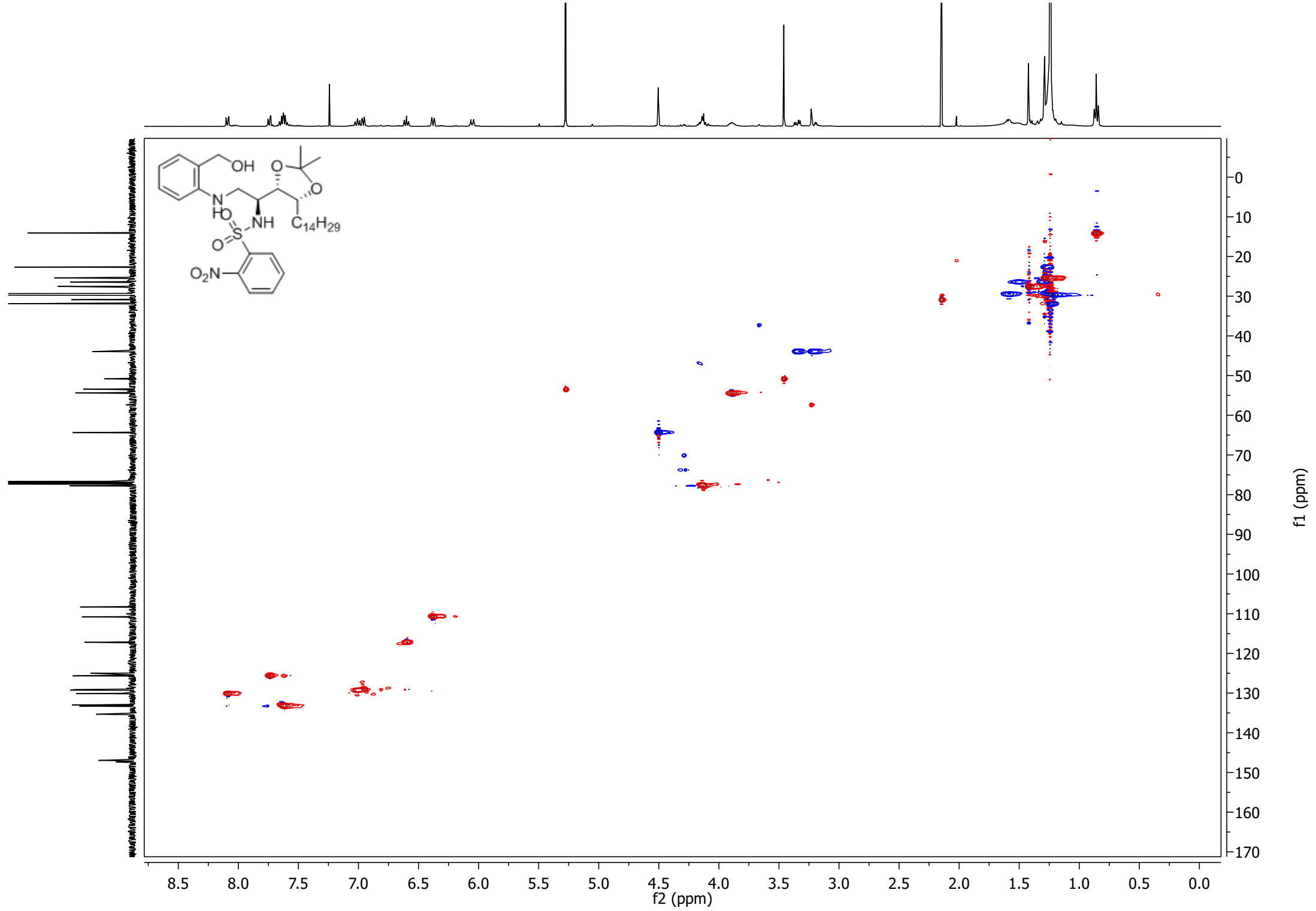
^{1}H NMR (400 MHz, Chloroform-d) δ 8.11 (dd, J = 7.4, 1.9 Hz, 1H), 7.76 (dd, J = 7.0, 2.3 Hz, 1H), 7.69 – 7.59 (m, 2H), 7.03 (td, J = 9.4, 1.7 Hz, 1H), 6.98 (dd, J = 7.4, 1.6 Hz, 1H), 6.62 (td, J = 7.4, 1.1 Hz, 1H), 6.40 (dd, J = 8.1, 1.0 Hz, 1H), 6.07 (d, J = 9.2 Hz, 1H), 4.52 (s, 2H), 4.21 – 4.11 (m, 2H), 3.95 – 3.87 (m, 1H), 3.37 (dd, J = 13.5, 5.1 Hz, 1H), 3.26 – 3.19 (m, 1H), 1.65 – 1.54 (m, 2H), 1.44 (s, 3H), 1.32 – 1.22 (m, 27H), 0.87 (t, J = 7.0, 6.0 Hz, 3H).



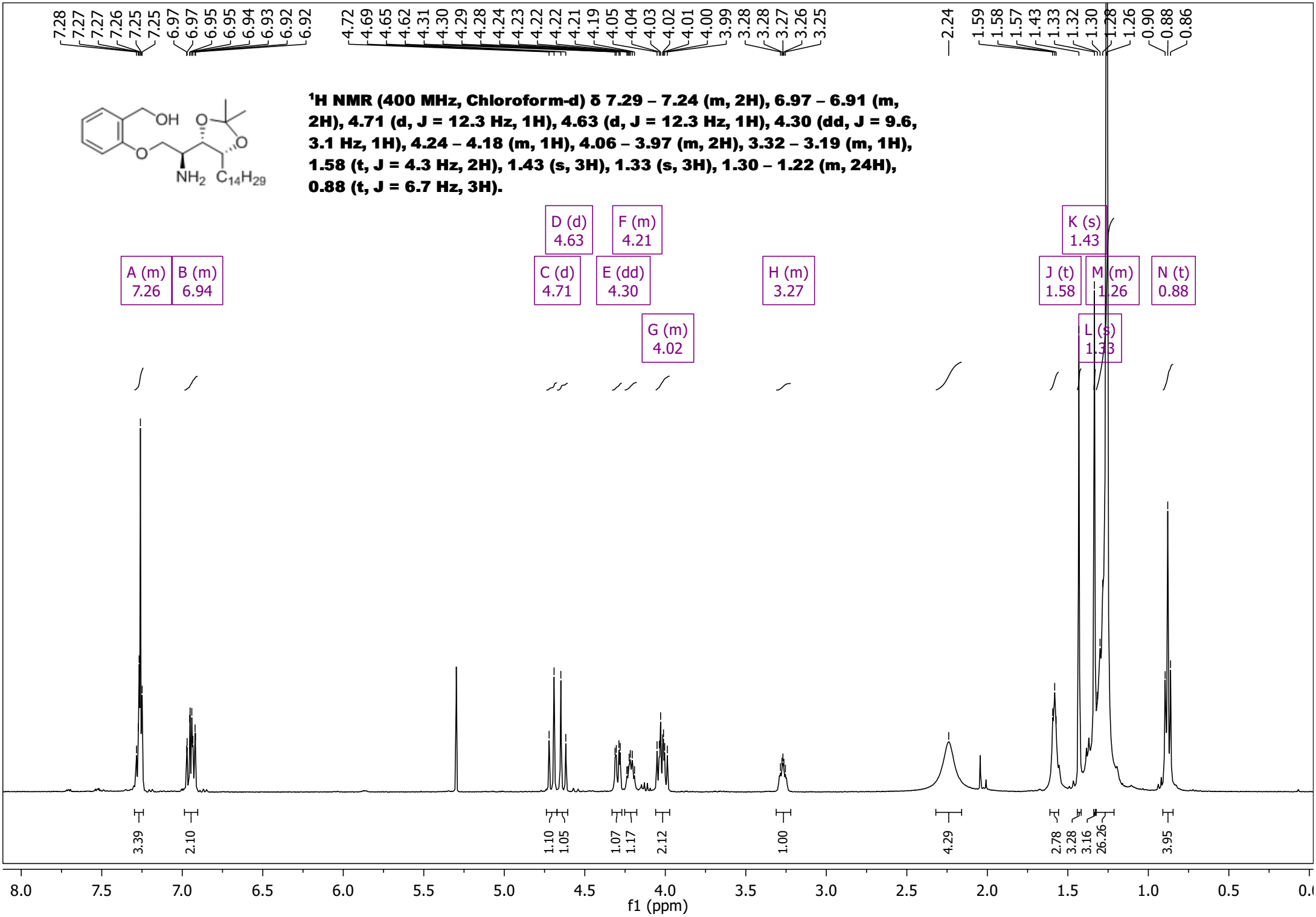


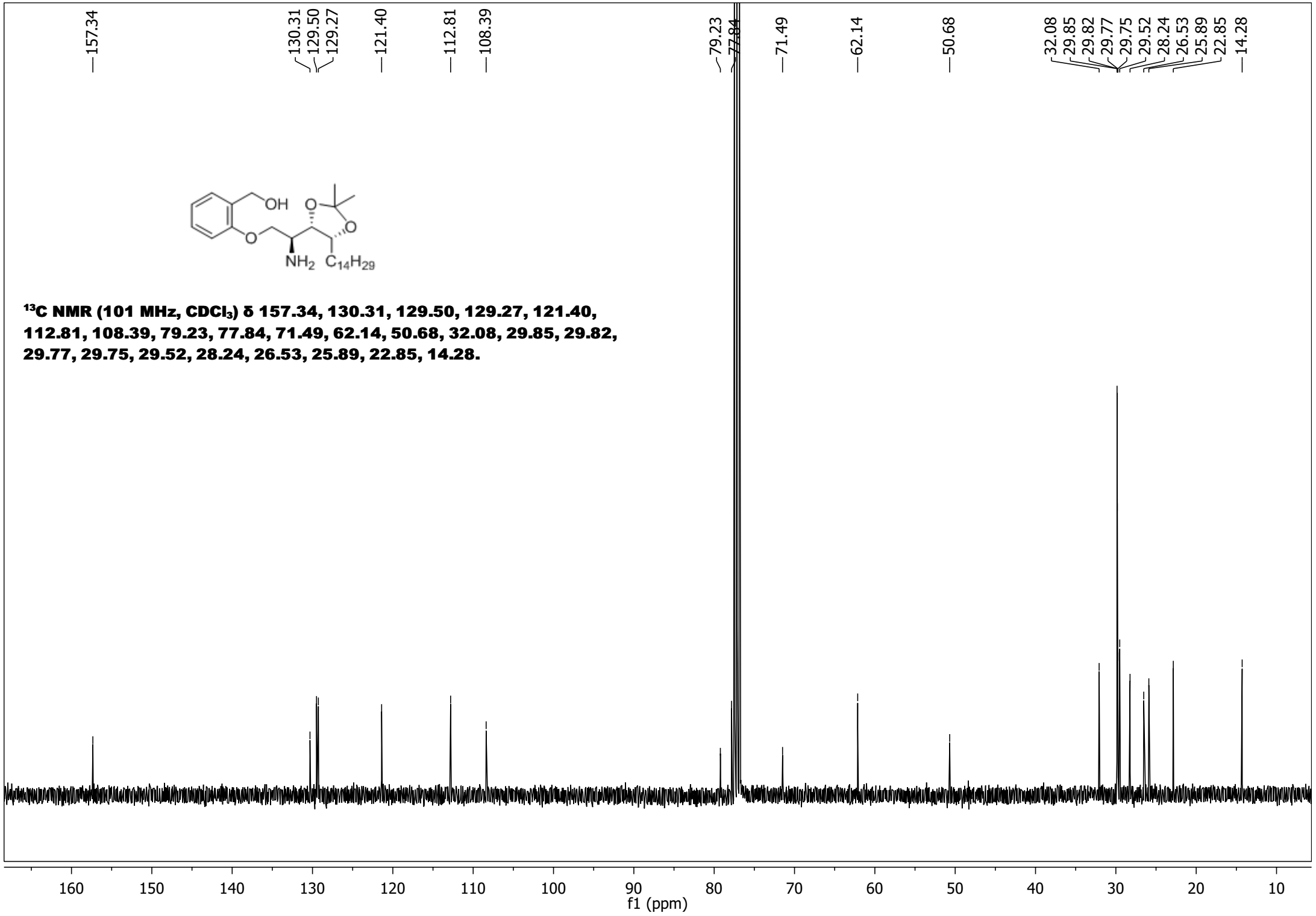
^{13}C NMR (101 MHz, Chloroform-d) δ 147.56, 147.12, 135.50, 133.46, 133.18, 130.27, 130.23, 129.44, 129.27, 125.83, 125.18, 117.38, 110.93, 108.49, 77.98, 77.70, 64.56, 53.57, 44.13, 32.07, 29.85, 29.81, 29.75, 29.73, 29.68, 29.64, 29.50, 27.72, 26.59, 25.55, 22.83, 14.26.


OH
O
O
N
H
O
NH
$C_{14}H_{29}$
S
O
O_2N
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

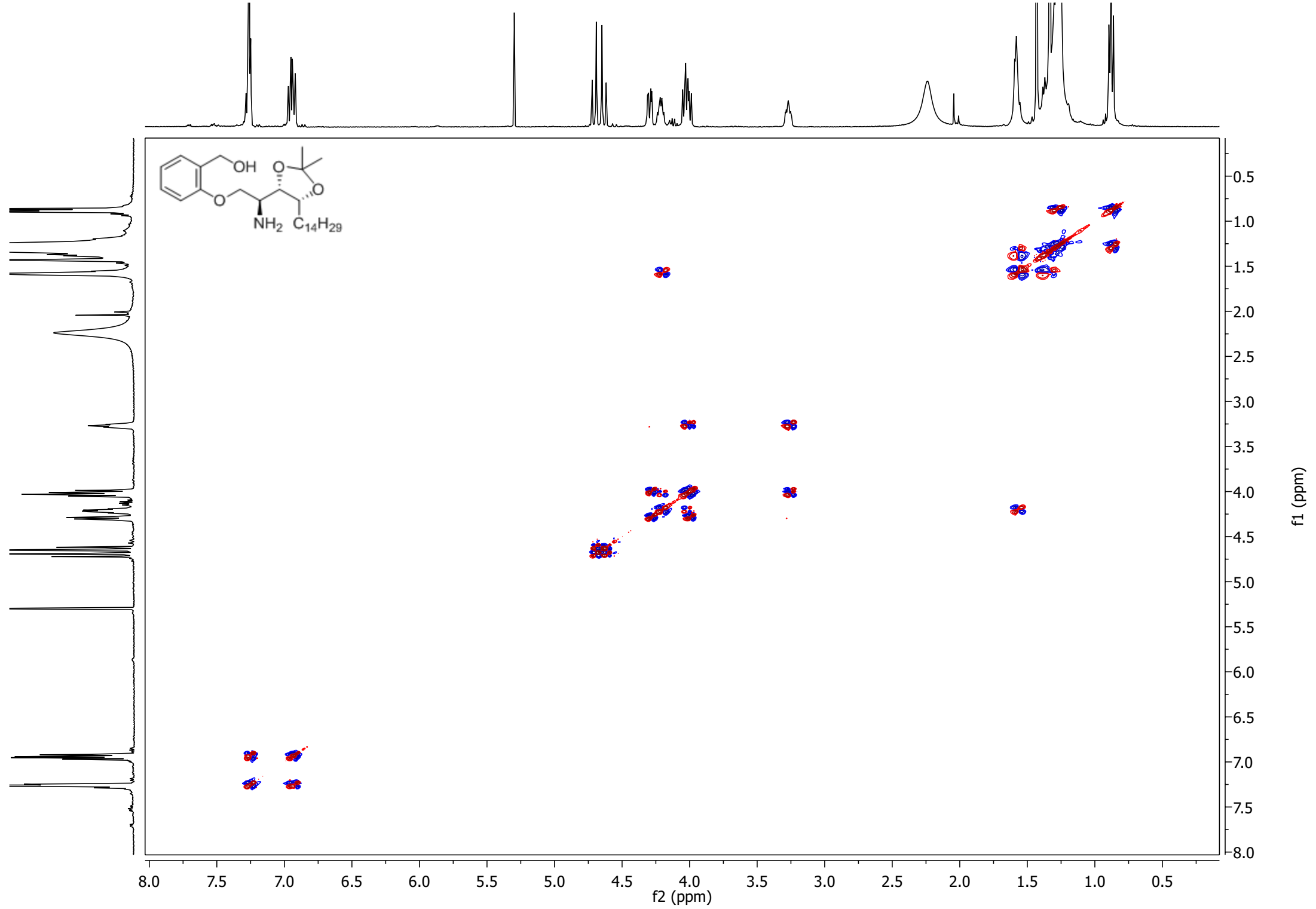

OH
O
O
N
HO
NH
$C_{14}H_{29}$
S
O
O_2N
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
f1 (ppm)

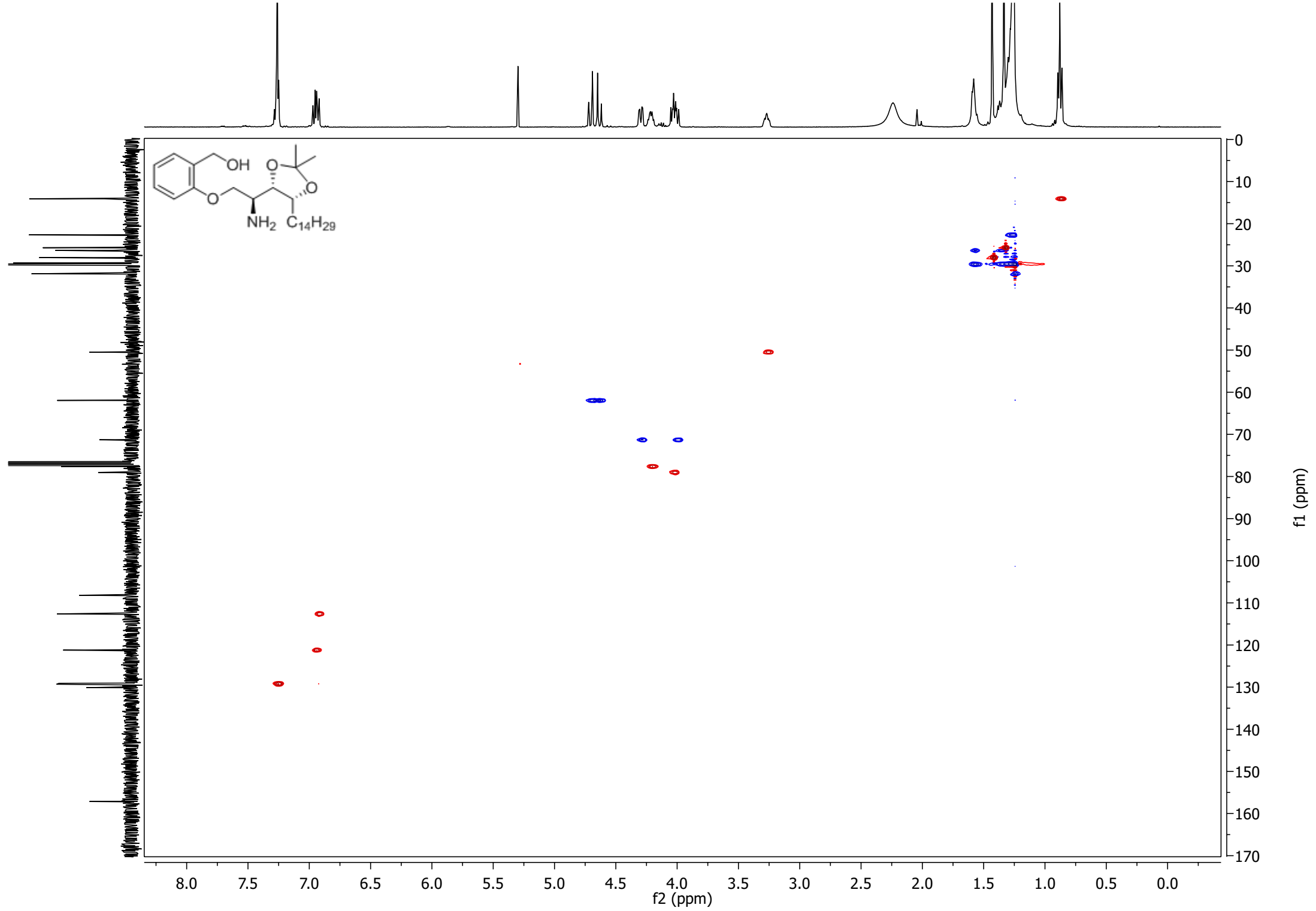
^{1}H NMR (400 MHz, Chloroform-d) δ 7.29 – 7.24 (m, 2H), 6.97 – 6.91 (m, 2H), 4.71 (d, J = 12.3 Hz, 1H), 4.63 (d, J = 12.3 Hz, 1H), 4.30 (dd, J = 9.6, 3.1 Hz, 1H), 4.24 – 4.18 (m, 1H), 4.06 – 3.97 (m, 2H), 3.32 – 3.19 (m, 1H), 1.58 (t, J = 4.3 Hz, 2H), 1.43 (s, 3H), 1.33 (s, 3H), 1.30 – 1.22 (m, 24H), 0.88 (t, J = 6.7 Hz, 3H).

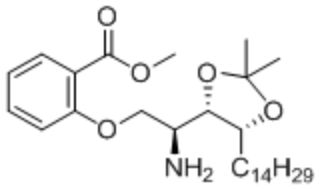




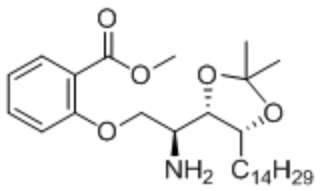
^{13}C NMR (101 MHz, $CDCl_3$) δ 157.34, 130.31, 129.50, 129.27, 121.40, 112.81, 108.39, 79.23, 77.84, 71.49, 62.14, 50.68, 32.08, 29.85, 29.82, 29.77, 29.75, 29.52, 28.24, 26.53, 25.89, 22.85, 14.28.


OH
O
O
O
NH2
C14H29
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
f1 (ppm)

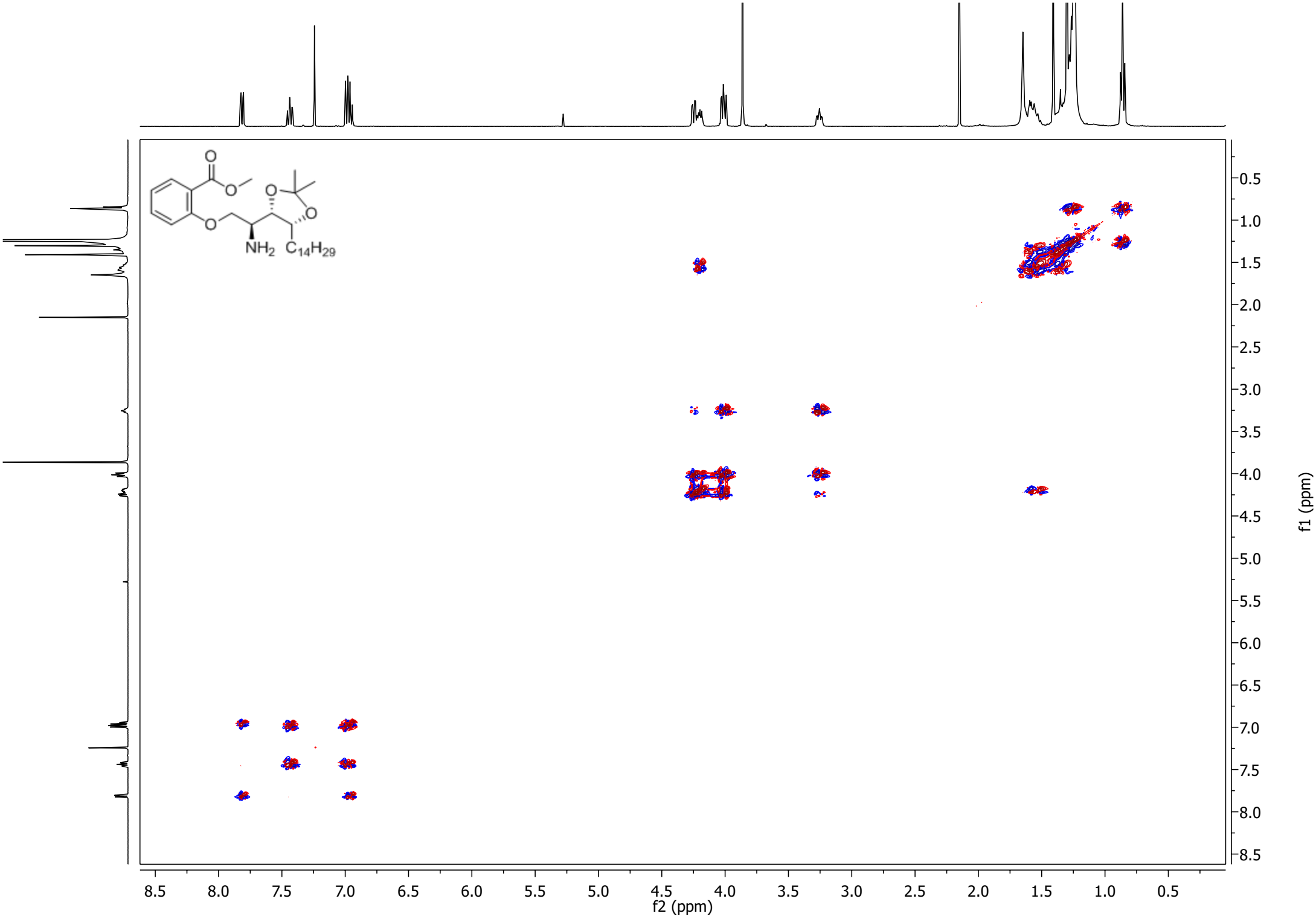

OH
O
O
O
NH2
C14H29
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
f1 (ppm)

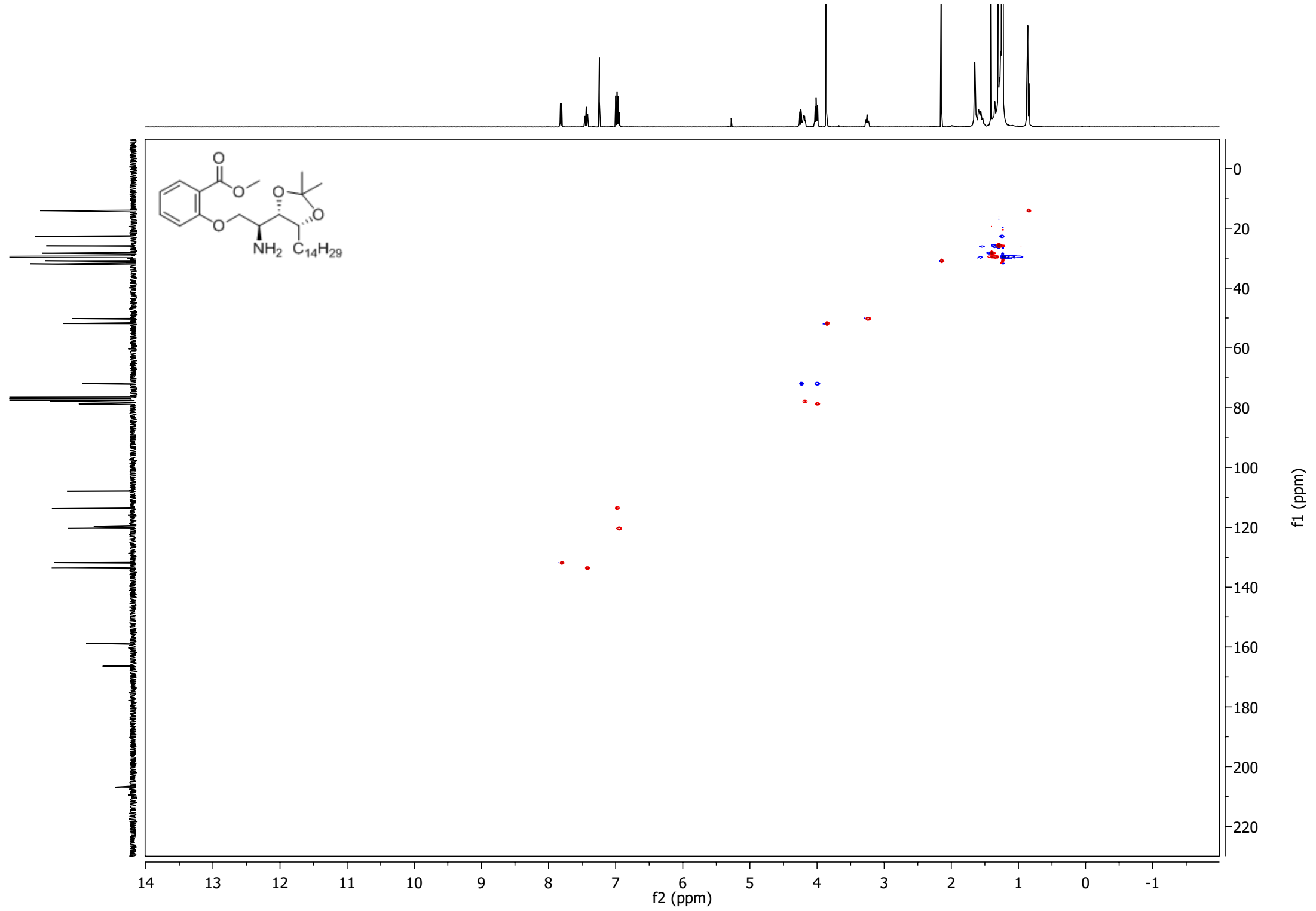


^{1}H NMR (400 MHz, Chloroform-d) δ 7.83 (dd, J = 7.8, 1.8 Hz, 1H), 7.46 (ddd, J = 8.8, 7.4, 1.8 Hz, 1H), 7.03 – 6.95 (m, 2H), 4.27 (dd, J = 8.9, 2.9 Hz, 1H), 4.22 (dt, J = 8.6, 4.3 Hz, 1H), 4.07 – 3.99 (m, 2H), 3.88 (s, 3H), 3.27 (ddd, J = 9.4, 6.7, 2.9 Hz, 1H), 1.65 – 1.52 (m, 2H), 1.43 (s, 3H), 1.38 – 1.22 (m, 27H), 0.88 (d, J = 6.3 Hz, 3H).

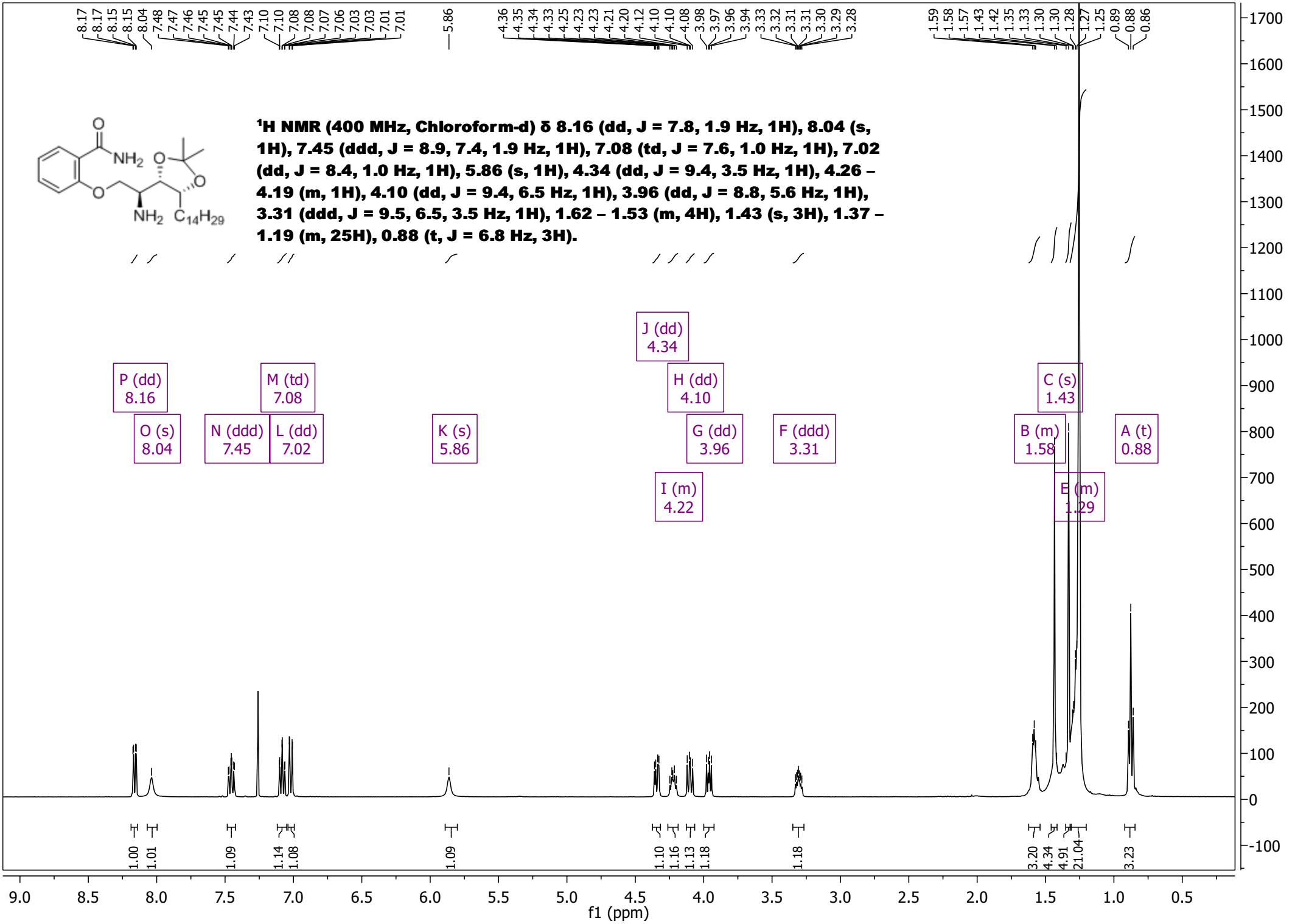


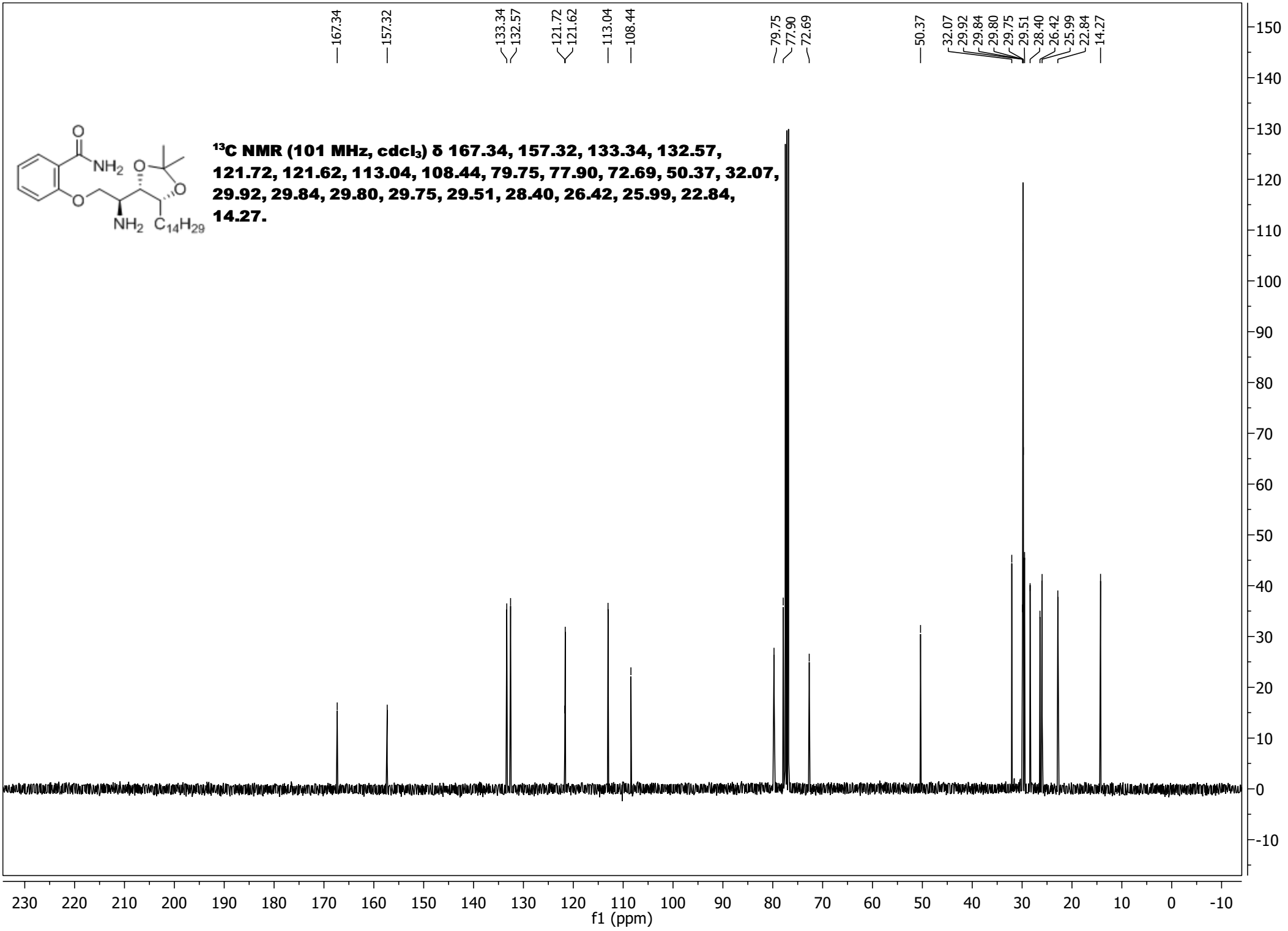
^{13}C NMR (101 MHz, cdcl$_3$) δ 207.06, 166.56, 159.00, 133.82, 131.98, 120.48, 119.98, 113.71, 108.09, 78.91, 78.09, 77.16, 72.15, 52.03, 50.40, 32.07, 31.07, 29.93, 29.84, 29.81, 29.77, 29.51, 28.52, 26.43, 26.08, 22.84, 14.27.

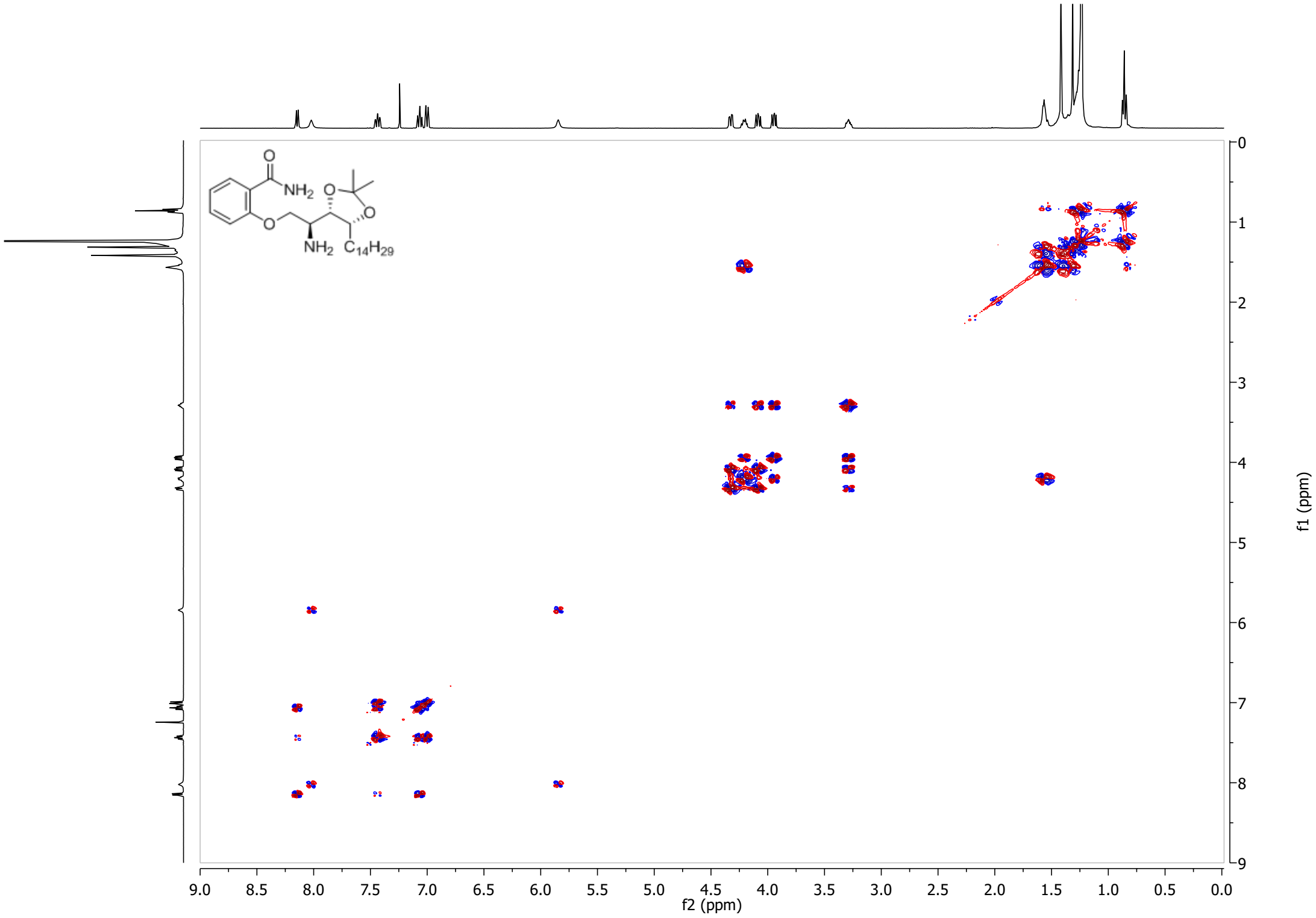

O
O
O
O
O
NH2
C14H29
f2 (ppm)
f1 (ppm)

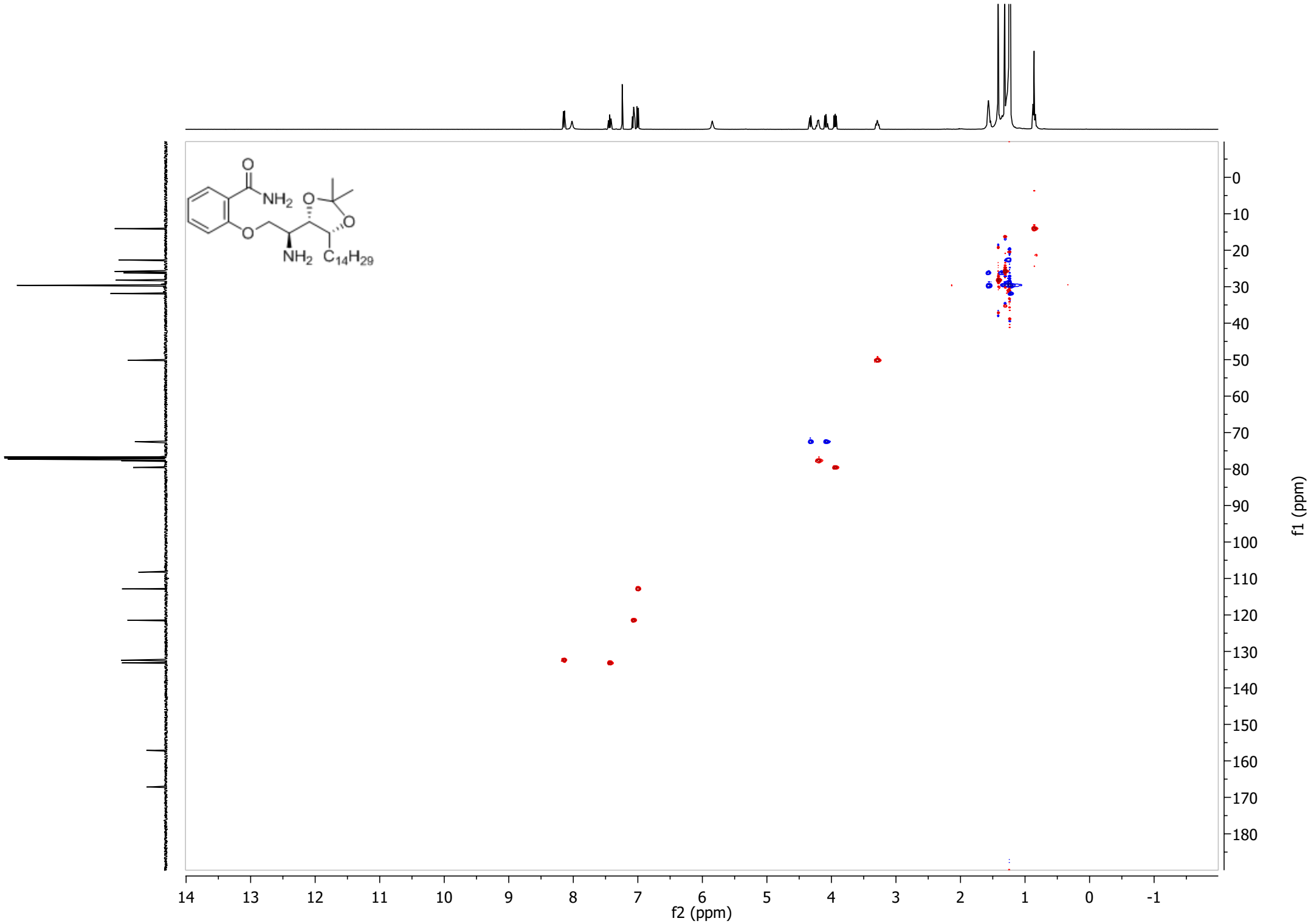

O
O
O
O
O
NH2
C14H29
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
20
40
60
80
100
120
140
160
180
200
220
f1 (ppm)

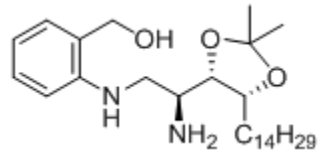
^{1}H NMR (400 MHz, Chloroform-d) δ 8.16 (dd, J = 7.8, 1.9 Hz, 1H), 8.04 (s, 1H), 7.45 (ddd, J = 8.9, 7.4, 1.9 Hz, 1H), 7.08 (td, J = 7.6, 1.0 Hz, 1H), 7.02 (dd, J = 8.4, 1.0 Hz, 1H), 5.86 (s, 1H), 4.34 (dd, J = 9.4, 3.5 Hz, 1H), 4.26 – 4.19 (m, 1H), 4.10 (dd, J = 9.4, 6.5 Hz, 1H), 3.96 (dd, J = 8.8, 5.6 Hz, 1H), 3.31 (ddd, J = 9.5, 6.5, 3.5 Hz, 1H), 1.62 – 1.53 (m, 4H), 1.43 (s, 3H), 1.37 – 1.19 (m, 25H), 0.88 (t, J = 6.8 Hz, 3H).




167.34
157.32
133.34
132.57
121.72
121.62
113.04
108.44
79.75
77.90
72.69
50.37
32.07
29.92
29.84
29.80
29.75
29.51
28.40
26.42
25.99
22.84
14.27
NH2
O
O
O
NH2
C14H29
13C NMR (101 MHz, cdcl3) δ 167.34, 157.32, 133.34, 132.57, 121.72, 121.62, 113.04, 108.44, 79.75, 77.90, 72.69, 50.37, 32.07, 29.92, 29.84, 29.80, 29.75, 29.51, 28.40, 26.42, 25.99, 22.84, 14.27.
f1 (ppm)

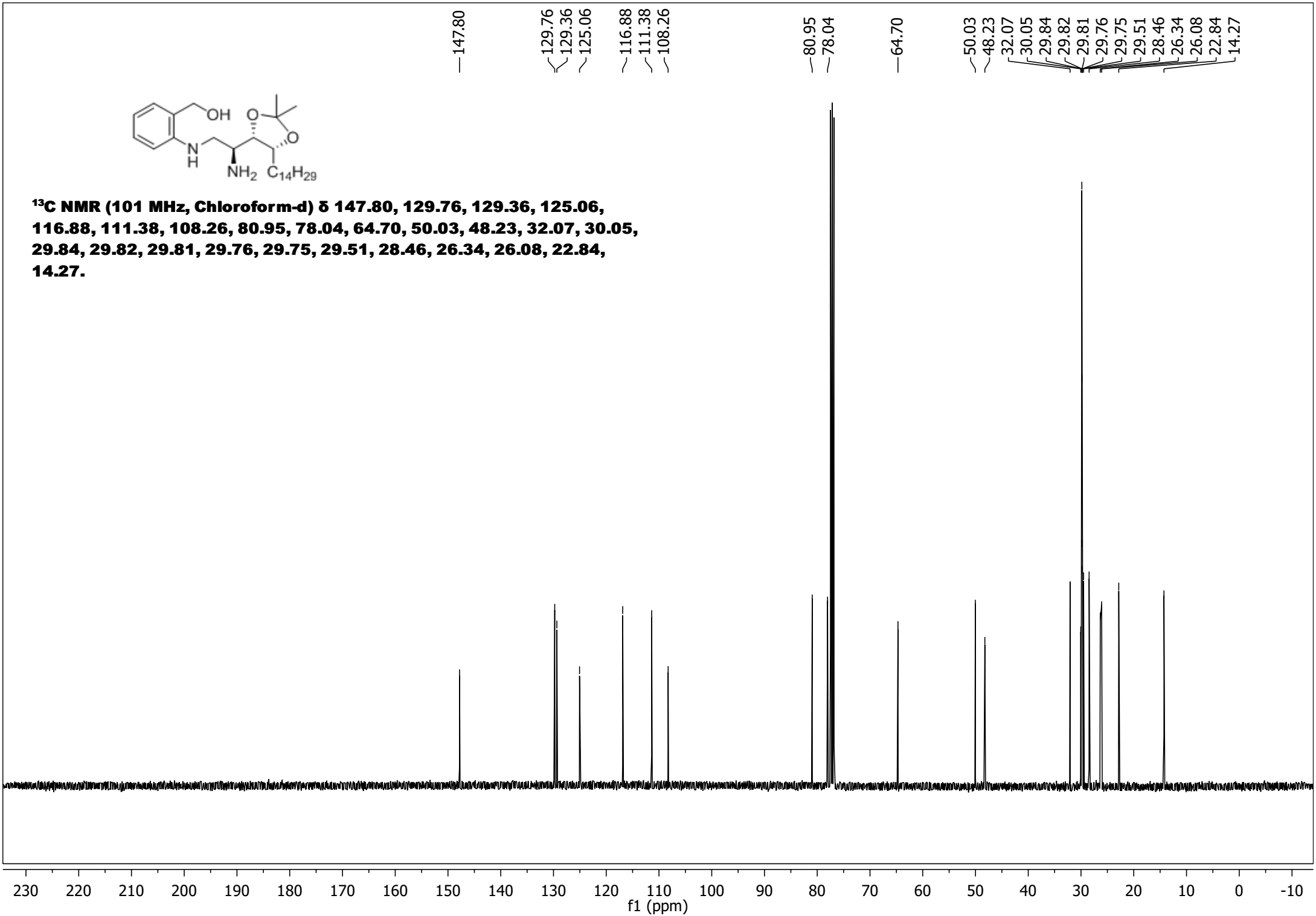

O
NH2
O
O
O
NH2
C14H29
f2 (ppm)
f1 (ppm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9

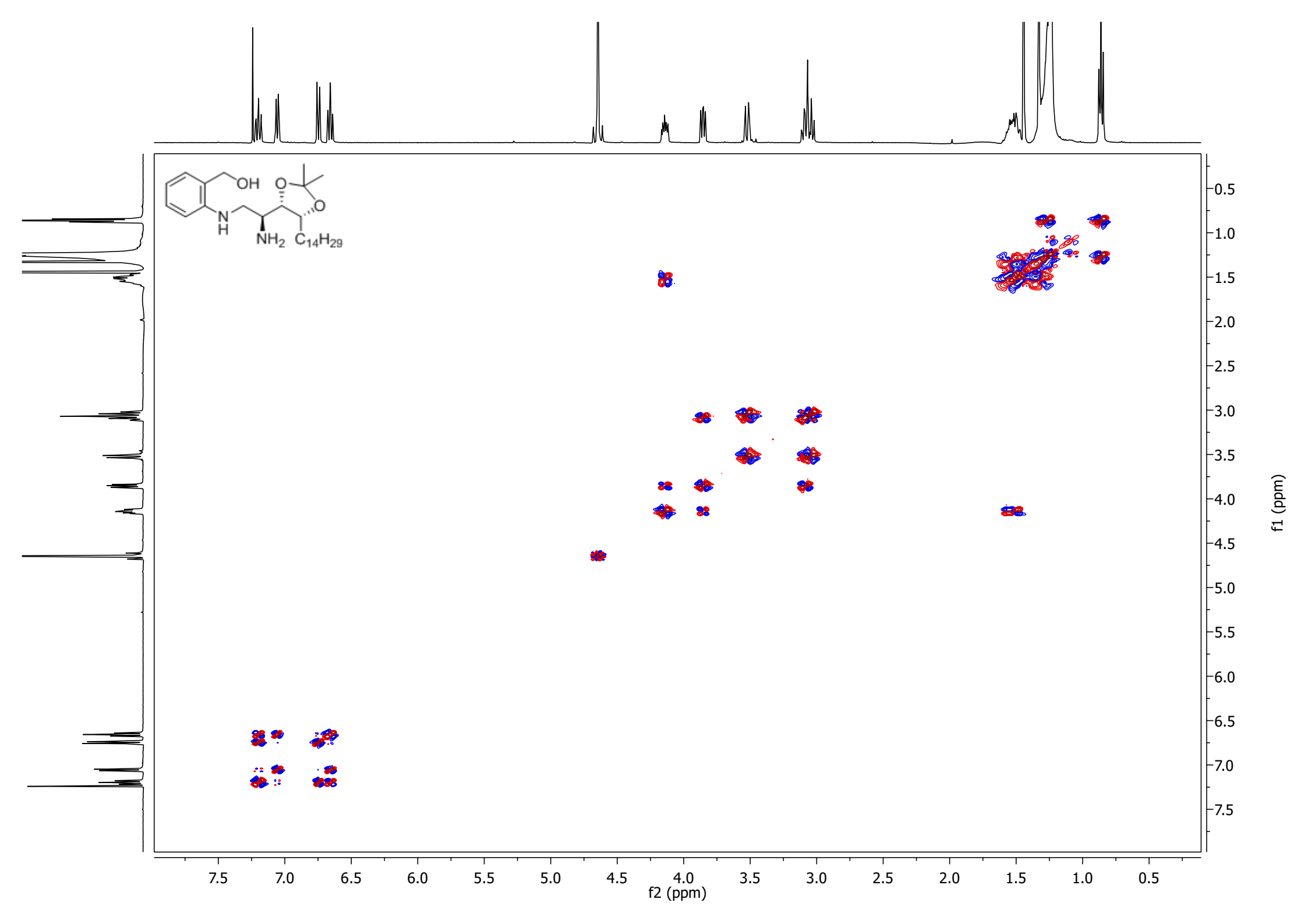

O
NH2
O
O
O
NH2
C14H29
f2 (ppm)
f1 (ppm)

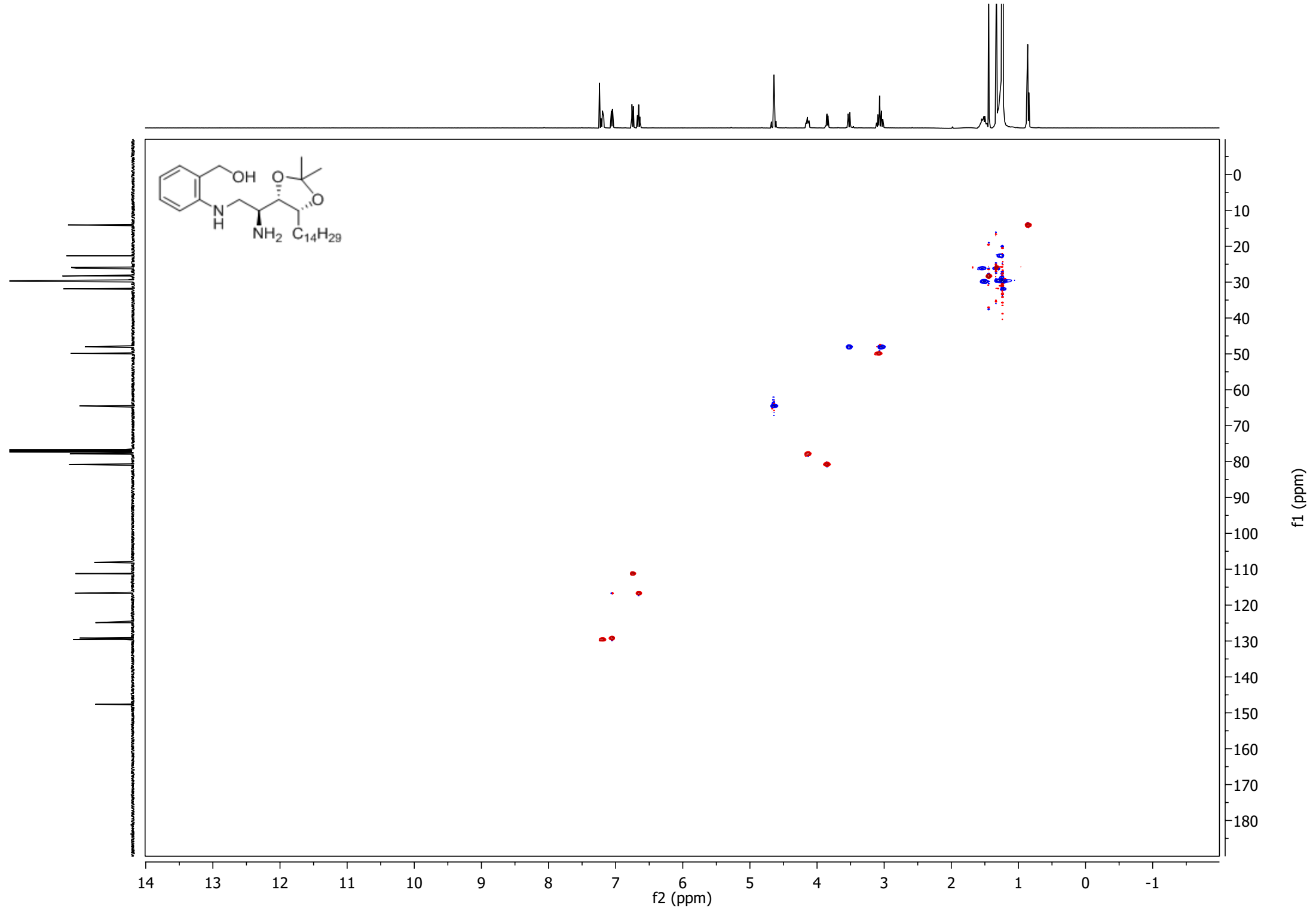


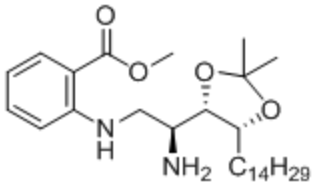
^{1}H NMR (400 MHz, Chloroform-d) δ 7.22 (td, J = 7.8, 1.7 Hz, 1H), 7.07 (dd, J = 7.3, 1.6 Hz, 1H), 6.77 (dd, J = 8.2, 1.1 Hz, 1H), 6.68 (dd, J = 7.3, 1.1 Hz, 1H), 4.66 (dd, J = 14.9, 11.9 Hz, 2H), 4.21 – 4.08 (m, 1H), 3.87 (dd, J = 8.2, 5.6 Hz, 1H), 3.54 (dd, J = 12.2, 2.7 Hz, 1H), 3.17 – 3.00 (m, 2H), 1.54 (dt, J = 13.4, 4.1 Hz, 2H), 1.46 (s, 3H), 1.40 – 1.17 (m, 27H), 0.88 (t, J = 7.1 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-d) δ 147.80, 129.76, 129.36, 125.06, 116.88, 111.38, 108.26, 80.95, 78.04, 64.70, 50.03, 48.23, 32.07, 30.05, 29.84, 29.82, 29.81, 29.76, 29.75, 29.51, 28.46, 26.34, 26.08, 22.84, 14.27.

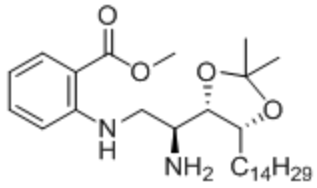



OH
O
O
N
H
NH2
C14H29
f2 (ppm)
f1 (ppm)

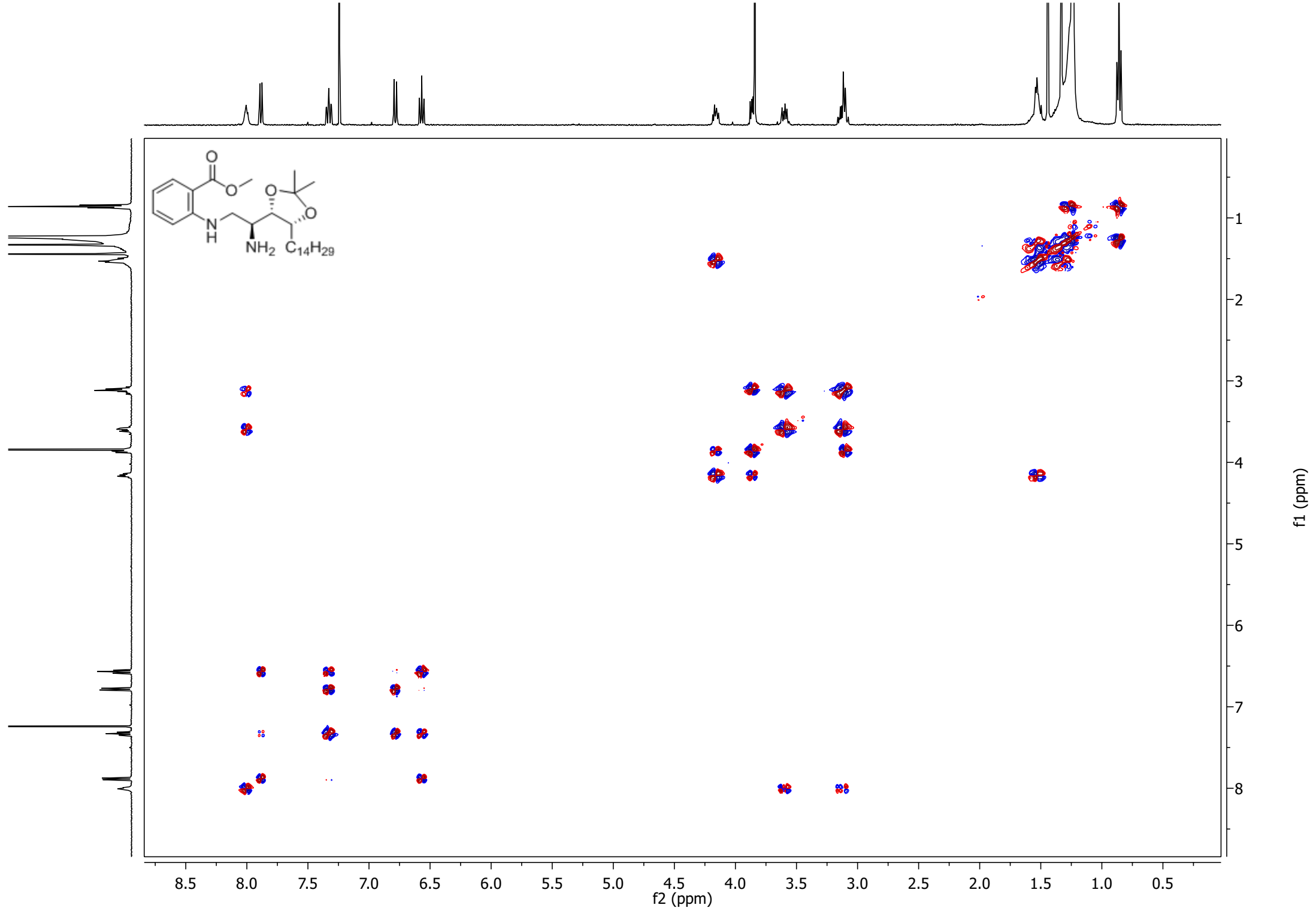

OH
O
O
N
H
NH2
C14H29
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
f1 (ppm)

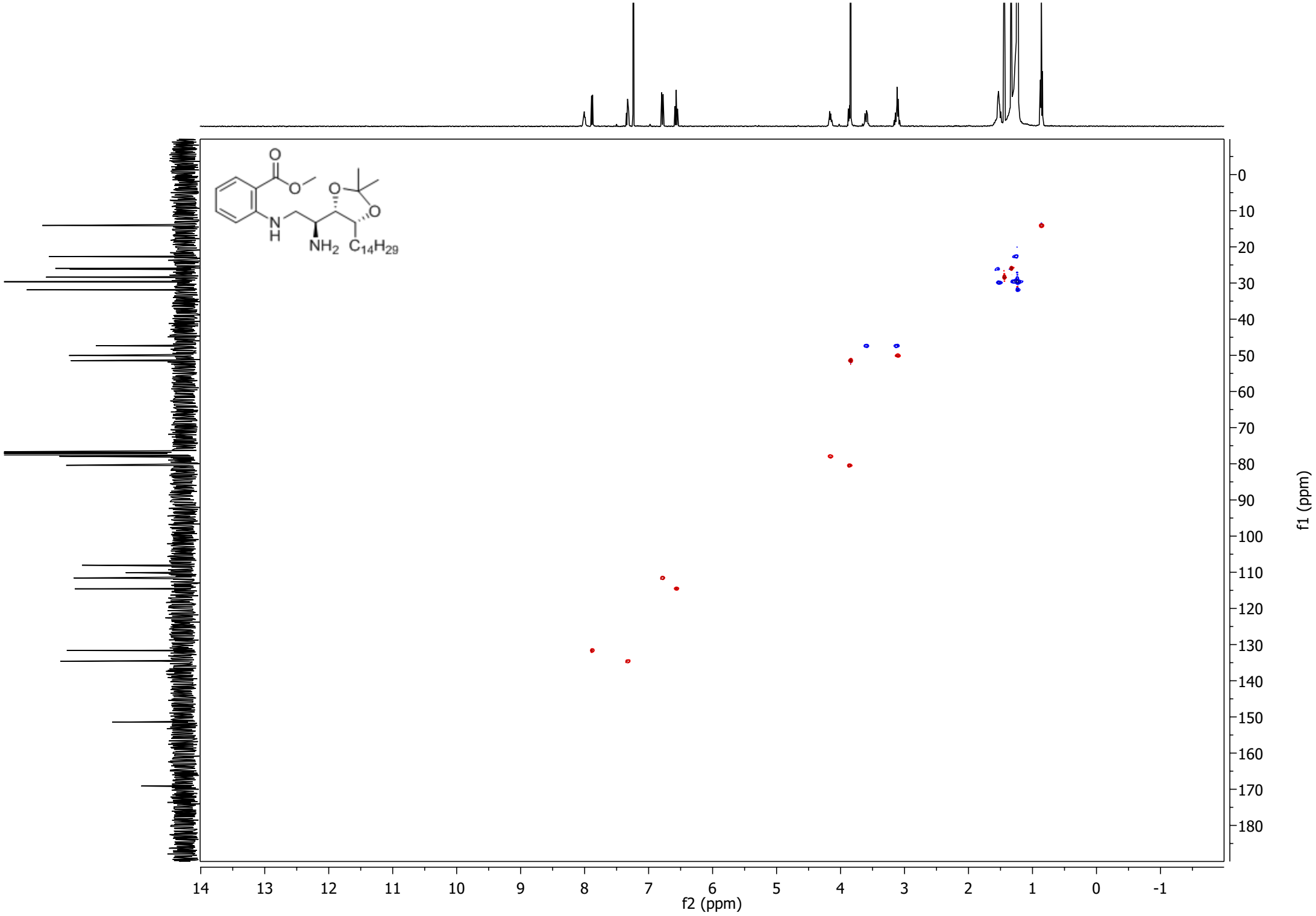


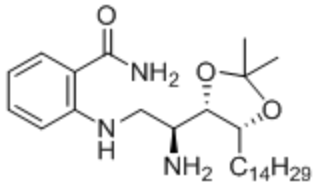
^{1}H NMR (400 MHz, Chloroform-d) δ 8.02 (t, J = 4.9 Hz, 1H), 7.90 (dd, J = 8.0, 1.7 Hz, 1H), 7.35 (ddd, J = 8.7, 7.0, 1.7 Hz, 1H), 6.80 (dd, J = 8.6, 1.0 Hz, 1H), 6.59 (ddd, J = 8.1, 7.0, 1.1 Hz, 1H), 4.17 (dd, J = 8.1, 5.4 Hz, 1H), 3.92 – 3.84 (m, 4H), 3.66 – 3.58 (m, 1H), 3.18 – 3.08 (m, 2H), 1.59 – 1.50 (m, 2H), 1.46 (s, 3H), 1.40 – 1.19 (m, 27H), 0.88 (t, J = 4.8, 3.9 Hz, 3H).



^{13}C NMR (101 MHz, Chloroform-d) δ 169.12, 151.45, 134.58, 131.62, 114.56, 111.56, 110.09, 108.04, 80.41, 77.92, 51.46, 50.06, 47.35, 31.89, 29.87, 29.66, 29.63, 29.58, 29.56, 29.33, 28.39, 26.12, 25.95, 22.66, 14.09.

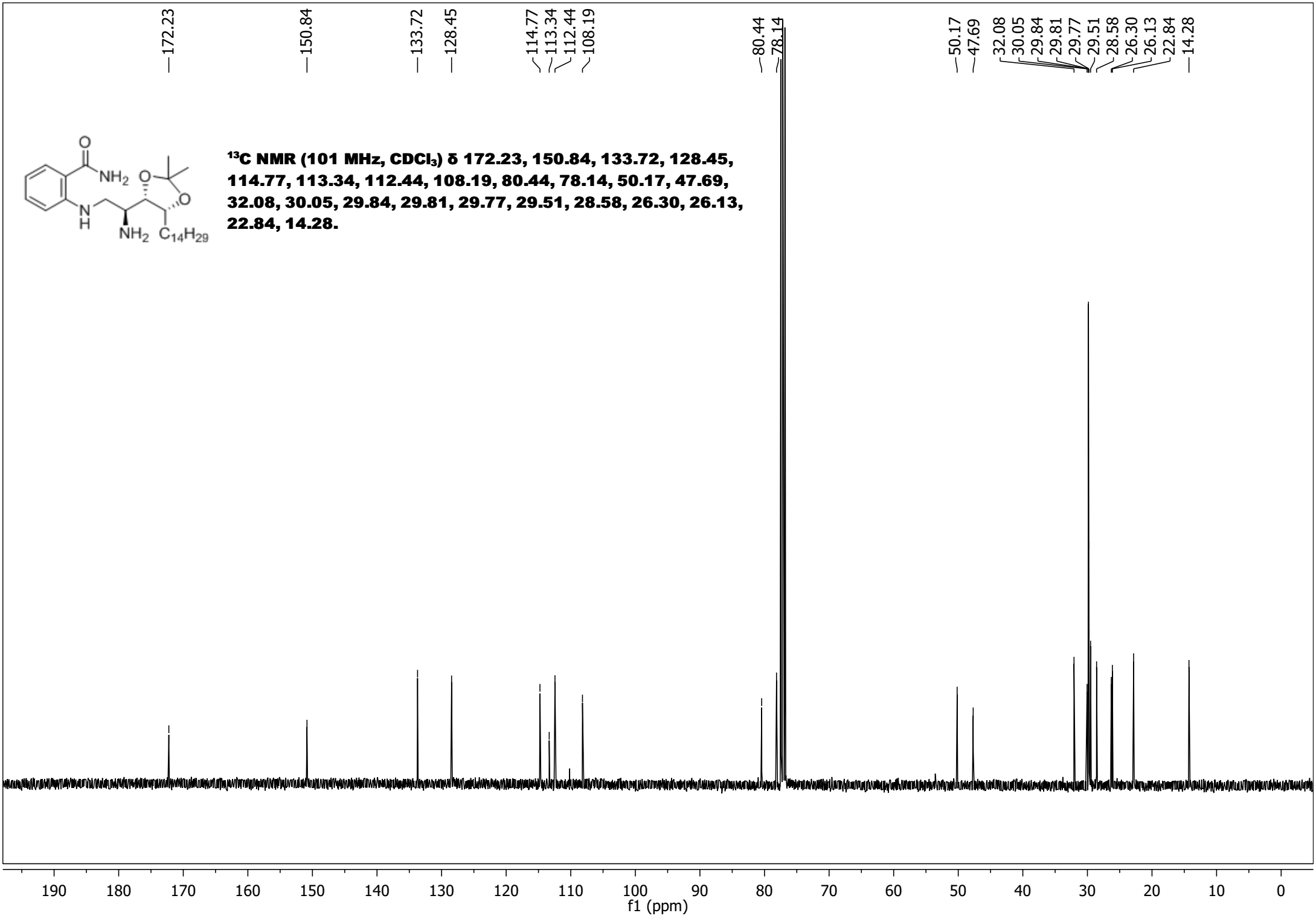

O
O
O
O
N
H
NH2
C14H29
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

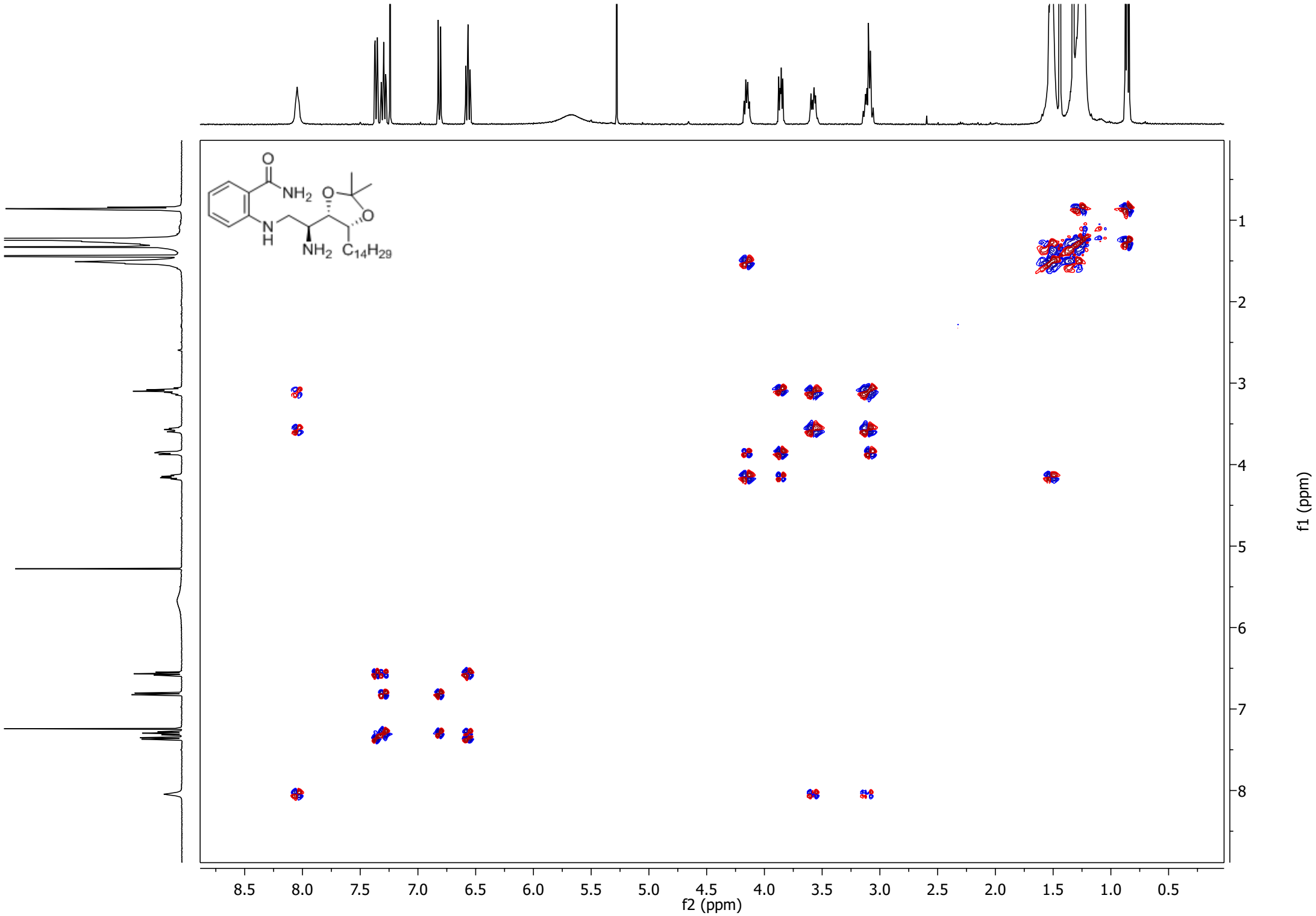

O
O
O
O
N
H
NH2
C14H29
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
f1 (ppm)

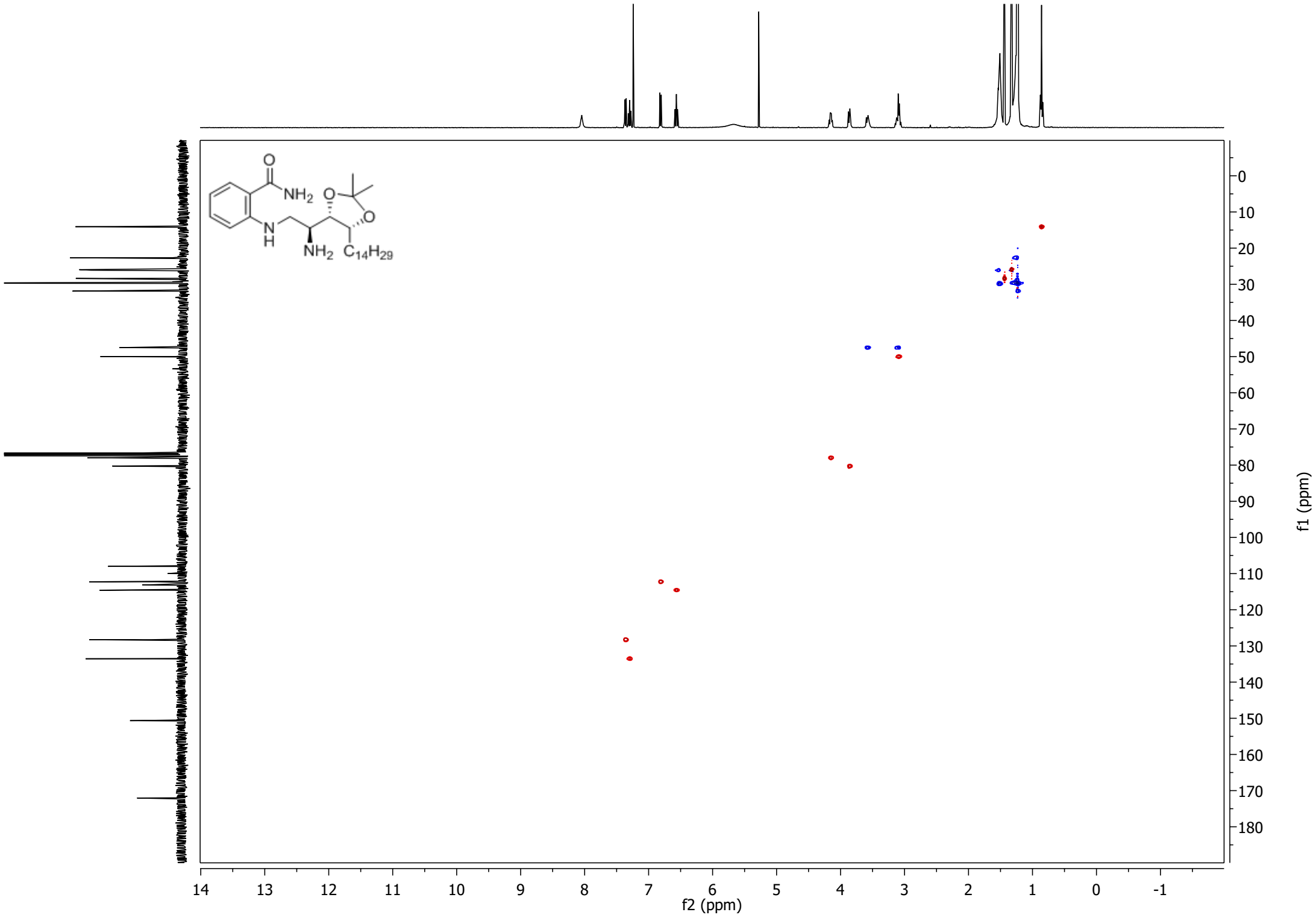


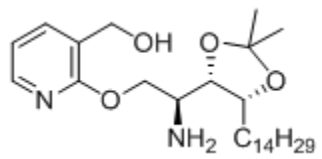
^{1}H NMR (400 MHz, Chloroform-d) δ 8.06 (d, J = 6.6 Hz, 1H), 7.38 (dd, J = 7.9, 1.5 Hz, 1H), 7.32 (ddd, J = 8.6, 7.1, 1.6 Hz, 1H), 6.83 (dd, J = 8.5, 1.0 Hz, 1H), 6.59 (dd, J = 8.0, 1.1 Hz, 1H), 5.70 (s, 2H), 4.17 (dt, J = 7.7, 5.7 Hz, 1H), 3.88 (dd, J = 8.7, 5.5 Hz, 1H), 3.65 – 3.54 (m, 1H), 3.20 – 3.06 (m, 2H), 1.61 – 1.49 (m, 2H), 1.46 (s, 3H), 1.35 (s, 3H), 1.38 – 1.17 (m, 24H), 0.88 (t, J = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 172.23, 150.84, 133.72, 128.45, 114.77, 113.34, 112.44, 108.19, 80.44, 78.14, 50.17, 47.69, 32.08, 30.05, 29.84, 29.81, 29.77, 29.51, 28.58, 26.30, 26.13, 22.84, 14.28.

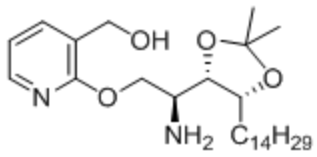



O
NH2
O
O
N
H
NH2
C14H29
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

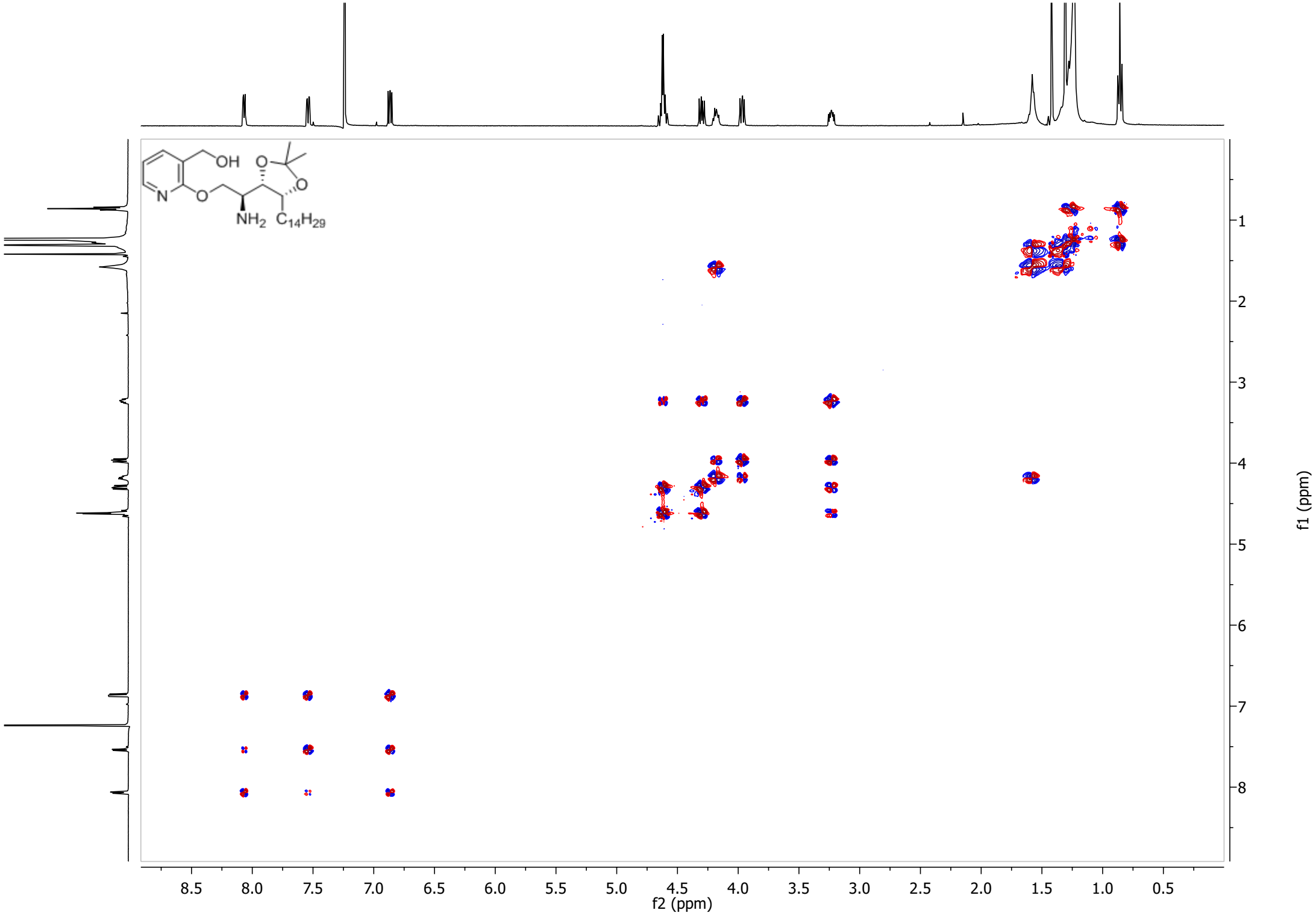

O
NH2
O
O
N
H
NH2
C14H29
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
f1 (ppm)

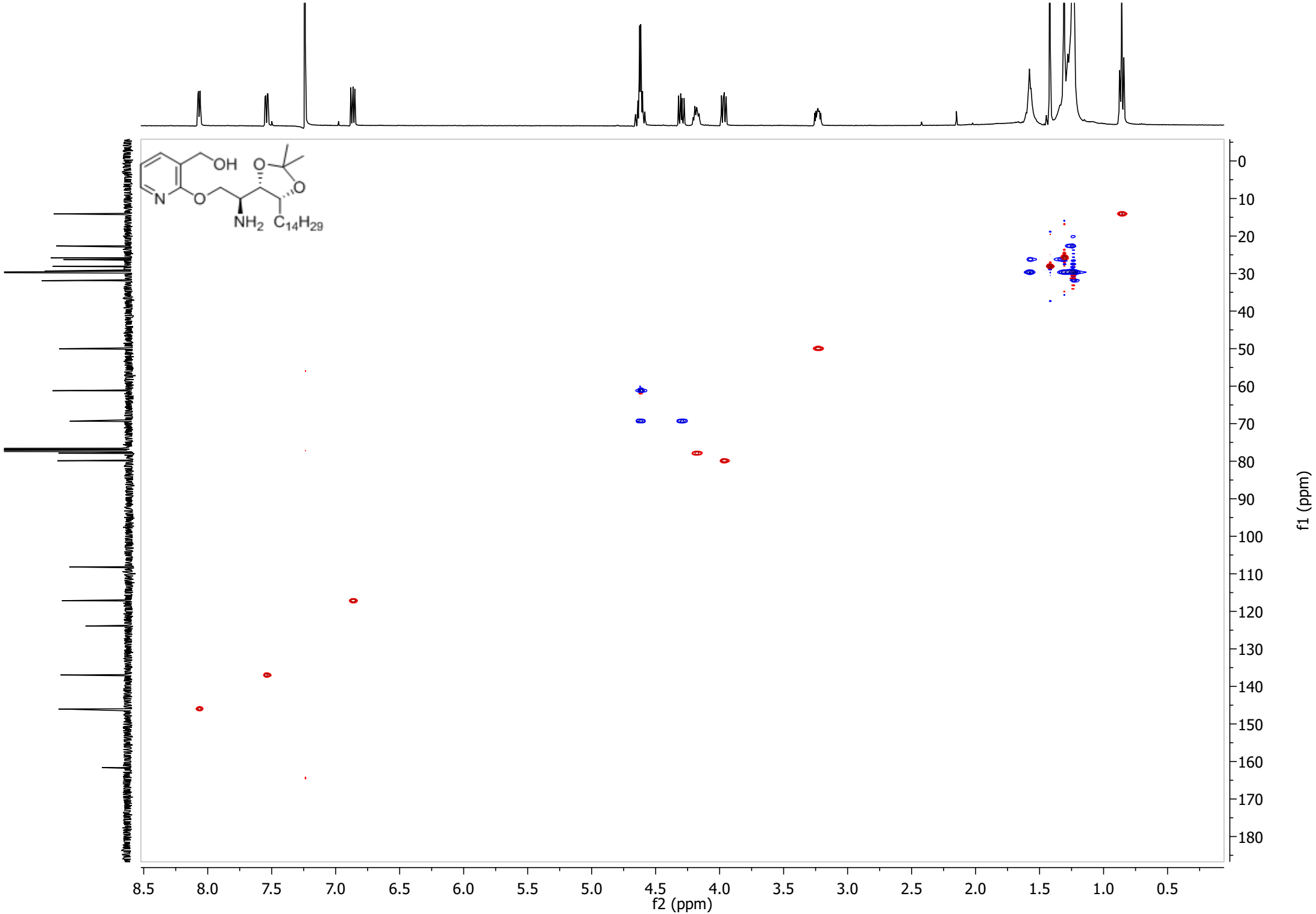


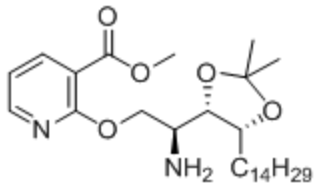
^{1}H NMR (400 MHz, Chloroform-d) δ 8.09 (dd, J = 5.1, 1.9 Hz, 1H), 7.56 (dd, J = 7.2, 1.9 Hz, 1H), 6.89 (dd, J = 7.1, 5.1 Hz, 1H), 4.70 – 4.58 (m, 3H), 4.32 (dd, J = 10.8, 6.6 Hz, 1H), 4.25 – 4.14 (m, 1H), 3.99 (dd, J = 8.6, 5.6 Hz, 1H), 3.25 (ddd, J = 8.6, 6.6, 3.8 Hz, 1H), 1.62 – 1.56 (m, 2H), 1.44 (s, 3H), 1.38 – 1.21 (m, 27H), 0.88 (t, J = 6.9 Hz, 3H).



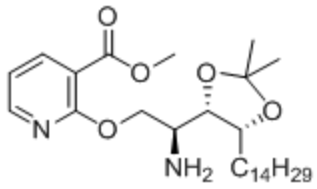
^{13}C NMR (101 MHz, cdcl$_3$) δ 161.84, 146.20, 137.16, 124.10, 117.34, 108.36, 80.05, 78.08, 69.50, 61.41, 50.22, 32.08, 29.85, 29.82, 29.78, 29.75, 29.52, 28.29, 26.44, 26.01, 22.85, 14.28.


OH
O
O
N
O
NH2
C14H29
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
1
2
3
4
5
6
7
8
f1 (ppm)

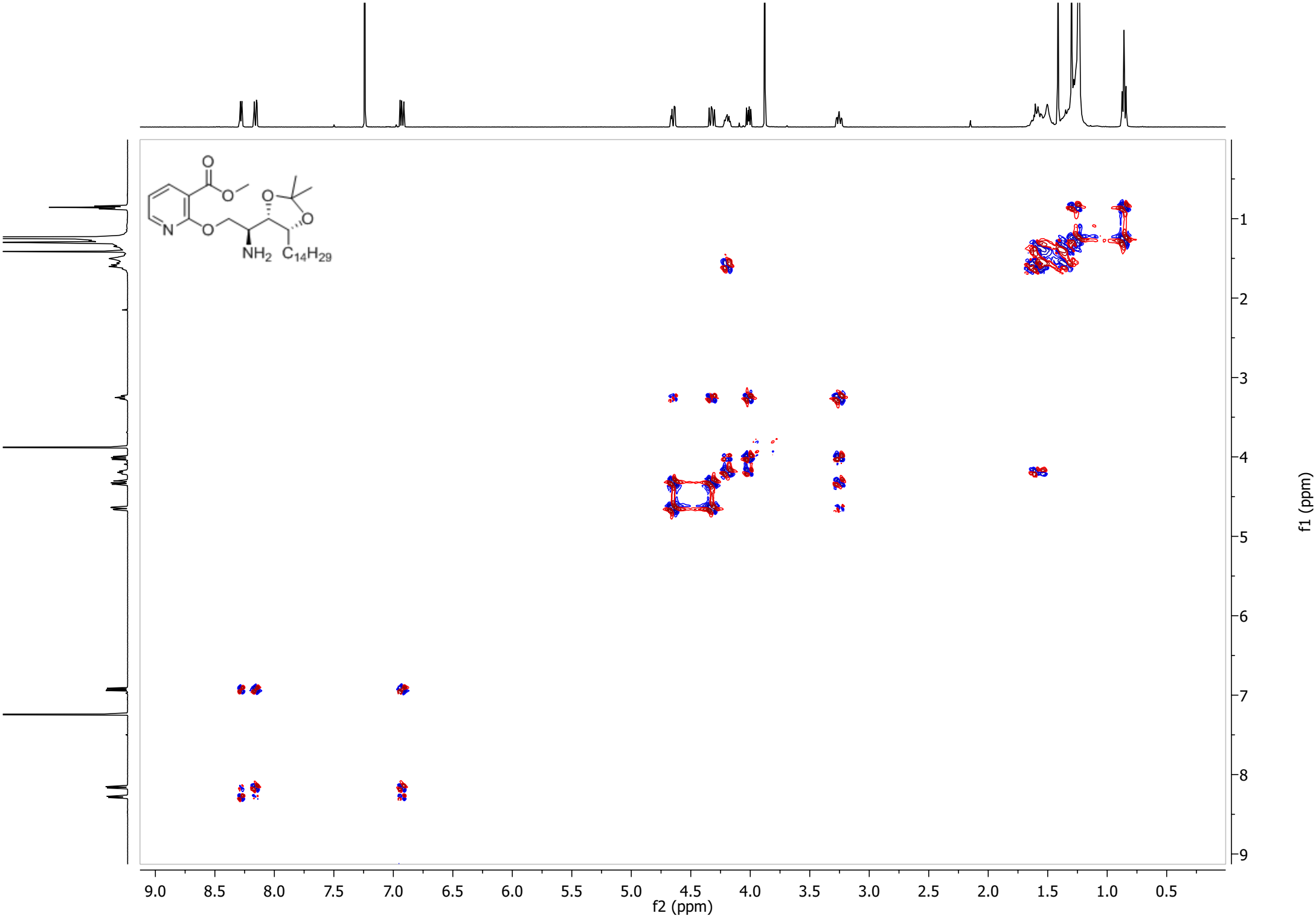

OH
O
O
N
O
NH2
C14H29
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
f1 (ppm)

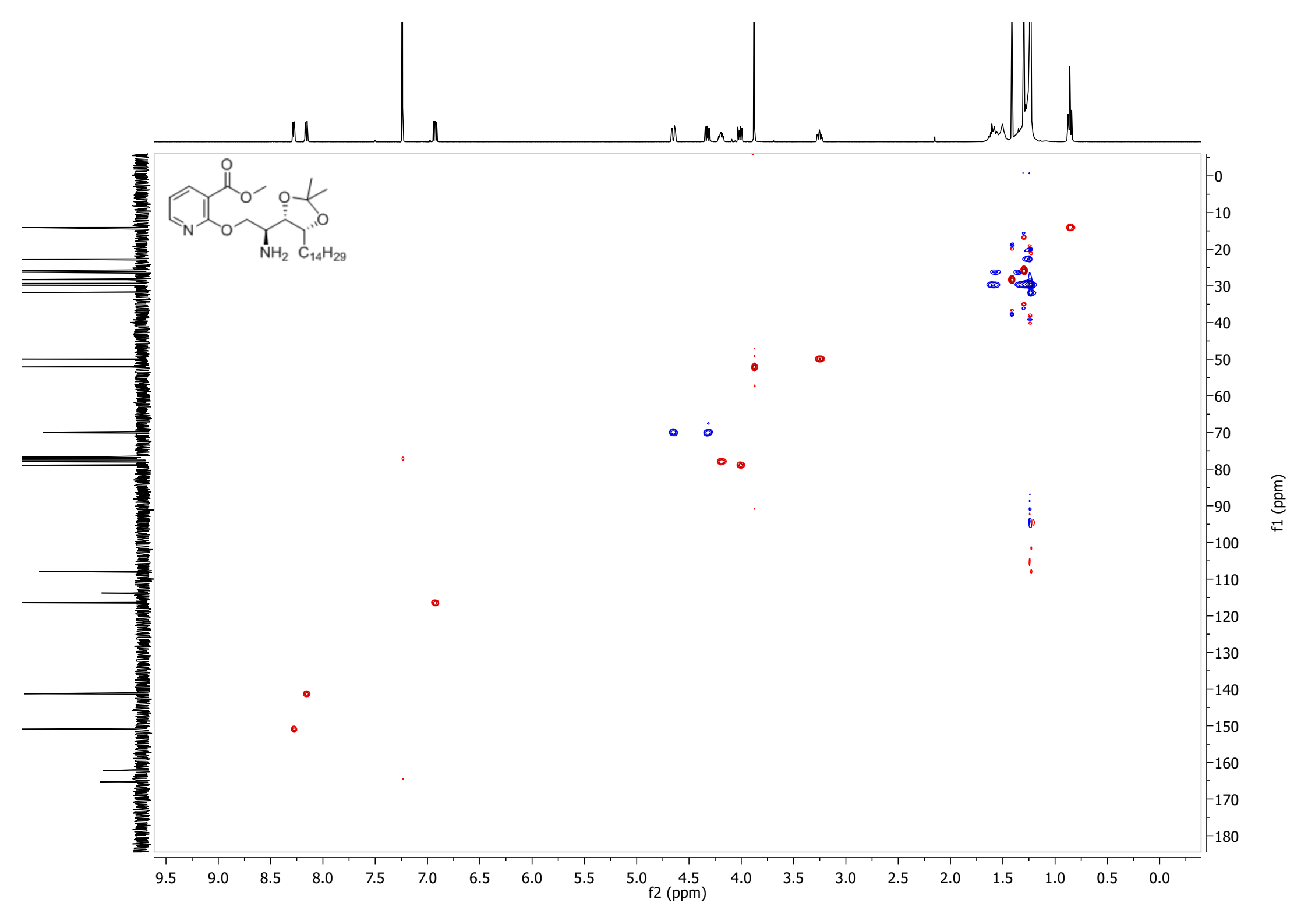


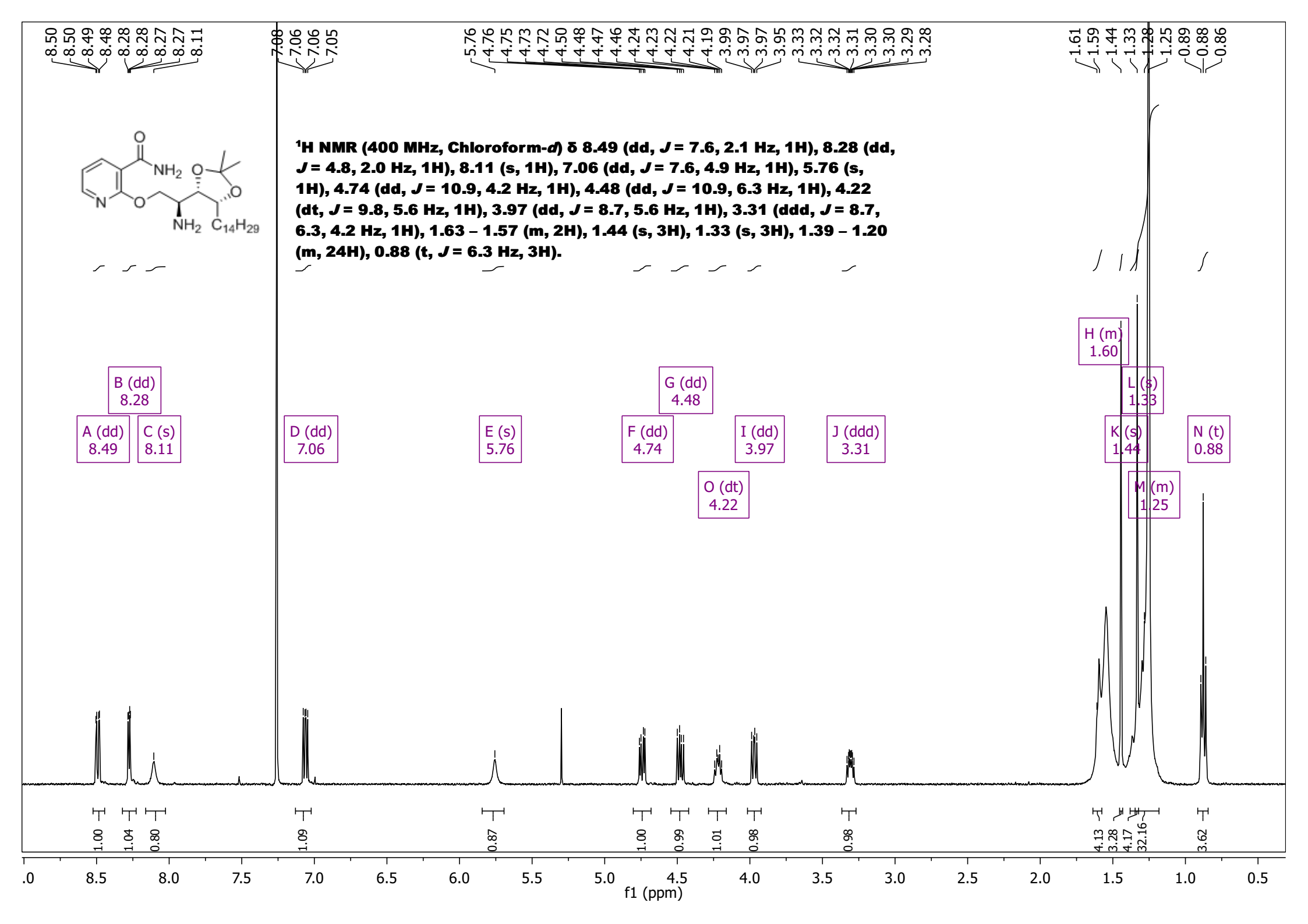
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.30 (dd, *J* = 4.9, 2.0 Hz, 1H), 8.18 (dd, *J* = 7.5, 2.0 Hz, 1H), 6.95 (dd, *J* = 7.5, 4.9 Hz, 1H), 4.67 (dd, *J* = 10.5, 2.9 Hz, 1H), 4.34 (dd, *J* = 10.5, 6.8 Hz, 1H), 4.25 – 4.17 (m, 1H), 4.03 (dd, *J* = 9.1, 5.5 Hz, 1H), 3.90 (s, 3H), 3.27 (ddd, *J* = 9.5, 6.8, 2.9 Hz, 1H), 1.68 – 1.55 (m, 2H), 1.43 (s, 3H), 1.42 – 1.21 (m, 27H), 0.88 (t, *J* = 6.8 Hz, 3H).

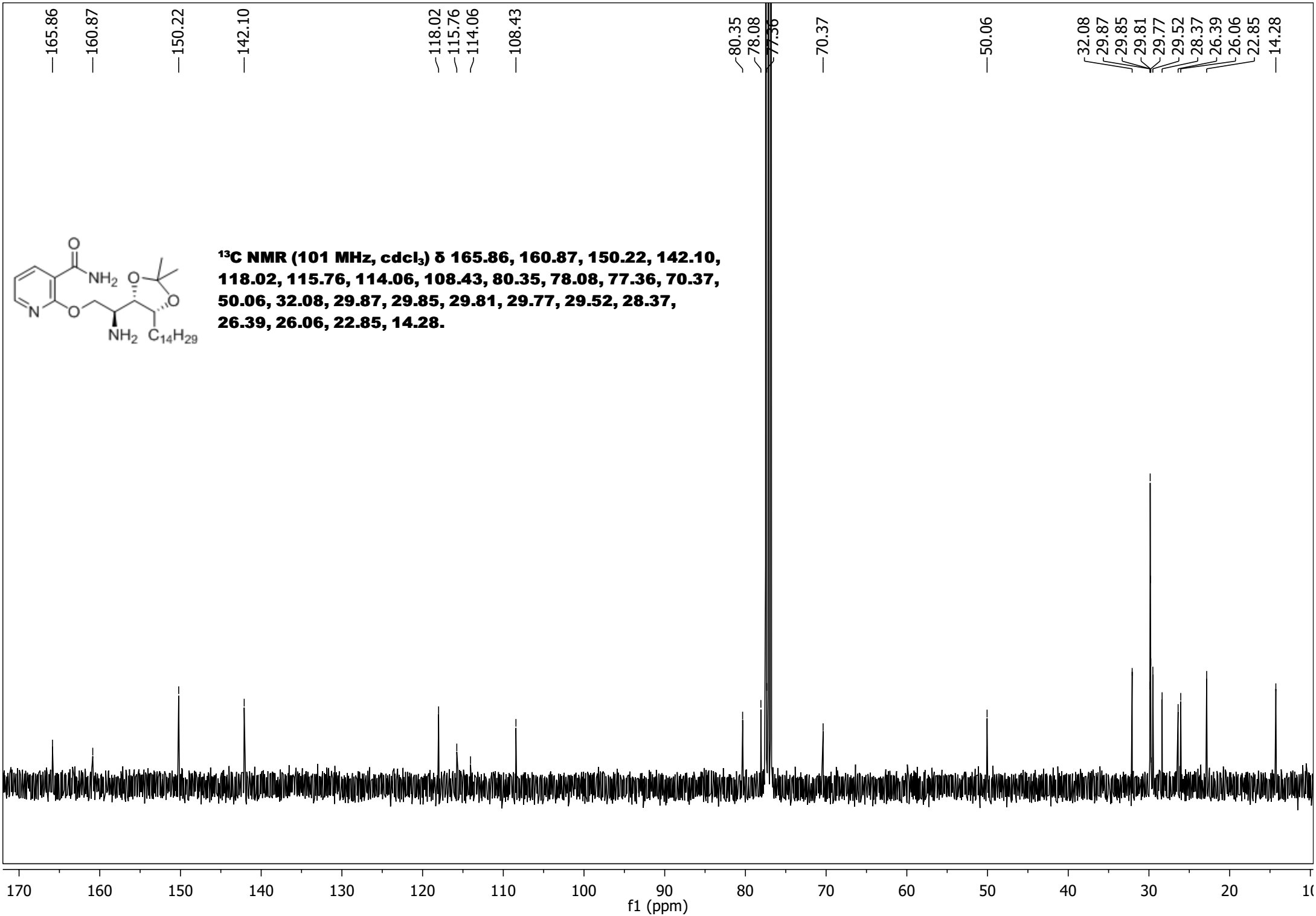


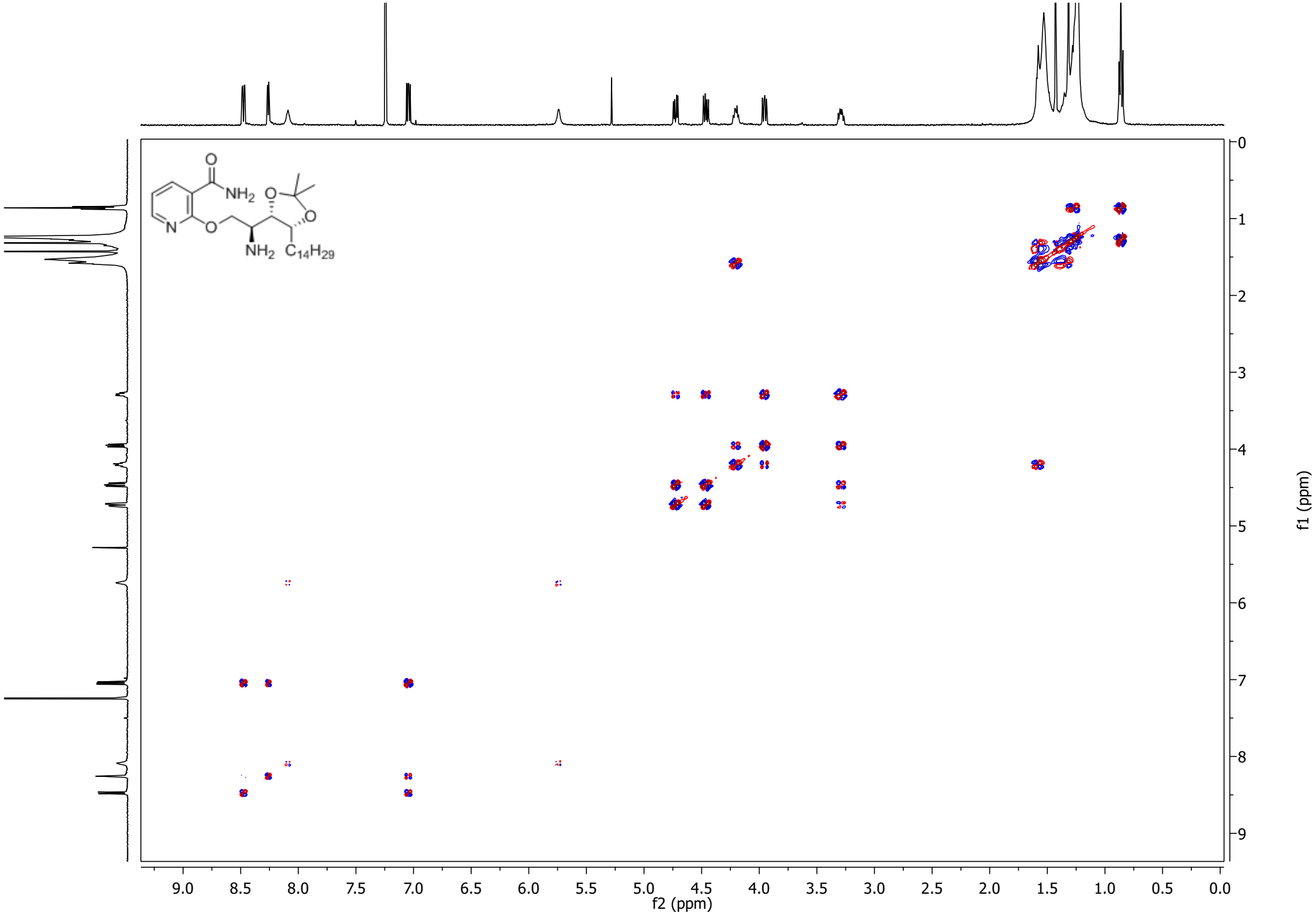
^{13}C NMR (101 MHz, cdcl$_3$) δ 165.28, 162.30, 150.93, 141.27, 116.44, 113.79, 107.89, 78.92, 77.94, 70.03, 52.13, 49.94, 31.89, 29.75, 29.70, 29.66, 29.64, 29.62, 29.60, 29.33, 28.30, 26.28, 25.90, 22.66, 14.09.

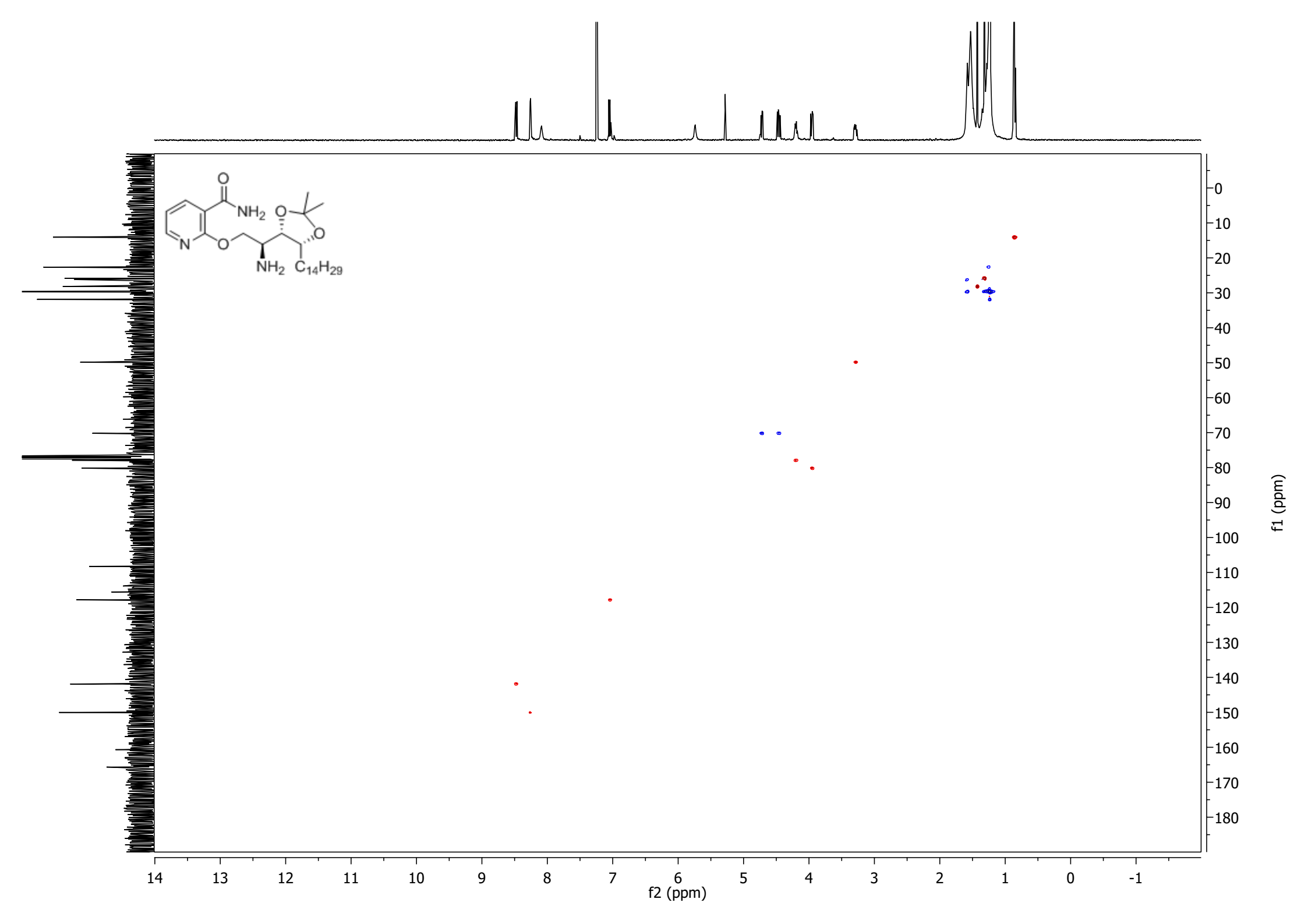

O
O
O
O
N
O
NH2
C14H29
f2 (ppm)
f1 (ppm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
1
2
3
4
5
6
7
8
9

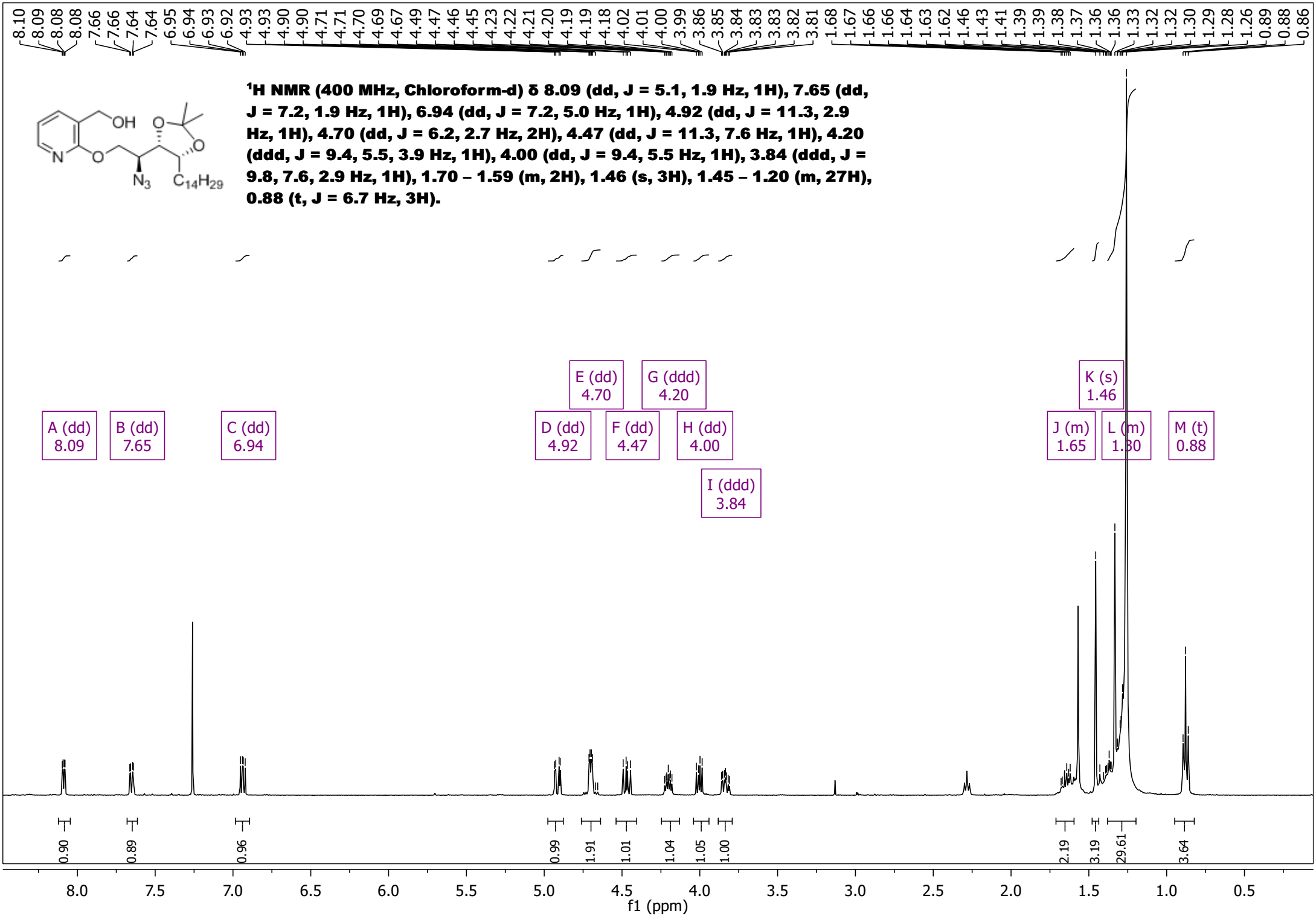

f2 (ppm)
f1 (ppm)
NH2
C14H29


8.50 8.50 8.49 8.48 8.28 8.28 8.27 8.27 8.11 7.08 7.06 7.06 7.05 5.76 4.76 4.75 4.73 4.72 4.50 4.48 4.47 4.46 4.24 4.23 4.22 4.21 4.19 3.99 3.97 3.97 3.95 3.33 3.32 3.32 3.31 3.30 3.30 3.29 3.28 1.61 1.59 1.44 1.33 1.28 1.25 0.89 0.88 0.86
NH2 O O N O NH2 C14H29
¹H NMR (400 MHz, Chloroform-d) δ 8.49 (dd, J = 7.6, 2.1 Hz, 1H), 8.28 (dd, J = 4.8, 2.0 Hz, 1H), 8.11 (s, 1H), 7.06 (dd, J = 7.6, 4.9 Hz, 1H), 5.76 (s, 1H), 4.74 (dd, J = 10.9, 4.2 Hz, 1H), 4.48 (dd, J = 10.9, 6.3 Hz, 1H), 4.22 (dt, J = 9.8, 5.6 Hz, 1H), 3.97 (dd, J = 8.7, 5.6 Hz, 1H), 3.31 (ddd, J = 8.7, 6.3, 4.2 Hz, 1H), 1.63 – 1.57 (m, 2H), 1.44 (s, 3H), 1.33 (s, 3H), 1.39 – 1.20 (m, 24H), 0.88 (t, J = 6.3 Hz, 3H).
A (dd) 8.49
B (dd) 8.28
C (s) 8.11
D (dd) 7.06
E (s) 5.76
F (dd) 4.74
G (dd) 4.48
O (dt) 4.22
I (dd) 3.97
J (ddd) 3.31
H (m) 1.60
K (s) 1.44
L (s) 1.33
M (m) 1.25
N (t) 0.88
1.00 1.04 0.80 1.09 0.87 1.00 0.99 1.01 0.98 0.98 4.13 3.28 4.17 32.16 3.62
.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)

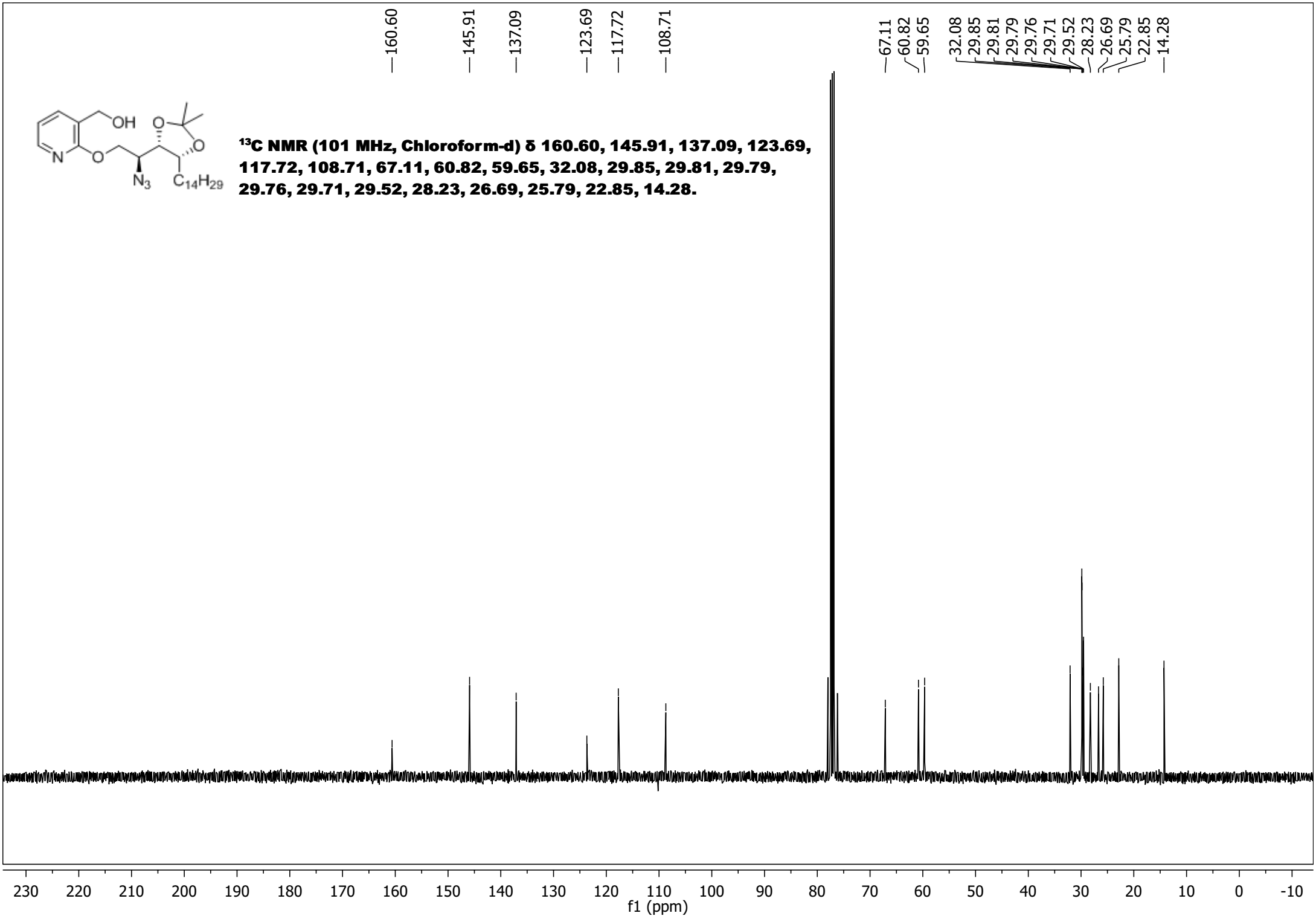

165.86
160.87
150.22
142.10
118.02
115.76
114.06
108.43
80.35
78.08
77.36
70.37
50.06
32.08
29.87
29.85
29.81
29.77
29.52
28.37
26.39
26.06
22.85
14.28
NH2
O
N
NH2
C14H29
13C NMR (101 MHz, cdcl3) δ 165.86, 160.87, 150.22, 142.10, 118.02, 115.76, 114.06, 108.43, 80.35, 78.08, 77.36, 70.37, 50.06, 32.08, 29.87, 29.85, 29.81, 29.77, 29.52, 28.37, 26.39, 26.06, 22.85, 14.28.
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
f1 (ppm)

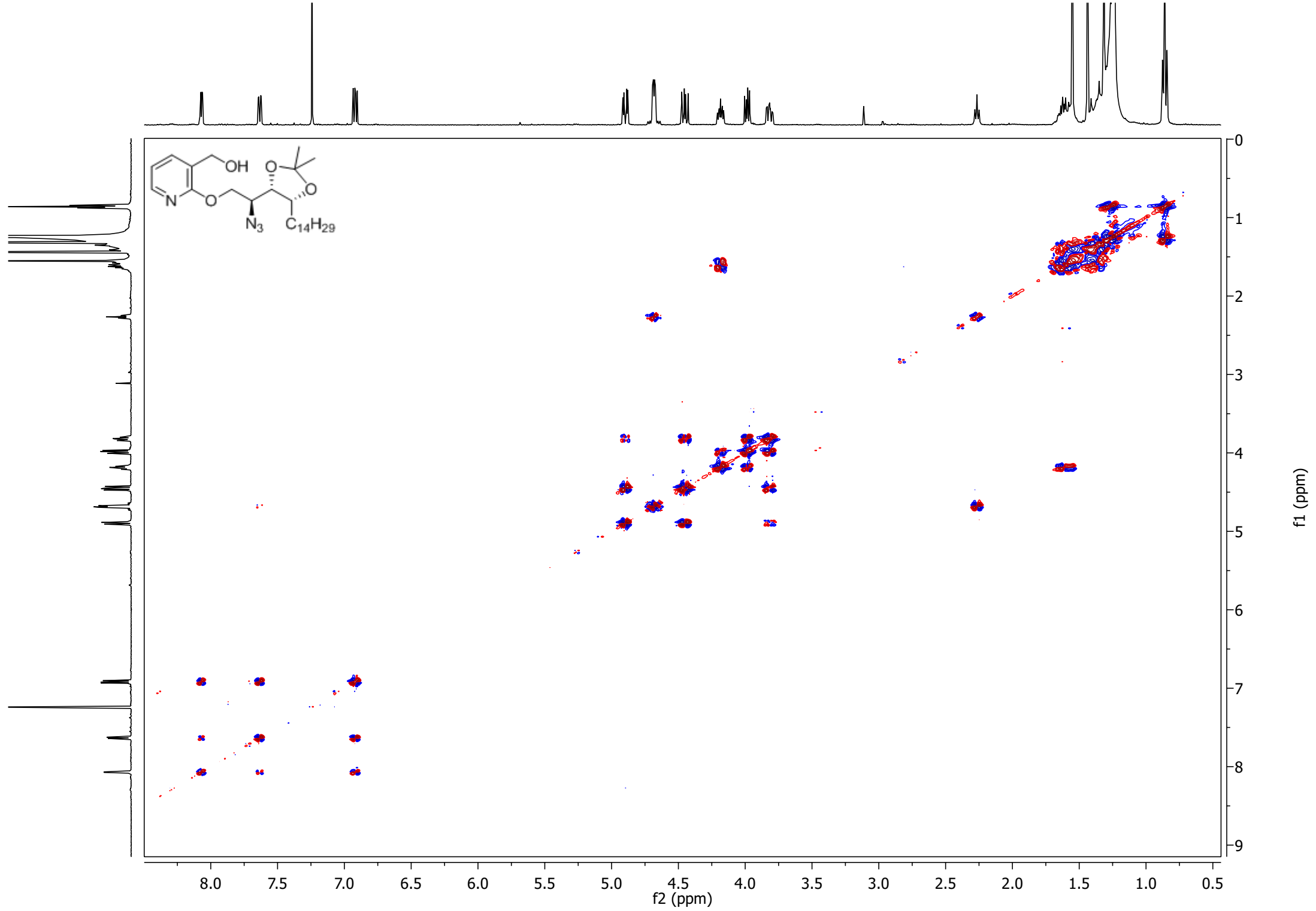

O
NH2
O
N
O
O
NH2
C14H29
f2 (ppm)
f1 (ppm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9

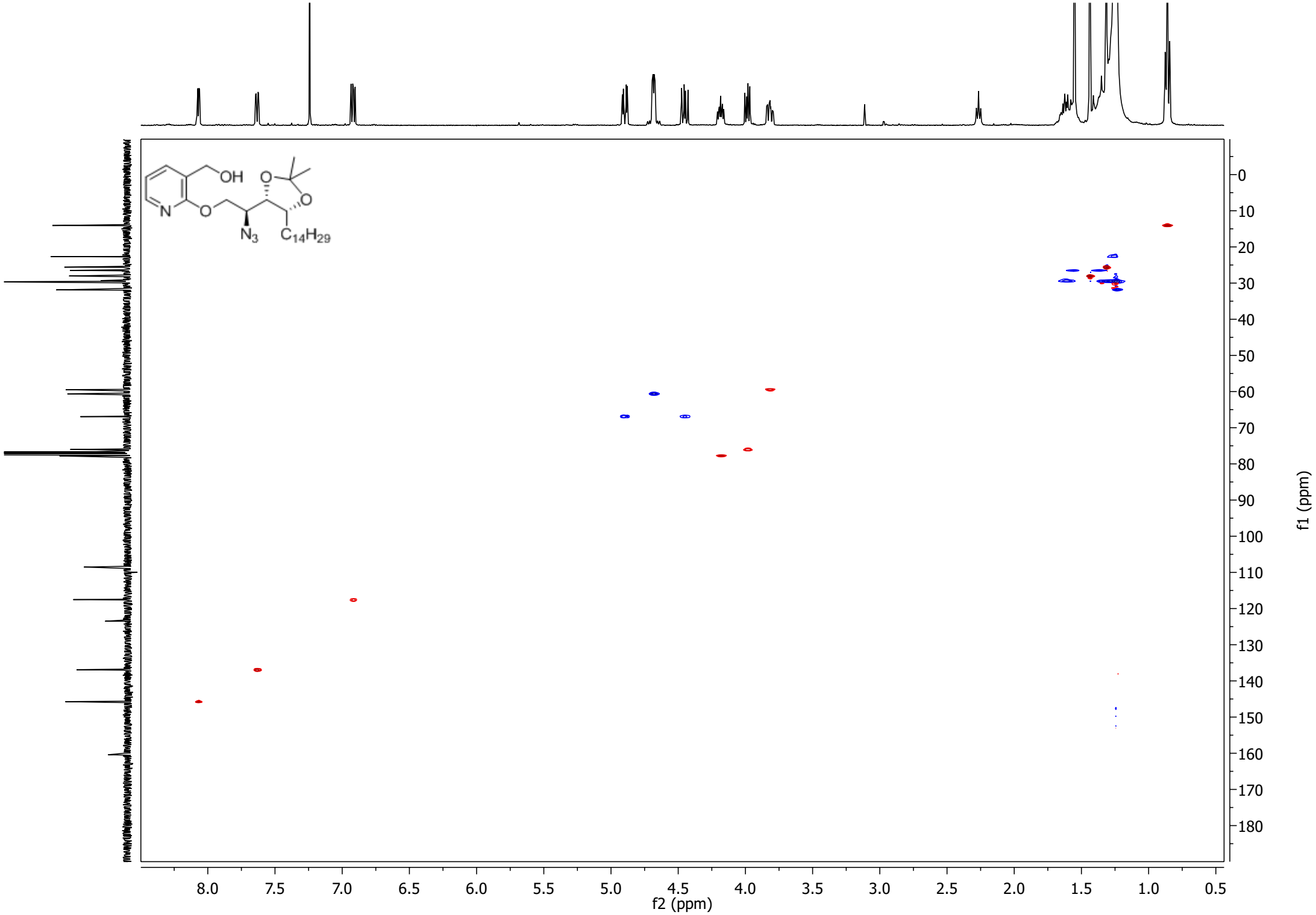

O
NH2
O
O
N
O
NH2
C14H29
f2 (ppm)
f1 (ppm)

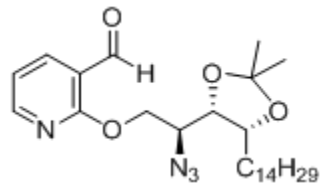

8.10 8.09 8.08 8.08 7.66 7.66 7.64 7.64 6.95 6.94 6.93 6.92 4.93 4.93 4.90 4.90 4.71 4.71 4.70 4.69 4.67 4.49 4.47 4.46 4.45 4.23 4.22 4.21 4.20 4.19 4.19 4.18 4.02 4.01 4.00 3.99 3.86 3.85 3.84 3.83 3.83 3.82 3.81 1.68 1.67 1.66 1.66 1.64 1.63 1.62 1.46 1.43 1.41 1.39 1.39 1.38 1.37 1.36 1.36 1.33 1.32 1.32 1.30 1.29 1.28 1.26 0.89 0.88 0.86
OH
O
O
N
O
N3
C14H29
¹H NMR (400 MHz, Chloroform-d) δ 8.09 (dd, J = 5.1, 1.9 Hz, 1H), 7.65 (dd, J = 7.2, 1.9 Hz, 1H), 6.94 (dd, J = 7.2, 5.0 Hz, 1H), 4.92 (dd, J = 11.3, 2.9 Hz, 1H), 4.70 (dd, J = 6.2, 2.7 Hz, 2H), 4.47 (dd, J = 11.3, 7.6 Hz, 1H), 4.20 (ddd, J = 9.4, 5.5, 3.9 Hz, 1H), 4.00 (dd, J = 9.4, 5.5 Hz, 1H), 3.84 (ddd, J = 9.8, 7.6, 2.9 Hz, 1H), 1.70 – 1.59 (m, 2H), 1.46 (s, 3H), 1.45 – 1.20 (m, 27H), 0.88 (t, J = 6.7 Hz, 3H).
A (dd) 8.09
B (dd) 7.65
C (dd) 6.94
D (dd) 4.92
E (dd) 4.70
F (dd) 4.47
G (ddd) 4.20
H (dd) 4.00
I (ddd) 3.84
J (m) 1.65
K (s) 1.46
L (m) 1.30
M (t) 0.88
0.90
0.89
0.96
0.99
1.91
1.01
1.04
1.05
1.00
2.19
3.19
29.61
3.64
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)

^{13}C NMR (101 MHz, Chloroform-d) δ 160.60, 145.91, 137.09, 123.69, 117.72, 108.71, 67.11, 60.82, 59.65, 32.08, 29.85, 29.81, 29.79, 29.76, 29.71, 29.52, 28.23, 26.69, 25.79, 22.85, 14.28.

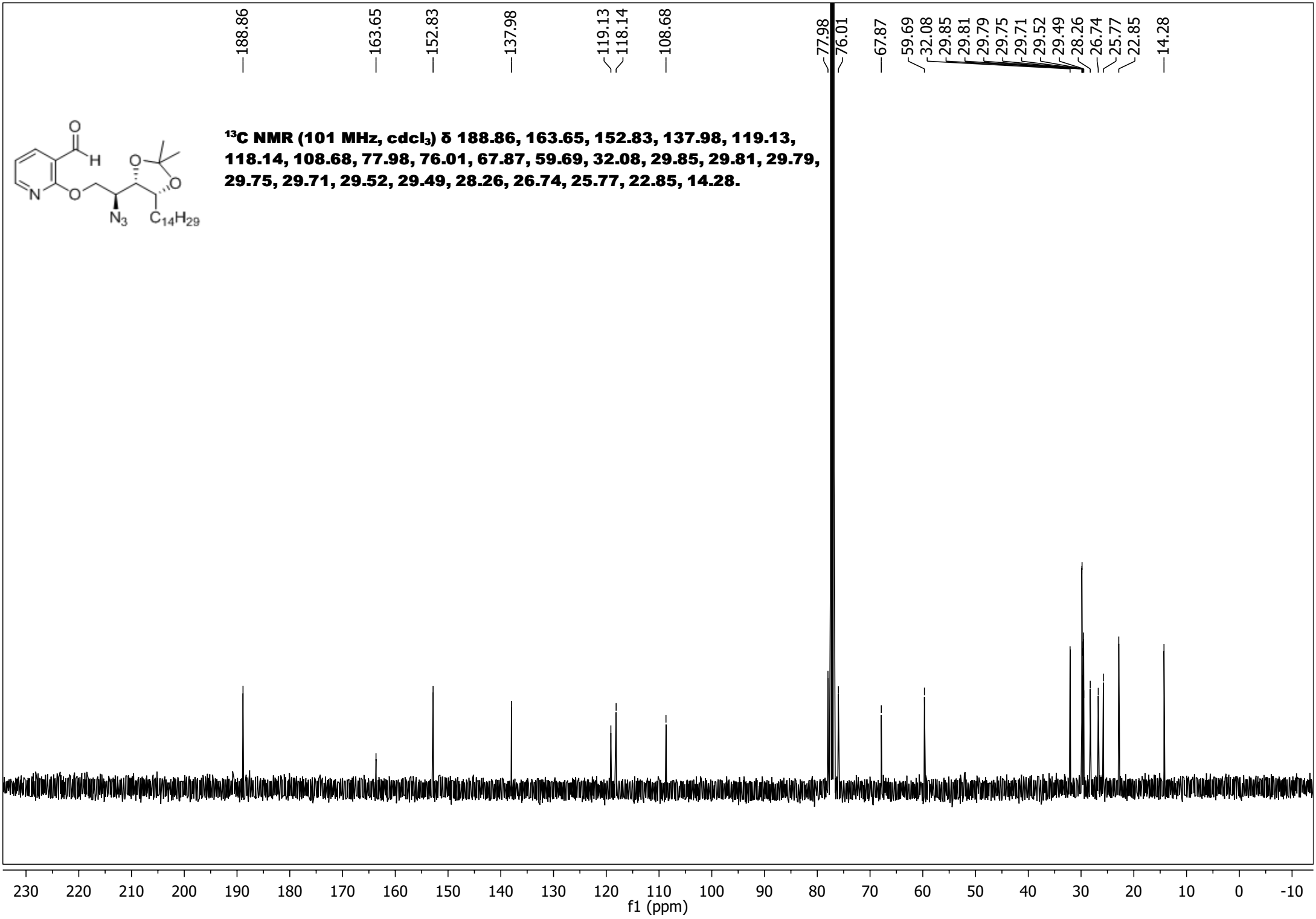


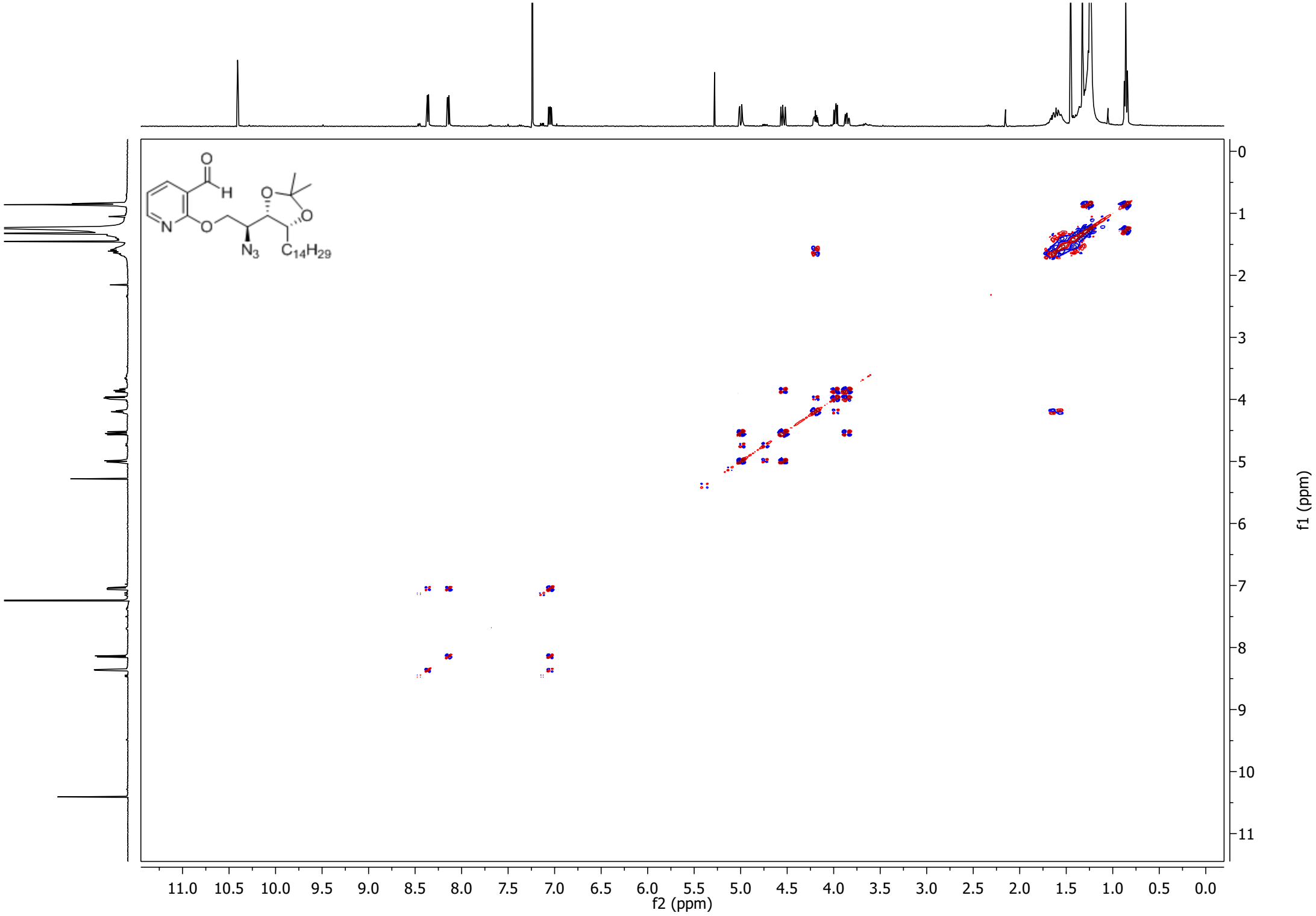

OH
O
O
N
O
N3
C14H29
f2 (ppm)
f1 (ppm)

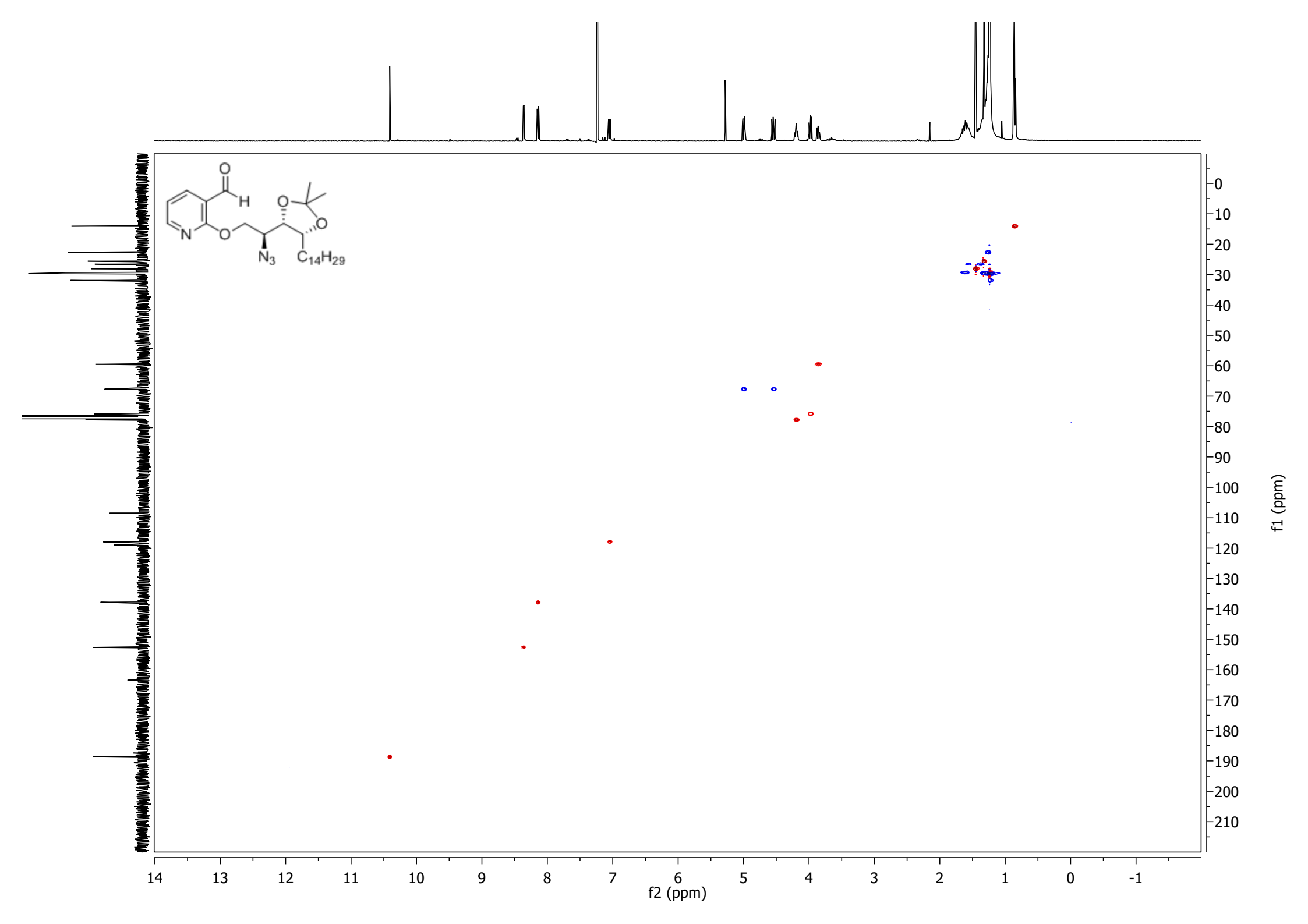

OH
O
O
N
O
N3
C14H29
f2 (ppm)
f1 (ppm)

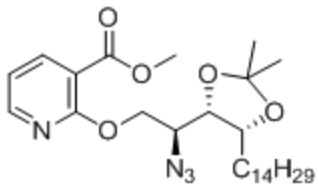


^{1}H NMR (400 MHz, Chloroform-d) δ 10.41 (d, J = 0.8 Hz, 1H), 8.36 (dd, J = 4.9, 2.1 Hz, 1H), 8.14 (dd, J = 7.5, 2.1 Hz, 1H), 7.05 (ddd, J = 7.5, 4.9, 0.8 Hz, 1H), 5.00 (dd, J = 11.4, 2.6 Hz, 1H), 4.54 (dd, J = 11.4, 8.0 Hz, 1H), 4.20 (ddd, J = 9.4, 5.5, 3.8 Hz, 1H), 3.98 (dd, J = 9.4, 5.5 Hz, 1H), 3.86 (ddd, J = 9.4, 8.0, 2.6 Hz, 1H), 1.67 – 1.52 (m, 2H), 1.45 (s, 3H), 1.33 (s, 3H), 1.30 – 1.20 (m, 24H), 0.86 (t, J = 6.8 Hz, 3H).

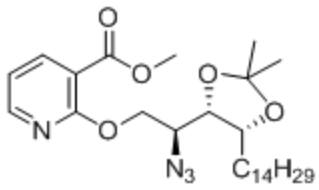

188.86
163.65
152.83
137.98
119.13
118.14
108.68
77.98
76.01
67.87
59.69
32.08
29.85
29.81
29.79
29.75
29.71
29.52
29.49
28.26
26.74
25.77
22.85
14.28
O
H
O
O
N
O
N3
C14H29
13C NMR (101 MHz, cdcl3) δ 188.86, 163.65, 152.83, 137.98, 119.13, 118.14, 108.68, 77.98, 76.01, 67.87, 59.69, 32.08, 29.85, 29.81, 29.79, 29.75, 29.71, 29.52, 29.49, 28.26, 26.74, 25.77, 22.85, 14.28.
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


O
H
O
O
N
O
N3
C14H29
f2 (ppm)
f1 (ppm)

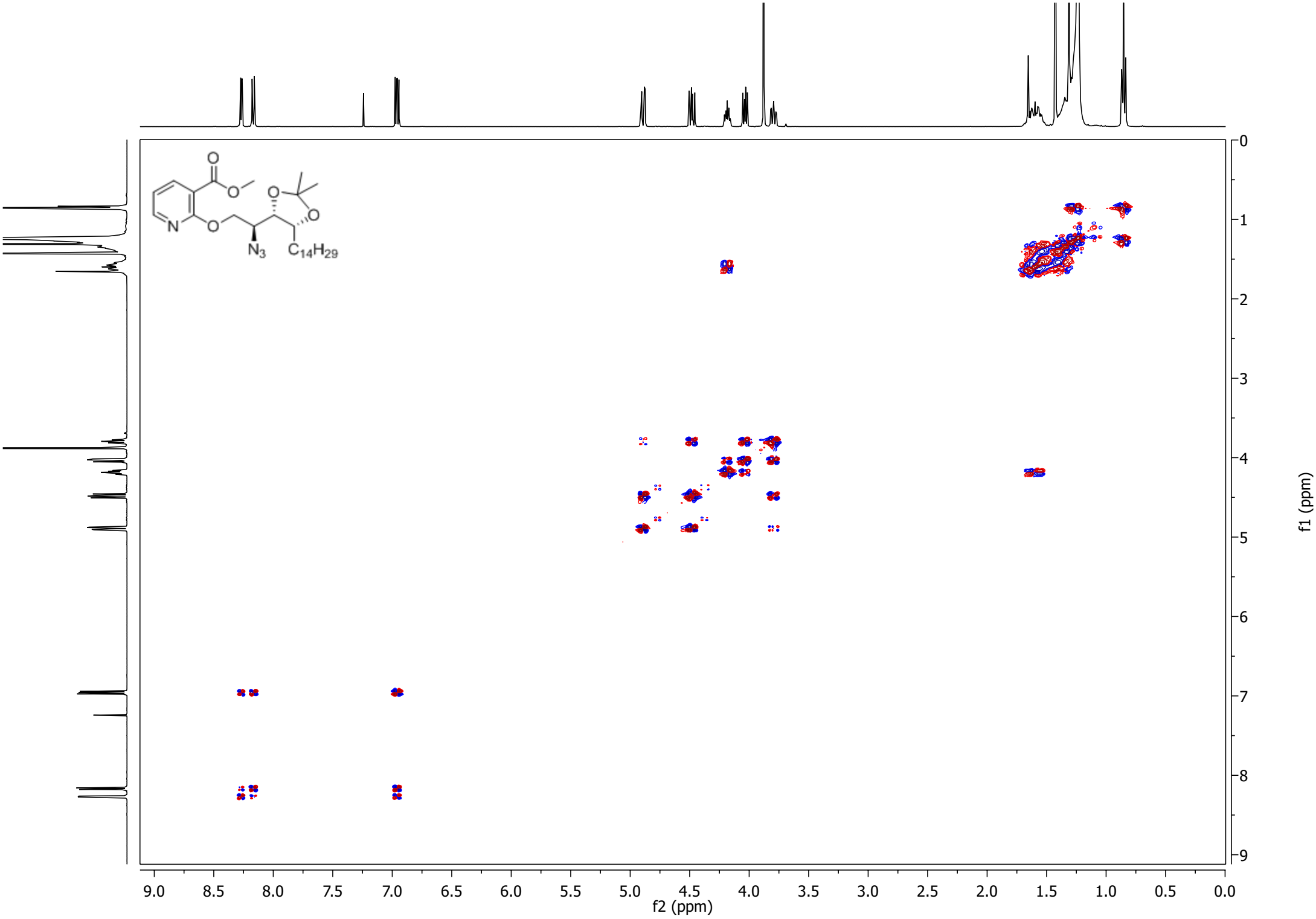

O
H
O
N
O
O
N3
C14H29
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
f1 (ppm)

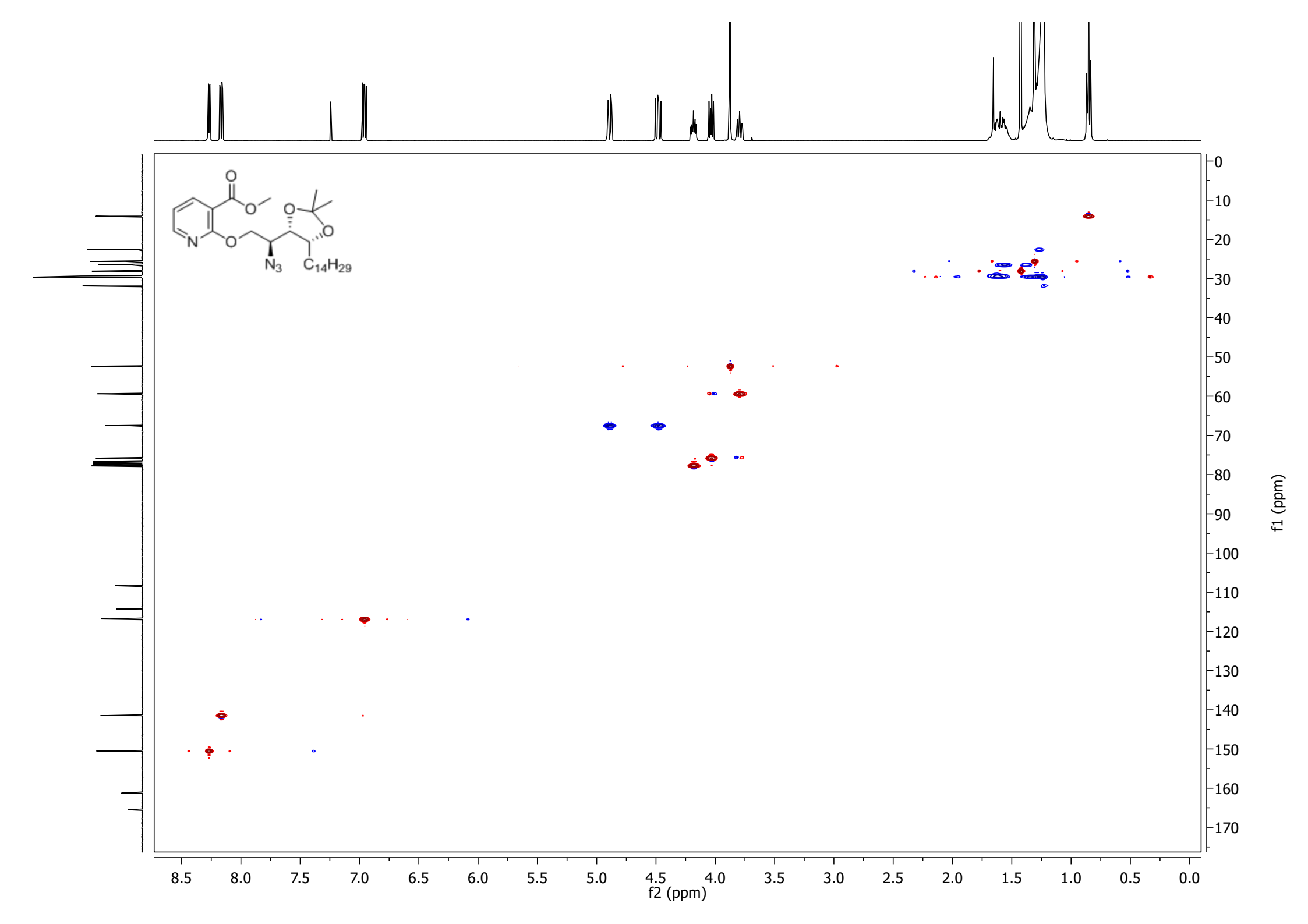


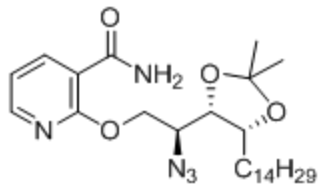
^{1}H NMR (400 MHz, Chloroform-d) δ 8.29 (dd, J = 4.9, 2.0 Hz, 1H), 8.18 (dd, J = 7.5, 2.0 Hz, 1H), 6.98 (dd, J = 7.5, 4.9 Hz, 1H), 4.91 (dd, J = 11.4, 2.5 Hz, 1H), 4.50 (dd, J = 11.4, 7.8 Hz, 1H), 4.20 (ddd, J = 9.4, 5.5, 3.7 Hz, 1H), 4.05 (dd, J = 9.5, 5.5 Hz, 1H), 3.90 (s, 3H), 3.81 (ddd, J = 9.8, 7.8, 2.5 Hz, 1H), 1.68 – 1.53 (m, 2H), 1.44 (s, 3H), 1.42 – 1.19 (m, 27H), 0.87 (t, J = 6.7 Hz, 3H).



^{13}C NMR (101 MHz, Chloroform-d) δ 165.69, 161.44, 150.69, 141.66, 117.02, 114.46, 108.53, 77.97, 75.99, 67.69, 59.56, 52.54, 32.06, 29.83, 29.82, 29.79, 29.78, 29.74, 29.69, 29.54, 29.49, 28.28, 26.69, 25.80, 22.83, 14.25.

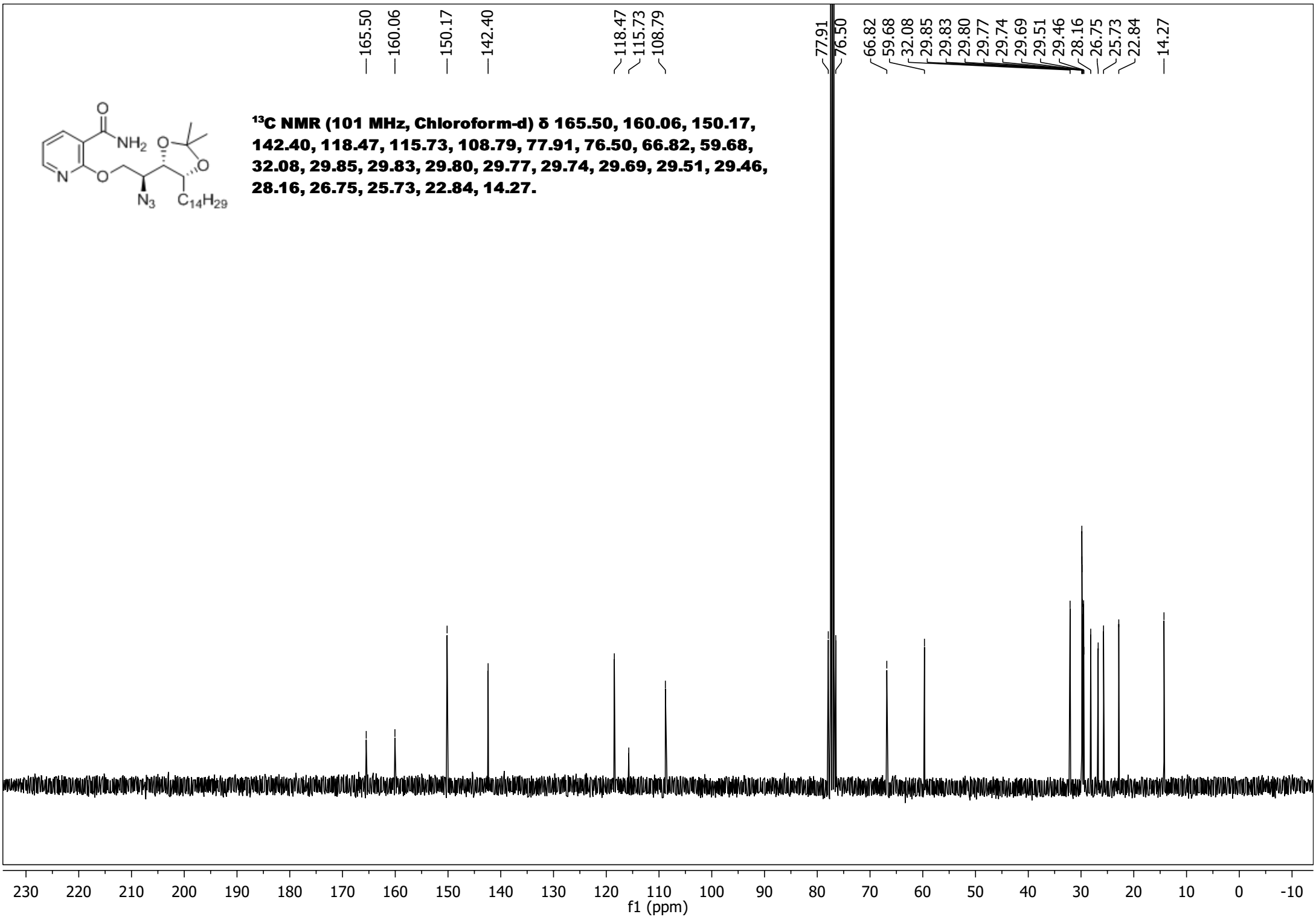

O
O
O
O
N
O
N3
C14H29
f2 (ppm)
f1 (ppm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9

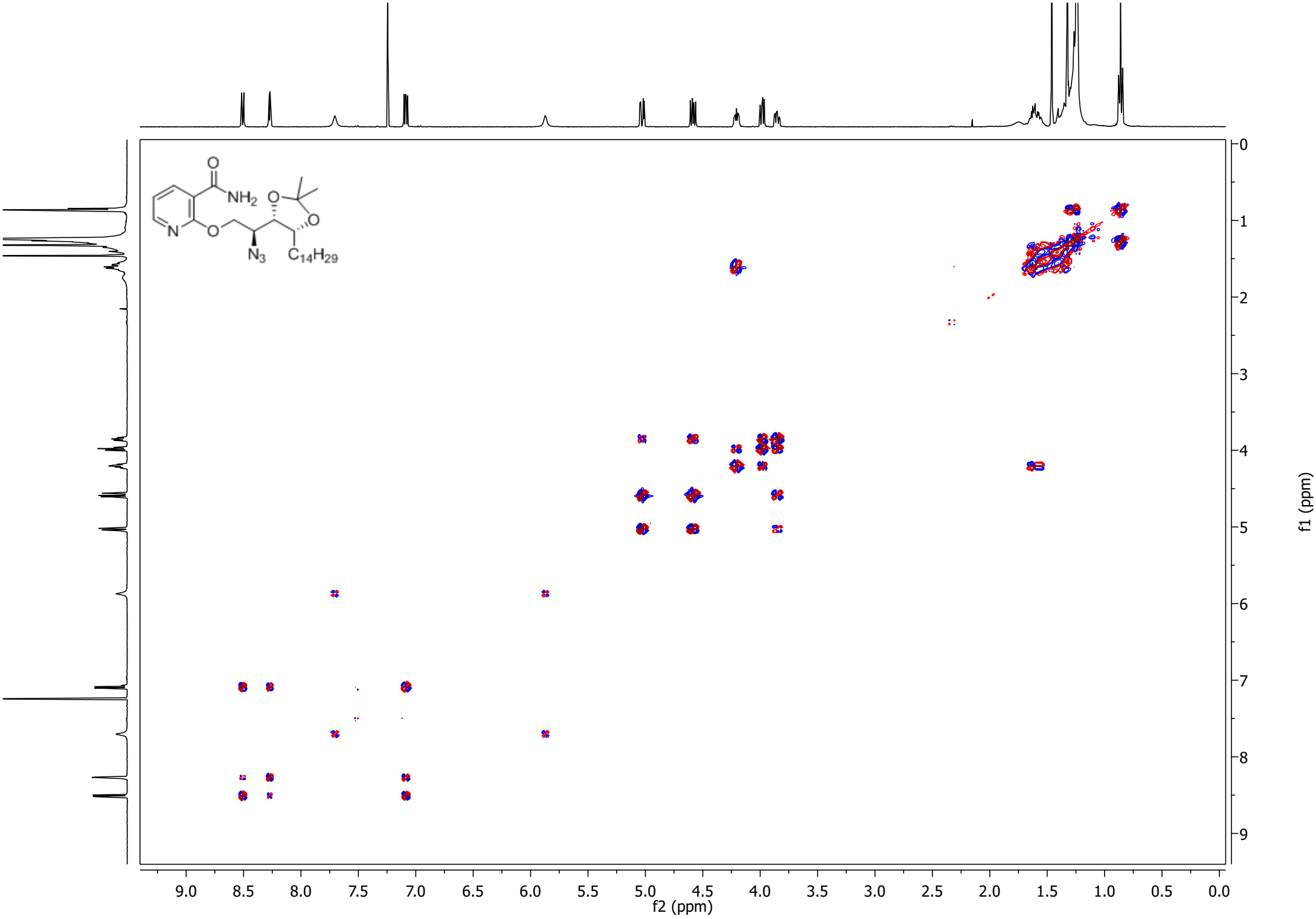

O
O
O
O
N
O
N3
C14H29
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
f1 (ppm)

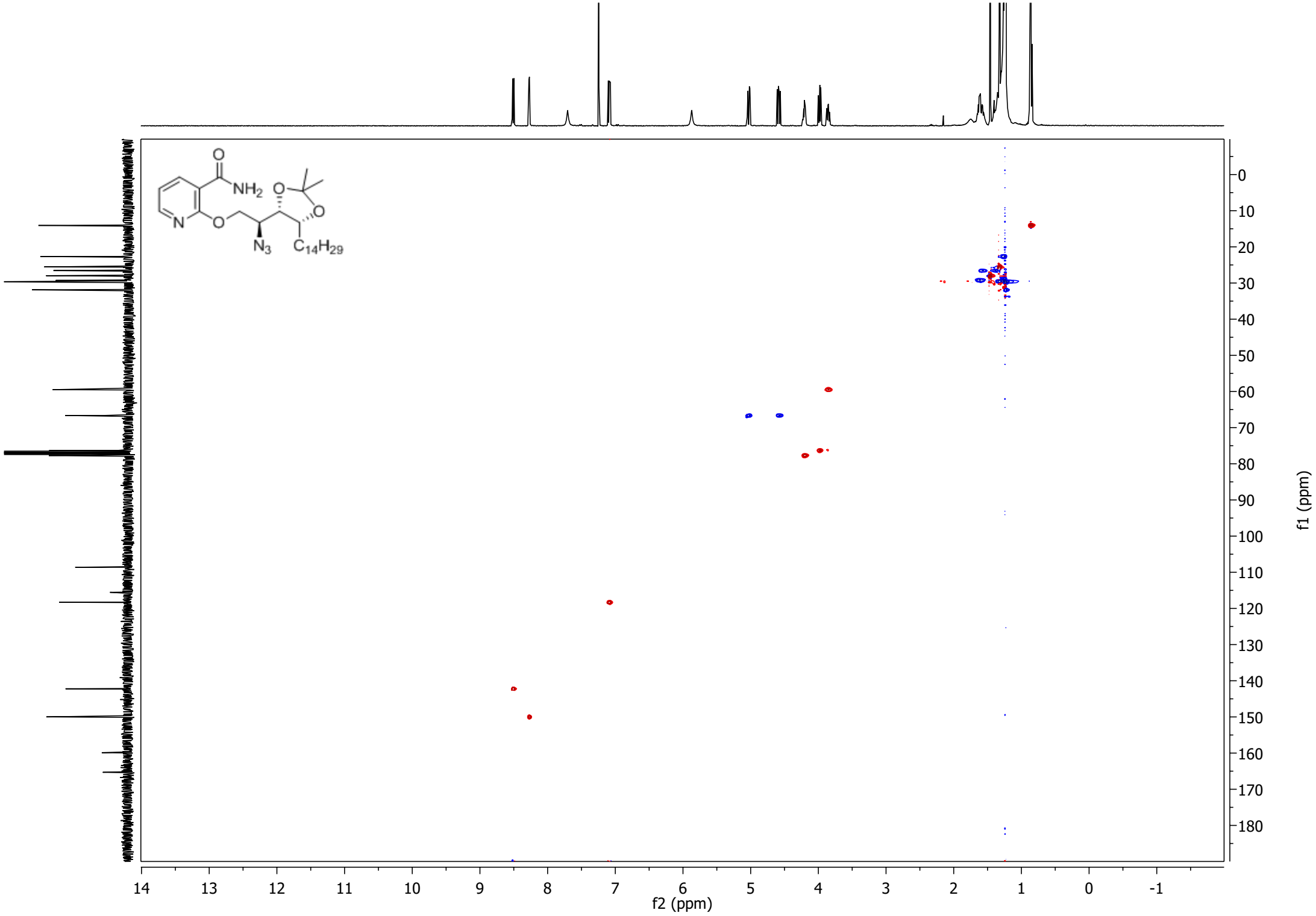


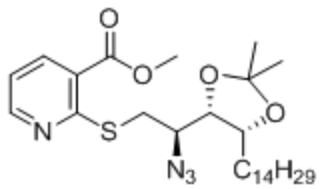
^{1}H NMR (400 MHz, Chloroform-d) δ 8.53 (dd, J = 7.6, 2.0 Hz, 1H), 8.29 (dd, J = 4.8, 2.0 Hz, 1H), 7.72 (s, 1H), 7.10 (dd, J = 7.6, 4.8 Hz, 1H), 5.89 (s, 1H), 5.05 (dd, J = 11.6, 3.2 Hz, 1H), 4.60 (dd, J = 11.6, 7.0 Hz, 1H), 4.22 (ddd, J = 9.3, 5.5, 3.9 Hz, 1H), 4.00 (dd, J = 9.1, 5.5 Hz, 1H), 3.87 (ddd, J = 9.0, 7.0, 3.2 Hz, 1H), 1.71 – 1.50 (m, 2H), 1.48 (s, 3H), 1.42 – 1.19 (m, 27H), 0.88 (t, J = 6.6 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-d) δ 165.50, 160.06, 150.17, 142.40, 118.47, 115.73, 108.79, 77.91, 76.50, 66.82, 59.68, 32.08, 29.85, 29.83, 29.80, 29.77, 29.74, 29.69, 29.51, 29.46, 28.16, 26.75, 25.73, 22.84, 14.27.

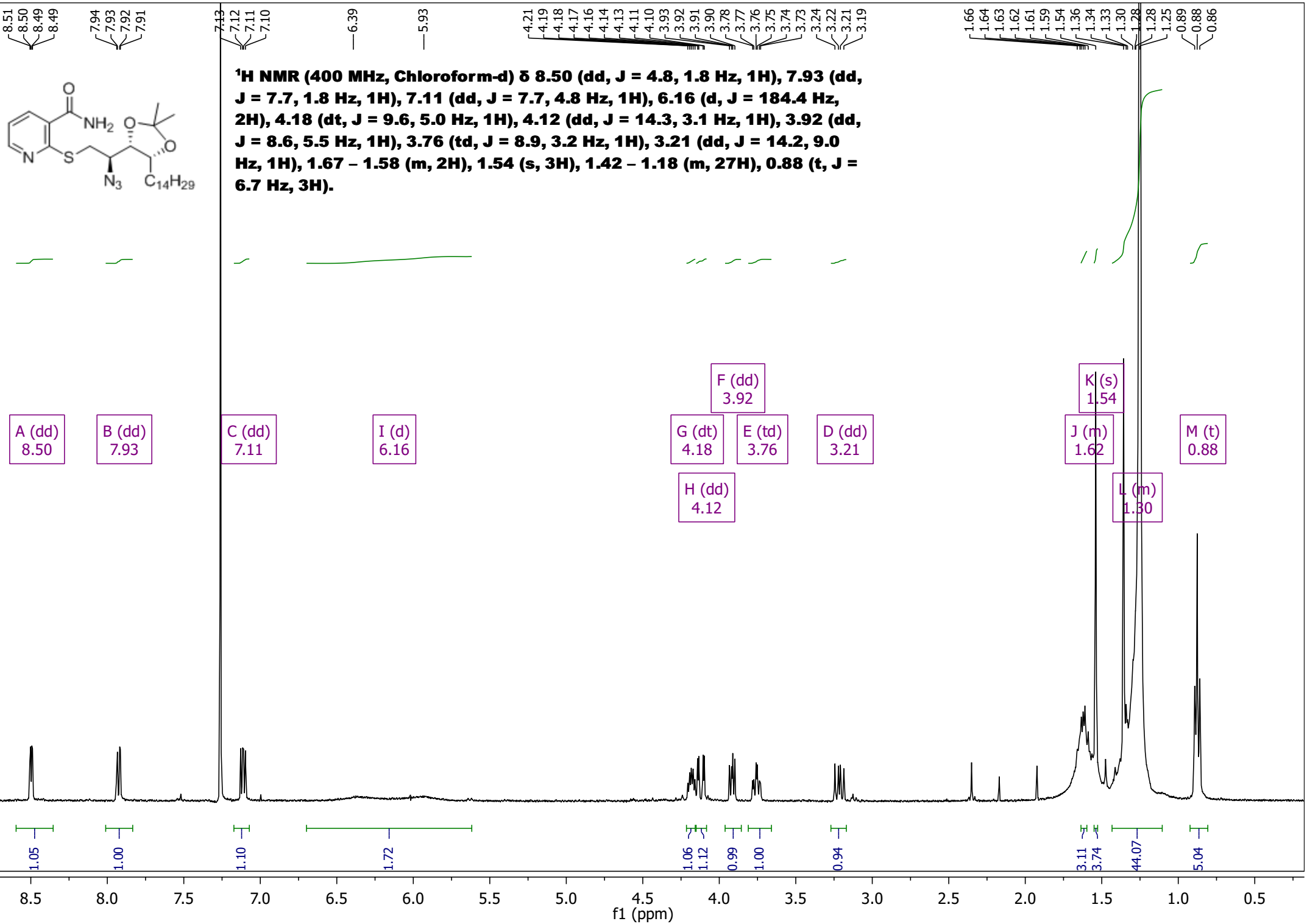


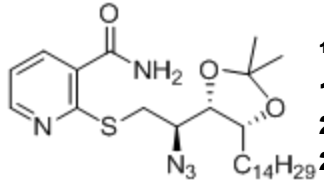

O
NH2
O
O
N
O
N3
C14H29
f2 (ppm)
f1 (ppm)


O
NH2
O
O
N
O
N3
C14H29
f2 (ppm)
f1 (ppm)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

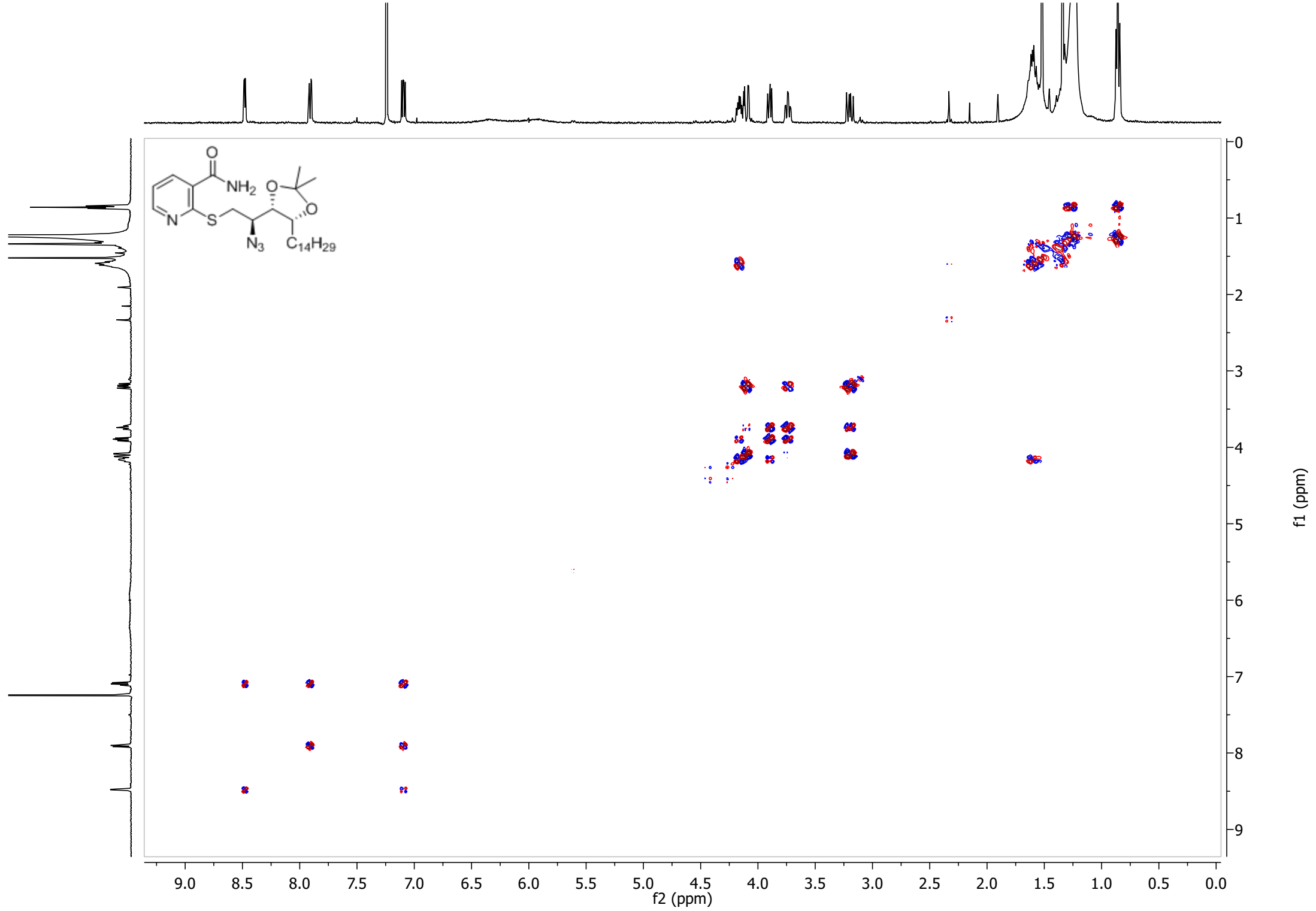


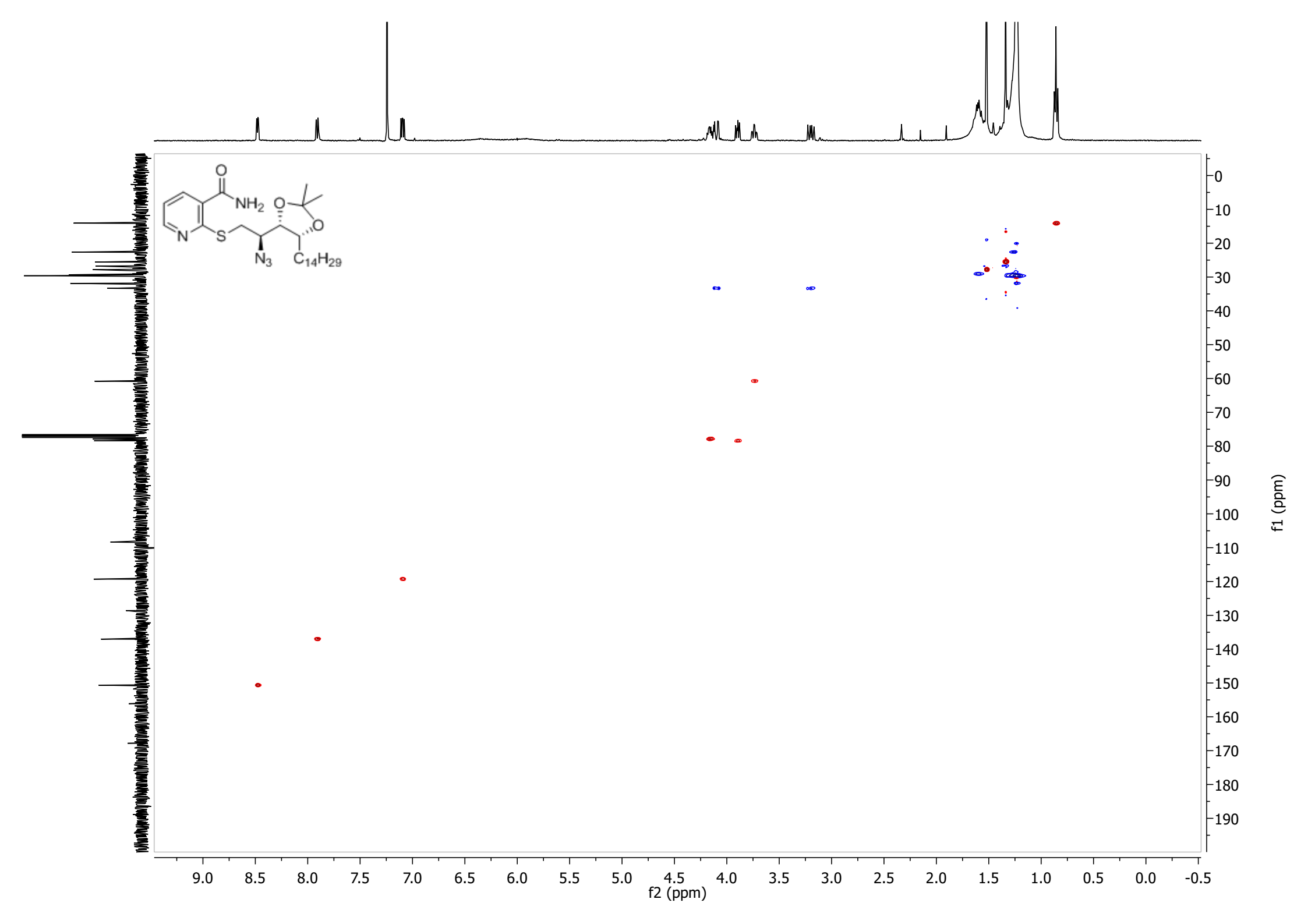
^{1}H NMR (400 MHz, Chloroform-d) δ 8.54 (dd, J = 4.7, 1.9 Hz, 1H), 8.23 (dd, J = 7.8, 1.9 Hz, 1H), 7.08 (dd, J = 7.8, 4.7 Hz, 1H), 4.19 (dt, J = 8.6, 5.2 Hz, 1H), 4.04 (dd, J = 14.2, 3.2 Hz, 1H), 3.99 – 3.89 (m, 4H), 3.77 (td, J = 8.8, 3.2 Hz, 1H), 3.17 (dd, J = 14.2, 9.0 Hz, 1H), 1.68 – 1.58 (m, 2H), 1.55 (s, 3H), 1.45 – 1.16 (m, 27H), 0.88 (t, J = 6.8 Hz, 3H).


8.51 8.50 8.49 8.49
7.94 7.93 7.92 7.91
7.13 7.12 7.11 7.10
6.39
5.93
4.21 4.19 4.18 4.17 4.16 4.14 4.13 4.11 4.10 3.93 3.92 3.91 3.90 3.78 3.77 3.76 3.75 3.74 3.73
3.24 3.22 3.21 3.19
1.66 1.64 1.63 1.62 1.61 1.59 1.54 1.36 1.34 1.33 1.30 1.28 1.28 1.25
0.89 0.88 0.86
NH2
O
N
S
N3
C14H29
¹H NMR (400 MHz, Chloroform-d) δ 8.50 (dd, J = 4.8, 1.8 Hz, 1H), 7.93 (dd, J = 7.7, 1.8 Hz, 1H), 7.11 (dd, J = 7.7, 4.8 Hz, 1H), 6.16 (d, J = 184.4 Hz, 2H), 4.18 (dt, J = 9.6, 5.0 Hz, 1H), 4.12 (dd, J = 14.3, 3.1 Hz, 1H), 3.92 (dd, J = 8.6, 5.5 Hz, 1H), 3.76 (td, J = 8.9, 3.2 Hz, 1H), 3.21 (dd, J = 14.2, 9.0 Hz, 1H), 1.67 – 1.58 (m, 2H), 1.54 (s, 3H), 1.42 – 1.18 (m, 27H), 0.88 (t, J = 6.7 Hz, 3H).
A (dd) 8.50
B (dd) 7.93
C (dd) 7.11
I (d) 6.16
F (dd) 3.92
G (dt) 4.18
E (td) 3.76
D (dd) 3.21
H (dd) 4.12
K (s) 1.54
J (m) 1.62
L (m) 1.30
M (t) 0.88
1.05
1.00
1.10
1.72
1.06
1.12
0.99
1.00
0.94
3.11
3.74
44.07
5.04
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)



^{13}C NMR (101 MHz, cdcl$_3$) δ 168.00, 156.31, 150.83, 137.22, 128.79, 119.49, 108.54, 78.59, 78.05, 60.99, 33.54, 32.08, 29.84, 29.81, 29.79, 29.76, 29.74, 29.69, 29.51, 29.38, 28.02, 26.95, 25.77, 22.85, 14.27.


O
NH2
O
O
N
S
N3
C14H29
f2 (ppm)
f1 (ppm)


O
NH2
O
O
N
S
N3
C14H29
f2 (ppm)
f1 (ppm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190