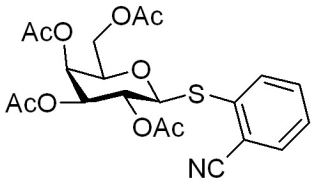
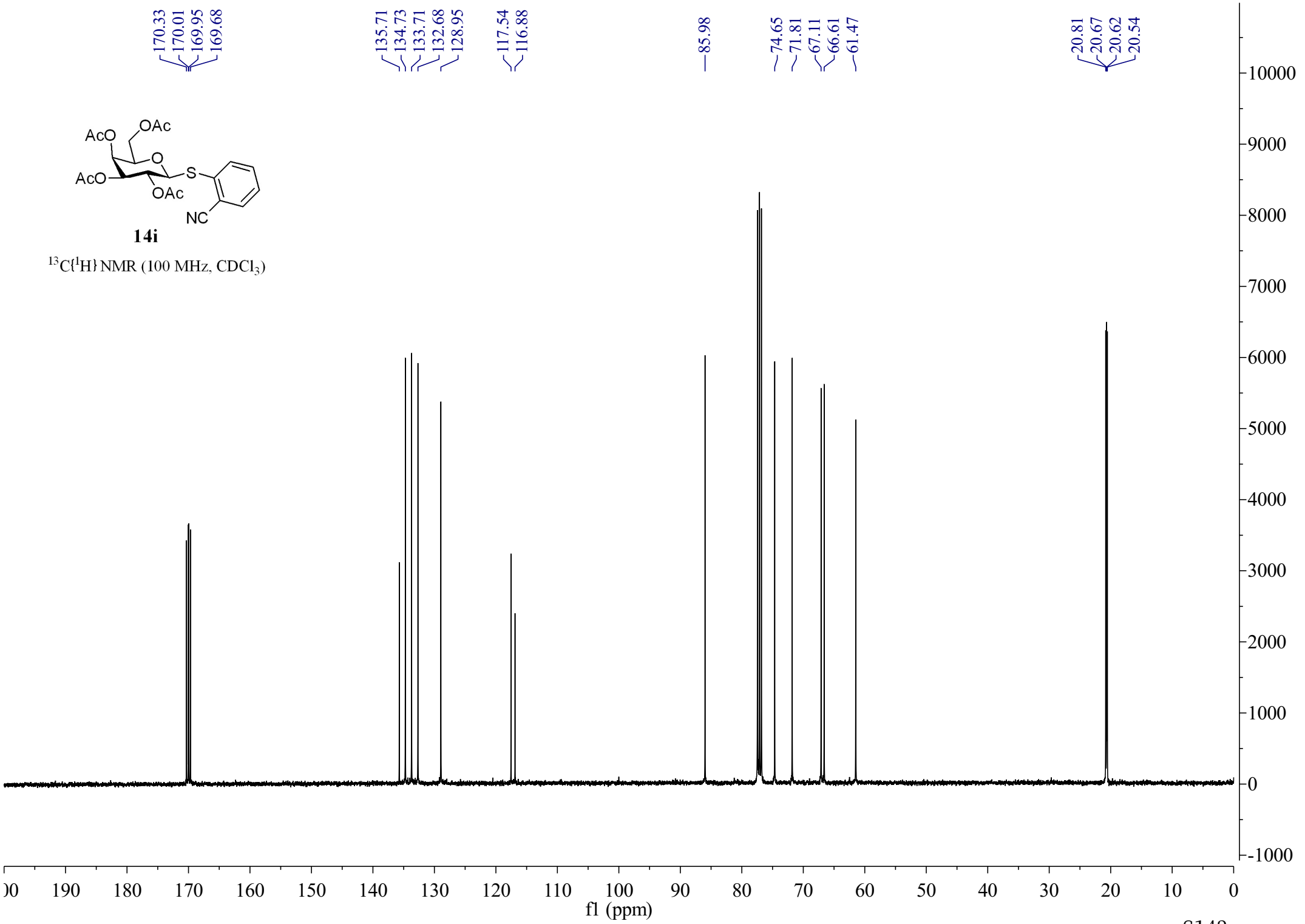
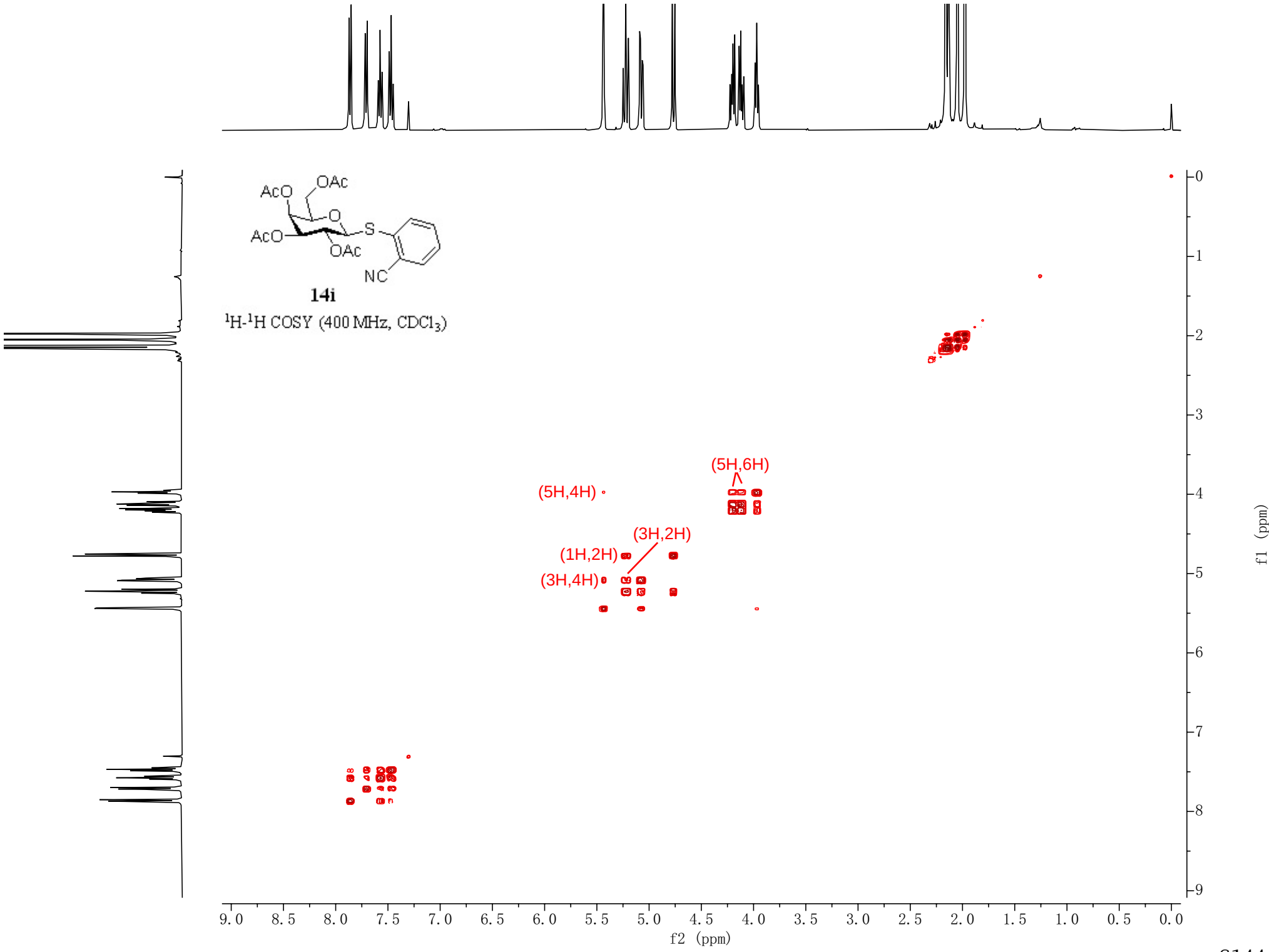
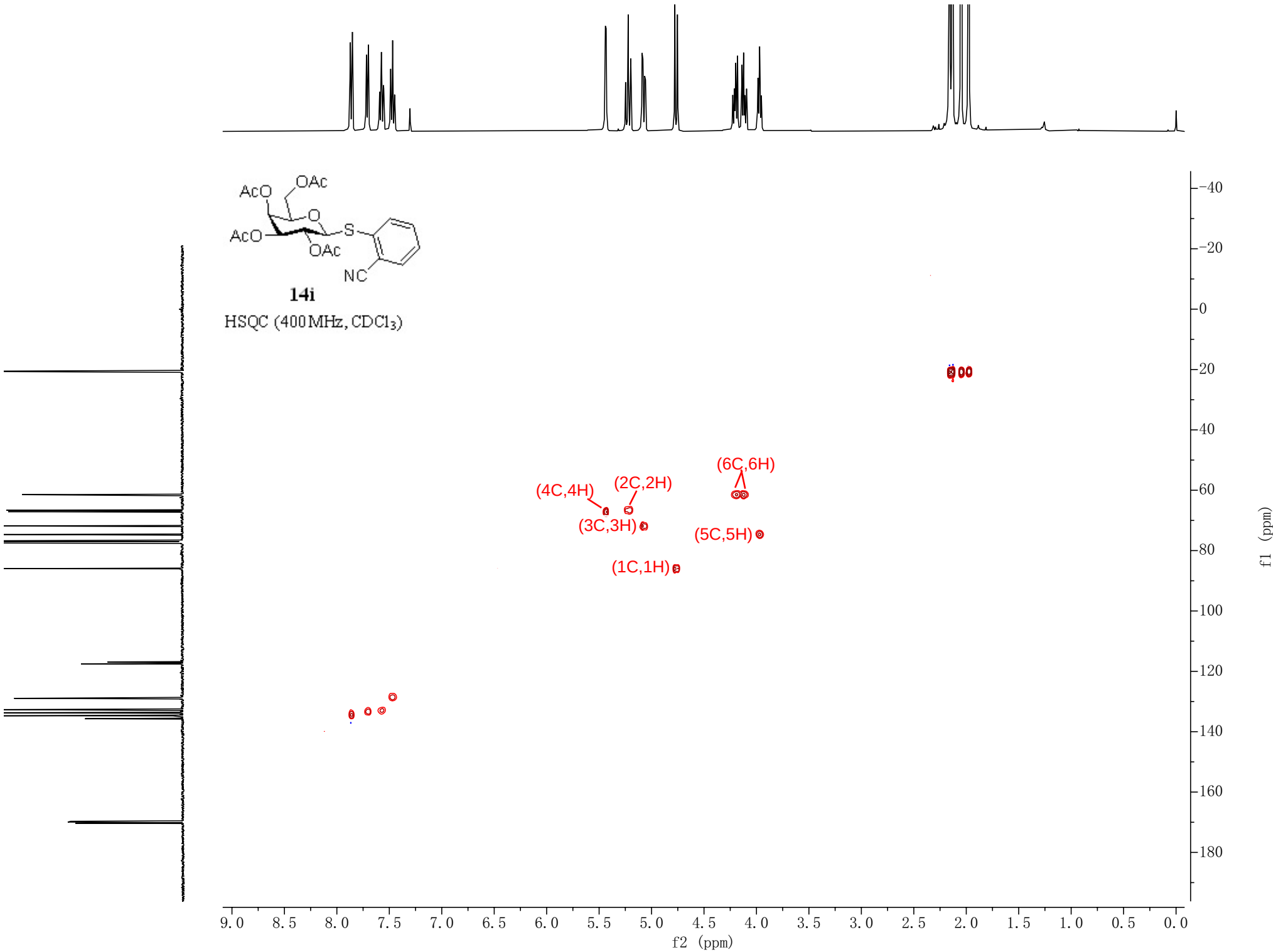


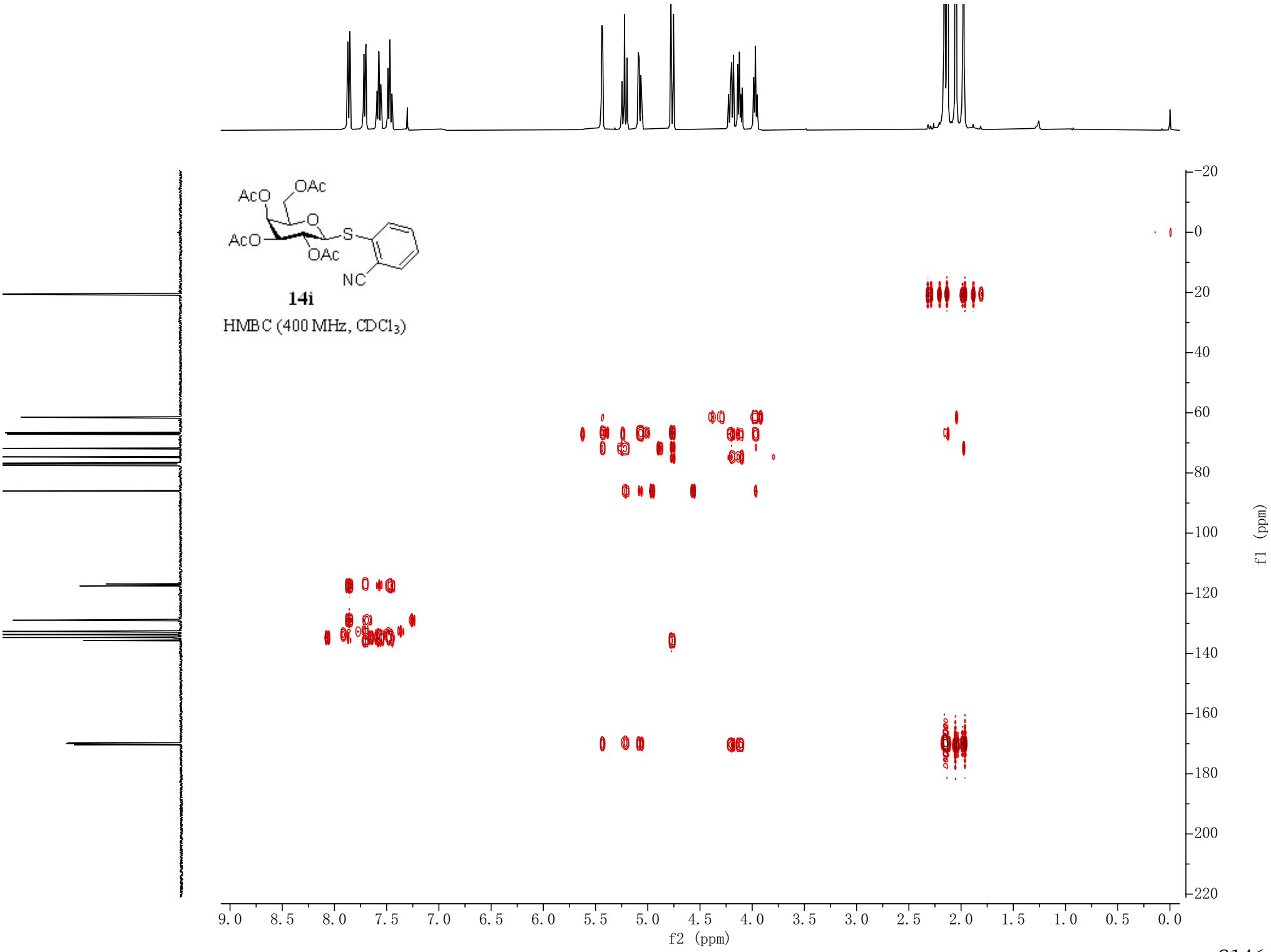
14i

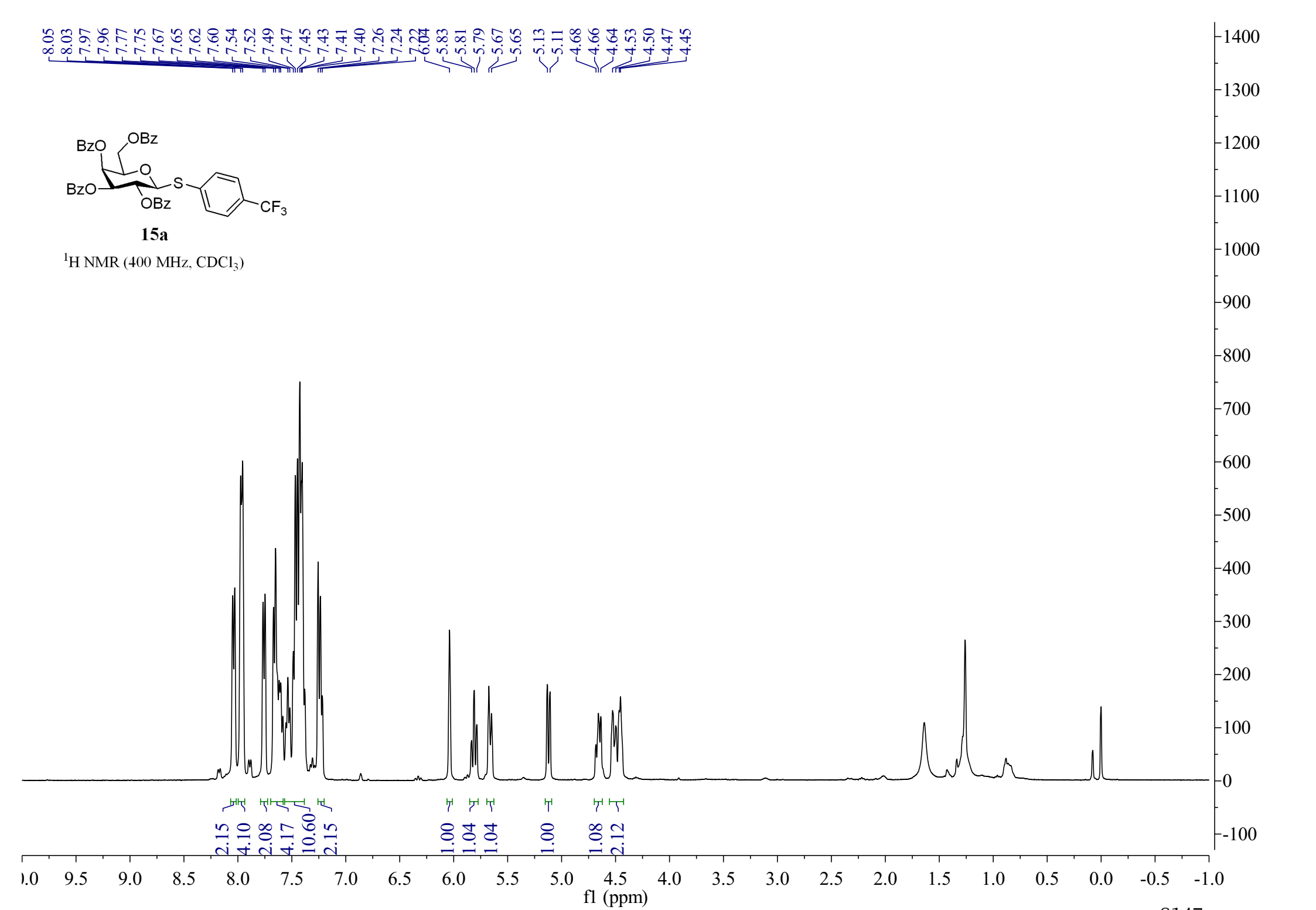
^{1}H NMR (400 MHz, $CDCl_3$)

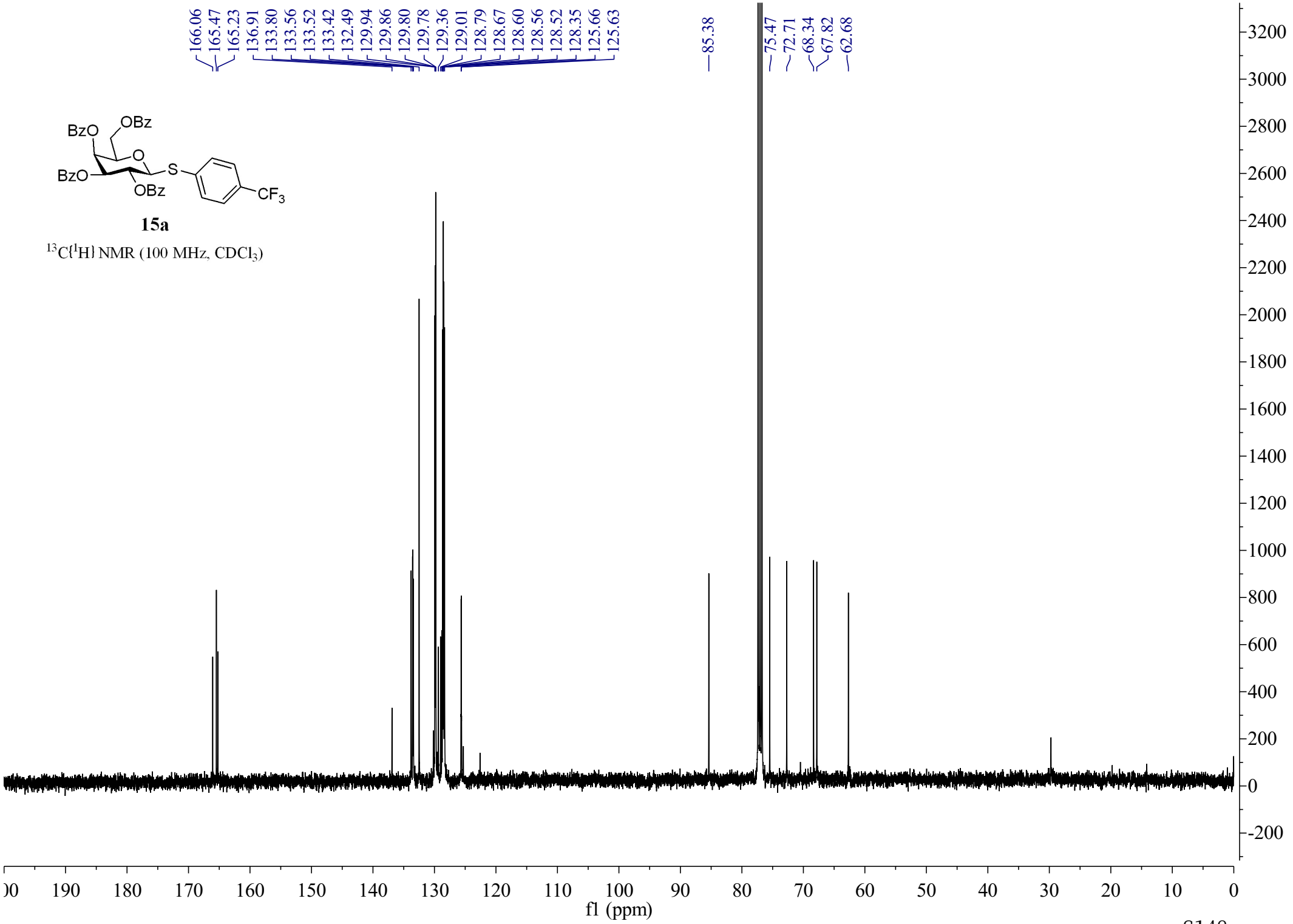

170.33
170.01
169.95
169.68
135.71
134.73
133.71
132.68
128.95
117.54
116.88
85.98
74.65
71.81
67.11
66.61
61.47
20.81
20.67
20.62
20.54
AcO
OAc
AcO
OAc
O
S
NC
14i
13C{1H} NMR (100 MHz, CDCl3)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

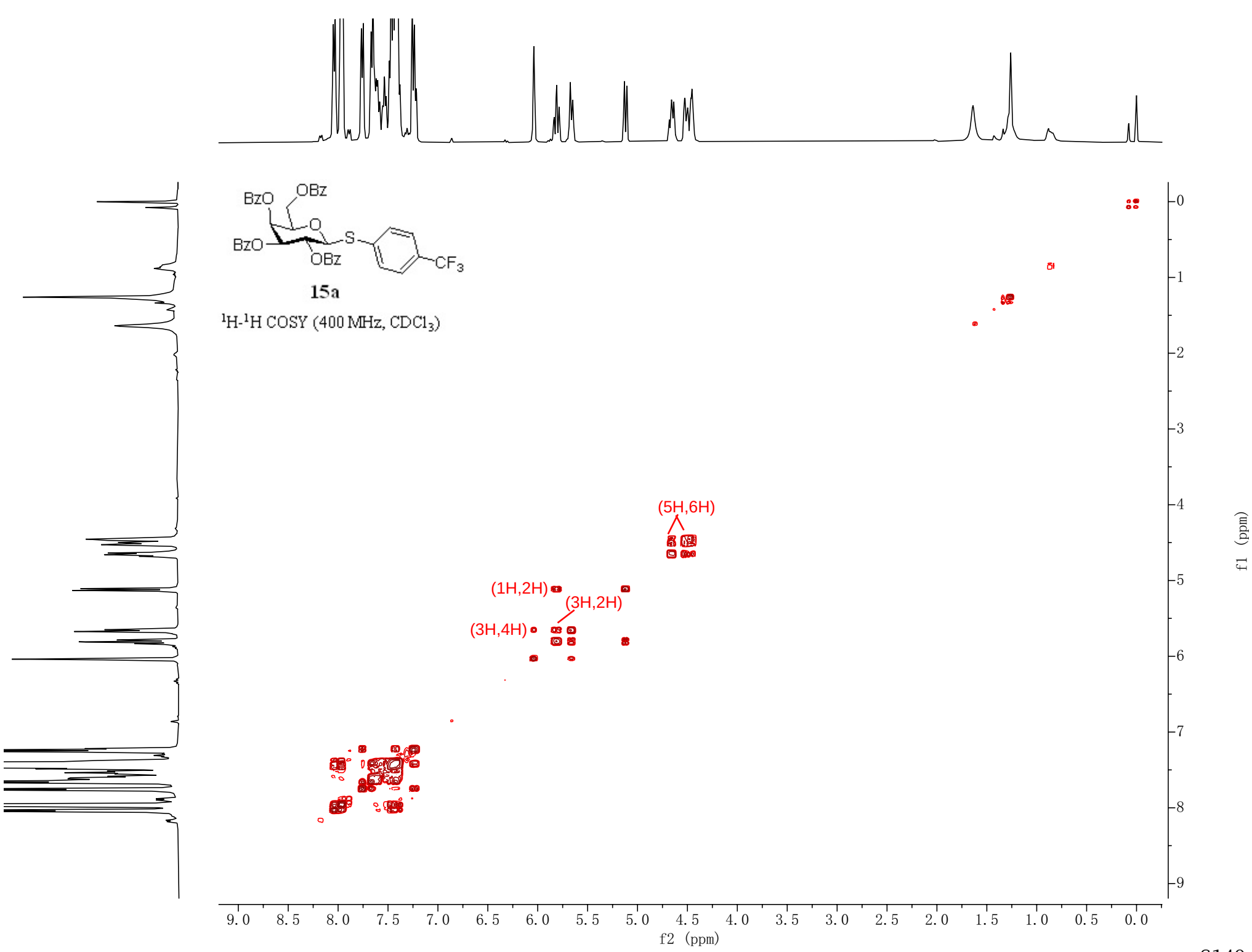

AcO
OAc
O
AcO
S
OAc
NC
14i
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
(5H,6H)
(5H,4H)
(3H,2H)
(1H,2H)
(3H,4H)
f1 (ppm)
f2 (ppm)
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
0 1 2 3 4 5 6 7 8 9

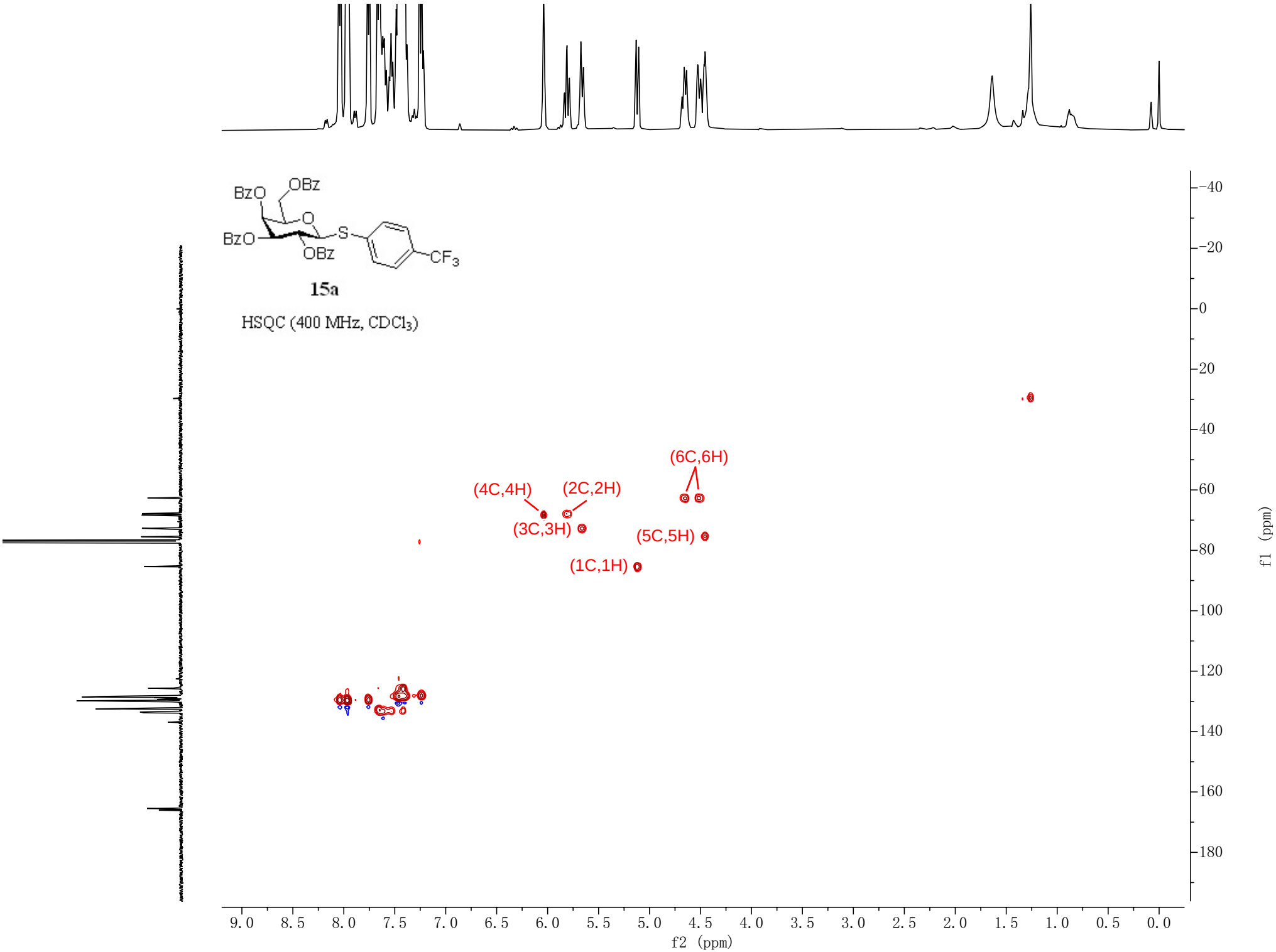

AcO
OAc
O
AcO
S
OAc
NC
14i
HSQC (400 MHz, CDCl3)
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

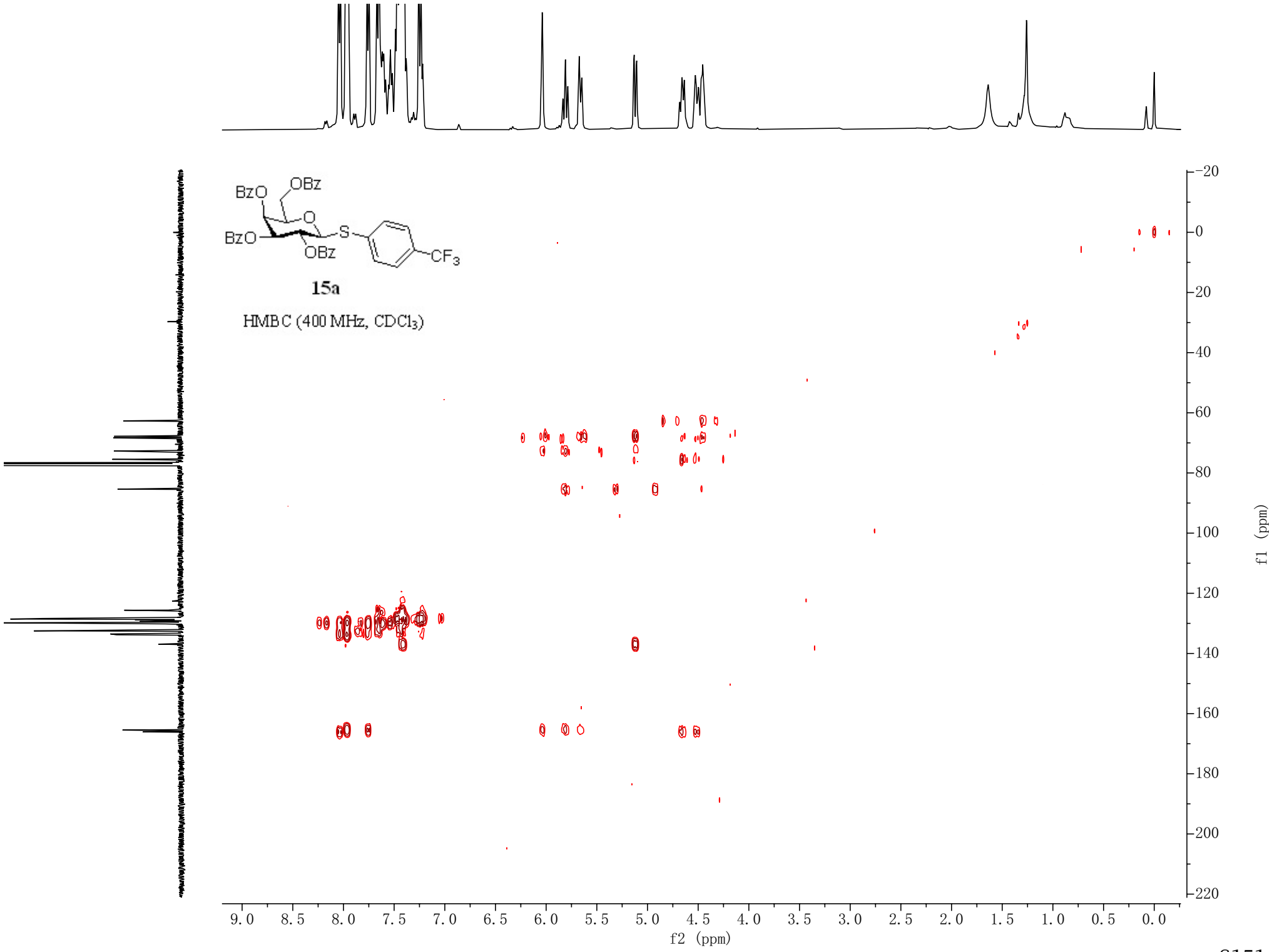

AcO
OAc
O
AcO
S
OAc
NC
14i
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

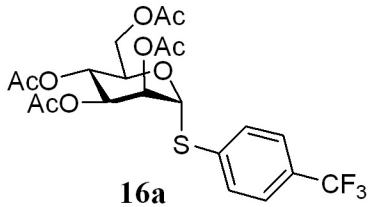

8.05
8.03
7.97
7.96
7.77
7.75
7.67
7.65
7.62
7.60
7.54
7.52
7.49
7.47
7.45
7.43
7.41
7.40
7.26
7.24
7.22
6.04
5.83
5.81
5.79
5.67
5.65
5.13
5.11
4.68
4.66
4.64
4.53
4.50
4.47
4.45
BzO
OBz
O
S
BzO
OBz
CF3
15a
1H NMR (400 MHz, CDCl3)
2.15
4.10
2.08
4.17
10.60
2.15
1.00
1.04
1.04
1.00
1.08
2.12
f1 (ppm)


166.06
165.47
165.23
136.91
133.80
133.56
133.52
133.42
132.49
129.94
129.86
129.80
129.78
129.36
129.01
128.79
128.67
128.60
128.56
128.52
128.35
125.66
125.63
85.38
75.47
72.71
68.34
67.82
62.68
BzO
OBz
BzO
OBz
O
S
CF3
15a
13C{1H} NMR (100 MHz, CDCl3)
fl (ppm)


BzO
OBz
O
BzO
S
OBz
CF3
15a
1H-1H COSY (400 MHz, CDCl3)
(5H,6H)
(1H,2H)
(3H,2H)
(3H,4H)
f1 (ppm)
f2 (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

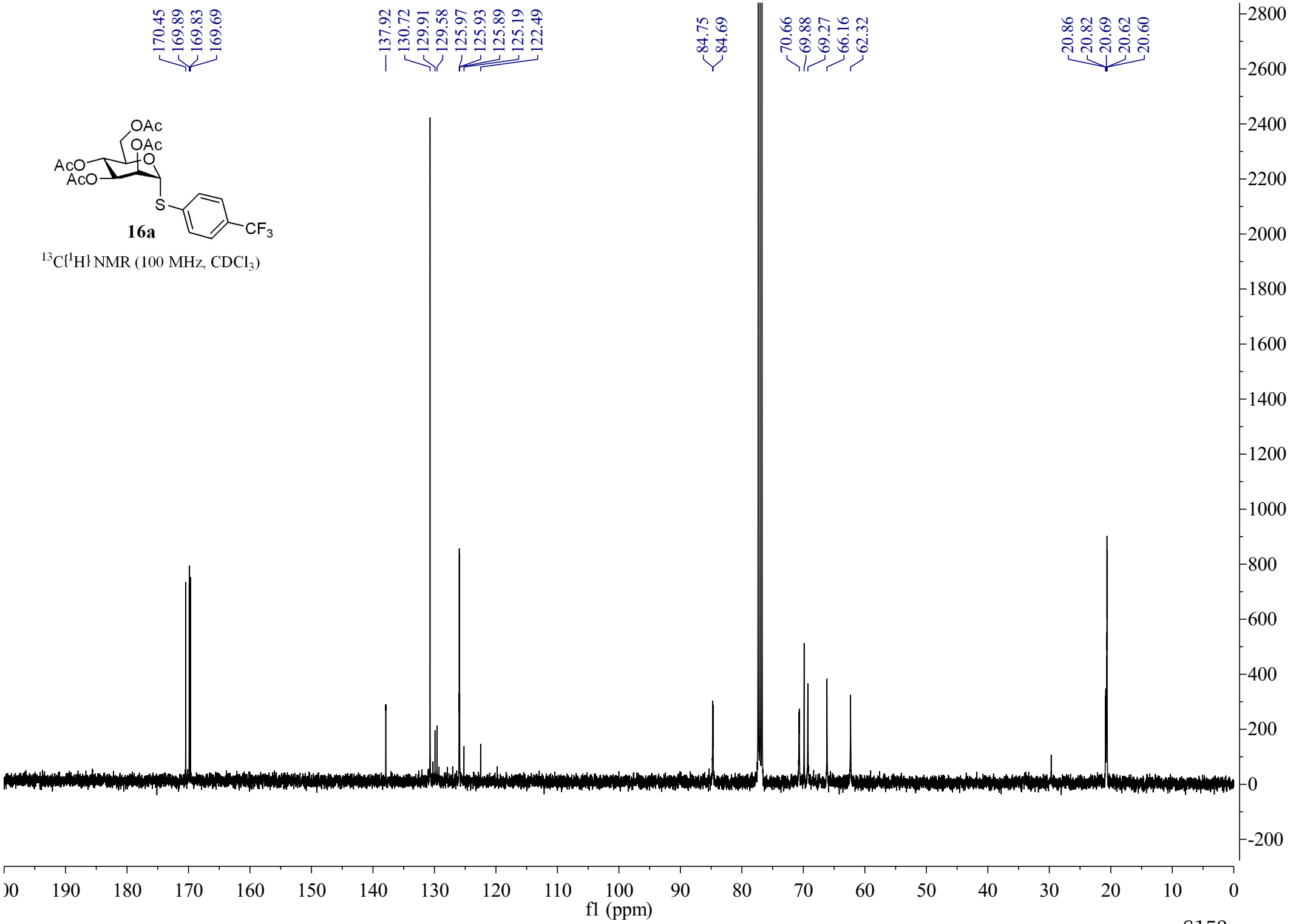

BzO
OBz
O
BzO
S
OBz
CF3
15a
HSQC (400 MHz, CDCl3)
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

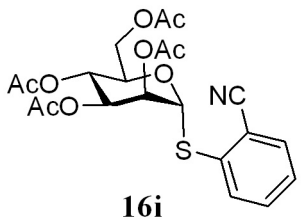

BzO
OBz
O
BzO
S
OBz
CF3
15a
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)



16a

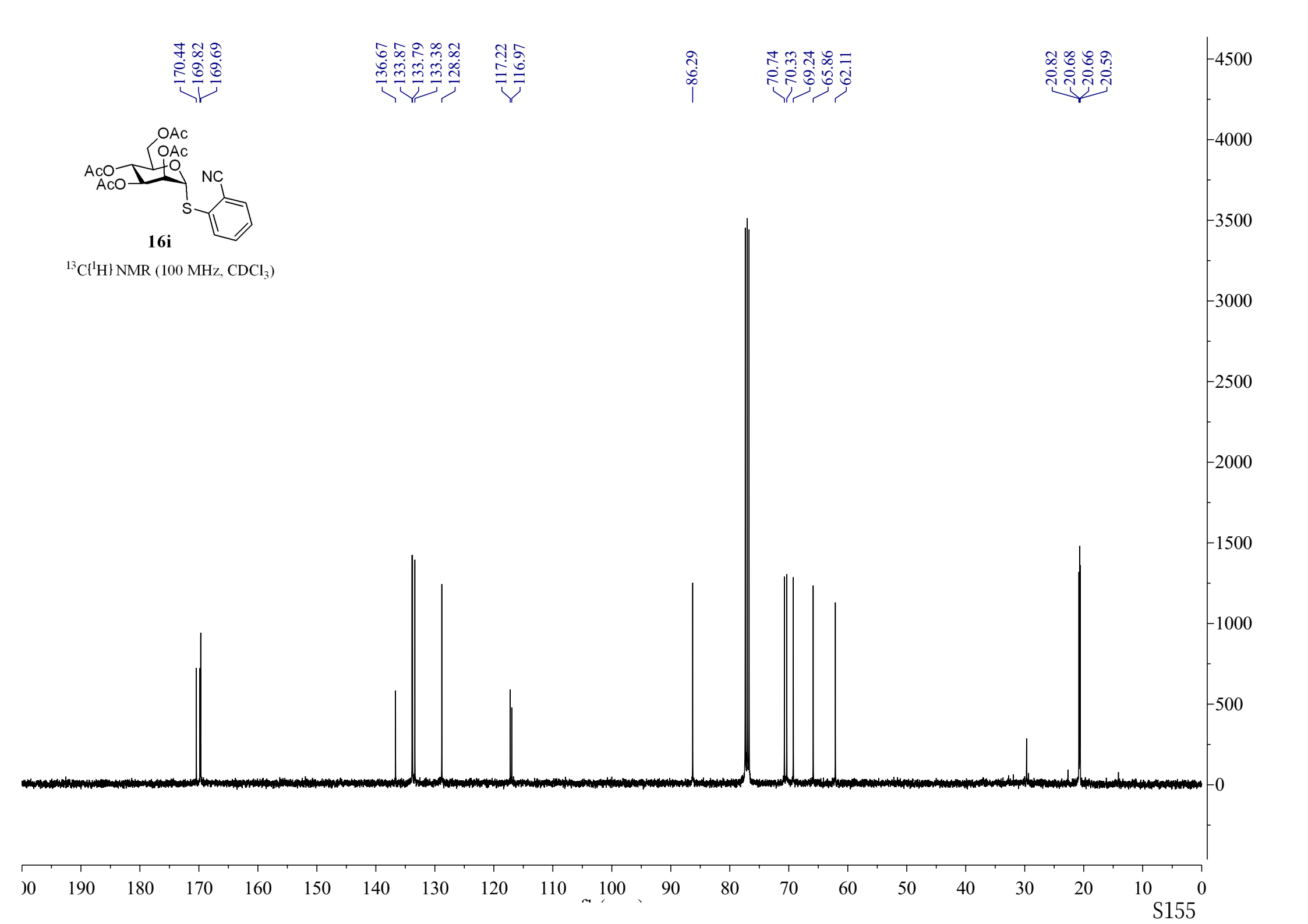
^{1}H NMR (400 MHz, $CDCl_3$)

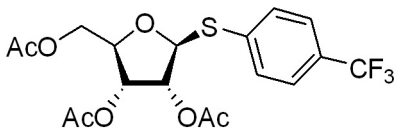

170.45
169.89
169.83
169.69
137.92
130.72
129.91
129.58
125.97
125.93
125.89
125.19
122.49
84.75
84.69
70.66
69.88
69.27
66.16
62.32
20.86
20.82
20.69
20.62
20.60
OAc
OAc
AcO
AcO
O
S
CF3
16a
13C{1H} NMR (100 MHz, CDCl3)
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



16i

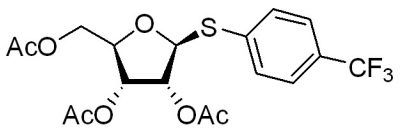
^{1}H NMR (400 MHz, $CDCl_3$)


170.44
169.82
169.69
136.67
133.87
133.79
133.38
128.82
117.22
116.97
86.29
70.74
70.33
69.24
65.86
62.11
20.82
20.68
20.66
20.59
OAc
OAc
AcO
AcO
O
NC
S
16i
13C{1H} NMR (100 MHz, CDCl3)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0



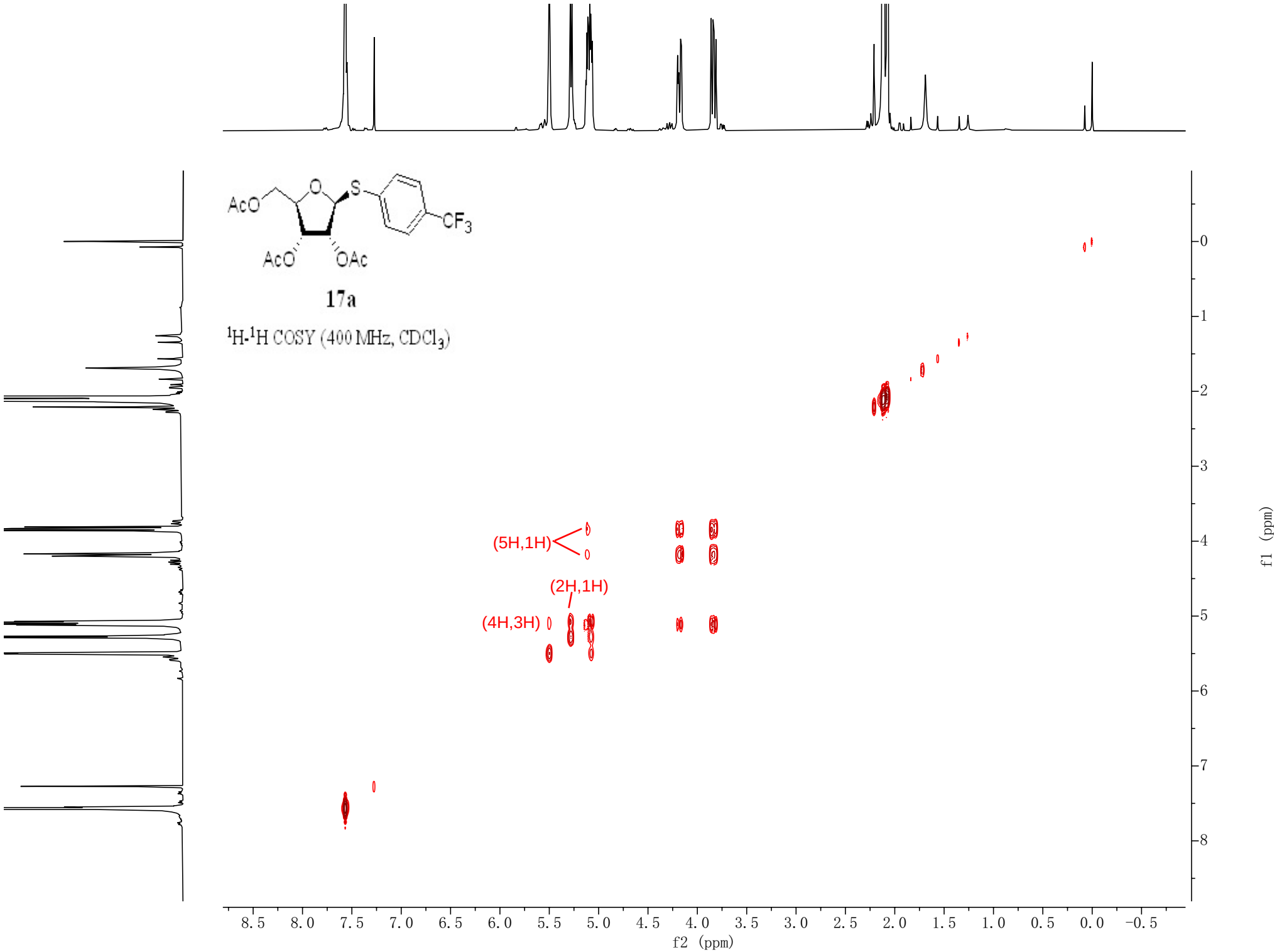
17a

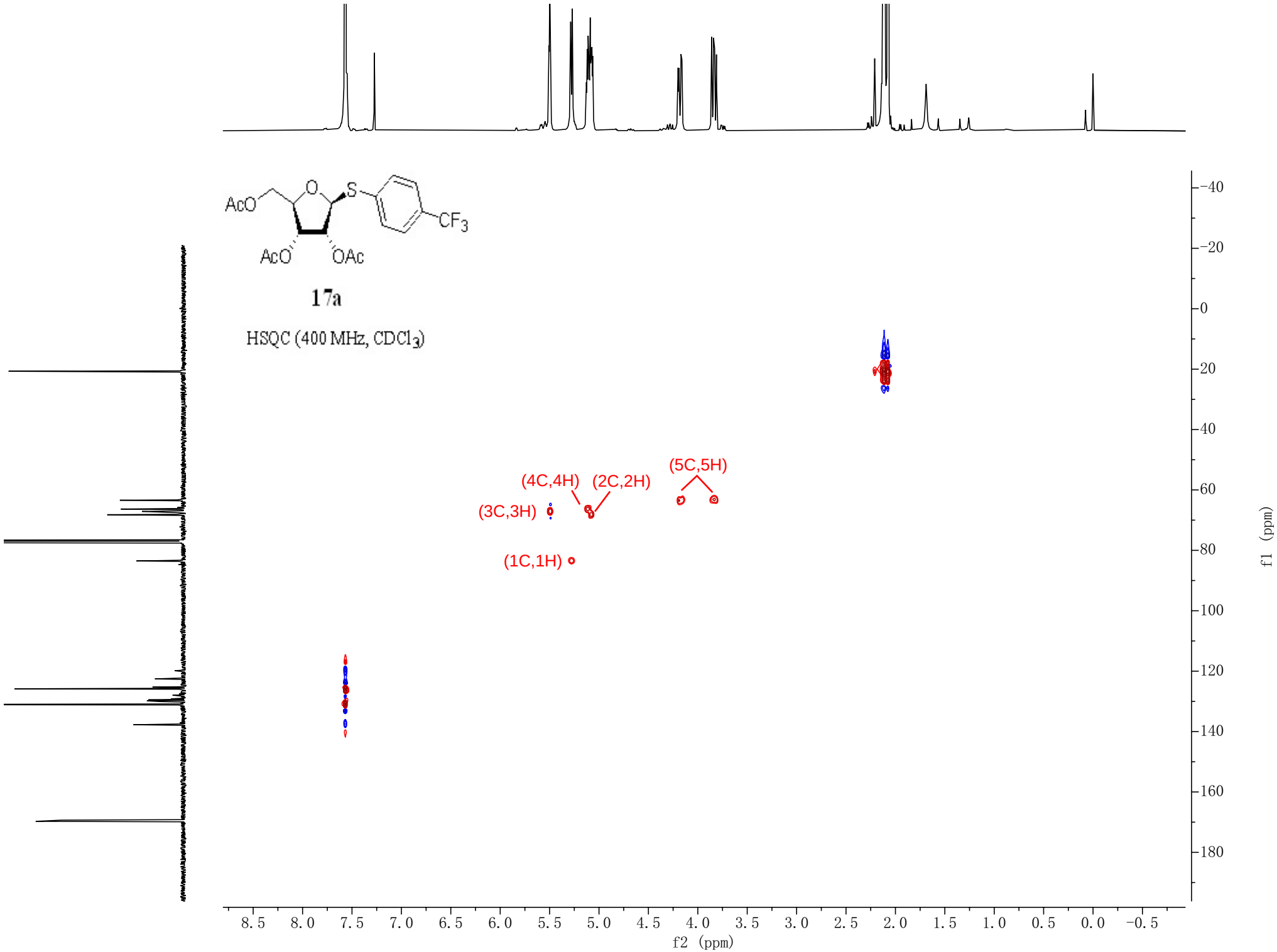
^{1}H NMR (400 MHz, $CDCl_3$)

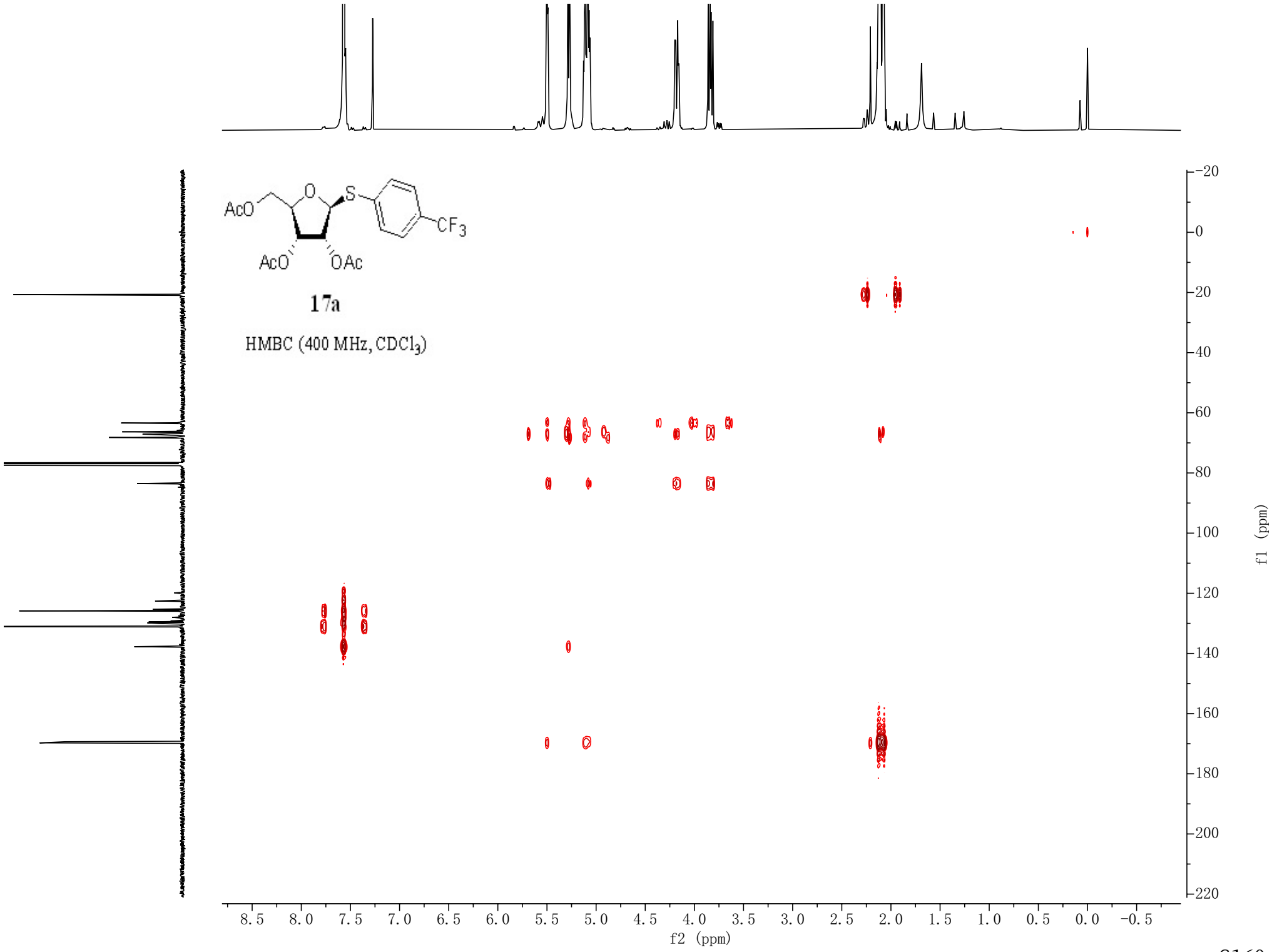


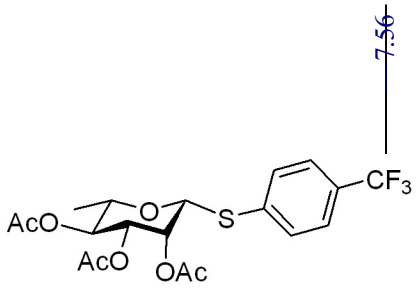
17a

$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)


AcO
O
S
CF3
AcO
OAc
17a
1H-1H COSY (400 MHz, CDCl3)
(5H,1H)
(2H,1H)
(4H,3H)
f2 (ppm)
f1 (ppm)

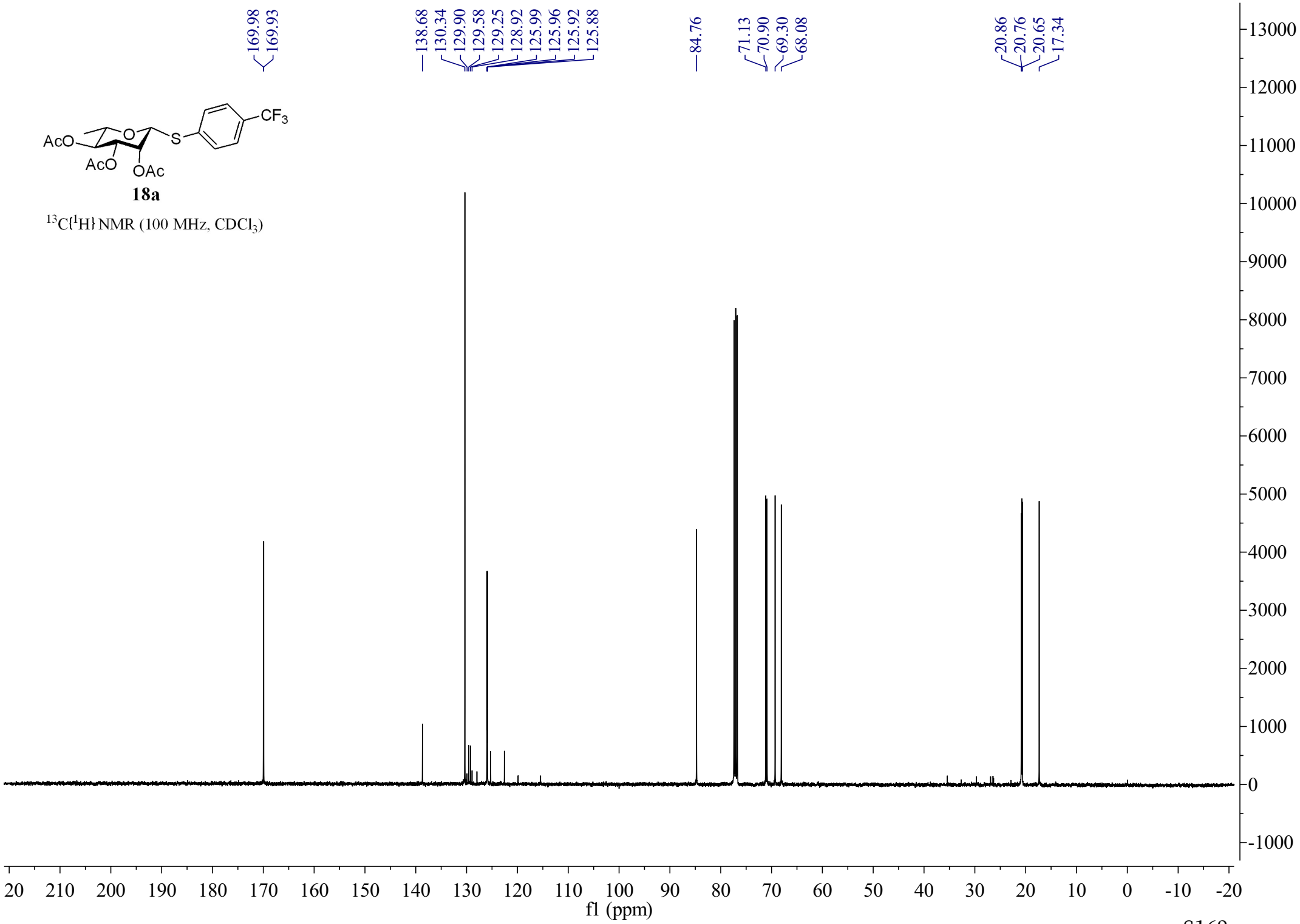

AcO
O
S
CF3
AcO
OAc
17a
HSQC (400 MHz, CDCl3)
(4C,4H)
(2C,2H)
(5C,5H)
(3C,3H)
(1C,1H)
f2 (ppm)
f1 (ppm)

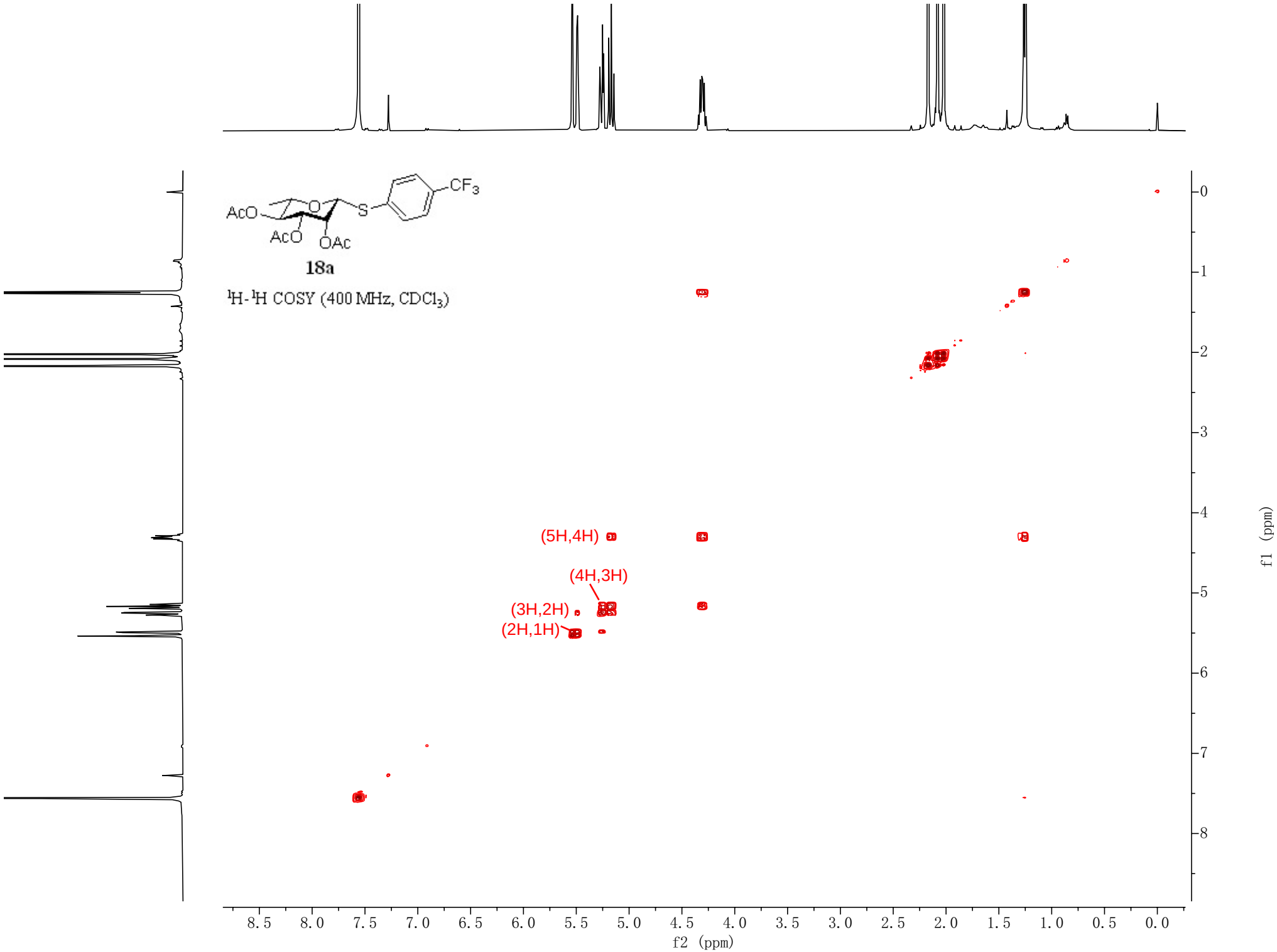

AcO
O
S
CF3
AcO
OAc
17a
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

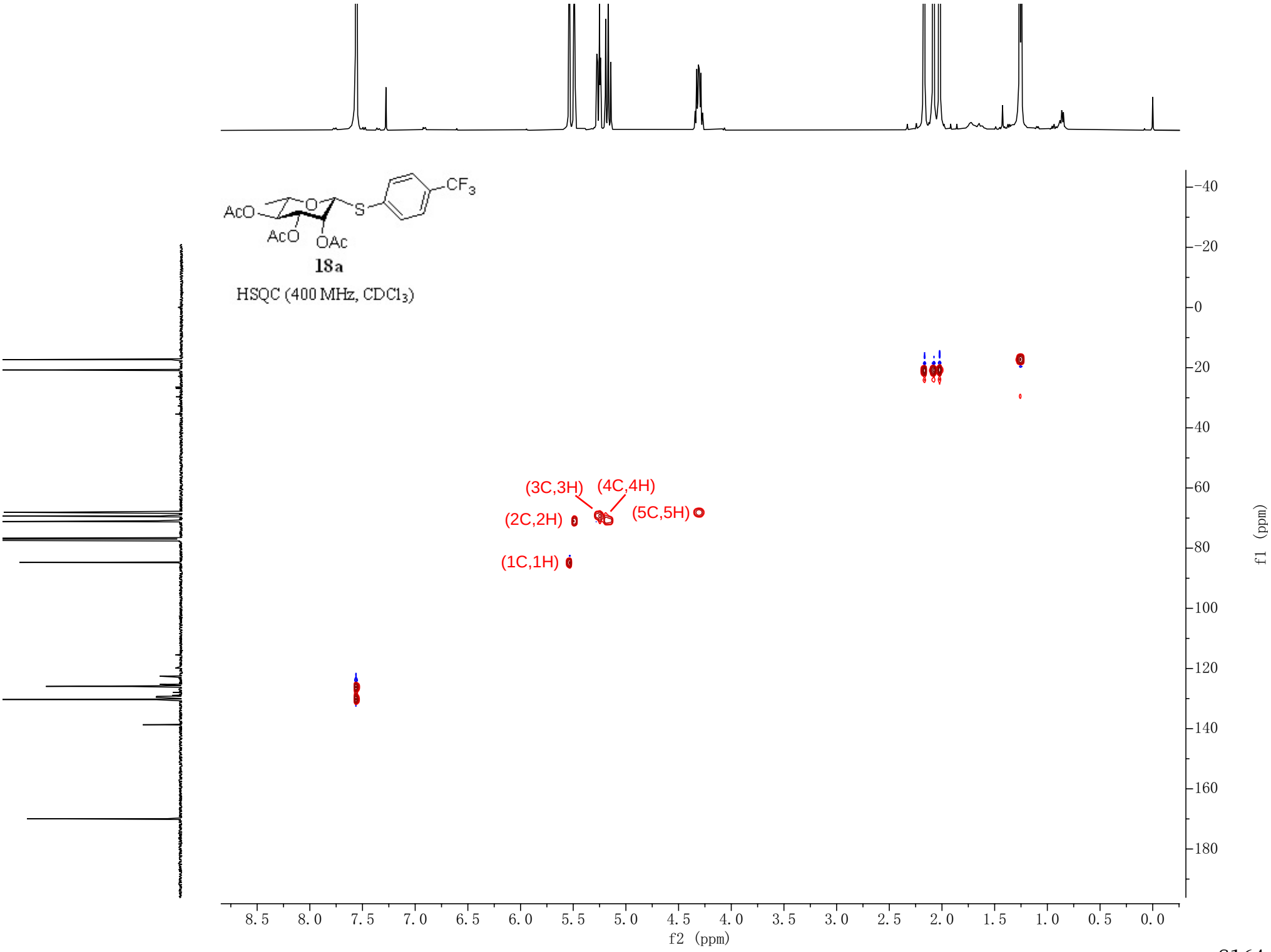


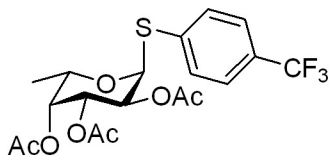
18a

^{1}H NMR (400 MHz, $CDCl_3$)


169.98
169.93
138.68
130.34
129.90
129.58
129.25
128.92
125.99
125.96
125.92
125.88
84.76
71.13
70.90
69.30
68.08
20.86
20.76
20.65
17.34
AcO
AcO
OAc
O
S
CF3
18a
13C{1H} NMR (100 MHz, CDCl3)
fl (ppm)

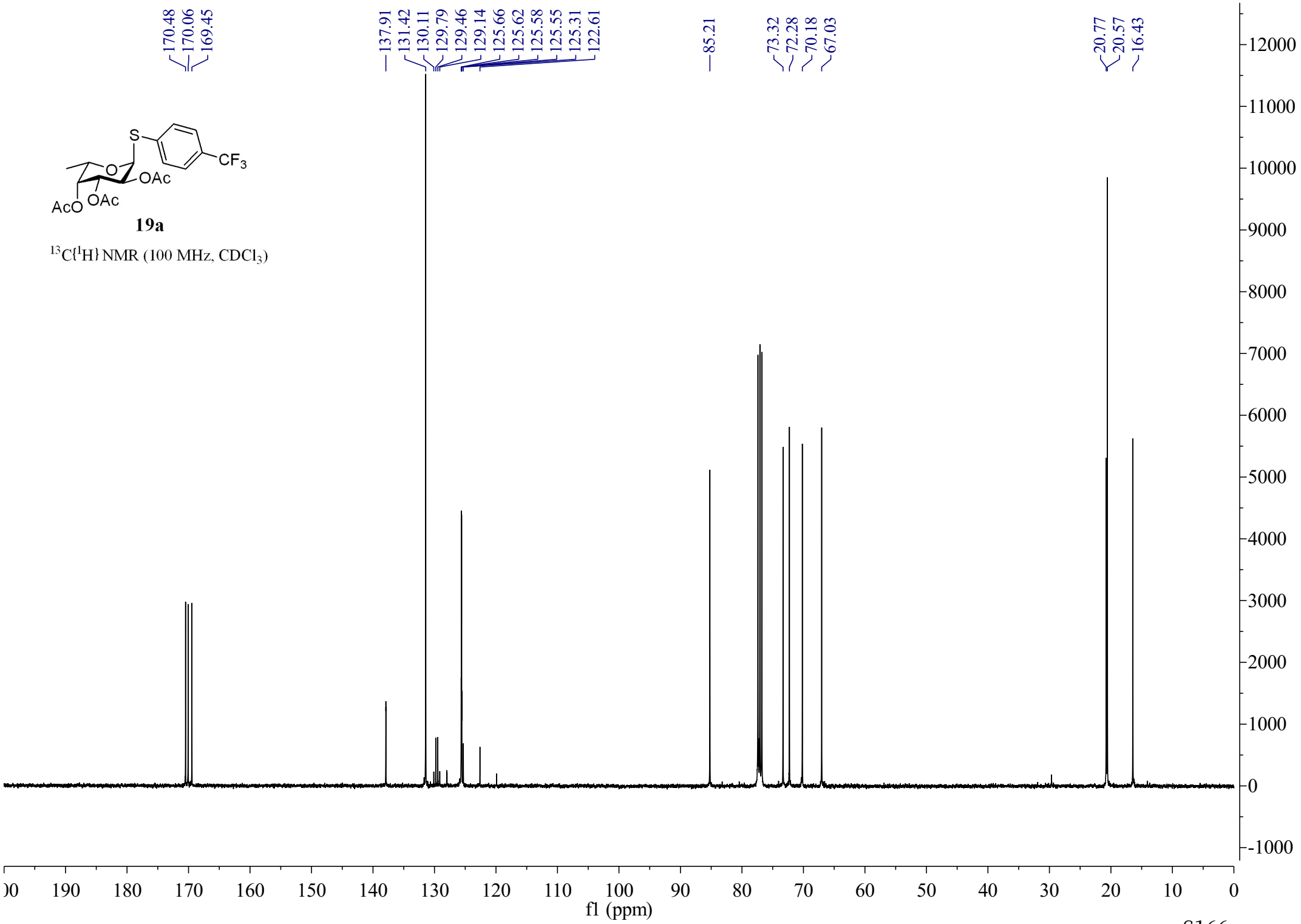

AcO
AcO
OAc
O
S
CF3
18a
1H-1H COSY (400 MHz, CDCl3)
(5H,4H)
(4H,3H)
(3H,2H)
(2H,1H)
f2 (ppm)
f1 (ppm)

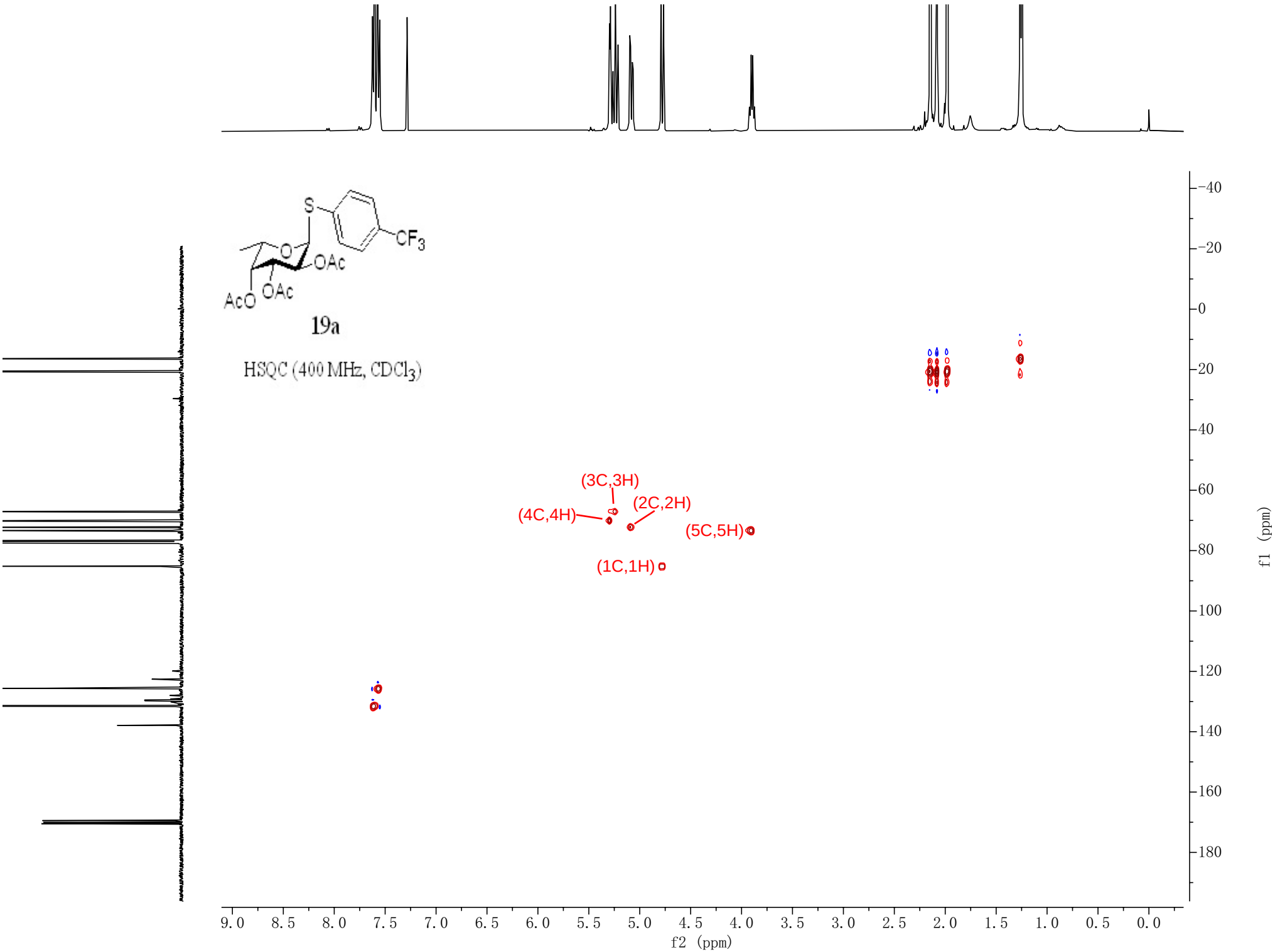

AcO
AcO
OAc
O
S
CF3
18a
HSQC (400 MHz, CDCl3)
(3C,3H)
(4C,4H)
(2C,2H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

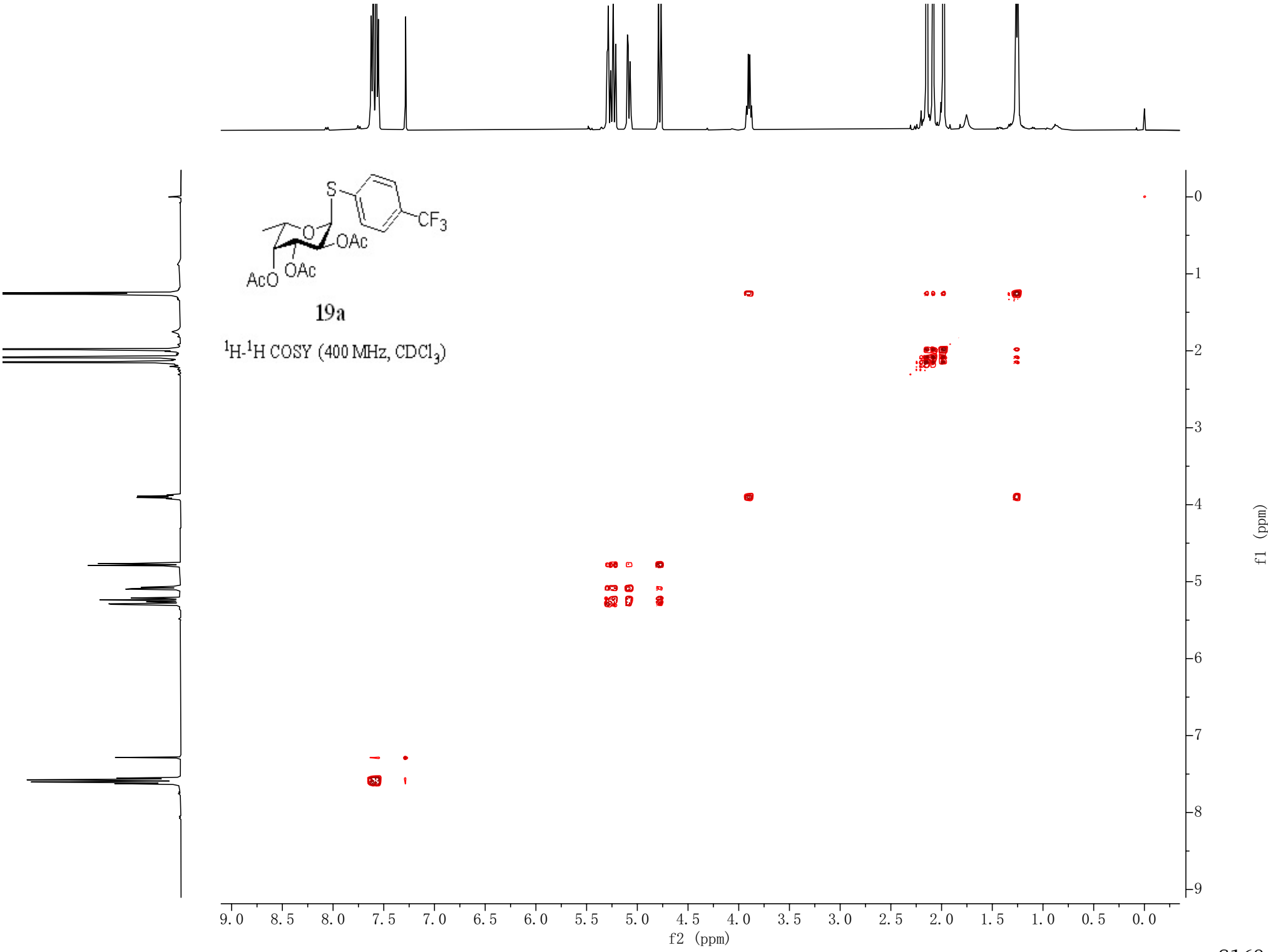


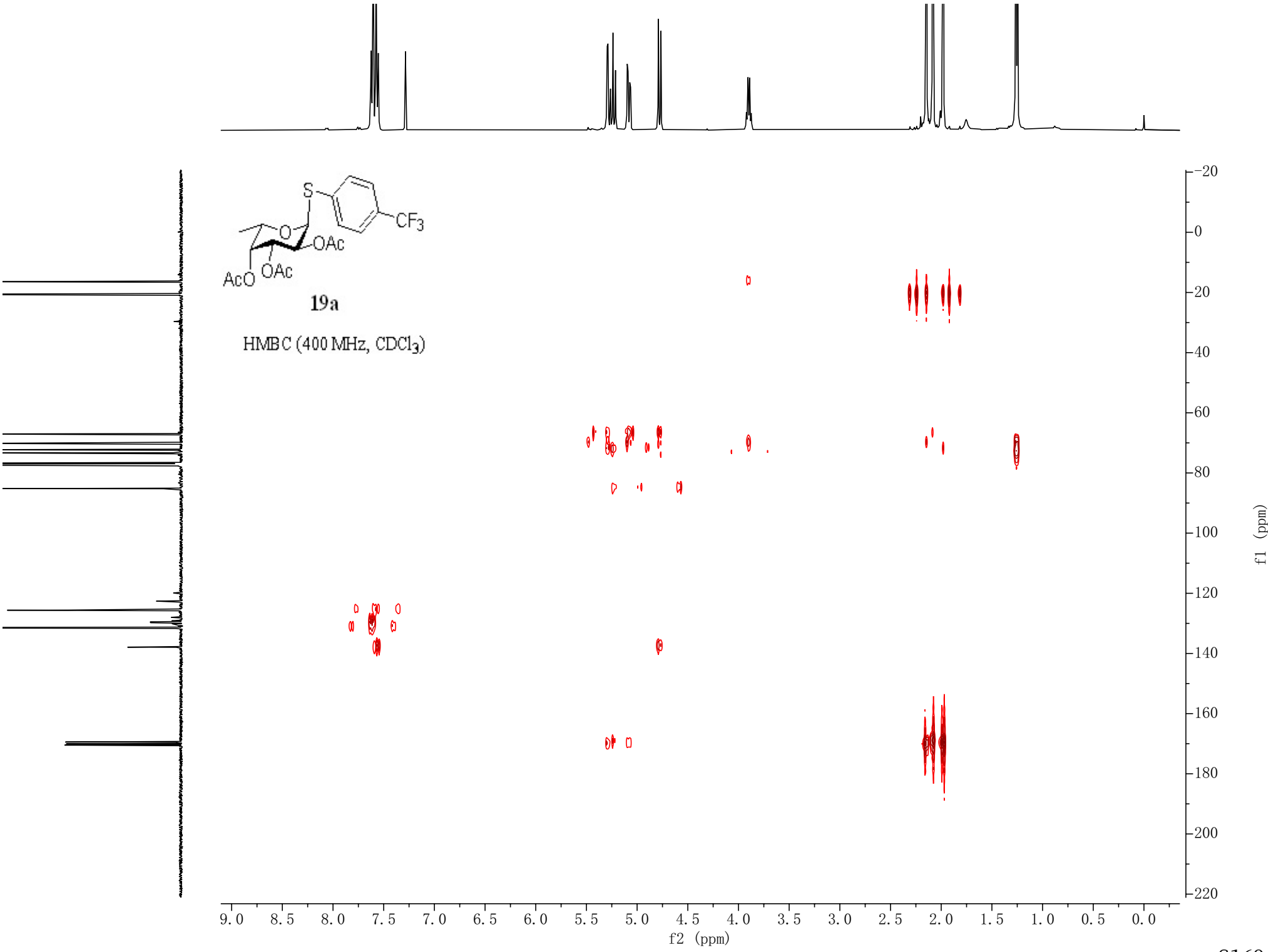
19a

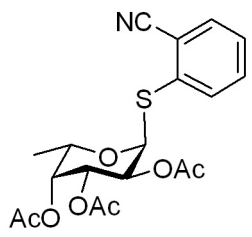
^{1}H NMR (400 MHz, $CDCl_3$)


170.48
170.06
169.45
137.91
131.42
130.11
129.79
129.46
129.14
125.66
125.62
125.58
125.55
125.31
122.61
85.21
73.32
72.28
70.18
67.03
20.77
20.57
16.43
S
CF3
O
OAc
AcO
OAc
19a
13C{1H} NMR (100 MHz, CDCl3)
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


S
CF3
O
OAc
AcO
OAc
19a
HSQC (400 MHz, CDCl3)
(3C,3H)
(2C,2H)
(4C,4H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

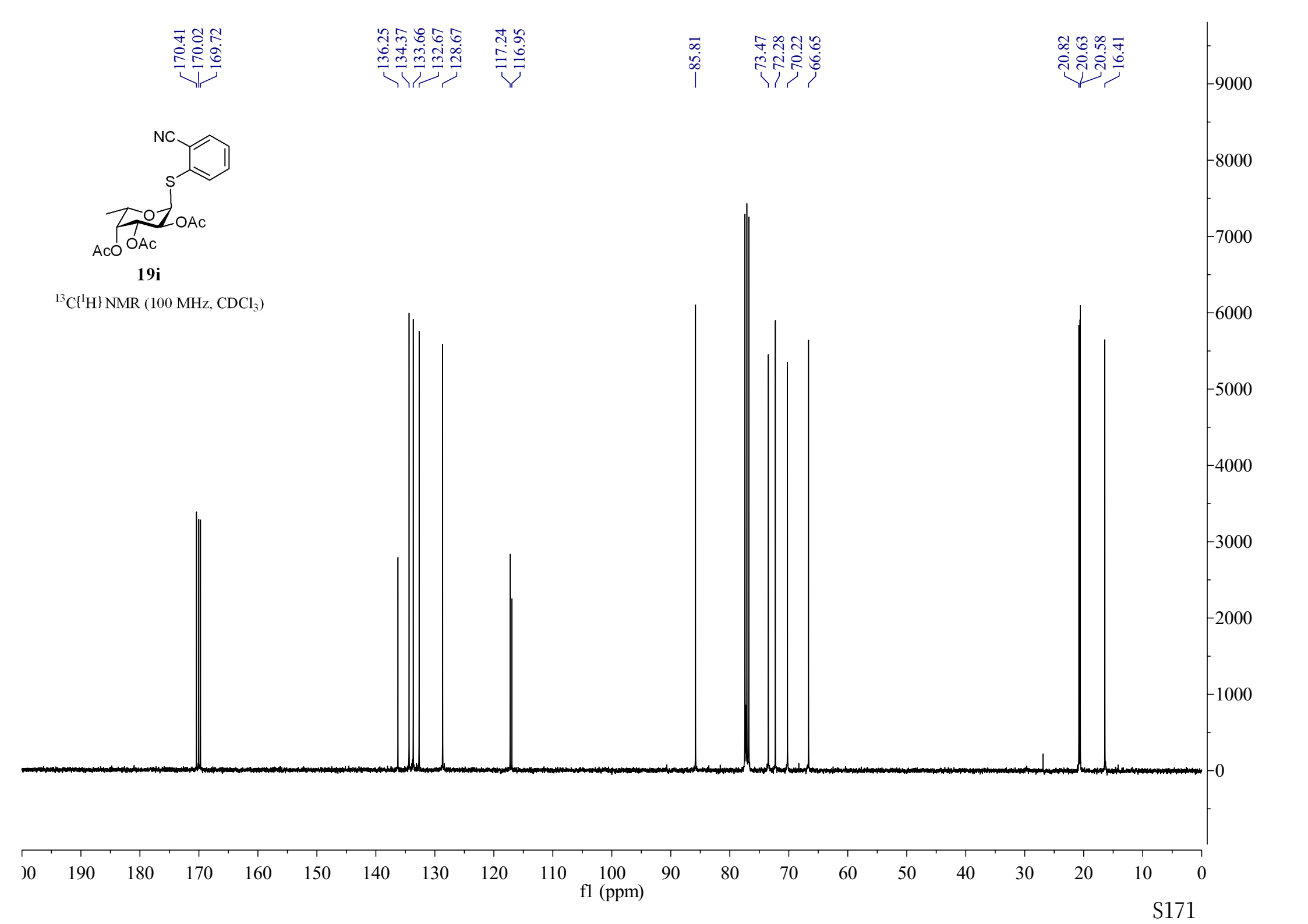

S
CF3
O
OAc
AcO
OAc
19a
1H-1H COSY (400 MHz, CDCl3)
f1 (ppm)
f2 (ppm)
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
0 1 2 3 4 5 6 7 8 9

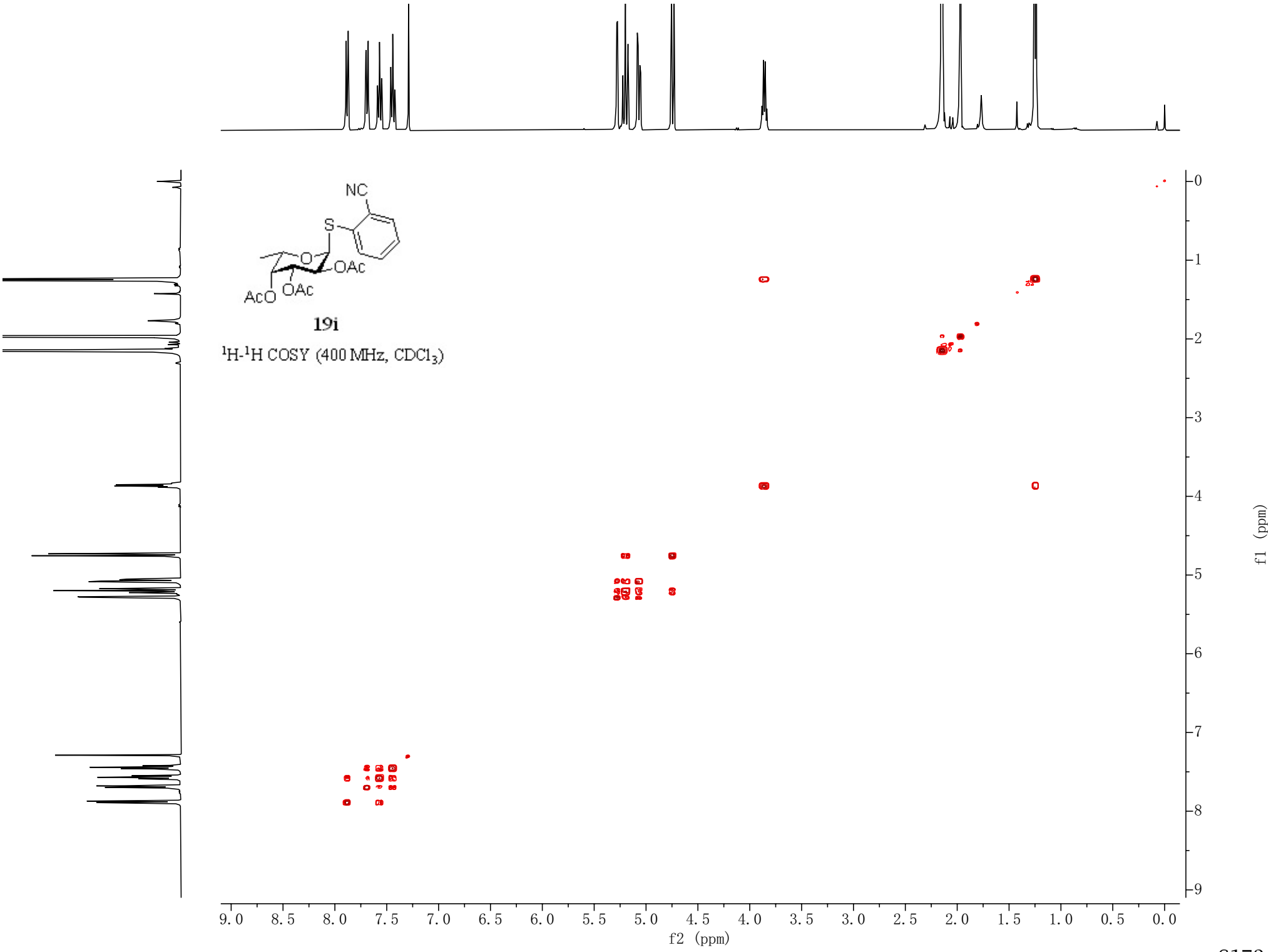

S
CF3
O
OAc
AcO
OAc
19a
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

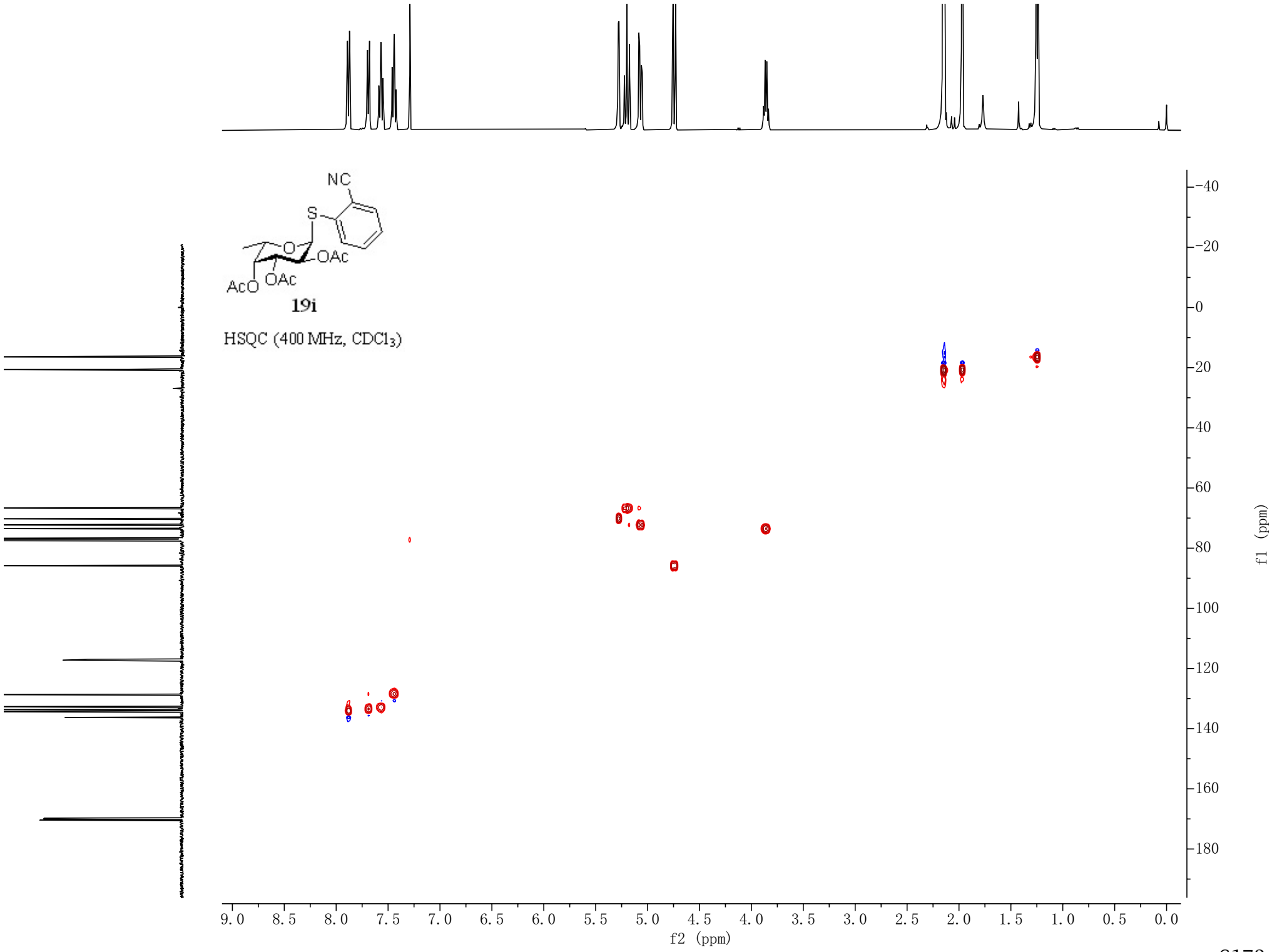


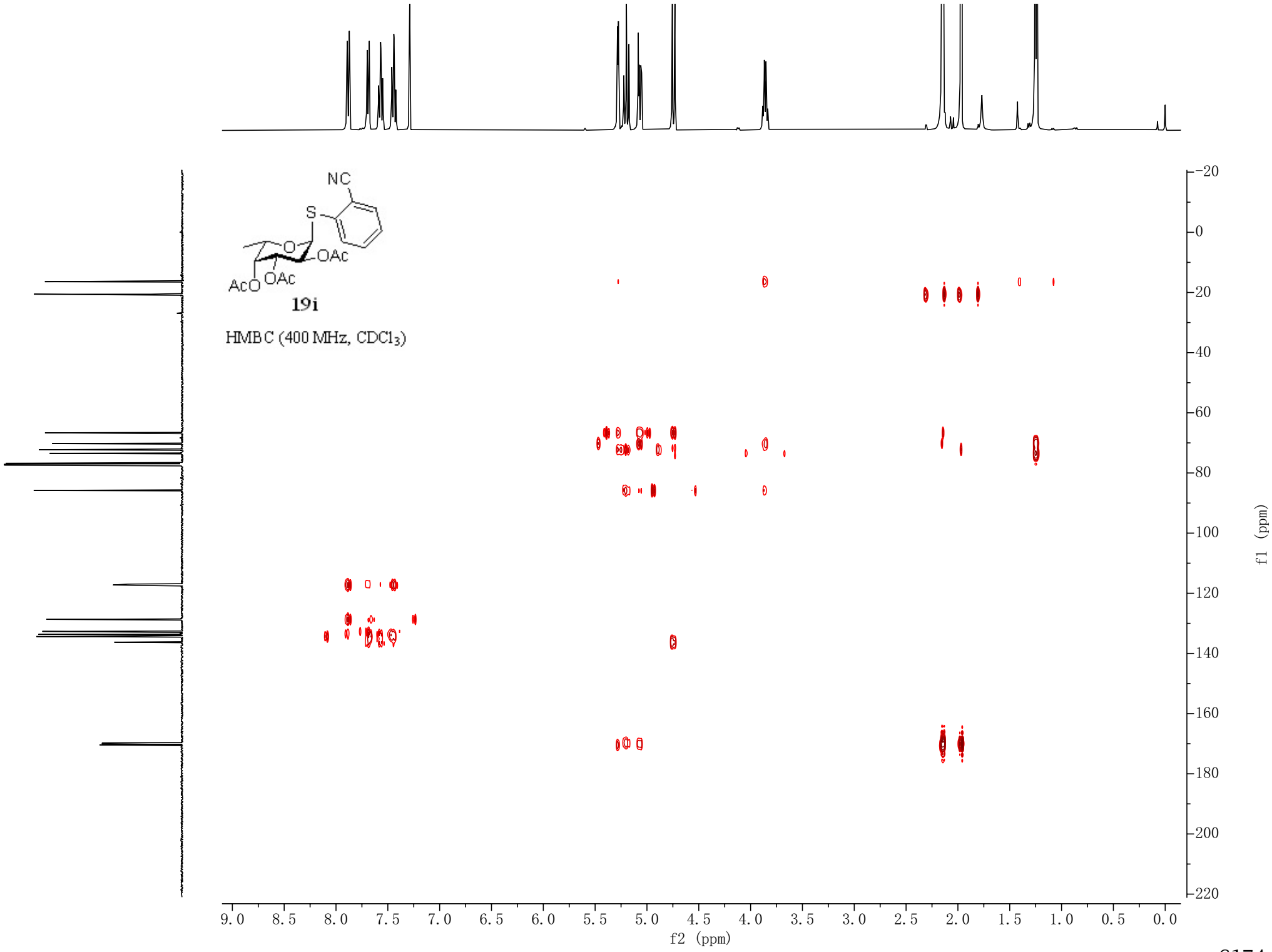
19i

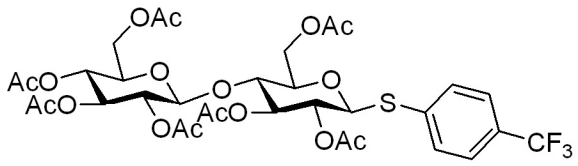
^{1}H NMR (400 MHz, $CDCl_3$)


170.41
170.02
169.72
136.25
134.37
133.66
132.67
128.67
117.24
116.95
85.81
73.47
72.28
70.22
66.65
20.82
20.63
20.58
16.41
NC
S
O
OAc
AcO
OAc
19i
13C{1H} NMR (100 MHz, CDCl3)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


NC
S
O
OAc
AcO
OAc
19i
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
f1 (ppm)
f2 (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

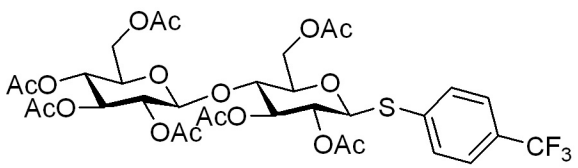

NC
S
O
OAc
AcO
OAc
19i
HSQC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)


NC
S
O
OAc
AcO
OAc
19i
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)



20a

^{1}H NMR (400 MHz, $CDCl_3$)

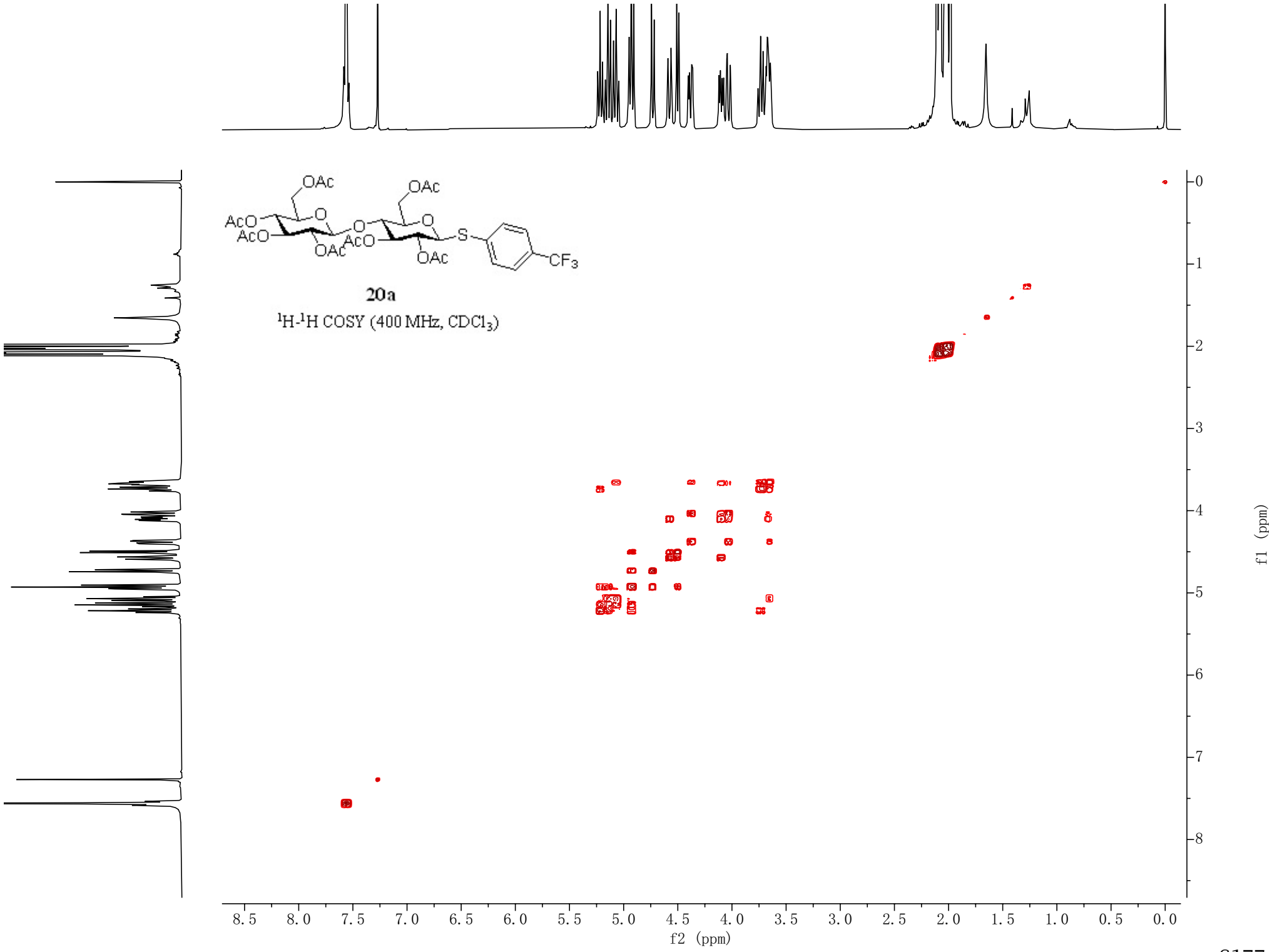


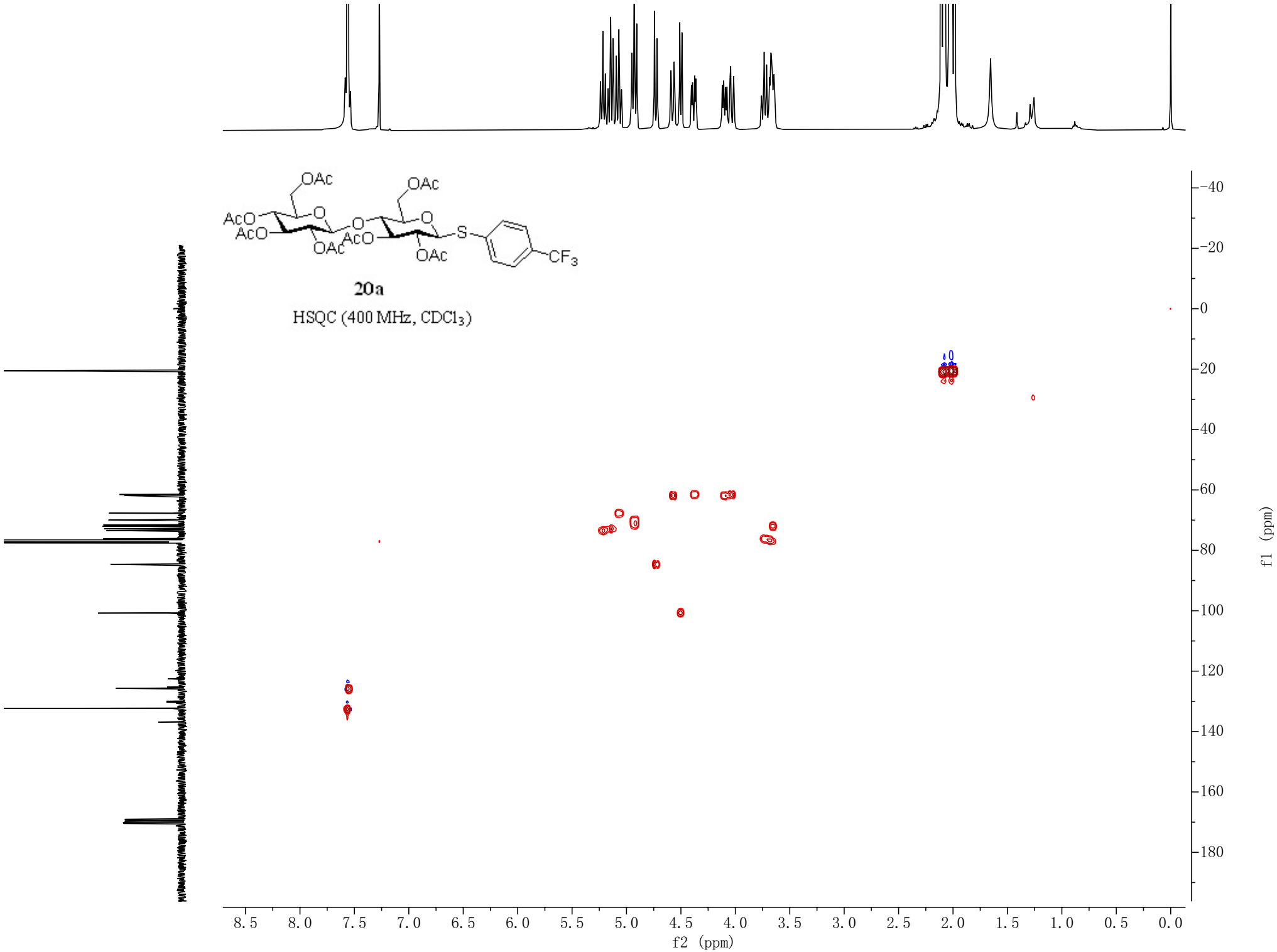
20a

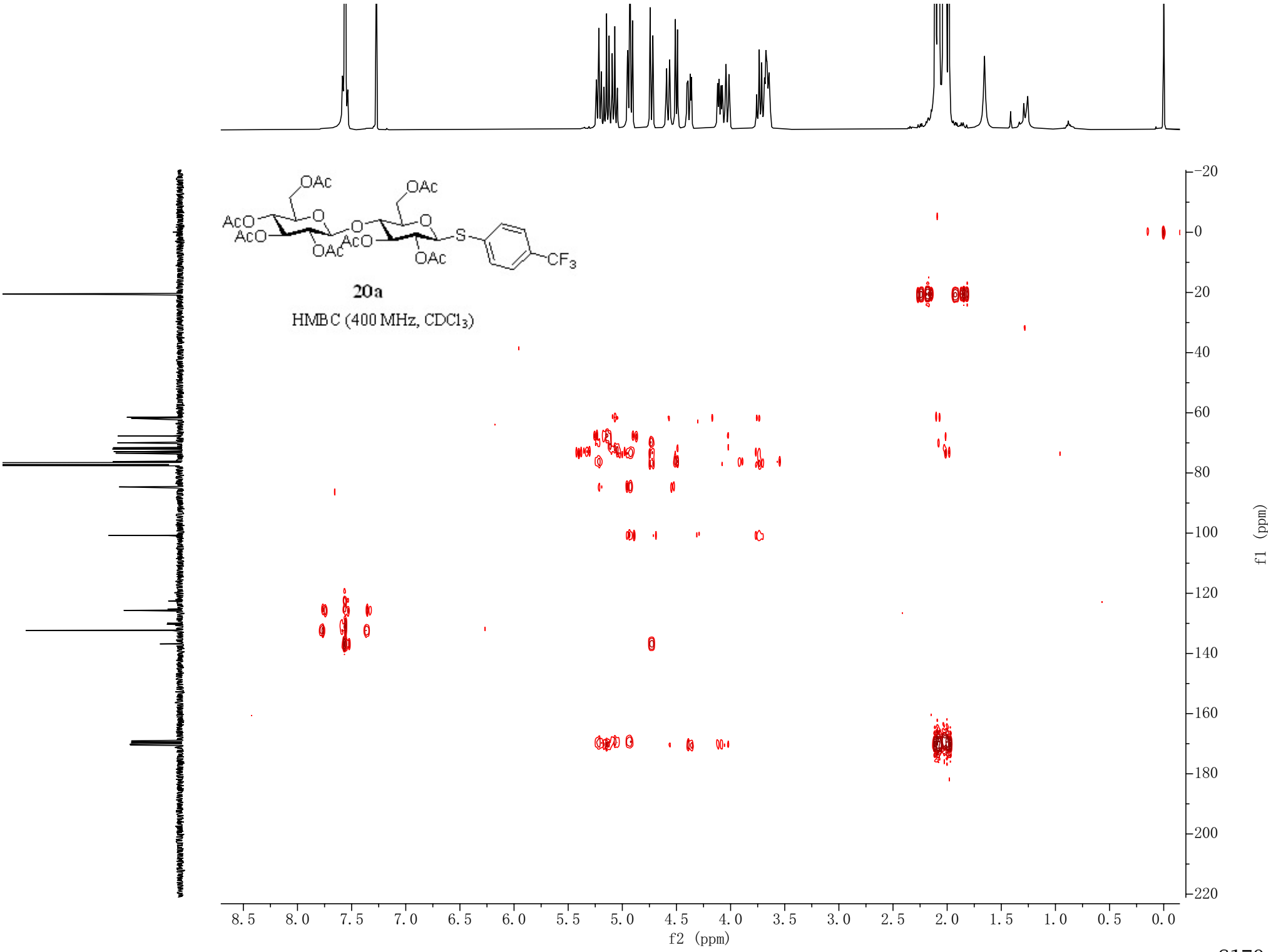
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)

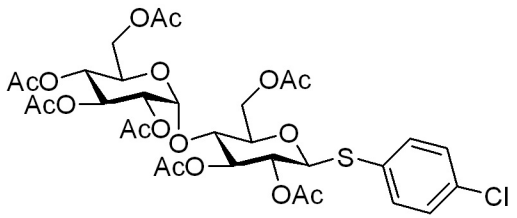
170.46
170.23
170.12
169.68
169.52
169.31
169.03
136.84
132.32
130.28
129.95
125.68
125.64
125.23
122.53
100.80
84.63
76.21
73.41
72.88
72.02
71.59
69.99
67.71
61.87
61.51
20.80
20.72
20.64
20.54
20.50

f1 (ppm)


OAc
OAc
AcO
AcO
AcO
OAc
OAc
S
CF3
20a
1H-1H COSY (400 MHz, CDCl3)
f1 (ppm)
f2 (ppm)
0
1
2
3
4
5
6
7
8
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

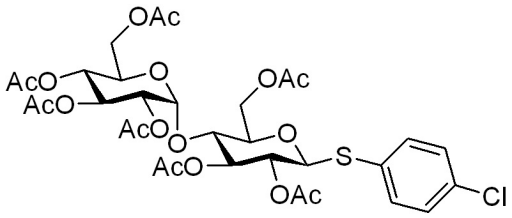

OAc
OAc
AcO
AcO
AcO
OAc
OAc
OAc
S
CF3
20a
HSQC (400 MHz, CDCl3)
-40
-20
0
20
40
60
80
100
120
140
160
180
f1 (ppm)
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)


OAc
OAc
AcO
AcO
AcO
OAc
OAc
S
CF3
20a
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)



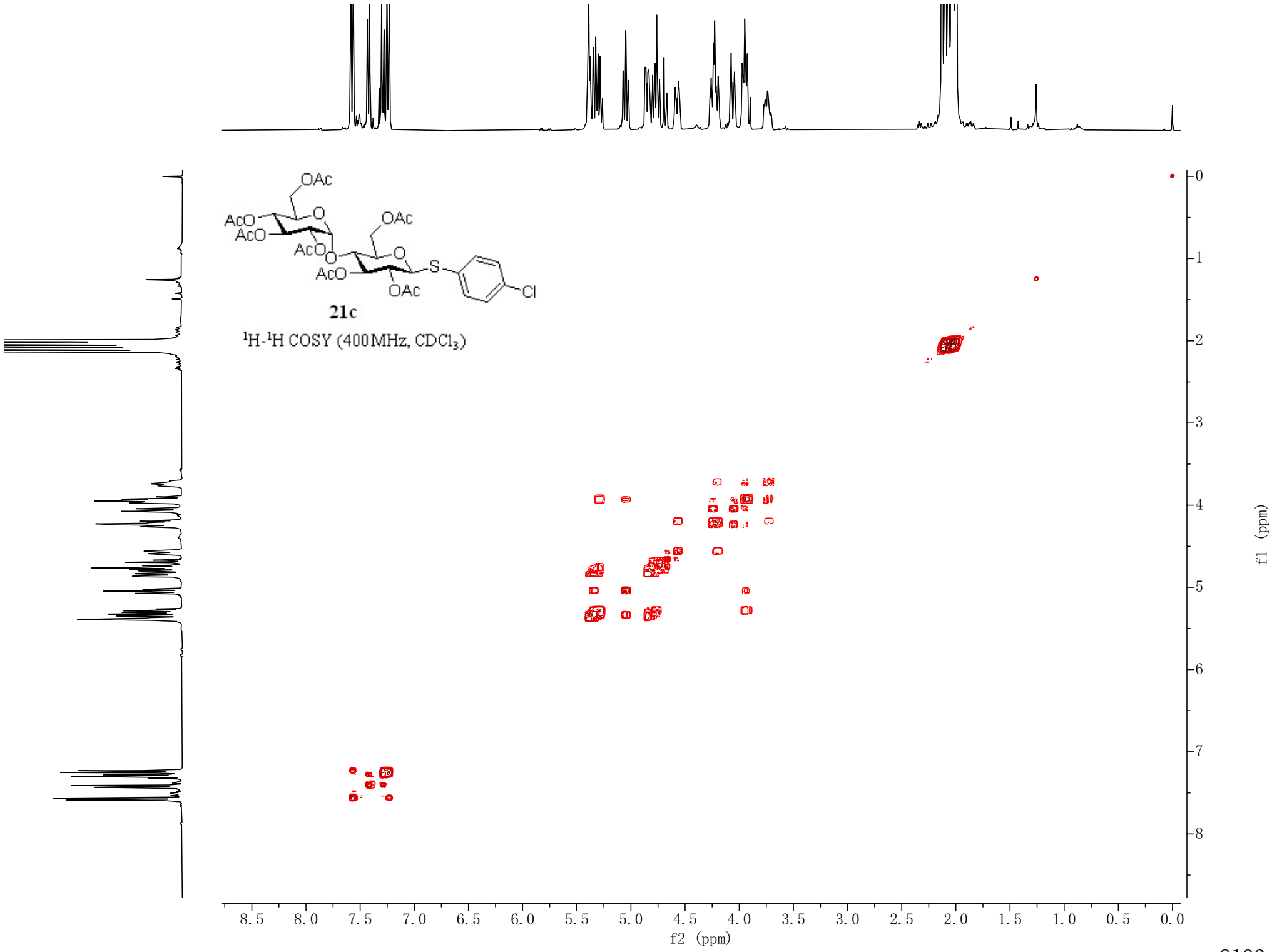
21c

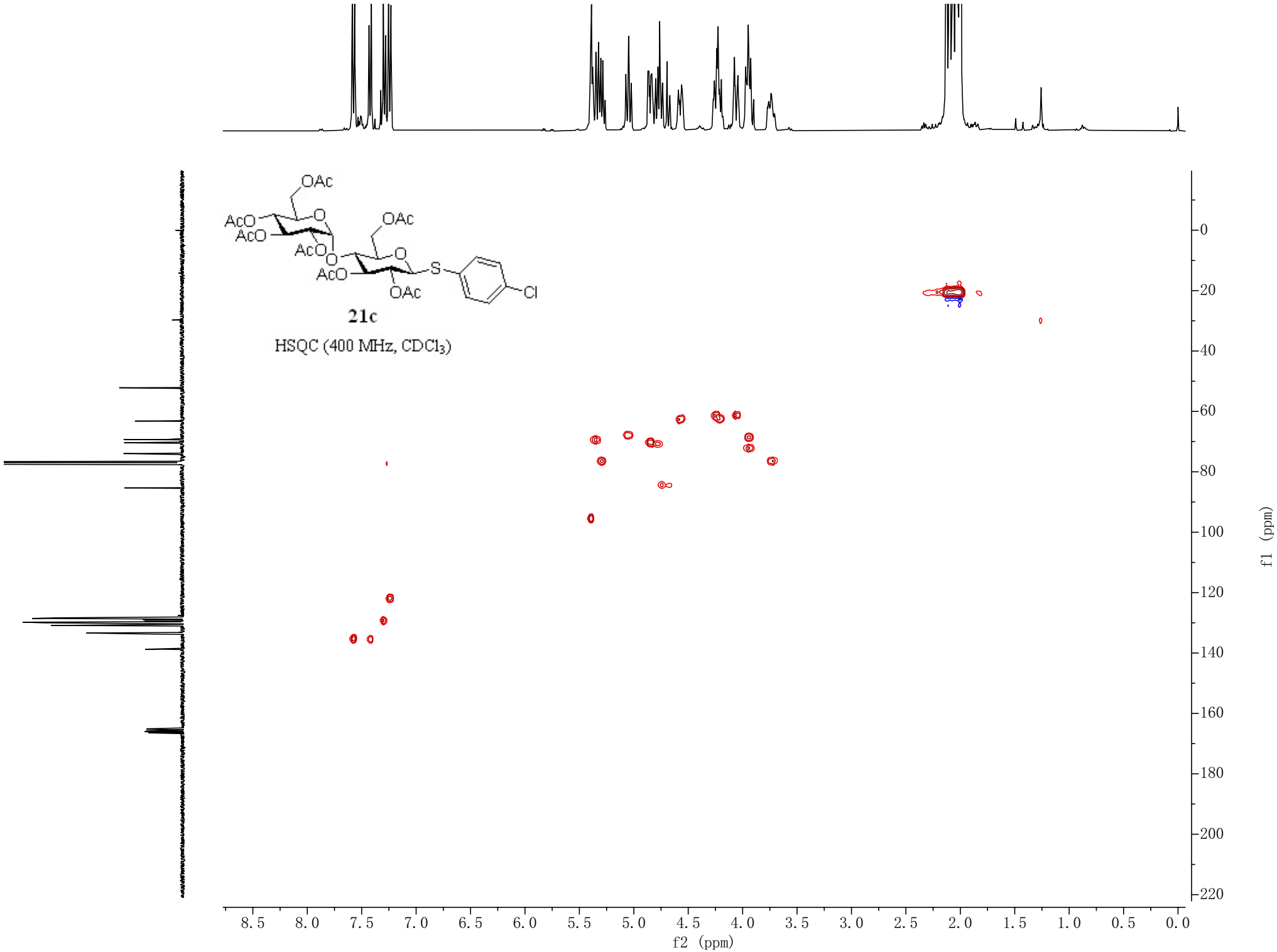
^{1}H NMR (400 MHz, $CDCl_3$)

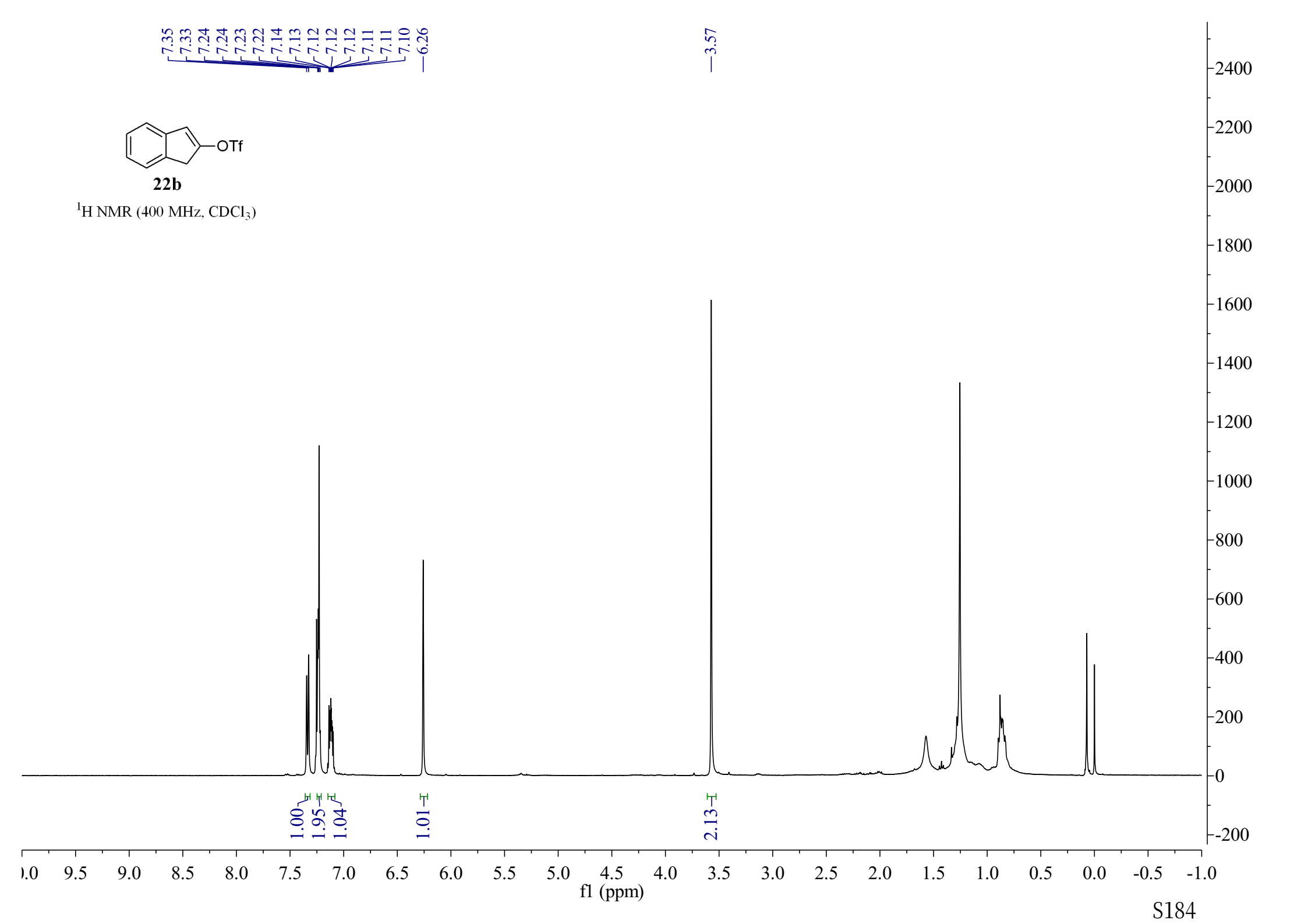


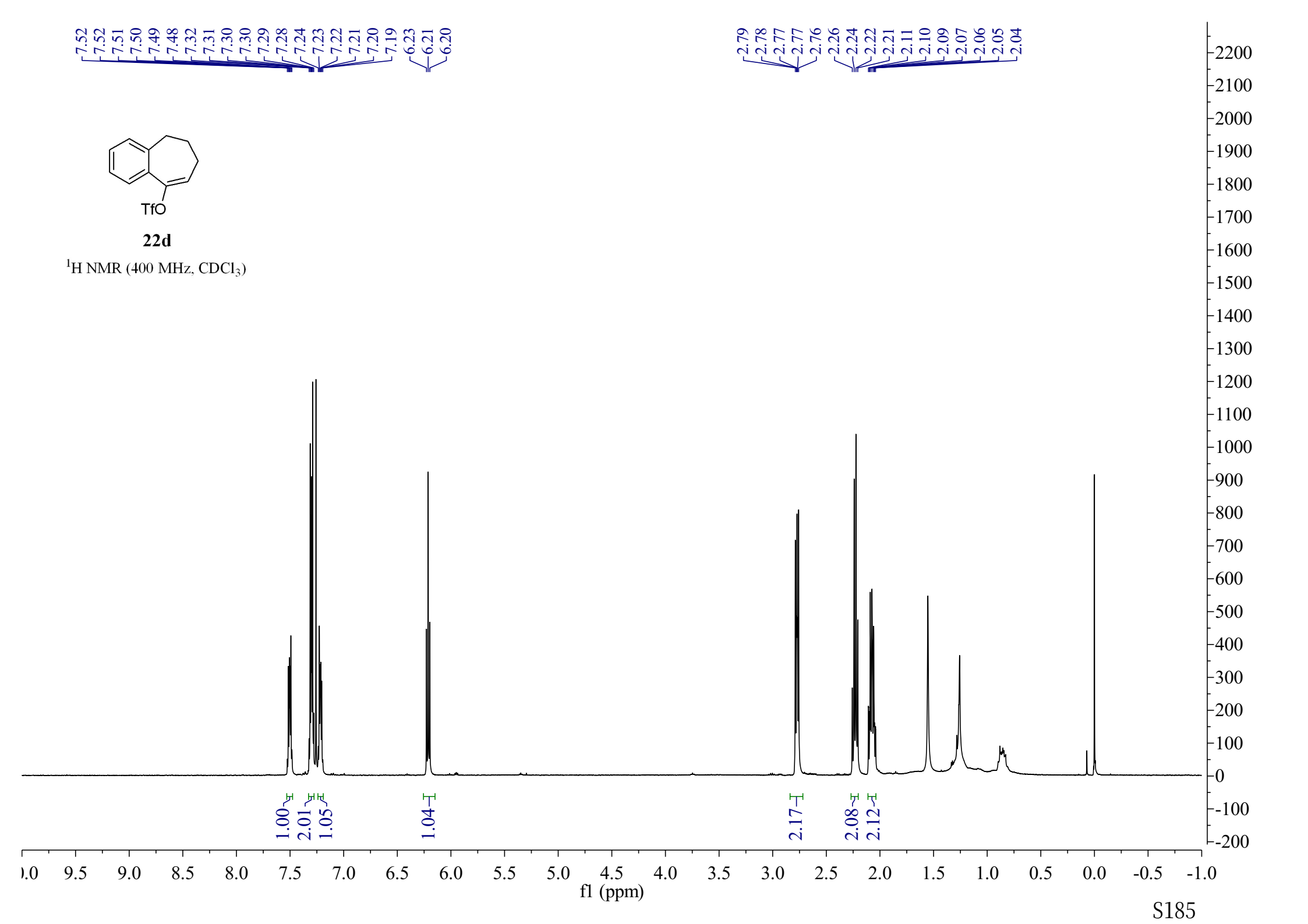
21c

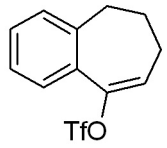
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)


OAc
AcO
AcO
AcO
O
OAc
O
AcO
O
S
AcO
OAc
Cl
21c
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
f1 (ppm)
f2 (ppm)
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


OAc
AcO
AcO
AcO
O
OAc
O
AcO
O
S
AcO
OAc
Cl
21c
HSQC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

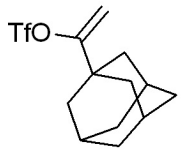

7.35
7.33
7.24
7.24
7.23
7.22
7.14
7.13
7.12
7.12
7.12
7.11
7.11
7.10
6.26
3.57
OTf
22b
1H NMR (400 MHz, CDCl3)
1.00
1.95
1.04
1.01
2.13
fl (ppm)


7.52
7.52
7.51
7.50
7.49
7.48
7.32
7.31
7.30
7.30
7.29
7.28
7.24
7.23
7.22
7.21
7.20
7.19
6.23
6.21
6.20
2.79
2.78
2.77
2.77
2.76
2.26
2.24
2.22
2.21
2.11
2.10
2.09
2.07
2.06
2.05
2.04
TfO
22d
1H NMR (400 MHz, CDCl3)
1.00
2.01
1.05
1.04
2.17
2.08
2.12
f1 (ppm)



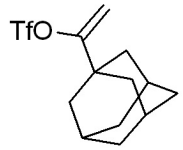
22d

^{19}F NMR (376 MHz, $CDCl_3$)



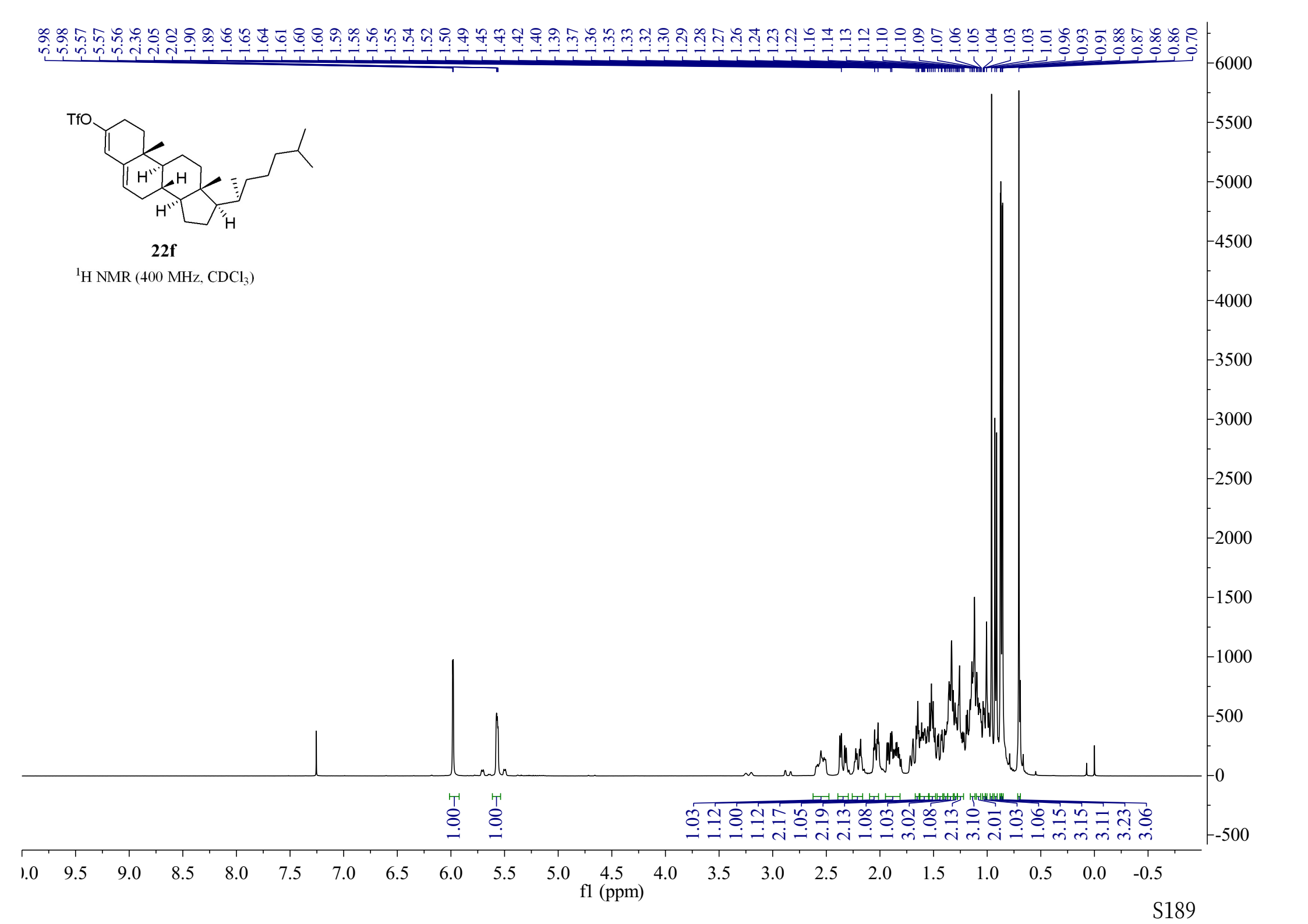
22e

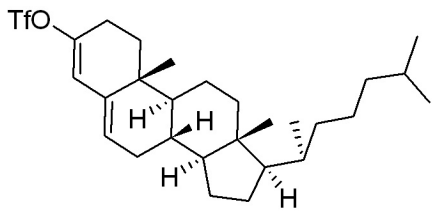
^{1}H NMR (400 MHz, $CDCl_3$)



22e

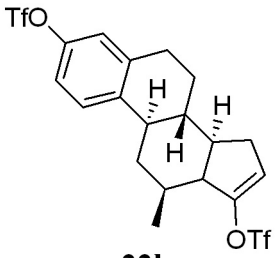
^{19}F NMR (376 MHz, $CDCl_3$)


TfO
H
H
H
H
22f
^{1}H NMR (400 MHz, $CDCl_3$)
fl (ppm)



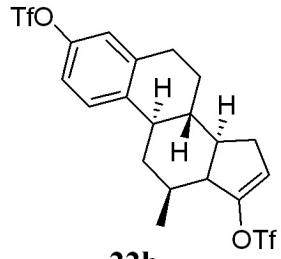
22f

^{19}F NMR (376 MHz, $CDCl_3$)



22h

^{1}H NMR (400 MHz, $CDCl_3$)



22h

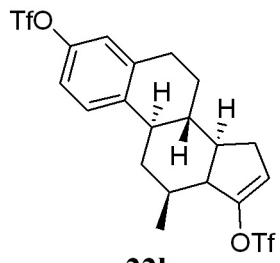
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)

159.06
147.63
140.37
139.22
128.42
127.80
126.83
123.55
123.39
121.27
120.36
120.21
118.31
117.17
117.02
114.55
53.49
44.98
44.29
36.11
32.66
29.17
28.35
26.29
25.58
15.28

8000 7500 7000 6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0 -500

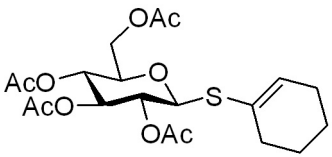
)0 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10

f1 (ppm)



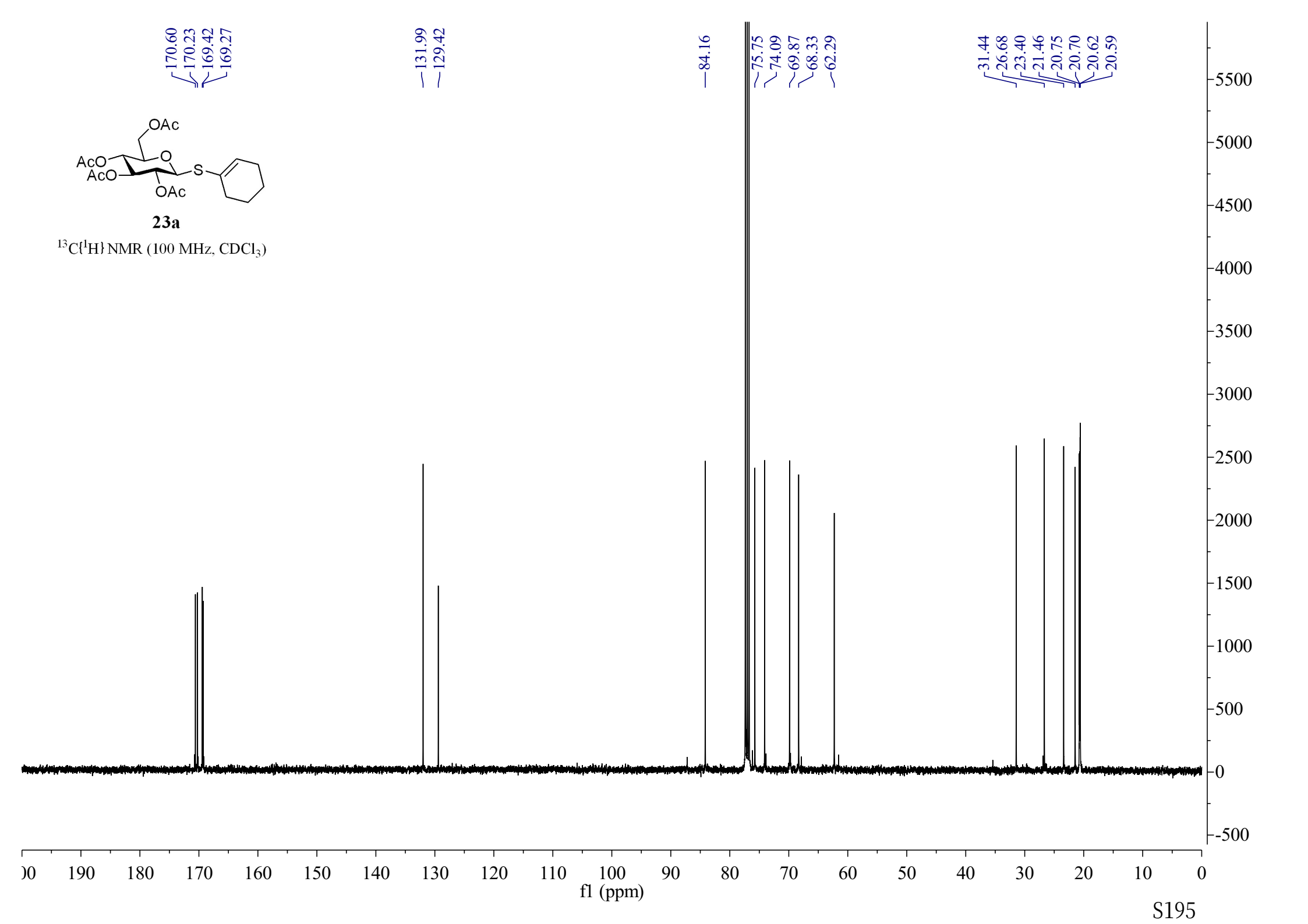
22h

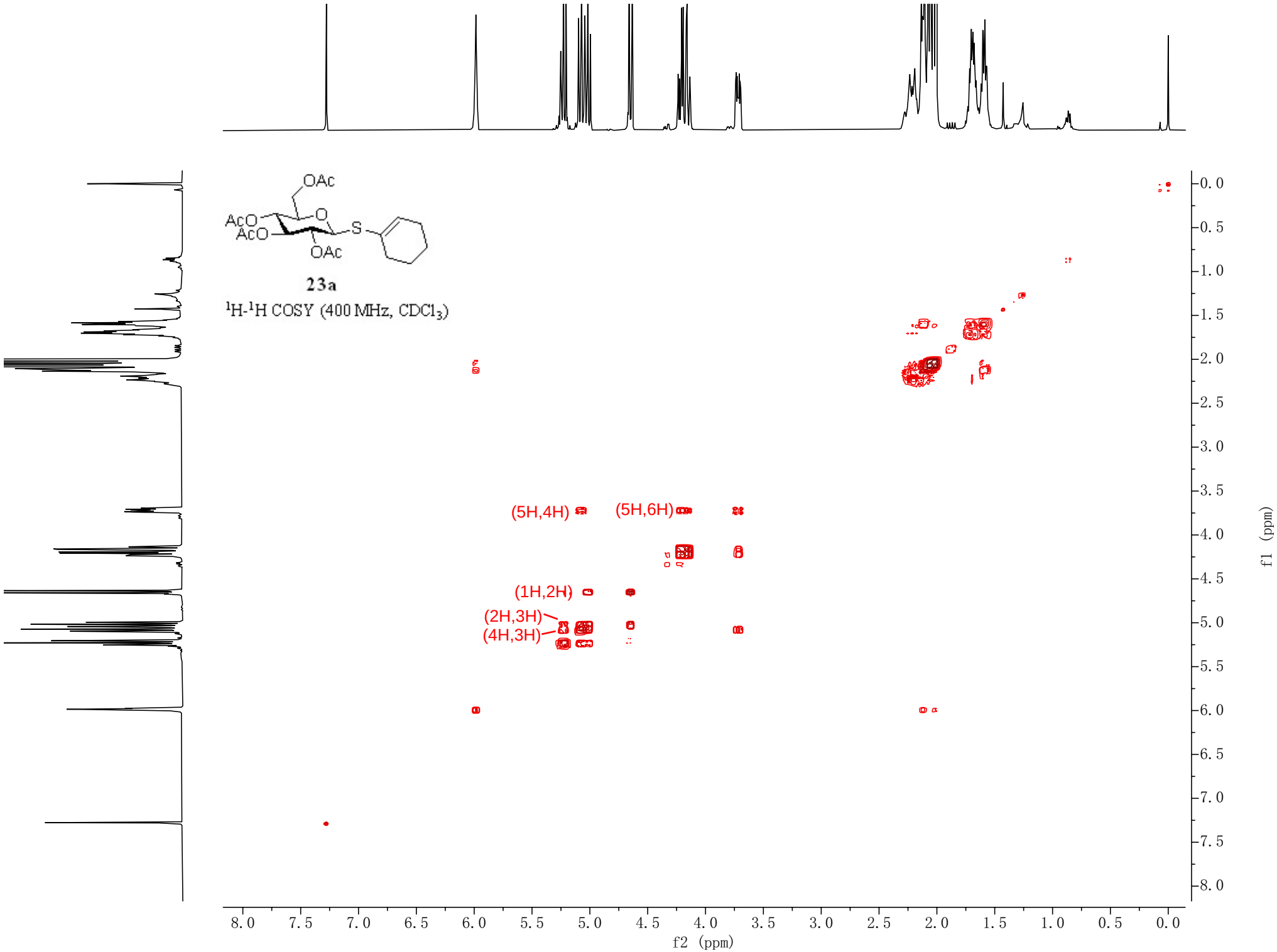
^{19}F NMR (376 MHz, $CDCl_3$)

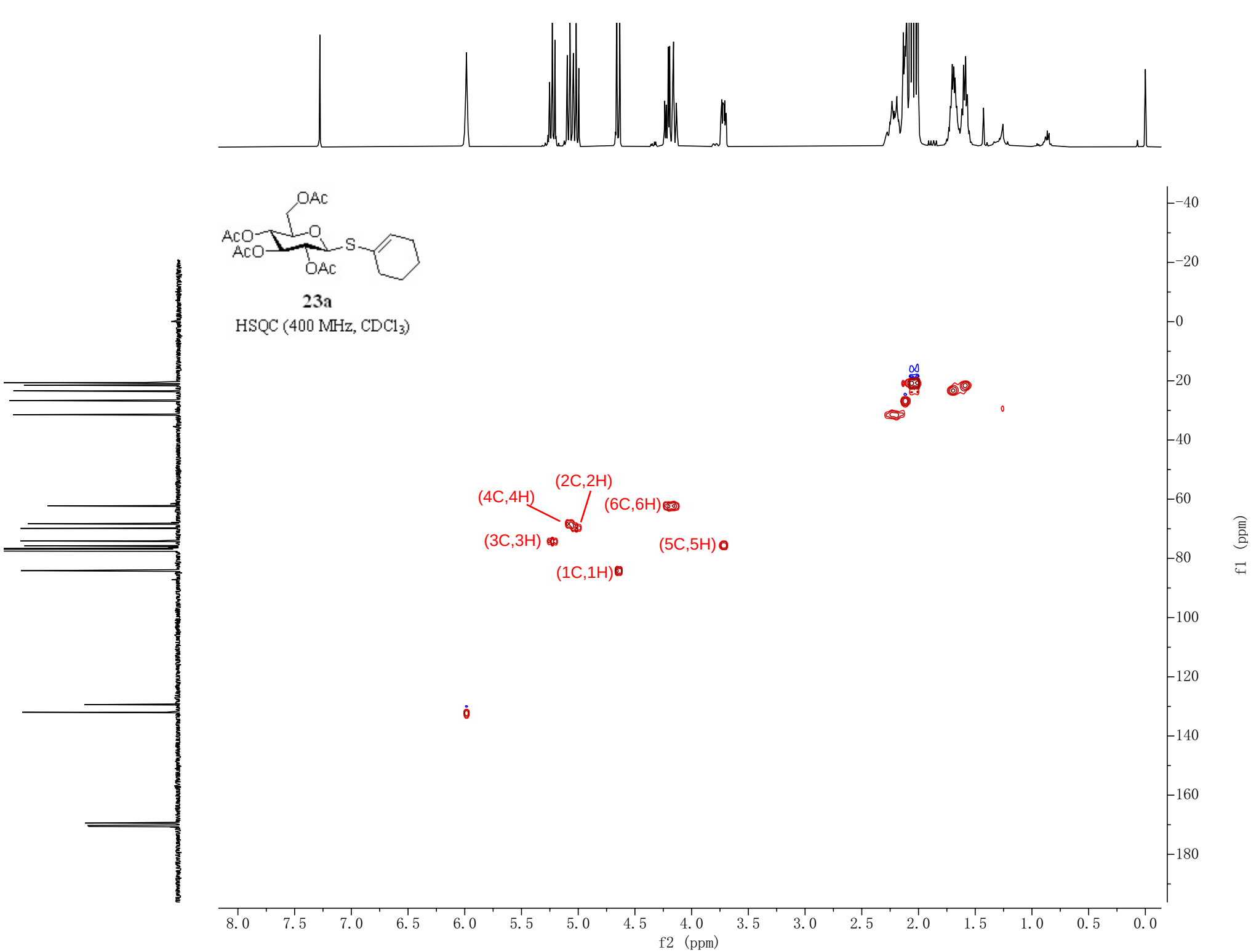


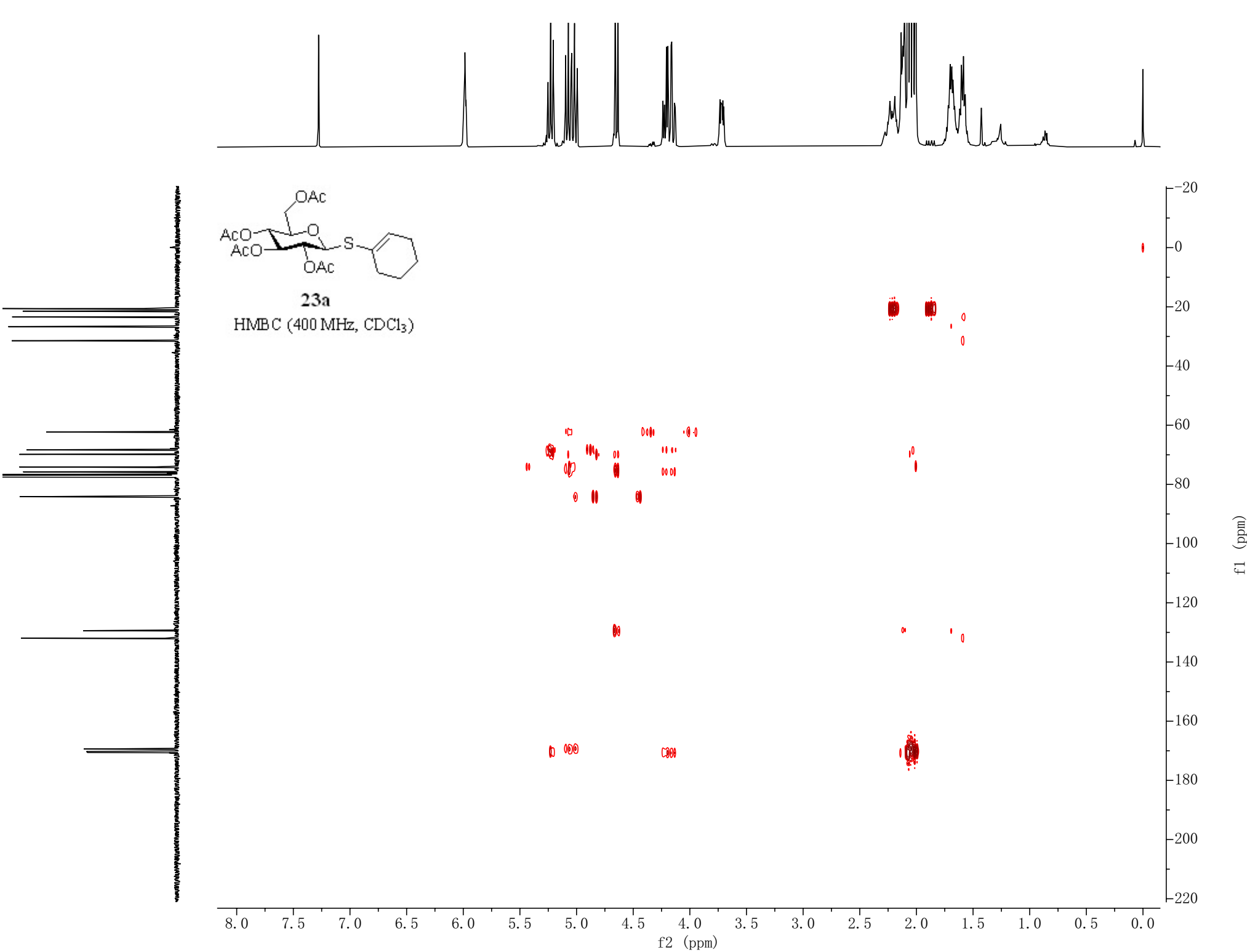
23a

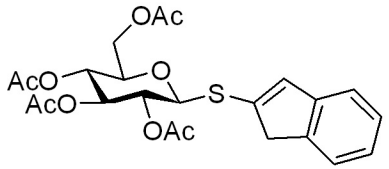
^{1}H NMR (400 MHz, $CDCl_3$)


170.60
170.23
169.42
169.27
131.99
129.42
84.16
75.75
74.09
69.87
68.33
62.29
31.44
26.68
23.40
21.46
20.75
20.70
20.62
20.59
OAc
AcO
AcO
O
S
OAc
23a
13C{1H} NMR (100 MHz, CDCl3)
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


OAc
AcO
AcO
O
S
OAc
23a
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
(5H,4H)
(5H,6H)
(1H,2H)
(2H,3H)
(4H,3H)
f2 (ppm)
f1 (ppm)

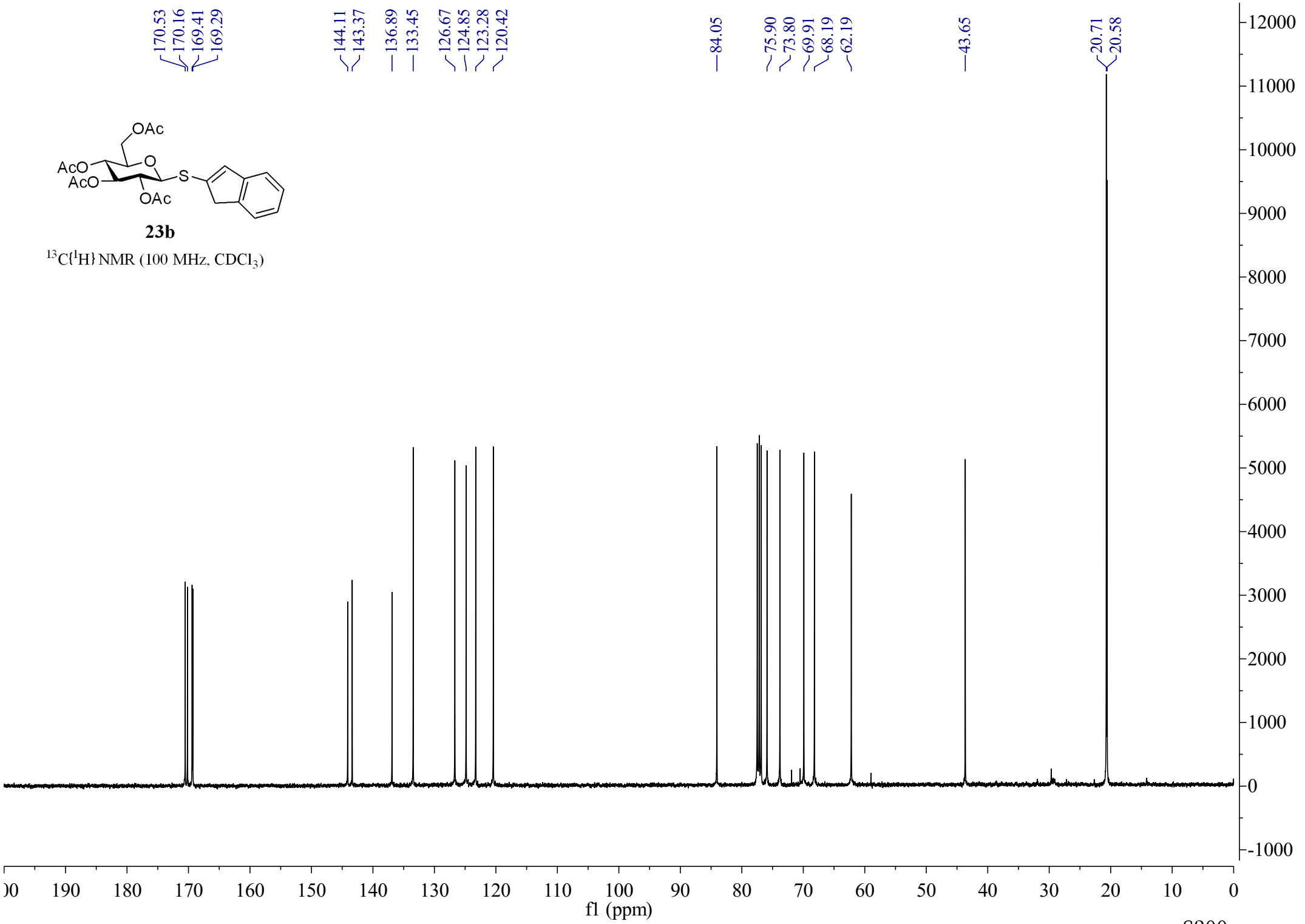

OAc
AcO
AcO
O
S
OAc
23a
HSQC (400 MHz, CDCl3)
(2C,2H)
(4C,4H)
(6C,6H)
(3C,3H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

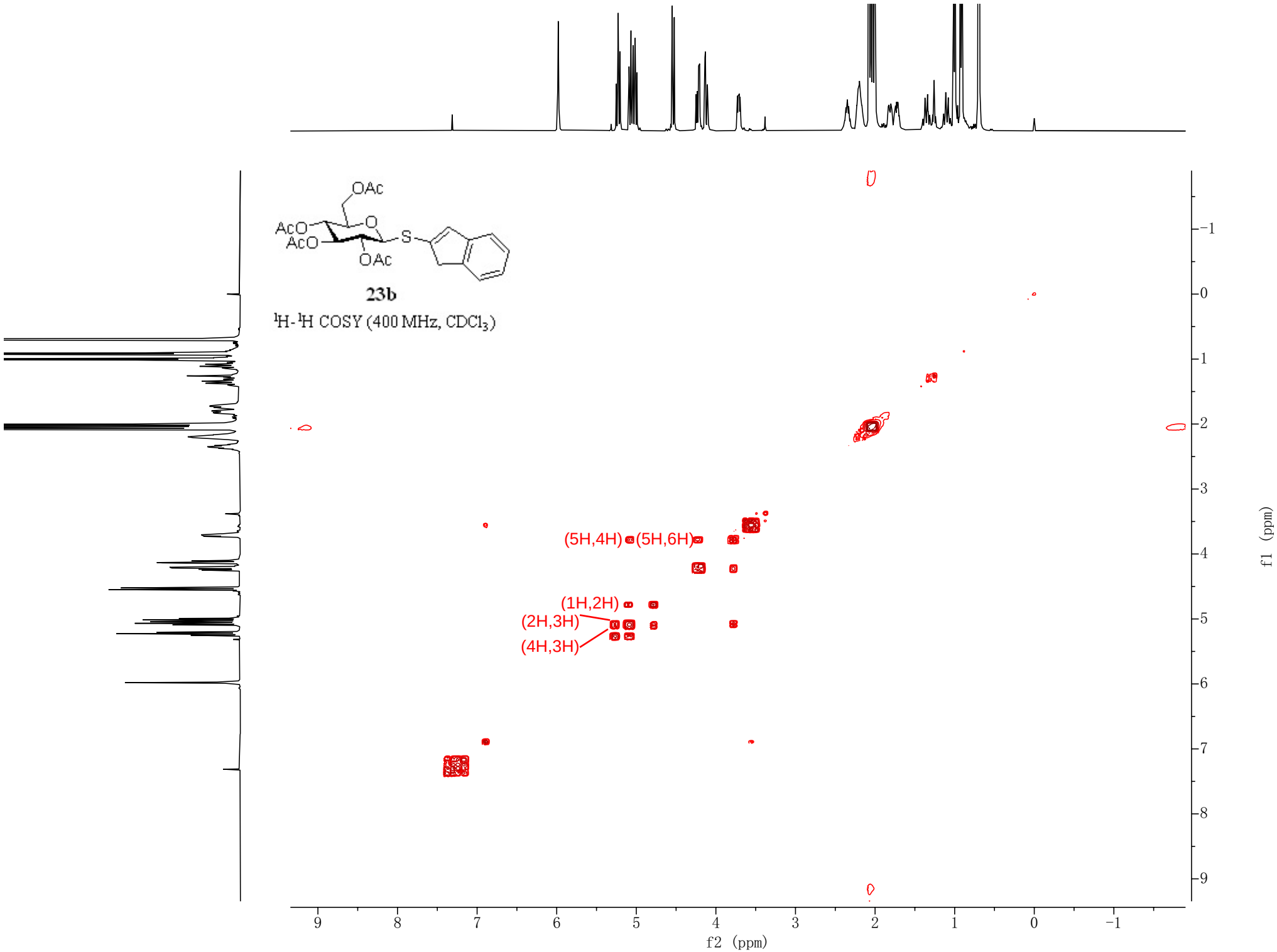

OAc
AcO
AcO
O
S
OAc
23a
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

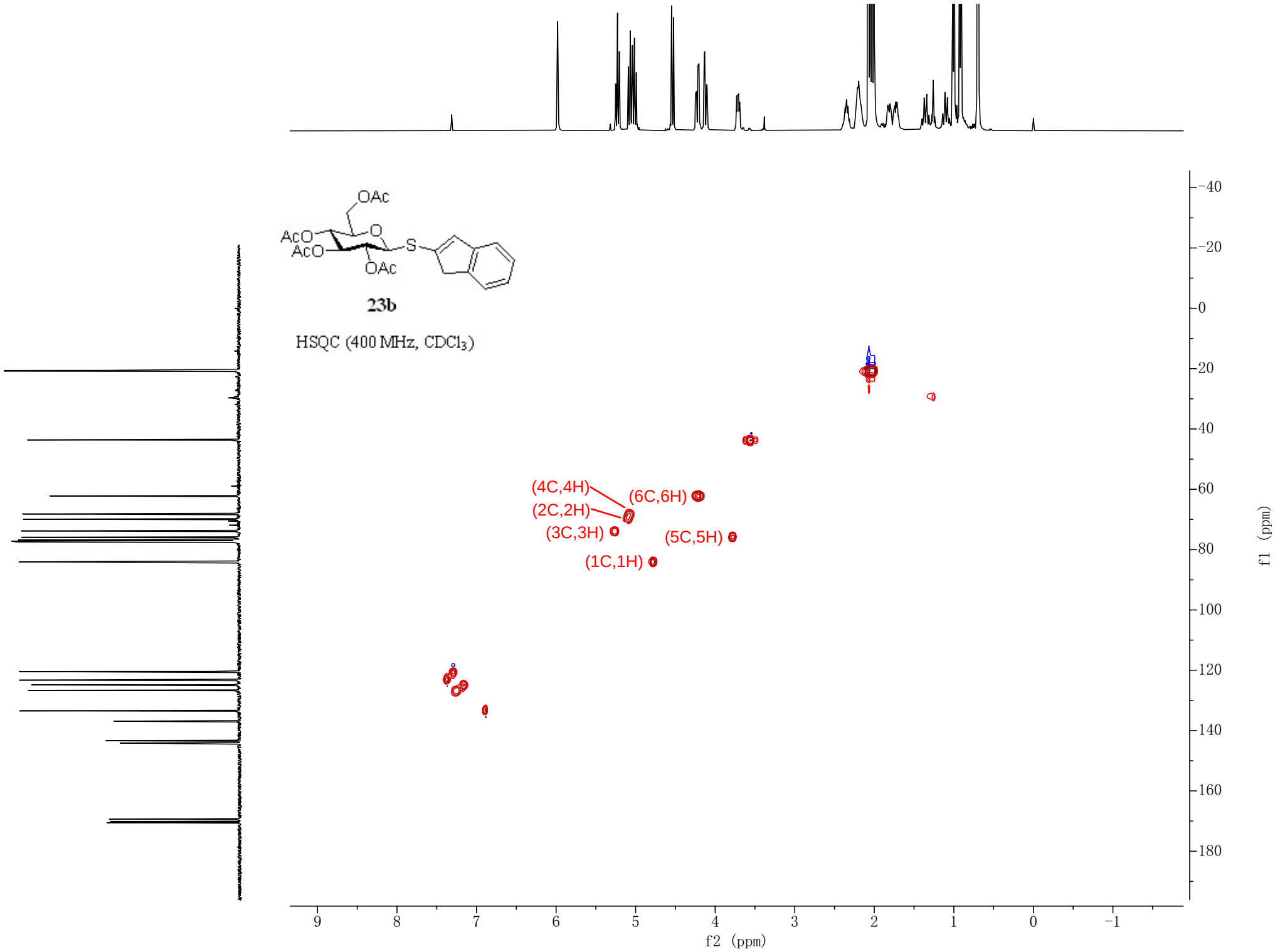


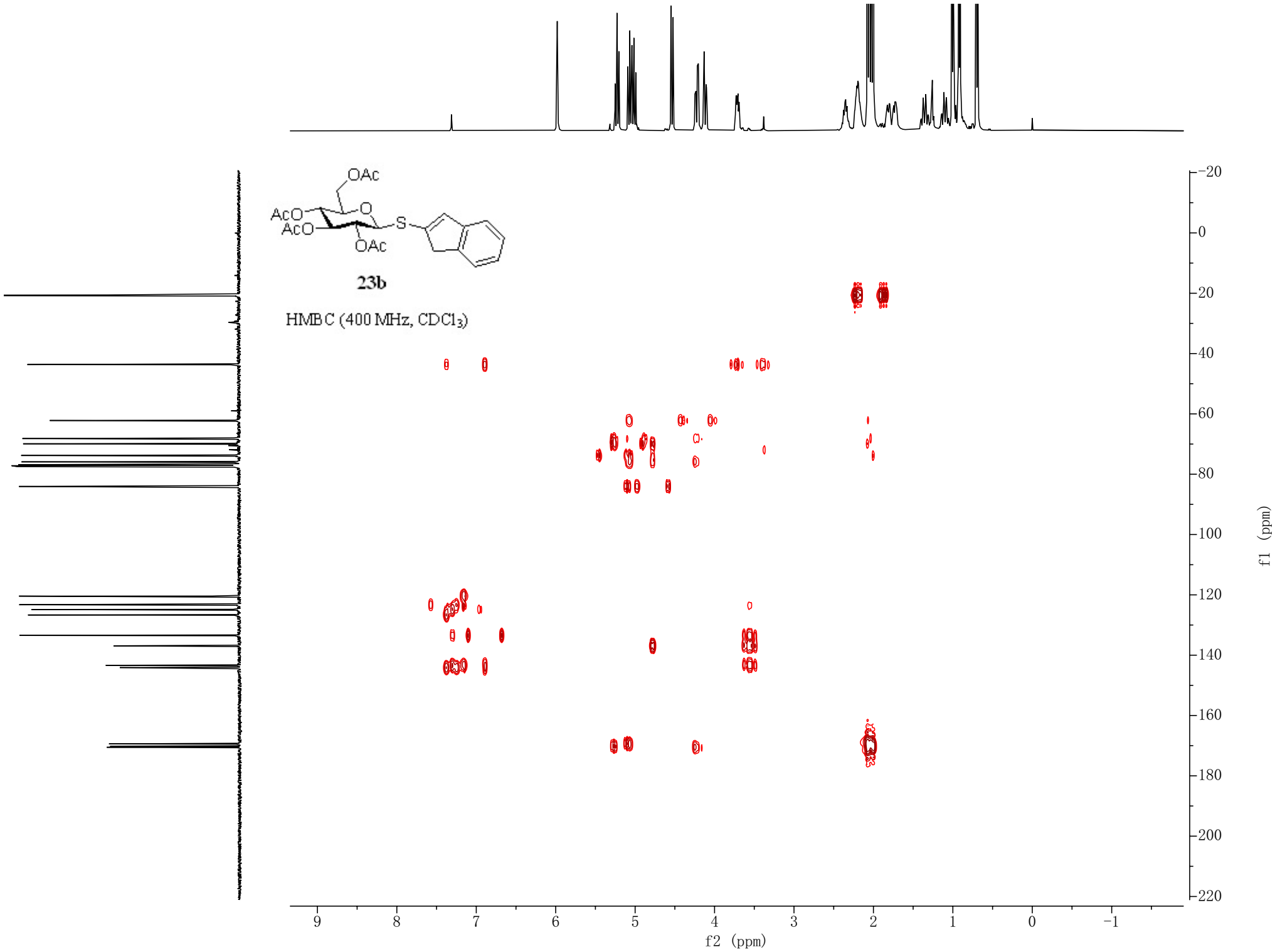
23b

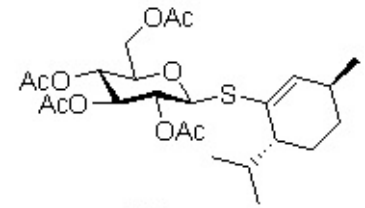
^{1}H NMR (400 MHz, $CDCl_3$)


170.53
170.16
169.41
169.29
144.11
143.37
136.89
133.45
126.67
124.85
123.28
120.42
84.05
75.90
73.80
69.91
68.19
62.19
43.65
20.71
20.58
OAc
AcO
AcO
O
S
OAc
23b
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


OAc
AcO
AcO
O
S
OAc
23b
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
(5H,4H)
(5H,6H)
(1H,2H)
(2H,3H)
(4H,3H)
f2 (ppm)
f1 (ppm)

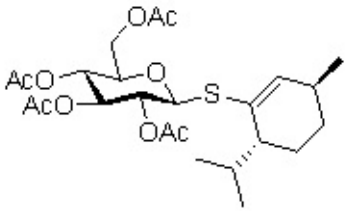

OAc
AcO
AcO
O
S
OAc
23b
HSQC (400 MHz, CDCl3)
(4C,4H)
(2C,2H)
(3C,3H)
(6C,6H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)


OAc
AcO
AcO
O
S
OAc
23b
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)



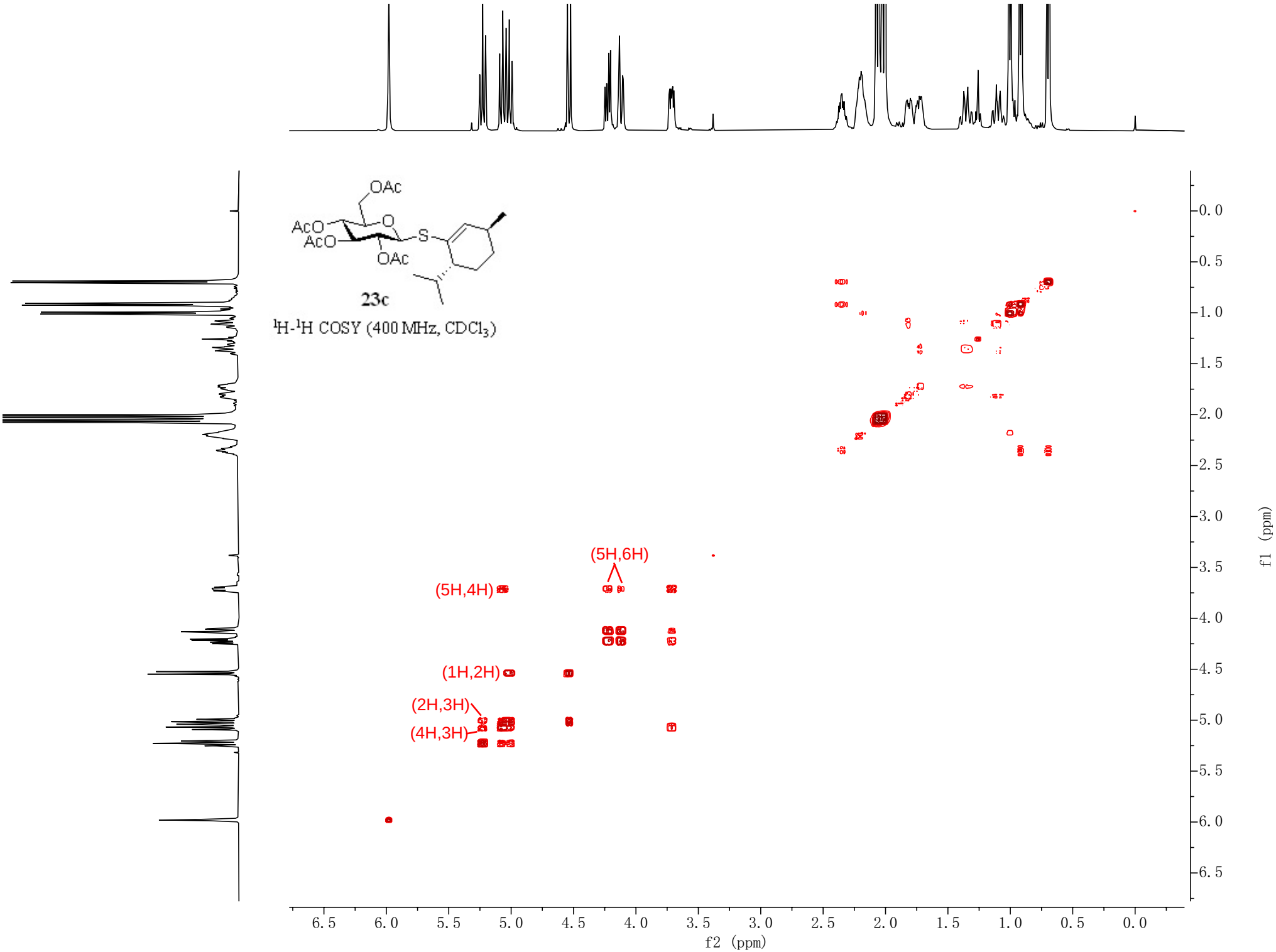
23c

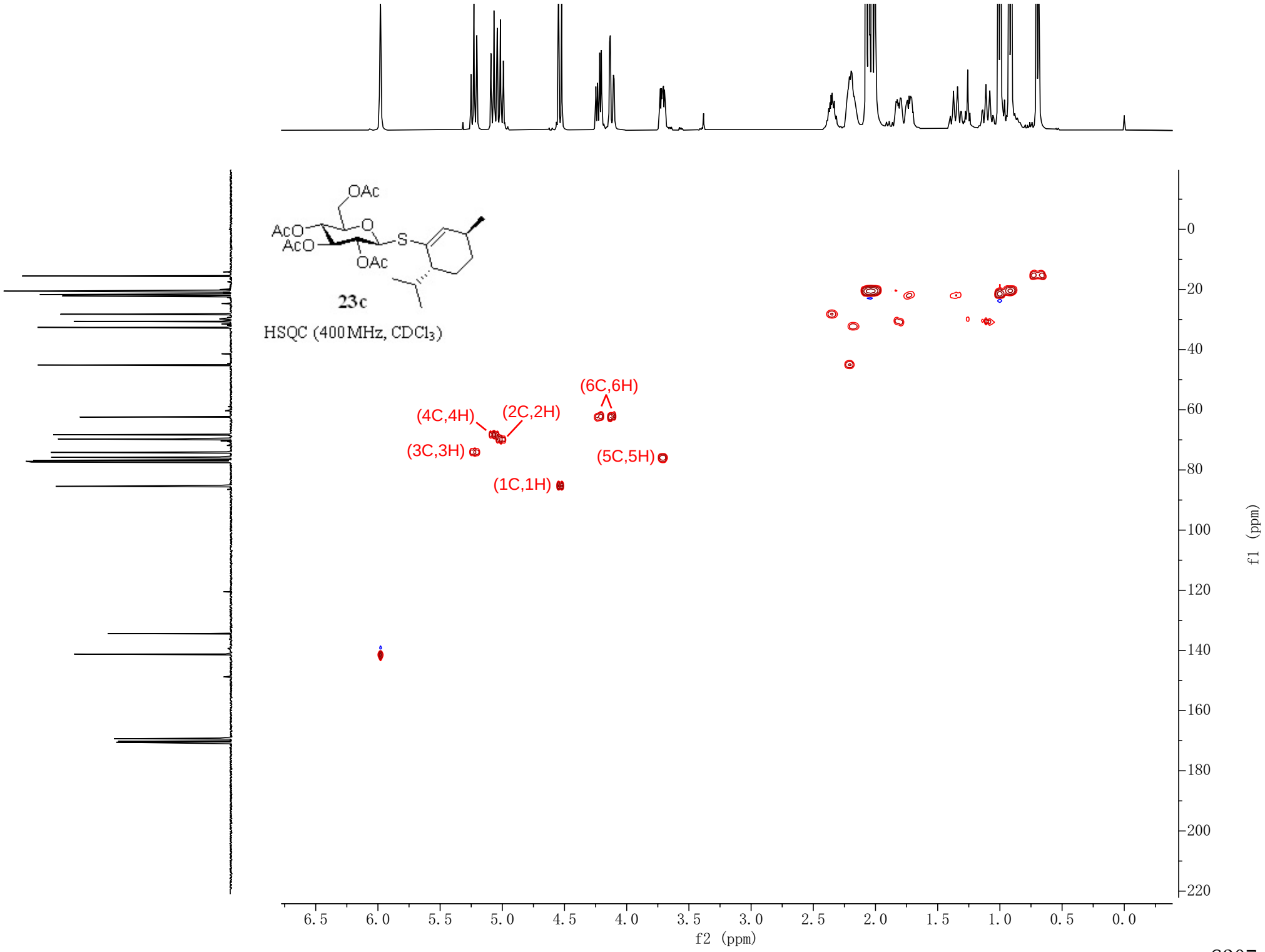
^{1}H NMR (400 MHz, $CDCl_3$)

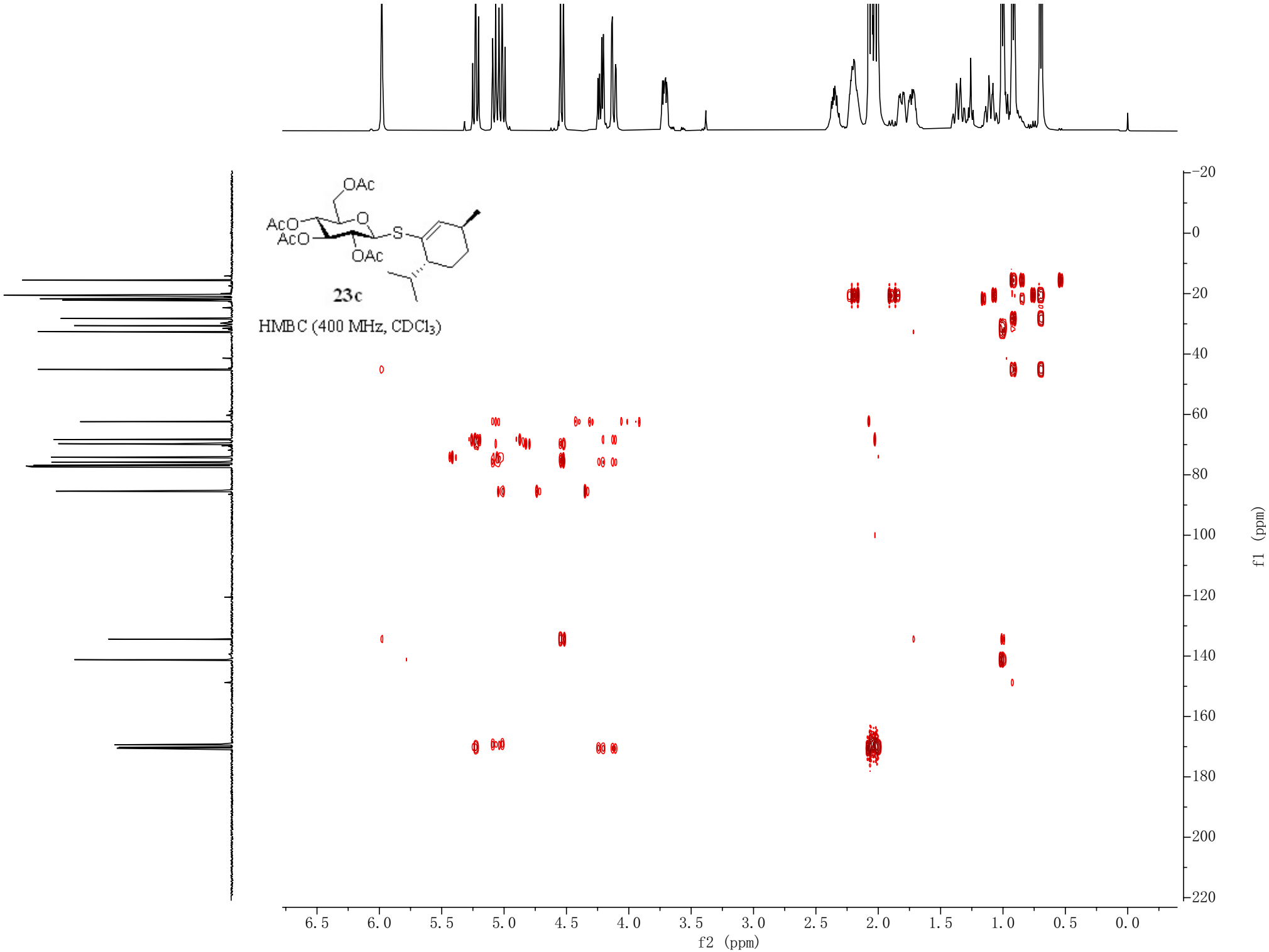


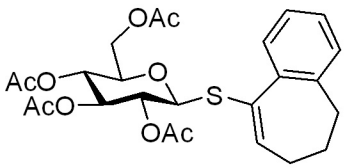
23c

$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)


OAc
AcO
AcO
O
S
OAc
23c
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
(5H,6H)
(5H,4H)
(1H,2H)
(2H,3H)
(4H,3H)
f2 (ppm)
f1 (ppm)

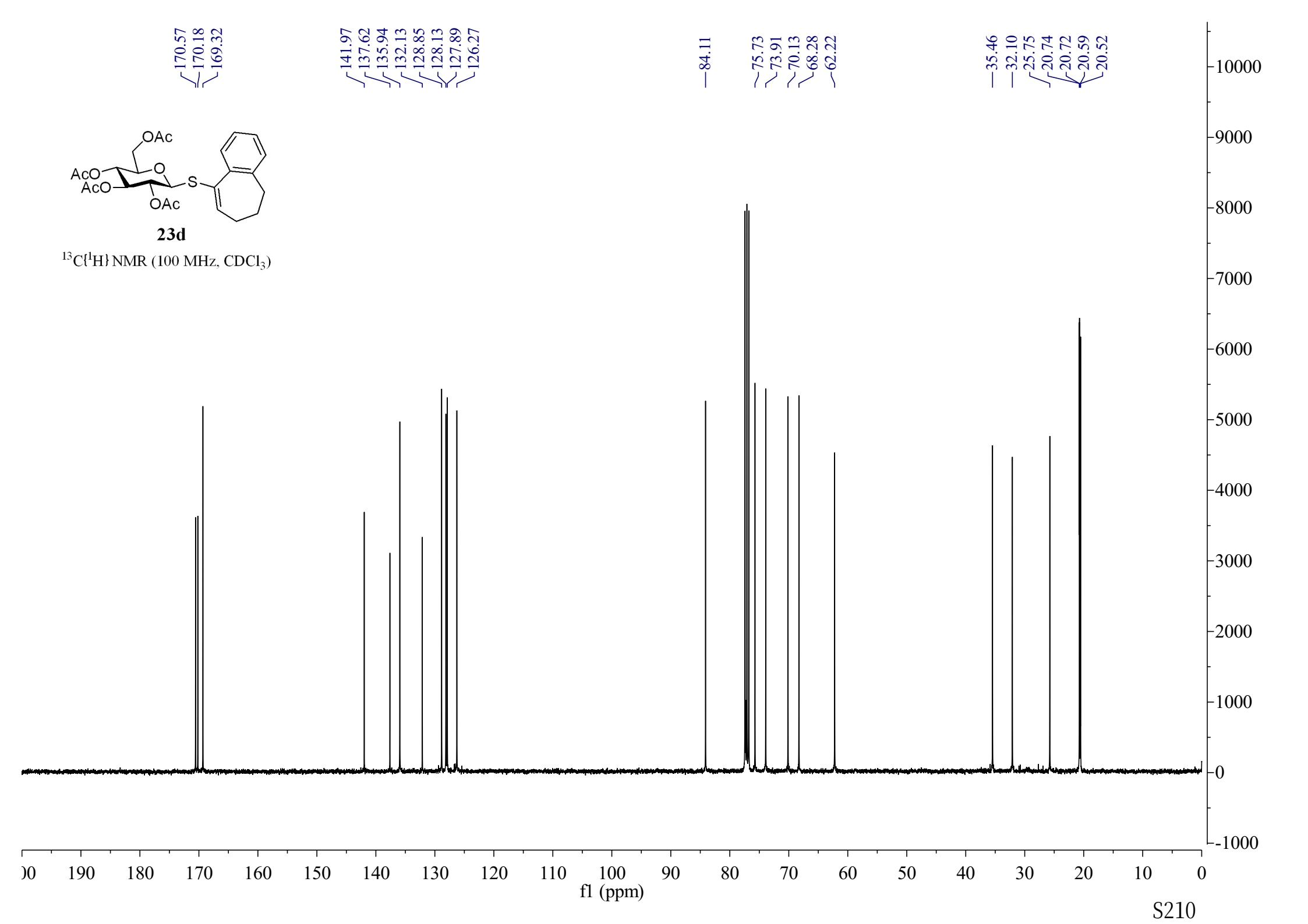

OAc
AcO
AcO
O
S
OAc
23c
HSQC (400MHz, CDCl3)
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

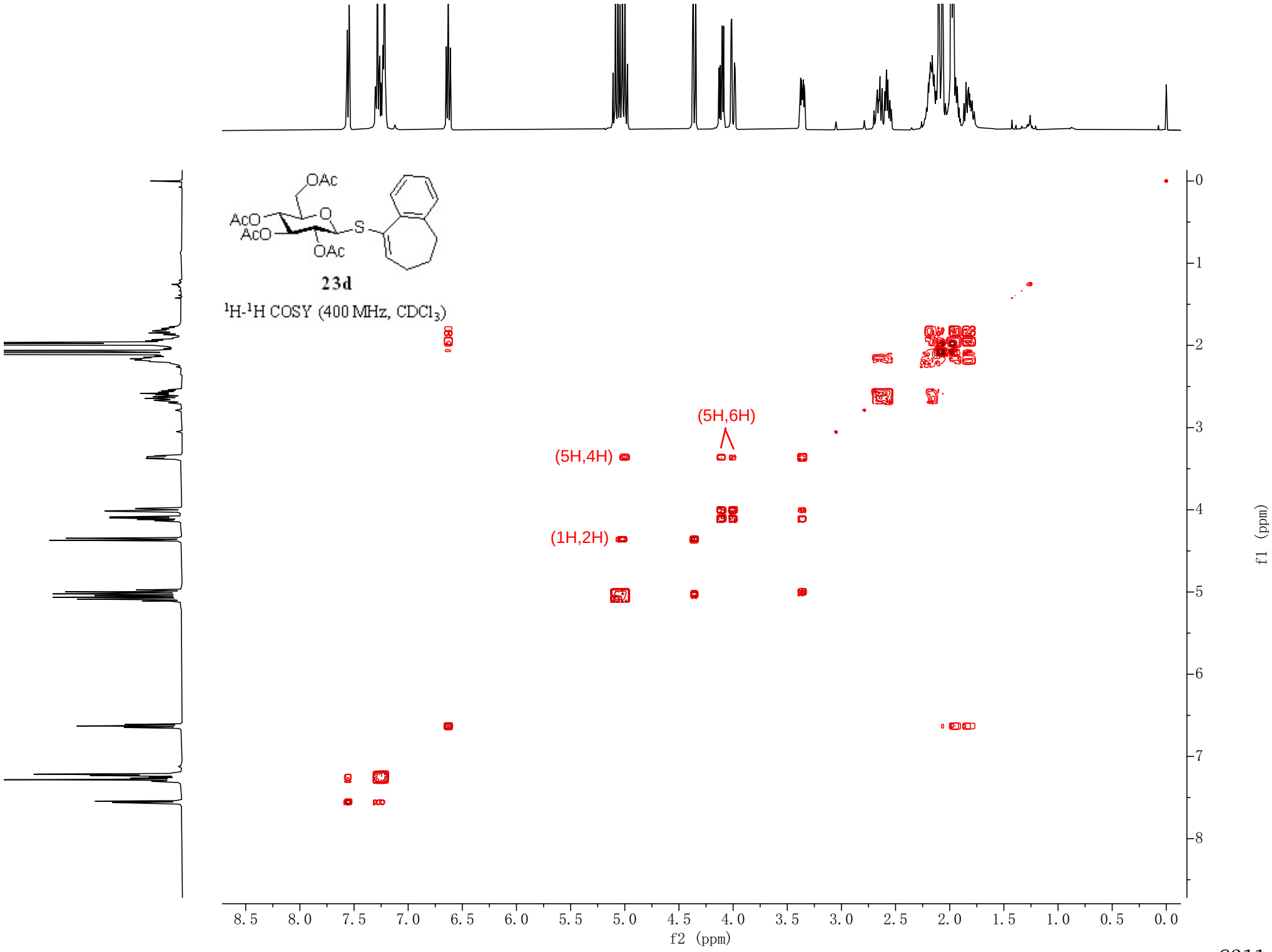

OAc
AcO
AcO
O
S
OAc
23c
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

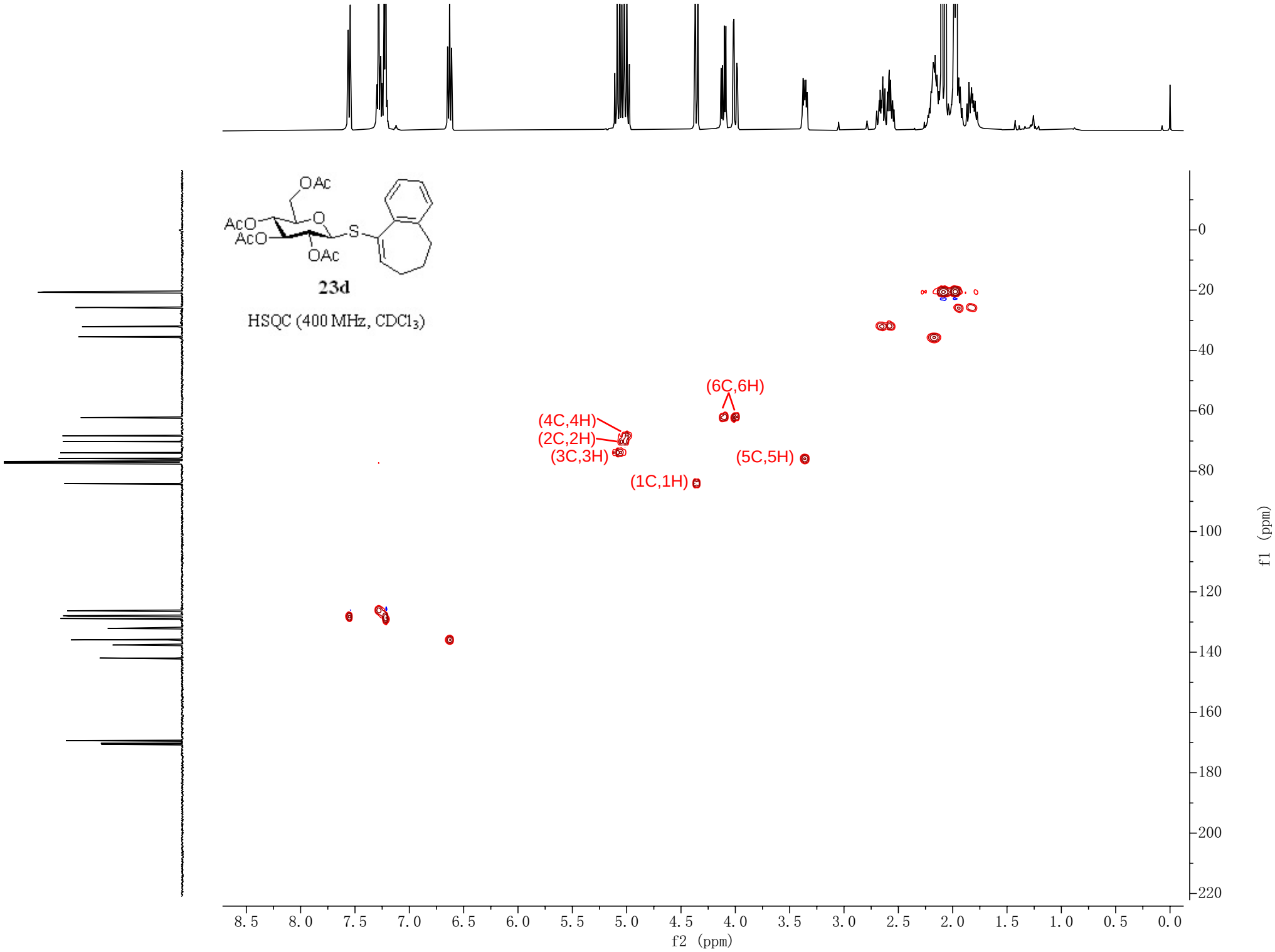


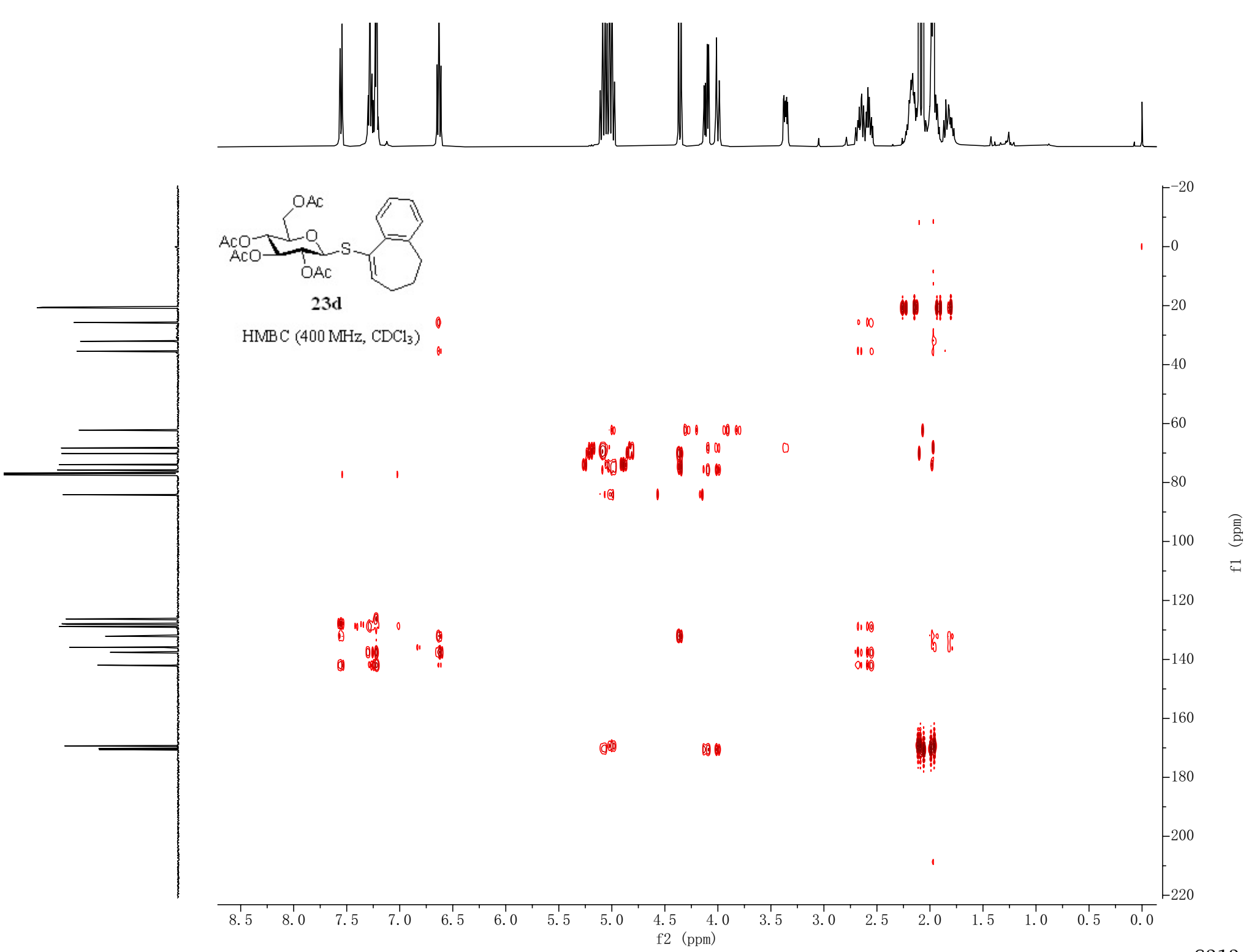
23d

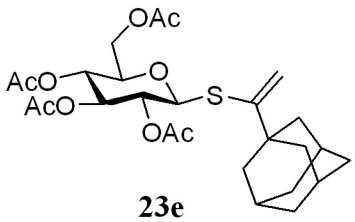
^{1}H NMR (400 MHz, $CDCl_3$)


170.57
170.18
169.32
141.97
137.62
135.94
132.13
128.85
128.13
127.89
126.27
84.11
75.73
73.91
70.13
68.28
62.22
35.46
32.10
25.75
20.74
20.72
20.59
20.52
OAc
AcO
AcO
O
S
OAc
23d
13C{1H} NMR (100 MHz, CDCl3)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


OAc
AcO
AcO
O
S
OAc
23d
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
(5H,6H)
(5H,4H)
(1H,2H)
f2 (ppm)
f1 (ppm)

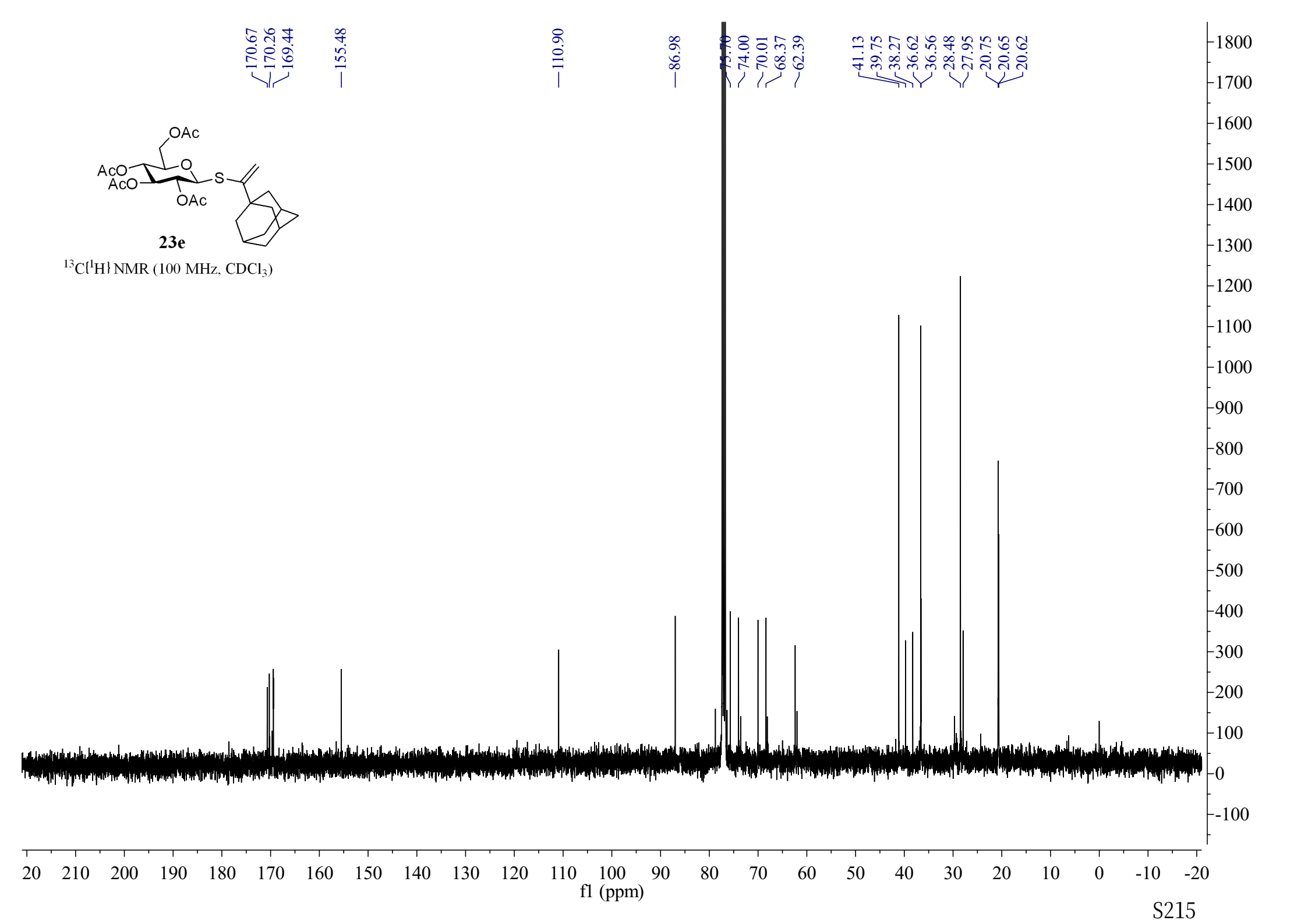

OAc
AcO
AcO
O
S
OAc
23d
HSQC (400 MHz, CDCl3)
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

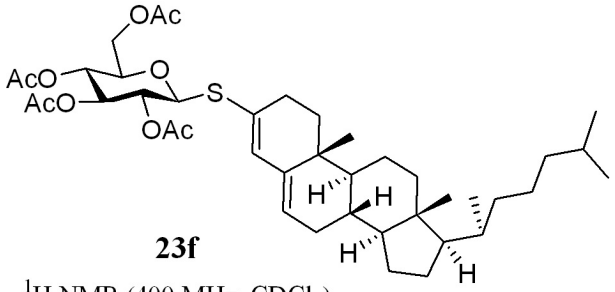

OAc
AcO
AcO
O
S
OAc
23d
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)



23e

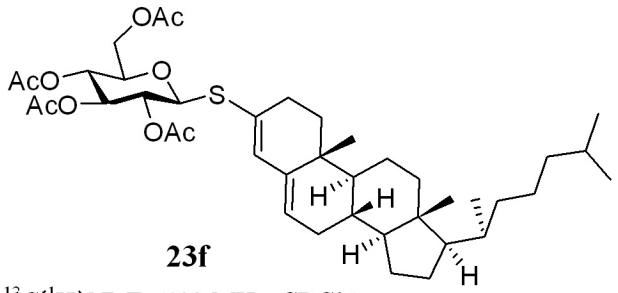
^{1}H NMR (400 MHz, $CDCl_3$)


170.67
170.26
169.44
155.48
110.90
86.98
75.70
74.00
70.01
68.37
62.39
41.13
39.75
38.27
36.62
36.56
28.48
27.95
20.75
20.65
20.62
OAc
AcO
AcO
O
S
OAc
23e
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)
fl (ppm)



23f

^{1}H NMR (400 MHz, $CDCl_3$)



23f

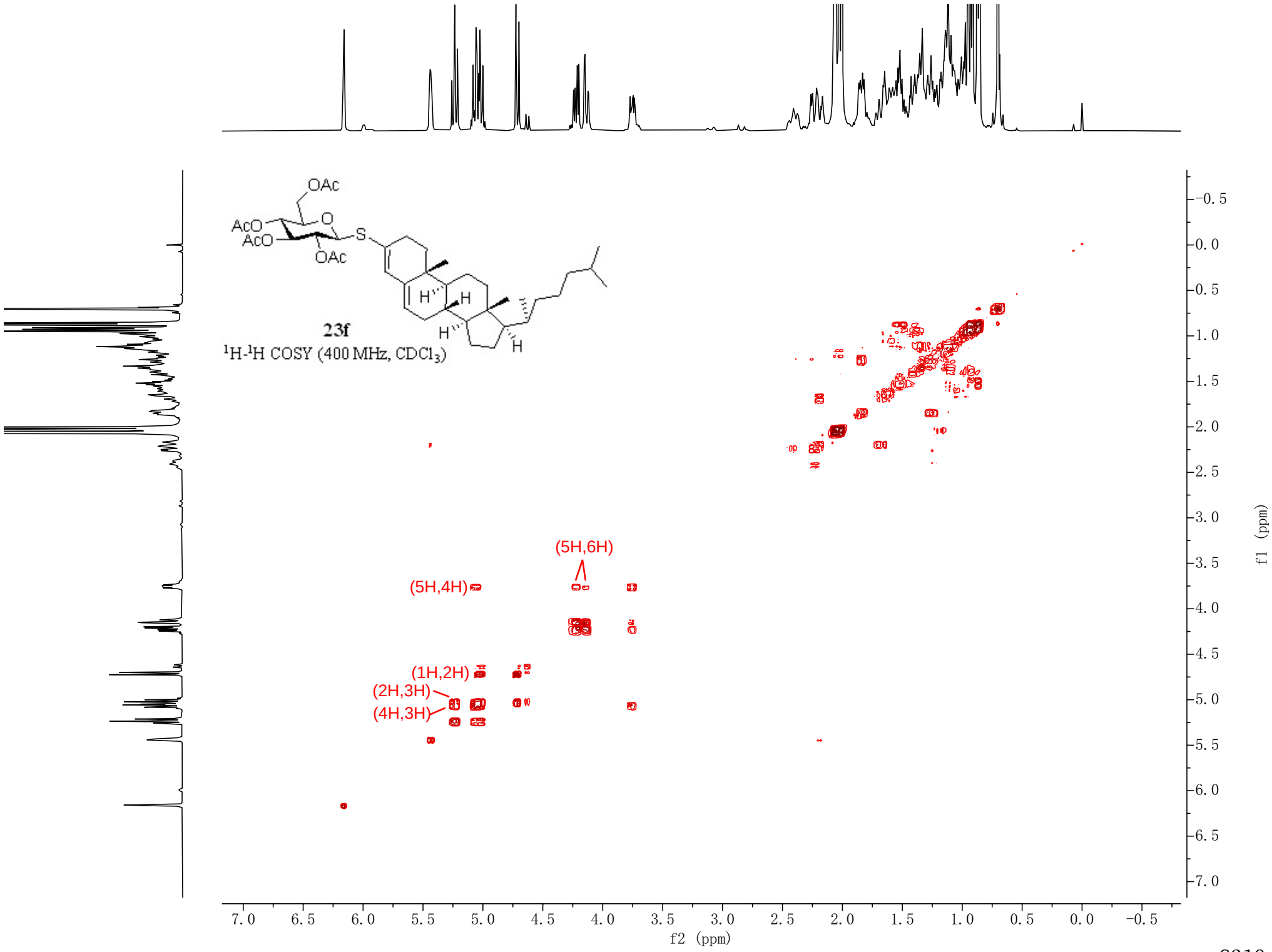
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)

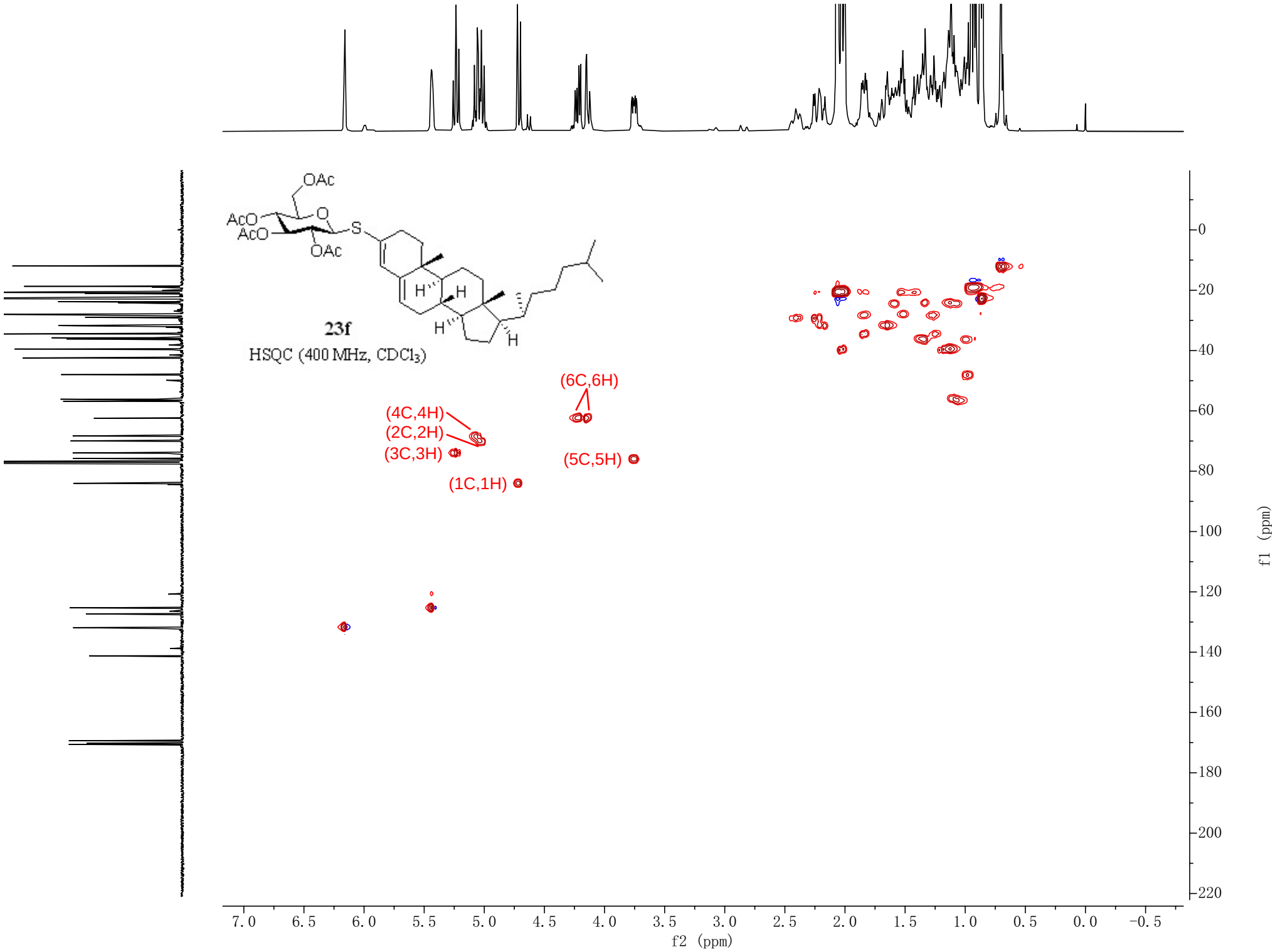
170.58
170.16
169.37
169.24
141.20
131.86
127.29
125.31
84.02
75.77
73.97
69.95
68.34
62.41
56.82
56.13
42.44
39.50
35.77
34.52
27.99
23.82
22.82
22.56
20.73
20.59
20.57
18.95
18.79
11.97

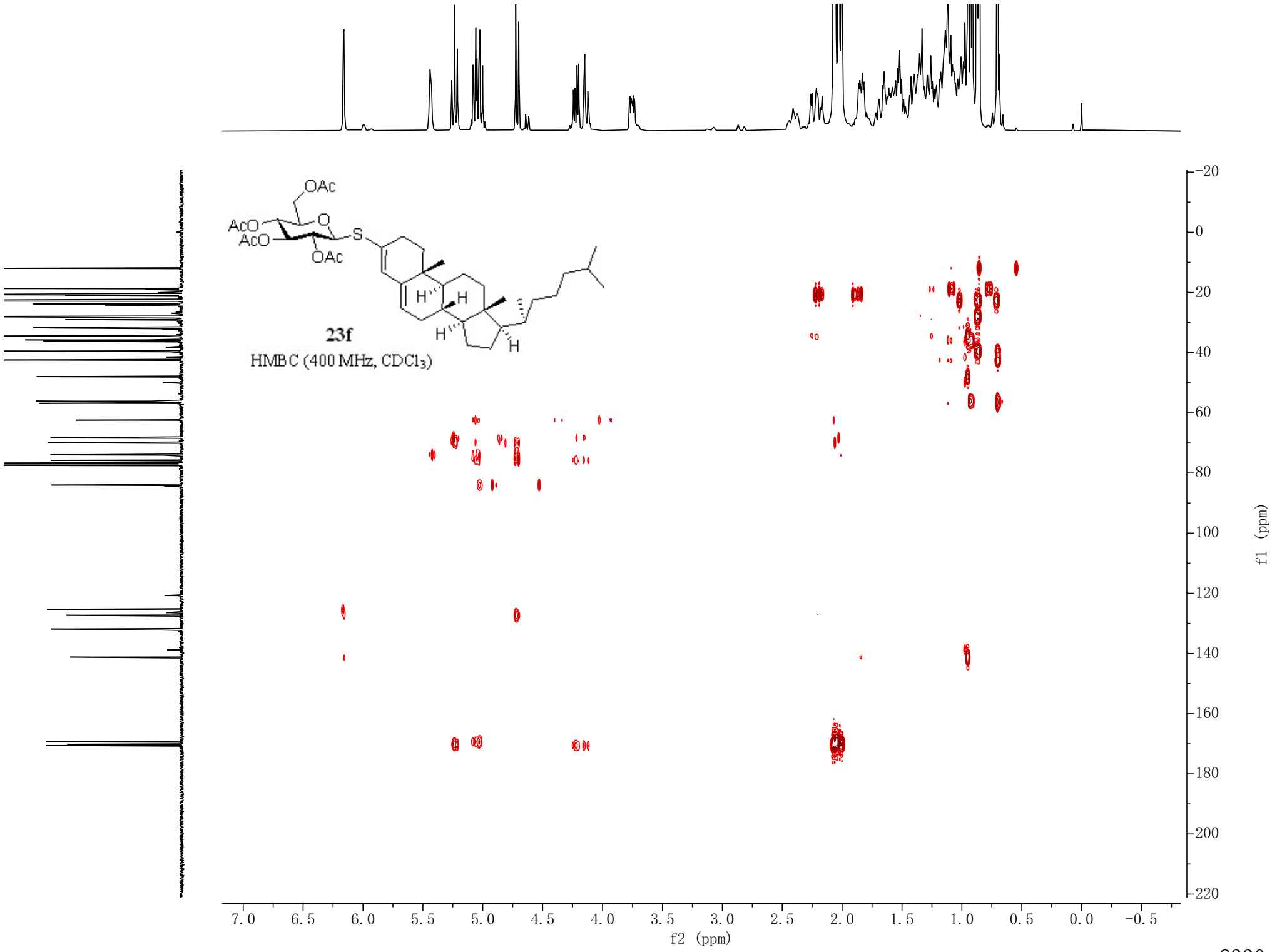
9000
8000
7000
6000
5000
4000
3000
2000
1000
0

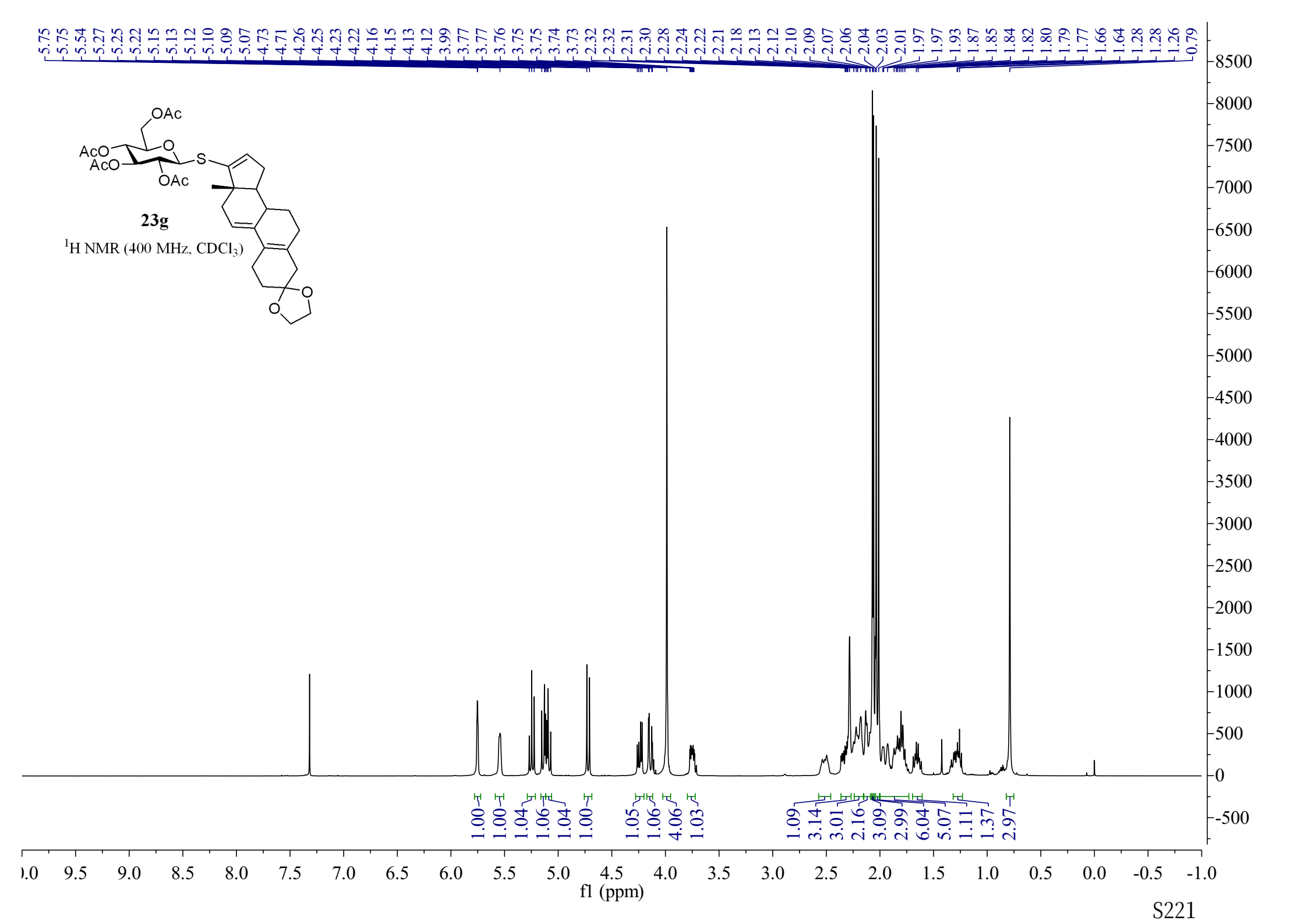
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0

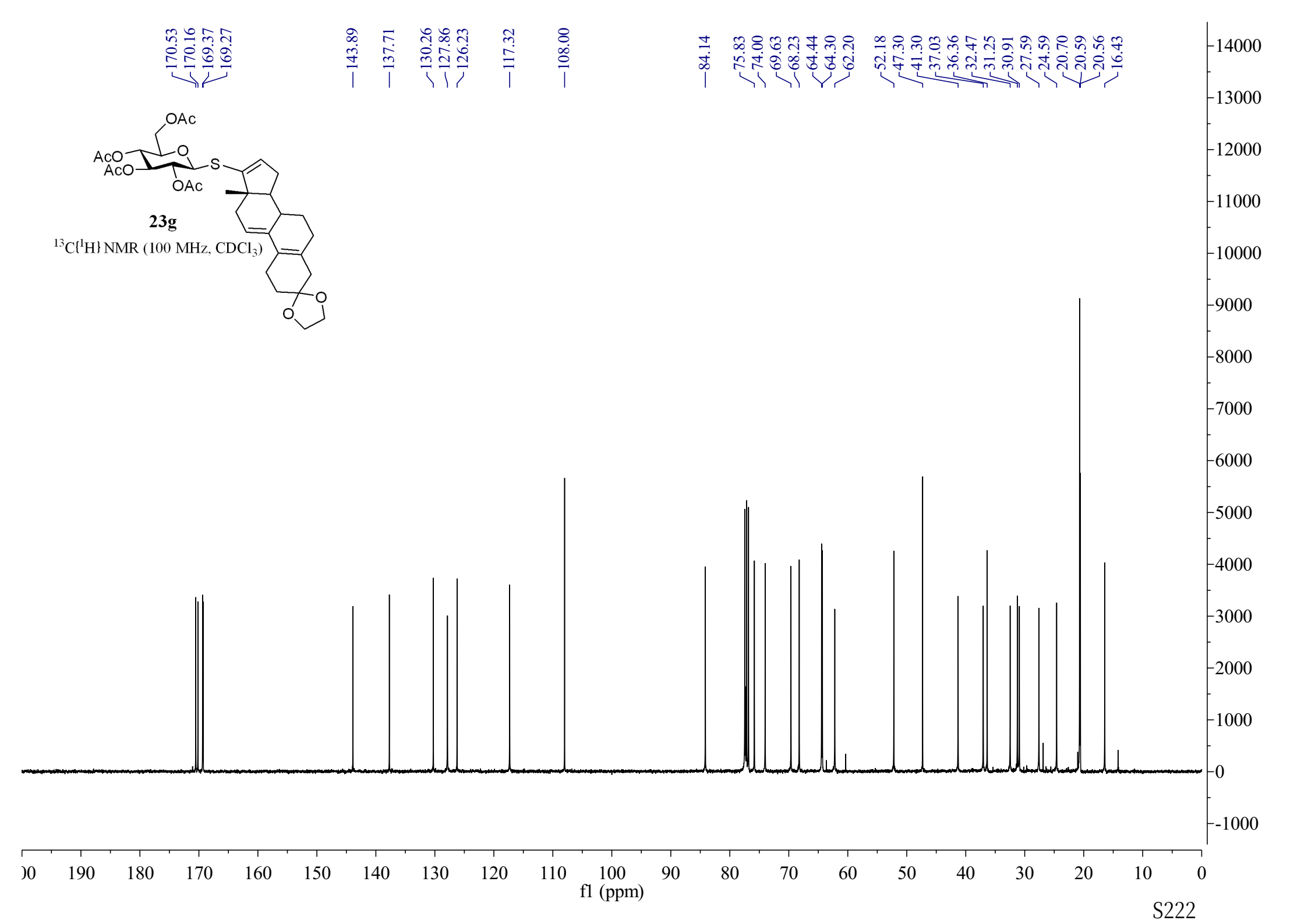
f1 (ppm)

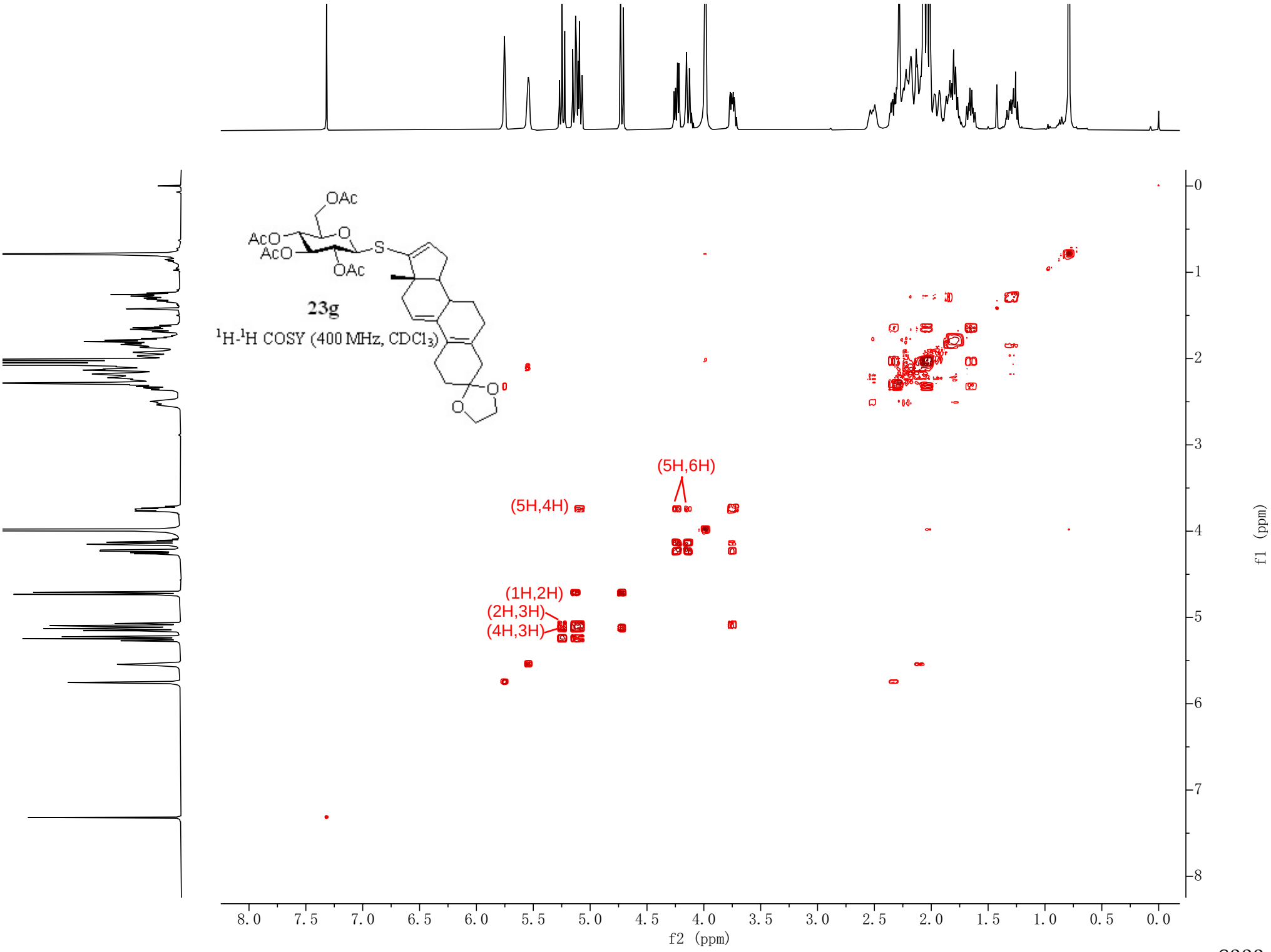

OAc
AcO
AcO
OAc
O
S
H
H
H
23f
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
(5H,6H)
(5H,4H)
(1H,2H)
(2H,3H)
(4H,3H)
f2 (ppm)
f1 (ppm)

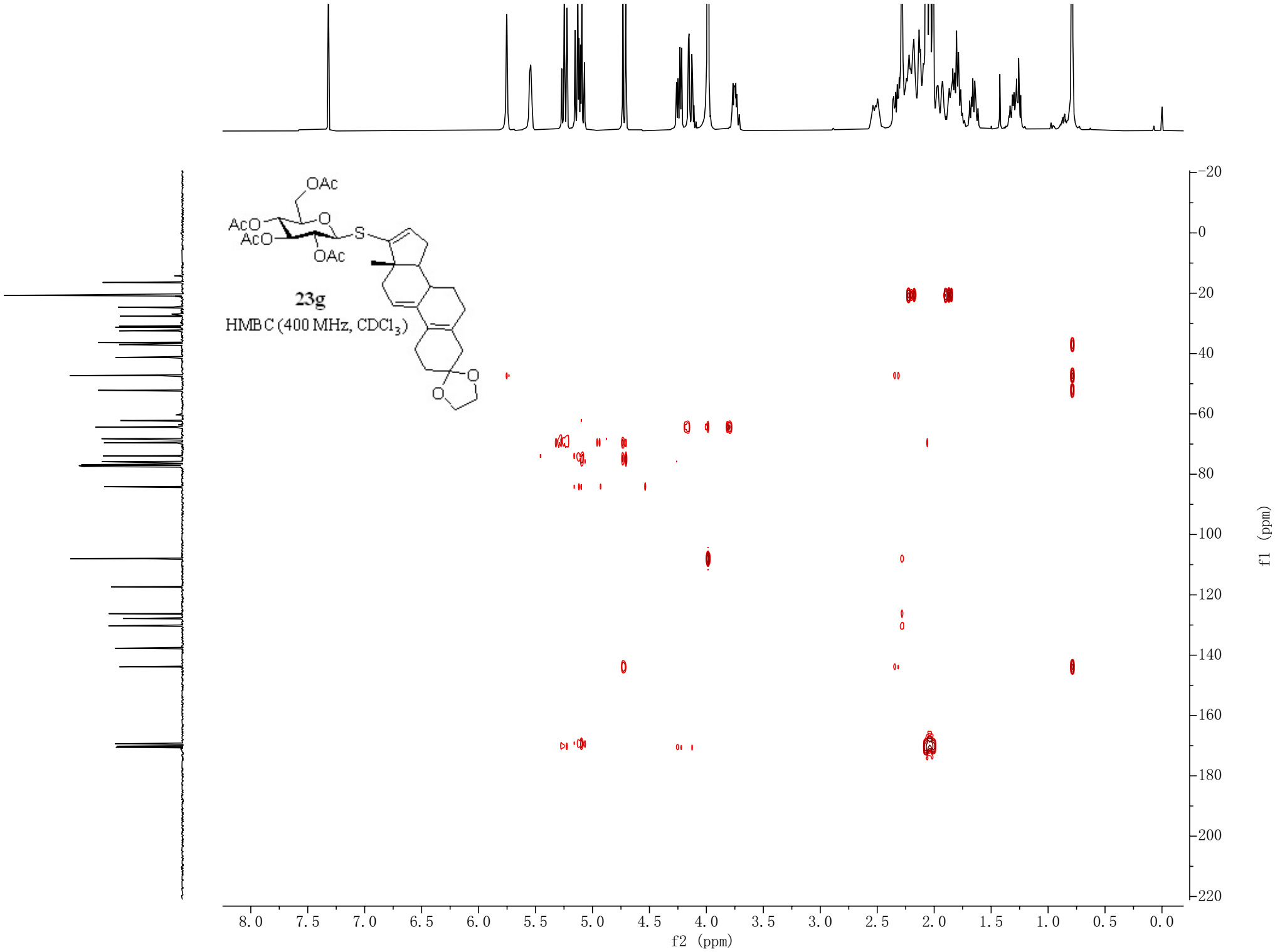

OAc
AcO
AcO
O
S
OAc
H
H
H
H
23f
HSQC (400 MHz, CDCl3)
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

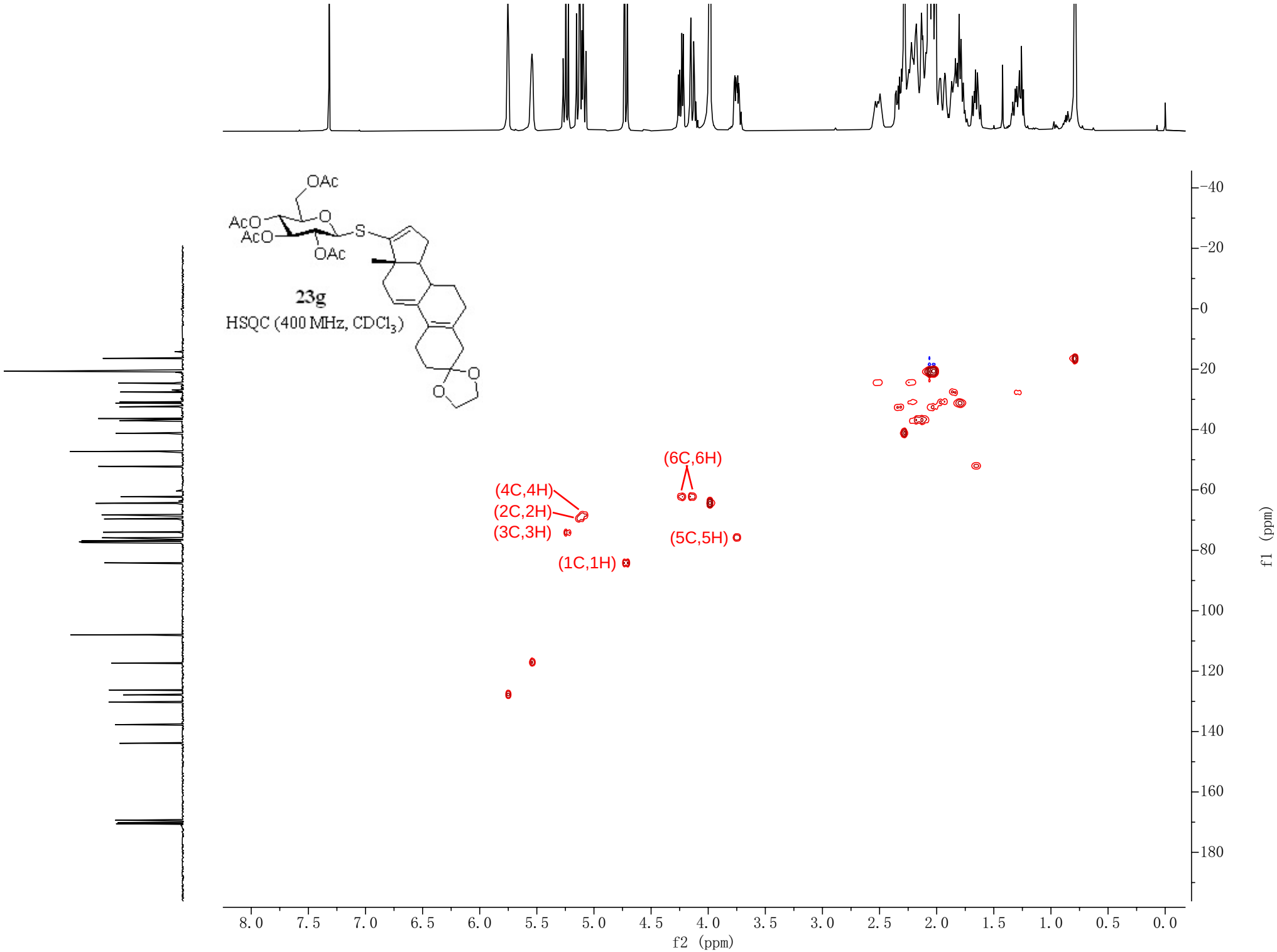

OAc
AcO
AcO
O
S
OAc
H
H
H
H
23f
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

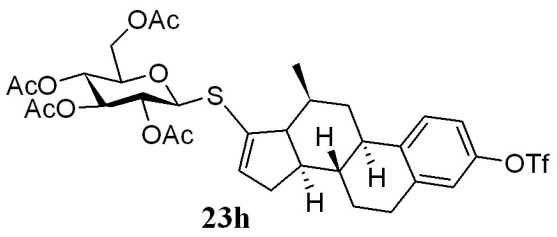

OAc
AcO
AcO
OAc
O
S
O
O
23g
^{1}H NMR (400 MHz, $CDCl_3$)
fl (ppm)


170.53
170.16
169.37
169.27
143.89
137.71
130.26
127.86
126.23
117.32
108.00
84.14
75.83
74.00
69.63
68.23
64.44
64.30
62.20
52.18
47.30
41.30
37.03
36.36
32.47
31.25
30.91
27.59
24.59
20.70
20.59
20.56
16.43
OAc
AcO
AcO
OAc
O
S
O
O
23g
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


OAc
AcO
AcO
O
S
OAc
23g
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
O
O
(5H,6H)
(5H,4H)
(1H,2H)
(2H,3H)
(4H,3H)
0
1
2
3
4
5
6
7
8
f1 (ppm)
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)

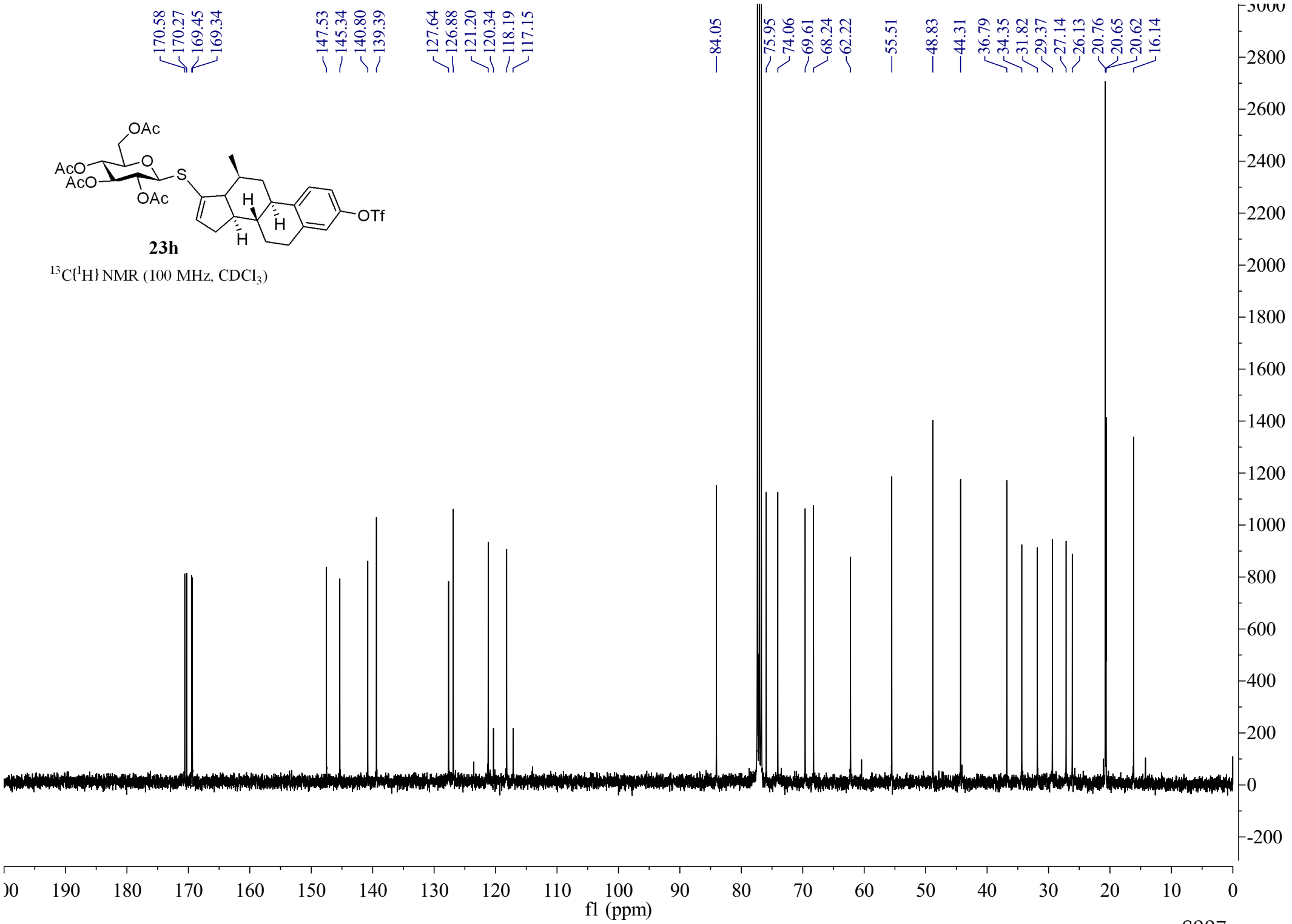

OAc
AcO
AcO
O
S
OAc
23g
HMBC (400 MHz, CDCl3)
O
O
f2 (ppm)
f1 (ppm)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-20
0
20
40
60
80
100
120
140
160
180
200
220

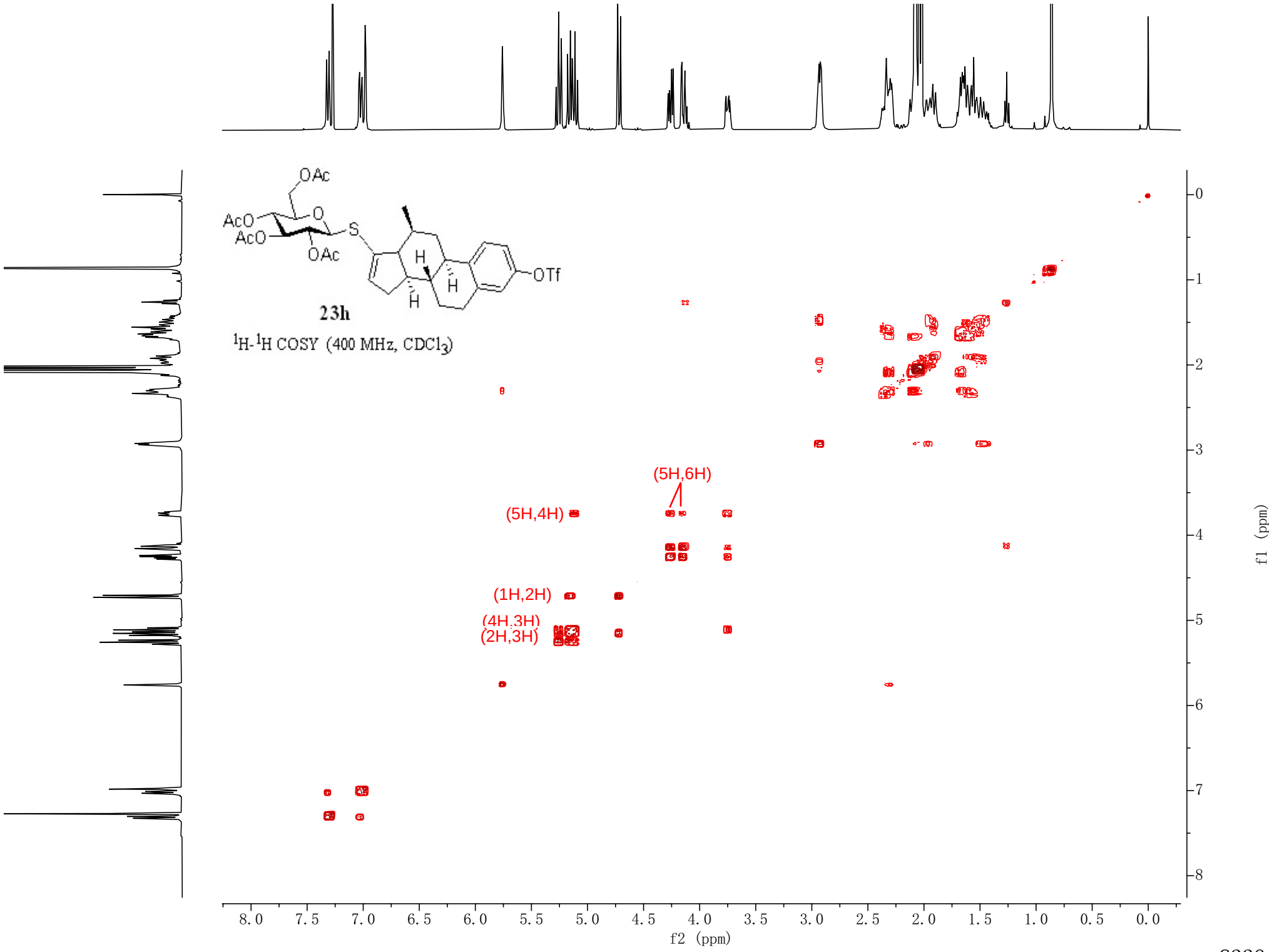

OAc
AcO
AcO
O
S
OAc
23g
HSQC (400 MHz, CDCl3)
O
O
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f1 (ppm)
f2 (ppm)

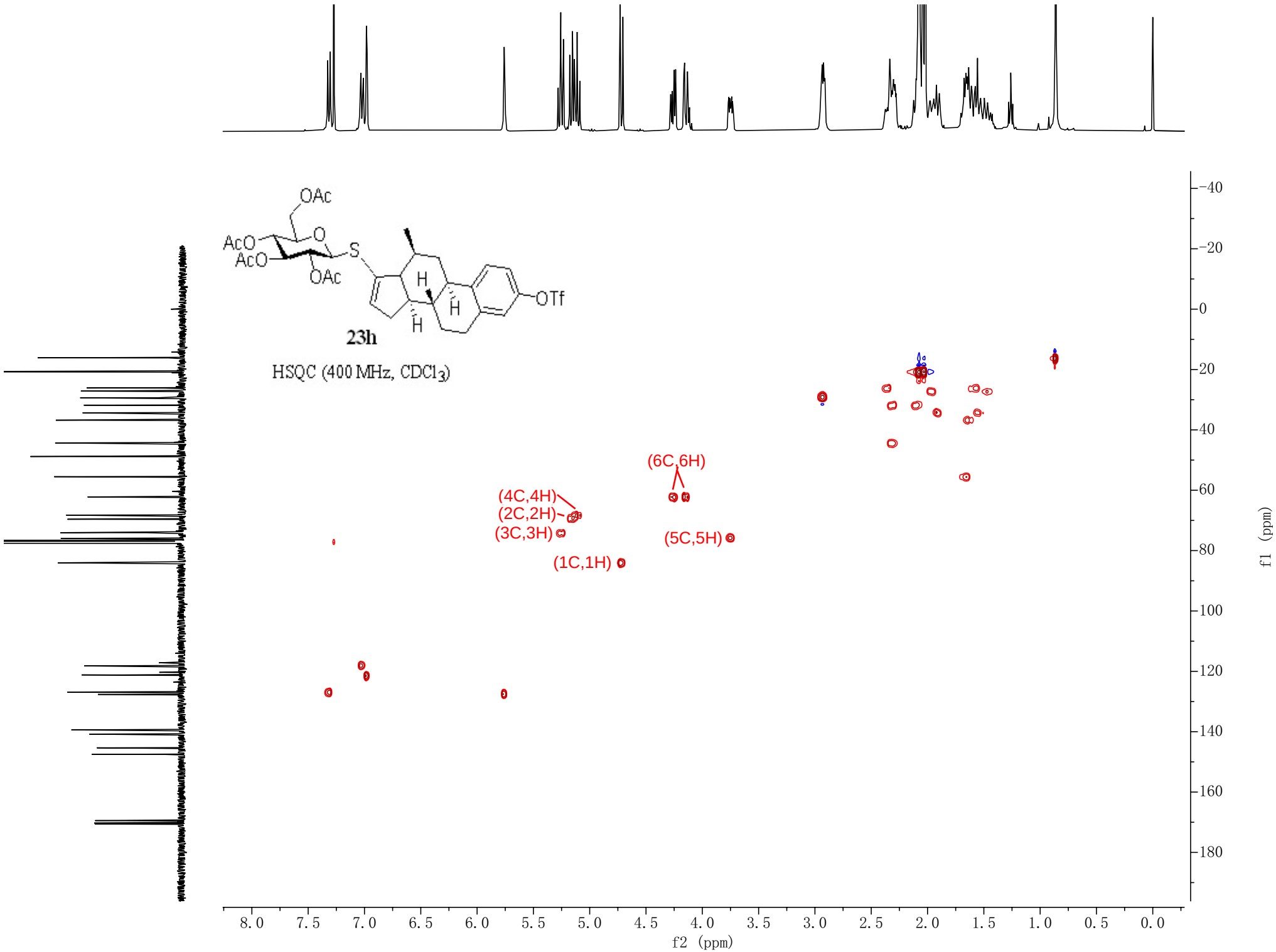


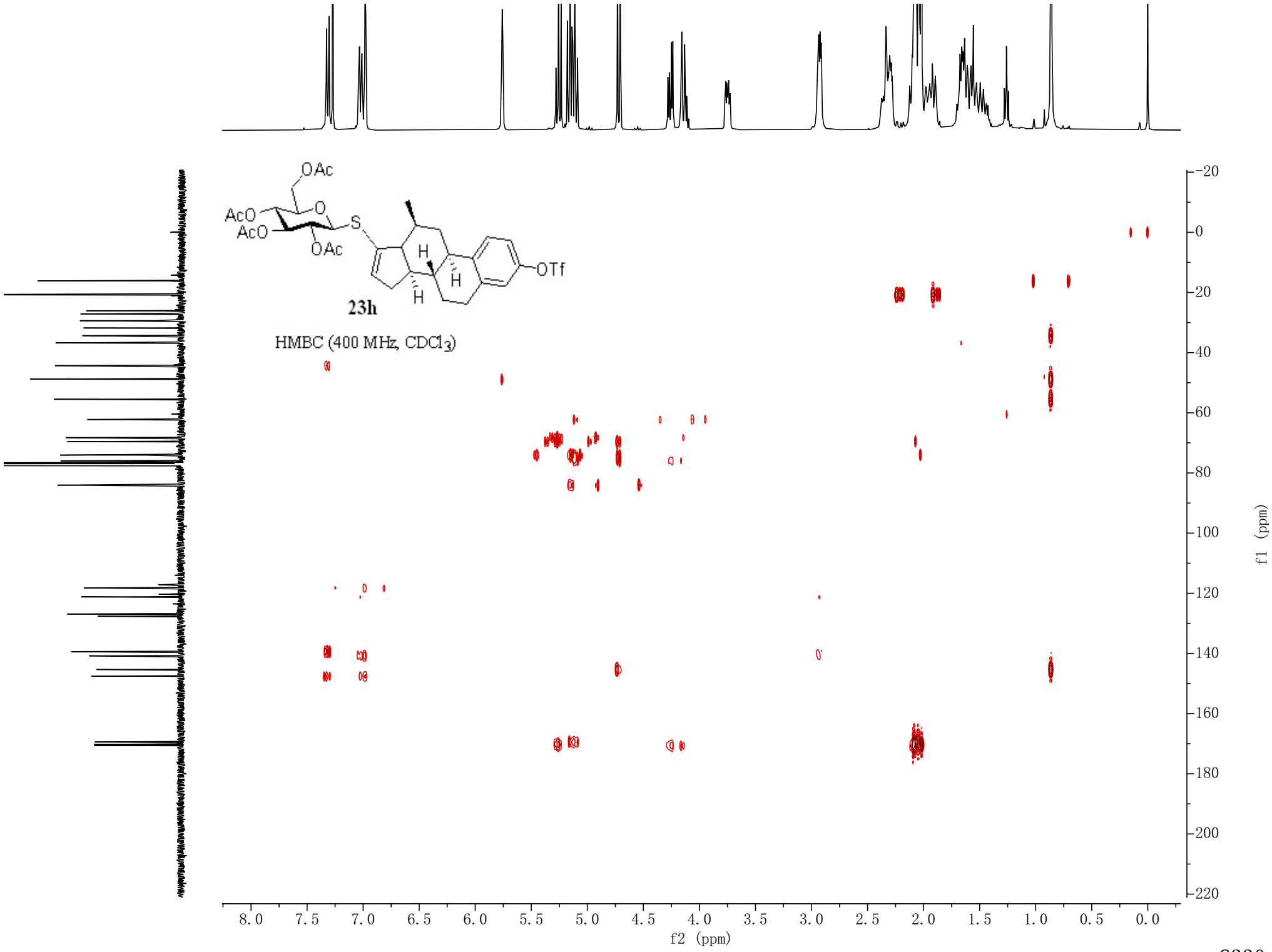
23h

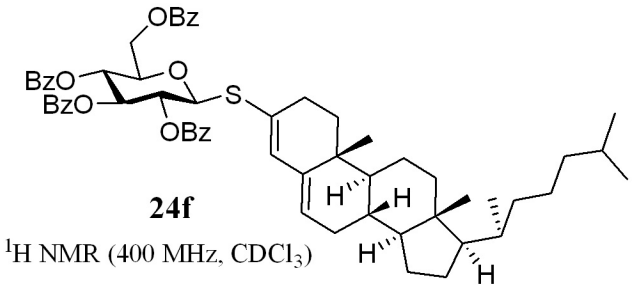
^{1}H NMR (400 MHz, $CDCl_3$)


170.58
170.27
169.45
169.34
147.53
145.34
140.80
139.39
127.64
126.88
121.20
120.34
118.19
117.15
84.05
75.95
74.06
69.61
68.24
62.22
55.51
48.83
44.31
36.79
34.35
31.82
29.37
27.14
26.13
20.76
20.65
20.62
16.14
OAc
AcO
AcO
OAc
O
S
H
H
H
OTf
23h
13C{1H} NMR (100 MHz, CDCl3)
fl (ppm)


OAc
AcO
AcO
O
OAc
S
H
H
H
OTf
23h
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
(5H,6H)
(5H,4H)
(1H,2H)
(4H,3H)
(2H,3H)
f1 (ppm)
f2 (ppm)
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

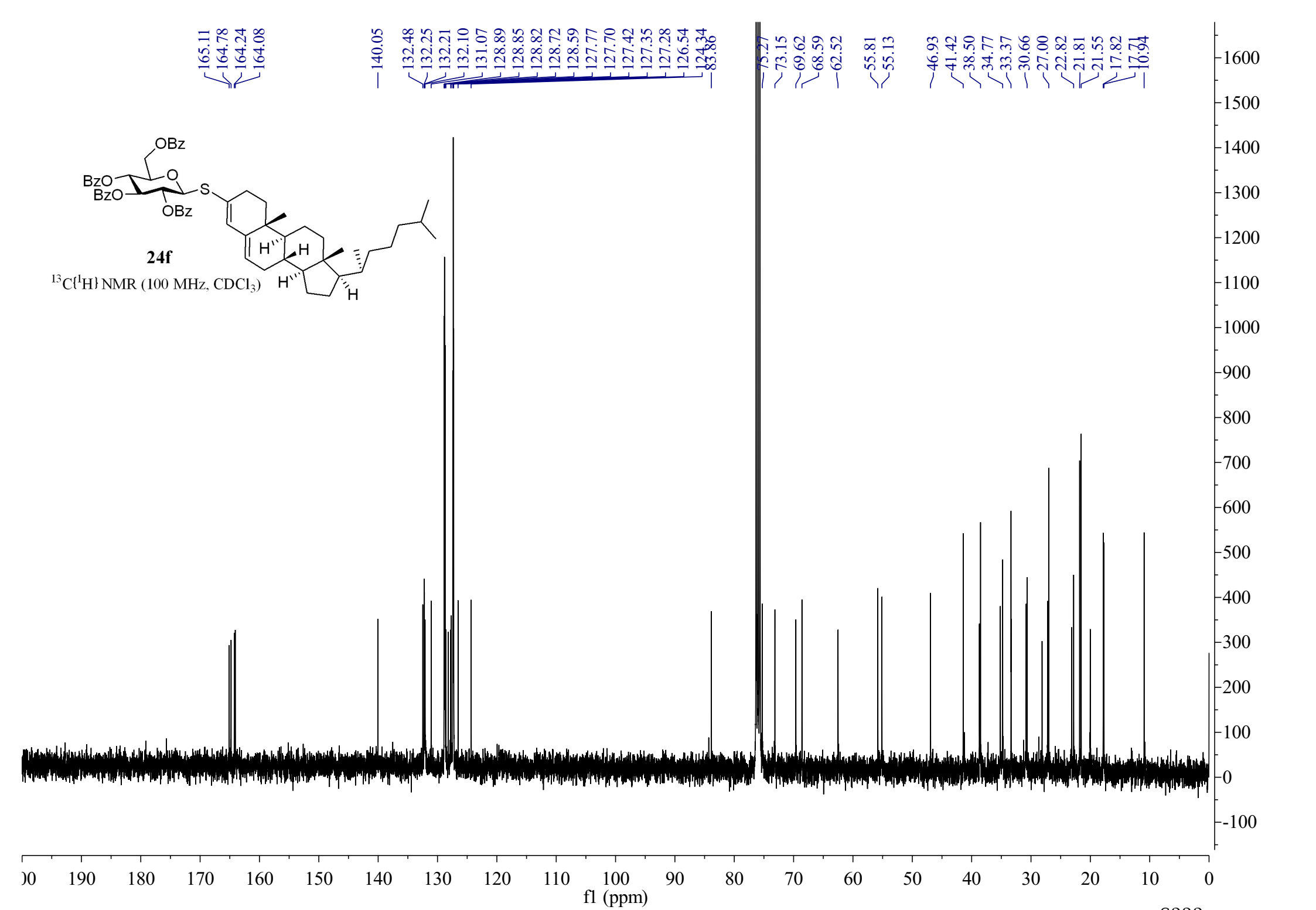

OAc
AcO
AcO
O
S
OAc
H
H
H
OTf
23h
HSQC (400 MHz, CDCl3)
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

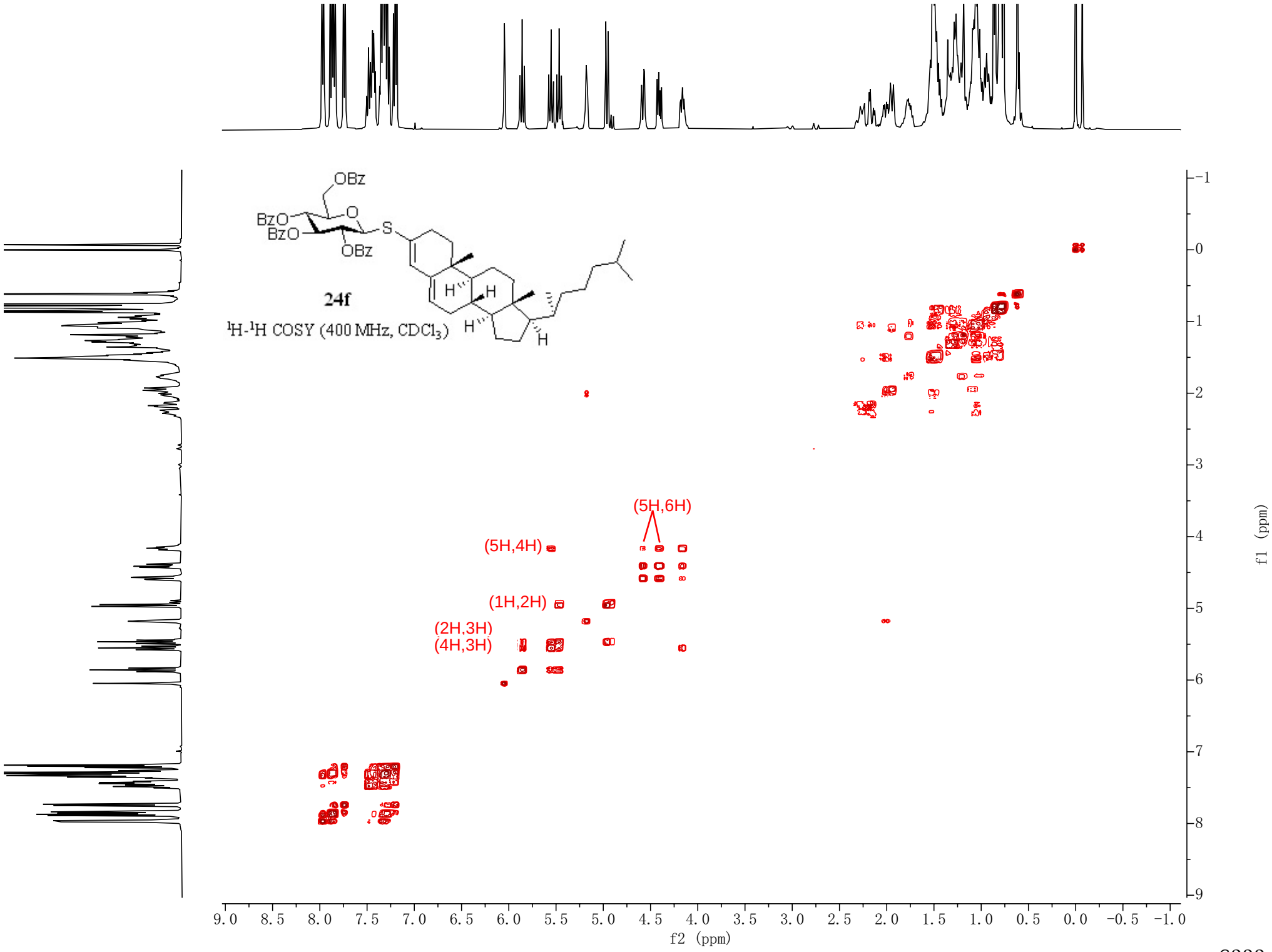

OAc
AcO
AcO
O
S
OAc
H
H
H
OTf
23h
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

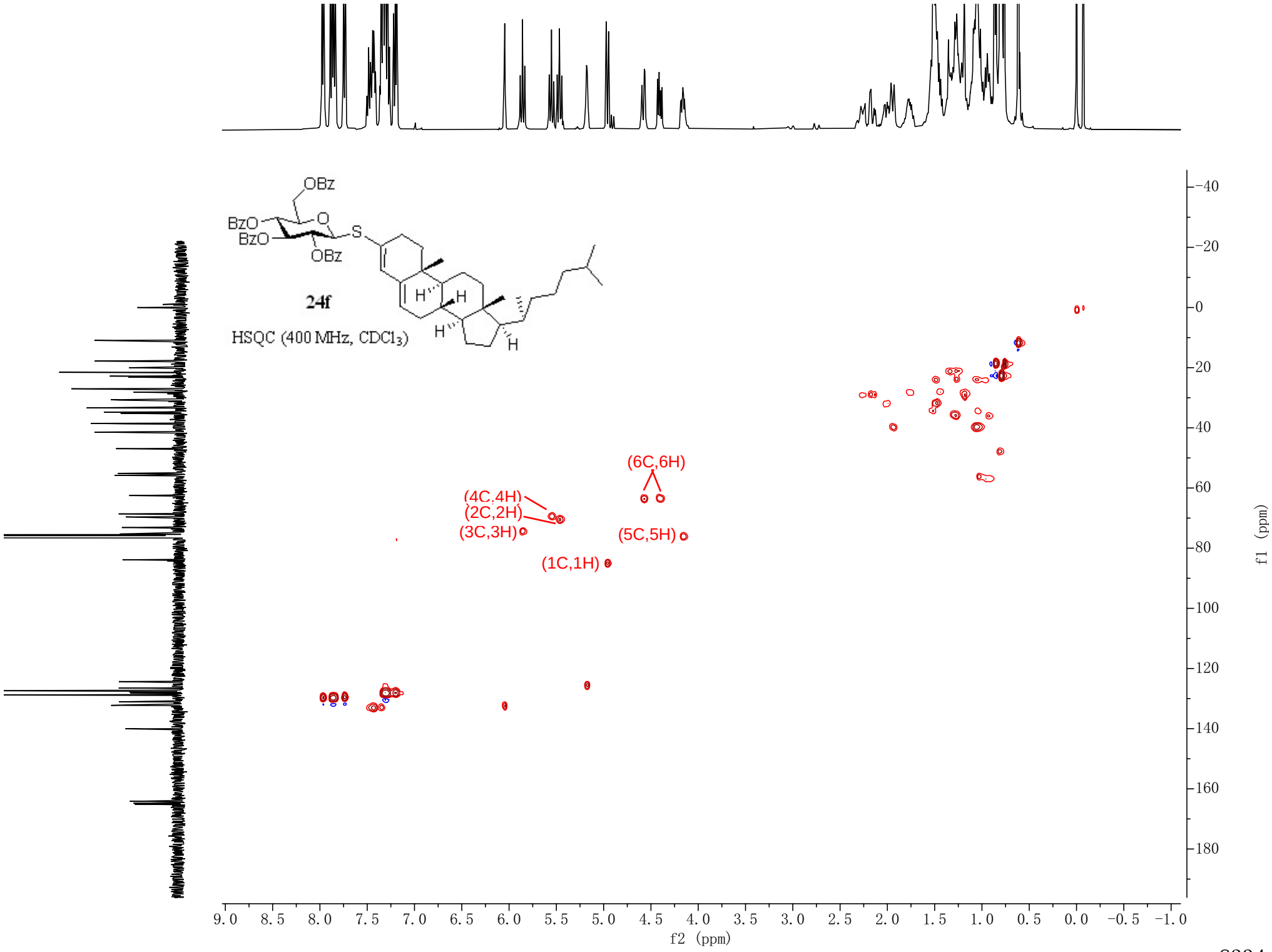


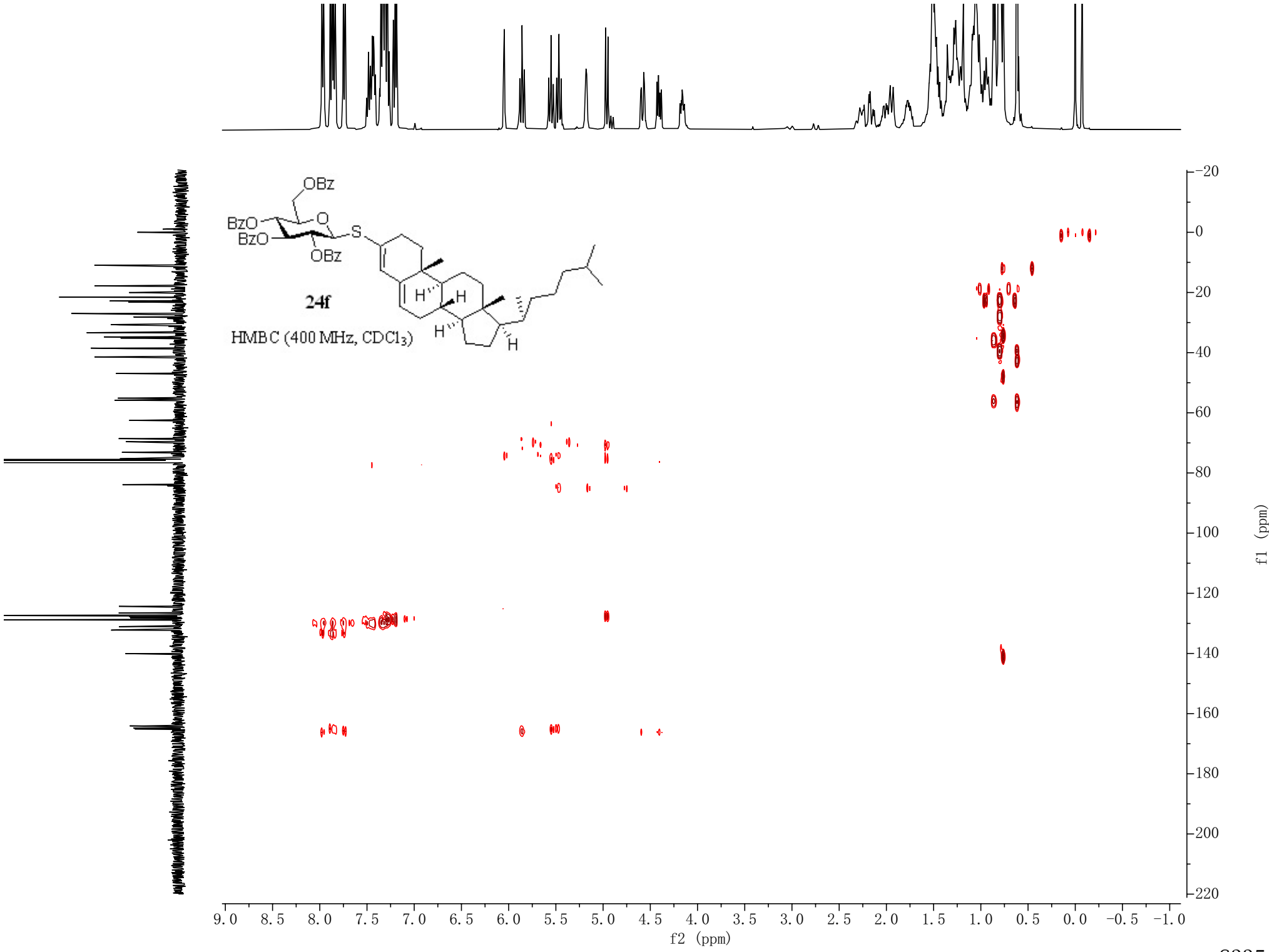
24f

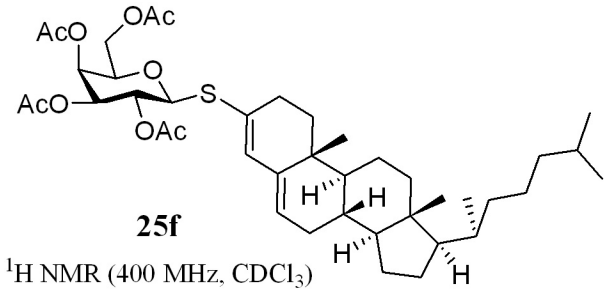
^{1}H NMR (400 MHz, $CDCl_3$)


165.11
164.78
164.24
164.08
140.05
132.48
132.25
132.21
132.10
131.07
128.89
128.85
128.82
128.72
128.59
127.77
127.70
127.42
127.35
127.28
126.54
124.34
83.86
75.27
73.15
69.62
68.59
62.52
55.81
55.13
46.93
41.42
38.50
34.77
33.37
30.66
27.00
22.82
21.81
21.55
17.82
17.71
10.94
OBz
BzO
BzO
OBz
O
S
H
H
H
H
24f
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


OBz
BzO
BzO
O
S
OBz
H
H
H
H
24f
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
(5H,6H)
(5H,4H)
(1H,2H)
(2H,3H)
(4H,3H)
f1 (ppm)
f2 (ppm)

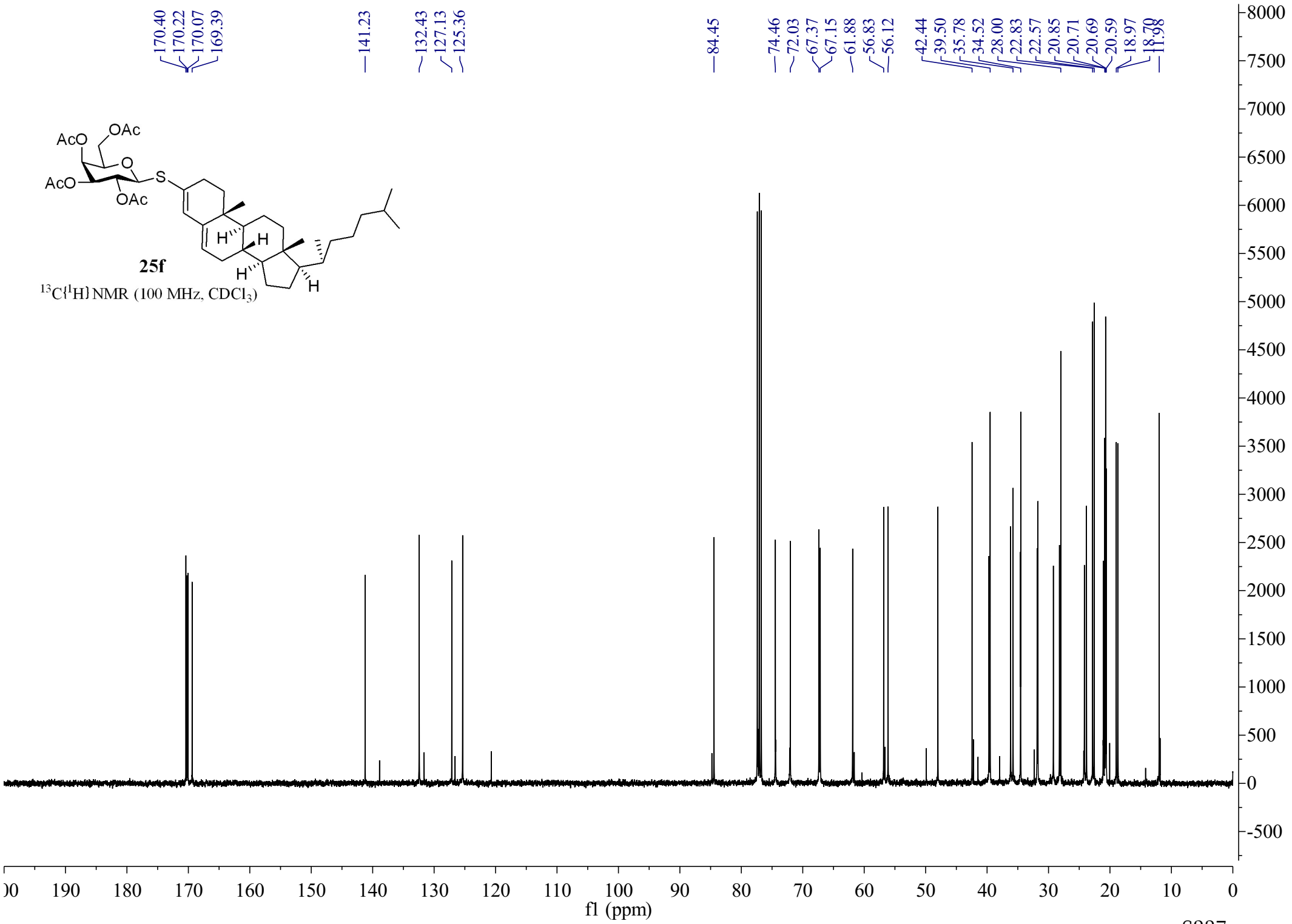

OBz
BzO
BzO
O
S
OBz
24f
HSQC (400 MHz, CDCl3)
H
H
H
H
(6C,6H)
(4C,4H)
(2C,2H)
(3C,3H)
(5C,5H)
(1C,1H)
f1 (ppm)
f2 (ppm)
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
-40 -20 0 20 40 60 80 100 120 140 160 180

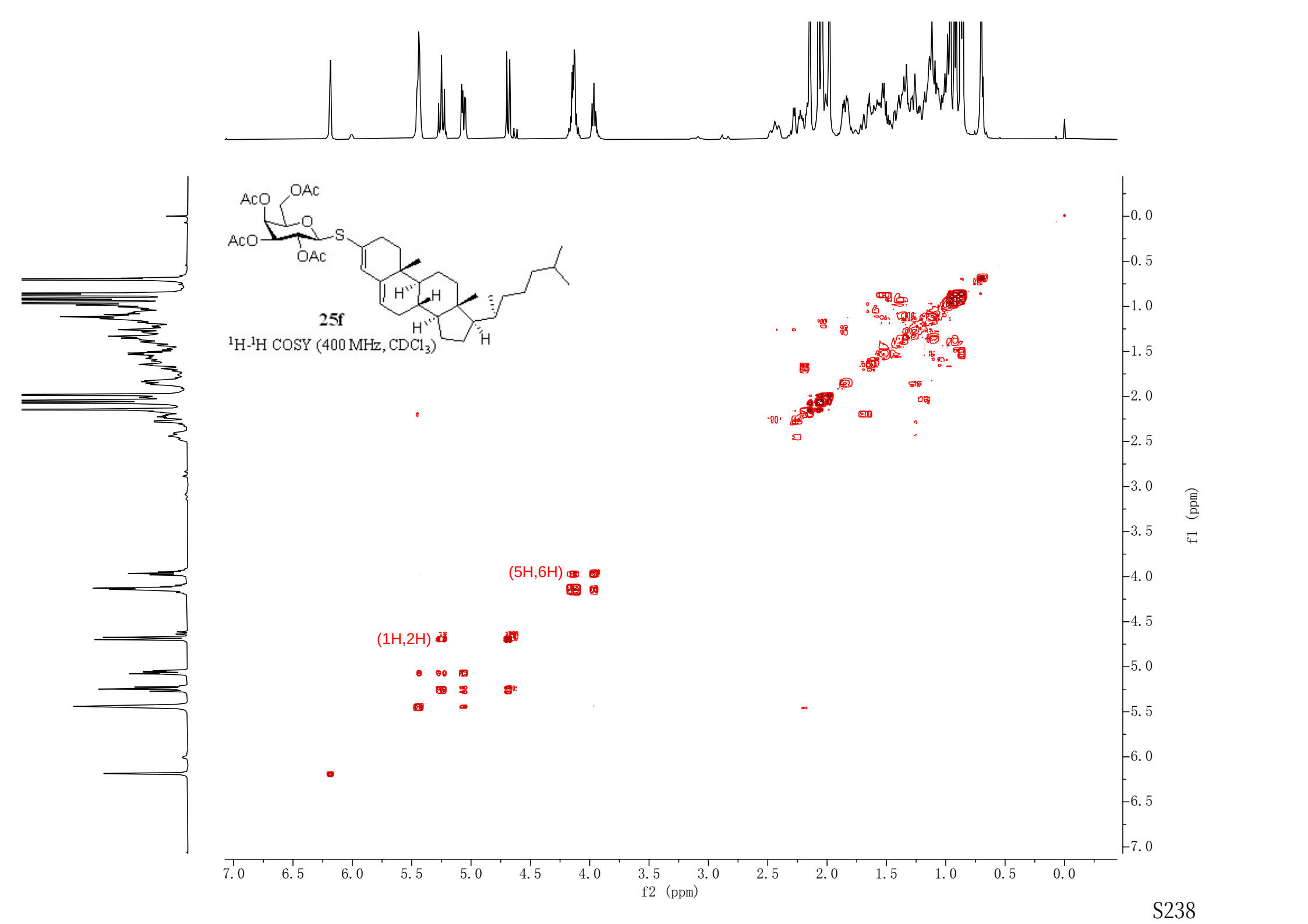

OBz
BzO
BzO
O
S
OBz
24f
HMBC (400 MHz, CDCl3)
H
H
H
H
f2 (ppm)
f1 (ppm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-20
0
20
40
60
80
100
120
140
160
180
200
220

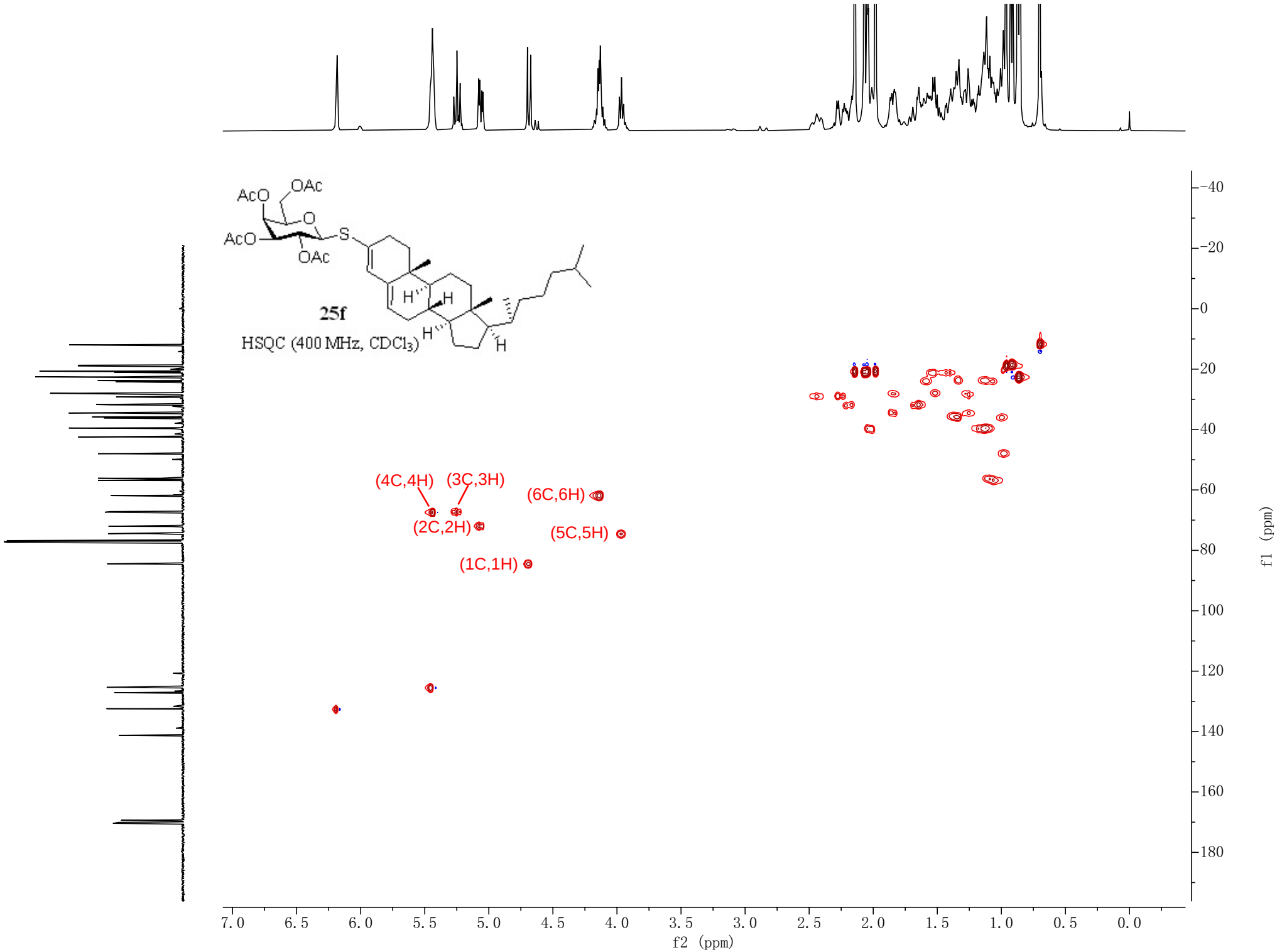


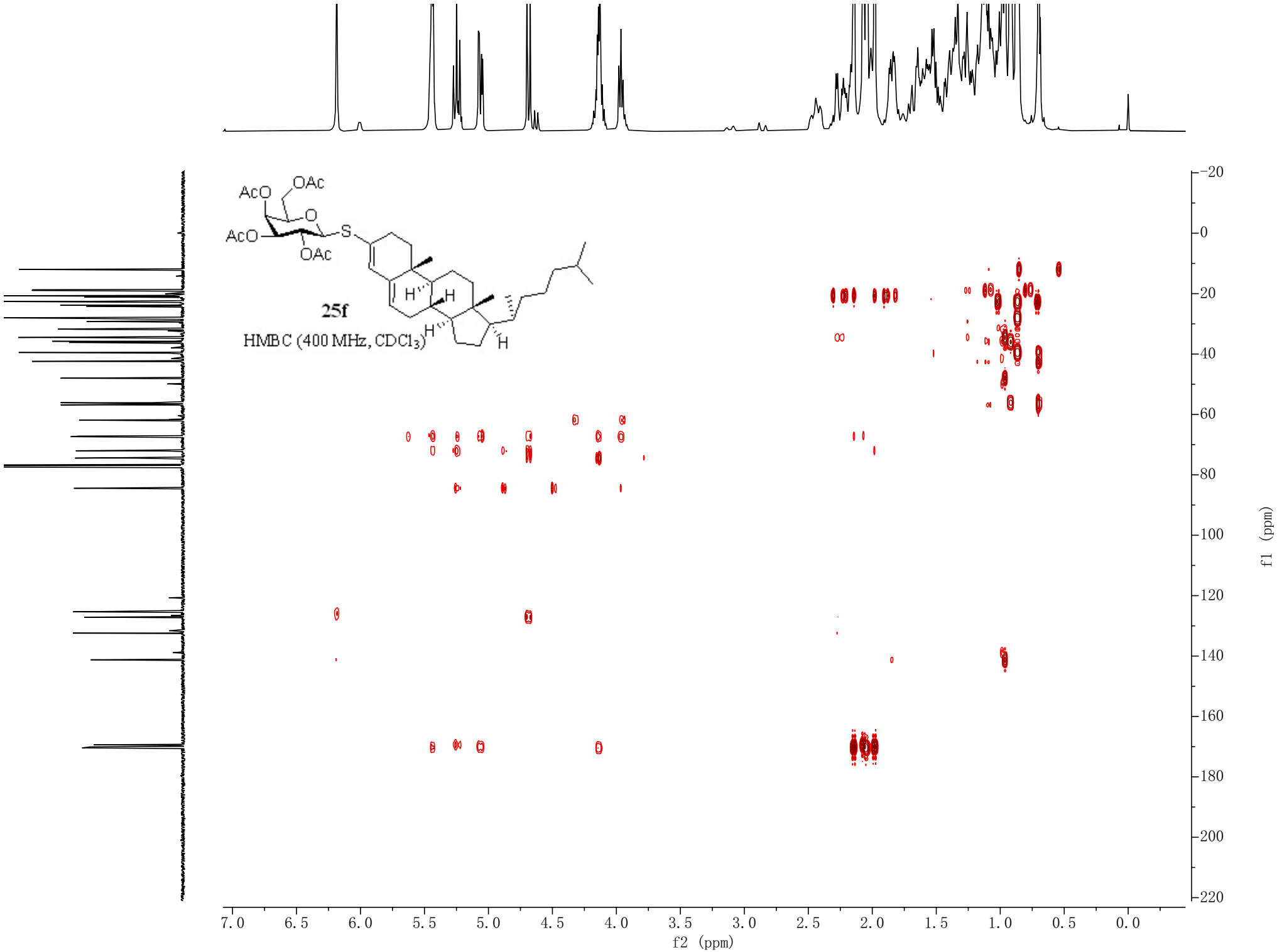
25f

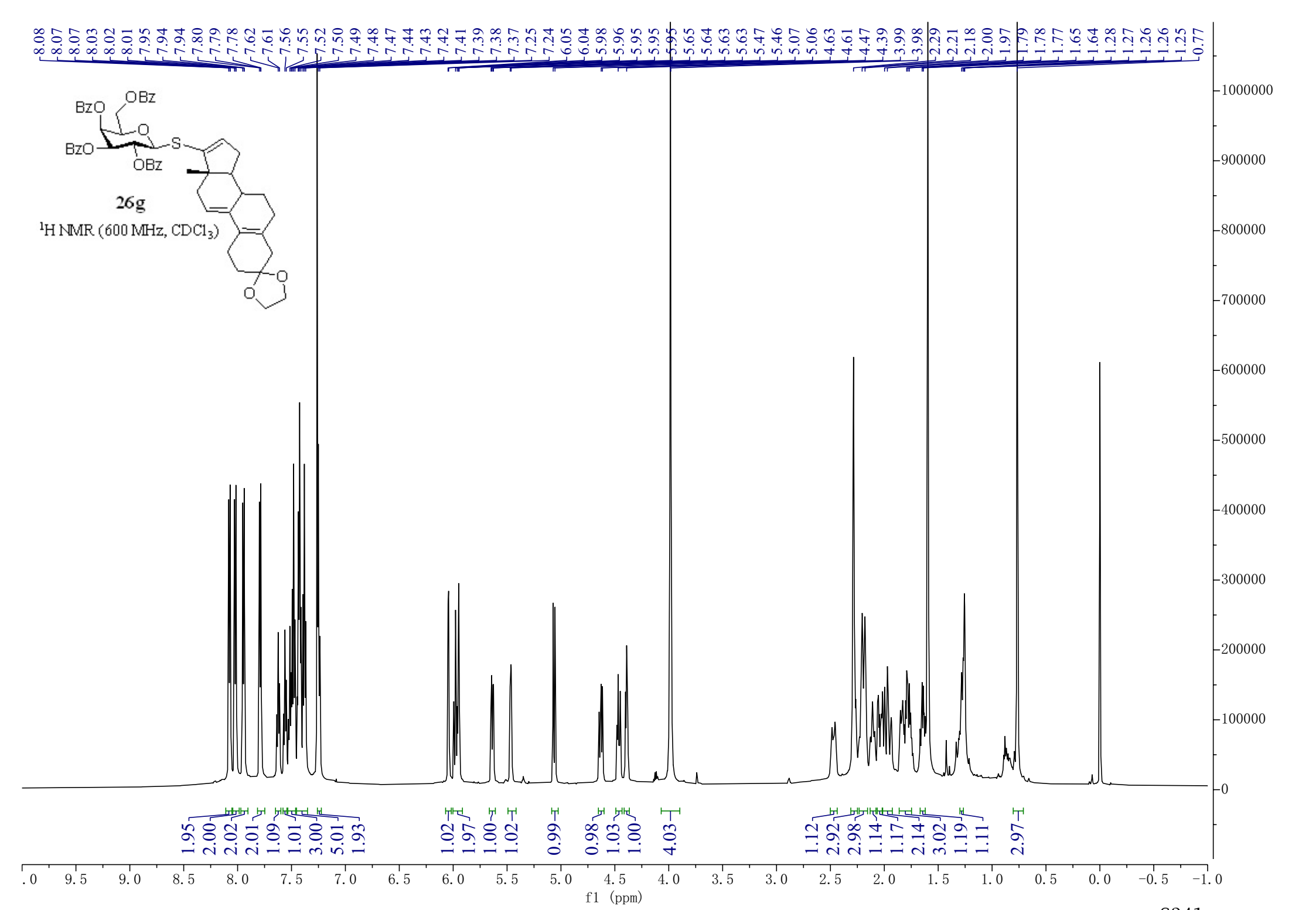
^{1}H NMR (400 MHz, $CDCl_3$)

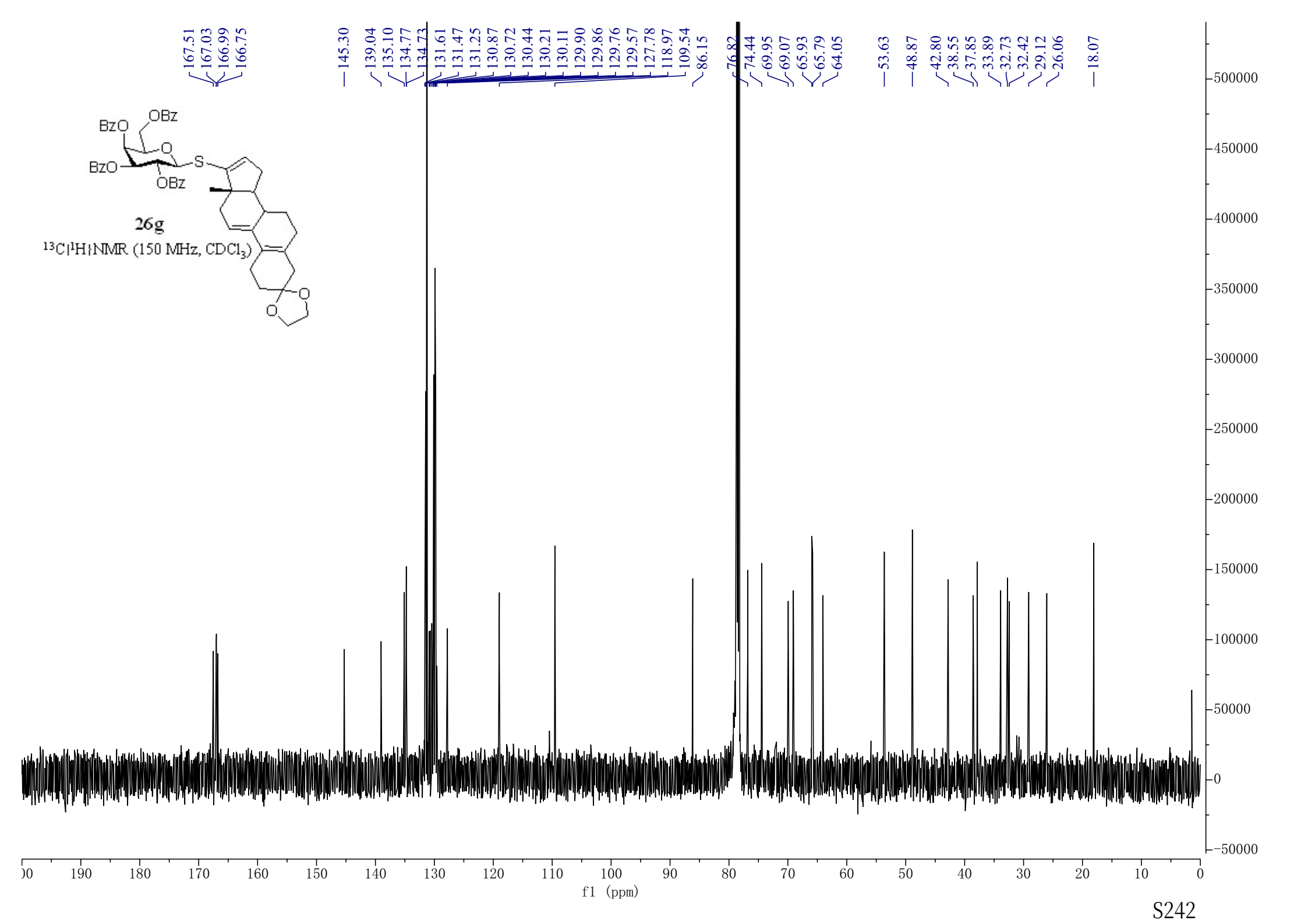

170.40
170.22
170.07
169.39
141.23
132.43
127.13
125.36
84.45
74.46
72.03
67.37
67.15
61.88
56.83
56.12
42.44
39.50
35.78
34.52
28.00
22.83
22.57
20.85
20.71
20.69
20.59
18.97
18.70
11.98
AcO
OAc
AcO
OAc
O
S
H
H
H
H
25f
13C{1H} NMR (100 MHz, CDCl3)
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

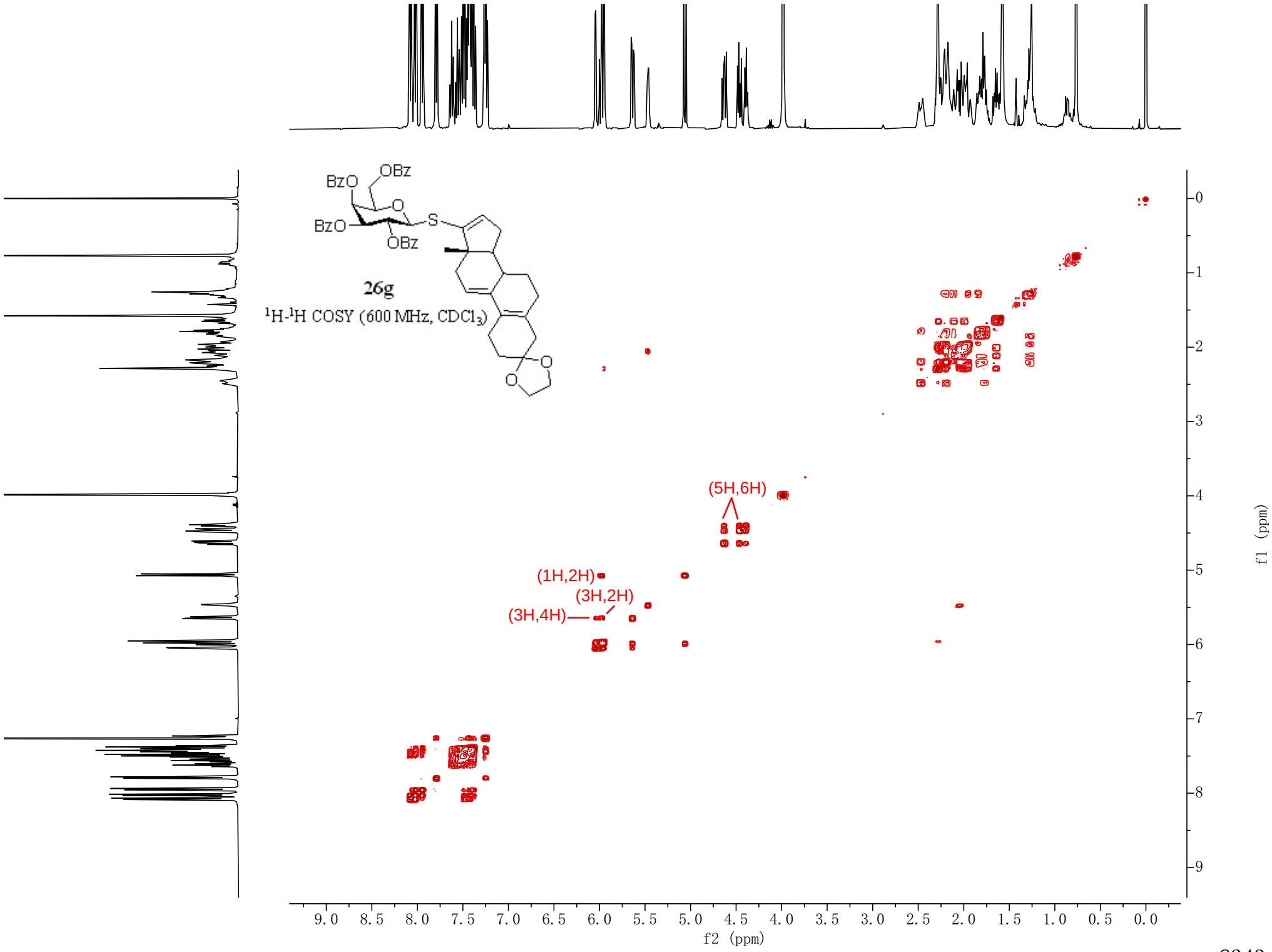

AcO
OAc
O
AcO
S
OAc
H
H
H
H
25f
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
(5H,6H)
(1H,2H)
f2 (ppm)
f1 (ppm)
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

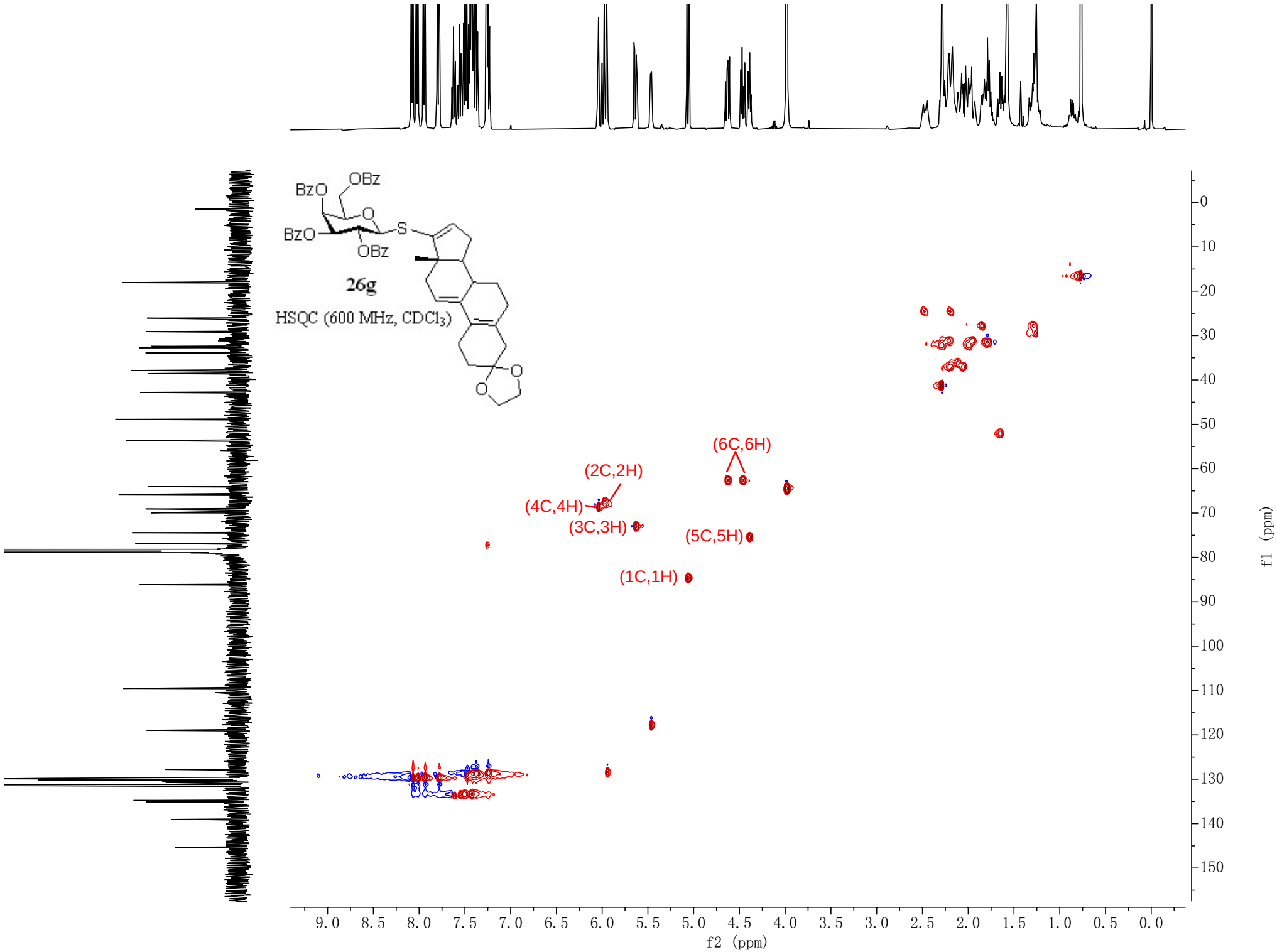

AcO
OAc
O
AcO
S
OAc
H
H
H
H
25f
HSQC (400 MHz, CDCl3)
(4C,4H)
(3C,3H)
(6C,6H)
(2C,2H)
(5C,5H)
(1C,1H)
-40
-20
0
20
40
60
80
100
120
140
160
180
f1 (ppm)
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)

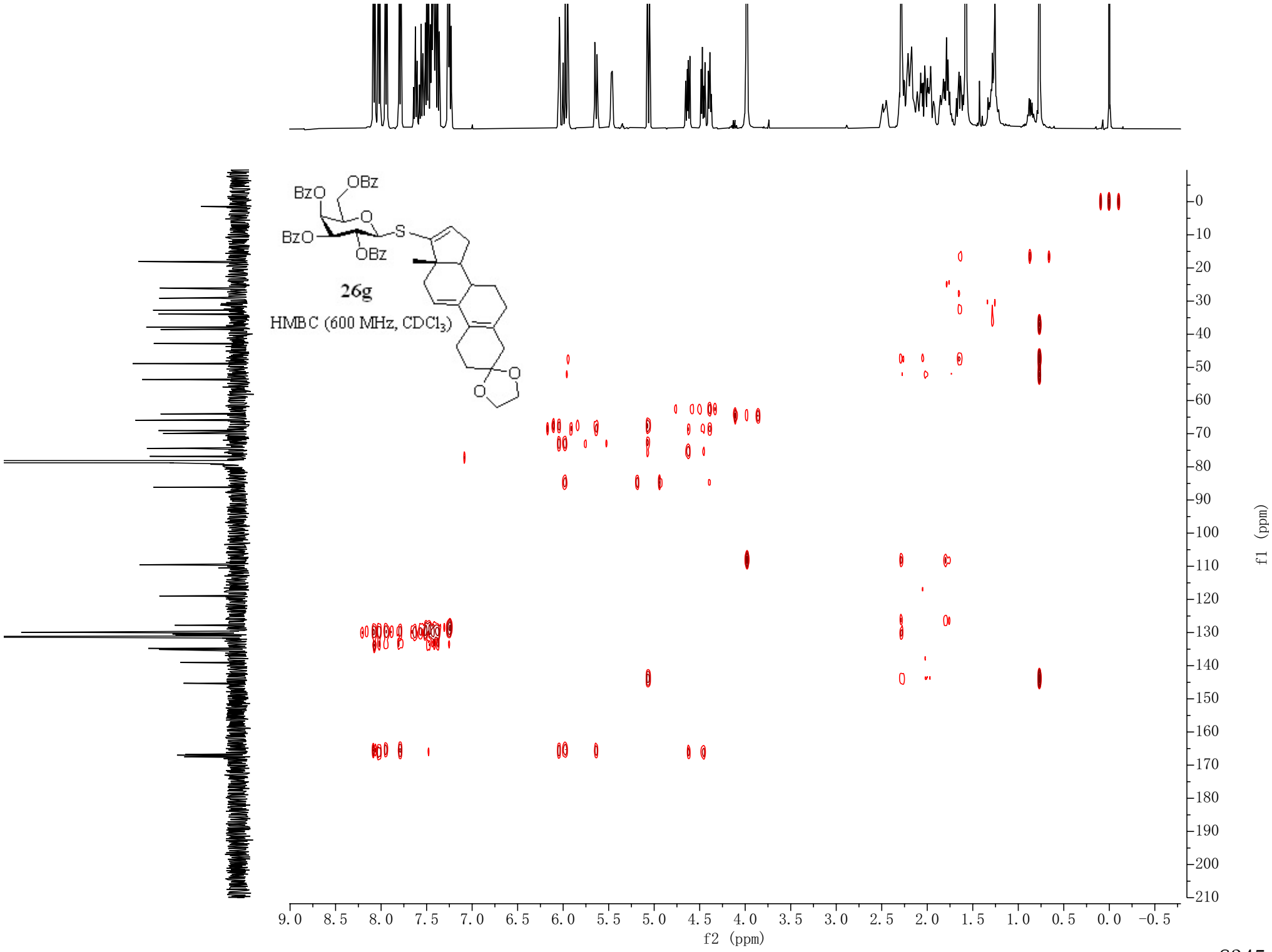

AcO
OAc
O
AcO
S
OAc
H
H
H
H
25f
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)

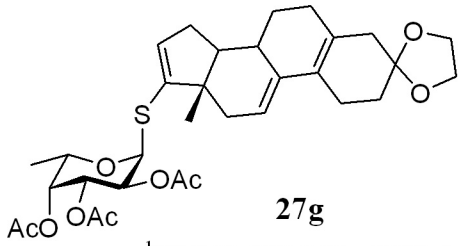

BzO
OBz
O
BzO
S
OBz
O
O
26g
^{1}H NMR (600 MHz, $CDCl_3$)
f1 (ppm)


167.51
167.03
166.99
166.75
145.30
139.04
135.10
134.77
134.73
131.61
131.47
131.25
130.87
130.72
130.44
130.21
130.11
129.90
129.86
129.76
129.57
127.78
118.97
109.54
86.15
76.82
74.44
69.95
69.07
65.93
65.79
64.05
53.63
48.87
42.80
38.55
37.85
33.89
32.73
32.42
29.12
26.06
18.07
BzO
OBz
BzO
OBz
O
S
O
O
26g
$^{13}C\{^{1}H\}$NMR (150 MHz, $CDCl_3$)
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
−50000
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


BzO
OBz
BzO
OBz
O
S
O
O
26g
^{1}H-^{1}H COSY (600 MHz, CDCl$_3$)
(5H,6H)
(1H,2H)
(3H,2H)
(3H,4H)
f2 (ppm)
f1 (ppm)

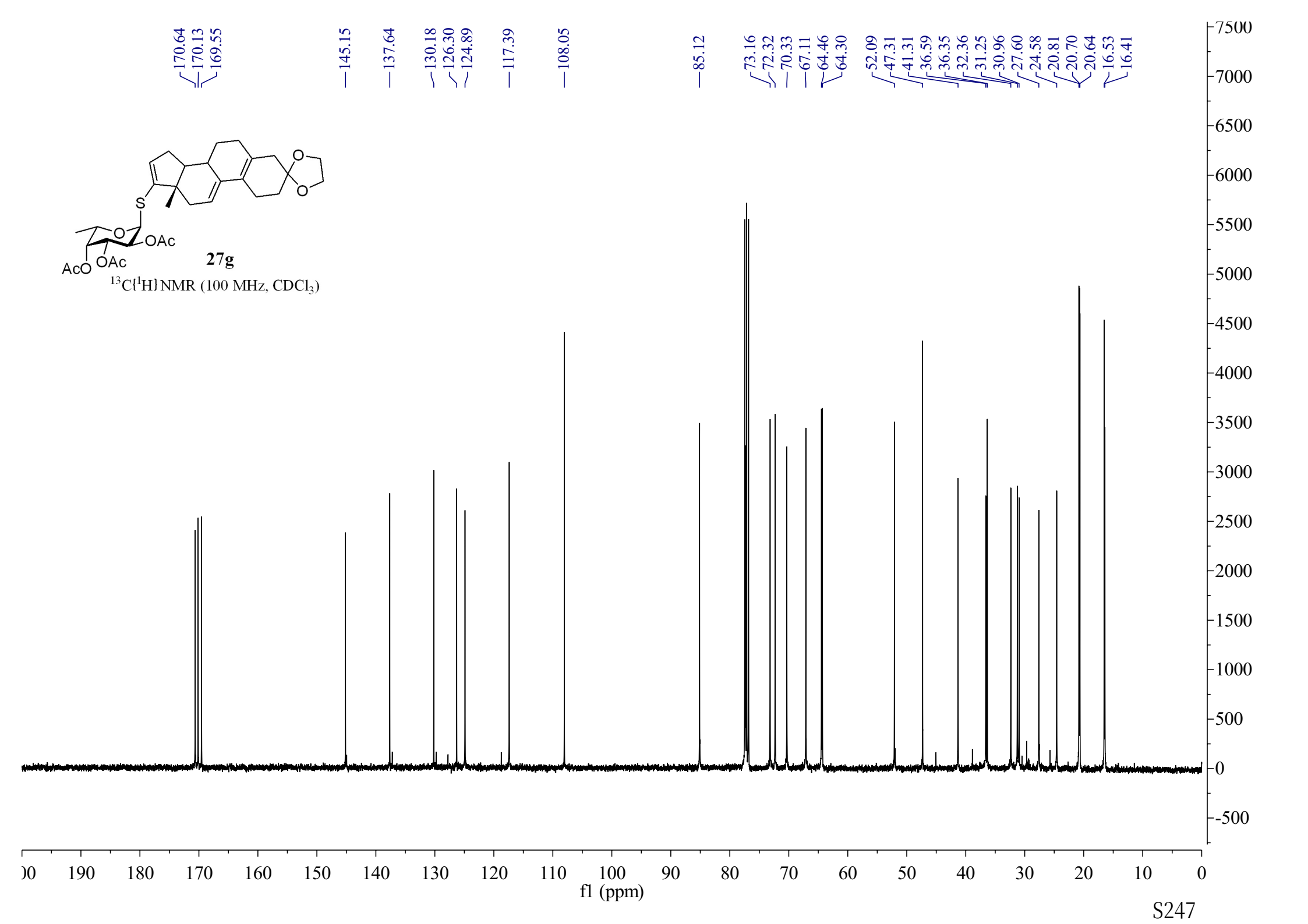

BzO
OBz
O
BzO
S
OBz
26g
HSQC (600 MHz, CDCl3)
O
O
(6C,6H)
(2C,2H)
(4C,4H)
(3C,3H)
(5C,5H)
(1C,1H)
f1 (ppm)
f2 (ppm)

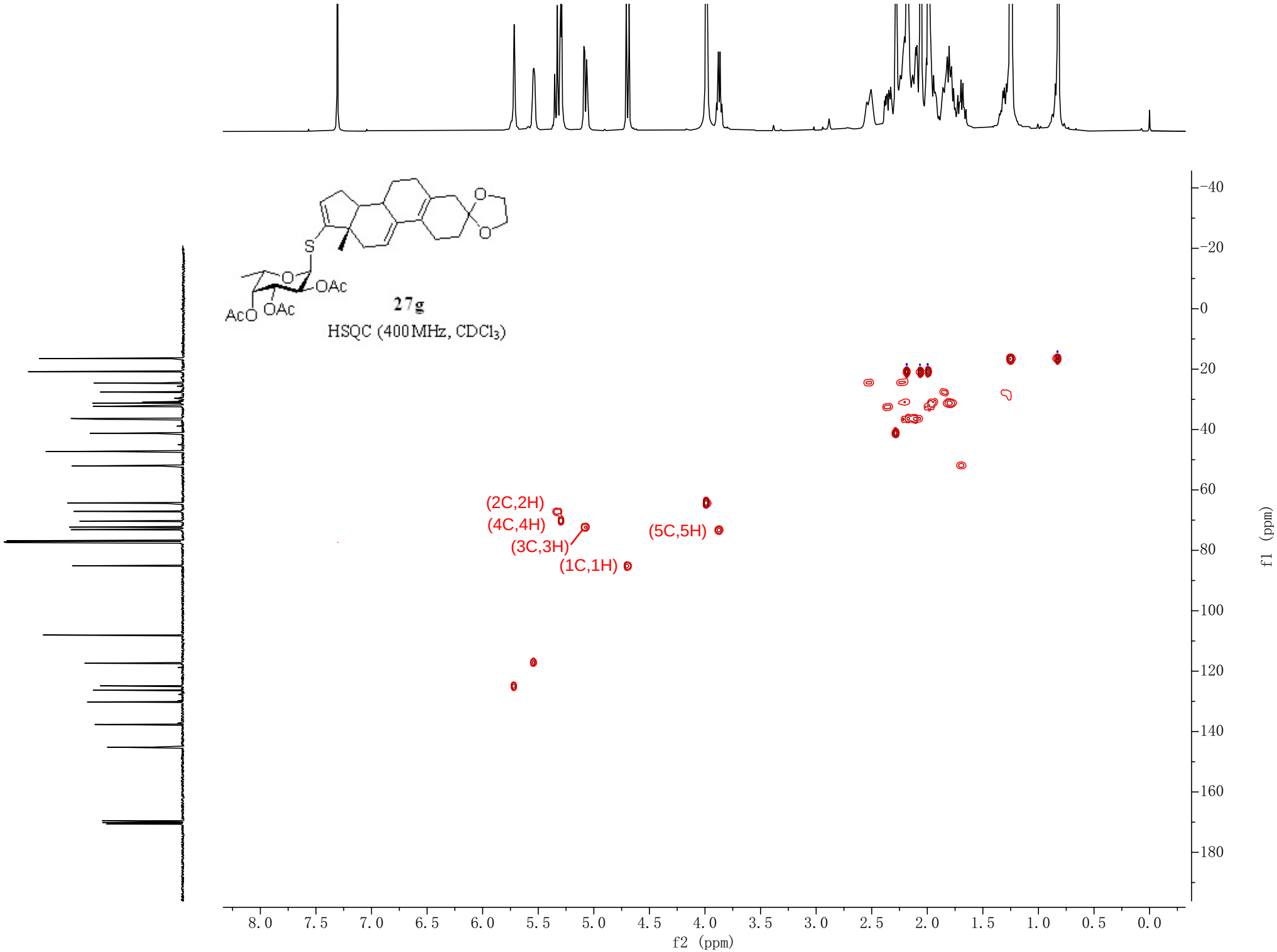

BzO
OBz
O
BzO
S
OBz
26g
HMBC (600 MHz, CDCl3)
O
O
f2 (ppm)
f1 (ppm)

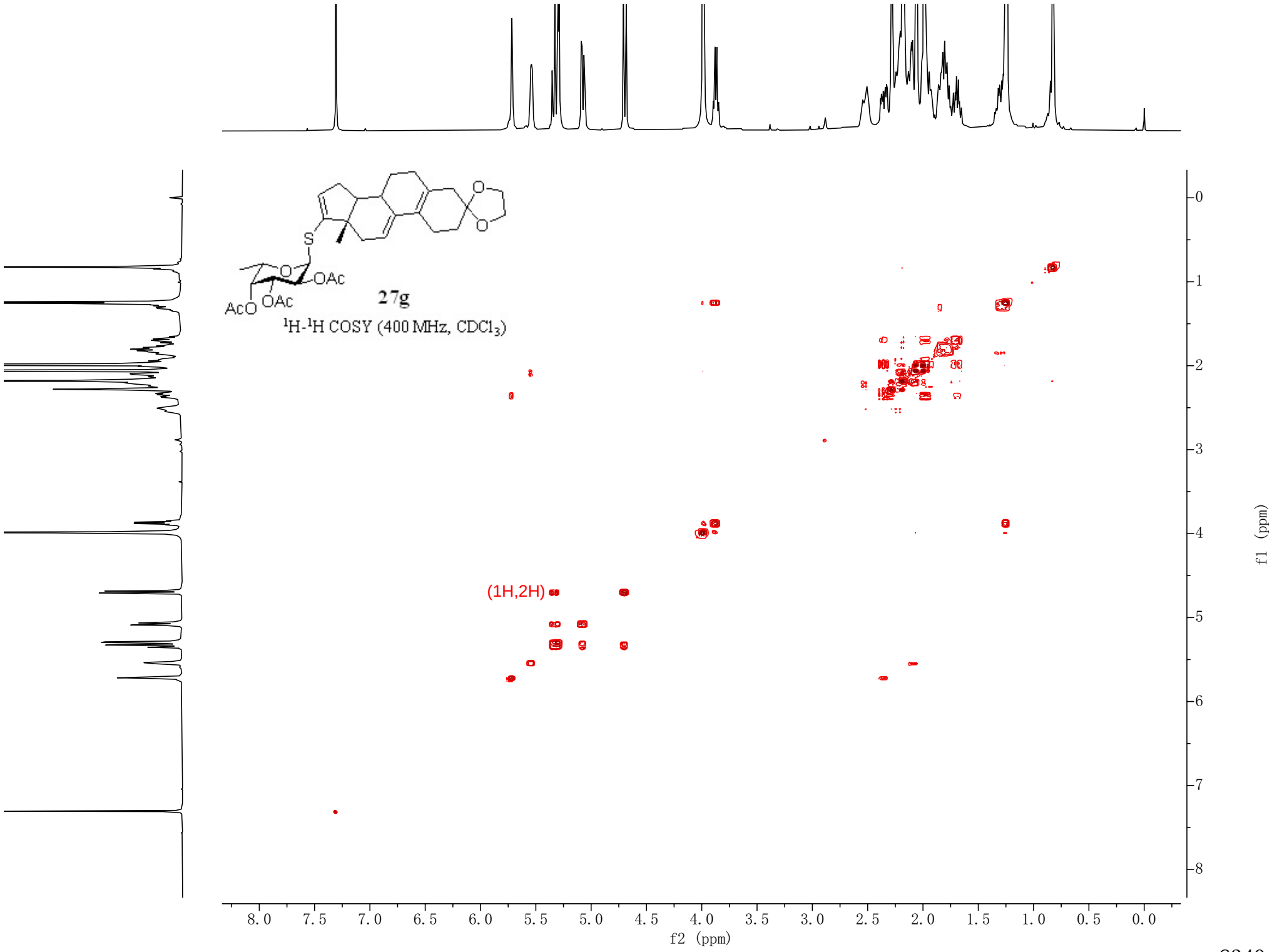


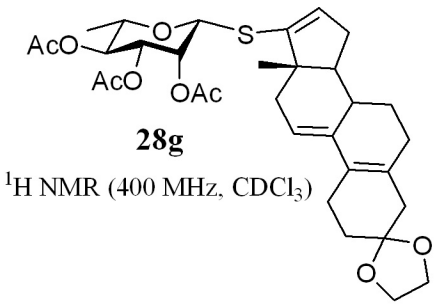
27g

^{1}H NMR (400 MHz, $CDCl_3$)


170.64
170.13
169.55
145.15
137.64
130.18
126.30
124.89
117.39
108.05
85.12
73.16
72.32
70.33
67.11
64.46
64.30
52.09
47.31
41.31
36.59
36.35
32.36
31.25
30.96
27.60
24.58
20.81
20.70
20.64
16.53
16.41
S
O
OAc
AcO
OAc
27g
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)
fl (ppm)

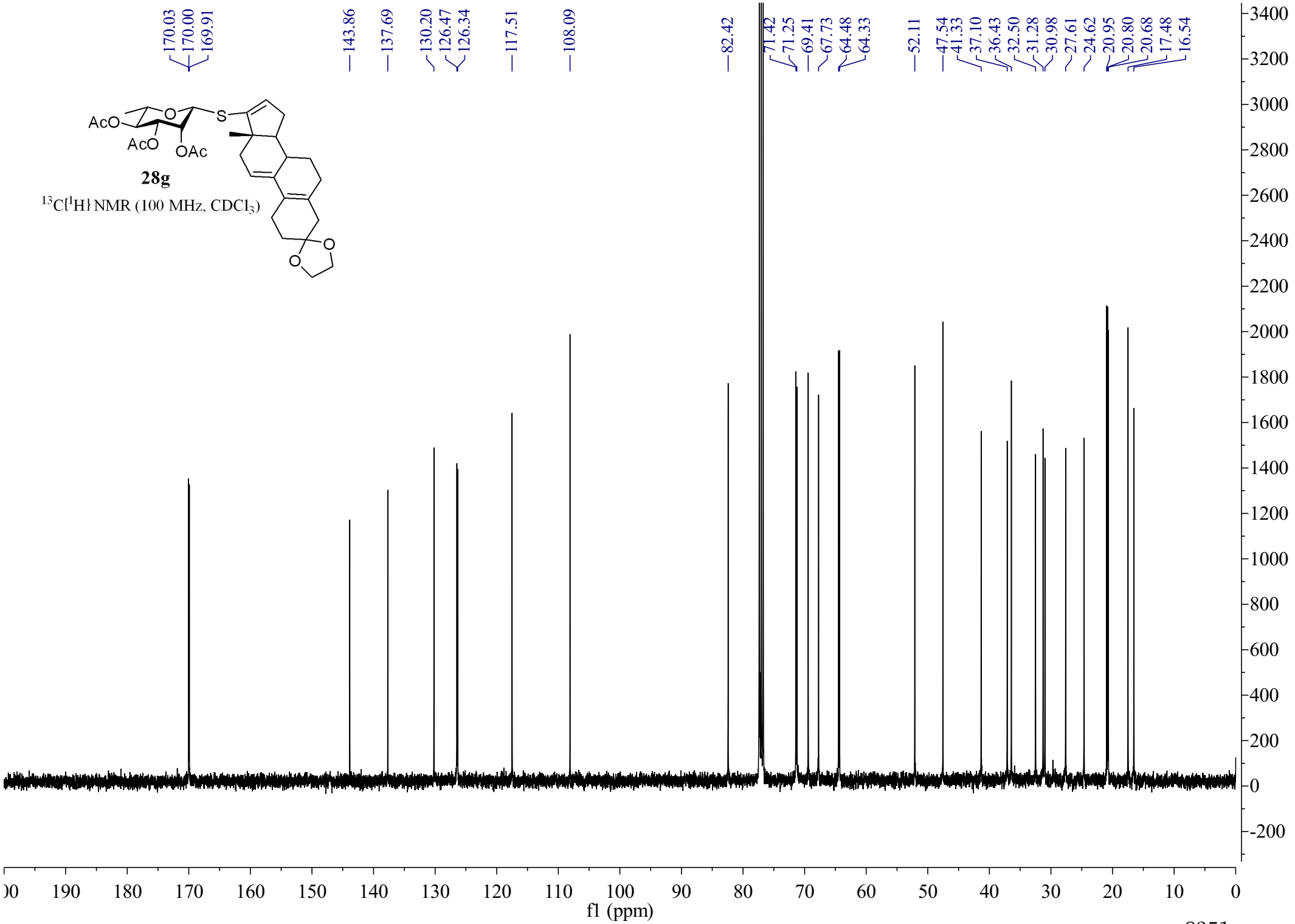

27g
HSQC (400MHz, CDCl3)
(2C,2H)
(4C,4H)
(3C,3H)
(1C,1H)
(5C,5H)
f2 (ppm)
f1 (ppm)

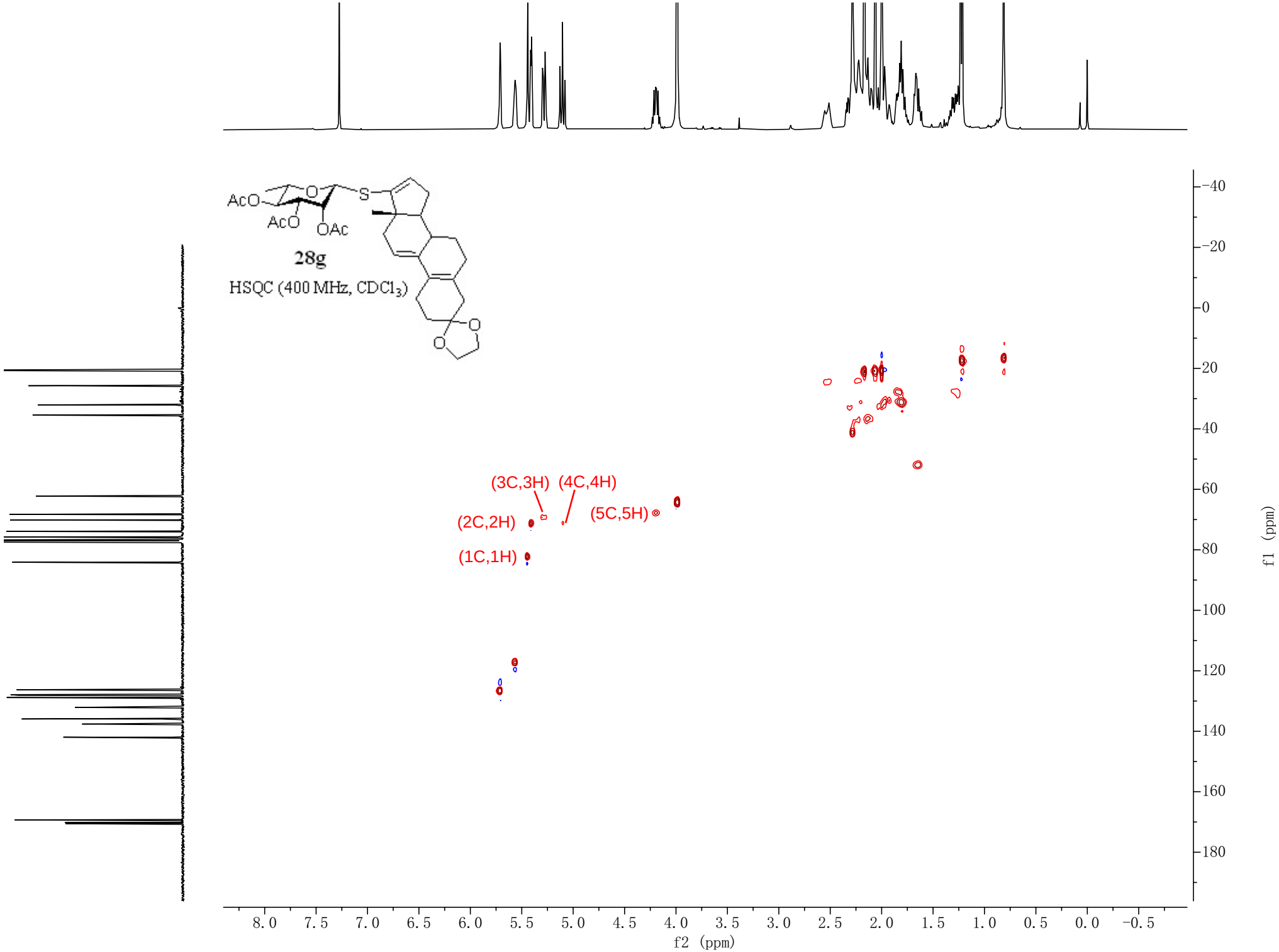

S
O
OAc
AcO
OAc
27g
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
(1H,2H)
f2 (ppm)
f1 (ppm)

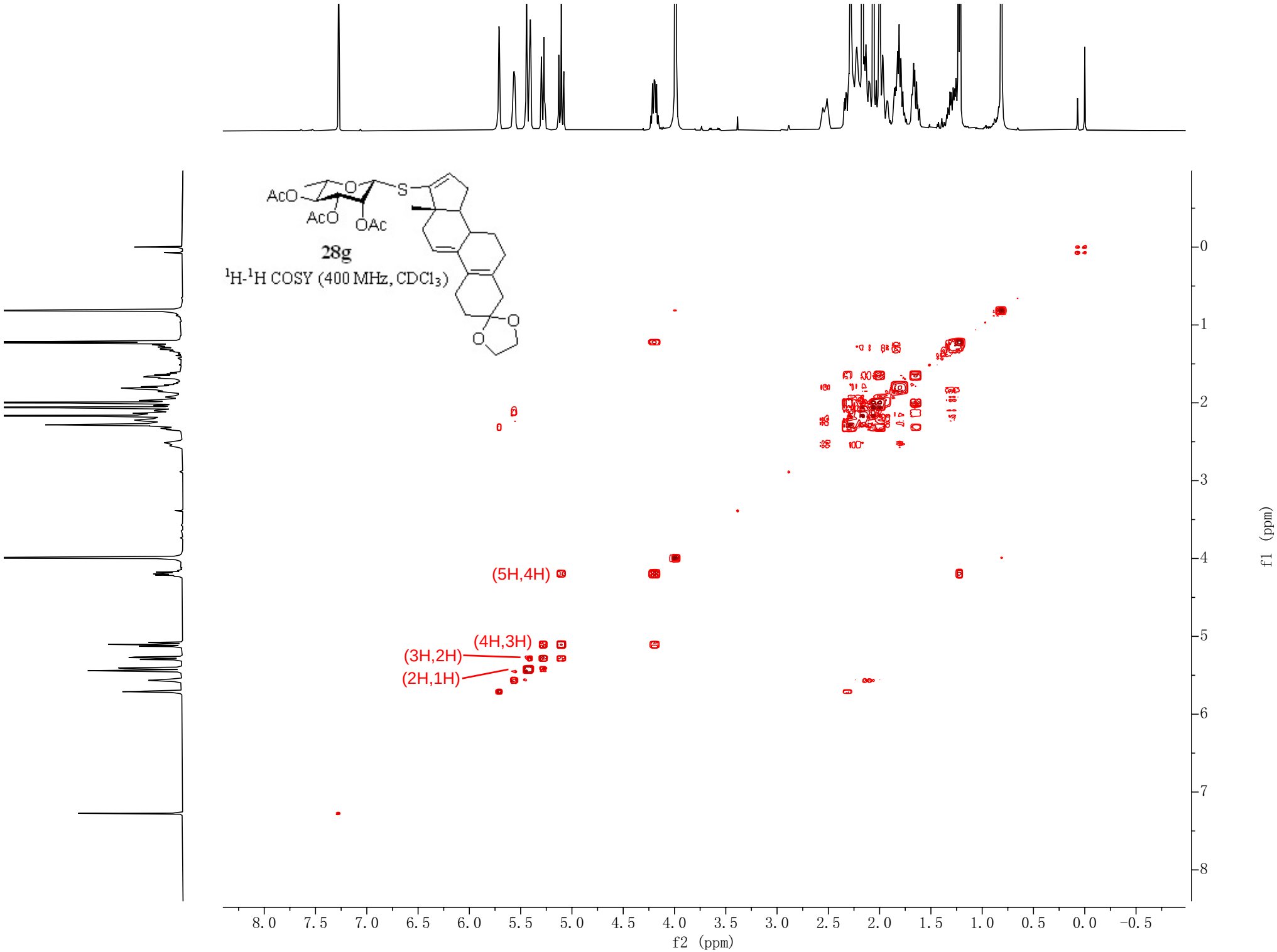


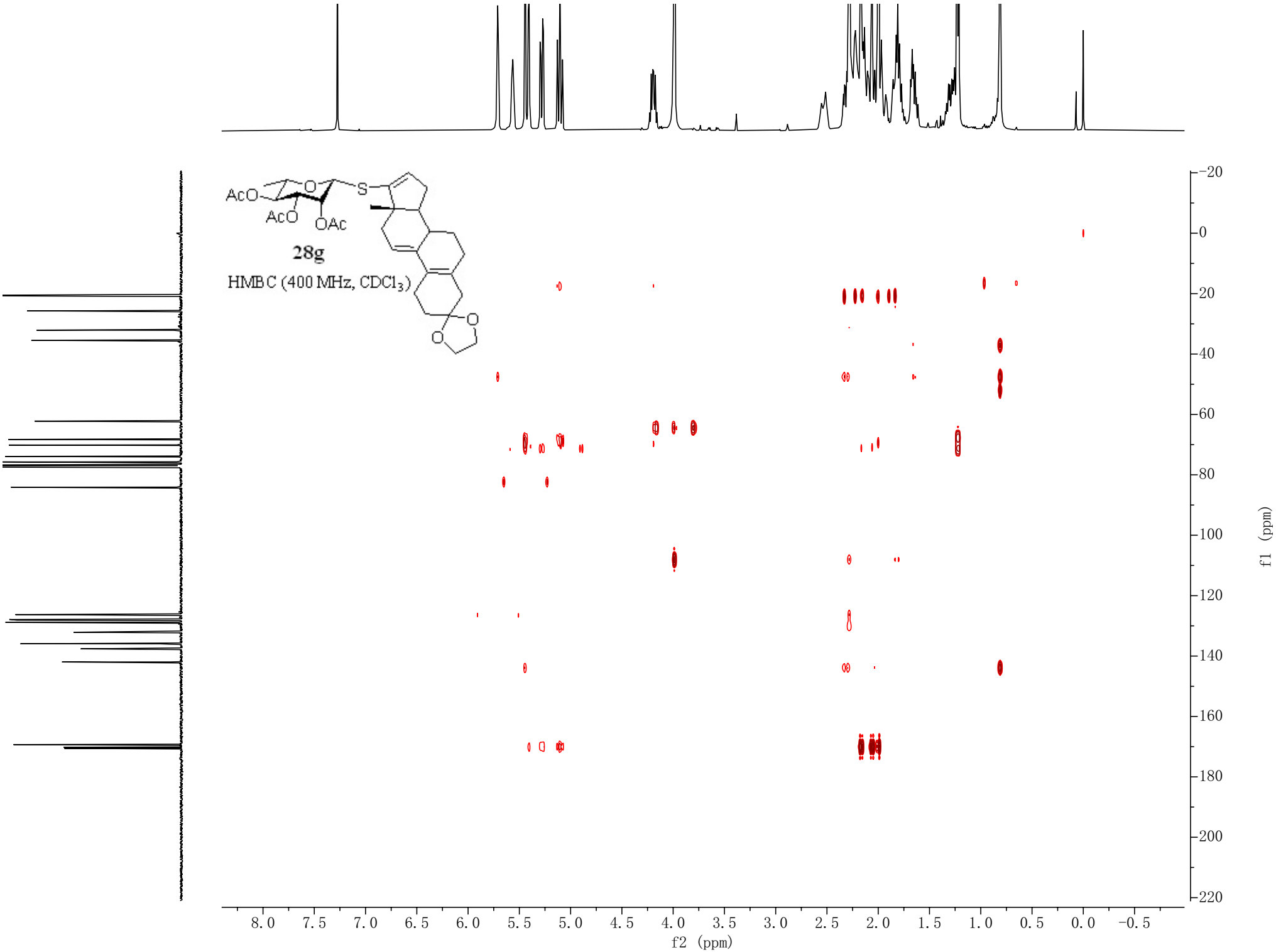
28g

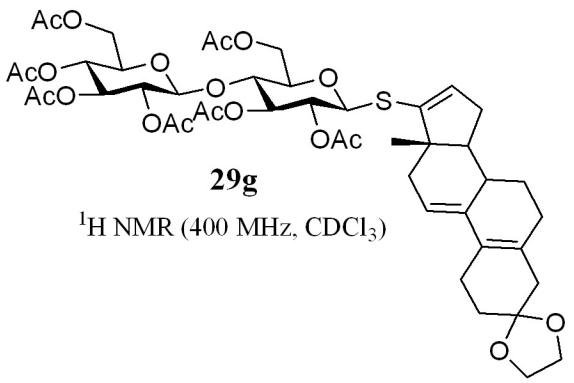
^{1}H NMR (400 MHz, $CDCl_3$)


170.03
170.00
169.91
143.86
137.69
130.20
126.47
126.34
117.51
108.09
82.42
71.42
71.25
69.41
67.73
64.48
64.33
52.11
47.54
41.33
37.10
36.43
32.50
31.28
30.98
27.61
24.62
20.95
20.80
20.68
17.48
16.54
AcO
AcO
OAc
O
S
O
O
O
28g
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


AcO
AcO
OAc
O
S
O
O
28g
HSQC (400 MHz, CDCl3)
(3C,3H)
(4C,4H)
(2C,2H)
(5C,5H)
(1C,1H)
f2 (ppm)
f1 (ppm)

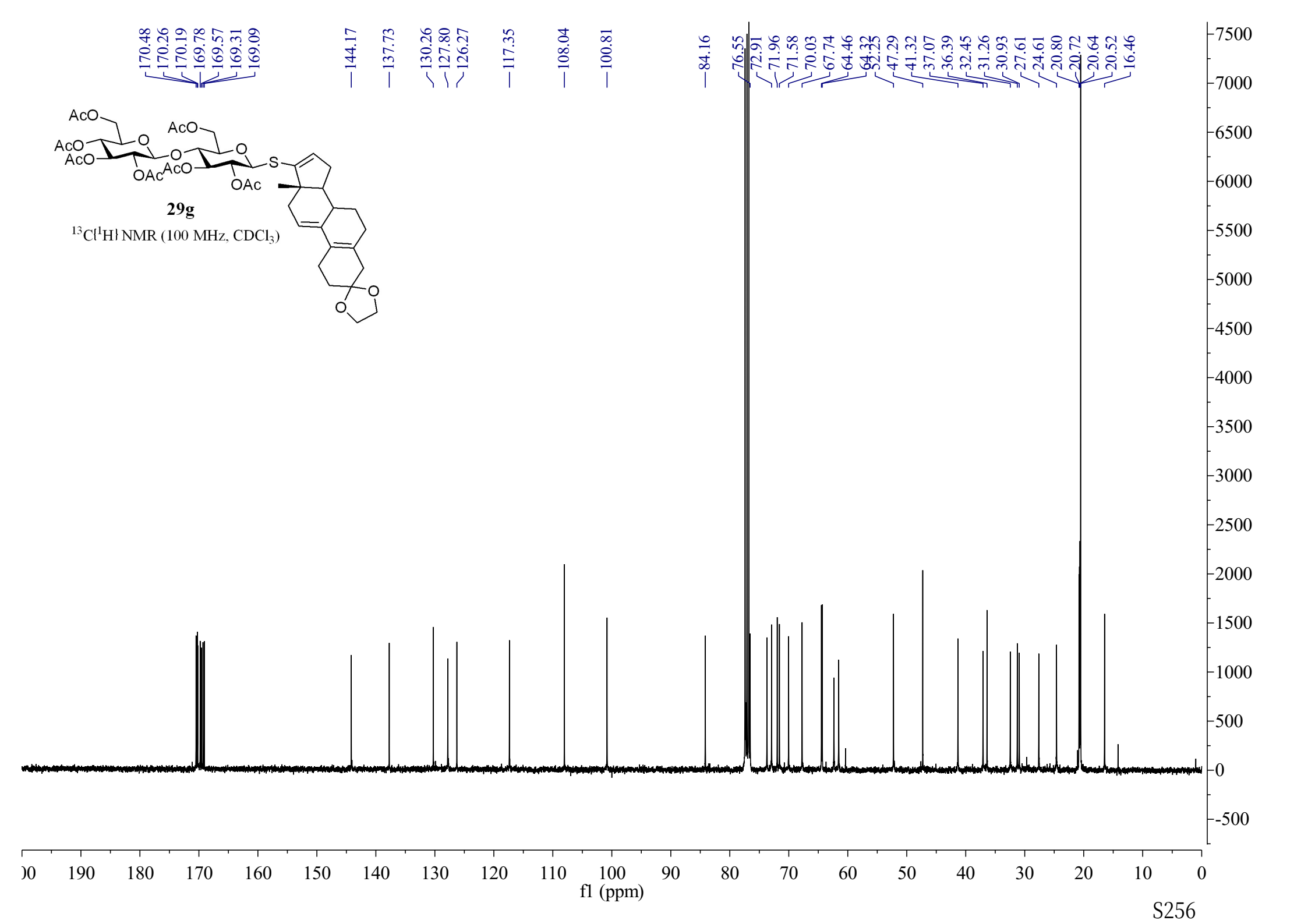

AcO
AcO
OAc
O
S
O
O
28g
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
(5H,4H)
(4H,3H)
(3H,2H)
(2H,1H)
f2 (ppm)
f1 (ppm)

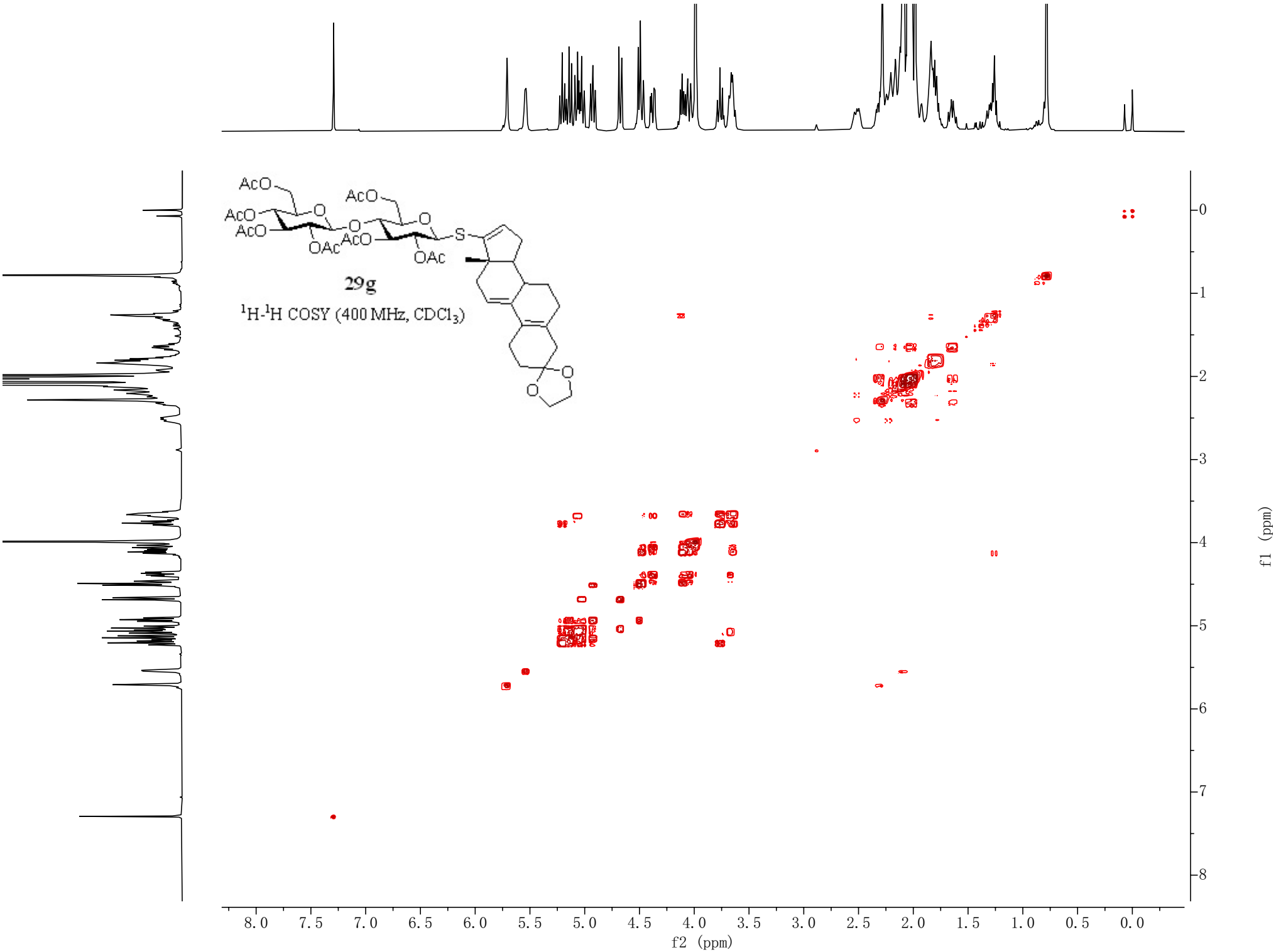

AcO
AcO
OAc
O
S
O
O
28g
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-20
0
20
40
60
80
100
120
140
160
180
200
220

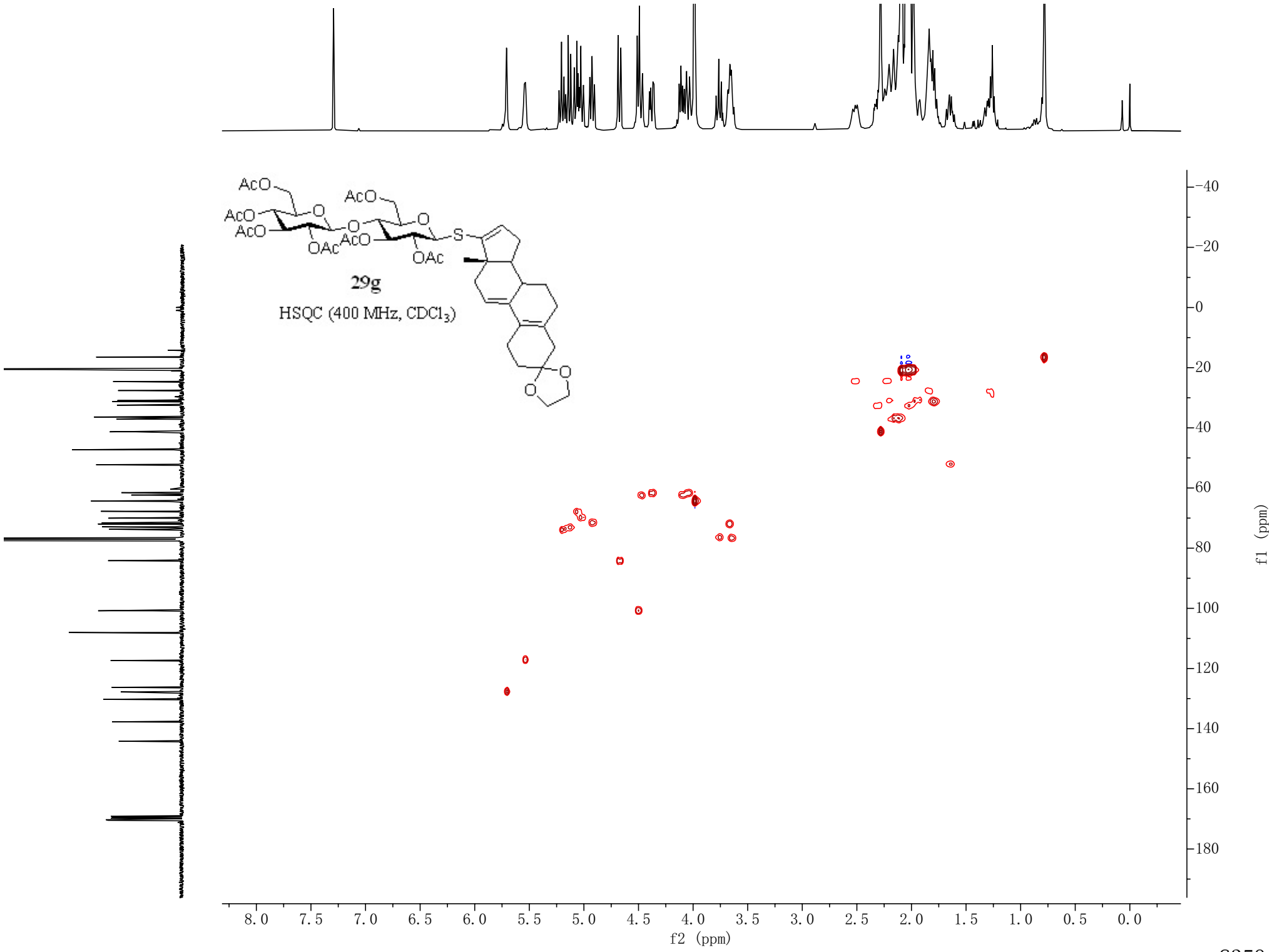


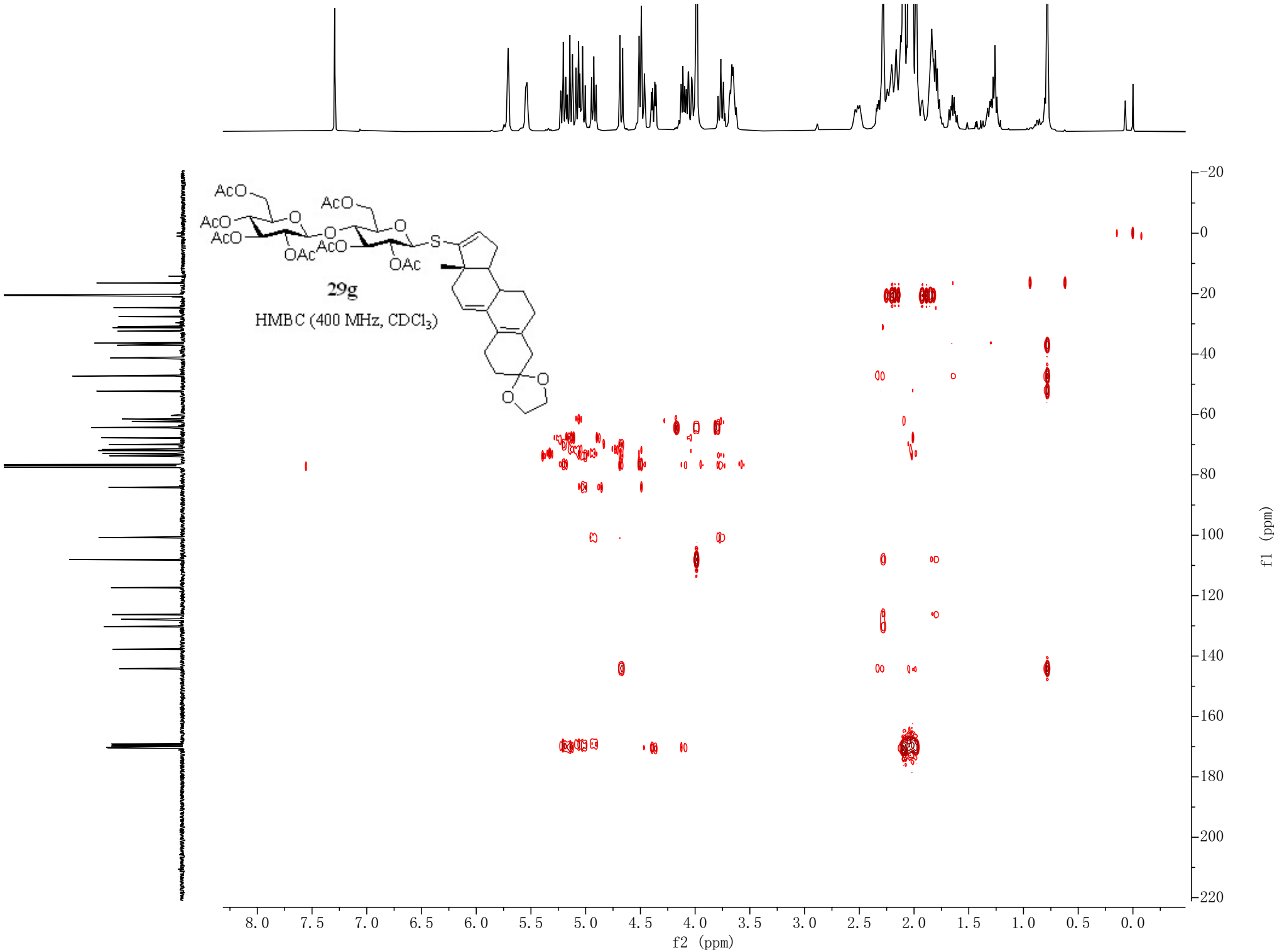
29g

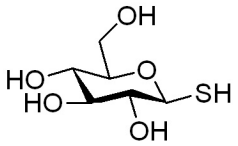
^{1}H NMR (400 MHz, $CDCl_3$)


170.48
170.26
170.19
169.78
169.57
169.31
169.09
144.17
137.73
130.26
127.80
126.27
117.35
108.04
100.81
84.16
76.55
72.91
71.96
71.58
70.03
67.74
64.46
64.32
52.25
47.29
41.32
37.07
36.39
32.45
31.26
30.93
27.61
24.61
20.80
20.72
20.64
20.52
16.46
AcO
AcO
AcO
OAc
AcO
AcO
OAc
S
O
O
O
O
O
O
29g
13C{1H} NMR (100 MHz, CDCl3)
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


AcO
AcO
AcO
OAc
AcO
AcO
OAc
S
O
O
O
29g
^{1}H-^{1}H COSY (400 MHz, CDCl$_3$)
f2 (ppm)
f1 (ppm)
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

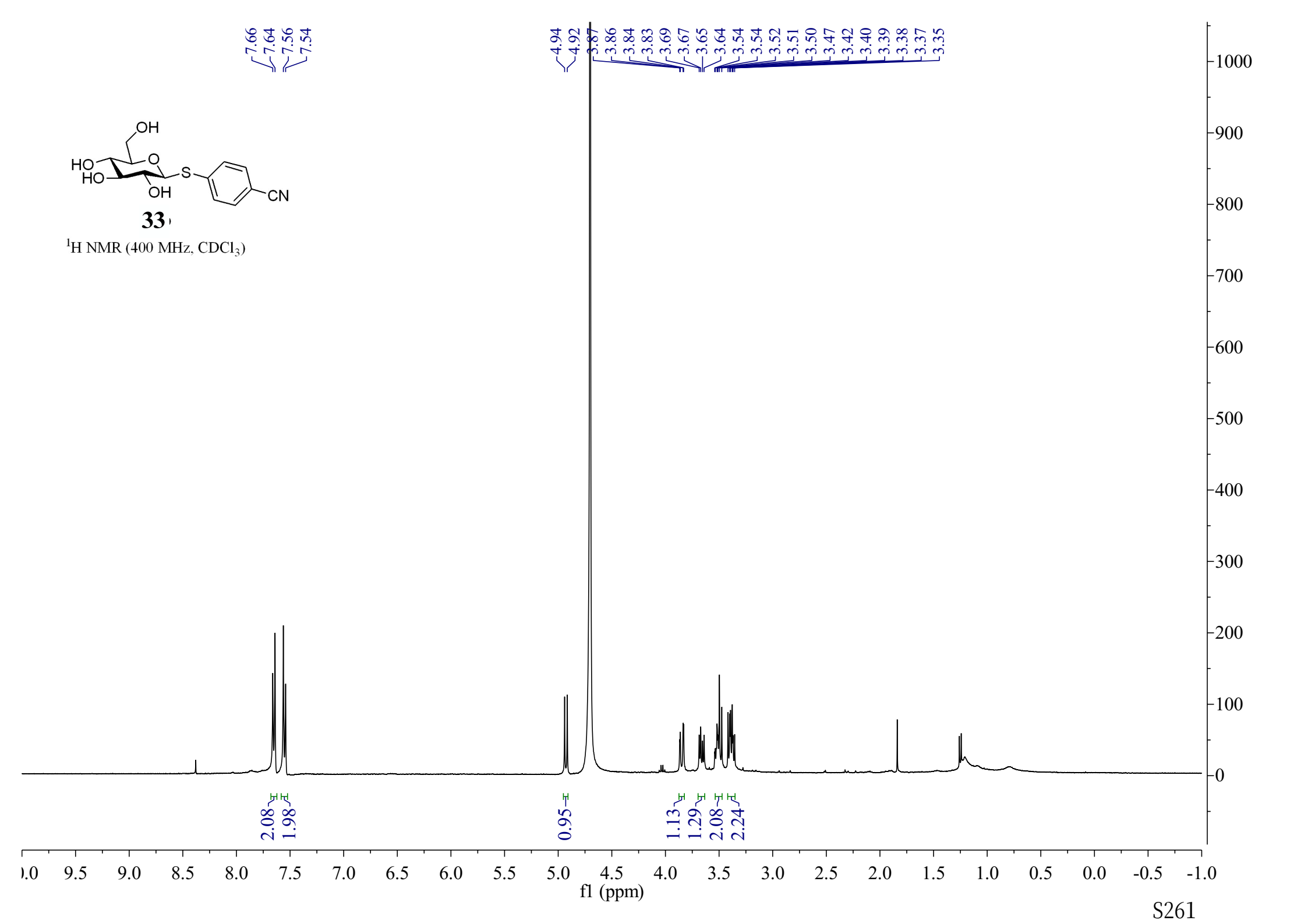

AcO
AcO
AcO
OAc
AcO
AcO
OAc
S
O
O
O
29g
HSQC (400 MHz, CDCl3)
-40
-20
0
20
40
60
80
100
120
140
160
180
f1 (ppm)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f2 (ppm)

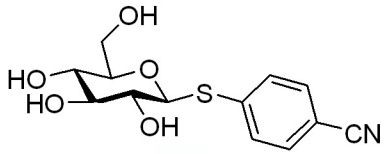

AcO
AcO
AcO
OAc
AcO
AcO
OAc
S
O
O
29g
HMBC (400 MHz, CDCl3)
f2 (ppm)
f1 (ppm)



30

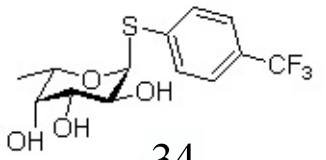
^{1}H NMR (400 MHz, $CDCl_3$)


7.66
7.64
7.56
7.54
4.94
4.92
3.87
3.86
3.84
3.83
3.69
3.67
3.65
3.64
3.54
3.54
3.52
3.51
3.50
3.47
3.42
3.40
3.39
3.38
3.37
3.35
OH
HO
HO
O
OH
S
CN
33
1H NMR (400 MHz, CDCl3)
2.08
1.98
0.95
1.13
1.29
2.08
2.24
f1 (ppm)



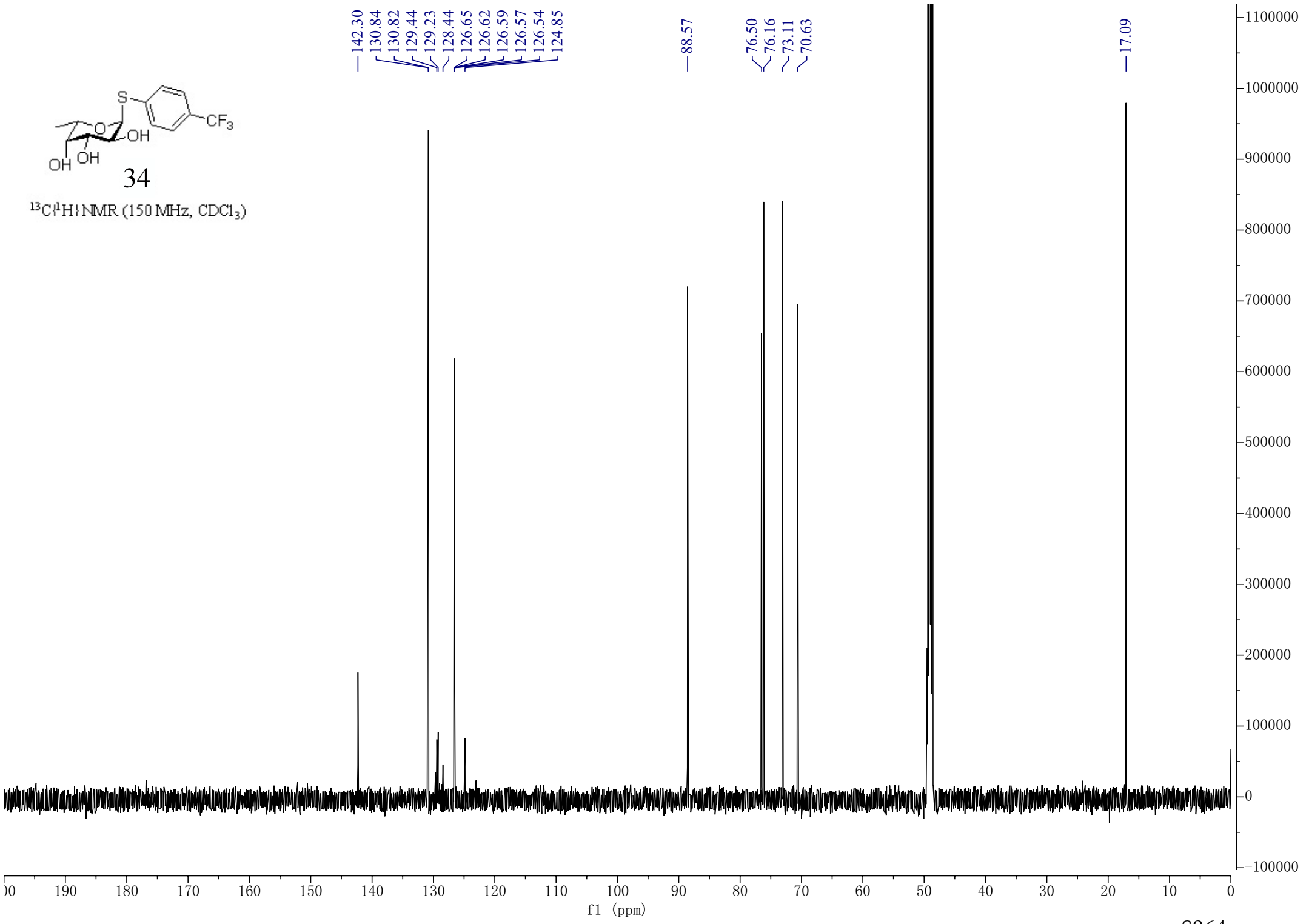
33

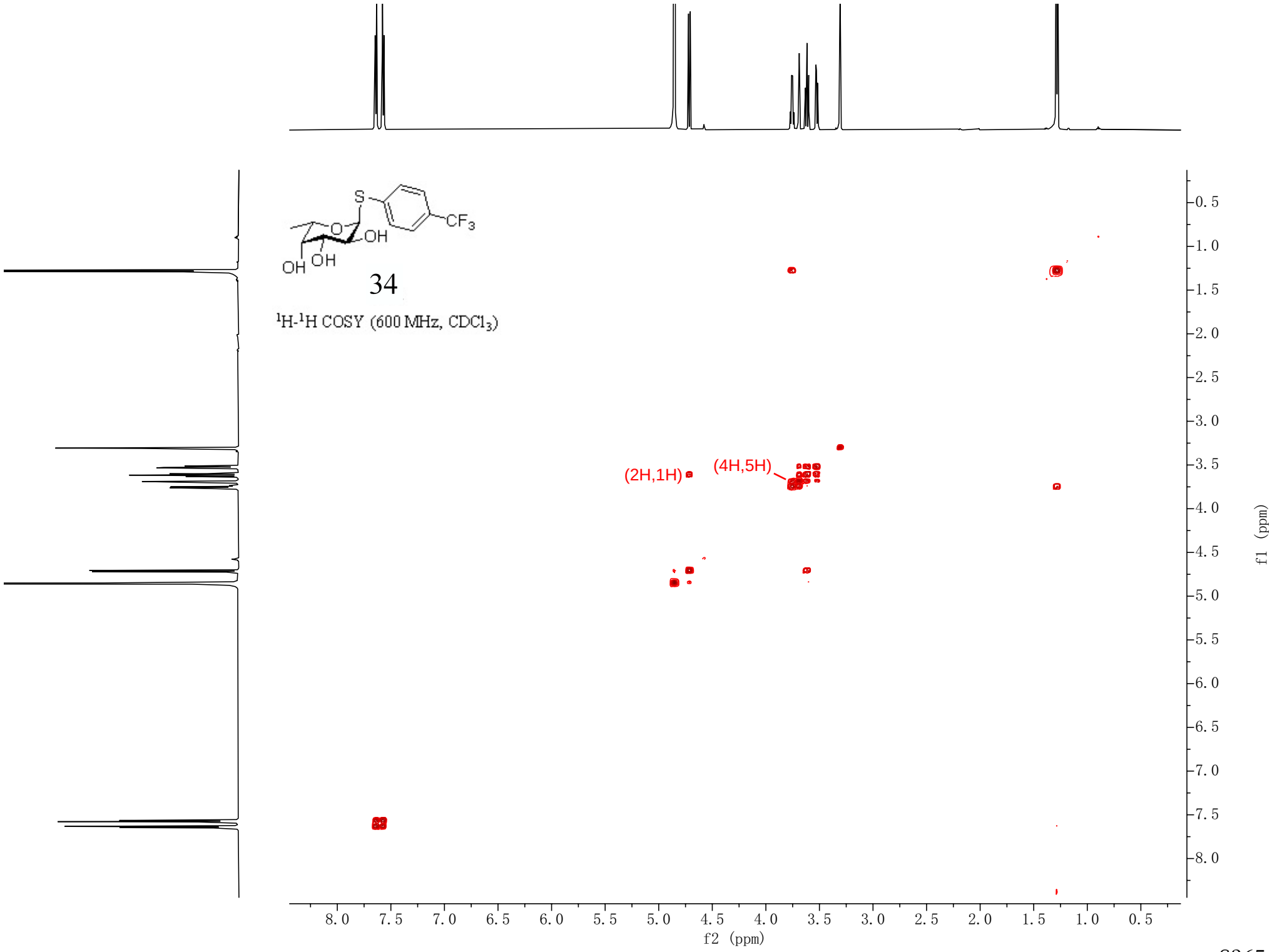
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)

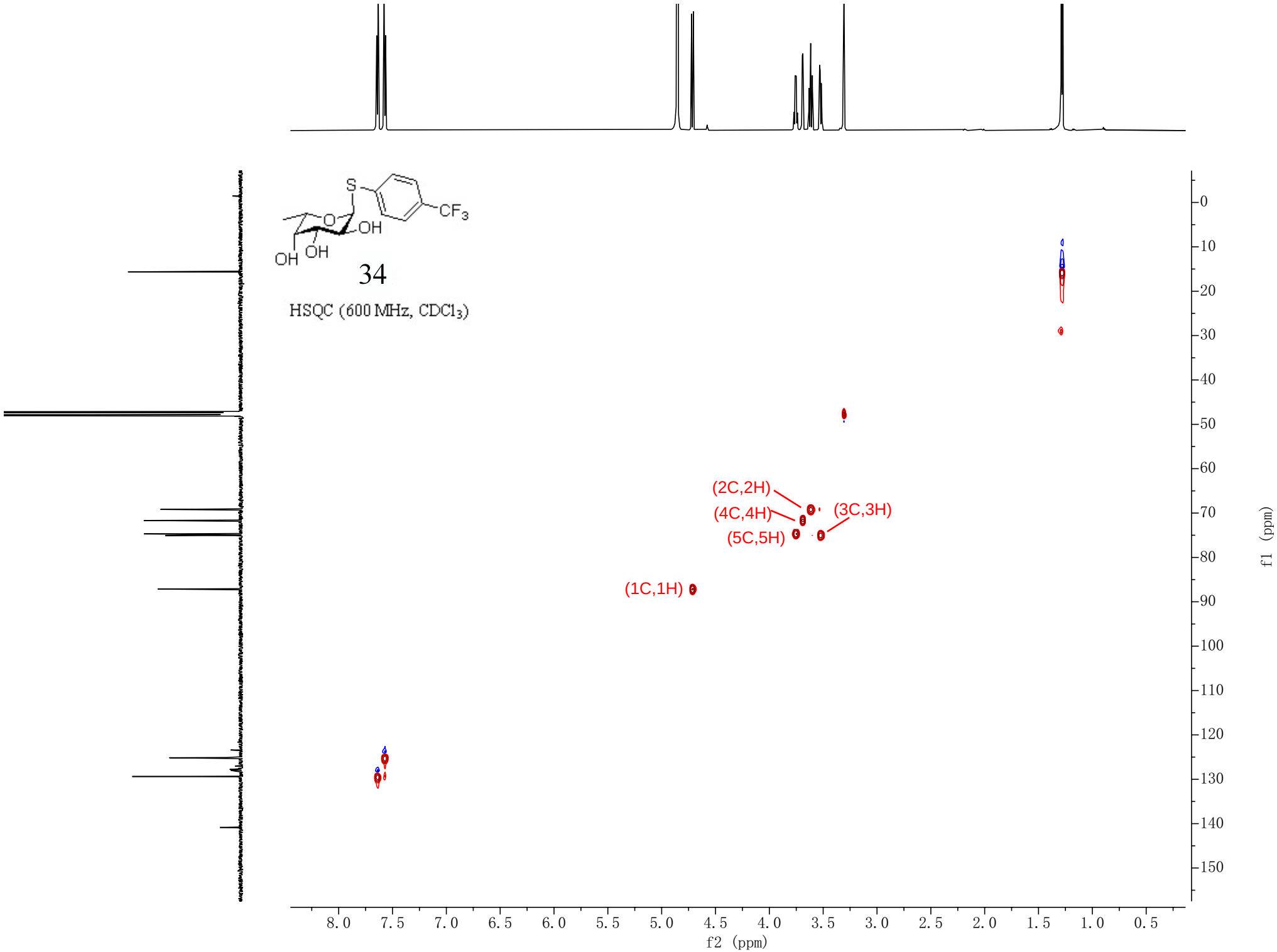


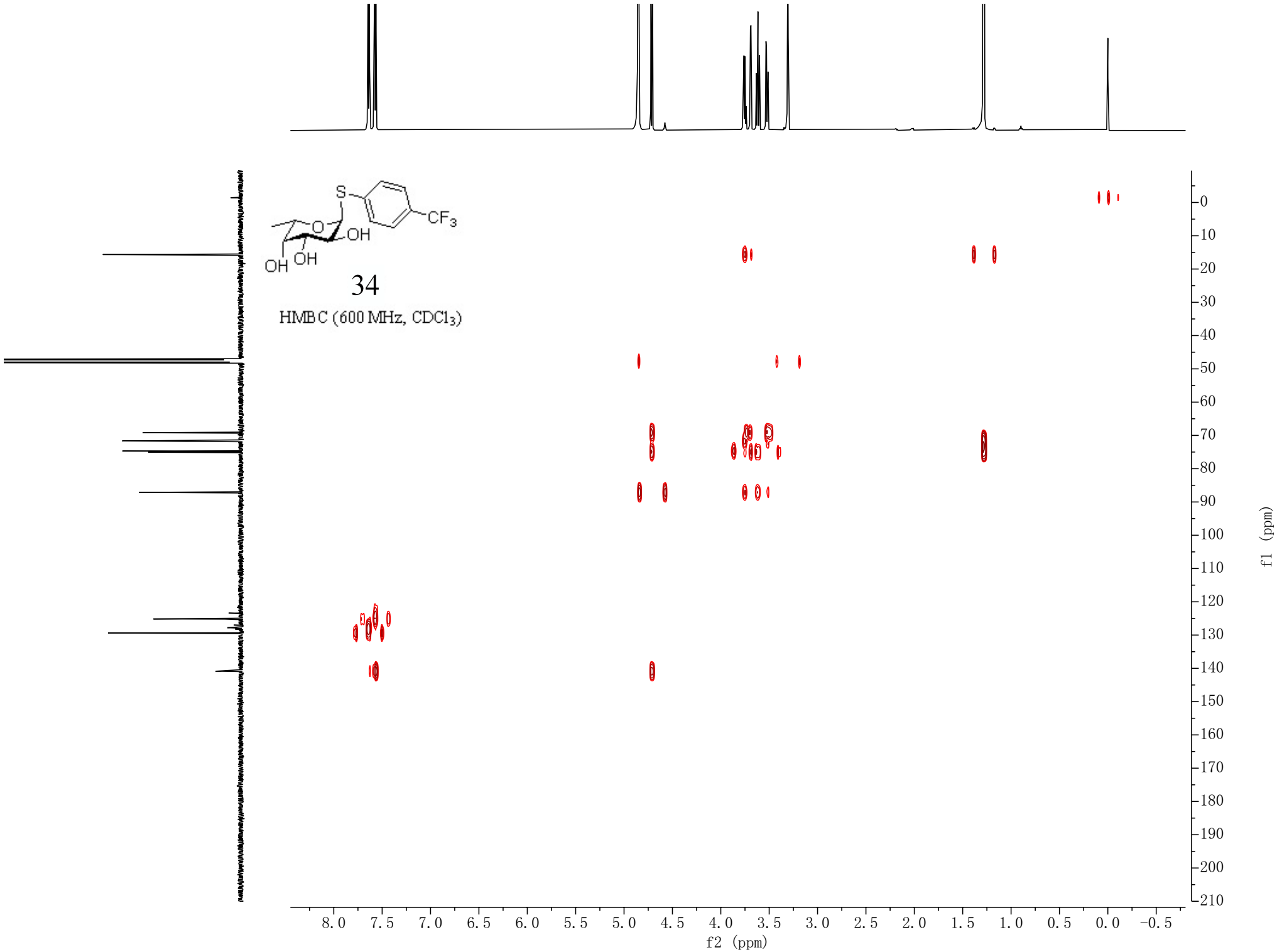
34

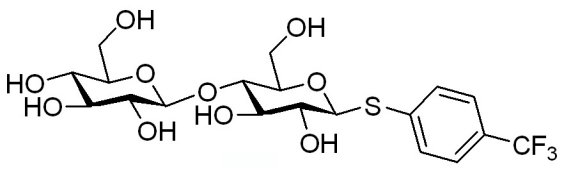
^{1}H NMR (600 MHz, $CDCl_3$)


142.30
130.84
130.82
129.44
129.23
128.44
126.65
126.62
126.59
126.57
126.54
124.85
88.57
76.50
76.16
73.11
70.63
17.09
S
O
OH
OH
OH
CF3
34
13C{1H} NMR (150 MHz, CDCl3)
f1 (ppm)


S
CF3
O
OH
OH
OH
34
1H-1H COSY (600 MHz, CDCl3)
(2H,1H)
(4H,5H)
f2 (ppm)
f1 (ppm)

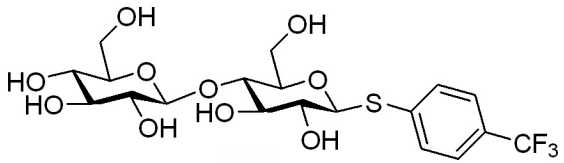

S
CF3
O
OH
OH
OH
34
HSQC (600 MHz, CDCl3)
(2C,2H)
(4C,4H)
(5C,5H)
(3C,3H)
(1C,1H)
f2 (ppm)
f1 (ppm)


S
CF3
O
OH
OH
OH
34
HMBC (600 MHz, CDCl3)
f2 (ppm)
f1 (ppm)



35

^{1}H NMR (400 MHz, $CDCl_3$)



35

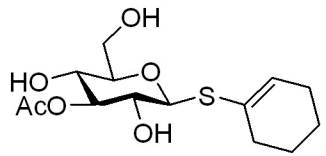
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)

137.77
130.34
125.96
125.92
125.43
122.73
102.53
102.46
100.00
86.30
78.16
76.00
75.50
73.15
71.51
69.45
69.39
60.59
60.05

1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100

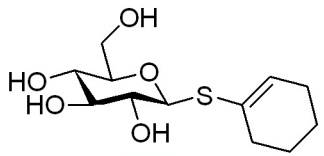
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10

f1 (ppm)



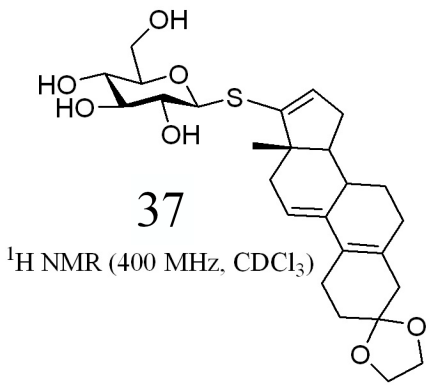
36

^{1}H NMR (400 MHz, $CDCl_3$)



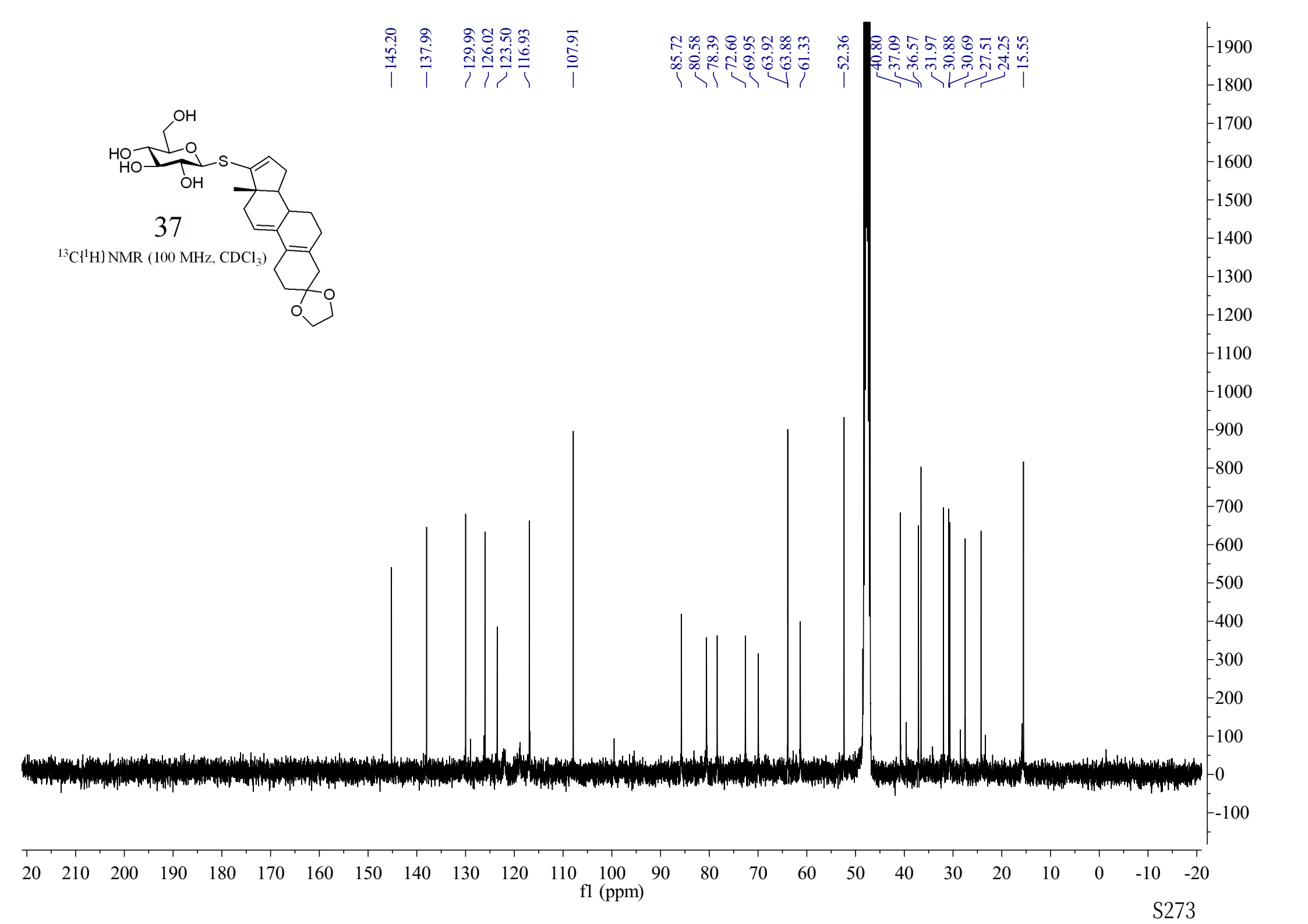
36

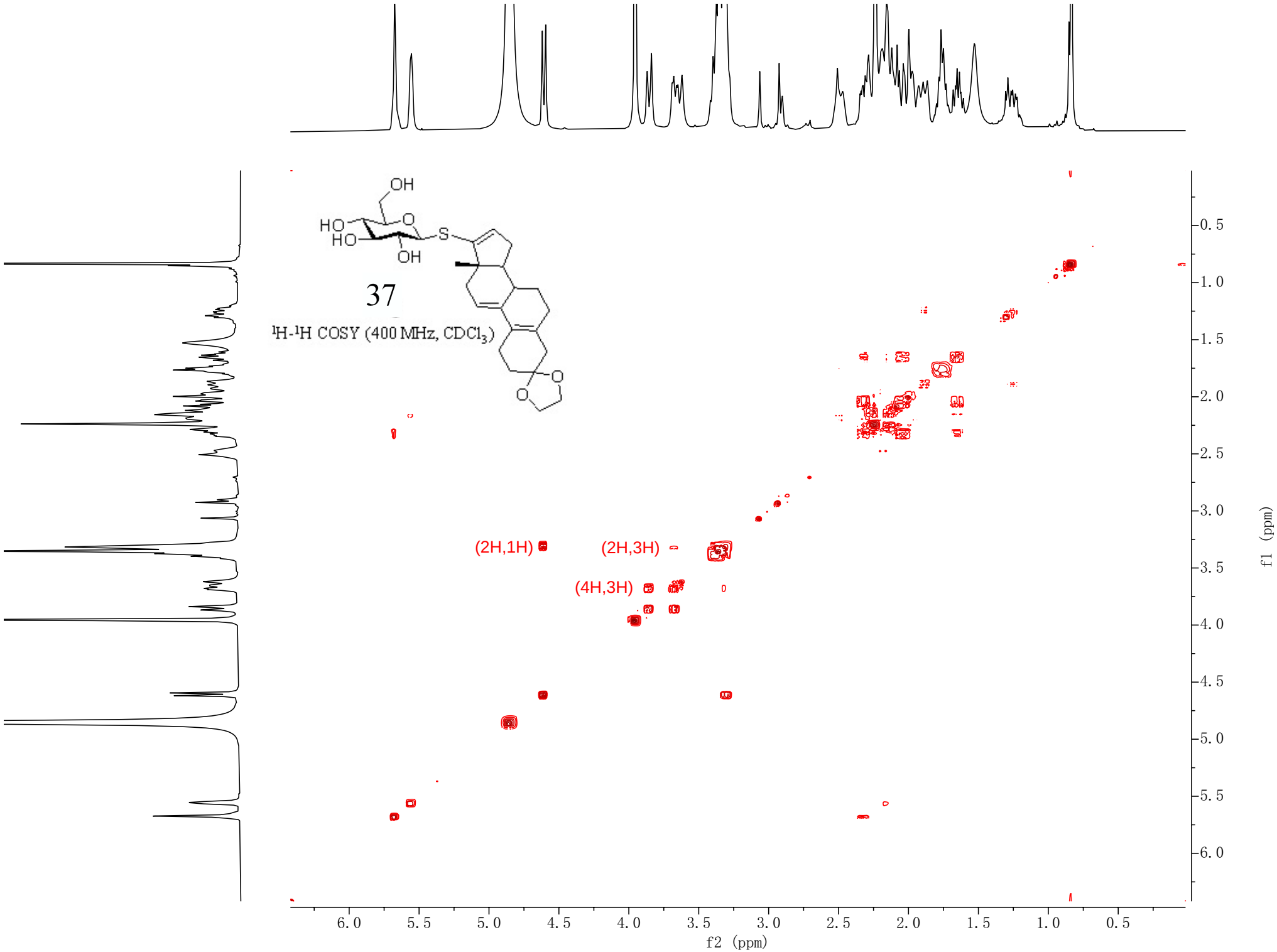
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)

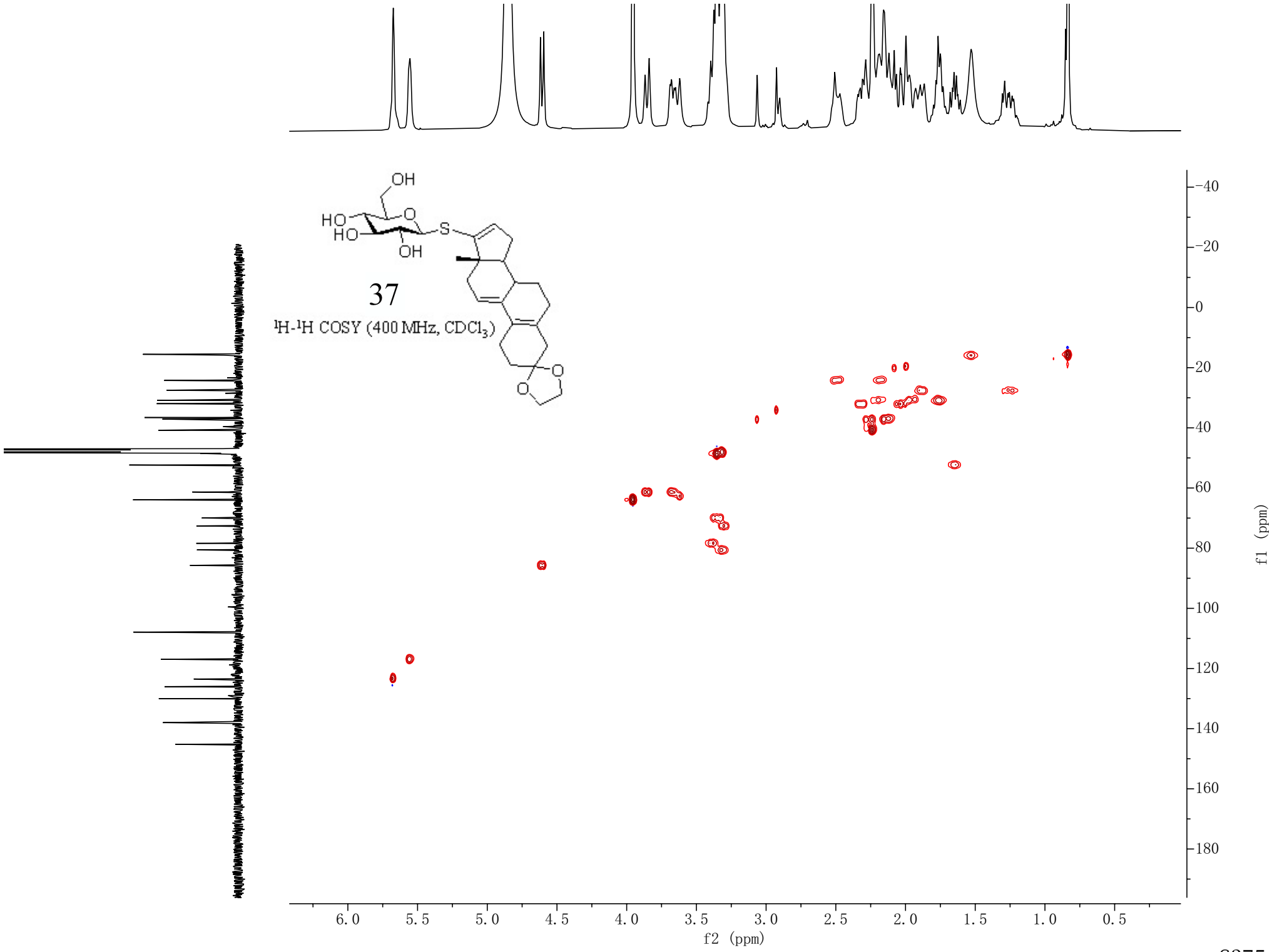


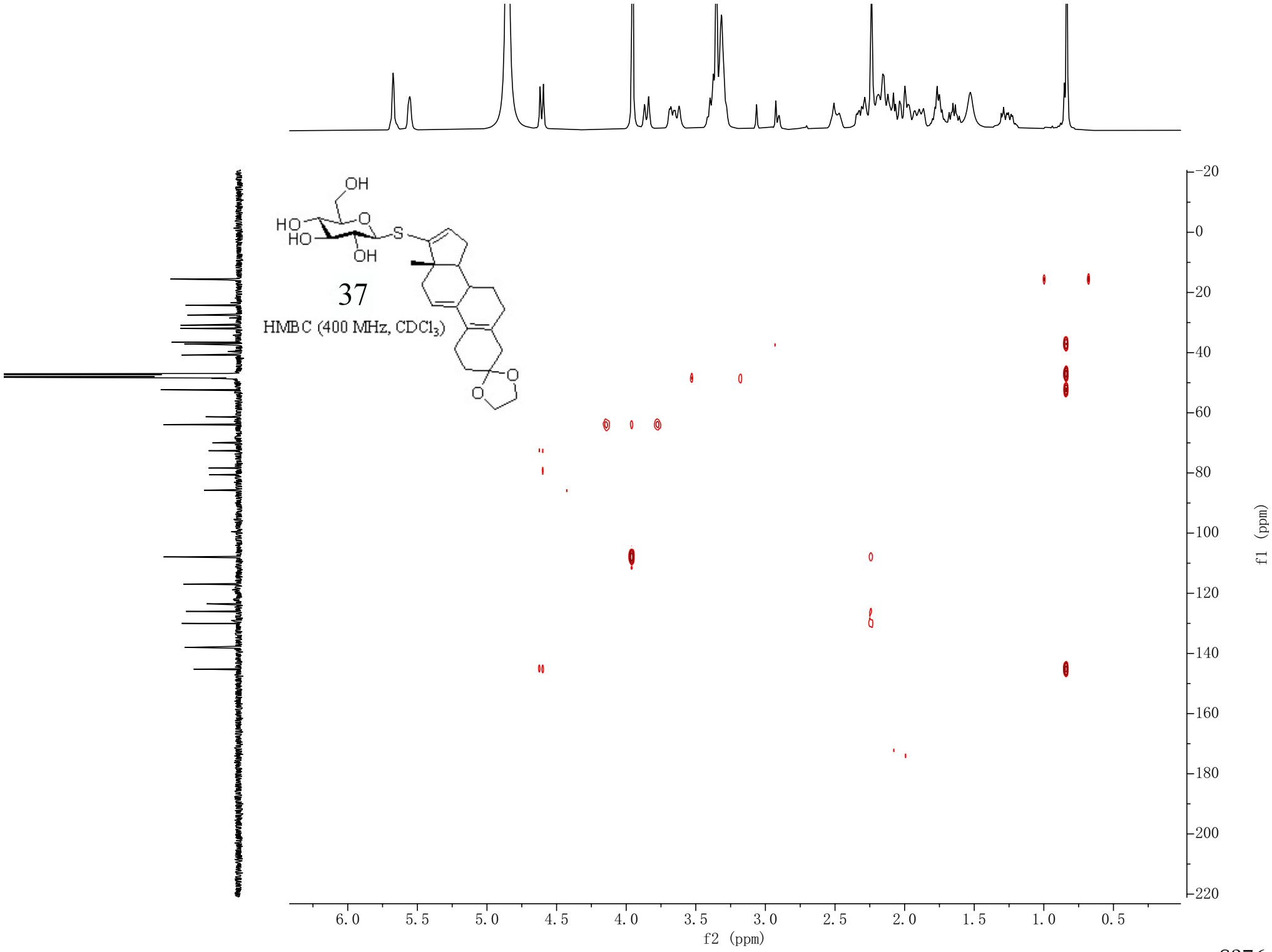
37

^{1}H NMR (400 MHz, $CDCl_3$)


145.20
137.99
129.99
126.02
123.50
116.93
107.91
85.72
80.58
78.39
72.60
69.95
63.92
63.88
61.33
52.36
40.80
37.09
36.57
31.97
30.88
30.69
27.51
24.25
15.55
OH
HO
HO
OH
O
S
O
O
37
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$)
f1 (ppm)


OH
HO
HO
O
S
OH
37
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
O
O
(2H,1H)
(2H,3H)
(4H,3H)
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
f1 (ppm)


OH
HO
HO
O
S
OH
37
^{1}H-^{1}H COSY (400 MHz, $CDCl_3$)
O
O
-40
-20
0
20
40
60
80
100
120
140
160
180
f1 (ppm)
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)


OH
HO
HO
O
S
OH
37
HMBC (400 MHz, CDCl3)
O
O
-20
0
20
40
60
80
100
120
140
160
180
200
220
f1 (ppm)
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)