

## SUPPLEMENTARY MATERIAL

### Glycosylation via $\text{Cp}_2\text{ZrCl}_2/\text{AgClO}_4$ Mediated Activation of Anomeric Sulfoxides

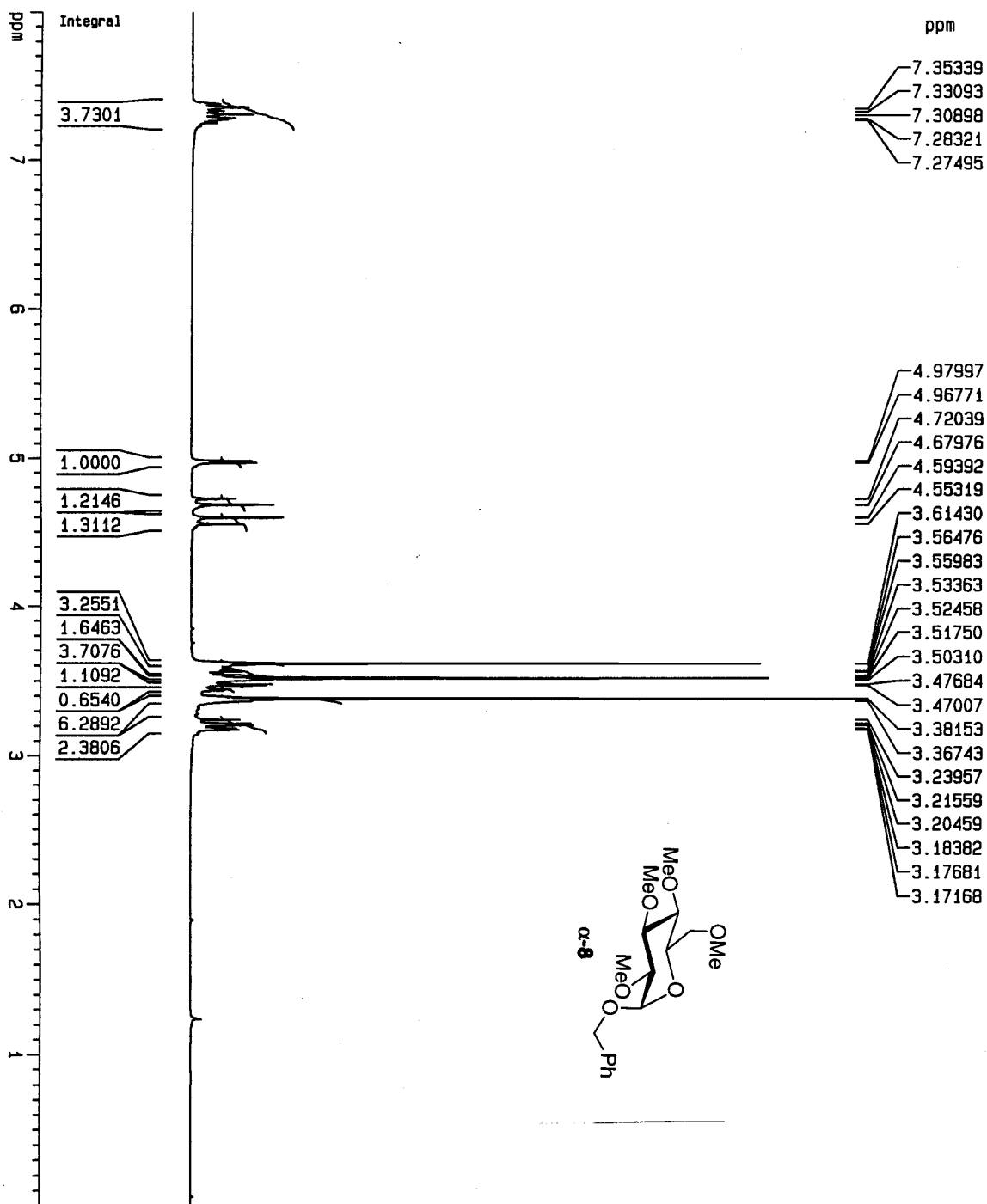
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$^1\text{H}$  and  $^{13}\text{C}$  NMR spectra for all new compounds.

## itr alpha benzyi tetramethyl glucoside



Current Data Parameters

NAME	test
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20001029
Time	18.09
INSTRUM	spect
PROBHD	5 mm QNP 1H
PULPROG	zg
TD	16384
SOLVENT	CDCl3
NS	24
DS	0
SMH	4496.403 Hz
FIDRES	0.274439 Hz
AQ	1.8219508 sec
RG	28.5
DW	111.200 usec
DE	6.00 usec
TE	300.0 K
D1	0.00000000 sec

===== CHANNEL f1 =====

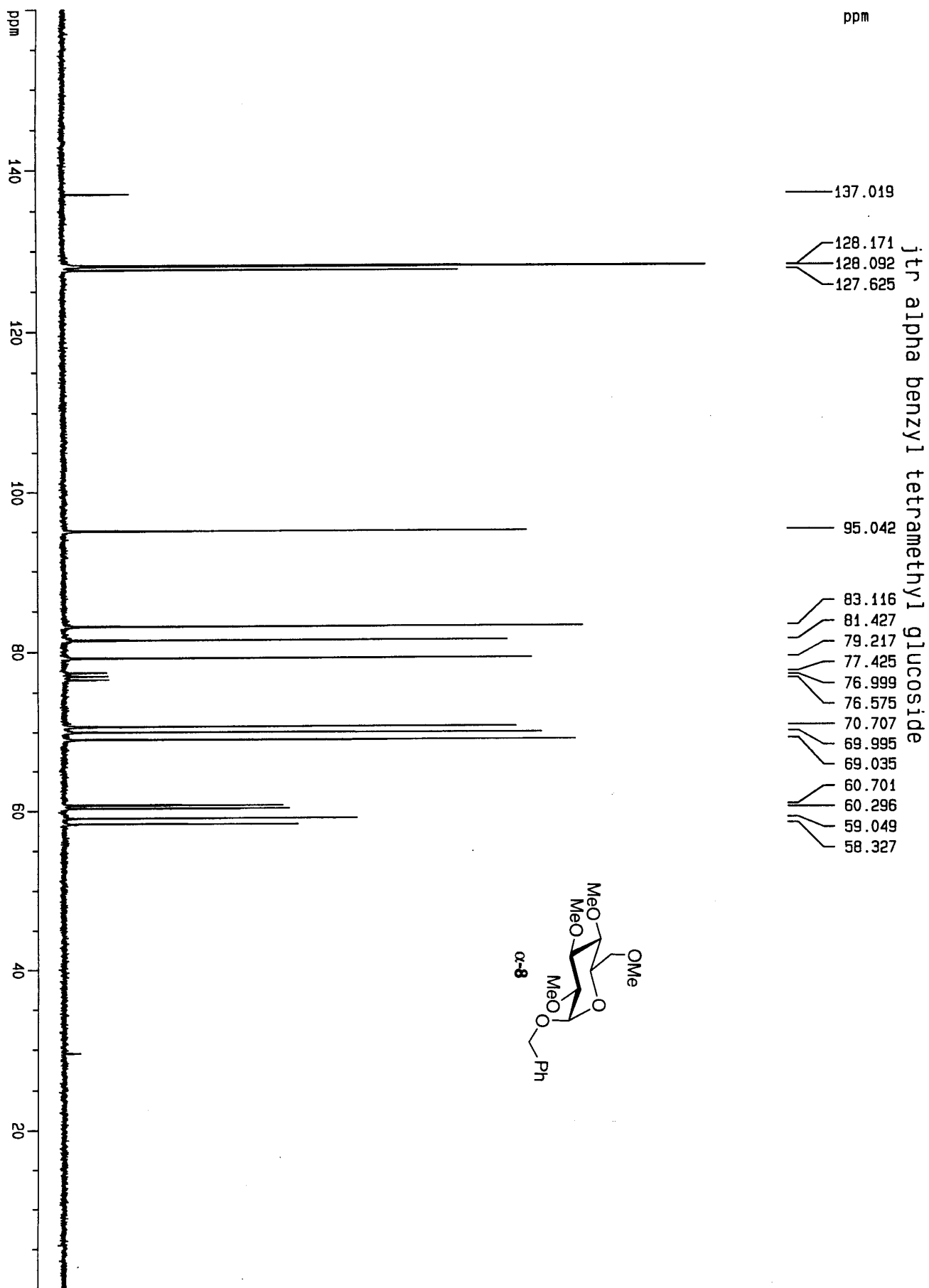
NUC1	<sup>1</sup> H
P1	7.10 usec
PL1	-6.00 dB
SFO1	300.1318008 MHz

F2 - Processing parameters

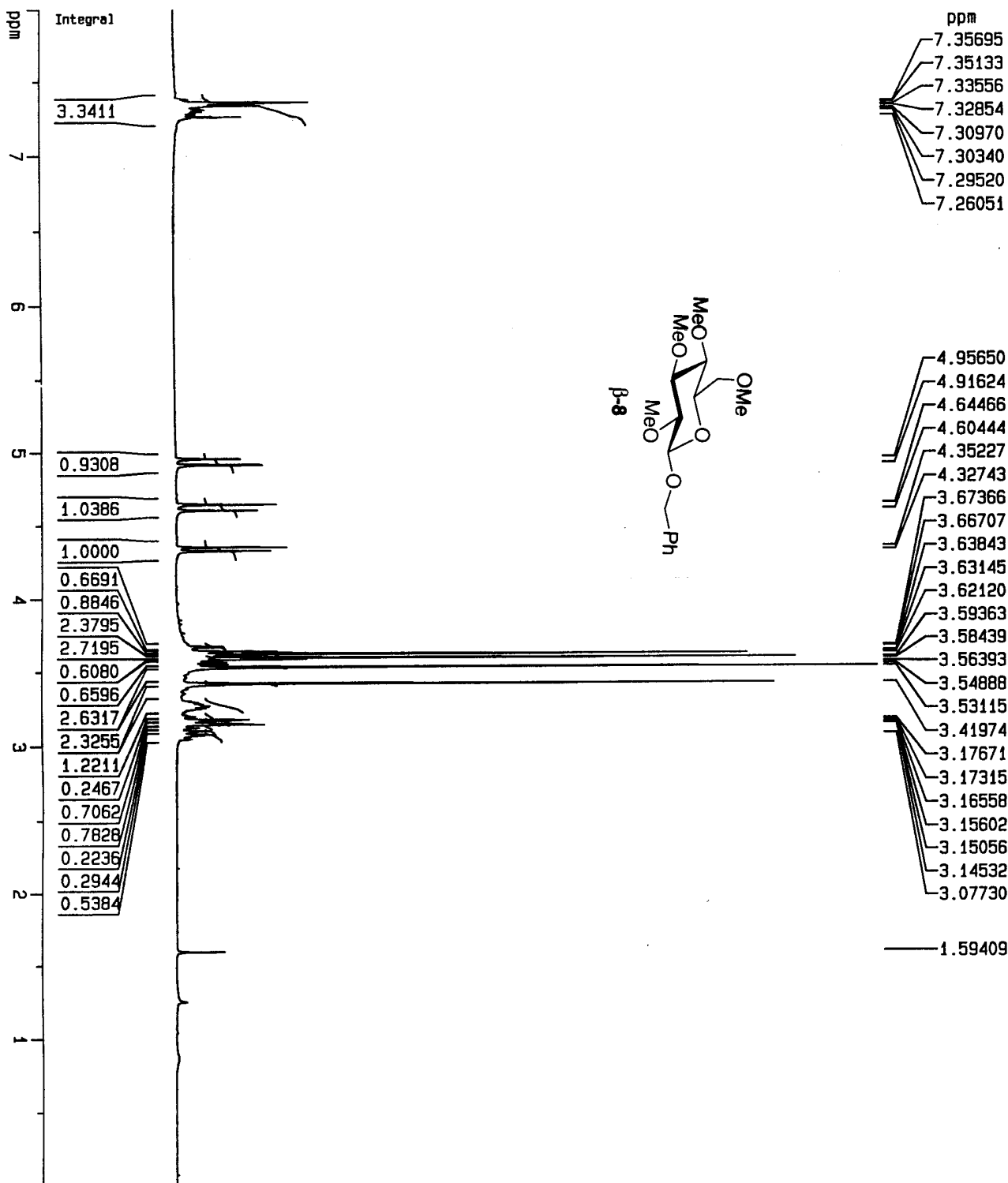
SI	8192
SF	300.1300118 MHz
WDW	EM
SSB	0
LB	0.20 Hz
GB	0
PC	1.00

1D NMR plot parameters

CX	20.00 cm
F1P	8.000 ppm
F1	2401.04 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	0.40000 ppm/cm
HZCM	120.05200 Hz/cm



## jtr beta benzyl tetramethyl glucoside



Current Data Parameters  
 NAME test  
 EXPNO 1  
 PROCNO 1

F2 - Acquisition Parameters  
 Date\_ 20001102  
 Time 15.58

INSTRUM spect  
 PROBD 5 mm Multinu  
 PULPROG zg

TD 16384  
 SOLVENT CDCl3  
 NS 32

DS 0  
 SMH 4496.403 Hz  
 FIDRES 0.274439 Hz

AQ 1.8219508 sec  
 RG 228.1

DM 111.200 usec  
 DE 14.29 usec

TE 300.0 K  
 D1 0.0000000 sec

P1 8.10 usec  
 SF01 300.1318008 MHz

NUC1 1H  
 PL1 -6.00 dB

F2 - Processing parameters  
 SI 8192

SF 300.1300050 MHz  
 MDW EM

SSB 0  
 LB 0.20 Hz

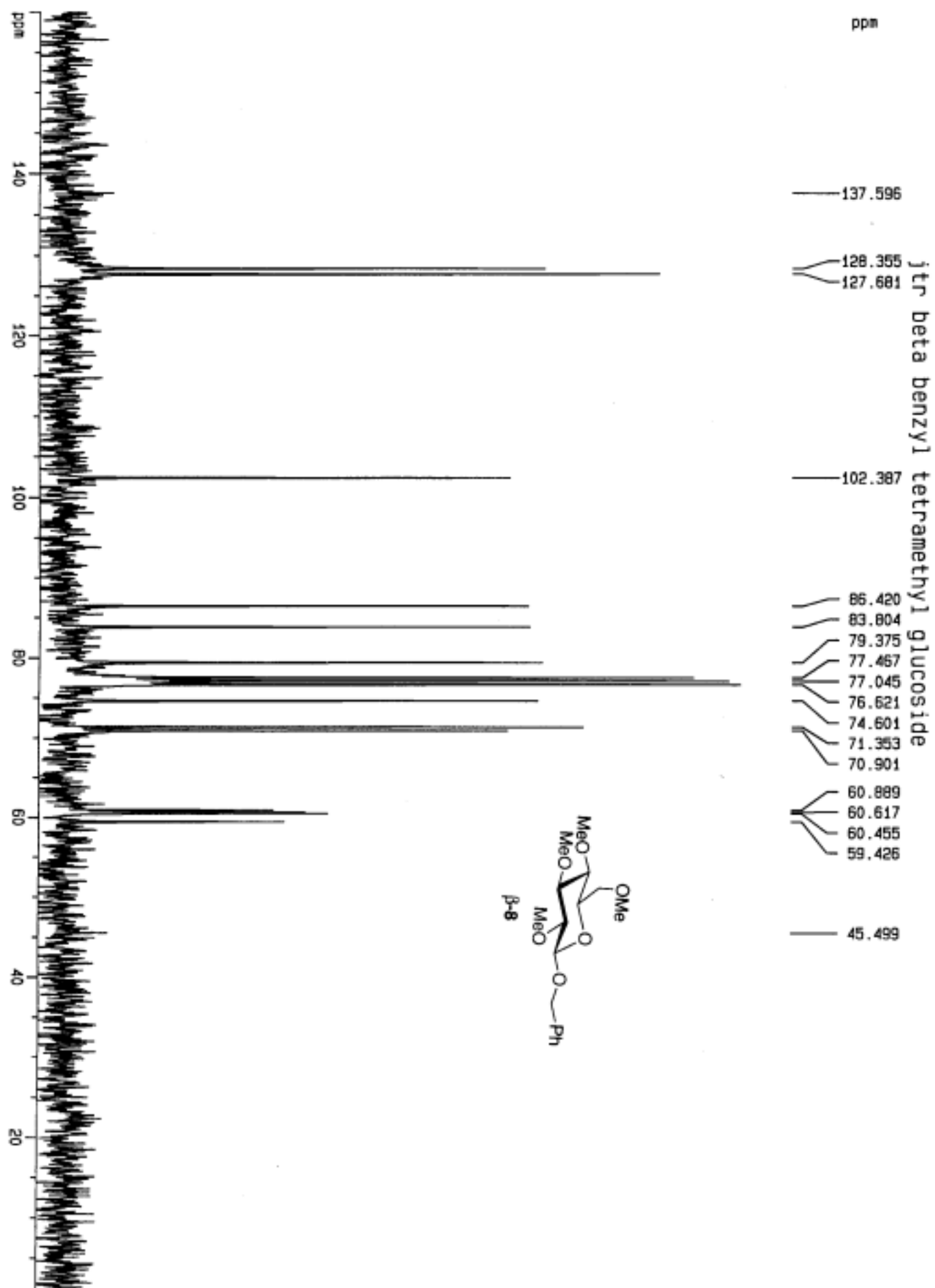
GB 0  
 PC 0.10

1D NMR plot parameters  
 CX 20.30 cm

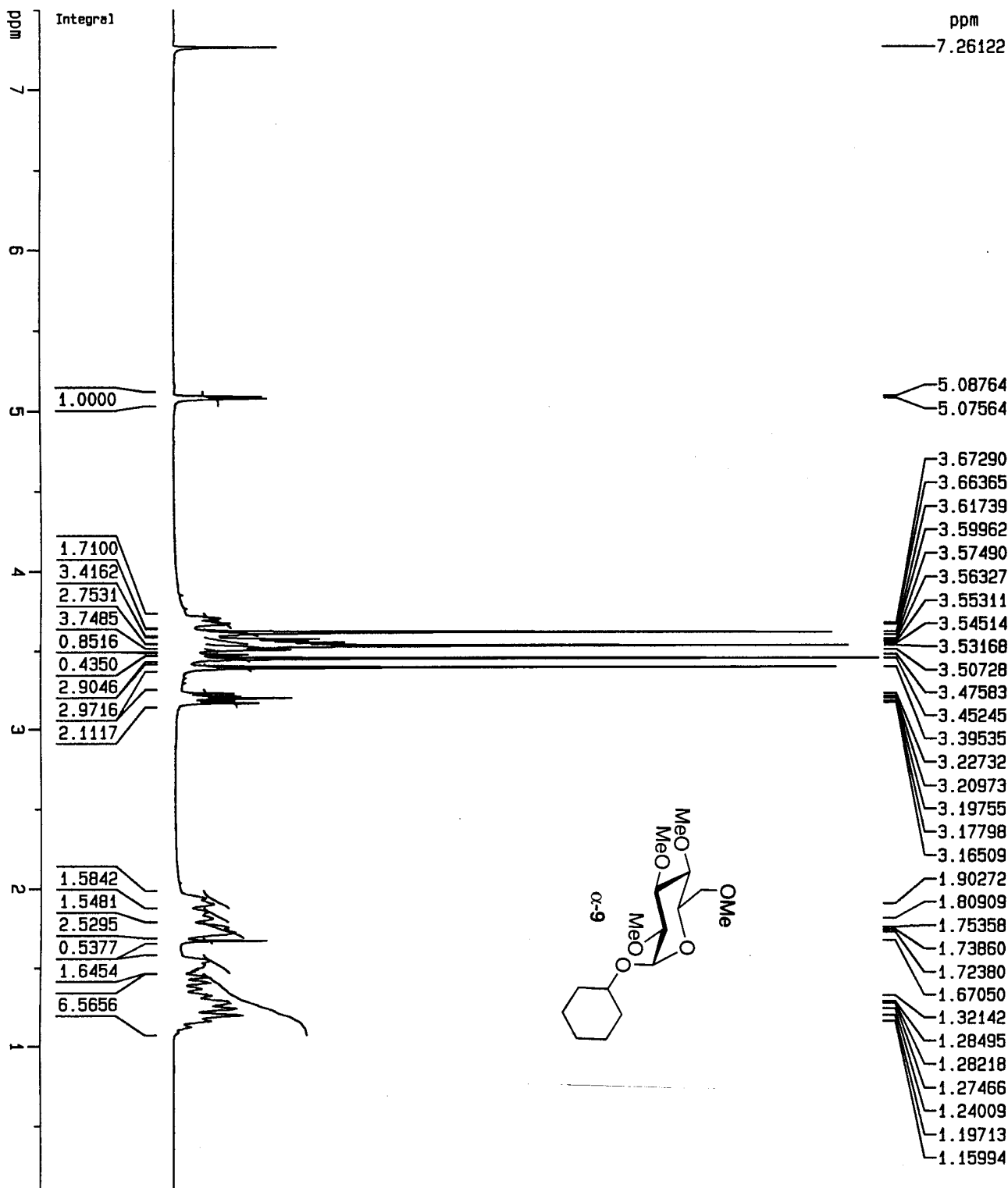
F1P 8.000 ppm  
 F1 2401.04 Hz

F2P 0.000 ppm  
 F2 0.00 Hz

PPMCM 0.39409 ppm/cm  
 HZCM 118.2784 Hz/cm



## itr alpha-cyclohexyl tetramethyl glucoside



Current Data Parameters

NAME test

EXPNO 1

PROCNO 1

F2 - Acquisition Parameters

Date\_ 20001027

Time 9.51

INSTRUM spect

PROBHD 5 mm Multinu

PULPROG zg

TD 16384

SOLVENT CDCl3

NS 32

DS 0

SMH 4496.403 Hz

FIDRES 0.274439 Hz

RG 114

DE 111.200 usec

TE 14.29 usec

D1 0.0000000 sec

P1 8.10 usec

SFO1 300.1318008 MHz

NUC1 1H

PL1 -6.00 dB

F2 - Processing parameters

SI 8192

SF 300.1300060 MHz

MDW EM

SSB 0

LB 0.20 Hz

GB 0

PC 0.10

1D NMR plot parameters

CX 20.30 cm

F1P 7.500 ppm

F1 2250.98 Hz

F2P 0.100 ppm

F2 30.01 Hz

PPMCH 0.36453 ppm/cm

HZCM 109.40700 Hz/cm

ppm

jtr alpha cyclohexyl tetramethyl glucoside

93.8045

83.1661

81.4906

79.6007

77.4777

77.2551

77.0545

76.6312

75.0521

71.0413

69.7685

60.8759

60.4997

59.1917

58.2219

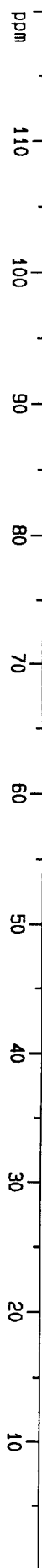
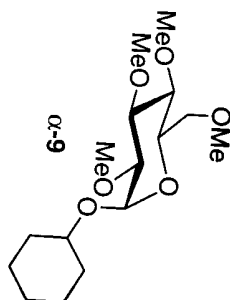
33.2888

31.3518

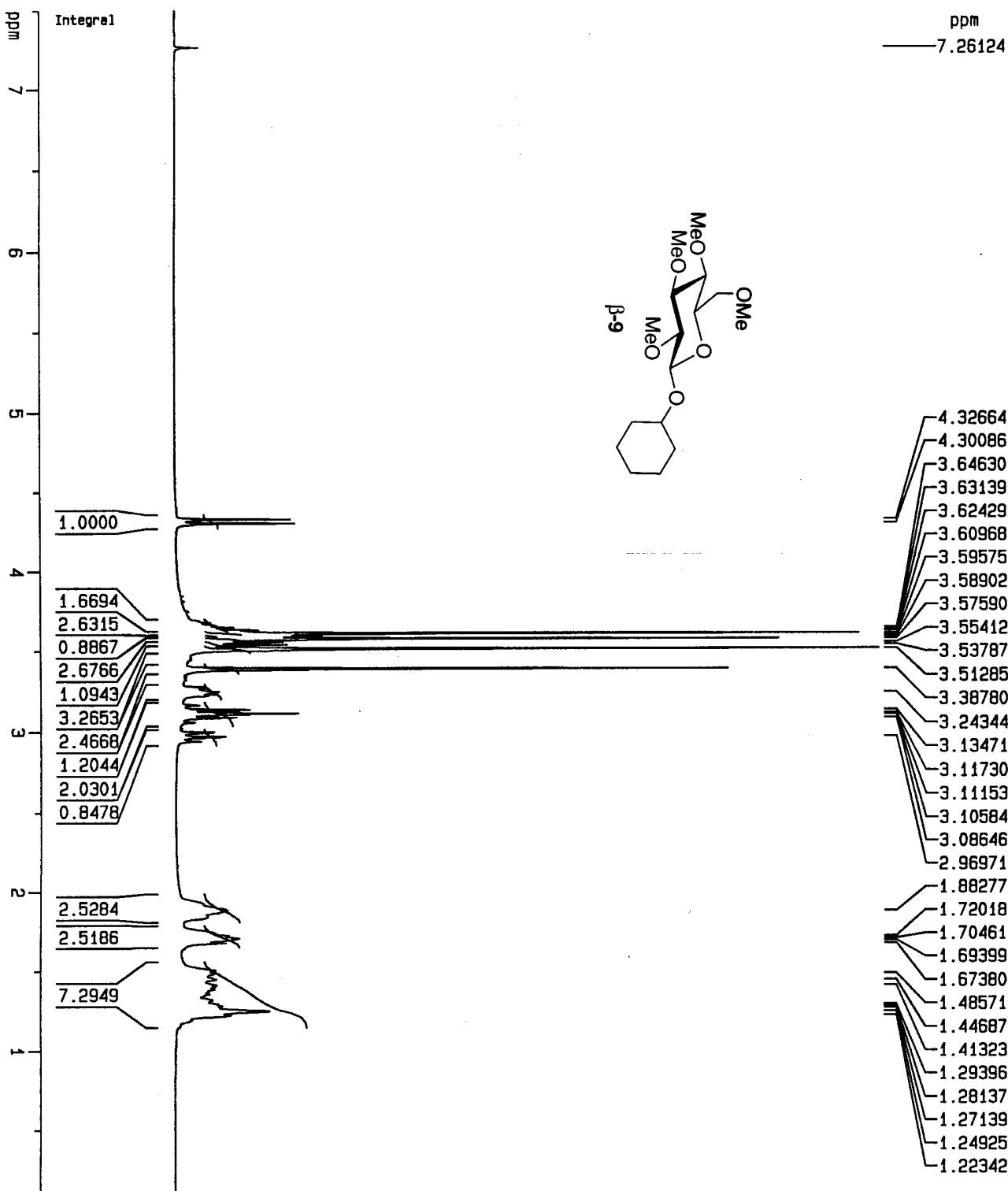
25.5858

24.5853

24.2039



## jtr beta-cyclohexyl tetramethyl glucoside



Current Data Parameters

NAME	test
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20001027
Time	9.33

INSTRUM 5 mm Multinu

PROBHD spect

PULPROG zg

TD 16384

SOLVENT CDCl3

NS 32

DS 0

SWH 4496.403 Hz

FIDRES 0.27439 Hz

AQ 1.8219508 sec

RG 114

DW 111.200 usec

DE 14.29 usec

TE 300.0 K

D1 0.0000000 sec

P1 8.10 usec

SFO1 300.1318008 MHz

NUC1 1H

PL1 -6.00 dB

F2 - Processing parameters

SI	8192
SF	300.1300060 MHz
WDW	EM
SSB	0
LB	0.20 Hz
GB	0
PC	0.10

1D NMR plot parameters

CX	20.30 cm
F1P	7.500 ppm
F1	2250.98 Hz
F2P	0.100 ppm
F2	30.01 Hz
PPMCM	0.36453 ppm/cm
HZCM	109.40700 Hz/cm

ppm

jtr beta cyclohexyl tetramethyl glucoside

101.484

86.478

83.804

79.513

77.475

77.214

77.053

76.628

74.590

71.596

60.843

60.550

60.444

59.424

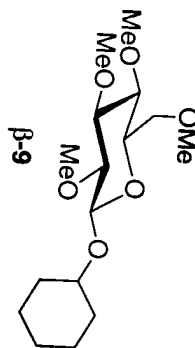
33.563

31.665

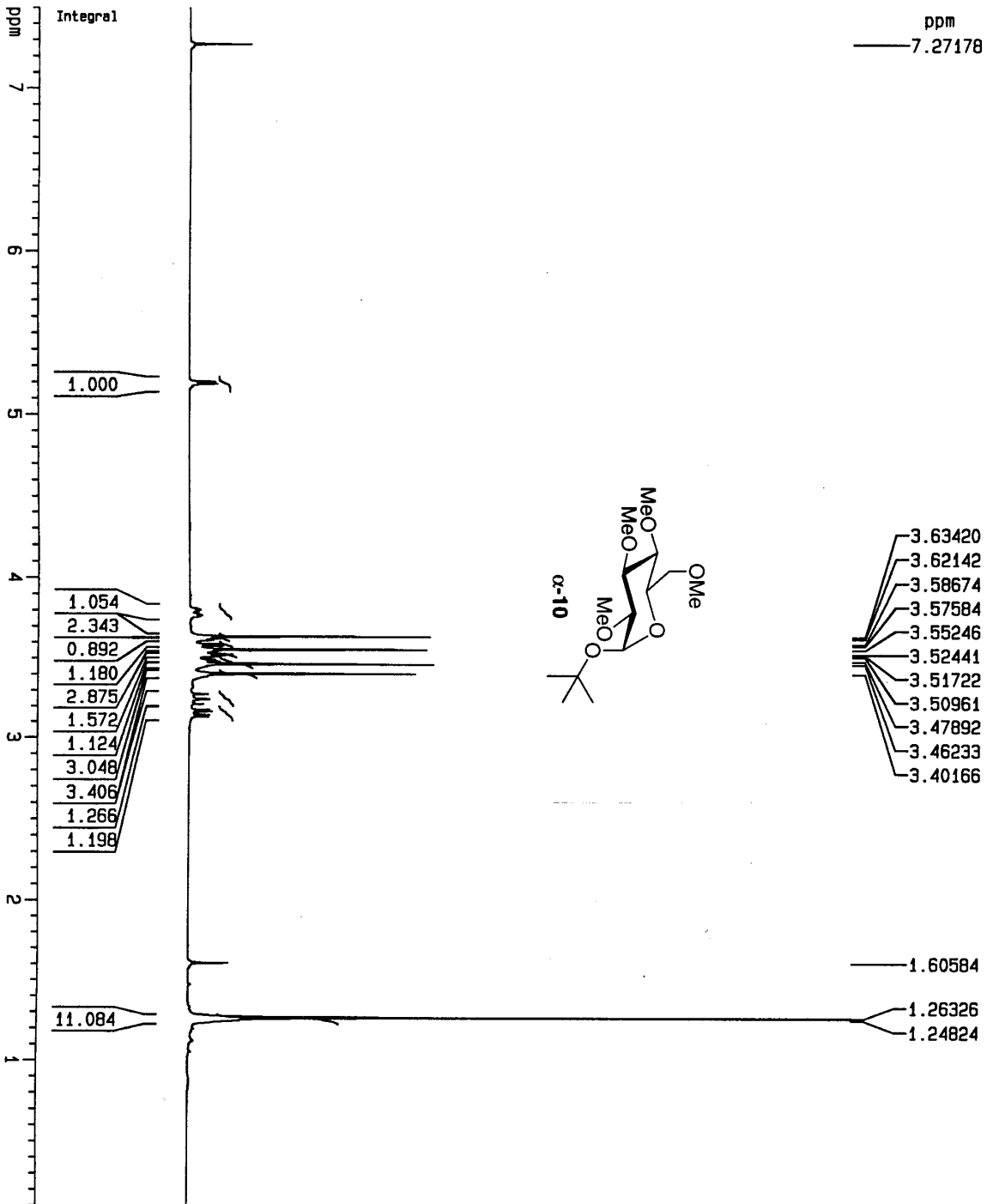
25.662

23.956

23.769



## jtr alpha-tert-butyl tetramethyl glucoside



Current Data Parameters  
NAME test  
EXPNO 1  
PROCNO 1

F2 - Acquisition Parameters  
Date\_ 20001027  
Time 20.00  
INSTRUM spect  
PROBHD 5 mm QNP 1H  
PULPROG zg  
TD 16384  
SOLVENT CDCl3  
NS 24  
DS 0  
SWH 4496.403 Hz  
FIDRES 0.27439 Hz  
AQ 1.8219508 sec  
RG 228.1  
DW 111.200 usec  
DE 6.00 usec  
TE 300.0 K  
D1 0.00000000 sec

===== CHANNEL f1 =====  
NUC1 1H  
P1 7.10 usec  
PL1 -6.00 dB  
SFO1 300.1318008 MHz

F2 - Processing parameters  
SI 8192  
SF 300.1300118 MHz  
WDW EM  
SSB 0  
LB 0.20 Hz  
GB 0  
PC 1.00

1D NMR plot parameters  
CX 20.00 cm  
F1P 7.500 ppm  
F1 2250.97 Hz  
F2P 0.100 ppm  
F2 30.01 Hz  
PPMCM 0.37000 ppm/cm  
HZCM 111.04810 Hz/cm

ppm

itr alpha tert-butyl tetramethyl glucoside

90.7411

83.0938

81.8758

79.6489

77.4693

77.0460

76.6227

75.1697

71.0195

69.3387

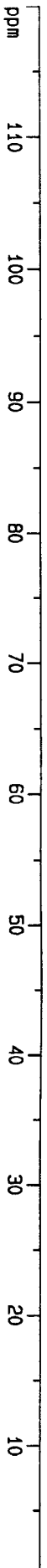
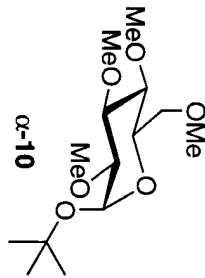
60.7770

60.4504

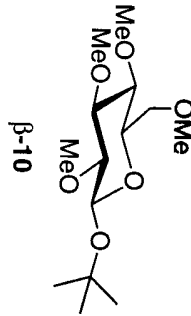
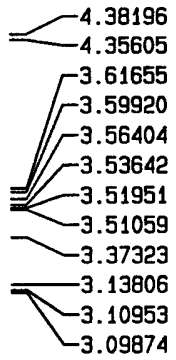
59.2170

58.4225

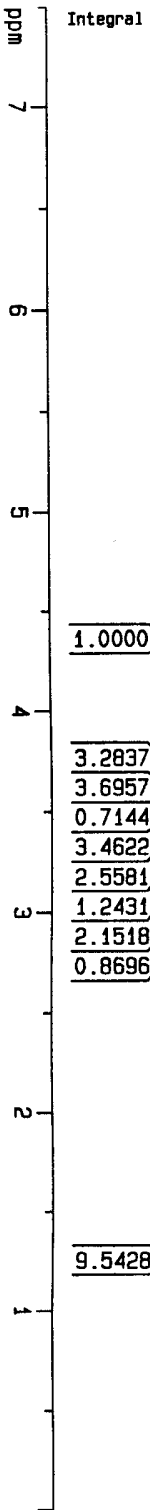
28.5582



## itr beta-tertbutoyl tetramethyl glucoside



1.26430



Current Data Parameters

NAME	test
EXPNO	2
PROCNO	1

F2 - Acquisition Parameters

Date_	20001027
Time	14.46
INSTRUM	spect
PROBHD	5 mm Multinu
PULPROG	zg
TD	16384
SOLVENT	CDCl3
NS	32
DS	0
SWH	4496.403 Hz
FIDRES	0.274439 Hz
AQ	1.8219508 sec
RG	114
DM	111.200 usec
DE	14.29 usec
TE	300.0 K
D1	0.00000000 sec
P1	8.10 usec
SFO1	300.1318008 MHz
NUC1	<sup>1</sup> H
PL1	-6.00 dB

F2 - Processing parameters

SI	8192
SF	300.1300060 MHz
WDW	EM
SSB	0
LB	0.20 Hz
GB	0
PC	0.10

1D NMR plot parameters

CX	20.30 cm
F1P	7.500 ppm
F1	2250.98 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	0.36946 ppm/cm
HZCM	110.88548 Hz/cm

ppm

itr beta tert-butyl tetramethyl glucoside

97.6474

86.7135

84.0310

79.7029

77.4899

77.0674

76.6433

74.3848

71.7873

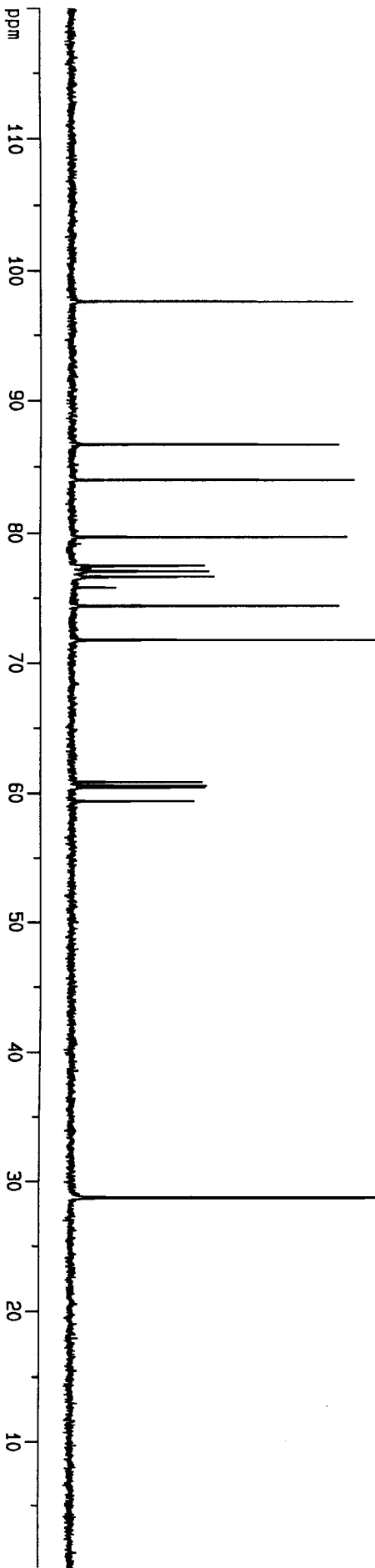
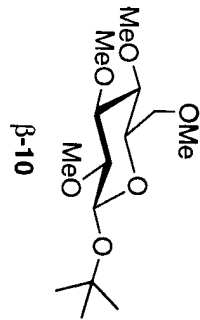
60.8493

60.5575

60.4279

59.3779

28.7485

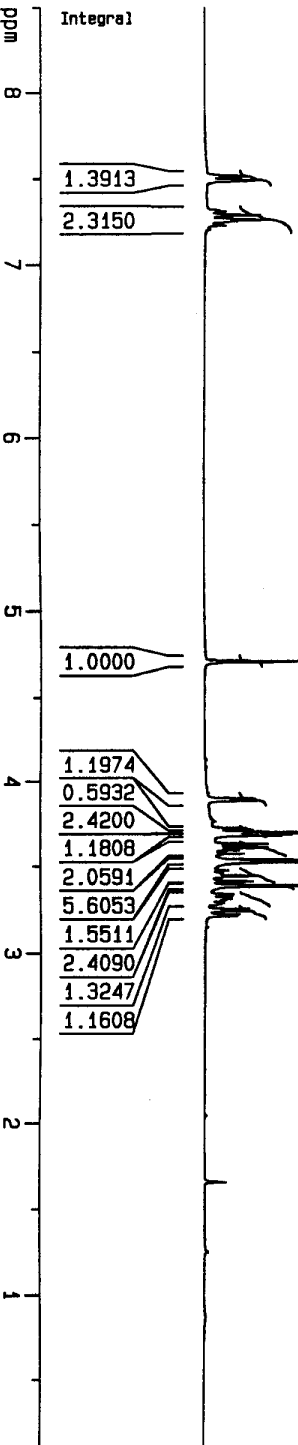
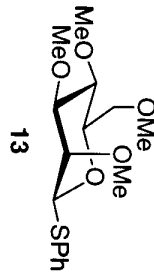


## jtr beta Sph tetramethyl mannoside

ppm

7.51964  
7.51478  
7.49222  
7.48905  
7.28904  
7.26225  
7.25207

4.70996  
3.89654  
3.88728  
3.72164  
3.71567  
3.69627  
3.68611  
3.67958  
3.62819  
3.60876  
3.59205  
3.57279  
3.52886  
3.44380  
3.41235  
3.38622  
3.25279  
3.24236  
3.22199  
3.21160



Current Data Parameters  
NAME test  
EXPNO 13  
PROCNO 1

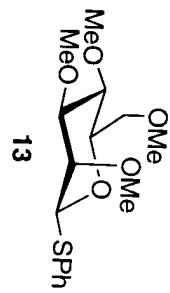
F2 - Acquisition Parameters  
Date\_ 20001113  
Time 18.38  
INSTRUM spect  
PROBHD 5 mm Multinu  
PULPROG zg  
TD 16384  
SOLVENT CDCl3  
NS 32  
DS 0  
SMH 4436.403 Hz  
FIDRES 0.274439 Hz  
AQ 1.8219508 sec  
RG 203.2  
DW 111.200 usec  
DE 14.29 usec  
TE 300.0 K  
D1 0.0000000 sec  
P1 8.10 usec  
SFO1 300.1318008 MHz  
NUC1 1H  
PL1 -6.00 dB

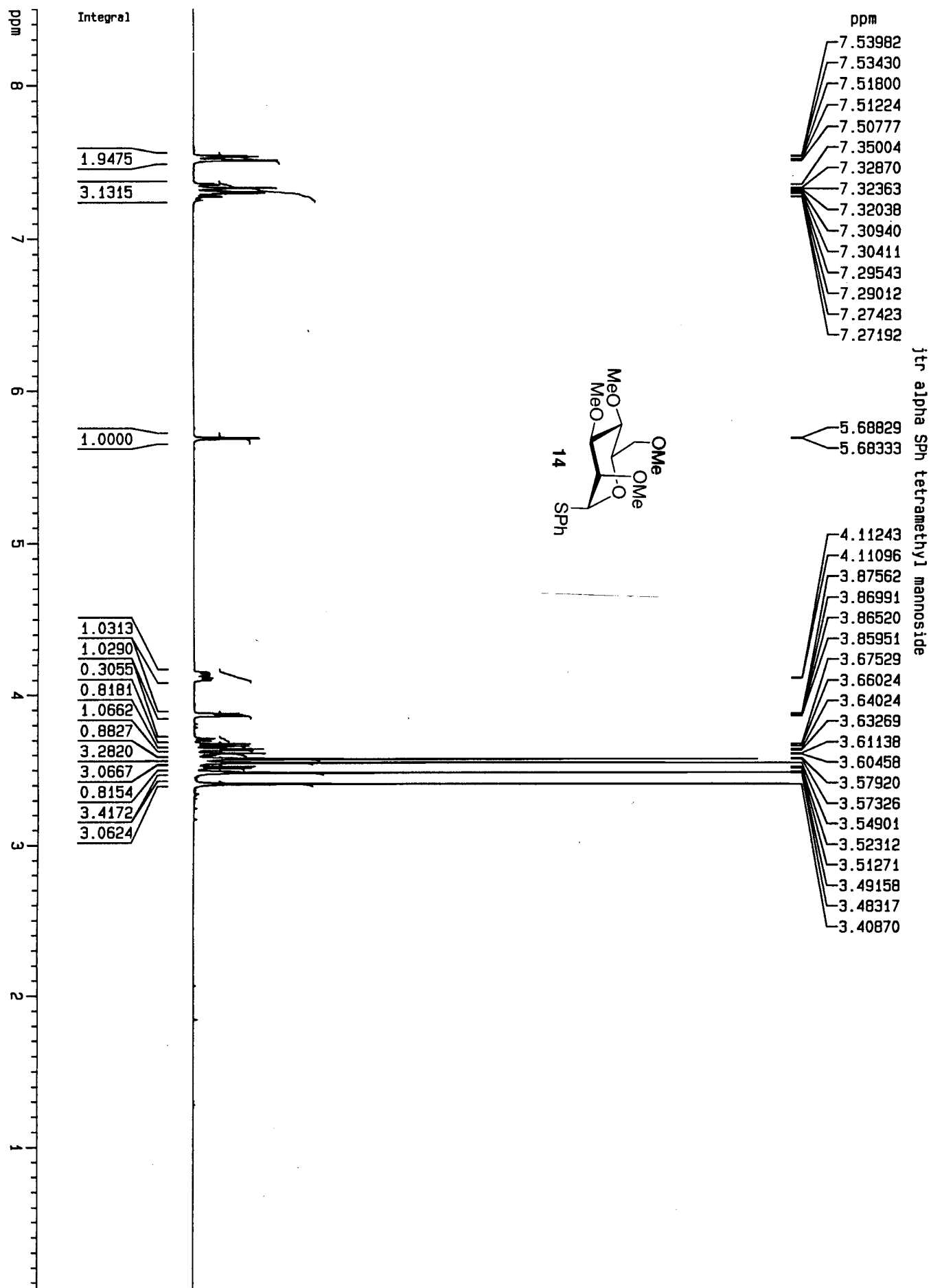
F2 - Processing parameters  
SI 8192  
SF 300.1300060 MHz  
WDW EM  
SSB 0  
LB 0.20 Hz  
GB 0  
PC 0.10

1D NMR plot parameters  
CX 20.30 cm  
F1P 8.500 ppm  
F1 2551.10 Hz  
F2P 0.100 ppm  
F2 30.01 Hz  
PPMCM 0.41379 ppm/cm  
HZCM 124.19173 Hz/cm

ppm

itr beta Sph tetramethyl mannoside

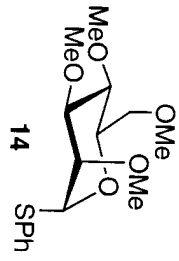
135.478  
130.733  
128.928  
127.13087.533  
86.105  
79.743  
79.126  
77.480  
77.057  
76.633  
76.422  
71.93962.105  
60.873  
59.383  
58.103ppm  
140  
120  
100  
80  
60  
40  
20



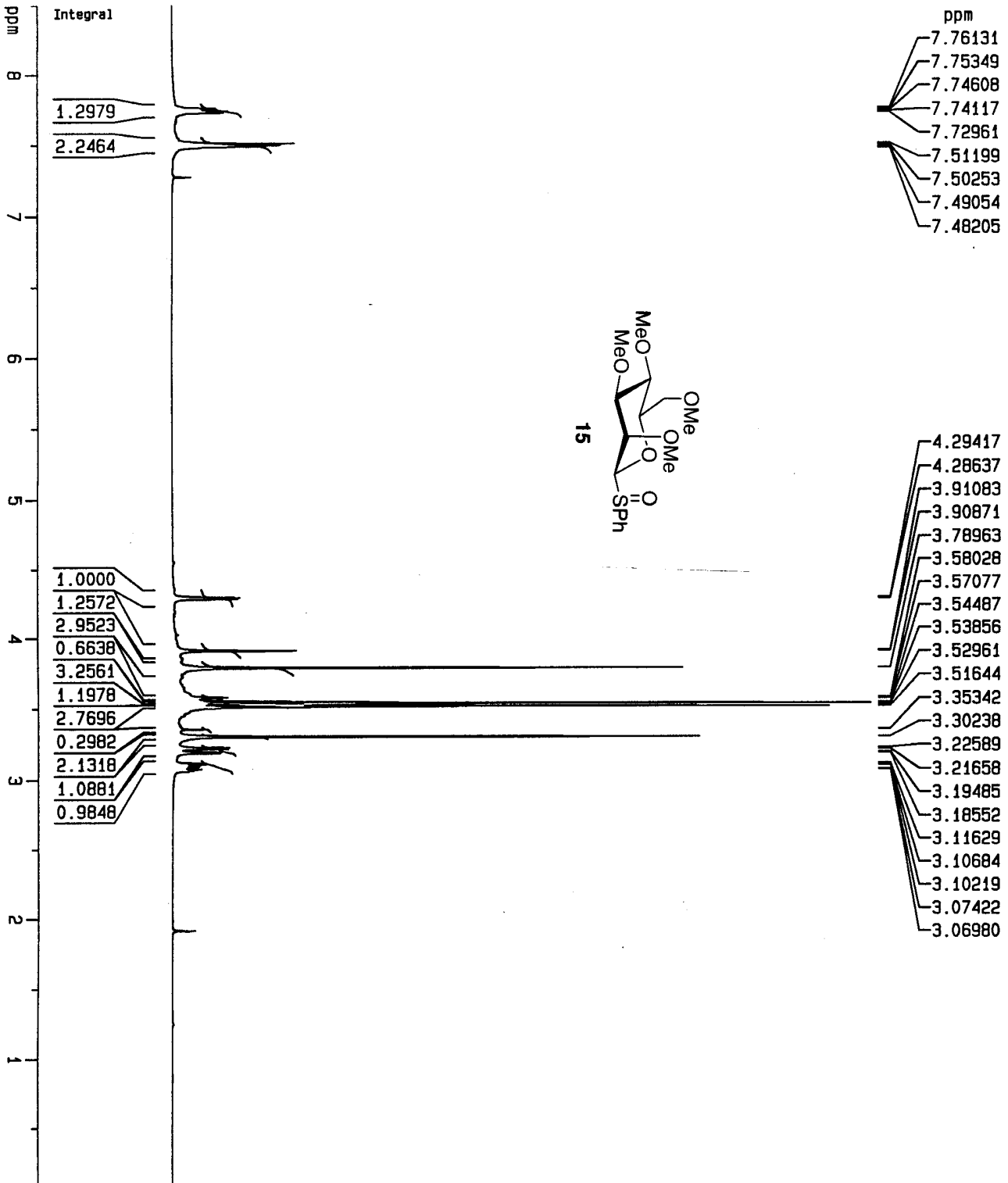
ppm

itr alpha SPn tetramethyl  
mannoside

134.593	
130.954	
128.956	
127.202	
84.661	
84.610	
81.494	
78.660	
77.428	
77.004	
76.580	
76.207	
72.106	
71.155	
60.659	
59.079	
58.051	
57.681	



## jtr beta S0Ph tetramethyl] mannoside



Current Data Parameters

NAME	test
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

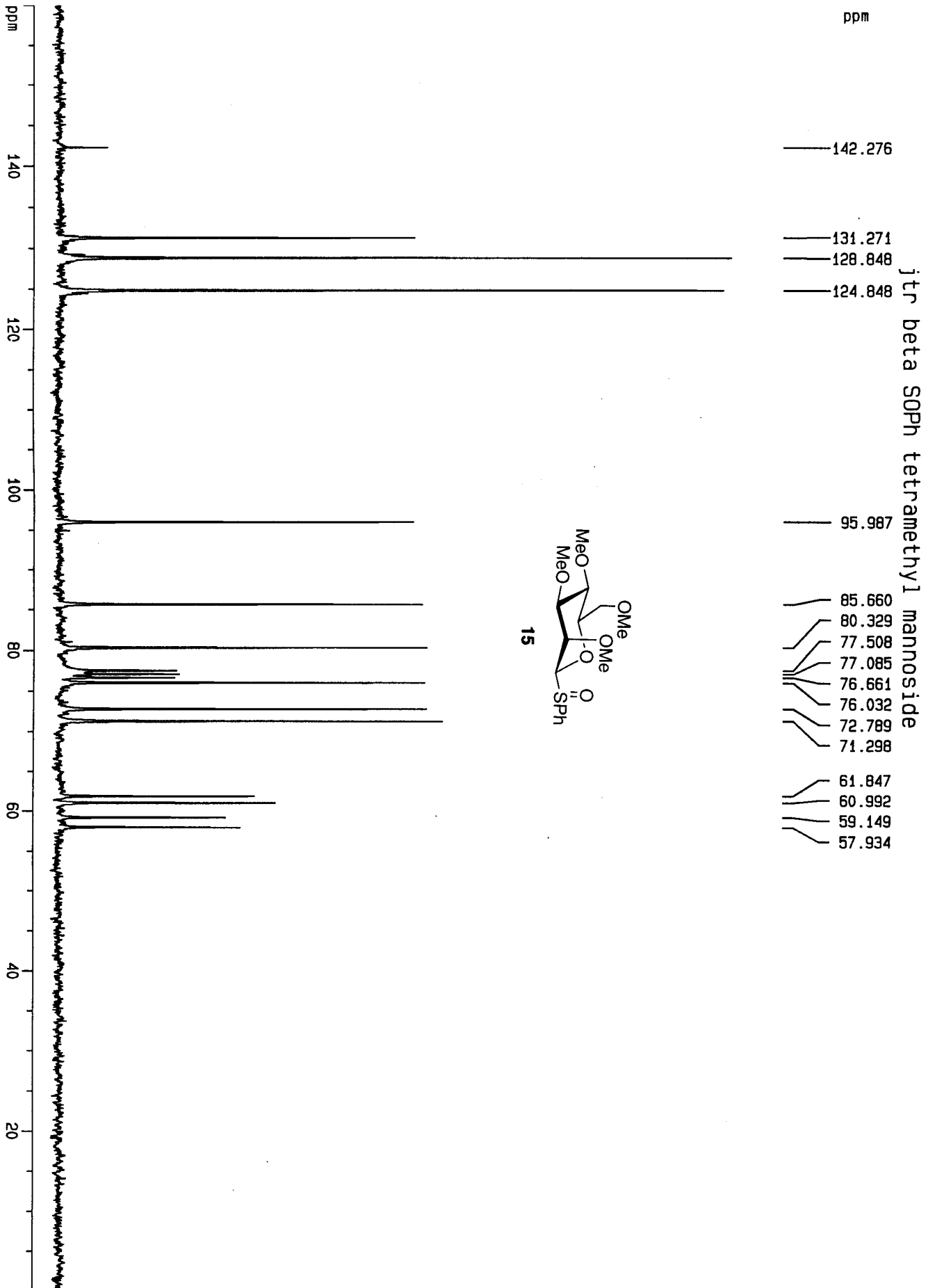
Date_	20001115
Time	18.12
INSTRUM	spect
PROBHD	5 mm Multinu
PULPROG	zg
TD	16384
SOLVENT	CDCl3
NS	32
DS	0
SWH	4496.403 Hz
FIDRES	0.274439 Hz
AQ	1.8219508 sec
RG	57
DM	111.200 usec
DE	14.29 usec
TE	300.0 K
D1	0.0000000 sec
P1	8.10 usec
SFO1	300.131808 MHz
NUC1	<sup>1</sup> H
PL1	-6.00 dB

F2 - Processing parameters

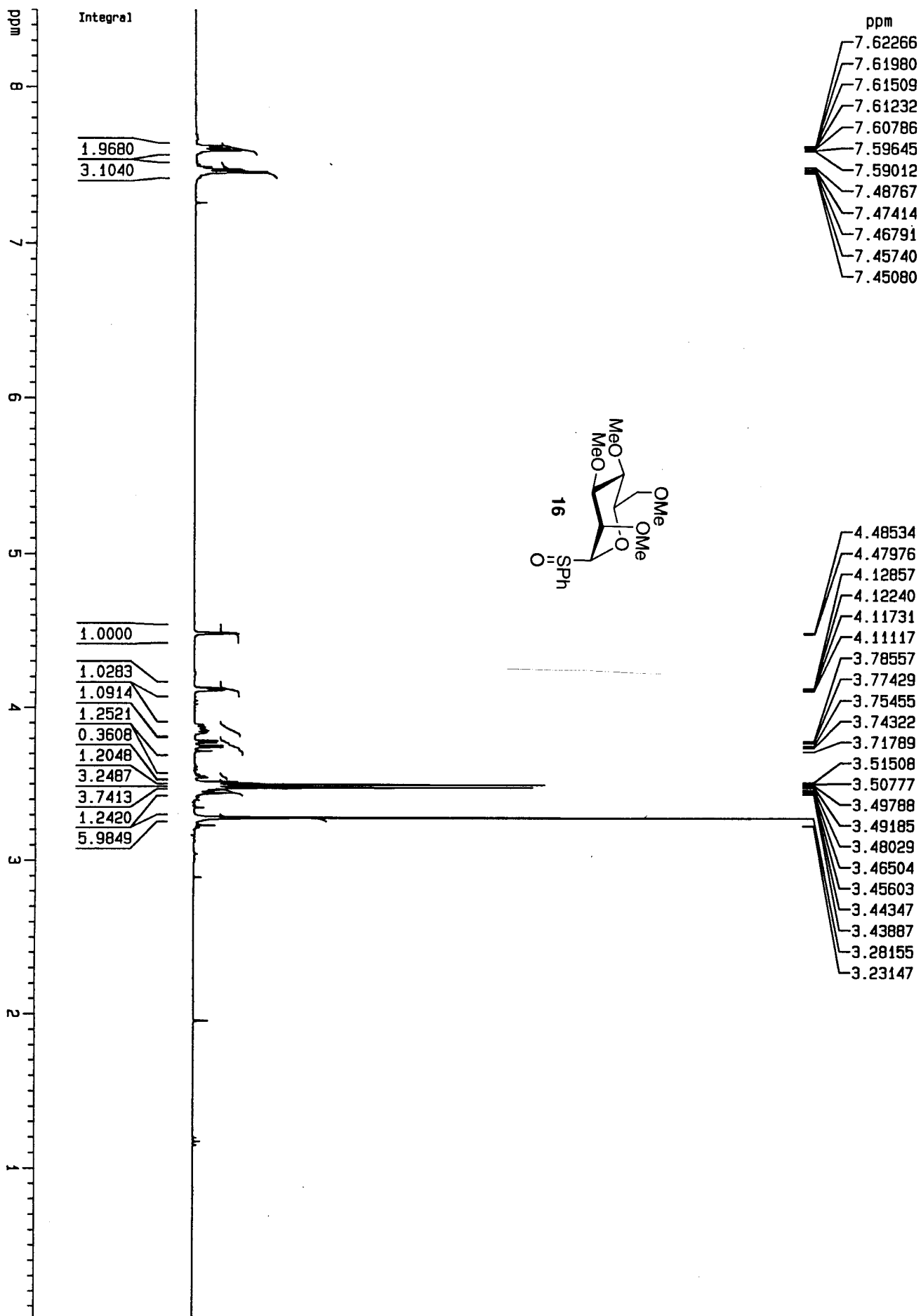
SI	8192
SF	300.1300014 MHz
WDW	EM
SSB	0
LB	0.20 Hz
GB	0
PC	0.10

1D NMR plot parameters

CX	20.30 cm
F1P	8.500 ppm
F1	2551.10 Hz
F2P	0.100 ppm
F2	30.04 Hz
PPMCM	0.41379 ppm/cm
HZCM	124.19173 Hz/cm



itr alpha SOPh tetramethyl mannoside



ppm

itr alpha SOPh tetramethyl mannoside

141.624

131.206

128.970

124.192

94.757

80.800

77.157

77.001

75.188

73.353

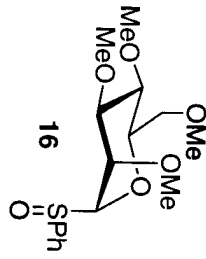
71.258

60.506

59.073

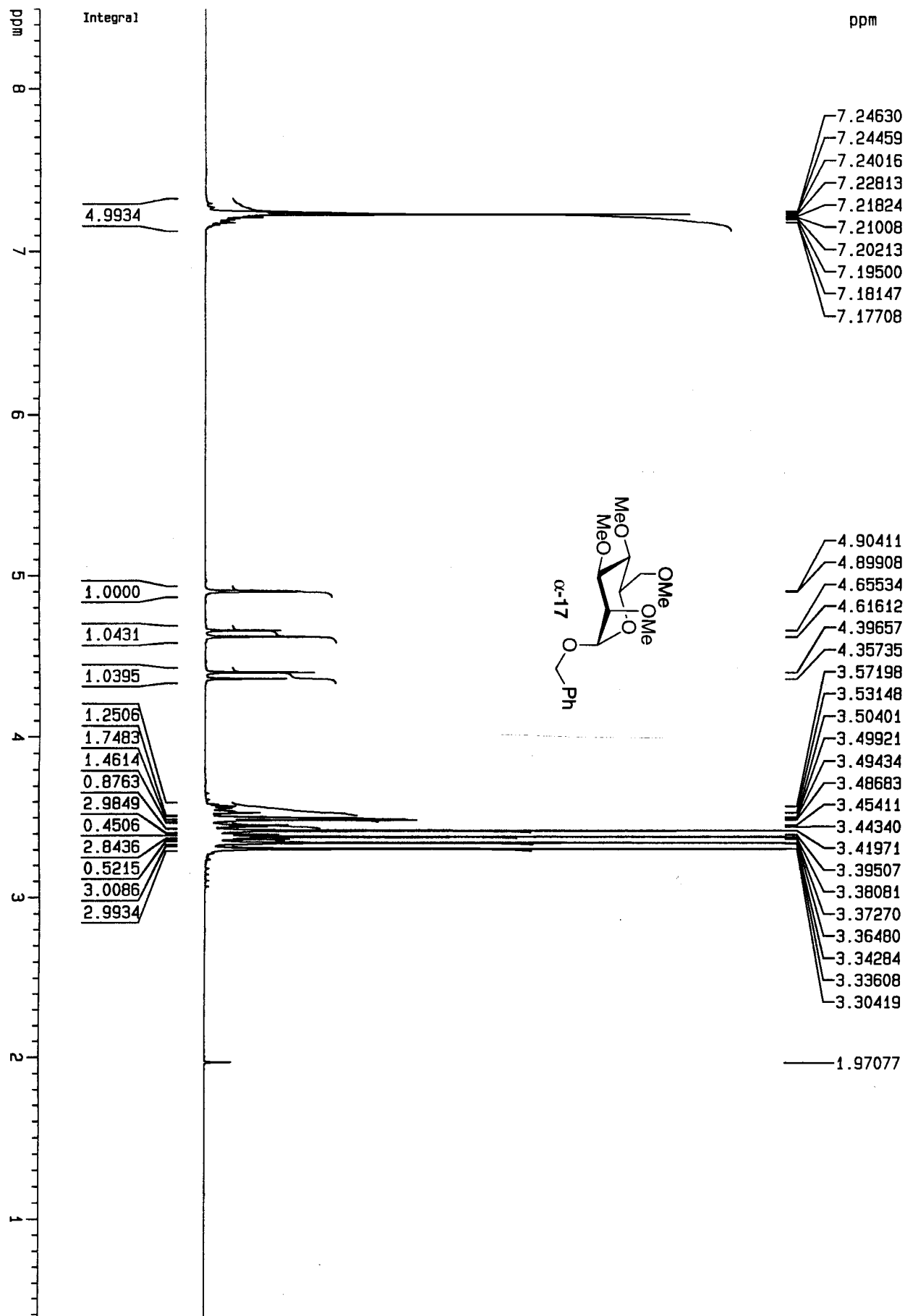
58.094

57.745



ppm

jtr alpha benzy1 tetramethyl1 mannoside



ppm

itr alpha benzyl tetramethyl mannoside

137.189  
128.339  
128.304  
128.271  
128.236  
128.203  
127.870  
127.838  
127.804  
127.767  
127.735  
127.703  
127.668

96.176

81.162

77.442

77.115

77.017

76.592

76.359

71.554

71.484

71.443

68.990

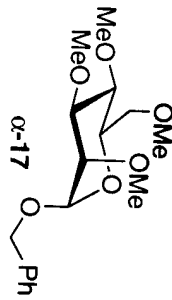
60.442

59.056

59.021

58.792

57.570



ppm

160

140

120

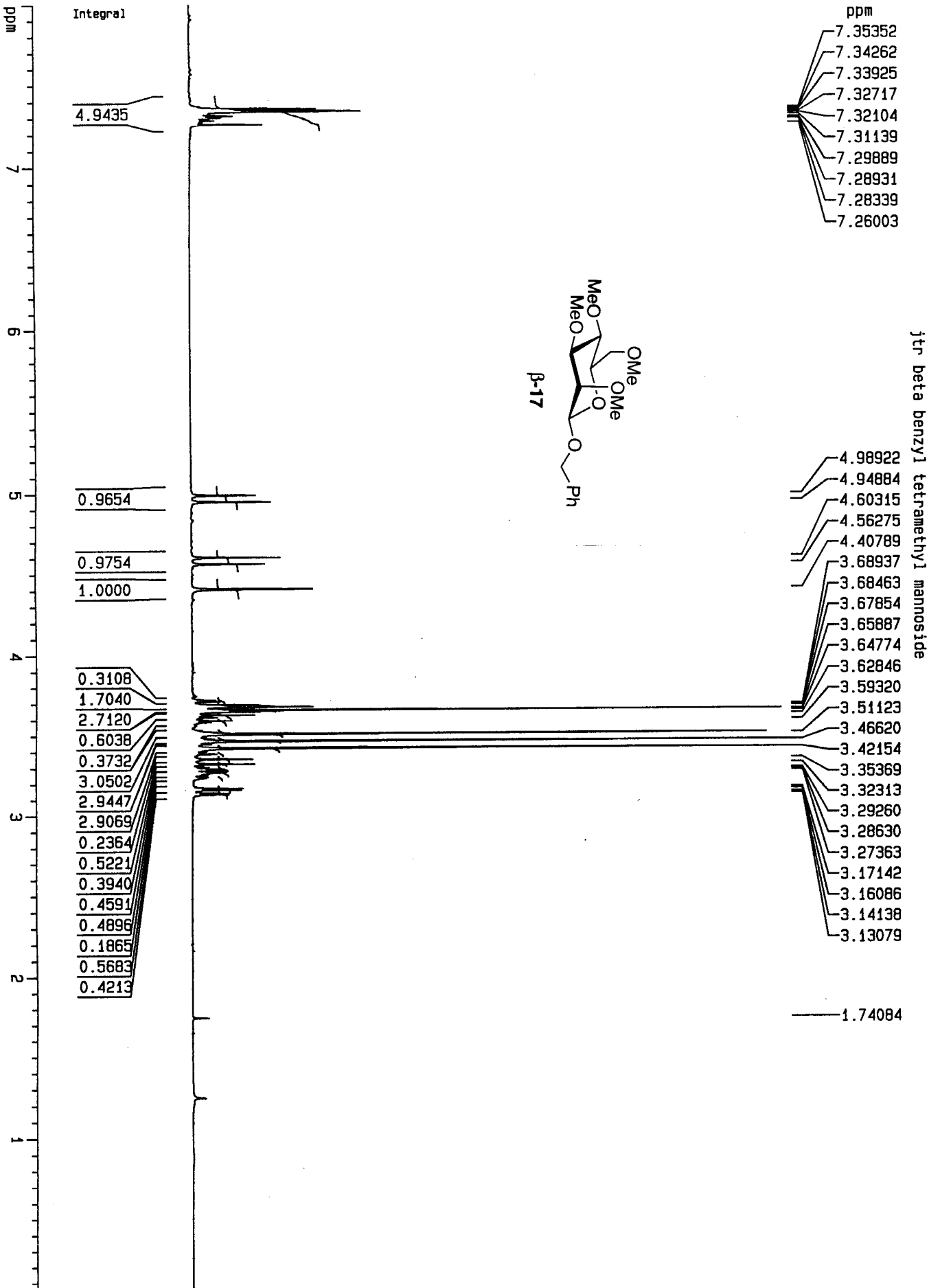
100

80

60

40

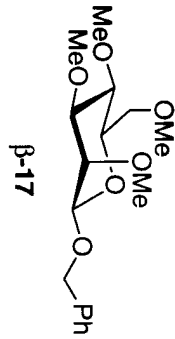
20



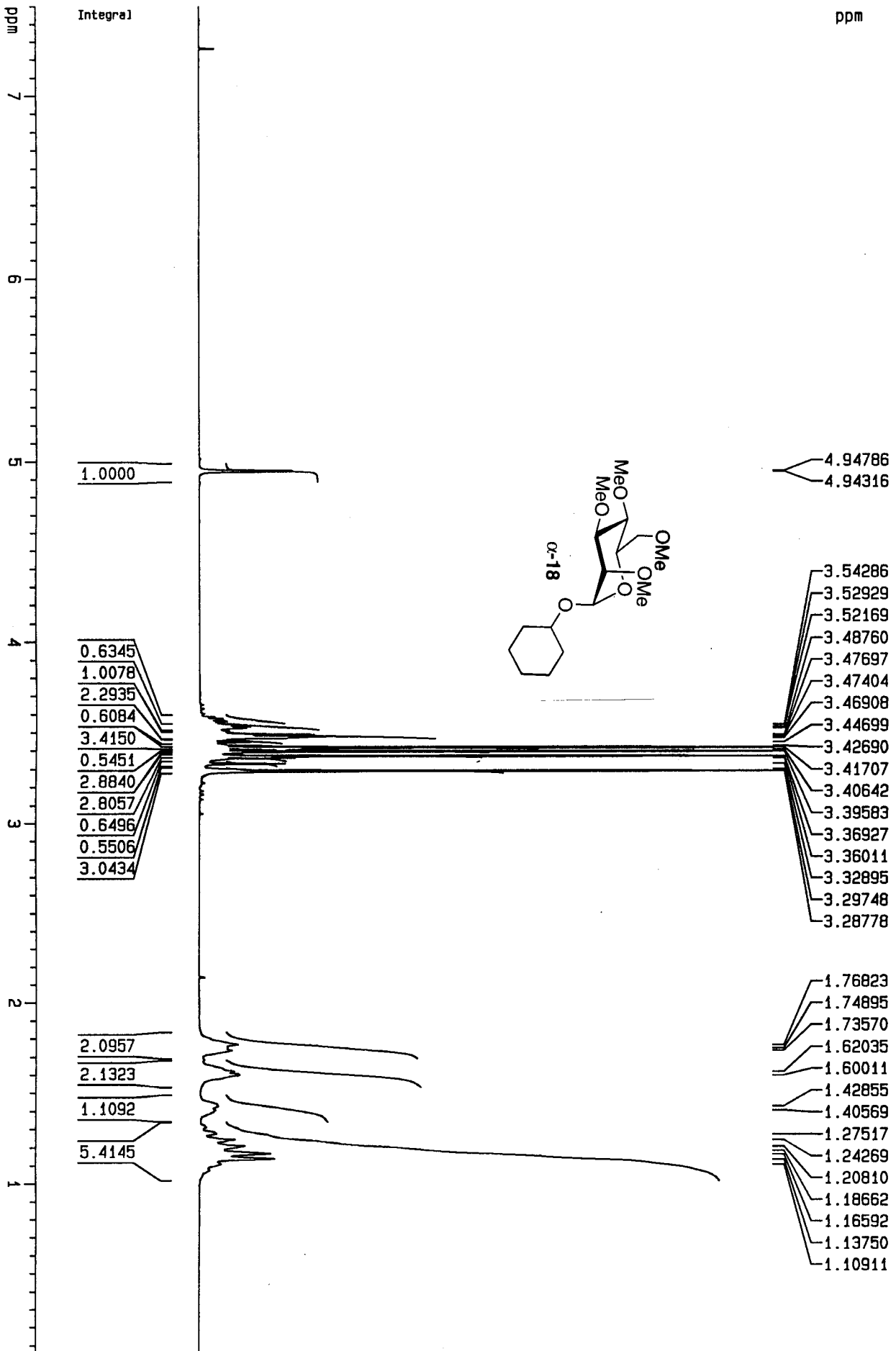
ppm

itr beta benzyl tetramethyl mannoside

137.382
128.310
127.838
127.659
99.962
83.968
77.422
76.996
76.950
76.574
76.505
75.593
71.941
70.617
61.679
60.689
59.280
57.343

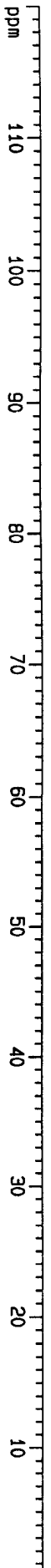
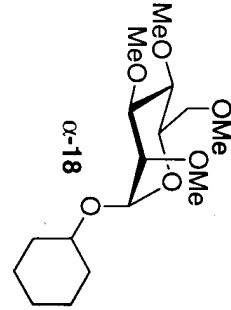


[1r alpha cyclohexyl tetramethyl mannoside



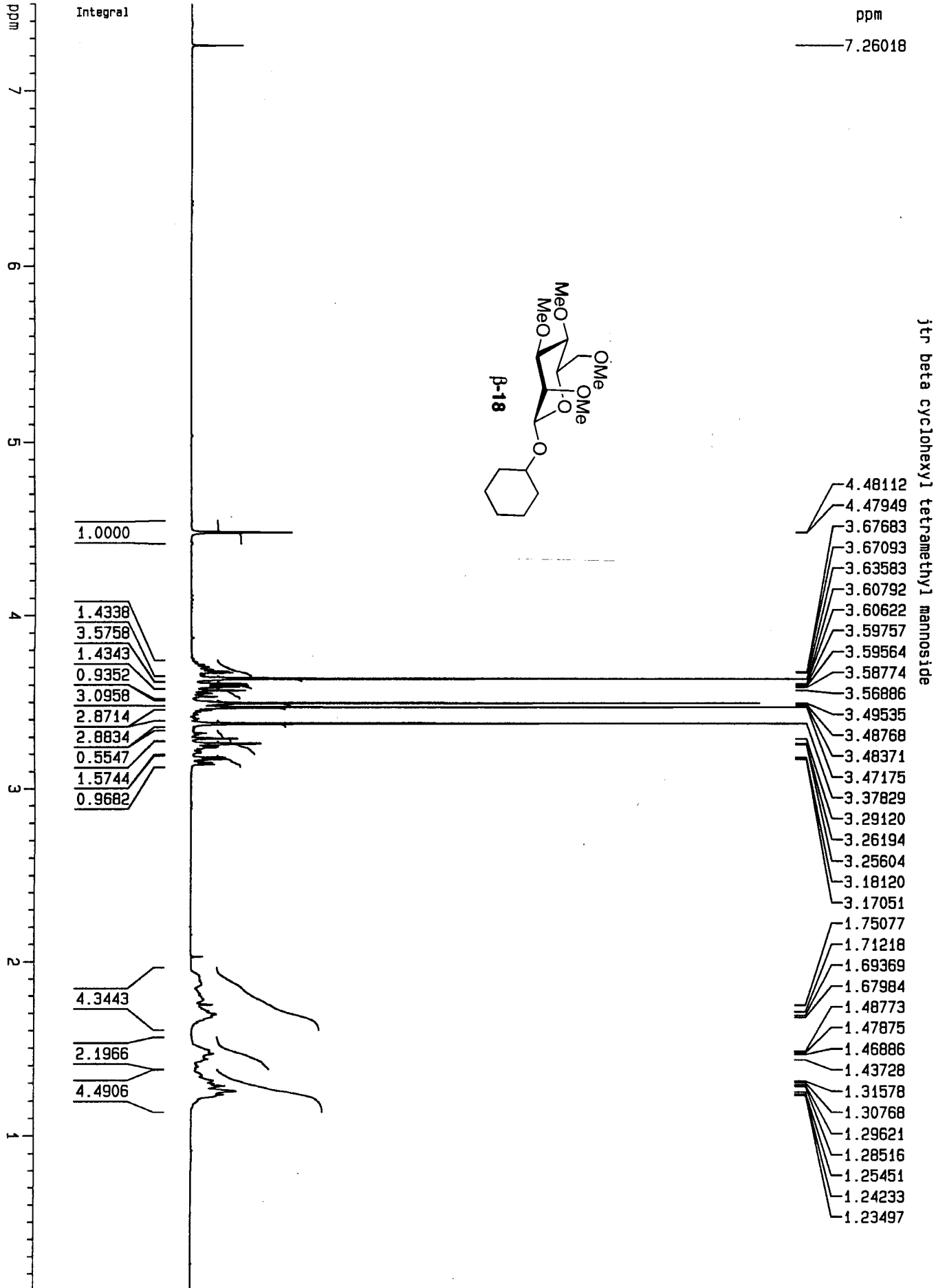
ppm

itr alpha cyclohexyl tetramethyl mannoside



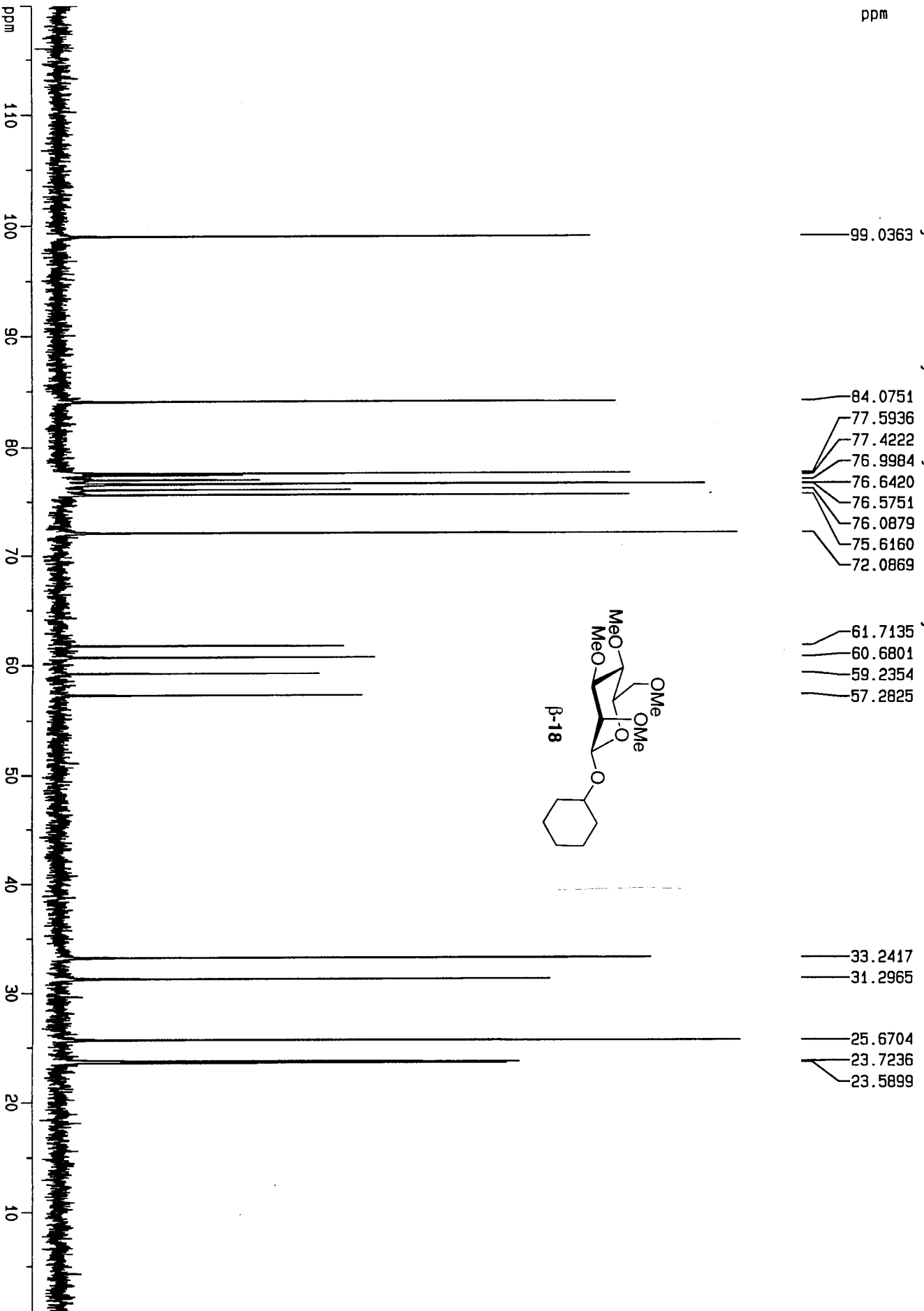
94.4636
81.1031
77.6536
77.5846
77.4290
77.2062
77.0037
76.5779
76.5109
76.4397
74.5286
71.5487
71.0401
60.2666
60.1974
58.8540
58.7847
58.7542
58.6620
58.6302
58.5618
57.4598
57.3927
57.3236

33.1015
33.0330
32.9643
31.1646
25.4752
25.4059
25.3380
23.8524
23.5814



ppm

itr beta cyclohexyl tetramethyl mannoside



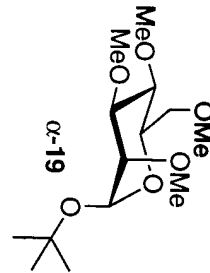
itr alpha t-butyl tetramethyl mannoside

ppm

5.17469  
5.16859

3.54878  
3.54233  
3.53393  
3.52477  
3.51627  
3.51115  
3.50011  
3.49022  
3.48102  
3.46943  
3.44386  
3.37649  
3.36962  
3.36657  
3.35857  
3.35224

1.24179  
1.21679  
1.19483



Integral

ppm

1.000

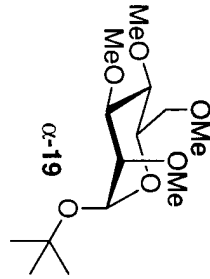
1.293  
4.096  
2.709  
3.553  
3.198  
2.373  
2.927

10.849

ppm

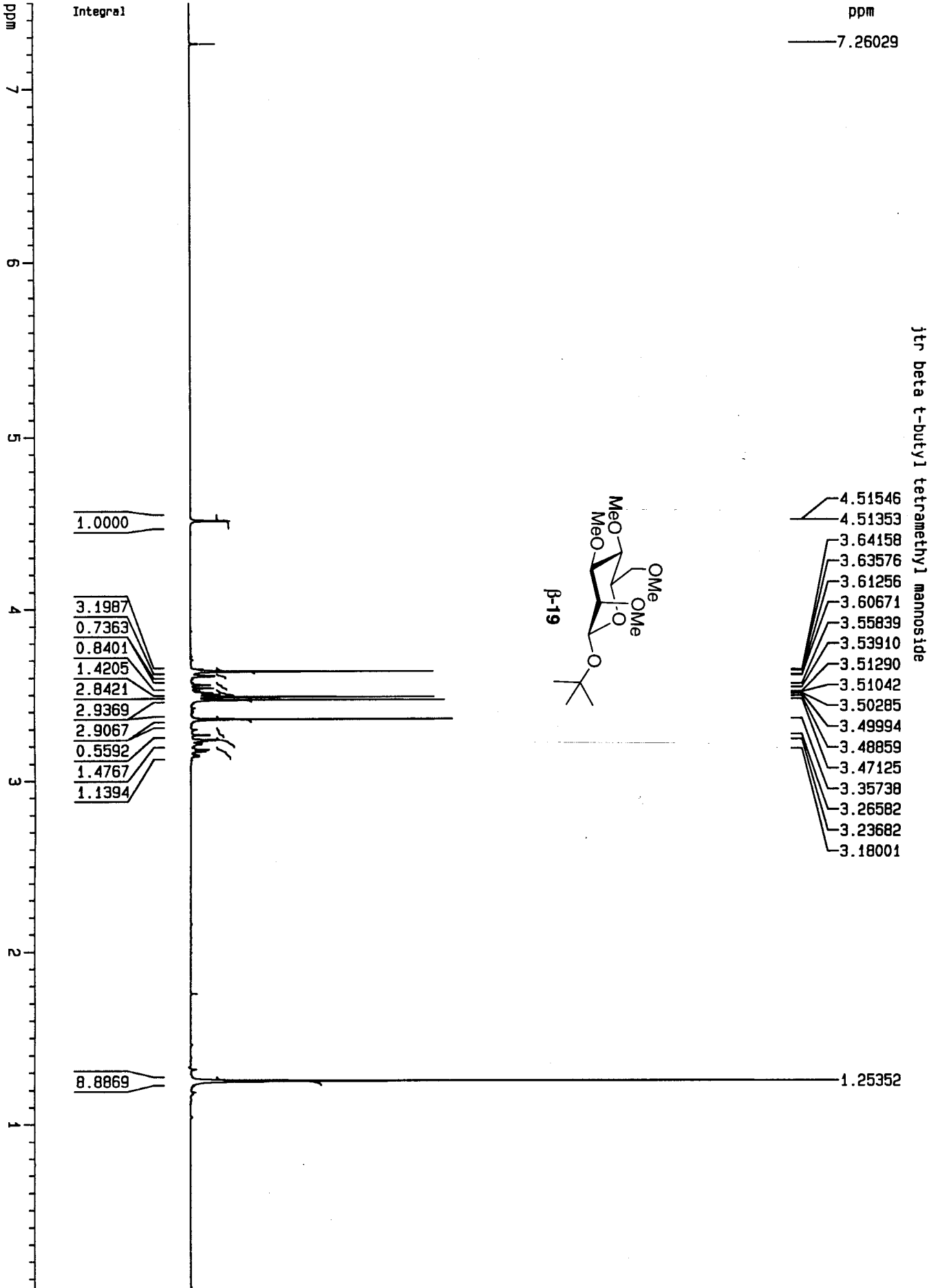
itr alpha t-butyl tetramethyl mannoside

91.2336  
81.0129  
78.5907  
77.4250  
77.0006  
76.5475  
75.1542  
71.5773  
70.6951  
60.5093  
59.1021  
58.6352  
57.5715



28.4044

ppm  
110  
100  
90  
80  
70  
60  
50  
40  
30  
20  
10



ppm

itr beta t-butyl tetramethyl mannoside

95.4653

83.7344

78.0705

77.0025

76.5794

76.1724

75.1617

74.7366

71.7186

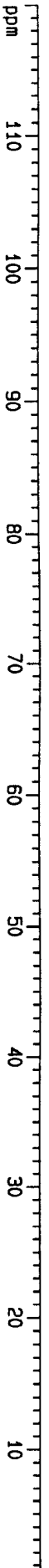
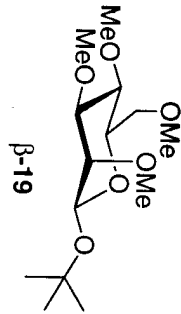
61.4668

60.2560

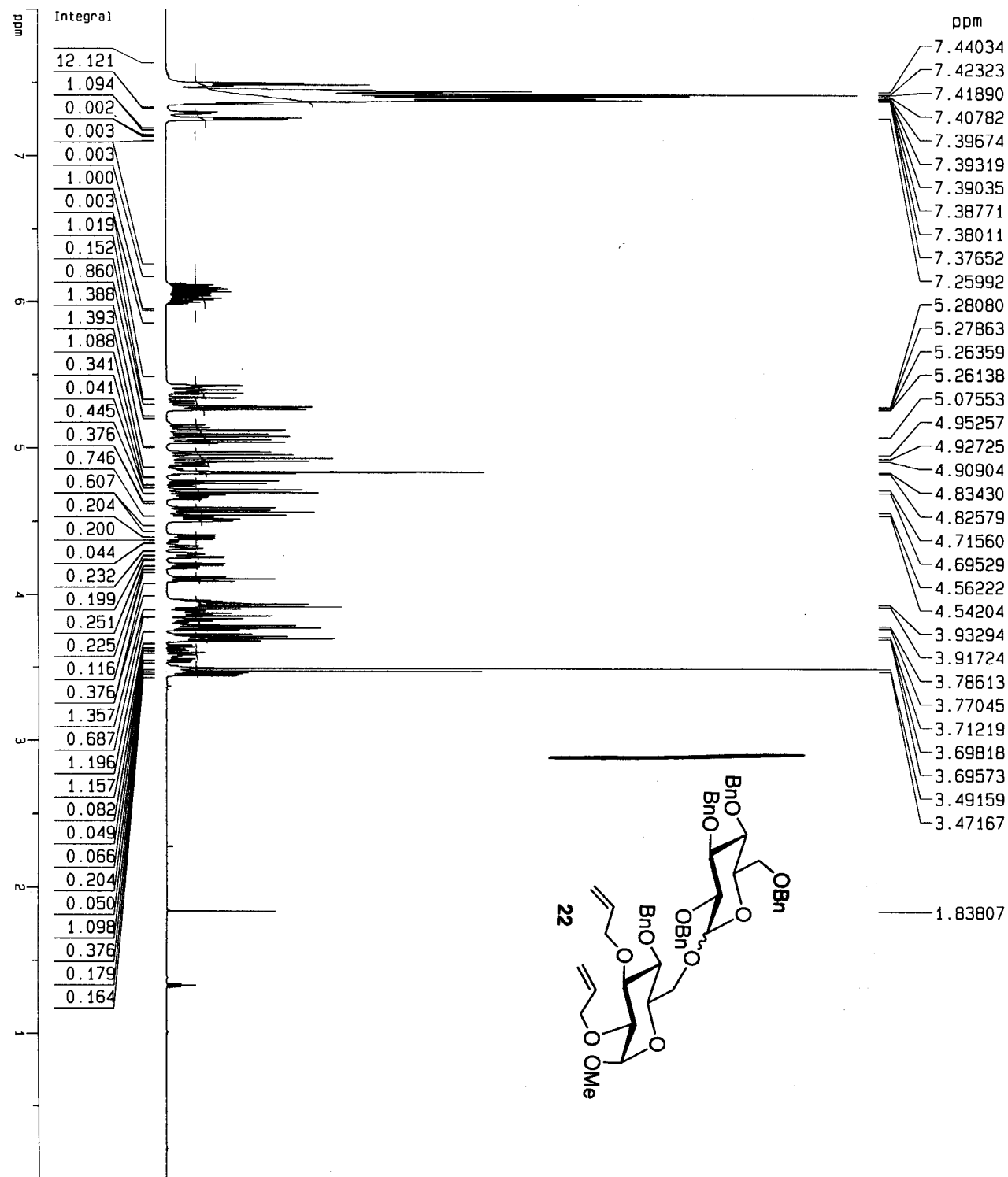
58.7260

56.8668

28.1156



600 Mhz <sup>1</sup>H NMR spectrum of JTR in CDCl<sub>3</sub> made by Jon Reeves at room temperature, 07/11/01



Current Data Parameters

NAME	JTR
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters:

Date_	20010711
Time	13.50
INSTRUM	spect
PROBHD	5 mm SEI 1H-
PULPROG	zg
TD	65536
SOLVENT	CDCl <sub>3</sub>
NS	8
DS	0
SWH	8992.806 Hz
FIDRES	0.137219 Hz
AQ	3.6438515 sec
RG	10
DW	55.600 usec
DE	6.00 usec
TE	290.0 K
D1	24.00000000 sec

===== CHANNEL f1 =====

NUC1	<sup>1</sup> H
P1	8.00 usec
PL1	0.00 dB
SFO1	600.8336050 MHz

F2 - Processing parameters

SI	65536
SF	600.8299796 MHz
WDW	EM
SSB	0
LB	0.10 Hz
GB	0
PC	1.00

1D NMR plot parameters

CX	20.00 cm
F1P	8.000 ppr
F1	4806.64 Hz
F2P	0.000 ppr
F2	0.00 Hz
PPMCM	0.40000 ppr
HZCM	240.33199 Hz

