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Brønsted Acid Promoted Reduction of Tertiary Phosphine Oxides

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DOI

[10.1002/zaac.201700125](https://doi.org/10.1002/zaac.201700125)

Publication date

2017

Document Version

Other version

Published in

Zeitschrift für anorganische und allgemeine Chemie

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Article 25fa Dutch Copyright Act

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Citation for published version (APA):

Krachko, T., Lyaskovskyy, V., Lutz, M., Lammertsma, K., & Slootweg, J. C. (2017). Brønsted Acid Promoted Reduction of Tertiary Phosphine Oxides. *Zeitschrift für anorganische und allgemeine Chemie*, 643(14), 916-921. <https://doi.org/10.1002/zaac.201700125>

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SUPPORTING INFORMATION

Title: Brønsted Acid Promoted Reduction of Tertiary Phosphine Oxides

Author(s): T. Krachko, V. Lyaskovskyy, M. Lutz, K. Lammertsma, J. C. Slootweg*

Ref. No.: z201700125

Brønsted Acid Promoted Reduction of Tertiary Phosphine Oxides

*Tetiana Krachko, Volodymyr Lyaskovskyy, Martin Lutz, Koop Lammertsma, and J. Chris Sootweg**

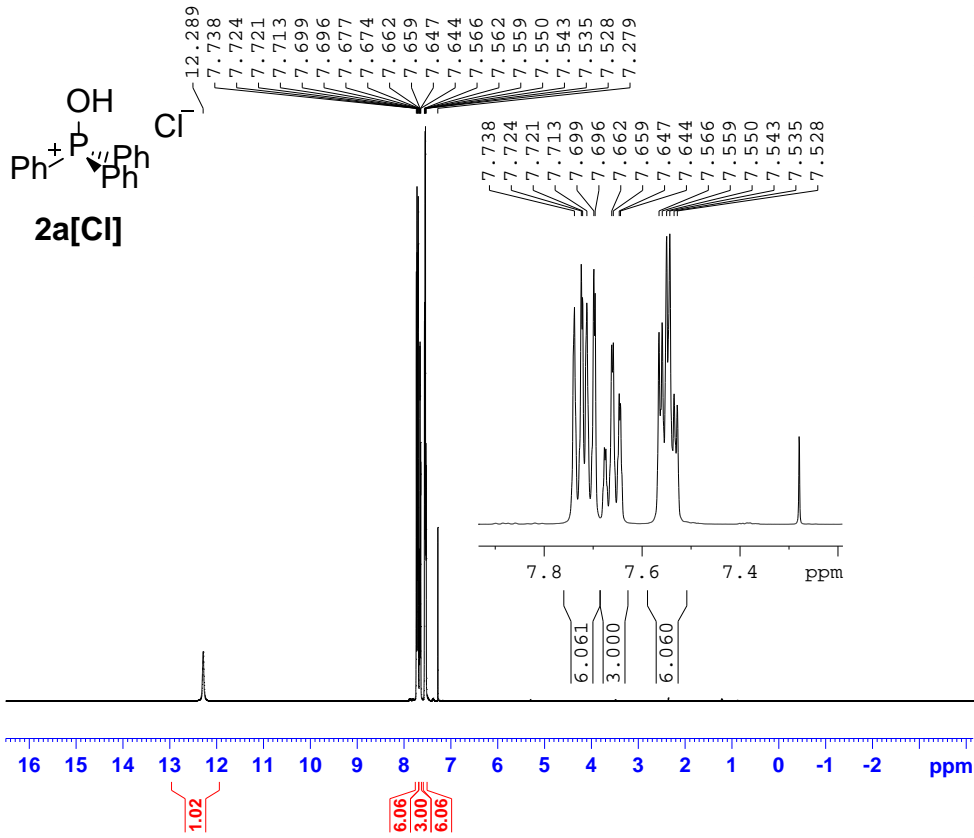
Supporting Information

1. NMR Spectra

S2

1. NMR Spectra

Ph₃P(O)-HCl



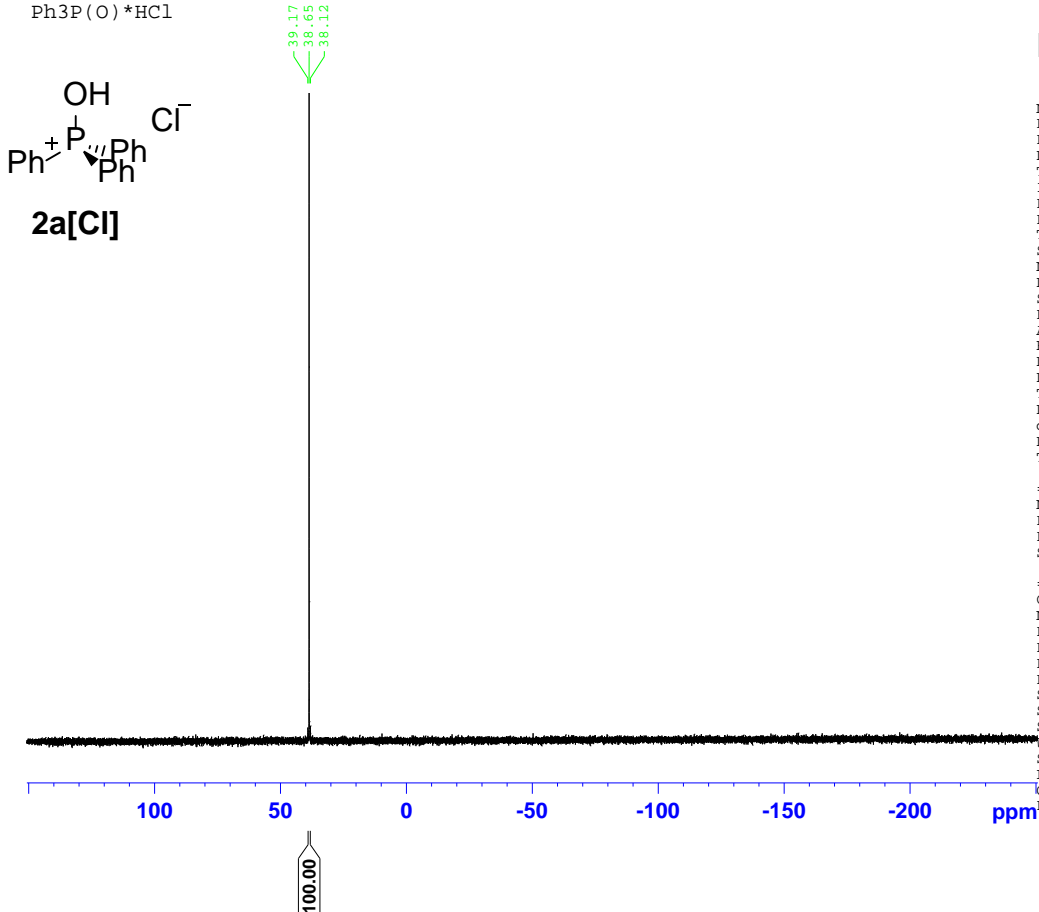
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NAME          VVL 5_500
EXPNO         1
PROCNO        1
Date_         20090630
Time          10.52
INSTRUM       spect
PROBHD        5 mm CPTCI 1H-
PULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            16
DS            2
SWH           10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1719923 sec
RG            16
DW            48.400 usec
DE            6.50 usec
TE            296.0 K
D1            1.00000000 sec
TD0           1
    
```

```

===== CHANNEL f1 =====
NUC1          1H
P1            6.70 usec
PL1           4.00 dB
PL1W          8.72000027 W
SFO1          500.2330891 MHz
SI            32768
SF            500.2300000 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00
    
```

Ph₃P(O)*HCl



```

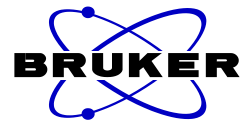
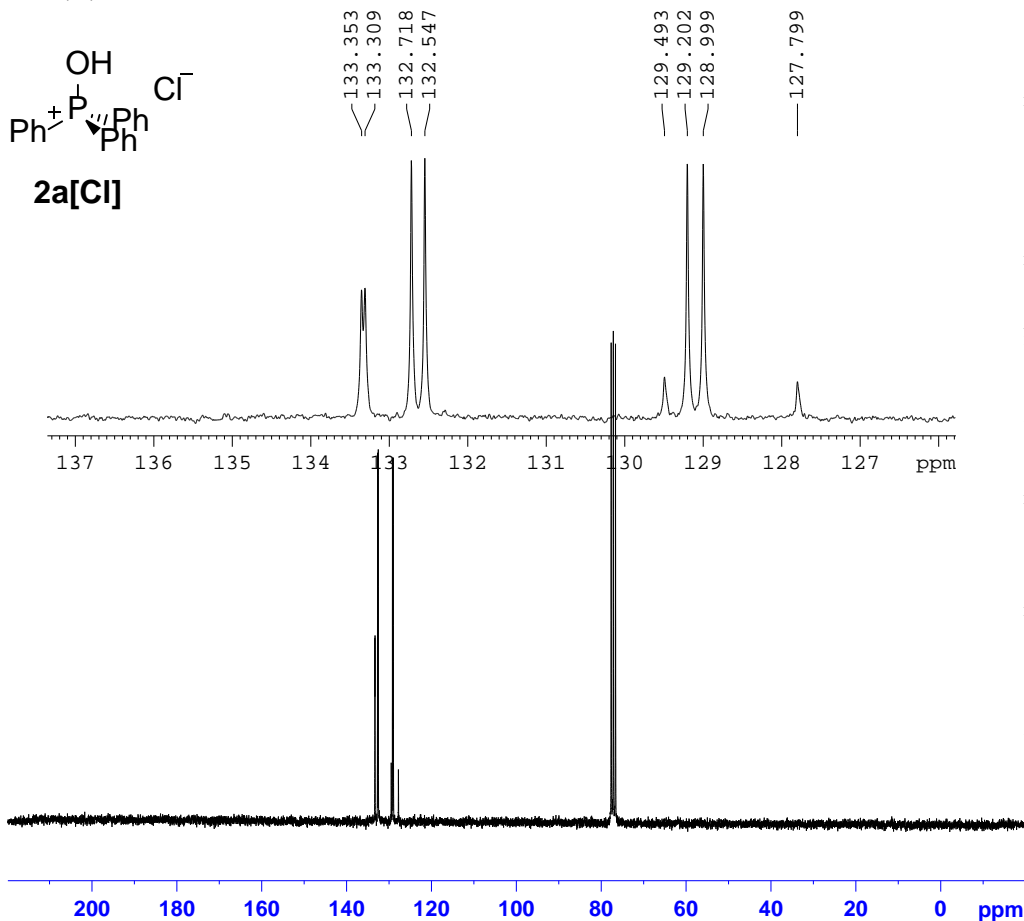
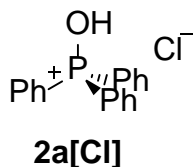
NAME          VVL 187
EXPNO         2
PROCNO        1
Date_         20080922
Time          22.26
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            64
DS            4
SWH           40650.406 Hz
FIDRES        0.620276 Hz
AQ            0.8061428 sec
RG            20642.5
DW            12.300 usec
DE            6.00 usec
TE            300.2 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0           1
    
```

```

===== CHANNEL f1 =====
NUC1          31P
P1            7.00 usec
PL1           0.00 dB
SFO1          101.2494172 MHz

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           -3.00 dB
PL12          20.00 dB
PL13          24.00 dB
SFO2          250.1310005 MHz
SI            32768
SF            101.2544800 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
    
```


Ph₃P(O)·HCl



```

NAME          VVL 187
EXPNO         3
PROCNO        1
Date_         20080923
Time          0.34
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            1800
DS            4
SWH           15060.241 Hz
FIDRES        0.229801 Hz
AQ            2.1758451 sec
RG            2298.8
DW            33.200 usec
DE            6.00 usec
TE            300.2 K
D1            2.0000000 sec
d11           0.0300000 sec
DELTA         1.89999998 sec
TD0           1
  
```

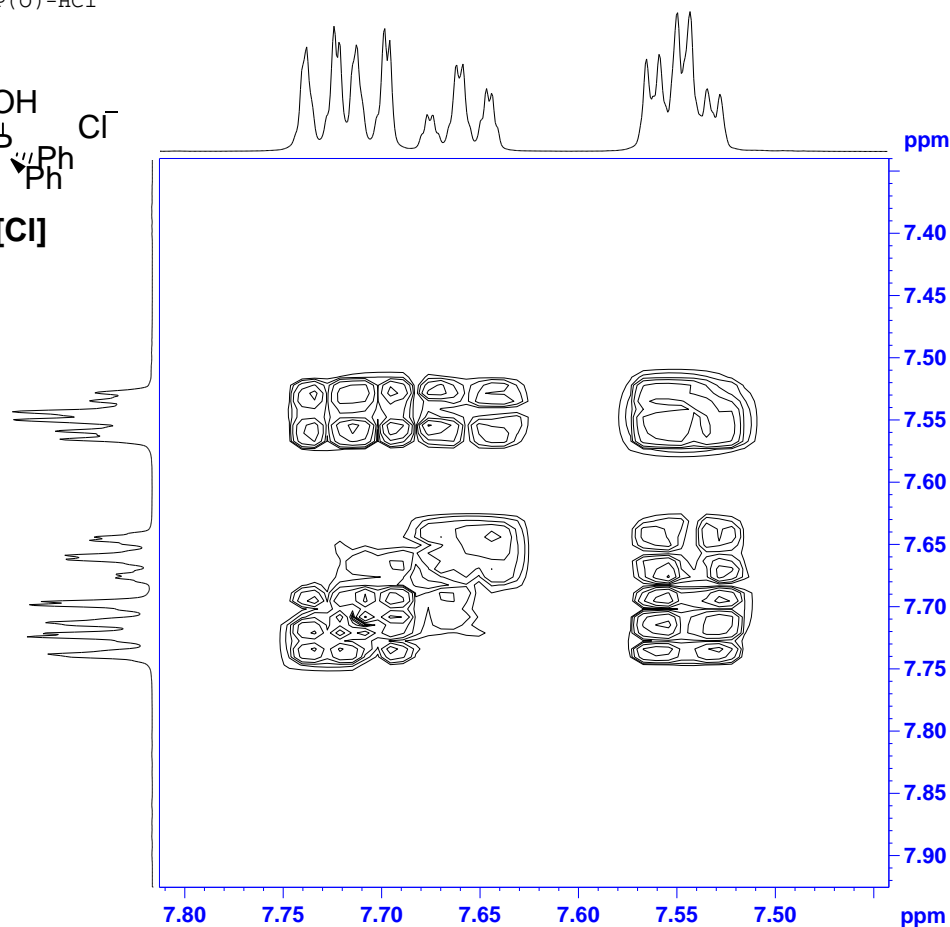
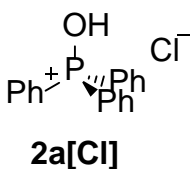
```

===== CHANNEL f1 =====
NUC1           13C
P1             6.75 usec
PL1            -3.00 dB
SFO1           62.9015280 MHz
  
```

```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2           1H
PCPD2         80.00 usec
PL2            -3.00 dB
PL12           20.00 dB
PL13           24.00 dB
SFO2           250.1310005 MHz
SI            65536
SF            62.8952322 MHz
WDW            EM
SSB            0
LB            1.00 Hz
GB            0
PC            1.40
  
```

Ph₃P(O)-HCl



```

NAME          VVL 5_500
EXPNO         2
PROCNO        1
Date_         20090630
Time          10.53
INSTRUM       spect
PROBHD        5 mm CPTCI 1H-
PULPROG       cosygpmfzf
TD            2048
SOLVENT       CDCl3
NS            2
DS            8
SWH           3289.474 Hz
FIDRES        1.606188 Hz
AQ            0.3113460 sec
RG            2050
DW            152.000 usec
DE            6.50 usec
TE            296.0 K
D0            0.00000300 sec
D1            1.34189403 sec
D13           0.00000400 sec
D16           0.00020000 sec
IN0           0.00030400 sec
  
```

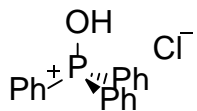
```

===== CHANNEL f1 =====
NUC1           1H
P1             6.70 usec
PL1            4.00 dB
PL1W           8.72000027 W
SFO1           500.2349947 MHz
  
```

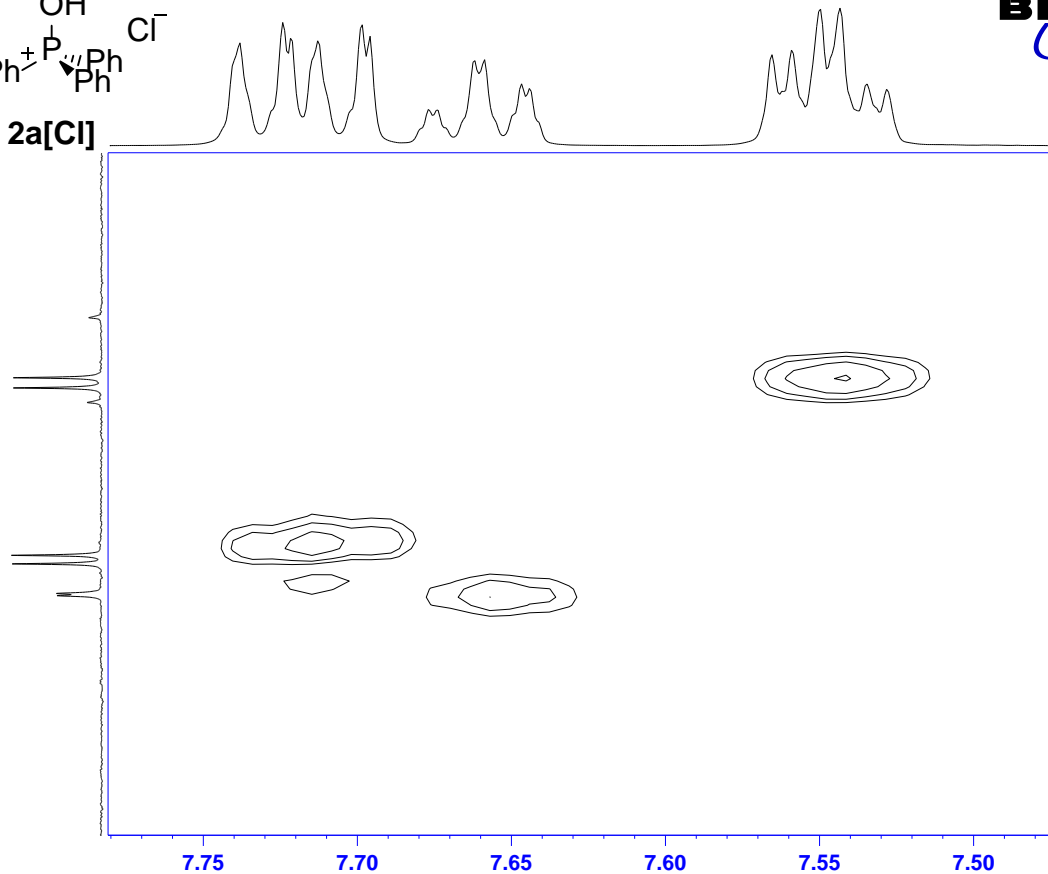
```

===== GRADIENT CHANNEL =====
GPNAM1        SINE.100
GPNAM2        SINE.100
GPNAM3        SINE.100
GPZ1          16.00 %
GPZ2          12.00 %
GPZ3          40.00 %
P16           1000.00 usec
ND0           1
TD            128
SFO1          500.235 MHz
FIDRES        25.699013 Hz
SW            6.576 ppm
FMODE         QF
SI            1024
SF            500.2300000 MHz
WDW           SINE
SSB           0
LB            0.00 Hz
GB            0
PC            1.40
SI            1024
MC2           QF
SF            500.2300000 MHz
WDW           SINE
SSB           0
LB            0.00 Hz
GB            0
  
```

Ph₃P(O)-HCl



2a[Cl]



```

NAME      VVL_5_500
EXPNO     3
PROCNO    1
Date_     20090630
Time      11.03
INSTRUM   spect
PROBHD    5 mm CPTCI 1H-
PULPROG   zgpg30
TD         1024
SOLVENT   CDCl3
NS         2
DS         16
SWH        3289.474 Hz
FIDRES     3.212377 Hz
AQ         0.1556980 sec
RG         2050
DW         152.000 usec
DE         6.50 usec
TE         296.0 K
CNST2     145.0000000
D0         0.00000300 sec
D1         1.42094696 sec
D4         0.00172414 sec
D11        0.03000000 sec
D13        0.00000400 sec
D16        0.00020000 sec
LNO        0.00002400 sec
ZGPG30S   2

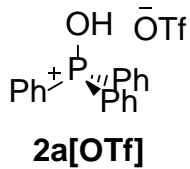
===== CHANNEL f1 =====
NUC1       1H
P1         6.70 usec
P2         13.40 usec
P28        1000.00 usec
PL1        4.00 dB
PL12W      8.7200027 W
SF01       500.2349947 MHz

===== CHANNEL f2 =====
CPDPRG2    garp
NUC2       13C
P3         11.20 usec
P4         22.40 usec
PCPD2      70.00 usec
GP21       -2.00 dB
PL12       13.92 dB
PL2W       88.77790070 W
PL12W      2.27145866 W
SF02       125.7923151 MHz

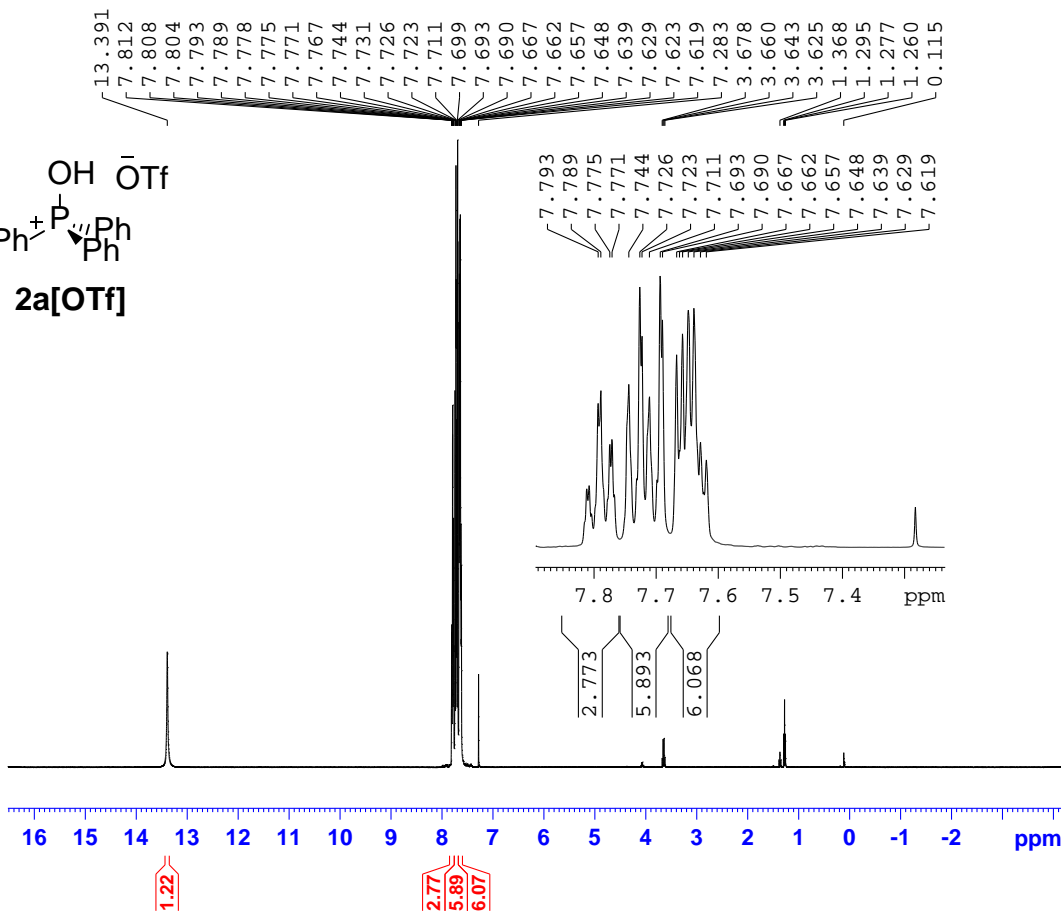
===== GRADIENT CHANNEL =====
GPNAM1     SINE.100
GPNAM2     SINE.100
GPZ1       80.00 %
GPZ2       20.10 %
P16        1000.00 usec
ND0        2
TD          256
SF01       125.7923 MHz
FIDRES     81.391190 Hz
SW         165.639 ppm
FnmODE     Echo-Antiecho
SI         1024
SF          500.2300000 MHz
WDW        QSINE
SSB         0
LB          0.00 Hz
GB          0
PC          1.40
SI         1024
MC2        echo-antiecho
SF          125.7829340 MHz
WDW        QSINE
SSB         2
LB          0.00 Hz
GB          0

```

TPPO*HOTf



2a[OTf]



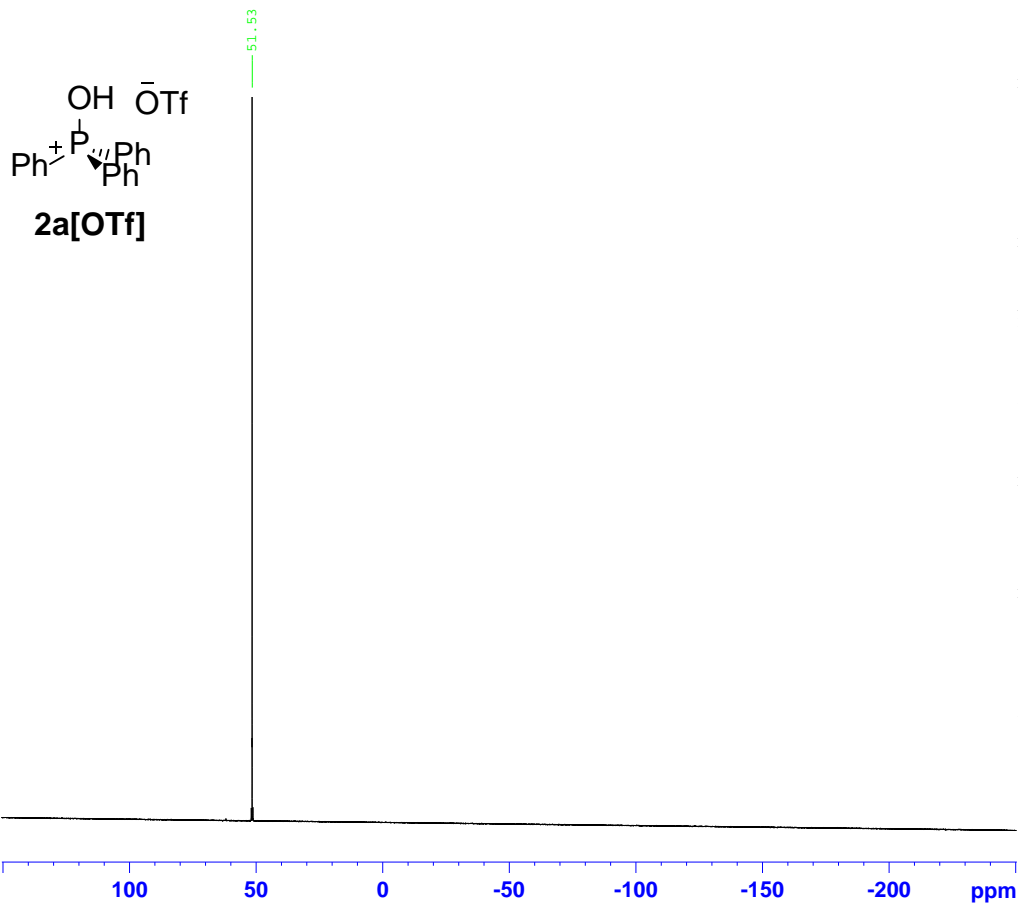
```

NAME      VVL 124_400
EXPNO     1
PROCNO    1
Date_     20090527
Time      17.20
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         2
DS         2
SWH        8278.146 Hz
FIDRES     0.126314 Hz
AQ         3.9584243 sec
RG         128
DW         60.400 usec
DE         6.00 usec
TE         300.2 K
D1         1.00000000 sec
L1         1
TD0        1

===== CHANNEL f1 =====
NUC1       1H
P1         13.00 usec
PL1        3.00 dB
SF01       400.1324710 MHz
SI         32768
SF          400.1300000 MHz
WDW        EM
SSB         0
LB          0.30 Hz
GB          0
PC          1.00

```

TPPO*HOTf



```

NAME      VVL 124_400
EXPNO     2
PROCNO    1
Date_     20090527
Time      17.27
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         128
DS         4
SWH       64935.066 Hz
FIDRES    0.990830 Hz
AQ         0.5046772 sec
RG         13004
DW         7.700 usec
DE         6.00 usec
TE         300.2 K
D1         2.00000000 sec
d11        0.03000000 sec
DELTA     1.89999998 sec
TD0        1
    
```

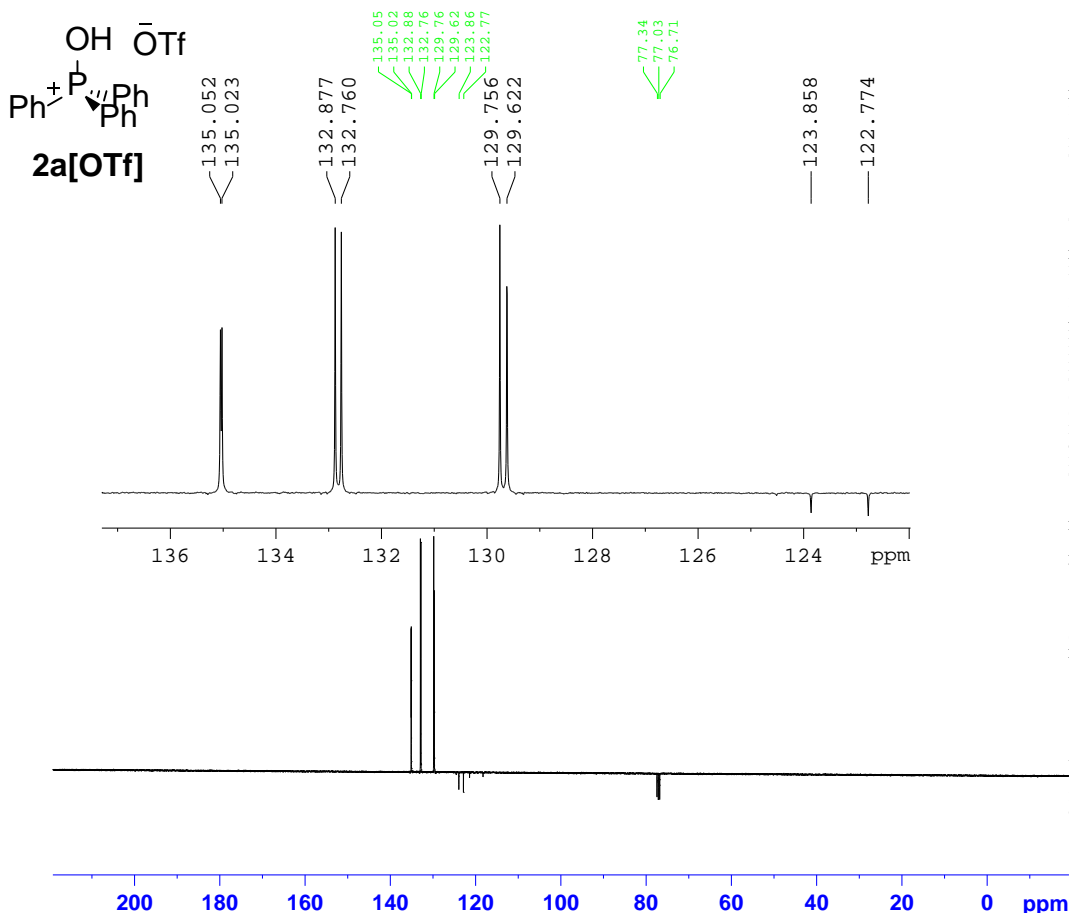
```

===== CHANNEL f1 =====
NUC1      31P
P1        6.25 usec
PL1       -1.00 dB
SFO1      161.9674942 MHz
    
```

```

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
PCPD2     80.00 usec
PL2       3.00 dB
PL12      18.00 dB
PL13      18.00 dB
SFO2      400.1316005 MHz
SI         65536
SF         161.9755930 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
    
```

TPPO*HOTf



```

NAME      VVL 124_400
EXPNO     3
PROCNO    1
Date_     20090527
Time      19.26
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   jmod
TD         65536
SOLVENT   CDCl3
NS         2048
DS         4
SWH       23980.814 Hz
FIDRES    0.365918 Hz
AQ         1.3664756 sec
RG         7298.2
DW         20.850 usec
DE         6.00 usec
TE         300.2 K
CNST2     145.0000000
CNST11    1.0000000
D1         2.00000000 sec
d20        0.00689655 sec
DELTA     0.00001120 sec
TD0        1
    
```

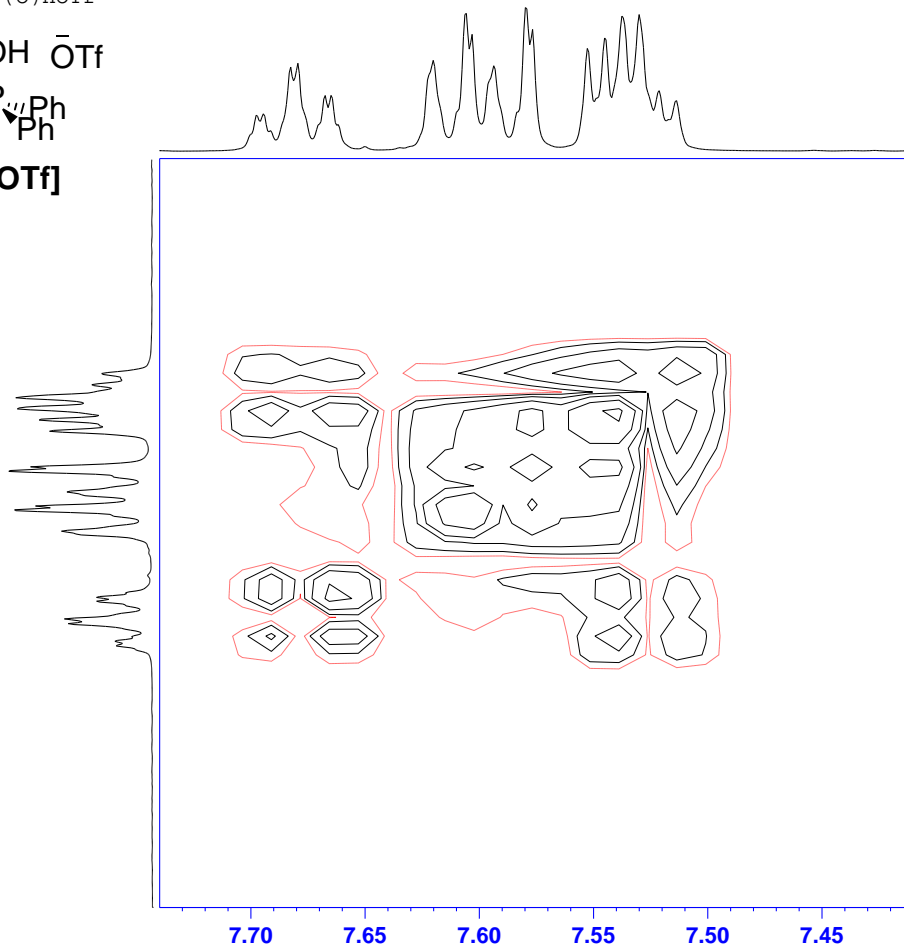
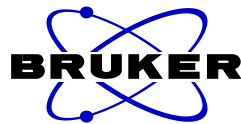
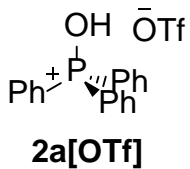
```

===== CHANNEL f1 =====
NUC1      13C
P1         8.80 usec
P2        17.60 usec
PL1       -1.00 dB
SFO1      100.6228298 MHz
    
```

```

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
PCPD2     80.00 usec
PL2       3.00 dB
PL12      18.00 dB
PL13      18.00 dB
SFO2      400.1316005 MHz
SI         32768
SF         100.6127690 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
    
```

Ph₃P(O)HOTf



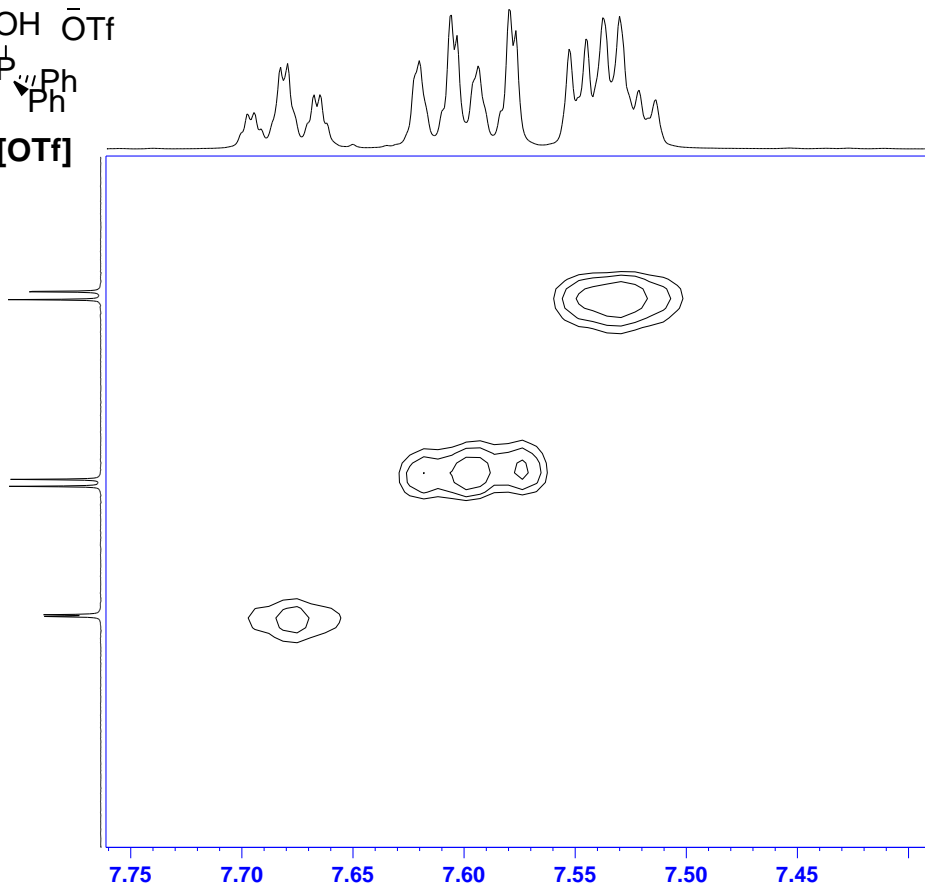
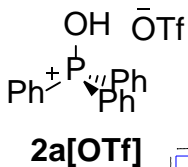
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 EXPNO 2
 PROCNO 1
 Date_ 20090703
 Time 20.52
 INSTRUM spect
 PROBHD 5 mm CPTCI 1H-
 PULPROG cosygmrgf
 TD 2048
 SOLVENT CDCl3
 NS 4
 DS 8
 SWH 6493.506 Hz
 FIDRES 3.170657 Hz
 AQ 0.1577460 sec
 RG 2050
 DW 77.000 usec
 DE 6.50 usec
 TE 296.0 K
 D0 0.0000300 sec
 D1 1.99549401 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 INO 0.00015400 sec

===== CHANNEL f1 =====
 NUC1 1H
 P1 6.70 usec
 PL1 4.00 dB
 PL1W 8.7200027 W
 SFO1 500.2334621 MHz

===== GRADIENT CHANNEL =====
 GPNAM1 SINE.100
 GPNAM2 SINE.100
 GPNAM3 SINE.100
 GPZ1 16.00 %
 GPZ2 12.00 %
 GPZ3 40.00 %
 P16 1000.00 usec
 ND0 1
 TD 128
 SFO1 500.2335 MHz
 FIDRES 50.730518 Hz
 SW 12.981 ppm
 FmMODE QF
 SI 1024
 SF 500.2300555 MHz
 WDW SINE
 SSB 0
 LB 0.00 Hz
 GB 0

7.40
7.45
7.50
7.55
7.60
7.65
7.70
7.75
7.80
7.85
ppm

Ph₃P(O)HOTf



NAME VVL 11_500
 EXPNO 3
 PROCNO 1
 Date_ 20090703
 Time 21.13
 INSTRUM spect
 PROBHD 5 mm CPTCI 1H-
 PULPROG haqcetgpg
 TD 2048
 SOLVENT CDCl3
 NS 2
 DS 16
 SWH 6493.506 Hz
 FIDRES 3.170657 Hz
 AQ 0.157460 sec
 RG 2050
 DW 77.000 usec
 DE 6.50 usec
 TE 296.0 K
 CNST2 145.0000000
 D0 0.0000300 sec
 D1 1.49590397 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 INO 0.00002400 sec
 ZGPTNS

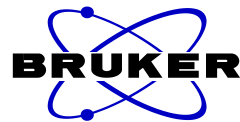
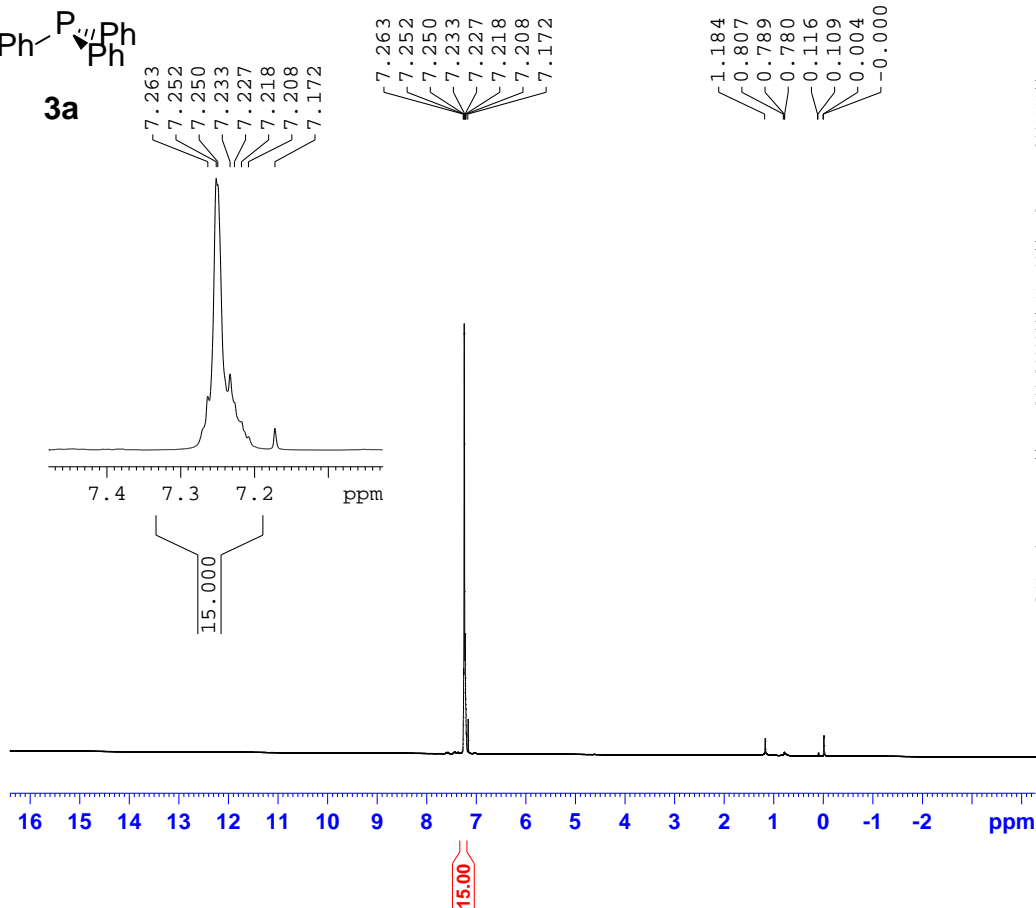
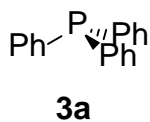
===== CHANNEL f1 =====
 NUC1 1H
 P1 6.70 usec
 P2 13.40 usec
 P28 1000.00 usec
 PL1 4.00 dB
 PL1W 8.7200027 W
 SFO1 500.2334621 MHz

===== CHANNEL f2 =====
 CPDPRG2 garr
 NUC2 13C
 P3 11.20 usec
 P4 22.40 usec
 PCPD2 70.00 usec
 PL2 -2.00 dB
 PL12 13.92 dB
 PL2W 88.77790070 W
 PL12W 2.27145886 W
 SFO2 125.7923646 MHz

===== GRADIENT CHANNEL =====
 GPNAM1 SINE.100
 GPNAM2 SINE.100
 GPZ1 80.00 %
 GPZ2 10.10 %
 P16 1000.00 usec
 ND0 2
 TD 256
 SFO1 125.7924 MHz
 FIDRES 81.396507 Hz
 SW 165.650 ppm
 FmMODE Echo-Antiecho
 SI 2048
 SF 500.2300555 MHz
 WDW QSINE
 SSB 2
 LB 0.00 Hz
 GB 0
 PC 1.40
 SI 1024
 MC2 echo-antiecho
 SF 125.7829340 MHz
 WDW QSINE
 SSB 2
 LB 0.00 Hz
 GB 0

128
129
130
131
132
133
134
135
136
137
138
ppm

TPP, after column



```

NAME          VVL 152_400
EXPNO         1
PROCNO        1
Date_         20090707
Time          17.25
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            16
DS            2
SWH           8278.146 Hz
FIDRES        0.126314 Hz
AQ            3.9584243 sec
RG            161.3
DW            60.400 usec
DE            6.00 usec
TE            301.5 K
D1            1.00000000 sec
TD0           1

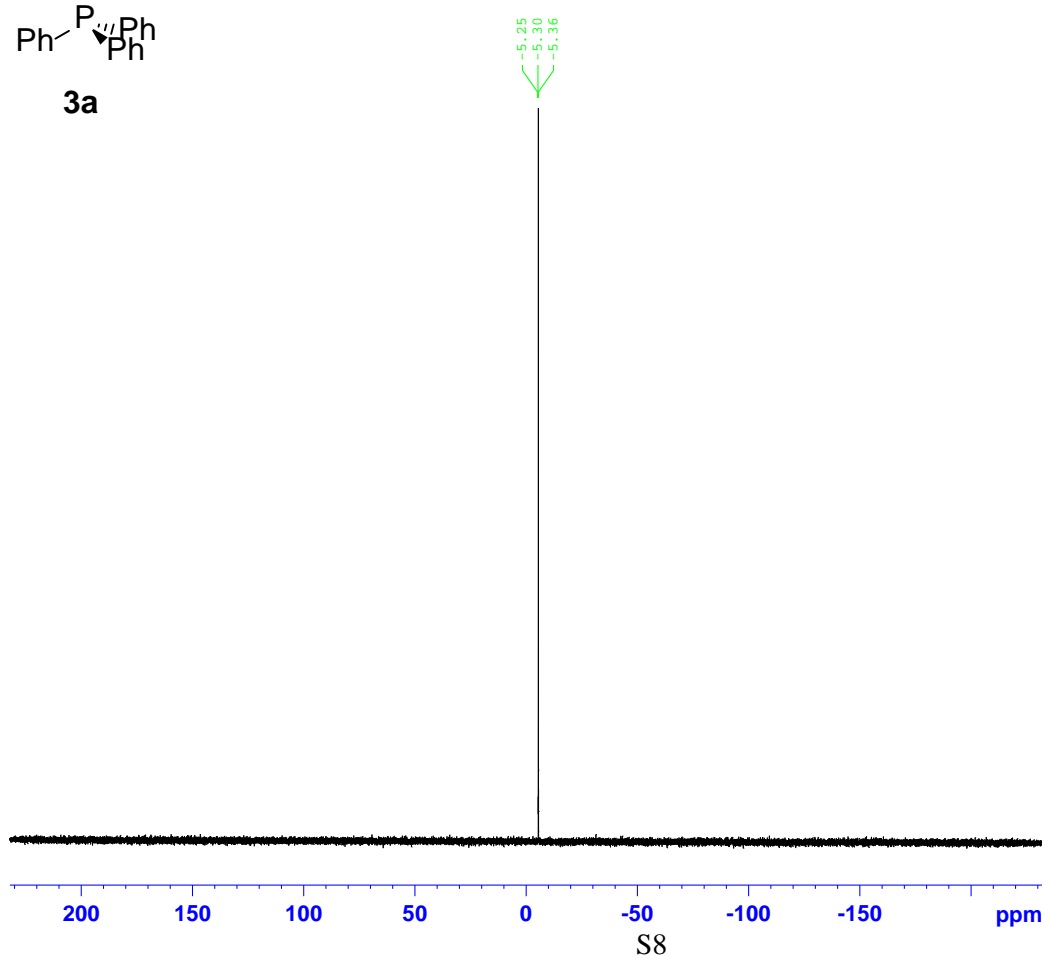
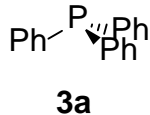
```

```

===== CHANNEL f1 =====
NUC1          1H
P1            13.00 usec
PL1           3.00 dB
SFO1         400.1324710 MHz
SI           32768
SF           400.1300438 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00

```

TPP, after column



```

NAME          VVL 146_400
EXPNO         3
PROCNO        1
Date_         20090707
Time          15.58
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zgpg30
TD            65536
SOLVENT       Acetone
NS            36
DS            4
SWH           75187.969 Hz
FIDRES        1.147277 Hz
AQ            0.4358644 sec
RG            13004
DW            6.650 usec
DE            6.00 usec
TE            301.5 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0           1

```

```

===== CHANNEL f1 =====
NUC1          31P
P1            6.25 usec
PL1           -1.00 dB
SFO1         161.9755930 MHz

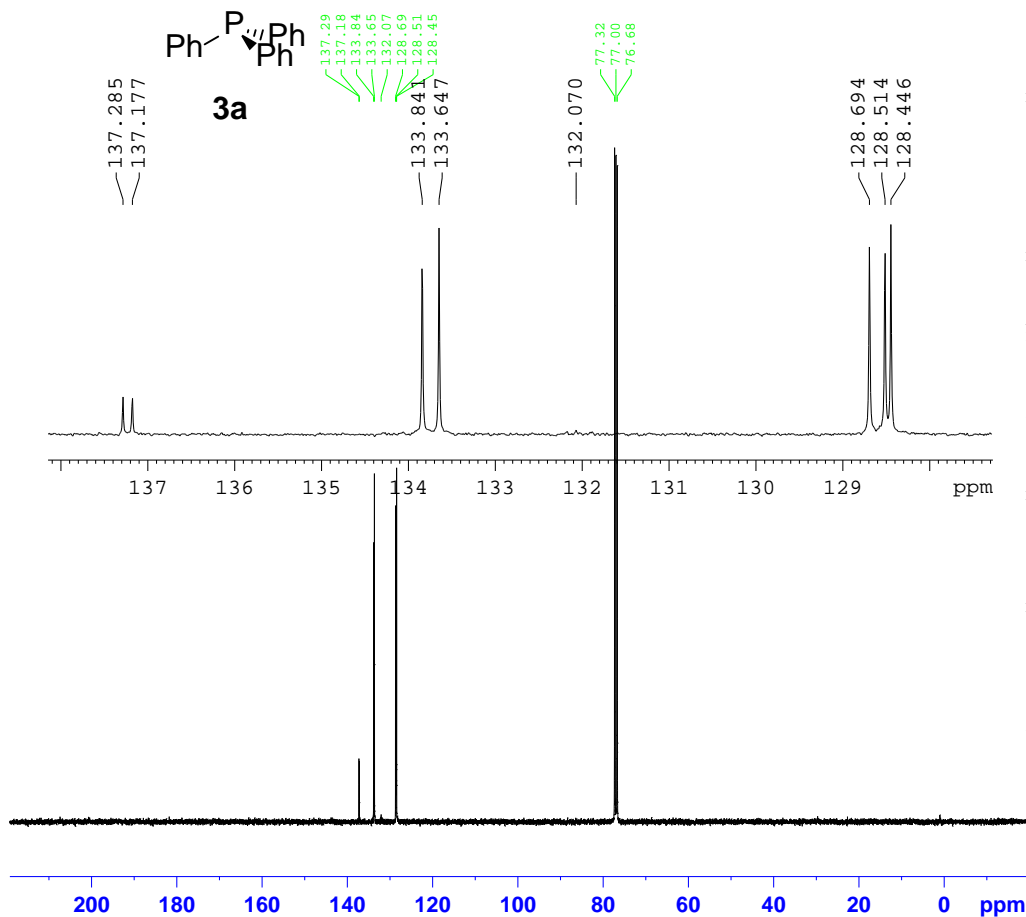
```

```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           3.00 dB
PL12          18.00 dB
PL13          18.00 dB
SFO2         400.1316005 MHz
SI           32768
SF           161.9755930 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40

```

TPP, after column



```

NAME      VVL 152_400
EXPNO    3
PROCNO   1
Date_    20090707
Time     18.29
INSTRUM  spect
PROBHD   5 mm PABBO BB/
PULPROG  zgpg30
TD       65536
SOLVENT  CDCl3
NS       1024
DS       4
SWH      23980.814 Hz
FIDRES   0.365918 Hz
AQ       1.3664756 sec
RG       2896.3
DW       20.850 usec
DE       6.00 usec
TE       301.5 K
D1       2.00000000 sec
d11      0.03000000 sec
DELTA    1.89999998 sec
TD0      1
    
```

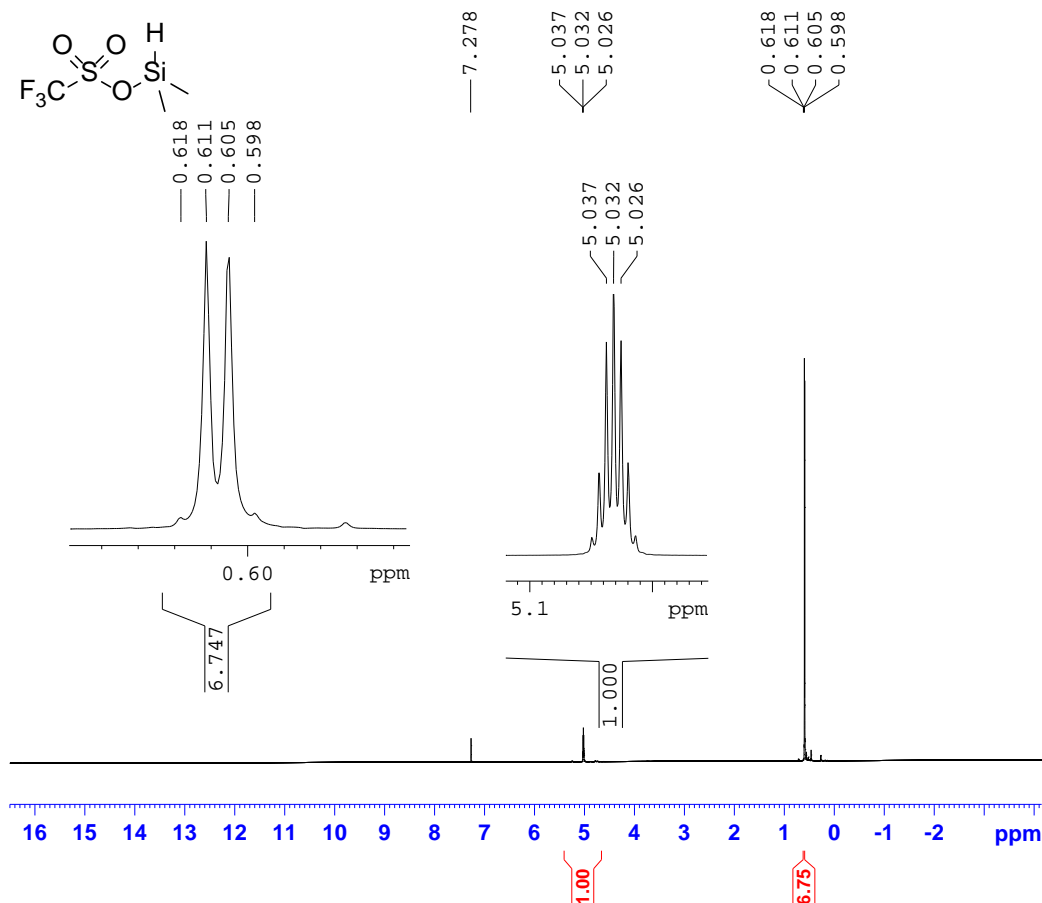
```

===== CHANNEL f1 =====
NUC1     13C
P1       8.80 usec
PL1      -1.00 dB
SFO1    100.6228298 MHz
    
```

```

===== CHANNEL f2 =====
CPDPRG2  waltz16
NUC2     1H
PCPD2    80.00 usec
PL2      3.00 dB
PL12     18.00 dB
PL13     18.00 dB
SFO2    400.1316005 MHz
SI       32768
SF      100.6127690 MHz
WDW      EM
SSB      0
LB       1.00 Hz
GB       0
PC       1.40
    
```

Me2SiHOTf



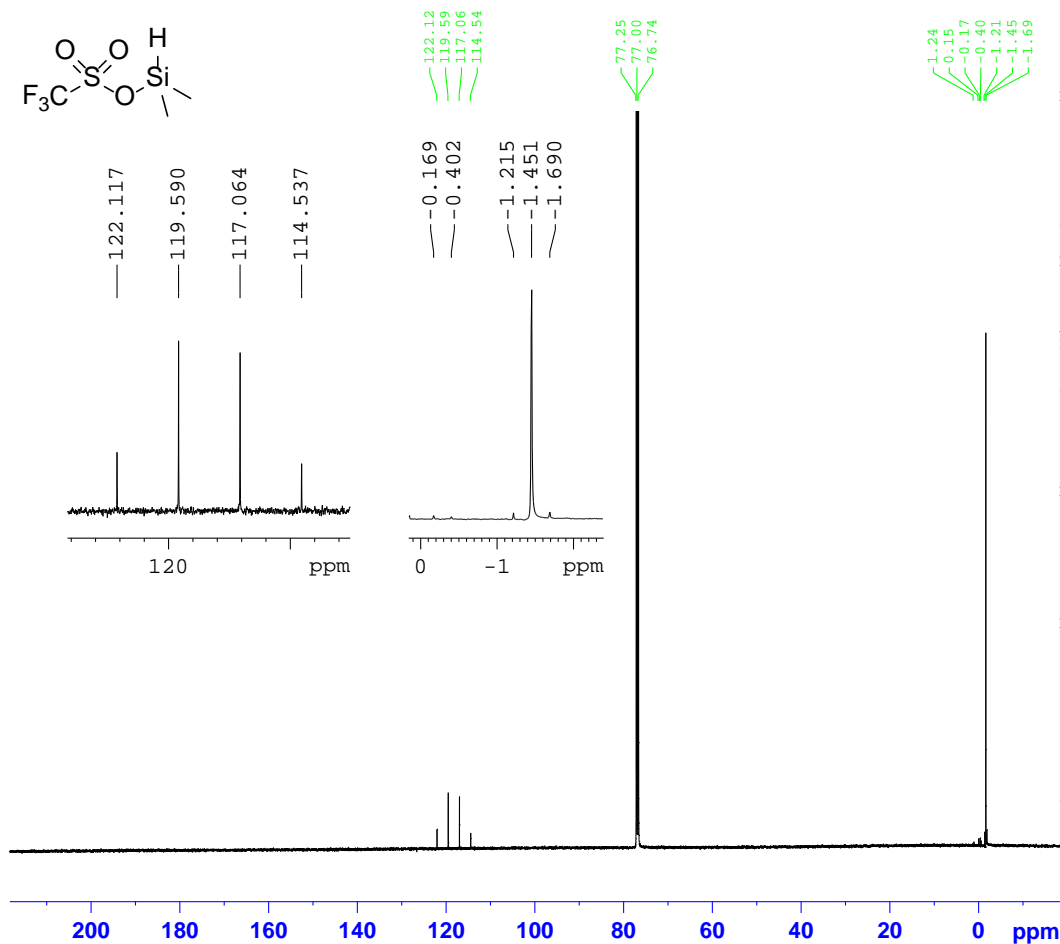
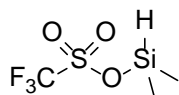
```

NAME      VVL 14_500
EXPNO    1
PROCNO   1
Date_    20091008
Time     17.25
INSTRUM  spect
PROBHD   5 mm CPTCI 1H-
PULPROG  zg30
TD       65536
SOLVENT  CDCl3
NS       16
DS       2
SWH      10330.578 Hz
FIDRES   0.157632 Hz
AQ       3.1719923 sec
RG       14.2
DW       48.400 usec
DE       6.50 usec
TE       296.1 K
D1       1.00000000 sec
TD0      1
    
```

```

===== CHANNEL f1 =====
NUC1     1H
P1       6.70 usec
PL1      4.00 dB
PL1W     8.72000027 W
SFO1    500.2330891 MHz
SI       32768
SF      500.2300000 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
    
```

Me2SiHOTf



```

NAME          VVL 14_500
EXPNO         2
PROCNO        1
Date_         20091008
Time          17.54
INSTRUM       spect
PROBHD        5 mm CPTCI 1H-
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            512
DS            4
SWH           29761.904 Hz
FIDRES        0.454131 Hz
AQ            1.1010548 sec
RG            2050
DW            16.800 usec
DE            6.50 usec
TE            296.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1
    
```

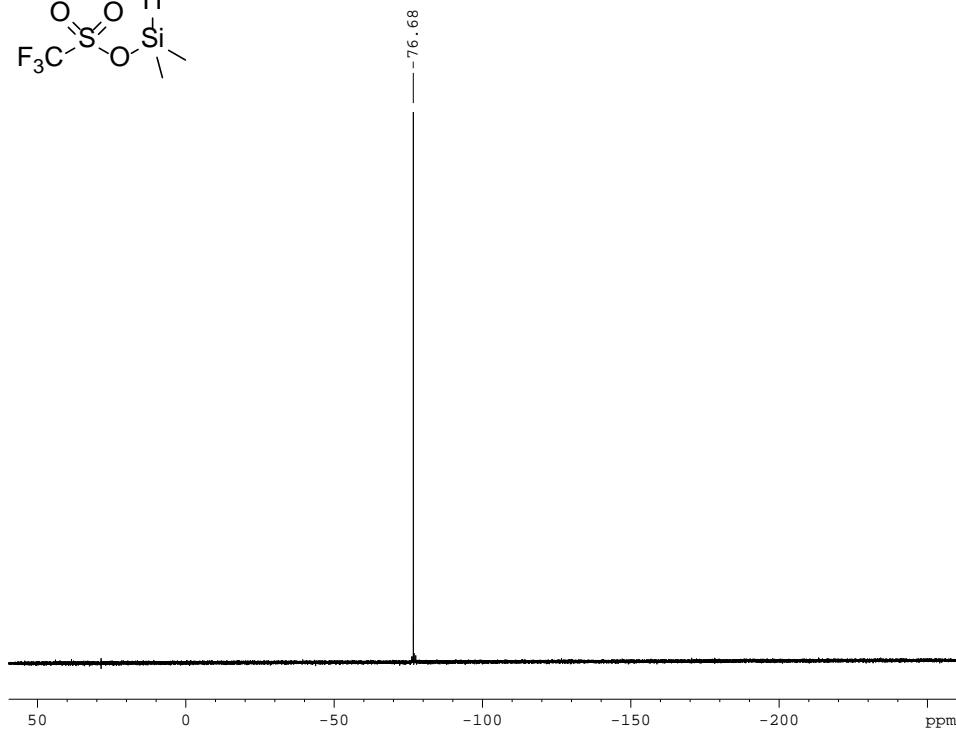
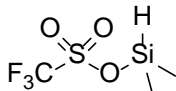
```

===== CHANNEL f1 =====
NUC1          13C
P1            11.20 usec
PL1           -2.00 dB
PL1W          88.77790070 W
SF01          125.7955118 MHz
    
```

```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           4.00 dB
PL12          25.28 dB
PL13          28.00 dB
PL2W          8.72000027 W
PL12W         0.06494062 W
PL13W         0.03471494 W
SF02          500.2320009 MHz
SI            32768
SF            125.7829340 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
    
```

Me2Si(H)OTf, after dest.
F19CPD CDCl3 {D:\NMRDATA} Volodymyr 57



```

NAME          VVL 357
EXPNO         2
PROCNO        1
Date_         20091007
Time          14.03
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgfhggn
TD            131072
SOLVENT       CDCl3
NS            16
DS            4
SWH           75187.969 Hz
FIDRES        0.573639 Hz
AQ            0.8716788 sec
RG            6502
DW            6.650 usec
DE            6.00 usec
TE            300.2 K
D1            1.00000000 sec
d11           0.03000000 sec
d12           0.00002000 sec
TD0           1
    
```

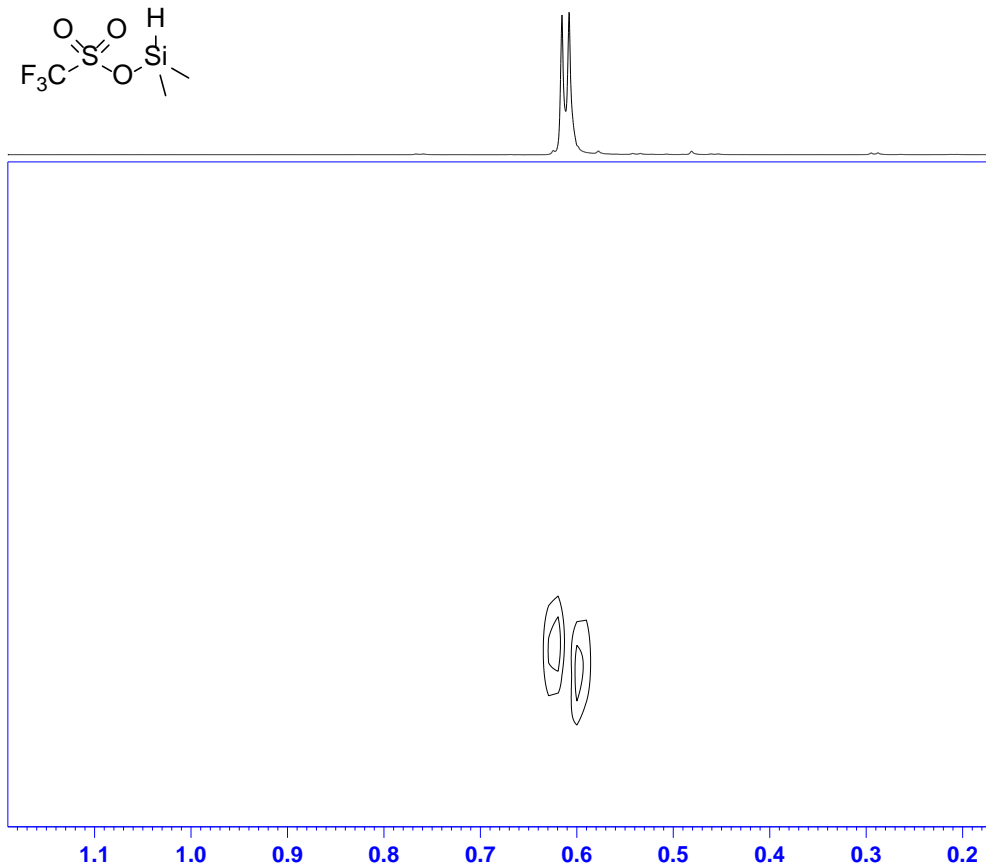
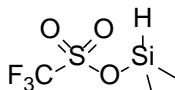
```

===== CHANNEL f1 =====
NUC1          19F
P1            8.00 usec
PL1           -3.00 dB
SF01          235.3338140 MHz
    
```

```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           -3.00 dB
PL12          20.00 dB
SF02          250.1310005 MHz
SI            65536
SF            235.3573500 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.20
    
```

Me2SiH-OTf



```

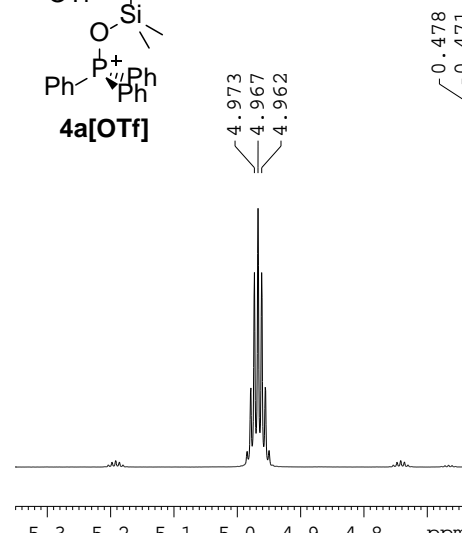
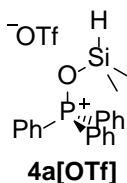
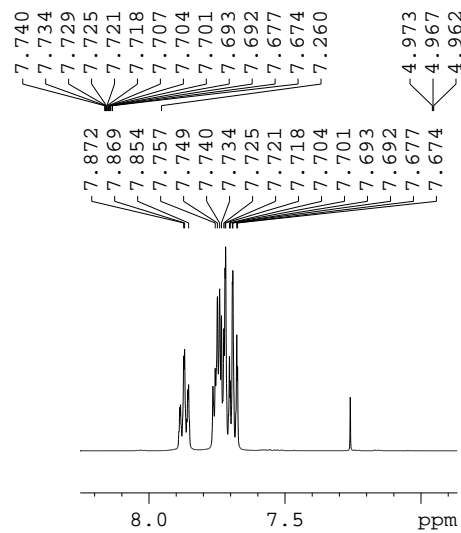
NAME          VVL 198_400
EXPNO         2
PROCNO        1
Date_         20091008
Time          15.52
INSTRUM       spect
PROBHD        5 mm DABBO BB/
PULPROG       hmbcpl1pndprqf
TD            2048
SOLVENT       THF
NS            8
DS            8
SWH           4006.410 Hz
FIDRES        1.956255 Hz
AQ            0.2556404 sec
RG            8192
DW            124.800 usec
DE            6.00 usec
TE            301.5 K
CNST2         145.0000000
CNST13        4.0000000
d1            0.0000000 sec
d2            0.00344828 sec
d6            0.1250000 sec
d11           0.0300000 sec
d12           0.0002000 sec
d16           0.0002000 sec
IND           0.00003145 sec

===== CHANNEL f1 =====
NUC1          1H
P1            13.00 usec
P2            26.00 usec
PL1           3.00 dB
PL9           54.70 dB
SFO1         400.1316005 MHz

===== CHANNEL f2 =====
NUC2          29Si
P3            8.60 usec
PL2           -3.00 dB
SFO2         79.4925676 MHz

0===== GRADIENT CHANNEL =====
GPNAM1       sine.100
GPNAM2       sine.100
GPNAM3       sine.100
GPZ1         30.00 %
GPZ2         30.00 %
GPZ3         -12.10 %
P16          1000.00 usec
ND0          2
TD            5
SFO1         79.49257 MHz
FIDRES       3179.650146 Hz
SW           199.997 ppm
FMODE        QF
SI            1024
SF           400.1296645 MHz
WDW          QSINE
SSB          0
LB           0.00 Hz
GB           0
PC           1.40
SI           2048
MC2          QF
SF           79.4945594 MHz
WDW          SINE
SSB          2
LB           0.00 Hz
GB           0
  
```

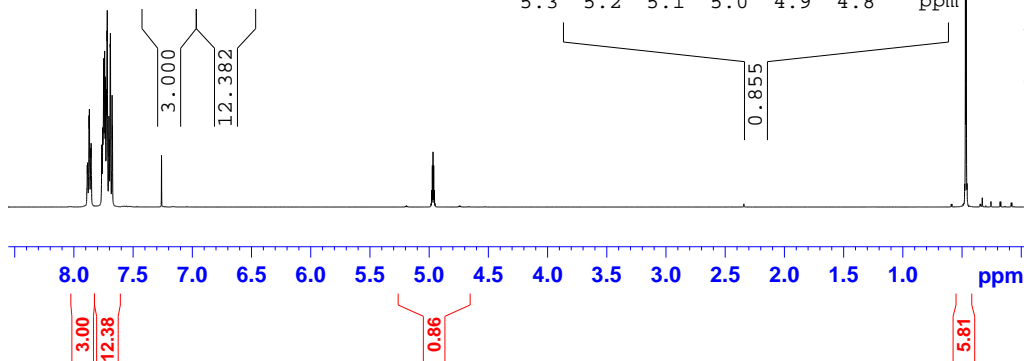
Ph3PO-SiHMe2 OTf



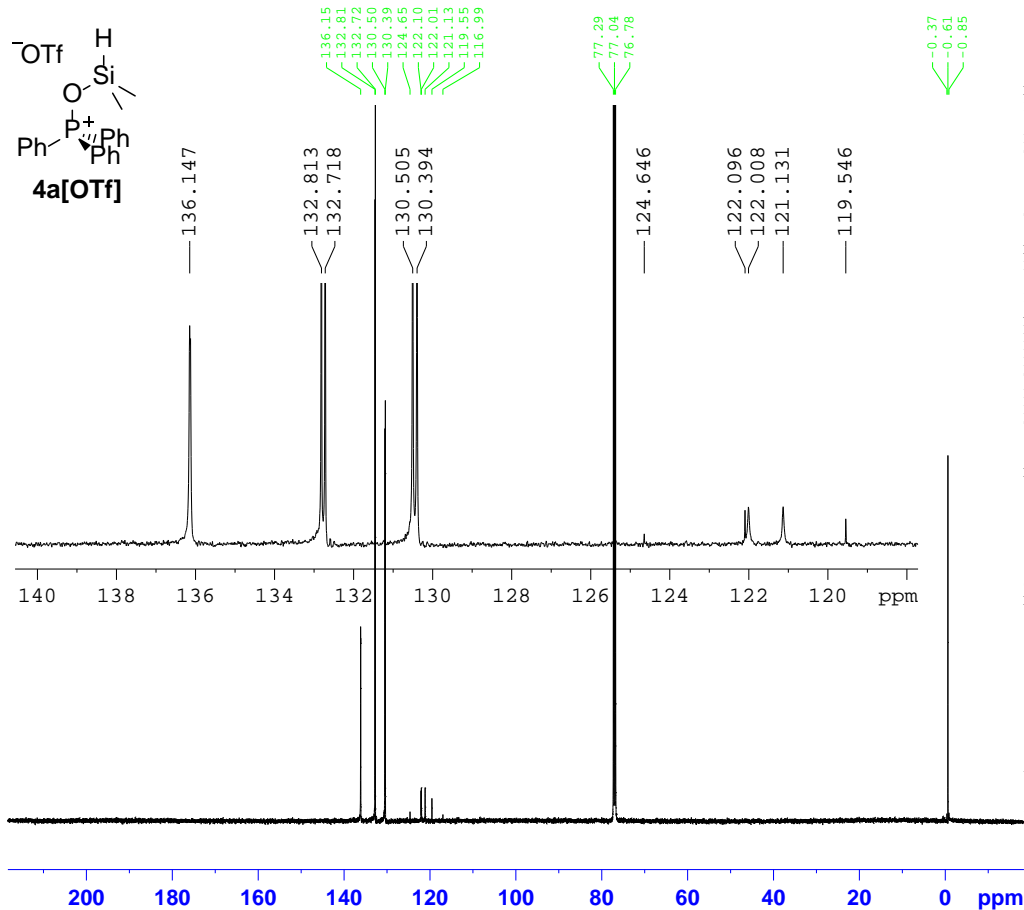
```

NAME          VVL 15_400
EXPNO         1
PROCNO        1
Date_         20091008
Time          18.00
INSTRUM       spect
PROBHD        5 mm CPTCI 1H-
PULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            16
DS            2
SWH           10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1719923 sec
RG            16
DW            48.400 usec
DE            6.50 usec
TE            296.1 K
D1            1.00000000 sec
TD0           1

===== CHANNEL f1 =====
NUC1          1H
P1            6.70 usec
PL1           4.00 dB
PL1W         8.72000027 W
SFO1         500.2330891 MHz
SI            32768
SF           500.2300090 MHz
WDW          EM
SSB          0
LB           0.30 Hz
GB           0
PC           1.00
  
```



Ph3PO-SiHMe2 OTf



```

NAME          VVL 15_400
EXPNO         2
PROCNO        1
Date_         20091008
Time          18.28
INSTRUM       spect
PROBHD        5 mm CPTCI 1H-
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            512
DS            4
SWH           29761.904 Hz
FIDRES        0.454131 Hz
AQ            1.1010548 sec
RG            2050
DW            16.800 usec
DE            6.50 usec
TE            296.2 K
D1            2.0000000 sec
D11           0.0300000 sec
TD0           1

```

```

===== CHANNEL f1 =====
NUC1          13C
P1            11.20 usec
PL1           -2.00 dB
PL1W          88.77790070 W
SFO1          125.7955118 MHz

```

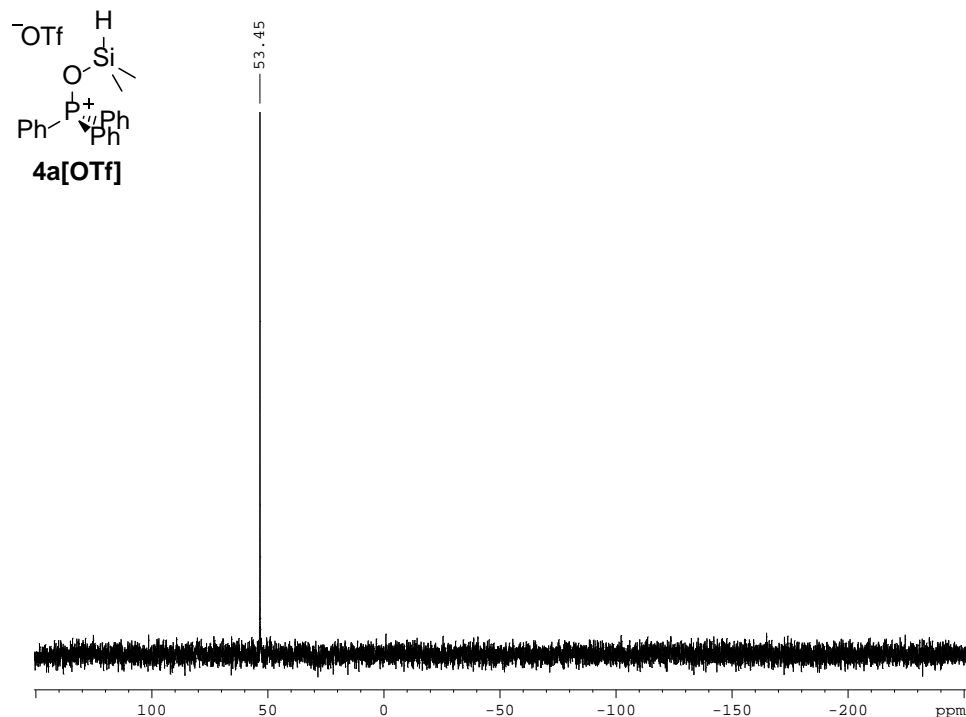
```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           4.00 dB
PL12          25.28 dB
PL13          28.00 dB
PL2W          8.72000027 W
PL12W         0.06494062 W
PL13W         0.03471494 W
SFO2          500.2320009 MHz
SI            32768
SF            125.7829340 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40

```

Ph3PO-SiMe2H OTf

P31CPD CDC13 {D:\NMRDATA} Volodymyr 7



```

NAME          VVL 358
EXPNO         3
PROCNO        1
Date_         20091008
Time          15.31
INSTRUM       spect
PROBHD        5 mm QNP
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            16
DS            4
SWH           40650.406 Hz
FIDRES        0.620276 Hz
AQ            0.8061428 sec
RG            20642.5
DW            12.300 usec
DE            6.00 usec
TE            300.2 K
D1            2.0000000 sec
d11           0.0300000 sec
DELTA        1.89999998 sec
TD0           1

```

```

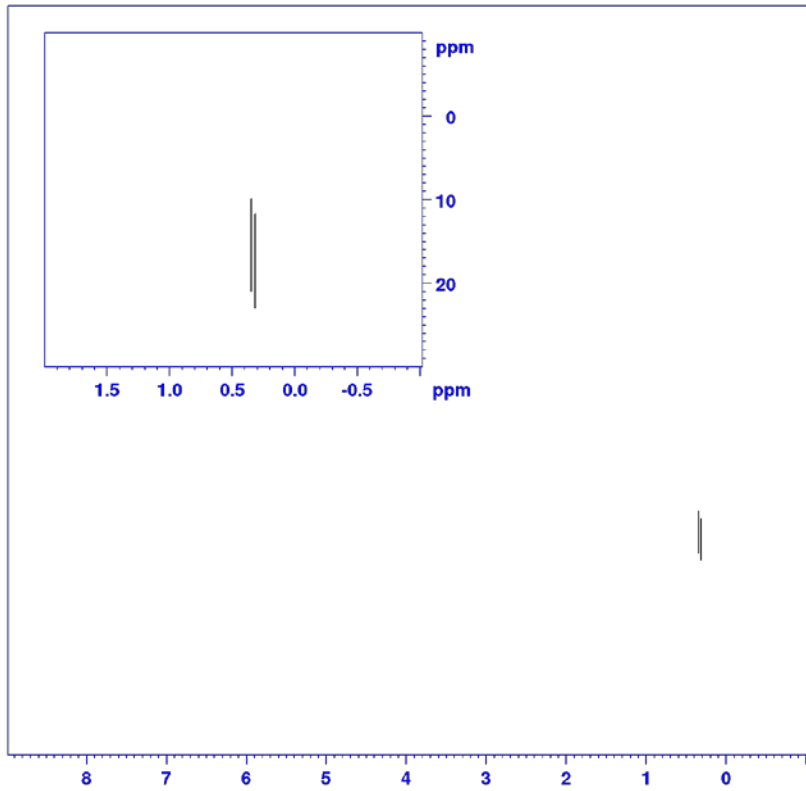
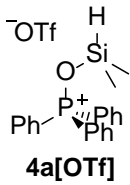
===== CHANNEL f1 =====
NUC1          31P
P1            7.00 usec
PL1           0.00 dB
SFO1          101.2494172 MHz

```

```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           -3.00 dB
PL12          20.00 dB
PL13          24.00 dB
SFO2          250.1310005 MHz
SI            32768
SF            101.2544800 MHz
WDW           EM
SSB           0
LB            3.00 Hz
GB            0
PC            1.40

```



Current Data Parameters
 NAME VVL 197_400
 EXPNO 3
 PROCNO 1

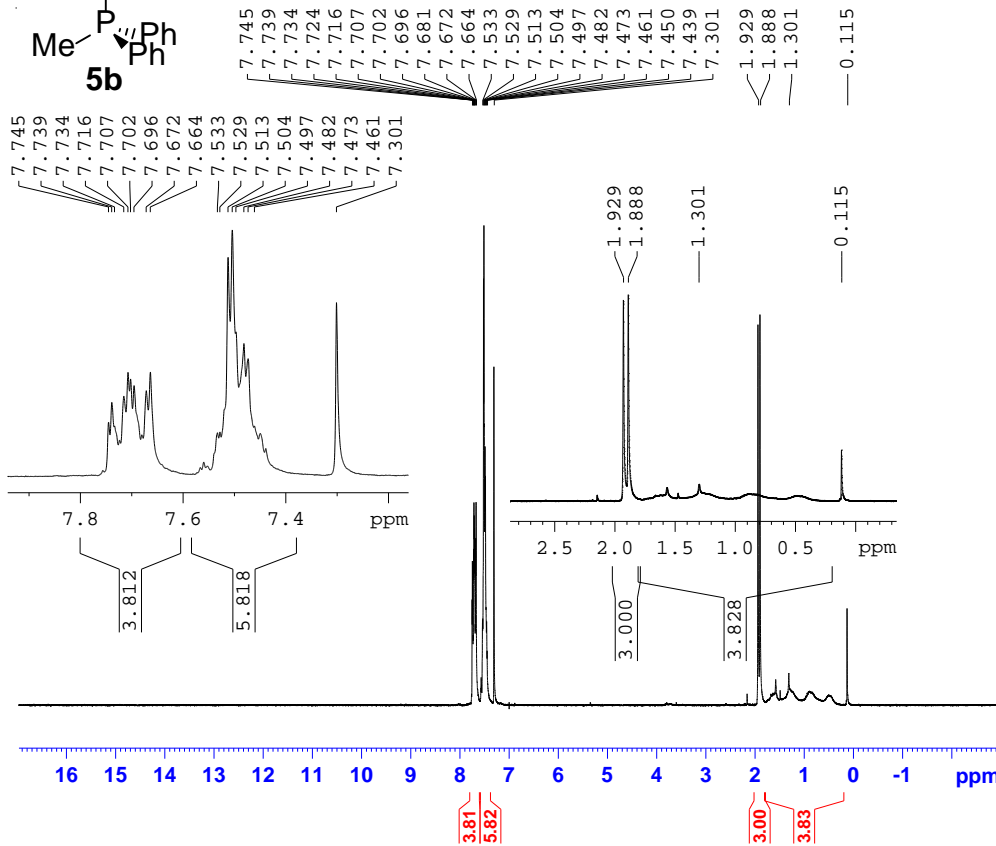
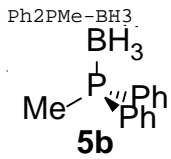
F2 - Acquisition Parameters
 Date_ 20091008
 Time 15.59
 INSTRUM spect
 PROBHD 5 mm PABEC BB/
 PULPROG hmbcpg1pnp1prqf
 TD 2048
 SOLVENT THF
 NS 8
 DS 8
 SWH 4006.410 Hz
 FIDRES 1.956255 Hz
 AQ 0.2555904 sec
 RG 8192
 DW 124.800 usec
 DE 6.00 usec
 TE 300.4 K
 CNST2 145.0000000
 CNST13 4.0000000
 d0 0.00000300 sec
 D1 1.50000000 sec

CHANNEL f1
 NUC1 1H
 P1 13.00 usec
 p2 26.00 usec
 PL1 3.00 dB
 PL9 56.70 dB
 SFO1 400.1318005 MHz

CHANNEL f2
 NUC2 29Si
 P3 8.60 usec
 PL2 -3.00 dB
 SFO2 79.4925676 MHz

GRADIENT CHANNEL
 GPNAM[1] sine.100
 GPNAM[2] sine.100
 GPNAM[3] sine.100
 GP21 30.00 %
 GP22 30.00 %
 GP23 -12.10 %
 P16 1000.00 usec

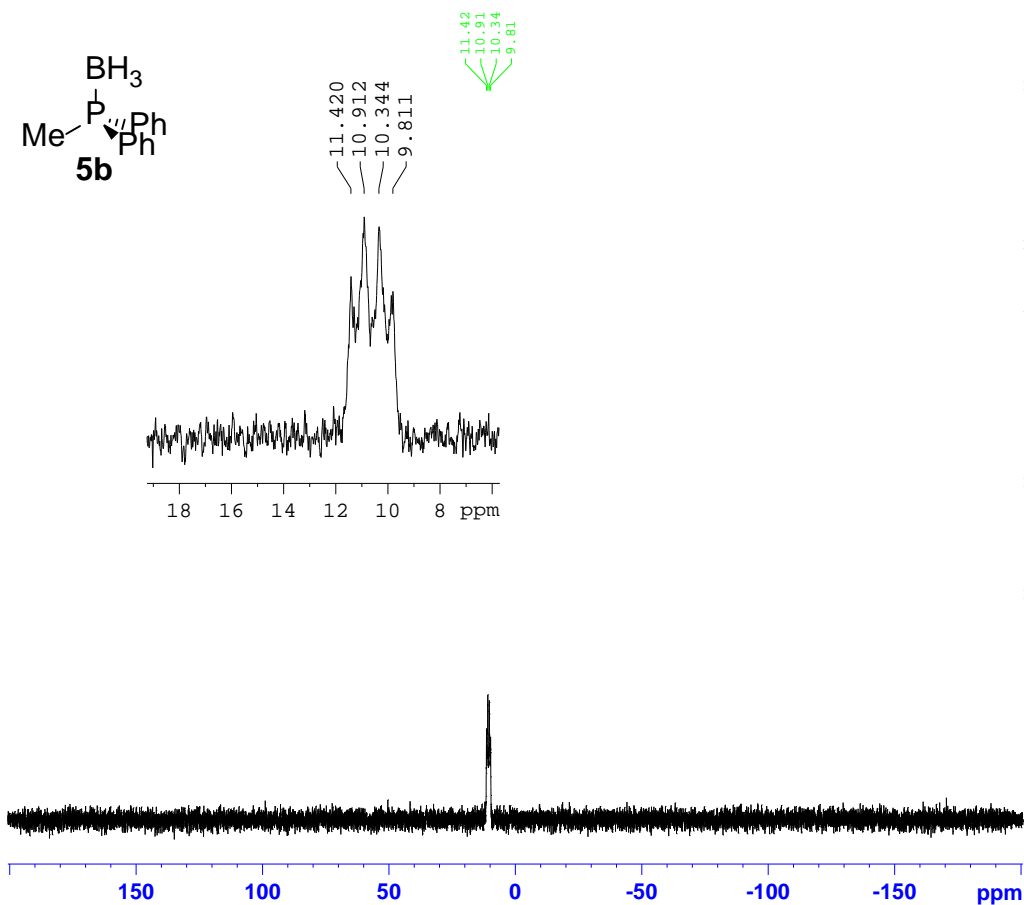
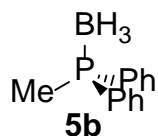
F1 - Acquisition parameters
 TD 5
 SFO1 79.49257 MHz
 FIDRES 6359.300293 Hz
 SW 199.997 ppm
 F1MORZ on



NAME VVL 158
 EXPNO 14
 PROCNO 1
 Date_ 20080908
 Time 11.24
 INSTRUM spect
 PROBHD 5 mm QNP 1H/1
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 4990.020 Hz
 FIDRES 0.076142 Hz
 AQ 6.5667572 sec
 RG 912.3
 DW 100.200 usec
 DE 6.00 usec
 TE 300.2 K
 D1 0.25000000 sec
 TD0 1

CHANNEL f1
 NUC1 1H
 P1 9.50 usec
 PL1 -3.00 dB
 SFO1 250.1317509 MHz
 SI 65536
 SF 250.1300022 MHz
 WDW EM
 SSB 0
 LB 0.10 Hz
 GB 0
 PC 1.00

Ph2POMe + HCl + LAH + H3B-SMe2



```

NAME          VVL 158
EXPNO         10
PROCNO        1
Date_         20080905
Time          16.15
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            11
DS            4
SWH           40650.406 Hz
FIDRES        0.620276 Hz
AQ            0.8061428 sec
RG            16384
DW            12.300 usec
DE            6.00 usec
TE            300.2 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0           1
    
```

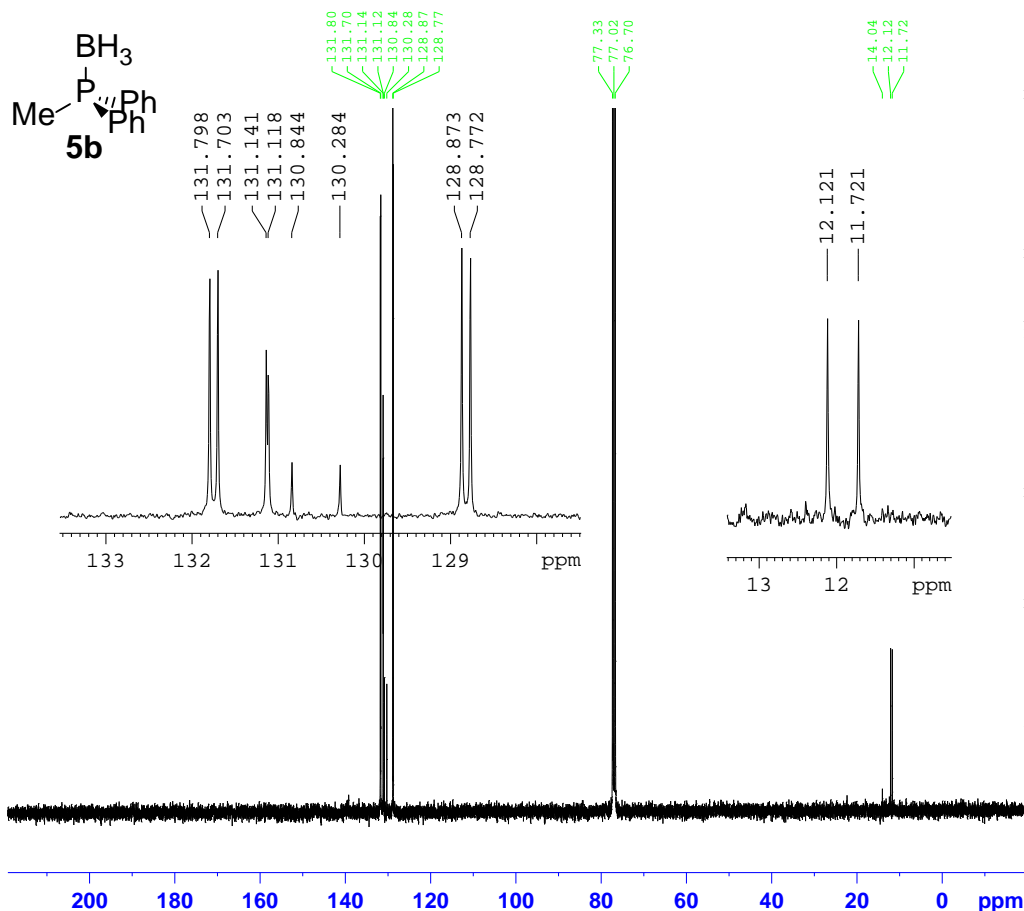
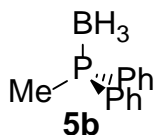
```

===== CHANNEL f1 =====
NUC1          31P
P1            7.00 usec
PL1           0.00 dB
SFO1         101.2544800 MHz
    
```

```

===== CHANNEL f2 =====
CPDPRG2      waltz16
NUC2          1H
PCPD2        80.00 usec
PL2          -3.00 dB
PL12         20.00 dB
PL13         24.00 dB
SFO2         250.1310005 MHz
SI           32768
SF           101.2544800 MHz
WDW          EM
SSB          0
LB           2.00 Hz
GB           0
PC           1.40
    
```

Ph2PMe-BH3



```

NAME          VVL 153_400
EXPNO         3
PROCNO        1
Date_         20090708
Time          18.08
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            1024
DS            4
SWH           23980.814 Hz
FIDRES        0.365918 Hz
AQ            1.3664756 sec
RG            7298.2
DW            20.850 usec
DE            6.00 usec
TE            300.4 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0           1
    
```

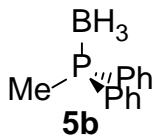
```

===== CHANNEL f1 =====
NUC1          13C
P1            8.80 usec
PL1           -1.00 dB
SFO1         100.6228298 MHz
    
```

```

===== CHANNEL f2 =====
CPDPRG2      waltz16
NUC2          1H
PCPD2        80.00 usec
PL2          3.00 dB
PL12         18.00 dB
PL13         18.00 dB
SFO2         400.1316005 MHz
SI           32768
SF           100.6127690 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
    
```

Ph₂P(Me)BH₃

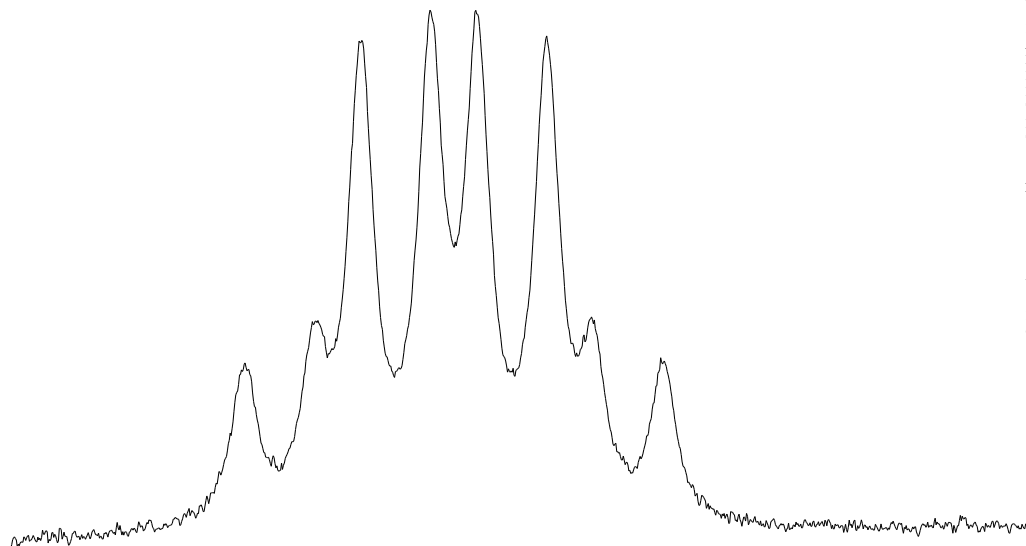


-36.64
-37.12
-37.40
-37.85
-38.15
-38.61
-38.90
-39.35



```

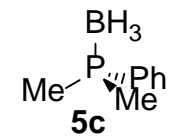
NAME      VVL 213_400
EXPNO    1
PROCNO   1
Date_    20091106
Time     22.19
INSTRUM  spect
PROBHD   5 mm PABBO BB/
PULPROG  zg
TD       65536
SOLVENT  CDCl3
NS       128
DS       4
SWH      25641.025 Hz
FIDRES   0.391251 Hz
AQ       1.2780020 sec
RG       512
DW       19.500 usec
DE       6.00 usec
TE       300.4 K
D1       1.00000000 sec
TD0      1
    
```



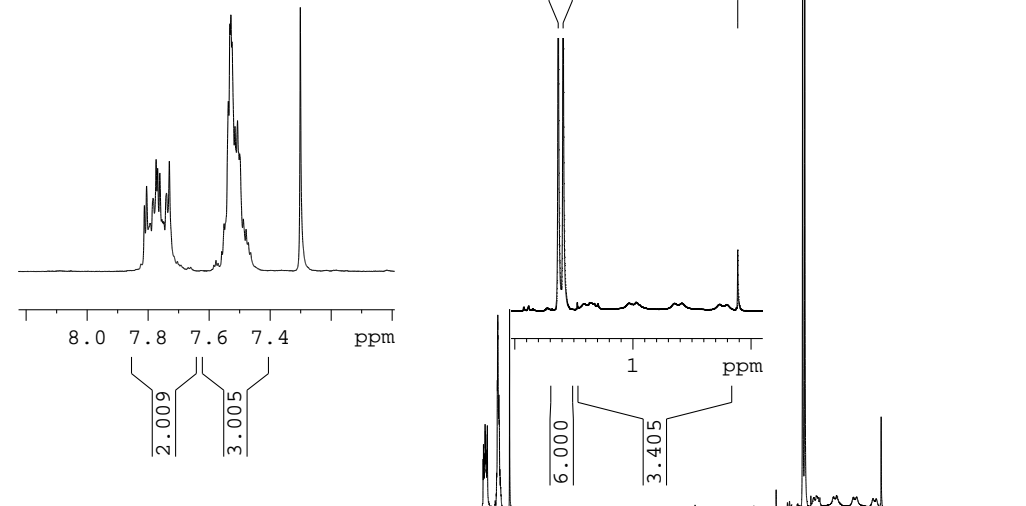
```

===== CHANNEL f1 =====
NUC1    11B
P1      8.90 usec
PL1     -1.00 dB
SFO1    128.3776052 MHz
SI      32768
SF      128.3776050 MHz
WDW     EM
SSB     0
LB      1.00 Hz
GB      0
PC      1.40
    
```

-36 -37 -38 -39 -40 -41 ppm



7.805
7.784
7.774
7.769
7.762
7.740
7.731
7.537
7.532
7.529
7.525
7.515
7.507
7.500
7.301
7.812
7.805
7.784
7.774
7.769
7.762
7.740
7.731
7.537
7.532
7.529
7.525
7.515
7.507
7.500
7.301



```

NAME      VVL 162
EXPNO    6
PROCNO   1
Date_    20080909
Time     13.20
INSTRUM  spect
PROBHD   5 mm QNP 1H/1
PULPROG  zg30
TD       65536
SOLVENT  CDCl3
NS       16
DS       2
SWH      4990.020 Hz
FIDRES   0.076142 Hz
AQ       6.5667572 sec
RG       574.7
DW       100.200 usec
DE       6.00 usec
TE       300.2 K
D1       0.25000000 sec
TD0      1
    
```

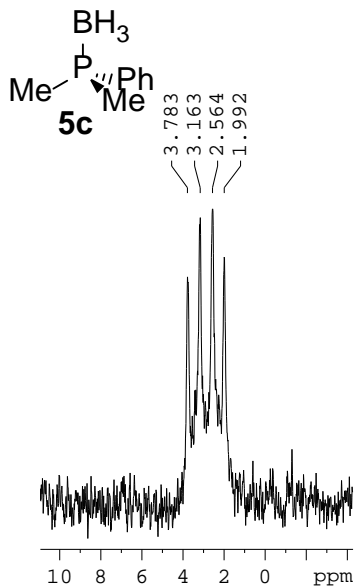
```

===== CHANNEL f1 =====
NUC1    1H
P1      9.50 usec
PL1     -3.00 dB
SFO1    250.1317509 MHz
SI      65536
SF      250.1300022 MHz
WDW     EM
SSB     0
LB      0.10 Hz
GB      0
PC      1.00
    
```

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 ppm

2.01
3.01

6.00
3.41



BRUKER

```

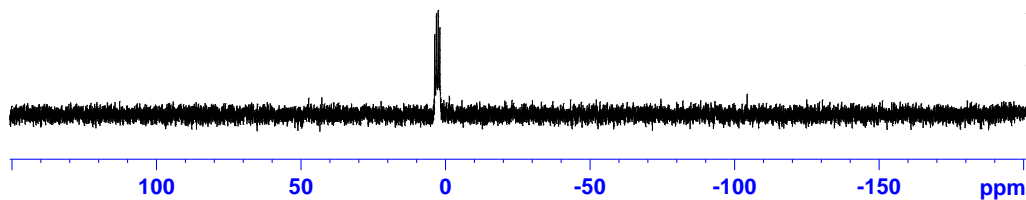
NAME          VVL 162
EXPNO         5
PROCNO        1
Date_         20080909
Time          13.14
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            8
DS            4
SWH           40650.406 Hz
FIDRES        0.620276 Hz
AQ            0.8061428 sec
RG            16384
DW            12.300 usec
DE            6.00 usec
TE            300.2 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.899999998 sec
TD0           1
  
```

```

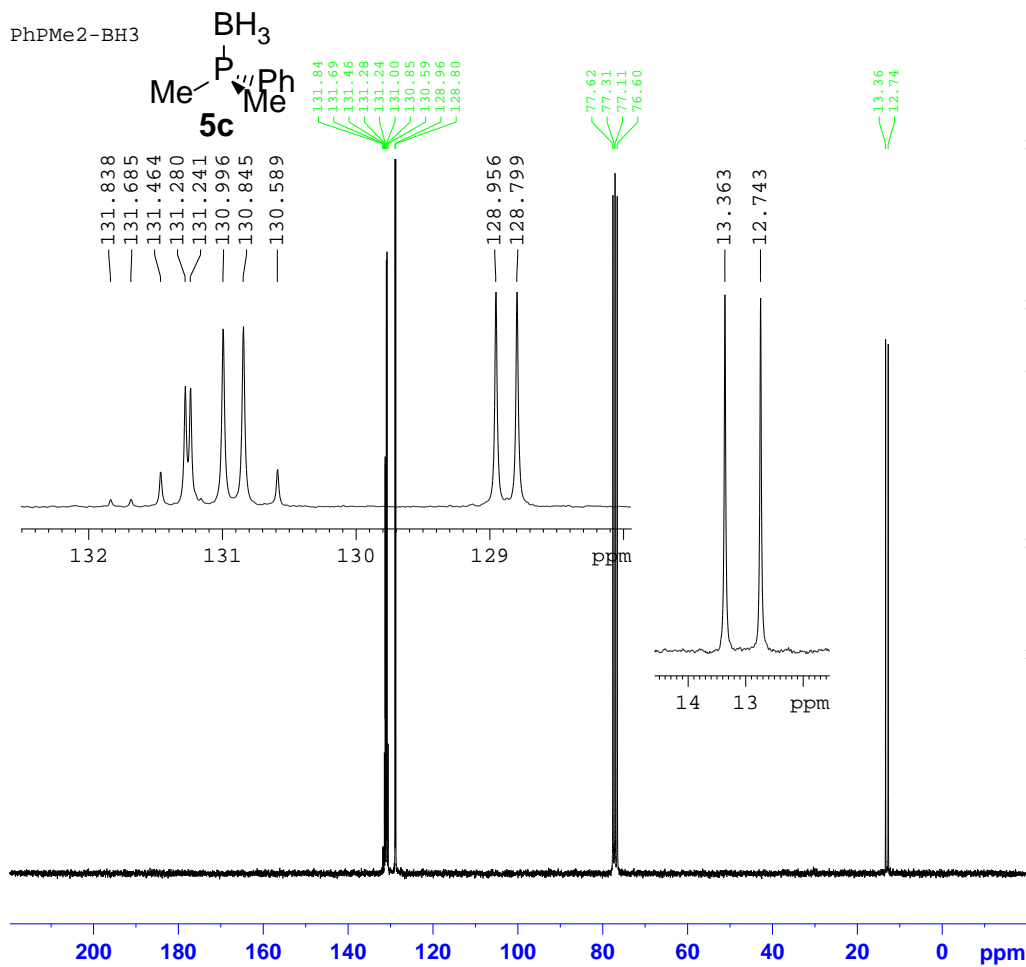
===== CHANNEL f1 =====
NUC1          31P
P1            7.00 usec
PL1           0.00 dB
SFO1         101.2544800 MHz
  
```

```

===== CHANNEL f2 =====
CPDPRG2      waltz16
NUC2          1H
PCPD2        80.00 usec
PL2          -3.00 dB
PL12         20.00 dB
PL13         24.00 dB
SFO2         250.1310005 MHz
SI           32768
SF           101.2544800 MHz
WDW          EM
SSB          0
LB           2.00 Hz
GB           0
PC           1.40
  
```



PhPMe2-BH3



BRUKER

```

NAME          PBH3
EXPNO         1
PROCNO        1
Date_         20080913
Time          0.56
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            3000
DS            4
SWH           15060.241 Hz
FIDRES        0.229801 Hz
AQ            2.1758451 sec
RG            2298.8
DW            33.200 usec
DE            6.00 usec
TE            300.2 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.899999998 sec
TD0           1
  
```

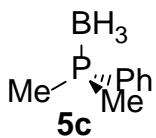
```

===== CHANNEL f1 =====
NUC1          13C
P1            6.75 usec
PL1           -3.00 dB
SFO1         62.9015280 MHz
  
```

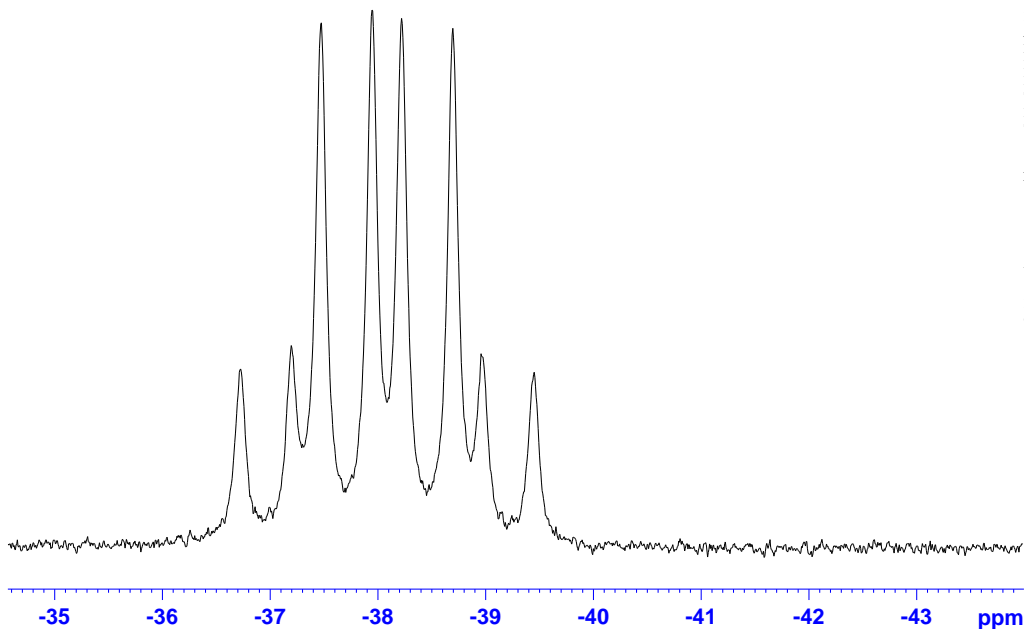
```

===== CHANNEL f2 =====
CPDPRG2      waltz16
NUC2          1H
PCPD2        80.00 usec
PL2          -3.00 dB
PL12         20.00 dB
PL13         24.00 dB
SFO2         250.1310005 MHz
SI           65536
SF           62.8952390 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```

PhPMe2-BH3



-36.72
 -37.20
 -37.47
 -37.95
 -38.22
 -38.69
 -38.96
 -39.45



```

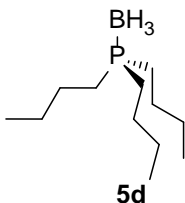
NAME      VVL 217_400
EXPNO     1
PROCNO    1
Date_     20091111
Time      17.15
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg
TD        65536
SOLVENT   CDCl3
NS        23
DS        4
SWH       25641.025 Hz
FIDRES    0.391251 Hz
AQ        1.2780020 sec
RG        574.7
DW        19.500 usec
DE        6.00 usec
TE        301.5 K
D1        1.00000000 sec
TD0       1
  
```

```

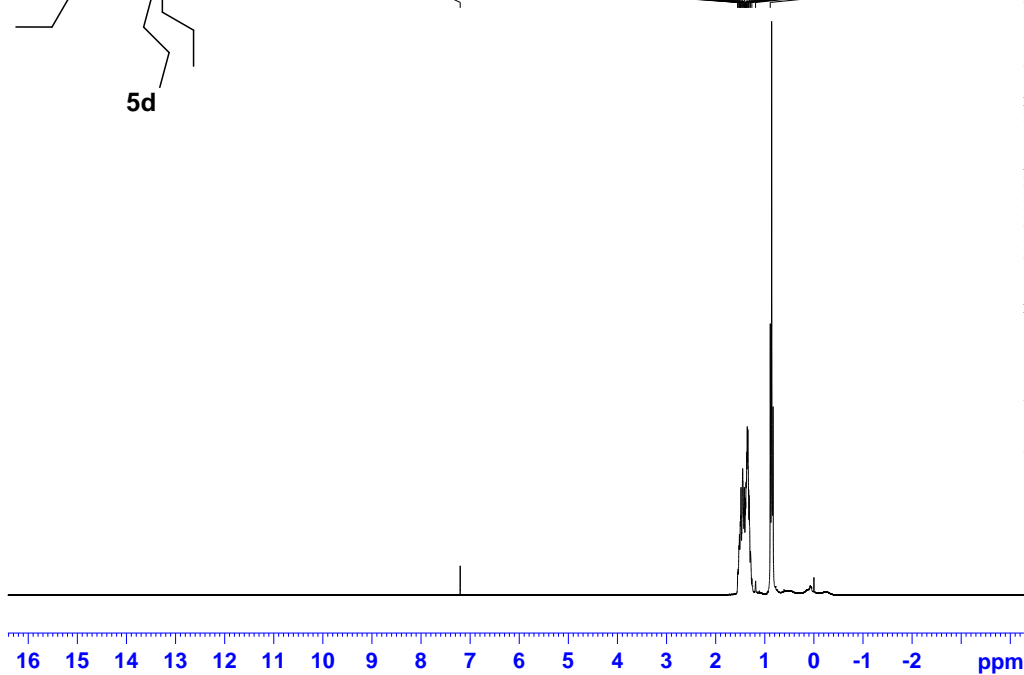
===== CHANNEL f1 =====
NUC1      1H
P1        8.90 usec
PL1       -1.00 dB
SFO1     128.3776052 MHz
SI        32768
SF        128.3776050 MHz
WDW       EM
SSB       0
LB        1.00 Hz
GB        0
PC        1.40
  
```

Bu3P-BH3

1H_proton CDCl3 {D:\NMRDATA} Volodymyr 53



7.203
 1.553
 1.544
 1.527
 1.516
 1.500
 1.493
 1.485
 1.471
 1.451
 1.432
 1.418
 1.413
 1.399
 1.392
 1.383
 1.376
 1.367
 1.357
 1.344
 1.329
 1.319
 1.292
 1.263
 1.188
 0.889



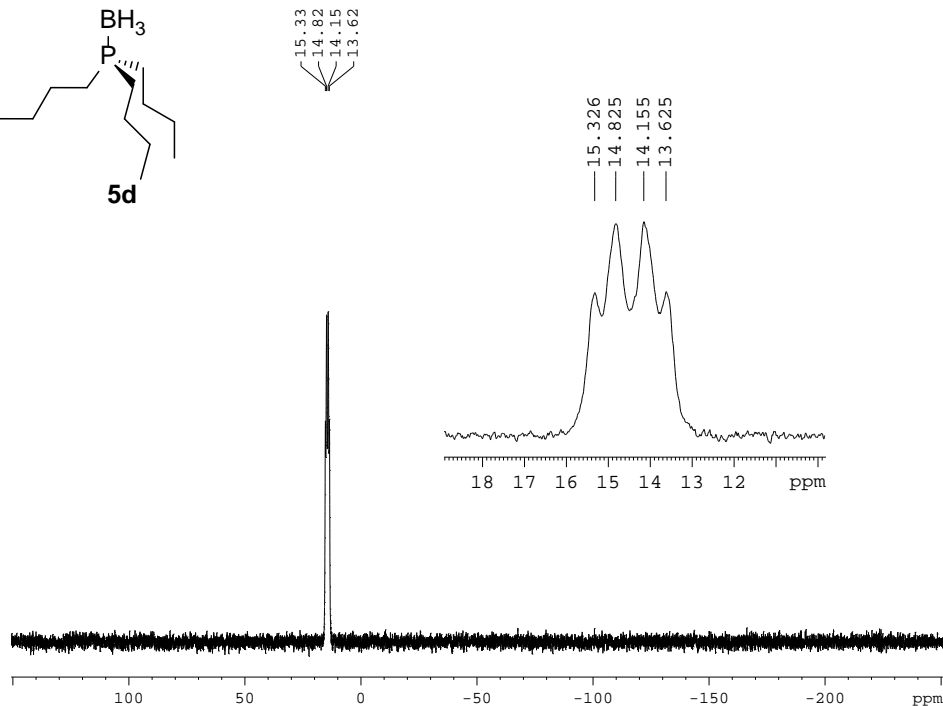
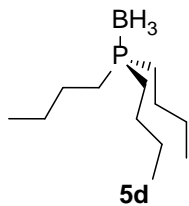
```

NAME      VVL 377
EXPNO     1
PROCNO    1
Date_     20091110
Time      17.09
INSTRUM   spect
PROBHD    5 mm QNP 1H/1
PULPROG   zg30
TD        65536
SOLVENT   CDCl3
NS        16
DS        2
SWH       5175.983 Hz
FIDRES    0.078979 Hz
AQ        6.3308277 sec
RG        114
DW        96.600 usec
DE        6.00 usec
TE        300.2 K
D1        1.00000000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        9.50 usec
PL1       -3.00 dB
SFO1     250.1315447 MHz
SI        65536
SF        250.1300266 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.40
  
```

Bu3P-BH3
P31CPD CDCl3 {D:\NMRDATA} Volodymyr 53



```

NAME          VVL 377
EXPNO         2
PROCNO        1
Date_         20091110
Time          17.11
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            16
DS            4
SWH           40650.406 Hz
FIDRES        0.620276 Hz
AQ            0.8061428 sec
RG            5160.6
DW            12.300 usec
DE            6.00 usec
TE            300.2 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0           1
  
```

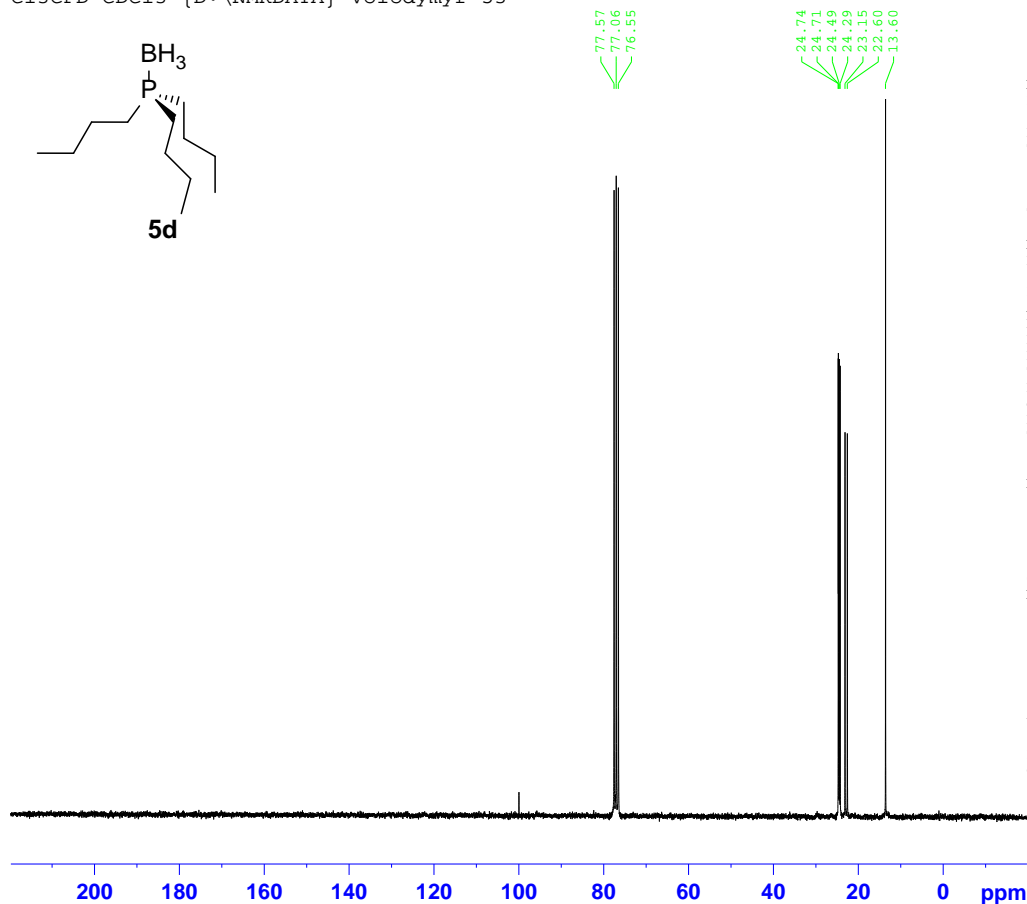
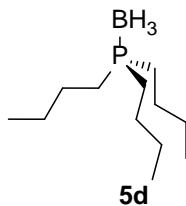
```

===== CHANNEL f1 =====
NUC1          31P
P1            7.00 usec
PL1           0.00 dB
SFO1         101.2494172 MHz
  
```

```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           -3.00 dB
PL12          20.00 dB
PL13          24.00 dB
SFO2         250.1310005 MHz
SI            32768
SF           101.2544800 MHz
WDB           EM
SSB           0
LB            3.00 Hz
GB            0
PC            1.40
  
```

Bu3P-BH3
C13CPD CDCl3 {D:\NMRDATA} Volodymyr 53



```

NAME          VVL 377
EXPNO         3
PROCNO        1
Date_         20091111
Time          6.29
INSTRUM       spect
PROBHD        5 mm QNP 1H/1
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            2048
DS            4
SWH           15060.241 Hz
FIDRES        0.229801 Hz
AQ            2.1758451 sec
RG            2298.8
DW            33.200 usec
DE            6.00 usec
TE            300.2 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0           1
  
```

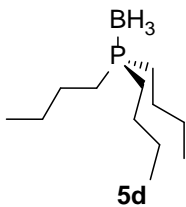
```

===== CHANNEL f1 =====
NUC1          13C
P1            6.75 usec
PL1           -3.00 dB
SFO1         62.9015280 MHz
  
```

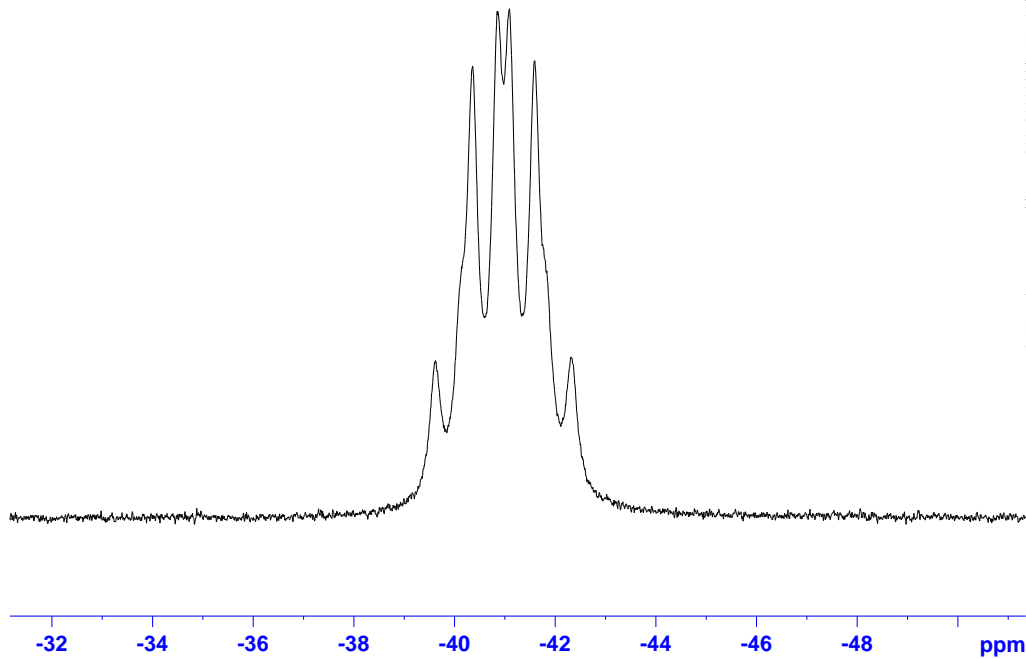
```

===== CHANNEL f2 =====
CPDPRG2       waltz16
NUC2          1H
PCPD2         80.00 usec
PL2           -3.00 dB
PL12          20.00 dB
PL13          24.00 dB
SFO2         250.1310005 MHz
SI            65536
SF           62.8952390 MHz
WDB           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

Bu₃P-BH₃



--39.62
--40.36
--40.86
--41.09
--41.59
--42.31



BRUKER

```
NAME      VVL 210_400
EXPNO     12
PROCNO    1
Date_     20091106
Time      22.07
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg
TD         65536
SOLVENT   CDCl3
NS         256
DS         4
SWH       25641.025 Hz
FIDRES    0.391251 Hz
AQ         1.2780020 sec
RG         645.1
DW         19.500 usec
DE         6.00 usec
TE         300.4 K
D1         1.00000000 sec
TD0        1
```

```
===== CHANNEL f1 =====
NUC1      11B
P1         8.90 usec
PL1       -1.00 dB
SF01     128.3776052 MHz
SI        32768
SF        128.3776050 MHz
WDW       EM
SSB       0
LB        1.00 Hz
GB        0
PC        1.40
```