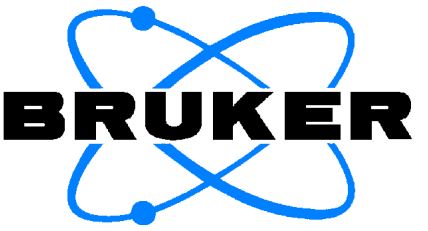


# Filter Configurations

## for High Resolution NMR

## Version 002

BRUKER

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© March 9, 2000: Bruker AG

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P/N: Z31430
DWG-Nr: 1140002

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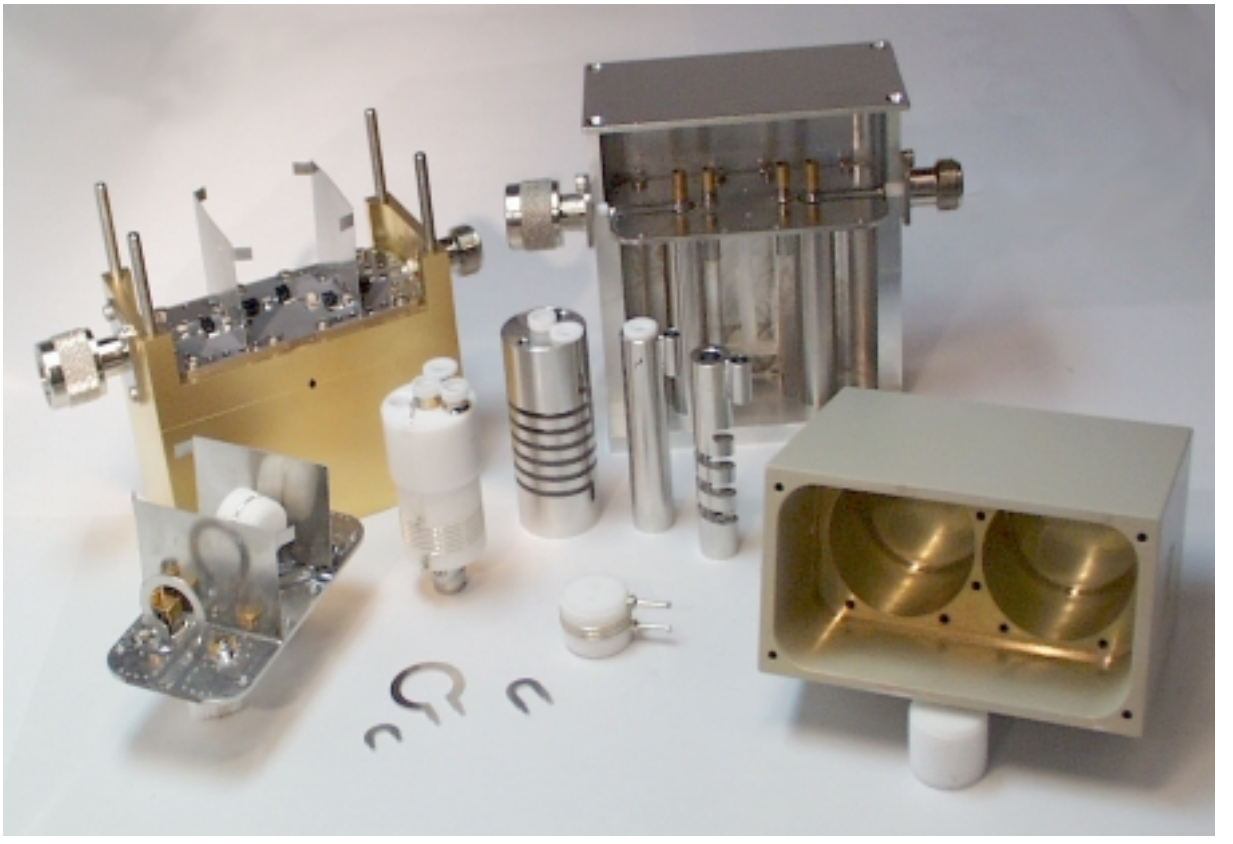
# Filter Configurations 1

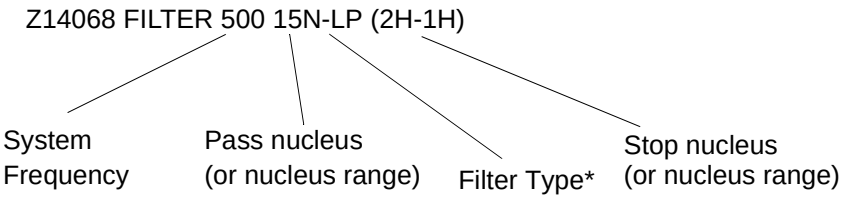
*Figure 1.1. High Resolution NMR Filters and Filtercomponents*



## Introduction 1.1

- The following chapter helps to select the necessary filter type dependent on the preamplifier and the probe.
- System orders with multiple probes require only the combined minimum set of filters.
- Only standard operation is guaranteed with the recommended filter configuration. Non-standard operation (observe on outer coil and decoupling on inner coil) may also be possible with the recommended filter configuration.

- With individual probe orders the current configuration at the customer‘s labs should be obtained to avoid ordering filters which are already at the site.
- If your probe is not included in this list, please fill in the filter requirements questionnaire at the end of this chapter (***page 28***) and send it to BRUKER AG, Production Department.
- The exact order number for the corresponding magnet frequency can be taken from the „Available Filters“ list (***page 29***).
- No additional filters are necessary in the lock channel.
- No additional filters are necessary for HPPR CRP modules.
- All filters should be mounted on the HPPR and not on the probe
- In cause of more than one filter, the 2H stop should be mounted closer to the HPPR
- Explanation of the filter nomenclature:




*) LP=low pass, HP= high pass, BP=band pass

- For use of outfaced filters (not mentioned in Table ***page 29***) see previous manual versions (Z31430 Index 1).

### *MAS Filters* *1.1.1*

Special filters are required for CP MAS (up 500W transmitter power). Due to high decoupling power during acquisition, harmonics of the decoupling signal must be attenuated at least 40dB to prevent saturation of the preamplifier. Other signals (spurious, noise) in the decoupling signal at the observe frequency must be attenuated at least 80dB. For those reasons a bandpass is required in the decoupling path.

MAS bandpasses have generally the specifications mentioned above, power rating is 500W (100ms, 20% duty cycle).

Nomenclature of MAS filters is pass frequency and filter type following the system frequency and stop frequency range in brackets e.g. Z14067 FILTER 500 13C-BP (0-29SI,P-H). P means 31P and H means 1H.

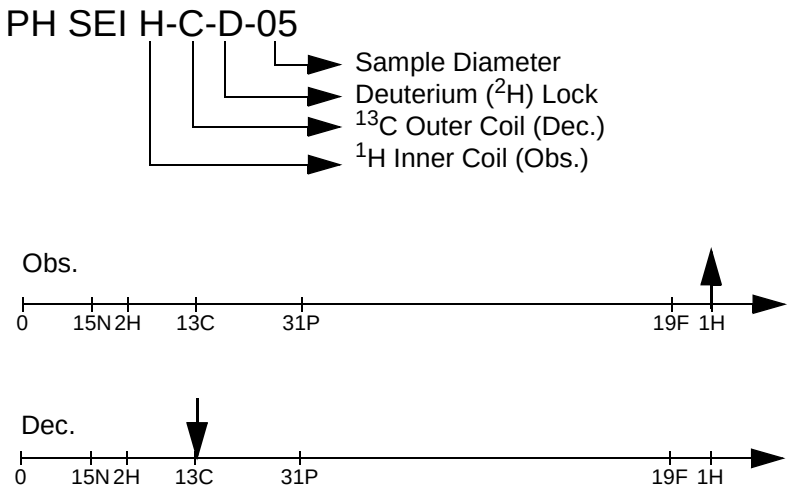
If 15N is the lowest used frequency, a lowpass can used in this case e.g. Z14068 FILTER 500 15N-LP (2H-1H).

All high CP MAS compatible filters are marked with a * in the table: ***"Available Filters (January 2000)" on page 29***

For more detailed information see the corresponding EC.

## *SEI (Selective Inverse)* *1.2*

***Example:***




***Required Filters:***

*Table 1.1. Required Filters for PH SEI H-C-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path X-BB Preamplifier | X-BB19F 2HP | 0-31P-LP (19F-3H) 2H Stop |
| | X-BB19F 2HS | 0-31P-LP (19F-3H) |
| | X-BB31P 2HS | - |

13C Observe/ 1H Decoupling might be possible with this configuration.

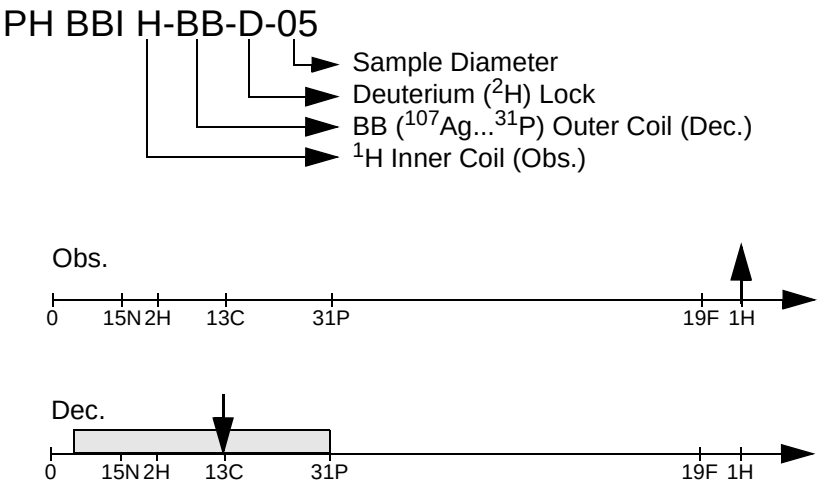
*Table 1.2. Required Filters for PH SEI H-F-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 1H Preamplifier | 1H LNA | 1H-PASS / 19-F STOP |
| | 1H Preamp | 1H-PASS / 19-F STOP |
| Decoupling Path X-BB Preamplifier | X-BB19F 2HP | 2H Stop <br>0-31P,19F-LP (1H) |
| | X-BB19F 2HS | 0-31P,19F-LP (1H) |
| | X-BB31P 2HS | not possible |

19F Observe/1H Decoupling might be possible with this configuration.

## *BBI (Broad Band Inverse)* *1.3*

***Example:***




***Required Filters:***

*Table 1.3. Required Filters for PH BBI H-BB-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path X-BB Preamplifier | X-BB19F 2HP | 0-31P-LP (19F-3H) 2H Stop |
| | X-BB19F 2HS | 0-31P-LP (19F-3H) |
| | X-BB31P 2HS | - |

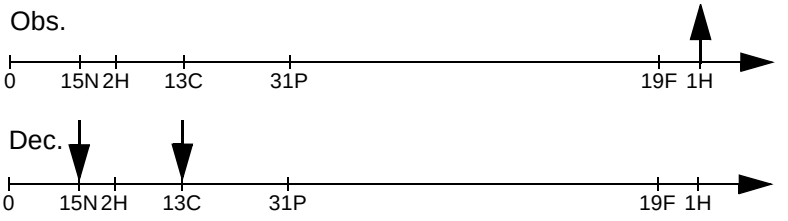
X Observe/ 1H Decoupling might be possible with this configuration.

## *TXI (Triple X-Nuclei Inverse)* *1.4*

***Example:***

PH TXI H-C/N-D-05

- Sample Diameter
- Deuterium ($^{2}$H) Lock
- $^{15}$N and $^{13}$C Outer Coil (Dec.)
- $^{1}$H Inner Coil (Obs.)




***Required Filters:***

*Table 1.4. Required Filters for PH TXI H-C/N-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path X-BB Preamplifier 13C | X-BB19F 2HP | 0-31P-LP (19F-3H) 13C-Pass / 2H-Stop |
| | X-BB19F 2HS | 0-31P-LP (19F-3H) 13C-Pass / 2H-Stop |
| | X-BB31P 2HS | 13C-Pass / 2H-Stop |
| Decoupling Path 15N | - | 15N-Pass / 2H-Stop |

13C Observe/ 1H Decoupling might be possible with this configuration.

For 15N Observe the X-BB Preamplifier must be plugged in the 15N channel.

*Table 1.5. Required Filters for PH TXI H-C/P-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path X-BB Preamplifier 13C | X-BB19F 2HP | 13C-Pass / 31P-Stop <br>13C-Pass / 2H-Stop |
| | X-BB19F 2HS | 13C-Pass / 31P-Stop |
| | X-BB31P 2HS | 13C-Pass / 31P-Stop |
| Decoupling Path 31P | - | 0-31P-LP (19F-3H) <br>31-P-Pass / 2H-Stop |

13C Observe/ 1H Decoupling might be possible with this configuration.

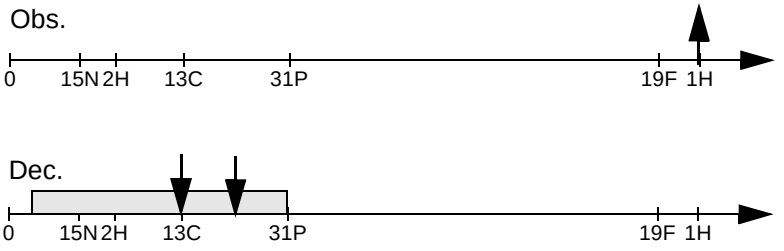
For 31P Observe the X-BB Preamplifier must be plugged in the 15N channel.

## *TBI (Triple Broad Band Inverse)* *1.5*

***Example:***

PH TBI H-C/BB-D-05

- Sample Diameter
- Deuterium ($^{2}$H) Lock
- $^{13}$C and BB ($^{107}$Ag...$^{31}$P) Outer Coil (Dec.)
- $^{1}$H Inner Coil (Obs.)




***Required Filters:***

*Table 1.6. Required Filters for PH TBI H-C/BB-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path X-BB Preamplifier 13C | X-BB19F 2HP | a b |
| | X-BB19F 2HS | a b |
| | X-BB31P 2HS | a b |
| Decoupling Path BB | - | a b |

aFor 13C and 15N decoupling filter requirements is the same as ***"Required Filters for PH TXI H-C/N-D" on page 13***

bFor 13C and 31P decoupling filter requirements is the same as ***"Required Filters for PH TXI H-C/P-D" on page 14***

For additional decoupling nuclei please contact the nearest local Bruker office.

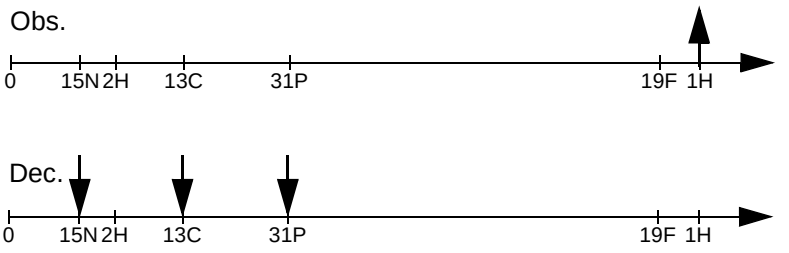
13C Observe/ 1H Decoupling might be possible with this configuration.

## *QXI (Quattro X-Nuclei Inverse)* *1.6*

***Example:***

PH QXI H/P-C/N-D-05

- Sample Diameter
- Deuterium ($^2$H) Lock
- 15N and 13C Outer Coil (Dec.)
- 31P Inner Coil (Dec.)
- 1H Inner Coil (Obs.)




***Required Filters:***

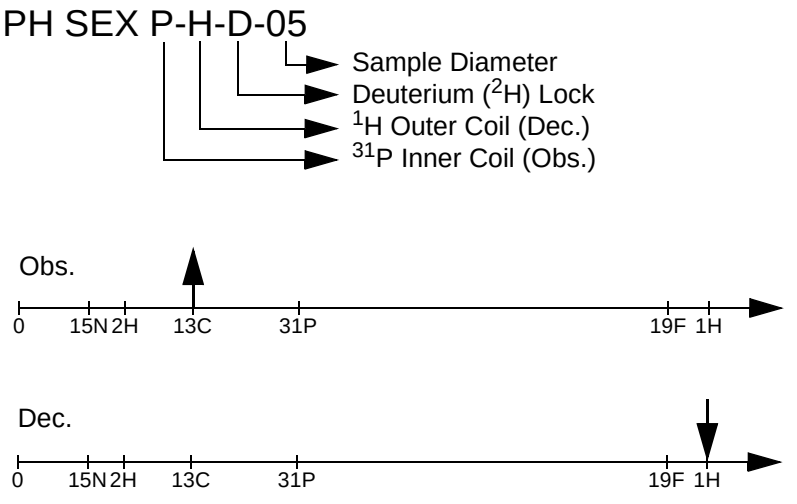
*Table 1.7. Required Filters for PH QXI H/P-C/N-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path X-BB Preamplifier 13C | X-BB19F 2HP | 13C-Pass / 31P-Stop 13C-Pass / 2H-Stop |
| | X-BB19F 2HS | 13C-Pass / 31P-Stop 13C-Pass / 2H-Stop |
| | X-BB31P 2HS | 13C-Pass / 31P-Stop 13C-Pass / 2H-Stop |
| Decoupling Path 15N | - | 15N-Pass / 2H-Stop |
| Decoupling Path 31P | | 0-31P-LP (19F-3H) 31P-Pass / 2H-Stop |

13C Observe/ 1H Decoupling might be possible with this configuration.

## *SEX, Dual (Selective X-Nuclei)* *1.7*

***Example:***




***Required Filters:***

*Table 1.8. Required Filters for PH SEX C-H-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path<br>X-BB Preamplifier<br>13C | X-BB19F 2HP | 0-31P-LP (19F-3H) <br>13C-Pass / 2H-Stop |
| | X-BB19F 2HS | 0-31P-LP (19F-3H) |
| | X-BB31P 2HS | - |
| Decoupling Path<br>1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |

1H Observe / 13C Decoupling might be possible with this configuration.

*Table 1.9. Required Filters for PH SEX 3H-H-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 3H Preamplifier | 3H Preamp | 3H-HP(1H) |
| Decoupling Path 1H Preamplifier | 1H LNA | 1H-LP(3H) |
| | 1H Preamp | 1H-LP(3H) |

1H Observe/ 3H Decoupling might be possible with this configuration.

*Table 1.10. Required Filters for PH SEX 2H-H-F*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 2H Preamplifier | 2H Preamp | - |
| Decoupling Path 1H Preamplifier | 1H LNA | 1H-Pass / 19F-Stop |
| | 1H Preamp | - |

1H Observe/ 2H Decoupling might be possible with this configuration.

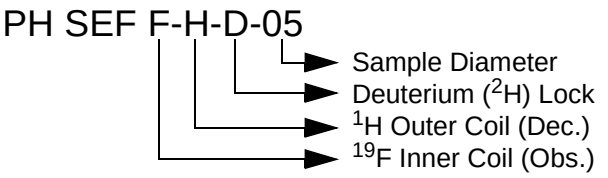
*Table 1.11. Filters for PH SEX X-H-D (x=all X-nuclei except 2H, 3H, 13C)*

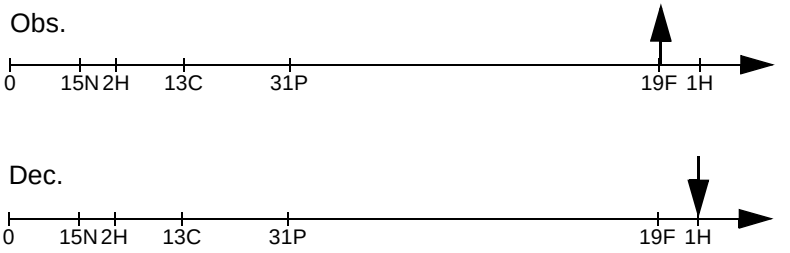
| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop |
| | X-BB19F 2HS | - |
| | X-BB31P 2HS | - |
| Decoupling Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |

1H Observe / X Decoupling might be possible with this configuration.

## *SEF (Selective 19F)* *1.8*

***Example:***




***Required Filters:***

*Table 1.12. Required Filters for PH SEF F-H-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path 19F Preamplifier | 19F Preamp | 0-31P,19F-LP (1H) |
| | X-BB19F 2HP | 2H-Stop <br>0-31P,19F-LP (1H) |
| | X-BB19F 2HS | 0-31P,19F-LP (1H) |
| Decoupling Path 1H Preamplifier | 1H LNA | 1H-PASS /19F-STOP |
| | 1H Preamp | 1H-PASS /19F-STOP |

1H Observe / 19F Decoupling might be possible with this configuration.

## *QNP (Quattro Nuclei Probe)* *1.9*

***Example:***

PH QNP P/C/N-H-D-05

- Sample Diameter
- Deuterium ($^{2}$H) Lock
- $^{1}$H Outer Coil (Dec.)
- $^{15}$N, $^{13}$C and $^{31}$P Inner Coil switchable (Obs.)

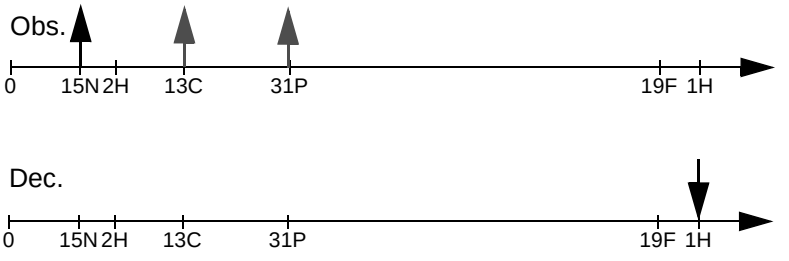



*Table 1.13. Required Filters for PH QNP P/C/N-H-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop 0-31P-LP (19F-3H) |
| | X-BB19F 2HS | 0-31P-LP (19F-3H) |
| | X-BB31P 2HS | - |
| Decoupling Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |

1H Observe / X Decoupling might be possible with this configuration.

*Table 1.14. Required Filters for PH QNP F/P/C -H-D*

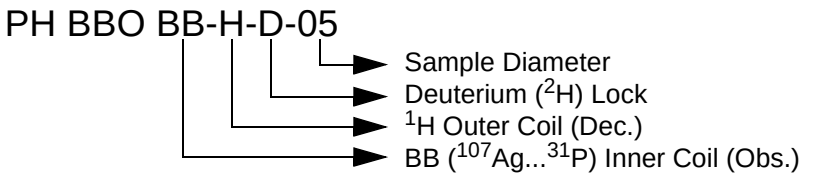
| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop 0-31P,19F-LP (1H) 0-31P-LP (19F-3H)[a] |
| | X-BB19F 2HS | 0-31P,19F-LP (1H) 0-31P-LP (19F-3H)[a] |
| | X-BB31P 2HS | 19F observe not possible |
| Decoupling Path 1H Preamplifier | 1H LNA | 1H-Pass / 19F-Stop |
| | 1H Preamp | 1H-Pass / 19F-Stop |

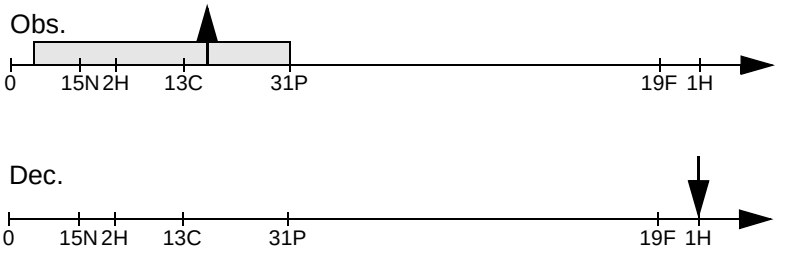
a This filter is only necessary for 13C decoupling and must be removed for 19F decoupling or observe

1H Observe / X Decoupling might be possible with this configuration.

## *BBO (Broad Band Observe)* *1.10*

***Example:***




***Required Filters:***

*Table 1.15. Required Filters for PH BBO BB-H-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop 0-31P-LP (19F-3H) |
| | X-BB19F 2HS | 0-31P-LP (19F-3H) |
| | X-BB31P 2HS | - |
| Decoupling Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |

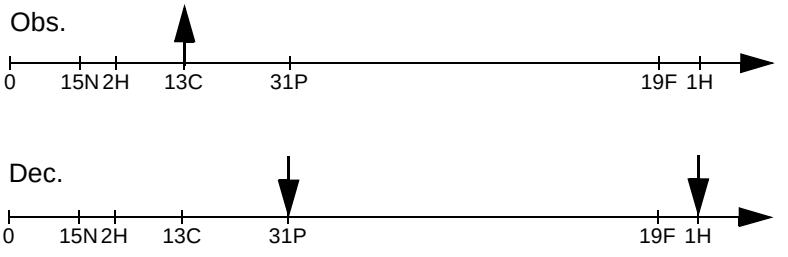
1H Observe / X Decoupling might be possible with this configuration.

## *TXO (Triple X-Nuclei Observe)* *1.11*

***Example:***

PH TXO P/C-H-D-05

- Sample Diameter
- Deuterium ($^{2}$H) Lock
- $^{1}$H Outer Coil (Dec.)
- $^{13}$C and $^{31}$P Inner Coil (Obs.)




***Required Filters:***

*Table 1.16. Required Filters for PH TXO X/Y-H-D (without 19F)*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop X-Pass / Y-Stop |
| | X-BB19F 2HS | X-Pass / Y-Stop |
| | X-BB31P 2HS | X-Pass / Y-Stop |
| Decoupling Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path Y | | 2H Stop Y-Pass / X-Stop |

Only X-Observe, Y and 1H Decoupling is possible with this configuration.

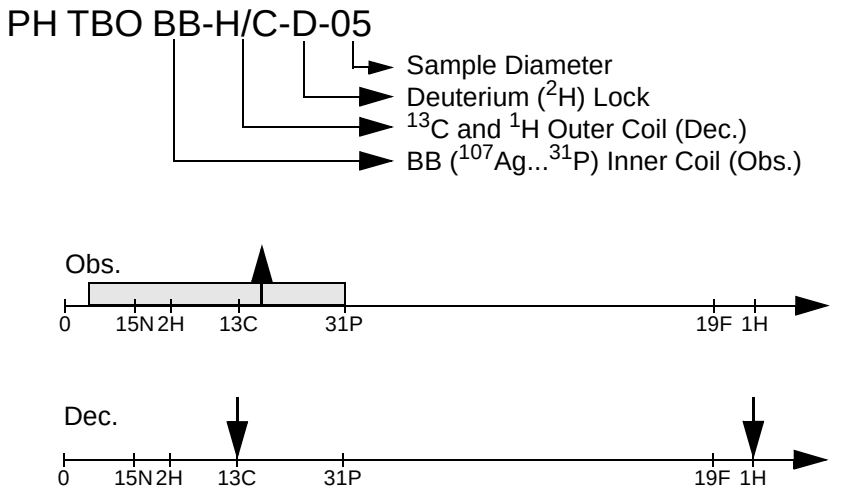
*Table 1.17. Required Filters for PH TXO F/Y-H-D (with X=19F)*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 19F Bandpass |
| | X-BB19F 2HS | 19F Bandpass |
| | X-BB31P 2HS | -not possible |
| Decoupling Path 1H Preamplifier | 1H LNA | 1H-Pass / 19F-Stop |
| | 1H Preamp | - |
| Decoupling Path Y | | 2H-Stop 0-31P-LP (19F-3H) |

Y Observe, 19F and 1H Decoupling might be possible with this configuration.

## *TBO (Triple Broad Band Observe)* *1.12*

***Example:***

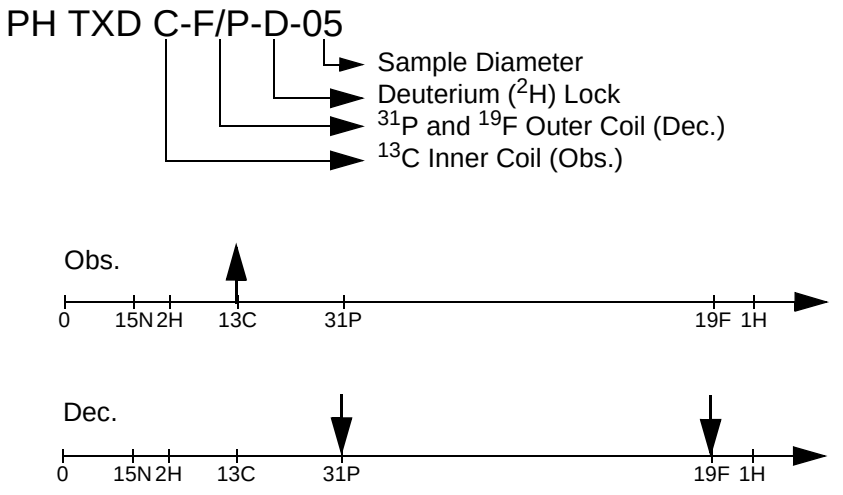



***Required Filters:***

Please contact the nearest Bruker head office for TBO filter requirements.

## *TXD (Triple X-Nuclei Double Decoupling)* *1.13*

***Example:***




***Required Filters:***

*Table 1.18. Required Filters for PH TXD X-H/Y-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop X-Pass / Y-Stop |
| | X-BB19F 2HS | X-Pass / Y-Stop |
| | X-BB31P 2HS | X-Pass / Y-Stop |
| Decoupling Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path Y | | 2H Stop Y-Pass / X-Stop |

*Table 1.19. Required Filters for PH TXD X-F/Z*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop X-Pass / Y-Stop |
| | X-BB19F 2HS | X-Pass / Y-Stop |
| | X-BB31P 2HS | X-Pass / Y-Stop |
| Decoupling Path y (19F) | | 19F Bandpass |
| Decoupling Path Z | | 2H Stop Z-Pass / X-Stop |

*Table 1.20. Required Filters for PH TXD X-H/F-D*

| Channel (Obs./Dec.) | Preamplifier Module Type | Required Filters |
|---|---|---|
| Observe Path X-BB Preamplifier | X-BB19F 2HP | 2H-Stop 0-31P-LP (19F-3H) |
| | X-BB19F 2HS | 0-31P-LP (19F-3H) |
| | X-BB31P 2HS | - |
| Decoupling Path 1H Preamplifier | 1H LNA | - |
| | 1H Preamp | - |
| Decoupling Path y (19F) | - | 19F Bandpass |

## *Filter Requirements Questionnaire* *1.14*

Please fill in the following questionnaire for each probe.

(Part. Nr. / Ser. Nr.)

| | | |
|---|---|---|
| Bruker Order Number | | |
| Spectrometer Type | | |
| Probe | | |
| Transmitter Configuration | 1H | |
| | 19F | |
| | X | |
| | Y | |
| | Z | |
| HPPR Configuration | 1H | |
| | 19F | |
| | XBB | |
| | ... | |
| Lock | 2H | |
| | 19F | |
| | 2H Lockswitch | |
| Existing Filter 1 | | |
| Existing Filter 2 | | |
| ... | | |
| | | |
| | | |
| Experiment 1 | Obs1 {Dec1} | |
| Experiment 2 | Obs2 {Dec2} | |
| ... | | |
| | | |

## *Available Filters (January 2000)* *1.15*

Z00105 FILTER 100 2H PASS
Z00113 FILTER 100 2H STOP
Z14345 FILTER 100 0-31P,19F-LP (1H)
Z6595 FILTER 100 BAND PASS 1H
Z6603 FILTER 100 LOW PASS 1H STOP
---
Z13381 FILTER 200 1H-BANDPASS *
Z13281 FILTER 200 1H-PASS / 19F-STOP
Z00106 FILTER 200 2H PASS
Z00114 FILTER 200 2H STOP
Z13742 FILTER 200 2H-PASS / 13C-STOP
Z13327 FILTER 200 0-31P,19F-LP (1H)
Z14329 FILTER 200 0-31P-LP (19F-3H) *
Z13088 FILTER 200 11B-PASS / 13C-STOP
Z41000 FILTER 200 11B-PASS / 31P-STOP
Z13087 FILTER 200 13C-PASS / 11B-STOP
Z13739 FILTER 200 13C-PASS / 15N-STOP
Z13083 FILTER 200 13C-PASS / 2H-STOP
Z6842 FILTER 200 13C-PASS / 31P-STOP
Z13740 FILTER 200 13C-PASS /29SI-STOP
Z13741 FILTER 200 15N-PASS / 13C-STOP
Z13908 FILTER 200 19F-BANDPASS *
Z12967 FILTER 200 23NA-PASS /31P-STOP
Z13015 FILTER 200 27AL-PASS /31P-STOP
Z13744 FILTER 200 29SI-PASS /11B-STOP
Z13743 FILTER 200 29SI-PASS /13C-STOP
Z41001 FILTER 200 31P-PASS / 11B-STOP
Z6843 FILTER 200 31P-PASS / 13C-STOP
Z12968 FILTER 200 31P-PASS /23NA-STOP
Z13111 FILTER 200 LDA/4-TRAFO 13C/31P
---
Z13382 FILTER 250 1H-BANDPASS *
Z13279 FILTER 250 1H-PASS / 19F-STOP
Z00107 FILTER 250 2H PASS
Z00115 FILTER 250 2H STOP
Z13439 FILTER 250 3H-PASS / 1H-STOP

Z13328 FILTER 250 0-31P,19F-LP (1H)
Z14330 FILTER 250 0-31P-LP (19F-3H) *
Z12810 FILTER 250 103RH-PASS/31P-STOP
Z13894 FILTER 250 117SN-PASS/13C-STOP
Z13892 FILTER 250 117SN-PASS/31P-STOP
Z9146 FILTER 250 13C-PASS / 2H-STOP
Z6818 FILTER 250 13C-PASS / 31P-STOP
Z13893 FILTER 250 13C-PASS/117SN-STOP
Z13375 FILTER 250 14N-PASS/195PT-STOP
Z42386 FILTER 250 15N-PASS / 2H-STOP
Z13376 FILTER 250 195PT-PASS/14N-STOP
Z13902 FILTER 250 19F-BANDPASS *
Z9774 FILTER 250 205TL-PASS/ 1H-STOP
Z6819 FILTER 250 31P-PASS / 13C-STOP
Z12811 FILTER 2531P-PASS/103RH-STOP
Z13891 FILTER 250 31P-PASS/117SN-STOP
---
Z13383 FILTER 300 1H-BANDPASS *
Z13270 FILTER 300 1H-PASS / 19F-STOP
Z13763 FILTER 300 1H-LP(3H)
Z00108 FILTER 300 2H PASS
Z00116 FILTER 300 2H STOP
Z9327 FILTER 300 2H-PASS / 13C-STOP
Z9330 FILTER 300 2H-PASS / 15N-STOP
Z7781 FILTER 300 2H-PASS / 19F-STOP
Z13764 FILTER 300 3H-PASS / 1H-STOP
Z13329 FILTER 300 0-31P,19F-LP (1H)
Z14331 FILTER 300 0-31P-LP (19F-3H) *
Z13029 FILTER 300 119SN-P 13C-29SI-ST
Z8742 FILTER 300 119SN-PASS/31P-STOP
Z9229 FILTER 300 11B-PASS / 31P-STOP
Z13972 FILTER 300 13C-BP (0-2H,P-H) *
Z9328 FILTER 300 13C-PASS / 2H-STOP
Z12853 FILTER 300 13C-PASS / 14N-STOP
Z8955 FILTER 300 13C-PASS / 15N-STOP
Z6845 FILTER 300 13C-PASS / 31P-STOP
Z9329 FILTER 300 15N-PASS / 2H-STOP

Z8954 FILTER 300 15N-PASS / 13C-STOP
Z7780 FILTER 300 15N-PASS / 6LI-STOP
Z13773 FILTER 300 19F-BANDPASS *
Z42428 FILTER 300 27A-PASS / 31P-STOP
Z9228 FILTER 300 31P-PASS / 11B-STOP
Z6844 FILTER 300 31P-PASS / 13C-STOP
Z42427 FILTER 300 31P-PASS / 27A-STOP
Z8741 FILTER 300 31P-PASS /119S-STOP
Z13373 FILTER 300 31P-PASS/195PT-STOP
Z9244 FILTER 300 6LI-PASS / 2H-STOP
Z7779 FILTER 300 6LI-PASS / 15N-STOP
Z9384 FILTER 300 LDA/4-TRAFO 13C/31P
---
Z13384 FILTER 360 1H-BANDPASS *
Z13284 FILTER 360 1H-PASS / 19F-STOP
Z00109 FILTER 360 2H PASS
Z00117 FILTER 360 2H STOP
Z13330 FILTER 360 0-31P,19F-LP (1H)
Z14332 FILTER 360 0-31P-LP (19F-3H) *
Z42364 FILTER 360 13C-PASS / 2H-STOP
Z8829 FILTER 360 13C-PASS / 15N-STOP
Z6828 FILTER 360 13C-PASS / 31P-STOP
Z42363 FILTER 360 15N-PASS / 2H-STOP
Z8830 FILTER 360 15N-PASS / 13C-STOP
Z13903 FILTER 360 19F-BANDPASS *
Z6829 FILTER 360 31P-PASS / 13C-STOP
Z41153 FILTER 360 LDA/4-TRAFO 13C/31P
---
Z13385 FILTER 400 1H-BANDPASS *
Z13271 FILTER 400 1H-PASS / 19F-STOP
Z14180 FILTER 400 1H-LP(3H)
Z6850 FILTER 400 1H-PASS/205TL-STOP
Z00110 FILTER 400 2H PASS
Z00118 FILTER 400 2H STOP
Z9032 FILTER 400 2H-PASS / 13C-STOP
Z9093 FILTER 400 2H-PASS / 15N-STOP
Z12805 FILTER 400 2H-PASS / 171YB-ST

Z5785 FILTER 400 2H-PASS / 31P-STOP
Z13204 FILTER 400 2H-PASS 400W
Z14181 FILTER 400 3H-HP(1H)
Z13331 FILTER 400 0-31P,19F-LP (1H)
Z14333 FILTER 400 0-31P-LP (19F-3H) *
Z13148 FILTER 400 10B-PASS / 11B-STOP
Z14324 FILTER 400 11B-BP (0-23NA,F-H) *
Z13149 FILTER 400 11B-PASS / 10B-STOP
Z14107 FILTER 400 13C-BP (0-29SI,P-H) *
Z9095 FILTER 400 13C-PASS / 2H-STOP
Z13432 FILTER 400 13C-PASS / 11B-STOP
Z8831 FILTER 400 13C-PASS / 15N-STOP
Z6841 FILTER 400 13C-PASS / 31P-STOP
Z14040 FILTER 400 15N-LP (2H-1H) *
Z9094 FILTER 400 15N-PASS / 2H-STOP
Z8832 FILTER 400 15N-PASS / 13C-STOP
Z12806 FILTER 400 171YB-PASS / 2H-STO
Z13774 FILTER 400 19F-BANDPASS *
Z6849 FILTER 400 205TL-PASS/ 1H-STOP
Z13202 FILTER 400 23NA-PASS /31P-STOP
Z13322 FILTER 400 27AL-PASS /31P-STOP
Z13976 FILTER 400 31P-BP (0-13C,1H) *
Z6840 FILTER 400 31P-PASS / 13C-STOP
Z13323 FILTER 400 31P-PASS /27AL-STOP
Z7785 FILTER 400 57FE PASS / 1H-STOP
Z42408 FILTER 400 6LI-PASS / 2H-STOP
Z13017 FILTER 400 LDA/4-TRAFO 13C/31P
---
Z13386 FILTER 500 1H-BANDPASS *
Z13272 FILTER 500 1H-PASS / 19F-STOP
Z13794 FILTER 500 1H-PASS / 3H-STOP
Z00111 FILTER 500 2H PASS
Z00119 FILTER 500 2H STOP
Z13509 FILTER 500 2H-BP (0-15N,C-1H) *
Z9031 FILTER 500 2H-PASS / 13C-STOP
Z9033 FILTER 500 2H-PASS / 15N-STOP
Z4637 FILTER 500 2H-PASS / 31P-STOP

Z13696 FILTER 500 2H-PASS / 6LI-STOP
Z13795 FILTER 500 3H-HP (1H)
Z13697 FILTER 500 6LI-PASS / 2H-STOP
Z13698 FILTER 500 6LI-PASS /15N-STOP
Z13332 FILTER 500 0-31P,19F-LP (1H)
Z14334 FILTER 500 0-31P-LP (19F-3H) *
Z14299 FILTER 500 117SN-LP (119SN)
Z14300 FILTER 500 119SN-HP (117SN)
Z13226 FILTER 500 119SN-PASS/31P-STOP
Z13114 FILTER 500 11B-PASS / 13C-STOP
Z14067 FILTER 500 13C-BP (0-29SI,P-H) *
Z8917 FILTER 500 13C-PASS / 2H-STOP
Z13113 FILTER 500 13C-PASS / 11B-STOP
Z8745 FILTER 500 13C-PASS / 15N-STOP
Z6807 FILTER 500 13C-PASS / 31P-STOP
Z42638 FILTER 500 13C-PASS /203TL-STP
Z14068 FILTER 500 15N-LP (2H-1H) *
Z8916 FILTER 500 15N-PASS / 2H-STOP
Z8744 FILTER 500 15N-PASS / 13C-STOP
Z13692 FILTER 500 15N-PASS /29SI-STOP
Z13597 FILTER 500 19F-BANDPASS *
Z12866 FILTER 500 19F-PASS / 31P-STOP
Z13346 FILTER 500 19F-PASS /205TL-STP
Z42639 FILTER 500 203T-PASS / 13C-STP
Z13345 FILTER 500 205TL-PASS /19F-STP
Z14069 FILTER 500 27AL-BP (0-29S,P-H) *
Z14070 FILTER 500 29SI-BP (0-2H,C-H) *
Z13693 FILTER 500 29SI-PASS /15N-STOP
Z13144 FILTER 500 29SI-PASS/31P-STOP
Z14071 FILTER 500 31P-BP (0-13C,1H) *
Z6808 FILTER 500 31P-PASS / 13C-STOP
Z13145 FILTER 500 31P-PASS/29SI-STOP
Z8891 FILTER 500 LDA/4-TRAFO 13C/31P
---
Z13387 FILTER 600 1H-BANDPASS *
Z13273 FILTER 600 1H-PASS / 19F-STOP
Z14042 FILTER 600 1H-PASS / 3H-STOP

Z6684 FILTER 600 2H PASS
Z6685 FILTER 600 2H STOP
Z9087 FILTER 600 2H-PASS / 13C-STOP
Z9089 FILTER 600 2H-PASS / 15N-STOP
Z8753 FILTER 600 2H-PASS / 19F-STOP
Z14260 FILTER 600 3H-HP(1H)
Z13333 FILTER 600 0-31P,19F-LP (1H)
Z14335 FILTER 600 0-31P-LP (19F-3H) *
Z14631 FILTER 600 13C-BP (0-29Si,P-H) *
Z9086 FILTER 600 13C-PASS / 2H-STOP
Z4132 FILTER 600 13C-PASS / 15N-STOP
Z6901 FILTER 600 13C-PASS / 31P-STOP
Z14633 FILTER 600 15N-LP (2H-1H) *
Z9088 FILTER 600 15N-PASS / 2H-STOP
Z4131 FILTER 600 15N-PASS / 13C-STOP
Z14637 FILTER 600 17O-BP (0-15N,C-H) *
Z13904 FILTER 600 19F-BANDPASS *
Z14634 FILTER 600 27AL-BP (0-29S,P-H) *
Z14636 FILTER 600 29SI-BP (0-15N,C,B-H) *
Z14635 FILTER 600 2H-BP (0-15N,C-1H) *
Z14632 FILTER 600 31P-BP (0-13C,1H) *
Z6900 FILTER 600 31P-PASS / 13C-STOP
---
Z13900 FILTER 700 1H-BANDPASS *
Z14547 FILTER 700 1H-PASS / 19F-STOP
Z14546 FILTER 700 0-31P,19F-LP (1H)
Z13501 FILTER 700 0-31P-LP (19F-3H) *
Z13500 FILTER 700 13C-PASS / 2H-STOP
Z13498 FILTER 700 15N-PASS / 2H-STOP
Z13905 FILTER 700 19F-BANDPASS *
---
Z13388 FILTER 750 1H-BANDPASS *
Z13286 FILTER 750 1H-PASS / 19F-STOP
Z7836 FILTER 750 2H PASS
Z12935 FILTER 750 2H STOP
Z13099 FILTER 750 2H-PASS / 15N-STOP
Z14336 FILTER 750 0-31P-LP (19F-3H) *

Z14216 FILTER 750 13C-BP (0-29SI,P-H) *

Z41122 FILTER 750 13C-PASS / 2H-STOP

Z12864 FILTER 750 13C-PASS / 15N-STOP

Z12812 FILTER 750 13C-PASS / 31P-STOP

Z14217 FILTER 750 15N-BP (2H-1H) *

Z41123 FILTER 750 15N-PASS / 2H-STOP

Z12865 FILTER 750 15N-PASS / 13C-STOP

Z13906 FILTER 750 19F-BANDPASS *

Z13334 FILTER 750 19F-PASS / 1H-STOP

Z12813 FILTER 750 31P-PASS / 13C-STOP

---

Z13198 FILTER 800 1H-BANDPASS *

Z13288 FILTER 800 1H-PASS / 19F-STOP

Z7839 FILTER 800 2H-PASS / 15N-STOP

Z13937 FILTER 800 0-31P-LP (19F-3H) *

Z7837 FILTER 800 13C-PASS / 2H-STOP

Z13936 FILTER 800 13C-PASS / 31P-STOP

Z7838 FILTER 800 15N-PASS / 2H-STOP

Z13909 FILTER 800 19F-BANDPASS *

Z13335 FILTER 800 19F-PASS / 1H-STOP

Z13199 FILTER 800 19F-PASS / 1H-STOP

Z13938 FILTER 800 31P-PASS / 2H-STOP

---

Z13901 FILTER 900 1H-BANDPASS *

Z13551 FILTER 900 0-15N-LP(2H,19F-1H)

Z14123 FILTER 900 0-31P-LP (19F-3H) *

Z13550 FILTER 900 13C-1H-HP (2H)

Z13907 FILTER 900 19F-BANDPASS *

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