

A decorative graphic on the left side of the slide, consisting of a blue sphere with a white sine wave pattern on its surface, set against a background of horizontal lines that fade out to the right.

Pulse calibration

RF-routing for triple resonance, 2H-dec.

| frequency | logical channel | amplifier | preamplifier |
|-----------|-----------------|-----------|--------------|
| BF1 | 500.1230000 MHz | NUC 1 | 1H LNA |
| SFO1 | 500.1253558 MHz | F1 | XBB19F 2HS |
| OFSH1 | 2355.800 Hz | 1H | 2H |
| BF2 | 125.7560280 MHz | NUC 2 | 13C |
| SFO2 | 125.7608067 MHz | F2 | 15N |
| OFSX1 | 4778.729 Hz | 13C | |
| BF3 | 50.6770230 MHz | NUC 3 | |
| SFO3 | 50.6828509 MHz | F3 | |
| OFSX2 | 5827.858 Hz | 15N | |
| BF4 | 76.7719260 MHz | NUC 4 | |
| SFO4 | 76.7722868 MHz | F4 | |
| OFSX3 | 360.828 Hz | 2H | |

Diagram components: FCU1, FCU2, FCU3, FCU4, X 300.0 W, H 100.0 W, H 1.0 W, H 10.0 W, X 300.0 W, 2H 20.0 W, 19F, 1H, 1H LNA, XBB19F 2HS, 2H, 13C, 15N.

Buttons: SAVE, SWITCH F1/F2, SWITCH F1/F3, DEFAULT, CANCEL, PARAM

F1 - 1H
F2 - 13C
F3 - 15N
F4 - 2H

XWIN-NMR < edsp >

```

FCUCHAN = 2 1 3 4 0 0 0 0
RSEL    = 1 2 6 7 0 0 0 0
SWIBOX  = 1 4 4 0 0 6 7 0
HPMOD   = 0 0 0 0 0

PRECHAN = 3 -1 -1 0 -1 4 2 -1
HPPRECH = -1 -1 -1 -1 -1 -1 -1
-1
    
```

Seen

New: change HPPR routing with edasp setpreamp, cf

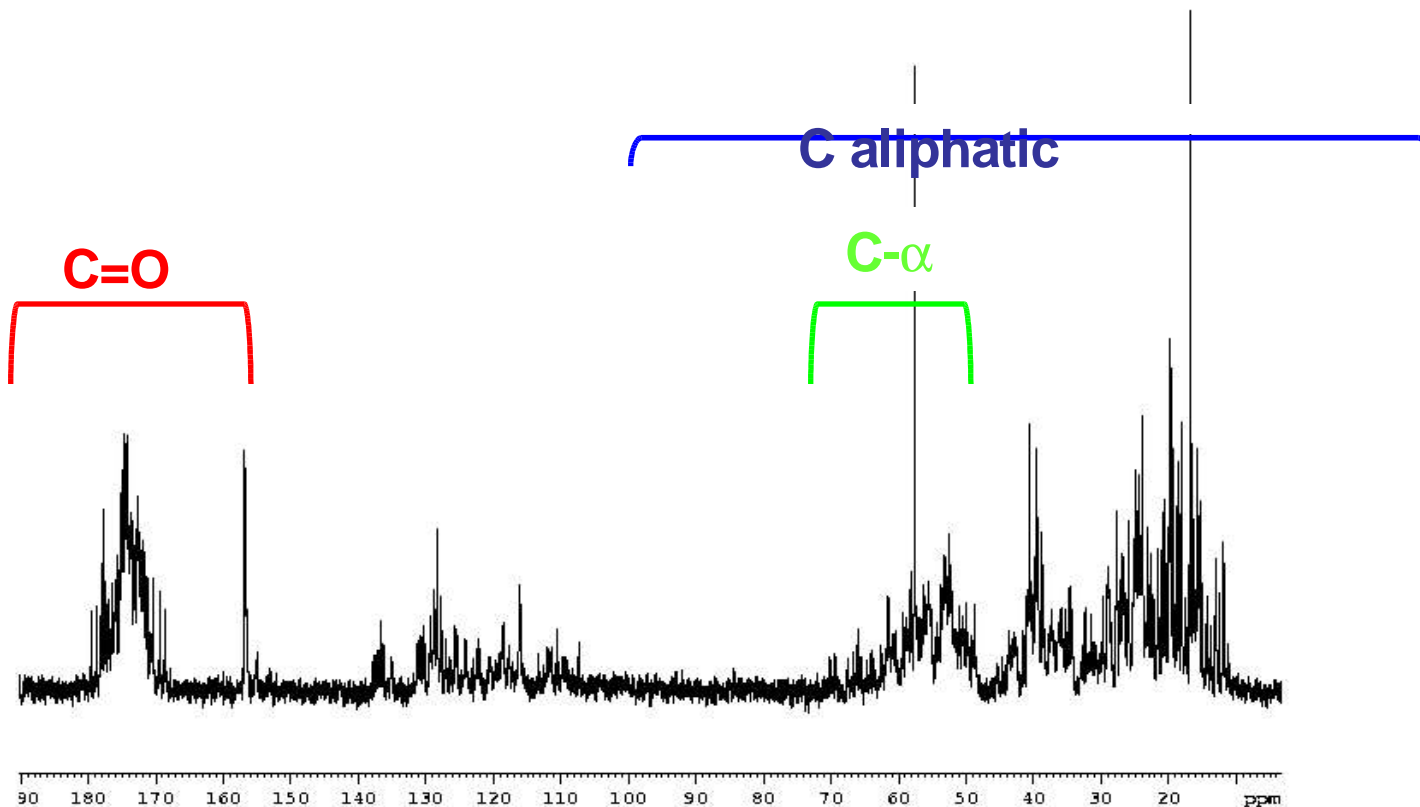
Pulse calibration: Check List



| | | | |
|-----------------------------------|------------------------|-------------------------|------------|
| ^1H | 90° hard pulse | xx μsec | |
| | flipback pulse | Sinc or Square, 2 ms | |
| | TOCSY | 25 - 35 μsec | |
| | ROESY | 80-100 μsec | |
| | WALTZ decoupling pulse | 80-100 μsec | |
| | DIPSI decoupling pulse | 40 μsec | |
| ^{15}N | 90° hard pulse | xx μsec | decp90f3 |
| | decoupling pulse | 250 μsec | decp90f3 |
| ^2H | 90° hard pulse | xx μsec | decp902hf4 |
| | decoupling pulse | 350-400 μsec | decp902hf4 |

Pulse calibration: Check List

- ^{13}C
 - selective pulses are required to excite / invert / refocus $\text{C}\alpha$, Cali and CO regions
 - identical parameters are used for the CO/Cali selective pulses
 - pulses with higher selectivity are used for $\text{C}\alpha$



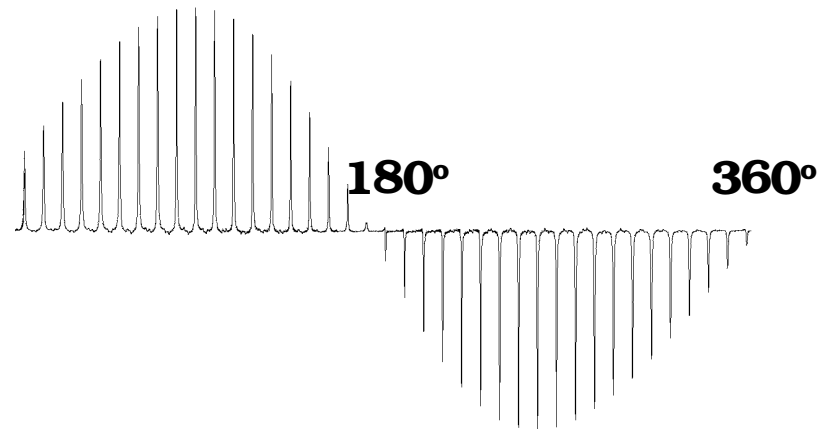
Pulse calibration: Check List



| | | | |
|-----------------|----------------------------|---|-----------|
| ¹³ C | 90° hard pulse | xx μsec | decp90 |
| | CC-TOCSY pulse | 22-25 μsec | decp90 |
| | GARP decoupling pulse | 55-65 μsec | decp90 |
| | 90° shape (Cali, CO) | Q5, 320 μsec / G4 308 μsec | decp90sp |
| | 90° shape (Cα) | Q5, 410 μsec | decp90sp |
| | 180° shape (Cali, CO) | Q3, 256/ 210 μsec | decp180sp |
| | 180° shape (Cα) | Q3, 360 μsec | decp180sp |
| | 180° shape (CO decoupling) | Gauss, truncation level 5%, 100 μsec | decp180sp |
| | adiabatic inversion | Crp60,0.5,20.1 or Crp80,0.5,20.1, 500 μsec | calculate |
| | adiabatic refocussing | Crp60comp.4 or Crp80comp.4, 2 msec | calculate |
| | adiabatic decoupling | CHIRP, 18-40kHz sweep 1.5 ms | calculate |

RED: values for 800 MHz





Pulse sequences: *zg*

[hard pulse]

selzg

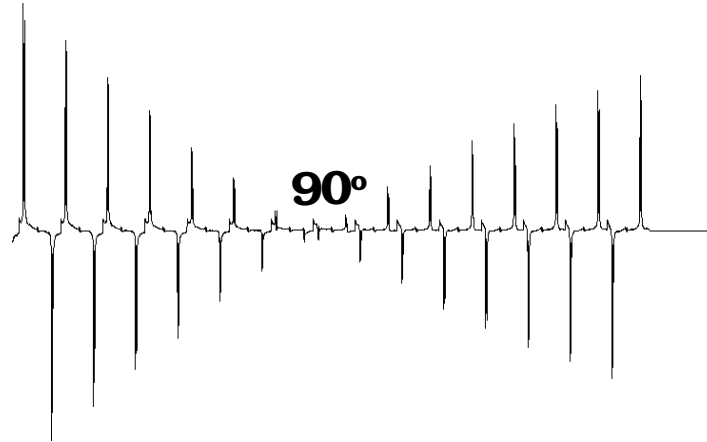
[for selective pulses]

Note:

- on- resonance

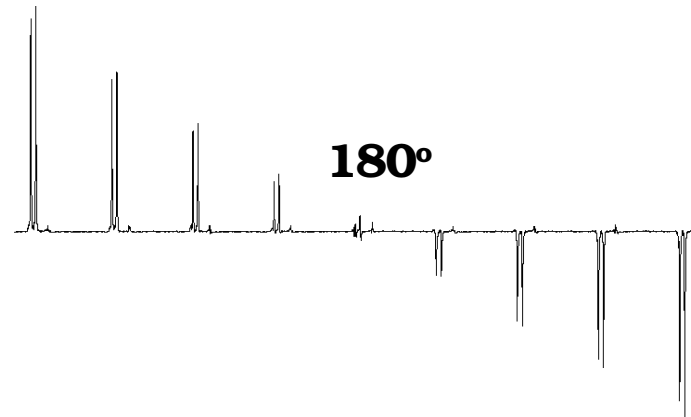
- 6dB attenuation doubles the pulse length

- excitation bandwidth $\gamma B_1 / 2\pi = 1 / (4 * \tau_p^{90})$



| | | | |
|--------------------------------|--------------------------|-----------------------------|------------------------------|
| <i>Pulse sequences:</i> | <i>decp90</i> | <i>2nd channel</i> | <i>¹³C</i> |
| | <i>decp90f3</i> | <i>3rd channel</i> | <i>¹⁵N</i> |
| | <i>decp902hf4</i> | <i>4th channel</i> | <i>²H</i> |
| | <i>decp90sp</i> | <i>2nd/selective</i> | <i>¹³C</i> |

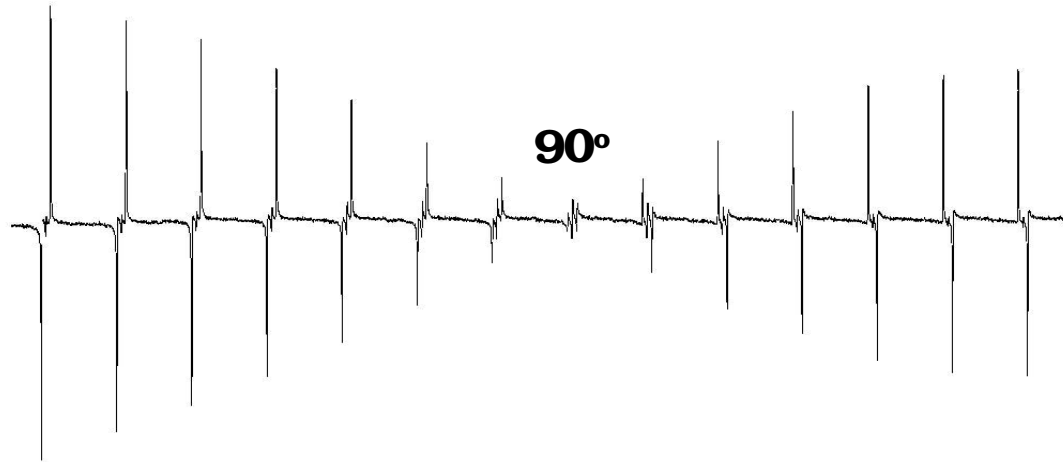
Note: - ***on- resonance on the other channel***
- ***anti-phase signal***



Pulse sequence: `decpl80sp` 2nd channel selective ^{13}C

Note:

- on-resonance on the 2nd channel (o2p)
- in-phase signal



| Parameter | Value | Comments |
|-----------|-----------------|------------------------|
| PULPROG | decp902hf4 | pulse program |
| NUC1 | ^{13}C | nucleus on f1 channel |
| O1P | 128 ppm | ^{13}C offset |
| NUC4 | ^2H | nucleus on f4 channel |
| O4P | 7.28 ppm | ^2H offset |
| NS | 1 | |
| DS | 0 | |
| CNST5 | 24 | $^1J_{\text{CD}}$ |

Pulse sequence: *decp902hf4*

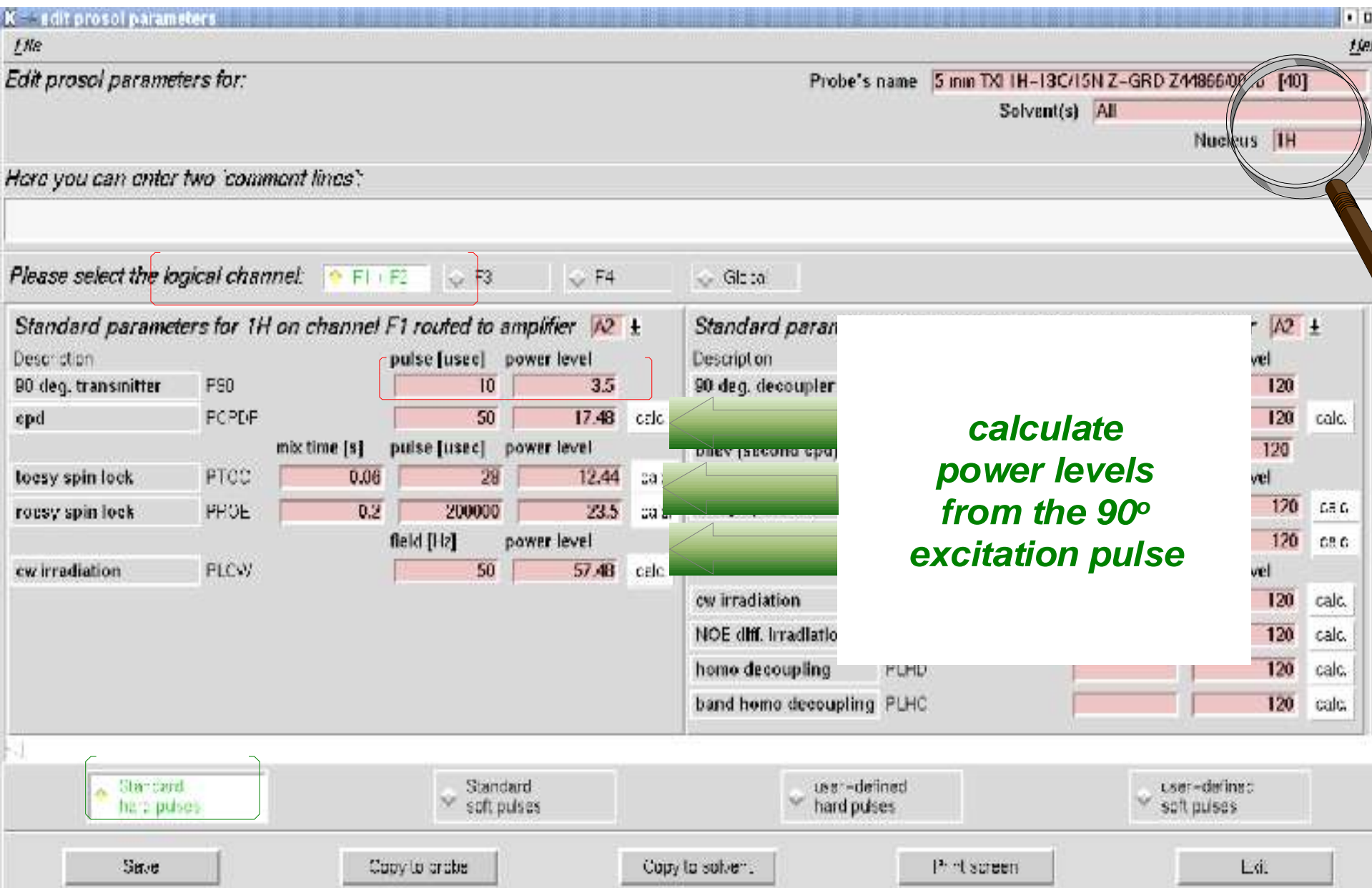
Note: *ASTM-sample: 60% D₆C₆*

- ^{13}C -observe

- ^2H on-resonance

- anti-phase triplet

edprosol - set hard pulses for ^1H



edit prosol parameters

Edit prosol parameters for: Probe's name 5 mm TXI 1H-13C/15N Z-GRD Z44866000 [40]
Solvent(s) All
Nucleus 1H

Here you can enter two 'comment lines':

Please select the logical channel: **F1 + F2** F3 F4 Global

| Description | | pulse [usec] | power level | |
|---------------------|-------|--------------|--------------|-------------|
| 90 deg. transmitter | P90 | 10 | 3.5 | |
| epd | PCPDF | 50 | 17.48 | calc |
| | | mix time [s] | pulse [usec] | power level |
| toesy spin lock | PTCC | 0.06 | 28 | 12.44 calc |
| rousy spin lock | PROE | 0.2 | 200000 | 23.5 calc |
| | | field [Hz] | power level | |
| cw irradiation | PLCW | 50 | 57.48 | calc |
| | | | | |
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| | | | | |

calculate power levels from the 90° excitation pulse

Standard hard pulses | Standard soft pulses | User-defined hard pulses | User-defined soft pulses

Save | Copy to probe | Copy to solvent | Print screen | Exit

edprosol - set hard pulses for ^{13}C



edit prosol parameters

File Help

Edit prosol parameters for: Probe name 5 mm DUL 13C-1H Z-GRD Z44862/004 [01]

Solvent(s) All Nucleus 13C

Here you can enter two 'comment lines':

Please select the logical channel: F1 + F2 F3 F4 Global

Standard parameters for 13C on channel F1 routed to amplifier A1

| Description | | pulse [usec] | power level | |
|---------------------|--------------|--------------|-------------|-----------|
| 90 deg. transmitter | P90 | 8.5 | 0.5 | |
| cpd | PCPDP | 65 | 18.25 | calc. |
| | mix time [s] | pulse [usec] | power level | |
| tocsy spin lock | PTOC | 0.06 | 0 | 120 calc. |
| roesy spin lock | PROE | 0.2 | 0 | 120 calc. |
| | field [Hz] | power level | | |
| cw irradiation | PLCW | 50 | 120 | calc. |

Standard parameters for 13C on channel F2 routed to amplifier A1

| Description | | pulse [usec] | power level | |
|-----------------------|--------------|--------------|-------------|-----------|
| 90 deg. decoupler | P90 | 9 | 1.25 | |
| cpd | PCPDP | 65 | 18.3 | calc. |
| bilev (second cpd) | PLCPD2 | | 120 | |
| | mix time [s] | pulse [usec] | power level | |
| tocsy spin lock | PTOC | 0.06 | 25 | 9.8 calc. |
| roesy spin lock | PROE | 0.2 | 0 | 120 calc. |
| | field [Hz] | power level | | |
| cw irradiation | PLCW | 50 | 120 | calc. |
| NOE diff. irradiation | PLNOE | | 120 | calc. |
| homo decoupling | PLHD | | 120 | calc. |
| band homo decoupling | PLHC | | 120 | calc. |

Standard hard pulses Standard soft pulses user-defined hard pulses user-defined soft pulses

Save Copy to probe Print screen Exit



edprosol - set hard pulses for ^{13}C , cont.

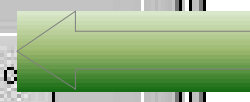
Standard parameters for ^{13}C on channel F2 routed to amplifier

A1

| Description | | | pulse [usec] | power level | |
|-----------------------|--------|--------------|--------------|-------------|-------|
| 90 deg. decoupler | P90 | | 15 | -2.1 | |
| cpd | PCPD0 | | 65 | 10.45 | calc. |
| bilev (second cpd) | PLCPD2 | | | 120 | |
| | | mix time [s] | pulse [usec] | power level | |
| toscy spin lock | PTOC | | 25 | 2.4 | calc. |
| roesy spin lock | PROE | | 0 | 120 | calc. |
| | | | field [Hz] | power level | |
| cw irradiation | PLCW | | | 120 | calc. |
| NOE diff. irradiation | PLNOE | | | 120 | calc. |
| homo decoupling | PLHD | | | 120 | calc. |
| band homo decoupling | PLHC | | | 120 | calc. |



calculate power levels from the 90° excitation pulse



edprosol - set hard pulses for ^{15}N



Edit prosol parameters for: Probe's name 5 mm TXI IH 13C/15N Z GRD Z448000016 [400] Solvent(s) All Nucleus ^{15}N

Here you can enter two 'comment lines':

Please select the logical channel: F + F2 **F3** F1 Global

Standard parameters for ^{15}N on channel F3 routed to amplifier A5 ↓

| Description | Parameter | Value | Unit | Power Level | Action |
|-----------------------|-----------|-------|------------|-------------|--------|
| 90 deg. decoupler | P90 | 40 | μsec | 0.7 | |
| cpd | PCPD | 200 | μsec | 13.28 | calc |
| bllev (second cpd) | P CPD? | | | 120 | |
| Loesy spin lock | PTSC | 0.0 | s | 120 | use |
| roesy spin lock | PROF | 0.0 | s | 120 | use |
| cw irradiation | PLOW | | field [Hz] | 120 | calc |
| NOI diff. irradiation | PNOI | | | 120 | calc |
| homo decoupling | P LHD | | | 120 | calc |
| band homo decoupling | P LHC | | | 120 | calc |

Standard hard pulses

Save Copy to probe Copy to solvent Print screen Exit

calculate power level from the 90° excitation pulse



edprosol - set decoupling pulse for ^2H



Edc

Edit prosol parameters for: Probe's name: 5 mm TXI IH 13C/15N Z GRD Z44B000016 [-40]
Solvent(s): All
Nucleus: ^2H

Here you can enter two 'comment lines':

Please select the logical channel: \diamond F + F2 | \diamond F3 | \diamond F4 | \diamond Global

Standard parameters for ^2H on channel F4 routed to amplifier AG \pm

| Descriptor | | | pulse [usec] | power level | |
|-----------------------|--------|--------------|--------------|-------------|-------|
| 90 deg. decoupler | P90 | | 0 | 120 | |
| cpd | PCPD | | 200 | 4 | calc. |
| bllev (second cpd) | P GPD? | | | 120 | |
| | | mix time [s] | pulse [usec] | power level | |
| toesy spin lock | PTOC | 0.08 | 0 | 120 | usc |
| roesy spin lock | PROF | 0.2 | 0 | 120 | usc |
| | | field [Hz] | | power level | |
| cw irradiation | P_CW | | | 120 | calc. |
| NDI dilt. irradiation | P_NOI | | | 120 | calc. |
| homo decoupling | P_LHC | | | 120 | calc. |
| band homo decoupling | P_LHC | | | 120 | calc. |

\diamond Standard hard pulses | \diamond Standard soft pulses | \diamond User-defined hard pulses | \diamond User-defined soft pulses

Save | Copy to probe | Copy to server | Print screen | Exit



edprosol - set water flip-back pulse for ^1H



edit.prosol.parameters

File Help

Edit prosol parameters for: Probe's name: 5 mm TXI 1H 13C/15N Z GRD Z4000/0016 P401
Solvent(s): All
NUCLEUS: 1H

Here you can enter two comment lines:

Please select the logical channel: F2 F3 F4 F obs:

| Standard soft pulses for ^1H on channel F1 routed to amplifier AV | | | | | | | Standard soft pulses for ^1H on channel F2 routed to amplifier AV | | | | | | |
|---|---------|----------|---------|------------------------|-------------------|---------|---|---------|----------------------|--|--|--|--|
| Description: | Pulses: | P.Level: | Align.: | Name: | Description: | Pulses: | P.Level: | Align.: | Name: | | | | |
| 90/270 excitation | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | 90 excitation | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| 100 refocusing | PS-L | 1000 | 15.52 | calc. 0.5 reburh | 100 adia refocuss | PS-L | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| 90 wfl 1 | PS-L | 0 | 120 | calc. 0.5 Gaus1.1000 | 100 adia inversio | PS-L | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| psh4 | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | CalvCO 90 on | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| psh5 | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | CalvCO 90 tr | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| psh6 | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | CalvCO 180 | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| off-reson.preset | PS-L | 0 | 120 | calc. 0.5 Gaus1.1000 | Calpha sel 90 | PS-L | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| 90 flip-back | PS-L | 2000 | 49.52 | calc. 0.5 Squa100.1000 | Calpha sel 90 tr | PS-L | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| psh9 | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | Calpha sel 180 | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |
| psh10 | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | CO decoupling | PS-H | 0 | 120 | calc. 0.5 Gaus1.1000 | | | | |

Standard hard pulses Standard soft pulses User defined hard pulses User defined soft pulses

Save Copy to probe Copy to solvent Print screen Exit



edprosol - set soft pulses for ^{13}C



Edit prosol parameters for: Probe's name: 5 mm TXI IH ^{13}C 15N Z GRD Z4480G0016 [400] Solvent(s): All Nucleus: ^{13}C

Here you can enter two 'comment lines':

Please select the logical channel: **F + F2** | F3 | F1 | Global

| Standard soft pulses for ^{13}C on channel F1 routed to amplifier | | | | | | | Standard soft pulses for ^{13}C on channel F2 routed to amplifier | | | | | | |
|--|--------|---------|---------|-------|-------------|------------|--|---------|------|------|-------|-----|----------------|
| Description | Pulses | P.Level | Alignm. | Name | Description | Pulses | P.Level | Alignm. | Name | | | | |
| 90/270 excitation | PS-H1 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | 90 excitation | PS-H1 | 0 | 120 | calc. | 0.5 | Gaus1.1000 |
| 110 refocussing | PS-D1 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | 110 adia refocuss | PS-D1 | 2000 | 4.4 | calc. | 0.5 | Crp60comp.4 |
| 00 WET | PS-H3 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | 180 adia inversio | PS-H3 | 500 | 4.4 | calc. | 0.5 | Crp60.0.5.20.1 |
| psht1 | PS-H1 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | CallrCO 90 on | PS-H1 | 120 | 1.21 | calc. | 0.5 | Q5.1000 |
| pshtb | PS-H5 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | CallrCO 90 tr | PS-H5 | 320 | 1.31 | calc. | 0.5 | Q5tr.1000 |
| psht0 | PS-H0 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | CallrCO 180 | PS-H0 | 256 | 2.23 | calc. | 0.5 | Q3.1000 |
| oll-reson.presat | PS-D1 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | Calpha sel 90 | PS-D1 | 410 | 3.46 | calc. | 0.5 | Q5.1000 |
| 00 flip back | PS-H8 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | Calpha sel 90 tr | PS-H8 | 410 | 3.46 | calc. | 0.5 | Q5tr.1000 |
| psht9 | PS-D1 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | Calpha sel 110 | PS-D1 | 160 | 5.19 | calc. | 0.5 | Q1.1000 |
| psht10 | PS-H10 | 0 | 120 | calc. | 0.5 | Gaus1.1000 | CO decoupling | PS-H 0 | 100 | 4.4 | calc. | 0.5 | Gaus5.1000 |

Standard hard pulses | **Standard soft pulses** | user-defined hard pulses | user-defined soft pulses

Save | Copy to probe | Copy to server | Print screen | Exit



edprosol - set soft pulses for ^{13}C , cont.

Standard soft pulses for ^{13}C on channel F2 routed to amplifier

A1 ↓

| Description: | Pulses: | P. Level: | Alignm.: | Name: | | |
|-------------------|---------|-----------|----------|-------|-----|----------------|
| 90 excitation | PSH1 | 0 | 120 | calc. | 0.5 | Gauss1.1000 |
| 180 adia refocuss | PSH2 | 2000 | 2.4 | calc. | 0.5 | Crp60comp.4 |
| 180 adia inversio | PSH3 | 500 | 2.4 | calc. | 0.5 | Crp60,0.5,20.1 |
| Cali/CO 90 on | PSH4 | 320 | -0.8 | calc. | 0.5 | Q5.1000 |
| Cali/CO 90 tr | PSH5 | 320 | -0.8 | calc. | 0.5 | Q5tr.1000 |
| Cali/CO 180 | PSH6 | 256 | 0.4 | calc. | 0.5 | Q3.1000 |
| Calpha sel 90 | PSH7 | 410 | 1.6 | calc. | 0.5 | Q5.1000 |
| Calpha sel 90 tr | PSH8 | 410 | 1.6 | calc. | 0.5 | Q5tr.1000 |
| Calpha sel 180 | PSH9 | 360 | 3.3 | calc. | 0.5 | Q3.1000 |
| CO decoupling | PSH10 | 100us | 2.4 | calc. | 0.5 | Gauss5%.256 |
| C sel 2 90 | PSH11 | 0 | 120 | calc. | 0.5 | Gauss1.1000 |

not used

note: same as the power of 25us 90°-pulse

advantage: shorter

not used

edprosol - global settings



edit prosol parameters

File *Help*

Edit prosol parameters for: Probe's name **5 mm CPTXI 1H/2H-13C/15N Z-GRD Z44896/0002 [04]** ↓
Solvent(s) **All** ↓
Nucleus **1H** ↓

Here you can enter two 'comment lines':

Please select the logical channel: F1 + F2 F3 F4 **Global**

Special parameters: values used for all nuclei

Description:

| | | | |
|----------------------|---------|-------------------------------------|------|
| grad. recovery delay | D_grad | <input type="text" value="0.0001"/> | sec |
| grad. pulse 1 | P_grad1 | <input type="text" value="1000"/> | usec |
| grad. pulse 2 | P_grad2 | <input type="text" value="600"/> | usec |
| trim pulse mlev | P_mlev | <input type="text" value="2500"/> | usec |
| trim pulse hsqc | P_hsqc | <input type="text" value="0"/> | usec |

Standard hard pulses

Save Copy to probe Copy to solvent Print screen Exit



edit prosol parameters

File: Save, Copy to probe, Print screen, Convert old prosol parametersets, Exit

Probe's name: 5 mm TXI 1H-13C/15N Z8281/116 [02]

Solvent(s): H₂O

Nucleus: 15N

expert mode

Please select the logical channel: F1 + F2 F3 F4 Global

Standard parameters for 15N on channel F3 routed to amplifier #6

| Description | | pulse [usec] | power level | |
|-----------------------|--------------|--------------|-------------|-------|
| 90 deg. decoupler | P90 | 40 | -1.65 | |
| cpd | PCPDP | 220 | 13 | calc. |
| bilev (second cpd) | PLCPD2 | | 120 | |
| | mix time [s] | pulse [usec] | power level | |
| toesy spin lock | PTOC | 0.06 | 0 | calc. |
| roesy spin lock | PROE | 0.2 | 80 | calc. |
| | | field [Hz] | power level | |
| cw irradiation | PLCW | 50 | 120 | calc. |
| NOE diff. irradiation | PLNOE | | 120 | calc. |
| homo decoupling | PLHD | | 120 | calc. |
| band homo decoupling | PLHC | | 120 | calc. |

amplifier #6

change of amplifier only in expert mode

Standard hard pulses Standard soft pulses user-defined hard pulses user-defined soft pulses

Save Copy to probe Print screen Exit

getprosol without options:

- loads parameters for pulses according to prosol-tables created with 'edprosol'
- prosol-tables are global, any changes will apply to all users and data set

getprosol <nuc> <P90> <PL90>

- recalculate power levels of the prosol-table for all pulses of selected nucleus
- standard prosol-tables are NOT modified
- changes act on current data set only

Example:

- Hard ^1H -pulse had been re-calibrated:
 - $90^\circ = 9.7\mu\text{s}$ @ $\text{p11} = 2.3\text{dB}$
- ^1H -pulse differs from value stored in prosol-table, which is:
 - $90^\circ = 7.2\mu\text{s}$ @ $\text{p11} = 1.8\text{dB}$
- Recalculate all power levels for all pulses stored in the prosol-table of ^1H :
enter: `getprosol 1H 9.7us 2.3dB`
- Now all ^1H pulses have been recalculated and set in the current dataset

pulse

- calculate power level, pulse duration or excitation bandwidth
- calculations are based on transmitter pulse P1 and PL1
- examples:
 - pulse 25us : power level and bandwidth for 25us pulse
 - pulse 12.3khz : power level and duration for a pulse with a bandwidth of $\gamma B_1 = 12.3\text{kHz}$
 - pulse 5.3db : pulse duration and bandwidth for a pulse applied with 5.3 dB RF power

calcpowlev

- calculate power for a new pulse, related to reference pulse

Before you start....

**Undamaged
coil in Probe**



Heat damaged Coil



Before you start - maximum power



Formular

Prüfprotokoll

**Datasheet output
power of amplifiers**

| ZUEP0101: | | Konsolentests von NMR-Geräten | | Bemerkungen (Anmerkungen) | |
|-----------|---|--|---------------------------------------|---|--|
| 4.2.1 | Speisespannungen: | not ok. <input type="checkbox"/> | | ok. <input checked="" type="checkbox"/> | |
| 4.2.2 | TCU - Test: | not ok. <input type="checkbox"/> | ADS | ok. <input checked="" type="checkbox"/> | |
| | FCU - Test: | not ok. <input type="checkbox"/> | ADS | ok. <input checked="" type="checkbox"/> | |
| | RCU - Test: | not ok. <input type="checkbox"/> | 4 | ok. <input checked="" type="checkbox"/> | |
| | GCU - Test: | not ok. <input type="checkbox"/> | 4 | ok. <input checked="" type="checkbox"/> | |
| 4.2.3 | Leistungsmessung der Sendekanäle mit Peak Power Meter (am Probenkopf) in Watt (W): Power of transmitter channels measured with peak power meter (at probe) in Watt (W): Synthesizer output adjusted to 1Vpp (4dBm ±1dBm) Cortab installed | | | | |
| Eingabe: | Observe channel (1H,X) with logical channel F1 (with preamp): | Decouple channel 1H,X with logical channel F2 (with preamp): | Y-channel with log. channel F3: | Z-channel with log. channel F4: | |
| | 1H 31P 13C 15N | 1H 31P 13C 15N | 31P 13C 15N | 31P 13C 15N | |
| pl = -6dB | 45 280 311 354 | 40 280 312 356 | 460 553 706 | | |
| pl = -5dB | 42 270 306 349 | 36 269 306 349 | 455 545 686 | | |
| pl = -4dB | 34 253 297 337 | 28 252 297 338 | 448 534 658 | | |
| pl = -3dB | 28 235 284 320 | 24 234 284 320 | 439 518 632 | | |
| pl = -2dB | 23 209 265 299 | 20 209 265 299 | 418 496 597 | | |
| pl = -1dB | 19 183 242 273 | 16 183 242 273 | 410 470 562 | | |
| pl = 0dB | 15 157 210 236 | 13 157 210 236 | 398 437 524 | | |
| pl = 3dB | 8 86 115 123 | 7 86 115 134 | 324 321 398 | | |
| pl = 6dB | 5 43 54 62 | 4 43 54 62 | 216 189 232 | | |
| pl = 9dB | 25 21 23 25 | 2 21 23 25 | 117 92 105 | | |
| pl = 12dB | | | 52 36 36 | | |

F3: direct

15.12.99/HAU/WAS ohne Cortab 19.1.2000 WAS

ZFEP0101

Seite: 2 (4)

CH 8117 Fällanden
Phone No: 01 / 825-91-11
Fax No: 01 / 825-96-96

TEST-DATA



| SEL | SEI | SEF | SEX | DUL | DUX | BEO | BBI | QNP | QXI | TXO | TXD | TXI | TBI | TBO |
|--------------------|---------------|----------|----------|------|---|------------------|---------------|-----|-----|-----|-----|-----|-----|-----|
| | X | | | | | | | | | | | | | |
| PROBEHAED NO: | z 3367 / 0030 | | EC | 1 | MHz | 500 | SB | X | WB | | | | | |
| Produktion | X | | 2,5mm | 10mm | 25mm | Dual Flow Insert | Yes | X | No | | | | | |
| Reparatur | | Sample Ø | 5mm | X | 15mm | 30mm | Probe-Body | SB | WB | | | | | |
| Convert | | | 8mm | 20mm | | | | | | | | | | |
| OPTIONS | | | | | | | | | | | | | | |
| Laser HT | PERFO | | 0000= | | _____ MHz | | Tuning - Card | | | | | | | |
| HT | LEAKPRF | | 7999= | | _____ MHz | | For BBI, BBO | | | | | | | |
| LT A | CPO | | 8999= | | _____ MHz | | TBI, TBO | | | | | | | |
| LT B | IVO | | | | | | | | | | | | | |
| CIDNP | IVOR | | | | | | | | | | | | | |
| Z-Grad | BTO 2000 | | | | | | | | | | | | | |
| XYZ-Grad | | | | | | | | | | | | | | |
| BRK | | | | | | | | | | | | | | |
| Nuc. / Freq. (MHz) | forw. Pulse * | | forw. CW | | * 0,4% duty cycle 100 microsec. Pulse-Length | | | | | | | | | |
| X: _____ | W | | W | | | | | | | | | | | |
| X: _____ | W | | W | | | | | | | | | | | |
| X: _____ | W | | W | | | | | | | | | | | |
| X: _____ | W | | W | | | | | | | | | | | |
| X: _____ | W | | W | | | | | | | | | | | |
| X: _____ | W | | W | | | | | | | | | | | |
| X: 19F 470, 515 | 40,8 | | w | | w | | | | | | | | | |
| 1H 500, 138 | 40,7 | | w | | 5,1 w | | | | | | | | | |

**Datasheet allowed
power for probe**

Date 13.10.1994

Signature Tamato

Before you start - maximum power



Formular

Prüfprotokoll

**Datasheet output
power of *amplifiers***

| | | | | |
|-----------|-------------------------------|----------------------------------|-------|---|
| ZUEP0101: | Konsolentests von NMR-Geräten | | | Bemerkungen (Anmerkung): |
| 4.2.1 | Speisespannungen: | not ok. <input type="checkbox"/> | | ok. <input checked="" type="checkbox"/> |
| 4.2.2 | TCU - Test: | not ok. <input type="checkbox"/> | AGS | ok. <input checked="" type="checkbox"/> |
| | FCU - Test: | not ok. <input type="checkbox"/> | AGS | ok. <input checked="" type="checkbox"/> |
| | RCU - Test: | not ok. <input type="checkbox"/> | q | ok. <input checked="" type="checkbox"/> |
| | GCU - Test: | not ok. <input type="checkbox"/> | q | ok. <input checked="" type="checkbox"/> |

4.2.3 Leistungsmessung der Sendekanäle mit Peak Power Meter (am Probenkopf) in Watt (W):
Power of transmitter channels measured with peak power meter (at probe) in Watt (W):
Synthesizer output adjusted to 1Vpp (4dBm ±1dBm) Cortab installed

Eingabe: Observe channel (1H,X) with logical channel F1 (with preamp): Decouple channel 1H,X with logical channel F2 (with preamp): Y-channel with log. channel F3: Z-channel with log. channel

| Eingabe: | Observe channel (1H,X) with logical channel F1 (with preamp): | | | | Decouple channel 1H,X with logical channel F2 (with preamp): | | | | Y-channel with log. channel F3: | | |
|------------|---|-----|-----|-----|--|-----|-----|-----|---------------------------------|-----|-----|
| | 1H | 31P | 13C | 15N | 1H | 31P | 13C | 15N | 31P | 13C | 15N |
| pl = - 6dB | 45 | 280 | 311 | 357 | 40 | 280 | 312 | 356 | 460 | 553 | 706 |
| pl = - 5dB | 42 | 270 | 306 | 349 | 36 | 269 | 306 | 349 | 455 | 545 | 686 |
| pl = - 4dB | 34 | 253 | 297 | 337 | 28 | 252 | 297 | 338 | 448 | 534 | 658 |
| pl = - 3dB | 28 | 235 | 284 | 320 | 24 | 234 | 284 | 320 | 439 | 518 | 632 |
| pl = - 2dB | 23 | 209 | 265 | 297 | 20 | 209 | 265 | 297 | 428 | 496 | 597 |
| pl = - 1dB | 19 | 185 | 242 | 273 | 16 | 185 | 242 | 273 | 414 | 470 | 562 |
| pl = 0dB | 15 | 157 | 210 | 236 | 13 | 157 | 210 | 236 | 398 | 437 | 524 |
| pl = 3dB | 8 | 86 | 115 | 133 | 7 | 86 | 115 | 134 | 324 | 321 | 398 |
| pl = 6dB | 5 | 45 | 57 | 62 | 4 | 43 | 54 | 62 | 216 | 181 | 232 |
| pl = 9dB | 25 | 24 | 23 | 25 | 2 | 21 | 23 | 25 | 117 | 92 | 105 |
| pl = 12dB | | | | | | | | | 52 | 36 | 36 |
| pl = ...dB | | | | | | | | | | | |
| pl = ...dB | | | | | | | | | | | |
| pl = ...dB | | | | | | | | | | | |
| pl = ...dB | | | | | | | | | | | |

15.12.99/BAU/WAS ohne Cortab 19.1.2000 WAS F3: direct

Typical Pulses for the 5mm CryoProbe™



Instructions

Typical Pulses for the 5mm CryoProbe™ 500MHz and 600MHz

| | | |
|-----|---------------------------------------|---|
| 1. | Purpose | 3 |
| 2. | Scope | 3 |
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| 4. | Implementation..... | 3 |
| 4.1 | Introduction | 3 |
| 4.2 | Pulse and power recommendations | 4 |
| 4.3 | Notes..... | 5 |



Instructions

4.2 Pulse and power recommendations

Note: all values require a minimum repetition rate appr. $dI+aq$ of 1sec²⁾
Important: observe the separate notes on the following page!

| | 5mm 500MHz TXI CryoProbe™ | 5mm 600MHz TXI CryoProbe™ |
|--|---|---|
| ¹ H | | |
| hard pulse ³⁾ (max. length 360°) | 8.0 µsec | 8.0 µsec |
| hard pulse for lossy samples | Power level corresponding to 8.0 µsec pulse for non-lossy sample | Power level corresponding to 8.0 µsec pulse for non-lossy sample |
| trim pulse p28 ⁴⁾ | 2 msec @ 10 µsec | 2 msec @ 10 µsec |
| TOCSY spin lock | 200 msec @ 25 µsec 400 msec @ 35 µsec | 200 msec @ 25 µsec 400 msec @ 35 µsec |
| ROESY spin lock | Up to CW for power level corresponding to a 100 µsec pulse | Up to CW for power level corresponding to a 100 µsec pulse |
| WALTZ16 decoupling during ¹³ C-detection | Up to CW for power level corresponding to a 100 µsec pulse | Up to CW for power level corresponding to a 100 µsec pulse |
| DIPS12-decoupling in triple resonance | 400 msec @ 50 µsec | 400 msec @ 50 µsec |
| ¹³ C | | |
| hard pulse (max. length 360°) | 15.0 µsec | 15.0 µsec |
| trim pulse ⁵⁾ | 2msec @ 25 µsec | 2msec @ 25 µsec |
| CC spin lock ⁵⁾ | 20msec @ 25 µsec | 20msec @ 25 µsec |
| GARP decoupling ⁶⁾ | 140msec @ 65 µsec | 140msec @ 55 µsec |
| selective pulses ⁷⁾ | Q5: 320 µsec Q3: 256 µsec CHIRP: 2ms @ 25 µsec | Q5: 320 µsec Q3: 256 µsec CHIRP: 2ms @ 25 µsec |
| ¹⁵ N | | |
| hard pulse (max. length 360°) | 40.0 µsec | 40.0 µsec |
| WALTZ16 decoupling ⁸⁾ | 140 msec @ 200 µsec | 140 msec @ 170 µsec |
| CPMG T2 ⁸⁾ | 250 msec @ 80 µsec | 250 msec @ 80 µsec |
| ² H | | |
| hard pulse (max. length 360°) | 150µsec | 150µsec |
| WALTZ16 decoupling | 100 msec @ 250 µsec | 100 msec @ 250 µsec |
| Z-Gradient | | |
| Absolute max. current | 10A | 10A |
| Max. overall length ⁹⁾ | 10ms @ 10A | 10ms @ 10A |

| | 5mm 500MHz TXI CryoProbe™ | 5mm 600MHz TXI CryoProbe™ |
|--|--|--|
| ¹ H | | |
| hard pulse ³⁾ (max. length 360°) | 8.0 μsec | 8.0 μsec |
| hard pulse for lossy samples | Power level corresponding to 8.0 μsec pulse for non-lossy sample | Power level corresponding to 8.0 μsec pulse for non-lossy sample |
| trim pulse p28 ⁴⁾ | 2 msec @ 10 μsec | 2 msec @ 10 μsec |
| TOCSY spin lock | 200 msec @ 25 μsec 400 msec @ 35 μsec | 200 msec @ 25 μsec 400 msec @ 35 μsec |
| ROESY spin lock | Up to CW for power level corresponding to a 100μsec pulse | Up to CW for power level corresponding to a 100μsec pulse |
| WALTZ16 decoupling during 13C-detection | Up to CW for power level corresponding to a 100μsec pulse | Up to CW for power level corresponding to a 100μsec pulse |
| DIPS12-decoupling in triple resonance | 400 msec @ 50 μsec | 400 msec @ 50 μsec |
| ¹³ C | | |
| hard pulse (max. length 360°) | 15.0 μsec | 15.0 μsec |
| trim pulse ⁵⁾ | 2msec @ 25 μsec | 2msec @ 25 μsec |
| CC spin lock ⁵⁾ | 20msec @ 25 μsec | 20msec @ 25 μsec |
| GARP decoupling ⁶⁾ | 140msec @ 65 μsec | 140msec @ 55 μsec |
| selective pulses ⁷⁾ | Q5: 320 μsec Q3: 256 μsec CHIRP: 2ms @ 25 μsec | Q5: 320 μsec Q3: 256 μsec CHIRP: 2ms @ 25 μsec |
| ¹⁵ N | | |
| hard pulse (max. length 360°) | 40.0 μsec | 40.0 μsec |
| WALTZ16 decoupling ⁶⁾ | 140 msec @ 200μsec | 140 msec @ 170μsec |
| CPMG T2 ⁸⁾ | 250 msec @ 80 μsec | 250 msec @ 80 μsec |
| ² H | | |
| hard pulse (max. length 360°) | 150usec | 150usec |
| WALTZ16 | 100msec @ 250 μsec | 100msec @ 250 μsec |

2. Observe the notes!

1. Repetition time

Note: all values require a minimum repetition rate appr. $dl+aq$ of 1sec²⁾
Important: observe the separate notes on the following page!

| | 5mm 500MHz TXI CryoProbe™ | 5mm 600MHz TXI CryoProbe™ |
|--|--|--|
| ¹ H | | |
| hard pulse ³⁾ (max. length 360°) | 8.0 μsec | 8.0 μsec |
| hard pulse for lossy samples | Power level corresponding to 8.0 μsec pulse for non-lossy sample | Power level corresponding to 8.0 μsec pulse for non-lossy sample |
| trim pulse p28: ⁴⁾ | 2 msec @ 10 μsec | 2 msec @ 10 μsec |
| TOCSY spin lock | 200 msec @ 25 μsec | 200 msec @ 25 μsec |

Note: all values require a minimum repetition rate appr. $d1+aq$ of 1sec ²⁾
Important: observe the separate notes on the following page!

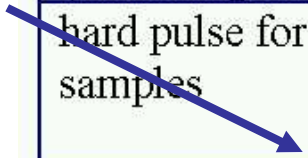
3. Max. pulse length

| | 5mm 500MHz TXI CryoProbe™ | 5mm 600MHz TXI CryoProbe™ |
|--|--|--|
| ¹ H | | |
| hard pulse ³⁾ (max. length 360°) | 8.0 μsec | 8.0 μsec |
| hard pulse for lossy samples | Power level corresponding to 8.0 μsec pulse for non-lossy sample | Power level corresponding to 8.0 μsec pulse for non-lossy sample |
| trim pulse p28: ⁴⁾ | 2 msec @ 10 μsec | 2 msec @ 10 μsec |
| TOCSY spin lock | 200 msec @ 25 μsec | 200 msec @ 25 μsec |

Note: all values require a minimum repetition rate appr. $d1+aq$ of 1sec ²⁾
Important: observe the separate notes on the following page!

| | 5mm 500MHz TXI CryoProbe™ | 5mm 600MHz TXI CryoProbe™ |
|---|--|--|
| ¹ H | | |
| 8.0 μsec ³⁾ (pulse length 360°) | 8.0 μsec | 8.0 μsec |
| hard pulse for lossy samples | Power level corresponding to 8.0 μsec pulse for non-lossy sample | Power level corresponding to 8.0 μsec pulse for non-lossy sample |
| trim pulse p28 ⁴⁾ | 2 msec @ 10 μsec | 2 msec @ 10 μsec |
| TOCSY spin lock | 200 msec @ 25 μsec | 200 msec @ 25 μsec |

4. ¹H trim pulses



¹H pulses:

- shortest pulse allowed for non-lossy samples:

8usec (max. 360°)

- hard pulse for lossy samples:

power level corresp. to 8usec for non-lossy sample:

- trim pulse 'P28':

2ms @ 10usec ¹⁾

- TOCSY spin lock:

200ms @ 25usec ¹⁾, 400ms @ 35usec ¹⁾

- ROESY, Waltz16-decoupling:

up to CW @ 100usec ¹⁾

¹⁾ power and pulse of non-lossy sample

¹³C pulses:

- shortest pulse allowed:

15usec (max. 360°)

- trim pulses:

2ms @ 25usec

- CC spin lock:

20ms @ 25usec

- GARP decoupling:

140ms @ 65usec (500MHz) / 55usec (600-800MHz)

- selective pulses:

500-600 MHz: Q5: 320usec

Q3: 256usec

700-800 MHz: G4: 308usec

Q3: 210usec

¹⁵N pulses:

- shortest pulse allowed:

40usec (max. 360°)

- WALTZ16 decoupling:

140ms @ 200usec (500MHz) / 170usec (600-800MHz)

- simultaneous ¹³C, ¹⁵N pulses:

attenuate power by 3dB on BOTH, ¹³C and ¹⁵N channel

Z-gradient:

- absolute max. current:

10A

- max. overall length:

10ms @ 10A