

NMR Setup Instructions

The computer and VME controller card are both connected to an ethernet router with DHCP enabled. Rhode Schwarz RF generator control is connected to computer with a National Instruments GPIB-USB interface.

EXT1 input of RF generator is connected to the #2 DAQ card, DAC Channel D output for frequency sweep.

RF generator output goes to an RF splitter, whose outputs go to the RF input (upper SMA connector) on analog NMR card.

NMR coil is connected to lower SMA connector on same board.

Toggle switch on digital NMR boards must be set to the left hand side, otherwise the card is disabled

Setup steps:

Double click on NMRTCP4 icon on desktop to open Labview NMR program\
Select appropriate NMR Channel #, IP address for VME controller and GPIB address.
GPIB address is usually 28. Controller address can be determined by starting
NBeclipse program and clicking on the IPsetup icon at the top. Address usually
starts with 192.168.xxx.xxx

Start and stop system Labview program.

On the large global display panel, click on edit - reinitialize values to default.

Check Set Initial Settings on Global panel -

Center Freq = 213.0 MHz\
Freq Span = 0.8 MHz. Can be set larger for initial tuning, wide enough to find Q curve.
Freq Step = .002 MHz, giving 400 frequency steps. Set larger if span was increased.
RF level = +9 dBm (for multichannel system with RF splitter only, otherwise 0 dBm)
Tank RF = ON, to apply RF to coil
IF Attenuation = 10 for ~ correct signal strength at IF amplifier
Sweeps = 1000
Autotune = OFF, disables automatic baseline adjustment while tuning
Remove Ped = ON, removes DC offset from display
Gauss Fit = OFF, no peak fitting
Tune = +1.8V, default tuning adjustments below
IFoffset = +2.V
Phase = +4.V for channels 2 and 3, +2.V for channel 1
Log Offset = 0.V, unused
Sample/step = 20, for 20 sweeps acquired, averaged and shown on display
Invert Polarity = OFF, for Log (diode) measurement
IF/LOG = LOG
Gain = Low, for log
Quality cuts = OFF
Subtract Q curve = OFF, used later
Quad/Real Q curve = Quad
AutoFreq = OFF, disables automatic tune voltage adjustment

Coil cable length adjustment and initial tune voltage using log amplifier:

Start Labview NMR program

Adjust cable length to place Q curve center close to 213 MHz. The 1/2 lambda cable
length for one of my inductor/crystal boxes is ~14'94

Adjust tune voltage to place center at 213 MHz. E.g. to move the center of the
Q curve downward in frequency, reduce the tune voltage.

If tune voltage is not $1.5 < V_{tune} < 2.5V$, readjust cable length until tune voltage
is in correct range. Lower tune voltages generally provide better S/N than high.
If the Q curve minimum is at too low a frequency, the cable is too long. If too
high, the cable is too short. Try to get the cable length right to the nearest 1/4
in. If the cable length is too far off, no sensible looking Q curve will be seen
and or the tune voltage will have no effect.
Cable length is a little longer for the LANL system versus UVa, due to internal path
length differences. ~1-2'94 longer, if I remember right.

Phase adjustment using IF amplifier:

Set Invert Polarity = ON and IF/LOG = IF for real part measurement of signal\
Adjust Phase voltage to bring Q curve center back to 213 MHz without changing tune
voltage.

Q curve measurement with IF amplifier:

Set Gain = HI
Set Autotune = ON, to remove DC offset automatically
Wait for pedestal offset to settle to 0V and Q curve should be visible
Readjust Phase voltage to center Q curve on 213 MHz, if needed
Stop and restart labview system, record data as needed

Issues:

Under rare circumstances the communication between the crate controller can get
fouled up. Stop the NMR system and push the black reset button on the VME
controller. Wait 5 seconds and restart the system. This reboots the controller.
Temperature drift frequency compensation has been installed, but may not be optimal
I have a newer version of the Labview program that makes the setup and operation
easier (for January)

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Changing settings:

Gauss fit switch is used to fit a gaussian to the signal peak and display the peak
area

Quad Q curve switch is used to subtract a quadratic Q curve
Quality cuts switch removes bad sweeps from averaging on global display
Invert Polarity switch is used to flip the sign of the Q-curve
IF Atten can be readjusted to keep the IF offset voltage from getting too large

(>4V) or too small (reducing S/N). Changing IF Atten will require a readjustment
of Phase voltage