No C13 signal on Mercury 300

Dr. Shaoxiong Wu **4/2/2014** [Edition 1, Volume 1]

Problem Reported

Mercury 300 NMR System

One is still able to acquire a normal proton spectrum, but there is not C13 signal at all.

Low Band amplifier input and output are OK(500mv input and 8 Volts output with 30dB attenuator). At Low BND TX output J211, measured for tpwr=60, with 30 dB attenuator, it 8.1 Volts. at J5603 7.6V, at J5105 and J5102 7.2 V and after the filter LR1300 7.1V; at the probe 6.9V. Measure Low BND TX Tx Offset J45, 10 Mhz at 277 mv. TX LO out 1.65V at 86 MHz. when acquire proton, (use pure water sample) check the OBS RX OBS 0 J59, one should see an FID. See attached movie. So the transmitter to the probe has no problem. Replaced a working preamplifier with the old one, there is no change. The problem must be at BB RX board. Take the BB RX board out and clean it and reseated, it works!!!!

Double check the probe tune for 1H and C13. Need a 2% H2O in D2O sample and a very concentrated C13 sample (40% Dioxane in Benzene-D6., One scan, should see a good FID. Also you need a special cable that allows you connect the console test pins and oscilloscope.

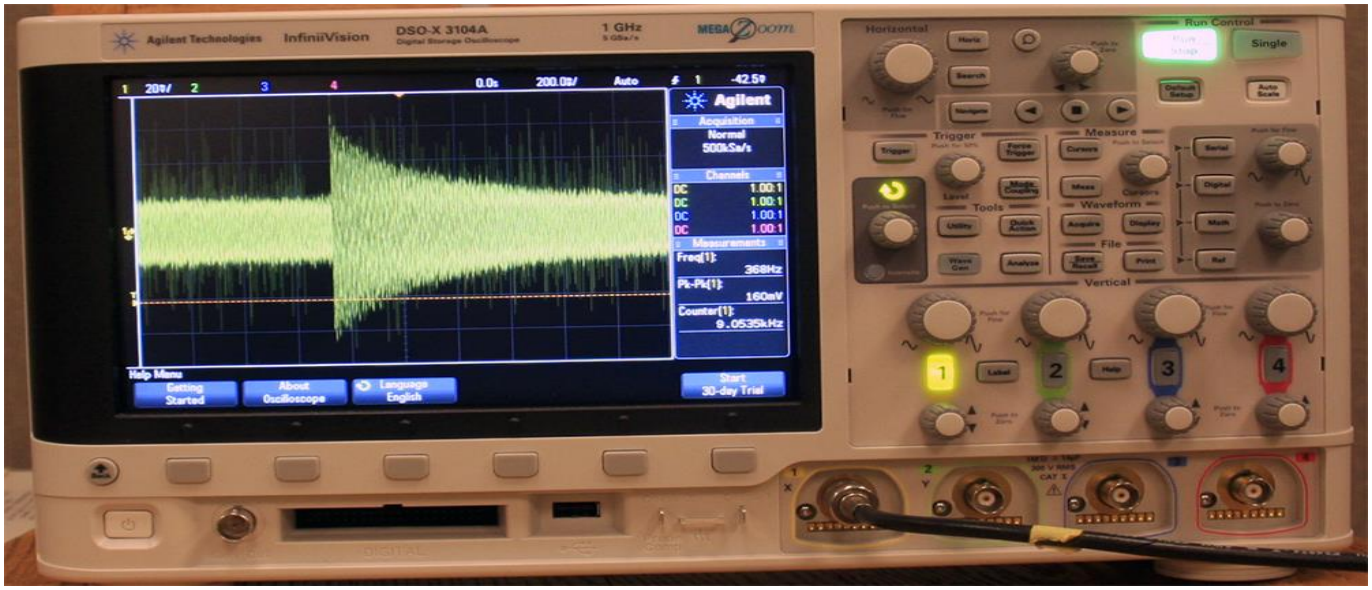
Note: We can observe the FID signal input the BB RX board by using a very concentration samples (C13).

For proton: use 2%H2O in D2O. For Carbon use 40% dioxane in Benzene-D6.

Mercury Version

There are two type of Mercury system, the VX and Mercury Plus. Also there are BB system and 4 nuclear systems (1H, F19, C13/P31 only). Varian discontinued to manufacture the system in 2006.

Some late version, the probe interface is different. It uses the box, rather than the legs.



FID signal observed at RX J59 OBS 0; Proton is easy to see, but the C13, you have to use very concentrated sample.

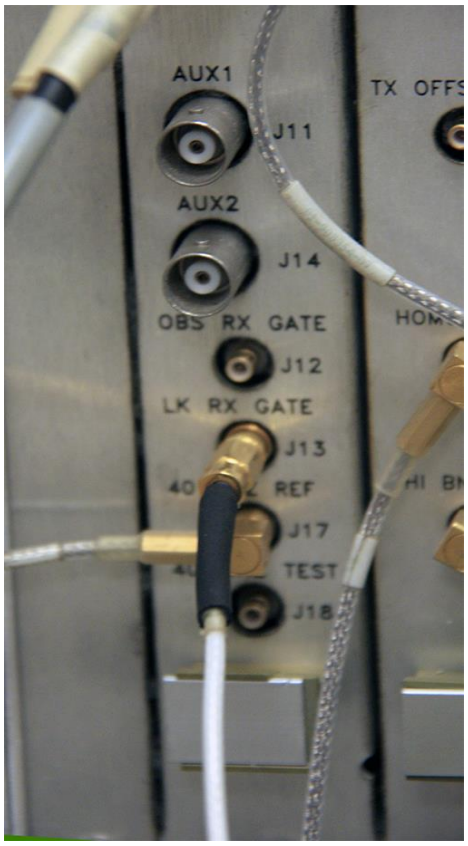


Figure 2. Junction board. J13 is Connected to the oscilloscope.

The blanking signals

You can measure the blanking signal on the Junction board. For OBS RX gate J12 and LK RX gate J13. See figure 2. The gate is to turn the amplifier on/off. For the lock, the gate is fixed. It is about 200 us apart and 4 volts. See the figure 3. You need special connector (see Figure 1) to connect the J13 or J12. Also at J18 (TEST), it should be 40 Mhz at about 4 volts.

The OBS gate signal is a little difficulty to observe. The high pulse is in microsecond, If you set the pw=10us, rofe=0 and alfa=0, the pulse width is 20us. If the rof2=10us, then the pulse width will be pw+10us, so in general the pulse observed is pw+rof2+10us (note it is not related alfa parameter). Between these gated pulses, the time is **d1+at** in seconds. See the Figure 4.

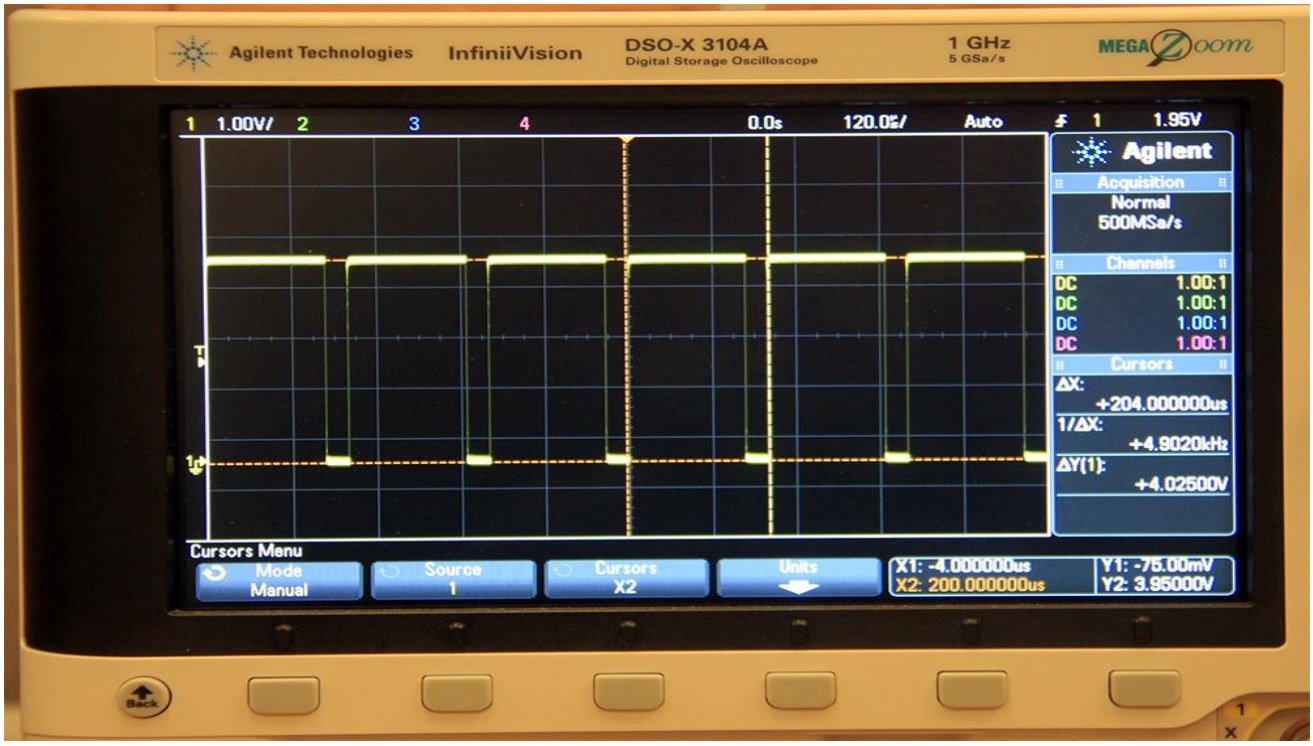


Figure 3. Lock Gate signal at LK RX gate J13.

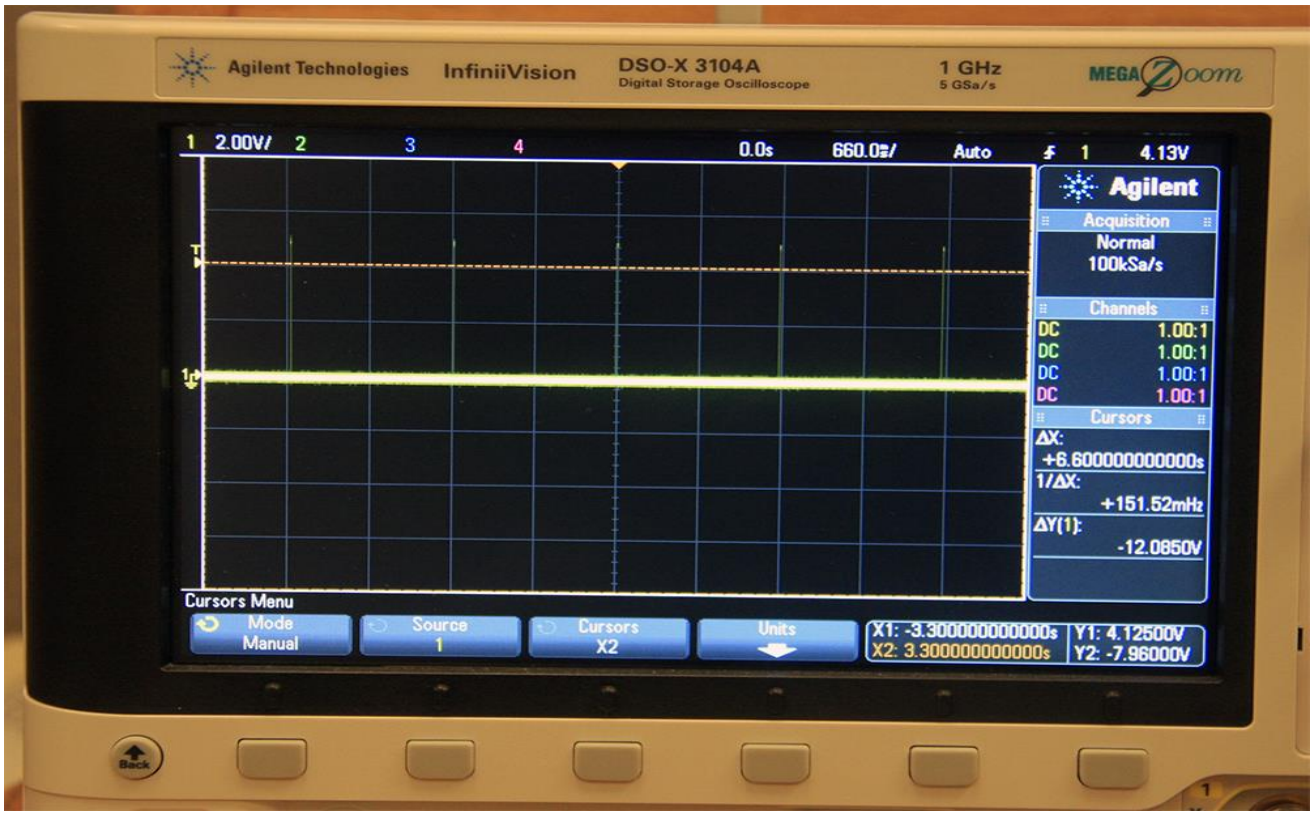


Figure 4. Obsever Gate Pulse. The signal will be inverted at the amplifier gate.

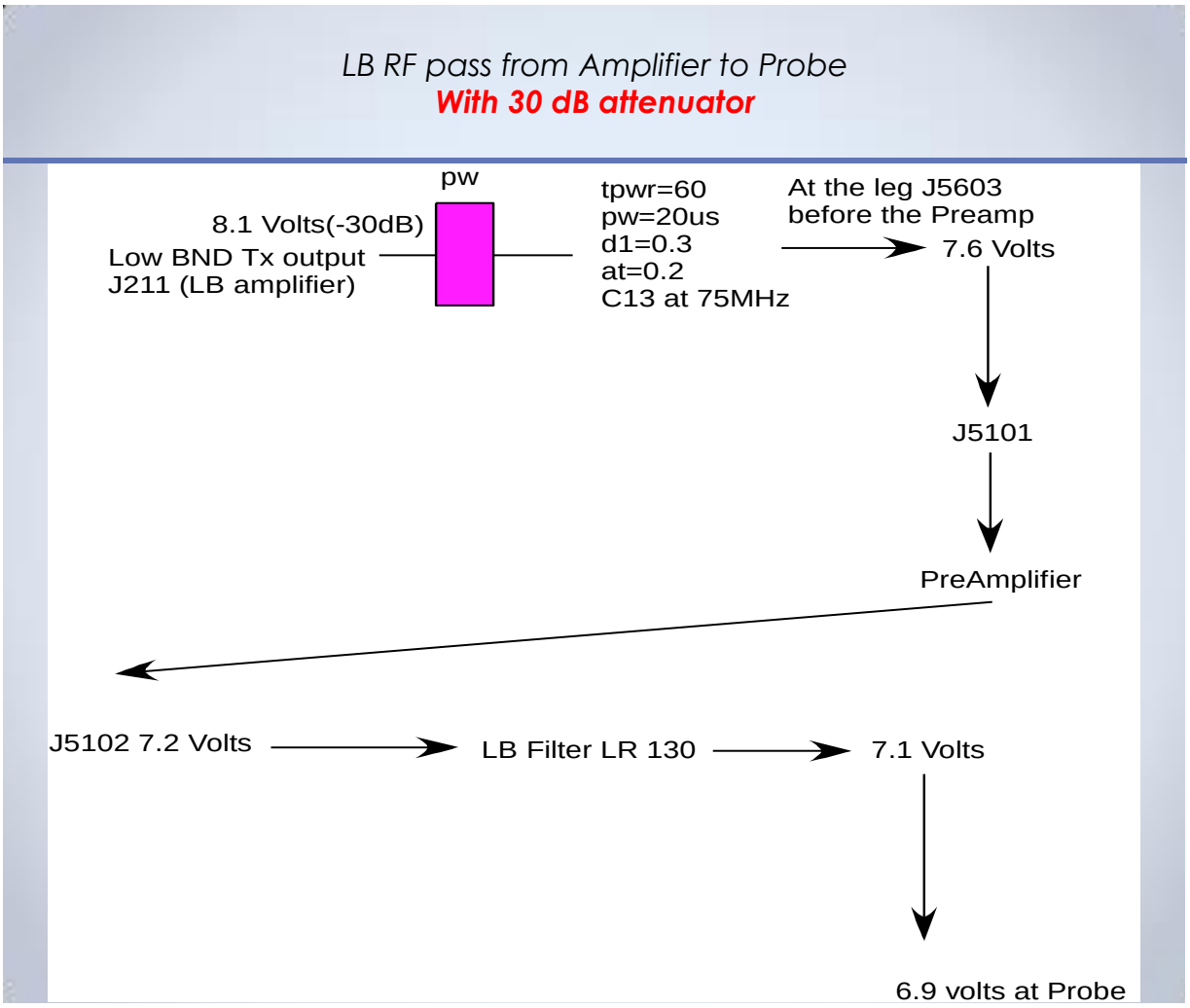
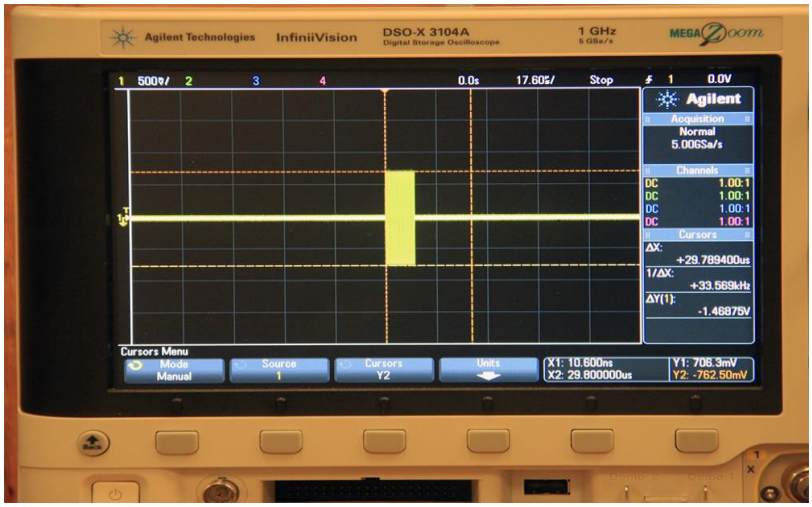


Figure 5. low Band RF pass from Amplifier to the probe. The pulse is from LB transmitter. At Tpwr=60, the pulse should be 1.4 volts at 75MHz for C13. For proton tpwr =60, the pulse is from HB transmitter is about 1.0 volts at 300 MHz. These signals are amplified and deliver to the probe.



An RF pulse from Transmitter BD to the probe. You MUST use an attenuator (-30db, or -20dB).