HDice Work Request Status

Detector Support Group

Monday, July 18, 2016

1. Search for semi-flexible NMR (RF) cables with low loss or controlled temperature variation.
   Status: Completed.

   After extensive research, the flexible, low loss, and temperature stable RF cable manufactured by Molex was selected; a 1,500-foot spool was purchased.

   Adapters to make generic SMA plugs, N-type plugs, and N-type jacks fit the cable were designed, fabricated, and tested.

   Cables for cryostats, RF Splitter/Attenuator Units, and NMR instrumentation rack interconnects were fabricated.

2. Construct two sets of dual cables with lengths adjusted to operate on λ/2 resonance with tuned NMR circuit (RL CL).
   Status: Incomplete.

   Waiting for information on lengths.

3. Install a precision (temperature-stabilized) shunt to directly read current from Oxford supplies that drive the magnets used for NMR — one shunt for each NMR rack.
   Status: Indeterminate.

   After extensive research, a precision, temperature-stabilized current shunt, the CAENels CT-Box, was selected and procured. Delivery time for the CT-box was ~15 weeks.

   As the CT-Box was a new product there were issues with firmware and a lack of detailed documentation. For the DAQ, a device driver library (~ 50 VIs) in LabVIEW was developed. DAQ was debugged, tested, and demonstrated.

   Procurement of the second CT box is pending HDice approval.

4. Update existing NMR analysis codes to the newest version of Mathematica. (e.g. Version 5 to version 8, or the most recent JLab supported version).
   1. General Polarization Data Analysis Package June 2008.nb
   2. Inductance JLab Target Reference.nb
   3. Inductance LEGS Target Reference.nb
   4. Parameters from Resonance Curves v1. nb
   5. RF Birdcage Coils.nb
   6. KK Transformation-Craig.nb
   7. Polarized Lineshape Analysis v1. nb

   Status: Incomplete.

   Required information to update the notebooks to the latest version of Mathematica was not provided by BNL.

5. Upgrade RF distribution and attenuation control to display current settings on attenuator box and integrate into NMR control codes so that changes are reflected in display.
   Status: Completed.

   Two RF Splitter/Attenuator Units' controls were upgraded and have been integrated into the NMR code to display settings on the RF Splitter/Attenuator Units.

6. Write a program to control two power supplies to rotate HDice target polarizations (by varying currents in both solenoid and saddle coils).
   Status: Completed.

   A new LabVIEW program has been developed for the automatic rotation of target polarization. New features include: automatic switching to manual operation mode after an automatic rotation, simultaneous ramping of axial and transverse supplies in the manual mode, and a ramp-hold feature during operation; program has been debugged, tested, and demonstrated.

7. Modify component-ID key portion of the NMR control codes to allow the VI to distinguish between cable types.
   Status: Completed.

   NMR control code was modified to identify different cable and terminator types using component-ID keys. Addition of the component-ID key required redesigning the RF Splitter/Attenuator Units' DAQ module interfaces and connections.

   Component-ID keys for the front panel of the units were fabricated for each type of cable (four types in all). Component-ID keys to DAQ-module interconnects were tested. Modifications and testing of this part of the NMR program is completed.

8. Modify NMR control program to run NMR scans with both positive and negative current in the magnet power supply.
   Status: Completed.

   The section of NMR code that prevents running both positive and negative NMR scans was identified, rewritten, debugged, and tested.

9. Incorporate precision shunt into field controls.
   Status: Completed.

   DAQ developed to read shunt directly was integrated into the NMR program. In the updated NMR program, the online field and lock-in amplifier's X-Y data is displayed on the front panel and allows online viewing of the calculated field using either CT-Box's current readback or the magnetic field readback from the Oxford power supply.

10. Debug and finish existing NMR control codes, eg. NMR field sweep: 

Present system is only understandable for $t_{dwn} = t_{up} = 31$ sec and range = 300 gauss; flexibility to change ranges and compare results is needed.
Status: Completed.

Program errors were identified, rewritten, debugged, tested and demonstrated. New code accepts input values 10 [s] – 300 [s]. Sweep range was increased from 300 [G] to 1000 [G].

11. Re-activate online noise analysis VI.
Status: Incomplete.

Task will be completed during the NMR program re-write; code development needs input from HDice group.

Additional work performed to complete tasks (not listed in the original work request):

1. Upgrading of PCs to Windows 7. After upgrading, PCs needed reconfiguring by Computer Center to disable auto-rebooting and sleep mode and to provide administrative rights to HDice group.

2. Investigation of LabVIEW for Linux; option discarded.

3. Upgrades of hardware and software for RS-485/RS-232 communication hubs.

4. Research of current measurement systems to find systems with <0.1% accuracy.

5. Replacement of HDice development PC after failure. Replacement took ~1.5 months. Initial setup done by Computer Center; DSG installed software and LabVIEW code, configured hardware interface, and tested instrument communications.

6. HDice test stand PCs were upgraded to LabVIEW 2015 and all instrument communication drivers updated, debugged, and tested.

7. Updated of the Oxford power supplies' drivers to LabVIEW 2015 for the rotation of target polarization program.

8. Developed drivers to have the capability to use either the original Oxford power supplies or the new Oxford Mercury iPS power supplies, which do not have GPIB interface.